GENERAL SERVICE MAINTENANCE

1. **Tires**
   a. Check daily for cuts, bulges, unusual wear, objects between and embedded in tires.
   b. Check inflation regularly; refer to inflation pressure rating on side of tires.

2. **Rims**
   a. Inspect lug nuts daily.
   b. Re-torque after first 50-100 miles of service.
   c. Check for rim slippage.
   d. Periodically check wheel torque.

3. **Hub Oil Level**
   a. Check frequently – every 1000 miles.
   b. Use SAE 80/90 or better for your application to replace or top up.
   c. Change every 100,000 miles or once a year.
   d. Service leaking seals immediately.
   e. For more information refer to wheel bearing section of Trailer Axles.

4. **Suspension**
   a. Inspect daily, looking for broken or cracked leafs, loose or missing bolts and general condition.
   b. Regularly check for worn bushings, loose parts, cracked welds, etc…
   c. For air rides and lift suspensions, check condition of bags and shocks. Replace when needed.
   d. For more information refer to suspension section.

5. **Brake Chambers**
   a. Frequent visual inspections are necessary. If a problem is sighted follow safety instructions in Brake Chamber section. Improper service or repair could cause severe injury or death.

6. **Automatic Slack Adjusters**
   a. Pre-trip inspections must include checking the movement of push rods with rods with slacks on each axle. With brakes applied, the angle of the push rod to the center line of slack and to the mounting face of brake chamber must be 90 degrees + -5 degrees.

7. **Air Tanks**
   a. Drain tanks daily to prevent buildup of moisture and contamination.
   b. Refer to Pneumatic section for more information.

8. **Glad Hands**
   a. Keep clean. Check screen and rubber seal frequently.
   b. When not in use if possible, cover with dummy glad hands.

9. **Trailer Frame and Body**
    a. After the first month and every 6 months thereafter inspect the trailer frame for cracks in structure and welds.
    b. Check for anything loose throughout the trailer.
    c. Check suspension welding and bolt torque, referring to proper section for ratings.
    d. Examine the king pin and end plate for unacceptable wear and tear.
    e. All welding repairs must be done by competent welders to manufacturers specifications.

10. **Electrical**
    a. Check lights daily, replace as needed using equivalent or better replacement.

11. **General Inspection**
    a. Inspect complete trailer (all systems) every six months.

12. **Drain Holes in Fifth Wheel Plate**
    a. Grease and dirt must be cleaned from all drain holes in fifth wheel plate. This check and service must be done weekly to prevent the plate from deteriorating due to build-up of water and other material trapped on top of coupler plate.

13. **Turntable**
    a. All screw connections are to be inspected at regular intervals for tightness and tightened if necessary.

ATTENTION

Maintain Originally Specified Tire Sizes

Titan Trailers recommends that the originally specified tire sizes always be used on your Titan trailer. Refer to your "Trailer Specification Sheet" provided in this manual for these specifications.

Changing the tire size will affect the suspension ride height range. This could result in clearance issues, especially when steering.

Please Note: Warranty will be voided for issues arising from the installation and use of the improper tire sizes.

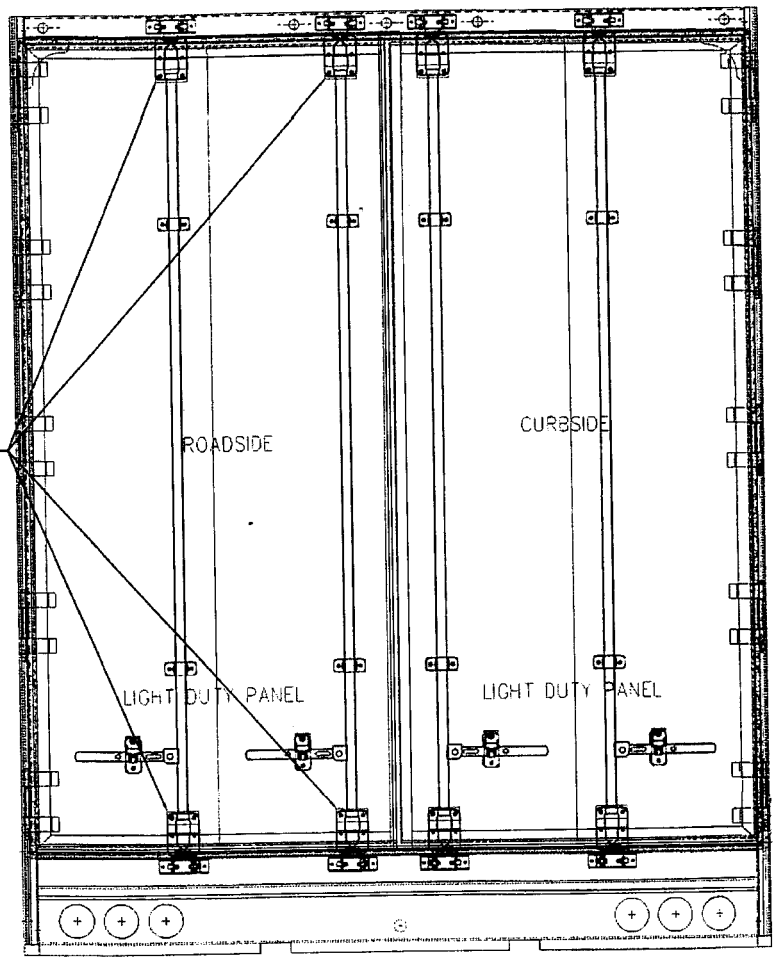
TITAN TRAILERS INC.

Strength Through Innovation

TITAN VAN STYLE DOORS

TO ENSURE PROPER PERFORMANCE OF YOUR VAN STYLE DOORS WE RECOMMEND THAT YOU PERIODICALLY MONITOR THE AMOUNT OF PLAY IN THE DOOR. THE CONSTANT MOVEMENT AND VIBRATION OF A TRAILER MAY CAUSE PREMATURE WEAR IF YOUR TRAILER DOORS ARE NOT PROPERLY TIGHTENED. TIGHTEN DOORS AS REQUIRED BY ADJUSTING THE LOCK-RODS WITH SHIMS.

USE SHIMS AT THESE LOCATIONS ON LEFT AND RIGHT DOORS



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LUBRICATION

ALL TRAILERS – Grease – Low Temperature – Multi-purpose

Auto Slacks (See Brake Parts for Haldex Slacks)

a) All are factory sealed and greased.
b) Minimum suggested lubrication is every 3 months or 50,000 miles under ideal driving conditions.
c) Under more extreme conditions (city driving, ice and salt) you should lubricate more frequently up to once a week.

Brake Cam Shaft

a) Two grease nipples one at a slack spline end and the other at the spiders end
b) Minimum suggested lubrication is once a month.
c) Under more extreme conditions, lubricate more often as required.

Landing Gear

a) Lube leg fittings twice a year.
b) Lube two speed gear fittings twice a year minimum, more if necessary.

ALUMINUM AND STEEL DUMPS

Box Hinges

a) For high dumping usage – minimum weekly lubrication.
b) For less frequent operating – grease as required.

Hoist

a) Grease nipple on top and bottom of cylinder.
b) For hing dumping usage – grease weekly
c) For less frequent use – grease as required

Tailgate and Doors

a) High dumping usage – grease weekly
b) Less frequently – grease as required

WALKING FLOORS

Doors

a) Once a month or as required.

TIPPERS

Tailgate Latching Underside

a) As required depending on usage.

HOPPERS

Hopper Door Linkage

a) Gear box, knuckle and shaft bearing as required depending on usage.

DOLLYS

Turntable Bearing

a) The turntable bearing is to be lubricated via the grease nipples with BPW special long- life grease ECO-Li 91 (lithium complex grease) every 25000km, but at least after every 3 months (or after every 2-3 weeks under extreme operational conditions). The grease must not be mixed with other (calcium base or sodium base) lubricants.

PNEUMATIC

1. Be sure air supply is compatible with trailer requirements. With multi-axle trailers (three or more, with a lift) the recommended air displacement of compressor should be 16cfm with a compression cut in a 100-105 psi and a cut out at 120-125 psi. This will ensure the best operation of trailers air systems under most circumstances.

2. Drain "All Reservoirs Daily".

3. Make sure air supply is clean. Air supply should be free of oil, moisture and contaminants that will harm valves and other components of the system.

4. DO NOT contaminate air lines with any alcohol based products. Pouring alcohol in the air lines will cause lubrication on 'O Rings' in valves to dry up, resulting in seal deterioration and valve problems. This will directly and adversely affect trailer brakes, accessories and valve warranty.

5. Replacement hardware – hoses, tubing and fittings must be of equivalent size, length, type and strength of O.E.M/ (original equipment manufacturer).

6. Use only genuine original product replacements. Valves may look identical but there could be dramatic differences inside that may affect the systems.

7. Never disconnect a pressurized air line or plug. Be sure pressure has first been depleted.

8. Always block vehicles wheels when working under a trailer. Depleting a vehicle's air may, under certain circumstances cause it to roll.

9. Never exceed recommended air pressure. Maximum air pressure 125psi. Always wear glasses when working with air and never look directly into the air stream or direct at others.

10. Never re-plumb or replace valves with different ones unless by an authorized licensed trailer mechanic.

ANY CHANGE FROM ORIGINAL DESIGN COULD CAUSE THE TRAILER NOT TO CONFORM TO 'CMVSS OR FMVSS 121' REGULATIONS.

TITAN TRAILERS INC.

Strength Through Innovation

CAUTION LOW AIR PRESSURE

Running a Titan Trailer under a condition of low air pressure, under the recommended 100-105 psi cut in and 120-125 psi cutout, will adversely affect the operation of trailer systems in high usage times. Consequences of running with low air pressure could be:

1. Excessive wear on brake linings as spring brakes start to apply.

2. Excessive drum heating with dragging brakes.

3. Loss of control of lift axles since air will be directed to service brake system before other systems (protected to 75 psi)

4. Lift axle tires dragging, with the combination of little air in ride system and spring brakes activating, there will be no weight on axle to prevent dragging and no air to lift axle.

For Titan's multi-axle trailers we recommend that the tractor compressor's air displacement should no be less than 16 cm. This will ensure that best operation of the air systems under most circumstances.

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MERITOR WABCO

Electronic Braking System (EBS)

Meritor WABCO, the leader in ABS technology, presents the newest product in its vehicle control systems offering...the electronic braking system (EBS).

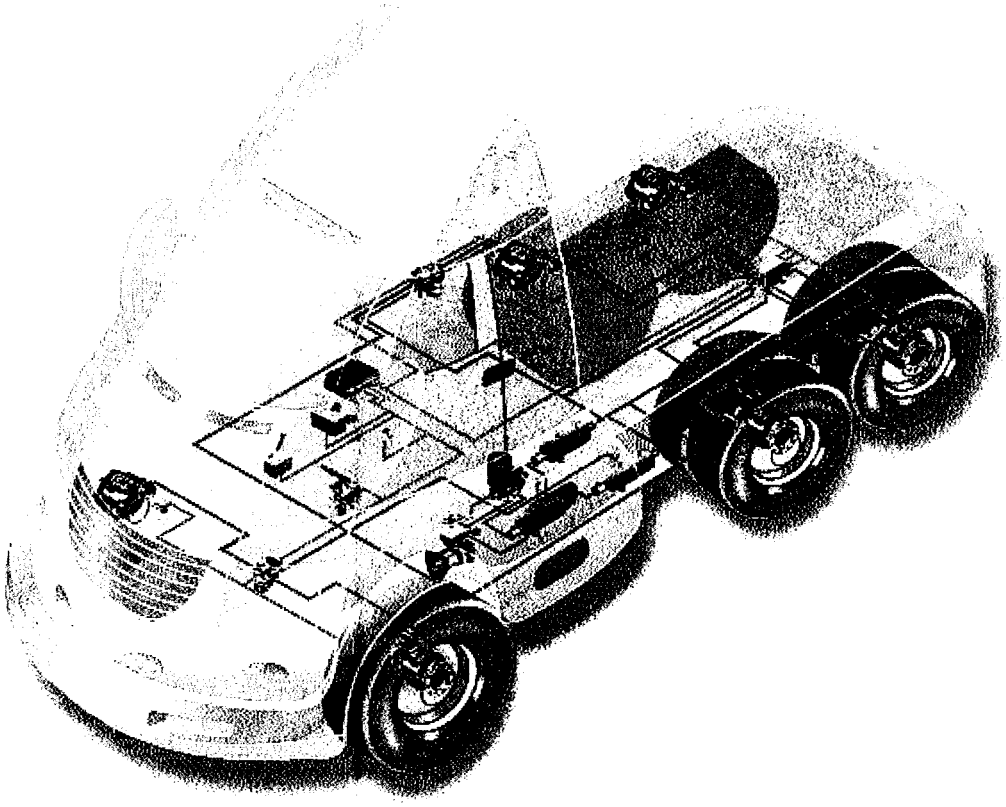
EBS, or "brake-by-wire," integrates anti-lock braking system (ABS) technology, automatic traction control (ATC) and other key vehicle control system features to offer the next generation of braking.

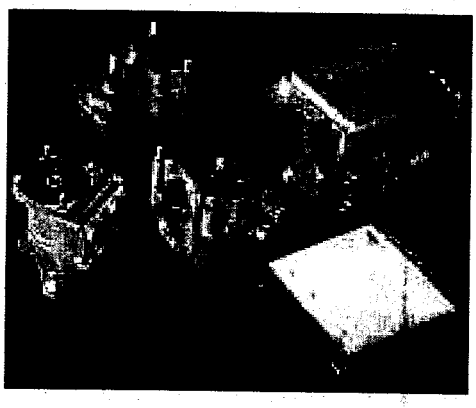
EBS utilizes electronics for the control side of the vehicle's braking system. More specifically, an electronic signal replaces the air signal sent by the brake pedal to activate the brakes, improving stopping distances and braking system performance. And, EBS will provide the platform for the advanced safety systems of the future.

Benefits of EBS

- Reduces number of brake system components and air lines
- Enhanced diagnostics of the complete braking system
- Detects brake fade and notifies the driver if wear levels become critical
- Provides more predictable braking control
- Shortened stopping distances
- Improved vehicle stability and driver control
- Brake "feel" like passenger car
- System control and diagnostics information transmitted over J1939 and J1587 data links

Complete Braking System With EBS





EBS Is the Foundation for Future Electronic Developments

- Electronic stability control (ESC) — Maintains stability and enhances performance during non-braking maneuvers, such as rapid lane change or cornering, as well as during braking situations.
- Improved brake wear through integrated control of retarders, equalization of lining wear and continuous adjustment of individual brake pressures.
- Provides capability for integrated adaptive cruise control (ACC) — a forward-looking detection system that automatically adjusts the vehicle cruise speed to create a safe following distance.

MERITOR WABCO

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SP-20145 (426732/11900)

INFORMATION DOCUMENT

Directive 71/ 320 – Annex XIV
ECE Regulation 13/10

Trailer Anti-Lock Braking System
Information Document
ID_EB123_8

Electronically controlled Brake System (EBS) for trailers

Trailer EBS E
Trailer EBS E with TCE

2S/ 2M - 4S/ 3M

			COPYRIGHT			WABCO		
			APPR. LEV.	DATE	NAME			
			COMPILER	15.01.2007	A. Stender	Trailer EBS E		
			2	15.01.2007	N. Witte			
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			TRI		PRODUCT IDENTIFICATION NO.	DOC.NAME	SHEET	
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Introduction

Information document for Trailer EBS

This information document is produced in accordance to Annex XIV of Directive 71/320/EEC and Annex 19 of ECE R13. The information contained in this document is used for the type approval of the prescribed braking system.

1 General

1.1 Name of manufacturer

WABCO GmbH & CO. OHG
Vehicle Control Systems
An American Standard Company

WABCO Fahrzeugbremsen
Am Lindener Hafen 21
D-30453 Hannover

1.2 System name/model: Trailer EBS

1.3 System variant: E

Versions:

Trailer EBS E

Trailer EBS E with TCE*

* TCE: Trailer Central Electronic

Note: Regarding the description of the above mentioned different versions see paragraph 2.1.3 of ID_EBS.

1.4 System configurations

2S/2M, 2 sensors and one trailer modulator for 1- to 3-axle semi- and centre-axle trailer with air suspension or mechanical suspension.

2S/2M+SLV, 2 sensors, one trailer modulator and one select low valve for 2- to 3-axle semi- and centre-axle trailer with air suspension or mechanical suspension and one self-steering axle.

4S/2M, 4 sensors and one trailer modulator for 2- and 3-axle semi-and centre-axle trailer with air suspension or mechanical suspension.

4S/2M + 1M, 4 sensors, one trailer modulator and one ABS-relay valve for 3- to 4-axle semi-trailers and 3-axle centre-axle trailers with air suspension or mechanical suspension.

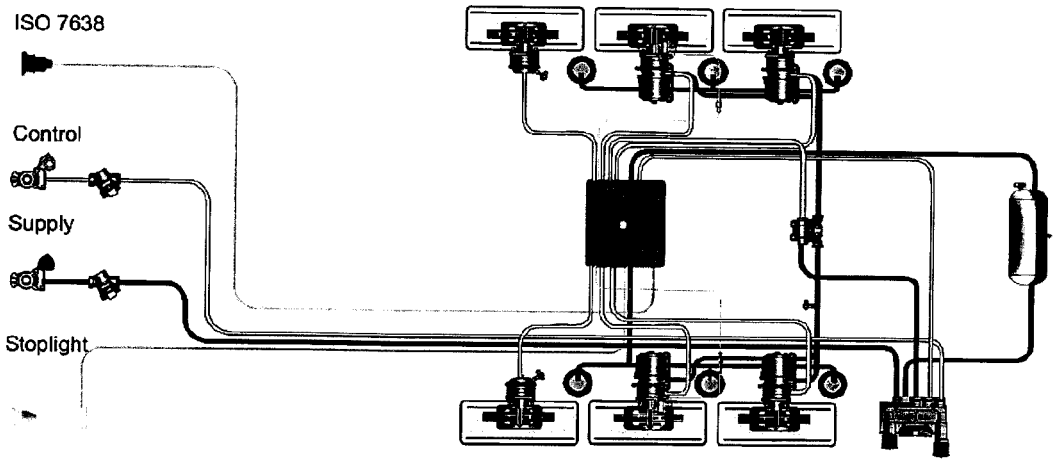
4S/3M, 4 sensors, one trailer modulator and one EBS-relay valve for 2- to 3-axle full trailers and 2- to 3-axle semi-trailer and 2- and 3-axle centre-axle trailer with air suspension or mechanical suspension.

1.5 Explanation of the basic functions and philosophy of the system

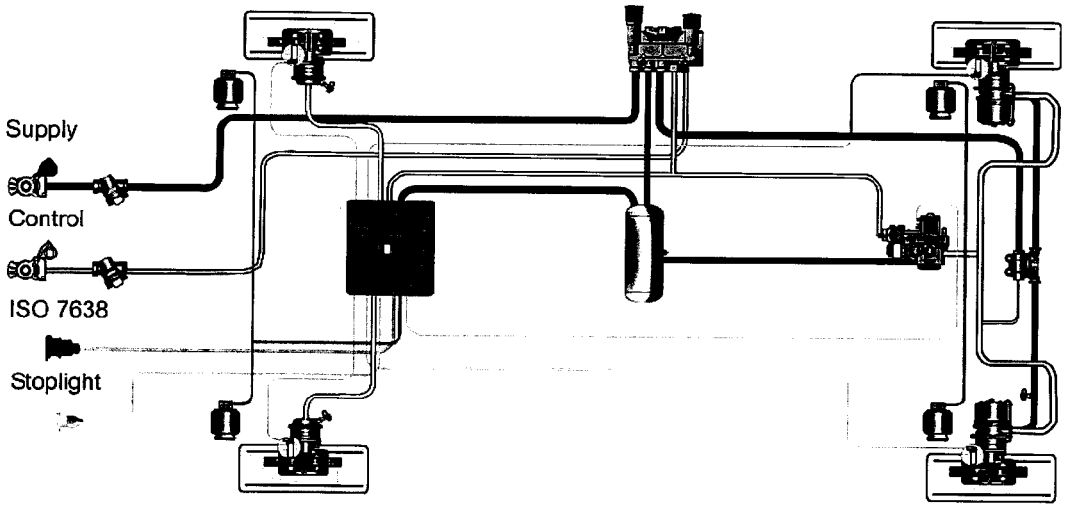
Electronically controlled braking system with load-dependent brake pressure regulation and automatic anti-lock device.

1.5.1 System structure

The standard EBS system for a three-axle semi-trailer is shown in the following figure. Itcontrols the brake pressures electronically on each side. The system is made up of a dual-circuit trailer modulator (2) with digital data interface according to ISO 11992 to the EBS towing vehicle, an EBS relay emergency valve or Park Release Emergency Valve (PREV) (1), and the ABS sensors.



When used in full trailers or semi-trailers, with a steering axle, a system with an additional EBS relay valve (7) on the steering axles is used.



Trailers with this brake system are compatible with conventional and EBS-braked towing vehicles. They can be braked with pneumatic redundancy in the case of an EBS failure on the trailer. This results in three possible modes of operation:

a) Operation behind towing vehicles with EBS and extended (7 pin) ISO 7638 plug-type connection with CAN interface according to ISO 11992.

All EBS functions can be utilised. The driver's braking demand (set value) is transmitted via the data interface to the trailer vehicle.

b) Operation behind conventional towing vehicles with ISO 7638 plug-type connection, without CAN interface

All EBS functions can be used except for transmission of the demand value via the CAN interface. The demand value is specified by the pressure sensor in the relay emergency valve. This pressure sensor measures the trailer control line pressure.

c) Redundancy operation

1. without ISO 1185 or ISO 12098-powering

If the electrical power supply fails or is not plugged in the braking is controlled pneumatically, although **without load-dependent brake force control** and **without ABS function.**

2. with ISO 1185 or ISO 12098-powering as a safety function

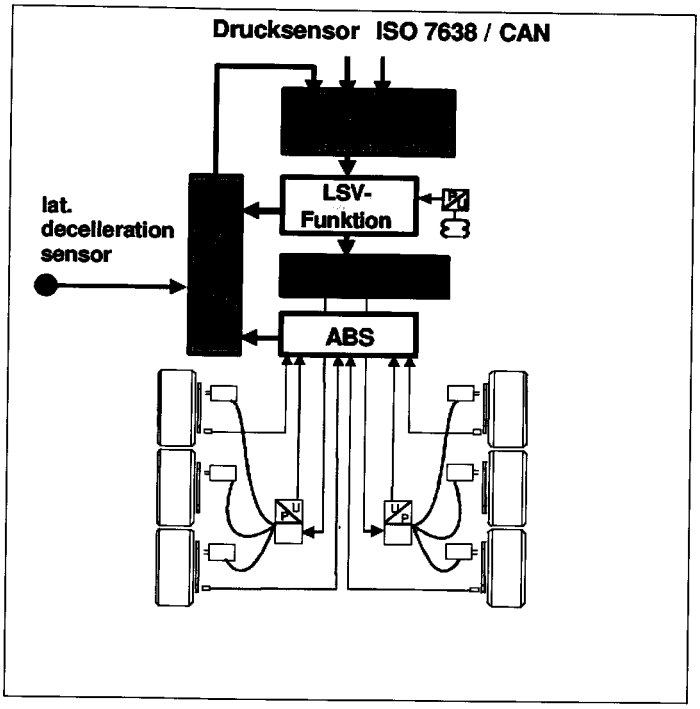
It is not allowed to use the trailer without the ISO 7638 connector. If the electrical power supply via ISO 7638 fails and the system is fitted by an ISO 1185 or ISO 12098-cable (optional feature), the system can be supplied by this optional connection (stoplight-powering). In this case only ABS and the load-dependent brake force control are in function with reduced performance.

1.5.1.1 Description of the EBS-functional blocks

The Trailer EBS mode of functioning can be described in terms of various sub-functions.

1.5.1.1.1 Selection of demand value

The demand value is the driver's braking request. When operated behind an EBS towing vehicle the trailer modulator obtains the demand value via the trailer interface from the EBS towing vehicle. If no demand value is available via the trailer interface, e.g. when operating the trailer behind a conventionally braked towing vehicle or if the trailer interface in the case of EBS combination is interrupted, a demand value is generated by measuring the control pressure. As a matter of priority, control is always the demand value via CAN.

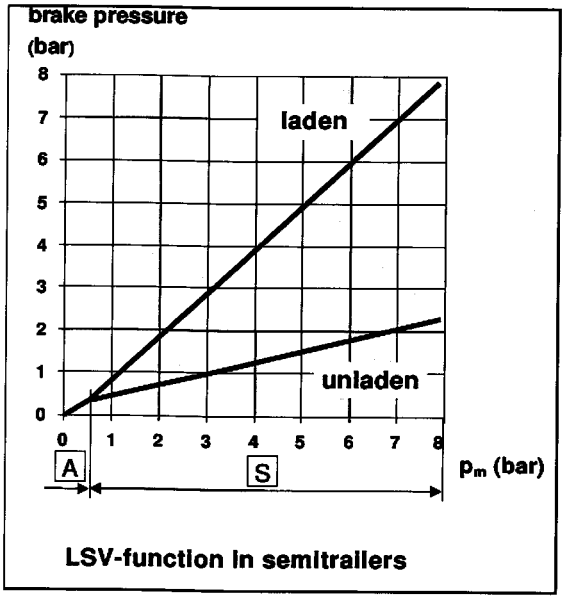


1.5.1.1.2 LSV- function

The Trailer EBS contains the **load-dependent brake force control**, a distinction being drawn between semi-trailers or centre-axle trailers and full trailers.

The current loading state is determined by sensing the air-suspension bellows pressure.

In case of semi-trailers, as at present, a static linear control function is used. The transmission function of brake pressure (p_{cyl}) to coupling head pressure (p_m) is broken down into two ranges:



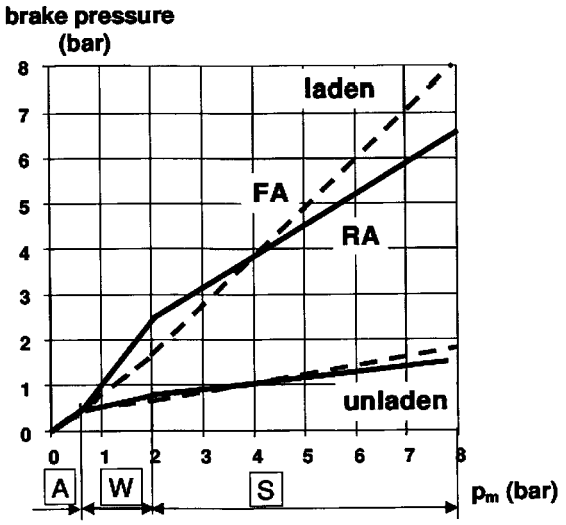
LSV-function in semitrailers

A • Application range

S • Stability range

In the example the brake cylinder pressure in the application range (p_m = 0 bar to p_m = 0.8 bar) rises from 0 to 0.4 bar. At p_m = 0.8 bar the threshold pressure of the wheel brake is reached, and the vehicle can start to generate brake force. The parameters for this point, in other words the response pressure of the whole trailer brake, can be set within the framework of the EEC bands.
Subsequently the brake pressure with laden vehicle follows the straight line which passes through the calculated value at p_m = 6.5 bar. With the unladen vehicle the response pressure is also modulated from p_m = 0.8 bar, and the brake pressure reduced in accordance with the load.

With a full trailer the brake force distribution, achieved on a software basis, replaces the two LSV valves, the adaptor valve on the front axle and the pressure limiting valve on the rear axle which are commonly used at present.



brake force distribution in drawbar trailers

Here the transmission function is broken down into three ranges:

- A application range
- W wear range
- S stability range

At the end of the application range, the response pressures of the brakes are adjusted again, and these pressures may of course differ from axle to axle.

In the partial braking range the pressures are adjusted so as to optimise wear. For a full trailer with, for example, type 24 cylinders on the front axle and type 20 cylinders on the rear axle the pressure to the front axle is reduced in accordance with the design and raised on the rear axle. This ensures uniform loading of all wheel brakes more precisely than can be achieved with the adaptor valve currently used.

In the stability range, the pressures corresponding to equal utilisation of adhesion are adjusted as a function of the axle load.

The rear axle load is determined from the air-suspension bellows pressure. The front axle load is determined, without an axle load sensor, from the slip difference between the speed-sensed wheels.

The parameters are calculated using the WABCO brake calculation program. The parameters are stored in the trailer modulator with the corresponding brake calculation number. The system checks the proper function of the axle load sensor.

1.5.1.1.3 Pressure control

The pressure control circuits convert the set pressure specified by the LSV function into cylinder pressures.

The control unit compares the actual pressures measured at the output of the relay valves with the set pressure specified. If a deviation arises, this is corrected by actuating the supply or exhaust solenoids.

1.5.1.1.4 Anti-lock function (ABS)

The control logic recognises, from the speed behaviour of the wheels, whether one or more wheels display a "locking tendency" and decides if the related brake pressure is to be lowered, maintained or raised.

Each wheel is controlled in its optimum range following this concept (**M**odified **A**xle **C**ontrol (MAR), **M**odified **S**ide **C**ontrol (MSR), **I**ndividual **C**ontrol (IR)).

1.5.1.1.5 Standstill function

With the vehicle at a standstill ($v \leq 1.8$ km/h) **and** when the control pressure (pneumatic and electric) is constant for 3 s, there is a switch from electro-pneumatic to pneumatic pressure adjustment. This function serves to prevent unnecessary power consumption when the vehicle is stands still e.g.. at a traffic light or if the handbrake is applied and ignition is on. This function is deactivated when the vehicle moves.

1.5.1.1.6 Emergency braking function

In order to apply the maximum possible brake force there is an emergency braking function. If the driver's braking command corresponds to more than 90% of the pressure available on the trailer, in other words panic braking is applied, the brake pressures are increased in a ramp fashion up to the characteristic of the vehicle in laden condition.

This function is also effective if the bellows of the air suspension system bursts.

1.5.1.1.7 Monitoring of brake air pressure

The supply pressure in the trailer vehicle is monitored by the EBS.
If the supply pressure falls below 4.5 bar the driver is warned by a warning light which illuminates. When the braking system is filling the warning light only goes out when the supply pressure in the trailer vehicle rises above 4.5 bar.

1.5.1.1.8 Lifting axle control

In conjunction with a WABCO lift axle control valve the EBS controls the lifting axle automatically as a function of the current axle load.

1.5.1.1.9 Integrated speed switch

This output can be used, for example, to lock a self-steering axle at higher speed.

1.5.1.1.10 Lining wear sensing

The system can read in max. 6 lining wear sensors or wear indicators. The driver will be warned when the wear limit is reached.

1.5.1.1.11 Roll stability support

The system is equipped with a system to prevent roll over of the trailer when exceeding the possible lateral acceleration.

1.5.1.1.12 Electronically controlled air suspension

As an option the system can control the air suspension of a trailer by an integrated control algorithm.

1.5.1.1.13 Parameter Setting

Variable parameters: The following parameters must be set in the production by the trailer manufacturer.

Vehicle type	semi-trailer or full trailer
Number of axles	for semi-trailers are allowed a max. of 3 axles and for full trailers 3 axles
ABS-system	installed ABS-system and position of sensors
Lift axle control	1 or 2 lift axles controlled
Integrated speed switch	to control self-steering axles or air suspension
Roll stability support (RSS)	for semi-trailers and centre-axle trailers
Lining wear sensors	to choose the type of wear sensors
Warning lamp sequence	on, after 2 s off or on – off - on- at 7 km/h off
Tyre diameter and pole wheel teeth number	to calibrate the wheel speeds for ABS and odometer
Service interval	The driver will be informed after a specified distance
Axles load unladen and laden	to adjust the load sensing function
Air bellow pressure unladen and laden	to adjust the load sensing function
Brake pressure unladen and laden	to adjust the load sensing function
Special functions	special functions like traction help or telematic support can be choosen
Electronically controlled air suspension	to control the level in trailers with air suspension
GIO- functions	special functions like lift axle control, speed switch, traction help or telematic support can be chosen

2. Applications

2.1 List of trailer types and ABS configurations

Single or multi-axle semi-trailer, centre- axle trailers or full trailers of categories O3 and O4 according to Directive 71/320/EEC, with air suspension or mechanical suspension, disc or drum brakes.

	Semi trailer			Centre-axle trailer			Full trailer	
Number of axles ⇒ ABS configuration	1	2	3	1	2	3	2	3
2S/2M	X	X	X	X	X	X		
2S/2M+SLV		X	X		X	X		
4S/2M		X	X		X	X		
4S/2M + 1 M		X	X		X	X		
4S/3M		X	X		X	X	X	X

For sample diagrams see 3.5.

2.2. Schematic diagrams of the system configurations

Appendix 1 shows possible configurations of sensors and modulators for the different trailers defined in item 2.1.
For possible length and diameters of tube/pipe length see 3.5.

2.3 Relationship of tyre circumference to the resolution of the exciter

The ratio between tyre circumference [mm] and pole wheel teeth number must be between 22 and 40.
The actual tyre circumference and pole wheel teeth numbers are stored in the trailer modulator.

2.4 Tolerance on tyre circumference between one axle and another fitted with the same exciter

The inter wheel variations of rolling circumference must not exceed a value of 6,5 %. Otherwise, the rolling circumference must be adjusted by setting parameter in the trailer modulator.

2.5 Scope of application with respect to suspension type

The Trailer EBS is applicable to trailers with air suspension or mechanical suspension. Appendix 2 defines the specific suspension types by manufacturer for use.

2.6 Recommendations on differential brake input torque in relation to the ABS configuration and trailer bogie

For multiple-axle applications an almost identical utilization of friction of these axles is required. If all of the wheels are not fitted with sensors, the axle(s) which usually lock(s) first must be equipped with sensors.

Multiple-axle applications having only static axle load proportioning must be equipped in that way that the wheels of all axles reach their locking point simultaneously and that one wheel directly controlled

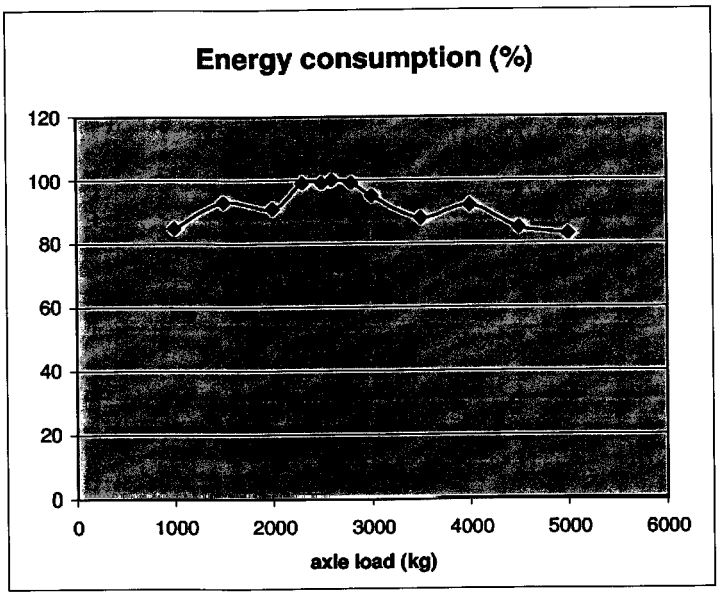
- does not control more than two other wheels
  or
- in the case of central axle trailers does not indirectly control more than one wheel or one axle

Differentials on brake input torque are admissible for all anti-lock configurations within a range of 20 %.

2.7 Test data of energy consumption

The energy consumption has been tested according to paragraph 6.1 of annex 10 of 98/12/EG and annex 13 of ECE R 13, respectively. To determine the worst case a variation of axle load has been made. Within a range of ±10,000 N of the worst case, the energy consumption for different ABS configurations has been determined.

During all energy consumption tests the load-sensing valve was in a fully laden position. The following diagram represents the data from the energy consumption tests. It gives the supply pressure after ABS control of 15 sec and five additional brake applications. The worst case axle load is 2600 kg.



2.8 Additional information to the application of the anti-lock braking system

When the vehicle is first put into service the parameters must be set and the system checked in accordance with the vehicle equipment using the WABCO Trailer- EBS PC diagnostic program. If this sign-off procedure is not followed, the warning light will not go out during operation, even if the system is fault-free. The parameters for the load-dependent brake pressure control and tyre circumference are determined by means of the WABCO brake calculation

3 Component description

3.1 Sensors and exciters

3.1.1 Wheel speed sensors

The sensors transmit the information from the rotating toothed wheels to the trailer modulator. Based on this information the ECU calculates the wheel and vehicle speeds. Special care must be taken to ensure accurate speed information.

Identification:

Wheel speed sensors: WABCO part number	441 032 ... 0 441 035 ... 0

Sensors are mounted in clamp bushings, WABCO part number 899 760 510 4, 899 759 815 4 or 899 759 882 4

3.1.2 Exciters

Exciters according WABCO specification 895 905 000 4

3.1.3 Pressure sensor

The sensor can be used optional as an external driver demand sensor in long vehicles or as an external axle load sensor.

Identification:

Pressure sensor: WABCO No.	441 040 007 0 to 441 040 015 0 441 044 0010 and 441 044 002 0

3.1.4 Levelling sensor

The sensor can be used in systems with integrated electronically controlled air suspension (Premium variant) and in trailers with mechanical suspension to measure the axle load.

Identification:

levelling sensor WABCO No.	441 050 1.. 0 .

3.2 Controllers

3.2.1 Trailer modulator

The trailer modulator (TM) serves to control and monitor the electro-pneumatic braking system. The TM is installed in the braking system between the reservoir, relay emergency valve and the brake cylinders. It controls the brake cylinder pressure on both sides of one, two or three axles.
The TM communicates directly or via TCE (Trailer Central Electronic see 3.2.2) using the extended ISO 7638 connector with the motor vehicle via the electric trailer interface according ISO 11992. The TM has two pneumatically independent pressure control circuits, each with a supply and exhaust valve, redundancy valve, pressure sensor and common control electronics. The required deceleration of the vehicle is determined from the pressure signal received from the CAN demand value. The TM has an integrated axle load sensor. If necessary an external demand sensor and axle load sensor can be connected. The TM has also a connector for lining wear sensor(s). The brake force is modified as a function of the vehicle load (brake force distribution function). In addition the wheel speeds are registered and analysed via up to four rotary speed sensors. If there is a locking tendency the braking pressure specified for the brake cylinder is controlled by the ABS control circuit. The TM has an electrical connection for the ABS or EBS relay valve. With this connection, it is possible to control the brake pressure of an axle separately. In the TM the reservoir pressure is sensed so that the driver can be warned if there is any pressure loss.

There two variants available. The Standard variant covers only 2S/2M applications, whereas the Premium variant covers all applications and in addition includes the electronically controlled air suspension.

Identification:

Trailer modulator: WABCO No. Standard variant: 480 102 030 0 – 480 102 058 0
Premium variant: 480 102 060 0 – 480 102 088 0

Failure modes:

The TM monitors itself. In the event of a fault, any parts found to be defective (ECU, sensors, modulator(s)) are selectively switched off, and the warning system is actuated. Even in the event of the whole system being switched off the back-up braking function is maintained **but without load-dependent brake force control** and **without ABS function**. In the case of stoplight-powering only ABS and the load-dependent brake force control are in function with reduced performance.
Correct electrical/electronic function of the EBS is indicated by warning device in the driver's cab of towing vehicle according to the provisions of the ECE R13
Section 5.2.1.29.

Additional features:

- integrated speed switch
- diagnostic interface according to ISO 14230 (KWP 2000)
- automatic lift-axle control
- integrated load proportioning function
- Roll stability control
- Lining wear sensing
- Integrated electronically controlled air suspension

3.2.2 Trailer Central Electronic

The Trailer Central Electronic (TCE) integrates a communication gateway and power distribution facilities for brake and running gear equipment as well as for equipment other than brake and running.

Electronically controlled power supply for brake and running gear equipment is provided via the connector according to ISO7638 with the highest priority given to the power supply of the TM. For equipment other than brake and running gear power supply is provided via the connector according to ISO12098.

For brake and running gear equipment the tractor-trailer CAN data link in the connector according to ISO7638 is used. For equipment other than brake and running the tractor-trailer CAN data link in the connector according to ISO12098 is used.

The TM and other trailer systems are connected to the TCE via a trailer CAN high speed data bus according to ISO11898 with separate physical CAN links. One CAN link is specially assigned for the connection of the TM. In case of a physical CAN link failure the respective link can be switched of individually to maintain communication via the other physical CAN links.

Identification:

Trailer Central Electronic: WABCO part number 446 122 ... 0

Failure detection and handling

The TCE is a self-monitoring system. In case of a malfunction, the power supplies and CAN data links of externally connected systems and components can be individually switched of. Detected failures are stored in a non-volatile memory and can be read out by a diagnostic tool via the central diagnostic connector.

Additional features:

- Loading ramp approach assistance
- Levelling control and lift axle control
- Brake lining wear sensing
- Vehicle lights control

3.3 Modulators

3.3.1 EBS relay emergency valve

Trailer brake valve with emergency brake function without predominance - with demand sensor to measure the towing vehicle control pressure.

Identification:

EBS relay emergency valve WABCO part numbers: 971 002 ... 0
400 600 ... 0

3.3.2 ABS Relay Valve

The ABS relay valve serves the purpose of holding or venting the pressure in the brake chambers, this is being done independently of the pressure that is transmitted by the brake valve of the trailer. Only relay valves without check valve between port 4 and the control chamber of the relay valve are permissible.

Electrically controlled relay valve with two solenoids to hold and vent the brake pressure during ABS-braking of one axle in 4S/2M+1M systems.

Identification:

ABS Relay Valve WABCO part numbers: 472 195 037 0

3.3.3 EBS Relay Valve

Electrically controlled relay valve with pressure sensor and redundancy valve (secondary safety circuit) to control the brake pressure during normal braking and ABS-braking of one axle in 4S/3M systems.

Identification:

EBS relay valve: WABCO No. 480 207 ... 0

3.3.4. Park Relay Emergency Valve (PREV)

Trailer brake valve with emergency brake function and integrated release and park valve.

Identification:

Park Release Emergency Valve WABCO part numbers: 971 002 9.. 0

3.3.5. Select Low Valve (SLV)

Double Cut Off Valve or Relay valve to control self-steering axles in 2S/2M+SLV systems.

Identification:

Select Low Valve WABCO part numbers: 434 500 00. 0

Relay valve WABCO part numbers: 973 001 ... 0
973 011 ... 0

3.4 Electrical equipment

The circuit diagrams in appendix 4 shows the connection of all external components (power supply, sensors and modulators). All components are connected via external connectors, which are moulded and coded to avoid mismatching. The cables and connectors fulfil GGVSE resp. ADR requirements (Test report TÜV Nord No. 1203/04).

Powering methods

Permanent power supply via the connector according to ISO 7638-1997 (7-pin) Part 1 (24 V) **or** to ISO 7638-1985 (5-pin) (24 V).

In the event of ISO 7638 power supply failure to maintain trailer stability during braking: Intermittent power supply via the connector according to ISO 1185 or ISO 12098. In this case only ABS and the load- dependent brake force control are in function with reduced performance.

Warning lamp sequence

The system can output two different warning lamp sequences. The sequences are according to the provisions of the ECE R13 Section 5.2.1.29 and can be changed by parameter setting.

1. Option

When vehicle is stationary:

- Warning light comes on when ignition is switched on.
- Warning light goes off after approx. 2 s if no fault is detected.
- If a fault has been detected e.g. sensor fault, the warning light will stay on.
- If a sensor fault was recorded during the previous journey but is no longer current, the warning light will go off at $v \geq 7$ km/h.

When vehicle is travelling at $v \geq 7$ km/h:

- Warning light comes on, or stays on, if a current error is detected.

2. Option

- Warning light comes on when ignition is switched on
- If no current defect has been detected, warning light goes out after about 2 s, lights up again after a further 2 s, and goes out at $v \geq 7$ km/h.
- If a current defect is detected, e.g. sensor broken off, the warning light stays on.

ISO 1185 (ISO 12098) powering failure warning:

The provision of powering the trailer braking system from the ISO1185 or ISO 12098 connector is to provide a backup in the event of failure of the power supplied via the ISO 7638 connector and therefore there is no failure warning requirement.

Non-specified faults

Non-specified faults are monitored by a flashing warning lamp. After energising the Trailer EBS the flashing of the yellow signal starts after the normal warning signal sequence was completed. When the vehicle speed increases over 10 km/h the flashing warning signal is terminated.
When a specified failure is present the flashing warning lamp signal is replaced by a non-flashing warning lamp signal.

3.5 Pneumatic circuits

Sample brake diagrams for different trailers with standard air brakes are represented in Appendix 4 (page 1 to 8):

Page 1: semi-trailer with 2S/2M and 4S/2M
Page 2: semi-trailer with 2S/2M and 4S/2M with PREV
Page 3: semi-trailer with 2S/2M +SLV
Page 4: semi-trailer with 4S/2M+1M
Page 5: semi-trailer with 4S/3M
Page 6: full trailers with 4S/3M
Page 7: full trailers with 2S/2M and TCE
Page 8: emi-trailer with 4S/2M+1M and mechanical suspension

Limitations on pipe/tube sizes and associated lengths:

The length of the hoses between actuator and brake chambers should be as short as possible.

tube and hoses	min. diameter	max. length
reservoir – trailer modulator	12 mm (see note)	see note
reservoir – EBS (ABS) relay valve	9 mm (see note)	see note
trailer modulator – brake chamber		
directly controlled wheels	9 mm	6 m
indirectly controlled wheels	9 mm	6 m
EBS (ABS) relay valve – brake chamber	9 mm	6 m

Note: energy supply lines between air reservoir and modulator(s): response time according to Annex III of Directive 71/320/EEC or Annex 6 of ECE R13/9 has to be fulfilled.

3.6 Electromagnetic Compatibility (EMC)

3.6.1 Documentation

The system has been proofed to confirm compliance with Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles as last amended by Directive 2006/28/EC.and has been given the following approval marks:

Approval mark e1 *72/245*2006/28*4868*00

Approval mark e1 *72/245*2006/28*1665*01

A copy of the EMC type approval certificates for Trailer EBS-E and TCE are attached as Appendix 5 (3 pages) and 6 (3 pages).

Appendix 1 (page 1/3)

System Configurations

ABS-Configurations for Semitrailer, Centre Axle Trailer and Drawbar Trailer

Lift axles

System 2S/2M: Lift axles shall not be sensed

All other systems: Lift axles can be sensed with ABS-sensors e and f.

Steering axles

Positively steered axles have to be handled like rigid axles.

WABCO recommends that trailers with self steering axles shall be used with 4S/3M, 4S/2M+1M or 2S/2M+SLV configuration.

If 2S/2M or 4S/2M EBS- Systems are used, checks should be carried at the time of type approval of a trailer to ensure that no undue vibration or course deviation is observed. It is not possible to evaluate the reaction of all available steering axles in the case of anti-lock braking control.

In the case of requirement to provide additional stability to a self-steering axle during anti-lock operation the output-signal of the ISS may be connected to a solenoid valve which locks the self steering function at higher speed.

