Operation Manual

INTEGRAL dx MIXER TRUCK

Part# 30357090
Revision: 2
Date: 3/28/2023

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Montevideo, MN 56265
320-435-0003
www.integraldx.com

CALIFORNIA

PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Introduction

1

This chapter covers introductory information for the Integral dx Mixer Truck.

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Manufacturer's Statement

The information contained in this operation manual is absolutely necessary for the safety, setup, operation, maintenance, and servicing of your Integral dx Mixer Truck. By learning this information and practicing it every day, your mixer will give you efficient and reliable service year after year. For your own benefit and safety, read the information in this manual and follow the instructions to the letter. With the wide variations of climate and terrain, some of the procedures and preventive maintenance may not apply to all areas. If you have any questions regarding operation in your climate please don't hesitate to contact us.

Before you operate your mixer for the first time, you should read the operating instructions several times through. We recommend that you keep a copy with the mixer for quick reference while on the job site. However, the general knowledge must be in place before you arrive on the job site. Any person that operates the mixer must be familiar with the operating instructions. The machine is built with the latest technology and safety regulations in mind, but it may still be dangerous to people and property if it is operated, maintained, repaired, or used incorrectly.

The illustrations contained in this manual are intended to clarify text passages. They may look slightly different from your mixer, but this has only been allowed if it does not fundamentally change the factual information.

The mixer body is covered by a written, twelve (12) months from the date of purchase or 2000 hours, warranty from the manufacturer. This warranty is provided on the last page of this manual. Please review it carefully because this is the only warranty covering the product. All warranty claims and other claims regarding the product must be made strictly in conformity with the written warranty. As detailed in the warranty, the manufacturer is not responsible for incidental or consequential damages, including lost profits.

The mixer capacity identified on the Main ID tag (Figure 1-2) is the certified volume of the drum provided with the mixer. Actual/Maximum allowable payload for on road use for your concrete mixer vary by Federal, State, City and Local Municipalities regulations/laws. The owner/operator is responsible for adherence to these regulations/laws and determining the payload/weight you are allowed to transport in your concrete mixer.

How to reach us

If you encounter a circumstance that is not covered by this manual, the Integral dx Call Center will be more than happy to assist you with all of your parts and service needs.

- 320-435-0003

To place an order for spare parts, go online to **www.integraldx.com**, or call our parts line

When contacting the Call Center please provide the mixer model and serial number. You can find the model and serial number on the Main ID tag that is mounted to the front pedestal on the drivers side, Figure 1-2.

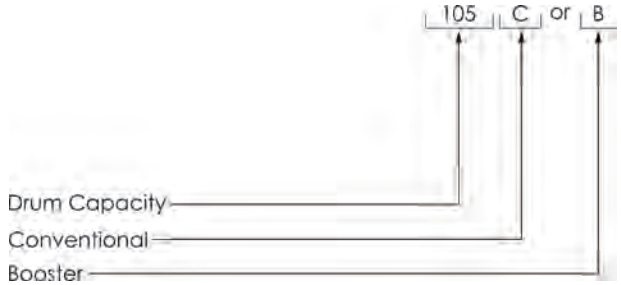
Model Number Nomenclature

The complete model number of the mixer is designated by a code, as in:

105C

The code is broken down as follows, Figure 1-1. Reference Section 2 (Page 2-2) for nomenclature.

Figure 1-1 Model number nomenclature



ID Tag

The Main ID tag, Figure 1-2, lists the model and serial number of the mixer. The serial number is also stamped into the front pedestal on the drivers side, immediately above the Main ID tag.

Figure 1-2 Main ID Tag

Expected Service Life

When used properly, the mixer has a service life of up to 15 years.

Below are the recommended operating conditions for the mixer truck:

- Maximum 8 hours of operation per job.
- Maximum ambient temperature of 86˚ F
- Maximum installation of 2600 ft above sea level
- Maximum relative humidity of 75%
- Hydraulic pressure 60% of P_{max}
- Maximum of 1000 jobs per year

Final Decommissioning

When the mixer has reached the end of it's service life, it needs to be decommissioned and disposed of in compliance with regional regulations.

Steel can be cut-up and recycled. Oils, greases, plastics, electrical components, rechargeable batteries, etc, need to be disposed of in a proper manner.

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Specifications

This chapter covers specification information for the Integral dx Mixer Truck.

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Mixer Specifications

Model	10	105C* or B**	11C* or B**	12C* or B**
Mixing capacity	10 yds³	10.5 yds³	11 yds³	12 yds³
Mixing speed	6-18 RPM	6-18 RPM	6-18 RPM	6-18 RPM
Agitation capacity	13.25 yds³	14 yds³	14.75 yds³	16.25 yds³
Agitation speed	1-6 RPM	1-6 RPM	1-6 RPM	1-6 RPM
Minimum number of revolutions for mixing	70	70	70	70
Minimum revolutions after adding water	30	30	30	30
Gross drum volume	448 ft³	472 ft³	496 ft³	544 ft³
Hydraulic fluid capacity Conventional	12 Gallons	12 Gallons	12 Gallons	12 Gallons
Hydraulic fluid capacity Booster	18 Gallons	18 Gallons	18 Gallons	18 Gallons

ICT: Integral dx Control Technology

Naming Convention:

ICT: EP_7RK_W_SMART

Code	Decsription
EP_	EP = Electronic Proportional CC = Cable Control
7RK_	7 = 7" LCD Touch Screen w/Backup Camera 3 = 2.8" LCD Screen R = Rocker Switch J = Joystick 0 = Blank plate K = Keypad module
W_	W = Wireless P = Pendant C = Cable Control with Pendant
SMART	SMART = Automatic Constant Speed

Available Options

Drum Material

- Standard shell
- Heavy shell/heavy blades
- Standard shell/heavy blades

Drum Options

- Single Square Bolted Hatch STD
- Dual Square Bolted Hatch
- Round Quick Open Hatch
- With 2"-3" Washout Holes in Fins

Controls

- Cable Controls
- Electronic Controls
- Smart Controls

Control Options

- Drum Start/Stop Switch In Cab and Rear Control
- Constant Speed Control - Eaton
- 8 Foot Rear Pendant
- 25 Foot Rear Pendant

Chute and extensions

- 4' Steel Chute
- 4' Aluminum Tuff-Lite Chute with Liner
- Paving Fold-Over With 36" Extension
- 4' Steel Tapered Chute

Chute and extensions

- Chute Stop Kit (Orange)
- Chute Shutter Forfam m100 (Steel)
- Street Guard Chute Cover (Polyurethane)
- Chute Vibrator - Vibco ss-1-1/4

Pump

- Front PTO
- Rear PTO

Washout Systems

- Chute Wash Recovery System Drivers Side
- Enviroguard Chute Wash System
- Washout Watchdog Recycle System

Hopper

- Tilt Hopper with Indicator Light (Cable & Electronic)
- Tilt Hopper No Indicator Light (SMART Only)
- Low Profile Charge Hopper Mount
- Tilt Hopper Cylinder Boot

Fender

- 115” Deck STD (Stop, Tail, Turn)(Reverse)
- 115” Deck LED (Stop, Tail, Turn)(Reverse)
- 115” Deck STD Dual (Stop, Tail, Turn)(Reverse on Truck Frame)
- 115” Deck LED Dual (Stop, Tail, Turn)(NO Reverse)
- 161” Deck STD (Stop, Tail, Turn)(Reverse)
- 161” Deck LED (Stop, Tail, Turn)(Reverse)
- 161” Deck LED Dual (Stop, Tail, Turn)(NO Reverse)
- 175” Deck STD (Stop, Tail, Turn)(Reverse)(Solid Deck)
- 175” Deck LED (Stop, Tail, Turn)(Reverse)(Solid Deck)
- 3 Axle Extension STD (Stop, Tail, Turn)(Reverse) (150” Deck W/ Extension)
- 3 Axle Extension LED (Stop, Tail, Turn)(Reverse) (150” Deck W/ Extension)
- 4 Axle Extension STD (Stop, Tail, Turn)(Reverse)
- 4 Axle Extension LED (Stop, Tail, Turn)(Reverse

Fender Options

- Front Aluminum Mud Flaps
- Plastic Mud Flaps
- Mud Flap Spring Kit
- Rubber Fender Edge Extension to Frame

Water system

- 65 GAL stainless steel
- 75 GAL stainless steel
- 90 GAL stainless steel
- 100 GAL stainless steel
- 125 GAL stainless steel
- 125/15 GAL stainless steel
- 150 GAL stainless steel

Water Tank Mount

- Cross Mount with Standard Step
- Cross Mount with Protech Aluminum Toolbox w/ Step
- Side Mount 65 - 125 Gallon
- Side Mount 125/15 - 150 Gallon
- Side Drop Mount 65 - 125 Gallon
- Side Drop Mount 125/15 - 150 Gallon

Water Tank Mount

- Spring Loaded Ball Valve
- Remote Electical Water Valve - 12v Alcon
- Digital Water Meter 3-30 GPM - Great Plains Industries
- Hose Connection at Water Tank (Hose Not Included)
- In-Cab Semi-Auto Slump Meter - Concrete Controls Corp
- Cold Weather Drain
- Drum Spray Down System
- Cold Climate Isolation Loop
- Pressurized Water Blowout System
- Extra Hose Rack Option
- Electronic Water Solenoid in Cab (Badger)

Miscellaneous

- Water Separator
- Stabilizer Eyelet Front and Rear Pedestal 2 each side
- Hose Separator
- Chassis Canvas Cover
- Front Slump Meter Mounted on Gear Box
- Rear Tow Hook Plate
- Cone Holder
- Bucket Holder
- Discharge Indicator Light

Booster Axle Option

- Aluminum Wheels
- Steel Wheels
- No Wheels
- Anti-Lock Brakes
- In-Cab Axle Gauge
- Cylinder Rod Protection Option.
- Booster Bumper

Safety

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This chapter covers safety information for the Integral dx Mixer Truck.

General Safety

This Safety section is a guide for the prevention of accidents. Knowing this information is absolutely necessary for safe driving, set up, operation, cleaning and maintenance of the mixer truck.

Safety is one of the major concerns of every person involved in the concrete industry. Although much of the responsibility for everyday safety rests upon you, it is vital that everyone involved makes safety the top priority.

Although this Safety section covers a great deal of information regarding the prevention of accidents while operating a truck-mounted mixer, it is unlikely that every possible circumstance has been covered. Regardless of how thorough a manual like this may be, there is always the unexpected. Please understand that there is no substitute for common sense and dedication to the idea that you are responsible for your own safety and the safety of those around you. You have to know the rules first, but you must keep your mind on the job for the rules to keep you and your co-workers safe. No attempt has been made in this Safety section to provide the highly specialized knowledge of the operation of the individual mixer truck that is critical for safe and proper operation. For that, you must read and understand the Operation Manual for the mixer truck(s) that you operate!

The triangle with the exclamation point inside is used to alert you to an important safety point and is called a "safety alert symbol". One of the following signal words will appear after the safety alert symbol:

Figure 3-1 Safety alert symbols

⚠ DANGER	Indicates a hazardous situation which, if not avoided, **WILL** lead to death or serious injury.
⚠WARNING	**I**ndicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, **COULD** result in minor to moderate injury.

The signal word **CAUTION** used without the safety alert symbol means the point addresses a hazard which COULD cause damage to equipment or property.

Preliminary Safety Rules

What to do before you arrive at work

⚠WARNING Never go to a job site, or work on, around, or near concrete machinery under the influence of drugs or alcohol. Beware of "over-the-counter" drugs; many have specific warnings about operating machinery after taking the medication.

⚠WARNING Don't bring your personal problems to work with you. In an office setting this may be annoying to co-workers, but on a job site it can be deadly. The workers around you depend on you for their safety.

⚠WARNING Do not operate the mixer truck until you have read and understand the truck's Operation Manual. Lack of understanding of proper operating procedures could result in unsafe operation. Operation Manuals are issued with each new truck. If you haven't seen it, ask your supervisor. Replacements are available from the manufacturer.

⚠WARNING Get enough sleep to be ready for the day's work. Accidents can happen when the body is on the job but the mind is not.

Dress in appropriate apparel, Figure 3-2. You should wear these items when hauling concrete:

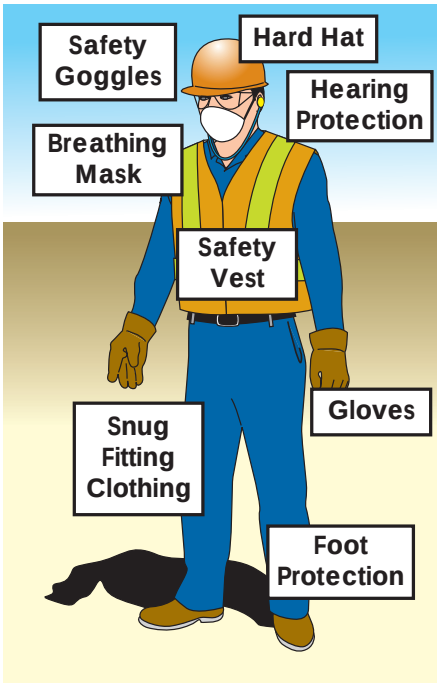
- Hard hat
- Hearing protection.
- Safety glasses or goggles.
- Snug fitting clothes.
- Gloves.
- Steel-toed shoes.
- Safety vest.

In addition, you should wear:

- Breathing mask when cement dust in the air.
- Rubber gloves when contacting concrete.
- Rubber boots anytime you have to stand in concrete.

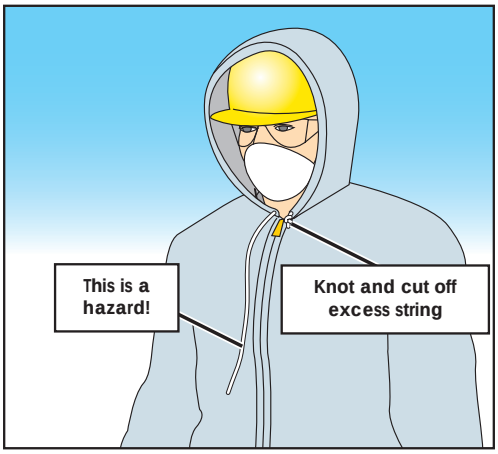
NOTE Jewelry, athletic shoes, sandals, and shorts are examples of clothing that must **NOT** be worn.

Figure 3-2 Personal Protective Equipment (PPE)



⚠WARNING Do **NOT** wear clothing with long strings or fringes that could be caught in moving parts, Figure 3-3.

Figure 3-3 No strings or fringes



⚠CAUTION Arrive to work on time. Accidents can be caused by hurrying through procedures.

Pre-departure Safety Inspection

⚠WARNING Do **NOT** operate the mixer until it is in safe and proper working condition. You are responsible for checking that repairs have been completed. Check the service record status for your truck.

⚠WARNING Do **NOT** operate a mixer truck with missing, incomplete, or damaged safety equipment and guards. Check that they are in place and in good condition.

⚠WARNING Ensure that all safety decals are in place and readable. Obtain replacements if missing or unreadable.

⚠WARNING Ensure that the mixer truck is equipped with accessories, components, and tools you will need. "Making do" with inappropriate equipment can cause accidents.

⚠CAUTION Ensure all fluid levels on the truck you will drive to the job site.

⚠CAUTION Ensure the oil, cooling system, and the air pressure system of the trucks. Accidents can occur when a lack of maintenance causes a distraction while operating the equipment.

⚠CAUTION Ensure the battery. It must have enough charge to start and operate the engine. You will be rushed if you have to do repairs before you can begin operation.

⚠WARNING Inspect the tires and brakes on the truck. Never drive a truck with bald or cracked tires, or with weak or worn brakes. If you have air brakes, ensure that the air system is free from leaks and maintains pressure when driving. Loss of air pressure causes the brakes to apply while vehicle is in motion. If driving continues after the brakes are applied, the resulting friction could cause enough heat to start a fire.

Drain moisture from the air tanks that supply the unit's brakes (if so equipped). This is especially important if weather conditions could cause the moisture to freeze. If you lose air pressure because of frozen moisture, the brakes apply themselves, and you will have to stop driving until the unit is repaired.

⚠CAUTION Ensure that the ladder is latched before driving the truck or the ladder might fall.

⚠WARNING Mount or dismount the truck or mixer using the 3 point rule, keeping two hands and one foot or one hand and two feet in contact with a secure surface at ALL times, Figure 3-4.

Figure 3-4 Three point rule

⚠WARNING Never mount or dismount the truck or mixer while carrying objects that prevent using the "3 point rule." Move objects separately.

⚠WARNING Do **NOT** drive the truck until chute latches are locked. Verify the fold-over chute and extensions are chained or latched to avoid injury. If the locking device is damaged or worn, it must be repaired.

⚠WARNING Verify that the cab is free from any loose items, (such as empty soda cans, loose tools, etc.) that could interfere with truck operation.

Know proper use of all road-related emergency equipment (warning signs, flares, fire extinguisher, etc.). Verify they are present and secure for travel.

Verify all personal protective devices (hard hat, safety goggles, rubber gloves, etc.) are secure for travel.

⚠WARNING Verify windshield and mirrors are clean and free of frost or ice and that the mirrors are properly adjusted.

⚠WARNING Verify head lights, tail lights, turn signals, brake lights, backup warning alarm, and backup lights are operational.

In some cases you may operate a truck other than the one with which you are familiar. In these cases, be sure to:

- Know weight of the mixer truck both full of concrete and empty.
- Know height and width of the mixer truck.
- Have a copy of the Operation Manual in the truck.
- Ask the truck's regular driver, the dispatcher, or your supervisor questions regarding unusual or unique operational characteristics of the truck.
- Operate the truck at the batch plant to familiarize yourself using the controls and read the Operation Manual. This is especially important if the new truck is different than the one you normally operate. Your co-workers depend on you to know the truck.

⚠WARNING Verify all loose items on the mixer truck are secure for travel before driving.

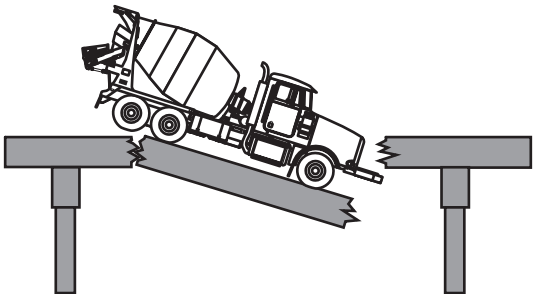
Safety While Driving The Truck

Federal Regulation 49 CFR 392.20 - Unattended Vehicles; precautions. No motor vehicle shall be left unattended until the parking brake has been securely set and all reasonable precautions have been taken to prevent the movement of such vehicle.

Select your route carefully. Know the weight and height of the truck. Avoid steep hills, residential areas, road construction, low overpass clearances, and narrow bridges when possible.

⚠WARNING Be certain bridges and roadways can support the weight of the truck and the load, Figure 3-5.

Figure 3-5 Know your weight



⚠WARNING Verify the truck will clear before driving under any structure.

⚠CAUTION Know the rules and laws that apply in your state and locality. They have been enacted for your protection and the protection of those around you.

⚠WARNING Do not drive under low-hanging overhead power lines; look for another route or contact the power company responsible for the lines and have them de-energized, Figure 3-6.

Figure 3-6 Electrocution hazard

⚠WARNING Use caution when working with a concrete pump truck. Electricity will pass through both trucks if pump truck is in contact with live wires, Figure 3-7.

Figure 3-7 Electrocution hazard

⚠WARNING Never refuel the mixer truck near hot surfaces, sparks, or open flames, and never smoke during refueling, Figure 3-8.

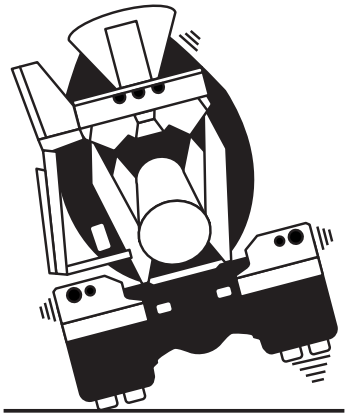
Figure 3-8 Explosion hazard

⚠WARNING Water tank under pressure. Do **NOT** remove pressure regulator or adjust it to more than 55 PSI.

⚠WARNING Never back up without a guide.

⚠WARNING Do **NOT** drive the mixer truck overloaded. Truck-mounted concrete mixers have a high center of gravity. Use caution when making sharp turns, Figure 3-9.

Figure 3-9 Tipping hazard



⚠CAUTION Never drive the truck with concrete in the chutes. Concrete could splash out and damage other cars or property.

⚠WARNING Use one gear lower going downhill than it would take going up.

⚠WARNING No passenger is allowed in the cab unless a manufacturer's approved passenger seat and seat belt are provided.

⚠WARNING Slow down at intersections, near playgrounds, residential areas, and near schools. Children do not know that heavy trucks need more distance to stop

⚠WARNING Drive defensively. You are at a disadvantage for maneuverability and stopping distance.

⚠CAUTION Do **NOT** exceed the GVWR (Gross vehicle weight rating) or GAWR (Gross axle weight rating). Exceeding these limits may cause damage to the equipment.

Job Setup Safety

The job-setup phase can set the stage for accidents. Set up the job correctly. This will promote a safe, trouble-free day.

You are responsible for the safe operation of the mixer truck. Notify your employer, the job superintendent, and/or O.S.H.A. if you are asked to set up in an unsafe manner. You are not required to take a chance with safety. You are the only person who can decide that the job situation is safe.

⚠WARNING Federal Regulation 49 CFR 392.20 - Unattended Vehicles; precautions. No motor vehicle shall be left unattended until the parking brake has been securely set and all reasonable precautions have been taken to prevent the movement of such vehicle.

⚠WARNING Fresh concrete is extremely alkaline and can cause severe burns. Protective clothing should be worn when working with concrete. If concrete comes in contact with skin, wash area with water. If concrete comes in contact with eyes, rinse immediately with water and get prompt medical attention.

⚠WARNING Do **NOT** exceed 3 m.p.h. when approaching the discharge area. Use the lowest gear in the truck.

⚠WARNING Do **NOT** drink the water. Serious internal injury may result.

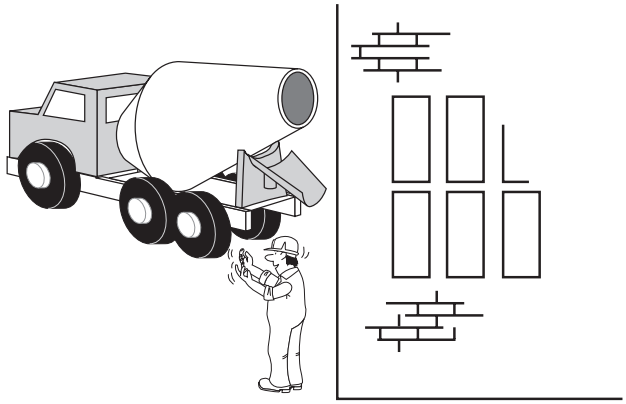
⚠ DANGER Do **NOT** go near or contact electric lines! Never decrease safety distance to reach an unsafe area with mixer. Position truck so a safe distance is maintained in all locations, Figure 3-10.

Figure 3-10 Electrocution hazard

⚠ DANGER Never rely on anyone at the job site that a power line has been de-energized. Assume a power line is live. Only a qualified representative of the responsible power company can verify a line has been de-energized.

⚠WARNING Maintain a safe distance from obstructions such as cranes, scaffolding, and buildings, and always use a spotter when backing, Figure 3-11.

Figure 3-11 Use a spotter



⚠WARNING Never back up when someone is standing behind the truck. Have guides stand to the side, Figure 3-12.

Figure 3-12 Crushing hazard

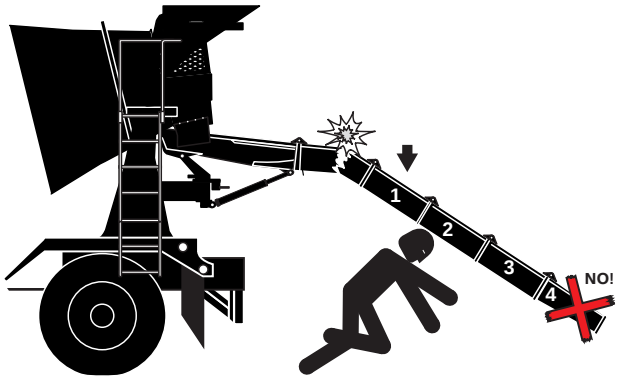
⚠CAUTION Remove any snow, ice, oil, or dirt from steps and platforms. Ladder or platform may be slippery.

⚠WARNING Check soil conditions before driving or unloading at a job site, especially in residential areas.

⚠WARNING Do **NOT** stand under the chute at any time. Keep hands clear of the fold- over chute when folding.

⚠WARNING Do **NOT** use more than 3 extension chutes. Do not replace with other types or styles of chutes. If extensions are connected to the chute, they must not add any weight on the chutes, Figure 3-13.

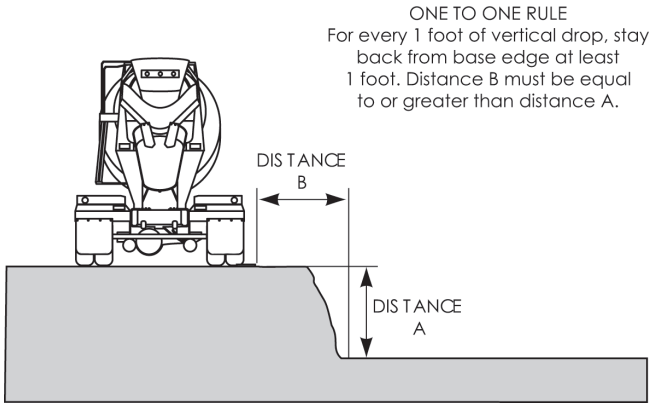
Figure 3-13 Maximum extensions



⚠WARNING Use two hands when flipping chutes, and always avoid putting fingers or other body parts between the two chutes.

⚠WARNING Maintain a safe distance between the mixer truck and the edge of a cliff or excavation. The rule of thumb is: for every foot of drop, stay back from base edge 1 foot. This is known as the one to one rule, Figure 3-14.

Figure 3-14 One to one rule



⚠WARNING Do **NOT** park on sloping terrain without the use of wheel chocks. Place wheel chocks under tires when parking on sloping terrain. Release the brakes, and allow the truck to settle against the chocks; then reapply the brakes.

⚠WARNING Do **NOT** let anyone under the truck while running. The rotating driveline(s) and hot components create serious hazards.

⚠WARNING Never operate the mixer truck if it is not safe. If spectators will be near the pour, cordon off a safe area.

⚠WARNING Secure the truck against unauthorized use! Stay with the truck, activate the stop switch, or remove the key and take it with you; then lock the cab of the truck.

⚠WARNING Select a safe approach and departure from the pour. Adjusting your set-up position by a few degrees could mean the difference between a safe or unsafe position. Some examples of unsafe positions are: too near an excavation or sticking out into traffic, as well as not leaving room for another mixer to access a pump.

⚠WARNING Secure the immediate area surrounding the mixer truck from public traffic following all applicable regulations (warning lights, safety cones, barricades with flashers, etc.).

⚠WARNING Do **NOT** let down your guard when the pour is completed. Accidents happen during clean out and the drive back to the batch plant. It is important not to become relaxed about job safety until you are no longer on the job.

Operation Safety - Drivers

⚠WARNING Only qualified drivers are allowed to operate the truck-mounted mixer. A "Qualified Driver" is defined as someone who:

- has reached the age of 18 years (21 for interstate travel),
- is physically and mentally capable,
- has been trained in the operation and maintenance of the truck and mixer,
- has demonstrated his/her capabilities to the employer regarding the operation and maintenance of the truck and mixer, and
- can perform these duties in a reliable manner.

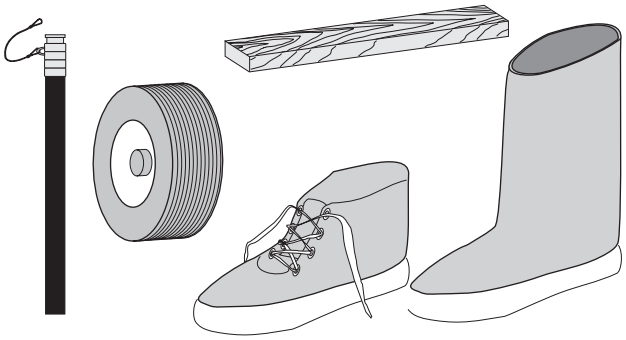
⚠WARNING You are responsible for the safe operation of the mixer truck. It is crucial that you understand the proper operation of the truck and the safety rules that apply to the job. Safe action must be used in unplanned circumstances. Only thorough training and supervised job experience can supply the necessary understanding.

⚠WARNING Wear personal protective clothing when operating the mixer truck.

⚠WARNING Close and lock all guards, covers, and service flaps during operation.

⚠ DANGER High voltages make conductors out of materials that would normally not conduct! Many nonconductors will conduct enough current to kill you if you contact the 8000 volts to ground that is normally found on power poles in the United States. Industrial areas may have wires with voltages higher than 8000, Figure 3-15.

Figure 3-15 High voltage conductors



Some examples of materials that normally do not conduct electricity. ALL of these items will conduct 8000 volts well enough to cause death.

⚠CAUTION While standing near a working mixer, sound pressure levels may exceed O.S.H.A. standards for constant exposure. Use hearing protection, Figure 3-16.

Figure 3-16 Noise level exposure limits

PERMISSIBLE NOISE EXPOSURES*

Duration per day in hours	Sound level in dB (A) Slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or LESS	115

*Under part 1910.95 "Occupational Noise Exposure," (Department of Labor) of the Code of Federal Regulations, Chap. XVII of Title 29 (39 F.R. 7006).

⚠WARNING Never back up when someone is standing behind the truck. Have a guide stand to the side, Figure 3-17.

Figure 3-17 Crushing hazard

⚠WARNING You must have communication with the pump operator. He/she will indicate the status of the load, especially when the mixer is nearly out of concrete.

⚠WARNING Do **NOT** allow unauthorized persons in the operational area of the mixer. Warn unauthorized persons in the area to leave. Stop work if they do not obey.

⚠WARNING Do **NOT** allow anyone to climb on the ladder or stand on the platform while the truck is in motion.

⚠WARNING Never leave truck unattended!

⚠WARNING In an emergency you may need to stop the pump truck. Have the pump operator teach you the emergency stop procedure.

⚠WARNING Never remove the fuel cap or refuel the truck near hot surfaces, sparks, or open flames. Never smoke while refueling.

⚠WARNING Never place tools, hoses, hands, arms, or any part of the body or clothing into a pump hopper, Figure 3-18.

Figure 3-18 Crushing hazard

Do not put any body part in the pump hopper or on moving parts of the mixer

⚠WARNING Never place tools, hoses, hands, arms, or any part of the body or clothing into or near fins, rollers, drum, or any other part of the mixer while it is in motion.

⚠WARNING Do **NOT** work on PTO or shaft (with or without guards) when the engine is running. The PTO rotates when the engine is running. Turn off the engine and remove the key.

⚠WARNING Do **NOT** work on the hopper or hydraulic system unless the drive engine is turned off and accumulator pressure (if so equipped) has been released! On trucks with internal combustion engines, the key must be removed. If there is more than one key, you should tag the ignition.

⚠WARNING Never lean or climb over railing.

Operation Safety - Co-workers

The following rules should be read and understood by persons who will be in the vicinity of the mixer truck, even if they will have no direct involvement with the operation.

⚠WARNING Do **NOT** attempt to remove foreign objects from the hopper or grate of a pump while the pump hydraulic system is working or moving. Signal the pump operator to stop the pump.

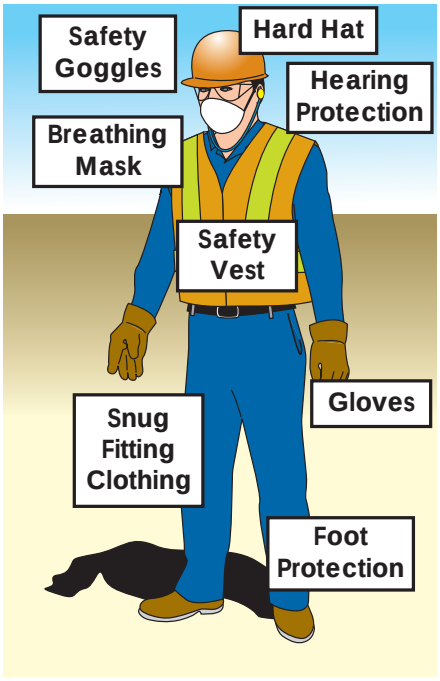
⚠WARNING Do **NOT** operate the mixer unless you are a trained driver and the regular driver has released the controls to you. There must not be more than one driver at a time. This does not apply to stopping the truck or drum in an emergency.

⚠WARNING Never place tools, hoses, hands, arms, or any part of the body or clothing close to the fins, rollers, drum, or any other part of the mixer while in motion.

⚠WARNING Know how to stop the mixer. Have the driver show you the locations of the stop switches.

⚠WARNING Wear the same personal safety equipment as the driver. Goggles, hard hat, ear protection, vest, and rubber gloves are important when working near the hopper, Figure 3-19.

Figure 3-19 Personal Protective Equipment (PPE)



⚠WARNING Never position yourself between a ready mix truck and a concrete pump or other obstacle! Stand to the side, so the ready mix driver can see you at all times, Figure 3-20.

Figure 3-20 Crushing hazard

⚠WARNING Do **NOT** climb on the ladder or stand on the platform while the truck is in motion.

⚠WARNING Do **NOT** flip the chutes of the mixer truck unless instructed to do so by the driver. If you are instructed to do so, use two hands when flipping chutes, and always avoid putting fingers or other body parts between the two chutes.

⚠WARNING Never lean or climb over the safety railing near the hopper, Figure 3-21.

Figure 3-21 Falling hazard

Do not climb over railing

Truck Maintenance Safety

Safety Inspection

⚠WARNING Proper and timely maintenance is important to the safe operation of a ready mix truck. The proper procedures are outlined in the Maintenance section. Do not put it off. Keep accurate records. The lives of the driver and workers on the job are depending on it.

⚠WARNING Replace safety devices or guards that have been removed for servicing before the truck is put back in service.

⚠WARNING Keep the truck clean! Oil spills, grease, loose tools, and scattered accessories are hazards.

⚠WARNING Do **NOT** change the maximum relief valve setting on any hydraulic circuit without permission from the manufacturer. Never change an accumulator circuit pressure setting without specific instructions from the manufacturer.

⚠WARNING Never make unauthorized modifications to structural members or pressure circuits.

⚠WARNING Do **NOT** repair damaged hydraulic hoses; they must be replaced.

⚠WARNING Never attempt repairs on a truck using worn, damaged, or defective parts.

⚠WARNING Do **NOT** weld on pressurized water tanks. If a tank is damaged or corroded, it should be replaced and not repaired.

Maintenance and Service Safety

⚠WARNING Repairs should be made by qualified workshop personnel. (See the Glossary section for the definition of Qualified Personnel.)

⚠WARNING Read and understand procedures in the Maintenance section of this manual before attempting any repairs. Call the manufacturer if in doubt.

⚠WARNING Do **NOT** work on PTO or shaft (with or without guards) when the engine is running. The PTO rotates when the engine is running. Turn off engine and remove key.

⚠WARNING Never work on a hot hydraulic system.

⚠WARNING Welding on any structural member may be done only by a welder certified to A.W. S. D1.1 (Section 3, 5 and paragraph 9.25 of Section 9). Do not weld on any structural members before notifying the manufacturer.

⚠WARNING Never allow welding current to travel through bearings or hydraulic cylinders. Keep ground cable on component being welded.

⚠WARNING Electronic components can be destroyed by welding current. Disconnect battery cables, and unplug all radio remote control power wires before welding on the mixer truck. If in doubt, contact the Service Department of the manufacturer for instructions.

⚠WARNING Remove extensions and lower chute to relieve hydraulic pressure before working on hydraulic system.

⚠WARNING Only drivers should operate the truck. If work on the truck requires it be operated and you are not qualified as an operator, you must get someone who is qualified to assist you.

⚠WARNING Inspect repairs. Repairs made to structural members must be inspected by qualified personnel before use.

⚠WARNING If you will be working in a hidden area inside the drum, lock out as follows:

Remove the ignition key, and place a **Do Not Operate** sign on the controls. Carry the key with you. This rule is one simple example of a "Lock-Out Tag-Out" procedure, Figure 3-22. Check regulations in your area. There may be state or local regulations that require a more advanced or stringent Lock-Out Tag-Out program.

Figure 3-22 Lock-out Tag-out

⚠WARNING Never activate system hydraulics without checking if another worker is in a hidden area. Always yell "clear" before starting the engine, and allow time for response.

⚠WARNING Never work on a pressurized hydraulic system. Stop the engine and relieve the accumulator circuit (if so equipped) before you open the hydraulic system.

⚠WARNING Never use gasoline or diesel as a cleaning solvent. This is critical to remember when cleaning hydraulic oil reservoirs. Gas and diesel fuels are highly explosive, and traces left in the oil may ignite when compressed!

⚠CAUTION Always use the correct tools for the job. Keep tools clean and in good condition.

⚠WARNING If you see a co-worker acting in an unsafe way, warn him/her about the dangers. Safety is the responsibility of those on the job!

⚠WARNING Understand the potential danger of spring-loaded or compressed gas components before servicing them (e.g., gas springs for toolbox doors, tires, brake chambers, nitrogen accumulators). Call the manufacturer before beginning work if you don't know the dangers!

Cleaning Safety

⚠CAUTION Wash truck regularly with clean water and a brush to prolong mixer paint finish. Touch up paint damage immediately. Acidic and alkaline cleaners, detergents, and high-pressure spray may deteriorate paint faster.

⚠CAUTION Do **NOT** expose chrome cylinder rams to acid. Corrosion will occur and warranty could be jeopardized.

⚠WARNING Secure footing when cleaning the drum, hopper, chute, chute extensions, fenders, and chassis.

⚠WARNING Visual inspection of mixer truck hydraulic circuits and safety devices should be done daily. Hands on inspection and documentation of results should be done weekly or at the scheduled preventative maintenance.

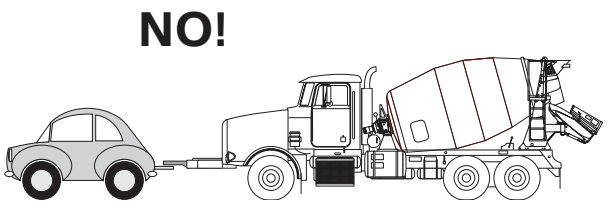
⚠WARNING Never put your hands, feet, or any other body part into hopper when the drum is ready to operate or operating, Figure 3-23.

Figure 3-23 Crushing hazard

Towing Safety

⚠WARNING Tow truck needs to be heavy enough and have enough horsepower and braking ability to tow mixer. This is critical to maintaining control at highway speeds and to brake effectively. Braking distances will greatly increase if mixer and contents are heavier than towing truck, Figure 3-24.

Figure 3-24 Proper towing



⚠WARNING Check tires and brakes on both trucks before towing. Tires in poor condition can cause a blowout, resulting in loss of control for the towing truck.

⚠WARNING Use care on ice or slippery roads. A skid that would normally be easily corrected can intensify, by load shift, causing loss of control.

⚠WARNING Stopping distance and turning radius are greatly increased. Be aware of additional length and weight when towing a mixer. A common cause of accidents is turning too close to curbs or objects.

⚠WARNING Check the tow strap or cables frequently when towing a mixer long distances.

⚠WARNING Never back up without a guide.

⚠CAUTION Improper towing can damage the truck. Know the correct places to hook the towing cable(s).

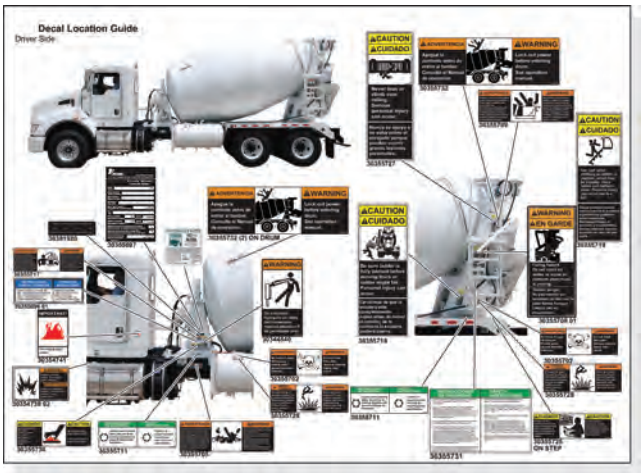
Safety Labels (Decals)

Each mixer truck has a set of safety labels specific to the model and options, which can be found in you're parts book. Safety decals MUST be replaced if damaged, faded, missing, or unreadable for any reason. Sun, rain, steam cleaning, and other factors cause labels to fade.

Labels can be ordered as complete sets or individually.

To get replacement labels:

1. Identify label(s) needed from the diagrams and lists.
2. Get the serial number of the mixer truck from the serial number plate. If the serial number plate is missing or unreadable, the number is stamped into the front pedestal of the driver's side just above the normal location of the serial number plate.
3. Call the Integral dx Call Center at 320-435-0003 to place your order.



