



SHERMAN + REILLY Revolution Series

T-2608 / T-7212 Tensioners

Operator's Manual

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Introduction



Liability

Publication of this manual and the safety precautions in it does not in any way represent an all-inclusive list. It is the operator's responsibility to make sure the machine is operated in accordance with all state and local safety requirements and codes, including all applicable OSHA- (Occupational Safety and Health Administration) and EPA- (Environmental Protection Agency) regulations, as well as ANSI- (American National Standards Institute) accredited standards.

Should a problem or unsafe condition arise, shut the machine down using the normal shut-down procedure. In the event of an emergency, use the emergency stop procedure described on page 75 of this manual, and then notify the proper authorities or follow your employer's prescribed procedure for an emergency situation.

Sherman+Reilly™ strongly recommends that only persons who have a full understanding of the provided manual and who are knowledgeable in the use of overhead line pulling and tensioning machines, including all applicable laws, regulations, and safety standards, be allowed to operate this machine. There are significant hazards inherent to the use of this machine; therefore all operators should be educated on all functions, procedures, and safety measures outlined in this manual prior to their use or maintenance of this machine.

Introduction

Terms of Use

It is important that every machine is operated in a safe manner. To properly, safely operate this machine, it is required that operators and service people read and understand the information in this and the engine manufacturer's manual. ANYONE working around the machine should read the safety precautions in the manuals. Be aware each warning and precaution is to help protect against injury. Taking unnecessary risks and ignoring warnings is the primary cause of personal injury and fatal accidents in the work place. If you have any questions regarding operation or safety of a procedure or situation, contact the Sherman+ Reilly™ Customer Service Manager at 800-251-7780 or via email at help@sherman-reilly.com.

Publication of this manual and the safety precautions in it does not in any way represent an all-inclusive list. It is the operator's responsibility to make sure the machine is operated and serviced in accordance with all state and local safety requirements and codes, including all applicable OSHA (Occupational Safety and Health Act) and ANSI (American National Standards Institute) regulations, and Environmental Protection Agency (EPA) regulations.

Sherman+Reilly™ also recommends following the guidance published by the Institute of Electrical and Electronics Engineers (IEEE), and specifically IEEE Standard 524 – Guide to the Installation of Overhead Transmission Line Conductors (IEEE 524-2003 or subsequent).

Sherman+Reilly™ strongly recommends that only personnel that are literate in the English language and who verbally understand the English language be considered as operators or service personnel for this machine.

This manual was prepared to help the operator use and service the machine in a safe manner. Responsibility for safety during operation and service rests with the person(s) performing the work. Being alert of surroundings and observing all safety precautions, and all rating requirements and standards is required to help reduce the possibility of an accident. This manual is of no value if the operator does not read and understand the instructions and precautions- before starting or trying to operate the machine. The operator must be aware of the machine's capacities and limitations. It is the operator's responsibility to watch for situations and conditions which could affect the normal performance of the machine and the safety of the operating/work environment.

Specifically, the Sherman+Reilly™ T-Series Tensioners are diesel engine powered, hydraulically actuated machines. This machine has variable speed and line tension controls; however, if tensioning multiple conductors using a running board, the total line pull applied from all conductors must not exceed the capacity of the machine.

Specifications



T-2608 General Overview

The Sherman+Reilly™ Revolution Series T-2608 is a bullwheel tensioner built with two pairs of 60 in. 5-groove bullwheels (4 total) and a max tensioning capacity of 8,000 lbs. per sub-conductor or bullwheel pair. Each bullwheel has its own planetary gearbox and hydraulic motor with spring-applied hydraulic release brake. A precision, microprocessor-controlled motor drive enables inching, even under maximum load.

The T-2608 includes an Automatic Tensioning System which maintains an operator set tension. The automatic bullwheel synchronization system maintains equal sag of all conductors, while recording/displaying tension and distance, and permitting manual override. In addition to tensioning mode, the T-2608 can operate in a pull-drive mode for easy rewinding of unused conductor and in forward drive for ease of bullwheel reeving. The T2608 is designed to work with the CRS-96/67 and CRS-108/83 reel stands by connecting any two of the four available external hydraulic connections either on the front or rear of the T-2608. When the CRS-96/67 or the CRS-108/83 is connected to the T-2608, the operator can control hold back tension from inside the T-2608's Safe-Zone™ Cab.

The T-2608 features a Safe-Zone™ Cab providing ultimate safety and comfort for the operator. The Safe-Zone™ Cab employs a polycarbonate front window for maximum visibility while providing superior protection against impact. The cab includes climate control, a fully adjustable ergonomic seat, and all required electronic controls and gauges. The Safe-Zone™ Cab is designed to reduce operator fatigue, and provide an "off-ground" envelope for greatly reducing the risk of "touch potential" in energized environments.

The T-2608 has PLC machine control with CAN-bus technology, uses a removable/replaceable memory card to store all relevant stringing data, self-diagnostic system for all hydraulic circuits, and a PTO for reel stand control.



Key Features

- Fully Hydraulic/Direct Drive System
- Tensions 2 conductors at once.
- Synchronized tensioning, up to 3 machines.
- Safe-Zone™ Cab- Fully Enclosed, w/Climate Control
- Protected, off-ground operator position.
- Digital Controls and Self Diagnostics

S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Specifications

Specifications Details: T-2608

(Dimensions, weights, and capacities listed are approximate. All specifications are subject to change without notice.)

Maximum Tensioning Capacity	8,000 lbs. per bullwheel pair
Maximum Line Speed	4 mph.
Bullwheels (4)	60 in. dia. / 5 Groove
Bullwheel Linings	1 in. groove radius / machine-grooved polyurethane
Tension Brake	Hydraulic, motor-driven
Brake Control	Automatic, per operator setting
Drive System	Direct Drive: hydraulic motor, bullwheel
Drive System Engine	Diesel, 72 HP, water-cooled
Fuel Capacity	12 U.S. gallon
Hydraulic Fluid	ISO Grade 32
Hydraulic Reservoir	20 U.S. gallon
External Hydraulic Connections (4)	Quick Disconnect Type, 2 front, 2 rear <i>(for use with CRS-96/67 and CRS-108/83)</i>
Fail-Safe Brake	Spring-applied- <i>released by hydraulic pressure</i>
Fairlead Rollers (4)	2 front, 2 rear, adjustable
Operator's Safety Enclosure	Safe-Zone™ Cab, fully enclosed, dual door, climate controlled
Frame Construction	Steel tubing, continuous-weld
Length (Overall, Nom.)	25 ft.
Width (Overall, Nom.)	8 ft., 6 in.
Height (Overall, Nom.)	10 ft., 4 in.
Weight (Nom.)	18,500 lbs.
GVWR	24,000 lbs.
Suspension	Leaf spring
Axle Configuration	Tandem
Wheel Configuration and Tires	Single, 245/70R 17.5
Brakes (Trailer)	Electric, with break-away safety switch
Towing Attachment	3 in. adjustable pintle eye, with two safety chains and hooks
Tie Downs (2)	3/4 in. dia. steel D-Rings
Rear (R/L) Jacks (2)	Hydraulic, with shoe, anti-slide
Front Jacks (2)	Hydraulic, with shoe, anti-slide
Electrical System	12 VDC
Battery (2)	12 V, 680 CCA, BCI group 48
Lights / Navigation	12 V, LED, U.S. DOT-approved
Exterior Work Lighting(2)	Cab-top, flood
Grounding (4)	¾ in. dia. copper-clad steel loops
Wheel Chocks	Standard
Fire Extinguisher	ABC
Color	S+R White



S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Specifications



T-7212 General Overview

The Sherman+Reilly™ Revolution Series T-7212 is a bullwheel tensioner built with two pairs of 72 in. 5-groove bullwheels (4 total) and a max tensioning capacity of 12,000 lbs. per sub-conductor or bullwheel pair. Each bullwheel has its own planetary gearbox and hydraulic motor with spring-applied hydraulic release brake. A precision, microprocessor-controlled motor drive enables inching, even under maximum load.

The T-7212 includes an Automatic Tensioning System which maintains an operator set tension. The automatic bullwheel synchronization system maintains equal sag of all conductors, while recording/displaying tension and distance, and permitting manual override. In addition to tensioning mode, the T-7212 can operate in a pull-drive mode for easy rewinding of unused conductor and in forward drive for ease of bullwheel reeving. The T-7212 is designed to work with the CRS-96/67 and the CRS-108/83 reel stands by connecting any two of the four available external hydraulic connections either on the front or rear of the T-7212. When the CRS-96/67 or CRS-108/83 is connected to the T-7212, the operator can control hold back tension from inside the T-7212's Safe-Zone™ Cab.

The T-7212 features a Safe-Zone™ Cab providing ultimate safety and comfort for the operator. The Safe-Zone™ Cab employs a polycarbonate front window for maximum visibility while providing superior protection against impact. The cab includes climate control, a fully adjustable ergonomic seat, and all required electronic controls and gauges. The Safe-Zone™ Cab is designed to reduce operator fatigue, and provide an "off-ground" envelope for greatly reducing the risk of "touch potential" in energized environments.

The T-7212 is mounted on a 5th wheel or pintle eye trailer, has PLC machine control with CAN-bus technology, uses a removable/replaceable memory card to store all relevant stringing data, self-diagnostic system for all hydraulic circuits, and a PTO for reel stand control.



Key Features

- Fully Hydraulic/Direct Drive System
- Tensions 2 conductors at once
- Synchronized tensioning, up to 3 machines
- Safe-Zone™ Cab- Fully Enclosed, w/Climate Control
- Protected, off-ground operator position
- Digital Controls and Self Diagnostics

S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Specifications

Specifications Details: T-7212 / T-7212-P

(Dimensions, weights, and capacities listed are approximate. All specifications are subject to change without notice.)

Maximum Tensioning Capacity	12,000 lbs. per bullwheel pair
Maximum Line Speed	4 mph.
Bullwheels (4)	72 in. dia. / 5 Groove
Bullwheel Linings	1 ½ in. groove radius / machine-grooved polyurethane
Tension Brake	Hydraulic, motor-driven
Brake Control	Automatic, per operator setting
Drive System	Direct Drive: hydraulic motor, bullwheel
Drive System Engine	Diesel, 80 HP, water-cooled
Fuel Capacity	12 U.S. gallon
Hydraulic Fluid	ISO Grade 32
Hydraulic Reservoir	20 U.S. gallon
External Hydraulic Connections (4)	Quick Disconnect Type, 2 front, 2 rear (for use with CRS-96/67 and CRS-108/83)
Fail-Safe Brake	Spring-applied- released by hydraulic pressure
Fairlead Rollers (4)	2 front, 2 rear, adjustable
Operator's Safety Enclosure	Safe-Zone™ Cab, fully enclosed, dual door, climate controlled
Frame Construction	Steel, continuous-weld
Length (Overall, Nom.)	34 ft. 6 in.
Width (Overall, Nom.)	8 ft., 6 in.
Height (Overall, Nom.)	12 ft., 4 in.
Weight (Nom.)	21,500 lbs.
GVWR	30,000 lbs.
Suspension	Air ride
Axle Configuration	Tandem
Wheel Configuration and Tires	Double, 275/70R 22.5
Brakes (Trailer)	Air
Towing Attachment	5 th Wheel, 2 in. king pin
Tie Downs (2)	1 in. dia. steel D-Rings
Rear (R/L) Jacks (2)	Hydraulic, with shoe, anti-slide
Front Jacks (2)	Hydraulic, vertical cylinder type, with shoe
Electrical System	Split 12/24 VDC
Battery (2)	12 V, 680 CCA, BCI group 48
Lights / Navigation	12 V, LED, U.S. DOT-approved
Exterior Work Lighting(2)	Cab-top, flood
Grounding (4)	¾ in. dia. copper-clad steel loops
Wheel Chocks	Standard
Fire Extinguisher	ABC
Color	S+R White



S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Safety

Hazard Overview

Please pay attention to all safety warning labels and information placards posted on the machine, components, and trailer assembly. These labels and placards are provided to assist in identifying areas containing potential hazards while also providing information regarding equipment specification and limitations. Please see below for examples:



Warning Terms: Are signal words in this manual that call the operator's attention to safety concerns.

The word **DANGER** indicates the information relates to a specific immediate hazard which, if disregarded, will result in severe personal injury or death.

The word **CAUTION** indicates the information pertains to a potential hazard or unsafe practice which, if disregarded, may result in minor personal injury or equipment damage.

The word **WARNING** indicates the information relates to a specific immediate hazard or unsafe practice which, if disregarded, could result in personal injury or death.

The word **NOTE** indicates the information is important to the correct operation or maintenance of the machine.

Safety

General Warnings

WARNING: Ear protection should be worn when operating machines with operator ear noise levels above 85dB.

WARNING: This machine must not be used as a winch for pulling another vehicle. For trailer models: this trailer must not be modified to allow towing of another trailer behind and in tandem with this trailer.

WARNING: California Proposition 65: Engine exhaust, some of its elements, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

WARNING: Batteries produce explosive gases, contain corrosive acid, and supply levels of electrical current high enough to cause burns.

WARNING: To prevent serious injury from hot and high pressure oil, never use your hands to check for oil leaks; use paper or cardboard. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this form of injury, otherwise gangrene may develop.

Safety

Operator Safety Precautions

- Do not place any part of the body into a potential pinch point. The machine must be turned off and locked out in accordance with OSHA regulations before attempting to correct a problem, work on the machine, or perform preventive maintenance.
- Do not attempt to operate any Sherman+Reilly™ equipment without proper instruction, including reading and understanding the provided manual.
- Obey and enforce all warnings including OSHA requirements and ANSI standards.
- Never allow anyone to ride on the unit while it is being towed.
- Always wear proper safety equipment as required by employer.
- Never bypass safety switches or operate equipment with faulty safety devices.
- Be sure all guards and access covers are in place and secured when the machine is being operated.
- Be aware of people in the work area who may be at risk during operation.
- Know all emergency shutdown procedures.
- Do not obstruct controls or fire extinguisher and make sure fire extinguisher is fully charged.
- Never operate equipment while under the influence of any substance which could impair ability or judgment.
- Do not operate equipment if work ability is impaired by fatigue, illness, or other causes.
- Always use employer approved grounding procedures when operating the machine.
- Never use hands to check for hydraulic system leaks. Hydraulic fluid escaping under pressure can cause personal injury.
- Avoid contact with pumps, cylinders, hoses, engine components, and exhaust system.
- Do not refuel unit while the engine is running or hot.
- Keep all body parts, to include head and limbs, away from all moving parts.
- Refer to engine manufacturer's manual for all additional safety precautions which relate to engine operation and service.
- Know location and function of all controls, gauges, instruments, and protective devices.
- Never use unit to tow or winch another vehicle.
- Never use controls or hoses for hand holds.
- Do not exceed unit specifications and limitations, to include weight.
- Know where to get help in the event of an emergency or injury.
- When towing this machine/unit trailer, the driver should use caution and adjust speed based on road, weather, and terrain conditions, as well as applicable laws and speed limits.
- Do not make physical contact with rope or cable as it enters or leaves the machine or drum.
- To prevent the possibility of electrocution, do not enter or leave the unit while it is operating or allow anyone to touch or lean on the machine when in use.

Safety

Employer Safety Precautions

This guideline is intended to assist owners/employers to ensure equipment is serviced and operated in a safe manner. Each job site may have additional situations and conditions which need consideration.

Monitor the operators to be sure they observe and practice safety procedures and operate the support equipment as outlined in this manual.

Establish a regular inspection program which includes malfunction reports, inspection, and service records. This inspection should cover the machine condition, adjustment, and ensure all safeguards are in place and functional. Additionally, all pre/post-operation inspections should be conducted at prescribed intervals.

Make sure that any malfunction or breakdown affecting the safe operation of the equipment is properly corrected or repaired before returning the machine to service.

The employer must provide training and instruction in chemical safety and safe methods of work before assigning workers to operate, service, or repair the machine and equipment. A record of training dates, employee names, and level of training shall be maintained. Only persons who have a full understanding of the provided manual- (*provided in English only*), and who are competent

in the use of overhead pulling and tensioning machines; to include all applicable laws, regulations, and safety standards, should be allowed to operate this machine. There are significant hazards inherent to the use of this machine, therefore all operators should be educated on all functions, procedures, and safety measures outlined in this manual- prior to their use or maintenance of this machine.

Employer must utilize a lock-out/tag-out procedure which complies with OSHA Standard, Part 1910.147, Title 29 of the Code of Federal Regulations or subsequent. This procedure must include control of all keys.

The employer will specifically inspect all safety equipment and protective devices on the equipment to ensure they are not bypassed or disabled. Operation of equipment will not be permitted unless all safety devices are in place and functional. The employer shall meet all appropriate information dissemination and protection requirements for the workers.



Safety

Chemical Safety

Exposure to chemicals during normal operation of the machine is limited; however, chemical exposure may be encountered through preventive maintenance and repair. Operators and maintenance/service personnel should take appropriate precautions, to include wearing all (PPE)- Personal Protection Equipment, prior to the operation, maintenance, or service of the machine. All Material Safety Data Sheets (MSDS's) or Safety Data Sheets (SDS's) for OEM chemicals present upon initial manufacture/shipment of machine can be made available upon request to Sherman+Reilly™.

Any additional chemicals introduced to the machine or used in conjunction with maintenance or repair of the machine must have a MSDS/SDS available for work being done, and would thereby be the responsibility of the operator's employer or the organization providing the maintenance. All chemical handling and disposal should be done in accordance with environmental, federal, state, and local laws and regulations. Sherman+Reilly™ is not liable for the mishandling, misuse, or improper disposal of chemicals, with regard to the use or maintenance of Sherman+Reilly™ machines or equipment.

All responsibilities, including but not limited to: handling and disposal of chemicals, availability and maintenance of MSDS's/SDS's, labeling of chemical containers, and training of employees and operators, should be fulfilled in accordance with the Hazard Communication Act, Hazardous Materials Transportation Act, OSHA's Hazard Communication Standard- (29 CFR) Part 1910.1200, and all applicable EPA Standards and Regulations- (*additional standards may apply*). For further information on safety standards regarding chemicals see OSHA and EPA websites.

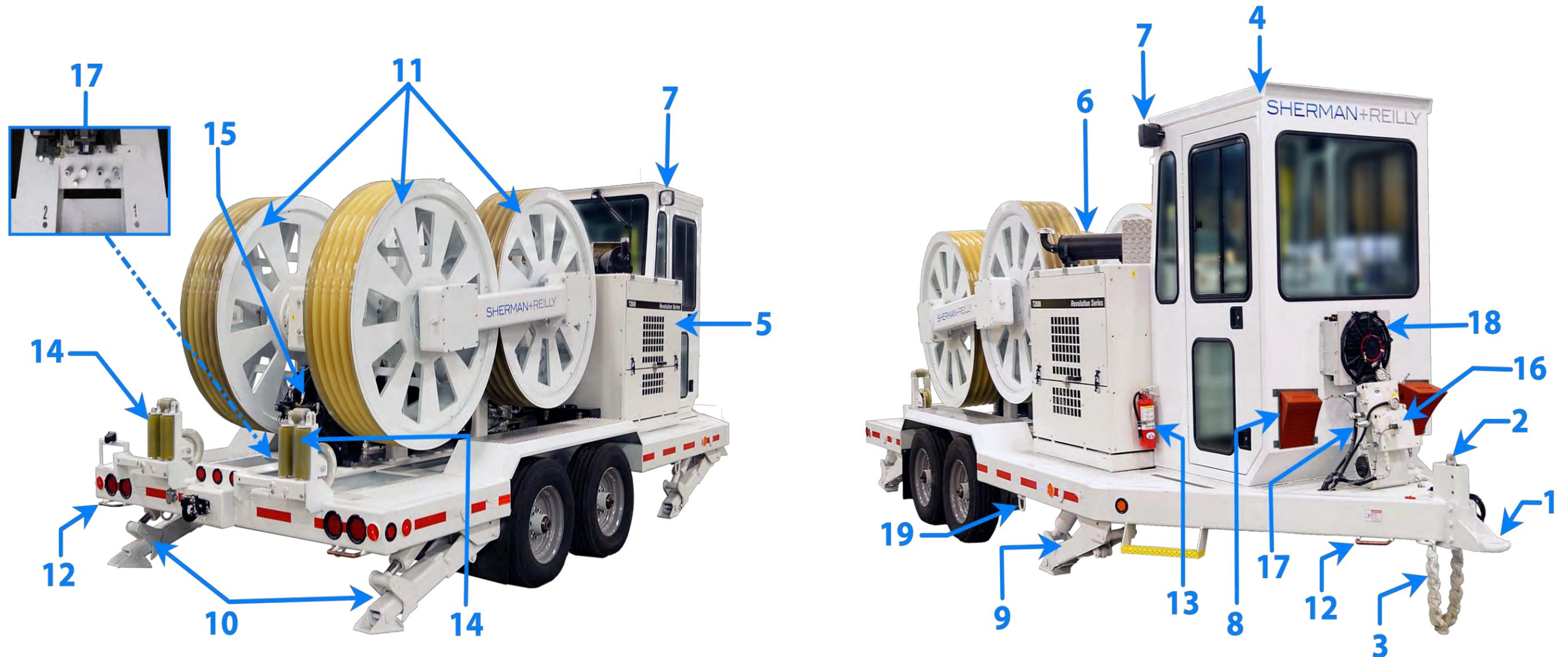
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Terms You Need to Know- T-2608

- 1. Pintle Eye Hitch
- 2. Emergency Brake Away Switch
- 3. Safety Chains
- 4. Safe-Zone™ Cab
- 5. Hydraulic Power Engine/Pump Enclosure
- 6. Engine Exhaust
- 7. Exterior Work Lighting

- 8. Wheel Chocks/holders (2)
- 9. Front/Nose [L/R] Jacks (2)
- 10. Rear [L/R] Jacks (2)
- 11. Bullwheels (2)
- 12. Grounding Bracket (4)
- 13. Fire Extinguisher
- 14. Fairleads (1 pair) - rear

- 15. Hydraulic Cooler
- 16. Hydraulic Reel Engagement Control Levers
- 17. Reel Hydraulic Hose Connections (4)
- 18. A/C Condenser and Fan
- 19. Tie Downs (2)

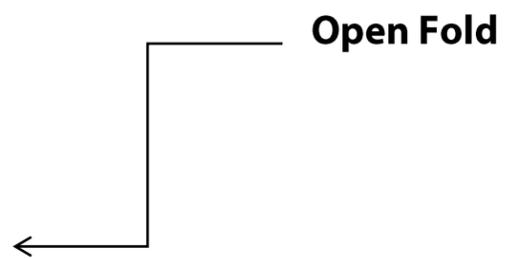


S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

4

Operation

Terms You Need to Know- T-2608



Terms You Need to Know- T-7212

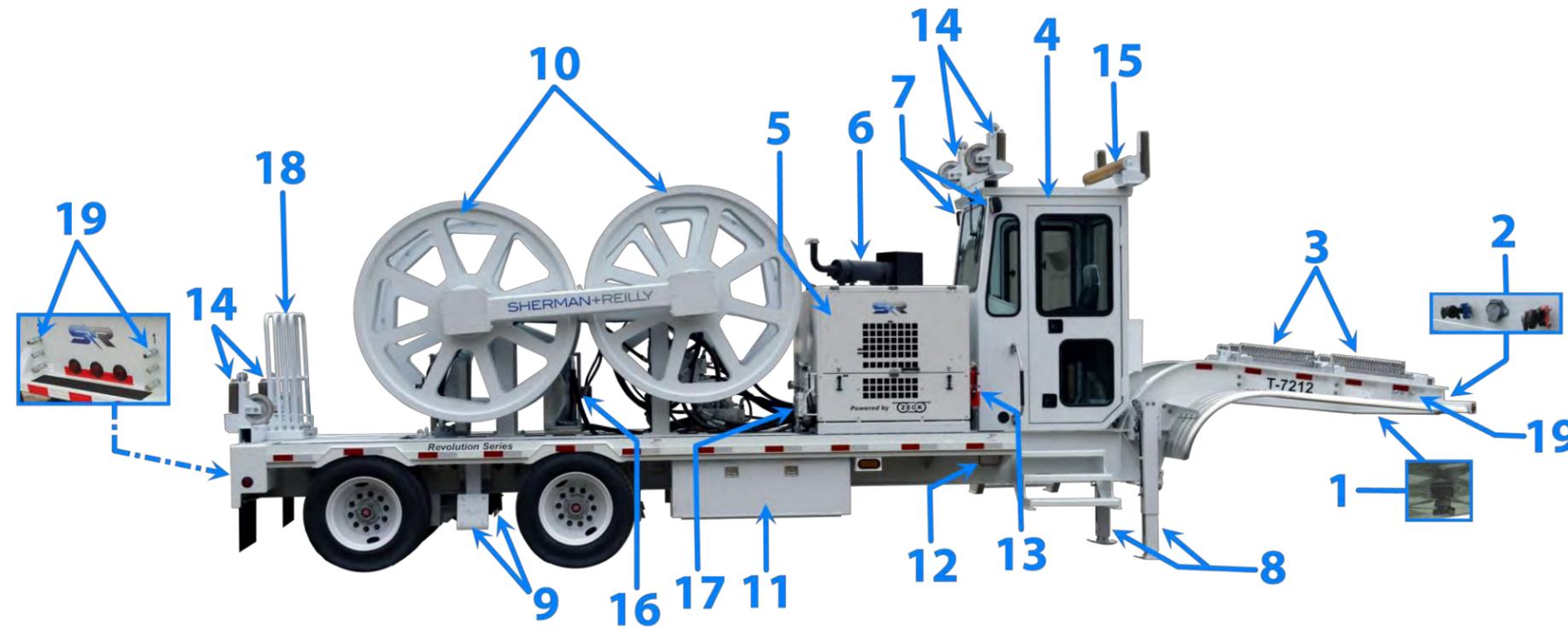
1. King Pin Hitch
2. Air Brake/Lights Hook-Up
3. Removable/Stowed Machine Side Ladders
4. Safe-Zone™ Cab
5. Hydraulic Power Engine/Pump Enclosure
6. Engine Exhaust
7. Exterior Work Lighting