LEGEND: Mounting Instructions for axle boogie types:

= driving direction

= trailer modulator

= two way valve (SHV)

= select low valve (SLV)

= EBS-relay valve

= ABS-relay valve

Arrangement of control channels:
(acc. to wiring diagram
841 801 620 to 841 801 622 0)

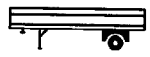
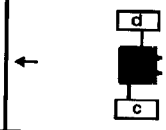
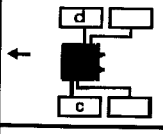
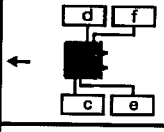
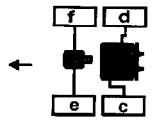
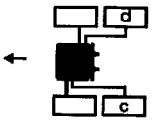
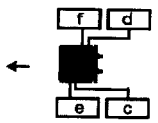
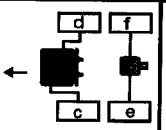
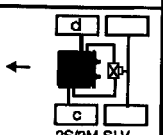
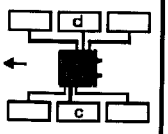
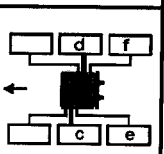
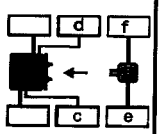
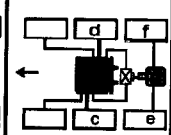
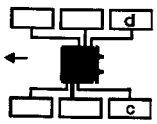
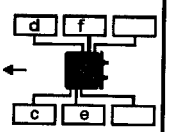
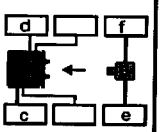
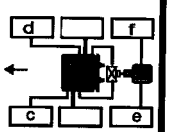
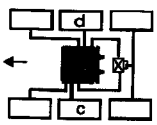
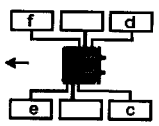
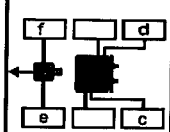
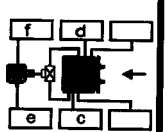
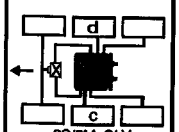
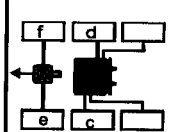
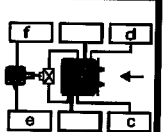
d = sensed (directly controlled)

□ = not sensed (indirectly controlled)

Modulator	Sensors	System axle:	control logic:
M	c, d	main axle (not liftable)	IR / MSR
A/E	e, f	steering axle (liftable)	MAR
Z	e, f	addition axle (liftable)	MSR

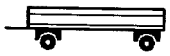
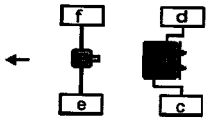
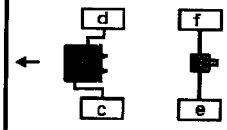
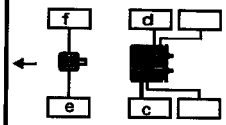
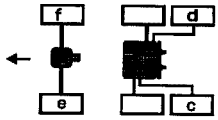
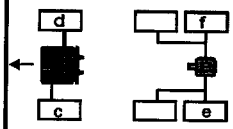
Appendix 1 (page 2/3)

Semi-trailer and Centre-axle Trailer

	Vehicle Type	2S/1M	2S/2M	4S/2M	4S/3M	4S/2M+1M
Centre axle trailer + Semitrailer						
	 + 					
						
			 2S/2M-SLV			
						
						
			 2S/2M+SLV			
			 2S/2M+SLV			

Appendix 1 (page 3/3) **System Configurations**

Full Trailer

	VEHICLE TYPE	2S/2M	4S/2M	4S/3M	*4S/2M+1M*
Drawbar Trailer					
					
					
					
					

Appendix 2 (page 1/3) Scope of suspension types

Manufacturer	Model	Type
BPW	SLO, SLM, SLU ALO, ALM, ALMT, ALMN, ALU, DLU, O, OM, OT	Air suspension, balanced
	VB, GW, BW, W	Mechanical
Cardi	PR, PR	Air suspension, balanced
	MR	Mechanical
Cometto	SP1, SP2	Air suspension, balanced
	MA3 + G1	Mechanical
Daimler Chrysler	DCA	Air suspension, balanced
Fruehauf	FA	Mechanical
Gigant / SAE	LG, TLG, LR, TLR, NLR,TO, NLRM 50, NTLRO 50, TLRM 72, NKLRT 50, NKLRM 50, NLRT 50, TKLRO 50	Air suspension, balanced
	LK	Mechanical
Granning	PTS, PTL	Air suspension, balanced
Hendrikson	HTE, HT 250, HDB	Air suspension, balanced
	HST	Mechanical
Kaiser	RK, RKV2	Air suspension, balanced
Lecitrailer	ALN	Air suspension, balanced
	411	Mechanical
Mecanización	SN	Air suspension, balanced
Meritor	Flexair, Indair, Flexlite, FL, FM, FP, XL	Air suspension, balanced
	SMT	Mechanical
Montenegro	Tipo estandar, Tipo C, Tipo 70	Air suspension, balanced
	Tipo parabólica, Tipo multihoja	Mechanical
Piazenza	U2, N2, P1, R2, S2,V1, V2	Air suspension, balanced
	R2, N2, S2	Mechanical

Appendix 2 (page 2/3) Scope of suspension types

Manufacturer	Model	Type
Rolfo	7T, 10T, 16T	Air suspension, balanced
SAF	Intraax, Intradisk, Intradisk plus, Intradisk plus II, Intradisk plus II integral, IWST, Modular, R421, AR313/413, AR 321/421, U, M, O, EO, HU, EU, XU/XO, PU/PO, IU/IO, SK RS 9042	Air suspension, balanced
SAF	XU,XO,PU,PO,IU,IO,VU,VO AR U, M, O BM, BO HU	Air suspension, balanced
	VA	Mechanical, balanced
	VR, VER, W	Mechanical
Schmitz	MRH, AC	Air suspension, balanced
SMB	NA, SA, ZA	Air suspension, balanced
	FA, M2 Cantilever	Mechanical
		Mechanical
Trouillet	9T12, 9T13, 11T ;SP912 ; SP913 ; SP1113 ; Monosam ; Bisam 5235 ; Bisam 5222 ; Monolame; Mecanosoude ; Mecanosude a composant Samro	Air suspension, balanced
Tridec	225120 HV-V 226606 HV-A 226935 HV-A	Air suspension, balanced
Weweler	Euro, Heavy Duty, Mega Lite, Specials, Ultra Lite, DLS, Premium Lite, Tipper, Heavy duty +	Air suspension, balanced
Viberti – Acerbi	A.V. Pn molla 70	Air suspension, balanced
Zorzi	B4P, R4P, R6P, R10P, S6P, S10P, S12P	Air suspension, balanced
	S6M, S10M, R10M	Mechanical

Appendix 2 (page 3/3) Scope of suspension types

Manufacturer	Model	Type
Castera	SR01.E1... SR01.E2... SR01.E3... SR02.E1... SR02.E2... SR02.E3... SR03.E1... SR03.E2... SR03.E3... SUSP.R09.00 SUSP.R15.00 SUSP.R19.00 SUSP.TPCB15.00	Mechanical
	SP05... SP06... SH01	Air suspension
Trailona	TG 933250000, TG921450000, TDPIHO01020, TG974651000 TG933451000, TG981351000, TG966151000	Air suspension, balanced
	GTL-nx116, TL-nx116, GTL-nX136, TL-nx136, GTL-nx152, TL-nx152	Mechanical
Fruehauf	FA, JA	Mechanical
Leciñena	ALN-01.X, ALN-02.X, ALN-03.X ALN-04.X, ALN-05.X, ALN-08.X, ALN-09.X, ALN-10.X, ALN-23.X, ALN-25.X, ALN-27.X, ALN-28.X	Air suspension, balanced
	120025100001, 411052, 120025100029, 411039, 120025100030, 411015, 120025100031, 411021,	Mechanical
	120025100063, 411011	

Appendix 3 (page 1/2) Failure-Deactivation Matrix

	WABCO Failure Deactivation Matrix	Semitrailer 4S/3M	Semitrailer 4S/2M + 1M	Semitrailer 2S/2M	Semitrailer 4S/2M	Trailer 4S/3M with 2 axle load sensors	Trailer 4S/3M with one axle load sensor	ABS-Axle e,f deativation (1)	ABS function Modulator side d,f deactivation (1)	ABS function Modulator side c,e deactivation (1)	EBS pressure contol deactivation	loadpropor.trail..set laden	Solenoid valve ABS/ EBS relay-valve currentless	back-up valve modulator currentless (2)	Solenoid valve ABS/ EBS relay-valve currentless	Solenoid valve ABS/ EBS relay-valve currentless	back-up valve modulator currentless (2)	solenoid valve trailmod .currentless	RSS Deactivation	Waning lamp status
A_1	**Sensors**																			
A_1_1	**Wheel speed sensors**																			
A_1_1_1	failure of wheel speed sensor c, d, e or f	X	X	X	X	X			■	■									■	1
	failure of wheel speed sensor c, d, e or f						X	■	■	■		■							■	1
A_1_1_3	Chattering of wheel c, d, e or f	X	X	X	X	X	X	■	■	■									■	0
A_1_1_5	Memorybit wheel c, d, e or f	X	X	X	X	X	X													0
A_1_2	**Brake pressure sensors**																			
A_1_2_1	failure of a pressure sensor in the EBS relay-valve	X				X	X				■			■					■	1
A_1_2_2	failure of a brake pressure sensor side d,f in the trailer- modulator	X	X	X	X	X	X				■						■		■	1
A_1_2_3	failure of a brake pressure sensor side c,d in the trailer- modulator	X	X	X	X	X	X				■						■		■	1
A_1_2_4	failure of a both brake pressure sensors in the trailer- modulator	X	X	X	X	X	X				■						■		■	1
A_1_3	**Driver demand**																			
A_1_3_1	failure of the driver demand sensor	X	X	X	X	X	X												■	1
A_1_3_2	Signal of demand sensor too low	X	X	X	X	X	X												■	1
A_1_3_3	failure of the driver demand sensor and CAN-communication	X	X	X	X	X	X				■			■			■		■	1
A_1_4	**Axle load sensor**																			
A_1_4_1	failure of the axle load sensor	X	X	X	X	X	X					■							■	1
A_1_5	**Supply pressure sensor**																			1
A_1_5_1	failure of the supply pressure sensor	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_2	**Solenoid valves**																			
A_2_1	**EBS/ABS)- relay valve**																			1
A_2_1_1	failure of solenoid valves in the EBS(ABS) relay-valve	X		X		X	X	■			■		■	■					■	1
A_2_2	**Trailer modulator**																			
A_2_2_1	failure of solenoid valves in the trailer-modulator side e,f	X	X	X	X	X	X		■		■				■		■		■	1
A_2_2_2	failure of solenoid valves in the trailer-modulator side c,e	X	X	X	X	X	X			■	■					■	■		■	1
A_2_2_3	failure of solenoid valves in the trailer-modulator side c,e and e,f	X	X	X	X	X	X		■	■	■				■	■	■		■	1
A_2_3	**Back-up valve**																			
A_2_3_1	back-up valve failure EBS relay-valve	X				X	X							■					■	1
A_2_3_2	back-up valve failure trailer-modulator	X	X	X	X	X	X										■		■	1
A_3	**ECU**																			
A_3_1	Trailer modulator																			
A_3_1_1	Internal failure	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_3_1_2	CPU-failure	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2

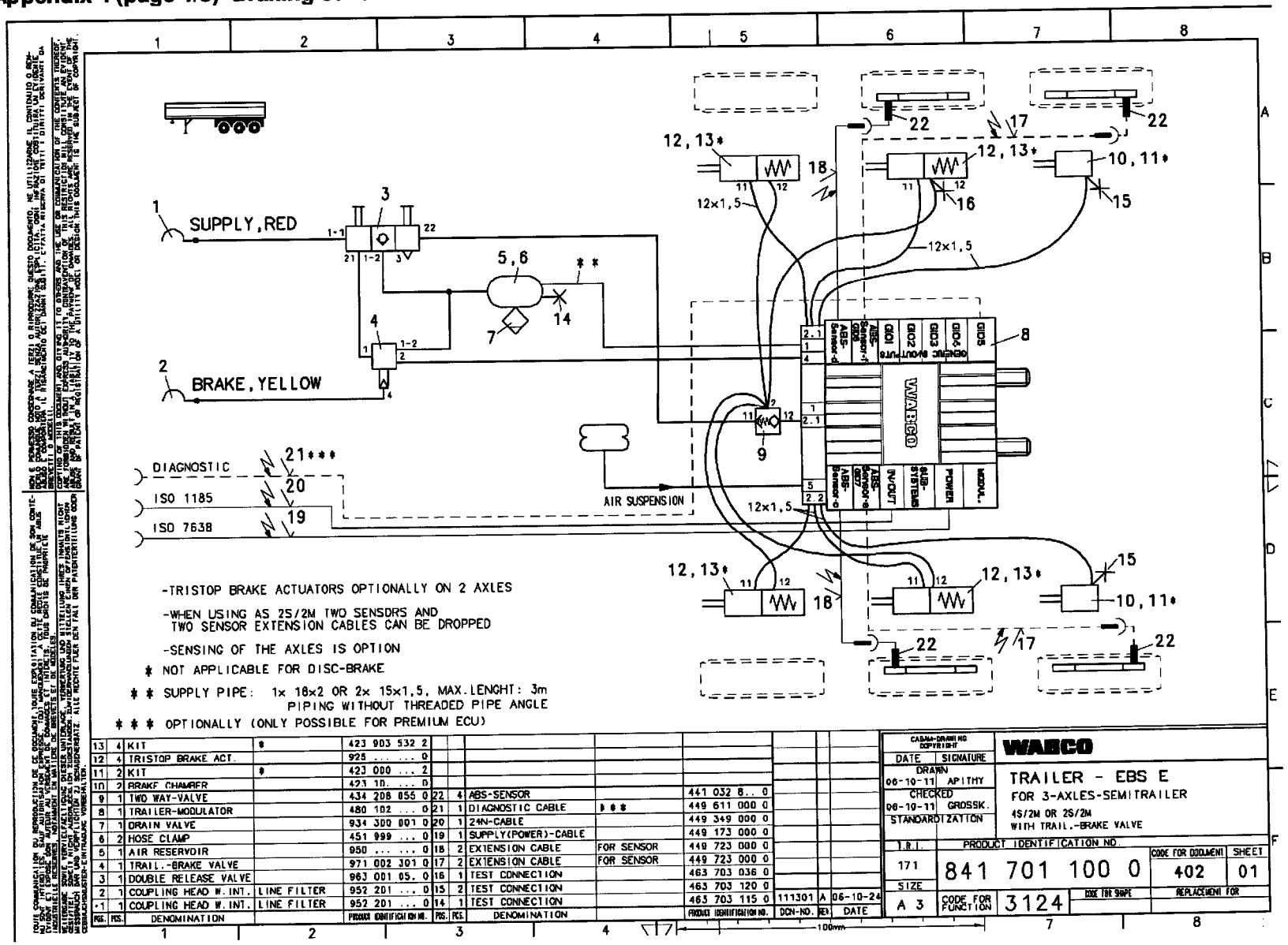
Appendix 3 (page 2/2) Failure-Deactivation Matrix

	WABCO Failure Deactivation Matrix	Semitrailer 4S/3M	Semitrailer 4S/2M + 1M	Semitrailer 2S/2M	Semitrailer 4S/2M	Trailer 4S/3M with 2 axle load sensors	Trailer 4S/3M with one axle load sensor	ABS-Liftaxle function deactivation (1)	ABS function Modulator side d,f deactivation (1)	ABS function Modulator side c,e deactivation (1)	EBS pressure control deactivation (2)	loadpropor.trail..set laden	Solenoid valve ABS/ EBS relay-valve currentless	back-up valve modulator currentless (2)	Solenoid valve ABS/ EBS relay-valve currentless	Solenoid valve ABS/ EBS relay-valve currentless	back-up valve modulator currentless (2)	solenoid valve trailmod .currentless	RSS Deactivation	Warning lamp status
A_3_1_3	EEPROM failure	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_3_1_4	Wrong parameter setting	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_3_1_5	GIO Main- Powerstage defect	X	X	X	X	X	X				■	■							■	2
A_3_1_7	EOL test at customer not passed	X	X	X	X	X	X												■	2
A_3_1_8	failure of ag-sensor	X	X	X	X	X	X												■	1
A_4	**CAN-Communication**																			
A_4_1	partial failure of CAN-Communication/ one-wire-operation	X	X	X	X	X	X													0
A_4_2	failure of CAN-communication	X	X	X	X	X	X													0
A_5	**Voltage Supply**																			
A_5_3	high voltage at Kl. 30 oder Kl. 15	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_5_7	low voltage	X	X	X	X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	2
A_5_9	massproblem (Kl. 15)	X	X	X	X	X	X													1
A_5_11	Warning undervoltage Kl. 30	X	X	X	X	X	X													0
A_5_13	failure in ECAS-communication	X	X	X	X	X	X													0
A_6	**Pneumatic**																			
A_6_1	service line not connected (only with ISO 7638 extended)	X	X	X	X	X	X													1
A_6_2	supply pressure low	X	X	X	X	X	X													2
A_7	**Miscellaneous**																			
A_7_1_1	failure in GIO-output	X	X	X	X	X	X													3/4
A_7_1_1	failure in internal ECAS function	X	X	X	X	X	X													3
A_7_1_2	failure of liftaxle or ISS	X	X	X	X	X	X													1
A_7_2_1	failure of lining wear sensor	X	X	X	X	X	X													3

Meaning of failure status	
0 = yellow warning lamp during the failure	(ECE R13 para. 5.2.1.29.1.2)
1 = yellow warning lamp until reset	(ECE R13 para. 5.2.1.29.1.2)
2 = yellow and red warning lamp until reset	(ECE R13 para. 5.2.1.29.1.1)
3 = yellow warning lamp flashing after ignition "ON"	(ECE R13 para. 5.2.1.29.6)
4 = no warning lamp	

Remarks:	
(1) ABS selective deactivated	(2) braking with pneumatic service line
■ = Function deactivated	

Appendix 4 (page 1/8) Braking schematic 2S/2M and 4S/2M for Semi-trailer



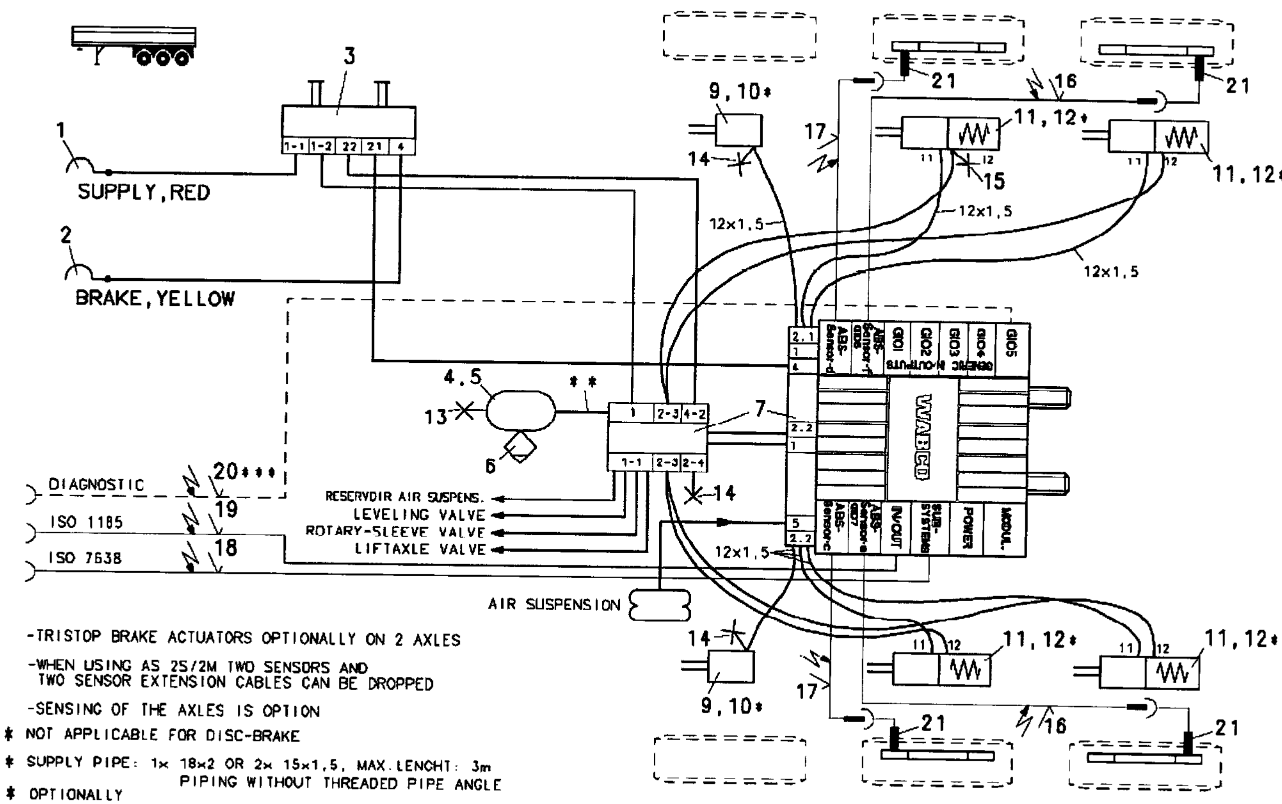
POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.	POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	4	KIT	*	423 903 532 2					
12	4	TRISTOP BRAKE ACT.		925 0					
11	2	KIT	*	423 000 ... 2					
10	2	BRAKE CHAMBER		423 10. ... 0					
9	1	TWO WAY-VALVE		434 208 055 0	22	4	ABS-SENSOR		441 032 8.. 0
8	1	TRAILER-MODULATOR		480 102 ... 0	21	1	DIAGNOSTIC CABLE	* * *	449 611 000 0
7	1	DRAIN VALVE		934 300 001 0	20	1	24N-CABLE		449 349 000 0
6	2	HOSE CLAMP		451 999 ... 0	19	1	SUPPLY(POWER)-CABLE		449 173 000 0
5	1	AIR RESERVOIR		950 0	18	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
4	1	TRAIL.-BRAKE VALVE		971 002 301 0	17	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
3	1	DOUBLE RELEASE VALVE		963 001 05. 0	16	1	TEST CONNECTION		463 703 036 0
2	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0	15	2	TEST CONNECTION		463 703 120 0
*1	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0	14	1	TEST CONNECTION		463 703 115 0

DRAWN	DATE	SIGNATURE
	06-10-11	APITHY
CHECKED	06-10-11	GROSSIK.
STANDARDIZATION		

I.R.I.	PRODUCT IDENTIFICATION NO.	CODE FOR DOCUMENT	SHEET
171	841 701 100 0	402	01
SIZE A 3	CODE FOR FUNCTION 3124	CODE FOR SHAPE	REPLACEMENT FOR

111301 | A | 06-10-24 (DCN-NO. | REV. | DATE)

Appendix 4 (page 2/8) Braking schematic 2S/2M and 4S/2M for Semi-trailer with PREV



-TRISTOP BRAKE ACTUATORS OPTIONALLY ON 2 AXLES

-WHEN USING AS 2S/2M TWO SENSORS AND TWO SENSOR EXTENSION CABLES CAN BE DROPPED

-SENSING OF THE AXLES IS OPTION

* NOT APPLICABLE FOR DISC-BRAKE

** SUPPLY PIPE: 1x 18x2 OR 2x 15x1,5, MAX. LENCHT: 3m PIPING WITHOUT THREADED PIPE ANGLE

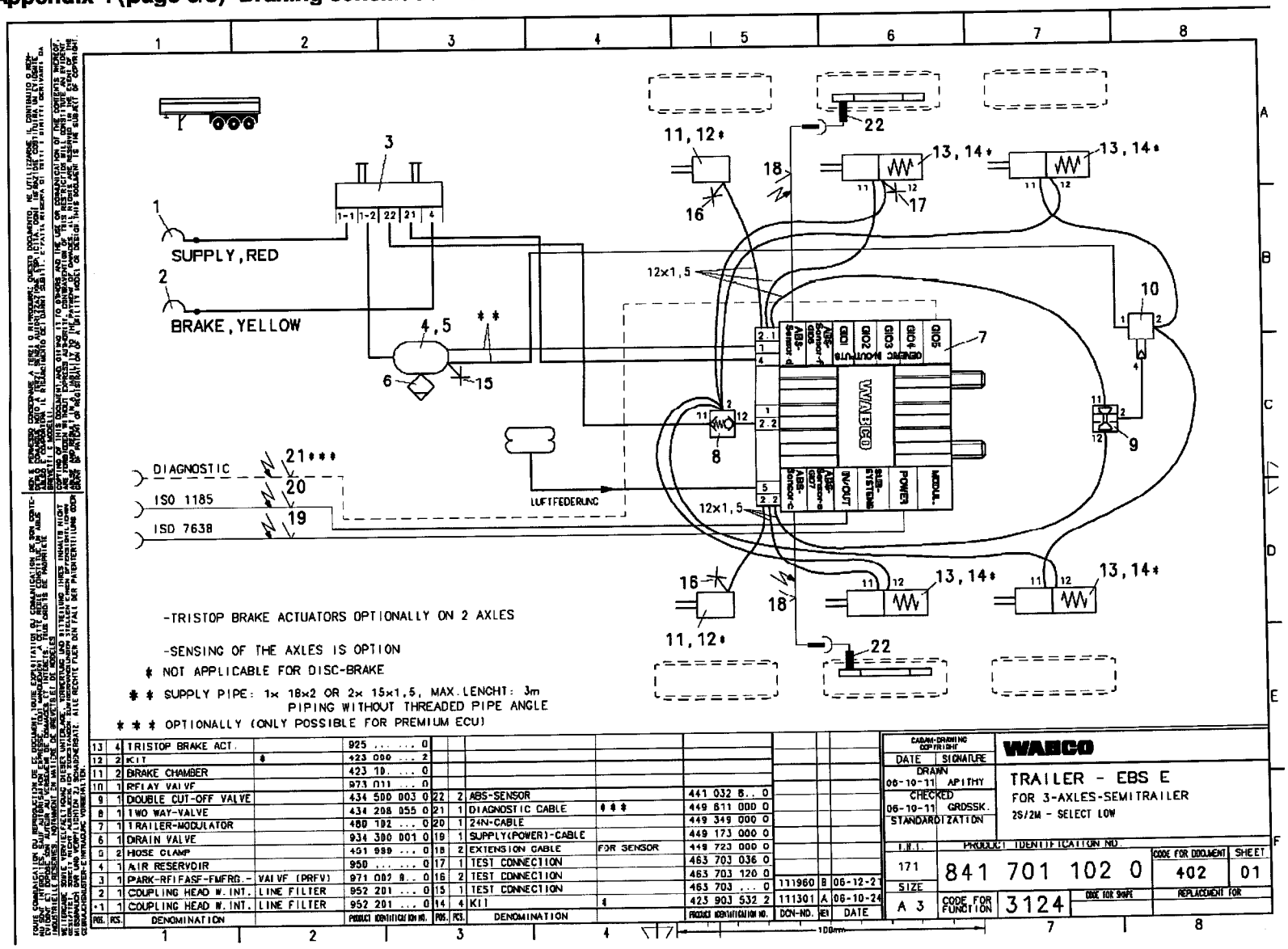
*** OPTIONALLY

POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.	POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	1	TEST CONNECTION		463 703 115 0					
12	4	KIT	♦	423 903 532 2					
11	4	TRISTOP BRAKE ACT.		925 0					
10	2	KIT	♦	423 000 ... 2					
9	2	BRAKE CHAMBER		423 10. ... 0					
8	.	.			21	4	ABS-SENSOR		441 032 8.. 0
7	1	TRAIL.-MODULATOR W.	EXTENSION MOD.	480 102 ... 0	20	1	DIAGNOSTIC CABLE	***	449 611 000 0
6	1	DRAIN VALVE		934 300 001 0	19	1	24N-CABLE		449 349 000 0
5	2	HOSE CLAMP		451 999 ... 2	18	1	SUPPLY(POWER)-CABLE		449 173 000 0
4	1	AIR RESERVOIR		950 0	17	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
3	1	PARK-RELEASE-EMERG.-	VALVE (PREV)	971 002 9.. 0	16	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
2	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 001 0	15	1	TEST CONNECTION		463 703 036 0
1	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 002 0	14	3	TEST CONNECTION		463 703 120 0

DCN-NO.	REV.	DATE

DATE / SIGNATURE	WABCO
DRAWN 06-12-04 APITHY	TRAILER - EBS E
CHECKED 06-12-04 GROSSK.	FOR 3-AXLES-SEMITRAILER
STANDARDIZATION	2S/2M -WITH EXTENSION MODUL-
T.N.I. 171	PRODUCT IDENTIFICATION NO 841 701 110 0
SIZE A 3	CODE FOR FUNCTION 3124
CODE FOR DOCUMENT 402	SHEET 01

Appendix 4 (page 3/8) Braking schematic 2S/2M+SLV for Semi-trailer with steering axle



POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	4	TRISTOP BRAKE ACT.		925 0
12	2	KIT	*	423 000 ... 2
11	2	BRAKE CHAMBER		423 10. ... 0
10	1	RELAY VALVE		973 011 ... 0
9	1	DOUBLE CUT-OFF VALVE		434 500 003 0
8	1	TWO WAY-VALVE		434 208 055 0
7	1	TRAILER-MODULATOR		480 102 ... 0
6	1	DRAIN VALVE		934 300 001 0
5	2	HOSE CLAMP		491 989 ... 0
4	1	AIR RESERVOIR		950 0
3	1	PARK-RELEASE-EMERG.	VALVE (PREV)	971 002 8.. 0
2	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0
*1	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0

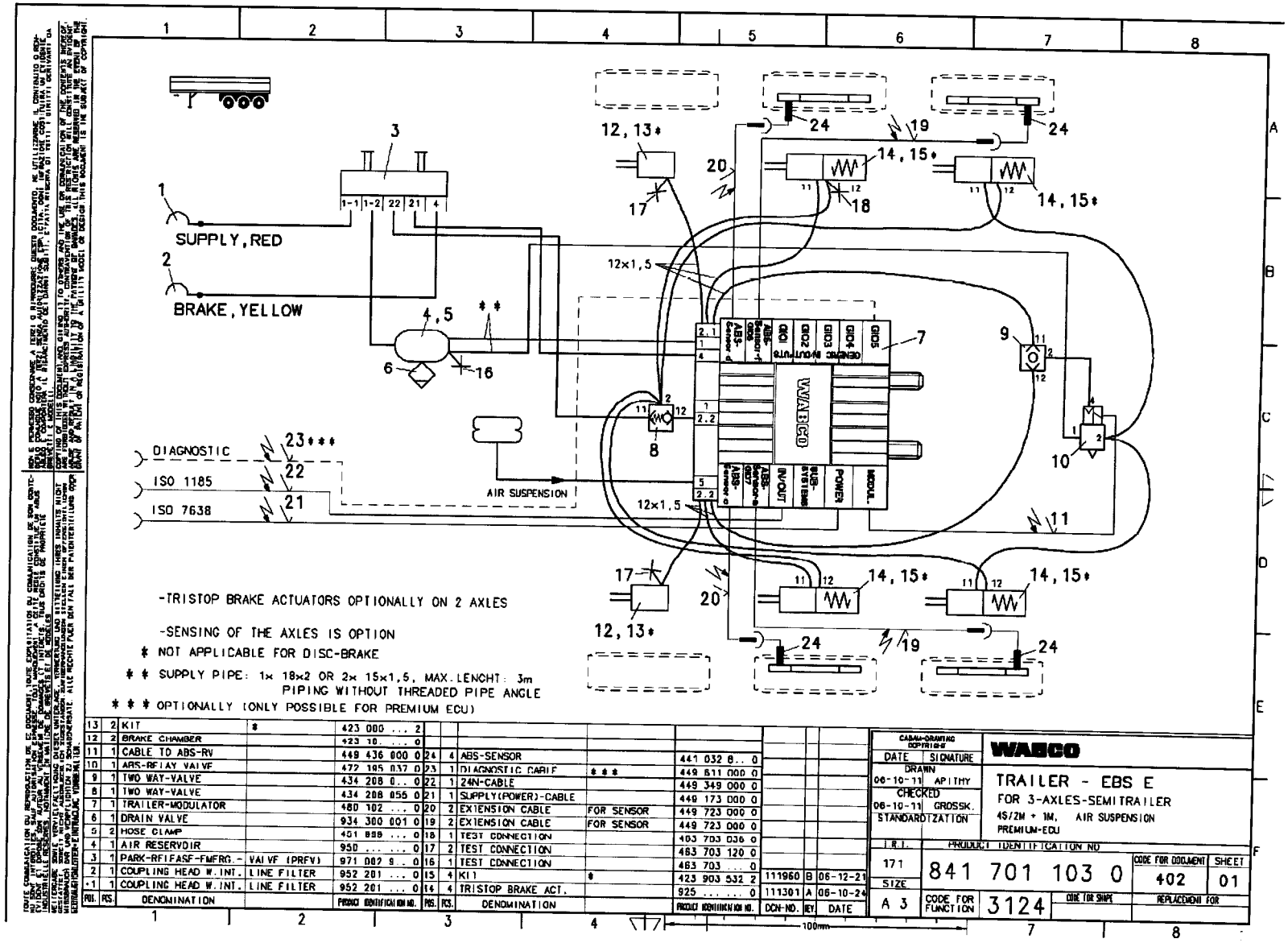
POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
22	2	ABS-SENSOR		441 032 8.. 0
21	1	DIAGNOSTIC CABLE	***	449 811 000 0
20	1	24N-CABLE		449 349 000 0
19	1	SUPPLY(POWER)-CABLE		449 173 000 0
18	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
17	1	TEST CONNECTION		463 703 036 0
16	2	TEST CONNECTION		463 703 120 0
15	1	TEST CONNECTION		463 703 ... 0
14	4	KIT	*	423 903 532 2

I.N.	PRODUCT IDENTIFICATION NO.	CODE FOR DOCUMENT	SHEET
171	841 701 102 0	402	01

SIZE	CODE FOR FUNCTION	CODE FOR SHAPE	REPLACEMENT FOR
A 3	3124		

DON-NO.	KEY	DATE
111960	B	06-12-21
111301	A	06-10-24

Appendix 4 (page 4/8) Braking schematic 4S/2M + 1M for Semi-trailer

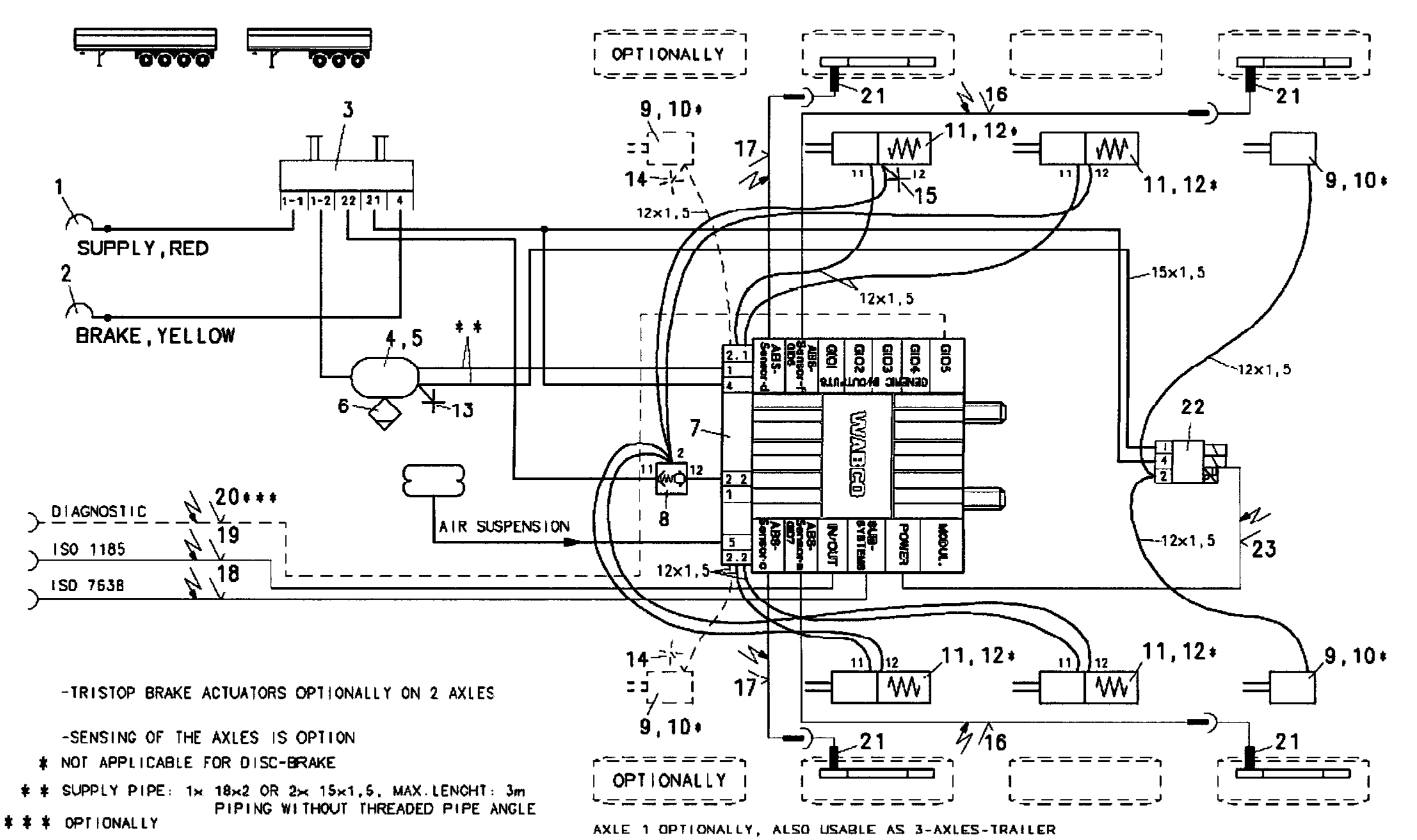


POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.	POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	2	KIT	*	423 000 ... 2					
12	2	BRAKE CHAMBER		423 10. ... 0					
11	1	CABLE TO ABS-RV		449 436 000 0	24	4	ABS-SENSOR		441 032 8.. 0
10	1	ABS-RELAY VALVE		472 195 037 0	23	1	DIAGNOSTIC CABLE	***	449 811 000 0
9	1	TWO WAY-VALVE		434 208 0.. 0	22	1	24N-CABLE		449 349 000 0
8	1	TWO WAY-VALVE		434 208 056 0	21	1	SUPPLY(POWER)-CABLE		449 173 000 0
7	1	TRAILER-MODULATOR		480 102 ... 0	20	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
6	1	DRAIN VALVE		934 300 001 0	19	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
5	2	HOSE CLAMP		401 889 ... 0	18	1	TEST CONNECTION		403 703 036 0
4	1	AIR RESERVOIR		950 0	17	2	TEST CONNECTION		463 703 120 0
3	1	PARK-RELEASE-EMERG. -	VALVE (PREV)	971 002 9 .. 0	16	1	TEST CONNECTION		463 703 ... 0
2	1	COUPLING HEAD W.INT.	LINE FILTER	952 201 ... 0	15	4	KIT	*	423 903 532 2
-1	1	COUPLING HEAD W.INT.	LINE FILTER	952 201 ... 0	14	4	TRISTOP BRAKE ACT.		925 0

DCN-NO.	REV.	DATE
111960	B	06-12-21
111301	A	06-10-24

DRAWN	06-10-11 APITHY
CHECKED	06-10-11 GROSSK.
STANDARDIZATION	
I.R.	171
SIZE	A 3
CODE FOR FUNCTION	3124

Appendix 4 (page 5/8) Braking schematic 4S/3M for Semi-trailer



-TRISTOP BRAKE ACTUATORS OPTIONALLY ON 2 AXLES

-SENSING OF THE AXLES IS OPTION

* NOT APPLICABLE FOR DISC-BRAKE

* * SUPPLY PIPE: 1x 18x2 OR 2x 15x1,5, MAX.LENGHT: 3m PIPING WITHOUT THREADED PIPE ANGLE

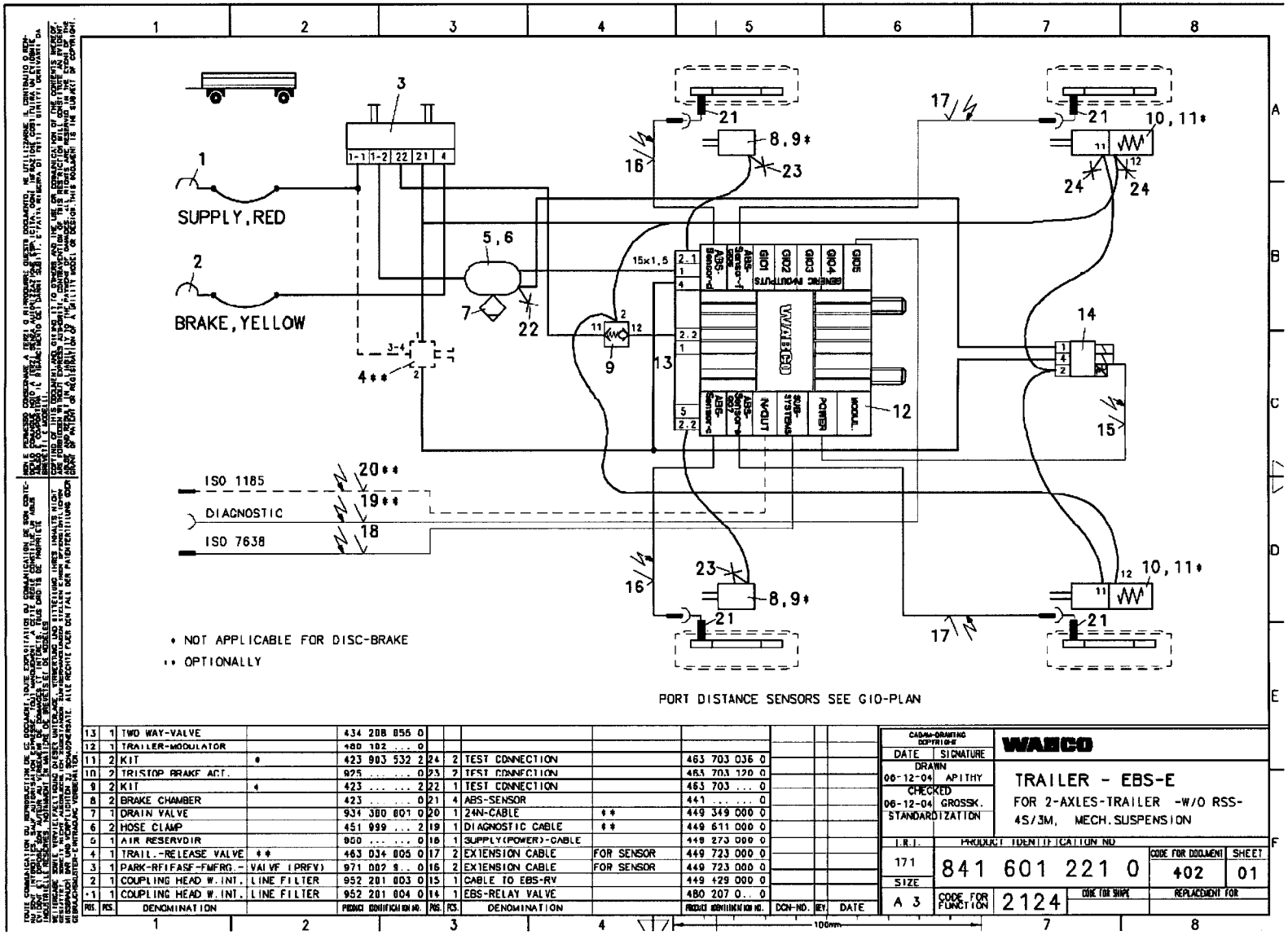
* * * OPTIONALLY

POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.	POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	1	TEST CONNECTION		463 703 ... 0					
12	1	KIT	*	423 903 532 2					
11	4	TRISTOP BRAKE ACT.		925 0					
10	4	KIT	*	423 000 ... 2	23	1	CABLE TO EBS-RV		449 429 000 0
9	4	BRAKE CHAMBER		423 10. ... 0	22	1	EBS-RELAY VALVE		480 207 001 0
8	1	TWO WAY-VALVE		434 208 055 0	21	4	ABS-SENSOR		441 032 8.. 0
7	1	TRAILER-MODULATOR		480 102 ... 0	20	1	DIAGNOSTIC CABLE	* * *	449 611 000 0
6	1	DRAIN VALVE		934 300 001 0	19	1	24N-CABLE		449 349 000 0
5	2	HOSE CLAMP		451 999 ... 2	18	1	SUPPLY(POWER)-CABLE		449 173 000 0
4	1	AIR RESERVOIR		950 0	17	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
3	1	PARK-RELEASE-EMERG.-	VALVE (PREV)	971 002 8.. 0	16	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
2	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 001 0	15	1	TEST CONNECTION		463 703 036 0
-1	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 002 0	14	2	TEST CONNECTION		463 703 120 0

DATE	SIGNATURE	
DRAWN		WABCO
06-12-04	APITHY	TRAILER - EBS E
CHECKED		FOR 3-AND 4-AXLES-SEMITRAILER
06-12-04	GROSSK.	4S/3M
STANDARDIZATION		

I.R.I.	PRODUCT IDENTIFICATION NO.	CODE FOR DOCUMENT	SHEET
171	841 701 050 0	402	01
SIZE A 3	CODE FOR FUNCTION 4124		

Appendix 4 (page 6/8) Braking schematics 4S/3M for Drawbar-Trailer



POS.	QTY.	DENOMINATION		PRODUCT IDENTIFICATION NO.
13	1	TWO WAY-VALVE		434 208 055 0
12	1	TRAILER-MODULATOR		480 102 ... 0
11	2	KIT	*	423 903 532 2
10	2	TRISTOP BRAKE ACT.		925 0
9	2	KIT	*	423 2
8	2	BRAKE CHAMBER		423 0
7	1	DRAIN VALVE		934 380 001 0
6	2	HOSE CLAMP		451 999 ... 2
5	1	AIR RESERVOIR		950 0
4	1	TRAIL.-RELEASE VALVE	**	463 034 005 0
3	1	PARK-RELEASE-EMERG.-	VALVE (PREV)	971 002 9... 0
2	1	COUPLING HEAD W.INT.	LINE FILTER	952 201 003 0
*1	1	COUPLING HEAD W.INT.	LINE FILTER	952 201 004 0

POS.	QTY.	DENOMINATION		PRODUCT IDENTIFICATION NO.
24	2	TEST CONNECTION		463 703 036 0
23	2	TEST CONNECTION		463 703 120 0
22	1	TEST CONNECTION		463 703 ... 0
21	4	ABS-SENSOR		441 0
20	1	24N-CABLE	**	449 349 000 0
19	1	DIAGNOSTIC CABLE	**	449 611 000 0
18	1	SUPPLY(POWER)-CABLE		449 273 000 0
17	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
16	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
15	1	CABLE TO EBS-RV		449 429 000 0
14	1	EBS-RELAY VALVE		480 207 0.. 0

DCN-NO. | REV. | DATE

CAD/M-DRAWING COPYRIGHT

DATE	SIGNATURE
DRAWN 06-12-04	APITHY
CHECKED 06-12-04	GROSSK.
STANDARDIZATION	

WABCO

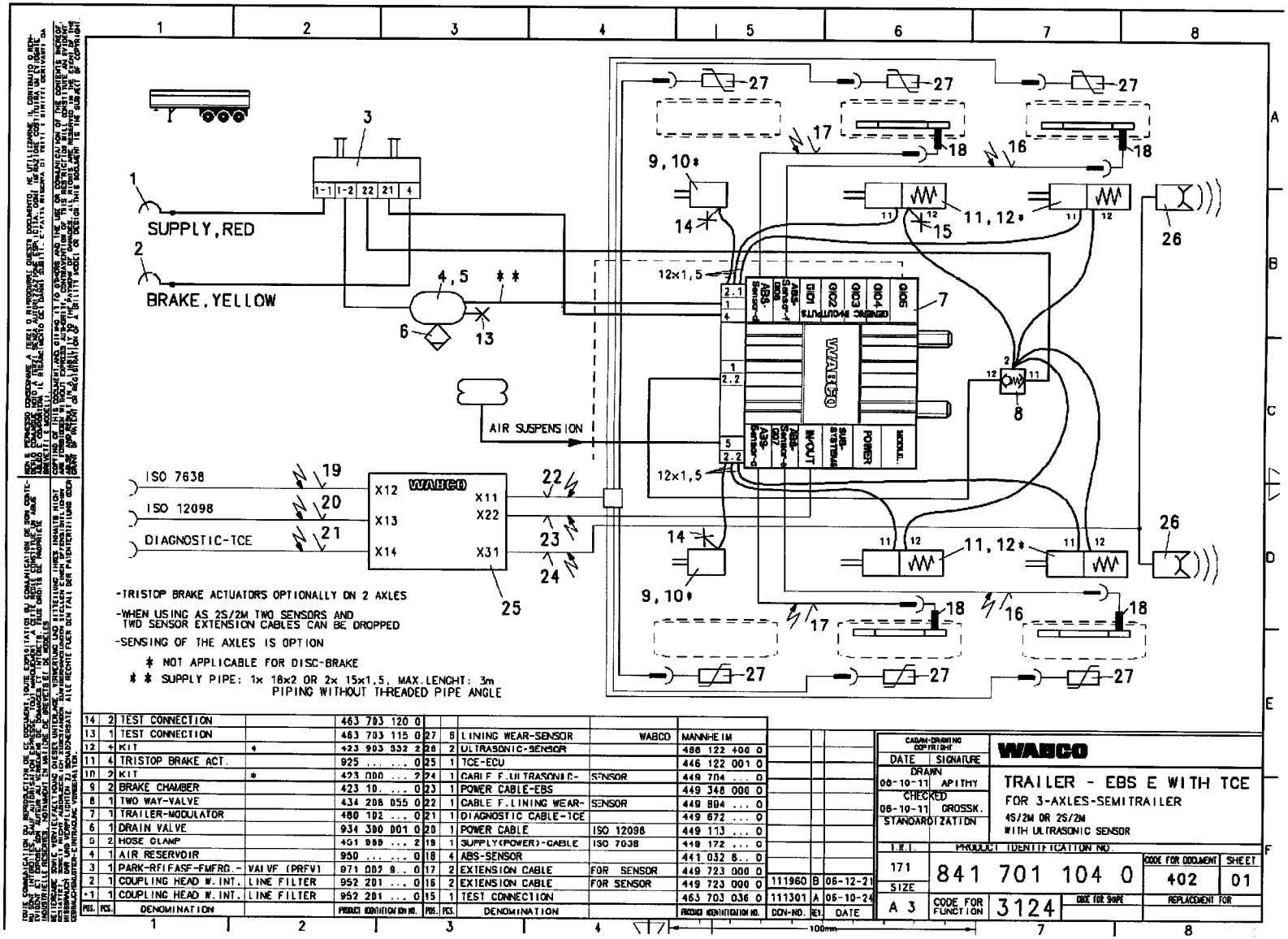
TRAILER - EBS-E

FOR 2-AXLES-TRAILER -W/O RSS-
4S/3M, MECH. SUSPENSION

I.R.I.	PRODUCT IDENTIFICATION NO.	CODE FOR DOCUMENT	SHEET
171	841 601 221 0	402	01
SIZE A 3	CODE FOR FUNCTION 2124	CODE FOR SHAPE	REPLACEMENT FOR

100mm

Appendix 4 (page 7/8) Braking schematics 2S/2M and 4S/2M for Semi-trailer with TCE



POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
14	2	TEST CONNECTION		463 703 120 0
13	1	TEST CONNECTION		463 703 115 0
12	4	KIT	*	423 903 532 2
11	4	TRISTOP BRAKE ACT.		925 0
10	2	KIT	*	423 000 ... 2
9	2	BRAKE CHAMBER		423 10. ... 0
8	1	TWO WAY-VALVE		434 208 055 0
7	1	TRAILER-MODULATOR		480 102 ... 0
6	1	DRAIN VALVE		934 300 001 0
5	2	HOSE CLAMP		451 989 ... 2
4	1	AIR RESERVOIR		950 0
3	1	PARK-RELEASE-EMERG.-	VALVE (PREV)	971 002 9.. 0
2	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0
1	1	COUPLING HEAD W. INT.	LINE FILTER	952 201 ... 0

POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
27	8	LINING WEAR-SENSOR	WABCO	MANNHEIM
26	2	ULTRASONIC-SENSOR		466 122 400 0
25	1	TCE-ECU		446 122 001 0
24	1	CABLE F.ULTRASONIC-	SENSOR	449 704 ... 0
23	1	POWER CABLE-EBS		449 348 000 0
22	1	CABLE F.LINING WEAR-	SENSOR	449 804 ... 0
21	1	DIAGNOSTIC CABLE-TCE		449 672 ... 0
20	1	POWER CABLE	ISO 12098	449 113 ... 0
19	1	SUPPLY(POWER)-CABLE	ISO 7638	449 172 ... 0
18	4	ABS-SENSOR		441 032 8.. 0
17	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
16	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
15	1	TEST CONNECTION		463 703 036 0

DCN-NO.	REV.	DATE
111960	B	06-12-21
111301	A	06-10-24

CADAM-DRAWING COPYRIGHT

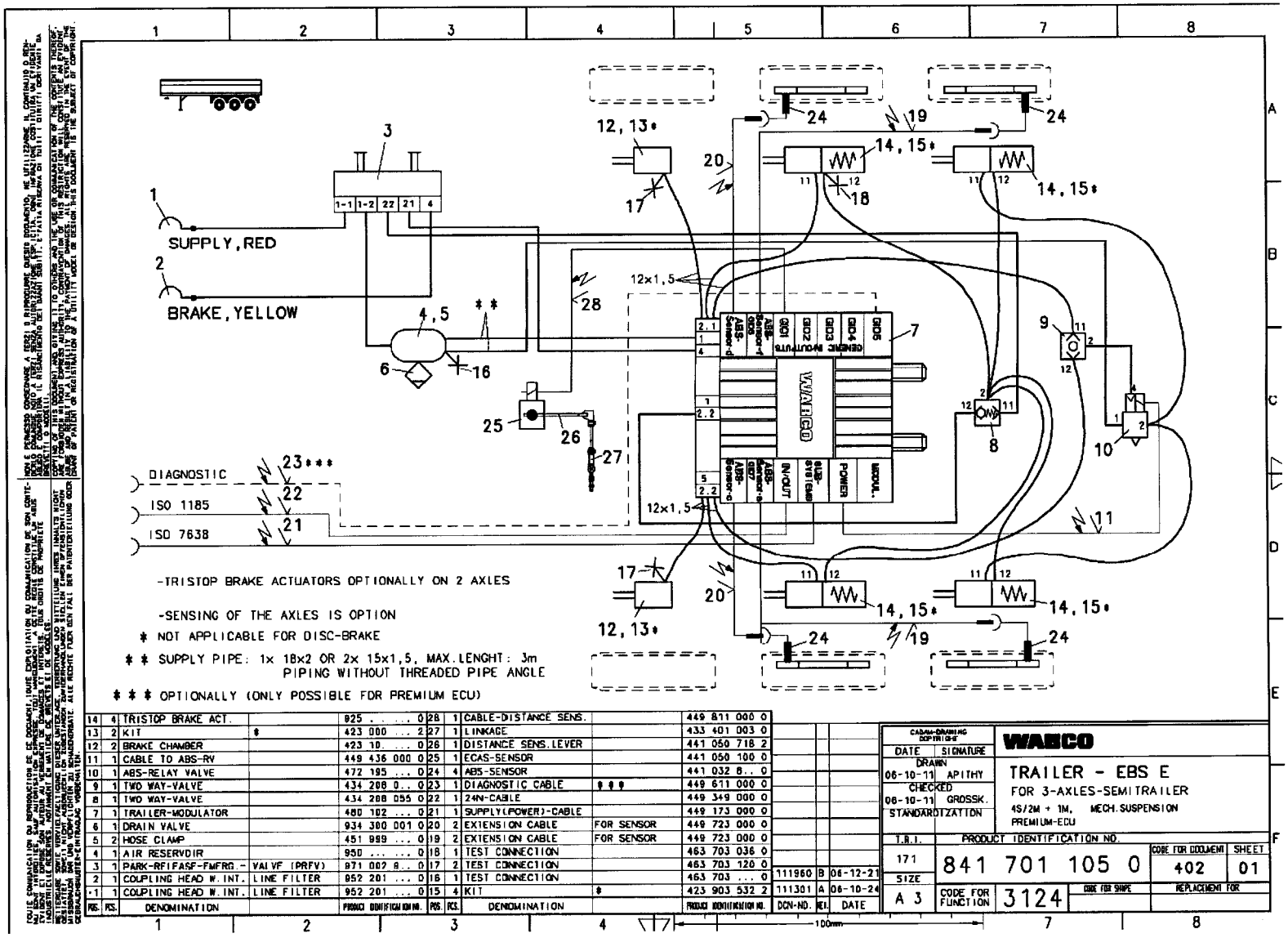
DATE	SIGNATURE
DRAWN 06-10-11	APITHY
CHECKED 06-10-11	GROSSK.
STANDARDIZATION	

WABCO

TRAILER - EBS E WITH TCE
FOR 3-AXLES-SEMITRAILER
4S/2M OR 2S/2M
WITH ULTRASONIC SENSOR

T.R.T.	PRODUCT IDENTIFICATION NO.	CODE FOR DOCUMENT	SHEET
171	841 701 104 0	402	01
SIZE A 3	CODE FOR FUNCTION 3124	CODE FOR SHAPE	REPLACEMENT FOR

