SERVICE MANUAL

E17C

Mini Excavator

Part number 48127424
English
February 2017

NEW HOLLAND CONSTRUCTION

Safety rules - Personal safety

Preliminary warnings to maintenance operation

⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

W1128B

⚠ WARNING

Improper operation or service of this machine can result in an accident.
Assign a supervisor to direct worksite operations. Agree on all safety measures, procedures, and suitable hand signals.
Failure to comply could result in death or serious injury.

W0287A

⚠ CAUTION

Pinch hazard!
Always use suitable tools to align mating parts. DO NOT use your hand or fingers.
Failure to comply could result in minor or moderate injury.

C0044A

Personal Protective Equipment (PPE)

⚠ WARNING

Avoid injury!
Use Personal Protective Equipment (PPE), including protective goggles, gloves, and safety footwear.
Failure to comply could result in death or serious injury.

W1036A

Lifting operation

⚠ WARNING

Crushing hazard!
The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.
Failure to comply could result in death or serious injury.

W0256A

⚠ WARNING

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply could result in death or serious injury.

W0398A

⚠ WARNING

Improper operation or service of this machine can result in an accident.
Raised equipment or machine movement without an operator can cause serious injury. Always do the following before performing any maintenance:
Park the machine on flat, level ground.
Lower the attachment to the ground.
Shut down the engine and remove the ignition key.
Lock the tracks.
Failure to comply could result in death or serious injury.

W0944D

Swing motor

Type	Fixed displacement orbit motor
Capacity	**19.5 cm³/rev** (**1.2 in³/rev**)
Relief pressure	**13238 kPa** (**1920 psi**)

Travel motor

Type	Variable displacement axial piston motor
Relief pressure	**20595 kPa** (**2987 psi**)
Reduction gear type	2-stage planetary

Cylinder

Boom cylinder	Bore diameter x Rod diameter x Stroke	Ø **60 mm** (**2.4 in**) x Ø **40 mm** (**1.6 in**) x **440 mm** (**17.3 in**)
	Cushion	Extend only
Arm cylinder	Bore diameter x Rod diameter x Stroke	Ø **60 mm** (**2.4 in**) x Ø **40 mm** (**1.6 in**) x **353 mm** (**13.9 in**)
	Cushion	Extend and retract
Bucket cylinder	Bore diameter x Rod diameter x Stroke	Ø **55 mm** (**2.2 in**) x Ø **35 mm** (**1.4 in**) x **320 mm** (**12.6 in**)
	Cushion	-
Boom swing cylinder	Bore diameter x Rod diameter x Stroke	Ø **55 mm** (**2.2 in**) x Ø **30 mm** (**1.2 in**) x **355 mm** (**14.0 in**)
	Cushion	-
Dozer cylinder	Bore diameter x Rod diameter x Stroke	Ø **65 mm** (**2.6 in**) x Ø **30 mm** (**1.2 in**) x **115 mm** (**4.5 in**)
	Cushion	-
Extension cylinder	Bore diameter x Rod diameter x Stroke	Ø **55 mm** (**2.2 in**) x Ø **30 mm** (**1.2 in**) x **310 mm** (**12.2 in**)
	Cushion	-

NOTE: *discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface. Discoloration does not cause any harmful effect on the cylinder performance.*

Types of shoes

Type	Rubber track
Shoe width	**230 mm** (**9.1 in**)
Ground pressure	**27.44 kPa** (**3.98 psi**)
Overall width	**1300.0 mm** (**51.2 in**)

Number of rollers and shoes on each side

Lower roller	3

Kilograms to pounds

kg	0	1	2	3	4	5	6	7	8	9	kg
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
----		2.205	4.409	6.614	8.819	11.023	13.228	15.432	17.637	19.842	----
10	22.046	24.251	26.456	28.660	30.865	33.069	35.274	37.479	39.683	41.888	10
20	44.093	46.297	48.502	50.707	52.911	55.116	57.320	59.525	61.730	63.934	20
30	66.139	68.344	70.548	72.753	74.958	77.162	79.367	81.571	83.776	85.981	30
40	88.185	90.39	92.595	94.799	97.004	99.209	101.413	103.618	105.822	108.027	40
50	110.232	112.436	114.641	116.846	119.050	121.255	123.460	125.664	127.869	130.073	50
60	132.278	134.483	136.687	138.892	141.097	143.301	145.506	147.710	149.915	152.120	60
70	154.324	156.529	158.734	160.938	163.143	165.348	167.552	169.757	171.961	174.166	70
80	176.371	178.575	180.780	182.985	185.189	187.394	189.599	191.803	194.008	196.212	80
90	198.417	200.622	202.826	205.031	207.236	209.440	211.645	213.850	216.054	218.259	90
100	220.463	222.668	224.873	227.077	229.282	231.487	233.691	235.896	238.100	240.305	100

Weight kilograms to newtons

kgf	0	1	2	3	4	5	6	7	8	9	kg
	N	N	N	N	N	N	N	N	N	N	
----		9.81	19.61	29.42	39.23	49.03	58.84	68.65	78.45	88.26	----
10	98.07	107.87	117.68	127.49	137.29	147.10	156.91	166.71	176.52	186.33	10
20	196.13	205.94	215.75	225.55	235.36	245.17	254.97	264.78	274.59	284.39	20
30	294.20	304.01	313.81	323.62	333.43	343.23	353.04	362.85	372.65	382.46	30
40	392.27	402.07	411.88	421.69	431.49	441.30	451.11	460.91	470.72	480.53	40
50	490.33	500.14	509.95	519.75	529.56	539.37	549.17	558.98	568.79	578.59	50
60	588.40	598.21	608.01	617.82	627.63	637.43	647.24	657.05	666.85	676.66	60
70	686.47	696.27	706.08	715.89	725.69	735.50	745.31	755.11	764.92	774.73	70
80	784.53	794.34	804.15	813.95	823.76	833.57	843.37	853.18	862.99	872.79	80
90	882.60	892.41	902.21	912.02	921.83	931.63	941.44	951.25	961.05	970.86	90
100	980.67	990.47	1000.28	1010.08	1019.89	1029.70	1039.5	1049.31	1059.12	1068.92	100

Newtons to weight kilograms

N	0	1	2	3	4	5	6	7	8	9	N
	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	kgf	
----		0.1020	0.2039	0.3059	0.4079	0.5099	0.6118	0.7138	0.8158	0.9177	----
10	1.0197	1.1217	1.2237	1.3256	1.4276	1.5296	1.6315	1.7335	1.8355	1.9375	10
20	2.0394	2.1414	2.2434	2.3453	2.4473	2.5493	2.6513	2.7532	2.8552	2.9572	20
30	3.0591	3.1611	3.2631	3.3651	3.4670	3.5690	3.6710	3.7729	3.8749	3.9769	30
40	4.0789	4.1808	4.2828	4.3848	4.4868	4.5887	4.6907	4.7927	4.8946	4.9966	40
50	5.0986	5.2006	5.3025	5.4045	5.5065	5.6084	5.7104	5.8124	5.9144	6.0163	50
60	6.1183	6.2203	6.3222	6.4242	6.5262	6.6282	6.7301	6.8321	6.9341	7.0360	60
70	7.1380	7.2400	7.3420	7.4439	7.5459	7.6479	7.7498	7.8518	7.9538	8.0558	70
80	8.1577	8.2597	8.3617	8.4636	8.5656	8.6676	8.7696	8.8715	8.9735	9.0755	80
90	9.1774	9.2794	9.3814	9.4834	9.5853	9.6873	9.7893	9.8912	9.9932	10.0952	90
100	10.1972	10.2991	10.4011	10.5031	10.6050	10.7070	10.8090	10.9110	11.0129	11.1149	100

Engine coolant

NEW HOLLAND CONSTRUCTION requires the use of a fully formulated Organic Acid Technology (OAT) based coolant. **NEW HOLLAND AMBRA ACTIFULL™ OT EXTENDED LIFE COOLANT** is the reference genuine product.

NOTICE: *use of different coolant brands is not recommended.*

NOTICE: *never add Supplemental Coolant Additives (SCA) when using* ***NEW HOLLAND AMBRA ACTIFULL™ OT EXTENDED LIFE COOLANT****.*

NOTICE: *never mix* ***NEW HOLLAND AMBRA ACTIFULL™ OT EXTENDED LIFE COOLANT*** *coolant with conventional coolant. Mixing OAT based coolant with conventional coolant will reduce the effectiveness of OAT coolant.*

NOTICE: *if only conventional coolant is available, a complete changeover of the fluid into the cooling system shall be carried out.*

the engine cooling system shall always be refilled with coolant solution made by mixture of antifreeze and distilled (deionized) water.

NOTICE: *never refill the cooling system with only antifreeze. Never refill the cooling system with only water.*

Using **NEW HOLLAND AMBRA ACTIFULL™ OT EXTENDED LIFE COOLANT**, a 50/50 mixture of antifreeze and distilled (deionized) water grants proper performance of the engine cooling system in the above mentioned operating temperature range of the machine.

NEW HOLLAND AMBRA ACTIFULL™ OT EXTENDED LIFE COOLANT is available as:

- 50/50 PREMIXED coolant solution ready for usage.
- CONCENTRATE antifreeze to be mixed 50/50 with distilled (deionized) water.

NOTICE: *if operating in extreme winter climate, a coolant solution made by 60/40 antifreeze/distilled (deionized) water mixture shall be used in order to grant proper performance of the engine cooling system.*

NOTICE: *never use coolant solution with more than* ***60%*** *of antifreeze. This affects the cooling capacity of the mixture.*

When the coolant solution is prepared starting from the CONCENTRATE product, the antifreeze concentration in the mixture of antifreeze and distilled (deionized) water can be determined with a refractometer designed to measure ethylene glycol content.

If distilled (deionized) water is not available, use water for dilution with the following properties:

Property	Maximum limit
Total Solids	**340 ppm**
Total Hardness	**340 ppm**
Chloride (Cl)	**340 ppm**
Sulfate (SO4)	**100 ppm**
Acidity pH	5.5 to 9.0

NOTICE: *never use hard water, sea water and softened sea water that has been conditioned with salt. The minerals and salts present in potable water can cause corrosion and deposits resulting in shortened engine life.*

Contents

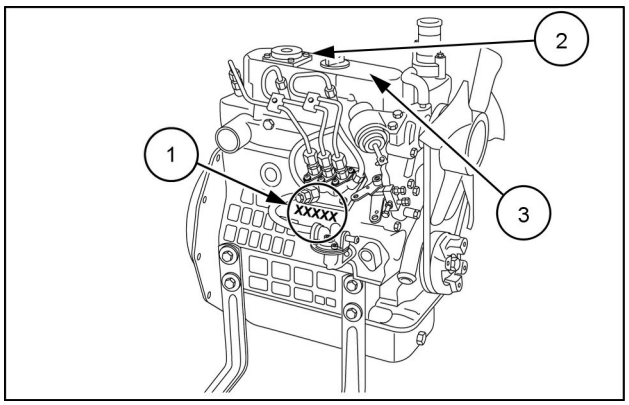
Engine - 10

Engine and crankcase - 001

Engine - Identification

You must identify engine model name and serial number before you start servicing.

1. Engine serial number
2. Engine ID label
3. Engine emission decal



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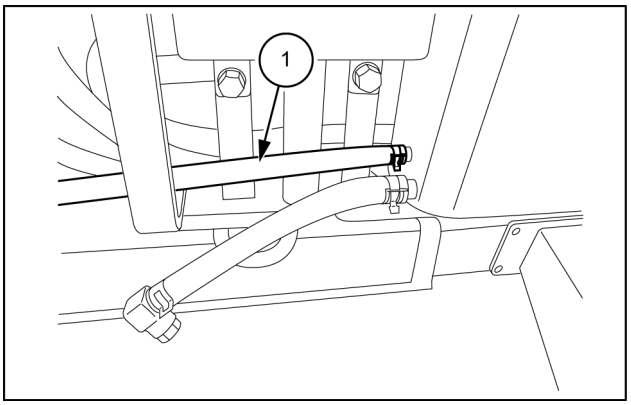
Engine series

Number	Series	Number	Series
1	05 series (include: WG)	6	GZ, OC, AC, EA, E
2	V3 series	7	03 series
3	08 series	8	07 series
4	SM series (include: WG)	A	EA, RK
5	Air Cooled Gasoline	B	03 (KET Production)

Year of manufacture

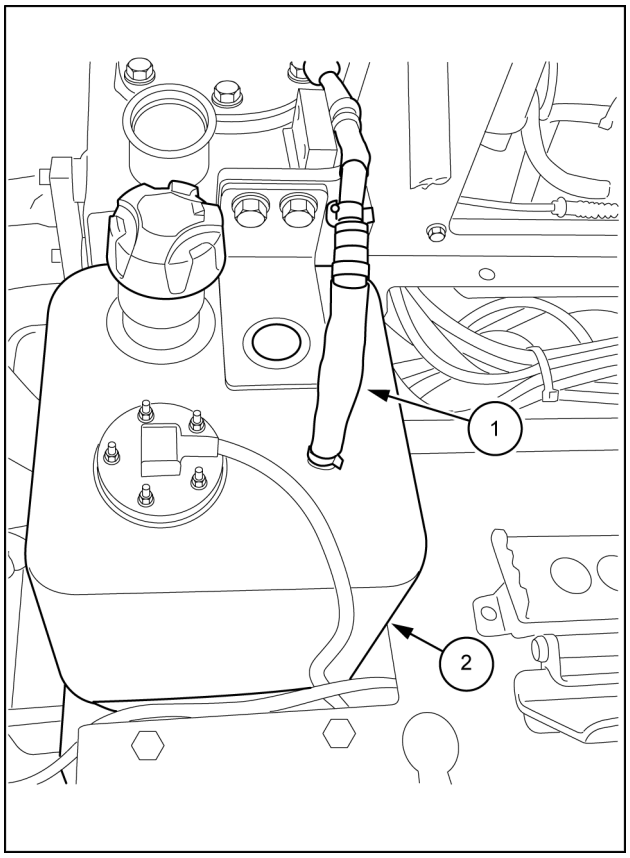
Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

32. Loosen the clamp to remove the fuel hose **(1)** from the tank.



SMIL17MEX0275AB 16

33. Loosen the clamp to remove the fuel hose **(1)** from the fuel tank **(2)**.



SMIL17MEX0277BB 17

Engine - Change fluid - Engine oil and oil filter

Changing engine oil

⚠ WARNING

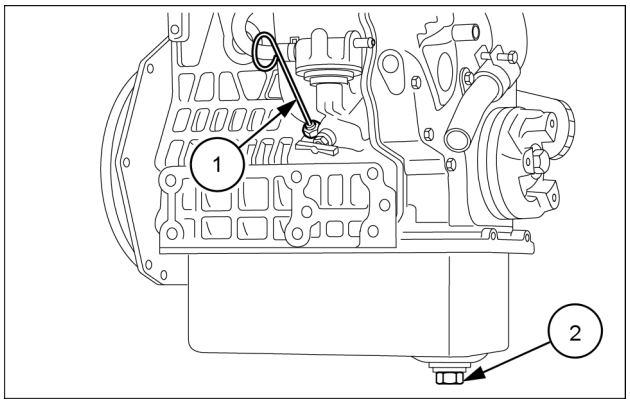
Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

W1128B

1. Start and warm up the engine for approximately **5 min**.
2. Place an oil pan underneath the engine.
3. To drain the used oil, remove the drain plug **(2)** at the bottom of the engine and drain the oil completely.
4. Screw the drain plug **(2)**.
5. Fill new oil up to upper line on the dipstick **(1)**.

NOTICE: *never mix two different types of oil.*
Upon an oil change, be sure to replace the gasket with new one.

Quantity: **3.7 L** (**0.98 US gal**)



SMIL17MEX0503AB 1

Tightening torque	Drain plug with copper gasket	M12 × 1.25	**33 – 37 N·m** (**24 – 27 lb ft**)
		M22 x 1.5	**64 – 73 N·m** (**47 – 54 lb ft**)
	Drain plug with rubber coated gasket	M22 × 1.5	**45 – 53 N·m** (**33 – 39 lb ft**)

Contents

Engine - 10

Pan and covers - 102

Contents

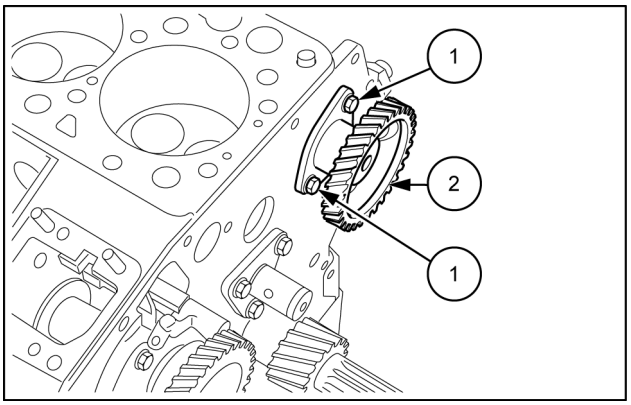
Engine - 10

Valve drive and gears - 106

Camshaft - Remove

Camshaft

1. Remove the timing gear housing (refer to **Timing gear housing - Remove (10.102)**).
2. Remove the idler gear (refer to **Idler gear - Remove (10.106)**).
3. Remove the camshaft mounting screws **(1)** and draw out the camshaft with the gear **(2)**.



SMIL17MEX0553AB 1

Fuel camshaft

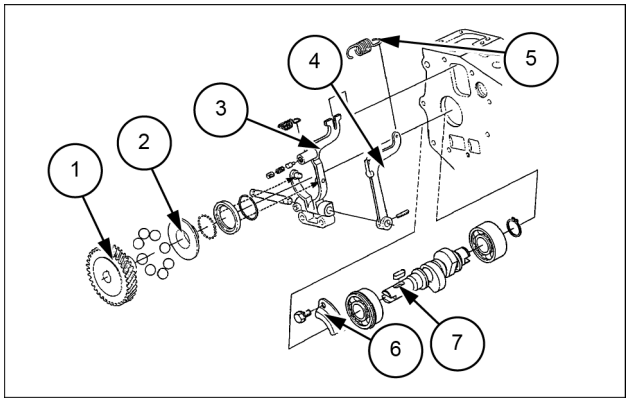
1. Remove the retaining plate **(6)**.
2. Remove the fork lever holder mounting screws **(8)**, then draw out the injection pump gear **(1)** and fuel camshaft **(7)** with the governor fork assembly.

    (2) Governor sleeve

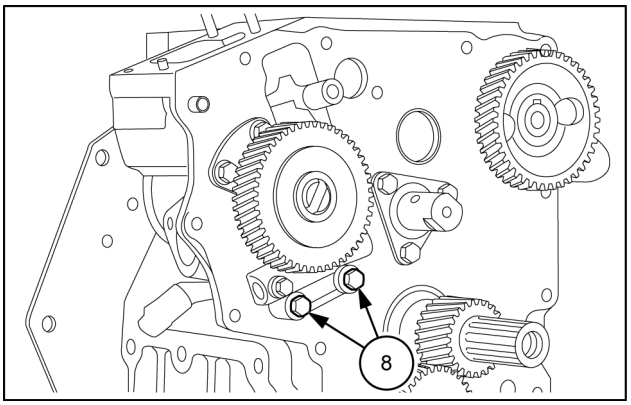
    (3) Fork lever 1

    (4) Fork lever 2

    (5) Governor spring



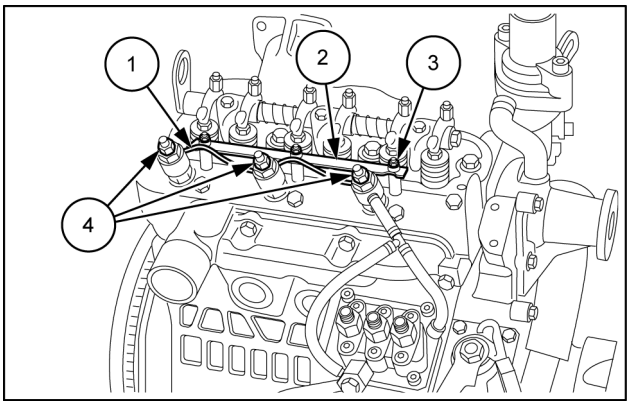
SMIL17MEX0610AB 2



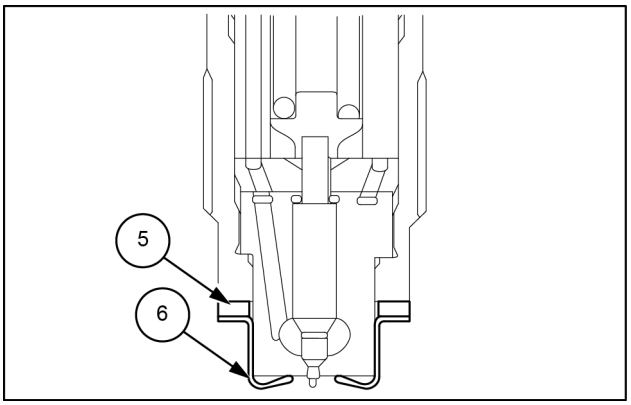
SMIL17MEX0554AB 3

Nozzle holder assembly and glow plug

1. Remove the overflow pipe **(1)**.
2. Remove the nozzle holder assemblies **(4)**.
3. Remove the copper gasket **(5)** and heat seal **(6)**.
4. Remove the lead **(2)** from the glow plugs **(3)**.
5. Remove the glow plugs **(3)**.



SMIL17MEX0524AB 3

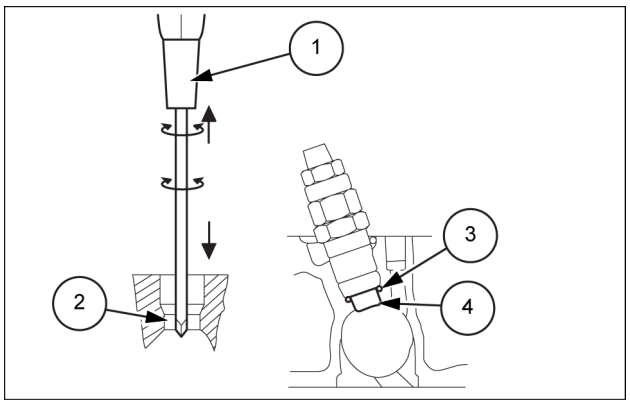


SMIL16MEX0785AB 4

Nozzle heat seal service removal procedure

NOTE: *use a phillips screwdriver **(1)** with a diameter bigger than the heat seal hole (approximately **6 mm** (**0.2 in**)).*

1. Drive the screwdriver **(1)** lightly into the heat seal hole **(2)**.
2. Turn the screwdriver three or four times each way.
3. While turning the screwdriver, slowly pull the heat seal **(4)** out together with the copper gasket **(3)**.
4. If the heat seal drops, repeat the above procedure.



