



SAS™ FORKS
SCORPION™
===== 30 SERIES =====
ENGINE PULLER
OPERATOR MANUAL
===== MANUAL v18 =====



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SAS™ SCORPION™ ENGINE PULLER

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LIMITED INTENDED USE OF THIS EQUIPMENT:

SAS SCORPION™ Engine Puller wheel loader attachment is designed break recyclable scrap materials from end of life cars and trucks. Materials removed from cars and trucks will be damaged. Some wheel loaders may require modification to pressures, valves, cylinders, or other modifications for installation and to operate in a desirable manner. This attachment is considered a non-OEM attachment and has not been approved by any specific excavator manufacturer. Customer is responsible to read the wheel loader's manual and warranty documents, if any, and identify any impact installation and use of this attachment may have on the wheel loader's warranty. Read this manual completely before installation or use.



INTRODUCTION LETTER (PAGE 3) **SAS™ SCORPION™ ENGINE PULLER**

TO THE OWNERS, MANAGERS, AND OPERATORS OF LOADERS EQUIPPED WITH SAS™ SCORPION™ & 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™ SCORPION™ ENGINE PULLER

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.



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.



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.



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.



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.



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.



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.



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.



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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! PROTECTIVE EQUIPMENT & CLEAR OPERATING SPACE RECOMMENDED



- Safety glasses with side shields
- Leather gloves
- Hard hat
- Fire extinguishing equipment
- Spill kit (i.e. 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 50 feet away from operating loader and Scorpion™ Engine Puller.



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.

! SITE PREPARATION RECOMMENDED



- Scorpion™ engine puller should only be used in areas that are equipped with proper fluid containment measures, to ensure capture and containment of residual fluids in accordance with any local, state, federal, building or environmental regulating body.
- No Smoking, Safety Glasses & Hard Hat required signage is recommended.

! VEHICLE PREPARATION PRIOR TO USING THE SCORPION™ ENGINE PULLER



- All batteries, mercury switches, air conditioning Freon, engine oil, transmission fluid, antifreeze and other fluids should be removed.
- Engines, transmissions, and other components will be damaged, and only be suitable for metals recycling, not as cores or resalable operable parts.



Vehicles contain several hazardous elements that pose explosion and fire hazards, such as electric batteries containing battery acid and gasoline. Be sure these are safely removed prior to using the engine puller. Failure to remove may result in explosion, fire hazard & injuries.

CE SPECIFIC NOTICES



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

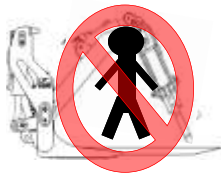
All three emergency stop options above ultimately stop the flow of hydraulic fluid.

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

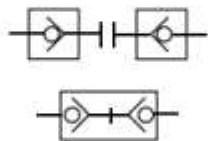
Hydraulics are a stored power source and as such must be treated as energized at all times. Be certain pressure has been relieved prior to handling, inspecting or performing maintenance on this unit. Follow lockout tag out procedures and release all stored energy before servicing equipment. Failure to 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.
- People should always stand 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 16](#), "DISCONNECTION" items [A] through [H].

The symbol at the left indicates hydraulic hose coupling quick release self sealing. It 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

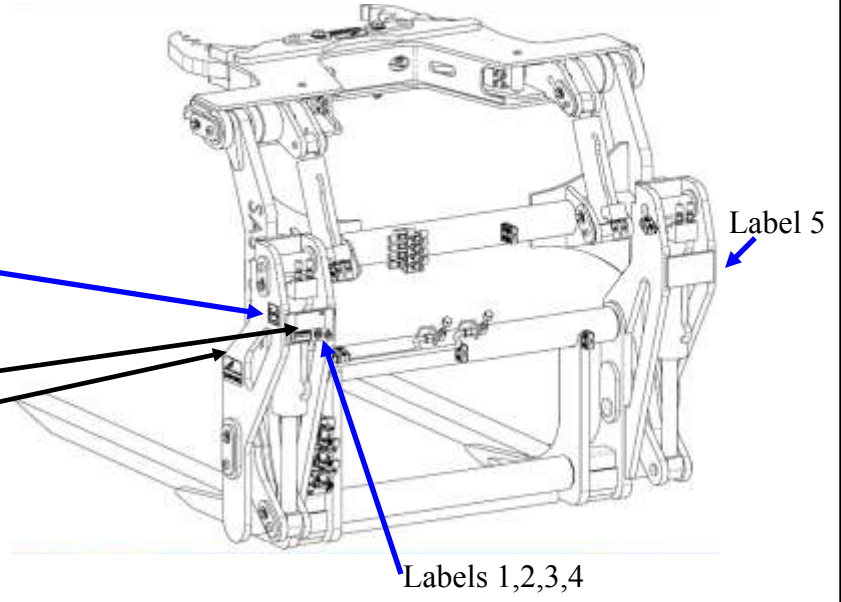
This equipment is best suited to operate in temperatures between 30°F to 90°F with minimum allowable temperature -25°F and maximum temperature 150°F



GENERAL SAFETY LABELING (PAGE 7)

SAS™ SCORPION™ ENGINE PULLER

CE SPECIFIC LABEL LOCATIONS



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



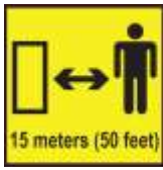
LABEL 2: HIGH PRESSURE HYDRAULICS
 Label reorder # W-LAB-PRES-503600



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-CE



LABEL 5: KEEP BACK 15 METERS (50 FEET)
 Label reorder # W-LAB-STAYBACK50FT

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INSTALLATION (PAGE 8) ADVANCE PREPARATION

TO HELP YOU GET UP AND RUNNING QUICKER WHEN YOUR SCORPION™ ARRIVES:

- Review this operator manual.
- Review your wheel loader manufacturer's manual & warranty document, if any.
Installation of this attachment may void machine manufacturer warranty, if any.
- If you've 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 Scorpion™:

- 7 Gallons of hydraulic fluid (specific for your machine)
- Locate area to mount control box or 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 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 will 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

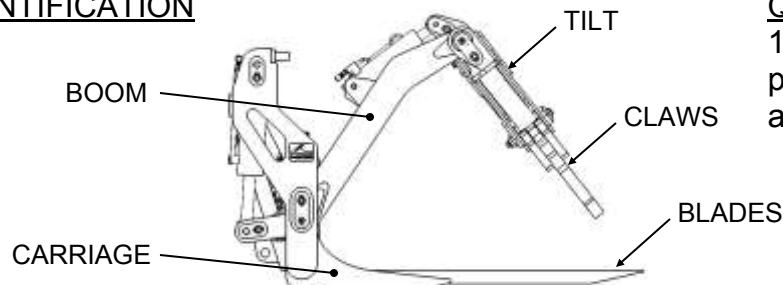
Service to do on your loader in advance:

- 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:

- At least (20) vehicles with fluids, AC Freon drained and batteries removed available.
- Designate an area (where it is safe to run the Scorpion™) and employee to operate unit.
- Your loader operator (person who can have conversation in English). Thank you.

COMPONENT IDENTIFICATION



QUESTIONS?

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INSTALLATION GUIDELINES (PAGE 9)

SAS™ SCORPION™ ENGINE PULLER

WARNING

- ▶ Installation of the Scorpion Engine Puller 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

NOTICE

Installation of purchased attachment may void machine manufacturer warranty, if any.

STEP 1 - CONTROL:

- Find a location to mount control module [A&B].
- The location should be accessible enough to get into the box 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 third function lever in cab.
- Remove current knob. Screw on new joystick with supplied adapter in the bottom of the joystick.
- Standard bushing 10mm x 1.25. Drill and tap bushing as needed if your thread requirements differ.
- Route wires to control module, avoid rubbing points.
- Connect to proper connection on side of control box.



STEP 3 - POWER CABLE:

- Locate 15 amp fused lead and connect a 24V power supply which energizes with ignition key and a good ground connection for control module [A&B]. Power & ground cable [A] is integrated with module [B].
- Units prior to 7/2012 power cable [A] was separate.

STEP 4 - ATTACH SCORPION™ TO WHEEL LOADER:

- **Quick Coupler Attachments:**
Be sure lower locking pins fully extend to lock in coupler & Scorpion™. 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 Scorpion™, insert and fasten pins in place. Apply ample grease to all pins.

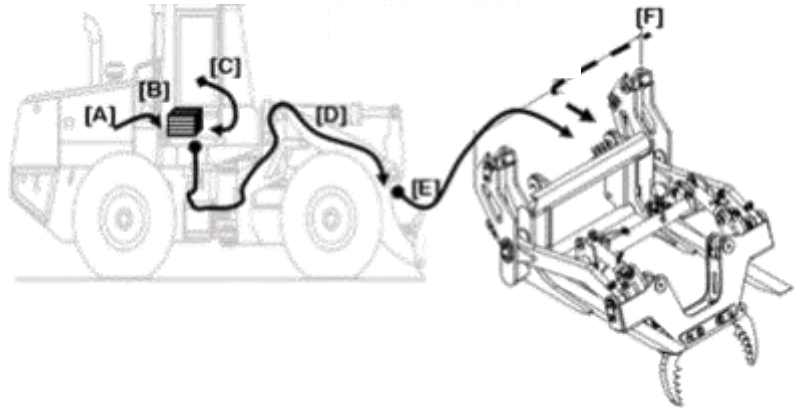
WARNING

Quick coupler locking pins are integral to the attachment of this unit to wheel loader vehicle. Verify the pins are locked in fully prior to lifting unit or using the Scorpion. Failing to verify proper engagement may cause the Scorpion™ Engine Puller falling off the loader resulting in property damage, injury or death.

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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.



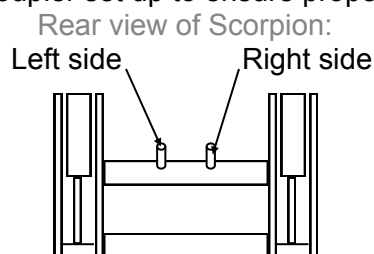
Protect the cable from rubbing on the edge of the hole, either install a rubber grommet or center the cable in the hole and fill around with silicone. Damage to wires can result in equipment failure leading to injury or property damage.

STEP 6 - IDENTIFY PRESSURE SIDE LINE ON LOADER:

- **Pull joystick lever back** briefly. You will see one of the lines move, or have someone **wearing safety glasses & leather gloves** hold the line to feel the pressure build. Label this line "Boom Lift Pressure".

STEP 7 - HYDRAULIC LINES:

- Determine adequate length of lines needed from existing third function connections on loader arms to bulkhead lines on Scorpion™.
- To decide length of line; raise unit, tilt unit full down; then measure distance required from bulkhead on Scorpion™ to loader connection. Make a loop in line to have sufficient length in hose to avoid creating tension in all positions.
- Use 4,000 PSI minimum hoses & high volume, heavy duty self sealing hydraulic quick coupler fittings on machine & 3/4" (#12) male JIC fittings to Scorpion™.
- Attach the line (labeled "Boom Lift Pressure" from STEP 6 above) which is pressurized when the joystick is pulled back to the **LEFT #12 JIC** bulkhead fitting on the Scorpion™. Clearly mark lines or use opposite quick coupler set up to ensure proper re-connection after disconnected.



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SAS™ SCORPION™ ENGINE PULLER HYDRAULIC FITTING

PROPER ALIGNMENT OF HOSE TO ENSURE STRAIGHT FITTING WILL PROMOTE LONG LIFE:

- Read the Scorpion™ operator manual. Wear safety glasses and gloves.
- Follow ‘DISCONNECTING’ instructions on PAGE 9 of the manual to safely park Scorpion™ & depressurize system.
- **Goal is to align the hoses coming from the Scorpion™ carriage toward the wheel loader at an angle that allows the hydraulic quick coupler fittings to align squarely, eliminating side pressure (side tension on the hose connection is undesirable).**

1. Note the position of any brackets which hold fittings.
2. Loosely attach hoses to the carriage and the loader mount.
3. Fit the hydraulic quick coupler fittings together.
4. Adjust either or both of these to allow good fit:
 - a. Reposition mounting bracket (1) which is fastened to the back of coupler up or down
And / Or
 - b. Loosen nut(s) (4) fastening the stainless steel line (only 1 turn) to 90 degree fitting on carriage
 - c. Loosen lock nut on 90° fitting (5) to carriage
 - d. Reposition the angle of the fitting to allow the hose to smoothly transition from the Scorpion™ to the fitting on the black bracket RESULTING IN A STRAIGHT ON ALIGNED CONNECTION OF THE HYDRAULIC QUICK COUPLER FITTINGS.



