



SAS™ FORKS

ULTIMATE™ HYDRAULIC ADJUSTABLE OPERATOR MANUAL

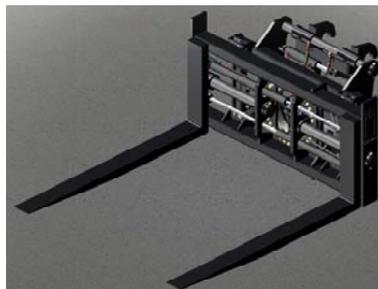




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SAS™ ULTIMATE™ HYDRAULIC ADJUSTABLE

Special Feature: Operator Controlled Recirculation Allows For Heat Distribution to Ultimate™ Hydraulic Adjustable with SAS™ FORKS **PATENT PENDING** Hydraulic System with By-Pass Why? Circulation of hydraulic fluid between the wheel loader's pump system and the forks may be desirable for providing warm fluid to forks if operating in extremely cold area, this circulation can provide an incremental heat transfer, either delivering warmer fluid or dispersing heat away from the forks, when operating in a hot environment.

How? With the forks connected to the wheel loader, being clear of all persons and property, and the wheel loader running, the operator actuates the 3rd spool yellow roller switch, without pressing any of the buttons 1, 2 or 3. A few minutes of circulation will exchange the fluid between the forks system and the machine's pump system.

**S.A.S. of Luxemburg, Ltd. 133 Center Drive Hwy 54, PO Box 260, Luxemburg, WI 54217 USA
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INTRODUCTION LETTER (PAGE 3) SAS™ HYDRAULIC ADJUSTABLE

TO THE OWNERS, MANAGERS, AND OPERATORS OF LOADERS EQUIPPED WITH SAS™ HYDRAULIC ADJUSTABLE & SAS FORKS™

Safety is the most important issue in the workplace. Observing safety guidelines, equipment capacities and using common sense will provide a work environment that is safe and efficient for employees, management and customers. It is important that you and your operators read and understand the information included in this manual prior to use of this equipment.

Safety warnings are highlighted through out this manual. Understanding the significance of these symbols is important. The following is a definition of each symbol you will encounter in this manual:



The Caution Symbol is intended to draw your attention to important safety information, hazard or precaution.



The Danger Symbol indicates a hazardous situation that if not avoided will result in serious injury or death



The Warning Symbol indicates a hazardous situation that if not avoided could result in serious injury or death



The Caution Symbol indicates a hazardous situation that if not avoided could result in minor injury or potential property damage



The Notice Symbol indicates worst credible severity of harm is property damage.

The following information presented in this Operator Manual for SAS FORKS™ is intended to be a guide only, and is not meant to encompass all issues that may need to be addressed for your particular type of business operation.

If you encounter any additional information that would be helpful to us, or others, please contact us.

Thank you for your business,

SAS Ltd.

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GENERAL SAFETY GUIDELINES (PAGE 4) SAS™ HYDRAULIC ADJUSTABLE

Operation of equipment should only be performed by qualified and trained individuals. All persons operating or working in the area of operation should read this manual and a copy of this manual should be kept with the equipment. To be considered qualified you must:

- Understand the written instructions supplied by the manufacturer of the device, the manufacturer of the wheel loader, all company rules and any applicable OSHA regulations.
- Completed training including actual operation of the device.
- Know and follow the safety rules and regulations of the jobsite.

WARNING

Operation of equipment by un-qualified or un-trained individuals can result in serious injury or death. Verify all operators have received proper training on operation of this equipment.

WARNING

Not designed to be operated in an explosive environment. Only use this equipment in well ventilated areas, a sufficient distance away from flammable or explosive gases, liquids or other hazards to avoid risk of ignition. Operating this equipment in an explosive environment may cause an explosion and fire resulting in injury, death, and substantial property damage.

WARNING

Operation of equipment under the influence of illegal, prescribed or over the counter drugs can result in potential injury or property damage. Consult your physician before operation of this equipment while on medication.

WARNING

Inspect the device and perform all preventative maintenance before operation at the start of every shift. Failure to perform inspections or proper maintenance can result in equipment failure resulting in serious injury or property damage.

WARNING

Read operators manual and follow all safety procedures for the equipment this device is attached to. Failure to follow Manufacturers recommendations can result in serious injury and property damage.

DANGER

This equipment is operated by high pressure hydraulics. Hydraulics are a stored power source and as such must be treated as energized at all times. Be certain pressure has been relieved prior to handling, inspecting or performing maintenance on this unit. Follow lockout tag out procedures and release all stored energy before servicing equipment. Failure to release energy or disable hydraulic energy can result in serious injury or death. High pressure fluids can also discharge at great velocity. Wear safety glasses while inspecting, operating and maintaining equipment.

DANGER

This equipment has numerous moving components. Do not wear loose fitting clothing, rings, jewelry or other items that may become entangled in the device. Be aware of resulting pinch points and keep clear during operation, inspection and maintenance. Pinch points exist between the puller and vehicle, puller and wheel loader, failure to keep clear while in operation can result in serious injury or death.

DANGER

Do not exceed posted weight limits on equipment or loader. Exceeding rated load limits will result in equipment damage, loss of steering control, serious injury or death.

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GENERAL SAFETY GUIDELINES (PAGE 5)

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PROTECTIVE EQUIPMENT & CLEAR OPERATING SPACE RECOMMENDED



- Safety glasses with side shields
- Leather gloves
- Hard hat
- Fire extinguishing equipment
- Spill kit (oil dry, absorbent towels, etc. as required by your company)
- Other such safety equipment to protect personnel from injury.
- Clear operating space: All personnel should be at least 30 feet away from operating loader and Hydraulic Adjustable.



Do not work under the fork or any object lifted by this equipment. An unexpected movement, shift in the object, or hydraulic failure may cause the forks and object drop. Serious injury or death may occur.



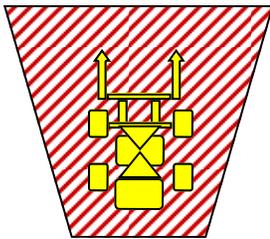
PERSONNEL TRAINING & PREPARATION



Prior to installation or use of this equipment all personnel should review the appropriate equipment & safety manuals and be trained by qualified personnel. Hazards, pinch points, and potential injury risks should be thoroughly covered to ensure personnel avoid these hazards at all times. Signed documentation certifying individual training is a must. Periodic refresher training meetings are highly recommended.

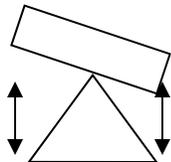


SPOTTERS MUST STAY CLEAR



Using a spotter is often helpful when positioning the forks under a load. Do not allow anyone to enter a potential pinch point or area where the load may fall, or any blind spot of the loader Operator. Always stand clear and a safe distance from this equipment and load. Example of area to stay clear of is illustrated in cross hatched diagram to right. Failure to observe this may result in serious injury or death.

ACTUATION OF CONTROLS ON THIS DEVICE MAY CAUSE CARGO TO BECOME UNSTABLE



Prior to lifting a load:

- Be sure load is adequately secured to pallet
- Position fork blades to widest possible position to provide best load stabilization.
- Be sure all persons and property are safely clear from the area.
- Move controls sufficiently slowly to enable adequate monitoring of load, surrounding persons and property to allow for the ability to timely stop and cease motion or corrective action in fork motions to avoid undesired contact or shifting of load.



Failure to operate this device with caution may result in property damage, personal injury or death.

SPECIFIC NOTICES (PAGE 6)

SAS™ HYDRAULIC ADJUSTABLE



EMERGENCY STOP FUNCTION

To immediately stop the motion of this equipment:

1. Operator is to release joystick button(s).

Additional secondary alternative measures to immediately stop the motion include:

2. Moving wheel loader's auxiliary hydraulic 3rd spool lever to neutral position
3. And/or turning off the ignition key of the wheel loader to shut off the engine

All three emergency stop options above ultimately stop the flow of hydraulic fluid.

Notice: Even after emergency stop function is followed, there is residual stored hydraulic pressure in the system. See following:



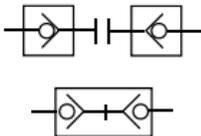
THIS EQUIPMENT IS OPERATED BY HIGH PRESSURE HYDRAULICS.

Hydraulics are a stored power source and as such must be treated as energized at all times. Be certain pressure has been relieved prior to handling, inspecting or performing maintenance on this unit. Follow lockout tag out procedures and release all stored energy before servicing equipment. Failure to release energy or disable hydraulic energy can result in serious injury or death. High pressure fluids can also discharge at great velocity. Be certain to wear safety glasses while inspecting, operating and maintaining equipment.



STAY CLEAR

- Do not lift persons with this equipment.
- Always maintain a safe distance away from this equipment.
- Do not go near or under this equipment or any object lifted by this equipment.



ENERGY ISOLATION

Follow Refer to [PAGE 13](#), "**DISCONNECTION**" items A through H.

The symbol at the left indicates hydraulic hose coupling quick release self sealing, which is recommended to be installed by the customer at the time this equipment is initially attached to the wheel loader.



POWER FAILURE

In the event of electrical or hydraulic supply failure from the wheel loader occurs, the equipment will stop further motion. Under normal circumstances the equipment is not expected to drop a load. *The symbol at the left indicates the hydraulic controls on this equipment are normally closed.* Thus without electrical power the gate valves are closed, in essence halting further movement.



SOUND

This equipment does not emit more than 70dba.



VIBRATIONS

This equipment does not transfer vibrations in excess of 2.5m/s².



OPERATING TEMPERATURE

This equipment is best suited to operate in temperatures between 30°F to 90°F with minimum allowable temperature -25°F and maximum temperature 150°F.