8. Front/Nose [L/R] Jacks (2)
9. Rear [L/R] Jacks (2)
10. Bullwheels (2)
11. Storage/Tool Box
12. Grounding Bracket (4)
13. Fire Extinguisher
14. Fairleads (2 pair) – front and rear

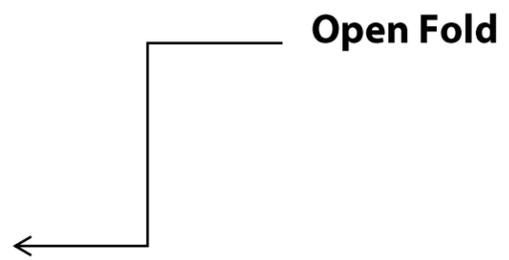
15. Over-cab Rollers
16. Spacing Hydraulic Cooler
17. Hydraulic Reel Engagement Control Levers
18. Removable/Stowed Machine Hand Rails
19. Reel Hydraulic Hose Connections (4)

T-7212-P

20. Conductor Reeving Platform
21. Pintle Eye

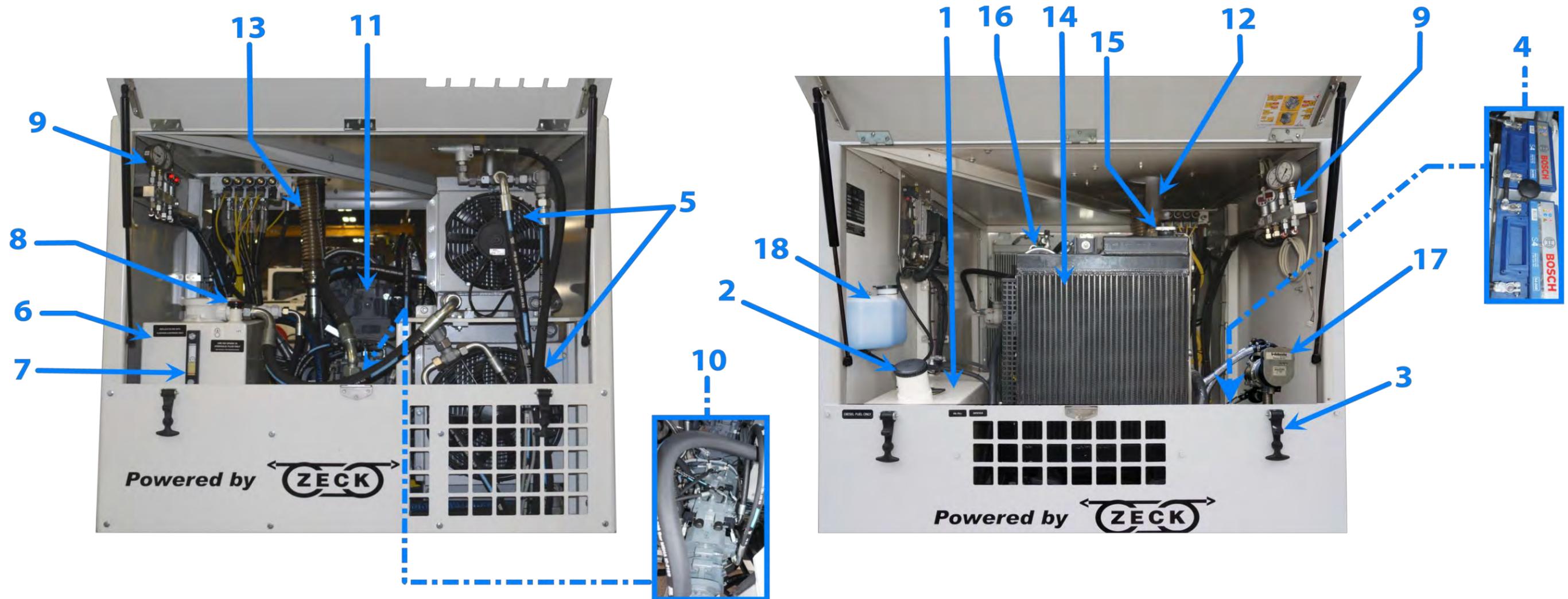


Terms You Need to Know- T-7212



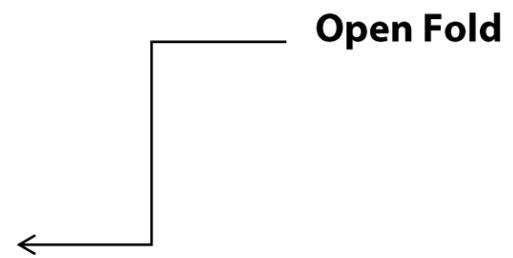
Under the Hood

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> 1. Diesel Fuel Tank 2. Diesel Fuel Tank Cap 3. Rubber Compartment Latches 4. Batteries 5. Hydraulic System Coolers 6. Hydraulic Tank w/Filters | <ul style="list-style-type: none"> 7. Sight Gauge 8. Hydraulic Tank Fill Cap 9. Hydraulic System Gauges 10. Hydraulic Pump 11. Hydraulic Power Engine 12. Engine Exhaust Pipe | <ul style="list-style-type: none"> 13. Engine Air Intake Pipe 14. Engine Radiator 15. Engine Radiator Cap/Fill 16. AC Compressor 17. Arctic Kit Burner 18. Windshield Wiper Fluid Reservoir |
|---|---|---|



S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Under the Hood



Operation

Safe-Zone™ Cab

The Safe-Zone™ Cab is designed to keep the operator off the ground while the equipment is in use, and is built with a polycarbonate front window, fully adjustable ergonomic seat, high-resolution color LCD screen, and a full set of electronic controls. The Safe-Zone™ Cab comes in several sizes and forms, dependent upon the machine. It is designed to reduce operator fatigue, reduce errors and injuries in the field, and also reduce the risk of “touch potential” in energized environments.



Operators Controls



Auxiliary Power Port

A 12-Volt DC power port has been provided on the operator control console. This port can be used to charge field radios or cellular telephones, or provide power for other similar devices.

Ergonomic Operators Chair



CAUTION: Do not use ammonia-based cleaners. Use only non-ammonia-based cleaners to clean the front polycarbonate window. Using ammonia on polycarbonate will cause structural damage to the polycarbonate material, thereby degrading the impact resistance of the front window. This can create a hazard for the operator should a line brakeage situation occur.



Operation

Safe-Zone™ Cab

Climate Control System

The T-Series Safe-Zone™ Cab comes equipped with a climate control system providing customized air temperature controls for both heating and cooling.



The climate control system has variable air fan speed, with overhead multidirectional vents.

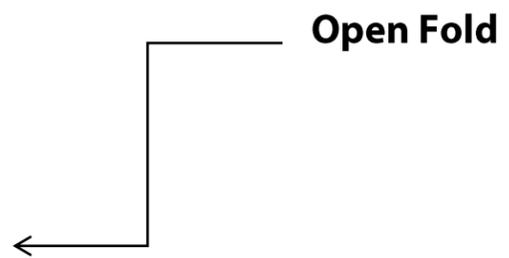


Operator Controls- Console



S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

Operator Controls- Console



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

Master Power Key Switch

This switch is used to control power to the operator controls. This switch must be turned to the [ON] position to start the machine.



NOTE: After the key switch is turned to the [ON] position, the system will begin a start-up phase, where the computer system boots up, and the ventilators, button lamps, and circuits are tested. This process takes approximately 30 seconds.

CAUTION: Always ensure that the master power key switch is turned to the [OFF] position when the machine is not in use. If the machine is to be left unattended, remove key from the key switch and stow in a secure place, while also securing the operators cab to prevent any unauthorized access to the controls or operation of the machine.

CAUTION: Before starting the machine or engaging any machine component, read and observe all safety precautions and operational procedures listed in this manual.

Engine Power Switch

This button controls power to the engine. To turn on power to the engine, first ensure that the master power key switch is turned to the [ON] position, then push the top [I]/On button on the hydraulic engine power switch.



After the engine power is engaged, the button will illuminate, and the engine control device will run through a function check. If the glow plugs are required, they will also engage automatically during this process. To turn the engine off, or turn off power to the engine, press the bottom [O]/Off button. If

the [O]/Off button is pressed during the start-up process, it will interrupt the start process, the lamp will go out, and the engine will stop.

O = Off | = On

Engine Start Button



This button, when pressed, will start the engine. However, the button light must be on, indicating that the engine is ready to be started, prior to this button being pushed.

NOTE: The starter engagement is limited in time by the engine control system to reduce drain on the battery charge. If the engine starter engagement times-out, the starter try can then be repeated by pressing the [START] button again.

NOTE: If an engine error occurs, the engine will be stopped automatically by the system control- (see System Control Panel section).

Emergency Stop Button

When pushed, this red push button stops all operation functions, turning off system and engine power, while disengaging all controls. After being depressed, the button must be rotated and released to the disengaged position to restore power to the system and re-engage operator controls.



NOTE: The emergency stop button should only be used to stop the machine in an emergency situation where there poses a risk of injury or death to personnel or to prevent equipment or property damage. When this button is pushed, line tensions can change rapidly. For more information on emergency shutdown situations- (see the Emergency Stop Procedure).

Operation

Operator Controls

***For control locations see Operator Control Panel Section on page 26.*

Pull Mode Selection Button



This control button, when pushed, engages the line pulling mode for the machine. When this button is pressed, the button backlight will illuminate, indicating that the system computer has changed over to Pull Mode.

NOTE: When the system is started, it will always be in Pull Mode. This ensure that hydraulic brake will be set when the system is started.

Joystick Control

The joystick is used in Pulling Mode to control the bullwheel/line speed and direction. To pull in the line, pull backward (toward the operator) on the joystick. To payout the line, push forward (away from the operator) on the joystick. The farther away from the center point the joystick is moved in either direction, the faster the bullwheels will turn, thereby increasing line speed. To slow the line speed from either payout or pulling directions, move the joystick closer to the center point. Once the joystick reaches the center point, the bullwheel motion and line speed will stop, and the hydraulic brake will set.

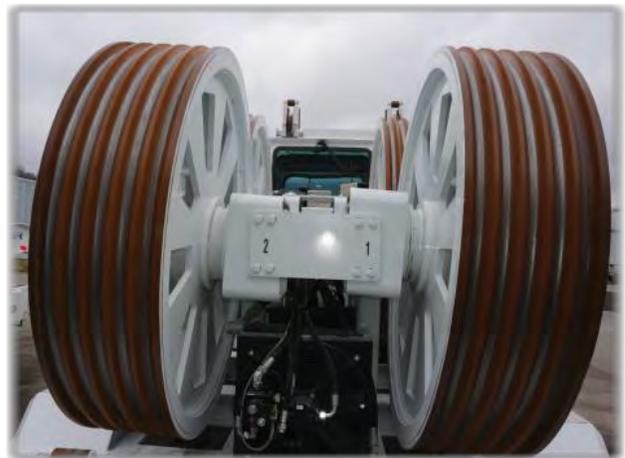


ATS/Tension Mode Selection Button



This control button, when pushed, engages the line tensioning mode for the machine- (ATS) “Automatic Tensioning System”. When this ATS/Tension Mode button is pressed for the first time, the button backlight will illuminate in a blinking pattern indicating that the system computer has changed to a “pre-tension” mode with line tension sensors On and the brake set. When the ATS/Tension Mode button is pushed a second time, the button backlight will illuminate solid indicating that the system computer has changed over to Tension Mode.

CAUTION: Before pushing the Tension Mode Selection Button a second time, the operator must set the pre-tension for the line.



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

Bullwheel Potentiometer



This potentiometer is used to regulate the amount of tension applied by the bullwheels. When setting the amount of tensioning force, rotate the knob CW to increase and CCW to decrease.



CAUTION: Before pushing the ATS/Tension Mode Selection Button a second time, the operator must set the pre-tension for the line. Otherwise, as soon as the ATS/Tension Mode is engaged (button pushed a second time), the bullwheels will begin to apply tension at the current potentiometer setting. This can create either a sudden rise or drop in tension.

Sync Mode Bullwheel Potentiometer

These potentiometers allow the operator to adjust the amount of tension applied to the second level bullwheels on the other connected machine and when running the system in Sync Mode.



NOTE: The Master Sync Mode Bullwheel Potentiometer can be used to control all bullwheels at once. These potentiometers allow additional individual tension adjustments.

Reel Stand Potentiometer



This potentiometer is used to regulate the amount of tension/braking pressure applied by the hydraulic reel stand.



CAUTION: Before starting the engine, ensure the Reel Stand Potentiometer is rotated CCW to the lowest setting.

Sync Mode Reel Stand Potentiometers

These potentiometers control the amount of tension applied to the reel stands for the other second level connected machine and when running the system in Sync Mode.



Winter/Summer Mode Switch

This switch controls the engine coolant flow for the engine, to precisely manage heat distribution for added heat of machine components.

Winter: <32°F

Summer: ≥32°F



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

Sync Mode Control Knob

This knob is used to select which synchronization mode the system is to be run.

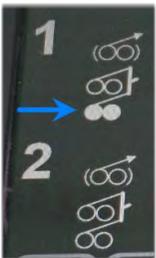


- 0- No Sync Mode/Single**
- A- Two Sync**
- B- Not Used
- C- Three Sync** [Two Machines Required]
- D- Four Sync** [Two Machines Required]
- E- Not Used
- F- Not Used

NOTE: The sync mode selection must be made prior to starting the engine. In order to change modes, the engine must be turned off.

Master Machine Control Selection Button

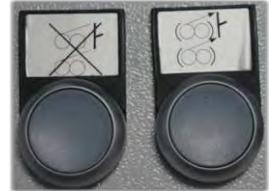
When either mode is selected, the operator must select whether the machine is operating as the “master” or “slave”. When the master machine control selection button is pressed, it will illuminate indicating that the system has the master control. When the system has master control, it can control the other machine and reel stands. The main system display will also show the role of the machine.



NOTE: This button only works when other machines are connected.

Synchronized Tension Mode Selection Buttons

These control buttons, when pushed on the master machine, engage or disengage the line tensioning mode for all connected machines while in Sync Mode. When the right hand Synchronized Tension Mode button is pressed for the first time, the button backlight will illuminate in a blinking pattern indicating that the system computer has changed to a “pre-tension” mode with line tension sensors On and the brake set. When the right hand Synchronized Tension Mode button is pushed a second time, the button backlight will illuminate solid indicating that the system computer has changed over to Tension Mode. When the left hand button is pressed on the master machine, it will disengage the tension mode and set the brake on all connected machines.



CAUTION: Before pushing the Tension Mode Selection Button a second time, the operator must set the pre-tension for the lines. See below section.

Master Sync Mode Bullwheel Potentiometer

This potentiometer allows the operator the ability to control all of the bullwheel/line tensions at the same time from the master machine.



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

Sync Mode

Select the desired sync mode using the available selector knob, prior to starting the engine. In order to change the desired sync mode, the engine must be turned off.

- If using **[0] mode**, the machine can be run using independent controls for each bullwheel. The sync controls do not apply in this mode.
- If using **[A] mode**, the machine can be run using the master sync controls to control both of the on-board bullwheels at the same time. However, incremental adjustments can be made to each bullwheel using the independent controls for each bullwheel.
- If using **[C] mode**, the machine can be run using the master sync controls to control both the on-board/"master" bullwheels and the first street-side bullwheel of the connected "slave" machine. This method provides for three bullwheel synchronized control.
- If using **[D] mode**, the machine can be run using the master sync controls to control both the on-board/"master" bullwheels and both of the connected "slave" machine bullwheels. This method provides for four bullwheel synchronized control.



Operation

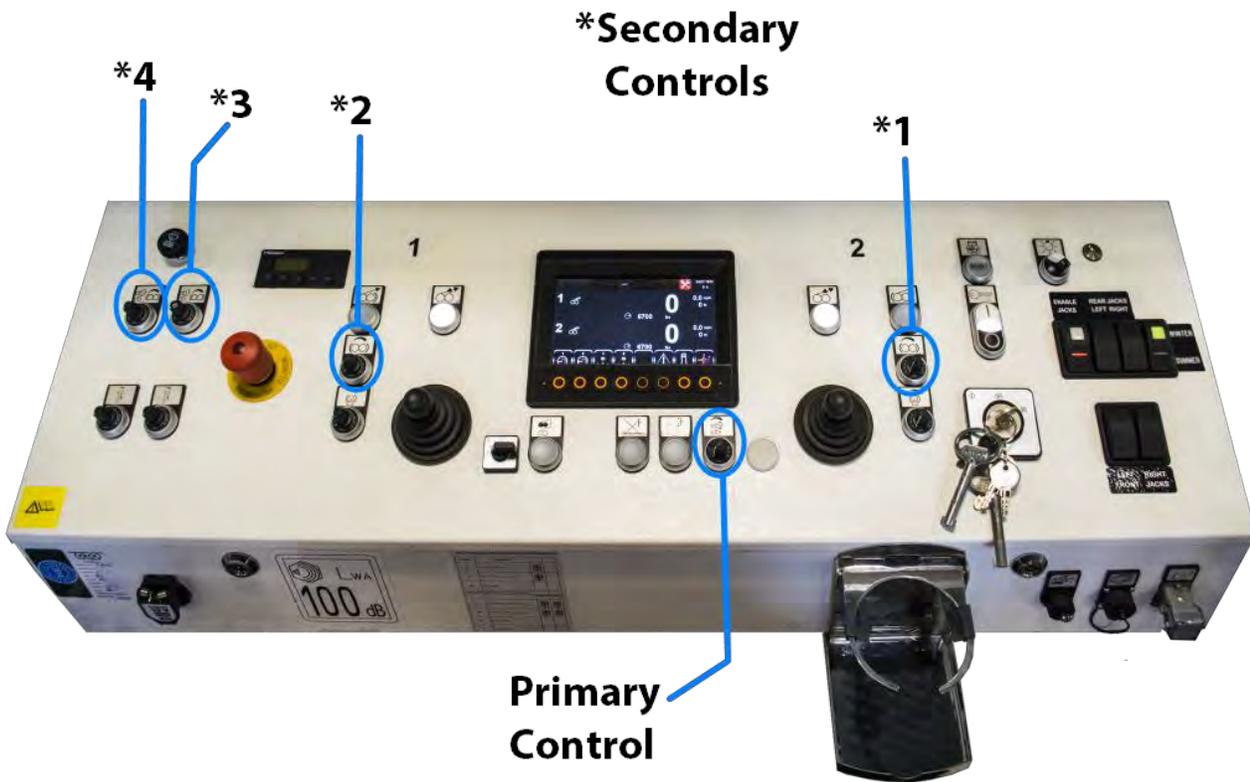
Operator Controls

***For control locations see Operator Control Panel Section on page 26.*

Sync Mode (cont.)

The below illustration outlines the individual bullwheel potentiometer controls as they apply to Sync Mode. The numbers represent the bullwheel pair numbers.

- The [1] and [2] represent the first and second bullwheel pairs on the “master” machine.
- The [3] represents the first bullwheel pair on the “slave” machine.
- The [4] represents the second bullwheel pair on the “slave” machine.



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel



The system control panel has eight backlit soft key buttons for control of machine and computer functions. The panel is also

equipped with a seven inch widescreen high-definition color liquid crystal display showing system and operation specific information.

Once the master power key switch is turned

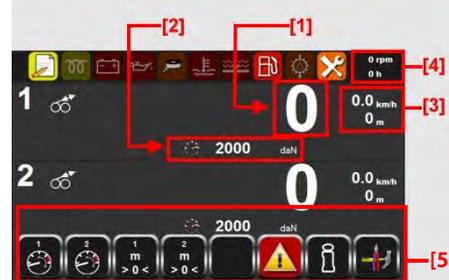


on and the system loads, the first screen the operator sees (after the S+R™ logo screen) is the **MAIN MENU screen**. This screen allows the operator to access the functions of the system, while also allowing access to settings and diagnostics.

[1] The display indicates all relevant information for the respective mode.

[2] Eight function buttons are arranged under the display, and the functions assigned to the individual buttons are at the lower edge of the display. Button assignment changes with the displayed screen. Only the functions which are currently authorized in operating mode are displayed. Some display fields require the input of numbers or the selection of options. To this effect, appropriate input fields are displayed, if necessary.

Regardless of the version of the machine, the display screen is always divided horizontally.



[1] The display of the pulling force is the central display element in pulling mode.

[2] The selectable limit value of overload indication is displayed directly underneath. The limit value is displayed in pulling mode only. If the pulling force in pulling mode gets close to the limit value of the overload device, the value flashes yellow and the machine drive is automatically reduced. If the limit value is exceeded, the value flashes red and the machine drive is stopped.

[3] The current line speed and the length of the unwound and wound conductor are indicated. The current counters starting from the actuation of the reset button are counted. The conductor is added to the current value and the unwound conductor is subtracted.

[4] Display for engine speed and operating hours is in the upper right corner.

[5] For machines with a single set of bullwheels, the lower part of the display remains empty and the page numbers at the bottom are not indicated.



Operation

Operator Controls

****For control locations see Operator Control Panel Section on page 26.**

System Control Panel

UPPER INDICATOR BAR

The bar at the top of the screen shows informational symbols pertaining to engine control functions and specific status updates. A bright luminous sign indicates a malfunction or a message.



The display fields described above are only for information purposes. If during operation one or several of the admissible machine limits are exceeded, the control immediately stops operation. If necessary, the engine is automatically switched off to protect the machine. The current malfunction will always show on the display.

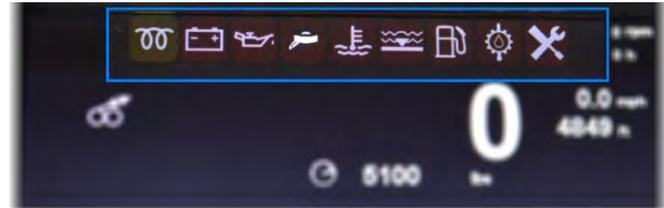
 Recording active: the recording function must have been activated previously.

 Pre-glow indicator

 Loading indicator: Indicates that the battery is not being charged

 Oil pressure indicator: "Engine oil pressure too low". This display must go out when the engine is running.

 Air filter indicator: "Dirty air filter" – clean



 Coolant temperature indicator

 Coolant level indicator: "Coolant level too low" - refill

 Diesel level indicator

 Hydraulic oil temperature indicator

 Maintenance indicator

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

LOWER CONTROL BAR

A bar with eight fields is at the lower edge of the display.