5. Tighten lock nut(s) (5) on 90 degree fitting on carriage
6. Tighten the nut(s) (4) fastening stainless steel line
7. Tighten all hose connections.
8. If equipped, secure black locking ring on hydraulic quick coupler fittings.

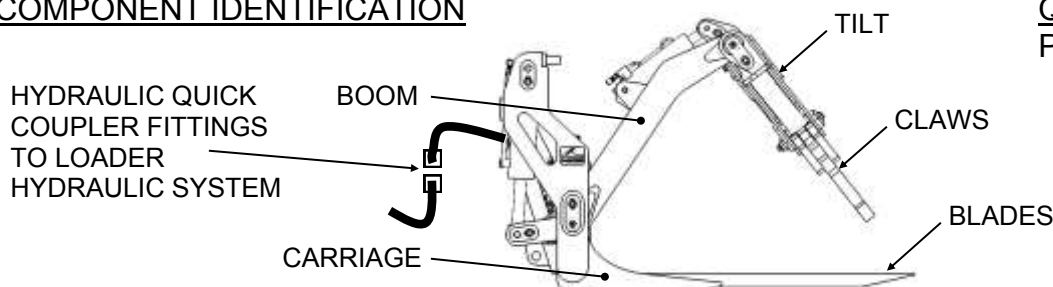


This equipment is operated by high pressure hydraulics. Hydraulics are a stored power source and as such must be treated as energized at all times. Be certain pressure has been relieved prior to handling, inspecting or performing maintenance on this unit. Follow lockout tag out procedures and release 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.

IMPROPER INSTALLATION & ALIGNMENT WILL CAUSE DAMAGE TO FITTINGS

- Misalignment may cause undue side pressure on the fittings.
- Failing to secure the black ring lock may cause the fitting to not be secure.
- Internal ball bearing parts may break out, fitting may fail and become disconnected.
- This condition will not be warranted.

COMPONENT IDENTIFICATION



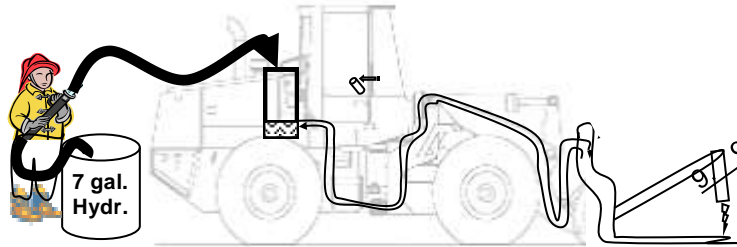
QUESTIONS?

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STEP 8 - HYDRAULIC FLUID LEVEL:



- You will need to add 7 gallons 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 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 Scorpion™ 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:

- Engage button or trigger before moving joystick.
 - => Left button depressed: Pull back joystick to lift the "BOOM".
Push forward on joystick to lower the "BOOM".
 - => Right button depressed: Pull back joystick to swing "TILT" away from loader.
Push forward joystick to swing "TILT" towards loader.
 - => Trigger button depressed: Pull back joystick to squeeze "CLAWS" together.
Push forward on joystick to open "CLAWS".

If functions operate backwards switch main hydraulic lines from loader.



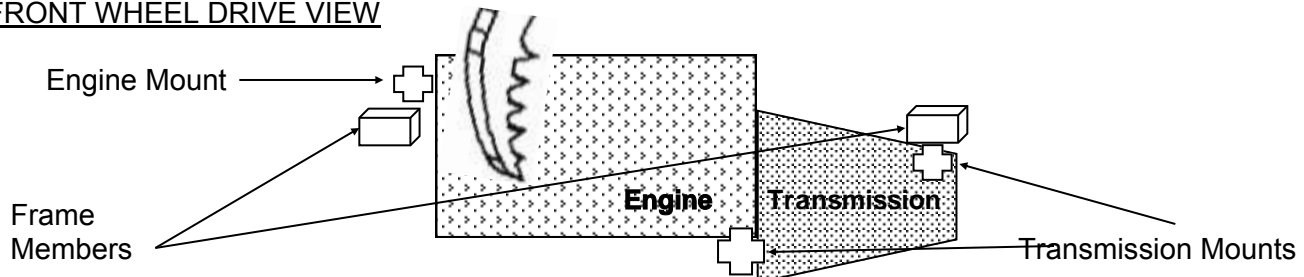
PULLING ENGINES (PAGE 14)

SAS™ SCORPION™ ENGINE PULLER

OPERATING PROCEDURE

- A. When tipping the forks up (roll back), tips down (dump), it is best to avoid unnecessarily bottoming out the stops to avoid possible damage to the stops, lift arms, or hydraulic cylinders. Always slow the movements when nearing a stop, including when raising the Scorpion™ “Boom” to fully raised position.
- B. Approach the vehicle;
 1. Front wheel drive vehicles: Approach from the side of the timing belt, opposite the transmission, typically passenger side.
 2. Rear wheel drive vehicles: Approach directly from the front.
- C. Position and set the forks down...
 1. Front wheel drive: Place fork on top of fire wall (cowl) and other fork over the radiator support, positioning the forks to allow you best visibility of the “Claws”.
 2. Rear wheel drive: Place forks on top of both fenders, positioning forks to allow you best visibility of the “Claws”.
- D. Squeeze the trigger and reposition the “Claws” so they will clear the middle of the forks as they are lowered into the engine compartment.
- E. Press the right button, move the joystick forward and move the “Tilt” about 1/2 way out. Reposition joystick to neutral and release the button.
- F. Press the left button, move the joystick forward and lower the “Boom” down, positioning the “Claws” low on the engine block, on the end of the engine block farthest away from the transmission. Don't go too low that the “Claws” grab the frame.
- G. Squeeze trigger, move joystick backwards, causing “Claws” to grab engine block.
- H. While continuing to hold the trigger and the joystick back, press the left button to cause the “Boom” to lift the engine out. This should break the passenger side mounts, then the center mounts, pulling the engine up, and begin to lift the transmission clear of the frame member. When lifted to maximum height, continue to hold the joystick back and holding the trigger. Only release the button. (Watch the front of the car, if the entire car is pulling up, you have caught the frame with the “Claws”, reposition the “Claws” and try again.
- I. Continuing to hold trigger & joystick back, now also press the right button to lift the “Tilt”. This will provide additional lift height to clear the transmission out vehicle.
- J. Transport the engine in the “Claws” to the desired location to deposit the engine and transmission, then press the left button and move the joystick forward to lower the “Boom”. Then squeeze the trigger and move the joystick forward to open the “Claws” and release the engine and transmission. Be cautious not to open the “Claws” to far that they hit the forks.

FRONT WHEEL DRIVE VIEW



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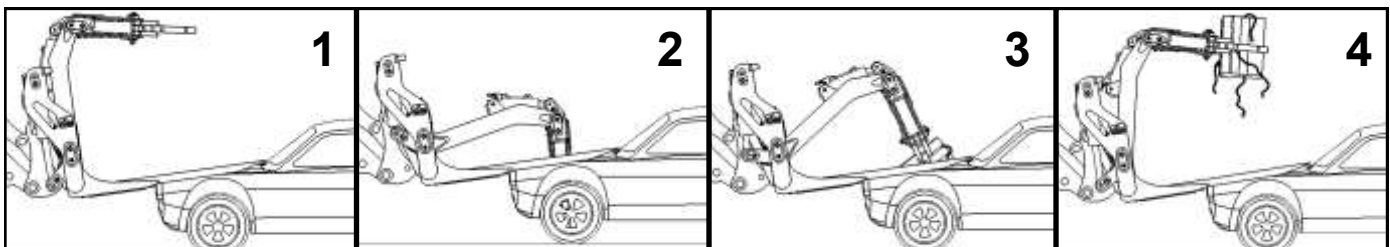
PULLING ENGINES (PAGE 15)

SAS™ SCORPION™ ENGINE PULLER

SAS™ SCORPION™ ENGINE PULLER USE

PROPER USE OF THE SCORPION ENGINE PULLER WILL ENSURE LONG LIFE:

- Read your manual
- Grease daily
- Method of proper use is covered on page 10 of the manual. This is a 4 step summary:
 1. Always lower & set blades on top of car, securing car firmly to ground, position the claws (to clear blades) & position the tilt about 1/2 way out. (Tilt straight down off boom)
 2. Lower the boom, allowing the claws to penetrate the engine compartment.
 3. Securely clamp claws on engine.

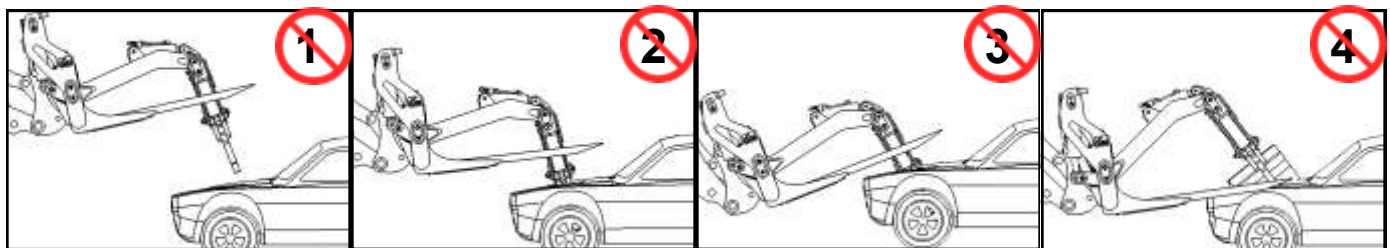


! Failure to follow proper instructions or using Scorpion™ for any other purpose will void warranty.

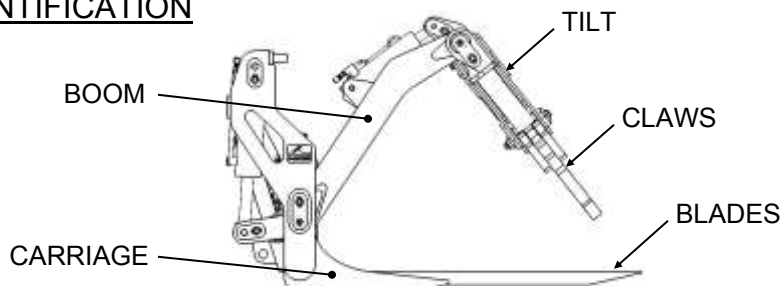
IMPROPER USE WILL CAUSE DAMAGE AND POTENTIAL CRACKING OF THE SCORPION™

- **To prevent damage or potential personal injury avoid the following actions:**
- An example of improper use:
 - ① Lowering the boom, extending tilt fully forward & opening claws before approaching car.
 - ② Dropping the Scorpion™ down onto the car with the claws below the fork blades.
 - ③ Clamping on engine & extracting without the blades securely holding down the car down.
 - ④ Having the blades come in contact with car before engine is disengaged.

! These operations will cause stress & cracking of the tilt assembly resulting in equipment dam-



COMPONENT IDENTIFICATION



. Check for leaks. Repair as needed.

S.A.S. of Luxemburg, LLC, 133 Center Drive Hwy 54, PO Box 260, Luxemburg, WI 54217 USA
 Phone: 920-845-2198 • 1-877-SAS-FORK • Fax: 920-845-2309 • Web: www.sasforks.com



CONNECTING / DISCONNECTING (PAGE 16)

SAS™ SCORPION™ ENGINE PULLER

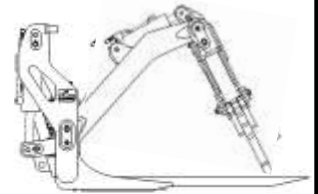
WARNING

- ▶ 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 procedures to prevent operation of equipment while servicing.