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SAFETY LABELING (PAGE 7)

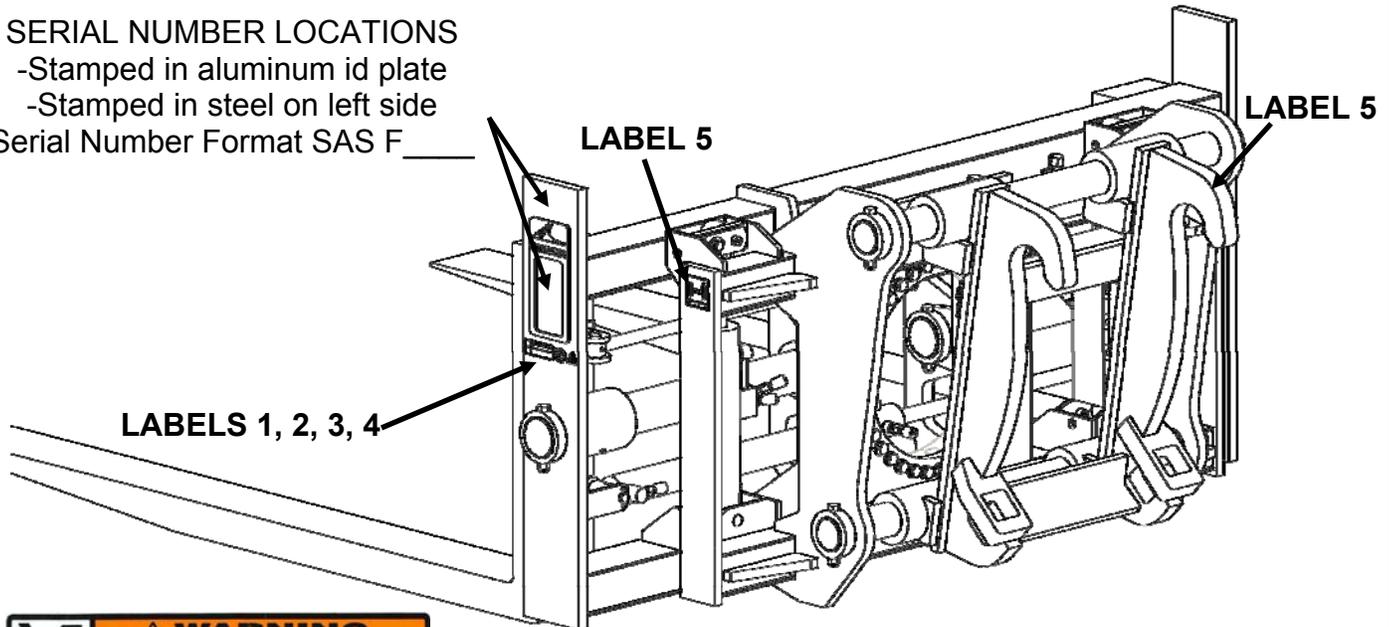
SAS™ HYDRAULIC ADJUSTABLE

SERIAL NUMBER LOCATIONS

-Stamped in aluminum id plate

-Stamped in steel on left side

Serial Number Format SAS F _____



LABEL 1: KEEP AWAY FROM MOVING PARTS

Label reorder # W-LAB-WARNING-PINCH



LABEL 2: HIGH PRESSURE HYDRAULICS.

Label reorder # W-LAB-PRES-503600



LABEL 3: READ EQUIPMENT MANUALS

Label reorder # W-LAB-READ-504060

LABEL 4: PRODUCT IDENTIFICATION LABEL

SERIAL NUMBER, MODEL, LIFT CAPACITIES

Label reorder # ID-PLATE



LABEL 5: KEEP BACK 10 METERS (30 FEET)

Label reorder # W-LAB-STAYBACK30FT

INSTALLATION (PAGE 8) ADVANCE PREPARATION

TO HELP YOU GET UP & RUNNING QUICKER WHEN YOUR HYDRAULIC ADJUSTABLE ARRIVES:

- Review this operator manual.
- If you have optionally opted for SAS™ to be onsite to assist your mechanic with installation and provide training, please be sure the following items are completed:

Items you need to obtain before arrival of Hydraulic Adjustable:

- (7) gallons of hydraulic fluid (specific for your machine)
- Locate area to mount control module (i.e. recommend dry area, clear of seat and door)
- Misc. nuts, bolts (1/4") or self tapping bolts
- Identify the hydraulic hose quick connections on your machine. Check with your machine manufacturer, and obtain the heaviest duty, highest volume self sealing male & female quick connections
- Locate a local hydraulic hose supplier who can make (2) 3/4" diameter 4,000 PSI hoses with heavy duty quick connection fittings same day once proper length is determined during installation

Tools your mechanic may need for installation:

- Electric Drill & 1.25" hole drill saw
- Basic socket and wrench set
- (2) large adjustable wrenches or large wrench set
- Teflon tape or thread sealer
- Wire cutter/crimper

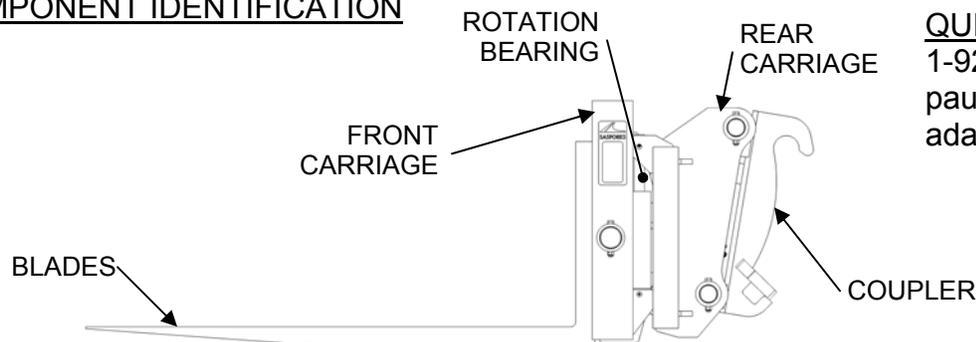
Service to do on your loader in advance:

- Have the maintenance personnel replace the hydraulic system filters & fluid
- Pressure and flow test (recommend but not required)
- Inspect lift arm pins & bushings for wear (replace as needed)

Available for training:

- Designate an area (i.e. where it is safe to run the unit) and an employee to operate unit
- Your loader operator (person who can have conversation in English) Thank you.

COMPONENT IDENTIFICATION



QUESTIONS?

1-920-845-2198 or Email:
paul@sasforks.com
adam@sasforks.com



INSTALLATION GUIDELINES (PAGE 9) SAS™ HYDRAULIC ADJUSTABLE

⚠ WARNING

- ▶ Installation of the Hydraulic Adjustable (H.A) on a wheel loader requires interfacing with electrical power system and high pressure hydraulic systems. Installation should be performed by qualified individuals.
- ▶ Failure to follow these instructions and precautions noted in the wheel loader manufacturer's service manual can result in serious damage to equipment and/or result in injury or death.
- ▶ Failure of hydraulic system can result in serious injury and property damage
- ▶ Use caution while testing operation of this unit. Be aware of:
 - Pinch points
 - High pressure hydraulic fluids or stored energy
 - Location of other individuals in the work area

STEP 1 - CONTROL:

- Find a location to mount control module [A&B].
- The location should be accessible enough to get to the control module [A&B] and wires, but out of the way so it will not get damaged. Mount where it will not be exposed to the weather.
- Needs to be within 2' of power supply.

STEP 2 - JOYSTICK:

- Install joystick [C] to 3rd function lever in cab.
- Route wires to control module, avoid rubbing points.
- Connect to proper connections on the control module [A&B].

STEP 3 - POWER CABLE:

- Locate 15 amp fused lead & connect a 24V power supply which energizes with ignition key and a good ground connection for cable [A]. Power & ground cable [A] is integrated with module [B].

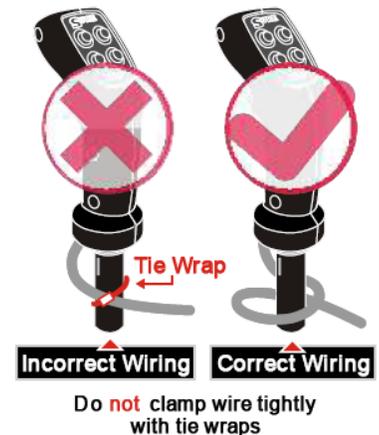
STEP 4 - ATTACH FORKS TO WHEEL LOADER:

• Quick Coupler Attachments:

Be sure lower locking pins fully extend to lock in coupler & H.A. This may require you to slightly lift or tilt the coupler to lock in. We recommend operator actually inspect each pin to be sure they are fully locked in.

• Direct Pin Mounting:

Remove existing pin attachment, align arms to H.A., insert and fasten pins in place. Apply ample grease to all pins.



⚠ WARNING

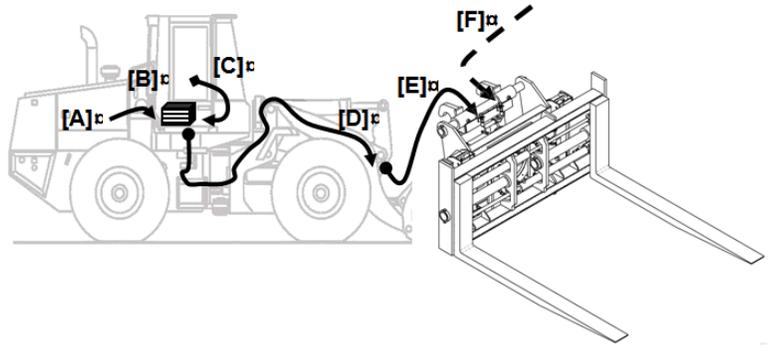
Quick coupler locking pins are integral to the attachment of this unit to wheel loader vehicles. Verify the pins are locked in fully prior to lifting unit or use. Failing to verify proper engagement may cause the forks to fall off the loader resulting in property damage, injury or death.

INSTALLATION GUIDELINES (PAGE 10)

SAS™ HYDRAULIC ADJUSTABLE

STEP 5 - CONTROL CABLE:

- Determine a suitable location for the bulkhead connection end on cable [D] on the forward area of the left loader arm. Pick a location that cable [E] can reach and provides enough flex as the loader arms are lifted or tilted. This is typically 2' from the lower pivot point. Mount the bulkhead securely on the loader arms.
- Run control cable [D] up loader arm, along hydraulic lines, following lines into frame & across frame articulation point, to cab of loader. Leave enough slack in the cable keeping in mind articulation of loader & lift of main arms so there is no tension on the control cable in all positions.
- Find a suitable location to bring the control cable into the cab.
- Enter through a existing grommet or drill a hole large enough to fit the end of the wire through.



Protect the cable from rubbing on the edge of the hole, either install a rubber grommet or center the cable in the hole and fill around with silicone. Damage to wires can result in equipment failure leading to injury or property damage.

STEP 6 - SECURE CABLES:

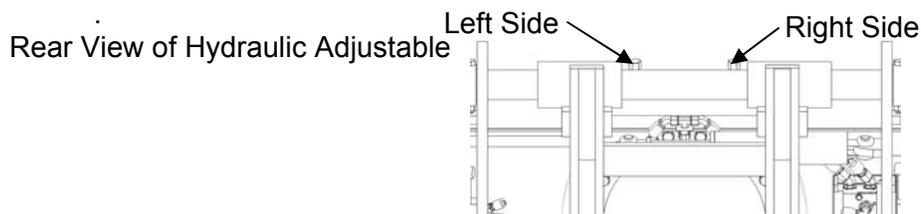
- Using plastic tie straps, all weather velcrow or similar non-marring strapping material to secure cables away from pinch, wear, or abrasive points. Damaged cable or wires will cause PATENT PENDING hydraulic system to fail to operate properly.