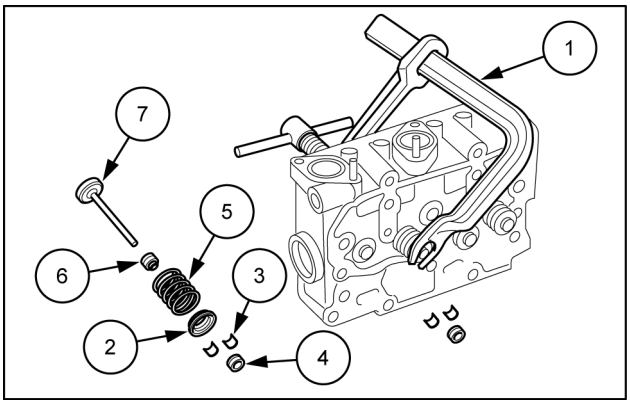
SMIL16MEX0786AB 5

Valves - Install

1. Wash the valve stem and valve guide hole, and apply engine oil sufficiently.
2. After installing the valve spring collet, lightly tap the stem to assure proper fit with a plastic hammer.

NOTICE: *do not change the combination of valve and valve guide.*

3. Install the valve **(7)** assembled with the valve stem seal **(6)**, the valve spring **(5)**, and the valve spring retainer **(2)**.
4. Install the valve spring collet **(3)** by means of the valve spring retainer **(2)** and valve spring replacer **(1)**.
5. Install the valve caps **(4)**.
6. Assemble the cylinder head (refer to **Cylinder heads - Assemble (10.101)**).



SMIL17MEX0529AB 1

Contents

Engine - 10

Connecting rods and pistons - 105

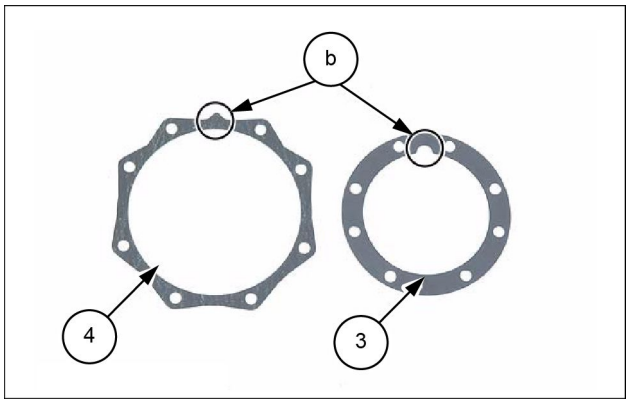
Index

Engine - 10

Connecting rods and pistons - 105

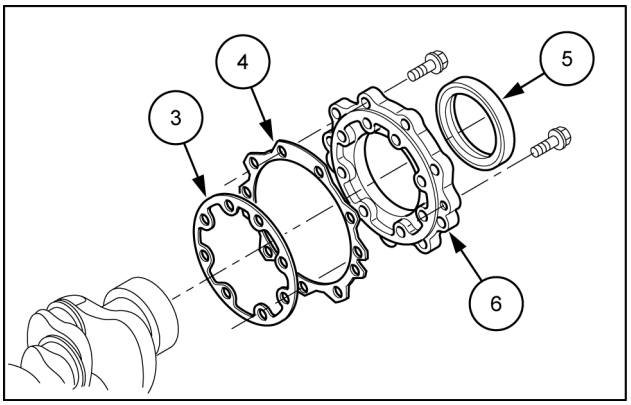
Bearing case cover

1. Fit the bearing case gasket **(3)** and the bearing case cover gasket **(4)**. Make sure of the gasket correct position.
   (b) Upside



SMIL17MEX0612AB 8

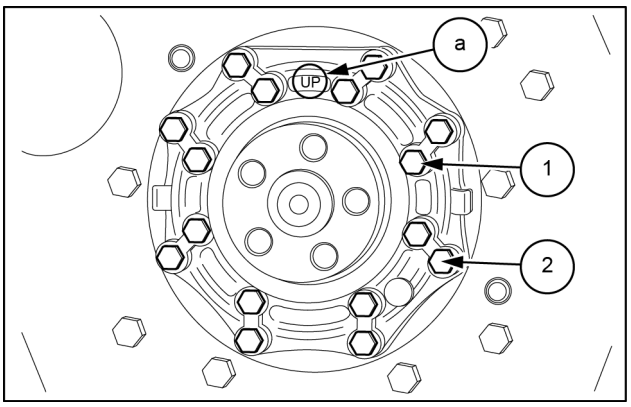
2. Install the bearing case cover **(6)** in the upward position marked as "UP" on the casting.
3. Apply engine oil to the oil seal **(5)** lip. Make sure that the oil seal is not rolled during the installation.



SMIL16MEX0827AB 9

4. Tighten the bearing case cover mounting screws **(1)** (outside) and **(2)** (inside) with even force on the diagonal line.

   Tightening torque: **9.81 – 11.2 N·m** (**7.24 – 8.26 lb ft**)



SMIL16MEX0826AB 10

Contents

Engine - 10

Fuel tanks - 216

SERVICE

Fuel tank lines - Replace

⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

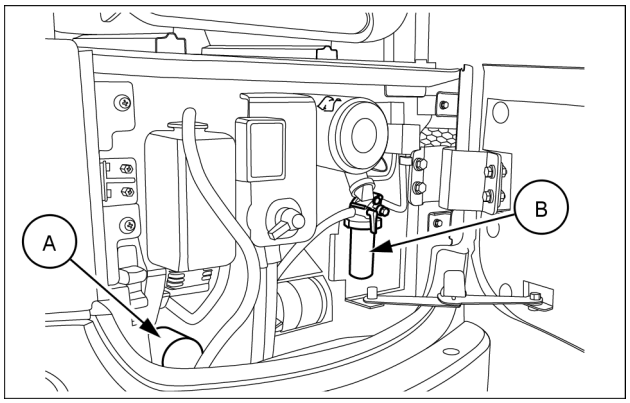
W1128B

⚠ WARNING

Chemical hazard!
When handling fuel, lubricants, and other service chemicals, follow the manufacturer's instructions. Wear Personal Protective Equipment (PPE) as instructed. Do not smoke or use open flame. Collect fluids in proper containers. Obey all local and environmental regulations when disposing of chemicals.
Failure to comply could result in death or serious injury.

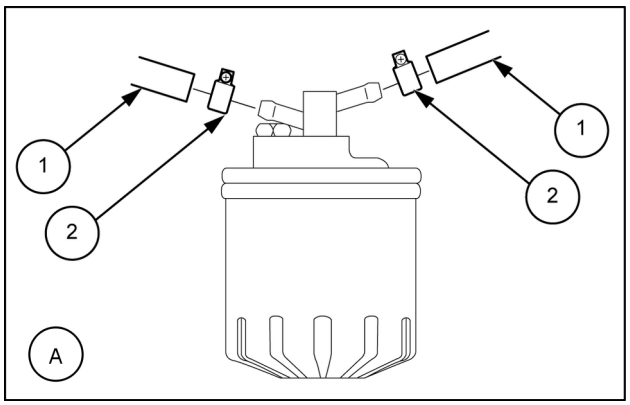
W0371A

1. Locate the fuel hoses **(1)** inside to the engine compartment:
   - Fuel filter **(A)** and related hoses
   - Water separator **(B)** and related hoses
   - Fuel pump (located in the upper side of the engine) and related hoses



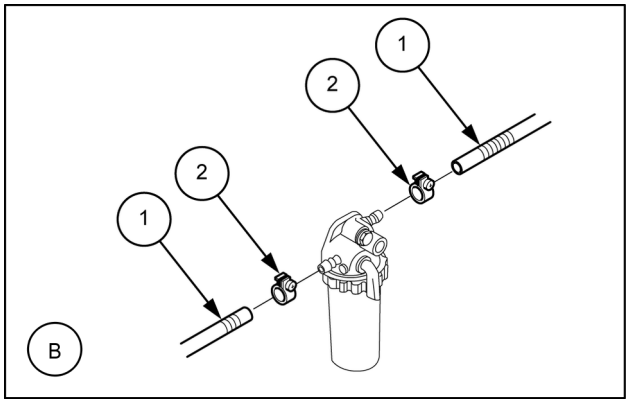
SMIL17MEX0468AB 1

2. Loosen the clamp **(2)** and remove the fuel hose **(1)** from both sides of the fuel filter **(A)**:
   - between the fuel filter and the fuel pump
   - between the fuel filter and the engine



SMIL16MEX0712AB 2

3. Loosen the clamp **(2)** and remove the fuel hose **(1)** from both sides of the water separator **(B)**:
   - between the water separator and the fuel pump
   - between the water separator and the fuel tank
4. Replace with a new fuel hose **(1)** and a new clamp **(2)**.
5. Tighten the clamp **(2)**.



SMIL16MEX0713AB 3

Contents

Engine - 10

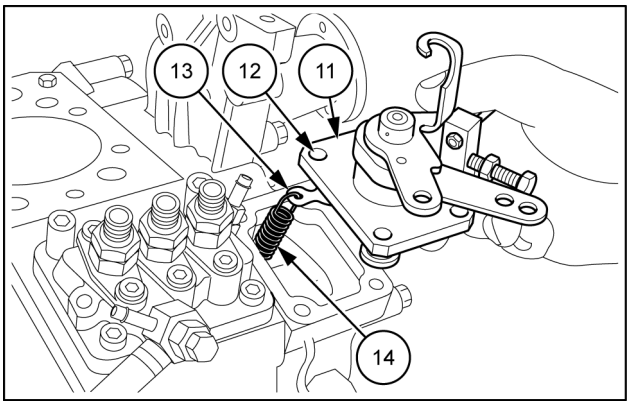
Fuel injection system - 218

6. Hook the governor springs (small and large) **(14)** to the governor lever **(13)** using the specific tool **(7)** and install the speed control plate **(11)**. Be sure to place the copper washers underneath two screws **(12)** in the upper of the speed control plate.
7. Install the engine stop solenoid rod **(15)** to the guide hole of cylinder block **(10)** (refer to figure **3**) and fix the engine stop solenoid **(16)** with socket head screws.

NOTE: *the sealant is applied to both sides of the soft metal gasket shim. The liquid gasket is not required for assembling.*

NOTE: *addition or reduction of shim (**0.5 mm** (**0.02 in**)) delays or advances the injection timing by approx. 0.009 rad (**0.5°**).*

NOTE: *in disassembling and replacing, be sure to use the same number of new gasket shims with the same thickness.*



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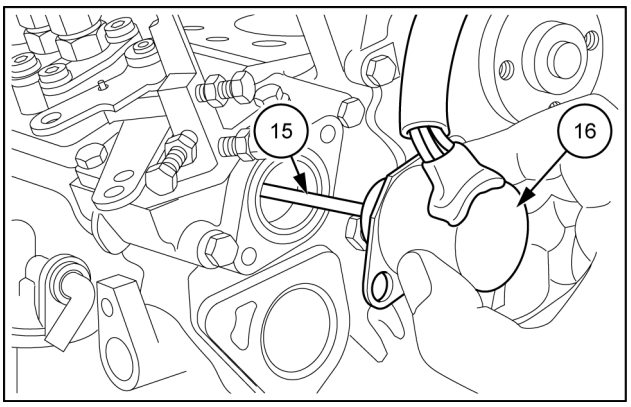
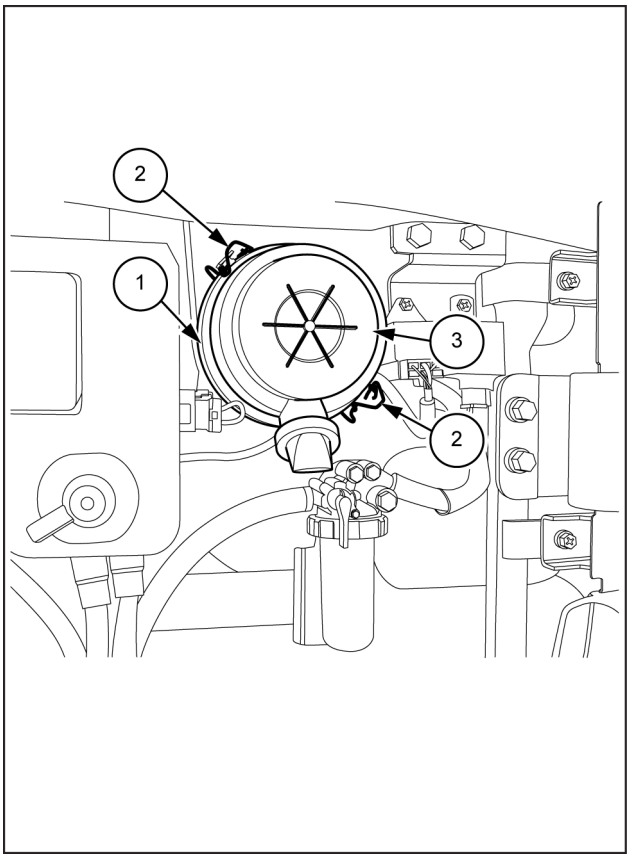


SMIL17MEX0544AB 5

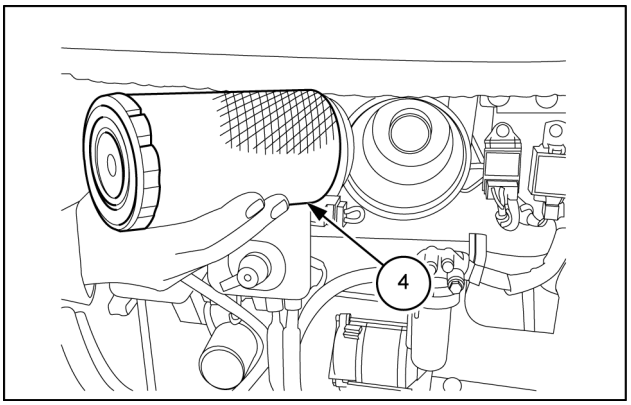
Air cleaner - Replace

1. Open the engine access door to access to the air cleaner **(1)**.
2. Unlock the two fastener **(2)** and remove the cover **(3)** of the air cleaner **(1)**.



SMIL16MEX2660BB 1

3. Remove the air filter element **(4)**.



SMIL16MEX2661AB 2

Radiator - Inspect - Air leakage

⚠ WARNING

Hazardous chemicals!
Coolant can be toxic. Avoid contact with skin, eyes, and clothing. Antidotes:
EXTERNAL - Rinse thoroughly with water. Remove soiled clothing.
INTERNAL - Rinse the mouth with water. DO NOT induce vomiting. Seek immediate medical attention.
EYES - Flush with water. Seek immediate medical attention.
Failure to comply could result in death or serious injury.

W0282A

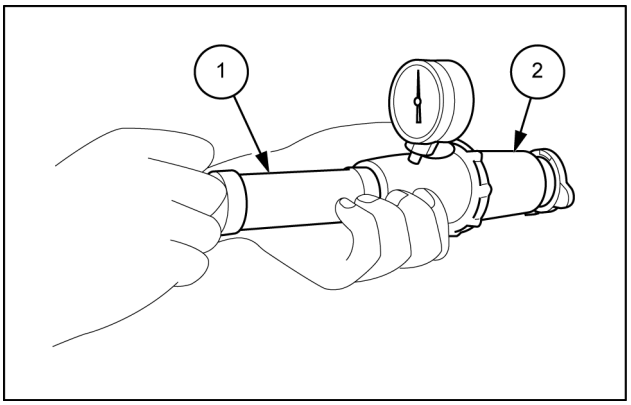
⚠ WARNING

Burn hazard!
Hot coolant can spray and scald if you remove the radiator or deaeration tank cap while the system is hot. To remove the cap: allow the system to cool, turn the cap to the first notch, and wait for all pressure to release. Remove the cap only after all pressure has released.
Failure to comply could result in death or serious injury.

W0367A

1. Set a radiator tester **(1)** and an adaptor **(2)** on the radiator cap.
2. Apply the specified pressure **88 kPa** (**13 psi**), and measure the time for the pressure to fall to **59 kPa** (**8.6 psi**)
3. If the measurement is less than the factory specification, replace the radiator cap.

Pressure falling time	Factory specification	More than **10 s** for pressure fall **88 – 59 kPa** (**13 – 8.6 psi**)



SMIL16MEX0767AA 1

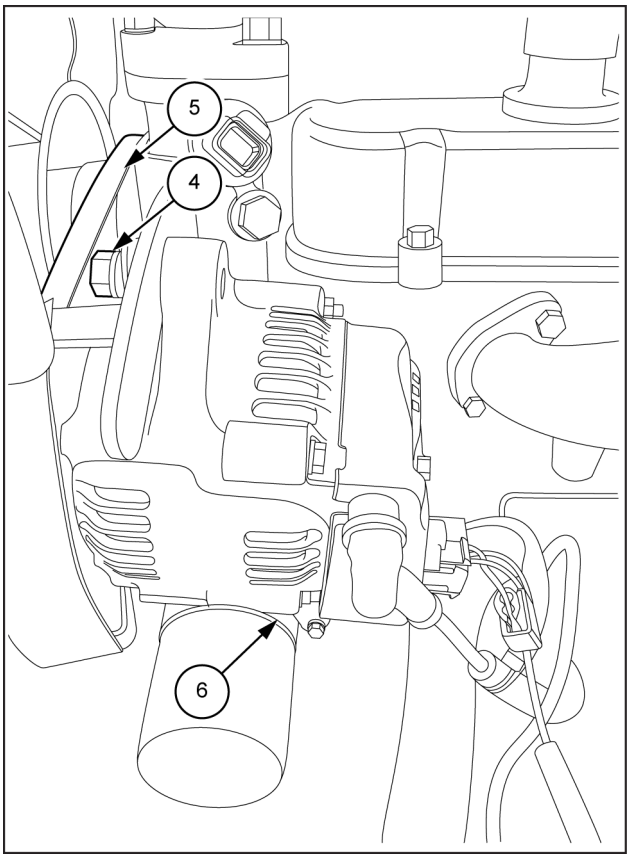
6. Fill the cooling system with the specified coolant.

NOTE: *the system has a maximum fill rate of* ***14 L/min*** *(****3.7 US gpm****). Do not exceed this fill rate.*

7. The system must be filled slowly to prevent air locks. Supply coolant up to the FULL mark of the expansion tank.
8. During filling, air must be vented from the engine coolant passage.
9. Install the coolant filling cap.
10. Start the engine until it reaches a temperature of **80 °C** (**176 °F**), and check for coolant leaks.
11. Check the coolant level again to make sure the system is full of coolant.

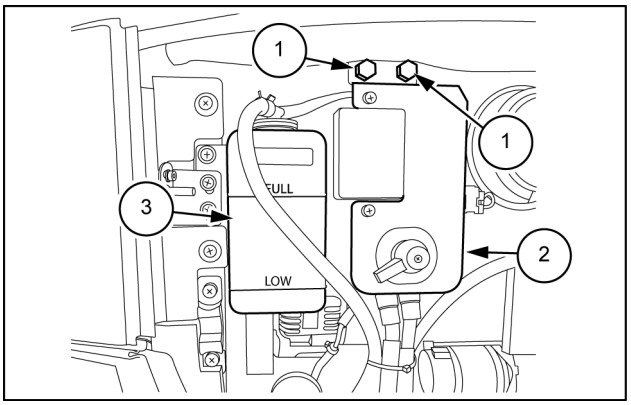
Belt - Install

1. Pass the belt through the blades of the fan and the radiator.
2. Install the belt **(5)** to the alternator pulley, engine fan pulley and engine shaft pulley.
3. Use a wrench [**17 mm**] to tighten the bolt **(4)** and the nut **(6)**.
4. Adjust the belt tension (For details, See " **Belt - Inspect (10.414)**").



SMIL17MEX0677BB 1

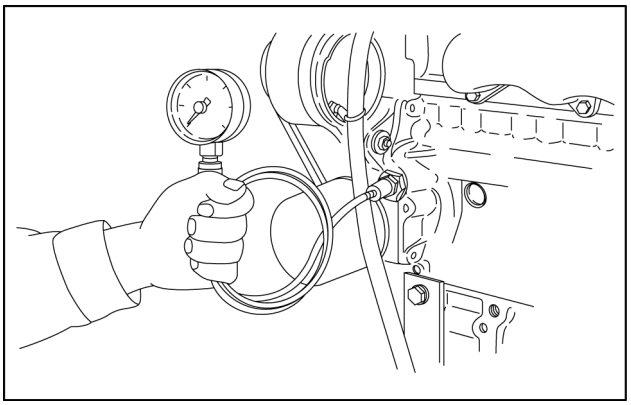
5. Install the engine coolant reservoir **(3)**.
6. Engage the battery disconnect switch **(2)** by means the two screws **(1)**.
7. Close the engine access door.