These eight fields correspond to the buttons directly below each field. The assignment of the function fields/buttons changes with each screen.



Back / Return Button

This button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.



Input Overload Button

This function button, when pressed, opens the overload setting screen, which allows the operator the ability to program the overload setting that limits the maximum amount of force when in pulling mode. These buttons are specific to each page (1 and 2).



NOTE: These buttons and page values are only shown when the system is in pulling mode.



INPUT OVERLOAD SETTINGS Screen

This screen allows the operator to set the force limitation or “overload setting” employed by the system. The system will use this setting (in pulling mode only) to limit the force from the system based on the amount programmed.



To increase or decrease the amount, press the UP and DOWN arrow buttons. The operator can increase or decrease the amount in increments of 100 or 1,000.



To apply the adjusted overload setting, once completed, press the green check mark button. This button will save the changes in the system and return the user to the MAIN screen.

NOTE: If no action is made on this page for a period of 10 seconds, the display returns automatically to the MAIN screen, and changes are not applied.

Operation

Operator Controls

***For control locations see Operator Control Panel Section on page 26.*

System Control Panel

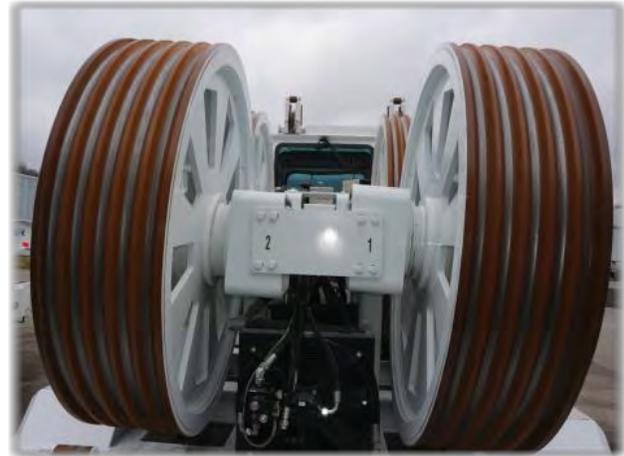
INPUT OVERLOAD SETTINGS Screen (Cont.)

To verify that the Overload setting is applied correctly, from the MAIN screen and in Pulling Mode, view the setting listed at the bottom of the active page- (see item [2]).



CAUTION: Operators should always verify that the setting changes are applied correctly prior to commencing operations.

NOTE: If the system times out and automatically returns the user to the MAIN screen, or the user manually presses the Back/Return button to return to the MAIN screen, the changed value will not be saved, and the new overload setting will not take effect. Operators must save the new setting before exiting the screen, before it will take effect.



If the pulling force in Pull Mode gets close to the limit value of the overload device, the value flashes yellow and the machine drive is automatically reduced.



If the limit value is exceeded, the value flashes red and the machine drive is stopped.

The operator can change the overload setting while pulling, at any time by:

1.  Accessing the INPUT OVERLOAD SETTINGS Screen.
2.  Changing the value.
3.  Saving the changes.

The adjusted overload limit will take effect once the setting is saved.

Operation

Operator Controls

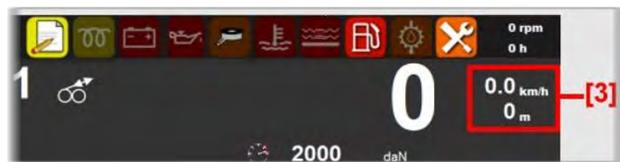
**For control locations see Operator Control Panel Section on page 26.

System Control Panel

Meter Counter Reset Button



When this button is pressed, it resets the respective meter counter shown on page 1 or page 2 to “zero”. See item [3] below.



Error Indicator and FUNCTION Screen

This symbol at the bottom left is displayed only in the case of a malfunction. Otherwise, the symbol will be grayed out. If an error occurs during operation, the error indicator will become active.

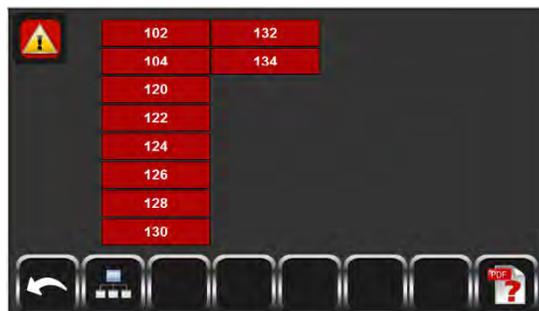


Active Indicator- (**Errors Present**)



Inactive Indicator- (**No Errors**)

When the corresponding button for the active error indicator is pressed, the system will display the error page where the operator can access individual errors.



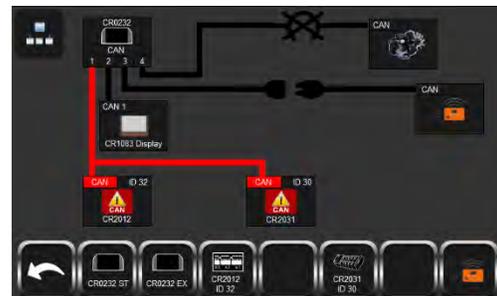
All active errors are displayed with their error number.



The presence of the [PDF?] option indicates that error descriptions are available in clear text, as well as the reasons for the errors and repair information. To access these error descriptions, press the corresponding button for the [PDF?] option.



Pressing the communications link button opens a screen displaying the CAN bus overview specific to the machine. If red lines are shown, this indicates a communication error, and error codes are shown.



The back/return button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

INFORMATION Screen



Press the [i] symbol button to call the screen "information". This will provide additional information on the activity being performed, such as detailed engine data.

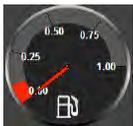


At the top of this display resides the date and time bar. This bar provides the current date and time- based on what is set in the system.

2012/04/02 13:38:30



The gauge on the far right displays the engine coolant temperature.



The middle gauge shows the fuel level.

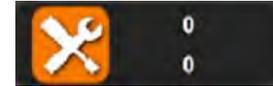


The third gauge displays the hydraulic oil temperature.

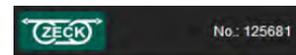
The information screen consists of the following additional display information:



Displays full load hours as well as residual operating time.



Display of next maintenance (if due, display in orange).



Display of chassis identification number (machine number).

Display of software version of control and display.



The back/return button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

SETTINGS Screen/Button



When this button is pressed, it will access the SETTINGS screen.



The settings screens shows information for the current date and time:

dd	mm	yyyy
01	08	2012
h	m	s
14	53	32

The status indicator for the data recorder is also located on this page. The status indicator tells the operator whether or not the data recorder is active or not.



The power symbol represents the status indicator. The gray indicator signifies that the data recorder is not active. The green indicator signifies that the data recorder is active.

(See the Data Recorder On/Off Button section).



The triangle symbol represents the recording intervals setting for the system. The recording interval setting is programmed using length in the measurement of feet or meters. Therefore, the values for pulling or tensioning force and velocity within the length difference are recorded every [] feet/meters. For longer recording segments, enter a higher number of feet/meters, and for shorter recording segments, enter a smaller number of feet/meters. For information on how to change this setting. (See the RECORDING INTERVALS Screen/Button section).

At the bottom of the Setting screen are multiple option buttons.

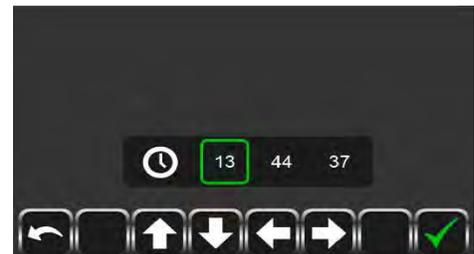


The back/return button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.

TIME SETTING Screen/Button



When pressed, this button will display the TIME SETTING screen, which allows the operator that ability to change the current time for the system. The time is displayed as 24 hour time.



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

TIME SETTING Screen/Button (Cont.)



To change the time in the system, use the right and left arrow buttons to move the green selection box between Hour, Minute, and Second intervals. Once an interval is selected, use the Up and Down arrow keys to adjust the number up or down.



Once the time is entered correctly, press the green check mark button to save the new time setting and return to the previous SETTINGS Screen. 

 The back/return button is present on all sub level screens, and when pressed returns the user to the previous or MAIN Screen.

NOTE: If the Back/Return button is pressed prior to saving the changes, the changed value will not be saved, and the new time setting will not take effect. Operators must save the new time setting before exiting the screen.

DATE SETTING Screen/Button



When pressed, this button will display the DATE SETTING Screen, which allows the operator to change the date programmed in the system.



To change the date in the system, use the right and left arrow buttons to move the green selection box between Month, Day, and Year intervals. Once an interval is selected, use the Up and Down arrow keys to adjust the setting up or down.



Once the date is entered correctly, press the green check mark button to save the new date setting and return to the previous SETTINGS Screen. 

 The back/return button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.

NOTE: If the Back/Return button is pressed prior to saving the changes, the changed value will not be saved, and the new date setting will not take effect. Operators must save the new date setting before exiting the screen.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

DATA RECORDING Screen



When this button is pressed, it will display the DATA RECORDING Screen.



This screen allows the operator to see information related to the storage and transfer of recorded system data logs.



This section displays the recorded data stored in the system computer memory. Stored data will show with the file name of the record consisting of the machine number with the bullwheel number, the current date, and a two-digit counter number. A new file is created each time recording is initiated.



Status indicator "Print file"



Status indicator "Copy file on USB stick"



Pressing the [ALL] button will select all data in the memory.



Press the Up or Down arrow buttons to select the desired data.



Pressing the "Delete" button will delete the data previously selected.



When this printer button is pressed, the system will send the selected data to a printer connected to the USB port.

NOTE: In order for the printer function to work correctly with the available USB interface, it must be a Zeck supplied printer.



Press USB Symbol button to copy the selected data to the USB stick connected to the USB port.



The back/return button is present on all sub level screens, and when pressed returns the user to the previous or MAIN Screen.

Data Recorder On/Off Button



This button, when pressed, will toggle between starting and stopping the data recorder. If the data recorder is active, the power icon on the screen will show green; if deactivated, the screen icon will appear gray.



NOTE: A Data Recording On/Off indicator is also displayed on the main menu screen.



Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

RECORDING INTERVALS Screen/Button

 When this button is pressed, it will display the RECORDING INTERVALS screen. The triangle symbol represents the recording intervals setting for the system. The recording interval setting is programmed using length in the measurement of feet or meters. Therefore, the values for pulling or tensioning force and speed within the length difference are recorded every [] feet/meters. (See the ADDITIONAL SETTINGS Screen/Button section for instructions on how to change from feet to meters.)



Once on the RECORDING INTERVALS screen, the operator can change the frequency of recording intervals by changing the length.



To increase the frequency of recording segments, reduce the length by pressing the Down arrow button. To decrease the frequency of recording segments, increase the length by pressing the Up arrow button.



The outcome of these changes results in longer recording segments for a higher number of feet/meters, and shorter recording segments for a smaller number of feet/meters.

Once the changes are made, press the  to save the changes and return to the previous SETTINGS screen.

 The back/return button is present on all sub level screens and, when pressed, returns the user to the previous or MAIN Screen.

NOTE: If the Back/Return button is pressed prior to saving the changes, the changed value will not be saved, and the new recording interval setting will not take effect. Operators must save the new recording interval setting before exiting the screen.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

ADDITIONAL SETTINGS Screen/Button



When this button is pressed, it will display a password screen. This password screen requires the user to enter a password to access the ADDITIONAL SETTINGS Screen.



There are two menus within the ADDITIONAL SETTINGS Screen: **Client Menu** and **Service Menu**. Each menu has an independent password; therefore, to access each menu the user must enter the specific password for that menu- Client or Service.

To enter a password, press a button to select a number from [1] to [6], to be populated in the green highlighted cell. Each password will be four digits in total.



Once the password is entered correctly, press the green check mark button to submit the password and access the corresponding screen (Client or Service).



Service Menu

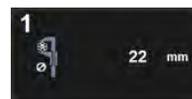
The service menu is only accessible by authorized service personnel, as this menu provides the user the ability to change critical system configurations, and complete advance system and machine diagnostics.

Client Menu

After entering the correct password to access the Client Menu within the ADDITIONAL SETTINGS Screen, the system will display the Client Menu.



This screen indicator represents the maintenance due notification, showing the client when the next maintenance is due. If the maintenance is due, the pictogram is displayed in orange. Otherwise, the pictogram is displayed in grey.



This screen field shows the diameter of cable/rope programmed in the system.

Operation

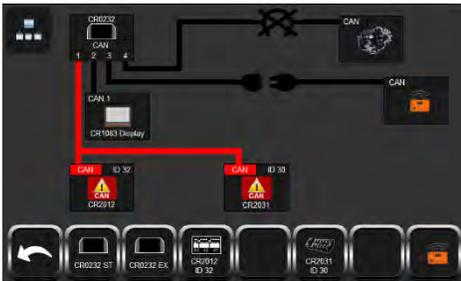
Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

ADDITIONAL SETTINGS Screen/Button (Cont.)

 Pressing this button opens the screen Input/Output- I/O Test Overview. This screen indicates the machine-specific bus topology as well as CAN network communication errors.



The selection buttons at the bottom of this screen represent communication components, and they may vary across different models and versions of the machine. Press the individual buttons to open the I/O pages of each different communication component.



 This symbol represents the machine interface remote control module. Press this button to open the machine-specific I/O-remote control screen.



 The back/return button is present on all sub level screens, and when pressed returns the user to the

previous or MAIN Screen.



Press this key to reset the maintenance interval. "K" or "S" in the service history indicates whether the reset was made from the client-(K) menu or from the service-(S) menu.



When this button is pressed, the INPUT CABLE/ROPE DIAMETER screen populates.

INPUT CABLE/ROPE DIAMETER Screen

When this screen is populated, the user will be able to change the cable/rope diameter by pressing the Up arrow button to increase the diameter or the Down arrow button to decrease the diameter. The available diameter setting range is between (10 mm to 80 mm) or (.40 in to 3.20 in).



Once the diameter is showing the correct value, press the green checkmark button to save the new setting and return to the Client/Service menu. 

 To return to the Client/Service menu without saving the new setting press the back button.

NOTE: If the Back/Return button is pressed prior to saving the changes, the changed value will not be saved, and the new rope/cable diameter setting will not take effect.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

System Control Panel

ADDITIONAL SETTINGS Screen/Button (Cont.)



The [daN/lbs] button represents a unit change option. When this button is pressed, it will display the UNITS CHANGE Screen.

UNITS CHANGE Screen

Once on the UNITS CHANGE Screen, the user can change the (UOM)-units of measure employed by the system.



The two options are metric/decimal-(Globe) and non-metric/customary-(USA Flag). This setting change is a global change for the system, meaning that it will affect all system displays where units of measure are displayed. Additionally, this setting will also change how the data is recorded. Once the data is recorded for an operation under one UOM, it cannot be changed in the system.

NOTE: It is recommended that the user select a suitable UOM prior to conduction operations.

To select between the two unit options, use the left and right arrow buttons.



Once the selection is made, press this the green check mark button to save the selection, change the UOM's in the system, and return to the Client/Service menu.



To return to the Client/Service menu without saving the new setting press the back button.

If no change is made on this page for a period of 10 seconds, the display will return to the Client/Service menu without saving any new settings.

NOTE: If the Back/Return button is pressed or the screen times out prior to saving the changes, the changed value will not be saved, and the new UOM setting will not take effect.

PARAMETER MENU Screen/Button



This icon represents the system parameters, and pressing this button from the Client/Service menu will open the PARAMETER MENU Screen. This screen allows the user to make critical parameters changes that may affect how the machine performs or functions.

NOTE: The parameters viewed on this screen through the Client menu can be read but not edited. **To edit the system parameters, the user must be signed in using the Service menu level password.**

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

USB Interface

The T-Series Tensioners come equipped with a Universal Serial Bus (USB) 2.0 interface port for attaching USB storage devices. The T-Series control system is designed to record pulling, tensioning, and reductoring operations information to its internal memory, and allow transfers to a USB storage device.



Next, select the file(s) to transfer, using the Arrow or All Buttons.



With the file(s) selected, press the USB transfer button on the DATA RECORDING Screen to copy the selected data file(s) to the USB stick connected to the USB port.



To initiate recording, first ensure that Data Recorder is turned to ON. See DATA RECORDING Screen for instructions.



NOTE: Once the data recorder is turned on, the system will record all operation data in length increments based on the set recording interval to the internal memory of the system. See RECORDING INTERVALS Screen/Button section.

Once operations are concluded, the operator can move the data from the internal memory to a USB storage device or "USB drive/stick". To do this, first insert the USB drive into the USB port. A green check mark indicator will appear just above the USB symbol once the USB drive is recognized by the system.



As the files are being transferred, the center screen image will change, showing an hour glass and folders.



Once the file transfer is completed, the center screen image will change, back to an arrow, but with a green check mark overlaid on top.



Remove the USB drive/stick.



NOTE: If copy errors are reported, this may be due to a faulty USB Drive, or that the USB drive is smaller than the data being transferred.

Operation

Operator Controls

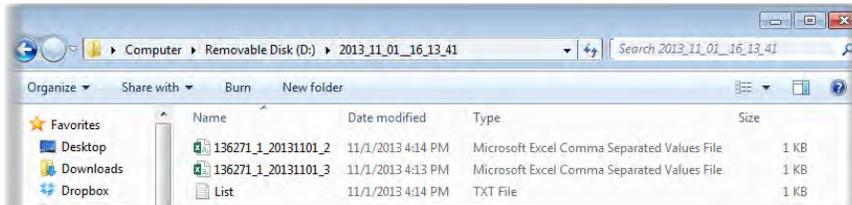
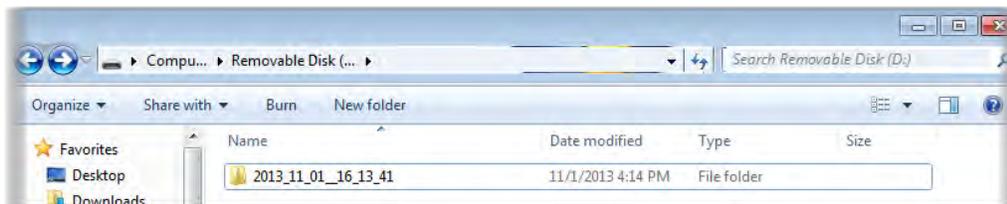
**For control locations see Operator Control Panel Section on page 26.

USB Interface (Cont.)

When the data is transferred to the USB drive/stick, it will create a folder with the date and time. Inside the folder will be the log files and another file that is a list of all of the files transferred.



NOTE: The data in each file will be recorded based on the programmed (UOM)-Unit of Measure for the system. See *UNITS CHANGE* Screen section for instructions on how to change UOM.

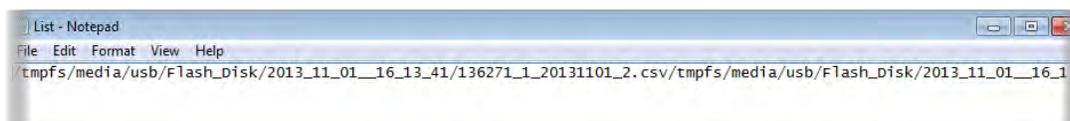


The list file will be a (.txt- text) file. These text files can be opened with many computer programs to include: Microsoft Excel/Word, Windows Note Pad, and Oracle's Open Office.

NOTE: Information within the text file may be displayed differently, dependent upon which program the file is opened with. Microsoft Excel and Word will list the events in a single column by date/time stamp, whereas Note Pad will display the information in block format- making it difficult to read.

	A	B	C	D	E	F	G	H	I
1	/tmpfs/media/usb/Flash_Disk/2013_11_01_16_13_41/136271_1_20131101_2.csv								
2	/tmpfs/media/usb/Flash_Disk/2013_11_01_16_13_41/136271_1_20131101_3.csv								
3									

```
/tmpfs/media/usb/Flash_Disk/2013_11_01_16_13_41/136271_1_20131101_2.csv
/tmpfs/media/usb/Flash_Disk/2013_11_01_16_13_41/136271_1_20131101_3.csv
```



Operation

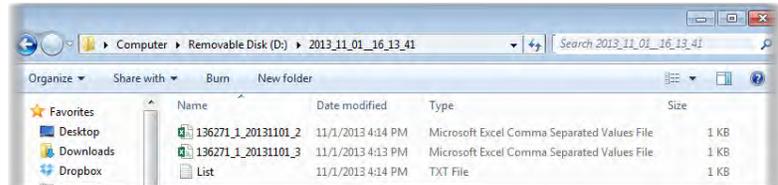
Operator Controls

**For control locations see Operator Control Panel Section on page 26.

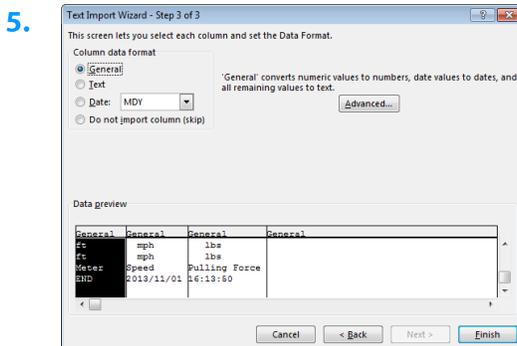
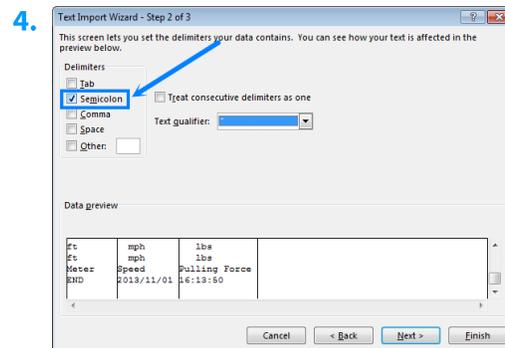
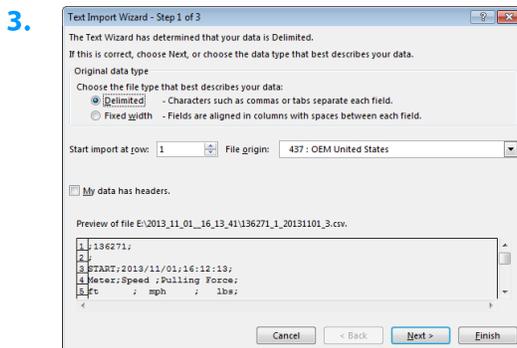
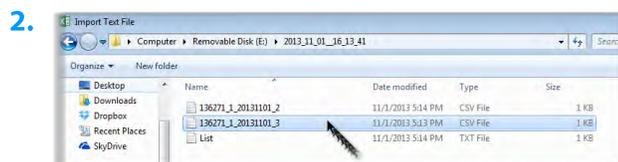
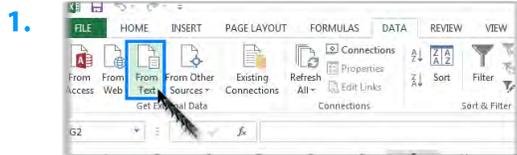
USB Interface (Cont.)

Each log file saved to the USB drive will be a (.csv- comma separated values) file. These files can be opened with many computer programs to include: Microsoft Excel, Microsoft Access, and Oracle's Open Office Calc.

NOTE: Information within the log file may be displayed differently, depending upon which program is used to open the file.



In order for the data to be properly displayed, the user must Import the files when using Microsoft Excel. The reason for this when importing the file, is that the text import wizard function will open allowing the user to select the [Delimited] option, along with the applicable delimiters. In this case it is a Semicolon. The semicolon delimiter is the default output for the T-Series machines, and would apply when opening the .csv files with other computer programs.



The information contained in the file is displayed with a Start and End time using increments of length- (see the RECORDING INTERVALS Screen/Button section)

6.

	A	B	C	D	E	F
1		136271				
2						
3	START	11/1/2013	16:12:13			
4	Meter	Speed	Pulling Force			
5	ft	mph	lbs			
6	ft	mph	lbs			
7	Meter	Speed	Pulling Force			
8	END	11/1/2013	16:13:50			
9						
10						

Operation

Operator Controls

***For control locations see Operator Control Panel Section on page 26.*

Exterior Work Light Power Switch



This switch when turned CW will turn on the exterior work lights.