DISCONNECTING

When disconnecting from Scorpion™ Engine Puller:

- A. Set Scorpion down to position the blades flat on level ground.
- B. Raise the “boom”, then raise the “tilt”, then open the “claws”, gently lower the boom to allow the “claws” to touch the ground or blades. Avoid applying any down pressure. This position with the boom lowered and the tilt extended will allow weight to be balanced forward enough on the blades so the Scorpion™ will be stable.
- C. Set the loader’s parking brake.
- D. Turn off the loader.
- E. Turn the key of the loader back on without starting the engine.
- F. 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.
- G. Turn the key back off and remove hydraulic lines & control cable.
- H. 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.
- I. 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 Scorpion™ hydraulics and may cause catastrophic failure of the wheel loader’s hydraulic pump.

CONNECTING

To re-connect to the Scorpion™ Engine Puller:

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

Always select and engage a button or trigger before moving the joystick.

- => Left button depressed: Pull back joystick to lift the “BOOM”.
Push forward on joystick to lower the “BOOM”.
- => Right button depressed: Pull back joystick to swing “TILT” away from loader.
Push forward joystick to swing “TILT” towards loader.
- => Trigger button depressed: Pull back joystick to squeeze “CLAWS” together.
Push forward on joystick to open “CLAWS”.

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

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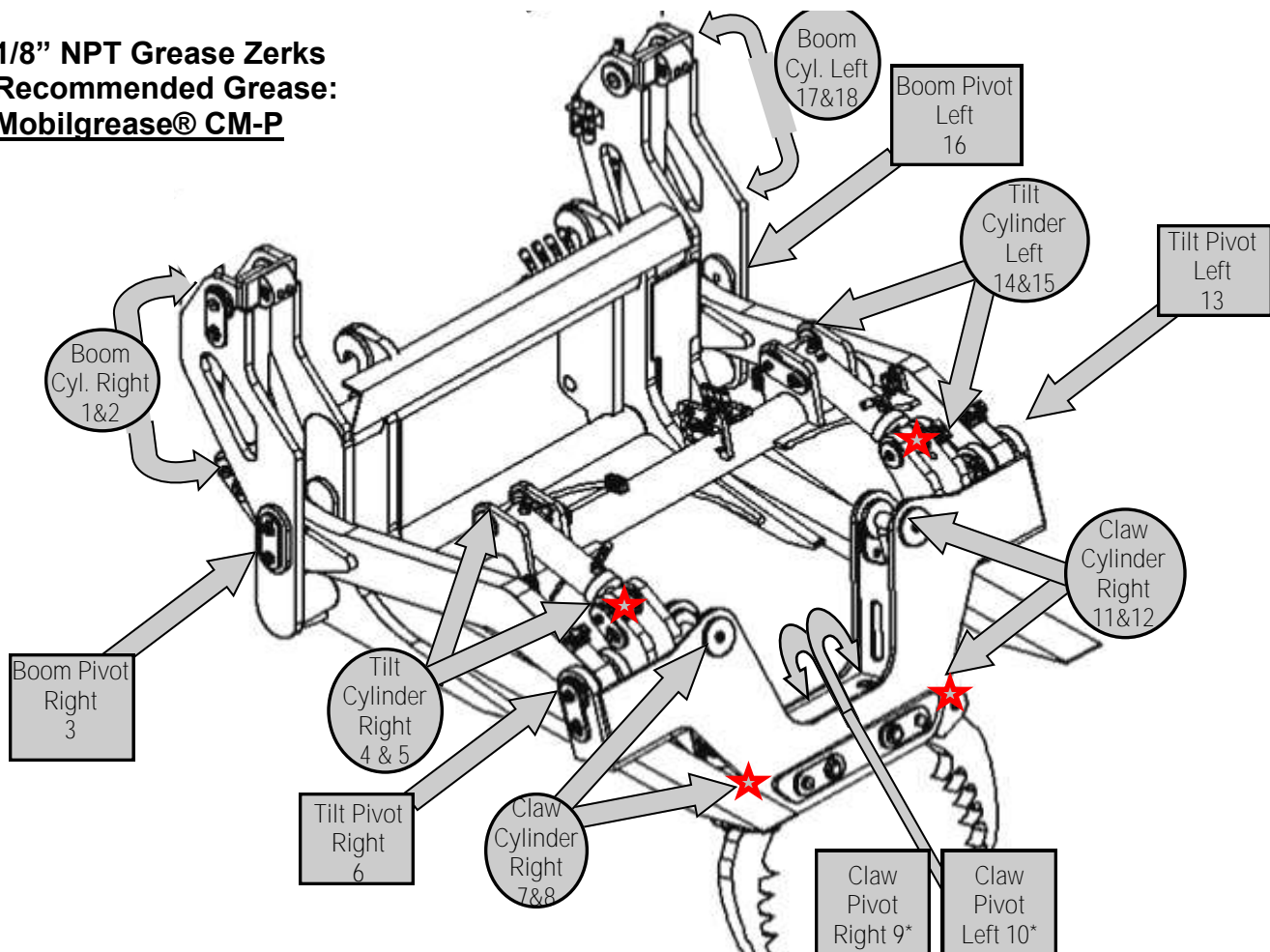
PREVENTIVE MAINTENANCE (PAGE 17)

SAS™ SCORPION™ ENGINE PULLER

⚠ 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.

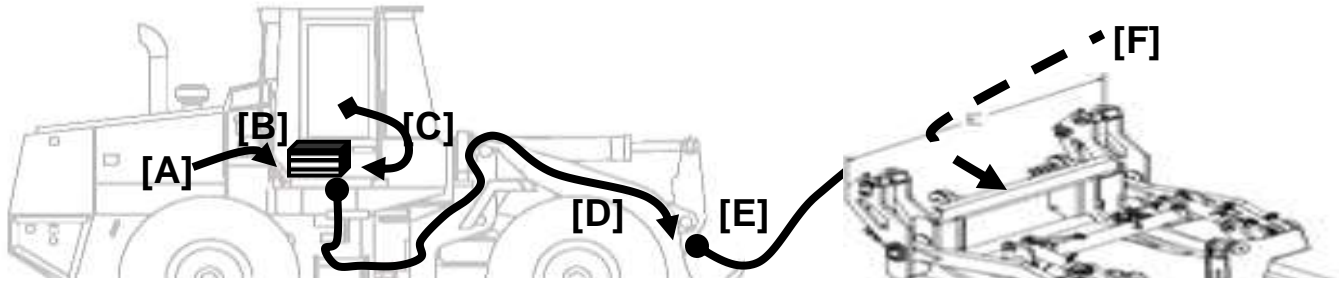
- A. Daily: Grease all 18 points; with particular attention to Boom pivot points & cylinders.
 - Cylinder Grease Points
 - Pivot Point Grease Points
- B. Daily: Inspect all pivot point pins and retaining bolts to be sure properly secured.
- C. Daily: Visually inspect pins and spacers
 - ★ Spacers equally center cylinder between mount ears (See detail on page 23)
- D. Daily: Inspect forks, carriage, and Scorpion™ framework for damage.
- E. Daily: Check loader hydraulic fluid level. Add fluid as required to maintain proper level.
- F. Weekly: Inspect hose fittings to be sure they are tight.
- G. Weekly: Inspect hoses for pinching or rubbing and correct or replace as needed.
- H. Monthly: Inspect skid plates under the carriage.

1/8" NPT Grease Zerk
Recommended Grease:
Mobilgrease® CM-P



*Claw Pivot grease zerks can be reached through round holes when claws are all the way apart.

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DESCRIPTION

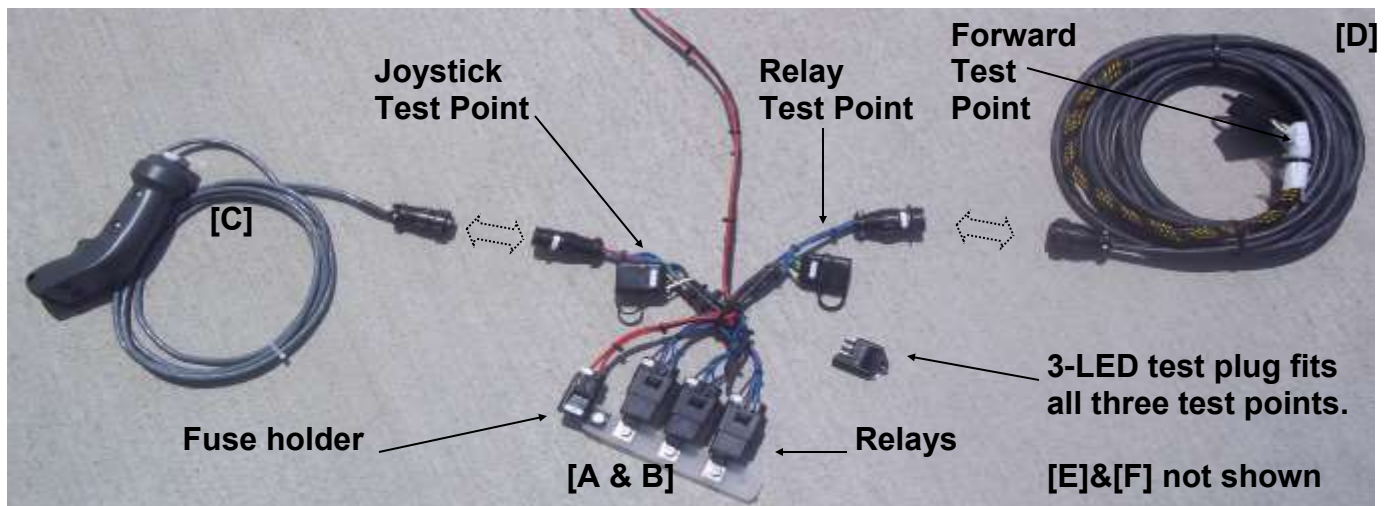
PART NUMBER

[...] COMPLETE ELECTRICAL KIT

DUAL HYDRAULIC BLOCK S/N F5172 & NEWER (A,B,C,D,E,F) 24 V...HC-KIT-S-24-1-20
 SINGLE HYDRAULIC BLOCK ELECTRICAL KIT:

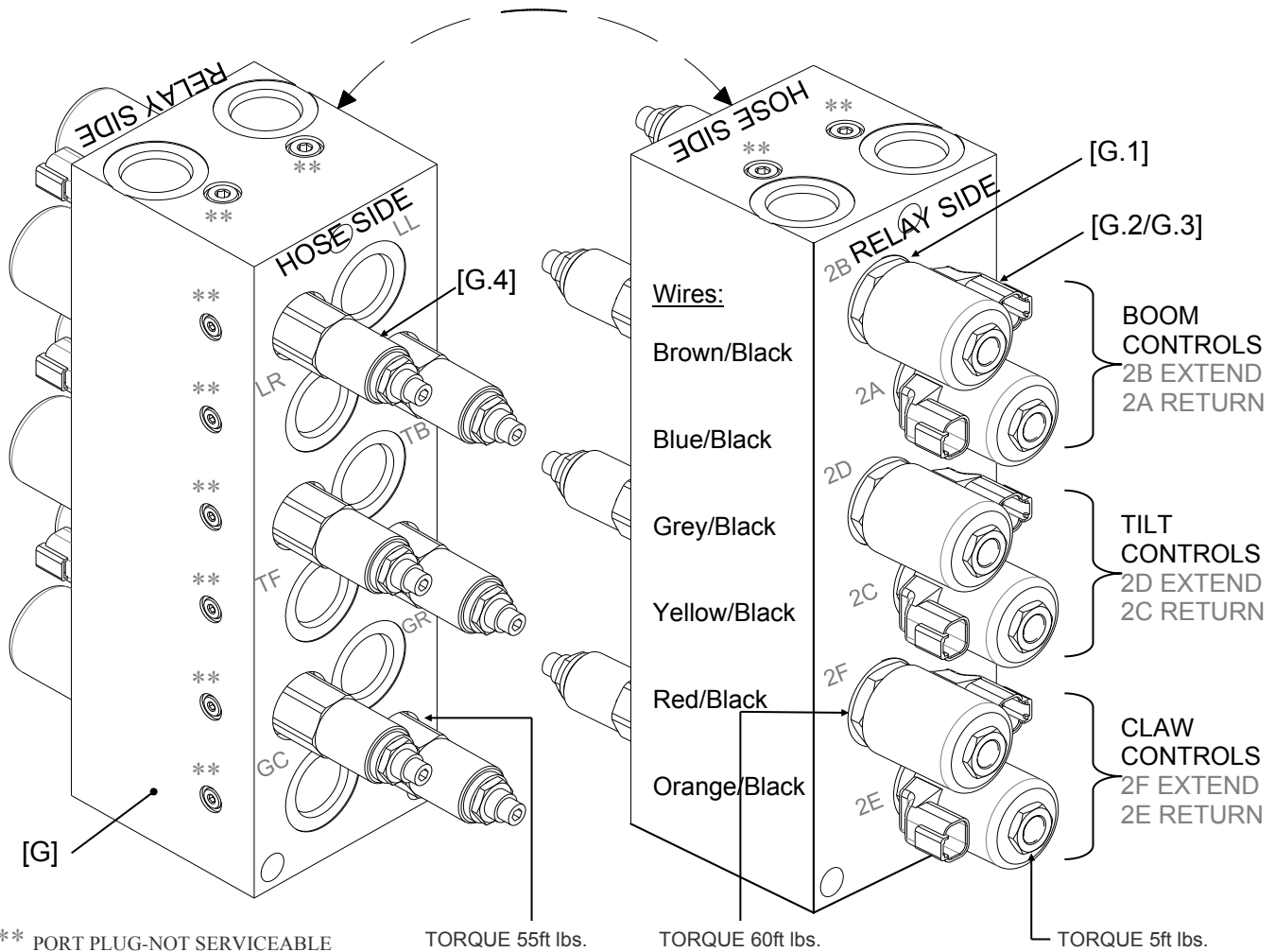
S/N 5171 & OLDER STANDARD KIT(A,B,C,D,E,F) 24V HC-KIT-S-24-1-30
 S/N 5171 & OLDER SPECIAL ORDER VOL. L90 (A,B,C,D,E) 24V HC-KIT-S-PCKNPL-30