Appendix 4 (page 8/8) Braking schematics 4S/2M+1M for Semi-trailer with mechanical suspension



POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.	POS.	PCS.	DENOMINATION		PRODUCT IDENTIFICATION NO.
14	4	TRISTOP BRAKE ACT.		925 0	28	1	CABLE-DISTANCE SENS.		449 811 000 0
13	2	KIT	*	423 000 . . . 2	27	1	LINKAGE		433 401 003 0
12	2	BRAKE CHAMBER		423 10. . . . 0	26	1	DISTANCE SENS. LEVER		441 050 718 2
11	1	CABLE TO ABS-RV		449 436 000 0	25	1	ECAS-SENSOR		441 050 100 0
10	1	ABS-RELAY VALVE		472 195 . . . 0	24	4	ABS-SENSOR		441 032 8. . 0
9	1	TWO WAY-VALVE		434 208 0. . 0	23	1	DIAGNOSTIC CABLE	***	449 611 000 0
8	1	TWO WAY-VALVE		434 208 055 0	22	1	24N-CABLE		449 349 000 0
7	1	TRAILER-MODULATOR		480 102 . . . 0	21	1	SUPPLY(POWER)-CABLE		449 173 000 0
6	1	DRAIN VALVE		934 300 001 0	20	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
5	2	HOSE CLAMP		451 999 . . . 0	19	2	EXTENSION CABLE	FOR SENSOR	449 723 000 0
4	1	AIR RESERVOIR		950 0	18	1	TEST CONNECTION		463 703 036 0
3	1	PARK-RELEASE-EMERG. - VALVE (PREV)		971 002 8. . . 0	17	2	TEST CONNECTION		463 703 120 0
2	1	COUPLING HEAD W. INT. LINE FILTER		952 201 . . . 0	16	1	TEST CONNECTION		463 703 . . . 0
*1	1	COUPLING HEAD W. INT. LINE FILTER		952 201 . . . 0	15	4	KIT	*	423 903 532 2

DCN-NO.	REV.	DATE
111960	B	06-12-21
111301	A	06-10-24

DRAWN	06-10-11 APITHY
CHECKED	06-10-11 GROSSK.
STANDARDIZATION	
T.R.I.	171
SIZE	A 3
CODE FOR FUNCTION	3124
CODE FOR DOCUMENT	402
SHEET	01

Kraftfahrt-Bundesamt

DE-24932 Flensburg

E G - T Y P G E N E H M I G U N G S B O G E N
EC TYPE-APPROVAL CERTIFICATE

Benachrichtigung über

- die Erweiterung der Typgenehmigung

eines Bauteiltyps gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 2006/28/EG

Communication concerning the

- extension of type-approval

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 2006/28/EC

Typgenehmigungsnummer: **e1*72/245*2006/28*4868*01**
Type-approval No.:

Grund für die Erweiterung:
Reason for extension:
Erweiterung des Nummernkreises zur Typidentifizierung
extension of numbers for identification of type

An der EUB anzubringendes EG-Typgenehmigungszeichen:
EC type-approval mark to be affixed on ESA:

e1

03 4868

ABSCHNITT I
SECTION I

0.1. Fabrikmarke (Firmenname des Herstellers):
Make (trade name of manufacturer):
WABCO

0.2. Typ:
Type:
EBS Trailer Modulator

Kraftfahrt-Bundesamt

DE-24932 Flensburg

2

Nummer der Genehmigung: e1*72/245*2006/28*4868*01
Approval No.:

0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden:
Means of identification of type, if marked on the component:
480 102 030 0 bis/up to 480 102 058 0
480 102 060 0 bis/up to 480 102 088 0

0.3.1. Anbringungsstelle dieser Merkmale:
Location of that marking:
auf dem Gehäuse
on the housing

0.5. Name und Anschrift des Herstellers:
Name and address of manufacturer:
WABCO GmbH
DE-30453 Hannover

0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens:
In the case of components and separate technical units, location and method of affixing of the EC approval-mark:
Erhebung auf dem Gehäuse
cast relief on the housing

0.8. Anschrift(en) der Fertigungsstätte(n):
Address(es) of assembly plant(s):
WABCO GmbH
DE-30453 Hannover

WABCO Polska Sp.z.o.o.
PL-53-238 Wroclaw

ABSCHNITT II
SECTION II

1. Zusätzliche Angaben (erforderlichenfalls):
Additional information (where applicable):
siehe Anlage
see appendix

2. Für die Durchführung der Prüfungen zuständiger technischer Dienst:
Technical service responsible for carrying out the tests:
WABCO EMV-Prüflabor
DE-30432 Hannover

Kraftfahrt-Bundesamt

DE-24932 Flensburg

3

Nummer der Genehmigung: e1*72/245*2006/28*4868*01
Approval No.:

3. Datum des Prüfprotokolls:
Date of test report:
entfällt
not applicable

4. Nummer des Prüfprotokolls:
Number of test report:
entfällt
not applicable

5. Gegebenenfalls Bemerkungen:
Remarks (if any):
siehe Anlage
see appendix

6. Ort: **DE-24932 Flensburg**
Place:

7. Datum: **11.01.2007**
Date:

8. Unterschrift: **Im Auftrag**
Signature:

KRAFTFAHRT-BUNDESAMT 448

Detlef Hansen

Kraftfahrt-Bundesamt

DE-24932 Flensburg

E G - T Y P G E N E H M I G U N G S B O G E N
EC TYPE-APPROVAL CERTIFICATE

Benachrichtigung über

- die Erweiterung der Typgenehmigung

eines Bauteiltyps gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 2006/28/EG

Communication concerning the

- extension of type-approval

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 2006/28/EC

Typgenehmigungsnummer: **e1*72/245*2006/28*1665*01**
Type-approval No.:

Grund für die Erweiterung:
Reason for extension:
Anpassung an die Fassung 2006/28/EG der Richtlinie
adaptation to the version 2006/28/EC of the directive
technische Änderungen
technical modification

An der EUB anzubringendes EG-Typgenehmigungszeichen:
EC type-approval mark to be affixed on ESA:

e1
03 1665

ABSCHNITT I
SECTION I

0.1. Fabrikmarke (Firmenname des Herstellers):
Make (trade name of manufacturer):
WABCO

Kraftfahrt-Bundesamt

DE-24932 Flensburg

2

Nummer der Genehmigung: e1*72/245*2006/28*1665*01
Approval No.:

0.2. Typ:
Type:
Trailer Central Electronik (TCE)

0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden:
Means of identification of type, if marked on the component:
446 122 000 0 bis / up to 446 122 015 0

0.3.1. Anbringungsstelle dieser Merkmale:
Location of that marking:
auf dem Typenschild auf dem Gehäuse
on the type label on the housing

0.5. Name und Anschrift des Herstellers:
Name and address of manufacturer:
WABCO GmbH & Co.OHG
DE-30453 Hannover

0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens:
In the case of components and separate technical units, location and method of affixing of the EC approval-mark:
Typenschild auf dem Gehäuse oder
als metallisiertes Klebeschild auf dem Elektronikgehäuse geklebt
type label on the housing or
metalized label on the housing of the electronic

0.8. Anschrift(en) der Fertigungsstätte(n):
Address(es) of assembly plant(s):
WABCO GmbH & Co.OHG
DE-30453 Hannover

ABSCHNITT II
SECTION II

1. Zusätzliche Angaben (erforderlichenfalls):
Additional information (where applicable):
siehe Anlage
see appendix

2. Für die Durchführung der Prüfungen zuständiger technischer Dienst:
Technical service responsible for carrying out the tests:
WABCO EMV-Prüflabor
DE-30432 Hannover

Kraftfahrt-Bundesamt

DE-24932 Flensburg

3

Nummer der Genehmigung: e1*72/245*2006/28*1665*01
Approval No.:

3. Datum des Prüfprotokolls:
Date of test report:
15.09.2006

4. Nummer des Prüfprotokolls:
Number of test report:
29_01

5. Gegebenenfalls Bemerkungen:
Remarks (if any):
siehe Anlage
see appendix

6. Ort: **DE-24932 Flensburg**
Place:

7. Datum: **26.09.2006**
Date:

8. Unterschrift: **Im Auftrag**
Signature:

KRAFTFAHRT-BUNDESAMT 448

Detlef Hansen

This side is for technical reasons free

AXLE ALIGNMENTS

Your new Titan Trailer has been aligned precisely at the factory, however all trailers require periodic checks to assure maximum performance and reliability.

We recommend that the alignment of your trailer be checked as part of your regular maintenance schedule at the following times:

- During pre-delivery inspection (by your dealer).
- After the first 1600 km (1000 miles) of operation.
- After each additional 80,000 km (50,000 miles) of operation.

In addition to checking alignment at these recommended intervals, axle alignment should be checked when any of the following conditions prevail:

- Discovery of loose suspension fasteners or components (loose is defined as any torque below the recommended values).
- Discovery of elongated holes in a suspension component.
- Each time bushings are replaced.
- Whenever excessive or abnormal tire wear is detected.

NOTE: Many common driving occurrences including accidents, hard cornering, rapid starts, sudden stops, frequent driving on surfaces which are in poor condition, road hazards, off-road use, improper tire inflation and worn or damaged vehicle components can all alter alignment, therefore alignment is acknowledged as a routine maintenance item and is not accepted as a warrantable expense.

NOTICE FOR PRIMARY AIR RIDE

Ride height is set from the factory when there is no load on the trailer. Ride height should be checked and if need be adjusted (by a qualified person) when first using the trailer loaded. Measuring the ride height should then be done once again after 30 days of use and then at regular Preventive Maintenance periods to verify proper ride.

PROCEDURE FOR PARKING TRAILERS
(AIR RIDE SUSPENSION ONLY)

1. Set the trailer parking brakes.
2. a. Raise lift axle(s).

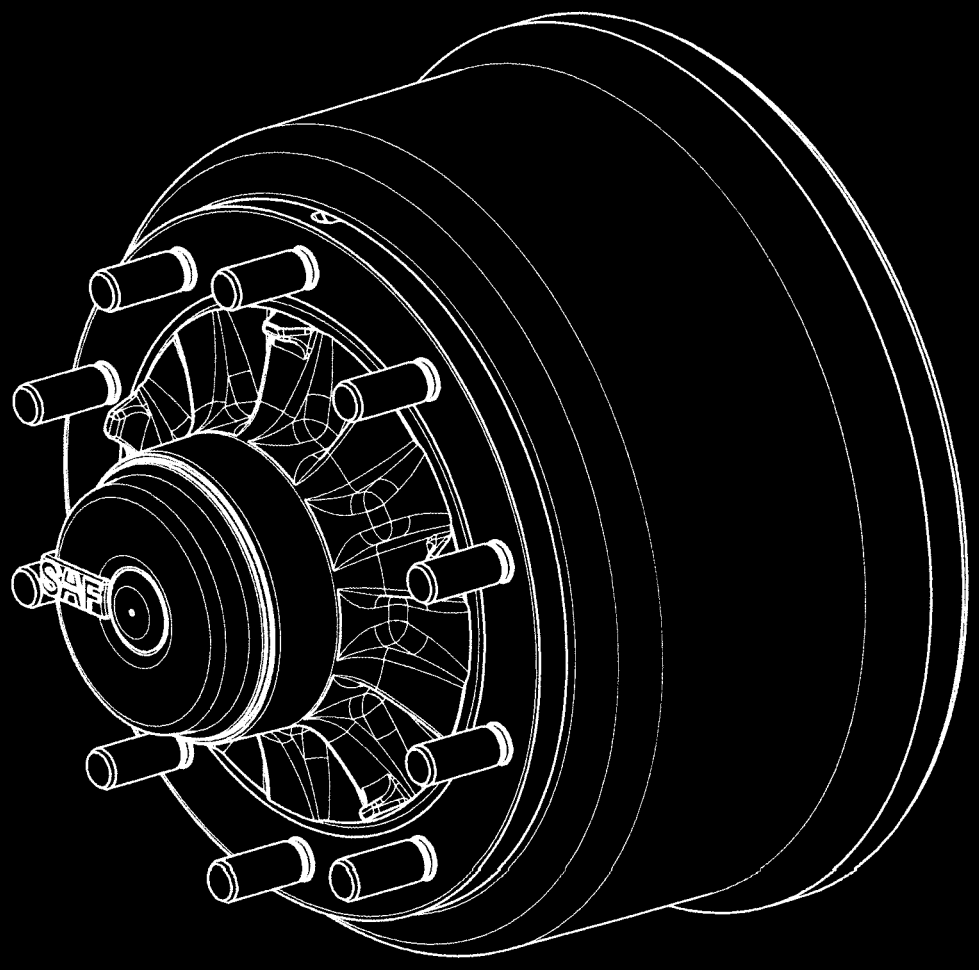
   or

   b. Release pressure from air springs on lift axle.
3. Dump air from ride suspension using dump switch.
4. Set landing gear to proper height.
5. Proceed with uncoupling.

WARNING: LEAVING TRAILER PARKED WITH AIR RIDE SUSPENSION UNDER PRESSURE COULD CAUSE DAMAGE TO LANDING GEAR SUPPORTS AND TRAILER IF AIR PRESSURE DROPS.

General Operating and Service Manual

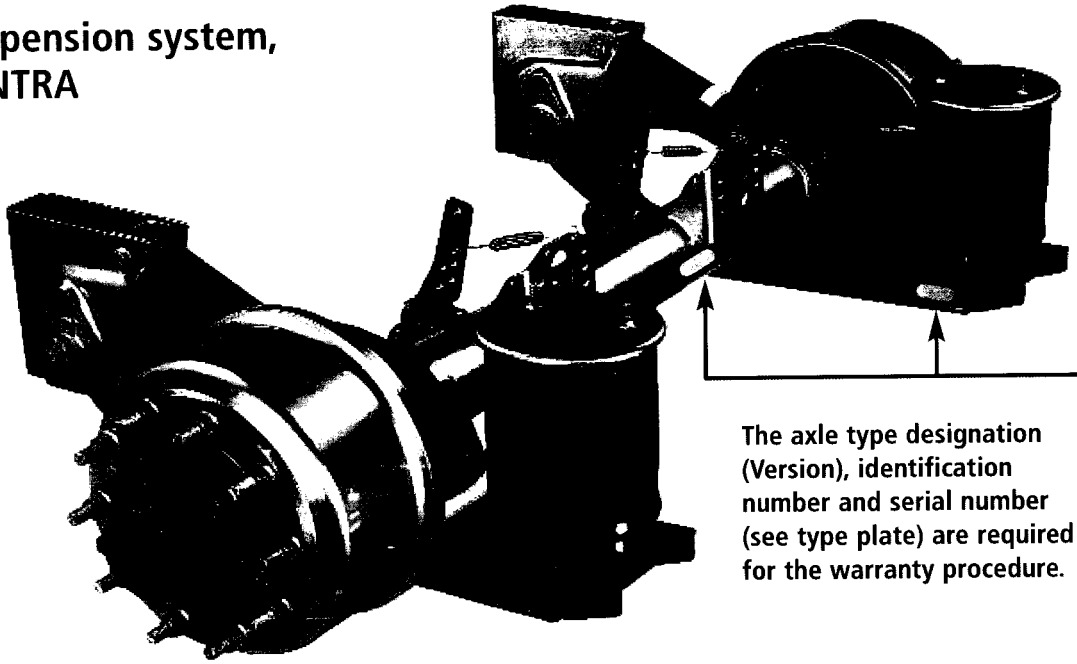
Air suspension systems and axles with drum brakes



Edition 04/2007

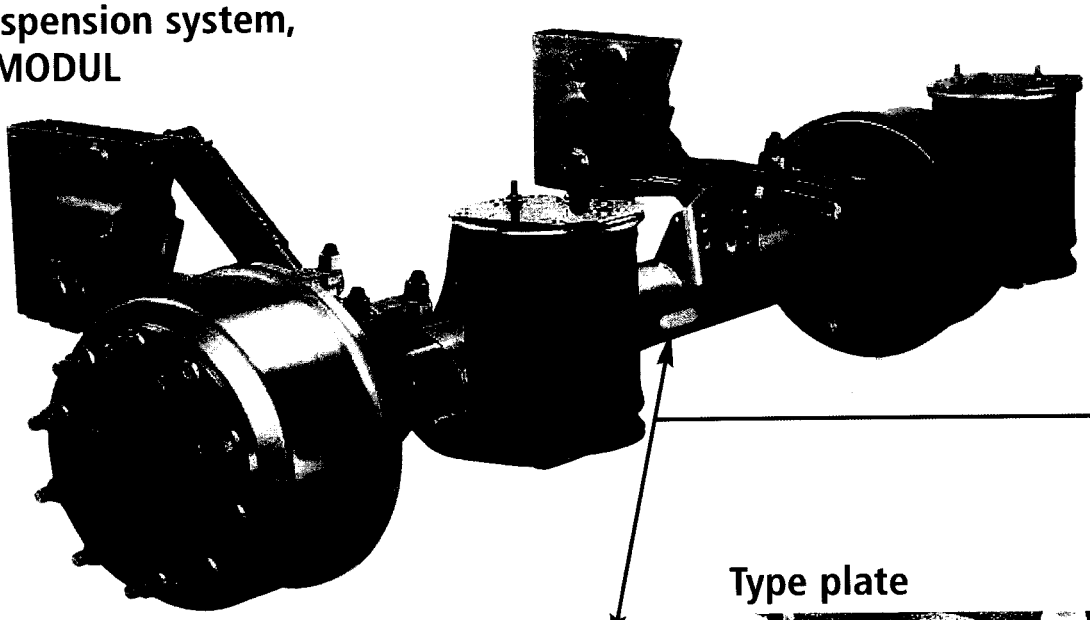
SAF Holland
ORIGINAL PARTS

Air suspension system, Type INTRA

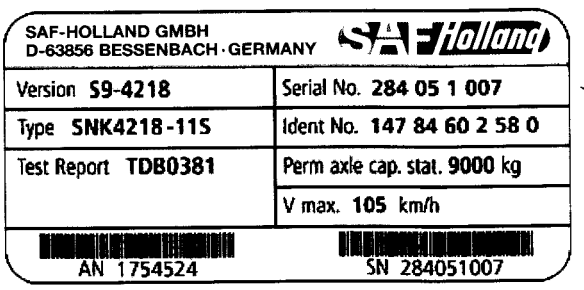


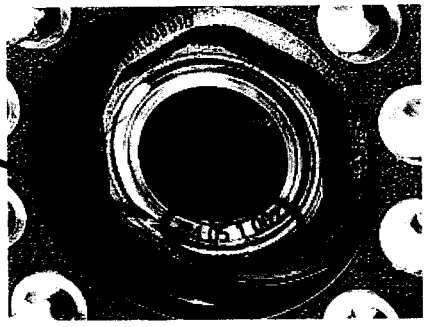
The axle type designation (Version), identification number and serial number (see type plate) are required for the warranty procedure.

Air suspension system, Type MODUL



Type plate





Identification if the type plate is missing:
The Serial No. of the axle is embossed in the axle end on the right-hand side (as seen in the direction of travel).

Vehicle and axle identification

Trailer manufacturer .....

Body type .....

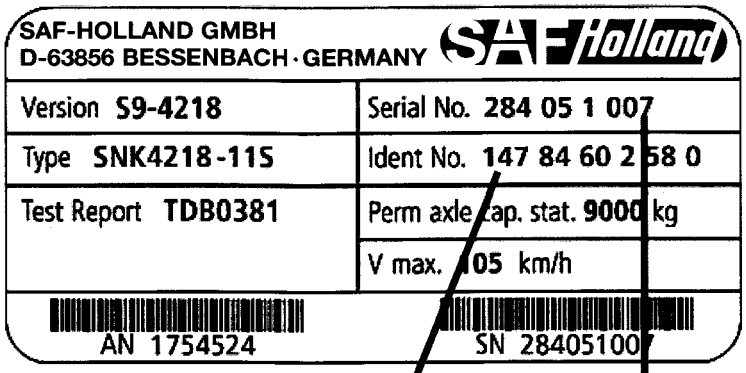
Chassis No. .....

Date of delivery/date of registration .....

Spare parts service for SAF-HOLLAND axles and suspension systems

Exact type designations are required for spare parts orders.

Please enter the identification data of the suspension system in the type plate illustrated below so that the correct information is available when necessary.



	Ident. No.	Prod. No. (Serial No.)
Example	147 84 60 2 58 0	284 05 1 007
1st axle		
2nd axle		
3rd axle		
4th axle		
5th axle		

Enter the axle data from the type plate

SAF Contents

GB

Page

General safety instructions

Please observe the following safety instructions in order to maintain the operational and road safety of your SAF-HOLLAND axles and suspension systems:

1. The wheel contact surfaces between the wheel disc and wheel hub and the wheel nut contact surface at the wheel disc must not be additionally painted. The contact surfaces must be clean, smooth and free from grease. Failure to observe this may result in the wheel coming loose. Any additional instructions of the wheel manufacturer must also be observed.
2. Only the wheel and tyre sizes approved by the trailer builder may be used. The tyres must always have the specified inflation pressure.
3. The brake systems of the tractor and the trailer/semi-trailer must be synchronised by means of a tractor/trailer brake synchronisation not later than 5,000 km after the initial start of operation of the trailer/semi-trailer in order to ensure a safe and uniform braking behaviour and uniform brake pad wear. Tractor/trailer brake synchronisations should be carried out by appropriately qualified and equipped brake workshops.

   The use of an additional braking system, such as a trailer anti-jackknife brake is forbidden by law on vehicles with type approval after January 1999.
4. Before starting a journey, ensure that the maximum permissible axle load is not exceeded and that the load is distributed equally and uniformly.
5. On trailers with air suspension, ensure that the air bags are completely filled with air before starting the journey. Incompletely filled air bags may result in damage to axles, suspension, frame and superstructure and impair road safety.
6. Ensure that the brakes are not overheated by continuous operation.

   With drum brakes, overheating can result in a hazardous deterioration in the braking efficiency.

   With disc brakes, overheating can result in damage to surrounding components – in particular the wheel bearings. This can result in a significant deterioration in road safety, e.g. failure of wheel bearings.
7. The parking brake must not be immediately applied when the brakes are hot, as the brake discs and brake drums may be damaged by different stress fields during cooling.
8. Use the supports provided when loading and unloading in order to avoid damage to the axle.
9. Observe the operating recommendation of the trailer builder for off-road operation of the installed axles and suspension systems.

   The SAF-HOLLAND definition of OFF-ROAD means driving on non-asphalted / non-concreted routes, such as e.g. gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

   Off-road operation of SAF-HOLLAND axles and suspension systems not designed for the purpose may result in damage and hence to an impairment of road safety.
10. SAF-HOLLAND axles and suspension systems require continuous care, service and maintenance in order to maintain operational and road safety and to be able to recognise natural wear and defects in good time.

    The daily inspection of the trailer for road safety before starting the journey is one of the driver's obligations.

    SAF-HOLLAND recommends that at least the inspections and maintenance operations described on page 6 should be carried out.

We recommend the use of original SAF-HOLLAND spare parts.

A close-knit service network of SAF-HOLLAND partner companies is available for the technical support of the SAF-HOLLAND axles and suspension systems and for the supply of original SAF-HOLLAND spare parts (see rear cover or on the Internet under www.safholland.com).

Updates will be published as necessary on the Internet under www.safholland.com.

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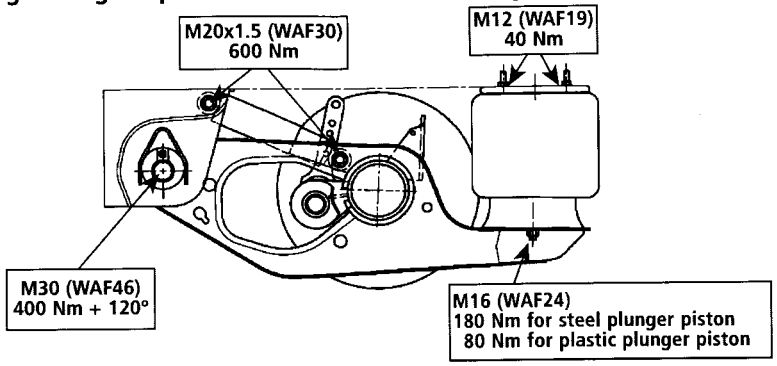
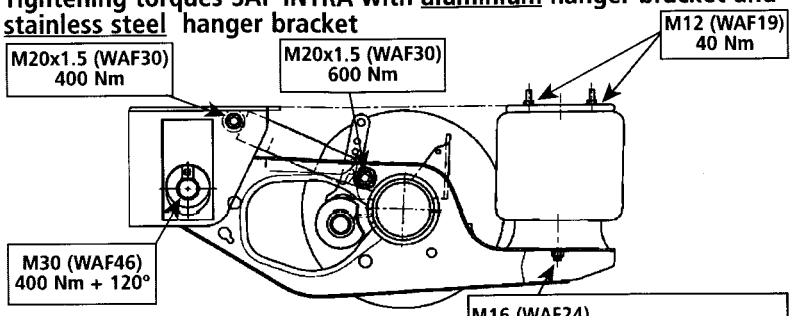
- **Caution:** After every wheel change, always retighten the wheel nuts to the prescribed torque after 50 km and again after 150 km.
- Check the brake lining thickness at regular intervals.
- Carry out general visual inspections of the brakes, tyres and all suspension components at regular intervals and check for proper attachment, wear, leaks, corrosion and damage.
- Carry out regular visual inspections of the wheel bearing unit for grease leaks and axial clearance.
  Wheel bearing grease change, see pages 9, 11, 13, 14 and 15.
- Regularly check the camshaft for smooth return and the slack adjuster for proper function.
- Lubricate the camshaft at regular intervals.
- Inspect the brake drum for wear* and cracking at every brake lining change.
  Minimum wear limits*, see pages 8 to 15.
- Replace the brake shoe return springs at every brake lining change.
- Check the air suspension ride height at regular intervals in accordance with the trailer builder's specifications and adjust as described on page 25.
- With aluminium and stainless steel hanger brackets, check that the bolts of the spring brackets and shock absorbers are tightened to the prescribed torques as described on page 7.
- On all units, check that the bolts of the U-brackets are tightened to the prescribed torques as described on page 7.
- For steering axles, observe also the points on pages 16 and 17.
- Carry out a general safety check in accordance with the statutory provisions.
- We recommend the use of original SAF-HOLLAND spare parts.

* We recommend that a general safety check is carried out when the minimum wear limit is reached.

Tightening torques SAF INTRA with steel hanger bracket

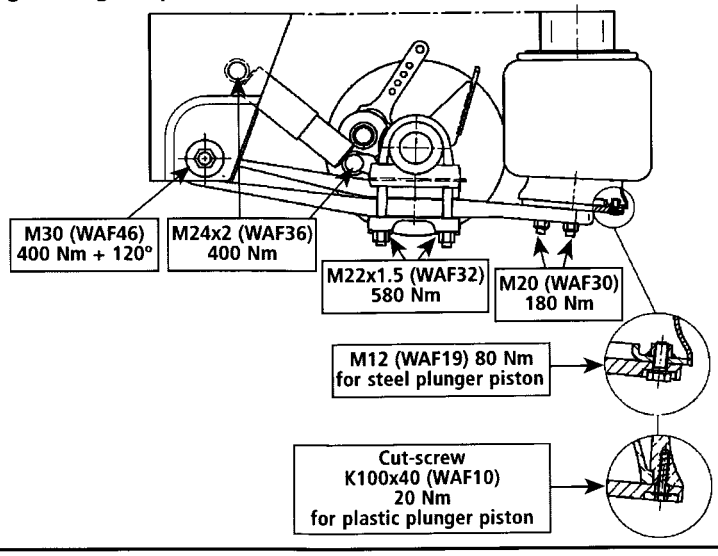


Tightening torques SAF INTRA with aluminium hanger bracket and stainless steel hanger bracket



NOT MAINTENANCE-FREE!

Tightening torques SAF MODUL



Attention!

- Threads not to be oiled or greased!
- Pivot bolt on steel hanger brackets maintenance-free.
- Service intervals for aluminium hanger brackets and stainless steel hanger brackets: first check after 500 km, further check after every 6 months
  Spring eye bolt: Inspection torque 1,200 Nm
  Shock absorber bolt: Inspection torque 400 Nm

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Axle types
S9-4218 / SL9-4218 / Z9-4218 / ZL9-4218 / S9-4220 / SL9-4220 / Z9-4220 / ZL9-4220 / S11-4218 / SL11-4218 / SZL11-4218 / Z11-4218 / ZL11-4218 / S11-4220 / SL11-4220 / SZL11-4220 / Z11-4220 / ZL11-4220 / ZZL11-4220

Wheel bearing play, wheel bearing grease

Adjustment of wheel bearing play not necessary.

Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.

Use a vacuum cleaner to remove brake dust.

Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.

Remove old grease from the stub axle and regrease.

Replace the O-ring.

Replace the brake shoe return springs at every brake pad change.

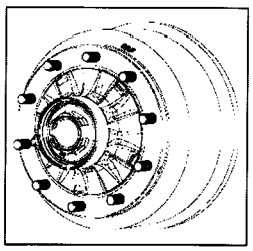
Grease specifications

For camshaft
Part No. 5 387 0011 05

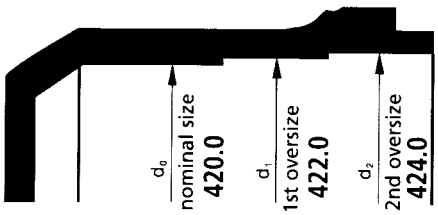
For axle stub end:
Mounting paste
Part No. 5 387 0021 05

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



On left-hand side in direction of travel:
Left-hand thread
On right-hand side in direction of travel:
Right-hand thread
Pretightening: 150 Nm, then turn the hub unit slowly by 5 revolutions.
Final tightening: Retighten by 1 increment (30°)
Marking of the nuts with left-hand thread:
Milled groove on outside of hexagon.
Max. permissible axial backlash of hub unit:
0 - 0.20 mm



BRAKE SNK 420

Max. admissible brake drum machining diameter:	424.0 mm
Max. admissible brake drum wear diameter:	425.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND:	SAF 396, BREMSKERL 6386

Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 420		d_0-420.0	d_1-422.0	d_2-424.0			
x 180	3 057 3960 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15
x 200	3 057 3966 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15

Assembly tools	**Part No.**
Axle nut wrench	4 434 3828 00
Brake shoe tensioner	3 349 1001 00
Puller for wheel hub	4 434 3822 00

Axle types
SK RS/RZ 9042/11242

Wheel bearing play, wheel bearing grease

Adjustment of wheel bearing play not necessary.

Change the wheel bearing grease after 500,000 km or 50 months.

Inspect taper roller bearing for serviceability at grease changes.

Replace the O-ring and fit the wheel cap.

Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.

Do not dismantle the wheel bearing unit.

Use a vacuum cleaner to remove brake dust.

Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.

Remove old grease from the stub axle and regrease.

Replace the brake shoe return springs at every brake pad change.

Grease specifications

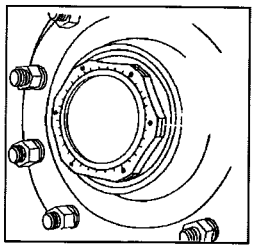
For wheel bearings:
Part No. 5 387 0011 05

For camshaft
Part No. 5 387 0011 05

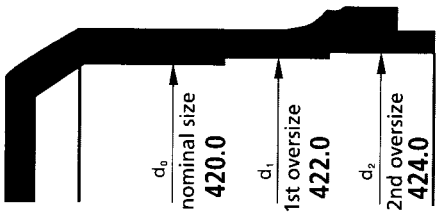
For axle stub end:
Mounting paste
Part No. 5 387 0021 05

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



On left-hand side in direction of travel:
Left-hand thread
On right-hand side in direction of travel:
Right-hand thread
Tightening torque 900 Nm. Each hub unit must be rotated smoothly at least twice while tightening the bolts.
Marking of the nuts with left-hand thread:
Milled groove on outside of hexagon.
Max. permissible axial backlash of hub unit:
0 - 0.20 mm



BRAKE SNK 420

Max. admissible brake drum machining diameter: 424.0 mm
Max. admissible brake drum wear diameter: 425.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND: SAF 396, BREMSKERL 6386
Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 420		d_0-420.0	d_1-422.0	d_2-424.0			
x 180	3 057 3960 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15
x 200	3 057 3966 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15

Assembly tools	Part No.
Axle nut wrench	1 012 0024 00
Brake shoe tensioner	3 349 1001 00
Brake drum mounting flanges	3 434 1040 01
Wheel bearing mounting mandrel	3 434 1043 00
Puller for wheel hub	4 434 3822 00

Axle types
Z8-3718 / S9-3718 / SL9-3718 / Z9-3720 / ZL9-3720 / S11-3720 / SL11-3720 / Z11-3720 / ZL11-3720

Wheel bearing play, wheel bearing grease

Adjustment of wheel bearing play not necessary.

Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.

Use a vacuum cleaner to remove brake dust.

Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.

Remove old grease from the stub axle and regrease.

Replace the O-ring.

Replace the brake shoe return springs at every brake pad change.

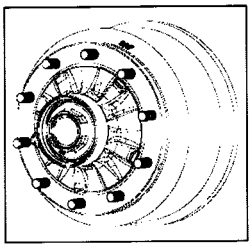
Grease specifications

For camshaft
Part No. 5 387 0011 05

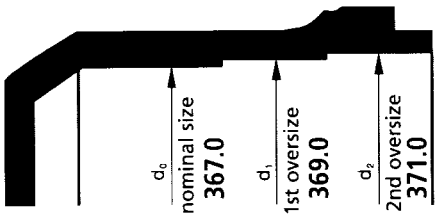
For axle stub end:
Mounting paste
Part No. 5 387 0021 05

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



On left-hand side in direction of travel: Left-hand thread
On right-hand side in direction of travel: Right-hand thread
Pretightening: 150 Nm, then turn the hub unit slowly by 5 revolutions.
Final tightening: Retighten by 1 increment (30°)
Marking of the nuts with left-hand thread: Milled groove on outside of hexagon.
Max. permissible axial backlash of hub unit: 0 - 0.20 mm



BRAKE SNK 367

Max. admissible brake drum machining diameter: 371.0 mm
Max. admissible brake drum wear diameter: 372.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND: SAF 396, BREMSKERL 6386
Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 367		d_0-367.0	d_1-369.0	d_2-371.0			
x 180	3 057 3168 00	21.1 20.5	22.1 21.5	23.1 22.5	4 4	64	B 8 x 15
x 200	3 057 3170 00	21.1 20.5	22.1 21.5	23.1 22.5	4 4	64	B 8 x 15

Assembly tools	Part No.
Axle nut wrench	4 434 3828 00
Brake shoe tensioner	3 349 1001 00
Brake drum mounting flanges	3 434 1040 01
Puller for wheel hub	4 434 3822 00

Axle types
SK RS/RZ 6537 / 9037/11037

Wheel bearing play, wheel bearing grease

Adjustment of wheel bearing play not necessary.

Change the wheel bearing grease after 500,000 km or 50 months.

Inspect taper roller bearing for serviceability at grease changes.

Replace the O-ring and fit the wheel cap.

Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.

Do not dismantle the wheel bearing unit.

Use a vacuum cleaner to remove brake dust.

Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.

Remove old grease from the stub axle and regrease.

Replace the brake shoe return springs at every brake pad change.

Grease specifications

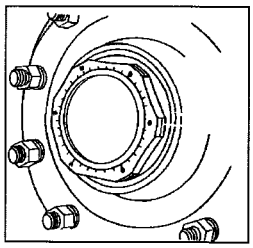
For wheel bearings:
Part No. 5 387 0011 05

For camshaft
Part No. 5 387 0011 05

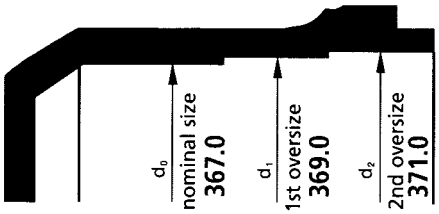
For axle stub end:
Mounting paste
Part No. 5 387 0021 01

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



On left-hand side in direction of travel:
Left-hand thread
On right-hand side in direction of travel:
Right-hand thread
Tightening torque 900 Nm. Each hub unit must be rotated smoothly at least twice while tightening the bolts.
Marking of the nuts with left-hand thread:
Milled groove on outside of hexagon.
Max. permissible axial backlash of hub unit:
0 - 0.20 mm



BRAKE SNK 367

Max. admissible brake drum machining diameter:	371.0 mm
Max. admissible brake drum wear diameter:	372.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND:	SAF 396, BREMSKERL 6386

Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 367		d_0-367.0	d_1-369.0	d_2-371.0			
x 150	3 057 3174 00	21.1 20.5	22.1 21.5	23.1 22.5	4 4	64	B 8 x 15
x 180	3 057 3168 00	21.1 20.5	22.1 21.5	23.1 22.5	4 4	64	B 8 x 15
x 200	3 057 3170 00	21.1 20.5	22.1 21.5	23.1 22.5	4 4	64	B 8 x 15

Assembly tools	**Part No.**
Axle nut wrench	1 012 0024 00
Brake shoe tensioner	3 349 1001 00
Brake drum mounting flanges	3 434 1040 01
Wheel bearing mounting mandrel	3 434 1058 00
Brass bush mounting device	1 434 1056 00
Brass bush mounting mandrel	1 434 1055 00
Puller for wheel hub	4 434 3822 00

Axle types
S7-3015 / Z7-3015 / S9-3020 / SL9-3020 / Z9-3020 / ZL9-3020 / Z11-3020 / ZL11-3020

Wheel bearing play, wheel bearing grease

Adjustment of wheel bearing play not necessary.

Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.

Use a vacuum cleaner to remove brake dust.

Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.

Remove old grease from the stub axle and regrease.

Replace the O-ring.

Replace the brake shoe return springs at every brake pad change.

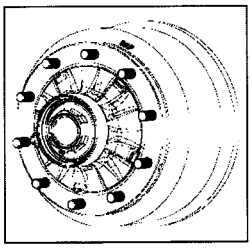
Grease specifications

For camshaft
Part No. 5 387 0011 05

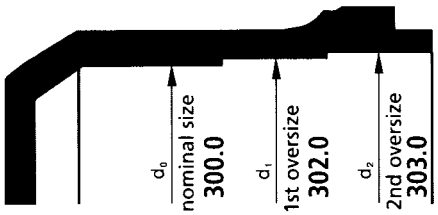
For axle stub end:
Mounting paste
Part No. 5 387 0021 05

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



On left-hand side in direction of travel: Left-hand thread
On right-hand side in direction of travel: Right-hand thread
Pretightening: 150 Nm, then turn the hub unit slowly by 5 revolutions.
Final tightening: Retighten by 1 increment (30°)
Marking of the nuts with left-hand thread: Milled groove on outside of hexagon.
Max. permissible axial backlash of hub unit: 0 - 0.20 mm



BRAKE SNK 300

Max. admissible brake drum machining diameter:	303.0 mm
Max. admissible brake drum wear diameter:	304.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND:	SAF 396, BREMSKERL 6386

Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 300		d_0-300.0	d_1-302.0	d_2-303.0			
x 150	3 057 3133 00	15.5 16.5	16.7 17.7	17.1 18.1	4 4	64	B 8 x 15
x 200	3 057 3124 00	15.5 16.5	16.7 17.7	17.1 18.1	4 4	64	B 8 x 15

Assembly tools	**Part No.**
Axle nut wrench	4 434 3828 00
Puller for wheel hub	3 301 0010 00
Puller for wheel hub	4 434 3822 00

Axle types
SK RS/RZ 6530 / 9030/11030/RZ 12030

Adjust wheel bearing clearance:
Tighten the WAF 85 axle nut to 150 Nm, turning the wheel hub at the same time.
Turn back the axle nut by 2 1/2 holes of the lock washer.
Push on the lock washer and secure the axle nut with the locking pin.
Tighten the lock nut to 400 Nm.
Check the running and rock of the wheel bearing.
The wheel must turn without resistance and no rock may be felt at the wheel rim. Correct the adjustment, if necessary.
Replace the O-ring and fit the wheel cap.
Replace the brake shoe return springs at every brake pad change.

Grease specifications

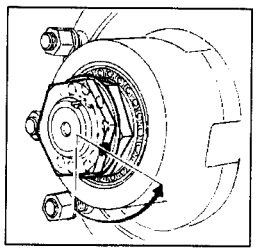
For wheel bearings:
Part No. 5 387 0011 05

For camshaft:
Part No. 5 387 0011 05

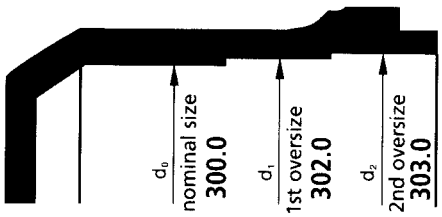
For axle stub end:
Mounting paste
Part No. 5 387 0021 01

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



Note during brake repairs:
Lubricate the camshafts, rotating the camshaft through 360° several times.
Use a vacuum cleaner to remove brake dust.
Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.
Remove old grease from the stub axle and regrease.
Max. permissible axial backlash of hub unit: 0 - 0.20 mm



BRAKE SNK 300

Max. admissible brake drum machining diameter:	303.0 mm
Max. admissible brake drum wear diameter:	304.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND:	SAF 396, BREMSKERL 6386

Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 300		d_0-300.0	d_1-302.0	d_2-303.0			
x 150	3 057 3133 00	15.5 16.5	16.7 17.7	17.1 18.1	4 4	64	B 8 x 15
x 200	3 057 3124 00	15.5 16.5	16.7 17.7	17.1 18.1	4 4	64	B 8 x 15

Assembly tools	**Part No.**
Axle nut wrench	4 434 3828 00
Puller for wheel hub	3 301 0010 00
Fitting mandrel for wheel bearing and seal ring	3 434 1014 00
Fitting mandrel for wheel bearing	3 434 3308 00
Brass bush mounting mandrel	1 434 1055 00
Brass bush mounting device	1 434 1056 00

Axle types
SK RS/RZ 12242

Adjust wheel bearing clearance:

Tighten the WAF 85 axle nut to 150 Nm, turning the wheel hub at the same time.

Turn back the axle nut by 2 1/2 holes of the lock washer.

Push on the lock washer and secure the axle nut with the locking pin.

Tighten the lock nut to 400 Nm.

Check the running and rock of the wheel bearing.

The wheel must turn without resistance and no rock may be felt at the wheel rim. Correct the adjustment, if necessary.

Replace the O-ring and fit the wheel cap.

Replace the brake shoe return springs at every brake pad change.

Grease specifications

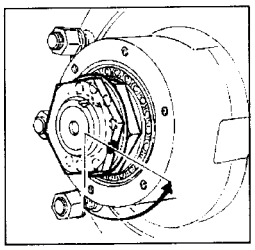
For wheel bearings:
Part No. 5 387 0011 05

For camshaft
Part No. 5 387 0011 05

For axle stub end:
Mounting paste
Part No. 5 387 0021 01

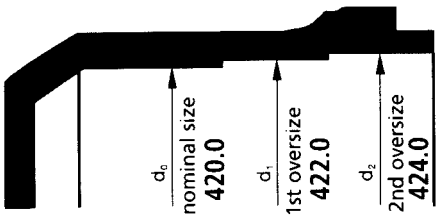
For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



Note during brake repairs:

Lubricate the camshafts, rotating the camshaft through 360° several times.
Do not dismantle the wheel bearing unit.
Use a vacuum cleaner to remove brake dust.
Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.
Remove old grease from the stub axle and regrease.
Max. permissible axial backlash of hub unit:
0 - 0.20 mm



BRAKE SNK 420

Max. admissible brake drum machining diameter: 424.0 mm
Max. admissible brake drum wear diameter: 425.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND: SAF 396, BREMSKERL 6386
Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 420		d_0-420.0	d_1-422.0	d_2-424.0			
x 180	3 057 3960 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15
x 200	3 057 3966 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15

Assembly tools	**Part No.**
Axle types 12242	
Axle nut wrench	4 434 3828 00
Puller for wheel hub	3 301 0010 00
Universal puller for wheel hub	4 434 3822 00
Fitting mandrel for wheel bearing and seal ring	3 434 3320 00
Fitting mandrel for cassette seal ring	3 434 1036 00
Brake shoe tensioner	3 349 1001 00

Axle types
K RS / RZ 14242 / 16242

Adjust wheel bearing clearance:

Tighten the axle nut, turning the wheel hub until a slight resistance is felt.
Turn back the axle nut by 1/12 turn to the next locking possibility.
Lock the axle nut with the cotter pin.
Turn back the wheel hub slightly against the front bearing with the wheel hub puller.
Seal the thread of the wheel cap.
Screw on the wheel cap.
Check the running and rock of the wheel bearing.
The wheel must turn without resistance and no rock may be felt at the wheel rim. Correct the adjustment, if necessary.
Replace the brake shoe return springs at every brake pad change.

Grease specifications

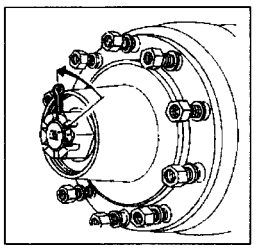
For wheel bearings:
Part No. 5 387 0011 05

For camshaft
Part No. 5 387 0011 05

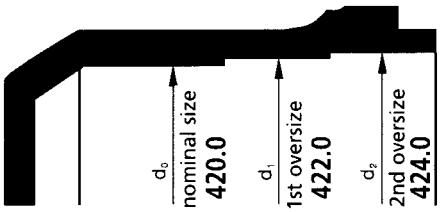
For axle stub end:
Mounting paste
Part No. 5 387 0021 01

For ball in brake carrier:
Copper paste
Part No. 5 387 0014 01

Tighten axle nuts



Note during brake repairs:
Lubricate the camshafts, rotating the camshaft through 360° several times.
Do not dismantle the wheel bearing unit.
Use a vacuum cleaner to remove brake dust.
Use of a high-pressure cleaner or liquid cleanser is not permitted on the brake drum and brake hub.
Remove old grease from the stub axle and regrease.
Max. permissible axial backlash of wheel bearing: 0 - 0.20 mm

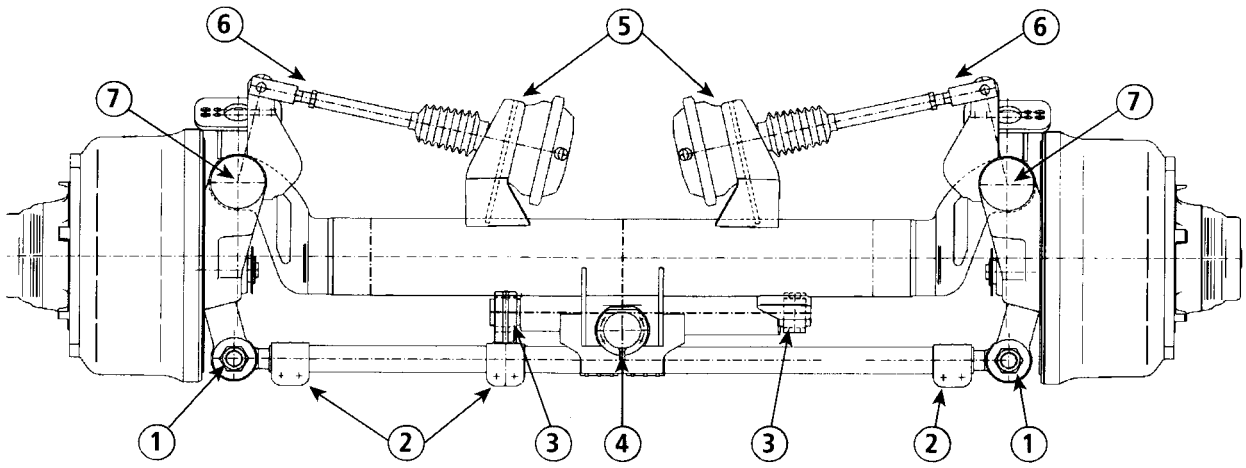


BRAKE SNK 420

Max. admissible brake drum machining diameter: 424.0 mm
Max. admissible brake drum wear diameter: 425.0 mm
Brake lining qualities recommended and approved by SAF-HOLLAND: SAF 396, BREMSKERL 6386
Machine new brake linings to diameter + 0.3 mm of the brake drum.
When riveting on, observe the lining form (see instructions in the pack).

