Shop Manual
DX140LCR-3 Excavator

Serial Number 1001 and Up

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Original Instructions

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COMPONENT LOCATIONS

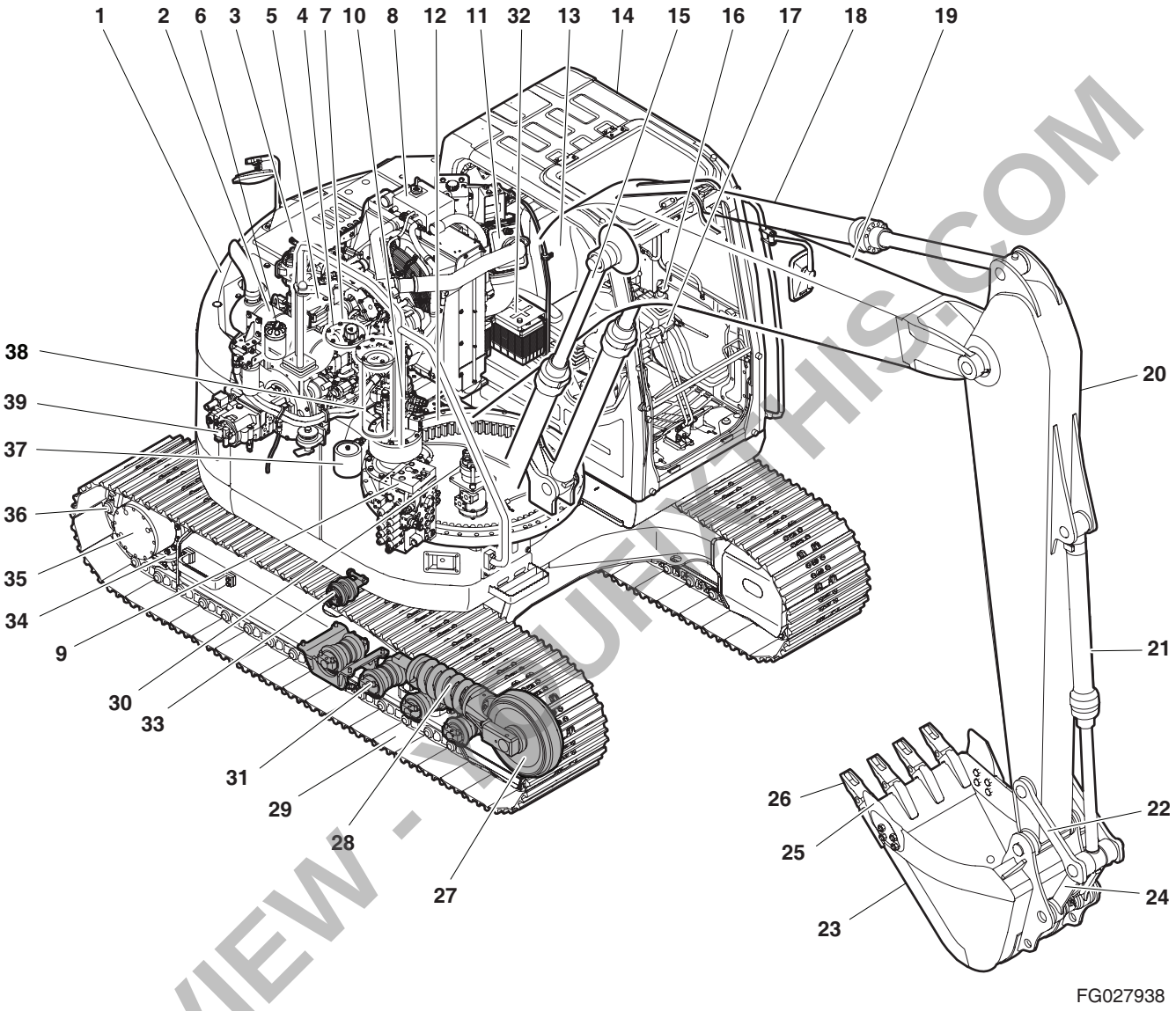


Figure 1

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WELDING PRECAUTIONS AND INSTRUCTIONS

WARNING

AVOID DEATH OR SERIOUS INJURY

To avoid accidents, personal injury and the possibility of causing damage to the machine or to components, welding must only be performed by properly trained and qualified personnel, who possess the correct certification (when required) for the specific welding fabrication or specialized repair being performed.

WARNING

AVOID DEATH OR SERIOUS INJURY

Structural elements of the machine may be built from a variety of steels. These could contain unique alloys or may have been heat-treated to obtain particular strength characteristics. It is extremely important that welding repairs on these types of steel are performed with the proper procedures and equipment. If repairs are performed incorrectly, structural weakening or other damage to the machine (that is not always readily visible) could result. Always consult *DOOSAN* After Sales Service before welding on integral components (loader arm, frames, car body, track frames, upper structure, attachment, etc.) of the machine. It is possible that some types of structurally critical repairs may require Magnetic Particle or Liquid Penetrant testing, to make sure there are no hidden cracks or damage, before the machine can be returned to service.

WARNING

AVOID DEATH OR SERIOUS INJURY

Always perform welding procedures with proper safety equipment and adequate ventilation in a dry work area. Keep a fire extinguisher near and wear personal protective equipment.

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ROPS Certification

This *DOOSAN* excavator has an operator's cabin that meets ROPS requirements. The seat belt must be worn for rollover protection.

The ROPS certification plate (Figure 1) is found on the left side of the cabin on most models. It may vary slightly in its location on some models.

Check the ROPS cabin, mounting, and hardware for damage.

Never modify the ROPS cabin. Replace the cabin and hardware if damaged. See your *DOOSAN* dealer for parts.

ROPS – Rollover Protective Structure complies with ISO 12117-2:2008.

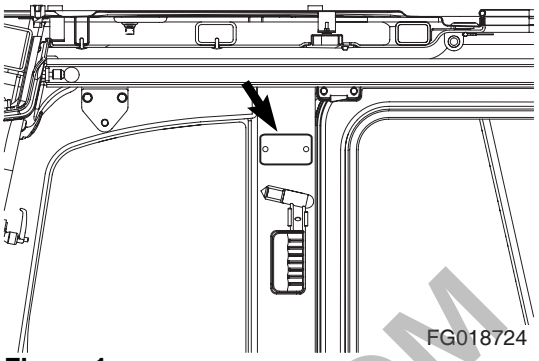


Figure 1

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Never modify the operator cabin by welding, grinding, drilling holes or adding attachments unless instructed by *DOOSAN*. Changes to the cabin can cause loss of operator protection from rollover and falling objects, and result in death or serious injury.

