

SERVICE MANUAL

B90B - B90BLR - B100B - B100BLR - B110B - B115B
LOADER BACKHOES

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SECTION 00 - SAFETY PRECAUTIONS

SECTION 01 - MAINTENANCE

SECTION 02 - TECHNICAL SPECIFICATIONS

1. MODELS.....	3
2. IDENTIFICATION OF MAIN COMPONENTS.....	4
3. SPECIFICATIONS	6
3.1 DIESEL ENGINE	6
3.2 TRANSMISSION.....	8
3.3 AXLES	9
3.4 BRAKES	9
3.5 STEERING.....	10
3.6 HYDRAULIC SYSTEM	10
3.7 FRONT COUNTERWEIGHT	10
3.8 NOISE AND VIBRATION LEVELS	11
3.9 BUCKETS.....	11
3.10 LOADER BUCKETS	11
3.11 TYRES	12
4. DIMENSIONS AND PERFORMANCE.....	13
4.1 DIMENSIONS - 2WS SIDESHIFT	13
4.2 DIMENSIONS - 2WS CENTER PIVOT.....	14
4.3 DIMENSIONS - 4WS SIDESHIFT	15
4.4 DIMENSIONS - 4WS CENTER PIVOT.....	16
4.5 LOADER ATTACHMENT PERFORMANCE.....	17
4.6 PERFORMANCE OF LOADER ATTACHMENT WITH FORKS	25
4.7 BACKHOE ATTACHMENT PERFORMANCE.....	29
5. BACKHOE ATTACHMENT LIFTING CAPACITY	49
6. MAXIMUM LIFTING LOADS.....	55
6.1 LOADER ATTACHMENT MAXIMUM LIFTING LOAD TABLE	55
6.2 BACKHOE ATTACHMENT MAXIMUM LIFTING LOAD TABLE	56
7. SUPPLY SUMMARY TABLE	57

SECTION 17 - TORQUE CONVERTERS

1. POWERSHUTTLE TORQUE CONVERTER	3
1.1 DESCRIPTION AND OPERATION.....	3
1.2 SPECIFICATIONS	5
1.3 OVERHAUL	5
1.4 INSPECTION	5
1.5 DISASSEMBLY AND ASSEMBLY.....	6
1.6 STALL TEST.....	6
1.7 FAULT FINDING.....	7
2. POWERSHIFT TORQUE CONVERTER	8
2.1 DESCRIPTION AND OPERATION.....	8
2.2 SPECIFICATIONS	9
2.3 OVERHAUL	9
2.4 INSPECTION	10
2.5 DISASSEMBLY AND ASSEMBLY.....	10
2.6 STALL TEST.....	12
2.7 FAULT FINDING.....	13

SECTION 21 - TRANSMISSION

1. POWERSHUTTLE TRANSMISSION "TURNER MODEL COM-T4-2025"	3
1.1 SPECIFICATIONS	3
1.2 MOUNTING SCREW TORQUE	5
1.3 TRANSMISSION CONTROLS	6
1.4 LUBRICATION	11
1.5 TRANSMISSION OIL FLOW AND SUPPLY	12
1.6 TRANSMISSION HYDRAULIC VALVES AND PRESSURE TEST POINTS	18
1.7 TRANSMISSION POWER FLOW	19
1.8 TRANSMISSION 2WD COMPONENTS	23
1.9 TRANSMISSION 4WD COMPONENTS	26
1.10 TRANSMISSION REMOVAL	31
1.11 DISASSEMBLY AND ASSEMBLY	32
1.12 FAULT FINDING	90
1.13 SPECIAL TOOLS	93
2. POWERSHIFT TRANSMISSION "DANA T16000"	94
2.1 SPECIFICATIONS	94
2.2 TRANSMISSION CONTROLS	95
2.3 LUBRICATION	105
2.4 PRESSURE SPECIFICATIONS AND CHECK POINTS	106
2.5 TRANSMISSION COOLER	108
2.6 HYDRAULIC DIAGRAM	109
2.7 OPERATION	110
2.8 POWER FLOWS	117
2.9 GEAR AND CLUTCH LAY OUT	135
2.10 TRANSMISSION REMOVAL AND INSTALLATION	136
2.11 TRANSMISSION COMPONENTS	140
2.12 DISASSEMBLY AND ASSEMBLY	158
2.13 SPECIAL TOOLS	267
2.14 FAULT FINDING	268
2.15 FAULT FINDING	270