NOTE: The master power key switch must be turned to the on position to activate the exterior work lights.

Engine Diagnostic Port:

The T-Series machines come equipped with an Engine Diagnostic Port. This port is used by the maintenance personnel and the manufacturer to access the engine system for advanced external computer diagnostics.



NOTE: The data port has two metal pins on the top to allow the data cable to be locked in place. This helps prevent the cable from unintentionally becoming detached during diagnostics.



Windshield Wiper Control Knob



When this knob is turned CCW it will turn on the windshield wipers. The wiper motor has two speeds: Lo and High. The farther CCW the knob is turned, the faster the wiper moves. To activate the windshield cleaner spray, press and hold the knob in. When the knob is released, the spray will stop.

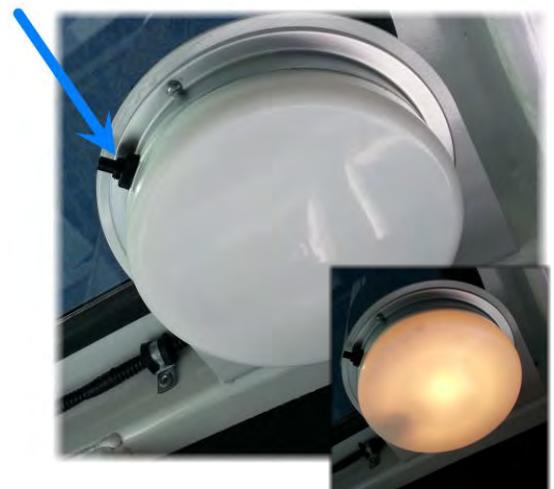
NOTE: If the knob is pressed and no fluid is sprayed, the wiper fluid level may be low or the spray heads may be clogged.



Interior Dome Light

This light provides interior cab lighting for the operator in low light conditions. Press the side button to toggle the light On and Off.

NOTE: The master power key switch must be turned to the On position to activate the interior cab light.



Operation

Operator Controls

***For control locations see Operator Control Panel Section on page 26.*

Hydraulic Control Switches

Enable Jacks:

As a safety feature, the jack controls must be manually enabled using the [ENABLE JACKS] rocker switch to reduce the chance of unintentionally shifting the machine set height during operations. This switch, when activated, supplies power to the jack system, as well as activating the audible warning alarm. To enable the jacks, depress the top portion of [ENABLE JACKS] switch so that it rocks forward-(away from the operator). To disable the jacks, depress the bottom portion of the switch so that it rocks backward-(toward the operator).



To lower a jack, first enable the jack controls, then depress and hold the top portion of the assigned switch. When the switch is released, the motion will stop. To retract the jack, depress and hold the bottom portion of the rocker switch. When the switch is released, the motion will stop.



CAUTION: Jacks must be disabled during operations.

Jack Controls:

The T-Series tensioners have four hydraulically actuated jacks for ease of leveling and stabilization; two- (right and left) jacks in the front and the rear of the machine. Each jack can be operated manually from inside the cab- through the console switches. The engine must be turned on and running to enable and use the jacks.



CAUTION: Ensure that all jacks are fully raised and clear of the ground before attempting to tow trailer.

Operation

Operator Controls

**For control locations see Operator Control Panel Section on page 26.

Hydraulic Control Switches (Cont.)

Jack Controls (Cont.):

The T-Series machines have a camera view of the jacks when in motion. Operators should utilize the available jack cameras, where available. Using the provided cameras and spotters to ensure that the area is clear while moving the jacks is a critical safety measure.

CAUTION: Jacks must be disabled when not in use and during operations.



View from jack camera on main display model.

The jacks on the T-2608 are of the anti-skid type, which reduces the change of the machine being dragged horizontally during pulling operations.



CAUTION: Always ensure the machine is securely anchored to an appropriate point prior to use.



CAUTION: Ensure that all jacks are fully raised and clear of the ground before attempting to tow trailer.

Operation

Reel Stand Hydraulics

The main power unit has hydraulic control valves ([1] and [2]) that supply both reel stand hydraulic circuits- [1] and [2]. These must be turned to On/Opened before the reel controls will work.

NOTE: To avoid creating excess heat, only open hydraulic circuits that are intended to be used.

CAUTION: Always ensure the hydraulic hoses are connected prior to engaging the hydraulic valves.

NOTE: The hydraulic control valves are located on the outside of the units but are in different locations dependent upon the machine model.

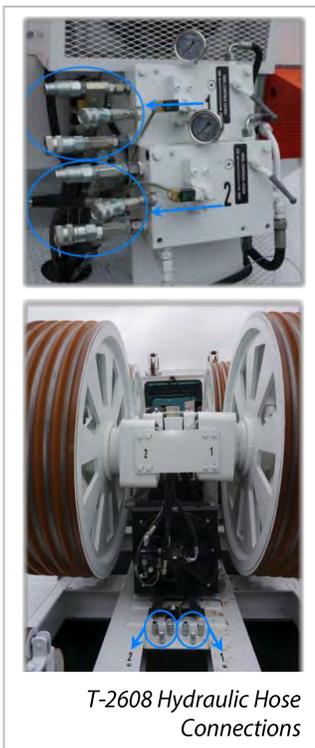
There are reel stand hydraulic hose connection ports on both the front and rear of the T-Series machines.



T-7212 Hydraulic Reel Control Valves



T-2608 Hydraulic Reel Control Valves



T-2608 Hydraulic Hose Connections

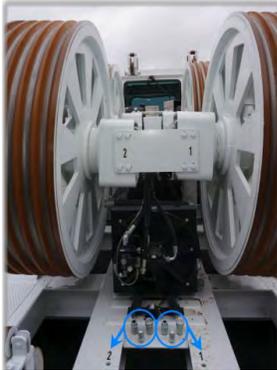


T-7212 Hydraulic Hose Connections

Operation

External Reel Stand Usage

- ✓ To use an external reel stand, the hoses must first be connected to the quick-release ports on the rear or front of the trailer using the correct Sherman+Reilly™ hose kit.



NOTE: Always ensure that the hydraulic hoses are properly secured to the quick release ports at both ends prior to starting the engine, and prior to engaging hydraulic circuit. Residual pressures existing in the hydraulic lines, even with valve Off, can inhibit connecting hose.

- ✓ Next, open the corresponding hydraulic control valve-[1]/[2], to initiate hydraulic flow to the external reel stand hydraulic connection.



T-7212 Hydraulic Reel Control Valves



T-2608 Hydraulic Reel Control Valves



- ✓ Once the hydraulic valves are enabled/opened, the operator has full control of the external reel stand tension, using the reel stand potentiometer on the operators control console.



NOTE: The reel stand hydraulic controls should be in the disengaged or Off/Closed position when not in use.

Operation

Quick Start Guide

Sherman+Reilly T-2608 / T-7212

Bullwheel Tensioner– 8,000 / 12,000 lb. Capacity



Acronym/Terms Key:

CW – Clockwise

CCW – Counter Clockwise

DANGER – Indicates the information relates to a specific immediate hazard which, if disregarded, will result in severe personal injury or death.

WARNING – Indicates the information relates to a specific immediate hazard or unsafe practice which, if disregarded, could result in personal injury or death.

CAUTION – Indicates the information pertains to a potential hazard or unsafe practice which, if disregarded, may result in minor personal injury or equipment damage.

NOTE – Indicates the information is important to the correct operation or maintenance of the machine.

Start-Up Procedure

Step	Action	Note
1	Perform all pre-operation inspections.	
2	Position machine, reel trailer/stand and components, connect hoses- (where appropriate), chock wheels, and dump trailer air.	The machine should be positioned in line with the tower and centered as much as possible on the line being pulled. Wheels should be chocked to prevent rolling.
3	Open all required hydraulic control levers on the machine and reel trailer/stands.	Ensure that operating areas and danger zones are clear of personnel.
4	Unsecure conductor from reel, and release brake/lock dog on reel stands/trailer.	
5	**Ensure that all controls (levers, switches, potentiometers, etc.) are in the neutral, disengaged, or Off position.	If using the Arctic Warming Kit, allow the heater to complete its cycle prior to starting engine.
6	With the key inserted, turn master power key switch CW to the [ON] position , then check Winter/Summer Mode switch for correct position.	Wait for the system display to light up, the system to load, and diagnostics to complete.
7	Use the sync mode control knob to select correct sync mode.	<u>Options:</u> 0, A, C, D.
8	Engage power to the engine: Once the display and panel lights are on, place the Engine Power switch to the [I] position.	In colder climates (below 40°F), the preheat function- (glow plugs) may be needed. The glow plugs are automatically engaged once the Engine Power switch is placed in the [I] position. After the preheat cycle has concluded- the engine can be started.
9	Start the engine , by pushing the Engine Start button.	<u>Allow system to run for several (15) minutes to warm up.</u>
10	Ensure that there are no warnings listed on the system display screen.	The engine oil pressure and hydraulic pressure/flows are both monitored by the system.
11	Level, stabilize, anchor, and ground the machine.	Use the jack control buttons to level the machine.
12	Route conductor through the fairleads, thread around bullwheels, and route toward lead tower.	Use joystick control in pull mode to rotate bullwheels. Adjust fairleads as needed.

Operation

Start Pulling Mode		
Step	Action	Note
1	Perform all Start-Up/Set-Up Procedures.	*Must include pre-operation inspections- if not already completed. CAUTION: Only attach running grounds to machine if the machine is properly grounded.
2	Ensure the system is set to Pull Mode , with the button illuminated.	The default mode for the system at start-up is Pull Mode, however, this mode can be selected by pressing the Pull Mode button.
3	Set the maximum pulling force limit to the desired setting.	Press the Input Overload button to access the Input Overload Settings screen, dial up or down the force setting, and then save/apply the setting by pressing the green check button. 
4	Set reel tension by rotating the reel potentiometer CW to increase and CCW to decrease tension.	CAUTION: Rotate reel potentiometers slowly, and ensure all personnel are clear of the area and are aware of line take-up.
5	Begin pulling in line by pulling the joystick backward. To payout out, push the joystick forward.	NOTE: A minimum of about 30 lbs. of pulling force (person or vehicle) is required to payout the line from the machine while in Pull Mode. If there is no pull on the line when attempting to payout, the bullwheels will not have enough traction to move the conductor. The conductor must stay tight around the bullwheels to payout using Pull Mode; therefore, reel back-tension is also recommended.
6	Continue to monitor line speed, pulling force, and the footage counter.	To stop rotation at any time, release the joystick and it will return to the center neutral position and the brake will set.

WARNING: When the line is being **driven out with a truck or other off road vehicle**, ensure that the payout vehicle has completely stopped prior to returning the joystick to the center neutral position to set the brake. Otherwise, serious personal injury and/or equipment damage will result. Also, limit off road vehicle speed to account for sudden accidental changes in line tension.

CAUTION: Before handling any pilot or conductor lines attached to this machine, the operator must ensure that the hydraulic brake is set by releasing the joystick while in pulling mode.

WARNING: Never touch a fast moving rope or conductor, whether energized or not. If clothing or gloves are snagged by moving conductor/rope, this machine has more than enough force to pull a person into a fairlead or bullwheels. All precautions should be taken by cordoning off all line paths and operating areas. Signs and barriers should be used where applicable, and in accordance with safety regulations. Machine operators should maintain visibility of all operating areas, using line of sight, cameras, or spotters- where applicable, and be ready to react in the event of an emergency.

Operation

Start Tension Mode		
Step	Action	Note
1	Perform all Start-Up/Set-Up Procedures. CAUTION: Only attach running grounds to machine if the machine is properly grounded.	*Must include pre-operation inspections, if not already completed.
2	For Sync Tension Modes (C or D) , connect the sync cable between the machines.	With cable connected, select the Master Machine Control Selection Button to designate which machine has the master control.
3	Push the Tension Mode or Sync Tension Mode button once , to engage the pretension mode of the system.	On the first depression of the Tension Mode/Sync Tension Mode button, the button backlight will blink.
4	Set the reel tension(s) by rotating the corresponding reel potentiometer. . If using the Sync Tension Mode (A,C, or D), utilize the corresponding reel potentiometer for each conductor. See Sync Mode Section.	Rotate potentiometer(s) CW to increase and CCW to decrease tension.
5	Set the initial bullwheel tension by rotating the corresponding bullwheel potentiometer. If using the Sync Tension Mode (A, C, or D), utilize the Master Sync Mode Bullwheel Potentiometer to set initial bullwheel tension.	Rotate potentiometer CW to increase and CCW to decrease tension.
6	Push the Tension Mode or Sync Tension Mode button again , to release the hydraulic brake and engage the bullwheels.	On the second depression of the button, its backlight will illuminate solid.
7	Continue to monitor line speed, tension force, and the footage counter.	During operations, the tension setting can be adjusted instantly by rotating the bullwheel potentiometer. Rotate potentiometer CW to increase and CCW to decrease tension.

NOTE: To stop the conductor and set brake, first increase tension to bring the line to a stop, then press the Pull Mode button to set the hydraulic brake. If using Sync Tension Mode (A, C, or D), push the Sync Tension Mode Off Button to stop and set brake.

CAUTION: Always ensure that the hydraulic brake is set before attempting to tie off any line or conductor that is tied to or being managed by this machine. **The operator should never hold tension on the line using the drive system while the conductor is being tied off- always set the brake first.**

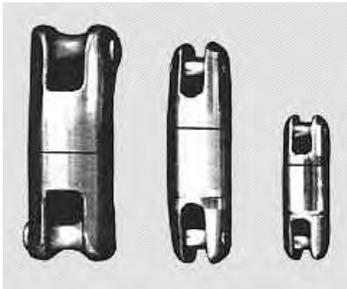
WARNING: When operating the machine, no one should stand in the danger zone between the reel stand and the machine, nor should anyone place hands on or near the bullwheels while in motion. In between the bullwheels is an extremely dangerous area of the machine. If any part of the body is caught between the bullwheels, or between the reel and the frame, serious injury or death may result. Keep the trailer deck clear of all personnel during operations. Always stop operations if personnel need to enter the trailer deck or danger zones of the machine.

Operation

Overhead Pulling Swivels and Cable Connections

Information specific to rope connection:

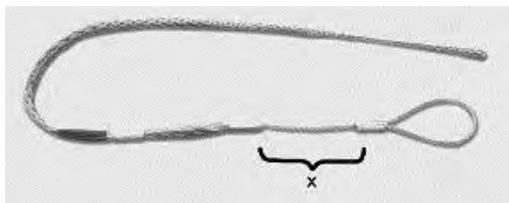
During the pulling operation, a swiveling jointing sleeve (so-called fish-shaped swivel) must be used between the pulling rope and the wire rope. Only use jointing sleeves that swivel easily at maximum pulling force.



Jointing sleeves that have an additional joint at the center and can be bent have the ideal form.

The jointing sleeve must have the tensile strength safety margin required for the pulling operation (at least four times the loading capacity). The difference between rope and jointing sleeve diameters should be as small as possible. Thereby, the jointing sleeve does not lift or stretch the conductor too much, as it overruns the grooves.

Grooved wheels with Zeck ground material made of elastic plastic allow pulling over the grooved wheels with rotational jointing sleeves, cable stockings and even with old press connectors. The jointing sleeves need not be replaced before overrunning the grooved wheels.



With cable stockings with pressed eye bolts there is an important difference in diameter between the pressed sleeves and the "x" zone. A similar result occurs when the grooves are overrun and when the jointing sleeve runs in: The rope is lifted. This problem can be eliminated by mounting a slid-open rubber-hose over the "x" zone. Cable stockings with slid-open eye bolts are most appropriate as diameter differences are small.

Information specific to the use of wire ropes which tend to splay:

Ropes with a relative loose outer layer tend to splay. In order to minimize this effect, observe the following:

Swivels between hoisting rope and wire rope must rotate easily even when under full strain.

The wire rope that runs out to the rope wheel at the mast must be in perfect alignment with the groove of the grooved wheel.

The drum stands must be mounted at a maximum distance to the tensioner unit whilst taking into account the hydraulic hose length.

The wire ropes coming from the drum stand to the tensioner must be slightly diverted in the rope feed.

The first rope wheel at the mast (behind the tensioner) must be vertical. In the case of diagonal pull, the rope wheel must be suspended laterally shifted in order to prevent the wire rope from touching the groove of the rope wheel.

The pulling operation should be effected with maximum sag of the wire rope.

The drum stands should – if possible, hydraulically – be slowed down. The ropes must not display any slippage on the grooved wheels of the tensioner.

Operation

Towing and Road Safety

Connecting to the Tow Vehicle

The T-2608 comes standard with an adjustable pintle eye hitch. While the larger T-7212 comes standard with a 5th wheel king pin type hitch.

- ✓ Make certain tow vehicle has the capacity and rating to tow machine safely.

NOTE: The approximate trailer weights are:

- **T-2608:** 18,500 lbs
- **T-7212 (5th Wheel):** 21,500 lbs.
- **T-7212 (Pintle eye):** 30,000 lbs

- ✓ Inspect king pin/pintle eye for excessive wear, corrosion, cracked welds or structural damage.
- ✓ Inspect tow vehicle hitch and ensure hitch is in good working order.
- ✓ Make sure trailer brakes are operable- (See *Trailer Brakes Section*).

WARNING: Do not attempt to tow machine/trailer if there is any question about the condition of the hitch or trailer brakes.

- ✓ Make sure the unit is safe for towing with tires in good condition and properly inflated- (See *Trailer Tires section*).
- ✓ Make sure there are no tools, objects, or trash items which could fall off during transport.
- ✓ Ensure that the hydraulic cut off valves for the reel controls are set to closed.



- ✓ Chock wheels on both sides of the machine/unit trailer, then start machine/unit engine- (See *Operator Controls and Start-Up Procedure*).
- ✓ Make sure the right and left rear jacks are fully retracted- (See *Jack Controls section*).
- ✓ Open the tow vehicle hitch and back vehicle into position under the king pin/pintle eye. Set tow vehicle parking brake.
- ✓ Slowly retract trailer nose/hitch jacks, so that the king pin/pintle eye rests correctly on the hitch.

CAUTION: Ensure that the nose/hitch jacks and all other jacks are fully retracted prior to transport.

- ✓ Ensure the hitch is secured.

CAUTION: The king pin and hitch strike plate, and the pintle eye and hitch, are both pinch points.



Operation

Towing and Road Safety

Connecting to the Tow Vehicle (cont.)

- ✓ After the trailer is secured to the vehicle, stop the machine/unit engine, and remove the key from the ignition key switch.
- ✓ Connect all appropriate air hoses and electrical plugs for the trailer brakes. For air brake systems, begin charging the trailer air system.



NOTE: T-7212 Ensure that the [DUMP] knob is pushed inward on the trailer air suspension system



- ✓ If not already, connect the electrical plug to the tow vehicle and check:
 - Clearance lights
 - Brake Lights
 - Turn Signals
 - Brakes



CAUTION: Do not tow the machine/unit unless all the trailer lights and brakes are working correctly.



- ✓ With operators cab closed and locked, position hand rails so that they overlap the doors. Tighten handrails in place to help hold doors closed during transit.



- ✓ Remove and stow the wheel chocks.

NOTE: When towing the machine/trailer assembly, the driver should be knowledgeable and obey all applicable transportation laws and speed limits. Laws for towing speed of trailers differ widely between states, provinces, and localities.

CAUTION: Drivers should use caution and drive slower at night and when hazardous conditions are present, such as heavy traffic, bad weather, or uneven or rough terrain.

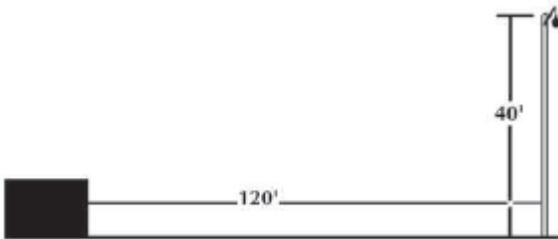
Unless otherwise indicated by applicable laws, posted speed limits, or cautionary conditions (stated above), a recommended maximum safe operating speed for normal road conditions is 50/55mph for night/day conditions, and 30mph in residential, urban, and business districts.

Operation

Positioning the Machine

The driver/operator should position the machine in a suitable location where it will be free from obstructions and clear of any obvious hazards. For overhead tensioning, the tensioner should be approximately three times the distance of the lead block height.

Example: If the lead block is 40 feet high, it is recommended that the tensioner be positioned approximately 120 feet from the base of the pole whenever possible. By allowing the distance to the lead block as specified, this reduces the direct downward forces that would be created otherwise. In some situations, however, it may not be possible to achieve these distances. See note below.



NOTE: In some situations, for example; due to rough terrain, it may not be possible to achieve these safe distances from the lead block. In these situations, operators should try and achieve as much distance as possible from the lead block, and be aware of the increased down forces during operations.

The unit should be leveled as much as possible, centered on the lead block, and parallel to the line prior to beginning operations.

CAUTION: On T-7212 models, the trailer air suspension system should be dumped prior to operating any component of the machine. Follow all posted trailer warnings and safety precautions.

CAUTION: All jacks must be extended for stabilization, and the machine must be leveled prior to conduction operations.

The operator must chock all trailer wheels and dump the trailer air system, where applicable, prior to operations and any time the vehicle is parked. All appropriate grounding, anchoring, and protective equipment must be installed and secured to machine prior to operations.



Operation

Start-Up/Set-Up Procedure

NOTE: Before beginning operations, the operator must perform all pre-operation inspections. See *Pre-Operation Inspection Checklist on page 104*. Pre-operation inspections are important for the safe operation of the machine, and are required under OSHA Regulations.

CAUTION: Before starting the machine, it is absolutely necessary to read and observe all safety precautions listed in this manual.

- ✓ Perform all pre-operation inspections.
- ✓ Position the machine and reel trailer and/or reel stands- (where applicable), chock trailer wheels, and dump air from trailer air suspension systems. The machine should be positioned centered on the lead block, and parallel to the line prior to beginning operations. Wheels should be chocked to prevent the unit from rolling. See Positioning the Machine section.
- ✓ Unpack hydraulic hoses and hook the reel stands to the tensioning machine by connecting the hoses to each of the unit's hydraulic connections.



- ✓ If using S+R reel stands, level and properly anchor the reel stands.



- ✓ Unsecure the conductor end on the reel trailer or reel stand.
- ✓ Release the reel stand/trailer lock dogs.



- ✓ Once all hoses are connected and while outside of the machine, ensure that all hydraulic control levers are turned to the On/Open position, if being used.

NOTE: On the T-7212, the two main hydraulic shut-off valves for the reel control(s) are located on the curb side behind the engine enclosure. On the T-2608, the two reel control shut-off valves are located on the front of the machine by the hitch.

CAUTION: Ensure that all hydraulic hoses are hooked-up and valves are turned to the On/Open position prior to operations to prevent the drive system components from overheating.

Operation

Start-Up/Set-Up Procedure

- ✓ If using the arctic kit, start the timer for the diesel burner to begin heating the engine components. For more information on the timer or arctic kit operations, see Appendix A.



NOTE: The arctic kit is an optional equipment add-on to assist with warming the machine engine components when operating in very cold temperatures. **This option may not be installed on all models. If not installed, skip this step.**

CAUTION: The arctic kit exhaust port may be positioned either to the rear or bottom of the engine compartment. In most cases, the fan can be heard; however, be aware that concentrations of diesel exhaust may be present around the engine compartment when the heater is engaged. Caution should be taken to avoid these areas when the heater is on, as this presents an inhalation hazard.

- ✓ If operating in extreme heat environments in excess of 100°F, the operator can open the outside engine compartment panels during operations to allow for improved engine compartment ventilation and cooling.

CAUTION: Always ensure the panels are secured prior to transport.

- ✓ Ensure that all controls (levers, switches, etc.) are in the neutral and disengaged position. Ensure that all potentiometers on the operator's console are set to their lowest setting.



WARNING: If the reel control potentiometers have a positive setting at the time the machine starts, any connected reels will automatically begin to rotate to apply the preset tension. This can create unanticipated line jolts as well as life threatening or severe bodily impacts to surrounding personnel if they are not aware of the line/conductor take up and/or reel spin.

- ✓ Ensure that all personnel are free and clear of the machine's moving parts. Also, ensure that all personnel are aware of the machine start-up.

- ✓ With the key inserted, turn the Master Power Key switch to the ON position.