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TRACK TENSION

WARNING

AVOID DEATH OR SERIOUS INJURY

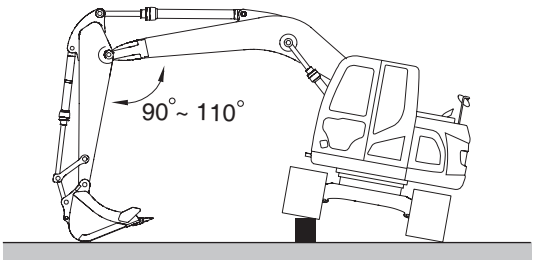
Measuring track tension requires two people. One person must be in the operator's seat, operating the controls while the other person makes dimensional checks. Block frame to make sure the machine won't move or shift position during service. Warm up the engine to prevent stalls, park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.

The track adjusting mechanism is under very high-pressure. NEVER release grease pressure too fast. The track tension grease valve should never be loosened more than one (1) complete turn from the fully tightened down position. Bleed off grease pressure slowly. Keep your body away from the valve always. Always wear eye and face protection when adjusting track tension.

Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.

1. Track tension is checked by jacking up one side of the excavator. See Figure 1. Place blocking under frame while taking measurement.

   Turn the track backward by 1 - 2 turns.



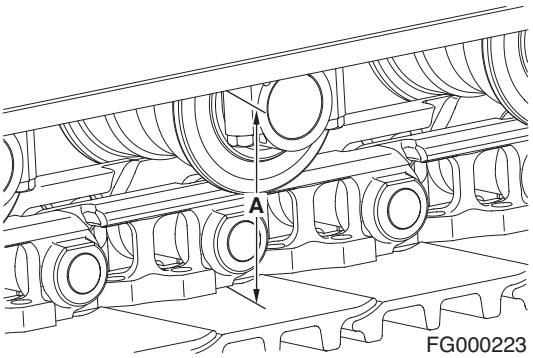
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Figure 1

2. Measuring the distance (A, Figure 2) between the bottom of the side frame and the top of the lowest crawler shoe. Recommended tension for operation over most types of terrain is distance "B" in below table.

   NOTE: *Clean off the tracks before checking clearance for accurate measurements.*

3. Too little sag in the crawler track (less than clearance distance "B" in below table) can cause excessive component wear. The recommended adjustment can also be too tight causing accelerated stress and wear if ground conditions are wet, marshy or muddy.



FG000223

Figure 2

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4. The Troubleshooting Symptom Charts are based on the following assumptions:
    - The components have been installed according to the manufacturer's specifications.
    - The easiest repairs are done first.
    - All generic solutions are designed for the most common applications and Original Equipment Manufacturer (OEM).

Refer to the Original Equipment Manufacturer's service manual for their specifications.

Symbols

The following symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below:

Symbol	Description
	**WARNING** - Death or serious injury can result if instructions are not followed.
	**CAUTION** - Minor personal injury can result if instructions are not followed.
	Indicates REMOVAL or DISASSEMBLY step.
	Indicates a INSTALLATION or ASSEMBLY step.
	INSPECTION is required.
	CLEAN the part or assembly.
	Perform a mechanical or time MEASUREMENT.

Symbol	Description
	LUBRICATE the part or assembly.
	Indicates that a WRENCH or TOOL SIZE will be given.
	TIGHTEN to a specific torque.
	PERFORM an electrical MEASUREMENT.
	Refer to another location in this manual or another publication for additional information.
	The component weighs 23 kg (50 lbs) or more. To reduce the possibility of personal injury, use a hoist or get assistance to lift the component.

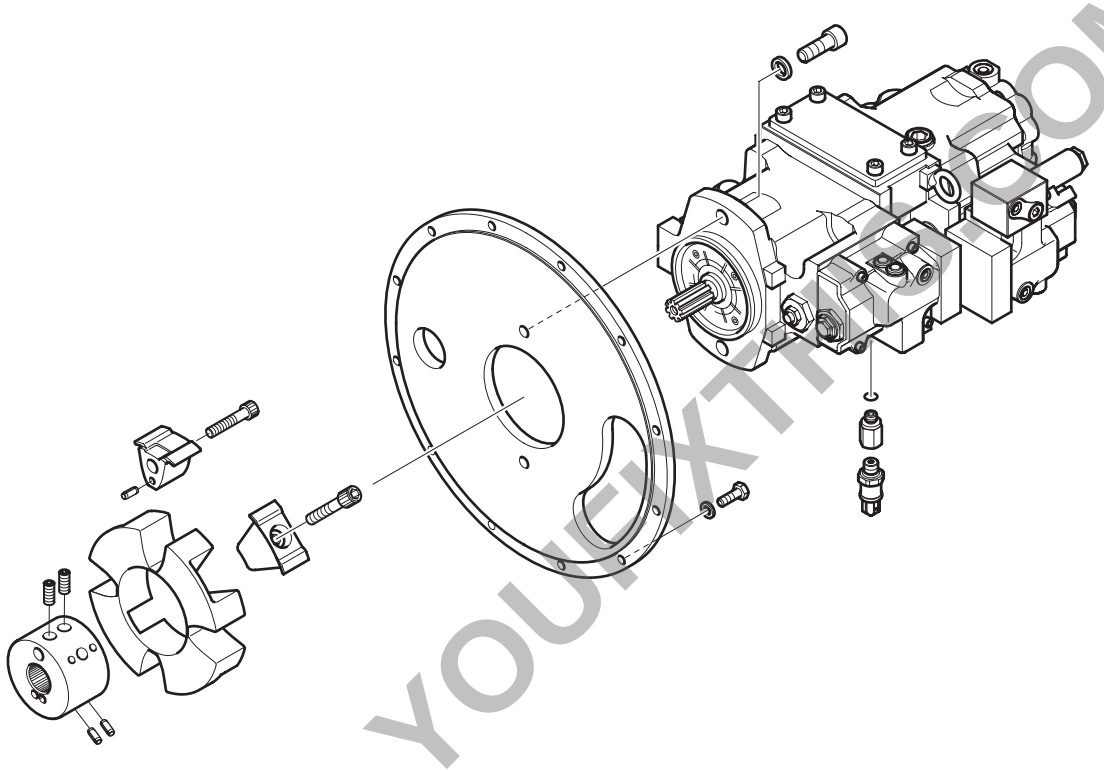
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DRIVE COUPLING

It is very important to set the specified clearance between the end of the pump driveshaft (the "Dimension H" described below) and the coupling hub surface when installing the main pump in the engine.

The Figure 1 shows installation of a typical drive coupling.