SECTION 25 - FRONT AXLES

1. FRONT AXLE 2WD "CARRARO"	3
1.1 SPECIFICATIONS	3
1.2 DISASSEMBLY AND ASSEMBLY	6
1.3 FAULT FINDING	24
2. FRONT AXLE 4WD "CARRARO"	26
2.1 SPECIFICATIONS	26
2.2 DISASSEMBLY AND ASSEMBLY	31
2.3 FAULT FINDING	77
3. FRONT AXLE 4WS "CARRARO"	80
3.1 SPECIFICATIONS	80
3.2 DISASSEMBLY AND ASSEMBLY	84
3.3 FAULT FINDING	137
1. SPECIAL TOOLS	140

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SECTION 27 - REAR AXLE

1. REAR AXLE 2WS	3
1.1 DESCRIPTION AND OPERATION	3
1.2 SPECIFICATIONS	6
1.3 DISASSEMBLY AND ASSEMBLY	8
1.4 FAULT FINDING	27
2. REAR AXLE 4WS "CARRARO"	28
2.1 SPECIFICATIONS	28
2.2 DISASSEMBLY AND ASSEMBLY	32
2.3 FAULT FINDING	81
3. SPECIAL TOOLS	84

SECTION 33 - BRAKES SYSTEM

1. SPECIFICATIONS	3
2. PARKING BRAKE	6
2.1 PARKING BRAKE ADJUSTMENT	7
3. BRAKE CYLINDERS	8
4. OIL BRAKE TANK	13
5. BLEEDING PROCEDURE	13

SECTION 35 - HYDRAULIC SYSTEM

1. HYDRAULIC DIAGRAMS	3
1.1 HYDRAULIC DIAGRAM - 2WS SIDESHIFT MECHANICAL MODELS	3
1.2 HYDRAULIC DIAGRAM - 2WS SIDESHIFT PILOT MODELS	5
1.3 HYDRAULIC DIAGRAM - 2WS CENTER PIVOT PILOT MODELS	7
1.4 HYDRAULIC DIAGRAM - 4WS SIDESHIFT MECHANICAL MODELS	9
1.5 HYDRAULIC DIAGRAM - 4WS SIDESHIFT PILOT MODELS	11
1.6 HYDRAULIC DIAGRAM - 4WS CENTER PIVOT PILOT MODELS	13
2. HYDRAULIC PUMP	15
2.1 DESCRIPTION AND OPERATION	15
2.2 SPECIFICATIONS	16
2.3 LOAD SENSING VALVE	18
2.4 REMOVAL	20
2.5 COMPONENTS	21
2.6 DISASSEMBLY AND ASSEMBLY	22
3. CONTROL VALVES	26
3.1 CONTROL VALVES "REXROTH" (MECHANICAL MODELS)	26
3.2 CONTROL VALVES "REXROTH" (PILOT MODELS)	42
3.3 SOLENOID VALVE FOR PILOTING THE BACKHOE CONTROL VALVE (WITH HYDRAULIC CONTROL)	51
3.4 RELIEF VALVES	54
3.5 ACCUMULATOR "GLIDE RIDE" PARKER	62
4. HYDRAULIC SWING SYSTEM	65
4.1 DESCRIPTION AND OPERATION	65
4.2 HYDRAULIC OIL FLOW	66

5. HYDRAULIC CYLINDERS.....	68
5.1 LOADER ATTACHMENT BOOM CYLINDER.....	69
5.2 LOADER BUCKET CYLINDER.....	75
5.3 4X1 LOADER BUCKET CYLINDER	81
5.4 BACKHOE BOOM CYLINDER	84
5.5 BACKHOE ATTACHMENT DIPPER CYLINDER	88
5.6 BACKHOE BUCKET CYLINDER.....	92
5.7 TELESCOPIC CYLINDER	96
5.8 STABILIZER CYLINDER - CENTER PIVOT.....	100
5.9 STABILIZER CYLINDER - SIDESHIFT	104
5.10 SWING CYLINDER.....	108
5.11 BACKHOE ATTACHMENT MOVEMENT LOCK CYLINDER (SIDESHIFT)	112
5.12 SPECIAL TOOLS.....	113
6. HYDRAULIC CONTROL LEVERS.....	114
6.1 SPECIFICATIONS	114
6.2 DESCRIPTION AND OPERATION.....	115
6.3 DISASSEMBLY AND ASSEMBLY	118
6.4 CONTROL LEVER VALVE	121
7. FAULT FINDING	124
7.1 PRELIMINARY CHECKS.....	124
7.2 FAULT FINDING (WITH “REXROTH” CONTROL VALVES).....	125