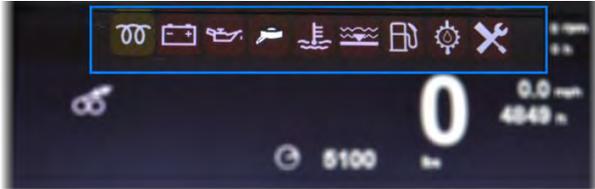


NOTE: When the master power key switch is turned to the ON position, the main system display will turn on and show the S+R Logo and then the Zeck screen. At this same time, the small light will blink on the bottom left hand corner of the display. This blinking light indicates that the system is conducting an initial diagnostic check of the system and communications components. Once the diagnostic is completed, the light will turn from blinking to Off. The engine power cannot be engaged during the diagnostic.

Operation

Start-Up/Set-Up Procedure

- ✓ Once the system diagnostic check is completed and the display and panel lights are on, view the main control panel screen for any system faults or warnings.



NOTE: If faults or warnings are found, they should be resolved prior to conducting operations- (see *Troubleshooting Section*).

- ✓ Ensure that the Engine Coolant Circulation- (Winter/Summer) Mode switch is set to the appropriate position: (Winter/Summer).
Winter: <32°F
Summer: ≥32°F

- ✓ Use the sync mode control knob to select correct sync mode: (0, A, C, D). See *Sync Mode subsection* under the *Operator Controls* section for details.



- ✓ Place Engine Power switch to the On- [I] position to engage engine power.



NOTE: The preheat function/glow plugs are automatically engaged once the Engine Power Button is placed in the On position. After the preheat cycle has concluded (about 5-10 seconds), the operator may start the engine- (See *Operator Controls* section).



- ✓ Once the glow plug indicator goes out, the start button will illuminate and the operator may depress the Engine Start button to start the engine.

CAUTION: Before starting the machine, it is absolutely necessary to read and observe all safety precautions listed in this manual.

- ✓ With the machine started, allow the engine to run for several minutes to ensure that the engine and hydraulic components have time to warm to their standard operating temperature of 95°F/35°C. This warm up cycle is critical to the optimal efficiency of the power system, and also ensures proper fluid flows and pressures are sustained.

NOTE: Warm up times may vary dependent upon the outside ambient temperature. If ambient temperature outside is 59°F/15°C, the warm up time will be approximately 15 minutes. For temperatures at or above 95°F/35°C, the engine warm up cycle may be significantly less or not required at all. Longer warm up times may be required when temperatures are below 59°F/15°C.

CAUTION: Before starting operations, the power engine and hydraulic system must be warmed to approximately 95°F/35°C. If the hydraulic system is operated at temperatures below 95°F/35°C, damage or excessive wear on system components may result.

Operation

Start-Up/Set-Up Procedure

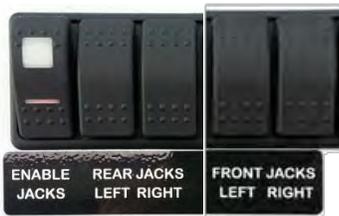
- ✓ View the main control panel screen to ensure that there are no warning messages. Also, view the engine information screen to make sure everything is working properly.
- ✓ Properly anchor the all machine components to prevent them from moving under tension or line load.



- ✓ Properly ground the tensioning machine and any coordinating reel trailers and reel stands using the available grounding brackets.



- ✓ Level and stabilize the machine using the available hydraulic jacks.



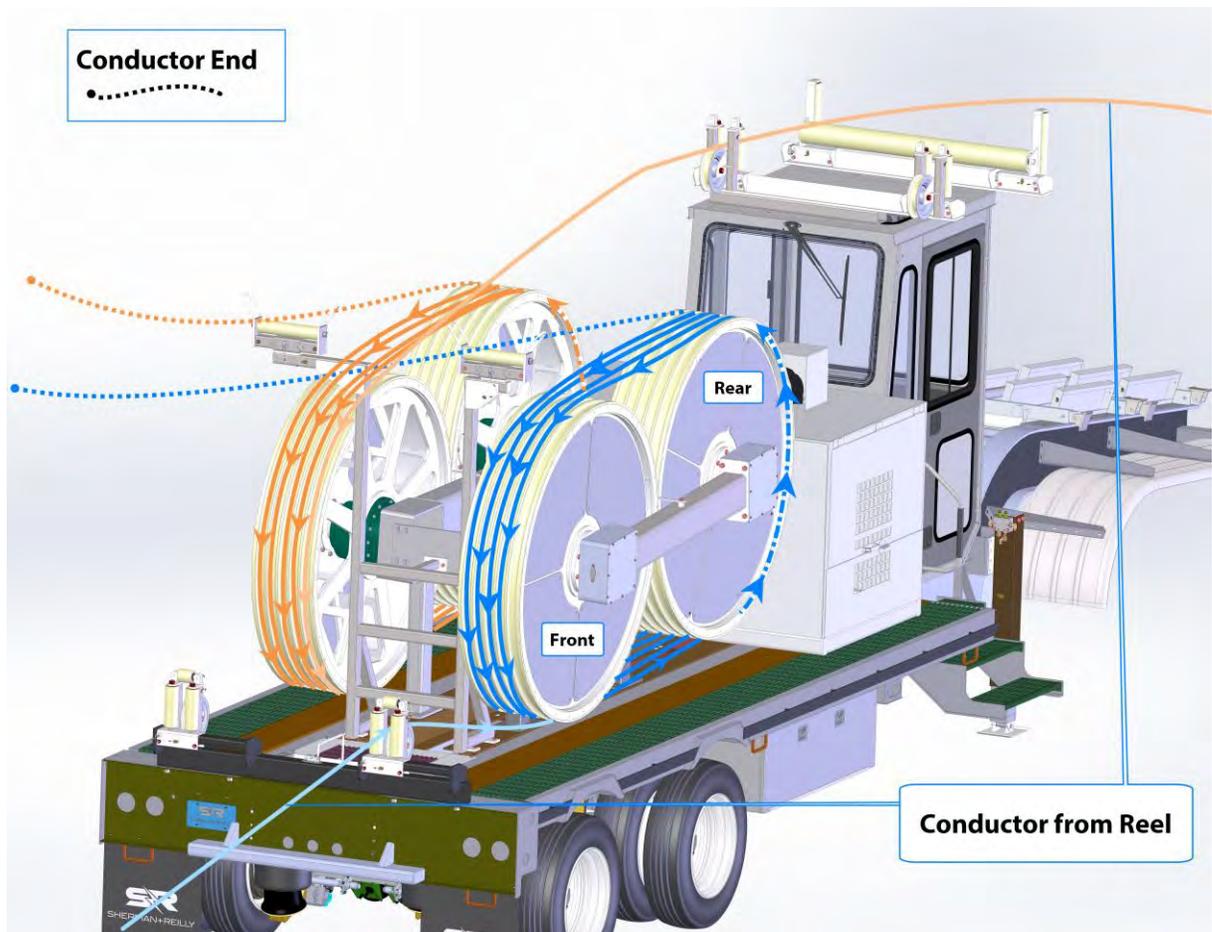
CAUTION: All jacks must be extended for stabilization, and the machine must be leveled prior to conduction operations.

Operation

Start-Up/Set-Up Procedure

Threading the Bullwheels:

- ✓ Thread the bullwheels using nylon or other small rope.
- ❖ When threading the bullwheels, start by wrapping the reeving ropes in reverse of the rope/conductor path outlined below. Start from the street-side groove of the top rear (cab side) bullwheel going downward, and wrapping outward away from the engine. Once you reach the bottom curb-side groove of the front bullwheel, attached the reeving rope to the rope/conductor end coming from the reel.
- ❖ **Reeving Patterns:** On the first wrap of the rope/conductor as it comes around to the front bullwheel, note the offsets as the rope/conductor approaches the top of the front bullwheel. At this point, the rope/conductor should be approaching the second groove from the curb-side of the front bullwheel. Note the top of the curb-side groove on the front bullwheel is empty when utilizing the rear reel placement and rear incoming fairleads.

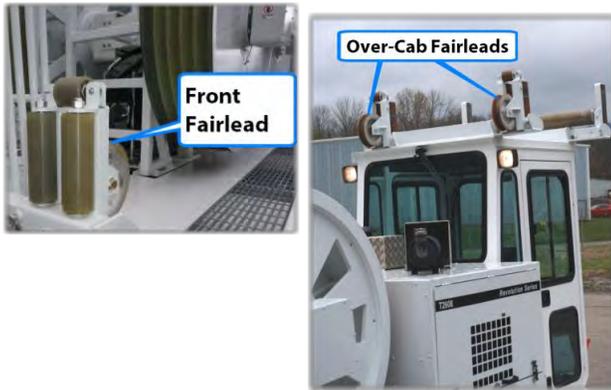


Operation

Start-Up/Set-Up

Threading the Bullwheels (cont.):

- ✓ When setting up an external reel stand, route the conductor end through the front fairleads or through the over-cab fairleads and rollers, and then around the bullwheels.



- ✓ Once the conductor end is through the fairleads and in reach of the reeving rope, tie the conductor end(s) to the reeving rope end(s).

CAUTION: It may be required to rotate or pull conductor off of the reel. Always use caution when handling reeving lines and conductor and always wear appropriate personal protective equipment to include gloves. Also, be ready to get clear of the line/machine in the event of a sudden or unanticipated reel stand rotation, rope or conductor take-up, bullwheel rotation, or line/rope brakeage. Line brakeage could have enough force to kill or seriously injure in the event it strikes a person.

Procedure

WARNING: When operating the machine, no one should stand in the danger zone between the reel stand and the machine, nor should anyone place hands on or near the bullwheels. In between the bullwheels is an extremely dangerous area of the machine. If any part of the body is caught between the bullwheels, or between the reel and the frame, serious injury or death may result. Keep the trailer deck clear of all personnel during operations. Always stop operations if personnel need to enter the trailer deck or danger zones of the machine.

WARNING: Never touch a fast moving rope or conductor, whether energized or not. If clothing or gloves are snagged by moving conductor/rope, this machine has more than enough force to pull a person into a fairlead or bullwheel. All precautions should be taken by cordoning off all line paths and operating areas. Signs and barriers should be used where applicable, and in accordance with safety regulations. Machine operators should maintain visibility of all operating areas, using line of sight, cameras, or spotters- where applicable, and be ready to react in the event of an emergency.

WARNING: If the reel control potentiometers have a positive setting at the time the machine starts, any connected reels will automatically begin to rotate to apply the preset tension. This can create unanticipated line jolts as well as life threatening or severe bodily impacts to surrounding personnel if they are not aware of the line/conductor take up and/or reel spin.

Operation

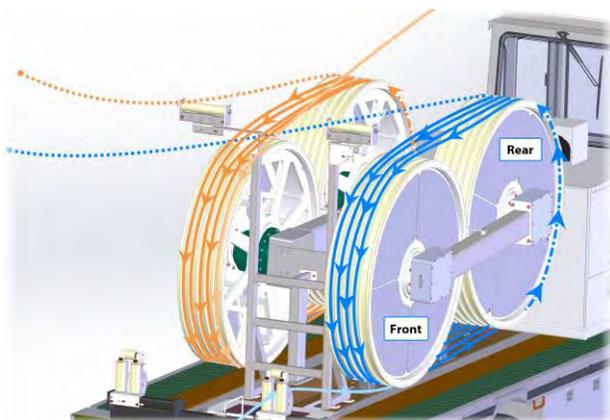
Start-Up/Set-Up Procedure

Threading the Bullwheels (cont.):

- ✓ Once the conductor is tied to the reeving rope, ensure that all personnel are clear of the danger zones, then begin to rotate the bullwheels to wind the conductor over the bullwheels. To do this, ensure the system is in the Pull Mode, turn the reel potentiometer(s) to the minimum setting, then push the joystick forward as though you were paying out the line. Adjust the reel potentiometer(s) as needed to prevent excessive sag of the conductor, while applying just enough tension to keep the reeving line and conductor tight around the bullwheels.

NOTE: Continue to monitor the conductor placement in the grooves. If the conductor is allowed to excessively sag, it may become tangled, or jump its groove. If this happens, you will need to stop the bullwheels, by putting the joystick in neutral to set the brake, and then manually fix the issue.

CAUTION: Always ensure that the joystick is in neutral with the brake set before attempting to touch bullwheels or handle lines going toward the bullwheels.



S+R™ Revolution Series T-2608 / T-7212 / T-7212-P Tensioner

- ✓ Once the conductor end reaches its lead-off point on the top street-side of the rear (cab side) bullwheel, payout enough conductor to reach over the upper roller and then to the ground with enough slack to connect to the pulling line.

CAUTION: Gathering the lead-off conductor is a manual process, involving a person to gather the excess reeving line and conductor coming off of the bullwheels. Caution should be taken to avoid all moving lines traveling toward the bullwheels.

- ✓ Once enough conductor is paid out, stop the bullwheels, reel rotation, and set the brake, by placing the joystick in the center neutral position.



- ✓ Adjust upper rollers and fair leads as needed. Ensure that all retaining pins are secured.



Operation

Pull Mode

NOTE: Before beginning pulling operations, the operator must perform all pre-operation inspections. See *Pre-Operation Inspection Checklist* on page 104. Pre-operation inspections are important for the safe operation of the machine, and are required under OSHA Regulations.

Sherman+Reilly™ T-Series Tensioners utilizes a hydraulically driven set of bullwheels that apply up to 8,000 lbs. or 12,000 lbs. of tensioning force respectively to the conductor. Both the T-2608 and the T-7212 come equipped with a variable speed drive system. The Pull Mode for the machine is primarily used to allow the operator forward and reverse movement of the line.

- ✓ Perform Start-Up/Set-Up Procedures starting on page 62.

CAUTION: Only attach running grounds to the machine if the machine is properly grounded.

- ✓ If pulling in old conductor and using it to pull new conductor during reconducting operations, attach the leadoff pulling rope to the old conductor end.

- ✓ Select Pull Mode on the system control panel by pressing the Pull Mode button. When the button is pressed, the button backlight will illuminate. And the main screen will change to display the pull mode.



NOTE: The default mode for the system at start-up is Pull Mode.

- ✓ Once the system is in Pull Mode, set the maximum pulling force limit to the desired setting for the machine. (See *Input Overload Settings* section starting on page 36.)



CAUTION: Pulling forces must be properly managed in order to prevent damage to conductor and equipment. It is absolutely necessary to set the maximum pulling force limit for this machine prior to conducting pulling operations.

- ✓ Set the desired reel tension, by rotating the reel potentiometer(s) on the operator's console CW to increase and CCW to decrease tension. Adequate reel tension should be achieved to maintain a tight back-tension on the conductor coming to the bullwheels from the reel.



CAUTION: Rotate reel potentiometers slowly, and ensure all personnel are clear of the area and aware of rope take-up. Rapid increases in reel tension can create large jolts in the line and possible equipment or conductor damage.

Operation

Pull Mode

- ✓ Begin pulling the conductor by slowly pulling backward on the joystick. To payout, push the joystick forward.



NOTE: If the joystick is released, it will return to the center neutral position, the bullwheel rotation will stop, and the hydraulic brake will set.

NOTE: A minimum of about **30 lbs. of pulling force (person or vehicle) is required** to payout the line from the machine while in Pull Mode. If there is no pull on the line when attempting to payout, the bullwheels will not have enough traction to move the rope. The rope must stay tight around the bullwheels to payout using Pull Mode; therefore, reel back-tension is also recommended.

WARNING: When the line is being **driven out with a truck or other off road vehicle**, ensure that the payout vehicle has completely stopped prior to returning the joystick to the center neutral position to set the brake. Otherwise, serious personal injury and/or equipment damage will result. Also, limit off road vehicle speed to account for sudden accidental changes in line tension.

- ✓ Continue to monitor the line speed, pulling force, and the footage counter.



NOTE: To stop bullwheel rotation at any time, release the joystick and the hydraulic brake will set.



- ✓ Once the completed and operations have concluded, release the joystick and bullwheel rotation will stop and the brake will set.



CAUTION: Before handling any pilot, pulling, or conductor lines attached to this machine, the operator must ensure that the hydraulic drum brake is set by releasing the joystick.

CAUTION: Never payout all of the conductor off of the reel; leave at least one layer of conductor wrapped on the reel. Otherwise, the conductor end could be pulled from its anchor point.

Operation

Tension Mode

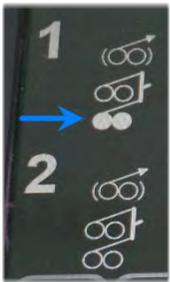
NOTE: Before beginning tensioning operations, the operator must perform all pre-operation inspections. See *Pre-Operation Inspection Checklist* on page 104. Pre-operation inspections are important for the safe operation of the machine, and are required under OSHA Regulations.

Conductor Payout:

- ✓ Perform Start-Up/Set-Up Procedures starting on page 62.

CAUTION: Only attach running grounds to the machine if the machine is properly grounded.

- ✓ If running the machine in Sync Tension Modes (C or D), ensure that the sync cable is properly connected, then select the Master Machine Control



Selection Button to designate which machine has the master control. Once this button is pushed, that machine will have control of the other connected machines. If running the machine in Sync Tension Mode

A, disregard this step and continue to the next step.

- ✓ Select Tension Mode or Sync Tension Mode on the system control panel by pressing the Tension Mode or Sync Tension Mode button. Once the button is pressed for the first time, the button backlight will blink indicating that the system is in a pre-tension phase. The pre-tension phase allows the operator to gauge the existing line tension, and adjust the potentiometer accordingly prior to releasing the brake and applying tension to the line.



- ✓ Set the desired reel tension(s) by rotating the corresponding reel potentiometer on the operator's console CW to increase and CCW to decrease tension. The reel tension should be minimal, but just enough to maintain a tight back-tension on the conductor leading to the bullwheels. If using the Sync Tension Mode (A, C, or D), utilize the corresponding reel potentiometer for each conductor. See Sync Mode Section.



CAUTION: Rotate reel potentiometers slowly, and ensure all personnel are clear of the area and aware of rope take-up. Rapid increases in reel tension can create large jolts in the line and possible equipment or conductor damage.

WARNING: When operating the machine, no one should stand in the danger zone between the reel stand and the machine, nor should anyone place hands on or near the bullwheels while in motion. In between the bullwheels is an extremely dangerous area of the machine. If any part of the body is caught between the bullwheels, or between the reel and the frame, serious injury or death may result. Keep the trailer deck clear of all personnel during operations. Always stop operations if personnel need to enter the trailer deck or danger zones of the machine.

Operation

Tension Mode

Conductor Payout (cont.):

- ✓ Set the initial desired bullwheel tension level by rotating the corresponding potentiometer CW to increase and CCW to decrease tension. The tension will show on the system control display as it is dialed up and down. If using the Sync Tension Mode (A, C, or D), utilize the Master Sync Mode Bullwheel Potentiometer to set initial bullwheel tension.



NOTE: If the initial tension is set lower than any pre-existing line tension, the bullwheels and reel will begin to payout and possible over-spin may occur.

- ✓ Once the initial tension is set, press the Tension Mode or Sync Tension Mode button again to release the brake and engage the bullwheels. When the button is pressed for the second time, the operator will notice the button backlight changes from blinking to solid illumination.
- ✓ During tensioning operations, continue to monitor the line speed, tension, and the footage counter.



- ✓ During operations, the tension setting can be adjusted by rotating either the individual bullwheel potentiometers or the Master Sync Mode Bullwheel Potentiometer. Rotate CW to increase, and CCW to decrease tension. The tension will be applied and show on the system control display as it is dialed up and down.



NOTE: If operations must be stopped and the line/bullwheels, for whatever reason, do not stop when the puller on the other end stops pulling; the operator can increase the tension until the bullwheels slow to a stop and hold the line. Once the bullwheels are stopped, press the Pull Mode button. If using Sync Tension Mode (A, C, or D), push the Sync Tension Mode Off Button to stop and set the brake. Ensure the tension setting is readjusted prior recommencing tensioning operations.

CAUTION: Never payout all of the conductor off of the reel, leave at least one layer of conductor wrapped on the reel. Otherwise, the conductor end could be pulled from its anchor point.

WARNING: Never touch a fast moving rope or conductor, whether energized or not. If clothing or gloves are snagged by moving conductor/rope, this machine has more than enough force to pull a person into a fairlead or bullwheels. All precautions should be taken by cordoning off all line paths and operating areas. Signs and barriers should be used where applicable, and in accordance with safety regulations. Machine operators should maintain visibility of all operating areas, using line of sight, cameras, or spotters- where applicable, and be ready to react in the event of an emergency.

Operation

Tension Mode

Conductor Payout (cont.):

- ✓ Once the rope/conductor is paid out, the line has stopped, and operations have concluded, push the Pull Mode button to engage the bullwheel hydraulic brake.



NOTE: By pressing the Pull Mode button, this takes the system out of tension mode. However, if the joystick is pushed or pulled, while in Pull Mode, it will rotate the bullwheels.

CAUTION: If the Pull Mode button is pressed during tensioning mode, the hydraulic brake will set on the bullwheels and all rotation will stop. This can create a hazard if the puller on the other end is unaware of a sudden stop.

CAUTION: Always ensure that the hydraulic brake is set before attempting to tie off any line or conductor that is tied to or being managed by this machine. **The operator should never hold tension on the line using the drive system while the conductor is being tied off—always set the brake first.**

Operation

Shut Down Procedure

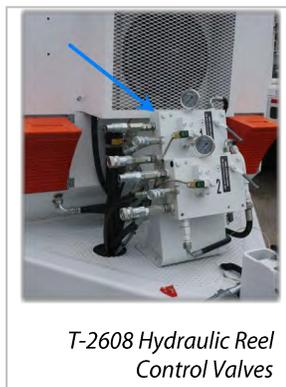
- ✓ Place Engine Power button to the Off/[O] position to disengage engine power.



- ✓ Once the engine is off, turn the Master Power Key Switch CCW to the OFF position and remove the key.



- ✓ Close all hydraulic control valves to the reels.



- ✓ Complete all towing and road safety procedures prior to towing machine. (See *Towing and Road Safety* section on page 59).

CAUTION: The reel brake and lock collar must be set prior to transport.

CAUTION: The conductor ends and must be secured on the reels prior to transport.

- ✓ If tools were used during operations, properly store them- unless further operations are planned.
- ✓ Complete all Post-Operation Inspections on page 107.

Operation

Emergency Stop Procedure

In the event of an emergency, the operator must be aware of how to shut down the machine so as to avoid any additional injuries or equipment damage. In these emergency situations, the lives of linemen, work crews, surrounding bystanders, as well as the operator may become at risk-dependent upon the severity of the situation. As an operator in these situations, the level of operating knowledge and proficiency can be tested. These factors alone make this procedure one of the most important to know.

1. The first step of an emergency shut down during operations is to de-energize the drive system/engine and stop all equipment rotation and power as quickly as possible. This is done by **pushing the Emergency Stop Button** located on the control panel.



2. If the Emergency Stop Button is pushed during operations and other machines/operators are being utilized in tandem or sync with your machine, notify them as quickly as possible that an emergency has occurred and advise to halt rotations.
3. Quickly assess situation and assist any injured personnel to get free from hazards- only if safe to do so.
4. Notify proper authorities and get help.
5. Follow all employer emergency procedures.

Fire Extinguisher Usage:

Most Sherman+Reilly™ equipment comes standard with a fire extinguisher mounted somewhere on the equipment for quick access by the operator. However, should a fire occur with S+R equipment; the **operator should only utilize the provided fire extinguisher, if trained in its use, if safe to do so, if in accordance with employer policy, and in these described situations:**

- a. To save your own life, if in jeopardy from fire.
- b. To save someone else's life, if in jeopardy as a result of a fire- but only if safe to do so.
- c. To put out small equipment fires to avoid further damage to equipment or prevent a dangerous explosion- but only if safe to do so.

CAUTION: Operators should exercise caution when attempting to put out fires, as **the provided extinguisher is only intended to suppress small localized fires**, and is not intended to put out or "fight" large scale fires, should one occur.

With the presence of flammable fluids and other operational environment factors, even small fires can grow out of control quickly- operators must maintain awareness of these factors.

Proper training must also be provided by employer before engaging in any firefighting efforts. Should a fire occur with Sherman+Reilly™ equipment, the operator should **not** use the equipment until it has been inspected for safety and approved to be returned to service- regardless of the size of the fire.

