DANA SPICER®
Off-Highway Products

Service Manual

8000 4 Speed EHO

Allied Form: 80-1382
Rev: 06/2022

TSM-0007E
October 2019

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INDEX

VERSION TRACKING 7
MANUAL APPLICABILITY AND SUPPORTED MODELS 7

INTRODUCTION 8

FOREWORD 8
SAFETY PRECAUTIONS 8

CLEANING, INSPECTION 9

CLEANING 9
BEARINGS 9
HOUSINGS 9
INSPECTION 9
OIL SEALS, GASKETS, ETC 9
GEARS & SHAFTS 9
HOUSINGS, COVERS, ETC 9

TECHNICAL SPECIFICATIONS 10

IDENTIFICATION OF THE UNIT 10
WEIGHT, DIMENSIONS, OIL CAPACITY 10
TORQUE CHARTS 11
PRESSURE AND TEMPERATURE SPECIFICATIONS 13
HYDRAULIC COOLER LINES SPECIFICATIONS 13
ELECTRICAL SPECIFICATIONS 13

MAINTENANCE 14

OIL SPECIFICATION 14
RECCOMENDED LUBRICANTS 14
MAINTENANCE INTERVALS 15
DAILY 15
NORMAL DRAIN PERIOD 15
SERVICING MACHINE AFTER COMPONENTS OVERHAUL 15
FILLING INSTRUCTIONS 16
PRESSURE AND OIL FLOW CHECKS 17
OIL PRESSURE AT CONVERTER OUT PORT 17
TRANSMISSION CLUTCH LEAKAGE 18
LEAKAGE IN TRANSMISSION CLUTCHES 18
CONVERTER LUBE FLOW 18
LEAKAGE IN CONVERTER 18

INSTALLATION DETAILS - EXTERNAL PLUMBING 19

PLUMBING DIAGRAM W/ EHO VALVE 19
PLUMBING DIAGRAM W/ EHO VALVE AND SCAVENGER PUMP 22
PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & LOCKUP 26
PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & CONV. BYPASS 29
PLUMBING DIAGRAM W/O MODULATION (SSP) 32
PLUMBING DIAGRAM W/O MODULATION (SSP) AND SCAVENGER PUMP 35
PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP AND LOCKUP 39
PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP & CONV. BYPASS 42
SCAVENGER PUMP AND BREATHER INSTALLATION 45

OPERATION OF THE TRANSMISSION 47

HOW THIS UNITS OPERATES 47
POWERFLOWS, ACTIVATED SOLENOIDS & HYDRAULIC CIRCUIT 49
NEUTRAL 49
FORWARD 1ST 50
FORWARD 2ND 51
FORWARD 3RD 52
FORWARD 4TH 53
REVERSE 1ST 54
REVERSE 2ND 55
REVERSE 3RD 56
REVERSE 4TH 57

TROUBLESHOOTING 58
8000 TRANSMISSION 58
TROUBLESHOOTING PROCEDURES 58
STALL TEST 58
TRANSMISSION PRESSURE CHECKS 58
MECHANICAL AND ELECTRICAL CHECKS 58
HYDRAULIC CHECKS 59
TROUBLESHOOTING GUIDE 60
LOW CLUTCH PRESSURE WITH NORMAL CLUTCH LEAKAGE 60
LOW CLUTCH PRESSURE WITH EXCESSIVE CLUTCH LEAKAGE 60
LOW CONVERTER CHARGING PUMP OUTPUT 60
LOW FLOW THROUGH COOLER WITH LOW PRESSURE IN CONVERTER 60
OVERHEATING 60
NOISY CONVERTER 60
NUMBERING OF PORTS FOR HYDRAULIC CIRCUIT DIAGRAMS 61
CHECK POINTS 62
SECTIONAL VIEWS AND PARTS IDENTIFICATION 63
8000 SERIES TRANSMISSION ASSEMBLY 63
8000 SERIES TUBE ASSEMBLY 68
8000 SERIES FWD & REV CLUTCHES, MODULATION 70
8000 SERIES 11.5 DIA. CLUTCH GROUP, RANGE MODULATION TAPERED BEARING ARRANGEMENT ...72
1ST & 2ND CLUTCH 72
TRANSMISSION 8421-267 8XXX-3YY 74
8000 ASSY-TRANSMISSION 74
1000 GROUP-SPEED SENSOR 75
8000 GROUP-BASE PARTS 76
8000 GROUP-FORWARD & REVERSE CLUTCHES 78
8000 GROUP-1ST/2ND CLUTCH 80
8000 GROUP-3RD & 4TH CLUTCH 82
8000 GROUP-OUTPUT SHAFT 84
8000 GROUP-IDLER SHAFT 86
8000 GROUP-1ST/3RD & 2ND/4TH SHAFT 88
8000 GROUP-REVERSE SHAFT 90
8000 GROUP-FORWARD/REVERSE SHAFT 92
8000 ASSY-TRANSMISSION CASE 94
CONTROL VALVE 96
8000 4 SPEED GENERAL ASSEMBLY INSTRUCTION 96
8000 8 SPEED GENERAL ASSEMBLY INSTRUCTION 102
8000 GROUP-CONTROL VALVE EHO 108
ASSY CONTROL VALVE 109
GROUP CONTROL VALVE WITH VARIABLE RESTRICTION 110
ASSY MODULATOR SPOOL 112
ASSY MODULATOR SPOOL - 2 112
ASSY MODULATOR SPOOL - 3 113
ASSY MODULATOR SPOOL - 4 113
ASSY SOLENOID PLATE 114
GROUP WIRING HARNESS 116
NEW GASKET AND SEALING KIT FOR 8000 TRANSMISSION 117
OUTPUT SHAFT GROUP 118
IDLER SHAFT GROUP 119
INPUT SHAFT GROUP 120
REVERSE SHAFT GROUP 121
2ND & 4TH SHAFT GROUP 122
1ST & 3RD SHAFT GROUP 123
SPEEDOMETER DRIVE GROUP 124

ASSEMBLY INSTRUCTIONS 125
ASSEMBLY INSTRUCTIONS TRANSMISSION 126
ASSEMBLY PROCEDURE 126
ASSEMBLY PROCEDURE IDLER SHAFT 126
CLUTCH ADJUSTMENT PROCEDURE 127
END-STOP PLIER SETTING 130
RETAINING SNAP RING FOR BORES 130
RETAINING SNAP RING FOR SHAFTS 130
DISASSEMBLY AND REASSEMBLY OF THE TRANSMISSION 131
DISASSEMBLY OF THE TRANSMISSION CASE 132
DISASSEMBLY OF THE 1ST & 2ND DRUM 134
DISASSEMBLY OF THE TRANSMISSION CASE 136
DISASSEMBLY & REASSEMBLY OF FWD, REV, 3RD & 4TH CLUTCH DRUM 143
DISASSEMBLY & REASSEMBLY OF CLUTCH SUPPORT 146
REASSEMBLY OF TRANSMISSION CASE 147
CLUTCH PROCEDURE FOR 8421-267 AND 8XXX-3YY 163
DISASSEMBLY 163
ASSEMBLY 165

VERSION TRACKING

FILE NAME	REVISION	DATE	CHANGES DESCRIPTION
TSM-0007E_Rev.00 8000 4 Speed EHO	00	25/10/2019	Document issued

MANUAL APPLICABILITY AND SUPPORTED MODELS

MODELS
8000

INTRODUCTION

FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the SPICER OFF-HIGWAY PRODUCTS product.

Extreme care has been exercised in the design, selection of materials, and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will be reimbursed many times in low cost operation and trouble-free service.

In order to become familiar with the various parts of the product, its principle of operation, troubleshooting and adjustments, it is urged that the mechanic studies the instructions in this manual carefully and uses it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only Dana Incorporated approved parts as listed in the applicable parts manual should be used. Use of “will-fit” or non-approved parts may endanger proper operation and performance of the equipment. Dana Incorporated does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by Dana Incorporated.

IMPORTANT:

ALWAYS FURNISH THE DISTRIBUTOR WITH THE SERIAL AND MODEL NUMBER WHEN ORDERING PARTS.

⚠ CAUTION

TOWING OR PUSHING

Before towing the vehicle, be sure to lift the driven axle wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing.

Because of the design of the hydraulic system, the engine cannot be started by pushing or towing.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe reliable operation of the machine. If replacement parts are required, the parts must be replaced by spare parts which have the same part number or with equivalent parts. DO NOT USE A SPARE PART OF LESSER QUALITY.

The service procedures recommended in this manual are effective methods for performing service and repair.

Some of these procedures require the use of tools specifically designed for the purpose.

Accordingly, anyone who intends to use a spare part, service procedure or tool, which is not recommended by Dana Incorporated, must first determine that neither his safety nor the safe operation of the machine will be jeopardized by the spare part, service procedure or tool selected.

IMPORTANT:

IT IS IMPORTANT TO NOTE THAT THIS MANUAL CONTAINS VARIOUS ‘CAUTIONS AND NOTICES' THAT MUST BE CAREFULLY OBSERVED IN ORDER TO REDUCE THE RISK OF PERSON AL INJURY DURING SERVICE OR REPAIR, OR THE POSSIBILITY THAT IMPROPER SERVICE OR REPAIR MAY DAMAGE THE UNIT OR RENDER IT UNSAFE. IT IS ALSO IMPORTANT TO UNDERSTAND THAT THESE ‘CAUTIONS AND NOTICES' ARE NOT EXHAUSTIVE, BECAUSE IT IS IMPOSSIBLE TO WARN ABOUT ALL POSSIBLE HAZARDOUS CONSEQUENCES THAT MIGHT RESULT FROM FAILURE TO FOLLOW THESE INSTRUCTIONS.

⚠ CAUTION

When maintenance works require welding, disconnect both connectors from the transmission controller and from the valve unit, before any welding is started.

⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a situation which, if not avoided, may result in damage to components.
NOTICE	Indicates information which may make product service easier to perform.

CLEANING AND INSPECTION

⚠ DANGER

Care should be exercised to avoid skin rashes, fire hazards, and inhalation of vapors when using solvent type and alkali cleaners.

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated slowly until parts are thoroughly cleaned of all old lubricants and foreign materials.

Thoroughly dry all cleaned parts immediately by using moisture-free compressed air or soft lint-free absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil, or lapping compound.

BEARINGS

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearings to avoid spinning. DO NOT SPIN BEARINGS WHEN DRYING. Bearings may be rotated slowly by hand to facilitate the drying process.

HOUSINGS, COVERS, AND CAPS

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft lint-free absorbent wiping rags, free of abrasive materials such as metal filings, contaminated oil, or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

BEARINGS

Carefully inspect all rollers, cages, and cups for wear, chipping, or nicks to determine fitness of bearings for further use. DO NOT REPLACE A BEARING CONE OR CUP INDIVIDUALLY without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lint-free cloth or paper to protect them until installed.

OIL SEALS, GASKETS AND RETAINING RINGS

Replacement of spring load oils seals, “O” rings, metal sealing rings, gaskets and snap rings is more economical when the unit is disassembled than premature overhaul to replace these parts at a future time.

Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed.

Cutting, scratching or curling under of lips of seals seriously impairs its efficiency.

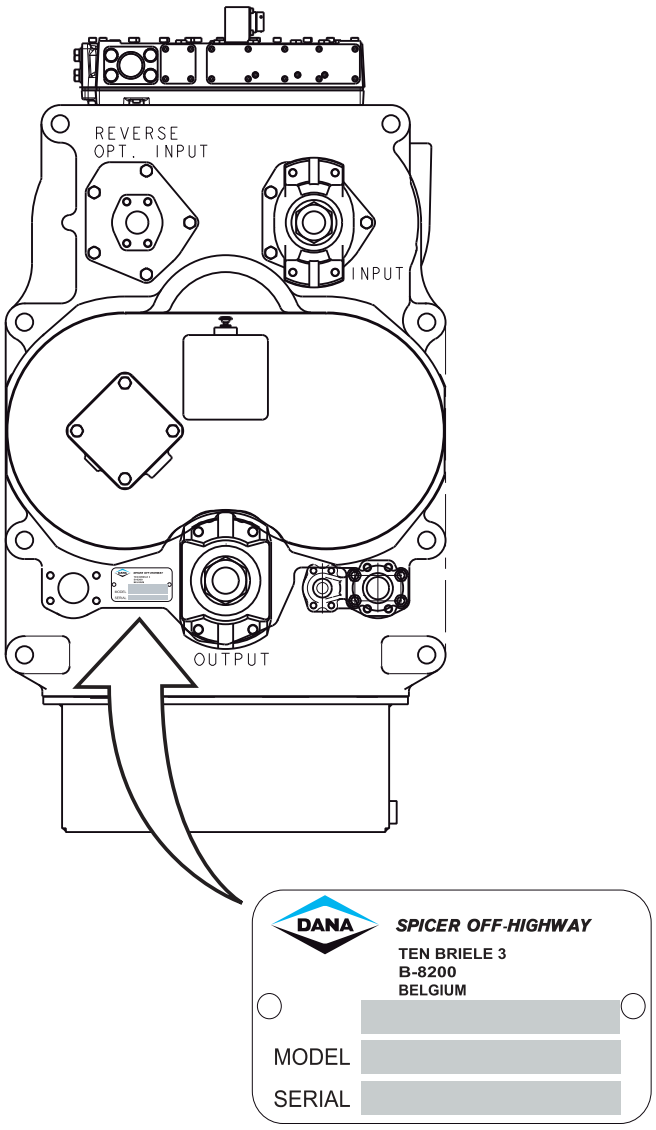
When assembling new metal type sealing rings, these should be lubricated with a coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all “O” rings and seals with recommended type Automatic Transmission Fluid before assembly.

GEARS AND SHAFTS

If Magna-Flux or a dye penetrant process is available, use this process to check parts. Examine teeth and the ground/ polished surfaces of all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scoring. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone stone. Inspect shafts to make certain they are not sprung, bent, or have twisted splines.

TECHNICAL SPECIFICATIONS

IDENTIFICATION OF THE UNIT



1 - Model and type of the unit.
2 - Serial number.

WEIGHT, DIMENSIONS, OIL CAPACITY

- Weight (dry): ±1327 kg [2925 lbs.]
- Maximum length : 949 mm [37.36”]
- Maximum width : 743 mm [29.25”]
- Maximum height : Standard sump: 1187 mm [46.72”]

Oil capacity

- Standard sump: ±32 l [8.5 US Gallon]
- Deep sump: ±49 l [13 US Gallon]
- Consult operator's manual on applicable machine for system capacity.

TORQUE CHARTS

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS						
NOM. SIZE	Grade 8.8		Grade 10.9		Grade 12.9	
	Coarse thread		Coarse thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
M5x0.8	[5-6]	3.7-4.4	[7-8]	5.2-5.9	[8-10]	5.9-7.4
M6x1	[8-10]	5.9 -7.4	[12-15]	8.9-11.1	[13-16]	9.6-11.8
M8x1.25	[20-25]	14.8-18.4	[30-35]	22.1-25.8	[35-40]	25.8-29.5
M10x1.5	[40-50]	29.5 -36.9	[60-65]	44.3-47.9	[65-75]	47.9-55.3
M12x1.75	[68-75]	50.2-55.3	[100-110]	73.8-81.1	[115-130]	85-96
M14x2	[110-125]	81-92	[150-175]	111-129	[180-210]	133-155
M16x2	[170-190]	125-140	[240-275]	177-203	[280-320]	207-236
M20x2.5	[320-360]	236-266	[450-500]	332-369	[525-600]	387-443
M24x3	[570-650]	420-479	[800-900]	590-664	[900-1050]	664-774
M30x3.5	[1150-1300]	848-959	[1600-1800]	1180-1328	[1850-2100]	1364-1549
M36x4	[2000-2250]	1475-1660	[2749-3149]	2028-2323	[3249-3699]	2397-2729

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS						
NOM. SIZE	GRADE 8.8		Grade 10.9		Grade 12.9	
	Coarse thread		Coarse thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
M8x1	[23-28]	17-20	[34-39]	25-28	[41-46]	30-34
M10x1	[47-57]	35-42	[71-81]	52-60	[84-94]	62-69
M10X 1.25	[44-54]	32-40	[67-77]	49-57	[79-89]	58-66
M12x1.25	[82-92]	60-68	[120-130]	89-96	[143-158]	105-116
M12x 1.5	[78-88]	58-65	[117-127]	86-94	[138-153]	101-112
M14x1.5	[128-143]	94-105	[193-208]	142-153	[220-250]	162-184
M16x1.5	[215-228]	159-169	[293-308]	216-227	[350-370]	258-273
M18x1.5	[300-320]	221-236	[433-448]	319-330	[500-540]	369-398
M18x2	[280-300]	207-221	[413-428]	304-315	[470-510]	347-376
M20x1.5	[410-450]	302-332	[595-645]	439-476	[683-758]	503-559
M22x1.5	[560-600]	413-443	[795-845]	586-623	[923-998]	681-736
M24x1.5	[720-800]	531-590	[1040-1140]	767-841	[1195-1345]	882-992
M24x2	[690-770]	509-568	[990-1090]	730-804	[1145-1295]	845-955
M27x1.5	[1070-1150]	789-848	[1530-1630]	1129-1202	[1775-1925]	1309-1420

TORQUE CHARTS

TORQUE SPECIFICATIONS FOR LUBRICATED OR PLATED THREADS								
NOM. SIZE	Grade 5				Grade 8			
	Fine thread		Coarse thread		Fine thread		Coarse thread	
	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft	[Nm]	Lbf-ft
43556	[12-15]	43778	[11-14]	43746	[15-18]	41579	[12-15]	43778
42491	[22-27]	16-20	[16-22]	42705	[38-43]	28-32	[35-41]	26-30
43680	[35-39]	26-29	[31-34]	23-25	[50-56]	37-41	[45-49]	33-36
42552	[56-61]	41-45	[50-56]	37-41	[79-87]	58-64	[70-77]	52-57
43497	[87-95]	64-70	[77-85]	57-63	[122-134]	90-99	[108-119]	80-88
42614	[123-136]	91-100	[111-122]	82-90	[174-191]	128-141	[156-172]	115-127
43682	[173-191]	128-141	[153-168]	113-124	[224-268]	180-198	[216-237]	159-175
43558	[302-332]	223-245	[271-298]	200-220	[427-470]	315-347	[382-420]	282-310

Torque specifications for plugs		
NPFT Nom. Size	O-ring ports	
	[Nm]	lbf-ft
5/16x24	[4-7]	43588
3/8x24	[7-11]	43682
7/16x20	[9-14]	43745
1/2x20	[14-18]	41548
9/16x18	[16-20]	42339
3/4x16	[27-34]	20-25
7/8x14	[41-47]	30-35
1 1/16x12	[61-68]	45-50
1 5/16x12	[88-102]	65-75
1 5/8x12	[102-115]	75-85
1 7/8x12	[102-115]	75-85

Torque specifications for plugs		
METRIC Nom. Size	O-ring ports	
	[Nm]	lbf-ft
M10x1	[8-9]	43652
M12x1.5	[14-18]	41518
M14x1.5	[16-20]	42339
M16x1.5	[27-34]	20-25
M18x1.5	[34-41]	25-30
M22x1.5	[48-60]	35-44
M26x1.5	[61-68]	45-50
M27x2	[81-89]	60-66
M33x2	[112-140]	83-103

Torque specifications for plugs		
Nom. Size	Pipe Plugs	
	[Nm]	Lbf-ft
1/16x27	[7-9]	43651
1/8x27	[9-14]	43745
1/4x18	[20-27]	15-20
3/8x18	[34-41]	25-30
1/2x14	[41-47]	30-35
3/4x14 or 10	[54-61]	40-45
1x11 1/2	[68-75]	50-55
1 1/4x11 1/2	[81-88]	60-65

Torque specifications for plugs		
METRIC Nom. Size	Permanent Plugs	
	Nm	Lbf-ft
M18x1.5 6H	[25-30]	34-41
M26x1.5 6H	[45-50]	61-68

Torque specification		
NFPT Nom. Size	Elastic Stop Nuts	
	Nm	Lbf-ft
1.00x20	[542-610]	150-200
1.25x18	[407-474]	200-250
1.50x18	[271-339]	300-350
1.75x12	[203-271]	400-450

PRESSURE AND TEMPERATURE SPECIFICATIONS

1 - Maximum allowed transmission temperature 120 °C [248 F].
2 - Transmission regulator pressure (*) - (neutral) - PORT 31 (**).
- At 600 RPM min. 12.4 BAR [180 PSI] minimum.

3 - Clutch pressures (*)
- 1st clutch: port 41 (**).
- 2nd clutch: port 42 (**).
- 3rd clutch: port 43 (**).
- 4th clutch: port 44 (**).
- FWD clutch: port 45 (**).
- Reverse clutch: port 46 (**).

4 - At 2000 RPM :
- 12.4 BAR [180 PSI] min. clutch activated.
- 0 - 0.2 BAR (0 - 3 PSI) clutch released.

5 - Safety valve: cracking pressure (*) 9 BAR [130 PSI].
6 - Converter out regulator 4 BAR [58 PSI].

NOTE:

(*) All pressures and flows to be measured with oil temperature of 82-93 °C (180-200 F).
(**) Refer to section Troubleshooting p. 58 for check port identification

HYDRAULIC COOLER LINES SPECIFICATIONS

See chapter Plumbing diagram w/ EHO valve and scavenger pump p. 22.

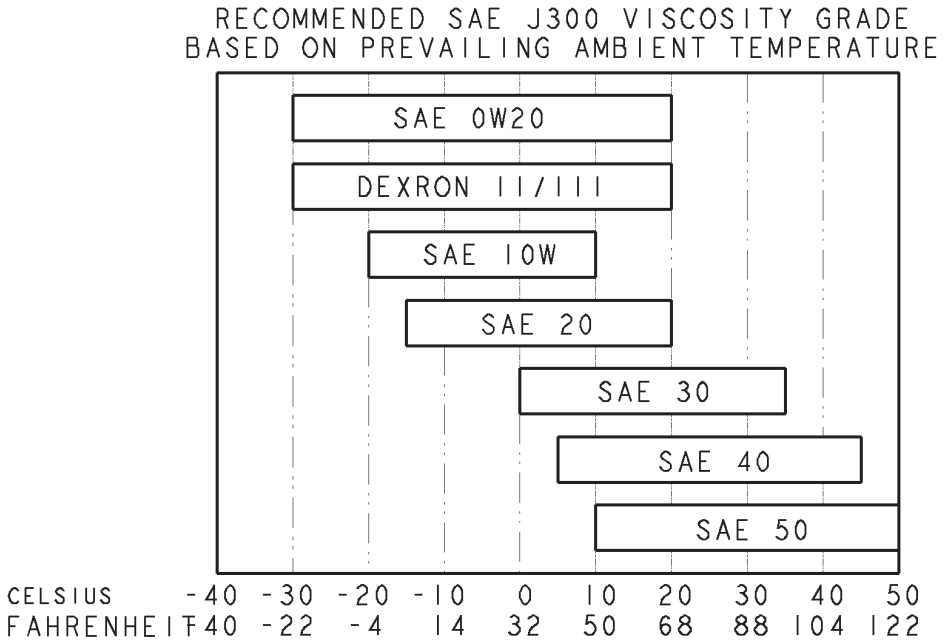
ELECTRICAL SPECIFICATIONS

- ON/OFF solenoid (FWD, REV, 1st, 2nd, 3rd & 4th)
- Coil resistance 24V 87 ± 2 Ω at 20° [68° F]

MAINTENANCE

OIL SPECIFICATION

RECCOMENDED LUBRICANTS



1 - The lubricant must be designed for transmission use. Engine oil is not allowed.

2 - Transmission lubricant must be qualified by one of the following specifications in order of preference:
- CATERPILLAR T0-4
- JOHN DEERE J20 C,D
- MIL-PRF-2104G
- DEXRON I ID OR DEXRON I I I*

3 - For the use of Dexron lubricants in combination with graphitic friction plates (used in i 000 series, hr36000, t 40000) a specific engineering approval is required.

4 - For electronic modulated transmissions (like the TE series) only Dexron III is approved.

5 - gl-5 oils are not approved.

6 - Multi-viscosity lubricants are approved.

7 - Preferred oil viscosity: select a lubricant with a viscosity grade that fully covers the prevailed ambient temperature on the oil application chart. Example: ambient temperature from -10 °C (14 °F) to 20 °C (68 °F): select 10W30 when multiple viscosity grades are suitable, select the grade where the ambient temperature is closest to the middle of the viscosity range. Example: for ambient temperature of 20 °C (68 °F), SAE 30 is preferred over SAE 40 or SAE 50.

8 - Fire resistant fluid - see vehicle manufacturers recommendations.

9 - Sump preheaters- before operating the transmission fluid must be preheated to a minimum temperature according the viscosity grade, to assure sufficient pumping viscosity.

10 - Warm-up- for full load transmission functionality, a minimum sump temperature of 20 °C (68 °F) is required. Before reaching 20 °C (68 °F) sump temperature only neutral gear or unloaded driving is allowed, not exceeding 1500 engine rpm and not exceeding half throttle.

11 - Extended oil change interval - extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals, over time, to determine a baseline. Wear metal analysis can provide useful information but a transmission should not be removed from service based solely on this analysis.

12 - Any deviation from this chart must have written approval from the application engineering department of Dana Incorporated.

*Dexron is a registered trademark of General Motors Corp.

MAINTENANCE INTERVALS

DAILY

Check oil level daily with engine running at idle (600 RPM) and oil at 82 - 93°C [180-200°F].

Maintain oil level at full mark.

NORMAL DRAIN PERIOD

The first change of oil and filter element must be done at 100 hours.

Drain and refill system every 1000 hours for average environmental and duty cycle conditions. Severe or sustained high operating

temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination.

Judgement must be used to determine the required change intervals for extreme conditions.

Every 1000 hours:

- Change oil filter element.
- Drain oil at 65-93°C [150–200°F] and refill system as follows:

1 - Drain transmission.

2 - Remove and discard filter.

3 - Install new filter.

4 - Refill transmission to FULL mark.

5 - Run engine at 500 - 600 RPM to prime converter and lines.

6 - Recheck level with engine running at 500 - 600 RPM and add oil to bring level to LOW mark. When oil temperature is hot 82.2-93.3°C [180-200°F] make final oil level check and adjust if necessary to bring oil level to FULL mark.

Extended oil change interval

Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals, over time, to determine a baseline. Wear metal analysis can provide useful information but a transmission should not be removed from service based solely on this analysis.

SERVICING MACHINE AFTER COMPONENTS OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the driveline between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other. Therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered complete.

After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgement must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1 - Drain entire system thoroughly.

2 - Disconnect and clean all hydraulic lines. Where feasible hydraulic lines should be removed from machine for cleaning.

3 - Replace oil filter element.

4 - The oil cooler must be thoroughly cleaned. The cooler should be “back flushed” with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from machine for cleaning, using oil, compressed air, and steam cleaner for that purpose.

IMPORTANT:

DO NOT USE FLUSHING COMPOUNDS FOR CLEANING PURPOSES.

5 - Reassemble all components and use only approved type oil (See chapter Reccomended lubricants p. 14).

Fill the transmission through filler opening until fluid comes up to FULL mark on transmission dipstick.

- Remove filler plug and fill oil until FULL mark.
- Run engine two minutes at 500 - 600 RPM to prime torque converter and hydraulic lines.
- Recheck level of fluid in transmission with engine running.
- Add quantity necessary to bring fluid level to LOW mark on dipstick.
- Recheck with hot oil 82.2 - 93.3°C [180 – 200° F].
- Adjust oil level to FULL mark on dipstick.

6 - Recheck all drain plugs, lines, connections, etc… for leaks and tighten where necessary.

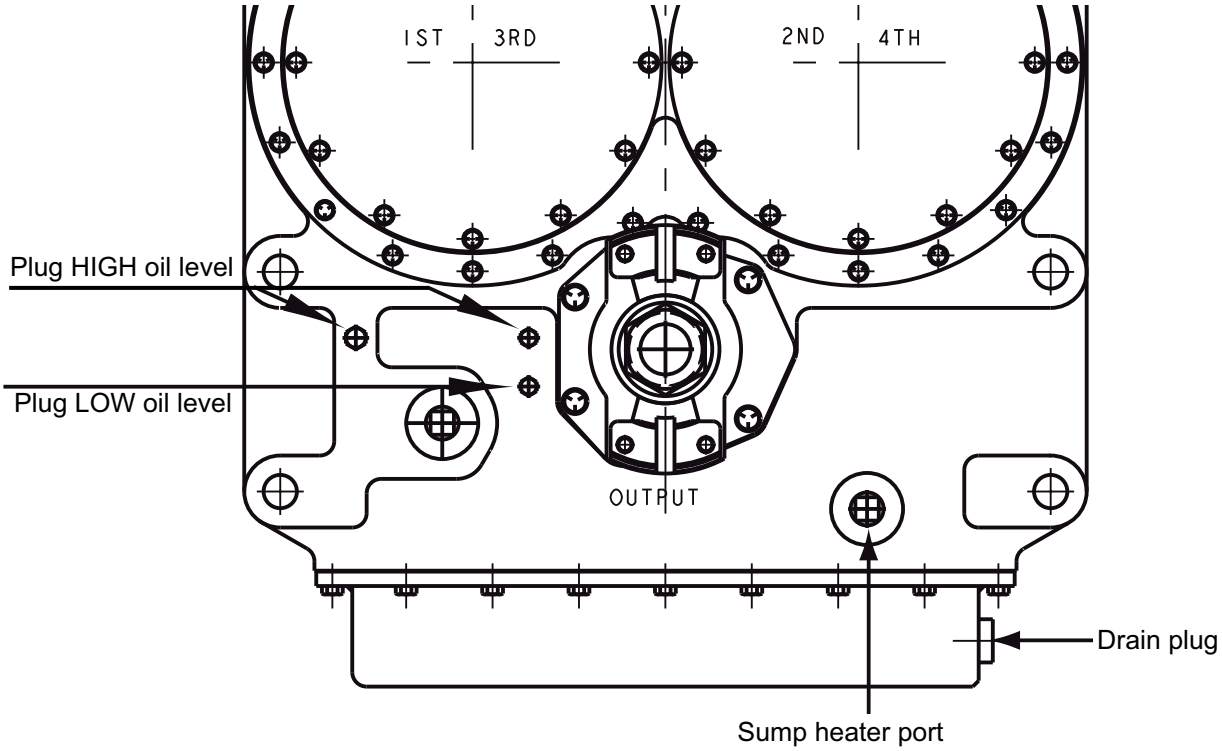
FILLING INSTRUCTIONS

Fill torque converter and transmission through filler opening until fluid comes up to LOW mark on transmission dipstick.

NOTE:

If the dipstick is not accessible oil level check plugs are provided. (See below)

1 - Remove LOWER check plug, fill until oil runs from LOWER oil level hole. Replace filler and level plug.
2 - Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle. (500-600 RPM)
3 - Add quantity necessary to bring fluid level to LOW mark on dipstick or runs freely from LOWER oil level check plug hole.
4 - Install oil level plug or dipstick. Recheck with hot oil (82 - 93° C) [180 - 200° F]
5 - Bring oil level to full mark on dipstick or runs freely from UPPER oil level plug.



PRESSURE AND OIL FLOW CHECKS

Whenever improper performance is evident the following basic pressure and oil flow checks should be performed and recorded. It is also recommended that these checks be taken periodically as a preventive maintenance measure. Doing so will permit possible detection of difficulties in advance of actual breakdown, this permitting scheduling of repair operation, likewise repair of minor difficulties can be made at considerable less cost and downtime than when delayed until major and complete breakdowns occur.

Analyzing the results of these checks by comparison with specifications and with each other will indicate in most cases the basic item or assembly in the system as the source of difficulty. Further checking will permit isolation of the specific cause of trouble.

OIL PRESSURE AT CONVERTER OUT PORT

Install hydraulic pressure gauge at pressure connection on converter regulator valve or at converter out pressure tap. (All models do not have pressure regulating valves.) Check and record pressure at 2000 RPM and at maximum speed (engine at full throttle)

CONVERTER MODEL	Min CONVERTER Out pressure at Idle	Max CONVERTER Out pressure at No load gov. speed
C5000, C8000, C16000	3,79 Bar [55 Psi]	4,82 Bar [70 Psi]

If a flow meter is available, install in line between converter charging pump and oil filters. Flow meter must be able to withstand 20 Bar [300 Psi].

Disconnect hose between pump and filter end and using suitable fittings connect to pressure port of tester.

⚠ CAUTION

Do not use tester load valve at anytime during test.

When taking flow reading, all readings should be taken on the first (left) half of the flow gauge. Whenever the needle shows on the right half of the gauge, correct by switching to a higher scale.

If a flow meter is not available for checking converter pump output, proceed with manual transmission and converter checks. If the converter shows leakage within specifications and clutch pressures 12,4 - 15,1 Bar [180-220 Psi] are all equal within 0,34 Bar [5 Psi] refer to paragraph on low converter charging pump output.

Pump are rated at 2000 RPM - Refer to Vehicle manufacturer Manual for specific pump output.

Nominal pump ratings		
C5000	C8000	C16000
79,5 l/min 21 GPM	79,5 l/min 21 GPM	151,4 l/min 40 GPM
117,3 l/min 31 GPM	117,3 l/min 31 GPM	189,2 l/min 50 GPM
	151,4 l/min 40 GPM	246 l/min 65 GPM

Pump output listed applies to a new pump in each case. A 20% tolerance below this figure is permissable; however if pump output is more than 20% below specification the pump must be replaced or rebuild.

TRANSMISSION CLUTCH LEAKAGE

Check clutch pressures at low engine idle with oil at operating temperature 82-93°C [180-200° F]. Engine speed must remain constant during entire leakage check. Shift lever into forward 4. Record pressures. Shift lever in reverse and first. Record pressure. All pressures must be equal within 0,3 Bar [5 Psi]. If clutch pressure varies in anyone clutch more than 0,3 Bar [5 Psi], repair clutch.

- If a flow meter is available install in line coming out of converter pump. Check pump volume at 2000 RPM and at low engine idle. Record readings.
- Install flow meter in the line coming from transmission to converter. Check oil at 2000 RPM and at low idle in the following speed selections. Record readings.
  - Forward low speed thru high
  - Reverse low speed

  Subtract readings in each speed from pump volume reading to get transmission clutch leakage. Example:

Pump volume at idle	30 l/min [8 Gal]
Forward low speed thru high	22,7 l/min [6 Gal]
Reverse low speed	22,7 l/min [6 Gal]
Pump volume	30 l/min [8 Gal]
Forward low speed	22,7 l/min [6 Gal]
Clutch leakage	7,5 l/min [2 Gal]

NOTE:

If clutch leakage varies more than 1 Gallon from one clutch to another, repair clutch.

LEAKAGE IN TRANSMISSION CLUTCHES

Leakage in:

- 3000 series transmission must not exceed 15,1 l/min [4 Gal.] max.
- 5000 series transmission must not exceed 15,1 l/min [4 Gal.] max.
- 8000 series transmission must not exceed 22,7 l/min [6 Gal.] max.
- 16000 series transmission must not exceed 26,5 l/min [7 Gal.] max.

CONVERTER LUBE FLOW

Disconnect converter drain back line at transmission with engine running at 2000 RPM and measure oil into a gallon container. Measure oil leakage for 15 seconds and multiply the volume of oil by four to get gallons per minute leakage.

LEAKAGE IN CONVERTER

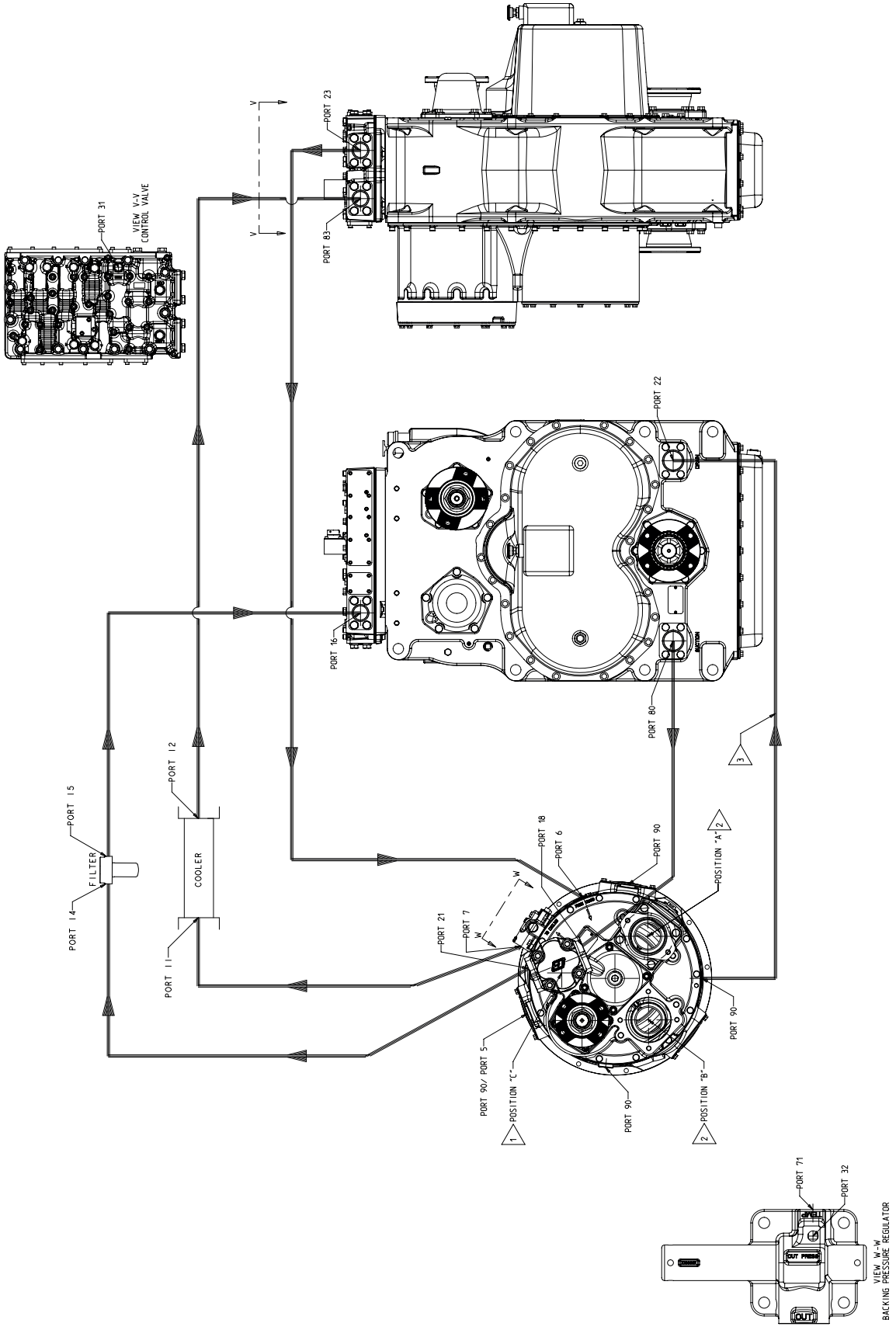
Leakage in:

- C270 series converter not to exceed 7,5 l/min [2 Gal.] max
- C5000 series converter not to exceed 11,3 l/min [3 Gal.] max.
- C8000 series converter not to exceed 18,9 l/min [5 Gal.] max.
- C16000 series converter not to exceed 18,9 l/min [5 Gal.] max.

INSTALLATION DETAILS - EXTERNAL PLUMBING

PLUMBING DIAGRAM W/ EHO VALVE

Fig. 1 Drawing: AD00000078



PLUMBING DIAGRAM W/ EHO VALVE

Hose line operating requirement

1 - pressure lines - suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 KPa continuous pressure, intermittent surges reference sae spec N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. suitable for operation from ambient to 121°C [250° F] continuous operating temperature.

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec.

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose.

5 - Oil specification: see chapter Reccomended lubricants p. 14 for recommendations

1	Pump shown in position C
2	Position is an alternative position
3	Drain line note: if vehicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by dana) see Plumbing diagram w/ EHO valve and scavenger pump p. 22 for scavenger installation requirements.
	PORT 5 - breather can be installed in any PORT 90 - install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter.
	PORT 90 - Converter drain port can be installed in any PORT 90 - select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission drain to port 22 only.
	PORT 71 - converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 PSI]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

CHARGING PUMP		
Pump	Port 18	Port 21
79,5 l/min [21 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
117,3 l/min [31 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
151,4 l/min [40 GPM]	ø 2.00 [50.8]	ø 1.00 [25.4]
189,2 l/min [50 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]

OIL FILTER	
Part No.	Thread
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 264,9 l/min (70 GPM)	2 G/BSP 1.5"

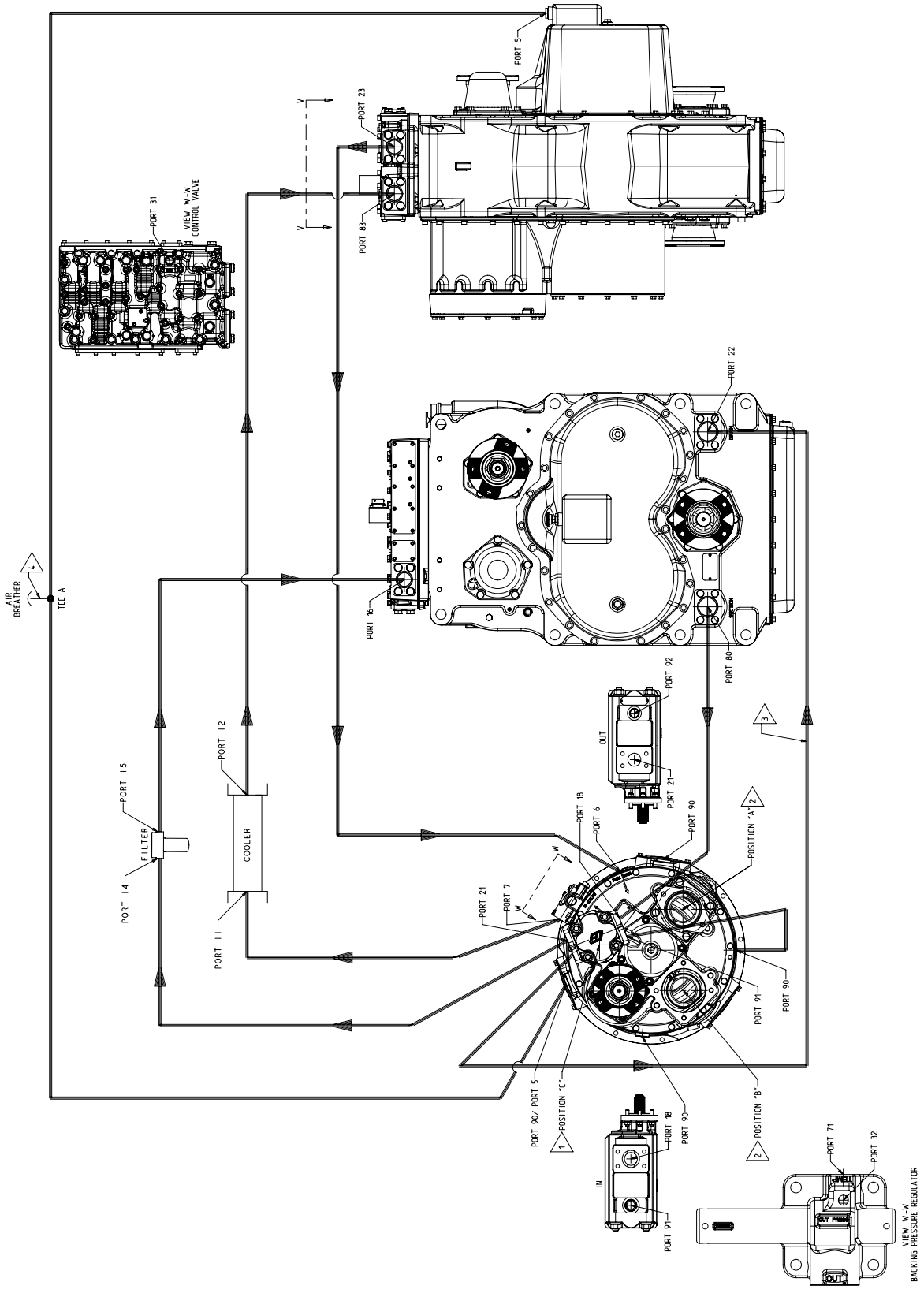
PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. Transmission in neutral	379 Kpa minimum pressure at low idle engine speed and must range between 414-483 Kpa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276Kpa with engine at wide open throttle no load governed speed

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.50 [38,1] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
21	14	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
15	16	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
23	6	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
7	11	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
12	83	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
90	92	1.25 [31,8]

PORT NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] split flange	Converter IN port
7	1 5/8-12 NS THD	Converter OUT port
11		Cooler IN port
12		Cooler OUT port
14	See oil filter table	Remote filter IN port
15	See oil filter table	Remote filter OUT port
16	Ø1.50 [38.1] split flange	Pressure regulator IN port
18	See pump table	Charging pump IN port
21	See pump table	Charging pump OUT port
22	Ø1.50 [38.1] split flange	Transmission drain port
23	Ø1.50 [38.1] split flange	Pressure regulator valve OUT port
31	M14x1,5 THD o-ring port	Regulated pressure check port
32	1/4-18 NPTF	Converter OUT pressure check port
71	1/2-14 NPTF	Converter OUT temperature check port
80	Ø2.00 [50.8] split flange	Transmission suction port
83	Ø1.50 [38.1] split flange	Lube IN port
90	1-1/4 NPTF	Converter drain port

PLUMBING DIAGRAM W/ EHO VALVE AND SCAVENGER PUMP

Fig. 2 Drawing: AD00000079



PLUMBING DIAGRAM W/ EHO VALVE AND SCAVENGER PUMP

Hose line operating requirement:

1 - Pressure lines - suitable for operation from ambient to 121°C [250° F] continuous operating temperature must withstand 2068 KPA continuous pressure, intermittent surges reference sae spec N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, ref sae spec J 517 100R4 hydraulic hose specification. suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. ref sae spec NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to sae spec no. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

6 - Remove breather from transmission and locate at high point in line between converter and transmission lines must have continuous slope from breather to both converter and transmission do not use check valve breather assy

1	Pump shown in position C
2	Alternative pump position
3	Drain line note: if vehicle configuration does not allow for gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by Dana)
4	PORT 5 - breather for breather installation instructions please see Scavenger pump and breather installation p. 45
	PORT 90 - converter drain port can be installed in any PORT 90 - The scavenger pump will ensure a continuous slope on drain line from converter to Transmission under all operating conditions. For scavenger pump data and installation requirements, please see Scavenger pump and breather installation p. 45 Drain to PORT 22 ONLY
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) Red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommended that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 PSI]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

OIL FILTER	
PART No.	PART No. THREAD
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

CHARGING PUMP				
Pump	Port 18	Port 21	Port 91	Port 92
79,5/68,1 l/min [21/18 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]	ø 1.00 [25.4]	ø 0.75 [19]
117,3/68,1 l/min [31/18 GPM]	ø 1.50 [38.1]	ø 1.25 [31.8]	ø 1.00 [25.4]	ø 0.75 [19]
151,4/68,1 l/min [40/18 GPM]	ø 1.50 [38.1]	ø 1.50 [38.1]	ø 1.00 [25.4]	ø 0.75 [19]
189,2/68,1 l/min [50/18 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]	ø 1.00 [25.4]	ø 0.75 [19]

PLUMBING DIAGRAM W/ EHO VALVE AND SCAVENGER PUMP

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.50 [38,1] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
21	14	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
15	16	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
23	6	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
7	11	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
12	83	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
90	91	1.25 [31,8] For pump 189,2 and 189,2-68,1, 151,4 and 151,4-68,1 l/min [50, 50-18, 40 and 40-18 GPM] 1.00 [25,4] For pump 117,3 and 117,3-68,1, 79,4 and 79,4-68,1 l/min [31, 31-18, 21 and 21-18 GPM]
92	22	1.25 [31,8]
5	TEE	A 1.00 [25.4]
5	TEE	A 1.00 [25.4]

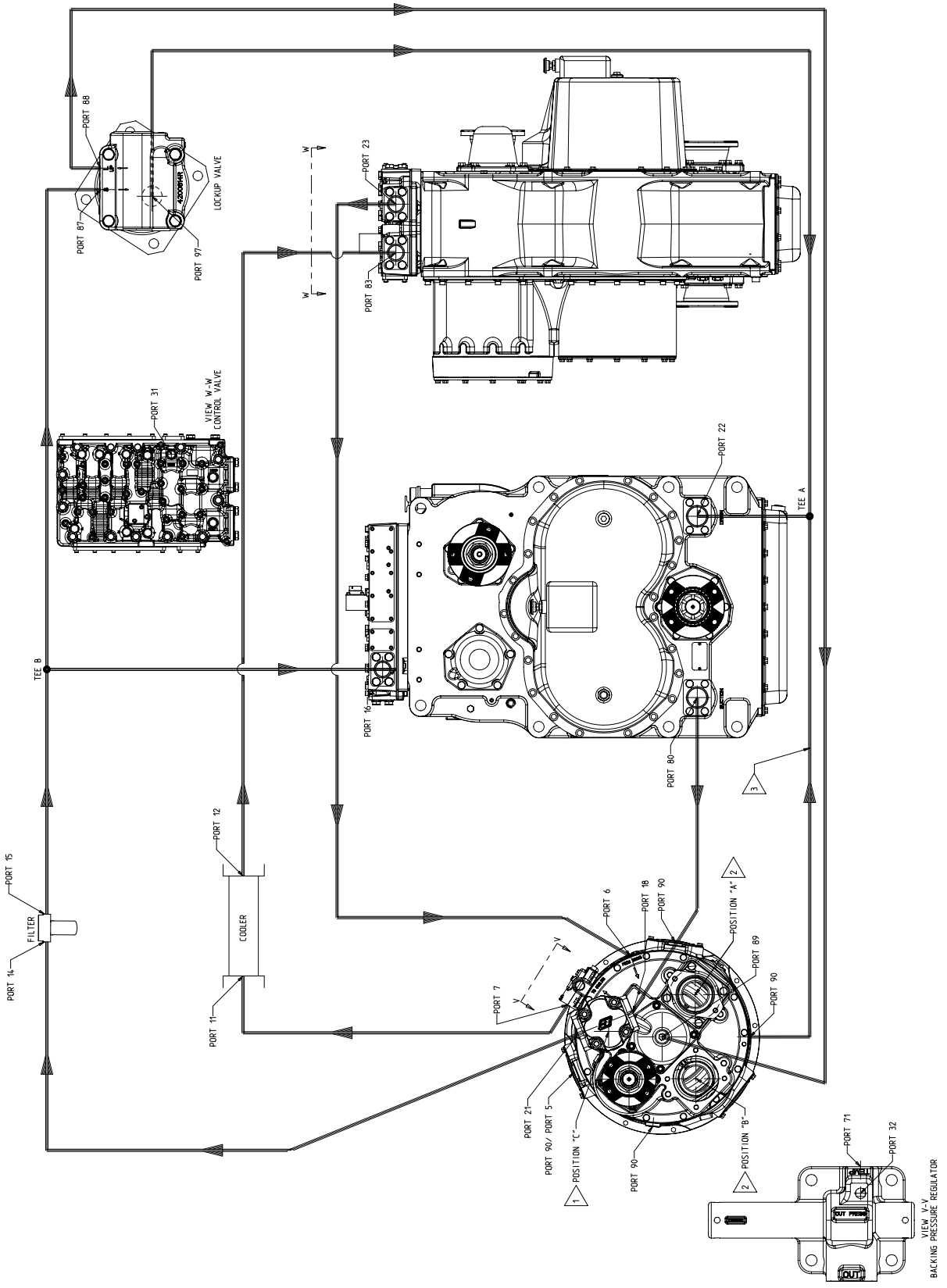
PORT NO	THREAD	DESCRIPTION
5	3/8-18 NPTF (transmission)	Breather port
5	1-1/4 NPTF (converter)	Breather port
6	Ø1.50 [38.1] split flange	Converter in port
7	1 5/8-12 NS THD	Converter out port
11		Cooler in port
12		Cooler out port
14	See oil filter table	Rmote filter in port
15	See oil filter table	Remote filter out port
16	Ø1.50 [38.1] split flange	Pressure regulator in port
18	See pumps table	Charging pump in port
21	See pumps table	Charging pump out port
22	Ø1.50 [38.1] split flange	Transmission drain port
23	Ø1.50 [38.1] split flange	Pressure regulator valve out port
31	M14x1,5 THD o-ring port	Regulated pressure check port
32	1/4-18 NPTF THD	Converter out pressure check port
71	1/2-14 NPTF THD	Converter out temperature check port
80	Ø2.00 [50.8] split flange	Transmission suction port
83	Ø1.50 [38.1] split flange	Lube in port
90	1-1/4 NPTF THD	Converter drain port
91	Ø1 [25.4]	Scavenger suction port
92	Ø1.5 [19]	Scavenger pressure port

PLUMBING DIAGRAM W/ EHO VALVE AND SCAVENGER PUMP

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 Kpa minimum pressure at low idle engine speed and must range between 414-483 Kpa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276Kpa with engine at wide open throttle no load governed speed

PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & LOCKUP

Fig. 3 Drawing: AD00000080



PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & LOCKUP

Hose line operating requirement:

1 - PRESSURE LINES - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 KPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - all hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Pump shown in position c
2	Position is an alternative position
3	Drain line note: if vehicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by dana) see Plumbing diagram w/ EHO valve and scavenger pump p. 22 for scavenger installation requirements
	PORT 5 - Breather can be installed in any PORT 90 - install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter
	PORT 90 - Converter drain port can be installed in any PORT 90 - select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission drain to PORT 22 only
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 PSI] . gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

OIL FILTER	
PART No.	THREAD
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

CHARGING PUMP		
Pump	Port 18	Port 21
79,5 l/min [21 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
117,3 l/min [31 GPM]	ø 1.50 [38.1]	ø 1.00 [25.4]
151,4 l/min [40 GPM]	ø 2.00 [50.8]	ø 1.00 [25.4]
189,2 l/min [50 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 Kpa Minimum pressure at low idle engine speed and must range between 414-483 Kpa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276Kpa with engine at wide open throttle no load governed speed