SMIL17MEX0675AB 2

Engine lubrication system - Check - Engine oil pressure

1. Remove the engine oil pressure switch, and set an oil pressure tester.
2. Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.
3. If the oil pressure is less than the allowable limit, check the following.
   - Engine oil insufficient
   - Oil pump damaged
   - Oil strainer clogged
   - Oil filter cartridge clogged
   - Oil gallery clogged
   - Excessive oil clearance
   - Foreign matter in the relief valve



SMIL16MEX0766AA 1

Engine oil pressure	At idle speed	Allowable limit	**49 kPa** (**7.1 psi**)
	At rated speed	Factory specification	**197 – 441 kPa** (**28.6 – 64.0 psi**)
		Allowable limit	**147 kPa** (**21.3 psi**)

When reassembling

- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

Tightening torque	Oil pressure switch	**15 – 19 N·m** (**11 – 14 lb ft**)

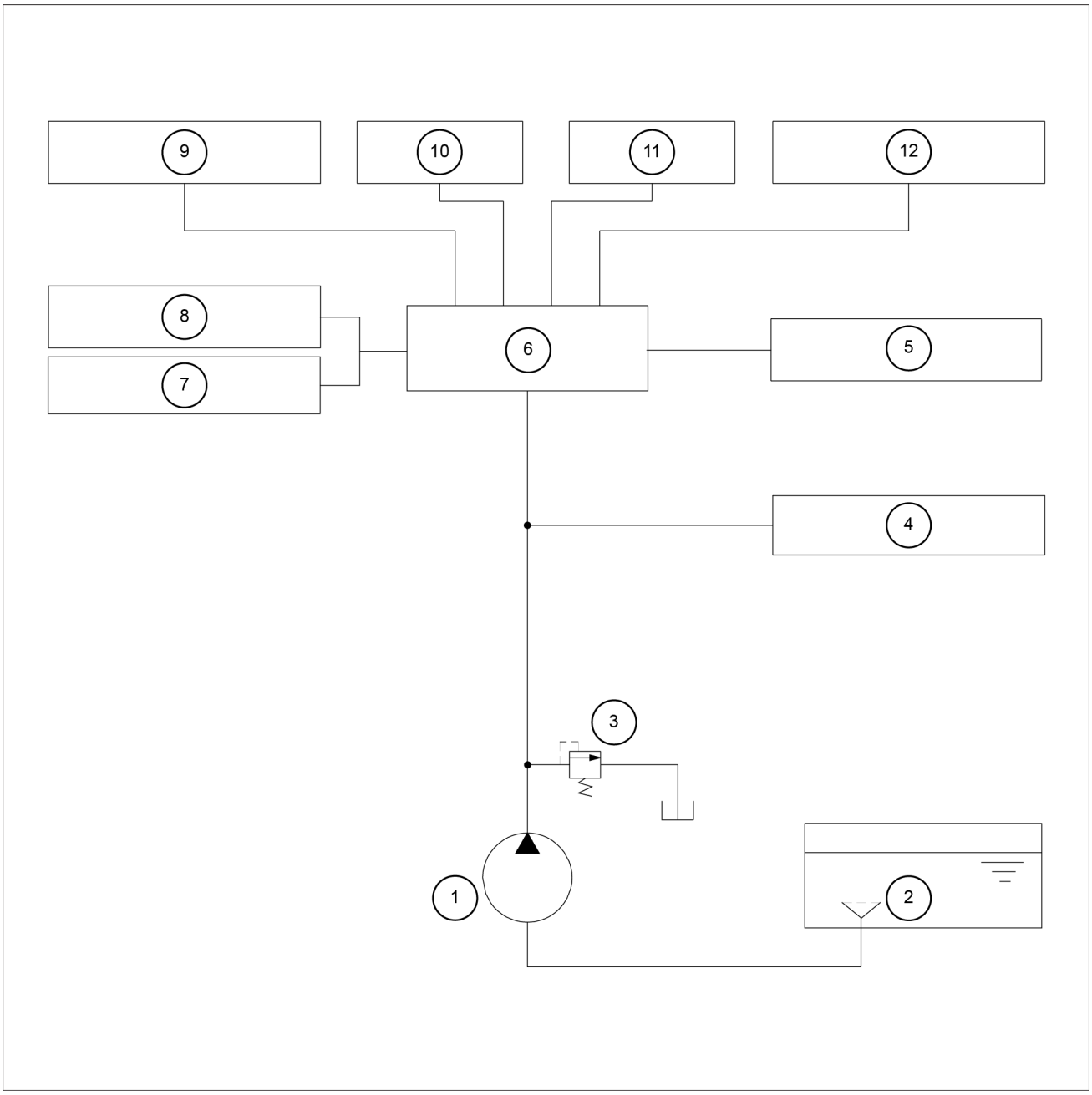
Index

Engine - 10

Oil cooler and lines - 408

PILOT CIRCUIT

The pilot pump **(1)** is provided with relief valve **(3)**, receives the oil from the hydraulic oil tank through the suction filter **(2)**.
The discharged oil from the pilot pump **(1)** flows to the remote control valves, the solenoid valve assemblies, the swing parking brake **(5)**, the main control valve **(7)** and the safety lock solenoid valve **(6)**.



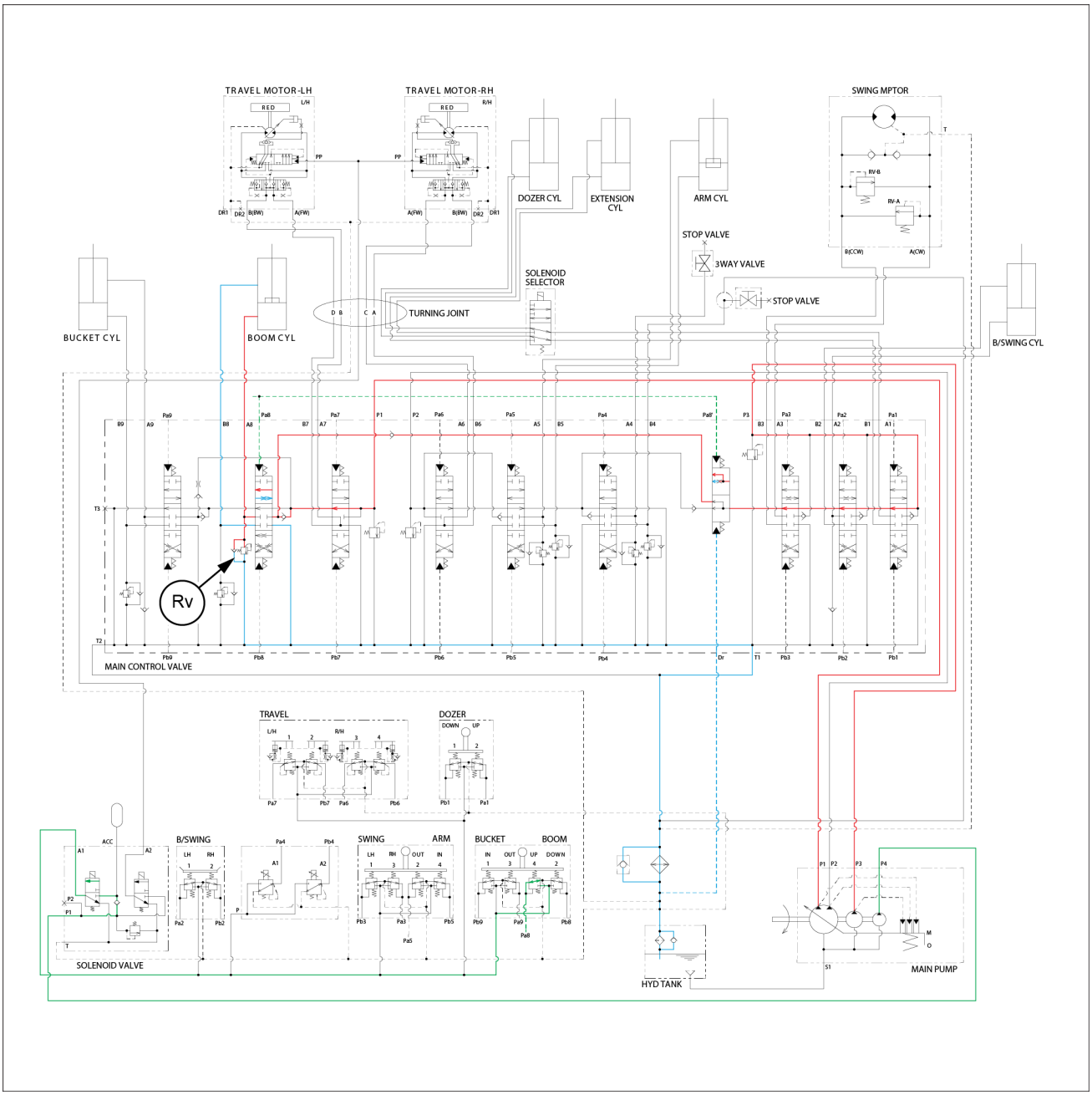
SMIL17MEX0119GB 4

1. Pilot pump
2. Suction filter
3. Relief valve - **30 bar** (**435 psi**)
4. Travel speed solenoid valve
5. Swing parking brake
6. Safety lock solenoid valve
7. Main control valve
8. Remote control valve (boom swing pedal)
9. Remote control valve (left-hand lever)
10. Remote control valve (travel pedal)
11. Remote control valve dozer
12. Remote control valve (right-hand lever)

Hydraulic systems - Hydraulic schema - Boom circuit

Boom up circuit

When the right-hand control lever is pulled back, the boom spools in the main control valve are moved to the up position by the pilot oil pressure from the remote control valve. The oil from the P1 and P3 pump flows into the main control valve and then goes to the large chamber of boom cylinders. At the same time, the oil from the small chamber of boom cylinders returns to the hydraulic oil tank through the boom spool in the main control valve. When this happens, the boom goes up. The excessive pressure in the boom cylinder bottom end circuit is prevented by relief valve.



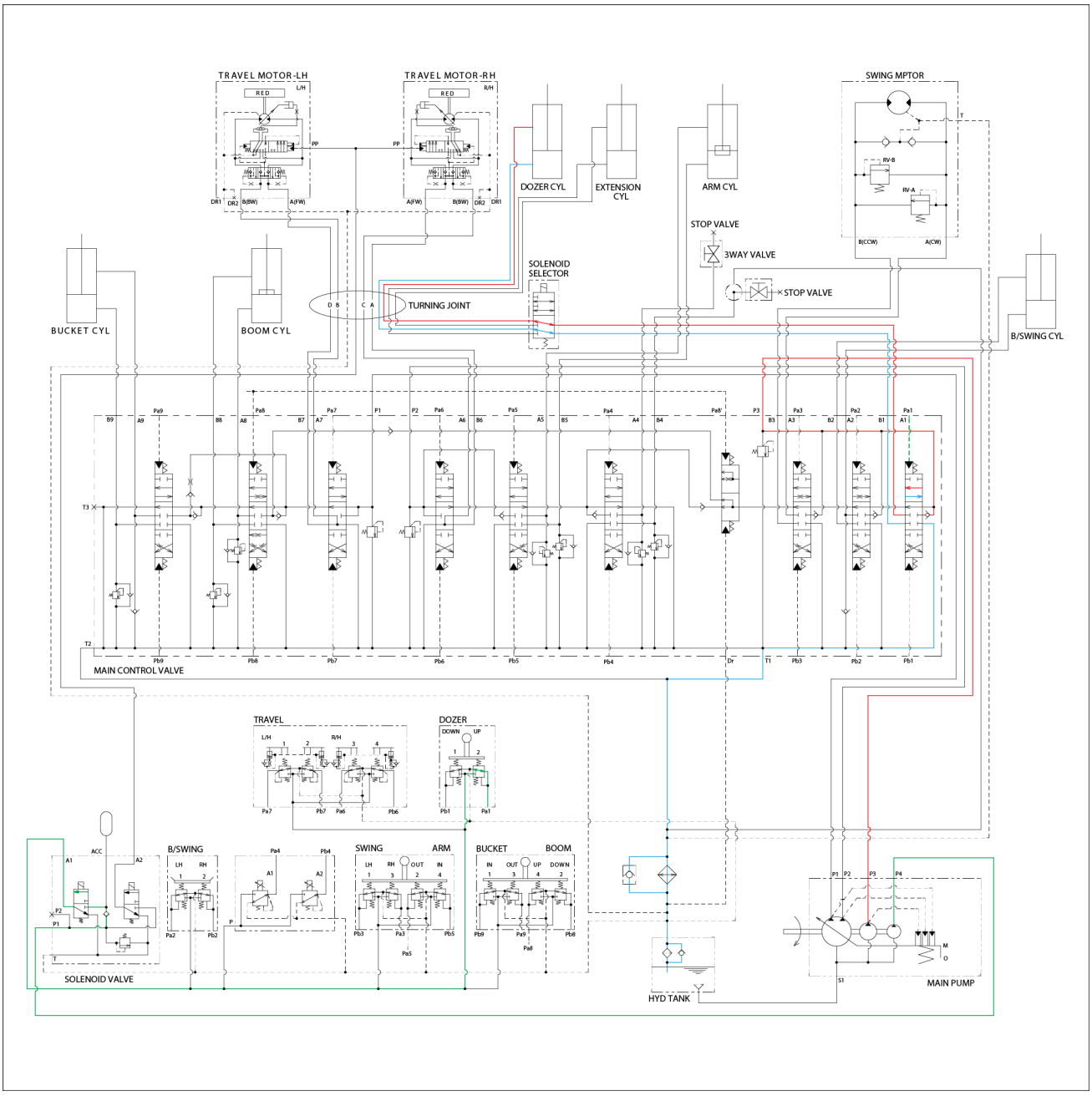
SMIL17MEX0999GB 1

	Pressure line		Pilot pressure line
	Tank line		Secondary pilot pressure line
	Pilot tank line	Rv.	Relief valve

Hydraulic systems - Hydraulic schema - Dozer circuit

Dozer up circuit

When the dozer control lever is pulled back, the dozer spool in the main control valve is moved to the dozer up position by the pilot oil pressure from the remote control valve. The oil from the P3 pump flows into the main control valve and then goes to the small chamber of dozer cylinders. At the same time, the oil from the large chamber of dozer cylinders returns to the hydraulic oil tank through the dozer spool in the main control valve. When this happens, the dozer goes up.



SMIL17MEX1009GA 1

Pressure line

Pilot pressure line

Tank line

Secondary pilot pressure line

Hydraulic systems - Service instruction - Troubleshooting

Machine inoperative with working engine

1. Check the oil level in the hydraulic oil tank.
   A. f the oil level in the hydraulic oil tank is below the lower red line of the level gauge, replenish with the hydraulic oil to the standard level.
   B. If the oil level in the hydraulic oil tank is between the red lines of the level gauge, proceed to step 2.
2. Check the noise from the hydraulic pump.
   A. If the hydraulic pump makes abnormal noise, hydraulic pump is broken. Disassemble and repair it.
   B. If the hydraulic pump does not make abnormal noise, proceed to step 3.
3. Check the noise from the hydraulic pump connections.
   A. If the hydraulic pump connections make abnormal noise, hydraulic pump or engine is faulty, refer to this manual.
   B. If the hydraulic pump connections do not make abnormal noise, proceed to step 4.
4. Measure the primary pilot pressure.
   A. If the primary pilot pressure is within the standard levels, proceed to step 5.
   B. If the primary pilot pressure is not within the standard levels, proceed to step 6.
5. Check the pilot piping clogging and oil leakage on pilot piping.
   A. If the pilot piping is clogged or oil leakage is presence on pilot piping, clean pilot piping interior or repair the piping.
   B. If the pilot piping is not clogged or oil leakage is not presence on pilot piping, pilot valve is faulty. Disassemble and repair it.
6. Check the gear pump in terms of the oil leakage.
   A. If the gear pump is delivery oil, pilot relief valve is faulty. Repair or replace it.
   B. If the gear pump is not delivery oil, gear pump is broken. Disassemble and repair it.

Contents

Hydraulic systems - 35

Reservoir, cooler, and filters - 300

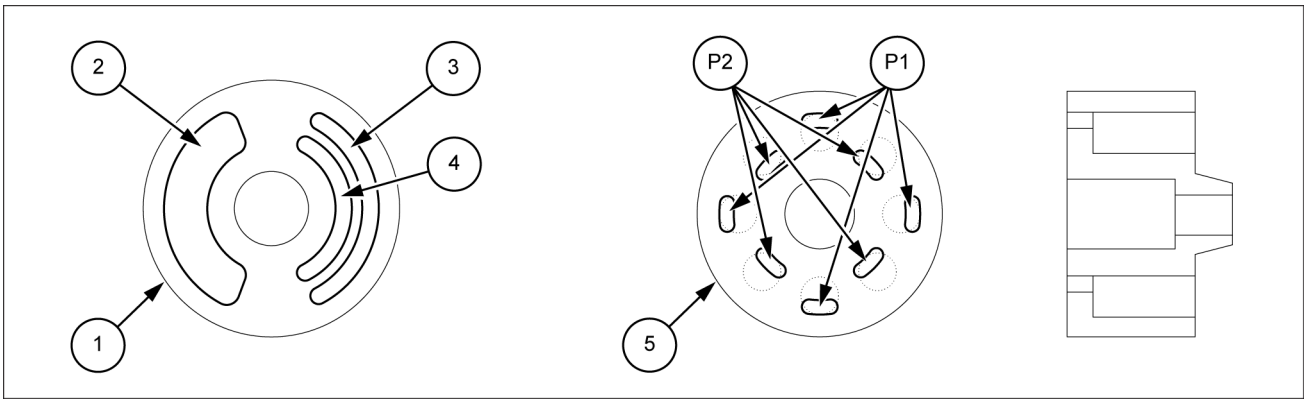
SERVICE

Oil cooler/Heat exchanger - Install

NOTE: *refer to* ***Radiator - Install (10.400)*** *for the hydraulic oil cooler installation.*

Pump - Static description

This pump is a variable displacement double-piston pump for discharge with two equal displacements from one cylinder block and using even numbered pistons to make functions of two same volume pumps available in one casing of a swash plate type variable volume piston pump. This method adopts one common suction groove **(2)** and two discharge grooves on the outer side **(P1)** and the inner side **(P2)** as shown in figure. The piston room in the cylinder barrel **(5)** opens to either the outer side **(P1)** or the inner side **(P2)** discharge groove of the valve plate alternately, and the discharges are performed independently on the inner side and the outer side.
Since this model has even numbered pistons, same number of pistons open to the outer side and the inner side of the valve plate **(1)**. All pistons are of same swash plate, so the discharges from the outer side **(P1)** and the inner side **(P2)** are equal.
Also, since only one swash plate is used, the discharges from **(3)** and **(4)** ports changes equally when the swash plate angle of rake changes in variable controls. So, there is no difference between the two discharges.



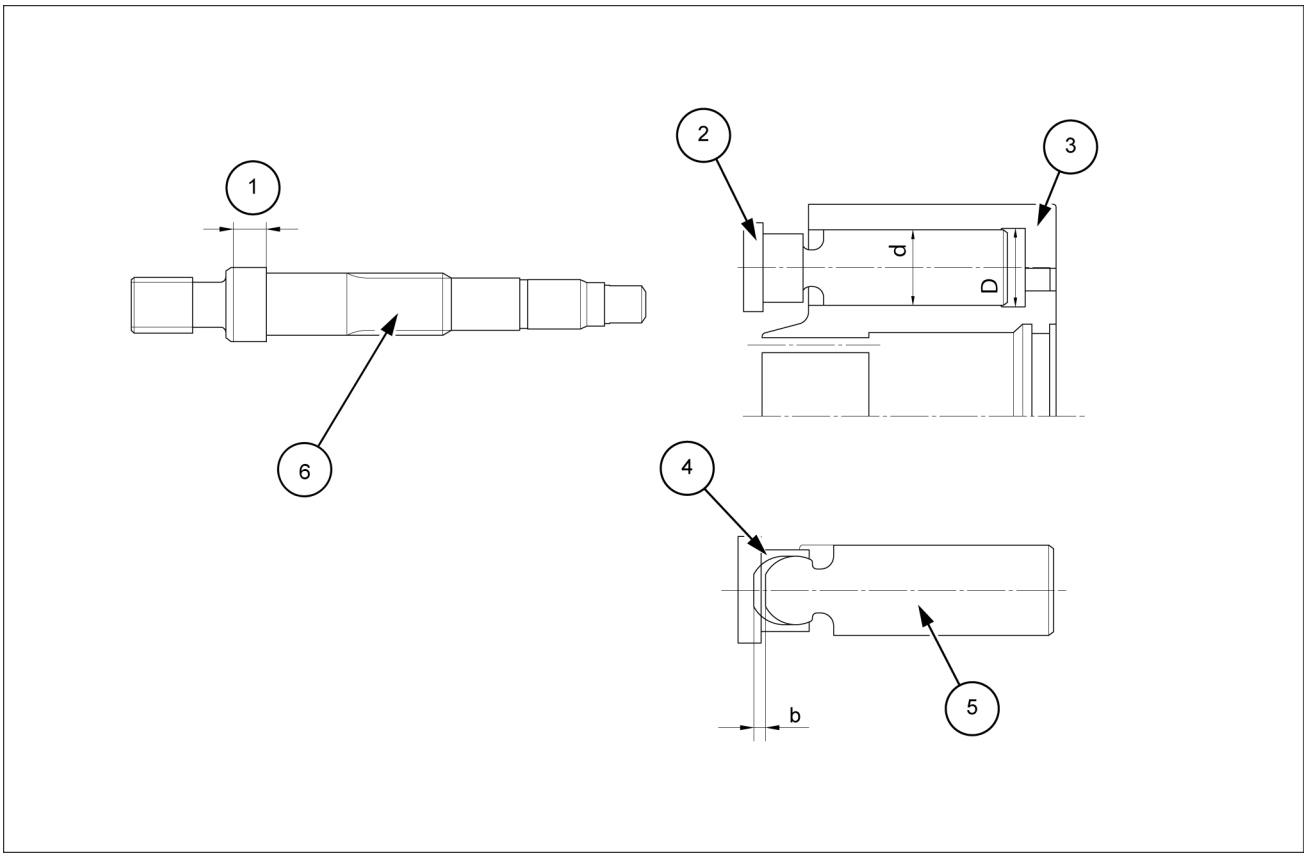
SMIL17MEX0497EB 1

P1. Outer side grooves
P2. Inner side grooves
1. Valve plate
2. Suction groove
3. Discharge groove P1
4. Discharge groove P2
5. Cylinder barrel

Pump - Inspect

1. Before inspection, wash the parts well and dry them completely.
2. Inspect the main parts with care and replace them with new parts in case of abnormal wear exceeding the allowable limit.