Troubleshooting

Quick Tips

ENGINE WILL NOT START OR RUN

- ✓ Dead battery.
- ✓ No fuel- check fuel gauge.
- ✓ Other- Refer to engine manufacturer's manual. *(Also, see General Faults section.)*

REEL/DRUM WILL NOT ROTATE

- ✓ Low system pressure drum clutch not releasing.
- ✓ Drum clutch out of adjustment.
- ✓ Obstruction between drum and inside fender/frame.
- ✓ Manual is brake set.
- ✓ Hydraulic valve(s) closed/off.
- ✓ Hoses burst or not attached.

HYDRAULIC JACK CREEPS DOWN

- ✓ If motor running, control valve seals bad.
- ✓ Motor off, or holding valve on jack is malfunctioning.

UNIT WILL NOT BUILD MAXIMUM HYDRAULIC SYSTEM PRESSURE

- ✓ Operator's pull setting set too low restricting hydraulic pressure.
- ✓ Control valve blocked or malfunctioning.
- ✓ Pump relief valve malfunctioning.
- ✓ Pump Failure.
- ✓ System pressure relief valve at the pump out of adjustment or malfunctioning.
- ✓ Contamination in hydraulic system.
- ✓ Wiring damage to pump actuators.

HYDRAULIC FLUID TEMPERATURE IS ABOVE NORMAL

- ✓ Restricted air flow to hydraulic cooler.
- ✓ Drum clutch not fully releasing.
- ✓ Contamination in hydraulic system.
- ✓ Wiring damage to the hydraulic cooling system- fan, wiring, coil, or sensor.

TRAILER LIGHTS DO NOT WORK AFTER CONNECTED TO VEHICLE

- ✓ Check vehicle/trailer wire connectors for damage or corrosion.
- ✓ The vehicle/trailer wire connectors can vary dependent upon owner/customer requirements. *(Also, see Trailer Lighting section.)*

Troubleshooting

The relays and fuses are located in the control panel. In order to open the control panel, the two supplied case keys will be required. Refer to the accompanying circuit diagram when checking or replacing cables, relays, fuses, thermostats or other electrical switching elements.

General Faults

Fault	Possible Cause	Solution
Diesel engine does not start, and indicator lights do not come on.	The emergency stop switch is still locked after it has been pressed.	Release the emergency stop switch.
Hydraulic oil overheats > (194° F / 90° C)	Not all oil coolers are in operations.	On the control panel: check oil cooler relays and fuses.
	Cooling power of the oil cooler insufficient.	Make sure that the air circulates around the oil coolers. Covering caps must be opened. If necessary, clean oil coolers.
Function errors at the control.	Cable break, defective sensor.	See System Display and Error Codes. Exchange the relevant cable or sensor.
	Error in electronics.	Check the printed circuit.

Engine Error Codes

Code	Error	Identification	Description
1	Rotary speed/speed collection errors	PickUp1	Frequency, pulse width or period outside of the normal range
2	Rotary speed/speed collection errors	PickUp2	Frequency, pulse width or period outside of the normal range
3	Rotary speed/speed collection errors	Tachometer	Frequency, pulse width or period outside of the normal range
4	Rotary speed/speed collection errors	Overspeed	Speed too high
5	Sensor failure	Setpoint device 1 (foot throttle)	Varying, incomplete or wrong data
6	Sensor failure	Setpoint device 1 (hand throttle)	Varying, incomplete or wrong data
7	Sensor failure	Charging pressure sensor	Varying, incomplete or wrong data
8	Sensor failure	Oil pressure sensor	Varying, incomplete or wrong data
9	Sensor failure	Cooling fluid sensor	Varying, incomplete or wrong data
10	Sensor failure	Charging air temperature sensor	Varying, incomplete or wrong data
11	Sensor failure	Fuel temperature sensor	Varying, incomplete or wrong data

Troubleshooting

Engine Error Codes (cont.):

Code	Error	Identification	Description
30	Functional failure: Warning	Oil pressure warning	Oil pressure too low
31	Functional failure: Warning	Cooling fluid temperature warning	Cooling fluid temperature too high
32	Functional failure: Warning	Charging air temperature warning	Charging air temperature too high
33	Functional failure: Warning	Oil level warning	Oil level too low
34	Functional failure: Warning	Cooling fluid level warning	Cooling fluid level too low
35	Functional failure: Warning	Warning trailing throttle	Special instructions
36	Functional failure: Warning	Fuel temperature warning	Fuel temperature too high
40	Functional failure: Warning	Oil pressure shut-off	Oil pressure too low
41	Functional failure: Warning	Cooling fluid temperature shut-off	Cooling fluid temperature too high
42	Functional failure: Warning	Charging air temperature shut-off	Charging air temperature too high
43	Functional failure: Warning	Oil level shut-off	Oil level too low
44	Functional failure: Warning	Coolant level shut-off	Coolant level too low
50	Error actuator	Feedback	Incorrect equipment or element
52	Error actuator	Reference of feedback	Not calibrated
53	Error actuator	Control process difference	The mechanical system does not respond correctly
59	Error actuator	Automatic calibration	Not calibrated
60	Hardware failure In-/Output	Digital output 3 (stopping magnet)	Varying, incomplete or wrong data
62	Hardware failure In-/Output	Digital output 7	Varying, incomplete or wrong data
63	Hardware failure In-/Output	Over Current OD3	Current over the normal range or ground fault
67	Hardware failure In-/Output	Error Hardware Setup 1	Error mode unknowable
68	Hardware failure In-/Output	Error CAN Setup 1	Varying, incomplete or wrong data
70	Communication failure	CAN-Controller	Incorrect equipment or element
71	Communication failure	CAN-communication SAE J1939	Update rate outside of the normal range
76	Storage failure	Parameter programming	Incorrect equipment or element
77	Storage failure	Cyclic flash-test	Incorrect equipment or element
78	Storage failure	Cyclic RAM-test	Varying, incomplete or wrong data
80	Internal Hardware failure	Current measurement (actuator)	Varying, incomplete or wrong data
83	Internal Hardware failure	Reference 1	Varying, incomplete or wrong data
84	Internal Hardware failure	Reference 2	Varying, incomplete or wrong data
85	Internal Hardware failure	Reference 4	varying, incomplete or wrong data

Troubleshooting

Engine Error Codes (cont.):

Code	Error	Identification	Description
86	Internal Hardware failure	Internal temperature	Incorrect equipment or element
87	Internal Hardware failure	Ambient Pressure	Incorrect equipment or element
90	Program logic	Parameter failure	Varying, incomplete or wrong data (EEPROM vintages and/or check sum incorrectly)
93	Program logic	Stack overflow	Varying, incomplete or wrong data
94	Program logic	Internal failure	Varying, incomplete or wrong data
95	General engine failure		With EMR3 not all possible errors are evaluated, these result individually into this general failure

Machine Control Error Codes:

Code	Error	Identification	Description
100	CAN communication error	No communication to EMR2/EMR3	No communication with EMR2 / EMR3, is only evaluated when ignition is on.
101	CAN communication error	No communication with display	No communication with display
102	CAN communication error	No communication with module CR2012 NodeID 32	No communication with module CR2012 NodeID 32
103	CAN communication error	No communication with module CR2012 NodeID 31	No communication with module CR2012 NodeID 31
104	CAN communication error	No communication with module CR2031 NodeID 30	No communication with module CR2031 NodeID 30
107	CAN communication error	No communication with remote control	No communication with remote control
108	Program PLC	Radio impact machine side 1	Radio impact machine side 1
109	Program PLC	Radio impact machine side 2	Radio impact machine side 2
120	CR0232 / CR0032	Pressure sensor system 1	Broken wire
121	CR0232 / CR0032	Pressure sensor system 1	Short cut
122	CR0232 / CR0032	Pressure sensor system 2	Broken wire
123	CR0232 / CR0032	Pressure sensor system 2	Short cut
124	CR0232 / CR0032	Pressure sensor rope in 1	Broken wire
125	CR0232 / CR0032	Pressure sensor rope in 1	Short cut
126	CR0232 / CR0032	Pressure sensor rope in 2	Broken wire
127	CR0232 / CR0032	Pressure sensor rope in 2	Short cut
128	CR0232 / CR0032	Pressure sensor rope out 1	Broken wire
129	CR0232 / CR0032	Pressure sensor rope out 1	Short cut
130	CR0232 / CR0032	Pressure sensor rope out 2	Broken wire
131	CR0232 / CR0032	Pressure sensor rope out 2	Short cut

Troubleshooting

Machine Control Error Codes (cont.):

Code	Group of failure	Description	Description
132	CR0232 / CR0032	Sensor oil temperature	Broken wire
133	CR0232 / CR0032	Sensor oil temperature	Short cut
134	CR0232 / CR0032	Sensor fuel level	Broken wire
135	CR0232 / CR0032	Sensor fuel level	Short cut
136	CR0232 / CR0032	Pressure sensor supply pressure 1	Broken wire
137	CR0232 / CR0032	Pressure sensor supply pressure 1	Short cut
138	CR0232 / CR0032	Pressure sensor supply pressure 2	Broken wire
139	CR0232 / CR0032	Pressure sensor supply pressure 2	Short cut
140	CR0232 / CR0032	Pressure sensor brake released 1	Broken wire
141	CR0232 / CR0032	Pressure sensor brake released 1	Short cut
142	CR0232 / CR0032	Pressure sensor brake released 2	Broken wire
143	CR0232 / CR0032	Pressure sensor brake released 2	Short cut
150	Program PLC	Hydraulic temperature above operational limit	Temperature too high
151	Program PLC	Error during the active connection in synchro mode Couple	Communication canceled, engine off at master or slave machine.
152	Program SPS	Error tension automatic supply pressure side 1	Supply pressure too low
153	Program SPS	Error tension automatic supply pressure side 2	Supply pressure too low
170	Program display	Typographical errors while creating a logging file	Memory full, delete login data in backup menu.

Maintenance



Safety and Reliability Disclaimer: The reliability and working life of the machine depends on the regular inspection and preventive maintenance of the machine. Further, all inspections and preventive maintenance described in this section are deemed as critical to the safe operation of the machine, and should be regarded as such.

The indicated intervals for maintenance work apply to normal operating conditions and stress. The manufacturer is not responsible for damages caused through faulty maintenance or inappropriate handling/operation of the machine.

Maintenance

Safety

Prior to work being performed, ensure the machine is locked/tagged out in accordance with OSHA safety requirements and all applicable safety regulations.

Take all fire prevention safety measures before using a welder or cutting device, including grinders. This should include having a fully charged fire extinguisher near the location of the work.

To avoid injury, make sure that all precautions are taken to support components before loosening or removing bolts.

Be sure everyone involved in the maintenance, service, or repair process understands what is being done and all of the safety precautions which need to be taken during the procedure.

Make sure all lifting devices, chains, slings, and hooks are in good condition and have the rated capacity to do the job. Use guide lines when necessary for control during the lifting process.

Always wear proper protective clothing and equipment when performing service: gloves, safety glasses, etc.

Warning Terms: Are signal words in this manual that call the operator's attention to safety concerns.

The word **NOTE** indicates the information is important to the correct operation or maintenance of the machine.

The word **WARNING** indicates the information relates to a specific immediate hazard or unsafe practice which, if disregarded, could result in personal injury or death.

The word **CAUTION** indicates the information pertains to a potential hazard or unsafe practice which, if disregarded, may result in minor personal injury or equipment damage.

The word **DANGER** indicates the information relates to a specific immediate hazard which, if disregarded, will result in severe personal injury or death.

Maintenance

General Care and Inspections Instructions

Cleaning

Metal parts and canvas must be cleaned with a soft cloth and a neutral cleaning solution without solvents. Aggressive solvents like acetone or nitro thinners should not be used.

Clean petroleum ether is suitable to degrease the machine parts. No water should get on or around the bearings. If a steam blower is used to clean the machine, water may

penetrate the machine causing damage to the bearings!

Make sure that no dirt gets into the bearings when vacuum cleaning the machine. If necessary, cover those parts beforehand. Bare metal parts can be cleaned and at the same time protected by using a slightly oiled cloth.

Fault and Malfunction Detection

Faults detected in supporting parts or parts which have an impact on safety must be corrected immediately. So long as the faults are not corrected, the machine must not be operated.

“Machines, including their support construction and rope blocks should be inspected by an expert before being put into operation for the first time as well as after having undergone substantial modification”.

“Machines, including their support construction and rope blocks should be inspected at least once a year by an expert. They should, however, if necessary, be inspected more often depending on the operating and working conditions”.

Essentially, the checking process consists of making sure that the *safety devices* are available, fitting properly and effective, as well as checking the state of the machine, the hitching gear, the rollers, the equipment, and the support construction.

Safety devices described are, e.g. brakes, rope reeling devices, devices against overcharging, et cetera.

Experts are persons who through their education and experience have sufficient knowledge in the field of pullers, lifters, and traction machines. Further, they are familiar with the valid regulations for protection at work, for the prevention of accidents, and with the regulations and rules generally accepted in technology. “Experts” referred to are also able to decide if the pullers, lifters and traction machines are in a safe working condition.

Source: BGV D8.

Maintenance

Hydraulic System

Absolute cleanliness of the hydraulic system is a must. The smallest amount of foreign material in the system can cause extensive damage to the pump, motor or valves.

Sherman+Reilly™ has taken precautions to assure that each component and fitting was thoroughly cleaned and the system purged before this machine was delivered. Therefore, maintenance of the system should be carried out with extreme care.



Maintenance Notes: (See Preventive Maintenance Schedule section for full details.)

- The hydraulic filters should be replaced as outlined in the Preventive Maintenance Schedule section.
- Only use recommended hydraulic fluids. See lubricant table for more information.
- When adding hydraulic fluid, be sure to wipe all dirt and grime from around reservoir filler cap before removing.
- Clean hoses, fittings, and other components thoroughly prior to replacing, and then assemble carefully.
- Hydraulic coolers should be inspected for damaged fins and clogged surfaces daily, and cooler surfaces should be cleaned.
- Always ensure that hydraulic fluid and system have cooled prior to attempting maintenance.
- ***Always follow all federal, state, local, and environmental laws and regulations, to include but not limited to OSHA, EPA, and Hazard Communication Act, with regard to the storage, maintenance, and disposal of hydraulic fluid and other chemicals used in the maintenance of described mechanical equipment.***

Maintenance

Hydraulic System

When working on any hydraulic connections or parts:

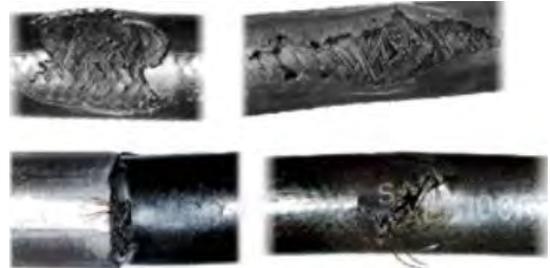
- Be sure there is no pressure on fluid at the location of the work.
- Make sure nothing will move or drop when loosening a connection.
- Collect all the hydraulic fluid which will drain from the loosened connection.
- Use oil-dry or some absorbent material to soak up any fluid spills to keep working surfaces from becoming slippery.
- Cover all open connections to prevent loss and contamination to the hydraulic system.

When the hydraulic system has a problem or is opened at any point, filters and fluid should be replaced to prevent contamination or damage to the system.

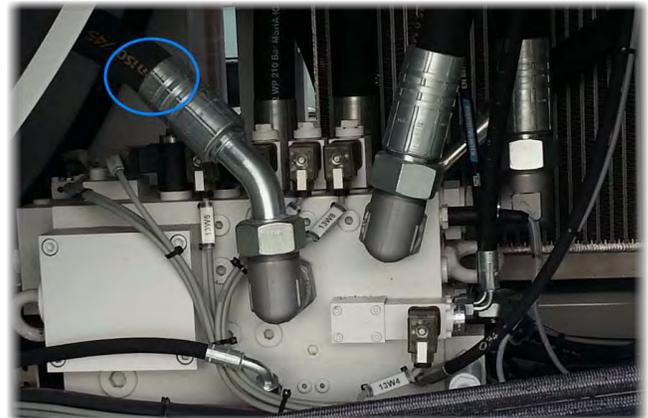
Hydraulic System/Hose Inspection

- ✓ Check the outer surface of the hoses for damages, e.g. tears, bends, cuts, loosened parts, abrasions, brittle spots, etc.

WARNING Never check for hydraulic leaks with hands or body. When under pressure, leaks can penetrate the skin. Small or pinhole size leaks may be invisible during visual inspection. (Using a piece of cardboard or wood is recommended).



- ✓ Check the hoses for deformations (when pressure free as well as when under pressure).
- ✓ Special attention should be given to the connection between hose and fitting. If hose, fitting, or component damages are identified, they must be replaced immediately.
- ✓ All hydraulic hoses must be replaced after 2,500 working hours or, at the latest, every 10 years (starting from the year of the construction of the machine- (see *Preventive Maintenance Schedule* section).



Maintenance

Hydraulic System

Checking Hydraulic Fluid

- ✓ To check hydraulic fluid level, first ensure that all cylinders: (jacks) are retracted, as much as possible, and that the pump is off.
- ✓ View the hydraulic fluid level in the reservoir through the sight gauge.
- ✓ Fluid should show within (High/Low) limits of the sight gauge.



Adding Hydraulic Fluid

- ✓ Clean around hydraulic fluid reservoir cap, and then remove reservoir cap.
- ✓ Carefully pour fluid into tank until it reaches within the (HIGH/LOW) limits of the sight gauge- about $\frac{3}{4}$ of the way full just below the HIGH mark is recommended.
- ✓ Replace and tighten the fluid reservoir cap.
- ✓ Clean-up any residual or spilled fluid.

Maintenance

Hydraulic System

CAUTION: Make sure hydraulic fluid system has had at least 30 minutes to cool prior to maintenance.

Replacing Hydraulic Fluid and Filter

Filter replacements are necessary if the indicator icon shows on the system control display. If the system indicates that a filter replacement is necessary, all filters must be replaced. The T-Series machines have two hydraulic supply filters at the pump, and two low pressure return filters located inside the hydraulic fluid tank/reservoir.



- ✓ First, ensure that all cylinders: (jacks, hoop, etc.) are retracted, as much as possible, and that the pump is off.

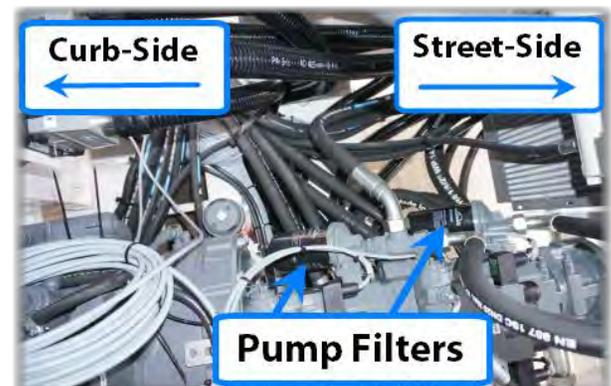
****For Filter Only Replacement skip next step:**

- ✓ **With proper reservoir in place to catch hydraulic fluid, loosen and remove plug at the bottom of the hydraulic tank.

***Filter Only Replacement continue here:**

- ✓ Loosen and remove the three retaining screws at the top of each tank filter housing. Remove both filter housing caps, and then remove both tank filters. Loosen pump filters using filter wrench, then carefully unscrew filters from hydraulic pump.

NOTE: Once removed, filters will still have fluid in them. Use care when removing filter so as not to spill remaining hydraulic fluid. A small collection reservoir may be needed.



Hydraulic System

CAUTION: Make sure hydraulic fluid system has had at least 30 minutes to cool prior to maintenance.

Replacing Hydraulic Fluid and Filter (cont.)

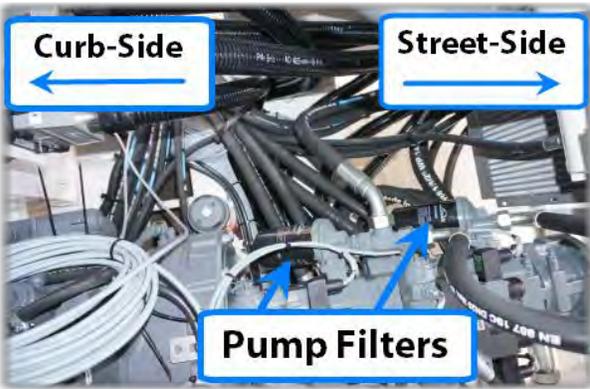
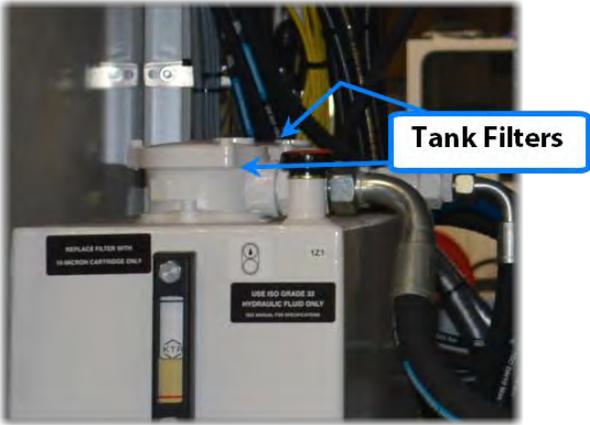
- ✓ Install new filter(s) using the following steps:
 Insert tank filters into the housings, then replace housing caps and screws. Thread screws by hand, then tighten using wrench.

 Next, hand thread new pump filters to filter ports on pump, then tighten filters with hand until snug.

NOTE: 25 micron filters must be used when replacing the hydraulic system filters.

- ✓ Once fluid has finished draining from the tank, re-tighten tank plug and refill tank using sight gauge or line of sight for proper level- (see *Adding Hydraulic Fluid* section).
- ✓ After hydraulic filter change is completed, the engine must be run at idle for approximately 10 minutes- without engaging the bullwheels. This will ensure that air is purged from the system. After the air purge, check the fluid level and replace any needed fluid.

NOTE: Filters should be changed in accordance with the **Preventive Maintenance Schedule**. However, the filters can be changed sooner as needed. Operators should watch for maintenance indicators on the system display.



Maintenance

Hydraulic System

CAUTION: Make sure hydraulic fluid system has had at least 30 minutes to cool prior to maintenance.

Hydraulic Hose Replacement

- ✓ Ensure that all cylinders: (jacks) are retracted, and that the pump is off.

NOTE: Some hoses with fittings at the top of the tank may not require draining the hydraulic fluid prior to replacing hydraulic hoses.

- ✓ If tank drain is necessary, drain the tank and replace the plug- (see *Replacing Hydraulic Fluid and Filter* section).
- ✓ With proper reservoir in place to catch hydraulic fluid, loosen hose connection for hose being replaced, and remove hose.
- ✓ Clean fitting using a non-scoring clean cloth, and ensure there is no damage to threads.
- ✓ Carefully thread new hose to fitting and tighten.

NOTE: The use of **thread sealant** may be required, dependent upon the type of fitting.



- ✓ Refill tank, run system at idle to purge air, and then replenish any lost hydraulic fluid, using sight gauge or line of sight for proper level- (see *Adding Hydraulic Fluid* section).



Maintenance

Drive Assembly

WARNING: Loss of Limb/Death: System must be off and tagged out prior to attempting any maintenance on the drive assembly.

The T-Series tensioners employ a fully hydraulic direct drive system. This drive system consists of hydraulic motors and bullwheels.

Drive Motor(s)

The T-Series machines come equipped with four hydraulic motors- one for each bullwheel.

- ✓ The drive motor(s), should be inspected for obvious signs of damage prior to each operation- *(See Pre-Operation Checklist).*
- ✓ The drive motor(s) mounting bolts/nuts should be inspected for damage or signs of cracking.
- ✓ Inspect the sensor connection to ensure that there is no damage. Inspect the sensor wires for frayed or cut wires. Ensure that all sensor connections to the motor are secure.
- ✓ The hydraulic hose connections should also be inspected for damage and leaks prior to operation. If leaks are found, replace the damaged hose/fitting- *(See Hydraulic Hose Replacement Section).*



WARNING Never check for hydraulic leaks with hands or body. When under pressure, leaks can penetrate the skin. Small or pinhole size leaks may be invisible during visual inspection. (Using a piece of cardboard or wood is recommended).