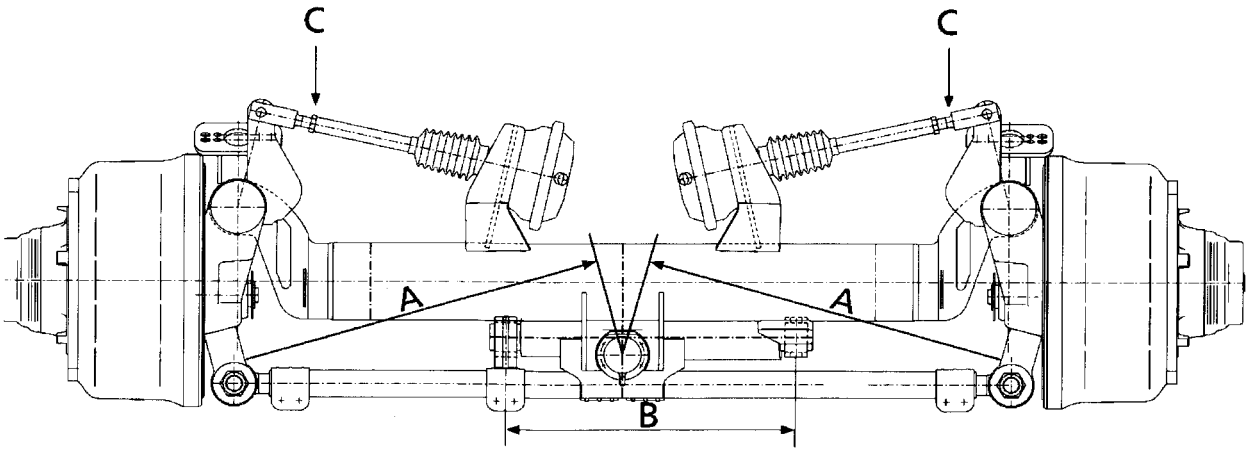
Brake size	Part No. Brake lining	Brake drum / brake lining Repair stages in mm			Brake lining	Rivet	Rivet DIN 7338
		Normal dimension	1st repair stage	2nd repair stage	Number per axle		
SNK 420		d_0-420.0	d_1-422.0	d_2-424.0			
x 180	3 057 3960 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15
x 200	3 057 3966 00	20.6 20.0	21.6 21.0	22.6 22.0	4 4	64	B 8 x 15

Assembly tools	**Part No.**	
Axle types	**14242**	**16242**
Axle nut wrench		1 012 0013 00
Puller for wheel hub		3 301 0007 01
Universal puller for wheel hub	4 434 3822 00	4 434 3822 00
Fitting mandrel for wheel bearing and seal ring		3 434 3301 00
Brake shoe tensioner	3 349 1001 00	3 349 1001 00
46 mm dia. brass bush driver mandrel	1 434 1056 00	1 434 1056 00
50/46 mm and 42/38 mm dia. mounting mandrel	1 434 1055 00	1 434 1055 00



Tightening torques

No.	Designation	Number per axle	Tightening torque
1	Ball joint screw	2	M30 (340 Nm)
2	Reatining clamp screw	10	M12 (80 - 90 Nm)
3	Steering damper screw	2	M24 (600 - 660 Nm)
4	Lock cylinder screw	4	M6 (8 - 10 Nm)
5	Stabilising cylinder screw	4	M16 (180 ± 30 Nm)
6	Lock nut	2	M20 (is locked against the thrust rod)
7	Cover plate screw	6	M8 (25 - 30 Nm)



- Dimension "A" must be the same; observe the toe-in (approx. 4.0 mm/m)
- Dimension "B" is 537 mm; engage the reversing lock
- On versions with pneumatic stabilisation, a steering damper must be used.
- On versions without pneumatic stabilisation, a steering damper must be used.
- Check: Backlash-free seating of the piston rods of the stabilising cylinders.
  Apply stabilising pressure (min. 2 bar) to the cylinders. Piston and pressure rods must then be backlash-free (under slight pressure); otherwise adjust at "C".
- When setting the track width on the trailer, the cylinders must be under stabilising pressure and the correct ride height of the air suspension system must have been set.
- Tighten all bolts to the prescribed torque and lock the nuts or insert the cotter pin.

Note:

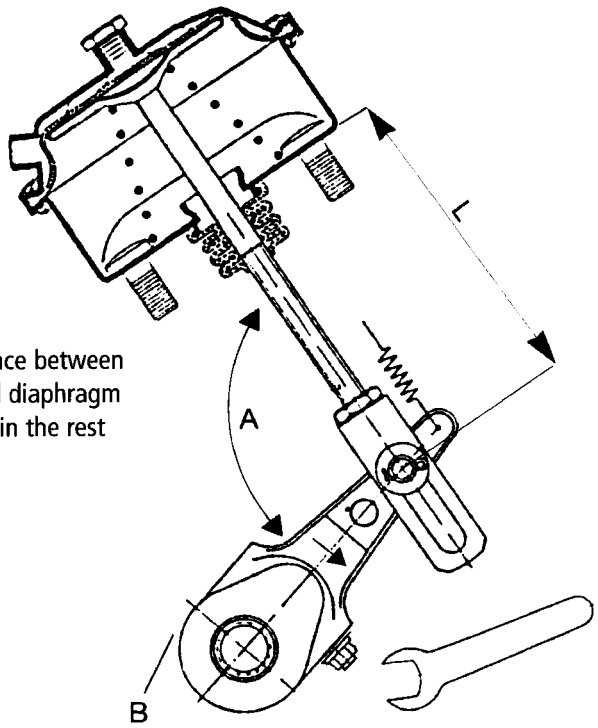
During lubrication work on the steering pin bearing, the axle must be relieved (raised).

Lubrication at the bearing points of the king pin bolt
for the first time after 1 month,
then every 6 months

Check the brake setting

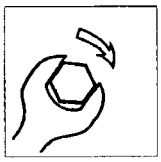
Adjustment of S-cam brakes with manual slack adjusters

The natural wear of the brake drum and brake lining necessitate frequent adjustment of the wheel brakes in order to maintain the maximum stroke of the brake cylinders. In order to achieve good braking, it is essential to minimise the clearance between the brake drum and brake lining. In order to check the clearance, the service brake is applied with full pressure and the stroke of the brake cylinder checked. If the stroke at the yoke end is more than 2/3 of the maximum cylinder stroke, the brake must be urgently adjusted. If the brakes are correctly adjusted, it should not be possible to move the piston rod more than 15 mm by hand.



No clearance between piston and diaphragm permitted in the rest position.

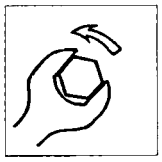
Adjustment is performed at the adjustment screw (WAF 19)

1 

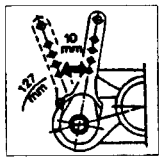
Turn the adjusting screw to the right until the

2 

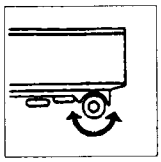
brake shoes are firmly up against the brake drum.

3 

Turn the adjusting screw to the left until

4 

the free travel of the slack adjuster (at 127 mm) is approx. 10 - 15 mm.

5 

It must be possible to turn the wheel freely without braking (without scraping noises).

Special instructions apply for automatic slack adjusters (see adjustment procedure on the following pages).

A = Angle must not exceed 90° at 1/2 stroke.
B = No contact permissible between slack adjuster and axle beam during emergency braking.
L = Observe piston rod length as per the SAF-HOLLAND specifications.

HALDEX automatic slack adjuster

Note when changing over from mechanical slack adjuster to automatic slack adjuster:

In order to avoid damage to the wheel brake, install only the automatic slack adjuster with the prescribed adjustment gate and corresponding mounting point strap approved by SAF-HOLLAND for the respective axle type.

Changes to the effective brake lever lengths are not admissible.

The field installation of automatic slack adjusters does not require type approval so that no inspection by the technical inspection authorities (TÜV) is necessary.

Technical information on SAF-HOLLAND spare part numbers and correspondence of slack adjusters and axle types can be obtained from the SAF-HOLLAND service partners.

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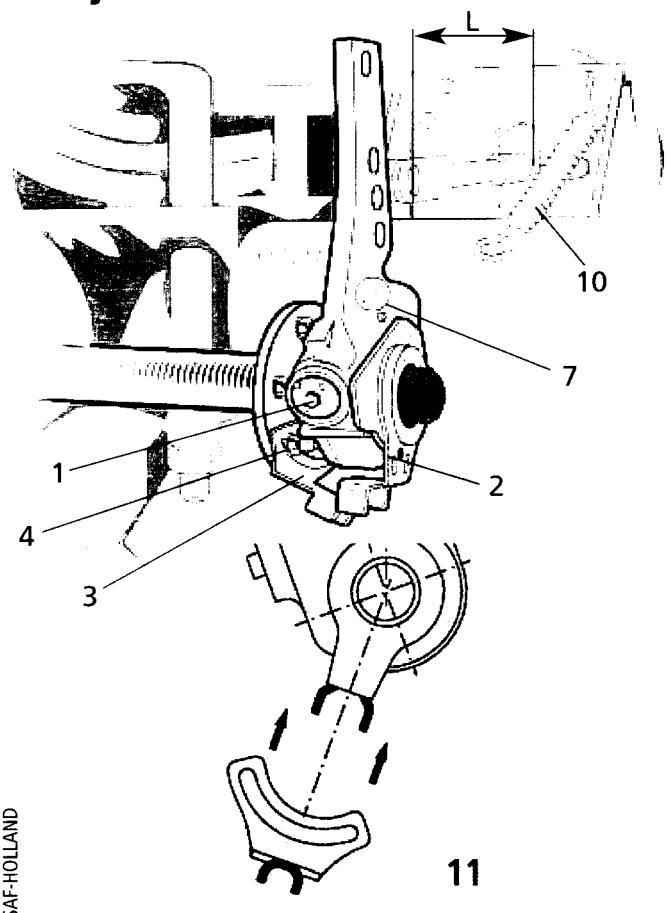
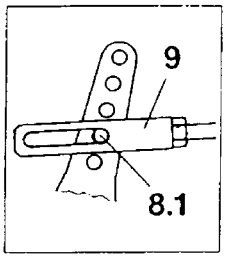
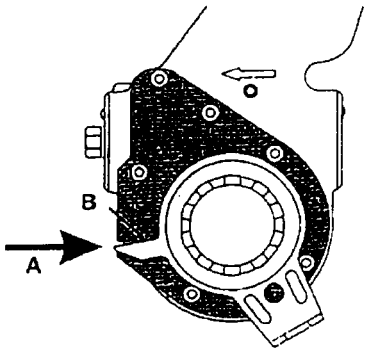
Adjustment of HALDEX automatic slack adjusters







When correctly installed, the Tip of arrow B must match notch A in the control unit.

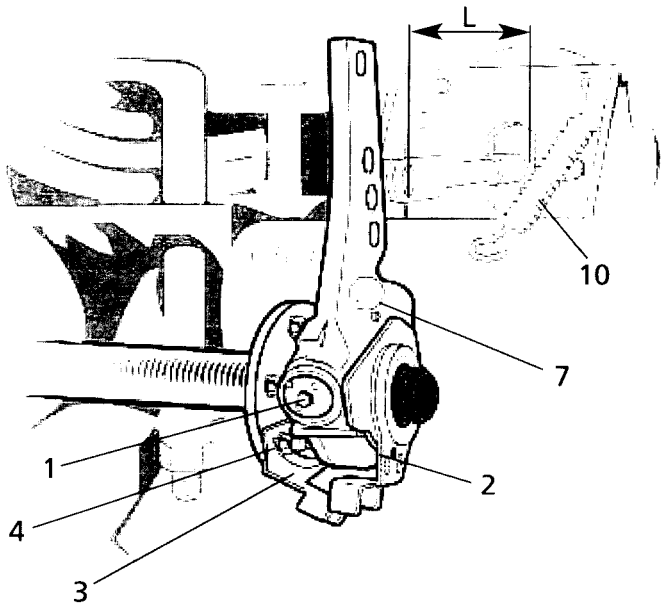
- Cams and brake shoes are in the zero position.
- Observe the correct piston rod length "L" as given in the SAF-HOLLAND specifications.
- **Brake chambers**
  Before installation, ensure that the brake chamber is in its starting position.
- **Spring brake chambers,** on the other hand, must be under full working pressure (min. 6 bar).

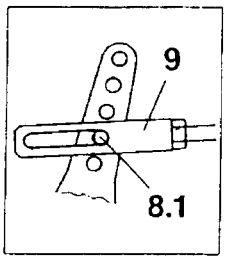
  IMPORTANT: If this is not observed, the basic setting will be wrong!
- Grease the camshaft.
- Install mounting point strap (3); be sure to use two mounting bolts (4).
- Install the slack adjuster on the camshaft.
- The arrow mark (7) points in the braking direction.
- Turn adjusting screw (1) until the bore in the slack adjuster (8.1) is aligned with the bore in the yoke end (9) (see figure).
- Grease cotter pin (8) and secure.
- Hook in return spring (10).
- Turn the control arm in the direction of the arrow (working direction of the slack adjuster) into its end position **without** using force
- In this end position of control arm (2), tighten mounting bolts (4).
- With the fixed mounting point (11), ensure that the 2 U-profiles engage correctly in one another.

  NOTE FOR SELF-STEERING AXLES:
- Weld on mounting point strap (3) in this position.
- Fix the slack adjuster on the camshaft.
- Axial clearance: Adjust the nominal value of 0.5 - 2 mm using shims.
- Adjust the clearance of the brake lining by turning adjusting screw (1) in clock-wise direction until the brake lining is in contact with the brake drum. Then back off adjusting screw (1) by 3/4 turn.
  Do not use an impact wrench!

  FUNCTION CHECK
- If the adjustment coupling is functioning correctly, a torque of at least 18 Nm must be felt when backing off adjusting screw (1); a ratchet noise should also be clearly audible.
- Actuate the service brake several times, check the free running of the brake drum, check the clearance.
  If necessary, repeat the adjustment of the slack adjuster.

Adjustment of S-ABA automatic slack adjusters

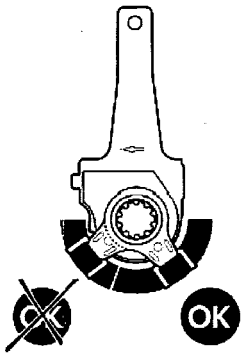




- Cams and brake shoes are in the zero position.
- Observe the correct piston rod length "L" as given in the SAF-HOLLAND specifications.
- **Brake chambers**
  Before installation, ensure that the brake chamber is in its starting position.
- **Spring brake chambers,** on the other hand, must be under full working pressure (min. 6 bar).

  IMPORTANT: If this is not observed, the basic setting will be wrong!
- Grease the camshaft.
- Install mounting point strap (3); be sure to use two mounting bolts (4).
- Install the slack adjuster on the camshaft.
- The arrow mark (7) points in the braking direction.
- Turn adjusting screw (1) until the bore in the slack adjuster (8.1) is aligned with the bore in the yoke end (9) (see figure).
- With the fixed mounting point, ensure that the 2 U-profiles engage correctly in one another.
- Grease cotter pin (8) and secure.
- Hook in return spring (10).
- Fix the slack adjuster on the camshaft.

- Axial clearance: Adjust the nominal value of 0.5 - 2 mm using shims.
- Adjust the control arm.
- Observe the possible setting range for the control lever position.

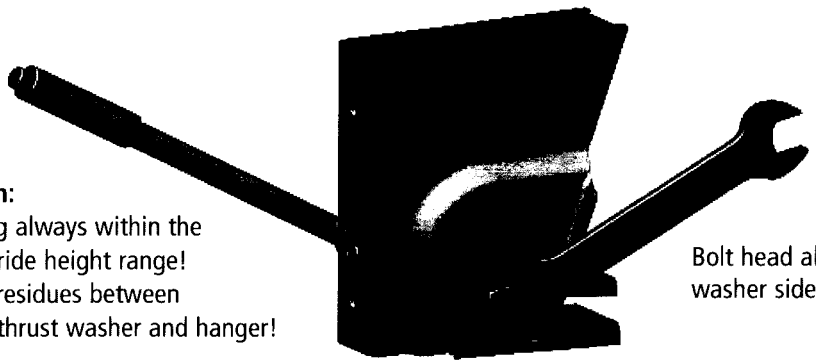


- Adjust the clearance of the brake lining by turning adjusting screw (1) in clock-wise direction until the brake lining is in contact with the brake drum. Then back off adjusting screw (1) by 3/4 turn.
  Do not use an impact wrench!

FUNCTION CHECK

- If the adjustment coupling is functioning correctly, a torque of at least 18 Nm must be felt when backing off adjusting screw (1); a ratchet noise should also be clearly audible.
- Actuate the service brake several times, check the free running of the brake drum, check the clearance.
  If necessary, repeat the adjustment of the slack adjuster.

Tightening instructions for adjustable pivot bolt

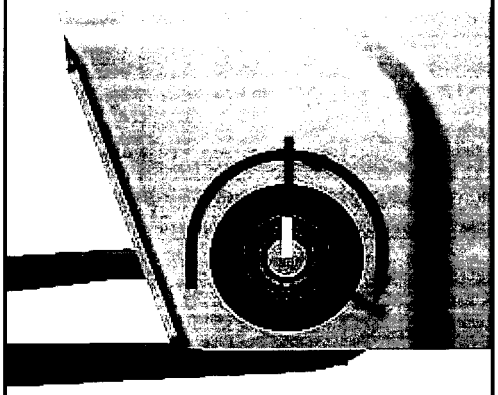


Attention:
Tightening always within the specified ride height range!
No paint residues between eccentric/thrust washer and hanger!

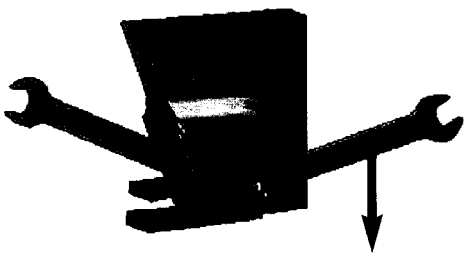
Bolt head always on the eccentric washer side.

Pretightening 400 Nm
Use Torque wrench

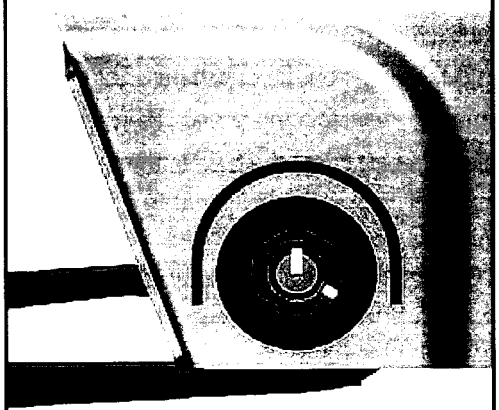
Marking for angle tightening



Angle tightening 120°
Use impact wrench or extend lever to 2.5 m



Visual inspection



Semi-trailer tilt angle

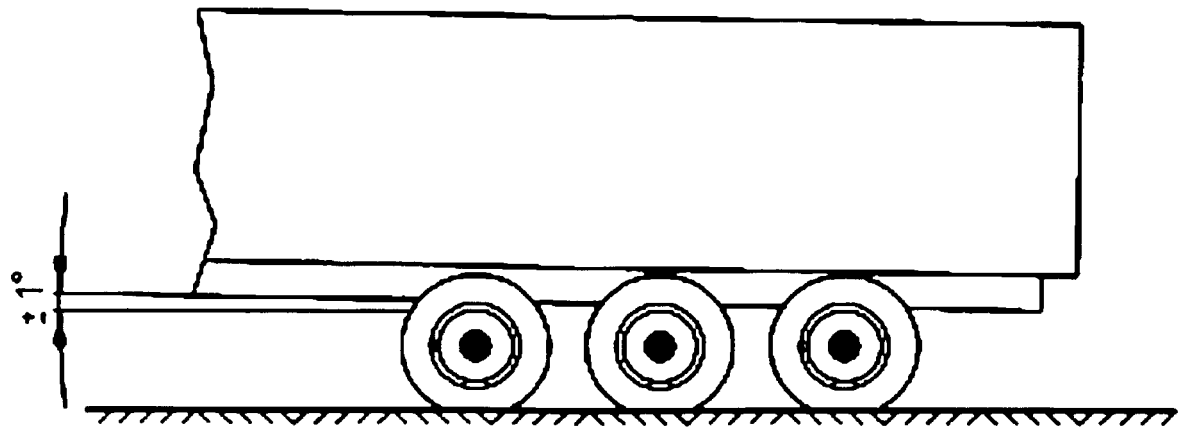
Ride heights

Adjust the ride height of the air suspension axles to the permissible range indicated in the corresponding SAF -HOLLAND documents.

With single axles, allow for a minimum suspension travel of 60 mm.

For trailers with multiple axles, allow for a minimum suspension travel of 70 mm.

Exception:
For multi-axle trailers with lift axles, the minimum suspension travel at the lift axle should not be less than 100 mm in order to ensure an adequate ground clearance.



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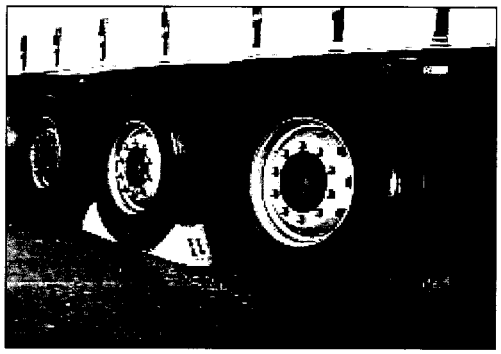
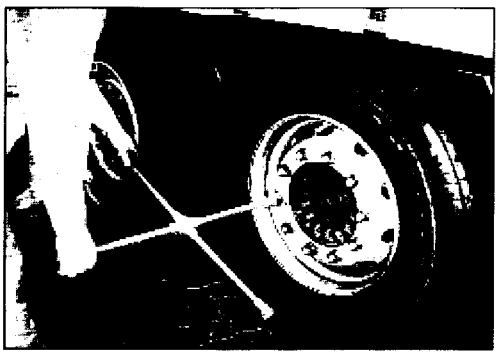
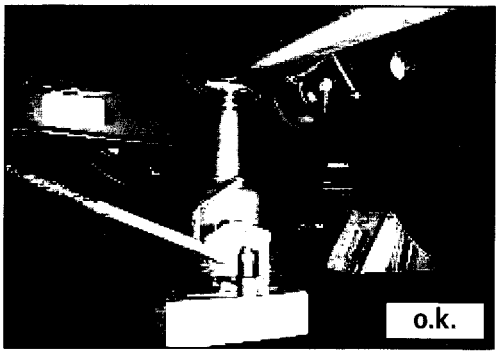
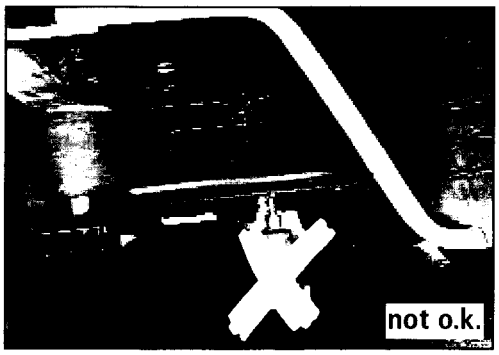
Tyre changing on fully loaded trailer with INTRA axle

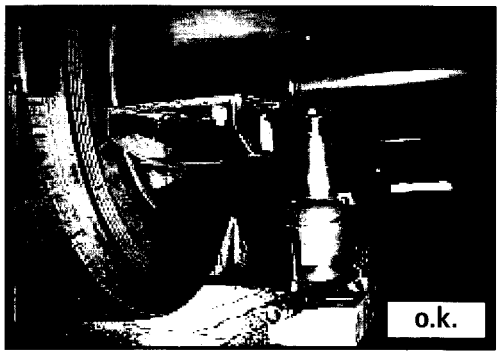
Jack positioning points:

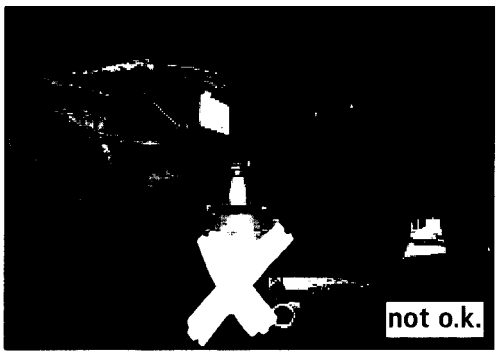


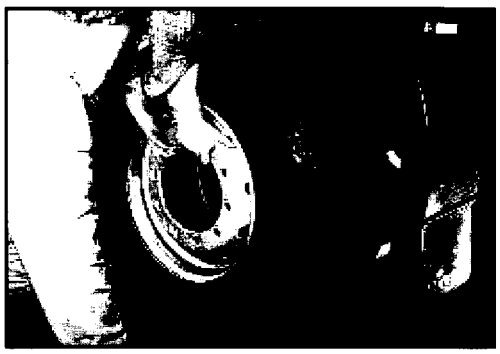


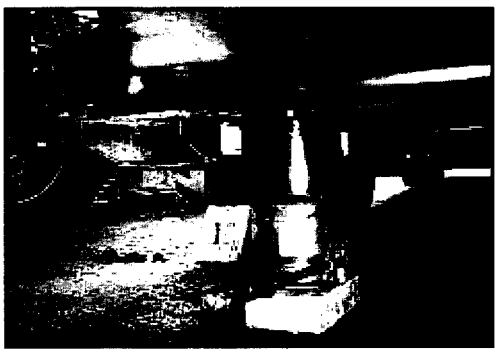










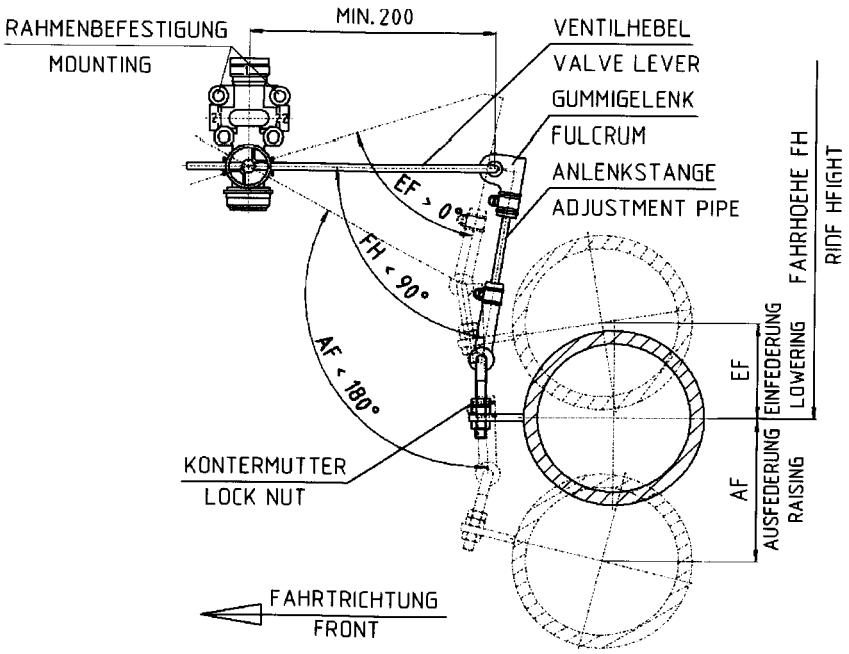


Adjustment of the air suspension system ride height

Air suspension valve

As standard, SAF-HOLLAND air suspension axles and system require only one air suspension valve.
The air suspension valve controls the air bag pressure in relation to the trailer load in order to maintain a constant ride height in every load condition.
The air suspension valve is fastened to the trailer frame with screws and connected to the axle via the pivot joint (valve lever and adjustment pipe). On triple-axle trailers, the system is generally connected to the middle axle (normally in the middle of the axle), and on twin-axle trailers to the rear axle. In special cases (e.g. large trailer tilt angle), the air suspension valve can be installed in the rear axle.

For trailers with axle lifting system, the axle to which the system is connected depends on the axle to be lifted.



Installation

The valve lever should be at least 200 mm long and is horizontal when the trailer is in the driving position.
As a function check, move the lever down slightly. Air must now escape via the venting cap into the atmosphere. If air flows into the air bags when the lever is pushed down, the valve lever has to be turned through 180°. For this the valve lever has to be disconnected. The ride height is set by adjusting the adjustment pipe in the fulcrums and by turning the lock nuts.
The adjustment must be carried out with the trailer standing on level ground. It can be carried out with the trailer either empty or loaded.

Note

For a final check, the air suspension system should be lowered to the suspension stop or raised to the limit (shock absorbers, stop ropes, air bag length). During this process, the specified angle between valve lever and adjustment pipe must not be exceeded in order that the valve lever does not move in the wrong direction.

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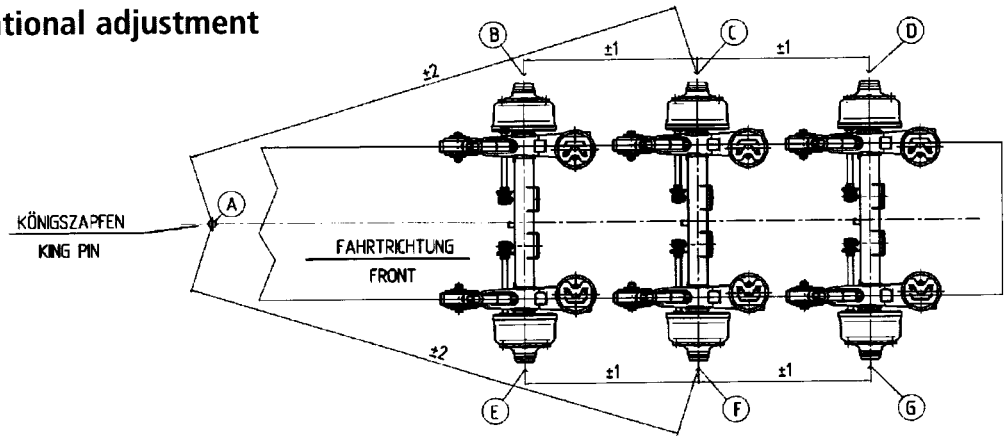
In order to compensate for production tolerances, an axle alignment and, if necessary, a correction should be carried out.
The maximum permissible deviations (tolerances) of the alignment values are specified by the tyre manufacturer.
The maximum possible wheelbase correction per axle is ± 6 mm.

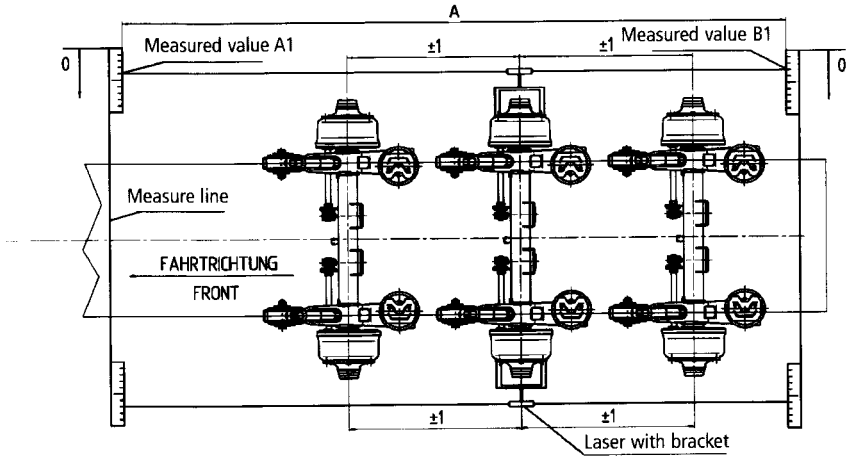
Conventional adjustment



Determine the lengths of the diagonals A - C and A - F for the middle axle (reference axle) by comparison measurements, observing the tolerances.
Check the wheelbases B - C and E - F for the front axle and C - D and F - G for the rear axle and correct, if necessary, observing the tolerances.

Optical adjustment

Observe the operating and setting instructions of the measuring system manufacturer.



Calculation of the toe-in and toe-out values:

$$\frac{\text{A1 - B1 (mm)}}{\text{A (m)}} = \text{S}$$

S = positive value = Toe-in
S = negative value = Toe-out

Notes

1. In order to avoid tyre wear, we recommend that an axle alignment is performed at regular intervals.
2. We recommend the use of an optical measuring system for carrying out the axle alignment.
3. For alignment, only the centres of the middle of the wheel cap or the middle of the axle stub end are of interest as reference points.
4. Possible causes of deviations in the axle alignment are:
   - Loose U-bolts
   - Wear of the spring guide bearing
   - Deformation of the axle assembly components due to improper use

NOTIZEN/NOTES/NOTE

Top24/7
Trailer Operating Programme

+49-6095-301-247

Ihre neue Servicenummer im Pannenfall:
24 Stunden, 7 Tage die Woche!

Your new service number in case of a breakdown:
24 hours, 7 days each week.

Nouveau numéro du service d'assistance en cas de panne :
24 heures sur 24, 7 jours sur 7.

Il vostro nuovo numero di servizio se restate in panne:
24 ore, 7 giorni la settimana.

En caso de avería, su nuevo número para asistencia técnica:
durante los 7 días de la semana, 24 horas al día.

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BA11484-001-01

www.safholland.com

SAF-HOLLAND GmbH · Hauptstraße 26 · D-63856 Bessenbach

SAF-Holland

SAF Guarantee of Competence

We assume the following manufacturer's warranty for the durability of the air suspension unit (hereinafter: the Unit).

SAF INTRADRUM

Type IU / IO for 9 t axle load with single tires.

The beneficiary of the warranty is the party which operates a vehicle equipped with the Unit, for its own purpose (final customer).

Term and Scope of Warranty

SAF-HOLLAND warrants to the final customer that the Unit will run without defects for 1 million km during a maximum period of 6 years as of the first registration of the vehicle equipped with the Unit, but not longer than 6.5 years from the date of manufacture of the Unit. (The date of manufacture can be determined by the serial number. This is located on the type plate of the Unit. From July 2009 the serial number has 11 digits. The year of production (by decade) results from the 3rd and 4th digit of the serial number. The three-digit date of manufacture (= current calendar day) results from the 5th, 6th and 7th digit. The serial number had 9 digits prior to July 2009. The three-digit production date (= current calendar day) results from the 1st and 2nd and 3rd digit; the year of production (by decade) results from the 4th and 5th digit of the serial number.).
Pending an assessment of the preconditions and approval by SAF-HOLLAND, the claims under this warranty are restricted to the repair free of charge or, at the discretion of SAF-HOLLAND, replacement of the Unit free of charge at the workshop of an SAF-HOLLAND Competence Partner (Germany) or a specialist workshop authorized by SAF-HOLLAND or the local SAF-HOLLAND country representative (other countries). SAF-HOLLAND shall be entitled to read and analyze the "Operating Conditions Protocol" from the EBS brake system of the trailer/semi-trailer. More extensive claims, especially claims for damages, may not be derived from the warranty. In particular, SAF-HOLLAND shall not be liable under this warranty for the reimbursement of transport and towing costs, or for loss of profits, loss of use, etc. Any more extensive claims against the seller shall remain unaffected by this warranty.

The guarantee is valid for the operation of vehicles in geographical Europe up to the Ural mountains and Turkey.

Defects Excluded

Defects caused by the application of external force, by operating errors, off-road use (driving on non-asphalted/non-concrete routes, e.g. on ballast-coated roads, agricultural or forestry tracks, on construction sites or gravel pit terrain), by use in races or for military purposes as well as by failure to observe operating, maintenance or installation instructions and by the use of spare parts not released by SAF-HOLLAND, are excluded from the manufacturer's warranty. Natural wear and tear of working parts such as, in particular, brake drums, brake linings, air springs, brake shoes, camshafts, camshaft bearings and slack adjusters, does not fall within the manufacturer's warranty.

Processing of Warranty

Claims under this warranty have to be made in writing to SAF-HOLLAND (SAF-HOLLAND GmbH, Hauptstraße 26, 63856 Bessenbach, Fax No. +49 (0) 60 95 - 301 259) without undue delay following the occurrence of a defect and no later than one month after expiry of the warranty period. Instead, the final customer may address an SAF-HOLLAND Competence Partner (Germany) or the local SAF-HOLLAND representative (other countries) in writing or in person. A list of SAF-HOLLAND Competence Partners and of the local SAF-HOLLAND country representatives can be obtained on the Internet at the website www.safholland.com, or at SAF-HOLLAND (see the above-mentioned address or telephone number +49 (0) 60 95 - 301 602). Parts replaced within the context of performance under this warranty shall become the property of SAF-HOLLAND. Insofar as SAF-HOLLAND performs under this warranty and the customer has reimbursement claims against third parties, such claims shall be assigned to SAF-HOLLAND.

This warranty is governed by German law. Place of exclusive jurisdiction is Aschaffenburg.

IMS Ltd WARRANTY PROCEDURES

It is our intention at IMS Ltd to ensure that any claim subject to warranty is treated quickly and fairly.

The following procedures are intended to be as simple as possible and to ensure that in the unlikely event that you should have a warranty claim then the steps listed below will assist to ensure a speedy resolve.

If the claim involves charges such as labour, breakdown or recovery then prior agreement and authorisation **MUST** be obtained from IMS Ltd. Without this agreement no claim for warranty can be considered.

1. In the event of a warranty claim please contact IMS Ltd direct on **01509 600185** and ask for the Warranty Department.

2. A SERVICE REPORT FORM will be forwarded to you, which must be completed (example attached) and returned to IMS Ltd in the first instance (a fax is sufficient).

   Please ensure that the section CUSTOMER ORDER NUMBER is completed. This is required for all pending warranty claims.

   When the Service Report Form is returned to IMS Ltd completed in full, IMS will qualify the claim. If successful the claim will become SUBJECT TO WARRANTY, a warranty claim number will be given, which is pre-fixed **W**...../.....

3. IMS will then authorise work to commence, with the necessary parts being sent out along with the warranty claim number, the warranty claim number MUST be notified in all future correspondence relating to your claim.

   At this time IMS will contact yourselves regarding a date when the replacement parts will be fitted. After this agreed date, our carrier will be instructed to collect the damaged parts.

   Please ensure that these parts are packaged appropriately and clearly marked with your warranty claim number.

4. If you wish to recharge any labour costs to IMS Ltd, please ensure that all invoices for labour contain the warranty claim number and are received by IMS within 5 working days of the repair being carried out. Your invoice will be returned if the above requirements are not fulfilled.

5. When the returned damaged parts are received by IMS, they will be inspected. You will be informed, in writing, as to whether your claim has been accepted or rejected.

6. If your claim becomes rejected at a later date by SAF (D) or a sub supplier IMS Ltd will then invoice for the part(s) used and any services provided in conjunction with the claim. You will receive a proof of rejection for your claim.

7. We endeavour to settle all simple warranty claims within four to six week's dependant on all information and parts being received at IMS Ltd. Claims requiring more in-depth investigations will be handled by the manufacturer and will take longer. We will endeavour to keep you informed at all stages.

HEAVY DUTY BRAKES

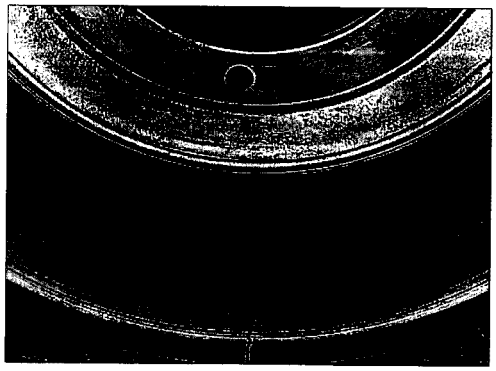
MAINTENANCE AND INSTALLATION

When and How to Inspect Brake Drums

Consistent, reliable brake system performance is dependent on a sound brake system maintenance program. It is important that regularly scheduled inspections of the brake system are incorporated into your preventative maintenance program. By incorporating a regular brake inspection program your cost-per-mile will be significantly reduced. Costly downtime can be reduced by spotting problems before they take a vehicle out of service for extended periods of time.

While there is no specific recommended timetable for brake system inspection, we recommend that you establish a regular and thorough inspection procedure to ensure consistent, reliable brake performance.

Following are some of the more common problems encountered during regular brake drum inspection and the recommended procedures for correcting the problem.



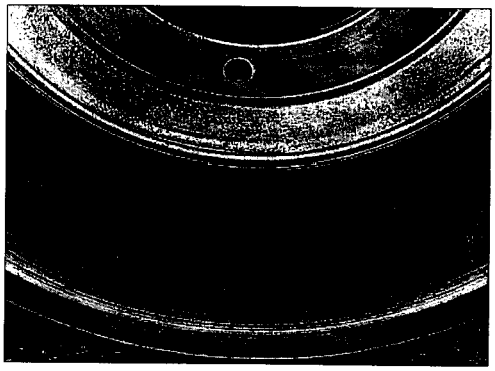
CRACKED DRUMS

Upon inspecting the drum, a crack extending through the entire wall is found. This condition is caused by excessive heating and cooling of the brake drum during operation.

If this condition is found, the drum **MUST** be replaced immediately.

Repeated cracking of brake drums may indicate that the brake system and/or the brake drums are inadequate for the particular application. This condition may also indicate drive abuse, particularly if the drums, lining, and brake system are correctly rated for the vehicle and the application.

If this problem occurs, the brake system should be checked for proper brake system balance and proper brake lining friction ratings as recommended by the OEM. If this problem occurs on a new drum, cause may be from mishandling.

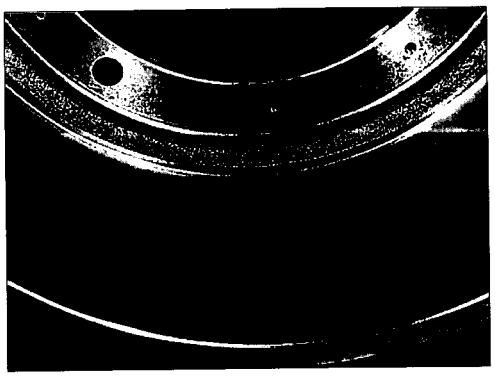


HEAT-CHECKING

Heat-checking is the appearance of numerous short, fine, hairline cracks on the braking surface of the drum. Heat-checking is a normal condition found on brake drums and is caused by the constant heating and cooling of the braking surface, which occurs as the brakes are applied during normal operation of the vehicle.

Heat-checks will frequently wear away and form as a result of the normal braking process however, heat-checks can progress over time into cracks in the braking surface depending on such factors as lining wear rate, brake system balance, and how hard the brakes are used.

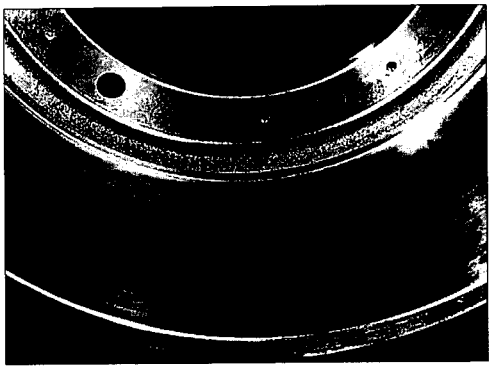
Normal heat-checking does not impair braking performance, however, it is advisable to make sure that deep cracks have not developed. Replace the brake drum if any of the following conditions are found: heat checks, one or more that extend completely across the brake surface. Heat check cracks that are 0.06 inches wide and/or 0.12 inches deep or greater.



GREASE-STAINED DRUMS

If this condition exists, the brake drum will show discolored spots on the braking surface, with oil and/or grease spattered on the brake assembly. This condition is most likely caused by a faulty lubrication system or improper greasing of the brake cams.

To correct the problem, the source of the grease and/or oil must be located and necessary repairs made to eliminate the leak. Remove the entire brake assembly and clean each component thoroughly. If the linings are soaked with oil or grease they must be replaced.



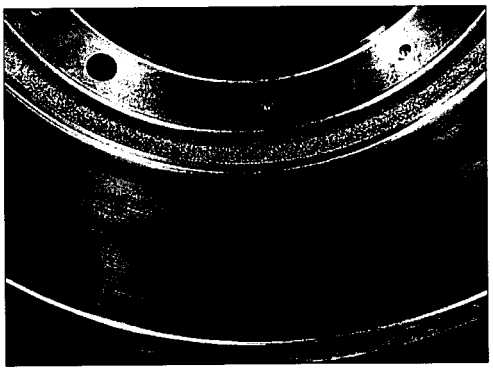
MARTENSITE SPOTTED DRUMS

This problem may be indicated by hard, slightly raised dark colored spots on the braking surface with uneven wear. This problem may also be indicated by a pulsating ride upon brake application or excessive noise upon braking.

This condition indicates that the drum has been subjected to extremely high temperatures caused by an improperly balanced braking system, a dragging brake, or continued severe brake applications. These extremely high temperatures have caused structural changes t occur in the drum material which makes the drum more susceptible to cracking.

If this condition exists, the drum must be replaced. The brake linings should be checked for uneven wear and replaced if necessary.

After replacing the brake drum, the entire braking system should be checked for proper balance between the tractor and the trailer as well as wheel to wheel (ie, air distribution, brake adjustment, and power A/L factors).



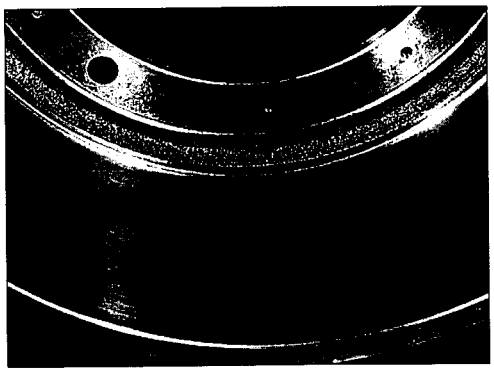
SCORED DRUMS

This problem is indicated by a defined, grooved appearance on the braking surface of the drum and excessive lining wear.

If the scoring is severe and the drum is within the recommended inside diameter limitation (see note below), then the drum could be machined to remove the scoring.

After reinstalling the brake components it is advisable to check the brake system to determine if there are excessive amounts of abrasive material entering and building up on the braking surface of the drum.

NOTE: WHEN CHECKING BRAKE DRUM DIAMETER FOR WEAR, THE DIAMETER SHOULD NOT EXCEED .120" OVER THE ORIGINAL DIAMETER. WHEN REBORING BRAKE DRUMS, THE FINISHED DIAMETER SHOULD NOT EXCEED .080" OVER THE ORIGINAL DIAMETER.

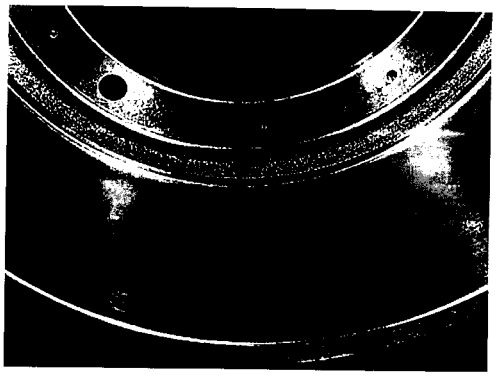


BLUE DRUMS

A drum which shows the signs of bluing has been subjected to extremely high temperatures. This condition may be caused by continued hard stops, by brake system imbalance, or improperly functioning return springs. It is not necessary to resurface or replace the drum as long as it remains within the allowable tolerance for operation.

To correct this problem the brake system should be checked for proper balance. The return springs should be checked to determine if they are weak or broken. The brake should be checked for proper adjustment and clearance.

If this condition is left unresolved, it can result in the development of a martensite condition or cause the drum to crack.

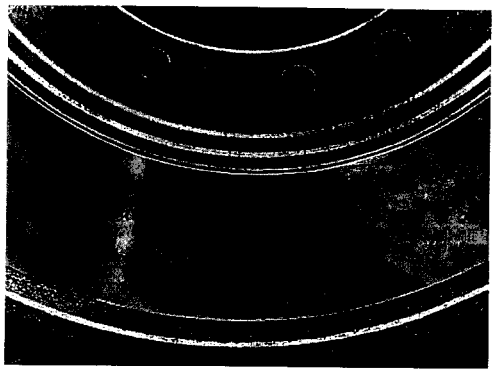


POLISHED DRUMS

A polished drum can be identified by the mirror-like finish on the braking surface. This problem can easily be solved by sanding the braking surface with 80 grit emery cloth. It is also necessary to remove the glaze from the linings at the same time using the 80 grit emery cloth.

The brake system should be checked for lightly dragging brake(s). The linings should als be checked to make sure that they have the correct friction rating.

NOTE: IT IS A RECOMMENDED PROCEDURE TO SAND THE BRAKING SURFACE OF THE DRUM AT THE TIME OF RELINING.



EXCESSIVE WEAR

If excessive wear occurs along the edges of the lining contact area of the braking surface or in areas coinciding with the lining rivet holes, the system should be checked to make sure that there is not an abnormal build-up of abrasive material.

The most common cause of this problem is the build-up of abrasive material from either the presence or absence of dust shields depending on the application of the vehicle. If th problem occurs while dust shields are installed, remove the lower dust shield to allow abrasive materials to more readily exit the braking system.

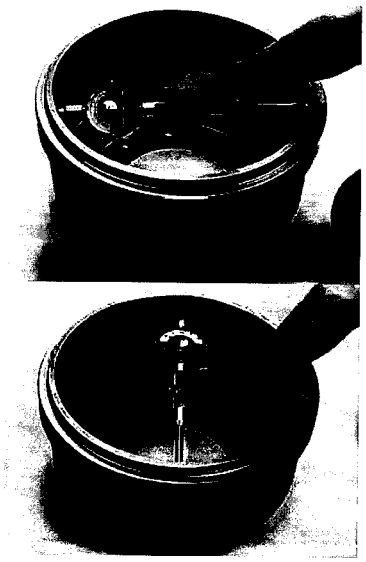
If the problem occurs when dust shields are not employed, install dust shields to restrict abrasive materials from entering the braking system. Brake drums should also be checked for evidence of scoring.

If the braking surface diameter is in excess of maximum allowable tolerances, the brake drum **MUST** be replaced.

NOTE: WHEN CHECKING BRAKE DRUM DIAMETER FOR WEAR, THE DIAMETER SHOULD NOT EXCEED .120" OVER THE ORIGINAL DIAMETER. WHEN REBORING BRAKE DRUMS, THE FINISHED DIAMETER SHOULD NOT EXCEED .080" OVER TH ORIGINAL DIAMETER.

WORN MOUNTING SURFACE

Rounding over of the drum-mounting surface is caused by continued operation with a loose wheel assembly. If this condition is left uncorrected it will cause the wheel bolts to break resulting in wheel-end failure and the loss of the wheel assembly. To check for this condition use a straight edge and a feeler gage as shown. If the wear exceeds .030", the drum must be replaced along with all wheel bolts in the assembly.

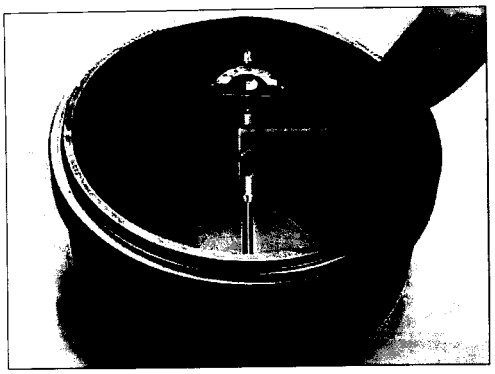


OUT-OF-ROUND DRUMS

This condition exists when the drum diameter shows variations at different points around the braking surface and the brake linings exhibit more wear on one side than the other. This distortion of the drum as a result of excessive heat generated during brake applications or as a result of improper drum storage techniques (see proper drum storage recommendations on page 5 of this manual). Other possible causes for this condition include improper chucking of the drum during turning or it could be the result of dropping the drum on a hard surface during routine wheel-end maintenance.

If the diameter of the drums braking surface is within allowable limitations (see note below), the drum can be machined to restore concentricity. If the drum diameter is past the recommended limitations, the drum **MUST** be replaced.

NOTE: WHEN CHECKING BRAKE DRUM DIAMETER FOR WEAR, THE DIAMETER SHOULD NOT EXCEED .120" OVER THE ORIGINAL DIAMETER. WHEN REBORING BRAKE DRUMS, THE FINISHED DIAMETER SHOULD NOT EXCEED .080" OVER TH ORIGINAL DIAMETER.



OVERSIZED (WORN) DRUMS

This condition is indicated by either excessive wear at the lip (outer edge of the drum) or improper lining to drum contact during brake application.

To check, use a drum gage as shown to measure the diameter of the drum at least 1" from the lip or outer edge of the braking surface. If the measurements exceed the allowable limitations (see note below), the brake drum can be machined to restore concentricity. If the drum diameter is past the recommended limitations, the drum **MUST** be replaced and new linings should be installed.

NOTE: WHEN CHECKING BRAKE DRUM DIAMETER FOR WEAR, THE DIAMETER SHOULD NOT EXCEED .120" OVER THE ORIGINAL DIAMETER. WHEN REBORING BRAKE DRUMS, THE FINISHED DIAMETER SHOULD NOT EXCEED .080" OVER TH ORIGINAL DIAMETER.

IMPROPER APPLICATION OF BRAKE DRUM

Linings protruding past the braking surface:

This condition can be identified by visually inspecting the brake assembly for evidence of the lining protruding past the outer edge of the braking surface as shown at left.

If this condition exists, check the hub application specifications to determine the proper drum for the application and replace the drum and install new linings if the old linings are damaged.

Broken mounting ring:

This problem can be identified by the presence of fractures or cracks around the bolt circle or mounting surface of the drum. This condition is caused by interference between the hub and drum-mounting surface due to improper seating of the drum on the hub pilot during installation or by installing a drum with a mounting ring diameter smaller than the hub pilot diameter.

