



# Service Manual



MELROE INGERSOLL-RAND 6724012(4–95)



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# **MAINTENANCE SAFETY**



Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death. W-2003-0903

Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.





Use the correct procedure to lift or lower operator cab.



Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause lift arms to drop. Do not go under lift arms when raised unless supported by an approved lift arm support device. Replace it if damaged.



Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.

Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding. Keep rear door closed except for

Keep rear door closed except for service. Close and latch door before operating the loader.







 Never work on loader with lift arms up unless lift arms are held by an approved lift arm support device. Replace if damaged.
 Never modify equipment or add attachments not approved by Bobcat Company.



flammable and explosive gases. Keep arcs, sparks, flames and lighted tobacco away from batteries.

Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/ operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL. Always use genuine Bobcat replacement parts.** The Service Safety Training Course is available from your Bobcat dealer.



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PREVENTIVE MAINTENANCE

HYDRAULIC SYSTEM

HYDROSTATIC SYSTEM

DRIVE SYSTEM

MAIN FRAME

ELECTRICAL SYSTEM

ENGINE SERVICE

SYSTEM ANALYSIS

SPECIFICATIONS

## FOREWORD

This manual is for the Bobcat loader mechanic. It provides necessary servicing and adjustment procedures for the Bobcat loader and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

A general inspection of the following items must be made after the loader has had service or repair:

1. Check that the ROPS/FOPS (Including sidescreens) is in good condition and is not modified.



- 2. Check that ROPS mounting hardware is tightened and is Melroe approved.
- 3. The seat belt must be correctly installed, functional and in good condition.



- 4. The seat bar and pedal interlocks must be correctly adjusted, clean and lubricated.
- 5. Machine signs must be legible and in the correct location.



6. Steering levers and foot pedals must return to neutral.



7. Check for correct function of the work lights.



The parking 8. brake must function correctly.



- 9. Enclosure door latches must open and close freely.
- 10. Bob–Tach wedges and linkages must function correctly and be in good condition.
- 11. Safety treads must in good condition.





- 12. Check for correct function of indicator lamps (Optional on some models).
- 13. Check hydraulic fluid level, engine oil level and fuel supply.



- 14. Inspect for fuel, oil or hydraulic fluid leaks.
- 15. Lubricate the loader.

battery and cables.



16. Check the condition of the

853, 853H Loader Service Manual 17. Inspect the air cleaner for damage or leaks. Check the condition of the element.



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- 18. Check the electrical charging system.
- 19. Check tires for wear and pressure.
- 20. Inspect for loose or broken parts or connections.



21. Operate the loader and check all functions.



22. Check for field any modification not completed.



23. Check for correct function of the Bobcat Interlock Control System (BICS<sup>TM</sup>) before the machine is returned to the customer.

Recommend to the owner that all necessary corrections be made before the machine is returned to service.







#### SAFETY INSTRUCTIONS

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Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Failure to follow instructions can cause injury or death.

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The following publications provide information on the safe use and maintenance of the loader and attachments:

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the loader gives operating information as well as routine maintenance and service procedures. It is a part of the loader and must stay with the machine when it is sold. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat loader dealer.
- The loader has machine signs (decals) which instruct on the safe operation and care. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat loader dealer.
- The loader has a plastic Operator's Handbook fastened to the operator cab. Its brief instructions are convenient to the operator. The handbook is available from your dealer in English edition or French, German, Italian, Dutch, Spanish, Portuguese, Finnish, Danish & Swedish editions.
- The EMI Safety Manual (available in Spanish) delivered with the loader gives general safety information.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop-type service and repair work.
- The Skid–Steer Loader Operator Training Course is available through your local Bobcat dealer. This course is intended to provide rules and practices for correct operation of the Bobcat loader. The course is available in English and Spanish versions.
- The Bobcat Skid–Steer Loader Safety Video is available from your Bobcat Dealer.





Safety Alert Symbol: This Safety Symbol is used for important safety messages. When you see this symbol follow the safety message to avoid personal injury or death.

#### SAFETY INSTRUCTIONS (Cont'd)

- Wear tight fitting clothing. Always wear safety glasses when maintaining or servicing loader. Safety glasses, hearing protection or loader special applications kit are required for some work. See your dealer for Melroe Safety equipment.
- Know where fire extinguishers and first aid kits are located and how to use them.
- Do not use the Bobcat loader where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazard and overheating.
- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
- Check fuel and hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Tighten or replace any parts that show leakage. Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.
- Follow any environmental safety regulations when disposing of used fluids such as engine oil, grease or anti-freeze.
- Do not use ether or starting fluids on this engine. It has glow plugs. These starting aids can cause explosion and injure you or bystanders.
- Always clean the loader and disconnect the battery before doing any welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the loader when welding. Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.
- Stop the engine and let it cool before adding fuel. No smoking!
- Use the procedure in the Operation & Maintenance or Service Manuals for connecting the battery.
- Use the procedure in the Operation & Maintenance or Service Manuals for cleaning the spark arrestor muffler.

A fire extinguisher is available from your local dealer. The fire extinguisher can be installed in the location shown [A].



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#### SERIAL NUMBER LOCATIONS

Always use the serial number of the loader when requesting service information or when ordering parts. Early or later models (identification made by serial number) may use different parts, or it may be necessary to use a different procedure in doing a specific service operation.

#### LOADER SERIAL NUMBER

The loader serial number plate is located on the inside of the left upright, above the grill **[A]**.

Explanation of loader Serial Number:



The four digit Model/Engine Combination module number identifies the model number and engine combination. This number (in parenthesis beside the model number) is used in the Service Manual to more easily identify the standard, optional and field accessory equipment included or available for each specific model.

The five digit Production Sequence Number identifies the order which the loader is produced.

#### **ENGINE SERIAL NUMBER**

The serial number is located above the starter on the engine block **[B]**.





#### **DELIVERY REPORT**

The Delivery Report must be filled out by the dealer and signed by the owner or operator when the Bobcat loader is delivered. An explanation of the form must be given to the owner. Make sure it is filled out completely **[C]**.

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		DELIVERT REPORT	
-			
	WARNING		
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#### **BOBCAT LOADER IDENTIFICATION**



- \* TIRES Flotation tires are shown. The Bobcat loader is based–equipped with standard tires.
- <sup>†</sup> BUCKET Several different buckets and other attachments are available for the Bobcat loader.
- ROPS, FOPS Roll Over Protective Structure, per SAE J1040 and ISO 3471 and Falling Object Protective Structure per SAE J1043 and ISO 3449 Level I. Level II FOPS is available for protection from heavy falling objects. The Bobcat loader is base–equipped with a standard operator cab as shown. Extra insulated cab is available as an option (Reduced noise level).

### **OPTIONS AND ACCESSORIES**

All 853 & 853H Bobcat loaders are equipped with the following standard items:

Bob–Tach Servo Assist Steering Spark Arrestor Muffler Lift Arm Support Device Operator Cab (W/ROPS & FOPS Approval) Seat Belt Seat Bar Parking Brake Gauges/Warning Lights Bobcat Interlock Control System (BICS<sup>™</sup>)

Below is a listing of the optional equipment which is available through your Bobcat Loader dealer.

#### 853 & 853H Std.

Opt. Opt. Opt. Opt.

<u>Tires</u>
8.25–15 6 PR
12.00–16.5. Segmented
12.00–16.5, 6 PR Flotation
12–16.5 8 PR Bobcat Heavy Duty Flotation
8.00–16 Solid
10.00–33 Solid
Operator Cab
Operator Cab Sound Cab (85 dBa)
<u>Operator Cab</u> Sound Cab (85 dBa) Deluxe Cab (90 dBa)
<u>Operator Cab</u> Sound Cab (85 dBa) Deluxe Cab (90 dBa) Suspension Seat
Operator Cab Sound Cab (85 dBa) Deluxe Cab (90 dBa) Suspension Seat Operating Lights (Front & Rear)
Operator Cab         Sound Cab (85 dBa)         Deluxe Cab (90 dBa)         Suspension Seat         Operating Lights (Front & Rear)
Operator Cab         Sound Cab (85 dBa)         Deluxe Cab (90 dBa)         Suspension Seat         Operating Lights (Front & Rear)         Horn         Back-up Alarm

Dack-up Alallii
Heated Enclosed Cab
Top Window
Rear Window
Cab Enclosure Panels
Vinyl Cab Enclosure
Hand Control Conversion
Cover Kit (Pedals Area)
Cover Kit (Hydraulic Réservoir Area)
Fire Extinguisher
Flasher Lights
Strobe or Řotating Beacon Light
3" Seat Belt
Special Applications Kit (Includes Front Door,
Top & Rear Windows)

#### Hydraulics

Front Auxiliary Hydraulics	
Rear Auxiliary Hydraulics	
Hydraulic Bucket Positioning	
Bucket Positioner On/Off	
High HP Hydraulics	

#### **Other**

Catalytic Purifier	
Engine Block Heater	
Single Point Lift	
Four Point Lift	
Locking Fuel Cap	
Radiator Screen Kit	
Rear Door Bumpers	
Tailgate Lock	
Тоој Вох	

#### Instrumentation

Bobcat Operation Sensing System (BOSS®) . .

Std. = Standard Equipment Opt. = Factory Installed Option FA = Field Accessory

Specifications subject to change without notice

Opt. Opt. (Std. in Europe) Opt. Opt. & FA (Std. in Europe) Opt. & FA (Std. in Europe) FA (Std. in Europe) FA Opt. & FA Opt. & FA (Std. in Europe) Opt. & FA (Std. in Europe) FA FA FA FA (Std. in Europe) FA FA FA FA FA FA Opt. & FA (Std. in Europe) Opt. & FA Opt. & FA (Std. in Europe) FA (Std. in Europe) Opt. FA FA FA FA FA FA FA FA (Std. in Europe) FA (Std. in Europe)

Opt.



#### **PREVENTIVE MAINTENANCE**

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#### SERVICE SCHEDULE

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat loader.

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	SERVICE SCHEDULE		Н	OUF	IS	
ITEM	SERVICE REQUIRED	8–10	50	100	250	1000
Engine Oil	Check the oil level & add oil as needed.					
Air Cleaner	Check condition indicator or display panel. Service only when required.					
Engine Cooling System	Clean debris from oil cooler, radiator & grill. Check coolant level cold in recovery tank. See Page 1–18 for correct coolant mixture.					
Lift Arms, Cyl., Bob–Tach Pivot Pins & Wedges	Lubricate with multi–purpose lithium based grease (12 places).					
Engine Air System	Check for leaks & damaged components.					
Tires	Check for damaged tires & correct air pressure.					
Seat Belt, Seat Bar & Pedal	Check the condition of seat belt. Check the seat bar & pedal interlocks for correct operation. Clean dirt & debris from moving parts					
Bobcat Interlock Control	Check BICS <sup>TM</sup> functions Clean dirt debris or objects from under					
System (BICS <sup>TM</sup> )	or behind seat as required.					
Safety Signs & Safety	Check for damaged signs (decals) & safety tread. Replace any					
Tread	signs or safety treads that are damaged or worn.					
Operator Cab	Check the fastening bolts, washers & nuts. Check the condition of cab.					
Fuel Filter	Remove the trapped water.					
Hydraulic Fluid, Hoses	Check fluid level & add as needed. Check for damage & leaks.					
& Tubelines	Repair & replace as needed.					
Final Drive Transmission (Chaincase)	Check oil level.					
Battery	Check cables & electrolyte level.					
Control Pedals & Steering	Check for correct operation, Repair or adjust as needed.					
Wheel Nuts	$\Box$ Check for loose wheel nuts & tighten to 105–115 ft.–lbs. (142–156 Nm)					
	torque.					
Parking Brake	Check operation.					
Alternator Belt	Check tension & adjust as needed.					
Engine Oil & Filter	Replace oil & filter.					
Spark Arrestor Muffler	Clean the spark chamber.					
Engine/Hydro. Drive Belt	<ul> <li>Check for wear or damage. Adjust as needed.</li> </ul>					
Fuel Filter	Replace filter element.					
Steering Shaft	Grease three fittings.					
Hyd./Hydro. Filter	Replace the filter element.					
Hydraulic Reservoir	Replace the reservoir breather cap.					
Breather Cap						
Fan Drive Gearbox	Check gear lube level.					
Final Drive Transmission	Replace the oil in the chaincase.					
Hydraulic Reservoir	Replace the fluid.					
Hydraulic Motors	+ Replace the two case drain filters.					
Bobcat Interlock Control System (BICS™)	Check lift arm bypass control.					

□ Check wheel nut torque every 8 hours for the first 24 hours.

- Also replace hydraulic/hydrostatic filter element when the transmission warning light comes "ON".
- Or every 12 months.
- \* Inspect the new belt after first 50 hours.
- <sup>†</sup> Clean or replace case drain filters in the event of any major hydraulic or hydrostatic repair.



Instructions are necessary before operating or servicing machine. Read Operation ጲ Maintenance Manuals, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Failure to follow instructions can cause injury or death.

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Read the Removal & Installation, Disassembly & Assembly, etc. completely to become familiar with the procedure before beginning [A].

#### LIFTING AND BLOCKING THE LOADER

#### **Procedure**

axle tubes [C].

Always park the loader on a level surface.



Put floor jack under the rear of the loader [B].

Lift the rear of the loader and install jackstands [B].





Put the floor jack under the front the loader [C]. Lift the front of the loader and put jackstands under the

NOTE: Make sure the jackstands do not touch the tires





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#### TRANSPORTING THE LOADER

#### Procedure



A loader with an empty bucket or no attachment must be loaded backward onto the transport vehicle **[A]**.

Be sure the transport and towing vehicles are of adequate size and capacity.

Use the following procedure to fasten the Bobcat loader to the transport vehicle to prevent the loader from moving during sudden stops or when going up or down slopes **[B]**.

Lower the bucket or attachment to the floor. Stop the engine. Engage the parking brake. Install chains at the front and rear loader tie down positions (Inset) **[B]**. Fasten each end of the chain to the transport vehicle and tighten the chain with a chain tightener.

#### **TOWING THE LOADER**

#### Procedure

To prevent damage to the loaders hydrostatic system, the loader must be towed only a short distance at slow speed. (Example: Moving the loader onto a transport vehicle.)

The towing chain (or cable) must be rated at 1-1/2 times the weight of the loader. (See *Specification* Page 9–1.)

- Turn the key switch to ON and press the Traction Lock Override button.
- Tow the Bobcat at 2 MPH (3,2 km/hr.) or less for not more than 25 feet (7,6 meters).

If the electrical system is not functioning, part, of the brake system must be disassembled to move the loader. See *Traction Lock* removal and installation procedure. (Page 8–1.)

#### STOPPING THE BOBCAT LOADER

When the steering levers are moved to the neutral position, the hydrostatic transmission will act as a *service brake* and stop the loader.





#### LIFTING THE LOADER

#### Four Point Lift



The loader can be lifted with the four point lift which is available as a kit from your Bobcat loader dealer.

Attach cables or chains to lift eyes as shown [A].

#### **Single Point Lift**



 Never allow riders in the cab or bystanders within 15 feet (5 meters) while lifting the machine.
 W-2007-1285

The loader can also be lifted with the single point lift which is available as a kit from your Bobcat loader dealer.

Install the kit and lift as shown [B].

The single point lift, supplied by Melroe Company is designed to lift and support the Bobcat loader without affecting roll over and falling object protection features of the operator cab.





#### LIFT ARM SUPPORT DEVICE



Never work on a machine with the lift arms up unless the lift arms are secured by a lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death. W-2059-0991

#### Engaging the Lift Arm Support Device

Maintenance and service work can be done with the lift arms lowered. If the lift arms must be raised for service, use the following procedure:

Put jackstands under the rear corners of the loader.

Disconnect the spring from the lift arm support device retaining pin, hold onto the lift arm support device and remove the retaining pin **[A]**.

Lower the lift arm support device on top of the lift cylinder. Hook the free end of the spring (item 1) **[B]** to the lift arm support device so there will be no interference with the support device engagement.

With the operator in the seat, seat belt fastened and seat bar lowered, start the engine.

Raise the lift arms, until the lift arm support device drops onto the lift cylinder rod **[C]**.

Lower the lift arms slowly until the support device is held between the lift arm and the lift cylinder. Stop the engine. Raise the seat and move pedals until both pedals lock.

Install pin (Item 1) **[C]** into the rear of the lift arm support device below the cylinder rod.

#### **Disengaging the Lift Arm Support Device**

Remove the pin from the lift arm support device.

Connect the spring (Item 1) **[D]** from the lift arm support device to the bracket below the lift arms.

With the operator in the seat, seat belt fastened and seat bar lowered, start the engine.

Raise the lift arms a small amount and the spring will lift the support device off the lift cylinder rod. Lower the lift arms. Stop the engine.

Raise the seat bar and move pedals until both pedals lock.

Disconnect the spring from the bracket.

Raise the support device into storage position and insert pin through lift arm support device and bracket **[A]**.

Connect spring to pin [A].









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#### **OPERATOR CAB**

#### Description

The Bobcat loader has an operator cab (ROPS and FOPS) as standard equipment to protect the operator from rollover and falling objects. Check with your dealer if the operator cab has been damaged. The seat belt must be worn for roll over protection.

**ROPS/FOPS** Roll Over Protective Structure per SAE J104 and ISO 3471, and Falling Object Protective Structure per SAE J1043 and ISO 3449, Level I. Level II is available.

**Level I** – Protection from falling bricks, small concrete blocks and hand tools encountered in operations such as highway maintenance, landscaping, and other construction site services.

**Level II** – Protection from falling trees, rocks; for machines involved in site clearing, overhead demolition or forestry.



#### **Raising the Operator Cab**

Stop the loader on a level surface. Lower the lift arms. If the lift arms must be up while raising the operator cab, install the lift arm support device. (See Page 1–7.)



Loosen the nut (Item 1) [A] (both sides) at the front corner of the operator cab.

Remove the nut and plate (both sides) [B].

Lift on the grab handle and bottom of the operator cab slowly until the cab latching mechanism engages and the cab is all the way up **[C]**.







#### **OPERATOR CAB (Cont'd)**

#### Lowering the Operator Cab

#### NOTE: Make sure the seat bar is fully raised or lowered when lowering the cab. Always use the grab handles to lower the cab.

Pull down on the bottom of the operator cab until it stops at the latching mechanism. Release the latching mechanism (Item 1) **[A]** and pull the cab all the way down.

Install the plate and nut (Item 1) [B] (both sides).

Tighten the nuts to 40–50 ft.-lbs. (54–68 Nm) torque [B].









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#### **Emergency Exit**

The front opening on the operator cab and rear window provide exits.

To exit through the rear window, use the following procedure:

Pull on the tag on the top of the rear window to remove the rubber cord **[C]**.

Push the rear window out of the rear of the operator cab.

Exit through the rear of the operator cab [D].

#### SEAT BAR RESTRAINT SYSTEM

#### Description

The seat bar restraint system has a pivoting seat bar with arm rests and has spring loaded interlocks for the lift and tilt control pedals. The operator controls the use of the seat bar. The seat bar in the down position helps to keep the operator in the seat. The interlocks require the operator to lower the seat bar in order to operate the foot pedal controls. When the seat bar is up, the lift and tilt pedals are locked when returned to the neutral position.



up. Service the system if pedals do not lock correctly.

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#### Seat Bar Inspection

Sit in the seat and fasten the seat belt. Engage the parking brake. Pull the seat bar all the way down. Start the engine. Operate each foot pedal to check both the lift and tilt functions. Raise the lift arms until the bucket is about 2 feet (600 mm) off the ground.

Raise the seat bar. Try to move each foot pedal. Pedals must be firmly locked in neutral position. There must be no motion of the lift arms or tilt (bucket) when the pedals are pushed.

Pull the seat bar down, lower the lift arms. Operate the lift pedals. While the lift arms are going up, raise the seat bar and the lift arms should stop.

Lower the seat bar, lower the lift arms and place the bucket flat on the ground. Stop the engine. Raise the seat bar and operate the foot pedals to be sure that the pedals are firmly locked in the neutral position. Unbuckle the seat belt.



#### AVOID INJURY OR DEATH

Never operate loader without pedal lock shield 6705474 on both interlocks. Shields prevent foot from unlocking interlocks when leaving loader seat.

W-2162-1194

#### Seat Bar Maintenance

See the Service Schedule Page 1–3 and on the loader for correct service interval.

Clean any debris or dirt from the moving parts [A] & [B]. Inspect the linkage bolts and nuts for tightness. The correct torque is 25–28 ft.–lbs. (34–38 Nm).

If the seat bar system does not function correctly, check for free movement of each linkage part. Check for excessive wear. Adjust pedal control linkage. Replace parts that are worn or damaged. Use only genuine Melroe replacement parts.





#### AIR CLEANER SERVICE

#### **Replacing Filter Element**

WITH CONDITION INDICATOR: Replace the large (outer) filter element only when the red ring shows in the window of the condition indicator (Item 1) **[A]**.

#### NOTE: Before replacing the filter element, push the button on the condition indicator (Item 2) [A]. Start the engine. If the red ring does not show, do not replace the filter element.

Replace the inner filter every third time the outer filter is replaced or when the red ring still shows in the indicator window after the outer filter has been replaced.

WITH BOSS® OPTION: It is important to change the air filter element only when the service codes (on the BOSS® option instrument panel) shows the symbols [AF.2] **[B]**.







Service the air cleaner as follows:

Remove the dust cover wing nut (Item 1) [C].

Remove the dust cover.

#### AIR CLEANER SERVICE (Cont'd)

#### Replacing Filter Element (Cont'd)

Remove the wing nut (Item 1) [A] at the large air filter element.



Remove the large filter element [B].

## NOTE: Make sure all sealing surfaces are free of dirt and debris.

Install the new filter element and washer and tighten the wing nut.

Check the air intake hose for damage. Check the air cleaner housing for damage. Check to make sure all connections are tight.

Only replace the inner filter element under the following conditions:

- 1. Replace the inner filter element every third time the outer filter is replaced.
- 2. If the service codes show symbols (See Page 8–1) during full engine speed, replace the inner filter element only after the outer filter element has been changed.

Remove the inner filter wing nut (Item 1) **[C]** to remove the filter element.



#### FUEL SYSTEM

#### **Fuel Specifications**

Use only clean, high quality diesel fuel, Grade No. 1 or Grade No. 2 .

The following is one suggested blending guideline which should prevent fuel gelling problems:

Temp. $F^{\circ}$ (C $^{\circ}$ )	No. 2	No.1
+15°(9°)	100%	0%
Down to –20° (–29°)	50%	50%
Below –20° (29°)	0%	100%

We recommend an operator contact their fuel supplier for local recommendations.

#### Filling the Fuel Tank



Remove the fuel fill cap (Item 1) [A].

Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. NO SMOKING! **[B]**.

Install and tighten the fuel fill cap [A].

#### **Fuel Filter**



See the *Service Schedule* Page 1–3 for the service interval when to remove the water from the fuel filter.

Loosen the drain (Item 1) **[C]** at the bottom of the filter element to drain any water from the filter.

See the *Service Schedule* Page 1–3 for the service interval when to replace the fuel filter.

To replace the fuel filter element (Item 2) **[C]**, use a filter wrench to remove the filter element.

Clean the area around the filter housing. Put oil on the seal of the new filter element. Install the fuel filter, and hand tighten. Remove the air from the fuel system. (See Page 1-14.)







#### FUEL SYSTEM (Cont'd)

#### **Removing Air From the Fuel System**

After replacing the fuel filter element or when the fuel tank has run out of fuel, the air must be removed from the fuel system prior to starting the engine.



Loosen the air vent plug (Item 1) [A] at the top of the fuel filter.

Operate the priming bulb (Item 2) **[A]** until fuel flows from the filter vent. Tighten the fuel filter vent plug (Item 1) **[A]**.

Loosen the air vent plug at the top of the fuel injection pump **[B]**.

Again operate the priming bulb (Item 2) **[A]** until fuel flows from the air vent plug with no air bubbles showing.

Tighten the air vent plug at the fuel injection pump [B].







#### ENGINE LUBRICATION SYSTEM

#### **Checking Engine Oil**

Check the engine oil level every day.

Before starting the engine for the work shift, open the rear door. Remove the dipstick (Item 1) **[A]**.

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets API Service Classification of CC, CD or CE (See Oil Chart below).

#### RECOMMENDED SAE VISCOSITY NUMBER (LUBRICATION OILS FOR ENGINE CRANKCASE)



° -30 -20 -10 0 +10 +20 +30 +40 +50 +60 +70 +80 +90 +100 +110 +120 +130 +140

#### TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE

#### **Replacing Oil and Filter**

See the Service Schedule Page 1–3 for the service interval for replacing the engine oil and filter.

Run the engine until it is at operating temperature. Stop the engine.

Open the rear door. Remove the drain plug (Item 1) **[B]**. Drain the oil into a container.

Remove the oil filter (Item 1) [C].

Clean the filter housing surface. Put clean oil on the new oil filter gasket. Install the filter and hand tighten only.

Install and tighten the drain plug.







#### **ENGINE LUBRICATION SYSTEM (Cont'd)**

#### Replacing Oil & Filter (Cont'd)

Remove the oil filler cap (Item 1) [A].

Put 8 qts. (7,6 L) of oil in the engine. (See Oil Chart, Page 1–15.)

Start the engine and let it run for several minutes. Stop the engine. Check for leaks at the oil filter. Add oil as needed if it is not at the top mark on the dipstick.



W-2103-1285



#### **ENGINE COOLING SYSTEM**

#### **Cleaning the Cooling System**

Check the cooling system every day to prevent over-heating, loss of performance or engine damage.



Wear safety glasses to prevent eye injury when any of the following conditions exist:

- When fluids are under pressure.
- Flying debris or loose material is present.
- Engine is running.
- Tools are being used.

W-2019-1285

Raise the rear grill.

Use air pressure or water pressure to clean the top of the oil cooler **[A]**.

Raise the oil cooler and clean the top of the radiator [B].

Check cooling system for leaks.

#### **Checking the Coolant Level**

Open the rear door. Check the coolant level in the coolant recovery tank on the right side of the engine **[C]**.

The coolant recovery tank must be 1/3 full.

**Propylene Glycol** 

Add premixed coolant, 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

One gallon and one pint of propylene flycol mixed with one gallon of water is the correct mixture of coolant to provide a  $-34^{\circ}F$  ( $-37^{\circ}C$ ) freeze protection.

#### Ethylene Glycol

Add premixed coolant, 50% water and 50% ethylene glycol to the recovery tank if the coolant level is low.







#### ENGINE COOLING SYSTEM (Cont'd)

#### **Removing Coolant From the Cooling System**



Open the rear door. Open the rear grill.

Remove the radiator cap (Item 1) [A].

Remove the drain plug (Item 1) **[B]** from the side of the engine block. Drain the coolant into a container.

After all the coolant is removed, install and tighten the drain plug.

#### **Propylene Glycol**

Add premixed coolant; 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

One gallon and one pint of propylene glycol mixed with one gallon of water is the correct mixture of coolant to provide a  $-34^{\circ}F$  ( $-37^{\circ}C$ ) freeze protection.

Mix the coolant in a separate container. (See *Specifications* for correct capacity, Page 9–1.)

Fill the radiator and engine block with the premixed coolant. Install the radiator cap.

Fill the coolant recovery tank 1/3 full.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level in the recovery tank when cool. Add coolant to the recovery tank as needed.

#### ALTERNATOR BELT

#### Adjusting the Alternator Belt

Stop the engine.

Raise the operator cab. (See Page 1–8.)

Loosen the alternator mounting bolt (Item 1) [C].

Loosen the adjustment bolt (Item 2) [C].

Move the alternator until the belt has 5/16" (8,0 mm) movement at the middle of the belt span with 15 lbs. (66 N) of force.







#### **USING A BOOSTER BATTERY (Jump Starting)**

#### Procedure

If it is necessary to use a booster battery to start the engine, BE CAREFUL! There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

The ignition must be in the OFF position. The booster battery to be used must be 12 volt.



Connect the end of the first cable (Item 1) **[A]** to the positive (+) terminal of the booster battery. Connect the other end of the same cable (Item 2) **[A]** to the positive terminal on the starter solenoid.

Connect the end of the second cable (Item 3) **[A]** to the negative (–) terminal of the booster battery. Connect the other end of the same cable (Item 4) **[A]** to the engine.

Keep cables away from moving parts. Start the engine. (See *Cold Temperature Starting Condition*, Operation & Maintenance Manual).

After the engine has started, remove the ground (–) cable (Item 4) **[A]** first. Remove the cable from the positive terminal on the starter solenoid.



# IMPORTANT

Damage to the alternator can occur if:

- Engine is operated with battery cables disconnected.
- Battery cables are connected when using a fast charger or when welding on the loader (Remove both cables from the battery).
- Extra battery cables (booster cables) are connected wrong.

I-2023-1285

#### HYDRAULIC/HYDROSTATIC SYSTEM

#### **Checking and Adding Fluid**

Use only recommended fluid in the hydraulic system. (See *Specifications* Section for the correct fluid, Page 9–1.)

To check the reservoir, use the following procedure:

Put the Bobcat loader on a level surface. Lower the lift arms and tilt the Bob–Tach fully back.

Stop the engine.

Remove the dipstick [A].

The fluid level must be between the marks on the dipstick.

If fluid is needed, remove the fill cap (Item 1) [B].

NOTE: Before installing the fill cap, make sure the rubber gasket is installed on the fill cap (Inset [B].



#### Replacing Hydraulic/Hydrostatic Filters

See the Service Schedule Page 1–3 for the correct service interval.

Raise the operator cab. (See Page 1-8.)









Use a filter wrench and remove the filter elements (Item 1) **[C]** & **[D]**.

Clean the surface of the filter housing where the element seal contacts the housing. Put clean oil on the rubber seal of the filter element.

Install and hand tighten the filter elements.

#### HYDRAULIC/HYDROSTATIC SYSTEM (Cont'd)

#### **Replacing Hydraulic Fluid**

See the Service Schedule Page 1-3 for the service interval.

The fluid must also be replaced if it becomes contaminated or after major repairs.

Remove the reservoir fill cap (Item 1) [A].

# NOTE: Before installing the fill cap, make sure the rubber gasket is installed on the fill cap (Inset) [A].

Remove the screen (Item 1) [B] and thoroughly clean with clean solvent.

Raise the operator cab. (See Page 1-8.)

Disconnect the hose from the hydrostatic motor case drain filter (Item 1) **[C]**.

### NOTE: There is a 90 micron filter in each hydrostatic motor case drain line.

Remove the two case drain filters (Item 1) **[C]** & **[D]** (one for each hydrostatic motor) and clean thoroughly.

When all the fluid is removed from the reservoir, connect and tighten the filters and case drain hoses.

Add the correct fluid to the reservoir until the fluid level is between the marks on the dipstick. DO NOT fill above the top mark on the dipstick.



Lower the operator cab. Start the engine and operate the loader hydraulic controls. Stop the engine. Check for leaks. Check the fluid level in the reservoir and add as needed.









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#### HYDRAULIC/HYDROSTATIC SYSTEM (Cont'd)

#### Hydraulic Reservoir Breather Cap

See Service Schedule Page 1–3 for the correct service interval.

Remove the breather cap [A].



# NOTE: Make sure the rubber gasket is installed on the breather cap (Inset) [A].

Make sure the baffle washer is installed in the hydraulic reservoir  $\ensuremath{\left[ B \right]}$ 


#### SPARK ARRESTOR MUFFLER

#### **Cleaning Procedure**

See the *Service Schedule* Page 1–3 for service interval for cleaning the spark arrestor muffler.

Do not operate the loader with a defective exhaust system.



Stop the engine. Open the rear door and rear grill.

Remove the plug (Item 1)  $\circlet{[A]}$  from the bottom of the muffler.



When the engine is running during service, the steering levers must be in neutral and the parking brake engaged. Failure to do so can cause injury or death.

W-2006-0284

Start the engine and run for about 10 seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler.

Stop the engine. Put anti-seize coating on plug. Install and tighten the plug. Lower the rear grill and close the rear door.



# 

When an engine is running in an enclosed area, fresh air must be added to avoid concentration of exhaust fumes. If the engine is stationary, vent the exhaust outside. Exhaust fumes contain odorless, invisible gases which can kill without warning.

W-2050-1285

Stop engine and allow the muffler to cool before cleaning the spark chamber. Wear safety glasses or goggles. Failure to obey can cause serious injury.

W-2011-1285

Never use machine in atmosphere with explosive dust or gases or where exhaust can contact flammable material. Failure to obey warnings can cause injury or death.

W-2068-1285

#### TIRE MAINTENANCE

#### Wheel Nuts

See the *Service Schedule* Page 1–3 for the service interval to check the wheel nuts. The correct torque is 105–115 ft.–lbs. (142–156 Nm) torque **[A]**.

#### **Tire Rotation**

Check the tires regularly for wear, damage and pressure. (See *Specifications* Page 9–1 for the correct tire pressure.)

Rear tires usually wear faster than front tires. To keep tire wear even, move the front tires to the rear and rear tires to the front **[B]**.

It is important to keep the same size tires on each side of the loader. If different sizes are used, each tire will be turning at a different rate and cause excessive wear. The tread bars of all the tires must face the same direction.

Recommended tire pressure must be maintained to avoid excessive tire wear and loss of stability and handling capability. Check for the correct pressure before operating the loader.

#### **Tire Mounting**

Tires are to be repaired only by an authorized person using the proper procedures and safety equipment. Tires and rims must always be checked for correct size before mounting. Check rim and tire bead for damage.

The rim flange must be cleaned and free of rust. The tire bead and rim flange must be lubricated with a rubber lubricant before mounting the tire, avoid excessive pressure which can rupture the tire and cause serious injury or death. During inflation of the tire, check the tire pressure frequently to avoid over inflation.



Failure to use correct tire mounting procedure can cause an explosion which can result in injury or death.



Inflate tires to the MAXIMUM pressure shown on the sidewall of the tire. DO NOT mix brands of tires used on the same loader.

I-2057-0794





#### FINAL DRIVE TRANSMISSION (CHAINCASE)

#### **Checking and Adding Oil**

The chaincase contains the final drive sprockets and chains and uses the same type of oil as the hydraulic/hydrostatic system. (See *Specifications* Section Page 9–1.)

To check the chaincase oil level, use the following procedure:

Drive the loader on a level surface. Stop the engine.

Remove the plug (Item 1) [A] from the front of the chaincase housing.

If oil can be reached with the tip of the your finger through the hole the oil level is correct.

If the level is low, add oil through the check plug hole until the oil flows from the hole. Install and tighten the plug.

#### **Removing Oil From the Chaincase**

To drain the oil from the chaincase, remove the cover (Item 1) [B] which is installed over the drain plug at the rear of the chaincase.

Remove the drain plug (Item 1) **[C]** and drain the oil into a container.

NOTE: When installing the drain plug into the chaincase, always use a NEW drain plug.









#### FAN GEARBOX

#### **Checking and Maintaining**

See the *Service Schedule* Page 1–3 for the correct service interval.

Raise the operator cab. (See Page 1–8.)

Remove the plug (Item 1) [D] to check the lubricant level.

If the level is low, add SAE 90W gear lube through the check plug hole until the lubricant flows from the hole. Install and tighten the plug.

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#### LUBRICATING THE LOADER

#### Procedure

Lubricate the loader as specified in the Service Schedule Page 1–3 for the best performance of the loader.

Record the operating hours each time you lubricate the Bobcat loader.

Always use a good quality lithium based multi–purpose grease when you lubricate the loader. Apply the lubricant until extra grease shows.

Lubricate the following locations on the loader:

- 1. Rod End Lift Cylinder (Both Sides) [A].
- 2. Base End Lift Cylinder (Both Sides) [B].









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3. Lift Arm Pivot Pin (Both Sides) [C].

4. Base End Tilt Cylinder [D].

## LUBRICATING THE LOADER (Cont'd)

6. Bob-Tach Pivot Pin (Both Sides) [B].

7. Bob-Tach Wedge (Both Sides) [B].

8. **250 Hours:** Steering Lever Shaft and Centering Mechanism **[C]**.

### Procedure (Cont'd)

5. Rod End Tilt Cylinder [A].

A 5 (D-15167





#### **REMOTE START SWITCH**

#### Procedure

The tool listed will be needed to do the following procedure:

MEL1429 - Remote Start Switch

The Remote Start Switch is required when the service technician is adjusting the steering linkage, checking the hydraulic/hydrostatic system.

Lift and block the loader. (See Page 1-4.)

Raise the lift arms and install an approved lift arm support device. (See Page 1–7.)

Raise the operator cab. (See Page 1–8.)

Disconnect the operator cab wire harness from the engine wire harness [A].

Connect the remote start switch to the engine harness connectors (Item 1) [B].



Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

WARNING ſ

Never work on a machine with the lift arms up unless the lift arms are secured by a lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death. W-2059-0991





#### **REMOTE START SWITCH (Cont'd)**

#### Procedure (Cont'd)

Put the traction lock override switch (Item 1) **[A]** in the ON position so the traction function is locked. The wheels are not able to turn.

Turn the key to the right and start the engine.

Move the traction lock override switch (Item 1) **[B]** to the OFF position so the traction function is unlocked. The wheels are now able to turn.

The auxiliary mode switch (Item 2) **[B]** is used to turn the front auxiliary quick couplers ON and OFF during relief pressure and flow tests.







# HYDRAULIC SYSTEM

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# HYDRAULIC SYSTEM

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TIGHTEN ALL HARDWARE PER SIZE TO GRADE 5 TORQUE (SEE STANDARD TORQUE SPECIFICATIONS FOR BOLTS, SECTION 9) UNLESS OTHERWISE SPECIFIED.

# HYDRAULIC/HYDROSTATIC SCHEMATIC

853 BICS  $^{\rm TM}$  S/N 512816001 and Above

S/N 509718001 and Above

(Printed June 1997)

= LEGEND =(24)FLUID RESERVOIR: (1 Cap . . . 15.5 Qts (14,7 L) Screen Filter. . . . 60 Mesh **HYDRAULIC FILTER:** #4 Synthetic Media (3) DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (248-303 kPa) Standard Loader (Normally Open) B.O.S.S. Loader (Normally Closed) (4) FILTER BYPASS 45-55 PSI (311-379 kPa) (5) CHECK VALVE . . LIFT CYLINDER (6) FLOW CONTROL SPOOL (7) FLOW ADJUSTMENT VALVE (8) CHECK VALVE . . TILT CYLINDER (9) UNLOADING SPOOL (10) MANUAL BYPASS CONTROL (11) CHECK VALVES (12) LIFT LOCK BYPASS VALVE CONTROL SPOOL (13) CONTROL SPOOL (14) TILT LOCK VALVE SOLENOID (15) LOAD CHECK VALVES (2) (16) MAIN RELIEF VALVE: @Quick Couplers 2700-2750 PSI (18616-18961 kPa) (17) ANTI-CAVITATION VALVES (18) PORT RELIEF VALVE: 3500 PSI (24132 kPa) (19) ONE WAY RESTRICTOR VALVE (20) AUXILIARY CONTROL SOLENOIDS (21) PORT RELIEF VALVE. . . (Optional) 2500 PSI (17238 kPa) (22) DRIVE MOTOR SHUTTLE VALVES (23) SHUTTLE RELIEF VALVES 290 PSI (2000 kPa)

 HIGH PRESSURE RELIEF/REPLENISHING VALVES..
 Standard . 4350 PSI (29993 kPa)
 Option . 4000 PSI (27580 kPa)
 Option . 5000 PSI (34475 kPa)

- (25) DISPLACEMENT CONTROL VALVES
- 26 HYDRAULIC PUMP....Gear Type 18.0 GPM (68,1 L/min.) @ 2750 RPM
- 27 CHARGE PUMP . . . 14-15 GPM (52,9-56,7 L/Min.) @ 2750 RPM
- 28 CHARGE RELIEF VALVE 100°F. (38°C.) Fluid @Full RPM Neutral . . . 310-330 PSI (2137-2275 kPa) Stroked . . . 300-320 PSI (2069-2206 kPa)
- (29) HYDRAULIC MUFFLER . (Optional)
- 30 HYDROSTATIC FILTER #4 Synthetic Media
- (31) "P1" & "F1" CONTROL SPOOL
- (32) "P2" & "F2" CONTROL SPOOL
- 33 DIVERTER CONTROL SPOOL -ELECTRICALLY ACTIVATED
- (34) CASE DRAIN CONTROL SPOOL For D2 Control Spool -Neutral Position
- (35) "D2" CONTROL SPOOL
- (36) "D1" CONTROL SPOOL
- NOTE: Unless otherwise specified springs have NO significant pressure value.



# HYDRAULIC/HYDROSTATIC SCHEMATIC 853H BICS <sup>™</sup> S/N 512816001 and Above

S/N 508418001 and Above

(Printed June 1997)

LEGEND					
<ol> <li>FLUID RESERVOIR: Capacity . 16.0 Qts (15,1 L) Screen Filter 60 Mesh</li> <li>HYDRAULIC FILTER: #3 Synthetic Media</li> <li>DIFFERENTIAL PRESSURE SWITCH: 36-44 PSI (248-303 kPa) Standard Loader (Normally Open) B.O.S.S. Loader (Normally Closed)</li> <li>FILTER BYPASS: 45-55 PSI (311-379 kPa)</li> <li>CHECK VALVE LIFT CYLINDER</li> <li>FLOW CONTROL SPOOL (Optional)</li> <li>FLOW ADJUSTMENT VALVE (Opt.)</li> <li>CHECK VALVE TILT CYLINDER (Optional)</li> <li>UNLOADING SPOOL (Optional)</li> <li>MANUAL BYPASS CONTROL</li> <li>CHECK VALVES</li> <li>LIFT LOCK BYPASS VALVE CONTROL SPOOL</li> <li>CONTROL SPOOL</li> <li>CONTROL SPOOL</li> <li>TILT LOCK VALVE SOLENOID</li> <li>LOAD CHECK VALVES (2)</li> <li>MAIN RELIEF VALVE: @ Quick Couplers SYSTEM MAIN RELIEF: 2800 PSI (19306 kPa) HI FLOW MAIN RELIEF: 3300 PSI (22754 kPa)</li> <li>ANTI-CAVITATION VALVES</li> <li>PORT RELIEF VALVE: 3500 PSI (24132 kPa)</li> <li>ONE WAY RESTRICTOR VALVE</li> </ol>	<ul> <li>23 SHUTTLE RELIEF VALVES: 290 PSI (2000 kPa)</li> <li>24 HIGH PRESSURE RELIEF/REPLENISHING VALVES: STANDARD . 4350 PSI (29993 kPa) OPTION 4000 PSI (27580 kPa) OPTION 4000 PSI (34475 kPa)</li> <li>25 DISPLACEMENT CONTROL VALVES</li> <li>26 AUXILIARY HYDRAULIC PUMP: 6.0 GPM (22,7 L/min.) @2750 RPM @1150 PSI (7929 kPa)</li> <li>27 HYDRAULIC PUMPGear Type PUMP CAPACITY: 18.0 GPM (68,1 L/min.) HI FLOW CAPACITY: 24.0 GPM (90,8 L/min.) @ 2750 RPM @ 1150 PSI (7929 kPa)</li> <li>28 CHARGE PUMP14.0-15.0 GPM (52,9-56,7 L/min.) @2750 RPM</li> <li>29 CHARGE RELIEF VALVE 100°F. (38°C.) Fluid @Full RPM Neutral 310-330 PSI (2137-2275 kPa) Stroked 300-320 PSI (2069-2206 kPa)</li> <li>30 CASE DRAIN FILTER 90 Micron</li> <li>31 HYDROSTATIC FILTER #3 Synthetic Media</li> <li>32 TWO COIL SOLENOID VALVE</li> <li>33 HIGH FLOW MAIN RELIEF VALVE</li> <li>36 DIVERTER SOLENOID</li> </ul>				
<ul> <li>21 PORT RELIEF VALVE (Optional)</li> <li>2500 PSI (17238 kPa)</li> <li>22 DRIVE MOTOR SHUTTLE VALVES</li> </ul>	NOTE: Unless otherwise specified springs have NO significant pressure value.				