SECTION 39 - CHASSIS

1. DESCRIPTION AND OPERATION.....	3
2. REMOVAL AND INSTALLATION COMPONENTS.....	6
2.1 COMPONENTS WITHIN THE CHASSIS.....	6
2.2 COMPONENTS BELOW THE CHASSIS	7
2.3 COMPONENTS ATTACHED OUTSIDE THE CHASSIS	9
2.4 COMPONENTS ATTACHED ON THE CHASSIS.....	10
2.5 MOUNTING SCREW TORQUE.....	12

SECTION 41 - STEERING SYSTEM

1. STEERING SYSTEM 2WS	4
2. STEERING SYSTEM 4WS	7
3. POWER STEERING	12
3.1 SPECIFICATIONS	13
3.2 COMPONENTS	15
3.3 DISASSEMBLY AND ASSEMBLY	16
3.4 SPECIAL TOOLS.....	33
3.5 FAULT FINDING	33

SECTION 50 - CAB HEATING AND AIR CONDITIONING

1. SPECIFICATIONS	3
2. CAB HEATING	5
2.1 DESCRIPTION AND OPERATION.....	5

3. AIR CONDITIONING	13
3.1 PRINCIPALS OF AIR CONDITIONING	13
3.2 SAFETY PRECAUTIONS	17
3.3 DESCRIPTION AND OPERATION	18
3.4 FAULT FINDING AND TESTING	27
3.5 FLUSHING THE SYSTEM	45
3.6 EVACUATING THE SYSTEM	47
3.7 CHARGING THE SYSTEM	48
3.8 COMPONENTS OVERHAUL	49
3.9 COMPRESSOR	54
3.10 SPECIAL TOOLS	68

SECTION 55 - ELECTRICAL SYSTEM

1. GENERALITIES	3
1.1 TEMPORARY WIRING HARNESS REPAIR	3
1.2 FAULT FINDING	4
2. ELECTRICAL DIAGRAMS	6
2.1 ELECTRICAL DIAGRAMS - POWERSHUTTLE ROPS (B90B)	6
2.2 ELECTRICAL DIAGRAMS - POWERSHUTTLE CAB (B90B)	24
2.3 ELECTRICAL DIAGRAMS - POWERSHUTTLE CAB (B100B - B110B)	44
2.4 ELECTRICAL DIAGRAMS - POWERSHIFT CAB (B110B)	60
2.5 ELECTRICAL DIAGRAMS - 4WS CAB	76
3. CONTROLS AND INSTRUMENTS	93
3.1 FRONT INSTRUMENT CLUSTER PANEL	93
3.2 CALIBRATION OF SPEEDOMETER	95
3.3 SIDE INSTRUMENT CLUSTER PANEL (B90B)	96
3.4 SIDE INSTRUMENT CLUSTER PANEL (B100B - B110B - B115B)	98
3.5 SIDE INSTRUMENT CLUSTER (B90B)	100
3.6 SIDE INSTRUMENT CLUSTER (B100B - B110B - B115B)	102
3.7 ANTI-START SYSTEM	104
4. DIAGNOSTIC DISPLAY (B100B-B110B-B115B)	105
4.1 SYMBOLS	107
4.2 SETUP MENU	108
4.3 PROCEDURE ABOUT SELF TEST	109
4.4 ON BOARD ERROR CODE RETRIEVAL	110
4.5 BACKLIGHTING AND DIMMING	111
4.6 WORK HOURS	112
4.7 FUNCTIONAL DESCRIPTION	113
4.8 MAINTENANCE	119
4.9 WARNING MESSAGES	120
5. STARTING SYSTEM	126
5.1 DESCRIPTION AND OPERATION	126
5.2 FAULT FINDING	127
5.3 STARTER MOTOR	130
6. ALTERNATOR	136
6.1 SPECIFICATIONS	136
6.2 DESCRIPTION AND OPERATION	136
6.3 COMPONENTS	138
6.4 REMOVAL	139
6.5 PRELIMINARY CHECK AND TESTS	140
6.6 FAULT FINDING	149