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STEP 7 - HYDRAULIC HOSES:

- Determine adequate length of hoses needed from third function connections on loader arms to bulkhead lines on the forks. To decide length of line; raise unit, tilt unit full down; then measure distance required from bulkhead on fork carriage hydraulic fittings to loader connection. Make a loop in line to have sufficient length in hose to avoid creating tension in all positions.
- Use a 4,000 PSI minimum hose and heavy duty self sealing hydraulic quick coupler fittings on machine and 3/4" (#12) Male JIC fittings on the forks.



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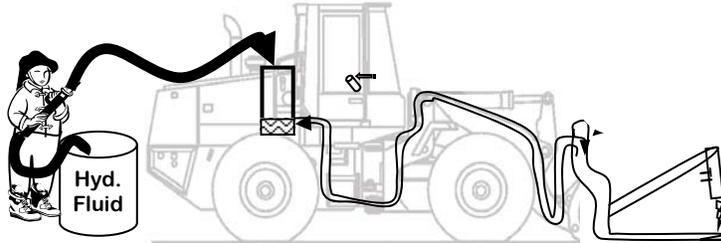
INSTALLATION GUIDELINES (PAGE 11)

SAS™ HYDRAULIC ADJUSTABLE

STEP 8 - HYDRAULIC FLUID LEVEL:



- You will need to add fluid at initial installation.
- Check level regularly. Refer to the wheel loader manufacturer's manual for proper filling specifications. Failure to keep fluid at proper operating levels can result in equipment failure.



STEP 9 - INITIAL INTERFERENCE TEST FOR LIFTING, TILTING, OR DUMPING MOVEMENTS:



- ▶ Watch for pinch points. Stay clear of moving parts while equipment is in operation. Moving parts can cause serious injury or death
- ▶ Watch for leaking hydraulic fittings, fix any leaks and clean up spills if they occur. Hydraulic fluid can cause eye irritation and slippery conditions which can result in injury.
- ▶ Watch for unexpected movements or erratic operation, stop test if unexpected movement occurs. Stored energy can cause unexpected movements that can result in serious injury or death.
- ▶ Verify all individuals are clear before performing test.



- Check for undesirable contact between loader lift arms and Hydraulic Adjustable framework. Watch for any loader arm, hoses, or cable pinch points.
- Begin testing by moving control levers slowly:
 - A. With carriage on the ground, fully roll back (fork tips up)
 - B. With carriage lifted high, fully rotate to the dump position (for tips down)
- Pin attach units may require addition of mechanical stops.
- If you experience interference you may need to install special roll back or dump stops. Contact SAS FORKS™ if you experience interference issues to discuss stop options.

STEP 10 - CHECK PROPER SEQUENCE: (SAS FORKS MODIFIED CAT JOYSTICK W/ROLLER)

- Engage button on joystick before actuating the roller switch on joystick.
- | | | |
|---|--|--|
|  | <p>FRONT button depressed:</p> <p>MIDDLE button depressed:</p> <p>REAR button depressed:</p> | <p>Pull roller on joystick back to SIDE SHIFT coupler carriage.
Push roller on joystick forward SIDE SHIFT opposite direction</p> <p>Pull roller on joystick back to ROTATE front carriage.
Push roller on joystick forward to ROTATE opposite direction.</p> <p>Pull roller on joystick back to POSITION blades in or out.
Push roller on joystick forward to POSITION blades opposite.</p> |
|---|--|--|

If functions operate backwards from desired, simply switch or cross over main hydraulic hoses from loader to forks.

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DAILY PRE-OPERATION INSPECTION (PAGE 12) (SUGGESTED MINIMUM INSPECTION GUIDELINES)

- > Inspection Required at start of each shift.
- > Responsible Person: First employee to use this piece of equipment on each shift, each day.
- > If you find any safety problems fix them immediately or tag and lock out this unit so no one uses it.
- > Notify your supervisor about any problems and arrange for immediate service.
- > A record of repairs made should be attached to this sheet for proof of safe operating condition
- > Park safely. Do not obstruct exit. set parking brake, lower forks with tips on ground, shut off lights.
- > When this page is full, turn page into office for filing request a blank form.
- > Office / Supervisor: Keep this completed sheet and associated records of repairs on file.

A. WHEEL LOADER GENERAL PRE-OPERATION INSPECTION

Week Day #	Think Safety First Unit # X=item OK S=needs Service Hour Meter	Engine Off & Keys Out	Parking Brake Set	Engine Oil Level	Hydraulic Fluid Level	Antifreeze Level	Fan / Alternator Belts	Fuel System Leaks	Tire Condition	Tire Pressure	Tire Lug Bolts Tight	Hydraulic Hoses	Lift Arms / Chains	Grease Lifting Pins	Forks Secure	Seat Belt Operation	Fire Ext. Charged	Parking Brake	Dash Warning Lights	Fuel Level	Engine - No Noises	Horn	Lift operation	Steering System	Brake System	Reverse Warning	
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1																												
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6																												
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B. SAS™ HYDRAULIC ADJUSTABLE (H.A.) PRE-OPERATION INSPECTION

Week Day #	Think Safety First Unit # X=item OK S=needs Service Hour Meter	Engine Off & Keys Out	Parking Brake Set	Forks on the ground	Quick Coupler (if any) free from cracks	H.A. Securely Mounted to Loader	Pivot Pin Lock Bolts	Pivot Pin Condition	Grease All Pins	Hydraulic Hoses Not Damaged or Worn	Power cable condition	Hydraulic Fitting Leaks	H.A. COUPLER Free From Cracks	H.A. REAR CARRIAGE Free From Cracks	H.A. BEARING free from cracks	H.A. BEARING fasteners secure	H.A. FRONT CARRIAGE Free From Cracks	H.A. FRONT CARRIAGE tilt stops in place	H.A. Hydraulic block cover in place	H.A. BLADES Free of cracks	H.A. Smooth Operation						
																							Date	By Who				
1																												
2																												
3																												
4																												
5																												
6																												
7																												

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CONNECTING / DISCONNECTING (PAGE 13) SAS™ HYDRAULIC ADJUSTABLE

WARNING

- ▶ Hydraulic system may have unexpected pressure.
- ▶ Always train operators on proper procedures. Set forks on the ground, depressurize hydraulic system, wear safety glasses, gloves and other personal protective equipment required by your workplace before attempting to disconnect hydraulic hoses.
- ▶ Practice lockout tagout procedure to prevent operation of equipment while servicing.
- ▶ Failure to follow these instructions can result in serious injury or property damage.

DISCONNECTING

When disconnecting from Hydraulic Adjustable:

- Set the Hydraulic Adjustable down to position the blades flat on level ground.
- Rotate the “front carriage” so that it is level with the “rear carriage”, then shift the “coupler” so that it is in the center of the Hydraulic Adjustable, and finally spread the “blades” out the furthest position. This position with all of the components in their home positions is ideal for storage and stability.
- Set the loader’s parking brake.
- Turn off the loader.
- Turn the key of the loader back on without starting the engine.
- Cycle through all joystick buttons moving the joystick forward and back several times while pressing & holding each button, to relieve all the hydraulic pressure in the lines.
- Turn the key back off and remove hydraulic lines & control cable.
- Disconnect hydraulic hoses at quick release, self sealing fittings only. Carefully place control cable and hoses where they will not be damaged or get soiled.
- Disengage the quick coupler and drive away.



NOTICE

Do not allow the hydraulic connections to get dirty. Allowing dirt into the hydraulics will damage the Hydraulic Adjustable hydraulics and may cause catastrophic failure of the wheel loader’s hydraulic pump.

CONNECTING

To re-connect to the Hydraulic Adjustable:

- Drive straight up to the Hydraulic Adjustable and avoid contact with hydraulic lines or control cable.
- Engage the quick coupler. Visually verify quick coupler locking pins are fully engaged.
- Turn off the loader.
- Cycle joystick and other lift levers in cab to relieve pressure in hydraulic lines.
- Connect hydraulic lines and control cable.
- Start loader and ensure proper operation.

Always select and engage a button before moving the lever.



- | | |
|--------------------------|---|
| FRONT button depressed: | Pull roller on joystick back to SIDE SHIFT coupler carriage.
Push roller on joystick forward SIDE SHIFT opposite direction |
| MIDDLE button depressed: | Pull roller on joystick back to ROTATE front carriage.
Push roller on joystick forward to ROTATE opposite direction. |
| REAR button depressed: | Pull roller on joystick back to POSITION blades in or out.
Push roller on joystick forward to POSITION blades opposite. |

Check hydraulic fluid level on loader. Add fluid as required to maintain adequate level

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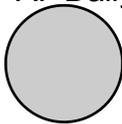
PREVENTIVE MAINTENANCE (PAGE 14)

SAS™ HYDRAULIC ADJUSTABLE



Set forks flat on the ground, turn off loader engine, depressurize hydraulic supply to forks, stay clear of pinch points during greasing. Safe and proper daily maintenance will help ensure long term performance and prevent failures. Failure to follow preventive maintenance guidelines can result in equipment failure resulting in injury or property damage.

A. Daily: Grease all (14) points; with particular attention to pivot points & cylinders.



Cylinder Grease Points

BC-L(R) - Blade Cylinder-Left (Right)
TC-L(R) - Tilt Cylinder-Left (Right)



Pivot Point Grease Points

BR - Rotation Bearing
CP-T(B) Coupler Top (Bottom)

