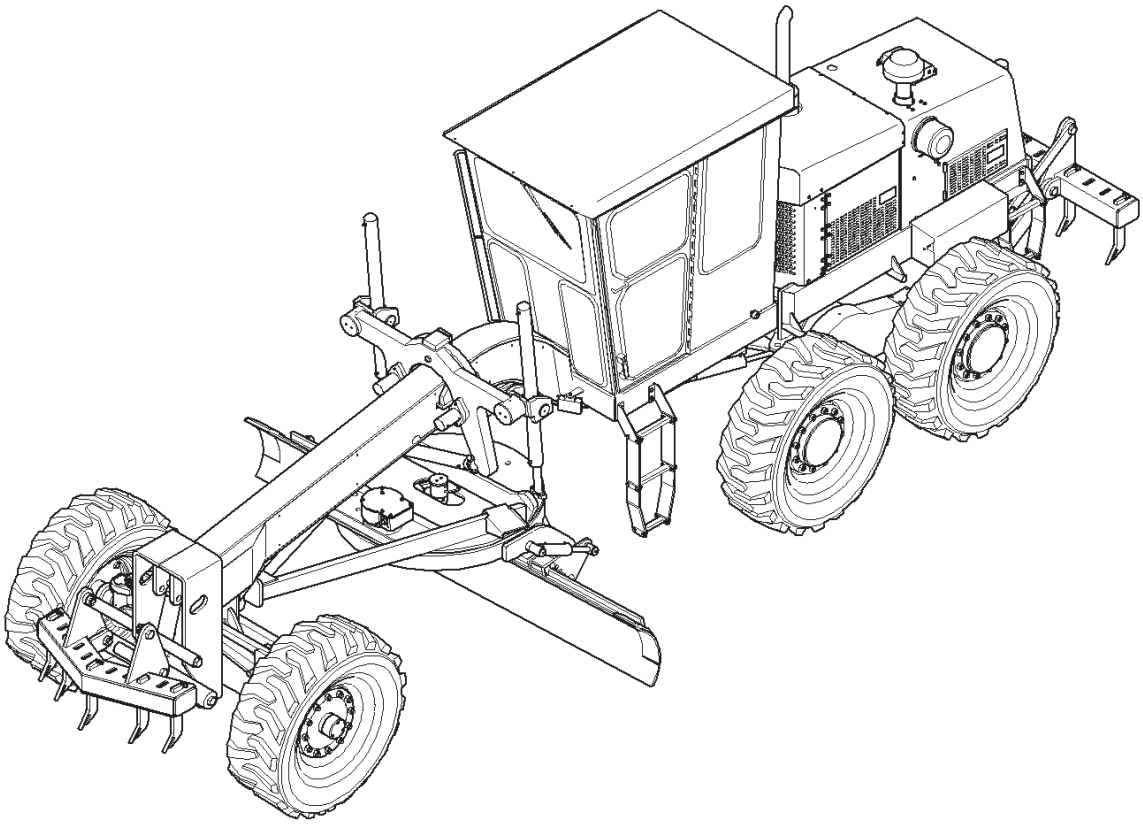
LeeBoy

OPERATIONS, SERVICE AND PARTS MANUAL



LeeBoy Model 785 Motor Grader

Manual No. 985480-01

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67016

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LIMITED WARRANTY POLICY

WARRANTY

1. Subject to the limitations, exclusions, and claims procedures set forth herein, LeeBoy warrants [to the first retail purchaser] that this product will be free from [substantial] defects in materials and workmanship during the warranty period.
2. If a defect in material or workmanship is found, your authorized LeeBoy Dealer is to be notified during the warranty period. LeeBoy and its authorized Dealer will repair or replace any part or component of the unit or part that fails to conform to the warranty during the warranty period.
3. The warranty period will begin on the initial start-up, training and delivery of the unit by the Dealer to the customer, and will expire after twelve (12) months following the delivery of the loader to the first retail purchaser. (See Dealer for additional warranty.)
4. Manufacturers' Warranties: Engines are warranted by their manufacturers and may have warranty coverage that differs from that of LeeBoy. LeeBoy does not warrant any engine.
5. Replacement parts furnished by LeeBoy are covered for the remainder of the warranty period applicable to the unit or component in which such parts are installed.
6. LeeBoy has the right to repair any component or part before replacing it with a new one.
7. All new replacement parts purchased by a LeeBoy Dealer will carry a six-month warranty.
8. This Limited Warranty is governed by the laws of the State of North Carolina.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESSED, STATUTORY AND IMPLIED WARRANTIES APPLICABLE TO UNITS, ENGINES, OR PARTS INCLUDING WITHOUT LIMITATION, ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE OR AGAINST INFRINGEMENT.

Limitations

LeeBoy has no obligation for:

1. Any defects caused by misuse, misapplication, negligence, accident or failure to maintain or use in accordance with the most current operating instructions.
2. Unauthorized alterations.
3. Defects or failures caused by any replacement parts or attachments not manufactured by or approved by LeeBoy.
4. Failure to conduct normal maintenance and operating service including, without limitation, providing lubricants, coolant, fuel, tune-ups, inspections or adjustments.
5. Unreasonable delay, as established by LeeBoy, in making the applicable units or parts available upon notification of a service notice ordered by same.
6. Warranty Responsibility: The warranty responsibility on all engines rests with the manufacturer of the engine.
7. Warranty and Parts Support: LeeBoy may have support agreements with some engine manufacturers for warranty and parts support. However, LeeBoy does not warrant the engine.
8. This Limited Warranty sets forth your sole remedy in connection with the sale or use of the LeeBoy product covered by this Limited Warranty.
9. This Limited Warranty extends only to the first retail purchaser, and is not transferable.
10. In the event any portion of this Limited Warranty shall be determined to be invalid under any applicable law, such provision shall be deemed null and void and the remainder of the Limited Warranty shall continue in full force and effect.

Items Not Covered

LeeBoy is not responsible for the following:

1. All used units or used parts of any kind.
2. Repairs due to normal wear and tear or brought about by abuse or lack of maintenance of the Machine.
3. Attachments not manufactured or installed by LeeBoy.
4. Liability for incidental or consequential damages of any type including, but not limited to, lost profits or expenses of acquiring replacement equipment.
5. Miscellaneous charges.

Other Limitations

IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT OR WARRANTY OR ALLEGED NEGLIGENCE OR LIABILITY WITHOUT FAULT, SHALL LEEBOY BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, LOSS OF PROFIT OR REVENUE, COST OF CAPITAL, COST OF SUBSTITUTED EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME COSTS, LABOR COSTS OR CLAIMS OF CUSTOMERS, PURCHASERS OR LESSEES FOR SUCH DAMAGES. IN NO EVENT WILL WARRANTY COMPENSATION, OR OTHER DAMAGES AVAILABLE FROM LEEBOY, EXCEED THE PURCHASE PRICE OF THE PRODUCT.

CONTACT INFORMATION

For information regarding parts and repairs about your LeeBoy product, first contact the dealer you purchased your product from.

If you have a persistent problem your dealer is unable to resolve, contact LeeBoy directly.

Record dealer information in the space provided.
For additional information about LeeBoy, please visit: www.leeboy.com.

Sales Representative: _____

Dealership Name: _____

Dealership Address: _____

Dealership Phone: _____

RECORD OF OWNERSHIP

Please fill out the following information and use it when you need to contact LeeBoy for service, parts or literature.

Grader Model Number: _____

Grader Serial Number: _____

Date of Purchase: _____

USER'S REFERENCE GUIDE

DELIVERY DATE_____

UNIT SERIAL NUMBER_____

ENGINE TYPE_____

ENGINE NUMBER_____

DEALER'S NAME AND ADDRESS

_____

_____

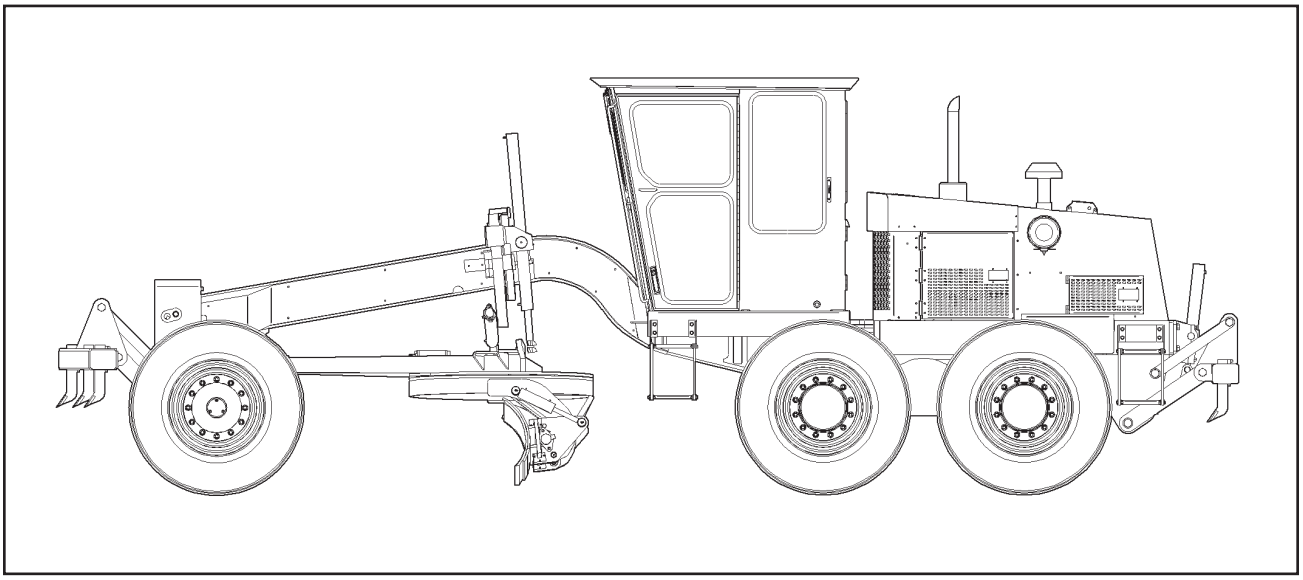
PHONE NUMBER_____

EQUIPMENT HOURS_____

SERVICE MANAGER _____

500 Lincoln County Parkway Ext. Lincolnton, NC 28092 • www.LeeBoy.com • (704) 966-3300

MODEL 785 MOTOR GRADER

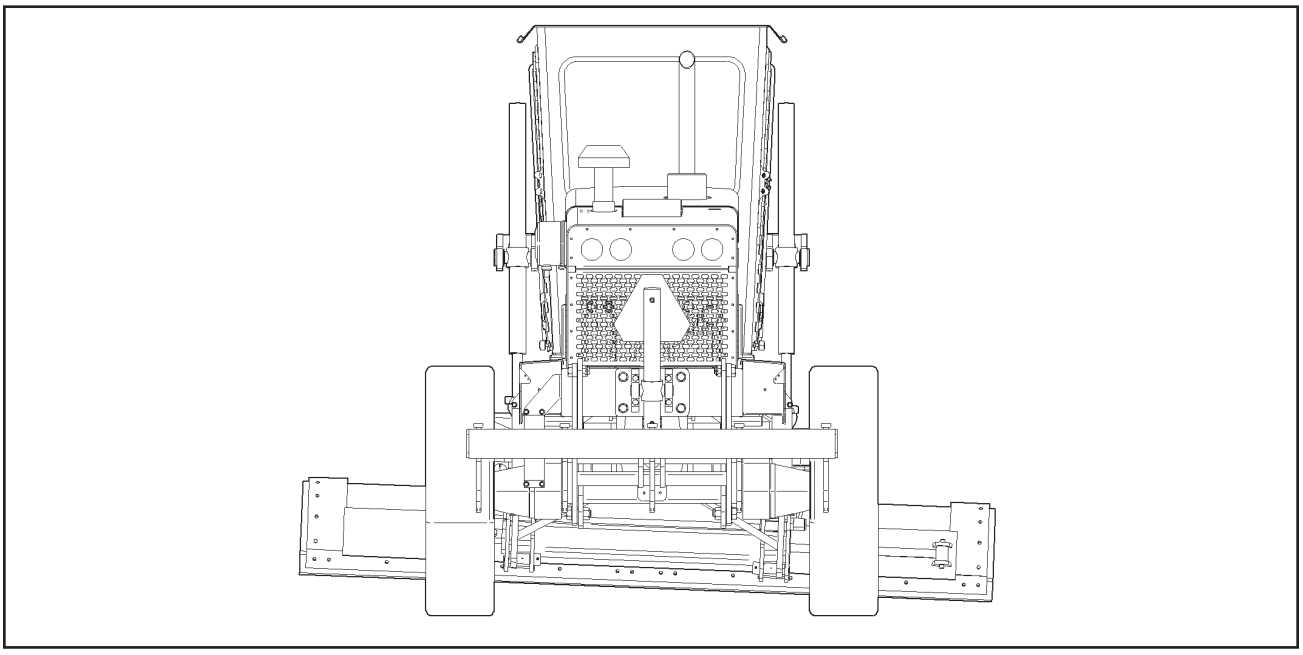


SIDE VIEW

This manual should be used with all related supplemental books, engine and transmission manuals, and parts books. Related Service Bulletins should be reviewed to provide information regarding some of the recent changes.

If any questions arise concerning this publication or others, contact your local LeeBoy Distributor for the latest available information.

Contents of this manual are based on information in effect at the time of publication and are subject to change without notice.



REAR VIEW

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Section 2
SAFETY

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IMPORTANT

SAFETY INSTRUCTIONS

This manual provides important information to familiarize you with safe operating and maintenance procedures. Even though you may be familiar with similar equipment, you MUST read and understand this manual before operating this unit.

Safety is everyone's business and is one of your primary concerns. Knowing the guidelines covered in the following paragraphs and in Section 1 will help provide for your safety, for the safety of those around you, and for the motor grader's proper operation.

LOOK FOR THESE SYMBOLS WHICH POINT OUT ITEMS OF EXTREME IMPORTANCE TO YOU AND YOUR COWORKERS SAFETY. READ AND UNDERSTAND THOROUGHLY. HEED THE WARNINGS AND FOLLOW THE INSTRUCTIONS.

⚠ DANGER YOU MUST FOLLOW ALL DANGER SAFETY NOTES. IF YOU DO NOT FOLLOW THE INSTRUCTIONS, YOUR MISTAKE MIGHT LIKELY RESULT IN VERY SERIOUS INJURY OR DEATH.

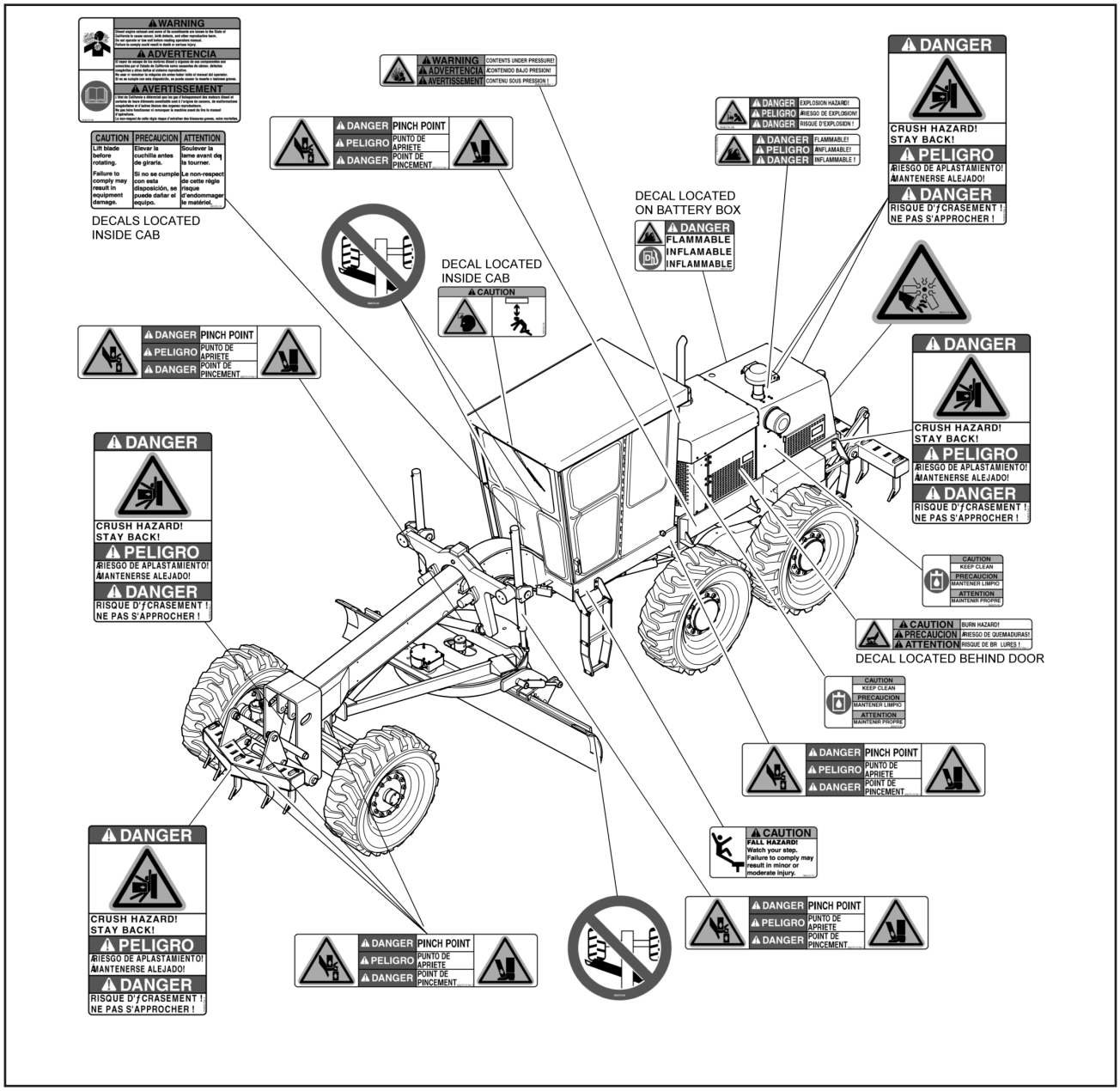
⚠ WARNING Safety notes must ALSO be followed. Your mistake might result in SERIOUS INJURY to yourself or others.

⚠ CAUTION Safety notes are ALSO very important. They point out to you where your mistakes could cause PHYSICAL HARM to you or others, or damage to the machine.

SAFETY PRECAUTIONS

If your motor grader has been repainted, it is extremely important that all the decals referring to cautions warnings and danger be replaced in their proper locations. The illustrations on this page will aid you in determining the proper locations. However for additional help, you should refer to the parts listing in the parts section of this manual and note the description column. Under this column a description on location is provided for each decal. If you still need more explicit instructions, contact your dealer.

NOTE: It is the responsibility of the owner and operator to make sure that all decals are readable and located on motor grader as designated by the manufacturer.`



785 DECALS and DECAL LOCATIONS

PRE-START INSPECTION

INSPECT machine. Have any malfunctioning, broken or missing parts corrected or replaced before using. Hydraulic hoses should be checked daily for wear and leaks. Replace if damaged.

CHECK that all the instruction and safety labels are in place and readable. These are as important as any other equipment on the machine.

READ and FOLLOW all instruction decals.

WEAR OSHA required safety equipment when running the motor grader.

FILL the fuel tank with the engine off. Never fill fuel tank near an open flame or when smoking.

Make sure all covers and guards are in place.

OPERATING SAFETY

ALWAYS make sure no person or object is in your line of travel BEFORE starting.

WORK slowly in tight areas.

DO NOT run engine in a closed building for long periods of time.

AVOID steep hills if possible.

ALWAYS look BEFORE changing your direction of travel.

AVOID leaving engine running without operator present.

ALWAYS wear your seatbelt.

NEVER attempt to jump clear of a tipping machine. FATAL crushing injuries will result.

BEFORE moving machine, check that all persons are clear.

When a signal person is used, BE SURE the person is in view at all times.

To prevent rollaway accidents, MAKE SURE machine is properly secured before leaving operator's seat.

NEVER attempt to mount or stop a moving machine.

USE handholds and steps when getting on or off machine. Be CAREFUL of slippery conditions.

STOPPING SAFETY

ALWAYS park the motor grader on solid, level ground in low range. If this is not possible, always park the motor grader at a right angle to the slope.

USE proper flags, barriers and warning devices especially when parking in areas of traffic.

DRIVING SAFETY

Know location of all bystanders before moving machine.

BE SURE backup warning system is properly operating.

USE a signal person when moving the machine.

AVOID power lines, serious injury or death may result.

KEEP riders off the machine.

MAINTENANCE SAFETY

NEVER work on the motor grader with the engine running.

NEVER fill the fuel tank with the engine running.

DO NOT change the engine governor settings.

ALWAYS replace damaged or lost decals.

DISCONNECT battery cables when working on the electrical system or when welding on the unit.

IF battery needs a charge, be sure battery charger is off when making connections.

BE SURE the correct battery polarity is observed (negative (-) to negative (-) and positive (+) to positive (+), when connecting a battery charger or jumper cable.

CLEAN trash from machine. Keep engine compartment and operator's station clean.

WARN others of Service Work. Before performing any machine work attach a "DO NOT OPERATE" tag to steering wheel.

UNDERSTAND the service procedure before beginning work.

ALWAYS lower attachments and implements to the ground before servicing. If work is required on a lifted machine or attachment, properly SUPPORT machine attachment or implement before working on it.

Section 3
INFORMATION

3

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Nameplate 3-2

GENERAL INFORMATION

This manual contains Specification information, Controls and Operating Procedures, Maintenance and Repair Procedures and Parts Lists for the 785 Motor Grader.

SPECIFICATIONS

Refer to Section 4 - SPECIFICATIONS in this manual for all major system specifications and for typical torque value tables.

CONTROLS AND OPERATING INSTRUCTIONS

Refer to Section 5 - COMPONENT LOCATION and Section 6 - OPERATION.

The operator of this equipment should READ, UNDERSTAND, and FOLLOW the operating instructions, Cautions, and Warnings provided in the front of this manual and in the OPERATION section.

⚠WARNING Do not attempt to operate the 785 Motor Grader unless fully trained in the machine operation, only authorized personnel should operate the Model 785 Motor Grader. All instructions provided in this manual and on the machine operating and warning decals must be followed to prevent damage to the equipment and/or injury to operating personnel.

MAINTENANCE PROCEDURES

Refer to Section 7 - MAINTENANCE, Section 8 - TROUBLESHOOTING, and Section 9 - SCHEMATICS in this manual for all maintenance and repair procedures.

⚠CAUTION All maintenance instructions provided in this manual should be followed to insure safety of the personnel performing the maintenance and to prevent damage to the machine.

NAMEPLATE

The Nameplate, Figure 1-1, contain the serial number and basic data used to identify the specific model on the Motor Grader.

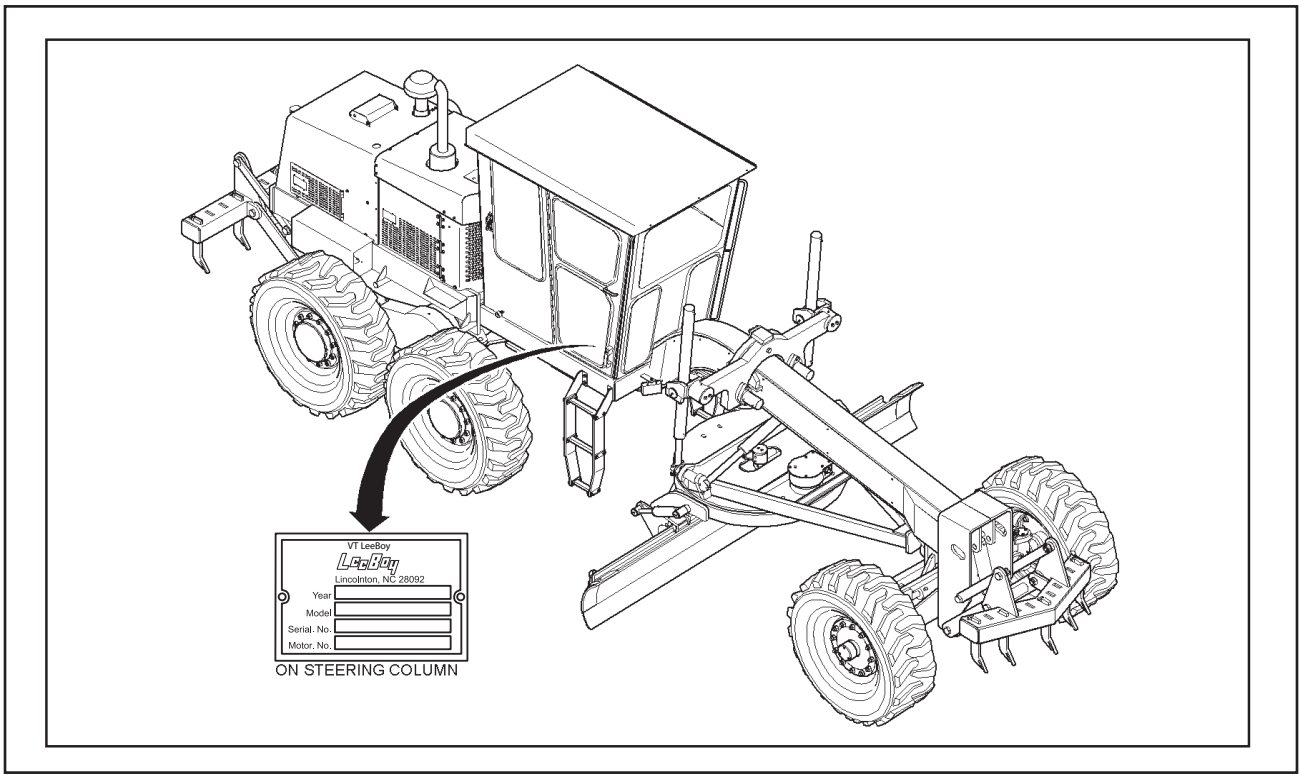


FIGURE 3-1. NAME PLATE

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Full Torque Nut Coupling Installation 4-8

4

SPECIFICATION TABLES

The specifications provided in this section are applicable to the Model 785 Motor Grader. Included in this section are machine weights, dimensions, performance and torque values for both metric and standard inch fasteners.

Table 4-1. ENGINE SPECIFICATIONS

ITEM	SPECIFICATIONS
ENGINE	
Manufacturer	CAT C4.4ETA
Horsepower	127 HP @2,200 RPM
Type	Four Stroke Turbo Charged and Charge Air Cooled, In-Line 4 cylinder Diesel engine (Tier III Compliant)
Bore & Stroke	4.13 in. [105 mm] x 5.00 in. [127 mm]
Displacement	269 cu. In.
Compression Ratio	18,2:1
Maximum Net Torque	368 Pound/Foot @1400 RPM
Lubrication system	Pressurized
Air Cleaner	Two Stage Dry Element
Engine Oil Type	15W-40
Capacity	10 Quarts [9.46 liter]
ENGINE COOLING SYSTEM	
Type	Liquid,
ENGINE FUEL	
Type Used	Diesel Fuel
Fuel Capacity	50 gallons [189.3 liters]
FUEL FILTER	
Fuel Filter	P/N 988536-03
Oil Filter	P/N 988536-02
Water Separator	P/N 988536-04

Table 4-2. ELECTRICAL SPECIFICATIONS

ITEM	SPECIFICATIONS
BATTERY	
Number Per Machine	Two maintenance free
Ampere Hour Rating	835 CCA
Voltage	12 Volts
Group #	24
ALTERNATOR	
Voltage	12 Volt, negative ground
Output Amperage	65 Amps
Fan Belt Tension	Belt tension mechanism keeps serpentine belt under tension at all times

STARTER	
Manufacturer	(See Engine Starter plate)
Voltage and Type	12 Volt, negative ground

Table 4-3. DIMENSION SPECIFICATIONS SEE (FIG. 4-1)

ITEM	SPECIFICATIONS
DIMENSIONS	
Overall Length	26 ft. [7.92 m]
Overall Length w/Rear mounted Scarifier	28 ft. [8.5 m]
Overall Height	10 ft. [3.0 m]
Overall Width	7 ft. [2.4 mm]
Wheelbase	17 ft. 4 in. [5.3 m]
Tandems	4 ft. 11 in. [1.5 m]
Weight Total	25,300 lbs. [11476 kg]
Front	7,800 lbs. [3538 kg]
Rear	17,700 lbs. [8029 kg]

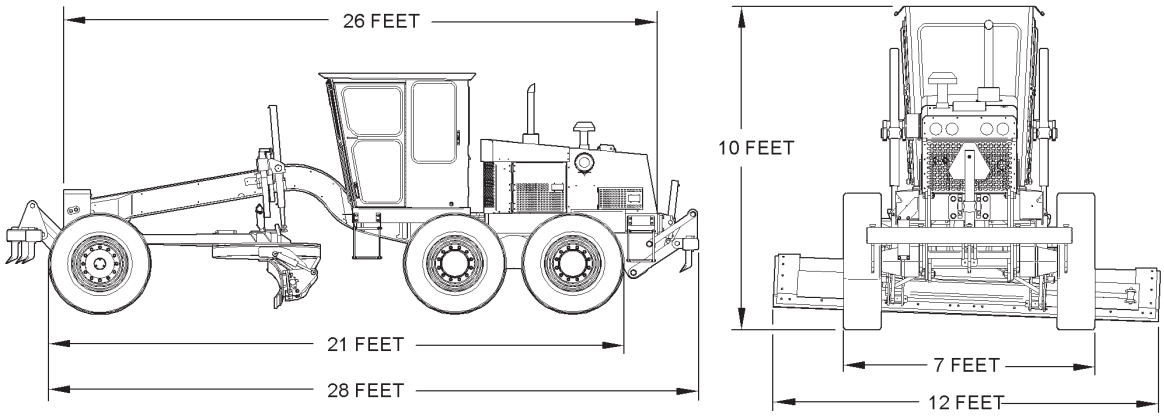


Figure 4-1. OUTLINE DIMENSIONAL DRAWING

Table 4-4.PERFORMANCE SPECIFICATIONS

ITEM	SPECIFICATIONS
SPEED	
Travel	0 - 21 mph [0 - 33.8 km/hr]
ARTICULATION	40° Total
WHEEL LEAN	17° each direction, 34° Total
STEERING	Hydraulic Power Steering
TURNING RADIUS	
Straight Frame	20 ft. [6.1 m] inside & 33 ft. [10.0 m] outside
Articulated	13 ft. [3.96 m] inside & 23.5 ft. [8.16 m] outside

Table 4-5. SCARIFIER

ITEM	FRONT	REAR
Spacing	4.5 in. [11.4 cm]	6 in. [15.2 cm]
Width	46 in. [116.8 cm]	73 in. [185.4 cm]
Lift Above Ground	17 in. [43.2 cm]	17 in. [43.2 cm]
Penetration	12 in. [30.5 cm]	12 in. [30.5 cm]

Table 4-6. MACHINE SYSTEM CAPACITY SPECIFICATIONS

ITEM	SPECIFICATIONS
Fuel	50 Gallons [189.3 L]
Cooling System	5.25 Gallons [19.9 L]
Crankcase	2.5 Gallons [9.5 L]
Hydraulic Oil Reservoir w/oil cooler	18 Gallons [68.1 L]

Table 4-7. MOLDBOARD

ITEM	SPECIFICATIONS
Length	12 ft. 0 in. [3 m]
Height	20 in. [0.5 m]
Cutting Edge Thickness	0.625 in. [1.588 cm]
Cutting Edge Width	6 in. [0.15 m]
Edge Tip Cutting Edge	0.625 in. [1.588 cm]

Table 4-8. HYDRAULIC SYSTEM

ITEM	SPECIFICATIONS
Hydraulic Pumps	Pressure compensated load sensing Proportional Hydraulic pump system
Hydraulic Oil Reservoir w/oil cooler	18 Gallons [68.13 liters]
Hydraulic Pressure Control System	2600 PSI (Operating) 325 PSI (Standby)

Table 4-9.TRANSMISSION

ITEM	SPECIFICATIONS
Transmission Type	Powershift, 6-speed forward/3-speed reverse

Shift Position	Forward Speed (mph)	Reverse Speed mph)
1	2.8	2.7
2	4.0	6.2
3	6.3	14.2
4	9.1	
5	14.7	
6	21.1	

Table 4-10. TYPES OF LUBRICANTS

ITEM	SPECIFICATIONS
Engine Oil	15W-40
Hydraulic Oil	AW #32 VG 32 Anti Wear
Grease	Shell Avania EP Grease or equivalent
Gear Box Oil	SAE 80W90

Table 4-11. TIRES

ITEM	SPECIFICATIONS
Size	15.50 X 25.00
Quantity	6
Pressure	35 PSI

TORQUE SPECS

Metric Fasteners

⚠WARNING **The following Table lists torque values for standard hardware and are intended as a guide for average application involving typical stresses and machined surfaces. Values are based on physical limitations of clean, plated and lubricated hardware. In all cases, when an individual torque value is specified, it should be followed instead of values given in this table.**

⚠CAUTION **Replace original equipment with hardware of equal grade.**

Table 4-12. Torque Specifications For Metric Fasteners

NOMINAL SIZE & PITCH	CLASS 8.8 [GRADE 5 EQUIVALENT]				CLASS 10.9 [GRADE 8 EQUIVALENT]			
	TORQUE FT. LBS.		TORQUE N•m		TORQUE FT. LBS.		TORQUE N•m	
	Dry	Lubed	Dry	Lubed	Dry	Lubed	Dry	Lubed
M4 x 0.7	2.27	1.70	3.07	2.30	2.27	2.31	4.17	3.13
M5 x 0.8	4.58	3.43	6.20	4.65	6.22	4.67	8.43	6.33
M6 x 1	7.75	5.83	10.5	7.90	10.60	7.97	14.3	10.8
M8 x 1.25	18.89	14.17	25.6	19.2	18.95	19.26	34.8	26.1
M10 x 1.25	39.11	29.52	53.0	40.1	53.87	40.59	73.0	55.0
M12 x 1.75	64.94	48.71	88.0	66.0	88.56	66.42	120.0	90.0
M14 x 2	103.32	77.49	140.0	105.0	140.22	107.01	190.0	145.0
M16 x 2	162.36	121.77	220.0	165.0	221.40	166.05	300.0	225.0
M20 x 2.5	317.34	236.16	430.0	320.0	428.04	321.03	580.0	435.0
M24 x 3	516.12	409.59	740.0	555.0	754.38	557.19	1010.0	755.0
M27 x 3	797.04	597.78	1080.0	810.0	1084.86	811.80	1470.0	1100.0
M30 x 3.5	1084.86	811.80	1470.0	1100.0	1476.00	1107.00	2000.0	1500.0

Inch Fasteners

⚠WARNING **The following Table lists torque values for standard hardware and are intended as a guide for average application involving typical stresses and machined surfaces. Values are based on physical limitations of clean, plated and lubricated hardware. In all cases, when an individual torque value is specified, it should be followed instead of values given in this table.**

⚠CAUTION **Replace original equipment with hardware of equal grade.**

Table 4-13. Torque Specifications For Standard Inch Fasteners

		CAPSCREWS: SAE GRADE 5				CAPSCREWS: SAE GRADE 8			
SIZE	THREAD	TORQUE FT. LBS.		TORQUE N•m		TORQUE FT. LBS.		TORQUE N•m	
		Dry	Lubed	Dry	Lubed	Dry	Lubed	Dry	Lubed
1/4	20 UNC	8	6	11	9	12	9	16	12
	28 UNF	10	7	13	10	14	10	19	14
5/16	18 UNC	17	13	24	18	25	18	33	25
	24 UNF	19	14	26	20	27	20	37	28
3/8	16 UNC	31	23	42	31	44	33	59	44
	24 UNF	35	26	47	36	49	37	67	50
7/16	14 UNC	49	37	67	50	70	52	95	71
	20 UNF	55	41	75	56	78	58	105	79
1/2	13 UNC	75	57	100	77	105	80	145	110
	20 UNF	85	64	115	86	120	90	165	120
9/16	12 UNC	110	82	145	110	155	115	210	155
	18 UNF	120	91	165	125	170	130	230	175
5/8	11 UNC	150	115	205	155	210	160	285	215
	18 UNF	170	130	230	175	240	180	325	245
3/4	10 UNC	265	200	360	270	375	280	510	380
	16 UNF	295	225	405	300	420	315	570	425
7/8	9 UNC	430	320	580	435	605	455	820	615
	14 UNF	475	355	640	480	670	500	905	680
1	8 UNC	645	485	875	655	910	680	1230	925
	14 UNF	720	540	980	735	1020	765	1380	1040
1-1/8	7 UNC	795	595	1080	805	1290	965	1750	1310
	12 UNF	890	670	1210	905	1440	1080	1960	1470
1-1/4	7 UNC	1120	840	1520	1140	1820	1360	2460	1850
	12 UNF	1240	930	1680	1260	2010	1500	2730	2050
1-3/8	6 UNC	1470	1100	1990	1490	2380	1780	3230	2420
	12 UNF	1670	1250	2270	1700	2710	2040	3680	2760
1-1/2	6 UNC	1950	1460	2640	1980	3160	2370	4290	3210
	12 UNF	2190	1650	2970	2230	3560	2670	4820	3620

Hydraulic Fittings

Tightening Flare Type Tube Fittings

1. Check the flare and flare seat for defects that might cause leakage.
2. Align tube with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting the tube(s), use two wrenches. Place one wrench on the connector body and with the second, tighten the swivel nut to the torque shown in **Table 4-12. Torque Specifications For Metric Fasteners**.