7. BATTERY.....	150
7.1 SPECIFICATIONS	150
7.2 DESCRIPTION AND OPERATION.....	150
7.3 BATTERY REPLACEMENT.....	151
7.4 MAINTENANCE	153
7.5 TESTS.....	155
7.6 CONNECTING A BOOSTER BATTERY	157
7.7 BATTERY MASTER SWITCH	157
8. COMPONENT TESTING	158
8.1 GENERAL INTRODUCTION	158
8.2 COMPONENT TESTING	159
8.3 GROUND POINTS.....	159
8.4 STARTER SWITCH KEY AND STOP SWITCH	161
8.5 ALTERNATOR.....	162
8.6 TRANSMISSIONS	162
8.7 PARKING BRAKE SWITCH.....	166
8.8 CAB.....	167
8.9 4WD SWITCH	172
8.10 BRAKE PEDAL SWITCHES	172
8.11 BRAKE OIL LEVEL WARNING LAMP.....	173
8.12 FRONT WORK LAMP SWITCH (1) - REAR WORK LAMP SWITCH (2) MAIN LIGHT SWITCH....	173
8.13 HAZARD SWITCH	174
8.14 HAZARD WARNING LIGHT RELAY.....	174
8.15 MULTI FUNCTION SWITCH.....	175
8.16 FRONT WINDSHIELD WIPER MOTOR (1) - REAR WINDSHIELD WIPER MOTOR (2)	175
8.17 4WS - STEERING SELECTOR SWITCH	176
8.18 STEERING CONTROL UNIT.....	177
8.19 4WS REAR AXLE STEERING SENSOR.....	179
8.20 4WS FRONT AXLE STEERING SENSOR	179
8.21 STEERING SOLENOID VALVE.....	180
8.22 DIFFERENTIAL LOCK SWITCH (1)	181
8.23 LOADER	182
8.24 BACKHOE.....	184
8.25 REVERSING BUZZER.....	188
8.26 FUEL LEVEL GAUGE.....	189

SECTION 82 - LOADER

1. LOADER ATTACHMENT CONTROLS.....	4
2. LOADER BUCKET SELF LEVELING	7
3. LOADER ATTACHMENT SAFETY STRUT	10
3.1 LOADER ATTACHMENT SAFETY STRUT (B90B - B100B - B110B).....	10
3.2 LOADER ATTACHMENT SAFETY STRUT (B115B).....	12
4. LOADER BUCKET REMOVAL	13
4.1 LOADER BUCKET (B90B - B100B - B110B).....	13
4.2 LOADER BUCKET (B115).....	14
4.3 LOADER BUCKET WITH FORKS (OPTIONAL).....	15
4.4 REPLACING LOADER BUCKET TEETH	16

5. LOADER REMOVAL.....	17
5.1 LOADER ATTACHMENT (B90B - B100B - B110B)	17
5.2 LOADER ATTACHMENT (B115B)	19

SECTION 84 - BACKHOE

1. DESCRIPTION AND OPERATION.....	3
2. BACKHOE ATTACHMENT MECHANICAL CONTROLS VERSION	6
3. BACKHOE ATTACHMENT HYDRAULIC CONTROLS VERSION	15
4. REMOVAL AND INSTALLATION	17
4.1 CENTER PIVOT BACKHOE ATTACHMENT DISASSEMBLY	17
4.2 SIDESHIFT BACKHOE ATTACHMENT DISASSEMBLY	20
4.3 BACKHOE BUCKET REMOVAL	22
4.4 BACKHOE BUCKET TEETH REPLACEMENT	23
4.5 DIPPER REMOVE	24
5. TELESCOPIC DIPPER REVISION.....	27
6. TELESCOPIC DIPPER REVISION.....	27
7. REVISIONE DEL BRACCIO TELESCOPICO	27

B90B - B90BLR
B100B - B100BLR
B110B
B115B



SECTION 00 - SAFETY PRECAUTIONS

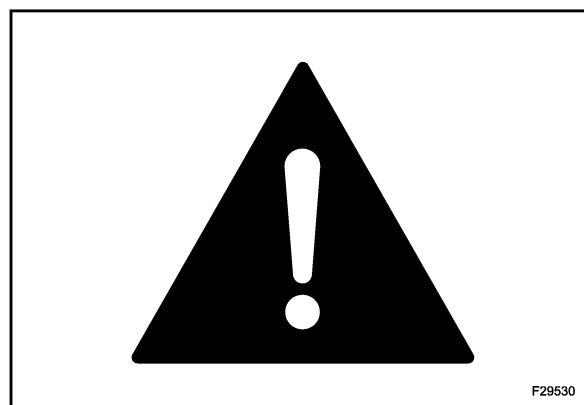
This warning symbol points out important messages involving personal safety.

Carefully read the safety rules contained herein and follow advised precautions to avoid potential hazards and safeguard your safety and personal integrity.

In this manual you will find this symbol together with the following keywords:

WARNING - it gives warning about improper repair operations and deriving potential consequences affecting the service technician's personal safety.

DANGER - it gives specific warning about potential dangers for personal safety of the operator or other persons directly or indirectly involved.



