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Applications

Introduction

This manual contains topics that relate to some or all JCB Loadall machines in the 5C group. There are several machine model codes in the family.	Machine Group	Model Code	**Model Name**
	5C	D	**506-36**
	5C	E	**507-42**
	5C	F	**509-42**
	5C	G	**510-56**
	5C	H	**512-56**
Machine variants: There are different machine variants within the same model name. This happens because of market requirements, or when the machine specification changes after a period of time.			
Use the applications tables to see which topics relate to which machine models and variants. ***Important:*** *The machine model names are NOT referred to in the topics. You must refer to the applications tables for the applicable machine models*			

⇨ *Tables (1-1-2)*

⇨ *Section 1 - General Information (1-1-2)*

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Zinc Plated Fasteners and Dacromet Fasteners

Table 2. Torque Settings - UNF Grade 'S' Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
in.	mm	in.	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
1/4	6.3	7/16	11.2	1.1	8.3	10.0	1.0	7.4
5/16	7.9	1/2	22.3	2.3	16.4	20.0	2.0	14.7
3/8	9.5	9/16	40.0	4.1	29.5	36.0	3.7	26.5
7/16	11.1	5/8	64.0	6.5	47.2	57.0	5.8	42.0
1/2	12.7	3/4	98.00	10.0	72.3	88.0	9.0	64.9
9/16	14.3	13/16	140.0	14.3	103.2	126.0	12.8	92.9
5/8	15.9	15/16	196.0	20.0	144.6	177.0	18.0	130.5
3/4	19.0	1 1/8	343.0	35.0	253.0	309.0	31.5	227.9
7/8	22.2	1 15/16	547.0	55.8	403.4	492.0	50.2	362.9
1	25.4	1 1/2	814.0	83.0	600.4	732.0	74.6	539.9
1 1/8	31.7	1 7/8	1181.0	120.4	871.1	1063.0	108.4	784.0
1 1/4	38.1	2 1/4	1646.0	167.8	1214.0	1481.0	151.0	1092.3

Table 3. Torque Settings - Metric Grade 8.8 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	5.8	0.6	4.3	5.2	0.5	3.8
M6	6	10	9.9	1.0	7.3	9.0	0.9	6.6
M8	8	13	24.0	2.4	17.7	22.0	2.2	16.2
M10	10	17	47.0	4.8	34.7	43.0	4.4	31.7
M12	12	19	83.0	8.5	61.2	74.0	7.5	54.6
M16	16	24	205.0	20.9	151.2	184.0	18.8	135.7
M20	20	30	400.0	40.8	295.0	360.0	36.7	265.5
M24	24	36	690.0	70.4	508.9	621.0	63.3	458.0
M30	30	46	1372.0	139.9	1011.9	1235.0	125.9	910.9
M36	36	55	2399.0	244.6	1769.4	2159.0	220.0	1592.4

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`Positional Type' Hydraulic Adaptors

Fitting Procedure

On a typical machine, some hydraulic components may utilise `Positional Type' SAE Hydraulic Adaptors. When fitting `Positional Type' Hydraulic Adaptors it is important to adopt the following procedure. If this procedure is not followed correctly, damage to the `O' ring seal **4-A** can occur resulting in oil leaks.

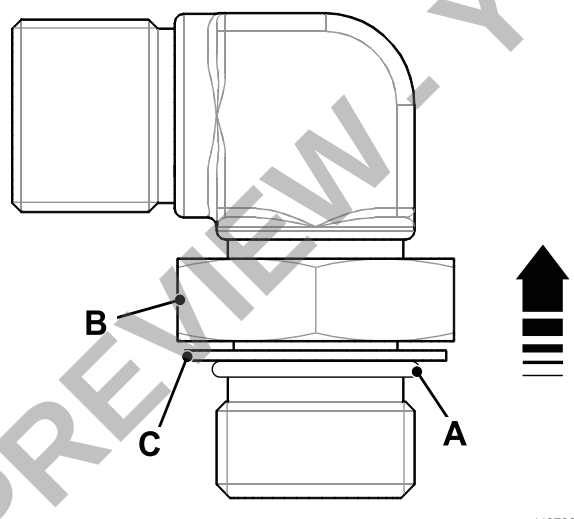
1 Ensure the locknut **4-B** is screwed back onto the body of the adaptor as far as possible as shown.

2 Check the `O' ring backing washer **4-C** is a tight fit on the adaptor. Note that the washer should not move freely, if the washer is slack do not use the adaptor.

3 Check the `O' ring **4-A** is fitted and that it is free from damage or nicks. Before fitting the adaptor, smear the `O' ring with clean hydraulic fluid.

Note: *The dimensions and shore hardness of the `O' ring is critical. Should it become necessary to replace the `O' ring, ensure that only JCB Genuine Parts are used.*

4 Screw the adaptor into the port of the hydraulic component as far as possible, so that ALL the threads engage and the `O' ring is correctly seated against the sealing face.