If this condition is present, the drum **MUST** be replaced. Check the application specifications to determine the proper drum for the application before attempting to install a replacement drum.

Radial cracking of the bolt holes on the mount surface:

This condition is caused by interference between the hub and drum-mounting surface during installation as a result of using the wrong drum for the application or improperly cleaning the hub piloting surface prior to drum installation. If this condition exists the drum **MUST** be replaced. Check the application specifications to determine the proper drum for the application before attempting to install a replacement drum.

Before attempting to re-install another brake drum, visually inspect the hub-piloting surface and make sure that all dirt and corrosion are properly removed. Also, take care when installing the drum to make sure that the drum-mounting surface is properly and evenly seated against the hub mounting surface before torquing the wheel nuts during re-assembly.

Proper Selection of New Drums

When replacing a worn-out or damaged drum, certain procedures should be followed to ensure that you choose the right replacement drum and that it is installed properly. Brake compatibility is extremely important in that each brake on the vehicle must perform equally to effectively produce a balanced and controlled stop.

Proper Matching of Brake Assemblies Will

- Maximize your brakes stopping performance
- Provide longer service life between overhauls
- Minimize brake maintenance costs

Proper Brake Drum Selection is Key to Maintaining Optimum Brake System Performance

When specifying replacement brake drums, the following information will be required:

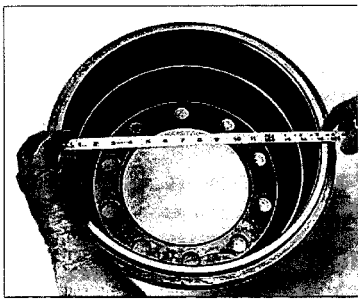
- The manufacturer's name
- The manufacturer's part number
- A description of any other markings appearing on the outer drum surface

In the event the information to the left is not available, the following information will be required in order to determine the proper brake drum for your vehicle:

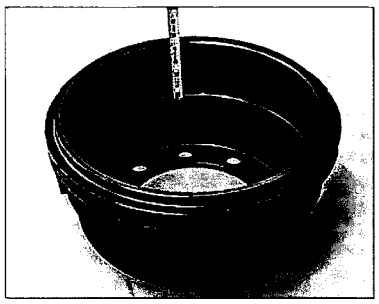
- Name of the vehicle manufacturer
- Model of the vehicle
- Manufacturer and model number of the axle
- Manufacturer and model number of the associated wheel and hub
- Brake size and type of actuation (S-Cam, Wedge, Air, or Hydraulic)
- Both ends of a common axle **MUST** be in the same state of repair. If the brake shoes on one end are replaced, the shoes on the other end should also be replaced. If one drum on an axle is turned or replaced, the other drum should also be turned or replaced to maintain consistent braking performance.

Sizing of a Brake Drum

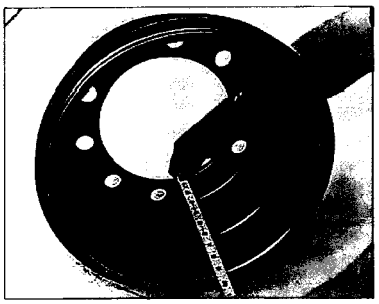
If the information previously described is not available, it will be necessary to make accurate measurements and gather the information as described in steps 1 through 7 below.



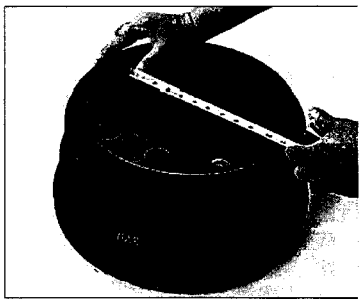
1. Braking surface diameter



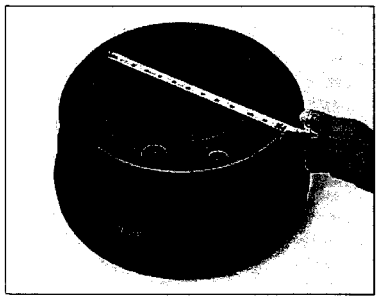
2. Width of braking surface



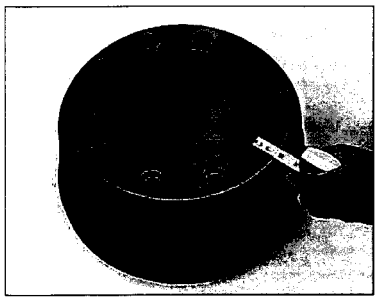
3. Overall depth of the drum



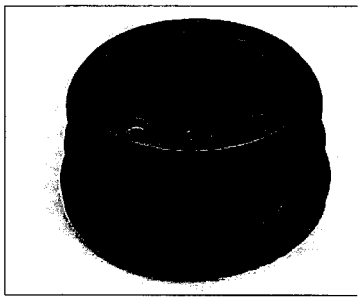
4. Pilot diameter



5. Bolt circle diameter



6. Number, size, and location of bolt holes

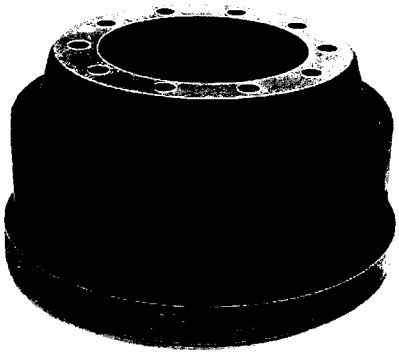


7. Are there slots in the back of the drum for wheel spoke clearance?

Factory Balanced Brake Drums

There are two types of factory balanced brake drums, machined-to-balance and traditional welded balance weights. Both styles are balanced to the same factory specifications (10 inch ounces - front axle and 20 inch - rear drive and trailer axle) and will provide identical performance. When ordering replacement drums or installing new drums during normal brake service, it is acceptable to interchange machined-to-balance with traditional weight balanced drums.

Machined-to-Balance



Welded balance weight

Proper Storage of Heavy-Duty Brake Drums

Many fleets maintain an inventory of heavy-duty brake drums for routine replacement. The proper storage and handling of these drums will ensure optimum performance and longer service life.

Correct Storage Method:

Drums should be stored in an area free from excess moisture and stacked as shown in Figure 1, to ensure proper distribution of weight on the sidewalls of the drum. Properly stacking new drums will avoid distortion of the sidewalls or damage to the braking surface.

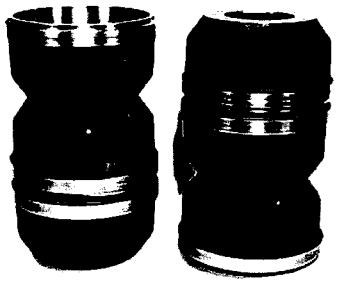


Figure 1

Incorrect Storage Methods:

Storing brake drums by "nesting" one drum in another, or resting the drums on their side "book end", as shown in Figure 2, will result in damage to the drums. Storing drums in any of these ways will cause an out-of-round condition to occur which will require machining to restore concentricity before installation. This will significantly reduce the service life of the drum and create unnecessary expense due to the machining of a new drum.

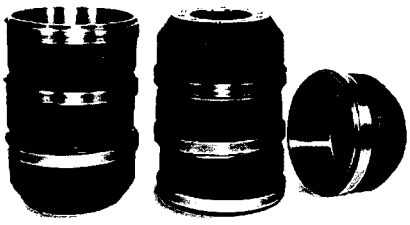


Figure 2

Installing New Brake Drums

When installing new brake drums, it is advisable to check all components of the brake system for wear and thoroughly clean them prior to installing the new drum. The brake system should also be checked for proper adjustment and balance to ensure proper operation.

Hub Piloted vs Ball Seat Drums

It is important to make sure that the correct hub and drum combination is used when replacing wheel-end assemblies. Incorrect or mismatched parts may result in loose or broken mounting studs or wheel-ends which can result in an accident. If you are unsure about the correct combination for your application, contact the manufacturer for the correct part numbers and styles.

Older ball seat mountings have a close fit between the drum stud holes and stud diameter. The drum is installed on the hub pilot. The wheels are piloted on the studs using inner and outer cap nuts. (see Figure 3)

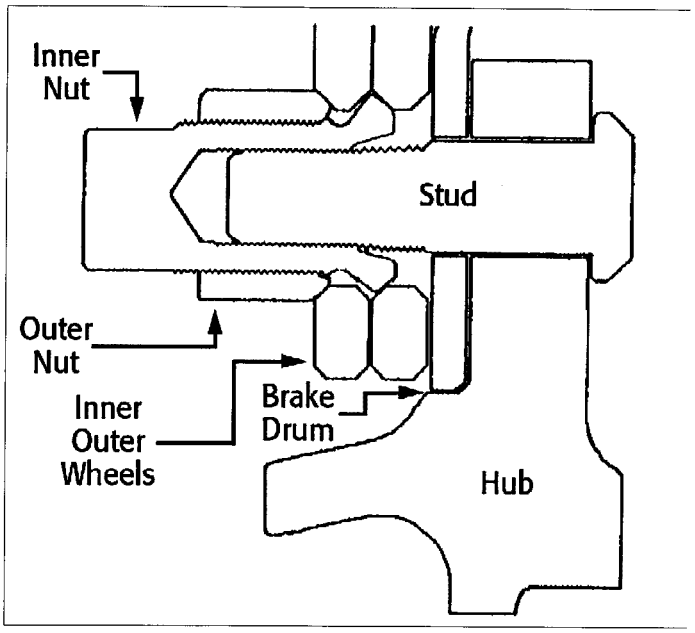


Figure 3 - A ball seat disc wheel mount

Hub piloted mountings have a close fit between the drum pilot and the machined pilot (continuous or interrupted) on the hub. The drum bolt mounting holes are larger than the stud diameter. The wheels and drum are piloted on the hub. (see Figure 4)

New drum designs will allow you to use the same drum for ball seat and hub piloted applications when matched with the proper hub. These new drums cannot be used with older hubs which have a different pilot diameter. Matching the drums with the proper hub is critical in providing and maintaining the support of the wheel-end.

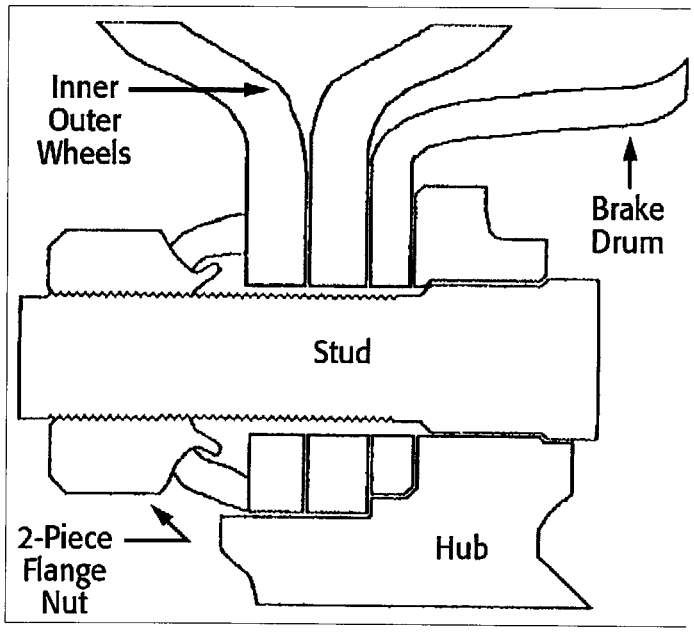
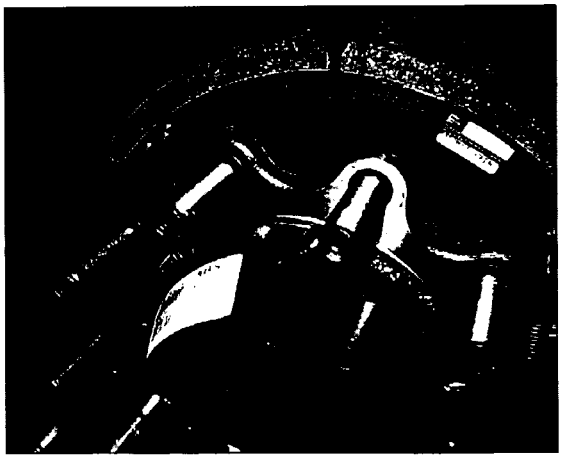


Figure 4 - A hub piloted disc wheel mount

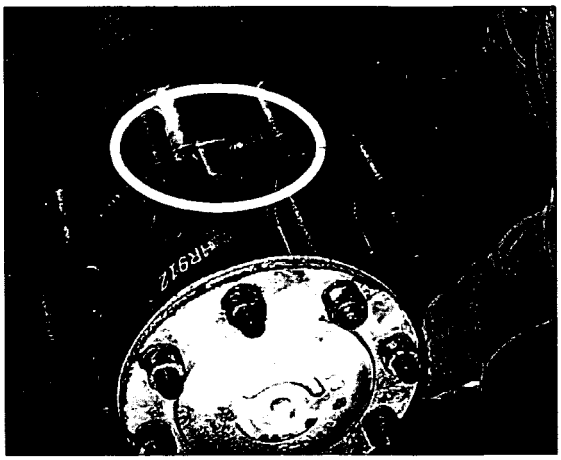
How to Properly Install an Outboard Mounted Brake Drum

The following steps will help one to insure that a drum is properly mounted and will not slip off the drum pilot when mounting the wheels.

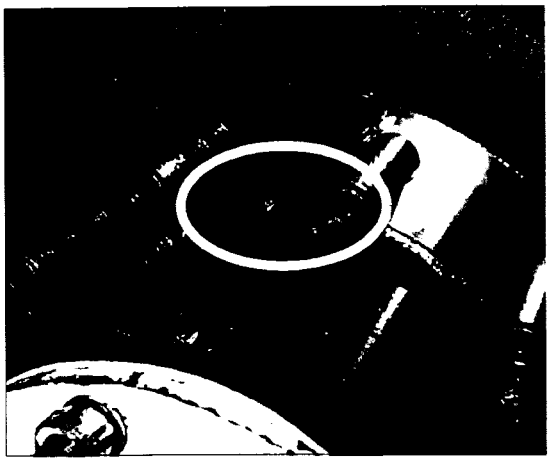


1. Position the hub pilots to be in the 12 o'clock location shown. **Note: It is very important to make sure that the pilots are clean and free from rust or any other foreign material.**

2. Making sure that the drum is mounted onto the drum pilot and the drum flange is flush against the hub flange, hold in on the bottom of the drum and adjust the brake lining until the lining touches the drum. This will hold the drum in place until the wheels are mounted.



3. Proceed with mounting the wheels and torque to proper specifications. **Do not forget to properly adjust the brakes.**



4. The picture above shows a drum that has slipped off the drum pilot, see the figure below for proper mounting.

5. The picture above shows a drum properly mounted onto the drum pilot.

Mounting Brake Drums on "Hub Piloted" Wheel-end Assembly

Drums are designed with different pilot chamfers where the drum fits the pilot. If corrosion builds up behind the chamfer (point "X" in Figure 5) and a drum with a smaller chamfer (point "Y" in Figure 5) is installed without removing the corrosion from the hub, the drum will not set properly and the mounting flange may break when the assembly is torqued. Therefore, it is necessary that you thoroughly clean the hub mounting surface using a scrapper and wire brush before attempting to mount a new brake drum. This is especially important if you are mounting brake drums on a wheel-end assembly using an aluminum hub.

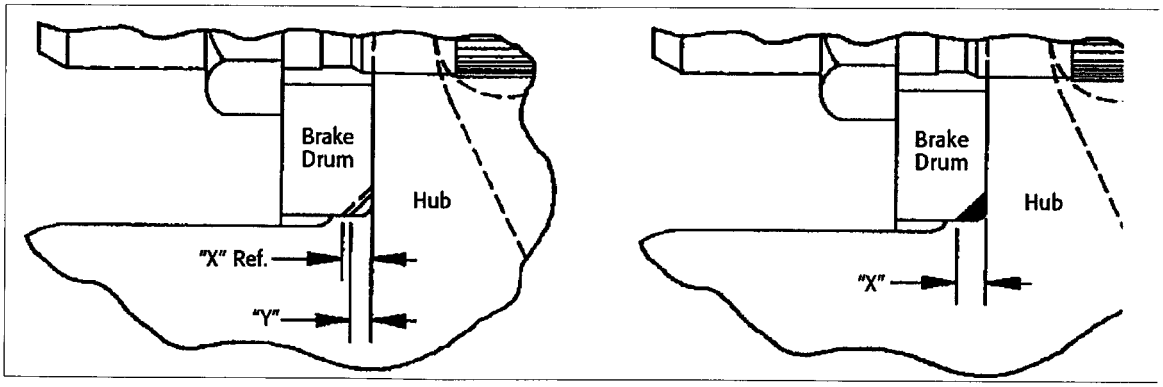


Figure 5 - A Hub Pilot Chamfer

Special Considerations for Mounting Brake Drums on Aluminum Hubs

Unlike traditional cast iron hubs, the surface on the drum pilot of an aluminum hub is susceptible to damage if the drum is not properly seated during the installation process. If the drum is improperly installed and allowed to rest on the wheel pilot, the drum pilot surface will be damaged when the assembly is torqued down. This will not allow the drum to properly seat, resulting in damage to the hub and may also result in a dragging brake condition. (See Figures 6 & 7 below)

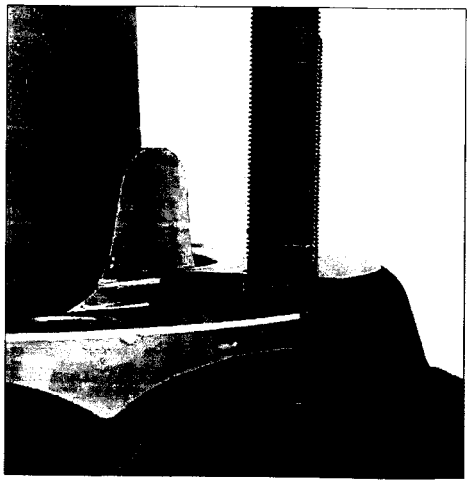


Figure 6 - Improper installation, drum is cocked and not properly seated on the drum pilot of the hub.

Figure 7 - Proper installation, drum is correctly positioned on the drum pilot and flat against the hub flange.

Disc Wheel Mounting

The drum mounting bolt hole sizes are standardized on outboard mounted drums. The bolt hole size on drums mounted on the front steerable axle is 1-1/4". The bolt hole size on drums mounted on the rear drive axle and trailer axles is 1".

In some applications, where smaller studs are used, a clearance may exist between the bolt hole diameter and the stud. This condition is not a problem because the drum will be centered by the hub pilot and will be held in place when the wheel is torqued against the drum. When the proper mounting hardware is used and the recommended wheel torque (shown in the chart on pg. 9) are maintained, the drum will be held securely in place.

Trouble-Shooting Driver Complaints

In some instances, drivers may complain of braking irregularities between normal or routine brake system inspections. The following list is comprised of some of the more common driver complaints, the cause, and the action required to solve the problem. Should driver complaints arise, it is advisable to inspect the braking system at the earliest possible time.

Driver Complaint	Common Cause	Solution
Driver complains of pulsating ride or excessive vibration during normal operation of the vehicle.	This problem may be caused by any one of or, a combination of, the following problems: Suspension, wheel base, cab mounting, frame, out-of-round tires and/or wheels; out-of- balance tire, wheel, brake drum, or hub. Improper mounting of hub piloted drum. Worn mounting surface on the drum as a result of loose wheel assembly.	If it is determined that the problem results from an unbalanced brake drum or wheel, the component can be balanced in the field or a new replacement part may be ordered from the factory pre-balanced. If the exterior of the drum is covered with rust, scale, dirt, tar or other foreign material, remove with a wire brush and clean with kerosene. Then wipe and thoroughly dry the drum before reinstallation. If the drum has been improperly mounted on the hub pilot, remove and check the hub and drum for any damage. Reinstall the drum properly.
Driver complains of excessive fade. Braking power diminished or is completely lost during brake application.	Any brake lining will eventually fade when subjected to high temperatures, such as instances of repeated quick stops from high speeds or during long periods of downhill braking. This problem can be caused by inferior linings which may suffer some chemical breakdown under extended periods of high temperature. A high quality brake lining will fade gradually allowing the driver time to increase braking pressure and maintain control of the vehicle. Excessive fade can also be caused by drums which expand to the point of maximum shoe travel during extended periods of excessive heat. This reduction of contact between lining and braking surface results in a loss of braking power.	When excessive fading occurs, the braking system should be checked for one or more of the following problems: Check the braking system to ensure that the entire system is properly balanced and that all brakes are functioning properly. Check the individual brake drums for the existence of martensite, bluing, drum distortion, or an out-of-round drum. Other causes may include oversized drums, worn or improperly rated linings. Check the drums for grease stains. If grease stains exist, clean the entire assembly, repair the broken or faulty component causing the leak, replace the lining if required and clean the braking surface of the drum.
Driver complains of brakes pulling during application, causing swerving to the left or right.	Pulling to the left or right during brake application can be caused by either unequal braking force (unbalanced braking system) or improperly functioning brake components.	When this problem occurs, the braking system should be checked for one or more of the following causes: The braking system should be checked for balance to make sure that all brakes are functioning equally during the brake application. Check the slack adjusters to make certain that they are functioning properly and that the proper clearance is present between the lining and the braking surface. Individual brakes should be checked for worn or damaged brake linings or other broken or damaged parts. Brake drums should be checked for excessive wear or specific damage to the braking surface. Drums should also be checked for the presence of abrasives or foreign matter in the drum.
Driver complains of excessive noise, chattering, or pulsating during brake application.	These problems can be caused by one or more of the following problems. The existence of bluing, a martensite condition, or grease spotted, polished drums, excessive wear at the rivet holes and/or at the point where the edge of the linings contact the braking surface. Other causes could include out-of-round drums, unbalanced drums, worn or damaged brake parts, or foreign matter on the braking surface.	The brake drums should be removed and checked for the existence of one or more of the problems described. The appropriate corrective action should be taken immediately, depending on the problem found to be the cause.

AX100 ALUMILIGHT Series Landing Gear

Aluminum Hybrid Landing Gear Series
Weight Savings of at Least 50 lbs Per Set!

Design Features

- Steel cover sealed with silicone to keep moisture out.
- Available in outside and inside mount.
- 6061-T6 extruded aluminum upper leg for durability.
- Standard JOST gear train allows easy interchangeability.
- A ⅜″ x 2″ reinforcing strap for superior side load strength.
- Polyester coated HSLA steel lower leg.
- All standard JOST ground members available.

Capacities & Ratings

Maximum Static Load Rating*
160,000 lbs

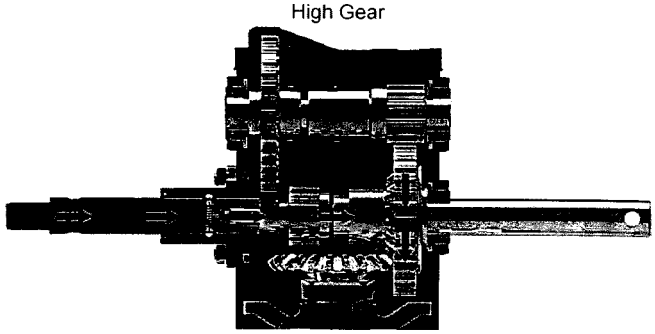
Rated Lift Capacity**:
55,000

Side Load Capacity*:
29,000 per set

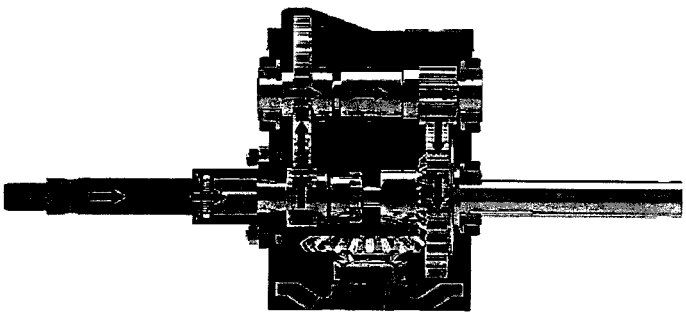
*When properly braced on a trailer.
**With 100ft-lbs input torque.

Gear Ratio
Low Gear: 32 Turns = 1″ Travel
High Gear: 3.5 Turns = 1″ Travel

High Gear



Low Gear



JOST International 1770 Hayes St., Grand Haven, MI 49417 Phone: 800-253-5105 Fax: (616) 846-0310 sales@jostinternational.com www.jostinternational.com

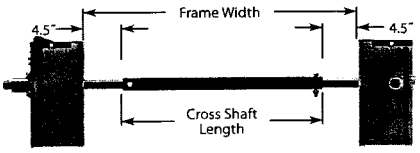
AX100 .G.17

Series
AX1

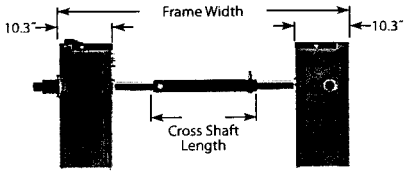
Grease Package
Standard - 0
5 Year Maint. Free - 4
5 Year Maint. Free & 10 Year Warranty - 5

Mounting Style

Outside Mount - 0



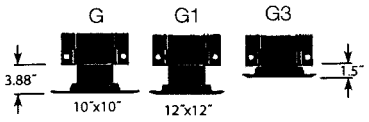
Inside Mount - 1



Leg Speed
Leave Blank To Order a Set
Gear Side Leg Only - R
Non-Gear Side Leg Only - L

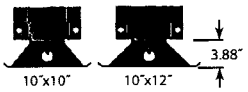
Footwear

Cushion Foot

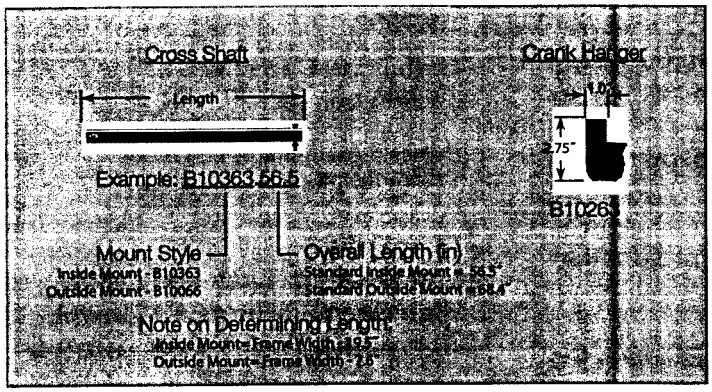


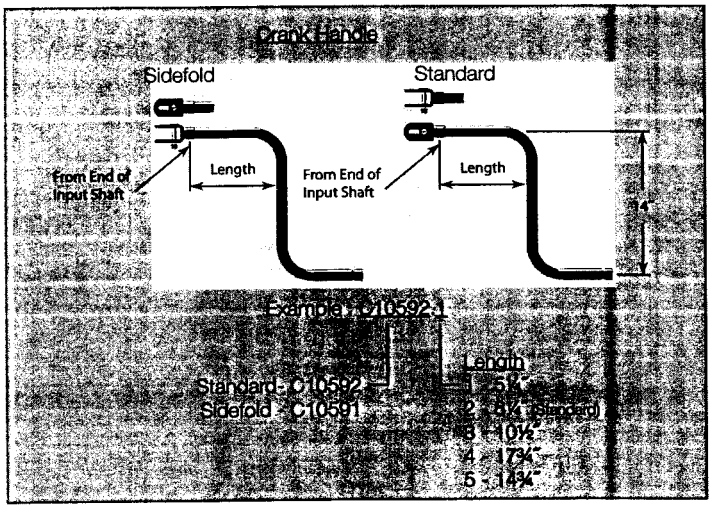
Compensator Shoe
S1

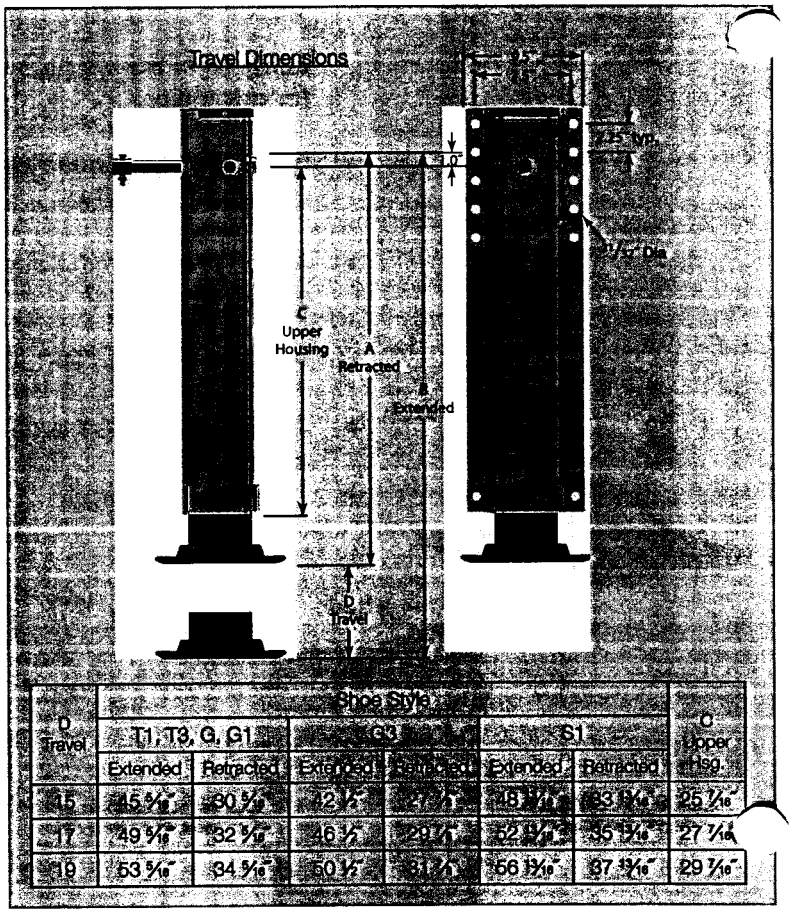
Sand Shoe



Travel
15 - 15" Travel
17 - 17" Travel
19 - 19" Travel







D Travel	Shoe Style: T1, T3, G, G1		Shoe Style: G3		Shoe Style: S1		C Upper Housing
	Extended	Retracted	Extended	Retracted	Extended	Retracted	
15	45 5/16"	30 5/16"	42 1/2"	27 1/4"	48 3/16"	33 1/16"	25 7/16"
17	49 5/16"	32 5/16"	46 1/2"	29 1/4"	52 3/16"	35 1/16"	27 7/16"
19	53 5/16"	34 5/16"	50 1/2"	31 1/4"	56 13/16"	37 1/16"	29 7/16"

JOST International Landing Gear Warranty

JOST Alumilight X Series Landing Gear
5 Year Manufacturer's Warranty

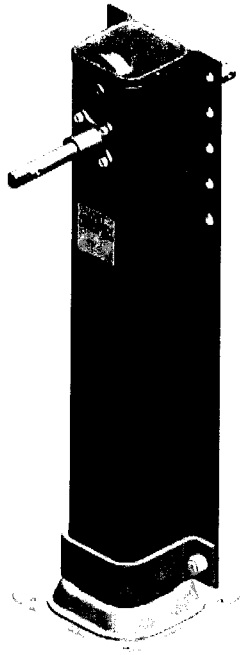
JOST International Corporation (hereafter called "JOST") warrants its Landing Gear to be free of defects in material and workmanship under normal use and service, exclusive of normal wear for a period of five years from the date in service or date of manufacture of the vehicle.

EXCLUSIONS:

This warranty is valid for the first purchaser only. It shall not apply to any Landing Gear which are improperly installed and maintained*, have been subject to misuse, negligence, modification or accident, or have been repaired or modified in such a way as to adversely affect its performance. This warranty is not valid if modifications or repairs are not approved by JOST in advance.

PURCHASER'S REMEDY:

JOST's sole obligation under this warranty will be to repair or replace, at its option, any unit or part which shall be returned to JOST or a JOST authorized facility and which examination shall disclose to JOST's satisfaction to have been defective. Freight or other transportation cost to and from JOST or a JOST authorized facility must be paid by the purchaser. JOST will not assume any charges for repairs without prior authorization.



EXCLUSION OF OTHER WARRANTIES:

No other expressed or implied warranty is made by JOST, and in particular JOST makes NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF ACTIONS:

Without extending the period of warranty stated above, any action for breach of warranty must be commenced within one year of the breach claimed or be forever barred.

LIMITATION OF DAMAGES:

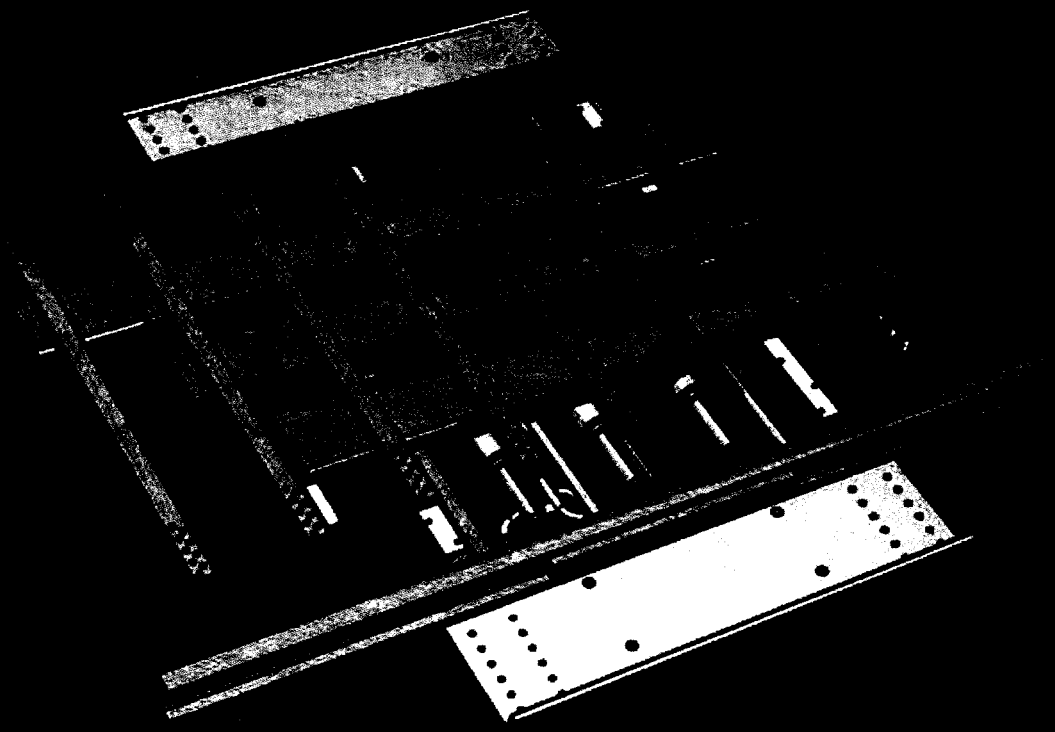
The purchaser's remedy stated above shall be exclusive for any and all claims against JOST whether based on contract, negligence, tort or any other theory. In no event shall JOST be liable for any consequential damages, including without limitation vehicle downtime and cargo loss, which may result from any defect or failure of the Landing Gear.

*Contact JOST International for maintenance requirements.

JOST International
1770 Hayes St. Grand Haven, MI 49417
Tel: 800-253-5105 / Fax: 616-846-0310

LT AX100-02 June 2011

WALKING FLOOR®
ONLY BY KEITH®



KEITH® V-FLOOR® DX
OWNERS MANUAL

- Advanced Switching Valve
- Center Frame Design
- Cross-Drive Bearing Support
- External Check Valves
- Strong Drive Frame
- Interchangeable Cylinders
- No Hydraulic Hoses
- Utilizes Durable KEITH® RUNNING FLOOR II® Technology

04.18.12

KEITH®
WALKING FLOOR®
SYSTEMS

www.keithwalkingfloor.com

KEITH Mfg. Co.
401 N.W. Adler St., P.O. Box 1
Madras, OR 97741
(800) 547 6161
T: (541) 475 3802
F: (541) 475 2169
sales@keithwalkingfloor.com

We at KEITH Mfg. Co. are very happy that you have decided to equip your trailer with the V-FLOOR® DX unloading system that utilizes KEITH® RUNNING FLOOR II® technology. We take great pride in the fact that we manufacture the simplest and lowest maintenance self-unloading system available. Installing the V-Floor® DX unloader in your trailer provides you with the versatility to unload virtually any type of material.

The following pages contain information on the operation and maintenance of your V-FLOOR® DX unloader. Also included is a troubleshooting guide and detailed views of the various parts contained in the V-FLOOR® DX system.

In addition, we have provided information on the type of hydraulic wet kit that will be needed on your tractor. **Please be sure to use the recommended pumps, filters and pressure relief valves listed, or approved equivalent equipment. It is critical to adhere to the outlined hydraulic wet kit specifications. Failing to follow the guidelines concerning required operation pressures can lead to your system operating improperly.**

Please review the entire manual before operation the V-FLOOR® DX unloading system. If you have any questions or concerns, do not hesitate to contact or factory on our toll-free line, 800-547-6161 or via email at techdept@keithwalkingfloor.com and our trained personnel will be happy to assist you.

Thank you again for equipping your trailer with a V-FLOOR® DX unloader.

Sincerely,

Keith Foster
Founder

Mark Foster
President

OPERATION

MAINTENANCE

COMPONENTS

KEITH Mfg. Co.
401 N.W. Adler St., P.O. Box 1
Madras, OR 97741
(800) 547 6161
T:(541) 475 3802 F:(541) 475 2169
sales@keithwalkingfloor.com
www.keithwalkingfloor.com

Superior by design.

V-FLOOR® DX
LIMITED WARRANTY

KEITH Mfg. Co. hereby warrants, only to the first owner of a new **KEITH® V-FLOOR® DX unloader** from the factory or selling distributor that the product shall be free from defects in material and workmanship for a period of **one year** after delivery to the first registered owner. **Hydraulic parts and components shall be warranted as free from defects in material and workmanship for a period of two years to the first registered owner. This warranty does not cover normal wear and tear and maintenance and is not to be construed as a service contract.**

Owners Obligation: To qualify for warranty coverage, a "warranty card must be completed and returned to Keith Mfg" and the equipment must be subject to normal use and service only.

Definition of Normal Use and Service: Normal use and service means the loading and/or unloading of uniformly distributed, **non-corrosive material, properly restrained and secured, on** properly maintained public roads, with gross vehicle weights not in excess of factory rated capacity. For stationary installations, normal use and service means the conveying of uniformly distributed, non-corrosive materials, with weights not in excess of factory rated capacity.

Sole and Exclusive Remedy: If the product covered hereby fails to conform to the above stated warranty, **KEITH Mfg. Co.'s** sole liability under this warranty and the owner's sole and exclusive remedy is limited to repair or replacement of the defective part(s) at a facility authorized by **KEITH Mfg. Co.** This is the owner's sole and exclusive remedy for all contract claims, and all tort claims including those based on the strict liability in tort and negligence. Any defective part(s) must be shipped freight prepaid to **KEITH Mfg. Co**, Madras, Oregon.

Except As Expressly Set Forth Above, KEITH Mfg. Co. Makes No Warranties: Expressed, implied or statutory, specifically: No warranties of fitness for a particular purpose or warranties of merchantability are made. Further, **KEITH Mfg. Co.** will not be liable for incidental damages or consequential damages such as, but not limited to, loss of use of the product, damage to the product, towing expenses, attorney's fees and the liability you may have in respect to any other reason.

Tort Disclaimer: KEITH Mfg. Co. shall not have any liability in tort with respect to the products, including any liability based on strict liability in tort and negligence.

If This Warranty Violates Law: To the extent any provision of this warranty, contravenes the law of any jurisdiction, that provision shall be inapplicable in such jurisdiction and the remainder of the warranty shall not be affected thereby.

WALKING FLOOR

Revision Date July 14, 2008

KEITH®

Superior by design.

A summary of the warranty conditions are as follows:

- The warranty period is for the first equipment owner only
- A warranty period of (1) one year for the entire V-FLOOR® DX unloader from date of sale by trailer manufacturer.
- A warranty period of (2) two years for the hydraulic parts and components from date of sale by trailer manufacturer.
- The V-FLOOR® DX unloader must be installed by the trailer builder according to KEITH® installation procedures.
- KEITH recommended maintenance and control procedures must be followed.
- In the case of a malfunction, trailer manufacturer, or KEITH must be informed.

The following components are not covered by the warranty:

- Malfunction of equipment, or caused by equipment, which was not supplied by KEITH Mfg. Co.
- Malfunction caused by the use of dirty oil, or oil of the wrong type.
- Malfunction caused by overheated oil: maximum temperature 70 °C or 140 °F.
- Malfunction caused by corrosive materials.
- Malfunction caused by overloading or improper use.
- Malfunction caused by repair work performed by an unauthorized third party.
- Filter elements and components which are subject to wear-and-tear.
- Defects in electrical components due to incorrect connection and/or incorrect voltage levels.

The warranty is void if:

- The V-FLOOR® DX unloader is used for purposes which have not been recommended by KEITH Mfg. Co.
- The wet kit does not meet KEITH system recommendations.
- The V-FLOOR® DX unloader is not installed properly.
- Loads in excess of legal limits are moved with the system without written permission from KEITH Mfg. Co.

WALKING FLOOR®

To Prevent Possible Injury or Death

Do Not:

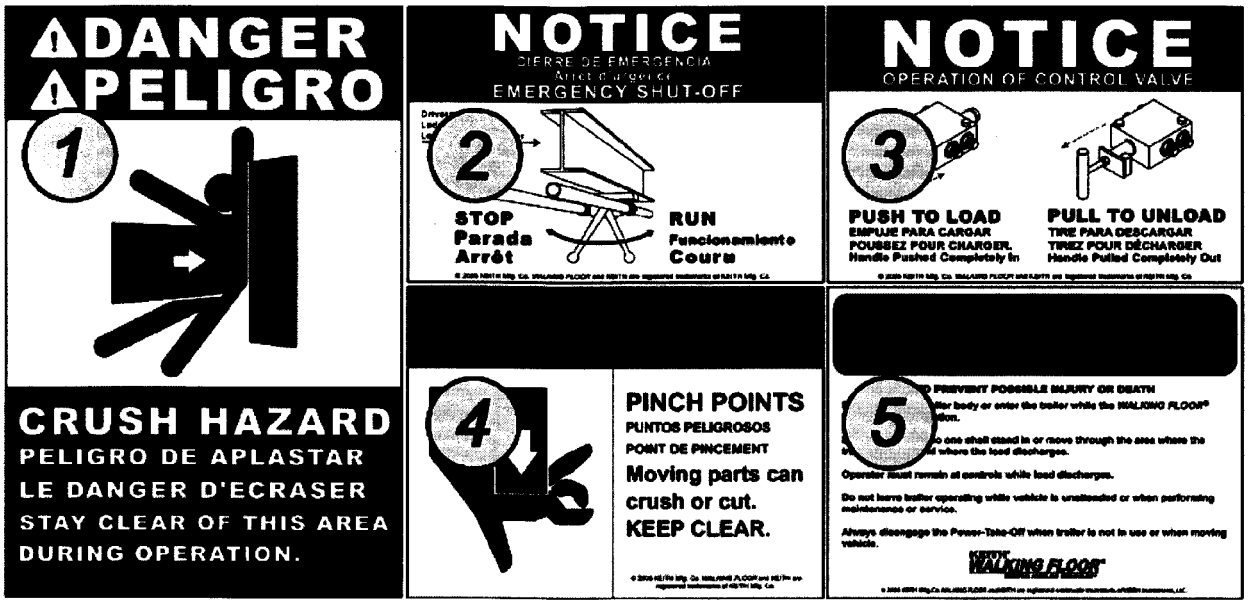
1. Operate the floor with the doors closed.
2. Stand behind the trailer or in the discharge area when the floor is operating.
3. Make adjustments to the unloading mechanism with the floor operating.
4. Operate unloader when protective covers and screens are not in place.
5. Go underneath the trailer when floor is operating.
6. Leave the trailer unattended while the unloader is in operation.

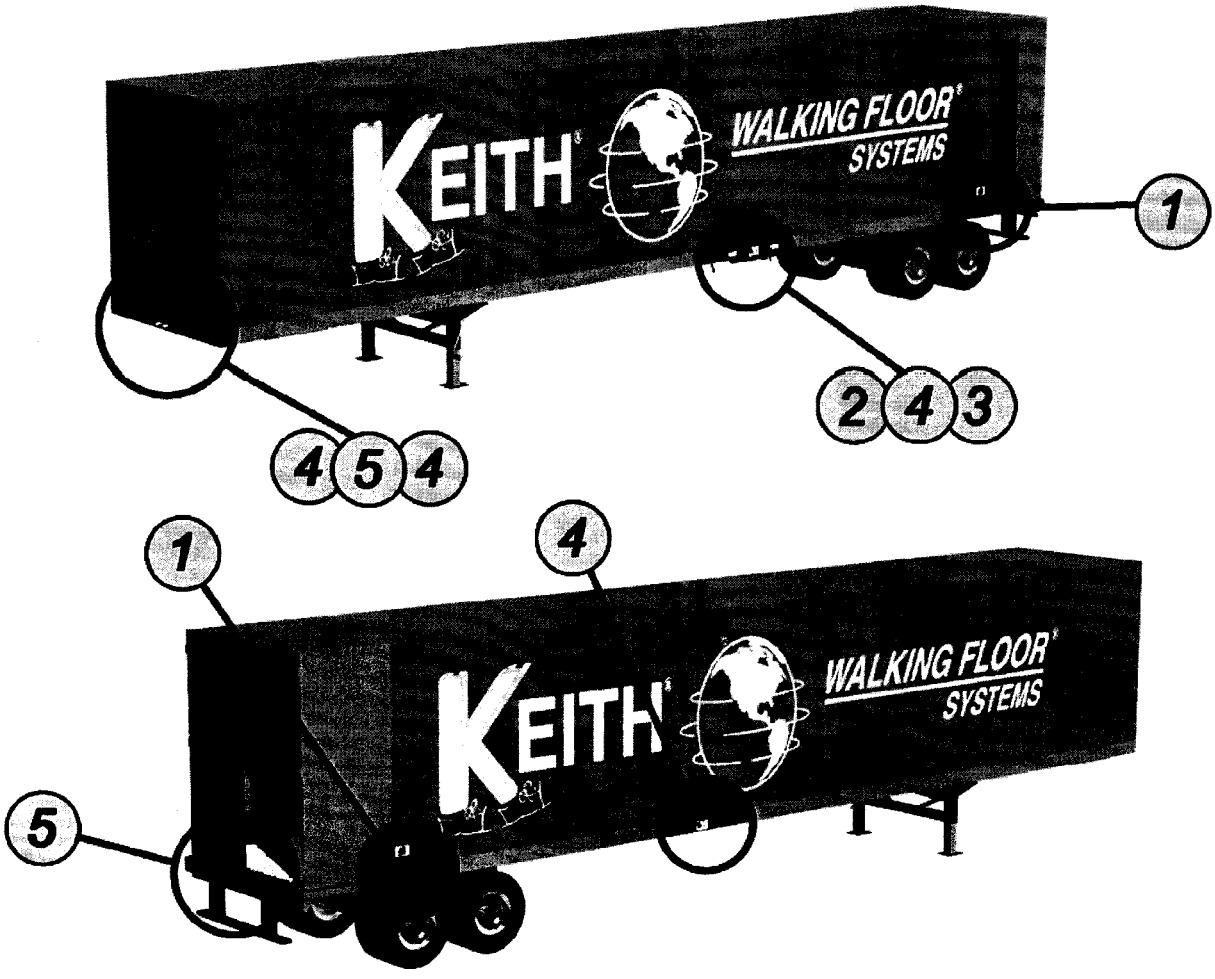
Always:

1. Disengage the trailer from the (P.T.O.) hydraulic power unit before service and maintenance.
2. Shut off the power supply before going underneath the trailer.
3. Stay away from any oil leaks when hydraulic pressure is high.
4. Shut off the hydraulic power take off unit (P.T.O) before moving the trailer.

!!Keep your hands, body parts and loose clothing away from the floor slats and drive mechanism when the unloading system is in operation!!

Each decal notifies the operator of instructions or potential safety hazards associated with the KEITH® *WALKING FLOOR*® unloader. If your dealer has not placed the decals during installation, please follow the decal placement guide provided and place the decals as directed. If you have not been provided with the operational and safety decals, please contact your dealer, or KEITH Mfg. Co. directly and we will provide a set of decals for your application and use. If you have any questions or concerns regarding the decal placement, please don't hesitate to contact your dealer or KEITH Mfg. Co.


DANGER
PELIGRO
1
CRUSH HAZARD
PELIGRO DE APLASTAR
LE DANGER D'ECRASER
STAY CLEAR OF THIS AREA
DURING OPERATION.
NOTICE
EMERGENCY SHUT-OFF
2
STOP
Parada
Arrêt
RUN
Funcionamiento
Courir
4
PINCH POINTS
PUNTOS PELIGROSOS
POINT DE PINCEMENT
Moving parts can crush or cut.
KEEP CLEAR.
NOTICE
OPERATION OF CONTROL VALVE
3
PUSH TO LOAD
EMPUJE PARA CARGAR
POUSSEZ POUR CHARGER.
Handle Pushed Completely In
PULL TO UNLOAD
TIRE PARA DESCARGAR
TIREZ POUR DÉCHARGER
Handle Pulled Completely Out
5


KEITH
WALKING FLOOR
SYSTEMS
1
2 4 3
4 5 4
1
4
KEITH
WALKING FLOOR
SYSTEMS
5

Operation of your KEITH® V-FLOOR® DX Unloader

UNLOADING

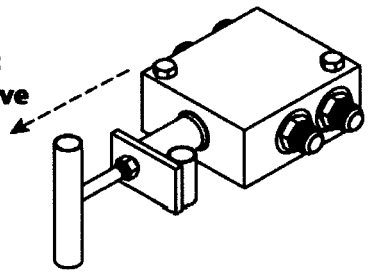
1. Before beginning to unload, make sure the trailer door is open.
2. To unload with your KEITH® V-FLOOR® DX system, pull the control valve handle all the way out. (See Diagram A.)
3. Make sure that the ball valve, located between the pressure and return lines, is in the closed (run) position. (See Diagram B.) This ball valve is used for the emergency shut-off.
4. Engage the P.T.O., then bring the tractor engine up to the predetermined unloading RPM. Your trailer floor should now be operating.
5. To stop the floor at any time during the loading or unloading process, switch the ball valve to the open (stop) position. (See Diagram B.)

LOADING

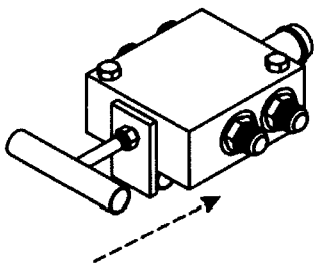
1. To load with your bi-directional KEITH® V-FLOOR® DX system, simply turn the control valve handle parallel to the ground and push it all the way in. (See Diagram A.) Then follow instructions 3, 4 and 5 listed above.

!!Note!!
Make sure the trailer door is open BEFORE starting the floor or the trailer door may be damaged. The nose of the trailer may also be damaged by the load force when loading.