TO PREVENT ACCIDENTS

Most accidents and personal injuries that occur in the work site or on the road, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions.

For this reason, **MOST ACCIDENTS CAN BE PREVENTED**: by recognizing the real cause and taking the necessary precautions, before the accident occurs.

Regardless of the care used in design and construction of any type of equipment, there may be conditions that cannot be completely safeguarded against, without interfering with reasonable accessibility and efficient operation.

A careful operator or technician is the best precaution against accidents. The complete observance of one simple rule would prevent many thousands of serious injuries each year.

This rule is: Never attempt to clean, lubricate or adjust a machine while it is in motion.

SAFETY PRECAUTIONS

- Carefully follow specified repair and maintenance procedures.
 - Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as: ties, torn clothes, scarves, open jackets or shirts with open zips which could get hold into moving parts. We advise to use approved safety clothing such as: anti-slipping footwear, gloves, safety goggles, helmets, etc.
 - Never carry out any repair on the machine if someone is sitting on the operator's seat, except if they are certified operators to assist in the operation to be carried out.
 - Never operate the machine or use attachments from a place other than sitting at the operator's seat.
 - Never carry out any operation on the machine when the engine is running, except when specifically indicated.
 - Stop the engine and ensure that all pressure is relieved from the hydraulic systems before removing caps, covers, valves, etc.
 - All repair and maintenance operations should be carried out with the greatest care and attention.
 - Service stairs and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.
 - Disconnect the batteries and label all controls to warn that the Machine is being serviced. Block the machine and all equipment which should be raised.
 - Never check or fill fuel tanks and accumulator batteries, nor use starting liquid if you are smoking or near open flames as such fluids are flammable.
 - Brakes are inoperative when they are manually released for maintenance purposes. In such cases, the machine should be kept constantly under control using blocks or similar devices.
 - The fuel filling gun should remain always in contact with the filler neck.
Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity buildup.
 - Use exclusively specified towing points for towing the machine. Connect parts carefully. Ensure that foreseen pins and/or locks are steadily fixed before applying traction.
Do not stop near towing bars, cables or chains working under load.
 - To transfer a failed machine, use a trailer or a low loading platform trolley if available.
 - To load and unload the machine from the transportation mean, select a flat area providing a firm support to the trailer or truck wheels. Firmly tie the machine to the truck or trailer platform and block wheels as required by the forwarder.
 - For electrical heaters, battery-chargers and similar equipment use exclusive auxiliary power supplies with a efficient ground to avoid electrical shock hazard.
 - Always use lifting equipment and similar of appropriate capacity to lift or move heavy components.
 - Pay special attention to bystanders.
 - Never pour gasoline or diesel oil into open, wide and low containers.
 - Never use gasoline, diesel oil or other flammable liquids as cleaning agents. Use non-flammable non-toxic proprietary solvents.
 - Wear protection goggles with side guards when cleaning parts using compressed air.
 - Do not exceed a pressure of 2.1 bar (30 psi), in accordance with local regulations.
 - Do not run the engine in a closed building without proper ventilation.
 - Do not smoke, use open flames, cause sparks in the nearby area when filling fuel or handling highly flammable liquids.
 - Do not use flames as light sources when working on a machine or checking for leaks.
 - Move with caution when working under a Machine, and also on or near a Machine. Wear proper safety accessories: helmets, goggles and special footwear.
 - During checks which should be carried out with the engine running, ask an assistant to sit at the operator's seat and keep the service technician under visual control at any moment. In case of operations outside the workshop, drive the machine to a flat area and block it. If working on an incline cannot be avoided, first block the Machine carefully. Move it to a flat area as soon as possible with a certain extent of safety.
 - Ruined or plied cables and chains are unreliable. Do not use them for lifting or trailing. Always handle them wearing gloves of proper thickness.
 - Chains should always be safely fastened. Ensure that fastening device is strong enough to hold the load foreseen. No persons should stop near the fastening point, trailing chains or cables.
 - The working area should be always kept CLEAN and DRY. Immediately clean any spillage of water or oil.
 - Do not pile up grease or oil soaked rags: they constitute a great fire hazard. Always place them into a metal container. Before starting the Machine or its attachments, check, adjust and block the operator's seat. Also ensure that there are no persons within the Machine or attachment operating range.
 - Do not keep in your pockets any object which might fall unobserved into the Machine's inner compartments.
-

- Whenever there is the possibility of being reached by ejected metal parts or similar, use protection eye mask or goggles with side guards, helmets, special footwear and heavy gloves. Wear suitable protection such as tinted eye protection, helmets, special clothing, gloves and footwear whenever it is necessary to carry out welding procedures. All persons standing in the vicinity of the welding process should wear tinted eye protection. **NEVER LOOK AT THE WELDING ARC IF YOUR EYES ARE NOT SUITABLY PROTECTED.**
- Metal cables with the use get frayed. Always wear adequate protections (heavy gloves, eye protection, etc.).
- Handle all parts with the greatest caution. Keep your hands and fingers far from gaps, moving gears and similar. Always use approved protective equipment, such as eye protection, heavy gloves and protective footwear.