Inspection points



SMIL16MEX1133FB 1

(1) Installation part of oil seal
(2) Piston assembly

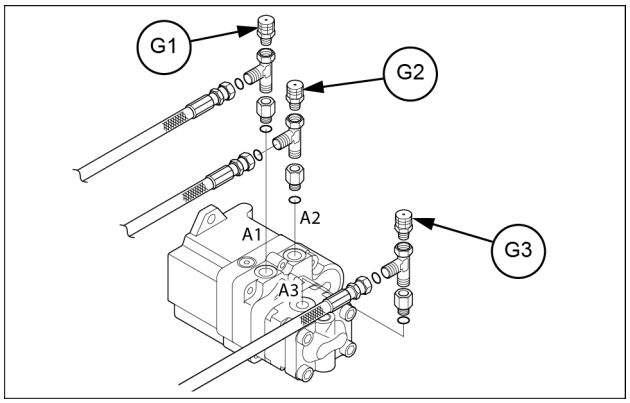
Part	Inspection result	Standard value	Action
Shaft **(6)**	Excessive wear on the seal surface.	Worn depth : **0.0250 mm** (**0.0010 in**) or more	Replace the shaft.
Valve plate	Excessive wear or damages on the sliding surface.	Worn depth : **0.0200 mm** (**0.0008 in**) or more	Replace the cylinder barrel kit.
Cylinder barrel **(3)**	Excessive wear or damages on the sliding surface.	Worn depth : **0.0200 mm** (**0.0008 in**) or more	Replace the cylinder barrel kit.
	Clearance between the pistons (D-d).	**0.0300 mm** (**0.0012 in**) or more	Replace the cylinder barrel kit.
Piston **(5)**, Shoe **(4)**	Wear of joint section	Play **(b)** between the shoe and the piston (**0.200 mm** (**0.008 in**) or more by hand operation).	Replace the cylinder barrel kit.
Seals (O-rings, gasket, etc.)	Damage, excessive rust	–	Replace each part.

Pump - Test

MAIN PUMP DELIVERY PRESSURE

Preparation

1. Stop the engine.
2. To measure the main pump pressure. Loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1, G2, G3) as shown.
3. Start the engine and check for oil leakage from the port.
4. Keep the hydraulic oil temperature at **45 – 55 °C** (**113 – 131 °F**).



SMIL17MEX1033AB 1

Measurement

1. Measure the main pump delivery pressure at high idle.

Evaluation

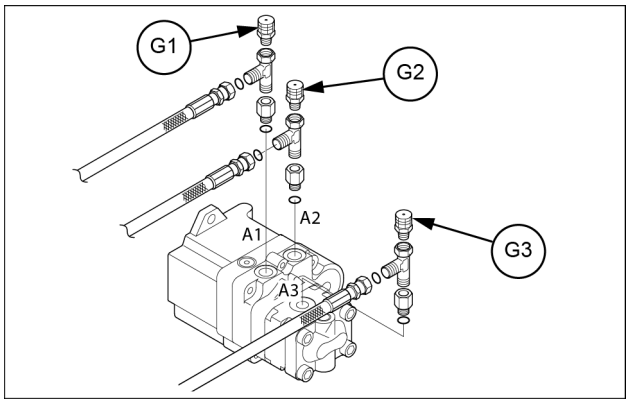
The average measured pressure should meet the following specifications.

Standard value: **1.47 – 2.45 MPa** (**213.22 – 355.37 psi**).

SYSTEM PRESSURE REGULATOR RELIEF SETTING

Preparation

1. Stop the engine.
2. To measure the system relief pressure, loosen the cap of screw coupling and connect pressure gauge to the main pump gauge port (G1, G2, G3).
3. Start the engine and check for oil leakage from the port.
4. Keep the hydraulic oil temperature at **45 – 55 °C** (**113 – 131 °F**).



SMIL17MEX1033AB 2

Measurement

1. Slowly operate each control lever of boom, arm and bucket functions at full stroke over relief and measure the pressure.
2. In the swing function, place bucket against an immovable object and measure the relief pressure.

Port	Port name	Port size	Tightening torque	Port	Port name	Port size	Tightening torque
T1	Tank return port	PF 1/2	**59 – 69 N·m (44 – 51 lb ft)**	B8	Boom down port	PF 1/4	**25 – 30 N·m (18 – 22 lb ft)**
A6	Travel [left-hand/rearward] port	PF 3/8	**39 – 49 N·m (29 – 36 lb ft)**	A9	Bucket out port		
B6	Travel [left-hand/forward] port			B9	Bucket in port		
A7	Travel [right-hand/ rearward] port			Pa1	Dozer down pilot port	PF 1/8	**9.8 – 14.1 N·m (7.2 – 10.4 lb ft)**
B7	Travel [right-hand/forward] port			Pb1	Dozer up pilot port		
P1	P1 (A1) pump port			Pa2	Boom swing (right-hand) pilot port		
P2	P2 (A2) pump port			Pb2	Boom swing (left-hand) pilot port		
P3	P3 (A3) pump port			Pa3	Swing (right-hand) pilot port		
T2	Tank return port			Pb3	Swing (left-hand) pilot port		
T3	Tank return port			Pa5	Arm out pilot port		
A1	Dozer	PF 1/4	**25 – 30 N·m (18 – 22 lb ft)**	Pb5	Arm in pilot port		
B1	Dozer			Pa6	Travel [left-hand/rearward] pilot port		
A2	Boom swing (right-hand) port			Pb6	Travel [left-hand/forward] pilot port		
B2	Boom swing (left-hand) port			Pa7	Travel [right-hand/rearward] pilot port		
A3	Swing (left-hand) port			Pb7	Travel [right-hand/forward] pilot port		
B3	Swing (right-hand) port			Pa8	Boom up pilot port		
A4	Option port			Pb8	Boom down pilot port		
B4	Option port			Pa9	Bucket out pilot port		
A5	Arm out port			Pb9	Bucket in pilot port		
B5	Arm in port			Pa8’	Boom connecting pilot port		
A8	Boom up port			Dr	Travel drain port		

1. Release the pressure in the hydraulic system (refer to **Hydraulic systems - Service instruction - Releasing pressure (35.000)**).

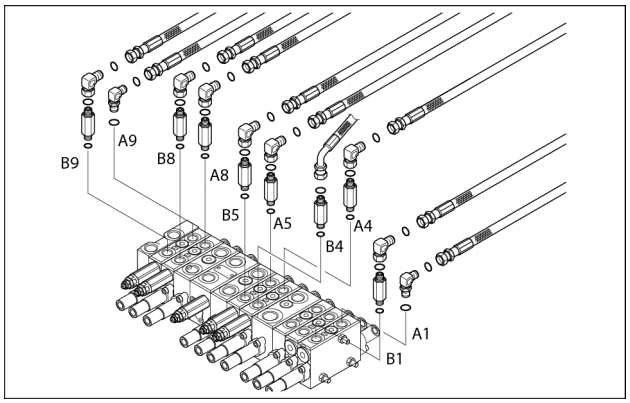
NOTE: *prepare an oil pan in order to collect the oil that flows out from the pump suction pipe.*

2. Disconnect the hydraulic hoses.
3. Disconnect the pilot line hoses.
4. Remove the links.
5. Sling the control valve assembly and remove the four control valve mounting bolts.

   Weight: **14 kg** (**31 lb**)

6. Remove the control valve assembly.

NOTE: *make sure that all hoses are disconnected before removing the main control valve.*



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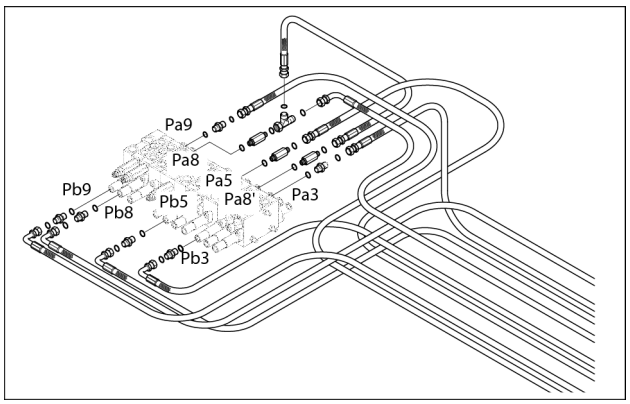
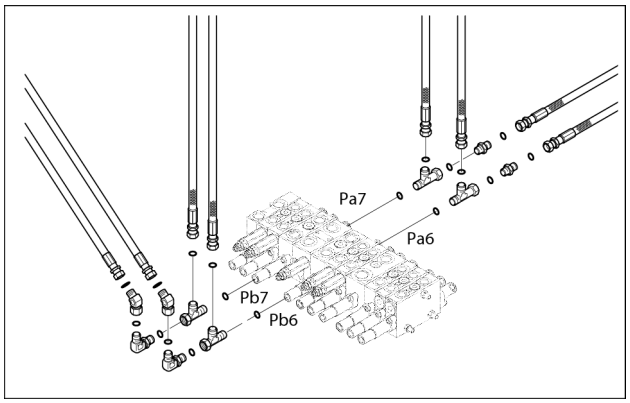


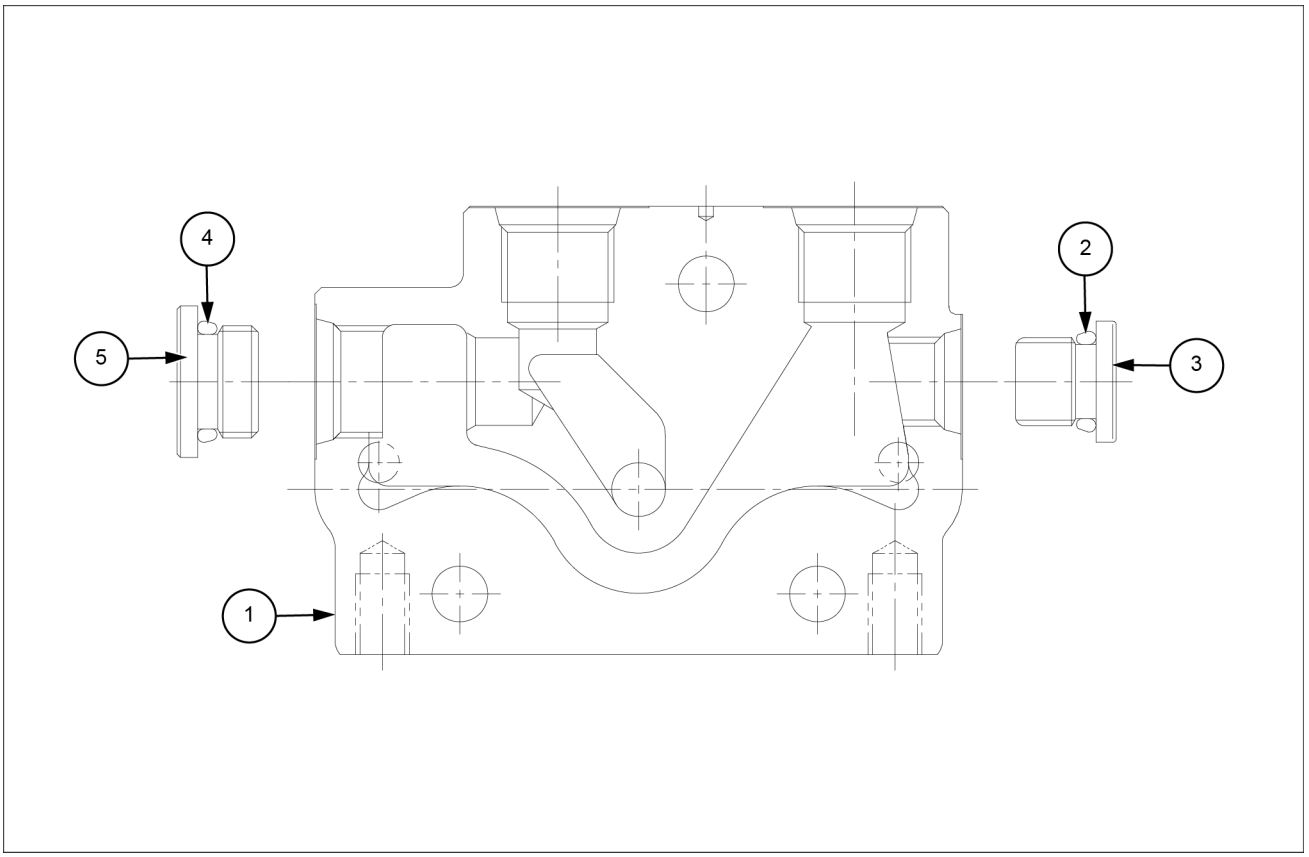
SMIL17MEX1042AA 2



SMIL17MEX1043AA 3

Plug (PF3/8, PF1/4) of outlet component

1. Loosen plug **(3)** by using **6 mm** hexagonal wrench to remove it from outlet body **(1)**.
2. Loosen plug **(5)** by using **8 mm** hexagonal wrench to remove it from outlet body **(1)**.



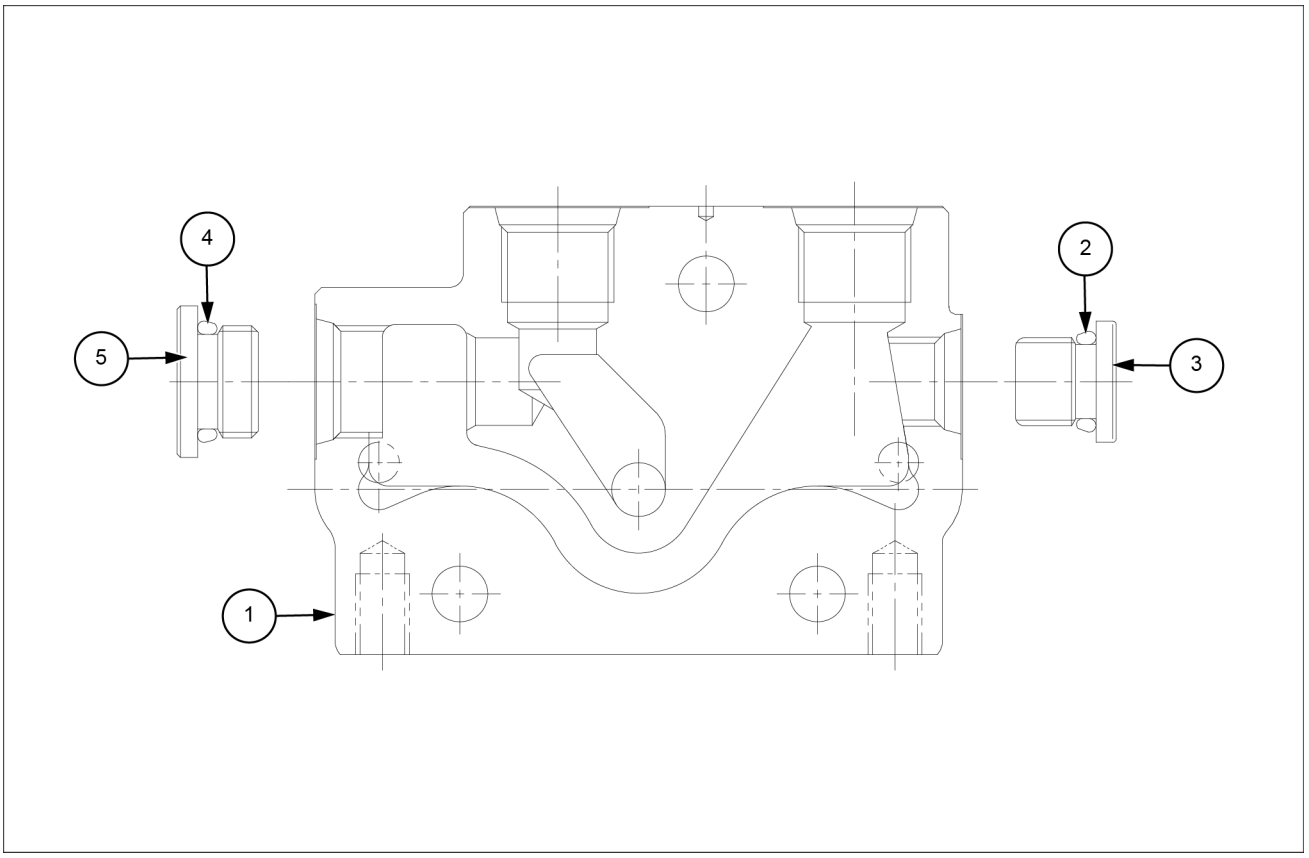
SMIL17MEX1053FB 7

1. Dozer (symbol QC)
2. Boom swing (symbol TC)
3. Swing (symbol VC)
4. Connecting (symbol CA)
5. PTO (symbol SE)
6. Arm (symbol SC)
7. Travel (symbol PE)
8. P1, P2 Inlet (symbol DA)
9. Travel (symbol PF)
10. Boom (symbol ND)
11. Bucket (symbol NF)
12. Outlet

NOTE: *do not apply hydraulic oil or grease to O-rings.*

Other parts assembly procedures

1. Plug (PF3/8, PF1/4) of outlet component
   After checking that plug **(3)** is mounted with O-ring **(2)**, screw the plug into outlet body **(1)** loosely and then tighten it with specified torque by using **6 mm** hexagonal wrench. And after checking that plug **(5)** is mounted with O-ring **(4)**, screw the plug into outlet body **(1)** loosely and then tighten it with specified torque by using **8 mm** hexagonal wrench.



SMIL17MEX1053FB 3

Index

Hydraulic systems - 35

Main control valve - 359

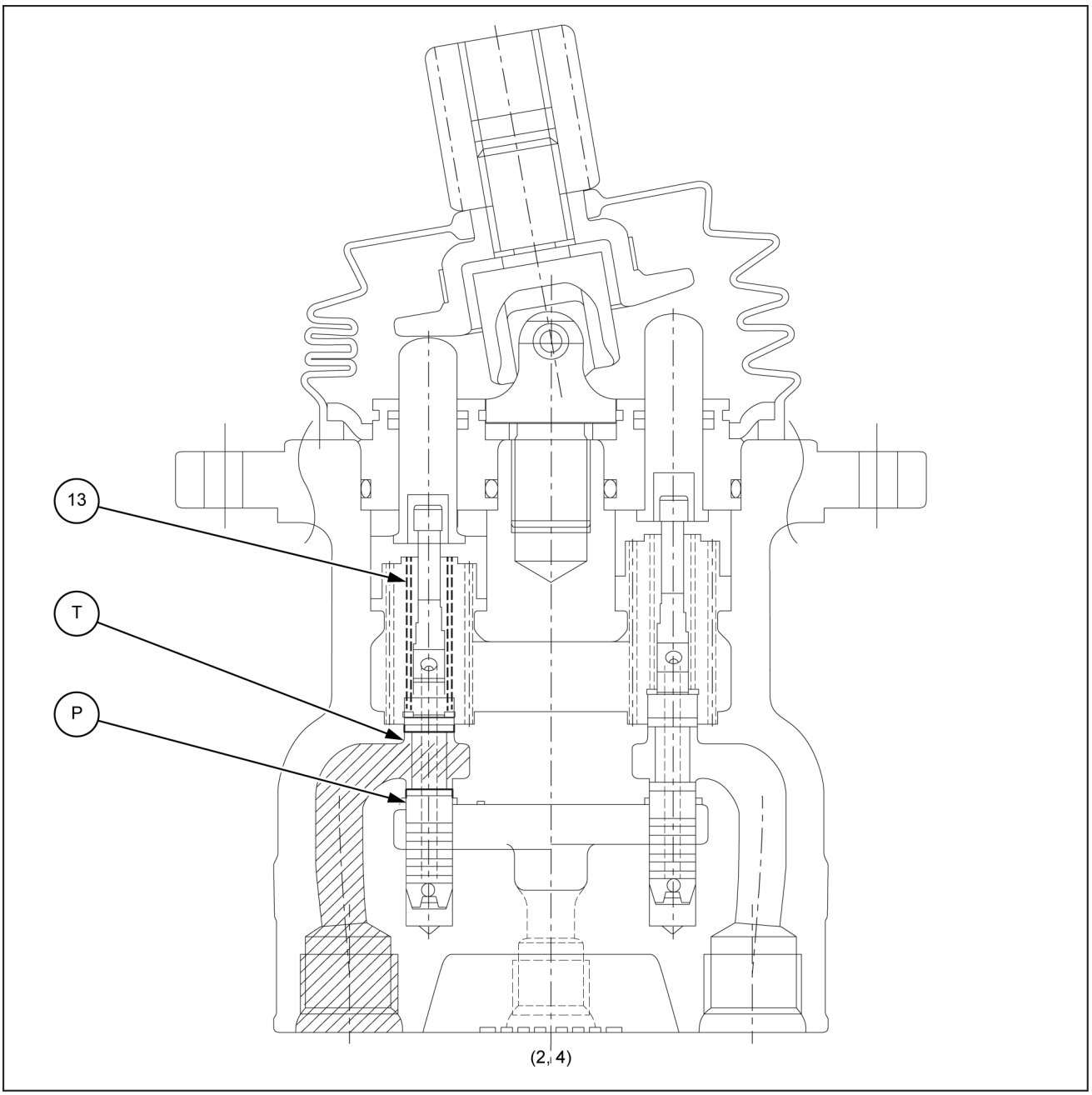
Index

Hydraulic systems - 35

Pilot system - 357

When the handle is held (See Fig. 4)

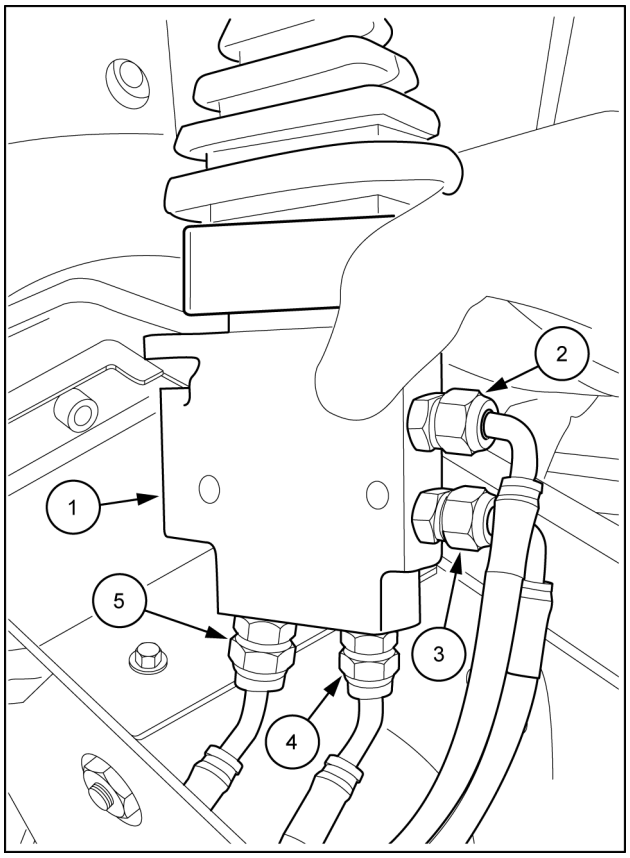
When the handle is tilted and the pressure of the ports (2, 4) rises to a pressure equivalent to the set spring force **(13)**, the hydraulic pressure and the spring force are in balance. When the ports (2, 4) pressure becomes higher than the set pressure, the ports (2, 4) and the P port **(P)** close and the ports (2, 4) and the T port **(T)** open. When the ports (2, 4) pressure becomes lower than the set pressure, the ports (2, 4) and the P port **(P)** open and the ports (2, 4) and the T port **(T)** close, so the secondary pressure is held constant.