Diagram A:
Control Valve

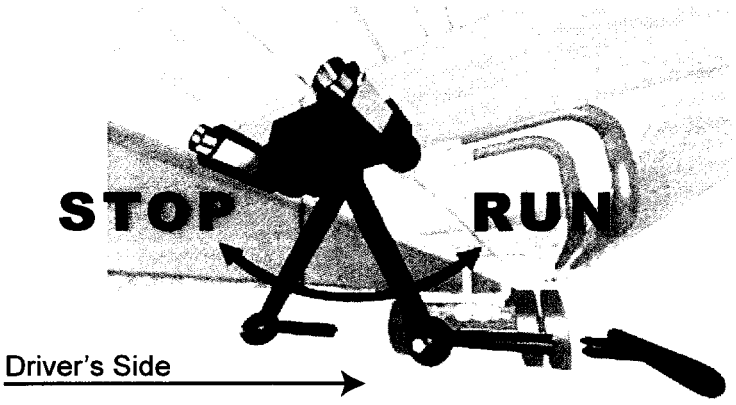


PULL TO UNLOAD
Handle Pulled Completely Out

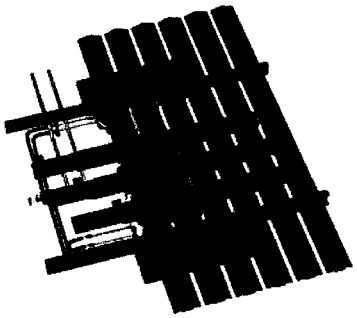


PUSH TO LOAD
Handle Pushed Completely In

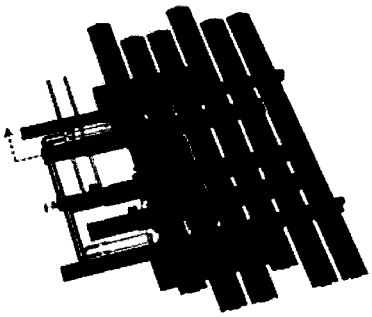
Diagram B:
Ball Valve



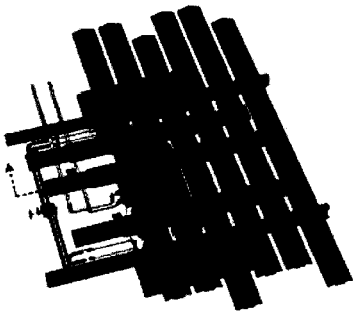
How It Works



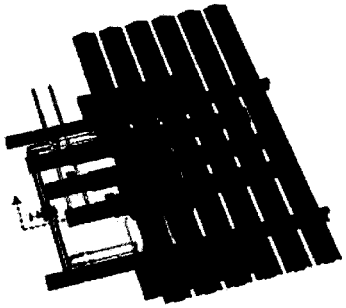
Initial State
All slats/planks at discharge end.



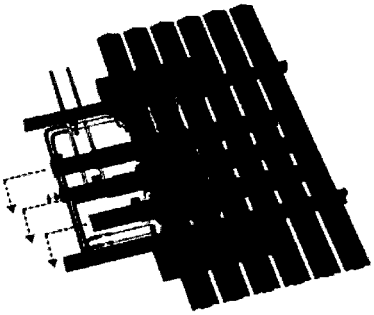
Stage 1
The first group of slats/planks moves under the load.
Load does not move.



Stage 2
The second group of slats/planks moves under the load.
Load does not move.



Stage 3
The final group of slats/planks moves under the load.
Load does not move.

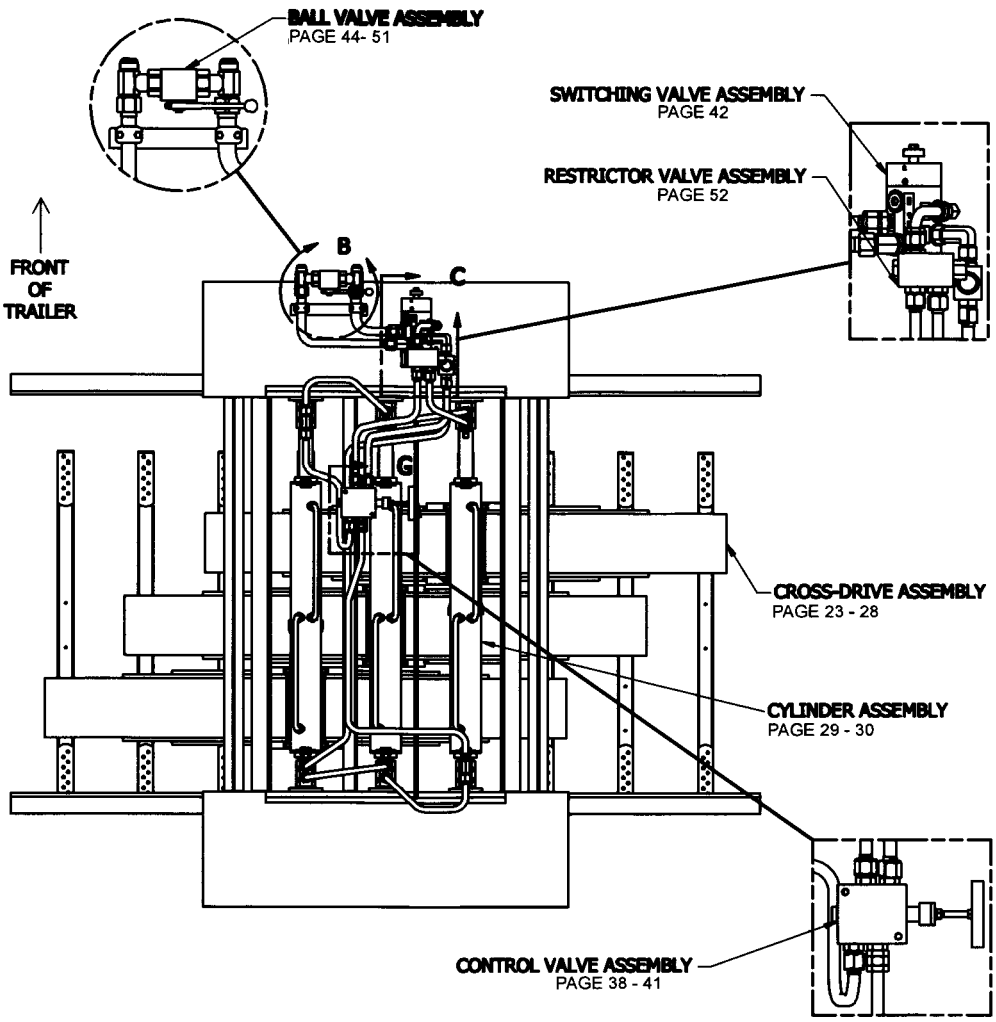


Stage 4
All slats/planks move together.
Load moves toward the discharge end.

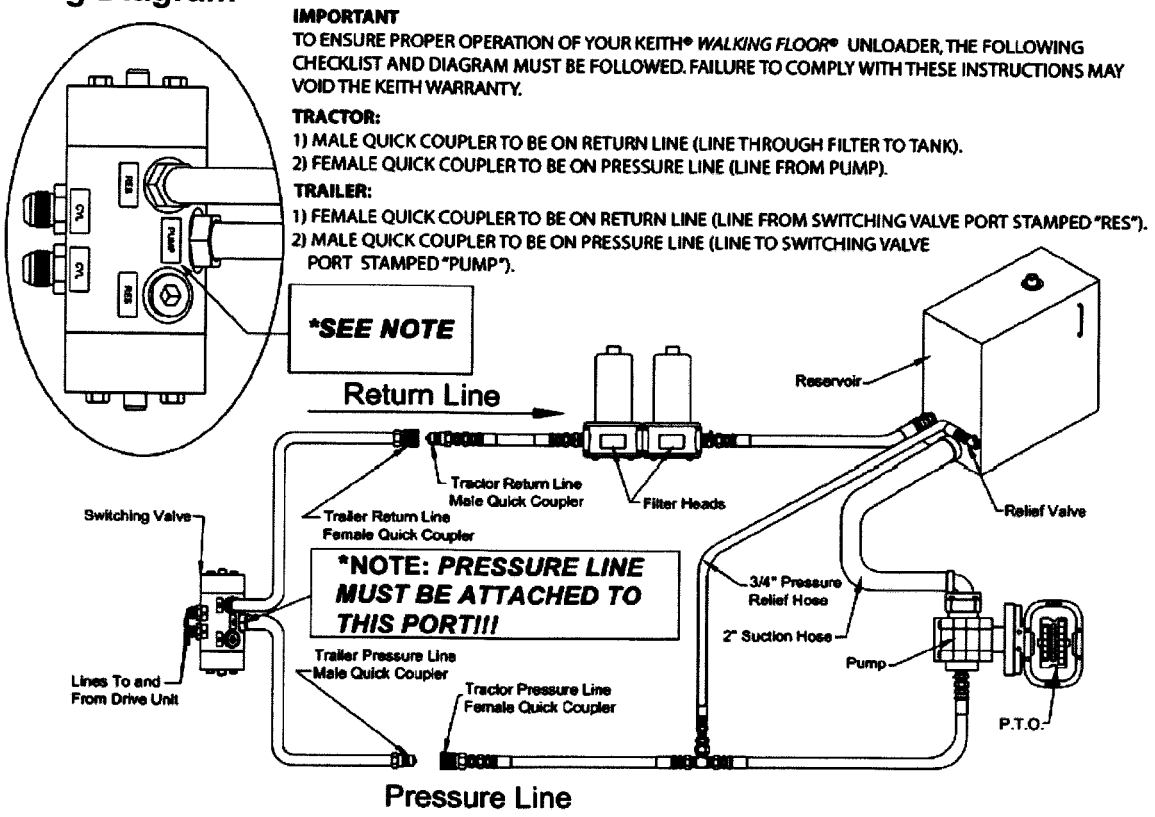
(Stages 1, 2 & 3 require more pressure than stage 4.)

Component Location Guide *(View from underneath the trailer).*

Component Location Guide (View from underneath the trailer)



Plumbing Diagram



NOTE: The pressure and return lines must attach to their proper ports on the switching valve. If you have any questions or problems, call KEITH Mfg. Co. at 800-547-6161.

Start-Up Check List for the KEITH® V-FLOOR® DX System

Before starting your new KEITH® V-FLOOR® DX unloader, a quick start-up check should be made.

1. Is your entire system plumbed to the plumbing diagram?
2. *Pump: Will it pump 30-35 GPM at 3000 PSI?
3. *Relief Valve: Is it set at 2800-3000 PSI?
4. Oil: Have you filled the reservoir?
5. Power Take Off: Is the P.T.O. engaged?
6. Quick Disconnects: Are they the same size and type? Are they completely engaged?
7. Ball Valve: Is the ball valve on the drive unit closed?
8. Is the pressure line on the trailer attached to the pressure line on the tractor and the return line on the trailer attached the return line on the tractor?

*If the information about your pump and relief valve is not known, a pressure/flow check will help determine this information. Be sure that your entire wet kit system meets the requirements of the hydraulic wet kit specifications in this manual.

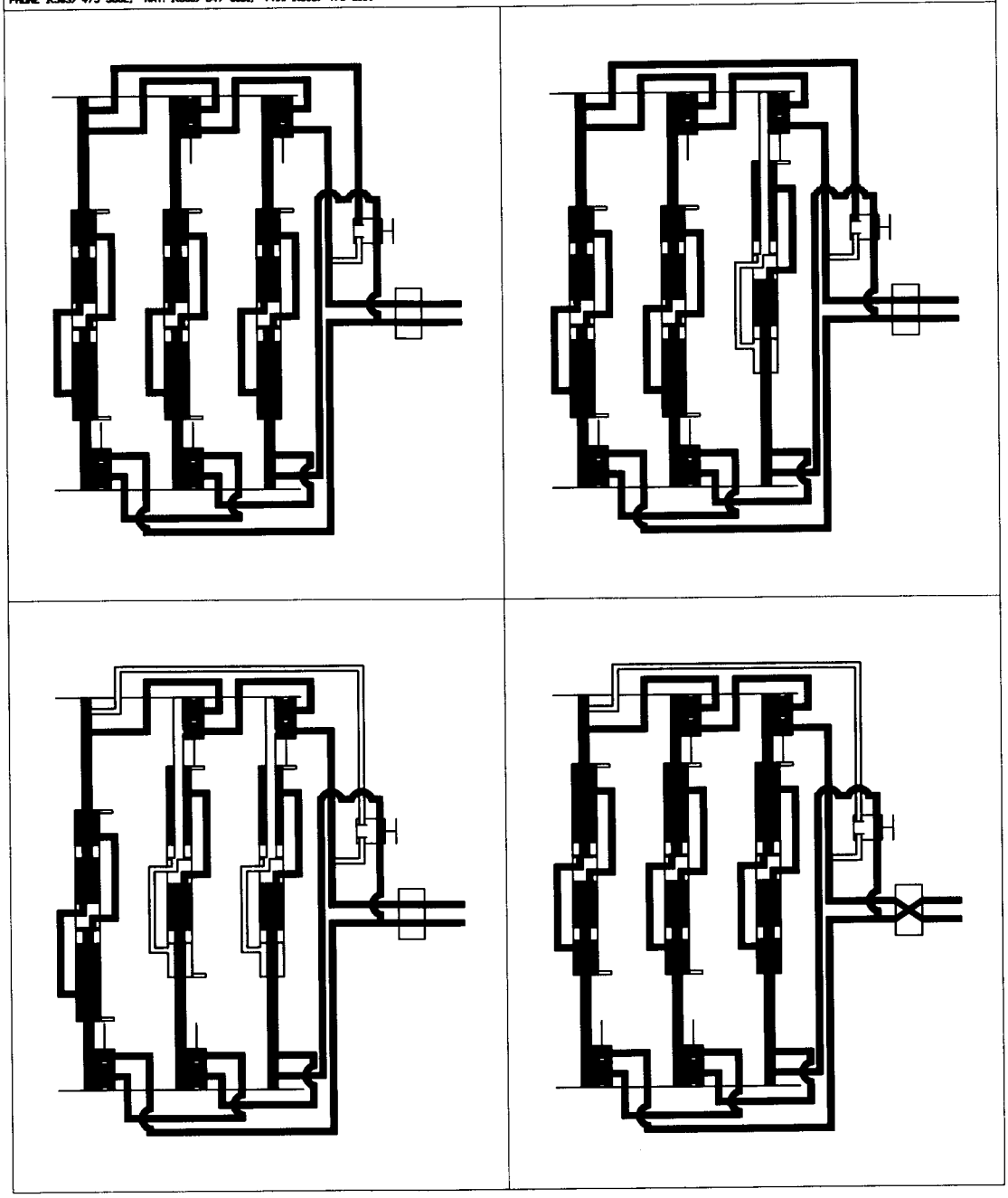
KEITH® RUNNING FLOOR II™

OIL FLOW DIAGRAM (UNLOAD CYCLE)

Pressure
Return
Blocked Return Oil
Standing Oil

KEITH MFG. CO.
P.O. BOX 1, MADRAS, OR 97741
PHONE 1(503) 475-3802, NAT. 1(800) 547-6161, FAX. 1(503) 475-2169

GP
8/29/01
D-45600



Wet Kit Information

Transmission:	This wet kit is designed for a Fuller 13 or 15 speed transmission. All of the following information applies to this transmission. Power Take Off (P.T.O.) specifications may vary with other transmissions. Please check with KEITH Mfg. Co. for other specifications.
Oil:	Chevron AW46 hydraulic oil or equivalent.
P.T.O.:	Chelsea series 442/489 bottom mount (6 or 8 bolt) 118% Power Take Off (electric over speed is highly recommended), or Muncie P.C. 65 with electric over speed.
Pump:	Commercial P51 type with dowelled housing; 2 1/2" gear (2" four bolt suction) with Anchor W43-32-32 flange.
Filter:	Filter should be 10 to 30 micron on the return line. Filter should be a double element Zinga or equivalent. Filter head #DF-15-25. MF 2215-25-0-2-0. Filter element #LE-10 or LE-30. (The filter element should be changed after 6 hours initially, and then every 6 months thereafter. This may vary with the operating environment.)
Hydraulic Reservoir:	Should hold approximately 1 gallon of oil for every gallon per minute you plan to pump, i.e. 40 GPM = 40 gallon reservoir. Reservoir should hold a minimum of 40 gallons of oil.
Suction Line:	Suction line from the tank to the pump should be no more than 5' in length and a minimum of 2" inside diameter. Example: SAE-100R4. (This type of line has a spiral wire to keep the hose from collapsing under suction.)
Pressure Line:	Hose from truck to trailer should be 1" 16 SAE-100R2.
Return Line:	Hose from **trailer to filter** should be 1" 16 SAE-100R1. Hose from **filter to tank** should be 1¼" 20 SAE-100R1.
***Pressure Relief Valve:**	High quality valve, with the ability to relieve full pump flow at 3000 PSI.

***Note: It is critical that this relief valve is set at no less than 2800 PSI and no more than 3000 PSI.**

SWITCHING VALVE TROUBLESHOOTING

Problem: Cylinder (#1) moves toward the front of the trailer. Cylinder (#2) moves toward the front of the trailer. Cylinder (#3) moves toward the front of the trailer; then the system stops.

Cause: The threaded rod nuts on the discharge end of the switching valve are not adjusted correctly.

Solution: Break the two nuts apart and adjust toward the rear of the trailer.

Problem: All three cylinders move toward the rear of the trailer; then the system stops.

Cause: The threaded rod nuts on the forward end of the switching valve are not adjusted correctly, or there is not enough hydraulic pressure. (See note.)

Solution: Break the two nuts apart and adjust toward the front of the trailer.

Problem: Floor runs fine empty or with a light load, but will not cycle with a heavy load.

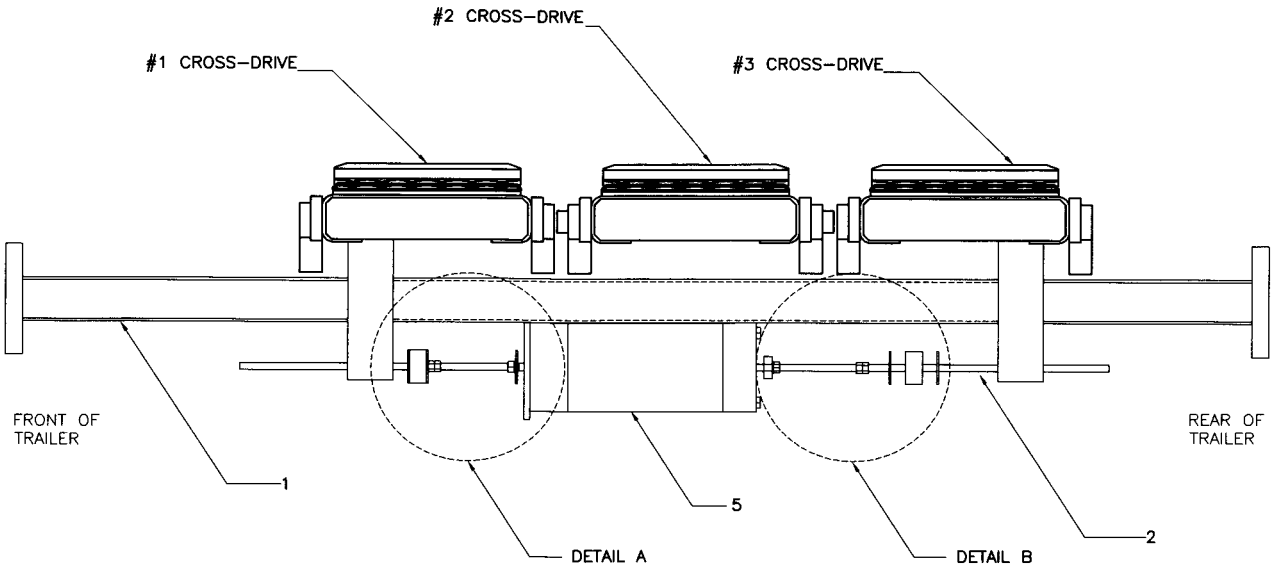
Cause: The nuts on the threaded rod are slightly out of adjustment, or there is not enough hydraulic pressure. (See note.)

Solution: Break the two nuts apart and adjust them.

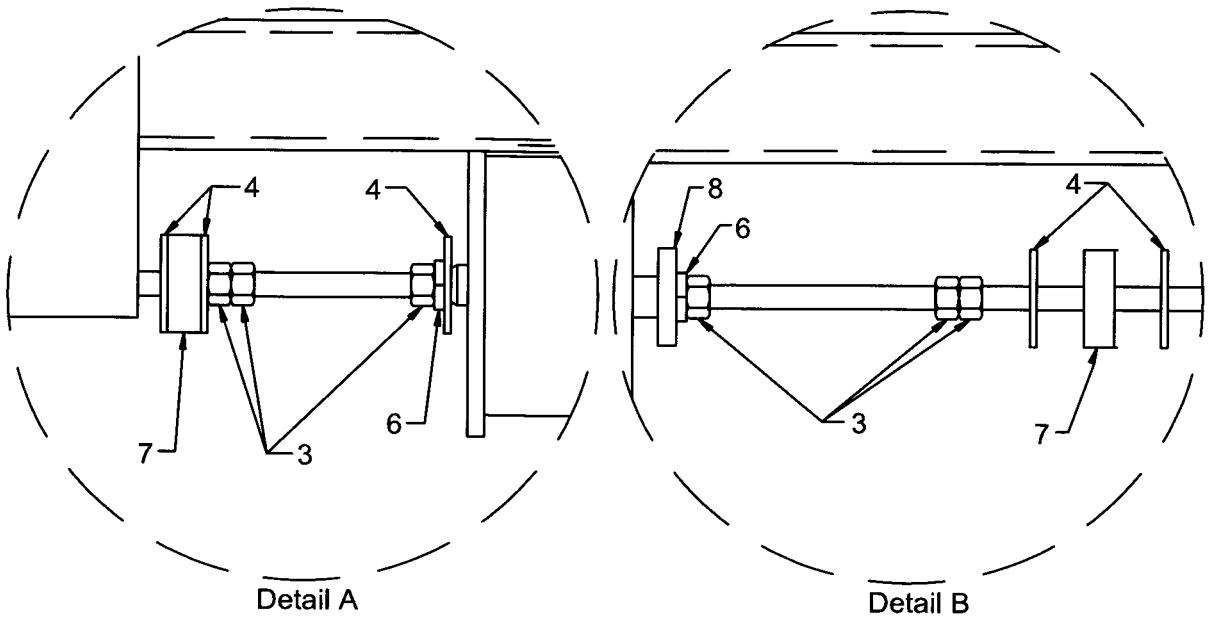
Note: ***If floor stops in the full rear position and the switching valve has switched, you may not have enough oil pressure. Less pressure is required to move the load than to pull the slats 1/3 at a time under the load.***

When empty, some trailers will cycle in sequence forward 1-2-3, then back 3-2-1, (instead of all slats moving back together.) This is not a malfunction; no repairs are needed. When load is put on a trailer, the drag will cause the floor to sequence properly.

SWITCHING VALVE ADJUSTMENT



1. 2" x 2" Steel Tube
2. 3/8" Threaded Rod (typ. 2 pcs)
3. 3/8" Nuts
4. 3/8" Flat Washers
5. Switching Valve
6. 3/8" Lock Washer
7. Switching Valve Grommet
8. Switching Valve Limit Cap



Detail A Detail B

Check Valve Troubleshooting

The exterior check valve is designed to vent oil from the return side of the cylinder. It does not direct pressurized oil into the cylinder.

Unloading

Problem:	Cylinders (#1) and (#2) extend together toward the front of trailer.
Cause:	The check valve at the forward end of cylinder (#1) has malfunctioned.
Solution:	Rebuild or replace the check valve.
Problem:	Cylinders (#2) and (#3) extend together toward the front of trailer.
Cause:	The check valve at the forward end of cylinder (#2) has malfunctioned.
Solution:	Rebuild or replace the check valve.
Problem:	All three cylinders extend together toward the front of trailer.
Cause:	The check valves at the forward end of cylinders (#1) and (#2) have malfunctioned (Unlikely) or oil is leaking in the control valve and "floating" the check valves.
Solution:	Rebuild or replace the check valves or control valve.

Loading

Problem:	Cylinders (#2) and (#3) extend together toward the rear of trailer.
Cause:	The check valve at the rear end of cylinder (#3) has malfunctioned.
Solution:	Rebuild or replace the check valve.
Problem:	Cylinders (#1) and (#2) extend together toward the rear of trailer.
Cause:	The check valve at the rear end of cylinder (#2) has malfunctioned.
Solution:	Rebuild or replace the check valve.
Problem:	All three cylinders extend together toward the rear of trailer.
Cause:	The check valves at the rear end of cylinders (#2) and (#3) have malfunctioned (Unlikely) or oil is leaking in the control valve and "floating" the check valves.
Solution:	Rebuild or replace the check valves or control valve.

See "Replacing a Check Valve" Page 16

The check valves at the rear of the cylinders (discharge end) do nothing when you are unloading. The check valves at the rear are used for loading only.

Note: When empty, some trailers will cycle in sequence forward 1-2-3, then back 3-2-1, (Instead of all slats moving back together). This is not a malfunction; no repairs are needed. When a load is put on a trailer, the drag will cause the floor to sequence properly.

Replacing a Check Valve

Replacing a KEITH® RUNNING FLOOR II® DX external check valve is a simple procedure. The tools required to do this are:

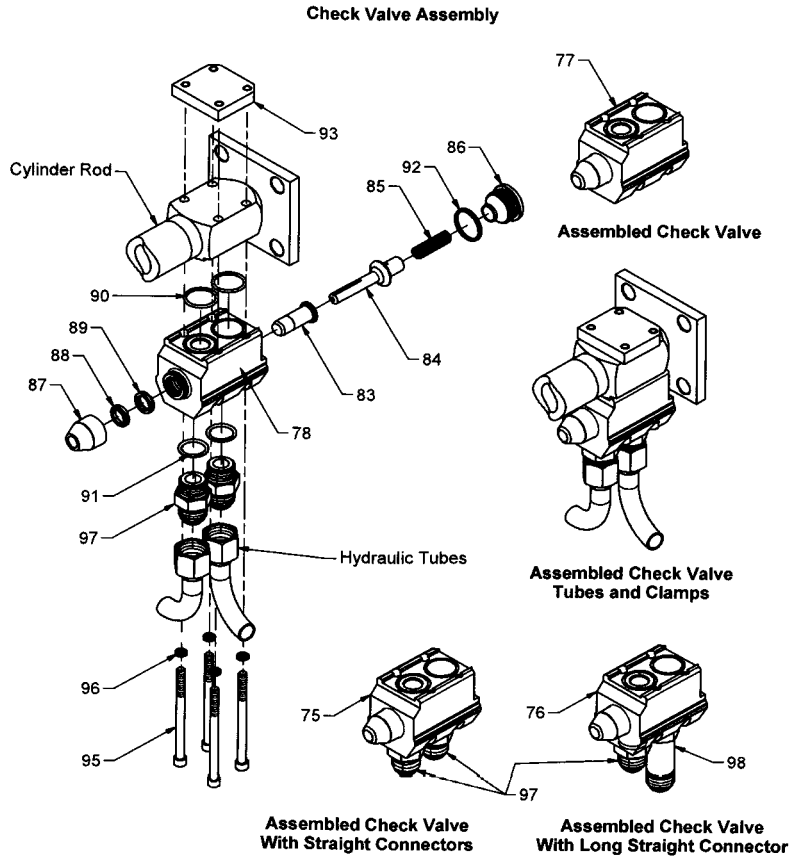
- (1) 1/4" Allen wrench
- (1) 1-1/4" Open end wrench

DISASSEMBLY

Before removing any bolts, run the cylinder away from the check valve in order to free it. Next remove the four socket head 5/16 x 4 1/2" bolts and tube clamp. Loosen the other end of the tubes and remove the check valve.

ASSEMBLY

First, make sure all of the surfaces are clean and the O-rings are in the proper places. Put the new check valve in place making sure it seats flat on the rod end. Put the 5/16" x 4 1/2" socket head bolts in and tighten the bolts down. Tighten bolts in a x-pattern. Snug each bolt first. Then torque each bolt. Attach the hydraulic tubes to the check valve and tighten. Run the floor and check for leaks.



Control Valve, Ball Valve Troubleshooting

Control Valve
The control valve controls the direction of material movement (Load or unload).

Hydraulic oil is directed through the valve by moving the valve handle in or out. When the handle is pulled out, the *WALKING FLOOR®* system unloads. The oil is flowing through the outside hydraulic lines and blocked from flowing through the inside lines. When the valve handle is pushed in, the floor loads. Oil flows through the inside lines and is blocked from flowing through the outside lines.

If the valve spool becomes worn or scored, a hydraulic bypass will be created and the oil will get hot. Isolate the valve by pulling the handle out. Remove the two inside hydraulic lines, cap the valve and plug the lines. If the drive unit runs without the oil getting hot, the valve needs to be changed.

Ball Valve
Note: The ball valve is intended to use as the start and stop valve and the emergency shut off!

The ball valve will start or stop the floor.

The ball valve is open when the handle is pushed in. Oil is allowed to flow through the ball valve and back to the tank. When the handle is pulled out, the valve is closed. Oil flows to the drive unit. If the ball valve gets hot to the touch, the inner seals are worn or damaged. This can occur from using the wrong hydraulic pump, bad quick couplers, or from any problem that causes a hydraulic bypass. The ball valve has two Teflon® cup seals; one located on each side of the ball port. If these seals get hot, they will break down. This causes hydraulic oil to slip by, creating heat. You may not be able to move the load because of loss of pressure. The ball valve needs to be rebuilt or replaced.

Hydraulic Cylinders Troubleshooting

Hydraulic Cylinders
Hydraulic cylinders are usually damaged from heat or foreign materials (Causing seals, wear sleeve, etc. to break down).

The way to check the cylinders is to use an infrared heat detector or by touching each end of the cylinder barrel. If you find one end or both that are warmer than the other cylinders, it usually indicates which cylinder is damaged.
Caution: Never touch any component part of the Running Floor II® DX drive or perform this check while the drive unit is operating or P.T.O. engaged. Always shut the system down before performing maintenance.

Problem:	Cylinder (#1) moves fine, (#2) moves fine, (#3) will start to move then suddenly stop. (#3) will then travel four to five inches and move fast.
Solution:	The cylinder (#3) clamp is too tight. This could happen on any one of the three cylinders. Re-torque to 135 ft-lbs.
Problem:	After (#1) cylinder, the left side cylinder, has been changed, the system is operated. (#1) moves to the check valve and opens the check valve. (#2) moves forward, but stops before it reaches the check valve and the hydraulics are at high pressure.
Solution:	Cylinder (#1) was not installed in the correct position. This is not allowing (#2) to travel the distance needed to open the (#2) check valve. The correct measurements for the Running Floor II® 3.0" and 3.5" cylinders are as follows: Cylinder (#1) from end of barrel to front threaded clamp = 1 ½" Cylinder (#3) from end of barrel to front threaded clamp = 1 ½" Cylinder (#2) is centered between (#1) and (#3) Do not measure from the cylinder head.
Problem:	In the Unload mode: As all three cylinders travel toward the rear of the trailer, cylinder (#3) moves faster than (#1) or (#2).
Solution:	There is not enough restriction on cylinder (#3). It is recommended to install an RV-2 valve, a restrictor valve, between the switching valve and cylinder or a check valve with a heavier internal spring.

Repairing Cylinders

To repair or replace the cylinder, you have to remove the hydraulic tubes and the check valves on each end of the cylinder that will be removed. There will be a total of twelve 5/8" bolts. Each end of the cylinder will have four and there will be four bolts from the cross-drive. Leave one bolt on each end of the cylinder to hold it in place, but loosen it so that it is almost out. Have one person on each end of the cylinder remove the bolt and let the cylinder down. Use the same method to put the cylinder back in.

Before installing the new cylinder, be sure to check the threaded pad on the cylinder and upper clamp on the cross-drive for damage. If the threads are damaged, replace with a new barrel or cross-drive, if necessary. The threaded pads must mate perfectly and the barrel clamps must be tightened properly to prevent slippage. (135 ft-lbs).

Note: In all RUNNING FLOOR II® DX units, cylinder (#1) is located on the left side of the trailer. It is also the first cross-drive that moves to the front of the trailer.

Rule of Thumb:
If you have a cylinder leaking due to heat, usually all three cylinders will need to be (or should be) repaired or replaced.

Suggested Preventive Maintenance Schedule

New Trailer:

1. Check torque on barrel clamp bolts before first load and after the first week of operation. 5/8" bolts/135-lbs. (See page 61)
2. Check torque on floor bolts after one week of operation.

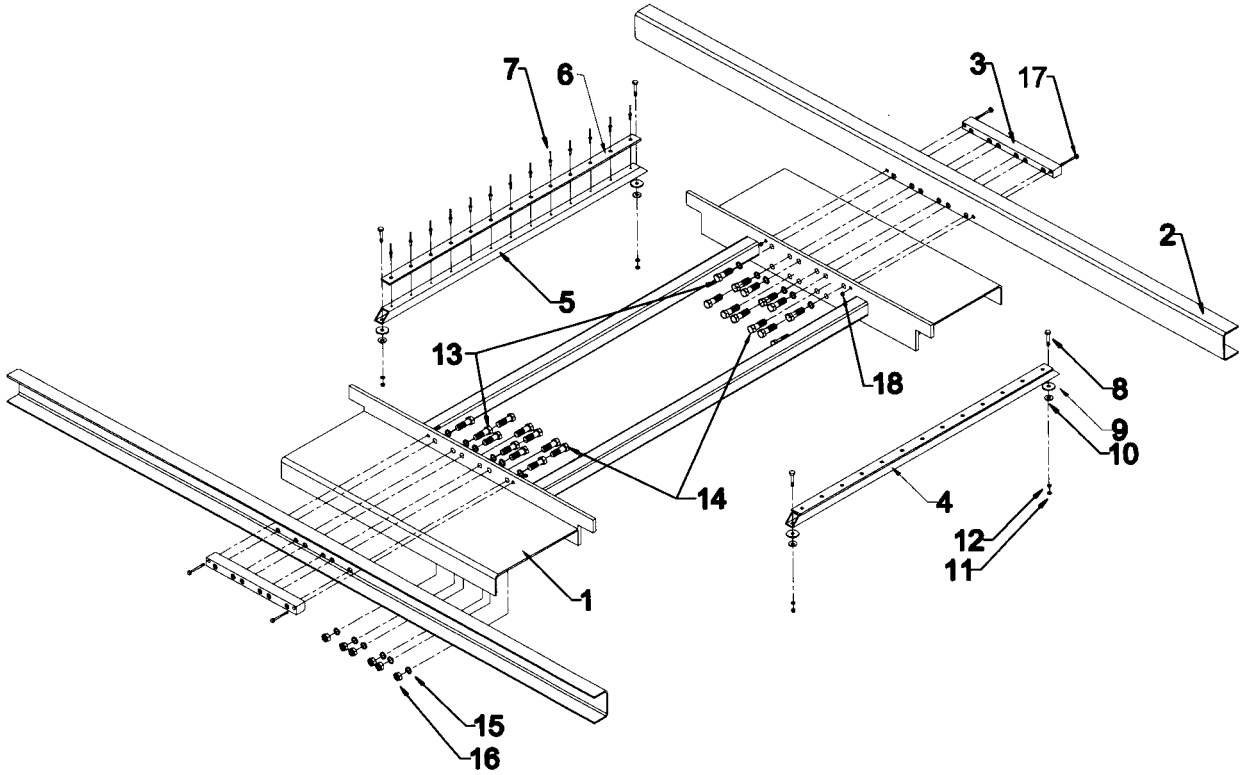
   - 5/16" bolts/22-lbs.
   - 3/8" bolts/42-lbs.
   - 5/8" bolts/180-lbs 9 Slat Kwik Klamp .
   - 5/8" bolts/150-lbs 24 Slat Kwik Klamp.
   - 3/8" bolts/45-lbs Integrated V Slat.

3. Visually check for hydraulic leaks. Check the cylinder area, around the pressure and return hydraulic tubes, around the switching valve, check valves, and the quick disconnect. If leaks are found, retighten the fittings.

Used Trailer:

1. Visually check for hydraulic leaks.
2. Visually inspect the cross-drive support bearing for excessive wear. Replace if needed.
3. Visually inspect the cross-drive tubes and drive shoes for damage. Replace or repair as needed.
4. Inspect flooring for loose slats or bent slats that may have popped up due to impact damage.
5. Visually inspect for excessive wear of the floor bearings over each vehicle tire. Replace as needed.
6. The type of material being transported will affect the timing of the following procedure. A general guide for slat rotation or replacement is after approximately 3,000 loads. Check for wear on the rear of the slats and if they are worn more than 75% of the original thickness, it is suggested to remove and rotate the flooring end-for-end for extended life.
7. Pressure wash the drive unit, sub-deck and slats at least twice per year. Once per quarter, if possible.
8. Cycle the system and observe for proper operation in the load and unload modes.
9. Check the torque of the barrel clamp and floor bolts. See torque chart Page 61.

Note: The hydraulic wet kit must meet KEITH Mfg. Co. requirements and must be properly maintained to avoid damaging the *WALKING FLOOR*® system.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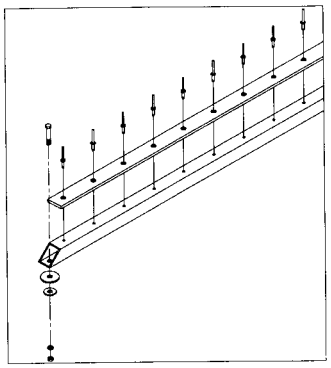
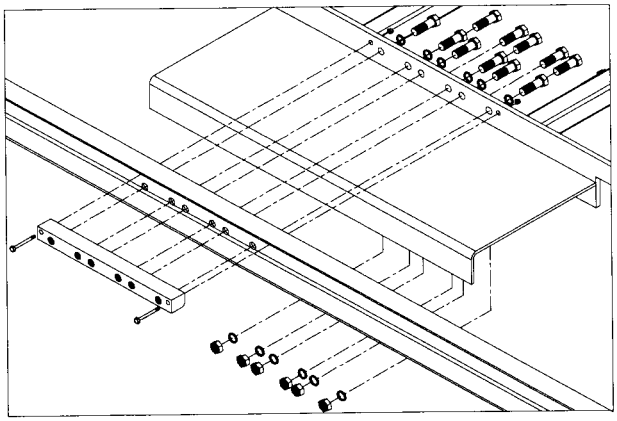
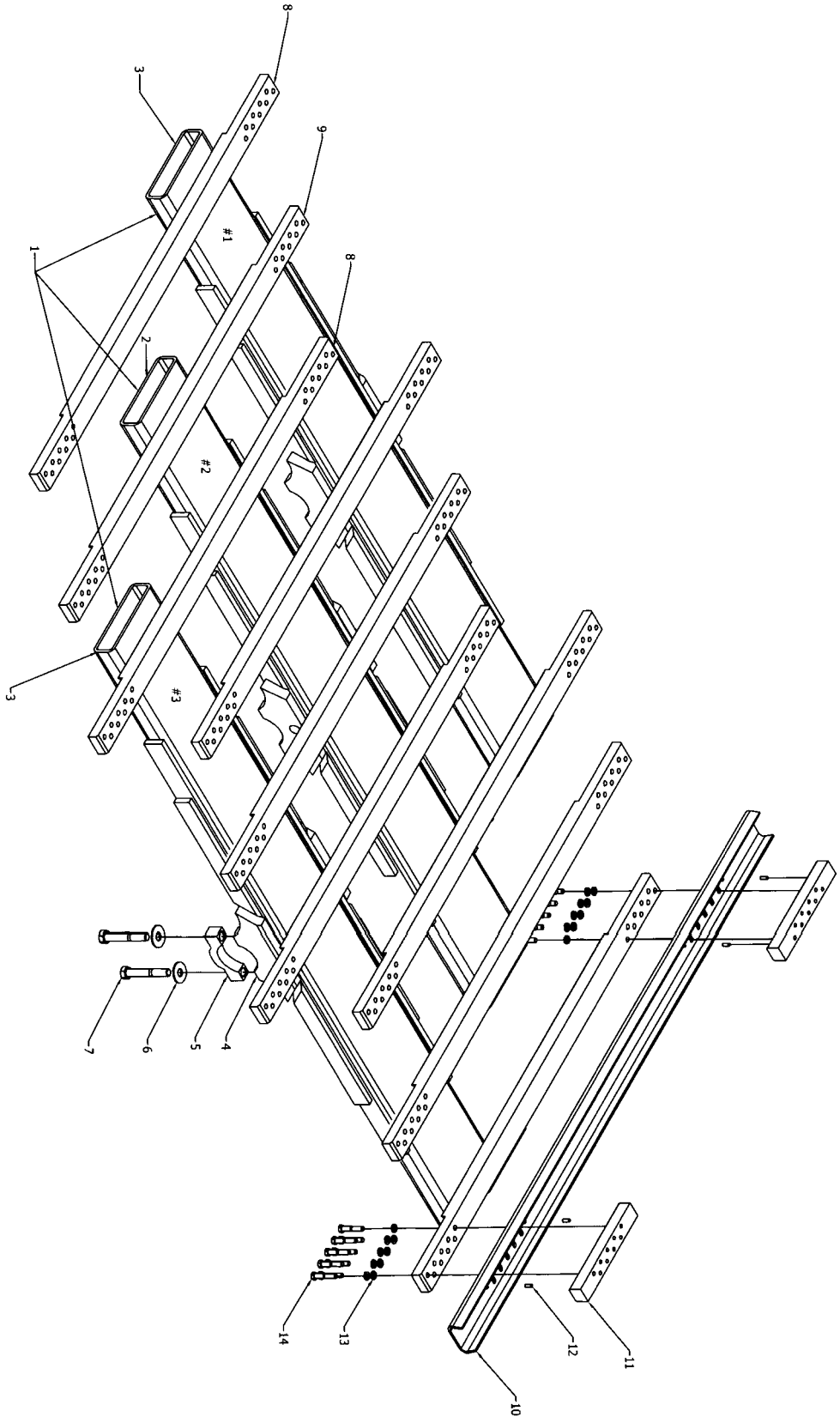




ID #	QUANTITY	DESCRIPTION	PART NUMBER
-	1	**Drive Frame Assembly**	-
-	-	Includes items 1-18	-
1(1)	1	Drive Frame Steel	-
2(1)(2)	2	Channel Formed 4"x2 1/4"x3/16"	w/frame
3(1)	2	Nut Bar Threaded 10.5" Cylinder Centers	05047001
3(1)	2	Nut Bar Threaded 10.0" Cylinder Centers	05181401
4(1)	**2**	**Bearing 1/4" Cross-Drive Support Assembly**	**03467801**
-	-	Includes items 5-7	-
5(1)	1	Bearing Cross-Drive Support Tube	03467701
6(1)	1	Bearing Cross-Drive Support 1/4" UHMW	03453901
7	13	Rivet 3/16"x1/2"	86528000
8	4	Bolt Hex GR5 3/8"x1 1/4"	86438000
9	4	Washer Large OD 3/8"	86553500
10	4	Washer Flat 3/8"	86554000
11	4	Nut Hex 3/8"	86628500
12	4	Washer Lock 3/8"	86555000
13	12	Bolt Hex GR8 5/8"x2 3/4", (3.0" Cyl)	86466500
13	12	Bolt Hex GR8 5/8"x3", (3.5" Cyl)	86467000
14	12	Bolt Hex GR8 5/8"x2", (3.0" Cyl)	86464500
14	12	Bolt Hex GR8 5/8"x2 1/4", (3.5" Cyl)	86465500
15	24	Washer Lock 5/8"	86559000
16	24	Nut Hex 5/8"	86632000
17	4	Bolt Hex GR5 1/4"x2 1/4", (3.0" Cyl)	86419500
17	4	Bolt Hex GR5 1/4"x2 1/2", (3.5" Cyl)	86420000
18	4	Nut Hex Nylock 1/4"	86626000

(1) Part numbers and descriptions vary based on drive configurations
(2) Formed channels are included with the frame. In many applications they are non-removable.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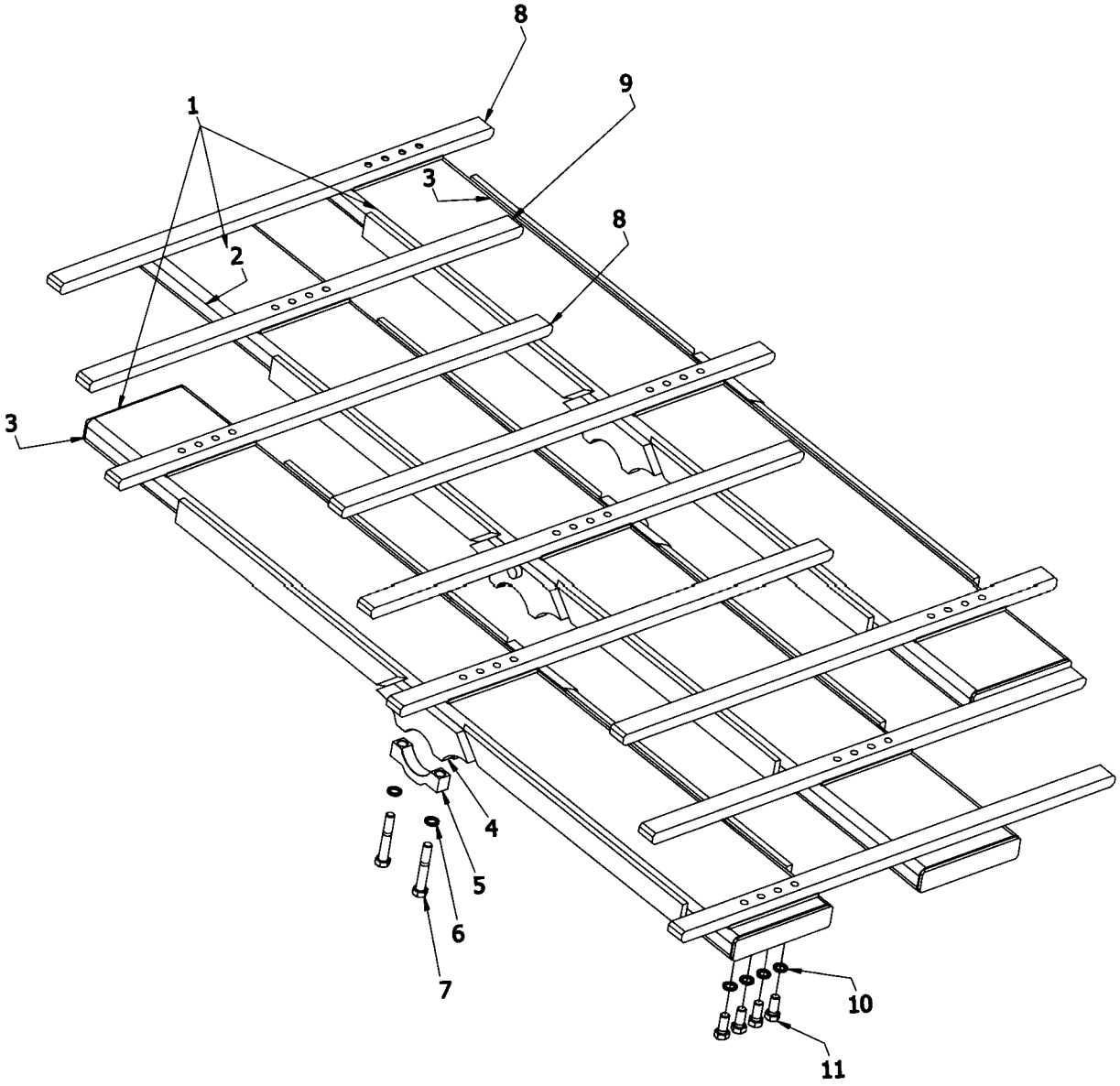
PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
1*	1	3" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.5" SC & CC Bolted Shoe	5981101
1*	1	3.5" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.5" SC & CC Bolted Shoe	5979801
1*	1	3" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.0" SC & CC Bolted Shoe	6039001
1*	1	3.5" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.0" SC & CC Bolted Shoe	5981601
2*	1	Cross Drive 3.0" Cylinder Bore #2, 10.5" CC	5981103
2*	1	Cross Drive 3.5" Cylinder Bore #2, 10.5" CC	5979803
2*	1	Cross Drive 3.0" Cylinder Bore #2, 10.0" CC	6039003
2*	1	Cross Drive 3.5" Cylinder Bore #2, 10.0" CC	5981603
3*	2	Cross Drive 3.0" Cylinder Bore #1 & #3, 10.5" CC	5981102
3*	2	Cross Drive 3.5" Cylinder Bore #1 & #3, 10.5" CC	5979802
3*	2	Cross Drive 3.0" Cylinder Bore #1 & #3, 10.0" CC	6039002
3*	2	Cross Drive 3.5" Cylinder Bore #1 & #3, 10.0" CC	5981602
4*	3	Threaded Clamp 3.0" Lower Cross Drive	3024501
4*	3	Threaded Clamp 3.5" Lower Cross Drive	3024601
4*	3	Smooth Clamp 3.0" Lower Cross Drive	3024401
4*	3	Smooth Clamp 3.5" Lower Cross Drive	3024701
5*	6	Clamp 3.0" Lower Cross Drive	03910501
5*	6	Clamp 3.5" Lower Cross Drive	03910601
6	12	Washer Tab Lock 5/8"	04430601
6	12	Washer, Wedge Locking 5/8" (3.0" Cyl)	86559010
6	12	Washer, Wedge Locking 5/8" (3.5" Cyl)	86559090
7*	12	Bolt Hex Patchlock GR8 5/8" x 4" (3.0" Cyl)	86470010
7*	12	Bolt Hex Patchlock GR8 5/8" x 4-1/2" (3.5" Cyl)	86470010
8	6	V-Floor Long Drive Shoe, 9 Hole, #1 & #3	5977601
9	3	V-Floor Long Drive Shoe, 9 Hole, #2	5977601
10*	9	Alum Drive Channel 10.5" SC	6191601
10*	9	Alum Drive Channel 10.0" SC	6341401
10*	9	Steel Drive Channel 10.5" SC	5977701
10*	9	Steel Drive Channel 10.0" SC	6006201
11	18	Aluminum Drive Channel Nut Bar	5979701
12	36	1/4"x5/8" Roll Pin	86651405
13	162	3/8" lock washer	86555000
14	162	3/8"x 2" Hex Bolts, Grade 8 with patchlock	86439521

* Part numbers and descriptions vary based on drive configurations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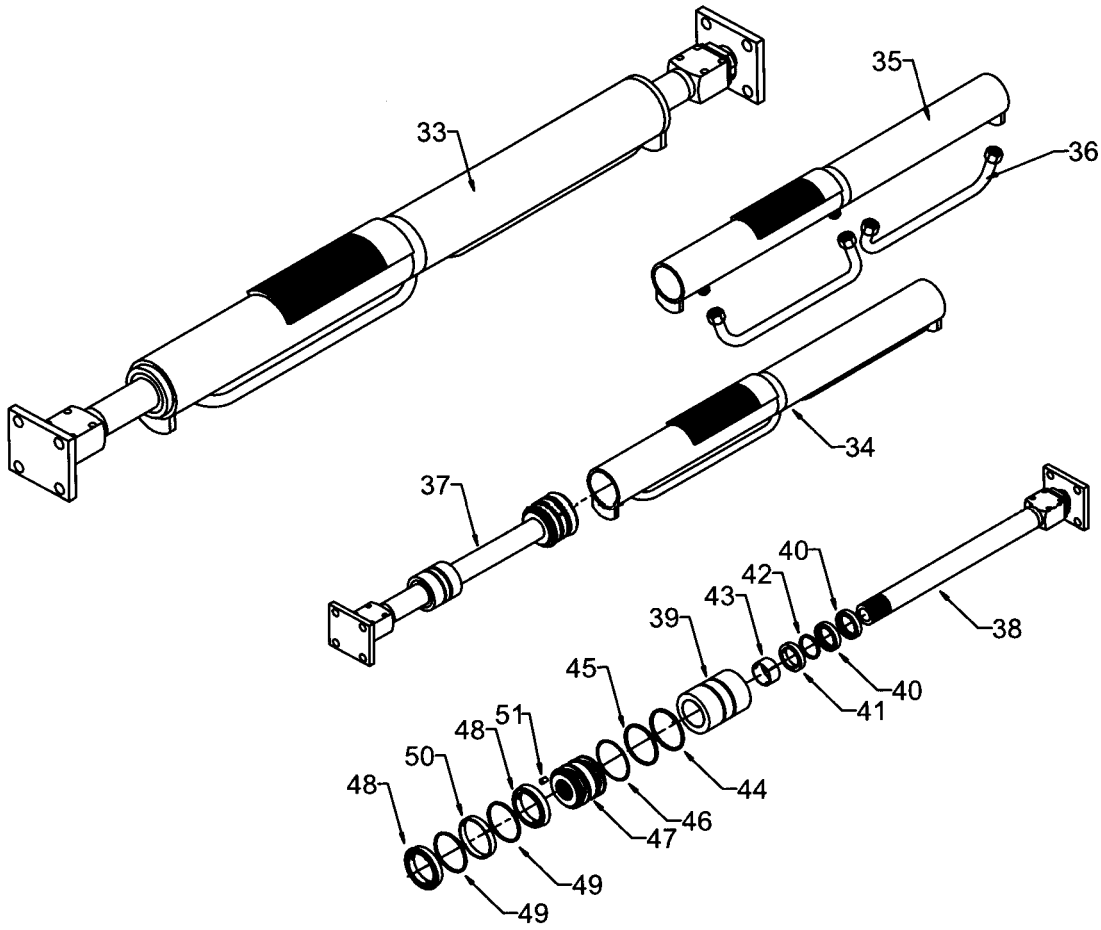
PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
1*	1	3" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.5" SC & CC Bolted Shoe	5471701
1*	1	3.5" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.5" SC & CC Bolted Shoe	5471704
1*	1	3" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.0" SC & CC Bolted Shoe	6723901
1*	1	3.5" KVD X-Drive Assembly Cross-Drive 9 V-Slat, 10.0" SC & CC Bolted Shoe	6723904
2*	1	Cross Drive 3.0" Cylinder Bore #2, 10.5" CC	5471703
2*	1	Cross Drive 3.5" Cylinder Bore #2, 10.5" CC	5471706
2*	1	Cross Drive 3.0" Cylinder Bore #2, 10.0" CC	6723903
2*	1	Cross Drive 3.5" Cylinder Bore #2, 10.0" CC	6723906
3*	2	Cross Drive 3.0" Cylinder Bore #1 & #3, 10.5" CC	5471702
3*	2	Cross Drive 3.5" Cylinder Bore #1 & #3, 10.5" CC	5471705
3*	2	Cross Drive 3.0" Cylinder Bore #1 & #3, 10.0" CC	6723902
3*	2	Cross Drive 3.5" Cylinder Bore #1 & #3, 10.0" CC	6723905
4*	3	Threaded Clamp 3.0" Upper Cross Drive	3024501
4*	3	Threaded Clamp 3.5" Upper Cross Drive	3024601
4*	3	Smooth Clamp 3.0" Upper Cross Drive	3024401
4*	3	Smooth Clamp 3.5" Upper Cross Drive	3024701
5*	6	Clamp 3.0" Lower Cross Drive	03910501
5*	6	Clamp 3.5" Lower Cross Drive	03910601
6	12	Washer, Wedge Locking 5/8:, (3.0" Cyl)	86559010
6	12	Washer, Wedge Locking 5/8:, (3.5" Cyl)	86559090
7*	12	Bolt Hex Patchlock GR8 5/8" x 4" (3.0" Cyl)	86470010
7*	12	Bolt Hex Patchlock GR8 5/8" x 4-1/2" (3.5" Cyl)	86470010
8	6	V-Floor Long Drive Shoe, 9 Hole, #1 & #3	5381701
9	3	V-Floor Long Drive Shoe, 9 Hole, #2	5381801
10	36	5/8" DISC LOCK WASHERS	86559090
11	36	Bolt Hex GR8 5/8" x 1-1/2"	86463500

* Part numbers and descriptions vary based on drive configurations



		Cylinder Assembly	
33	**1**	**Cylinder 3.0" Assembly**	**04567901**
33	**1**	**Cylinder 3.5" Assembly**	**04568001**
-	-	Includes items 34-51	
34	**1**	**Barrel Weld Assembly 3.0" Cylinder**	**04560901**
34	**1**	**Barrel Weld Assembly 3.5" Cylinder**	**04561001**
-	-	Includes items 35 & 36	
35	1	Barrel Assembly 3.0" Cylinder	04560601
35	1	Barrel Assembly 3.5" Cylinder	04560701
36	2	Cylinder Cross-Over Tube Assembly	04560801
37	**2**	**Rod W/Piston & Head 3.0" Assembly**	**02553201**
37	**2**	**Rod W/Piston & Head 3.5" Assembly**	**02553301**
-	-	Includes items 38-51	
38(1)	1	Rod 45mm W/Block & Plate	02568501

(1) Part numbers and description vary based on drive and configuration and application.