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Overview

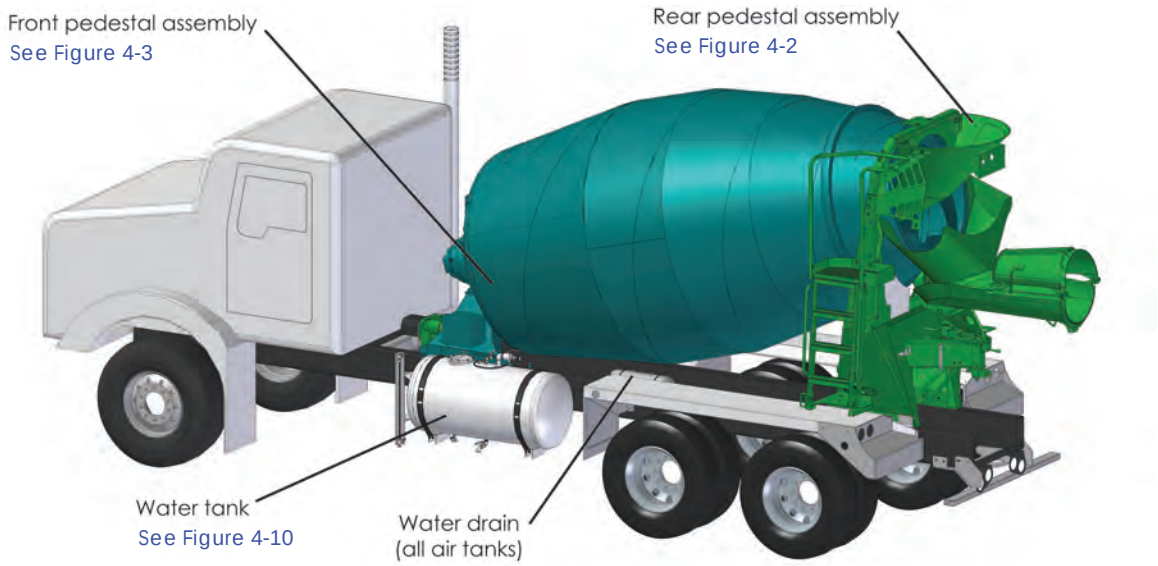
This chapter covers overview information for the Integral dx Mixer Truck.

4

Component Locations

Rear PTO Mixer Trucks

Figure 4-1 Rear PTO mixer truck detail



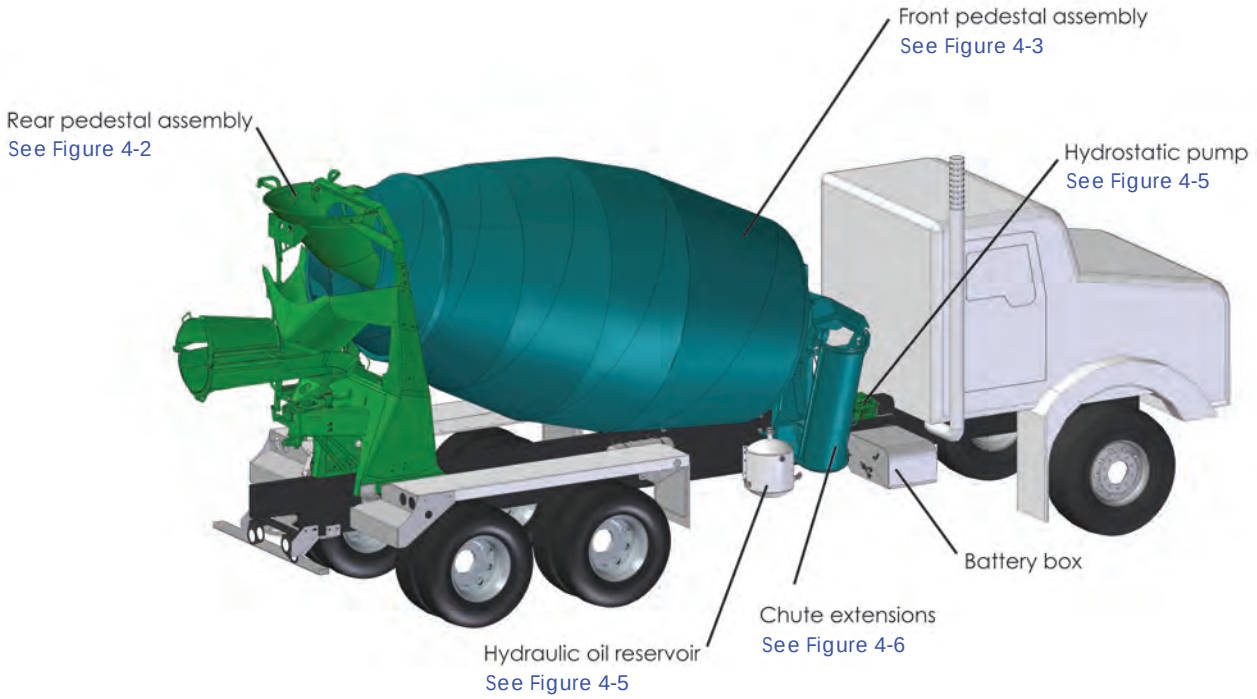


Figure 4-2 Rear pedestal assembly detail

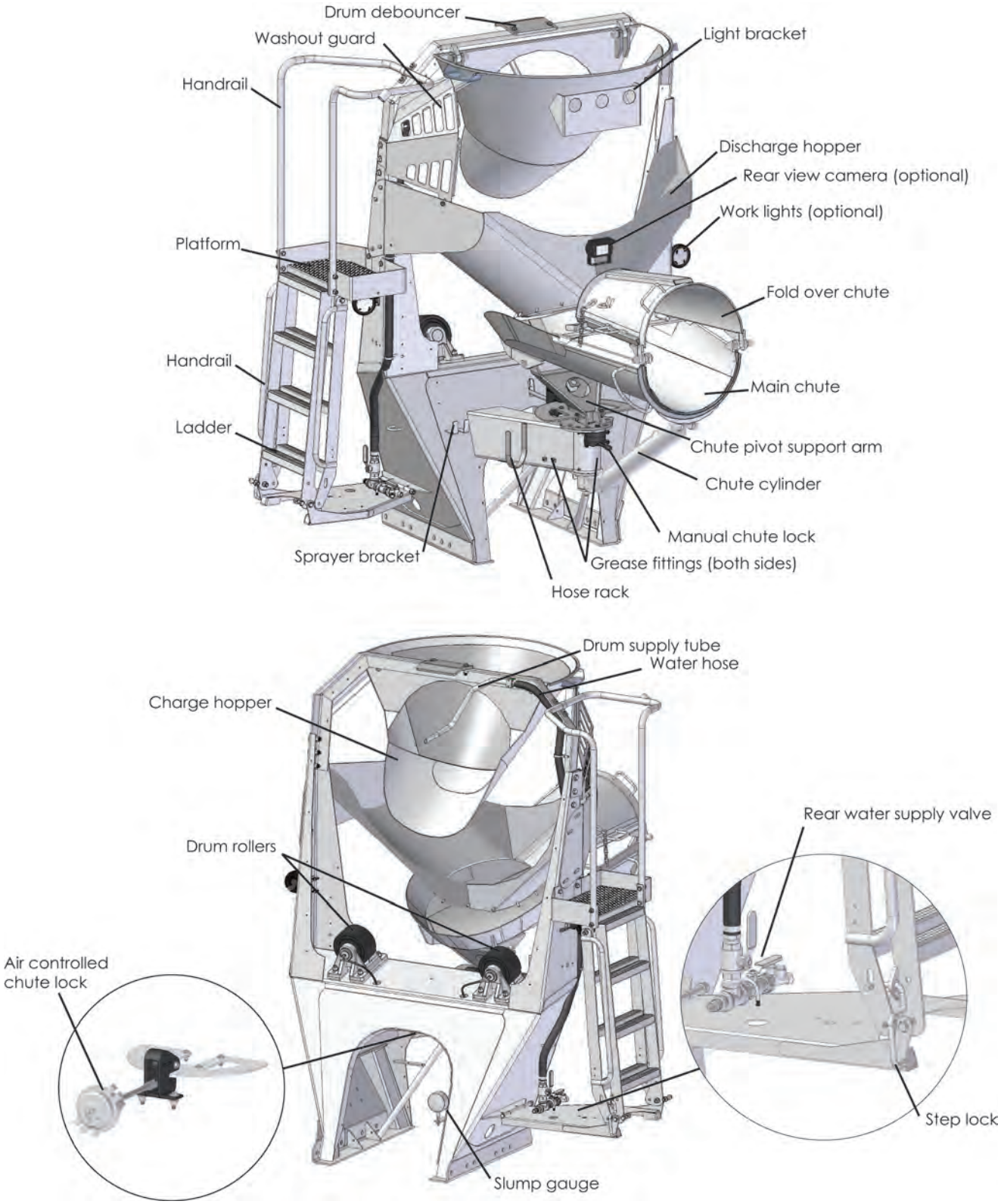


Figure 4-3 Front pedestal assembly detail

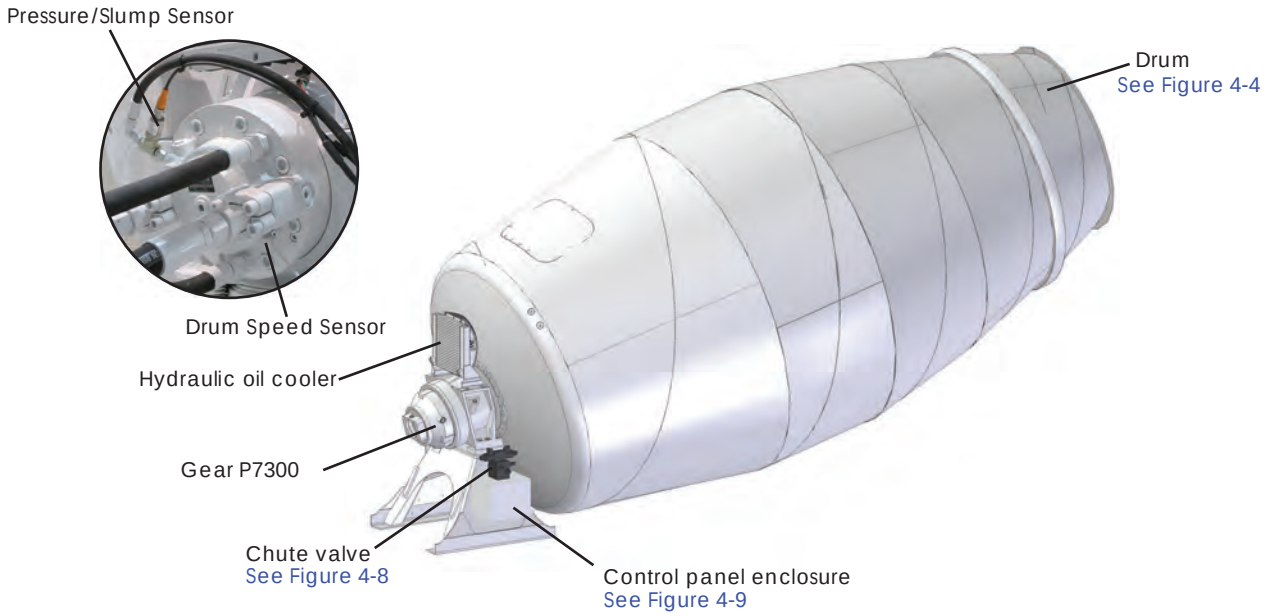


Figure 4-4 Drum detail

Figure 4-5 Hydraulic reservoir detail

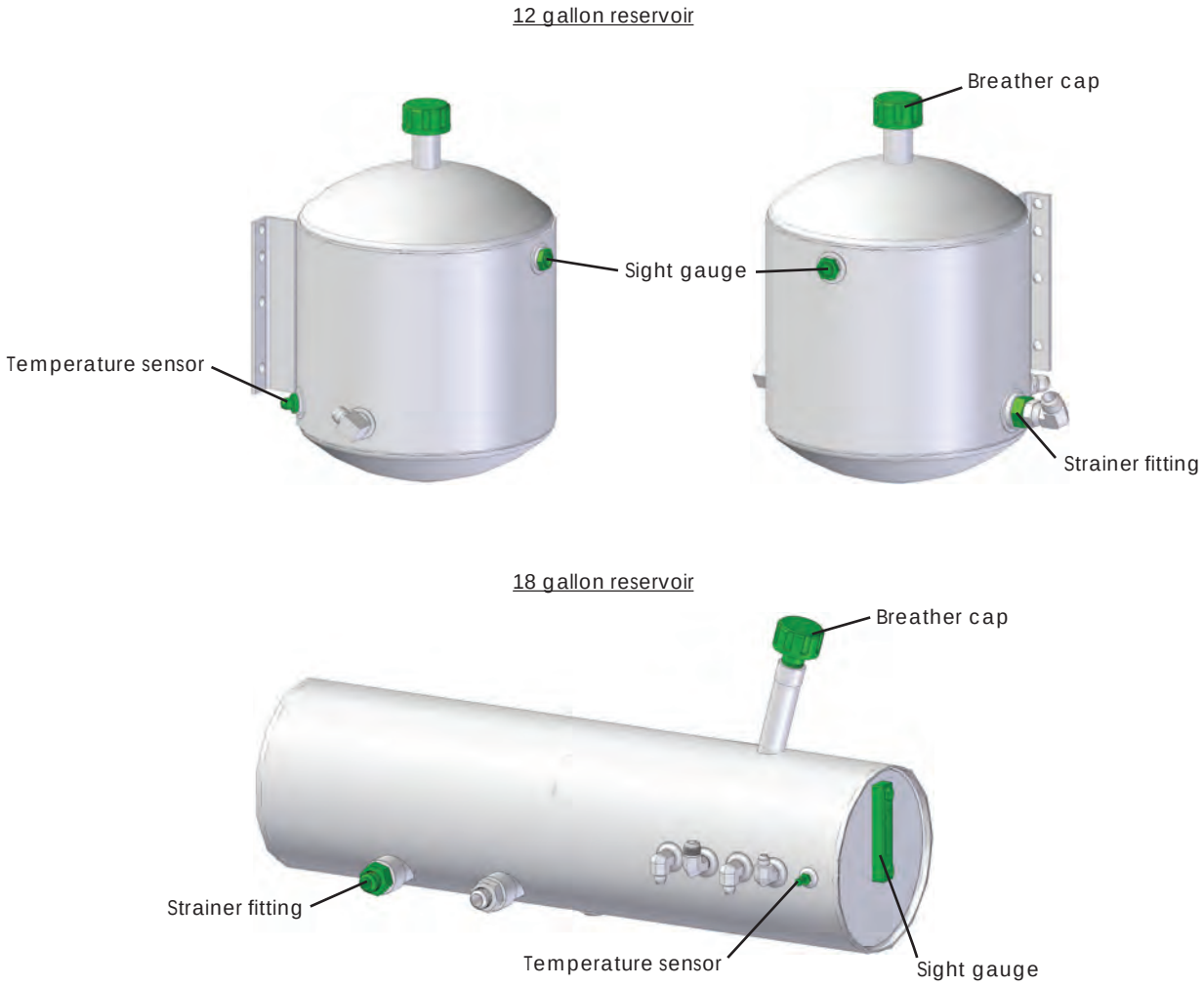


Figure 4-6 Chute rack configurations

Figure 4-7 Hydrostatic pump detail

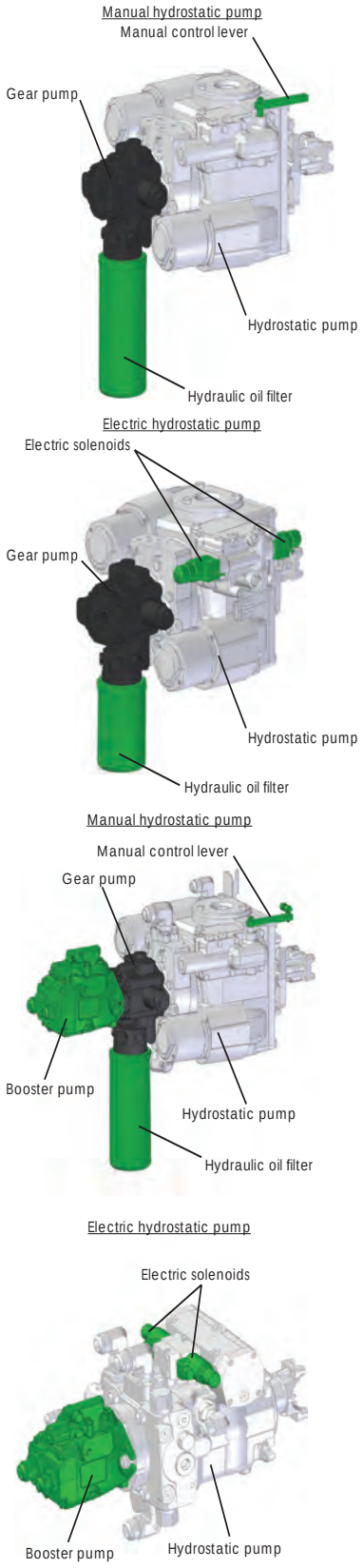


Figure 4-8 Chute valve detail

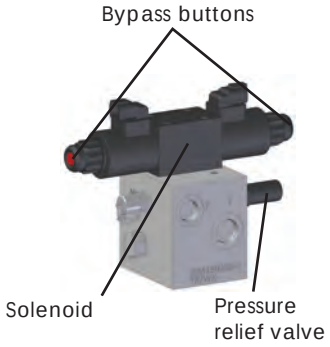


Figure 4-9 Control panel enclosure detail

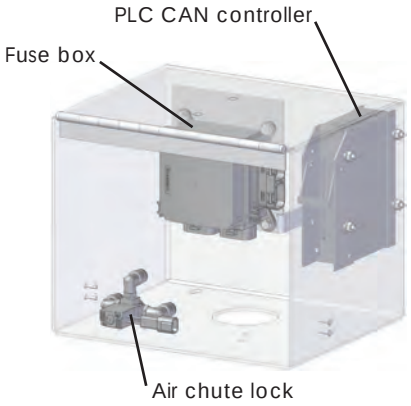
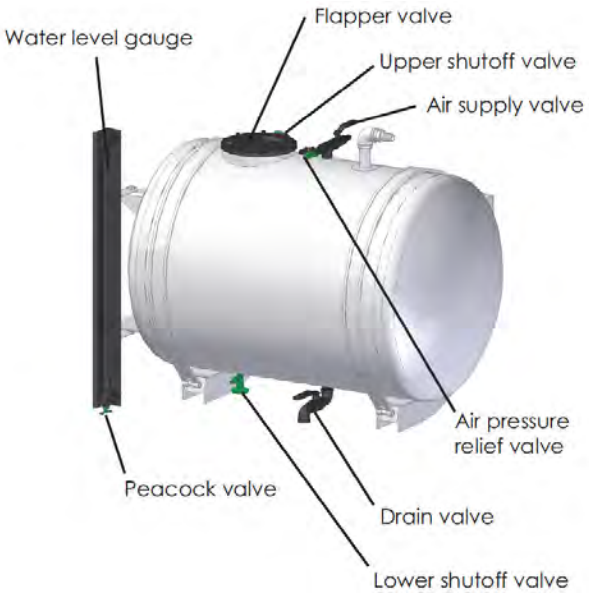
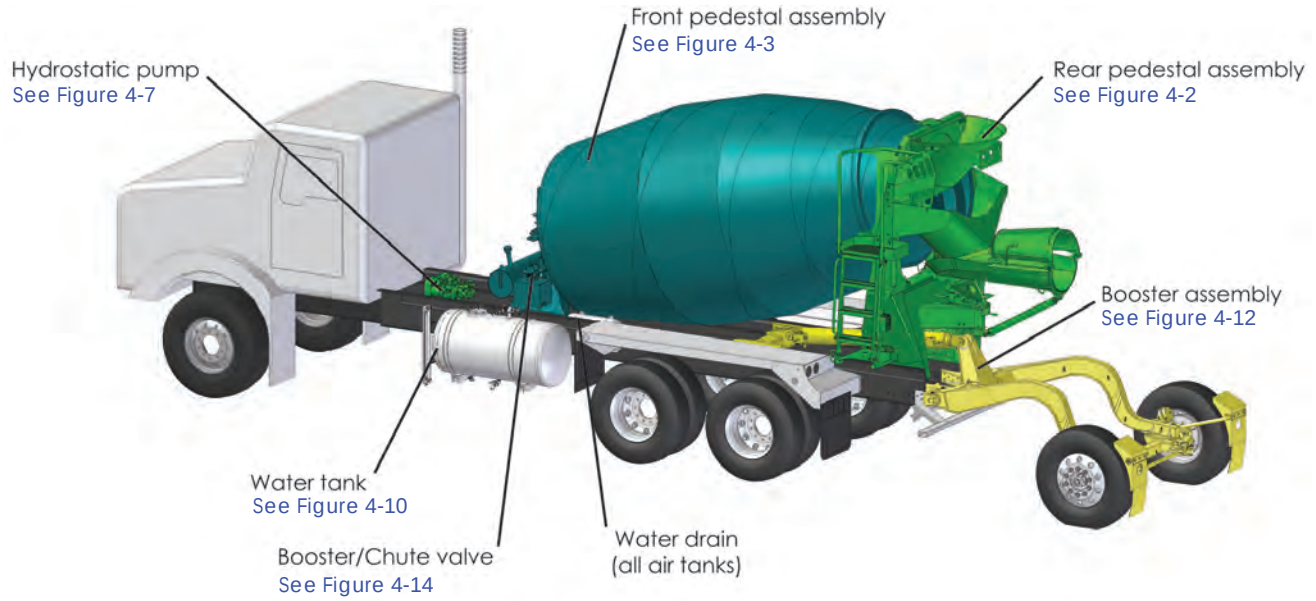


Figure 4-10 Water tank detail



Optional Booster

Figure 4-11 Booster mixer truck detail



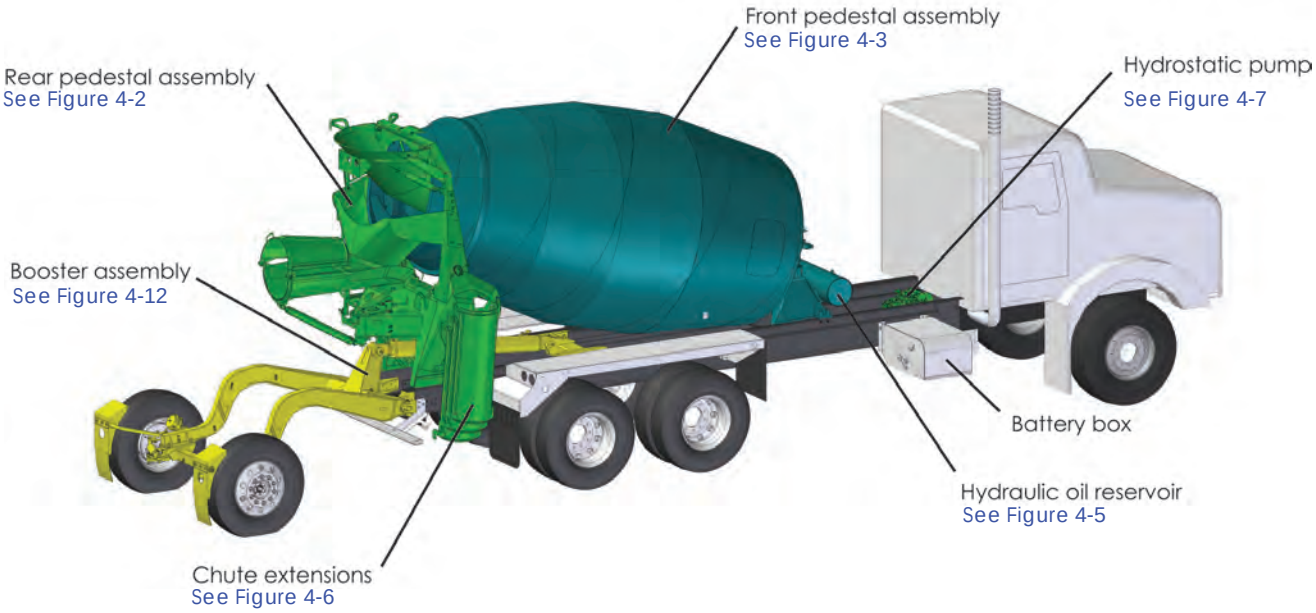


Figure 4-12 Booster assembly detail

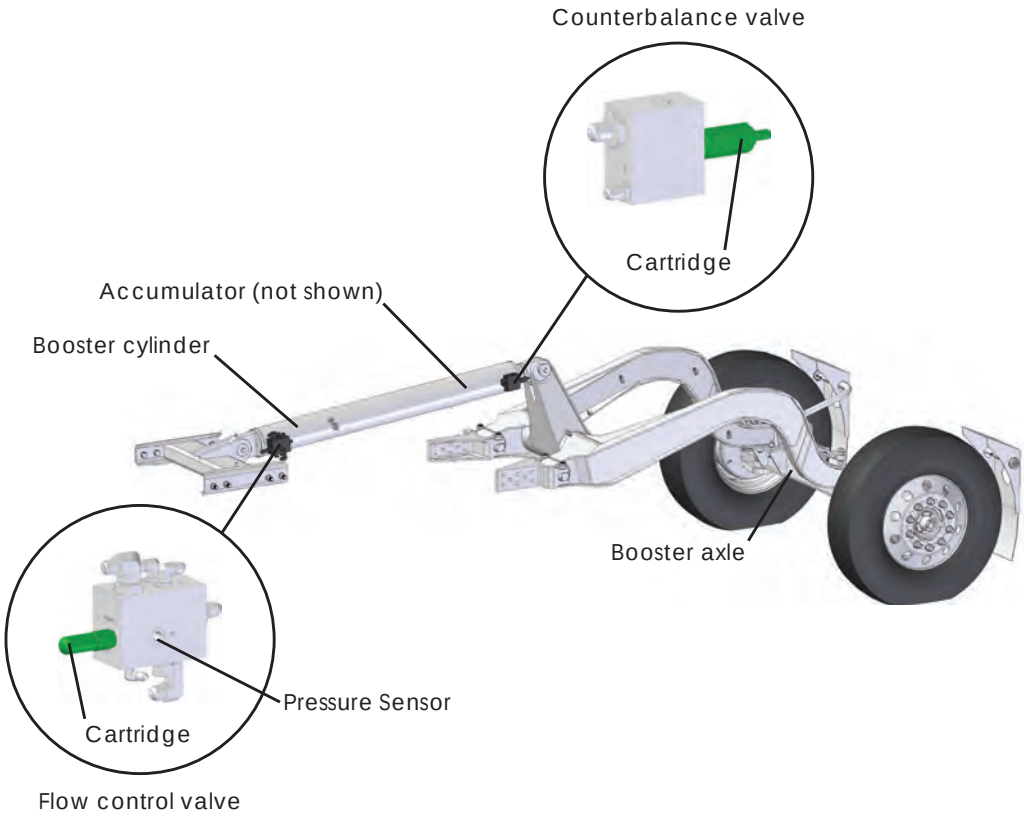


Figure 4-13 Hydraulic reservoir detail

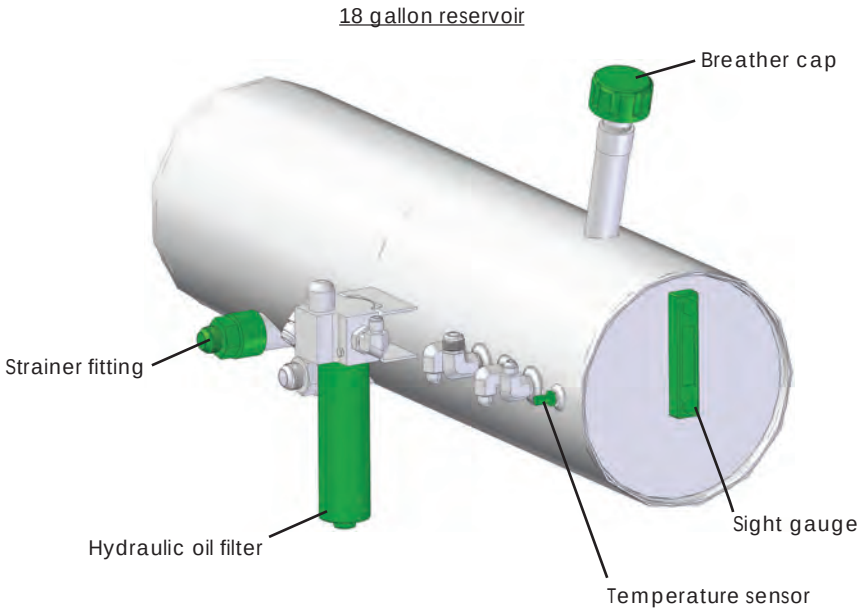
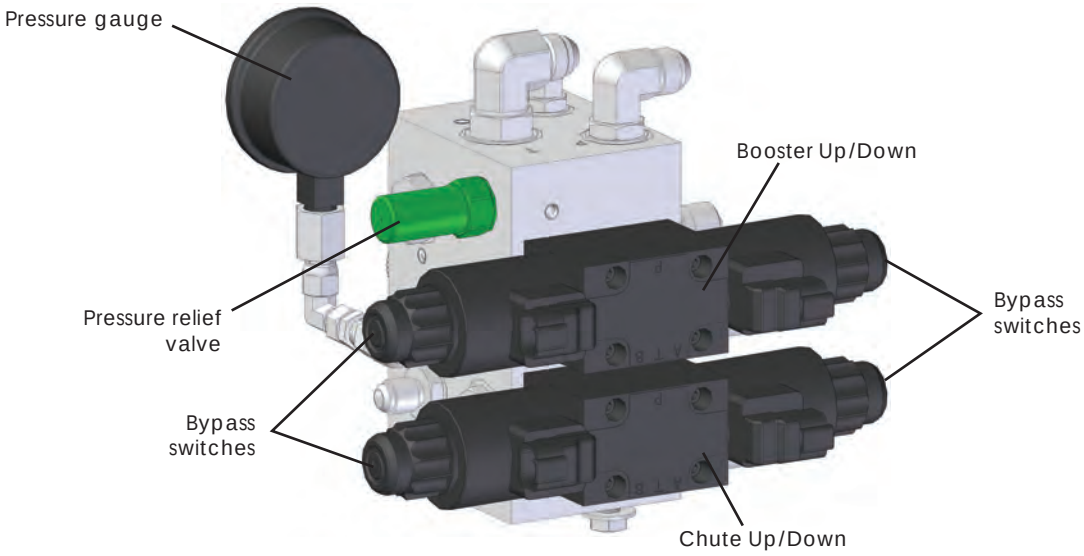


Figure 4-14 Booster/Chute valve detail



Mixer Control Components

Cable Controls

Figure 4-15 Cable control

In cab controls

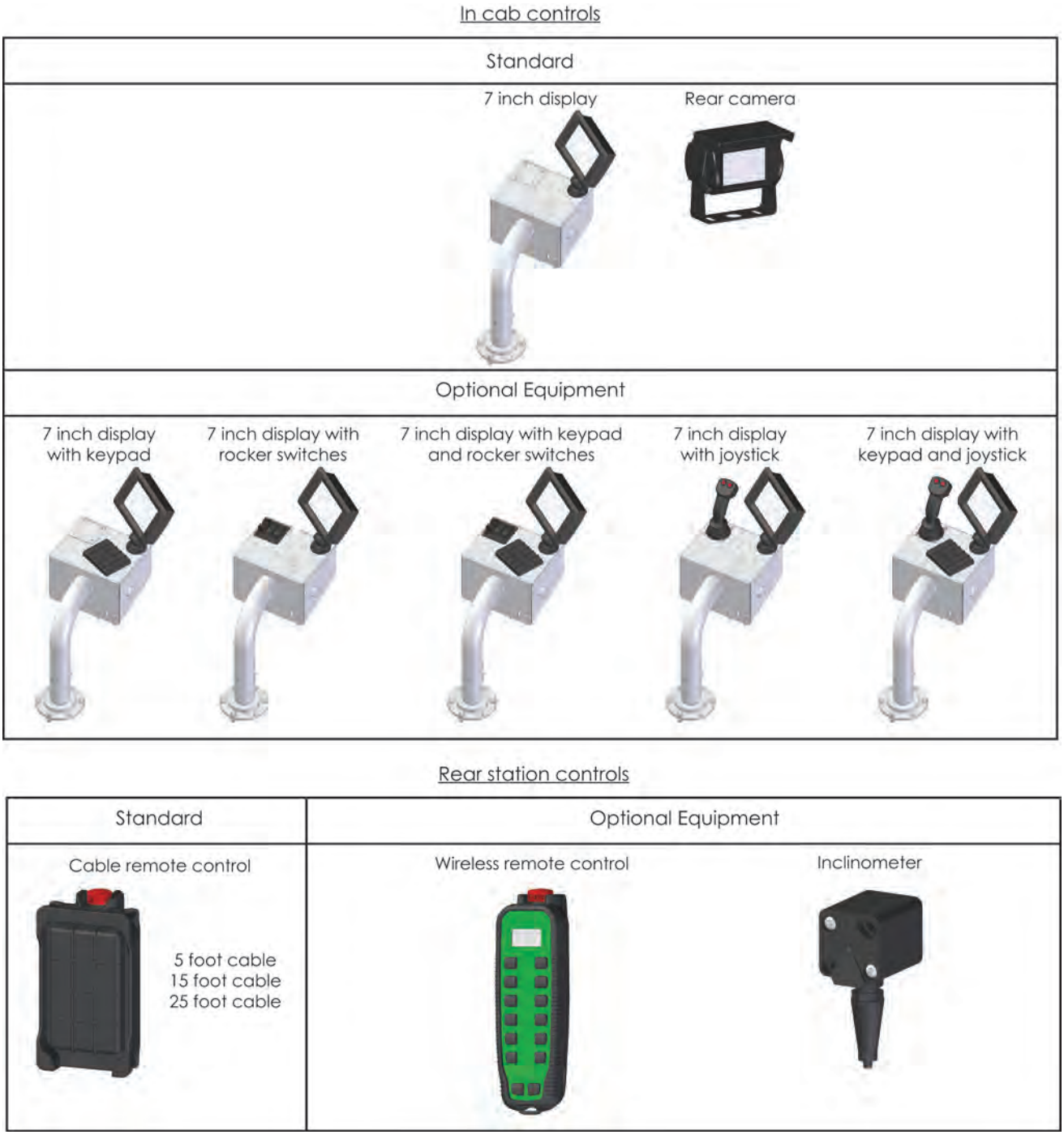
Standard
3 inch display is not availalbe. 7 inch display is standard with keypad as an option. 

Rear station controls

Standard		Optional Equipment
Pendant 	Cable remote control  25 foot cable	Wireless remote control 

Electric Controls - 7 Inch Display

Figure 4-16 7 inch display options



Mixer Controls

Keypad

Figure 4-17 Keypad functions

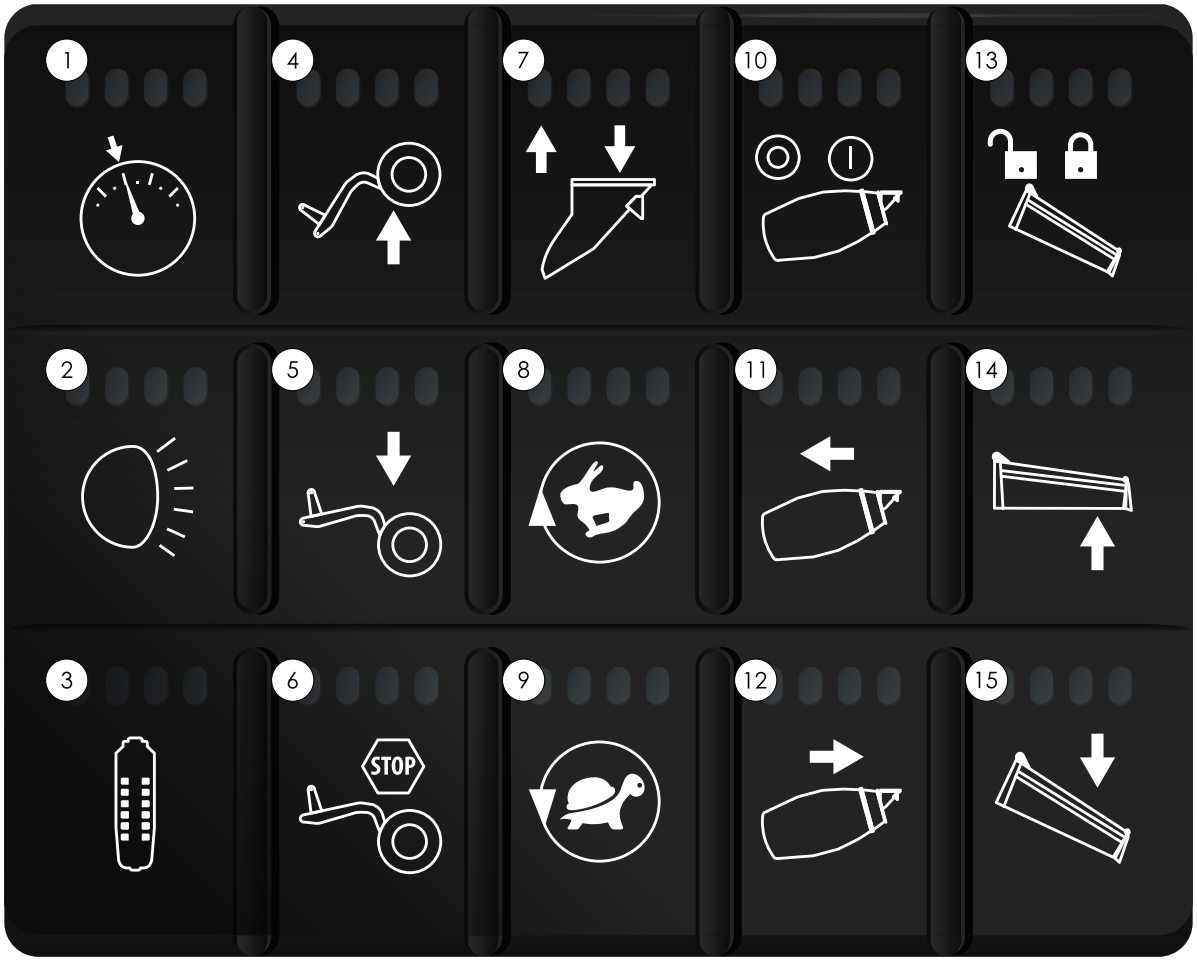


Table 4-1 Keypad functions

1	Constant speed on/off	6	Booster stop	11	Drum charge
2	Working lights on/off	7	Hopper up/down	12	Drum discharge
3	Remote control enable/disable	8	Throttle up	13	Chute lock
4	Booster up	9	Throttle down	14	Chute up
5	Booster down	10	Drum start/stop	15	Chute down

Rocker Switches

Figure 4-18 Rocker switch functions

Table 4-2 Rocker switch functions

1	Drum charge	3	Chute lock	5	Chute up
2	Drum discharge	4	Drum start/stop	6	Chute down

Joystick

Figure 4-19 Joystick functions

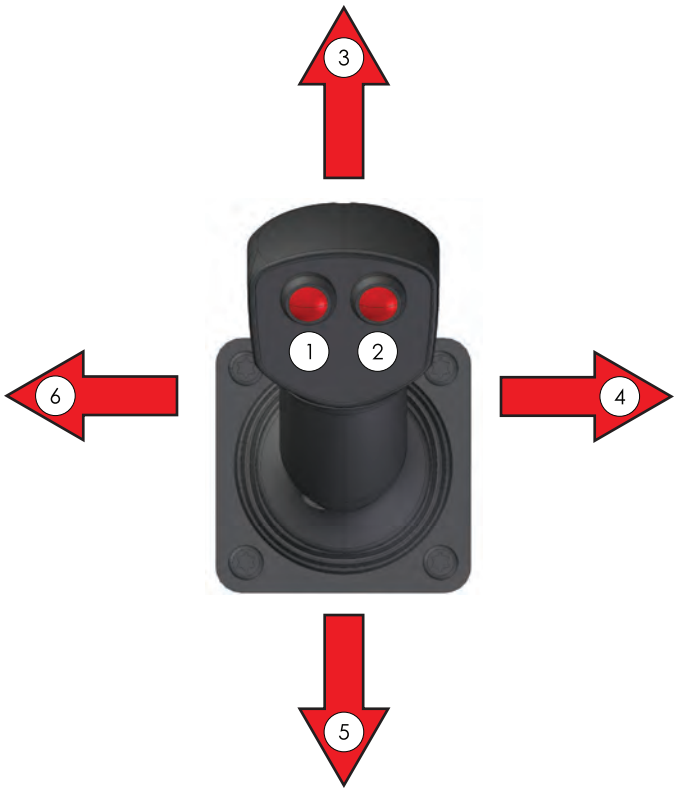


Table 4-3 Joystick functions

1	Drum start/stop	4	Right - discharge drum
2	Chute lock/unlock	5	Reverse - chute down
3	Forward - chute up	6	Left - charge drum

Trigger switch on the joystick needs to be depressed for functions to work.