B. Daily: Inspect all pivot point pins and retaining bolts to be sure properly secured.

C. Daily: Inspect forks, carriage, and Hydraulic Adjustable framework for damage.

D. Daily: Check loader hydraulic fluid level. Add fluid as required to maintain proper level.

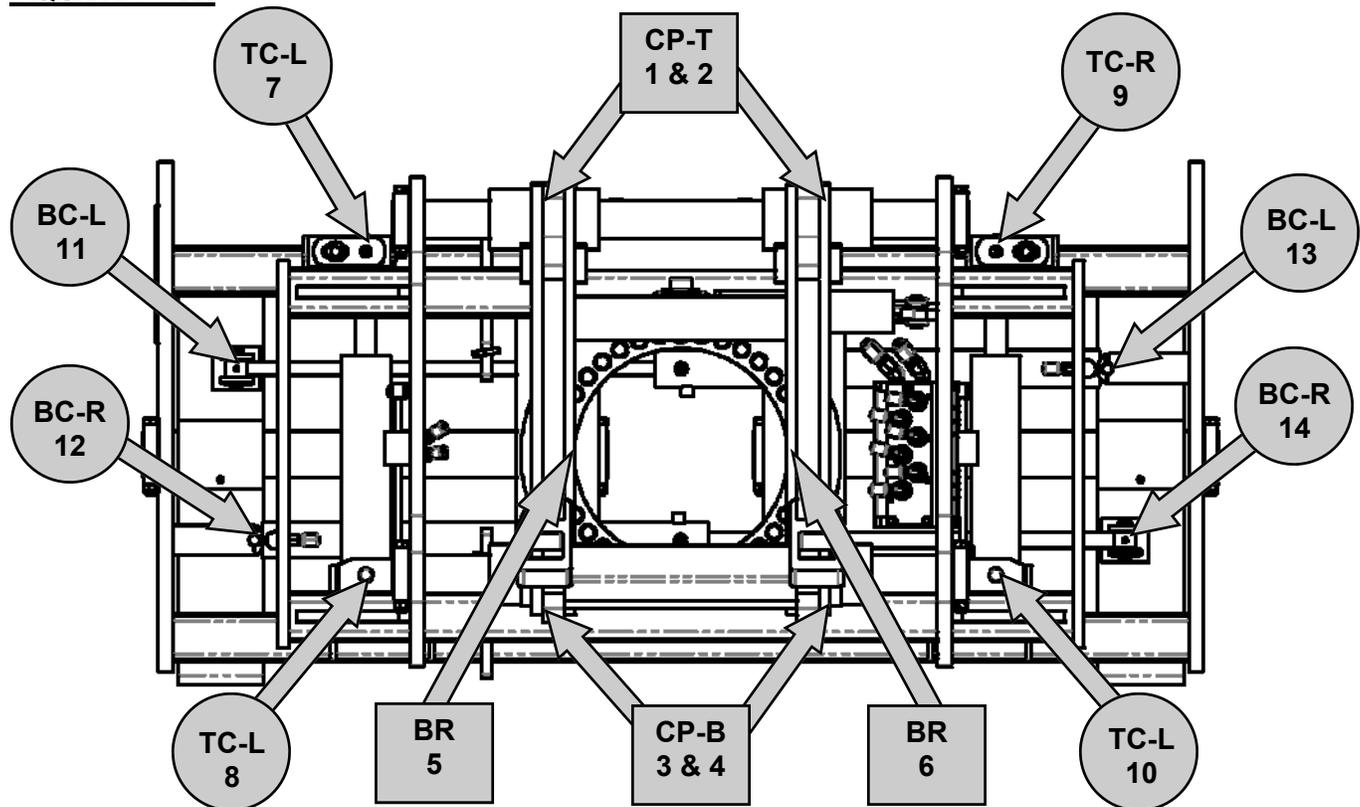
E. Weekly: Inspect hose fittings to be sure they are tight.

F. Weekly: Inspect hoses for pinching or rubbing. Correct or replace as needed.

1/8" NPT Grease Zerks

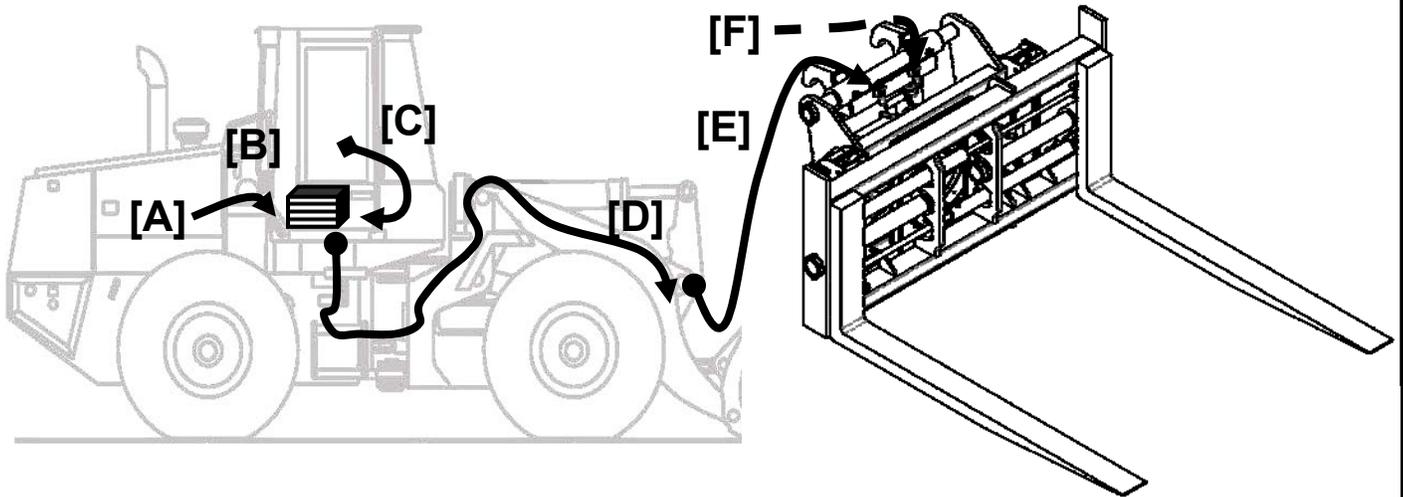
Recommended Grease:

**JET-LUBE® ARCTIC (#35050) OR
EQUIVALENT**



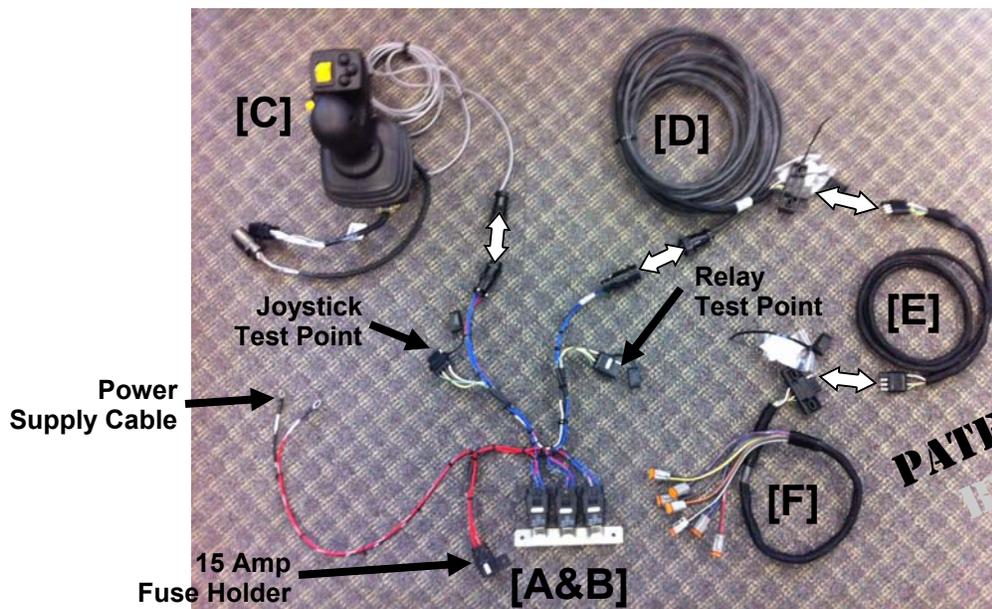
ELECTRONICS PARTS GUIDE (PAGE 15)

SAS™ HYDRAULIC ADJUSTABLE



DESCRIPTION

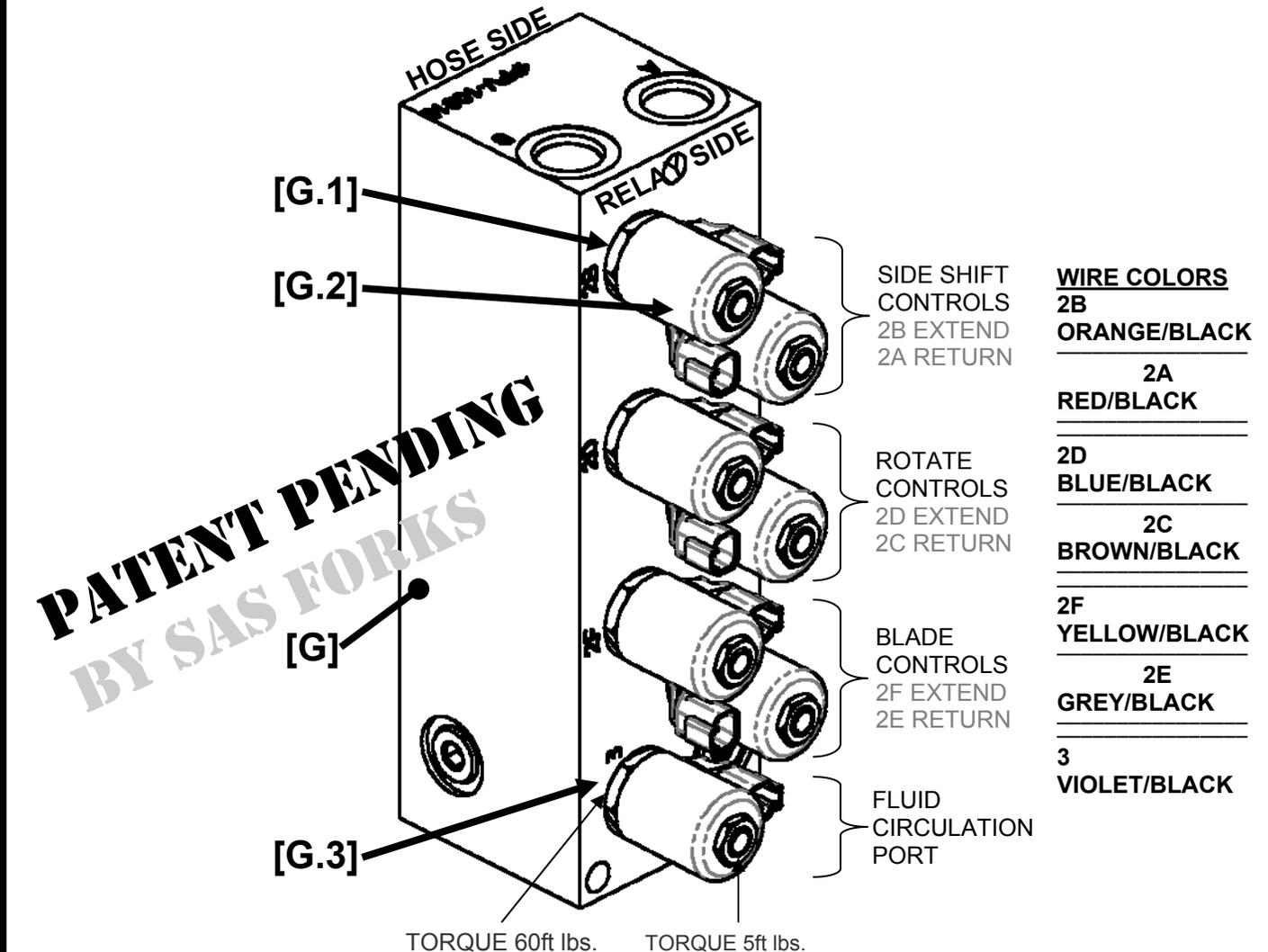
DESCRIPTION	PART NUMBER
[..] COMPLETE ELECTRICAL KIT (A,B,C,D,E) 24 VOLT (SHOWN BELOW IN PICTURE)	HC-KIT-S-24-1-30-M
[A&B] CONTROL MODULE W/LOCAL TEST & 2' PWR WIRE	HC-MOD-S-21478
B.1 RELAY 24 VOLT (BLACK) (3 REQ.)	HC-BRL-H-4RD933332
B.2 15 AMP FUSE (TYPICAL AUTOMOTIVE STYLE FUSE) (1 REQ.)	HC-FUS-...-ATC15
[C] JOYSTICK & 10' CABLE ASSEMBLY W/PLUG (CAT-SAS CUSTOM) (note: this joystick fits 950K to 972K machines only)	HC-JYA-C-364-4027
[D] 30' FORWARD CONTROL CABLE W/FLAT 4 WIRE PLUG	HC-CAB-S-50266-1
[E] 7' JUMPER CABLE W/PLUGS (LOADER TO CARRIAGE)	HC-CAB-S-50274
[F] 32" VALVE BLOCK CABLE W/BULKHEAD AND COIL PLUGS	HC-CAB-S-50272-M
OPTIONAL TEST LIGHTS	
1-LED CIRCUIT TESTER FOR WIRE "F.7" AT HYDRAULIC BLOCK	HC-PLG-I-TESTLIGHT-1
3-LED CIRCUIT TESTER FOR "Test Points" SHOWN BELOW	HC-PLG-I-TESTLIGHT-3