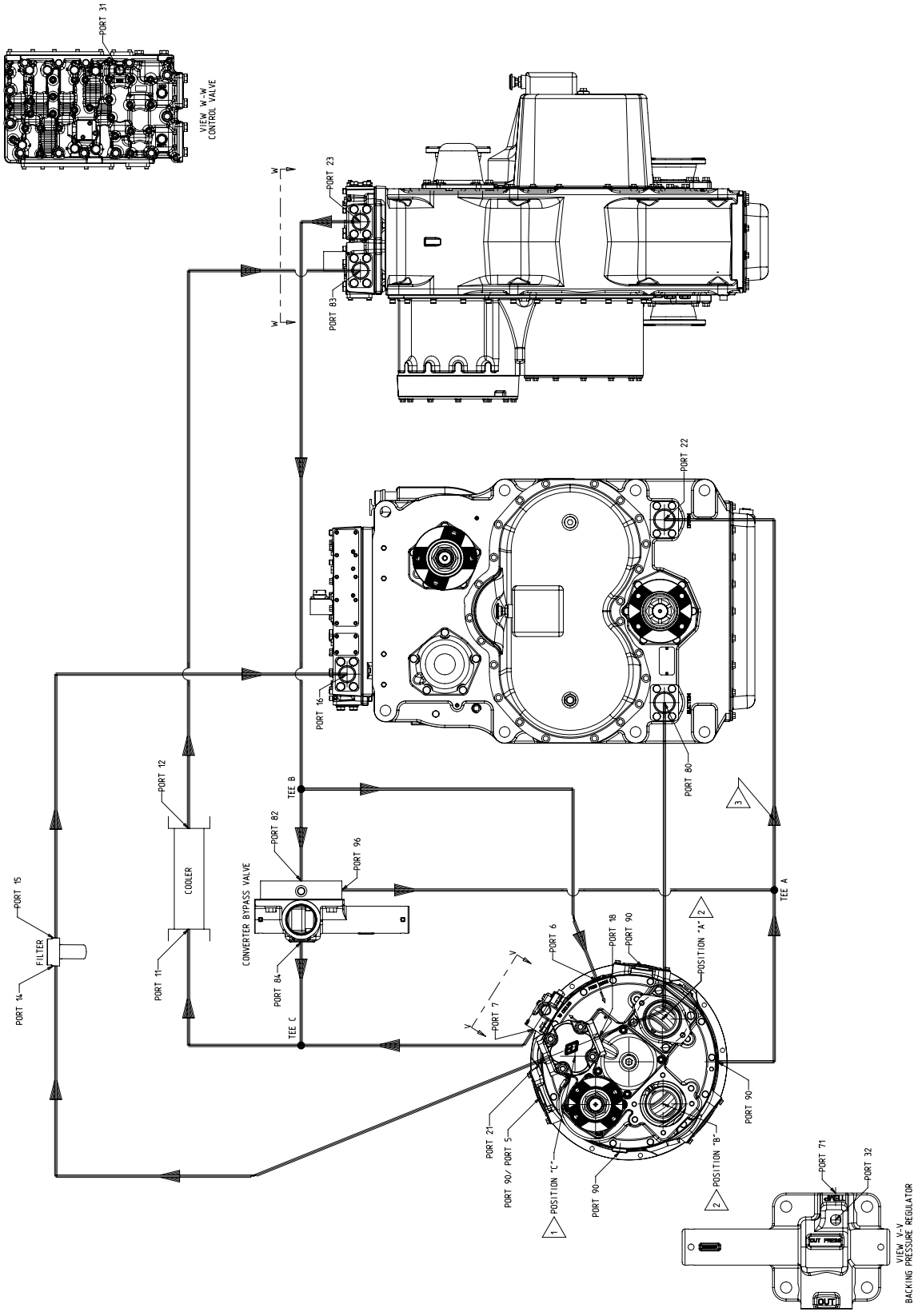
PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & LOCKUP

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.50 [38,1] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
21	14	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
15	TEE B	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
23	6	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
7	11	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
12	83	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
88	89	0.38 [9,7]
90	TEE A	1.25 [31,8]
97	TEE A	1.25 [31,8]
TEE A	22	1.25 [31,8]
TEE B	87	0.38 [9,7]
TEE B	16	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]

PORN NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] Split flange	Converter in port
7	1 5/8-12 NS THD	Converter out port
11		Cooler in port
12		Cooler out port
14	See oil filter table	Remote filter in port
15	See oil filter table	Remote filter out port
16	Ø1.50 [38.1] Split flange	Pressure regulator in port
18	See pump table	Charging pump in port
21	See pump table	Charging pump out port
22	Ø1.50 [38.1] split flange	Transmission drain port
23	Ø1.50 [38.1] split flange	Pressure regulator valve out port
31	M14x1,5 THD o-ring port	Regulated pressure check port
32	1/4-18 NPTF THD	Converter out pressure check port
71	1/2-14NPTF THD	Converter out temperature check port
80	Ø2.00 [50.8] split flange	Transmission suction port
83	Ø1.50 [38.1] split flange	Lube in port
87	Plug hexagon socket SAE J-ANSI 8116.1	Lockup valve in port
88	Plug hexagon socket SAE J-ANSI 8116.1	Lockup valve out port
89	3/8 NPTF THD	Lockup clutch in port
90	1-1/4 NPTF THD	Converter drain port
97	1 NPTF THD	Lockup valve drain port

PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & CONV. BYPASS

Fig. 4 Drawing: AD00000081



PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & CONV. BYPASS

Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 KPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J 517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Pump shown in position C
2	Alternative pump position
3	Drain line note: if vehicle configuration does not allow for gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavanger pump must be provided (not supplied by dana) see Plumbing diagram w/ EHO valve and scavenger pump p. 22 for scavanger installation requirements
	PORT 5 - Breather can be installed in any PORT 90 - Install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter
	PORT 90 - Converter drain port can be installed in any PORT 90 - Select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission. Drain to PORT 22 ONLY
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommended that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 PSI]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

CHARGING PUMP		
Pump	Port 18	Port 21
189,2 l/min [50 GPM]	Ø2.00 [50.8]	Ø1.50 [38.1]

OIL FILTER	
PART No.	THREAD
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 Kpa minimum pressure at low idle engine speed and must range between 414-483 Kpa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276Kpa with engine at wide open throttle no load governed speed

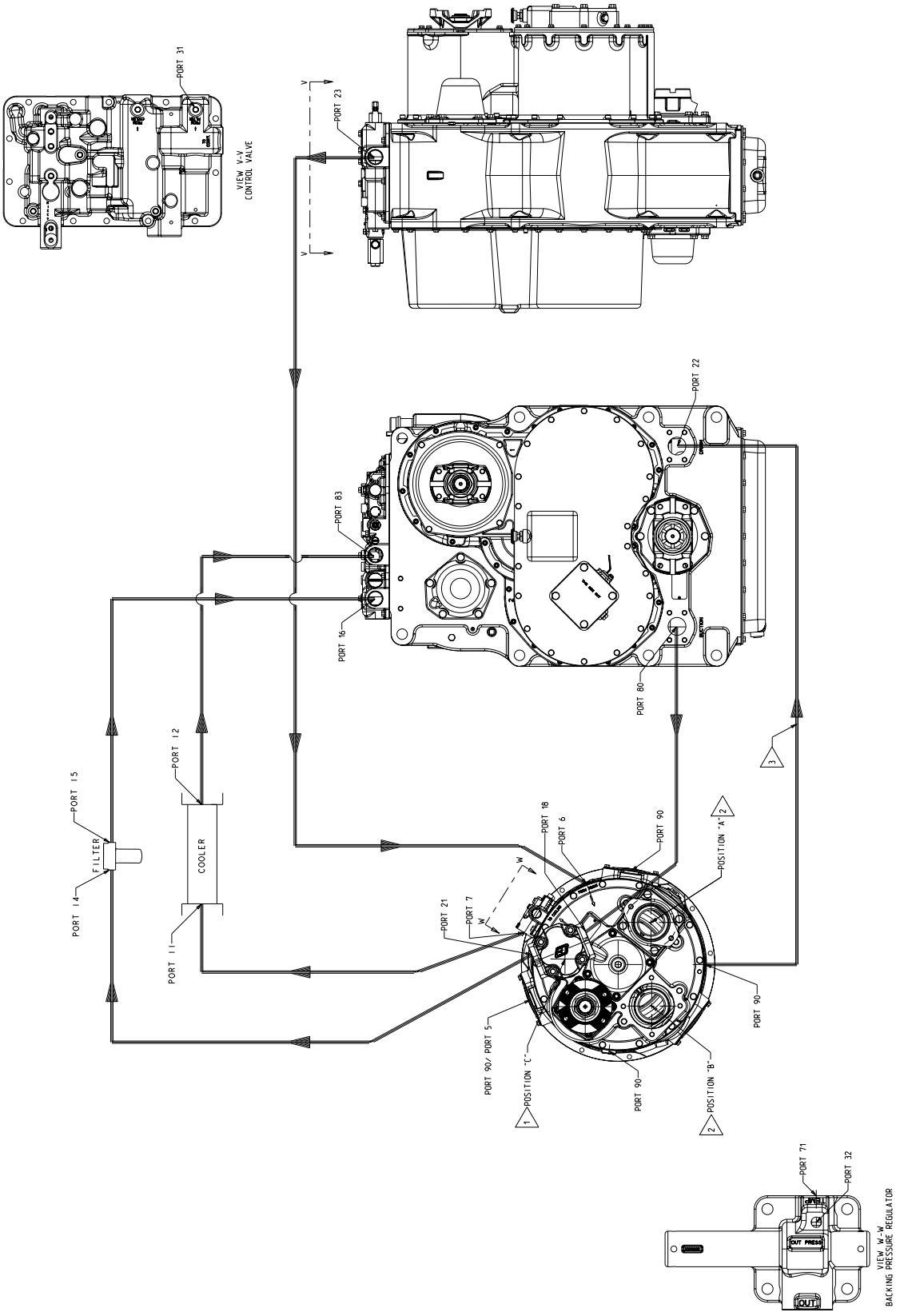
PLUMBING DIAGRAM W/ EHO VALVE & SINGLE PUMP & CONV. BYPASS

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pumps 189,2 l/min [50 GPM]
21	14	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
15	16	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
23	TEE B	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE B	6	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE B	82	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
7	TEE C	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
84	TEE C	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE C	11	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
12	83	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
90	TEE A	1.25 [31,8]
96	TEE A	1.25 [31,8]
TEE A	22	1.25 [31,8]

PORT NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] Split flange	Converter in port
7	1 5/8-12 NS THD	Converter out port
11		Cooler in port
12		Cooler out port
14	See oil filter table	Remote filter in port
15	See oil filter table	Remote filter out port
16	Ø1.50 [38.1] split flange	Pressure regulator in port
18	See pumps table	Charging pump in port
21	See pumps table	Charging pump out port
22	Ø1.50 [38.1] split flange	Transmission drain port
23	Ø1.50 [38.1] split flange	Pressure regulator valve out port
31	M14x1,5 THD o-ring port	Regulated pressure check port
32	1/4-18 NPTF	Converter out pressure check port
71	1/2-14 NPTF	Converter out temperature check port
80	Ø2.00 [50.8] split flange	Transmission suction port
82	1.065-12 UNF-2B SAE o-ring port	Converter bypass valve in port
83	Ø1.50 [38.1] split flange	Lube in port
84	1.065-12 UNF-2B SAE o-ring port	Converter bypass valve out port
90	1-1/4 NPTF	Converter drain port
96	1/4 NPTF drain	Converter bypass valve drain port

PLUMBING DIAGRAM W/O MODULATION (SSP)

Fig. 5 Drawing: AD00000082



Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 kPa continuous pressure, intermittent surges reference sae spec N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Pump shown in position C
2	Alternative pump position
3	Drain line note: if vehicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by dana) see Plumbing diagram W/O modulation (SSP) and scavenger pump p. 35 for scavenger installation requirements
	PORT 5 - breather can be installed in any PORT 90 - install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter
	PORT 90 - converter drain port can be installed in any PORT 90 - select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission drain to port 22 only
	PORT 71 - converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 PSI]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

CHARGING PUMP		
Pump	Port 18	Port 21
79,5 l/min [21 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
117,3 l/min [31 GPM]	ø 1.50 [38.1]	ø 1.00 [25.4]
151,4 l/min [40 GPM]	ø 2.00 [50.8]	ø 1.00 [25.4]
189,2 l/min [50 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]

OIL FILTER	
Part No.	Thread
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 kPa minimum pressure at low idle engine speed and must range between 414-483 kPa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276 kPa with engine at wide open throttle no load governed speed

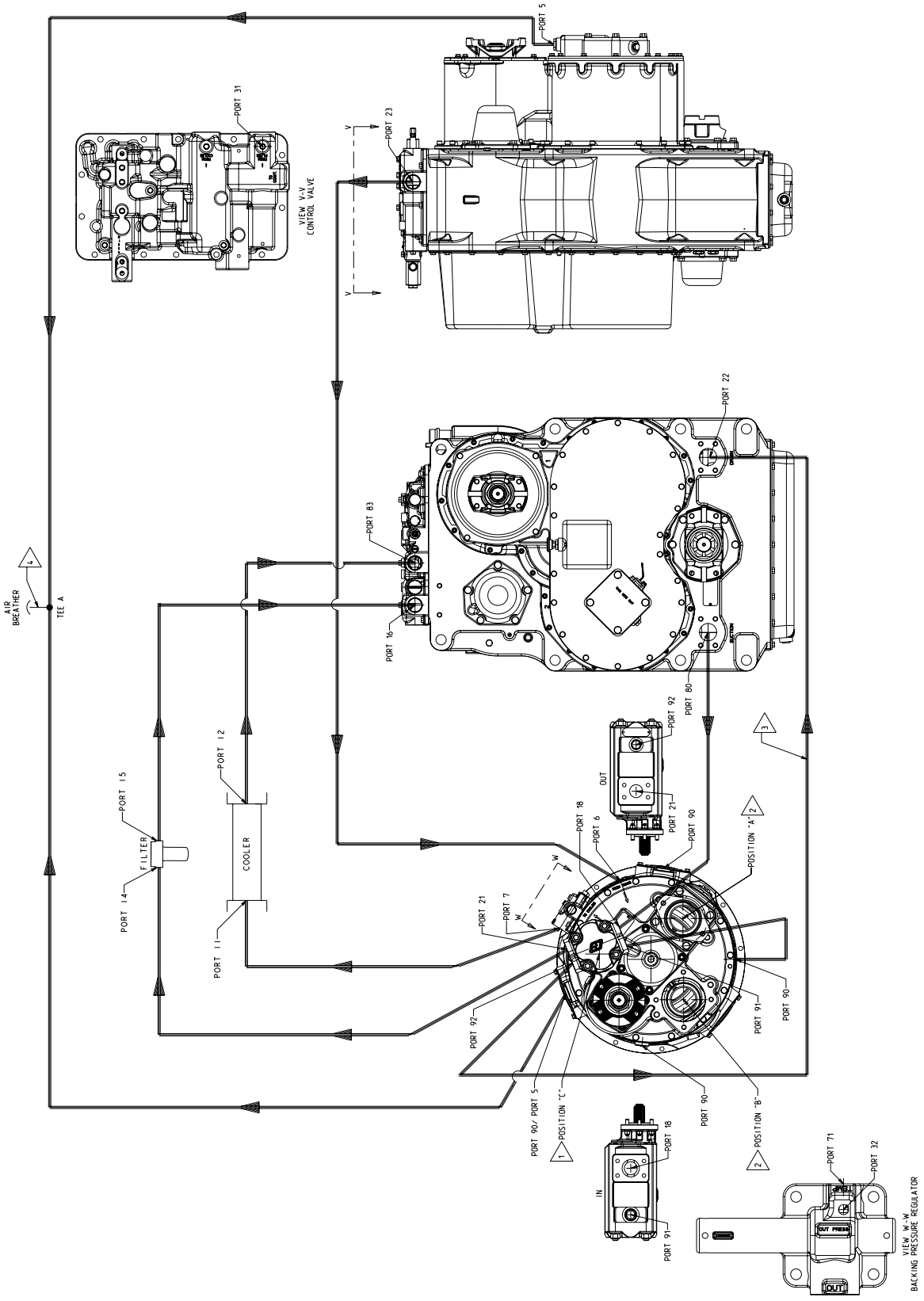
PLUMBING DIAGRAM W/O MODULATION (SSP)

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.50 [38,1] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
21	14	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
15	16	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
23	6	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
7	11	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
12	83	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
90	22	1.25 [31,8]

PORT NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] Split flange	Converter IN port
7	1 5/8-12 NS THD	Converter OUT port
11		Cooler IN port
12		Cooler OUT port
14	See oil filter table	Remote filter IN port
15	See oil filter table	Remote filter OUT port
16	1.3125-12 UN-2B	Pressure regulator IN port
18	See pump table	Charging pump IN port
21	See pump table	Charging pump OUT port
22	Ø1.50 [38.1] Split flange	Transmission drain port
23	1.3125-12 UN-2B	Pressure regulator valve OUT port
31	1/4-18 NPTF	Regulated pressure check port
32	1/4-18 NPTF	Converter OUT pressure check port
71	1/2-14 NPTF	Converter OUT temperature check port
80	Ø1.50 [38.1] Split flange	Transmission suction port
83	1.3125-12 UN-2B	Lube IN port
90	1-1/4 NPTF	Converter drain port

PLUMBING DIAGRAM W/O MODULATION (SSP) AND SCAVENGER PUMP

Fig. 6 Drawing: AD00000083



PLUMBING DIAGRAM W/O MODULATION (SSP) AND SCAVENGER PUMP

Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 kPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

6 - Remove breather from transmission and locate at high point in line between converter and transmission lines to have continuous slope from breather to both converter and transmission do not use check valve breather assy

1	Pump shown in position c
2	Alternative pump position
3	Drain line note: if vechicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by dana)
4	PORT 5 - Breather for breather instalation instructions Scavenger pump and breather installation p. 45
	PORT 90 - Converter drain port can be installed in any PORT 90 - the scavenger pump will ensure a continuous slope on drain line from converter to transmission under all operating conditions. For scavenger pump data and installation requirements, see Scavenger pump and breather installation p. 45. Drain to port 22 only
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 psi]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

OIL FILTER	
Part No.	Thread
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

PUMPS TABLE				
Pump	Port 18	Port 21	Port 91	Port 92
79,5/68,1 l/min [21/18 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]	ø 1.00 [25.4]	ø 0.75 [19]
117,3/68,1 l/min [31/18 GPM]	ø 1.50 [38.1]	ø 1.25 [31.8]	ø 1.00 [25.4]	ø 0.75 [19]
151,4/68,1 l/min [40/18 GPM]	ø 1.50 [38.1]	ø 1.50 [38.1]	ø 1.00 [25.4]	ø 0.75 [19]
189,2/68,1 l/min [50/18 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]	ø 1.00 [25.4]	ø 0.75 [19]

PLUMBING DIAGRAM W/O MODULATION (SSP) AND SCAVENGER PUMP

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.50 [38,1] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
21	14	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
15	16	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
23	6	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
7	11	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
12	83	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
90	91	1.25 [31,8] for pump 189,2-68,1 and 151,4-68,1 l/min [50-18 and 40-18 GPM] 1.00 [25,4] for pump 117,3-68,1 and 79,4-68,1 l/min [31-18 and 21-18 GPM]
92	22	1.25 [31,8]
5	TEE A	1.00 [25.4]
5	TEE A	1.00 [25.4]

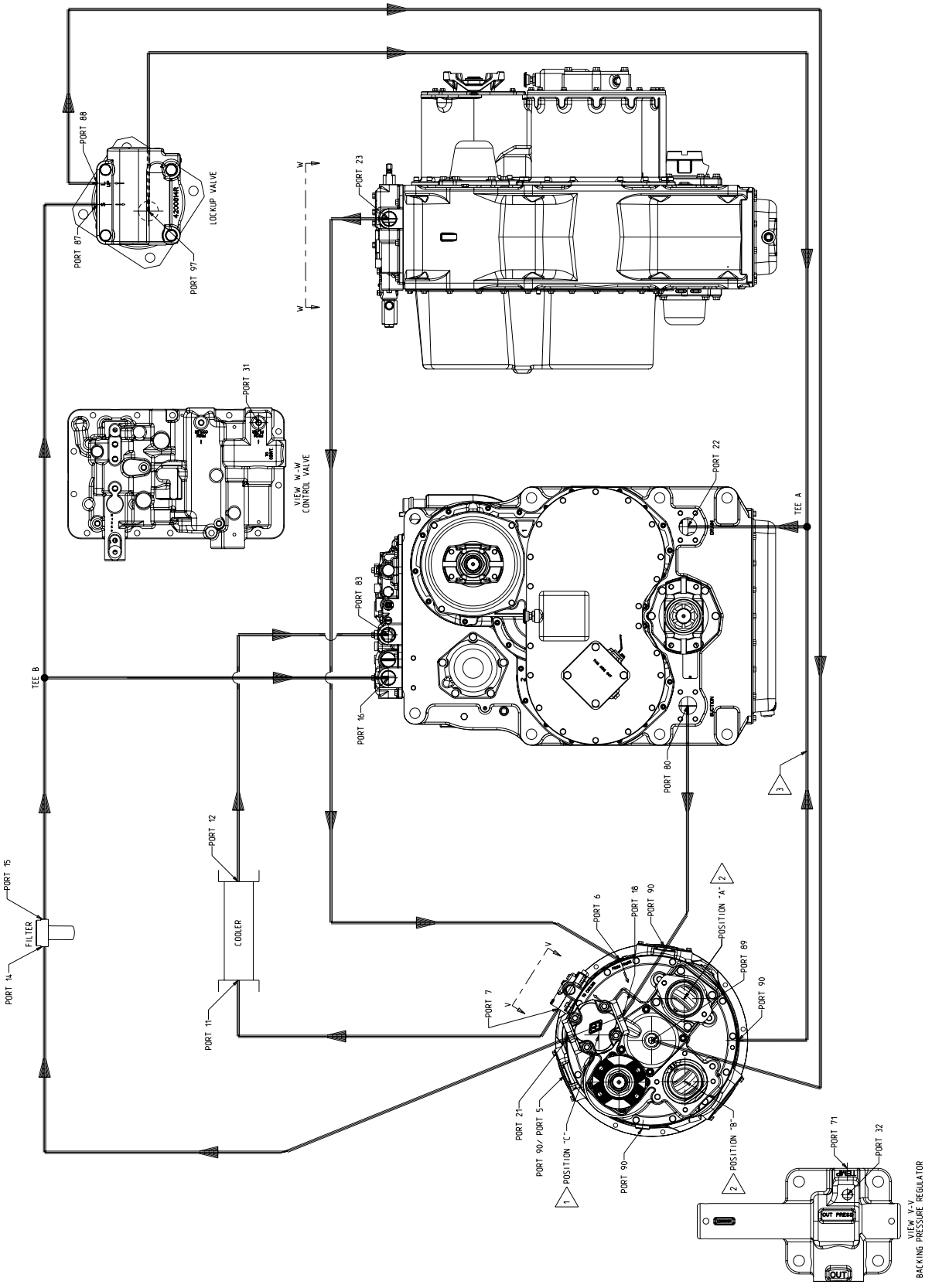
PORT NO	THREAD	DESCRIPTION
5	3/8-18 NPTF THD	Breather port transmission
5	1-1/4 NPTF THD	Breather port converter
6	Ø1.50 [38.1] Split flange	Converter IN port
7	1 5/8-12 NS THD	Converter OUT port
11		Cooler IN port
12		Cooler OUT port
14	See oil filter table	Remote filter IN port
15	See oil filter table	Remote filter OUT port
16	1.3125-12 UN-2B o-ring port	Pressure regulator IN port
18	See pump table	Charging pump IN port
21	See pump table	Charging pump OUT port
22	Ø1.50 [38.1] Split flange	Transmission drain port
23	1.3125-12 UN-2B o-ring port	Pressure regulator valve OUT port
31	1/4-18 NPTF THD	Regulated pressure check port
32	1/4-18 NPTF THD	Converter OUT pressure check port
71	1/2-14 NPTF THD	Converter OUT temperature check port
80	Ø2.00 [50.8] Split flange	Transmission suction port
83	1.3125-12 UN-2B O-ring port	Lube IN port
90	1-1/4 NPTF THD	Converter drain port
91	Ø1.00 [25.4]	Scavenger suction port
92	Ø1.5 [19]	Scavenger pressure port

PLUMBING DIAGRAM W/O MODULATION (SSP) AND SCAVENGER PUMP

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 kPa minimum pressure at low idle engine speed and must range between 414-483 kPa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276 kPa with engine at wide open throttle no load governed speed

PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP AND LOCKUP

Fig. 7 Drawing: AD00000084



PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP AND LOCKUP

Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 kPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Pump shown in position C
2	Alternative pump position
3	Drain line note: if vehicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by DANA) see Plumbing diagram W/O modulation (SSP) and scavenger pump p. 35 for scavenger installation requirements
	PORT 5 - Breather can be installed in any PORT 90 - install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter
	PORT 90 - Converter drain port can be installed in any PORT 90 - select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission drain to port 22 only
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 psi]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

PUMPS TABLE		
Pump	Port 18	Port 21
79,5 l/min [21 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
117,3 l/min [31 GPM]	ø 1.25 [31.8]	ø 1.00 [25.4]
151,4 l/min [40 GPM]	ø 2.00 [50.8]	ø 1.00 [25.4]
189,2 l/min [50 GPM]	ø 2.00 [50.8]	ø 1.50 [38.1]

OIL FILTER	
Part No.	Thread
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 kPa minimum pressure at low idle engine speed and must range between 414-483 kPa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276 kPa with engine at wide open throttle no load governed speed

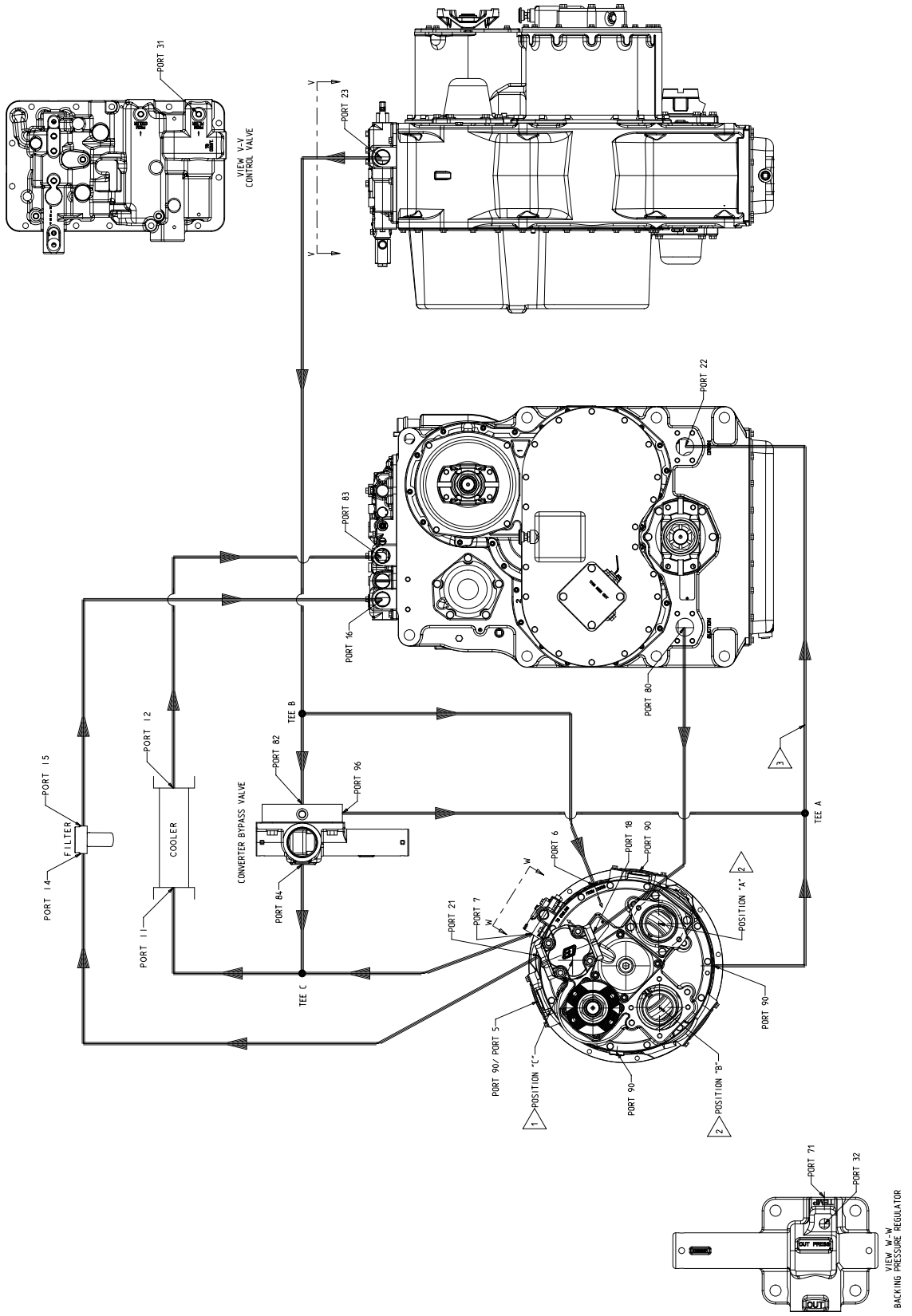
PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP AND LOCKUP

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.50 [38,1] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
21	14	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
15	TEE B	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
23	6	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
7	11	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
12	83	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]
88	89	0.38 [9,7]
90	TEE A	1.25 [31,8]
97	TEE A	1.25 [31,8]
TEE A	22	1.25 [31,8]
TEE B	87	0.38 [9,7]
TEE B	16	1.25 [31,8] for pump 189,2 and 151,4 l/min [50 and 40 GPM] 1.00 [25,4] for pump 117,3 and 79,5 l/min [31 and 21 GPM]

PORT NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] Split flange	Converter IN port
7	1 5/8-12 NS THD	Converter OUT port
11		Cooler IN port
12		Cooler OUT port
14	See oil filter table	Remote filter IN port
15	See oil filter table	Remote filter OUT port
16	1.3125-12 UN-2B o-ring port	Pressure regulator IN port
18	See pumps table	Charging pump IN port
21	See pumps table	Charging pump OUT port
22	Ø1.50 [38.1] Split flange	Transmission drain port
23	1.3125-12 UN-2B O-RING PORT	Pressure regulator valve OUT port
31	1/4-18 NPTF THD	Regulated pressure check port
32	1/4-18 NPTF THD	Converter OUT pressure check port
71	1/2-14 NPTF THD	Converter OUT temperature check port
80	Ø2.00 [50.8] Split flange	Transmission suction port
83	1.3125-12 UN-2B o-ring port	Lube IN port
87	Plug hexagon socket SAE J512- 8116.1	Lockup valve IN port
88	Plug hexagon socket SAE J-512 8116.1	Lockup valve OUT port
89	3/8 NPTF THD	Lockup clutch IN port
90	1-1/4 NPTF THD	Converter drain port
97	1 NPTF THD	Lockup valve drain port

PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP & CONV. BYPASS

Fig. 8 Drawing: AD00000085



PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP & CONV.

Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 kPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Pump shown in position c
2	Alternative pump position
3	Drain line note: if vehicle configuration does not allow a gravitational drain (continuous downward slope of drain line) in all operating conditions. A scavenger pump must be provided (not supplied by dana) see Plumbing diagram W/O modulation (SSP) and scavenger pump p. 35 for scavenger installation requirements
	PORT 5 - Breather can be installed in any PORT 90 - install breather valve assy in highest converter drain port from instruction bag & tag assy shipped loose with torque converter
	PORT 90 - Converter drain port can be installed in any PORT 90 - select the lowest port for gravity drain to transmission. Line must have continuous slope from converter to transmission drain to port 22 only
	PORT 71 - Converter out temperature check port this port is to be used for converter outlet temperature pick-up gauge is to be located in the operator compartment oil temperature gauge specification normal operating temperature range: 82°-121°C (180°-250°F) red zone temperature: 121°-148°C (250°-300°F)
	PORT 31 - Regulated pressure check port this port is used to check the clutch pressure and it is recommend that the clutch pressure be monitored by a gauge having an indicator dial range of 0 - 27,6 Bar [0-400 psi]. Gauge is to be located in the operator compartment

TRANSMISSION MODEL	CLUTCH PRESSURE RANGE
8000	12,4 - 15,1 Bar [180-220 PSI]

PUMP TABLE		
Pump	Port 18	Port 21
189,2 l/min [50 GPM]	Ø2.00 [50.8]	Ø1.50 [38.1]

OIL FILTER	
Part No.	Thread
4220426 117,3 l/min (31 GPM)	2 G/BSP 1"
4221161 265 l/min (70 GPM)	2 G/BSP 1.5"

PORT 32 - CONVERTER OUT PRESSURE CHECK PORT OIL PRESSURE MUST BE MEASURED WITH NORMAL VECHICLE PRODUCTION LINE TEST			
Converter model	Test conditions	Operating specifications	Heat exchanger circuit pressure specifications
C8000	Converter oil temp 82°-93°C [180-200° F]. transmission in neutral	379 kPa minimum pressure at low idle engine speed and must range between 414-483 kPa with engine at wide open throttle. No load governed speed	Circuit pressure drop from PORT 7 to PORT 83 is not exceed 276 kPa with engine at wide open throttle no load governed speed

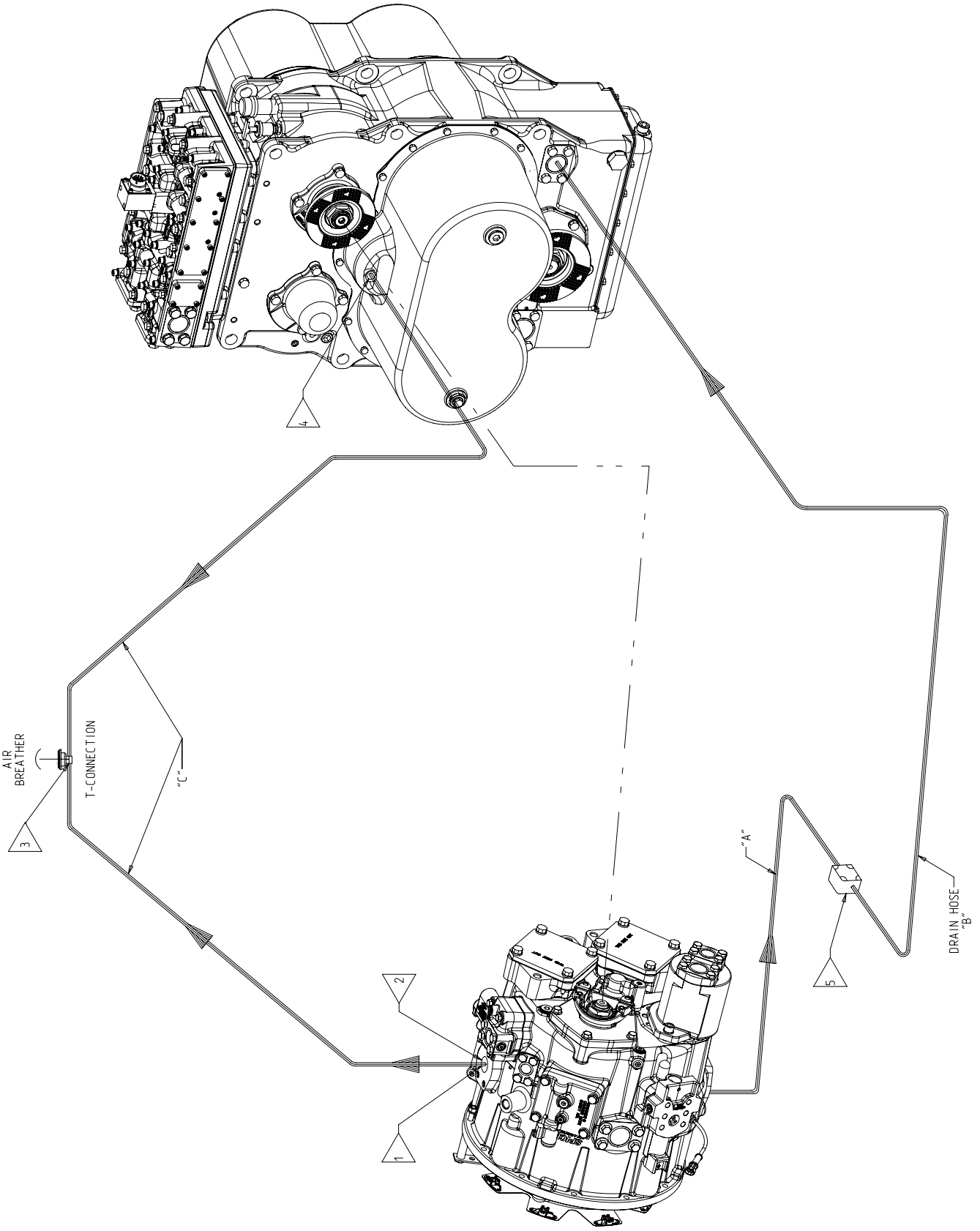
PLUMBING DIAGRAM W/O MODULATION (SSP), SINGLE PUMP & CONV.

FROM PORT	TO PORT	MIN LINE SIZE
80	18	2.00 [50,8] for pumps 189,2 l/min [50 GPM]
21	14	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
15	16	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
23	TEE B	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE B	6	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE B	82	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
7	TEE C	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
84	TEE C	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
TEE C	11	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
12	83	1.25 [31,8] for pumps 189,2 l/min [50 GPM]
90	TEE A	1.25 [31,8]
96	TEE A	1.25 [31,8]
TEE A	22	1.25 [31,8]

PORT NO	THREAD	DESCRIPTION
5		Breather port
6	Ø1.50 [38.1] Split flange	Converter IN port
7	1 5/8-12 NS THD	Converter OUT port
11		Cooler IN port
12		Cooler OUT port
14	See oil filter table	Remote filter IN port
15	See oil filter table	Remote filter OUT port
16	1.3125-12 UNF-2B o-ring port	Pressure regulator IN port
18	See pump table	Charging pump IN port
21	See pump table	Charging pump OUT port
22	Ø1.50 [38.1] Split flange	Transmission drain port
23	1.3125-12 UNF-2B o-ring port	Pressure regulator valve OUT port
31	1/4-18 NPTF THD	Regulated pressure check port
32	1/4-18 NPTF THD	Converter OUT pressure check port
71	1/2-14 NPTF THD	Converter OUT temperature check port
80	Ø1.50 [38.1] Split flange	Transmission suction port
82	1.065-12 UNF-2B SAE o-ring port	Converter bypass valve IN port
83	1.3125-12 UNF-2B o-ring port	Lube IN port
84	1.065-12 UNF-2B SAE o-ring port	Converter bypass valve OUT port
90	1-1/4 NPTF THD	Converter drain port
96	1/4 NPTF drain	Converter bypass valve drain port

SCAVENGER PUMP AND BREATHER INSTALLATION

Fig. 9 Drwaing: 000232693000



SCAVENGER PUMP AND BREATHER INSTALLATION

Hose line operating requirement:

1 - Pressure lines - Suitable for operation from ambient to 121°C [250° F] continuous operating temperaturemust withstand 2068 KPa continuous pressure, intermittent surges reference SAE SPEC N0. J517 100R1 hydraulic hose specification.

2 - Suction line to be protected from collapse by interwoven steel wire, REF SAE SPEC J 517 100R4 hydraulic hose specification. Suitable for operation from ambient to 121°C [250° F] continuous operating temperature

3 - Gravity drain line suitable for operation from ambient to 121°C [250° F] continuous operating temperature. REF SAE SPEC NO. J517 100R1 hydraulic hose spec

4 - All hose lines used must conform to SAE SPEC NO. J1019 tests and procedures for high temperature transmission oil hose

5 - Oil specification: see Reccomended lubricants p. 14 for recommendations

1	Connect to upper most converter breather port location
2	No breather is installed on torque converter when scavenger pump is used
3	Locate breather, removed from transmission, at high point in line between converter and transmission. Lines to have continuous slope from breather to both converter and transmission. -Do not use check valve breather assembly.
4	Connect to transmission breather port location
5	Gear pump: scavenger pump can be a seperate unit, section of the main or steering pump, or a combination torque convertertransmission charging-scavenger pump assembly.

SCAVENGER PUMP REQUIREMENTS; SEPERATE UNIT OR SECTION OF MAIN OR STEERING PUMP:				
Torque converter series	Minimum pump capacity @ 500 RPM	Minimum pump capacity		
		"A"	"B"	"C"
C2000	15,1 L/MIN [4 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C270 & C320	15,1 L/MIN [4 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C3000	15,1 L/MIN [4 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C330	15,1 L/MIN [4 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C3300	15,1 L/MIN [4 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C5000	11,4 L/MIN [3 GPM]	1.00 [25,4]	.75 [19,1]	.75 [19,1]
C8000	18,9 L/MIN [5 GPM]	1.00 [25,4]	1.00 [25,4]	1.00 [25,4]
C9000	18,9 L/MIN [5 GPM]	1.00 [25,4]	1.00 [25,4]	1.00 [25,4]
C16000	18,9 L/MIN [5 GPM]	1.00 [25,4]	1.00 [25,4]	1.00 [25,4]

COMBINATION CHARGING-SCAVENGER PUMP ASSEMBLY INFORMATION:							
Charging section capacity @ 2000 RPM	Scavenger section capacity @ 2000 RPM	Pump assembly part number	Pump assembly installation drawing	Port connection			
				Charging section		Scavenger section	
				Inlet	Outlet	Inlet	Outlet
79,5 L/MIN [21 GPM]	68,1 L/MIN [18 GPM]	235821	IPFR213140	1.6250-12 THD SAE "o"-ring	1.3125-12 THD SAE "o"-ring	1.3125-12 THD SAE "o"-ring	1.6250-12 THD SAE "o"-ring
117,3 L/MIN [31 GPM]	68,1 L/MIN [18 GPM]	235831	IPFR213140	1.8750-12 THD SAE "o"-ring	1.6250-12 THD SAE "o"-ring	1.3125-12 THD SAE "o"-ring	1.6250-12 THD SAE "o"-ring
151,4 L/MIN [40 GPM]	68,1 L/MIN [18 GPM]	235840	IPFR213140	1.500 [38,10] Split flange	1.500 [38,10] Split flange	1.3125-12 THD SAE "o"-ring	1.6250-12 THD SAE "o"-ring
189,3 L/MIN [50 GPM]	68,1 L/MIN [18 GPM]	4223046	4223046	2.000 [50,80] Split flange	1.500 [38,10] Split flange	1.3125-12 THD SAE "o"-ring	1.6250-12 THD SAE "o"-ring
196,8 L/MIN [52 GPM]	37,9 L/MIN [10 GPM]	249263	249263	2.000 [50,80] Split flange	1.500 [38,10] Split flange	1.1875-12 THD SAE "o"-ring	.875-14 THD SAE "o"-ring

OPERATION OF THE TRANSMISSION

HOW THIS UNITS OPERATES

With the engine running, the converter charging pump draws oil from the transmission sump and directs it through oil filters to the regulating valve located on top of the transmission. From the regulating valve it is then directed through the control valve on top of the transmission to the converter and the transmission clutches.

The pressure regulating valve mounted on top of the transmission remains closed until required pressure is delivered to the transmission for actuating the direction and speed clutches. This regulator valve consists of a hardened valve spool operating in a closely fitted bore. The valve spool is backed up by a spring to hold the valve spool against its seat until the oil pressure builds up to the specified pressure. The valve spool then moves towards the spring until a port is exposed along the side of the bore. The oil then flows through this port into a distributor which directs the oil into the converter inlet port.

After entering the converter, the oil is directed through the stator support to the converter cavity and exits between the turbine shaft and converter support. The oil passes through an oil distributor which directs the oil out of the converter by way of a down-stream regulator valve and then to the oil cooler. After leaving the cooler the oil is directed through a hose to the lubricating oil inlet on the transmission, then through a series of tubes to the transmission clutches. The oil then returns to the transmission sump.

A safety valve is built in the transmission control cover and will open to bypass oil only if an excessive pressure is built up due to a blocked passage.

The rear compartiment of the converter unit also houses the converter output shaft. A flexible hose provides an overflow to the transmission.

The three members of the torque converter are composed of a series of blades. The blades are curved in such a manner as to force the oil to circulate from the impeller to the turbine, through the reaction member again onto the impeller. This circulation causes the turbine to turn in the same direction as the impeller. Oil enters the inner side of the impeller and exits from the outer side of the turbine. It then exits from the inner side of the turbine and after passing through the reaction member, again enters the inner side of the impeller.

NOTE:

Converter “stall” is achieved whenever the turbine and turbine shaft are stationary and the engine is operating at full power or wide open throttle.

⚠ CAUTION

Do not maintain “stall” for more than 30 seconds at the time. excessive heat will be generated and may cause converter or transmission damage.

In converters equiped with “Lock-up” clutches, a hydraulic clutch, simular to the transmission clutches is used to “lock” the engine mechanically to the output shaft. This is accomplished by hydraulic pressure actuating the “Lock-up” clutch which in turn locks the impeller cover to the turbine hub. During “lock-up” the converter turns at 1 to 1 speed ratio.

The donstream regulator valve on the converter consists of a valve body and regulator spool. The spool is backed up by a spring to hold the valve unitil the converter pressure builds up to specified pressure. The valve is used to maintain a given converter pressure to insure proper performance under all conditions.

The transmission is controlled by the control valve. The control valve is mounted on top of the transmission. The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutches.

The control valve has 5 On/Off solenoids and 5 shift spools.

1st gear can be selected by activating the 1st solenoid.The 1st solenoid will then allow a pilot pressure of 8,5 bar to move the 1st shift spool.

Due to this movement of the shift spool, the 1st clutch is fed with oil under 12.4 bar [180 PSI] regulator pressure. The same priciple is valid for 2nd, 3rd & 4th gear.

There is one 3-position shift spool for FWD, Neutral, or Rev.To ensure that only 1 direction can be selected. The directional shift spool is held in Neutral by means of springs as a safety feature. You need to apply pressure to select either FWD or REV. When both FWD & REV are selected the resulting force is 0 and the spool stays in Neutral position.

When the pressure is directed to one of the direction positions, the oil is guided to the modulator before entering the clutch. The modulator achieves a gradual pressure increase instead of an abrupt increase.

When pressure is applied initially a spool moves and uncovers a vent, which, because if its discharge or bleeding of fluid produces a low pressure. At the same time, fluid flows through a restrictor passageway to an accumulator and as the pressure builds up in the accumilator, it moves the spool back towards its initial position, causing a gradual increase in pressure.

The direction or speed clutch assembly consists of a drum with internal gear teeth and a bore to receive a hydraulically actuated piston. A piston is inserted into the bore of the drum. The piston is “oil tight” by the use of sealing rings. A friction disc with internal teeth is inserted into the drum and rests against the piston. Next, a disc with splines at the outer diameter is inserted. Discs are alternated until the required total is achieved. After inserting the last disc, a series of springs and pins are assembled

in such a manner that these springs rest on theeth of the piston. A heavy backup plate is then inserted and secured by a snap ring. A hub with ID and OD splines is inserted into the splines of the discs with theeth on the inner diameter and the splined shaft extending through the clutch support. This hub is retained by a snap ring. The discs and inner shaft are free to increase in speed or rotated in the opposite direction as long as no pressure is present in the direction or speed clutch.

To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to flow from the control valve through a tube in the transmission case to a chosen clutch. Once into the drum, oil is directed through a drilled hole into the rear side of the piston bore. Pressure of the oil forces the piston and discs over against the heavy backup-up plate. The discs, with teeth on the outer diameter, clamping against discs with teeth on inner diameter, enables the clutch drum and drive shaft to be locked together and allow them to turn as a unit.

There are bleed holes in the clutch drums which allow quick escape for oil when the pressure to the piston is released.

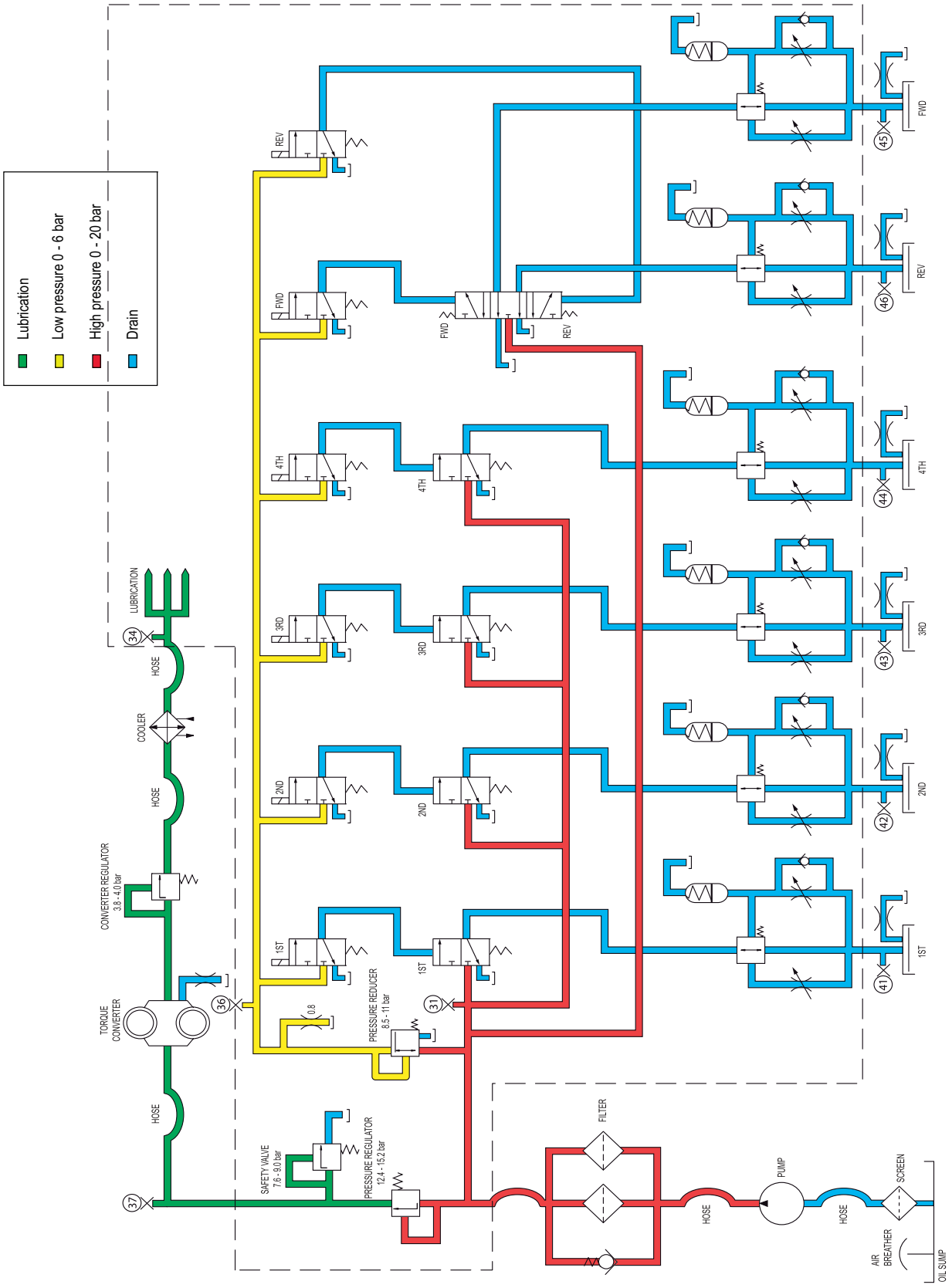
The transmission gear train consists of six shafts:	
1	Input shaft
2	Reverse shaft
3	Idler shaft
4	First & third shaft
5	Second & fourth shaft
6	Output shaft

A screen mounted in a frame is positioned on the bottom of the transmission case to screen out any foreign material. This screen is covered by the sump pan. This pan is provided with magnets to catch any metallic particles.

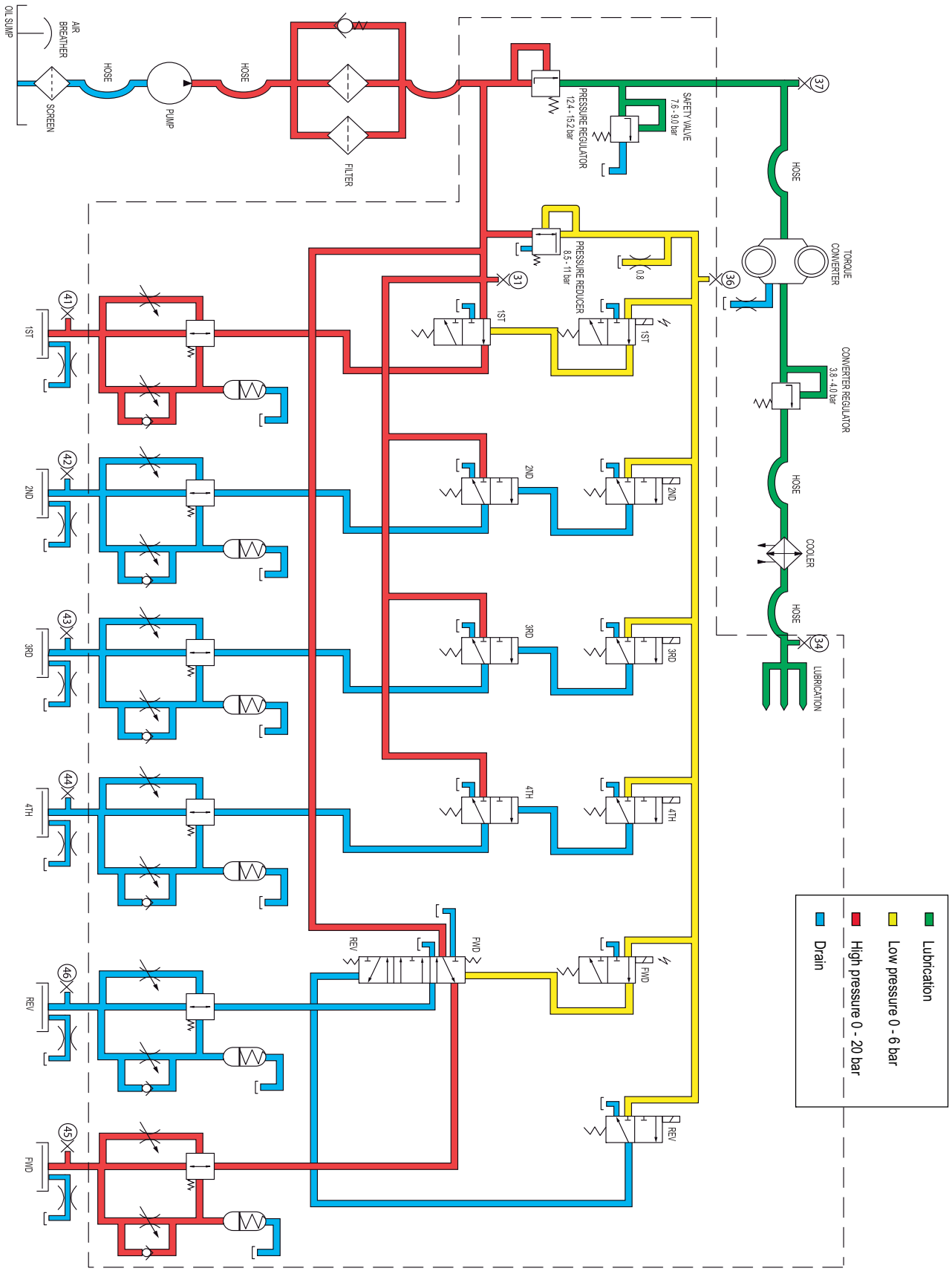
Some transmissions may have an axle declutching unit as optional equipment. This unit consists of a split output shaft with a sliding splined sleeve to engage or disengage the axle. This is accomplished by manually shifting a lever in the operator compartiment, which is mechanically connected to the shift fork on the clutching unit sliding sleeve. This unit, of course, is only used on four wheel drive machines. On the front drive only or the rear drive only, the output shaft is a one piece type and an output flange assembled only on the required end.