Wireless Remote Control

Figure 4-20 Wireless remote control functions

Table 4-4 Wireless remote control functions

1	Remote power off button (will also stop the drum)	7	Chute down	13	Drum discharge
2	Battery charging	8	Throttle increase	14	Hopper up/down
3	Battery low	9	Throttle decrease	15	Working lights on/off
4	Wireless signal	10	Booster stop	16	Not used
5	Chute lock	11	Drum start/stop	17	Remote power on
6	Chute up	12	Drum charge	18	Remote power off

Cabled Rear Pendant

Figure 4-21 Cabled rear pendant functions

Table 4-5 Cabled rear pendant functions

1	Chute lock	6	Throttle increase	11	Drum discharge
2	Chute up	7	Throttle decrease	12	Not used
3	Chute down	8	Booster stop	13	Remote power off button (will also stop the drum)
4	Working lights on/off	9	Drum start/stop		
5	Hopper up/down	10	Drum charge		

Display Screens

7 Inch Touchscreen Display

Driving Screen

Figure 4-22 Screen 1 detail (driving screen)

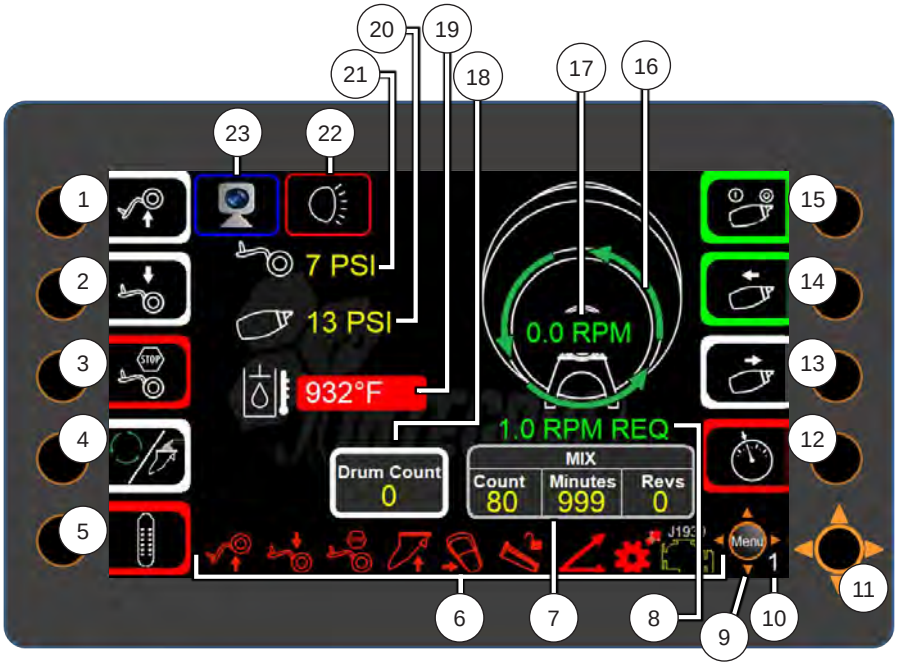


Table 4-6 Screen 1 detail (driving screen)

1	Booster up (button or touchscreen)	13	Drum discharge (button or touchscreen)
2	Booster down (button or touchscreen)	14	Drum charge (button or touchscreen)
3	Booster stop (button or touchscreen)	15	Drum start/stop (button or touchscreen)
4	Mix/Load (button or touchscreen)	16	Drum rotation indicator
5	Wireless remote on/off (button or touchscreen)	17	Drum speed indicator
6	Status icons	18	Drum counter
7	Mix counter	19	Hydraulic oil temperature indicator
8	Requested RPM	20	Drum pressure indicator
9	Indicates available arrow pad commands	21	Booster pressure indicator
10	Screen indicator *	22	Working lights on/off (touchscreen)
11	Arrow pad	23	Rear view camera on/off (touchscreen)
12	Constant speed manual on/off (button or touchscreen)		

* Please reference screen number when calling the service department.

Delivery Screen

Figure 4-23 Screen 2 detail (delivery screen)

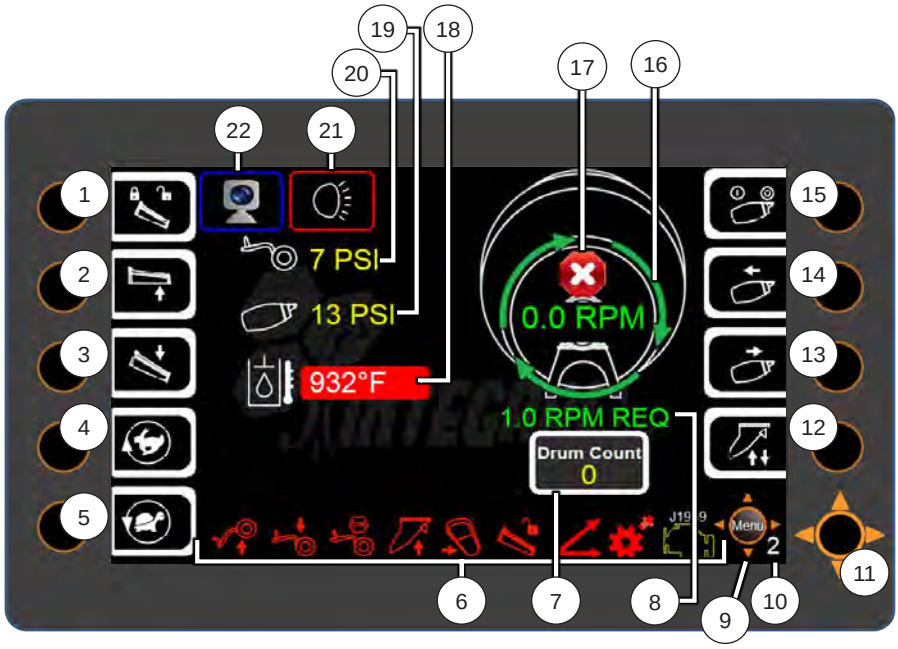


Table 4-7 Delivery screen detail

1	Chute lock/unlock (button or touchscreen)	12	Hopper up/down (button or touchscreen)
2	Chute up (button or touchscreen)	13	Drum discharge (button or touchscreen)
3	Chute down (button or touchscreen)	14	Drum charge (button or touchscreen)
4	Increase RPM (button or touchscreen)	15	Drum start/stop (button or touchscreen)
5	Decrease RPM (button or touchscreen)	16	Drum direction indicator
6	Status icons	17	Drum speed indicator
7	Drum counter	18	Hydraulic oil temperature indicator
8	Requested RPM	19	Drum pressure indicator
9	Indicates available arrow pad commands	20	Booster pressure indicator
10	Screen indicator	21	Working lights on/off (touchscreen)
11	Arrow pad	22	Rear view camera on/off (touchscreen)

Slump Gauge Screen

Figure 4-24 Slump gauge screen detail

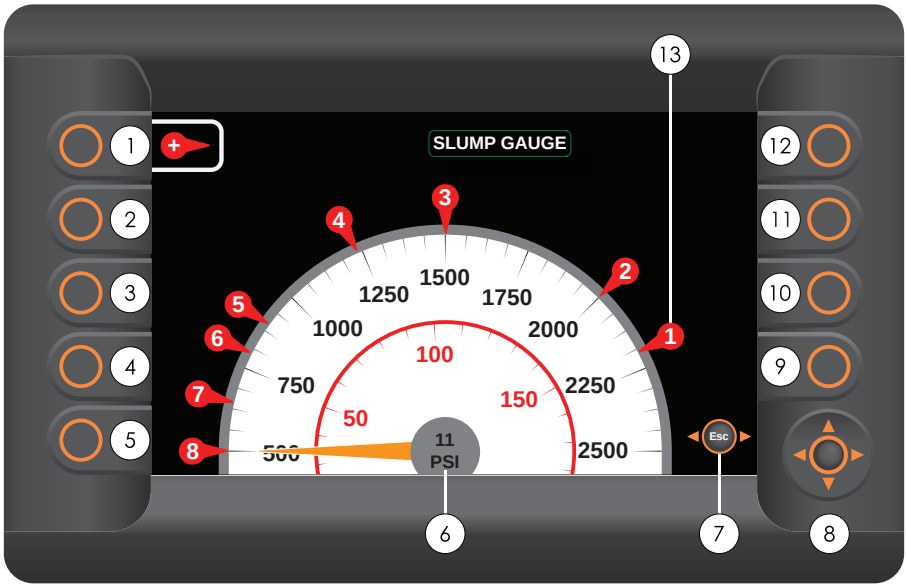


Table 4-8 Slump gauge screen detail

1	Set slump marker (button or touchscreen)	8	Arrow pad
2	Not used	9	Not used
3	Not used	10	Not used
4	Not used	11	Not used
5	Not used	12	Not used
6	PSI gauge	13	Slump marker
7	Indicates available arrow pad commands		

Refer to "Adjusting Digital Slump Gauge" on page 5-16 to change slump meter settings.

Menu Screen

Figure 4-25 Menu screen detail

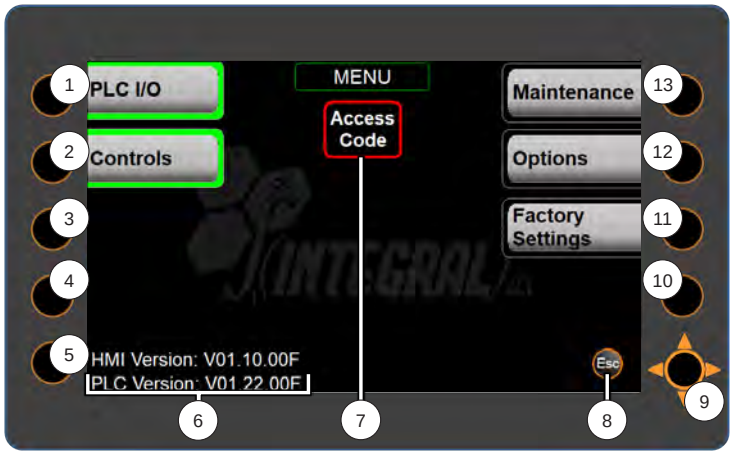


Table 4-9 Menu screen detail

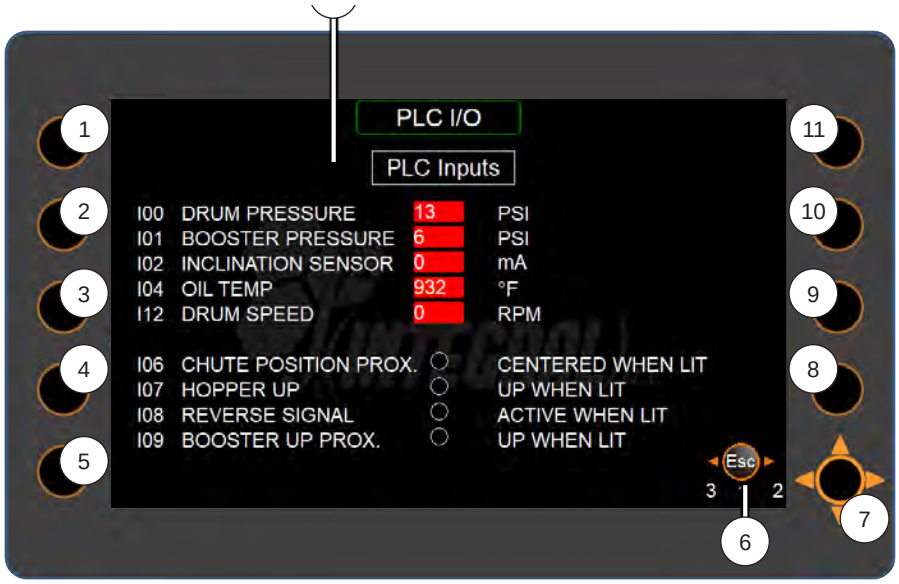
1	PLC I/O settings (touchscreen or button)	8	Indicates available arrow pad commands
2	Controls settings (touchscreen or button)	9	Arrow pad
3	Not used	10	Not used
4	Not used	11	*Factory settings menu
5	Not used	12	Options menu
6	Software version information	13	Maintenance menu
7	Access code for service menu		

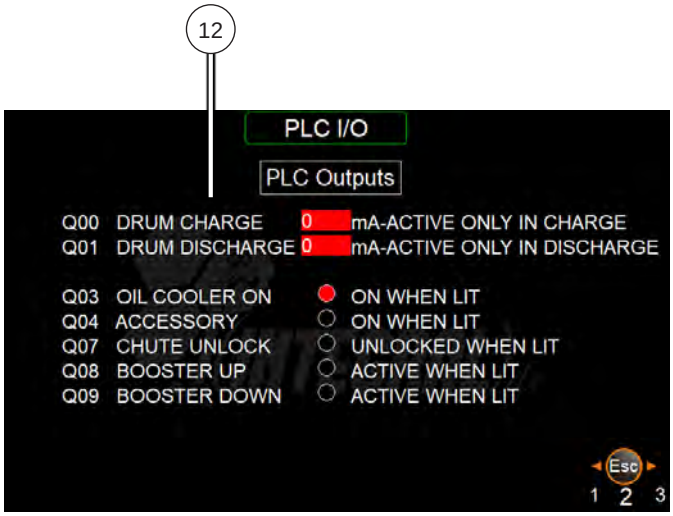
*The Factory Settings menu can only be accessed by an authorized service technician.

If enabled, buttons will be highlighted with a green boarder.

PLC I/O Menu

Figure 4-26 PLC I/O menu detail





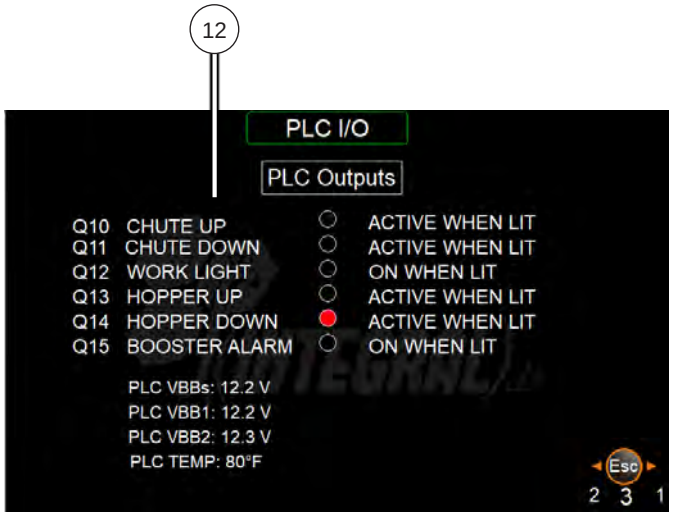


Table 4-10 PLC I/O menu detail

1	Not used	8	Not used
2	Not used	9	Not used
3	Not used	10	Not used
4	Not used	11	Not used
5	Not used	12	PLC output values
6	Indicates available arrow pad commands	13	PLC input values
7	Arrow pad		

Controls Menu

Figure 4-27 Controls menu detail

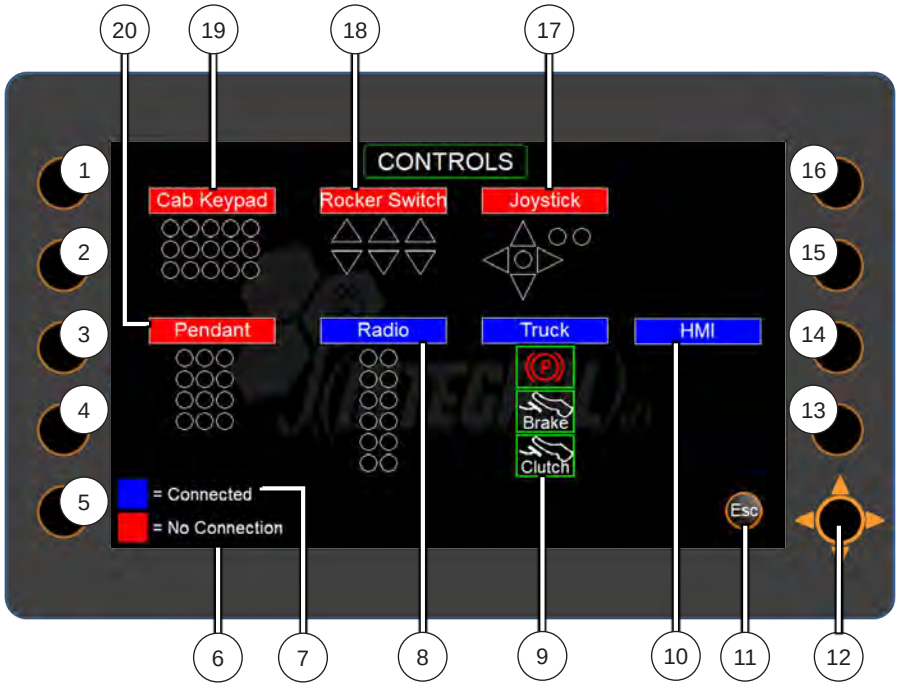


Table 4-11 Controls menu detail

1	Not used	11	Indicates available arrow pad commands
2	Not used	12	Arrow pad
3	Not used	13	Not used
4	Not used	14	Not used
5	Not used	15	Not used
6	No connection indicator	16	Not used
7	Connected indicator	17	Joystick connection indicator
8	Wireless Remote connection indicator	18	Rocker switch connection indicator
9	Truck connection indicator	19	Cab keypad connection indicator
10	HMI Display connection indicator	20	Rear pendant connection indicator

Any controls that are connected and operational will be displayed with a blue background. If a control is not connected or perhaps not functioning, it will displayed with a red background.

With this screen displayed we can verify if our controls are functioning. When a button is pressed the corresponding button on the display will illuminate with red color.

Maintenance Menu

Figure 4-28 Maintenance menu detail

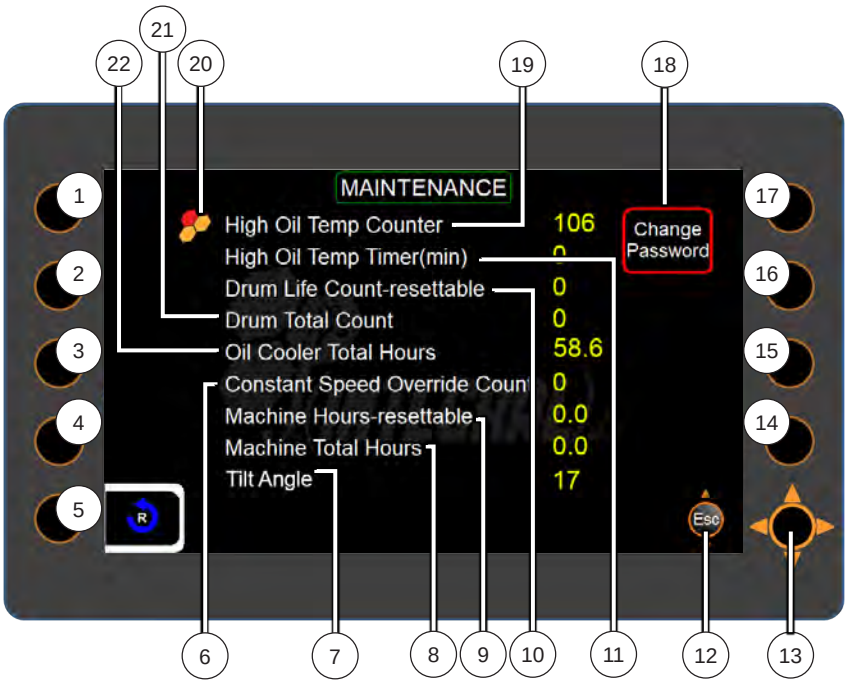


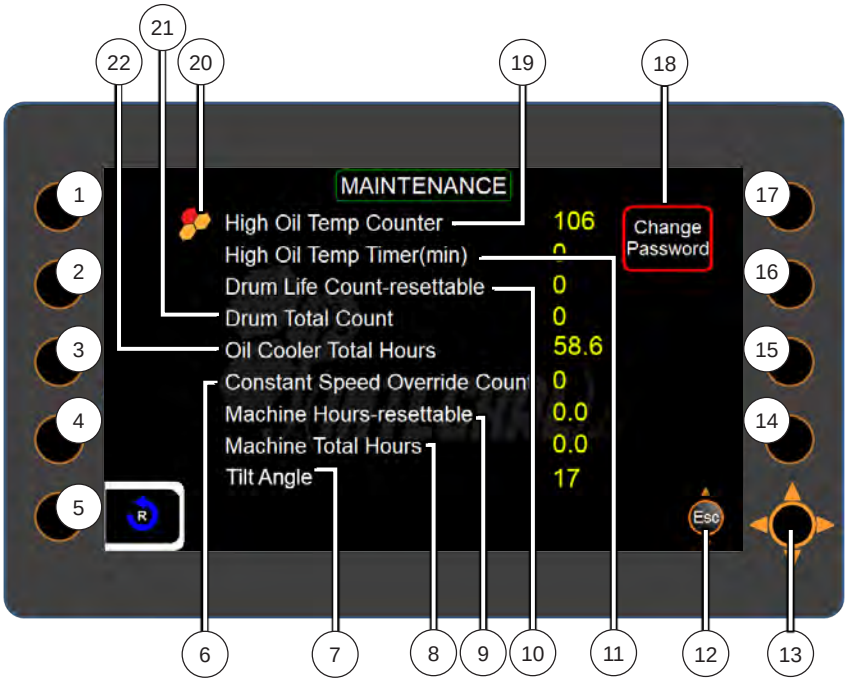
Table 4-12 Maintenance menu detail

1	Not used	12	Indicates available arrow pad commands
2	Not used	13	Arrow pad
3	Not used	14	Not used
4	Not used	15	Not used
5	Reset button	16	Not used
6	Constant speed override counter	17	Not used
7	Tilt angle (in degrees)	18	Change password button
8	Machine total hours counter	19	High oil temp counter
9	Machine hours - resettable counter	20	Selection indicator
10	Drum life count - resettable counter	21	Drum total counter
11	High oil temp timer (in minutes)	22	Oil cooler total hours counter

Use the Arrow pad ( ) to scroll up and down the Maintenance menu. The logo will indicate which menu item is selected.

When an item is selected and it can be reset, the reset icon will be displayed. Pressing the reset icon for 3 seconds will change the selected value to 0. If it is not a resettable item, the reset icon will not be displayed.

Figure 4-29 Maintenance menu detail



High Oil Temp Counter: This field displays the number of times that the oil has exceded the factory preset of 85 °C.

High Oil Temp Timer: This field displays the amount of time that the oil has exceded the factory preset of 85 °C.

Drum Life Count: This field is resettable and can used to aid in total counts per job, or maintenance intervals.

Drum Total Count: This field displays the total count for the drum. It is resettable only by Maintenance personel.

Oil Cooler Total Hours: This field displays the total hours of a oil cooler, and aids in the PM of a company.

Constant Speed Override Count: This filed displays the number of times that the constant speed preset has been overriden.

Machine Hours Resettable: This field displays the number of hours the machine has run, can be reset for each job.

Machine Hours Total: This field displays the total number of hours the machine has run.

Tilt Angle: This field displays the angle of tilt the machine is at.

Options Menu

Figure 4-30 Options menu detail

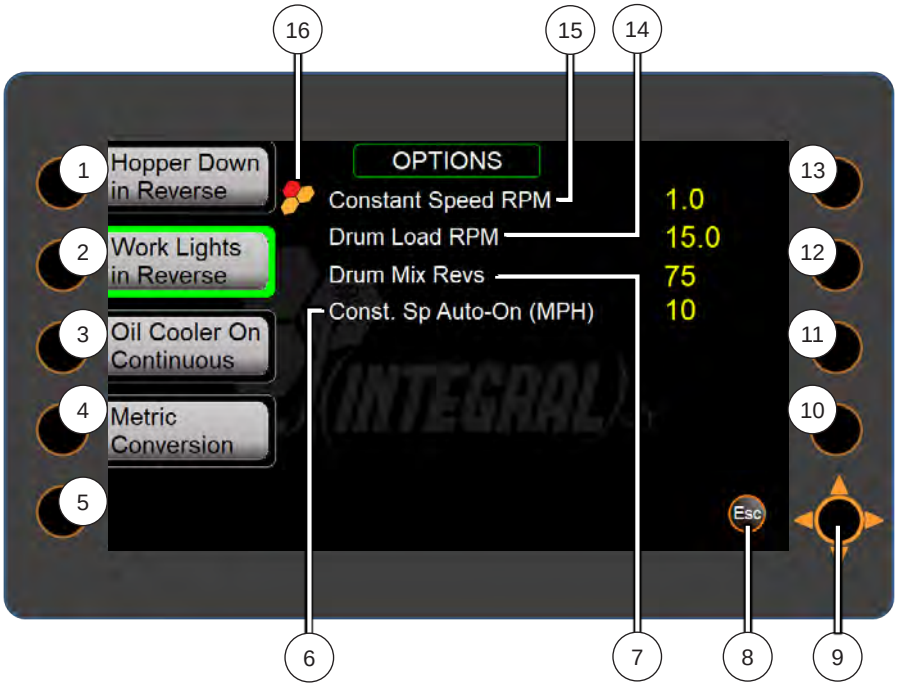


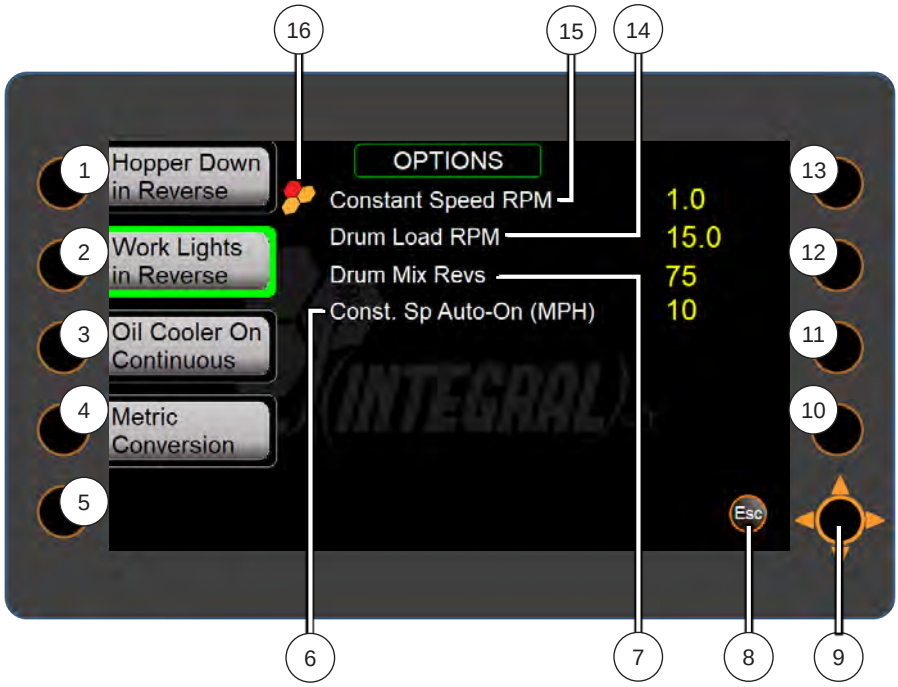
Table 4-13 Options menu detail

1	Hopper down in reverse on/off (button or touchscreen)	9	Arrow pad
2	Work lights in reverse on/off (button or touchscreen)	10	Not used
3	Oil cooler on continuous on/off (button or touchscreen)	11	Not used
4	Metric conversion on/off (button or touchscreen)	12	Not used
5	Not used	13	Not used
6	Constant speed auto-on setting	14	Drum load RPM setting
7	Drum mix revolutions setting	15	Constant speed RPM setting
8	Indicates available arrow pad commands	16	Selection indicator

Items 1-4, if enabled, will be highlighted with green.

Use the Arrow pad () up and down arrows to navigate through the Options menu. The logo will indicate which menu item is selected. Use the left and right arrows to change the selected values.

Figure 4-31 Options menu detail



Constant Speed RPM: This field displays the RPM of the drum once the threshold speed of 10 MPH is reached. The RPM range is between 0.5 RPM and 6 RPM, and can be overriden by the operator.

Drum Load RPM: This field displays the RPM of the drum while it's being loaded. RPM range is between 10 RPM to 18 RPM. The engine will automatacally increase speed to increase speed of the drum during loading, and will automatically decrease speed when loading is complete.

Drum Mix Revs: This field displays the number of revolutions of the drum for mixing process. The preset value is 75 revs at 6 RPM, which can be changed by the operator.

Constant Speed Auto-On: This field displays the speed in MPH that the vehicle must obtain to engage the constant speed on the drum. The preset is 10 MPH.

Indicator Icons

Indicator icons give feedback on the status of the machine. When a function is being used or has malfunctioned, an indicator icon will be displayed.

Table 4-14 Indicator Icons

Icon	Description
	Horn Active - Press to disable
	Booster Up
	Booster Down
	Booster Stop
	Hopper Up
	Chute not centered
	Chute unlocked
	Hydraulic Oil Cooler Green - Normal Red - Over temperature
	Inclinometer malfunction
	Speed Sensor malfunction
	Engine Warning

SMART Drum

SMART drum (constant speed) will automatically be engaged when the truck travels greater than 10 MPH (factory default). SMART drum setting will turn the drum at 1 RPM (factory default).

- Once constant speed is engaged it will not shut down automatically when speeds are lower than 10 MPH.
- Constant speed can be bypassed. The  constant speed, or charge buttons are pressed by the operator (SMART drum bypasses are recorded in the log).
- While the mixer is in the constant speed setting, it will not discharge.
- Constant speed can be manually engaged by pressing the  (constant speed) button.
- If the optional inclinometer is installed, it will automatically adjust the drum speed while on an incline, lock the chute and disable the optional remote.

To stop the drum, press the  (drum start/stop) button from either the cab controls or the remote transmitter.

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Operation

This chapter covers operating information for the Integral dx Mixer Truck.

5

Safety Keywords

Please read and understand this manual before operating an Integral dx Mixer Truck.

DANGER, **WARNING**, and **CAUTION** keywords have been placed throughout the manual as needed. Some of the text is shown in bold characters for emphasis. The following list defines each of these keywords:

⚠ DANGER	Indicates a hazardous situation which, if not avoided, **WILL** lead to death or serious injury.
⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, **COULD** result in minor to moderate injury.

The keywords listed above will be displayed throughout this manual in the form of information boxes like the ones shown above.

Anyone working near the concrete mixer truck must be aware of **DANGER**, **WARNING**, and **CAUTION** indicators. All personnel must know how to avoid a hazardous situation and what action to take if hazardous situations occur.

Transport Mode

Disabling Transport Mode

When an Integral dx mixer truck leaves the factory it is placed into transport mode. This setting turns the drum at 1 RPM and locks out all controls. The transport icon will be displayed until the transport mode has been disabled. Note: The drum will not turn until the parking brake shut off.

Figure 5-1 Transport mode icon

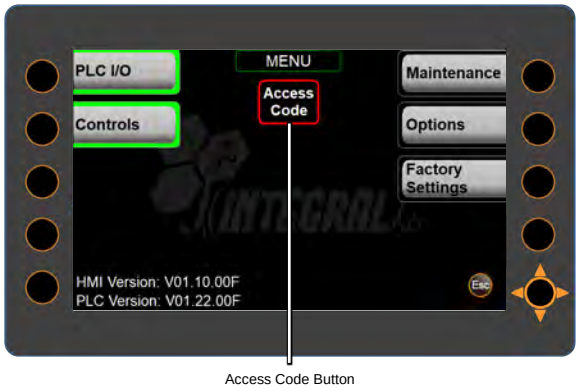
Figure 5-2 Transport mode icon locations

To remove the Integral dx mixer truck from transport mode, follow the steps below:

7 inch HMI Display

1. Press the center of the arrow pad (menu button).
2. Press the access code button, see Figure 5-3.

Figure 5-3 Access code button

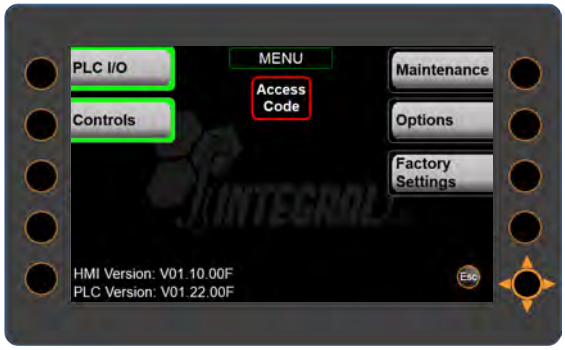


3. Enter access code (1234 is factory default), see Figure 5-4.
4. Press ok.

Figure 5-4 Access code keypad

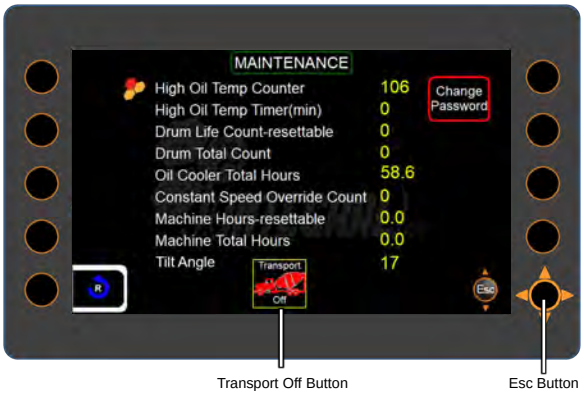
5. Press the Maintenance button, see Figure 5-5.

Figure 5-5 Maintenance button



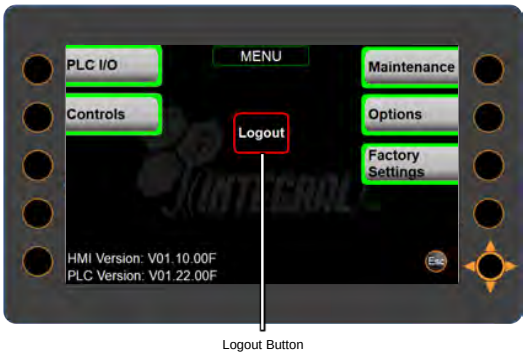
6. Press the Transport off button, see Figure 5-6.

Figure 5-6 Transport off button



7. Press the esc button to exit.
8. Press the logout button, see Figure 5-7.
9. Press the esc button to exit.

Figure 5-7 Log out button



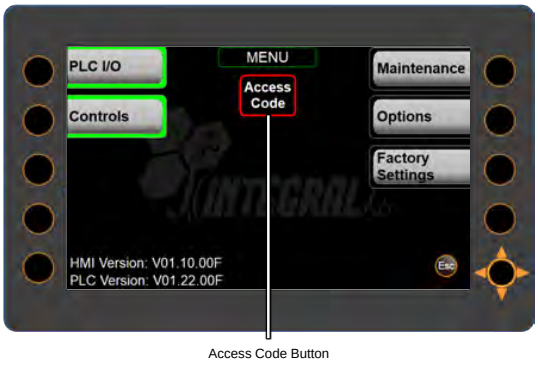
Enabling Transport Mode

To put the mixer truck into transport mode, follow the steps below:

7 inch HMI Display

1. Press the center of the arrow pad (menu button).
2. Press the access code button, see Figure 5-8.

Figure 5-8 Access code button

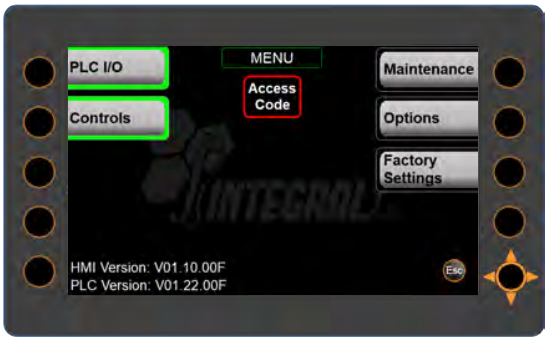


3. Enter access code (1234 is factory default) see Figure 5-9.
4. Press ok.

Figure 5-9 Access code keypad

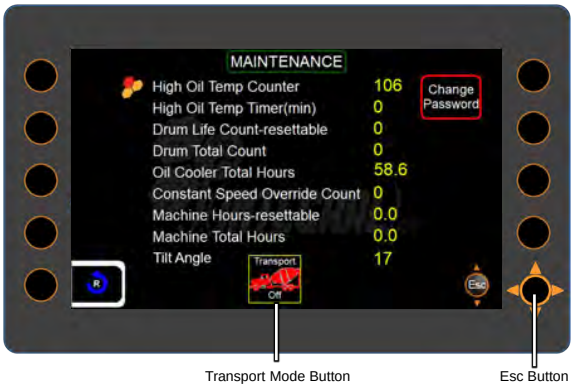
5. Press the Maintenance button, see Figure 5-10.

Figure 5-10 Maintenance button



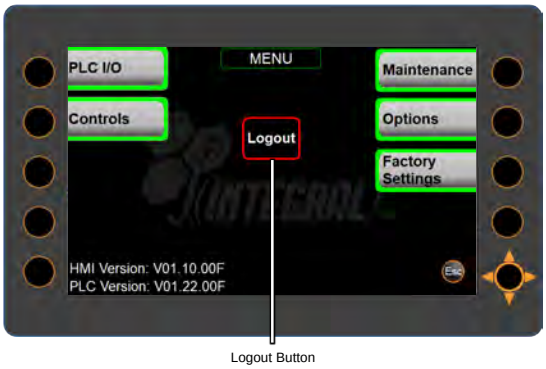
6. Press the and hold the left/right arrow buttons on the arrow pad until the Transport icon appears (10-15 seconds), see Figure 5-11.

Figure 5-11 Transport mode icon



7. Press the esc button to exit.
8. Press the logout button, see Figure 5-12.
9. Press the esc button to exit.

Figure 5-12 Log out button



Pre-Travel

⚠WARNING Do **NOT** operate mixer truck until you have read and understand all information in this manual. Death, serious injury, or property damage could result from improper operation.

Familiarize yourself with the components and controls of the mixer truck before beginning operations, refer to the "Overview" chapter beginning on page 4-1.

Cab Equipment

Be certain that the mixer truck, equipment and accessories are in good working order.

You will need all of the items required by law for safe operation of a motor vehicle, as well as the necessary items needed for the job:

- Valid commercial driver's license
- Fuel permit
- Cab card
- Registration
- Insurance card
- First aid kit
- Flares
- Reflector signs
- Fire extinguisher
- Job ticket
- Maps
- Job site phone number and contact person

Truck Equipment

Use the following checklist to determine your truck equipment needs:

- Grease gun and grease tubes
- Spray can filled with form oil or Kleen Kote (not necessary, but very helpful)
- Water hose and nozzle
- Chute rake
- Scrub brush
- Working lamps or flashlight

Personal Protective Equipment (PPE)

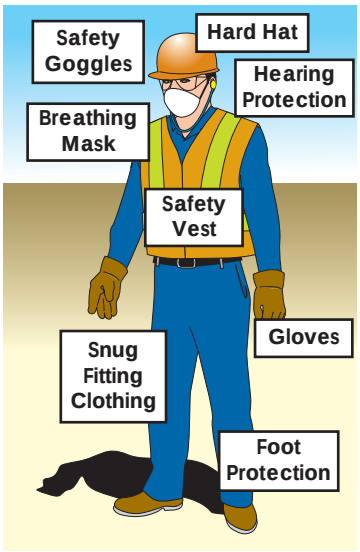
⚠WARNING Concrete contains toxic chemicals. Wear proper personal protective equipment.

Concrete is made from lime, which is extremely alkaline. If wet concrete stays on your skin, it can cause severe burns. In extreme cases, it can cause the affected skin to fall off. When you work around concrete, wear water-resistant gloves and boots. When working in concrete wear waterproof gloves and boots. Boots should have steel toes. There are boots made especially for concrete work that will protect your feet from lime and accidental contact.

The following personal protective equipment should be worn to protect you from chemicals and other job site hazards.

- Protective rubber gloves and boots
- Hard hat
- Safety goggles
- Snug-fitting work clothes
- Hearing protection
- Breathing protection (when cement dust or exhaust fumes are present)
- Safety vest (when working in any area where traffic is present)

Figure 5-13 Personal protective equipment



Hydraulic Oil

Do not mix name brands even if they have the same viscosity. Each oil manufacturer uses a different additive package to accomplish anti-foaming, silt settling, anti-wear, etc. Mixing different chemical additive packages may render them useless. Top off oil levels **only** with the same type of oil that is in the reservoir.

Visually inspect for and repair any hydraulic leaks before operating the truck. Lost hydraulic oil harms the environment and is expensive to clean up and replace.

NOTE If oil becomes bubbly on the job, it is most likely a problem with the hydraulic seals in the system.

Cold Weather Precautions

Frost or ice on drum rollers will cause roller failure and damage, be sure to remove any frost or ice from the drum rollers.

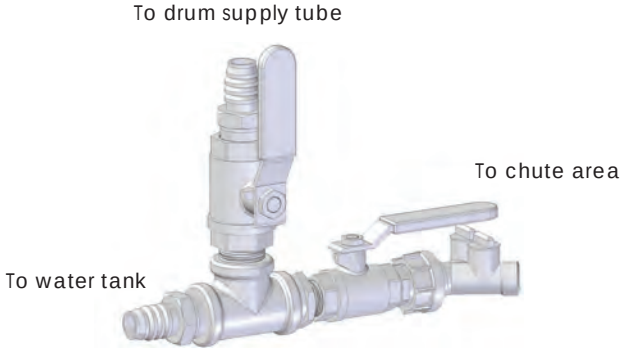
Ice can push the water tank flapper valve out of its sealed condition. A worn flapper valve loses its seal unless pressure is maintained. Be sure to remove any ice from the flapper valve.

Drain Water System

To drain the water system for cold weather:

1. Remove all connected hoses from rear water supply valve and drain.
2. Open the shutoff valve on the rear water supply valve, Figure 5-14.