NOTE: The torque values shown are based on lubricated connections as in assembly.

Table 4-14. Torque Specifications For Flare Type Tube Fittings

TUBE SIZE OD	NUT SIZE (ACROSS FLATS)	TORQUE VALUE		RECOMMENDED TURNS TO TIGHTEN (AFTER FINGER TIGHTENING)	
(in)	(in)	(N•m)	(lb-ft)	(N•m)	(lb-ft)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	15	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1 1/4	102	75	3/4	1/8
7/8	1 3/8	122	90	3/4	1/8

Full Torque Nut Coupling Installation

The only completely reliable method of creating a consistent leak free, long lasting connection is to ensure that the coupling is brought to the proper torque.

The best method of ensuring a coupling is brought to the proper torque is to use a torque wrench with crowfoot. To ensure the proper torque is met, use the flats method of torque verification. Flats method may be used alone in situations where a torque wrench is inaccessible or unavailable.

There are 7 steps involved in proper coupling installation:

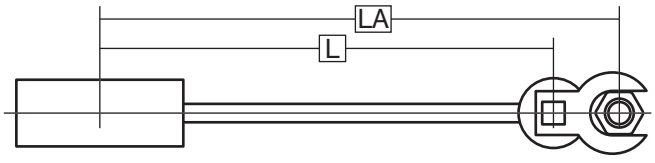
5. Determine the correct torque value for your coupling.

NOTE: Only use the torque values specified from the manufacturer, do not use SAE torque recommendations.

The minimum torque values are adequate for sealing in most applications, and the maximum torque values should never be exceeded.

6. Calculate the correct torque wrench setting using (see ***Equations*** in Section 4-8).

NOTE: The most straight forward method of determining the correct torque setting is to multiply the desired torque by the length of the wrench from the center of the handle to the center of the drive (L) divided by the length of the wrench from the center of the handle to the crowfoot center (LA), (**Figure 4-2**).



Torque Wrench - Crowfoot

Figure 4-2

NOTE: Torque Wrench Setting = Desired Torque * L / LA

7. Ensure that the seal face and threads are clean and in good condition. Do not lubricate coupling threads.

NOTE: O-Rings should be lubricated with light oil, but threads should be completely dry unless making pipe thread connections (interference seal).

Attach the male end of the hose onto the equipment first, since it may be necessary to rotate the entire hose assembly to tighten the male threads. Then route the hose into position while avoiding twisting the hose.

8. Hand tighten the connection by bringing seal face in contact and rotating the nut by hand until it stops.

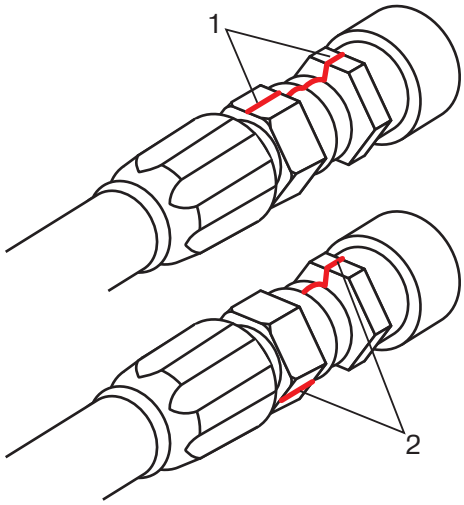
NOTE: By definition hand tight is 0.3-1 ft-lb or when the seal faces are touching and with the threads engaged the hex can no longer be rotated by hand.

9. Mark a line across the coupling nut and backup hex for flats method verification of coupling torque (**Figure 4-3**).

10. Apply a wrench to the backup hex to prevent the coupling and hose from moving while tightening the nut with a torque wrench.

NOTICE **Failure to retain the backup hex during installation will also result in additional clamp load force that could cause damage to the seal face.**

NOTE: The coupling nut must be in motion for an accurate torque reading. If the nut is stopped before final torque value is achieved, it must be loosened and retightened until the torque is attained while the nut is in motion.



Flats Method Tightening

Figure 4-3

1 - Mark Line on Nut

2 - Example 2 Flats difference

11. If a torque wrench cannot fit into the coupling area or if it is unavailable, flats method may be used to ensure that the coupling is properly tightened, as shown in **Figure 4-3**.

NOTE: The mark placed on the nut and backup hex after hand tightening should have rotated 1 to 1.5 flats during final tightening. At this point in time, if desired, the nut and backup hex may be marked to indicate if the coupling loosens over time.

Table 4-15. Torque Specifications For US Style Coupling Terminations

JIC, SAE 45°, ORFS, O-Ring Boss, Gates Adapterless and MegaSeal										
Dash Size	JIC 37°, SAE 45° & MegaSeal (steel)		JIC 37°, SAE 45° & Mega-Seal (steel)		Flat Face O-Ring Seal (Steel)		SAE O-Ring Boss (Steel) & Gates Adapterless ≤ 4000 PSI		SAE O-Ring Boss (Steel) & Gates Adapterless > 4000 PSI	
1/16 Inch	ft-Lb		ft-Lb		ft-Lb		ft-Lb		ft-Lb	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
-3									8	10
-4	10	11	5	6	10	12	14	16	14	16
-5	13	15	7	9					18	20
-6	17	19	12	15	18	20	24	26	24	26
-8	34	38	20	24	32	40	37	44	50	60
-10	50	56	34	40	46	56	50	60	72	80
-12	70	78	53	60	65	80	75	83	125	135
-14					65	80			160	180
-16	94	104	74	82	92	105	111	125	200	220
-20	124	138	75	83	125	140	133	152	210	280
-24	156	173	79	87	150	180	156	184	270	360
-32	219	243	158	175						

Table 4-16. Torque Specifications For DIN 24, DIN 60, and Inverted Cone Style Coupling Terminations

DIN 24, DIN 60, and Inverted Cone			
Size		Torque	
mm		ft-Lb	
Light Series Tube OD	Heavy Series Tube OD	Min	Max
6		7	15
8		15	26
10	8	18	30
12	10	22	33
14	12	26	37
15	14	30	52
	16	30	52
18	20	44	74
22	25	59	89
28	30	74	111
	38	74	162
35		133	184
42		148	221

Table 4-17. Torque Specifications For 4-Bolt Flange Connections

4-Bolt Flanges		
Dash Size	Bolt Size	Torque
1/16 Inch	Inch	ft-Lb
-8	0.31	17
-12	0.38	26
-16	0.44	43
-20	0.50	65
-24	0.63	130
-32	0.75	220

1. Align faces and finger tighten bolts before applying final torque in a pattern. The seal faces must be parallel with even bolt tension to seal properly.
2. Torque values apply to bolts which are plated or coated in light engine oil.
3. Before assembly lubricate O-Ring with light oil (SAE 10W or 20W).

Table 4-18. Torque Specifications For SAE Male Flareless Assembly (MFA)

SAE Male Flareless Assembly (MFA)
After hand tight rotate nut one full turn (8 flats)

Table 4-19. Torque Specifications For NPTF Dry Seal Pipe Threads

NPTF	
Dash Size	Max Torque
1/16 Inch	ft-Lb
-2	20
-4	25
-6	35
-8	45
-12	55
-16	65
-20	80
-24	95
-32	120

1. The torque values obtained from tightening pipe threads can vary considerably depending on thread condition. Adequate sealing can occur at values much lower than the maximum values listed above. Only enough torque to achieve adequate sealing should be used.
2. When using a male tapered pipe thread with a female straight or parallel pipe thread, maximum values are 50% of those listed in the table.
3. If thread sealant is used, maximum values shown should be decreased by 25%.

Table 4-20. Torque Specifications For BSP 30° Inverted Cone and JIS Coupling Terminations

BSP 30° Inverted Cone and JIS		
Dash Size	Torque	
mm	ft-Lb	
1/16 Inch	Min	Max
-2	7	9
-4	11	18
-6	19	28
-8	30	36
-10	37	44
-12	50	60
-16	79	95
-20	127	152
-24	167	190
-32	262	314

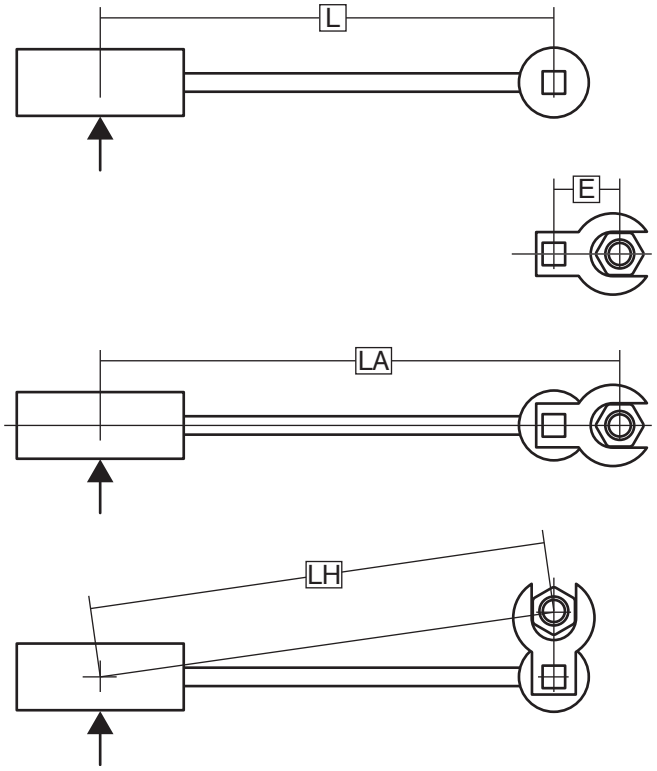
Table 4-21. Flats Method Values For Selected Terminations

Flats Method Values		
Termination Type	Dash Size	Flats
	1/16 Inch	
JIC	4	1.5 - 1.75
JIC	6	1.0 - 1.5
JIC	8	1.5 - 1.75
JIC	10	1.0 - 1.5
JIC	12	1.0 - 1.5
JIC	16	.75 - 1.0
JIC	20	.75 - 1.0
JIC	24	.75 - 1.0
JIC	32	.75 - 1.0
JIS	4	.5 - 1.5

1. Seal faces must be in contact and the fitting fully hand tightened before marking flats.
2. Flats method is most accurate for the first assembly cycle, for multiple disassembly/ assembly cycles torque values are more reliable.
3. Tightening 2 flats or more is analogous to sever over torque and may damage seal faces.

Determining Torque Setting

There are several methods of determining the correct setting on the torque wrench when using a crowfoot. All of the methods involve making the setting proportional to the effective change in length of the wrench multiplied by the desired final torque.



Measurements Needed

Figure 4-4

L = Distance from center of torque wrench handle to the center of socket drive

E = Distance from center of socket drive to the center of crowfoot

LA = Distance from center of torque wrench handle to the center of crowfoot

LH = Distance from center of torque wrench handle to the center of crowfoot, when mounted at 90°

TD = Desired torque at the fitting

TS = Torque setting indicated on wrench

Equations

Equation 1

Torque setting if the crowfoot is placed in line with respect to the wrench:

$$TS = TD * L / LA$$

or

$$TS = TD * L / (L+E)$$

Equation 2

Torque setting if the crowfoot is placed at 90° with respect to the wrench

$$TS = TD * L / LH$$

or

$$TS = TD * L / \sqrt{(L^2 + E^2)}$$

Equation 3

To estimate the crowfoot size (E)

E = Drive Size * 0.5 + Distance between Drive & Open End + Wrench Size * 0.5774

Section 5
COMPONENT LOCATION

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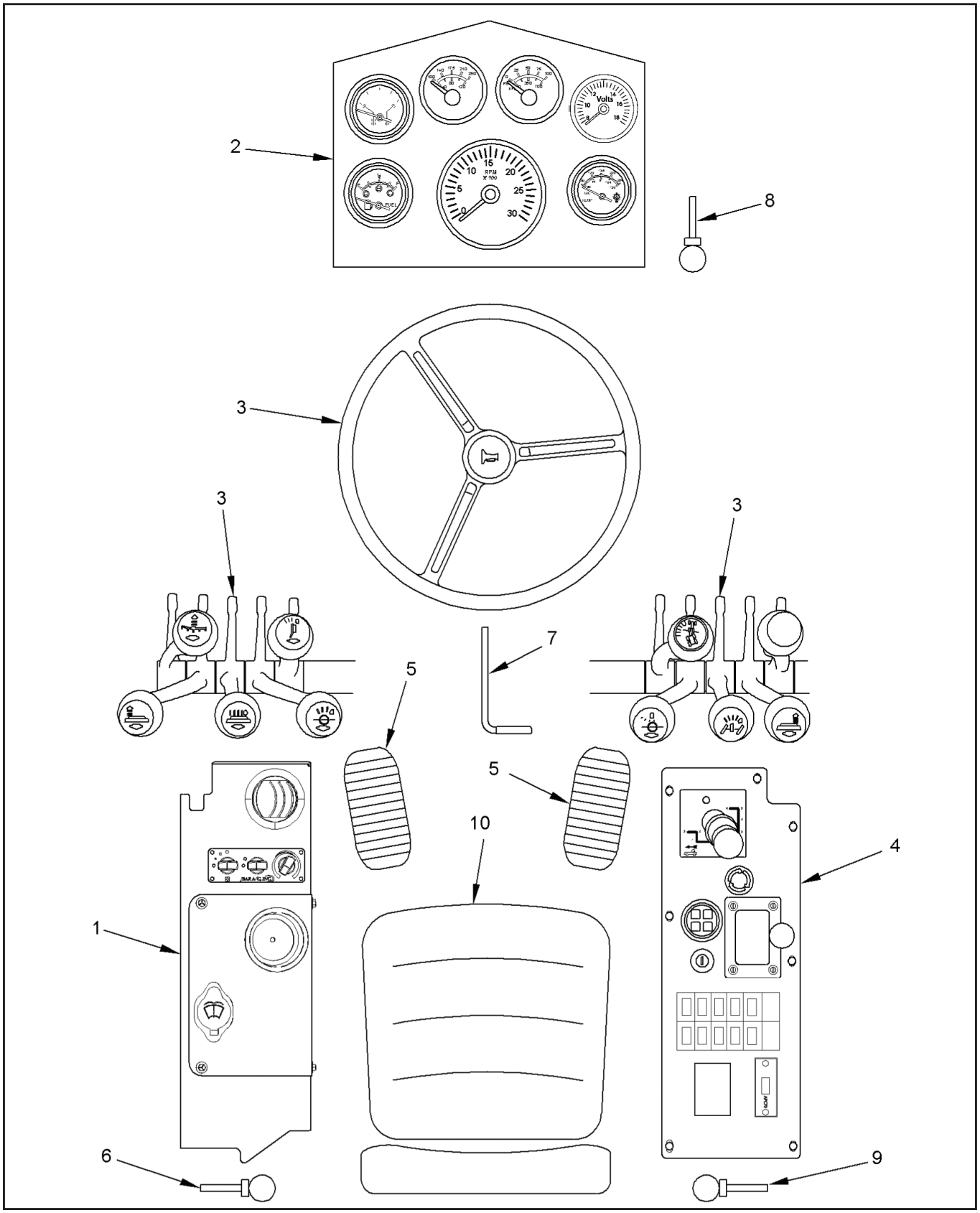


Figure 5-1. OPERATING CONTROL GROUPS

Table 5-1. OPERATING CONTROL GROUPS (see Figure 5-1)

ITEM	NAME	TYPE	FUNCTION
1	Air Conditioning Control Panel		Provide control of the air conditioning unit. Also contains the windshield washer reservoir. See Figure 5-2 for detailed breakdown.
2	Gauge Panel		Contains gauges that monitor machine operation. See Figure 5-3 for detailed breakdown.
3	Steering and Control Lever Group		Contains all grader control levers and the steering wheel. See Figure 5-4 for detailed breakdown.
4	Throttle, Brake, Transmission, Stop Controls and Main Switch Panel		Contains driving controls and switches. See Figure 5-5 for detailed breakdown.
5	Foot Pedals	Pedals	Pressing the left pedal down applies the service brake and declutches the transmission. Pressing the right pedal controls the throttle.
6	Left Door Release Lever	Lever	Holds left door open.
7	Dash Tilt Lever	Lever	Position dash for most comfortable operating position.
8	Front Windshield Latch	Lever	Allows front windshield to be opened.
9	Right Door Release Lever	Lever	Holds right door open.
10	Seat		Operator's seat.

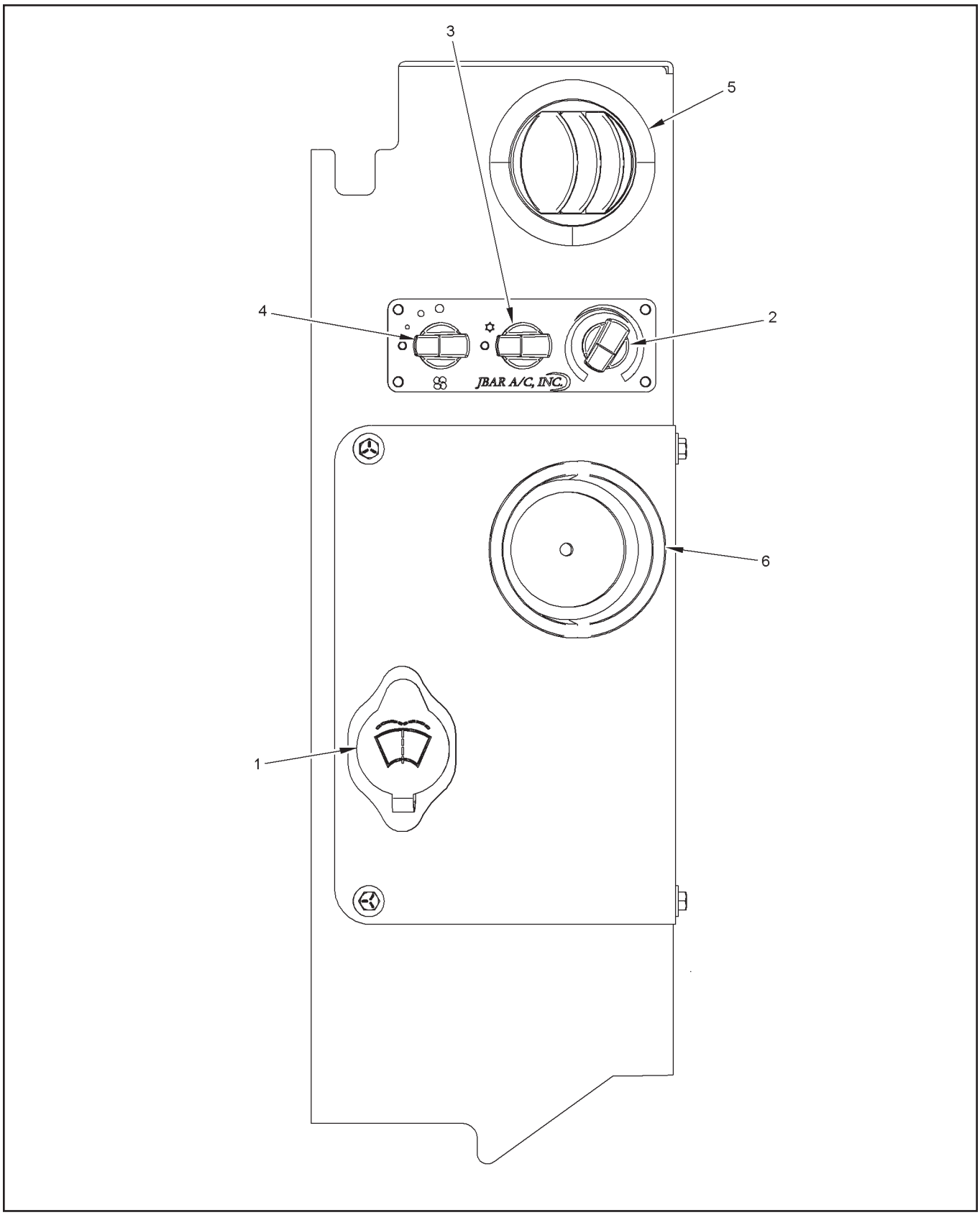


Figure 5-2. AIR CONDITIONING CONTROL PANEL

Table 5-2. AIR CONDITIONING CONTROL PANEL (see Figure 5-2)

ITEM	NAME	TYPE	FUNCTION
1	Washer Fluid Reservoir		Provides storage for the windshield washer fluid.
2	Temp Switch	Rotary Switch	Adjusts the output temperature of the air conditioner.
3	A/C On/Off Switch	2-Position Toggle Switch	Turns air conditioner On or Off.
4	Fan Speed	Rotary Switch	Adjust speed of blower fan.
5	Vent Opening		Output vent for the air conditioner.
6	Cup Holder		Hold drinking cup.

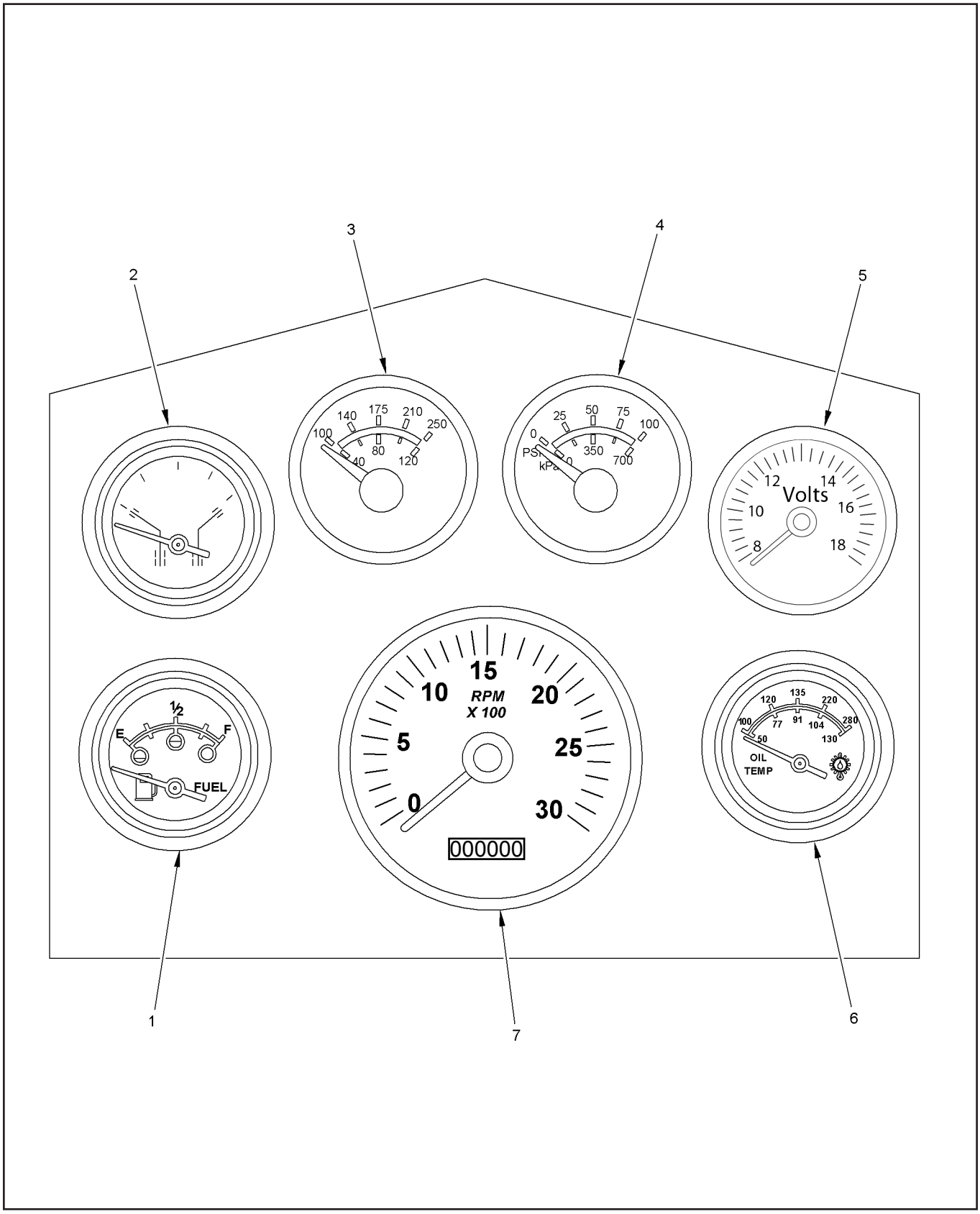


Figure 5-3. GAUGE PANEL

Table 5-3. GAUGE PANEL (see Figure 5-3)

ITEM	NAME	TYPE	FUNCTION
1	Fuel Level Gauge	Gauge	Indicates the amount of fuel remaining in the tank.
2	Articulation Gauge	Gauge	Indicates degrees of articulation both left and right.
3	Engine Water Temperature Gauge	Gauge	Indicates the temperature of the water in the Engine cooling system.
4	Engine Oil Pressure Gauge	Gauge	Indicates engine oil pressure.
5	Voltmeter	Gauge	Indicates battery voltage.
6	Transmission Oil Temp. Gauge	Gauge	Indicates the temperature of the transmission fluid.
7	Engine RPM Gauge and Total Time Display	Gauge	Indicates Engine RPM and Total operating time of Engine

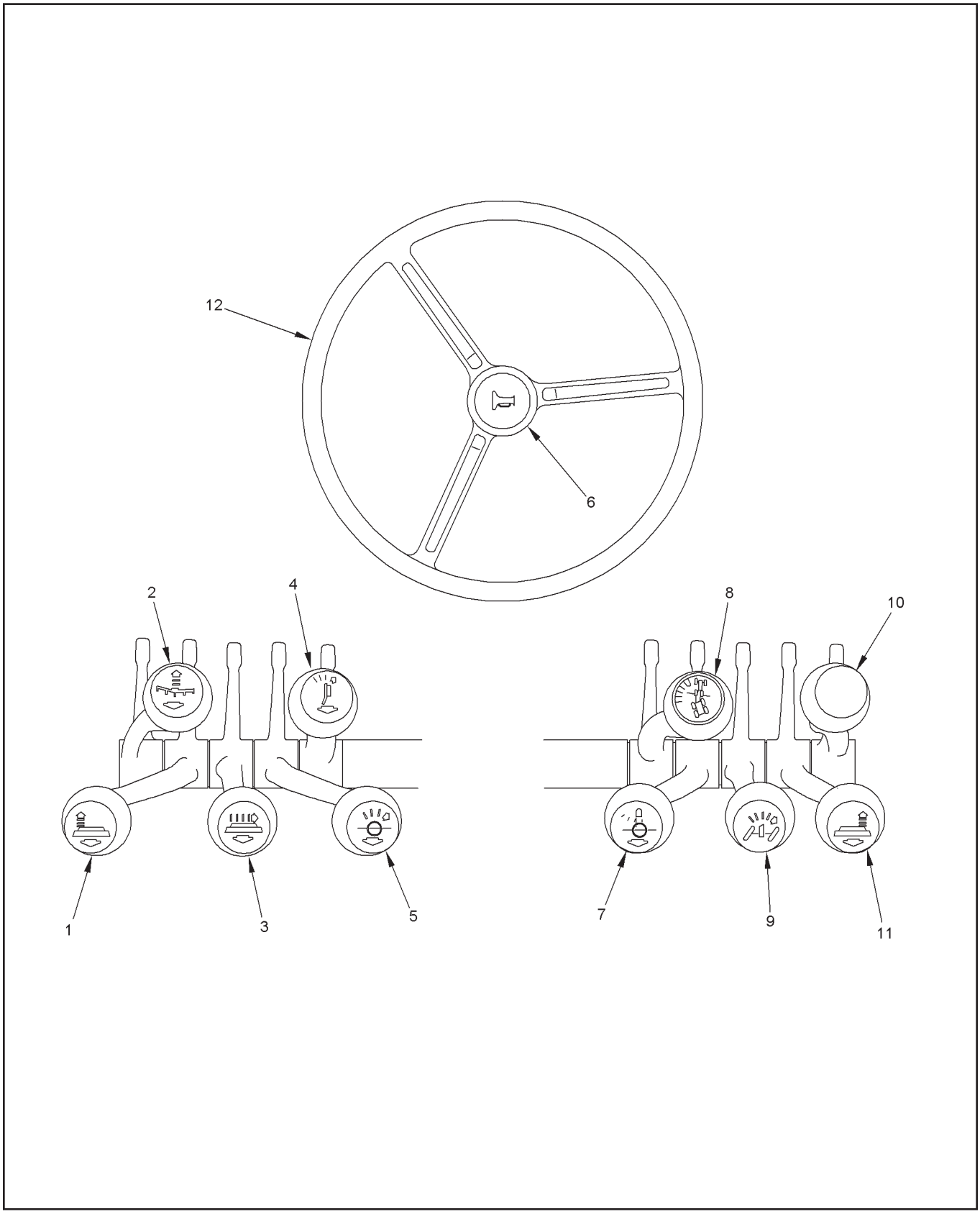


Figure 5-4. STEERING AND CONTROL LEVER GROUP

Table 5-4. STEERING AND CONTROL LEVER GROUP (see Figure 5-4)

ITEM	NAME	TYPE	FUNCTION
1	Moldboard Lift Lever	Lever	Lifts moldboard when pulled. Lowers moldboard
2	Scarifier Lever	Lever	Lifts Scarifier when pulled. Lowers Scarifier when pushed.
3	Moldboard Slide Lever	Lever	Slides Moldboard left or right, 5 ft. total.
4	Moldboard Tilt Lever	Lever	Tilts moldboard to rear when pulled. Tilts mold
5	Circle Turn Lever	Lever	Rotates Circle clockwise when pulled. Rotates
6	Horn Button	Push button switch	Sounds Horn when pushed.
7	Circle Shift Lever	Lever	Shifts Circle right when pulled. Shifts Circle left
8	Articulation Lever	Lever	Articulates Grader up to 40°.
9	Leaning Wheel Lever	Lever	Leans Wheel right when pulled. Leans Wheel left
10	Auxiliary Lever	Lever	Not Used
11	Moldboard Lift Lever	Lever	Lifts moldboard when pulled. Lowers moldboard pushed hard.
12	Steering Wheel	Wheel	Used to steer machine.

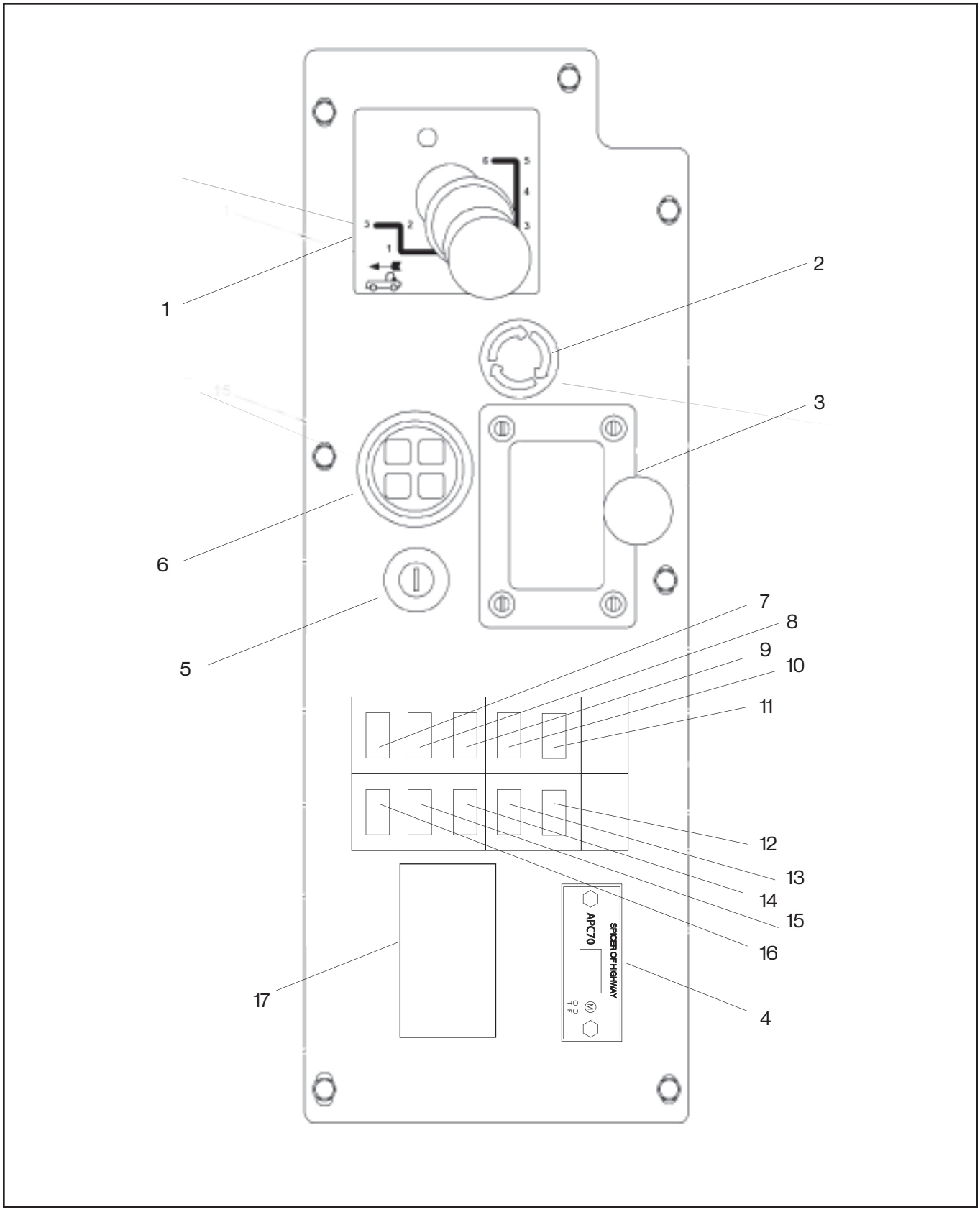


Figure 5-5. MAIN SWITCH CONTROL PANEL

Table 5-5. MAIN SWITCH CONTROL PANEL (See Figure 5-5)

ITEM	NAME	TYPE	FUNCTION
1	Transmission Shifter	Lever	Shifts Transmission through 6-forward speeds and 3-reverse speeds.
2	Emergency Stop Switch	Push switch	Press switch down for emergency stop. Turn and lift to disengage brake.
3	Engine Throttle	Lever	Adjusts engine RPM.
4	APC Transmission Control	Gauge	Controls Transmission and troubleshoots.
5	Ignition Switch	Key switch	Full clockwise position to start engine. Auto
6	Start Gauge	Indicator	Monitors status of the engine and alerts operator of staring status. Four main indicators are WARN, STOP, WAIT, and MAINT.
7	Switch, Rocker, Beacon	Toggle Switch	Turns on beacon light
8	Switch , Rocker, Fr. Washer / Wiper	Toggle Switch	Operate front windshield wipers / washes front windshield
9	Switch, Rocker, Rr. Washer/ Wiper	Toggle Switch	Operate rear windshield wipers / washes rear windshield
10	Indicator, Brake / Tran	Light	Indicator, Park Brake.
11	Switch, indicator, Accum / Filter	Light	Indicator, Warning lights for accumulator and air filter.
12	Switch, Rocker, Light Work Fr / Rr	Toggle Switch	Controls working lights on front and rear of machine.
13	Switch, Rocker, Lights Hi / Lo	Toggle Switch	Controls head lights.
14	Switch, Rocker, Auto / Manual	Toggle Switch	Changes between manual and automatic modes.
15	Switch, Rocker, Diff Lock	Toggle Switch	Controls axel differential lock on and off.
16	Switch, Rocker, Blade Shift	Toggle Switch	Controls engage and disengaging of saddle lock.
17	Relay / Fuse Panel		Fuses for side panel functions, Relays 1-4

NOTES

Section 6
OPERATION

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GENERAL INFORMATION

This section provides the Operating Instructions for the Model 785 Motor Grader.

It is important to read, understand, and follow all "Precautions, Operating Instructions and Warnings" written in this manual before starting or operating the machine.