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Figure 1

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HYDRAULIC SYSTEM - GENERAL NOTES

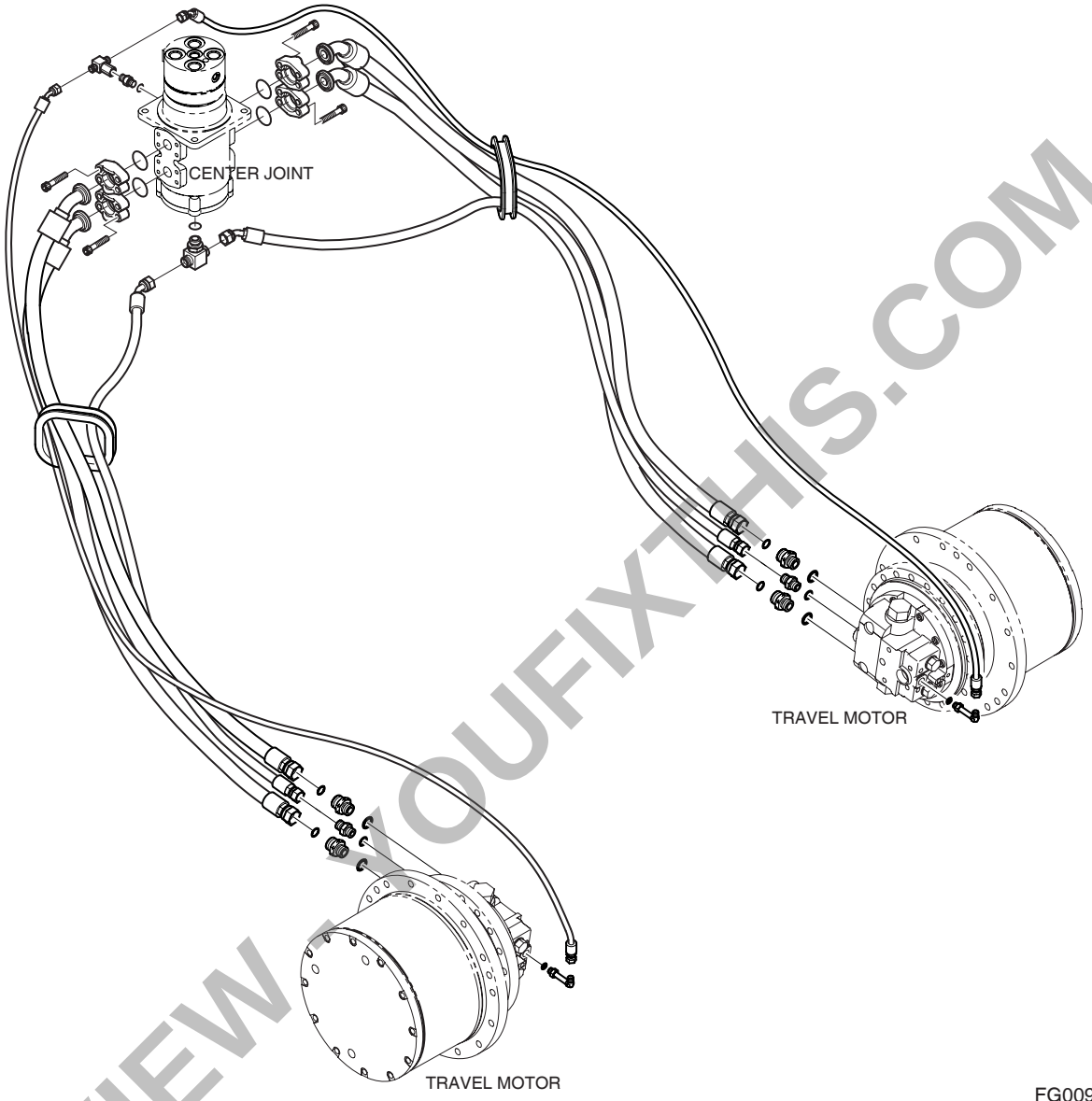


Figure 1

The hydraulic system has several improvements over conventional hydraulic systems - including cross sensing total horsepower control - to maximize output efficiency.

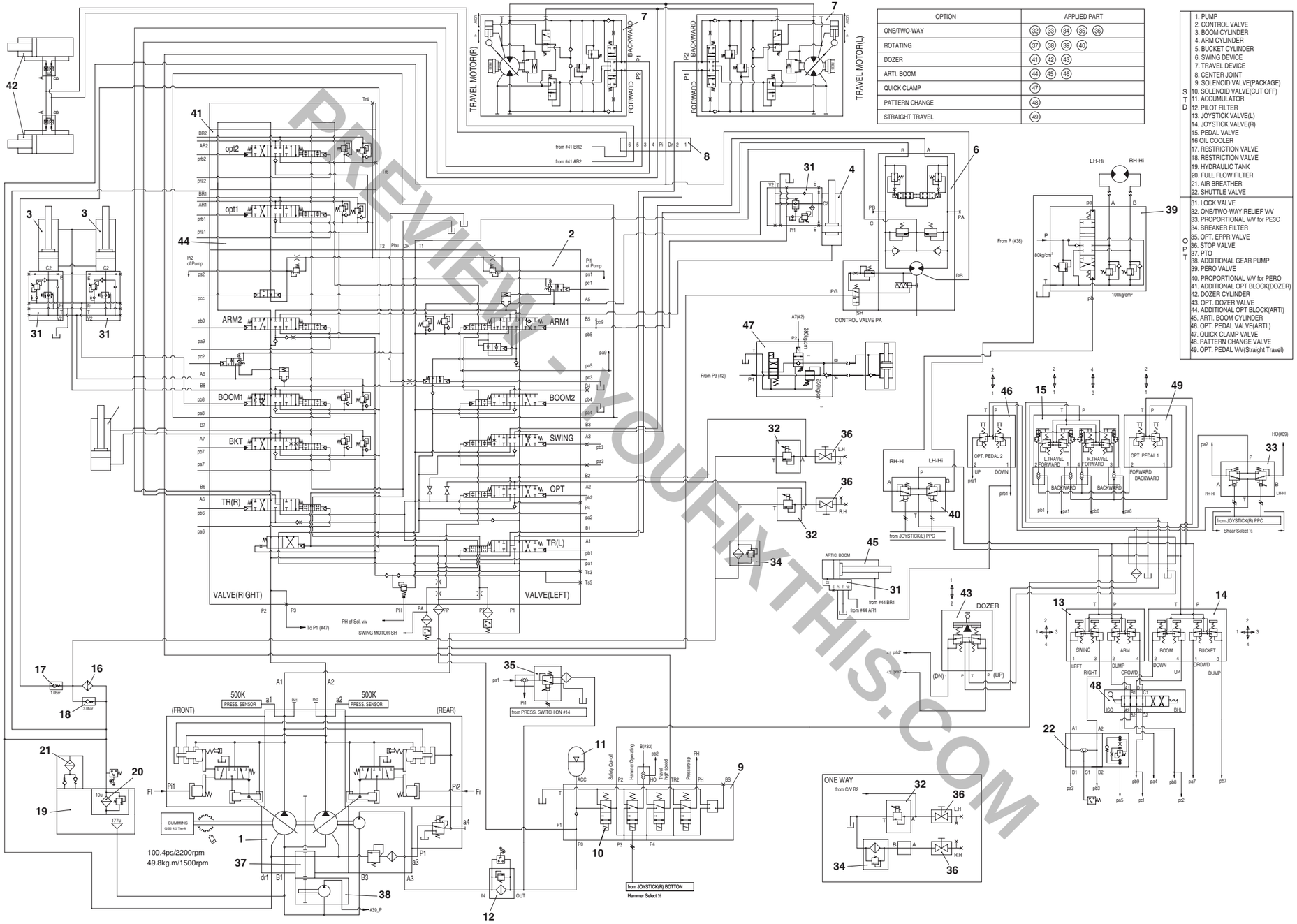
The system features an electronically controlled output optimization system, which allows the operator to choose between two, distinctly different power modes: high output/rapid cycling maximum speed power mode, and a standard power mode for most types of general operation.