Figure 5-14 Rear water supply (Y valve)



3. Depressurize water tank by rotating the handle pointer to EXHAUST on the water pressure control valve, Figure 5-15.
4. Verify gauge pressure drops to 0 PSI.

Figure 5-15 Water pressure control valve

5. Open water tank drain valve and purge water from system.
6. Open sight gauge drain valve.

Figure 5-16 Water tank drains

7. With the drain valves open, rotate the handle pointer from EXHAUST to PRESSURISE to purge tank with air and let the water settle out.
8. Leave drain valves open until the next day of operation.

Truck Chassis Inspection

Check the following items each day before operating the mixer truck:

Figure 5-17 Chassis components

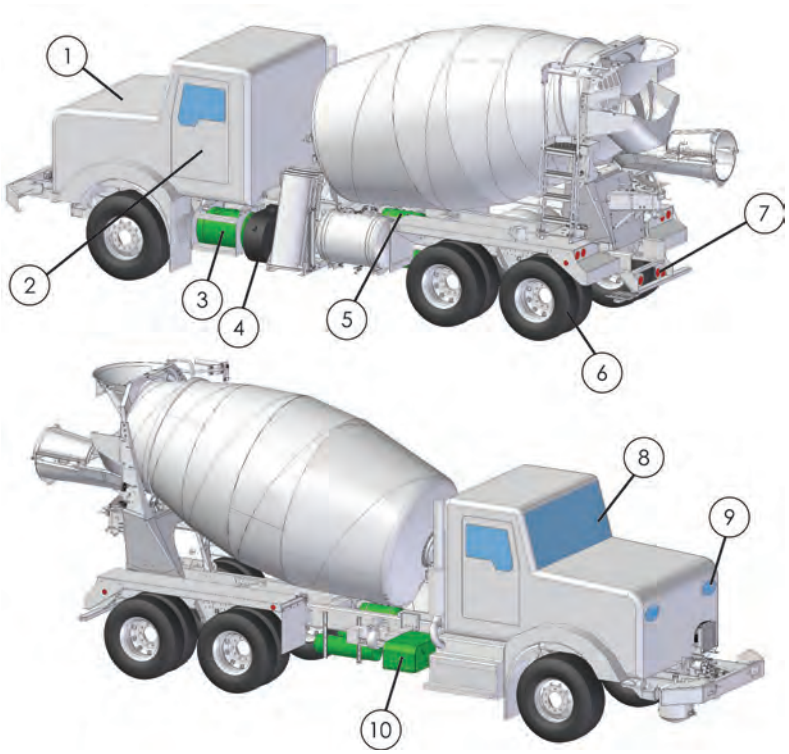


Table 5-1 Chassis components

1	Truck engine oil level and condition. Antifreeze / coolant level in the radiator. Horn. Brakes.	6	Tire condition and proper air pressure.
2	Dash lights. Keep cab free of debris, especially on the floor. Accidents can happen when foreign objects get stuck between clutch or brake pedal and fire wall.	7	Lights. Signals. Reflectors.
3	Fuel level.	8	Clear windows of ice, frost, mud, and obstructions. Clear mirrors of ice, frost, and mud, and align them properly for clear vision.
4	Diesel exhaust fluid level. (DEF)	9	Headlights.
5	Brake system air pressure and condition (bleed water from air tanks).	10	Battery fluid level and condition.

Mixer Inspection

Visually and physically inspect mixer components daily for condition and function, see Figure 5-18. Any issues must be corrected before operations. Do **NOT** operate the mixer truck until issues are corrected.

Ensure all ladders, chutes, chute extensions and any other items being transported are securely stowed for travel. Safety guards must be in place and secured before operation.

Structural stability is vital. Inspect for cracks, chipped paint, rust (especially under paint), and missing components. Clean and repaint areas where the paint is chipped to prevent damage to the structural steel. Replace missing parts before operations.

⚠WARNING Visually and physically inspect the unit each day. Problems must be repaired before using the mixer. Neglecting these inspections could result in accidents.

Figure 5-18 Mixer Components

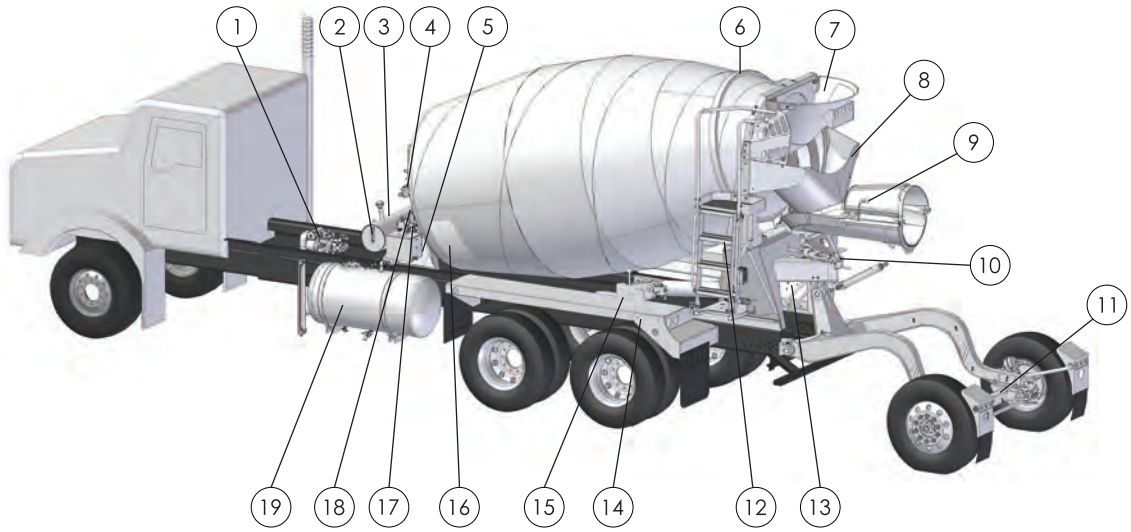


Table 5-2 Mixer checkpoints

1	Direct drive from truck engine, U-joints, slip joint, hydraulic pump drive shaft and both hydraulic pumps (mixer drive and chute cylinder). May be front or rear mounted.	11	Booster axle (optional).
2	Hydraulic oil reservoir fluid level and condition. Can be mounted front or rear.	12	Ladder, top railing, extension, and extension lock.
3	Hydraulic spin-on filter element.	13	Back up alarm.
4	Drum drive - drum drive flange bolts and mounting bolts.	14	Fender, mounting hardware, reflectors and lights.
5	Front pedestal mounting bolts and springs.	15	Charge - discharge drum rotation.
6	Drum rollers, drum track, alignment, drum fins, and debouncer.	16	Inspection hatch hardware.
7	Charging hopper, optional hopper raise lower cylinder.	17	Drum drive RPM sensor.
8	Discharge funnel and skirting.	18	Drum drive motor and gear reducer mount bolts.
9	Fold over chute and travel chain lock.	19	Water tank, straps, valves, hoses and flapper valve.
10	Chute center lock, pivot, air lock, and position sensor.		

Rear Pedestal Locks

Ensure everything on the mixer truck is ready for travel. This includes locking the chute, chute extensions, ladder and miscellaneous equipment.

Figure 5-19 Rear pedestal lock locations

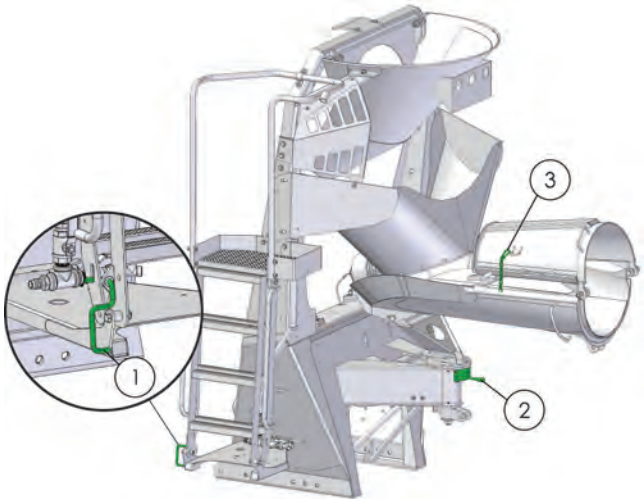


Table 5-3 Rear pedestal lock locations

1	Ladder lock
2	Manual chute lock
3	Travel chain lock

Chute Straps

Ensure that the chute straps are secured and ready for travel. Please refer to Figure 4-6 for various types of chute rack configurations.

Figure 5-20 Chute Rack

Driving the Mixer Truck

Many accidents involving mixer trucks are traffic accidents. You must obey all traffic laws and warning signs.

A ready mix truck has a high center of gravity (top heavy) and must be driven accordingly. Cornering too fast causes the load to shift. You need to use caution when making turns.

Every load has variables that can affect the stability when driving the mixer truck. The stiffer the mix, the higher the center of gravity. You must use caution on steep grades and when making turns. Heavier ready mix loads increase stopping distance requirements.

⚠WARNING High center of gravity and off center load exists. Use caution when making turns.

Planning your Route

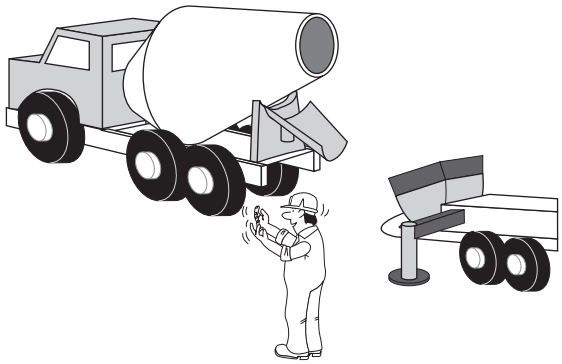
Determine what roads will get you to the job site quickly and safely. Take into consideration any road construction, traffic, hills, bridges or weight restrictions that apply to the selected route. It may require more time and attention, but the effort can result in savings.

Backing Up

⚠WARNING Do **NOT** back up without a Guide.

In a mixer truck you will not be able to see directly behind you. Use a Guide when backing up, see Figure 5-21. If you lose sight of your Guide - **STOP**.

Figure 5-21 Back-up Guide



A Guide is a person who stands where you can see them; signals instructions, alerts you to traffic, pedestrians and other obstructions behind the mixer truck.

- Coordinate signals before backing.
- Maintain visual contact with the Guide.
- Back up slowly.

If you are in an isolated area and no Guide is available, get out of the cab and look for obstructions before you start to back up.

⚠WARNING Determine job site conditions and take necessary precautions.

The backup warning alarm can give you some measure of safety, but you must **NOT** rely on it. For example, a child walking behind your truck when you begin to back up may become frightened by the backup warning alarm and freeze on the spot.

Slippery conditions around a job site should be taken into consideration. Remove any mud, ice, snow, or other slippery materials from shoes to maintain contact with clutch and brake pedals.

Rear View Camera (optional)

The rear view camera will automatically turn on when the truck is placed into reverse. When the truck is taken out of reverse the camera will automatically turn off. You can turn the camera off at anytime by pressing the center of the screen.

To turn the rear view camera on manually, press the (camera icon) on the display panel. You can turn the camera off by pressing anywhere on the 7" display.

Changing Lanes

You have blind spots on your left and right sides. Unfortunately, many other drivers are unaware of these spots and will travel in them for extended periods of time. Remove these blind spots by using convex mirrors, which attach on or below outside rear view mirrors. Before changing lanes, check convex mirrors for other drivers who may be hidden in your blind spots. Signaling well in advance will warn other drivers of your intent to change lanes.

Towing the Mixer Truck

Poor driving conditions on the job site may make towing the truck necessary. It is better to tow the truck through deep mud, sand, snow, or other driving hazards than to risk damaging an axle or sliding off the road. In these cases, remember the following:

- It is best to use the towing pin supplied by the truck manufacturer. The towing pin is usually located inside the front bumper.
- Many trucks are equipped with tow hooks on the front of the truck. If you are unable to use the tow hooks for any reason, use extreme caution when selecting a place to connect the towing cable. Be sure the selected location has adequate room for the cable to move without hitting or damaging other parts. The cable or strap and attachment point must be able to withstand the weight of the truck.

⚠WARNING Never use chain for towing. If a link breaks, the chain will whip with great force. This could cause injury or property damage.

Using the Mixer

Filling the Water Tank

Fill your water tank before leaving, it is not possible to pour the job without water. Water is also necessary for clean out.

⚠WARNING Water tank under pressure could cause mechanical failure or damage to water system or severe injury. Maintain a pressure no greater than 55 PSI.

1. Locate the water pressure control valve, see Figure 5-22.

Figure 5-22 Water pressure control valve

2. Rotate the handle pointer to EXHAUST.
3. Verify gauge pressure drops to 0 PSI.
4. Insert water supply hose into water tank through the flapper valve, see Figure 5-23.

Figure 5-23 Flapper valve location

5. Fill the water tank to the desired level.
6. Remove water supply hose from water tank.
7. Rotate the handle pointer to PRESSURIZE, see Figure 5-22.
8. Watch the gauge pressure increase to the 55 PSI set point, see Figure 5-22.
9. Inspect the entire water system for water and air leaks, including the spray nozzle.
10. Release pressure before charging and traveling to job site.
11. Rotate the handle pointer to EXHAUST, see Figure 5-22.
12. Watch the gauge pressure drop from the 55 PSI set point to 0 PSI, see Figure 5-22.

⚠WARNING **NEVER** travel with a pressurized water tank! Water tank under pressure could cause mechanical failure or damage to water system or severe injury.

Loading and Mixing the Batch

When mixer fins are in good condition, 75 drum revolutions properly mixes the load (approximately 5 minutes).

1. Start the truck and run at idle until adequate air pressure and operating temperatures of engine and hydraulic systems are reached.
2. Position hopper under discharge chute at the batch plant.
3. Press the ⬡/⚡ (mix/load) button to start the loading process.(Button highlighted green).
   - Drum RPM is automatically set to 14 RPM (factory default) when loading has been detected.
4. Transfer the load from batch plant to the mixer truck.
5. When loading is completed, press twice the ⬡/⚡ (mix/load) button to start the mixing process.
   - Engine RPM automatically raises to default setting.
   - Drum automatically raises to default RPM.
   - Drum counter will reset, and drum will rotate 75 (factory default) revolutions.
   - When the drum has turned 75 revolutions, the drum will be put into drive mode automatically and set the drum to 1 RPM.
   - Engine RPM will return to idle.

NOTE If truck brakes or parking brakes are disengaged, the drum will remain in mix mode, but the truck RPM will return to idle and drum will rotate at 6 RPM. Drum RPM setting will return to constant speed default, when the mixing cycle is complete.

6. Obtain job ticket and appropriate information. Job ticket information is important!

Load Inspection

Move the mixer to the inspection and clean up area. Follow all safety precautions.

1. Reduce engine RPM to idle by pressing the (decrease RPM) button.
2. Reduce drum speed to 1-6 RPM by repeatedly pressing the (drum discharge) button until the desired RPM has been requested.

⚠WARNING Do **NOT** touch rotating parts. Verify all safety guards are in place.

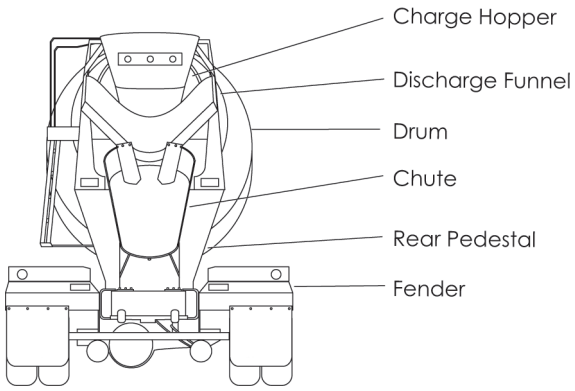
⚠WARNING Mount or dismount truck using the three point rule. One hand and two feet or two hands and one foot are to be in contact with a secure surface at all times.

3. Climb up the ladder, using the three point rule, Figure 5-24.

Figure 5-24 Three point rule

4. Look inside the drum to determine the condition of the mix:
   - Aggregate should be completely covered with a consistent mix, no clumping and not too wet or not too dry.
   - Thoroughly rinse the hopper, chute, fenders and rear pedestal area of splatters or spills.

Figure 5-25 Hopper area



5. Leave drum speed at 1-6 RPM for transport using:
   - Slower speed - longer distance to destination.
   - Higher speed - shorter distance to destination.

Traveling to Job Site (Agitating)

1. Follow the selected route to job site.

⚠WARNING Accidental discharge of concrete could create a traffic hazard. Verify control lever is in the charge position and properly adjust the control lever pivot.

⚠WARNING High center of gravity and off center load exists. Use caution when making turns.

⚠WARNING **NEVER** travel with a pressurized water tank! Water tank under pressure could cause mechanical failure or damage to water system or severe injury.

2. SMART drum (constant speed) will automatically be engaged when the truck travels faster than 10 MPH (factory default). SMART drum setting will turn the drum at 1 RPM (factory default).
3. SMART drum can be manually engaged by pressing the (constant speed) button.
4. Once SMART drum is engaged it will **NOT** shut down automatically when speeds are lower than 10 MPH.
5. SMART drum can be disabled if the (constant speed) button is pressed by operator (SMART drum disables are recorded in the log).
6. Monitor slump meter pressure.

Arrival and Setup

Establish communication with the job supervisor.

An experienced job supervisor will pick an appropriate spot that will allow a safe and efficient pour. If the location is not safe and efficient, you will have to make it safe.

⚠WARNING Do **NOT** set up near power lines. Check for low power lines.

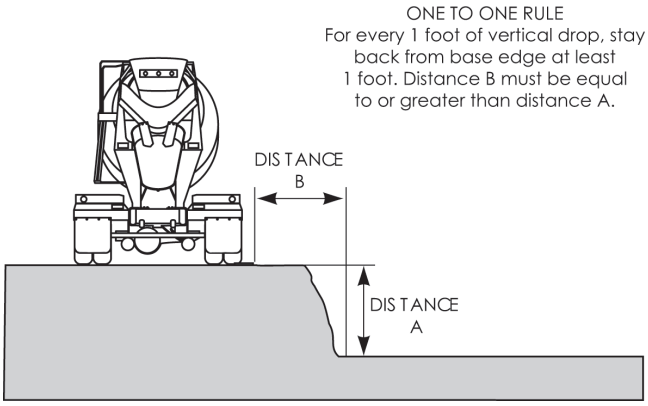
⚠WARNING High center of gravity and off center load exists. Use caution when making turns.

On occasion, you will be told only what is to be poured, and you will have to select the setup location.

In all cases, the setup point is your responsibility. It must have the following features:

1. You must be able to reach the pour with the chute and chute extensions. If obstructions are in the way, select a different site or have the obstructions removed. In the case of electrical wires, do not set up or back into a position that gives you less than 10 feet of clearance.
2. The soil must be able to support the weight of the mixer truck. Under no circumstance should you compromise the stability of the mixer truck by setting up on unstable soil. Even solid granite may collapse when a mixer truck is driven too close to the edge. Stay back from the base edge of any excavation or cliff the same distance as the vertical drop of the excavation or cliff. For example, if the excavation is 10 feet deep, you must be 10 feet back from the bottom edge. This is known as the 1-to-1 rule, see Figure 5-26.

Figure 5-26 One to one rule



In addition to the preceding requirements, it is desirable that the setup point also have these features:

- You must have clean and clear accessibility to the pour.
- Fairly level terrain with adequate delivery to the customer, crew, and discharge point.
- Out of traffic flow.
- If delivering to a concrete pump, every effort should be made to accommodate two mixers at the pump hopper simultaneously.

Discharge Location

You need to prepare the mixer for use before moving to the discharge point.

⚠WARNING Do **NOT** touch the chute pivot points. Use caution when working with the chutes.

⚠WARNING Do **NOT** stand under the chutes at any time.

1. Unfold chute and add extensions if necessary.
2. Unlock the chute by pressing the (chute lock/unlock) button.
3. Position the chute in the general area required.
4. Lock chute before backing up by pressing the (chute lock/unlock) button.
5. If the mixer is equipped with the hopper up (optional), raise the hopper by pressing the (hopper up/down) button.

⚠WARNING Do **NOT** back up without a Guide.

6. Back truck into position with the help of a Guide.
7. Unlock chute by pressing the button (chute lock/unlock) and position chute over delivery point. Lock chute in place by pressing the button (chute lock/unlock).
8. Raise or lower chute by pressing the (chute up) button or by pressing the (chute down) button.
9. Rotate the water pressure control valve pointer handle to PRESSURIZE, see Figure 5-27.
10. Gather tools.

Figure 5-27 Water pressure control valve

11. Wet chute and back of truck.
    - Do not put water into a pump hopper unless instructed to do so by the pump operator as segregation can cause blockages.
12. Switch the drum from charge to discharge by pressing the (discharge drum) button.
13. Dump a small amount of ready mix for approval.
    - Add water and agitate if requested.
    - (Carefully add water as water cannot be removed.)
14. Discharge as directed.

With the engine RPM at idle, it is best to use the discharge control lever to control the discharge flow.

Slump

The slump gauge is an oil pressure gauge that monitors the pressure it takes to turn the drum, see Figure 5-28. The higher the pressure, the stiffer the mix or lower the slump. The lower the pressure, the softer the mix or higher the slump.

Compare order specifications to the slump gauge reading. If necessary, adjust ingredients to match the customer order according to the contractors instructions.

Every load has variables even though ingredient measurements are exact. Other factors affect the load and adjustments may be necessary each time.

Some factors affecting the slump gauge:

1. Individual hydraulic system (test at 600 - 800 engine RPM with mixer in full charge.
2. Aggregate size (larger pulls harder).
3. Load size (partial loads pull easier).

Figure 5-28 Slump gauge

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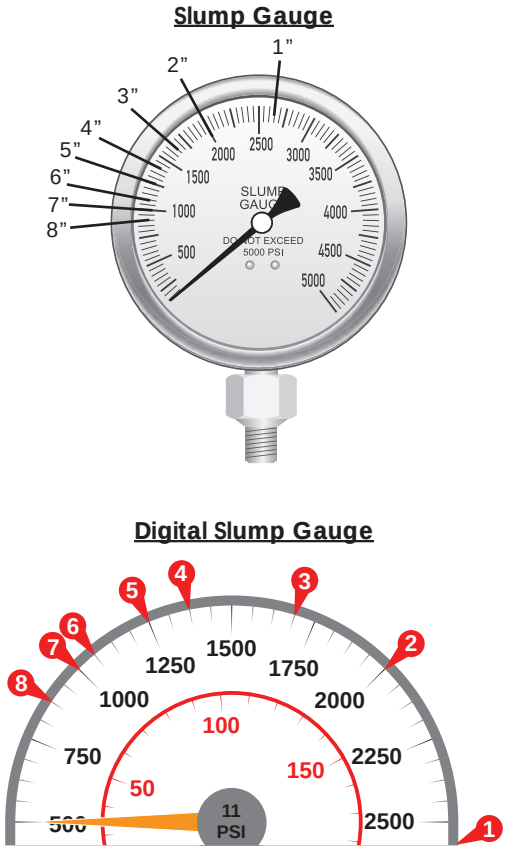


Table 5-4 represents an estimated guide for the relationship of hydraulic pressure to slump. The numbers were developed from a variety of truck models and mixes. Each driver must be responsible for fine tuning the slump meter on their own truck by observing on-site slump tests and comparing them with their own gauge.

Table 5-4 Pressure to slump Guide

Hydraulic pressure PSI	Slump in inches
2650	1
2000	2
1650	3
1400	4
1250	5
1100	6
1000	7
900	8+

Adjusting Digital Slump Gauge

The digital slump gauge markers can be changed to match slump that is tested on the job site.

1. Press the left or right arrow buttons () until screen 3 (slump meter) is displayed.
2. Press the up or down arrow buttons () until the desired slump setting is selected.
3. Press the left or right arrow buttons () until the desired PSI is reached.
4. Press the Esc button or cycle through all slump settings to exit.

Figure 5-29 Digital slump meter

Discharging to a Concrete Pump

⚠WARNING Do **NOT** back up without a Guide.

Exercise caution when backing towards a concrete pump; always use a Guide. Stop the truck if the Guide steps out of your vision or you can't understand their signals.

The pump operator may be working in a location that prevents you from seeing them, it is important to establish and maintain communication at all times.

Ask the pump operator how to stop the pump in an emergency.

Resetting the pump from an emergency stop may require that the pump operator physically resets the switches at the machine. This would cause delays for the entire crew. Therefore, do not press the emergency stop without reason or as a joke. Do **NOT** hesitate to push it if there is an emergency.

If the Pump Sucks Air

When dumping into a pump, **NEVER** let the level of concrete get below the agitator, unless specifically instructed by the pump operator, see Figure 5-30.

⚠WARNING Air pumped through the machine could injure the hose person. If air is sucked into the pump, signal operator to stop. If that fails, activate emergency stop.

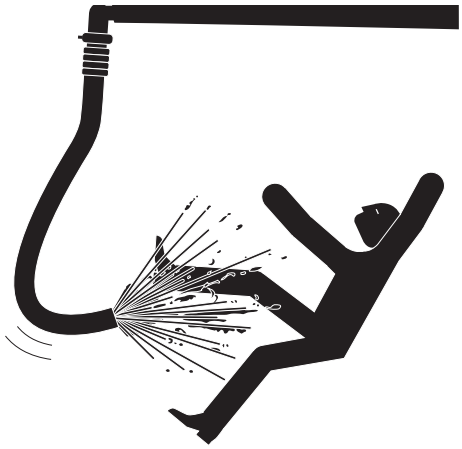
Figure 5-30 Empy Hopper Hazard

1. Alert the operator.
2. If unable to gain operator attention, activate emergency stop switch.
3. Fill hopper with concrete before pumping resumes.
4. Look away from the hopper when resuming pump.
5. Keep all people clear of end of hose until air has passed through the hose. Alert operator if anyone gets near the hose end.

If a pump operator asks to pump out into your mixer, never allow anyone to hold the discharge hose as the operator pumps out. If they are pumping out with a line pump, they should always use a candy cane or wall hook to prevent any chance of a hose whip, see Figure 5-31.

⚠WARNING Never allow anyone to hold the discharge hose of a pump while it is pumping into a mixer drum.

Figure 5-31 Hose whip hazard



Clean Up and Leaving Job

To stop discharge:

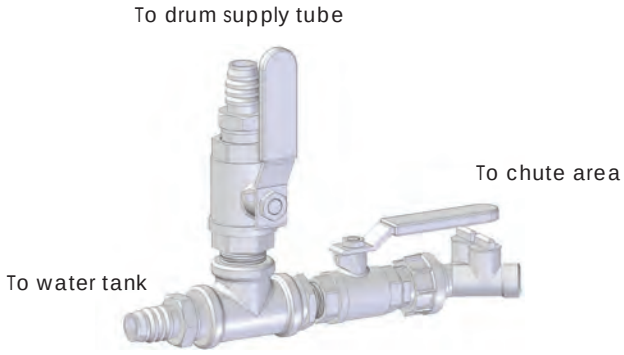
1. Stop drum from turning by pressing the (stop drum) button. Then move the drum control to charge by pressing the (charge drum) button. Increase to 4 RPM by pressing the (increase RPM) button.
2. Ask:
   - Do you want more ready mix?
   - What do you want done with the balance of the load?
   - Do you have a place to pour the balance of the load?
   - Do you need more water?
   - Where is the designated clean up area?
3. Empty the balance of the load at the designated area if so instructed, and proceed to clean up area.

⚠WARNING Do **NOT** step in or near any rotating parts. Use caution around rotating parts.

To clean mixer:

1. Operate the mixer drum in the charge position at 4 RPM.
2. Connect hose to Y valve and switch valve to use hose attachment, see Figure 5-32. Start at the top and work down. Rinse splatters and spills from hopper, inside and outside drum and rear pedestal using the drum supply tube.
3. Clean chutes, chute extensions, chute pivot, and fenders.
   - As you clean, check for concrete build up inside drum and around fins, weep holes, charge hopper, discharge funnel, drum, rollers, drum track, chutes, rear pivot, locks and other components. Concrete build up unfavorably affects operation, performance, and life of the mixer truck.

Figure 5-32 Rear water supply (Y valve)



4. Return chute, extensions, and tools to transport positions.
5. Lock the ladder in transport position.
6. Ask the job supervisor to sign the job delivery receipt, and give a copy to contractor.

Return Route

1. Continue to operate the mixer drum in CHARGE position at 4 RPM or slurry will set up and cause expensive clean up or damage to drum rollers and truck.

⚠WARNING **NEVER** travel with a pressurized water tank! Water tank under pressure could cause mechanical failure or damage to water system or severe injury.

2. Release air pressure in water tank before leaving the job.
3. Follow the selected return route to the batch plant.

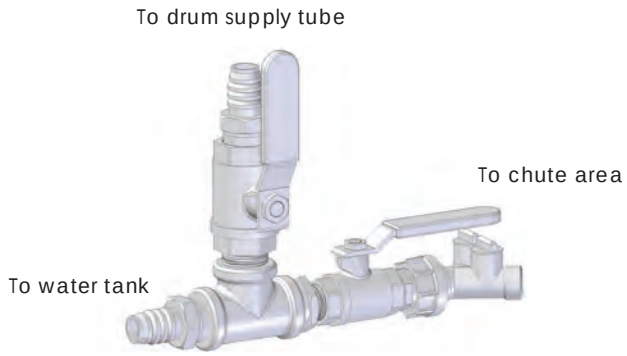
Reload or Shut Down

When you arrive at the batch plant, check with dispatch about how to deposit the balance of the load - cube it, reuse (footings), or recycle for next procedure. Discharge left-over mix as ordered. If re-dispatched, repeat loading procedure. If shut down, use batch plant shut down procedure.

Recommended Shut Down Procedure

1. To empty drum of all contents - operate mixer in the discharge position at a drum speed fast enough to keep aggregate from free falling with gravity.
2. Fill water tank.
3. Fill drum with 200-300 gallons of water by positioning hopper under wash water spout.
4. Operate mixer in maximum charge position.
5. Move mixer truck to wash out area.
6. Empty water from drum with engine at idle and the mixer in discharge position.
7. Operate mixer in full charge position with engine at 1200 RPM.
8. Transfer all water from tank to drum by opening water valve to the drum supply tube, see Figure 5-33.

Figure 5-33 Rear water supply (Y valve)



9. As water is transferring from tank to drum, slowly cycle from charge to discharge 2-3 times, cycling water from front to back in the drum so fins are well rinsed.
10. Turn water pressure control valve to EXHAUST position, see Figure 5-34.

Figure 5-34 Water pressure control valve

11. Empty all wash water from drum with engine at idle and drum in discharge position.
12. Examine condition of the mixer truck and report any damage, wear, unusual noises, leaks or unusual operation.
13. Move clean mixer to the designated storage facility as directed.

Optional Equipment

Booster Information

Figure 5-35 Booster axle components

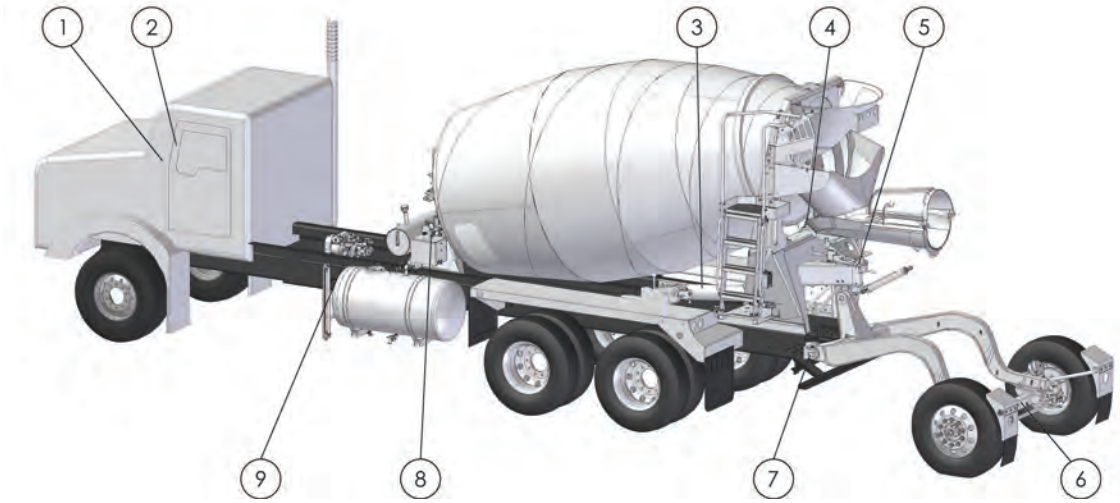


Table 5-5 Booster axle components

1	**Axle pressure settings gauge** - located in cab. Measures hydraulic pressure applied to booster axle.	6	**Booster axle assembly** - allows for more load carrying capacity by evenly distributing weight and stabilizing truck.
2	**Booster axle control switches** - engages booster up ( ), booster down ( )and stop booster ( ) movement. The booster is safety protected and will raise when the truck is put in reverse.	7	**Booster axle pivot** - allows up and down movement of booster axle and houses one of two proximity switches designed to be sure the chute is centered before activating booster.
3	**Booster cylinder** - raises and lowers booster axle and houses the accumulator, which absorbs road shock from booster axle.	8	**Axle pressure settings plate** - tag located on the front pedestal. It provides ratios of hydraulic pressure requirements for different size loads.
4	**Booster up latch** - hydraulic pressure will hold the booster in the up position. The latch is a safety feature.	9	**Booster pressure regulator adjustment** - knob used to adjust hydraulic pressure of booster to match load chart.
5	**Chute center sensor** - Proximity sensor for chute being centered.		

NOTE Safety features have been built into the unit; however, these are useless unless you are alert and apply your equipment knowledge as well as driving knowledge.

NOTE There are chute sensors: "chute up" and "chute off center". The chute hazard icon ( )should become highlighted when the chute is up or off center.

NOTE Anytime the chute hazard icon is highlighted, the booster will not operate and the booster buttons are disabled.

⚠WARNING Do **NOT** operate the booster axle until you have read and understand all information in this manual.

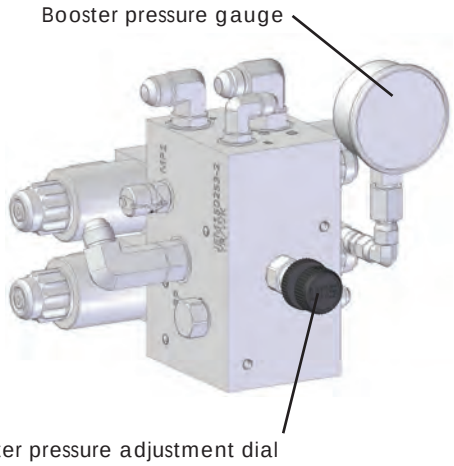
Front Control Location and Description

1. Chute hazard icon ( )- Chute hazard icon will be highlighted when a chute hazard exists.
2. Booster up button ( ) moves the booster up.
3. Booster down button ( ) moves the booster down.

NOTE The booster will not move up or down if chute is off center or not in lowest position. Switch will light when booster is in motion.

4. Booster stop button ( ) button allows immediate mid-position stop of booster axle. The booster up/down buttons will resume motion of booster axle.
5. Booster pressure regulator adjustment - Adjusts to increase and decrease pressure on the booster axle by rotating the knob on the control valve, see Figure 5-36.

Figure 5-36 Booster pressure regulator detail



6. Axle pressure settings gauge - Measures hydraulic pressure to booster cylinder.
7. Axle pressure settings chart - Provides pressure settings information for booster cylinder load size.

NOTE Numbers on the Axle pressure settings plate are based on maximum axle capacity and not necessarily local road restrictions. Always confirm that the numbers on the Axle pressure settings plate are legal in the area you will be driving. The plate is located on the front pedestal, driver side, next to the main serial number ID plate.

Figure 5-37 Booster axle pressure setting plate

Pre-Travel Inspection

Check the following items of the booster axle each day before the mixer truck is taken from the yard:

(Issues must be corrected before the truck with booster axle is used.)

- Tire pressure and condition
- Check air brake lines for cracks or wear spots
- Lights and mud flaps
- Check hydraulic lines from cylinder to valves and pump
- Tie rod ends
- Stabilizers
- Slack adjusters
- Brake shoes
- Booster Warning Alarm
- Indicator lights in cab control

⚠WARNING Tire failure could result in loss of vehicle control. Check tire condition and pressure daily.

Only qualified personnel should operate the truck with booster axle. Do not press any buttons or activate any switches until you know what will happen as a result.

These procedures must be used before operating the booster axle:

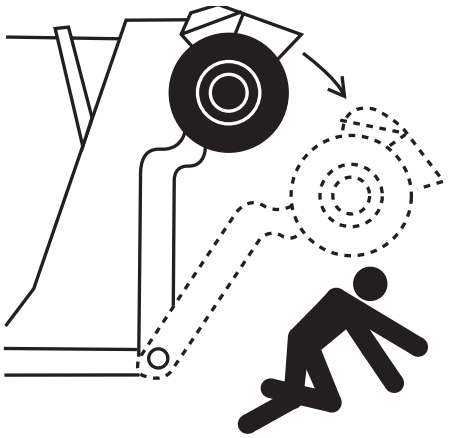
- Check the chute hazard icon ( ) before raising or lowering booster axle. If the chute hazard switch is illuminated, a chute hazard exists. Center or lower chute to correct hazard.
- Stop booster axle movement by pressing the booster stop ( ) button. Press the booster up ( ) or booster down ( ) buttons to resume movement of the booster axle.

At the Batch Plant

1. Push the button (booster up) to raise the booster axle. Move the mixer under the batching hopper. Load the drum as described in "Loading and Mixing the Batch" on page 5-11.

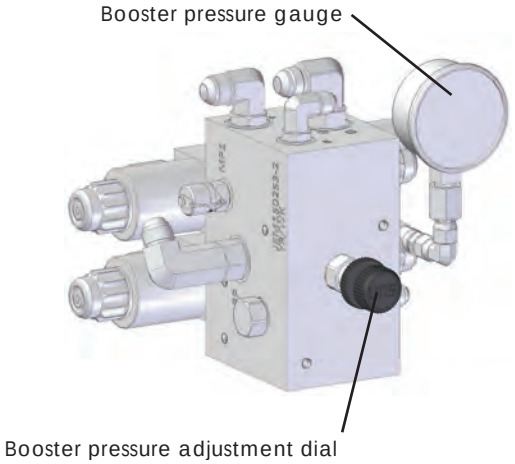
⚠WARNING Do **NOT** raise or lower the booster axle until all people and objects are clear of moving parts.

Figure 5-38 Clear booster area



2. Push the button (booster down) to lower the booster axle when loading is complete.
3. Confirm the size of your load and set booster pressure regulator adjustment, see Figure 5-39, to match axle pressure gauge with axle pressure chart for load size.

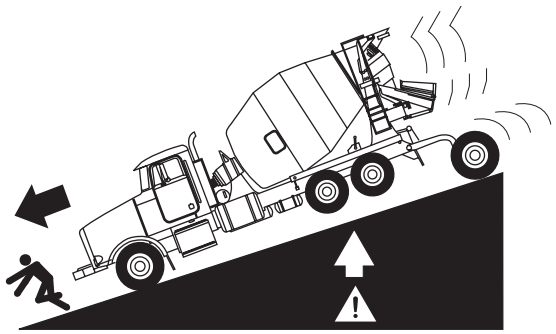
Figure 5-39 Booster pressure regulator detail



NOTE Numbers on the Axle pressure settings plate are based on maximum axle capacity and not necessarily local road restrictions. Always confirm that the numbers on the Axle pressure settings plate are legal in the area you will be driving. The plate is located on the front pedestal, driver side, next to the main serial number ID plate.

4. Move mixer to the load inspection area, see "Load Inspection" on page 5-12.
5. Clean and visually inspect booster axle components.
6. Recheck pressure against load to be transported. If there is too much pressure, the truck driving tandem could be affected by loss of traction, see Figure 5-40.

Figure 5-40 Traction loss



⚠WARNING Check hydraulic pressure against load to be transported.

⚠WARNING Booster axle can lift an empty truck, causing loss of brakes and traction. Adjust booster pressure to the load.

Traveling

⚠WARNING High center of gravity and off center load exists. Use caution when making turns.

Driving a mixer truck with a booster axle is different than driving a traditional mixer truck. A booster truck has a long wheel base. You must allow for extra length when making turns.

The hydraulic pressure of the booster axle must correspond with the load being transported, see Figure 5-40. Monitor the hydraulic pressure while en-route using the in-cab pressure gauge.

At the Job Site

Check the chute hazard icon ( ); if illuminated, a chute hazard exists. Center or lower chute to correct hazard.

⚠CAUTION Chute in raised or off center position could collide with booster axle. Lower and center chute before activating booster axle.

1. Raise booster axle after making sure the area is clear of personnel by pressing the (booster up) button.

⚠WARNING Do **NOT** raise or lower the booster axle until all people and objects are clear of moving parts.

2. Discharge and clean up, see "Clean Up and Leaving Job" on page 5-18.

Returning to Batch Plant with Empty Truck:

NOTE Numbers on the Axle pressure settings plate are based on maximum axle capacity and not necessarily local road restrictions. Always confirm that the numbers on the Axle pressure settings plate are legal in the area you will be driving. The plate is located on the front pedestal, driver side, next to the main serial number ID plate.

1. Raise booster axle by pressing the (booster up) button.
2. Set pressure to 0 PSI before leaving the job site.
3. Check "booster up" latch to be sure it is secure for transporting.