[A&B]	CONTROL MODULE W/LOCAL TEST & 2' PWR WIRE	HC-MOD-S-21478
B.1	RELAY 24 VOLT (BLACK) S/N:F4655 & NEWER (3 REQ.)	HC-BRL-H-4RD933332
B.2	15 AMP FUSE (TYPICAL AUTOMOTIVE STYLE FUSE) (1 REQ.)	HC-FUS-...-ATC15
A	POWER SUPPLY CABLE (F4647 & 7/12 EARLIER) (1 REQ.)	HC-CAB-S-50265
B	CONTROL BOX ASSEMBLY (F4647 & 7/12 EARLIER) (1 REQ.)	HC-BOX-S-50267-1
B	CONTROL (ALUM PLATE W/ORANGE RELAYS L90 SPECIAL) (1 REQ.)	HC-PANEL-S-01 [PCKNPL]
B.1	RELAY 24 VOLT (ORANGE) (F4097-F4647) (3 REQ.)	HC-BRL-S-RT314024
B.1	RELAY 24 VOLT (BLUE) (UP TO F4026) (3 REQ.)	HC-BRL-I-50264
[C]	JOYSTICK & 10' CABLE ASSEMBLY W/PLUG	HC-JYA-S-50270
	JOYSTICKS DIFFERENT THAN PHOTO BELOW REQUIRE SPECIAL #	HC-JYA-_____
[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
	[E] OPTION: NO JUMPER CABLE ON PCKNPL KITS	N/A
[F]	VALVE BLOCK CABLE WITH BULKHEAD & COIL PLUGS	
	DUAL HYDRAULIC BLOCKS S/N 5172 & NEWER ...(Req. Jumper)....	HC-CAB-S-50276
	SINGLE HYDR. BLOCK 32" STANDARD CABLE SC30 S/N 5171 & OLDER	HC-CAB-S-50272
	SINGLE HYDR. BLOCK 48" SPECIAL L90 CABLE (TYPE W/O JUMP CABLE)	HC-CAB-S-PCKNPL-48IN
<u>TEST LIGHTS:</u>	1-LED CIRCUIT TESTER FOR WIRE "F" AT HYDRAULIC BLOCK	HC-PLG-I-TESTLIGHT-1
	3-LED CIRCUIT TESTER FOR "Test Points" SHOWN BELOW	HC-PLG-I-TESTLIGHT-3



SINGLE VALVE BLOCK PARTS GUIDE (PAGE 19)

SAS™ SCORPION™ 30 BEFORE S/N F5171



** PORT PLUG-NOT SERVICEABLE
DESCRIPTION

[F] SINGLE HYDR. BLOCK 32" STANDARD CABLE SC30 S/N 5171 & OLDER
SINGLE HYDR. BLOCK 48" SPECIAL L90 CABLE (TYPE W/O JUMP CABLE)

[G] **HYDRAULIC VALVE BLOCK ASSY W/VALVES, COILS & PSI REL.**

- G.1 CARTRIDGE VALVE (SCREWS IN BLOCK)(6 REQ.)
O-RING SIZE: SAE # 12—O-RING KIT (1 big & 1 small, 2 split)
VALVE INSTALLATION: 1-1/4" WRENCH, TORQUE 60 FT LBS
- G.2 ELECTRIC COIL 24 VOLT STANDARD (6 REQ.)
COIL INSTALLATION: 7/8" WRENCH, TORQUE 6 FT LBS
- G.3 ELECTRIC COIL 12 VOLT OPTIONAL (6 REQ.)
- G.4 PRESSURE RELIEF CARTRIDGE (6 REQ.)
O-RING SIZE: SAE # 10—O-RING (1 big, 1 small, 2 split)
RELIEF CARTRIDGE INSTALLATION: TORQUE 55 FT LBS

PART NUMBER
HC-CAB-S-50272
HC-CAB-S-PCKNPL-48IN
HV-BLK-S-FV9537-V3 (QTY 1)
HV-CRT-V-SBV1112VC00
HV-ORG-SA-5940
HV-COL-V-300AA00142A
HV-COL-V-300AA00141A
HV-REL-P-RDH103S50V
HV-ORG-SA-5941
HV-PLG-E-22S-S02V (6 REQ)
HV-PLG-E-22S-S04V (6 REQ)

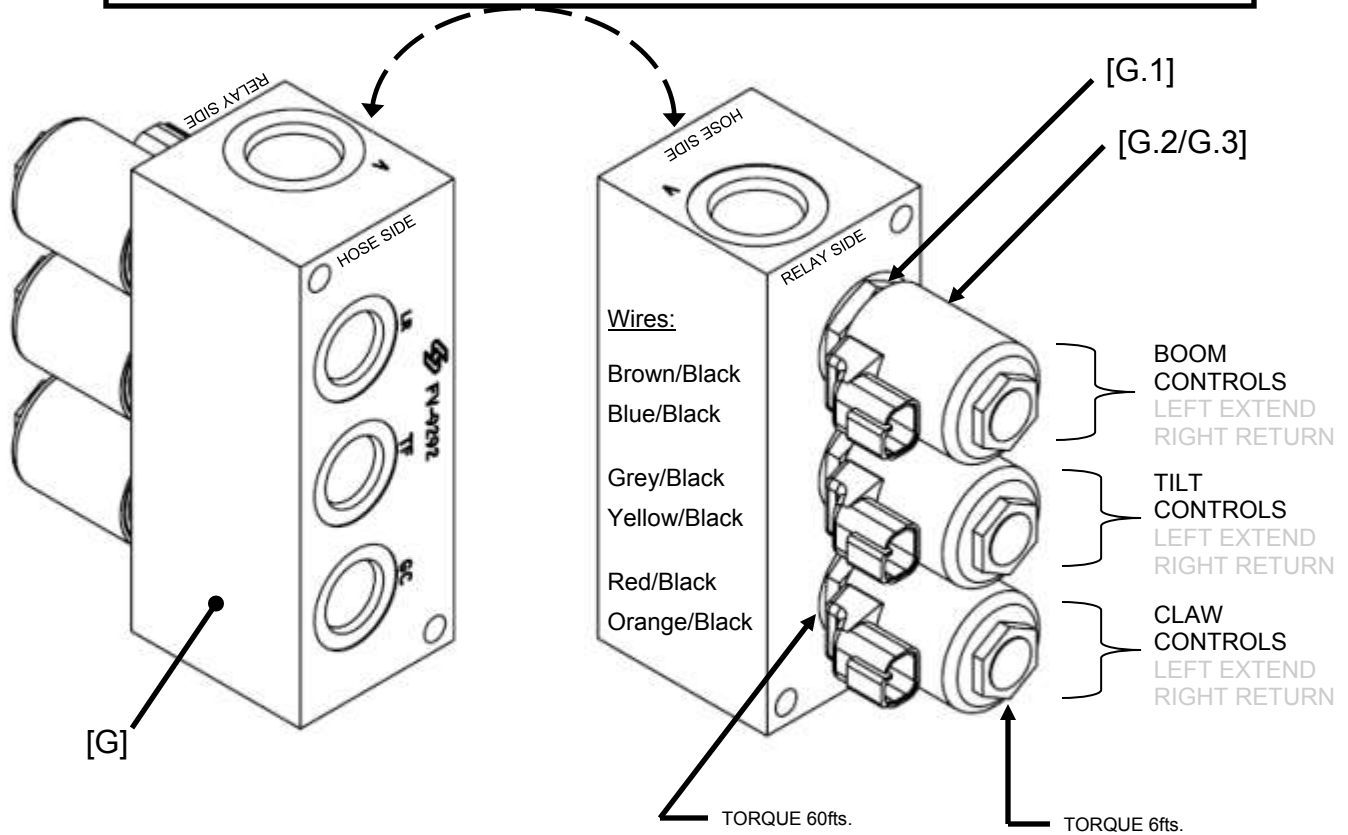
**Side port plug: SAE-2 with o-ring. *Must Hammer out to remove.* Req.107 IN-LBS torque
 **Top port plug : SAE-4 with o-ring. *Must Hammer out to remove.* Req. 54 IN-LBS torque

EARLY BUILT SCORPIONS PRIOR TO 7/2010 (WITH NON-PRESSURE RELIEF TYPE BLOCKS)		
G.1.1 CARTRIDGE VALVE (SCREWS INTO BLOCK)	(6 REQ)	HV-CRT-P-GS068100N
G.2.1 ELECTRIC COIL 24 VOLT STANDARD	(6 REQ)	HV-COL-P-CCP024H
G.3.1 ELECTRIC COIL 12 VOLT OPTIONAL	(6 REQ)	HV-COL-P-CCP012H



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

DUAL HYDRAULIC VALVE BLOCK UNITS HAVE TWO OF THE HYDRAULIC BLOCKS SHOWN BELOW. EACH IS WIRED AND OPERATES TOGETHER.