PATENT PENDING
BY SAS FORKS

VALVE BLOCK PARTS GUIDE (PAGE 16)

SAS™ HYDRAULIC ADJUSTABLE



DESCRIPTION

DESCRIPTION	PART NUMBER
[G] HYDRAULIC VALVE BLOCK ASSY W/ VALVES & COILS	HV-BLK-S-FV10615-V1
G.1 SOLENOID CARTRIDGE Closed VALVE (Screws in block-6 REQ.) O-RING SIZE: SAE # 12—additional o-ring detail on next page VALVE INSTALLATION NOTE: REQUIRES 1-1/4" WRENCH, TORQUE TO 80 FT-LBS	HV-CRT-V-SBV1112C000
G.2 SOLENOID ELECTRIC COIL 24 VOLT STANDARD (7 REQ.) COIL INSTALLATION NOTE: REQUIRES 7/8" WRENCH, TORQUE TO 6 FT-LBS	HV-COL-V-300AA00142A
G.3 SOLENOID CARTRIDGE Open VALVE (Screws in block-1 REQ.) O-RING SIZE: SAE # 12—additional o-ring detail on next page VALVE INSTALLATION NOTE: REQUIRES 1-1/4" WRENCH, TORQUE TO 80 FT-LBS	HV-CRT-X-SBV11120000

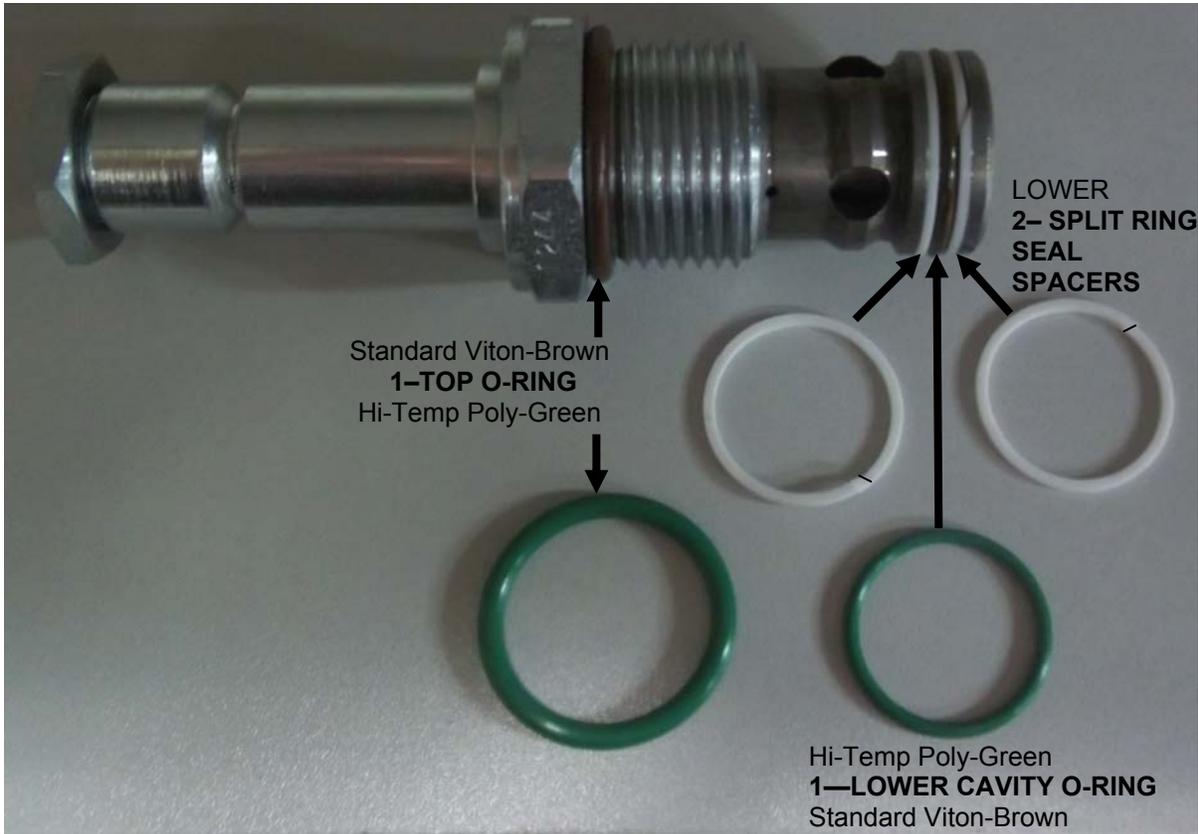


System may have stored hydraulic pressure. Disassembly of any hydraulic part, cartridge valve, coil or hose may result in sudden release of hydraulic fluid and may result in unexpected movement. Avoid this fluid or pinch hazard. Only qualified personnel should service this unit. The Hydraulic Adjustable unit should be lowered to the ground and secured.

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CARTRIDGE VALVE O-RING GUIDE (PAGE 17) SAS™ HYDRAULIC ADJUSTABLE



Standard O-Ring seal kit: This kit includes these items:
HV-ORG-V-SK212V2 (2) LOWER SPLIT RING SEAL SPACERS-typical white
 Discard: (1) SAE #12 TOP O-RING-typical brown in color
 Discard: (1) LOWER CAVITY VITON O-RING-typical brown in color

Special Hi-Temp O-ring This is one o-ring only includes:
HV-ORG-POLY#568-912 (1) TOP O-RING-typical green in color ~ 23 mm ID

Special Hi-Temp O-ring This is one o-ring only includes:
HV-ORG-POLY#568-019 (1) LOWER CAVITY POLY #568-019 O-RING-typical green~ 20 mm ID

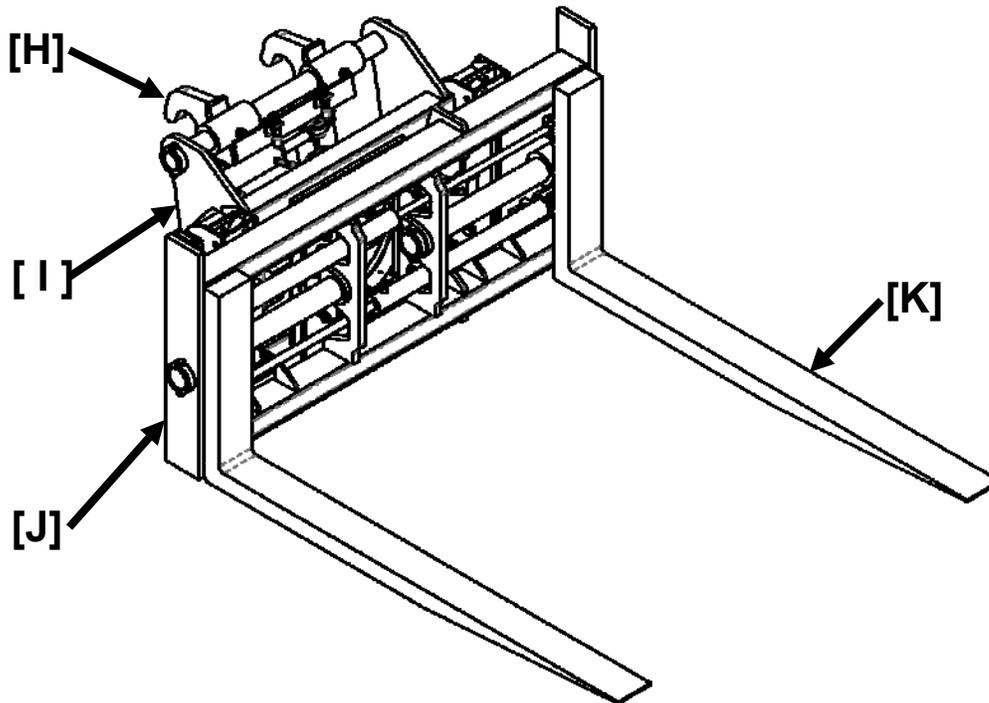
Order replacement parts from:

SAS FORKS Phone 920-845-2198, Fax 920-845-2309 or Email: Sales@sasforks.com

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MOVEABLE PARTS GUIDE (PAGE 18)

SAS™ HYDRAULIC ADJUSTABLE



DESCRIPTION		PART NUMBER
[H] COUPLER MOUNT	(QTY: 1)	1420CAT966-96-4820
[I] REAR CARRIAGE—SIDE SHIFT	(QTY: 1)	1429CAT966-96-4820
 PRESS FORWARD BUTTON #1 ON JOYSTICK ▼PULL LEVEL BACK ON JOYSTICK LEVER TO SIDE SHIFT ▲PUSH LEVER FORWARD ON JOYSTICK LEVER TO SIDE SHIFT		
[J] FRONT CARRIAGE— ROTATE	(QTY: 1)	1419CAT966-96-4820
 PRESS MIDDLE BUTTON #2 ON JOYSTICK ▼PULL LEVEL BACK ON JOYSTICK LEVER TO ROTATE ▲PUSH LEVER FORWARD ON JOYSTICK LEVER TO ROTATE		
[K] BLADES—FORK WIDTH POSITIONING	(QTY: 2)	1401CAT966K-96-4820
 PRESS REAR BUTTON #3 ON JOYSTICK ▼PULL LEVEL BACK ON JOYSTICK LEVER TO MOVE BLADES ▲PUSH LEVER FORWARD ON JOYSTICK LEVER TO MOVE BLADES		