⚠WARNING High center of gravity and off center load exists. Use caution when making turns.

4. Reload or shutdown, see "Reload or Shut Down" on page 5-19.

Returning to Batch Plant with a Partial Load:

1. Lower booster axle by pressing the (booster down) button when ready to return to the batch plant.
2. Confirm size of load, then set the booster pressure regulator adjustment to match axle pressure gauge with axle pressure chart for load size.

⚠WARNING Check hydraulic pressure against load to be transported.

3. Reload or shutdown, see "Reload or Shut Down" on page 5-19.

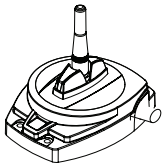
NOTE If unit is equipped with optional pusher, booster, or tag axles it is important to understand that the pressure used when deploying them must comply with local regulations. Always check, understand and comply with all applicable state, provincial and other government regulations regarding allowable weight and axle configurations.

Inclinometer

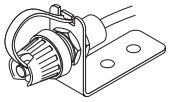
The optional inclinometer will detect when the truck is traveling at an incline. If an incline is detected and SMART drum (constant speed) is enabled, the drum RPM will increase to keep the ready mix at the front of the drum. When the there is no more incline, the drum RPM will be automatically adjusted back down.

Safe Paring of Transmitter to Receiver

Safe pairing is used to get a unique assignment between a single Transmitter and a single G3 Receiver. To exchange the Transmitter and Receivers ID's when replacing either the Receiver or Transmitter in a system follow the Safe Paring procedure below:



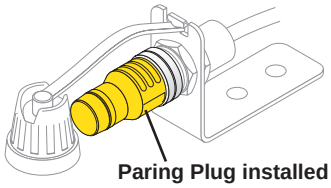
G3 Receiver



Receiver Socket

Paring Plug

1. Remove power to the Receiver by turning the truck engine off.
2. Install the paring plug into into the receiver socket.



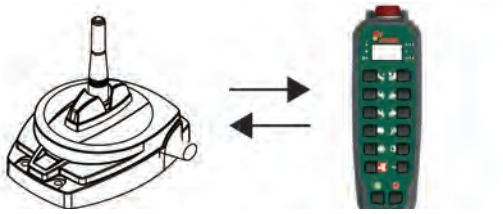
Paring Plug installed in socket

3. It is recommeneded you sit in the truck cab for this step. Simultaneously press button #1 and button #3 on the Transmitter. LED#3 will light indicating the Transmitter is ready for Safe Pairing.

4. Re-apply power to the Receiver by starting the truck engine. (Step 4 must be done within 10 seconds of step 3).
5. The Transmitter will confirm the download is complete by flashing LED#3 eight times.

6. The Receiver LED Display will flash Po-Id.

7. Turn off the power to the Receiver by shutting off the truck engine. Remove the pairing plug from the receiver socket. Restart the truck engine to power up the Receiver. The Transmitter has now been paired to the Receiver.



NOTE If pairing is performed during low battery on the Transmitter it may look like the paring works but it does not. This is related to a safety precaution. Replace battery and repeat the paring procedure.

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Maintenance

This chapter covers maintenance information for the Integral dx Mixer Truck.

6

Regular maintenance is required to keep your mixer truck in good working condition. There are two kinds of maintenance: preventive and repairs. Preventive maintenance will help you avoid unnecessary repairs, but eventually even well-maintained truck parts wear out and require repair or replacement. Repairs should be made before using the truck.

Preventive maintenance is done on a regularly scheduled basis. That schedule can be daily, weekly, monthly, quarterly, semi-annually, or annually. Make a checklist that will tell you what maintenance is due and when. A sample checklist is included in this section of the manual on page 6-10.

Keep accurate records of maintenance performed and when the work was completed. Complete maintenance records add to the truck's value.

There are certain things you should know about the maintenance of your mixer truck that will not come up on a timetable of things to do. We begin this section with information about some of these items.

Filtration

Filtration is the single most important method of keeping your mixer truck's hydraulic system operational. Particles that could damage the components are introduced into the oil by the pump, valves, motor, cylinders, reservoir breather tube, and by internal wear of the components.

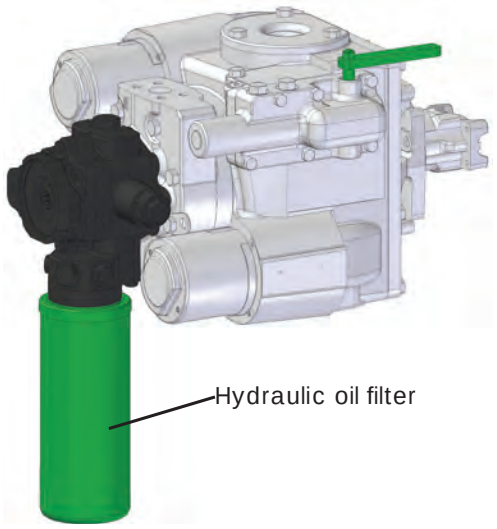
The Integral dx mixer truck hydraulic system is protected with a spin-on filter element that has a Rexroth 20 micron absolute rating.

When to change your hydraulic oil filters

Change your oil filter(s) annually or any time components are repaired or replaced.

To replace a filter

1. Remove the filter and discard properly.
2. Clean the filter seal mating surface and mounting threads.
3. Apply clean fluid to the filter seal.
4. Fill the new filter with the recommended clean fluid prior to installing.
5. Install the filter and hand tighten, plus 3/4 of a turn. Wipe up any spilled fluid.
6. Operate the hydraulics and shut down.
7. Check the fluid level again.



Hydraulic Oils

Hydraulic oils are rated for viscosity, heat dissipation, foaming characteristics, pour point, anti-wear additives, anti-corrosive additives, lubricating qualities, compressibility, temperature range, temperature stability, and other functions. Although many different brands of oil meet these specifications, they may use different chemical additive packages to achieve the end result. For this reason, you should not mix two different brands of oil. The additive package from one brand may be incompatible with the additive package from the other, making both packages useless.

Recently, a few manufacturers have introduced biodegradable hydraulic oils onto the market. These oils are based on vegetable extracts instead of mineral extracts. They are considered safer for the environment in the event of a spill, although the additive packages are not inert. One brand, Mobil EAL 224-H, has been accepted for use in the Integral dx mixer, and other brands are under consideration and testing. These oils must not be mixed with mineral-based hydraulic oils, even in very small amounts. If you will be dumping a job in an environmentally sensitive location and want to use this type of hydraulic oil, please contact the Integral dx Service Department at 320-435-0003 for instructions on making the change from mineral oil to biodegradable.

Viscosity of hydraulic oil is similar in concept to the different weights of motor oil. For example, in the winter you may run 5W-30 in your car, while in the summer you run 10W-40. The same is true for hydraulic systems. If you live in a climate where the weather is changing from extremely hot conditions to extremely cold conditions, you should consider changing the weight of the hydraulic oil that you use by the season. The International Standards Organization (ISO) has developed a method of grading hydraulic oils for viscosity. For summer in northern North America, we recommend ISO VG 46 weight oil, while in the winter we recommend ISO VG 32 or even VG 22, depending on how cold it gets in your area. For southern North America and Central America, we recommend ISO VG 46 for the winter and ISO VG 68 or VG 100 for the summer, depending on how hot it gets. The lower the ISO VG number, the thinner the oil and the lower the pour point of the oil. In addition, the thinner the oil is, the lower the temperature will have to be before it breaks down the lubricating film that protects your components. See the chart under "Hydraulic Oil Viscosity" in this section for help in selecting the proper oil for your requirements.

The quality of the oil needed for use in an Integral dx mixer truck is rated in the DIN system. The ratings have to do with the chemical additive package that is introduced into the oil. Both the DIN rating HLP and HV qualities are approved for use in our trucks.

Specific Information

All machines leave the factory filled with Mobil UNIVIS N46 hydraulic oil unless otherwise requested by the customer. The multi viscosity nature of this oil should work nicely for any temperature between -20° F and 100° F. If you want your new machine filled with a different brand or different viscosity oil, you should specify when ordering.

Many other brands of oil have been approved for use in Integral dx mixer trucks, including:

- Rando HD 46
- Mobil DTE 25
- Shell Tellus oil
- BP Energol
- Aral Vitam
- Esso Nuto
- Esso Univis
- Total Azolla
- Wintershall Wiolan

The brands listed have been approved; however, any oil that meets the quality and viscosity standards described above can be used.

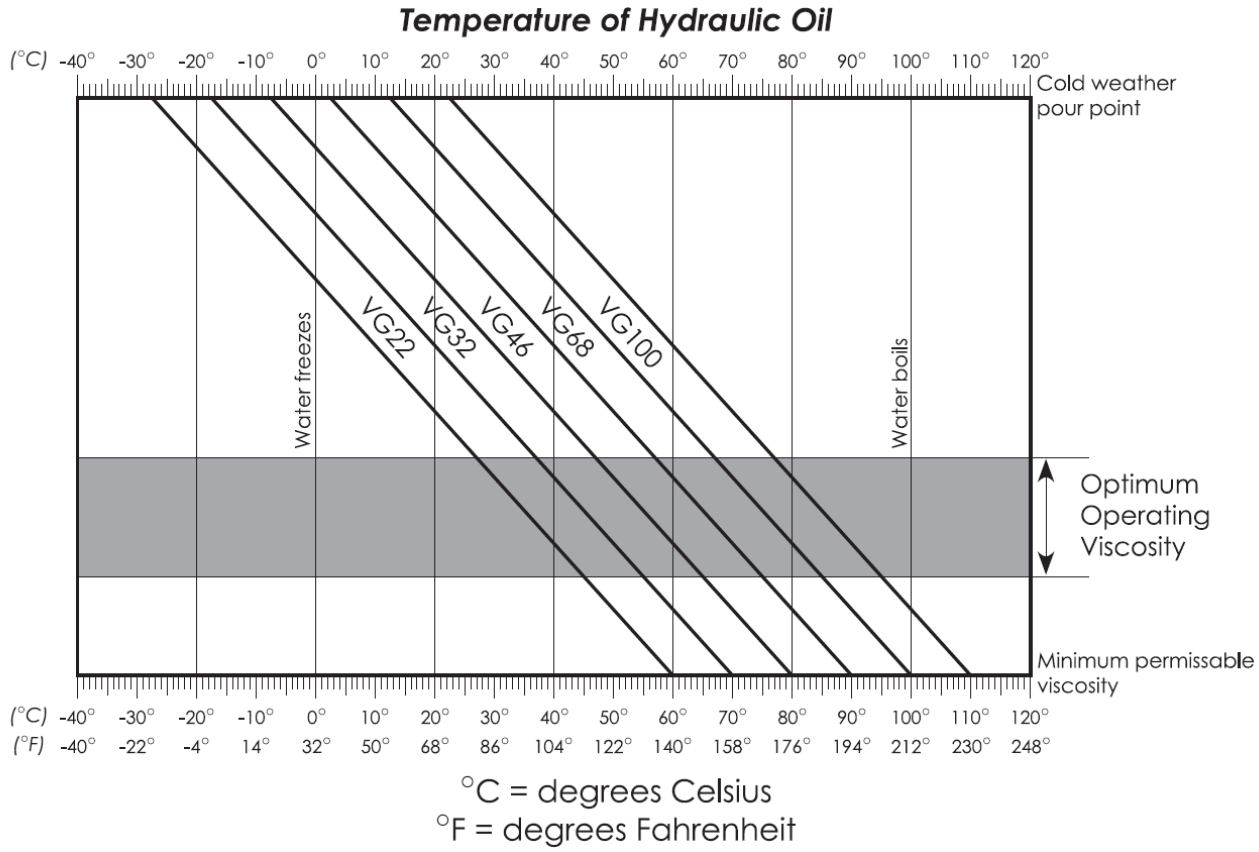
Hydraulic Oil Viscosity

The chart in Figure 6-1 shows the relationship between oil temperature and viscosity. Oil gets thicker when the temperature is low and thinner as the temperature rises.

When to Change your Hydraulic Oil

After the initial 100 hour oil change, change your hydraulic oil at least once a year. If you use good filters and change them when they are dirty, the oil will be clean even after a year. However, the chemical additive packages that give the oil its properties will break down with time, and no amount of filtration will bring them back.

Figure 6-1 Viscosity chart



Pressure, Hoses and Fittings

⚠WARNING Excess pressure could cause hoses to burst. Do **NOT** over pressurize system.

Hydraulic Piping

Before assembly of any hydraulic system, the following precautions should be read and understood.

- Tubes and hoses should be checked for dirt and foreign material. Flush clean. Cap all hoses and tubing until ready for installation.
- All ports on pumps and motors should remain capped or plugged until fittings are installed and hoses attached.
- Do not over-torque fittings when tightening. Two wrenches will be used when tightening tube and hose fitting nuts.
- Labeled and sealed containers are used to fill the hydraulic systems.
- Connect the hydraulic system completely before hydraulic pump operation and the start-up procedure is followed.
- To avoid a possible fire hazard, install a heat shield if the truck muffler or exhaust pipe is located below the hydraulic lines.
- Never mount components near welding areas. Heat could damage the seals.

Recommended Emergency Hose Kit

Integral dx recommends that you carry one of each of the hydraulic hoses in stock for use in case you blow a hose.

Keep the inside of the hoses clean until they are needed by capping the ends and taping the cap into place. Dirt introduced into a hydraulic system by installing a hose that was not kept clean will cause a variety of problems in the operation of the mixer truck.

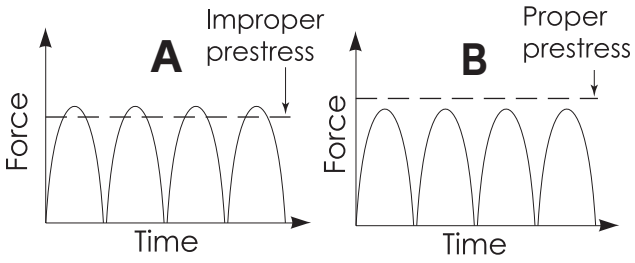
General Maintenance Tips

Torque Specifications

When performing maintenance that requires removal and replacement of bolts, you must adhere to the torque specifications for those bolts.

The graphs in Figure 6-2 demonstrate what happens to a bolt if it is not properly torqued. The dashed line represents the prestress or tightness of the bolt. As the device that uses the bolt goes through its normal functions, the bolt in Example A, which is not tight enough, gets stretched and relaxed with every duty cycle, because the bolt is prestressed under the maximum force of the cycle. In Example B, the torque on the bolt has been raised to the proper level, which is more than the maximum force of the duty cycle, so the bolt doesn't ever feel the cycle. In this example, bolt B would last much longer than bolt A. Use the following torque specification charts for bolts used on Integral dx mixers.

Figure 6-2 Torque effects



Torque Specification Tables

Figure 6-3 Metric torque Specifications

Geomet 500 and Dacromet 500 coating
Applicable to black and silver chromated nuts and bolts
fitted with mounting paste such as Cu or MOS2
Assuming a friction coefficient of μ = 0.1

Coarse-Pitch Thread

Thread Designation	*Fitting Tightening Torque (N•m, ft-lb) Property Class 8.8 N•m	8.8 ft-lb	10.9 N•m	10.9 ft-lb	12.9 N•m	12.9 ft-lb
M4x0.7	2.2	1.6	3.2	2.4	3.8	2.8
M5x0.8	4.3	3.2	6.4	4.7	7.5	5.5
M6x1	7.5	5.5	10.8	8	12.6	9.3
M4x0.7	18	13	27	20	31	23
M8x1.25	36	27	53	39	62	46
M12x1.75	62	46	90	66	108	80
M14x2	100	74	140	103	170	125
M16x2	150	111	225	166	260	192
M18x2.5	220	162	310	228	324	510
M20x20.5	300	221	440	324	435	700
M22x22.5	420	310	590	435	700	516
M24x3	530	391	750	553	880	649
M27x3	780	575	1120	826	1300	958
M30x3.5	1080	796	1530	1128	1750	1290
M36x4	-	-	**2000	**1475	-	-

Fine-Pitch Thread

Thread Designation	*Fitting Tightening Torque (N•m, ft-lb) Property Class 8.8 N•m	8.8 ft-lb	10.9 N•m	10.9 ft-lb	12.9 N•m	12.9 ft-lb
M8x1	20	15	28	21	33	24
M10x1	40	29	57	42	68	50
M10x1.25	37	27	55	41	64	47
M12x1.25	67	49	100	74	115	85
M12x1.5	65	48	95	70	110	81
M14x1.5	105	77	155	114	180	133
M16x1.5	160	118	235	173	280	206
M18x1.5	240	177	345	254	400	295
M20x1.5	335	247	475	350	590	413
M22x1.5	460	339	650	479	750	553
M24x2	560	413	810	597	940	693
M27x2	820	604	1170	862	1390	1025
M30x2	1170	862	1660	1224	1930	1423

Applicable to black and silver chromated nuts and bolts
Assuming a friction coefficient of μ = 0.14

Coarse-Pitch Thread

Thread Designation	*Fitting Tightening Torque (N•m, ft-lb) Property Class 8.8 N•m	8.8 ft-lb	10.9 N•m	10.9 ft-lb	12.9 N•m	12.9 ft-lb
M4x0.7	2.7	2	4	3	4.6	3
M5x0.8	5.3	4	7.8	6	9	7
M6x1	8	6	13.5	10	16.2	12
M4x0.7	22	16	32	24	38	28
M8x1.25	44	32	64	47	75	55
M12x1.75	76	56	112	83	130	96
M14x2	120	89	180	133	210	155
M16x2	185	136	275	203	325	240
M18x2.5	270	199	385	284	450	332
M20x20.5	380	280	550	406	640	472
M22x22.5	520	384	740	546	870	642
M24x3	650	479	940	693	1095	808
M27x3	990	730	1390	1025	1620	1190
M30x3.5	1300	959	1890	1394	2200	1623
M36x4	-	-	**2000	**1475	-	-

Fine-Pitch Thread

Thread Designation	*Fitting Tightening Torque (N•m, ft-lb) Property Class 8.8 N•m	8.8 ft-lb	10.9 N•m	10.9 ft-lb	12.9 N•m	12.9 ft-lb
M8x1	24	18	35	26	41	30
M10x1	50	37	70	52	85	63
M10x1.25	46	34	65	48	80	59
M12x1.25	83	61	120	89	145	107
M12x1.5	80	59	115	85	140	103
M14x1.5	130	96	190	140	230	170
M16x1.5	200	148	295	218	350	258
M18x1.5	300	221	435	321	510	376
M20x1.5	425	313	610	450	710	524
M22x1.5	580	428	825	608	940	693
M24x2	720	531	1030	760	1210	892
M27x2	1030	760	1480	1092	1750	1291
M30x2	1480	1092	2110	1556	2470	1822

*The fitting tightening torque corresponds to the axial force in the bolt at which the limit of elasticity of th elatter is utilized 90% by tension and torsion.
** SPB - Octagonal Mast

NOTE Use the values listed unless special torque values are specified. Values are for UNC and UNF thread fasteners. Values do NOT apply if graphite, moly-disulphide or other extreme pressure lubricants are used.

Removing Safety Devices

⚠WARNING Do **NOT** remove any safety guards or other safety devices.

⚠WARNING Do **NOT** work in a hidden area without using an approved "Lock-Out Tag-Out" procedure.

Sometimes you will need to remove a safety guard or another safety device to perform maintenance. In these situations, you must take extra care to ensure your own safety and that of your co-workers. If you have to put your hands, feet, or any other body part into an area of the mixer truck that would normally be guarded, be sure that the truck is turned off and the key is in your pocket. If there is more than one key, put a Do Not Operate sign on the controls or over the start switch.

After performing maintenance, put away all tools, parts, and supplies, and clear the area of personnel.

Before starting the mixer truck, yell "Clear!" and allow enough time for response before proceeding. Ready mix trucks are big enough to hide a person, especially inside the drum. If your company has a specific "Lock-Out Tag-Out" policy, abide by it.

Lock-Out Tag-Out Procedure

Remove the ignition key and place a Do Not Operate sign on the controls. Carry the key with you.

NOTE The above rule is one simple "Lock-Out Tag-Out" procedure. There may be state or local regulations that require a more advanced or stringent "Lock-Out Tag-Out" program. Be aware of the regulations in your area.

Replacing Hydraulic Pump and Motor

If you replace the hydraulic pump, grease the splines on the new pump with Castrol Optimoly Paste White T or equivalent before installing it.

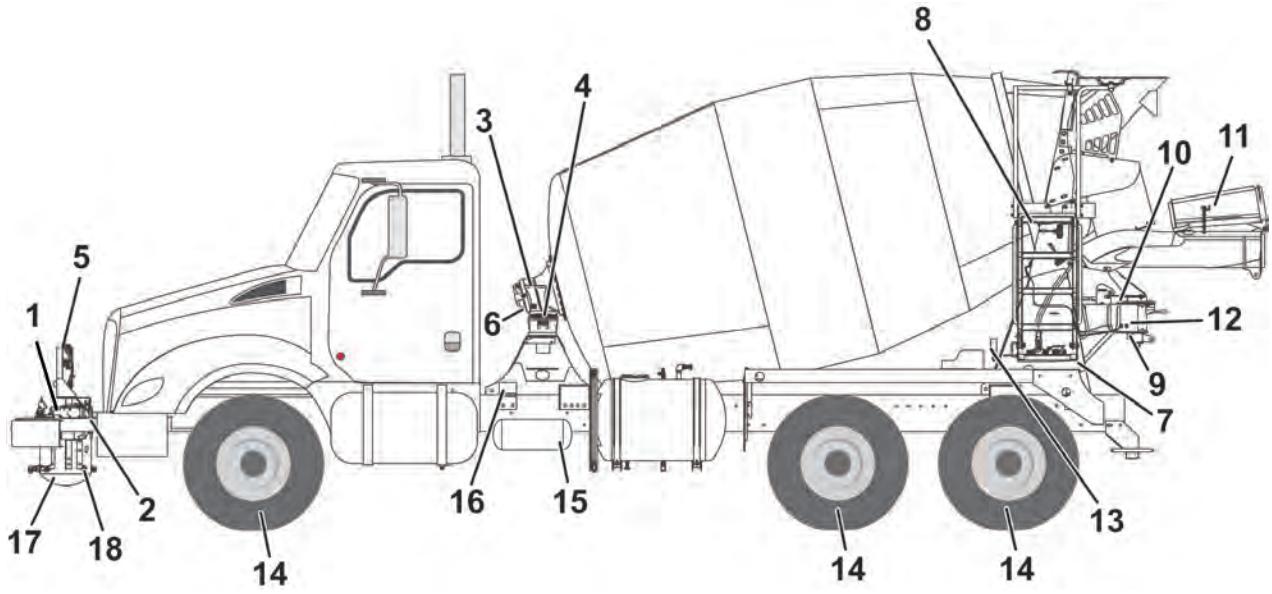
Fuses and Relays

Fuse	Function
F1	Radio Charger (10A)
F2	Spare +12V (10A)
F3	Booster Valve (10A)
F4	Work Light (15A)
F5	PLC VBB1 (10A)
F6	PLC VBBs (5A)
F7	Oil Cooler (20A)
F8	PLC VBB2 (10A)
F9	Spare Ign+ (20A)
F10	Cab Controls / Remote (10A)
F11	Sensors (10A)

Relays	Function
K1	Ignition
K2	Work Light
K3	Booster Up
K4	Booster Down
K5	Oil Cooler

Service and Lubrication Points

Figure 6-4 Service Areas



Conventional (Manual) Mixer Truck

The following list references components and locations which require service or lubrication on a conventional (manual) Integral dx mixer truck.

1. Direct drive from the truck engine and both hydraulic pumps (mixer drive pump and chute cylinder pump)

NOTE PTO may be mounted in front as shown or behind the cab.

2. U-joints, slip joint, and hydraulic pump drive shaft
3. Drum drive motor and gear reducer mount bolts
4. Drum drive flange bolts and mount bolts
5. Oil Cooler
6. Drum drive RPM sensor
7. Rear pedestal
8. Hopper access ladder, fold down extension and extension lock
9. Chute position sensor
10. Chute center lock
11. Fold-over chute and travel chain lock
12. Chute pivot mount bolt
13. Charge - discharge drum rotation
14. Truck tires
15. Air supply tank for truck brakes
16. Front pedestal mount bolts and springs
17. Hydraulic oil reservoir - sight gauge
18. Hydraulic oil reservoir

NOTE Hydraulic reservoir is usually mounted on front bumper when PTO is front mounted but may be mounted behind the cab as shown.

Maintenance Checklists

The following are the normal recommended maintenance schedules (after the break-in period).

Mixer Maintenance

Table 6-6: Mixer maintenance checklist

Item	Daily	Weekly	Monthly	Quarterly	Semi- Annually	Annually	Pg
Check if Maintenance is due	X						6-12
Bleed moisture from air tanks	X						6-12
Check truck tires	X						6-12
Check hydraulic fluid	X						6-12
Check hydraulic motor for leaks	X						6-12
Check for leaks in hydraulic pump(s)	X						6-12
Inspect for leaks/damage in hydraulic lines	X						6-12
Check fold over chute hinges	X						6-12
Check chute pivot	X						6-12
Check pump drive shaft universal joints	X						6-12
Check drum track/drum rollers/alignment	X						6-12
Lubricate mechanical moving parts		X					6-12
Grease chute pivot		X					6-12
Check drum drive plate bolts (170 lb•ft)		X					6-12
Check drum drive hold down bolts (420 lb•ft)		X					6-12
Check for rust or chipped paint		X					6-12
Grease drum rollers			X				6-12
Check pump drive shaft cap screws			X				6-12
Check oil in drum drive gear case			X				6-12
Clean oil cooler fins, fan and motor			X				6-12
Check torque of drum drive flange bolts			X				6-12
Check torque on drum drive trans bolts			X				6-12
Grease rear manual controller				X			6-12
Change hydraulic oil for temperature reasons					X		6-12
Change hydraulic oil for age reasons						X	6-12
Change main filter						X	6-12
Change oil in drum drive gear case						X	6-12

Optional Booster Maintenance

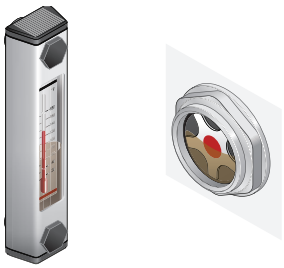
Table 6-7: Booster maintenance checklist

Item	Daily	Weekly	Monthly	Quarterly	Semi- Annually	Annually	Pg
Check if maintenance is due	X						6-23
Check tire pressure	X						6-23
Check air brake lines for cracks or wear spots	X						6-23
Check lights and mud flaps	X						6-23
Check hydraulic lines from cylinder (both sides)	X						6-23
Check axle pivots and mounting hardware		X					6-24
Inspect tie rod ends		X					6-24
Inspect stabilizers		X					6-24
Grease pivots (2)		X					6-24
Grease booster cylinder pivot pins		X					6-24
Check stabilizers for oil leaks around shafts		X					6-24
Grease wheel bearing/hub oil level			X				6-24
Inspect brake shoes			X				6-24
Grease king pins (2)			X				6-24
Charge accumulator						X	6-24

Daily Maintenance

1. Check the levels and condition of the lubricants and coolant in the truck. Follow the manufacturers' recommendations for quantity and type, Figure 6-5.

Figure 6-5 Hydraulic Oil Level Indicators



2. Bleed the moisture out of the air tanks by opening the petcocks located on the bottom of the air tanks. This is especially important if there is a chance that the moisture will freeze.
3. Check the condition of the truck tires. Do not drive the mixer truck with bald, cracked, or damaged tires.
4. Check the level and condition of the hydraulic oil, Figure 6-5. Fill with the same brand and type of oil if adding. Add only filtered oil. If you have a filter buggy to pump oil into the tank, use it. Replace milky looking oil, which is a sign of water contamination. Try to determine the source of the water. If the oil has turned milky quickly, such as from one day to the next, replacing the oil will not solve the problem. If you need ideas about where to look for the source of water contamination, call the Integral dx Service Department at 320-435-0003.
5. Check fold over chute hinges for free movement with no binding.
6. Check chute pivot for free operation with no binding.
7. Start engine to warm up hydraulic system for at least 5 minutes.
8. Check for hydraulic leaks on motor, fittings, hoses, filter, valves, pump, and cylinders.
9. Check pump drive shaft universal joints. Typical life of drive shaft is 6,000 hours depending upon usage.
10. Check pivots and mounting hardware.
11. Visually look at the roller track and roller alignment. Adjust according to procedure described "Roller Alignment" on page 6-15.

Weekly Maintenance

1. Lubricate mixer according to Maintenance Checklist in this section.
2. Lubricate mechanical moving parts.
3. Grease chute pivot.
4. After first 30 days of operation check drum drive hold down bolts. Proper torque is 420 ft/lbs.
5. Check drum drive plate bolts. Proper torque is 170 ft/lbs.
6. Check for rust or chipped paint.

Monthly Maintenance

1. Check the hydraulic pump drive shaft cap screws for proper tightness.
2. Grease drum rollers.
3. Check oil in drum drive gear case.
4. Clean oil cooler fins; check fan and motor.
5. Check torque of drum drive flange bolts (170 ft/lbs).
6. Check torque on drum drive transmission hold down bolts (420 ft/lbs).
7. Check booster filter indicator: The green falls away, leaving only red to indicate that service is needed.

Quarterly Maintenance

1. Grease rear manual controller.

Semi-Annual Maintenance

1. Change hydraulic oil for temperature reasons.

Annual Maintenance

1. Change hydraulic oil for age reasons.
2. Change main filter.
3. Change oil in drum drive gear case.

Unscheduled Maintenance

Hydraulic hoses should be checked during routine inspections. Check for damage to the outer layer or fittings. For example; Wire reinforcement is exposed, separation from the fitting, chafing, cuts, cracks, brittle outer layer or any other type of deformation like layer separation, blistering, crushing, corrosion, or kinking. In addition check for leaking fittings or improper fit.

NOTE Hydraulic hoses should be replaced every six years to avoid the possibility of accidental rupture and possible personal injury. The date of manufacture of a hydraulic hose can be found stamped into the hose fitting.

Change Hydraulic Oil

After initial 100 hours, change hydraulic oil and filter.

⚠WARNING Hot oil can cause burns. Do **NOT** change oil until cool.

If you have not changed your hydraulic oil because of seasonal temperature changes you will need to replace the oil now for age reasons. The same filling rules that apply to adding hydraulic oil apply to filling the tank after draining and cleaning. To change the oil:

1. Shut off truck engine, and put key in your pocket.
2. For safety, the oil should be cool. Do not change oil that is above 120°F (49°C).
3. Drain oil into a barrel or receptacle. The oil can be drained out of the drain plug on the bottom of the tank.
4. After the oil is drained, clean the tank with solvent. Do not use gasoline! Remove all the silt from the bottom of the tank.

⚠CAUTION Do **NOT** use unfiltered oil. Use filtered oil to 25 microns or less when refilling tank.

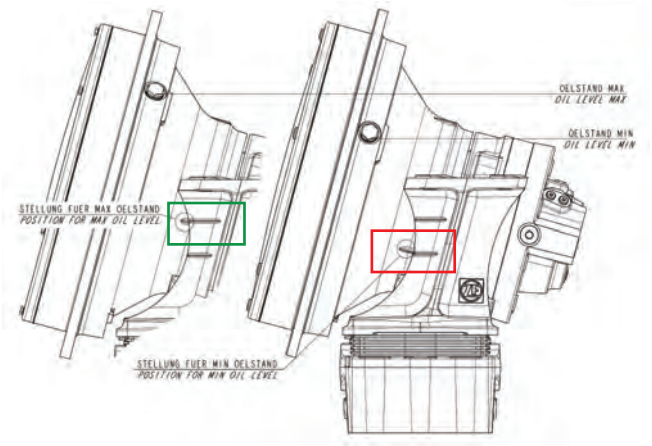
5. Close drain if open. Refill by pumping new oil out of the barrels with a filter. See information regarding specific information about hydraulic oils that are approved for use in Integral dx mixers in "Hydraulic Oils" on page 6-4.
6. Change spin-on filter element before restarting the truck.

Drum Drive Gear Case Oil Level Check

Check Gearbox Oil Level

- Check the oil level monthly.
- The vehicle should be parked on level ground.
- Check oil level when mixer drive is at operating temperture.
- Rotate mixer drive into position according to following figure:
  - At MIN- position, oil level is near the center of oil sight glass.
  - AT MAX position, oil level is at center of oil sight glass. Otherwise a possibility that hydraulic circuit oil has leaked into gearbox unit.

Figure 6-6 Gearbox Oil Level



Add Gearbox Oil

Do not use any other oil types than ZF-Ecofluid X. Check/ add oil before the MIN oil level has been reached. The volume difference between MIN and MAX oil level is approximately 1.6 qts (1.5 liter).

- Position gearbox to check for MAX oil level.
- Turn off engine.
- Clean level sight glass from all debris.
- Remove the sight glass.
- Add **ZF-Ecofluid X** oil until slight overflow.
- Install oil sight glass and gasket, torque screws to 35 in-lbs. (4 Nm).
- Check for leaks.

Drum Roller Adjustments

Drum Roller

Each drum roller has two tapered roller bearings with seals. If the bearings need to be replaced, the assembly must be cleaned thoroughly before installing, and the new bearings must be greased.

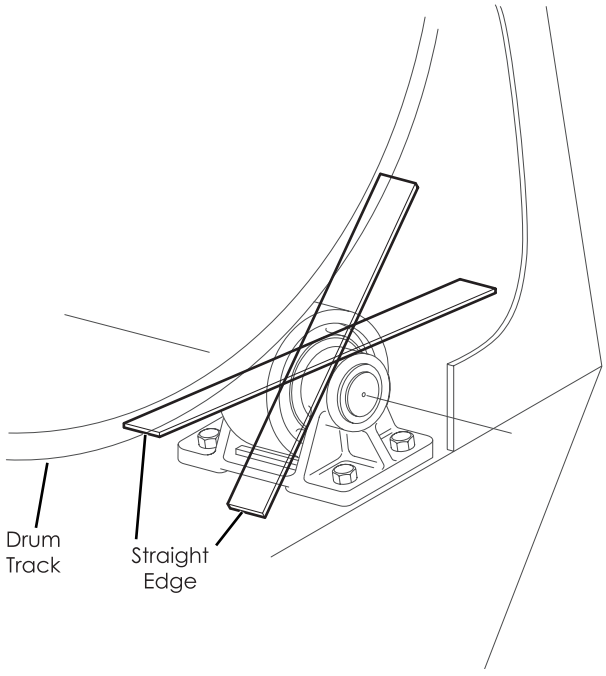
To tighten bearing assemblies (move inward), turn nut clockwise until roller cannot be rotated by hand; then back off nut until the roller rotates with a slight drag.

Surface contact of the track and rollers must be flat. No visible space between these two should be observed under load.

Roller Alignment

Drum rollers must run parallel with the roller track. Rollers are set using a minimum of a 12" straight edge with one knife edge. Check both sides of the rear face of the roller, the straight edge should match with the rear face of the drum track, Figure 6-7.

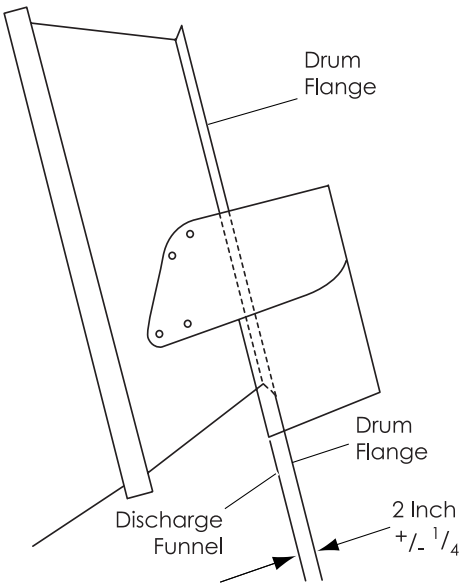
Figure 6-7 Drum roller alignment



Drum Clearance

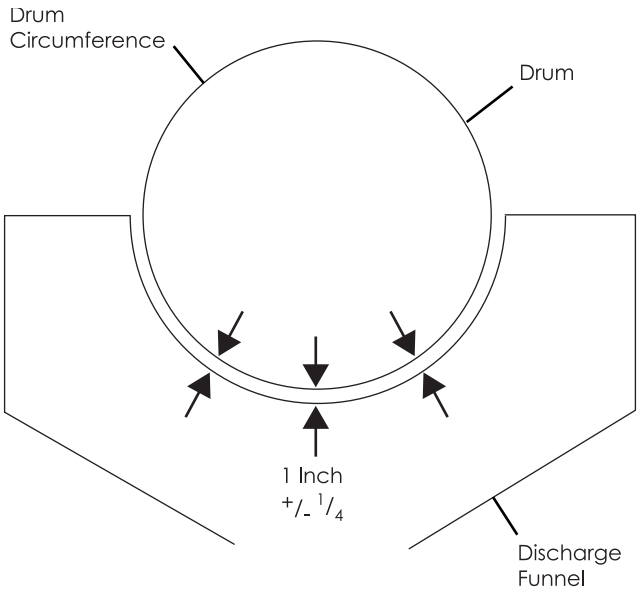
Maintain a 2 inch (±1/4) clearance space between the drum flange and the discharge funnel, Figure 6-8.

Figure 6-8 Drum flange clearance



Maintain a 1 inch (±1/4) clearance space between drum circumference and discharge funnel, Figure 6-9.

Figure 6-9 Drum flange clearance

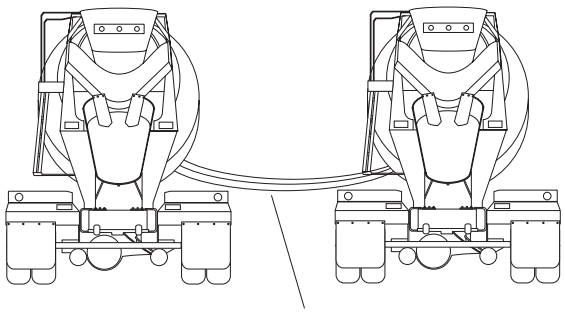


Emergency Jumping

Use this procedure to operate and/or discharge a load from a disabled truck by using the hydraulic system and the controls of a working truck.

If your truck should have either a pump or motor failure, both the pump and motor must be replaced. When one of these fail, the other has been contaminated and damaged. If you replace one unit and not the other, the old contaminated unit will cause premature failure of the new unit.

Figure 6-10 Jumper Kit



Jumper Kit

Safety Precautions

⚠WARNING Relieve all hydraulic pressure from the system before starting the Emergency Jumper procedure.

1. The hydraulic system and truck components must be cooled sufficiently before disconnecting any hydraulic fittings. The unit cannot be running when disconnecting hydraulics.
2. Relieve all hydraulic pressure before disconnecting the hydraulic motor from the drum drive gear reducer.
3. The drum on both the operating and disabled trucks must be balanced and able to turn freely BEFORE removing the hydraulic motors from the drum drive gear reducer. Use the motor from the second truck to prevent contamination of the hydraulic system in the working truck.
4. Cleanliness is very important. Do not spill oil or allow dirt or lint to enter the hydraulic system of both the working and disabled truck.

Jumping Procedure

Confirm all pressure has been relieved from hydraulic system before starting this procedure.

1. Disconnect the high pressure hoses (4 bolt flange) and the case drain hose from the hydraulic motor on the disabled truck (Figure 6-11 & Figure 6-12). Watch for oil pressure build up, it will cause oil to spray from fittings.

2. Remove the hydraulic motor from the drum drive gear reducer on the disabled truck. Drain the gear oil first as the hydraulic motor seals the gear box. For the CML 12 drum drive consult ZF's maintenance manual for motor removal (5871.790.202 en).

3. From the operating truck, disconnect the high pressure hoses and the case drain hose from the hydraulic motor.

4. Remove the hydraulic motor from the working truck and install it on the disabled truck. Drain the gear oil first as the hydraulic motor seals the gear box. For the CML 12 drum drive consult ZF's Maintenance Manual for motor removal (5871.790.202 en).

5. From the working truck, disconnect the high pressure hoses and case drain hoses from the hydraulic pump.

6. Connect jumper kit hoses (Figure 6-10) exactly the same as the originals (2 high pressure and 2 case drain). Be sure hoses are flushed, clean and filled with approved hydraulic oil. Fittings are to be loose at pump during the filling of hoses from the motor end. Bleed air out completely before tightening hoses. Do not operate until hydraulics are securely fastened.

7. Use the jumper kit as a means of extending the hydraulic lines of the working truck to the Drum Drive on the disabled truck.

8. Check sight gauge for correct oil level on the hydraulic reservoir. Fill with correct hydraulic oil as needed.

9. Fill the Gear box with the correct gear oil to the correct level.

You should now be ready to use the controls of the working truck to operate the disabled truck.