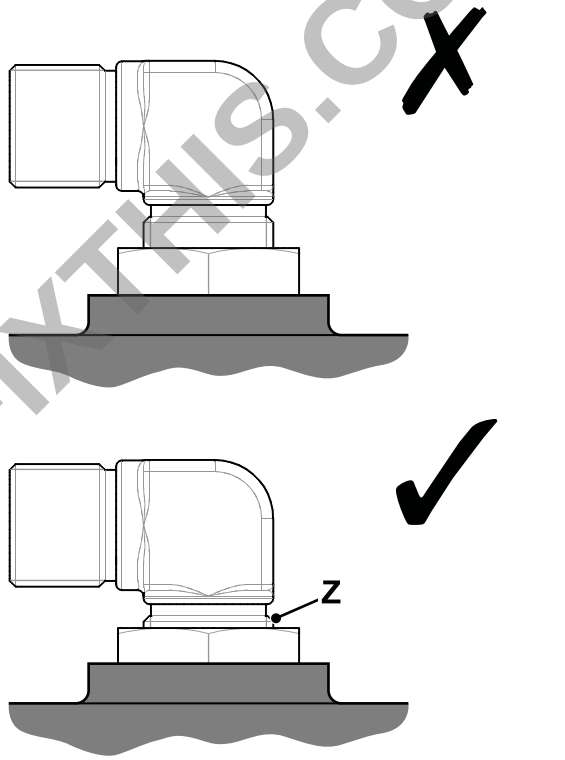
449790-C1

Fig 4.

5 Set the angular position of the adaptor as required, then secure by tightening the locknut **4**-**B**.

Note: *When fitted correctly no more than one thread should be visible at **5-Z** as shown.*

6 Torque tighten the locknut to 81 Nm (60 lbf ft).



449800-C1

Fig 5.

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Numerical List

Some tools are supplied as kits or sets. Cross references are given to tables showing the kit contents.

Part Number:	Description:	Tool Detail Reference:
-	Bonded Washers - see tool detail reference for content	⇨ Fig 35. (1-5-14)
-	Electrical Repair Kit - see tool detail reference for content	⇨ Fig 19. (1-5-9)
-	Female Cone Blanking Plugs - see tool detail reference for content	⇨ Fig 32. (1-5-14)
-	Female Connectors - see tool detail reference for content	⇨ Fig 34. (1-5-14)
-	Hydraulic Hand Pump Equipment - see tool detail reference for content	⇨ Fig 41. (1-5-15)
-	Male Adaptors BSP x BSP - see tool detail reference for content	⇨ Fig 28. (1-5-13)
-	Male Adaptors BSP x NPT (USA only) - see tool detail reference for content	⇨ Fig 28. (1-5-13)
-	Male Cone Blanking Caps - see tool detail reference for content	⇨ Fig 33. (1-5-14)
-	Pressure Test Point `T' Adaptors - see tool detail reference for content	⇨ Fig 30. (1-5-13)
-	Pressure Test Point Adaptors - see tool detail reference for content	⇨ Fig 29. (1-5-13)
-	Rivet Nut Tool - see tool detail reference for content	⇨ Fig 1. (1-5-5)
320/20050	Engine Lifting Bracket Kit	⇨ Fig 60. (1-5-20)
332/D1039	RAS System Bleeding Cap	⇨ Fig 39. (1-5-15)
332/E7911	Exhaust fitting clamp	⇨ Fig 58. (1-5-20)
4104/1310	Hand Cleaner	⇨ Fig 15. (1-5-8)
460/15708	Flow Test Adaptor (Powershift) - Other components required, see tool detail	⇨ Fig 42. (1-5-16)
718/20235	USB PC Cable	⇨ Fig 61. (1-5-20)
718/20236	Serial PC Cable	⇨ Fig 61. (1-5-20)
718/20237	Machine Cable	⇨ Fig 61. (1-5-20)
728/26500	USB DLA	⇨ Fig 61. (1-5-20)
892/00011	Spool Clamp	⇨ Fig 51. (1-5-19)
892/00167	Ram Protection Sleeve for 90 mm Rod Diameter	⇨ Fig 45. (1-5-17)
892/00180	Seal Fitting Tool - Hydraulic Steer Unit	⇨ Fig 52. (1-5-19)
892/00181	Replacement Plastic Boss for 892/00180	⇨ Fig 52. (1-5-19)
892/00229	Flow Meter	⇨ Fig 38. (1-5-15)
892/00253	Hydraulic Pressure Test Kit - see tool detail reference for content	⇨ Fig 25. (1-5-12)
892/00268	Flow Monitoring Unit - Other components required, see tool detail	⇨ Fig 23. (1-5-11)
892/00301	Flow Test Adaptor (Synchro Shuttle) - Other components required, see tool detail	⇨ Fig 43. (1-5-16)
892/00334	Ram Seal Fitting Tool	⇨ Fig 46. (1-5-17)
892/00349	Crimp Tool	⇨ Fig 21. (1-5-10)
892/00350	Butane Heater Assembly	⇨ Fig 20. (1-5-9)
892/00351	Splice 0.5-1.5 mm (Red)	⇨ Fig 22. (1-5-10)

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Fluids, Lubricants and Capacities

Table 3.