Maintenance

Drive Assembly

WARNING: Loss of Limb/Death: System must be off and tagged out prior to attempting any maintenance on the drive assembly.

Bullwheels

Bullwheels should be inspected as part of the Pre-Operation Checklist.

- ✓ The bullwheels must be inspected to ensure that they are free from debris, there is no damage.
- ✓ The bullwheel surfaces must also be inspected for excessive wear before each operating period- *(See Pre-Operation Checklist).*

If excessive wear is found the part should be replaced prior to operation- contact Sherman+Reilly™ Service Department for service- *(see Service & Repair section).*



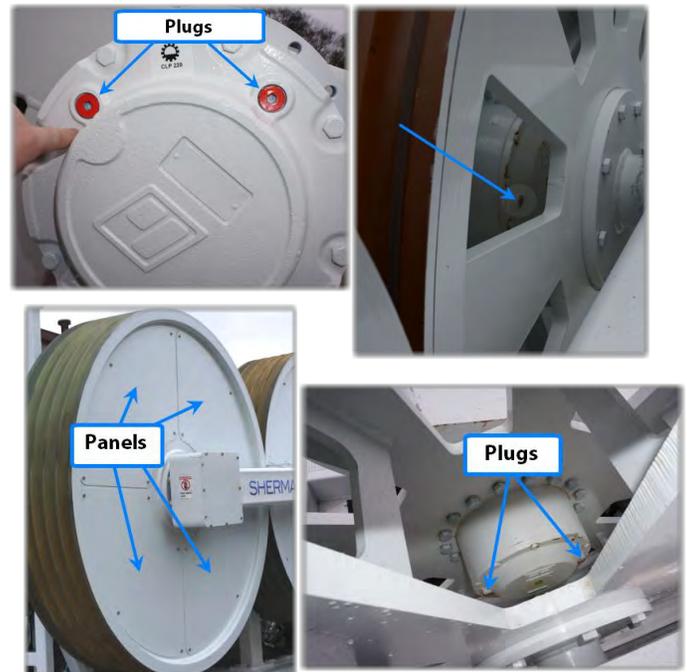
Checking/Adding Bullwheel Gear Oil

Planetary gear oil level should be checked in accordance with the preventive maintenance schedule.

- ✓ When checking the gear oil for new model bullwheel planetary gears, the outside bullwheel panels must first be removed in order to access the plugs.
- ✓ When checking the gear oil for the older model bullwheel planetary gears, there are no covers on the outside of the bullwheels, and there is open access to the plugs.

NOTE: The bullwheels will need to be rotated so that one oil plug is at the bottom with the other at the half full point.

WARNING: Do not touch bullwheels while they are in motion. Wait until they have stopped, brake is set, and engine is off to resume maintenance.



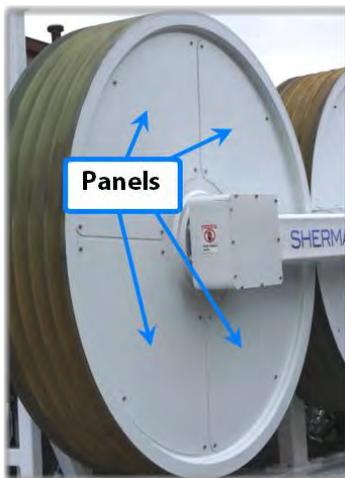
Maintenance

Drive Assembly

WARNING: Loss of Limb/Death: System must be off and tagged out prior to attempting any maintenance on the drive assembly.

Checking/Adding Bullwheel Gear Oil (cont.)

- ✓ Once the plugs are accessible, using a hex head wrench with extension, loosen the plug at the half way point on the gear housing. If oil begins to pour out of the plug at the half point, then the oil level is at the appropriate half full level.
- ✓ If no oil drips out of the half-way point, oil level may be low. Add oil, as needed, until oil level fills half of the gear housing- (just under the half way plug).
- ✓ Once complete, reinstall and tighten plugs.
- ✓ **New Models:** Replace outside covers using original screws.



Maintenance

Drive Assembly

WARNING: Loss of Limb/Death: System must be off and tagged out prior to attempting any maintenance on the drive assembly.

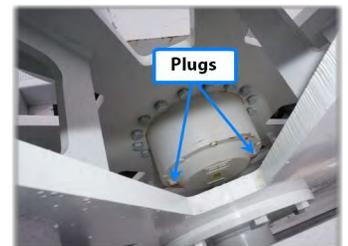
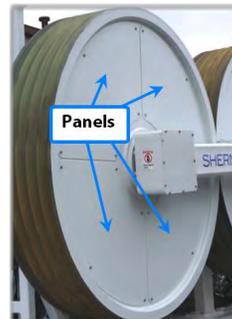
Changing Bullwheel Gear Oil

Bullwheel planetary gear oil level should be changed in accordance with the preventive maintenance schedule.

- ✓ When changing the gear oil for newer model bullwheel planetary gears, the outside bullwheel panels must first be removed in order to access the plugs.
- ✓ When changing the gear oil for older model bullwheel planetary gears, there are no covers on the outside of the bullwheels, and there is open access to the plugs.

NOTE: The bullwheels will need to be rotated so that one oil plug is at the bottom with the other at the half full point. Turn off machine once they are rotated.

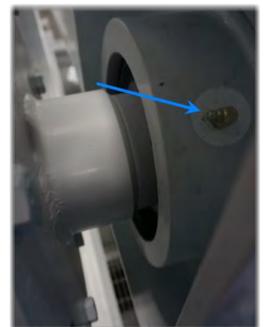
- ✓ Once the plugs are accessible, and with a proper reservoir in place to catch the gear oil, use a hex head wrench with extension to loosen and remove the lower plug on the gear housing. Oil will drain out of this plug.
- ✓ When oil has drained completely, reinstall lower plug, and remove upper halfway point plug.
- ✓ Add new oil to the halfway point plug until fluid is just below the plug- (oil should fill half of the gear housing).
- ✓ Clean up any residual oil and replace plugs and panels and close compartments once complete.



Greasing Bullwheel Bearings

Both bullwheels should be greased in accordance with the preventive maintenance schedule.

- ✓ Grease the bullwheel bearings using a grease gun to the each grease fitting located on the inside of each bullwheel bearing/shaft block.



Maintenance

Hydraulic Power Engine

All maintenance to the engine should be done in accordance to the instructions located in the engine manufacturer's manual.

Keep all fluids at their proper level. *(See engine manufacturer's manual for minimum fluid levels.)*



CAUTION: Never add ETHER to fuel to start cold engine. Ether WILL damage diesel engines. Use available heater system as needed.

CAUTION: Do not exceed 50% of anti-freeze in the coolant. More anti-freeze will damage diesel engines.

Maintenance Notes: *(See Preventive Maintenance Schedule section for full details.)*

- Engine coolants and oil should meet minimum manufacturer's specifications. *(For further details see engine manufacturer's manual- Appendix A.)*
- When replacing hoses, fittings or other components, clean thoroughly and then assemble carefully.
- ***Always follow all federal, state, local, and environmental laws and regulations, to include but not limited to OSHA, EPA, and Hazard Communication Act, with regard to the storage, maintenance, and disposal of engine oils, coolants, and other chemicals used in the maintenance of described mechanical equipment.***

Maintenance

Arctic Kit

All maintenance to the arctic kit and its components should be done in accordance with the instructions located in the manufacturer's manual.



Maintenance Notes: (See Preventive Maintenance Schedule section for full details.)

- The arctic kit must be run with the system in winter mode, once per month for ten minutes, to ensure that the fuel in the lines and in the internal burner components does not solidify. Additionally, this ensures that all coolant in the system and attached lines have an opportunity to cycle through the system.
- ***Always follow all federal, state, local, and environmental laws and regulations, to include but not limited to OSHA, EPA, and Hazard Communication Act, with regard to the storage, maintenance, and disposal of engine coolants, fuel, and other chemicals used in the maintenance of described mechanical equipment.***

Maintenance

Safe-Zone™ Cab

CAUTION: Do not use ammonia-based cleaners. Use only non-ammonia based cleaners to clean the front polycarbonate window.



Inspection of Operators Chair

The operators chair should be inspected for damage and loose or missing parts. (For replacement parts, see Parts section.)



CAUTION: For Turret Models: The operator must be seated while rotating the turret to avoid being accidentally thrown from the machine.

Climate Control System

(Not installed on open cab platforms, and may not be available on all models. System types vary by model.)

The climate control systems are designed for both cooling and heating comfort functions.



- ✓ Routine visual inspections of the machine/unit should include the climate control system, (compressor, condenser, fans, hoses, etc.).
- ✓ Climate control system should be regularly inspected for damages and leaks.



NOTES:

Any maintenance or modifications to the climate control system must be in accordance with US Federal EPA and State regulations.

Only qualified HVACR technicians should perform work on Safe-Zone™ climate control systems. For maintenance concerns, contact the Sherman+Reilly™ Parts & Service Department at parts@sherman-reilly.com.

Maintenance

Trailer Assembly

Disclaimer: Any modifications to the Sherman+Reilly™ T-Series trailer assemblies or attached structures could result in damages to equipment, injury to operators, personnel, or others, and voiding of the manufacturer's warranty.

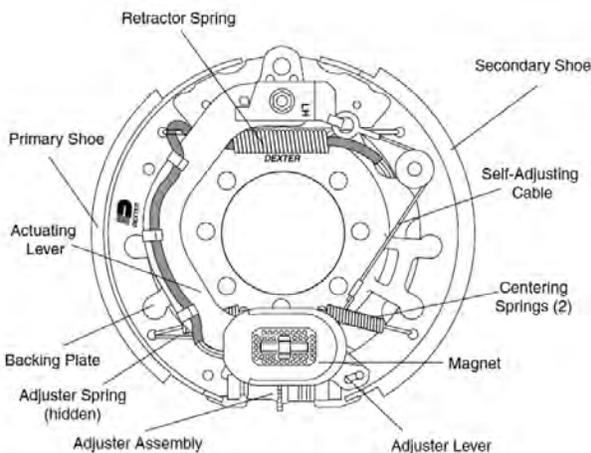
(United States Only) Any and all maintenance or modifications to the Sherman+Reilly™ T-Series trailer assemblies must be done in accordance with United States Federal and State Department of Transportation Standards, to include all applicable Federal Motor Vehicle Standards covered under Section 571.

Brakes

The T-Series machines are equipped with a self-adjusting air/electric brake systems.

- ✓ Brakes should be adjusted after the **first 200 miles**, and then every **3,000 miles thereafter**. (See self-adjusting instructions in manufacturer's manual).

NOTE: Replacement of linings is necessary when thickness is worn to **1/16inch or less**.



For Air brakes, see trailer manufacturers manual.

For all additional inspection, cleaning, adjustment, and replacement instructions see the manufacturer's manual.

CAUTION: Some older brake linings may contain asbestos dust which can cause serious health problems. Certain precautions should be taken when servicing brakes. See manufacturer's manual for instructions.

Towing

Prior to towing, the trailer must be hooked up to a vehicle and hitch capable of supporting and towing a trailer/machine of this size and weight, while ensuring that the hitch is secure, and trailer lighting and air hoses are connected.

- ✓ Hitches and the trailer king pin(s) should be inspected prior to towing the vehicle.
- ✓ If air suspension system or brake system does not fully charge with air after connecting vehicle air supply system, or there is an obvious air leak, a full inspection must take place.
- ✓ If air leaks are identified, they must be fixed prior to attempting to tow the trailer.

NOTE: The approximate trailer weights are:

- **T-2608:** 18,500 lbs
- **T-7212 (5th Wheel):** 21,500 lbs.
- **T-7212 (Pintle eye):** 30,000 lbs

Maintenance

Trailer Assembly

Tires

- The T-2608 comes standard with four tires.
- The T-7212 comes standard with eight tires.



- The required air pressure for these tires is posted on the tire sidewall.
- Tire pressure should be checked each time before towing/operation, and weekly thereafter to ensure proper inflation.
- Tires should be inspected for wear and damage at least every **3,000 miles or 3 months**.
- The specifications for the tires can be found on the tire sidewall.



CAUTION: Replacement tires must meet the same specifications as the originals. Tires for Sherman+Reilly™ machines meet specific duty requirements, as well as weight and roadway/speed ratings. Mismatched tires and rims may come apart with explosive force causing personal injury. Mismatched and underrated tires can also blow out causing vehicle and roadway accidents that can create serious injury or death for those involved.

Wheels

- Wheel lug nuts should be torqued in accordance with manufacturer's specifications.
- Wheel lug nut torque should be checked in accordance with the maintenance schedule to ensure safe towing operations. (See *Preventive Maintenance Schedule*)



CAUTION: Wheel nuts or bolts must be tightened and maintained at the proper torque levels to prevent loose wheels, broken studs, and potential dangerous separation of the wheel from the axle, which can cause accidents, personal injuries, and death.

For all additional inspection, cleaning, adjustment, and replacement instructions see the manufacturer's manual.

Maintenance

Trailer Assembly

Axle Drum Oil

- Axle drum oil should be checked each time prior to towing or moving the trailer.
- Axle drum oil should be just below the oil cap plug hole.
- If axle drum oil level is low, remove the axle drum oil cap plug, pour in fluid until the fluid level is just below the oil cap plug hole, and replace the plug. *(A funnel may be required to avoid spilling fluid.)*



Maintenance

Trailer Assembly

Trailer Lighting

All trailer lights should be inspected to ensure they work prior to transport. (For replacement see Parts section.)

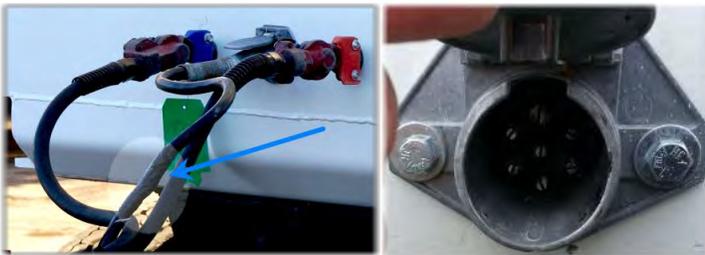


If none of the lights work:

- ✓ Check vehicle/trailer wire and wire connectors for damage or corrosion.

The vehicle/trailer wire connectors can vary, dependent upon owner/customer requirements.

- ✓ Also, check lighting junction box for damage. Open and inspect wires for loose or corroded connections.



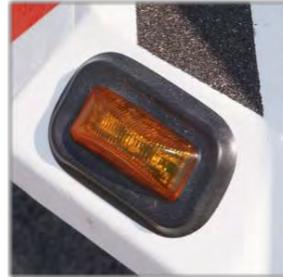
Maintenance

Trailer Assembly

Lighting Replacement

To replace trailer lighting, remove existing lighting by one of several methods, dependent upon the light:

- ✓ Pop out the lighting pod from its rubber grommet holder, by pushing from the inside toward the outside, or pushing in from the outside and reaching into the hole to pull the pod back through to the outside of the trailer. Once out of the rubber, unplug connection, and replace with new pod:



- ✓ Pop Tabs: Some lighting may require the use of a screw driver to unsnap the light from its retaining tabs.



- ✓ Unscrew: Some lighting may require the use of a screw driver to unscrew the light from its housing.



Maintenance

Electrical Equipment

Only authorized and qualified personnel should be allowed to work on the electrical system.



- ✓ If connectors, cables or other electrical parts show breaks, tears, cuts, are scoured out or show brittle spots, etc., they must immediately be replaced. During these operations, keep the covers of the electrical devices shut.



- ✓ Checking the electrical parts is limited to checking the correct connection of cables and connectors. Scoured cables must be fixed. Charred contacts must be replaced.



- ✓ Furthermore, the lighting system of the chassis must be checked. This check should be made while the traction vehicle is connected. The trailer lighting system must function in sync with the traction vehicle. Defective light bulbs must be replaced.
(See Towing and Road Safety).



- ✓ The electrical circuit diagrams of the machine describing the cable routes in detail can be made available upon request to S+R. The fuses and relays are located under the dash in the operators cab.



Maintenance

Pre-Operation Inspection Checklist (Page 1)

NOTE: Pre-operation checklist should be conducted in accordance with OSHA requirements, to include OSHA Standard- 29 CFR, Parts 1926.601, 1926.952, 1926.955, and 1926.150, as well as NFPA Standard No. 10-2013. It is recommended that pre-operation inspections be done before leaving the yard or garage.

- 1. Check fuel level and battery charge-** With key inserted in master power key switch, turn key to the On position to activate the display. The fuel level will show on the engine information screen.



- 2. Check windshield washer fluid level.** Reservoir is mounted inside the engine enclosure, on the curb-side of the machine).



- 3. Open all engine compartments,** while inspecting compartment latches.

NOTE: Be sure the engine covers are replaced and latched in position properly before transport or operating the machine.



- 4. Check inside engine compartment for debris.**

- 5. Check the engine radiator coolant level,** by opening the radiator cap.

CAUTION: Ensure radiator cap is reinstalled and tightened prior to operations.



- 6. Inspect bullwheel surfaces for signs of damage or excessive wear.**



- 7. Check for proper engine oil level.** After checking oil level, wipe dipstick clean of any debris prior to reinserting into spout.

- 8. Ensure proper hydraulic fluid level in reservoir for hydraulic system,** by viewing the sight gauge on the side of the tank.



- 9. Inspect hydraulic pump, drive motors, and hoses for loose fittings, leaking fluid, and damaged hoses.**



Maintenance

Pre-Operation Inspection Checklist (Page 2)

- 10. Inspect the battery, terminals, and add wires for any signs of corrosion or damage.**



- 11. Close all engine compartment panels and re-secure all latches.**

CAUTION: Unless operating in an extreme heat environment, ensure all engine compartment panels are re-secured and latched in position properly before operating or transporting the machine.



- 12. Inspect all reel hoses for signs of damage or excessive wear. Inspect tool box contents and ensure it is closed when complete.**



- 13. Inspect for structural damage, bent or broken parts, cracked or broken welds, missing pins and retainers.**



- 14. Inspect all equipment grounds for any signs of damage.**



- 15. Inspect all jacks for damage or leaking hydraulic components.**

- 16. Inspect reel stand drive motor(s), drive bar, drive pin, and reel shaft coupling(s) to ensure they are secure and that there are no obvious signs of damage- if damaged do not operate, service may be required.**



- 17. Inspect fairleads and rollers for any obvious signs of damage, and ensure rollers move freely.**



Maintenance

Pre-Operation Inspection Checklist (Page 3)

18. Inspect all Fire Extinguishers.

- a. Inspect fire extinguisher charge, and ensure that gauge shows within charge limits.

NOTE: If undercharged or overcharged, see instructions on label-replacement may be required. **(Additional minimum monthly/annual inspections required. See instruction label on extinguisher for details.)**



- b. Inspect the physical condition of the extinguisher- (cylinder, hose/cone assembly, etc.), for any signs of damage or corrosion.
- c. Ensure that hinge pin is in place, to prevent accidental discharge.
- d. Ensure that the plastic safety seal is secured to hinge pin, and that it has not been removed.

NOTE: If safety seal is missing or is broken; extinguisher may have been tampered with or have already been used, thereby indicating the need for re-inspection or replacement.

- e. Inspect mounting strap/bracket assembly to ensure extinguisher is secured to structure.



19. Conduct towing readiness inspection.

- a. Inspect all trailer connections, and ensure that the hitch is secured, and air supply/electrical hoses and trailer lighting are connected.
 - i. Inspect tail lights to ensure all lights work- replace bulbs as needed. If none of the lights work, inspect vehicle fuses and trailer wiring for corrosion.
 - ii. Ensure that trailer brakes work and that wheel chocks are available.
- b. Check tire pressure- tire pressures are posted on the tire sidewall.
 - i. If tire pressure is low, inspect tire for damage or punctures. If damaged or punctured, have repaired or replace.
- c. Ensure air suspension system controls are set correctly, and that air system is charged- if equipped.
- d. Ensure that all jacks are raised and that trailer is clean and free from trash or debris.



Maintenance

Post-Operation Inspection Checklist (Page 1)

NOTE: Post-operation checklist should be conducted in accordance with OSHA requirements, to include OSHA Standard- 29 CFR, Part 1926.600.

1. Check engine oil, radiator coolant, and hydraulic fluid levels- to ensure no leakage after operations.



NOTE: It is necessary to open the engine covers to check the fluid levels. Be sure all covers are closed and latched in position properly before transport or operating the machine.

If machine is to be parked in a publically accessible area or area adjacent to a roadway or construction site, the engine compartments must be secured/locked.

2. Close all windows on the Safe-Zone™ Cab, remove the master keys from the control panel, and shut and lock the door.



NOTE: It is important that the windows are closed, the door is locked, and that all keys are removed to prevent unauthorized access or tampering with the equipment, especially when the machine is parked in a publically accessible area or area adjacent to a roadway or construction site.

3. If leaving machine parked/unattended at night adjacent to a roadway or occupied construction area, caution should be taken to ensure that there is no obstruction of the reflectors- all reflectors must be visible.

4. When parking the machine, the wheels should be chocked and the air suspension should be dumped. When parking the machine/trailer on an incline, having the wheels chocked is extremely important.



5. Disconnect and store all hoses used for the reel stands.

6. Set the reel stand/trailer lock dogs/collars, then secure all rope/conductor ends to the reel using a tie-off rope around the reel or an industrial zip tie.



Maintenance

Post-Operation Inspection Checklist (Page 2)

7. Remove any trash, rags, or other loose material from the machine, to keep the machine clean and so as not to create a fire hazard.

Storage:

- ✓ For periods of extended storage without use, the batteries will need to be periodically charged. A low amperage “trickle” charger can be used periodically to maintain proper battery charge during periods of extended storage.



- ✓ During extended storage, the trailer tire pressures should be periodically monitored, as heavy trailer weight on low tires can create permanent buckling of the tire sidewall resulting in the need for tire replacement.



Periodic refilling of the tire air pressure during seasonal temperature changes may be required- always see the specified air psi. ratings listed on the tire sidewall.

Maintenance

Preventive Maintenance Schedule (Page 1)

NOTE: All preventive maintenance steps detailed in this sections are in addition to the required pre/post-operation inspection steps.

NOTE: All Preventive Maintenance should be conducted in accordance with OSHA requirements, to include OSHA Standard- 29 CFR, Part 1910.147.

WARNING: System must be tagged/locked out prior to removing any machine guarding, removing any system component, or performing any maintenance outside of basic visual

Reference Hydraulic Power Engine Manufacturer's (DEUTZ) Manual

For all hydraulic power engine models, please refer to manufacturer's manual for complete maintenance schedule and instructions- (See Appendix A).

Reference Axle/Brake/Suspension Assembly Manufacturer's Manual

For all axle, brake, and trailer suspension assembly models, please refer to manufacturer's manual for complete maintenance schedule and instructions- (See Appendix B).

Break-In Period

First 50 hours	Check Battery for Proper Charge, Corrosion of Battery Terminals.
First 25 miles	Check Trailer Wheel Lug Nut Torque. <i>See Trailer Wheels Section</i>
First 50 miles	Check Trailer Wheel Lug Nut Torque. <i>See Trailer Wheels Section</i>
First 100 miles	Check Trailer Wheel Lug Nut Torque. <i>See Trailer Wheels Section</i>
First 200 miles	Adjust Brakes. <i>See Brake Section</i>

Trailer Safety

Weekly/Routinely	Inspect trailer axle assembly for alignment, broken or damaged spring leaves- where applicable.
Weekly/Routinely	Inspect axle drum oil level, and fill to just below drum plug.
Weekly/Routinely	Check tire air pressure. <i>See Tires Section</i>
3 Months/3,000 Miles	Inspect tires for wear and damage. <i>See Tires Section</i>
3 Months/3,000 Miles	Check trailer wheel lug nut torque. <i>See Trailer Wheels Section</i>
3 Months/3,000 Miles	Adjust brakes. <i>See Brake Section</i>
6 Months/6,000 Miles	Inspect trailer Brake Magnets and Brake Controller. <i>See Brake Section</i>
6 Months/6,000 Miles	Inspect Trailer Air Brake System Components. <i>See Brake Section</i>
6 Months/6,000 Miles	Inspect Trailer Suspension for bending, loose fasteners, and wear.
6 Months/6,000 Miles	Inspect wheels for damage, (i.e. cracks, dents, or distortions).