Figure 6-11 CML 12 & Rexroth Drum Drive

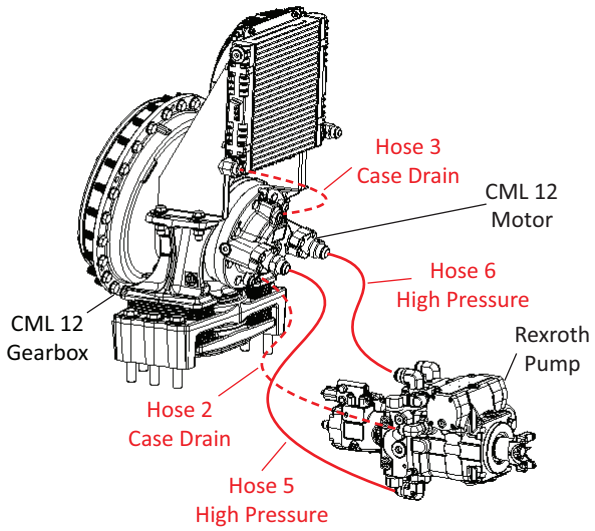
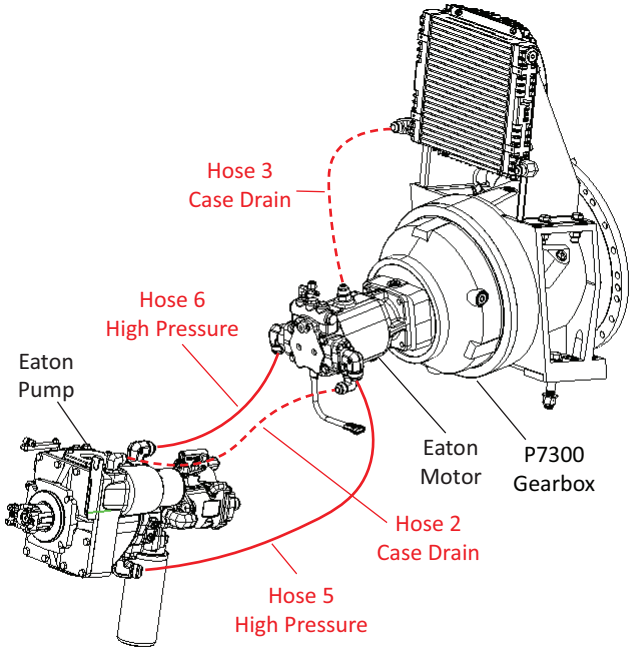


Figure 6-12 P7300 and Eaton Drum Drive



D.O.T. Drum Certification

This inspection procedure is to ensure the safe thickness of the drum.

Drum Measurments

The drum consists of a head section and 5 cones.

- Divide the head section and each cone into 4 equal quadrants.
- Using a ultrasonic thickness tester, take 2 measurements per each head section quadrant. Record the results on page 6-18

- Using a ultrasonic thickness tester, take 3 measurments per cone quadrant. Do NOT measure where the fins connect to the drum. Record the results on page 6-18.
- If ANY measurements are below .065 in min, the entire drum must be replaced.

Figure 6-13 Drum Measurement Form

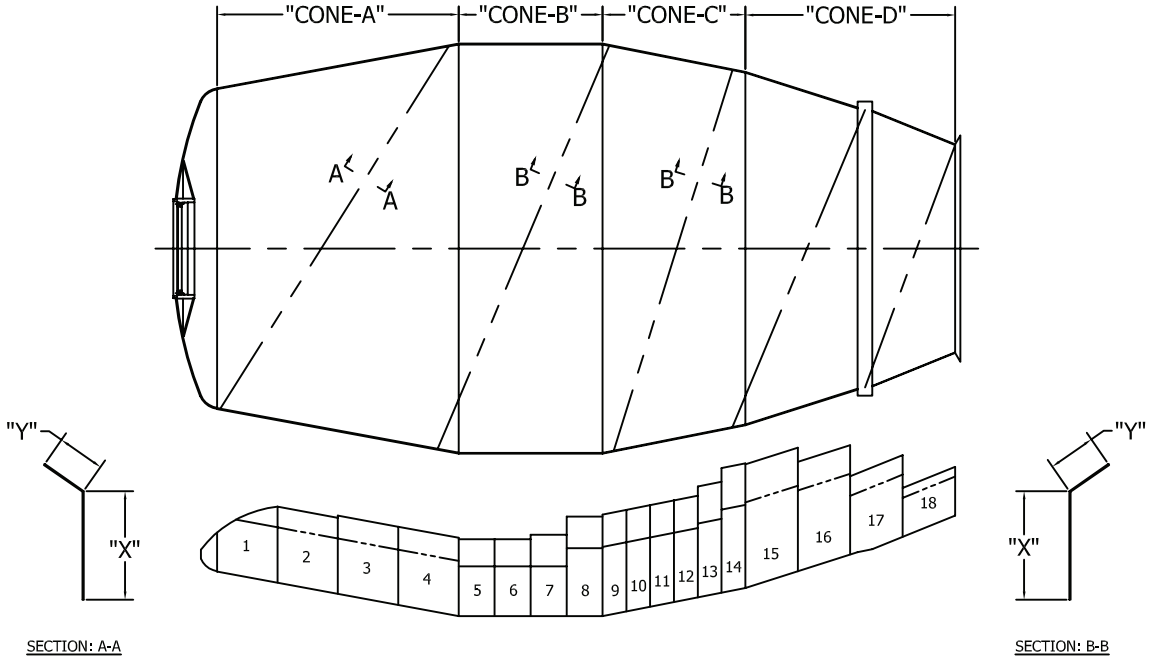
Drum	Thinkness	Minimum Thickness
Light	1/8" (.125)	.065
Standard	3/16" (.1875)	.065
Heavy	1/4" (.25)	.065

Head Section	Cone A						Cone B						Cone C						Cone D						Cone E					
A	Measurement			B	Measurement			C	Measurement			D	Measurement			A	Measurement			B	Measurement			C	Measurement			D	Measurement		
	1	2			1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3
	.065 min	.065 min			.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min
B	Measurement			C	Measurement			D	Measurement			A	Measurement			B	Measurement			C	Measurement			D	Measurement			A	Measurement		
	1	2			1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3
	.065 min	.065 min			.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min
C	Measurement			D	Measurement			A	Measurement			B	Measurement			C	Measurement			D	Measurement			A	Measurement			B	Measurement		
	1	2			1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3
	.065 min	.065 min			.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min
D	Measurement			A	Measurement			B	Measurement			C	Measurement			D	Measurement			A	Measurement			B	Measurement			C	Measurement		
	1	2			1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3		1	2	3
	.065 min	.065 min			.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min		.065 min	.065 min	.065 min

Figure 6-14 Drum Fins Specification

Integral dx
121 N. 1st St.
Montevdeo, MN 56265

DRUM CERTIFICATION



DRUM SECTION "A"

SPIRAL	"X"	"Y"	SECTION
1	12"	4-1/2"	A-A
2	12"	4-1/2"	A-A
3	12"	5"	A-A
4	12"	5"	A-A

DRUM SECTION "B"

SPIRAL	"X"	"Y"	SECTION
5	11"	6"	B-B
6	11"	6"	B-B
7	11"	7"	B-B
8	15"	7"	B-B

DRUM SECTION "C"

SPIRAL	"X"	"Y"	SECTION
9	15"	7"	B-B
10	15"	7"	B-B
11	15"	7"	B-B
12	15"	7"	B-B
13	16"	8"	B-B
14	18"	9"	B-B

DRUM SECTION "D"

SPIRAL	"X"	"Y"	SECTION
15	18"	8"	B-B
16	17"	6"	B-B
17	12-3/4"	4"	B-B
18	8"	2"	B-B

CUSTOMER FIELD MODIFICATION OPTION

THE OPTION TO ADD ADDTIONAL HOLES IN THE FINS FOR THE PURPOSE OF IMPROVED CLEAN OUT OF DRUM IS AT THE SOLE DISCREATION OF THE MIXER TRUCK OWNER. THESE ADDITIONAL HOLES SHOULD FOLLOW THE FOLLOWING GUIDELINES:

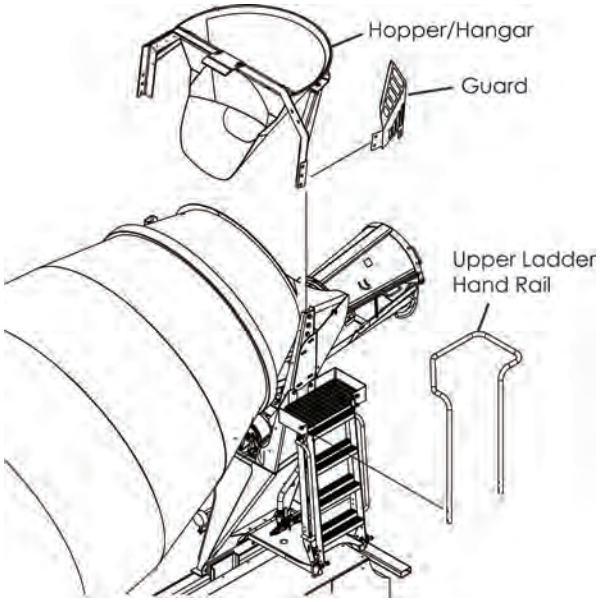
BEGIN 1FT IN ON THE DRUM SPIRAL AND 2" UP FROM THE BOTTOM OF DRUM SURFACE, MARK THE CENTER POINT.

CONTINUE MARKING CENTER MARKS EVERY 18" ALL THE WAY IN TO THE END OF THE SPIRAL. CUT A 2" DIAMETER HOLE AT EVERY MARK. REPEAT PROCESS FOR 2ND SPIRAL.

Mixer Drum Replacement

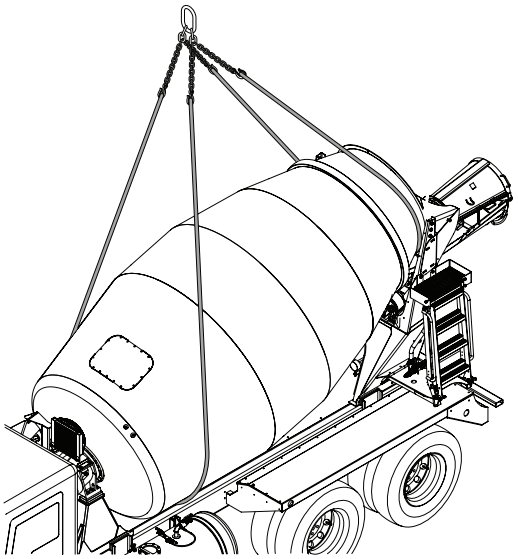
1. Remove the hopper with hanger, guard and upper ladder handrail, Figure 6-15.

Figure 6-15 Hopper Detail



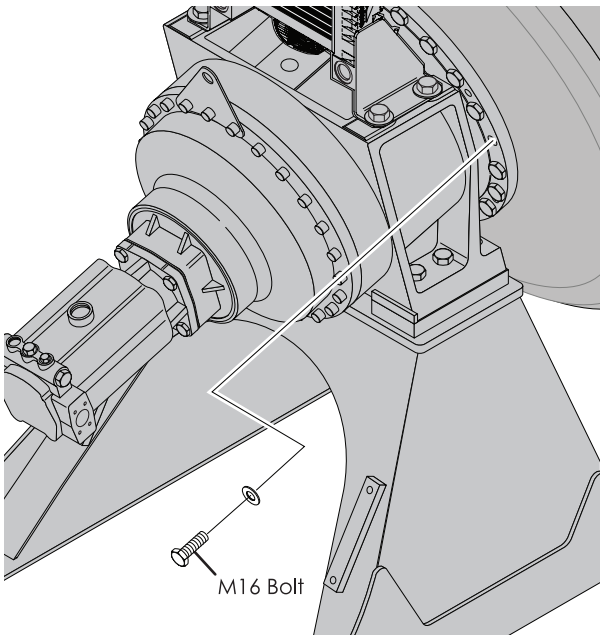
2. Use proper rigging to lift and support the drum, weight could be from 4000-6000 lbs. depending on drum size. Note: weight does not include potential concrete build-up, Figure 6-16.

Figure 6-16 Rigging



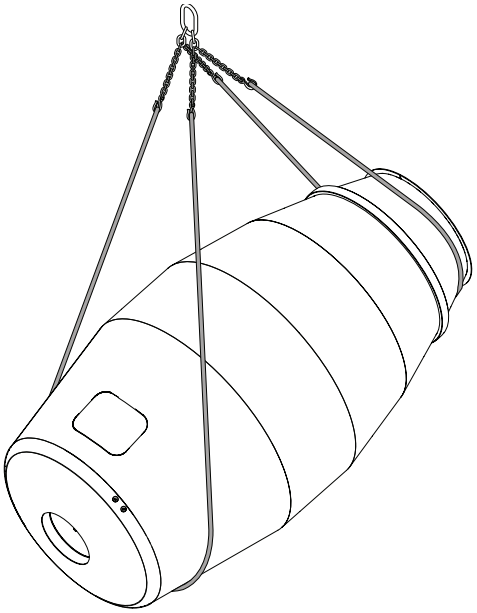
3. Remove M16 bolts holding drum to gearbox (it might be beneficial to remove the hydraulic oil cooler), Figure 6-17.

Figure 6-17 M16 Bolt locations



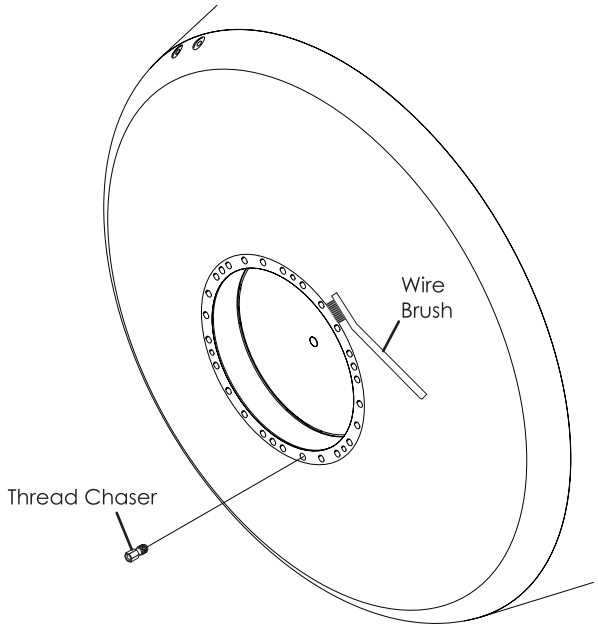
4. Lift drum off truck, Figure 6-18.

Figure 6-18 Lifting the drum



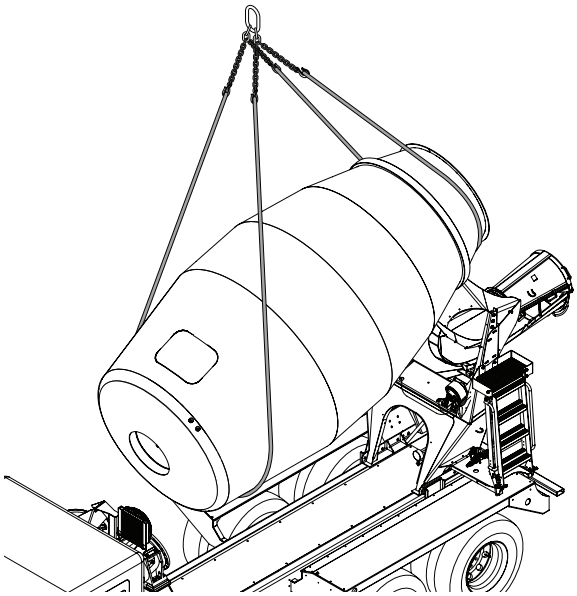
5. Chase tapped holes in new drum head to ensure debris is removed and threads are clean. Use a wire brush or sand paper to clean the flat surface of the drum ring that contacts the gearbox, Figure 6-19.

Figure 6-19 Chasing tapped holes



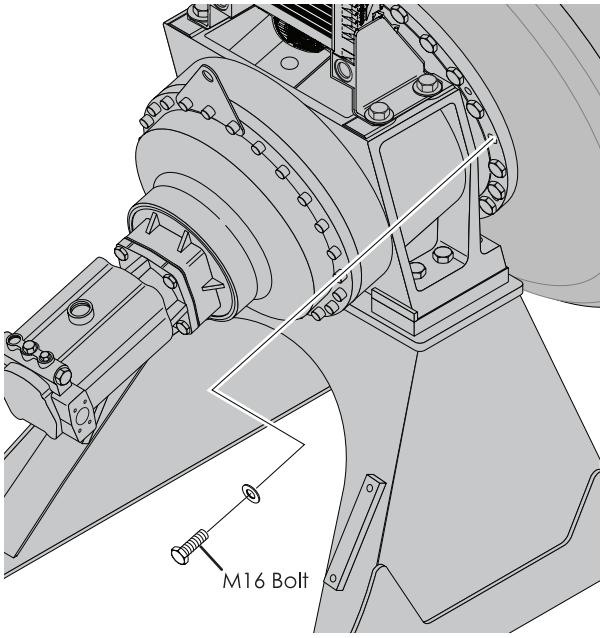
6. Place new drum on truck and line up the bolt holes with gearbox, Figure 6-20.

Figure 6-20 Drum alignment



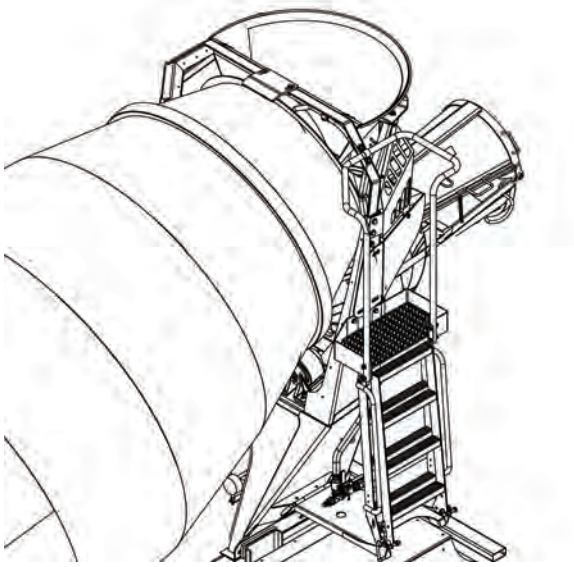
7. Install bolts from gearbox to drum in an offset pattern. Torque all bolts to 206 ft. lbs, Figure 6-21.

Figure 6-21 M16 Bolts



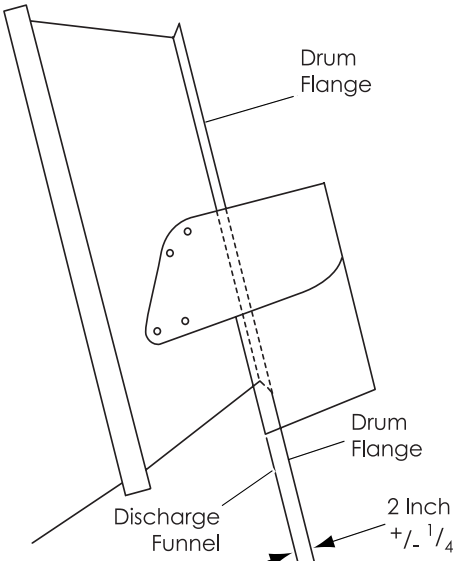
8. Put the hopper with hanger, guard and upper ladder handrail back in place, Figure 6-22.

Figure 6-22 Hopper installation



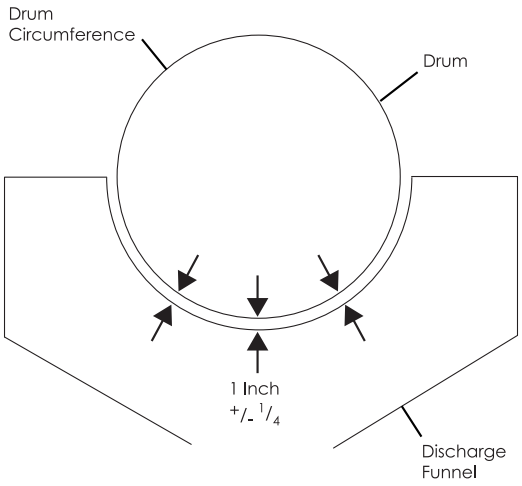
9. Maintain a 2 inch (±1/4) clearance space between the drum flange and the discharge funnel, Figure 6-23.

Figure 6-23 Drum flange clearance



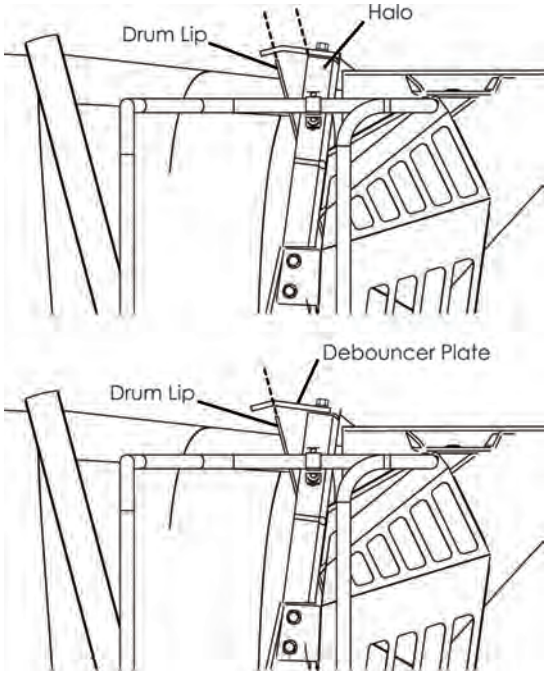
10. Maintain a 1 inch (±1/4) clearance space between drum circumference and discharge funnel, Figure 6-24.

Figure 6-24 Discharge funnel clearance



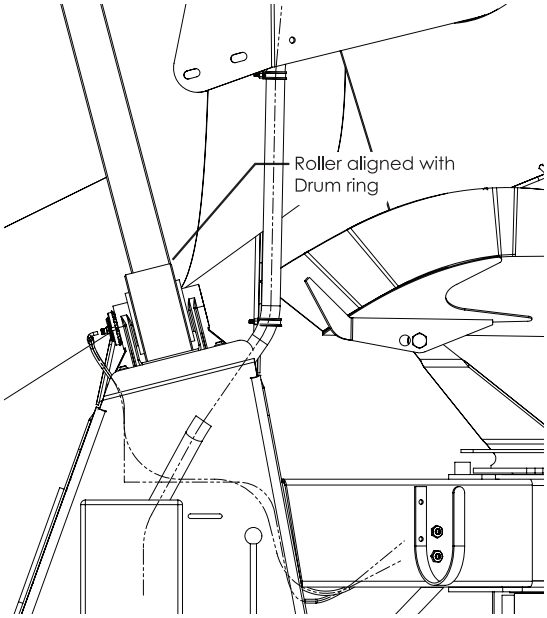
11. Check clearance between drum lip and halo. Line up the rear drum lip with the bend in the drum debouncer plate, Figure 6-25.

Figure 6-25 Halo clearance



12. Check the alignment of the drum roller, Figure 6-26.

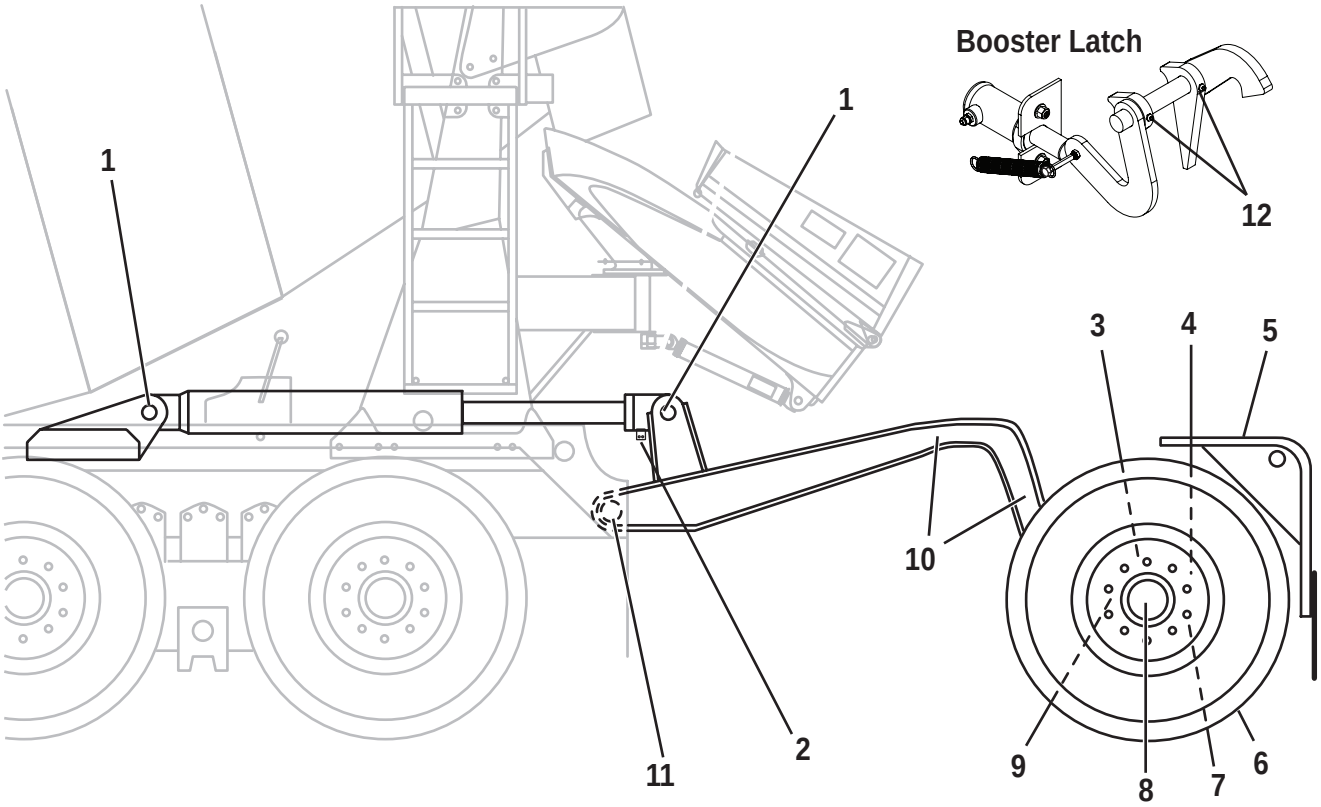
Figure 6-26 Drum roller alignment



Maintenance for Optional Booster

This Maintenance section refers to the (optional) booster axle assembly only.

Figure 6-27 Booster service and lubrication points



1. Booster cylinder grease points
2. Shrader valve for accumulator circuit
3. Upper and lower king pins on each side
4. Tie rod arm - one on each side
5. Fender
6. Tire
7. Grease pivot point for brake cam
8. Hub
9. Brake pivot
10. Booster arm
11. Phenolic bearing (no grease)
12. Booster latch

Daily Maintenance

⚠WARNING Do **NOT** service booster axle components without using an approved "Lock-Out Tag-Out" procedure.

Remove the ignition key and place a **Do Not Operate** sign on the controls. Carry the key with you.

The above rule is one simple "Lock-Out Tag-Out" procedure. There may be state or local regulations that require a more advanced or stringent "Lock-Out Tag-Out" program. Be aware of regulations in your area.

1. Check booster axle assembly pivots and mounting hardware.
2. Check tire pressure.
3. Check air brake lines for cracks or worn spots.
4. Check lights, reflectors and fenders and repair or replace if necessary.
5. Check the hydraulic lines from the booster cylinder both directions.

Weekly Maintenance

1. Lubricate booster axle assembly according to "Service and Lubrication" chart.
   - Tie rod ends
   - Stabilizers
   - Slack adjusters
   - Grease pivots (2)
   - Grease booster cylinder pivots points
2. Check stabilizers for oil leaks around shafts.
3. Check for rust or chipped paint.

Monthly Maintenance

1. Visually check wheel hub oil level.
2. Visually check brake shoes for wear and cracks.
3. Grease wheel bearing and king pins (2).

Annual Maintenance

Check accumulator pressure, and charge accumulator according to instructions beginning on 6-25 when necessary.

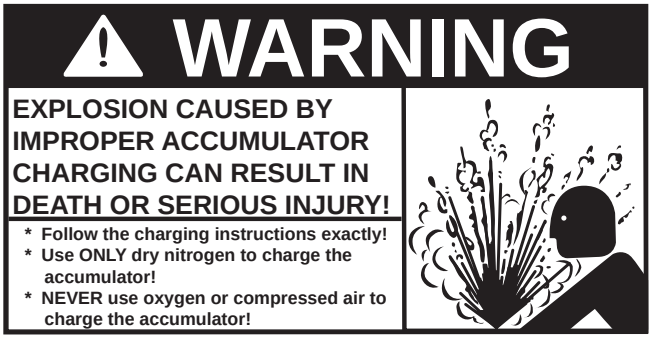
Accumulator Maintenance

Read all instructions before beginning the job.

Accumulators must be charged only with dry nitrogen. Never use compressed air or oxygen. The oxygen molecules will combine with the hydraulic oil and lower the flash point of the oil to below room temperature. A major explosion will be created by using compressed air or oxygen to charge accumulators. People have died using compressed air or oxygen to charge accumulators.

Check the accumulator gas charge every 12 months or 2,000 hours, Figure 6-28.

Figure 6-28 Accumulator warning decal



Quick Check of Accumulator Charge Pressure

No tools are required for this procedure.

A quick check of accumulator pressure should be performed and low accumulator charge suspected if:

The booster axle is slow when lowering and is irregular when it finally moves.

The estimated accumulator pressure can be checked on an empty mixer using the following steps:

1. Chock the truck tires, both front and rear.

⚠WARNING Do **NOT** allow anyone behind booster axle when raising or lowering.

2. Lower booster axle (UP/DOWN switch will light when booster is in motion) and set booster pressure regulator adjustment to 2000 PSI.
3. Raise booster axle UP (UP/DOWN switch will light when booster is in motion) and count two seconds; then lower DOWN. Watch axle pressure settings gauge. The pointer will rise rapidly as booster axle moves DOWN. The pointer will hesitate, then continue a slow climb to the preset pressure of 2000 PSI as axle tires contact ground.
4. The estimated pressure is where the pointer hesitates. (Repeat above procedure several times to verify estimated accumulator pressure.) The correct gauge reading should be 1100 to 1200 PSI.
   - No hesitation or hesitation below 1100 PSI indicates low accumulator pressure. Refer to "Checking and Charging Accumulator Pressure" on page 6-25.

A hesitation pressure reading above 1200 PSI indicates an overcharged accumulator.

Checking and Charging Accumulator Pressure

The following items will be necessary to complete the procedure:

- Accumulator charging kit. Do not attempt to charge an accumulator without one. You can order the charging kit from Integral dx. Call Spare Parts for kit part number, Figure 6-29.
- Nitrogen bottle and gauge set, Figure 6-30.
- Two 3/4" open-end wrenches.

Figure 6-29 Accumulator charging kit

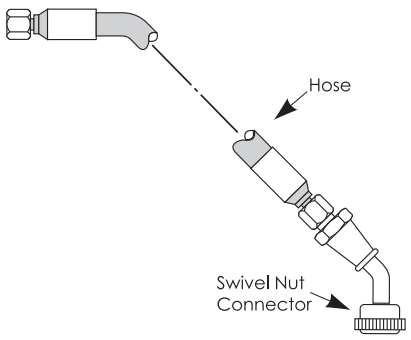
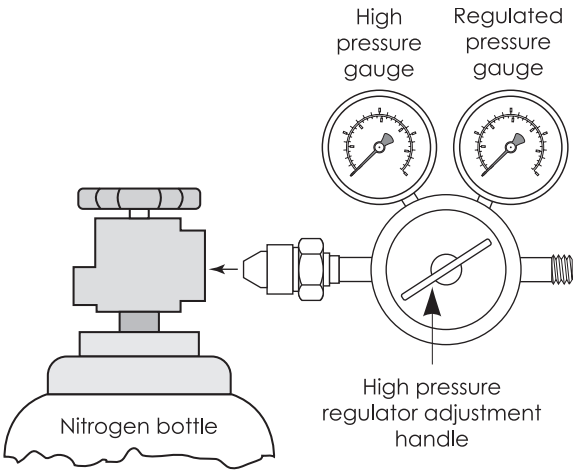


Figure 6-30 Nitrogen gauge set



Checking the accumulator pressure

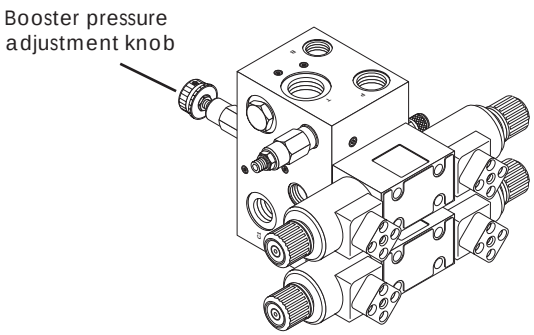
⚠WARNING Do **NOT** service booster axle components without using an approved "Lock-Out Tag-Out" procedure.

1. Lower booster axle (UP/DOWN switch will light when booster is in motion).

⚠WARNING Extend booster cylinder before charging accumulator.

2. Set booster pressure regulator adjustment to 0 PSI, Figure 6-31.

Figure 6-31 Booster pressure regulator

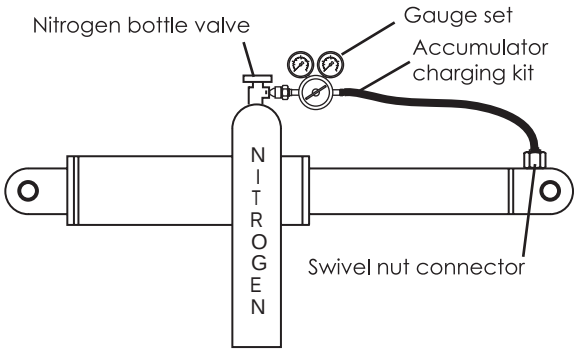


3. Verify 0 PSI on the axle pressure settings gauge.

⚠WARNING Do **NOT** service an accumulator when pressurized. Turn off truck engine and relieve hydraulic pressure.

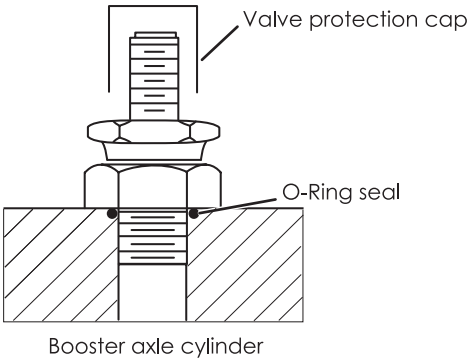
4. Stop engine, remove key, and put a Do Not Operate tag over the key switch. Put the key in your pocket, so no one can start the engine.
5. Move the nitrogen bottle to the side of the truck, and attach the accumulator charging kit to the nitrogen bottle gauge set, Figure 6-32.

Figure 6-32 Connected charging kit



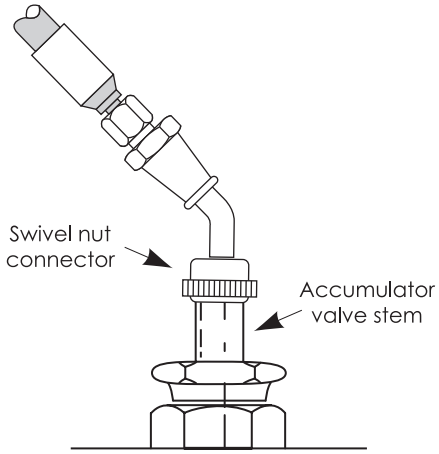
6. Remove the valve protection cap (Figure 68).

Figure 6-33 Accumulator valve stem



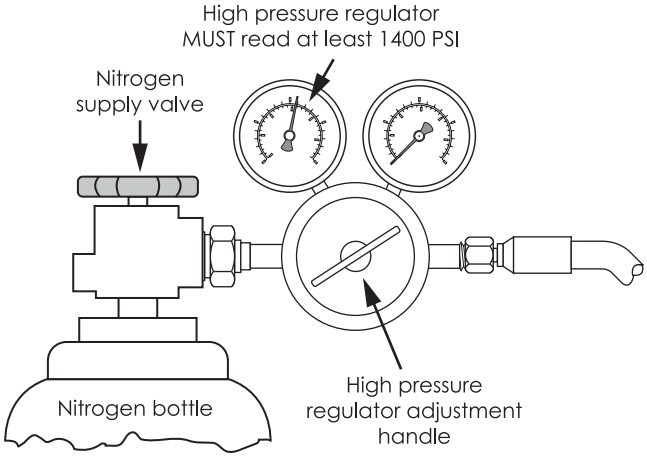
7. Attach the charging kit swivel nut connector to the accumulator valve stem, Figure 6-34.

Figure 6-34 Swivel nut



8. Loosen the swivel nut connector to allow nitrogen to purge air from the hose in preparation for step 10, Figure 6-34.
9. Rotate the high pressure regulator adjustment handle counter-clockwise until loose, and open the nitrogen bottle. The nitrogen bottle must contain at least 1400 PSI, Figure 6-35

Figure 6-35 High pressure regulator gauge



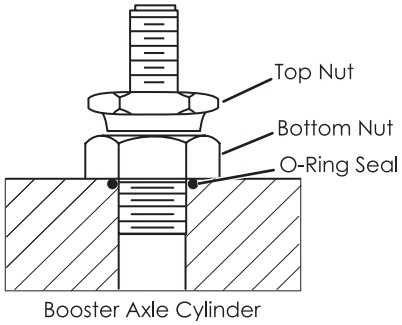
10. Rotate the high pressure regulator adjustment handle clockwise to release nitrogen into charging kit hose. This will purge air from the hose, Figure 6-35.
11. Tighten the swivel nut connector, Figure 6-34.
12. Open the accumulator valve stem using both 3/4" open-end wrenches, Figure 6-36.

⚠WARNING Do **NOT** remove accumulator inlet valve from a pressurized system. Discharge pressure before removing valve.

13. Hold the bottom nut with the first 3/4" wrench.

NOTE This will hold the valve stem in place and prevent o-ring seal damage.

Figure 6-36 Accumulator valve stem

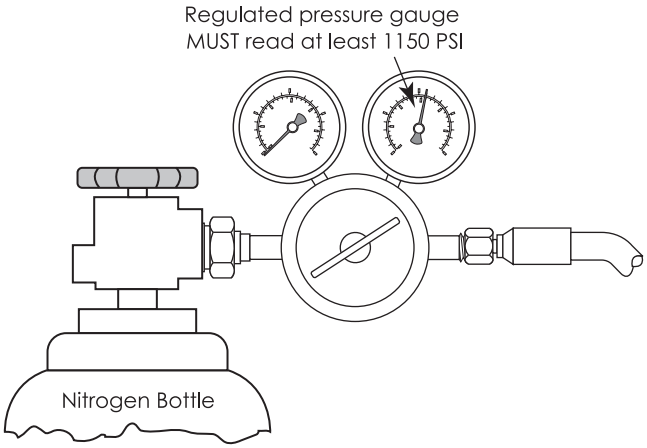


14. Loosen the top nut with the second 3/4" wrench.
    - 1-1/2 to 2 turns of free play is normal. When resistance is felt, loosen the top nut enough to get a reading on the regulated pressure gauge.
15. Charge the accumulator if the reading is less than 1150 PSI.

Charging the Accumulator

1. Rotate the high pressure regulator adjustment handle further in the clockwise direction.
2. Fill the accumulator until the regulated pressure gauge reads 1150 PSI, Figure 6-37.

Figure 6-37 Regulated pressure gauge



A. If you overcharge the nitrogen pressure, proceed as follows:
   i. Close the nitrogen bottle supply valve.
   ii. Slowly open the swivel nut connector to bleed off excess nitrogen until 1150 PSI.
   iii. Close the swivel nut connector when correct pressure is reached.

B. When correct accumulator pressure is reached complete as follows:
   i. Close nitrogen bottle supply valve.
   ii. Wait 10 to 15 minutes for nitrogen temperature to stabilize.
   iii. Recheck pressure on the regulated pressure gauge.
   iv. Tighten the top nut to close the accumulator valve stem.
   v. Open the swivel nut connector. This will release pressure in the charging kit and gauge set.
   vi. Remove the charge kit, gauge set, and nitrogen tank.

3. Check for leaks around the accumulator valve stem.
   A. Make a bubbly mixture from soap and water. Spread the mixture around the accumulator valve stem and check for gas leaks. Gas leaks will push soap bubbles away from the area of the leak. If you find a leak, replace the valve stem and o-ring seal.
   B. An accumulator that will not hold pressure for one year indicates internal seal problems. The cylinder must be replaced. Never repair an accumulator yourself. Records should be kept when a leak is suspected to isolate the leak to the accumulator valve stem or the accumulator internal seals.
4. Replace and hand-tighten the valve protection cap.

Appendix

7

This chapter covers supplemental information for the Integral dx Mixer Truck.

Manual Overrides

General Overview

When a truck's controls malfunction, it may be possible to actuate the hydraulic functions using the valve overrides. Electrical valve actuators are referred to as coils. They are cylindrical objects, about 1-2" in diameter, with an electrical connector on the side. They are located on the hydraulic valve blocks and pumps. On the end of the coil will be a retaining nut and potentially a manual override device. The end of the coil may have a rubber dust cover which can be pulled off. The electrical wires going to the coil may have a label that identifies the hydraulic function of the coil (Chute up, Booster down…). It is recommended that the engine is running at least 900 rpm when operating hydraulic functions.

⚠WARNING If a valve cartridge has an Allen screw end with a lock nut and no electrical wires going to it, **do not tamper with it.** This may change system pressures above safe levels and resetting the valve may be difficult.

⚠WARNING During this process functions may activate unexpectedly. Keep all personnel clear of all moving components on the truck.