⚠ DANGER Failure to observe the “Precautions, Operating Instructions and Warnings” provided in this manual can cause serious injury or death. Only authorized personnel, who are fully trained in the machine operation, can operate the Model 785 Motor Grader.

This machine should be kept in good mechanical condition at all times.

⚠ WARNING Do not operate a machine needing repair. Put an information tag on the instrument panel that says, “DO NOT OPERATE”. Remove the key from the ignition switch. Repair all damage at once. Minor damage can result in major system failures.

OPERATING CONTROLS, INDICATORS, AND GAUGES

Operating controls for the Model 785 Motor Grader are shown in Figures 5-1 through 5-5 and listed in Tables 5-1 through 5-5.

⚠ WARNING Do not start or operate the Model 785 Motor Grader before reading, understanding and following all information given in this section and shown on the machine. The operators must read and understand the function of all controls, indicators, and gauges before starting the engine. Serious injury or death can result if these procedures are not followed.

OPERATION SAFETY

Operating Safety

- Always make sure no person or object is in the line of travel before starting.
- Work slowly in tight areas.
- Do not run engine in a closed building for long periods of time.
- Always look before changing the direction of travel.
- Avoid leaving engine running without operator present.
- Keep hands, feet and clothing away from power driven parts.
- Clothing worn by the operator should be relatively tight and belted. Do not wear loose jackets, shirts, sleeves or other items of clothing because of the danger of catching them in moving parts.
- Before starting the engine, always check the brake system to ensure proper working condition of brakes.
- Keep hands, floors and controls free from water, grease and mud to ensure non-slip control.
- Never attempt to start or operate the grader except from the operator's platform.
- Always keep the grader in gear when going down steep hills.
- When transporting or driving on a road or highway at night or during the day, use accessory lights and devices for adequate warning to the operators of other vehicles. In this regard, check local government regulations.
- Do not oil, grease or adjust any part of the grader while it is in motion.
- Check for faulty wiring or loose connections.
- Keep a firm grip on steering wheel at all times when speed is increased.
- Do not allow anyone near the grader while the driver is in the seat with the engine running.
- Reduce speed before turning or applying brakes. Drive at speeds slow enough to ensure your safety, especially over rough ground.
- Be sure the path ahead is clear to avoid collision with other machines.
- Watch for overhead wires. Never touch wires with any part of grader.
- Always lower moldboard and attachments when machine is not in use.
- Park grader on level ground or across the slope.

Stopping Safety

- Always park the grader on solid, level ground. If this is not possible, always park the grader at a right angle to the slope, and set parking brake.
- Use proper flags, barriers and warning devices, especially when parking in areas of traffic.

Maintenance Safety

- Never work on the grader with the engine running.
- Never refuel when the engine is running. Do not smoke while filling the fuel tank or servicing the system.
- Do not change the engine governor settings.
- Always replace damaged or lost decals.
- Disconnect battery when working on the electrical system or when welding on the unit.
- If battery needs a charge, be sure battery charger is off when making connections.
- Be sure the correct battery polarity is observed (negative (-) to negative (-) and positive (+) to positive (+)) when connecting a battery charger or jumper cable.
- Work slowly in tight areas.
- Do not run engine in a closed building for long periods of time.
- Add coolant to the radiator only when the machine is stopped or idling slowly. To avoid being scalded when the pressure-type filler cap is being removed, turn the cap slightly to relieve pressure before removing the cap.
- Do not leave the engine running while making adjustments or repairs unless specifically recommended.
- Never allow anyone to work under a raised moldboard or other attachments.

INSPECTION

General Information

Daily inspection and servicing at required intervals is necessary for the safe operation and maximum service life of the LeeBoy Model 785 Motor Grader and its components.

⚠WARNING **Do not smoke when performing inspections or servicing unit. Flammable liquids are present.**

Receiving Inspection

When the grader arrives at a new site, the grader should be inspected for road hazards or vandalism that could occur during transportation and could have damaged the machine. Perform the following inspections and correct any faulty condition using the procedures in the MAINTENANCE section of this manual.

1. Check for any missing or damaged parts
2. Check engine oil level
3. Check Transmission Oil Level
4. Check Differential Oil Level
5. Check Tandem Oil Level
6. Check Gear Hub Oil Level
7. Check Coolant in Radiator
8. Check Fuel Level
9. Check Tires for Cuts
10. Have a qualified Operator Test All Functions

INSPECTION ITEMS	PROCEDURE
Loose or Missing Hardware	Check all visually accessible areas for loose or missing hardware. Any loose hardware should be torqued to the correct value.
Check for Worn or Damaged Parts	Check all accessible parts for wear or damage. Replace any part
Check for Leaks	Check all hydraulic lines, fuel lines, and tanks for leaks.
Check Engine Oil Level	Check that engine oil is between the marks on the dipstick.
Check Transmission Oil Level	Check oil level with dip stick. Transmission oil must be hot and engine running with transmission in neutral when checking. Be sure sufficient oil is present.
Check Differential Oil Level	Check that differential oil level is at proper level.
Check Tandem Oil Level	Check that tandem oil level is at proper level.
Check Planetary Hub Oil Level	Check that gear oil level is at proper level.
Check Coolant in Radiator	⚠WARNING **Never remove radiator cap when hot. Serious burns can result from hot liquid.** Allow coolant to cool down before checking level.
Check Fuel Level	Check fuel gauge for sufficient fuel level.
Check Hydraulic Oil Level	Check at sight gauge on side of hydraulic oil tank.
Batteries	Make sure that all cables are tight and clean. Check for corrosion on the battery terminals
Air Cleaner	Check the air filter element and hose connections. Air cleaner has both a primary and secondary filter.
Check Lugs on All Wheels	Check for loose appearing lugs. If any lug is suspect, tighten to
Check Tire Pressure	Check for correct tire pressure in all six tires.
Drain Plugs	Make sure plugs are in and tight.

INSPECTION ITEMS	PROCEDURE
Engine Belt	Check for proper tension of belt.
Grease Fittings	Make sure the fittings are greased and in good working order.
Check Steering Joint and Welds	Check for any cracks.
Check all Lights for Proper Operation	Test the signal, brake, flasher, work, strobe and driving lights for
Check Parking Brake and Service Brake	Check that both brakes are working properly.
Test All Functions	Have a qualified operator test all functions before allowing grader to be placed in operation. If any function is not performing, take machine out of service until it has been corrected.

Inspection Before Initial Start-Up

The following inspection by the operator is essential. This inspection should be performed on a daily basis. Procedures for performing the inspections are described in the MAINTENANCE Section of this manual.

Visually inspect the unit for familiarization and to check its general condition. Continue with a check of special systems and components.

Preliminary Procedures

Adjusting Front Console

The front console can be positioned using the Dash Tilt Lever (7, Figure 5-1) Adjust for best operator comfort.

Air Conditioner

The air conditioner controls are located to the left of the operator. Proceed as follows to control the air conditioner.

1. Set the A/C ON-OFF switch (3, Figure 5-2) to the ON position.
2. Adjust the vents (5) for the desired opening.
3. Adjust the Temperature switch (2) for the desired temperature.
4. Adjust the Fan Speed (4) for the desired level.
5. To turn the air conditioner off set the A/C On/Off Switch to the OFF position.

NOTE: Built in console supplies air to the windshield when the A/C Heater fan is in the on position.

Opening Windshield

The windshield can be opened by using the front windshield latch (8, Figure 5-1).

Cab Door Release Levers

Both the right door release lever (9, Figure 5-1), and left door release lever (6) will hold the associated door open.

Cab Light

The cab light is located on the cab ceiling. The switch for the cab light is located on the light assembly.

Console Light

The console lights illuminate the gauges for reading at low light levels. These are turned on when the headlight switch is set to the ON (up) position.

DRIVING THE MACHINE

Start-up Procedure

⚠CAUTION **NEVER start engine unless properly seated in the operators seat, seat belt is secured, and transmission is in Neutral.**

1. Ensure turn key is in off position , Park Break (2, Figure 5-5) is on, throttle (3) is in idle position, and transmission shifter (1) is in neutral position.
2. Turn Master Switch to the ON position.
3. Enter cab and Fasten seat belt.

⚠WARNING Do not move the throttle lever from the idle position while cranking the engine. This can result in engine over-speed and severe damage to the engine.

⚠CAUTION To prevent damage to the starting motor, do not engage the starting motor for more than 30 seconds. Wait two minutes between each attempt to start.

4. Turn Key ON and wait for all lights to turn off on the Start Gauge.
5. Turn the Ignition switch to the Start position. If the engine does not start after three attempts, check the fuel supply system.

NOTE: The engine must have adequate oil pressure within 15 seconds after starting. If there is no oil pressure indicated on the gauge within 15 seconds, shut off the engine immediately to avoid engine damage.

6. Idle the engine for 3 to 5 minutes before operating with a load.
7. After starting a cold engine, increase the engine speed (rpm) slowly to provide adequate lubrication to the bearings and to allow the oil pressure to stabilize.

⚠CAUTION Do not operate engine at low idle for long periods with engine coolant temperature below the minimum specification. This can result in the following:

- Fuel dilution of the lubricating oil.
- Cylinder head valves sticking.
- Reduced performance.

Using Booster Batteries

⚠CAUTION Explosive gases are produced while batteries are in use or being charged. Keep flames or sparks away from battery area. Booster batteries must be connected properly to prevent dangerous sparking.

The grader electrical system is 12 volt negative ground and uses two batteries in parallel. When connecting a booster battery be sure the negative terminal of the booster battery is connected to the negative terminal of the grader battery and positive terminal of the booster battery is connected to the positive terminal of the grader battery

Engine Shutdown

NOTE: Before leaving the operator's seat perform the following shut-down procedure.

1. Place throttle in idle position.
2. Place Transmission Shifter in Neutral position.
3. Set park brake.
4. Lower all tools (blades).
5. Place all light switches to the off position.
6. Turn Ignition switch to the off position.
7. Turn the master switch to the off position.

Auto Mode

Moving Forward/Reverse.

1. Start engine as described in start-up procedure.
2. Hold foot on brake.
3. Check that area is clear.
4. Lift tools (implements).

NOTE: Make sure blade is not near a tire.

5. Set MANUAL/AUTO switch to the AUTO position.
6. Set throttle to the idle position.

NOTE: If throttle is not at full Idle, controller will not engage transmission.

7. Set Transmission Shifter to the desired gear.
8. Release foot brake.
9. Wait until transmission engages.
10. Increase the engine RPM with the throttle.

NOTE: As the engine RPM's increase the transmission will begin to shift until it reaches the selected gear.

Manual Mode

Moving Forward/Reverse

1. Start engine as described in START-UP PROCEDURE
2. Hold foot on brake.
3. Check that area is clear.
4. Lift tools (implements).

NOTE: Make sure blade is not near a tire.

5. Set MANUAL/AUTO switch to the MANUAL position.
6. Set throttle to the idle position.

NOTE: If throttle is not at full Idle, controller will not engage transmission.

7. Set Transmission Shifter to 1st gear forward or reverse as desired.
8. Wait until transmission engages.
9. Release foot brake.
10. Increase the engine RPM with the throttle and shift gears as desired..

NOTE: Grader can be down shifted on the go. The computer will control and protect the transmission.

NOTE: When switching directions, the controller will try to start in 3rd gear. Do not select 1st or 2nd gear unless you need that gear.

Stopping

1. Apply foot brake.
2. Move throttle back to the idle position.
3. Set Transmission Shifter to Neutral position.

Stopping and Restarting

1. Apply foot brake.
2. Set Throttle to the idle position.
3. Release foot brake.
4. Apply Throttle.

NOTE: Transmission will not engage if throttle is not at full Idle position.

Operating The Machine

Blade Lift Levers

The Blades Lift levers (1 and 11, Figure 5-4) control the lifting and lowering of the Blade.

1. Pull levers to raise the blade.
2. Push levers to lower the blade.
3. Push levers fully forward into detent to float the blade. Pull levers back to manually release the float.

NOTE: Blade float allows blade to float over hard surfaces.

Moldboard Slide Lever

The Moldboard Slide lever (3, Figure 5-4) is located in the left lever group.

1. Pull lever to shift blade right.
2. Push lever to shift blade left.

Blade Tilt Lever

The Blade Tilt lever (4, Figure 5-4) is used to tilt the blade.

1. Pull lever to tilt blade to the rear.
2. Push lever to tilt blade forward.

Circle Turn Lever

The Circle Turn lever (5, Figure 5-4) is used to rotate the circle.

1. Pull lever to turn circle clockwise.
2. Push lever to turn circle counterclockwise.

Circle Shift Lever

The Circle Shift lever (7, Figure 5-4) is used to shift the circle left or right.

1. Pull lever to shift circle right.
2. Push lever to shift circle left.

Articulation Lever

The Articulation lever (8, Figure 5-4) is used to set the grader articulation up to 40°.

1. Pull lever for right articulation
2. Push lever for left articulation.

NOTE: Amount of articulation is displayed on the Articulation gauge (2, Figure 5-3).

Leaning Wheel Lever

The Leaning Wheel lever (9, Figure 5-4) is used to set the amount of wheel lean.

1. Pull lever to lean wheels right.
2. Push lever to lean wheel left.

Scarifier Lever

The Scarifier lever (2, Figure 5-4) is used to raise or lower the Scarifier.

1. Pull lever to lift Scarifier.
2. Push lever to lower Scarifier.

Differential Lock Switch

NOTE: The differential lock is used when conditions require maximum traction.

The Differential Lock switch (15, Figure 5-5) is used to help with traction. When the switch is set to the ON (up) position the differential lock is engaged. The differential lock can be locked or release while grader is in motion. Releasing the differential lock will allow shorter turns.

Moving Blade to Bank Position

The following procedure is for moving blade to the right. Use opposite functions to move to the left.

1. Position the circle slightly to the right of center.
2. Shift blade right.
3. Lower blade to ground.
4. Set blades to the float position.
5. Disengage lift arm locking pin.
6. Retract left lift cylinder and circle side shift cylinder and extend right lift cylinder to rotate lift arms.
7. Align lift arm indicator with desired locking position and engage locking pin.
8. Use lift cylinders and circle side shift cylinder to lift blade off ground (4 - 5 in. [100 - 125 mm]).
9. Rotate blade counterclockwise to put right end of blade forward.
10. Retract right lift cylinder, extend left lift cylinder, rotate circle, adjust circle side shift cylinder and pitch, and side shift blade to obtain desired position.
11. Follow steps in reverse order to move blade out of the bank position.

Steering

The grader is steered using the steering wheel (12, Figure 5-4). The machine can be steered in the straight frame or articulated position. The straight frame position is most often used for long runs. The articulated position shortens turns and also can be used to counteract the side thrust in normal grading.

Blade Side Thrust

When a load is being pushed, the front of the grader tends to swing toward the toe of the blade. This can be counteracted as follows:

1. Articulate machine toward the toe of the blade.
2. Lean top of front wheels toward heel (discharge side) of blade.

Blade Pitch Adjustment

Use the upright position of the Moldboard for normal grading. Position the blade so that the top edge is vertical or slightly ahead of bottom edge. This places the cutting edge at the best cutting angle.

Use a backward pitch of the Moldboard for greater cutting ability. This will cause the cutting edge to dig in.

NOTE: Dirt may build up and pile into circle due to decreased rolling action. Adjust position as required.

For better mixing and rolling action, pitch Moldboard ahead of vertical position. When spreading material moldboard should be tipped further forward. This helps compact material and fill low spots. Use only as much forward tilt as necessary for the job.

Pile Spreading

1. Set moldboard at right angles to the direction of travel and shift the moldboard toward pile.
2. Tilt blade slightly forward.
3. Raise blade for the desired depth.

4. Shift circle toward pile.
5. Lean front wheels slightly away from pile.

NOTE: The material spread in each pass will be limited by the power and traction of the grader.

Back Filling

The moldboard can be used to backfill a trench and the rear tandem can be used to compact the backfill material.

Vee Ditching

Vee ditching requires at least three passes; The first pass shapes the ditch, the second pass deepens the ditch, and the third pass cleans up the materials. The material is then spread to form the roadbed and shoulder. The final step is cutting the back slope.

First Pass

1. Center the circle.
2. Position toe of blade just outside edge of front tire.
3. Tilt blade and pitch forward until top of blade is in line with center of front tire.
4. Raise blade heel just ahead of tandem tires so dirt will spill out between them.
5. Lead front wheels slightly toward discharge end of blade.
6. Engage the differential lock.
7. Travel in 1st or 2nd gear.
8. Make first pass very shallow in order to establish line of ditch.

Second Pass

Position wheels in vee ditch made on first pass to compensate for side thrust.

NOTE: This allows a deeper cut at higher speed during second pass.

Third Pass

This is the clean-up pass. The cleanup pass is used to reduce the build-up of dirt between the tandem wheels from successive passes. After the cleanup pass the material can be spread to establish the roadbed and the shoulder.

1. Sideshift circle and blade toward ditch.
2. Position front wheels outside windrow.
3. Set blade at an angle that positions heel between tandems with blade pitched slightly forward.
4. Position toe of blade well beyond windrow to minimize spillage back into the vee ditch;.
5. Articulate grader slightly to deposit windrow between tandems.

Spreading Material

1. Use a straight frame position to spread windrow left from cleanup pass.
2. Position circle and moldboard to deposit material evenly. Use material to establish roadbed and shoulder.

Cutting Back Slope

1. Sideshift circle and blade toward bank.
2. Position heel of blade in center of rear tire.
3. Pitch blade slightly forward.
4. Blade angle is toward direction of travel at approximately 40° depending upon degree and height of slope.
5. Drive wheels of machine in established vee ditch.

NOTE: This will deposit dirt from back slope slightly up onto shoulder slope when a cleanup pass will pull it up onto roadbed for spreading.

6. To finish vee ditch; pull windrow up from shoulder slope, clean it away from edge of ditch and spread it.
7. Repeat steps as necessary.

Cleaning Ditches

If ditch is soft or wet and can not support the full weight of the grader, proceed as follows:

1. Offset tandems so that the tandems ride on shoulder of road.
2. Lift material from ditch and dump it outside of tandems.
3. By articulating tandems on road and front wheels into ditch, the grader can be backed up until toe of blade is at end of culvert. Then start cut, windrowing material onto shoulder of roadbed.

NOTE: When filling washouts on existing back slopes, blade can be angled back and side-shifted enough so that material can be rolled up slope.

Road Crowning

1. Blade material inward from shoulders of ditches.
2. Cut top of crown with blade at a 0° angle, or a slight angle to side cast material to whichever side might require it.
3. Spread windrows by putting blade at an angle of 10° - 25° toward center.
4. Keep blade above level of undisturbed surface so as to avoid collision with solid objects such as rocks in roadbed.
5. Perform crowning operation at relatively high speed. High speed causes loose material to be thrown from the blade, which feathers the material and blends it at the top.

NOTE: Any ridge that is left in the center can then be spread out at high speed with a straight blade.

Bank Cutting

1. The first pass should be at the base of the bank to level and smooth a platform for the grader.
2. Locate heel of blade in front of center of rear wheel.
3. Shift toe of blade forward.
4. Tilt blade forward.
5. Lean wheels slightly toward bank.
6. Position grader frame straight with all wheels at base of bank, or if more reach is needed, articulate slightly to position front inside wheel on bank.

Three methods can be used to vary depth of cut, these are:

1. Leaning wheels away or toward the bank.
2. Maneuvering lift cylinders.
3. Changing blade pitch.

NOTE: After first bank cut, it may be necessary to clean loose material away from bottom of bank.

Slope Work

1. The first pass should be made from above the slope, if possible, to establish angle.
2. Side-shift the circle and the blade toward slope.
3. Set blade angle slightly toward rear of machine with a slight forward tilt.
4. Reach the blade as far down slope as possible and make first pass.

NOTE: The grader can be in straight frame position or articulated for extra reach.

5. Lean front wheels toward slope on second pass.
6. To help prevent front end from drifting down, position upper front wheel above windrow.
7. To increase stability of machine, articulate tandems down slope.
8. Position toe of blade forward and angled so material is spilled off heel of blade slightly between or under tandems. Set blade pitch ahead of vertical plane and side-shift circle toward the upside.
9. Repeat the procedure until dirt is deposited at toe of slope. Establish toe of slope by cleaning windrow away from bottom.
10. When working on steep slopes, the differential may be locked or unlocked at the operator's preference.

⚠CAUTION A rollover with the grader articulated is unlikely; however, extreme caution should always be used when working on slopes steeper then 16.5°.

Cul-De-Sacs

1. Shift circle to outside.
2. Articulate grader to inside.
3. Tilt blade forward about 5° - 10°.
4. Travel in 1st gear, fast idle with front wheels leaning toward direction of turn.

NOTE: After curb is poured, back fill against the outside of curb to give support.

To finish grading, as the turns become shorter on each succeeding pass, the circle and moldboard are shifted toward the center. Then any excess material left in the middle can be moved out of the cul-de-sac.

Loading Grader On A Trailer

When transporting the Grader on a trailer, the vehicle should be large enough to safely handle the size and weight of the loader in all driving situations.

1. Park the Grader on a level surface with the EMERGENCY/STOP parking brake engaged (pressed down) and block the wheels in both directions so the Grader will not roll.
2. Load the Grader onto the trailer and block the wheels in both directions. Use enough chains to secure the Grader to make sure that it will not move while transporting. Use the factory tie downs.
3. Ensure all implements are lowered onto blocks on the trailer bed, the transmission is in neutral and the park break is set.

NOTE: Blade must not extend beyond trailer bed.

Towing The Grader

Prepare the machine for towing as follows:

⚠WARNING Wheels must be blocked to prevent machine from moving while preparing machine for towing.

⚠WARNING The following procedure can only be used for new machines.

1. Block wheels to prevent machine from moving.
2. Using a small pry bar, manually pull shifting lever at front of rear end all the way out.
3. Now push lever all the way in.
4. Find center position to disengage gears for towing.
5. On the sides of the rear end, locate the screw with a square head.
6. Using a caliper, measure the exact extension of the screw and record measurement.
7. Turn the screw all the way in to release the brakes for towing the machine.

To return the machine from the towing condition to normal operation proceed as follows:

1. Push shifting bar at front of rear end all the way in.
2. Adjust square head screw to the exact position measured in step 5 above. TOWING THE GRADER.

NOTE: Steering, brakes and transmission may be operational depending on the failure type

⚠CAUTION Operator must be in operator's seat to control; steering and brakes.

NOTE: Engine can not be started by towing. Damage to transmission will result.

⚠CAUTION DO NOT tow the grader faster than 25 mph (40 km/h).

3. Secure blade and scarifier.

⚠CAUTION Before towing the grader, move the tow lever to TOW position to avoid damage to transmission and brakes.

4. Fasten tow bar or chain to frame.
5. Set transmission to Neutral position.
6. Release Park brake.
7. Run the engine for braking and steering.

⚠CAUTION The following procedure can be used to move a machine that is not running. Once the brakes are released the operator will not be able to stop the machine. Care must be taken when moving the machine in this capacity.

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MAINTENANCE

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7

No.	Grease Fitting Location	Weekly	Monthly
1	Front Axel Pivot	X	
2	King Pins & Steering	X	
3	Circle Drive	X	
4	Moldboard Pivot	X	
5	Articulated Joints	X	
6	Cylinder Joints	X	
7	Tandems		X
8	Trunnions	X	
9	Front Scarifier Cylinder	X	
10	Rear Scarifier Cylinder	X	
11	Drag Bar Pivot Ball	X	

Recommended Filter Change Interval

GROUP	HOURS
Engine Air	250
Engine Fuel	500
Engine Oil	250
Transmission Oil	500
Hydraulic Return	500

Recommended Oil Change Interval

GROUP	HOURS
Engine	250
Transmission	1000
Hydraulic	2000
Differential	2500
Tandems	2500
Planetary Hubs	2500

System Pressures

FUNCTION	PRESSURE (PSI)
Hydraulic function	2600
Standby Pressure	325
Hydraulic steering pressure	2500
Differential lock pressure	400
Park brake pressure	400
Circle lock pressure	400
Brake accumulator pressure	1000
Transmission declutch pressure	800

Fuels And Lubricants

Fuel Specifications

Use only clean, high quality fuel

Use Grade No. 2-D fuel above 4°C (40°F)

Use Grade No. 1-D fuel below 4°C (40°F)

Use Grade No. 1-D fuel for all air temperatures at altitudes above 5,000 ft. (1500 m)

NOTE: If sulfur content exceeds 0.5%, change the engine oil at half the normal interval.

Storing Fuel

If there is a very slow turnover of fuel in the fuel tank or supply tank, it may be necessary to add a fuel conditioner to prevent water condensation. Contact your authorized dealer for proper service or maintenance recommendations.

Do not use galvanized container to store diesel fuel.

NOTE: Diesel fuel stored in galvanized containers reacts with zinc coating to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters and damage fuel injectors and fuel pumps.

Do not use brass-coated containers. Brass is an alloy of copper and zinc.

Fuel Tank

⚠CAUTION **Do not fill fuel tank if engine is hot.**

⚠CAUTION **Do not smoke while filling fuel tank or working on fuel system. Fuel or fumes could ignite and explode causing bodily injury.**

Shut off engine and fill the fuel tank at the end of each day to avoid condensation.

Engine Oil

The oil should meet API Service Class CE or CD. Additives are not required and are not recommended.

Transmission

CITCO transguard THF lo temp

Grease

SAE multi-purpose EP Grease

Lubricant Storage

Whenever possible, store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Mixing Lubricants

Avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specification and performance requirements. Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Heater Shutoff

Hot water to the heater should be turned off in the summer. Close the heater shutoff valve located by the lower water inlet.

Periodic Maintenance

General

1. Use only recommended fuels and lubricants to prevent machine damage.
2. Use the hour meter to determine when your machine needs periodic maintenance.

NOTE: Intervals on the periodic maintenance chart are for operating in normal conditions. If the machine is operating in difficult conditions, machine should be serviced at shorter intervals.

3. Perform service on items at multiples of the original requirement. For example, at 500 hours, also service these items, if applicable, listed under 250 hours, 100 hours and 50 hours.

Prepare Machine For Maintenance

Before performing the following maintenance procedures and before leaving the operator's seat, perform the following steps unless another position is specified in the procedure.

1. Park machine on a level surface.
2. Lower all equipment to the ground.
3. Move transmission selector lever to Neutral.
4. Engage parking brake.

NOTE: Turbocharger may be damaged if engine is not properly shut down.

5. Run engine at one-half speed without load for 2 minutes.
6. Move engine speed control level to slow idle.
7. Turn key switch to OFF position.

NOTE: If maintenance must be performed with the engine running, do not leave machine unattended.

Accessing Engine

There are two access panels on each side of the grader. These panels are hinged on one side and have a latch on the other side. The engine can be accessed by pulling out on the latch handle and rotating the access panel on the hinges.

MAINTENANCE SCHEDULE

The following checklist summarizes scheduled maintenance and parts and oil required at each maintenance interval.

Service the machine at intervals shown in the following schedule. Also, perform service on items at multiples of the original requirement. For example, at 500 hours, also service these items, if applicable, listed under 250 hours, 100 hours and 50 hours.

Procedures for performing each of these maintenance tasks are provided in the section SCHEDULED MAINTENANCE PROCEDURES.

As Required

- Check, clean, and tighten battery terminals
- Check tire pressure
- Check belt tension
- Grease saddle locking pin holes
- Grease circle gear
- Check precleaner
- Drain fuel tank sump
- Clean or replace air cleaner elements

10 Hour Intervals

- Check transmission and hydraulic oil level
- Check coolant level
- Grease frame hinge pivots
- Check engine oil level

50 Hour Intervals

- Grease front axle pivot
- Grease king pins and steering
- Grease circle drive gearbox
- Grease moldboard pivots
- Grease articulated joint
- Grease cylinder joints
- Grease trunnions
- Grease front scarifier cylinder
- Grease rear scarifier cylinder
- Grease drawbar pivot
- Change planetary hub oil

250 Hour Intervals

- Check battery electrolyte level
- Grease tandems
- Change engine oil and replace filter

500 Hour Intervals

- Check hub oil level
- Check tandem oil level
- Check brake accumulator
- Change hydraulic return filter
- Change transmission oil filter
- Change fuel filter

1000 Hour Intervals

- Check engine speed
- Check hydraulic oil
- Check, pack, and adjust front wheel bearings
- Check air intake hoses
- Clean fuel tank filter
- Change transmission oil

2000 Hour Intervals

- Change tandem oil
- Grease tandem pivots
- Grease circle gearbox
- Change differential oil
- Change planetary hubs oil
- Change hydraulic oil

SCHEDULED MAINTENANCE PROCEDURES

As Required Maintenance

Clean and Tighten Battery Terminals

⚠WARNING Battery gas can explode. Keep sparks and flames away from batteries. Always remove grounded (-) battery clamp first and replace last.

The batteries are located in a compartment on the left side of the machine.

1. Disconnect battery clamps, grounded clamp first.
2. Clean terminal and clamp with a stiff brush.
3. Install and tighten clamps, grounded clamp last.

Check Tire Pressure

⚠WARNING Explosive separation of a tire and rim parts can cause serious injury or death.

- DO NOT operate with low pressure, cuts, bubbles, damaged rims, or missing wheel studs and nuts.
- Always maintain correct tire pressure. DO NOT inflate tires above the recommended level.
- When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly.

Check tire pressure with an accurate gauge having 1 PSI (6.9 kPa) (0.07 bar) graduations.

1. Shut off air supply to hose.
2. Move gauge hand to correct pressure.
3. Lock air chuck on tire valve.
4. Turn on air supply. Stand to front or rear of tire when air is added. Inflate tires to 35 PSI (241 kPa) (2.41 bar).

NOTE: Tire pressure may need to be changed for specific working conditions. Refer to manufacturers information.

5. After tire is at correct pressure, shut off air supply. Release chuck.
6. Inspect tire for damage.

Belt Inspection and Adjustment

1. Check belt regularly for wear. Replace if defective.
2. Check tension of belt closest to fan midway between pulleys. Apply a force of 20 lb. (90 N) and check for a deflection of in. (19 mm).
3. If deflection is not within specifications, loosen alternator mounting cap screw.
4. Tighten capscrews to 20 ft. lb. (27.12 N•m).

Lubricate Saddle Locking Pin Holes

Lower blade to ground. Disengage locking pin from hole, Figure 4-1. Apply grease with brush to all 10 lock pin holes. Reengage locking pins.

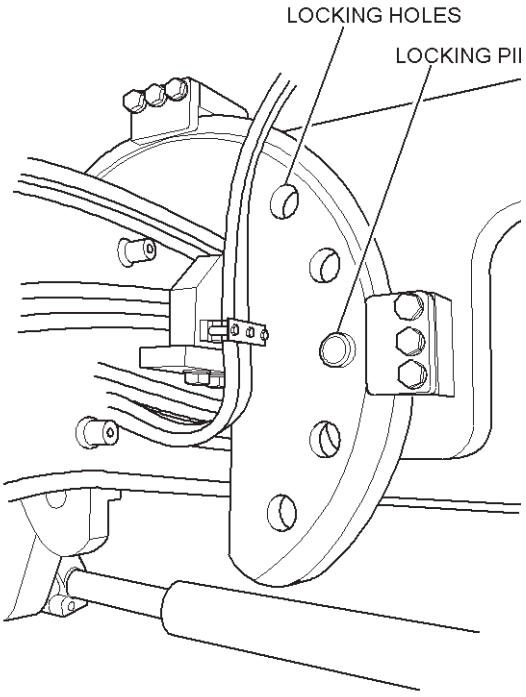


Figure 7-1. Saddle Locking Pin Holes

Lubricate Circle Gear

Clean circle, if necessary.

Lubricate all contact areas on top and bottom of circle. Rotate circle in both directions.

Check Precleaner

Empty pre-cleaner if accumulations of dirt, dust, or snow is up to the mark in the bowl.

Drain Fuel Tank Sump and filter sediment.

NOTE: Collect and dispose of material properly.

1. Remove filler cap from fuel tank.
2. Open fuel drain valve on water separator, Figure 7-2, for several seconds to drain water and sediment.
3. Close valve.
4. Install filler cap.



Figure 7-2. Location of Fuel Drain Valve

Check Air Cleaner

When the engine air filter restriction indictor light illuminates, clean or replace air filter elements.

Replacing Air Cleaner Elements

1. Remove cap. (Refer to IPL Figure 10-50, 60)
2. Remove outer air cleaner element.
3. Remove inner air cleaner element.
4. Clean air cleaner housing.
5. Install new elements.
6. Install cap.

10 Hour Maintenance

Check Transmission-Hydraulic Oil Level

⚠CAUTION **Do not start engine without oil in the transmission-hydraulic system.**

1. Park machine on a level surface - set park brake.
2. Lower all equipment to the ground and roll blade back completely.
3. Wheels must be straight up. Front and back of machine must be aligned.
4. Engine must be running in Neutral.
5. Remove dipstick (see Figure 7-3). Oil must be in the crosshatched area.
6. If necessary, add oil.
7. Install dipstick.

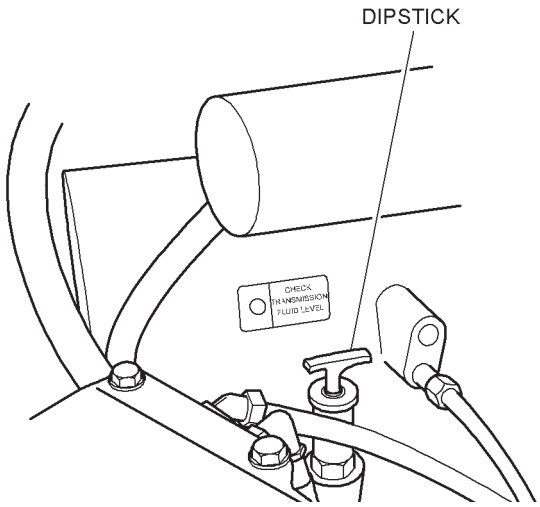


Figure 7-3. Location of Dip Stick

Check Radiator Coolant Level

⚠WARNING **Explosive release of fluids from pressurized cooling system can cause serious burns.**

1. Shut off engine.
2. Remove filer cap when cool enough to touch with bare hands.
3. Slowly loosen cap to first stop to relieve pressure before removing completely
4. Remove radiator cap. Check that radiator is full. Add coolant as necessary.
5. Install filler cap.

Grease Frame Hinge Pivots

Lubricate grease fittings, until grease escapes at joints, Figure 7-4.



Figure 7-4. Frame Hinge Pivots

Check Engine Oil Level

NOTE: DO NOT run engine when oil level is below the ADD mark.

Check oil level at the beginning of the day's operation while the engine is still cold.

1. Be sure dipstick, Figure 7-3, is fully seated.
2. Remove dipstick to check oil level.

NOTE: The engine is full when the oil level is in the cross hatched area on the dipstick before the engine is started.

3. After running the engine allow oil to drain for 10 minutes before checking. Oil level is ok if above the ADD mark on the dipstick.
4. Add oil if necessary.

50 Hour Maintenance

Lubricate Pivots and Yoke

Lubricate the following points. Refer to Figure 7-6. Lubricate until grease escapes at joint.