# HYDRAULIC SYSTEM

#### TROUBLESHOOTING

#### Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

# **WARNING**

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 5, 8
The transmission warning light comes "ON" when hydraulics are operating. (853 Standard)	1, 3
Slow hydraulic system action.	1, 3, 4, 6, 8
Hydraulic action is not smooth.	1, 4, 5, 6, 7
Lift arms go up slowly at full engine RPM.	1, 3, 4, 5, 6, 7, 8, 9
The lift arms or Bob–Tach will move when the pedal is in neutral position.	4
The lift arms come down with the pedal in the neutral position.	4, 9, 10, 11

<b>KEY TO CORRECT THE CA</b>	USE
------------------------------	-----

- 1. The fluid level is not correct.
- 2. The pedal linkage is disconnected.
- 3. The hydraulic pump has damage.
- 4. The pedal linkage is not adjusted correctly.
- 5. Relief valve is not at the correct pressure.
- 6. Suction leak on the inlet side of the hydraulic pump.
- 7. Fluid is cold. Wrong viscosity fluid (See Section 9).
- 8. Using the loader for more than its rated capacity.
- 9. Internal leak in the lift cylinder(s).
- 10. External leak from the lift cylinder(s).
- 11. Damaged lift spool.



#### **Flare Connections**

Use the following procedure to tighten the flare fitting:

Tighten the nut until it makes contact with the seat. Make a mark across the *flats* of both the male and female parts of the connection **[A]**.

Use the chart to find the correct tightness needed.**[B]**. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

#### **O-ring Face Seal Connection**

When the fitting is tightened, you can *feel* when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use Vaseline petroleum jelly to hold the O-ring in position until the fittings are assembled **[C]**.



В	Tube Size		Rotate No
Wrench Size	Outside Dia.	Thread Size	of Hex Flats
5/8"	5/16"	1/2" – 20	2–1/2
11/16"	3/8"	9/16" – 18	2
7/8"	1/2"	3/4" – 16	2
1"	5/8"	7/8" – 14	1-1/2 - 2
1–1/4"	3/4"	1–1/16" – 12	1
1–3/8"	1"	1–5/16" – 12	3/4 – 1
2"	1–1/4"	1–5/8" – 12	3/4 – 1
2–1/4"	1–1/2"	1–7/8" – 12	1/2 – 3/4



#### Straight Thread O-ring Fitting

Lubricate the O-ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface **[D]**.

#### **Tubelines and Hoses**

Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

Replace hoses which show signs of wear, damage or weather cracked rubber.

Always use two wrenches when loosening and tightening hose or tubeline fittings.



#### LIFT CYLINDER(S)

#### Checking the Lift Cylinder

Lower the lift arms. Stop the engine. Raise the seat bar.



Check only one cylinder at a time. Disconnect the hose (Item 1) **[A]** which goes to the base end of the lift cylinder.

Install a plug (Item1) [B] in the hose and tighten.

Install a test hose between the cylinder and a drain pan.

Engage the parking brake. Lower the seat bar. Start the engine and push the top (toe) of the lift pedal.

If there is any leakage from the open port, remove the lift cylinder for repair. Repeat the procedure to check the other lift cylinder.

#### **Removal and Installation**

Raise the lift arms so the rod end retaining pin will clear the loader frame for removal.

Have a second person put jackstands under the Bob–Tach to support the lift arms **[C]**. Stop the engine.

Raise the operator cab. (See Page 1-1.)

Remove the retaining bolt and nut (Item 1) **[D]** from the retaining pin on the rod end of the cylinder.

*Installation:* Tighten the retainer bolt and nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the retaining pin from the rod end of the cylinder.









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#### LIFT CYLINDER(S) (Cont'd)

#### Removal and Installation (Cont'd)

Remove the retaining bolt and nut (Item 1) **[A]** from the retaining pin on the base end of the cylinder.

*Installation:* Tighten the retainer bolt and nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the retaining pin from the base end of the cylinder **[B]**.

Slide the cylinder forward for clearance to disconnect the hoses.



Mark the hoses for correct installation.

Disconnect the two hoses (Item 1)  $\circe{[C]}$  from the lift cylinder.

Remove the lift cylinder.





#### **TILT CYLINDER**

#### Checking the Tilt Cylinder

Remove the attachment. Roll the Bob–Tach fully back. Stop the engine. Raise the seat bar.



Disconnect the hose (Item 1) **[A]** which goes to the base end of the tilt cylinder.

Put a plug in the hose and tighten.

Engage the parking brake. Lower the seat bar. Start the engine and push the bottom (heel) of the tilt pedal. If there is leakage from the open port, remove the tilt cylinder for repair.

#### **Removal and Installation**

Remove the attachment. Roll the Bob–Tach fully forward **[B]**.

Stop the engine. Raise the seat bar.

Disconnect both hydraulic hoses (Items 1 & 2) [A].

Remove the retainer bolt and nut (Item 1) **[C]** from the rod end pivot pin.

*Installation:* Tighten the retainer nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the grease fitting from the rod end pivot pin.

Remove the rod end pivot pin (Item 1) [D].









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### TILT CYLINDER (Cont'd)

#### Removal and Installation (Cont'd)

Remove the retainer bolt and nut (Item 1) [A] from the base end pivot pin.

*Installation:* Tighten the retainer nut and bolt to 18–20 ft.–lbs. (24–27 Nm) torque.



Remove the base end pivot pin (Item 1) [B].

Remove the tilt cylinder from the loader.









#### Rod End Seal

Remove the old seal (both sides) from the rod end of the tilt cylinder.

Install the new seals with the lip facing out [C].

Using two pieces of shim stock, install the rod end of the tilt cylinder into the Bob–Tach **[D]**.

Be careful not to damage the new seals during installation.

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#### HYDRAULIC CYLINDER

#### Lift Cylinder Identification



**Tilt Cylinder Identification** 



#### Disassembly

Tools necessary for the disassembly/assembly procedures:

MEL1074 – O-ring Seal Hook MEL1075 – Adjustable Gland Nut Wrench MEL1396 – Seal Installation Tool MEL1033 – Rod Seal Installation Tool Piston Ring Compressor

#### NOTE: The drawings may not show the cylinder exactly as it appears, but the procedure is correct for all cylinders.

Put the base end of the hydraulic cylinder in a drain pan. Move the rod in and out to remove the fluid from the cylinder. Move the rod slowly so the fluid will go directly into the drain pan.

Put the base end of the cylinder in a vise.

Use the adjustable gland nut wrench to loosen the head **[A]**.

Remove the rod assembly from the cylinder case [B].

Remove the cylinder case from the vise.

Put the rod end in the vise.

Remove the nut from the piston end of the rod [C].











#### **Disassembly (Cont'd)**

If the head has a seal, remove the seal from the head [A].



Remove the O-ring and backup washer from the head **[B]**.







Remove the oil seal from the head [D].

Remove the wiper seal [C].

Disassembly (Cont'd)

Remove the piston seal from the piston [A].



Remove the O-ring from the piston [B].

Wash the cylinder parts in solvent and air dry them.

While servicing the cylinder do not damage the parts. Inspect for nicks, scratches or otherwise damaged or bent parts before assembling the cylinder. Replace parts that appear damaged in any way. The cylinder may not function correctly if there is damage to any of the parts.

Destroy all the O–rings and seals and replace them with NEW O–rings and seals.

#### Assembly

Install the O-ring on the piston [C].

# NOTE: Do not overstretch the seal.

Install the seal on the tool and stretch it until it fits the piston **[D]**.

Allow the O-ring to stretch for 30 seconds before removing it from the tool.







Assembly (Cont'd)

Install the seal on the piston [A].



Use a ring compressor to compress the seal to the correct size **[B]**.

Leave the piston in the ring compressor for three minutes.



Install the oil seal on the rod seal tool [C].

NOTE: The O-ring side of the oil seal goes toward the inside of the cylinder.



Install the oil seal in the head [D].



## Assembly (Cont'd)

Install the wiper seal with the lip toward the outside of the head **[A]**.



Install the backup washer on the head [B] & [C].







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Install the O-ring next to the backup ring [D].

#### Assembly (Cont'd)

If a seal was removed from the head use the following procedure to install a new one.

#### NOTE: Do not overstretch the seal.

Install the seal on the tool and stretch it until it fits the piston  $\car{[A]}.$ 

Allow the O-ring to stretch for 30 seconds before removing it from the tool.

# NOTE: Do not turn (roll) the seal as you install it. Damage to the seal may result.

Use a ring compressor to compress the seal to the correct size **[B]**. Leave the tool over the seal for five minutes.

Install the head on the rod [C].

Install the piston on the rod [D].









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#### Assembly (Cont'd)

Install the nut (Item 1) [A] on the rod.

See Page 2–9 or 2–10 for the correct torque specifications.

Remove the rod from the vise.

Install the cylinder case in the vise.

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Α

Put oil on the seal surface of the cylinder case [B].





Put oil on the teflon seal on the piston [C].

#### Assembly (Cont'd)

Install the rod assembly in the cylinder case [A].



Put oil on the seals on the head [B].

Put oil on the threads of the head.

Use the adjustable gland nut wrench to tighten the head **[C]**.

Replace the seal on the rod end (if so equipped) if it shows signs of wear or damage **[D]**.



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#### MAIN RELIEF VALVE

#### **Checking the Main Relief Valve**

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

Turn the key switch to the OFF position, as the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

Lift and block the loader. (See Page 1–1.)

Connect the IN port of the hydraulic tester to the female quick coupler on the loader **[A]**.

Connect the OUT port of the hydraulic tester to the male quick coupler on the loader **[A]**.



WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

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Start the engine and run at low engine idle RPM. Push the mode switch (Item 1) **[B]** two times (on the instrument panel) to engage the front auxiliary hydraulics, the light (Item 2) **[B]** will come ON.

Push the button (Item 1) **[C]** for fluid pressure to the quick couplers.

Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

There should be 18.0 GPM (68 L/min.) free flow. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is 2700–2750 PSI (18617–18961 kPa).

If the relief pressure is not correct, stop the engine. Replace or adjust the main relief valve. (See Page 2–21.)







#### MAIN RELIEF VALVE (Cont'd)

#### Checking the Main Relief Valve Without Auxiliaries

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

Stop the engine.

Lift and block the loader. (See Page 1–1.)

Disconnect the hydraulic hoses (Item 1)  $\circlet{A}$  at the tilt cylinder.

Connect the hydraulic tester to the tilt cylinder hoses [B].

Have a second person in the operator seat, with seat bar in down position.



Start the engine and run at idle RPM.

Push the tilt pedal at the top (toe) or bottom (heel) until the hydraulic tester shows the correct fluid flow through the flow meter.

Increase the engine RPM to maximum.

There should be 18.0 GPM (68,1 L/min.) free flow.

Turn the restrictor control, at the tester, to increase the pressure until the main relief valve opens.

The correct pressure is 2700–2750 PSI (18617–18961 kPa).

If not, stop the engine.

Replace or adjust the main relief valve. (See Page 2-21.)







#### MAIN RELIEF VALVE (Cont'd)

#### **Removal and Installation**

Raise the operator cab. (See Page 1-1.)



The main relief valve (Item 1) **[A]** is located at the right rear of the control valve.

Clean the area around the control valve.

Loosen and remove the main relief valve [B].

*Installation*: Tighten the main relief valve to 35–40 ft.–lbs. (47–54 Nm) torque.

Remove the O-rings and back-up washers.

Clean the main relief valve in clean solvent. Use air pressure to dry the valve.

Install new O–rings and backup washers. Install the main relief valve and tighten **[A]**. Check the pressure again. (See Page 2–19 or 2–20.)

If the pressure is not correct, adjust the main relief valve. Remove the end cap (Item 1) **[C]**.

Turn the adjusting screw in or out until the pressure is correct.

NOTE: If the correct pressure can not be reached, replace the main relief valve. Check the pressure setting of the new relief valve.







#### DUAL PRESSURE MAIN RELIEF VALVE – 853H

#### **Checking the Low Setting**

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

Turn the key switch to the OFF position. Before the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

Lift and block the loader. (See Page 1–1.)

Connect the IN port of the hydraulic tester to the female quick coupler on the loader **[A]**.

Connect the OUT port of the hydraulic tester to the male quick coupler on the loader **[A]**.

# NOTE: Flow will be out from the female coupler on the loader.



Start the engine and run at low idle RPM. Push the mode switch (Item 1) **[B]** twice (on the instrument panel) to engage the front auxiliary hydraulics "detent", both lights (Items 2 & 3) **[B]** will come ON.

# NOTE: High horsepower switch should be in the OFF position.

Push the button (Item 1) **[C]** for fluid flow to the quick couplers.

Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

There should be approximately 18.0 GPM (68,1 L/min.) free flow. Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is 2700–2750 PSI (18617–18961 kPa).

Push the button (Item 1) **[C]** to disengage the "detent" flow to the front quick couplers.

If the relief pressure is not correct, stop the engine. Adjust or replace the main relief valve. (See Page 2–25.)







# WARNING

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

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# DUAL PRESSURE MAIN RELIEF VALVE - 853H (Cont'd)

#### **Checking the High Setting**

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

Turn the key switch to the OFF position. Before the engine stops running, turn the key switch all the way to the left to release the hydraulic pressure at the front auxiliary quick couplers.

Lift and block the loader. (See Page 1–1.).

Connect the hydraulic tester to the auxiliary quick coupler [A].

The IN port on the tester connects to the female coupler on the loader.

The OUT port from the tester connects to the male coupler on the loader.



Obtain a 3/8 inch (9,5 mm) I.D. hose (Item 1) **[B]** with a 3000 PSI (20685 kPa) rating or greater.

The hose loop (Item 1) **[B]** should be a total of 28 inches (711 mm) in length (including quick couplers).

A small male coupler (Item 2) **[B]** (P/N 6648969) is needed for one end of the hose, and a small female coupler (Item 3) **[B]** (P/N 6648967) is needed for the other end of the hose.

A 15K–5 fitting is also needed for each end of the hose  $\car{B}$ .

A 79K–6 O–ring is used toward the coupler side of each fitting (this O–ring is included with each fitting).

Install a 15K–5 fitting on each end of the hose loop.

Install the female coupler (Item 3)  $[{\ensuremath{\mathsf{B}}}]$  on one end of the hose loop.

Drill orifice (P/N 6655091) size to .070 inch. Install the threaded orifice (Item 1) **[C]** in the male coupler (Item 2) **[C]** and install the coupler on the fitting.







# DUAL PRESSURE MAIN RELIEF VALVE - 853H (Cont'd)

#### Checking the High Setting (Cont'd)

Install the hose (Item 1) **[A]** on the secondary auxiliary quick couplers as shown.

NOTE: The hose loop (Item 1) [A] (with .070 inch orifice), provides restriction and pilot pressure necessary to shift the dual stage main relief valve to the high pressure setting.



Start the engine and run at low idle RPM. Increase the engine speed to full RPM. Push the mode switch (Item 1) **[B]** twice (on the instrument panel) to engage the front auxiliary hydraulics "detent", the lights (Items 2 & 3) **[B]** will come ON.

# NOTE: The High Horsepower switch should be in the OFF position.

Push the button (Item 1) **[C]** to engage the "detent" position to the front auxiliary quick couplers.

Push and hold the button (Item 2) **[C]** for fluid flow through the secondary auxiliary couplers and hose loop.

Watch the flow meter on the hydraulic tester to be sure the flow is correct.

There should be approximately 18.0 GPM (68,1 L/min.) free flow. Turn the restrictor control on the tester, until the main relief valve opens. The correct pressure for the main relief is 3000 PSI (20685 kPa).

Release the button (Item 2) **[C]** and push the button (Item 1) **[C]** to disengage the "detent" position to the front auxiliary quick couplers.

If the relief pressure is not correct, stop the engine. Replace or adjust the main relief valve. (See Page 2–26.)




DUAL PRESSURE MAIN RELIEF VALVE - 853H (Cont'd)

Adjusting the Low Setting

# NOTE: Adjust the low pressure setting before adjusting the high pressure setting.

Correct pressure for the low setting is 2700–2750 PSI (18617–18961 kPa). (See Page 2–22) for the correct procedure to check the setting.

To adjust the low pressure setting on the main relief valve, (Item 1) **[A]** disconnect the pilot hose (Item 2) **[A]** from the adapter fitting (Item 3) **[A]**.

Remove the adapter fitting (Item 3) [A].

Remove the high pressure adjustment housing (Item 1) **[B]** from the main relief valve.





Use a 1/4" allen wrench (Item 1) **[C]** to turn the adjusting screw (Item 2) **[C]** in to increase pressure or out to decrease pressure.

One turn is equal to approximately 490 PSI (3379 kPa).

Reinstall the high pressure adjustment housing and adapter.

Reconnect the pilot hose.

Start the engine and increase the engine speed to full RPM. Check for the correct pressure setting.

Repeat the procedure until the pressure setting is approximately 2700–2750 PSI (18617–18961 kPa).

When the correct pressure setting is reached, the next step is to set the high pressure adjustment on the main relief valve (See Page 2–23 for the correct procedure).

Stop the engine.



DUAL PRESSURE MAIN RELIEF VALVE - 853H (Cont'd)

Adjusting the High Setting

# NOTE: Adjust the low pressure setting before adjusting the high pressure setting.

Correct pressure for the high setting is 3000 PSI (20685 kPa). (See Page 2–23) for the correct procedure to check the setting.

To adjust the high pressure setting on the main relief valve (Item 1) **[A]** disconnect the pilot hose (Item 2) **[A]** from the adapter fitting (Item 3) **[A]**.

Remove the adapter fitting (Item 3) [A].

Use a 1/4" allen wrench (Item 1) **[B]** to press the push pin (Item 2) **[B]** in until it bottoms out.

Turn the adjusting guide (Item 3) **[B]** in to increase pressure or out to decrease pressure.

One turn is equal to approximately 390 PSI (2689 kPa).

Reinstall the adapter fitting and pilot hose.

Check for the high pressure setting.

Reconfirm the correct adjustment.

Repeat the adjustment procedure if necessary.





#### SELECT VALVE (G.E.M. Block) 853H

#### **Checking the Main Relief Valve**

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

Lift and block the loader (Page 1–1).

Connect the IN port of the hydraulic tester to the female quick couplers (Item 1) **[A]** on the loader.

Connect the OUT port of the hydraulic tester to the male quick coupler (Item 2) **[A]** on the loader.



Start the engine and run at low idle RPM. Push the mode switch (Item 1) **[B]** once (on the instrument panel) to engage the front auxiliary hydraulics momentary, the light (Item 2) **[B]** will come ON.

Push the rocker switch (Item 3) **[B]** for fluid pressure to the secondary quick couplers.

Watch the flow meter on the hydraulic tester to make sure the flow is correct. Increase the engine speed to full RPM.

The free flow should be approximately 8.0 GPM (30,3 L/min.). Turn the restrictor control, on the tester, until the main relief valve opens. The correct pressure for the main relief is approximately 3000 PSI (20685 kPa).

Release the rocker switch (Item 3) **[B]** to disengage the flow to the secondary quick couplers.

If the relief pressure is not correct, stop the engine. Adjust or replace the main relief valve in the select valve (Item 1) **[C]**. The select valve (G.E.M. Block) is located at the left side under the control panel.

Remove the cap from the relief valve (Item 1) **[D]** and turn the adjusting screw in or out until the correct pressure is reached.









#### HYDRAULIC CONTROL VALVE

#### **Removal and Installation**

# IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Stop the engine. Raise the seat bar.

Raise the operator cab. (See Page 1–1.)

Clean the area around the control valve.

Remove the lift lock valve (Item 1) [A]. (See Page 8-1.)

Disconnect the solenoid harness connectors (Item 1) [A].

Remove the tubeline clamp (Item 1) [B] from the tubelines.

Disconnect the linkage (Items 1 & 2)  $\car{C}\car{C}$  from the lift and tilt spools.







Remove the lift lock valve support bracket from the loader frame **[D]**.

#### Removal and Installation (Cont'd)

Disconnect the tubeline (Item 1) **[A]** from the tee fitting and control valve lift section.



Disconnect the inlet hose (Item 1) [B].

Disconnect the tubeline (Item 2) [B] from the lift section.



Disconnect the two tubelines (Item 2)  $\circ{[C]}$  from the tilt section.

Disconnect the auxiliary tubelines (Item 3) [C].

Disconnect the charge tubeline (Item 4) [C].

Disconnect the outlet tubeline (Item 1) [D].

Remove the control valve mounting bolts (Item 2) [D].

*Installation:* Tighten the mounting bolts to 25 ft.–lbs. (34 Nm) torque.

Remove the control valve from the mounting bracket.









#### **Identification Chart**

ltem	853, 853H Loader	
A1	Lift Cylinder Rod End	
A2	Tilt Cylinder Rod End	
A3	Auxiliary Hydraulics	
B1	Lift Cylinder Base End Restrictor	
B2	Tilt Cylinder Base End	
B3	Auxiliary Hydraulics	
C1	Load Check Valve/Lift Function	
C2	Load Check Valve/Tilt Function	
C3	NO Load Check Valve Auxiliary Function	
C4	Outlet Fluid Flow	
D1	Lift Spool	
D2	Tilt Spool	
D3	Auxiliary Spool	
E1	Anti-Cavitation Valve	
E2	Plug	
F1	Port Relief	
F2	Anti-Cavitation Valve	
G1	Lift Spool Detent	
G2	Tilt Spool Centering Spring	
G3	Auxiliary Spool	
H1	Auxiliary Electric Solenoid	
H2	Plug/Port Relief (Optional)	
H3	Auxiliary Electric Solenoid	
MR	Main Relief Valve	



#### **Disassembly and Assembly**

The anti–cavitation valve, port relief valves and plugs are at different locations in the control valve.(See Page 2–30.) (Control Valve Identification Chart) for the correct location of the parts.



Mark each valve section and spool so that the parts will be returned to its original bore during assembly.

Use bolts to fasten the control valve to a work bench for easier disassembly and assembly.

#### Load Check Valve

Loosen the load check plug (Item 1) [A].

**Assembly:** Always use new O–ring. Tighten the plug to 35–40 ft.–lbs. (47–54 Nm) torque.

Remove the load check plug [B].

Remove the spring and poppet [C].







#### Main Relief Valve

Loosen the main relief valve (Item 1) [A].

**Assembly:** Always use new O-rings and back-up washers. Tighten to 35–40 ft.-lbs. (47–54 Nm) torque.



Remove the main relief valve [B].

Remove the O-ring, sleeve, and glide ring from the main relief valve **[C]**.







Loosen the port relief valve (Item 1) [D].

**Assembly:** Always use new O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.



#### Port Relief Valve (Cont'd)

Remove the port relief valve [A].



Remove the O-rings and backup washer from the port relief valve **[B]**.



#### Anti-Cavitation Valve

Loosen the anti-cavitation valve (Item 1) [C].

**Assembly:** Always use new O-rings and backup washers. Tighten to 35–40 ft.-lbs. (47–54 Nm) torque.



Remove the anti–cavitation valve from the control valve  $[\ensuremath{\textbf{D}}].$ 



#### Anti-Cavitation Valve (Cont'd)

Remove the O-rings and backup washer from the anti-cavitation valve [A].



#### **Rubber Boot**

Loosen the two screws (Item 1)  $\ensuremath{\left[ B \right]}$  on the rubber boot retainer.

**Assembly:** Tighten the screws to 90–100 in.–lbs. (10,2–11,3 Nm) torque.

Remove the screws **[C]**.



Remove the rubber boot and retainer [D].







#### Lift Spool and Detent

The tool listed will be needed to do the following procedure:

MEL1278 - Detent Tool

Remove the cap from the detent end cap [A].



Use a screwdriver to remove the snap ring (Item 1) [B].

Remove the washer (Item 2) [B].



Remove the screws (Item 1) [C] from the detent sleeve.

Remove the detent sleeve (Item 2) [C].



Wrap a rag around the detent assembly [D].





Lift Spool Detent (Cont'd)

Remove the detent sleeve, detent balls and spring [A].



Remove the spool, centering spring, backup washer, seal and spool assembly from the control valve **[B]**.



At the other end of the spool bore, remove the backup washer and seal **[C]**.



Put the linkage end of the spool in the vise [D].

# NOTE: Be careful when removing the detent adapter, because there is spring pressure.

Loosen the detent adapter [D].



#### Lift Spool Detent (Cont'd)

Remove the detent adapter, and cap and centering spring [A]



Remove the backup washer and spool seal [B].



Remove the stud from the end of the spool  $\cite{[C]}$ .

Removal of the plastic plug:

- a. Make a center point in the plug using a 1/16 inch drill.
- b. Drill a hole all the way through the plug using a 7/64 inch tap drill.
- c. Turn a 6–32 tap into the plug. Pull the tap and plug out of the spool. Be careful, do not break the tap.
- d. Clean all the debris from inside the spool bore.

# NOTE: DO NOT USE LOCTITE ON THE STUD THREADS.

**Assembly:** Install the new plastic plug. Install the stud so that the end is about 0.60 inch (15,2 mm) from the spool.





#### Lift Spool and Detent (Cont'd)

Put grease on all the detent component surfaces before assembly  $\ensuremath{\left[ A \right]}$  .



Install the detent balls and spring into the detent adapter. Hold the detent balls in position with the tool (MEL1278) and install the detent adapter into the end cap **[B]**.





Install the new spool seal (Item 1) [C] and backup washer (Item 2) [C].

Install the centering spring, end cap/detent adapter on the valve spool. Tighten the detent adapter to 90–100 in.–lbs. (10,2–11,3 Nm) torque [D].



## Lift Spool and Detent (Cont'd)

Install the detent balls and spring [A].



Hold the detent balls and spring in position with the tool (MEL1278) **[B]**.



Install the detent sleeve (Item 1)  $\circe{[C]}$  over the balls and into position.



#### **Tilt Spool and Centering Spring**

Remove the end cap screws (Item 1) [A].

**Assembly:** Tighten the screws to 90–100 in.–lbs. (10,2–11,3 Nm) torque.

Remove the end cap [B].

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Remove the spool, centering spring, backup washer and spool seal  $\cal{[C]}$ 

**Assembly:** If the centering spring bolt is removed, tighten to 90–100 in.–lbs. (10,2–11,3 Nm) torque. Put grease on all the centering spring component parts. Always use new spool seal.



# **Auxiliary Spool**

Remove the end plate screws (Item 1) [A].

**Assembly:** Tighten the screws to 90–100 in.–lbs. (10,2–11,3 Nm) torque.



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Remove the end plate, O-ring and spring (both sides) [B].

Remove the washer (Item 1) **[C]** (both sides). Remove the auxiliary spool (Item 2) **[C]**.

#### **Auxiliary Electric Solenoid**

Remove the nut (Item 1) [A] from the end of the solenoid.

**Assembly:** Tighten the nut to 9-12 in.-lbs. (1,02-1,36 Nm) torque.



Remove the solenoid metal housing [B].

Remove the solenoid coil and end plate [C].





Remove the electric solenoid valve (Item 1) [D].

**Assembly:** Tighten the electric solenoid valve to 96–144 in.–lbs. (10,8–16 Nm) torque. Always install new O–rings and backup washers.



#### H Port – Auxiliary Section

Loosen the plug (Item 1) [A].

**Assembly:** Tighten the plug to 35–40 ft.–lbs. (47–54 Nm) torque.

Remove the plug from the control valve [B].

Replace the O-ring.

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Depending on the application of the auxiliaries, the control valve may be equipped with a port relief valve (H port).

Remove the port relief valve (Item 1) [C].

**Assembly:** Replace the O–rings and backup washers. Tighten the port relief valve to 35–40 ft.–lbs. (47–54 Nm) torque.

#### **Base End Restrictor**

Remove the adapter fitting (Item 1) **[D]** and remove the restrictor (Item 2) **[D]**.

#### Inspection

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers that they are not worn or damaged.

Replace the parts as needed.





#### **Spool Seal Installation**

To install new spool seals when the centering spring (tilt spool) or the detent assembly (lift spool) are not removed from the spool, use the following procedure:

Check the seal surface area (in the control valve) for rust, corrosion, scratches, etc. Correct any irregularities before continuing.

Put plastic material on the valve spool [A].

Put clean oil on the spool seal. Install the spool seal (Item 1) **[A]** on the spool being careful not to damage the seal on the sharp edges.

Remove the plastic material.

Install the spool into the control valve.

Slide the linkage end spool seal over the rubber boot groove **[B]**.

Be careful not to damage the spool seal.

Install the backup washer [B].

Continue assembling the control valve.



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#### HYDRAULIC PUMP

#### Checking the Output of the Pump

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

NOTE: Make sure all the air is removed from the hydraulic system before beginning the test. Air in the system can give an inaccurate test.

\*Relief pressure must be per specification before the test is done.

Lift and block the loader. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Connect the remote start switch. (See Page 1–1.)

Disconnect the OUTLET hose from the pump [A].

Connect the INLET hose from the tester to the OUTLET of the pump. Connect the OUTLET hose from the tester to the hose which was disconnected from the pump **[B]**.

A WARNING Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death. W-2017-0286

Start the engine and run at low idle RPM. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to full RPM.

Warm the fluid to 140°F. (60°C.) by turning the restrictor control on the tester to about 1000 PSI (6895 kPa). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM.

Push the mode switch (on the remote start switch) to engage the front auxiliary hydraulics, the light will come ON. Push the button (on the right steering lever) for fluid pressure to the quick coupler (fluid pressure will go over main relief). Record the highest pressure (PSI) and flow (GPM). The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{FREE FLOW (GPM)}} \times 100$$

A low percentage may indicate a pump problem.





#### Removal and Installation

# IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

Raise the operator cab. (See Page 1–1.)

Drain the hydraulic reservoir. (See Page 1–1.)

Disconnect the hose (Item 1) **[A]** from the pump outlet. Install a cap on the fitting.

Disconnect the hose (Item 1) [B] from the pump inlet.

Disconnect the second hose (Item 1) **[C]** from the pump inlet.









Remove the pump mounting bolts (Item 1) [D].

Remove the hydraulic pump.



#### **Parts Identification**



#### Description Ref.

- BOLT WASHER
- END HOUSING O-RING SEAL SEAL RING

- 1. 2. 3. 4. 5. 6. 7. 8. 9.
- BODY
- BEARING HOUSING
- DRIVE GEAR IDLER GEAR
- 10.
- BOLT 11.
- 12. WASHER
- COVER SEAL 13.
- 14.

#### Disassembly



Mark the pump sections for correct assembly [A].

Remove the pump housing bolts (Item 1) [B].

Remove the end housing (Item 1) [C].

Remove the mounting flange end housing (Item 1) [D].









Disassembly (Cont'd)

Remove the gears/bearings assembly [A].



Remove the O-rings (Item 1) [B] from the pump housing.





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Remove the bearing housing (Item 1) [C] from the gears.

Remove the backup seals/O–ring seals (Item 2)  $\car{C}\car{C}$  from the bearing housing.

Remove the drive gear shaft seals (Item 1) [D].

#### Inspection

Wash all parts in clean solvent.

Use air pressure to dry them.

Make a visual inspection of all the parts.

After visual inspection, those parts which are of questionable condition must be repaired.

Check the drive and idler gears [A].

If excessive wear is visible on the journals, side or face of the gears they must be replaced. If the splines are worn, replace the drive gear.

Check the bushings in the housing [B].

If the bushings are worn, scratched, and etc., replace them as needed.





Check the pump housing [C].

Check the surface in the gear area for scratches, wear and etc.

Replace all parts as needed.



#### Assembly

Always use new O-rings and seals when assembling the hydraulic pump.

# IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

Install the two seals (Item 1) **[A]** into the mounting flange housing using the correct size driver tool.

Install the inside seal with the lip facing the drive gear and the outside seal with the lip facing outward.

Install the bearing housing/gears assembly into the pump housing **[B]**.

Install the backup seals/O-ring seals (Item 1) [C].

Install the large O-ring (Item 2) [C].

Install the mounting flange housing on the pump housing **[D]**.









## Assembly (Cont'd)

Install the backup seals/O-ring seals (Item 1) **[A]**. Install the large O-ring (Item 2) **[A]**.



Install the end housing (Item 1) **[B]**. Install the four pump housing bolts **[B]**. B 



Tighten the bolts to 45–50 ft.–lbs. (61–68 Nm) torque [C].

#### HYDRAULIC PUMP (Double Gear) 853H

#### Checking the Output of the Pump

The tools listed will be needed to do the following procedure:

MEL10003 – Hydraulic Tester MEL10006 – Hydraulic Test Kit

NOTE: Make sure all the air is removed from the hydraulic system before beginning the test. Air in the system can give an inaccurate test.

\*Relief pressure must be per specification before the test is done.

Lift and block the loader. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

Connect the remote start switch. (See Page 1-1.)

Disconnect the OUTLET hose (Item 1) [A] Large Section; or (Item 2) [A] Small Section from the pump.

Connect the INLET hose from the tester to the OUTLET of the pump. Connect the OUTLET hose from the tester to the hose which was disconnected from the pump **[B]**.



Start the engine and run at low idle RPM. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. With the hoses connected correctly, increase the engine speed to full RPM.

Warm the fluid to 140°F. ( $60^{\circ}C.$ ) by turning the restrictor control on the tester to about 1000 PSI (6895 kPa). DO NOT exceed system relief pressure. Open the restrictor control and record the free flow (GPM) at full RPM.

Push the mode switch (on the remote start switch) to engage the front auxiliary hydraulics, the light will come ON. Push the button (on the right steering lever) for fluid pressure to the quick coupler (fluid pressure will go over main relief). Record the highest pressure (PSI) and flow (GPM). The high pressure flow must be at least 80% of free flow.

% = <u>HIGH PRESSURE FLOW (GPM)</u> FREE FLOW (GPM) X 100

A low percentage may indicate a pump problem.





#### **Removal and Installation**



Raise the operator cab. (See Page 1–1.)

Drain the hydraulic reservoir. (See Page 1–1.)

Disconnect the high pressure hose (Item 1) **[A]** from the large section. Disconnect the high pressure hose (Item 2) **[A]** from the small section of the pump.

Install caps over the fittings.

Disconnect the inlet hoses from the large and small sections of the pump.

Remove the two mounting bolts (Item 1) [B].

Remove the hydraulic pump.





**Parts Identification** 



# Ref. Description

1.	BOLT	14.
2.	WASHER	15.
3.	COVER	16.
4.	O–RING SEAL	17.
5.	SEAL	18.
6.	RING	19.
7.	BODY	20.
8.	DOWEL	21.
9.	BEARING	22.
10.	DRIVE GEAR	23.
11.	IDLER GEAR	24.
12.	COVER	25.
13.	O–RING SEAL	26.

Description

1. 5	SEAL
). 5.	BODY
7.	BEARING
3.	DRIVE GEAR
).	IDLER GEAR
).	BEARING
۱.	COVER
2.	SEAL
3.	BOLT
1.	SEAL
5.	WASHER
2	

#### Disassembly



Mark the pump sections for correct assembly [A].

Remove the four pump housing bolts (Item 1) **[B]** from the small gear pump end housing.

Remove the small gear pump end housing (Item 2) [B].

Remove the small gear pump housing (Item 3) **[B]** from the center housing.

Remove the O-ring (Item 1) **[C]** from the end housing.

Remove the backup seal/O-ring seal (Item 2)  $\car{C}\car{C}$  from the pump housing.









Remove the O–ring (Item 1) **[D]** from the center housing. Remove the backup seal/O–ring seal (Item 2) **[D]**.

#### Disassembly (Cont'd)

Remove the bearing housing/gears assembly from the housing **[A]**.



Remove the drive and idler gear from the bearing housing **[B]**.







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Remove the two hex head bolts (Item 1)  $[\mbox{C}]$  and two allen head bolts (Item 2)  $[\mbox{C}]$  from the mounting flange housing.

Remove the mounting flange housing (Item 3) [C].

Remove the O-ring (Item 1) [D].

Remove the backup seal/O-ring seal (Item 2) [D].

#### Disassembly (Cont'd)

Remove the center housing (Item 1)  $\circ{[A]}$  from the large gear pump housing.



Remove the O-ring (Item 1) [B].

Remove the backup seal/O-ring seal (Item 2) [B].



Remove the bearing housing/gears assembly from the large pump housing  $\circ{[C]}$ .



Remove the drive and idler gear from the bearing housings  $[\mbox{D}].$ 





### Disassembly (Cont'd)

Remove the two seals (Item 1) [A] from the mounting flange housing.



Check the connecting coupler (Item 1) **[D]** in the center housing. If worn or damaged, use a press and correct size driver tool to remove it from the center housing.



#### Inspection

Wash all parts in clean solvent.

Use air pressure to dry them.

Make a visual inspection of all the parts.

After visual inspection, those parts which are of questionable condition must be replaced.

Check the bushings in the large and small bearing housings [A].

If the bushings are worn, scratched, and etc., replace them as needed.

Check the drive and idler gears for the large and small pumps **[B]**.

If excessive wear is visible on the journals, side or face of the gears they must be replaced. If the splines are worn, replace the drive gear(s).





Check the large and small pump housing [C].

Check the surfaces in the gear area for scratches, wear and etc.

Replace all parts as needed.


#### HYDRAULIC PUMP (Double Gear) 853H (Cont'd)

#### Assembly

Always use new O-rings and seals when assembling the hydraulic pump.



Install the two seals (Item 1) **[A]** into the mounting flange housing using the correct size driver tool.

Install the inside seal with the lip facing the drive gear and the outside seal with the lip facing outward.





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Install the large drive and idler gears into the bearing housing (Item 1) [B].

Install the bearing housing/gears assembly into the large pump housing **[C]**.

Install the backup seal/O-ring seal (Item 1) [C].

Install the large O-ring (Item 2) [C].

Turn the large pump housing around; install the backup seal/O-ring seal (Item 1) **[D]**.

Install the large O-ring (Item 2) [D].

#### HYDRAULIC PUMP (Double Gear) 853H (Cont'd)

#### Assembly (Cont'd)

Install the center housing (Item 1)  $\circ{[A]}$  on the large pump housing.



Install the mounting flange housing (Item 1)  $\ensuremath{\left[ B \right]}$  on the large pump housing.







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Install the hex head bolts (Item 1) **[C]** and allen head bolts (Item 2) **[C]**. Finger tighten only.

Install the drive and idler gears into the bearing housing (Item 1)  $[\mbox{D}].$ 

#### HYDRAULIC PUMP (Double Gear) 853H (Cont'd)

#### Assembly (Cont'd)

Install the bearing housing/gears assembly into the pump housing  $\car{[A]}$  .

Install the large O-ring (Item 1) [A].

Install the backup seal/O-ring seal (Item 2) [A].

Install pump housing on the center housing **[B]**. Install the large O–ring (Item 1) **[B]**. Install the backup seal/O–ring seal (Item 2) **[B]**. Install the end housing. Install the four pump housing bolts.

Tighten the small pump housing bolts to 20–25 ft.–lbs. (27–34 Nm) torque **[C]**.

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Tighten the large pump housing bolts (hex head & allen head) to 33–41 ft.–lbs. (45–56 Nm) torque **[D]**.

#### **BUCKET POSITION VALVE (Optional)**

#### **Removal and Installation**

Remove the steering levers/front panel assembly. (See Page 3–1.)

Remove the lift lock valve. (See Page 8-1.)

Mark all the tubelines for correct assembly.

Disconnect the tubelines (Items 1 & 2) **[A]** from the tee fitting at the bucket position valve.

Disconnect the tubeline (Item 1) [B] from the control valve.

Disconnect the two tubelines (Item 2) **[B]** at the rear of the bucket position valve.

Remove the two mounting bolts and nuts (Item 3) [B].

*Installation:* Tighten the mounting bolts and nuts to 15–16 ft.–lbs. (20–22 Nm) torque.







Remove the bucket position valve [C].



#### HYDRAULIC FLUID RESERVOIR

#### **Removal and Installation**

Raise the operator cab. (See Page 1–1)

Disconnect the hose (Item 1)  $\circlet{A}$  at the case drain filter and drain the fluid into a container.

Loosen the hose clamp and disconnect the reservoir outlet hose (Item 1) [B].

Disconnect the case drain hose (Item 2)  $\case{[B]}$  at the reservoir.

Remove the bolt and plate from the mounting strap (Item 1) **[C]** & **[D]**.

*Installation:* Tighten the bolt to 16–20 ft.–lbs. (21–27 Nm) torque.

Remove the mounting strap.

Remove the hydraulic reservoir from the loader.









#### HYDROSTATIC FILTER HOUSING

#### **Removal and Installation**

## **IMPORTANT** When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

Disconnect the wires (Item 1) [A] from the sender.

Disconnect the tubelines (Items 2 & 3) [A].



Disconnect the hose (Item 1) [B].

Remove the four mounting bolts (Item 2) [B].

*Installation:* Tighten the mounting bolts to 25 ft.–lbs. (34 Nm) torque.

Remove the filter/filter housing assembly.





#### HYDRAULIC FILTER HOUSING

#### **Removal and Installation**

# IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

Remove the hydrostatic filter housing. (See Page 2–66.)

Disconnect the wire (Item 1) [A] from the sender.

Disconnect the tubeline (Item 2) [A].

Disconnect the hose (Item 1) [B].

Remove the four mounting bolts (Item 2) [B].

*Installation:* Tighten the mounting bolts to 25 ft.–lbs. (34 Nm) torque.

Remove the hydraulic filter/filter housing assembly.





#### **CONTROL PEDALS**

#### **Removal and Installation**

Remove the bolt and nut (Item 1) [A] from the pedal linkage.

*Installation:* Tighten the bolt and nut to 21–25 ft.–lbs. (28–34 Nm) torque.

Check the rubber bushing in the pedal for wear and replace as needed.

Remove the two mounting bolts (Item 1) [B].

Remove the pedal assembly from the loader.