Electronic management of hydraulic control valves assists in optimizing the application speed and overall operator control of hydraulic actuators and functions.

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OPTION	APPLIED PART
ONE/TWO-WAY	32 33 34 35 36
ROTATING	37 38 39 40
DOZER	41 42 43
ARTI. BOOM	44 45 46
QUICK CLAMP	47
PATTERN CHANGE	48
STRAIGHT TRAVEL	49

STD
1. PUMP
2. CONTROL VALVE
3. BOOM CYLINDER
4. ARM CYLINDER
5. BUCKET CYLINDER
6. SWING DEVICE
7. TRAVEL DEVICE
8. CENTER JOINT
9. SOLENOID VALVE(PACKAGE)
10. SOLENOID VALVE(CUT OFF)
11. ACCUMULATOR
12. PILOT FILTER
13. JOYSTICK VALVE(L)
14. JOYSTICK VALVE(R)
15. PEDAL VALVE
16 OIL COOLER
17. RESTRICTION VALVE
18. RESTRICTION VALVE
19. HYDRAULIC TANK
20. FULL FLOW FILTER
21. AIR BREATHER
22. SHUTTLE VALVE

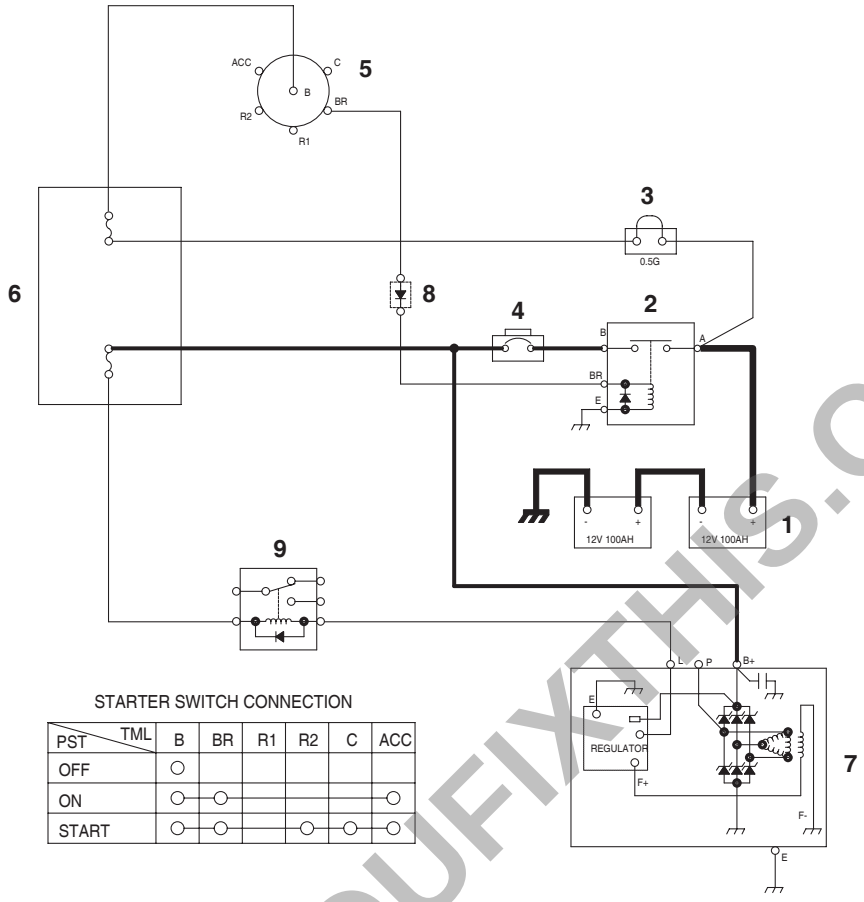
OPT
31. LOCK VALVE
32. ONE/TWO-WAY RELIEF V/V
33. PROPORTIONAL V/V for PE3C
34. BREAKER FILTER
35. OPT. EPPR VALVE
36. STOP VALVE
37. PTO
38. ADDITIONAL GEAR PUMP
39. PERO VALVE
40. PROPORTIONAL V/V for PERO
41. ADDITIONAL OPT BLOCK(DOZER)
42. DOZER CYLINDER
43. OPT. DOZER VALVE
44. ADDITIONAL OPT BLOCK(ARTI)
45. ARTI. BOOM CYLINDER
46. OPT. PEDAL VALVE(ARTI.)
47. QUICK CLAMP VALVE
48. PATTERN CHANGE VALVE
49. OPT. PEDAL V/V(Straight Travel)

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Figure 1



FG015054

Figure 1 Electric Power Circuit Diagram

Reference Number	Description
1	Battery
2	Battery Relay
3	Fusible Link
4	Circuit Breaker
5	Starter Switch

Reference Number	Description
6	Fuse Box
7	Alternator
8	Diode
9	Relay

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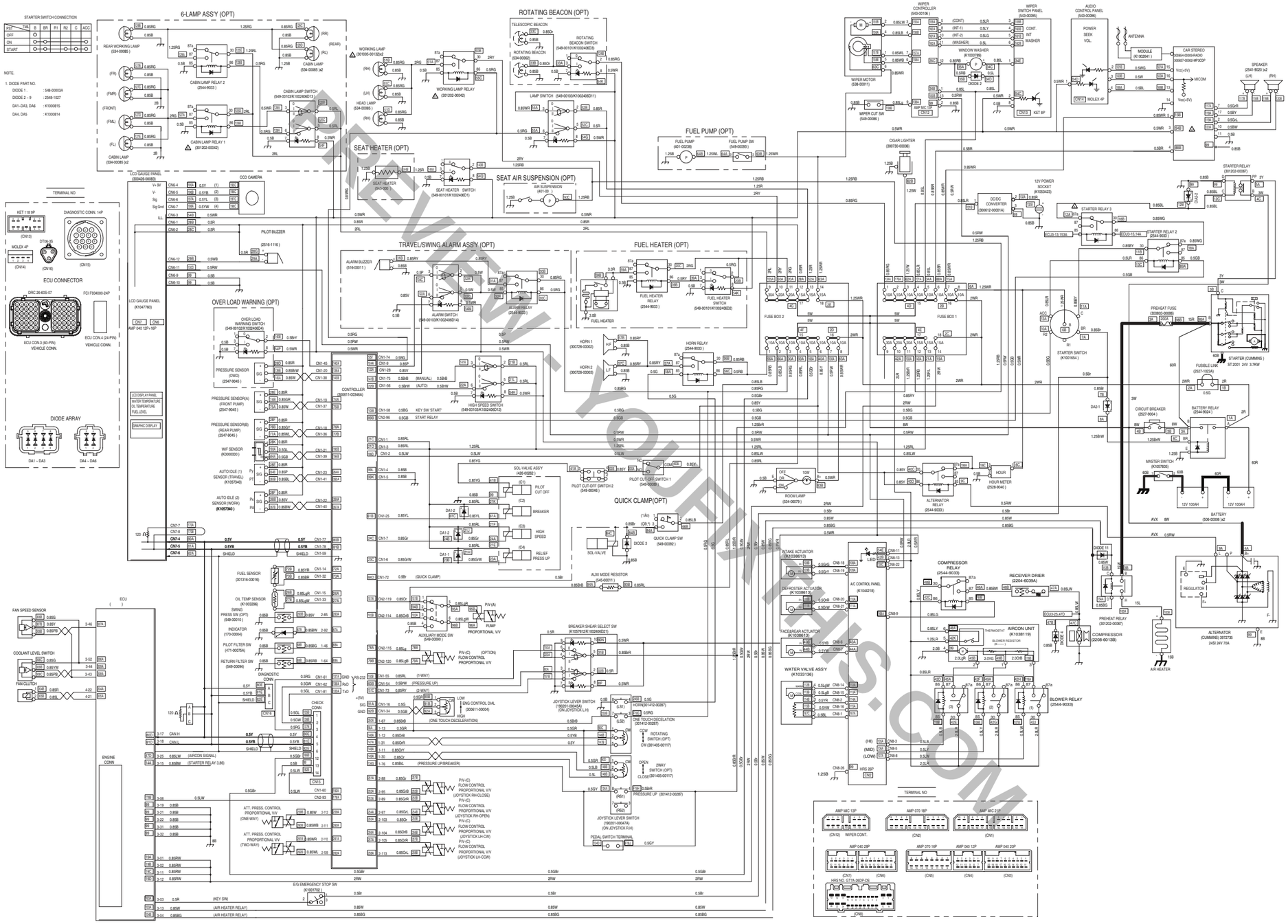