[L & M] UNASSIGNED

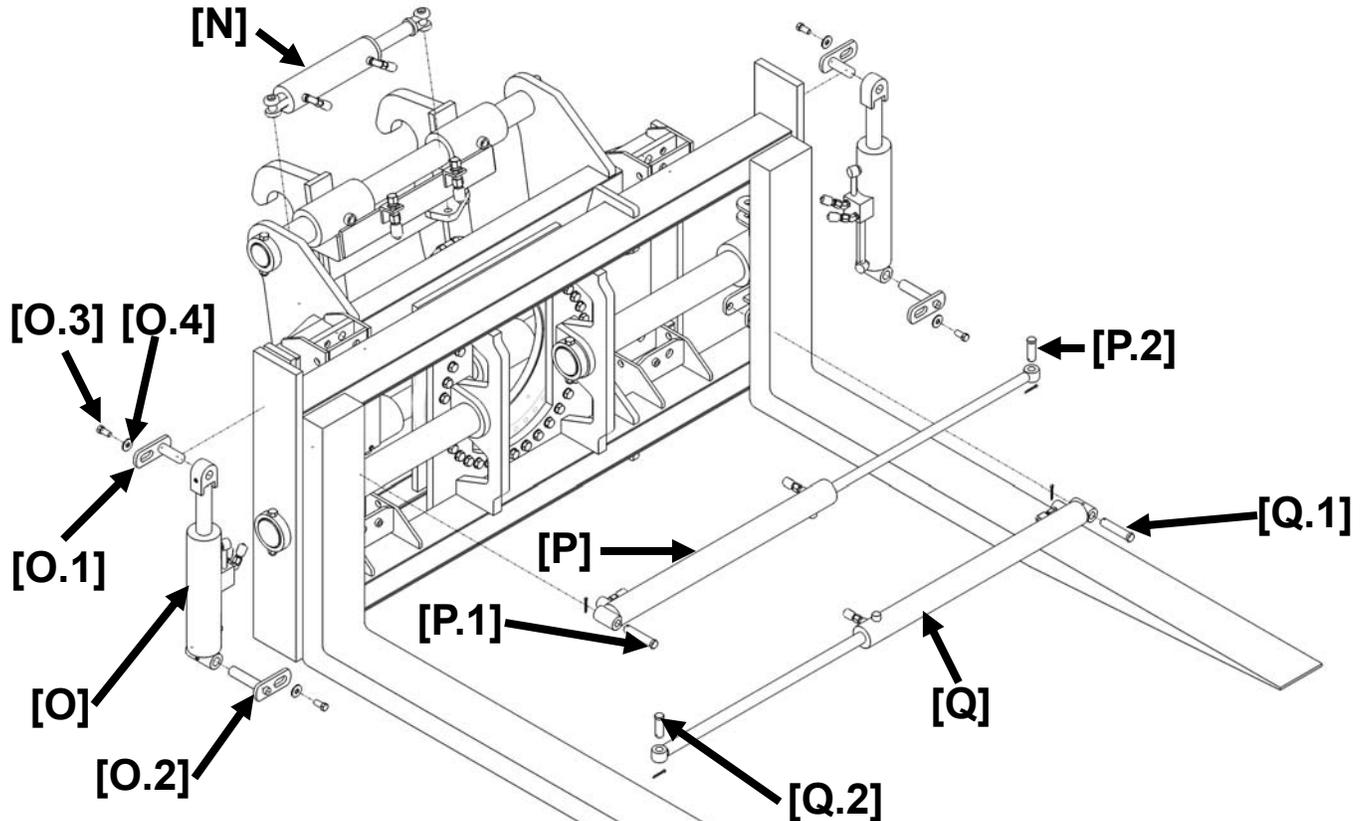


The moving parts shown on this page pose several pinch points. Keep all persons clear of pinch points at all times including, but not limited to, operation and maintenance activities. Be sure cargo is properly secured to prevent unexpected movement. Failure to stay clear and avoid all pinch points could result in serious injury or death.

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CYLINDER & PIN DIAGRAM (PAGE 19)

SAS™ HYDRAULIC ADJUSTABLE



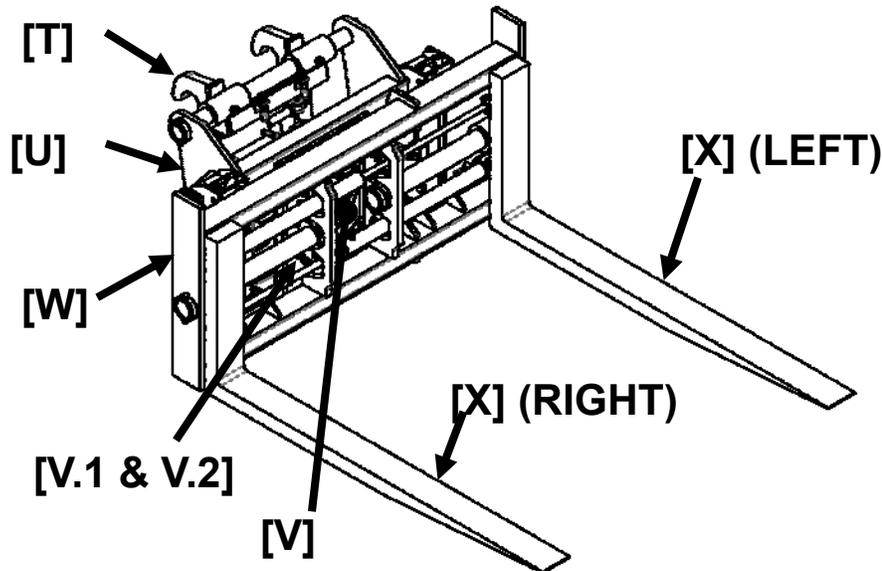
DESCRIPTION	QTY	PART NUMBER
[N] SIDE SHIFT CYLINDER	2	HY-CYL-03.5X12
N.1 SIDE SHIFT PIN	2	BAILEY #172-250
N.2 SIDE SHIFT PIN RETAINER CLIP	4	BAILEY #172-213
N.3 COMPLETE CYLINDER SEAL PACKING KIT	1	HK-3.5-204-603
[O] FRONT CARRIAGE TILT CYLINDER	2	HY-CYL-04X12-4000PSI
O.1 UPPER TILT PIN	2	1437CAT966K-96-4820
O.2 LOWER TILT PIN	2	1438CAT966K-96-4820
O.3 RETAINER BOLT FOR TILT PINS	4	WBOLT 0.625X1.50 GR8
O.4 WIDE WASHER FOR RETAINER BOLT	4	WASHER-F .625 GR8
[P] LEFT BLADE ADJUSTMENT CYLINDER	1	HY-CYL-03X36 REPH
P.1 ROD END CYLINDER PIN (BLADE SIDE)	1	PIN-98306A682
P.2 CYLINDER PIN (CARRIAGE SIDE)	1	PIN-98306A685
P.3 PIN RETAINER COTTER PIN	2	WPIN .125X1.25
P.4 CYLINDER PISTON SEAL (ONE OF THE SEALS ONLY)	1	HALLITE 755 #8910700
P.5 COMPLETE CYLINDER SEAL PACKING KIT	1	HK-3.00-783-236
[Q] RIGHT BLADE ADJUSTMENT CYLINDER	1	HY-CYL-02.75X36 REPH
Q.1 ROD END CYLINDER PIN (BLADE SIDE)	1	PIN-98306A682
Q.2 CYLINDER PIN (CARRIAGE SIDE)	1	PIN-98306A685
Q.3 PIN RETAINER COTTER PIN	2	WPIN .125X1.25
Q.4 CYLINDER PISTON SEAL (ONE OF THE SEALS ONLY)	1	HALLITE 755 #8910800
Q.5 COMPLETE CYLINDER SEAL PACKING KIT	1	HK-2.75-783-235

[R & S] UNASSIGNED

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FRAMEWORK PARTS GUIDE (PAGE 20)

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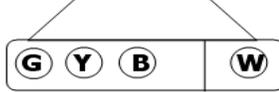
DESCRIPTION	QTY	PART NUMBER
[T] FUSION COUPLER INTERFACE ASSEMBLY	1	1420CAT966K-96-4820
T.1 SIDE SHIFT SHAFT	2	1444CAT9KKK-96-4820
T.2 SIDE SHIFT COLLAR	2	0611MED ADJ-3.5
T.3 SIDE SHIFT COLLAR BOLT	2	WBOLT 0.750X6.00 GR8
T.4 SIDE SHIFT COLLAR NUT	2	WNUT 0.750-10-GR8-NY
[U] REAR CARRIAGE ASSEMBLY	1	1429CAT966K-96-4820
[V] ROTATION BEARING ASSEMBLY	1	HY-GM2510
V.1 M20-2.5X65MM HEX HEAD BOLT GR10.9	69	WBOLT M20-2.5X65MM
V.2 M20 FLAT WASHER	69	WASHER-F M20 GR8
[W] FRONT CARRIAGE ASSEMBLY	1	1419CAT966K-96-4820
W.1 BLADE MOUNT SHAFT	2	1405CAT966K-96-4820
W.2 BLADE MOUNT SHAFT COLLARS	4	1414CAT966K-96-4820
W.3 SIDE SHIFT COLLAR BOLT	2	WBOLT 0.750X6.50 GR8
W.4 SIDE SHIFT COLLAR NUT	2	WNUT 0.750-10-GR8-NY
[X] BLADES	2	1401CAT966K-96-4820
NOTE: 1401CAT966K-96-4820 HAS LEFT AND RIGHT BLADES		
X.1 GREASE WIPERS	4	SKF #42422
[Y] HYDRAULIC BLOCK COVER (NOT SHOWN)	1	1447CAT966K-96-4820
Y.1 1/4-20X1" HEX HEAD BOLT GR8 (NOT SHOWN)	4	WBOLT 0.250X1.00 GR8
Y.2 1/4" FLAT WASHER (NOT SHOWN)	4	WASHER-F .250 GR8
[Z] UNASSIGNED		

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WIRING SCHEMATIC GUIDE (PAGE 21)