#### **Pedal Adjustment**

After installing the pedal, adjust the pedal so that there is clearance under the rear of the pedal and the valve spool must travel full stroke without hitting the floor panel.



NOTE: See Page 2–69 for correct procedure to adjust the pedal interlock linkage.





#### PEDAL INTERLOCK LINKAGE

#### **Removal and Installation**

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Raise the operator cab. (See Page 1–1.)

Remove the interlock shield mounting nuts (Item 1) [A].

*Installation:* Tighten the shield mounting nuts to 25–28 ft.–lbs. (34–38 Nm) torque.

Remove the interlock shield (Item 2) [A].

Remove the interlock mounting nuts and plastic washers from behind the nuts **[B]**.

Remove the interlock (Item 1)  $[{\mbox{\bf B}}]$  and plastic washers from behind the interlock.



*Installation:* Tighten the interlock mounting nuts to 84–95 in.–lbs. (9,5–10,8 Nm) torque.

To install new interlock mounting bolts, remove the top bolt from the front panel and loosen the two bolts at the bottom of the panel **[D]**.









#### PEDAL INTERLOCK LINKAGE (Cont'd)

#### Removal and Installation (Cont'd)

Remove the panel from the loader frame [A].



Install the mounting bolts (Item 1) **[B]** through the back of the panel as shown.



Check the pedal interlock linkage so it is free and locks both pedals.

Check that the tab (Item 1) **[C]** on the linkage, slides into the slot on the interlock and holds the pedal in locked position.

If not, loosen the bolts and adjust the tab for correct engagement.

Tighten the bolts to 25–28 ft.–lbs. (34–38 Nm) torque.



The locking tab should fit into the slot of the interlock as shown in figure **[D]**, when adjusted correctly.







#### HYDROSTATIC SYSTEM

Number DRIVE BELT DRIVE BELT SHIELD DRIVE BELT TENSIONER PULLEY Checking Pulley End Play ...... 3–72 FRONT PANEL HYDROSTATIC MOTOR Disassembly ...... 3–17 Removal and Installation ..... 3–15 HYDROSTATIC PUMP Charge Pump Assembly ...... 3–57 Charge Pump Disassembly ..... 3–36 Hydraulic Pump Installation ...... 3–59 Hydraulic Pump Removal ...... 3–35 Hydrostatic Pump Neutral Adjustment ...... 3–60 Removal and Installation ...... 3–27 HYDROSTATIC SYSTEM INFORMATION Replenishing Valve Function ...... 3–4 **OIL COOLER** STEERING LEVERS Adjusting Lever Freeplay ...... 3–10 Adjusting the Wheel RPM Forward Compared to Reverse Travel ..... 3–11 Adjusting the Wheel RPM Left Compared to Right Side ...... 3-14 Disassembly and Assembly ..... 3–7 TROUBLESHOOTING 

#### HYDROSTATIC SYSTEM

Page



#### TROUBLESHOOTING

#### Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE
No drive on one side, in one direction.	1, 2
No drive on one side in both directions.	2, 3, 4, 5
The loader does not move in a straight line.	2, 3, 5, 6, 7
The hydrostatic system is overheating.	8, 9, 10, 11
Service code HP 2 appears (Warnings, low charge pressure) or the warning light comes ON (853 Standard).	8, 11, 12, 13, 14

#### KEY TO CORRECT THE CAUSE

- 1. The hydrostatic pump replenishing valves not seating.
- 2. The steering linkage needs adjustment.
- 3. The hydrostatic pump has damage.
- 4. The final drive chains are broken.
- 5. The hydrostatic motor has damage.
- 6. The tires do not have the correct tire pressure.
- 7. The tires are not the same size.
- 8. The hydrostatic fluid is not at the correct level.
- 9. The oil cooler has a restriction.
- 10. The temperature sending switch is not operating correctly.
- 11. The loader is not being operated at the correct RPM.
- 12. The sender is defective.
- 13. Pump is defective or worn hydrostatics.
- 14. Hydraulic filter is plugged.



#### **Replenishing Valve Function**

The functions of the replenishing valves are:

- 1. To give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling; Function 1 [A].
- 2. To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 [A].



#### **FRONT PANEL**

#### **Removal and Installation**



Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Raise the operator cab. (See Page 1-1.)

Remove the mounting bolts (Item 1) **[A]** from the throttle lever.

Disconnect the linkage rod (Item 1)  $\ensuremath{\left[ B \right]}$  from the throttle lever.

Hold the lock nut and remove the knob (Item 1)  $\circ{[C]}$  from the lift lock valve.









Disconnect the wire harness connectors (Item 1) [D] from the steering lever wire harness.

## NOTE: The 853 without front auxiliary hydraulics does not have electric control handle.

Remove the right side steering shock (Item 2) [D].

#### FRONT PANEL (Cont'd)

Removal and Installation (Cont'd)

Remove the steering cable U–bolt (Item 1) **[A]**. Disconnect the steering cable ball joint (Item 2) **[A]**.

Remove the steering cable U–bolt (Item 1) [B]. Disconnect the steering cable ball joint (Item 2) [B]. Remove the top mounting bolt (Item 3) [A] & [B].

Remove the two mounting bolts (Item 1) **[C]** at the side of the front panel (both sides).

Remove the three mounting bolts (Item 2)  $\circe{[C]}$  along the bottom of the front panel.

Remove the front panel.



#### STEERING LEVERS

#### **Disassembly and Assembly**

Remove the front panel/steering lever assembly. (See Page 3–5.)

Remove the steering shaft centering mechanism bolt and nut (Item 1) [A] and spring.

Disconnect the steering shock (Item 1) [B].

Loosen both U-bolts (Item 2) [B] at the steering lever.

Remove the steering lever.

Loosen both U-bolts (Item 1) [C] at the steering lever.

Remove the steering lever.

**Assembly:** The steering levers must be mounted flush with the back of the mounting plate (Item 3) **[B]**.

Remove the steering shaft assembly bolts (Item 2) **[C]** (both sides).

Remove the steering shaft.

Disassemble the right and left steering shaft from the cross shaft **[D]**.

Install new nylon bushings (Item 1) **[D]** as needed at the ends of the steering shaft.









#### Disassembly and Assembly (Cont'd)

Check the nylon bushing (Item 1)  $\ensuremath{\left[ A \right]}$  and replace as needed.

**Assembly:** Make sure the wave washer (Item 2) **[A]** is between the nylon bushings.

Check and replace the cams (Item 3) [A] if worn or damaged.

## NOTE: The cams must not rotate on the mounting bolts.

Remove the bolts (Item 1) **[B]** to remove the steering shaft mounting bracket (Item 1) **[C]** and the steering lever stop plate (Item 2) **[C]**.

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To remove the centering mechanism bracket from the front panel, remove the two nuts and bolts (Item 1) [D].

#### **Pre-Adjustment Checks**

Read this adjustment completely to become familiar with the procedure before beginning the adjustment.

The loader should not creep (slow wheel movement) when the steering levers are at rest in the neutral position.

The following special tool will be needed to do the following procedure:

MEL1429A - Remote Start Switch

Lift and block the loader. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

Connect the remote start switch. (See Page 1–1.)



Check the following items (Steps 1, 2 & 3) before making any adjustments on the steering linkage:

- 1. Always check tire pressure and tire size before making any adjustments. Inflate tires to maximum pressure shown on the sidewall of the tire. Be sure the tires do not vary more than 1 inch (25,4 mm) in circumference [A] which could cause different rate of travel and the loader drifting to one side with both steering levers at equal travel.
- 2. To be sure the hydrostatic pump is in neutral, block the neutral spring bracket out with a deep socket (approximately 7/16 inch) so you can no longer feel the linkage neutral setting **[B]** & **[C]**.
- 3. Start the engine. Move the levers while observing the neutral position on the pump servo spool valve. You can feel and see the spring (Item 1) **[D]** of the pump neutral adjustment. If the wheels do not move when the pump is in the neutral position, then the pump is correctly adjusted. Only linkage adjustment will be necessary for neutral position. If the wheels move when the pump levers are in neutral position, see Page 3–59 for the pump neutral adjustment.
- 4. Stop the engine. Remove the socket [B].









#### **Adjusting Lever Freeplay**

Read this adjustment completely to become familiar with the procedure before beginning the adjustment.

Use the following procedure to adjust the steering linkage so both steering levers have no **free play** against the cam. To remove the **free play**, move the right cam to match the left cam so there is no **free play** between the two cams in the pocket of the detent bracket **[C]**. Use the following procedure to adjust the the cam free play.

- Only the right side cam is adjustable in slotted hole in bellcrank (Item 1) [B]. The left side cam is fixed and will not require adjustment. The cam should not rotate on the mounting bolt. If cam rotates, tighten the jam nut (Item 1) [A] against the cam while holding cam mounting bolt (Item 3) [A].
- 2. Loose the cam mounting bolt nut (Item 2) [A] and move the cam to the rear to get free play in the left hand lever.
- Tighten the cam bolt. Use a punch and hammer, hit the cam nut (cam mounting bolt is still tight) until the free play is removed from the left hand lever [B]. The cam must be centered in the detent bracket pocket [C].
- 4. Recheck the torque at the cam bolt to be sure it is still tight. Check again to be sure there is no free play in the cams. If there is any free play the neutral setting can not be obtained.





## Adjusting the Wheel RPM Forward Compared to Reverse Travel

Read this adjustment completely to become familiar with the procedure before beginning the adjustment.

- NOTE: This procedure adjusts the position of the steering levers in the panel when in neutral. Levers centered in steering panel give equal travel forward compared to reverse.
  - 1. Disconnect the two bolts of the pintle links (both sides) (Item 1) [A].
  - 2. Fully lower steering lever stop and tighten (both sides) (Item 1) [B].
- NOTE: Before measuring, move the steering lever a small amount to be sure the cam is in the detent pocket with no freeplay.

3. Move the lever to full forward, measure the distance from the U-bolt to the lock nut. Record this measurement **[C]**.

EXAMPLE ONLY: 3.66 inch (82 mm)







4. Move the lever to full reverse, measure the distance from the U–bolt to the lock nut. Make a record of this measurement **[D]**.

EXAMPLE ONLY: 2.76 inch (70 mm)



## Adjusting the Wheel RPM Forward Compared to Reverse Travel (Cont'd)

5. Move the lever to the neutral position. Measure the distance from the U–bolt to the lock nut [A]. Neutral must be adjusted to 3.21 inch (82 mm) per example.

EXAMPLE:

Forward	3.66 inch (93 mm)
Reverse	– <u>2.76</u> inch (70 mm)
	0.90 inch (23 mm) Total Travel*

Divided by Two = 0.45 inch (11 mm) Half the Travel +  $\frac{2.76}{3.21}$  inch (70 mm) Reverse Travel 3.21 inch (82 mm) Is Neutral

If adjustment is required, loosen the mounting bolts (Item 1) [B].

Moving the neutral spring bracket up will allow more forward stroke and more forward wheel RPM. Moving it down will allow more rearward stroke and more reverse wheel RPM.

Use a screwdriver to move the neutral spring bracket (Item 1) **[C]** down or a large pliers to move it up in its slotted holes.

NOTE: Keep the bracket vertical to be sure that the cams make full contact in the pocket of the detent bracket.

Tighten the mounting bolts on the spring bracket (Item 1) **[B]**.

Neutral to forward cable travel must be within 0.010 inch (0,25 mm) left compared to right side.

Install pintle link bolts (Item 1) [D] (both sides).









#### Adjusting the Steering Neutral Setting

Read this adjustment completely to become familiar with the procedure before beginning the adjustment.

- NOTE: This procedure adjusts the creep (wheel movement in neutral) and dead-band (lever travel before wheels start to turn). Adjusting steering cable length will match lever neutral and pump neutral.
- NOTE: The following adjustments (Steps a, b, c & d) are not necessary if the thread engagement in the ball joint is equal on both ends of the cable (Item 1) [A] & [B].
  - a. Disconnect the cable ball joint from the steering lever shaft (Item 2) [A].
  - b. Loosen the jam nut and turn the ball joint all the way to the end of the threads (toward cable housing).
  - c. At the pumps, loosen the jam nut and turn the inner cable until the ball joint is all the way to the end of the threads (toward the cable housing).
  - d. Connect the steering cable ball joint.
  - 1. Start the engine. WHEN THE ENGINE IS RUNNING, THE WHEELS WILL BE TURNING.



- 2. The steering cable ends have right and left hand threads. By turning the inner cable, it will shorten or lengthen the cable. Turn the inner cable until the wheels stop turning **[C]**.
- NOTE: Before measuring, move the steering lever a small amount to be sure the cam is in the detent pocket with no freeplay.
  - 3. Use a straight edge for a measuring reference point positioned against the pedal lock links (Item 1) [D]. Put a ruler between reference and steering lever to measure lever travel from neutral until wheel starts to travel forward. Then measure from neutral until wheel starts to travel reverse [D].
  - 4. Adjust cable length by turning the inner cable until the two measurements are equal **[C]**. Tighten the jam nut (both ends).
  - 5. Repeat the procedure for the other side of the loader.









Adjusting the Wheel RPM Left Compared to Right Side

- NOTE: This procedure is for MINOR adjustment in full forward travel only. Steering neutral setting must be correctly adjusted before this procedure.
  - 1. Loosen the bolts at the stop (Item 1) **[A]** and lower the lever stops (both sides).
  - 2. Start the engine.



3. Check wheel RPM left and right side **[B]**. They should be the same. If not, the stop (Item 1) **[A]** can be used for MINOR adjustment. Bring the stop up on the faster side until RPM is equal. (Tighten stop before re-checking) tighten remaining side in down position.



#### HYDROSTATIC MOTOR

#### **Removal and Installation**

## IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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Lift and block the loader. (See Page 1–1.)

Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Remove the front tire/wheel assembly.

Remove the four mounting bolts for the motor cover (Item 1) [A].

Remove the motor cover.

Mark the hoses for correct installation.

Disconnect the case drain hose (Item 1) [B].

Disconnect the high pressure hoses (Item 2) [B].

Remove the four mounting bolts (Item 1)  $\circe{[C]}$  from the motor.

*Installation:* Tighten the bolts to 65–70 ft.–lbs. (88–95 Nm) torque.

Remove the hydrostatic motor from the gearcase.

*Installation:* Replace the large O-ring (Item 1) [D] and face seals on the motor fittings before installing the motor.











#### **Parts Identification**



#### Ref. Description

Ref.	Description

1	FLANGE, mounting
2	O-RING
3	DRIVE
4	O–RING
5	GEROLER
6	PLATE, valve
7	DRIVE, valve
8	VALVE
9	PLATE, balance assy.
10	SEAL, outer
11	SEAL, inner
12	SPRING
13	O–RING
14	O–RING

15	HOUSING, valve
16	BOLT
17	BOLT
18	SEAL
19	PLUG
20	O-RING
21	SPRING
22	POPPET
23	PISTON
24	PLUG
25	PLUG
26	BEARING, bronze
27	SHUTTLE

#### Disassembly



Put a mark across the sections for correct assembly.

Remove the four bolts from the motor [A].

Remove the plug at the shuttle valve [C].

Lift the valve housing straight up **[B]**. If done carefully, the springs and balance plate will stay on the valve.









Remove the O-rings.

Remove the spring and shuttle [D].

Disassembly (Cont'd)

Remove the shuttle valve spool [A].



Use a punch, through the housing and remove the poppet, spring, O-ring and plug from the other side **[B]**.





Remove the balance plate [C].

Disassembly (Cont'd)

Remove the inner seal from the balance plate [A].

A Balance Plate Outer Seal Pin Inner Seal Pin Balance Plate Outer Seal Balance Plate Outer Seal Balance Plate Outer Seal Balance Balance Plate Balance Balance Balance Plate Balance B







Remove the outer seal from the balance plate [B].

Remove the valve [C].

Remove the valve plate [D].

#### Disassembly (Cont'd)

Remove the valve drive [A].



Remove the geroler [B].

Make sure to keep the rollers in the geroler.

Remove the drive shaft [C].





Remove the O-rings from the housing [D].

#### Disassembly (Cont'd)

Remove the O-rings inside the bore of the mounting flange **[A]**.



Β

The bushing is a guide to center the motor on the gearcase. If the bushing needs replacing, use the following procedure:

1. Drill several holes in the bushing [B].



3. Use a hydraulic press to install the new bushing.

C

B-09470

#### Inspection

Clean all the parts in solvent and use air pressure to dry them. DO NOT use cloth or paper because small pieces of material can get into the system and cause damage.

Before the motor is assembled, check the following items:

Check the geroler rollers and rotor for wear and scratches **[A]**.

NOTE: Put all the rollers back in their original position.

Check the valve plate for scratches [B].









Check the balance plate for scratches **[C]**.

Check the valve drive and the main drive for wear.

Check the end plate surface for scratches [D].

Assembly



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## NOTE: Always use new O-rings, gaskets and seals when assembling the hydrostatic motor.

If the bushing was removed use a hydraulic press and bushing driver tool to install the new bushing.

Install new O-rings in the bore of the mounting flange [A].

Install new O-rings on the housing [B].

Install the drive shaft [C].







Make sure to keep the rollers in the geroler and install the geroler [D].

NOTE: See Page 3–26 for timing of the motor when installing the valve, valve drive and geroler.



#### Assembly (Cont'd)

Install the valve drive [A].

NOTE: See Page 3–26 for timing of the motor when installing the valve, valve drive and geroler.

Install the valve plate [B].

Install the valve [C].

Put grease on the seals. Install the outer seal on the balance plate as shown in Figure **[D]**.







#### Assembly (Cont'd)

Put grease on the seals. Install the inner seal on the balance plate as shown in Figure [A].



Install the poppet, shuttle valve, spring and plug into the end housing **[B]**.

Install the balance plate in the end housing, put your finger through the hole and hold the balance plate in

position until the housing is in position [C].







Tighten the bolts to 63 ft.-Ibs. (85 Nm) torque as the

sequence shows in Figure [D].

Install the four bolts in the motor.

#### **Timing the Hydrostatic Motor**

The timing of the motor controls the direction of rotation of the drive shaft of the motor. The timing parts are as follows:

- 1. Geroler (Item 1) [A].
- 2. Valve Drive (Item 2) [A].
- 3. Valve Plate (Item 3) [A].
- 4. Valve (Item 4) [A].

Find the largest opening between the geroler star and the geroler ring and mark the outside of the geroler ring at that point **[A]**.

Align the two drain holes and the three pressure holes in the geroler ring with the same holes in the mounting flange and install the geroler assembly.

Install new O-rings.

Install the valve drive [A].

Align the drain hole in the valve plate with the drain hole in the geroler. Install the valve plate with the O–ring toward the geroler. Make sure the slot opening of the valve plate is in alignment with the largest opening of the geroler.

Install the valve plate.

Install the valve on the valve plate. Make alignment with one of the side openings with the mark on the geroler. Turn the valve **clockwise** a small amount until the teeth on the valve drive engage.

Continue with the rest of the assembly procedure.


#### HYDROSTATIC PUMP

#### **Removal and Installation**

Remove the hydrostatic pump/engine assembly from the loade. (See Page 7–1.)

Remove the belt shield clips (Item 1) **[A]** and belt shield (Item 2) **[A]**.

Loosen the tensioner pulley nut (Item 1) [B].

Remove the drive belt (Item 2) [B].

*Installation:* Tighten the drive belt to the correct specifications. (See Page 3–61.)

Remove the washer and nut (Item 1) **[C]** from the hydrostatic pump drive shaft.

*Installation:* Tighten the nut to 175–200 ft.–lbs. (237–271 Nm) torque.

Install the nut on the end of the pump drive shaft (without washer).

Use a puller (Item 1)  $\left[ D \right]$  to remove the pulley from the pump drive shaft.









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#### Removal and Installation (Cont'd)

Remove the two mounting bolts (Item 1) **[A]** and nuts (Item 1) **[B]**.

**Installation:** Tighten the mounting bolts and nuts to 65–70 ft.–lbs. (88–95 Nm) torque. Make sure the key (Item 2) **[A]** is installed.





Remove the mounting bolt (Item 1)  $\circe{[C]}$  at the hydraulic pump end of the pump.

Remove the hydrostatic pump from the mounting bracket and drive belt housing.

# **Replenishing/High Pressure Relief Valve**

There are four replenishing/high pressure relief valves (Item 1) **[A]** in the hydrostatic pump. Two are located at the front of the pump and two at the rear of the pump.

See Page 3–4 for valve function.



Remove the plug spring and high pressure relief value from the pump  $[\mbox{B}].$ 

Check for damage and replace as needed.

Ref.	Description
1. 2. 3. 4.	PLUG O-RING SPRING HIGH PRESSURE RELIEF



# **Parts Identification**



Parts Identification (Cont'd)

Ref.	Description	Ref.	Description
$\begin{array}{c}1\\2\\3\\4\\5\\6\\7\\8\\9\\0\\1\\1\\2\\3\\4\\5\\6\\7\\8\\9\\0\\1\\2\\2\\2\\2\\4\\5\\6\\7\\8\\9\\0\\1\\2\\3\\3\\4\\5\\6\\7\\8\\9\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3\\3$	O-RING O-RING O-RING COVER ROTOR ASSY. PIN COUPLER PIN RELIEF VALVE SPRING O-RING PLUG O-RING SHIM SPRING CHARGE RELIEF VALVE O-RING RING BYPASS VALVE BOLT GUIDE SPRING STOP GUIDE SPRING STOP GUIDE SNAP RING NUT LOCKING NUT BOLT PLUG BOLT VASHER SERVO COVER GASKET SEAL RING SERVO PISTON ROTATING GROUP ASSY. VALVE PLATE	$\begin{array}{c} 40\\ 41\\ 42\\ 43\\ 44\\ 45\\ 46\\ 47\\ 48\\ 49\\ 50\\ 51\\ 52\\ 53\\ 54\\ 55\\ 56\\ 57\\ 58\\ 59\\ 60\\ 61\\ 62\\ 63\\ 64\\ 65\\ 66\\ 67\\ 68\\ 69\\ 70\\ 71\\ 72\\ 73\\ 74\\ 75\\ 76\\ 77\\ 78\end{array}$	BEARING GASKET PIN SERVO COVER NUT COVER HOUSING O-RING PLATE ADAPTER BOLT ORIFICE PLUG SLEEVE O-RING SPOOL O-RING SPOOL O-RING SPRING BRACKET BOLT NUT WASHER HANDLE SHAFT KEY PIN SWASH PLATE PIN SWASH PLATE PIN SURASH PLATE PI

# Parts Identification (Cont'd)



Parts Identification (Cont'd)



-3-34-

Hydraulic Pump Removal



Remove the two hydraulic pump mounting bolts [A].

Remove the hydraulic pump and O-ring [B].











Remove the bolt from both sides of the pump assembly  $\cal{[C]}$ 

Remove the nut and lift bracket [D].

## Hydrostatic Pump Separation (Cont'd)

Separate the two pumps [A].

Remove the large O-ring (Item 1)  $[{\bf A}]$  and two small O-rings (Item 2)  $[{\bf A}]$  from the rear pump.



# **Charge Pump Disassembly**

Remove the two O-rings from the gerotor cover [B].

Remove the gerotor pump assembly and splined coupler from the rear pump  $[\ensuremath{\textbf{C}}]$ .







Remove the splined coupler and drive pin (Item 1) [D].

#### Charge Pump Disassembly (Cont'd)

Remove the gerotor assembly from the gerotor cover [A].

Check all charge pump components for wear or damage. Replace parts as necessary.



# IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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Use the following procedure to disassemble both front and rear hydrostatic pumps. Procedures to be performed on the front or rear pump only are marked.

# NOTE: Keep front and rear pump parts separate during disassembly and assembly.

Remove the plug, shims (if equipped), spring and high pressure relief valve cartridge from each side of the pump **[B]**.

- Remove the plug, shims (if equipped), spring and charge pressure relief valve [C].
- Remove the by-pass valve [D].









- ♦ Front Pump
- Rear Pump

# Disassembly (Cont'd)

◊ Remove the three bolts at the adapter housing **[A]**.



• Remove the adapter housing and plate (Item 1) [B].

Β CD-00062





- Front Pump Rear Pump  $\Diamond$
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Remove the plug at the control inlet orifice port [C].

Remove the screened orifice plug (Item 1) [D].

#### **Disassembly (Cont'd)**

Mark the position of the neutral bracket for reference during assembly **[A]**.

NOTE: Removal of any part of the mechanical control will result in the loss of the neutral setting and will require neutral adjustment. Refer to Page 3–9 for the correct neutral adjustment procedure. The neutral adjustment procedure must be performed with the pump installed and engine running.

Remove the flange head screw [B].

Remove the control lever and spool assembly [C].

If necessary, remove the spring from the control lever and spool assembly **[D]**.











#### **Disassembly (Cont'd)**

If disassembly of the control lever and spool assembly is necessary, locate the notch (Item 1) [A] in the end of the spool. Mark the control lever and neutral bracket on the same side as the spool notch.



3

Disassembly as shown in Figure [B]:

Remove the nut (Item 1) **[B]**, lock washer (Item 2) **[B]**, control lever (Item 3) **[B]**, neutral bracket (Item 4) **[B]**, back–up washer (Item 5) **[B]** and O–ring (Item 6) **[B]** from the spool (Item 7) **[B]**.

Gripping the outside of the control sleeve with a pliers, remove the control sleeve [C].

#### NOTE: Do not grip the inside diameter of the control sleeve.

В





Remove the seven end housing bolts [D].

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#### Disassembly (Cont'd)

Remove the end housing with the shaft assembly [A].

Remove the gasket [A].



Remove the swashplate journal bearings from the end housing **[B]**.

Use an electric drill with a magnetized or greased bit to make a small hole in the seal **[D]**.

NOTE: Be careful not to damage the bearing behind

♦ Remove the snap ring at the seal **[C]**.







CD-00093

- ♦ Front Pump
- Rear Pump

 $\Diamond$ 

the seal.



# Disassembly (Cont'd)

◊ Install a seal puller and remove the seal [A].



Remove the large snap ring at the bearing [B].

Remove the shaft and bearing assembly [C].

Remove the swashplate from the housing [D].







- Front Pump
- Rear Pump



Disassembly (Cont'd)

Remove the guide from the swashplate [A].



Using a snap ring pliers, remove the rotating group assembly **[B]**.

To remove the valve plate, use an O-ring pick tool to lift the valve plate up. Remove the valve plate from the housing **[C]**.







- Remove the five bolts and bracket (Item 1) [D] from the end cap.

- Front Pump
  Poor Pump
- Rear Pump

Disassembly (Cont'd)

Remove the end cap and gasket [A].



Β







Measure and record the distance between the piston and housing [B].

While holding the centering screw stationary, remove the neutral adjustment lock nut **[C]**.

Remove the five bolts from the end cap [D].



#### Disassembly (Cont'd)

Turn the end cap off the centering screw. Remove the gasket **[A]**.









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Push the end of the piston into the housing and remove the seal **[B]**.

Remove the piston from the housing by pulling on the centering screw **[B]**.

Disassembly of the piston as shown in Fig. [C]:

Remove the seal (Item 1) **[C]** from the centering screw end of the piston. Remove the O-ring (Item 2) **[C]** and bearing ring (Item 3) **[C]** from both ends of the spool.

If it is necessary to disassemble the piston, use the following procedure:

Loosen the jam nut (Item 1) **[D]**. Tighten the nut at the piston to release spring tension on the snap ring.

#### Disassembly (Cont'd)

Remove the snap ring and centering spring assembly from the piston **[A]**.



Disassemble the centering spring assembly as shown in Figure **[B]**:

Remove the lock nut (Item 1) **[B]**, nut (Item 2) **[B]**, short spring guide (Item 3) **[B]**, spring (Item 4) **[B]**, stop (Item 5) **[B]** and long spring guide (Item 6) **[B]** from the centering screw (Item 7) **[B]**.



#### Inspection

Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper because small pieces of material can get into the system and cause damage.

Lubricate all internal pump parts with clean hydraulic oil before assembly.

Check the two bearing locater pins (Item 1) **[C]** in the end housing. The pins must measure 0.0625-0.080 inch (1,65-2,03 mm) from the end housing surface to the end of the pins.

Check the shaft for wear or damage in the splined and bearing areas **[D]**.

Check the bearing for proper operation. Remove from the shaft only if necessary to replace **[D]**.





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#### Inspection (Cont'd)

Check the needle bearing (Item 1) **[A]** in the housing for proper operation.

If the bearing must be replaced, use the correct driver to remove and install the bearing. The numbered end of the bearing must be installed toward the inside of the pump housing. When installed correctly, the end of the bearing must measure 0.08-0.10 inch (2,0-2,5 mm) above the machined housing surface.

Check the locating spring pin (Item 2) [A].

The pin must measure 0.165-0.185 inch (4,19-4,70 mm) from the housing to the end of the pin.

Check the swashplate (Item 1) **[B]** and valve plate (Item 2) **[B]**.

The surface finish must be smooth and free of scratches. If scratches can be felt with a fingernail, replace the parts.

Check the four small holes in the swashplate surface to make sure they are open.

Check the guide pin (Item 3) [B].

The guide pin must measure 0.29-0.31 inch (7,4-7,9 mm) from the swashplate surface to the end of the pin.

Check the spring pin (Item 4) [B].

The spring pin must be installed with the split toward the center of the swashplate. The spring pin must measure 0.33–0.5 inch (8,4–8,9 mm) from the swashplate to the end of the pin.

Check the end of the piston block. The surface must be smooth and free of scratches **[C]**.







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Check that each piston moves freely in its bore [D].

Check each piston and piston shoe for wear or scratches.

Check the cylinder bores in the piston block for wear or scratches.

Check the shoe plate. The shoe plate must be flat with no sign of cracks or wear.



#### Inspection (Cont'd)

Check the spherical washer for wear or damage [A].



Check the three pins [B].

The pins must not be bent. All pins must be the same length.

NOTE: If there is any defect in the rotating group, the complete rotating group must be replaced.



# Assembly

If disassembly, assembly as shown in Fig. [C]:

Apply oil to and install the long spring guide (Item 1) **[C]**, stop (Item 2) **[C]**, spring (Item 3) **[C]**, short spring guide (Item 4) **[C]**, nut (Item 5) **[C]** and lock nut (Item 6) **[C]** onto the centering screw (Item 7) **[C]**.

Hold the centering screw from turning and tighten the nut to compress the spring.

Install the centering spring assembly and snap ring into the piston **[D]**.





#### Assembly (Cont'd)

To seat the snap ring, loosen the nut until the centering screw is loose **[A]**.

Tighten the nut until all axial looseness is removed between the centering screw and spring guides but stop tightening the nut before the spring assembly becomes loose in the piston **[A]**.

NOTE: It will be impossible to set the pump neutral position if there is any free play between the piston and spring assembly or between the spring assembly and centering screw.

While holding the nut, tighten the jam nut to 18-27 ft.-lbs. (24-37 Nm) torque.

Install the rings, O–rings and seals as shown in Figure **[B]**:

Apply oil to two new bearing rings (Item 1) **[B]**, two new O–rings (Item 2) **[B]** and two new seals (Item 3) **[B]**.

Install a bearing ring (Item 1) **[B]** and O–ring (Item 2) **[B]** onto each end of the piston.

Install a seal (Item 3) **[B]** over the O-ring on the end opposite the centering screw.

Apply oil to the spool. Carefully install the spool, centering screw first, into the housing toward the outlet port side of the housing **[C]**.

With the centering screw toward the front it makes neutral adjustment easier.

Push the piston through the housing just far enough to install the new seal over the O–ring **[D]**.

Carefully push the piston back into the housing.









#### Assembly (Cont'd)

Install a new gasket. Install the end cap over the centering screw. Turn the end cap up to the housing **[A]**.



Install the five bolts into the end cap [B].

Tighten the bolts to 10–13 ft.–lbs. (14–18 Nm) torque.



Center the piston using the measurement recorded during disassembly **[C]**.

NOTE: The approximate distance between the piston and housing edge is 0.5 inch (12,7 mm). Any measured adjustment is approximate. The final neutral adjustment must be performed with the pump installed and engine running.

While holding the centering screw stationary, install the neutral adjustment lock nut **[D]**.





# Assembly (Cont'd)

Install a new gasket and the end cap [A].



Install the five bolts into the end cap [B].

Tighten the bolts to 10–13 ft.–lbs. (14–18 Nm) torque.





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Apply oil to the valve plate.

Install the value plate, bronze side up, into the housing  $\car{[C]}$ 

The notch (Item 1) **[C]** in the valve plate must engage the locating spring pin in the housing.

Apply oil to the needle bearing at the base of the housing.

Apply oil to all parts and surfaces in the rotating group. Using a snap ring pliers, lower the rotating group into the housing **[D]**.

#### Assembly (Cont'd)

Apply oil to the guide and swashplate. Install the guide onto the swashplate with the guide offset positioned to provide clearance for the journal bearing **[A]**.



Install the swashplate into the housing [B].

Adjust the swashplate so that the guide engages the piston.

Center the rotating group and swashplate over the needle bearing.

Check that the spherical washer is on top of the three pins.

Apply oil to the bearing and shaft. Install the shaft and bearing assembly into the end housing **[C]**.







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Install the snap ring [D].

#### Assembly (Cont'd)

Apply a light coating of grease to the lips of a new seal. Using a correct size driver tool, install the new seal [A].

linstall the snap ring [B].

Apply oil to both journal bearings. Install the journal bearings on the end housing **[C]**.

Check that the journal bearings are seated on the bearing locater pins.

NOTE: Petroleum jelly can be applied between the journal bearings and end housing to retain the journal bearings during installation on the pump.

Install a new gasket. Carefully install the end housing and shaft assembly **[D]**.

When the shaft and end housing are properly installed the rotating group spring will hold the end housing. A maximum distance of 0.125 inch (3,2 mm) away from the housing.









- ♦ Front Pump
- Rear Pump

#### Assembly (Cont'd)

Install the seven end housing bolts [A].

Evenly tighten the six 7/16 inch bolts to 60–74 ft.–lbs. (81–100 Nm) torque and 3/8 inch bolt to 39–47 ft.–lbs. (53–64 Nm) torque.

Rotate the shaft periodically while tightening the bolts to assure the correct pump assembly. When fully assembled a torque of 4-8 ft.–lbs. (5,4–10,8 Nm) will be required to turn the shaft.

Apply petroleum jelly to a new O-ring and back-up washer. Install the O-ring (Item 1) **[B]** and back-up washer (Item 2) **[B]** on the control sleeve.

Apply oil to the control sleeve. Install the sleeve into the housing **[B]**.

The notch (Item 3) **[B]** in the control sleeve must be installed toward the end housing and engage the spring pin in the swashplate.

Apply petroleum jelly to a new O-ring and back-up washer. Install the O-ring (Item 1) **[C]** and back-up washer (Item 2) **[C]** onto the spool.

Install the neutral bracket (Item 3) **[C]** and control lever (Item 4) **[C]** on the spool aligning the marks made during disassembly with the notch (Item 7) **[C]** in the end of the spool (Item 8) **[C]**.

# NOTE: The notch (Item 7) [C], on either spool must face the servo during assembly.

Install the lock washer (Item 5) **[C]** and nut (Item 6) **[C]** onto the spool.

Tighten the nut to 10–12 ft.–lbs. (13,6–16,3 Nm) torque.

Install the spring on the control lever and spool assembly **[D]**.









#### Assembly (Cont'd)

Apply oil to the spool. Install the control lever and spool assembly into the housing **[A]**.

# NOTE: Be sure the notch (Item 1) [B] in the servo spool faces toward the servo piston during assembly.

Align the neutral bracket with the reference mark made during disassembly. Install the flange head screw **[B]**.

NOTE: Removal of any part of the mechanical control will result in the loss of the neutral setting and will require neutral adjustment. Refer to Page 3–60 for the correct neutral adjustment procedure. The neutral adjustment procedure must be performed with the pump installed and engine running.

Install the screened orifice plug [C].

Tighten the plug to 8–12 ft.–lbs. (10,8–16,3 Nm) torque.

Apply thread sealant to the plug threads. Install the plug into the housing **[D]**.









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#### Assembly (Cont'd)

 $\Diamond$ Apply oil to the three molded O-rings on the plate (Item 1) [A]. Install the plate onto the housing.

Install the adapter housing [A].

• Install the three bolts into the adapter housing [B].

Evenly tighten the bolts to 16-21 ft.-lbs. (22-28 Nm) torque.

Apply petroleum jelly to a new O-ring and back-up ٠ washer. Install the back-up washer (Item 1) [C] and O-ring (Item 2) [C] onto the bypass valve.

Install the by-pass valve [C].

Tighten the valve to 7–10 ft.–lbs. (9,5–13,6 Nm) torque.







Apply petroleum jelly to a new O-ring. Install the O-ring on the plug [D].

Apply oil to the charge pressure relief valve. Install the charge pressure relief valve, spring, shims (if equipped) and plug [D].

Tighten the plug to 30–70 ft.–lbs. (41–95 Nm) torque.



- Front Pump  $\Diamond$ Rear Pump

#### Assembly (Cont'd)

Apply petroleum jelly to a new O-ring. Install the O-ring on the plug **[A]**.

Apply oil to the high pressure relief valve cartridge. Install the high pressure relief valve cartridge, spring, shims (if equipped) and plug **[A]**.

Tighten the plug to 70–170 ft.–lbs. (95–230 Nm) torque.

### Charge Pump Assembly

Apply oil to the gerotor assembly and gerotor cover. Install the gerotor assembly into the gerotor cover **[B]**.









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Apply oil to the splined coupler (Item 1) **[C]** and drive pin (Item 2) **[C]**.

Install the splined coupler and drive pin into the gerotor assembly **[C]**.

The drive pin must be engaged in the gerotor slot.

Install the gerotor assembly into the rear pump [D].

# NOTE: The gerotor assembly must be installed for the correct rotation.

Pumps with split hydrostatic porting (two ports facing forward and two facing rearward) the pin (Item 1) **[D]** must be installed in the bottom holes (Item 2) **[D]**.

Make sure to install the gerotor assembly for the correct rotation. The pin (Item 1) **[D]** must be installed in the top hole (Item 3) **[D]** in the housing.

#### Charge Pump Assembly (Cont'd)

Apply petroleum jelly to two new O-rings. Install the O-rings on the gerotor cover **[A]**.



#### **Hydrostatic Pump Connection**

Apply petroleum jelly to two new small O–rings (Item 1) **[B]** and a large O–ring (Item 2) **[B]**. Install the O–rings on the rear pump.

Connect the two hydrostatic pumps [B].

Install the lift bracket and nut [C].

Install a bolt on both sides of the pump assembly [D].

Evenly tighten the two bolts and nuts to 67–82 ft.–lbs. (91–111 Nm) torque.

Rotate the tandem pump input shaft to check for proper assembly.







## **Hydraulic Pump Installation**

Apply petroleum jelly to a new O-ring. Install the O-ring on the hydraulic pump **[A]**.

Install the hydraulic pump on the tandem pump assembly **[A]**.



Install the two bolts [B].

Tighten the bolts evenly to 25–27 ft.-lbs. (34–37 Nm) torque.



## Hydrostatic Pump Neutral Adjustment



After the hydrostatic pump has been rebuilt, the neutral for the servo valve spool will have to be adjusted. Use the following procedure:

# NOTE: The hydrostatic pump must be installed in the loader for this procedure.

The following tool will be needed to do the following procedure:

MEL1429A - Remote Start Switch

Lift and block the loader. (See Page 1-1.)

Raise the lift arms and install an approved lift arm support devise. (See Page 1-1.)

Raise the operator cab. (See Page 1–1.)

Connect the remote start switch. (See Page 1-1.)

1. Block the neutral spring bracket out with a large socket (1–1/8 inch) so you can feel and see the linkage neutral setting **[A]** & **[B]**.

The pump neutral adjustment bracket (Item 1) **[C]** controls the position of the spool lever arm (Item 2) **[C]** with a centering spring (Item 1) **[D]**.

Inspect centering spring ends for damage or wear. Replace the spring if there is excessive freeplay between spool lever arm (Item 2) **[C]** and spring ends (Item 1) **[D]**.

2. Loosen the bolt (Item 2) **[D]** for the neutral adjustment bracket.









#### Hydrostatic Pump Neutral Adjustment (Cont'd)

3. Clamp the control lever to the neutral adjustment bracket with a small locking pliers **[A]**.

- 4. Start the engine. With the engine running at full RPM, move the control lever forward until the wheels just begin to move. Mark the position on the bracket (felt tip pen) **[B]**.
- 5. Move the control lever in reverse until the wheels just begin to move. Mark this position.
- 6. Stop the engine.

7. Position the neutral adjustment bracket between the two marks and tighten the holddown bolt **[C]**. Remove the locking pliers. Start the engine and check in both directions to be sure the pump will return to neutral.

- 8. Remove the socket from blocking the neutral spring bracket **[D]**.
- 9. Adjust the steering neutral setting. (See Page 3–12.)









#### **DRIVE BELT SHIELD**

# **Removal and Installation**

Stop the engine.

Open the rear door.

Remove the three belt shield holddown clips (Item 1) [A].



Remove the belt shield (Item 1)  $\ensuremath{\left[ B \right]}$  from the drive belt housing.


#### **DRIVE BELT**

#### Adjusting the Drive Belt

See the Service Schedule Page 1–1 for the service interval.

To adjust the drive belt between the engine flywheel and the hydrostatic pump pulley, use the following procedure:

Raise the operator cab. (See Page 1–1.)

Remove the belt shield. (See Page 3–62.)

Use the following tools to check the belt tension:

```
MEL1404 – Bar
MEL1406 – Spring Scale
```

- 1. Install the tool on the drive belt. The pin (Item 1) [A] must be pulled tight against the engine drive pulley.
- 2. Make a mark (Item 2) **[A]** on the cast flange just above the tool handle.
- 3. Install the spring scale on the tool handle. The line of pull (Item 3) **[A]** on the spring scale must be at approximately 90° from the tool handle.
- 4. Loosen bolt (Item 4) [A] and jam nut (Item 5) [A].
- 5. Tighten adjustment nut (Item 6) **[A]** to increase belt tension; loosen to decrease belt tension.
- 6. Tighten bolt (Item 4) [A] and jam nut (Item 5) [A].

NEW BELT: (less than .5 hours use): With 14 lbs. (62 N) for force, the tool should move 1.25 inches (32 mm) (the width of the tool handle). Run the engine approximately 5 minutes and readjust the tension.

USED BELT: (more than .5 hours use): With 12 lbs. (52 N) of force, the tool should move 1.25 inches (32 mm) (the width of the tool handle).

Always readjust if a tension check results in a reading of less than 10 lbs. (44N) of force.



### DRIVE BELT (Cont'd)

#### **Replacing the Drive Belt**

Raise the operator cab. (See Page 1-1.)

Remove the belt shield. (See Page 3-62.)

Loosen the bolt (Item 1) [A] on the idler pulley tensioner mounting bracket.