POWERFLOWS, ACTIVATED SOLENOIDS & HYDRAULIC CIRCUIT

NEUTRAL



FORWARD 1ST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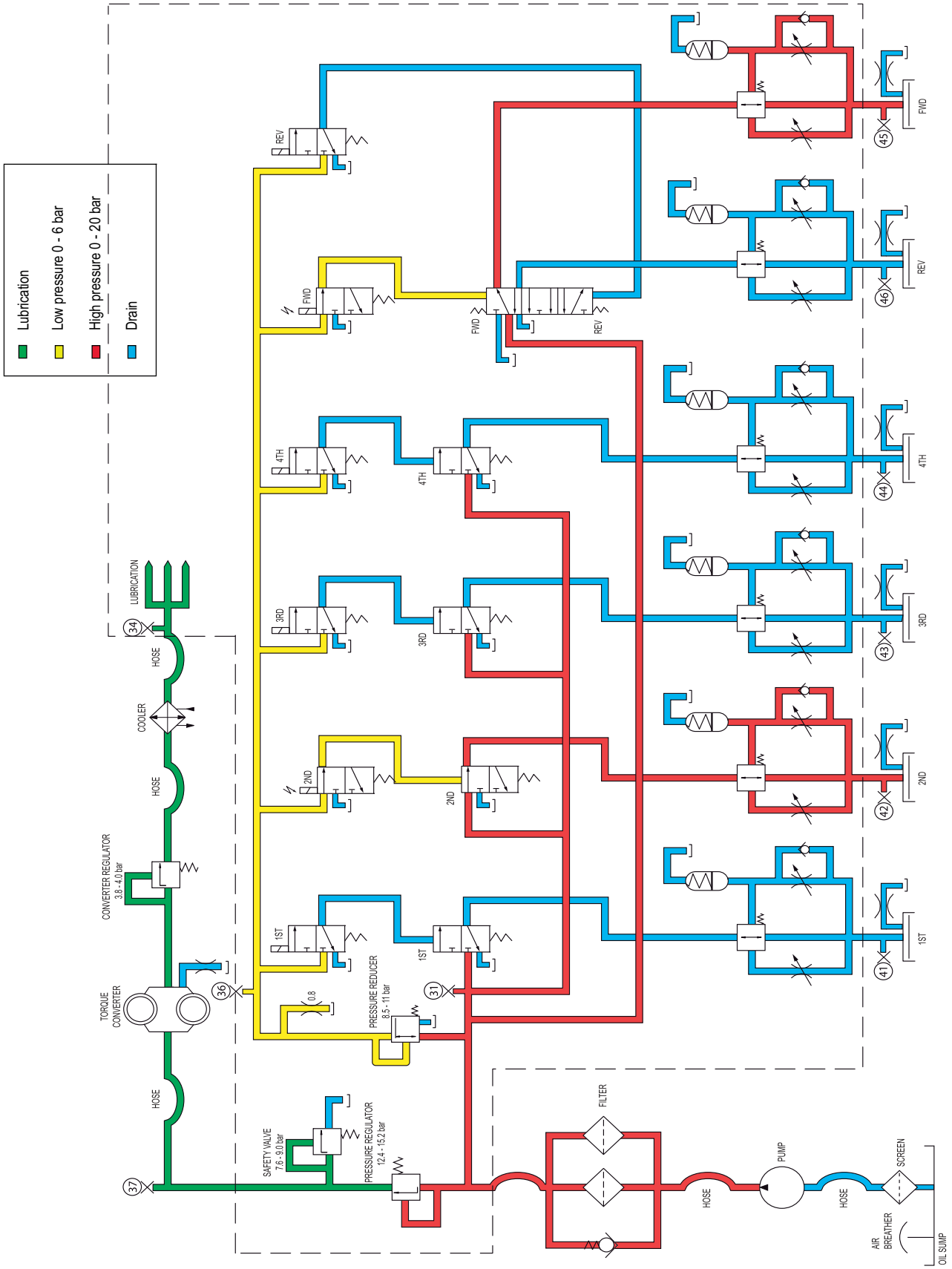
SCREEN
HOSE
PUMP
HOSE
FILTER
PRESSURE REGULATOR 12.4 - 15.2 bar
SAFETY VALVE 7.6 - 9.0 bar
HOSE
TORQUE CONVERTER
PRESSURE REDUCER 8.5 - 11 bar
0.8
CONVERTER REGULATOR 3.8 - 4.0 bar
HOSE
COOLER
HOSE
LUBRICATION
1ST
2ND
3RD
4TH
REV
FWD
Lubrication
Low pressure 0 - 6 bar
High pressure 0 - 20 bar
Drain

FORWARD 2ND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High pressure 0 - 20 bar
Drain
REV
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LUBRICATION
HOSE
COOLER
CONVERTER REGULATOR
3.8 - 4.0 bar
TORQUE CONVERTER
0.8
PRESSURE REDUCER
8.5 - 11 bar
SAFETY VALVE
7.6 - 9.0 bar
PRESSURE REGULATOR
12.4 - 15.2 bar
FILTER
PUMP
SCREEN
AIR BREATHER
OIL SUMP
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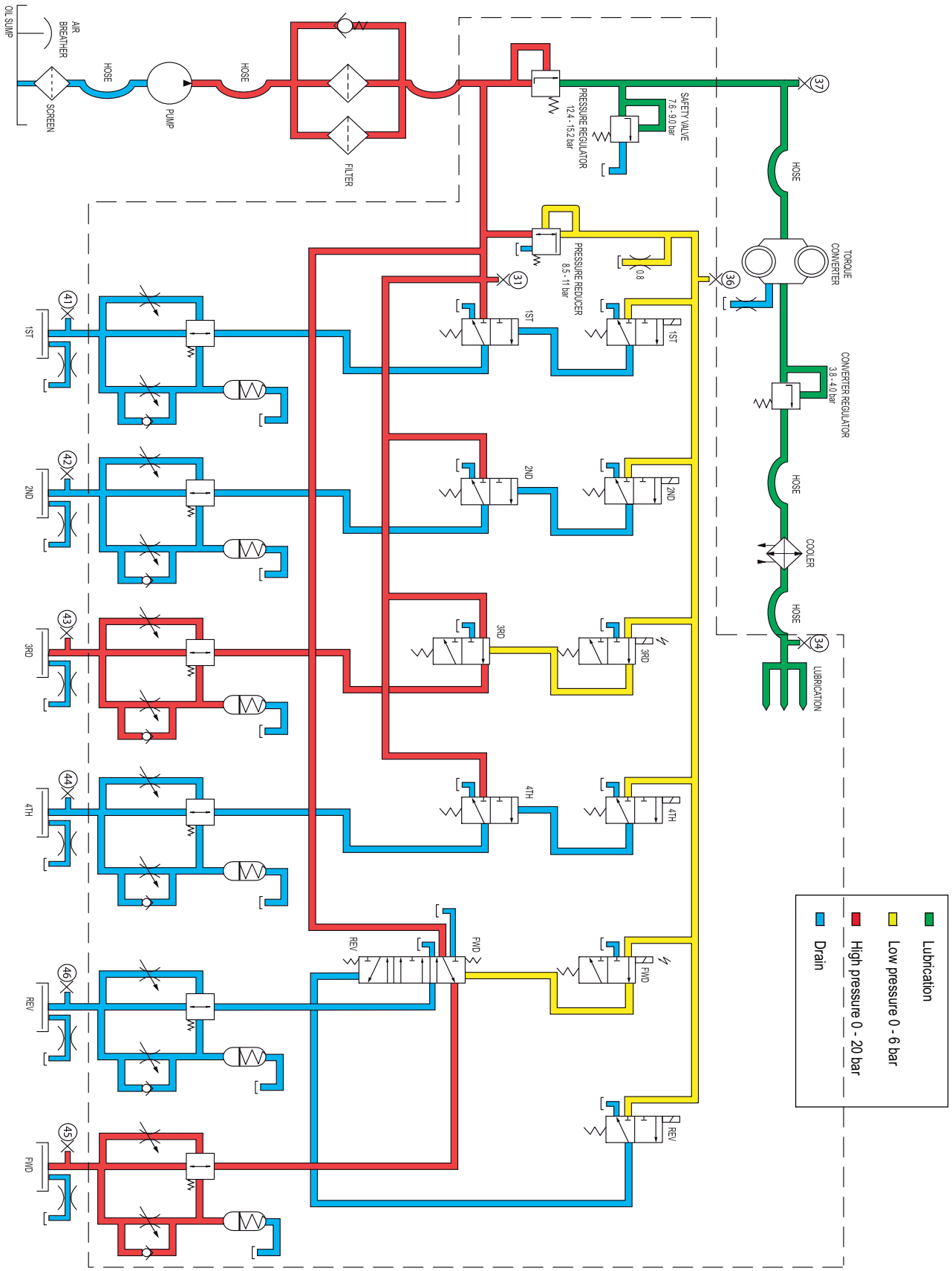
FORWARD 3RD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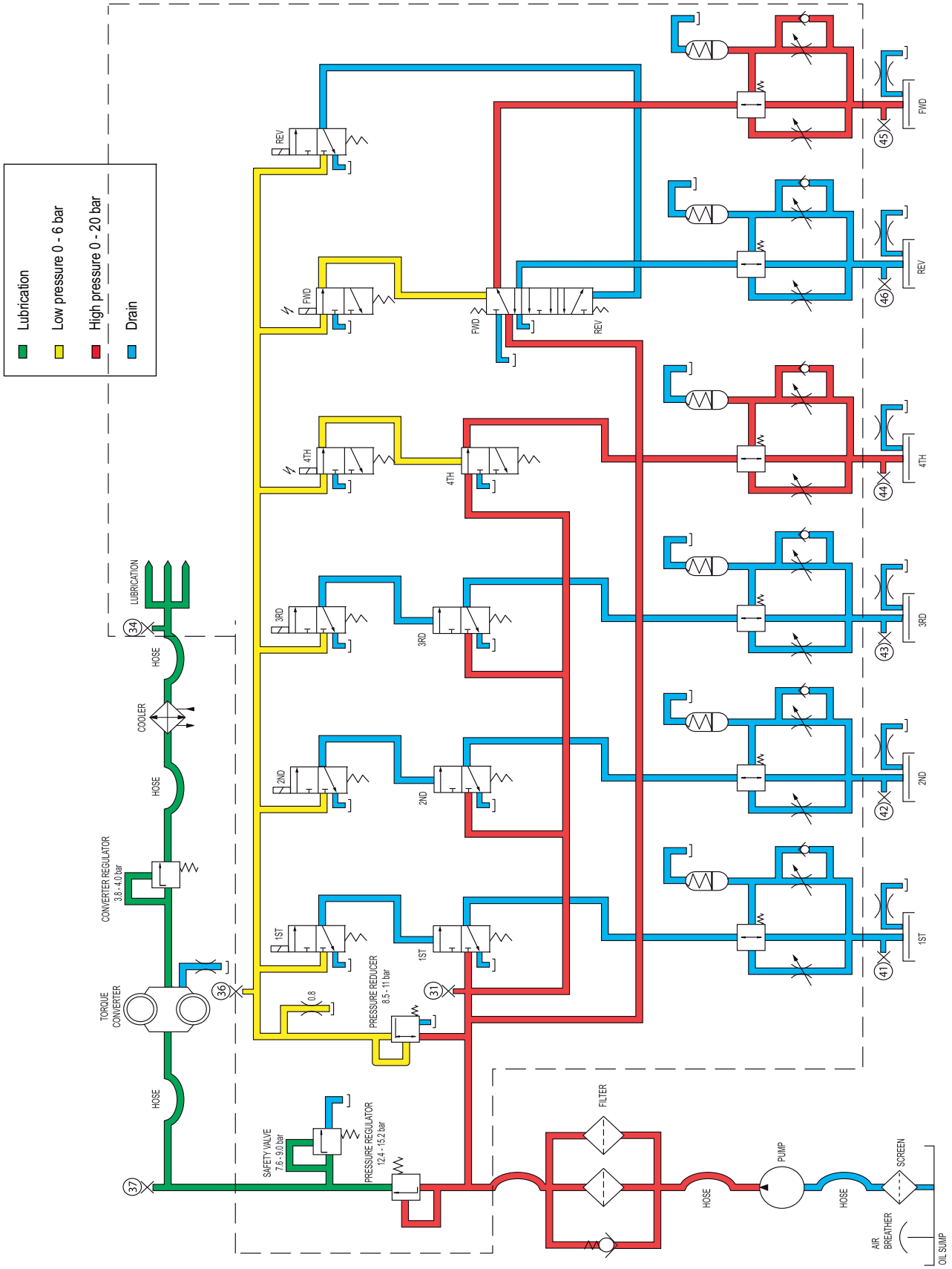
SAFETY VALVE 7.6 - 9.0 bar
HOSE
TORQUE CONVERTER
PRESSURE REDUCER 8.5 - 11 bar
0.8
CONVERTER REGULATOR 3.8 - 4.0 bar
HOSE
COOLER
HOSE
LUBRICATION
1ST
2ND
3RD
4TH
REV
FWD
Lubrication
Low pressure 0 - 6 bar
High pressure 0 - 20 bar
Drain

FORWARD 4TH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High pressure 0 - 20 bar
Drain
REV
FWD
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LUBRICATION
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COOLER
CONVERTER REGULATOR
3.8 - 4.0 bar
TORQUE CONVERTER
PRESSURE REDUCER
8.5 - 11 bar
0.8
SAFETY VALVE
7.6 - 9.0 bar
PRESSURE REGULATOR
12.4 - 15.2 bar
FILTER
PUMP
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AIR BREATHER
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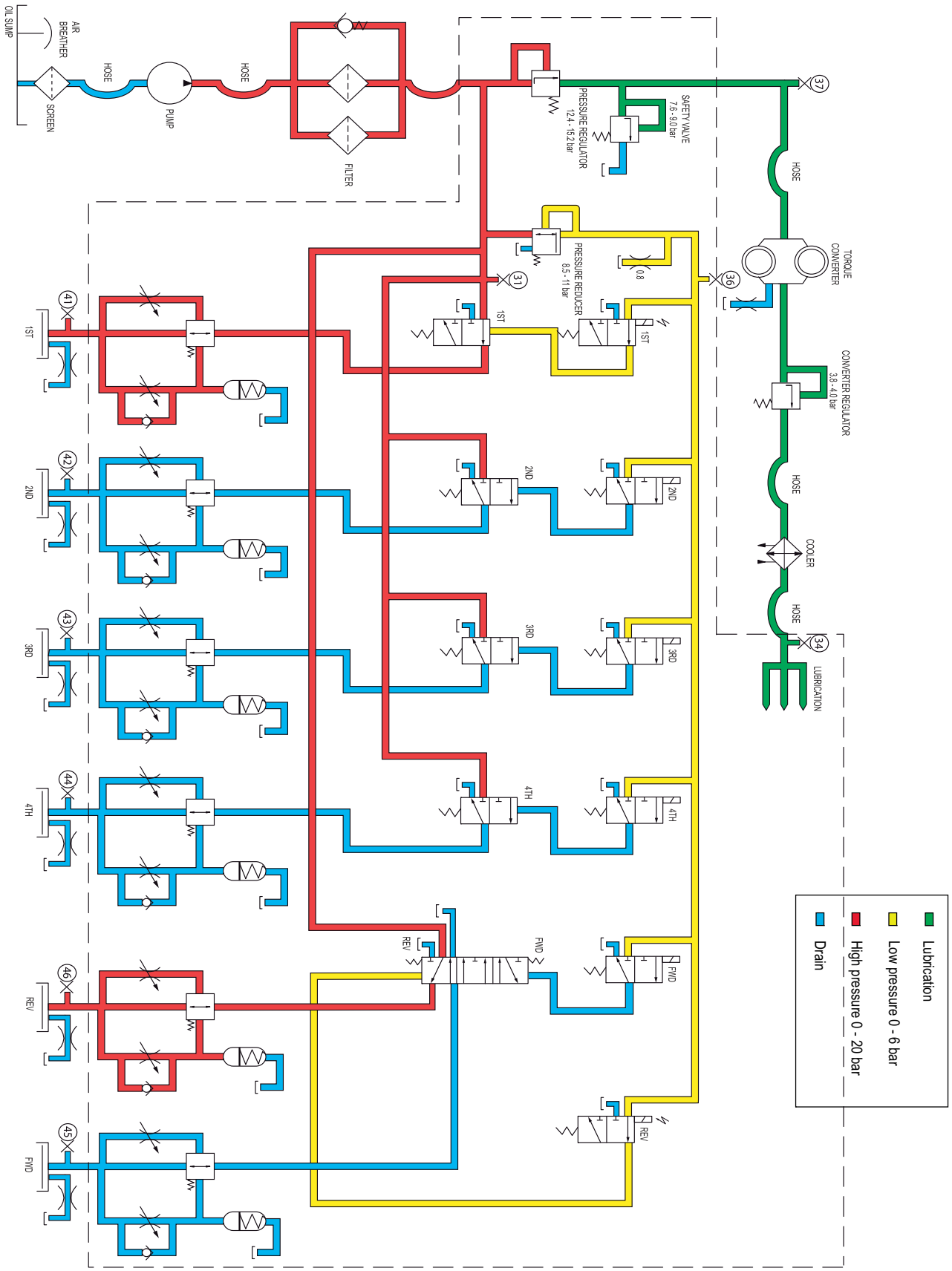
REVERSE 1ST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HOSE
TORQUE CONVERTER
PRESSURE REDUCER 8.5 - 11 bar
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1ST
1ST
1ST
CONVERTER REGULATOR 3.8 - 4.0 bar
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2ND
2ND
2ND
HOSE
COOLER
43
3RD
3RD
3RD
HOSE
34
LUBRICATION
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4TH
4TH
4TH
REV
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FWD
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REV
REV
45
FWD
Lubrication
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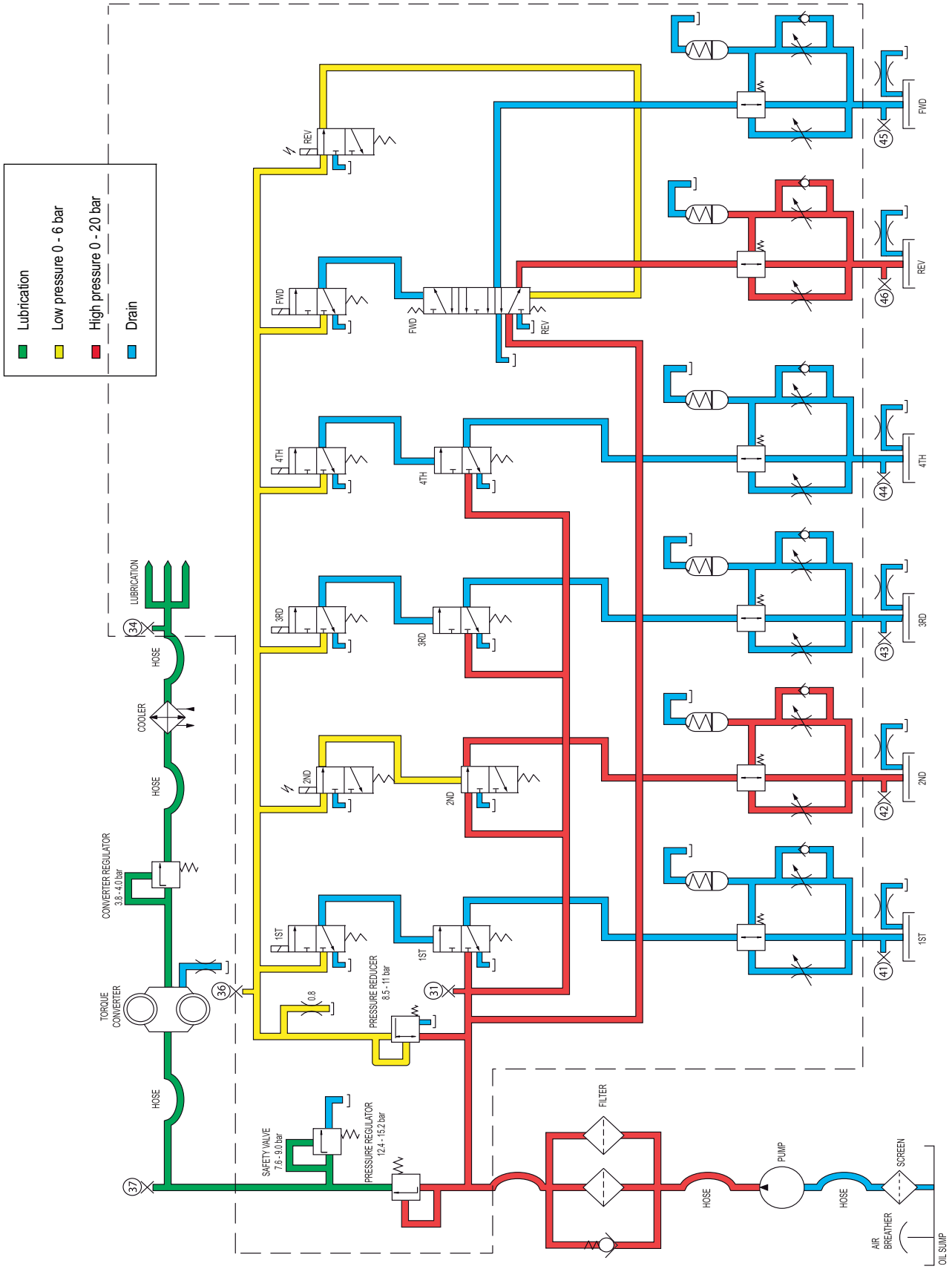
High pressure 0 - 20 bar
Drain

REVERSE 2ND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High pressure 0 - 20 bar
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TORQUE CONVERTER
PRESSURE REDUCER
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SAFETY VALVE
7.6 - 9.0 bar
PRESSURE REGULATOR
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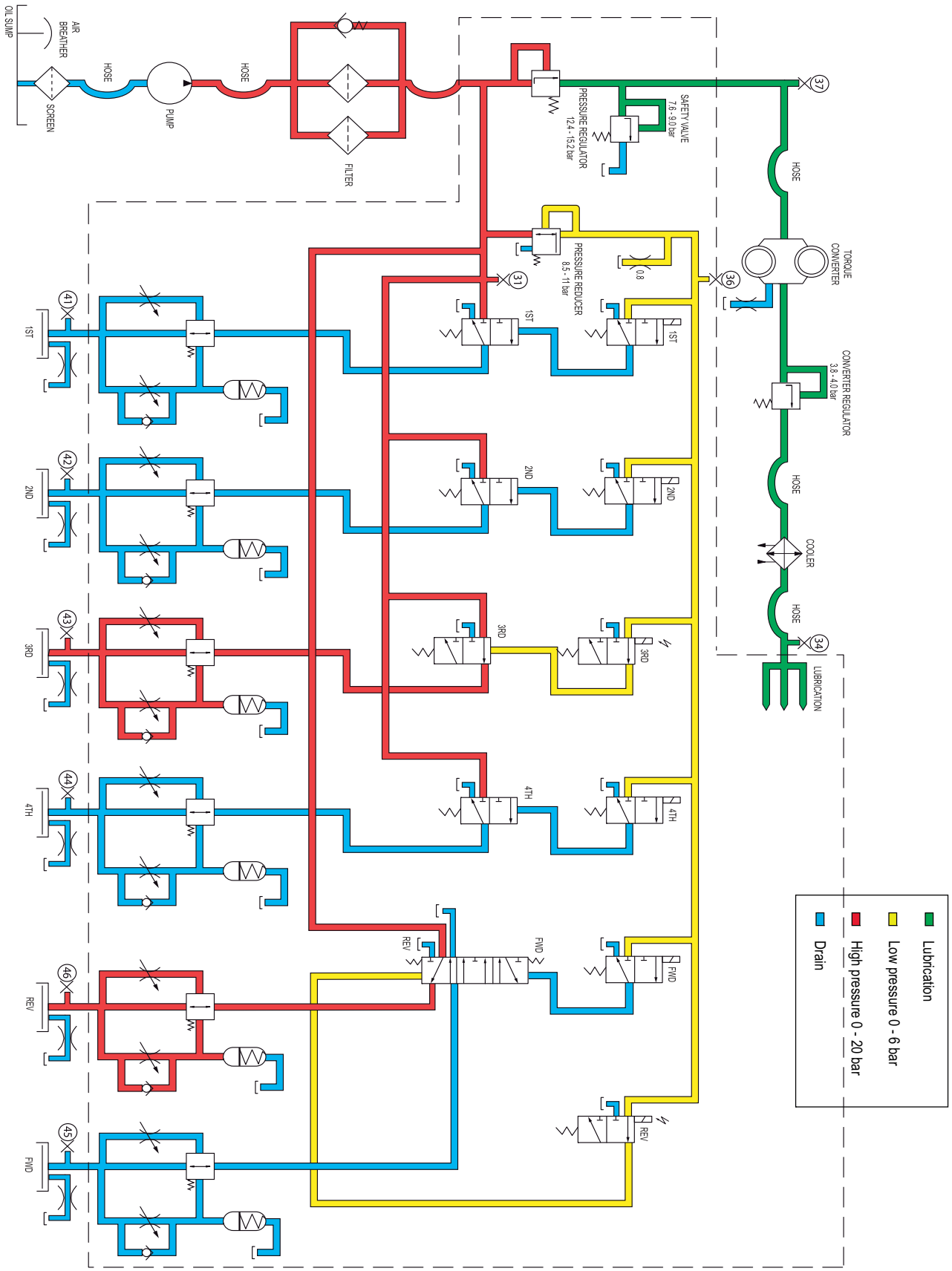
REVERSE 3RD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0.8
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HOSE
COOLER
HOSE
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Lubrication
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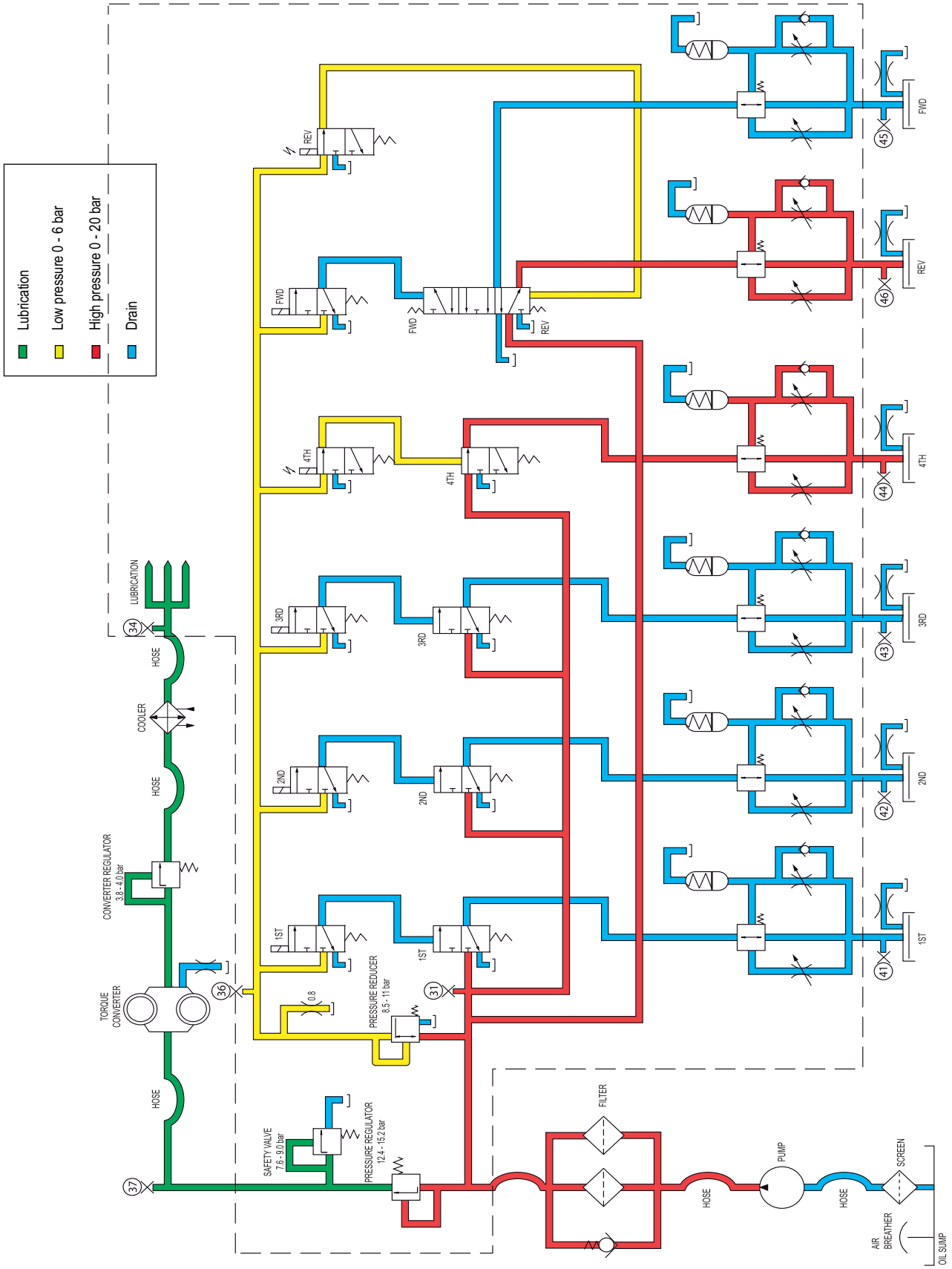
High pressure 0 - 20 bar
Drain

REVERSE 4TH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CONVERTER REGULATOR
3.6 - 4.0 bar
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PRESSURE REDUCER
8.5 - 11 bar
SAFETY VALVE
7.6 - 9.0 bar
PRESSURE REGULATOR
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FILTER
PUMP
SCREEN
AIR BREATHER
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TROUBLESHOOTING

The following information is presented as an aid to isolate and determine the specific problem areas in a transmission that is not functioning correctly.

When troubleshooting a “transmission” problem, it should be kept in mind that the transmission is only the central unit of a group of related powertrain components. Proper operation of the transmission depends on the condition and correct functioning of the other components of the group. Therefore, to properly diagnose a suspected problem in the transmission, it is necessary to consider the transmission fluid, charging pump, torque converter, transmission assembly, oil cooler, filter, connecting lines, and controls, including the engine, as a complete system.

By analysing the principles of operation together with the information in this section, it should be possible to identify and correct any malfunction which may occur in the system.

8000 TRANSMISSION

8000 transmission troubles fall into four general categories:

1 - Mechanical problems.

2 - Hydraulic problems.

3 - Electrical problems.

In addition to the mechanical and electrical components, all of which must be in the proper condition and functioning correctly, the correct functioning of the hydraulic circuit is most important. Transmission fluid is the “life blood” of the transmission. It must be supplied in an adequate quantity and delivered to the system at the correct pressures to ensure converter operation, to engage and hold the clutches from slipping, and to cool and lubricate the working components.

TROUBLESHOOTING PROCEDURES

STALL TEST

A stall test to identifies transmission, converter, or engine problems.

Use following procedure:

1 - Put the vehicle against a solid barrier, such as a wall, and/or apply the parking brake and block the wheels.

2 - Put the directional control lever in FORWARD (or REVERSE, as applicable).

3 - Select the highest speed in manual mode Run the engine to max speed.

⚠ CAUTION

Do not operate the converter at stall condition longer than 30 seconds at one time, shift to neutral for 15 seconds and repeat the procedure until desired temperature is reached. Excessive temperature 120 °C (250 F) maximum will cause damage to transmission clutches, fluid, converter, and seals.

TRANSMISSION PRESSURE CHECKS

Transmission problems can be isolated by the use of pressure tests. When the stall test indicates slipping clutches, then measure clutch pack pressure to determine if the slippage is due to low pressure or clutch plate friction material failure. In addition, converter charging pressure and transmission lubrication pressure can also be measured.

MECHANICAL AND ELECTRICAL CHECKS

Prior to checking any part of the system for hydraulic function (pressure testing), the following mechanical and electrical checks should be made:

- A check should be made to be sure all control lever linkage is properly connected and adjusted at all connecting points.
- Check the wiring and electronic components. Be sure that all components of the cooling system are in good condition and operating correctly. The radiator must be clean to maintain proper cooling and operating temperatures for the engine and transmission. Air clean the radiator, if necessary.
- Check shift levers and rods for binding or restrictions in travel that would prevent full engagement. Shift levers by hand at transmisison case, if full engagement cannot be obtained, difficulty may be in control cover and valve assembly.

HYDRAULIC CHECKS

Before checking on the torque converter, transmission and allied hydraulic systems for pressures and rate of oil flow, it is essential that the following preliminary checks are made.

- Check oil level in the transmission. This should be done with oil temperatures of 82° - 93° C [180° - 200° F]. DO NOT ATTEMPT THIS CHECK WITH COLD OIL. To bring oil temperaure to this specification, it is necessary to either work the machine or “stall” out the converter. Where the former means is impractical, the latter means should be employed as follows. Engage shift levers in forward high speed and apply brakes. Accelerate engine half to three-quarter throttle for about 30 seconds at the time. Hold stall until desired converter outlet temperature is reached.

⚠ CAUTION

Full throttle stall speed for an excessive lenght of time will overheat the converter.

Whenever improper performance is evident the basic pressure and oil flow checks should be performed and recorded. It is also recommended that these checks be taken periodically as a preventative maintenance measure. Doing so will permit possible detection of difficulties in advance of actual breakdown, this permitting scheduling of repair operation, likewise, repair of minor difficulties can be made at considerably less cost and down-time than when delayed until major and complete breakdowns occur.

Analyzing the result of these checks by comparison with specifications and with other will indicate in most cases the basic item or assembly in the system as the source of difficulty. Further checking of that assembly will permit isolation of the specific cause of throuble.

TROUBLESHOOTING GUIDE

Refer to the following troubleshooting guide for the diagnosis of typical transmission throubles.

LOW CLUTCH PRESSURE WITH NORMAL CLUTCH LEAKAGE

Cause	Remedy
1. Low oil level.	1. Fill to proper level.
2. Clutch pressure regulating valve stuck open.	2. Clean valve spool and sleeve.
3. Faulty charging pump.	3. See paragraph on charging pump output.
4. Broken spring in transmission regulator valve.	4. Replace spring.

LOW CLUTCH PRESSURE WITH EXCESSIVE CLUTCH LEAKAGE

Cause	Remedy
1. Broken or worn piston sealing rings.	1. Replace sealing rings.
2. Broken or worn sealing rings on clutch support.	2. Replace sealing rings.
3. Low converter charging pump output.	3. See paragraph on charging pump output.

LOW CONVERTER CHARGING PUMP OUTPUT

Cause	Remedy
1. Low oil level.	1. Fill to proper level.
2. Sump screen plugged	2. Clean screen & sump.
3. Excessive converter internal leakage See paragraph on converter lube flow.	3. Remove, disassemble and rebuild converter assembly, replacing all worn or damaged parts
4. Broken or worn sealing rings in transmission clutches.	4. See paragraph on clutch leakage

LOW FLOW THROUGH COOLER WITH LOW PRESSURE IN CONVERTER

Cause	Remedy
1. Plugged oil cooler. Indicated if transmission lube pressure is low.	1. Back flush and clean oil cooler.
2. Restricted cooler return line.	2. Clean out line.
3. Lube oil ports in transmission plugged	3. Check lube lines for restrictions.

OVERHEATING

Cause	Remedy
1. Worn oil seal rings	1. Remove, disassemble and rebuild transmission.
2. Worn oil pump	2. Replace
3. Low oil level	3. Fill to proper level
4. Pump suction line intaking air	4. Check oil line connections and tighten securely.

NOISY CONVERTER

Cause	Remedy
1. Low engine RPM at converter stall	1. Tune engine, check governor.
2. See “overheating” and make same checks	2. Make corrections as explained in “Overheating”

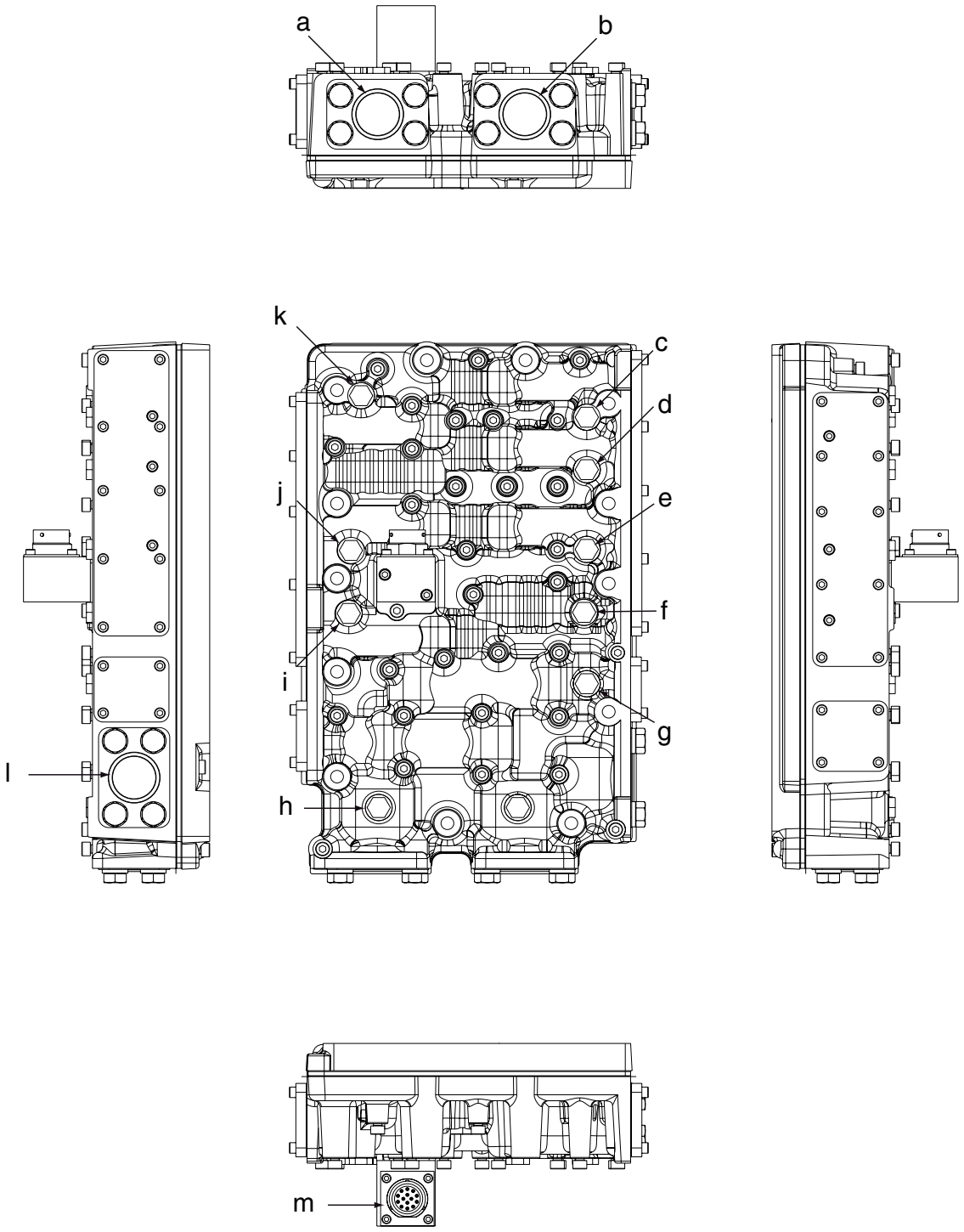
NUMBERING OF PORTS FOR HYDRAULIC CIRCUIT DIAGRAMS

PORTS	PRESSURE CHECK PORTS	TEMPERATURE CHECK PORTS
1	31 Regulated Clutch pressuure	71 To Cooler
2	32 To Cooler	72
3	33 From Cooler	73
4	34 Lube	74
5	35 Pump	75
6	36 Solenoid	76
7	37 Converter In	77
8	38	78
9	39	79
10	40	80
11 To Cooler	41 1st Clutch	81
12 From Cooler	42 2nd Clutch	82
13 To Remote Filter (on Transmission)	43 3rd Clutch	83
14 From Transmission (on Remote Filter)	44 FWD High	84
15 To Transmission (on Remote Filter)	45 FWD Low	85
16 From remote Filter (on Transmission)	46 REV Clutch	86
17 Air/Hydr Disconnect - 4WD	47 Disconnect Clutch	87
18 To Pump	48 Clutch Return Line	88
19 Air/Hydr Inching	49 SAHR Brake Release	89
20 Air/Hydr Disconnect - 2WD	50 VFS 1st	90
21 From Pump	51 VFS 2nd	
22 Drain	52 VFS 3rd	
23 From Regulator	53 VFS High	
24 SAHR brake Release	54 VFS FWD	
25 Range - Shift	55 VFS REV	
26 Diff. Lock	56 System Pressure (after Total Neutral)	
27 Power Brake Supply	57 Pilot Pressure	
28 Clutch Return Line	58 Pressure Check Range Clutches	
29 From Pump for Brake Release	59 Pressure Check Direct. Clutches	
30	60 Pressure Intensifier 1st	
	61 Pressure Intensifier 2nd	
	62 Pressure Intensifier 3rd	
	63 Pressure Intensifier High	
	64 Pressure Intensifier FWD	
	65 Pressure Intensifier REV	
	66	

NOTE:

For ports drawings see chapter INSTALLATION DETAILS - External Plumbing p. 19

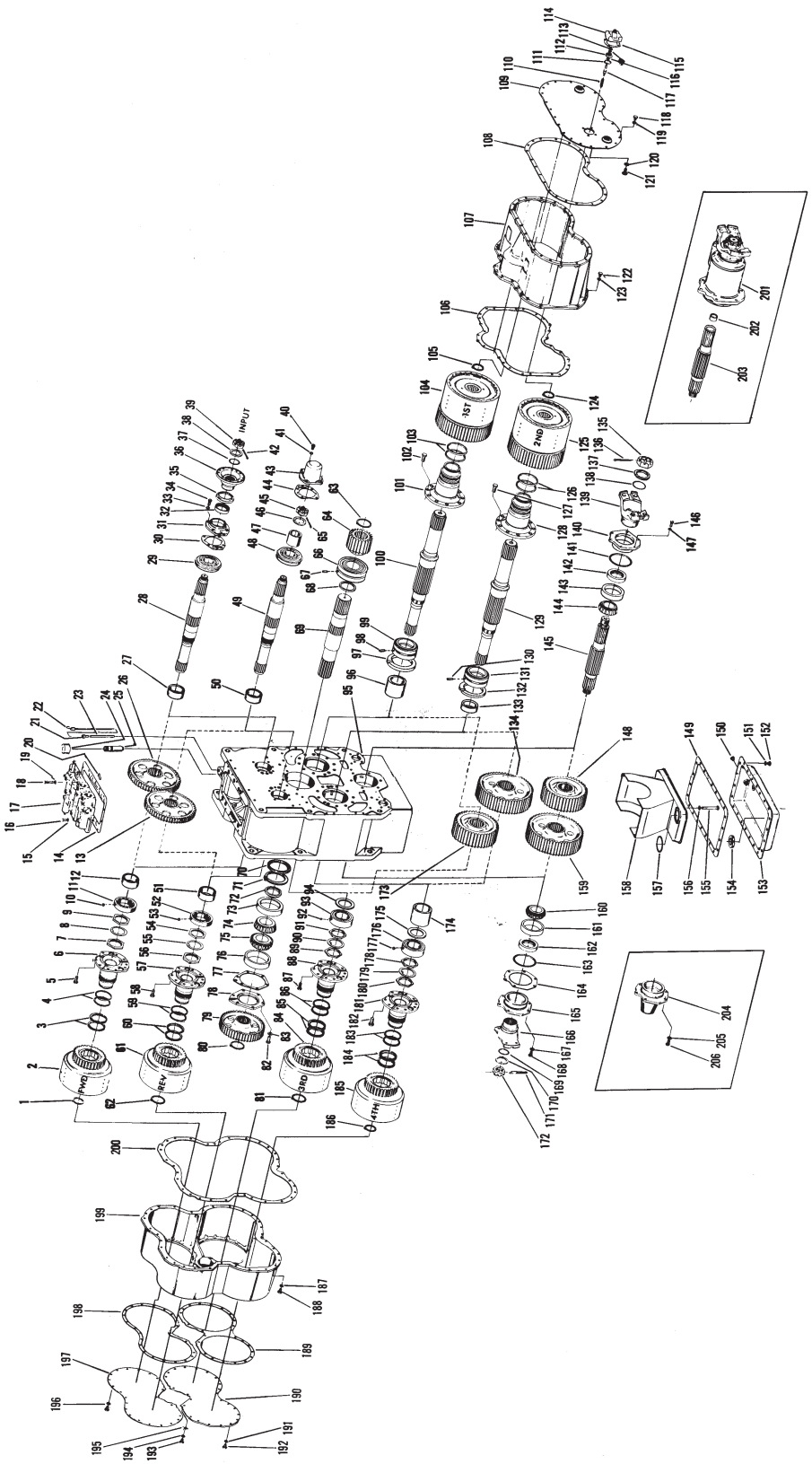
CHECK POINTS



a - From cooler
b - To converter
c - Port 43 3rd clutch pressure M14 x 1.5
d - Port 41 1st clutch pressure M14 x 1.5
e - Port 42 2nd clutch pressure M14 x 1.5
f - Port 36 Solenoid pressure M14 x 1.5
g - Port 37 Converter in pressure M14 x 1.5
h - Port 34 Lube pressure M14 x 1.5
i - Port 44 4th clutch pressure M14 x 1.5
j - Port 46 Rev clutch pressure M14 x 1.5
k - Port 45 Fwd clutch pressure M14 x 1.5
l - From charging pump
m - 14 pole deutz connector HD34-18-14PN mating parts specs connector deutz HD36-18-14SN contact (female) deutz 0462-209-16141

SECTIONAL VIEWS AND PARTS IDENTIFICATION

8000 SERIES TRANSMISSION ASSEMBLY



Item	Description	Qty.
1	Snapring - Disc hub	1
2	Assembly - Clutch	1
3	Spring - Piston ring expander	2
4	Ring - Clutch support piston	2
5	Screw - Clutch support to case	8
6	Support - Clutch	1
7	Locknut - Bearing	1
8	Lockplate - Bearing nut	1
9	Locknut - Bearing	1
10	Ball - Bearing lock	1
11	Bearing	1
12	Spacer - Bearing	1
13	Gear	1
14	Gasket - Control valve to transmission case	1
15	Lockwasher - Control valve to transmission case screw	11
16	Screw - Control valve to transmission case	11
17	Control valve assembly	1
18	Screw - Control valve to transmission case	2
19	Lockwasher - Control valve to transmission case screw	2
20	O-ring	8
21	Housing - Dipstick	1
22	Dipstick	1
23	Tube - Dipstick	1
24	Cap - Oil filler pipe	1
25	Pipe - Oil filler	1
26	Gear - Input shaft	1
27	Spacer - Input shaft gear	1
28	Shaft - Input	1
29	Bearing - Input shaft front	1
30	Gasket - Bearing cap	1
31	Cap - Input bearing	1
32	Seal - Input oil	1
33	Lockwasher - Bearing cap screw	5
34	Screw - Bearing cap	5
35	Seal -Oil	1
36	Flange - Input	1
37	O-ring	1
38	Washer - Input flange	1
39	Nut - Input flange	1

Item	Description	Qty.
40	Screw - Bearing cap	5
41	Lockwasher - Bearing cap screw	5
42	Not used on this model	
43	Cap - Input bearing	1
44	Gasket - Bearing cap	1
45	Nut - Retaining	1
46	Washer - Retaining nut	1
47	Spacer - Bearing	1
48	Bearing - reverse shaft front	1
49	Shaft - Reverse	1
50	Spacer - Gear	1
51	Spacer - Gear	1
52	Bearing - Reverse shaft rear	1
53	Ball - Rear bearing lock	1
54	Nut - Bearing lock	1
55	Lockplate - Bearing nut	1
56	Nut - Bearing lock	1
57	Support - Clutch	1
58	Screw - Clutch support to transmission case	8
59	Ring - Clutch support piston	2
60	Spring - Piston ring expander	2
61	Assembly - Clutch (Reverse)	1
62	Snapring - Disc hub	1
63	Snapring - Gear	1
64	Gear - Idler shaft	1
65	Not used on this model	
66	Bearing - Idler shaft	1
67	Lockpin - Bearing	1
68	Snapring	1
69	Shaft - Idler	1
70	Shield - Oil	1
71	Snapring - Bearing	1
72	Not used on this model	
73	Cup - Bearing	1
74	Cone - Bearing	1
75	Cone - Bearing	1
76	Cup - Bearing	1
77	Shim - Bearing cap .004	AR
77A	Shim - Bearing cap .007	AR
77B	Shim - Bearing cap .010	AR

Item	Description	Qty.
78	Cap - Bearing	1
79	Gear - Idler	1
80	Snapring - Idler gear	1
81	Snapring - Disc hub	1
82	Screw - Bearing cap	6
83	Lockwasher - Bearing cap	6
84	Assembly - Clutch (3rd speed)	1
85	Spring - Piston ring expander	2
86	Ring - Piston	2
87	Screw - Clutch support to transmission case	8
88	Support - Clutch	1
89	Locknut - Bearing	1
90	Lock - Bearing nut	1
91	Locknut - Bearing	1
92	Ball - Bearing lock	1
93	Bearing -Roller	1
94	Spacer - Gear	1
95	Case - Transmission	1
96	Spacer - Gear	1
97	Snapring - Bearing	1
98	Lockpin - Bearing cup	1
99	Bearing	1
100	Shaft - 1st & 3rd	1
101	Support - Clutch	1
102	Screw - Clutch support to transmission case	9
103	Ring - Clutch support piston	2
103A	Spring - Piston ring expander	2
104	Assembly - Clutch (1st speed)	1
105	Snapring - Disc hub	1
106	Gasket - Clutch cover	1
107	Cover - 1st & 2nd clutch	1
108	Not used on this model	
109	Not used on this model	
110	Spring - Speedo drive	1
111	Snapring - Bearing	1
112	Bearing - Speedo drive	1
113	Seal - Speedo drive shaft oil	1
114	Housing - Speedo drive	1
115	Gasket - Speedo drive housing	1
116	Snapring - Bearing	2

Item	Description	Qty.
117	Shaft - Speedo drive	1
118	Not used on this model	
119	Not used on this model	
120	Washer - Housing to transmission case sealing	4
121	Screw - Housing to transmission case	4
122	Screw - Clutch cover to transmission case	23
123	Washer - Clutch cover to transmission case screw	23
124	Snapring - Disc hub	1
125	Assembly - Clutch (2nd speed)	1
126	Ring - Clutch support piston	2
126A	Spring - Piston ring expander	2
127	Screw - Clutch support to transmission case	9
128	Assembly - Clutch	1
129	Shaft - 2nd & 4th	1
130	Lockpin - Bearing cup	1
131	Bearing	1
132	Snapring - Bearing	1
133	Spacer - Gear	1
134	Gear - 2nd & 4th	1
135	Nut - Flange	1
136	Pin - Cotter	1
137	Washer - Flange	1
138	O-ring - Flange	1
139	Flange - Output	1
140	Cap - Output bearing	1
141	O-ring	1
142	Seal - Oil	1
143	Cup - Output bearing	1
144	Cone - Output bearing	1
145	Shaft - Output	1
146	Screw - Output bearing cap	6
147	Lockwasher - Bearing cap screw	6
148	Gear - output	1
149	Gasket -Oil sump	1
150	Plug - Drain	2
151	Not used on this model	
152	Screw - Sump to transmission case	22
153	Sump - Oil	1
154	Magnet -Sump	2
155	Screw - Screen assembly to transmission case	4