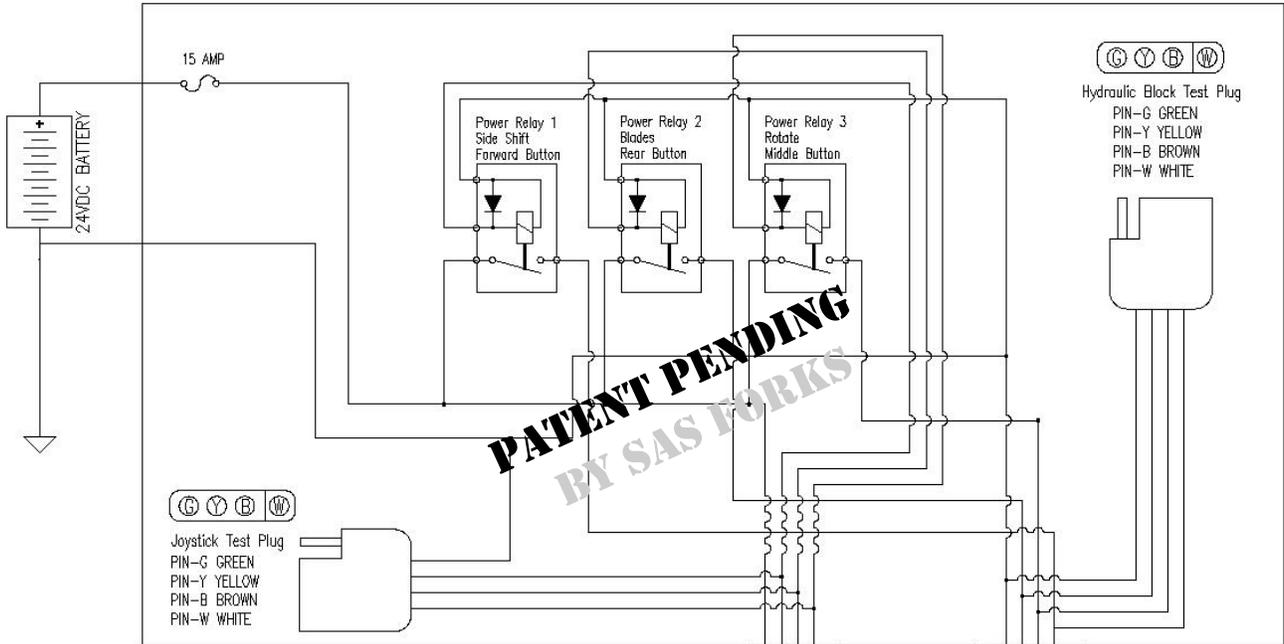
SAS™ HYDRAULIC ADJUSTABLE

MAIN PLUG ON LOADER ARM (LEADING TO CONTROL BOX)



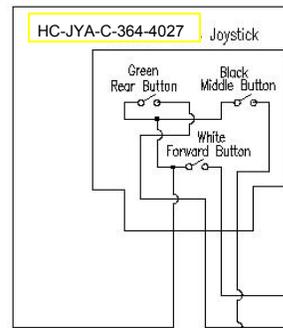
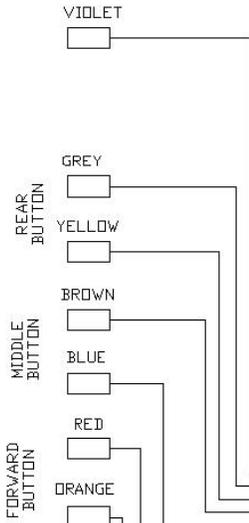
GREEN=ROTATE POSITIVE WITH BUTTON PRESSED
YELLOW=BLADES POSITIVE WITH BUTTON PRESSED
BROWN=SIDE SHIFT POSITIVE WITH BUTTON PRESSED
WHITE=GROUND

SAS21478 Control Module



VALVE BLOCK STAMPED REFERENCE (FROM BOTTOM)

- 3 VIOLET/BLACK
- 2E GREY/BLACK
- 2F YELLOW/BLACK
- 2C BROWN/BLACK
- 2D BLUE/BLACK
- 2A RED/BLACK
- 2B ORANGE/BLACK



Joy Stick Pinout
1 White/Forward Button
2 Black/Middle Button
3 Green/Rear Button
9 Ground

Hydraulic Block Pinout
1 Red/Middle Button
5 Black/Rear Button
9 Green/Forward Button
12 Ground

HC-CAB-S-50272-M
32" SOLENOID CABLE

HC-CAB-S-50274
7' JUMPER CABLE
PIN-G GREEN
PIN-Y YELLOW
PIN-B BROWN
PIN-W WHITE

HC-CAB-S-50266
30" LOADER CABLE
PIN-G GREEN
PIN-Y YELLOW
PIN-B BROWN
PIN-W WHITE

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TROUBLE SHOOTING (PAGE 22) SAS™ HYDRAULIC ADJUSTABLE

WARNING

- ▶ Hydraulic system may have stored energy.
- ▶ Electrical system is hazardous.
- ▶ Be certain to follow all safety procedures and guidelines while trouble shooting.
- ▶ Only qualified heavy equipment technicians should service this equipment.
- ▶ Malfunctions of equipment can result in un-expected movements resulting from stored energy releases.
- ▶ Failure to follow safe procedures or practices can result in property damage, injury or death.

PROBLEM - Key is 'ON' and loader is running. When I move the lever on the joystick, nothing works.

FLUID CHECKS:

STEP 1: *Is hydraulic fluid level in tank of loader at proper level?*

YES - Go to next step. NO - Add needed fluid and retest.

STEP 2: *Are hydraulic hoses properly attached from the wheel loader to Hydraulic Adjustable (H.A.)?*

YES - Go to next step. NO - Properly secure hoses from loader to H.A.

STEP 3: *Some wheel loaders have hydraulic cut-outs, which turn off the 3rd spool when the other levers are moved. Is the operator only moving one lever in the cab at a time?*

YES - Go to next step. NO - Test only moving 3rd spool auxiliary hydraulic lever.

STEP 4: *Check if your machine has a manual diverter valve at the front of the machine arms where the auxiliary hydraulic function maybe shared with the quick coupler. Is the lever for this valve turned properly to divert fluid to the H.A.?*

YES - Go to next step. NO - Move lever & lock to ensure fluid flow to H.A.

ELECTRICAL CONTROL CHECKS:

STEP 5: *Are you pressing & holding one button with moving the level on the joystick?*

YES - Go to next step. NO - Proper operation requires to keep a button on the joystick pressed while moving lever on joystick.

STEP 6: *Are both front connectors properly plugged in? (Cable [D] to [E], and Cable [E] to [F])*

YES - Go to next step. NO - Properly attach wire connections and retest.

STEP 7: *Attach 3-LED tester at end of cable [D] on wheel loader arm. Press one button at a time on the joystick. Did a LED light come on with each button?*

YES - **Go to STEP 11.** SOMETIMES/NO - Check fuse. If fuse good, go to STEP 8.

STEP 8: *Attach 3-LED tester to 'Relay Test Point' (see PAGE 15). Do individual LED lights turn on when joystick buttons are pressed one at a time?*

YES - Inspect & repair Cable [D] or replace. NO - Go to STEP 9.

STEP 9: *Attached 3-LED tester to 'Joystick Test Point' (see PAGE 15). Do individual LED lights turn on when joystick buttons are pressed one at a time?*

YES - Identify & replace bad relay, retest. NO - Check fuse, verify proper ground & power supply.

STEP 10: *Are all connectors for cables [A], [C], and [D] tightly secured to control box [B]?*

YES - Go-to next step. No - Properly attach & twist the outer lock to secure.

WARNING

Before accessing H.A carriage service panel in STEP 11, be sure to secure boom to prevent becoming entangled in a pinch point, between the boom & carriage tower. Serious injury or death may result if proper safety precautions are not taken.

STEP 11: *Check the wire leads in the H.A Rear Carriage under the service access panel that connect to each solenoid coil. Connect 1-LED tester to each coil feed wire. When the buttons are pressed on the joystick, does the 1-LED tester light up? (Or using other test light: Is there positive & negative in each pair of wires at the hydraulic block?)*

NO - Replace carriage cable [F]. YES- Contact local wheel loader service technician.

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TROUBLE SHOOTING (PAGE 23)

SAS™ HYDRAULIC ADJUSTABLE

WARNING

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- ▶ Electrical system is hazardous.
- ▶ Be certain to follow all safety procedures and guidelines while trouble shooting.
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- ▶ Malfunctions of equipment can result in un-expected movements resulting from stored energy releases.
- ▶ Failure to follow safe procedures or practices can result in property damage, injury

PROBLEM - The Hydraulic Adjustable (H.A) parts move backwards - or opposite of the direction indicated in the manual.

STEP 1: *The main hydraulic lines routed from the wheel loader to the H.A. are hooked up backwards to the H.A. Switch the two hoses where they connect to the H.A. Retest. Did that correct the problem?*

YES - End.

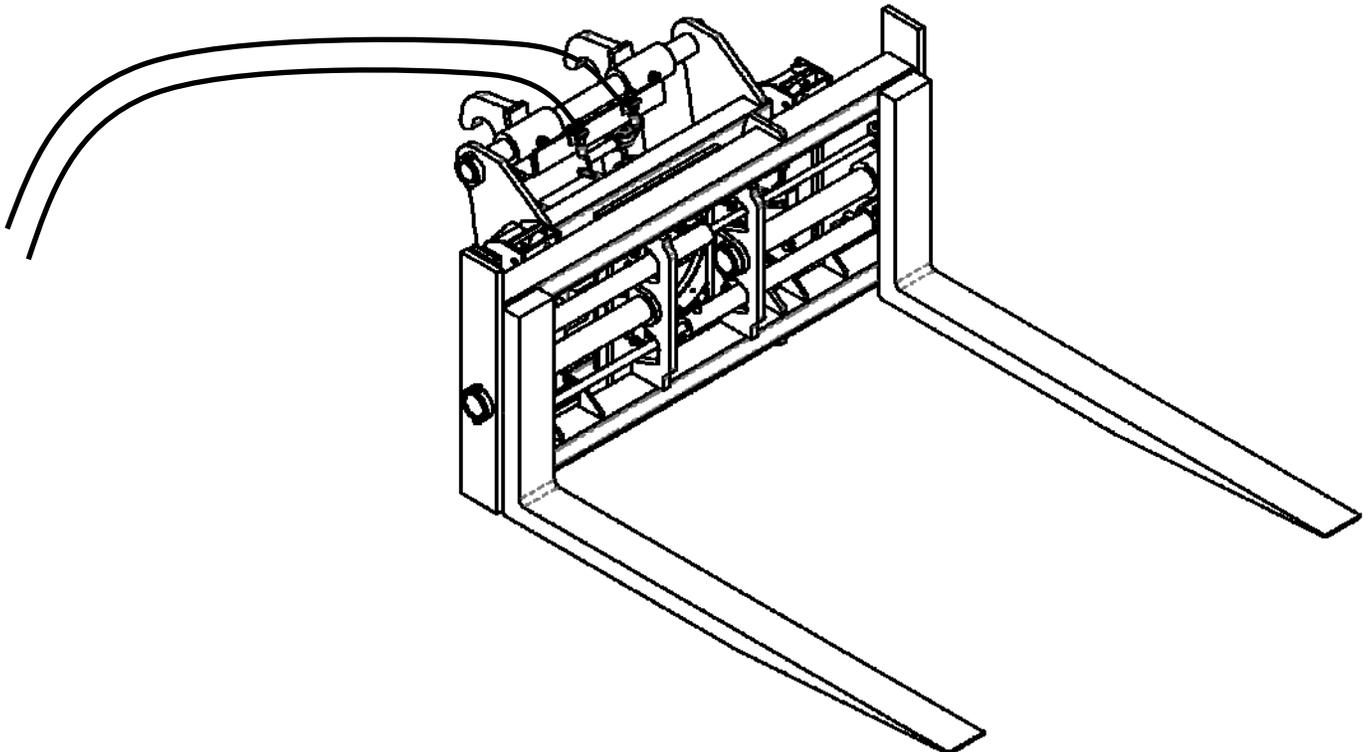
NO - Go to next step.