Loosen the jam nut (Item 2) **[A]** and turn the nut (Item 3) **[A]** to release the belt tension.

Remove the drive belt from the hydrostatic pump pulley and flywheel pulley.

Remove the drive belt [B].

*Installation:* Install the new drive belt and adjust. (See Page 3–63.)





# DRIVE BELT TENSIONER PULLEY

#### **Removal and Installation**

Remove the three belt shield holddown clips (Item 1) [A].

Remove the belt shield.





Loosen the tensioner pulley mounting bolt (Item 1) [B].

Loosen the jam nut and lock nut (Item 2) [B].

Remove the drive belt.

*Installation:* Tighten the drive belt to the correct specifications. (See Page 3–63.)

Remove the jam nut and lock nut (Item 1) **[C]**. Remove the mounting bolt (Item 2) **[C]**. Remove the tensioner pulley assembly.

Disassembly

NOTE: Be careful, the pulley hub is full of oil.

Remove the cap [A].



Remove the bolt and washer [B].







Install a long bolt into the shaft [C].

Remove the idler pulley and bearing from the shaft using a press **[D]**.

#### Disassembly (Cont'd)

Install a bearing puller behind the seal and wear sleeve **[A]**.



PHOTO CLARITY ONLY: If the bearing puller is installed behind the bearing, seal and wear sleeve, the wear sleeve will also be removed **[B]**.





Remove the bearing, seal and wear sleeve using the press **[C]**.

#### Assembly

# NOTE: The bearings, cups and spacers are a matched set and must be replaced as a unit.

If the spacer is replaced, compress the new spacer and install into the pulley  $\cite{[A]}$ .



Use a driver tool (1-5/16" diameter) and push the spacer into the machined groove **[B]**.



Install the bearing cup using the driver tool (both sides) **[C]**.

NOTE: The seal side of the pulley hub has the larger I.D. diameter.



Install the taper roller bearing to the pulley (seal side) [D].



#### Assembly (Cont'd)

Put sealant (P/N 6633538) around the diameter of the shaft where the wear sleeve is installed on the shaft **[A]**.

Put grease (P/N 6599719) on the seal lips (Item 1) **[B]**. Make sure the grease is between the outside and inside lips and all the way around the seal.

Press the seal into the pulley hub larger diameter using a press **[C]**.

# NOTE: The wear sleeve and the seal must be replaced as a unit.

DO NOT damage the seal lips with the sharp edge of the wear sleeve. Install the wear sleeve into the seal.

Use a spacer tube which goes over the shaft and pushes on the inside diameter of the taper bearing, install the pulley, seal and wear sleeve onto the shaft **[D]**.







B



Assembly (Cont'd)

Install the small bearing spacer [A].



Install the taper roller bearing pushing on the I.D. of the bearing **[B]**.

Put LOCTITE (P/N 6540410) on the bolt threads [C].







Install the bolt and washer into the shaft [D].

#### Assembly (Cont'd)

Tighten the bolt to 25–28 ft.–lbs. (43–38 Nm) torque [A].

Use only 15W/50 synthetic oil (Example: Mobil One) for the bearings. Use the cap and add oil until it is at the 0.50" (12,7 mm) mark on the scale, which should be 0.75 oz. (20 C.C.) of oil **[B]**.

Add the oil slowly, at one location of the bearing which will allow the trapped air to escape from the other side **[C]**.

# NOTE: Oil capacity is very critical, do not add any more and/or any less oil to the idler pulley.

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Check the cap sealing edge to make sure it is not damaged. Replace the cap as needed.

Make sure the sealing edge on the hub bore and cap sealing edge is clean and free of oil, put a bead of sealant (P/N 6633538) on the cap **[D]**.

Install the cap.









### **Checking Pulley End Play**

Install the pulley/mounting bracket assembly in to vise.

Install a dial indicator on the pulley hub [A].



Move the pulley by hand, back and forth. The correct end play is 0.005-0.013" (0,13-0,33 mm) [B].

If the end play is not correct, there is no adjustment. Replace the hub, pulley and/or bearings.



# OIL COOLER

#### **Removal and Installation**

Disconnect the inlet hose (Item 1) [A] from the oil cooler.







Disconnect the outlet hose (Item 1) [B] from the oil cooler.

Remove the oil cooler [C].



# **DRIVE SYSTEM**

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# DRIVE SYSTEM



# **DRIVE SYSTEM**

#### PARKING BRAKE PEDAL

#### **Removal and Installation**

Raise the loader operator cab. (See Page 1-1.)

Remove the front panel. (See Page 3–1.)

Remove the two mounting bolts (Item 1) **[A]** for the foot rest (both sides).

Remove the foot rest (both sides).

Remove the lower panel mounting bolt (Item 1) **[B]** (both sides).

Remove the lower panel.

Disconnect the wire harness connectors (Item 1) **[C]** for the parking brake.

Remove the mounting bolts (Item 1) **[D]** for the parking brake pedal.

Remove the parking brake pedal assembly.









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### PARKING BRAKE PEDAL (Cont'd)

#### **Disassembly and Assembly**

Loosen and remove the mounting bolt (Item 1) **[A]** and nut from the spring mounting bracket (Item 2) **[A]**.

Remove the brake pedal spring (Item 3) **[A]** from the tension spring mounting bracket (Item 2) **[A]** and from the brake pedal mounting bracket (Item 4) **[A]**.

Remove the (2) mounting bolts, washers and nuts (Item 5) **[A]** from the brake pedal sensor.

Remove the harness mounting clamp (Item 1) **[B]** from the pedal mounting bracket (Item 4) **[A]**.

Remove the sensor harness from the pedal mounting bracket.

Remove the pedal mounting bolt (Item 6) **[A]**, plastic spacers and bushing nut from the brake pedal.

Remove the pedal from the pedal mounting bracket.

Photo **[B]** shows the parking brake disassembled to identify the existing parts in the brake assembly.





#### PARKING BRAKE DISC

#### **Removal and Installation**

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Raise the loader operator cab. (See Page 1–1.)

Disconnect the traction lock solenoid wiring harness connector (Item 1) [A].

Remove the traction lock solenoid (Item 2) [A]. (See Page 8-1.)

Remove the bolt and nut (Item 1) **[B]** to disconnect the lift linkage from crossmember.

Remove the crossmember bolt (Item 2) [B].

Disconnect the crossmember from the control valve lift spool (Item 1) **[C]**.

Remove the crossmember from the pivot [D].

*Installation:* Check the nylon bushing (Item 1) **[D]** for wear and replace as needed.

Remove the center cover mounting bolts (Item 2) [D].









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#### PARKING BRAKE DISC (Cont'd)

#### Removal and Installation (Cont'd)

Remove the center chaincase cover/disc guides assembly [A].

*Installation:* Make sure the brake discs go between the disc guide slots.

NOTE: \*Later serial number machines do not use disc guides (Item 1) [A]. A snap ring is used on both sides of disc to limit disc movement on these machines.

\*Later design (no disc guides)

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A snap ring pliers with  $90^\circ$  tips is needed for removing the brake disc snap ring.

Remove the snap ring from the end of the disc hub (Item 1) **[B]** (both sides).



Inspect the brake disc guides for wear or damage and replace as needed.







The brake disc guides can be replaced by removing the guide mounting bolts (Item 1) **[D]**.

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### FRONT CHAINCASE COVER

#### **Removal and Installation**

Remove the front panel. (See Page 3-1.)

Remove the parking brake pedal. (See Page 4-3)

Remove the mounting bolts from the front chaincase cover (Item 1) [A].

Remove the cover.

#### **REAR CHAINCASE COVER**

#### **Removal and Installation**

Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1–1.)

Remove the mounting bolts from the rear chaincase cover (Item 1) [A].

Remove the cover.





#### AXLE SEAL

#### **Removal and Installation**

Lift and block the loader. (See Page 1-1.)

Remove the tire/wheel assembly.

*Installation:* Tighten the wheel nuts to 105–115 ft.–lbs. (142–155 Nm) torque.

Remove the bolts (Item 1) [A] and plate.

*Installation:* Tighten the bolts to 175–190 ft.–lbs. (240–260 Nm) torque.

Remove the two wheel studs (Item 2)  $\circlet{A}$  across from each other.

Install puller (Item 1) [B] on the wheel hub.



Remove the hub from the axle.

Drill a hole into the axle seal [D].

Remove the key (Item 1) [C] from the axle.









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#### AXLE SEAL (Cont'd)

#### Removal and Installation (Cont'd)

Install a slide hammer (Item 1) [A] with a screw tip end into the axle seal.

Remove the axle seal.

The tool listed will be needed to do the following procedure:

MEL1407 – Seal Installation Tool

If the axle is damaged or worn, an axle repair sleeve kit is available from Melroe Parts Sales in Chicago.

# NOTE: If a new wear ring is being installed with new seal, put LOCTITE sealant on the inside diameter of the wear ring.

Place the taper on the wear ring so it faces the outside [B].

Place the seal with the lip facing in [B].

Use a hammer, install the new axle seal until the tool is flush with the edge of the axle tube **[C]**.







#### AXLE, SPROCKET AND BEARINGS

#### **Removal and Installation**

The tools listed will be needed to do the following procedure:

MEL1242 – Port–a–Power MEL1202B – Axle Bearing Service Set

NOTE: The procedure shown for removal and installation of the axle, sprocket and bearings is for a front axle. This procedure will be the same for the rear axle also (See Page 4–7 for rear chaincase cover removal).

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Lift and block the loader. (See Page 1–1)

Remove the front panel/steering lever assembly. (See Page 3–1.)

Remove the front cover. (See Page 4–7.)

Remove the fluid from the chaincase. (See Page 4-26.)

Loosen the axle sprocket bolt (Item 1) [A].

*Installation:* Tighten the axle sprocket bolt to 475–525 ft.–lbs. (644–710 Nm) torque.

Remove the bolts (Item 1) [B] and plate.

*Installation:* Tighten the bolts to 175–190 ft.–lbs. (240–260 Nm) torque.

Remove the two wheel studs (Item 2)  $[\mbox{B}]$  across from each other.

Install a puller (Item 1) [C] on the wheel hub.



Remove the hub from the axle.

Install a Port–a–Power ram between the two sprockets **[D]**.









#### AXLE, BEARINGS AND SPROCKET (Cont'd)

#### Removal and Installation (Cont'd)

Push the axle out until the ram is at the end of the stroke. Add a spacer and push the axle out again. Repeat this procedure until the axle is out of the sprocket.

Remove the drive chain from the sprocket.

Remove the sprocket (Item 1) [A] and inner bearing (Item 2) [A].

*Installation:* Pack the inner and outer bearing with grease before installing them.

A bearing puller (Item 1) **[B]** is needed to do the following procedure:

Be sure the bearing puller makes good contact with the inner race and press the bearing off the mounting surface of the axle **[B]**.

NOTE: Hold onto the axle during removal as it will slide freely after the bearing is removed from the mounting surface.

Press the splined end of the axle free from the bearing  $\car{[C]}$ 







*Installation:* Put the spline end of the axle shaft into the bearing and press the bearing onto the axle.

#### NOTE: Hold onto the axle during installation as it will slide freely after the bearing is pressed over the splined end of the shaft.

Put a piece of tubing (Item 1) **[D]** that contacts inner race of the bearing only.

Press the bearing onto the mounting surface until the bearing is fully seated **[D]**.

### AXLE, BEARINGS AND SPROCKET (Cont'd)

#### Removal and Installation (Cont'd)

Use the tools provided in the MEL1202B Axle Bearing Service Set for bearing cup removal and installation. A slide hammer is also needed.

Use the long rod and bearing cup tool to remove the inner bearing cup **[A]**.



To remove the outer bearing cup, install a bearing cup tool on the slide hammer.

Leave the bearing cup tool loose until the tool is installed inside the tube **[B]**.

Pull the tool against the bearing cup and tighten the nut.

Use the slide hammer and remove the bearing cup from the axle tube  $\car{[C]}$ .





# AXLE, BEARING AND SPROCKET (Cont'd)

#### Removal and Installation (Cont'd)

Use the bearing cup installation tools (Item 1)  $[\mbox{A}]$  and (Item 1)  $[\mbox{B}].$ 

Put the inner cup (Item 2) [A] in the axle tube.

Install the long treaded rod (Item 2) [B] into the axle tube and through the installation tool (Item 1) [A].

Install the nut (Item 3) [A].

Install the installation tool (Item 1) **[B]** on the threaded rod. Install the nut.

Hold the inside nut (Item 3)  $[\mbox{A}]$  with a wrench and tighten the outside nut  $[\mbox{B}].$ 

Tighten the nut until the bearing cup is seated.

Remove the installation tools and threaded rod.

To install the outer bearing cup, install the bearing cup tool on the driver handle.

Install the bearing cup into the axle tube, and put the tool into the bearing cup.

Hit the driver handle with a hammer until the bearing cup is seated inside the axle tube **[C]**.







#### **REDUCTION GEARCASE**

#### **Reduction Gearcase Seal**

The tool listed will be needed to do the following procedure:

MEL1047 - Seal Installation Tool

Lift and block the loader. (See Page 1–1.)

Remove the hydrostatic motor. (See Page 3-1.)

Drill a hole into the reduction gearcase seal [A].

Install a slide hammer with a screw tip end into the seal **[B]**.

Remove the reduction gearcase seal.





Install the new quad ring on the installation tool.

Install the backup washer.

Use a hammer, hit the installation tool until the quad ring is fully seated  $\c[C]$ .



#### **Removal and Installation**

Lift and block the loader. (See Page 1–1.)

Raise the lift arms and install an approved lift arm support device (Page 1-1).

Raise the operator cab (Page 1–1).

Remove the front panel/steering levers assembly (Page 3–1).

Remove the hydraulic control valve if the right side reduction gearcase is removed (Page 2–1).

Remove the center cover (Page 4-5).

Remove the front cover (Page 4-7).

Remove the fluid from the chaincase (Page 4–26).

Remove the hydrostatic motor (Page 3–1).

Remove the front axle (Page 4–10).

Remove the reduction gearcase mounting bolts (Item 1) **[A]**.

*Installation:* Tighten the mounting bolts to the following torque:

3/4 inch Bolt – 220–245 ft.–lbs. (300–330 Nm) 1/2 inch Bolt – 65–70 ft.–lbs. (88–95 Nm)

Remove the front and the rear drive chains from the cluster sprocket.

Connect a chain hoist as shown in figure [B].

Remove the reduction gearcase from the chaincase [B].

**Installation:** Make sure the ring (Item 1) **[C]** and the O-ring (Item 2) **[C]** are in position before tightening the bolts.









#### **Checking Reduction Gearcase**

Before disassembly of the gearcase do the following checks:

Install a dial indicator on the input shaft **[A]**. The end play must be between 0.00–0.010 inch (0,0254 mm). If not, the following parts may need replacing: Bearing, bearing cups, gear or gearcase housing.

Install the dial indicator on the output shaft **[B]**. The end play must be between 0.00–0.010 inch (0,0254 mm). If not, the following parts may need replacing: Bearing, bearing cups, gear or gearcase housing.

Remove the seal (Page 4-14).

Install a feeler gauge between the teeth of the gears [C].

The back lash must be between 0.003–0.009 inch (0,076–0,228 mm). If not, the following parts may need replacing: Large gear or the shaft.

Measure the bore diameter for the seal. Correct diameter is  $3.750 \pm 0.001$  inch ( $95,25 \pm 0,025$  mm). Install a dial indicator on the input shaft. Set the indicator so the stylus is against the pilot bore for the drive motor. Rotate the shaft 360 degrees. Maximum run–out should not exceed 0.009 inch (0,23 mm). If either check (Bore I.D. & Run–Out) is not within these specifications, replace the gearbox.

#### Disassembly

The tool listed will be needed to do the following procedure:

MEL1047 – Seal Installation Tool

Remove the bolts from the end plate [D].



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Disassembly (Cont'd)

Remove the end plate [A].

Remove the dust cap [B].

Loosen the bolt from the output shaft [C].

Remove the bolt and washer [D].







# Disassembly (Cont'd)

Remove the bolt from the disc hub [A].



Remove the bolt and washer [B].

Remove the disc hub and key [C].







Put the gearcase housing in the press and remove the output shaft  $[\![ D ]\!].$ 

Disassembly (Cont'd)

Remove the bearing [A].

Remove the spacer [B].

Remove the output shaft [C].

Remove the large gear [D].









Disassembly (Cont'd)

Remove the bearing at the input shaft [A].



Use a press and remove the input shaft **[B]**.

B





Use a punch and hammer and remove the bearing cups as needed **[D]**.

Remove the input shaft assembly from the housing [C].

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#### Assembly

Using a press and bearing cup tool, install the bearing cup in the housing.

Install the input shaft [A].









Install the bearing on the input shaft [B].

Install the large gear into the housing [C].

Install the output shaft into the housing and large gear [D].

Assembly (Cont'd)

Install the spacer [A].

Install the bearing [B].

Put LOCTITE on the bolt.

Install the bolt and washer [C].

Tighten the bolt to 210–235 ft.–lbs. (285–305 Nm) torque **[D]**.

Put *Boretite* sealant on the edge of the dust cup and install the dust cup into the housing.









# Assembly (Cont'd)

Install the key and hub on the input shaft [A].



Put LOCTITE on the bolt.

Install the bolt and washer [B].

Tighten the bolt to 210–235 ft.–lbs. (285–305 Nm) torque **[C]**.

Instal the end plate on the housing [D].







## Assembly (Cont'd)

Install the end plate bolts and tighten to 13–14 ft.–lbs. (Nm) torque  $\car{[A]}$ .



Install a new quad ring. Install the backup washer [B].





Install the new seal using the seal installation tool [C].
#### **DRIVE CHAIN**

#### **Removal and Installation**

Raise the lift arms and install an approved lift arm support device (Page 1-1).

Lift and block the loader (Page 1–1).

Raise the operator cab (Page 1–1).

Removing the front panel/steering lever assembly (Page 3–1).

Remove the center chaincase cover (Page 4–5).

Remove the front and rear chaincase cover (Page 4-7).

Remove the fluid from the chaincase (Page 4-26).

Remove the rear axle (Page 4–10).

NOTE: It is necessary to remove the rear axle and drive chain [A]. If the front chain has to be removed.



#### CHAINCASE FLUID

#### **Removing the Fluid From the Chaincase**

To drain the oil from the chaincase, remove the cover (Item 1) **[A]** which is installed over the drain plug at the rear of the chaincase.



Remove the drain plug (Item 1)  $[\mbox{\bf B}]$  and drain the oil into a container.

Check the drain plug and replace if necessary.

#### **MAIN FRAME**

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#### MAIN FRAME



#### **MAIN FRAME**

#### **SEAT BAR**

#### **Removal and Installation**

The tool listed is needed for the following procedure:

MEL1426 - Gas Spring Retainer Tool

Lower the operator seat bar.

Install the gas spring retainer tool on the gas cylinder (Item 1)  $\car{[A]}.$ 

Install the end of the tool that is bent at a  $90^{\circ}$  angle in the clevis of the cylinder as shown **[B]**.

Install the curved end of the tool on the base end of the gas cylinder.

Secure the tool to the gas cylinder with a hose clamp (Item 2) [A].

Remove the cotter pin (Item 1) [B] from the clevis pin.

Remove the clevis pin (Item 1) [C] from the gas cylinder.

Use a 17/32 inch tappet wrench (Item 1) **[D]** to hold the ball joint on the gas cylinder.

Remove the mounting nut from the ball joint [D].

*Installation:* Be careful not to overtighten the mounting nut on the ball joint.

Remove the gas cylinder from the seat bar.



Replace the gas cylinder if it malfunctions.









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#### SEAT BAR (Cont'd)

Removal and Installation (Cont'd)

Disconnect the seat bar sensor connector (Item 1) [A].



Remove the seat bar mounting bolt (Item 1) [B] (both sides).

*Installation:* Tighten the seat bar mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque.

Remove the seat bar sensor mounting bolt (Item 2) [B] and nut.

*Installation:* Tighten the sensor mounting bolt to 80–90 in.–lbs. (9–10 Nm) torque.

Remove the sensor assembly from the magnetic bushing on the seat bar.

*Installation:* Be sure the two tabs on the pivot bushing are located in the slot on the cab as shown **[C]**.





Pull both ends of the seat bar which are mounted to the operator cab, back from the mounting positions on the operator cab [D].

Remove the magnetic bushing mounting bolt, washer, magnetic bushing, plastic bushing and pivot bushing from the seat bar **[D]**. Refer to Page 8–1 for correct assembly procedure of the seat bar sensor assembly.

Remove the mounting bolt, gas cylinder mounting bracket, plastic bushing and pivot bushing from the seat bar **[D]**. Refer to Page 5–3 for correct assembly procedure of the gas cylinder mounting assembly.

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#### SEAT BAR (Cont'd)

#### Removal and Installation (Cont'd)

To remove the seat bar from the operator cab, the seat bar needs to be put in the correct location.

Use the squares in the right side of the operator cab side screen to locate the seat bar correctly **[A]**.

Put the padded corner of the seat bar five squares back from the front of the operator cab side screen and four squares up from the bottom of the screen **[A]**.

The arm of the seat bar (Item 1) **[B]** should also be located outside of the operator cab, just below the bottom edge of the cab.

Grab both ends of the seat bar as shown and pull the left side of the seat bar out of the operator cab until the seat bar is free **[B]**.

Remove the seat bar from the operator cab.

Reverse removal procedure to install the seat bar.

See the following assembly procedure when installing the seat bar.

#### Assembly

Assemble the parts as shown for the left side of the seat bar pivot assembly **[C]**:

Mounting Bolt – (Item 1). Washer – (Item 2). Keyed Plastic Bushing – (Item 3).

Magnetic Bushing Assembly (Item 4).

Sensor Bracket – (Item 5). Pivot Bushing – (Item 6). Mounting Bolt – (Item 7). Sensor Mounting Bolt (Item 8). Sensor Mounting Nut (Item 9).







#### SEAT BAR (Cont'd)

#### Assembly (Cont'd)

Assemble the parts as shown for the right side of the seat bar pivot assembly **[A]**:

Mounting Bolt (Item 1). Pivot Bushing (Item 2). Keyed Plastic Bushing (Item 3). Gas Spring Mounting Bracket (Item 4). Mounting Bolt (Item 5).

Install the right side pivot assembly as shown. Tighten the mounting bolt (Item 1) **[B]** to 180–200 in.–Ibs. (21–23 Nm) torque.

NOTE: Be sure the bend in the gas spring bracket faces in toward the operator when installing the gas spring bracket. Slide the bracket all the way forward so the front edge of the bracket fits tightly against the operator cab.

#### **Compressing the Gas Cylinder**

To compress the seat bar gas spring, it is necessary to use the gas spring retainer tool MEL1426.

Use the following procedure to compress the gas spring:



Open the rear door of the loader and install the gas spring (Item 1 -ball stud end) **[C]** in the hole located in the loader frame.

# NOTE: Install the ball stud threads up through the hole and install a nut (Item 2) [C] on the ball stud.

Put the clevis end of the gas cylinder on the edge of the rear door as shown **[C]** and install a vise grip (Item 3) **[C]** on the bottom edge of the door to keep the gas cylinder from sliding along the edge.

Pull the door in and compress the gas cylinder [D].

Install the retainer tool (Item 1) **[D]** with the  $90^{\circ}$  bend in the clevis of the rod end of the gas cylinder. Install the curved end of the tool around the base end of the gas spring.

Install the clamp (Item 2) **[D]** around the gas cylinder to hold the retainer tool in place. Remove the nut and remove the gas spring from the rear door.









#### **OPERATOR CAB GAS CYLINDER**

#### **Removal and Installation**



Remove the operator cab stop (Item 1) [A] (both sides).

NOTE: Be careful not to break the rear window when the cab is raised after the cab stops are removed.

Raise the operator cab (See Page 1–1).

Remove the nuts (Item 1) **[B]** from the gas cylinder mounting bracket.

Move the mounting bracket to relieve any remaining tension on the gas cylinder **[C]**.

Remove the cotter pin (Item 1) **[D]** from the top pivot pin. Remove the pivot pin and bushing from the gas cylinder. Remove the gas cylinder.









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#### **OPERATOR CAB GAS CYLINDER (Cont'd)**

#### **Disassembly and Assembly**

Remove the clevis (Item 1) **[A]** and washer (Item 2) **[A]** from the end of the gas cylinder.

Remove the gas cylinder from the outer housing.



**Assembly:** Install a replacement cylinder inside the cylinder housing.

Apply a small amount of LOCTITE on the threads of the cylinder rod **[B]**.

Reinstall the washer and clevis on the cylinder rod.



#### **OPERATOR CAB**

#### **Removal and Installation**

Remove the cab nut and holddown plate (Item 1)  $\circlet{A}$  (both sides).

*Installation:* Tighten the nut to 40–50 ft.–lbs. (54–68 Nm) torque.

Remove both gas cylinders (Page 5–7).

Disconnect the wiring harness connectors (Item 1) [B].

Disconnect the ground wire (Item 2) [B].

Connect a chain hoist to the operator cab grab handles and lower the operator cab when the gas cylinders are disconnected **[C]**.







#### **OPERATOR CAB (Cont'd)**

#### Removal and Installation (Cont'd)

Remove the nut (Item 1) [A] from the pivot bolt (both sides).

*Installation:* Tighten the pivot bolt and nut to 25–35 ft.–lbs. (34–47 Nm) torque.

Remove the pivot bolt (both sides).





Install the pivot bolt, washer (one on each side) and nut (Item 1) **[B]** (both sides).

Move the operator cab forward a small amount for

clearance at the pivot mounting brackets [B].

Install the sling under the pivot bolt and pivot of the operator cab **[B]**.

Connect the slings to a chain hoist and remove the operator cab from the loader  $[{\bf C}].$ 

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#### **OPERATOR SEAT**

#### **Removal and Installation**

Use the following procedure to remove the operator seat from the operator cab:

Raise the operator cab (See Page 1-1).

Locate the operator seat sensor (Item 1) [A] on the bottom of the seat pan.

Disconnect the seat sensor connector and remove the seat sensor assembly (See Page 8-1).

Remove the three seat mounting nuts (Item 1) [B] and washers from the operator seat mounting studs.

Lower the operator cab and remove the operator seat from the cab.



Remove the seat spring (Item 2) [C] from under the right seat track when removing the operator seat.

P-03987





1 Seat Pan

D Operator Seat Seat Spring MC-02043

> 853, 853H BICS Loader Service Manual

Installation: Install the seat spring (Item 1) [D] with the bend of the seat spring in the position shown.

Inspect the seat adjustment track (Item 3) [C].

Remove the mounting bolt from each end of the track and replace the adjustment track if necessary.

Reverse the removal procedure to install the operator seat.

#### **Removal and Installation**

Tilt the Bob–Tach forward, so it is parallel to the floor. Put blocks approximately 3 inches thick under each side of the Bob–Tach (Item 1) **[A]**. Lower the Bob–Tach onto the blocks **[A]**.

Remove the retainer bolt (Item 1) [B] from the pivot pin.

*Installation:* Tighten the retainer bolt to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the grease fitting from the pivot pin (Item 1) **[C]**. Remove the rod end pivot pin (Item 1) **[C]**.

Remove the tilt cylinder rod end.

Remove the seals (Item 1)  $\circlet{D}\circlet{D}$ .









#### **BOB-TACH (Cont'd)**

#### Removal and Installation (Cont'd)

*Installation:* Use two pieces of shim stock (light cardboard), install the rod end of the tilt cylinder into the Bob–Tach **[A]**.

Be careful not to damage the seals during installation.

## NOTE: Removal procedure is shown for the right side. Left side procedure is the same.

Remove the grease fitting (Item 1) **[B]** from the Bob–Tach frame for the pivot pin (both sides) **[C]**.

# NOTE: The grease fitting must be removed to prevent the pivot pin from being hydraulic locked in the Bob–Tach frame.

Loosen the bolt (Item 2) [B] at the Bob–Tach pivot pin.

*Installation:* Tighten the bolt to 250–260 ft.–lbs. (339–353 Nm) torque.

Strike the head of the bolt (Item 2) **[B]** to push the pivot pin into the Bob–Tach frame.

Remove the bolt (Item 2) [B].

Use a punch to push the pivot pin all the way into the Bob–Tach frame.

*Installation:* A longer bolt is necessary to install through lift arms into the pivot pin, to pull the pivot pin into the lift arms.

NOTE: Use tapered reamer MEL1233 to clean the tapered hole in the lift arms. The tapered hole must be clean and free of debris to provide a good contact surface for the pivot pin.

Remove the Bob–Tach frame from the lift arms [C].

Remove the seal dust cup (Item 1) [C].

Remove the rubber seal [D].









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#### **BOB-TACH (Cont'd)**

#### Removal and Installation (Cont'd)

Install the Bob-Tach mounting bolt (Item 1) [A] into the pivot pin (Item 2) [A]. Remove the pivot pin from the Bob-Tach frame.

Check for wear and damage. Replace the pivot pins as needed.

*Installation:* Push the pivot pin (Item 2) **[A]** into the Bob–Tach frame. Position the end of the pin flush with the end of the Bob-Tach bushing (Item 3) [A].

Reverse the removal procedure to install the Bob-Tach.

#### **Bob–Tach Lever and Wedge**

Use the following procedure to remove and install the Bob–Tach lever (Item 1) **[B]**, spring and wedge:







Installation: Tighten the nut to 25-28 ft.-lbs. (34-38 Nm) torque.

С

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Remove the Bob-Tach lever (Item 1) [D].

#### **BOB-TACH** (Cont'd)

#### Bob-Tach Lever and Wedge (Cont'd)

Using a punch and hammer, remove the roll pin (Item 1) **[A]** from the Bob–Tach wedge and spring, bolt and clevis assembly.

Remove the spring, bolt and clevis assembly (Item 1) [B].

Remove the wedge (Item 2)  $[\mbox{B}]$  from the Bob-Tach frame.

Always replace bent or broken wedges.

If the bolt (Item 1) **[C]**, handle pivot (Item 2) **[C]**, spring (Item 3) **[C]** or clevis (Item 4) **[C]** are damaged, put the assembly in the vise. Loosen and remove the bolt (Item 1) **[C]** with a 5/16 inch allen wrench.

Replace the worn or damaged parts as needed.

Reverse the removal procedure to install the Bob–Tach Lever and Wedge.









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#### **Bob–Tach Stops**

Remove and replace the Bob–Tach stop (Item 1) [D] (both sides) if worn or damaged. NOTE: The Bob–Tach stop (Item 1) [D] must contact

NOTE: The Bob–Tach stop (Item 1) [D] must contact the lift arm at the same time the tilt cylinder reaches full extension. Use available shims to adjust the Bob–Tach stop and tilt cylinder sequence as closely as possible.

#### LIFT ARMS

#### **Removal and Installation**

Roll the Bob-Tach (Item 1) [A] fully forward.

Stop the engine.

Remove the Bob-Tach (Item 1) [A] from the lift arms (Page 5-13).

Install the slings (Item 2) [A] on the lift arms.

Connect a chain hoist to the slings [A].

Remove the retainer bolt and nut (Item 1) **[B]** from the rod end lift cylinder pivot pin (both sides).

*Installation:* Tighten the retainer bolt and nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Raise the lift arms with the chain hoist so there is enough clearance to remove the rod end pivot pin.

Remove the lift cylinder rod end pivot pin (both sides).

Lower the lift arms.

Disconnect the auxiliary hydraulic tubelines and hoses (Item 1) **[C]** if so equipped (both sides).

Remove the retainer bolt and nut (Item 2) **[C]** from the lift arm pivot pin.

*Installation:* Tighten the retainer bolt and nut to 18–20 ft.–lbs. (24–27 Nm) torque.

Remove the lift arm pivot pin.

Raise the lift arms with the chain hoist and remove from the loader frame.







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#### **REAR GRILL**

#### **Removal and Installation**

Raise the rear grill.

Support the rear grill.

Remove the nut (Item 1)  $\circlet{A}$  to disconnect the gas cylinder from the rear grill.

Lower the rear grill.

Remove the cotter pin (Item 1)  $[{\mbox{\bf B}}]$  from the pivot pin (both sides).

Remove the pivot pin (Item 1) [C] (both sides).

Remove the rear grill from the loader [D].









#### **REAR DOOR**

#### **Removal and Installation**

Open the rear door, disconnect the wiring harness connector (Item 1) [A].

Remove the nuts (Item 2) [A] from the pivot bolts.

*Installation:* Tighten the bolts and nuts to 25–28 ft.–lbs. (34–38 Nm) torque.



Connect a 1/4 inch chain to the rear door using two bolts (Item 1) **[B]**.

Inside the rear door, secure the chain with washers and nuts.

Connect a chain hoist to the chain.

Remove the rear door pivot bolts.

Lift the rear door away from the loader frame and put the door flat on the floor.



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#### **REAR DOOR (Cont'd)**

#### Hood Removal and Installation

Remove the rear lights harness from the rear door hood if so equipped.

Remove the mounting bolts from the rear door hood (Item 1) [A].

*Installation:* Tighten the hood mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque.

Remove the hood from the rear door.

#### **Bumper Removal and Installation**

Remove the rear bumper mounting bolts (Item 1) **[B]** with a 7/32 inch allen wrench.

*Installation:* Tighten the mounting bolts to 180–200 in.–lbs. (21–23 Nm) torque.

Remove the bumper (Item 2) [B] from the rear door.

#### **Door Latch Removal and Installation**

Remove the door latch mounting bolts (Item 1) **[C]** from the door latch mechanism.

*Installation:* Tighten the mounting bolts to 80–90 in.–lbs. (9–10 Nm) torque.

Remove the latch and handle mechanisms from the rear door.

#### **Door Latch and Catch Adjustment**



The door catch (Item 1) **[D]** can be adjusted side to side for alignment with the door latch.

The door latch mechanism (Item 1) **[C]** can be adjusted forward or backward for alignment with the door catch.









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#### **FUEL TANK**

#### **Removal and Installation**

Remove the cover (Item 1)  $\circle{A}\circle{A}$  which is installed over the drain plug.



Remove the drain plug (Item 1) [B].

Drain the fuel into a container.

Check the drain plug and replace if necessary.

Remove the engine/hydrostatic pump assembly from the loader (Page 7–1).

Disconnect the fuel fill hose (Item 1) **[C]**. Disconnect the tank vent hose (Item 2) **[C]**.

Remove the bolts (Item 1)  $\circlet{D}\circlet{D}$  from the battery holddown plate.

Remove the battery holddown plate from the loader.

P-04959

#### FUEL TANK (Cont'd)

#### Removal and Installation (Cont'd)

Remove the mounting plate (Item 1) **[A]** for the battery holddown plate.



Lift the fuel tank and remove it from the loader frame [B].

#### **Fuel Level Sender**

Loosen the fuel level sender (Item 1) [B].

Remove the fuel level sender from the fuel tank [C].





# 

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#### Inlet Screen

The inlet screen (Item 1)  $\left[ D \right]$  is located at fuel tank fill neck.

Disconnect the fuel fill hose.

Remove the inlet screen (Item 1) [D].

Wash the screen in clean solvent.

Dry the screen and check for damage. Replace as needed.



#### **ELECTRICAL SYSTEM**

#### Page Number

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#### ELECTRICAL SYSTEM



## 853 BICS<sup>™</sup> CAB WIRING DIAGRAM INDEX

# USE YOUR LOADER SERIAL NUMBER and OPTIONS TO FIND THE CORRECT WIRING DIAGRAM SHEETS.

	LOADER S/N			SEE WIRING DIA	GRAM SHEET NUMBER:
OPTION	COMMENTS	CAB	CONNECTOR	ENGINE	OPERATOR CONTROLS
W IB TO	512816001 and Above	4	А	1	
n S O S U T		8	В		1.2. 3 or 4
W B 1 O	512816001 and Above 508418001 and Above 509718001 and Above	0	А	2	
HS		2	В		1.2. 3 or 4

#### HOW TO USE YOUR WIRING DIAGRAM INDEX:

OPTION (when listed): Which OPTION does your loader have?

- LOADER S/N and COMMENTS Identify your loader's SERIAL NUMBER. COMMENTS (when listed) are items to identify the latest changes made within the range of S/N's listed.
- SHEET NUMBERS in LARGE BOLD Print Represent the SHEET NUMBERS which correspond to this INDEX'S WIRING DIAGRAM TYPE. The heading directly above each LARGE BOLD NUMBER identifies this INDEX'S WIRING DIAGRAM TYPE.
- CONNECTOR A list of all CONNECTORS for each range of S/N's for this WIRING DIAGRAM TYPE and each of it's SHEETS.
- SHEET NUMBERS in SMALLER Print, Represent the SHEET NUMBERS which contain the matching CONNECTOR on a different TYPE of WIRING DIAGRAM. The matching WIRING DIAGRAM TYPE is identified in the heading directly above these SMALLER NUMBERS. If multiple SHEET NUMBERS are listed, refer to that WIRING DIAGRAM INDEX page to determine the correct SHEET NUMBER your SERIAL NUMBER loader is represented on.

Printed in U.S.A.

8530CW (4-5-97)

CAB WIRING DIAGRAM - SHEET 1 Without BOSS (Harness 6707665 Rev. C) 853 BICS<sup>TM</sup> (S/N 512816001 and Above) (Printed June 1997)

Downloaded from <u>www.Manualslib.com</u> manuals search engine

#### WIRE LEGEND COLOR

NO.'s	COLOR	GAUGE	NO.'s
10	Black	10	42FR
10A	Black	12	42R
_10P	Black	16	_42RF
10W	Black	16	46B
125	Orange	*18	46H
12FB	Orange	*18	46L
12H	Orange	16	40LA
12HW	Orange	*18	40LF
12T	Orange	16	46R
12V	Oranae	16	46RA
_19D	Red/White	16	46RF
19G	Red/White	16	46RR
19L	Red/White	14	46T
_19LA	Red/White	16	_ <u>49F</u>
IALR	Red/White	16	49T
195	Red/White	14	497
A19WA	Red/White	10	
IGWP	Red/White	14	561
21G	White	*18	560
2 1R	White	*18	57F
2 1RM	White	*18	57
23BL	White/Black	*18	58B
23F	White/Black	16	59E
23HF	White/Black	*18	60H
<u>26A</u>	<u>Lt. Blue/Green</u>	16	<u>60W</u>
28	LT. Blue/Black	*18	60WA
204	LT. Blue/Black	*18	EOMB
300	Black	10	634
301	Black	16	630
31	Yellow/Green	*18	64
31P	Yellow/Green	*18	
32	Yellow/Dk. Blue	*18	
_32F	Yellow/Dk. Blue	*18	
35H	Yellow/Brown	*18	
36	Purple	*18	
	Purple/White	*18	
40	Black	16	
408	Black	16	
400	Black	16	
40FA	Black	16	
40FL	Black	16	
40FR	Black	16	
40H	Black	16	
40L	Black	*18	
40R	Black	*18	
41	Pink	16	
4 IA	Pink	16	
410		16	
425	Dk. Diue	10	

#### WIRE LEGEND (Cont'd) COLOR

NO. 5	COLOR	GAUGE
42FR	Dk. Blue	16
42R	Dk. Blue/White	16
42RF	Dk. Blue/White	16
408	Brown/Red	16
401	Brown	16
401	Brown/rellow	10
4014	Brown/rellow	*10
40LF	Brown (Yollow	10
468	Brown /Green	16
46R4	Brown /Green	*18
46RF	Brown/Green	16
46RR	Brown/Green	16
46T	Brown	16
49F	Gray	16
49T	Gray	16
49V	Gray	16
50E	Black	16
56A	Dk. Green/Yellow	*18
26L	Lt. Green/Blue	*18
262	Lt. Green/Red	*18
575	LT. Blue/Red	*18
580	LT. Green/Pink	*18
505	Occopica	*18
60H	Black	*10
60W	Black	16
60WA	Black	16
60WB	Black	16
63	Orange/Black	16
63A	Blue/Black	16
63B	Orange/Black	16
61	Onenia /Dluis	10

#### PARTS LEGEND

- () Cab Harness (Without BOSS)
- 6707665 Rev. C Control Harness Connector
- (3) Mainframe Ground
- Operator Cab Ground
- 5 For Future Use
- (6) Headlight Harness (Opt.) 6578528 Rev. B
- Left Headlight (Opt.)
- 8 For Future Use
- (9) Light Connector
- (1) Flasher (Opt.)
- (1) For Future Use
- (12) Horn (Opt.)
- (1) For Future Use
- (1) Right Headlight (Opt.) (5) Front Wiper Harness - RH Hinged Door (For Non PWM Machines) 6708225
- 6708225
  (b) Front Wiper Harness RH Hinged Door (Opt.) 6568739 Rev. D
  (c) Front Wiper Switch RH Hinged Door (Opt.)
  (c) Front Wiper Motor RH Hinged Door (Opt.)
  (c) Front Wiper Harness LH Hinged Door (Opt.) 6708269 Rev. A
  (c) Front Wiper Switch LH Hinged

- Front Wiper Switch LH Hinged Door (Opt.)
- Front Wiper Motor LH Hinged Door (Opt.)
- Front Windshield Washer Pump and Water Tank Reservoir LH Hinged Door (Opt.)
- Front Wiper Harness LH Hinged Door (Opt.) 6712259 Rev. A

2 Diode

MC 2173LT (4-2-97)

PARTS LEGEND (Cont'd)

Connection (Used ONLY on Machines Without High Flow Switch)

(2) Bucket Level Switch (Opt.)

Beacon/Strobe Switch (Opt.)

(3) Keyless Ignition Module (Opt.)

(3) Engine & Transmission Warning Indicator Lights

(39) Engine Temperature Gauge

 Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light Rotating Beacon/Strobe Harness (Opt.) 6708318 Strobe Light or Rotating Beacon (Opt.)

1 High Flow Switch (Opt.)

3 Glow Plug Switch

3 For Future Use

2 Ignition Switch

3 Accessory Power Plug

3 Light Switch (Opt.)

3 Light Connectors

Hourmeter

38 Fuel Gauge

Ø Voltmeter

\* Some machines have 16 gauge wires.

^ This wire may NOT be found on all harnesses. Printed in U.S.A.



CAB WIRING DIAGRAM - SHEET 2 With BOSS (Harness 6707671 Rev. C) 853 BICS<sup>™</sup> (S/N 512816001 and Above) (S/N 508418001 and Above) (S/N 509718001 and Above) (Printed June 1997)

Printed in U.S.A.