ITEM	CAPACITY US Gal (Liters)	FLUID/LUBRICANT	JCB Part Number	Container Size(1)
Fuel Tank	35 (132)	Diesel Oil (Refer to Fuels)	-	-
Engine (Oil)(2) - MIN - MAX	 3.3 (12.5) 3.9 (15)	JCB Engine Oil EP 15W40 -10°C to +50°C (14°F to 122°F) JCB Cold Climate Engine Oil EP 5W40 -20°C to +50°C (-4°F to 122°F)	4001/1805 4001/2705	20 liters 20 liters
Engine (Coolant)(3)	5.3 (20)	JCB Antifreeze HP/Coolant + Water (Refer to ***Coolant Mixtures***)	4006/1120	20 liters
Gearbox	5 (19)	JCB Transmission Fluid EP 10W(4) -32ºC to 40ºC (-25ºF to 104ºF)	4000/2505	20 liters
Front Axle Housing Hubs (x2)	 4.7 (18) 0.5 (2)	 JCB Gear Oil HP Plus	 4000/2205(5)	 20 liters
Rear Axle Housing Hubs (x2)	 3.4 (13) 0.5 (2)	 JCB Gear Oil HP Plus	 4000/2205(5)	 20 liters
Brake System		JCB Hydraulic Fluid HP15(6)	4002/0503	5 liters
Hydraulic Tank(7)	34 (128)	JCB Hydraulic Fluid HP - Above 100 °F, 38 °C - Below 100 °F, 38 °C	 4002/0805 4002/1025	 20 liters 20 liters
Grease Points		JCB Special HP Grease(8)	4003/2017	400g
		JCB Special MPL-EP Grease(8)	4003/1501	400g
Wear Pad Runways		JCB Waxoyl	4004/0502	5 liters
Boom Hoses		JCB Special Slide Lubricant	4003/1115	400g
Boom Chains	-	JCB Chain Lubricant	4004/0237A	300ml

(1) For information about the different container sizes that are available (and their part numbers), contact your JCB Dealer.
(2) Do not use ordinary engine oil
(3) It is recommended that the cooling system be filled at a maximum rate of 6 liters per minute. If the fill rate is any higher than this then there is a possibility of air becoming trapped in the system.
(4) Friction modified oils must not be used (eg Dexron ATF type).
(5) Must be suitable for use with oil immersed brakes and limited slip differentials (LSD).
(6) !CAUTION: Do not use ordinary brake fluid.
(7) This is nominal tank capacity. The total hydraulic system capacity depends on the equipment being used. Fill with all cylinders closed. Watch level sight glass when filling.
(8) JCB Special HP Grease is the recommended specification grease. If JCB Special MPL-EP Grease is used, all 50 hour greasing operations must be carried out at ten (10) hour intervals; all 500 hour greasing operations must be carried out at 50 hour intervals.

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Pre-start Cold Checks, Service Points and Fluid Levels

	Operation	10	50	100(1)	500	1000	2000	6000
ENGINE								
Coolant Quality and Level	- Check	☐	☐	☐	☐	☐		
Cooling System	- Drain and Refill						☐	☐
Oil level	- Check	☐	☐					
Oil and Filter(2)(3)(4)	- Change				☐	☐	☐	☐
Air Cleaner Dust Valve(5)	- Clean				☐	☐	☐	☐
Air Cleaner Outer Element(5)	- Change					☐	☐	☐
Air Cleaner Inner Element	- Change						☐	☐
Pre-Cleaner (if fitted)	- Check			☐				
Water Separator	- Check for contamination and Drain		☐	☐	☐	☐	☐	☐
Water Separator Fuel Filter(6)	- Change				☐	☐	☐	☐
Engine Fuel Filter(6)	- Change					☐	☐	☐
Front End Accessory Drive (FEAD) Belt Condition	- Check				☐	☐	☐	☐
Front End Accessory Drive (FEAD) Belt	- Change							☐
Powertrain Mounting Bolts for Tightness	- Check			☐	☐	☐	☐	☐
All Hoses - Condition	- Check			☐	☐	☐	☐	☐
Radiator(5)	- Clean				☐	☐	☐	☐
Crankcase Ventilation Filter (if fitted)	- Change					☐	☐	☐
Valve Clearances(7)	- Check and Adjust						☐	☐
Oil Filler and Dipstick Seals	- Change						☐	☐
Injectors(7)	- Change							☐
Injector(s) Leak Off Rail(7)	- Change							☐
High Pressure Fuel Lines(7)	- Change							☐
TRANSMISSION, AXLES AND STEERING								
Transmission Mount Security	- Check			☐				
Transmission Oil Level	- Check	☐	☐	☐	☐			
Transmission Oil(8)	- Change					☐	☐	☐
Transmission Oil Filter	- Change			☐	☐	☐	☐	☐
Axle Mount Security	- Check			☐				

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Contaminant Standards

Dirt that damages your system is in many cases too small to be seen with the eye. The particle size is measured in microns.

1 micron = 0.001 mm (0.0000394 in).

Listed below are a few typical comparisons:

- Red Blood Cell = 8 microns (0.008 mm, 0.000315 in)
- Human Hair = 70 microns (0.07 mm, 0.00275 in)
- Grain of Salt = 100 microns (0.1 mm, 0.00394 in)

Smallest particle visible to the naked eye is 40 microns (0.00157) approximately.