STEP 2: *Check to be sure harness [A], which provides the ground and power to the control box is hooked up properly. The wire with the fuse link should be positive power. The wire without the fuse should be ground. If the wires are not hooked up properly, then remove and hook up properly. Retest movement. Does the H.A. work properly now?*

YES - End.

NO - Go to next step.

STEP 3: *Contact a local wheel loader or hydraulics service technician or contact SAS™ with your H.A. Serial # for technical support.*



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TROUBLE SHOOTING (PAGE 24) SAS™ HYDRAULIC ADJUSTABLE

WARNING

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- ▶ Malfunctions of equipment can result in un-expected movements resulting from stored energy releases.
- ▶ Failure to follow safe procedures or practices can result in property damage, injury or death.

PROBLEM - The blades, front carriage, and/or coupler seem to move by themselves or when a different function is selected on the joystick.

STEP 1: *Is only 1 button on the joystick being selected before moving lever on joystick?*

YES - Go to next step.

NO - Only move the lever on the joystick forward or back after one of the buttons are engaged. If the lever on the joystick is moved without selecting one of buttons, full pressure hydraulic fluid circulated through the hydraulic block assembly.

STEP 2: *Is one function that is moving by itself consistently?*

YES - See "**ELECTRONIC PARTS GUIDE**", **PAGE 15** for test locations. Then follow directions:

PLACE FORKS FLAT ON GROUND

TURN ENGINE OFF & KEY IN "ON" POSITIO FOR THESE TESTS

Disconnect cables [D] & [E] and attach the 3-LED test light end of cable [D]

When no buttons are pressed, is one of the LED lights on?

YES - The orange relay is bad. Replace & retest.

NO- Go to next step.

STEP 3: *Move joystick lever forward and back, without pressing any buttons. Do one of the LED lights come on occasionally?*

YES - The joystick cable is shorting out, likely just under the handle. Repair cable or replace joystick and cable assembly.

NO - Go to next step.

STEP 4: *Identify specifically which item is moving when you are not selecting that button. Does this uncontrolled or undesired movement happen all the time?*

YES - Replace the appropriate pair of solenoids cartridge valves in the valve block which control this specific function.

NO - If this only happens very rarely, you may have dirt in your hydraulic system which is interfering with the solenoid valve closing and sealing properly. Be sure prior to connecting hydraulic fittings, that both ends are clean.

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TROUBLE SHOOTING (PAGE 25) SAS™ HYDRAULIC ADJUSTABLE

WARNING

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- ▶ Malfunctions of equipment can result in un-expected movements resulting from stored energy releases.
- ▶ Failure to follow safe procedures or practices can result in property damage, injury or death.

PROBLEM - The operator either cannot connect or disconnect the hydraulic quick disconnect fittings on the loader. The operator pushes real hard and the fittings still will not come off / on.

STEP 1: *Is the loader engine turned off?*

YES - Go-to next step.

NO - Turn off engine, and follow next step.

STEP 2: *Was the pressure released from the lines by:*

- A. Placing the Hydraulic Adjustable (H.A) flat on the ground. Set the parking brake on the loader.
- B. Position the “Blades”, “Front Carriage” and “Coupler” so they are centered and the H.A. gently resting on the ground.
- C. Shut off the engine of the loader and turn the key off.
- D. Turn the key to ‘on’ position (without starting engine) then move each hydraulic control lever forward and back a few times.
- E. Press each button on the joystick and move the joystick forward and back a few times.
- F. Turn off the key; then briefly move joystick forward and back.

Were the hydraulic line able to be either connected or disconnected (with gloves and safety glasses worn)?

YES - End.

NO - Go-to next step.

STEP 3: *Closely inspect the fittings. Do the fitting have a twist lock feature. (Common on Volvo machines for example)?*

YES - End.

NO - Go-to next step

STEP 4: *Closely inspect the fittings for damage or other reasons why they will not connect / disconnect. Try to resolve. Was the issue able to be resolved?*

YES - End.

No - Go-to next step

STEP 5: *Contact a local wheel loader or hydraulics service technician at your expense, or contact SAS™ with your H.A. serial # for technical support.*



LIMITED WARRANTY (PAGE 26)

SAS™ HYDRAULIC ADJUSTABLE

SAFETY

Buyer accepts the responsibility to (1) Ensure that all personnel that will use and/or work in the area of the purchased product will read the safety ID plate and the Operator Manual for machines equipped with SAS FORKS™ and the machine manufacturer's Operators Manual, prior to use; and (2) Ensure that all personnel follow the safety guidelines outlined on these materials.

S.A.S. OF LUXEMBURG, LTD. IS NOT RESPONSIBLE FOR SAFETY IN THE FIELD.

GOALS OF THE S.A.S. OF LUXEMBURG, LTD. LIMITED WARRANTY PROCEDURE

- ASSURE MINIMUM CUSTOMER DOWNTIME by resolving the problem correctly on a timely basis.
- ASSURE END-USER CONFIDENCE while maintaining an equitable warranty expense for both your company and SAS.
- PRODUCT IMPROVEMENT. We have an engineering staff ready to assist you. Call us at 1-877-SAS-FORK (1-877-727-3675)
Please call S.A.S. of Luxemburg, Ltd. (SAS™) before attempting any repair, modification, or questionable job applications.

LIMITED WARRANTY FOR SAS FORKS™

For products that SAS™ manufactures, SAS™ warrants that such products conform to all specifications for materials and workmanship for the period of time indicated below, after delivery, when used in compliance with the SAS FORKS™ Operator Manual.

<u>PRODUCT</u>	<u>LIMITED WARRANTY PERIOD</u>	<u>ITEM</u>	<u>COVERED</u>
HYDRAULIC ADJUSTABLE	1 year from original ship date	Carriage & Frame	Defects in materials & workmanship
HYDRAULIC ADJUSTABLE	90 days from original ship date	Hydraulic cylinders, controls, joystick	Defects in materials

No warranty on other products not listed above, unless otherwise specified on the face of the original invoice.

No warranty against abrasion wear, claw chip wear, fork tip damage, blade bending, fusable link, separation, bent fork mounting shafts, hoses, cables, or wires.

SAS™ does not warranty the products that it does not manufacture. Rather all warranties, if any, for these products are supplied by the manufacture. SELLER EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

CALL FOR WARRANTY CONSIDERATION:

To be considered for warranty repairs or replacement buyer must notify SAS™ of any warranty claim within 10 days after such claim arises, and prior to expiration of the warranty period and prior to the performance of any repairs being done, otherwise buyer waives all rights to such claim.

- Obtain the SAS™ Fork serial number & call SAS™ at 920-845-2198. Clearly describe the problem and the operation that was taking place when it occurred.
- Buyer is to return defective assembly, freight prepaid, or photographic evidence clearly showing the problem area and details of failure to SAS™ for review. When necessary, a factory representative may evaluate the problem in the field.

WHAT SAS WILL DO:

SAS™ will examine the defective product, and the details of the failure. If SAS™ determines that the failure of materials or workmanship was proven to be within the terms of this limited warranty, SAS™ will, at it's option, repair or replace, Freight On Board (FOB) to the factory, in Luxemburg, WI, USA, the defective product. If the product cannot be returned to the factory, SAS™ may approve field repair of defective product. SAS™ will approve an appropriate amount of hours and cost for the repair before authorizing repairs to begin. No provisions will be made for incidental damages, mileage, travel time, overtime, downtime, or special freight charges.

CONDITIONS THAT WILL VOID YOUR WARRANTY:

Failures, which in our determination were the result of:

- Improper installation.
- Misapplication - See SAS FORKS™ Operator Manual.
- Misuse or improper operation - See SAS FORKS™ Operator Manual.
- Exceeding the weight and/or lift limitation posted on the Identification Plate attached the SAS FORKS™.
- Negligence or failure to perform routine inspection and/or maintenance as outlined in the SAS FORKS™ Operator Manual.
- Unauthorized modification, welding, burning, grinding, installation of non-factory skid plates, etc. (other than specifically allowed in the SAS FORKS™ Operator Manual or as provided in a written authorization directly from SAS™ Factory Engineers.).
- Continued use after a malfunction of the hydraulic system in the forklift or loader.
- Accidental damage.

LIMITED WARRANTY REMEDIES:

Buyer must notify SAS™ of any warranty claim within 10 days after such claim arises; otherwise buyer waves all rights to such claim, unless agreed otherwise in writing. Buyer's sole remedy for breach of warranty is, at seller's option, the repair of the defect, or the providing of a replacement part FOB to seller's office. **Seller will not be responsible for costs of shipping, travel time, travel expense, dismantling or reassembling the product.** Further, seller will not be liable for any direct, indirect, consequential, incidental, or special damages arising out of a breach of warranty. These remedies are exclusive, and all other warranty remedies are excluded.

PROPRIETARY RIGHTS:

All designs and other proprietary rights provided by SAS™ to Buyer are to remain the property of SAS™, and Buyer shall honor all proprietary legends. Buyer agrees not to copy the design of SAS FORKS™ & SAS™ Hydraulic Adjustable or hire a third party to copy.

LIMITATION OF LIABILITY:

The seller's price is based on the enforceability of this limitation of liability, and the buyer understands that the price would be substantially higher without this limitation. Seller shall have no liability to buyer for lost profits or for special, consequential, exemplary, or incidental damages of any kind, whether arising in contract, tort, product-liability, or otherwise, even if advised of the potential damages in advance.

- In no event shall seller be liable to buyer for any damages whatsoever in excess of the contract price.
- In the event that any warranty or warranty remedy fails of its essential purpose, or is held to be invalid or unenforceable for any reason, in consideration of the other provisions of this agreement, the parties understand and agree that all limitations of liability under this provision will nevertheless remain in effect.

SEVERABILITY:

Any legally unenforceable provision may be severed from this agreement, and the remaining terms and conditions will be enforced as a whole.

SALES TERMS:

SAS FORKS™ SALES TERMS document is included as part of this document. See www.sasforks.com/SalesTerms.pdf