	WIRE LEGEND	)	
NO.'s	COLOR	GAUGE	NO
1M	Red	*18	46L
10	Black	10	46L/
_10A	Black	12	_46LF
10EA	Black	16	46LF
1004	Black	10	461 5
10P	Black	16	40LI
12DB	Orange	18	46R/
_12DL	Orange	16	46RF
12DR	Orange	18	46RF
100	Urange Red (White	18	4600
190	Red/White	14	40RH
19LA	Red/White	16	50F
19LB	Red/White	16	56Å
195	Red/White	14	56L
19W	Red/White	16	56P
TIGWA	Red/White	16	57F
218	White	_14 ≭18	5/L
23BI	White /Black	*18	505
23F	White/Black	16	60H
23HF	White/Black	*18	60W
<u>_38A</u>	Purple/Red	18	60W/
38AA	Purple/Red	18	60WE
38B	Purple/Red	16	63A
38BA	Purple/White	18	64
38BM	Purple/White	16	04
40	Black	16	
40A	Black	16	
408	Black	16	
400	Black	16	
40FA	Black	16	
40FB	Black	16	
40FC	Black	16	
40FD	Black	16	
40FL	Black	16	
40FR	Black	16	
40L	Black	*18	
40R	Black	*18	
41	Pink	16	
_ <u>41A</u>	Pink	16	
418	PINK Blue	16	
42FA	DK. Blue	16	
42FL	Dk. Blue	16	
42FR	Dk. Blue	16	
42R	Dk. Blue/White	16	
42RF	Dk. Blue/White	16	
408	Brown/Red	16	

#### WIRE LEGEND (Cont'd) 's COLOR Brown/Yellow GAUGE 16

16LA	Brown/Yellow	*18
16LF	Brown/Yellow	16
16LF	Yellow (Flasher	
	_Harness)	16
IGLR	Brown/Yellow	16
16R	Brown/Green	16
16RA	Brown/Green	*18
16RF	Brown/Green	16
10KF	Green (Flasher	
	_Harness)	16
IOKK	Brown/Green	16
61	Brown	16
OE	Black	16
CI CI	DK. Green/Yellow	*18
OL	LT. Green/Blue	*18
9E	LI. Green/Red	*18
71	LT. Diue/Red	*10
8B	Dk Croop (Pod	*10
GE	Orange	*10
0H	Black	*10
ŏw	Black	16
ŎŴA	Black	16
OWB	Black	16
3A	Blue/Black	16
3B	Orange/Black	16
4	Orange/Blue	16
	3	

#### PARTS LEGEND

- () Cab Harness (With BOSS) 6707671 Rev. C
- (2) Control Harness Connector
- 3 Mainframe Ground
- () Öperator Cab Ground
- Dome Light With Switch ( > Euro. Opt.)
- (6) Headlight Harness 6578528 Rev. B
- Left Headlight
- 8 Left Front Turn Indicator
- ( > Euro. Opt.)
- (9) Flasher ( > Euro. Opt.)
- (1) Horn ( > Euro. Opt.)
- (1) Right Headlight
- 12 Right Front Turn Indicator ( > Euro. Opt.)
- (1) Front Wiper Harness (Opt.)

- Pump and Water Tank Reservoir (Opt.) Trant Wiper Harness (Opt.) 6712259 Rev. A
- (B) Connection (Used ONLY on Machines Without High Flow Switch)
- (19) High Flow Switch (Opt.) 1 Bucket Level Switch (> Euro. Std.)
- (1) Beacon/Strobe Switch (Opt.)
- Hazard Switch ( > Euro. Opt.)
- Accessory Power Plug
- Ignition Switch
- (5) Keyless Ignition Module (Opt.)
- 26 Light Switch
- Diagnostic Monitor

#### 28 Light Connectors Auxiliary Enable Switch/ Momentary Enable Light/ Detent Enable Light Instrument Lamp LCD Display Connector (2) LCD Panel Display 3 Diode 3 Rotating Beacon/Strobe Harness (Opt.) 6708318 Strobe Light or Rotating Beacon (Opt.) 3 4-Way Flasher Harness ( > Euro. Opt.) 6709530 Beacon or Strobe Connector (3) For Future Use Weith Front Turn Light (> Euro. Opt.) Weith Clearance Lamp (> Euro. Opt.) Right Front Turn Light ( > Euro. Opt.) 6707672 Right Clearance Lamp ( > Euro. Opt.) (1) European Headlight Harness (> Euro. 0pt.) 6707672

PARTS LEGEND (Cont'd)

#### > NOT AVAILABLE DOMESTICALLY

MC 2171LT (4-17-97)

This wire may NOT be found on all Harnesses.
 \* Some machines have 16 gauge wires.

Printed in U.S.A.

6708269 Rev. A (I) Front Wiper Switch (Opt.) (5) Front Wiper Motor (Opt.) 16 Front Windshield Washer



### 853 BICS<sup>™</sup> ENGINE WIRING DIAGRAM INDEX

#### USE YOUR LOADER SERIAL NUMBER and OPTIONS TO FIND THE CORRECT WIRING DIAGRAM SHEETS.

	LOADER S/N			SEE	WIRING DIAGR	AM SHEET NU	MBER:
OPTION	OND COMMENTS	ENGINE	CONNECTOR	CAB	OPERATOR CONTROLS	BICS	ATTACHMENT
W IB TO HS	512816001 and Above		A	1			
0 S U T		1	с		1.2. 3 or 4		
			D			1	
			E.F				1 or 2
W B I O	512816001 and Above 508418001 and Above		A	2			
HS	509718001 and Above	2	С		1.2. 3 or 4		
			D			1	
			E.F				1 or 2

#### HOW TO USE YOUR WIRING DIAGRAM INDEX:

OPTION (when listed): Which OPTION does your loader have?

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- CONNECTOR A list of all CONNECTORS for each range of S/N's for this WIRING DIAGRAM TYPE and each of it's SHEETS.
- SHEET NUMBERS in SMALLER Print Represent the SHEET NUMBERS which contain the matching CONNECTOR on a different TYPE of WIRING DIAGRAM. The matching WIRING DIAGRAM TYPE is identified in the heading directly above these SMALLER NUMBERS. If multiple.SHEET NUMBERS are listed, refer to that WIRING DIAGRAM INDEX page to determine the correct SHEET NUMBER your SERIAL NUMBER loader is represented on.

Printed in U.S.A.

853EWD (4-5-97)

#### ENGINE WIRING DIAGRAM - SHEET 1 Without BOSS (Harness 6707709 Rev. D or 6709895) 853 BICS<sup>TM</sup> (S/N 512816001 and Above) (Printed June 1997)

Printed in U.S.A.

MC 2143TT

#### WIRE LEGEND

NO.'s COLOR

WIRE LEGEND (Cont'd)

GAUGE



42R	DK. DIUE/White	
42RR	Dk. Blue/White	ie
40LA	Brown/Yellow	16
461 RA	Brown/Yellow	16
46RA	Brown/Green	18
46RR	Brown/Green	16
46RRA 46T	Brown/Green	16
50A	Black	16
+ 50B	Black	16
	Black	16
57DA	Yellow	16
57F	Lt. Blue/Red	iĕ
SSE	Orange	16
60BA	Black	16
63W	Orange/Black	16
63WR	Blue/Black	16
66	Orange/Green	16
žŏ	Black	14
700	Black	16
78 <sup>1</sup>	Pink/White	16
10	wille of Red	14

Printed in U.S.A

\* Found ONLY on Harness 6707709 + Found ONLY on Harness 6709895

#### PARTS LEGEND

① Engine Harness (BASE) \* 6707709 Rev. D or + 6709895 (2) Engine Coolant Temperature Sender Fuel Sensor
 Engine Oil Pressure Switch
 Rear Wiper Harness (Opt.) 6708285 6 Rear Wiper Switch (Opt.) Rear Wiper Motor (Opt.)
 Hydraulic Filter - Return Pressure Switch Hydraulic Filter Differential Pressure Sensor (1) Hydraulic Oil Charge Pressure Switch (1) Charge Pressure Harness 6704931 🕲 Hydraulic Fluid (Oil) Temperature Switch Diverter Valve (Opt.) Rear Auxiliary Bleed (Opt.)
 Hourmeter Harness (Opt.) 6700228 Hourmeter (Opt.) Glow Plugs Alternator (19) Engine Shut-Off Solenoid Dight of a control Brake Relay Fused 10 Amp - BICS
Fused 15 Amp - Engine
Fused 15 Amp - PWM (Attachment)
Fused 25 Amp - Brake
Fused 25 Amp - Accessories
Fused 25 Amp - Lights
Fused 10 Amp - Instrumentation
Accessory Fused and Switch Power
BICS Connector
Auxiliary Hydraulic Connector

#### PARTS LEGEND (Cont'd)

- 3 Back-Up Alarm Harness (Opt.) 6704815
- Back-Up Alarm Switch (Opt.)
- 998 () Heater Relay Switch (Opt.)
- Heater and Heater Motor (Opt.)
- ø Heater Harness (Heater Section) (Opt.) 6660892
- Heater Fan Switch (Opt.) (13)
- Heater Harness (Eng. Section) (Opt.) 6660894 (5) Fuse and Fuse Cap (Opt.)
- Rear Light Harness (Opt.) 6707669 Rev. B
- (1) Left Rear Taillight (Opt.)

- (a) Left Rear Work Light (Opt.)
  (b) Back-Up Alarm (Opt.)
  (c) Right Rear Work Light (Opt.)
  (c) Right Rear Taillight (Opt.)

#### Harness 6707709 512816001-20646

Harness 6709895 512820647 and Above

MC 2143LT (4-2-97)


ENGINE WIRING DIAGRAM - SHEET 2 With BOSS (Harness 6707605 Rev. D or 6709892 Rev. A) 853 BICS<sup>TM</sup> (S/N 512816001 and Above) (S/N 508418001 and Above) (S/N 509718001 and Above) (Printed June 1997)

GAUGE NO.'s COLOR

NU. 5	CULUR 0A	UUL
0	Black Cat	ole
1	Red Car	Die
1A	Red	12
144	Red 12 or	14
1AB	Red	12
1B	Red	10
1CB	Red	16
10	Red	16
iĔ	Red	14
1H	Red	14
- ii '	Red	12
15	Red	12
154	Red	12
ISB	Red	16
180	Ped	16
100	Red	12
15R	Red	16
1 SP	Red	14
100	Red	14
10	Black	12
IOA	Black (Heater Harpers)	14
OA	Black (Healer Harness)	16
IOE	Black	16
IOH	DIUCK	16
10HA	BIOCK	12
10K	Black	15
10L	Black	16
105	Black	10
12	Orange	16
12B	Oranãe	10
12C	Orange	14
12CA	Orange	14
12CB	Orange 12 or	16
12CC	Oranãe	16
12CD	Orange	14
1201	Orange	16
12DR	Orange	16
126	Orange	16
12GA	Orange	16
124	Orange	16
12H	Orange (Heater Harness)	14
125	Orange	16
1 AF	It Green	16
148	Lt Green/White	16
194	White	14
19F	Red/White	14
10H	Red/White	14
101	Red/White	12
105	Red/White 14 or	16
IOW	Red/White	14
A GWP	Red/White	16
10WPA	Red/White	16
20	Black	16
20	Red (Heater Harness)	14
ZOB	Black	16
2014	Black	16
205	Black	16
21	Yellow	14
210	White	16
5100	White	16
518	White/It Green 12 or	14
215	Orango	14
55-	White /Black	16
536 4	Red /Blue	16
294	It Blue (Orange	16
588		12
SOB	Plack	16
_ SUAF	Black	16
30CL	Віаск	16
30F	Black	16
_ <u>30H</u>	Віаск	16
30P	Віаск	16
SOPE	віаск	16
305	BIOCK	16
30T_	Black	10
30TE	Black	10
31S	Yellow/LT. Blue	10

WIRE LEGEND (Cont'd)

^ May NOT be found on all Harnesses. Found ONLY on Horness 6709892 -S/N 512820647 and Above 508418144 and Above 509718237 and Above

#### PARTS LEGEND

 D Engine Harness (With BOSS)

 6707605 Rev. D or + 6709892 Rev. A
 Rear Wiper Harness (Opt.)
 6708285

 6/09263
Rear Wiper Switch (Opt.)
Rear Wiper Motor (Opt.)
System Operating Unit
Coolant Level Sensor
Magnetic Pickup (Engine RPM)

- Rear Auxiliary Bleed (Opt.)
- Diverter Valve (Opt.)
- Fuel Sensor
   Engine Oil Pressure Sensor
- Channe Coolant Temperature Sensor
   Hydraulic Fluid (Oil) Temperature Sensor
   Hydraulic Oil Charge Pressure Sensor
- (i) Vacuum Switch
  (ii) Hydraulic Filter Return Pressure
- Sensor
- 🕧 Hydraulic Filter Differential Pressure Sensor
- (18) Shut-Down Relay
- (1) Diode
   (2) Engine Shut-Off Solenoid
   (2) Hourmeter Harness (Opt.)
- 6700228 Hourmeter (Opt.)
- 🗿 Glow Plugs

- W Alternator
  Starter
  Battery
  Switched Power Relay
  Starter Relay
  Claw Blue Relay

- Glow Plug Relay
   Glow Plug Relay
   Glow Plug Relay
   Glow Brake Relay
   Fused 10 Amp BICS
   Fused 15 Amp Engine
   Fused 15 Amp PWM (Attachment)
- W Fused 25 Amp Brake
   Fused 25 Amp Accessories
   Fused 25 Amp Accessories
- 1 Fused 25 Amp Lights
- (3) Fused 10 Amp BOSS

#### PARTS LEGEND (Cont'd)

- Accessory Fused and Switch Power
- ۲ BICS Connector
- Back-Up Alarm Harness (Opt.) 6704358

- BICS Connector
   Auxiliary Hydraulic Connector
   Back-Up Alarm Harness (Opt.) 6
   Back-Up Alarm Switch (Opt.)
   Heater Relay Switch (Opt.)
   Heater and Heater Motor (Opt.)
   Heater Harness (Heater Section) (Ont.) 6660892
- (Opt.) 6660892
- Heater Fan Switch (Opt.) Heater Harness (Eng. Section) (Opt.) 6660894
- (9) Fuse and Fuse Cap (Opt.)
- 🗑 Rear Light Harness
- 6707669 Rev. B
- (1) Left Rear Taillight
- Deft Rear Vork Light
  Back-Up Alarm (Opt.)
  Right Rear Work Light
  Right Rear Taillight
- 🔞 Rear Light Harness ( > Euro. Std.) 6709048 Rev. A
- 🕑 Left Rear Taillight ( > Euro. Std.) B License Plate Light ( > Euro. Opt. ONLY)
- (i) Right Rear Taillight ( > Euro. Std.)
  (ii) Rear Windshield Washer Pump and Reservoir Tank (Opt.)

# 18143

+ Found ONLY on Harness 6709892 -S/N 512820647 and Above 508418144 and Above 509718237 and Above

#### > NOT AVAILABLE DOMESTICALLY

MC 2144LT (3-28-97)

Printed in U.S.A.

33P 33T

0.'s	COLOR	GAUGE
3P	Yellow/Green	16
4F	Yellow/Dk. Blue	16
4FR	Yellow/Dk. Blue	16
4P	Yellow/Lt. Blue	16
6 1	Purple/Red	16
ĕĉ	Purple/Lt. Blue	16
6F	Purple	16
8A A	Purple/Red Rurple/White	16
0	Black	16
OL .	Black	16
OLA	Black	16
ORA	Black	16
1	Pink	16
10	Pink	16
16	Pink	16
28	Dk. Blue/White	16
2RR	Dk. Blue/White	16
6LA	Brown/Yellow or Yellow	10
6LR	Brown/Yellow	16
6R	Dk. Green	16
6RA	Brown/Green or Green	16
6RR	Brown/Green	16
6T 6T	Brown	16
ÓA	Black	16
OB	Black	16
<u>ov</u>	Black	16
	It Blue/White	16
B	Orange/Blue	16
51S	Orange/White	16
1SA	Orange/White	16
5155	White/Orange	16
6RB	Dk. Green/Yellow	16
7DA	Yellow	16
GE SOF	Orange	16
SOB	Black	16
OBA	Black	16
S W	Orange /Black	16
33WR	Blue/Black	16
4	Orange/Blue	16
20	Plack	14
70C	Black	16
72B	Pink/White	16
78	White or Red	14



# 853 BICS<sup>™</sup> BICS<sup>™</sup> WIRING DIAGRAM INDEX

#### USE YOUR LOADER SERIAL NUMBER and OPTIONS TO FIND THE CORRECT WIRING DIAGRAM SHEETS.

OPTION	LOADER S/N and COMMENTS	BICS	CONNECTOR	SEE WIRING DIAGRAM SHEET NUMBER: ENGINE
A L L	512816001 and Above 508418001 and Above 509718001 and Above	1	D	1 or 2

#### HOW TO USE YOUR WIRING DIAGRAM INDEX:

OPTION (when listed): Which OPTION does your loader have?

- LOADER S/N and COMMENTS Identify your loader's SERIAL NUMBER. COMMENTS (when listed) are items to identify the latest changes made within the range of S/N's listed.
- SHEET NUMBERS in LARGE BOLD Print Represent the SHEET NUMBERS which correspond to this INDEX'S WIRING DIAGRAM TYPE. The heading directly above each LARGE BOLD NUMBER identifies this INDEX'S WIRING DIAGRAM TYPE.
- CONNECTOR A list of all CONNECTORS for each range of S/N's for this WIRING DIAGRAM TYPE and each of it's SHEETS.
- SHEET NUMBERS in SMALLER Print Represent the SHEET NUMBERS which contain the matching CONNECTOR on a different TYPE of WIRING DIAGRAM. The matching WIRING DIAGRAM TYPE is identified in the heading directly above these SMALLER NUMBERS. If multiple SHEET NUMBERS are listed, refer to that WIRING DIAGRAM INDEX page to determine the correct SHEET NUMBER your SERIAL NUMBER loader is represented on.

# BICS<sup>™</sup> WIRING DIAGRAM - SHEET 1 (BICS<sup>™</sup> Controller Harness 6706828 Rev. E or 6710312 Rev. A) 853 BICS<sup>TM</sup> (S/N 512816001 and Above) (S/N 508418001 and Above) (S/N 509718001 and Above)

(Printed June 1997)

NO.'s	COLOR G	AUGE
12	Orange	16
70	Black (BICS Controller	
	Harness)	16
10	Black (Mainframe	
-	Harness)	14
70A	Black	14
TOB	Black	16
70D	Black	16
<u>_71A</u>	<u>Dk.</u> Green	16
72A	Red (Color Was Pink/Red	
-	on some machines)	16
<u>_72B</u>	Pink/White	16
73A	Blue (Color Was Dk. Blue	9
700	on some machines)	16
_73B	White (Color Was Brown	
	on some machines)	16
(4A	Lt. Blue/Red	16
<u>74B</u>	Lt. Blue/Black	16
74C	Lt. Blue/Green	16
75A	Dk. Blue/White	16
<u>75B</u>	Gray	16
76A	Yellow/Red	16
16B	Yellow/Black	16
<u>_76C</u>	Yellow/Green	16
18	White (Color Was Red	
	on some Mainframe	
	Harnesses)	14

\*S/N for BICS Controller Harness 6706828 Rev. E and Mainframe Controller Harness 6706876 Rev. E 853 BICS<sup>™</sup> (S/N 512816001-20177) (S/N 508418001-18137) (S/N 509718001-18180)

#### +S/N for BICS Controller Harness 6710312 (Rev. A) and Mainframe Controller Harness 6710313 853 BICS<sup>™</sup> (S/N 512820166, 20175 and 20178 and Above) (S/N 508418138 and Above) (S/N 509718181 and Above)

Printed in U.S.A.

PARTS LEGEND

1 BICS Controller Harness
Connector (All S/N Machines)
6706828 (Rev. E) and 6710312 (Rev. A) A BICS Controller Harness
(B) BICS Controller Harness
Connector +6710312 (Rev. A)
3 Traction Lock (Brake) Override
Switch Seathar Sensor
<ul><li>5 Seat Sensor</li></ul>
6 Traction Lock (Manual Brake) Assembly Switch
Traction Lock (Brake) Solenoid (Pull Coil is 0.4-0.5 of an ohm - White to Black) (Hold Coil is 10-11 ohms - Red to Black)
8 Hydraulic Tilt Lock Valve Solenoid (8-10 ohms)
(9) Mainframe Controller Harness Connector (All S/N Machines) 6706876 (Rev. E) and 6710313
(94) Mainframe Controller Harness
Mainframe Controller Harness Connector + 6710313

MC 2172LT (2-28-97)



# 853 BICS<sup>™</sup> OPERATOR CONTROLS WIRING DIAGRAM INDEX

# USE YOUR LOADER SERIAL NUMBER and OPTIONS TO FIND THE CORRECT WIRING DIAGRAM SHEETS.

	LOADER S/N			SEE WIRIN	G DIAGRAM S	HEET NUMBER:
OPTION	COMMENTS	OPERATOR CONTROLS	CONNECTOR	CAB	ENGINE	ATTACHMENT
W H	512816001-18815.		В	1 or 2		
ĨÏ	512818817-18867. 512818869-18871.	1	С		1 or 2	
H F O L U O	508418001-18085		G.H.J. K.L.M			1
TW	512818816, 18868,		В	1 or 2		
	512818874 and Above 508418086 and Above	2	С		1 or 2	
	added proportional controls		G.H.J. K.N			1 or 2
w u	5 128 1600 1 - 188 15,		В	1 or 2		
ĨĨ	512818817-18867, 512818869-18871, 512818873 509718001-18112	3	С		1 or 2	
Ĥ F L O W			G, H, J, K, L, M, P			1
	512818816 512818868	-	В	1 or 2		
	512818872. 512818874 and Above	4	С		1 or 2	
	added proportional controls		G. H. J. K. N. P			1 or 2

#### HOW TO USE YOUR WIRING DIAGRAM INDEX:

OPTION (when listed): Which OPTION does your loader have?

- LOADER S/N and COMMENTS Identify your loader's SERIAL NUMBER. COMMENTS (when listed) are items to identify the latest changes made within the range of S/N's listed.
- SHEET NUMBERS in LARGE BOLD Print Represent the SHEET NUMBERS which correspond to this INDEX'S WIRING DIAGRAM TYPE. The heading directly above each LARGE BOLD NUMBER identifies this INDEX'S WIRING DIAGRAM TYPE.
- CONNECTOR A list of all CONNECTORS for each range of S/N's for this WIRING DIAGRAM TYPE and each of it's SHEETS.
- SHEET NUMBERS in SMALLER Print Represent the SHEET NUMBERS which contain the matching CONNECTOR on a different TYPE of WIRING DIAGRAM. The matching WIRING DIAGRAM TYPE is identified in the heading directly above these SMALLER NUMBERS. If multiple SHEET NUMBERS are listed, refer to that WIRING DIAGRAM INDEX page to determine the correct SHEET NUMBER your SERIAL NUMBER loader is represented on.

Printed in U.S.A.

853CWD (4-5-97)

### OPERATOR CONTROLS WIRING DIAGRAM - SHEET 1 Without Hi-Flow Hydraulics (Harness 6708076) 853 BICS<sup>™</sup> (S/N 512816001-18815, 512818817-18867, 512818869-18871, 512818873) (S/N 508418001-18085) (Printed June 1997)

NO.'s	COLOR	GAUGE
12	Orange	16
12B	Orange	16
12H	Orange/White	16
12HW	Orange	16
12K	Orange	16
12L	Orange/White	16
12M	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50A	Black	16
50B	Black	16
50C	Black	16
50D	Black	16
50E	Black	16
56A	Dk. Green/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56BA	Dk. Green/Red	16
<u>56BB</u>	Dk. Green/Red	16
56L	Lt. Green/Blue	16
56P	Lt. Green/Red	16
56R	Dk. Green/Lt. Green	16
56RA	Dk. Green/Lt. Green	16
56RC	Dk. Green/Lt. Green	16
57DA	Yellow	16
57L	Lt. Green/Pink	16
57RB.	Yellow/Red	16
57RR	Yellow/Lt. Green	16
59E	Orange	16
64	Orange/Blue	16

#### PARTS LEGEND

<ol> <li>Left Multi-Switch</li> </ol>
Control Handle (Opt.)
2 Left Two-Switch Control Handle (Opt.)
(3) Right Two-Switch Control Handle (Ont.)
(4) Right Multi-Switch Control Handle (Opt.)
(5) Auxiliary Control Module (Opt.)
6 Diode
⑦ Electrical Connector Assembly Harness (Opt.) For Rear Auxiliary ONLY 6704114 Rev. A
(8) Control Harness (Opt.) 6708076
(9) Bucket Positioning Valve Solenoid (Opt.)
Bucket Positioning Valve (Opt.)
<ol> <li>Front Auxiliary Solenoid</li> </ol>

- (11 ohms) (Base End/ Female Coupler)
- 12 Hydraulic Control Valve
- (13) Front Auxiliary Solenoid (11 ohms) (Rod End/ Male Coupler)

Printed in U.S.A.

MC 2335LT (4-2-97)



## OPERATOR CONTROLS WIRING DIAGRAM - SHEET 2 Without Hi-Flow Hydraulics (Harness 6706247 or 6710330) 853 BICS<sup>™</sup> (S/N 512818816, 18868, 18872, 18874 and Above) (S/N 508418086 and Above)

(Printed June 1997)

NO.'s	COLOR	GAUGE
12	Orange/White	16
12H	Orange	16
12K	Orange/White	16
12L	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50	Black	16
50A	Black	16
50B	Black	16
50C	Black	16
50H	Black	16
53P	Dk. Blue	16
53PB	Dk. Green/Yellow	16
53PR	Dk. Blue/White	16
53PW	Dk. Blue/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56R	Dk. Green/Lt. Green	16
+ 56RB	Dk. Green/Yellow	16
57DA	Yellow	16
57RB	Yellow/Lt. Green	16
57RR	Yellow/Brown	16
58A	Orange/Green	16
59E	Orange	16
64	Orange/Blue	16

- \* Harness 6706247 S/N 512818816, 18868, 18872 and 512818874-20646 508418086-18143
- + Harness 6710330 S/N 512820647 and Above 508418144 and Above

#### PARTS LEGEND

- Left Deluxe (Multi-Switch) Control Handle (Opt.)
- (2) Left Two-Switch Control Handle (Opt.)
- (3) Right PWM Deluxe 4-Switch Control Handle (Opt.)
- (4) Right PWM 2-Switch Control Handle (Euro. Std. and Domestic Opt.)
- (5) PWM Auxiliary Controller Module (Opt.) (S/N 512818816, 18868, 18872 and 512818874-22829) (S/N 508418086-18281)
- 5A PWM Auxiliary Controller Module (Opt.) (S/N 512822830 and Above) (S/N 508418282 and Above)
- (6) PWM Control Harness
   (Euro. Std. and Domestic Opt.)
   \* 6706247 or + 6710330
- (7) Front Auxiliary Solenoid (Base End/Female Coupler)
- (8) Front Auxiliary Solenoid (Rod End/Male Coupler)
- (9) PWM Control Valve (Opt.)
- Bucket Level Off Solenoid (Opt.)
- (1) Bucket Positioning Valve (Opt.)
- +(12) Rear Auxiliary Bleed Connector

MC 2336LT (4-1-97)



OPERATOR CONTROLS WIRING DIAGRAM - SHEET 2 Without Hi-Flow Hydraulics (Harness \* 6706247 or. + 6710330) 853 BICS<sup>™</sup> (S/N 512818816, 18868, 18872, 18874 and Above) (S/N 508418086 and Above) (Printed June 1997) OPERATOR CONTROLS WIRING DIAGRAM - SHEET 3 With Hi-Flow Hydraulics (Harness 6708075) 853 BICS<sup>™</sup> (S/N 512816001-18815, 512818817-18867, 512818869-18871, 512818873) (S/N 509718001-18112) (Printed June 1997)

NO.'s	COLOR GA	UGE
12	Orange	16
12B	Orange	16
12H	Orange/White	16
12HW	Orange	16
12K	Orange	16
12L	Orange/White	16
12M	Orange	16
12S	Orange	16
_46LA	Yellow	16
46RA	Green	16
461	Brown	16
<u>SOA</u>	Black	10
50B	Black	10
500	Black	16
505	Black	16
50E	Black	16
506	Black	16
50H	Black	16
50.1	Black	16
56A	Dk. Green/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56BA	Dk. Green/Red	16
56BB	Dk. Green/Red	16
56L	Lt. Green/Blue	16
56P	Lt. Green/Red	16
56R	Dk. Green/Lt. Green	16
56RA	Dk. Green/Lt. Green	16
56RC	Dk. Green/Lt. Green	16
56SG	Dk. Green	16
57DA	Yellow	16
575	Lt. Blue/Red	16
5/L	Lt. Green/Pink	16
57RB	Yellow/Red	16
57RBA	White/reliow	10
57RBB	Yellow / t Choon	16
57DDA	Prown	10
57000	Prown	16
58P	Dk Green/Pad	16
59E	Orange	16
61	Orange /Blue	16
04	or unger blue	10

#### PARTS LEGEND

- (1) Left Multi-Switch Control Handle (Opt.)
- (2) Right Multi-Switch Control Handle (Opt.)
- (3) Auxiliary Control Module (Opt.)
- (4) Control Harness (Opt.) 6708075
- (5) Diodes
- 6 Bucket Positioning Valve Solenoid (Opt.)
- (7) Bucket Positioning Valve (Opt.)
- (8) Diverter Solenoid
- (9) Hi-Flow Solenoid
- (10) Rear/Secondary Front Auxiliary Solenoid (Rod)
- (1) Rear/Secondary Front Auxiliary Solenoid (Base)
- (12) Front Auxiliary Solenoid (11 ohms) (Base End/ Female Coupler)

(13) Hydraulic Control Valve

 (14) Front Auxiliary Solenoid (11 ohms) (Rod End/ Male Coupler)

Printed in U.S.A.

MC 2337LT (3-17-97)



# OPERATOR CONTROLS WIRING DIAGRAM - SHEET 4 With Hi-Flow Hydraulics (Harness 6708183 or 6710331) 853 BICS<sup>™</sup> (S/N 512818816, 18868, 18872, 18874 and Above) (S/N 509718113 and Above)

(Printed June 1997)

Printed in U.S.A.

- )

NO.'s	COLOR	GAUGE
12	Orange/White	16
12H	Orange	16
12K	Orange/White	16
12L	Orange	16
12S	Orange	16
46LA	Yellow	16
46RA	Green	16
46T	Brown	16
50	Black	16
50A	Black	16
50B	Black	16
50C	Black	16
50D	Black	16
50E	Black	16
50F	Black	16
50G	Black	16
50H	Black	16
* 50J	Black	16
53P	Dk. Blue	16
53PB	Dk. Green/Yellow	16
53PR	Dk. Blue/White	16
53PW	Dk. Blue/Yellow	16
56AL	Dk. Green	16
56B	Dk. Green/Red	16
56R	Dk. Green/Lt. Green	16
* 56RB	Dk. Green/Yellow	16
<u>57DA</u>	Yellow	16
57F	Lt. Blue/Red	16
57FA	Dk. Green	16
<u>57FB</u>	Lt. Blue/Red	16
57RB	Yellow/Lt. Green	16
57RBB	Yellow/Lt. Green	16
<u>57RR</u>	Yellow/Brown	16
57RRB	Yellow/Brown	16
58A	Orange/Green	16
59E	Orange	16
64	Orange/Blue	16

\* Harness 6708183 S/N 512818816, 18868, 18872 and 512818874-20646 509718113-18236

+ Harness 6710331 S/N 512820647 and Above 509718237 and Above

Printed in U.S.A.

#### PARTS LEGEND

		TARTS LEOLID
	1	Left Deluxe (Multi-Switch)
	2	Control Handle (Opt.) Left Two-Switch Control
	3	Handle (Opt.) Right PWM Deluxe 4-Switch
	4	Right PWM 2-Switch
	(5)	PWM Auxiliary Controller
	6	Module (Opt.) High Flow PWM Control Harness (Opt.)
	7	Front Auxiliary Solenoid (Base End/Female
	8	Front Auxiliary Solenoid (Rod End/Male Coupler)
	9	Hydraulic Control Valve (Opt.)
	10	Bucket Level Off Solenoid (Opt.)
		Bucket Positioning
+	(12)	Rear Auxiliary
	(13)	Second/Rear Auxiliary
	(14)	Second/Rear Auxiliary
	(15)	Female Coupler) Second/Rear Auxiliary Solenoid (Rod End/
	(16)	Male Coupler) Hi Flow Solenoid
	(17)	Diverter Solenoid
	(18)	PWM Boom Attachment
	(19)	Assembly Diode Harness
	20	Diode
		MC 2338LT (4-1-97)



NO.'s COLOR GAUGE	
12 Orange	16
12A Orange	16
12B Orange	14
12B Orange(40 Power Harness)	16
12C Orange	16
12D Orange	16
12E Orange	16
19 Red/White	14
50 Black	14
SUA BIACK	10
SUD Black	10
	10
SOE Block	10
50W Black	14
564 Dk Green/Vellow	16
56B Vellow	16
56BA Yellow	16
56BAA Yellow	16
56BB Dk Blue	16
56BBA Dk. Blue	16
56BBB Dk. Blue	16
56R Dk. Green	16
56RA Dk. Green	16
56RAA Dk. Green	16
56RB White (*Orange/White)	16
56RBA Orange/White	16
56RBB Orange/White	16
56S Dk. Green	16
56SA Dk. Green	16
56SG Dk. Green	16
56W Lt. Green/White	16
57B Yellow/Red (*Lt. Blue)	16
57BA Lt. Blue	16
57BB Lt. Blue	10
57BBA Lt. Green	10
57BBC Lt Croop	10
57BC Vollow/White	10
57C Orange/Dk Blue	10
57CA Orange/Dk Blue	16
57CB Orange/Dk Blue	16
57RB Yellow/Red (*Red)	16
57RR Yellow/Lt. Green	
(*Brown/White)	16
57RRA Yellow/Lt. Green (*Brown)	16
57RRB Brown	16
57RRC Brown	16
57RRD Red	14
57RRE White	16
57RRF Brown/Yellow	16
64 Orange/Blue	16

#### PARTS LEGEND

- (1) Connector-Water Kit
- 2 Connector Auxiliary/Hydraulic BASE
- 3) Connector Fused and Switched
- 4 Connector Power and Fused (Angle Broom)
- 5 Connector-Stump Grinder (High Flow Valve)
- (6) Power Relay Stump Grinder
- 7) Power Relay Angle Broom
- 8 Power Relay Front/Rear Auxiliary
- 9 Plug-In Connector Lift Arm Harness - Boom Electrical Attachment Connector
- (10) Diode Module
- (11) Connector Diode Module
- (12) Connector Right Control Handle
- (13) Connector Loader Control Harness
- (14) Connector Left Control Handle
- (15) Adapter Connector Optional Attachment Harness
- (16) New to Old Adapter Harness 6706391
- (17) Adapter Connector Older Model Attachments
- (18) Grader Harness 6707303
- (19) Lift Arm (PWM) Attachment Harness 6705901 Rev. D
- (20) Attachment Power Harness 6706552 Rev. A
- 21) Power Wiring Harness 6706446 Rev. A
- (22) Jumper Wire -Stump Grinder 50 ONLY

\* Alternate Color Used On Some Harnesses.



#### ATTACHMENT (OPTIONAL) WIRING DIAGRAM - SHEET 2 (Harness 6710299 and 6710300 Rev. A) 853 BICS<sup>TM</sup> (S/N 512821197 and Above) (S/N 508418150 and Above) (S/N 509718256 and Above)

(Printed June 1997)

#### WIRE LEGEND GAUGE

NO.'s COLOR GAUGE	
12 Orange	16
12A Orange	16
12B Orange	14
12C Orange	16
19 Red/White	14
50 Black	14
50A Black	16
50B Black	16
50C Black	16
50D Black	16
50E Black	14
50W Black	16
50Z Black	16
56A Dk. Green/Yellow	16
56B Yellow	16
56BA Yellow	16
56BAA Yellow	16
56BB Dk. Blue	16
56BBA Dk. Blue	16
56BBB Dk. Blue	16
56R Dk. Green	16
56RA Dk. Green	16
56RAA Dk. Green	16
56RB White	16
56RBA Orange/White	16
56RBB Orange/White	16
56S Dk. Green	16
56SA Dk. Green	16
56SG Dk. Green	16
56W Lt. Green/White	16
57B Yellow/Red	16
57BA Lt. Blue	16
57BB Lt. Blue	16
57BBA Lt. Green	16
57BBB Lt. Green	16
57BBC Lt. Green	16
57BC Yellow/White	16
57C Orange/Dk. Blue	16
57CA Orange/Dk. Blue	16
57CB Orange/Dk. Blue	16
57J Lt. Green	16
57N Pink	16
57P White	16
57RB Yellow/Red	16
57RR Yellow/Lt. Green	16
57RRA Yellow/Lt. Green	16
57RRB Brown	16
57RRC Brown	16
57RRD Red	14
57RRE White	16
57RRF Brown/Yellow	16

#### PARTS LEGEND

Connector - Aux

(1)	Connector-Water Kit				
$(\mathbf{\tilde{2}})$	NOT USED KL Attach	ments issue			
$(\mathbf{\breve{3}})$	Connector - Fused and Se	witched		Input to	the C
(4)	Connector - Power and Fe	used		W/in	PWM
	(Angle Broom)				
(5)	NOT USED Connector (High Flo	-Stump Grind w Valve)	er		
6	Power Relay - Stump Grin	nder	6670312	2	
(7)	Power Relay - Angle Broc	om	6670312	2	
8	Power Relay - Front/Rear Auxiliary		6670312	2	
9	Boom Connector				
(10)	Diode Module Assy.	6664388			
$(\widetilde{11})$	Connector - Diode Module	е			
(12)	Connector - Control Harne	ess			
13	NOT USED Connect	or - Loader Co	ontrol Hari	ness	
(14)	Connector - Left Control H	landle			
15	Main Frame Attachment H 6710300 Rev. A	larness (Opt.)	)		
16	Boom Attachment Harnes 6710299 No Rev.	s (Opt.)			
(17)	Attachment Connector				
18	Adapter Connector - Optio Attachment Harness	onal			
(19)	New to Old Adapter Harne 6706391 No R	ess (Opt.) ev.			
20	Adapter Connector - Olde Model Attachments	r			
21	NOT USED	Attachr	ment C	ontrol	H arr
		C on	nector		
		Only 700's a	fter PWM	Jarness	
		Allaciment	Control 1	lamess	



#### ELECTRICAL SYSTEM

#### TROUBLESHOOTING

#### Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

# **A** WARNING

Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manuals, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Failure to follow instructions can cause injury or death.

W-2003-1289

PROBLEM	CAUSE
Battery will not take a charge.	2, 3, 4
Alternator will not charge.	1, 4
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9

#### **KEY TO CORRECT THE CAUSE**

- 1. Alternator belt is loose or damaged.
- 2. Battery connections are dirty or loose.
- 3. Battery is damaged.
- 4. The cable & wire connection are not making a good contact.
- 5. The alternator is damaged.
- 6. The engine is locked.
- 7. The starter is damaged.
- 8. The wiring or the solenoid is damaged.
- 9. Check the fuses.

#### **ELECTRICAL SYSTEM INFORMATION**

#### Description

The loader has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses (Item 1) **[A]** located in the engine compartment. The fuses will protect the electrical system when there is an electrical overload. The reason for the overload must be found before starting the engine again.

#### Fuse Location (Standard & BOSS® Option)

The electrical system for loaders is protected by eight fuses located in the fuse block (Item 1) **[B]**. Remove the fuse block cover to access the fuses.

The decal inside the rear door specifies the fuse sizes used in various loader circuits **[C]**.

# IMPORTANT

Always check for pinching, rubbing or abrading of wire harnesses. Route away from and use nylon tie straps to hold the harness away from hot or moving parts.

I-2114-0596







#### BATTERY

#### **Removal and Installation**



Open the rear door.

Disconnect the negative(-) cable (Item 1) [A] from the battery.

Disconnect the positive (+) cable (Item 1) [B] from the battery.

Remove the nuts from the holddown clamp (Item 2) **[B]** and remove the battery holddown clamp.

Remove the battery from the loader [C].



Always clean the terminals and cable ends when installing a new battery **[D]**.

When installing the battery in the loader, do not touch any metal parts with the battery terminal posts.

Connect and tighten the battery cables. Connect the negative (-) cable last to prevent sparks.









853, 853H BICS Loader Service Manual

#### ALTERNATOR

#### Alternator Output Test

# WARNING Put jackstands under the front axles and rear

Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death. W-2017-0286

Lift and block the loader (See Page 1–1).

Disconnect the negative (-) cable from the battery.

Disconnect the red wire (Item 1) **[A]** from the alternator. Connect the wire to the negative (–) side of the ammeter.

Connect the positive (+) side of the ammeter to the output terminal on the alternator (Item 1) **[A]**.

Disconnect the fuel stop solenoid connector.

Connect the negative (-) cable to the battery.

Turn on the lights and crank the engine for 30 seconds to discharge the battery.

Connect the fuel stop solenoid, start the engine and run at 2600 RPM.

If ammeter reading is between 45–55 amps. @ 2600 RPM the alternator is good and no further testing is needed.

If the reading is low, remove the screws and pull the regulator cover away from the alternator and continue testing (below).

#### **Rectifier (Diode) Test**

# NOTE: The alternator is removed from the loader for clarity purposes.

Disconnect the negative (-) cable from the battery.

Install the wire in their original location on the back of the alternator.

Connect a jumper wire (Item 1) **[B]** to the alternator output terminal and the regulator terminal.

Connect the battery negative (–) cable.

Start the engine and run at 2600 RPM.

If the reading is within 45–55 amps. @ 2600 RPM replace the rectifier (diode) assembly or replace the alternator.

If the reading is low, do the Alternator Regulator Test.





#### **Alternator Regulator Test**



Connect the positive (+) voltmeter lead to the positive (+) battery terminal **[A]**.

Connect the negative (–) voltmeter lead to the negative (–) battery terminal **[A]**.

Start the engine and run at 1500-2000 RPM.

The voltmeter should read between 13.9–14.7 volts.

If the reading is low, stop the engine and disconnect the battery negative (–) cable.

#### NOTE: The alternator is removed from the loader for clarity purposes.

Remove the wires from the back of the alternator.

Remove the regulator cover from the back of the alternator.

Install the wires on the back of the alternator.

Connect a jumper wire (Item 1) **[B]** from the brush terminal to the ground stud.

Connect the negative (–) battery cable and start the engine. Run at 1500 RPM.

If the voltmeter reading is 14.5 or above, replace the regulator.

If the voltmeter reading is below 14.5, repair or replace the alternator.





Removal and Installation

NOTE: The engine/hydrostatic pump assembly is shown removed for photo clarity purpose only.

# IMPORTANT

Damage to the alternator can occur if:

- Engine is operated with battery cables disconnected.
- Battery cables are connected when using a fast charger or when welding on the loader (Remove both cables from the battery).
- Extra battery cables (booster cables) are connected wrong.
   I-2023-1285

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Raise the operator cab. (See Page 1-1.)

Open the rear door. Disconnect the negative (-) battery cable.

Disconnect the orange wire (Item 1)  $\circlet{A}\circlet{A}$  from the alternator.

Disconnect the wiring harness connector (Item 2) [A].