Standards will often be quoted to ISO (International Standards Organisation) for which literature can be obtained.

Filters

The filter assembly fitted to all product ranges is designed to filter all the contamination that is generated through use to the required level of cleanliness. The filter must be serviced to the requirements of the machine Service Schedules.

To ensure optimum performance and reliability it is important that the machines hydraulic system is serviced periodically in accordance with the manufacturers requirements.

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Health and Safety

Lubricants

T3-060U_3

Introduction

It is most important that you read and understand this information and the publications referred to. Make sure all your colleagues who are concerned with lubricants read it too.

Hygiene

JCB lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following.

Storage

Always keep lubricants out of the reach of children.

Never store lubricants in open or unlabelled containers.

Waste Disposal

⚠ CAUTION

It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.

Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.

INT-3-2-14

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil should be in accordance with any local regulations. Never pour used engine oil into sewers, drains or on the ground.

Handling

⚠ WARNING

Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use gasoline, diesel fuel or kerosene to clean your skin.

INT-3-2-3U

New Oil

There are no special precautions needed for the handling or use of new oil, beside the normal care and hygiene practices.

Used Oil

Used engine crankcase lubricants contain harmful contaminants.

Here are precautions to protect your health when handling used engine oil:

1 Avoid prolonged, excessive or repeated skin contact with used oil.

2 Apply a barrier cream to the skin before handling used oil. Note the following when removing engine oil from skin:

- **a** Wash your skin thoroughly with soap and water.
- **b** Using a nail brush will help.
- **c** Use special hand cleansers to help clean dirty hands.
- **d** Never use gasoline, diesel fuel, or kerosene for washing.

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Section M - Electronic Data Systems

			Machine models		
Topic Ref	**Title**	**VARIANT**	**506-36 5CD**	**507-42 5CE 509-42 5CF**	**510-56 5CG 512-56 5CH**
M1	CANbus SYSTEM		●	●	●
M2	Loadall Monitoring SYSTEM		●	●	●
M3	Fault Code SYSTEM		●	●	●
M4	Servicemaster SYSTEM		●	●	●
M5	Servicemaster Tools			●	●

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Loadall Monitoring System ECU Fault Codes

Fault Code List - General "D" Codes

Fault Code	Description	Warning Displays		Severity
D001	Air filter blocked	MIL lamp activated (Amber). Buzzer activated for 1 second. Air filter blocked warning lamp activated.		SERVICE
D002	Water in fuel detected	On start-up sequence -		STOP NOW
		With engine running - MIL lamp activated (Red). Continuous buzzer activated.		STOP NOW

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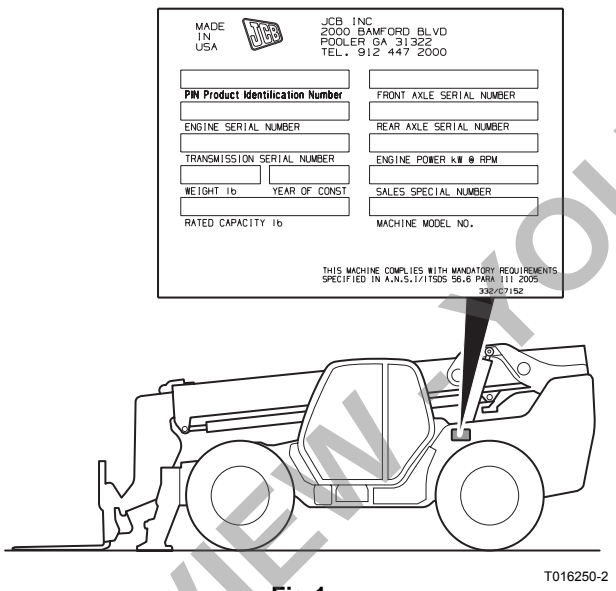
Machine Identification Plate

Your machine has an identification plate mounted as shown. The serial numbers of the machine and its major units are stamped on the plate.

Note: *The machine model and build specification is indicated by the PIN. Refer to* ***Typical Product Identification Number (PIN)****.*

The serial number of each major unit is also stamped on the unit itself. If a major unit is replaced by a new one, the serial number on the identification plate will be wrong. Either stamp the new number of the unit on the identification plate, or simply stamp out the old number. This will prevent the wrong unit number being quoted when replacement parts are ordered.

The machine and engine serial numbers can help identify exactly the type of equipment you have.

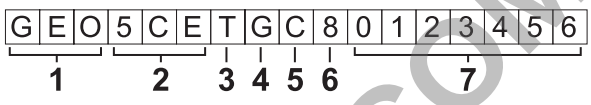


T016250-2

Fig 1.

Typical Product Identification Number (PIN)

Machines Built Before January 2010



T016210-1

1 World Manufacturer Identification (3 Digits)

2 Machine Model (3 Digits)

5CD = 506-36	5CF = 509-42
5CE = 507-42	5CG = 510-56

3 Engine Type (1 Digit)

JCB Dieselmax:

P = SF (114 Hp)	T = SD (85 Hp)
S = SF (100 Hp)	

4 Gearbox Model (1 Digit)

G = 4 Speed (PS750)

5 Randomly generated check letter (1 Digit)

6 Year of Manufacture (1 Digit)

7 = 2007	A = 2010
8 = 2008	B = 2011
9 = 2009	C = 2012

7 Machine Serial Number (7 Digits)

Each machine has a unique serial number.