Maintenance

Preventive Maintenance Schedule (Page 2)

NOTE: All preventive maintenance steps detailed in this sections are in addition to the required pre/post-operation inspection steps. All Preventive Maintenance should be conducted in accordance with OSHA requirements, to include OSHA Standard- 29 CFR, Part 1910.147.

WARNING: System must be tagged/locked out prior to removing any machine guarding, removing any system component, or performing any maintenance outside of basic visual inspections.

The indicated intervals for basic preventive maintenance work apply to normal operating conditions and stress. The manufacturer is not responsible for damages caused through faulty and inappropriate handling of the machine. The below table represents basic preventive maintenance outline, all other maintenance and instructions can be found in OEM equipment manuals. In the table below the following key letters are used:

PN CHECK, if necessary REFILL	S LUBRICATE
PE CHECK, if necessary. REGULATE 7 ADJUST	W CHANGE
PW CHECK, if necessary CHANGE	P CHECK
R CLEAN	L CHARGE

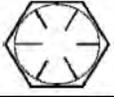
Maintenance work to be performed	Before each use of the machine	Weekly or when necessary	Yearly or every 300 hours of service	Every 2 years or 600 hours of service
Cleaning and care	—	R	R	R
Mechanical system	PW	PW	PW	PW
Electrical equipment	PW	PW	PW	PW
Hydraulic system	—	PW	PW	PW
Hydraulic oil	PN	PN	W	—
Hydraulic oil return filter	—	PW	PW	W
Oil filter cartridge at the hydraulic pump	—	PW	PW	W
Transmission oil in the bull wheel gearing	—	—	PN	W
Motor oil	PN	PN	W	W
Coolant	PN	PN	PN	PN
Hydraulic and engine coolant	—	R	R	R
Battery	—	—	PW	PW
Fuel filter	—	—	—	W
Air filter	P	R	W	W
Lubrication	—	S	S	S
Groove tread	—	—	PW	PW

Maintenance

Torque Ratings for Machine Fasteners

Torque ratings for fasteners on this piece of equipment follow ANSI accredited guidelines for ASTM/ASME specifications on tightening torque. As a general rule, tightening torque should be set according to the below table, with a tolerance of approximately + / - 5%, unless other specific torque rating is noted in this manual. The below table is for advisory purposes only.

General Recommended Torque for Fasteners by Size:

Nominal Dia. (in.)	 SAE J429 Grade 5			 SAE J429 Grade 8		
	Tightening Torque			Tightening Torque		
	K = 0.15	K = 0.17	K = 0.20	K = 0.15	K = 0.17	K = 0.20
Unified Coarse Thread Series						
1/4	76 in-lbs	86 in-lbs	101 in-lbs	107 in-lbs	122 in-lbs	143 in-lbs
5/16	157	178	209	221	251	295
3/8	23 ft-lbs	26 ft-lbs	31 ft-lbs	33 ft-lbs	37 ft-lbs	44 ft-lbs
7/16	37	42	49	52	59	70
1/2	57	64	75	80	90	106
9/16	82	92	109	115	130	154
5/8	113	128	150	159	180	212
3/4	200	227	267	282	320	376
7/8	322	365	429	455	515	606
1	483	547	644	681	772	909
1 1/4	840	952	1121	1363	1545	1817
1 1/2	1462	1657	1950	2371	2688	3162
Fine Thread Series						
1/4	87 in-lbs	99 in-lbs	116 in-lbs	123 in-lbs	139 in-lbs	164 in-lbs
5/16	174	197	231	245	278	327
3/8	26 ft-lbs	30 ft-lbs	35 ft-lbs	37 ft-lbs	42 ft-lbs	49 ft-lbs
7/16	41	47	55	58	66	78
1/2	64	72	85	90	102	120
9/16	91	103	121	128	146	171
5/8	127	144	170	180	204	240
3/4	223	253	297	315	357	420
7/8	355	403	474	502	568	669
1	542	614	722	765	867	1020
1 1/4	930	1055	1241	1509	1710	2012
1 1/2	1645	1865	2194	2668	3024	3557

Source: Fastenal

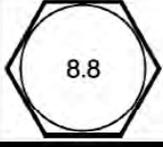
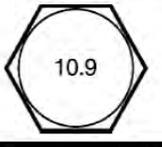
Torque ratings for 1/4" and 5/16" are listed in inch-pounds. All other torque ratings are listed in foot-pounds. (K = .15 for "lubricated" conditions) (K = .17 for Zinc plated and dry conditions) (K = .20 for plain and dry conditions).

Maintenance

Torque Ratings for Machine Fasteners

Torque ratings for fasteners on this piece of equipment follow ANSI accredited guidelines for ASTM/ASME specifications on tightening torque. As a general rule, tightening torque should be set according to the below table, with a tolerance of approximately + / - 5%, unless other specific torque rating is noted in this manual. The below table is for advisory purposes only.

General Recommended Torque for Fasteners by Size:

Nominal Dia. (mm)	 Class 8.8			 Class 10.9		
	Tightening Torque			Tightening Torque		
	Lubricated (ft-lbs)	Zinc Plated (ft-lbs)	Plain&Dry (ft-lbs)	Lubricated (ft-lbs)	Zinc Plated (ft-lbs)	Plain&Dry (ft-lbs)
4	1.7	1.9	2.3	2.4	2.7	3.2
5	3.4	3.9	4.5	4.9	5.5	6.5
6	5.8	6.6	7.7	8.3	9.4	11.1
7	9.7	11.0	13.0	13.9	15.8	18.5
8	14.1	16.0	18.8	20.2	22.9	26.9
10	27.9	31.6	37.2	39.9	45.2	53.2
12	48.7	55.1	64.9	69.6	78.9	92.8
14	77.8	88.1	103.7	111.3	126.1	148.4
16	121	137	161	173	196	230
18	167	189	222	239	270	318
20	236	267	314	337	382	449
22	321	364	428	460	521	613
24	407	461	543	582	660	777
27	597	676	796	854	968	1139
30	809	917	1079	1158	1312	1544
33	1101	1248	1468	1576	1786	2101
36	1415	1603	1886	2024	2294	2699

Source: Fastenal

All torque ratings are listed in foot-pounds. Torque value formula $T=KDF$ where; (K = .15 for "lubricated" conditions) (K= .17 for Zinc plated and dry conditions) (K= .20 for plain and dry conditions).

CAUTION: Under/Over tightening fasteners can result in costly equipment failure or personal injury.

Maintenance

Lubrication Chart

CAUTION: Do not mix transmission oils on polyalphaolefine base with oils on polyglycol base.

	Engine oil to -10°C	Engine oil to -25°C	Hydraulic oil to -10°C	Hydraulic oil to -25°C	Transmission oil	Multi-purpose grease
Identification Qualification	SAE 10W-40	SAE 5W-30	HLP 32 HEES 46	HVLP(D) 32 HEES 22	CLP 220 based onPAO	KP2K-30
	ACEA E4-99	ACEA E4-99	DIN 51524-T2	DIN 51524-T3	DIN 51517-T3	DIN 51502
	MB 228.5	MB 228.5	Bosch Rexroth RE 90 220-1			MB 267
	MAN 3277	MAN 3277				MAN 283 Li-P 2
Oil company	Oil Type					
Agip	Sigma TFE 10W-40	Agip SIGMA TRUCKSINT TFE	Agip OSO 32 Arnica S46	Autol HVI 32 Arnica S22	BLASIA 220	Agip GR MU / EP 2
Aral	Extra Turboral 10W-40	SuperTurboral 5W-30	Vitam GF 32 Vitam EHF 46	Vitam HF 32 Vitam EHF 22	Degol PAS 220	Aralub HLP 2
AVIA	AVIA TURBOSYNTH HT-E 10W-40	AVIA TURBOSYNTH HT-U 5W-30	AVIA FLUID RSL 32 AVIA SYNTOFLUID N 46	AVIA FLUID HVI 32 AVIA SYNTOFLUID N 22	AVIA GEAR RSX 220	AVIALITH 2 EP
BP	Vanellus E7 Plus 10W-40	Vanellus E8 Ultra 5W-30	Energol HLP HM 32	Energol EHPM 32	Energol HTX 220	Energol LS-EP 2
Castrol	Enduron 10W-40		Hyspin AWS 32 Biohyd SE46	Hyspin AWH-M 32 Biohyd SE22	Alphasyn T 220	Tribol 3020/1000-2
Fuchs	TITAN CARGO MC 10W-40	TITAN CARGO SL 5W-30	RENOLIN B 10 Plantosyn 3268 ECO	RENOLIN MR 520 Plantohyd 22S	Renolin Unisyn CLP 220	RENOLIT EP 2
Klüber			LAMORA LP 32		Klübersynth GEM 4-220 N	CENTOPLEX 2 EP
Mobil	Delvac XHP LE 10W-40	Delvac XHP Ultra 5W-30	Nuto H 32 EAL Hydraulic Oil 46	Univis N 32	Mobilgear SHC 220	Mobilgrease MB 2
Shell	Shell Rimula Signia 10W-40	Shell Rimula Ultra 5W-30	Tellus 32 Naturelle HF-E 46	Arctic 32	Omala HD 220	Shell Retinax EPL2
Texaco	URSA SUPER TDX 10W-40	URSA PREMIUM FE 5W-30	RANDO HD 32 Hydra 46	RANDO HDZ 32	PINNACLE EP 220	MULTIFAK EP 2
TOTAL	RUBIA TIR 8900 10W-40	RUBIA TIR 9200 FE 5W-30	AZOLLA AF 32 Biohydran SE 46	EQUIVIS ZS 32	Carter SH 220	MULTIS EP 2

Service & Repair

NOTE: For service or repair please contact the Sherman+Reilly Parts & Service Department at parts@sherman-reilly.com or call (423)756-5300.

EQUIPMENT INFORMATION	
Company Name:	_____
Date of Purchase:	_____
Date of Manufacture:	_____
Equipment/Unit Model Number:	_____
Equipment/Unit VIN Number:	_____
Engine Serial Number:	_____

Major Fault:

A “major fault” describes a system malfunction or other system degradation that, by equipment failure, operator error, or other environmental condition, renders that machine inoperable. A major fault can be identified when, through normal operations, the machine would create; an unsafe condition, further or permanent equipment damage, or other situations deemed outside of the operator’s ability to effectively and safely operate the machine.

When to send for Service or Repair:

If after troubleshooting an issue or fault that cannot be resolved, or a major fault has been identified, the operator should stop all operation attempts and contact the Sherman+Reilly™ Parts & Service Department. Further operation should not continue until the issue or fault is resolved- (See Fault and Malfunction Detection Section).

Scan with Smartphone to complete and email repair request form.



Parts

NOTE: Parts or features may only apply to certain models or build configurations, for questions, parts ordering, and pricing inquiries please contact the Sherman+Reilly™ Parts & Service Department at parts@sherman-reilly.com or call (423)756-5300.

Sherman+Reilly Accessories:

Bundle Block 70 Series 36.5 in. UUU	701410
Helicopter Attachment for Bundle Block 70 Series 36.5 in. UUU	370141
Block Ground Steel Center for Bundle Block 70 Series 36.5 in. UUU	306019
Block Ground Aluminum Center for Bundle Block 70 Series 36.5 in. UUU	303009
Bundle Block Rack	305712
Running Board (1) D-300 / (2) D-160	602058
Running Board (1) D-300 / (2) C-100	602056
Reel Stand CRS-96/67-20K	601233
Transmission Unit Hydraulic Hose Kit	600298

Miscellaneous Replacement Parts:

Fire Extinguisher	553858
Wheel Chocks, Rubber, (8"x5 ¼"x9"H)	552974
S+R Logo Mud Flap	550620

Appendix

TORQUE PROCEDURES FOR HYDRAULIC FITTINGS



Rev. 14 July, 2015

Introduction:

Proper torque of hydraulic connectors is required to ensure, not only a good seal on connector, but to ensure the seal lasts the life of the product. Over torque can lead to permanent damage of hydraulic components and under torque can lead to leaks that may be hard to find as well as hard to fix after final assembly is complete. Sherman and Reilly currently spends around 20 man hours a month on locating the source of leaking hydraulic fittings and fixing them. The use of proper torque values and torque seal will help to minimize leaking hydraulic issues.

The following procedure will provide torque values and guidance for installing any and all hydraulic lines and fittings that are used on Sherman + Reilly equipment. There are several types of hydraulic fittings and connections used on Sherman + Reilly equipment. The fittings consist of the following types:

- Adjustable port end assembly
- Non-adjustable port end assembly
- Flange ports
- Bulkhead locknut assembly
- JIC 37.

With each of these types of fittings, there are two (2) methods used to tighten the fitting after installation. The first and preferred method is the torque method. The second method is known as the Flats from Wrench Resistance (FFWR) or “Flats” method. Both methods will be explained in this procedure. All values listed in this procedure pertain to dry and clean threads.

CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.

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Adjustable Port End L-series adapters:

1. Inspect components for any damage to threaded parts and install the o-ring if not already installed. Inspect o-ring for signs of damage and lubricate lightly with system fluid, i.e. hydraulic fluid.
2. Back off lock nut as far as possible. Make sure back-up washer is not loose and is pushed up as far as possible. (Fig. 1)

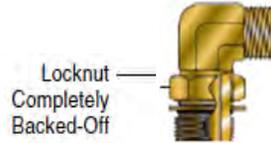


Fig. 1

3. Screw adapter into port until the back-up washer or the retaining ring contacts face of the port. Light wrenching may be necessary. **Over tightening may damage washer.** (Fig. 2)



Fig. 2

4. To align the tube end of the adapter to accept incoming tube or hose assembly, unscrew the adapter by the required amount, but not more than one full turn.

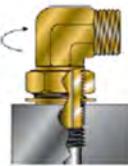


Fig. 3

5. Using two wrenches hold adapter in desired position and tighten locknut to the proper torque value from the table listed below. See Fig. 4 for visual and Table 1 for torque specification

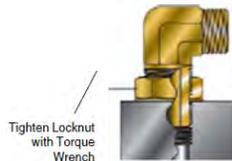


Fig. 4

TABLE 1

SAE Dash size	Thread size	Torque value (+10%-0%)	
		ft. lbs. (in. lbs)	*Aluminum block Torque Value
2	5/16-24	(60)	(39)
3	3/8-24	(100)	(65)
4	7/16-20	(180)	(117)
5	1/2-20	(250)	(162.5)
6	9/16-18	(350)	(227.5)
8	3/4-16	(620)	(403)
10	7/8-14	85	55.25
12	1 1/16-12	135	87.75
14	1 3/16-12	175	113.75
16	1 5/16-12	200	130
20	1 5/8-12	250	162.5
24	1 7/8-12	305	198.25
32	2 1/2-12	375	243.75

4 Bolt Split flange assembly:

The 4 bolt split flange assembly consists of 4 main components. Refer to Fig. 5 below.

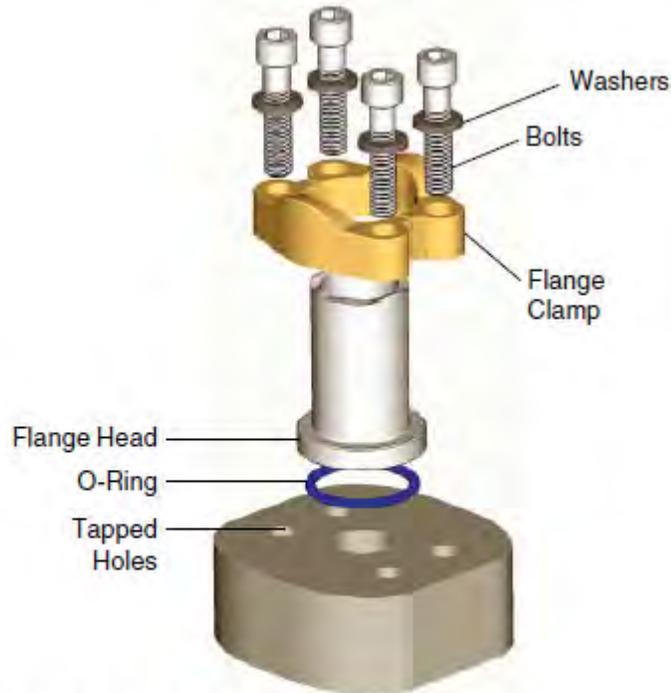
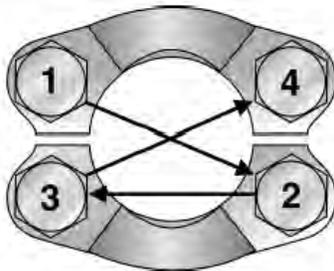


Fig. T8 – 4-Bolt Split Flange Components

Fig. 5

The steps to properly assemble the flange port clamping bolts are as follows:

1. Make sure sealing surfaces are free of burrs, nicks, scratches, or any foreign particles. Lubricate the O-ring and position flange and clamp halves as shown in figure above.
2. Place lock washers on bolts and insert through clamp halves and hand tighten bolts.
3. Torque bolts in diagonal sequence (see Fig. 6) in small increments to the appropriate torque level listed in Table 2.



Flange Bolt Tightening Sequence

Dash Size	Flange Size	Inch Bolt (J518)	Torque ft. lbs.	Metric Bolt (ISO 6162)	Torque N-m
8	1/2	5/16-18	17 ± 2	M8	25
12	3/4	3/8-16	30 ± 4.5	M10	49
16	1	7/16-14	46 ± 4.5	M12	85
20	1-1/4	1/2-13	69 ± 6	M14*	135
24	1-1/2	5/8-11	125 ± 8	M16	210
32	2	3/4-10	208 ± 20	M20	425

Fig. 6

Table 2

CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.

Flat Face O-Ring Seal Fitting:

The following describes the preferred method for the tightening of O-Ring face seal style connections. The steps to properly install the O-Ring face seal style connections are as follows:

1. Inspect fitting, port, O-rings to insure they are free of dirt or defects
2. Lubricate O-ring and install into groove using a good amount of petroleum jelly to hold the O-ring in place
3. Start fitting and tighten by hand, pressing joint together to ensure O-ring remains in place
4. Torque to value shown in Table 3 per the dash size stamped on the fitting. **Do not allow hoses to twist when tightening fittings.**

The recommended installation method for this type of connection is the torque method using the following table, Table 3 below.

Flat Face O-Ring Seal Fitting Torque					
Nominal			Thread Size	Swivel Nut Torque	
Tube mm	O.D. (In.)	Dash Size	In.	N·m	(lb-ft)
6.35	0.250	-4	9/16-18	24	18
9.52	0.375	-6	11/16-16	30	22
12.70	0.500	-8	13/16-16	47	35
15.88	0.625	-10	1-14	75	55
19.05	0.750	-12	1 3/16-12	114	84
22.22	0.875	-14	1 3/16-12	114	84
25.40	1.000	-16	1 7/16-12	156	115
31.75	1.250	-20	1 11/16-12	193	142
38.10	1.500	-24	2-12	225	166

Table 3

CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.

Seal Lok connections:

The following describes the preferred method for the tightening of seal-lok style connections. The recommended installation method for this type of connection is the torque method using the following table, Table 4.

Dash Size	Swivel Nut Torque		Flats From Wrench Resistance (FFWR)
	Newton Meters (+10% / -0)	Pound Feet (+10% / -0)	
-4	25	18	1/2 - 3/4
-6	40	30	1/2 - 3/4
-8	55	40	1/2 - 3/4
-10	80	60	1/2 - 3/4
-12	115	85	1/3 - 1/2
-16	150	110	1/3 - 1/2
-20	205	150	1/3 - 1/2
-24	315	230	1/3 - 1/2
-32	-	-	-

Table 4

CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.

JIC 37 Degree flare:

The following describes the preferred method for the installation of all JIC 37 degree flare connections. This connection type is the most common type of connection used here at Sherman and Reilly. Once hand tightened, the recommended method of installation is known as the Flats From Wrench Resistance (FFWR) method. Refer to Table 4 for values used in this method. Fig. 7 is a description of how to use the FFWR method.

Dash Size	Flats From Wrench Resistance (FFWR)	Swivel Nut Torque	
		Newton Meters (Ref)	Pound Feet (Ref)
-4	2	18	13
-5	2	23	17
-6	1-1/2	30	22
-8	1-1/2	57	42
-10	1-1/2	81	60
-12	1-1/4	114	84
-16	1	160	118
-20	1	228	168
-24	1	265	195
-32	1	360	265

Table 5

CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.

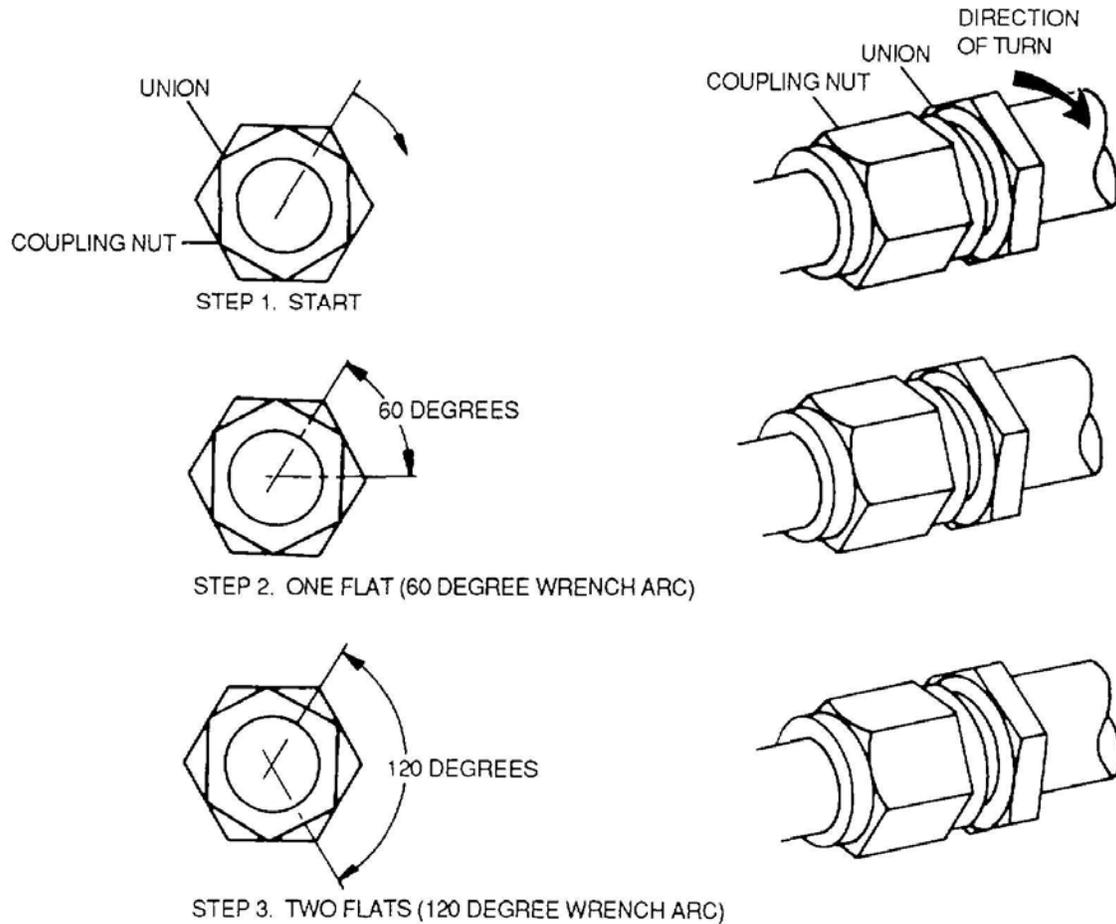


Fig. 7

Torque Seal:

Once the connections are made, with the proper method using the values from the appropriate table, the assembler will then apply a visual inspection aid known as torque seal. Torque seal is a lacquer used in production on compression fittings, studs, nuts, parts, and assemblies after they are in proper torque position. Torque seal can be applied in the following manner as demonstrated in figures 8 and 9.



Fig. 8



Fig. 9

Although a problem may not be detected at the plant during testing, improper torque can lead to eventual break down of the equipment during normal and consistent field use.



CAUTION: Failure to follow these procedures can lead to catastrophic failure of equipment that can lead to injury or even death.



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