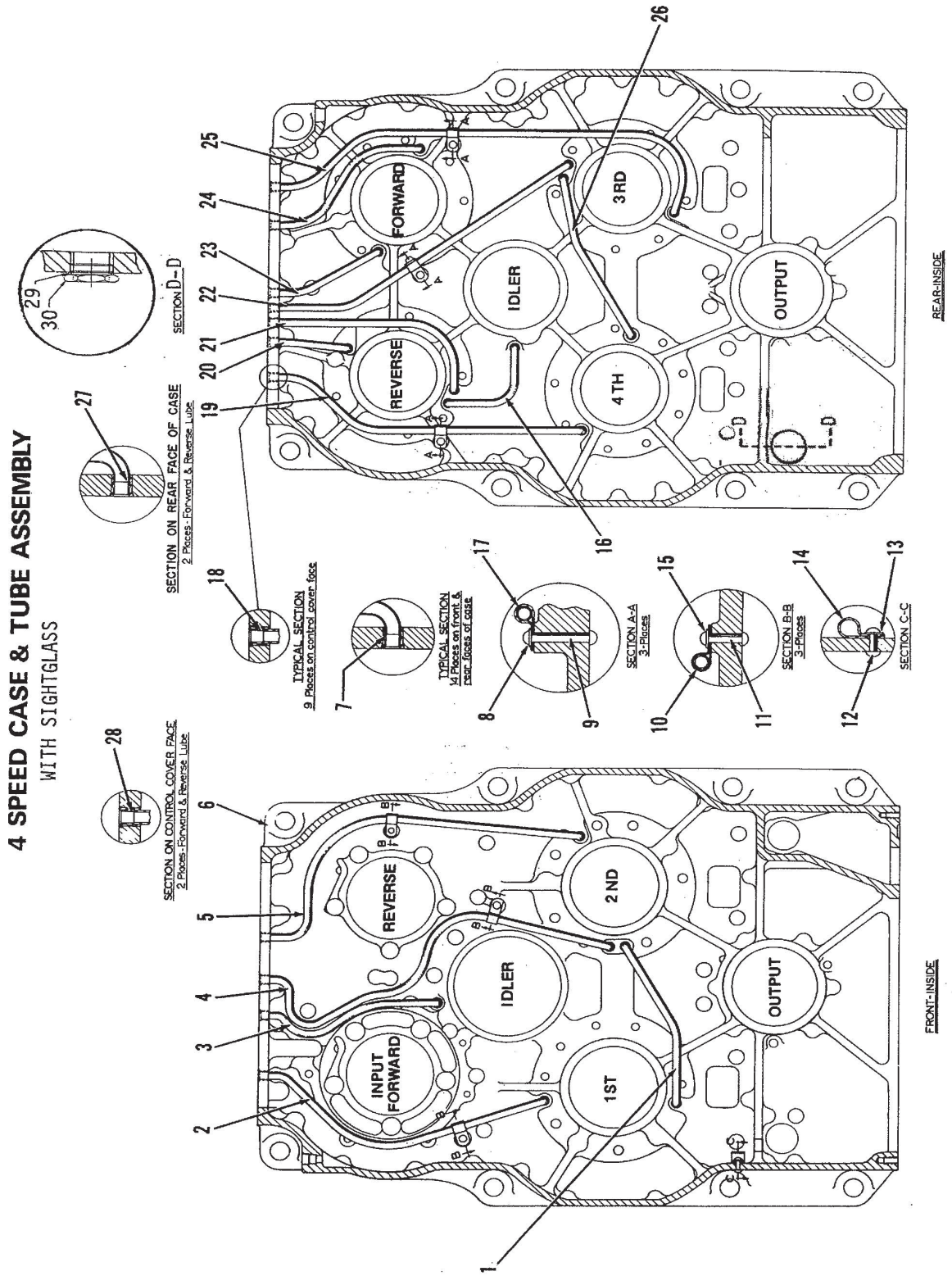
Item	Description	Qty.
156	Lockwasher -Screen assembly to transmission case	4
157	Gasket - Screen assembly to transmission case	1
158	Assembly - Oil sump frame & screen	1
159	Gear - Output	1
160	Cone - Output bearing	1
161	Cup - Output bearing	1
162	Seal - Bearing cap oil	1
163	O-ring	1
164	Shim - Output .004	AR
164A	Shim - Output .007	AR
164B	Shim - Output .010	AR
165	Cap - Bearing	1
166	Flange - Front output	1
167	Lockwasher - Bearing cap screw	6
168	Screw - Bearing cap	6
169	O-ring - Flange	1
170	Washer - Flange	1
171	Pin - Cotter	1
172	Nut - Flange	1
173	Gear - 1st & 3rd	1
174	Spacer - Gear	1
174	Spacer - Gear	1
175	Gear - Spazcer	1
176	Bearing	1
177	Ball - Bearing lock	1
178	Locknut - Bearing	1
179	Lock - Bearing nut	1
180	Locknut - Bearing lock	1
181	Support - Clutch	1
182	Screw - Clutch support to transmission case	8
183	Ring - Clutch support sealing	2
184	Spring - Piston ring expander	2
185	Assembly -Clutch 4th	1
186	Snapring -Disc hub	1
187	Lockwasher - Clutch cover to transmission case	33
188	Screw - Clutch cover to transmission case	33
189	Gasket - 3rd & 4th cover plate	2
190	Plate - 3rd & 4th cover	2
191	Lockwasher - Clutch cover to transmission case	24
192	Screw - Clutch cover to transmission case	24

Item	Description	Qty.
193	Not used on this model	
194	Not used on this model	
195	Not used on this model	
196	Screw - Cover plate	20
196A	Lockwasher - Cover plate	20
197	Plate - Cover	1
197A	Spacer - Cover plate (NI)	1
198	Gasket - Cover plate to spacer & spacer to transmission case	2
199	Cover - Fwd, Rev, 3rd & 4th clutch	1
200	Gasket - Clutch cover	1
201	Not used on this model	
202	Not used on this model	
203	Not used on this model	
204	Not used on this model	
205	Not used on this model	
206	Not used on this model	
	Breather - Air (NI)	1
	Plug - Pipe (NI)	1
	Adaptor - Air breather	1
	Plug - Oil level	2
	Plug - Pipe	2

AR = As Required

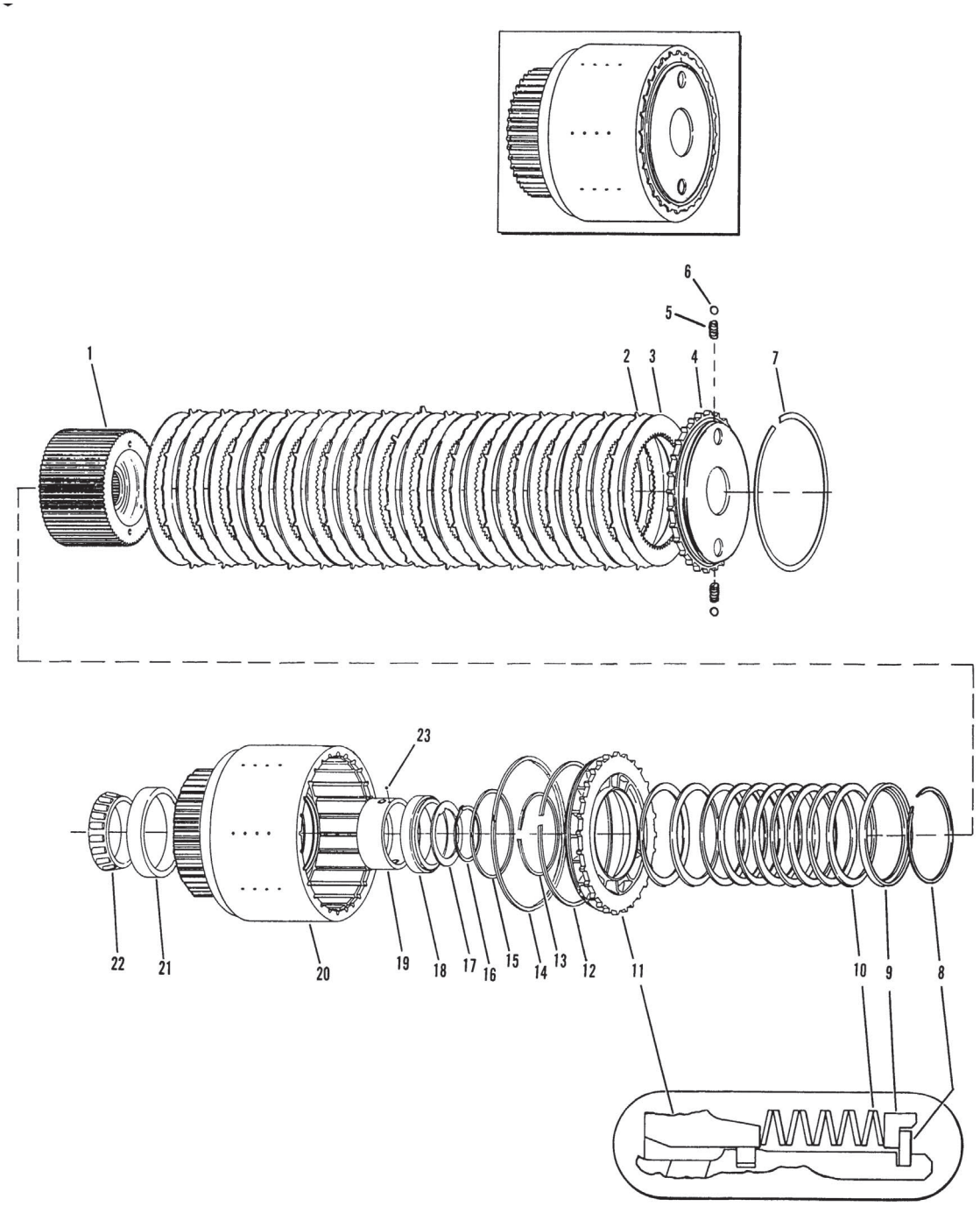
NI = Not Illustrated

8000 SERIES TUBE ASSEMBLY



Item	Description	Qty.
1	Tube - 2nd to 1st crossover lube	1
2	Tube - 1st clutch pressure	1
3	Tube - Idler shaft front bearing lube	1
4	Tube - 2nd clutch lube	1
5	Tube - 2nd clutch pressure	1
6	Assembly - Transmission case	1
7	Sleeve - Tube	14
8	Washer	3
9	Rivet	3
10	Clip - Tube	3
11	Rivet	3
12	Rivet	1
13	Washer	1
14	Clip - Tube	1
15	Washer	3
16	Tube - Rev to idler crossover lube	1
17	Clip - Tube	3
18	Sleeve - Tube	9
19	Tube - 4th clutch pressure	1
20	Tube - Rev clutch pressure	1
21	Tube - Rev clutch lube	1
22	Tube - 3rd clutch lube	1
23	Tube - Fwd clutch lube	1
24	Tube - Fwd clutch pressure	1
25	Tube - 3rd clutch pressure	1
26	Tube - 4th to 3rd crossover lube	1
27	Sleeve - Tube	2
28	Sleeve - Tube	2
29	O-ring - Oil level sight glass	1
30	Sight glass - Oil level	1

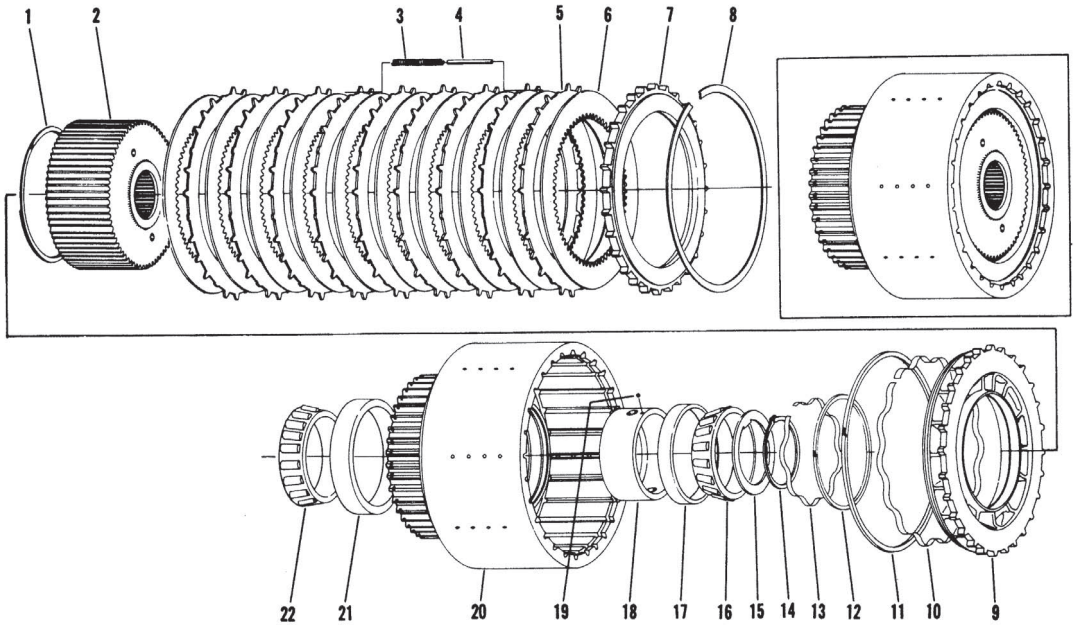
8000 SERIES FWD & REV CLUTCHES, MODULATION



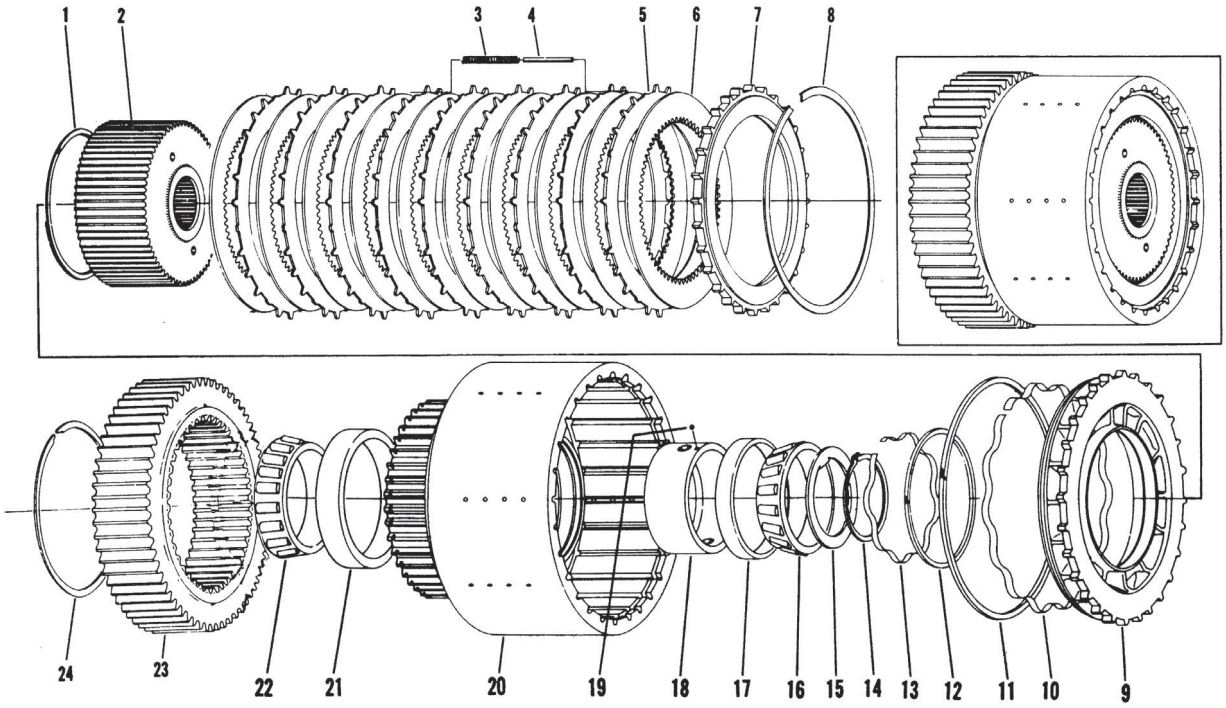
Item	Description	Qty.
1	Hub	1
2	Disc - Outer	15
2A	Shim - Outer clutch disc	AR
3	Disc - Inner	16
4	Plate - End	1
5	Spring - End plate	2
6	Ball - End plate spring retaining	2
7	Snapring - End plate retaining	1
8	Snapring - Spring retainer	1
9	Washer - Snapring retainer	1
10	Spring - Disc	10
11	Piston - Clutch	1
12	Ring - Outer clutch piston expander	1
13	Ring - Inner clutch piston expander	1
14	Ring - Outer clutch piston	1
15	Ring - Inner clutch piston	1
16	Washer - Snapring 0.100 / 0.101 thick	AR
16A	Washer - Snapring 0.094 / 0.095 thick	AR
17	Washer - Keyed 0.124 / 0.125 thick	AR
17A	Washer - Keyed 0.122 / 0.123 thick	AR
17B	Washer - keyed 0.120 / 0.121 thick	AR
18	Bearing	1
19	Race - Piston ring outer	1
20	Assembly - Drum	1
21	Cup - Bearing cup	1
22	Cone - Bearing	1
23	Ball - Outer race lock	1

8000 SERIES 11.5 DIA. CLUTCH GROUP, RANGE MODULATION TAPERED BEARING ARRANGEMENT

1ST & 2ND CLUTCH



1st & 2nd CLUTCH GROUP

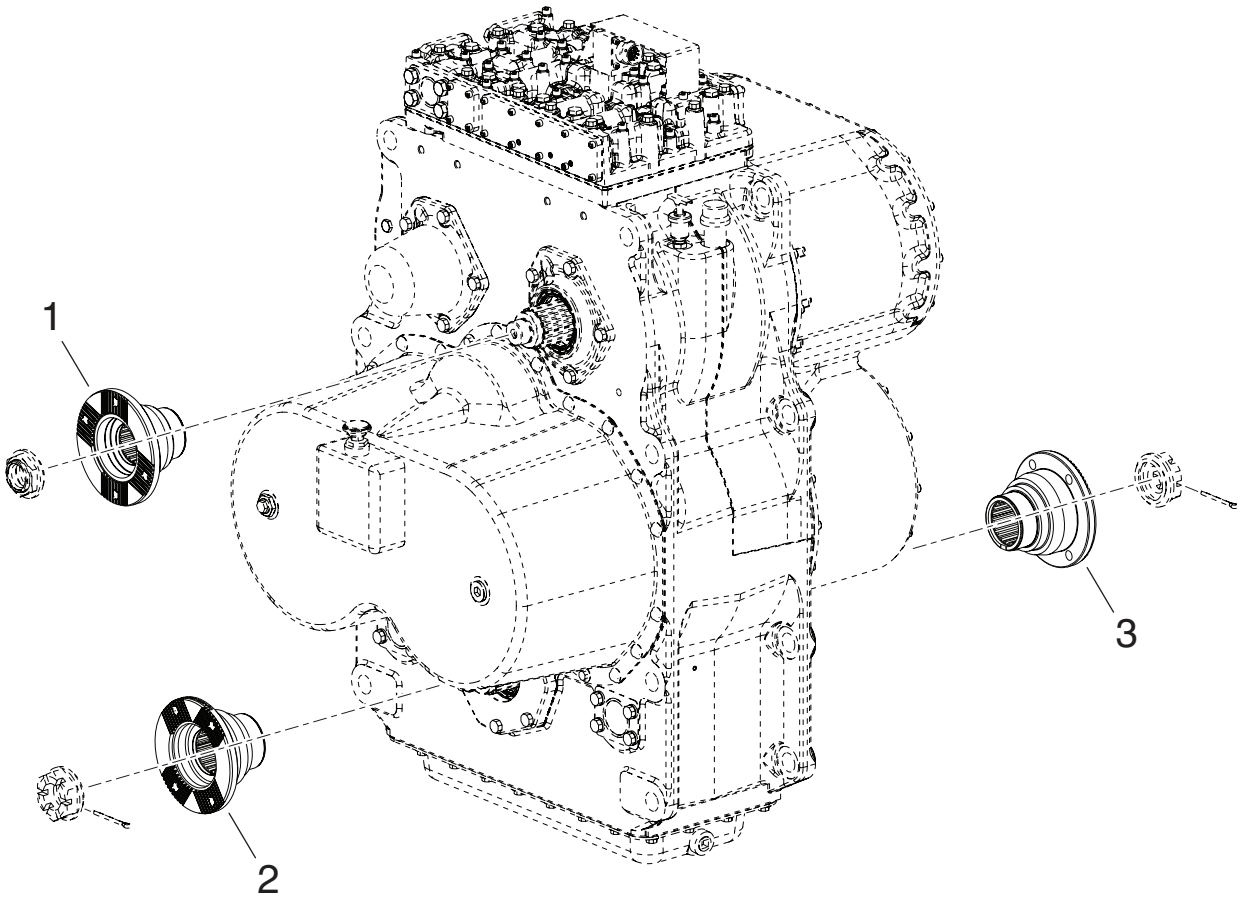


8000 SERIES 11.5 DIA. CLUTCH GROUP, RANGE MODULATION TAPERED BEA-

Item	Description	Qty.
1	Ring - Disc hub oil baffle	1
2	Hub assembly	1
3	Spring - Piston return	21
4	Pin - Piston return spring	21
5	Disc - Outer clutch	9
5A	Shim - Outer clutch disc	AR
6	Disc -Inner clutch	10
7	Plate - End	1
8	Snapring - End plate	1
9	Piston - Clutch	1
10	Spring - Outer piston ring expander	1
11	Ring - Outer piston	1
12	Ring - Inner piston	1
13	Spring - Inner piston ring expander	1
14	Snapring - Bearing .119 / .125	AR
14A	Snapring - Bearing .111 / .117	AR
14B	Snapring - Bearing .102 / .108	AR
15	Washer - Bearing	1
16	Cone - Outer support bearing	1
17	Cup - Outer support bearing	1
18	Race - Piston ring outer	1
19	Ball - Piston ring outer race lock	1
20	Drum assembly	1
21	Cup - Inner support bearing	1
22	Cone -Inner support bearing	1
23	Gear - Clutch hub	1
24	Snapring - Gear	1

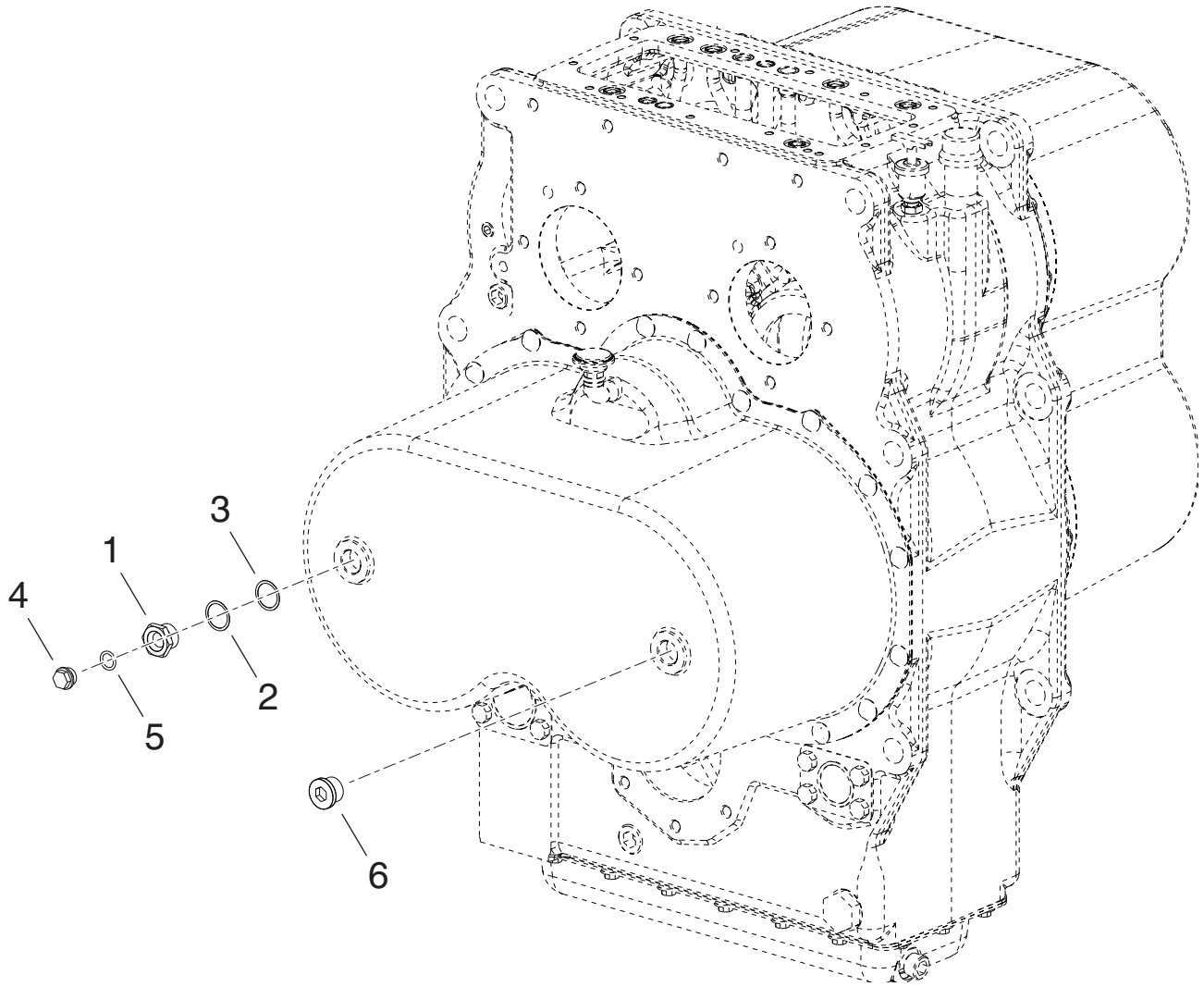
TRANSMISSION 8421-267 8XXX-3YY

8000 ASSY-TRANSMISSION



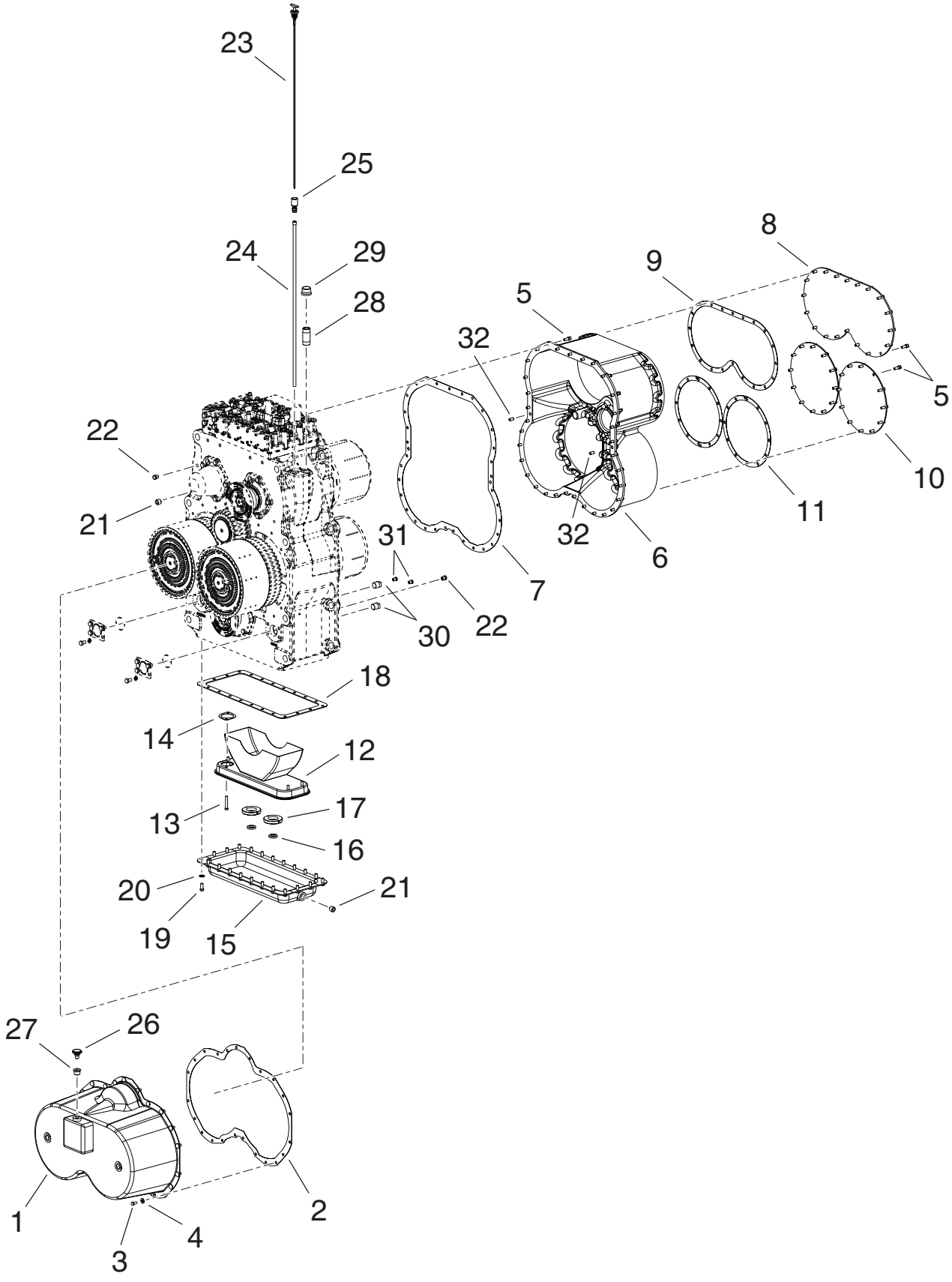
Item	Description	Qty
1	Flange-input 180KV70	1
2	Flange-output 180KV70 front	1
3	Flange-output 180KV70 rear	1

1000 GROUP-SPEED SENSOR



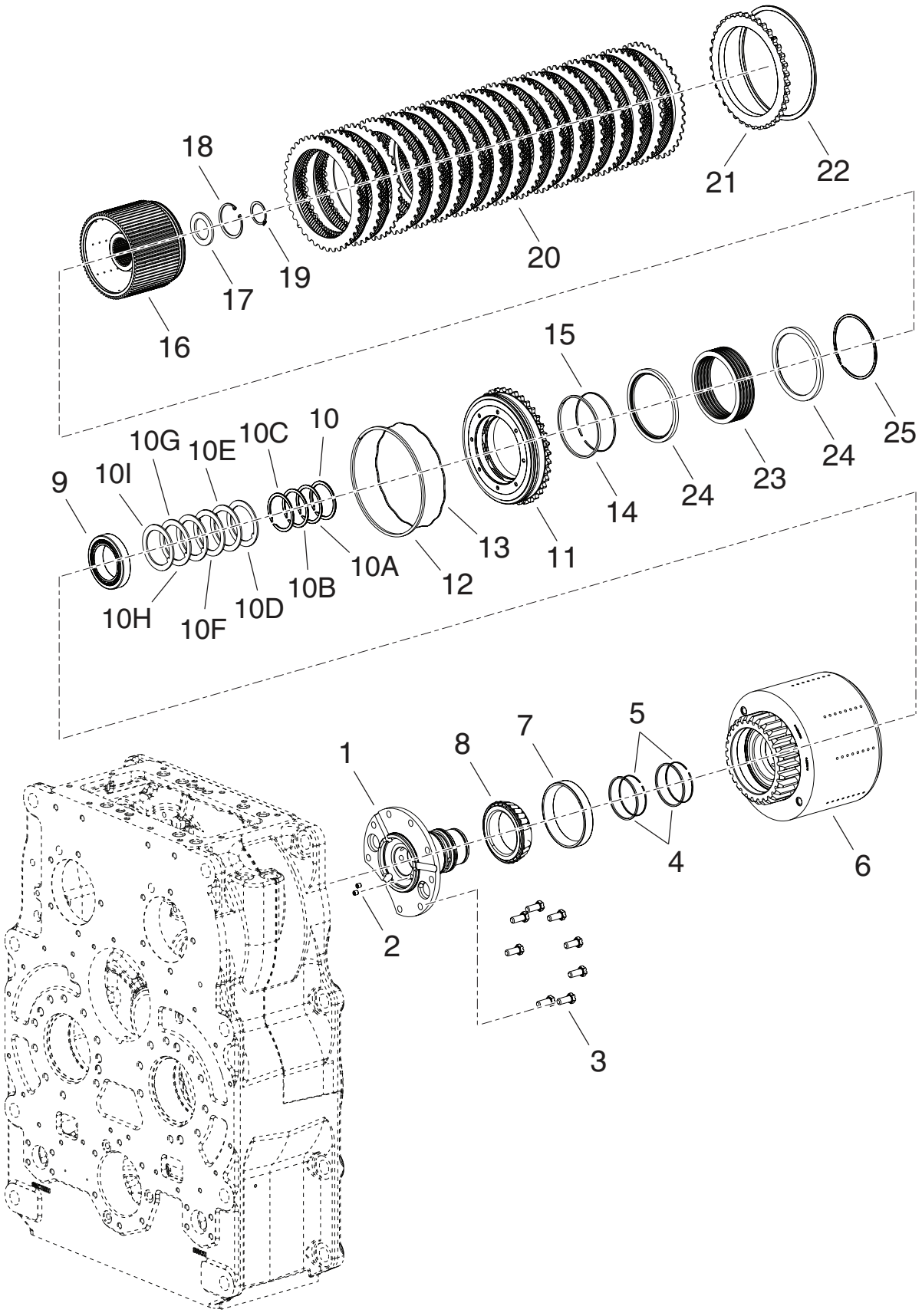
Item	Description	Qty
1	Bushing-speed sensor	1
2	Shim-speed sensor	A/R
3	Shim-speed sensor	A/R
4	Plug-speed sensor	1
5	O-ring	1
6	Plug-speed sensor hole	1

8000 GROUP-BASE PARTS



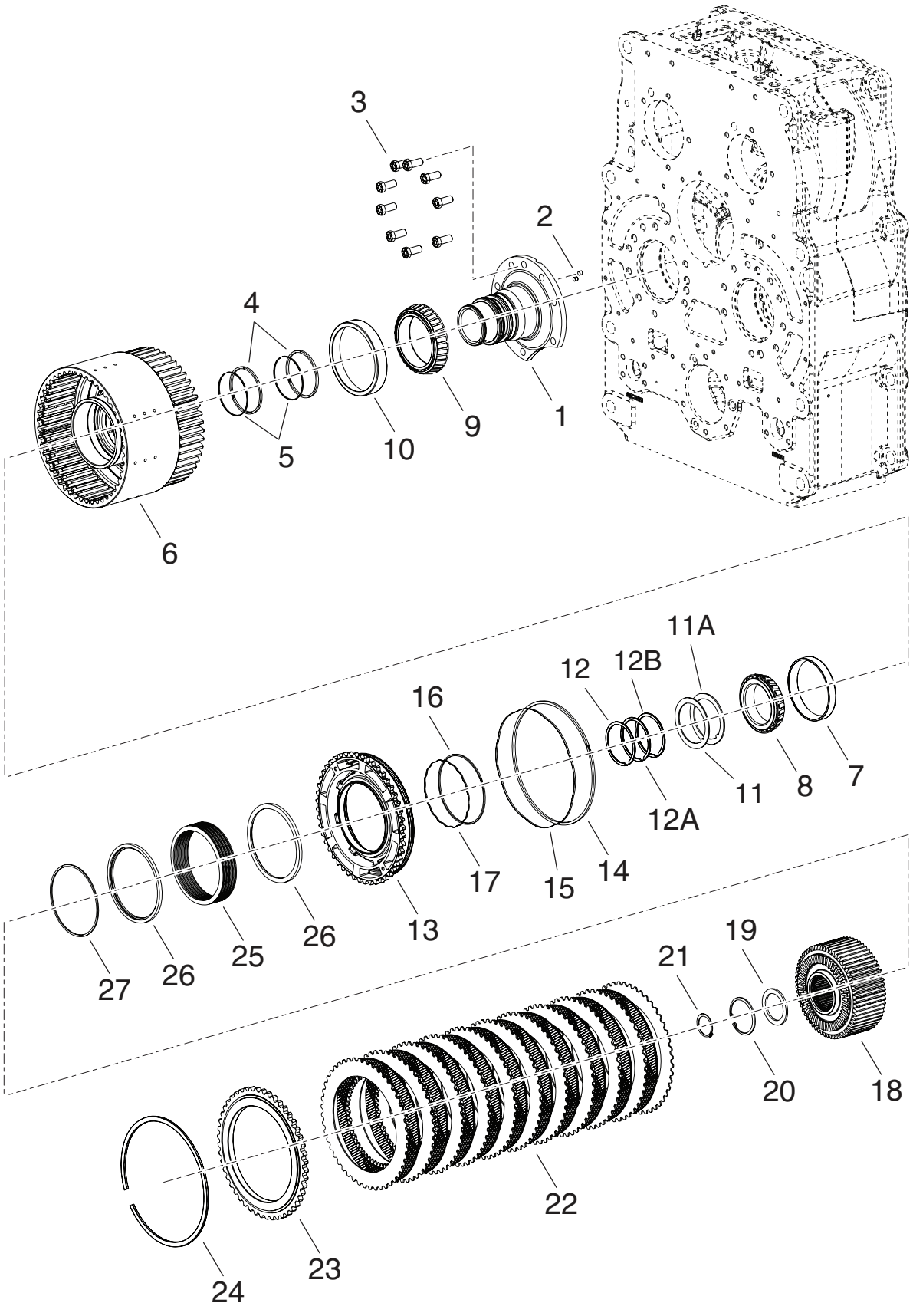
Item	Description	Qty
1	Assy clutch cover	1
2	Gasket-clutch cover	1
3	Screw-cover to case	23
4	Belleville washer	23
5	Capscrew-cover to case	77
6	Cover-clutch	1
7	Gasket-clutch cover	1
8	Plate-forward-reverse cover	1
9	Gasket- cover plate	1
10	Plate-3rd & 4th cover	2
11	Gasket-cover plate	2
12	Assy-oil sump frame & screen	1
13	Screw-screen assembly to case	4
14	Gasket-screen assembly to case	1
15	Assembly-oil sump including item 16 (washer)	1
16	Washer - part of item 15 (not sold seperately)	2
17	Magnet-sump	2
18	Gasket-oil sump	1
19	Screw-sump to case	22
20	Washer-plain	22
21	Plug-drain	2
22	Plug-oil level	2
23	Dipstick 33 11/16" long green 230609	1
24	Tube-dipstick 31 1/4" long 230604	1
25	Assembly-dipstick housing	1
26	Breather-air	1
27	Adaptor-air breather	1
28	Pipe-oil filler	1
29	Cap-filler	1
30	Plug-pipe	2
31	Plug-oil level	2
32	Dowel-pin	2

8000 GROUP-FORWARD & REVERSE CLUTCHES



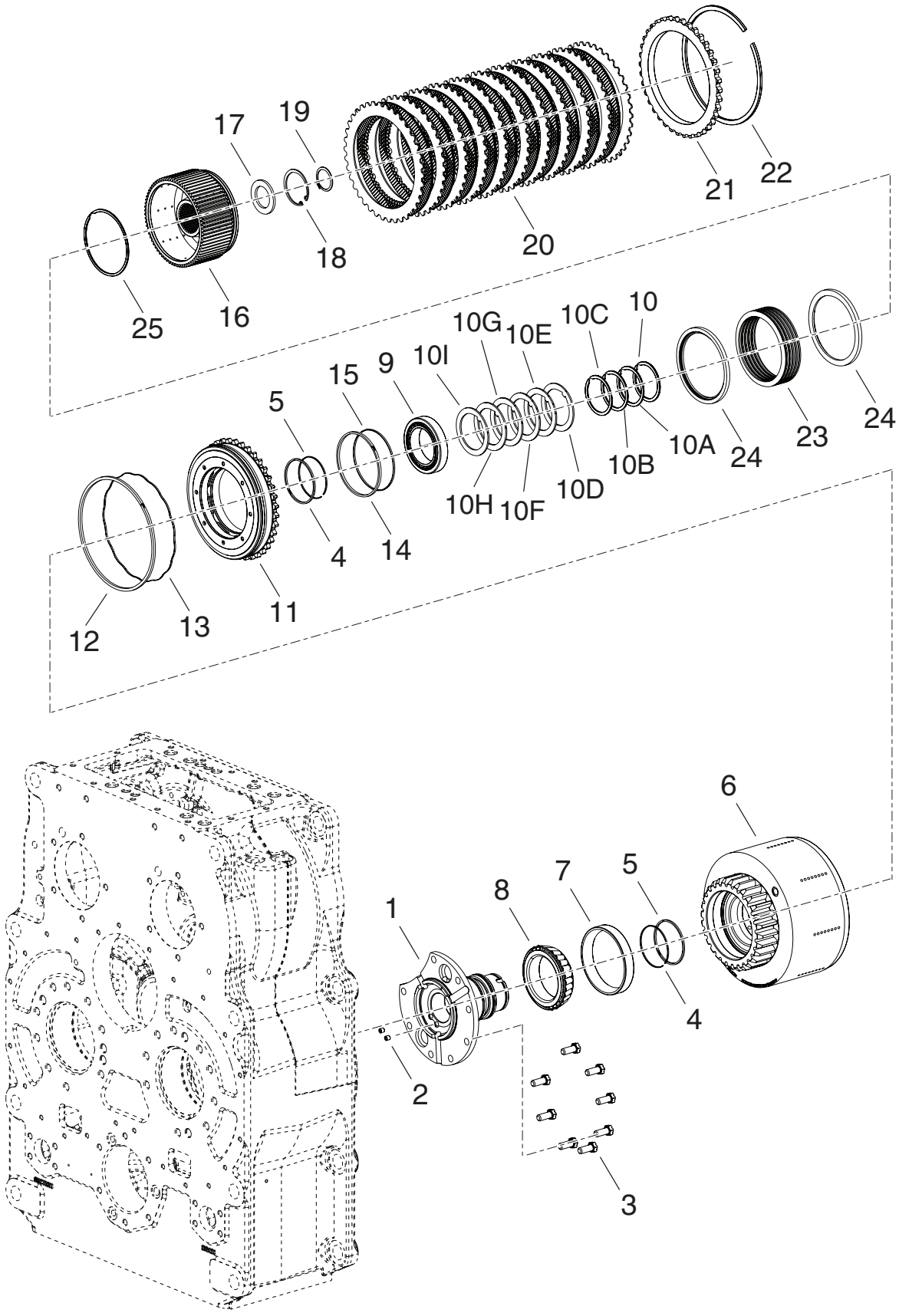
Item	Description	Qty
1	Clutch support assy 9.250 DIA.	1
2	Plug - part of item 1	2
3	Capscrew	8
4	Ring-piston	2
5	Expander-piston ring	2
6	E assy-gear, drum and bleed orifice	1
7	Cup-taper roller bearing	1
8	Cone-taper roller bearing	1
9	Bearing-taper roller assembly	1
10	Ring-snap .100-.101	A/R
10A	Ring-snap .095-.094	A/R
10B	Ring-snap .089-.088	A/R
10C	Ring-snap .113-.112	A/R
10D	Washer-keyed .124-.125	A/R
10E	Washer-keyed .122-.123	A/R
10F	Washer-keyed .120-.121	A/R
10G	Washer-keyed .114-.115	A/R
10H	Washer-keyed .116-.117	A/R
10I	Washer-keyed .118-.119	A/R
11	Piston-clutch	1
12	Ring-piston	1
13	Spring-piston ring expander	1
14	Ring-piston inner	1
15	Expander-piston ring inner	1
16	Hub-clutch	1
17	Washer-clutch hub	1
18	Snap ring	1
19	Ring-retaining external type	1
20	Assy-clutch pack shimmed	1
21	Plate-end	1
22	Ring-snap	1
23	Spring-belleville	1
23A	Spring-disc - part of item 23 (not sold seperately)	10
24	Washer-snap ring retainer	2
25	Ring-snap	1

8000 GROUP-1ST/2ND CLUTCH



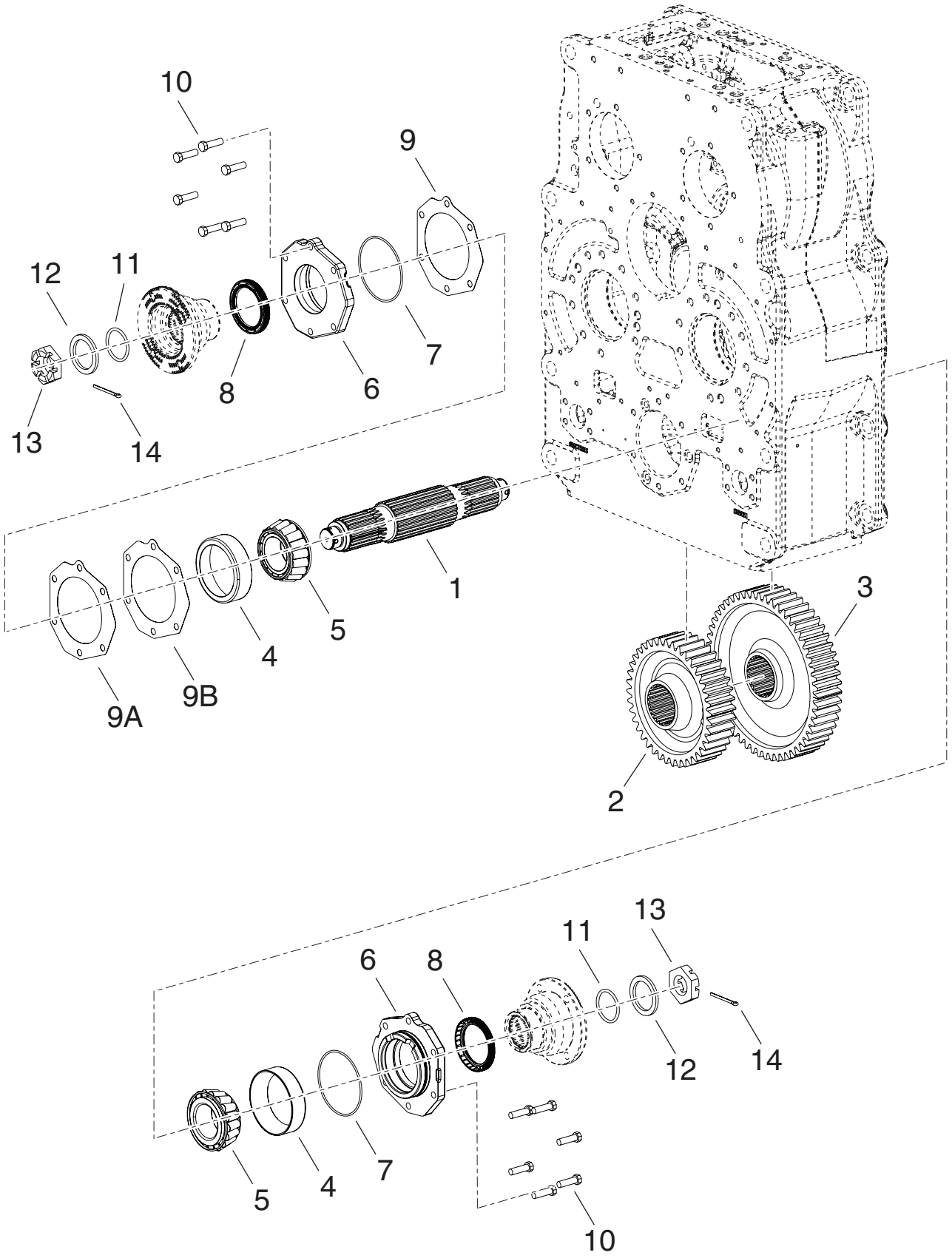
Item	Description	Qty
1	Clutch support and plug assy including item 2 (plug)	1
2	Plug - part of item 1	2
3	Capscrew	9
4	Expander-piston ring	2
5	Ring-piston	2
6	Assy-gear, drum & bleed orifice	1
7	Cup-taper roller bearing 42584	1
8	Cone-taper roller bearing 42375	1
9	Cone-taper roller bearing M224749	1
10	Cup-taper roller bearing M224710	1
11	Washer-keyed .122-.125	A/R
11A	Washer-keyed .099-.102	A/R
12	Ring-snap .122"	A/R
12A	Ring-snap .114"	A/R
12B	Ring-snap .105"	A/R
13	Piston-clutch	1
14	Ring-piston outer	1
15	Expander-piston ring outer	1
16	Ring-piston inner	1
17	Expander-piston ring inner	1
18	Hub-clutch 11.5 diameter	1
19	Washer-clutch hub	1
20	Snap ring-internal	1
21	Ring-snap	1
22	Assy-clutch pack shimmed	1
23	Plate-end	1
24	Ring-snap	1
25	Assy-spring disc including item 25A (disc-springs)	1
25A	Disc-spring - part of item 25 (not sold seperately)	10
26	Washer-snap ring retainer	2
27	Snapring-external	1

8000 GROUP-3RD & 4TH CLUTCH



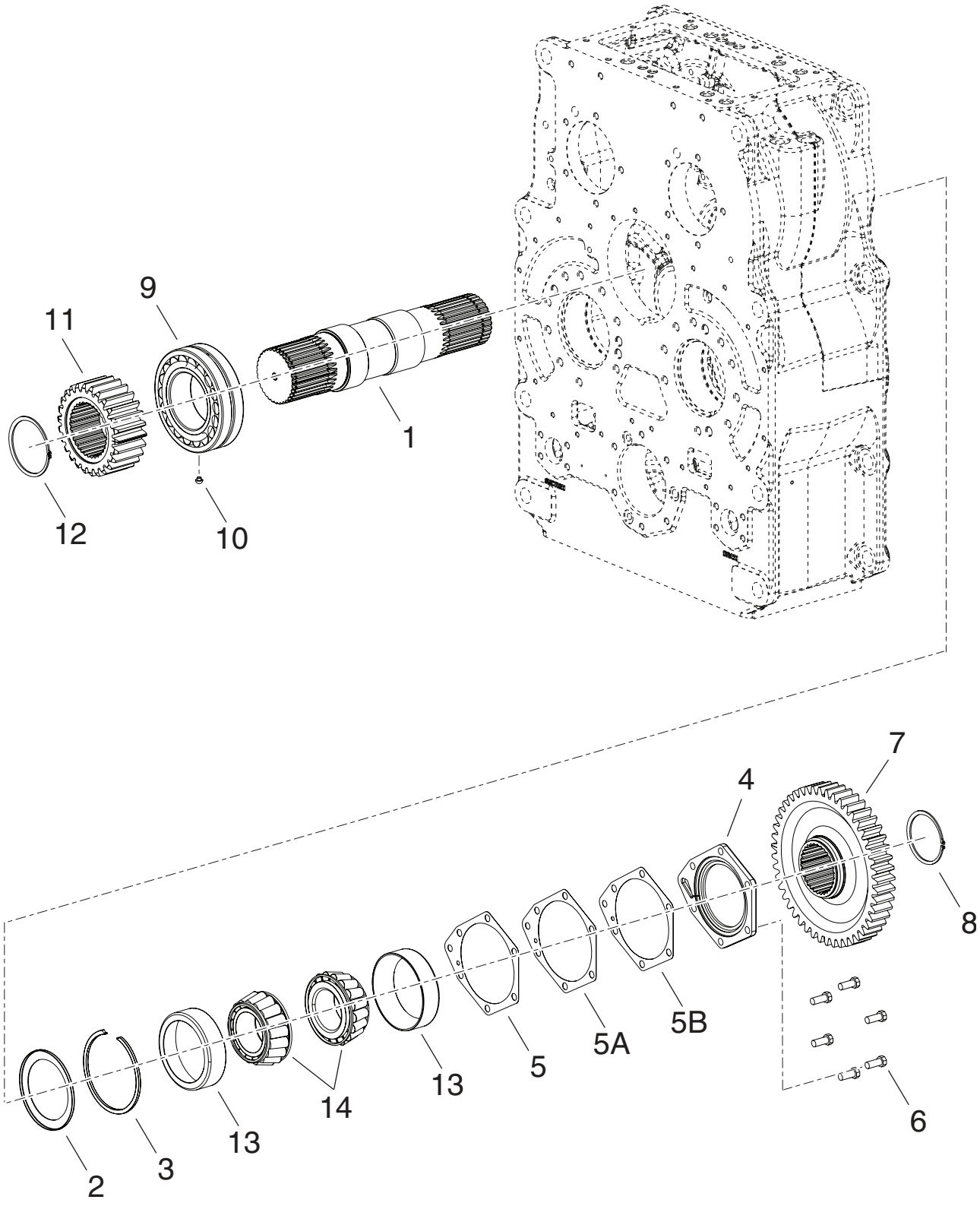
Item	Description	Qty
1	Clutch support assy 9.250 dia. including item 2 (plug)	1
2	Plug - part of item 1	2
3	Capscrew	8
4	Expander-piston ring	2
5	Ring-piston	2
6	Assy-gear, drum & bleed orifice	1
7	Cup-taper roller bearing	1
8	Cone-taper roller bearing	1
9	Bearing-taper roller assembly	1
10	Ring-snap .100-.101	A/R
10A	Ring-snap .095-.094	A/R
10B	Ring-snap .089-.088	A/R
10C	Ring-snap .113-.112	A/R
10D	Washer-keyed .124-.125	A/R
10E	Washer-keyed .122-.123	A/R
10F	Washer-keyed .120-.121	A/R
10G	Washer-keyed .114-.115	A/R
10H	Washer-keyed .116-.117	A/R
10I	Washer-keyed .118-.119	A/R
11	Piston-clutch	1
12	Ring-piston	1
13	Spring-piston ring expander	1
14	Ring-piston inner	1
15	Expander-piston ring inner	1
16	Hub-clutch	1
17	Washer-clutch hub	1
18	Snap ring	1
19	Ring-retaining external type	1
20	Assy-clutch pack shimmed	1
21	Plate-end	1
22	Ring-snap	1
23	Spring-belleville including item 23A(spring-disc's)	1
23A	Spring-disc - part of item 23 (not sold seperately)	10
24	Washer-snap ring retainer	2
25	Ring-snap	1

8000 GROUP-OUTPUT SHAFT



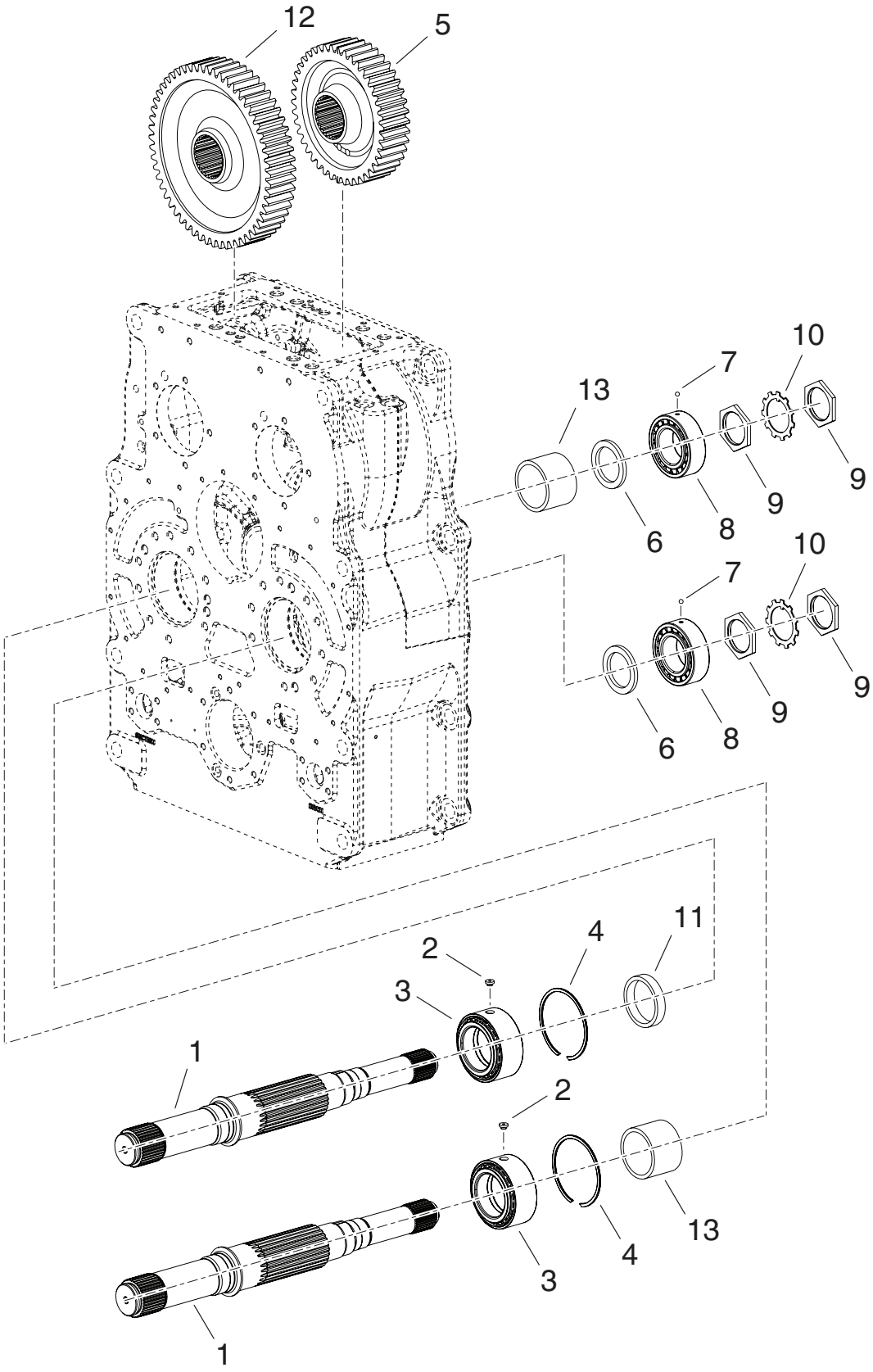
Item	Description	Qty
1	Shaft-output	1
2	Gear-output 40t	1
3	Gear-output 54t	1
4	Cup-inner pinion bearing	2
5	Bearing-conical	2
6	Cap-output shaft bearing	2
7	O-ring	2
8	Seal-oil	2
9	Shim .004	A/R
9A	Shim .007	A/R
9B	Shim .010	A/R
10	Capscrew	12
11	O-ring	2
12	Washer-input flange nut	2
13	Nut	2
14	Cotter pin	2