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T11-010

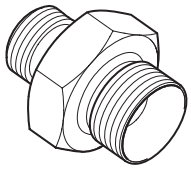


Fig 28. Male Adaptors

	Male Adapters - BSP x NPT (USA only)
816/00439	3/8 in. x 1/4 in.
816/00440	1/2 in. x 1/4 in.
816/15007A	3/8 in. x 3/8 in.
816/15008	1/2 in. x 3/8 in.

	Male Adapters - BSP x BSP
1606/2052	3/8 in. x 1/4 in.
1604/0003A	3/8 in. x 3/8 in.
892/00071	3/8 in. x 3/8 in. taper
1606/0004	1/2 in. x 1/4 in.
1606/0007A	1/2 in. x 3/8 in.
1604/0004A	1/2 in. x 1/2 in.
1606/0017	5/8 in. x 1/2 in.
1606/0008	3/4 in. x 3/8 in.
1606/0009	3/4 in. x 1/2 in.
1604/2055	3/4 in. x 3/4 in.
1606/0012	3/4 in. x 1 in.
1606/0014	3/4 in. x 1.1/4 in.
1606/0015	1 in. x 1.1/4 in.

T11-010

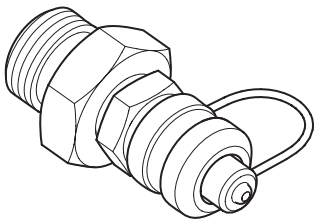


Fig 29. Pressure Test Adapters

892/00255	1/4 in. BSP x Test Point
892/00256	3/8 in. BSP x Test Point
892/00257	1/2 in. BSP x Test Point
892/00258	5/8 in. BSP x Test Point
816/15118	3/4 in. BSP x Test Point
892/00259	1 in BSP x Test Point
892/00260	1.1/4 in. BSP x Test Point
892/00261	5/8 in. UNF x Test Point

T11-010

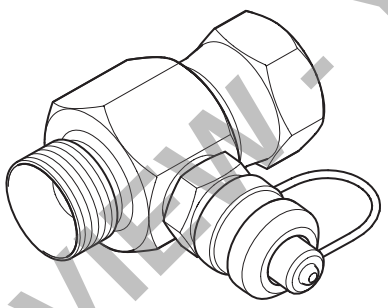


Fig 30. Pressure Test 'T' Adapters

816/55045	1/4 in. M BSP x 1/4 in. F BSP x Test Point
816/55038	3/8 in. M BSP x 3/8 in. F BSP x Test Point
816/55040	1/2 in. M BSP x 1/2 in. F BSP x Test Point
892/00263	5/8 in. M BSP x 5/8 in. F BSP x Test Point
892/00264	3/4 in. M BSP x 3/4 in. F BSP x Test Point
892/00265	1 in. M BSP x 1 in. F BSP x Test Point
892/00266	1.1/4 in. M BSP x 1.1/4 in. F BSP x Test Point
892/00267	1.1/4 in. M BSP x 1.1/2 in. F BSP x Test Point

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Boom Chains

Adjustment

For adjustment procedures refer to ***Section B***.

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Service Schedules

Introduction

T3-036

A badly maintained machine is a danger to the operator and the people working around him. Make sure that the regular maintenance and lubrication jobs listed in the service schedules are done to keep the machine in a safe and efficient working condition.

⚠ WARNING

Maintenance must be done only by suitably qualified and competent persons. Before doing any maintenance make sure the machine is safe. It should be correctly parked on firm level ground.

To prevent anyone starting the engine, remove the starter key. Disconnect the battery and block the wheels when you are working beneath the machine.

If you do not take these precautions you could be killed or injured.

9-3-1-1

Apart from the daily jobs, the schedules are based on machine running hours. Keep a regular check on the hourmeter readings to correctly gauge service intervals. Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance checks are rectified immediately.

How to Use the Service Schedules

T3-012_3

In the example shown, **A** shows all service requirements to be carried out every 10 hours and **B** shows the requirements to be carried out every 500 hours.

Important: *Services should be carried out at either the hourly interval or calendar interval, whichever occurs first. Refer to* ***Calendar Equivalents****.*

Pre-start Cold Checks, Service Points and Fluid Levels

Operation		A: 10	50	100(1)	B: 500	1000	2000	8000
ENGINE								
Coolant Quality and Level	- Check	□	□	□	□	□		
Cooling System	- Drain and Refill						□	□
Oil level	- Check	□	□					
Oil and Filter(2)(3)(4)	- Change				□	□	□	□
Air Cleaner Dust Valve(5)	- Change				□	□	□	□
Air Cleaner Outer Element(5)	- Change					□	□	□
Air Cleaner Inner Element	- Change						□	□
Pre-Cleaner (if fitted)	- Check			□				
Water Seperator	- Check for contamination and Drain		□	□	□	□	□	□
Engine Fuel Filter	- Change					□	□	□
Front End Accessory Drive (FEAD) Belt Condition	- Check				□	□	□	□
Front End Accessory Drive (FEAD) Belt	- Change							□
Engine Mounting Bolts for Tightness	- Check			□	□	□	□	□
All Hoses - Condition	- Check			□	□	□	□	□
Radiator(5)	- Clean				□	□	□	□
Crankcase Ventilation Filter	- Change					□	□	□