Loosen the adjustment bolt (Item 1) [B].

Remove the alternator belt.

Remove the adjustment bolt (Item 1) [B].

Remove the mounting bolt, nut and spacer (Item 2) [B].

Remove the alternator.





#### **Disassembly and Inspection**

Disassemble the alternator. (See Parts Identification [A].)

Remove the regulator cover and regulator.

Remove the four bolts holding halves together.

Pry the halves apart.

Use a soft jaw vise to hold rotor while removing pulley nut.

Remove front case half from the rotor using a plastic hammer.

Unsolder the stator leads from the rectifier. Remove the stator.



#### **Stator Continuity Test**

Use an ohmmeter to test the stator.

Touch the probes to two of the bare stator wires [B].

Move one of the probes to the third wire.

The readings should be the same.

If there is no continuity, replace the stator.

#### Stator Ground Test

Touch one probe to a bare stator lead and the other probe to the bare metal surface of the stator **[C]**.

There should be no continuity.

Replace the stator if there is continuity.





#### **Rotor Continuity Test**

Touch the probes to the slip rings [A].

The ohmmeter should read between 3.0–33.0 ohms.

If there is no continuity replace the rotor.



#### **Rotor Ground Test**

Touch one probe to one of the slip rings and the other probe to the rotor shaft  $[{\bf B}].$ 

There should be no continuity.

Replace the rotor if there is continuity.



#### **Rectifier Continuity (Diode) Test**

NOTE: In the diode tests there should be continuity in one direction only. If the diode being tested shows no continuity or continuity in both directions, replace the rectifier assembly.

Touch the probes to the terminals of each diode and read the meter **[C]**.

Reverse the probes to check the diode in the other direction.

There should be continuity in one direction only.

Touch one probe to the diode and the other probe to the connected heatsink and read the meter **[D]**.

Reverse the probes to check the diode in the other direction.

There should be continuity in one direction only.





#### Assembly

Reverse the order of disassembly.

Place the rotor in soft jaws when tightening the shaft nut. Tighten to 50 ft.–lbs. (68 Nm) torque **[A]**.

Install the rear case half and the remaining parts.



#### STARTER

#### **Removal and Installation**

Disconnect the negative (-) cable from the battery.

Disconnect the positive (+) cable (Item 1) **[A]** and starter wires from the starter solenoid.

Remove the starter mounting bolt (Item 1) **[B]** and engine harness ground wires from the starter.

Remove the other two mounting bolts (Item 1) **[C]**. Remove the starter from the engine.







#### STARTER (Cont'd)

#### **Checking the Starter**

The key switch must be in the "OFF" position.

The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between "S" terminal and "BAT" terminal **[A]**.

If the starter turns but does not turn the engine, the starter drive has a defect.

Connect a jumper wire between the "M" terminal and the "BAT" terminal **[B]**.

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.




# **Parts Identification**



#### STARTER (Cont'd)

#### **Disassembly and Assembly**

Remove the starter thru-bolts [A].

Remove the screws for the brush holders [B].





Remove the starter housing/armature assembly from the reduction gear drive **[D]**.





# STARTER (Cont'd)

#### Disassembly and Assembly (Cont'd)

Remove the armature and brushes from the starter housing [A].



Remove the bolts from the reduction gear housing [B].





Remove the reduction gear housing [C].

#### STARTER (Cont'd)

#### **Cleaning and Inspection**

Use a brush and air pressure to clean the drive, field coils, armature and starter housing.

# NOTE: DO NOT use solvent to clean the drive assembly. The solvent will remove the lubricant and the drive will slip.

Check the following items:

Armature

Broken or burned insulation Loose connections at commutator Open or grounded circuits **[A] & [B]** Worn shaft or bearings Rough commutator

Brush Holders Broken springs Broken insulation Spring tension

#### Field Coils

Broken or burned insulation Electrical continuity Brush connections

Drive Gears Worn teeth Tooth engagement





#### STANDARD INSTRUMENT PANEL

#### **Removal and Installation**

Pry the rubber light mount loose from the operator cab (both sides) **[A]**.



Lower the light from the operator cab and locate the three instrument panel mounting bolts (Item 1) **[B]** (both sides).

Remove the three mounting bolts (Item 1) [B].

*Installation:* Be careful not to overtighten the instrument panel mounting bolts to prevent stripping the threaded holes in the panels.

Pull the left instrument panel down and disconnect the wire harness connectors from the panel. Remove the panel **[C]**.





Repeat steps **[A]** and **[B]**. Pull the right instrument panel down and disconnect the wire harness connectors from the panel. Remove the panel **[D]**.

Reverse the removal procedure to install the instrument panel.

#### FRONT LIGHTS

#### **Removal and Installation**

The front lights are mounted in the upper corners of the operator cab **[A]**.



B -03995



Pry the rubber light mount free from the operator cab [B].

Pull the light down and remove the three mounting bolts (Item 1) **[C]** from the instrument panel.

Disconnect the front light connector from the instrument panel. Remove the front light from the operator cab.

Reverse the removal procedure to install the front light.

#### **RELAY SWITCHES**

#### Location

The loader engine harness has relay switches located at the coolant recovery tank **[A]** and **[B]**.

There are four switches (Item 1)  $\circ{[A]}$  on the Standard equipped loader.

The switches are for the starter, switch power, glow plug and brake.

There are five switches on the  $\ensuremath{\mathsf{BOSS}}\xspace$  equipped loader [B].

The switches are for the starter, switch power, glow plug, brake and engine shutdown.

Remove the screw from the mounting tab on the switch and replace if the switch malfunctions.





# **ENGINE SERVICE**

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# ENGINE SERVICE

# ENGINE SERVICE (Cont'd)

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# **ENGINE SERVICE**

#### TROUBLESHOOTING

#### Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4
Engine will not start.	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 27, 28, 29
Difficult to start.	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29
No power for engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29
Engine is mis–firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 39, 52
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure warning.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure.	22, 27, 29, 30, 40, 49
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop.	9, 10, 11

# **KEY TO CORRECT THE CAUSE**

- 1. Battery capacity low.
- 2. Bad electrical connections.
- 3. Faulty starter motor.
- 4. Incorrect grade of oil.
- 5. Low cranking speed.
- 6. Fuel tank empty.
- 7. Faulty stop control operation.
- 8. Plugged fuel line.
- 9. Plugged fuel filter.
- 10. Restriction in the air cleaner.
- 11. Air in the fuel system.
- 12. Faulty fuel injection pump.
- 13. Faulty fuel injectors.
- 14. Broken injection pump drive.
- 15. Incorrect injection pump timing.
- 16. Incorrect valve timing.
- 17. Poor compression.
- 18. Plugged fuel tank vent.
- 19. Incorrect grade of fuel.
- 20. Exhaust pipe restriction.
- 21. Cylinder head gasket leaking.
- 22. Overheating.
- 23. Cold running.
- 24. Incorrect tappet adjustment.
- 25. Sticking valves.
- 26. Incorrect high pressure fuel pipes.
- 27. Worn cylinder bores.

- 28. Worn valve and seats.
- 29. Broken, worn or sticking piston rings.
- 30. Worn valve stems or guides.
- 31. Worn or damaged bearings.
- 32. Not enough oil in the oil pan.
- 33. Switch/sensor is defective.
- 34. Oil pump worn.
- 35. Pressure relief valve is sticking open.
- 36. Pressure relief valve is sticking closed.
- 37. Broken relief valve spring.
- 38. Faulty suction pipe.
- 39. Plugged oil filter.
- 40. Piston seizure.
- 41. Incorrect piston height.
- 42. Faulty engine mounting.
- 43. Incorrect alignment of flywheel.
- 44. Faulty thermostat.
- 45. Restriction in water jacket.
- 46. Loose alternator belt.
- 47. Plugged radiator.
- 48. Faulty water pump.
- 49. Plugged breather pipe.
- 50. Damaged valve stem oil deflectors.
- 51. Coolant level too low.
- 52. Plugged oil pump pipe strainer.
- 53. Broken valve spring.

#### **ENGINE SPEED CONTROL**

#### **Removal and Installation**

Raise the lift arms. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Remove the two mounting bolts (Item 1) **[A]** and nuts from the speed control mounting bracket.

*Installation:* Tighten the bolts (Item 2) **[A]** evenly until the speed control lever moves back and forth at a comfortable tension.

Pull the speed control away from the loader frame and disconnect the speed control rod (Item 1) **[B]** from the control.

*Installation:* Be sure to install the control rod in the bottom hole of the speed control.

**Installation:** Install the stop bracket (Item 1) **[C]** in the same location. It is necessary for the front and rear stop on the bracket to be located correctly.

Reverse the removal procedure to install the engine speed control.

#### Disassembly

Loosen the two control lever mounting bolts and remove the mounting nuts (Item 2) **[C]**.

Assembly: Do not lubricate the engine speed control.

Replace any worn or damaged parts if necessary.







#### RADIATOR

#### **Removal and Installation**

Open the rear door.

Remove the rear grill. (See Page 5-1.)

Remove the oil cooler. (See Page 3–1.)

Remove the engine muffler. (See Page 7-8.)

Loosen the radiator cap.

Connect a hose to the engine block drain (Item 1) [A].

Open the block drain (Item 1) [A] and drain coolant into a container.

Disconnect the hose (Item 1) [B].

Disconnect the hose (Item 1) [C].

Remove the radiator mounting bolts (Item 1) [D] (both sides).

*Installation:* Mix coolant in a separate container. (See *Specifications* for correct capacity Page 9–1.)

#### Propylene Glycol

Add premixed coolant: 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

One gallon and one pint of propylene glycol mixed with one gallon of water is the correct mixture of coolant to provide a  $-34^{\circ}F$  ( $-37^{\circ}C$ ) freeze protection.

Use a refractometer to check the condition of propylene glycol in your cooling system.

#### Ethylene Glycol

Add premixed coolant: 50% water and 50% ethylene glycol to the recovery tank if the coolant level is low.









#### RADIATOR (Cont'd)

#### Removal and Installation (Cont'd)

Disconnect the over-fill hose (Item 1) [A].



If so equipped, disconnect the wires from the water level sensor (Item 1) **[B]**.

Remove the radiator from the loader.

**Installation:** Be sure the rubber bumpers (Item 2) **[A]** are located at each side (Item 1) **[C]** before installing the radiator tabs into the loader frame.





#### COOLANT RECOVERY TANK

#### **Removal and Installation**

Open the rear door.

Raise the rear grill.

Remove the mounting bolt (Item 1) **[A]** from the fuses/relay switches mounting bracket.

Lift the coolant recovery tank from the bracket **[B]**.

Disconnect the overflow hose (Item 1) [B].

Remove the two mounting bolts (Item 1)  $\circe{[C]}$  from the recovery tank mounting bracket.

Remove the mounting bracket.







#### **ENGINE MUFFLER**

**Removal and Installation** 

Open the rear door.

Raise the rear grill.

Remove the air cleaner. (See Page 7-9.)

Loosen the exhaust pipe clamp (Item 1) [A].

Disconnect the exhaust pipe from the muffler.

Remove the mounting bolt (Item 1)  $\cite{[B]}$  from the muffler (both sides).

Remove the muffler from the loader.



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#### **AIR CLEANER HOUSING**

#### **Removal and Installation**

Loosen the hose clamp (Item 1) [A].

Disconnect the hose from the intake manifold.

Loosen the hose clamp (Item 1) [B].

Disconnect the intake hose from the air cleaner housing.







NOTE: The manual indicator (Item 1) [C] is equipped on the 853 standard loader only.

Remove the two mounting bolts (Item 2) **[C]** (at the top) and one mounting bolt at the bottom of the housing.

Remove the air cleaner housing.

NOTE: Disconnect the wires (Item 1) [D] from the sensor at the rear of the air cleaner housing. The sensor is equipped on 853 BOSS® option loaders only.



#### **BLOWER HOUSING/FAN GEARBOX**

#### **Removal and Installation**

Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Remove the mounting bolts (Item 1) **[A]** from the gas cylinder mounting bracket.

*Installation:* Tighten the mounting bolts to 80–90 in.–lbs. (9–10 Nm) torque.

Remove the hydraulic fluid reservoir. (See Page 2–1.)

Disconnect the wiring harness connectors (Item 1) [B].

Remove the harness clamp (Item 2) [B].

Disconnect the breather hose from the fan drive housing.

Lay the electrical harness down for clearance at the blower housing.

Remove the clamp and belt shield (Item 1) **[C]** for the fan drive.

Remove the fan drive belt.

*Installation:* When checking the fan gearbox oil level, make sure the level does not go above the top of the shaft in the gearbox **[C]**. Use 90W gear lube oil if the level is low.

Use a putty knife to remove the sealant from the blower housing and loader frame **[D]**.









#### BLOWER HOUSING/FAN GEARBOX (Cont'd)

#### Removal and Installation (Cont'd)

*Installation:* Use R.T.V. sealant to reseal the blower housing to the loader frame **[A]**.









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Remove the four mounting bolts (Item 1) **[B]** and spacer tubes (two outside housing and two inside housing).

#### NOTE: Remove the two rear mounting bolts first.

*Installation:* Use sealant on each end of the inside spacer tubes to prevent the tubes from falling out of the housing during installation.

*Installation:* Tighten the mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque.

Slide the blower housing forward and remove the fan/fan gearbox assembly **[C]**.

Remove the blower housing.

See Page 7–15 for Disassembly of the Fan Gearbox.

The blower housing must be moved away from the loader frame if the side grills have to be replaced.

To replace the side grill, remove the four mounting screws (Item 1) **[D]** from the blower housing.

Install the new grill and replace the screws.

#### FAN DRIVE TENSION PULLEY

#### **Removal and Installation**

Remove the fan drive belt.

Remove the idler pulley bolt (Item 1) [A].



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Remove the spacers, bolt and washers from the arm [B].

*Installation:* Put a small amount of grease around the outside edge (Item 1) [B] on the grease rings (both sides).

Remove the bolt (Item 1) [C] & [D].

Remove the thrust washer (Item 2) **[D]**, O–rings (Item 3) **[D]** and spring (Item 4) **[D]**.

Check all parts for damage or wear and replace them as needed.

Reverse the removal procedure to install the tension pulley.

NOTE: When making repairs, replace the bronze bushing (Item 5) [D] with a new style nylon bushing. Clean all parts and assemble dry. Do not lubricate. (See Parts Manual for correct part numbers.)

#### **BLOWER FAN**

#### **Removal and Installation**

Remove the lock nut and spacer [A].

*Installation:* Tighten the nut to 45–55 ft.–lbs. (61–75 Nm) torque.

Use the following procedure to remove the fan from the shaft:



Install the nut (Item 1)  $[\mbox{B}]$  on the tapered shaft to protect the shaft and threads.

Install the puller on the fan as shown [B].

As the center bolt (Item 2) **[B]** is tightened, periodically strike the bolt head to loosen the fan from the shaft .

Remove the fan from the tapered shaft [C].

To remove the blower housing mounting plate, remove the six bolts (Item 1) **[D]**.









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#### FAN GEARBOX

**Parts Identification** 



#### Disassembly

- NOTE: When repairing the gearbox order the following as needed:
  - 1. Complete Assembly
  - 2. Long Housing Assembly
  - 3. Long Housing
  - Short Housing Assembly (See Note Below)
  - 5. Internál Parts
- NOTE: The short housing is only available as an assembly. See the parts identification page (Page 7–14) for reference (Order parts from Melroe Parts Sales).
- NOTE: Be sure to count the number and thickness of shims during disassembly. Install the shims in the original location during assembly.

Remove the fan and blower housing mounting plate. (See Page 7–13.)

Long Housing

Loosen the set screws (Item 1) [A] and remove the pulley (Item 2) [A].

Remove the long key (Item 3) [A].

Remove the four mounting bolts and the part number tag **[B]**.

Remove the oil from the gearbox.



Drill an 1/8 inch (13 mm) hole in the seal. Use a slide hammer tool to remove the seal [C].

Remove the small snap ring [D].











Remove the screw and washer from the shaft [B].



Support the lower flange and press the shaft from the bearing  $\car{[C]}$ 

NOTE: The gear and the other bearing (pulley end) will be removed with the shaft.





Support the bearing and press the shaft from the bearing **[D]**.

Disassembly (Cont'd)

Short Housing

Remove the end cap [A].

Use care not to damage the housing.



Drill an 1/8 inch (3 mm) hole in the seal. Use a slide hammer tool to remove the seal **[B]**.









Remove the large shims from the housing [D].

NOTE: Use the same size and thickness of shims during assembly.



#### Disassembly (Cont'd)

[B].

Remove the screw and washer (Item 1)  $\car{A}\car{A}$  from the shaft.



Remove the snap ring from the cap end of the housing

Press the shaft from the housing [C].

NOTE: Both bearings may come out of the housing with the shaft. If one bearing remains in the housing, use a non metal object to tap the bearing from the housing. Press the bearing from the tapered end of the shaft [D].



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## Disassembly (Cont'd)

Press the bearing, shims and gear from the shaft [A].



Remove the key (Item 1) [B] from the shaft.



Assembly

- NOTE: See Note Page 7–15 when ordering parts for the Fan Gearbox. Always replace seals during assembly. Replace the parts in the gearbox as needed.
- NOTE: Do not install the seals and cap in the housing until after the backlash has been checked.
- NOTE: Use care when pressing the bearings into the aluminum housing. The housing can be damaged if too much pressure is used.
- NOTE: For procedures requiring the use of LOCTITE adhesive, thoroughly clean and dry affected parts before the application of LOCTITE.

Long Housing

Press a bearing on the short keyed end of the long shaft **[A]**.

Install the long housing on the shaft [B].

Be sure the bearing is seated in the bore at the lower end of the housing.

Install a bearing on the long keyed end of the shaft [C].

Support the lower bearing and press the other bearing in the housing until the bearings seat in the housing **[C]**.

Install on the bearing, the same number and size shims that were removed during disassembly **[D]**.









#### Assembly (Cont'd)

Install the small snap ring in the groove above the shims **[A]**.









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Install the gear key in the flange end of the shaft [B].

Align the key and gear. While supporting the bearing on the other end, press the gear on the shaft until it seats against the bearing **[C]**.

Install the washer [D].

Put liquid adhesive (LOCTITE #242) on the screw threads. Install and tighten the screw [D].

#### Assembly (Cont'd)

Short Housing

Install a bearing in the flanged end of the housing [A].



Install the large shims on the bearing (flanged end) [B].



Install the large snap ring in the groove above the shims **[C]**.



Install the short key (Item 1) [D].

Align and press the gear on the shaft (teeth toward the tapered end of the shaft) [D].



#### Assembly (Cont'd)

After the gear is seated, drive the key down inside the gear key way **[A]**.

# NOTE: This will prevent damage to the shims when the bearing is installed later.

Install the shaft in the housing, tapered end in the bearing at the round flange end of the housing **[B]**.

Install on the shaft, the same number and size shims that were removed during disassembly **[C]**.

Install a bearing on the gear end of the shaft [D].









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#### Assembly (Cont'd)

Install the snap ring in the groove above the bearing [A].



Install the washer (Item 1) **[B]** on the shaft. Put liquid adhesive (LOCTITE #242) on the screw threads and install the screw **[B]**.



#### **Checking Backlash**

# NOTE: For procedures requiring the use of LOCTITE adhesive, thoroughly clean and dry affected parts before the application of LOCTITE.

The backlash tolerance between the gears should be 0.005-0.008 inch (0,127-0,203 mm).

To check the gear backlash use the following procedure:

Put the short housing in a vise, square flange facing up as shown  $\car{[A]}$ .

Install the same size and number of square shims (if present during disassembly) between the two housings **[B]**.

Set the long housing on the short housing with a small amount of liquid adhesive (LOCTITE #242) between the mounting surfaces.

NOTE: If square shims are used, put a small amount of the liquid adhesive on both sides of all shims.

Install the four mounting bolts through the flange holes  $\car{[C]}$ 

Install the part number tag [C].

Install and tighten the nut to 25–28 ft.–lbs. (34–38 Nm) torque.









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Install the long key (Item 1) [D] and the pulley (Item 2) [D].

Install a bolt in the set screw hole to maintain a 1.000 inch (25,4 mm) distance from the shaft center to the bolt head (to be used with a dial indicator) **[D]**.

#### Checking Backlash (Cont'd)

Put the fan nut (Item 1) [A] on the shaft and tighten snugly.

Install a locking pliers on the fan nut and support the handle against the long housing **[A]**.



Using a magnetic based dial indicator mounted on a bench vise, touch the dial stem on the bolt (Item 1) **[B]**.

Hold the locking pliers against the long housing and rotate the pulley back and forth to read the dial gauge **[B]**.

If the backlash is GREATER than 0.008 inch (0,203 mm), do the following:

- 1. Remove a square shim(s) (if present) between the two housings.
- 2. Remove a large shim(s) from the tapered end of the short shaft and add a small shim(s) of the same thickness between the bearing and the gear on the screw end of the shaft.

If the backlash is LESS than 0.005 inch (0,127 mm) do the following:

- 1. Add a square shim(s) between the two housings.
- 2. Remove a small shim(s) between the bearing and the gear on the screw end of the short shaft and add a large shim(s) of the same thickness between the snap ring and the bearing on the tapered end of the shaft.



#### Checking Backlash (Cont'd)

When the backlash is correct, install the seals, cap and gear oil as follows:

Remove the bolts from the flanges and separate the two housings.

Put liquid adhesive (LOCTITE 242) on the outside diameter of the seal(s) **[A]**.

Install the seal(s) flush with the housing surface [B] & [C].

Clean any oil from the flange surface.

Install the long housing on the short housing flange.

Install the four bolts and part number tag.

Install and tighten the nuts to 25–28 ft.–lbs. (34–38 Nm) torque.







#### ENGINE

## **Removal and Installation**

Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Disconnect the case drain hose (Item 1) [A] and drain the hydraulic fluid into a container.

After the fluid is removed from the reservoir, loosen both hose clamps and remove the hose (Item 2) **[A]** from the reservoir and hydrostatic pump.

Loosen both hose clamps and remove the fuel vent hose (Item 1) **[B]**.

Loosen both hose clamps and remove the fuel fill hose (Item 2) **[B]**.

Remove the fan drive belt (Item 1) [C].

Loosen the hose clamps and remove the hose (Item 1) **[D]** from the filter and the hydrostatic pump.











#### ENGINE (Cont'd)

#### Removal and Installation (Cont'd)

Disconnect the wires (Item 1) [A] at both filters.

Disconnect the BICS<sup>TM</sup> wiring harness connectors (Item 2) **[A]** from the engine electrical harness.

Disconnect the wiring connector (Item 3) [A].

Disconnect the electrical harness connectors (Item 1) [B].

NOTE: The electrical harness will be removed with the engine.

Remove the bolt from the harness clip (Item 2) [B].

Disconnect the hose (Item 1) [C] from the oil cooler.

Disconnect the hose (Items 2 & 3)  $[\mbox{C}]$  from the hydrostatic pump.








#### Removal and Installation (Cont'd)

Disconnect the steering cables (Item 1) [A].

*Installation:* See Page 3–1 for transmission neutral adjustment.

Mark the high pressure hoses for correct installation.

Disconnect the four high pressure hoses (Item 2)  $\circlet{A}$  from the pump.

Disconnect the high pressure hose (Item 1) **[B]** from the hydraulic pump.







Remove the bolt and nut (Item 2)  $[{\mbox{\bf B}}]$  at the left front engine mount.





Remove the bolt (Item 1)  $\left[ \textbf{D} \right]$  at the right front engine mount.

## NOTE: The nut is held in the housing and will not turn (Inset) [D].

*Installation:* Tighten the mounting bolts and nuts to 90–100 ft.–lbs. (125–130 Nm) torque.

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#### Removal and Installation (Cont'd)

Remove the battery. (See Page 6-1.)

Remove the air cleaner housing. (See Page 7-9.)

After the air cleaner hose is disconnected, remove the air horn (Item 1)  $[\mbox{A}]$  from the intake manifold.

Plug the intake manifold to prevent material from falling into manifold.

Remove the rear grill. (See Page 5-1.)

Remove the muffler. (See Page 7-8.)

Loosen the radiator cap.

Connect a hose to the engine block drain (Item 1) [B].

Open the drain and drain coolant into a container.

Loosen the hose clamp and disconnect the radiator hose (Item 1) [C].

Loosen the hose clamp and disconnect the radiator hose (Item 1) **[D]**.









#### Removal and Installation (Cont'd)

Remove the mounting bolt (Item 1) **[A]** for the relays/fuses mounting bracket.

Disconnect the electrical connector (Item 2) [A].

Remove the coolant recovery tank and bracket (Page 7–7).

Disconnect the throttle linkage (Item 1)  $[\mbox{\bf B}]$  from the bellcrank.









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Disconnect the ground cable (Item 1)  $\circ{[C]}$  from the loader frame.

Disconnect the fuel hose (Item 2) [C] from the fuel filter.

Disconnect the fuel return hose (Item 1)  $\circlet{D}\circlet{D}$  from the injection pump.

*Installation:* Remove the air from the fuel system (Page 1–1).

Removal and Installation (Cont'd)

Remove the left rear engine mount bolt and nut [A].



Remove the right rear engine mount bolt (Item 1) [B].

*Installation:* Tighten the bolts and nuts to 65–70 (88–95 Nm) torque.



Use the dimensions from Figure **[C]** to make the engine removal and installation brackets.



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#### Removal and Installation (Cont'd)

The engine lift eye bracket (Item 1) **[A]** has been turned down for clearance at the exhaust pipe. Turn the lift eye bracket and install the bolt.

The valve cover (Item 2) **[A]** will have to be removed for clearance for the engine lift brackets.

Install the engine lift brackets on the engine as shown in Figure  $\car{[A]}$ 

Connect a chain hoist to the ring (Item 3)  $\car{[A]}$  on the lift bracket.







#### **Engine Mount Replacement**

Use the following procedure to install new engine mounts:

Remove the existing mount from the engine. Refer to engine removal and installation for engine mount locations.

Replace all four engine mounts (2 front and 2 rear).

Use the parts shown to install the new engine mounts [A].

- Item 1 Square Nut Used on left side engine mounts
- Item 2 Hex Nut Used on right side engine mounts
- Item 3 Mount Washer
- Item 4 Engine Mount
- Item 5 Tube Spacer Front 1.47 inch (37,3 mm) Rear 1.57 inch (39,9 mm)
- Item 6 Snubbing Washer
- Item 7 Mounting Bolt

Install the new engine mount as shown in the cut away side view  $\ensuremath{\left[ B \right]}$  .

Tighten the mounting bolts to 90–100 ft.–lbs. (125–130  $\ensuremath{\mathsf{Nm}}\xspace$ ) torque.





#### FLYWHEEL

#### **Removal and Installation**

Remove the drive belt (Page 3–1).

Remove the bolts (Item 1) [A] from the flywheel.

*Installation:* Put LOCTITE on the flywheel bolts. Tighten the bolts to 83–90 ft.–lbs. (113–122 Nm) torque.



Remove the flywheel from the engine crankshaft [B].

#### **Flywheel Ring Gear**

The ring gear on the flywheel is an interference fit. Heat the ring gear enough to expand it and hit it with a hammer to remove it evenly.

Clean the outer surface of the flywheel to give it a smooth fit.

Clean the new ring gear and heat it to a temperature of  $450-500^{\circ}F$  (232-260°C).

Fit the ring gear over the flywheel. Make sure the gear is on the seat correctly.



#### **BELT SHIELD**

#### **Removal and Installation**

Remove the mounting bolt (Item 1) **[A]** from the thermostat housing.

Remove the mounting bolt (Item 2) **[A]** from the cylinder head.

Remove the mounting bolt (Item 3) [A].

Remove the mounting bolt (Item 1) **[B]** from the alternator mounting bracket.

Remove the belt shield from the engine.





#### VALVE CLEARANCE

#### Adjustment

Make the valve clearance adjustment with engine stopped and cold.

The correct clearance is 0.016 inch (0,41 mm) with the engine cold  $\car{[A]}.$ 

Put the correct size feeler gauge between the rocker arm and the valve stem. Turn the adjustment bolt until the clearance is correct **[B]**.

Use the following sequence to set the valve clearance:

	Fr	ont					Re	ear
Cylinder No.		1		2		3		4
Valve arrangement	Ι	Е	Ι	Е	Ι	Е	Ι	Е
Piston in No. 1 cylinder is at TDC on compression stroke	•	•	•			•		
Piston in No. 4 cylinder is at TDC on compression stroke				•	•		•	•

#### ENGINE COMPRESSION

#### Checking

The tools listed will be needed to do the following procedure:

OEM1074 – Engine Compression Kit MEL1268 – Compression Gauge Test Adapter

The engine must be at operating temperature.

Remove the glow plugs (Page 7–39) [C].

Install the correct compression adapter into the cylinder head.

Connect the compression gauge [D].

The engine must be turning at about 175 RPM.

The compression must be between 300–500 PSI (2069–3448 kPa) with no more than 50 PSI (345 kPa) difference between cylinders.

The engine has an open crankcase ventilation system.

The ventilation hose comes from the valve cover tube (Item 1) **[D]** and passes down the side of the engine block.









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#### **GLOW PLUGS**

#### **Removal and Installation**

Disconnect the negative (-) cable from the battery.

Remove the electrical bar holddown nuts at the glow plugs [A].



Remove the electrical connector bar [B].

Remove the glow plug from the cylinder head [C].



### **Checking the Glow Plugs**

Connect the voltmeter to the terminal end of the glow plug. Touch the other lead from the voltmeter to the heating end of the glow plug [D].

The reading must be approximately 1.5 ohms. If the resistance is zero ohms the glow plug has a short circuit. If the resistance is infinite, the coil of the glow plug is broken.







#### FUEL INJECTION PUMP

#### Description

The injection pump contains parts which have a very close tolerance and its operation has a direct effect on the performance of the engine.



#### **Removal and Installation**

Disconnect the throttle linkage.

Disconnect the shut-off wire [A].

Remove the valve cover.

Rotate the engine until No. 1 piston is at TDC. Both valves at No. 1 cylinder are not moving and have clearance [B].





#### Removal and Installation (Cont'd)

The TDC mark (Item 1) [A] is located on the engine pulley v-belt groove.

There are two sets of timing marks on the engine pulley, one at 12 o'clock and the other at the 3 o'clock position. Use the timing marks located at the 3 o'clock position (Inset) **[A]**.

Use the parting line (off-set) (Item 2) **[A]** or (Item 1) **[B]** of the timing case cover to make alignment of the TDC mark.

Align the mark on the injection pump gear with the pointer in the window **[C]**.







Removal and Installation (Cont'd)



Disconnect the high pressure fuel lines at the injection pump  $\car{[A]}$  .

Disconnect the fuel lines at the injectors [B].

*Installation:* Tighten the fittings on the high pressure fuel lines to 14–29 ft.–lbs. (19–39 Nm) torque.

Remove the high pressure fuel lines from the engine [C].

Align the injection removal zero mark (Item 1) **[D]** in the window before removing the injection pump.

#### NOTE: The crankshaft will not be on top dead center.

Remove the bolts at the front of the timing case cover [D].

*Installation:* Tighten bolts & nuts to 10–17 ft.–lbs. (14–23 Nm) torque.









#### Removal and Installation (Cont'd)

Remove the fuel injection pump [A].

**Installation:** After the injection pump is installed, the air must be removed from the fuel system (Page 1-1).

Also the injection pump timing must be set (Page 7–44).



#### **Timing the Injection Pump**

The tools listed will be needed to do the following procedure:

MEL1201 – Timing Tool

Remove the valve cover.

Rotate the engine until No. 1 piston is at TDC. Both valves at No. 1 cylinder are not moving and have clearance [A].

The TDC mark (Item 1) [B] is located on the engine pulley v-belt groove.

There are two sets of timing marks on the engine pulley one at 12 o'clock and the other at the 3 o'clock position. Use the timing mark located at the 3 o'clock position (Inset) **[B]**.

Use the parting line (off-set) (Item 2) **[B]** or (Item 1) **[C]** of the timing case cover to make alignment of the TDC mark.

Remove the plug at the rear of the injection pump **[D]**.









#### Timing the Injection Pump (Cont'd)

Install the timing tool and dial indicator [A].

Rotate the engine counterclockwise so the front pulley mark goes  $30^\circ$  to  $40^\circ$  before TDC.

Set the dial indicator to zero  $\ensuremath{\left[ B \right]}$  .

Rotate the engine back to  $17^\circ$  BTDC mark on the front pulley.

The dial indicator must read approximately 0.020 inch (0,50 mm) [B].

If not, loosen the bolts at the injection pump flange [C].

Move the injection pump to obtain the 0.020–0.022 inch (0,50–0,59 mm) reading at the dial indicator with the front pulley marks at the 17° BTDC.

Repeat the procedure until the timing is correct.







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#### FUEL INJECTOR NOZZLES

#### **Removal and Installation**



Some problems caused by faulty injector nozzles:

The engine is hard to start or will not start.

Rough engine operation and idle.

The engine will not have full power.

The engine exhaust smoke is black, white or blue.



Disconnect the high pressure fuel lines at the fuel injection pump **[A]**.

*Installation:* Tighten the fittings on the high pressure fuel lines to 14–29 ft.–lbs. (19–39 Nm) torque.

Disconnect the fuel lines at the fuel injectors [B].

Remove the high pressure fuel lines from the engine [C].

Remove the low pressure hoses from the fuel injector nozzles **[D]**.









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#### FUEL INJECTOR NOZZLES (Cont'd)

#### Removal and Installation (Cont'd)

Remove the nut at the fuel injector holddown clamp [A].

*Installation:* Tighten the nuts to 23–32 ft.–lbs. (31–43 Nm) torque.

Use a screwdriver and pry the injector from the cylinder





Remove the injector nozzle from the head [C].

#### Checking

head [B].



The tools listed will be needed to do the following procedure:

OEM1064 – Injection Nozzle Tester OEM1065 – Accessory Set

Connect the nozzle to the test pump, in a down position **[D]**.

Operate the test pump until the nozzle valve opens:

Injection Pressure: 2630 PSI (18134 kPa)

#### FUEL INJECTOR NOZZLES (Cont'd)

#### Checking (Cont'd)

If the pressure is not correct, do the following:

Disassemble the injector nozzle and clean.

Replace the shim (Item 6) [A].

Check the pressure again.



Tighten the retaining nut (Item 1) **[A]** when assembling the injector nozzle to 29–32 ft.–Ibs. (39–43 Nm) torque.

Checking nozzles spray pattern [B]:

Does not come out the side of the nozzle. Does not have drops coming from the nozzle. Does not have a solid stream coming from nozzle.

Any of the above conditions show a defect or dirty injector nozzle. Clean or replace any injector nozzle that does not operate correctly.





#### **CYLINDER HEAD**

#### **Removal and Installation**

The tools listed will be needed to do the following procedure:

MEL1267 – Cylinder Head Bolt Wrench

Clean all the debris from the cylinder head and engine.

Remove the coolant from the engine and radiator. Remove the radiator hoses.

Remove the fuel injectors and fuel tubelines. (See Page 7-46.)

Remove the valve cover nuts in the correct sequence [A].

Installation: Tighten the nuts to 6-13 ft.-lbs. (8-17 Nm) torque in the correct sequence [A].

Remove the rocker arm assembly bolts in the correct sequence [B].

Installation: Tighten the bolts in the correct sequence to 36–43 ft.–lbs. (49–58 Nm) torque.



Installation: Lubricate the bolts and tighten them in two steps as listed, in the correct numerical sequence [D].

	Step 1	Step 2
New Bolts	29 ft.–Ibs. (39 Nm)	59–67 ft.–lbs (80–91 Nm)
Used Bolts	62 ft.–lbs. (83 Nm)	72–80 ft.–lbs

NOTE: When removing the head, do not use a sharp tool between the head and the engine block. Always put the cylinder head on a flat surface, such as wood, to prevent damage to the machined surface.

Remove the head from the engine.

See Page 7-51 for removing and reconditioning the valves.

After the cylinder head is installed, adjust the valve clearance. (See Page 7–38.)









ft.-lbs.

ft.-lbs. (97-108 Nm)

#### CYLINDER HEAD (Cont'd)

#### **Cylinder Head Surface Alignment**

Check the surface of the head with the straight edge [A].



Check the head at six different directions [B].

The standard distortion is 0.002 inch (0,05 mm) and the maximum limit is 0.008 inch (0,20 mm).

When the head distortion exceeds the maximum limit, regrind the head with a maximum limit of 0.012 inch (0,30 mm).



If the exhaust manifold has been removed, use the correct torque sequence and tighten the bolts to 10-17 ft.-lbs. (14-23 Nm) torque **[C]**.





#### VALVES, VALVE SEAT AND GUIDE

#### Removal

The tools listed will be needed to do the following procedure:

MEL1266 - Valve Stem Seal Installer

Mark the valves and parts so they are returned to their original position when assembling.

Remove the valve spring locks **[A]**, using a spring compressor **[B]**.

Remove the valve springs, spring seats, oil seal and valve **[A]**.

Before reassembly, check the valves, valve seats and guides.

#### Installation

Make sure the head is clean.

Put oil on the valve guides and valve stems.

Put each valve in the correct location.

Install the valve springs, spring seats and oil seals [A].

NOTE: Install the valve springs with their closed pitched (painted side) end toward the cylinder head.

Use a valve spring compressor and install the valve spring locks.

Tap the valve stem with a hammer a small amount to seat the valve stem locks.





# C Thickness 45° B-08202

#### **Reconditioning the Valve and Valve Seats**

Use the correct equipment to grind the valve and valve seats.

The angle of the intake and exhaust values is  $45^{\circ}$  [C].

The valve head thickness is as listed [C]:

Standard – 0.071 inch (1,8 mm) Limit – 0.059 inch (1,5 mm)

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#### Reconditioning the Valve and Valve Seats (Cont'd)

Check the valve head depth in the cylinder head after grinding the valves and seat. The correct specifications are as follows**[A]**:

Intake –	Standard	(	0.029 inch	(0,73 mm)
	Limit	(	0.05 inch (1	,28 mm) (
Exhaust -	- Standard	(	0.028 inch	(0,70 mm)
	Limit	(	0.047 inch	(1,20 mm)

Check the valve seat contact width [A]:

Intake –	Standard	0.067 inch (	(1,70 mm)
	Limit	0.087 inch (	(2,20 mm)
Exhaust –	Standard	0.079 inch (	(2,0 mm) (
	Limit	0.098 inch (	(2,5 mm)

#### Valve Seat Insert

To remove the valve seat insert, put a bead of weld around the inner face of the insert and allow to cool a few minutes, then pry them out **[B]**.

Press the new valve seat insert into the bore using a hydraulic press.

After installation, grind the insert to the correct angle and check the depth of the valve.









#### Valve Guide

The tools listed will be needed to do the following procedure:

MEL1259 - Valve Guide Remover

Check the valve guides for wear with a dial indicator [C].

If the movement is more than the listed specifications, replace the guide.

Intake –	Standard Limit	0.0015–0.0027 inch (0,039–0,068 mm) 0.008 inch (0,2 mm)
Exhaust -	- Standard	0.0025–0.0038 inch
	Limit	0.010 inch (0,25 mm)

NOTE: Check the valve stem for wear before replacing the valve guide [D].

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#### VALVES, VALVE SEAT AND GUIDE (Cont'd)

Valve Guide (Cont'd)

Remove the guide [A].



Install the new guide [B].

The height of the valve guide top edge to the cylinder is 0.51 inch. (13 mm).



#### Valve Spring

Check the free length and inclination [C].

		Std.	Limit
Free Length	Inner	1.783 inch (45,3 mm)	1.748 inch (44,4 mm)
Free Length	Outer	1.957 inch (49,7 mm)	1.898 inch (48,2 mm)
la elia eti e a	Inner		0.118 inch (3,0 mm)
Inclination	Outer		0.126 inch (3,2 mm)

Check the valve spring tension [D].

	Set Length	Std.	Limit
Inner	1.46 inch	13 lbs.	11 lbs.
	(37 mm)	(5,9 kg)	(5,02 kg)
Outer	1.54 inch	46 lbs.	40 lbs.
	(39,0 mm)	(20,9 kg)	(18,1 kg)





#### **ROCKER ARM AND SHAFT**

#### **Disassembly and Assembly**

Mark the rocker arms and support brackets for correct assembly.

Remove the snap ring (Item 1) **[A]** from each end of the shaft (Item 5) **[A]**.

Remove the rocker arms (Items 2 & 4) and support brackets (Item 3)  $[{\rm A}].$ 

**Assembly:** The support bracket with the oil hole is toward the front of the engine.

Inspect all the parts for wear or damage.

Check the rocker arm O.D. [B].

Standard – 0.7478–0.7486 inch (18,98–19 mm) Limit – 0.7427 inch (18,85 mm)





#### **Checking Rocker Arm and Push Rods**

Check the rocker arm [C].

Rocker arm diameter.

Standard – 0.7489–0.7497 inch (19,01–19,03 mm) Limit – 0.7505 inch (19,05 mm)

Clearance between rocker arm and shaft.

Standard – 0.0003–0.002 inch (0,01–0,05 mm) Limit – 0.0078 inch (0,2 mm)

Replace the parts as needed.

Check the push rods for run-out [D].

Limit – 0.012 inch (0,3 mm)





#### PISTON AND CONNECTING ROD

#### Removal

Remove the cylinder head. (See Page 7-49.)

Remove the oil pan. (See Page 7-79.)

Remove the ridge and carbon deposits at the top of the cylinder bore with a ridge reamer.

Make sure the pistons have identification marks [A].

Rotate the crankshaft until a pair of connecting rods are at the bottom dead center. Make sure the connecting rod caps and the rods have identification marks.

Remove the nuts and remove the bearing caps [B].

NOTE: If the bearings are to be used again, they must be identified so they are returned to their original location.



After the pair has been removed, rotate the engine crankshaft and remove the other pair of pistons.







#### Disassembly

Remove the rings from the pistons [D].



#### Disassembly (Cont'd)

Remove the piston pin snap ring [A].



Drive out the piston pin using a brass rod [B].







Clean all the parts in clean solvent.

Check the clearance of the new rings in the piston grooves  $\car{[C]}$ 

	Standard	Limit
1st	0.0035–0.0049 inch	0.006 inch
Compression	(0,09–(0,125 mm)	(0,15 mm)
2nd	0.002–0.0033 inch	0.006 inch
Compression	(0,05–0,085 mm)	(0,15 mm)
Oil	0.001–0.003 inch (0,03–0,07 mm)	0.006 inch (0,15 mm)

Check the piston diameter [D].

Pistons are available in two sizes.

Piston Grade A	3.6608–3.6616 inch (92,985–93,004 mm)
Piston Grade C	3.6616–3.6624 inch (93,005–93,024 mm)

Refer to parts fiche when ordering pistons, piston rods and cylinder liners.





#### Checking (Cont'd)

Check the ring gap in the cylinder bore [A].