START UP

- Never run the engine in confined spaces which are not equipped with adequate ventilation for exhaust gas extraction.
- Never bring your head, body, arms, legs, feet, hands, fingers near fans or rotating belts.

ENGINE

- Always loosen the radiator cap very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped or idle if hot.
- Do not fill up fuel tank when the engine is running, mainly if it is hot, to avoid ignition of fires in case of fuel spilling.
- Never check or adjust the fan belt tension when the engine is running. Never adjust the fuel injection pump when the machine is moving.
- Never lubricate the machine when the engine is running.

ELECTRICAL SYSTEMS

- If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) to (+) and (-) to (-). Avoid short-circuiting the terminals. **GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE.** During charging, leave the battery compartment uncovered to improve ventilation. Avoid checking the battery charge by means of "jumpers" made by placing metallic objects across the terminals. Avoid sparks or flames near the battery area. Do not smoke to prevent explosion hazards.
- Prior to any service, check for fuel or coolant leaks. Remove these leaks before going on with the work. Do not charge batteries in confined spaces. Ensure that ventilation is appropriate to prevent accidental explosion hazard due to build-up of gasses relieved during charging.

- Always disconnect the batteries before performing any type of service on the electrical system.

HYDRAULIC SYSTEMS

- Some fluid slowly coming out from a very small port can be almost invisible and be strong enough to penetrate the skin. For this reason, use a piece of cardboard or a piece of wood for checking. **NEVER USE YOUR HANDS TO CHECK FOR LEAKS.** If any fluid is injected into the skin, seek medical aid immediately. Lack of immediate medical attention, serious infections or dermatitis may result.
- Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

- Check that the tyres are correctly inflated at the pressure specified by the Manufacturer. Periodically check possible damages to the rims and tyres.
- Keep off and stay at the tyre side when correcting the inflation pressure.
- Check the pressure only when the machine is unloaded and tyres are cold to avoid wrong readings due to over-pressure. Do not reuse parts of recovered wheels as improper welding, brazing or heating may weaken the wheel and make it fail.
- Never cut, nor weld a rim with the inflated tyre assembled.
- To remove the wheels, block both front and rear Machine wheels. Raise the Machine and install safe and stable supports under the Machine in accordance with regulations in force.
- Deflate the tyre before removing any object caught into the tyre tread.
- Never inflate tyres using flammable gases as they may originate explosions and cause injuries to bystanders.

REMOVAL AND INSTALLATION

- Lift and handle all heavy components using lifting equipment of adequate capacity. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Take care of the persons near the loads to be lifted.
- Handle all parts with great care. Do not place your hands or fingers between two parts. Wear approved protective clothing such as safety goggles, gloves and footwear.
- Do not twist chains or metal cables. Always wear protection gloves to handle cables or chains.

IMPORTANT ECOLOGICAL CONSIDERATIONS

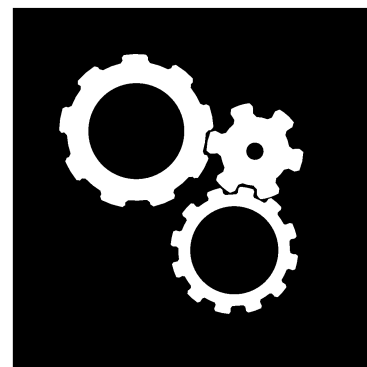
The following are recommendations which may be of assistance:

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances.