795390-1

Calendar Equivalents

Every 10 Hours = Daily

Every 50 Hours = Weekly

Every 500 Hours = Six Months

Every 1000 Hours = Yearly

Every 2000 Hours = 2 Years

Every 6000 Hours = 6 Years

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Safety Check List

Safety - Yours and Others

INT-1-3-1_3

All machinery can be hazardous. When a machine is correctly operated and properly maintained, it is a safe machine to work with. But when it is carelessly operated or poorly maintained it can become a danger to you (the operator) and others.

In this manual and on the machine you will find warning messages. Read and understand them. They tell you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your employer or JCB distributor to explain them.

But safety is not just a matter of responding to the warnings. All the time you are working on or with the machine you must be thinking what hazards there might be and how to avoid them.

Do not work with the machine until you are sure that you can control it.

Do not start any job until you are sure that you and those around you will be safe.

If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.

Remember

BE CAREFUL
BE ALERT
BE SAFE

General Safety

T1-007_3

⚠ WARNING

Operator Manual

You and others can be injured if you operate or maintain the machine without first studying the Operator Manual. Read the safety instructions before operating the machine. If you do not understand anything, ask your employer or JCB dealer to explain it. Keep the Operator Manual clean and in good condition. Do not operate the machine without an Operator Manual in the cab, or if there is anything on the machine you do not understand.

INT-1-3-2_2

⚠ WARNING

Care and Alertness

All the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.

INT-1-3-5

⚠ WARNING

Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the machinery. Wear protective clothing to suit the job. Examples of protective clothing are: a hard hat, safety shoes, safety glasses, a well fitting overall, ear-protectors and industrial gloves. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained. Remove rings, watches and personal jewellery.

INT-1-3-6_2

⚠ WARNING

Alcohol and Drugs

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or while operating the machine or attachments. Be aware of medicines which can cause drowsiness.

INT-1-3-9_2

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Changing the Oil and Filter

T3-030_2

Drain the oil when the engine is warm as contaminants held in suspension will then be drained with the oil.

1 Get access to the engine. Refer to ***Access Panels, Engine Cover***.

2 Place a container of suitable size beneath the sump drain plug **C**.

⚠ CAUTION

Oil will gush from the hole when the drain plug is removed. Hot oil and engine components can burn you. Keep to one side when you remove the plug.

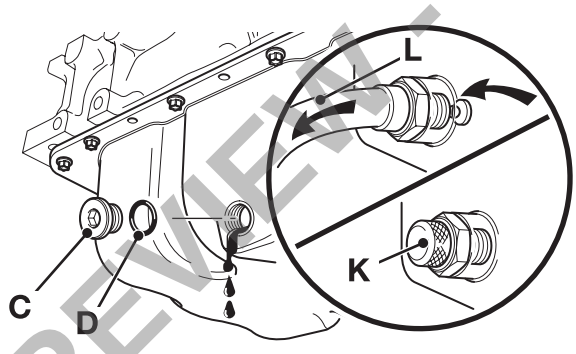
13-3-1-15

3 Drain the engine oil.

a Machine with a sump plug, remove the sump drain plug **C** and its 'O' ring **D**. Let the oil drain out, then clean and refit the drain plug with a new 'O' ring. Torque the drain plug to 40-60Nm (30-44lbf ft).

b Machines with a drain valve, remove the dust cap **K** from the sump drain port. Attach drain tube **L**. With the free end of the tube in an oil container, screw in the drain tube assembly to open the valve.

When all the oil has drained, unscrew the drain tube assembly and fit the dust cap **K**.



C012110-1

Fig 31.

4 Place a container of suitable size under drain plug **E** to catch the oil. ⇒ *Fig 32. (3-1-45)*.

5 Loosen and remove the filter housing drain plug **E** and its 'O' ring **J**. Let the oil fully drain, then clean and refit the drain plug with a new 'O' ring. Torque the drain plug to 40-60Nm (30-44lbf ft).

6 Unscrew the filter canister **F**, use a chain wrench if necessary.

7 Clean the seal face of the filter head **G**.

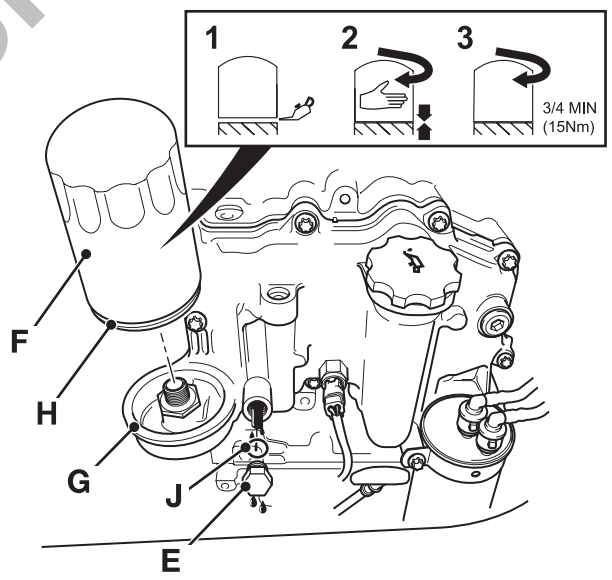
8 Smear the seal **H** on the new filter canister **F** with clean engine oil.