1. Lubricate Front Axle Pivot (One point)
2. Lubricate King Pins (Two points each side)
3. Lubricate Steering Cylinders (One point each side)
4. Lubricate Wheel Lean Pivots (Five points)
5. Lubricate Tie Rod Ends (Two points)
6. Lubricate Circle Drive (One point)
7. Lubricate Moldboard Pivots (Two points each side)
8. Lubricate Articulated Joint (Two points)
9. Lubricate Articulating Cylinders (Two each side)
10. Lubricate Lift and Angle Cylinder Joints (Three points)
11. Lubricate Tandems (One point each side)
12. Lubricate Trunnions (Three points each side)
13. Lubricate Front Scarifier Cylinder (Two points)
14. Lubricate Rear Scarifier Cylinder (Two points)
15. Lubricate Drawbar Pivot (One point)

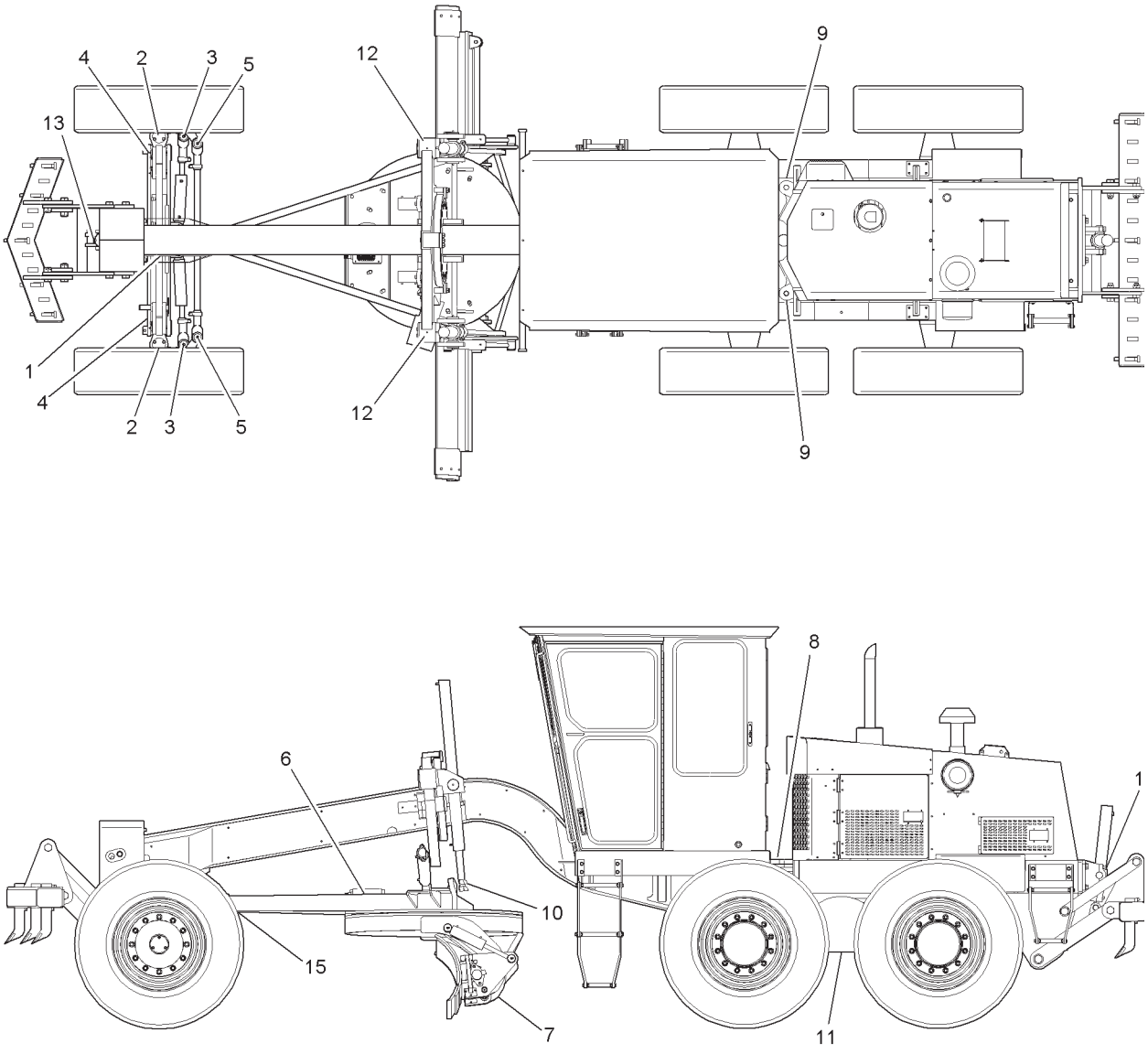


Figure 7-5. . Location of Lubrication Points

250 Hour Maintenance

Lubricate Circle Drive Gearbox

1. Park machine on level ground.
2. Level frame.
3. Lower blade.
4. Lubricate grease fitting (A), Figure 7-5.

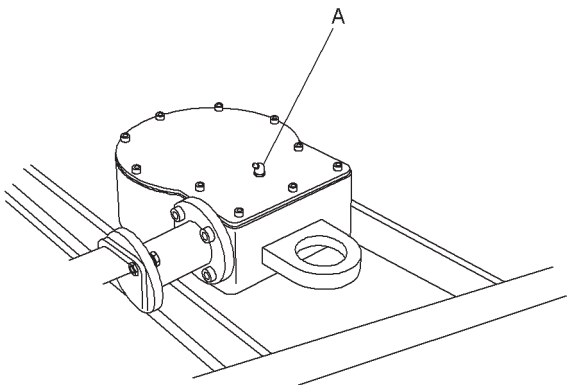


Figure 7-6. Circle Drive Lubrication Point

Change Engine Oil and Replace Filters

1. Run engine to warm oil.
2. Before leaving operator's seat, perform the following procedures.
   a. Park machine on a level surface.
   b. Lower all equipment to the ground.
   c. Engage parking brake.
   d. Move transmission selector level to neutral (N) position.

⚠CAUTION Turbocharger may be damaged if engine is not properly shutdown.

   e. Run engine at one-half speed without load for two minutes.
   f. Move engine speed control lever to slow idle.
   g. Turn key switch to OFF position and remove key from switch.
3. Remove drain plug and allow oil to drain into a container. Dispose of waste oil properly.
4. Remove filter by rotating counterclockwise.
5. Apply a thin film of oil to rubber gasket of new filter.
6. Install new filter by turning clockwise to hand tightness.
7. Tighten 1/2 - 3/4 turn more.
8. Install drain plug.
9. Remove fill cap.
10. Fill engine with oil to the appropriate level.
11. Install fill cap.
12. Start and run engine at a slow idle.
13. Check that oil pressure light goes out. If light does not go out immediately stop engine and find the cause.
14. Check for leaks around filter. Tighten filter just enough to stop leaks.
15. Stop engine. Check oil level and add as needed.

500 Hour Maintenance

Check Hub Oil Level

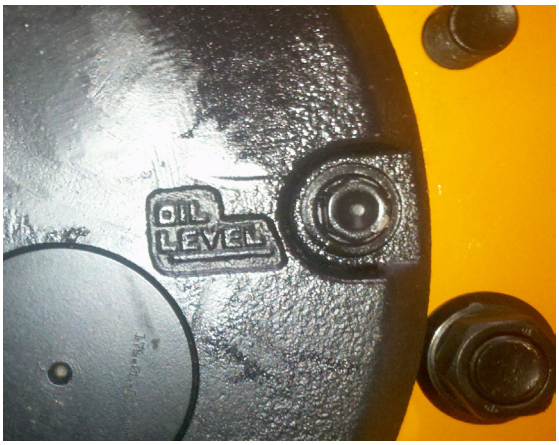


Figure 7-7. Hub Oil Check Bolt

1. Rotate hub until Oil Level bolts are in horizontal position, see Figure 7-6
2. Remove bolt, check oil level. Add as needed.
3. Replace bolt.
4. Repeat process for all other hubs.

Check Tandem Oil Level

1. Remove oil level plug. Oil must be level with plughole.
2. Add oil, if necessary.
3. Install oil level plug.
4. Turn cap on top of breather tube to make sure cap moves freely. A plugged breather tube may cause leakage. Breather tube is on inside front of tandems.

Check Brake Accumulator

1. Engage parking brake.
2. Run engine for 1 minute to fully charge accumulator.
3. Stop engine.
4. Turn key to BULB CHECK position and release to "arm" the monitor. Brake pressure indicator must be off. Other indicator lights will be on and stop engine indicator will flash.
5. Apply brake five times at 5 second intervals. Brake pressure indicator must not come on before three applications and pedal should feel firm for five applications.

NOTE: If brake pressure indicator comes on before three applications or pedal feels "soft" before five applications: There is a hydraulic leak in the brake system, there is air in the brake system or the nitrogen gas precharge in the accumulator is too low.

⚠CAUTION Do not operate the machine until the problem is resolved.

6. Continue to apply brakes until brake pressure light is on. If pedal feels "soft" before brake pressure light is on, do not operate the machine until low brake pressure condition has been corrected.

Replace Hydraulic Return Oil Filter

NOTE: Hydraulic return oil filter is a spin-on type filter.

1. Remove spin-on filter.
2. Clean mounting surface.
3. Install new filter.
4. Add oil.
5. Start engine and run at one-half speed for 2 minutes.
6. Stop engine.
7. Check for leaks around filter. Tighten filter only enough to stop leaks.
8. Check oil level.

Replace Transmission Oil Filter

NOTE: Transmission oil filter is a spin-on type filter.

1. Remove spin-on filter.
2. Clean mounting surface.
3. Install new filter.
4. Add oil.
5. Start engine and run at one-half speed for 2 minutes.
6. Stop engine.
7. Check for leaks around filter. Tighten filter only enough to stop leaks.
8. Check oil level.

Replace Fuel Filter or Fuel Water Separator

NOTE: Fuel filters are spin-on type filters.

⚠CAUTION Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. Turn start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.

1. Turn fuel supply vale (if equipped) to the off position.
2. Place a suitable container under the water separator to catch any fuel that may spill. Clean the outside of the water separator.
3. Install a suitable tube onto the drain. Open the drain. Allow the fluid to drain into the container. Remove the tube.
4. Tighten drain by hand pressure only.
5. If equipped, remove the wiring harness from the sensor on the bottom of the glass bowl.
6. Hold glass bowl and remove screw. Remove glass bowl from canister.

7. Use wrench to remove canister. Discard old seals and canister in safe place.
8. Clean glass bowl.
9. Install new canister, use hand pressure only.
10. Install new O ring seals onto setscrew and into glass bowl.
11. Align glass bowl with canister. Ensure sensor (if equipped) is in correct position. Install set screw. Tighten setscrew to a torque of 5 N*m (44 lb in).
12. If equipped install wiring harness to sensor.
13. Remove container, dispose of fuel in safe place.
14. The secondary filter must be replaced at the same time as the primary filter.

NOTE: Whenever filters are changes fuel system must be reprimed.

Repriming fuel system

Use the following procedure to remove air from the fuel system.

1. Ensure fuel system is in working order. Check that fuel supply valve (if equipped) is in the "ON" position.
2. Operate the fuel priming pump. Count the number of operations of the fuel priming pump. After 100 depressions of the fuel priming pump stop.
3. The engine fuel system should now be primed and the engine should now be able to start.
4. Properly operate the engine starter and crank the engine at low idle for a minimum of five minutes, immediately after air has been removed from the fuel system.

1000 Hour Maintenance

Engine Speed

1. Warm engine to normal operating temperature.
2. Connect a tachometer to check engine speed.

Slow Idle	900 +/-25 rpm
Fast Idle	2500 +/-25 rpm

If engine speeds need adjustment, see your authorized dealer.

Clean, Pack, and Adjust Front Wheel Bearings

NOTE: If machine is operated in wet or muddy conditions, clean and pack bearing as necessary.

⚠CAUTION Raise and support the grader axle end properly on jack stands rated for the load.

1. Remove the following parts, see Figure 7-8.
   a. Hub cap (10)
   b. Gasket (30)
   c. Cotter pin (40) and castle nut (50)
   d. Retainer Washer (60)
   e. Bearing cone (70)
   f. Wheel Hub (90)
   g. Bearing cone (110)
   h. Bearing cup (120)
   i. Tandem axle seal (100)
2. Clean all parts. Replace worn or damaged parts.
3. Pack bearing cones with grease.
4. Assemble bearing cone, bearing cup and axle seal into wheel hub.
5. Place hub on axle. Install bearing cone and retainer washer.
6. Apply lubricant to threads.
7. Install castellated nut. Tighten nut until you feel a slight drag when wheel is turned. Loosen nut to the nearest alignment or slot with hole in shaft. Install cotter pin.
8. Install hub cap, gasket, and wheel.

Check Air Intake Hoses

1. Check air intake hoses for cracks.
2. Tighten hose clamps.

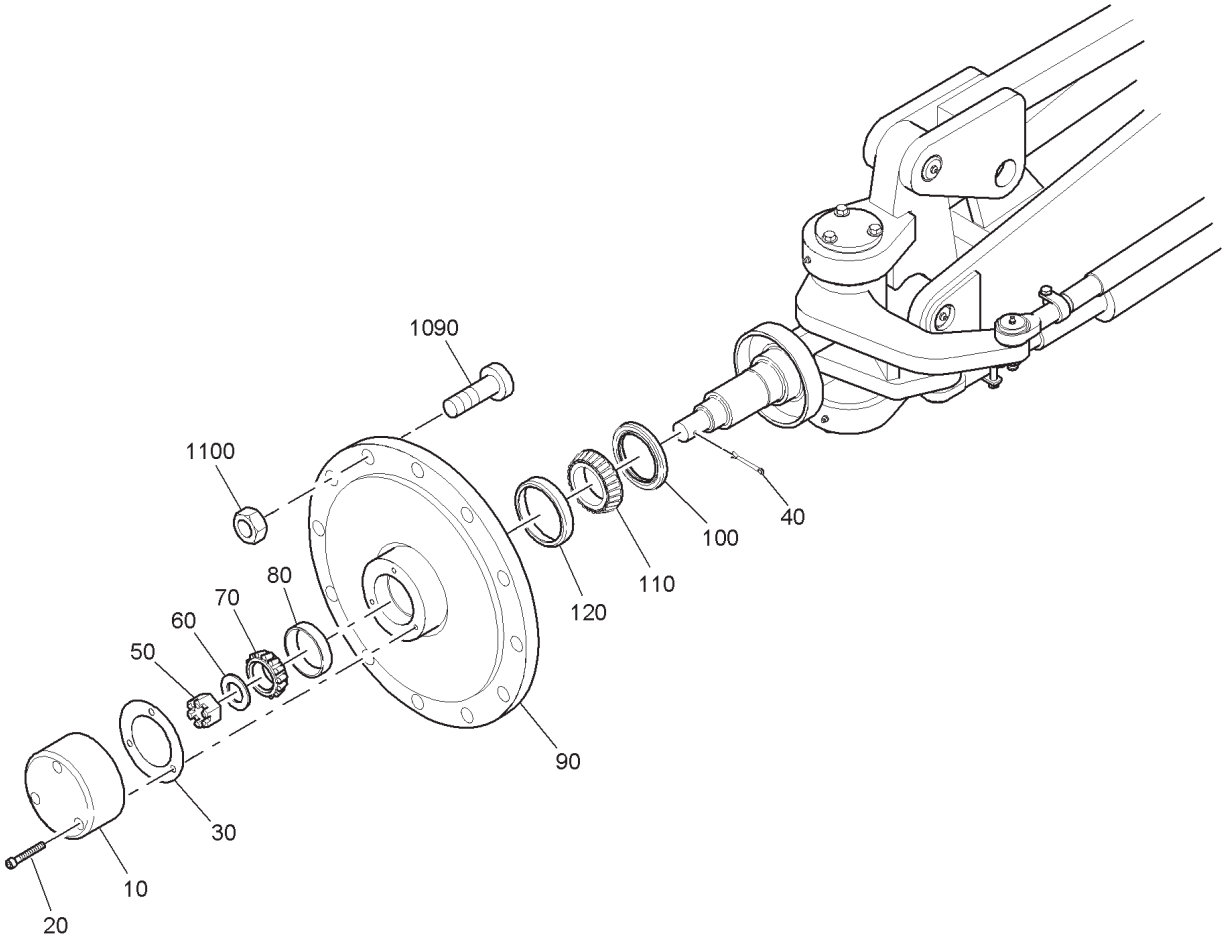


Figure 7-8. . Front Wheel Assembly

2000 Hour Maintenance

Change Tandem Oil

1. Remove drain plug from tandem.
2. Allow oil to drain into a container.
3. Dispose of waste oil properly.
4. Flush each housing with diesel fuel.
5. Install drain plugs.
6. Add oil to each housing.

Lubricate Tandem Pivots

Lubricate tandem pivot with 3 or 4 shots of grease at each of the fittings; see Figure 7-9.

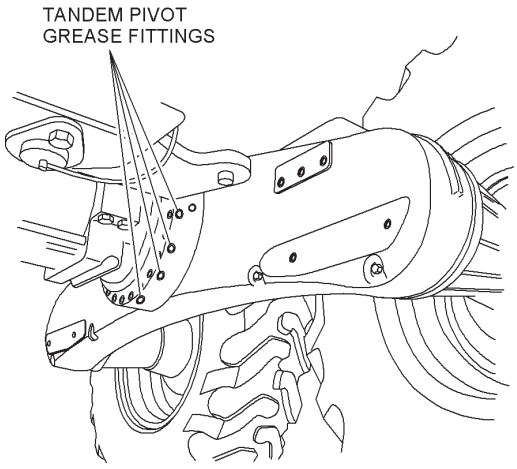


Figure 7-9. Tandem Pivot Left Side

Draining The Cooling System

The cooling system should be drained and flushed every two years. Replace thermostats and refill with new coolant.

⚠CAUTION Hot coolant can cause serious injury.

1. Shut off engine.
2. Only remove filler cap, Figure 7-10, when cool enough to touch with bare hands.
3. Slowly loosen cap to first stop to relieve pressure before removing completely.
4. Connect a hose to draincock on radiator.
5. Turn draincock counterclockwise to open valve. Allow coolant to drain into a container. Dispose of used coolant properly.
6. Remove engine block plug to drain engine block. Allow coolant to drain into a container. Dispose of used coolant properly.
7. Close draincock.
8. Install engine block plug.

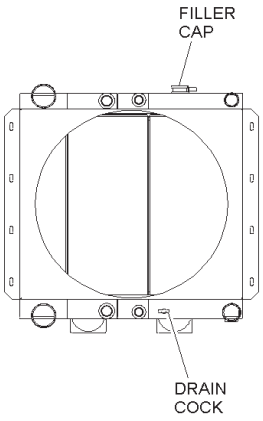


Figure 7-10. Radiator

Filling The Cooling System

All machines are shipped from the factory with a 50-50 mixture for protection to -34°F (-37°C). Adjust mixture accordingly to provide freeze protection for your machine.

NOTE: After filling radiator, operate engine 15-30 minutes to purge air from the engine block. Shut off engine and add coolant to the radiator. Start engine and run until engine is at normal operating temperature. Stop engine and verify that radiator is completely full.

Injection Nozzles And Pump

Do not service or remove injection nozzles. The service life of the injection nozzle may be shortened by:

Overheating

Poor quality fuel

Improper operation

Excessive idling

If injection nozzles are not working correctly or are dirty, the engine will not run normally. See your authorized dealer for service.

NOTE: Do not adjust injection pumps.

Do not attempt to service an injection pump that is not operating correctly. See your authorized injection pump service center.

Fuses And Circuit Breakers

The fuse box is on the right-hand console. Both fuse and circuit breakers are located in the fuse box.

⚠CAUTION Install fuses with correct amperage rating to prevent damage to the electrical system from overload.

The following list cross-references blade type fuse color codes to the amperage rating.

Amp rating	Color
1	Black
3	Violet
4	Pink
5	Tan
7.5	Brown
10	Red
15	Light Blue
20	Yellow
25	Natural (white)
30	Light Green

Checking Neutral Start System

1. Engage parking brake.
2. Move transmission selector lever to 1st gear forward or reverse.
3. Turn key switch to START position. Starter must not crank. If starter cranks engine, release key. Do not operate machine.
4. Repeat test with selector lever in each gear, both forward and reverse.

NOTE: Do not operate machine if starter cranks engine with control lever in any gear except neutral.

5. Move transmission selector lever to neutral "N" and turn key switch to START position. Starter should crank engine.

Checks And Adjustments

Adjusting Blade Side Shift Guides

1. Rest blade lightly on the ground. Raise and lower blade slightly to check tightness of the guides. Blade should slide easily.
2. Remove wear bar cover plate, Figure 7-11, and replace shims as needed.
3. Tighten wear bar cover plate capscrews to 44 ft. lb. (59 N•m).

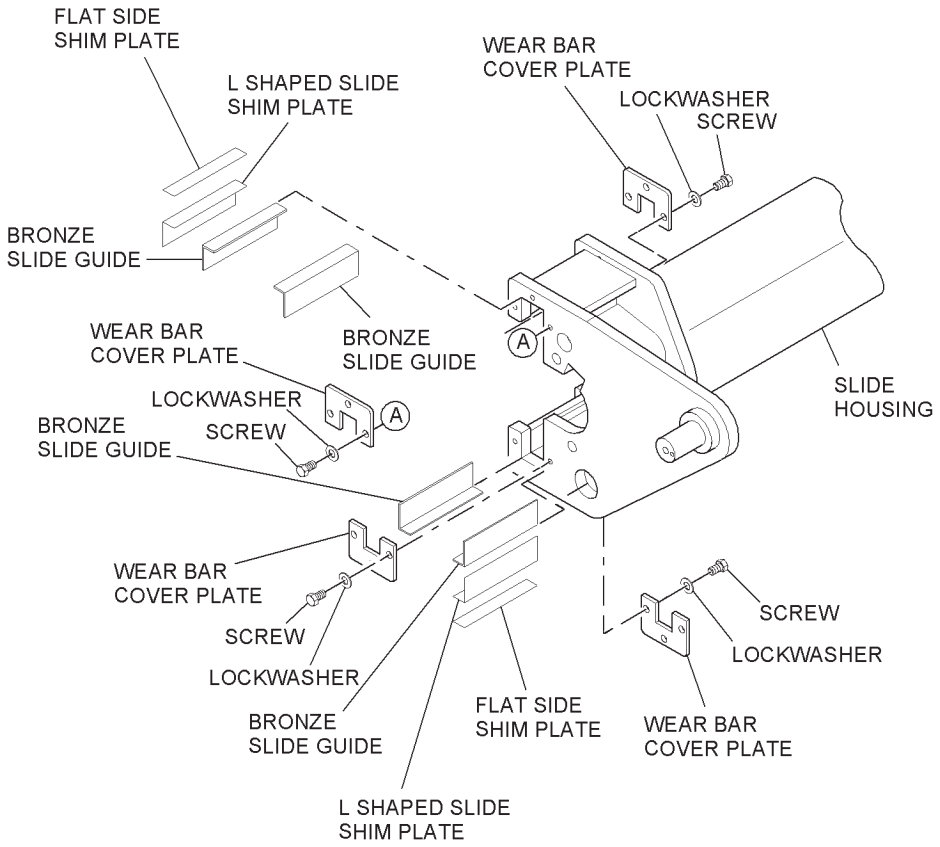


Figure 7-11. Blade Shift Guides

Checking Cylinder Ball And Socket Clearances

1. Lower blade to ground. Check each ball and socket assembly, Figure 7-12.
2. Move cylinder without load. Ball should move freely in cylinder socket.
3. Check for excessive looseness (more that 0.045 in. [1.1 mm]).
4. Ensure the blade is properly support, and then adjust clearance by removing shims.

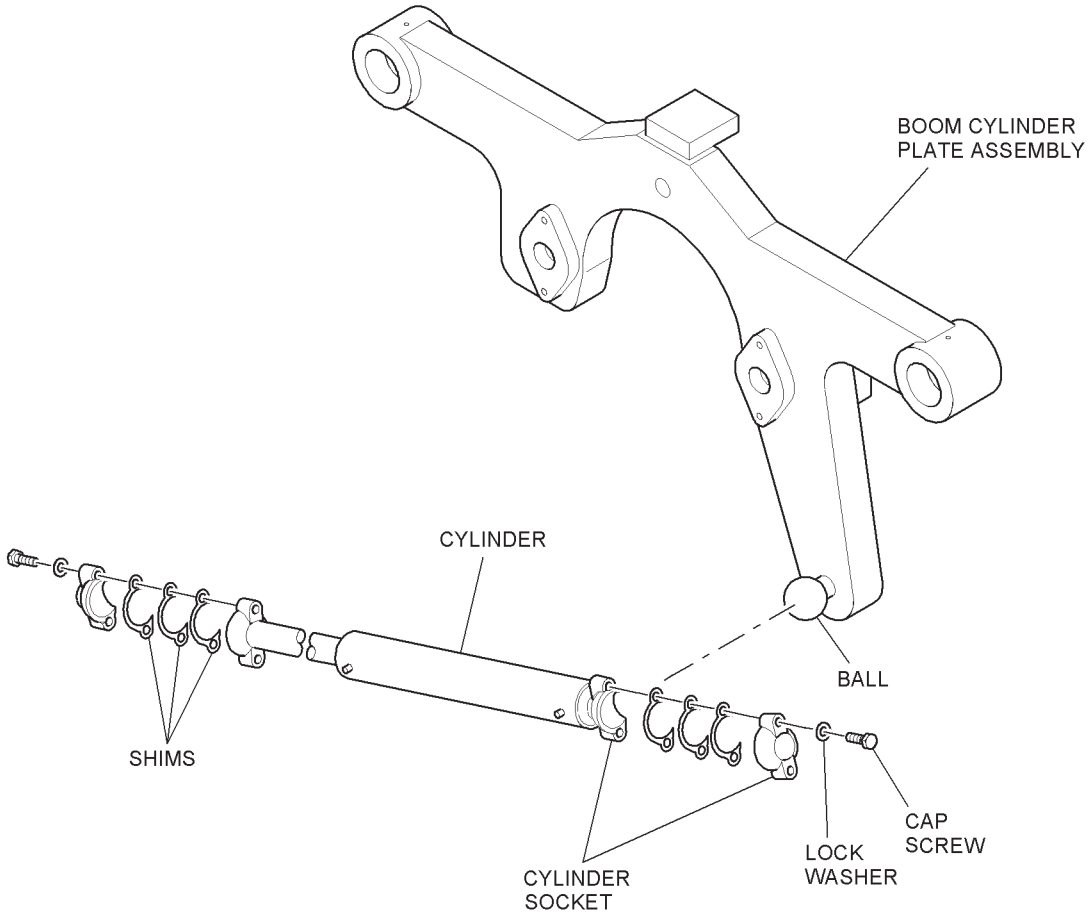


Figure 7-12. Typical Cylinder Ball and Socket

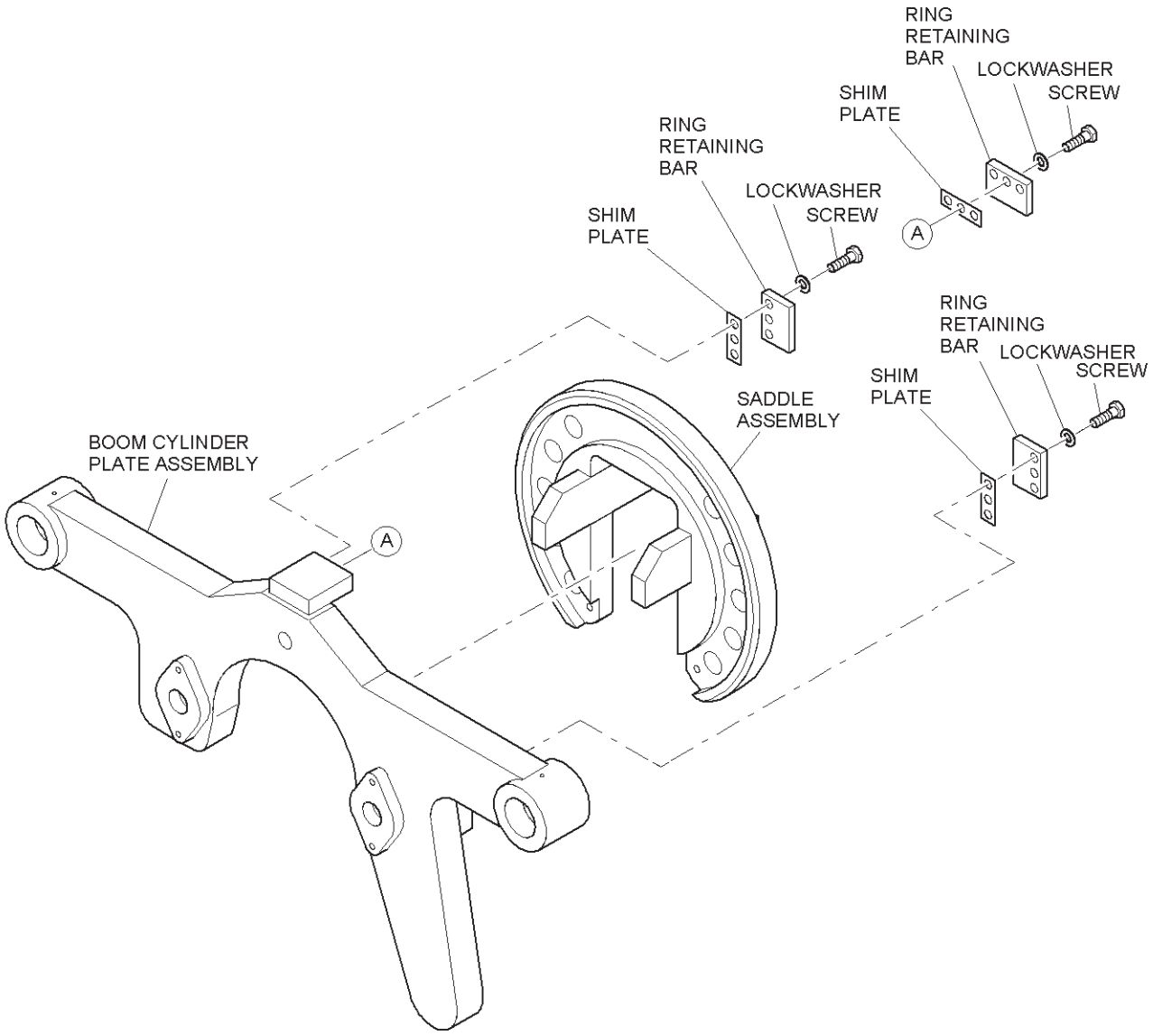


Figure 7-13. Shoe Saddle Guide

Check Ring Retainer Bar Clearance

1. Retainer bars, Figure 7-13, should move freely around saddle assembly.
2. Check for excessive looseness (more than 0.09 in. [2.3 mm]).
3. Ensure the blade is properly support, and them adjust clearance by removing ring retainer bar, Figure 14.
4. Replace shims.
5. Install ring retainer bar. Tighten capscrews to 375 ft. lb. (510 N•m).

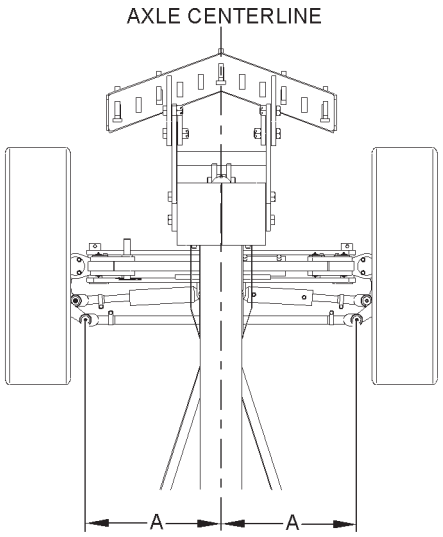


Figure 7-14. .Axle Centerline to Tie Rod Alignment

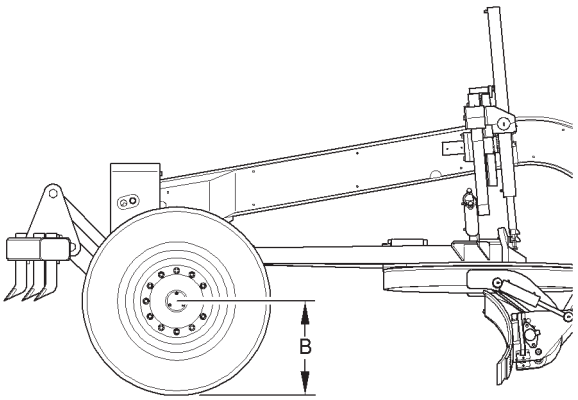


Figure 7-15. Ground to Hub Center Distance

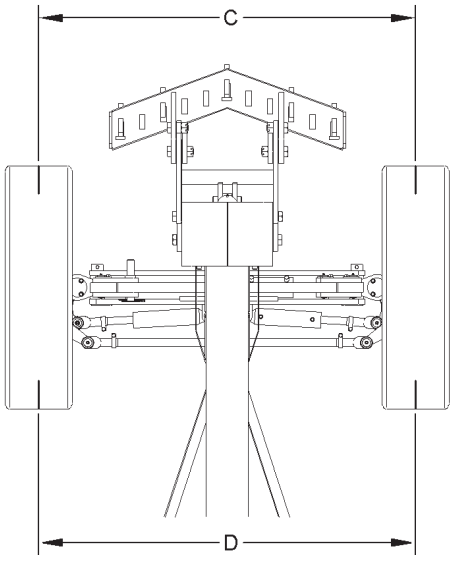


Figure 7-16. Front and Rear Marks

Checking And Adjusting Toe-In

1. Straighten wheels to vertical position.
2. Lower blade just enough to raise front wheels slightly off the ground. Block the front axle properly to support the machine.
3. Turn wheels to straight ahead position.
4. Measure the distance between axle centerline and tie rod pin centerline (A), Figure 7-14, on each tie rod. The difference between axle centerline should be 0.0 - 0.10 in. (0.0 - 2.5 mm).
5. If the distance is greater than 0.10 in. (2.5 mm) loosen tie rod nut on one tie rod.
6. Turn the tie rod until the distance between the tie rod pins is within 0.10 in. (2.5 mm) of the second tie rod.
7. Measure distance (B), Figure 7-15, from ground to center of hub.
8. Lift tires off ground enough to rotate.
9. At height (B), make a mark in center of tread on rear of each front tire.
10. Measure distance between marks (D), Figure 7-16, at rear of tires.
11. Rotate front tires so that marks are at the front.
12. Measure distance between marks (C), Figure 7-16, on front of tires
13. If difference is greater than 1/4 in. (6.5 mm), loosen tie rod nuts on both tie rods.
14. Turn each tie rod the same number of turns until difference is between 1/4 in. (6.5 mm) and 1/8 in. (3.25mm).

NOTE: May need to adjust the rod ends on the steering cylinders.

15. Tighten nuts to 210 ft. lb. (285 N•m).

NOTE: After adjustments are made, turn front wheels to the stops in both directions to check for interference.

Check Oil Lines And Fittings

⚠WARNING **Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluid.**

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

Check all oil lines, hoses, and fittings regularly for leaks or damage. Make sure all clamps are in position and tight. Make sure hoses are not twisted or touching moving machine parts. If abrasion or wear occurs, replace immediately.

Tubing with dents may cause the oil to overheat. If you find tubing with dents, install new tubing immediately.

When tightening connections, use two wrenches to prevent bending or breaking tubing and fittings.

Replacement Procedures

Reference numbers shown in parenthesis ( ) in the following procedures refer to item references in the Illustrated Parts List for the specified Figure Number.

Replacing Front Or Rear Scarifier Assembly Shank

Removal

1. Lift shank (30), IPL Figure 10-7 and 10-56, to relieve pressure.
2. Pull retainer (20) up to remove.
3. Center the shank in the slot and drop down.

Installation

1. Insert shank (30) up through bottom of slot. Push shank forward to engage it.
2. Slide retainer down fully behind shank..
3. Pull shank (30) down to lock into place.

REPLACING SCARIFIER TOOTH

⚠CAUTION **Wear safety glasses when replacing scarifier tooth**

1. Pry tooth (40), IPL Figure 10-7 and 10-56, away from shank (30). (may need to remove shank scarifier for easier replacement)
2. Slide new tooth on to shank.
3. Bump new tooth tight with a hammer.

Replacing Articulate Cylinders

For replacement of the articulate cylinders, refer to IPL Figure 10-4 for the articulation group.

⚠WARNING **When replacing any hydraulic components, remove pressure from the hydraulic system by lowering all items, discharge any accumulator, block any load whose movement could generate pressure, and turn off the engine to prevent pump operation. Remove keys from the ignition to prevent unexpected starting of the machine.**

NOTE: Plug and cap all lines and ports when disconnected to prevent entry of dirt into the system.

Removal

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps. Move articulation lever to relieve any remaining pressure.
2. Support cylinder during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

Disconnect hydraulic hoses from the cylinder (10).

3. Remove roll pin (50) and articulating cylinder pin (60).
4. Disengage cylinder from boom weldment.
5. Remove roll pin (20) and articulating cylinder pin (30).
6. Lift cylinder out of assembly.
7. Remove bushings (40) and (70) from cylinder.

Installation

1. Install new bushings (40) and (70) into cylinder (10) before installing cylinder.
2. Attach cylinder (10) to boom weldment with articulating pin (60) and roll pin (50).

3. Attach cylinder (10) to rear frame assembly with articulating cylinder pin (30) and roll pin (20).
4. Connect the two hydraulic hoses.
5. Add hydraulic oil, if necessary.
6. Start engine and operate cylinder to check for leaks and for proper operation.
7. Stop the engine.

Replacing Wheel Steering Cylinders - right side listed, left side similar

For replacement of the right wheel steering cylinder, refer to IPL Figure 10-8 to 10-13 for the front axle assembly.

⚠WARNING When replacing any hydraulic components, remove pressure from the hydraulic system by lowering all items, discharge any accumulator, block any load whose movement could generate pressure, and turning off the engine to prevent pump operation. Remove keys from the ignition to prevent unexpected starting of the machine.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, relieve any remaining pressure.
2. Support steering cylinder during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the steering cylinder (530).
4. Remove nut (570) and capscrew (560) and two bushings (620).
5. Remove cotter pin (540) and castellated nut (550) then drop ball joint (580) out of hub and lever arm assembly (790).
6. Lift cylinder out of assembly.
7. Remove ball joint (580) from cylinder (530).

Installation

NOTE: If ball joint (580) needs to be replaced, be sure grease fitting (610) is in place and grease new ball joint.