Manual Override Identification

Figure 7-1 No override on coils

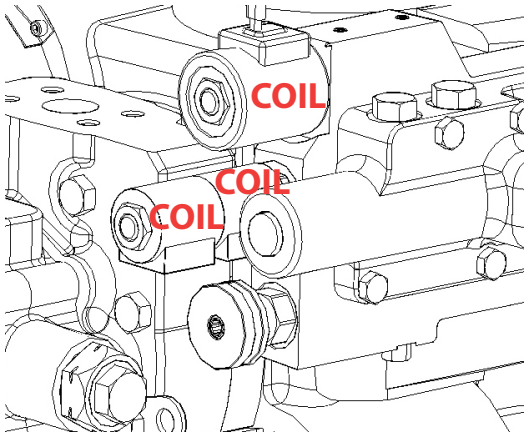


Figure 7-2 Button Override

Figure 7-3 Knurled Plumger Override

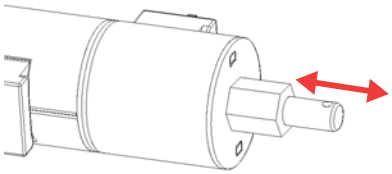
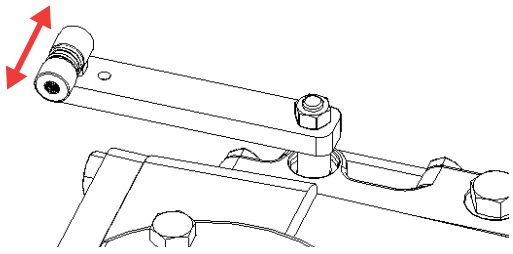


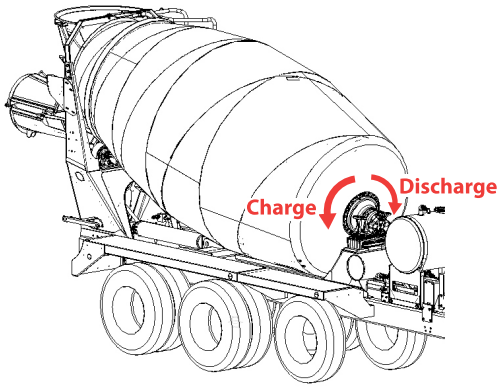
Figure 7-4 Cable Control



Drum Drive

NOTE An observer at the back of the truck may be useful to determine if the drum is turning the correct direction.

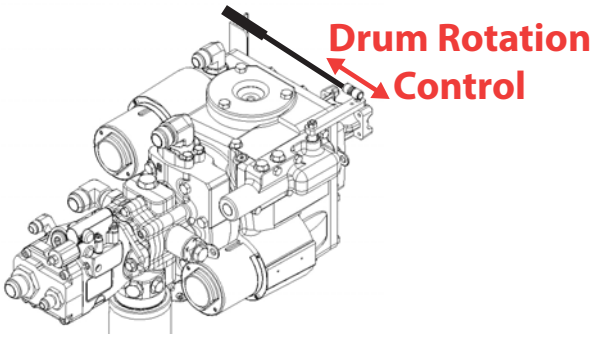
Figure 7-5 Drum rotation



Cable Control

1. The lever that the cable attaches to controls the drum speed and direction, and can be used to control the pump directly.

Figure 7-6 Cable control linkage



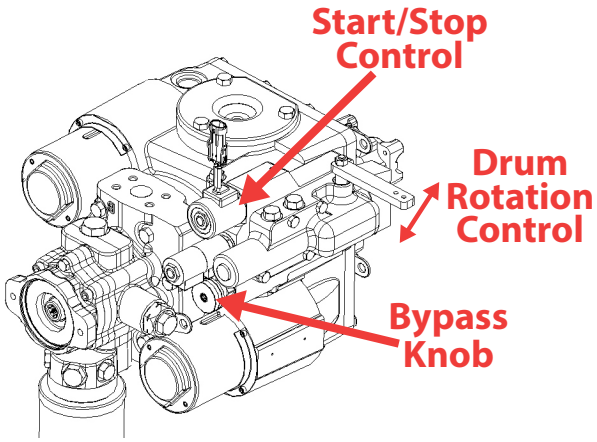
Pilot/Electric Control

1. Turn the bypass knob out all the way on the pump to enable the lever control. This will also disable the pilot electric control.

2. With the bypass knob turned out, the lever on top of the pump will control the drum speed and direction. The lever must be returned to the neutral position and the bypass knob turned back in for the electric control to work properly.

3. The top electrical coil starts and stops the drum. It may or may not have a manual override button or knob on the end. Certain versions will require the user to pull and hold the override button to start the drum. Needle-nose locking pliers may be useful to keep the override pulled out.

Figure 7-7 Pilot/electrical control layout



Proportional Electric Control

1. Remove rubber dust covers from the end of the coils.

2. Use small object, like an allen key, to push and hold the small button in the center of the coil.

Figure 7-8 Proportional electric control - Eaton pump

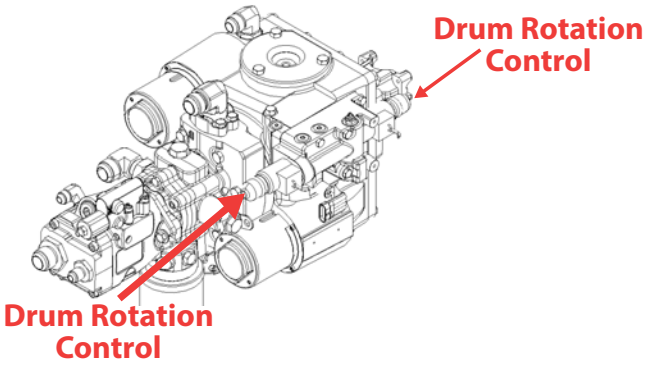
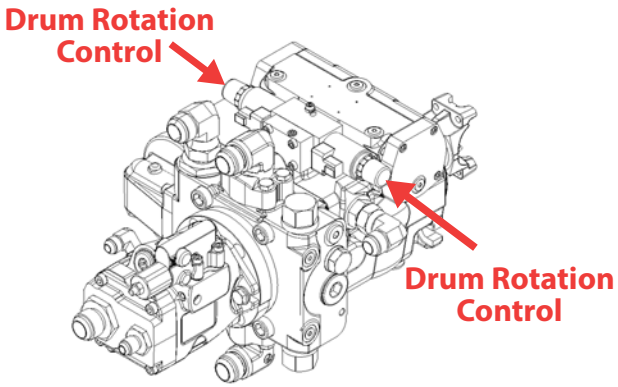


Figure 7-9 Proportional electric control - Rexroth pump

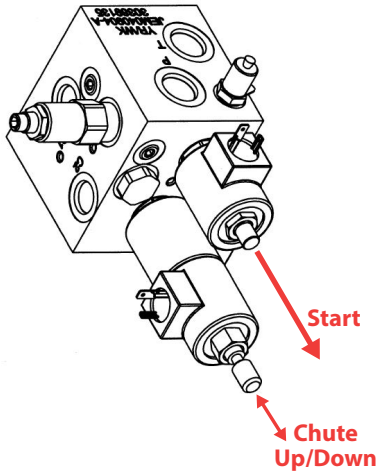


Cylinder Control

Series 1, Conventional

1. Push/Pull and hold override knurled knob for desired function. Both valves must be used at the same time. The Start valve will supply flow to the chute direction valve.

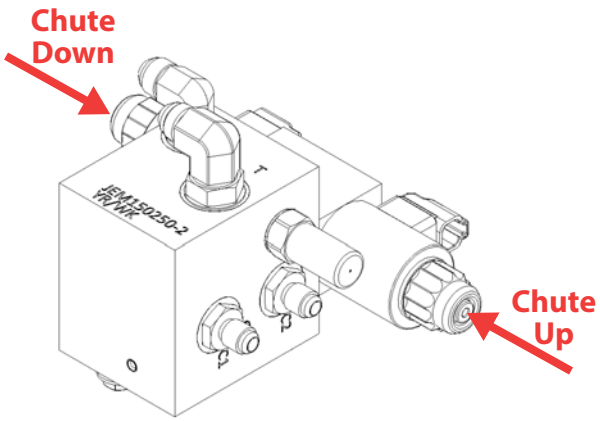
Figure 7-10 Series 1 conventional truck manifold



Series 2, Conventioinal

1. Push and hold override button for desired function

Figure 7-11 Series 2 conventional truck manifold

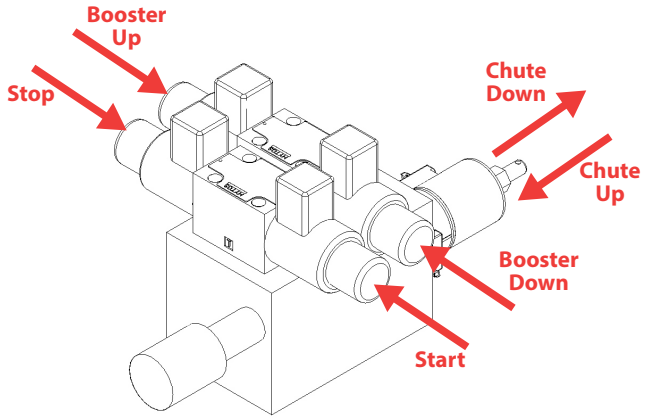


Series 1, Booster

1. Push start coil override button will supply pressure to the other functions. The top valves have detents and are not spring return.

2. Push/Pull your desired function override. The chute function is momentary and needs to be held, the booster does not need to be held.

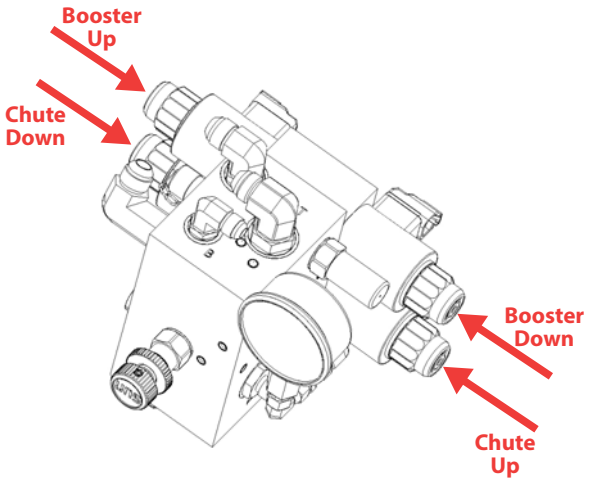
Figure 7-12 Series 1 booster truck manifold



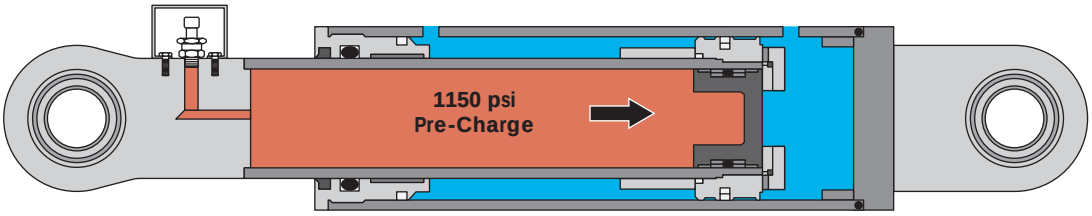
Series 2, Booster

1. Push and hold override button for desired function

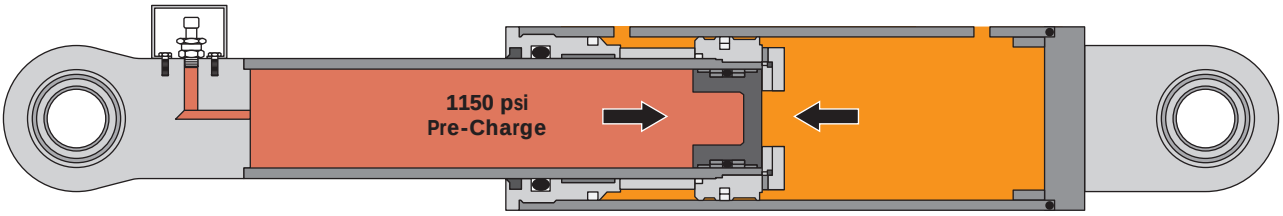
Figure 7-13 Series 2 booster truck manifold



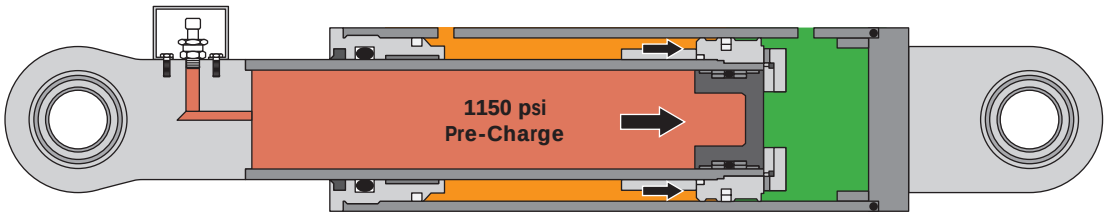
Booster Cylinder



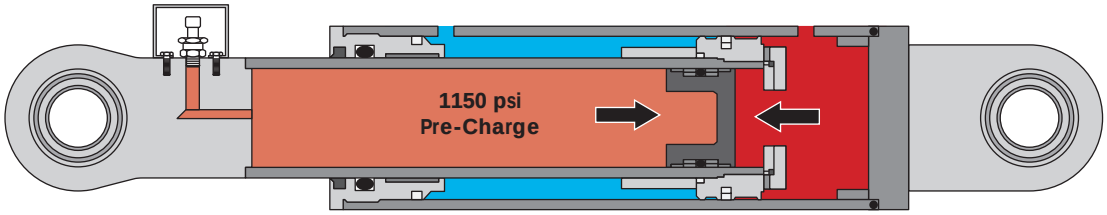
Cylinder In Neutral Position



Cylinder Extending



Cylinder Retracting



Accumulator, absorbing shock

Troubleshooting

Hydraulics

Mixer drum controls

Issue	Where to look	Cause/Solution
Neutral difficult or impossible to find.	A. Control linkage.	1. Cables out of adjustment, binding or are broken. Adjust or replace cable. 2. Cables not correlated with control valve neutral. Adjust cables to valve neutral. 3. Arm or control valve stripping a control shaft spline. Repair or replace arm or shaft on control valve. 4. Cable shaft loose or incorrectly installed. Tighten or readjust control shaft.
	B. Control valve.	1. Plugged control orifice. Clear orifice of any debris. 2. Damaged mounting gasket between valve and pump body. Replace gasket. 3. Misadjusted, damaged or broken neutral return spring. Repair or replace spring. 4. Broken control connector pin. Repair or replace pin. 5. Broken or missing control linkage pins. Replace with working control valve unit. 6. Galled, stuck or contaminated control spool. Replace with working control valve unit.

Issue	Where to look	Cause/Solution
Mixer drum turns in one direction only.	C. Control linkage.	Refer to "A. Control linkage.".
	D. Control valve.	Refer to "B. Control valve.".
	E. Relief valves.	1. Improper pressure relief setting. Replace relief valve. 2. Damaged or missing o-ring and backing ring. Replace o-ring. 3. Plugged orifices. Clear orifices of any debris. 4. Spool galled, stuck or contaminated. Replace relief valve. 5. Poppet style relief valve may be stuck open or contaminated. Replace relief valve.
	F. Shuttle valve on motor.	1. Bent or broken return centering spring. Replace shuttle valve (spring is not repairable in the field). 2. Galled, stuck or contaminated spool. Replace shuttle valve. 3. Bent or broken shuttle spool. Replace shuttle valve. 4. Excess wear. Replace shuttle valve.
	G. Charge pump check valves	1. Damaged or missing o-ring. Replace o-ring. 2. Damaged check ball seat. Replace check valve. 3. Stuck check ball. Repair or replace.

Issue	Where to look	Cause/Solution
System sluggish in response.	H. Check charge pressure. (Install a 600 PSI gauge in o-ring port on top of mixer drive pump)	1. Pressure should be 240 - 260 PSI when pump is in neutral. There should be a 60 PSI drop in pressure when pump is set to charge or discharge. 2. Pressure still low, check for restrictions to the charge pump inlet or replace charge pump. 3. Low pressure in neutral, charge or discharge. Replace relief valve at pump. 4. Low pressure in charge or discharge only. Relief valve at motor is failing, replace relief valve.

Issue	Where to look	Cause/Solution
System operates hot.	I. Oil level	Low oil level, fill to proper level.
	J. Oil cooler	1. Obstructed airflow from debris and oil on the outside cooler. Clean cooler for proper venitaltion. 2. Improper plumbing. Reroute hoses to allow for less restricted oil flow. 3. Obstructed flow through cooler. Flush out or replace cooler.
	K. Charge pressures faulty	Refer to "H. Check charge pressure."
	L. System high pressure	An empty drum reads approximately 500 PSI on the slump meter when the drum is rotating. A loaded drum will register 2500-3500 PSI depending on slump of mix. When readings are higher, refer to "E. Relief valves."

Issue	Where to look	Cause/Solution
System will not operate in either direction.		Start with "A. Control linkage." and run through all steps until issue is located.

Chute hydraulics

Issue	Where to look	Cause/Solution
Chute drifts down while in hold mode.		1. Pilot operated check valve is leaking. Replace valve. 2. Down solenoid valve is stuck in energized position. Replace solenoid valve. 3. Correct electrical if required coil should not be energized.
Chute will not raise.		1. Up solenoid valve does not operate properly. Replace solenoid valve. 2. Correct electrical.
Chute will not lower.		1. Down solenoid valve does not operate properly. Replace solenoid valve. 2. Pilot operated check valve stuck shut. Replace valve. 3. Correct electrical.
Chute raises too fast.		Flow adjustment not correct. Adjust up speed valve screw in to slow down, screw out to speed up (basic setting is 1/4 turn open).
Chute lowers too fast or too slow.		Flow adjustment not correct. Adjust up speed valve screw out to slow down, screw in to speed up.

NOTE Check electrical first.

Solenoids should be energized when respective chute control button is depressed.

Energized solenoid will be magnetic.

Mixer drum hydraulics

Issue	Where to look	Cause/Solution
Noisy pump caused by cavitation.		1. Oil too heavy. Change oil to proper viscosity. 2. Filter plugged. Clean or replace filter. 3. Suction line plugged, too short or too long. Clean line and verify proper size and length.
Noisy pump caused by aeration.		1. Oil supply low. Fill oil resevoir. 2. Air leaking into suction line. Tighten fittings. 3. Foaming oil. Drain resevoir and fill with non-foaming type oil.
Hydraulic system overheating.		1. Excessive internal leakage. Disconnect case, remove drain line and measure leakage volume while pressurizing hydraulic system. Case drain flow should not exceed 2.5 GPM. If excessive, replace. 2. Aeration of oil. Tighten fittings.
System not developing adequate pressure		1. Excessive internal leakage of hydraulic pressure. Disconnect case, remove drain line and measure leakage volume while pressurizing hydraulic system. Case drain flow should not exceed 2.5 GPM. If excessive, replace. 2. Compensator spool on hydraulic motor stuck open. Disassemble compensator, inspect for stuck spool and clean or replace compensator assembly. 3. Compensator spring on motor is weak or broken. Disassemble compensator and inspect for weak or broken spring. Replace spring if necessary. 4. Loss of oil flow compensator signal. Check signal line connections. Check for line obstructions, line damage and proper size and length.
System not developing adequate flow		1. Excessive internal leakage of hydraulic pressure. Disconnect case, remove drain line and measure leakage volume while pressurizing hydraulic system. Case drain flow should not exceed 2.5 GPM. If excessive, replace. 2. Compensator spool on hydraulic motor stuck open. Disassemble compensator, inspect for stuck spool and clean or replace compensator assembly. 3. Compensator spring on motor is weak or broken. Disassemble compensator and inspect for weak or broken spring. Replace spring if necessary. 4. Oil too heavy. Change oil to proper viscosity. 5. Filter plugged. Clean or replace filter. 6. Suction line plugged, too short or too long. Clean line and verify proper size and length.

Optional Booster

Booster Axle Electrical Control System

The booster axle electrical control system consists of hydraulic valves controlled by electrical switches and safety switches. Do not bypass or remove any of these safety switches from the system, or severe damage could happen to the mixer.

The system has an UP/DOWN button and a STOP button. The UP/DOWN button moves the booster up or down. When the system is activated up or down, it rises to the fully up position or lowers to the fully down position. The STOP button allows immediate mid-position stop of the booster axle. The UP/DOWN button will resume motion of the booster axle.

There are 2 chute safety sensors: chute up and chute off center. There is a chute hazard icon on display panel. The icon should be illuminated when the chute is up or off center. If the chute is off center or too high, it could be damaged by contact with the axles and booster support arms.

If the chute hazard icon is on - the chute is out of position and the system will not operate.

Check the chute for off center or raised position.

Center or lower the chute to the lowest position and the system will work.

Safety Features

There are two additional features for the booster axle. First is the back-up protection: the booster will raise when the truck is put in reverse. Second is the booster warning alarm: an audible alarm located in-cab and rear of the mixer that alerts the operator and the people around the unit when the booster is raised and lowered. There is also a light that indicates booster in motion. These features are activated by a Motion Proximity switch.

Optional Booster Electrical

Issue	Cause/Solution
Booster Axle Will Not Raise or Lower.	The system operates with a group of switches wired in series for the safety of the workers around the unit. To lower the booster axle, the ACTIVATE switch, along with the UP/DOWN switch, must be activated.

Issue	Cause/Solution
Booster axle will not raise or lower	
The switches are activated and the Chute Hazard Light is OFF but the booster will not lower.	1. Check fuses, replace as needed. 2. Check Chute Position Proximity switch wire connections. If wire connections are faulty, replace the Chute Position Proximity switch. 3. Check Chute Position Proximity switch clearance from the chute. The correct clearance between the switch and the chute is 1/8 inch. If the Chute Position Proximity switch is not positioned the proper distance from the chute and the gap is too big, reposition the switch to the proper distance from the chute. 4. Check for power going into the Chute Center Proximity switch. If there is power, replace the Chute Center Proximity switch. If there is no power, the Chute Center Proximity switch is good.

Issue	Cause/Solution
Power at activate switch	
Power is coming out of the Activate switch, but the booster doesn't raise or lower.	Check the UP/DOWN switch for power coming out with the switch held in both the up and down positions. If there is no power, replace the UP/DOWN switch. If there is power, the switch is good.
Up/Down switch	
The booster axle will raise and not lower or lower and not raise, therefore performing only half of its function.	Check the UP/DOWN switch for power out. If there is no power, replace the UP/DOWN switch. If there is power, the switch is good.
The UP/DOWN switch is operating on both up and down with the ACTIVATE switch held on but the booster axle is still not functioning.	1. Check the wire harness for worn spots and check connectors on the booster up and down solenoids on the hydraulic raise and lower valve for power. If there is no power, replace the wire harness and/or up and down solenoids. 2. If there is power to the solenoids but the booster still doesn't work, replace the hydraulic raise/lower valve.
Start - Stop system	
Start-stop will not stop the motion of the booster.	1. Check the wire harness and wire connections for power at the start-stop hydraulic valve. If there is no power, replace the wire harness and/or the wire connectors. 2. If there is power but still no function, replace the solenoids and/or the stop-start hydraulic valve.
Safety features	
The booster axle will not raise when the truck is put into reverse.	1. Check the wire connections, position, and power into the Motion Proximity switch the same way the Chute Proximity switches are checked. Refer to "Booster axle will not raise or lower".

Glossary of Terms

Accumulator

A hydraulic device that stores fluid power energy in much the same way that a capacitor stores electrical energy. An accumulator stores energy, so it must be drained and depressurized before working on the hydraulic system.

Agitator

A device set in the concrete hopper of a pump to keep concrete moving, which prevents it from setting. It is typically a rotating shaft to which several paddles have been mounted. See also: Hopper Grate

AWS D1.1

The code for structural welding with steel, as defined by the American Welding Society. Sections 3, 5, and paragraph 9.25 of section 9 apply. See also: Certified Welder and EN 287-1

Blockage

If the pump is pushing and concrete fails to come out at the point of discharge, a blockage is the cause. Blockages can create dangerous situations by causing high concrete pressure, combined with the sometimes uncoordinated efforts of untrained workers to remedy the problem.

Bulk Density

The mass of a substance per volume. For example, 1 cubic foot of air weighs much less than 1 cubic foot of water. One cubic foot of lightweight concrete weighs less than 1 cubic foot of steel-entrained concrete. We could say that steel-entrained concrete has a higher bulk density than lightweight concrete. All calculations for the operation manuals and specifications of concrete pumps are based upon 150 pounds per cubic foot, which is the approximate mass of hard rock (normal) concrete.

Cab and Rear Controls

In-cab controls and rear controls for the drum directions with drum counter, chute lock, and chute raising/lowering functions.

Certified Operator

An operator who has been issued a certification card by the American Concrete Pumping Association. There are several classes of certification, each relating to a different category of pump. For an operator to become certified, he or she must pass tests regarding operation, setup, and cleanout for each category of pump, pass the safety rules test common to all certification categories, meet the experience requirements set forth for each category, and maintain a safe and clean driving record. Certified operators are considered qualified operators in their categories. See also: Expert, Qualified Operator

Certified Welder

As it relates to concrete pumping and this safety manual, a Certified Welder is a person who has applied for, taken, and passed the American Welding Society (AWS) or the European Normal (EN) test for structural steel welding. Anyone welding on a concrete pump placing boom, outrigger, tower, or other device must be certified to AWS D1.1 sections 3, 5, and paragraph 9.25 of section 9 and/or EN287-1/PREN288-3.

Charging Hopper

A funnel opening with a throat for smooth charging of the mixer.

Chute Lock

7-position positive pin lock and variable chute positioner.

Chute Pivot

Rotates chute left to right on 2 TimkenTM greasable roller bearings.

Concrete Pressure

The force per square area that is exerted on the concrete. The concrete pressure is always a ratio in direct proportion to the hydraulic oil pressure on the concrete pump circuit. See also: Maximum Pressure

Conductors

Materials that conduct electricity. Copper, silver, aluminum, gold, steel, and water are considered good conductors of electricity. Air, fiberglass, rubber, ceramics, and glass are considered poor conductors. All of these conductors have a resistance to the flow of electricity,

which is measured in terms of ohms per linear foot. As voltage increases, more current flows through the same resistance. With high-voltage electric wires—8000 volts, for example—even poor conductors carry enough current through your body to ground to kill you. (As little as 35 milliamps can cause cardiac arrest.) Some conductors, such as air, resist electricity very well, but if the voltage gets high enough, current will flow. (Lightning is a good example of this.) See also: Electrocution

Decibels

A measurement of volume equal to one tenth of a bel, abbreviated dB. As it applies to concrete pumps, it is a measurement of the sound pressure level one meter away from a noise source. Because constant exposure to loud sound can cause permanent hearing loss, OSHA has developed guidelines for time limits on exposure to sound at different volumes.

Discharge Funnel

Enclosed free-flow discharge system with enclosed skirting to minimize clean-up.

Drive Engine

The primary source of power for a hydraulic system. Typically, the word engine denotes an internal combustion device, whereas the word motor denotes an electrical device. See also: Prime Mover

Drum

Consists of head, shell, shape, and blades. Use to mix, transport and discharge concrete.

Drum Roller

Surface hardened 8" diameter alloy steel. Tapered TimkenTM roller bearings with center shaft lubrication as well as dual seals to protect rollers from water and dirt.

Drum Track

Track between drum rollers and drum.

Electrocution

Made by combining the words "electric" + "execution." It means "death by electricity." See also: Conductors

EN 287-1 / PREN 288-3

The code for structural welding with steel as defined by the European Norm. See also: Certified Welder

Expert

As used in this manual, an expert is defined as a person who, on the basis of specialized training and experience, has developed a high degree of knowledge and skill in the areas of concrete pumps, concrete pumping, cleanout procedures, generally accepted engineering norms, and safety regulations to the extent of being able to evaluate equipment and processes as they relate to job safety. Experts demonstrate their knowledge and abilities by passing the certification testing and experience requirements of the American Concrete Pumping Association. Other experts may include master mechanics and after-sales service technicians of the manufacturer. See also: Certified Operator

Fenders

Mud shields with stop, turn and tail lights, and rear mudflaps.

Foreign Material

Material that was never intended to be put into a concrete pump but ends up in the concrete hopper. Examples of foreign material include small animals, hammers, ready-mix truck fins, unmixed clumps of cement, hardened concrete that breaks away from ready-mix truck fins, and soft drink cans. Many of these items can create a blockage if they are pumped through the system.

Front Pedestal

The pedestal is the mounting point for the drum drive, gear reducer, and the front of the drum.

Gear Box

Two stage 7000 series ZF drive gear box with a deep reduction drive.

Guide

An assistant brought in to help back up a truck or trailer or to help in other circumstances in which the driver cannot see enough to ensure safety.

Hatch

Located in the front section of the drum, bolted in place for maintenance.

High Voltage

For the purposes of this manual, any current over 120 volts AC is considered high voltage. With electric wires in residential or industrial areas, the voltage is approximately 8000 volts to ground, or 13,800 volts from phase to phase (distribution voltage). When dealing with electric wires that are mounted high above the ground on steel towers, the voltage ranges from 100,000 to 1,000,000 volts (transmission voltage).

Hopper Grate

A meshwork typically made from steel bars and placed over the concrete hopper of a concrete pump. It serves to keep human body parts away from the agitator (when left in its proper position) and to keep large foreign objects from falling into the hopper, which could cause blockages if they were to be pumped. The hopper grate must be secured in position in order to be effective.

Maintenance

All procedures for servicing, inspection, and repair of concrete pumps and related equipment and devices. Maintenance and inspection are methods of maintaining the desired state of the equipment. Repair is the method of restoring the desired state of the equipment.

Maximum Pressure

When talking about a hydraulic system, maximum pressure refers to the highest pressure that can be achieved with the settings of the circuit relief valves.

Minimum Safety Distance

In this manual, the term "minimum safety distance" refers to the closest distance that you are allowed to approach an object or electrical wires and still leave room for errors in human judgment or machine malfunction.

Murphy's Law

An old adage that says: "Anything that can go wrong, will go wrong, and at the worst possible moment."

Operational Area

The area around a working piece of equipment or point of discharge where dangers can be encountered because of the nature of the machinery or process in use. For safety reasons, do not allow unauthorized presence in the operational area.

OSHA

Occupational Safety and Health Administration. A branch of the U. S. federal government that deals with job safety. They establish and enforce safety regulations for industry and business. Among the areas over which they have authority are construction job sites and workshops.

Personal Protective Equipment

Things you can wear to protect yourself from potential dangers in a concrete placing environment. Examples are:

- snug-fitting work clothes
- steel-toed work boots
- lime-resistant gloves
- safety glasses
- ear muffs or ear plugs
- rubber boots for when you have to stand in concrete
- hard hat

Point of Discharge

The location on the machine from which concrete is delivered. This can be the point of placement (the actual form that is being filled with concrete) or the cleanout area after completion of a job.

Prime Mover

The primary power source for a hydraulic system. The term "prime mover" denotes neither an internal combustion engine nor an electric motor.

PTO

Power Take Off. A switchable output from the transmission or an intermediate gearcase.

Qualified Operator

An individual who meets all the following qualifications:

- reached the age of 18
- is physically and mentally capable
- has been trained in the proper operation and maintenance of the pump and placing boom, if applicable
- has demonstrated his or her capabilities to the hiring company with respect to the operation and maintenance of the pump and placing boom
- can be expected to perform assigned duties in a reliable manner.

Qualified Personnel

A generic term used to describe people who are qualified to do work in their area of application. For example, having your boom repairs inspected by "qualified personnel" before use refers to inspection by a certified welder or certified welding inspector. Having repairs to your hydraulic system done by "qualified personnel" would refer to repairs made by qualified workshop personnel.

Qualified Workshop Personnel

An individual who meets all of the following qualifications:

- has reached the age of 18 years
- is physically and mentally capable
- has been trained in proper repair, maintenance, and inspection procedures plus the pertinent safety rules for concrete pumps and related equipment
- has demonstrated their capabilities to their company with regard to the procedures and rules discussed above, and
- can be expected to perform assigned duties in a reliable manner.

Rear Ladder

The grip strut rungs with fold down extension. Hand rails located on each side of the work platform.

Rear Pendant Control

Control is equipped with mobile hard wire with control functions.

Rock Jam

A specific type of blockage during concrete pumping operation caused when the cement and fines of the concrete are not present in sufficient quantity to fully coat the larger aggregates and the walls of the delivery system. In these cases, the rocks (larger aggregates of the mix) form a wedge inside the pipe. Resistance to movement then becomes overpowering, and the concrete stops. Increasing pressure to try to remove the wedge only results in forcing more of the finest particles past the rocks, compounding the problem. In some cases, the wedge can be broken up by alternately pumping in forward and then reverse.

Soil Pressure

The force per square area that is exerted on the ground by the truck tires. The amount of pressure that the soil will support varies with the composition and compaction of the soil.

Swing Chute

Chute with fold over, rotates side to side, you can control the chute hoist with controls at the rear of the mixer and in cab.

Water Hose

30 foot wash down hose with pistol grip spray nozzle.

Water Jet

The stream of water that comes out the end of a water hose or pressure washer. The water jet is the only part of the water system that needs to go into the charge hopper, discharge funnel, and drum.

Water Pressure Control

Three position valve (fill, hold and release) for pressurizing the water tank.

Water Tank

Side mounted or cross mounted pressurized steel or aluminum water tank.

4' Chute Extension

Storage of up to 3-4' chutes in a frame mounted chute cradle. Fender mounting or gun rack mounting.

Mixer Truck
New Product and Parts Warranty

Integral dx warrants its **mixer body (equipment)** against defects in material and workmanship under normal use and service for a period of **twelve (12) months** from the date of purchase or 2000 hours of use whichever shall occur first. This warranty shall not cover such equipment that has been subject to misuse, negligence or accident.

Integral dx warrants **new spare/replacement parts** against defects in material and workmanship for a period of **six (6) months** from the date of purchase. This includes but not limited to replacement mixer drums. This warranty shall not cover damage from improper installation by installer unless installed by Integral dx.

This warranty shall not apply to any equipment or spare parts which shall have been loaded or operated beyond their rated capacity as specified by Integral dx. Damage resulting from improper installations, alterations, or neglect of recommended maintenance, misuse, or accident will be considered as misuse and not as a defect. Certain parts of the equipment, such as, but not limited to, mixer drums and chutes, are subject to normal wear. Normal wear is not covered under this warranty. Your Integral dx equipment is designed to operate with only Integral dx OEM products. Use of non-Integral dx products voids any warranties provided by Integral dx.

The Buyer's Exclusive and Sole Remedy for breach of this warranty shall be limited to replacement, modification or repair free of charge, of such part or parts as are determined to be defective, or repayment of the purchase price paid by the Buyer, whichever remedy Integral dx shall select. To make a claim under this warranty, Buyer must, within (90) days of discovery of the defect in material or workmanship, give written notice of the defect to Integral dx and, if requested by Integral dx, promptly deliver the equipment to Integral dx, FOB Integral dx warehouse. Integral dx shall not in any event be liable for the cost of any special, direct or consequential damages.

INTEGRAL DX SHALL HAVE NO LIABILITY TO THE BUYER OF SUCH EQUIPMENT OR SPARE PARTS OR OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER BREACH OF CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE, EVEN IF INTEGRAL DX SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For purpose hereof the term "consequential damages" shall include lost profits, penalties, delay damages, liquidated damages or other damages and liabilities which the Buyer shall be obligated to pay or which the Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Integral dx be liable for any amount of damages in excess of amounts paid by the Buyer for goods or services as to which a breach of warranty or contract has been determined to exist. The parties expressly agree that the price for goods and the services was determined in consideration of the limitations on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose. Integral dx reserves the right to make changes and improvements in its product without incurring any obligation to install any such changes or improvements in its products previously manufactured.

Integral dx makes no warranty of components or accessory equipment purchased by Integral dx from third parties, such as, but not limited to, truck chassis, engines, transmissions, gear cases, tires, wheels, and tools, the same being subject to the warranties of their respective manufacturers. Except as provided herein, and in Integral dx's General Terms and Conditions of Sale, which are incorporated herein by reference, INTEGRAL DX MAKES NO OTHER REPRESENTATIONS OR WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO NEW EQUIPMENT OR SPARE PARTS, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

Rev Date – 04/09/21

REPAIR MANUAL

ZF - ECOMIX II

CML-10/12/16
Repair Level I

5871.790.202 en

REPAIR MANUAL
ZF Ecomix II
CML-10/12/16

I M P O R T A N T I N F O R M A T I O N :

Due to the great variety of ZF units it is necessary to limit disassembly and reassembly manuals to a current ZF production unit. Technical upgrading of ZF units and extension of design options may require differing operations which can be carried out by qualified specialists without greater difficulties by means of the perspective views included in the corresponding spare parts lists.

This disassembly and reassembly manual is based on the design level of a ZF production unit at the time of issue of the manual.

ZF Friedrichshafen AG reserves the right to replace this disassembly and reassembly manual by a successive edition at any time without advance notice. Upon request, ZF Friedrichshafen AG will advise which edition is the latest one.

Any commissioning and maintenance work must be done in accordance with the specifications provided in the Operating Manual (ZF order No.: 5872.800.002)!

The ZF list of lubricants is being continuously updated and can be obtained or viewed as follows:
- at all ZF plants
- at all ZF service organizations
- Internet www.zf.com

ATTENTION:

Observe the vehicle manufacturer's instructions and specifications for installation and commissioning of the unit!

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This document is a translation of the German original.

Design level 2009/11
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PREFACE

This documentation has been developed for specialized staff trained by ZF Friedrichshafen AG for repair and maintenance work to be done on ZF-units.

This manual describes a ZF series product with a design level valid at the date of edition.

Due to the continuous technical upgrading of the product, however, the repair of the unit at your disposal may require both deviating work steps and different setting and testing data.

We would therefore recommend you to entrust masters and servicemen with the work on your ZF product whose practical and theoretical training is constantly updated in our training school.

The Service Stations established by ZF Friedrichshafen AG all over the world offer you:

1. Permanently trained staff

2. Specified equipment, e.g. special tools

3. State-of-the-art genuine ZF spare parts

All work is done there with utmost care and reliability.

In addition, repair work carried out by ZF Service Stations is covered by the ZF warranty within the terms of the currently applicable contractual conditions.

Any damage resulting from work which is done in an improper and unprofessional manner by third parties and any consequential costs incurred are excluded from this contractual liability. This shall also be applicable if other than genuine ZF spare parts are used.

This manual is based on the state-of-the-art at the time of printing.
It was prepared with utmost care in order to avoid errors.
However, we shall not be liable for any possible errors in figures or descriptions.

ZF Friedrichshafen AG

GENERAL

Structure of the Service Manual

The structure of this manual reflects the sequence of work steps for completely dismantling the removed unit.

Tools required for carrying out the repair work are listed in the current text as well as in chapters “WS” (Special Tools) and “WH” (Commercial Tools).

Important information on work safety

As a basic principle, the workshop carrying out the repair or maintenance of ZF units shall be fully responsible for work safety.

The observance of all valid safety regulations and legal requirements is a prerequisite for avoiding any damage to persons and products during maintenance and repair work.
Repair workshops must familiarize themselves with these regulations prior to starting any work.

A suitably trained and skilled staff is required for a proper repair of these ZF products.

The repair workshop shall be responsible for the training.

The following safety references are used in this manual:

	**INFO**	This symbol serves as a reference to text passages in this repair manual giving an **INFO** on special working procedures, methods, information, use of auxiliaries, etc.

	**NOTE**	This symbol identifies situations in which lacking care might lead **to damage to the product**.

	**DANGER**	This symbol identifies situations in which lacking care might lead to **personal injury**.

	Thoroughly study this manual before starting any tests and repair work. Figures, drawings and parts in this manual do not always represent the original; they show the working procedure. Since the figures, drawings and parts are not shown to scale, do not draw any conclusions on size and weight (not even within one and the same illustration). Carry out work according to the legend. After repair work and tests, the expert staff must verify that the product is perfectly functioning again.

The Service Manual covers all work required for disassembly and the relating reassembly.