9 Screw the filter on until it just contacts the filter head.

10 Turn the filter at least a further 3/4 of a turn.

11 Through the top filler point, fill the engine with the recommended oil to the MAX mark on the dipstick. Refer to ***Checking the Oil Level***. Wipe off any spilt oil, refit the filler cap and make sure it is secure.

12 Operate the engine until the oil pressure low warning light has extinguished. Check for oil leakage. When the oil has cooled, check the oil level again, and if necessary top up with clean engine oil.



C012110-5

Fig 32.

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Actuated Devices

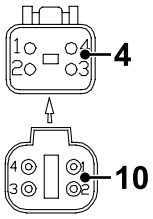
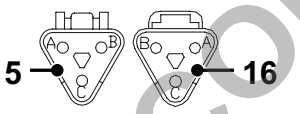
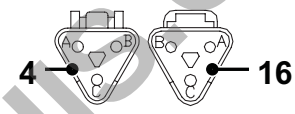
⇨ *Electrical Schematic 507, 509 - Actuated Devices (B11-13)*
⇨ *Electrical Schematic 510, 512 - Actuated Devices (B11-14)*

The RAS ECU 4018 actuates the following devices:	
RAS proportional solenoid control valves	The ECU controls the RAS left and right control valve solenoids 3051 and 3052 with a PWM signal.
RAS diagnostic LED	The ECU sends a signal to the LMS display ECU 4013 in the right hand instrument cluster to activate the RAS diagnostic LED if there is a fault with the system.
RAS mode LEDs	The ECU sends a signal to the LMS display ECU 4013 in the right hand instrument cluster to activate the RAS mode LEDs via the CANbus.
The LMS display ECU 4013 actuates the following devices:	
Left and right RAS isolation relays	If there is a critical RAS system fault the ECU energises the left and right isolation relays 2051 and 2052. The solenoids 3051 and 3052 are de-energised and the RAS system is set to mode 1 (locked).

Key	Device	RAS ECU Connector Pin	
2051	RAS isolation relay - Left cylinder	35A	
2052	RAS isolation relay - Right cylinder	12A	
3051	RAS Left cylinder control valve solenoid		23B
3052	RAS Right cylinder control valve solenoid		12B
4018A	RAS ECU connector 1 (black)	-	-
4018B	RAS ECU connector 2 (white)	-	-
4013	LMS Display ECU connector J2 (Black)		
8000	Harness interconnections	-	-
9001	Secondary fuse box A	11A	
9003	Secondary fuse box C	2A, 3A, 4A, 5A, 6A	
-003	Earth point, cab harness	15A, 16A, 17A	22B

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8028	4 - Chassis 10 - Boom	TBA	
8034 (Machines from April 2010)	5 - Transmission 16 - Speed Sensor Link	TBA	
8035 (Machines from April 2010)	4 - Chassis 16 - Speed Sensor Link	TBA	

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Bleeding the Sway Ram Circuit

The sway ram has an integral bleed valve, which can be used to bleed the sway hydraulic circuit.

Important: *Make sure that the boom is in the lowered position when bleeding the sway ram circuit.*

Note: *This procedure requires two people. One person to operate the sway controls and another to tighten the bleed screw when all air has been expelled. If this procedure is done by one person air may enter the cylinder due to the delay in dismounting from the cab to attend to the sway cylinder.*

⚠ WARNING

Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine make sure the others are clear of the danger areas; examples of danger areas are: the rotating blades and belt on the engine, the attachments and linkages, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

INT-3-1-5

1 Park the machine and make it safe. Lower the boom. Vent the hydraulic pressure. Obey the care and safety procedures. ⇨ ***Related Topics (E3-2)***

Important: *Opening the sway ram bleed valve can cause the machine to sway unexpectedly. Only open the bleed valve when the machine is swayed fully to the left or the right.*

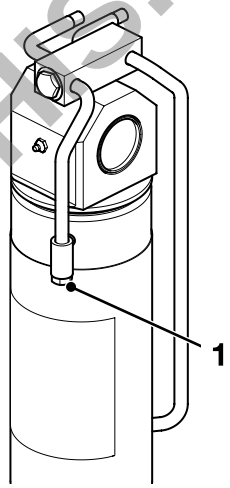
Important: *DO NOT stand between the chassis and the wheel. You can be trapped or crushed when sway is operated.*

Important: *The bleed valve should only be completely removed from the valve body to allow cleaning of the integral 1.2mm orifice.*

2 Start the engine and operate the sway lever to sway the machine fully to the operator's left side (sway ram extended). Stop the engine and vent the hydraulic pressure. Follow the correct procedure, see ***Venting the Hydraulic Pressure, Section 2.***

3 ⇨ ***Fig 8. (E3-15)*** Get an assistant to carefully unscrew the bleed valve **1**, be prepared for hydraulic oil to escape. DO NOT unscrew more than 6.5 mm (0.25 in).