Figure 1

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FRONT ATTACHMENT PIN SPECIFICATIONS

The table below has a complete listing of dimensional specifications for all mounting pins used on the front attachment.

NOTE: *Some mounting pins must be drilled and tapped for lubrication fittings and piping, or may have other required specifications. Consult DOOSAN After Sales Service for information on wear tolerances and replacement limits for mounting pins.*

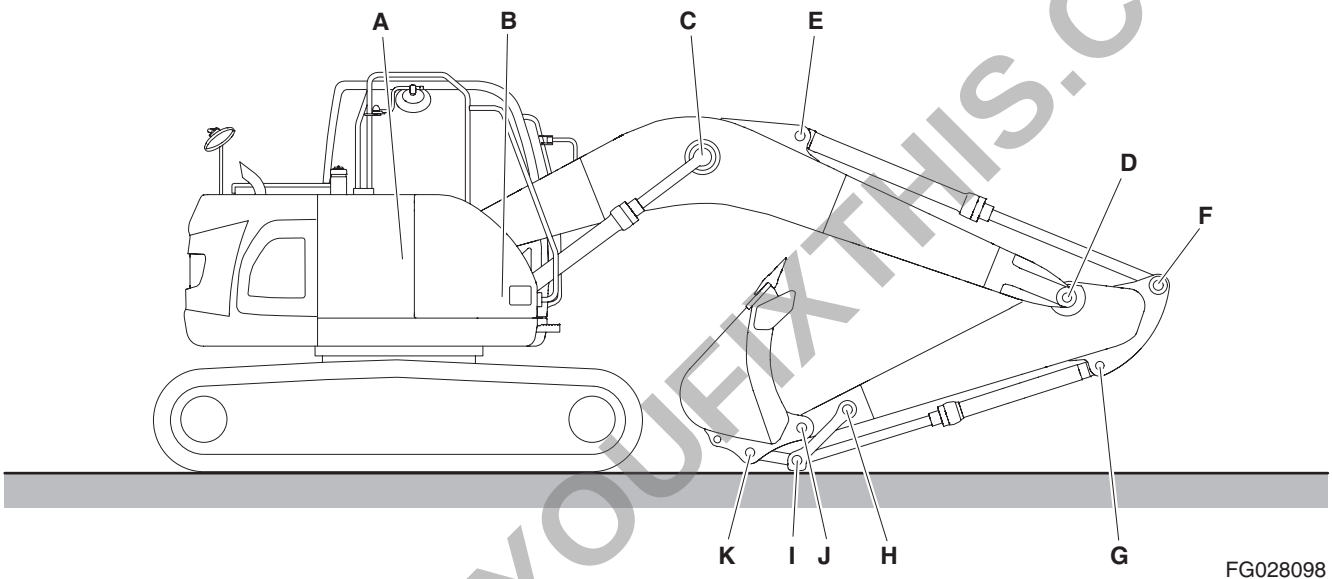


Figure 1

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Personal Protective Equipment (PPE)

Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.

Do not wear oily clothes. They are highly flammable.

Do not forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries. Breathing masks and/or ear protection may be required.

Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.

While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended functions.



Figure 4

Correction of Machine Problems

If any machine problems are found during operation and maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc.), or if any abnormal warming alerts are displayed on display monitor, stop the machine and take the necessary corrective actions. Do not operate machine until problem has been corrected.

Crushing and Cutting

Keep objects away from moving fan blades. Fan blades can throw and cut objects.

Do not use a wire rope that is kinked or frayed, or a wire rope with any loss of diameter. Wear leather gloves when handling a wire rope.

When striking a loose retainer pin, it can fly out and can cause a serious injury. Make sure that area is clear of personnel when striking a retainer pin. To avoid injury to your eyes, wear safety goggles when striking a retainer pin.

Do not put your hand, arm or any other part of your body between movable parts. If going between movable parts is necessary, always position and secure work equipment so it cannot move. Properly support equipment before performing any work or maintenance under raised equipment.

If control levers are operated, clearance between machine and work equipment will change and this may lead to serious damage or can result in death or serious injury. Stay clear of areas that may have a sudden change in clearance with machine movement or equipment movement. Stay clear of all rotating and moving parts. Unless instructed, never attempt adjustments while machine is moving or while engine is running.

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Cylinders SP002918
Swing Motor SP002919
Travel Device SP002920
Main Pump SP002930
Gear Pump SP002500
Main Control Valve SP002528
Remote Control Valve (Work Lever / Joystick) SP002921
Travel Control Valve (with Damper) SP002922
Solenoid Valve Assembly SP002923
Breaker EPPR Valve (Option) SP002458
Hydraulic Schematic (DX140LCR-3) SP002924

Electrical System

Electrical System SP002925
Electrical Schematic SP002926

Attachments

Boom and Arm SP002927
Bucket SP002506

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APPROXIMATE WEIGHT OF WORKLOAD MATERIALS

IMPORTANT

Weights are approximations of estimated average volume and mass. Exposure to rain, snow or groundwater; settling or compaction because of overhead weight and chemical or industrial processing or changes because of thermal or chemical transformations could all increase value of weights listed in table.