SMIL16MEX0320GB 4

13. Spring
P. P port
T. T port

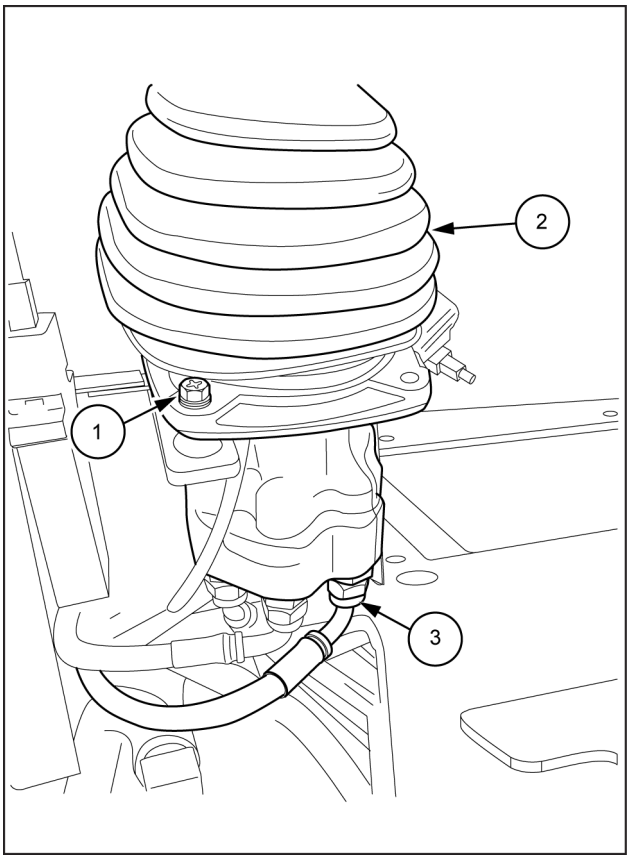
7. Remove the hydraulic hoses **(2)**, **(3)**, **(4)**, and **(5)** from the dozer hand control **(1)**.



SMIL17MEX0283BB 3

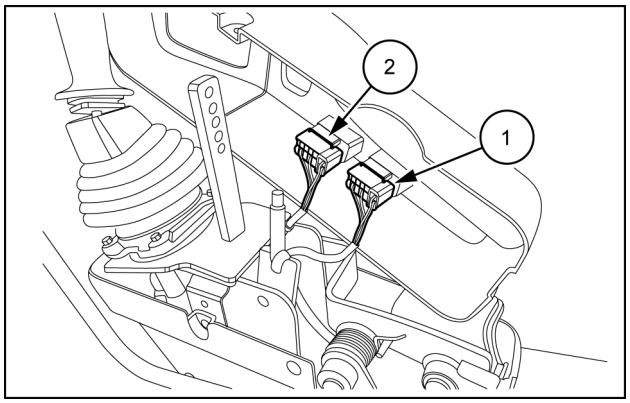
Hand control - Install - Left side

1. Use a wrench [**19 mm**] to install the six hoses **(1)** on the left-hand control lever **(2)**.
2. Install the left-hand control lever **(2)** on the bracket and then use a wrench [**19 mm**] to tighten the three screws **(3)**.



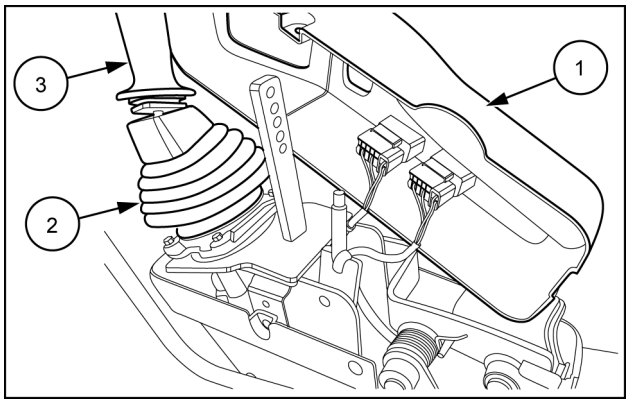
SMIL17MEX0284BB 1

3. Connect the electrical connector **CS-67 (1)**.
4. Connect the electrical connector **CN-36 (2)**.



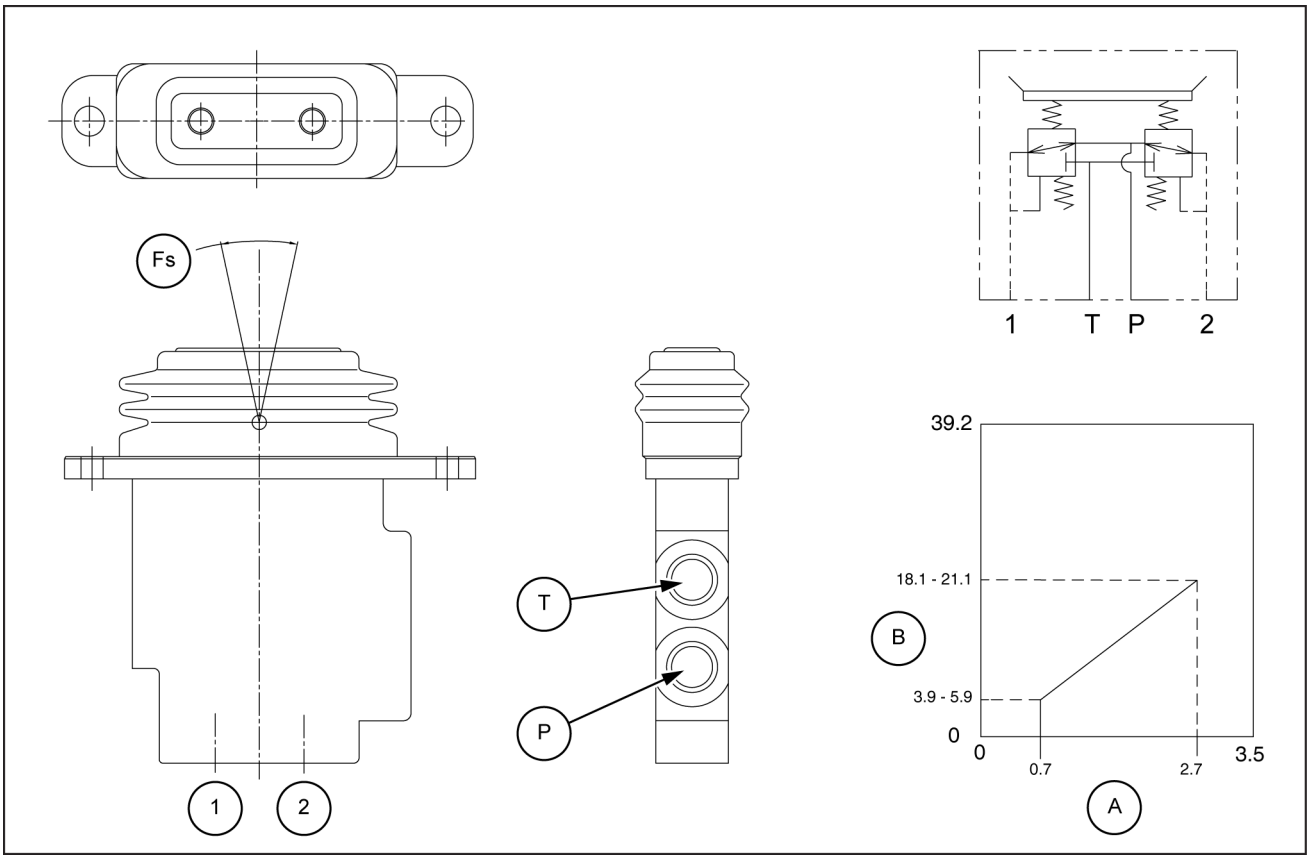
SMIL17MEX0242AB 2

5. Install the left-hand console **(1)** on the hand control lever **(3)** and refit the bellow **(2)**.



SMIL17MEX0241AB 3

Remote control valve (boom swing)

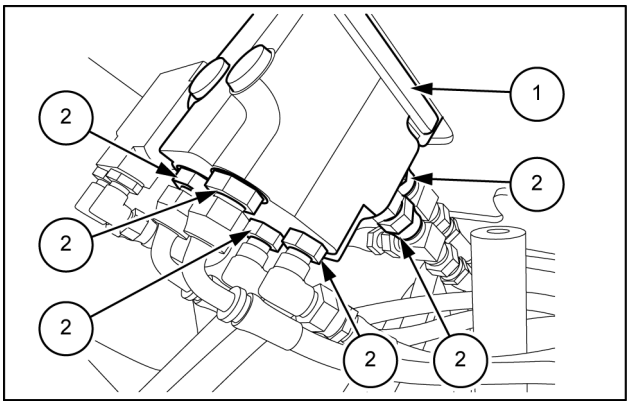


SMIL16MEX0268FB 2

A. Push rod stroke (mm)
B. Secondary pressure (bar)
Fs. Full stroke **24°**

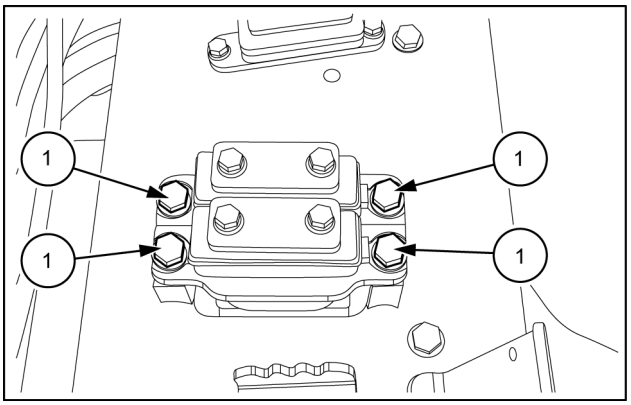
Port	Port name	Port size
1	Boom swing left	PF 1/4
2	Boom swing right	PF 1/4
P	Pressure	PF 1/4
T	Return	PF 1/4

13. Use a wrench [**19 mm**] to remove the six hoses **(2)** from the travel remote control valve **(1)**.
    - Mark the hoses so that the connectors match at the time of assembly.
    - Use caps or plugs to cover the hoses and lines to prevent any entry of water, dust or dirt.
    - Clean the hoses by spraying with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.



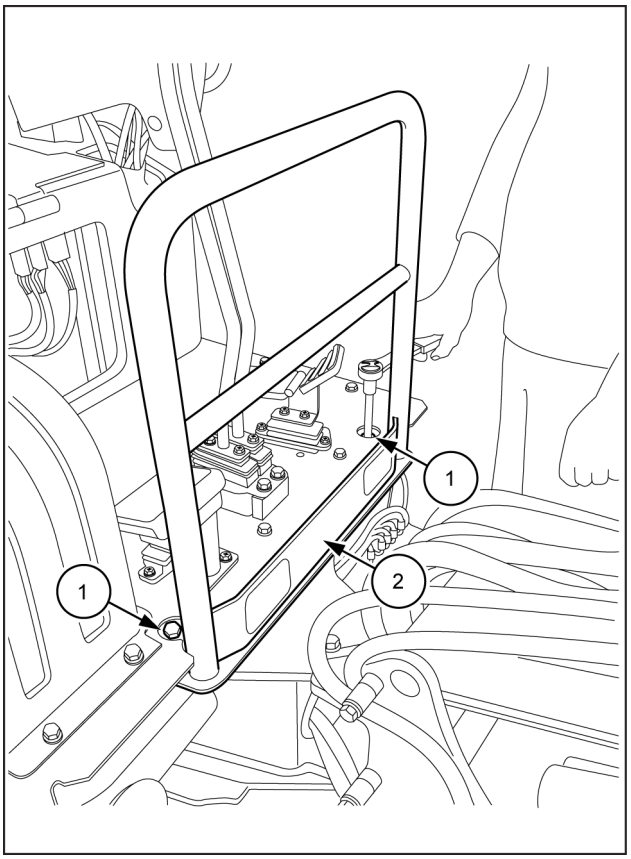
SMIL17MEX0690AB 8

14. Use a wrench [**13 mm**] to remove the four bolts **(1)** that fix the travel remote control valve.
15. Remove the remote control valve.



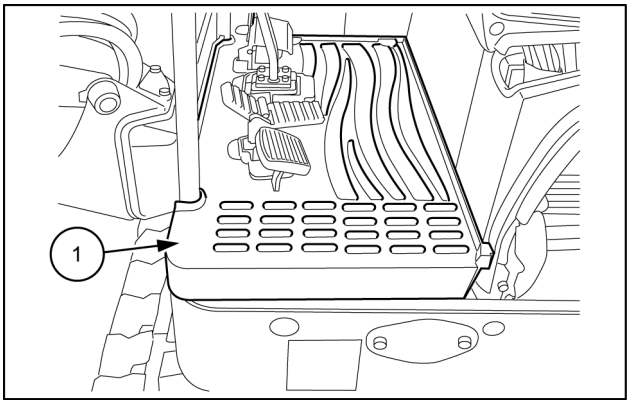
SMIL17MEX0691AB 9

12. Install the front-guard **(2)** and then use a wrench [**19 mm**] to remove the two bolts **(1)**.



SMIL17MEX0238BB 7

13. Install the floor mat **(1)**.
14. Refill the hydraulic oil.
15. Install the right-hand side and the left-hand-side panels. For details see **Side panels - Install (90.100)**.



SMIL17MEX0207AB 8

1. Release the pressure in the hydraulic system (refer to **Hydraulic systems - Service instruction - Releasing pressure (35.000)**).

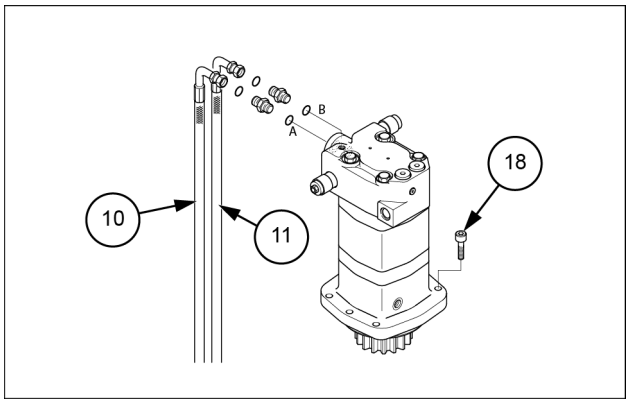
NOTE: *prepare an oil pan in order to collect the oil that flows out from the hydraulic swing unit.*

2. Disconnect hose assembly **(8)**, **(10)**, **(11)**, and **(13)**.
3. Sling the hydraulic swing unit and remove the mounting bolts **(18)**.

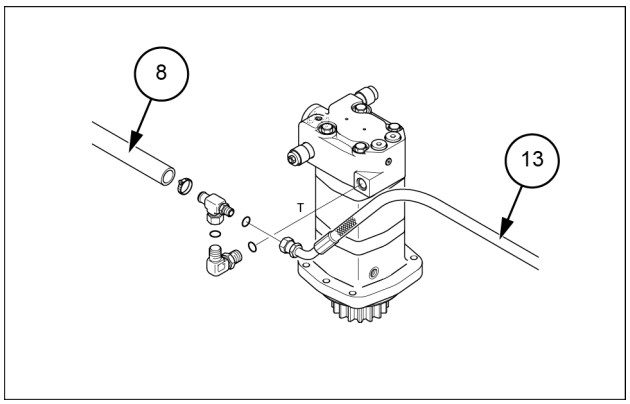
   Weight: **15.0 kg** (**33.1 lb**)

4. Remove the hydraulic swing unit.

NOTE: *make sure that all hoses are disconnected before removing the hydraulic swing unit.*



SMIL17MEX1061AB 1



SMIL17MEX1062AB 2

Swing reduction motor - Prepare for disassemble and assemble

⚠ WARNING

Crushing hazard!
The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.
Failure to comply could result in death or serious injury.

W0256A

⚠ WARNING

Chemical hazard!
When handling fuel, lubricants, and other service chemicals, follow the manufacturer's instructions. Wear Personal Protective Equipment (PPE) as instructed. Do not smoke or use open flame. Collect fluids in proper containers. Obey all local and environmental regulations when disposing of chemicals.
Failure to comply could result in death or serious injury.

W0371A

General precautions

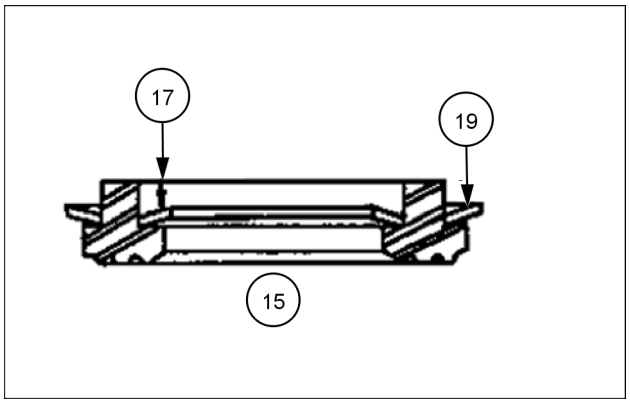
1. Cleanliness is extremely important when repairing a hydraulic motor.
2. Work in a clean area.
3. Before disconnecting the lines, clean the port area of the motor thoroughly.
4. Use a wire brush to remove foreign material and debris from around the exterior joints of the motor.

NOTE: *Don't disassemble the pinion gear and valve housing assembly if not necessary.*

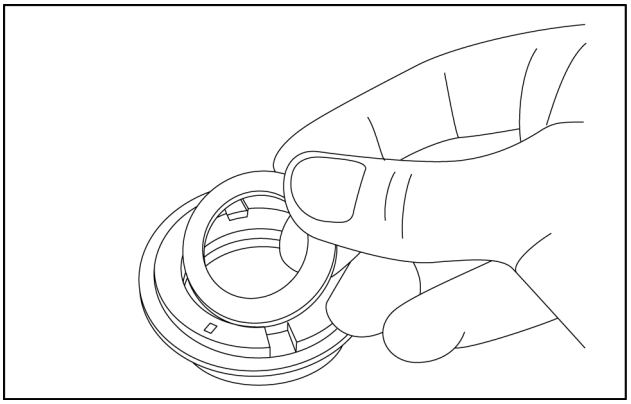
Items to prepare

Tool name	Information
Torque wrench	**9.8 – 97.6 N·m** (**7.2 – 72.0 lb ft**)
Socket	9/16" (or **14 mm**)
Hexagon socket	**5 mm**, **8 mm**
Snap ring pliers	-
Screwdriver	-
Plastic hammer	-
Press machine	-

13. Install the inner face seal **(17)** and outer face seal **(19)** on the balancing ring **(15)**.

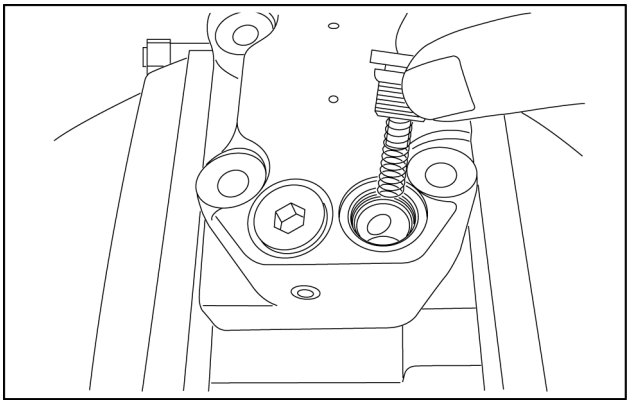


SMIL17MEX1065AB 15



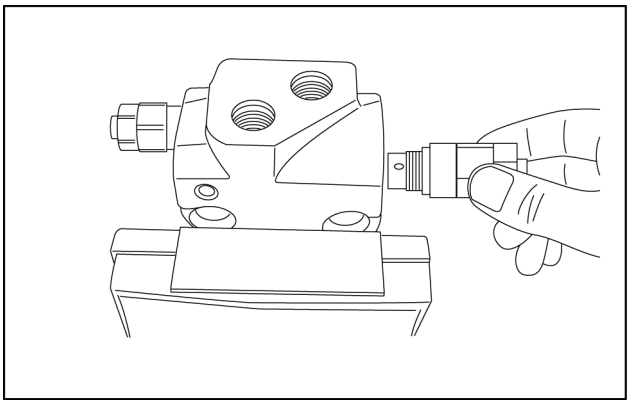
SMIL17MEX0911AA 16

14. Install the steel ball **(27)**, the check plug **(28)** and the spring **(30)** in the valve housing **(25)**.



SMIL17MEX0912AA 17

15. Install the relief cartridge **(26)** in the valve housing **(25)**.



SMIL17MEX0913AA 18

Hydraulic travel system - Dynamic description

The hydraulic travel unit consists of a travel motor (fixed parts) and a travel reduction gear (rotating parts).