4 Start the engine and operate the sway lever to sway the machine fully to the operator's left side. Hold the lever in this position until no more air is expelled through the bleed valve **1**. Return the control lever to its neutral position. Immediately tighten the bleed valve **1** to prevent air entering the circuit.



766840-C1

Fig 8. Unscrewing the Bleed Valve

5 Operate the sway ram fully in both directions 10 times

6 Repeat steps 2, 3 and 4.

7 Stop the engine and remove the starter key.

8 Check the hydraulic fluid level. ⇨ ***Related Topics (E3-2)***

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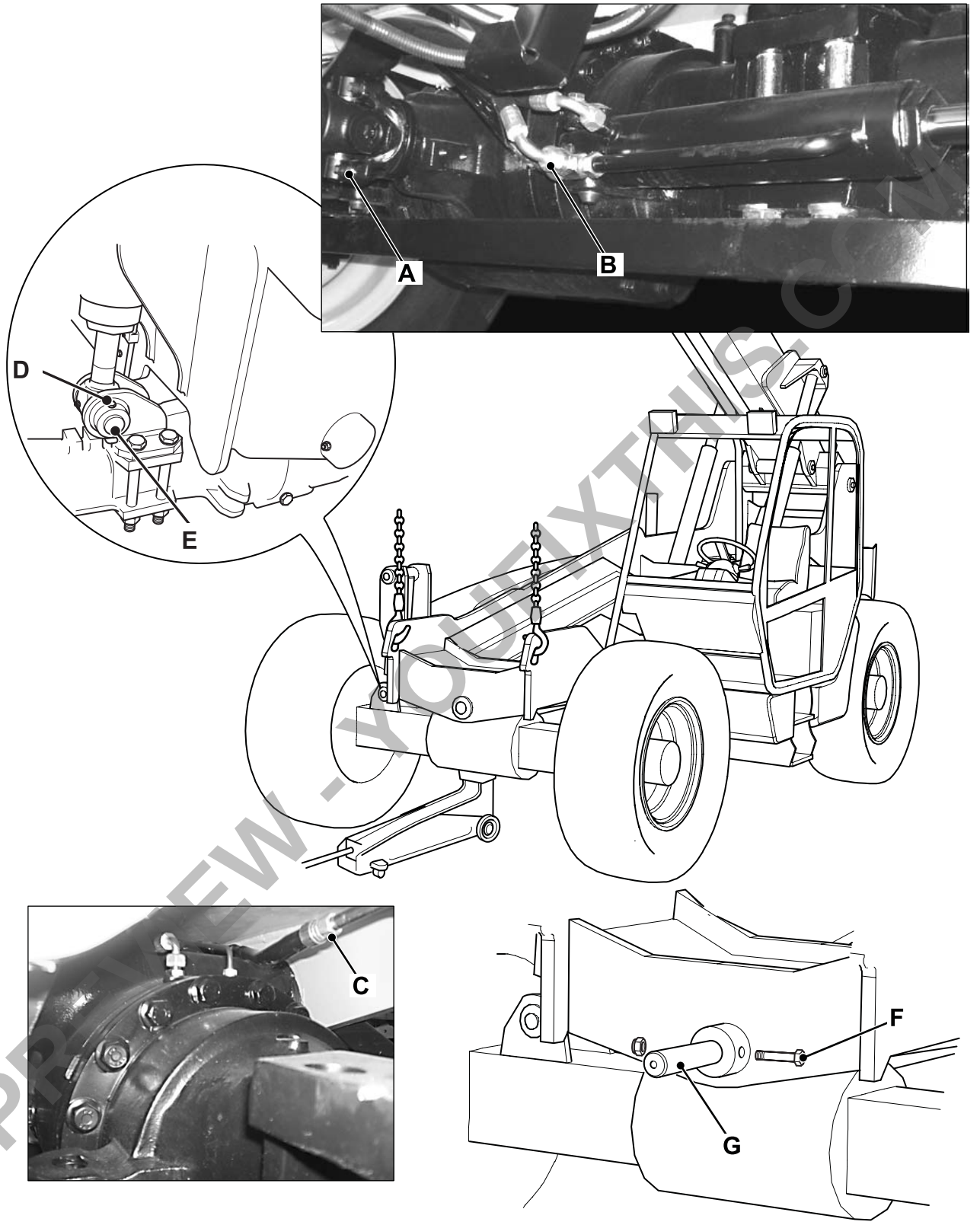


Fig 2. SD80 Pivot Sway Axle

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Related Topics

Table 1. Related Topics in This Publication

The table lists other topics in the manual that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text in this section contains cross references to this page to help you find the correct information. Some machines have different systems and devices. Make sure you refer to the correct topic, refer to *Section 1 - Applications*.		
Sections	**Topic Titles**	**Sub Titles**
1	***Applications***	ALL
2	ALL (Care and Safety)(1)	ALL

(1) You must obey all of the relevant care and safety procedures.

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