	Standard	Limit
Compression	0.008–0.016 inch (0,2–0,4 mm)	0.059 inch (1,5 mm)
Oil	0.004–0.012 inch (0,1–0,3 mm)	0.059 inch (1,5 mm)

Check the piston pin diameter [B].

Standard – 1.220 inch (31 mm) Limit – 1.219 inch (30,97 mm)





Check the clearance between piston pin and piston pin bore **[C]**.

 $\begin{array}{c} Clearance-0.00008 - 0.00006 \ inch \\ (0,002 - 0,015 \ mm) \end{array}$ 



Check the connecting rod alignment [D].

Standard – 0.002 inch (0,5 mm) or less Limit – 0.0079 inch (0,2 mm)



#### Checking (Cont'd)

Check the connecting rod small end bushing [A].

Standard - 1.2208-1.2211 inch (31,008-31,015 mm)





Standard – 0.0003–0.00079 inch (0,008–0,02 mm) Limit – 0.0002 inch (0,5 mm)



Replace the small end bushing if not within specifications using a hydraulic press **[C]**.







#### Assembly

Heat the piston to about 140°F (60°C) [A].



Assemble the piston and connecting rod [B].



Install the piston to the connecting rod. The piston head front mark (Item 1) **[C]** and the connecting rod "ISUZU" casting mark (Item 2) **[C]** must be facing the same direction.



Install the piston pin. Install the snap rings [D].



#### Assembly (Cont'd)

Install the rings on the piston [A].

The face with the mark NPR or TOP must be turned up for the 1st and 2nd compression rings.

## A Marked Side Up 1st Comp. 2nd Comp. Oil B-08253







#### Installation

Using a ring compressor tool, compress the rings on the piston. Make sure the *mark* is to the front of the engine and install the piston in the block **[B]**.

Put oil on the bearings. Install the bearing cap [C].

Tighten the nuts to 58-65 ft.-lbs. (78-88 Nm) torque [D].

Rotate the crankshaft to put the other pair of crank pins at bottom dead center. Repeat the procedure and install the other pair of pistons.

#### **CYLINDER LINERS**

#### **Checking the Cylinder Bore**

The tools listed will be needed to do the following procedure:

MEL1180 – Puller Set MEL1261 – Cylinder Liner Remover Ankle

Check the cylinder bore with an inside micrometer. The checks must be made at parallel and right angles to the center line of the bore **[A]**.

Measuring point is done approximately 0.75 inch (20 mm) below the top of the cylinder bore.

Standard – 3.6622–3.6638 inch (93,021–93,060 mm) Limit – 3.6653 inch (93,100 mm)

#### Removal

Remove all the parts from the engine.

Using a cylinder liner tool, remove the cylinder liner from the engine block **[B]**.

There is only one size liner available.

#### Installation

The tools listed will be needed to do the following procedure:

MEL1262 – Cylinder Liner Installer

Clean the bore and remove any metal burrs.

Clean the grease from the cylinder liner and dry it.

Use dry ice to cool the cylinder liner, so it will install easier and smoothly into the engine block.

Using the correct tool, install the cylinder liner [C].

First apply a load of 1103 lbs. (500 kg) using a hydraulic press.

## NOTE: Do Not use a hammer to install the cylinder liners.

Then, apply a final load of 5513 lbs. (2500 kg). Push the liner in until 0-0.0039 inch (0-0.1 mm) of the liner is above the block face **[D]**.

## NOTE: The liners are chrome plated and must not be honed after installation.

Measure the inside diameter of the liner and select the correct size piston for the liner.

#### **Minimum Diameter**

Piston Grade A	3.6622–3.6630 inch (93,021–93,040 mm)
Piston Grade C	3.6630–3.6638 inch (93,041–93,060 mm)

Refer to parts fiche when ordering pistons, piston rods and cylinder liners.









#### MAIN BEARINGS

#### Description

The crankshaft has five main bearings. The end play is controlled by a thrust washer on both sides of the center main bearing.

Each main bearing cap has an identification mark in relation to the engine block [A].

The position of each cap can not be changed from the original location.

#### Removal

Remove the oil pan. (See Page 7-79.)

Remove the oil pump. (See Page 7–80.)

Remove the bolts from the main bearing caps.

Remove the main bearing cap and remove the bearing from the cap half.

Remove the top half of the bearing by pushing on one side of the bearing half and rotating the crankshaft **[B]**.

On the center main bearing, remove the cap.

Remove the top half of the bearing and thrust washers by pushing on one side of the bearing and rotating the crankshaft **[C]**.







#### MAIN BEARINGS (Cont'd)

#### Installation

Check the bearing spread as listed [A].

Limit - 2.93 inch (74,5 mm)

Check to see if the bearing has enough tension, so that finger pressure is needed to fit the bearing into the cap **[B]**.

Check the crankshaft journals before installing the main bearings. (See Page 7–65.)

Make sure to position the bearing halves in their correct locations  $\circet{[C]}$ 

Lubricate the new bearings. Install them by putting the end without the tab into the block and rotating the crankshaft until the tab is on its seat.

Install the other bearing half in the bearing cap. Lubricate the bearing and install the cap on the engine block.

Lubricate the bolts, install them finger tight only.

Install the center main bearing and thrust washers [D].

The thrust washer must be installed so that their oil grooves are turned to the rotating face of the crankshaft.

Repeat the procedure until all the main bearings and caps are installed.









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#### MAIN BEARINGS (Cont'd)

#### Installation (Cont'd)

Tighten the crankshaft bearing cap bolts in the correct sequence **[A]**.

Torque - 116-130 ft.-lbs. (157-176 Nm).



#### **Crankshaft End Play**

The end play can be checked by either a feeler gauge **[B]** or dial indicator **[C]**.

Std.	Limit
------	-------

End Play 0.004 inch (0,1 mm) 0.012 inch (0,3 mm)

The fitting of oversize thrust washer can be used to correct the end play if it is over the specifications.





#### CRANKSHAFT

#### **Removal and Installation**

Remove the oil pan. (See Page 7-79.)

Remove the oil pump. (See Page 7-80.)

Remove the crankshaft pulley, timing gearcase cover and timing gears. (See Page 7–69.)

Remove the flywheel.

Remove the connecting rod cap. (See Page 7-55.)

Remove the main bearing cap. (See Page 7-62.)

Lift the crankshaft out of the engine block.

#### **Checking Tuffriding (Soft Nitriding) Coating**

Clean the crankshaft thoroughly using an organic solvent. Make sure there is no oil or grease in the area to be tested.

Using a glass rod, put a drop of cupric ammonium chloride 5/10% solution at the test location **[A]**.

If no change takes place after an interval of 30–40 seconds, the crankshaft can be re–used if within specifications.

Replace the crankshaft, if within the 30–40 seconds, the original color of the solution (light blue in color) becomes transparent where the test solution was dropped and will discolor to a copper color.

Immediately after the test is completed, wipe off the area with a cloth and thoroughly rinse with water.

## NOTE: Since the crankshaft is tuffride coated it cannot be reground.

#### **Checking the Crankshaft**

Check the crankshaft connecting rod journals [B].

Standard – 2.0833–2.0839 inch (52,915–52,930 mm) Limit – 2.0829 inch (52,906 mm)




#### **CRANKSHAFT** (Cont'd)

#### Checking the Crankshaft (Cont'd)

Check the crankshaft main bearing journals [A].

Standard – 2.7526–2.7532 inch (69,917–69,932 mm) Limit – 2.7524 inch (69,910)



Check the clearance between connecting rod bearing and crankshaft journal **[B]**.

Install the bearing and cap and tighten nuts to 58–65 ft.–lbs. (79–88 Nm) torque. Put oil on the bearing and measure.

Nominal Diameter - 2.09 inch (53 mm)

Clearance between journal and bearing:

Standard – 0.0011–0.0026 inch (0,029–0,066 mm) Limit – 0.004 inch (0,10 mm)

Check the clearance between main bearings and crankshaft journals **[C]**.

Install the main bearing and caps and tighten the bolts to 116–130 ft.–lbs. (157–176 Nm) torque. Put oil on the main bearings and measure.

Nominal Diameter - 2.76 inch (70 mm)

Clearance between the journal and bearing:

Standard – 0.0014–0.0031 inch (0,035–0,080 mm) Limit – 0.0043 inch (0,11 mm)

Check the crankshaft run-out [D].

Standard – 0.0019 inch (0,05 mm) or less Limit – 0.003 inch (0,08 mm)







#### **CRANKSHAFT GEAR**

#### **Removal and Installation**

The tools listed will be needed to do the following procedure:

MEL1263 – Crankshaft Gear Installer MEL1264 – Crankshaft Rear Oil Seal

Use a puller to remove the gear [A].

Use the correct size driver tool to install the gear [B].

Clean the crankshaft and check that all the oil passages are clean and open.

Clean the engine block, lubricate and install the upper halves of the main bearings.

Put the crankshaft carefully in position.

Install the main bearing caps and bolts. (See Page 7–63.)

Check the crankshaft so that it rotates freely. Check the end play. (See Page 7–64.)

Install a new rear oil seal **[C]**. Using the correct size driver tool.

Lubricate the connecting rod bearings. Install the bearings and rod caps. (See Page 7–60.)

Install the oil pump. (See Page 7-80.)

Install the oil pan. (See Page 7-79.)

Install the timing gears, timing gearcase cover and new front seal. (See Page 7–69.)

Install the flywheel. (See Page 7-36.)







#### TIMING GEARCASE COVER SEAL

#### **Removal and Installation**

The tool listed will be needed to do the following procedure:

MEL1265 – Crankshaft Front Oil Seal Installer

Remove the alternator and belt. (See Page 6-1.)

Remove the bolt at the crankshaft pulley [A].

*Installation:* Tighten the bolt to 123–152 ft.–lbs. (167–206 Nm) torque.

Install a standard puller and remove the crankshaft pulley **[B]**.

Use a screwdriver and pry the front seal out of the timing

case cover [C].









Use the seal installation tool and install the new seal [D].

#### TIMING GEARCASE COVER

#### **Removal and Installation**

Remove the alternator and belt. (See Page 6–1.)

Remove the bolt at the crankshaft pulley [A].

*Installation:* Tighten the bolt to 123–152 ft.–lbs. (167–206 Nm) torque.

Use a puller to remove the crankshaft pulley [B].

Remove the bolts which fasten the noise dampening shield to the timing case cover  $[\![C]\!].$ 

Remove the noise dampening shield [D].









#### TIMING GEARCASE COVER (Cont'd)

#### Removal and Installation (Cont'd)

Remove the bolts from the timing gearcase cover [A].

Installation: Tighten the bolts to 10 ft.-lbs. (14 Nm) torque.



Use an allen wrench to remove the allen head bolt from the cover  $\car{[B]}$ 

*Installation:* Tighten the bolt to 11–17 ft.–lbs. (15–23 Nm) torque.

Remove the timing gearcase cover [C].

**Installation:** Put the O-ring gasket in the groove and hold it in position using Form-A-Gasket so it will not fall out when installing the cover **[D]**.







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#### **IDLER GEAR AND HUB**

#### Removal

Remove the timing gearcase cover. (See Page 7-69.)

Remove the bolts at the tube for gear lubrication [A].

Remove the tube [B].

Remove the bolts at the idler gear [C].

*Installation:* Tighten the bolts to 10–12 ft.–lbs. (14–16 Nm) torque.

Remove the idler gear and hub [D].

#### Checking

Check the idler gear hub.

Standard – 1.7695–1.7707 inch (44,945–44,975 mm) Limit – 1.7656 inch (44,845 mm)

Check the clearance between the idler gear and hub.

Limit - 0.0079 inch (0,2 mm)

Check the end play at the gear and hub.

 $\begin{array}{l} Standard-0.003 \text{ inch (0,07 mm)} \\ Limit-0.008 \text{ inch (0,2 mm)} \end{array}$ 







#### IDLER GEAR AND HUB (Cont'd)

#### Installation

Install the idler gear on the hub.

Make sure the timing marks are in alignment with the crankshaft, camshaft and fuel injection pump idler gears **[A]**.

Check the backlash between the gears. The correct backlash is 0.003 inch (0,178 mm).

NOTE: The zero marks (Item 1) [A], for the injector pump removal, will align with the marks in the timing case cover.



#### FUEL INJECTION PUMP IDLER GEAR

#### **Removal and Installation**

Remove the timing gearcase cover. (See Page 7–69.)

Remove the idler gear. (See Page 7-71.)

Remove the bolt at the fuel injection pump idler gear [A].

*Installation:* Tighten the bolt to 72–87 ft.–lbs. (98–118 Nm) torque.

Remove the idler gear and bearing [B].

If the bearing needs replacement, remove the snap ring at the bearing **[C]**.

Use a press to remove and install the new bearing.





#### **Bearing Installation**

When installing the new bearing, make sure the projection and height is correct **[D]**.

Projection – 0.016–0.024 inch (0,4–0,6 mm) Height – 0.933–0.945 inch (23,7–24 mm)



#### **CAMSHAFT GEAR**

#### **Removal and Installation**

Remove the timing gearcase cover. (See Page 7-69.)

Remove the idler gear. (See Page 7-71.)

Remove the bolt at the camshaft gear [A].

*Installation:* Tighten the bolt to 72–87 ft.–lbs. (98–118 Nm) torque.



Install the puller and remove the gear [B].





Remove the bolts at the retainer plate [C].

*Installation:* Tighten the bolts to 11–17 ft.–lbs. (15–23 Nm) torque.

Remove the retainer plate [D].

Installation: Check the camshaft end play.

Standard – 0.002–0.0045 inch (0,05–0,114 mm) Limit – 0.0079 inch (0,2 mm)



#### TIMING GEARCASE

#### **Removal and Installation**

Remove the timing gearcase cover. (See Page 7-69.)

Remove the idler gear. (See Page 7–71.)

Remove the fuel injection pump. (See Page 7-40.)

Remove the fuel injection pump idler gear. (See Page 7–73.)

Remove the camshaft gear. (See Page 7-74.)

Remove the water pump. (See Page 7-83.)

Remove the oil pan. (See Page 7–79.)

Remove the bolts at the timing case [A].

*Installation:* Tighten the bolts to 11–17 ft.–lbs. (15–23 Nm) torque.

Remove the timing case [B].

*Installation:* After the timing case cover is installed with the new gasket, cut the excess gasket at the engine block **[C]**.







#### CAMSHAFT

### **Removal and Installation**

Remove the rocker arm cover, rocker arm assembly and the push rods. (See Page 7–54.)

Remove the timing gearcase cover. (See Page 7–69.)

Remove the camshaft gear. (See Page 7-74.)

Remove the oil pan and oil pump. (See Pages 7–79 & 7–80.)

Remove the camshaft from the engine.

### Checking

Check the camshaft journals [A].

Standard – 1.9662–1.9675 inch (49,945–49,975 mm) Limit – 1.9528 inch (49,60 mm)

Check the bearing inside diameter [B].

Standard - 1.9685-1.9697 inch (50,0-50,03 mm)

Clearance between camshaft journal and bearing:

 $\begin{array}{l} Standard-0.002 \ inch. \ (0,05 \ mm) \\ Limit-0.0047 \ inch \ (0,12 \ mm) \end{array}$ 

Check camshaft run-out [C].

Limit - 0.0039 inch (0,1 mm)

Check cam lobe height [D].

Standard – 1.654 inch (42,02 mm) Limit – 1.640 inch (41,65 mm)









#### CAMSHAFT (Cont'd)

#### **Camshaft Bearings**

The tools listed will be needed to do the following procedure:

MEL1260 - Camshaft Bearing Remover/Installer

Use the correct tool to remove the bearings [A].

When installing the new bearings, make sure to align the oil hole in the bearing with the hole in the engine block (Item 1) **[B]**.





### Tappets

Remove the tappets from the engine block. Mark the cylinder number on each tappet after removal **[C]**.



Inspect the tappets for wear, damage or abnormal conditions [D].



### CAMSHAFT (Cont'd)

#### Tappets (Cont'd)

Check the diameter of the tappets [A].

Standard – 0.511–0.5114 inch (12,98–12,99 mm) Limit – 0.510 inch (12,95 mm)



Clearance between tappet and engine block bore as listed **[B]**.

Standard – 0.0012 inch (0,03 mm) Limit – 0.0039 inch (0,09 mm)





Lubricate the camshaft bearings and journals. Install the camshaft, carefully not to damage the bearings.

Install the camshaft gear. (See Page 7-74.)

Check the camshaft end play using a feeler gauge [C].

Standard – 0.0002–0.0045 inch (0,05–0,114 mm) Limit – 0.0079 inch (0,2 mm)

After the rocker arm assembly is installed, make sure to set the valve clearance. (See Page 7–38.)



#### **OIL PAN**

#### Removal

Remove the oil drain plug and remove the oil.

Remove the fastening bolts and nuts from the oil pan [A].









#### Installation

Clean the surface on the oil pan and engine block.

Put Three Bond (TB–1207B) at the front and rear main bearing caps (Item 1) **[B]** & **[C]**.

Put liquid gasket on the oil pan surface area of the engine block.

Install the oil pan. Install and tighten the bolts in the sequence shown **[D]**.

Tighten the bolts and nuts to 13–18 ft.–lbs. (19–26 Nm) torque.

#### OIL PUMP

#### **Removal and Installation**

Remove the oil pan. (See Page 7-79.)

Remove the bolts at the oil pump [A].

*Installation:* Tighten the bolts to 10–17 ft.–lbs. (14–23 Nm) torque.



Remove the oil pump assembly from the engine block [B].



# 

### Checking

Disassemble the oil pump as illustrated [C].

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#### OIL PUMP (Cont'd)

#### Checking (Cont'd)

Check the clearance between vane and body [A].

Standard – 0.0008-0.0028 inch (0,02-0,07 mm) Limit – 0.0059 inch (0,15 mm)

Check the clearance between the rotor and vane [B].

Standard – 0.0055 inch (0,14 mm) or less.

Check the clearance between the vane and pump body **[B]**.

Standard - 0.0079-0.0105 inch (0,2-0,27 mm)

Check clearance between rotor shaft and pump body.

Standard – 0.0016 inch (0,04 mm) Limit – 0.0079 inch (0,2 mm)

#### **Gear Replacement**

File off one end of the roll pin at the gear. Use a punch and hammer and remove the pin **[C]**.







#### NOTE: It may be necessary to drill a hole in one side of the gear for service as it does not have a hole on both sides [D].

*Installation:* Install the gear and new pin. Peen the end of the pin after installation.



#### OIL PUMP (Cont'd)

#### **Rotor Replacement**

Remove the pin at the rotor using a punch and hammer **[A]**.

*Installation:* When installing the new pin in the rotor, make sure to check the end of the pin that it does not project from the end of the rotor **[A]**.

After the oil pump is assembled, put oil into the pump and turn the shaft to prime the pump.

#### **Oil Pump Relief Valve**

Remove the relief valve from the oil filter housing [B].

Check the relief valve and clean. Replace as needed.





#### **Oil Filter Housing and Block**

To remove the oil filter block & housing, disconnect the tubelines (Item 1) **[C]** & **[D]**.

remove the four mounting bolts (Item 2) [C] at the block.

Remove the two mounting bolts (Item 2) **[D]** at the oil filter housing.





#### WATER PUMP

#### **Removal and Installation**

Remove the alternator belt.

Remove the water pump pulley [A].

Remove the water pump bolts [B].

*Installation:* Tighten the bolts to 11–18 ft.–lbs. (15–24 Nm) torque.

Remove the water pump from the engine block [C].









### Disassembly

Remove the hub for the pulley using a press [D].

Disassembly (Cont'd)

Disassemble the water pump [A].



Check the bearing for abnormal noise, binding or wear  $\ensuremath{\left[ B \right]}$ 

Replace the parts as needed.



#### Assembly

Apply a thin coat of liquid gasket cement to the outer surface of the seal unit before assembly **[C]**.



Press the bearing assembly into position by aligning the set screw hole in the bearing with that in the pump body **[D]**.



#### WATER PUMP (Cont'd)

#### Assembly (Cont'd)

After installation, check that the rear face of the impeller has the correct height **[A]**.

Height - 0.98 inch (25 mm)



Check the distance between the pulley hub and pump body **[B]**.

Distance - 3.12-3.14 inch (79,2-79,8 mm)



#### THERMOSTAT

### **Removal and Installation**

Remove the bolts from the thermostat housing [A].

*Installation:* Tighten the bolts to 10–17 ft.–lbs. (14–23 Nm) torque.

Remove the thermostat.



#### **Checking the Thermostat**

Check the thermostat opening temperature [B].

Standard – 176–183°F (80–84°C)

Check the thermostat valve lift.

Standard – Approximately 0.3 inch (8 mm) @ 203°F (95°C)

If the thermostat housing assembly is removed, tighten the bolts to 10–17 ft.–lbs. (14–34 Nm) torque [C].





#### WATER JACKET TUBE

#### **Removal and Installation**

Remove the timing gearcase cover. (See Page 7-69.)

Remove the idler gear and hub. (See Page 7–71.)

Remove the fuel injection pump. (See Page 7-40.)

Remove the fuel injection pump idler gear. (See Page 7–73.)

Remove the camshaft gear. (See Page 7-74.)

Remove the timing case. (See Page 7-75.)

Remove the water pump. (See Page 7-83.)

Grip the edge of the water jacket tube with a vise grip. Use a screwdriver to pry the jacket from the engine block **[A]**.

Remove the water jacket tube from the engine block [B].







# SYSTEMS ANALYSIS

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# Inspecting the BICS System Controller (Engine STOPPED – Key ON)

- Sit in the operator's seat. Turn key ON, lower the seat bar and disengage the parking brake. All five (5) BICS Controller lights should be ON (Items 1, 2, 3, 4 & 5) [A].
- Engage the parking brake, raise the seat bar fully. Seat bar light (Item 2) [A], valve light (Item 3) [A] and traction light (Item 4) [A] should be OFF.
- 3. Raise up slightly off the seat. Seat light (Item 1) [A] should be OFF.

#### NOTE: Record what lights are blinking (if any) and number of blinks. Refer to BICS Troubleshooting Chart, Page 8–4.

 Exit the loader and press traction lock override button. Traction light (Item 4) [A] should be ON. Press override button again and traction light (Item 4) [A] should be OFF.

# Inspecting the Seat and Seat Bar Sensors (Engine RUNNING)

- 5. Sit in the operator's seat, lower the seat bar and engage the parking brake. Fasten the seat belt.
- 6. Start the engine and operate at low idle. While raising the lift arms, raise the seat bar fully. The lift arms should stop. Repeat using the tilt function.
- NOTE: The auxiliary hydraulic functions are not affected by the Bobcat Interlock Control System (BICS).

## Inspecting the Traction Lock (Engine RUNNING)

- 7. Fasten the seat belt, disengage the parking brake, and raise the seat bar fully. Move the steering levers slowly forward and backward. The traction lock should be engaged. Lower the seat bar.
- 8. Engage the parking brake pedal and move the steering levers slowly forward and backward. The traction lock should be engaged.

## Inspecting the Lift Arm By–Pass Control

9. Raise the lift arms six feet (2 m) off the ground. Stop the engine, pull and hold the by–pass control knob. Push the *toe* of the left foot pedal or move the left hand control in toward the operator (hand controls) and the lift arms should lower slowly.

### Maintenance

Clean any debris, dirt or objects from under or behind the operator seat **[B] & [C]**. The rear of the seat must move up and down.

Clearance is necessary under the seat spring (Item 1) **[C]** and the seat, to allow the seat to move up and down freely. With adequate clearance, the seat sensor will be allowed to function properly.

Inspect seat bar pivot area for tightness of linkage bolts.

Replace parts that are damaged. Use only genuine Melroe replacement parts.









The Bobcat Interlock Control System (BICS™) must deactivate the lift, tilt and traction drive functions. If it does not, contact your dealer for service. DO NOT modify the system.

W-2151-0394

#### **Troubleshooting Chart**

The following list shows the effects which can happen to the loader, and the probable causes when the BICS Controller lights are off or flashing. Have the service procedure performed ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL.

			Effect on Operation	Flashing Indicator Means System Problem (See Your Bobcat Dealer for Service)	
Indicator Light	Light ON	Light OFF	of Loader When Light Is OFF	Number of Flashes	Cause
Seat	Operator in Seat	No Operator in Seat	Lift and tilt functions will not operate.	2	Seat sensor circuit shorted to battery voltage*.
				3	Seat sensor circuit shorted to ground
Seat Bar	Seat Bar Down	Seat Bar Up	Lift, tilt and traction functions will not	2	Seat bar sensor circuit shorted to battery voltage*.
			operate.	3	Seat bar sensor circuit shorted to ground.
Valve	Control Valve Can	Control Valve	Lift and tilt functions	1	Valve output circuit is open.
	Be Used	Cannot Be Used	will not operate.	2	Valve output circuit shorted to batterv
170)					voltage*.
				3	Valve output circuit shorted to ground.
				3	Valve output circuit is not grounded.
Traction	Loader can be	Loader cannot be	Loader cannot be	1	Traction lock hold coil circuit is open.
	moved forward & backward.	moved forward and backward.	moved forward and backward.	2	Traction lock hold coil circuit shorted to battery voltage*.
				3	Traction lock hold coil circuit shorted
				4	Traction lock pull coil circuit is open
				5	Traction lock pull coil circuit is shorted
				Ŭ	to battery voltage*.
				6	Traction lock pull coil circuit is shorted to ground.
Power	BICS Controller is operating correctly.	BICS Controller is not operating correctly.	Lift, tilt and traction functions will not operate.		

NOTES:

- (1) If the seat and/or seat bar sensor circuits are open, the corresponding lights will be OFF. If one of the lights stay OFF, check the circuit for continuity. See Inspection & Maintenance Instructions in Preventive Maintenance section.
- (2) If all five lights flash repeatedly, the voltage supply is greater than 16 volts or less than 9 volts.
- (3) Flashing patterns will repeat every 3.25 seconds.
- (4) If seat indicator light does not go ON, check for debris, dirt or objects under or behind the seat.
- NOTE: If the Seat Bar is lowered before the seat sensor is activated, a 10 second delay will occur before the valve and traction lights come on. (only loaders with BICS controller S/N's above 200,000 will have this delay.)
- \* Normal BICS operating voltage is less than the electrical system voltage. If voltage is more, the circuit is shorted to system voltage.

#### **Troubleshooting Guide**

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

#### **BICS SYSTEM CONTROLLER**

PROBLEM	SOLUTION #
Power indicator light does not come "ON".	1, 2, 3, 6
All indicator lights flashing.	4
One of the indicator lights flashing.	5
Intermittent indicator lights.	6, 7, 8, 9

- 1. Check that ignition switch is "ON".
- 2. Check BICS 10 amp. fuse.
- 3. Check wiring and connections. Make sure the connector is securely connected to the controller. Remove controller and pull on connector to check.
- 4. Look at indicator light windows, if they are milky white in appearance, it is most likely caused by moisture in the controller. Allow to dry or replace the controller.
- 5. Refer to BICS controller troubleshooting chart (See Page 8–1).
- 6. Check wire connections to make sure connectors are locked into place.
- 7. Check pins in connectors for pins pushed back or bent.
- 8. Move the system wiring back & forth to try to find area that may be causing the intermittent connection.
- 9. Use sensor tester MEL1428 to isolate problem between sensor and controller and wiring.

#### Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

# **WARNING**

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

#### TRACTION LOCK

PROBLEM	SOLUTION #
Traction lock stays engaged.	1, 2, 3, 4, 5, 6, 7, 8
Intermittent activation of traction lock.	9, 10, 11

- 1. Check that controller power indicator light is "ON".
- 2. Make sure brake pedal is not engaged.
- 3. Maneuver loader to allow brake discs to move and remove pressure on the brake wedge so it can retract.
- 4. If all lights indicate the brake should be released, but it doesn't, check the brake 25 amp. fuse.
- 5. When checking fuse, also check other fuses. Check the fuse block for correct orientation and location of fuses (See Electrical System, Page 6–1).
- 6. To test the solenoid, the pull coil should be .4 to .5 ohms and the hold coil 10.5 to 11.0 ohms.
- 7. Check brake solenoid and cover mounting hardware for the correct torque.
- 8. Remove brake cover and check wedges for binding in the wedge guides.
- 9. Check wire connections for loose connector body.
- 10. Check for loose or bent pins in connectors.
- 11. Check for loose spade connectors in fuse holder.

#### Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems It is recommended that these procedures be done by authorized Bobcat Service Personnel only.



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death. W-2004-1285

#### SEAT SENSOR

PROBLEM	SOLUTION #
Seat indicator light does not come ON with operator in seat.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Seat indicator light stays ON when operator is out of seat.	2, 3, 6, 10, 11, 12, 13, 14
Intermittent indicator light during operation.	11, 15, 16, 17, 18

- 1. Check to make sure power indicator light is ON.
- 2. Check for debris under and around seat.
- 3. Look for any obstruction around seat.
- 4. Check to make sure seat rail lowers when weight is in seat.
- 5. Raise cab and check for magnet collar movement when weight is added to seat. (Magnet collar should extend approximately 3/8" beyond the sensor assembly with weight in the seat).
- 6. Use sensor tester to check operation of sensor and controller. Follow instructions on tester.
- 7. Check to make sure the magnet guide pin is in place.
- 8. Check for contamination on magnets such as metal particles or for shipping plate over magnets.
- 9. Check to make sure both magnets are in collar.
- 10. Check for binding of magnet collar or bushing with hex head on other side for binding.
- 11. Check for correct mounting. One spring for standard seat. Two springs for suspension seats. Thick washers should be under front seat mounting rails on both sides.
- 12. Check for loose hardware mounting magnet collar. Check to make sure the magnet collar bushing is threaded on all the way so it is contacting seat rail.
- 13. Check to make sure seat rail raises when weight is removed from the seat.
- 14. Raise cab and check for magnet collar movement when weight is removed from seat. (Magnet collar should extend approximately 1/8" beyond the sensor assembly without weight in seat).
- 15. With smaller operators that operate with the seat forward some mounting alterations may be required. (See solution suggestions 16, 17 and 18).
- 16. Adjust suspension seat to lightest weight setting.
- 17. Check to make sure the seat rails move up and down freely when weight is added.
- 18. Add washer between the bushing and the magnet collar assembly which slides on and the seat rail. This will reduce the amount of seat travel required to activate the system. **Must check**, with seat moved all the way back, that indicator light does not stay on with operator out of seat. If light does not go out with operator out of the seat, the washer must be removed.

#### Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.

# **WARNING**

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

#### SEAT BAR SENSOR

PROBLEM	SOLUTION #
Indicator light does not come ON when seat bar is lowered.	1, 2, 3, 4, 5, 6

- 1. Check controller power indicator light. It must be ON.
- 2. Check sensor wire connection.
- 3. Use the BICS sensor tester MEL1428 to check sensor and controller.
- 4. Check for loose hardware.
- 5. Check keyed bushing to make sure magnet collar rotates with seat bar.
- 6. Check magnet collar magnets for contamination such as metal particles.

#### Troubleshooting Guide (Cont'd)

The following troubleshooting guide is provided for assistance in locating and correcting BICS system problems. It is recommended that these procedures be done by authorized Bobcat Service Personnel only.



W-2004-1285

#### LIFT LOCK BY-PASS VALVE

PROBLEM	SOLUTION #	
By–pass valve stuck.	1	
By-pass valve stem bent or broke.	2	

- 1. Rotate shaft.
- 2. Replace manual spool cartridge.

#### BICS<sup>TM</sup> SYSTEM CONTROLLER

#### **Removal and Installation**

Raise the loader operator cab. (See Page 1-1.)

The controller mounting bolts are located on the back of the operator cab **[A]**.

Remove the top mounting bolt (Item 1) [A] from the controller.

Loosen the two lower mounting bolts (Item 2) [A].

Lower the operator cab.

NOTE: The operator seat is removed in photo [B] for clarity purpose only. The seat does not need to be removed to remove the controller.

Slide the controller (Item 1) **[B]** up and remove it from the back of the operator cab.

Disconnect the electrical harness from the controller and remove the controller from the loader.

NOTE: Install the harness connector (Item 1) [C] into the controller (Item 2) [C] before installing the controller.

# IMPORTANT

Be sure the connector to the BICS controller is correctly engaged in the controller when installing the controller. An audible snap can be heard when the connector is correctly installed. Try to pull the connector out of the controller, if it cannot be removed it has been correctly installed [C].

*Installation:* Tighten the controller mounting bolts to 80–90 in.–Ibs. (9–10 Nm) torque.

Reverse the removal procedure to install the controller.







#### BICS<sup>TM</sup> SYSTEM CONTROLLER (Cont'd)

#### **Controller Test**

MEL1428 Sensor Tester is necessary for the following procedure:

Turn the key to the ON position. **DO NOT START THE ENGINE**.

After completing the procedure for the Seat sensor test or the Seat Bar sensor test, do the Controller test. Refer to Page 8–3 for correct procedures to do the Seat Bar sensor test or the Seat sensor test.

Move the toggle switch (Item 1) **[A]** on the sensor tester (Item 2) **[A]** to the **Present** position.

If the controller is working correctly, the Seat light (Item 1) **[B]** on the controller will illuminate when the tester is connected to the Seat sensor.

When the tester is connected to Seat Bar sensor, the Seat Bar light (Item 1) **[C]** will illuminate if the controller is working correctly.

Move the toggle switch (Item 1) **[D]** on the sensor tester (Item 2) **[D]** to the **Absent** position.

The Seat light (Item 1) **[B]** or the Seat Bar light (Item 1) **[C]** should go off.

If the tests above fail, there is a problem with the BICS system controller or the wiring harness.

Refer to Page 8–3 for the correct procedure to inspect the BICS System Controller.









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#### SEAT BAR SENSOR

#### **Removal and Installation**

Disconnect the seat bar sensor connector (Item 1) [A].



Remove the mounting bolt (Item 1) [B] from the pivot bushing.

*Installation:* Tighten the mounting bolt to 25–28 ft.–lbs. (34–38 Nm) torque.

Remove the sensor mounting bolt (Item 2) [B] and nut.



*Installation:* Be sure the tabs on the pivot bushing are positioned in the slotted hole (Item 1) **[C]** of the operator cab as shown.

Pull the seat bar back and remove the assembly as follows:

NOTE: The sensor assembly [D] is shown removed from the operator cab for clarity purpose only. The sensor assembly can be removed without removing the seat bar from the operator cab.

Remove the pivot bushing mounting bolt (Item 1) **[D]** and washer (Item 2) **[D]** from the pivot bushing (Item 3) **[D]**.

*Installation:* Tighten the pivot bushing mounting bolt to 180–200 in.–lbs. (21–23 Nm) torque.

Remove the pivot bushing (Item 3) **[D]**, sensor (Item 4) **[D]**, magnet (Item 5) **[D]** and plastic bushing (Item 6) **[D]** from the seat bar.

Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat bar sensor.

Refer to Page 5–1 for seat bar removal and installation procedure.







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#### SEAT BAR SENSOR (Cont'd)

#### Seat Bar Sensor Test

Use MEL1428 Sensor Tester for the following procedure:

Turn the key to the ON position. **DO NOT START THE ENGINE**.

Disconnect the seat bar sensor connector (Item 1) [A].

Connect MEL1428 Sensor Tester (Item 1) **[B]** inline as shown to the seat bar sensor connectors. Also see inset **[B]**.

The power light (Item 1)  $\circe{[C]}$  on the sensor tester will illuminate.

Lower the seat bar. The sensor test light (Item 1) [D] should illuminate.

Raise the seat bar. The sensor test light (Item 1)  $\circlet{D}$  should go off.

If the above tests fails, there is a problem with the seat bar sensor.

Refer to Page 8–3 for the correct procedure to inspect the Seat Bar Sensor.

Refer to Page 5–1 for seat bar removal and installation procedure.



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#### SEAT SENSOR

#### **Removal and Installation**

Raise the loader operator cab. (See Page 1-1.)

Locate the seat sensor (Item 1)  $\circ{[A]}$  beneath the operator cab.



Remove the sensor connector (Item 1) [B] from the holder.

Disconnect the sensor connector (Item 1) [B].

Remove the magnet collar mounting bolt (Item 2) **[B]**, washer (Item 1) **[C]** and magnet (Item 2) **[C]** from the sensor (Item 3) **[B]**.





Remove the sensor (Item 3) [C].

NOTE: Be sure not to lose the magnet collar alignment pin (Item 4) [C] which is located in the sensor (Item 3) [C] when removing the sensor.

Remove the threaded bushing (Item 5) [C] from the seat track mounting bolt (Item 1) [D].

Inspect all parts for damage and wear and replace if necessary.

Reverse the removal procedure to install the seat sensor.

Refer to Page 5–1 for seat removal and installation procedure.







#### SEAT SENSOR (Cont'd)

#### Seat Sensor Test

Use MEL1428 Sensor Tester for the following procedure:

Turn the key to the ON position. **DO NOT START THE ENGINE**.

Disconnect the seat sensor connector (Item 1 – Inset) [A].

Connect MEL1428 Sensor Tester (Item 2)  $\circlet{A}$  inline as shown to the seat sensor.

The power light (Item 1)  $[\mbox{\bf B}]$  on the sensor tester will illuminate.

Sit on the operator seat. The sensor test light (Item 1) [C] should illuminate.

Get off the operator seat. The sensor test light (Item 1)  $\circe{[C]}$  should go off.

If the above tests fail, there is a problem with the seat sensor.

Refer to Page 8–14 for the correct procedure to inspect the Seat Sensor.

Refer to Page 5–1 for seat removal and installation procedure.







853,853H BICS Loader Service Manual **TRACTION LOCK** 

**Removal and Installation** 

# 

#### AVOID INJURY OR DEATH

Do not modify the electrical wiring connected to the traction lock solenoid or any part of the traction lock system. The traction lock provides the locking function of the parking brake. Service work on the traction lock system should only be performed by a qualified technician. Use only genuine Melroe parts if repair is necessary. W-2165-0195

Raise the loader operator cab. (See Page 1-1.)

Remove the *Do Not Modify* sta–strap (P/N 6665527) from the electric solenoid connector (Item 1) **[A]**.

*Installation:* Install a new *Do Not Modify* sta–strap (P/N 6665527) on the electric solenoid connector.

Remove the two mounting bolts (Item 2) **[A]** from the electric solenoid mounting bracket.

**Installation:** Tighten the mounting bolts to 25–28 ft.–lbs. (34–38 Nm) torque. Be sure the solenoid mounting bracket is installed in the same position. The solenoid mounting surface has a slight angle which tips the top of the solenoid toward the rear of the loader when installed correctly.

Remove the electric solenoid and bracket assembly from the chaincase cover **[B]**.

Remove and inspect the compression spring (Item 1) **[B]** for wear or damage. Replace if necessary. The spring may also stay with the shaft when the electric solenoid and bracket are removed from the chaincase.

**Installation:** Install the compression spring (Item 1) **[B]** on the collar located on the electric solenoid.

Remove the traction lock assembly (Item 1)  $\circ{[C]}$  from the chaincase.

Remove the shaft mounting bolt (Item 1) **[D]**, washer and spring from the assembly shaft (Item 2) **[D]**. Remove the wedge (Item 3) **[D]** and inspect all parts for damage or wear. Replace if necessary.

**Installation:** Thoroughly clean and dry the shaft mounting bolt (Item 1) **[D]**, the shaft (Item 2) **[D]** and wedge (Item 3) **[D]**. Use LOCTITE 242 when assembling these parts to the traction lock assembly.



Failure to use LOCTITE may allow the traction lock assembly to loosen up which can cause damage to the traction lock system.









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#### LIFT LOCK BY-PASS VALVE

#### **Removal and Installation**



Never work on a machine with the lift arms up unless the lift arms are secured by a lift arm support device. Failure to use an approved lift arm support device can allow the lift arms or attachment to fall and cause injury or death. W-2059-0991

W-2059-0991

## IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I–2003–0284

Raise the lift arms and install an approved lift arm support device. (See Page 1-1.)

Raise the operator cab. (See Page 1-1.)

Drain the fluid from the hydraulic reservoir. (See Page 1-1.)

Remove the control panel. (See Page 3–1.)

Disconnect the tubelines (Items 1 & 2) [A].

Disconnect the tubeline (Item 1) [B].

Remove the two mounting bolts (Item 2) [B].

*Installation:* Tighten the mounting bolts to 180–200 in.–lbs. (21–23 Nm) torque.

Turn the elbow fitting (Item 1) [C] for clearance.

Disconnect the tubeline (Item 2) [C].

Turn the lift lock by-pass valve so there is clearance to disconnect the tubeline (Item 1) **[D]**.

Remove the lift lock by-pass valve.









#### LIFT LOCK BY-PASS VALVE (Cont'd)

#### Removal and Installation (Cont'd)

Remove and replace the by-pass valve mounting bracket (Item 1) [A] if necessary.

Reverse the removal procedure to install the lift lock by-pass valve in the loader.



#### **Disassembly and Assembly**

Remove the by–pass valve (Item 1) **[B]** from the valve block. Inspect the by–pass valve for damage and replace if necessary.

Remove the check valve (Item 2) **[B]** from the valve block. Inspect the check valve for damage and replace if necessary.

Inspect the hydraulic fittings on the valve block for damage and replace if necessary.



#### TILT LOCK VALVE Removal and Installation



Raise the lift arms and install an approved lift arm support device. (See Page 1–1.)

Raise the operator cab. (See Page 1-1.)

Drain the fluid from the hydraulic reservoir. (See Page 1-1.)

Mark all tubelines for correct installation.

Disconnect the tubelines from fitting (Items 1 & 2) [A].

Disconnect the hose (Item 1) [B].

Disconnect the tubelines from the fittings (Item 1) [C].

Remove the "Do Not Modify" sta-strap (P/N 6665527) from the electric solenoid connector (Item 2) **[C]**.

*Installation:* Install a new "Do Not Modify" sta–strap (P/N 6665527) on the solenoid connector.

Remove the two mounting bolts (Item 3) [C].

*Installation:* Tighten the mounting bolts to 180–200 in.–lbs. (21–23 Nm) torque.

Remove the tilt lock valve.







#### TILT LOCK VALVE (Cont'd)

#### **Disassembly and Assembly**

Remove the solenoid mounting nut (Item 1) **[A]**, solenoid (Item 2) **[A]** and solenoid valve (Item 3) **[A]** from the tilt lock valve.



Remove the check valve (Item 1) [B] from the lift lock valve.

**Assembly:** Tighten the solenoid mounting nut to 80–90 in.–lbs. (9–10 Nm) torque.

Inspect the solenoid valve, check valve and hydraulic fittings for damage or wear. Replace if necessary.

Refer to Page 8–1 for lift arm by–pass control inspection procedure.



#### **BOSS® DIAGNOSTIC TOOL**

#### Procedure

The tool listed will be needed to do the following procedure:

MEL1400 – Diagnostic Tool

Stop the engine.

Lift and block the loader. (See Page 1–1.)