8000 GROUP-IDLER SHAFT



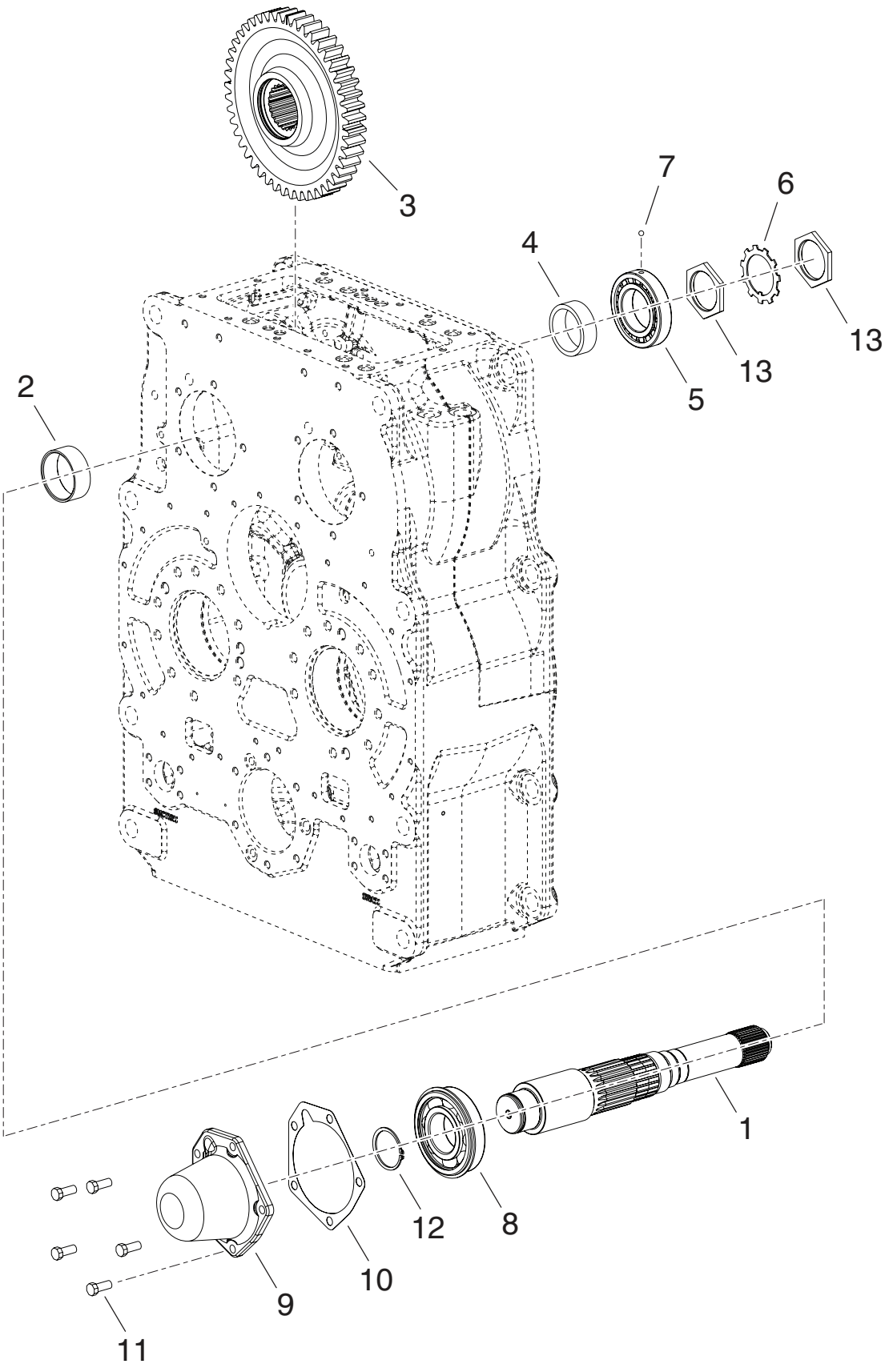
Item	Description	Qty
1	Shaft-idler	1
2	Idler shaft oil shield	1
3	Internal snap ring	1
4	Idler shaft bearing cap	1
5	Shim-bearing cap	A/R
5A	Shim	A/R
5B	Shim	A/R
6	Capscrew	6
7	Gear-47T	1
8	Snap rings	1
9	Spherical roller bearing	1
10	Pin	1
11	Gear-idler shaft 26T	1
12	Snap rings	1
13	Taper roller bearing cup	2
14	Taper roller bearing cone	2

8000 GROUP-1ST/3RD & 2ND/4TH SHAFT



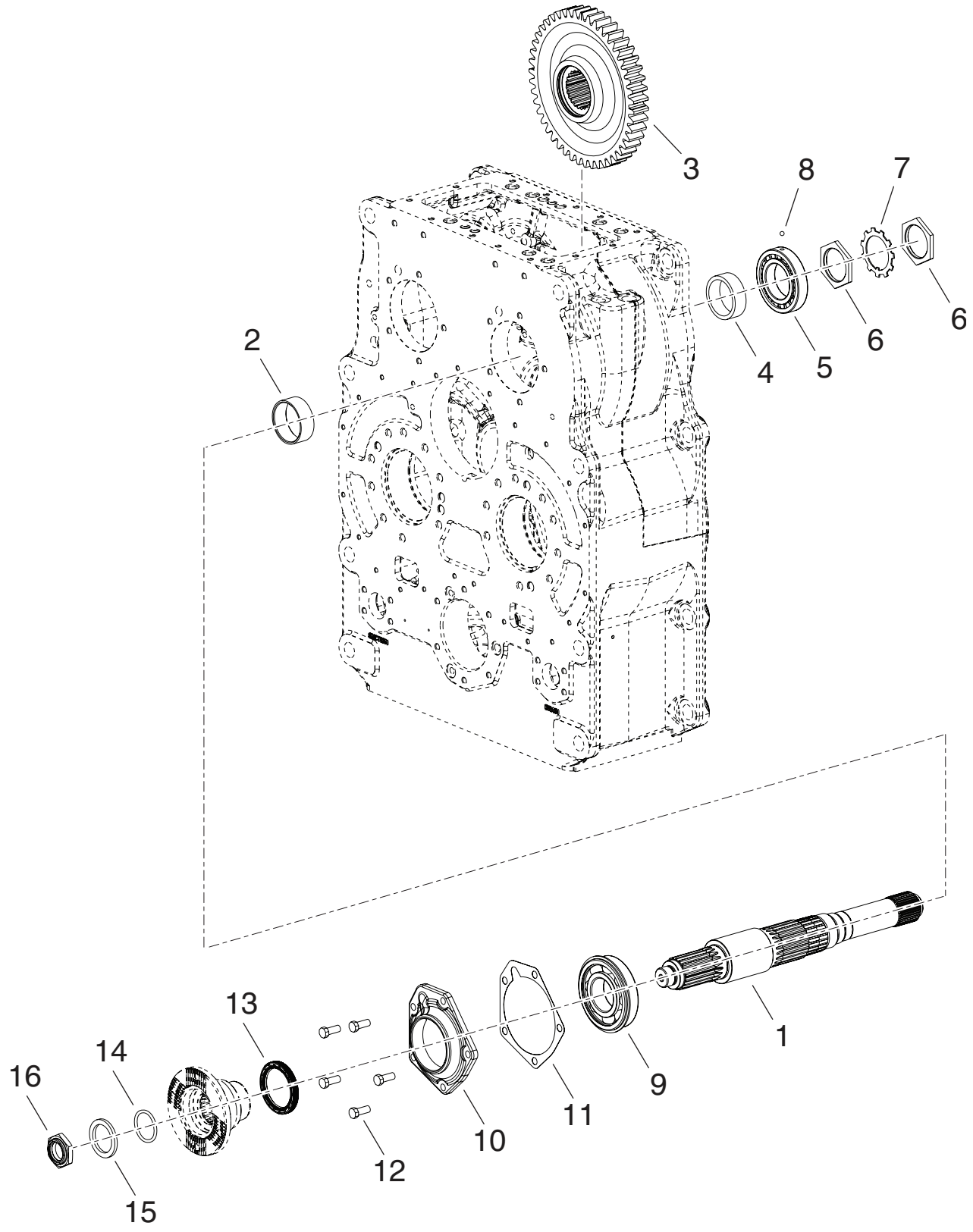
Item	Description	Qty
1	Shaft-1st/3rd and 2nd/4th	2
2	Bearing cup pin 1-3 and 2-4 shaft	2
3	Double taper roller bearing	2
4	Snap ring	2
5	1st and 3rd gear	1
6	Gear spacer	2
7	Ball	2
8	Cylindrical roller bearing	2
9	Nut-bearing adjusting	4
10	Housing tube nut lock	2
11	2nd and 4th shaft spacer	1
12	Output gear 56T	1
13	Spacer	2

8000 GROUP-REVERSE SHAFT



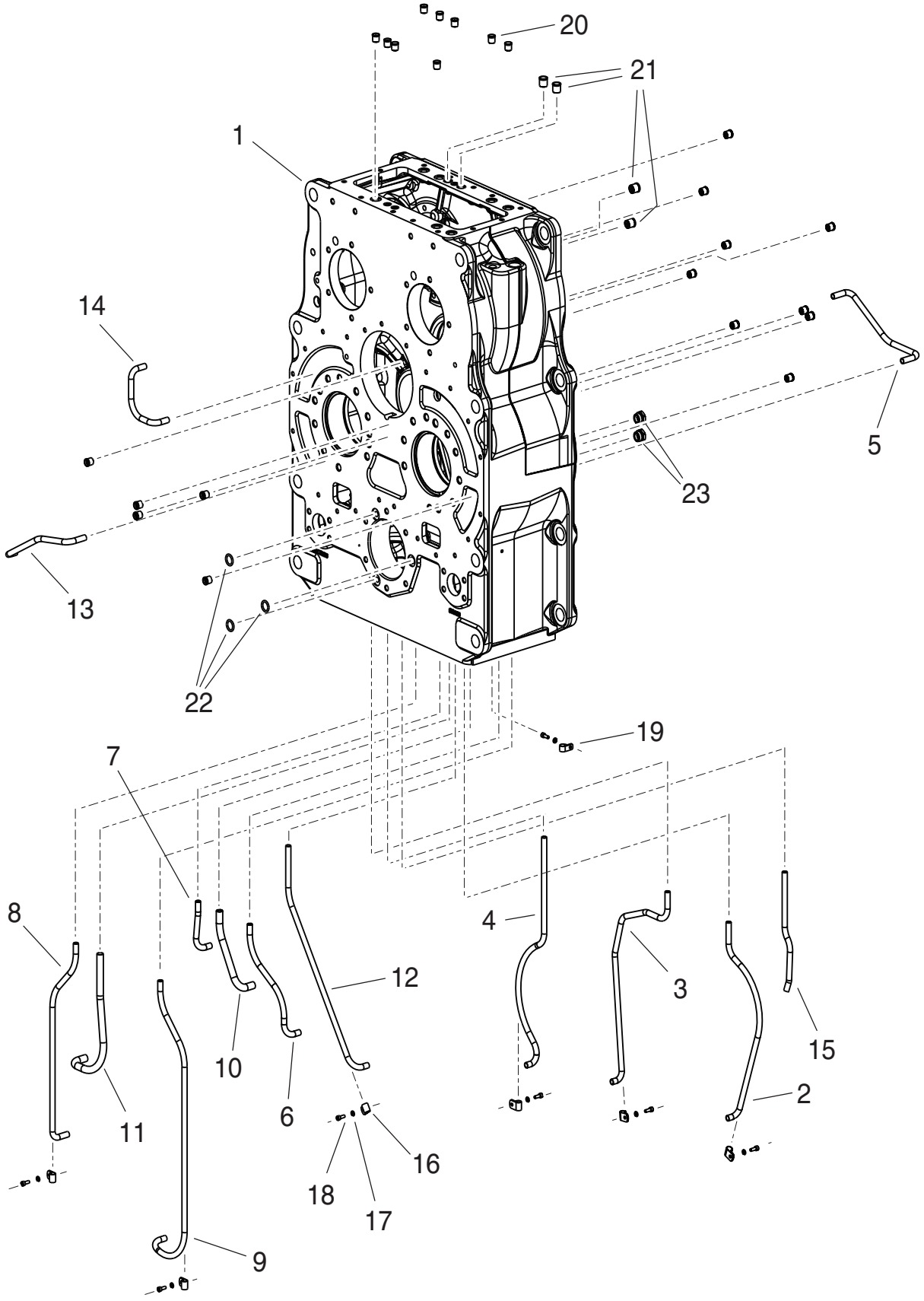
Item	Description	Qty
1	Shaft-forward/reverse	1
2	Gear spacer (input shaft)	1
3	Input gear 47t	1
4	Input and rev. shaft spacer	1
5	Bearing-roller	1
6	Housing tube nut lock	1
7	Ball	1
8	Ball bearing	1
9	Cap-bearing	1
10	Gasket-bearing cap	1
11	Capscrew	5
12	Snap ring-external	1
13	Nut-bearing adjusting	2

8000 GROUP-FORWARD/REVERSE SHAFT



Item	Description	Qty
1	Shaft-forward/reverse	1
2	Gear spacer (input shaft)	1
3	Input gear 47T	1
4	Input and rev. shaft spacer	1
5	Bearing-roller	1
6	Nut-bearing adjusting	2
7	Housing tube nut lock	1
8	Ball	1
9	Ball bearing met flens	1
10	Input brg. cap.	1
11	Bearing cap gasket	1
12	Capscrew	5
13	Oil seal	1
14	O ring	1
15	Washer	1
16	Nut-idler shaft	1

8000 ASSY-TRANSMISSION CASE

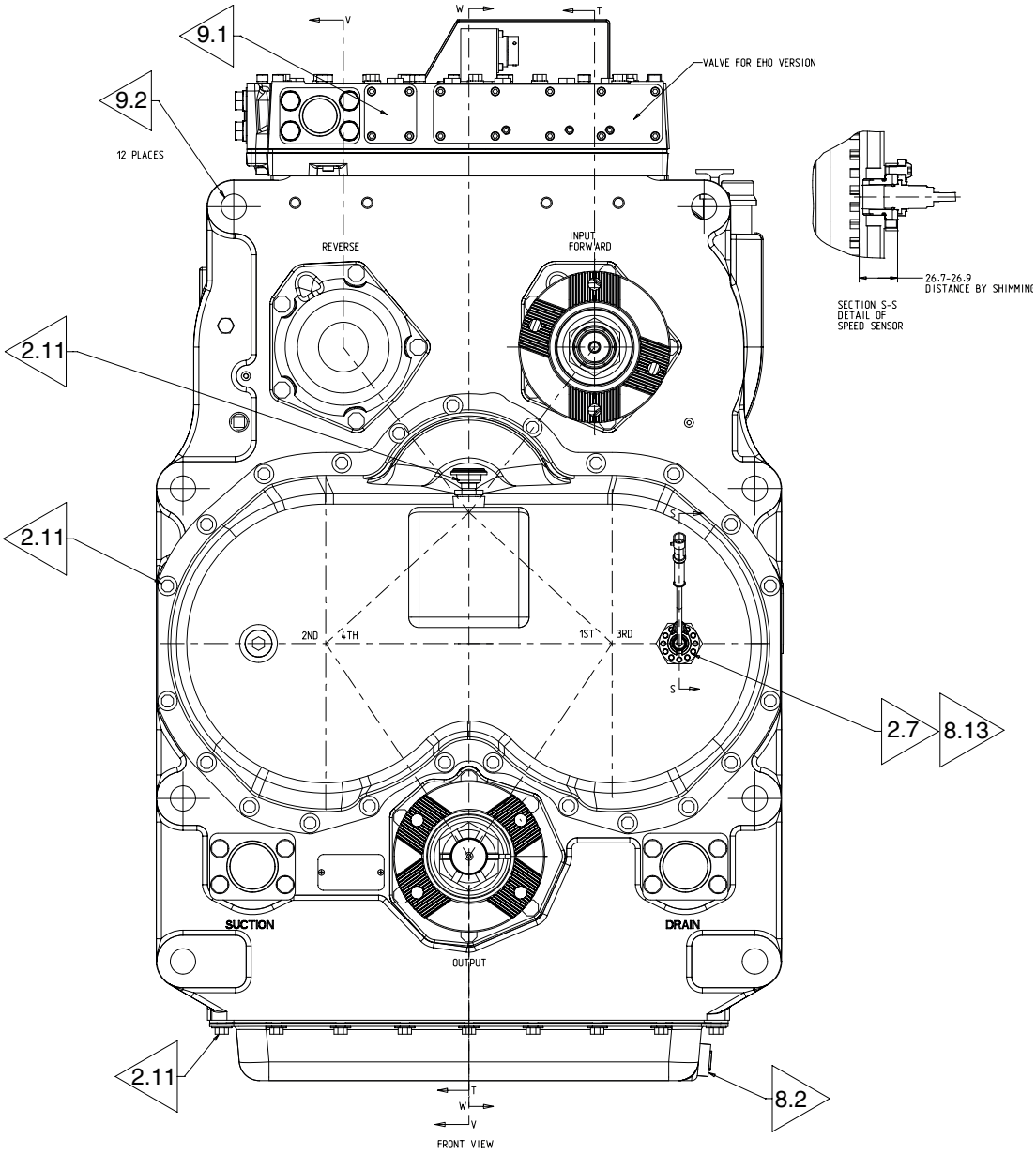


Item	Description	Qty
1	Transmission case 4 speed	1
2	Tube-1st clutch pressure	1
3	Tube-2nd clutch pressure	1
4	Tube-2nd clutch lube	1
5	Tube-2nd to 1st lube	1
6	Tube-fwd clutch pressure	1
7	Tube-rev. clutch pressure	1
8	Tube-4th clutch pressure	1
9	Tube-3rd clutch pressure	1
10	Tube-input lube	1
11	Tube-reverse lube	1
12	Tube-3rd lube	1
13	Tube-3rd to 4th lube	1
14	Tube-reverse to idler lube	1
15	Tube-idler lube with orfice	1
16	Clip	7
17	Lockwasher	7
18	Capscrew	7
20	Sleeve-pressure & lube tube	23
21	Sleeve-tube	4

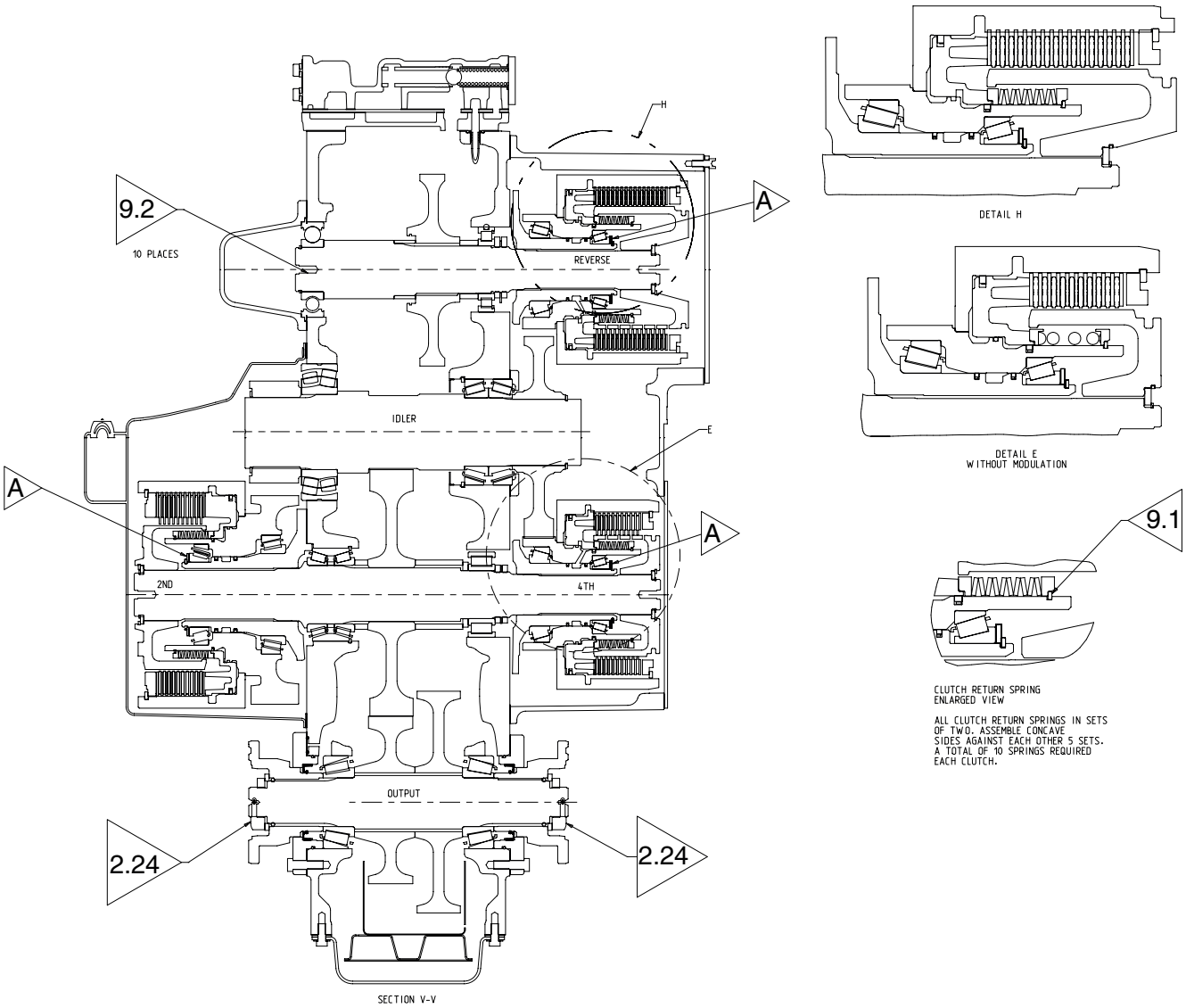
CONTROL VALVE

8000 4 SPEED GENERAL ASSEMBLY INSTRUCTION

- Tightening management process as per GQP-017 torque tolerances as per GQP-017 class II except on partnumber table
- For detailed assembly instruction: see sharepoint: engineering-standardsassembly insrtuctions for exploded view of assembly valvessee group and valve assembly
- All clutch packages are shimmed as per seperate detailed drawings [see bill of material]
- Optional positions (input,speed sensor ,output) as per drawings 242392



2.7	Torque to 61–68 Nm (45-50 lbs-ft)
2.11	Torque to 34-41 Nm (25-30 lbs-ft)
8.2	Apply Loctite 577, when threads are without coating
8.13	Apply Loctite 638
9.1	WARNING: HEAVY SPRING LOAD! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies



A	CLUTCH TAPER BEARING ADJUSTMENT

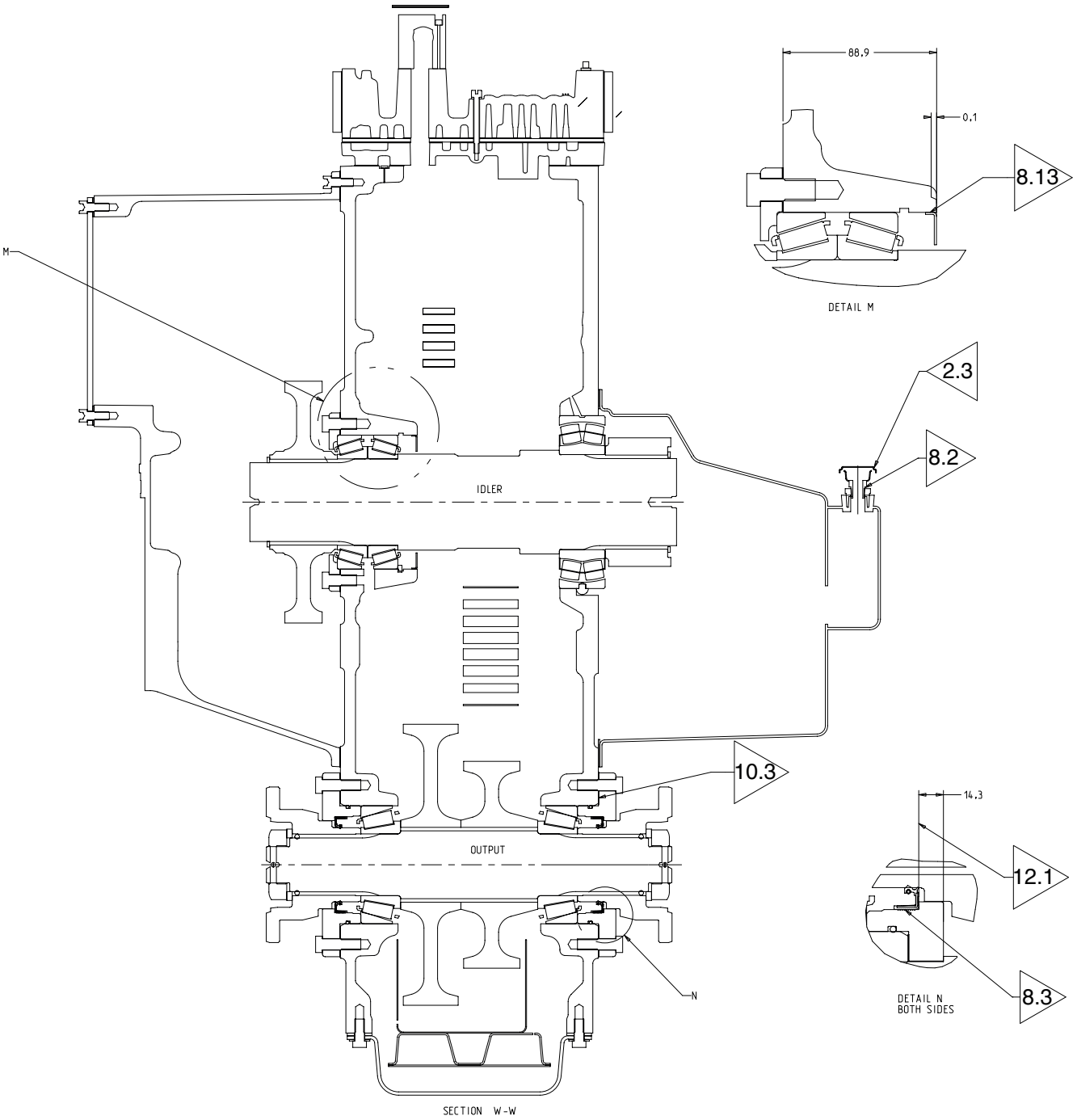
Adjust taper bearings as a bench sub-assembly with the clutch support in a vertical orientation and the clutch drum up using the following procedure:

1 - Use the thickest washer and snap ring to start procedure one notch in washer and one notch in snap ring. Position washer on clutch support aligning tang on washer with notch in support.

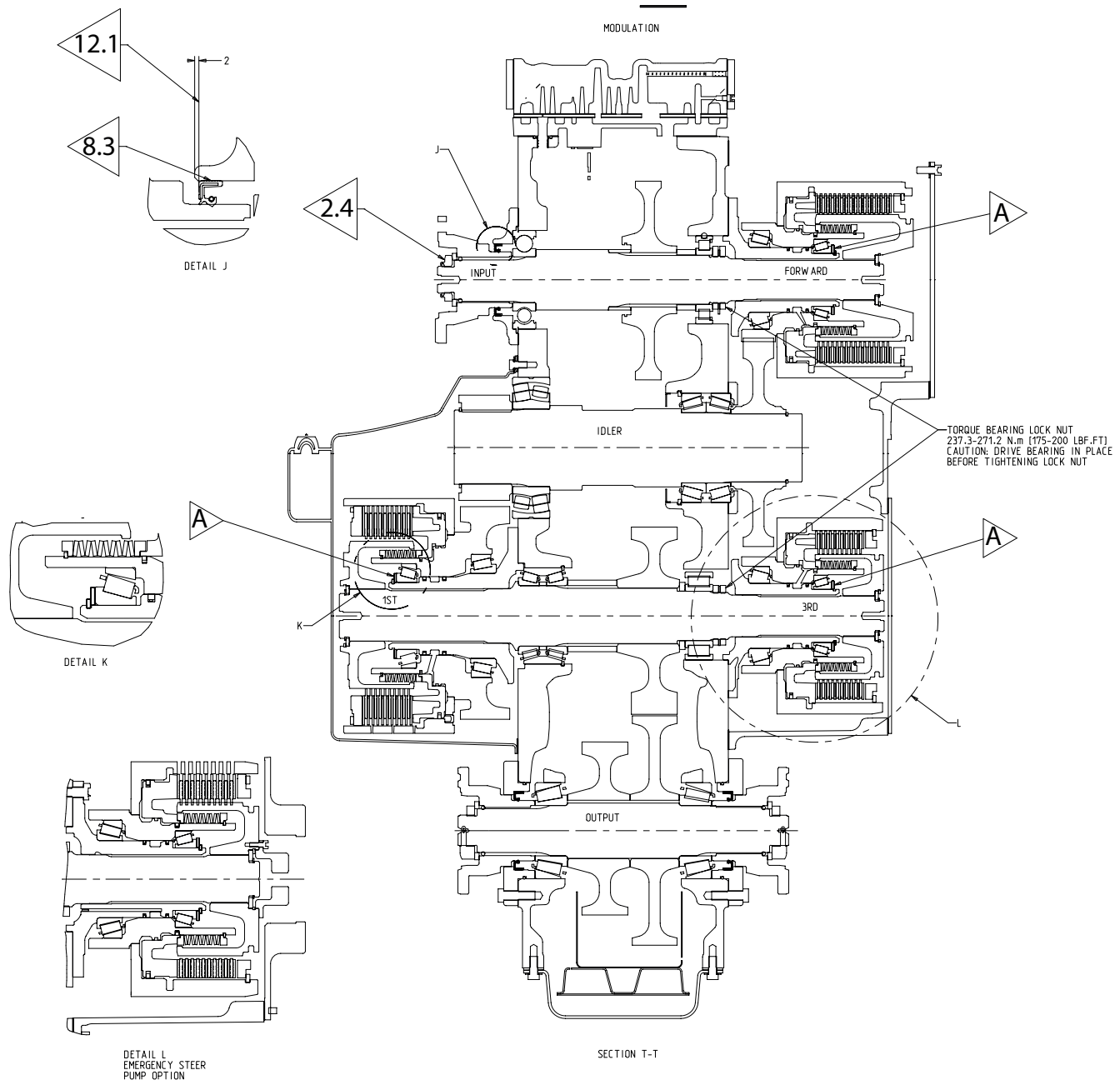
2 - Check snap ring in snap ring groove. If ring will not go in groove, remove washer and install a two notch washer and again use the one notch snap ring. If ring still does not go in snap ring groove, remove washer and install a three notch washer and again use the one notch snap ring.

3 - If the one notch snap ring still not seat properly in the ring groove, repeat step 2 using the two notch snap ring and start with the one notch washer (thickest). When the ring fit in the ring groove check the clutch to support the clutch endplay. Endplay can be 0,0000 (line to line) to a maximum of 0,05 mm (0.002") loose (endplay). After selection of proper snap ring and tanged washer,do not intermix parts prior to re-assembly on transmission.

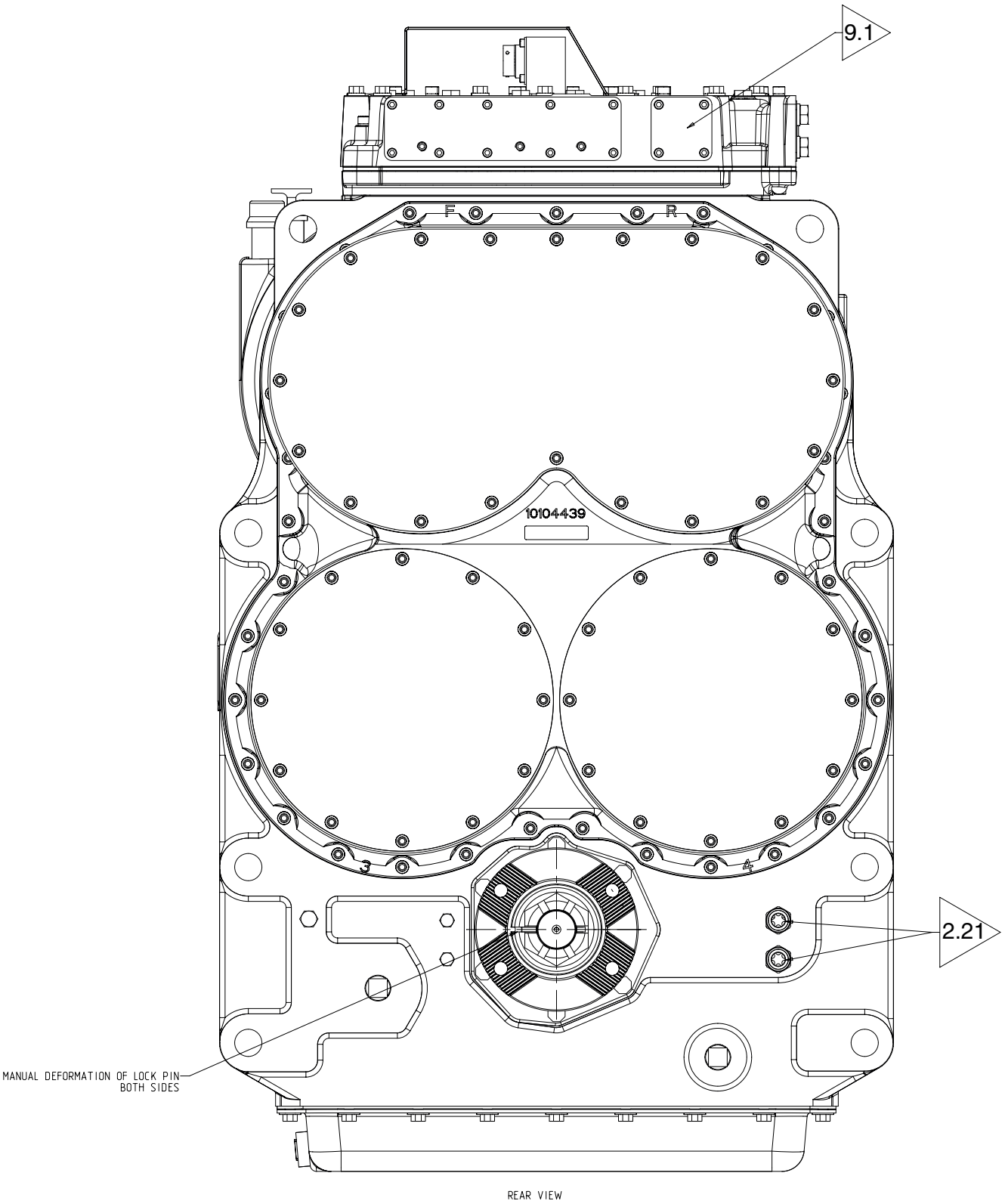
2.24	Valve Assembly: -identify of each valve assembly with part number (etch, ink stamp or label). -each assembly or reassembly must be tested or retested according to the tp-drawings. -assembled valve ready for shipment, must be covered with rust-preventative
9.1	WARNING: HEAVY SPRING LOAD ! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies



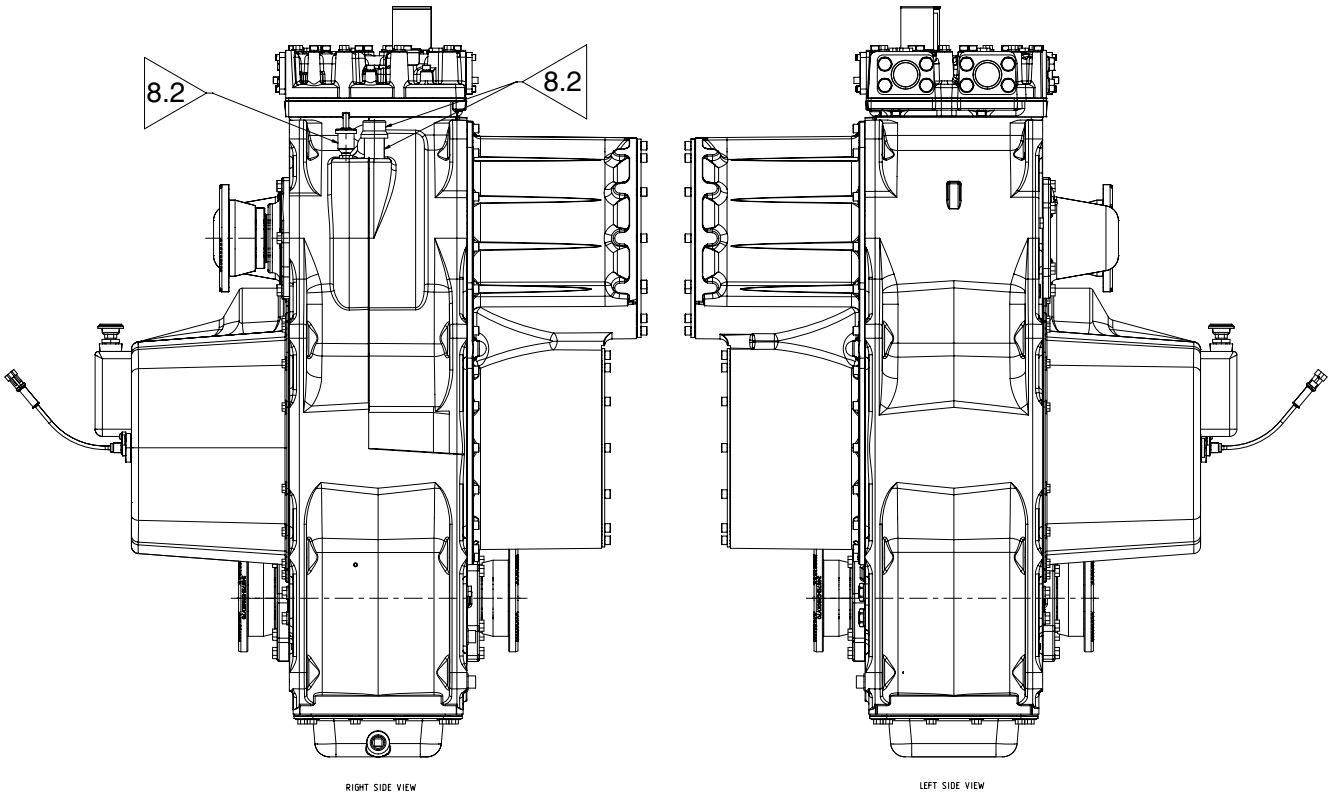
2.3	Torque to 14 - 20 Nm (10-15 lbs-ft).
8.2	Apply Loctite 577, when threads are without coating
8.3	Apply Loctite 641 to the O.D. of the seals, when seals are without rubber O.D, and add some grease on the lip seal
8.13	Apply Loctite 638
10.3	Shim bearings to produce 0.68 – 0.90 Nm (6-8 lbs-inch) preload
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.



A	CLUTCH TAPER BEARING ADJUSTMENT
2.4	Torque to 339 - 407 Nm (250-300 lbs-ft).
8.3	Apply Loctite 641 to the O.D. of the seals, when seals are without rubber O.D, and add some grease on the lip seal
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.



2.21	Torque to 27-34Nm (20-25 lbs-ft)
9.1	WARNING: HEAVY SPRING LOAD !!!!! Use the correct tools to assemble and disassemble this item



8.2	Apply Loctite 577, when threads are without coating

8000 8 SPEED GENERAL ASSEMBLY INSTRUCTION

- Tightening management process as per GQP-017 torque tolerances as per GQP-017 class II except on partnumber table
- For detailed assembly instruction: see sharepoint: engineering-standardsassembly insrtuctions for exploded view of assembly valvessee group and valve assembly
- All clutch packages are shimmed as per seperate detailed drawings [see bill of material]
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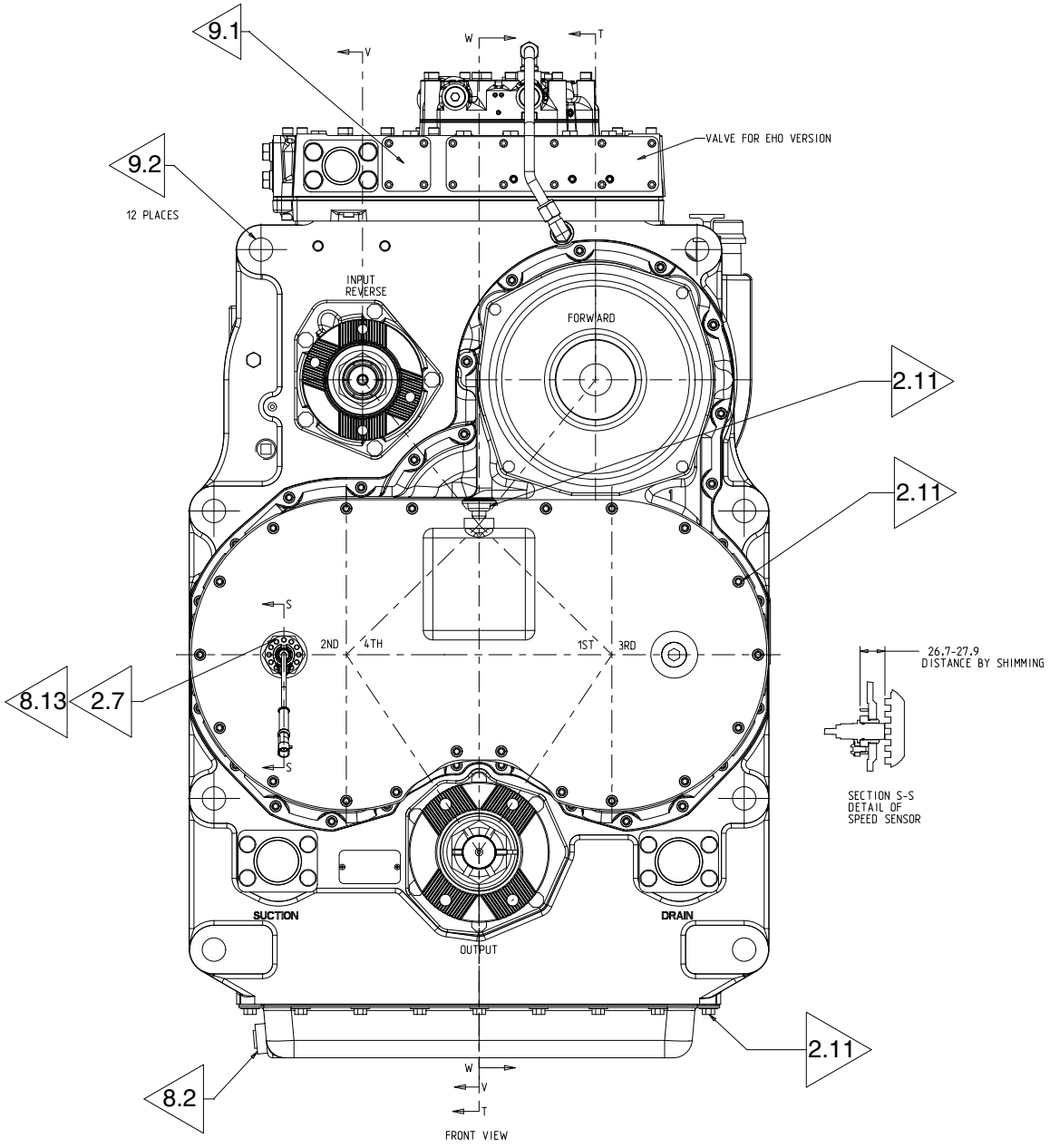
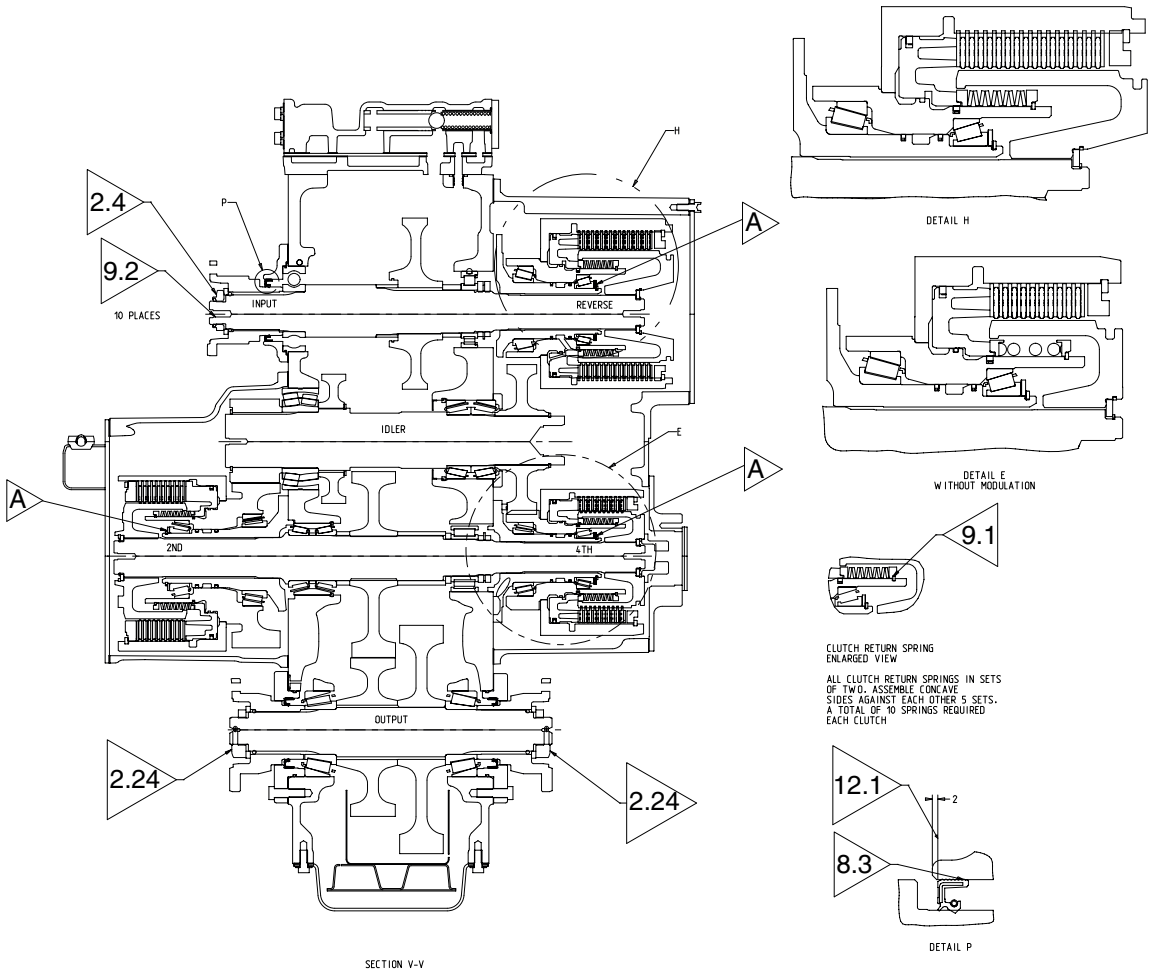


2.7	Torque to 61–68 Nm (45-50 lbs-ft)
2.11	Torque to 34-41 Nm (25-30 lbs-ft)
8.2	Apply Loctite 577, when threads are without coating
8.13	Apply Loctite 638
9.1	WARNING: HEAVY SPRING LOAD! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies



A	CLUTCH TAPER BEARING ADJUSTMENT

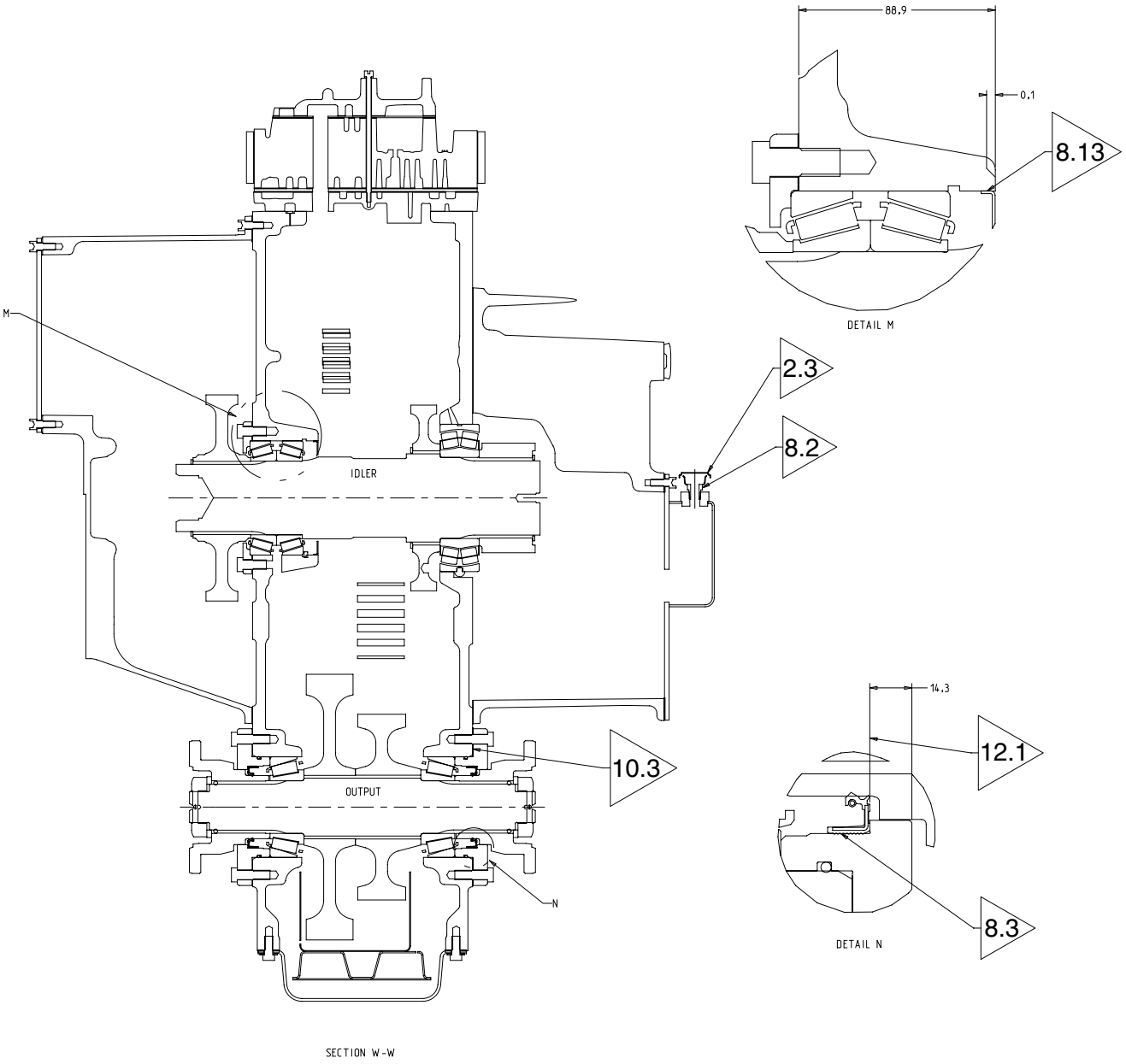
Adjust taper bearings as a bench sub-assembly with the clutch support in a vertical orientation and the clutch drum up using the following procedure:

1 - Use the thickest washer and snap ring to start procedure one notch in washer and one notch in snap ring. Position washer on clutch support aligning tang on washer with notch in support.