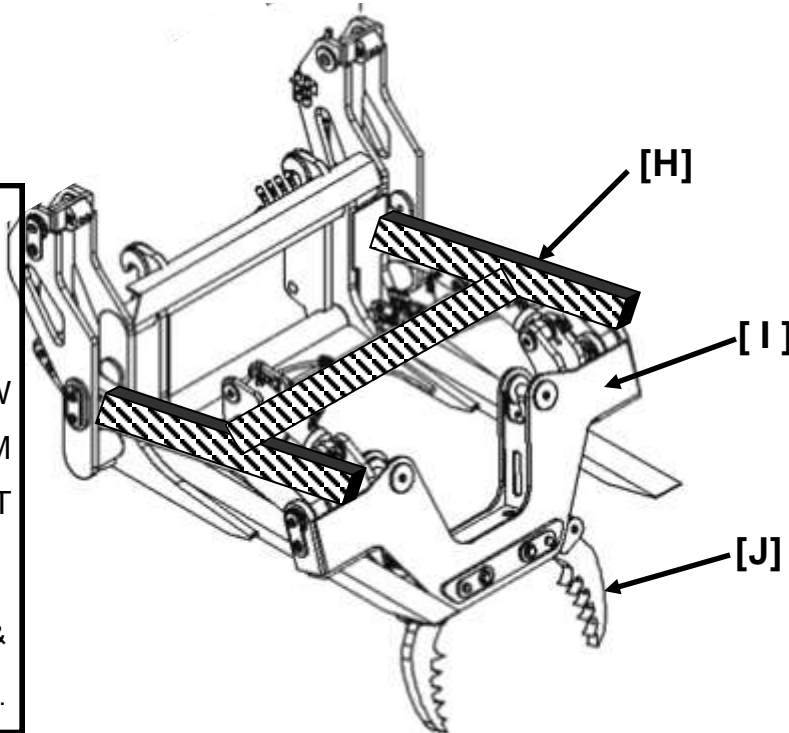


DESCRIPTION	PART NUMBER
[F] DUAL HYDR. VALVE BLOCK SPLIT CABLE WITH BULKHEAD & COIL PLUGS S/N 5172 & NEWER	HC-CAB-S-50276
[G] HYDRAULIC VALVE BLOCK ASSEMBLY	HV-BLK-S-FV9292 (QTY 2)
G.1 CARTRIDGE VALVE (SCREWS IN BLOCK)(6 REQ.)	HV-CRT-V-SBV1112VC00
O-RING SIZE: SAE # 12—O-RING KIT (1 big & 1 small, 2 split)	HV-ORG-SA-5940
VALVE INSTALLATION NOTE: REQUIRES 1-1/4" WRENCH, TORQUE TO 60 FT LBS	
G.2 ELECTRIC COIL 24 VOLT STANDARD (6 REQ.)	HV-COL-V-300AA00142A
COIL INSTALLATION NOTE: REQUIRES 7/8" WRENCH, TORQUE TO 6 FT LBS	
G.3 ELECTRIC COIL 12 VOLT OPTION (6 REQ.)	HV-COL-V-300AA00141A

[G] UNASSIGNED



System may have stored hydraulic pressure. Disassembly of any hydraulic part, cartridge valve, coil, pressure relief valve or hose may result in sudden release of hydraulic fluid and may result in boom or tilt unexpected movement. Avoid this fluid or pinch hazard, only qualified personnel ship service this unit. Boom & tilt should be lowered to the ground & secured.



CAT924K, 930K, 938K
WITH JOYSTICK:
HC-JYA-C-356-5206
(forward button)



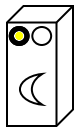
CLAW
BOOM
TILT

(rear button)
To operate:
Press & hold desired button &
rock 3rd spool rocker switch
Stop: release rocker & button.

DESCRIPTION
PART NUMBER

[H] BOOM

MOVEMENT OF BOOM:

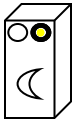


PRESS LEFT BUTTON ON JOYSTICK
>PULL BACK ON JOYSTICK RAISES BOOM
<PUSH FORWARD ON JOYSTICK LOWERS BOOM

EP-SC-30-BOOM-01

[I] TILT

MOVEMENT OF TILT:

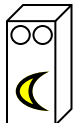


PRESS RIGHT BUTTON ON JOYSTICK
<PULL BACK ON JOYSTICK, TILT SWINGS OUT AWAY FROM LOADER
>PUSH FORWARD ON JOYSTICK, TILT SWINGS TOWARD LOADER

EP-SC-30-TILT-01

[J] CLAW (TWO REQUIRED)

MOVEMENT OF CLAWS:



SQUEEZE JOYSTICK TRIGGER
<PULL BACK ON JOYSTICK; CLAWS WILL PINCH TOGETHER
>PUSH FORWARD ON JOYSTICK; CLAWS WILL MOVE APART

EP-SC-30-CLAW-01

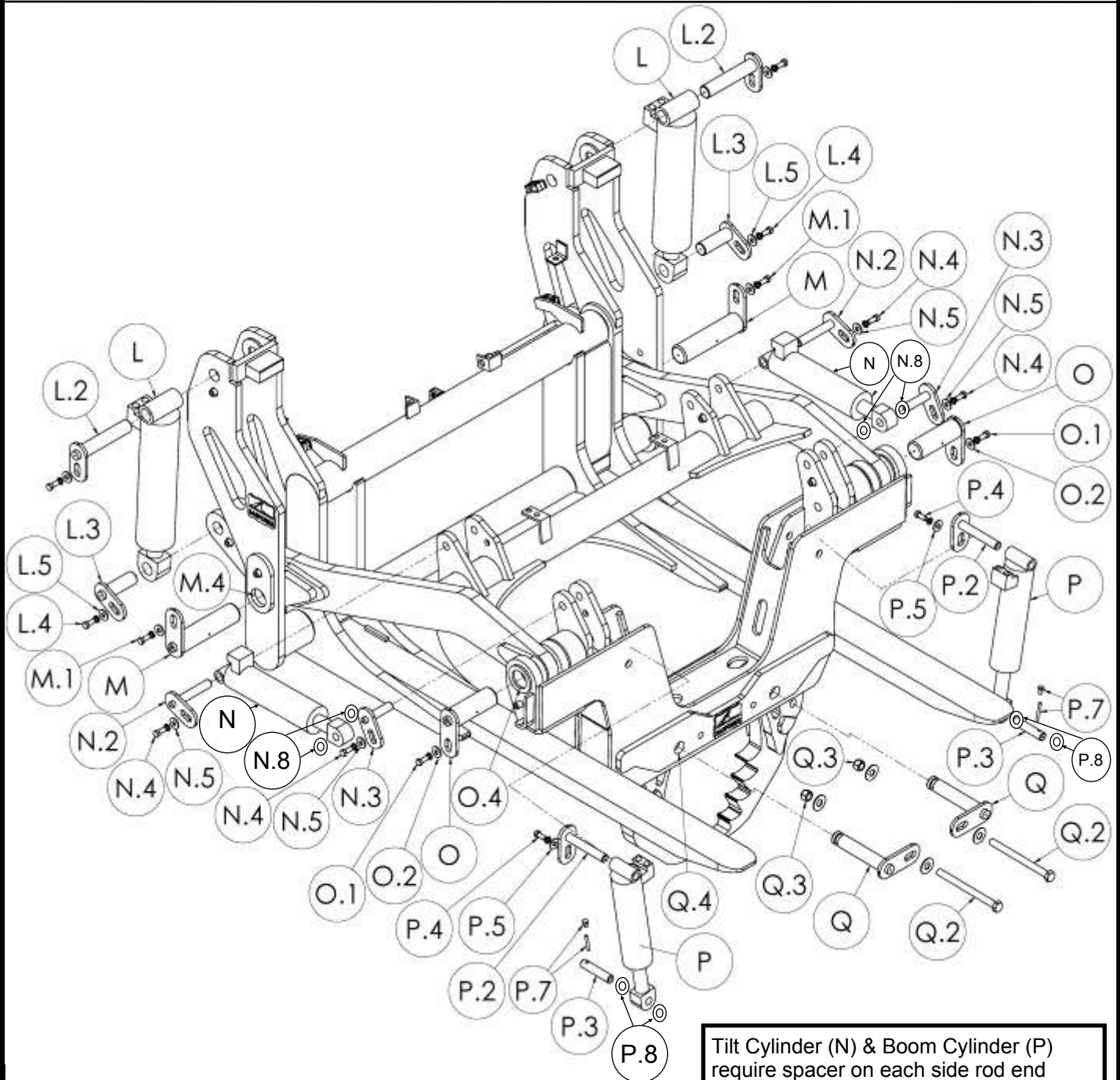
[K] UNASSIGNED



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. Failure to stay clear and avoid all pinch points could result in serious injury or death.

CYLINDER & PIN DIAGRAM (PAGE 22)

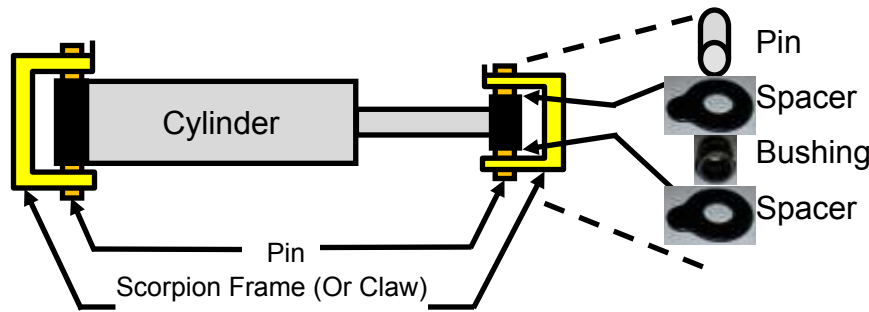
SAS™ SCORPION™ 30 ENGINE PULLER



Tilt Cylinder (N) & Boom Cylinder (P) require spacer on each side rod end to equally center cylinder rod between Scorpion Frame (Or Claw) mount.

If ordering N3 (PIN), may also need:
 N6 (QTY 1: BUSHING)
 N4, N5a, N5b (QTY 1: Ea.BOLT)
 N8 (QTY 2: SPACERS)

If ordering P3 (PIN), may also need:
 P6 (QTY 1: BUSHING)
 P7 (QTY 1: BOLT-PIN COMBO)
 P8 (QTY 2: SPACERS)





CYLINDER & PIN PARTS LIST (PAGE 23)

SAS™ SCORPION™ 30 ENGINE PULLER

DESCRIPTION	SHIP WT	QTY	SAS BW PART NUMBER
[L] BOOM LIFT CYLINDER	115#	2	HY-CYL-5.0X16.25-4K
L.1 SEAL KIT, INTERNAL END CAP, STAMPED 319-117,AFTER 2010		2	HK-5.00-203-871
SEAL KIT, EXTERNAL END CAP.....BEFORE 2009		2	HK-5.00-M-DA500250RP
L.2 UPPER PIN (BASE END OF BOOM CYLINDER)		2	1310CARRIAGE-3453ASY
UPPER PIN (BASE END BOOM CYLINDER) F3775 & EARLIER		2	1310CARRIAGE-ASY-R1
L.3 LOWER PIN (ROD END ON BOOM CYLINDER)		2	1308BOOM-3453 ASY
L.3a BUSHING FOR LOWER PIN (ROD END ON BOOM CYL)		2	W-B2.000X2.500X1.750
L.3b GREASE SEAL WIPER BY BUSHING (ROD END ON BOOM CYL)		4	W-WIPER-2.0X2.5
L.4 RETAINER BOLT BOOM CYL PINS (SAME UPPER & LOWER)		4	WBOLT 0.625X1.50 GR8
L.5a FLAT WASHER FOR RETAINER BOLT		4	WASHER-F 0.625 GR8
L.5b LOCK WASHER FOR RETAINER BOLT		4	WASHER-L 0.625 GR8
L.5c PIN-LOCK SPACER FOR RETAINER BOLT		4	SPACER-0625-0000
[M] MAIN BOOM PIVOT PIN		2	1311CARRIAGE-3453ASY
M.1 RETAINER BOLT FOR BOOM PIVOT PIN		2	WBOLT 0.625X1.50 GR8
M.1a FLAT WASHER FOR RETAINER BOLT		2	WASHER-F 0.625 GR8
M.1b LOCK WASHER FOR RETAINER BOLT		2	WASHER-L 0.625 GR8
M.1c PIN-LOCK SPACER FOR RETAINER BOLT		2	SPACER-0625-0000
M.4 BOOM PIVOT BUSHING		2	W-B3.002X3.750X5.500
[N] TILT CYLINDER	60#		CHOOSE CORRECT CYLINDER:
S/N 5499 & LOWER (1.25" DIA PIN)		2	HY-CYL-4.0X10.25-125
S/N 5500 & HIGHER (1.75" DIA PIN)		2	HY-CYL-4.0X10.25-175
N.1 SEAL KIT (IDENTIFY CYLINDER TO SELECT CORRECT SEALS)			
INTERNAL END CAP, STAMPED BM320-544, AFTER 2010		1/CYL	HK-4.00-203-868
EXTERNAL END CAP, STAMPED.....BEFORE 2009		1/CYL	HK-4.00-M-DA400200RP
INTERNAL END CAP, STAMPED..T#####, AFTER 2016		1/CYL	HK-4.00-1B298
INTERNAL END CAP, STAMPED..##RR##, AFTER 10/2017		1/CYL	HK-4.00-432249P
N.2 LOWER PIN (CYLINDER BASE END ON TILT CYL)			
SC30-V1 S/N F5499 & LOWER (1.25" DIA)		2	1314BOOM-3453 ASY
SC30-V2 S/N F5500 & HIGHER (1.75" DIA)		2	1324BOOM-5500 ASY
N.3 UPPER PIN (ROD END ON TILT CYL)			
SC30-V1 S/N F5499 & LOWER (1.25" DIA)		2	1316TILT-3453 ASY
SC30-V2 S/N F5500 & HIGHER (1.75" DIA)		2	1346TILT-5500 ASY
N.4 RETAINER BOLT FOR TILT CYL PIN		4	WBOLT 0.625X1.50 GR8
N.5a WIDE WASHER FOR TILT CYL PIN		4	WASHER-F 0.625 GR8
N.5b LOCK WASHER FOR TILT CYL PIN		4	WASHER-L 0.625 GR8
N.5c PIN-LOCK SPACER FOR RETAINER BOLT		4	SPACER-0625-0000
N.6 BUSHINGS FOR CYLINDER ENDS SEE OPTIONS UNDER P.6, SAME PART			
N.8. SPACER			
S/N F5499 & LOWER ...THIN .094"...MED .125"...STD .188"...THICK .250"...		2/CYL	W-SC-SPAC1.25-...
S/N F5500 & HIGHER...THIN .094"...MED .125"...STD .188"...THICK .250"...		2/CYL	W-SC-SPAC1.75-...
[O] MAIN TILT PIVOT PIN	20#	2	1119TILT ASY
O.1 RETAINER BOLT FOR TILT PIVOT PIN		2	WBOLT 0.625X1.50 GR8
O.2 WIDE WASHER FOR TILT CYL PIN		2	WASHER-F 0.625 GR8
O.3 RETAINER BOLT LOCK WASHER		2	WASHER-L 0.625 GR8
O.4 TILT PIVOT BUSHING		2	W-B3.002X3.500X3.000
O.5 PIN LOCK SPACER FOR RETAINING BOLT		2	SPACER-1000-0375