Remove the dust cap from the diagnostic connector plug. Connect the diagnostic tool plug (Item 1) **[A]** into the loader connector.

Use the instructions from the BOSS Operation & Maintenance Manual to make service checks of BOSS system operating unit and other components **[A]**.

#### SENDER AND SENSOR

#### **Service Checks**

Use the following information when checking the senders and sensor with a volt/ohmmeter:

#### Component

Value

TEMPERATURE SENDER	
70 degree F. (21 degree C.) 80 degree F. (27 degree C.)	

ENGINE OIL PRESSURE SENDER

0 PSI		3 ohms Max.
6 PSI (41 kPa) .		7 ohms Min.
50 PSI (345 kPa)	)	49 ohms
70 PSI (483 kPa)	)	59 ohms
( )		

TRANSMISSION CHARGE PRESSURE SENDER

0 PSI 0–5 (	ohms
100 PSI (690 kPa) 58 (	ohms
130 PSI (896 kPa)	ohms
150 PSI (1034 kPa) 87 (	ohms
· · · · · · · · · · · · · · · · · · ·	

FUEL SENDER		
Full	 	 30 ohms
Empty	 	 270 ohms

#### **RPM SENSOR**

#### Adjustment

Continuity Resistance of 3000-3500 ohms.

Disconnect the connector [B] from the engine harness.

Loosen the jam nut (Item 1) [B] on the RPM sensor.

Turn the RPM sensor (Item 1) **[C]** in until it makes contact with the engine flywheel.

Turn the jam nut until it contacts the flywheel housing. The jam nut should not be tightened, it needs to turn with the RPM sensor when the sensor is turned back out for adjustment.

Turn the RPM sensor and the jam nut out from the flywheel. Set a clearance of 0.050" (1,27 mm) between the jam nut and the housing with a feeler gauge **[C]**.

Retighten the jam nut.

#### NOTE: The plastic tip is used as a gauge to set a new RPM SENSOR. The plastic tip is designed to come off after the engine is started.







### MONITOR SERVICE CODES

One of the following Alphabetic Codes may appear on your monitor.



One of the following Numeric Codes will appear following one of the above Alphabetic Codes. Example:



SC01-0198

#### SERVICE CODES (Cont'd)

The following list references the defect codes that are transmitted to the instrument panel display which can occur. Some service procedures for correcting the problems can be found in this manual and other procedures must be performed ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL.

## A WARNING

Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Failure to follow instructions can cause injury or death.

W-2003-1289

SERVICE CODES				
SUBJECT	DISPLAY READS	CONDITION		
Engine Coolant Level	ECL 1	SHUTDOWN, No Coolant		
Engine Coolant Temp.	EC-1.1	SHUTDOWN, Engine Temperature		
	EC-2.1	WARNING, Engine Temperature		
	EC 3	Wiring Not Connected		
	EC 4	Wiring Shorted		
	EC 5	High Sensor Voltage		
	EC 7	Sensor Out Of Range		
Engine Oil Pressure	EP 1	SHUTDOWN, Pressure		
<b>88</b> 55.5 🛛	EP 2	WARNING, Pressure		
	EP 3	Wiring Not Connected		
	EP 4	Wiring Shorted		
	EP 5	High Sensor Voltage		
	EP 7	Sensor Out Of Range		
Engine Speed	ES 1	SHUTDOWN, Engine Speed Too High		
	ES-2.1	WARNING, Engine Speed Slightly High		
	ES–6	Sensor No Signal		
	ES–7	Sensor Out Of Range		
Air Filter	AF 2	WARNING, Restriction Too High		
	AF 6	Sensor No Signal		
Battery	b–2.1	WARNING, Bad Battery		
	b–2.2	WARNING, Battery Voltage		
Fuel Level	FUEL2	WARNING, Low Level		
	FUEL3	Wiring Not Connected		
	FUEL4	Wiring Shorted		
	FUEL5	High Sensor Voltage		
	FUEL7	Sensor Out Of Range		

SERVICE CODES				
SUBJECT	DISPLAY READS	CONDITION		
Hydrostatic Charge	HF1–2	WARNING, High Restriction		
Filter Condition	HF16	Sensor No Signal		
Hydrostatic Fluid	HP 1	SHUTDOWN, Pressure		
	HP 2	WARNING, Pressure		
	HP 3	Wiring Not Connected		
	HP 4	Wiring Shorted		
	HP 5	High Sensor Voltage		
	HP 7	Sensor Out Of Range		
Hydrostatic Fluid	HC 1	SHUTDOWN, Temperature		
Temperature	HC 2	WARNING, Temperature		
	HC 3	Wiring Not Connected		
	HC 4	Wiring Shorted		
	HC 5	High Sensor Voltage		
	HC 7	Sensor Out Of Range		

#### TROUBLESHOOTING THE BOSS® & LCD DISPLAY

SUBJECT	SYMPTOM	INDICATES		TO CORRECT SYMPTOM
BOSS	Temperature related shutdown codes when no heating occurs. * NOTE: You may ha codes liste temps, high and low fue	12 volt supply and BOSS failure. ve some or all of the d. You will have high press, low voltage I.	1. *2. 3.	Check stored defects with the BOSS tool. If defect list has EC1, HC1, EC2.1, HC2. EP3, EP7, HP7, B2.2, low fuel, Fuel 7 and last occurrence hr. readings are within a hundredth, the BOSS is defective and must be replaced. Using a voltmeter, check the alternator output.
LCD Display	Intermittent code of ES6 while engine running.	Sensor No Signal or No RPM's.	1.	ES6 will occur if the loader is stalled or shutdown during run cycle. The code is generated due to the lack of RPM and the existence of residual pressure in the system.
	Display is dead – No Icons, Bar Graphs, Hourmeter.	Lack of 5.0 volts regulated power.	1. 2.	Check pin A for 5.0 volts. If 5.0 volts is present replace the display. If no power exists at pin A, install BOSS backup to confirm the BOSS system.
	CONNECTOR A B C D E			continuity.
	During an active WARNING display, reset occurs and the hourmeter becomes all zero's.	Low voltage (5.0) triggered reset.	1. 2.	Turn the ignition switch OFF. Re-starting will return hourmeter reading. If re-starting will not return hourmeter reading, check pins B & C as stated in Step 5 below.
	Garbled message, missing segments, etc.	The display is not fault tolerant. Also can be an indication of poor internal connections.	1.	Turn the ignition switch OFF and re-start. A fault is an invalid message that the display tries to display. Generally a fault occurs if communications of two messages are combined on the display.
	After glow sequence or after a WARNING goes away, the Icon remains ON.		1.	Turn the key OFF and re-start.
	No Bar Graphs, no Hours.	Bad display or BOSS is not communicating.	1. 2. 3. *4.	Plug in the BOSS tool and start the engine. If data is being received by the BOSS tool, the BOSS unit is not the cause of the problem. If no data is received at the BOSS tool. disconnect the LCD display. If messages are now received at the tool, the display is the problem. If problem still exists go to
	* NOTE: The display problem communicat stopping co the BOSS.	y has caused the by locking the ion lines and ommunications from	5. 6. 7.	Step 5. Check pins B & C for signal. If there is no signal, install BOSS backup unit. If the problem still exists, check the harness for continuity.

#### **OPERATION SENSING SYSTEM UNIT**

#### **Removal and Installation**

Raise the loader operator cab. (See Page 1-1.)

Loosen the nuts (Item 1) **[A]** from the sensing system unit (Item 2) **[A]**.

Slide the unit forward in the mounting slots and remove it from the operator cab.

Use a screwdriver and remove the two connectors (Item 1) **[B]** from the sensing system unit (Item 2) **[B]**.

**Installation:** Put the heads of the mounting bolts into the slots of the operator cab and slide the unit back into place. Tighten the three mounting nuts to 80–90 in.–lbs. (9–10 Nm) torque.





#### **BOSS® INSTRUMENT PANEL**

#### **Removal and Installation**

Pry the rubber light mount free from the operator cab (both sides) **[A]**.



Lower the light from the operator cab to locate the three instrument panel mounting bolts (Item 1) [B] (both sides.)



*Installation:* Be careful to not overtighten the panel mounting bolts to prevent stripping the threaded holes of the panels.

Disconnect the wire harness connectors from the panel and remove the panel.

Remove the three mounting bolts and pull the right panel (Item 1) **[D]** down from the operator cab.

*Installation:* Be careful to not overtighten the panel mounting bolts to prevent stripping the threaded holes of the panels.

Disconnect the wire harness connectors from the panel and remove the panel.







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#### **PWM MODULE**

#### Description

- Take voltage measurements by probing into wires near the PWM module shown in figure **[A]**. All connectors must remain plugged into their respectful harness.
- Turn the key to the ON position with the engine OFF.
- Turn the switches ON to get their appropriate readings. (Example: Input from Proportional flow switch – Push switch full left then full right to get the voltage readings listed below.)
- Press the auxiliary hydraulic switch (Item 2) **[B]** twice. Both Green lights will be ON. Check Wire# 9, 17, 18, or 19.
- NOTE: Item descriptions are listed below as Input to or Output from the Module. Voltage readings are approximate. They are affected by battery condition (system voltage). Voltage readings for Items 10, 18, and 19 are variable and correspond to Proportional Flow Switch travel.

Fig.	[A]	:
	L, J	

ltem	Description	Volts
1	Input for Attachment I.D.	11.5
2	Ground	0
3	Input from Key Switch	12.0
4	Input from *Auxiliary Hydraulic Switch	9.5
5	Output to Momentary Light	7.5
6	Output to Auxiliary Hydraulic Switch	11.0
7	Output to Detent Light	6.5
8	Input from Key Switch (Bleed position)	12.5
9	Output to **High Flow Solenoid	11.5
	Non High Flow Loaders	0
10	Input from Proportional Flow Switch	.5–1.5
11	Ground to Proportional Flow Switch	0
12	Output to Proportional Flow Switch	2.0
13	Input for Loader Model I.D.	12.0
14	Input from Detent Switch	12.0
15	Input from Rear Aux. Base Switch	11.0
16	Input from Rear Aux. Rod Switch	11.0
17	Output to Rear Aux. Diverter Solenoid	10.0
18	Output to Aux. Rod Solenoid	0–6.0
19	Output to Aux. Base Solenoid	0–6.0

\*Input signal is present only as Auxiliary Hydraulic Switch is pushed.

\*\*Output signal goes to High Flow dash panel switch, then to solenoid. Used only on H models. Zero voltage on Non High Flow loaders.

Key Switch	Item 1 <b>[B]</b>
Auxiliary Hydraulic Switch	Item 2 <b>[B]</b>
Momentary Light	Item 3 <b>[B]</b>
Detent Light	Item 4 <b>[B]</b>
High Flow Switch	Item 5 <b>[B]</b>
Proportional Flow Switch	Item 1 <b>[C]</b>
Detent Switch	Item 2 <b>[C]</b>
Rear Aux. Switch (Base & Rod)	Item 3 <b>[C]</b>







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#### PWM MODULE (Cont'd)

#### Description (Cont'd)

Later S/N loaders have additional wires in the PWM module as shown in Fig. **[A]**. Loaders with the module mounted on the inside left fender are equipped with the auxiliary hydraulic deactivation feature and are listed below:

Loader S/N's	514411603 & Above
	514511003 & Above
	514611002 & Above

- Take voltage measurements by probing into wires near the PWM module. All connectors must remain plugged into their respectful harness
- Sit in the operator's seat. Turn key to ON position. Lower the seat bar. Check that the BICS<sup>™</sup> controller lights are on. Check input voltage (Item 1) **[A]**. Press the auxiliary hydraulics switch. The mode switch light will come ON. Raise the seat bar. The light should be OFF. Input voltage will drop to less than 1.0 volts.

#### NOTE: Item descriptions are listed below as Input to or Output from the Module. Voltage readings are approximate. They are affected by battery condition (system voltage).

Fig. [A]:				
ltem	Description	Volts		
1	Input from BICS <sup>TM</sup> Auxiliary Deactivation	12.0		
2	For future use			
3	For future use			
4	For future use			



#### Conditions

• Auxiliary Hydraulic Switch lights will not come ON. Check the following:

PWM fuse Wires disconnected, shorted, or cut. Auxiliary hydraulic switch failure.

Module failure.

Use the voltage tests in the wire identification section to determine the cause.

• Auxiliary Hydraulic Switch lights are flashing. See the troubleshooting chart. (See Page 8–30.)



#### PWM TROUBLESHOOTING (Cont'd)

#### Chart

The PWM module sends a diagnostic code to the Mode Switch lights when the conditions listed in the chart below occur.

- When the lights are flashing, the key needs to be turned OFF and then ON. If the problem still exists they will continue to flash.
- Proportional flow cannot be engaged if the lights are blinking.
- Continuous flow (detent) can be engaged if alternate blinking lights are off after the key switch is turned OFF and then ON (during a proportional flow switch failure).



Momentary LED (Item 1) [A]	Detent LED (Item 2) [A]	PROBLEM AREA	PROBLEM CAUSE
Light Blinking	Light OFF	Base End Solenoid or Wiring	<ul> <li>Wires Disconnected</li> <li>Wires Shorted</li> <li>Wires Cut</li> <li>Solenoid failed. Perform solenoid coil test.</li> <li>PWM module failed.</li> </ul>
Light Off	Light Blinking	Rod End Solenoid or Wiring	<ul> <li>Wires Disconnected</li> <li>Wires Shorted</li> <li>Wires Cut</li> <li>Solenoid failed. Perform solenoid coil test.</li> <li>PWM module failed.</li> </ul>
Light Blinking	Light Blinking	Diverter Solenoid or Wiring	<ul> <li>Wires Disconnected</li> <li>Wires Shorted</li> <li>Wires Cut</li> <li>Solenoid failed. Perform solenoid coil test.</li> <li>PWM module failed.</li> </ul>
*Blinking/OFF	*OFF/Blinking	Proportional Flow Switch (Right Handle)	<ul> <li>Wires Disconnected</li> <li>Wires Shorted</li> <li>Wires Cut</li> <li>Proportional flow switch failed. Check voltage to switch. Perform handle test.</li> <li>PWM module failed.</li> </ul>

\*Alternate Blinking Lights

#### **PWM CONTROL HANDLE**

#### Handle Testing

The right side steering lever handle switch (Item 1) **[A]** controls the proportional flow to front auxiliary. Test the switch with a Ohm test meter.

Disconnect the handle switch harness from the controls harness. Use the chart below to test the handle switch.

Test between handle wires	Full Left	Center	Full Right
White/Black	No	4.8–5.2	No
& White	Test	Ohms	Test
White/Red	1.3–1.5	2.6–2.8	3.8–4.0
& White	Ohms	Ohms	Ohms
White/Red &	3.8–4.0	2.6–2.8	1.3–1.5
White/Black	Ohms	Ohms	Ohms

Handle Switch Position

NOTE: Push the switch gradually from center to either left or right. The Ohm reading must change gradually. Replace the handle switch assembly if required.

#### **PWM ELECTRIC SOLENOID**

#### **Solenoid Coil Testing**

The front auxiliary solenoid valves (Item 1) **[B]** are located in the hydraulic control valve. Test the solenoid coils with a Ohm test meter.

Disconnect the coil from the controls harness. The correct reading is 1–5 Ohms.





#### ELECTRICAL/HYDRAULIC CONTROLS REFERENCE Controls Identification Chart

L oft Side	Switch Number		Sole Num Activ	noid iber ated	Attachment Harness Terminal Activated	Attachment Harness Connector	Right Side
Control Handle Switches			RH	HFH			Control Handle Switches
	1	1	1	1,8	к		
	2	2	2	2	к		
$\alpha \frown$	* 3	1	1	1,8	К		$\overline{\alpha}$
	4	2	2,3	6,7	K, A, D		
	5	1	1,3	5,7	K, A, C		
	6	1	1,3	5,7	K, E		
	7	1	1,3	5,7	K, F		
	8	1	1,3	5,7	K, G	Viewed from front	
	9	1	1,3	5,7	К, Н	(pin side of connector) of loader.	
	10, 11, 12, 13, 14	-	_		к		

RH – Loaders with Rear Hydraulics Option.

HFH – Loaders with High Flow Hydraulics Option.

\* If harness terminals K & L are jumped together, switches 4 thru 9 will function the same as switch 3.



Solenoid Number	Hydraulic Coupler	Wiring Color
1	Front Female	Dk. Green/ Red
2	Front Male	Dk. Green/ Lt. Green
3 (Top)	Diverter	Yellow
4 (Bottom)	Bleed – Rear Male & Female	Dk. Green/ Yellow
5	Rear Female	Yellow/ Lt. Green
6	Rear Male	Yellow/ Brown
7 (Bottom)	Diverter	Yellow
8 (Middle)	High Flow	Lt. Blue/ Red
9 (Top)	Bleed – Rear Male & Female	Dk. Green/ Yellow

MC-02314

NOTE: The Key Switch fully left position activates solenoids number 1, 4 and 9. The high flow rocker switch in the left side instrument panel must be ON to activate solenoid number 8.

#### **SPECIFICATIONS**

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SPECIFICATIONS



#### LOADER SPECIFICATIONS

#### LOADER DIMENSIONS

• Dimensions are given for loader equipped with standard tires and dirt bucket. Dimensions may vary with other types. All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

• Where applicable, specifications conform to SAE/ISO standards and are subject to change without notice.



MC-1113

48.3 (1227)

#### \* Overall Length W/O Bucket

This loader was designed without counterweights or ballasts. Changes of structure or weight distribution of the loader can cause changes in control and steering response and can cause failure of the loader parts.

<b>OPERATION &amp; PERFORMANCE</b>	853 & 853H
Weights         Operating Weight         Rated Operating Capcity         Tipping Load	6500 lbs. (2950 kg) 1700 lbs. (772 kg) 3420 lbs. (1533 kg)
Travel Speed	Infinitely variable 0–6.3 MPH (10,1 km/hr.)
Controls Vehicle Loader Function Engine Main Drive Service Brake Secondary Brake Parking Brake	Direction & speed controlled by two hand levers. Lift, tilt functions controlled by separate foot pedals. Auxiliary functions controlled by electrical push buttons on steering levers and toggle switch in operator area. Hand lever throttle; key–type starter switch. Hydrostatic Two independent hydrostatic drive systems controlled by two hand operated steering levers. One of the hydrostatic transmissions. Spring Actuated mechanical traction lock set when seat bar is up,
	key is turned off or when foot pedal is engaged.
ENGINE         Make         Model         Fuel         Horsepower         Maximum Governed RPM         Torque         Number of Cylinders         Bore/Stroke         Displacement         Cooling System         Lubrication         Air Cleaner         Ignition         Low Idle         High Idle	Isuzu 4JB1 PK–03 Diesel [62 HP (46 kW) Gross] [58 HP (43 kW) Net] 2600 RPM Gross: 130 ft.–lbs. (176 Nm) @ 1600 RPM Net: 127 ft.–lbs. (172 Nm) Four 3.66/4.02(93/102) 169 cu.in. (2769 cu. cm.) Liquid Pressure System W/Filter External Dry replaceable cartridge, dual safety element Diesel–Compression 1150 RPM 2800 RPM

LOADER SPECIFICATIONS (Cont'd)	853 & 853H
HYDRAULIC SYSTEMPumpPump CapacityHi Flow Pump Capacity (Optional)System Main ReliefHi Flow Main Relief (Optional)Filters	Engine driven gear type 18.0 GPM (68,1 L/min.) @ 2750 RPM @ 1150 PSI (7929 kPa) 24 GPM (90,8 L/min.) @ 2750 RPM @ 1150 PSI (7929 kPa) 2700–2750 PSI (18617–18961 kPa) @ Quick Couplers 3300 PSI (22754 kPa) @ Quick Couplers Two full flow replaceable 3 media synthetic element Two 90 micron motor case drain filters
Hydraulic Cylinders	Doubleacting
Bore Diameter: Lift Cylinder (2) Tilt Cylinder (1) Rod Diameter: Lift Cylinder (2) Tilt Cylinder (1) Stroke: Lift Cylinder (2) Tilt Cylinder (1)	2.25 (57,2) 3.25 (82,6) 1.50 (38,1) 1.50 (38,1) 33.5 (851) 18.17 (462)
Control Valve	3–spool, open center, series type W/float detent on lift, single spool electrical control front auxiliary & electrical control rear auxiliary SAE standard tubes, hoses & fittings
Hydraulic Function Time: Raise Lift Arms to Maximum Height Lower Lift Arms from Maximum Height . Move Empty Bucket to Dump Position . Move Bucket to Retracted Position	3.9 Seconds 3.4 Seconds 2.2 Seconds 1.9 Seconds
Fluid Type	Bobcat Fluid (P/N 6563328); If fluid is not available, use 10W–30/10W–40 Class SE Motor Oil for temperatures above 0°F (–18°C) & 5W–30 Motor Oil for temperatures below 0°F (–18°C).
ELECTRICAL Alternator Battery Starter	Belt drive, 55 amps. Open 12 volt, 700 cold crank amps. @ 0ºF (–18ºC) 170 min. reserve capacity 12 volt, 3.89 HP (2,9 kW)
DRIVE SYSTEM         Transmission         Final Drive         Total Engine to Wheel Reduction	Tandem hydro. pumps infinitely variable, driving 2 fully reversing hydrostatic motors Gear Reduction & #100 HS roller chain & sprockets in sealed chaincase with oil lubrication 47:27:1
CAPACITIES Cooling System Fuel Engine Oil W/Filter Hydraulic Reservoir Hydraulic/Hydrostatic System Chaincase Reservoir	22 qts. (20,8 L) 25 gals. (95 L) 8 qts. (7,6 L) 16.0 qts. (15.1 L) 8 gals. (30,3 L) 9 gals. (34,1 L)
TIRES Recommended Pressure	Inflate tires to the MAXIMUM pressure shown on the side wall of the tire. DO NOT mix brands of tires used on the same loader.
VIBRATION DATA Hand Arm Vibration Whole Body Vibration	Less Than 2,5 m/sec <sup>2</sup> RMS Less Than 0,5 m/sec <sup>2</sup> RMS

#### **ENGINE SPECIFICATIONS**

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

#### **Cylinder Head**

Distortion	. 0.002 (0,05) it 0.008 (0,20)
Re–Grind Limi Valve Seat Angle	t 0.012 (0,30) . 45 degrees
Valve, Valve Guide & Seat Insert	
Valve Seat Width Intake	d. 0.067 (1,7)
Exhaust St	d. 0.079 (2,2) nit 0.079 (2,0)
Valve Head Depth Intake	. 0.029 (0,73)
Lin Exhaust	nit 0.05 (1,28) . 0.028 (0,70)
Valve Seat Angle	. 45 degrees Std. 0.07 (1,8)
Valve Stem Diameter Intake	(7,945–7,960)
Limi Exhaust	t 0.310 (7,87) (7,922–7,935)
Valve & Valve Guide Clearance Intake	(0,038–0,069)
Lin Exhaust	nit 0.008 (0,2) (0,064–0,097)
Valve Guide Height	0.51 (13)
Valve Springs	
Free Length Inner	. 1.783 (45,3)
Limi Outer Std Limi	t 1.748 (44,4) . 1.957 (49,7) it 1.898 (48.2)
Inclination Inner Outer Lin	nit 0.118 (3,0) nit 0.126 (3,2)
Tension Inner – Set Length	3 lbs. (5,9 kg)
Outer – Set Length	lbs. (5,02 kg) lbs. (20,9 kg) lbs. (18,2 kg)
Rocker Arm	
Shaft Diameter	(18,99–19,01)
Rocker Arm I.D. Std. 0.7489–0.7497 (	(19,02–19,04)
Clearance Between Rocker Arm & Shaft Std. 0.0003–0.0003	(0,008-0,05)
Limi Push Rod Run–Out	nit 0.0078 (0,2)
Tappets	

#### ENGINE SPECIFICATIONS (Cont'd)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

#### Piston, Pin & Rings

Piston O.D. Piston Grade A	
Clearance in Bore	
Clearance Between Ring & Piston Groove           1st Compression	Std. 0.0035–0.0049 (0,09–0,124)
2nd Compression	Limit 0.006 (0,15) Std. 0.002–0.0033 (0,05–0,084)
Oil	Limit 0.006 (0,15)
Piston Ring Gap Compression	Limit 0.006 (0,15)
Oil	Limit 0.059 (1,5)
Piston Pin O.D.	Limit 0.0059 (1,5) Std. 1.220 (30,99)
Inference Fit Clearance	Limit 1.219 (30,96) 0.0008–0.0006 (0,002–0,015)

#### **Connecting Rod & Bearing**

Connecting Rod Misalignment	Std. 0.002 (0,05) or less
Small End Bushing I.D.	Std. 12208–1.2211 (31,008–31,06)
Small End Bushing	St. 0.0003–0.00079 (0,008–0,20) Limit 0.0002 (0,05)
Clearance Between Crankshaft Journal & Bearing	Std. 0.001–0.0026 (0,029–0,066) Limit 0.004 (0,10)

#### **Cylinder Liners**

Cylinder Liner I.D.	Std. 3.6622-2.6638 (93,02-93,06)
	Limit 3.6653 (93,10)
Inference Fit in Block	0.00004–0.00075 (0,001–0,019)
Projection Above Block	
Cylinder Liner Bore I.D.	
Piston Grade A	Min. Dia. 3.6622-3.6630 (93,01-93,04)
Piston Grade C	Min. Dia. 3.6630–3.6638 (93,04–93,06)

#### Camshaft

Gear Backlash	Std. 0.004–0.007 (0,10–0,17)
End Play	
Journal Diameter	
Camshaft Bearing I.D.	Limit 1.9528 (49,60) Std. 1.9685–1.9697 (50,0–50,03) Std. 0.0020 (0.05)
Camshaft Run–Out	Limit 0.0047 (0,12) Limit 0.0039 (0,1)
Cam Lobe Height	Std. 1.654 (42,01) Limit 1.640 (41,66)

#### ENGINE SPECIFICATIONS (Cont'd)

All dimensions are given in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

NOTE: Crankshaft is Tuffride coated and cannot be re-ground.

#### Crankshaft

End Play	Std. 0.004 (0,1)
Connecting Rod Journal O.D.	Limit 0.012 (0,31)
Main Bearing Journal O.D.	Limit 2.0829 (52,91) Std. 2.7526–2.7532 (69,92–69,93)
Clearance Between Journal & Main Bearing	Limit 2.7524 (69,91) Std. 0.0014–0.0041 (0,035–0,080)
Crankshaft Run–Out	Limit 0.0043 (0,11)
	Limit 0.003 (0,08)

#### **Idler Gear**

End Play	Std. 0.003 (0,07)
Backlash	
Idler Gear Hub O.D.	Limit 0.012 (0,3)
Clearance Between Hub & Gear	Limit 1.7656 (44,85) Std. 0.0009–0.003 (0,025–0,085)
Bearing Replacement	Limit 0.0079 (0,2)
Projection	

#### **Oil Pump**

End Play Between Vane & Body	Std. 0.0008-0.0028 (0,02-0,07)
	Limit 0.0059 (0,15)
Clearance Between Rotor & Vane	Std. 0.0055 (0,14) or less
Clearance Between Vane & Body	. Std. 0.0079–0.0105 (0,2–0,27)
Clearance Between Rotor Shaft & Body	Std. 0.0016 (0,04)
,	Limit 0.0079 (0,2)
Oil Pump Pressure	PSI (393–490 kPa) @ 1400 RPM
	21 PSI (145 kPa) @ Idle RPM

#### **Fuel System**

Pump Type Nozzles	Bosch VE Bosch Multi–hole (4 orifices) Bosch Multi–hole (18134 kPa)
Idle RPM         High Idler RPM         Injection Pump Timing	

#### ENGINE SPECIFICATIONS (Cont'd)

#### **Torque For General Metric Bolts**

Thread Cine	Material				
(Dia. x Pitch)	Head Mark 4	Head Mark 7	Head Mark 10		
M 5 x 0.8		3–4 ft.–lbs. (4–5 Nm)			
M 6 x 1.0		6–7 ft.–lbs. (8–9 Nm)	6–9 ft.–lbs. (8–12 Nm)		
M 8 x 1.25	6–9 ft.–lbs.	11–16 ft.–lbs.	18–25 ft.–lbs.		
	(8–12 Nm)	(15–22 Nm)	(24–34 Nm)		
M 10 x 1.25	13–18 ft.–lbs.	22–30 ft.–lbs.	36–50 ft.–lbs.		
	(18–24 Nm)	(30–41 Nm)	(49–68 Nm)		
M 12 x 1.25	22–30 ft.–lbs.	40–54 ft.–lbs.	69–87 ft.–lbs.		
	(30–41 Nm)	(54–73 Nm)	(94–118 Nm)		
M 14 x 1.25	36–50 ft.–lbs.	58–80 ft.–lbs.	116–137 ft.–lbs.		
	(49–68 Nm)	(79–108 Nm)	(157–186 Nm)		

#### TORQUE SPECIFICATIONS FOR LOADER

#### Specifications

Item	Ft.–Lbs.	Nm
Air Cleaner Mounting Bolts	25–28	34–38
Alternator Pulley Nut	50	68
Axle Hub Mounting Bolt	175–190	237–258
Axle Sprocket Bolt	475–525	644–710
Bob–Tach Pivot Pin Bolts	220–245	198–332
Bob–Tach Lever Pivot Bolt	25–28	34–38
Brake Block Mounting Bolts	65–70	88–95
Brake Lever Bolt	65–70	88–95
Brake Pad Mounting Bolts	65–70	88–95
Camshaft Gear Bolts Camshaft Retainer Plate Bolts Chaincase to Main Frame Bolts & Nuts Connecting Rod Bolts Control Pedal Linkage Bolts Control Valve Mounting Bolts & Nuts Crankshaft Pulley Nut Cylinder Head Bolts	72–87 11–17 90–100 58–65 21–25 15–16 123–152 New 57–67 Used 72–80	98–118 15–23 122–136 79–88 28–34 20–22 167–206 77–91 98–108
Exhaust Manifold Bolts	10–17	14–23
Exhaust Pipe to Exhaust Manifold	20–35	27–47
Flywheel Bolts	83–90	113–122
Front Panel Bolts	16–20	22–27
Fuel Injector Holddown Nut	23–32	31–43
Glow Plug	15–18	20–24
High Pressure Tubeline FittingsHydraulic Housing Mounting BoltsHydraulic Reservoir Strap BoltsHydrostatic Motor Mounting BoltsHydrostatic Pump Mounting BoltsHydrostatic Pump Mounting BoltsHydrostatic Pump Pulley Bolt	14–29 25 16–20 65–70 65–70 175–200	19–39 34 22–27 88–95 88–95 237–271
Idler Gear Bolts	10–12	14–16
Injection Nozzles	36–51	46–69
Injector Nozzle Body	43–58	59–79
Injection Pump Gear Bolt	43–51	58–69
Injection Pump Idler Gear Bolt	72–87	98–118
Injection Pump Mounting Bolts	10–17	14–23
Intake Manifold Bolts	10–17	14–23
Main Bearing Cap Bolts	116–130 35–40	157–176 47–54
Oil Filter Housing Bolts	10–17	157–176
Oil Pan Nuts & Bolts	14–19	19–26
Oil Pump Bolts (Hollow)	9–12	12–16
Oil Pump Mounting Bolts	10–17	14–23
Operator Cab Fastening Nuts	40–50	54–68
Operator Cab Pivot Bolts & Nuts	25–35	34–47
Pedal Lock Linkage to Main Frame Bolts	7–8	9,5–10,8
Pedal Lock Linkage Tab Bolt	25	34
Pivot Pins Lock Bolt & Nut	18–20	24–27
Rocker Arm Adjustment Nut	12–14 36–43	16–19 49–58
Seat Belt Fastening Bolts	40–45	54–61
Seat Mounting Bolts	9–11	12,2–15
Seat Bar Pivot Bolts	25–28	34–38

#### TORQUE SPECIFICATIONS FOR LOADER (Cont'd)

#### Specifications (Cont'd)

Item (Cont'd)	FtLbs.	Nm
Thermostat Housing Bolts	10–17	14–23
Timing Case Bolts	11–17	15–23
Timing Case Cover Bolts	11–17	15–23
Valve Cover Nuts	6–13	8–18
Water Jacket Tube (Outside)	10–17	14–23
Water Pump Bolts	11–18	15–24
Wheel Nuts	105–115	142–156

#### HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS

#### **Specifications**

Use Melroe hydraulic/hydrostatic transmission fluid (P/N 6563328). If this fluid is not available, use 10W–30 or 10W–40 SAE Motor Oil (5W–30 for  $0^{\circ}F$  [–18°C] and Below).

DO NOT use automatic transmission fluids in the loader or permanent damage to the transmission will result.



Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes causing serious injury. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention.

W-2074-1285

When temperatures below zero degree F ( $-18^{\circ}$ C) are common, the loader must be kept in a warm building. Extra warm–up time must be used each time the loader is started during cold temperature conditions. Cold fluid will not flow easily and it makes action of the hydraulic function slower. Loss of fluid flow to the hydrostatic transmission pump (indicated by "TRANS" light "ON") can cause transmission damage in less than 60 seconds.



#### STANDARD TORQUE SPECIFICATIONS FOR BOLTS

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Melroe that have zinc phosphate coating are specified by the letter "H" following the part number.

	THREAD SIZE	SAE GRADE 5	SAE GRADE 8
INCH. LBS.	.250	80–90 (9,0–10,2)	110–120 (12,4–13,6)
(INIII)	.3125	180–200 (20,3–22,6)	215–240 (24,2–27,1)
	.375	25–28 (34–38)	35–40 (47–54)
	.4375	40–45 (54–61)	60–65 (81–88)
	.500	65–70 (88–95)	90–100 (122–136)
	.5625	90–100 (122–136)	125–140 (170–190)
	.625	125–140 (170–190)	175–190 (240–260)
FOOT LBS.	.750	220–245 (300–330)	300–330 (410–450)
(INM)	.875	330–360 (450–490)	475–525 (645–710)
	1.000	475–525 (645–710)	725–800 (985–1085)
	1.125	650–720 (880–975)	1050–1175 (1425–1600)
	1.250	900–1000 (1200–1360)	1475–1625 (2000–2200)
	1.375	1200–1350 (1630–1830)	2000–2200 (2720–2980)
	1.500	1500–1650 (2040–2240)	2600–2850 (3530–3870)
	1.625	2000–2800 (2720–2980)	3450–3800 (4680–5150)
	1.750	2500–2750 (3390–3730)	4300–4800 (5830–6500)
	1.875	3150–3500 (4270–4750)	5500–6100 (7450–8300)
	2.000	3800–4200 (5150–5700)	6500–7200 (8800–9800)

#### DECIMAL AND MILLIMETER EQUIVALENTS

FR	ACTION	S	DECIMALS	MM	FRACTIONS		DECIMALS	MM
	1/22	1/64 ——	0.015625 —	0.397	17/00	33/64	0.515625 —	13.097
4/4.0	1/32	3/64 —	0.03125 —	0.794	17/32-	35/64 —	0.53125 —	13.494
1/16—	2/22	5/64	· 0.0625 — · 0.078125 —	1.588	9/16	37/64 —	0.5625 — 0.578125 —	14.288
1/8 —	3/32	7/64 —	· 0.109375 — · 0.109375 —	2.301 2.778 3.175	5/8	39/64 —	0.59375 - 0.609375 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0.62500 - 0	15.001
1/0	E/22	9/64	· 0.140625 —	3.572	21/22	41/64	0.640625 —	16.272
2/16-	5/32	11/64 —	0.15025 - 0.171875 - 0.171875	3.909 4.366 4.762	21/32	43/64 —	0.671875	17.066
3/10	7/32	13/64 —	0.1070	4.702 5.159 5.556	23/32	45/64 —	0.0075 - 0.703125 - 0.718755 - 0.718755 - 0.718755 - 0.718755 - 0.718755 - 0.718755	17.859
4/4	1732	15/64 —	0.234375 —	5.953	23/32	47/64 —	0.734375 —	18.653
1/4	0/22	17/64 —	0.265625 —	6.747	<b>3/4</b>	49/64 —	0.765625 —	19.050
E/4.0	9/32	19/64 —	0.296875 —	7.541	25/32	51/64 —	0.796875 —	20.241
5/16-	11/22	21/64 —	· 0.3125 —	7.938 8.334 9.724	13/10	53/64 —	0.8125 —	20.638
3/8	11/32	23/64 —	· 0.359375 —	9.128 9.525	7/8	55/64	0.859375 —	21.431 21.828
5/0	12/22-	25/64 —	· 0.390625 —	9.922	20/22	57/64 —	0.890625	22.622
7/16-	13/32	27/64 —	· 0.421875 —	10.716	15/16	59/64 —	0.921875	23.416
//10-	15/22-	29/64 —	0.453125 —	11.509	15/10	61/64	0.953125 —	23.012
1/2 —	10/32	31/64	· 0.484375 — · 0.5000 —	12.303 12.700	1	63/64 —	0.984375 — 1.000 —	25.003 25.400
-/-			0.0000	00	-			_000

#### 1 mm = 0.03937"

#### 0.001" = 0.0254 mm

#### **U.S. TO METRIC CONVERSION**

	TO CONVERT	ΙΝΤΟ	MULTIPLY BY
LINEAR MEASUREMENT	Miles Yards Feet Feet Inches Inches Inches	Kilometers Meters Meters Centimeters Meters Centimeters Millimeters	1.609 0.9144 0.3048 30.48 0.0254 2.54 25.4
AREA	Square Miles Square Feet Square Inches Acre	Square Kilometers Square Meters Square Centimeters Hectare	2.59 0.0929 6.452 0.4047
VOLUME	Cubic Yards Cubic Feet Cubic Inches	Cubic Meters Cubic Meters Cubic Centimeters	0.7646 0.02832 16.39
WEIGHT	Tons (Short) Pounds Ounces (Avdp.)	Metric Tons Kilograms Grams	0.9078 0.4536 28.3495
PRESSURE	Pounds/Sq. In.	Kilopascal	6.895
WORK	Foot–Pounds	Newton-Metre	1.356
LIQUID VOLUME	Quarts Gallons	Liters Liters	0.9463 3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1.Subtract 32° 2. Multiply by 5/9



MELROE INGERSOLL-RAND SERVICE MANUAL REVISION	850–001 Revision Number 20 February 1996 Date ROUTE TO ATTENTION
AFFECTING:	PARTS MANAGER
Product BOBCAT LOADER	SERVICE MANAGER
Model850	SALES MANAGER
Manual No. <u>6724012 (5–95)</u>	

**NOTICE** Insert This Sheet With The Appropriate Manual For Future Reference.

The following pages are a revision to the 850 Service Manual P/N 6724012 (5-95).

Put in the added pages as follows:

TAKE OUT

**PUT IN** 

Hydraulic/Hydrostatic Schmatic (P/N 6724476) 853H BICS™ (Printed February 1996)

MELROE	
INGERSOLL-RAND	



## SERVICE MANUAL REVISION

**AFFECTING:** 

Product BOBCAT LOADER

Model <u>853, 853H</u>

Manual No. 6724012 (4-95)

## **NOTICE** Insert This Sheet With The Appropriate Manual For Future Reference.

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Take out the pages shown and put in the revised pages as follows:

#### TAKE OUT

Hydraulic/Hydrostatic Schematic (P/N 6724476) 853H BICS™ (Printed April 1995)

Hydraulic/Hydrostatic Schematic (P/N 6724379) 853 BICS™ (Printed April 1995)

> 2–7, 2–8 2–19, 2–20 2–31, 2–32

**SECTION 3** 

4-5, 4-6

CONTENT PAGE (Section 8) 8–3, 8–4

#### **PUT IN**

Hydraulic/Hydrostatic Schematic (P/N 6724476) 853H BICS™ (Printed February 1996)

Hydraulic/Hydrostatic Schematic (P/N 6724379) 853 BICS™ (Printed April 1995) (Revised Legend June 1996)

> 2–7, 2–8 (Revised June 96) 2–19 (Revised June 96), 2–20 2–31, 2–32 (Revised June 96)

SECTION 3 (Revised June 96)

4-5, 4-6 (Revised June 96)

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850–002 Revision Number

5 June 1996

Date

ROUTE TO ATTENTION

Х

PARTS MANAGER

SALES MANAGER

SERVICE MANAGER
MELROE	
INGERSOLL-RAND	



# SERVICE MANUAL REVISION

AF	FF	Ε	C.	TI	Ν	G	-
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Product BOBCAT LOADER

Model <u>853, 853H</u>

Manual No. 6724012 (4-95)

## Revision Number 12 July 1996 Date ROUTE TO ATTENTION

850-003

PARTS MANAGER SERVICE MANAGER SALES MANAGER

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Hydraulic/Hydrostatic Schematic (P/N 6724476) 853H BICS™ (Printed November 1995)

Hydraulic/Hydrostatic Schematic (P/N 6724379) 853 BICS<sup>TM</sup> (Printed April 1995) **PUT IN** 

Hydraulic/Hydrostatic Schematic (P/N 6724476) 853H BICS<sup>TM</sup> (Printed July 1996)

Hydraulic/Hydrostatic Schematic (P/N 6724379) 853 BICS™ (Printed July 1996)

SERVICE MANUAL	B50-004 Revision Number <u>1 June 1997</u> Date				
AFFECTING:	ROUTE TO ATTENTION				
Product <u>BOBCAT LOADER</u> Model <u>853, 853H</u>	PARTS MANAGER     SERVICE MANAGER  X    SALES MANAGER				
Manual No. <u>6724012 (4–95)</u>					
<b>NOTICE</b> Insert This Sheet With Th	e Appropriate Manual For Future Reference.				
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i, ii v, vi	853, 853H Cover i (Revised June 97), ii v (Revised June 97), vi (Revised June 97)				
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853 BICS – ENGINE WIRING DIAGRAM INDEX ENGINE WIRING DIAGRAM – SHEET 1 – 853 BICS (Printed June 1997) ENGINE WIRING DIAGRAM – SHEET 2 – 853 BICS (Printed June 1997)

853 BICS – BICS WIRING DIAGRAM INDEX BICS WIRING DIAGRAM – SHEET 1 – 853 BICS (Printed June 1997)

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#### **PUT IN**

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(Printed June 1997) OPERATOR CONTROLS WIRING DIAGRAM SHEET 4 – 853 BICS (Printed June 1997)
853 BICS – ATTACHMENT (OPTIONAL) WIRING
ATTACHMENT (OPTIONAL) WIRING DIAGRAM SHEET 1 – 853 BICS
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## SERVICE MANUAL REVISION

**AFFECTING:** 

Product BOBCAT LOADER

Model <u>853, 853H</u>

Manual No. 6724012 (4-95)

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3–57, 3–58	3–57, 3–58	Text change
7–41, 7–42 7–71, 7–72	7–41, 7–42 7–71, 7–72	Text change Text change
8–1, 8–2 8–27 thru 8–32	8–1, 8–2 8–27 thru 8–32	Text change Added information
9–3, 9–4	9–3, 9–4	Text change