REDUCTION GEAR SECTION

Function

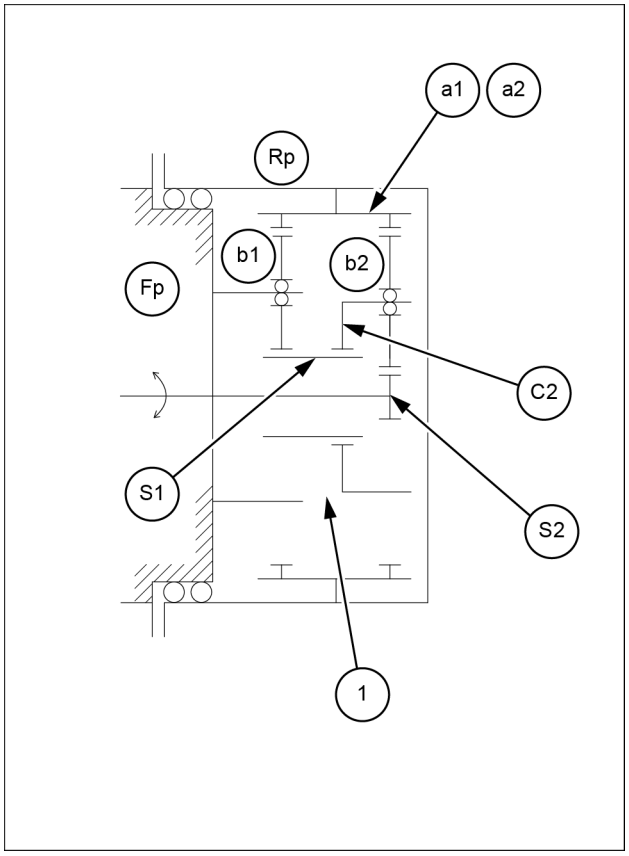
The speed reducer of travel motor is a simple planetary gear type with two stages. The high output speed of the hydraulic motor is reduced to low speed with high torque.

Operation

The S2 gear is attached to the hydraulic motor shaft and the S2 output speed is reduced between the gears **(s2)**, **(b2)** and **(a2)** as a first stage speed reducer. The reduced output speed of this first stage is reduced again between the gears **(s1)**, **(b1)** and **(a1)** which are connected to the carrier 2 **(C2)** with the spline. This reduced output speed of the second stage is transmitted to the body case "rotating parts" **(Rp)** through the inner gears **(a1)**, **(a2)** and drives the machine.

Fp. Fixed parts

1. Two-stage planetary speed



SMIL17MEX0995BB 1

Evaluation

The average measured time should meet the following specifications.

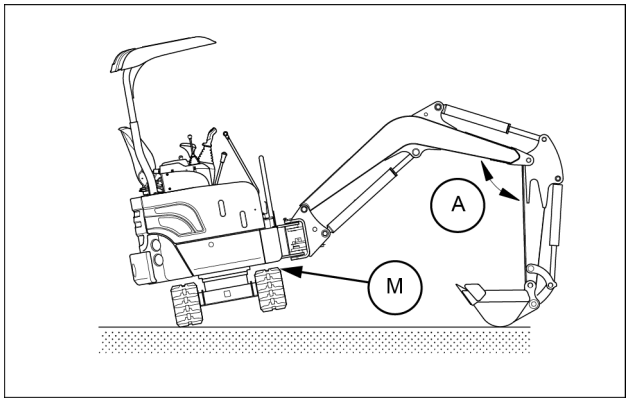
Travel speed	Standard value	Maximum allowable
1 Speed	**31.5 – 35.5 s** every **20 m** (**787 in**)	**41 s** every **20 m** (**787 in**)
2 Speed	**17.3 – 19.3 s** every **20 m** (**787 in**)	**22.6 s** every **20 m** (**787 in**)

TRACK REVOLUTION SPEED

Measure the track revolution cycle time with the track raised off ground.

Preparation

1. Adjust the tension of both side tracks to be equal.
2. On the track to be measured, mark one shoe with chalk **(M)**.
3. Swing the upper structure **90°** and lower the bucket to raise the track off ground. Keep the boom-arm angle **(A)** between **90 – 110°**. Place blocks under machine frame.
4. Keep the hydraulic oil temperature at **45 – 55 °C** (**113 – 131 °F**).



SMIL17MEX1025AB 3

Measurement

1. Select the following switch positions.
   - Travel mode switch: 1 or 2 speed
2. Operate the travel control lever of the raised track in full forward and reverse.
3. Rotate one turn, then measure time taken for next three revolutions.
4. Raise the other side of machine and repeat the procedure.
5. Repeat steps 3 and 4 three times and calculate the average values.

Evaluation

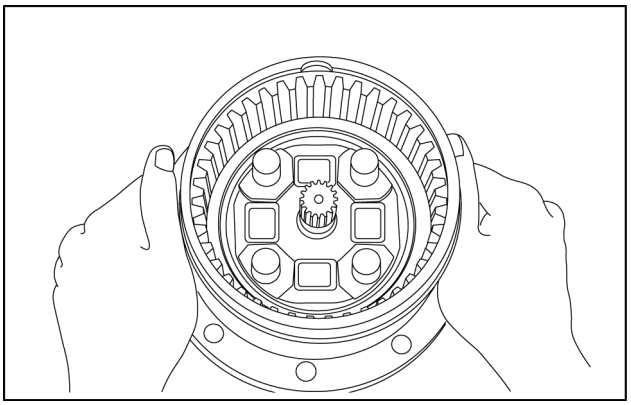
The revolution cycle time (3 revolutions) of each track should meet the following specifications.

Travel speed	Standard value	Maximum allowable
1 Speed	**14.9 – 18.9 s**	**21.00 s**
2 Speed	**7.2 – 11.2 s**	**11.35 s**

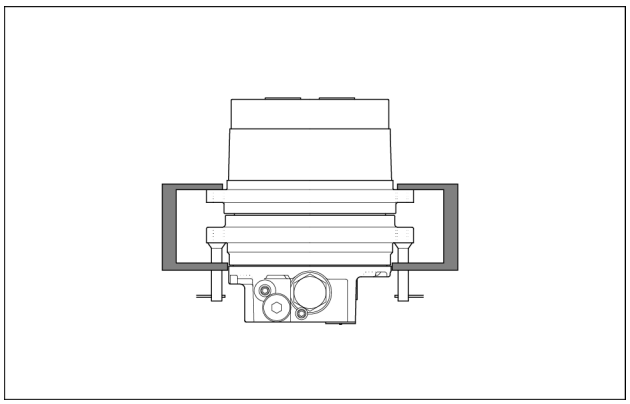
4. Join the body to the motor.

NOTE: *wipe grease from the seal surface.*

NOTE: *tighten the speed reducer flange and the motor flange with C-cramps or a hydraulic press.*



SMIL17MEX0931AA 5

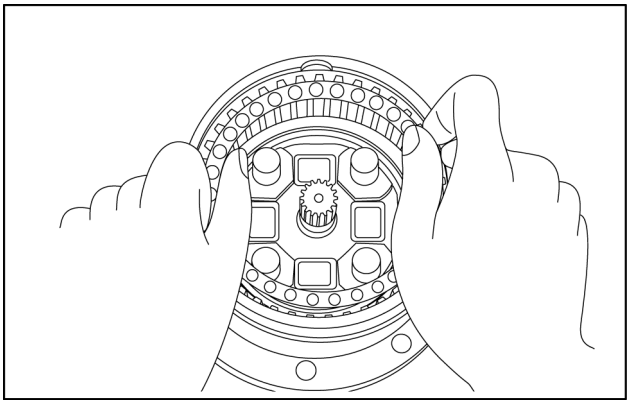


SMIL17MEX1075AA 6

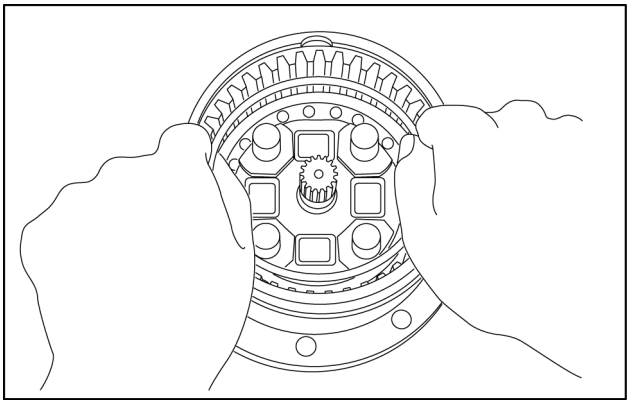
5. Place retainer with balls, inner ring of the bearing in that order onto the hydraulic motor.

NOTE: *pay attention to the direction of the inner ring and the retainer.*

NOTE: *pay attention not to disassemble the balls from retainer.*



SMIL17MEX0932AA 7



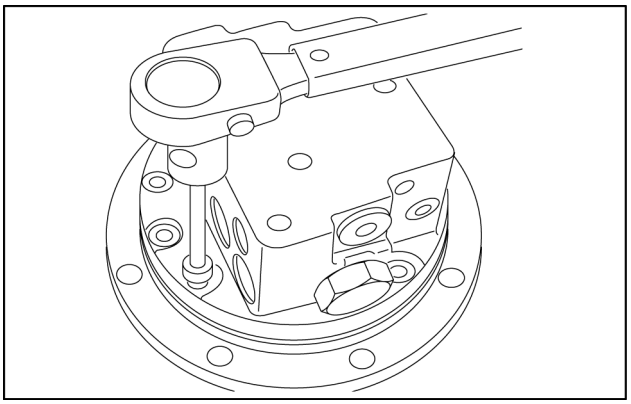
SMIL17MEX0962AA 8

Travel motor - Disassemble

1. Remove the seven hexagon socket head cap bolts.

   Hexagon size: **6 mm**

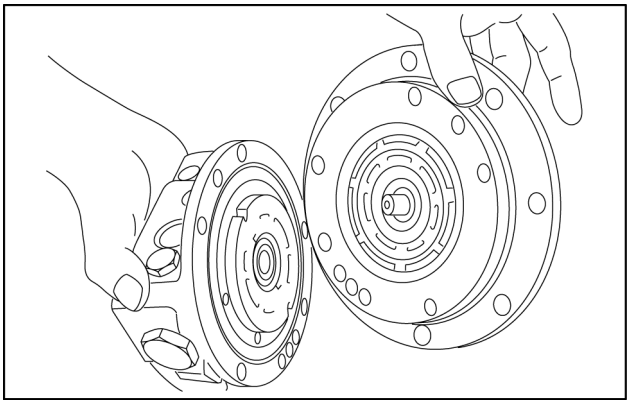
   NOTE: *if you fix the motor with a vice, protect it with aluminum plates or equivalent.*



SMIL17MEX0937AA 1

2. Remove the body 1 from the body 2.

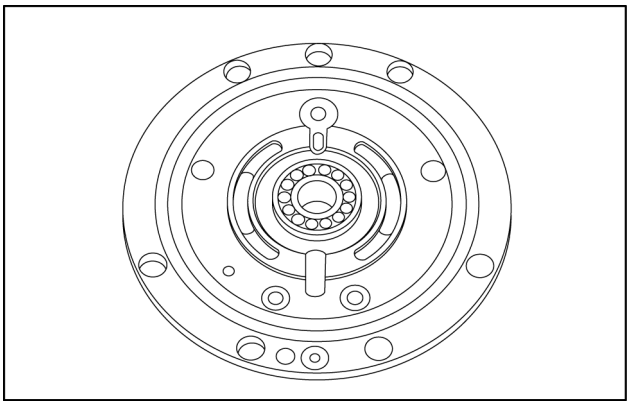
NOTE: *pay attention not to come off and damage the valve plate.*



SMIL17MEX0938AA 2

3. Remove the valve plate.
4. Remove the two O-rings from the body 1.

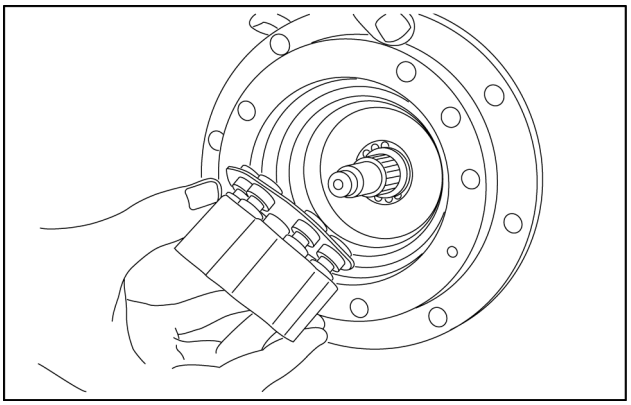
NOTE: *the bearing and spring pins are not able to disassemble, because they are press-fitted.*



SMIL17MEX0939AA 3

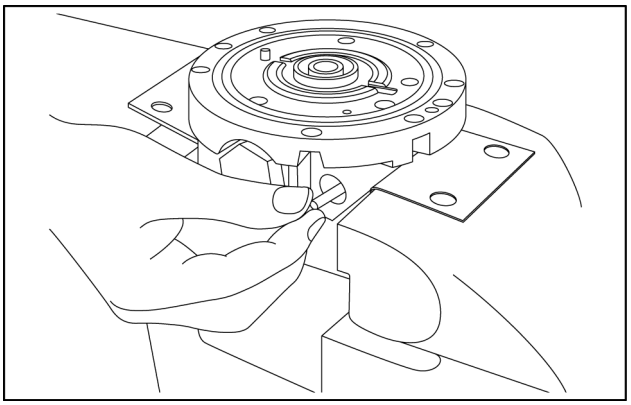
5. Remove the cylinder barrel assembly from the body 2.

NOTE: *the small parts are easily dispersed, pay attention not to miss.*

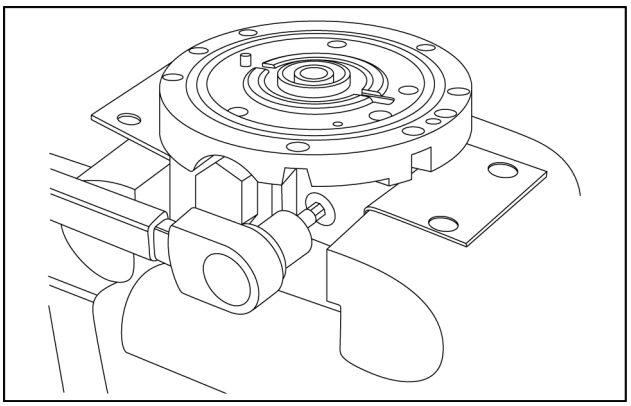


SMIL17MEX0941AA 4

4. Insert the shuttle spool and the two needles (1 piece/side) into the body 1, and then screw them in with the two plugs with the O-rings (1 piece/side).
   - Plugs tightening torque: **11.8 – 17.6 N·m** (**8.7 – 13.0 lb ft**)
   - Hexagon size: **5 mm**

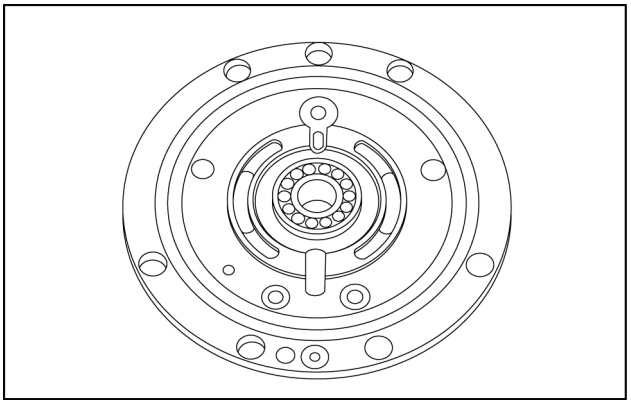


SMIL17MEX0955AA 9



SMIL17MEX0954AA 10

5. Place the two O-rings onto the body 1.

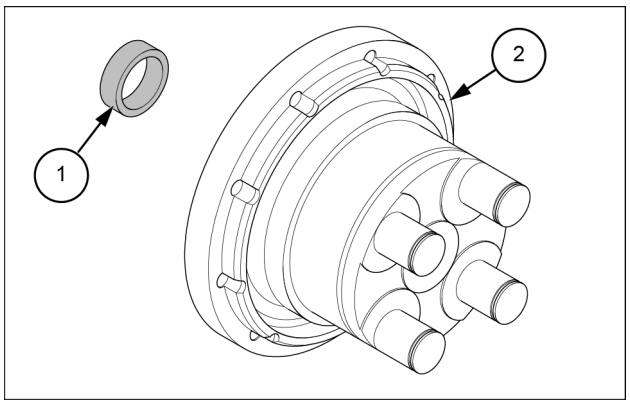


SMIL17MEX0939AA 11

6. Press-fit the oil seal into the body 2 **(2)**.

NOTE: *apply grease to the periphery of the oil seal **(1)**.*

NOTE: *pay attention to the direction of the oil seal, and do not slant it.*



SMIL17MEX1072AB 12

Travel motor - Service instruction - Troubleshooting

Abnormally function of travel motors

The machine makes a curved travel or does not travel at all when travel and attachment operations are executed at the same time.

1. Check the operation of the travel lever.
   A. If the travel lever is operative, proceed to step 2.
   B. If the travel lever is not operative, proceed to step 3.

2. Check the operation of the select valve.
   A. If the select valve is not operative, the select valve is faulty. Repair or replace it.

3. Check the filter in the pilot piping between the gear pump and the control valve.
   A. If the filter in the pilot piping between the gear pump and the control valve is not clogged, proceed to step 4.
   B. If the filter in the pilot piping between the gear pump and the control valve is clogged, remove dirt on the pilot line filter.

4. Check the gear pump in terms in delivering oil.
   A. If the gear pump is delivering oil, proceed to step 5.
   B. If the gear pump is not delivering oil, the gear pump is broken. Disassemble and repair it.

5. Check the operation of the pilot relief valve.
   A. If the pilot relief valve is not operative, the pilot relief valve is defective. Disassemble and repair or replace it.

Hydraulic swivel - Remove

⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

W1128B

⚠ WARNING

Pressurized system!
Before attempting any service procedure, it is your responsibility to know the number of accumulators on the machine, and the correct procedure for releasing the pressure of each accumulator.
Failure to comply could result in death or serious injury.

W0136A

⚠ WARNING

Crushing hazard!
The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.
Failure to comply could result in death or serious injury.

W0256A

⚠ WARNING

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply could result in death or serious injury.

W0398A

⚠ WARNING

Burn hazard!
Before performing any service on the hydraulic system, you must allow it to cool. Hydraulic fluid temperature should not exceed 40 °C (104 °F).
Failure to comply could result in death or serious injury.

W0241A

⚠ WARNING

Escaping fluid!
Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.
Failure to comply could result in death or serious injury.

W0178A

⚠ WARNING

Chemical hazard!
When handling fuel, lubricants, and other service chemicals, follow the manufacturer's instructions. Wear Personal Protective Equipment (PPE) as instructed. Do not smoke or use open flame. Collect fluids in proper containers. Obey all local and environmental regulations when disposing of chemicals.
Failure to comply could result in death or serious injury.

W0371A

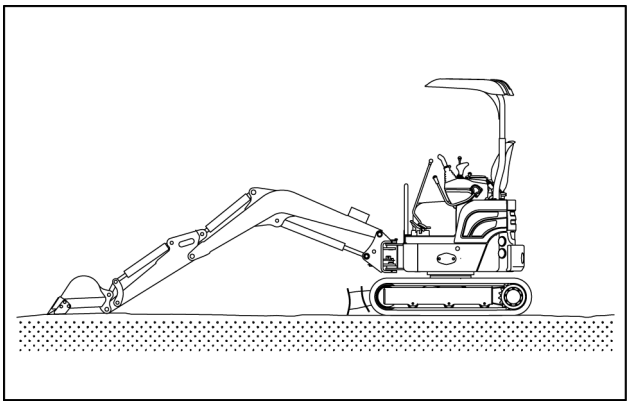
Contents

Hydraulic systems - 35

Boom hydraulic system - 736

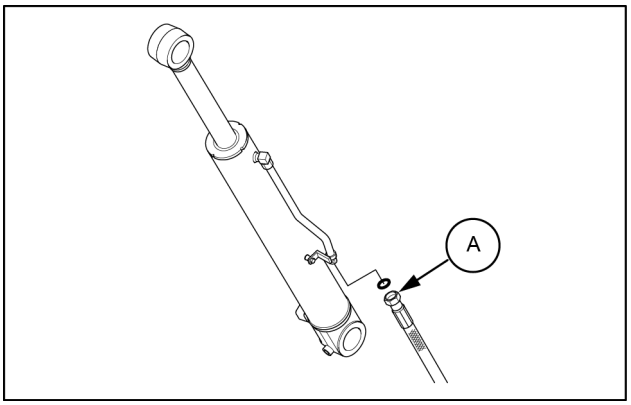
Boom cylinder - Check - Internal boom cylinder leakage

1. Lower the bucket teeth to the ground with bucket cylinder fully retracted and arm cylinder rod retracted almost in full.



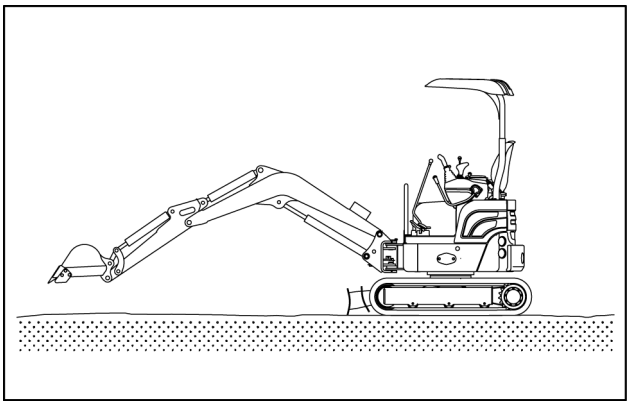
SMIL16MEX2502AA 1

2. Disconnect hose **(A)** from rod side of boom cylinder and drain oil from cylinders and hose. (Put cups on piping and hose ends)



SMIL16MEX1261AA 2

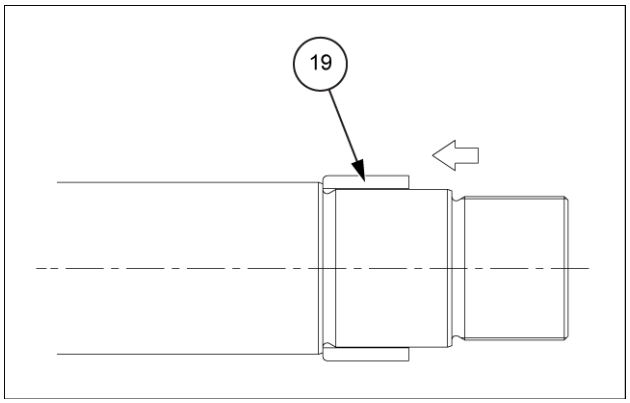
3. Raise bucket OFF the ground by retracting the arm cylinder rod.
   If oil leaks from piping side and boom cylinder rod are retracted there is an internal leak in the cylinder. If no oil leaks from piping side and boom cylinder rod is retracted, there is an internal leak in the control valve.