1. Attach ball joint (580) and grease fitting (610) to cylinder (530).
2. Attach cylinder (530) to front axle with nut (570) and capscrew (580) and two bushings (620).
3. Attach ball joint (580) to hub and lever arm assembly (790) with cotter pin (540) and castellated nut (550).
4. Add hydraulic oil, if necessary.
5. Start engine and operate cylinder to check for leaks and for proper operation.
6. Stop the engine.

Replacing Wheel Lean Cylinder

For replacement of the wheel lean cylinder, refer to IPL Figure 10-8 to 10-13 for the front axle assembly. Properly support the front axle.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move lever to reduce any remaining pressure,
2. Support steering cylinder during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the lean cylinder (1050).
4. Remove nut (1040) and capscrew (1030).
5. Remove wheel lean pin shaft (1020).
6. Check condition of two bushings (1060) and replace if damaged.
7. Remove capscrew (920) and lockwasher (930).
8. Remove capscrew (932), lockwasher (934) and flat washer (936).
9. Pull out retainer pin assembly (910).
10. Check condition of two bushings (950) and replace if damaged.
11. Lift cylinder out of assembly - may need to remove or raise the crossbar assembly to gain clearance.
12. Reverse procedure to install a new cylinder.

NOTE: If retainer pin assembly (910) needs to be replaced, be sure grease fitting (940) is in place and grease new retainer pin assembly.

Replacing Scarifier Lift Cylinder, Front Scarifier Assembly

For replacement of the scarifier lift cylinder, refer to IPL Figure 10-7 for the front scarifier assembly.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move lever to reduce any remaining pressure.
2. Support lift cylinder during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the lift cylinder (250).
4. Remove one roll pin (260) and upper scarifier pin (270).
5. Remove one roll pin (230) and lower scarifier pin (240).
6. Lift cylinder out of assembly.
7. Reverse procedure to install a new cylinder.

Replacing Scarifier Lift Cylinder, Rear Scarifier Assembly

For replacement of the scarifier lift cylinder, refer to IPL Figure 10-56 for the rear scarifier assembly.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move the scarifier lever to reduce any remaining pressure..
2. Support lift cylinder during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the lift cylinder (130).
4. Remove two roll pins (110) and rear scarifier pin (120).
5. Remove four screws (140), lockwashers (150) and two cylinder mounting collars (160) attached to cylinder mounting plate (170).
6. Lift cylinder out.
7. Reverse procedure to install a new cylinder.

Replacing Moldboard Slide Hydraulic Cylinder

For replacement of the moldboard slide hydraulic cylinder, refer to IPL Figure 10-16 for the moldboard assembly.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move the lever to reduce any remaining pressure.
2. Support slide cylinder (130) during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the slide cylinder (130).
4. Remove two roll pins (20) and slide cylinder mounting pin (30).
5. Remove capscrews (140) and lockwashers (150).
6. Pull or slide the cylinder out of the slide assembly (130).
7. Reverse procedure to install slide cylinder.

Replacing Moldboard Tilt Hydraulic Cylinders

For replacement of the moldboard tilt hydraulic cylinders, refer to IPL Figure 10-16 for the moldboard assembly.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move the tilt lever to reduce any remaining pressure.
2. Support tilt cylinder (40) during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the tilt cylinder (40).
4. Remove hex capscrew (50), lockwasher (70) and cylinder end cap plate (60) from both ends of the cylinder to be replaced.
5. Slide cylinder ends off the slide assembly (160) and turntable assembly (200) and lift out tilt cylinder (40).
6. Reverse procedure to install tilt cylinders.

Replacing Circle Shift Hydraulic Cylinders

For replacement of the moldboard angle hydraulic cylinder, refer to IPL Figure 10-15 Yoke Assembly.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move the shift lever to reduce any remaining pressure.
2. Support shift cylinder (40) during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the shift cylinder (40).
4. Remove four hex head screws (50), lockwashers (60), and two bearing caps (40),
5. Remove cylinder from plate assembly (270) and from moldboard assembly (10), IPL Figure 5-2, and lift out shift cylinder (40), IPL Figure 5-14.
6. Reverse procedure to install shift cylinders and torque capscrews (50) to 210 in. lb. (23.7 N•m).

Replacing Moldboard Lift Hydraulic Cylinders

For replacement of the moldboard lift hydraulic cylinders, refer to IPL Figure 10-14 and 10-15, Yoke Assembly.

Removal

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move the lift lever to reduce any remaining pressure.
2. Support lift cylinder (220) to be removed during removal process.

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

3. Disconnect hydraulic hoses from the lift cylinder (220).
4. Remove two hex capscrews (230), lockwashers (240) and the bearing cap (220), disconnecting cylinder (220) from moldboard assembly (10), IPL Figure 2.
5. Remove two capscrews (150), IPL Figure 9, lockwashers (160), and each cylinder bottom clamp plate (140).
6. Remove cylinder end cap (180), steel bushing (190), drawbar bushing (200), and oil seal (210).

Installation

1. Install grease fittings (250) into cylinder end caps (180).
2. Install new oil seals (210), drawbar bushings (200), steel bushings (190), and cylinder end caps (180).
3. Position cylinders (220) in cylinder clamps (170).
4. Attach each cylinder bottom clamp plate (140) with two capscrews (150) and lockwashers (160).
5. Torque capscrews (150) to 105 in. lb. (11.9 N•m).
6. Attach bearing cap (220) with hex capscrew (230) and lockwasher (240) to moldboard assembly (10), IPL Figure 2.
7. Torque capscrews (230), IPL Figure 9, to 210 in. lb. (23.7 N•m).

NOTE: If hydraulic fittings have been removed from the cylinder, be sure that the fitting with the orifice is attached at the rod end.

Replacing Moldboard End Bits

For replacement of the moldboard end bits, refer to IPL Figure 10-16 for the moldboard assembly.

1. Remove the four nuts (60) and plow bolts (50) securing each end bit (40) to moldboard weldment (70) and remove end bit (40).
2. Reverse procedures to install a new end bit.

Replacing Moldboard Cutting Edge

For replacement of the moldboard cutting edge, refer to IPL Figure 10-16 for the moldboard assembly.

1. Raise and support moldboard so that cutting edges (10) are off ground.
2. Remove the eight nuts (30) and plow bolts (20) securing each cutting edge (10) to moldboard weldment (70) and remove each cutting edge (10).
3. Reverse procedures to install a new cutting edge.

Replacing Hydraulic Reservoir Strainers

For replacement of the hydraulic reservoir strainers refer to IPL Figure 10-51.

Hydraulic Oil Suction Strainer and Hydraulic Oil Strainer Filter

⚠WARNING Hydraulic oil is extremely hot after use. Allow oil to cool before servicing.

1. Lower all hydraulically operated components. Turn engine off to stop hydraulic pumps.
2. Place a container with enough capacity to hold the hydraulic fluid from the hydraulic tank.
3. Drain the hydraulic tank and discard the oil in accordance with regulations.
4. Disconnect suction line from strainer.
5. Remove the oil suction strainer (20) or oil strainer filter (30) as applicable.
6. Install new components.
7. Reconnect the suction line to strainer.
8. Refill the hydraulic tank with new hydraulic fluid.
9. Check system operation.

Strainer and Gasket Kit

⚠WARNING Hydraulic oil is extremely hot after use. Allow oil to cool before servicing.

1. Remove cap (40).
2. Remove six screws (60).
3. Remove filler neck (50).
4. Remove strainer and gasket (70).
5. Install new strainer and gasket (70) and align the six screw holes of the components.
6. Install filler neck (50) and align screw holes.
7. Attach filler neck (50) and strainer and gasket kit (70) with the six screws (60).
8. Check hydraulic oil level and add oil if required.
9. Install cap (40).

Replacing Exhaust System

For replacement of the muffler, refer to IPL Figure 10-45.

⚠WARNING Allow engine to cool down before performing any service.

1. Support muffler (150) then loosen clamp (160) attaching muffler to hood assembly (170).
2. Remove muffler (150) from grader.
3. Install new muffler by reversing procedure.

Replacing Radiator Assembly

For replacement of the radiator, refer to IPL Figure 10-45.

⚠WARNING Allow engine to cool down before performing any service.

NOTE: Remove hood and grill to access radiator.

1. Drain radiator coolant into a container large enough to hold all radiator coolant.
2. Disconnect the transmission fluid lines and plug lines. Allow transmission fluid in radiator to drain into a container.
3. Disconnect the hydraulic fluid lines and plug lines. Allow hydraulic fluid in radiator to drain into a container.

NOTE: May need to properly discharge the A/E system and disconnect the condenser lines and plug lines.

4. Support radiator during removal process.
5. Remove nuts (70), lockwashers (80), and screws (60) attaching radiator-mounting pad (50) to radiator support plate (90).
6. Lift radiator (10) off of mounting surface.
7. Remove screw (20), nut (30), and lockwasher (40) attaching radiator-mounting pad (50) to radiator.

NOTE: Check radiator mounting pads (50) for wear or damage and replace if necessary.

8. Install a new radiator by reversing procedure.
9. Check for proper centering of the fan in the shroud. Fan should be 2/3 in shroud for proper air flow.
10. After reconnecting hoses, add coolant, hydraulic fluid and transmission fluid as needed. Add coolant to overflow tank if necessary. Charge all systems as necessary.

Replacing Valve Bank

Refer to IPL Figure 10-36 to replace a valve in the valve group.

⚠WARNING When replacing any hydraulic components, remove pressure from the hydraulic system by lowering all items, discharge any accumulator, block any load whose movement could generate pressure, and turning off the engine to prevent pump operation. Remove keys from the ignition to prevent unexpected starting of the machine.

1. Lower all hydraulically operated components then turn engine off to stop hydraulic pumps, move levers on the valve needing to be replaced to reduce any remaining pressure..

NOTE: Place a container under hydraulic hoses to catch any hydraulic fluid when disconnecting hoses.

2. Tag and disconnect all hydraulic hoses from the valves. Plug all hoses and ports. Disconnect all levers arm assemblies.
3. Remove valve assembly and place on a clean table for service.
4. Disconnect the ball stud heim joint (150 or 170), as applicable, from the valve mount shaft (190).
5. Remove two nuts (100) and slide capscrew (90) out far enough to clear the valve that is to be replaced.
6. Slide the defective valve out of the valve assembly. Inspect seals an replace as necessary.
7. Reverse procedure when installing a new valve.
8. Torque nuts (100) and capscrews (90) to 49 ft. lb. (67 N•m).
9. Inspect all components for wear, after assembly check levers arm assemblies and lever arms for alignment and position. Adjust heim joints and clevis as needed.

Replacing Windshield Wiper Assembly

The motor assembly (220) for the windshield wiper is attached at the center of the windshield. Refer to IPL Figure 10-26 to replace the motor assembly.

1. Remove wiper motor cover (215).
2. Disconnect electrical wires from wiper motor (220).
3. Remove the wiper arm retaining nut (200), flat washer (210), and wiper arm (190).
4. Remove self-locking nut (240), flat washer (250) inside cab.
5. Remove screw (230) and flat washer (250) outside cab.
6. Remove wiper motor (220).
7. Reverse procedure to install a new wiper motor (220).

Replacing Wheel And Tire

Front Wheel

For replacement of the front tire and wheel, refer to IPL Figure 10-1.

Removal

1. Place wooden blocks in front of and in back of the rear wheels.
2. Raise up the front end of the grader, under the wheel that is to be removed so it is just touching the ground.
3. Properly support the frame in the event the jack slips.
4. Remove the 12 nuts (120) securing the front wheel (100 or -130) to the axle, then remove wheel.

Installation

NOTE: Be sure tires are mounted on the rim with proper tread orientation as shown in the IPL.

1. Slide the front wheel (100 or -130) onto the axle with the tire oriented as shown in the IPL.
2. Secure the tire to the axle with the 12 nuts (120) and studs (110). Be sure flat side of nut is toward tire rim.
3. Using a torque wrench, torque the nuts in a star pattern to even the tension on the wheel as the nuts are tightened. Torque nuts to 460 ft. lb. (628 N•m).
4. Remove the support from under the frame and lower to the ground.
5. Check tire pressure. Pressure should be 35 psi (241 kPa) (2.45 bar).

Rear Wheel

For replacement of the rear tire and wheel, refer to IPL Figure 10-4.

Removal

1. Place wooden blocks in front of and in back of the front wheels.
2. Raise up the rear end of the grader, so that the wheel that is to be removed is just touching the ground.
3. Properly support the frame in the event the jack slips.
4. Remove the 12 nuts (230) securing the rear wheel (210 or -240) to the axle, then remove wheel.

Installation

NOTE: Be sure tires are mounted on the rim with proper tread orientation as shown in the IPL.

1. Slide the rear wheel (210 or -240) onto the axle with the tire oriented as shown in the IPL.
2. Secure the tire to the axle with the 12 nuts (230). Be sure flat side of nut is toward tire rim.
3. Using a torque wrench, torque the nuts in a star pattern to even the tension on the wheel as the nuts are tightened. Torque nuts to 460 ft. lb. (624 N•m).
4. Remove the support from under the frame and lower to the ground.
5. Check tire pressure. Pressure should be 35 psi (241 kPa) (2.45 bar).

Circle Adjustment Pre-Check

1. Clean circle thoroughly to remove all debris and old lubricants.
2. Check clearance between the Moldboard Turntable Mounting Assembly (Circle) and the Drawbar Assembly. (This clearance is the thickness of one Circle shoe shim)
3. If removal of shims is necessary, remove circle Wear Mounting Plates (shoes) one at a time and inspect Wear Plate Shims for excessive wear. If replacement is necessary do so at this time before attempting any Circle adjustments.
4. When proper clearance is obtained, lubricate Circle Turntable with spray graphite lubricant.
5. Start machine and observe circle movement thru complete movement. (Front wheel to front wheel) Use caution and do not allow the blade to come in contact with the front wheels.

Circle Adjustment

6. Turn Circle until blade is 90 degrees to main machine frame. (Figure 7-17)
7. Use an assistant spotter to observe Circle drive pinion gear to Circle ring gear mesh. Make sure one Circle pinion gear tooth is in mesh between two ring gear segment teeth. (Figure 7-18)
8. Use blade tip function and tip blade full forward.
9. Lower blade to the ground and allow it to rest on wood blocks.
10. Apply slight down pressure with the blade on wood blocks using the left and right Lift cylinders.



Figure 7-17 Moldboard Turntable Assembly

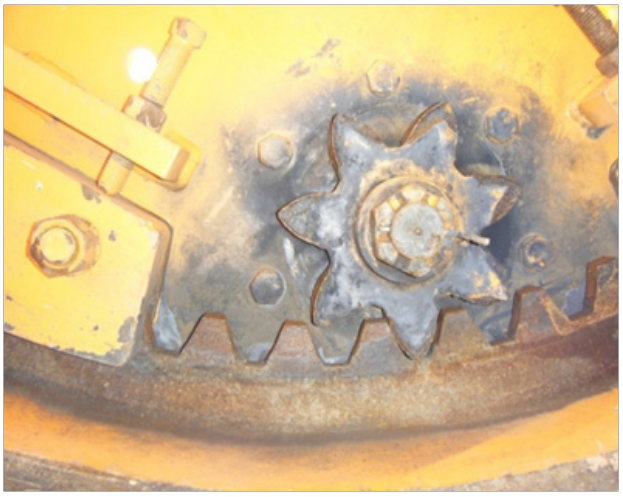


Figure 7-18. Turntable Pinion Gear

11. Holding service brake with foot, shift transmission to forward gear. Slightly remove foot from service brake pedal and allow the machine to inch forward slightly to remove all free travel fore and aft from the Circle assembly.
12. Apply the Parking brake and shut down the engine. Remove the key from the ignition.
13. Loosen all 10 Circle Shoe bolts. (Figure 7-17)
14. Loosen the set screw jam nuts and set screws on all five Circle shoes. Adjust Circle table forward or backward as needed to achieve 1/8"(inch) clearance between Circle drive pinion gear tooth and the Circle ring gear segment teeth. (Figure 7-18)

NOTE: Loosen set screws on outer left and outer right circle shoes significantly to allow for a lot of free play. Observe gear mesh. Using rear circle shoe and both front shoe set screws, adjust the gear mesh clearance.

15. When proper clearance is obtained, slightly tighten set screws on rear circle shoe and both front shoes. Now adjust set screws on outer left and outer right circle shoes to a torque of 10-15 ft. lb., loosen one flat (90 degrees), then tighten the jam nuts. Loosen set screws on rear shoe and front left and right shoes, torque to 10-15 ft. lb., loosen one flat (90 degrees), and tighten the jam nuts.
16. Tighten all 10 Circle shoe mounting bolts to 645 ft. lb..
17. Start the machine and raise blade. Test turn Circle full left and full right and observe Circle movement. Circle should turn without binding or indexing. If binding or indexing occurs recheck all adjustments and Circle condition.

NOTES

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TROUBLESHOOTING

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GENERAL

The Troubleshooting Chart is based on identifying a symptom, identifying the probable causes, and identifying the remedy for the indicated symptom. The causes listed are the most probable. If these causes do not locate the problem a more detailed analysis is required.

Table 8-1.

***TROUBLE SHOOTING CHART* - ENGINE PROBLEMS**

SYMPTOM	CAUSE	REMEDY
Engine Won't Turn Over (Starter motor will not turn)	Master switch in OFF position	Set switch to the ON position.
	Ignition switch defective	Check ignition switch.
	Controls not in Neutral	Check safety neutral switches.
	Engine ground corroded	Check engine ground wire.
	Batteries undercharged	Disconnect batteries and charge separately. Replace both batteries if
	Battery cable making poor contact	Clean connections at battery and
	Start Relay	Listen for solenoid to "click" as key is
	Starter solenoid	Check for 24 VDC at small solenoid 24 VDC is present, replace solenoid.
	Key switch	Check for 24 VDC at key switch "ST" terminal with key in start position.
	Starter motor	Listen for starter solenoid "click" as defective. Repair or replace.
	Neutral start switch	Replace switch. See your authorized dealer.
Engine Won't Start - "Engine Turns over"	Low fuel level	Check fuel in tank.
	Contaminated fuel	Drain fuel tank and refill.
	Fuel flow cutoff	Check fuel cutoff.
	Fuel tank vent clogged	Remove cap and listen for air entering tank rapidly.
	Fuel pump faulty	Repair or replace pump.
	Air filter element restricted	Clean or replace filter element.
	Injection pump faulty	See your authorized dealer.
	Injection nozzle(s) faulty	See your authorized dealer.
	Blown head gasket	See your authorized dealer.
	No voltage to injection transfer pump	Check voltage to pump.

Table 8-1.

TROUBLE SHOOTING CHART - ENGINE PROBLEMS (Continued)

SYMPTOM	CAUSE	REMEDY
Starter Motor Turns But Will Not ``Crank Engine	Fly wheel gear teeth broken	dealer.
	Starter pinion gear not engaging flywheel ring gear	Pinion shift mechanism "jammed" or malfunctioning. See your authorized dealer.
Engine Cranks Slowly	Battery or starter cable connections loose or corroded	Clean and tighten connections.
	Battery cable damaged or broken internally	Inspect and replace cables.
	Batteries discharged or will not hold a charge	Recharge or replace both batteries.
	Wrong oil for low ambient temperature	Drain and refill with proper weight oil. Change oil filter.
	Dirty connections at battery	Clean battery posts and cable ends.
	Starter motor faulty	Replace starter motor.
	Batteries not charging	Check specific gravity of batteries. Check alternator belt tension. If batteries are to be replaced, replace both batteries.
Engine Surges or Stalls Frequently	Air entering suction side of fuel system	Check fuel filter for air bubble. Tighten fittings.
	Fuel tank vent clogged	Remove cap and listen for air entering tank rapidly.
	Air filter element restricted	Clean or replace filter element.
	Fuel pump faulty	Repair or replace pump.
	Injection pump faulty	See your authorized dealer.
	Injection nozzle(s) faulty	See your authorized dealer.
Erratic Engine or Poor Slow Speed	Air entering suction side of fuel system	Check fuel filter for air bubble. Tighten fittings.
Operation	Fuel tank vent clogged	Remove cap and listen for air entering tank rapidly.
	Air filter element restricted	Clean or replace filter element.
	Fuel pump faulty	Repair or replace pump.
	Injection pump faulty	See your authorized dealer.
	Injection nozzle(s) faulty	See your authorized dealer.
	Slow idle speed set too low	Check for worn or loose speed

Table 8-1.

TROUBLE SHOOTING CHART - ENGINE PROBLEMS (Continued)

SYMPTOM	CAUSE	REMEDY
Engine not Developing Full Power	Wrong grade of fuel or water in fuel	Drain water from fuel sump or drain
	Air filter elements clogged	Clean or replace elements.
	Fuel filter clogged	Replace fuel filter.
	Exhaust system restriction	Check condition of muffler interior.
	Incorrect valve clearance	Adjust clearance.
	Fuel line restriction	Clear restriction with compressed air.
	Fuel transfer pump malfunction	Repair or replace pump. See your
	Injection pump or nozzle malfunction	Repair or replace. See your authorized dealer.
Low Engine Oil Pressure	Low oil level	Check oil level. Fill to correct level. Check for leaks and repair as necessary.
	Low viscosity using winter oil in summer	Drain and fill with summer weight oil.
	Oil pressure sensor	Replace sensor.
	Clogged oil pump intake screen	See your authorized dealer.
Engine Overheats	Loose, worn, or broken fan belt	Tighten or replace belt.
	Low coolant level	Fill to correct level and check for leaks.
	Radiator dirty or clogged	Check airflow. Clean radiator.
	Engine overloaded	Reduce load. Operate in low gear.
	Radiator cap not sealing	Replace cap.
	Faulty sender	Replace sender.
	Excessive brake drag	Repair. See your authorized dealer.
	Thermostat stuck or missing	Replace thermostat.
	Water pump leaking	Repair or replace water pump.
Excessive Fuel Consumption	Air system restricted	Clean or replace filter elements.
	Fuel system leakage	Repair.
	Incorrect grade of fuel	Drain and fill with proper fuel.
Oil in Coolant or Coolant in Oil	Leaking cylinder head gasket cracked cylinder or block	Repair. See your authorized dealer.

Table 8-2.

TROUBLE SHOOTING CHART - HYDRAULIC SYSTEM

SYMPTOM	CAUSE	REMEDY
Grader Will Not Move	Transmission fluid low	Add transmission fluid.
	Parking brake engaged	Disengage parking brake.
	Throttle not at idle	Set throttle to idle.
	Check that rpm is less than 1200	Lower rpm to 1200 or less.
	No power to shifter	Check for power at shifter and correct if defective.
	Check that APC is operating	Correct defect.
No Hydraulic Steering Power	Steering pump bad	Replace pump.
	Relief valve bad	Replace valve.
	Brake charge valve bad	Replace valve.
	Steering valve bad	Replace valve.
Slow Hydraulic Functions	Low oil level	Add oil.
	Air in hydraulic oil	Inspect suction side hoses and fittings.
	Engine rpm low	Inspect and adjust speed control.
	Hydraulic strainer clogged	Change strainer.
	Hydraulic standby pressure too low	Adjust. See your authorized dealer.
	Low pump flow (worn pump)	See your authorized dealer.
Hydraulics Overheat	Excessive load.	Reduce load.
	Low oil level.	Fill to proper level.
	Oil cooler clogged.	Clean and check airflow.
	Max pressure on the valve is set lower than the maximum pressure on the pump causing pump to operate all the time.	Adjust pressure setting.
Hydraulic Functions Drift or Settle	Cylinder or control valve leaking	Repair leakage.
	Contamination in valve bore	See your authorized dealer.
	Scored valve bore or bent valve spool	See your authorized dealer.
Foaming Oil	Incorrect type of oil	Use recommended oil.
	Air leak on suction side of pump	Tighten fittings and inspect hoses for damage.
	Oil level too high or low	Adjust to FULL mark on dipstick.
Hydraulic Pump Leaking	Worn shaft seal	See your authorized dealer.
	Capscrews holding pump housing loose	Tighten capscrews.

Table 8-3.

TROUBLE SHOOTING CHART - ELECTRICAL SYSTEM

SYMPTOM	CAUSE	REMEDY
Starter Solenoid Chatters	Poor connections at battery or starter Defective start solenoid Batteries discharged	Clean connections. See your authorized dealer. Recharge or replace batteries.
Excessive Noise When Cranking The Engine	Hydraulic pump or pump drive Major engine malfunction	Repair. See our authorized dealer. Repair. See your authorized dealer.
Battery Uses Too Much Water	Battery being overcharged High ambient temperature Faulty regulator	If one battery is low on charge, the other battery will be over charged. Refill with distilled water. See your authorized dealer.
Cracked Battery Case	Frozen battery Battery hold down clamp too tight, too loose, or missing	Keep batteries fully charged during cold weather. Replace both batteries. Install new batteries. Install hold down clamps correctly.
Low Battery Output	Low water level	Refill with distilled water. Recharge
	Corroded or loose battery cable ends	Clean and tighten cable and clamps.
	Loose fan/alternator belt or worn	Belt is slipping. Adjust or replace belt.
	Low alternator output	Inspect charging system and repair.
High Charging System Voltage (Batteries Hot or Boiling)	Alternator or regulator malfunction	See your authorized dealer.
Noisy Alternator	Bearings in alternator	Repair or replace alternator.
Horn Will Not Sound	Horn fuse	Replace fuse.
	Poor ground connection	Clean connector and frame.
	Broken wire	Replace wire.
	Horn faulty	Replace horn.
Front Wiper Will Not Operate at any Switch Position.	Wiper fuse	Replace fuse.
	Wiper switch	Replace switch.
	Wiper motor	Replace motor.

Table 8-3.

TROUBLE SHOOTING CHART - ELECTRICAL SYSTEM (Continued)

SYMPTOM	CAUSE	REMEDY
Front Wiper Operates in One Position Only	Open wire	Repair wire.
	Wiper motor	Replace motor.
Front Wiper Will Not Operate At Any Switch Position.	Wiper fuse	Replace fuse.
	Wiper switch	Replace switch.
	Wiper motor	Replace motor.
Front Washer Will Not Operate	Washer fuse	Replace fuse.
	Wiper switch	Replace switch.
	Washer pump	Replace pump.
Driving Lights Will Not Operate	Blown fuse	Replace fuse.
	Driving light switch	0 volts at light with key on and light switch is on. Replace switch
	Accessory relay	Turn key switch to ACC or ON. Accessory relay inside console should "Click". If no click is heard and 24 volts read on wire from switch to relay, replace relay.
One Front Driving Light Does Not Operate	Bulb	Replace bulb.
One Rear (Red) Tail Light Does Not Operate	Bulb	Replace bulb.

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Table 8-4.

TROUBLE SHOOTING CHART - POWER TRAIN

SYMPTOM	CAUSE	REMEDY
Transmission Overheats	High oil level	Adjust to correct level.
	Restricted oil filter	Change filter.
	Low lubrication oil flow or pressure	See our authorized dealer.
	Clutch or brake disc warped	See your authorized dealer.
	Excessive high taxi speed operation in hot weather	Lower taxi speed.
	Running in too high of a gear when working	Set transmission to a lower gear.
	Transmission cooler not clean	Clean transmission cooler.
Machine Lacks Power or moves slow.	Low oil level	Adjust to correct level.
	Brakes dragging	Check for excessive heat in tandem
	Overloading machine	Reduce load.
	Restricted filter	Change filter.
	Transmission leaking	See your authorized dealer.
	Low engine power	See your authorized dealer.
	Transmission slipping	See your authorized dealer.
Machine Makes Excessive Noise when moving.	Transmission/hydraulic oil level low	Adjust to correct level.
	Transmission or differential	See your authorized dealer.
	Wheel bearing	See your authorized dealer.
	Brakes dragging	See your authorized dealer.
Excessive Machine Vibration	Adjust slow idle speed.	
	Engine mounting hardware loose or missing	See your authorized dealer.
	Hydraulic pump drive coupling or mounting hardware loose	See your authorized dealer.
	Hydraulic pump malfunction	See your authorized dealer.
	Engine malfunction	See your authorized dealer.
	Transmission malfunction	See your authorized dealer.
	Axle or final drive malfunction	See your authorized dealer.

FUNCTIONAL SPECIFICATION

General

The APC72 is a device used to control the shifting of many Spicer Off-Highway Powershift transmissions. While being easy to operate, it takes care of all transmission related functions in order to achieve superior shift quality and high reliability.

The built in self-test and trouble shooting features allow fast problem resolution. The integration in the vehicle wiring system is straightforward and mainly involves connections between the shift selector, the APC72 and the transmission control valve.

Additionally the APC72 requires some connections for supplying power and for selection of different operating modes. Refer to 8-35, Technical guidlines for installation for details about the installation.

External Interfaces

The APC72 is connected to the vehicle wiring system using a 30 pole Packard Electric Metripack Connector.

Table 8-5.

MATING CONNECTOR PART NUMBERS.

Part	Packed Part Number
Receptacle	12048455
Contact	12089290 (0.35-0.5mm^2)
	12103881 (0.8 - 1.0 mm^2)

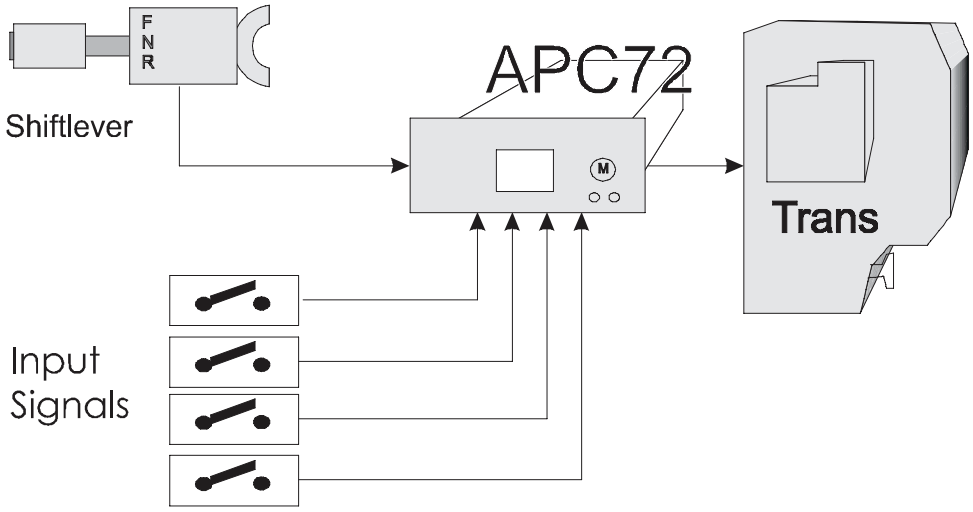


Figure 8-1. APC72

Table 8-6.

TYPE DESIGNATIONS.

Ptg	Pull to ground	Input internally pulled high, must be connected to Ground to activate.
Ptp	Pull to plus	Input internally pulled low, must be connected to Plus to activate.
Stg	Switch to ground	Output switches internally to Ground. Other side of Load must be connected with Plus
Stp	Switch to plus	Output switches internally to Battery plus. Other side of load must be connected with ground.

Table 8-7.

APC72 CONNECTIONS (Prefix TC refers to the APC72 connector pins.)

Wire	Pin	Function	Type	Comment
TC01	A1	Battery + 12V/24V		Connect to Battery through 6 A fuse
TC02	B1	Ground		Connect to chassis Ground
TC03	C1	PWM0	stg	Warning lamp
TC04	D1	Solenoid 1	stp	Gear position selection solenoid (1)
TC05	E1	Solenoid 2	stp	Gear position selection solenoid (2)
TC06	F1	Forward Solenoid	stp	Forward / Neutral selection solenoid
TC07	G1	Reverse Solenoid	stp	Reverse / Neutral selection solenoid
TC08	H1	PWM1	stg	Lockup solenoid
TC09	J1	Splitter Solenoid	stp	Gear position selection solenoid (splitter)
TC10	K1	PWM solenoid supply	stp	PWM solenoid supply
TC11	A2	Battery + 12V		Connect to Bat+ : for 12 V applications only
TC12	B2	Signal Ground		For speed sensors only
TC13	C2	Input 0	ptp	Shift lever Forward input
TC14	D2	Input 1	ptp	Shift lever Reverse input
TC15	E2	Input 3	ptp	Shift lever range selection
TC16	F2	RXD (RS232)		Not used
TC17	G2	CAN H		Not used
TC18	H2	Input 4	ptp	Shift lever range selection
TC19	J2	Input 6	ptp	Not idle / Idle input
TC20	K2	Analogue input 1	ptg	Not used
TC21	A3	Engine speed		Engine speed - inductive pickup
TC22	B3	Input 7		Lockup Enabled / Disabled
TC23	C3	Turbine speed		Turbine speed - inductive pickup
TC24	D3	Not used		Not used
TC25	E3	Input 2	ptp	Shift lever range selection
TC26	F3	Output 8	stp	Not used
TC27	G3	TXD (RS232)		Not used
TC28	H3	CAN L		Not used
TC29	J3	Input 5	ptp	Manual/automatic switch
TC30	K3	Analogue input 0	ptg	Declutch Request Inactive (2000 ohm)/ Active (1000 ohm)

Man — Machine Interface

Shift Lever

The main interface with the driver is the shift lever. It allows selecting the driving direction and the different ranges. The shift lever output signals serve as inputs for the APC72.

Display

The display is located on the APC72 front panel and consists of:

- 2 red 7-segment LED digits
- 2 status LED lamps
- a push button labeled ‘M’ for display mode selection.

The LED lamp labeled 'T' is yellow and is used to indicate test modes and faults.

The LED lamp labeled 'F' is red and is switched on when the APC72 is in the reset condition. (See 8-25, Reset Condition).

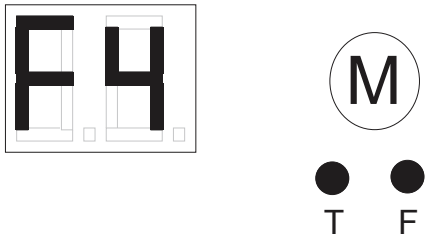


Figure 8-2. APC72 FRONT PANEL DISPLAY

After power up, the display defaults to the gear position mode. In this mode, the left digit shows the actually engaged direction and the right digit shows the currently engaged range (gear).

Pressing the 'M' switch changes the displayed information.

While pushing the switch (and about 1 second after it is released) the display shows which information is about to be displayed.

Pushing the switch activates the next mode. Pushing while in shift lever display, the gear position display is again selected.

When holding the switch for more than 2 seconds, the display shows a code identifying the severest problem currently detected, if any. The T-led flashes while an error is detected.

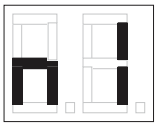
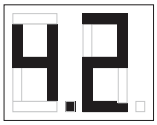
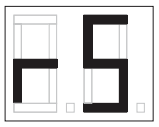
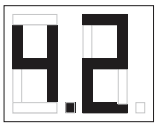
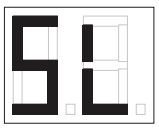
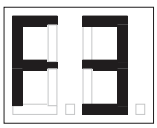
Error codes are described in 8-27, Indication of Faults.

Other

Additionally several on/off switches with function described in 8-14, External inputs, are used to select different operating functions.

Table 8-8.

AVAILABLE MODES

While pressed	Info shown	Comment
		This mode shows actually engaged direction and range. If either or both differ from the shift lever, the corresponding dot blinks. The example shows Neutral 1st.
		This mode shows vehicle speed in km/h. For speeds below 10km/h, speed is shown with 0.1km/h resolution. The example shows 4.2km/h
		This mode shows vehicle speed in mph. For speeds below 10mph, speed is shown with 0.1mph resolution. The example shows 4.2mph
		This mode shows the current shift lever position. Only positions actually available on the transmission are shown. If different from the transmission, the corresponding dot blinks.

8

Operating Modes

Normal Driving

See 8-14, Functional description for detailed description.

Self Test Mode

This mode is selected when the mode switch is pressed at power up.

See 8-32 , Self test Functions for detailed description.

Operating Characteristics

The APC72 is designed to operate continuously under the environmental conditions described in Table 8-20.

Below sections detail some specific system limits and specification data relevant for interfacing with the APC72.

System

The APC72 is designed for operation at 12V and at 24V without modifications to the controller.

Table 8-9.

APC72 SYSTEM

Operating temperature range		-40°C to +80°C
Sealing		IP65 & IP66
Supply Voltage	Vnom Min - max.	12V 9V - 16V DC
Supply Voltage	Vnom Min - max.	24V 18V -32V DC
Over voltage conditions		5 min @ 48V 350ms @ 226V 2 ms @ 300V
Maximum continuous total load current @ Vnom		6 Amperes

Table 8-10.

ON/OFF INPUTS

Low input level	< 0.8 V
High input level	> 2.3V
Minimum DC voltage level	- 60V
Maximum DC voltage level	+60V

Table 8-11.