Helpful hints

- Avoid filling tanks using jerry cans or inappropriate pressurized fuel delivery systems which may cause considerable spillage.
 - In general, avoid skin contact with all fuels, oils, acids, solvents, etc.
Most of them contain substances which can be harmful to your health.
 - Modern oils contain additives. Do not burn contaminated fuels and/or waste oils in ordinary heating systems.
 - Avoid spillage when draining off used engine coolant mixtures, engine, transmission and hydraulic oils, brake fluids, etc.
Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
 - Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.
 - Do not open the Air-Conditioning system yourself. It may contain gases which should not be released into the atmosphere. Your air conditioning specialist has special equipment for discharging and charging the system.
 - Repair any leaks or defects in the engine cooling or hydraulic system immediately.
 - Do not increase the pressure in a pressurized system as this may lead to a catastrophic failure of the system components.
 - Protect hoses during welding as penetrating weld chips may burn a hole or weaken them, causing the loss of oils, coolant, etc.
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B100B - B100BLR
B110B
B115B



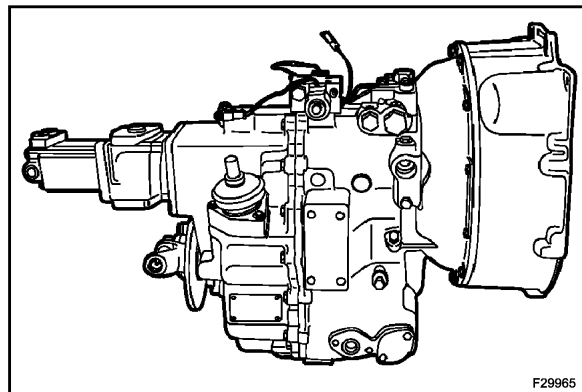
SECTION 21 - TRANSMISSION

1. POWERSHUTTLE TRANSMISSION “TURNER MODEL COM-T4-2025”	3
1.1 SPECIFICATIONS	3
1.2 MOUNTING SCREW TORQUE	5
1.3 TRANSMISSION CONTROLS	6
1.4 LUBRICATION	11
1.5 TRANSMISSION OIL FLOW AND SUPPLY	12
1.6 TRANSMISSION HYDRAULIC VALVES AND PRESSURE TEST POINTS	18
1.7 TRANSMISSION POWER FLOW	19
1.8 TRANSMISSION 2WD COMPONENTS	23
1.9 TRANSMISSION 4WD COMPONENTS	26
1.10 TRANSMISSION REMOVAL	31
1.11 DISASSEMBLY AND ASSEMBLY	32
1.12 FAULT FINDING	90
1.13 SPECIAL TOOLS	93
2. POWERSHIFT TRANSMISSION “DANA T16000”	94
2.1 SPECIFICATIONS	94
2.2 TRANSMISSION CONTROLS	95
2.3 LUBRICATION	105
2.4 PRESSURE SPECIFICATIONS AND CHECK POINTS	106
2.5 TRANSMISSION COOLER	108
2.6 HYDRAULIC DIAGRAM	109
2.7 OPERATION	110
2.8 POWER FLOWS	117
2.9 GEAR AND CLUTCH LAY OUT	135
2.10 TRANSMISSION REMOVAL AND INSTALLATION	136
2.11 TRANSMISSION COMPONENTS	140
2.12 DISASSEMBLY AND ASSEMBLY	158
2.13 SPECIAL TOOLS	267
2.14 FAULT FINDING	268
2.15 FAULT FINDING	270

1. POWERSHUTTLE TRANSMISSION “TURNER MODEL COM-T4-2025”

This transmission is used on powershuttle loader backhoe models B90B-B90BLR-B100B-B100BLR-B110B-B115B.

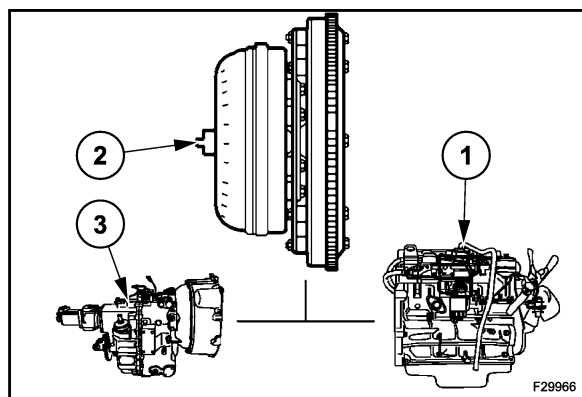
The transmission consists of a torque converter, an internal rotor-type hydraulic pump, an oil distributor, a solenoid control valve assembly, two hydraulically operated clutches, a 4-speed synchromesh geartrain, transmission case and oil cooler tubes.



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NOTE: a conventional clutch is not used with this transmission.

The transmission case serves as an oil tank for the torque converter and hydraulic clutch assemblies. The transmission receives power from the engine (1) by a fluid coupling in the torque converter (2) and hydraulic clutch assemblies in the transmission (3).