SMIL17MEX1174AA 3

4. Install the cushion ring **(19)** onto rod assembly.

NOTICE: *the cushion ring **(19)** has a direction in which it should be fitted.*



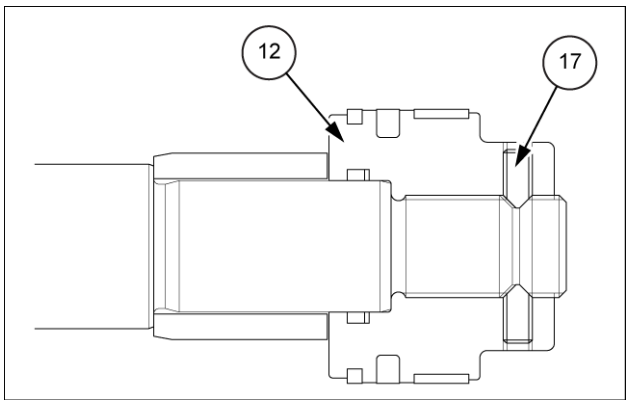
SMIL17MEX0493AB 9

5. Apply hydraulic oil to the inner surface of the piston **(12)** and install the piston assembly onto rod assembly.

   Tightening torque: **617.4 – 754.6 N·m** (**455.4 – 556.6 lb ft**)

6. Install the locking screw **(17)** and tighten to a torque of **17.7 – 21.6 N·m** (**13.0 – 16.0 lb ft**).

NOTICE: *refer to the assemble section of each cylinder typology in order to apply the specific torques.*

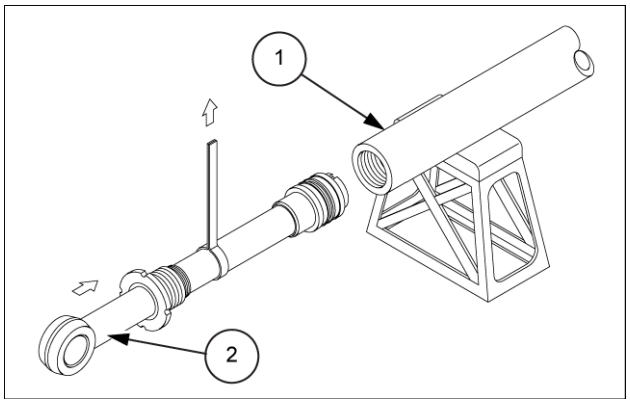


SMIL17MEX0494AB 10

Install the piston rod with the cylinder head

1. Place a V-block on a rigid work bench. Mount the tube assembly **(1)** on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
2. Insert the rod assembly in to the tube assembly **(1)**, while lifting and moving the rod assembly **(2)** with a crane.

NOTICE: *be careful not to damage the piston seal and the cylinder head seals by thread of the tube assembly.*

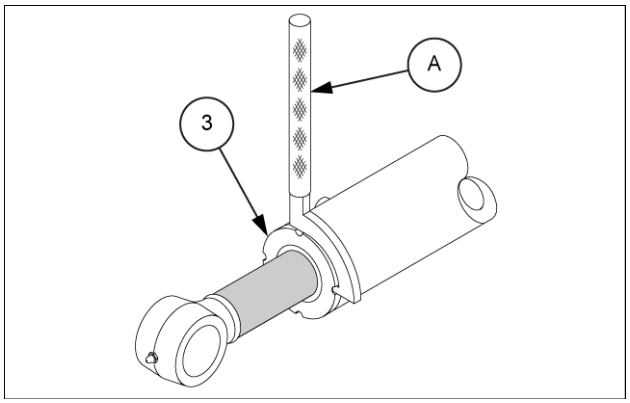


SMIL17MEX0495AB 11

3. Use a hook spanner **(A)** and turn it clockwise to tighten the cylinder head **(3)**.

   Tightening torque: **460.7 – 558.9 N·m** (**339.8 – 412.2 lb ft**)

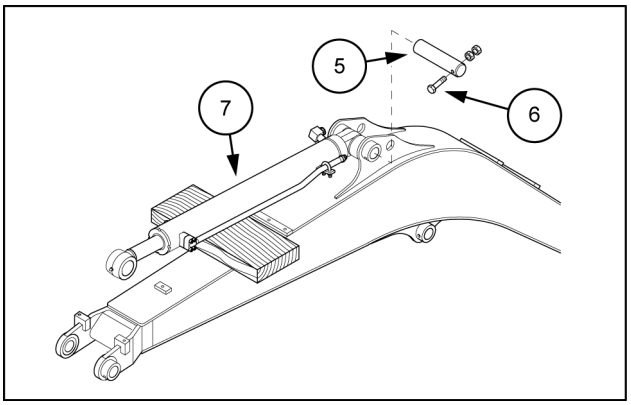
NOTICE: *be careful not to damage the cylinder head seals by thread of the tube assembly.*
*Cover the extracted rod assembly **(3)** with rag to prevent it from being accidentally damaged during operation.*



SMIL17MEX0479AB 12

7. Sling the dipper cylinder assembly **(7)**, remove the bolt **(6)**, then pull out the pin **(5)**.
8. Remove the dipper cylinder assembly **(7)**.

   Weight: **15 kg** (**33 lb**)



SMIL17MEX0669AB 5

Bucket cylinder - Remove

⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

W1128B

⚠ WARNING

Pressurized system!
Before attempting any service procedure, it is your responsibility to know the number of accumulators on the machine, and the correct procedure for releasing the pressure of each accumulator.
Failure to comply could result in death or serious injury.

W0136A

⚠ WARNING

Crushing hazard!
The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.
Failure to comply could result in death or serious injury.

W0256A

⚠ WARNING

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply could result in death or serious injury.

W0398A

⚠ WARNING

Burn hazard!
Before performing any service on the hydraulic system, you must allow it to cool. Hydraulic fluid temperature should not exceed 40 °C (104 °F).
Failure to comply could result in death or serious injury.

W0241A

⚠ WARNING

Escaping fluid!
Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.
Failure to comply could result in death or serious injury.

W0178A

⚠ WARNING

Chemical hazard!
When handling fuel, lubricants, and other service chemicals, follow the manufacturer's instructions. Wear Personal Protective Equipment (PPE) as instructed. Do not smoke or use open flame. Collect fluids in proper containers. Obey all local and environmental regulations when disposing of chemicals.
Failure to comply could result in death or serious injury.

W0371A

Contents

Hydraulic systems - 35

Tool quick coupler hydraulic system - 734

SERVICE

Contents

Hydraulic systems - 35

Swing arm hydraulic system - 739

Blade lifting cylinder - Test

BLADE LIFTING CYLINDER CYCLE TIME

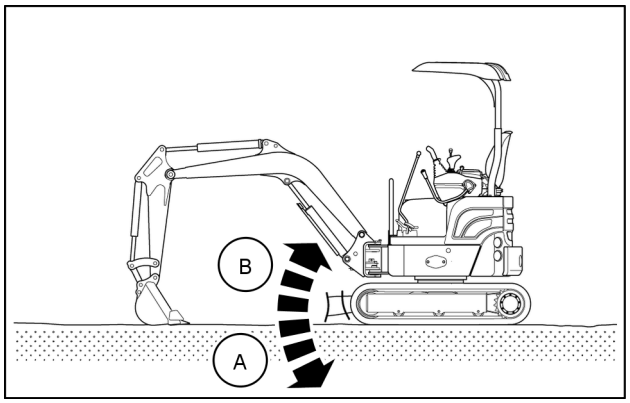
Measure the cycle time of the blade lifting cylinder.

Preparation

1. With the empty bucket rolled in, position the arm so that it is vertical to the ground.
2. Keep the hydraulic oil temperature at **45 – 55 °C** (**113 – 131 °F**).

Measurement

1. Measure the time it takes to lower the dozer blade, and the time it takes to raise the dozer blade.
2. From the neutral position, pull the dozer blade control lever rearward to raise the dozer blade **(B)** as quickly as possible.
3. From the neutral position, push the dozer blade control lever forward to lower the dozer blade **(A)** as quickly as possible.
4. Repeat each measurement 3 times and calculate the average values.



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Evaluation

The average measured time should meet the following specifications.

Function	Standard value	Maximum allowable
Dozer blade up (raise)	**1.6 – 2.2 s**	**2.2 s**
Dozer blade down (lower)	**1.9 – 2.5 s**	**2.5 s**

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SERVICE - Technical Publications & Tools

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All data given in this publication is subject to production variations. Dimensions and weight are approximate only and the illustrations do not necessarily show products in standard condition. For exact information about any particular product, please consult your NEW HOLLAND CONSTRUCTION Dealer.

Index

Frames and ballasting - 39

Ballasts and supports - 140

Index

Tracks and track suspension - 48

Track frame and driving wheels - 130

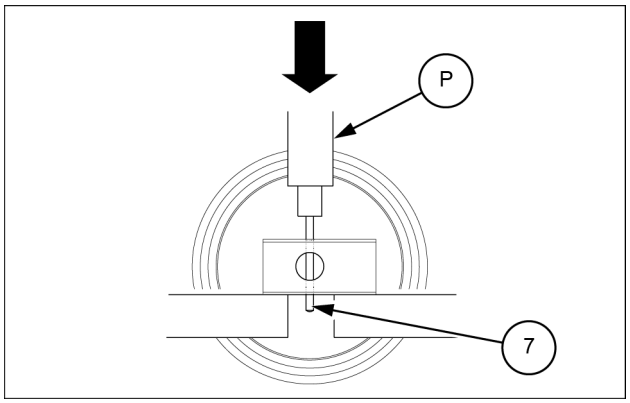
Contents

Tracks and track suspension - 48

Track tension units - 134

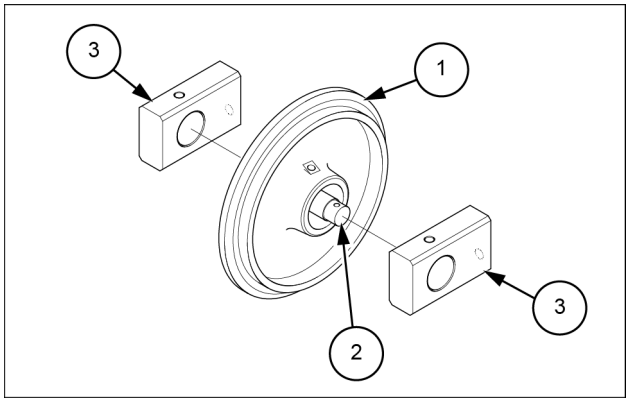
Idler wheel - Disassemble

1. Remove plug and drain oil.
2. Use a press **(P)** to pull out the spring pin **(7)**.



SMIL17MEX0101AB 1

3. Remove the hubs **(3)** from the shaft **(2)**.

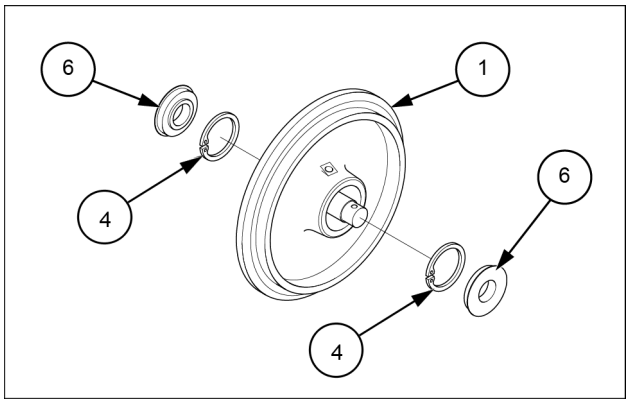


SMIL17MEX0102AB 2

4. Remove the oil seals **(6)** from the idler wheel **(1)**.

NOTE: *do not reuse the oil seal after removal.*

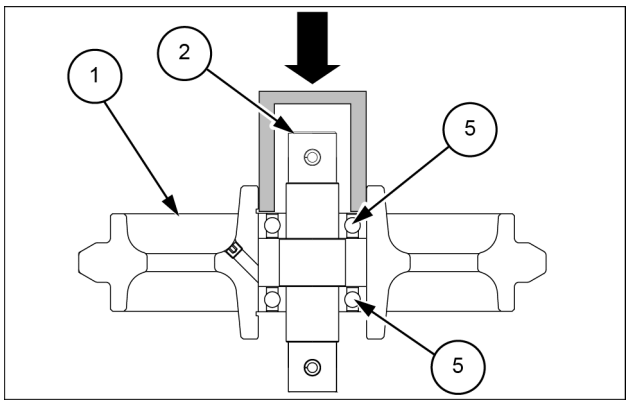
5. Remove the snap ring **(4)** from the idler wheel **(1)**.



SMIL17MEX0103AB 3

6. Pull out the ball bearing **(5)** with the shaft **(2)**.
7. Use a suitable tool to remove the ball bearing **(5)** from the shaft **(2)**.

NOTE: *only remove the ball bearing if replacement is necessity.*



SMIL17MEX0104AB 4

Index

Tracks and track suspension - 48

Track rollers - 138

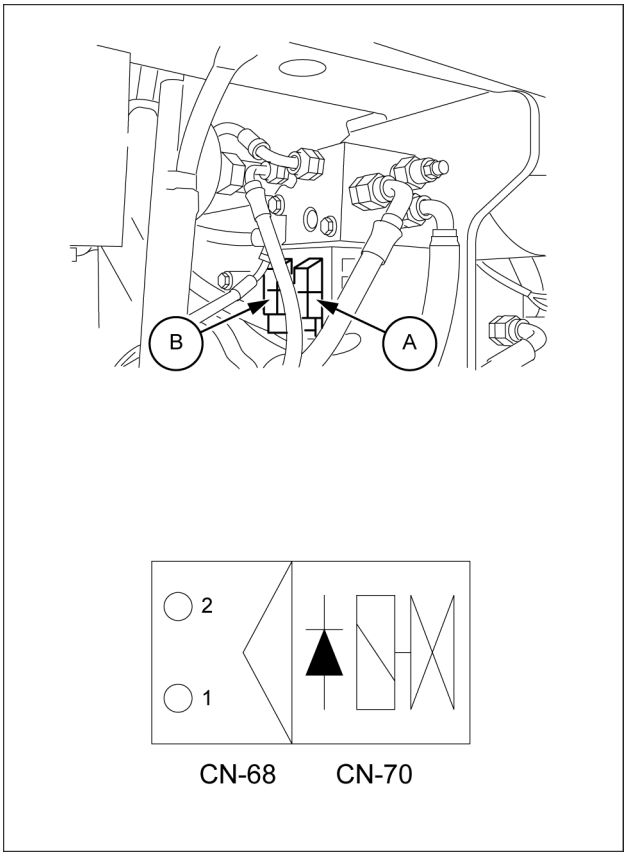
Name: Solenoid valve

A. Safety solenoid valve (**CN-68**)

B. Travel solenoid valve (**CN-70**)

Specification: **12 V** – **1 A**

Check resistance
Normal: **15 – 25 Ω** (for terminal 1-2)

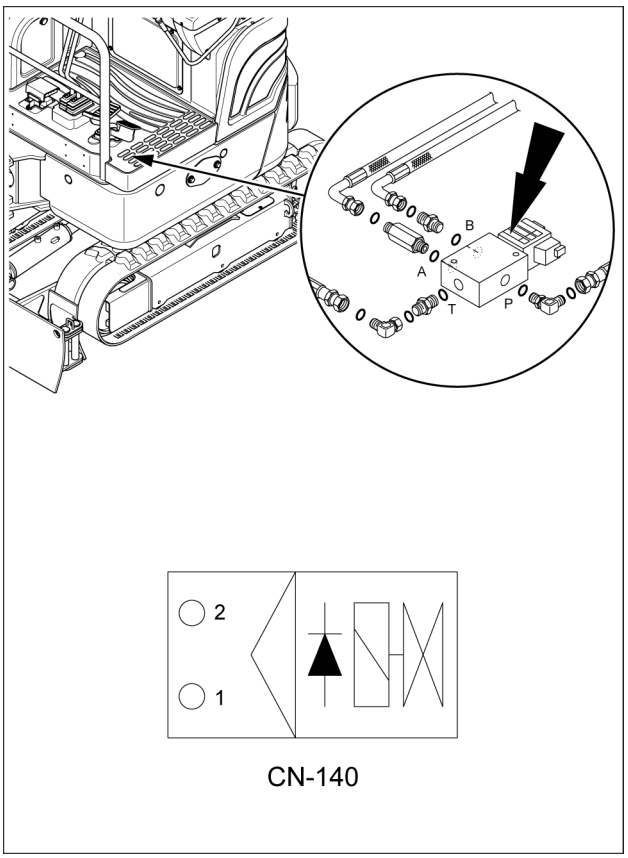


SMIL17MEX0373BB 7

Name: Quick coupler solenoid valve

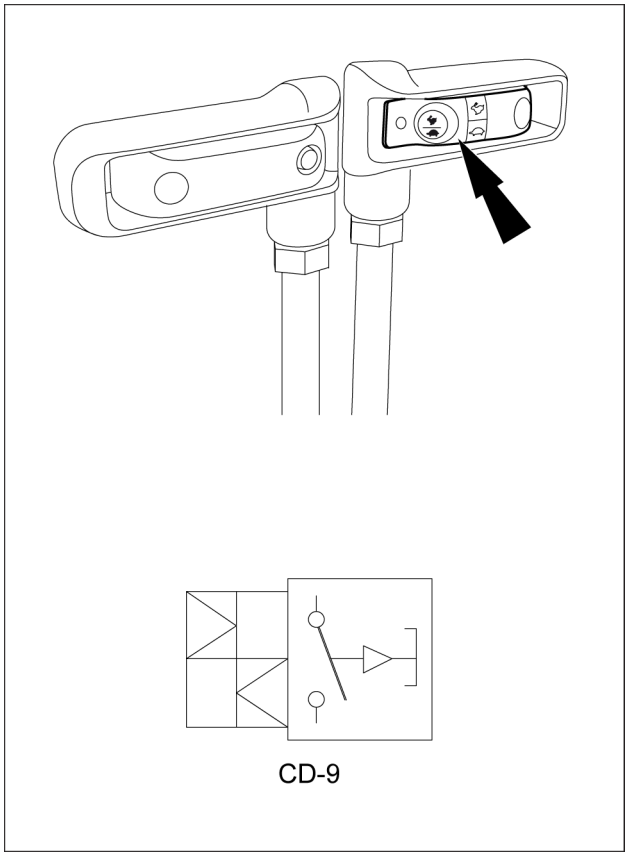
Specification: **12 V** - **1 A**

Check resistance
Normal: **15 – 25 Ω** (for terminal 1-2)



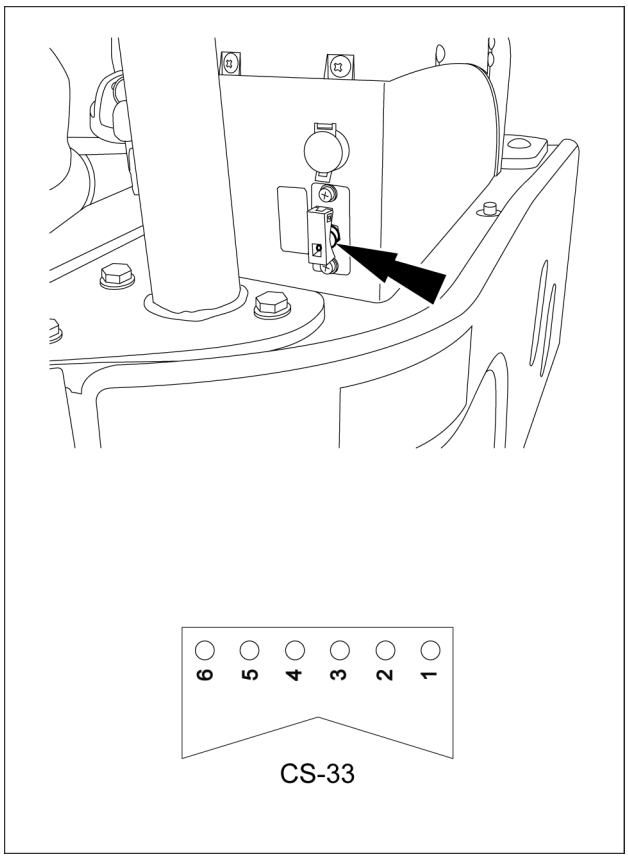
SMIL17MEX0374BB 8

Name: Travel speed control switch



SMIL17MEX0395BB 27

Name: Emergency STOP switch



SMIL17MEX0396BB 28

Electrical system - Electrical schema - Charging circuit

Check point

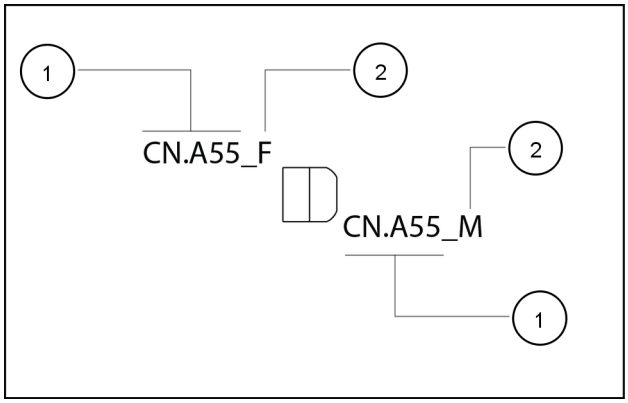
Engine	Starter switch	Check point	Voltage
ON	ON	1. Ground (Battery voltage)	**10 – 12.5 V**
		2. Ground (Alternator B+ terminal)	
		3. Ground (Cluster)	

Components	Connectors/link	Type	Description
CN-3	**CN-3**	AMP connector	Main harness - Left console harness
CN-4	**CN-4**	AMP connector	Main harness - Right console harness
CN-5	**CN-5**	AMP connector	Right console harness - Main harness
CN-19	**CN-19**	Connector	EPPR controller - Main harness
CN-36	**CN-36**	–	Fuse box
CN-56	**CN-56**	AMP connector	Cluster
CN-68	**CN-68**	DEUTSCH connector	Safety solenoid valve
CN-238	**CN-238**	Connector	EPPR left solenoid valve
CN-239	**CN-239**	Connector	EPPR right solenoid valve
CN-240	**CN-240**	Connector	EPPR
CN-305	**CN-305**	Connector	EPPR controller
CN-307	**CN-307**	Connector	Service tool
CS-4	**CS-4**	AMP connector	Safety switch