ANALOGUE INPUTS (Not Used)

Internal pull up resistor (to battery voltage)	11 kOhm
Input voltage range	0 to 5 V
Resolution	10 bit
Minimum DC voltage level	- 60V
Maximum DC voltage level	+60V

Speed Sensor Inputs

Turbine Speed

The APC72 has two input circuits for sensing turbine speed - a current loop circuit compatible with the Dana Magneto Resistive Sensor (MRS) and an inductive pickup input circuit. This way it's compatible with all existing sensor options on Dana transmissions.

The LeeBoy Model 785 Motor Grader uses an inductive speed sensor to measure transmission speed.

The controller only supports electrical fault detection for the MRS (short circuit or open load).

Engine Speed

For sensing engine speed, the APC72 accepts all existing Dana inductive speed pickups.

Table 8-12.

SENSOR CIRCUIT CHARACTERISTICS

Sensor type	Magneto resistive	Inductive
Electrical interface	Current sensing	Voltage sensing
Normal operating levels	7 / 14 mA	0.8 / 1.2 Vtt
Short circuit detect	Yes	No
Open circuit detect	Yes	No
Reverse polarity detect	Seen as short ckt	N.A.
Fully protected	Yes	Yes

Table 8-13.

ON/OFF OUTPUTS

Maximum continuous load current	1.5 Amperes
Short circuit detect	yes
Open circuit detect	yes
Redundant shutdown path. Common for 5 outputs	yes
Fully protected	yes

Table 8-14.

ANALOGUE OUTPUTS

Output current	10mA -1100mA
Resolution	8 bit
Short circuit detect	yes
Open circuit detect	yes
Redundant shutdown path. Common for 2 outputs	yes
Fully protected	yes

Functional Description

External Inputs

Not Idle/Idle Switch (wire 19)

Input is active when the throttle pedal is applied. Input is inactive when the throttle pedal is released. The information received from this input is vital for correct functioning of the control unit during automatic shifting.

Manual/Automatic Switch (wire 29)

Manual to Automatic: Switching from manual to automatic is possible in all circumstances.

Automatic to Manual: Switching from automatic to manual is possible in all circumstances.

NOTE : When the shiftlever is lower than the transmission gear, the downshift protection will inhibit downshifts at too high speed (See 8-14, Downshift protection).

Lockup Enabled/Disabled (wire 22)

Lockup can be enabled and disabled with a switch on wire 22. If wire 22 is activated, lockup is enabled. If wire 22 is not activated, lockup is disabled.

Declutch Request Inactive/Active (wire 30)

A request for Declutch is made with a switch under the brake pedal on wire 30. The switch is normally closed and thus the analog input measures 2000 ohms. Resistance greater than 1800 ohms yields an inactive request. Conversely opening the switch by depressing the brake pedal will yield 1000 ohms and thus an active request for declutch. Declutch is only granted when the vehicle speed is below 2.3 MPH.

Shift Lever

The main interface with the driver is the shift lever. It allows selecting the driving direction and the different ranges. The shift lever output signals serve as inputs for the APC72.

The APC72 is designed to interface with a 6 speed shift lever that generates a grey coded selection pattern as shown in following table.

In manual mode, the transmission gear will equal the shiftlever position, provided the downshift protection is not engaged (See 8-14, Downshift Protection).

In automatic mode, there will be automatic shifting between 1st gear and the shiftlever position.

Table 8-15.

SHIFT LEVER INTERFACE

Selected Position	Standard Shift lever: wire number							
	1	2	3	4	5	6	7	13
F1	BAT +			•	•	•		
F2	BAT +			•	•	•		•
F3	BAT +				•	•		
F4	BAT +				•	•		•
F5	BAT +					•		
F6	BAT +					•		•
N1								
N1	BAT +			•	•			
R1	BAT +			•	•		•	
R2	BAT +				•		•	
R3	BAT +						•	

• = Wire connected to pin 1 of standard shift lever (BAT+)

Table 8-16.

CONNECTIONS TO THE APC72

Wire Standard shift lever	Wire on APC72
6	13
7	14
4	25
5	15
13	18

Overspeeding Upshifts As Transmission Protection

In automatic mode, when the shiftlever position is higher than the transmission gear and the turbine speed exceeds the overspeeding limit of 3000 RPM, an automatic upshift will occur to protect the transmission against overspeeding.

Automatic Shifting

Automatic shifting in neutral

If the transmission is in neutral, the control unit will shift to the next higher gear when the transmission overspeeding limit is reached (3000 rpm) or will shift down when the transmission input speed after the downshift would not exceed 1800 RPM.

Definitions

If lockup is engaged, the transmission is in 'lockup drive'.

If lockup is not engaged, and speed ratio is below 1, the transmission is in 'converter drive' :

$$\text{speed ratio} = \frac{\text{turbine speed}}{\text{engine speed}} < 1$$

If lockup is not engaged, and speed ratio is above 1, the transmission is in 'braking mode' :

$$\text{speed ratio} = \frac{\text{turbine speed}}{\text{engine speed}} > 1$$

Automatic Shifting (if in 'Converter Drive')

Automatic Upshifting

An automatic shift to a higher gear is made when the throttle pedal is pressed, the turbine speed exceeds a minimum turbine speed of 1500 RPM and the slip in the converter (speed ratio) has reached a certain value. This occurs when the tractive effort in the higher gear is higher than the tractive effort in the lower gear.

The graphs below show both the upshift curve used for each gear.

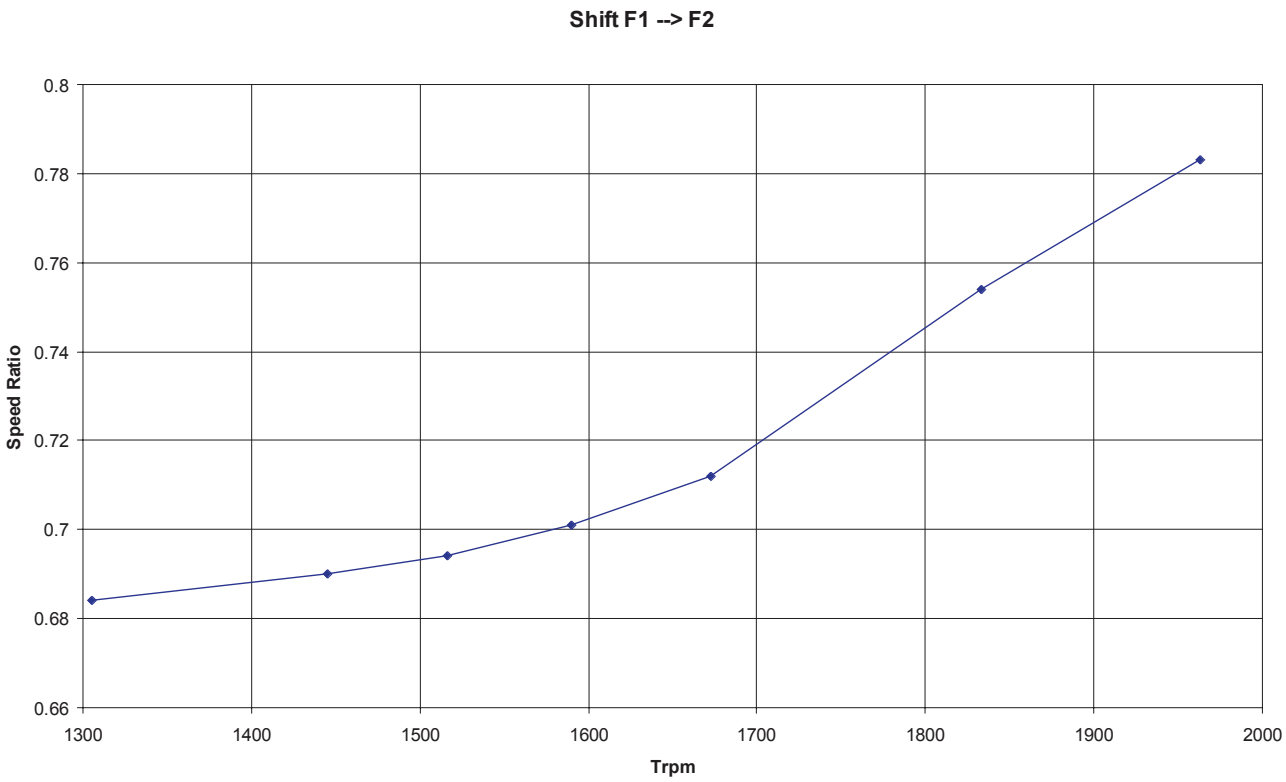


Figure 8-3

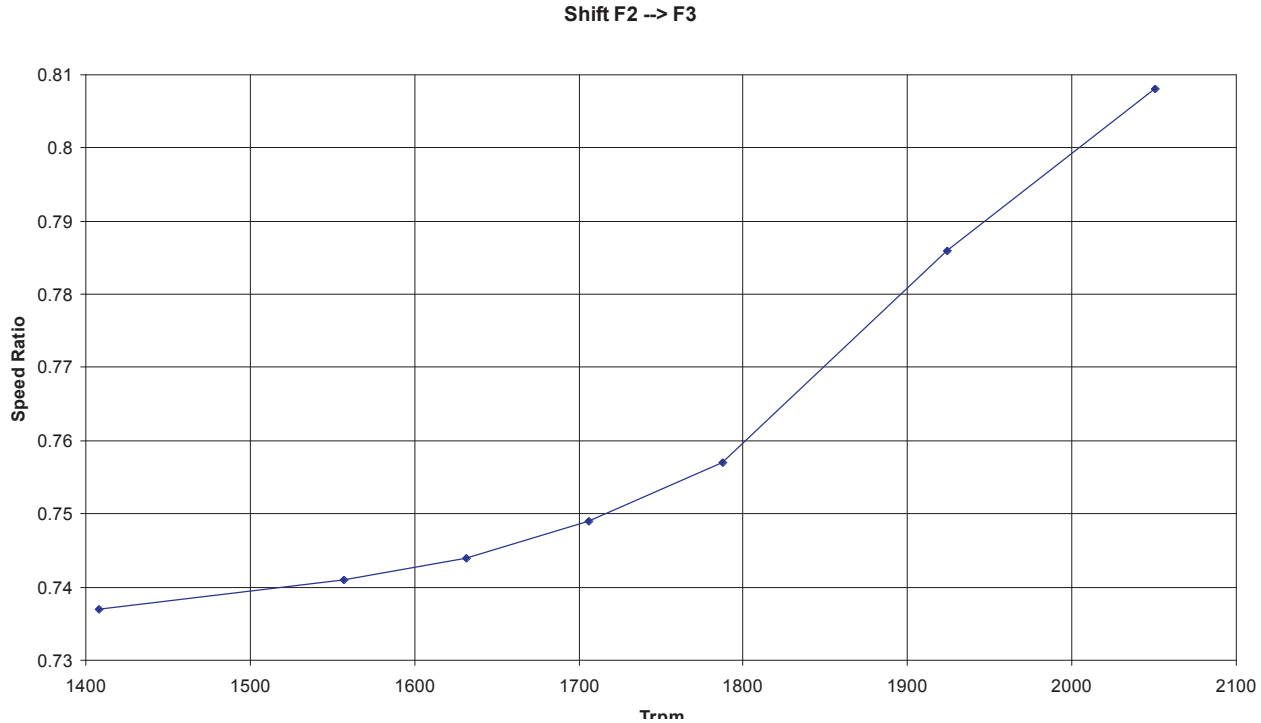


Figure 8-4

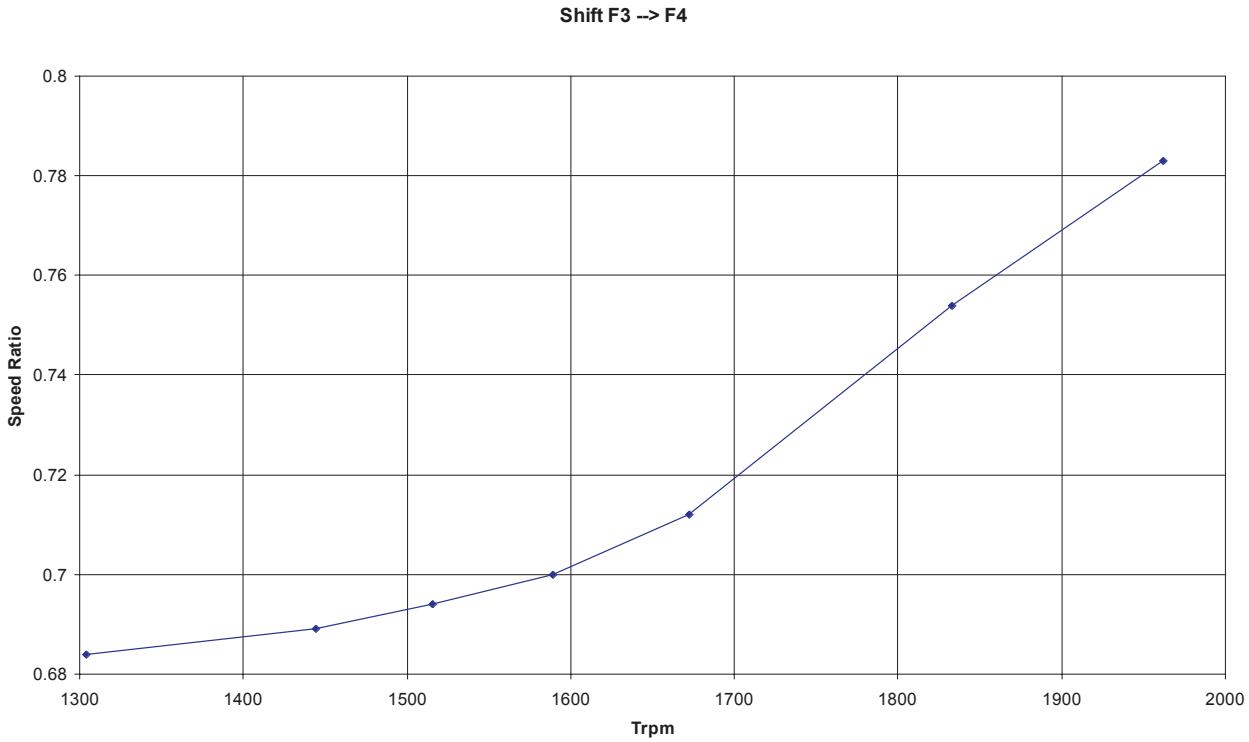


Figure 8-5

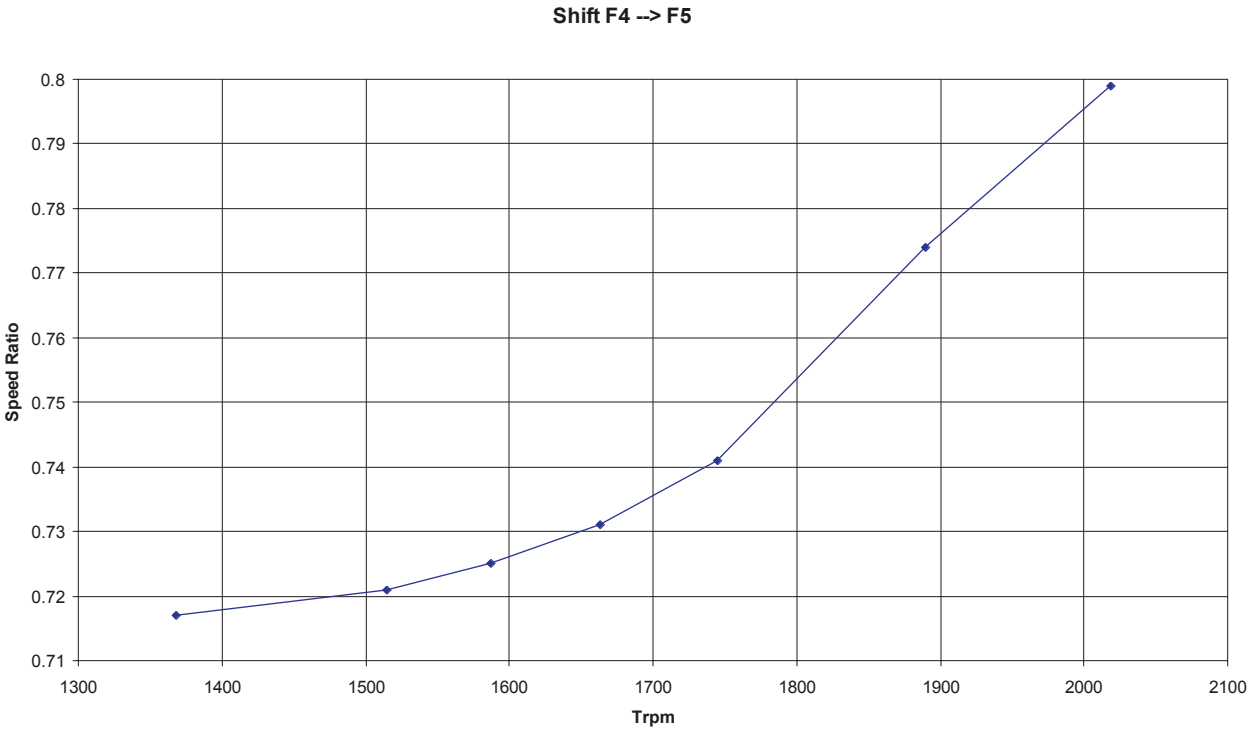


Figure 8-6

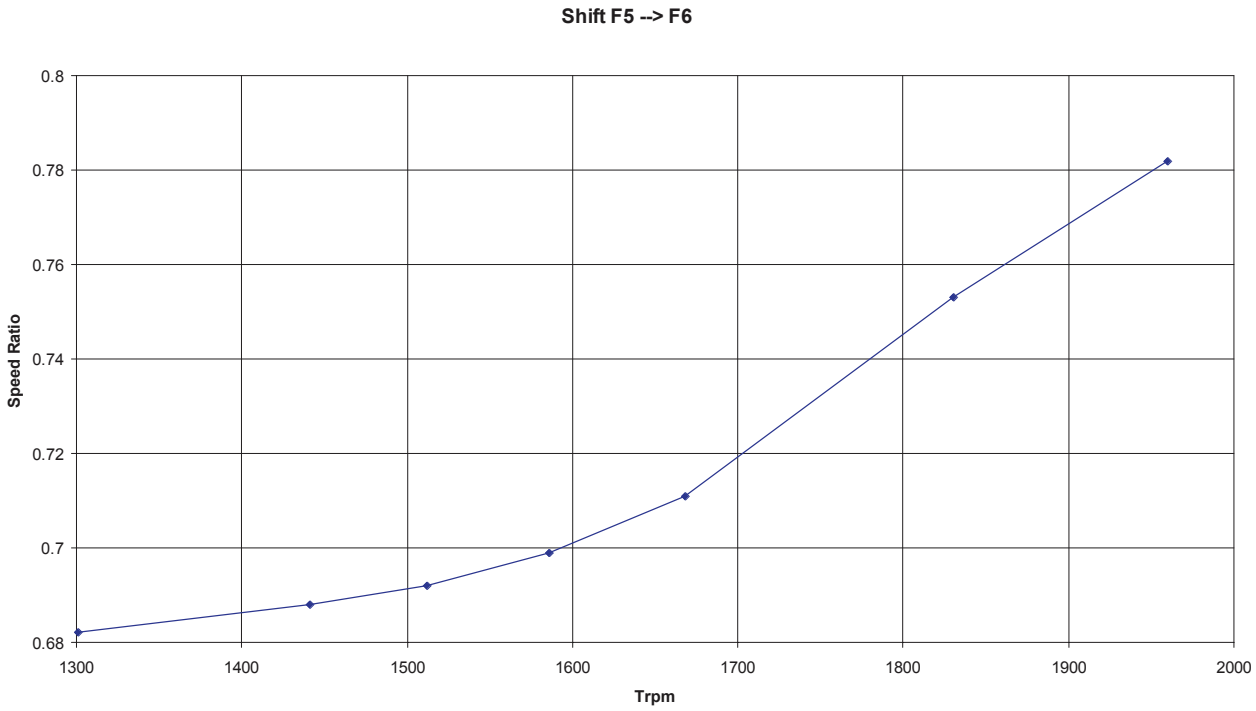


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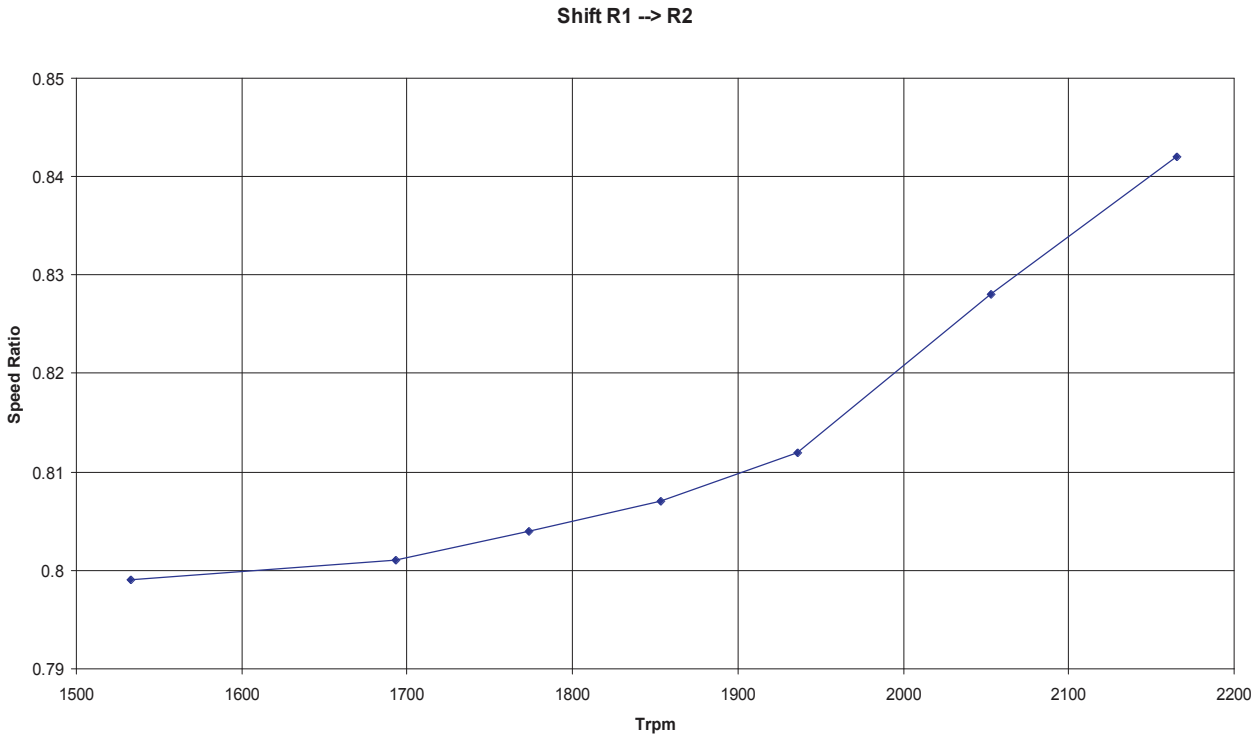


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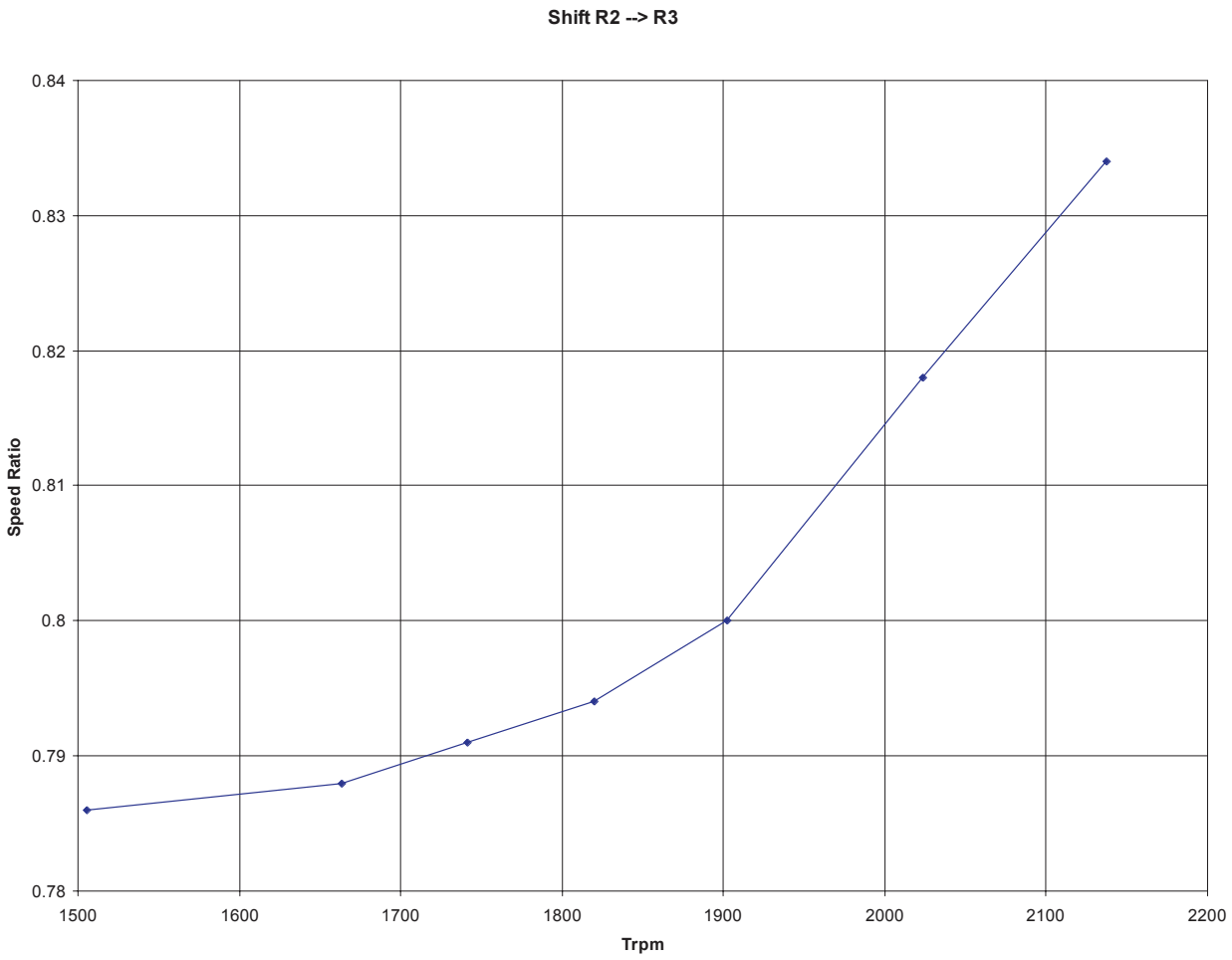


Figure 8-9

Automatic Downshifting

An automatic shift to a lower gear is made when the tractive effort in the lower gear exceeds the tractive effort in the higher gear.

Following curves show the downshift curves for all gears.

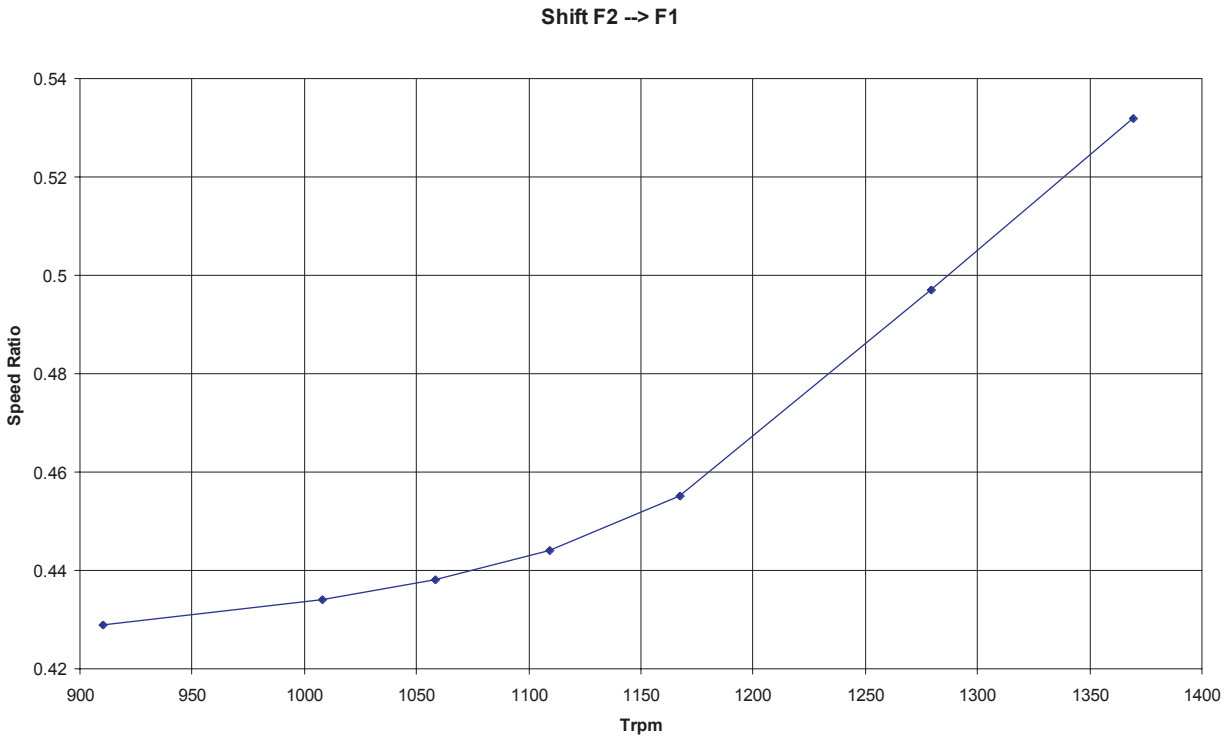


Figure 8-10

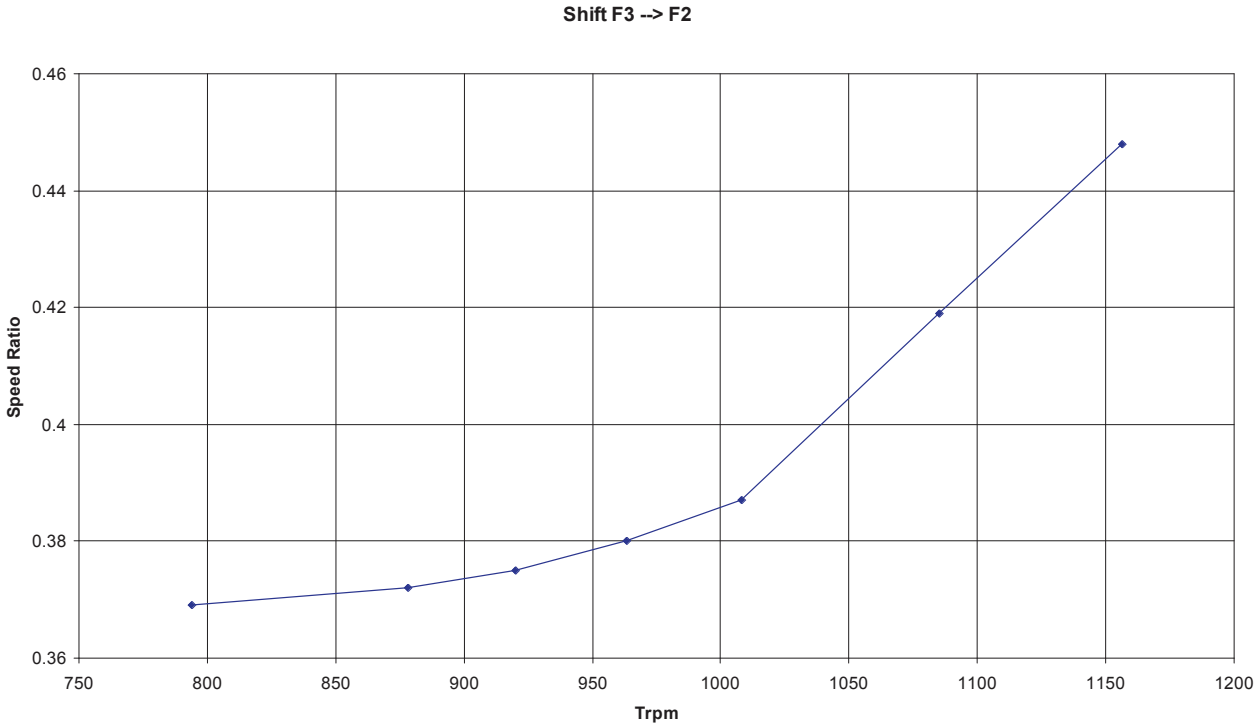


Figure 8-11

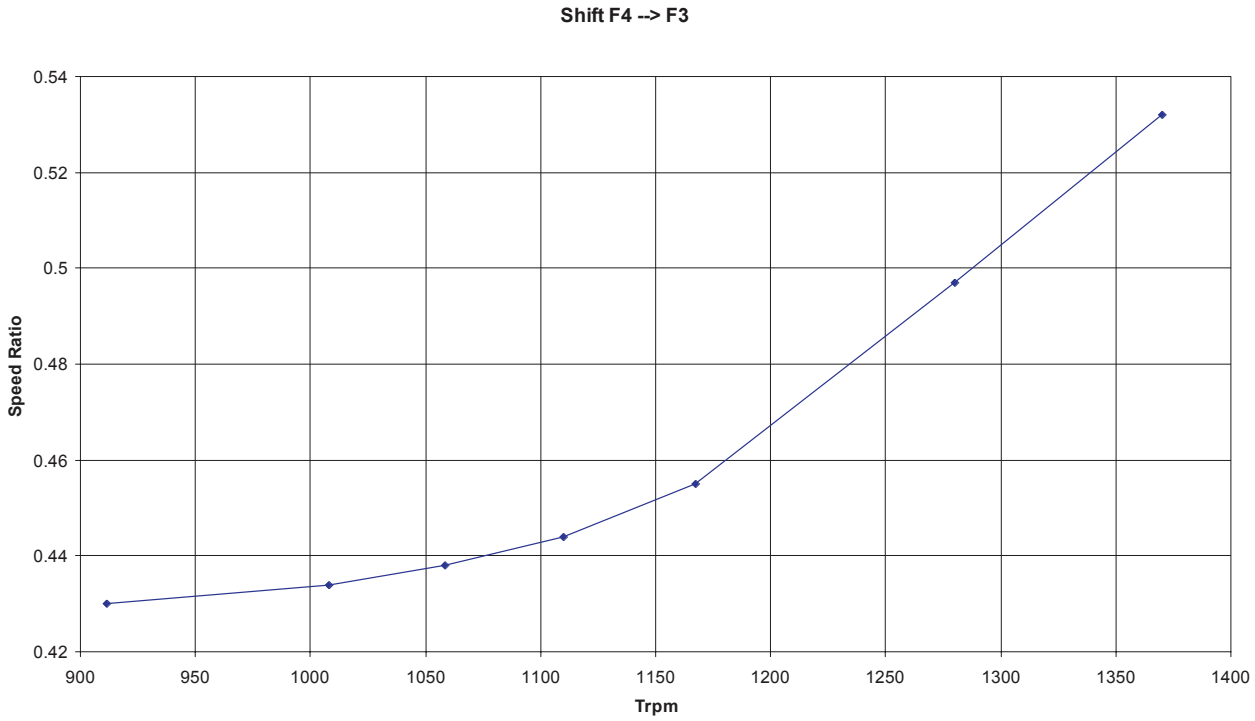


Figure 8-12

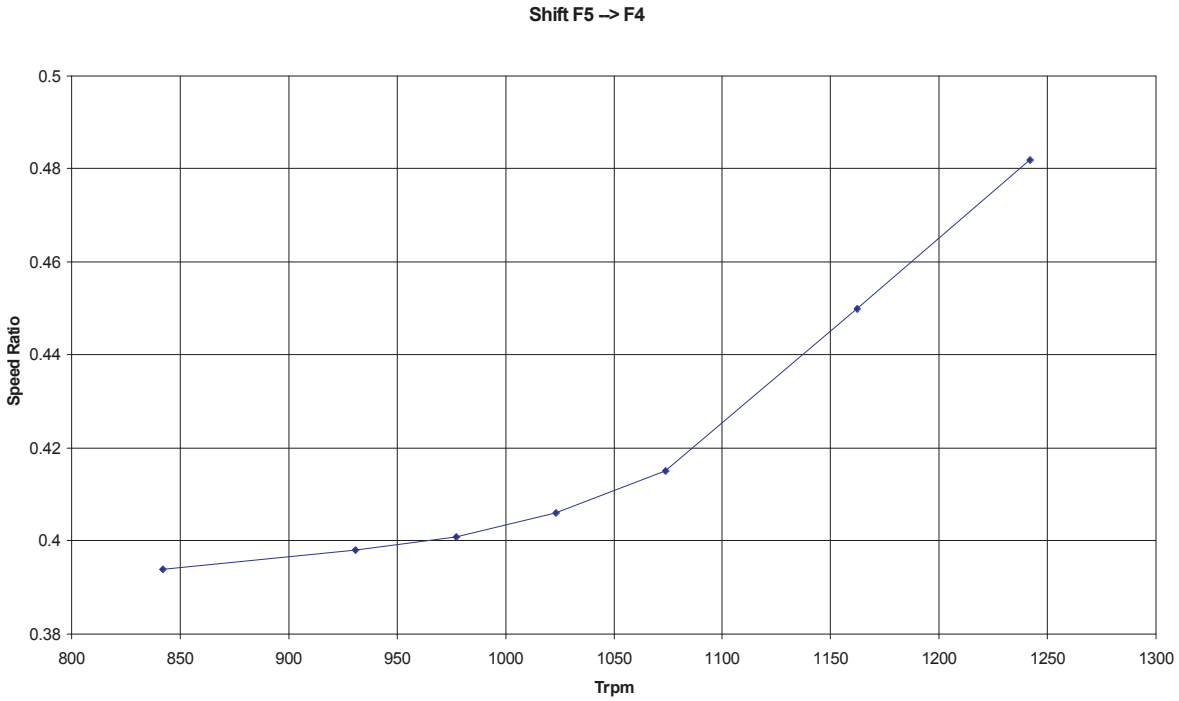


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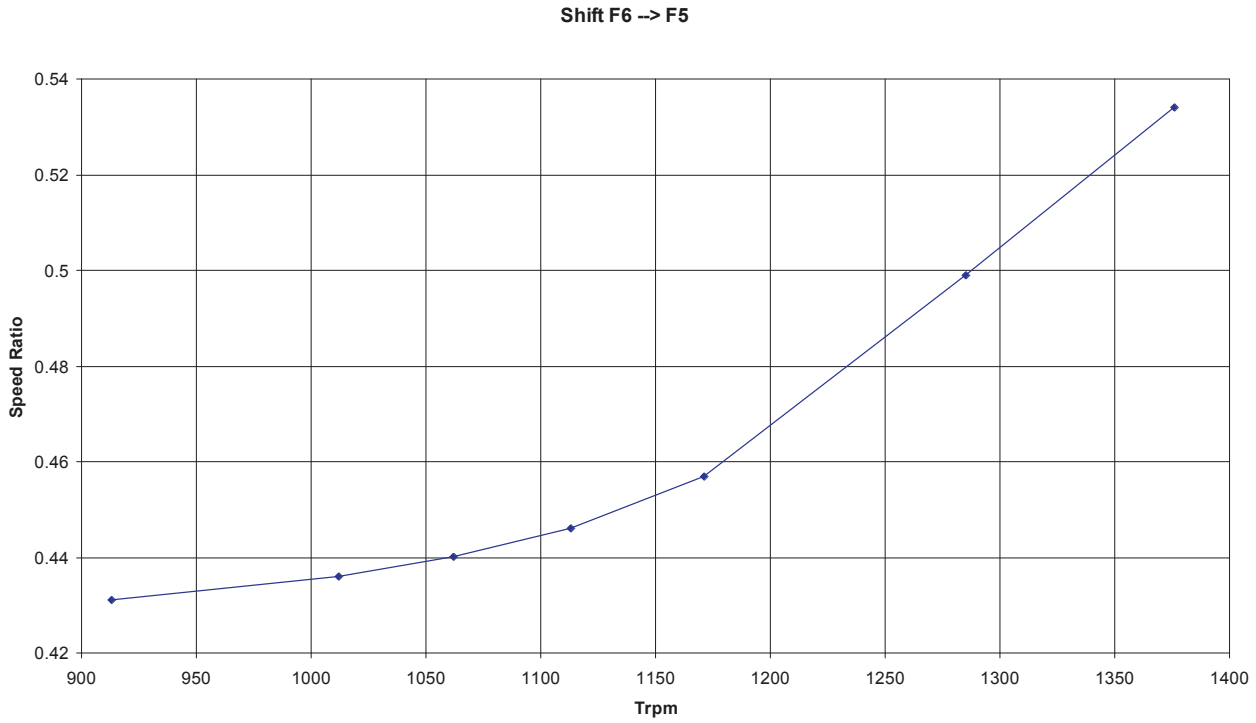