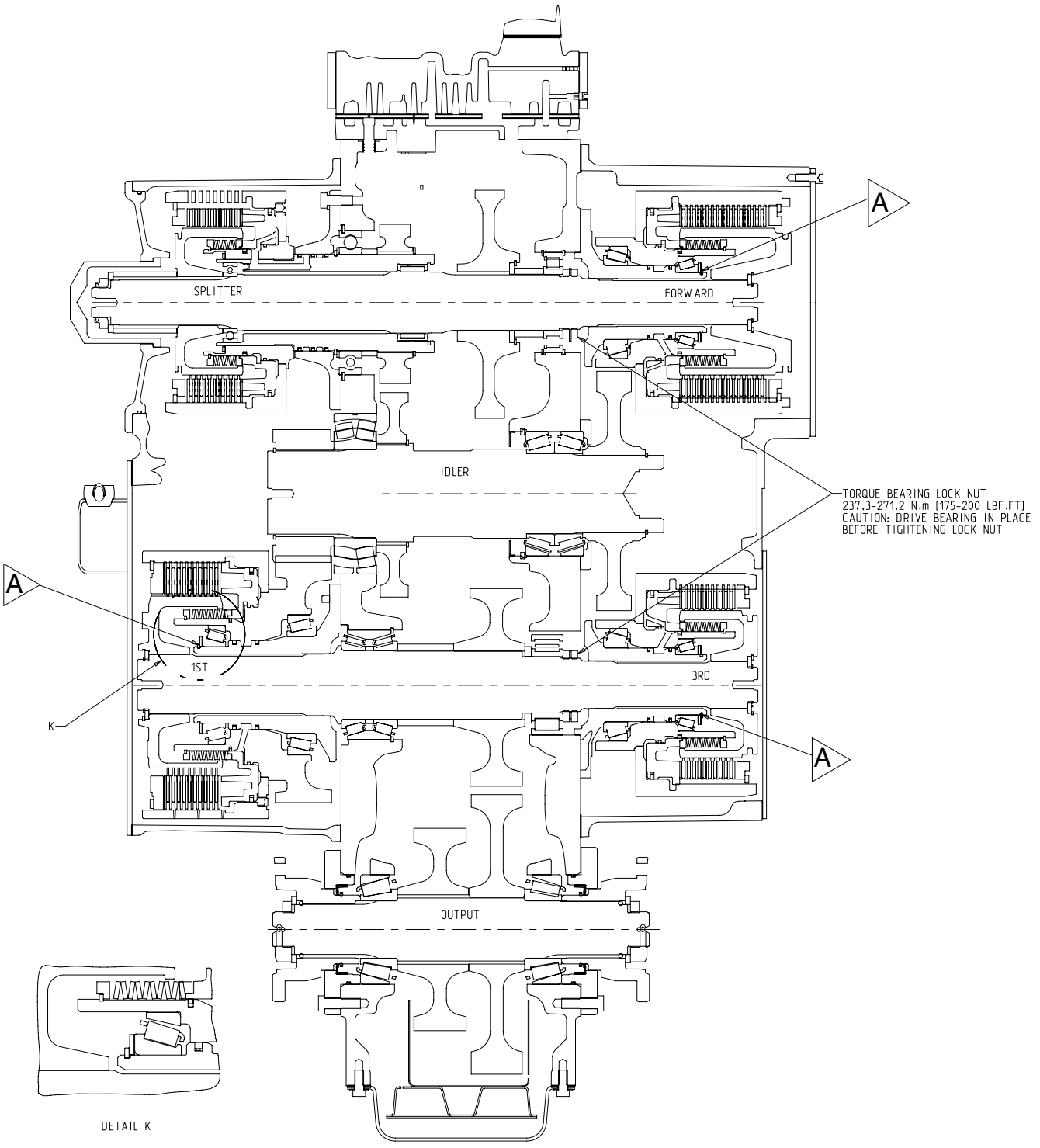
2 - Check snap ring in snap ring groove. If ring will not go in groove, remove washer and install a two notch washer and again use the one notch snap ring. If ring still does not go in snap ring groove, remove washer and install a three notch washer and again use the one notch snap ring.

3 - If the one notch snap ring still not seat properly in the ring groove, repeat step 2 using the two notch snap ring and start with the one notch washer (thickest). When the ring fit in the ring groove check the clutch to support the clutch endplay. Endplay can be 0,0000 (line to line) to a maximum of 0,05 mm (0.002") loose (endplay). After selection of proper snap ring and tanged washer, do not intermix parts prior to re-assembly on transmission.

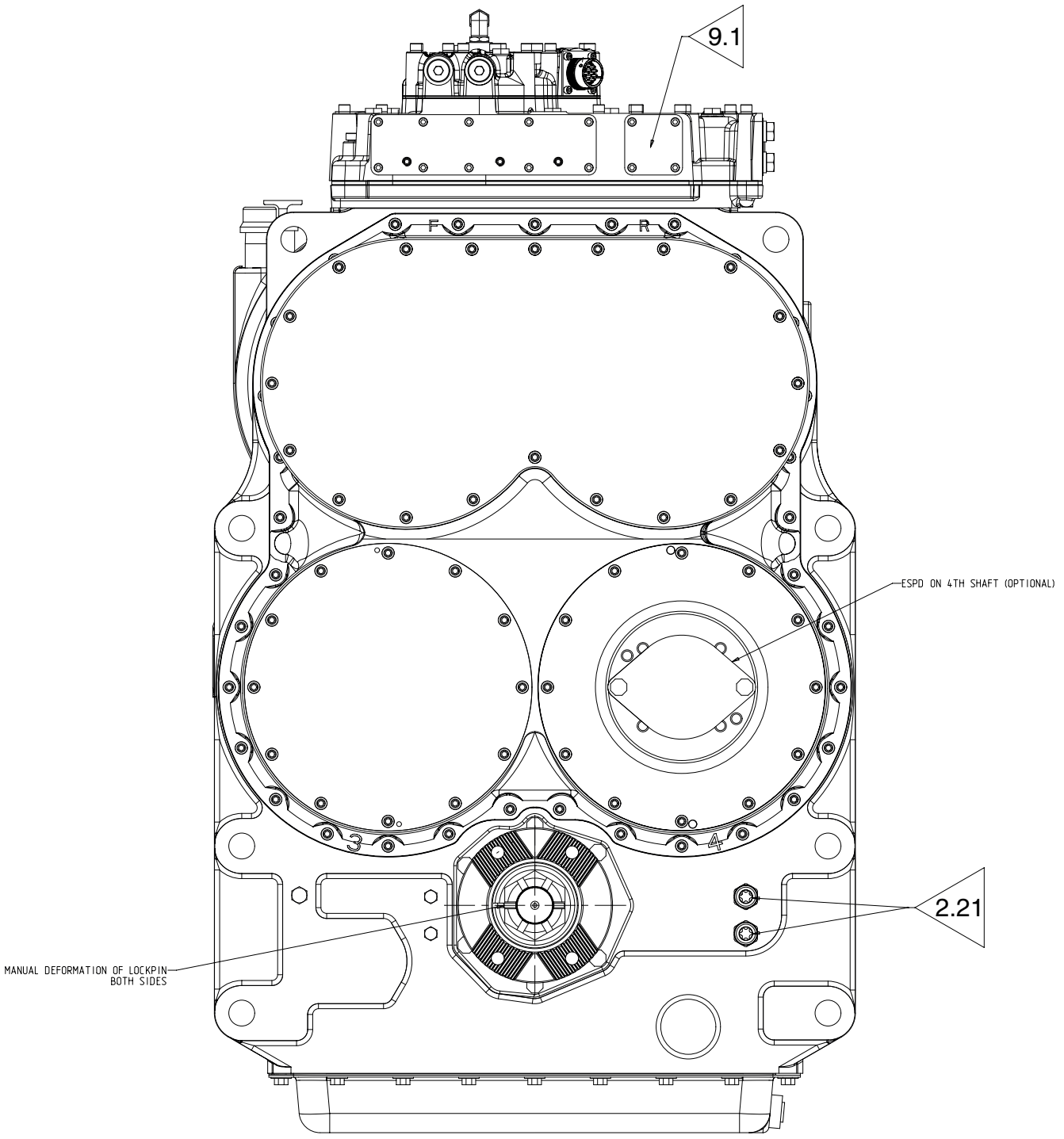
2.4	Torque to 339 - 407 Nm (250-300 lbs-ft).
2.24	Valve Assembly: -identify of each valve assembly with part number (etch, ink stamp or label). -each assembly or reassembly must be tested or retested according to the tp-drawings. -assembled valve ready for shipment, must be covered with rust-preventative
8.3	Apply Loctite 641 to the O.D. of the seals, when seals are without rubber O.D, and add some grease on the lip seal
9.1	WARNING: HEAVY SPRING LOAD! Use the correct tools to assemble and disassemble this item
9.2	Only use the specified lifting locations to lift the transmission or subassemblies
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.



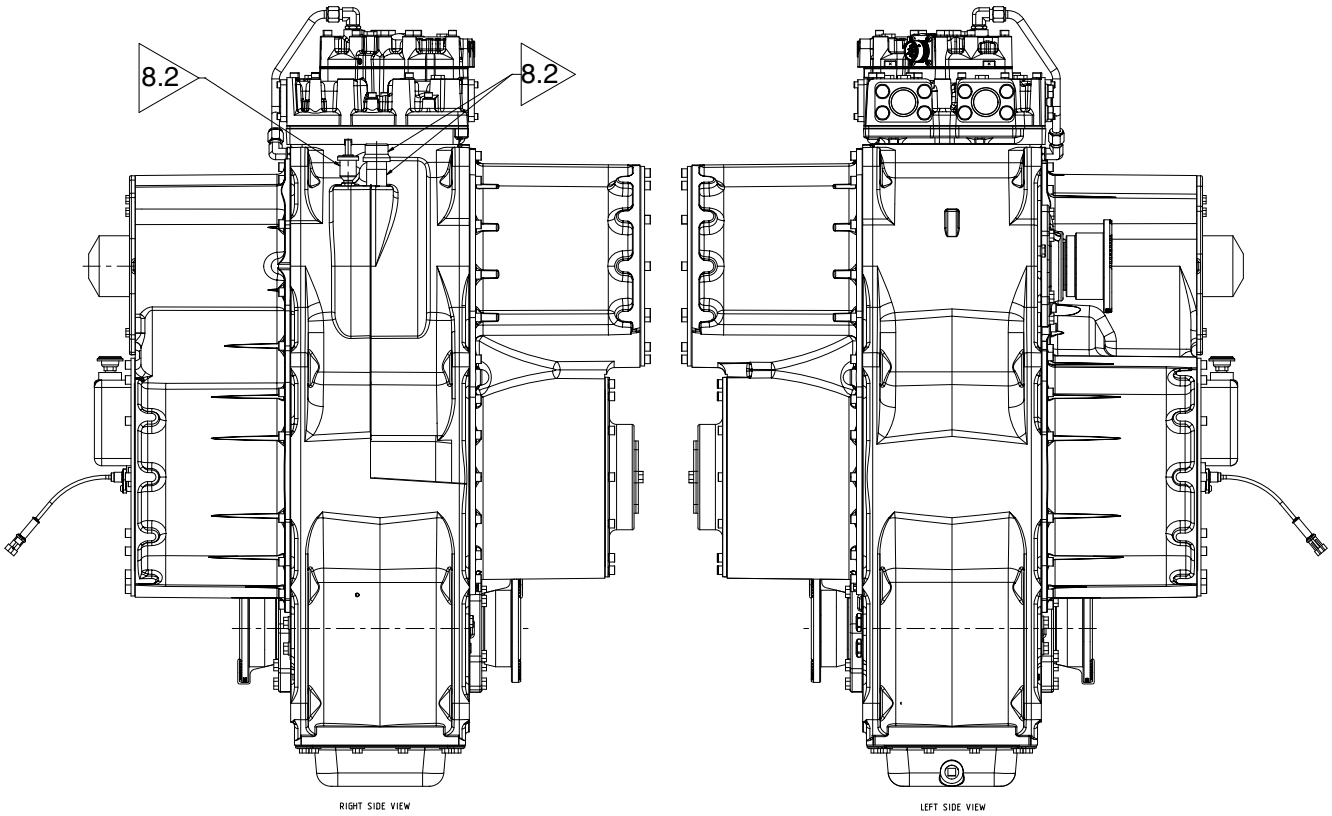
2.3	Torque to 14 - 20 Nm (10-15 lbs-ft).
8.2	Apply Loctite 577, when threads are without coating
8.3	Apply Loctite 641 to the O.D. of the seals, when seals are without rubber O.D, and add some grease on the lip seal
8.13	Apply Loctite 638
10.3	Shim bearings to produce 0.68 – 0.90 Nm (6-8 lbs-inch) preload
12.1	Seals must be pressed in perpendicularly on shaft axis from this side.



A	CLUTCH TAPER BEARING ADJUSTMENT

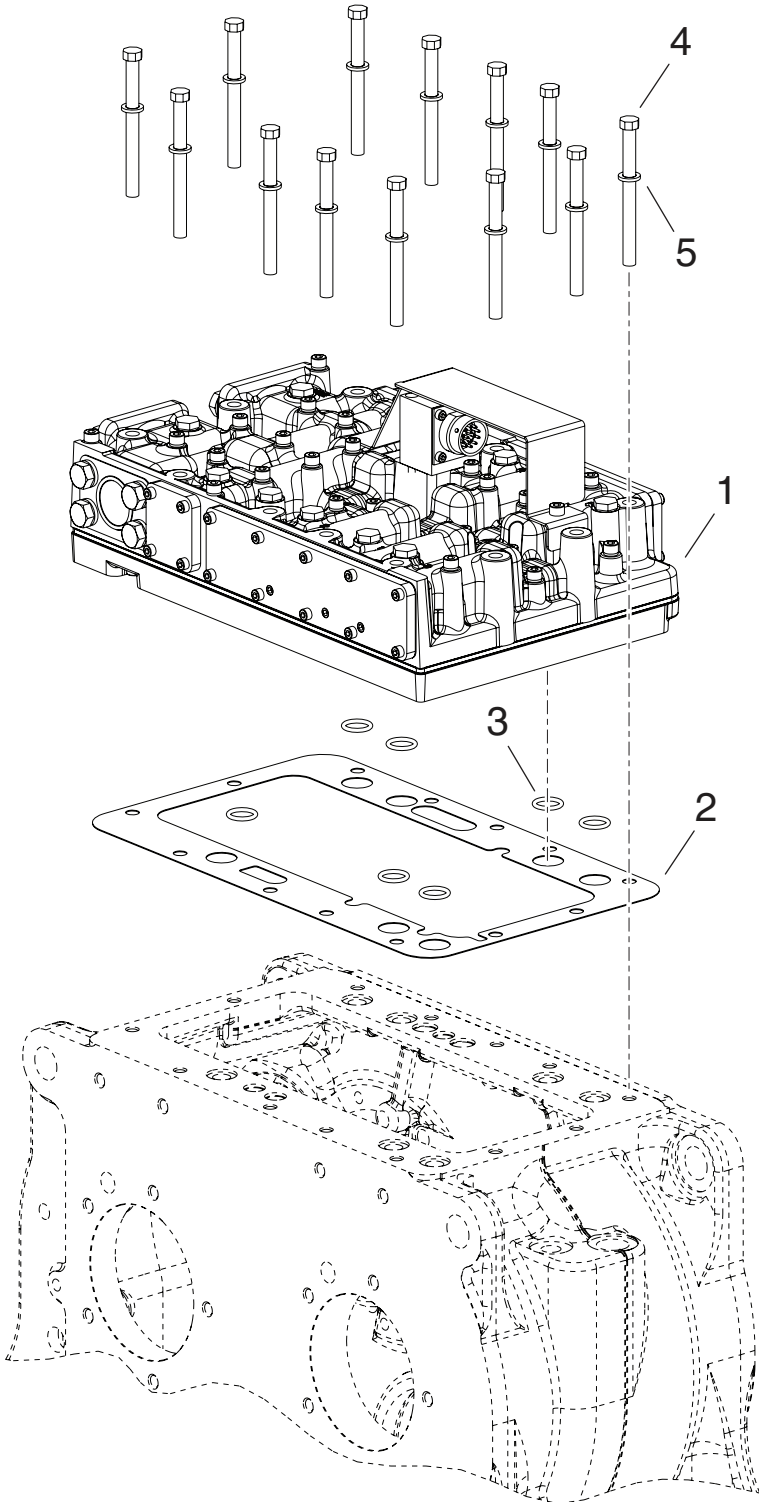


2.21	Torque to 27-34Nm (20-25 lbs-ft)
9.1	WARNING: HEAVY SPRING LOAD! Use the correct tools to assemble and disassemble this item



8.2	Apply Loctite 577, when threads are without coating

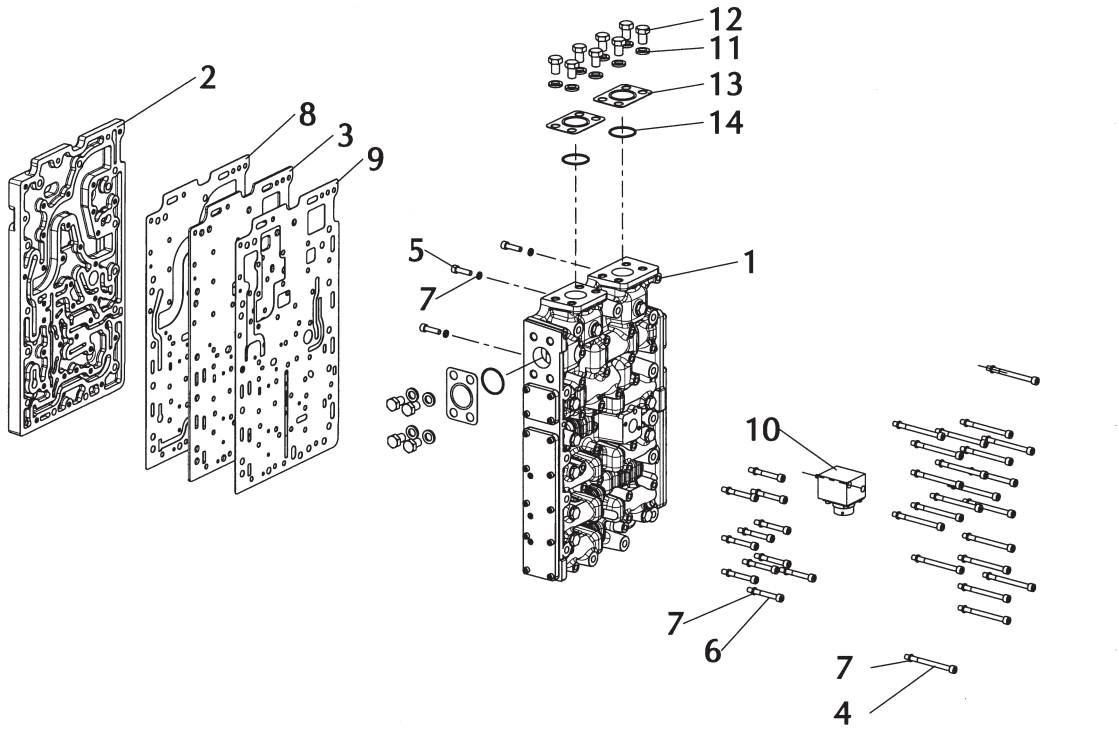
8000 GROUP-CONTROL VALVE EHO



Item	Description	Qty
1	Assy-control valve eho	1
2	Gasket control valve to trans case	1
3	O ring	7

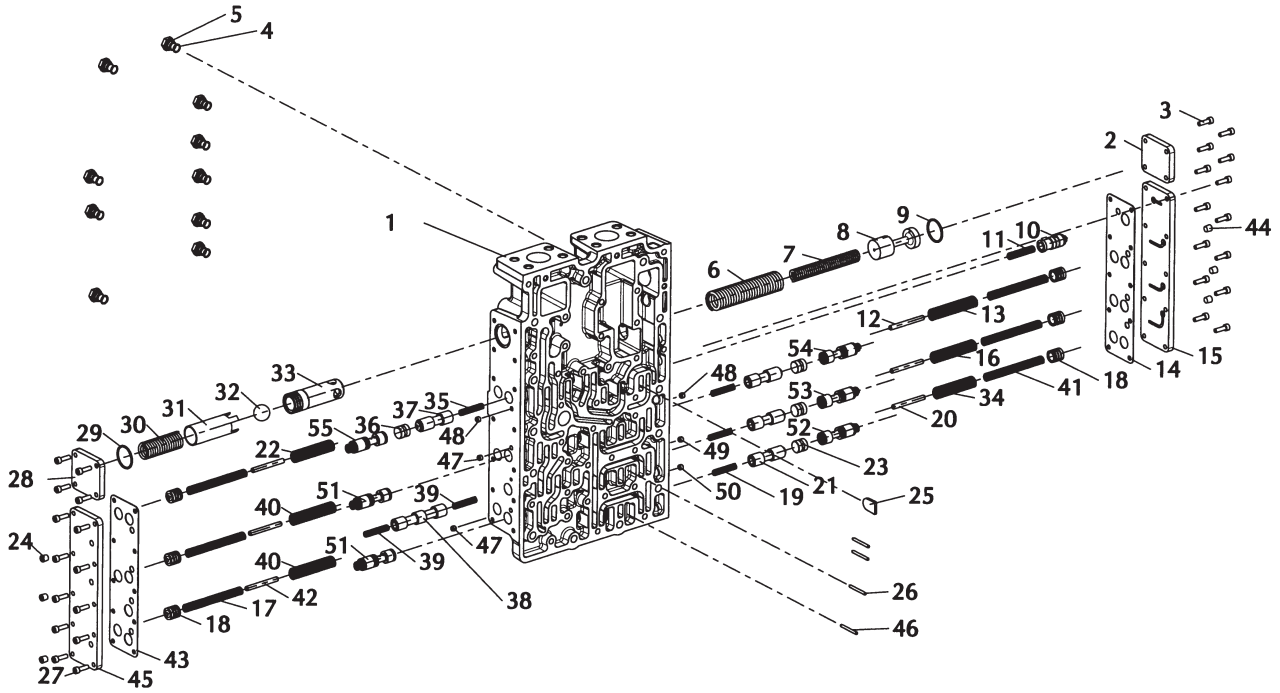
Item	Description	Qty
4	Capscrew	13
5	Lockwasher	13

ASSY CONTROL VALVE



Item	Description	Qty
	Cover-protection (not illustrated)	1
1	Assy-control valve with variable restrictions	1
2	Assembly-solenoid plate (not sold seperately)	1
3	Plate-spacer	1
4	Screw M8x100	22
5	Capscrew	3
6	Capscrew	11
7	Lockwasher	36
8	Gasket plate spacer to plate solenoid	1
9	Gasket spool body to plate spacer	1
10	Group-wiring harness	1
11	Lockwasher	12
12	Capscrew	12
13	Cover-split flange	3
14	O ring	3

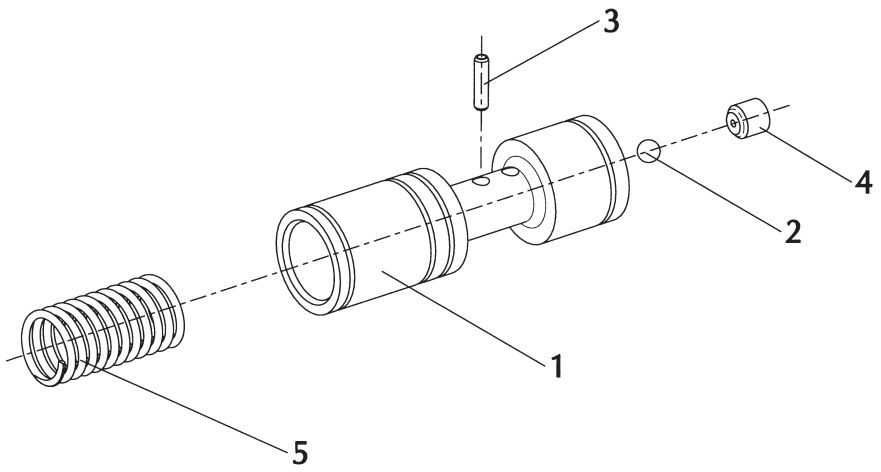
GROUP CONTROL VALVE WITH VARIABLE RESTRICTION



Item	Description	Qty
1	Spool-body non total neutral (not sold seperately) order assy-control valve 251777 to service spool-body	1
2	Cover pressure regulator	1
3	Screw	14
4	O-ring	10
5	Plug-screw type	10
6	Spring-outer	1
7	Spring-inner	1
8	Spool regulator	1
9	O-ring	1
10	Spool-pressure reducer	1
11	Spring pressure reducer	1
12	Not used on this model	
13	Not used on this model	
14	Gasket cover range spools	1
15	Cover-range spools	1
16	Spring-accu outer	1
17	Spring middle soft accumulator	3
18	Spool-accumulator	6
19	Spring	3
20	Pin-stop hard accumulator	2
21	Spool off/on	3
22	Spring outer accumulator	1
23	Spool stop	3
24	Plug	3
25	Plate-separater	1
26	Parallel pin	3
27	Screw	14
28	Cover-safety valve	1
29	O-ring	1
30	Spring-safety valve	1
31	Safety valve spacer	1
32	E ball	1
33	Seat safety valve	1
34	Spring outer accumulator	1
35	Spring	1
36	Spool stop	1
37	Spool off/on	1
38	Spool-fwd/n/rev	1
39	Spring-spool slector	2

Item	Description	Qty
40	Spring-accu outer	2
41	Spring middle soft accumulator	3
42	Pin-stop hard accumulator	3
43	Gasket cover direction spools	1
44	Plug	3
45	Cover-direction spools	1
46	Parallel pin	1
47	Plug-restriction 5/16-24UNF DIA .032 FWD-REV	2
48	Plug-restriction 5/16-24UNF DIA .045 4th	1
49	Plug-restriction 5/16-24UNF DIA .042 1st-2nd	2
50	Plug-restriction 5/16-24UNF DIA .055 3rd	1
51	Assy-modulator spool fwd-rev	2
52	Assy-modulator spool 1st-2nd	1
53	Assy-modulator spool 1st-2nd	1
54	Assy-modulator spool 3rd	1
55	Assy-modulator spool 4th	1

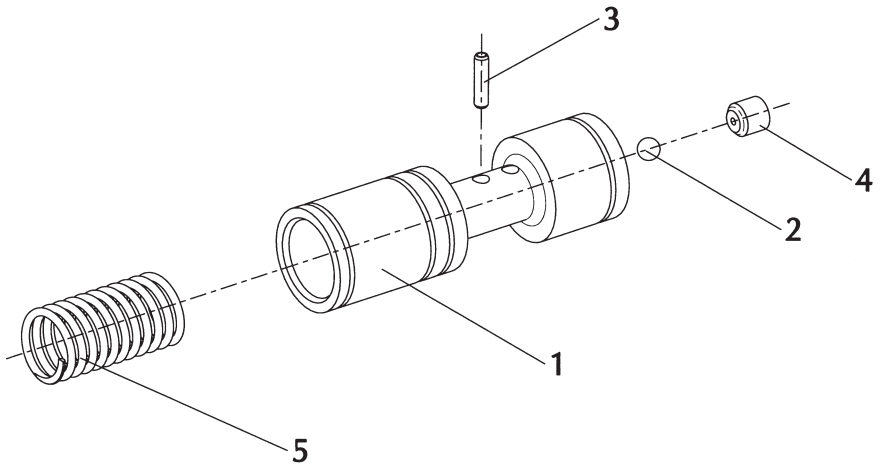
ASSY MODULATOR SPOOL



Item	Description	Qty
1	Spool-modulation	1
2	Ball (not sold seperately)	1
3	Pin roll (not sold seperately)	1

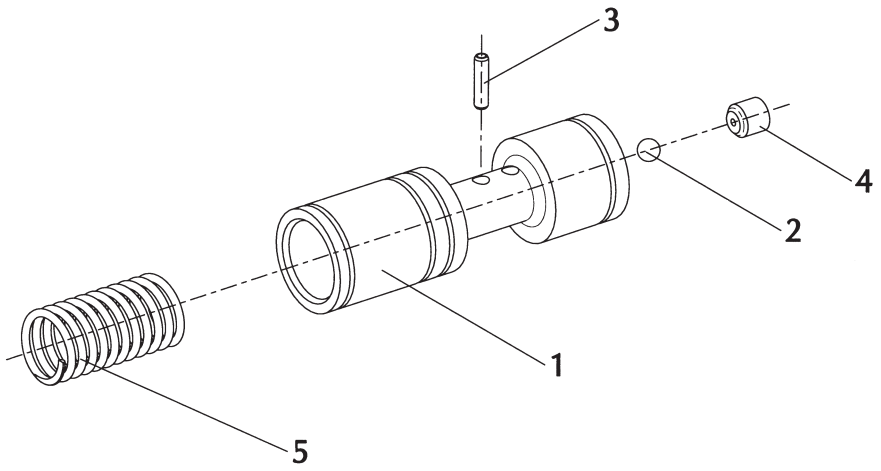
Item	Description	Qty
4	Plug restriction dia 1.3	1
5	Spring-helical	1
6	Order 10106957 to service individual parts	1

ASSY MODULATOR SPOOL - 2



Item	Description	Qty
1	Spool-modulation	1
2	Ball (not sold seperately)	1
3	Pin roll (not sold seperately)	1
4	Plug-restriction dia 0.8mm (not sold seperately)	1
5	Spring-helical (not sold seperately)	1
6	Order 10091434 to service individual parts	1

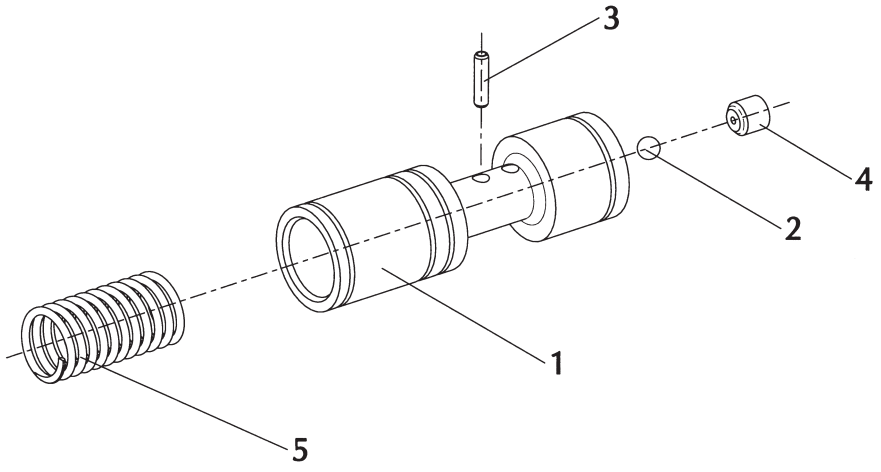
ASSY MODULATOR SPOOL - 3



Item	Description	Qty
1	Spool-modulation	1
2	Ball (not sold seperately)	1
3	Pin roll (not sold seperately)	1

Item	Description	Qty
4	Plug-restriction dia 1.2mm (not sold seperately)	1
5	Spring-helical (not sold seperately)	1
6	Order 10106960 to service individual parts	1

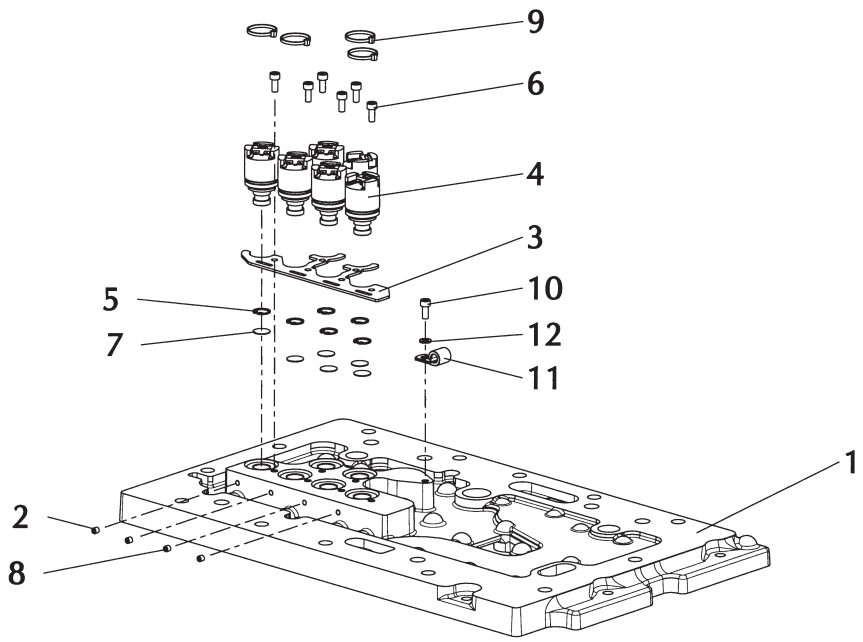
ASSY MODULATOR SPOOL - 4



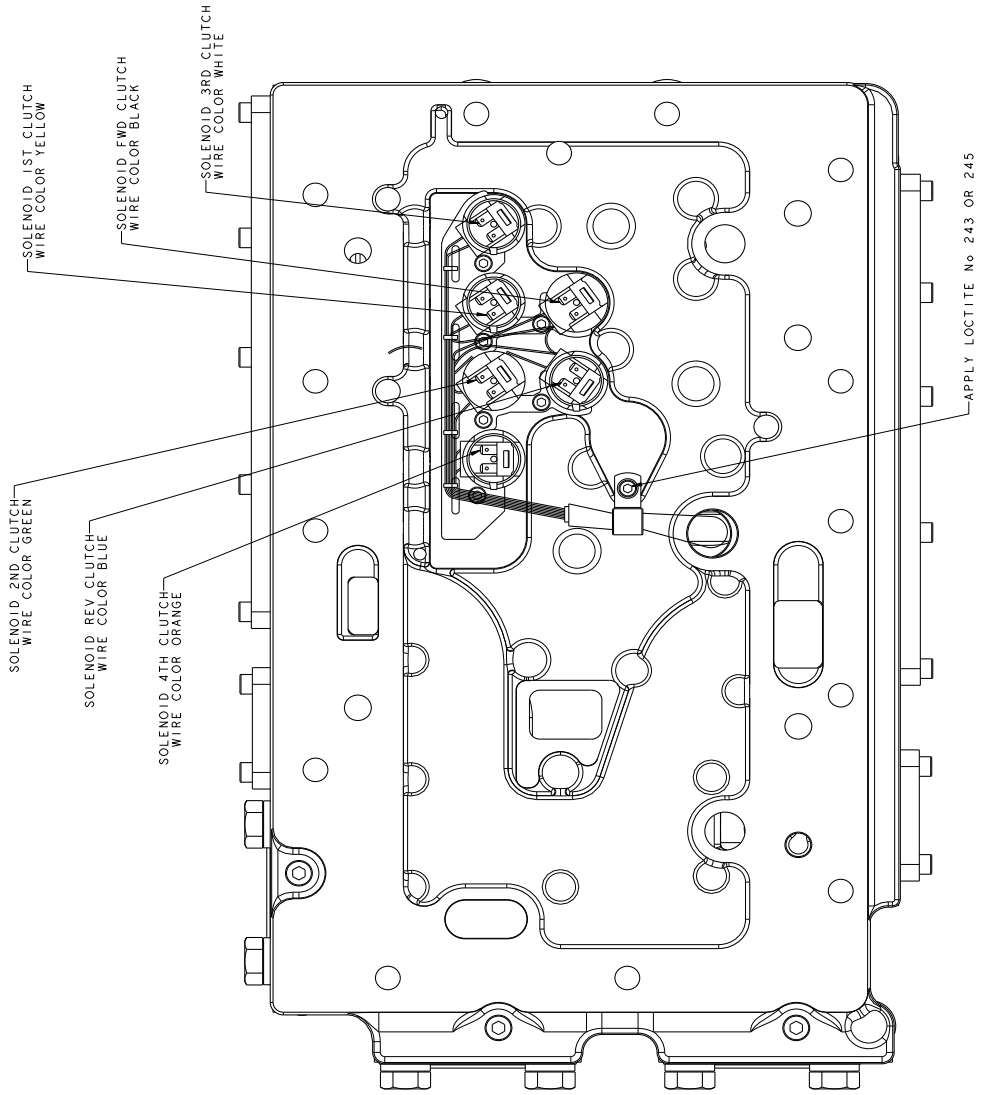
Item	Description	Qty
1	Spool-modulation fast relieve	1
2	Ball (not sold seperately)	1
3	Pin roll (not sold seperately)	1

Item	Description	Qty
4	Plug restriction dia 1.8 (not sold seperately)	1
5	Spring-modulator (not sold seperately)	1
6	Order 10106962 to service individual parts	1

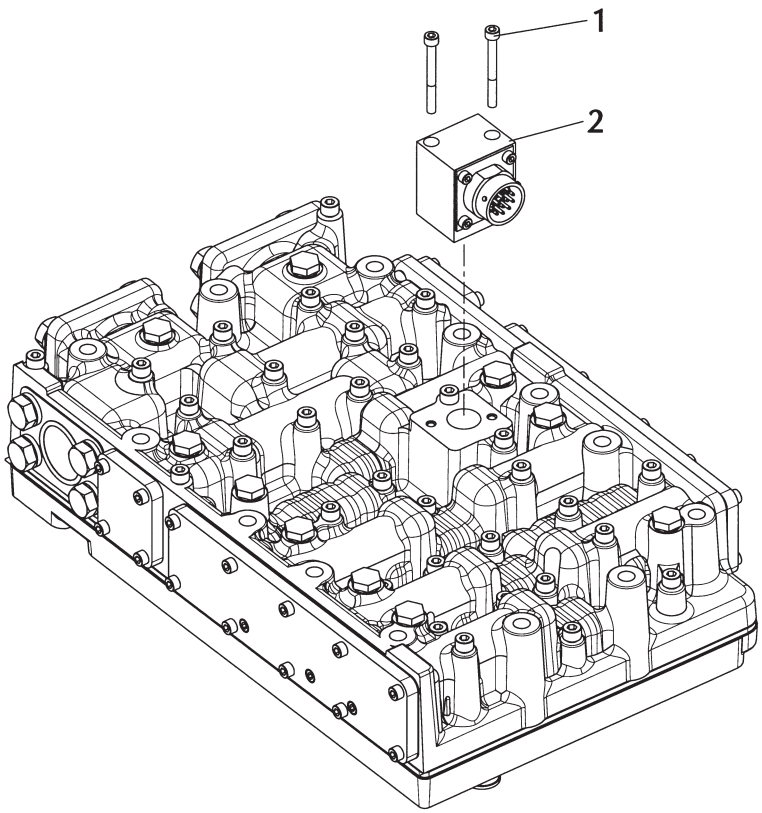
ASSY SOLENOID PLATE



Item	Description	Qty.
1	Plate-solenoid non total neutral	1
2	Screw	3
3	Clamp-solenoid	1
4	Solenoid 24V	6
5	Ring-snap	6
6	Screw M5	6
7	Disc-filter	6
8	Plug-restriction dia. 0,8	1
9	Strap 2,4 x 200 mm	4
10	Screw M5	1
11	Clamp wiring	1
12	Lockwasher	1


SOLENOID 1ST CLUTCH
WIRE COLOR YELLOW
SOLENOID FWD CLUTCH
WIRE COLOR BLACK
SOLENOID 3RD CLUTCH
WIRE COLOR WHITE
APPLY LOCTITE No 243 OR 245
SOLENOID 2ND CLUTCH
WIRE COLOR GREEN
SOLENOID REV CLUTCH
WIRE COLOR BLUE
SOLENOID 4TH CLUTCH
WIRE COLOR ORANGE

GROUP WIRING HARNESS

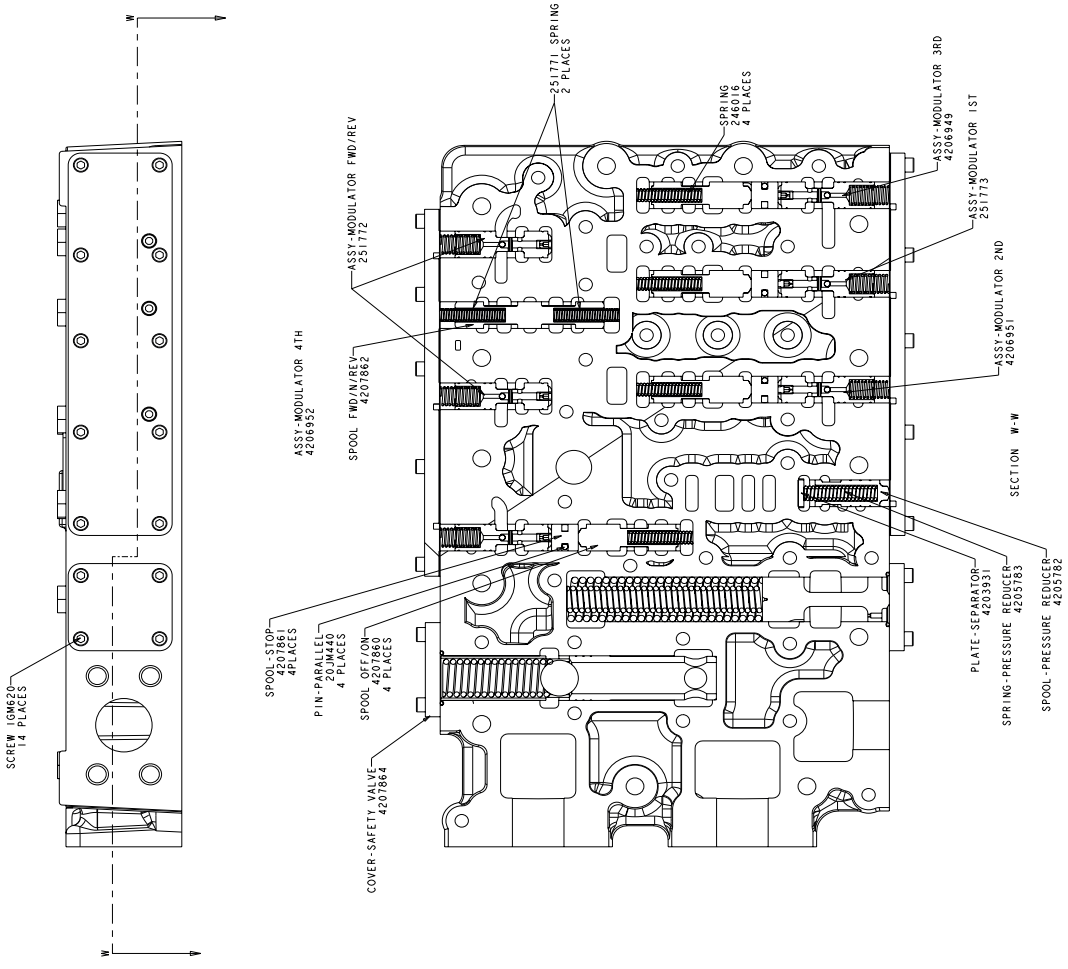


Item	Description	Qty.
1	Screw	2
2	Assy-adaptor and wiring harness non total neutral includes o-ring 60K40106	1

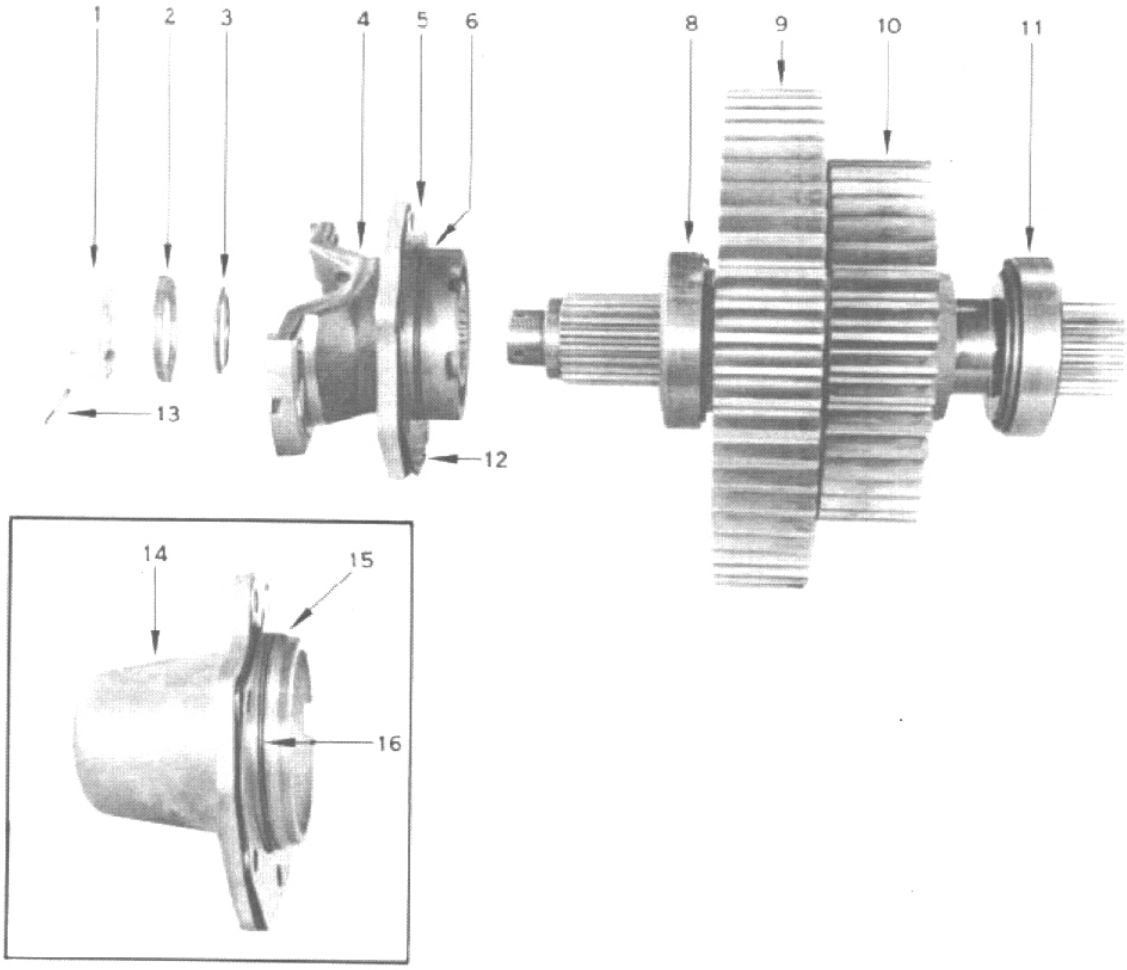
NEW GASKET AND SEALING KIT FOR 8000 TRANSMISSION

Description	Qty
O-ring	10
Gasket-clutch cover	1
Gasket fwd and reverse and clutch cover	1
Gasket- fwd and rev clutch	1
3rd and 4th clutch cover plate gasket	2
Gasket-oil sump frame	1
Gasket-oil sump	1
O-ring	1
Ring-piston	4
Ring-piston	2
Ring-piston	2
Spring-piston ring expander	2
Ring-piston	2
Spring-piston ring expander	2
Gasket-bearing cap	1
Spring-piston ring expander	2

Description	Qty
Ring-piston	2
Ring-piston	1
Spring-piston ring expander	1
Ring-piston	1
Spring-piston ring expander	1
O-ring	2
Seal-oil	2
O-ring	2
Gasket control valve to trans case	1
O-ring	2
Gasket cover range spools	1
Gasket cover direction spools	1
O-ring	10
O-ring	1
O ring	3



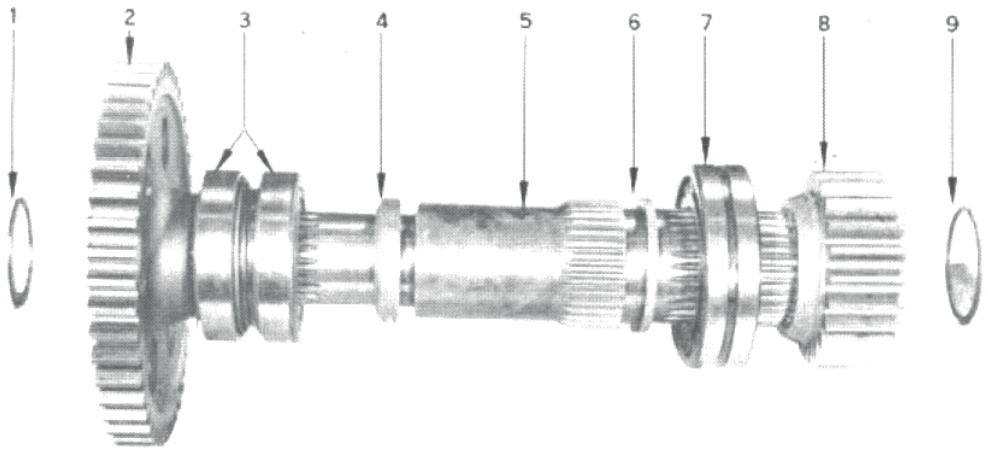
OUTPUT SHAFT GROUP



Item	Description	Qty
1	Flange nut	1
2	Flange washer	1
3	Flange O-ring	1
4	Companion flange	1
5	Bearing cap	1
6	Bearing cap O-ring	1
7	Output shaft	1
8	Output shaft tapered bearing	1
9	Output gear	1
10	Output gear	1
11	Output shaft tapered bearing	1
12	Bearing cap shims	AR
13	Flange nut cotter pin	1

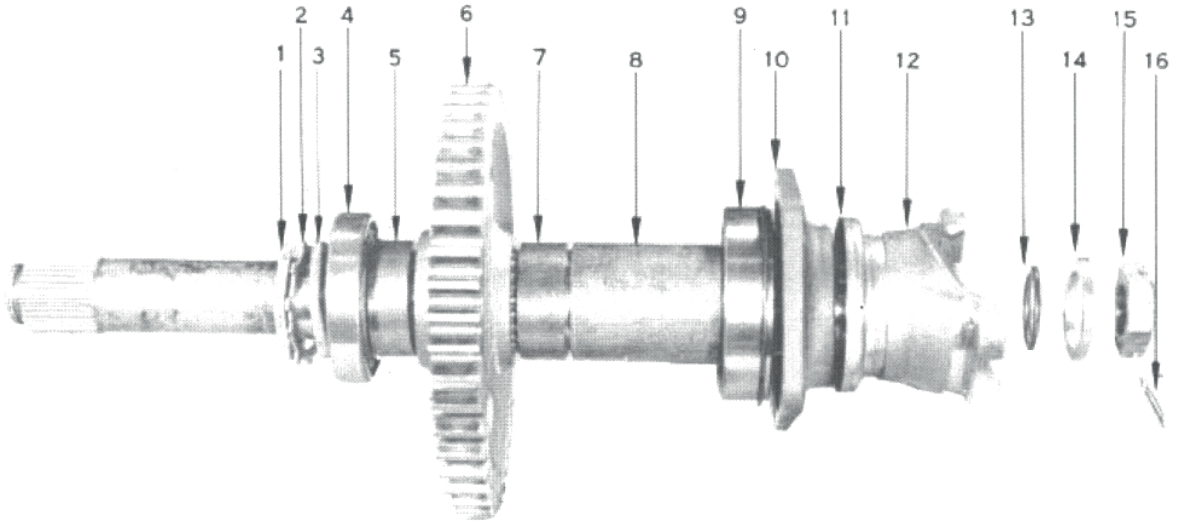
Item	Description	Qty
14	Optional bearing cap	AR
15	Bearing cap shims	AR
16	Bearing cap O-ring	AR

IDLER SHAFT GROUP



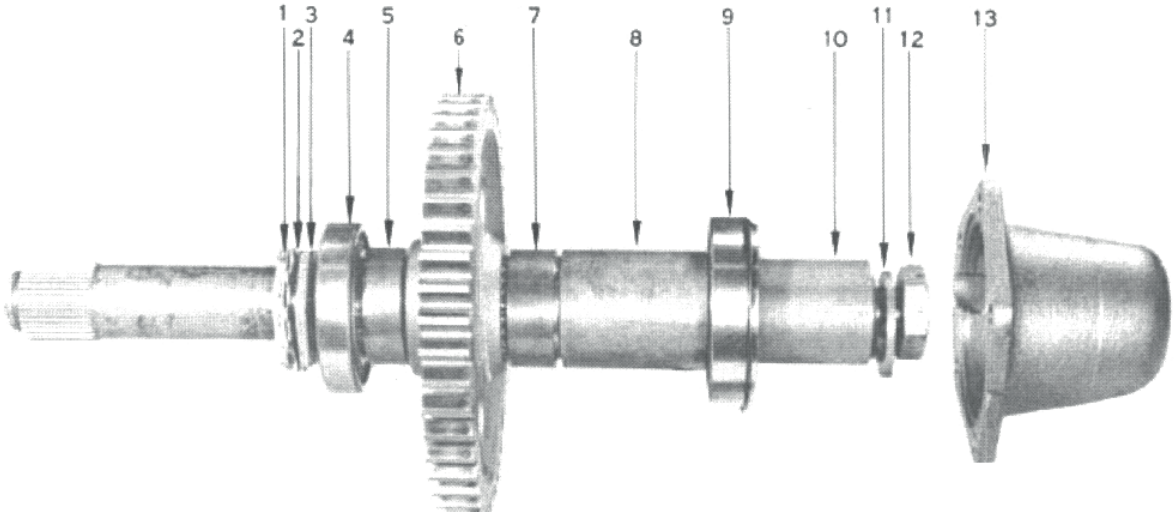
Item	Description	Qty
1	Gear snap ring	1
2	Idler gear	1
3	Tapered bearing	1
4	Tapered bearing spacer	1
5	Idler shaft	1
6	Roller bearing spacer	1
7	Roller bearing	1
8	Idler gear	1
9	Gear snap ring	1

INPUT SHAFT GROUP



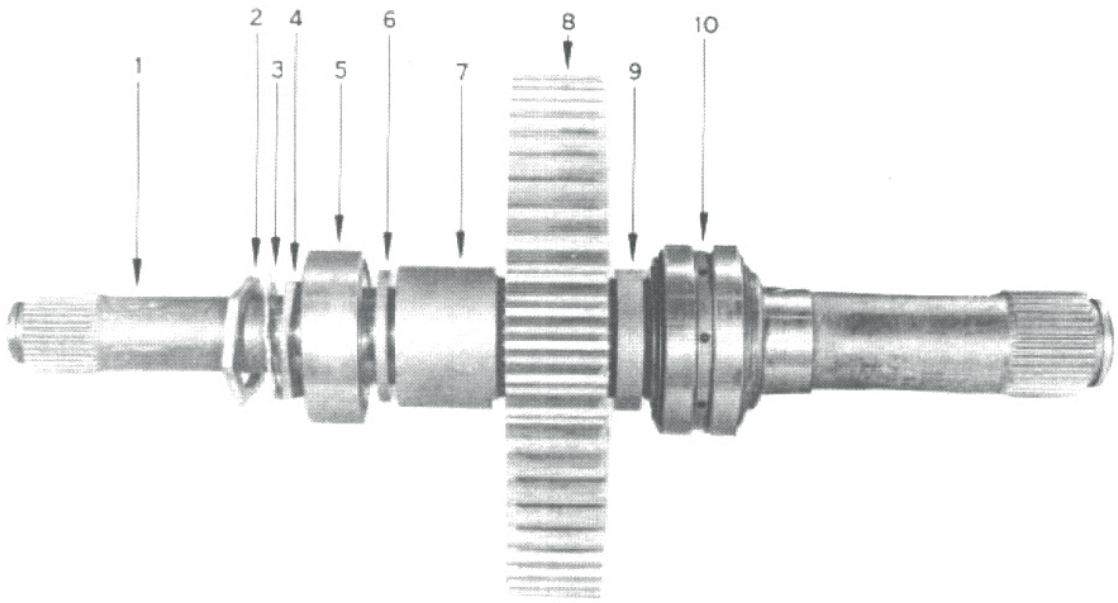
Item	Description	Qty
1	Outer bearing lock nut	1
2	Bearing nut lock	1
3	Inner bearing lock nut	1
4	Ball bearing	1
5	Gear spacer (short)	1
6	Input gear	1
7	Gear spacer (long)	1
8	Input shaft	1
9	Ball bearing	1
10	Bearing cap	1
11	Flange deflector	1
12	Comapnion flange	1
13	Flange O-ring	1
14	Flange washer	1
15	Flange nut	1
16	Flange nut cotter pin	1