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1.1 SPECIFICATIONS

GEAR RATIO

Forward				Reverse			
1	2	3	4	1	2	3	4
4.824	2.998	1.408	0.792	4.020	2.496	1.173	0.660

COLD START BY-PASS VALVE SPRING

Free length.....53.4 mm $\pm$ 0.96 mm (2.10 in $\pm$ 0.038 in)

FORWARD CLUTCH SPRING

Free length..... 76.6 mm (3.017 in)

CLUTCH PISTON SPRING

Free length..... 75.9 mm (2.99 in)

DETENT SPRING

Free length (Approximately)..... 42.06 mm (1.656 in)

END FLOAT

Input forward Primary Shaft	0.0508-0.41 mm (0.002 in - 0.016 in)
Input reverse Primary Shaft	0.0508-0.41 mm (0.002 in - 0.016 in)
Output shaft.....	1st Gear - 0.33-0.508 mm (0.013 in - 0.020 in)
.....	2nd Gear - 0.35-0.558 mm (0.014 in - 0.022 in)
.....	3rd Gear - 0.38-0.838 mm (0.015 in - 0.033 in)
.....	4th Gear - 0.20-0.558 mm (0.008 in - 0.022 in)
4WD Shaft.....	0.050-0.28 mm (0.002 in - 0.011 in)
Bearing End Floats.....	0.025-0.076 mm (0.001 in - 0.003 in)
Bearing End Float Shims available	0.050/0.076/0.127/0.177/0.381/0.508 mm
.....	(0.002/0.003/0.005/0.007/0.015/0.020 in)

HYDRAULIC TESTS

Tachometer setting	2000 rpm
Test temperature, oil	80-85 °C (176 -185°F)
Cold Start Valve (For reference only).....	26 bar (377 psi)
System Pressure Test.....	13.7-15.2 bar (198 - 220 psi)
Torque Converter	7-11 bar (101 - 159 psi)
Reverse Clutch.....	13.7-15.2 bar (198 - 220 psi)
Forward Clutch.....	13.7-15.2 bar (198 - 220 psi)
4WD Supply	13.7-15.2 bar (198 - 220 psi)

COOLER FLOW TEST

Oil temperature 80-85 °C	Rpm	Oil flow l/min
.....	700	12.5 litres (3.3 US Gallons)
.....	1000	18.2 litres (4.8 US Gallons)
.....	1500	22.1 litres (5.8 US Gallons)
.....	2000	24.0 litres (6.3 US Gallons)
.....	2200	24.5 litres (6.5 US Gallons)
.....	2500	25.0 litres (6.6 US Gallons)



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1.2 MOUNTING SCREW TORQUE

Strainer bolts.....	18 to 31 Nm (13 to 23 lbf.ft)
Pump retaining bolts	18 to 31 Nm (13 to 23 lbf.ft)
Output Yoke bolts	68 to 88 Nm (50 to 65 lbf.ft)
Pressure test plugs	41 to 54 Nm (30 to 40 lbf.ft)
Main transmission case bolts.....	45 to 64 Nm (33 to 47 lbf.ft)
Shift detent plug	41 to 54 Nm (30 to 40 lbf.ft)
Shift fork screws.....	18 to 25 Nm (13 to 18 lbf.ft)
Shift lever assembly screws.....	16 to 24 Nm (12 to 18 lbf.ft)
Drain plugs.....	34 to 54 Nm (25 to 40 lbf.ft)
Relief valve	23 to 30 Nm (17 to 22 lbf.ft)
Pressure regulator valve	46 to 60 Nm (34 to 44 lbf.ft)
Cold start valve	46 to 60 Nm (34 to 44 lbf.ft)
4WD solenoid valve spool.....	20 to 27 Nm (15 to 22 lbf.ft)
4WD Solenoid coil retaining nut.....	5.4 Nm (4 lbf.ft)
Control valve retaining screws	6.8 to 8.5 Nm (5 to 6.3 lbf.ft)
4WD hydraulic pipe connections.....	6.8 to 10.2 Nm (5 to 7.5 lbf.ft)
Filter housing bolts.....	45 to 64 Nm (33 to 47 lbf.ft)
Oil filter.....	7 to 10 Nm (5 to 7.5 lbf.ft)
Temperature sender	20 to 27 Nm (15 to 20 lbf.ft)

RECOMMENDED SEALANTS

Transmission case joint	Loctite 5203
4WD Output gear.....	Loctite 649
4WD gear (Permanent 4WD assy)	Loctite 649
4WD clutch supply pipe	Loctite 542
Gear lever housing.....	Loctite 5900 RTV
Shimming access plug	Loctite 649

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