CYLINDER & PIN PARTS LIST (PAGE 24)

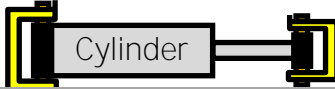
SAS™ SCORPION™ 30 ENGINE PULLER

DESCRIPTION	SHIP WT	QTY	SAS BW PART NUMBER
[P] CLAW CYLINDER	60#		CHOOSE CORRECT CYL:
S/N 5499 & LOWER (1.25" DIA PIN).....		2.....	HY-CYL-4.0X10.25-125
S/N 5500 & HIGHER (1.75" DIA PIN)		2	HY-CYL-4.0X10.25-175
P.1 SEAL KIT SEE OPTIONS UNDER N.1, SAME PART			

P.2 UPPER PIN (BASE END ON CLAW CYLINDER)			
S/N F5499 & LOWER (1.25" DIA PIN).....		2.....	1317TILT-3453 ASY
S/N F5500 & HIGHER (1.75" DIA PIN)		2	1347TILT-5500 ASY
P.4 RETAINER BOLT FOR CLAW UPPER PIN (1 / CYL).....		2.....	WBOLT 0.625X1.50 GR8
P.5a WIDE WASHER FOR CLAW UPPER PIN (1 / CYL)		2	WASHER-F 0.625 GR8
P.5b LOCK WASHER FOR CLAW UPPER PIN (1 / CYL).....		2.....	WASHER-L 0.625 GR8
P.5c PIN-LOCK SPACER FOR RETAINER BOLT (1 / CYL)		2	SPACER-0625-0000

P.3 LOWER PIN (ROD END ON CLAW CYLINDER)			
S/N F5499 & LOWER (1.25" DIA PIN).....		2.....	1303CLAW-F3453
S/N F5500 & HIGHER (1.75" DIA PIN)		2	1323CLAW-5500
P.7 RETAINER BOLT CLAW PIN:ROD END(WBOLT 0.500X3.50 TAP).....		2.....	WPIN-SC CLAW
P.8. SPACER			
S/N F5499 & LOWER ...THIN .094"...MED .125"...STD .188"...THICK .250"...		2/CYL	W-SC-SPAC1.25-...
S/N F5500 & HIGHER...THIN .094"...MED .125"...STD .188"...THICK .250"...		2/CYL	W-SC-SPAC1.75-...

P.6 BUSHING CLAW & TILT CYLINDERS (IDENTIFY CYLINDER TO SELECT) SEE TABLE BELOW:

<u>S/N F5499 & LOWER (1.25" DIA PIN)</u>			Base End		Rod/Tang End
CYL STAMPED	USE DATE	QTY BASE BUSHINGS	P/N BASE END BUSHINGS	QTY ROD BUSHINGS	P/N ROD/TANG END BUSHINGS
319-118	BEFORE 2010	0	N/A	1 / CYL	W-B1.252X1.750X2.250
320-544	AFTER 2010	0	N/A	1 / CYL	W-B1.252X1.750X2.250
T#	2016	2 / CYL	W-B-35831 (POLY)	2 / CYL	W-B-35831 (POLY)
T#	2016	2 / CYL	W-B-38979-13(STEEL)*	2 / CYL	W-B-38979-13 (STEEL)*
##RR##	AFTER 2017	2 / CYL	W-B1.256X1.75X1.500	1 / CYL	W-B1.256X2.003X2.250

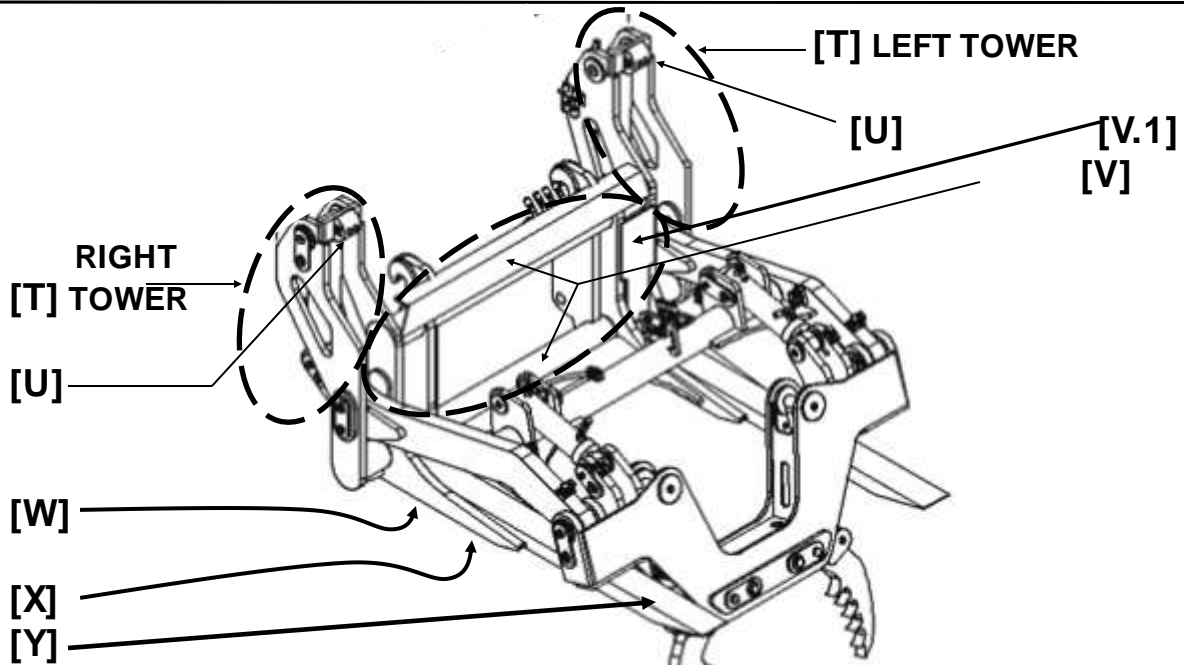
*MUST DRILL & TAP GREASE ZERK IN CYLINDER END

<u>S/N F5500 & HIGHER (1.75" DIA PIN)</u>					
CYL STAMPED	USE DATE	QTY BASE BUSHINGS	P/N BASE END BUSHINGS	QTY ROD BUSHINGS	P/N ROD/TANG END BUSHINGS
##RR##	AFTER 2017	0	N/A	1 / CYL	W-B1.756X2.003X2.250

[Q] MAIN CLAW PIVOT PIN		2	1005CARRIAGE-3152ASY
Q.1 REAR LOCKING SLEEVE BRACKET		2	1006CARRIAGEPP-3152
Q.2 GR8 LONG RETAINING BOLT		2	WBOLT 1.00X12.00 GR8
Q.x GR8 FLAT WASHER		4	WASHER-F 1.000 GR8
Q.3 GR8 NYLON LOCKING NUT		2	WNUT 1.000-8-NY GR8
Q.4 CLAW PIVOT BUSHING		2	W-B2.002X2.500X5.875

FRAMEWORK PARTS GUIDE (PAGE 25)

SAS™ SCORPION™ 30 ENGINE PULLER



[R] HYDRAULIC HOSES & LINES	QTY	PART NUMBER
R.1 HOSE & FITTING KIT (NO STAINLESS STEEL LINES OR CLAMPS):		
DUAL HYDRAULIC BLOCKS (F5172 & HIGHER) 1		HY-SCORPION-30-KIT-2
SINGLE HYDRAULIC BLOCK (F5171 & LOWER) 1		HY-SCORPION-30-KIT-1
R.2 STAINLESS STEEL LINE (LEFT-FROM OPERATOR'S VIEW)		
DUAL HYDRAULIC BLOCKS (F5172 & HIGHER) 1		HY-SC20-SS-LINE-L
SINGLE HYDRAULIC BLOCK (F5171 & LOWER) 1		HY-SC30-SS INLET
R.3 STAINLESS STEEL LINE (RIGHT-FROM OPERATOR'S VIEW)		
DUAL HYDRAULIC BLOCKS (F5172 & HIGHER) 1		HY-SC20-SS-LINE-R
SINGLE HYDRAULIC BLOCK (F5171 & LOWER) 1		HY-SC30-SS OUTLET
R.4 CLAMPS FOR HOSES		
DUAL HYDRAULIC BLOCKS (F5172 & HIGHER) 5		HY-CLAMP-.750-2 HOSE
SINGLE HYDRAULIC BLOCK (F5171 & LOWER) 6		HY-CLAMP-.750-2 HOSE
[T] TOWER		N/A
[U] BOOM SOLID REST PAD (AFTER F4400 WELDED IN)	2	1322CARRIAGE
BEFORE F4400 (BOLT/NUT/WSH) QTY 4:WBOLT 0.500X3.50 GR8, WNUT 0.500-13-GR8-NY, WASHER-L .500 GR8		
[V] CARRIAGE FRAME ASSEMBLY		N/A
DUAL VALVE BLOCK:S/N F5172 & AFTER		
[V.1] WELD IN FRONT PANELS (F5172 & AFTER) 2		N/A NOT REMOVABLE
[V.2] REAR BLOCK COVER 3"X3" TUBE (F5172 & AFTER) 2		SM-SC20/30-BLOCK CVR
[V.3] BLOCK CAP FOR 3"X3" TUBE (F5172 & AFTER) 2		W-CAP-3X3 TUBE
[V.4] THREADED VALVE BLOCK STUD (F5172 & AFTER) 2		WROD 0.3125X040GRB7
[V.5] BLOCK COVER BOLT (F5172 & AFTER) 4		WBOLT 0.3125X2.50GR8
SINGLE VALVE BLOCK TYPE:S/N BEFORE F5171		
[V.1] BOLT IN FRONT ACCESS PANEL (BEFORE F5171) 1		1330CARRIAGE-ASSEM
[V.2] 3/8" BUTTON HEAD BOLT GR8 (BEFORE F5171) 3		WBOLT 0.375X1.00 BTH
[V.3] LOCK WASHER (BEFORE F5171) 3		WASHER-L .375 8
[W] SKID PLATE	2	SKID PLATE LARGE
[X] SCRAPER BLADE	1	1308CARRIAGE
[Y] BLADES (MODEL SC30—STANDARD)	2	BFF-300-06-90-00-12T
(MODEL SC40—OPTIONAL)	2	BFF-350-06-90-00-12T
[S] & [Z] UNASSIGNED		