REVERSE SHAFT GROUP



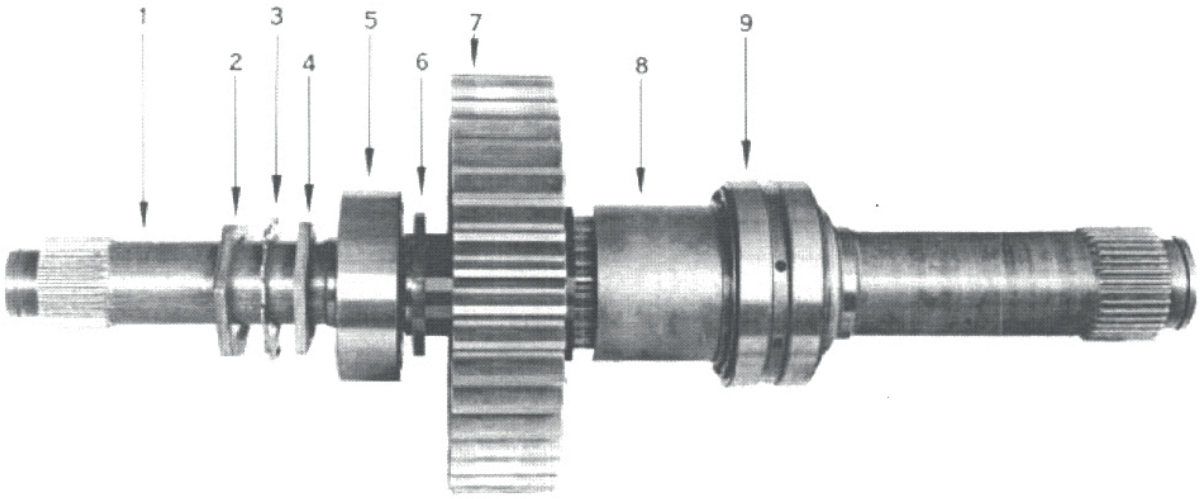
Item	Description	Qty
1	Outer bearing lock	1
2	Bearing nut lock	1
3	Inner bearing nut lock	1
4	Ball bearing	1
5	Gear spacer (short)	1
6	Reverse gear	1
7	Gear spacer (long)	1
8	Reverse shaft	1
9	Ball bearing	1
10	Bearing spacer	1
11	Reverse nut washer	1
12	Reverse nut	1
13	Bearing cap	1

2ND & 4TH SHAFT GROUP



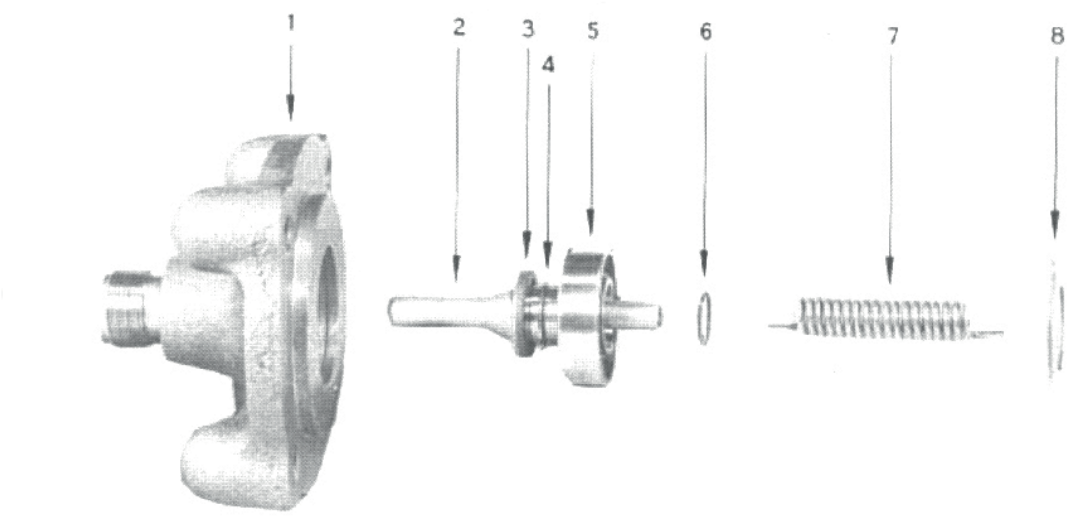
Item	Description	Qty
1	2nd & 4th shaft	1
2	Outer bearing lock nut	1
3	Bearing nut lock	1
4	Inner bearing lock nut	1
5	Roller bearing	1
6	Gear spacer (thin)	1
7	Gear spacer (long)	1
8	2nd & 4th gear	1
9	Gear spacer (short)	1
10	Tapered bearing assembly	1

1ST & 3RD SHAFT GROUP

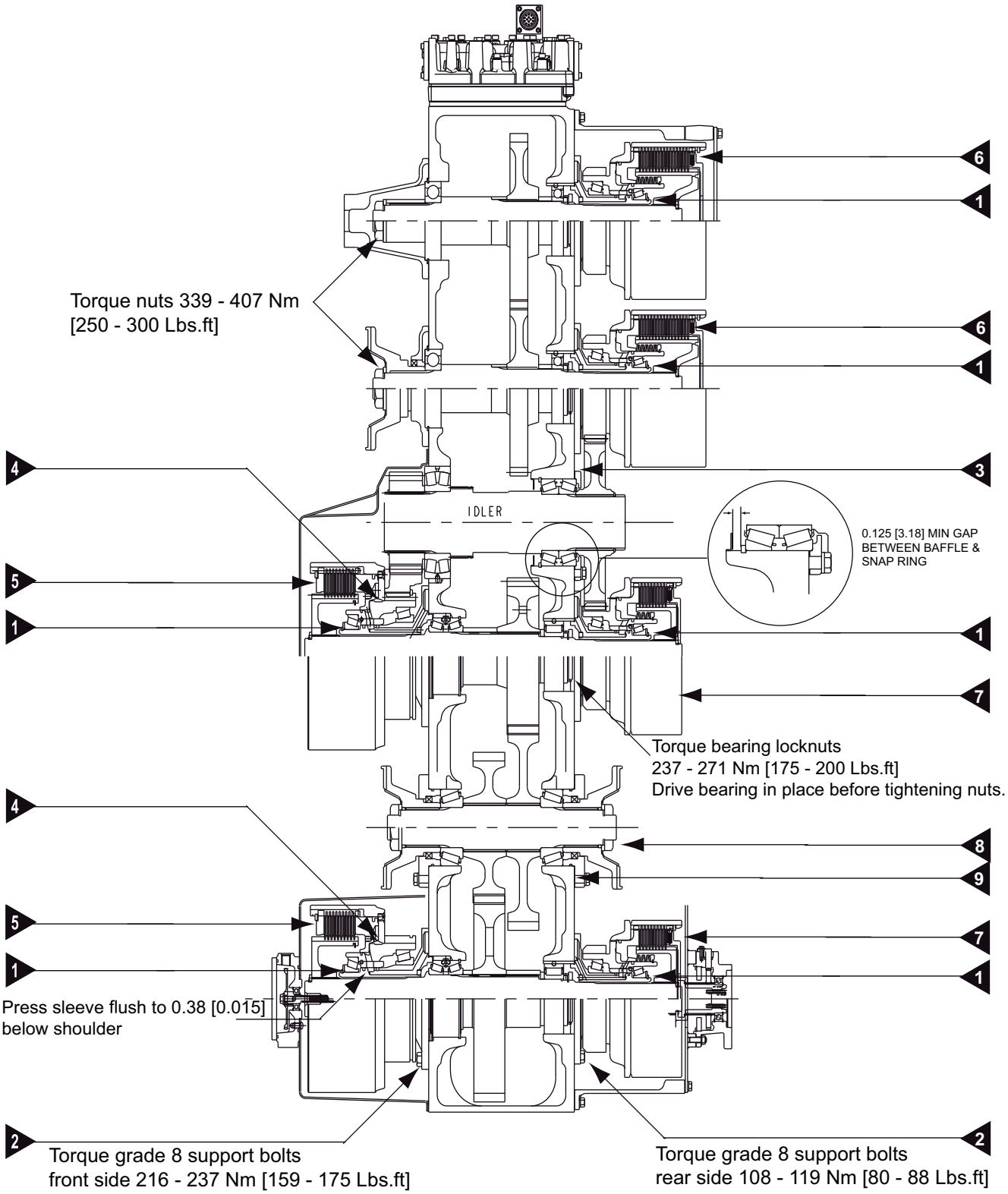


Item	Description	Qty
1	1st & 3rd shaft	1
2	Outer bearing lock nut	1
3	Bearing nut lock	1
4	Inner bearing lock nut	1
5	Roller bearing	1
6	Gear spacer (Thin)	1
7	1st & 3rd gear	1
8	Gear spacer long	1
9	Tapered bearing assembly	1

SPEEDOMETER DRIVE GROUP



Item	Description	Qty
1	Speedometer drive housing	1
2	Speedometer drive shaft	1
3	Drive shaft oil seal	1
4	Bearing snap ring	1
5	Speedometer drive bearing	1
6	Bearing snap ring	1
7	Speedometer drive spring	1
8	Bearing snap ring	1


Torque nuts 339 - 407 Nm
[250 - 300 Lbs.ft]
IDLER
0.125 [3.18] MIN GAP
BETWEEN BAFFLE &
SNAP RING
Torque bearing locknuts
237 - 271 Nm [175 - 200 Lbs.ft]
Drive bearing in place before tightening nuts.
Press sleeve flush to 0.38 [0.015]
below shoulder
Torque grade 8 support bolts
front side 216 - 237 Nm [159 - 175 Lbs.ft]
Torque grade 8 support bolts
rear side 108 - 119 Nm [80 - 88 Lbs.ft]

ASSEMBLY INSTRUCTIONS TRANSMISSION

All lead in chamfer for oil seals. Piston rings and O-rings must be smooth and free from burrs. Inspect as assembled.

Prelube before assembly. All piston ring grooves and O-rings with Multi-Purpose grease Grade 2.

Apply a thin coat of Loctite 638 to outer diameter of all oil seals, bore plugs and bores. They are to be installed in before assembly. Use extreme care not to allow sealant to come in contact with seal lip material.

Apply a thin coat of Loctite 638 or Loctite 270 to all thru hole stud threads.

Use only precoated pipe plugs. On uncoated pipe plugs apply a thin coat of Loctite 638.

If grease is required for positioning gasket during assembly. Use Multi purpose grease grade 2.

After assembly of parts using sealant or thread locking compound, there must not be any free or excess material which might enter the oil circuit. Only use thread locking compound where specified.

Apply a small bead of Loctite 510 around dowel holes to both sides of the gasket.

Apply a thin coat of Multu-purpose grease Grade 2 between seal lips on lip type seals, prior to assembly.

1	Adjust taper bearing 0.000 - 0.127 [0.000 - 0.05] end play by selecting variable thickness washer and snapring at assembly.
2	Adhesive lockscrew assembly procedure

Clean support mounting surface with solvent. Dry thoroughly being certain tapped holes are clean and dry. Install support and tighten screws to specified torque. Assembly of support must be completed within a 15 minute period from start of screw installation. The special screws are used for one installation only. If the screw is removed for any reason it must be replaced. The adhesive left in the tapped holes must be removed with the proper tap and cleaned with solvent. Dry the hole thoroughly and use a new screw for installation.

ASSEMBLY PROCEDURE

ASSEMBLY PROCEDURE IDLER SHAFT

3	Assemble procedure Idler Bearing

AVG Rolling Torque	Shim Addition	Assembly Procedure
Nm [Lbs.in]	Add to internal shim pack	
3 [30]	0.13 [0.005]	1. Assemble components with shim pack to achieve 3-14 Nm [30-120 Lbs-in] Torque. Suggested shim pack is 0.89 [0.035]
5 [40]	0.15 [0.006]	2. Torque all capscrews to assembly specifications
6 [50]	0.18 [0.007]	3. Rotate shaft to seat bearings
7 [60]	0.20 [0.008]	4. Measure shaft rolling torque. Use avg value
8 [70]	0.23 [0.009]	5. Determinate shim pack from chart
9 [80]	0.25 [0.010]	6. Remove cover and initial shim pack
10 [90]	0.28 [0.011]	7. Rap end of shaft to be sure there is end play in bearings
11 [100]	0.30 [0.012]	8. Reassemble unit with final shim pack
12 [110]	0.33 [0.013]	9. Chack end play. Final end play to be 0.000 - 0.076 [0.000 - 0.003] loose.
14 [120]	0.36 [0.014]	

4	Modulated clutch pistons to have no step or to have tapered clearance step. Inspect at assembly.

CLUTCH ADJUSTMENT PROCEDURE

5	adjustment procedure 1st & 2nd

Assemble piston, outer and inner plates. End plate and snap ring per parts list, without clutch return springs or pins.

Measure clutch free play and adjudt as required using additional plates per parts list.

Adjusting plates to be located next to the psiton and oriented so that the clutch return springs are in contact with the piston and end plate teeth.

1st & 2nd Clutch Adjustment Procedure					
Measured clutch free play		Adjusting Plate		Final free play	
		Produciotn outer plate	Production adjusting plate		
Min	Max	0.1026[2.606]	0.077 [1 .956]	Ref. Min	Ref. Max
0.439 [11.15]	0.465 [11.67]	2	2	0.080 [2.03]	0.106 [2.69]
0.414 [10.52]	0.439 [11.15]	1	3	0.080 [2.03]	0.106 [2,69]
0.388 [9.85]	0.414 [10.52]	3	0	0.080 [2.03]	0.106 [2.69]
0.362 [9.19]	0.388 [9,85]	2	1	0.080 [2.03]	0.106 [2,69]
0.337 [8.56]	0.362 [9.19]	1	2	0.080 [2.03]	0.106 [2.69]
0.311 [7.90]	0.337 [8.56]	0	3	0.080 [2.03]	0.106 [2.69]
0.285 [7.24]	0.311 [7.90]	2	0	0.080 [2.03]	0.106 [2.69]
0.260 [6.60]	0.285 [7.24]	1	1	0.080 [2.03]	0.106 [2.69]
0.234 [5.94]	0.260 [6.60]	0	2	0.080 [2.03]	0.106 [2.69]
After adjusting free play. Add clucth return springs and pins to assembly.					

6	adjustment procedure FWD & REV

Assemble piston, outer and inner plates. End plate and snap ring per parts list. Measure clutch free play and adjudt by adding and/or removing outer plates as indicated on chart.

Adjusting plates to be located next to the psiton.

Fwd & Rev Clutch Adjustment Procedure					
Measured clutch free play		Adjusting Plate		Final free play	
		Produciotn outer plate	Production adjusting plate		
Min	Max	0.1026[2.606]	0.077 [1 .956]	Ref. Min	Ref. Max
0.396 [10.05]	0.421 [10.70]	1	2	0.139 [3.53]	0.165 [4.18]
0.370 [9.39]	0.396 [10.05]	0	3	0.139 [3.53]	0.165 [4.18]
0.344 [8.74]	0.370 [9. 39]	2	0	0.139 [3.53]	0.165 [4.18]
0.319 [8.09]	0.344 [8.74]	1	1	0.139 [3.53]	0.165 [4,18]
0.293 [7.44]	0.319 [8.09]	0	2	0.139 [3.53]	0.165 [4.18]
0.267 [6.79]	0.293 [7.44]	-1	3	0.139 [3.53]	0.165 [4.18]
0.242 [6.14]	0.267 [6.79]	1	0	0.139 [3.53]	0.165 [4.18]
0.216 [5.49]	0.242 [6.14]	0	1	0.139 [3.53]	0.165 [4.18]
0.190 [4.83]	0.216 [5.49]	-1	2	0.139 [3.53]	0.165 [4.18]

NOTE:

Do not shim tighter than 0.70 to allow assembly of dutch end plate and retaining ring.

7	adjustment procedure 3rd & 4th

Assemble piston, outer and inner plates. End plate and snap ring per parts list. Measure clutch free play and adjudt by adding and/or removing outer plates as indicated on chart.

Adjusting plates to be located next to the piston.

3rd & 4th Clutch Adjustment Procedure				
Measured clutch free play		Adjusting Plate		Final free play
		Produciotn outer plate	Production adjusting plate	
Min	Max	0.1026[2.606]	0.077 [1 .956]	Ref. Min
0.336 [8.54]	0.362 [9.19]	1	2	0.080 [2.03]
0.311 [7.89]	0.336 [8.54]	0	3	0.080 [2.03]
0.285 [7.24]	0.311 [7.89]	2	0	0.080 [2.03]
0.259 [6.59]	0.285 [7.24]	1	1	0.080 [2.03]
0.234 [5.94]	0.259 [6.59]	0	2	0.080 [2.03]
0.208 [5.29]	0.234 [5,94]	-1	3	0.080 [2.03]
0.182 [4,63]	0.208 [5.29]	1	0	0.080 [2.03]
0.157 [3.98]	0.182 [4.63]	0	1	0.080 [2.03]
0.131 [3.33]	0.157 [3.98]	-1	2	0.080 [2.03]
0.131 [3.33]	0.157 [3,98]	-2	3	0.080 [2.03]

NOTE:

Do not shim tighter than 0.70 to allow assembly of clutch end plate and retaining ring

8	Output shaft

Torque output shaft nuts 542 - 610 Nm [400 - 450 Lbs.ft]

NOTE:

Models with single output flange or models with output disconnect plus an opposite end output flange, are to be assembled by pressing the inner race on the threaded end firmly against the shoulder on the shaft. After assembly in case, with gears positioned. Drive opposite bearing race on output shaft until bearing shoulders against gear hub.

9	Shim output shaft bearings to produce 0.68 - 0.90 Nm [6 - 8 Lbs.in] preload.

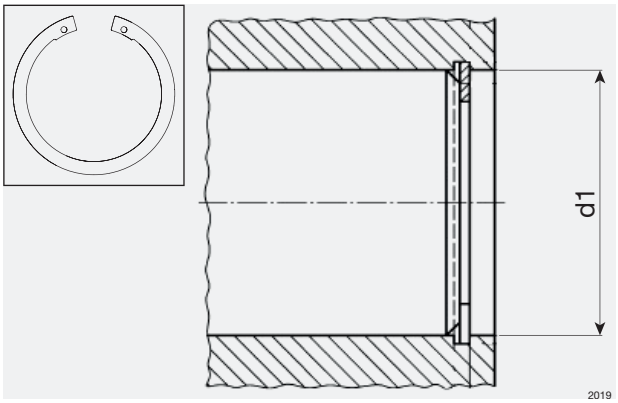
NOTE:

Models with single output flange or models with output disconnect plus an opposite end output flange, are to be assembled by pressing the inner race on the threaded end firmly against the shoulder on the shaft.

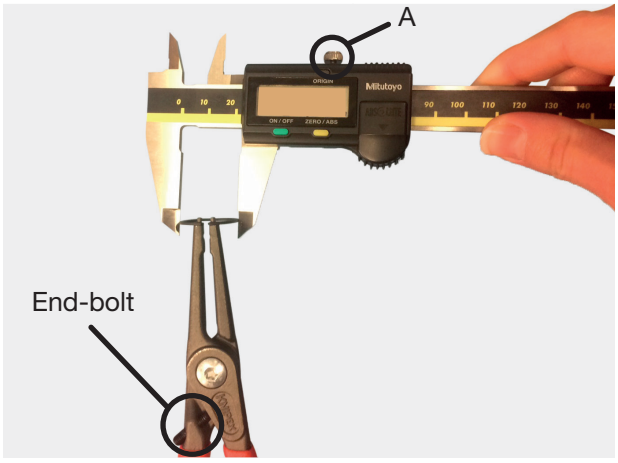
After assembly in case, with gears positioned, drive opposite bearing race on output shaft until bearing shoulders against gear hub.

END-STOP PLIER SETTING

RETAINING SNAP RING FOR BORES



1 - Measure the bore diameter of circlip (or snapring) "d1";
2 - Pre-set the caliber at value "Dmin" ("Dmin"= "d1" x 0,99);
3 - Fix it with the screw on caliber (see picture - Point A);
4 - Put the snap ring into the plier;
5 - Close it until the end-stop bolt allows;
6 - Adjust the end-bolt in order to match the external diameter of the snap ring with "Dmin" value;
7 - Scrap the snap ring used for the end-stop plier calibration.



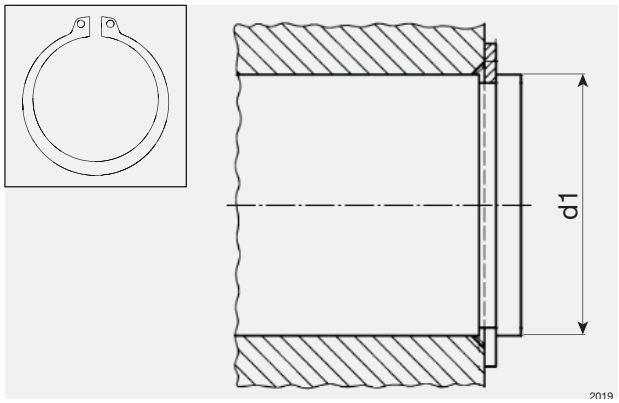
⚠ CAUTION

This procedure is aligned with DIN standard. In any case, DIN 472 regulation prevails.

⚠ CAUTION

Snap ring replacement is mandatory if they are removed without pre-setted plier.

RETAINING SNAP RING FOR SHAFTS



1 - Measure the shaft diameter of circlip (or snapring) "d1";
2 - Pre-set the caliber at value "Dmax" ("Dmax"= "d1" x 1,01);
3 - Fix it with the screw on caliber (see picture - Point A);
4 - Put the snap ring into the plier;
5 - Open it until the end-stop bolt allows:
6 - Adjust the end-bolt in order to match the internal diameter of the snap ring with "Dmax" value;
7 - Scrap the snap ring used for the end-stop plier calibration.

⚠ CAUTION

This procedure is aligned with DIN standard. In any case, DIN 471 regulation prevails.

⚠ CAUTION

Snap ring replacement is mandatory if they are removed without pre-setted plier.

DISASSEMBLY AND REASSEMBLY OF THE TRANSMISSION

⚠ CAUTION

For disassembly and reassembly of this unit you will need, besides normal workshop tools the special tools mentioned in the last chapter of this manual; an induction heater of minimum 3.5 Kw to heat bearings up to 120° C [248° F]

NOTE:

Clutch return spring packs are certified according to compression weight specifications and are pre-packed in quantities to repair one (1) specific clutch.

The disc spring packs are to be used as complete assemblies and care should be taken not to intermix the individual disc springs witk disc springs in another clutch or disc spring pack.

Each disc spring assembly is made up of selected springs to precisely match each part within this assembly. Failure to replace all piston return springs can result in unequal deflection within the spring pack. The result of this inbalance may edversely affect overall life of the springs.

DISASSEMBLY OF THE TRANSMISSION CASE

⚠WARNING

Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released.

FIGURE 1: Front view of the 8000 4 speed transmission.

FIGURE 2: Remove sump pan bolts, lockwashers and oil sump pan.

FIGURE 3: Remove oil screen bolts and lockwashers.

FIGURE 4: Remove oil sump frame and screen.

FIGURE 5: Remove control valve bolts and lochwashers.

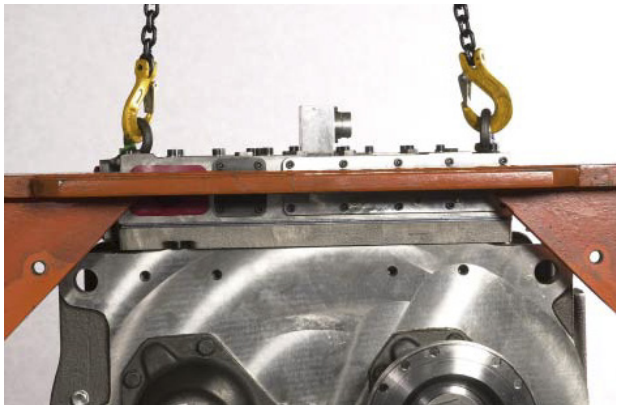


FIGURE 6: Using a hoist remove the control valve as an assembly.

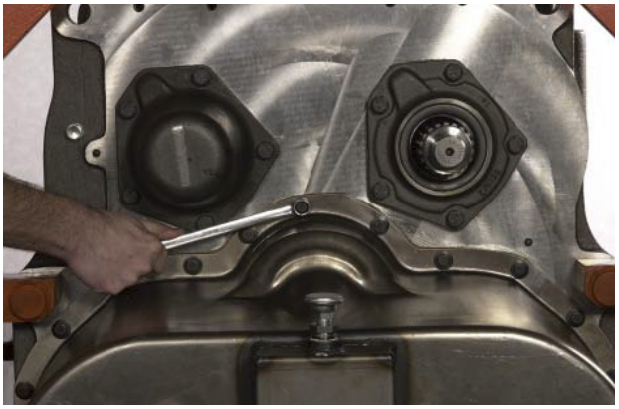


FIGURE 9: Use aligning studs to hold cover in place, remove 1st & 2nd clutch cover screws and lockwashers.

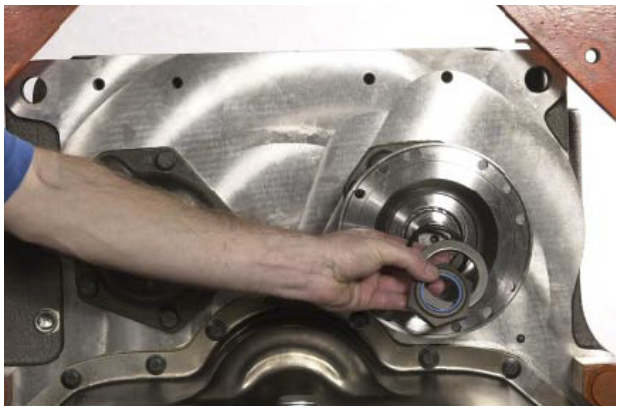


FIGURE 7: Remove input flange nut, washer and O-ring.

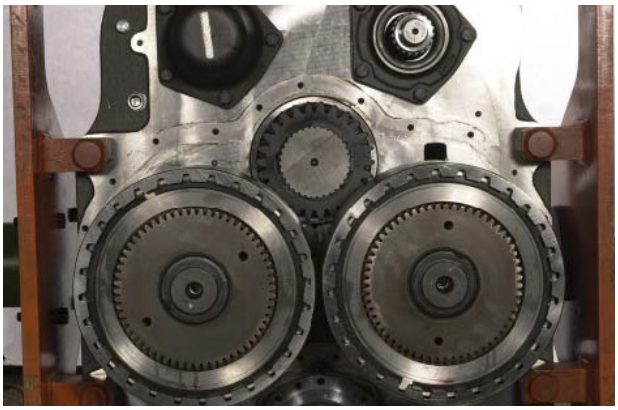


FIGURE 10: 1st & 2nd clutch cover removed.

FIGURE 8: Remove input flange.

NOTE:

All clutches are disassembled in a simular manner. Clutches shown being disassembled are 1st & 2nd. Forward, reverse, 3rd & 4th.

DISASSEMBLY OF THE 1ST & 2ND DRUM

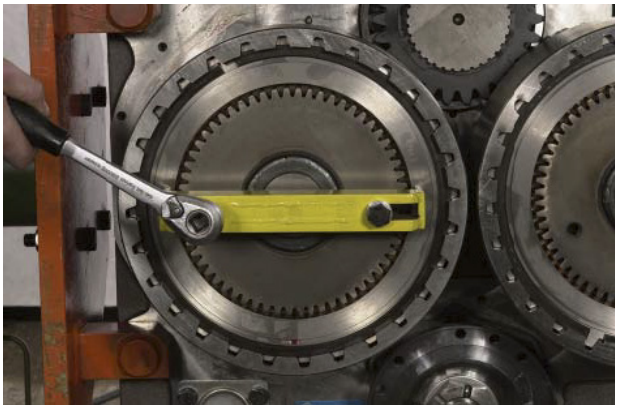


FIGURE 11: Using a special tool depress end plate by turning the bolts as shown.

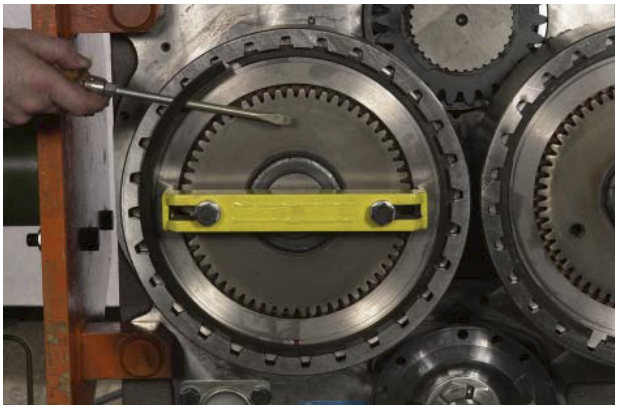


FIGURE 12: Remove end plate retaining ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

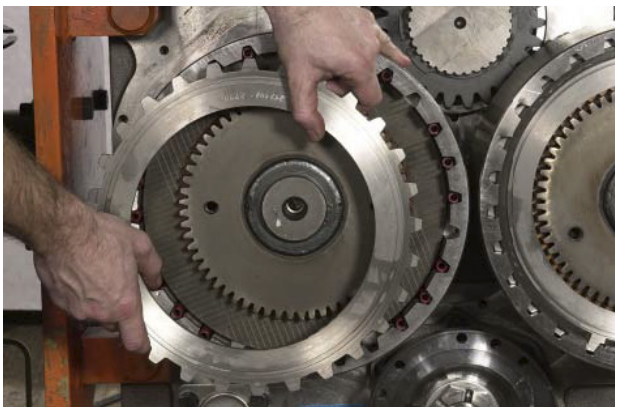


FIGURE 13: Remove end plate. Remove springs and pins.

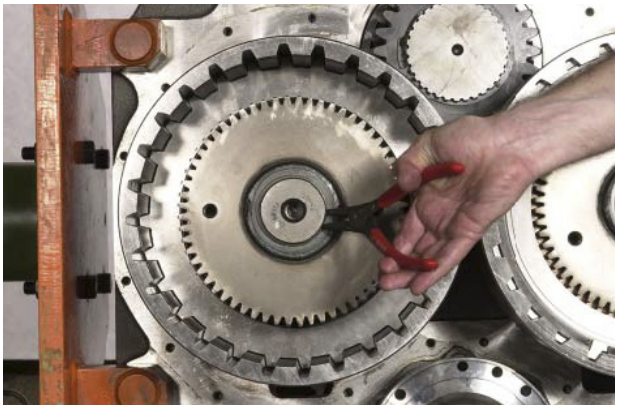


FIGURE 14: Remove clutch disc hub retaining ring.

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

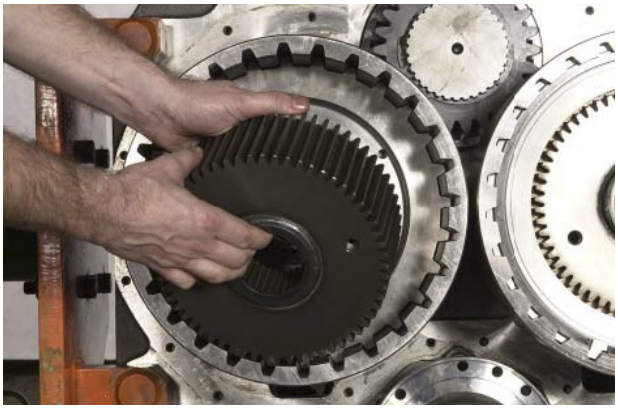


FIGURE 15: Remove disc hub. Remove inner and outer clutch discs.

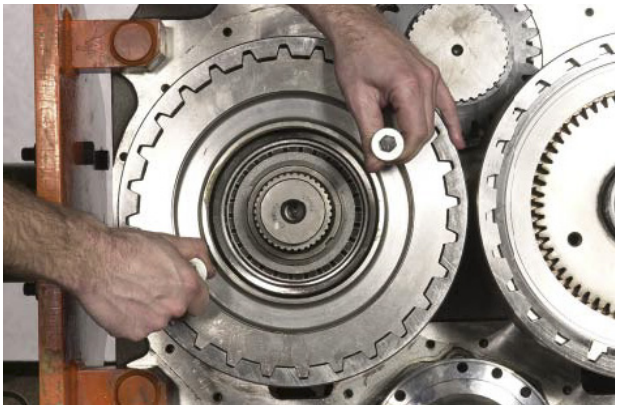


FIGURE 16: Install 2 bolts as shown and remove clutch piston.

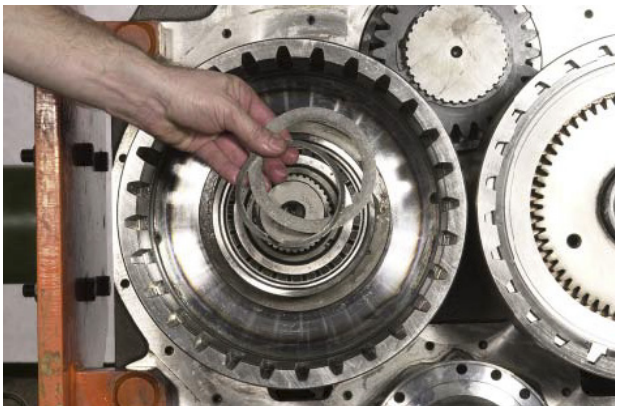


FIGURE 17: Remove clutch drum retaining ring and retainer spacer.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

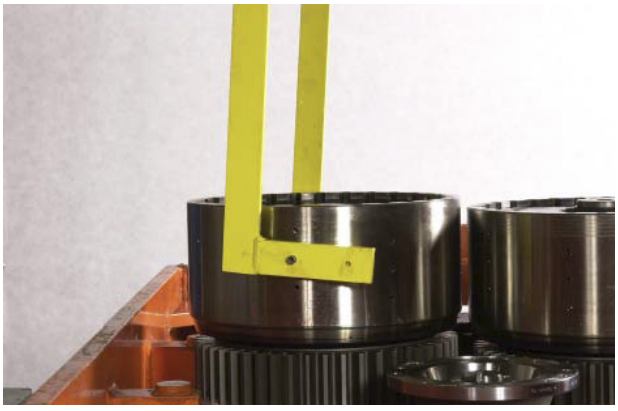


FIGURE 18: Using a special tool and a hoist remove clutch drum from clutch support.

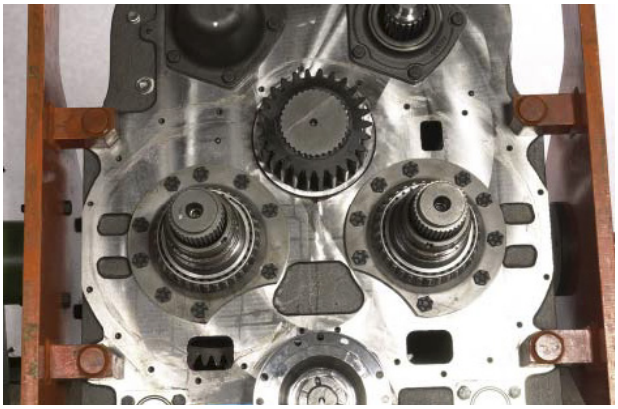


FIGURE 19: 1st and 2nd clutch drums removed.

DISASSEMBLY OF THE TRANSMISSION CASE

⚠WARNING

Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released.

FIGURE 20: Remove cotter pin, output flange nut, washer and o-ring.

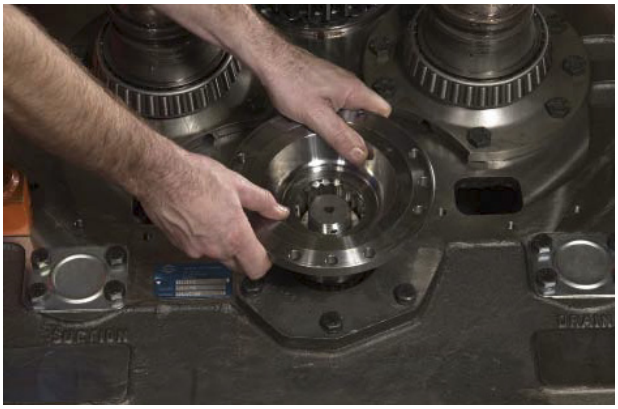


FIGURE 21: Remove output flange.

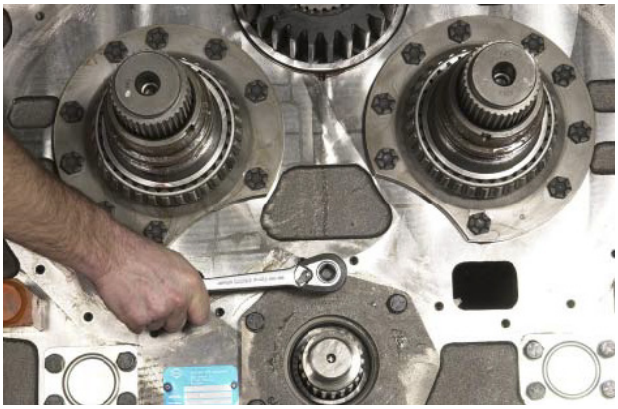


FIGURE 22: Remove output flange bearing cover.

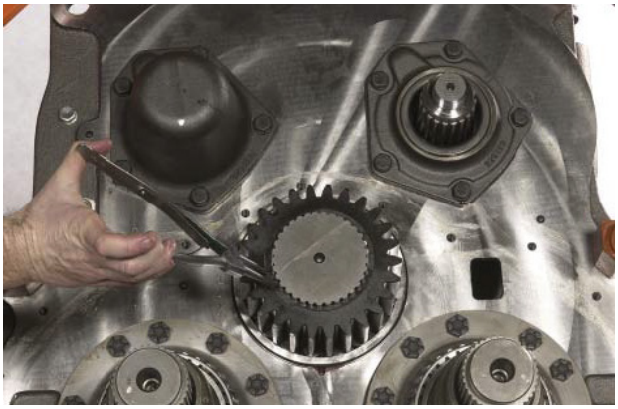


FIGURE 23: Remove idler gear retainnig ring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

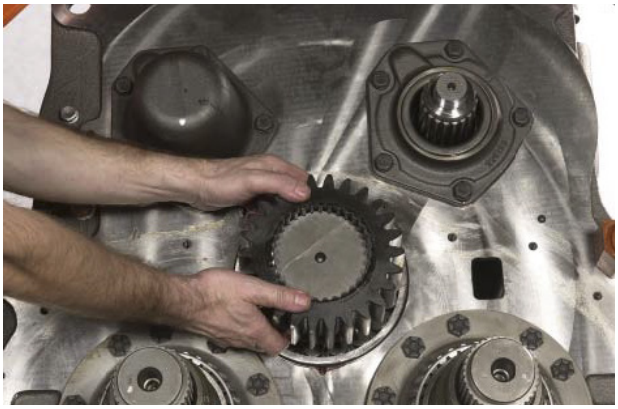


FIGURE 24: Remove idler gear.

FIGURE 25: Remove reverse shaft bearing cap.

FIGURE 26: Remove reverse shaft nut washer and spacer.

FIGURE 27: Remove input shaft bearing cap bolts, lockwashers and bearing cap. Remove bearing cap and oil seal.

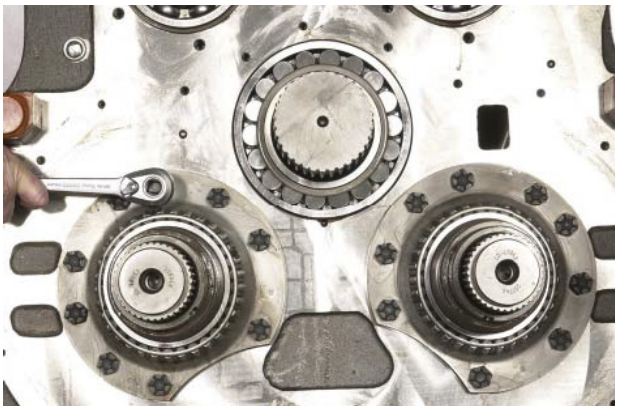


FIGURE 28: Remove clutch supports (1st and 2nd).

FIGURE 29: On other side of transmission, remove output flange nut, washer and o-ring.

FIGURE 30: Remove output flange.

FIGURE 31: Remove forward, reverse, 3rd and 4th clutch cover bolts and lockwashers.

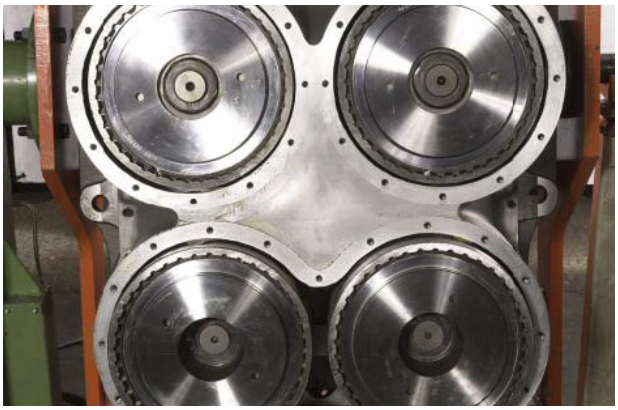


FIGURE 32: Covers removed.

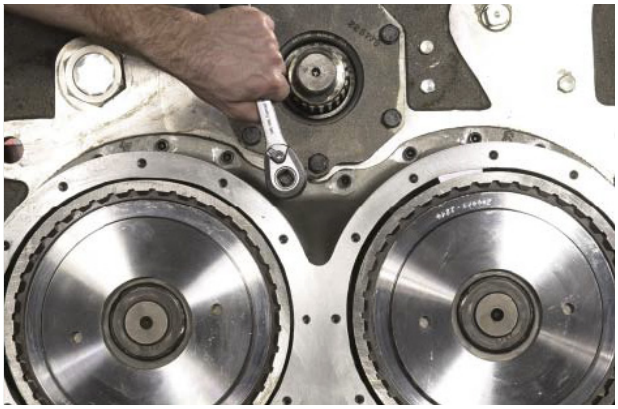


FIGURE 33: Remove cover base bolts, lockwashers and hoist cover base from transmission case.

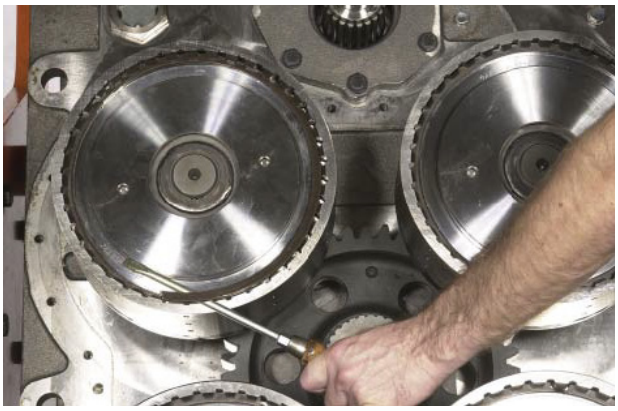


FIGURE 34: Remove clutch drum end plate retaining ring, and remove end plate. Take care not to loose the 2 balls and springs. See figure below.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

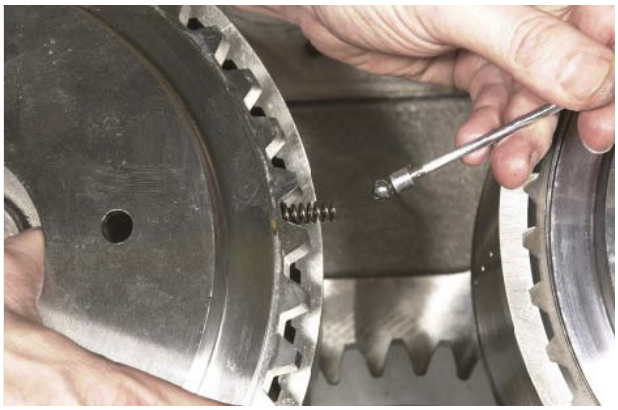


FIGURE 35: Locating ball and spring on either side of the end plate.

FIGURE 36: Remove clutch disc hub retaining snap ring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠ WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 37: Remove clutch disc hub.

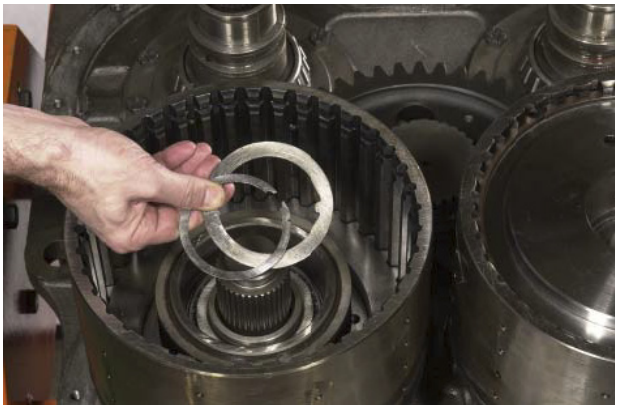


FIGURE 38: Remove clutch drum retainer ring and spacer.

⚠ WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 39: Hoist clutch drum from clutch support using a special tool as illustrated.

FIGURE 40: Clutch drums removed.

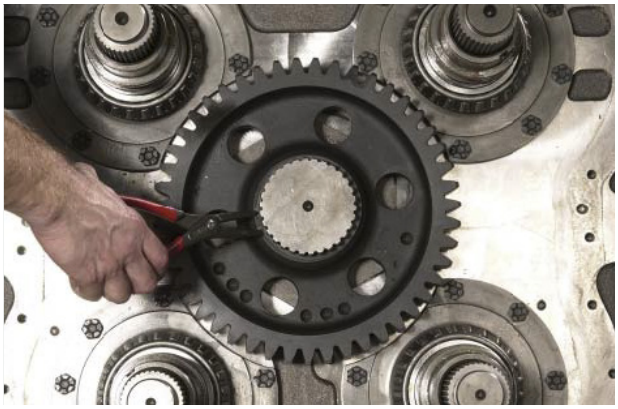


FIGURE 41: Remove idler gear retaining ring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠ WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 42: Remove idler gear.

FIGURE 43: Remove rear output flange bearing cap.

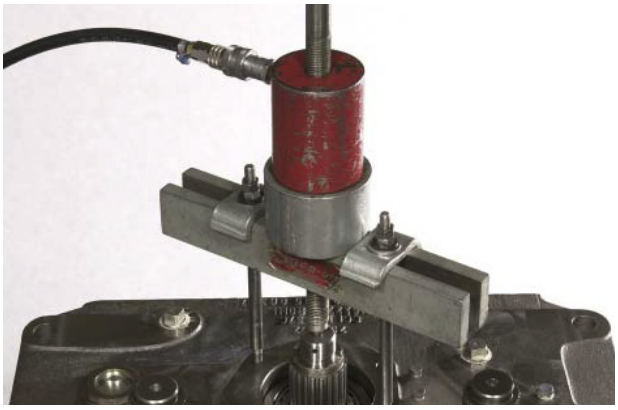


FIGURE 44: Press output shaft from case. Output shaft may be removed or installed from eiter side.

⚠ CAUTION

Be carefull inner transmission case gears are heavy.

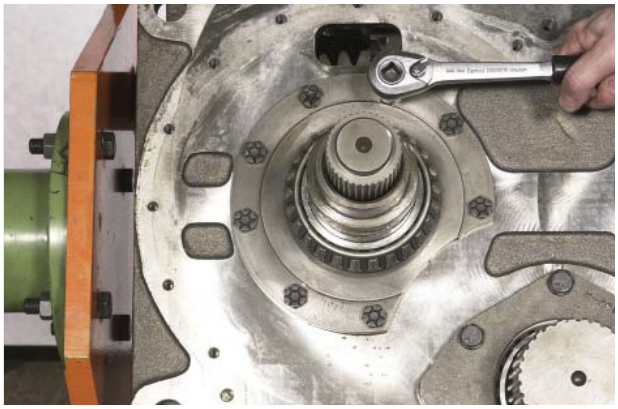


FIGURE 45: Remove clutch supports.

FIGURE 46: Straighten tongs on shaft nut locks. Lock gears with a soft bar and remove outer lock nut, nut lock and inner lock nut.

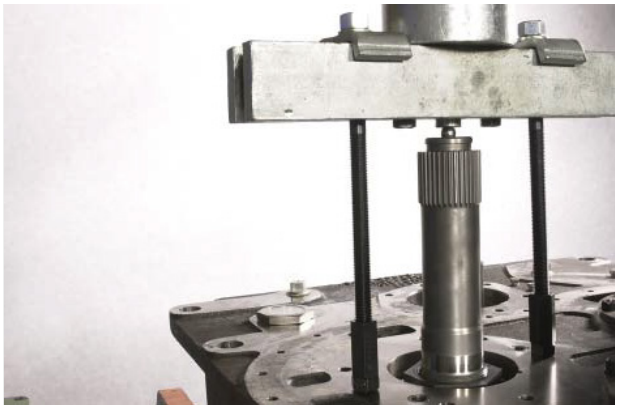


FIGURE 47: Using a suitable pusher tool, remove clutch shafts. Remove gears and spacers from inside of transmission case.

FIGURE 48: Remove idler shaft bearing cap.

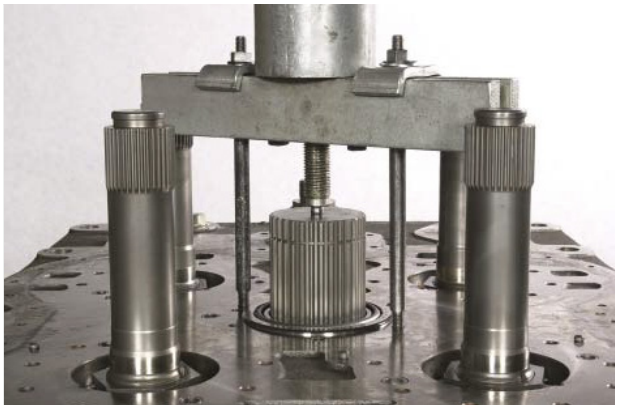


FIGURE 49: Use a suitable pusher tool and push idler shaft out of transmission case.

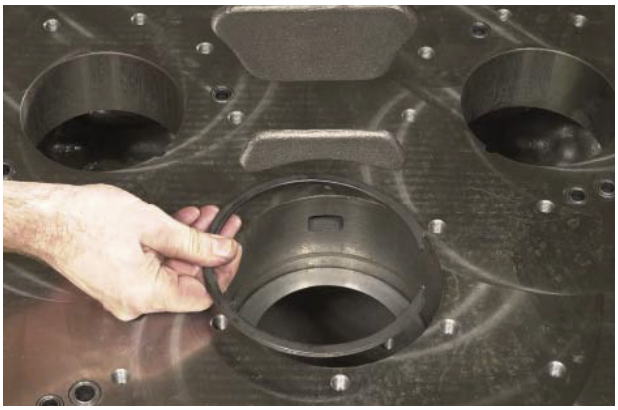


FIGURE 50: Remove bearing locating snap ring

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 51: Remove oil shield.

FIGURE 52: Remove input shaft and bearing as an assembly

FIGURE 53: From other side remove bearing cup

DISASSEMBLY & REASSEMBLY OF FWD, REV, 3RD & 4TH CLUTCH DRUM

FIGURE 54: Use this procedure for all drums. Remove clutch hub gear snap ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 55: Remove clutch hub gear.

FIGURE 56: Remove piston ring outer race and outer support bearing cup.

FIGURE 57: Press return springs and remove spring retaining snap ring.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

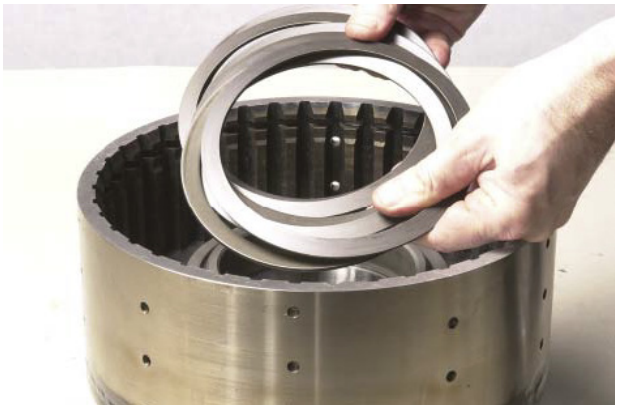


FIGURE 58: Remove return springs

FIGURE 59: Use 2 bolts to remove clutch piston.

FIGURE 60: Install piston.

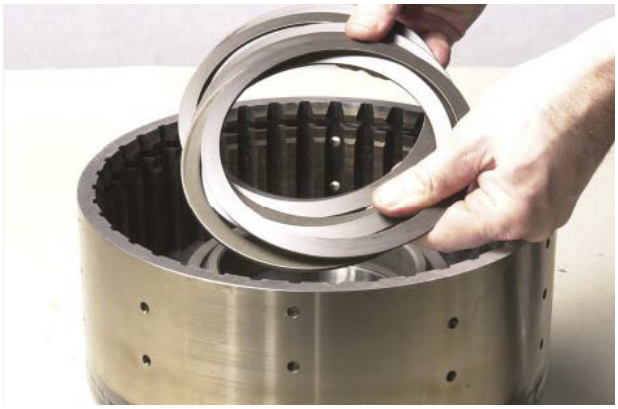


FIGURE 61: Install return springs. See picture below.

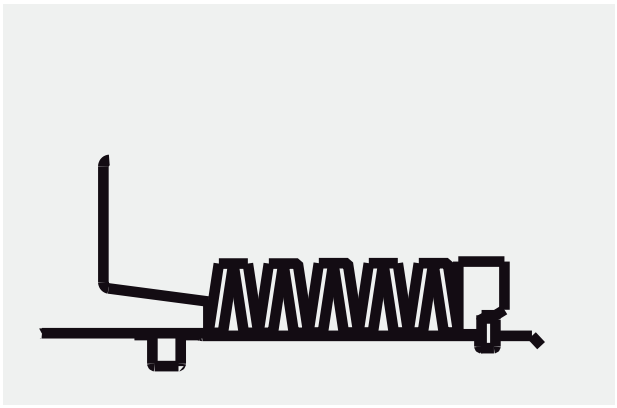


FIGURE 62: Detail

FIGURE 63: Install spring retaining snapring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

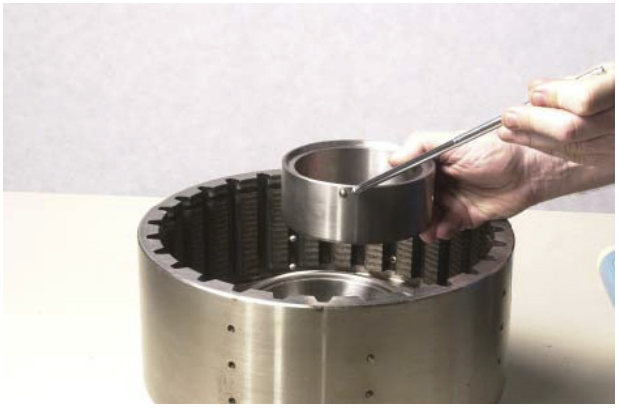


FIGURE 64: Install piston ring outer race and locking ball.