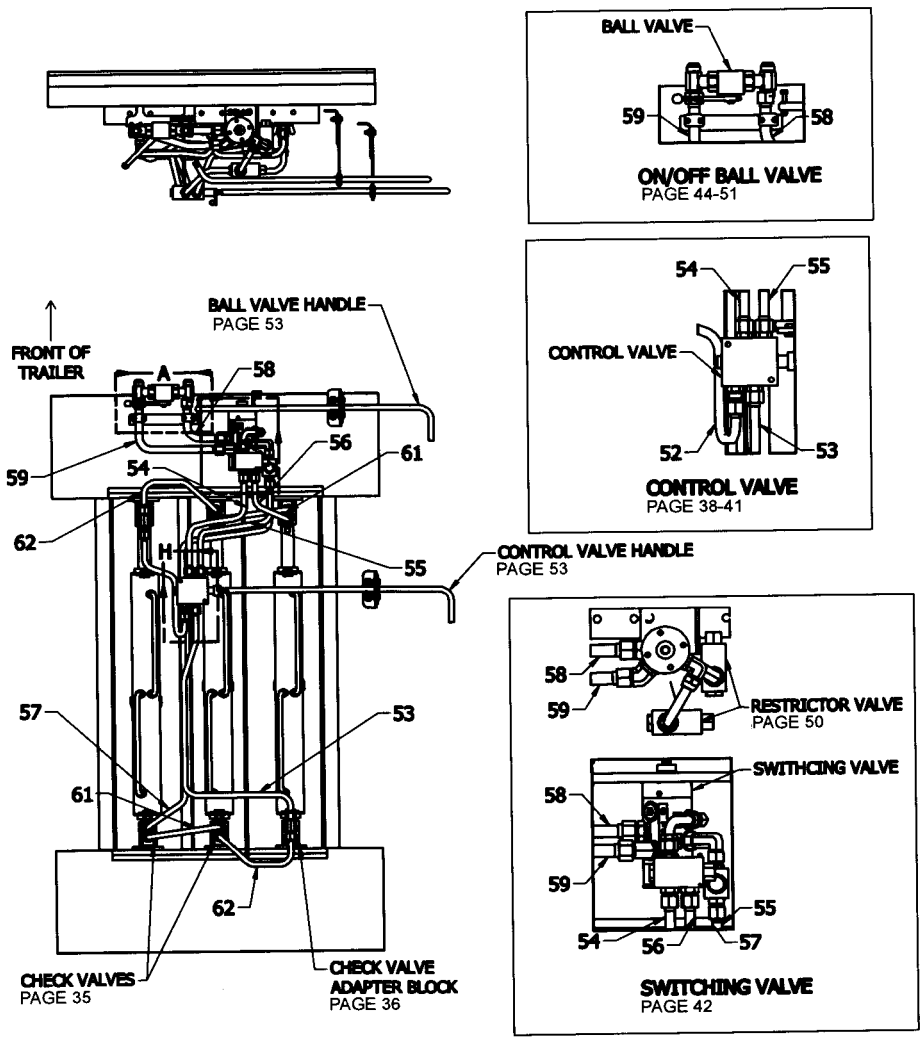
PARTS LIST (CONT.)

ID #	QUANTITY	DESCRIPTION	PART#
-	**1**	**Head 3.0" Assembly Cylinder**	**03808501**
-	**1**	**Head 3.5" Assembly Cylinder**	**03811001**
-	-	Includes items 39-46	
39	1	Head 3.0" Cylinder	01786201
39	1	Head 3.5" Cylinder	02553501
40	2	Wiper Rod 45mm Canned	84426600
41	1	Seal Rod Cylinder 45mm	84354200
42(2)	1	Seal Backup Rod Cylinder 45mm	w/seal
43	1	Wear Ring Rod Cylinder 45mm	84401200
44	1	Lock Wire 3.0" Head Cylinder	03812102
44	1	Lock Wire 3.5" Head Cylinder	03812104
45	1	O-Ring 232, (3.0" Cyl)	84384200
45	1	O-Ring 236, (3.5" Cyl)	84384600
46	1	O-Ring Backup 8-232, (3.0" Cyl)	84392400
46	1	O-Ring Backup 8-236, (3.5" Cyl)	84392800
-	**1**	**Piston 3.0" Assembly Cylinder**	**03808101**
-	**1**	**Piston 3.5" Assembly Cylinder**	**03810901**
-	-	Includes items 47-51	
47	1	Piston 3.0" Cylinder	02564801
47	1	Piston 3.5" Cylinder	02553601
48	2	Seal Piston Cylinder 3.0"	84353600
48	2	Seal Piston Cylinder 3.5"	84353800
49(2)	2	Seal Backup Piston Cylinder 3.0" & 3.5"	w/seal
50	1	Wear Ring Piston 3.0"	84404600
50	1	Wear Ring Piston 3.5"	84404800
51	1	Pin Drive Lock 3/16" x 1/2"	86650400
-(3)	**1**	**Seal Kit 3.0" Cylinder Metric**	**03877501**
-(3)	**1**	**Seal Kit 3.5" Cylinder Metric**	**03877601**
-	-	Includes items 40-46 & 48-50	

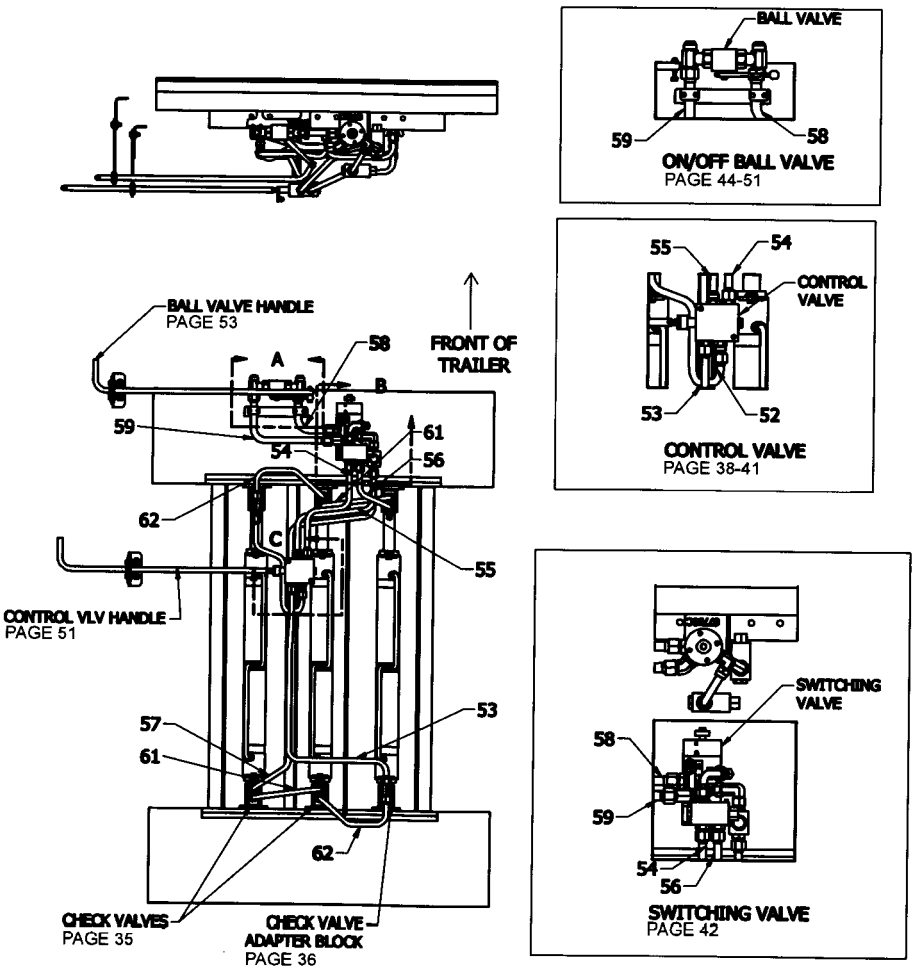
(2) Backup included with seal.

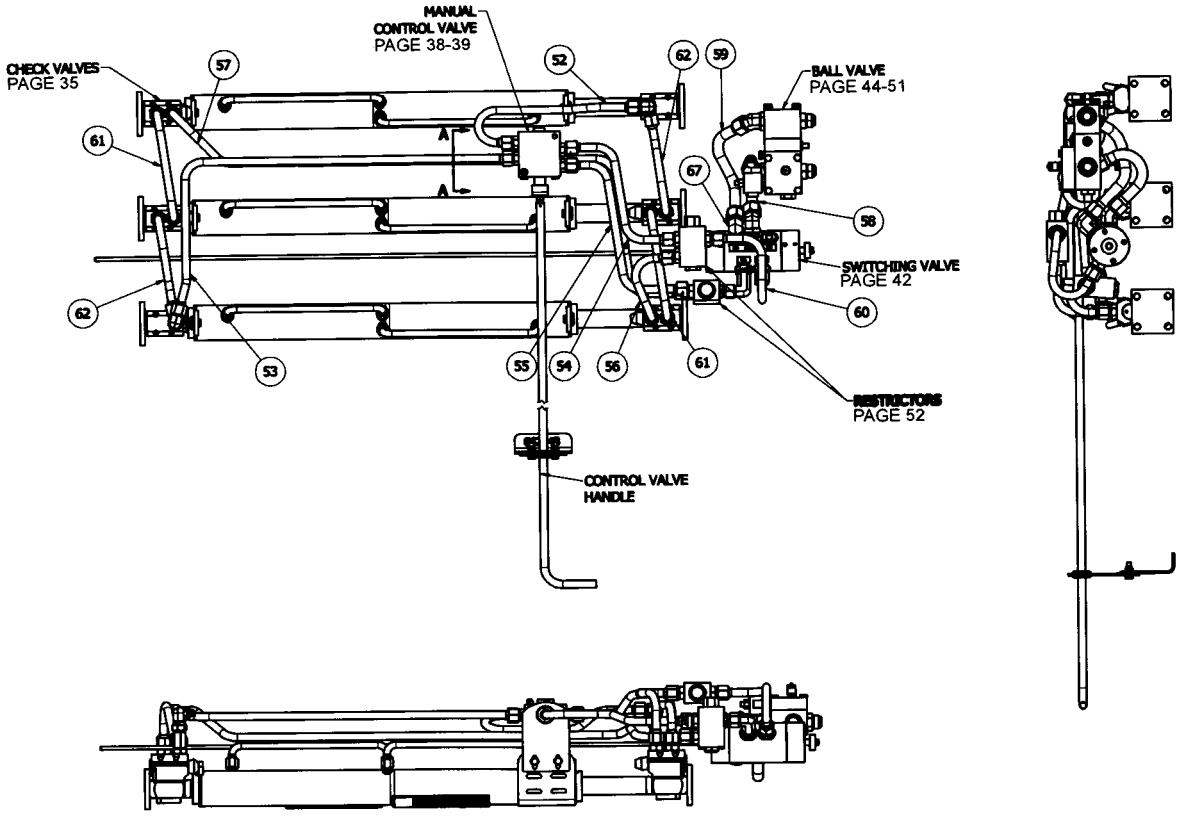
(3) The seal kit includes all necessary items required to rebuild the entire cylinder. It does not include items such as the Rod or Piston.

			PART #	PART #	PART #	PART #
V9 KRFII-DX-11 & DX-15, LEFT HAND CONTROLS						
ID#	QUANTITY	DESCRIPTION	DX-11, 10.0	DX-15, 10.0	DX-11, 10.5	DX-15,10.5
52	1	#52 Tube	6663001	6800201	6653001	*
53	1	#53 Tube	6663101	6800301	6653101	*
54	1	#54 Tube	6653201	6800401	6653201	*
55	1	#55 Tube	6653301	6800501	6653301	*
56	1	#56 Tube	6663201	6663201	6653401	*
57	1	#57 Tube	6663301	6663301	6653501	*
58	1	#58 Tube	6653601	6653601	6653601	*
59	1	#59 Tube	6653701	6653701	6653701	*
61	2	#61 Tube	6663401	6663401	6654401	*
62	2	#62 Tube	6663501	6663501	6654501	*

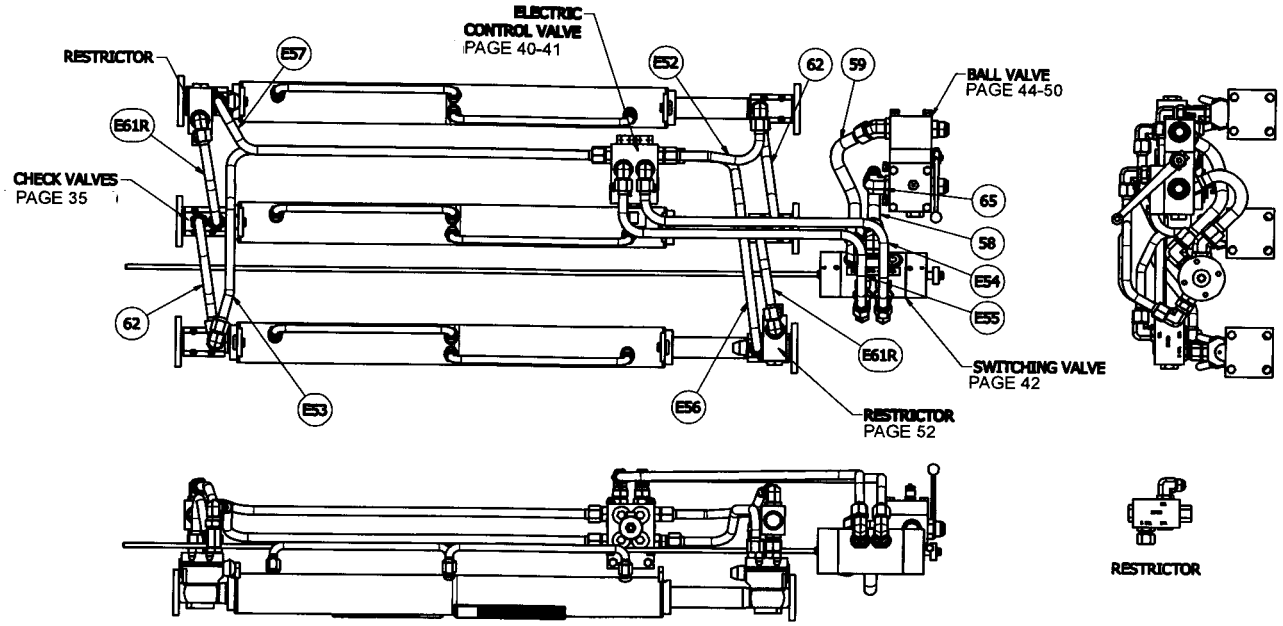


			PART #	PART #	PART #	PART #
V9 KRFII-DX-11 & DX-15, RIGHT HAND CONTROLS						
ID#	QUANTITY	DESCRIPTION	DX-11, 10.0	DX-15, 10.0	DX-11, 10.5	DX-15,10.5
52	1	#52 Tube	6663601	*	6658501	*
53	1	#53 Tube	6663701	*	6658601	*
54	1	#54 Tube	6658701	*	6658701	*
55	1	#55 Tube	6658801	*	6658801	*
56	1	#56 Tube	6663201	*	6653401	*
57	1	#57 Tube	6663301	*	6653501	*
58	1	#58 Tube	6653601	*	6653601	*
59	1	#59 Tube	6653701	*	6653701	*
61	2	#61 Tube	6663401	*	6654401	*
62	2	#62 Tube	6663501	*	6654501	*

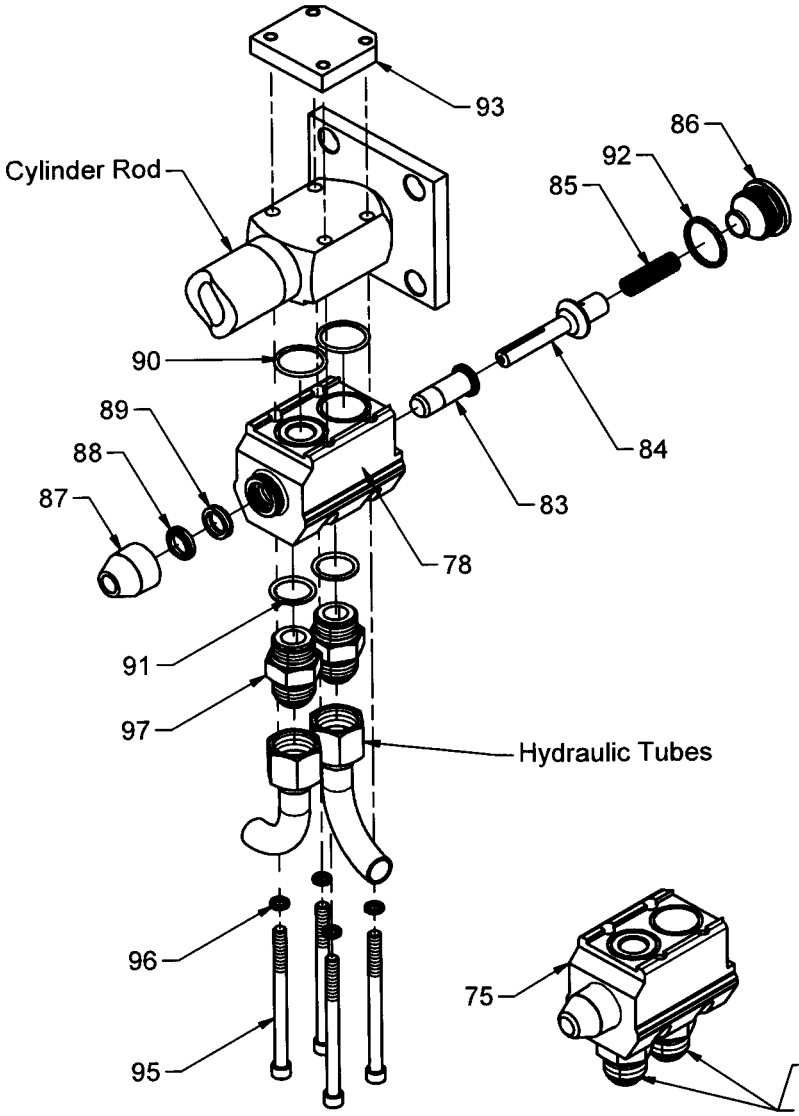


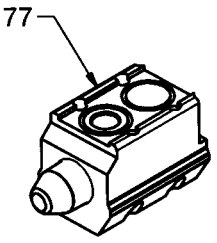


V9 KRFII-EURO, MANUAL CONTROL VALVE,10.5" CYL. CENTERS			
ID#	QUANTITY	DESCRIPTION	DX-EURO
52	1	#52 Tube	6833101
53	1	#53 Tube	6833201
54	1	#54 Tube	6836901
55	1	#55 Tube	6837001
56	1	#56 Tube	6833301
57	1	#57 Tube	6833401
58	1	#58 Tube	6756101
59	1	#59 Tube	6756201
60	1	#60 Tube	6810101
61	2	#61 Tube	6654401
62	2	#62 Tube	6832901

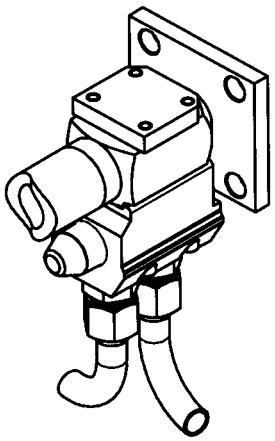


V9 KRFII-EURO, ELECTRIC CONTROL VALVE,10.5" CYL. CENTERS			
ID#	QUANTITY	DESCRIPTION	DX-EURO
E52	1	#52 ECV Tube	6832401
E53	1	#53 ECV Tube	6832501
E54	1	#54 ECV Tube	6835101
E55	1	#55 ECV Tube	6835201
E56	1	#56 ECV Tube	6832601
E57	1	#57 ECV Tube	6832701
58	1	#58 Tube	6756101
59	1	#59 Tube	6756201
E61R	2	#61 ECV Restrictor Tube	6832801
62	2	#62 Tube	6832901



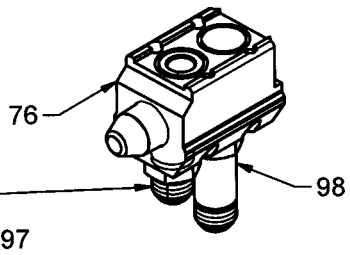


Assembled Check Valve

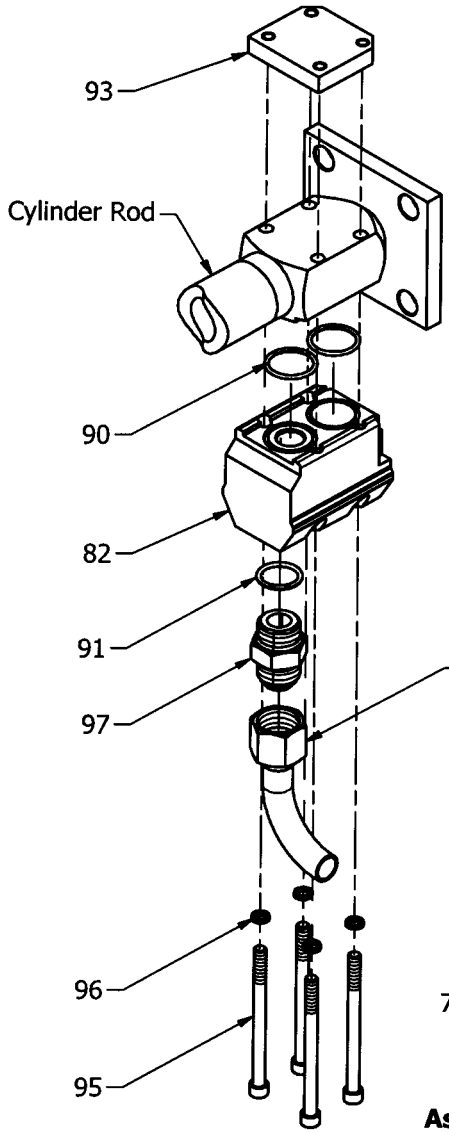


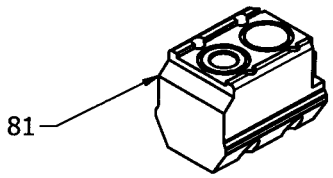
Assembled Check Valve Tubes and Clamps

Assembled Check Valve With Straight Connectors

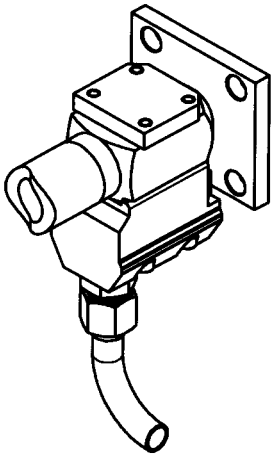


Assembled Check Valve With Long Straight Connector

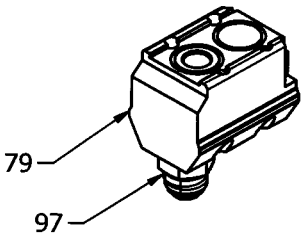




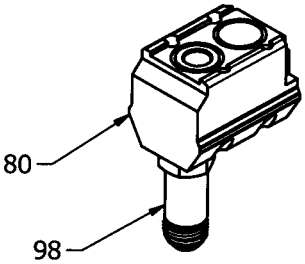
Assembled Check Valve Adaptor Block



Assembled Check Valve Adaptor Block with Tubes and Clamps

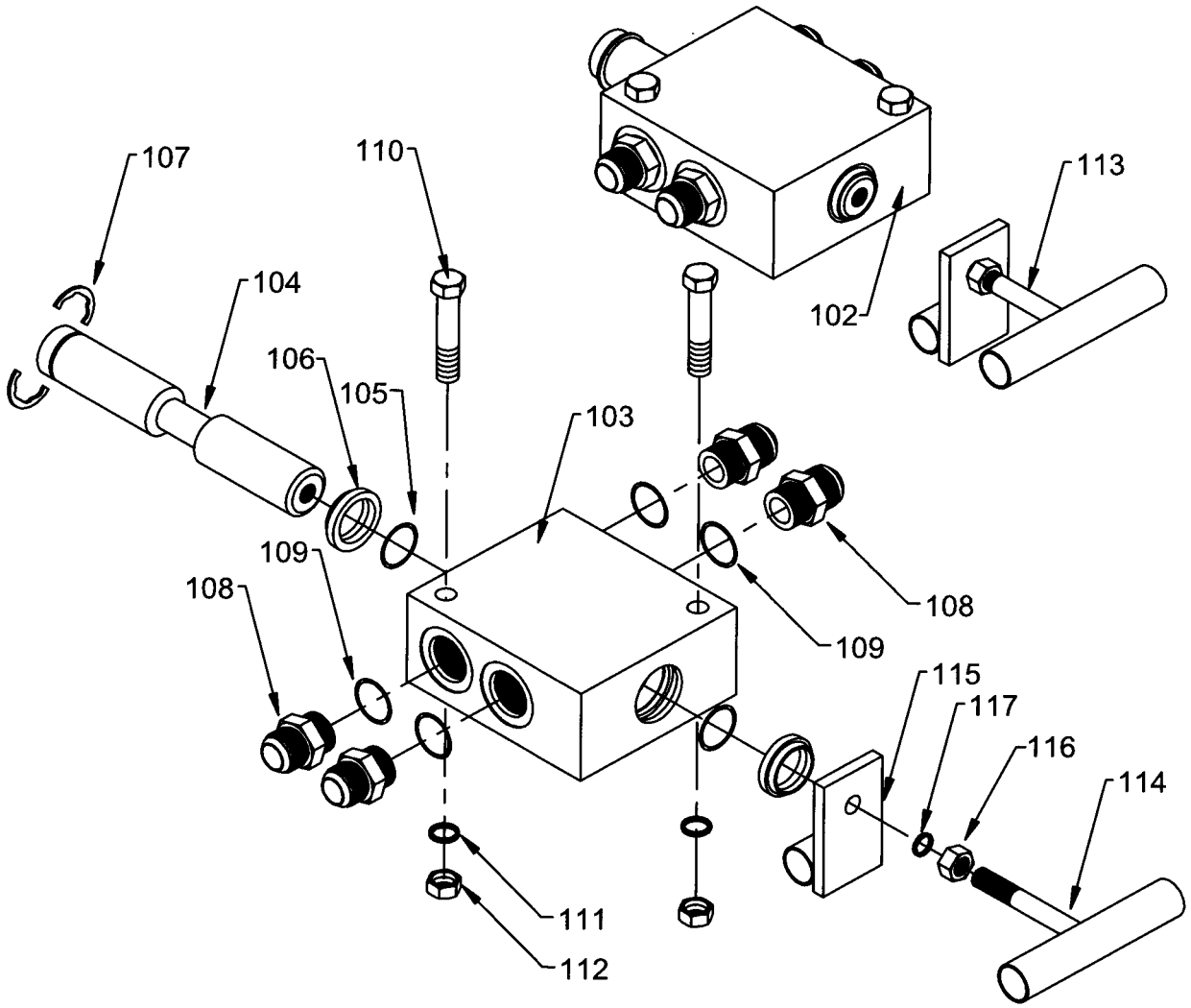


Assembled Check Valve Adaptor Block with one Straight Connector



Assembled Check Valve Adaptor Block with one Long Straight Connector

#ID	QUANTITY	DESCRIPTION	PART NUMBER
		Check Valve Assembly Parts List	
75	1	Check Valve External Assembly w/Straight Connector	6520101
-	-	Includes items 77, 97, 98	-
76	1	Check Valve External Assembly w/Long Connector	6520102
-	-	Includes items 77, 97, 98	-
77	1	Check Valve External Assembly (no connecters)	6520103
-	-	Includes Items 78, 83-92	-
78	1	Body Check Valve External	6602901
79	1	Check Valve Adaptor Block Assembly w/Straight Connector	6613501
-	-	Includes items 81, 97	-
80	1	Check Valve Adaptor Block Assembly w/Long Connector	6613502
-	-	Includes items 81, 98	-
81	1	Check Valve Adaptor Block Assembly (no connectors)	6613503
-	-	Includes items 82, 86, 90, 91, 92	-
82	1	Body Check Valve External Adaptor Block	6602901
83	1	Plunger Check Valve External	1771101
84	1	Rod Check Valve External	1766901
85	1	Spring Check Valve External Large #B-18273	84453400
-	1	Seal Kit Check Valve External	6691301
86	1	End Cap	3654501
-		Includes Items 87-92	-
87	1	Dust Boot Check Valve Externa	84801100
88	1	Plunger Wiper Check Valve External	84426800
89	1	Seal Rod 5/8" Check Valve Externa	84352200
90	2	O-Ring 122	84377800
91	2	O-Ring 912	84387400
92	1	O-Ring 916	84387800
93	1	Clamp Top Check Valve External	2513001
95	4	Bolt Socket Head 5/16 x 4-1/2" S.S.	86435014
96	4	Washer Lock 5/16"	86553000
97	1 or 2	Staight Threaded Connector W/O-Ring 912	84685000
98	1	Long St. Threaded Connector W/O-Ring 912	84685010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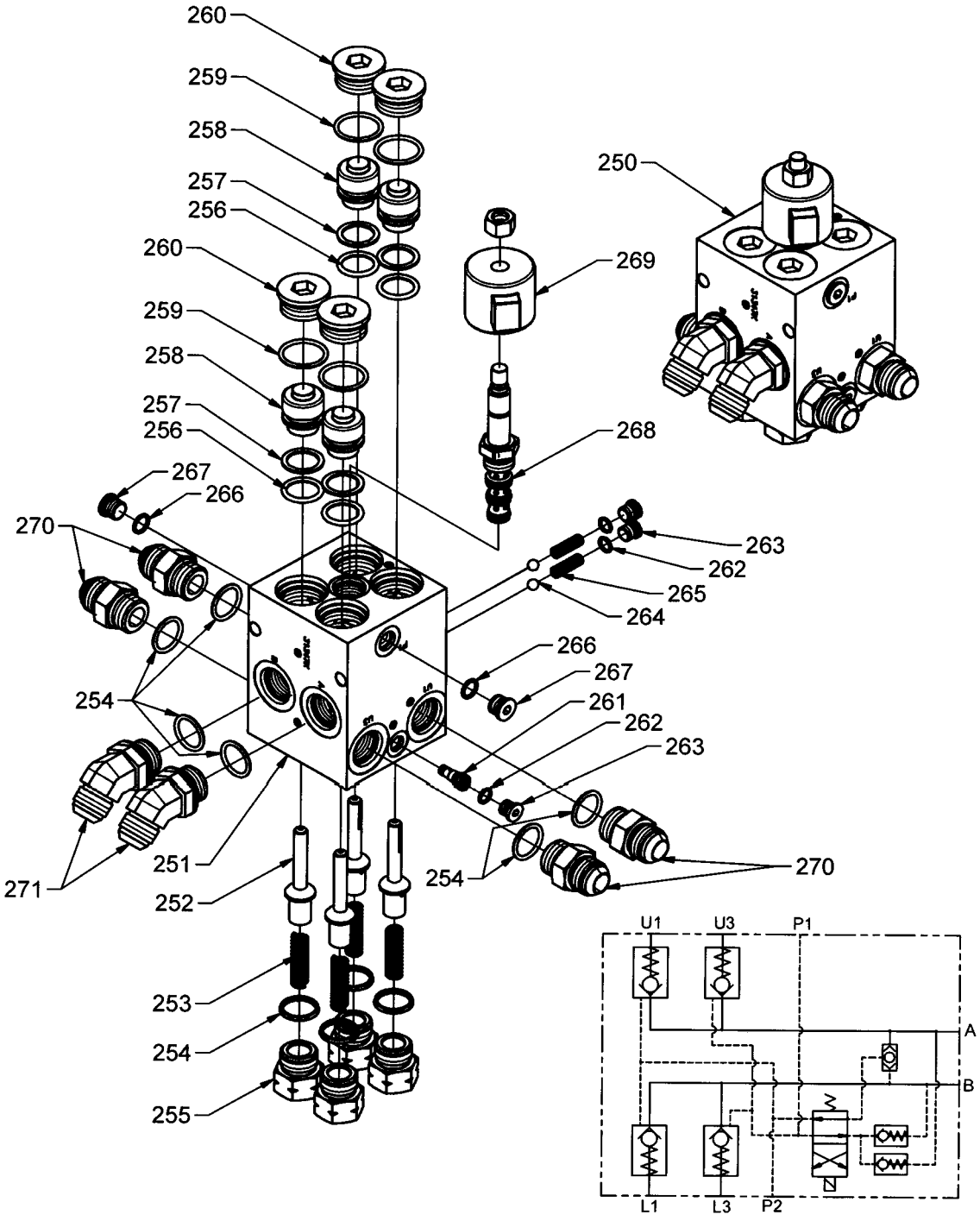
PARTS LIST

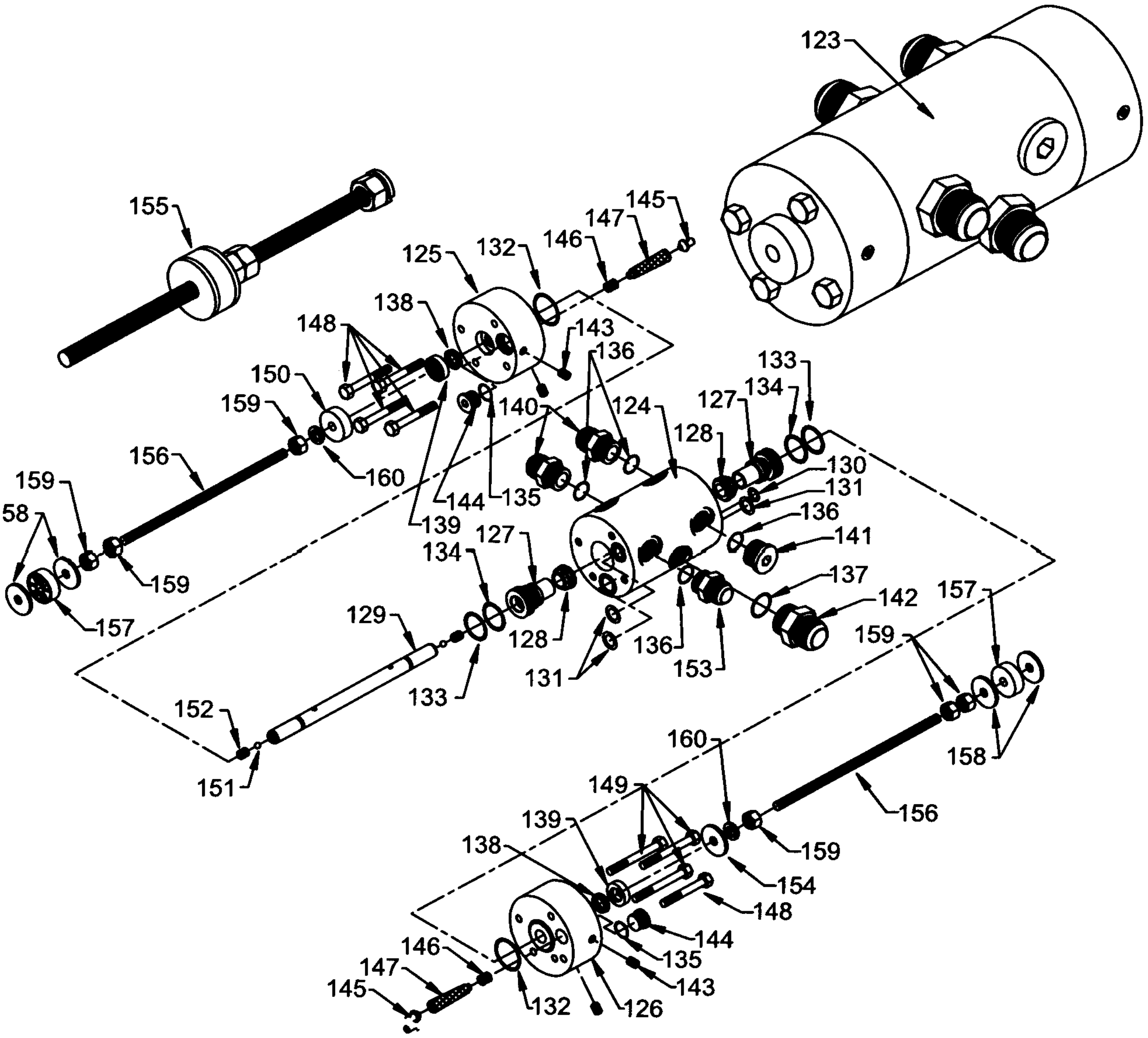
ID#	QUANTITY	DESCRIPTION	PART NUMBER
102	**1**	**Control Valve Load/Unload Assembly**	**02552701**
-	-	Includes items 103-109	-
103	1	Body Control Valve	01049501
104	1	Spool Control Valve	03423201
-	**1**	**Seal Kit Control Valve Load/Unload**	**03877901**
-	-	Includes items 105-107	-
105	2	O-Ring 214 B-70	84381800
106	2	Wiper 1" Rod	84427000
107	1	Snap Ring 2-Piece For Spool	84801000
108	4	6400-12-10 Straight	84684900
109	4	O-Ring 910	84387200
110	2	Bolt Hex GR5 3/8"x3"	86442000
111	2	Washer Lock 3/8"	86555000
112	2	Nut Hex 3/8"	86628500
113	**1**	**Handle Assembly Control Valve Load/Unload**	**02552601**
-	-	Includes items 114-117	-
114(1)	1	"T" Handle	-
115(1)	1	"T" Handle Plate	-
116	1	Nut Hex 3/8"	86628500
117	1	Washer Lock 3/8"	86555000

(1) Not sold separately. Included only with Control Valve Assembly.

Electric Load/Unload Control Valve



#ID	QUANTITY	DESCRIPTION	PART NUMBER
		ELECTRIC LOAD/UNLOAD CONTROL VALVE PARTS LIST	
250	1	Electric Load/Unload Control Valve Assembly	3244601
		Includes items 251-269	
251	1	Electric ControlValve Body	3134701
252	4	Pilot Oeperated Check Valve	3138401
253	4	Ext Check Valve Spring Large	84453400
254	10	912 O-Ring	84387400
255	4	-12 Pilot Operated Spring End Cap	3860201
256	4	8-213 O-Ring	84391200
257	4	213 O-Ring	84381200
258	4	Plunger Pilot Operated Check Valve	3123601
259	4	916 O-Ring	84387800
260	4	6409-16 MSAE O-Ring Socket Plug	84687900
261	1	Shuttle Valve LS04-B-30-0-N	85104800
262	3	904 O-Ring	84386600
263	3	6409-04 MSAE O-Ring Socket Plug	84687400
264	2	5/16" Chrome Steel Ball	84800500
265	2	I-9 Spring	84450800
266	2	906 O-Ring	84386800
267	2	6409-06 MSAE O-Ring Socket Plug	84687400
268	1	SV-10-40M-12DG Solenoid Valve	85108600
269	1	Coil 115 Dac Din 6366115	85600650
270	4	6400-12-12 MSAE-MJIC Straight Connector	84685000
271	2	6802-12-12 MSAE-MJIC 45 Deg Elbow	84691975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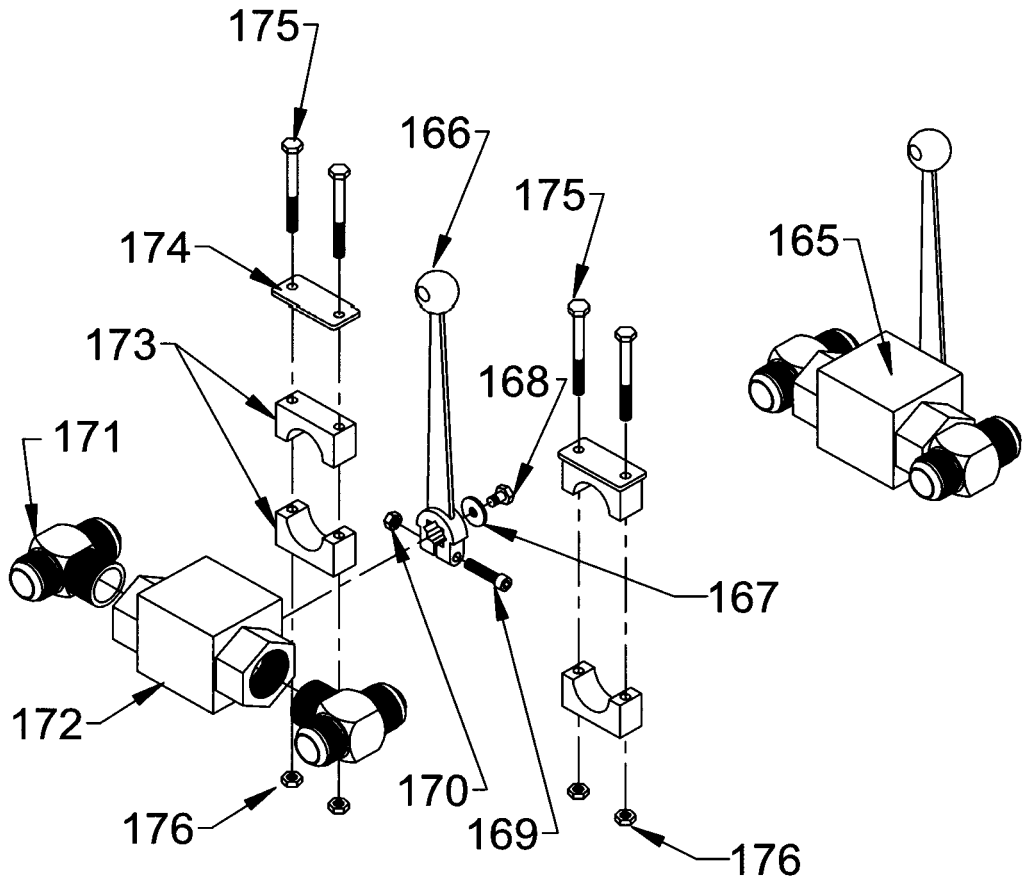
PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
123(1)	**1**	**Switching Valve Assembly SAE**	**03888901**
-	-	Includes Items 124-154	-
124(1)	1	Body Switching Valve	04504601
125(1)	1	End Cap Right Switching Valve	04504701
126(1)	1	End Cap Left Switching Valve	04504801
127	2	Poppet Switching Valve	03718901
128	2	Ring Poppet Switching Valve	03718801
129	1	Rod Control Switching Valve	01335501
-(2)	**1**	**Seal Kit Switching Valve**	**03878001**
-	-	Includes items 130-139	-
130	1	O-Ring 111	84376200
131	3	O-Ring 117 Urethane	84377200
132	2	O-Ring 126	84378200
133	2	O-Ring 216	84382200
134	2	O-Ring Backup 8-216	84391600
135	2	O-Ring 908	84387000
136	4	O-Ring 912	84387400
137	1	O-Ring 916	84387800
138	2	Seal Rod 5/8"	84352200
139	2	Wiper Canned 5/8" Rod	84427200
-(3)	3	O-Ring 011	84375200
-(3)	1	O-Ring 114	84376700
-(3)	2	O-Ring 124	84378000
-(3)	1	1/2" Pipe Plug Socket 7/8" Taper	84680790
140	2	6400-12-12 Straight	84685000
141	1	6409-12 M O-Ring Socket Plug	84687700
142	1	6400-16-16 Straight	84685400
143	4	1/8" Pipe Plug Socket 7/8" Taper	84680780
144	2	6409-08 M O-Ring Socket Plug	84687500
145	2	Pilot Filter Seat	04502701
146	2	Spring S157	84451750
147	2	Filter Element CF0563-46	84012700
148	5	Bolt Hex GR5 3/8"x2 1/2"	86441000
149	3	Bolt Hex GR5 3/8"x3"	86442000
150	1	Cap Limit Switching Valve	02552101
151	2	Ball 5/16" Chrome Steel	84800500
152	2	Set Screw 3/8"x3/8" Half Dog	86435500
153	1	6400-16-12 Straight	84685300
154	1	Washer Large OD 3/8"	86553500
155	**2**	**Rod Threaded Assembly Switching Valve**	**03869701**
-	-	Includes Items 156-160	-
156	1	Threaded Rod 3/8"x18"	86603000
157	1	Switching Valve Grommet	83217500
158	2	Washer Large OD 3/8"	86553500
159	3	Nut Hex 3/8"	86628500
160	1	Washer Lock 3/8"	86555000

(1) Part numbers vary for Switching Valves made before 1998.
(2) The Switching Valve Seal Kit contains all necessary components to rebuild all Switching Valve models.
(3) Not Shown. For use with previous model Switching Valve.

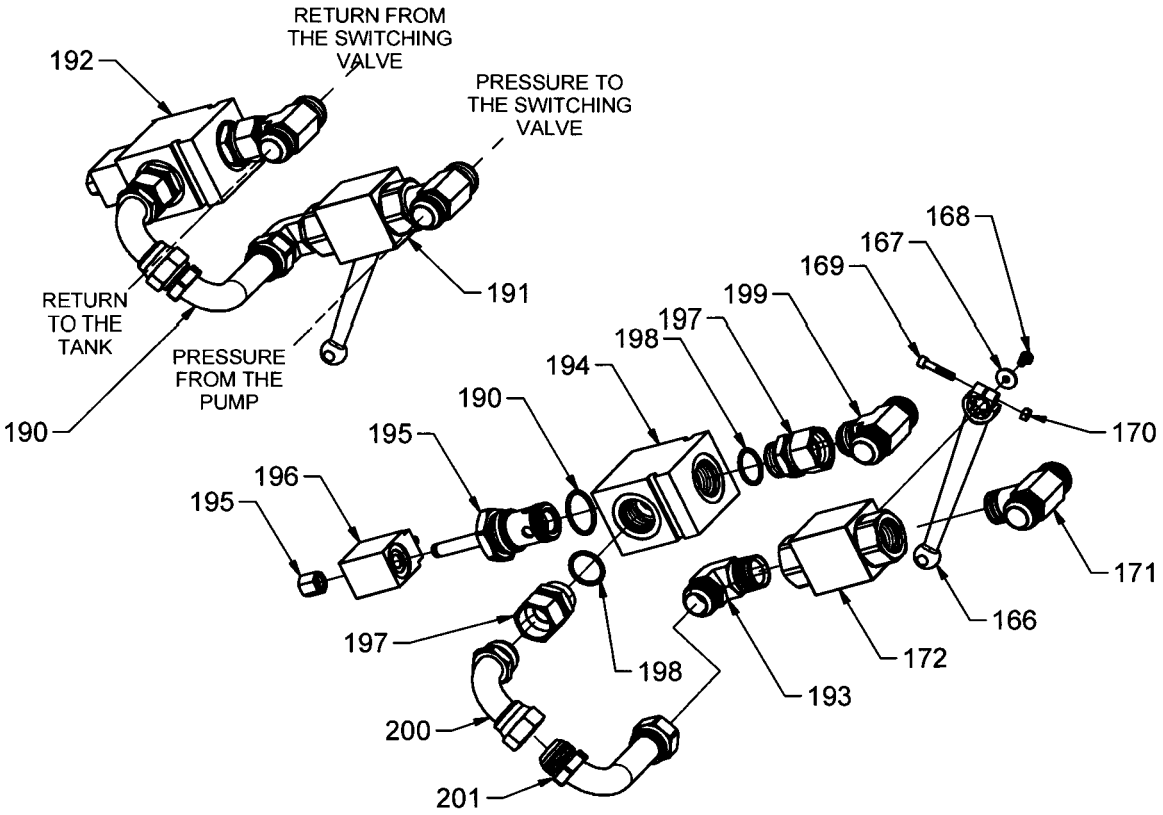


PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
165	**1**	**Ball Valve 1" W/ Tees & Handle**	**84802600**
-	-	Includes items 166-172	-
166	1	Handle Ball Valve	84802900
167	1	Washer Flat 6mm	w/ball valve
168	1	Bolt Hex GR8 6mmx1mmx10mm	w/ball valve
169	1	Bolt Socket Head GR8 6mmx1mmx30mm	w/handle
170	1	Nut Hex 6mmx1mm	w/handle
171	2	2601-16-16-16 Tee	84677880
172	1	Ball Valve Assembly 1"	84802800
-	**2**	**Clamp Hydraulic Tube 1" Kit**	**04631101**
-	-	Includes items 173-176	-
173(1)	1	Clamp Hydraulic Tube 1" Set	84750300
174	1	Plate Clamp Tube Top COP-3	84751200
175	2	Bolt Hex GR5 1/4"x2 1/4"	86419500
176	2	Nut Hex Nylock 1/4"	86626000

(1) 1 set includes 2 clamp halves.