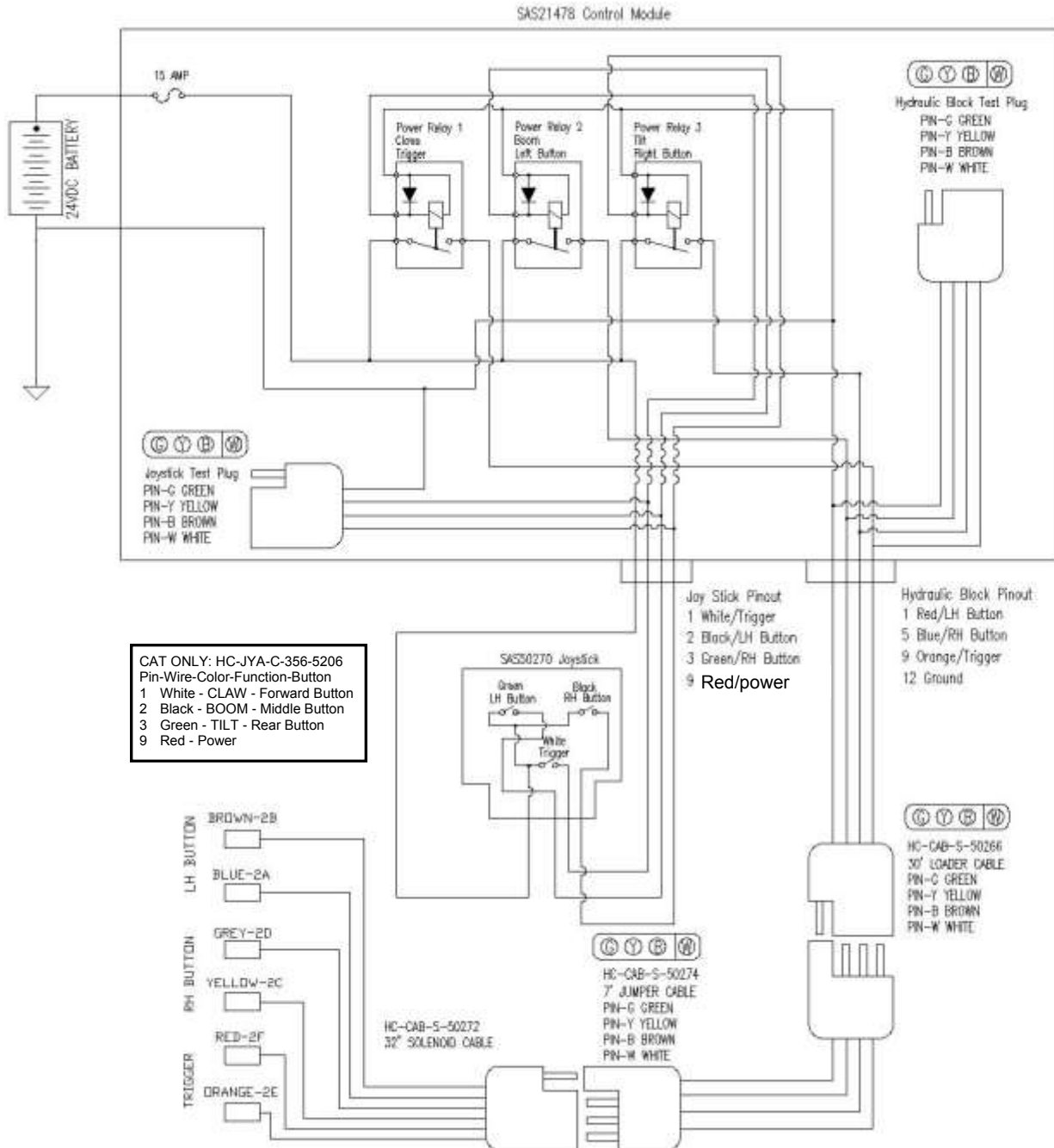
WIRING SCHEMATIC GUIDE (PAGE 26)

SAS™ SCORPION™ 30 ENGINE PULLER

MAIN PLUG ON LOADER ARM (LEADING TO CONTROL BOX)



GREEN=BOOM POSITIVE WITH BUTTON PRESSED
YELLOW=TILT POSITIVE WITH BUTTON PRESSED
BROWN=CLAW POSITIVE WITH BUTTON PRESSED
WHITE= GROUND



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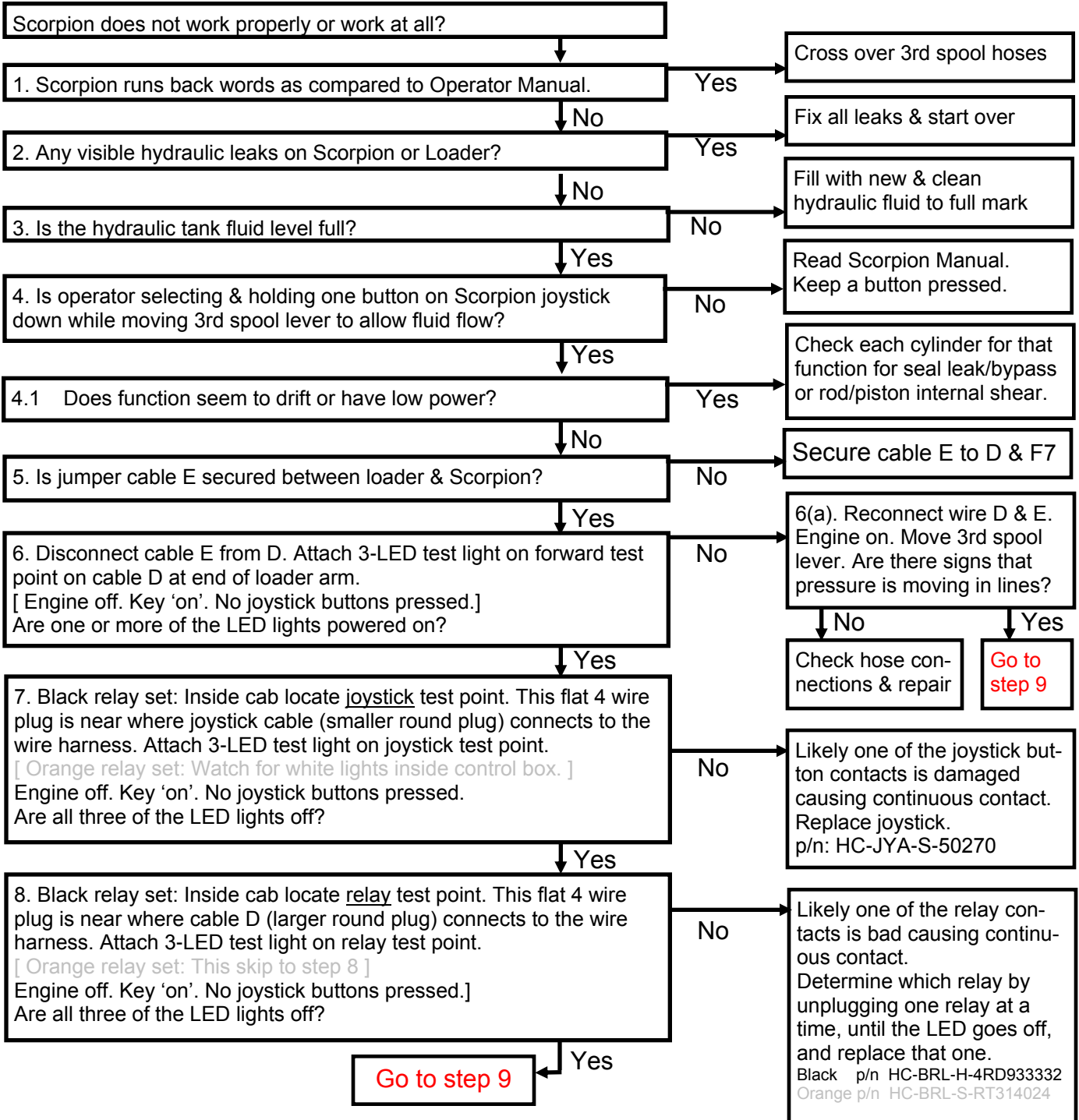


REPAIR FLOW CHART (PAGE 27)

SAS™ SCORPION™ ENGINE PULLER



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 from stored energy. Failure to follow safe practices can result in property damage, injury or death.

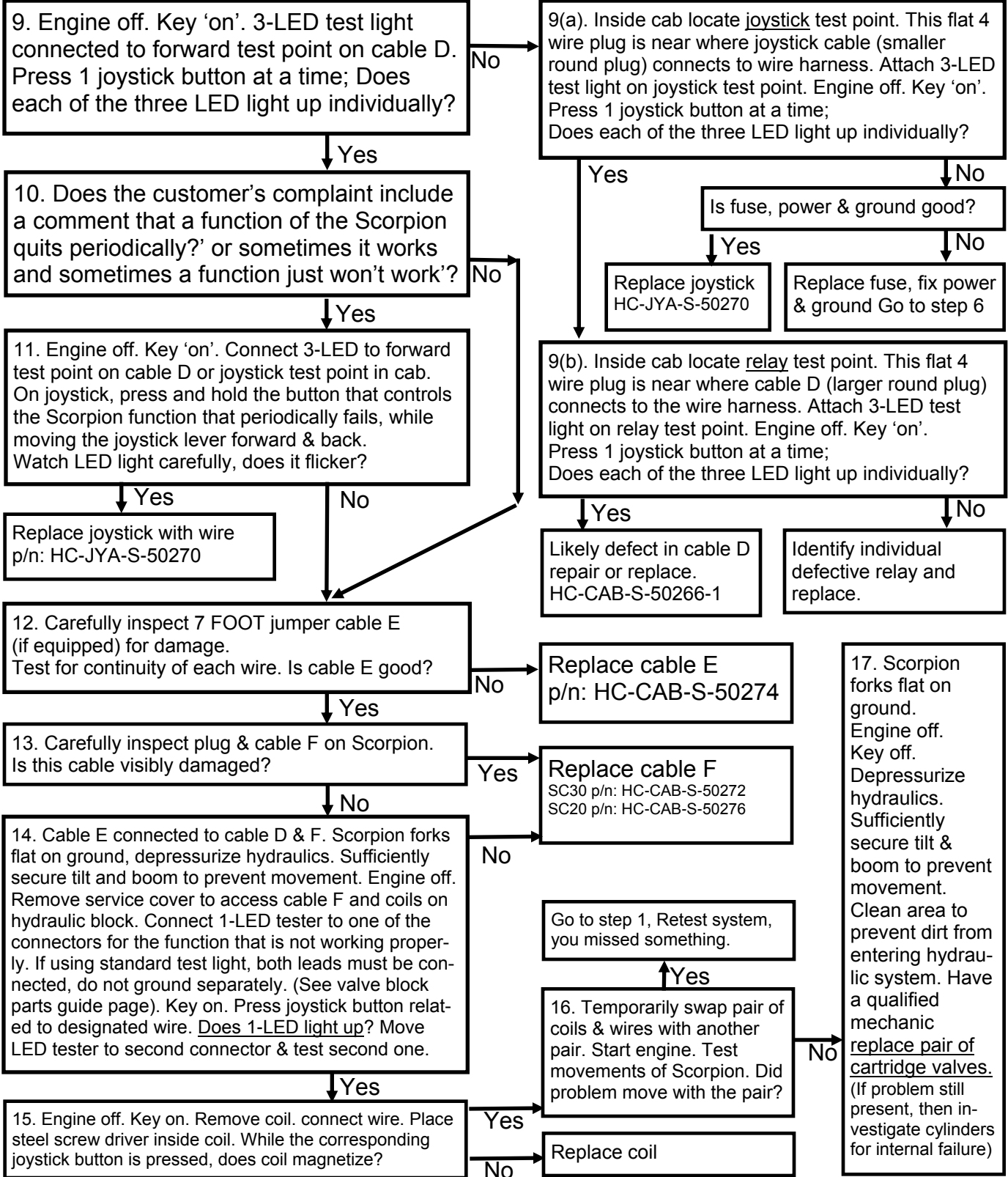


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REPAIR FLOW CHART (PAGE 28)

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PROBLEM The Scorpion doesn't seem to have the power to pull engines out. The claws hold tight on the engine, but won't lift it out.

STEP 1 Check the fluid level in the hydraulic tank of the loader. Does the tank indicator show the fluid at the proper level?

No - Add needed fluid and retest.