FIGURE 65: Install clutch inner bearing cup.

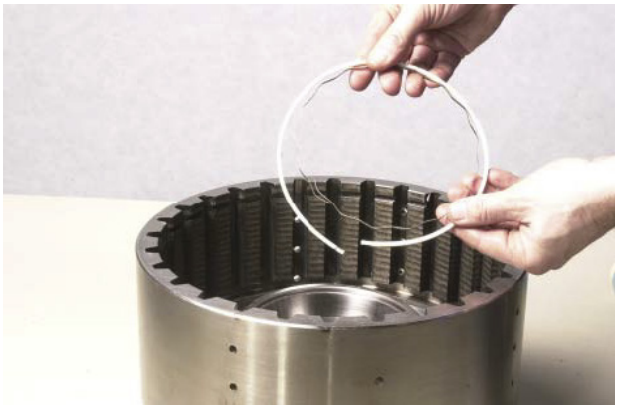


FIGURE 66: Install new sealing expander ring and sealing ring.

FIGURE 67: Install clutch outer bearing cup.

FIGURE 68: Install clutch hub gear.

FIGURE 69: Instal clutch hub gear retaining snapring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

DISASSEMBLY & REASSEMBLY OF CLUTCH SUPPORT

FIGURE 70: Remove clutch support bearing come.

FIGURE 71: Remove clutch support piston rings.

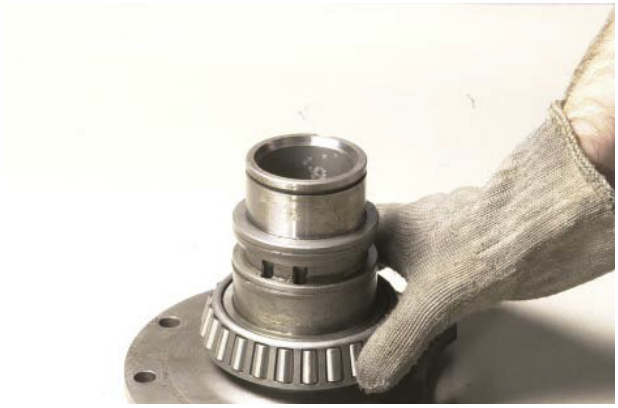


FIGURE 72: Warm bearing cone to 120° C [248° F] and install on clutch support.

⚠WARNING

Wear protective garments when handling hot objects.

FIGURE 73: Install clutch support piston rings.

REASSEMBLY OF TRANSMISSION CASE

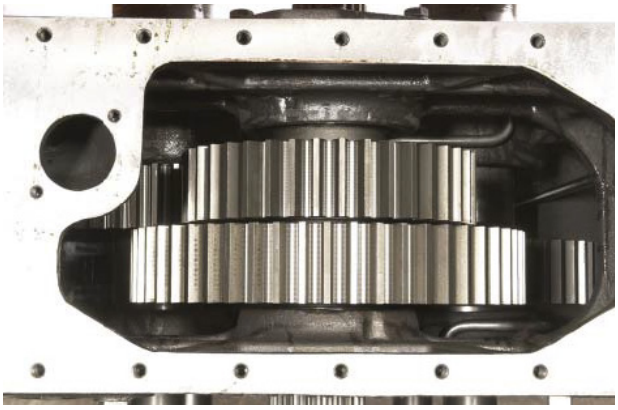


FIGURE 74: Install output shaft with the treaded end of the output shaft to the rear. Warm bearing to 120°C [248°F] and press taper bearing (larger diameter of taper inward) over threaded end of output shaft against shoulder on shaft. Position small output shaft gear in transmission case to the front. With longer offset of gear hub towards the front. Position large output shaft gear in transmission to the rear. Insert output shaft through rear bore of case and through small and larger output gears. Drive front tapered bearing (large diameter of taper inward) on output shaft until bearing shoulder is against smaller gear. Install bearing cups over front and rear bearings.

⚠WARNING

Wear protective garments when handling hot objects.

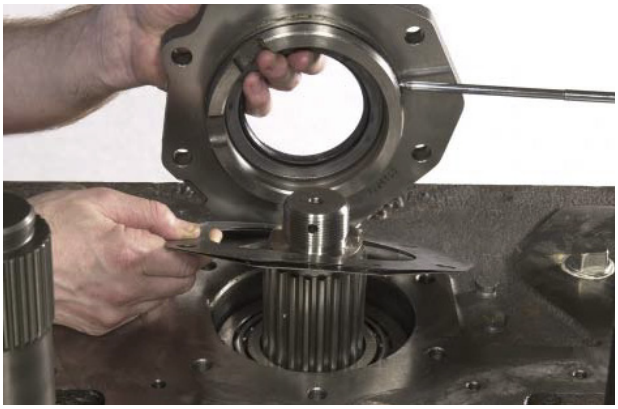


FIGURE 75: Install new O-ring on output shaft bearing cap. Install bearing cap and shims.

FIGURE 76: Install output shaft bearing cap bolts and lockwashers. See installation instruction for proper shim procedure.

FIGURE 77: Install oil shield.

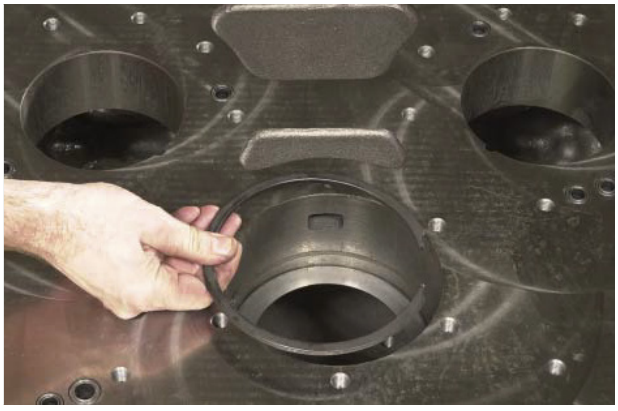


FIGURE 78: Install bearing locating snap ring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 79: Tap idler shaft bearing cup into place.

FIGURE 80: From the other side install idler shaft and bearings as an assembly.

NOTE:

Don't loose locking ball.

FIGURE 81: Warm idler shaft bearing cone to 120° C [248° F] and install on idler shaft.
Install 2nd bearing in the same manner. See figure below for installation sequence.

⚠WARNING

Wear protective garments when handling hot objects.

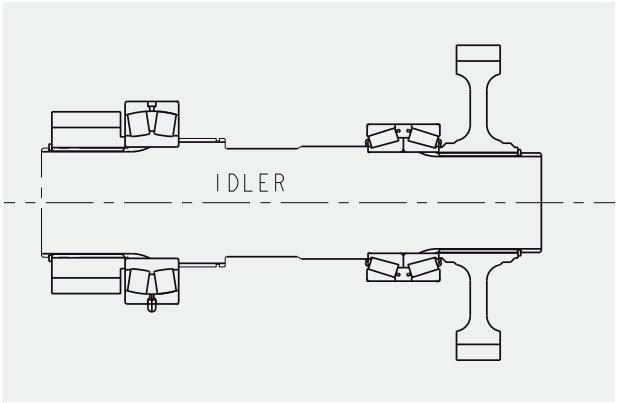


FIGURE 82: Detail

FIGURE 83: Install bearing cap and shims and torque bolts to specified torque. See installation instruction for shim procedure.

FIGURE 84: Install clutch drum shafts & gears. Install bearing lock nut, nut lock and lock nut.

FIGURE 85: Torque to specified torque

FIGURE 86: Secure nut loc by bending 2 lips.

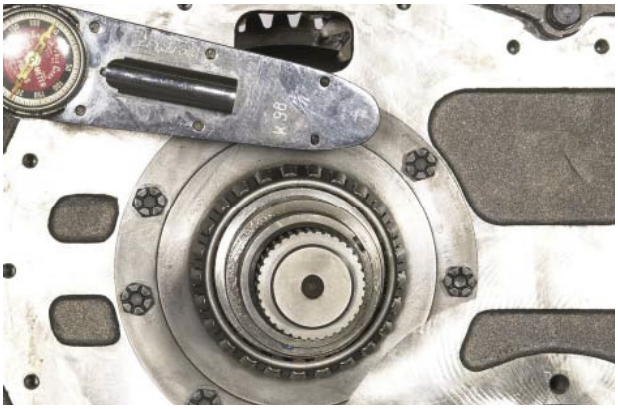


FIGURE 87: Install clutch support, clutch support lockwashers and screws and torque to specified torque.

FIGURE 88: Install idler gear

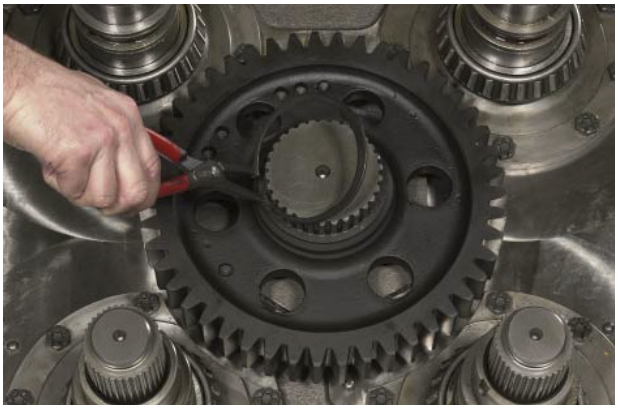


FIGURE 89: Install idler gear retaining snap ring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 90: Install clutch drum on clutch drum support.

FIGURE 91: Install tapered roller bearing.

FIGURE 92: Install keyed washer and washer retaining snapring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

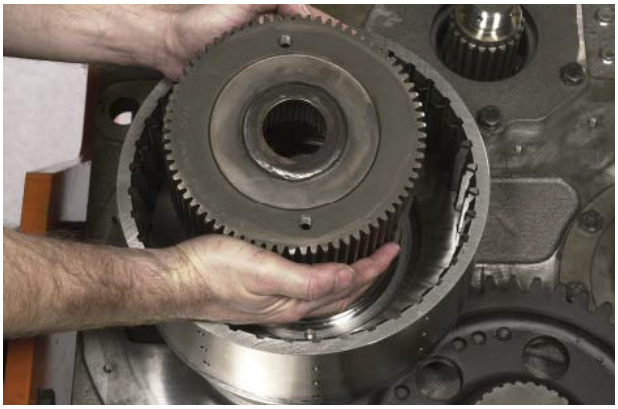


FIGURE 93: Install disc hub.

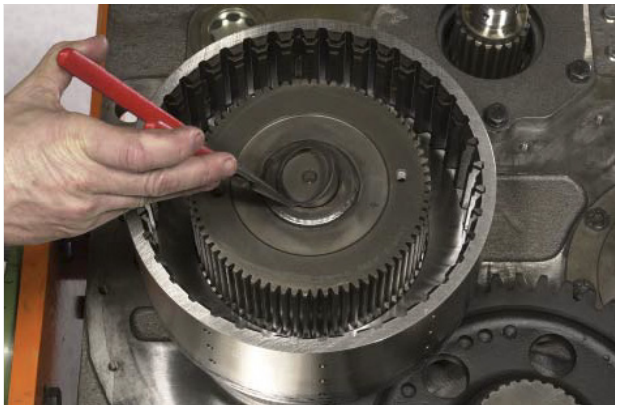


FIGURE 94: Install disc hub retaining ring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 95: Install one friction plate.

FIGURE 96: Install one outer clutch plate. Alternate friction and clutch plates till proper amount is reached.

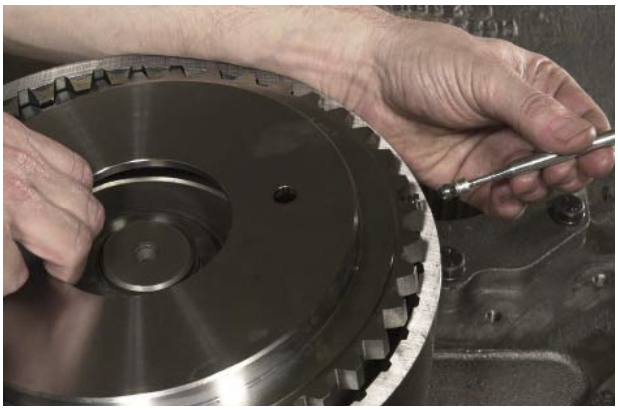


FIGURE 97: Install 2 springs and balls in end plate and install end plate into drum.

FIGURE 98: Install end plate retaining snapring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

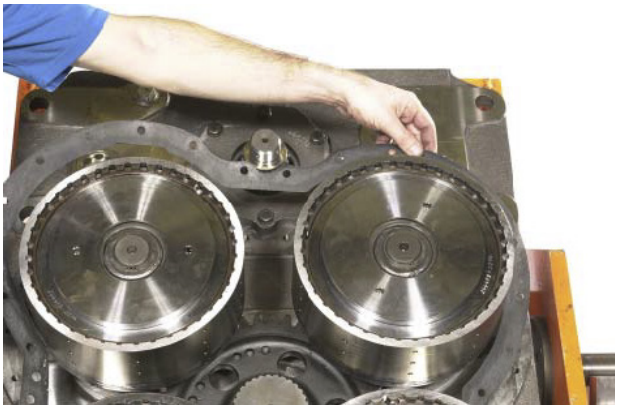


FIGURE 99: Install new gasket.

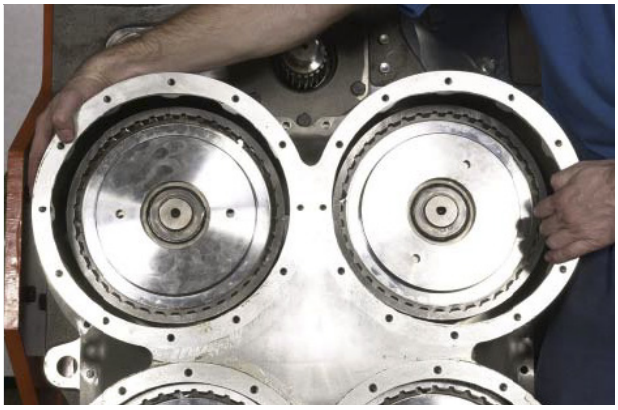


FIGURE 100: Use 2 aligning studs and install clutch drum cover.

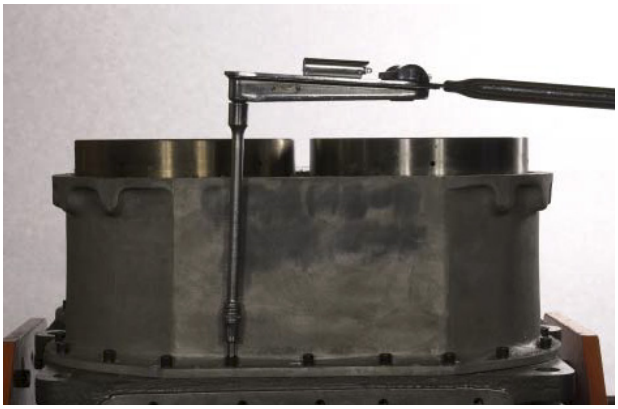


FIGURE 101: Install lockwashers and bolts and torque to specified torque.

FIGURE 102: Install 2 new gaskets

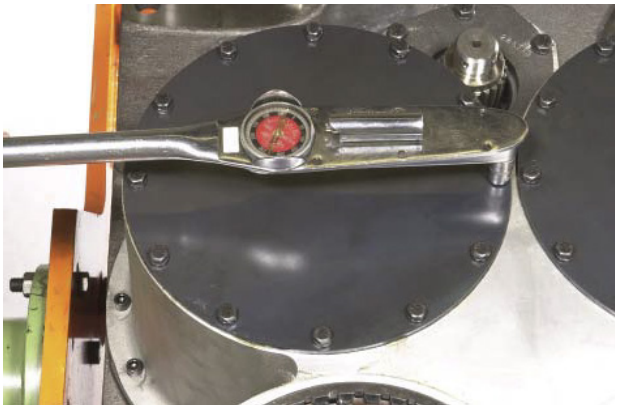


FIGURE 103: Install cover plates, lockwashers and screw and torque to half the specified torque.

FIGURE 104: Install new gasket.

FIGURE 105: Place spacer.

FIGURE 106: Turn shaft and using a puller remove bearing.

FIGURE 107: Place cover, lockwashers and bolts and torque to half the specified torque.

FIGURE 108: Install output flange on output shaft.

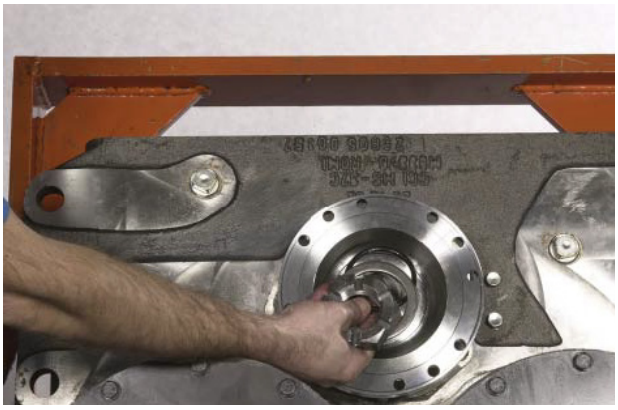


FIGURE 109: Install o-ring, washer and flange lock nut.

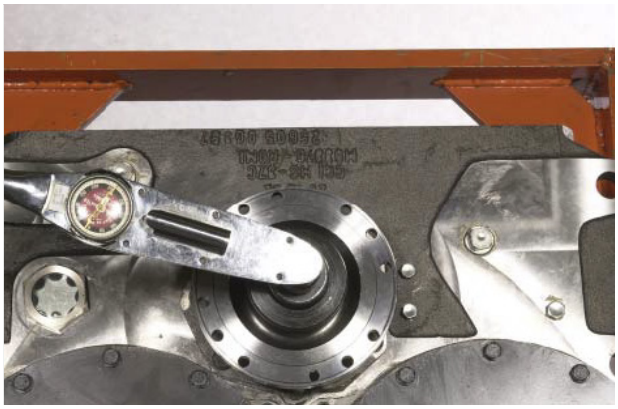


FIGURE 110: Torque to specified torque.

FIGURE 111: Install cotter pin and bend lips to secure.

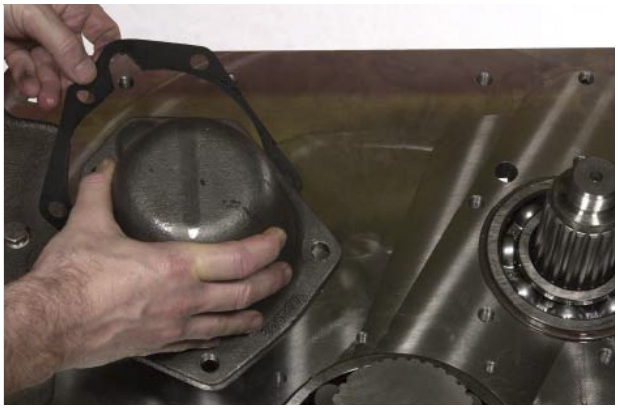


FIGURE 112: Install reverse shaft bearing cap gasket and bearing cap.

FIGURE 113: Place lockwashers and bolts and torque to specified torque.

FIGURE 114: Install new gasket and input shaft bearing cap.

FIGURE 115: Install lockwashers and bolts and torque to specified torque.

FIGURE 116: Install input flange.

FIGURE 117: Install o-ring, washer and nut on input shaft and torque to specified torque.

FIGURE 118: Install spacer, retainer and retaining nut on reverse shaft.

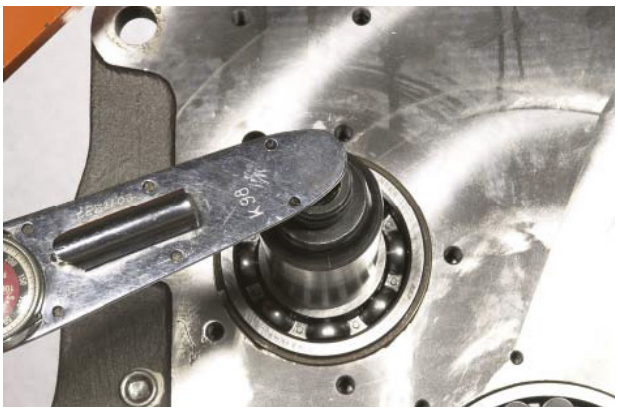


FIGURE 119: Torque to specified torque.

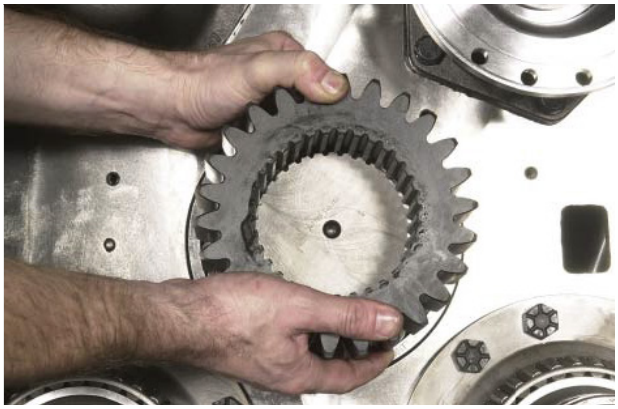


FIGURE 120: Install idler gear.

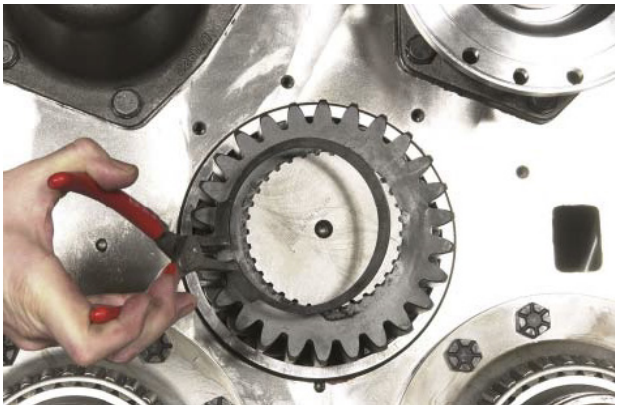


FIGURE 121: Install idler gear retaining snapring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

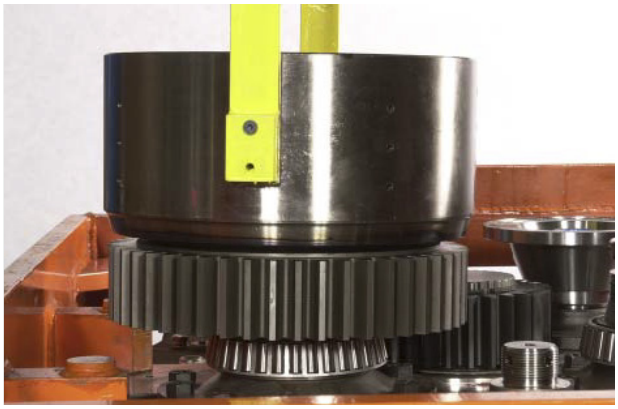


FIGURE 122: Install drum on drum support.

FIGURE 123: Install drum inner bearing cone.

FIGURE 124: Install bearing washer and bearing snap ring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 125: Install clutch piston.

FIGURE 126: Install disc hub. Check that disc hub oil baffle ring is in place and intact. (See inset)

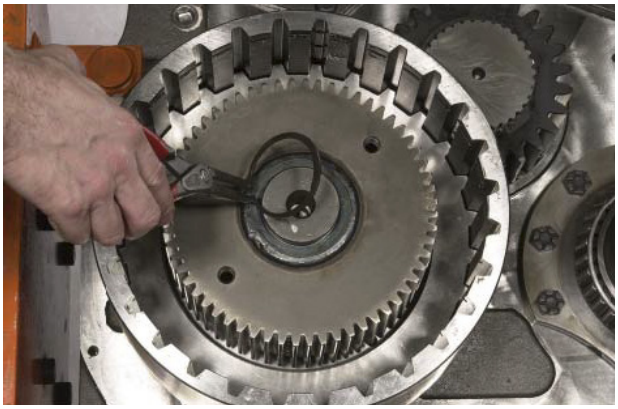


FIGURE 127: Install disc hub retaining snapring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠ WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

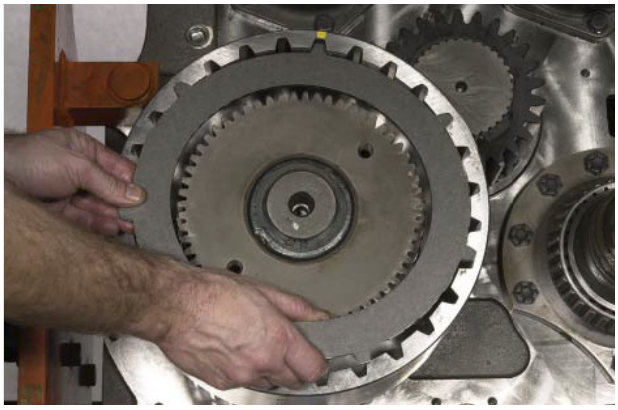


FIGURE 128: Install outer disc.

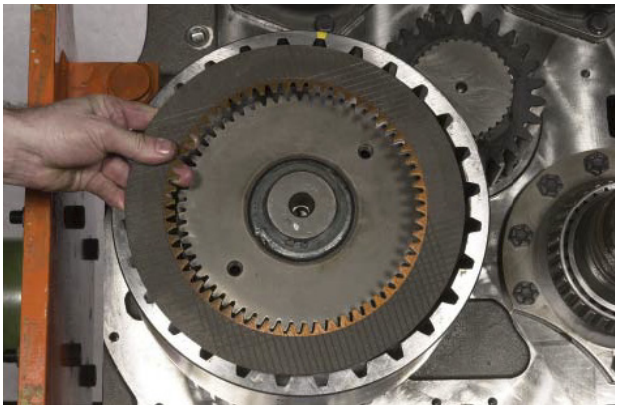


FIGURE 129: Install friction disc. Alternate outer disc and friction disc until proper amount is installed.

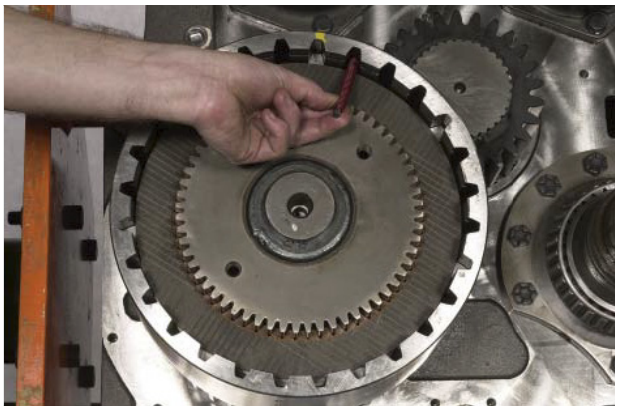


FIGURE 130: Install piston return springs and pins.

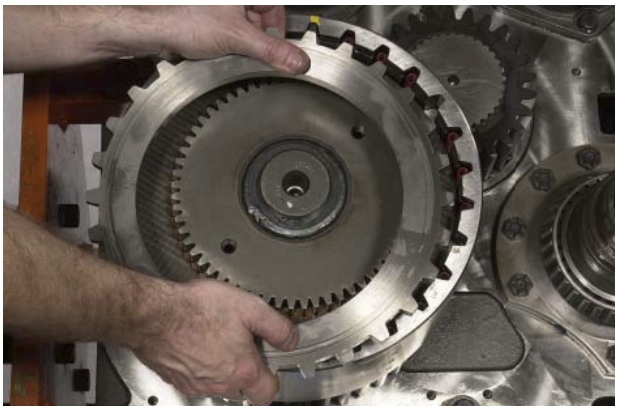


FIGURE 131: Install end plate.

FIGURE 132: Use special tool to press end plate donw and install end plate retaining ring.

⚠ CAUTION

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 133: Remove speedo drive spring.

FIGURE 134: Speedo drive housing to case screws and sealing washers and gently tap speedo drive housing from cover.

FIGURE 135: Remove speedo gear centre bolt.

FIGURE 136: Remove speedo bearing retaining snapring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 137: Remove speedo axle and bearing as an assembly.

FIGURE 138: Install speedo drive axle and bearing.

FIGURE 139: Install bearing locating snapring.

⚠ CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠ WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 140: Install speedo drive gear.

FIGURE 141: Install bolt and torque to specified torque.

FIGURE 142: Install new seal and install speedo onto cover.

FIGURE 143: Install sealing washers and bolts. Torque to specified torque.

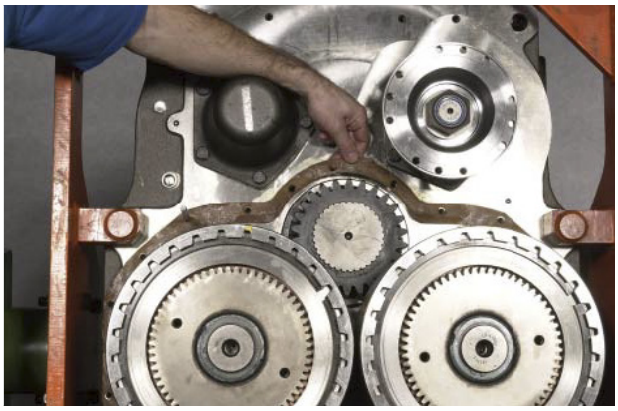


FIGURE 144: Install new gasket.

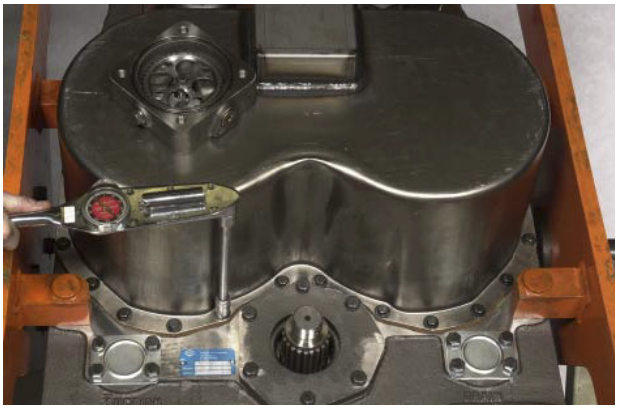


FIGURE 145: Install clutch cover, lockwashers and bolts and torque to specified torque.

FIGURE 146: Install gasket and speedo drive cover. Place bolts and torque to specified torque.

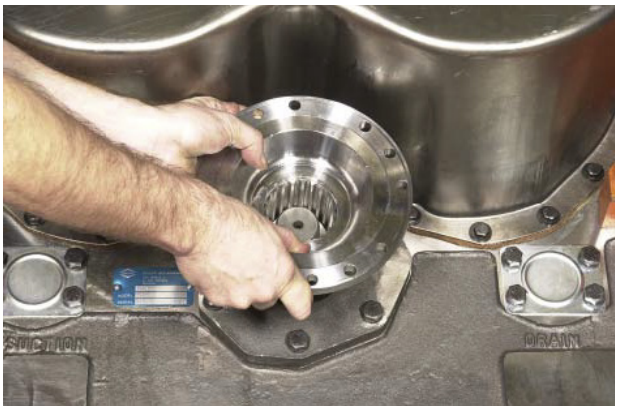


FIGURE 147: Install output flange.

FIGURE 148: Install Flange o-ring, washer and lock nut.

FIGURE 149: Torque nut to specified torque.

FIGURE 152: Clean and replace magnets in oil sump.

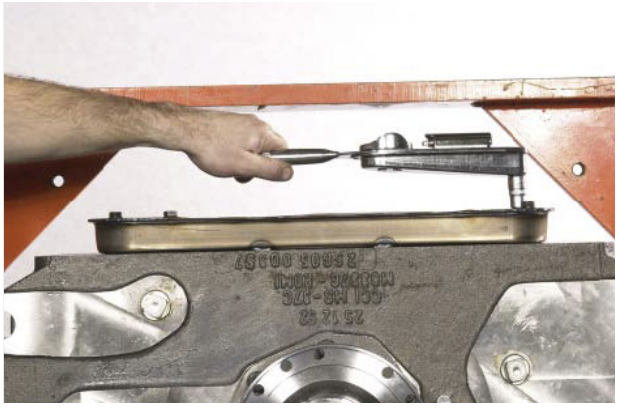


FIGURE 150: Use new screen assembly gasket, place and screen assembly on transmission case. Place bolts and lock-washers and torque to specified torque.

FIGURE 153: Install screws and lockwashers and torque to specified torque.

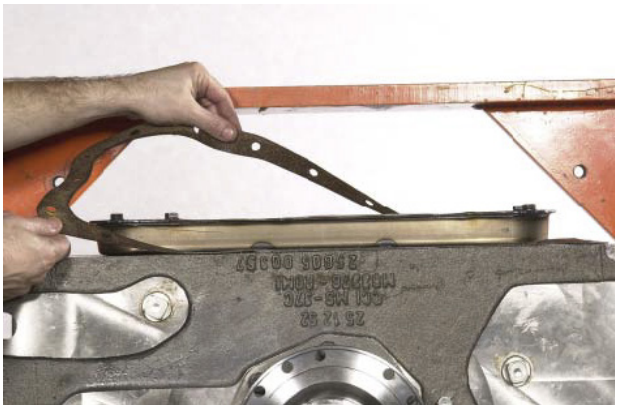


FIGURE 151: Install new oils sump gasket.

FIGURE 154: Install new control valve to transmission case gasket.

FIGURE 155: Install screws and torque to specified torque.

CLUTCH PROCEDURE FOR 8421-267 AND 8XXX-3YY

DISASSEMBLY

⚠WARNING

Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released.

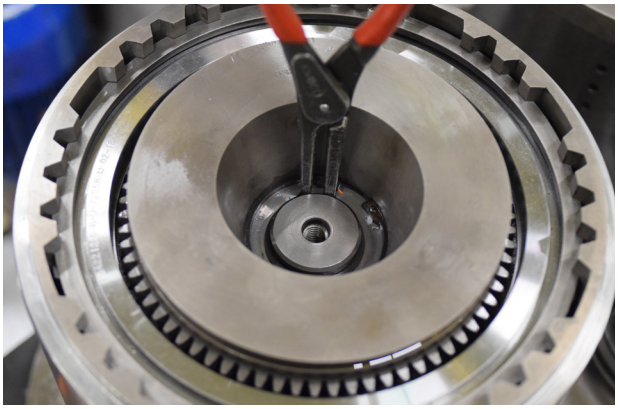


FIGURE 1: Remove clutch hub snap ring

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

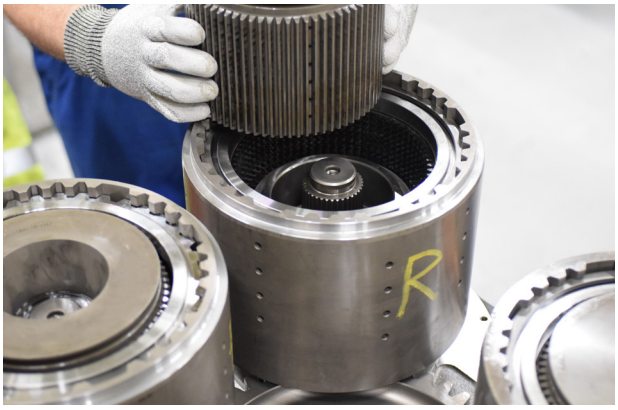


FIGURE 2: Remove clutch hub

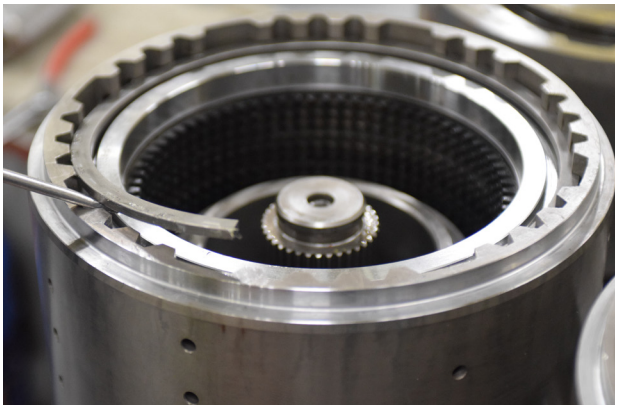


FIGURE 3: Remove end plate snap ring using a screw driver

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

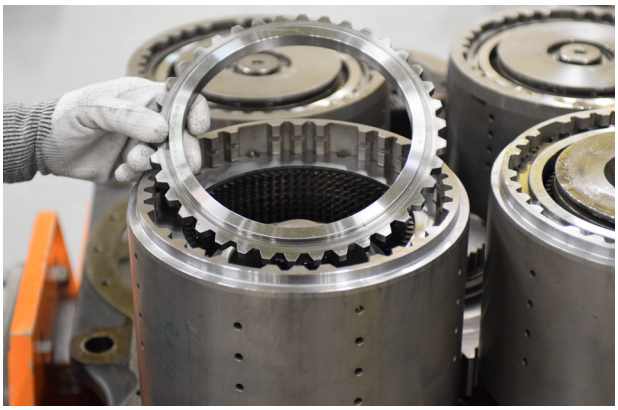


FIGURE 4: Remove end plate

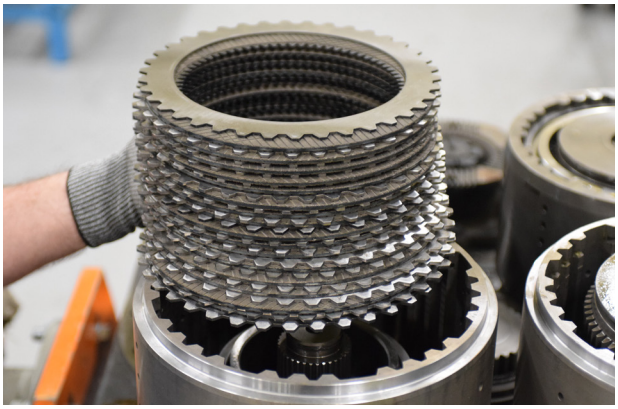


FIGURE 5: Remove clutch pack steel and friction disc's

FIGURE 6: Open clutch support snap ring

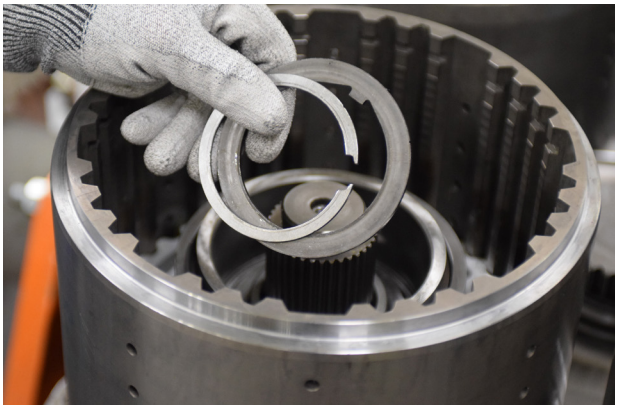


FIGURE 7: Remove clutch support snap ring and spacer

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

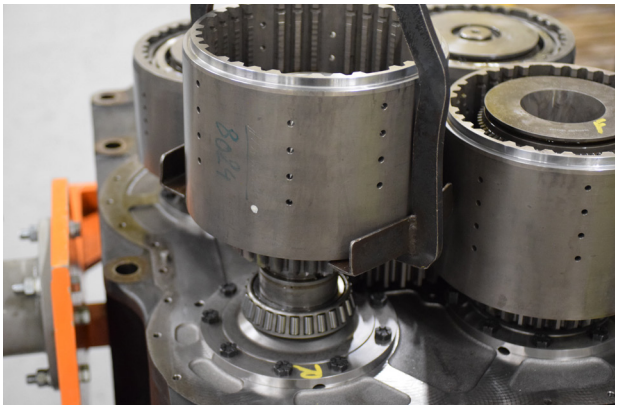


FIGURE 8: Remove clutch

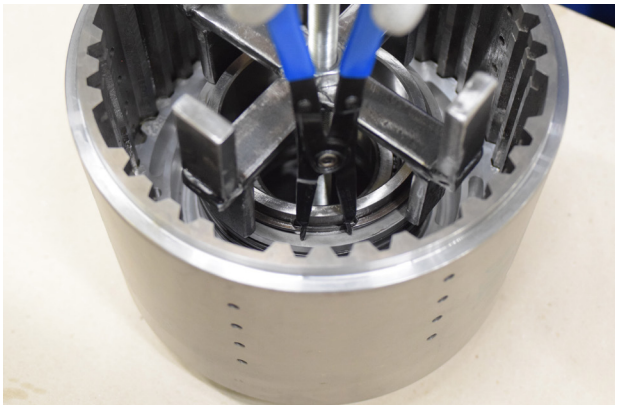


FIGURE 9: Install tool compress belleville springs washers and open snap ring

⚠CAUTION

MANDATORY PROCEDURE

Set the pliers following the correct procedure shown in END-STOP PLIER SETTING p. 130.

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

FIGURE 10: Remove belleville springs washer snap ring, spacer (2) and belleville springs washers (9)

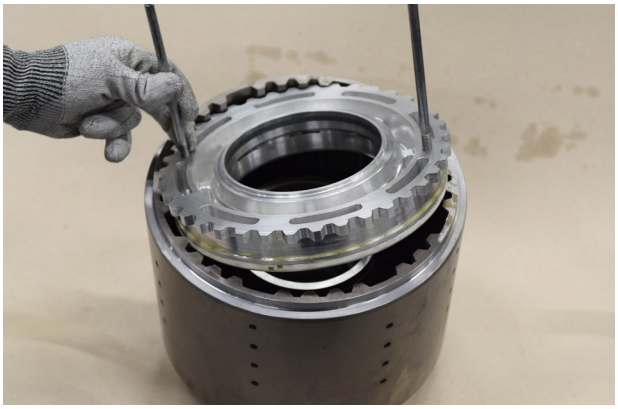


FIGURE 11: Remove clutch piston

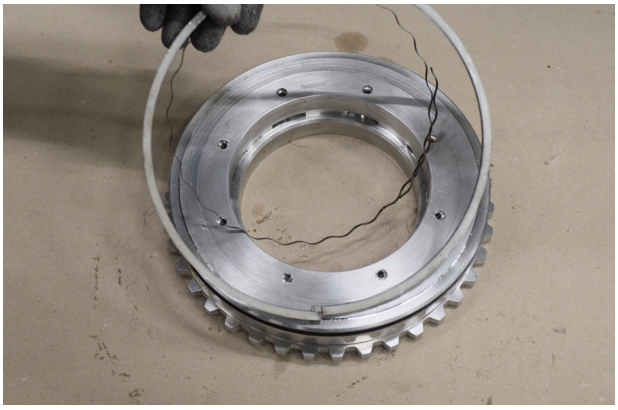


FIGURE 12: Remove clutch piston ring and expander

FIGURE 13: Remove clutch piston ring and expander.

ASSEMBLY

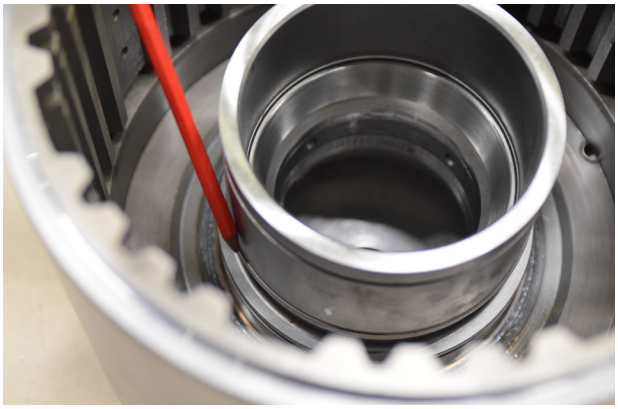


FIGURE 14: install clutch piston ring and expander after assembly apply grease after assembly apply grease on piston ring

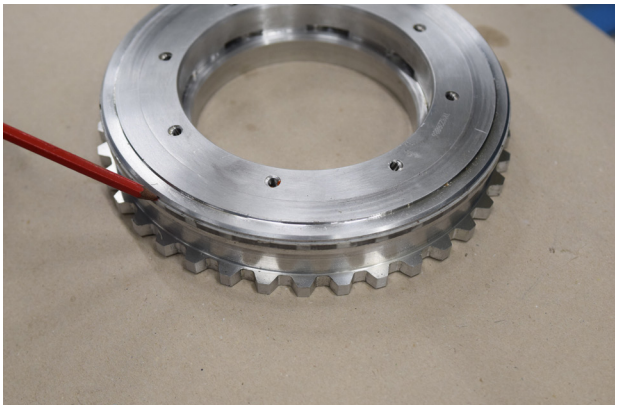


FIGURE 15: Install clutch piston ring and expander after assembly apply grease on piston ring

FIGURE 16: Install clutch piston assembly

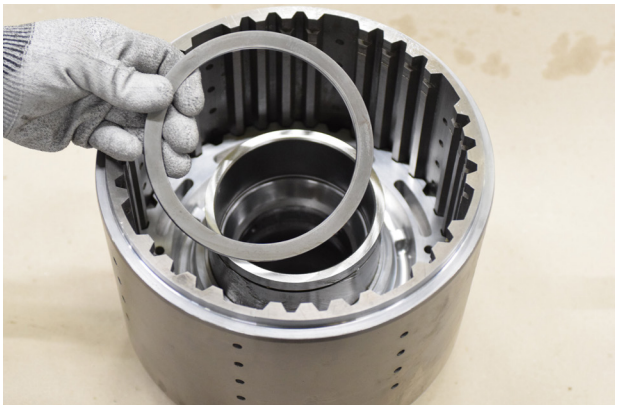


FIGURE 17: Install clutch piston spacer, with flat side up

FIGURE 18: Install belleville springs washers (10).

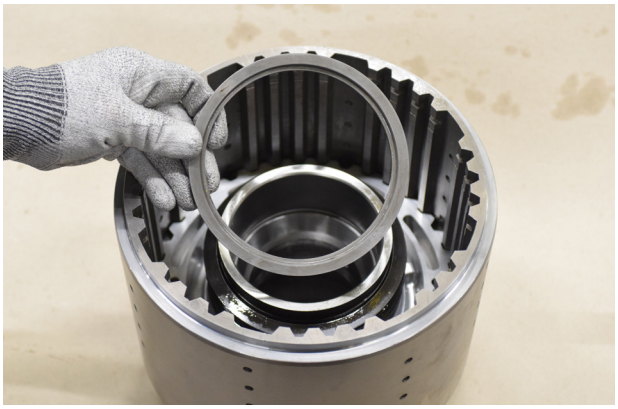


FIGURE 19: Install snap ring spacer, flat side down.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 20: Install belleville springs washer snap ring

FIGURE 21: Install tool, compress belleville springs washers and install belleville springs washer snap ring into groove

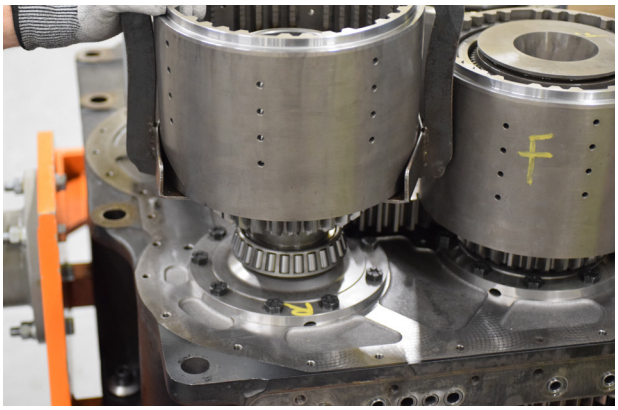


FIGURE 22: Install clutch drum

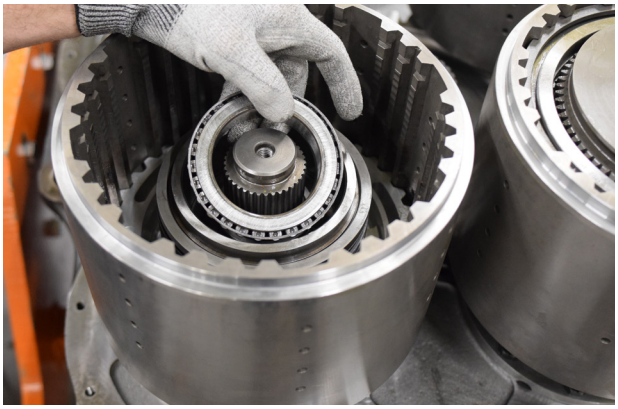


FIGURE 23: Install clutch drum bearing

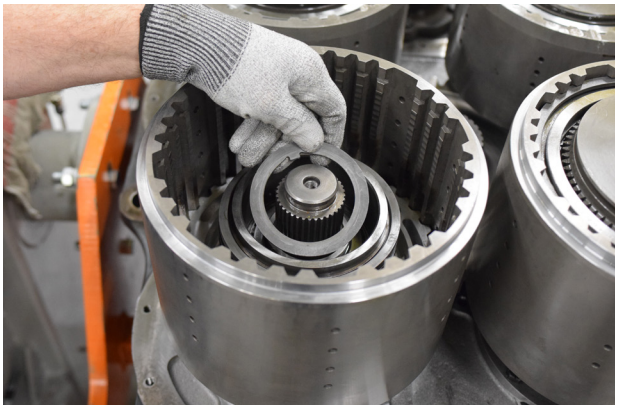


FIGURE 24: Install spacer

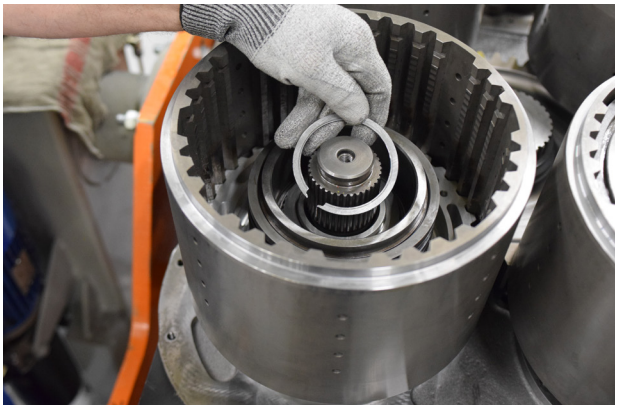


FIGURE 25: Install clutch support snap ring (see procedure for correct spacer and snap ring)

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

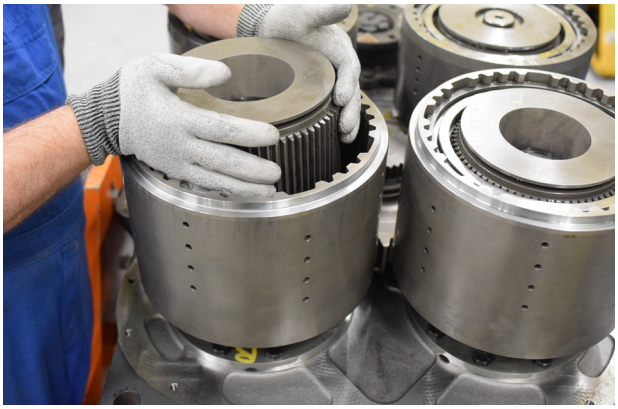


FIGURE 26: Install clutch drum hub

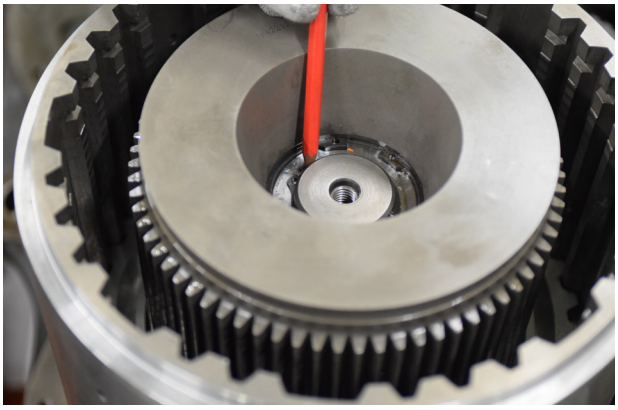


FIGURE 27: Install clutch drum hub snap ring

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

FIGURE 28: Install clutch patch, clutch pack shims. It is purchased as a pack

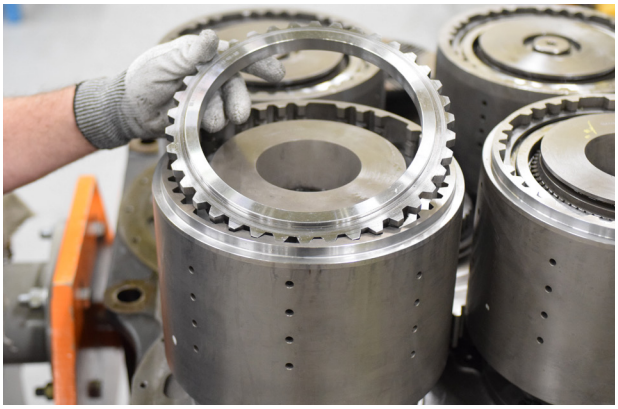


FIGURE 29: Install clutch pack end plate.

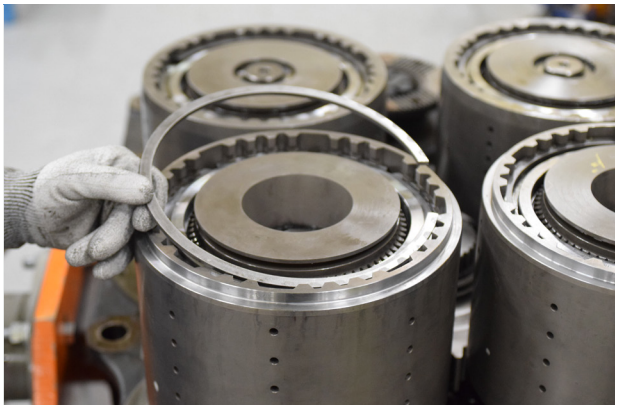


FIGURE 30: Install end plate snap ring.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

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