Figure 8-14

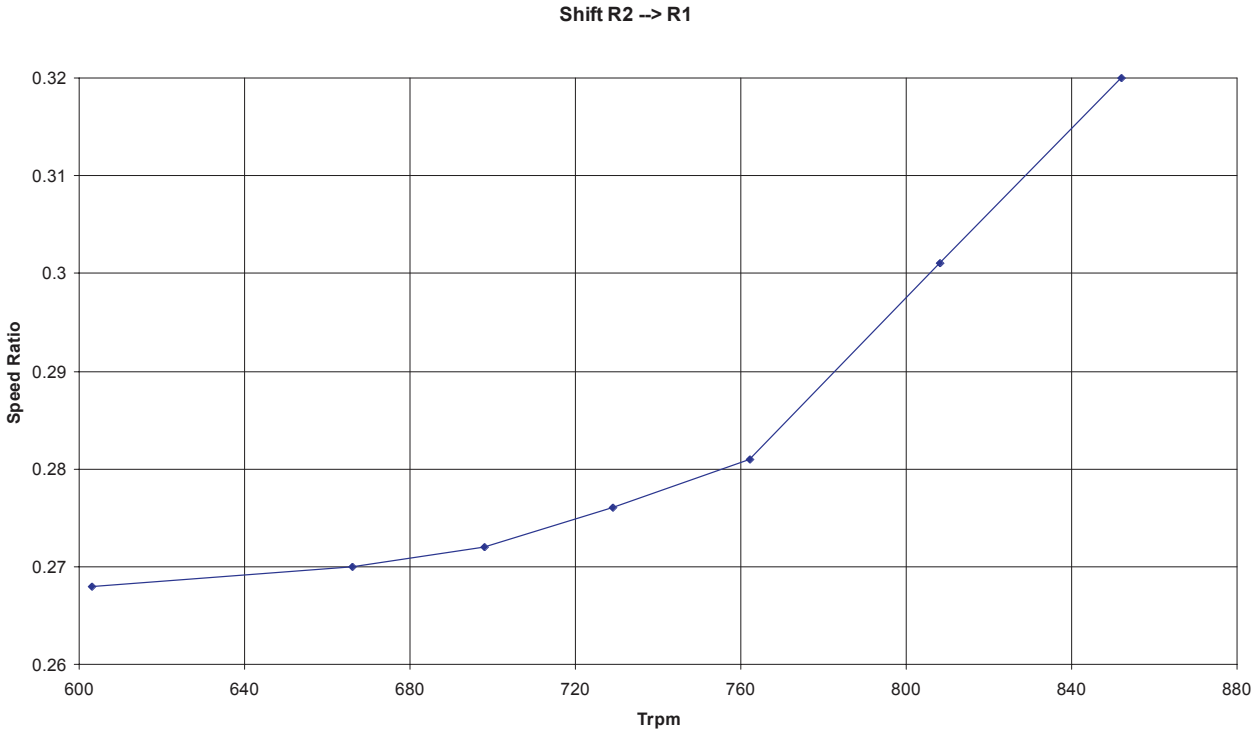


Figure 8-15

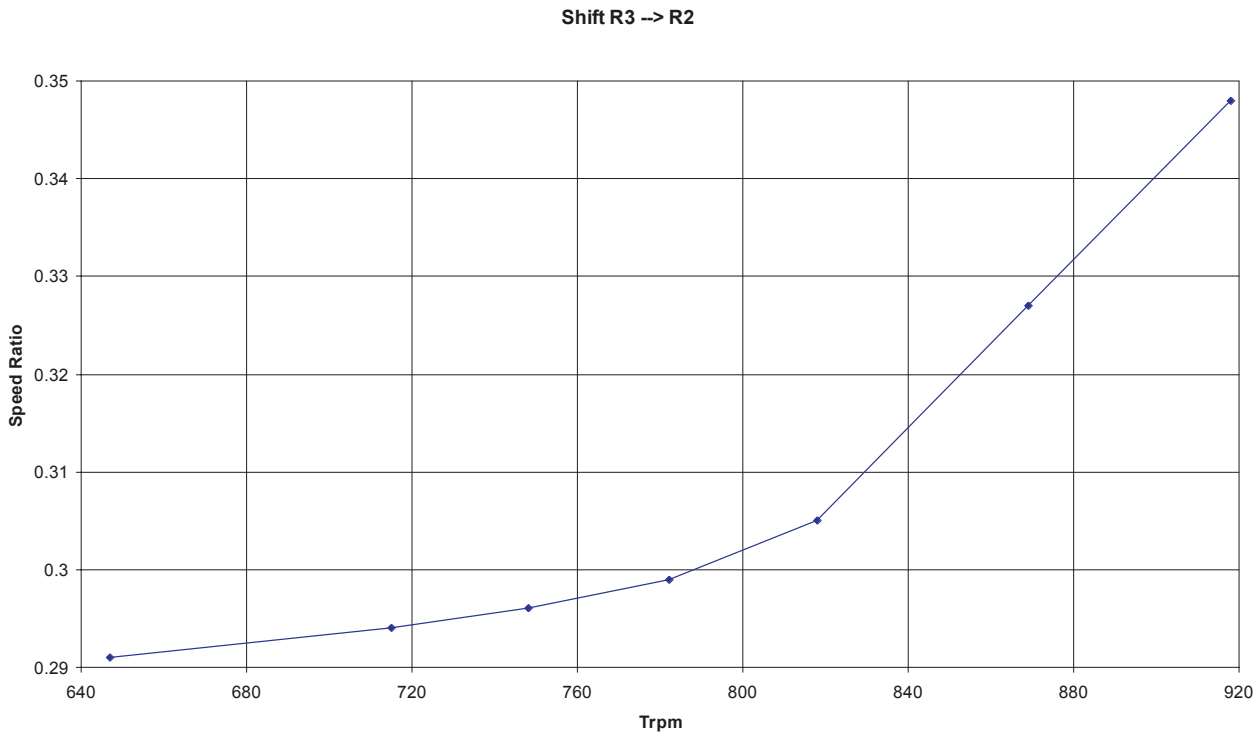


Figure 8-16

Automatic Shifting (if in 'Braking Mode')

Automatic Upshift

No automatic upshifts are allowed in braking mode (throttle pedal released). The only condition in which an upshift is made during braking mode is when the transmission overspeeding limit is reached and the shift lever indicates a gear higher than the one selected on the transmission. (See 8-15, Overspeeding Upshifts as transmission protection).

Automatic Downshift

Since the downshifts based upon speed ratio would take a very long time (because the engine speed is low), the turbine speed must be also very low before a downshift based upon speed ratio's would take place. In order to overcome this long period in which no downshift is made, braking downshifts can be incorporated in the program. When the engine speed drops below 1000 RPM and the vehicle speed drops below 500 RPM, a braking downshift is made.

Lockup Engagement (if in 'Converter Drive')

In 'idle position' of the throttle pedal (see not idle/idle switch on wire 19), lockup engages at 1650 RPM of the turbine. In 'not idle position' of the throttle pedal (see not idle/idle switch on wire 19), lockup engages at 1750 RPM of the turbine.

Lockup Disengagement (if in 'Lockup Drive')

In 'idle position' of the throttle pedal (see not idle/idle switch on wire 19), lockup disengages at 1350 RPM of the turbine. In 'not idle position' of the throttle pedal (see not idle/idle switch on wire 19), lockup engages at 1450 RPM of the turbine.

Automatic Upshifts (if in 'Lockup Drive')

Automatic upshifts in 'lockup drive' occur at 2300 RPM.

Output features

Warning lamp output (wire 3)

When a downshift request, a forward - reverse request, a reverse - forward request, a neutral - forward request, a neutral - reverse request, a forward - neutral - forward request or reverse - neutral - reverse request is not granted due to too high vehicle speed or engine speed, or when the transmission is overspeeding, the warning lamp output (wire 3) switches on.

Control valve outputs (wire 6, 7, 4, 5, 9)

Wires TC06, TC07, TC04, TC05 and TC09 are used to control the transmission. The table below reflects the gear pattern generated in each of the transmission gears.

Table 8-17.

CONTROL VALVE OUTPUTS

Transmission gear	TC06	TC07	TC04	TC05	TC09
F1	•		•	•	
F2	•		•	•	•
F3	•			•	
F4	•			•	•
F5	•				
F6	•				•
N1			•	•	
N3				•	
N5					
R1		•	•	•	
R3		•		•	
R5		•			

Direction Change Protections

Forward - Reverse or Reverse - Forward

The behavior of the transmission during direction changes depends on the vehicle speed.

If the vehicle speed is below 1 km/h and the engine speed below 1000 RPM, the direction change will be executed immediately. The new gear after a direction change will be :

- 1st in automatic mode
- Equal to the shift lever position in manual mode

If the vehicle speed is too high (above 1 km/h) or the engine speed is above 1000 RPM, the direction change will be not be executed and the transmission will be put in neutral until the vehicle speed has dropped below 1 km/h and the engine speed has dropped below 1000 RPM. Then the new gear after a direction change will be:

- 1st in automatic mode
- Equal to the shift lever position in manual mode

Neutral - Forward or Neutral - Reverse

A Neutral - Forward or Neutral - Reverse action occurs when Forward or Reverse is selected out of Neutral after machine standstill. In case of a Neutral - Forward or Neutral - Reverse action, Forward or Reverse will only be put on the transmission if the engine speed is lower than 1000 RPM and the vehicle speed is lower than 1 km/h.

Forward - Neutral - Forward or Reverse - Neutral - Reverse

A Forward - Neutral - Forward or Reverse - Neutral - Reverse action occur if a Forward - Neutral - Forward selection or Reverse - Neutral - Reverse selection has been executed with the shiftlever and the vehicle has not been standing still in neutral.

A Forward - Neutral - Forward or Reverse - Neutral - Reverse action will only be executed if the engine speed is lower than 1000 RPM. This includes engagements following Declutch.

Downshift Protection

When a downshift is requested at high speed (in manual mode or in automatic mode) and the turbine speed would exceed the transmission limit in the lower gear (exceeding 3000 RPM), the downshift is not executed and the warning lamp switches on.

SAFETY RELATED REQUIREMENTS

Applicable Safety Guidelines

The control system was designed and developed in close adherence to DIN/VDE801.

Safety Concept

General

The safety concept is based on the control system's safety classification according to DIN19250 and on the definition of the Fail Safe State for a powershift transmission used in earth moving equipment.

The applicable safety class requires considering single faults affecting driver safety and a redundant method to achieve the fail safe state in case of a single safety critical fault.

For earth moving equipment acceptable fault conditions are considered to be:

- Fail to higher range
- Fail to next lower range

The fail safe state (to be attained when all else fails) is:

- Fail to neutral

APC72 Implementation

The transmission concept mechanically prevents simultaneously locking of two conflicting clutches and guarantees Fail To Neutral in case of electrical power loss.

These properties are used in the APC72 to implement the safety concept.

It monitors its inputs and outputs permanently in order to detect internal and external faults.

All faults are reported within 0.5 seconds, but only safety critical faults are acted upon.

Faults resulting in range shifts and loss of drive are tolerated.

Faults resulting in unwanted direction clutch engagement result in immediate selection of neutral using the available redundant shutdown method.

Some other faults are tolerated but the performance of the system is crippled when the fault persists.

Considered Faults

- Over voltage
- Under voltage
- Internal faults
- Program out of control
- Single faults on outputs
- Incorrect input patterns
- Intermittent power loss
- Speed sensor failure

Behavior In Case of Faults

General

It's considered critical to be able to select Neutral in all circumstances. Selection of Neutral is also considered the safe state in case of many faults.

The APC72 has been designed to guarantee automatic selection of Neutral in some conditions. This is accomplished through use of two separate watchdog timers and a redundant shutdown path for outputs.

Reset Condition

When power is applied, the APC72 first selects the highest gear and starts initializing itself. This includes a series of self tests to assure system integrity.

The highest gear is believed to be the safest possible condition in case of an intermittent power failure.

The initialization phase takes about 1 second.

After power up, the APC72 is in the so called Neutral Lock state. This means that the transmission remains in Neutral until the shift lever is cycled physically through Neutral.

Overvoltage

The APC72 is very tolerant to large transients on its power lines (Table 8-21.). Even power supply levels up to 30 V will not damage circuit components in 12V mode. For 24V mode, supply levels can go as high as 50V without damaging the controller.

However in case of 12V operation a supply voltage exceeds 18Vdc, or if the 12V/24V supply input is left unconnected, the controller responds by issuing a fault and switches itself into high voltage mode until the high voltage is removed. Nevertheless, in 12V mode, the controller will accept sustained voltages up to 36 V.

In 24V mode, voltages in excess of 34V will be flagged as fault. For supply voltages in excess of 42V, the controller will protect itself by turning outputs off (or back on at even higher voltages).

Undervoltage

In 12V mode the APC72 operates at voltages well below 9 Vdc. To achieve this however it's important that both supply inputs are connected (12V AND 12V/24V).

Below 8Vdc however the APC72 enters the reset condition and shuts off all outputs.

For 24V operation, the same applies but the lower reliable operating voltage is 18V. The under voltage condition is signalled as a 'battery low fault'. The controller will not reset until the operating voltage drops below approximately 12V (but solenoids will not work well below 18V).

Because the APC72 is not involved in functions essential to engine cranking this is not considered as a problem.

Program Out Of Control

The watchdog timers reset the APC72 automatically if due to a program disturbance the watchdog timers aren't reset in time (150 ms).

Additionally, during program execution, critical variables are continuously checked for contents integrity. If faults are detected, the APC72 defaults to the reset state.

Intermittent Power Loss

After power is restored, the APC72 enters the reset condition, resulting in the immediate selection of the highest gear.

In absence of power the transmission defaults to neutral. This is due to the transmission design and has nothing to do with the APC72.

Single Faults On Outputs General

If any ON/OFF output is shorted to ground, the fault is shown on the display but no further action is taken. The background for this is that a short on an output always results in switching the load off. This either forces Neutral or a shift to a higher range.

Direction Selection Related Outputs (TC06,TC07) :

A short to plus is considered as a critical fault. Shorts to plus usually result in being blocked in either Forward or Reverse (If both are on simultaneously, the transmission behavior depends on the state of a hydro-mechanical interlock inside the transmission).

In this case, the APC72 cuts off the power to its power switches using the redundant shutdown path in order to bring the transmission to neutral (this only helps if the APC72 itself is the cause of the problem).

NOTE: This response prevents the APC72 from further monitoring the outputs. Therefore once it enters this condition, it remains blocked in it until power is cycled off and on.

Other ON/OFF Outputs:

Shorts to plus or open load conditions on these outputs are not considered to cause a safety hazard and are tolerated. Usually however open load conditions are mistaken for shorts to plus (due to hardware limitations) and are then treated accordingly.

The faults are indicated on the display as any output related fault.

Analogue Solenoid Related Faults (TC03,TC08):

Shorts to plus or ground and open load conditions on analogue outputs are not considered to cause a safety hazard and are tolerated.

Whether faults can be detected depends on the normal load of the output. If a VFS (variable force solenoid) with a coil resistance of about 4 Ohms is used, faults can reliably be detected.

A short to ground is signalled as an open circuit fault.

Incorrect Input Patterns

The shift lever pattern presented to the APC72 is continuously check for plausibility.

Direction Selection Related Inputs:

If both Forward and Reverse are requested simultaneously, Neutral is selected.

Single 'stuck on' faults of either input are not recognized and result in a valid input signal, probably causing the 'faulty' direction to be engaged.

Range Selection Related Inputs:

In case a shift lever pattern is generated on the inputs which does not have a matching pattern in the internal table (See 18-14, Shift Lever), the pattern is ignored and the last known shift lever position is taken into consideration.

Speed Sensor Failure

An electrical speed sensor failure can be detected when using a MRS (magneto resistive sensor). If a speed sensor fault is detected, no automatic downshifts are allowed. As soon as the error disappears, the automatic downshift is granted again.

In case of an inductive sensor, electrical fault detection on the sensor is not possible.

Indication Of Faults

When a fault is detected, the T-led starts flashing.

In order to find out which fault was last detected hold the 'M' switch for more than 2 seconds. The display will then show alternately the fault area and the fault type. If several faults coexist, only the severest one is shown.

See Table 8-19. for lists faults in order of severity (severest fault on top) along with displayed codes.

Behavior When Faults Are Removed

Internal Faults

Not applicable, because internal faults are only checked at power up

Program Out Of Control

Not applicable, because this fault results in APC72 reset

Single Faults On Outputs

Table 8-18.

SINGLE FAULTS ON OUTPUTS

Fault	Response after fault removal
Short to ground	Normal operation is resumed
Direction outputs : Shutdown condition	Neutral remains selected until the APC72 is reset (power off/ on)
Direction outputs : Short to plus	Normal operation is resumed after ±0.5 sec
Any fault on other ON/OFF outputs	Normal operation is resumed

Incorrect Input Patterns

Normal operation is resumed.

Intermittent Power Loss

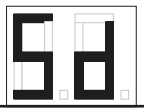
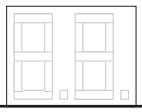
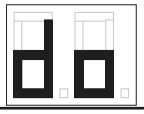
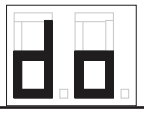
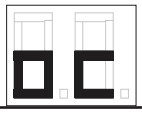
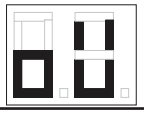
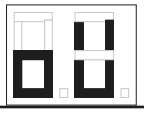
Not Applicable, because this fault results in APC72 reset

Speed Sensor Failure

Normal operation is resumed.

Table 8-19.

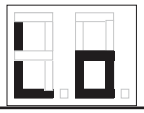
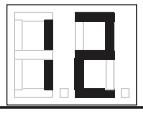
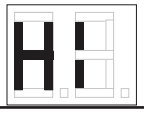
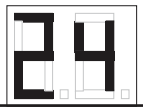
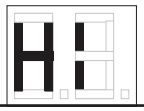
FAULT CODES

Fault	Fault area	Fault Type
Direction outputs shutdown (latched)		
Direction outputs forced to plus		
Direction outputs open connection		
MRS Speed sensor failure open connection		
MRS Speed sensor failure short circuit		
Inductive Speed sensor failure		
Digital output short circuit		
Digital output other fault		
Incorrect input pattern		

8

Table 8-19.

FAULT CODES (Continued)

Battery voltage too low		
12V input voltage too high		
12V/24V input voltage missing		
24V input voltage too high		

Specific Measures To Guarantee Fault Tolerance Operational

The control system must be installed according to the requirements and instructions stated on the appropriate customer specific wiring diagram. It shall not be operated outside the environmental conditions defined in Table 8-20. and Table 8-21.

In case a fault is signalled, the vehicle must be serviced in order to find and correct the cause of the problem.

Production Test

During the production cycle, all units receive following tests:

- Visual inspection of Printed Circuit Boards and finished product
- Functional test at nominal load and nominal power supply
- Minimum operating voltage @ 20°C is verified
- Speed sensor input function over complete operating voltage range
- Communication link test and check of programmed EEPROM parameters

Measures To Protect From External Factors

Identification

Each APC72 unit is marked with a label showing following items:

- Spicer Off-Highway
- Serial Number
- Dana Spicer Off-Highway Part Number
- Program version reference

Each Printed Circuit Board shows following items:

- SOH part number of the assembled board,
- Board Revision Number
- Board issue date

Traceability And Configuration Control

A permanent record of above information along with other information relevant for production and service is kept in the Dana Spicer Off-Highway Bruges Controls department.

Design and implementation details of each hardware revision is available in a structured format showing following information:

- Reason for change
- Revision date, and release date
- Impact study of change
- Reference to the revision it's based on
- Circuit Diagram with changes marked
- Layout plots
- List of changes with references to the relevant drawings
- Related correspondence with manufacturer

Design and implementation details of each released software version is available in a structured format showing following information:

- Original problem analysis (or reference to it)
- Reason for change
- Revision date, and release date
- Impact study of change
- Reference to the revision it's based on
- Program source code or references to untouched modules
- List of changes with reference to reason for change
- Test report of the new release
- Related correspondence with customer

Sourcing

Spicer Off-Highway is the only supplier for the APC72 described in this document.

All shipped units are produced, tested and inspected by the Controls group of the Dana Spicer Off-Highway plant located in Brugge (Belgium Europe). This guarantees strict conformance to above stated identification and traceability requirements.

Software

Communication services are disabled during normal operation. Modifications to APC72 parameters are only possible with the shift lever in neutral.

The APC72 contains tables of boundaries limiting the range of modification of EEPROM parameters, in order to assure safe values for limits at all times.

ENVIRONMENTAL CONDITIONS

Nature Of Environmental Conditions

The APC72 is intended to be used on mobile earth moving and material handling machinery and as such is exposed to the severe environmental conditions these machines operate in.

The APC72 should be installed inside the driver's cabin, protected from direct exposure to rain, dust and direct steam cleaning.

Behavior Of The System Under Certain Conditions

The built in On/Off outputs will automatically shut off in case their junction temperature exceeds 150°C. This can be caused by external short circuits of outputs to ground, but also by over-current conditions when the unit is operated at high temperature. After cooling down, they automatically retry to drive their load.

Table 8-20.

ENVIRONMENTAL STANDARDS AND LIMITS

Subject	Standard	Parameters
Temperature cycling	IEC68-2-14N	-40°C/80°C @ max. Voltage
Power up at min. Temp.	SAEJ1455	-40°C @ min. Voltage
Power up at max. Temp.	SAEJ1455	+80°C @ min. Voltage
Humidity	IEC68-2-38	
Vibration	IEC68-68-2-34Fd	5g pk 10-150Hz 1 Oct /min 2.5Hrs 3 directions
Mechanical Shock	IEC68-68-2-29	25g 1/2 sine 6ms @ 1 Hz
Sealing	IEC529	IP66

Table 8-21.

INTERFERENCE IMMUNITY STANDARDS AND LIMITS

Subject	Standard	Parameters 12V	Parameters 24V
Steady state voltage	SAEJ1455	9V - 16V , -40°C/80°C	18V - 32V , -40°C/80°C
Jump start requirements	SAEJ1455	5 min @ 26V, 25°C	5 min @ 50V, 25°C
Reverse polarity	SAEJ1455	5 min @ -13V, 25°C	5 min @ -26V, 25°C
Negative inductive transients	ISO7637-1/1	Vs = -100V tr=1ìs td=2ms Ri=10Ù 5000 pulses Class IV	Vs = -100V tr=1ìs td=2ms Ri=10Ù 5000 pulses Class IV
Positive inductive transients	ISO7637-1/2	Vs = +100V td=50ìs tr=1ìs Ri=10Ù 5000 pulses Class IV	Vs = +100V td=50ìs tr=1ìs Ri=10Ù 5000 pulses Class IV
Commutation noise	ISO7637-1/3	Vs = +100V/-150V td=100ns tr=5ns Ri=50Ù 5000 pulses pos and neg Class IV	Vs = +100V/-150V td=100ns tr=5ns Ri=50Ù 5000 pulses pos and neg Class IV
Voltage drop	ISO7637-1/4		
Load Dump	ISO7637-1/5	Vs =+86.5V td=350ms tr=5ms Ri=3Ù Class IV	Vs =+226V td=350ms tr=5ms Ri=5Ù Class IV
Electrostatic discharge	IEC801-2	air discharge 8 kV Class III contact discharge 4kV Class III	air discharge 8 kV Class III contact discharge 4kV Class III
Radiated interference	ISO/ CD13766	Parameters as per standard	Parameters as per standard

DEVELOPMENT REQUIREMENTS

Special Requirements For Design And Implementation

Conformance with European directive 89/336.

A Technical Construction File must prove close adherence to all requirements laid down in draft standard ISO/CD 13766

Misapplication of voltage: any one pin must tolerate short circuit to plus or ground at nominal operating voltage.

Design And Development Tools

The control system hardware was designed with development tools purchased from PADS inc. Schematic entry is done with PADS Logic. Printed Circuit Design occurs with PADS Perform.

About 80% of the software is written in PLM-51 (Intel © High Level language for 80C51 compatible products). The remaining 20 % are written in INTEL ASM-51, the largest part of it being a library of 32-bit integer math functions, which have been used for 6 years in comparable applications.

The Hardware / Software combination is tested using Ashling CTS51 in circuit emulators.

GUIDELINES AND CONDITIONS FOR USE

Diagnostics And Maintenance

General

Principally there are no specific devices required for first level troubleshooting as the APC72 incorporates several self-test features assisting in this process.

Nevertheless, use of digital multi-meters and simple tools such as an indicator lamp will be required to pinpoint exact causes of problems.

More in depth troubleshooting and system tuning involves use of an IBM Compatible PC with appropriate software and EPROM programming equipment.

The APC72 allows recall and modification of non-volatile parameters through RS232.

This way, customers can (given the necessary equipment) choose to adapt certain parameters to suit their needs.

From a maintenance point of view, this is relevant in so far that the APC72 allows reading back the (modified) parameters along with serial number, part number and modification date.

Self Test Functions

The APC72 has special circuitry to help verifying its operation.

Four self-test modes are built into the APC72 control programs:

- Turbine speed monitor
- Engine speed monitor
- Speed ratio monitor
- Speed Ratio Up
- Speed Ratio Down
- Battery voltage monitor
- Input Test
- Output Test
- Analog Input Monitor

The ‘T’ led is on while operating the APC72 in test mode.

Depending on the application, it’s possible that additional test modes are supported.

Self Test Operation

Self-test mode is activated by pressing the mode switch on the APC72 front panel while powering up the APC72.

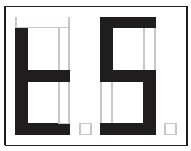
Switching off the power of the APC72 leaves the self-test mode.

After powering up, the turbine speed monitor is activated.

Pushing the mode switch after powering up selects the next mode in the order listed above. After output test, turbine speed monitoring is again selected.

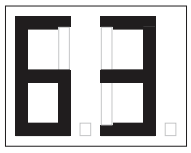
Turbine Speed Monitor

When selecting this mode the display shows:

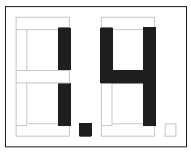


After releasing the mode switch the display shows turbine speed in RPM (rotations per minute).

From 0 - 999 rpm the display displays 10's - i.e. below display corresponds with 630 RPM.

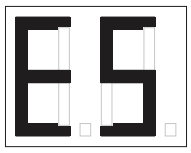


From 1000 RPM on, the display shows thousands. The example indicates 1400 RPM



Engine Speed Monitor

When selecting this mode the display shows:

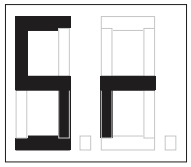


After releasing the mode switch the display shows engine speed in RPM (rotations per minute).

The display method is identical as described above for turbine speed.

Speed Ratio Monitor

When selecting this mode the display shows:

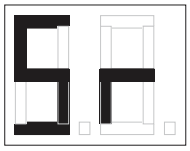


After releasing the mode switch the display shows the speed ratio in the converter.

$$\text{speed ratio} = \frac{\text{turbine speed}}{\text{engine speed}} < 1$$

Upshift Speed Ratio

When selecting this mode the display shows:

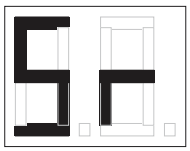


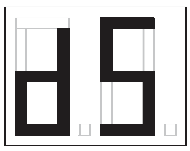


The value indicates the theoretical optimal upshift speed ratio. See also upshift curve(s) shown earlier.

Downshift Speed Ratio

When selecting this mode the display shows :

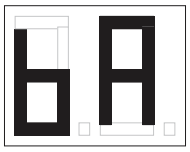




The value indicates the theoretical optimal downshift speed ratio. See also downshift curve(s) shown earlier.

Battery Voltage Monitor

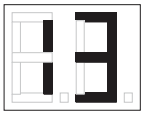
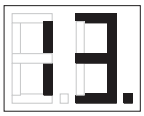
When selecting this mode the display shows:



The voltage displayed is measured on the 12V/24V input i.e. on pin TC01.

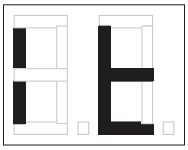
The displayed value after the mode switch is released is the battery voltage in Volts.

Values with a fractional part of 0.5V or higher have the right dot on.

	Voltage range : 13.0 V - 13.4 V
	Voltage range : 13.5 V - 13.9 V

Input Test

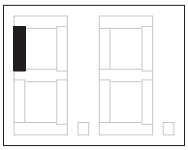
When selecting this mode the display shows:



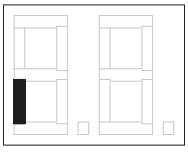
This test is used to verify operation of the shift lever and other inputs.

The display shows which inputs are active. The driver (or technician) can follow the sequence of inputs and thus verify the wiring of the vehicle. Each segment of the display indicates a specific input. Different segments can be switched on simultaneously if different inputs are activated simultaneously.

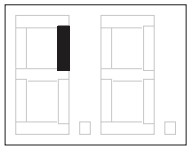
This segment is switched on if input wire TC13 is activated (Shiftlever F).



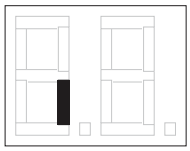
This segment is switched on if input wire TC14 is activated (Shiftlever R).



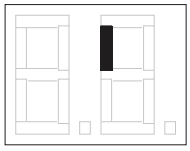
This segment is switched on if input wire TC25 is activated (Shiftlever range).



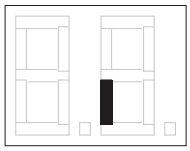
This segment is switched on if input wire TC15 is activated (Shiftlever range).



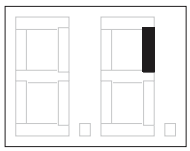
This segment is switched on if input wire TC18 is activated (Shiftlever range).



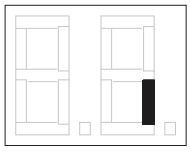
This segment is switched on if input wire TC29 is activated (Man/Automatic).



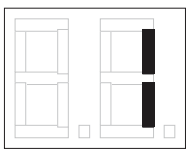
This segment is switched on if input wire TC19 is activated (Not idle/Idle).



This segment is switched on if input wire TC22 is activated (Lockup).

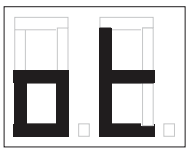


Input wire TC19 and wire TC22 are both activated.



Output Test

When selecting this mode the display shows:



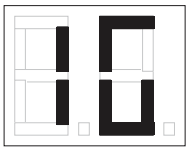
This mode can only be selected at standstill. When pressing the mode switch while driving or if a speed sensor fault is flagged, this mode is skipped.

After operating in this test mode, the transmission is blocked in neutral until the shift lever is cycled through its neutral position.

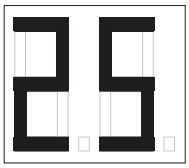
The APC72 gives information about the status of the outputs. The possible states are: G (good), S (short-circuit with ground) and O (open load : output is not connected or has a short-circuit to the battery plus).

The APC72 tests each output sequentially, the left side of the display gives information about which output is tested, the right side gives the status of the output.

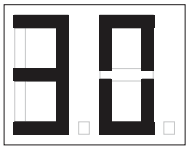
OUTPUT 1 is good.



OUTPUT 2 has a short circuit to ground.



OUTPUT 3 is not connected or has a short circuit to battery +.



Each output corresponds to a specific output wire.

Table 8-22.

DISPLAY OUTPUT WIRE CORRESPONDENCE

Output	Function	Wire	Normal Display
1	Forward	TC06	’1G’
2	Reverse	TC07	’2G’
3	Solenoid 1	TC04	’3G’
4	Solenoid 2	TC05	’4G’
5	Solenoid 3	TC09	’5G’
8	PWM0 Solenoid supply.	TC03	’8G’

Analog Input Monitor

When selecting this mode the display shows:

The displayed value after the mode switch is released is the resistance of the respective analogue input. In this case analog input 0 is wire 30.

Technical Guidelines For Installation

The information contained in this section is provided to ease the installation of the APC72 on the vehicle.

The main part of the installation concerns connecting APC72 wiring harness with the Transmission’s control valve harness and to the shift lever. Below tables show the pin functions for the control valve harness and which connections are required between control valve and APC72.

Table 8-23.

TRANSMISSION CONTROL VALVE CONNECTIONS

Wire	Color	Pin	Function
7	Brown	A	Reverse
5	Green	B	Solenoid 2
4	Yellow	C	Solenoid 1
9	Orange	D	Common
6	Blue	E	Forward
11	Pink	F	Splitter Solenoid

Power supply

Positive terminals TC01 / TC11 For 24V operation only terminal TC01 shall be connected to the battery plus.