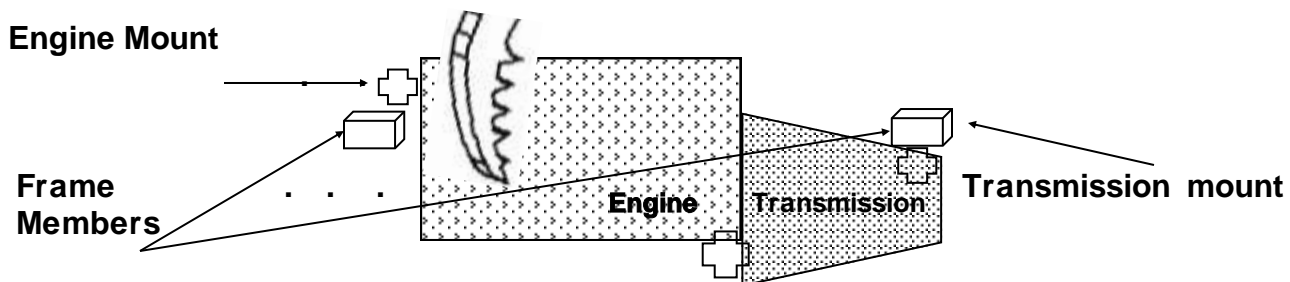
Yes - Go-to next step:

STEP 2 Typically, immediately after installing the Scorpion, there may be air in the lines, which will reduce the effectiveness of the moving parts. Cycle the boom, tilt, and claws through the motions, completely from one position, to the other, several times. Then re-test at pulling an engine out. Did this resolve the issue?

Yes - End.

No - Go-to next step:

STEP 3 When grabbing the engine with the claws, try repositioning the claws on the far end of the engine, away from the transmission; typically on the block, near the timing chain. This will allow the Scorpion to lift one side of the engine.



breaking the side motor mounts, then gradually, breaking the center, and then opposite side motor mounts. Additionally, this method is the best method to successfully have the transmission come out with the engine at the same time, due to it will lift the engine side up and allow the transmission to pivot clear of the frame rail.

Did this method work better?

Yes—End.

No - Go-to next step.

STEP 4 Either inspect the tips of the claws or observe the front of the car to determine if you have the claws pushed too deeply into the engine compartment that you have hold of the frame or engine cross-member. This will result in the enter front of the car begin to bend, and try to be pulled up between the forks. Open the claws, and reposition, a bit less deep into the engine compartment to avoid grabbing the frame or cross-member. Did this work better?

Yes - End.

No - Go-to next step.

STEP 5 Contact a professional wheel loader service technician to see if your PSI on the auxiliary spool can be increased, but no greater than 4,000 PSI.

If that doesn't work, contact SAS with your Scorpion serial # for technical support.

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TROUBLE SHOOTING (PAGE 30) **SAS™ SCORPION™ ENGINE PULLER**

PROBLEM The Scorpion claws won't hold onto the engine. The claws keep slipping off the engine.

STEP 1 Check the fluid level in the hydraulic tank of the loader. Does the tank indicator show the fluid at the proper level?

No - Add needed fluid and retest.

Yes - Go-to next step:

STEP 2 Typically, immediately after installing the Scorpion, there may be air in the lines, which will reduce the effectiveness of the moving parts. Cycle the boom, tilt, and claws through the motions, completely from one position, to the other, several times. Then re-test at pulling an engine out. Did this resolve the issue?

Yes - End.

No - Go-to next step:

STEP 3 Squeeze and hold the trigger, while the auxiliary function lever is pulled back. Continuously hold the trigger, while also selecting the boom lift button, then alternating to the tilt lift button, after the boom has reached it's full lift.

Did this technique resolve the issue?

Yes—End.

No—Go-to next step.

STEP 4 Contact a local wheel loader or hydraulics service technician or contact SAS with your Scorpion serial # for advice on the telephone.

PROBLEM The transmissions seem to break off often when pulling engines.

STEP 1 See page 10: Review 'PULLING ENGINES- Operation Procedure'.
See page 25: STEP 3 for resolution.

PROBLEM The hydraulic line connections for the auxiliary function on the loader arms pop off.

STEP 1 Typically this is a result of not engaging the line quick couplers fully. Check for dirt in the fittings that may not allow the fitting to fully engage.

Yes—End.

No—Go-to next step.

STEP 2 The fitting coupler may have an outside collar that may need to be rotated to lock in place. Check the fitting, and rotate as needed to lock in.

Yes—End.

No—Go-to next step.

STEP 3 Contact a local wheel loader or hydraulics service technician or contact SAS with your Scorpion serial # for technical support.

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TROUBLE SHOOTING (PAGE 31) **SAS™ SCORPION™ ENGINE PULLER**

PROBLEM I either can't disconnect the hydraulic quick disconnect fittings on the loader or I can't connect them. I push real hard and they still won't come off / on.



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

STEP 1 Is the loader engine turned off?

No - Turn off engine, and follow next step.

Yes - Go-to next step

STEP 2 Did you release the pressure from the lines by:

- A. Placing the Scorpion™ flat on the ground. Set the parking brake on the loader.
- B. Position the “Boom”, “Tilt” and “Claws” so they are forward, gently resting on the ground or on the forks.
- C. Shut off the engine of the loader and turn the key off.
- D. Turn the key ‘on’ (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.

Now try to either remove or install the hydraulic lines (with gloves and safety glasses)

Did this work?

Yes - End.

No - Go-to next step

STEP 3 Closely inspect the fittings, as they may 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.

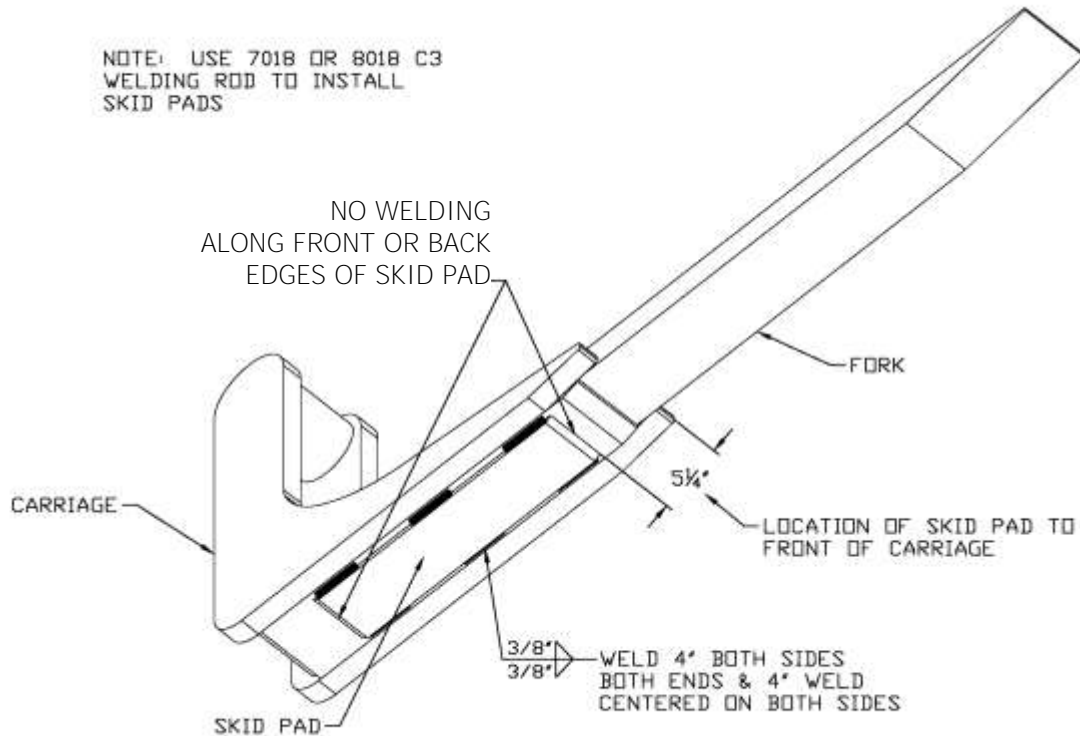
Yes - End.

No - Go-to next step

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



SKID PLATES & WELD NOTICE (PAGE 32) SAS™ SCORPION™ ENGINE PULLER



MAXIMIZE SAS FORKS™ LIFE WITH SKID PLATE MAINTENANCE

To get the maximum life from your SAS FORK™ carriage, the skid plates on the bottom should not wear thinner than 1/8".

Periodic inspection of the skid plates is needed. Order factory replacement skid plates from S.A.S. of Luxemburg, Ltd. when they are worn thin (about 1/8").



Carriage Skid Plates: Failure to keep skid plates on the carriage will result in structural damage to the carriage and could result in tearing out one or both blades and necessitating the purchase of a new carriage. Do not use forks without skid plates in place. Skid plate and fork failure can result in equipment damage, injury or death.

DO NOT MAKE UNAUTHORIZED WELDS TO SAS FORKS™

To prolong the life of the SAS FORK™ assembly, do not weld on the forks except as shown in this diagram. Improper welding repairs can result in equipment failure resulting in injury or death. If you need to make any other repairs on the SAS FORKS™, please contact S.A.S. of Luxemburg, Ltd. Engineering and discuss the situation with them.



RECOMMENDED PRECAUTIONS TO TAKE PRIOR TO WELDING

- Weld repairs should only be performed by qualified individuals.
- Completely disconnect the Scorpion from the wheel loader before welding. Do not weld if connected to wheel loader due to the risk of damage to the loader's electrical system or on board electronics.
- Disconnect hydraulic valve block electrical cord from the loader and carriage.
- Connect the welder ground directly to the part being welded. Avoid attaching ground

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across any pivot points; this may cause an arc to form damaging the pivot point.



LIMITED WARRANTY (PAGE 33) SAS™ SCORPION™ ENGINE PULLER

SAFETY

Buyer accepts responsibility to; (1) Ensure that all personnel that will use and/or work in area of purchased product will read safety ID plate and Operators Manual For SAS (product) 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. (3) To determine and compare the weight of the original machine’s attachment, to the new SAS FORKS™ or other attachment purchased herein, and reduce the lift capacity as needed to accommodate the increase in the attachment weight if any. (4) Observe the most restrictive weight capacity specified on any machine and/or attachment. (5) Buyer has duty to inspect equipment & attachment regularly.
S.A.S. OF LUXEMBURG, LLC. 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 SAS before attempting any repair, modification, or questionable job applications.

LIMITED WARRANTY FOR SAS FORKS™

For products that S.A.S. of Luxemburg, LLC. (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.

PRODUCT	LIMITED WARRANTY PERIOD	ITEM	COVERED
SCORPION™	1 year from original ship date	CARRIAGE & FRAME	DEFECTS IN MATERIALS & WORKMANSHIP
SCORPION™	1 year from original ship date	Hydraulic cylinders, controls, joystick.	DEFECTS IN MATERIALS

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

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

SAS does not warrant 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, FOB 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. (unless otherwise specified 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 F.O.B. 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 S.A.S., and Buyer shall honor all proprietary legends. Buyer agrees not to copy the design of S.A.S.™ Forks & SAS Scorpion or hire a third party to copy. S.A.S. may use product modification ideas suggested by user, without any obligation to originator of modification suggestion. If S.A.S. chooses to implement such product modification such becomes property of S.A.S. of Luxemburg, Ltd.

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



CE DOCUMENT (PAGE 34)
SAS™ SCORPION™ ENGINE PULLER

**Declaration of Conformity for CE Marking
EU Directive 2006/42/EC (Machinery Directive)**

SAS FORKS
133 Center Drive Hwy 54
Luxemburg, WI 54217
USA

We declare that the products listed below conform to the listed provisions of the following Council Directives

Model	Description
Scorpion Engine Puller	Hydraulically actuated attachment for wheel loader used to extract vehicle engines for salvage operations


Conforms to the following directives:

2006/42/EC Machinery Directive

Date of CE Marking: 10/1/2012

Technical Construction File is maintained at:

SAS Forks
133 Center Drive Hwy 54
Luxemburg, WI 54217 USA


S.A.S. of Luxemburg, LLC.
DBA: SAS FORKS
133 Center Drive Hwy 54
Luxemburg WI 54217-0260 U.S.A.