Connectors

1. Connector number (in cab)/connector letter located (outside cab)
2. M: Male
   F: Female

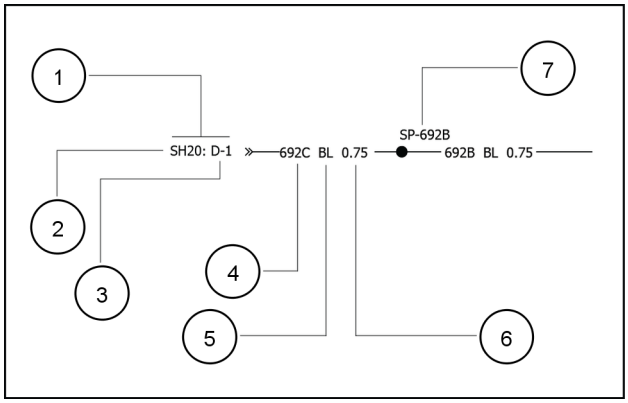
NOTE: *Waterproof connectors are used outside the cab.*



SMIL15CEXYYY7AA 1

Wiring harnesses

1. Circuit break
2. Sheet number
3. Zone number
4. Circuit number
5. Wire color
6. Wire size (mm²)
7. Circuit splice



SMIL15CEXYYY8AA 2

Color abbreviations

SYMBOL	COLOR
B	Black
BR	Brown
W	White
P	Pink
V	Violet
G	Green
O	Orange
R	Red
Y	Yellow
L	Blue
GR	Gray
LG	Light green
SB	Sky blue

NOTE: *" BR" indicates black cable with red stripe.*

Wiring harnesses - Electrical schematic sheet 06 - EXT. V/V switch, travel alarm and 12V socket

Type	Components	Connectors/link	Description
Horn	CS-5	**CS-5**	RCV Horn
Switch	CS-16	**CS-33**	Travel alarm switch
Switch	CS-33	**CS-33**	Emergency stop switch
Switch	CS-83	**CS-83**	Ext. V/V switch
Socket	CN-139A	**CN-139A**	**12 V** Socket
Connector	CN-4	**CN-4**	

CONNECTOR CN-5: CN-5 (Male)

Pin	From	Wire	Description	Color-Size	Frame
1	CN-56-P-3	9D		BK/WH-0.85	**SHEET 07**
2	SP50-P-X	G1F		BK-1.25	
3	CN-56-P-2	10C		GN/WH-0.85	
5	CN-56-P-18	12B		BR-0.85	
6	CN-56-P-8	13		GN-0.85	
7	CN-56-P-17	14C		GY-0.85	
8	SP49-P-X	15D		RD-1.25	
9	CN-240-P-C	16A		BL-0.85	**SHEET 08**
10	CN-240-P-A	17		RD/WH-0.85	
11	CN-125-P-1	G2D		BK-1.25	**SHEET 07**
12	SP43-P-X	18D		BL/WH-0.85	
13	SP48-P-X	19B		OR-0.85	
14	CN-56-P-1	20A		YE-0.85	
15	CN-240-P-B	21A		BK/WH-0.85	**SHEET 08**

CONNECTOR CS-16: TRAVEL ALARM SWITCH (Female)

Pin	From	Wire	Description	Color-Size	Frame
1	SP36-P-X	4D		BL-0.85	**SHEET 06**
5	SP34-P-X	8A		GN-0.85	
9	SP36-P-X	4A		BL-0.85	
10	SP56-P-X	GK		BK-0.5	

CONNECTOR CR-24: TIMER GLOW (Female)

Pin	From	Wire	Description	Color-Size	Frame
3	SP19-P-X	G1B		BK-0.85	**SHEET 09**
4	CN-36-P-2	9		VT-1.25	**SHEET 03**
5	CN-36-P-3	4		WH-2.0	
6	CN-5F-P-6	28		OR-0.85	**SHEET 08**

CONNECTOR CN-307: SERVICE TOOL (Female)

Pin	From	Wire	Description	Color-Size	Frame
A	CN-305-P-3	7B		BL-0.85	**SHEET 05**
B	CN-305-P-4	8C		OR-0.85	

CONNECTOR CN-74B: ALTERNATOR (Female)

Pin	From	Wire	Description	Color-Size	Frame
1	CN-5F-P-13	32		RD/WH-0.85	**SHEET 08**
2	SP41-P-X	12A		GN-0.85	**SHEET 03**
3	CN-5F-P-14	47		BL-1.25	**SHEET 08**

Index

Electrical systems - 55

Harnesses and connectors - 100

Engine starter - Test

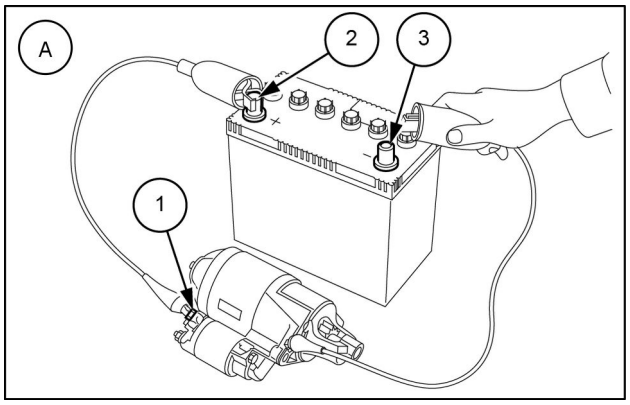
Motor test

NOTICE: *secure the starter to prevent it from jumping up and down while testing the motor.*

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable from the battery.
3. Disconnect the leads from the starter B terminal.
4. Remove the starter from the engine.
5. Connect a jumper lead from the starter C terminal **(1)** to the battery positive terminal **(2)**.
6. Connect a jumper lead momentarily between the starter's body and the battery negative terminal **(3)**.
7. If the motor does not run, starter is failure. Repair or replace the starter.

NOTE: *B terminal: It is the terminal which connects the cable from the battery to the starter.*
C terminal: It is the terminal which connects the cable from the motor to the magnet switch.

(A) Electromagnetic drive type
(B) Planetary gear reduction type



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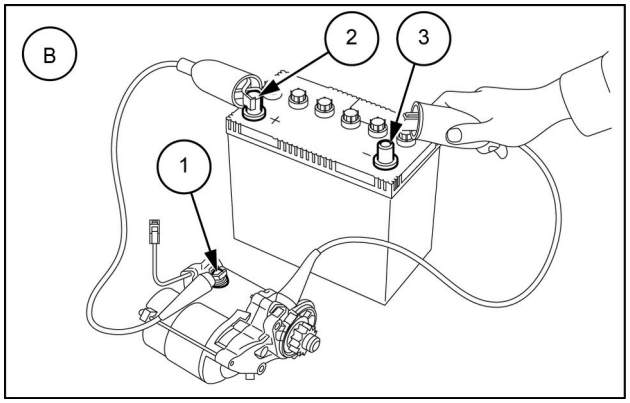
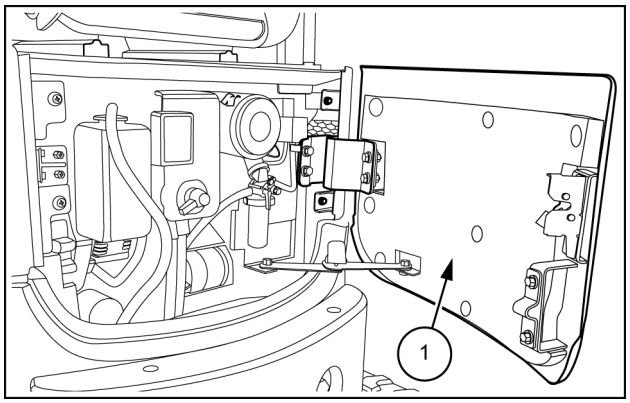


SMIL16MEX0773AB 2

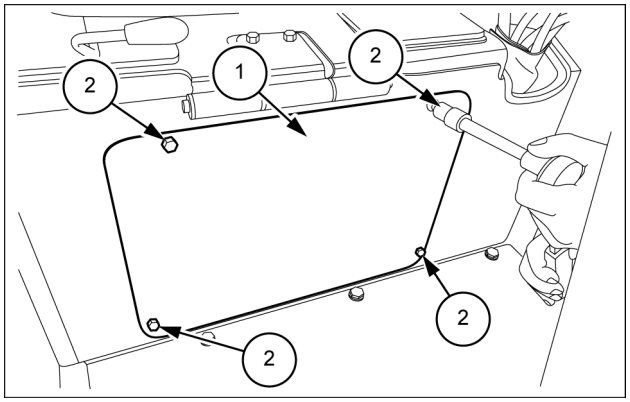
8. Close the engine access door **(1)**.



SMIL17MEX0279AB 5

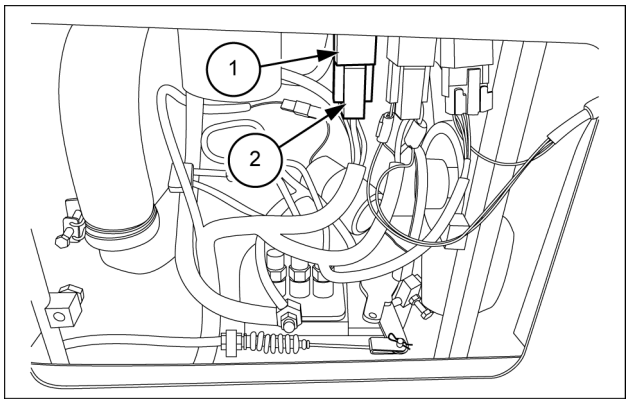
Engine start relay - Remove

1. Set the battery disconnect switch to O position (OFF position) to cut off any power supply in the electrical system of the machine (refer to **Mechanical battery isolator - Dynamic description (55.302)**).
2. Remove the screws **(2)** and remove the panel **(1)** located under the seat.



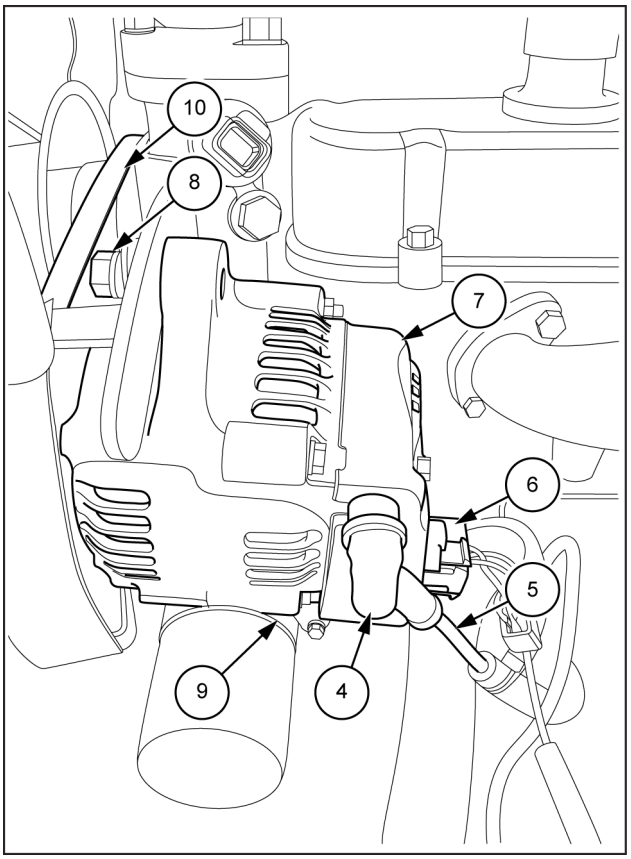
SMIL17MEX0470AB 1

3. Disconnect the connector **CR-23 (2)** and remove the engine start relay **(1)**.



SMIL17MEX0471AB 2

5. Move the cap **(4)** and remove the nut to disconnect the wire **(5)**.
6. Disconnect the electrical connector **(6)** from the alternator **(7)**.
7. Use a wrench [**17 mm**] to remove the bolt **(8)** and the nut **(9)** for loosen the tension of the belt **(10)**.
8. Remove the belt **(10)** from the alternator pulley.
9. Remove the alternator **(7)**.



SMIL17MEX0676BB 3

Contents

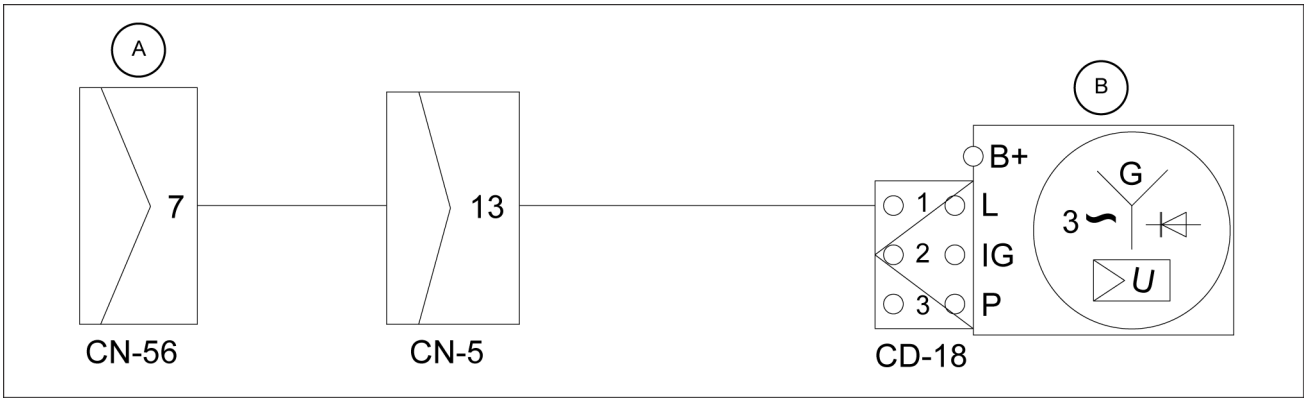
Electrical systems - 55

Battery - 302

Battery - Service instruction - Troubleshooting

Battery charging warning lamp lighting up

- Before disconnecting the connector, always turn OFF the starter switch.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.



SMIL17MEX0857EB 1

A. Cluster
B. Alternator

Engine is running.

1. Measure the voltage between terminal 1 of the alternator and the ground.
   A. If the voltage is within **10 – 12.5 V**, proceed to step 2.
   B. If the voltage is not within **10 – 12.5 V**, the alternator is defective. Replace it (refer to **Alternator - Remove (55.301)**).

2. Measure the voltage between terminal 13 of the connector **CN-5** and the ground.
   A. If the voltage is within **10 – 12.5 V**, proceed to step 3.
   B. If the voltage is not within **10 – 12.5 V**, there is a disconnection in the wiring harness or a poor contact between terminal 13 of the **CN-5** and the terminal 1 of the alternator. Repair or replace it, after clean.

3. Measure the voltage between terminal 7 of the connector **CN-56** and the ground.
   A. If the voltage is within **10 – 12.5 V**, the cluster is defective. Replace the cluster (refer to **Instrument cluster - Remove (55.408)**).
   B. If the voltage is not within **10 – 12.5 V**, there is a disconnection in the wiring harness or a poor contact between terminal 7 of the connector **CN-56** and terminal 13 of the connector **CN-5**. Repair or replace it, after clean.

Index

Electrical systems - 55

Cold start aid - 202

Contents

Electrical systems - 55

Engine cooling system - 012

SERVICE

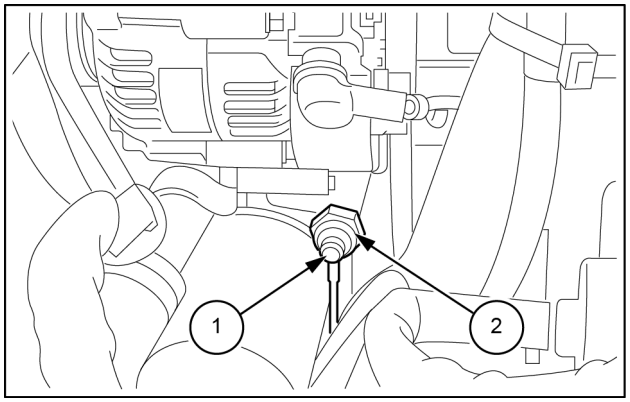
Engine oil pressure sensor and switch - Install

⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all machine motion stops before you service the machine.
Failure to comply could result in death or serious injury.

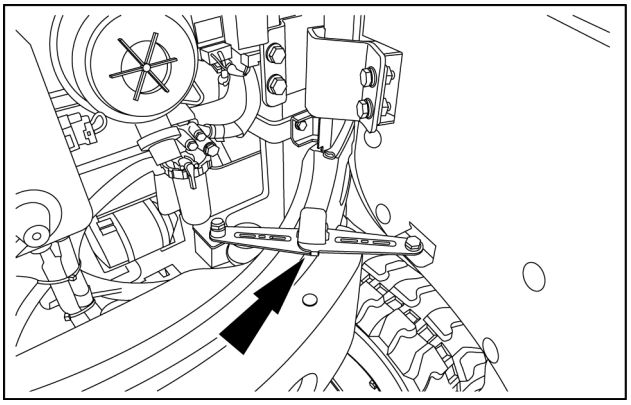
W1128B

1. Use a wrench to install the engine oil pressure switch **(2)**.
2. Connect the wire to the engine oil pressure switch **(2)**.
3. Use a wrench to install the nut **(1)**.



SMIL16MEX2802AB 1

4. Set the battery disconnect switch to I position (ON position).
5. Pull the hook in order to unlock the engine access door.
6. Use the handle and close the engine door firmly.
7. Use the starter key to lock the door.



SMIL16MEX2655AB 2

Index

Electrical systems - 55

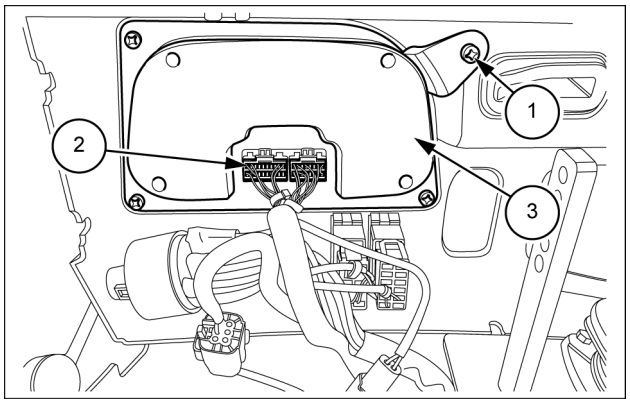
Cab controls - 512

3. Turn ON the starter switch.
   Switch ON the work light switch.
   Measure the voltage between terminal 14 of the connector **CN-3** and ground.
   A. If the voltage is within **10 – 12.5 V**, proceed to step 4.
   B. If the voltage is not within **10 – 12.5 V**, there is a disconnection in the wiring harness or a poor contact between terminal 2 of the connector CS-36 and terminal 14 of the connector **CN-3**. Repair or replace it, after clean.

4. Turn ON the starter switch.
   Switch ON the work light switch.
   Measure the voltage between terminal 2 of the connector **CL-5** and ground.
   A. If the voltage is within **10 – 12.5 V**, the bulb is defective. Replace it.
   B. If the voltage is not within **10 – 12.5 V**, there is a disconnection in the wiring harness or a poor contact between terminal 14 of the connector **CN-3** and terminal 2 of the connector **CL-5**. Repair or replace it, after clean.

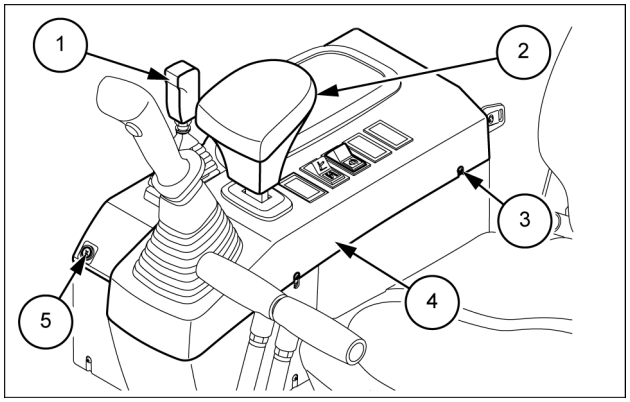
Instrument cluster - Install

1. Use a screwdriver to install the cluster by means of the four screws **(1)**.
2. Connect the connector **CN-56 (2)** to the cluster **(3)**.



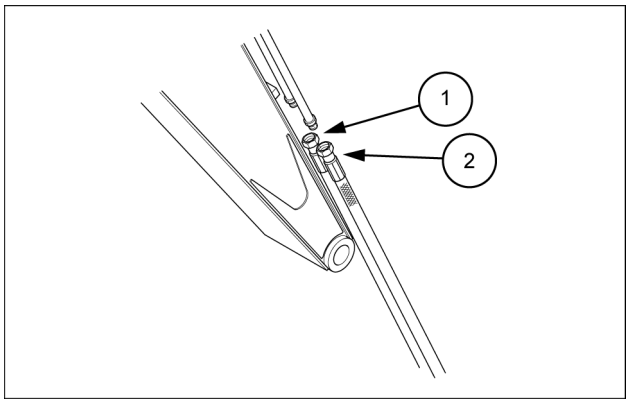
SMIL17MEX0868AB 1

3. Use a screwdriver to install the panel **(4)** by means of the six screws **(3)** and the screw **(5)**.
4. Install the knob **(1)** of the dozer blade control lever and the armrest **(2)**.



SMIL17MEX0853AB 2

3. Connect the bucket cylinder hose **(2)** and the arm cylinder hose **(1)**.
4. Connect the head lamp wiring.
5. Connect the boom cylinder. (For details, see " **Boom cylinder - Install (35.736)**").
6. Connect the arm. (For details, see " **Dipper - Install (84.912)**").
7. Connect the arm cylinder. (For details, see " **Dipper cylinder - Install (35.737)**").



SMIL16MEX1516AB 2