ELECTRIC ON/OFF BALL VALVE ASSEMBLY

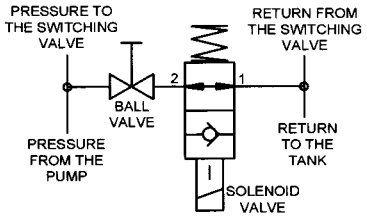


INSTALLATION

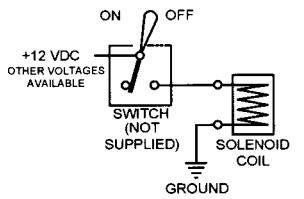
REMOVE THE EXISTING BALL VALVE. THE BALL VALVE IS MOUNTED ON THE FRONT OF THE DRIVE FRAME ON THE DRIVERS SIDE. THE BALL VALVE IS MOUNTED BETWEEN THE PRESSURE AND RETURN LINES.
INSTALL THE ELECTRICAL ON/OFF CONTROL ASSEMBLY.
CONNECT THE PRESSURE AND RETURN LINES AS SHOWN.
SUPPLY ELECTICAL POWER TO THE SOLINOID. INSTALL A SWITCH IN THE ELECTRICAL SUPPLY COIL. RUN THE WIRING IN WATER-TIGHT FLEX CONDUIT.

OPERATION

SHIFT THE BALL VALVE HANDLE TO THE OPEN POSITION.
SET THE ELECTRICAL SWITCH TO THE OFF POSITION.
ENGAGE THE PTO TO START THE HYDRAULIC PUMP.
SWITCH THE ELECTRICAL SWITCH TO THE ON POSITION TO START THE WALKING FLOOR.
THE SOLENOID COIL MUST BE ENERGIZED FOR THE WALKING FLOOR TO RUN.
TO START OR STOP THE FLOOR AT THE DRIVE USING THE BALL VALVE.
- SET ELECTICAL SWITCH TO THE OFF POSITION.
- CLOSE THE BALL VALVE TO START THE WALKING FLOOR. OPEN THE BALL VALVE TO STOP THE WALKING FLOOR.

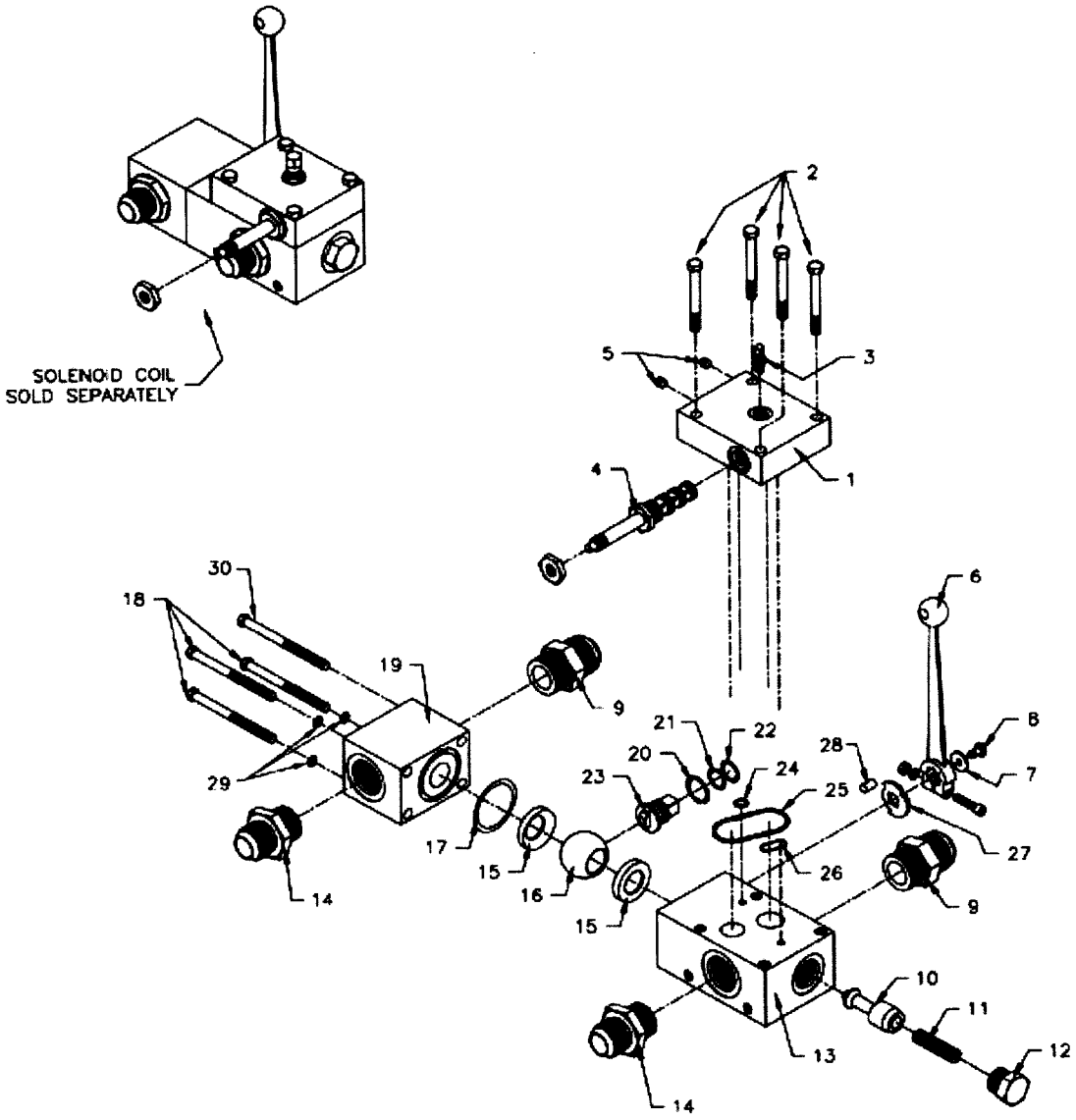


HYDRAULIC SCHEMATIC



WIRING DIAGRAM

#ID	QUANTITY	DESCRIPTION	PART NUMBER
		ELECTRIC ON/OFF BALL VALVE PARTS LIST	
166	1	Handle Ball Valve	84802900
167	1	Washer Flat 6mm	w/ball valve
168	1	Bolt Hex GR8 6mm x 1mm x 10mm	w/ball valve
169	1	Blot Socket Head GR8 6mmx1mmx30mm	w/handle
170	1	Nut Hex 6mm x 1mm	w/handle
171	1	2601-16-16-16 Tee	84677880
172	1	Ball Valve Assembly 1"	84802800
190	1	Electric On/Off Ball Valve Assembly	3426601
		Includes items 191 & 192	
191	1	Manual On/Off Ball Valve Assembly	84802601
		Includes items 166 - 172 & 193	
192	1	Electric Soleniod Valve Assembly	85108200
		Includes items 194 - 196	
193	1	2501-16-16 Male Elbow	84677400
194	1	Body Valve 20822 566409 2-Way	85101600
195	1	Valve Cartridge SV3-20-0-0-00	85108120
196	1	Coil, 12 VDC w/Lead Wire MC 30545	85600300
197	1	6402-16-16 Swivel St. Thread Connector	84686200
198	2	916 Buna-90 O-Ring	84387800
199	1	2603-16-16-16 Union Tee	84678100
200	1	63UA-16-16 Bent Stem 90 Deg.	84683200
201	1	63UC-16-16 Long Bent Stem 90 Deg.	84683700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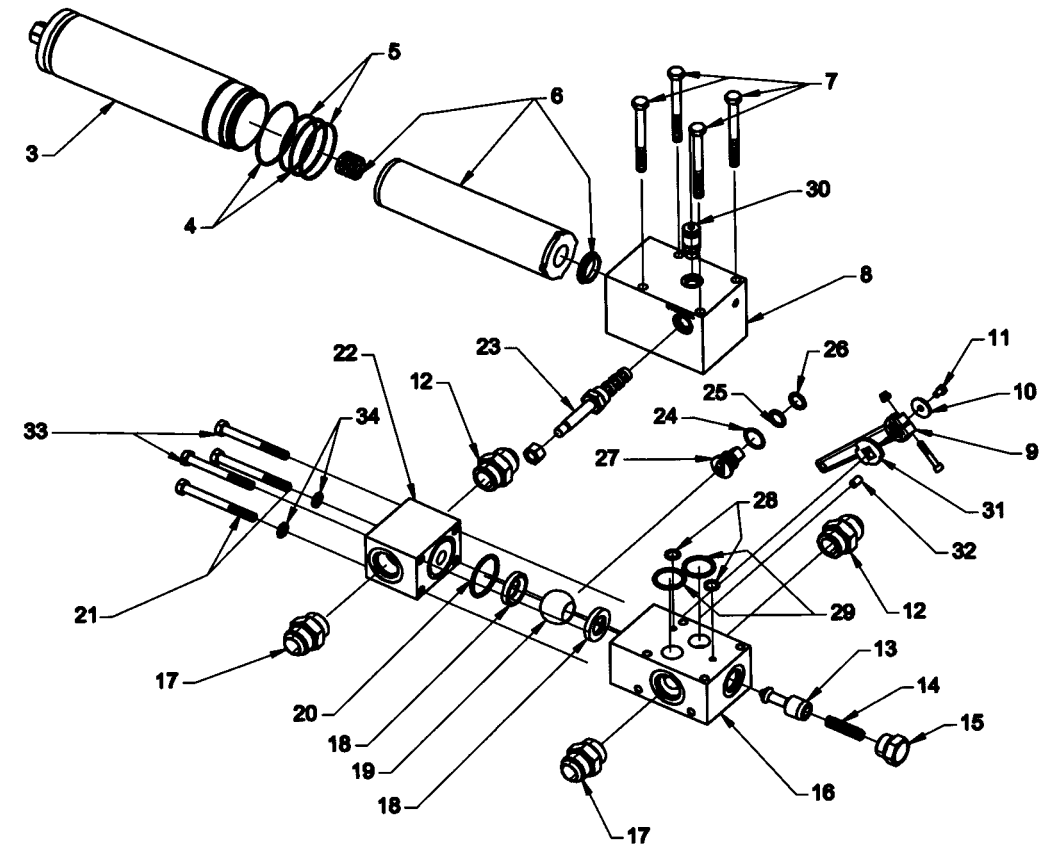
Electric/Manual ON/OFF Ball Valve			
ID #	**QUANTITY**	**DESCRIPTION**	**PART NUMBER**
	1	**Ball Valve Assembly Pilot Operated/Manual**	**06525902**
		Includes items 1-30	
1	1	Electric Cover Plate On/Off Ball Valve	04795702
2	4	Bolt Hex M10x1.5x50mm	87008530
3	1	Test Coupling SMK20-G1/4VC	84904000
4	1	Solenoid Cartridge Valve SV10-40	85108800
5	2	1-16" NPT Pipe Plug Socket 7/8" Taper	84680770
6	1	Handle Ball Valve	0647501
7	1	Washer Flat M6	87075400
8	1	Bolt Hex M6x1x10mm GR8	87002450
9	2	2404-16-16 BSPP Straight	84671400
10	1	Poppet On/Off	04438401
11	1	Spring Check Valve External Large #B-18273	84453400
12	1	6408-12 O-Ring Plug	84686900
13	1	Valve Housing	04436602
14	2	6400-16-16 Straight	84685400
15	2	Ball Valve Seal Bushing	04337301
16	1	Ball Valve Ball	04337101
17	1	O-Ring 225	84383800
18	4	Bolt Hex M10x1.5x100mm	87011000
19	1	Non-Valve Housing	04437902
20	1	Spud Wear Washer	04337601
21	1	O-Ring 208	84379600
22	1	O-Ring Backup 8-208	84390200
23	1	Spud Shaft	04438101
24	1	O-Ring 112	84376300
25	1	O-Ring Backup 8-228	84384000
26	1	O-Ring 216	84382200
27	1	Spud Stop	84802910
28	1	Dowel Pin 5/16"x1/2"	86651500
29	3	Washer Lock M10	87076500
30	1	Bolt Hex M10x1.5x90mm	87010500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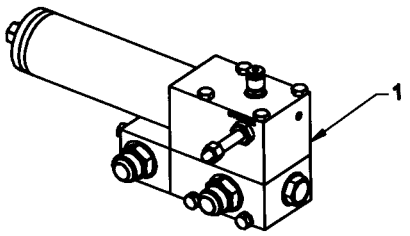
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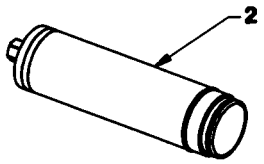
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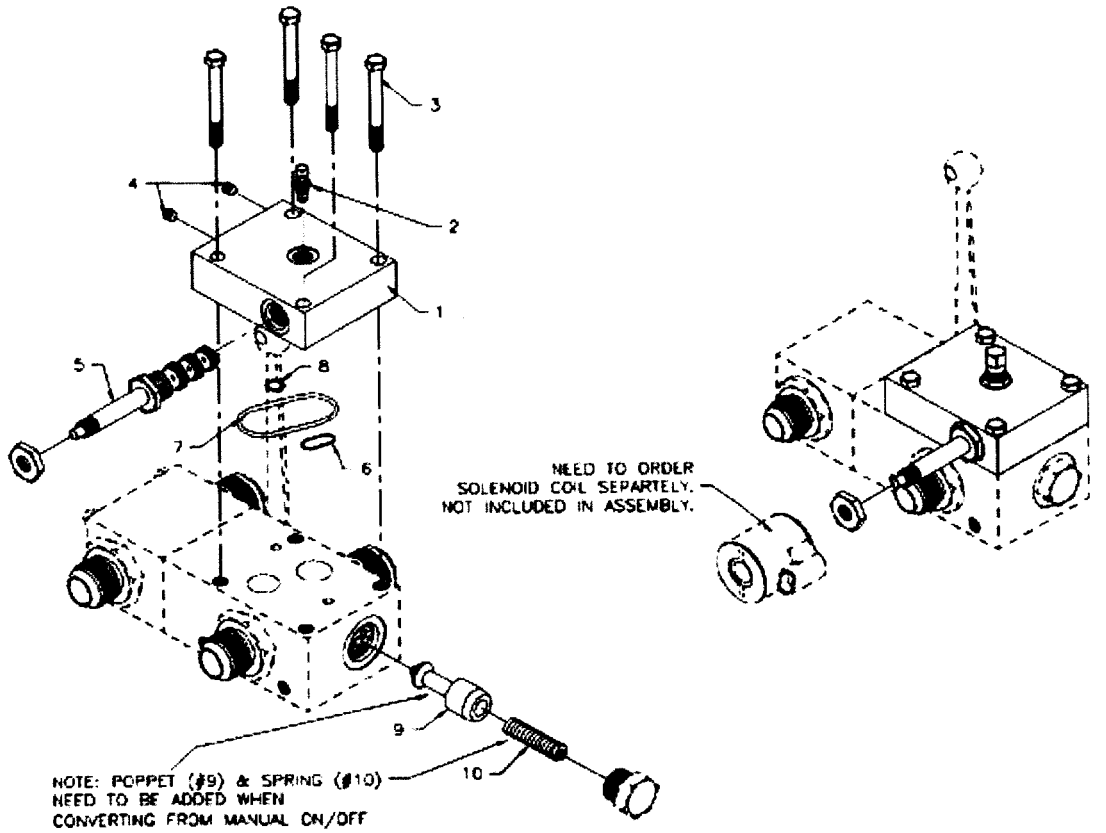
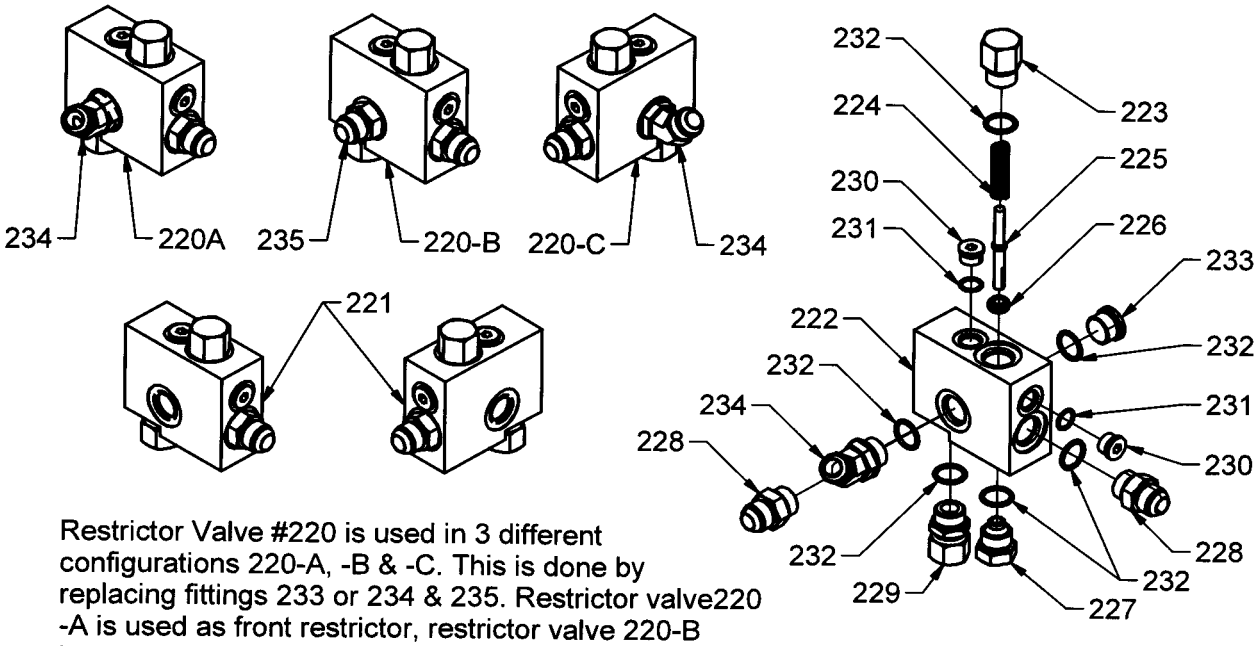
Electric/Manual ON/OFF Ball Valve with Fairley Arlon Filter			
ID#	**QUANTITY**	**DESCRIPTION**	**PART NUMBER**
1	1	**Pilot Operated/Manual Ball Valve**	06513102
		Includes items 2, 6-34	
2	1	**Welded Filter Canister Assembly**	06151502
		Includes items 3-5	
3	1	Welded Filter Canister	06151501
4	2	O-Ring 147	84378447
5	2	O-Ring Backup 8-147	84389047
6	1	Filter Element Fairley Arlon #MXW2-GDL20	84006520
7	4	Bolt Hex M10x1.5x110mm	87011500
8	1	Filter Block Fairley Arlon	04436501
9	1	Handle Ball Valve	06457402
10	1	Washer Flat M6	87075400
11	1	Bolt Hex M6x1x10mm	87002450
12	2	2404-16-16 BSPP Straight	84671400
13	1	Poppet On/Off	04438401
14	1	Spring Check Valve External Large #B-18273	84453400
15	1	6408-12 O-Ring Plug	84686900
16	1	Valve Housing	04436602
17	2	6400-16-16 Straight	84685400
18	2	Ball Valve Seal Bushing	04337301
19	1	Ball Valve Ball	04337101
20	1	O-Ring 225	84383800
21	2	Bolt Hex M10x1.5x100mm	87011000
22	1	Non-Valve Housing	04437902
23	1	Solenoid Cartridge Vlave SV10-40	85108800
24	1	Spud Wear Washer	04337601
25	1	O-Ring 208	84379600
26	1	O-Ring Backup 8-208	84390200
27	1	Spud Shaft	04438101
28	2	O-Ring 112	84376300
29	2	O-Ring 218	84382800
30	1	Test Coupling SMK20-G1/4VC	84904000
31	1	Spud Stop	84802910
32	1	Dowel Pin 5/16"x1/2"	86651500
33	2	Bolt Hex M10x1.5x90mm	87010500
34	2	Washer Lock M10	87076500



Electric/Manual On/Off Ball Valve Conversion Kit			
ID #	**QUANTITY**	**DESCRIPTION**	**PART NUMBER**
	1	**Conversion Kit On/Off Electric**	**04839502**
		Includes items 1-10	
1	1	Electric Cover Plate On/Off Ball Valve	04795702
2	1	Test Coupling SMK20-G1/4VC	84904000
3	4	Bolt Hex M10x1.5x50mm	87008530
4	2	1-16" NPT Pipe Plug Socket 7/8" Taper	84680770
5	1	Solenoid Cartridge Valve SV10-40	85108800
6	1	O-Ring 216	84382200
7	1	O-Ring 228	84384000
8	1	O-Ring 112	84376300
9	1	Poppet On/Off	04438401
10	1	Spring #B-18273	84453400

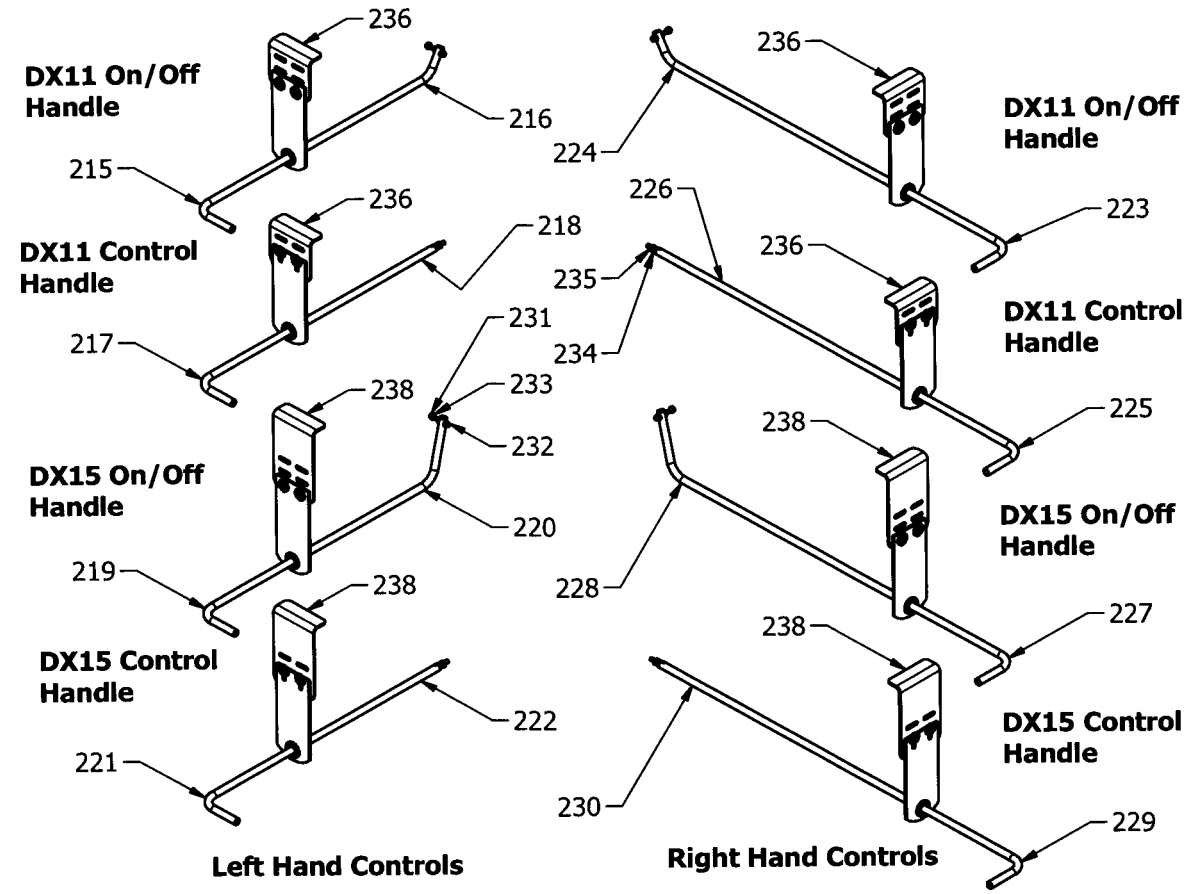
Restrictor Valve Assembly

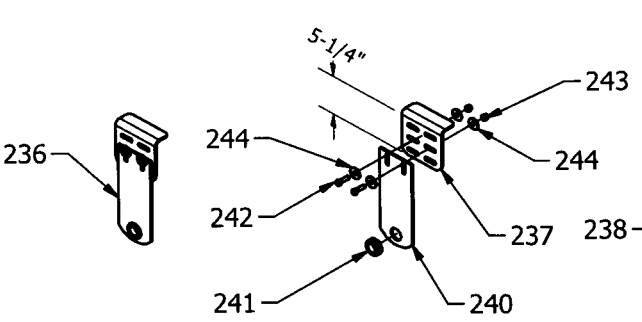


Restrictor Valve #220 is used in 3 different configurations 220-A, -B & -C. This is done by replacing fittings 233 or 234 & 235. Restrictor valve220 -A is used as front restrictor, restrictor valve 220-B is used as front restrictor on right hand DX-11 and restrictor valve 185-C is used as rear restrictor.

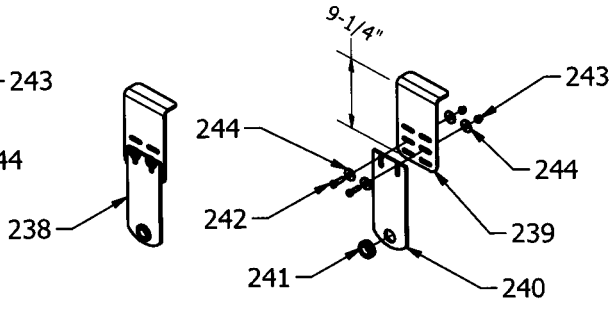
#ID	QUANTITY	DESCRIPTION	PART NUMBER
		Restrictor Valve Parts List	
220	1	Restrictor Valve Assembly with Fittings	6549901
-	-	Includes items 256 - 269	-
221	1	Restrictor Valve Assembly without Fittings	6549902
-	-	Includes items 257 - 266	-
222	1	Restrictor Valve Body	6549601
223	1	Restictor Rod End Cap Spring End	3349001
224	1	Spring Danly Yellow	84455400
225	1	Restrictor Rod	3348901
226	1	Restrictor Valve	1951901
227	1	Restrictor Rod End Cap Small End	3349101
228	1	6400-12-12 Straight Connector	84685000
229	1	6402-12-12 Swivel Straight Thread	84686100
230	2	6408-H-8 Hollow Hex Plug	84687500
231	2	908 O-Ring	84387000
232	6	912 O-Ring	84387400
233	1	6408-H-12 Hollow Hex Plug	84687700
234	1	6802-12-12 45° Straight Thread Elbow	84691950
235	1	6400-12-12 Straight Connector	84685000

SAE On/Off Ball Valve & Control Valve Handle Assemblies for DX11 & DX15





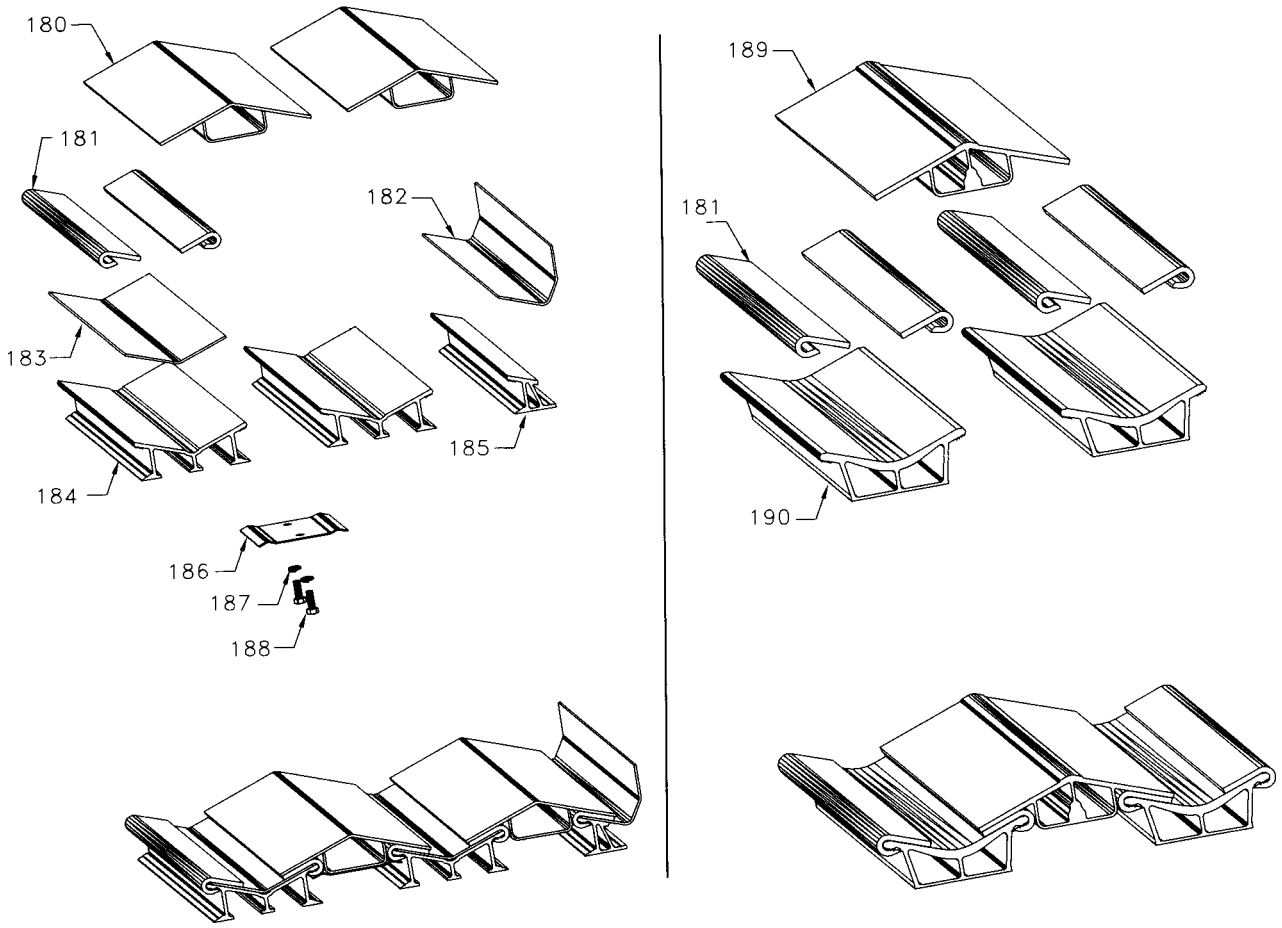
DX11 HANDLE SUPPORT ASSEMBLY



DX15 HANDLE SUPPORT ASSEMBLY

SAE ON/OFF BALL VALVE & CONTROL VALVE HANDLE ASSEMBLIES FOR DX11 & DX15 V-FLOOR® DX

#ID	QUANTITY	DESCRIPTION	PART NUMBER
		ON/OFF BALL VALVE & CONTROL VALVE HANDLE ASSEMBLIES, DX11 & DX15	
215	1	DX11 On/Off Ball Valve Handle Assembly	6625501
216	1	DX11 On/Off Ball Valve Handle	6625101
-	-	Includes items 231-233 & 236	-
217	1	DX11 Control Valve Handle Assembly	6627301
218	1	DX Control Valve Handle	6714801
-	-	Includes items 234, 235 & 236	-
219	1	DX15 On/Off Ball Valve Handle Assembly	6698601
220	1	DX15 On/Off Valve Handle	6698801
-	-	Includes items 231-233 & 238	-
221	1	DX15 Control Valve Handle Assembly	6698701
222	1	DX Control Valve Handle	6714801
-	-	Includes items 234, 235 & 238	-
223	1	DX11 On/Off Ball Valve Handle Assembly Right Hand	6712901
224	1	DX11 On/Off Valve Handle	6713001
-	-	Include items 231-233 & 236	-
225	1	DX11 Control Valve Handle Assembly Right Hand	6712501
226	1	DX Control Valve Handle	6747601
-	-	Includes items 234, 235 & 236	-
227	1	DX15 On/Off Ball Valve Handle Assembly Right Hand	6713101
228	1	DX15 On/Off Valve Handle	6713201
-	-	Includes items 231-233 & 238	-
229	1	DX15 Control Valve Handle Assembly Right Hand	6712701
230	1	DX Control Valve Handle	6747601
-	-	Includes items 234, 235 & 238	-
231	1	Bolt Hex GR5 5/16" x 1-3/4"	86439500
232	1	Nut Hex Nylock 5/16"	86627500
233	3	Washer Flat 5/16"	86552500
234	1	Nut Hex 3/8"	86628500
235	1	Washer Lock 3/8"	86555000
236	1	DX11 Handle Support Assembly	6627101
237	1	DX11 Angle Mount Plate	6625401
-	-	Includes items 240-244	-
238	1	DX15 Handle Support Assembly	6747801
239		DX15 Angle Mount Plate	6698501
-	-	Includes items 240-244	-
240	1	On/Off & Control Valve Handle Mount Plate	3690401
241	1	Groumet Handle Support	83218400
242	2	Bolt Hex GR5 3/8" x 1-1/4"	86428500
243	2	Nut Hex Nylock 3/8"	86628000
244	4	Washer Flat 3/8"	86554000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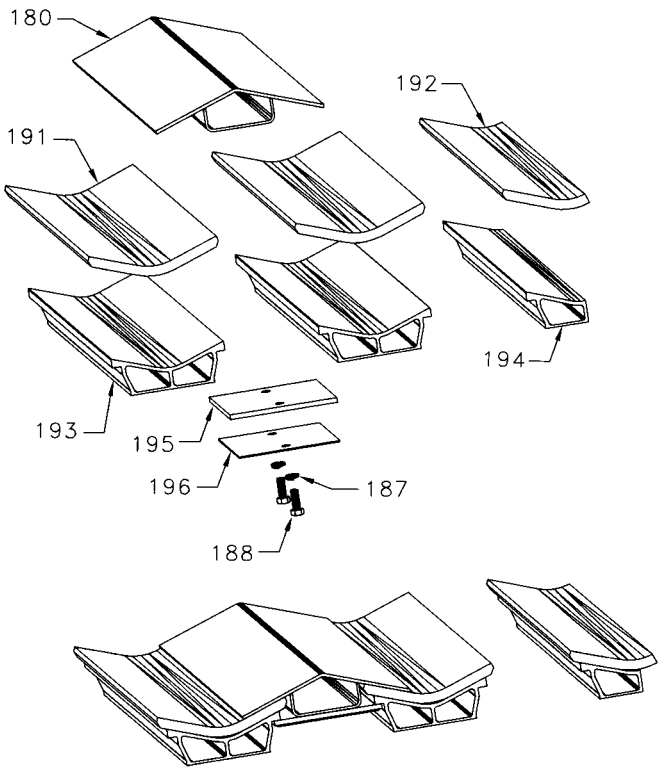
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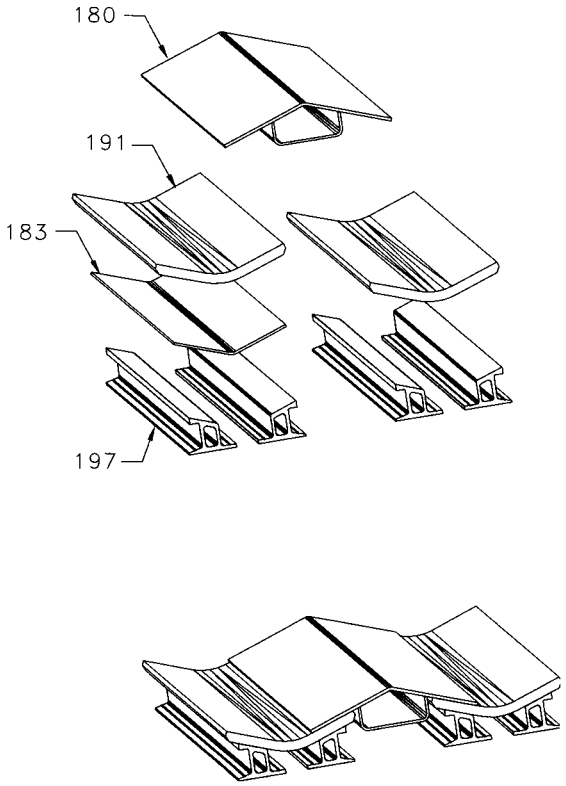
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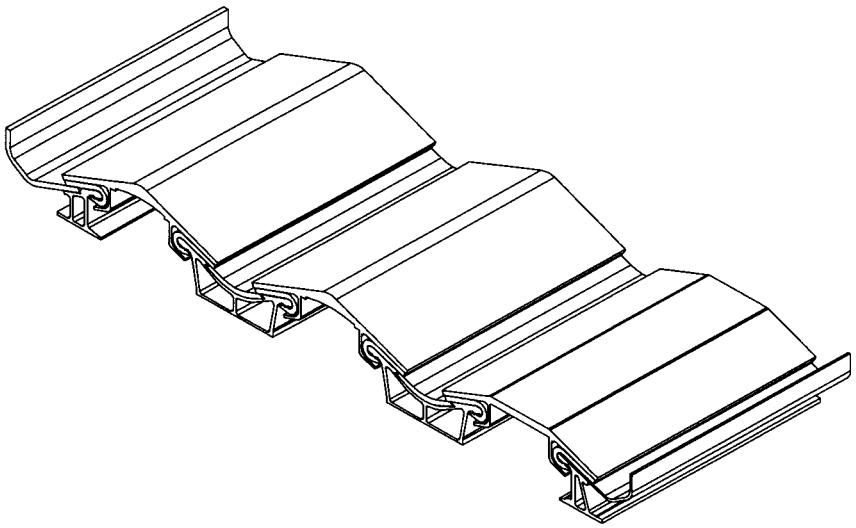
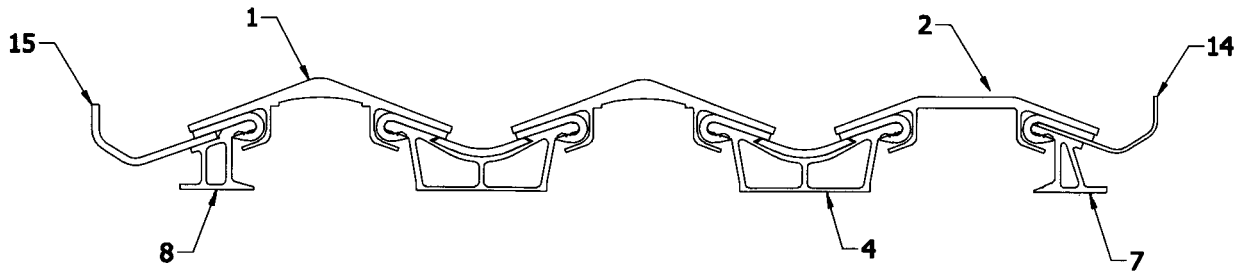
PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
180*	9	5/32" Steel V-Floor® Slat	02448
180*	9	1/8" Steel V-Floor® Slat	02459
181*	18	J-Bearing Extended	832493
182*	-	Side Seal (12 ft Sections)	05084601
183*	8	1/8" Bottom V-Pan	02460**
184*	8	Bolt Down Sub-Deck	02491**
185*	2	Side Seal Sub-Deck	02492**
186	-	Hold Down Plate	05045501
187	-	3/8" Lock Washer	86555000
188	-	3/8" x 1" HCS w/ Patch Lock	86437500
189	9	7/32" Aluminum V-Floor® Slat	02453**
190	8	Weld Down Sub-Deck and Pan	02490**
191	8	1/2" Quick-Silver Asphalt Bearing	02457**
192	2	1/2" Side Seal Quick-Silver Asphalt Bearing	05493001
193	8	Weld Down Sub-Deck and Pan For Asphalt Bearing	02478**
194	2	Side Seal Weld Down Sub-Deck and Pan For Asphalt Bearing	05437801
195	-	1/4" Hold Down Bearing (Quick-Silver)	05211101
196	-	Flat Hold Down	05211201
197	18	Bolt Down Sub-Deck For Asphalt Bearing	02479**

* Part numbers and descriptions vary based on drive configurations

** Last four numbers indicate length

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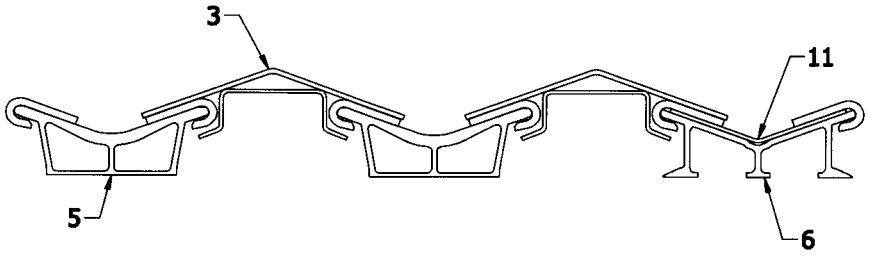
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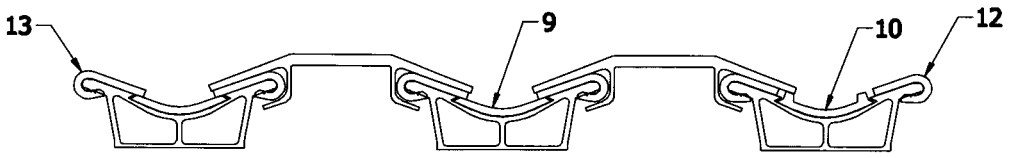
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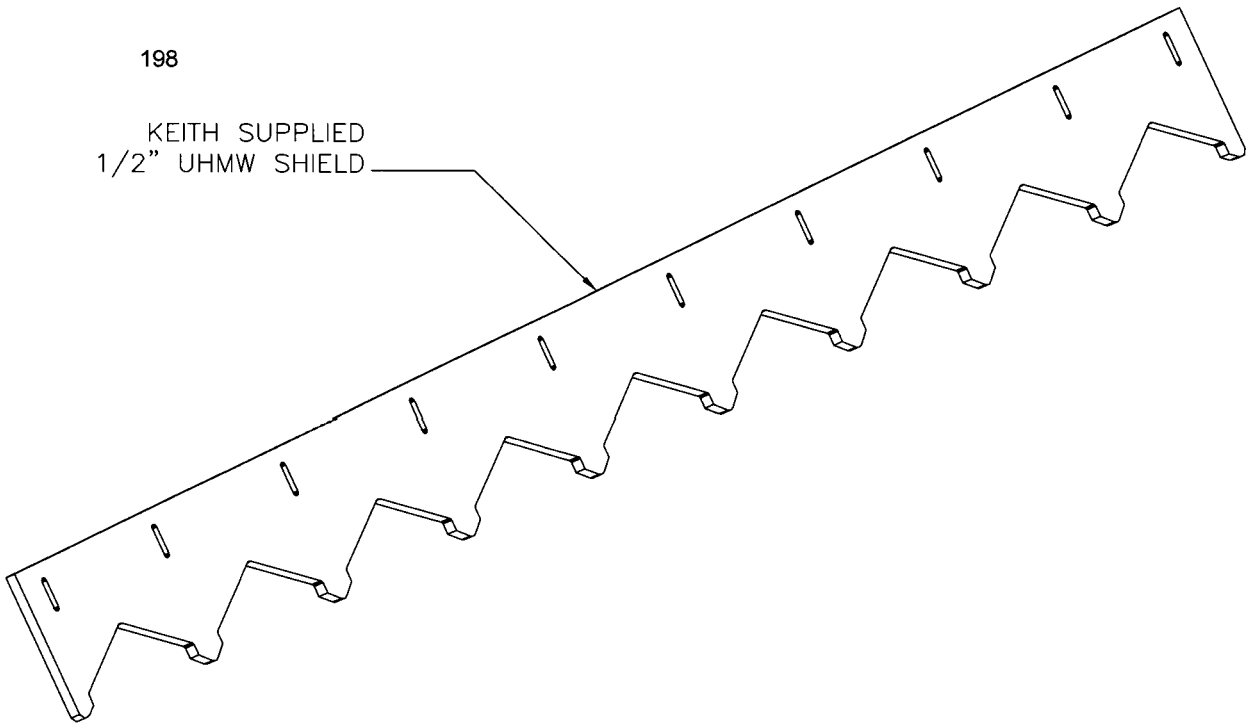
PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
1*	9	Aluminum V-Slat with Integrated Hold Down, 10.5" SC	2531**
1*	9	Aluminum V-Slat with Integrated Hold Down, 10.0" SC	2644**
2*	9	Flat Top Aluminum V-Slat with Integrated Hold Down, 10.5" SC	2631**
3*	9	Steel Integrated Slat, .157" thick, 10.5" SC	5661701
3*	9	Steel Integrated Slat, .118" thick, 10.5" SC	5661702
3*	9	Steel Integrated Slat, .157" thick, 10.0" SC	6008501
3*	9	Steel Integrated Slat, .118" thick, 10.0" SC	6008502
4*	8	Weld Down Sub-Deck with Insert Groove	2527**
5*	8	Weld Down Sub-Deck	2490**
6*	8	Bolt Down Sub-Deck	2491**
7	2	Side Seal Sub-Deck (For Steel Walls)	2492**
8	2	Side Seal Sub-Deck (For Alum Walls)	2502**
9	8	Alum Flat Sub-Deck Insert	2529**
10	8	Alum Two Ridge Sub-Deck Insert	2528**
11	8	1/8" Bottom V-Pan	2460**
12	18	Yellow UHMW J-Bearing	2446**
13	18	Orange UHMW J-Bearing	2493**
14	-	Steel Side Seal (12 ft Sections)	5408101
15	-	Alum Side Seal (10 ft Sections)	5408102

* Part numbers and descriptions vary based on drive configurations

** Last four numbers indicate length



PARTS LIST

ID#	QUANTITY	DESCRIPTION	PART NUMBER
198*	1	Keith Supplied 1/2" UHMW Shield	05408001

* Part numbers and descriptions vary based on drive configurations

Maintenance For Your New KEITH® RUNNING FLOOR II® and Hydraulic Wet Kit

1. For proper operation of your new RUNNING FLOOR II® equipped trailer and wet kit, make sure the pressure and return lines are hooked up correctly. It is important to periodically inspect hoses and connectors for damage and contamination. Clean all dirt and water from connectors before hooking up.
2. Change the hydraulic return filter element after the first six (6) hours of operation and then every six (6) months. This may vary with the operating environment.
3. During the first two (2) weeks of operation, it will be necessary to check and tighten all floor bolts. Floor bolts should be checked regularly for proper torque, in accordance with a preventive maintenance program, as loose floor bolts will cause serious damage to floor slats.
4. After the first week of operation, you must check and tighten the lower cross-drive clamps that fasten the cross-drives to the cylinder. Also check the end cylinder rod plates that fasten the cylinders to the drive frame.
5. During the first several weeks of operation, examine the check valve and tube clamps regularly to ensure that they are securely fastened.

Recommended Bolt Torque Values

Bolt Description		Torque
Bolt Hex 3/8"	Integrated Slat Shoes	45 FT-LBS
Nut Hex 5/8"	Kwik-Klamp® Shoes (See pg. 16)	180 FT-LBS
Bolt Hex 5/8" HCS	Lower cross–drive clamp bolt (Over torque may distort the barrel enough to bind the piston.)	135 FT-LBS (See Pg. 20)
Bolt Hex 5/8" HCS	Rod end plates	135 FT-LBS
Bolt Hex 5/16" HCS	Check Valve and tube clamp bolts	20 FT-LBS

Problems and Trouble-Shooting

KEITH Mfg. Co. 24-hour Fax Service (541) 475-2169
KEITH Mfg. Co. Customer Service and Support (800) 547-6161 or (541) 475-3802
Monday - Friday, 7 am to 4 pm Pacific Standard Time
Email: techdept@keithwalkingfloor.com

Before you call, please review the following:

1. See start-up check list on page 9.
   Re-checking items on this list can solve most problems.

a. Model Number
b. Serial Number
c. Number of floor slats
d. Trailer make
e. Cylinder bore size
f. Drive unit model

PLEASE FILL OUT AND RETURN IMMEDIATELY TO KEITH Mfg. Co.

The warranty registration card must be completed and on file at KEITH Mfg. Co. in order for the warranty period to begin on the purchase date. If no purchase date is registered, the beginning of the warranty will be the date of the manufacture if no other date can be determined.

Please make sure the serial number listed on the card coincides with the serial number plate on the drive unit.

Please print or type

KEITH® V-FLOOR® DX unloading System Warranty Registration Card

Purchaser		
Address		Phone
City		State/Prov.
Country		Postal Code
Original Purchase Date of System		
Model No.		
Serial No. (See page 8 for location guide)		
Installed in:	New Trailer	Used Trailer
Dealer Name & Location		
Type of Material Unloaded		

I have fully read the KEITH Mfg. Co. warranty information and I/ we fully understand and agree to the terms of the warranty.

Signature _____ Date _____

Note: To validate the warranty, this registration card must be filled out completely and returned to KEITH Mfg. Co. within ten (10) days of purchase and/or installation.

Please fax, mail or email this warranty registration information to KEITH Mfg. Co. at:

Warranty Registration
KEITH Mfg. Co.
P.O. Box 1
Madras, OR 97741-0001
Fax: (541) 475-2169
Email: techdept@keithwalkingfloor.com

CUT HERE

!!CAUTION!!

To prevent Possible Injury or Death

DO NOT:

1. Operate the floor with the doors closed.
2. Stand behind the trailer or in the discharge area when floor is operating.
3. Make adjustments to the unloading mechanism with floor operating.
4. Operate the unloader when protective covers and screens are not in place.
5. Go underneath the trailer when floor is operating.
6. Leave the trailer unattended while the unloader is in operation.

ALWAYS:

1. Disengage the trailer from the hydraulic power unit (P.T.O.) before service and maintenance.
2. Shut off the power supply before going underneath the trailer.
3. Stay away from any oil leaks when hydraulic pressure is high.
4. Shut off the hydraulic power take off unit (P.T.O.) before moving the trailer.

!!Keep your hands, body parts and loose clothing away from the floor slats and drive mechanism when the unloading system is in operation!!

WALKING FLOOR®
ONLY BY KEITH®