Material	Density 1,200 kg/m³ (2,000 lb/yd³), or less	Density 1,500 kg/m³ (2,500 lb/yd³), or less	Density 1,800 kg/m³ (3,000 lb/yd³), or less	Density 2,100 kg/m³ (3,500 lb/yd³), or less
Charcoal	401 kg/m³ (695 lb/yd³)	-	-	-
Coke, blast furnace size	433 kg/m³ (729 lb/yd³)	-	-	-
Coke, foundry size	449 kg/m³ (756 lb/yd³)	-	-	-
Coal, bituminous slack, piled	801 kg/m³ (1,350 lb/yd³)	-	-	-
Coal, bituminous r. of m., piled	881 kg/m³ (1,485 lb/yd³)	-	-	-
Coal, anthracite	897 kg/m³ (1,512 lb/yd³)	-	-	-
Clay, DRY, in broken lumps	1,009 kg/m³ (1,701 lb/yd³)	-	-	-
Clay, DAMP, natural bed	-	-	1,746 kg/m³ (2,943 lb/yd³)	-
Cement, portland, DRY granular	-	-	1,506 kg/m³ (2,583 lb/yd³)	-
Cement, portland, DRY clinkers	-	1,362 kg/m³ (2,295 lb/yd³)	-	-
Dolomite, crushed	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Earth, loamy, DRY, loose	-	1,202 kg/m³ (2,025 lb/yd³)	-	-
Earth, DRY, packed	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Earth, WET, muddy	-	-	1,762 kg/m³ (2,970 lb/yd³)	-
Gypsum, calcined, (heated, powder)	961 kg/m³ (1,620 lb/yd³)	-	-	-

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SAFETY INSTRUCTIONS

WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual 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 death or serious injury.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DX140LCR-3	1001 and Up

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Crankcase Breather Tube....64
Fuel-Water Separator....66
Lubricating Oil Level....67
Cooling Fan....67
Coolant Level....68
Air Intake Piping....69
Maintenance Procedures at 250 Hours or 3 Months....70
Maintenance Procedures - Overview....70
Radiator Hoses....70
Air Intake Piping....70
Radiator....71
Charge-Air Cooler....72
Charge-Air Piping....79
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Maintenance Procedures - Overview....80
Fuel Filter (Spin-on Type)....80
Lubricating Oil and Filters....85
Engine Coolant Antifreeze....89
Batteries....89
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Cooling Fan Belt Tensioner....94
Drive Belt, Cooling Fan....98
Air Compressor Discharge Lines....105
Fan Hub, Belt Driven....106
Maintenance Procedures at 2,000 Hours or 2 Years....107
Maintenance Procedures - Overview....107
Vibration Damper, Viscous....107
Vibration Damper, Rubber....108
Engine Steam Cleaning....108
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Maintenance Procedures at 2,000 Hours....119

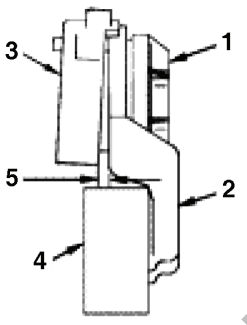
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Measure the clearance between the tensioner spring case and the tensioner arm to verify tensioner wear-out and uneven bearing wear. If the clearance at measurement point 5 exceeds 3 mm (0.12 in) at any point, the tensioner is damaged and must be replaced as a complete assembly.

Tensioners generally show a larger clearance gap near the lower portion of the spring case, resulting in the upper portion rubbing against the tensioner arm.

Reference Number	Description
1	Tensioner Cap
2	Tensioner Arm
3	Spring Case
4	Tensioner Pulley
5	Clearance Gap



FG028289

Figure 148

NOTE: *Always replace the belt when a tensioner is replaced. However, it is not always necessary to replace a tensioner when a belt is replaced.*

Inspect the tensioner for evidence of the tensioner arm contacting the tensioner cap. If there is evidence of the two areas making contact, the pivot tube bushing has failed and the tensioner must be replaced.

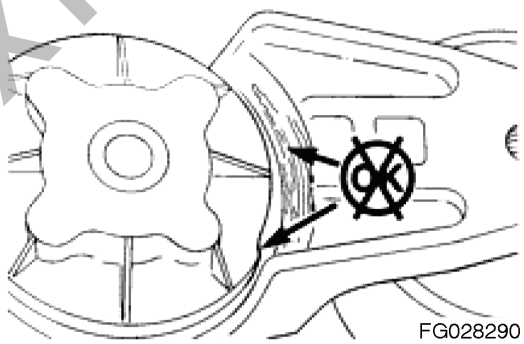

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Figure 149

Install

If removed, install the belt tensioner mounting bracket and mounting bracket cap screws.

NOTE: *Some belt tensioner mounting brackets use internal fasteners for clearance.*

- Torque Value: 24 Nm (212 in lb)

Install the belt tensioner and cap screw.

Tighten the cap screw.

- Torque Value: 43 Nm (32 ft lb)

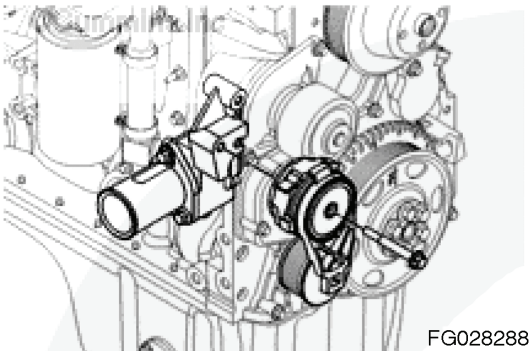

FG028288

Figure 150

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Cairns	Cummins Engine Company, Pty. Ltd. P.O. Box 7189 Cairns Mail Center, 4870 Queensland, Australia Location: Liberty Street Cairns, 4870 Telephone: (61-7) 935-2999
Campbellfield	Cummins Engine Company, Pty. Ltd. Private Bag 9 Campbellfield, 3061 Victoria, Australia Location: 1788-1800 Hume Highway Campbellfield, 3061 Telephone: (613) 9357-9200
Dandenong	Cummins Engine Company, Pty. Ltd. Lot 7 Greens Road Dandenong, 3175 Victoria, Australia Telephone: (613) 9706-8088
Darwin	Cummins Engine Company, Pty. Ltd. P.O. Box 37587 Winnellie, 0821 Northern Territory, Australia Location: Lot 1758 Graffin Crescent Winnellie, 0821 Telephone: (61-8) 8947-0766
Devonport	Cummins Engine Company, Pty. Ltd. P.O. Box 72E Tasmania, Australia Location: 2 Matthews Way Devonport, 7310 Telephone: (61-3) 6424-8800
Emerald	Cummins Engine Company, Pty. Ltd. P.O. Box 668 Emerald, 4720 Queensland, Australia Location: Capricorn Highway Emerald, 4720 Telephone: (61-7) 4982-4022
Grafton	Cummins Engine Company, Pty. Ltd. P.O. Box 18 South Grafton, 2461 New South Wales, Australia Location: 18-20 Induna Street South Grafton, 2461 Telephone: (61-2) 6642-3655

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Cap Screw Markings and Torque Values

General Information

IMPORTANT

When replacing cap screws, always use a cap screw of the same measurement and strength as the cap screw being replaced. Using the wrong cap screws can result in engine damage.