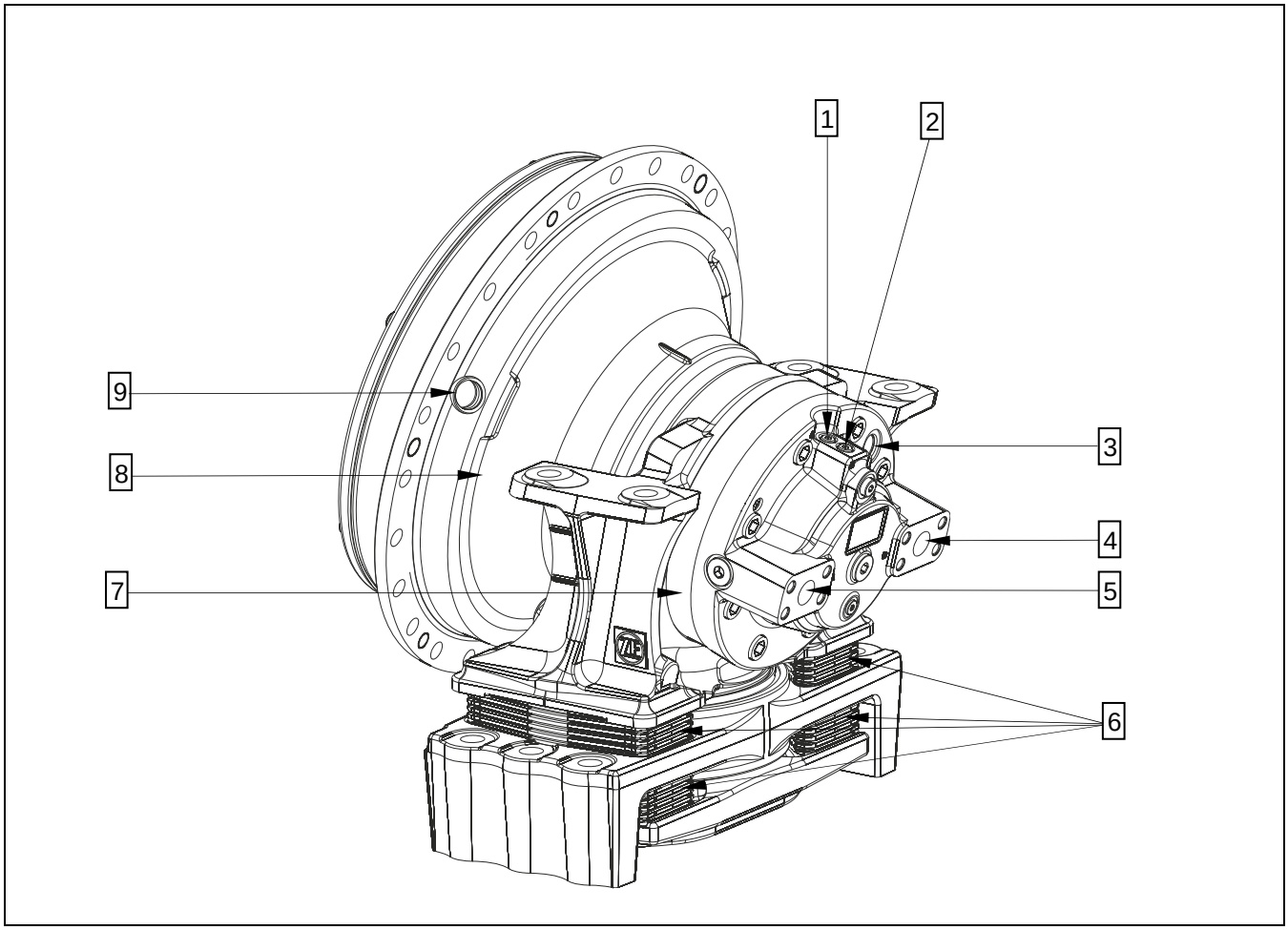
When repairing the unit, ensure utmost cleanliness and excellent workmanship. Dismantle the unit only if any damaged parts must be replaced. After removing screws or nuts, loosen covers and housing parts which were installed with seals by slight blows with a plastic hammer. Use suitable pulling devices for removing parts being tightly installed on the shafts, such as bearings, bearing rings and similar.

Carry out disassembly and reassembly work on a clean working place. Use special tools which have been developed for this purpose. Prior to reinstallation of the parts, clean contact faces of housings and lids from residues of seals. Remove any burrs or similar irregularities with an oil stone. Clean housings and end covers, in particular corners and angles, with a suitable detergent. Damaged or heavily worn parts must be replaced, with an expert assessing whether parts subject to normal wear during operation, such as bearings, thrust washers etc. will be reinstalled.
Parts such as seal rings, locking plates, split pins etc. must generally be replaced. Radial seal rings with worn or broken sealing lip must also be renewed. In particular, ensure that no chips or other foreign bodies remain in the housing. Check the lube oil holes and grooves regarding unhindered passage.
Oil according to the relating List of Lubricants shall be applied to all bearings prior to their installation.

☞	Only a heating furnace or an electric drier is permitted to be used for heating parts such as bearings, housings, etc.! Parts fitted in heated state must be readjusted after cooling-down to ensure a perfect contact! When assembling the unit, exactly observe the tightening torques and setting data indicated in the manual. Tighten screws and nuts according to the enclosed standard table, unless otherwise specified. When assembling snap rings and retaining rings, pay attention to an exact contact in the grooves! NEVER wash disks having organic friction linings (e.g. paper disks) since this would have an adverse effect on lining adhesion. Only dry-cleaning is permitted (leather cloth).

⚠	**When using detergents, observe the manufacturer's instructions regarding their handling.**

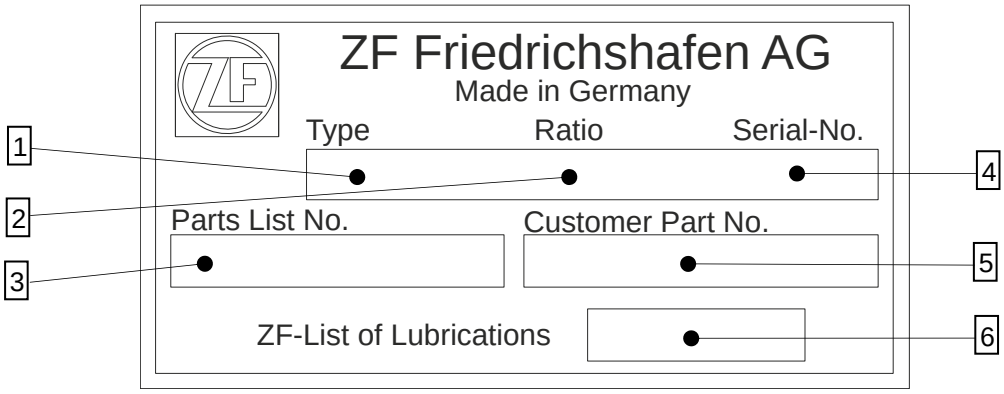
Installation sheet
ZF Ecomix II



1 = Measuring connection „A“
2 = Measuring connection „B“
3 = Leak oil connection „L“
4 = High-pressure connection „B“
5 = High-pressure connection „A“
6 = Elastomer unit
7 = Drive unit (radial piston hydraulic motor)
8 = Transmission part
9 = Oil sight glass

Transmission part and drive unit have a separate oil supply!

LABELING OF IDENTIFICATION PLATE



1 = Unit type
2 = Ratio
3 = ZF parts list number
4 = Unit number (serial number)
5 = Customer number (vehicle identification number)
6 = ZF list of lubricants (oil grade)

INFORMATION ON SPARE PARTS ORDERING

The following information is required when ordering genuine ZF spare parts:

1. Unit type

2. Unit number/serial number

3. ZF parts list number

4. Make and type of vehicle

5. Denomination of spare part

6. Spare part number

7. Shipping mode

Items 1, 2 and 3 are indicated on the identification plate.

Please indicate all the a.m. details to avoid any mistakes in the delivery of the ordered spare parts!

VERGLEICHSTABELLE FÜR MASSEINHEITEN
CONVERSION TABLE
TABLEAU DE CONVERSION

25.40 mm	=	1 in (inch)
1 kg (kilogram)	=	2.205 lb (pounds)
9.81 Nm (1 kpm)	=	7.233 lbf x ft (pound force foot)
1.356 Nm (0.138 kpm)	=	1 lbf x ft (pound force foot)
1 kg / cm	=	5.560 lb / in (pound per inch)
1 bar (1.02 kp/cm^2)	=	14.5 psi (pound force per square inch lbf/in^2)
0.070 bar (0.071 kp/cm^2)	=	1 psi (lbf/in^2)
1 liter	=	0.264 gallons (Imp.)
4.456 liters	=	1 gallon (Imp.)
1 liter	=	0.220 gallons (US)
3.785 liters	=	1 gallon (US)
1609.344 m	=	1 mile (land mile)
0° C (Celsius)	=	+ 32° F (Fahrenheit)
0° C (Celsius)	=	273.15 Kelvin

BEZEICHNUNG DER GESETZLICHEN EINHEITEN
DENOMINATION OF STANDARD DIMENSIONS
DENOMINATION DES DIMENSIONS STANDARDISEES

Hinweis : Längenbezogene Masse in kg/m Flächenbezogene Masse in t/m^2

Note : Linear density in kg/m Areal density in t/m^2

Nota : Densité linéaire en kg/m Densité superficielle en t/m^2

Begriff **Unit** **Unité**	**Formelzeichen** **Formula Sign** **Symbole**	**Neu** **New** **Nouveau**	**Alt** **Old** **Vieux**	**Umrechnung** **Conversion** **Conversion**	**Bemerkungen** **Note** **Nota**
Masse Density Densité	m	kg (kilogram)	kg		
Kraft Force Force	F	N (Newton)	kp	1 kp = 9.81 N	
Arbeit Work Travail	A	J (Joule)	kpm	0.102 kpm = 1J = 1Nm	
Leistung Power Puissance	P	KW (Kilowatt)	PS (DIN)	1 PS = 0.7355 KW 1 KW = 1.36 PS	
Drehmoment Torque Couple	T	Nm (Newtonmeter)	kpm	1 kpm = 9.81 Nm	T (Nm) = F (N) · r (m)
Kraftmoment Moment (Force) Moment (Force)	M	Nm (Newtonmeter)	kpm	1 kpm = 9.81 Nm	M (Nm) = F (N) · r (m)
Druck (Über-) Pressure (Over-) Pression (Sur-)	pü	bar	atü	1.02 atü = 1.02 kp/cm^2 = 1 bar = 750 torr	
Drehzahl Speed Nombre de Tours	n	min^{-1} rpm tr/min			

TIGHTENING TORQUES FOR SCREWS (IN Nm) ACC. TO ZF STANDARD 148

Friction coefficient: μ tot.= 0.12 for screws and nuts without subsequent treatment, as well as for phosphated nuts. Tighten manually!
Unless otherwise specified, the tightening torques can be taken from the following chart:

Metric ISO standard thread DIN 13, page 13

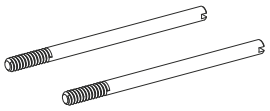
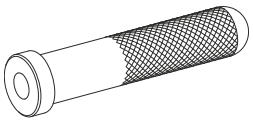
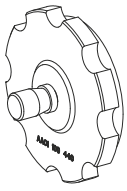
Dimension	**8.8**		**10.9**		**12.9**
M4	2.8		4.1		4,8
M5	5.5		8.1		9.5
M6	9.5		14		16.5
M7	15		23		28
M8	23		34		40
M10	46		68		79
M12	79		115		135
M14	125		185		215
M16	195		280		330
M18	280		390		460
M20	390		560		650
M22	530		750		880
M24	670		960		1100
M27	1000		1400		1650
M30	1350		1900		2250
M33	1850		2600		3000
M36	2350		3300		3900
M39	3000		4300		5100

Metric ISO fine thread DIN 13, page 13

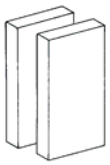
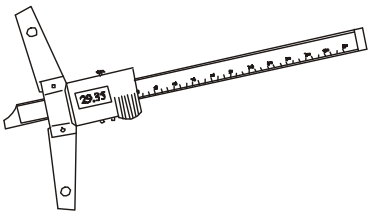
Dimension	8.8		10.9		12.9
M 8 x 1	24		36		43
M 9 x 1	36		53		62
M 10 x 1	52		76		89
M 10 x 1.25	49		72		84
M 12 x 1.25	87		125		150
M 12 x 1.5	83		120		145
M 14 x 1.5	135		200		235
M 16 x 1.5	205		300		360
M 18 x 1.5	310		440		520
M 18 x 2	290		420		490
M 20 x 1.5	430		620		720
M 22 x 1.5	580		820		960
M 24 x 1.5	760		1100		1250
M 24 x 2	730		1050		1200
M 27 x 1.5	1100		1600		1850
M 27 x 2	1050		1500		1800
M 30 x 1.5	1550		2200		2550
M 30 x 2	1500		2100		2500
M33 x 1.5	2050		2900		3400
M 33 x 2	2000		2800		3300
M 36 x 1.5	2700		3800		4450
M 36 x 3	2500		3500		4100
M 39 x 1.5	3450		4900		5700
M 39 x 3	3200		4600		5300

SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

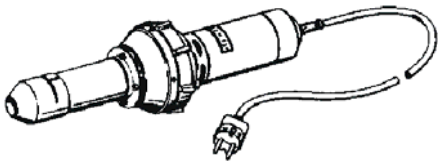
CML-10/12/16

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
1		**Fixing pins** **5870.204.063**	1	2/2
2		**Driver tool** CML-10/12 **5870.055.115**	1	4/1
3		**Handle** **5870.260.002**	1	4/1 4/4
4		**Driver tool** CML-16 **AA01.109.440**	1	4/4

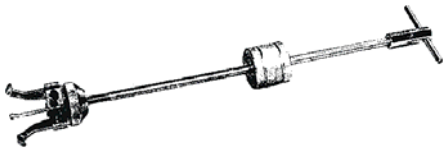
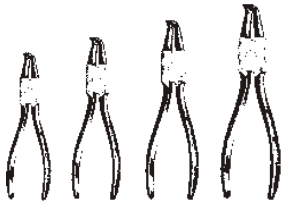
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
1		**Magnetic stand** **5870.200.055**	1	Universal
2		**Dial indicator** **5870.200.057**	1	Universal
3		**Gauge blocks** **5870.200.066** 70 mm **5870.200.067** 100 mm	1	Universal
4		**Digital depth gauge** **5870.200.072** 200 mm **5870.200.114** 300 mm	1	Universal
5		**Digital caliper gauge** **5870.200.109** 150 mm **4P46.001.065** 300 mm **4P46.000.032** 500 mm	1	Universal

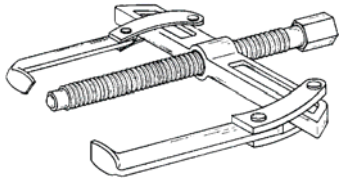
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
6	 	**Torque wrench** **5870.203.030** 0.6 -6.0 Nm **5870.203.031** 1.0 – 12 Nm **5870.203.032** 3.0 – 23 Nm **5870.203.033** 5.0 – 45 Nm **5870.203.034** 10 – 90 Nm **5870.203.039** 80 – 400 Nm **5870.203.016** 140 – 750 Nm **5870.203.011** 750 - 2000 Nm	1	Universal
7		**Hot air blower** **5870.221.500** 230 V **5870.221.501** 115 V	1	Universal
8		**Plastic hammer** **5870.280.004** Ø 60 mm **Substitute nylon insert** **5870.280.006**	1	Universal
9		**Lifting strap** **5870.281.026**	1	Universal

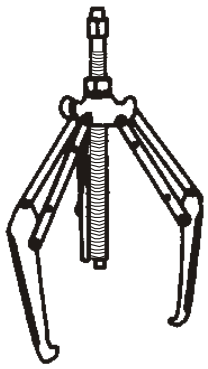
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
10		**Lifting chain** **5870.281.047**	1	Universal
11		**Pry bar** **5870.345.071**	1	Universal
12		**Striker** **5870.650.004**	1	Universal
13		**Set of internal pliers** I1-I2-I3-I4 **5870.900.013**	1	Universal
14		**Set of internal pliers** I11-I21-I31-I41 90° **5870.900.014**	1	Universal

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
15		**Set of external pliers** A1-A2-A3-A4 **5870.900.015**	1	Universal
16		**Set of external pliers** A01-A02-A03-A04 90° **5870.900.016**	1	Universal
17		**Two-armed puller** **5870.970.001** Jaw width 80 mm Throat depth 100 mm **5870.970.002** Jaw width 120 mm Throat depth 125 mm **5870.970.003** Jaw width 170 mm Throat depth 125 mm **5870.970.004** Jaw width 200 mm Throat depth 175 mm **5870.970.006** Jaw width 350 mm Throat depth 250 mm **5870.970.007** Jaw width 520 mm Throat depth 300 - 500 mm **5870.970.026** Jaw width 250 mm Throat depth 200 mm **5870.970.028** Jaw width 380 mm Throat depth 200 mm	1	Universal

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order no.	Qty.	Chapter/Fig
18		**Three armed puller** **5870.971.001** Jaw width 85 mm Throat depth 65 mm **5870.971.002** Jaw width 130 mm Throat depth 105 mm **5870.971.003** Jaw width 230 mm Throat depth 150 mm **5870.971.004** Jaw width 295 mm Throat depth 235 mm **5870.971.005** Jaw width 390 mm Throat depth 230 mm **5870.971.006** Jaw width 640 mm Throat depth 290 mm	1	Universal

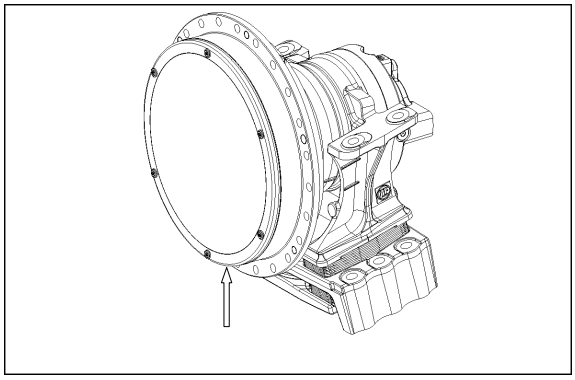


Fig. 1

ZF – Ecomix II
CML-10/12/16

1. Output cover

Bring oil sight glass into lowermost position (6 o'clock, see arrow).

Loosen screw plug and drain oil from transmission part.

Observe regulations for environmental protection. Use suitable oil reservoir.

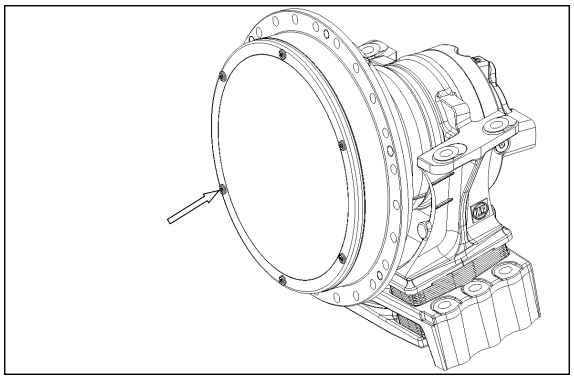


Fig. 2

Loosen bolted connection (Torx screws, see arrow).

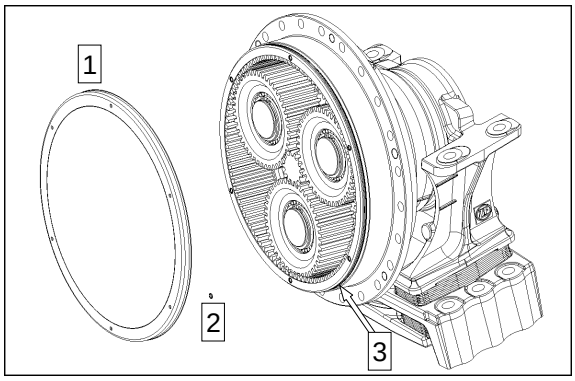


Fig. 3

Remove output cover (1).

Pay attention to releasing O-rings (2).

Remove O-ring (3) from annular groove of ring gear carrier.

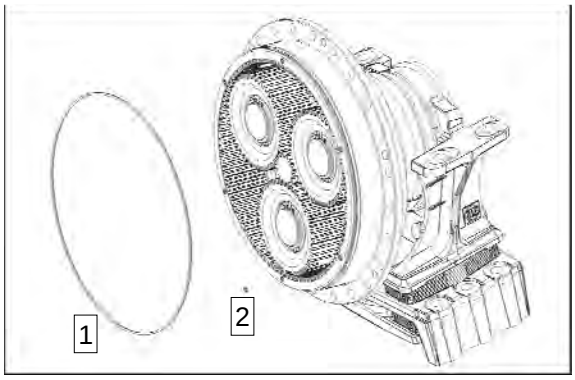


Fig. 1

2. Output cover

Grease O-ring (1) and insert it into the annular groove of the ring gear carrier.

Fix O-rings (2) into the countersinks using grease.

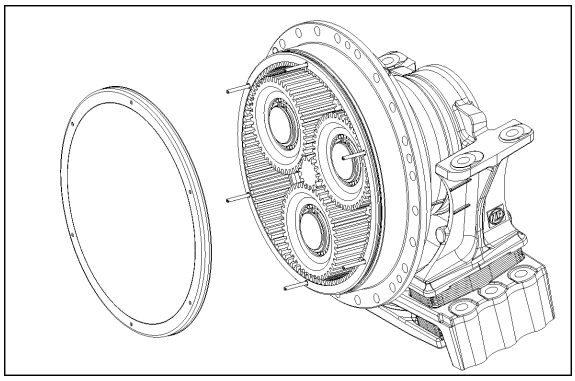


Fig. 2

Mount fixing pins (S).

(S) Fixing pins 5870.204.063

Bring output cover into contact position at the ring gear carrier.

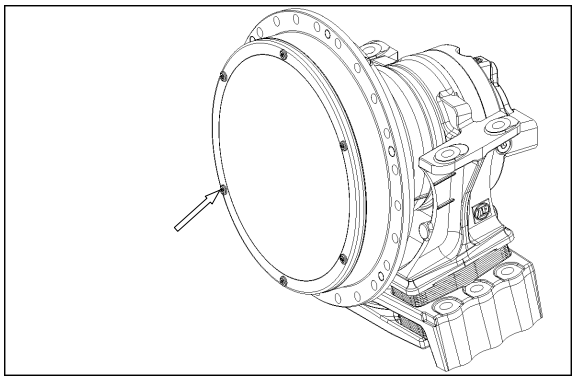


Fig. 3

Fix output cover with Torx screws (6x).

Tightening torque (M6/8.8) M_A = 10 Nm

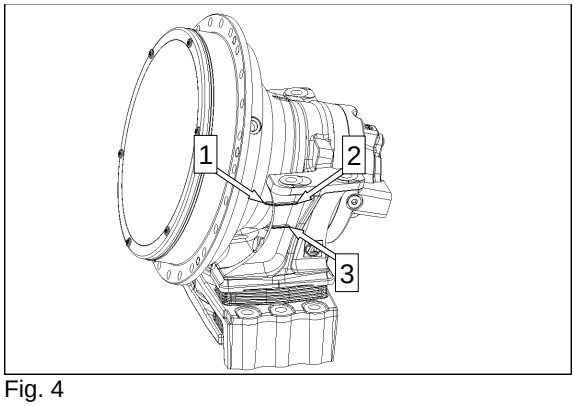


Fig. 4

Align marking on ring gear carrier (1) with marking on bearing housing (2).

Position for „MAX oil level“ in output.

Fill in oil until overflow at the filler hole (oil sight glass, see arrow).

1 = Marking on ring gear carrier
2 = Marking on bearing housing „MAX oil level“
3 = Marking on bearing housing „MIN oil level“

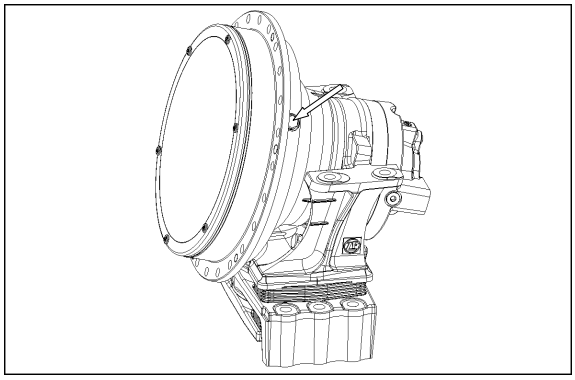


Fig. 5

Provide oil sight glass (see arrow) with seal ring and fit it.

Tightening torque M_A = 4 Nm

☞ **Any commissioning and maintenance work must be done in accordance with the specifications provided in the Operating Manual (ZF order No.: 5872.800.002)!**

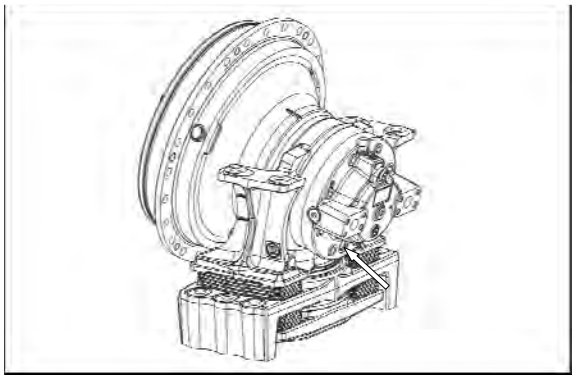


Fig. 1

3. Hydraulic motor

Loosen screw plug (see arrow) and drain oil.

Observe regulations for environmental protection. Use suitable oil reservoir.

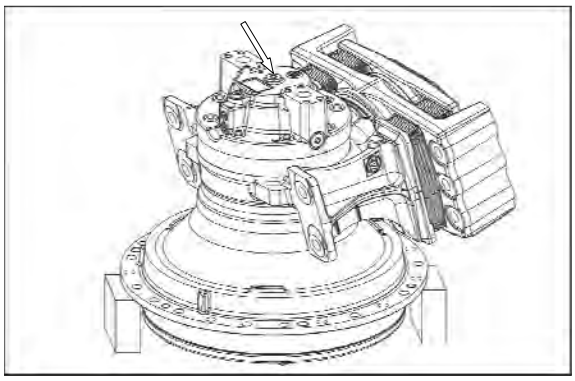


Fig. 2

Place transmission onto suitable blocks (see figure).

Do not put transmission onto output cover, risk of damage!

Loosen screw plug (see arrow).

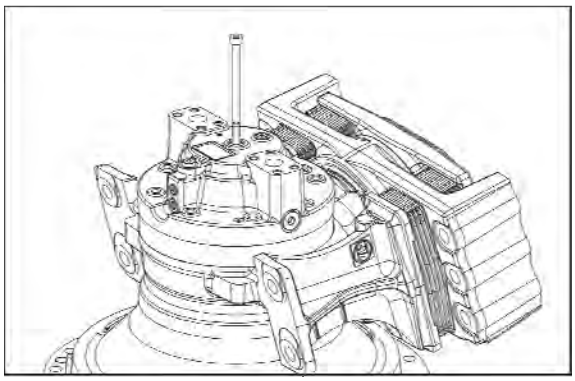


Fig. 3

Loosen cylindrical screw.

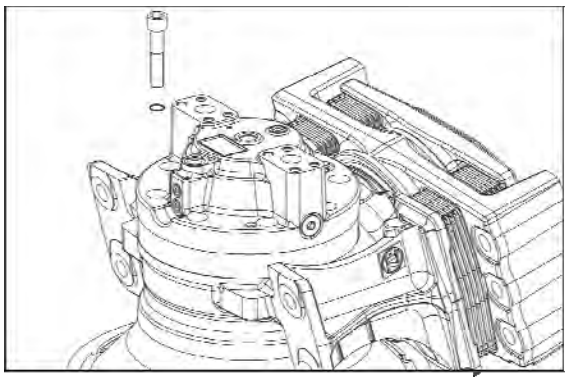


Fig. 4

Loosen bolted connection.

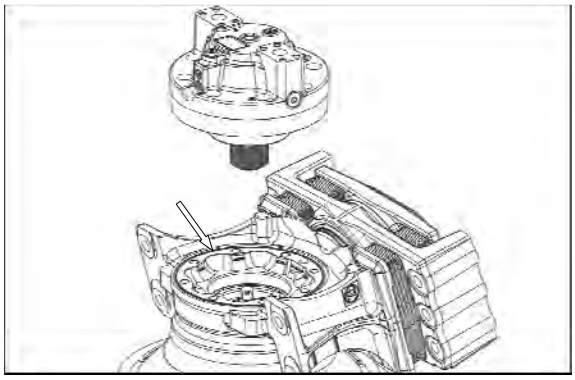


Fig. 5

Pull off hydraulic motor.

Remove seal ring (see arrow).

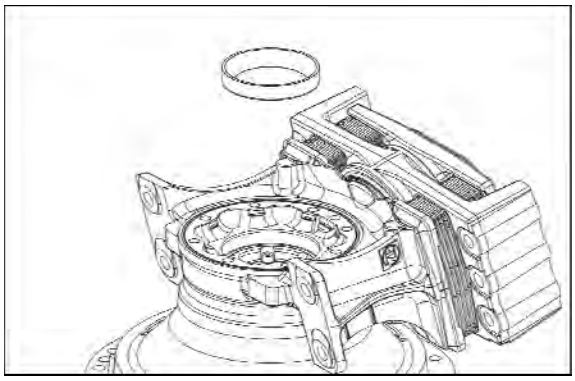


Fig. 6

Pull bearing outer ring out of the bearing hole.

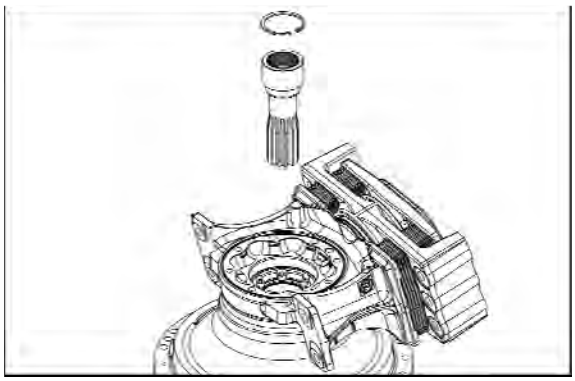


Fig. 7

Removal of scraper CML-10/12 (fig. 7 … 8)

Disengage retaining ring.

Pull drive shaft.

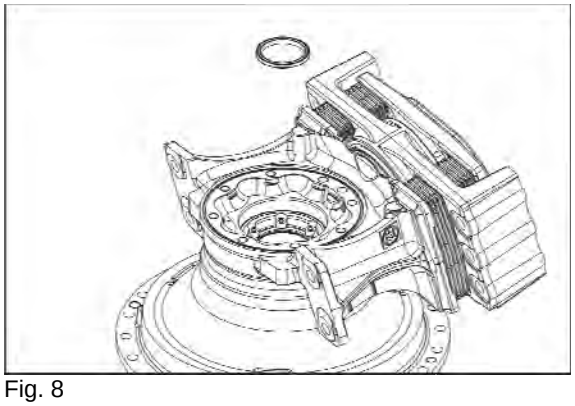


Fig. 8

Remove scraper from bearing housing.

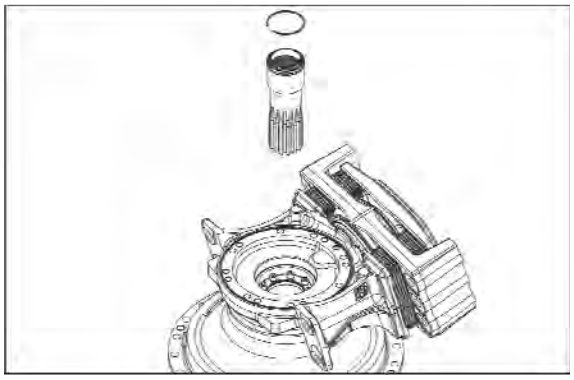


Fig. 9

Removal of scraper CML-16 (fig. 9 … 10)

Disengage retaining ring.

Pull drive shaft together with scraper.

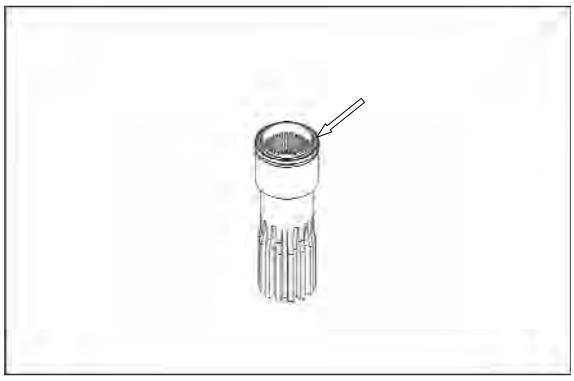


Fig. 10

Remove scraper (see arrow) from drive shaft.

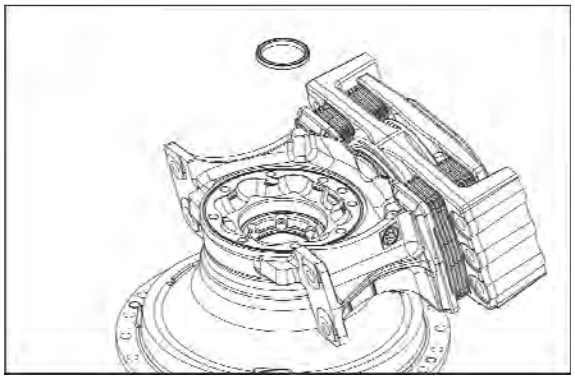


Fig. 1

4. Hydraulic motor

Reassembly of scraper CML-10/12 (fig. 1 … 2)

Wet outer diameter of scraper with Loctite (type No.: 574).

Place scraper into the bearing housing until contact, with the open side showing towards the hydraulic motor (upwards).

(S) Driver tool	5870.055.115
(S) Handle	5870.260.002

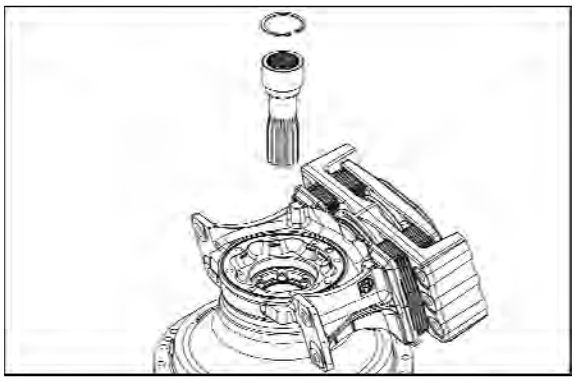


Fig. 2

Insert drive shaft into planetary carrier and fix it with retaining ring.

Reassembly of scraper CML-16 (fig. 3 … 5)

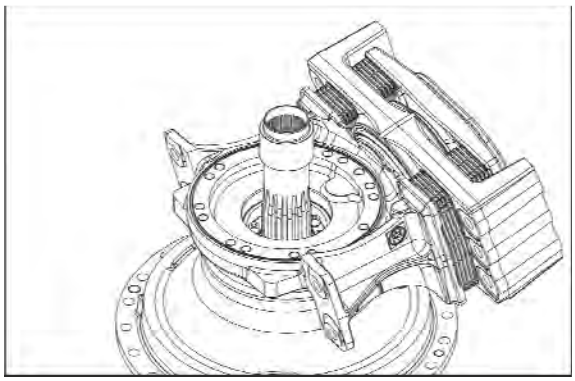


Fig. 3

Insert drive shaft into planetary carrier.

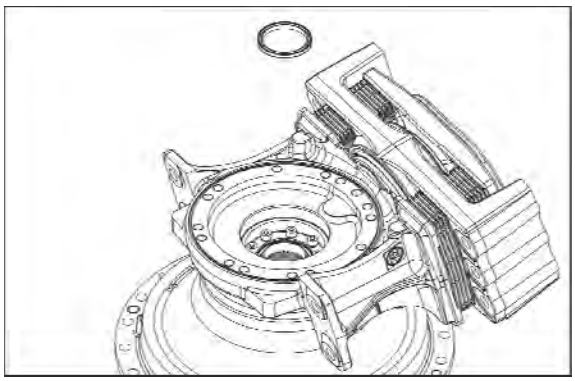


Fig. 4

Wet outer diameter of scraper with Loctite (type No.: 574).

Place scraper into the bearing housing, with the open side showing towards the hydraulic motor (upwards).

(S) Driver tool	AA01.109.440
(S) Handle	5870.260.002

Use of the specified driver tool (S) ensures the exact installation position of the scraper.

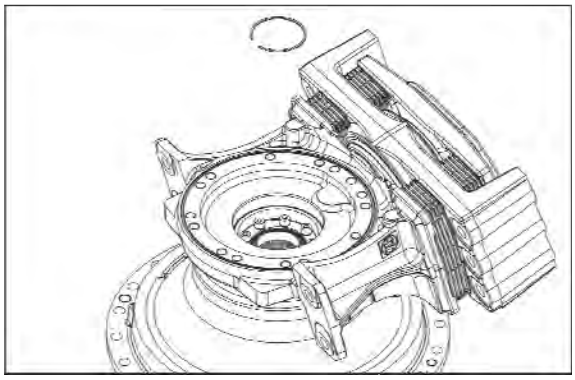


Fig. 5

Fix drive shaft with snap ring.

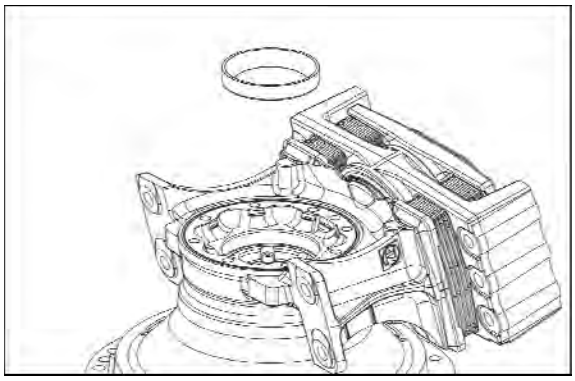


Fig. 6

Place bearing outer ring into the bearing housing until contact.

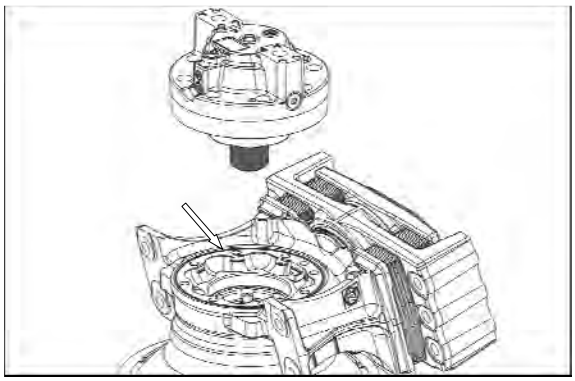


Fig. 7

Grease seal ring (see arrow) and place it into the groove of the bearing housing.

Insert hydraulic motor into the drive shaft.

Observe radial installation position of hydraulic motor, see following figure.

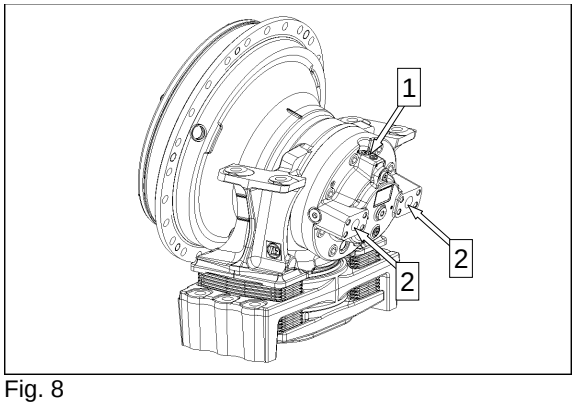


Fig. 8

Figure shows installation position of hydraulic motor.

Measuring connections (1) must be located in the upper area. High-pressure connections (2) must be arranged horizontally.

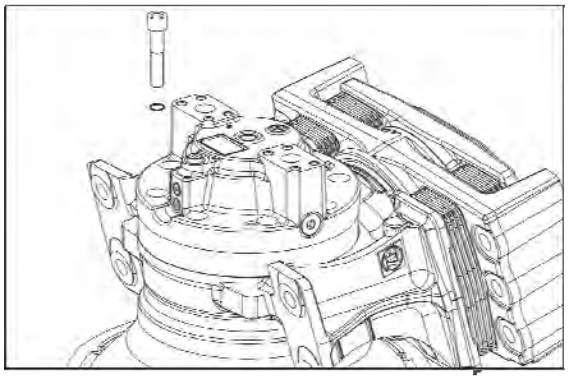


Fig. 9

Mount O-rings onto the cylindrical screws.

Fix hydraulic motor with cylindrical screws.

Tightening torque (M16/12.9) M_A = 347 Nm

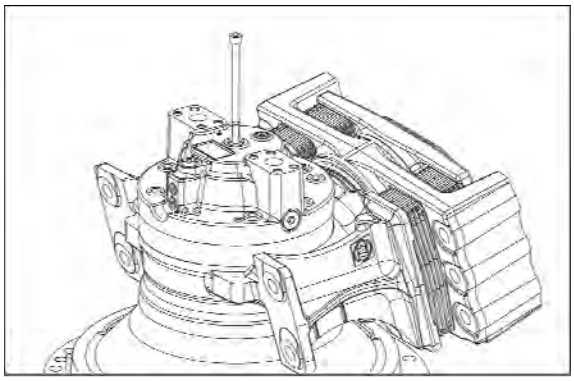


Fig. 10

Connect hydraulic motor and drive shaft by cylindrical screw.

Tightening torque (M10/8.8) M_A = 46 Nm

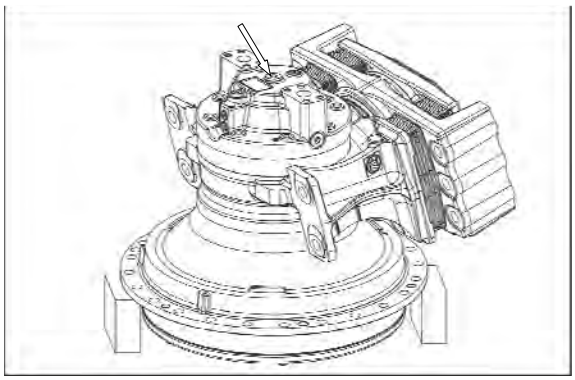


Fig. 11

Provide screw plug (see arrow) with O-ring and fit it.

Tightening torque M_A = 60 Nm

☞ **Any commissioning and maintenance work must be done in accordance with the specifications provided in the Operating Manual (ZF order No.: 5872.800.002)!**