Metric cap screws and nuts are identified by the grade number stamped on the head of the cap screw or on the surface of the nuts. U.S. Customary cap screws are identified by radial lines stamped on the head of the cap screw.

The following examples indicate how cap screws are identified:



FG004897

Figure 307

- Always use the torque values listed in the following tables when specific torque values are not available.
- Do not use the torque values in place of those specified in other sections of this manual.
- The torque values in the table are based on the use of lubricated threads.
- When the ft lb value is less than 10, convert the ft lb value to in lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft lb equals 72 in lb.

- Always use the torque values listed in the following tables when specific torque values are not available.
- Do not use the torque values in place of those specified in other sections of this manual.
- The torque values in the table are based on the use of lubricated threads.
- When the ft lb value is less than 10, convert the ft lb value to in lb to obtain a better torque with an in lb torque wrench. Example: 6 ft lb equals 72 in lb.

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Reference Number	Description
1	Tube Assembly
2	Bushing
3	Rod Cylinder
4	Bushing
5	Rod Cover
6	DD-Bushing
7	Retaining Ring
8	Buffer Seal
9	U-Packing
10	Backup Ring
11	Dust Wiper
12	Retaining Ring
13	O-ring
14	Backup Ring
15	O-ring
16	Cushion Ring
17	Piston
18	Slipper Seal

Reference Number	Description
19	Wear Ring
20	Dust Ring
21	O-ring
22	Backup Ring
23	Piston Nut
24	Set Screw
25	Socket Bolt
26	Pipe Band Assembly
27	Pipe Band
28	Spring Washer
29	Bolt
30	Pipe Assembly - H (LH)
31	Pipe Assembly - R (LH)
32	O-ring
33	Washer
34	Socket Bolt
35	Spring Washer
36	Bolt

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OUTLINE OF MAINTENANCE

Tools

No.	Name	Type · Specification	Q'ty
1	Hex-wrench	2.5 (M5), 3 (M6), 4 (NPTF 1/16,) 5 (PF 1/8), 6 (PF 1/4) 8 (M10,PF 3/8), 10 (M12,PF 1/2)	1
2	Socket Wrench (Ratchet Handel) (JIS B 4641)	Tumbler type	1
3	Torque Wrench (JIS B 4650)	Dial type: 50 (N), Dial type: 100 (N), Dial type:300 (N), Dial type: 560 (N)	1
4	Adapter for Torque Wrench		1
5	Hex-Socket	Diagonal size 24 mm, 41 mm	1
6	Extension Bar (JIS B 4637)	150 mm	1
7	Hammer	Various	1
8	Plastic Hammer	L = 400 mm	1
9	O-driver (JIS B 4609)	50 mm, 150 mm	1
10	Retaining Ring Pliers	For axle, For groove	1
11	Pliers (JIS B 4623)	200 mm	1
12	Lifting Device	Lifting Load : 2,940 (N), 300 (kg) min. Eyebolt (M16) Eyebolt (M12) Eyebolt (PF 1/2) Hooked wire	1 Set 2 3 2 1
13	Container	General: W450 x D300 x 120 mm	2
14	Leather Gloves		1 Pair

Bolts

No.	Name	Type · Size	Q'ty
1	Long Hex-Bolt	M12 (P1.5) x 40 mm	2

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Parallel Orifices for Arm

In the arm parallel circuit of this valve, both arm1 (Section 5) and arm2 (Section 9) are equipped with orifices, which control the arm speed even in composite operation. The parallel circuit of arm2 (section 9) is throttled at the orifice (Rc6) of the sleeve (S9-3) in the parallel path (R3), and connected with path (S9-2) through the poppet (S9-4).

The parallel circuit of the arm1 (Section 5) pushes open the poppet (S5-8) in the parallel path (L3), is throttled by the orifice (Lc9) of the parallel variable orifice spool, and connected with the path (S5-2, Figure 11). The throttle volume of orifice (Lc9) can be controlled by the pressure at the pilot port (pbu) (Pc3).

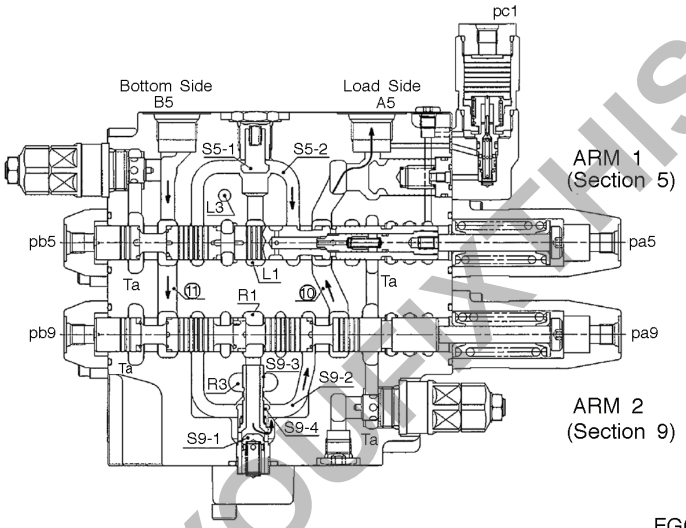


Figure 10

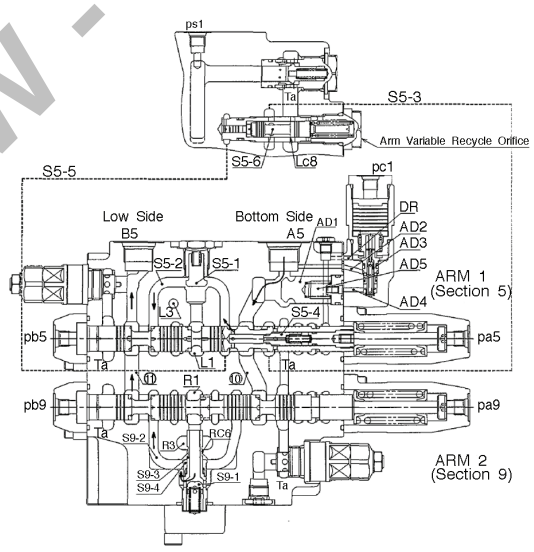


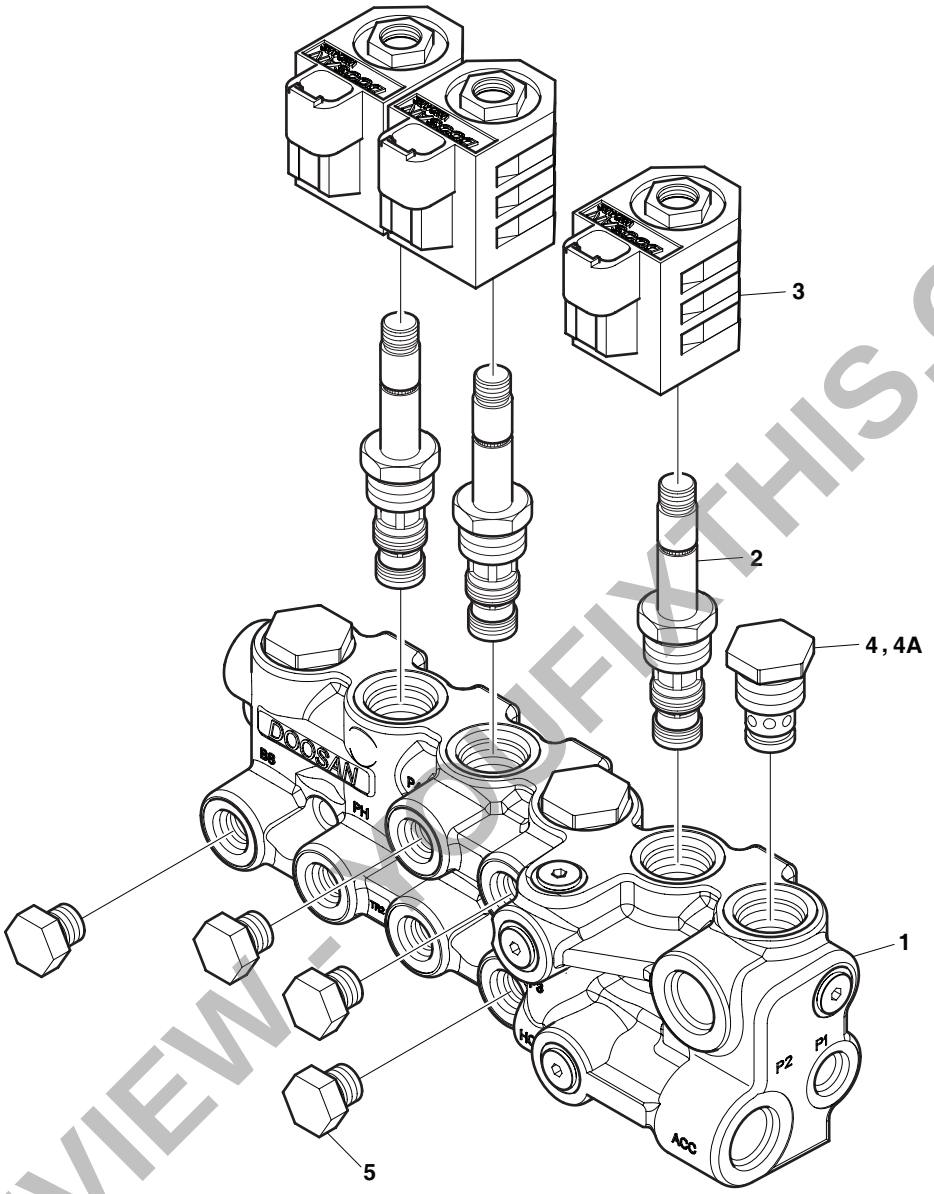
Figure 11

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PARTS LIST

Components used for the solenoid valve package are the same as in the parts list below.



FG028360

Figure 1

Reference Number	Description
1	Block
2	Solenoid Spool
3	Coil

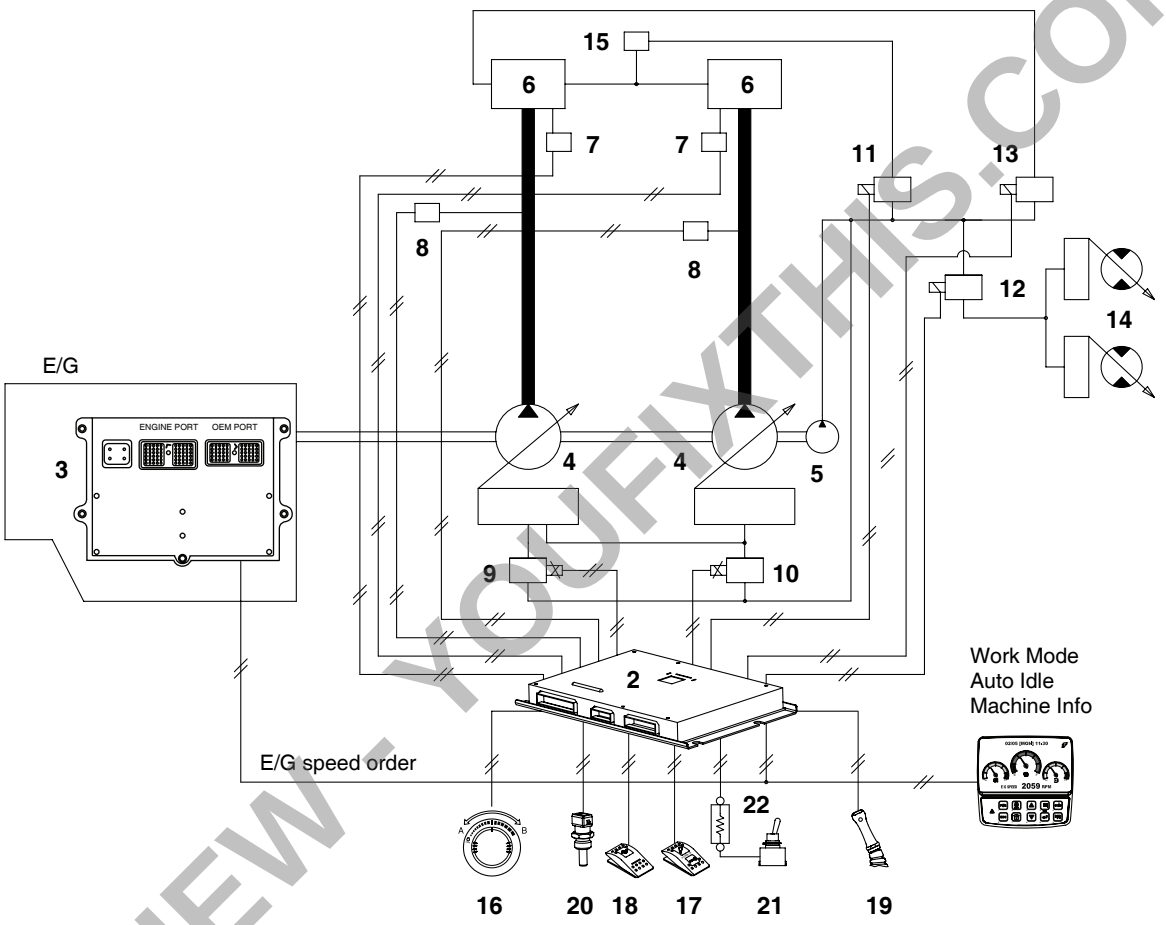
Reference Number	Description
4	Check Valve
4A	Seal Kit
5	Plug

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ELECTRONIC HYDRAULIC CONTROL SYSTEM (EPOS)

Control System Schematic



FG015090

Figure 67

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