Connecting TC11 also to 24V can damage the APC72 and will be flagged as a severe fault continuously.

On the other hand, 12V operation requires that the battery plus is connected to both TC01 and TC11. Failure to connect to TC11 will be flagged as a warning and ncreases the minimum operating voltage to approximately 11 Volts.

Wires TC01 (and TC11 if applicable) must be connected to the battery through a fast 6 Amp fuse. They provide power for the shift logic and for the outputs which control the transmission solenoids.

Analogue Solenoid Supply TC10

This terminal is a special on/off output. It should be connected only to solenoids connected to TC03 and TC08. It provides specially conditioned power to both analogue modulation solenoid outputs.

For wire lengths greater than 4 m it's recommended to use a twisted triple in order to minimize radiated emissions from these wires.

A twisted triple is a cable consisting of 3 parallel wires twisted together with roughly 60 turns per meter. The three cables involved are those coming from TC10, TC03 and TC08.

Ground Terminal TC02

Pin TC02 is the APC72's ground terminal and must be connected to a well-defined ground terminal. This can be the vehicle's chassis or an AWG16 wire routed straight to the battery minus.

For the APC72 control to work properly, a T-split of the ground wire (close to the connector) must be made to form a suitable ground reference for the Control Valve.

Ground Terminal TC12

Pin TC12 is the signal ground terminal and is intended for following signals

- Speed sensor ground for TC21 and TC23
- Analogue inputs TC20 and TC30
- Communication link ground (CAN and RS232, RS485)

Input Signals

Shift Lever Inputs (TC13, TC14,TC25,TC15,TC18)

The common terminal of the shift lever is to be connected to the plus (TC01).

The expected pattern on these inputs is described in 8-14, Shift Lever.

Inductive Turbine Speed Sensor Input (TC23)

TC23 must be connected to the inductive sensor's terminal. The other terminal should be connected to TC12.

TC24 (MRS input) must be left unconnected.

Inductive Engine Speed Sensor Input (TC21)

TC21 must be connected to the inductive engine speed sensor's terminal. The other terminal should be connected to TC12.

Output Signals

These signals control the selection of direction and range. See also 8-24, Output Features.

Communication Interfaces

Can Link (TC28,TC17): Interface

This interface complies electrically with ISO11898.

Although the system is capable of handling CAN 2A messages, it is not an issue in the current application.

It is foreseen to ease future system extensions beyond the scope of this specification.

Tuning Link (TC08,TC28)

The communication protocol is RS232 compatible and is intended for use with existing Spicer Off-Highway Tuning tool and is reserved for Spicer Off-Highway use only.

NOTES

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SCHEMATICS

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Wiring Schematic (Sheet 1 Of 5)

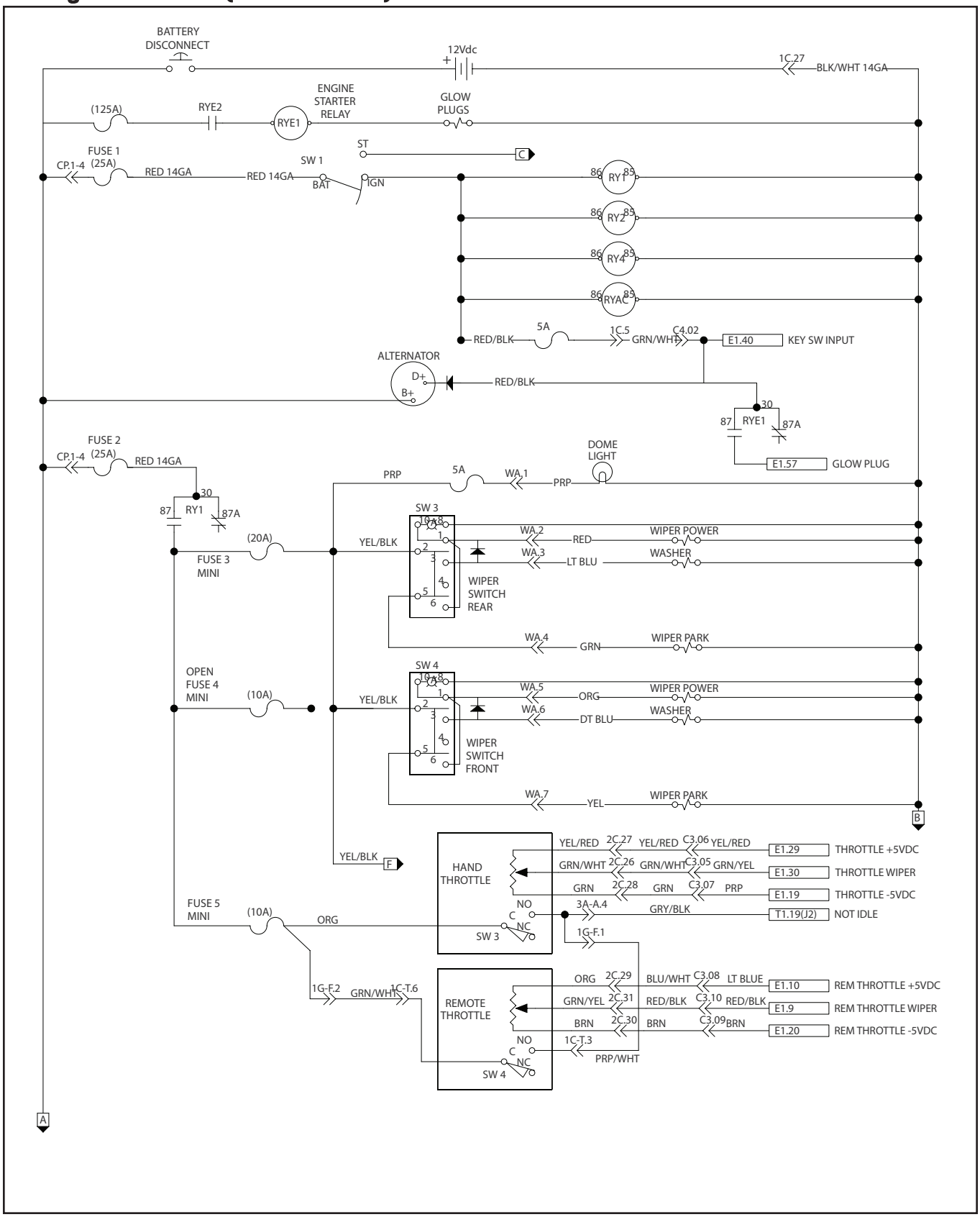


Figure 9-1

Wiring Schematic (Sheet 2 Of 5)

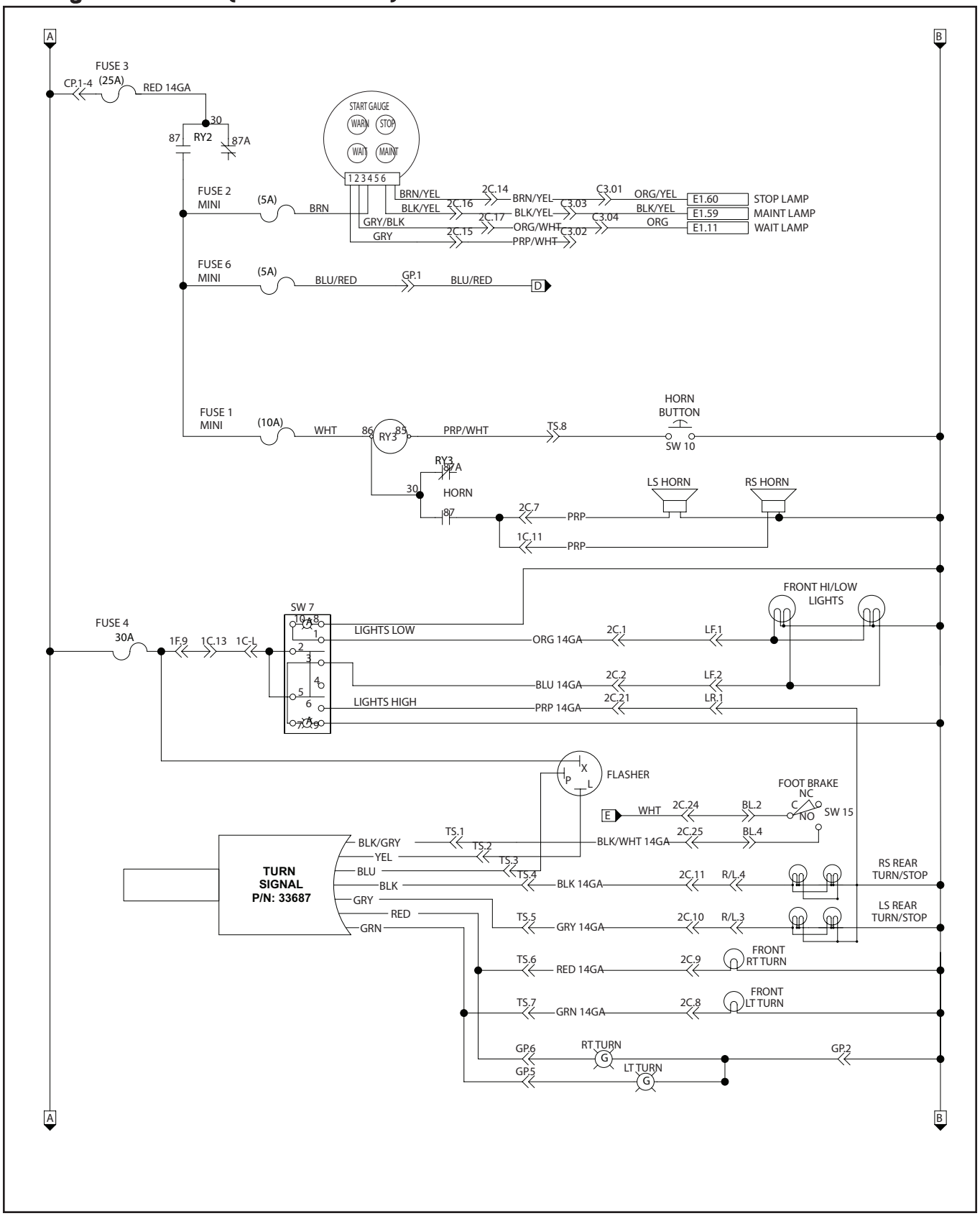


Figure 9-2

Wiring Schematic (Sheet 3 Of 5)

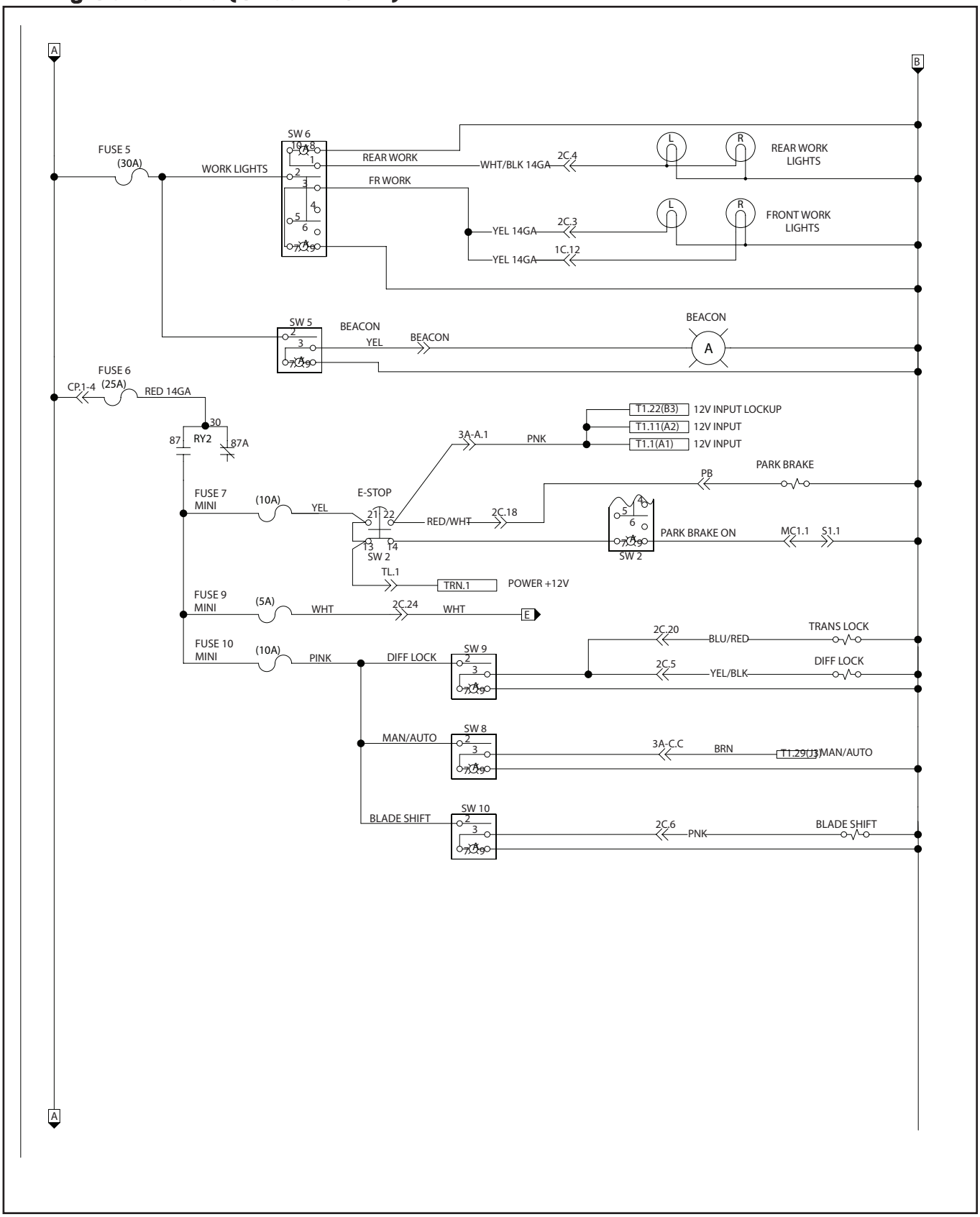


Figure 9-3

Wiring Schematic (Sheet 4 Of 5)

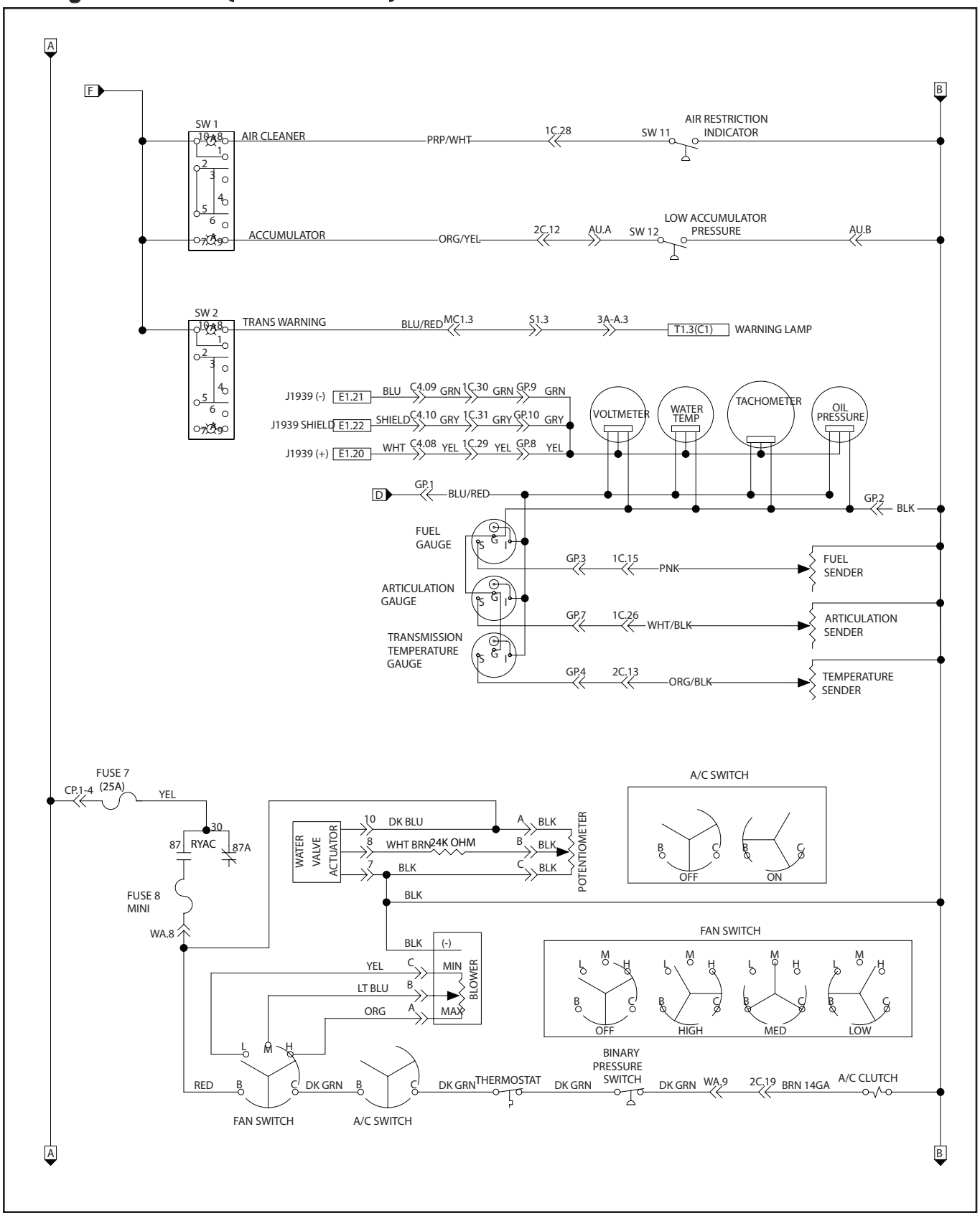


Figure 9-4

Wiring Schematic (Sheet 5 Of 5)

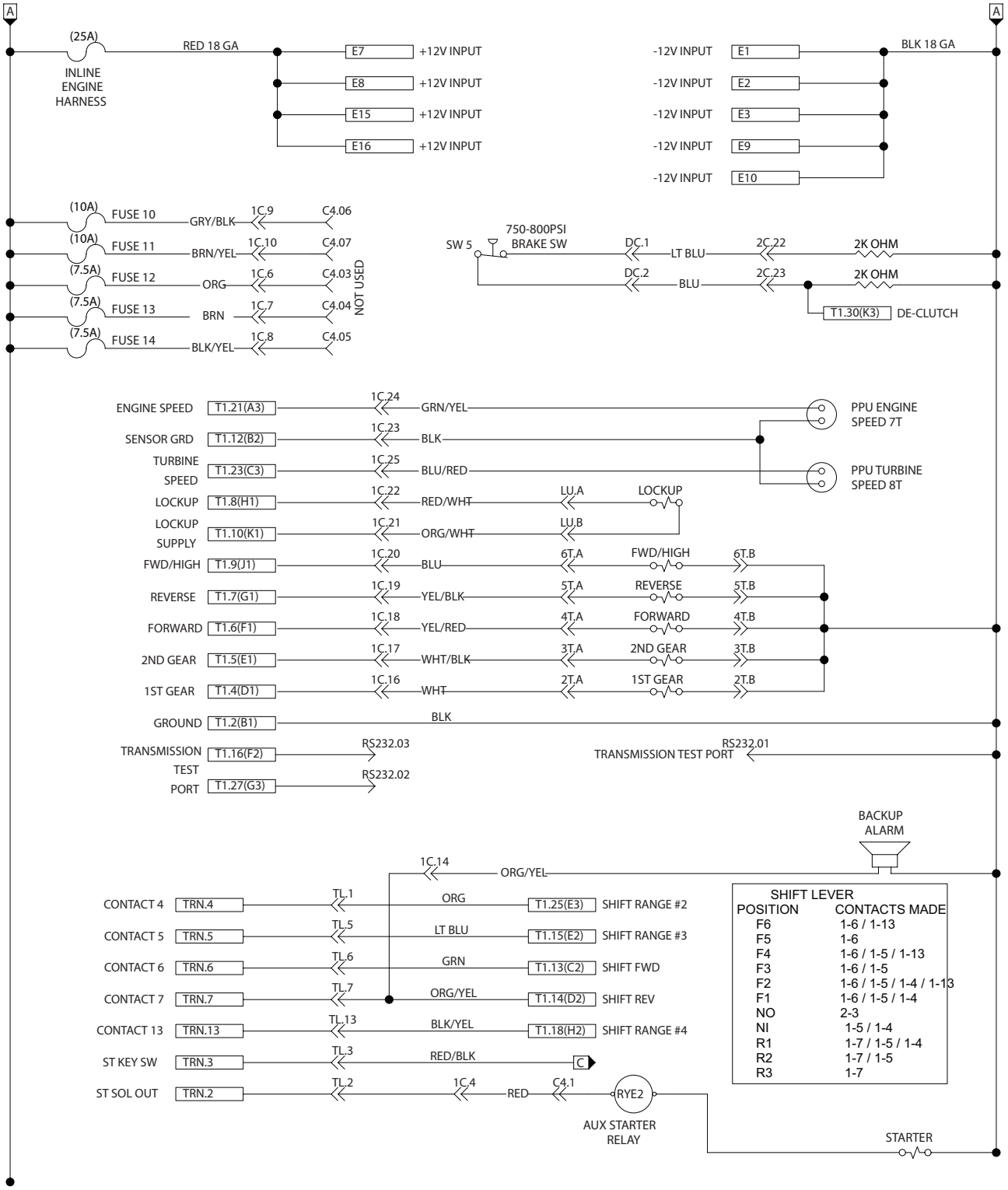


Figure 9-5

Hydraulic Schematic (Sheet 1 Of 2)

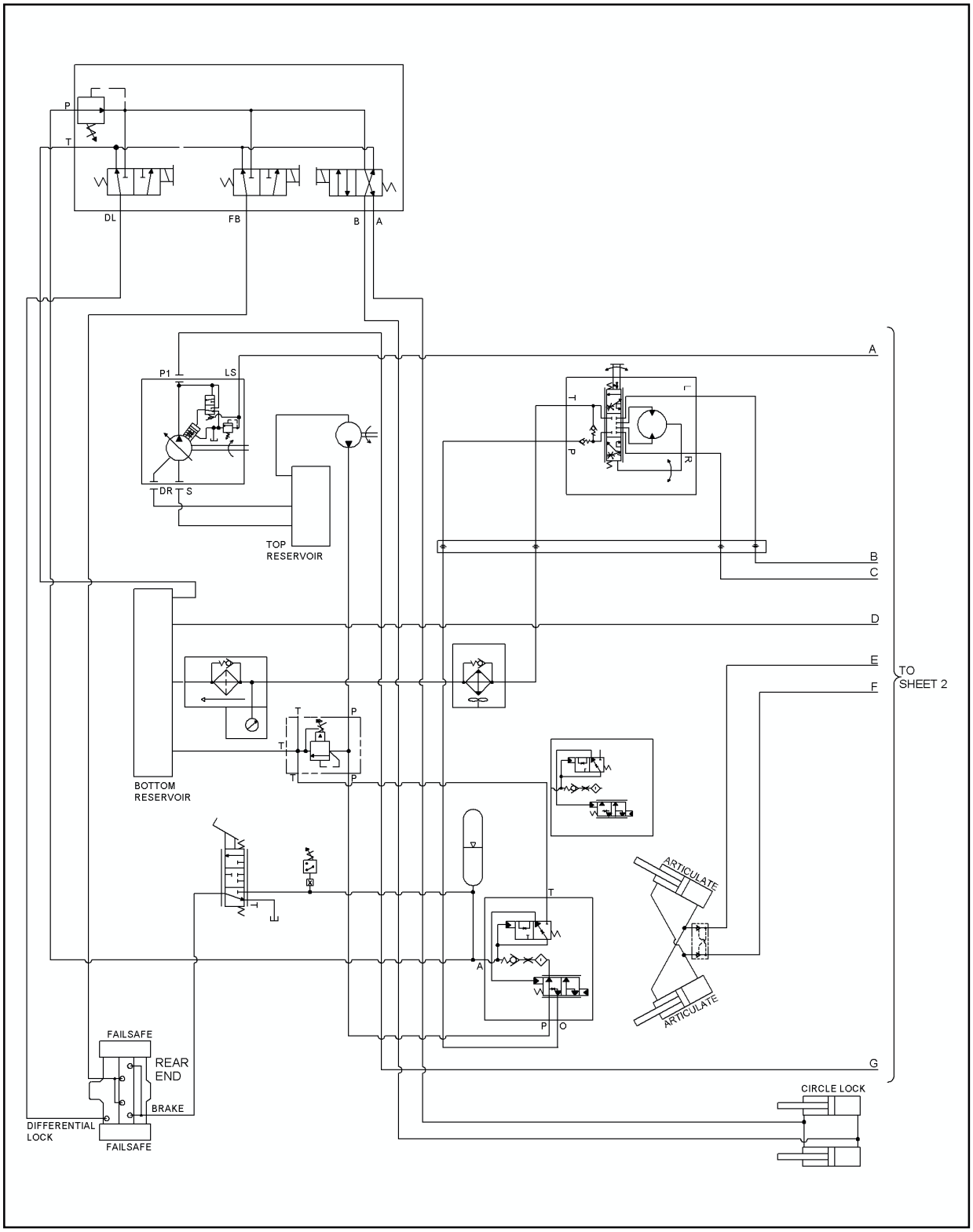


Figure 9-6

Hydraulic Schematic (Sheet 2 Of 2)

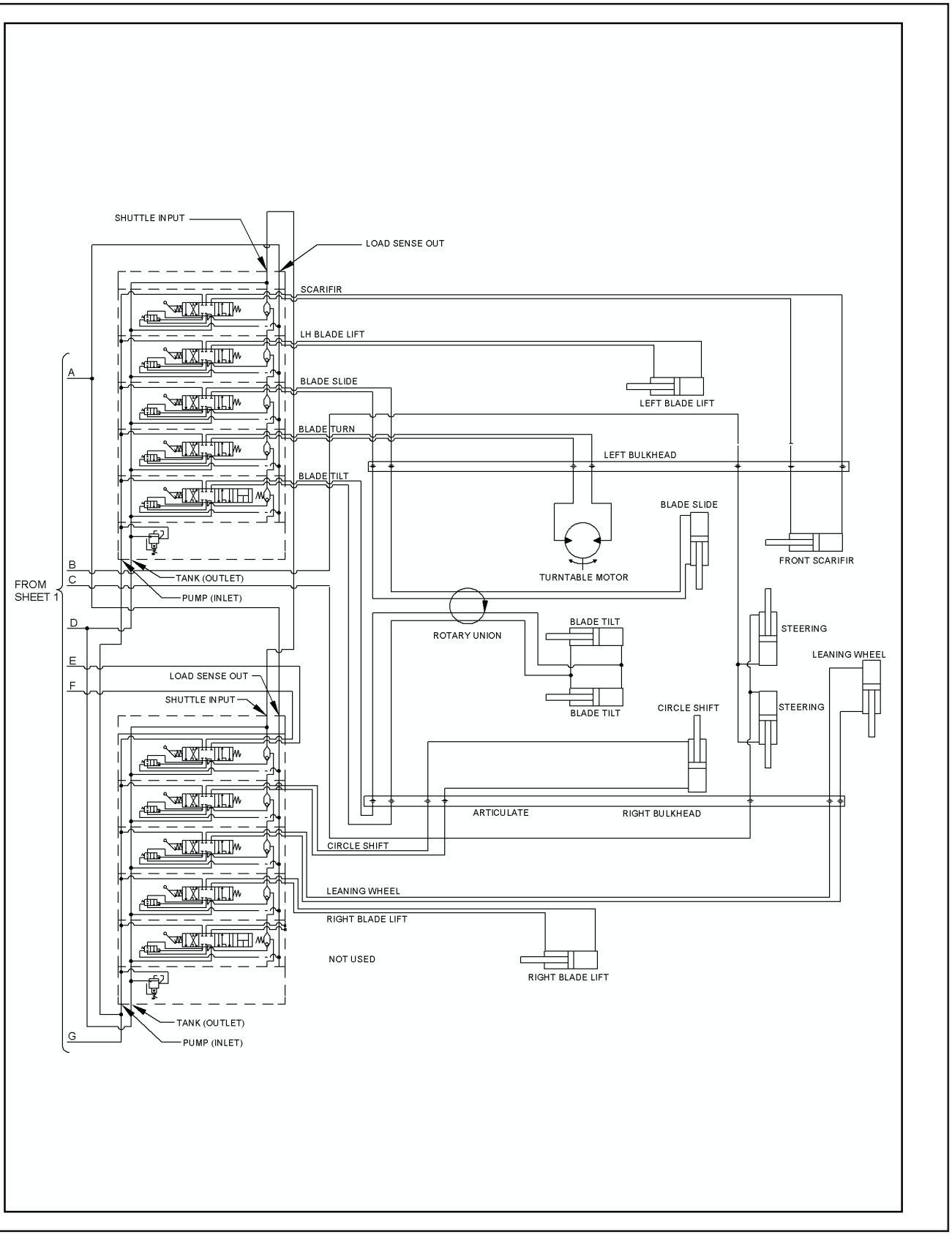


Figure 9-7

Side To Center Panels Harness Schematic

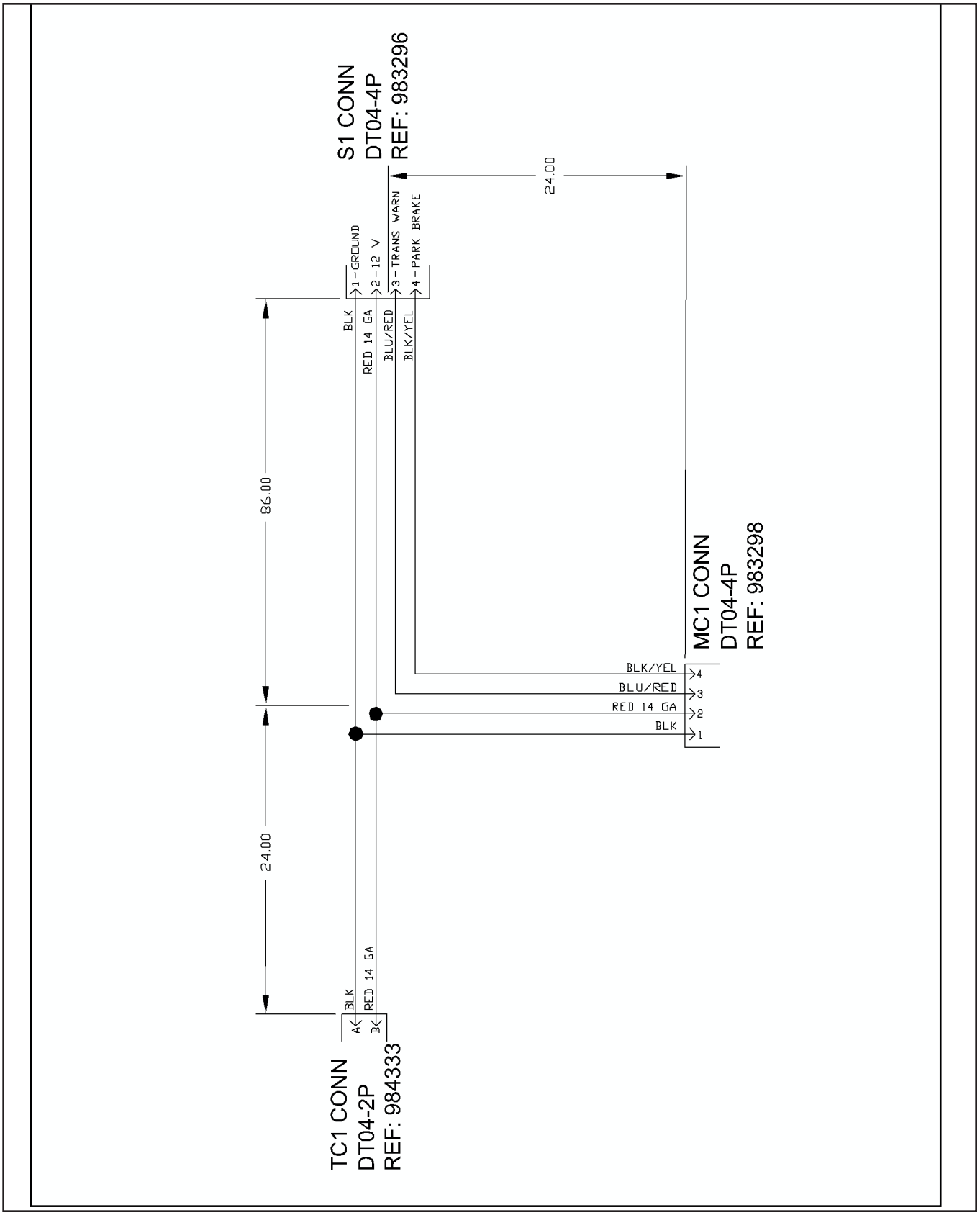
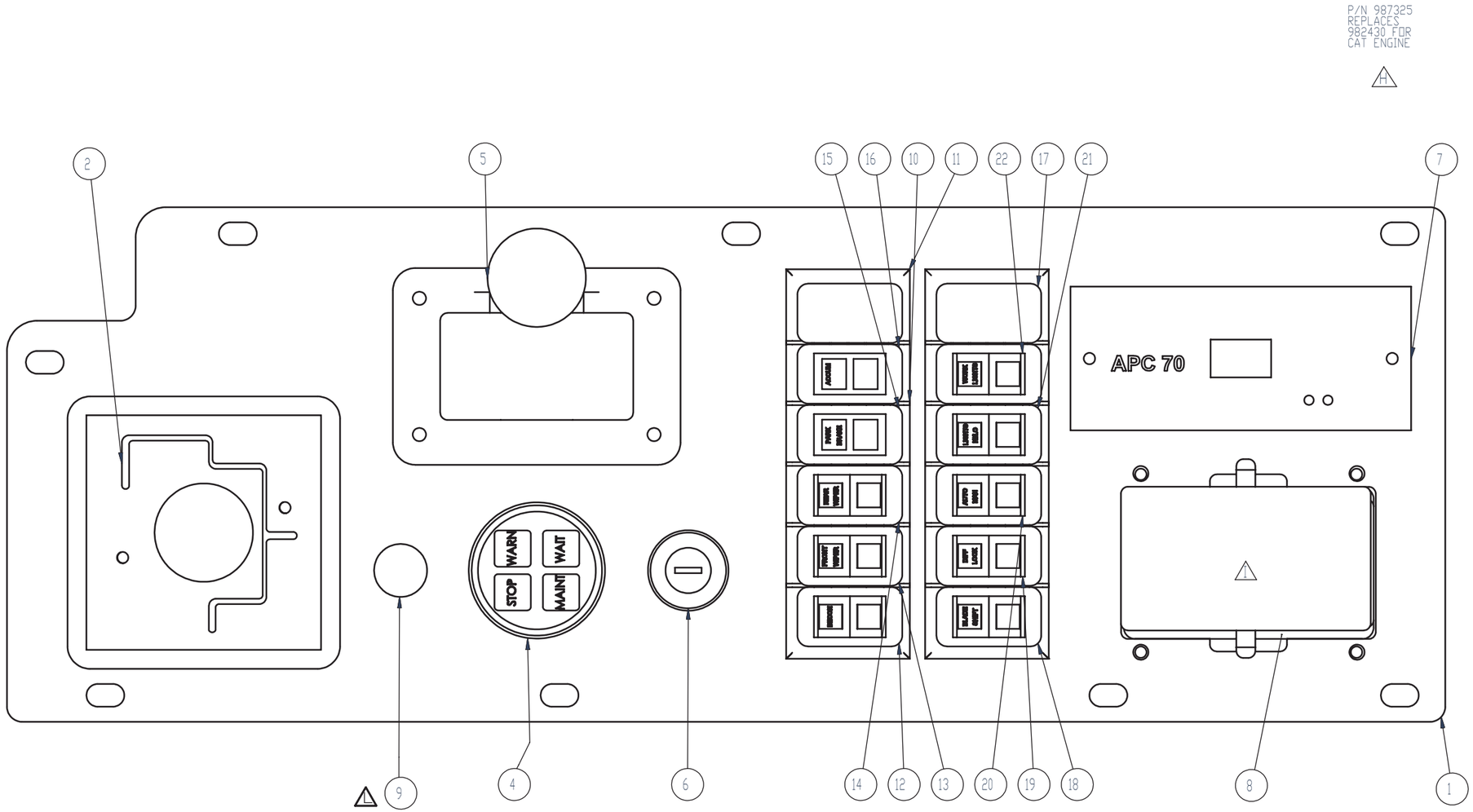


Figure 9-8

Wiring Side Panel 1 of 9



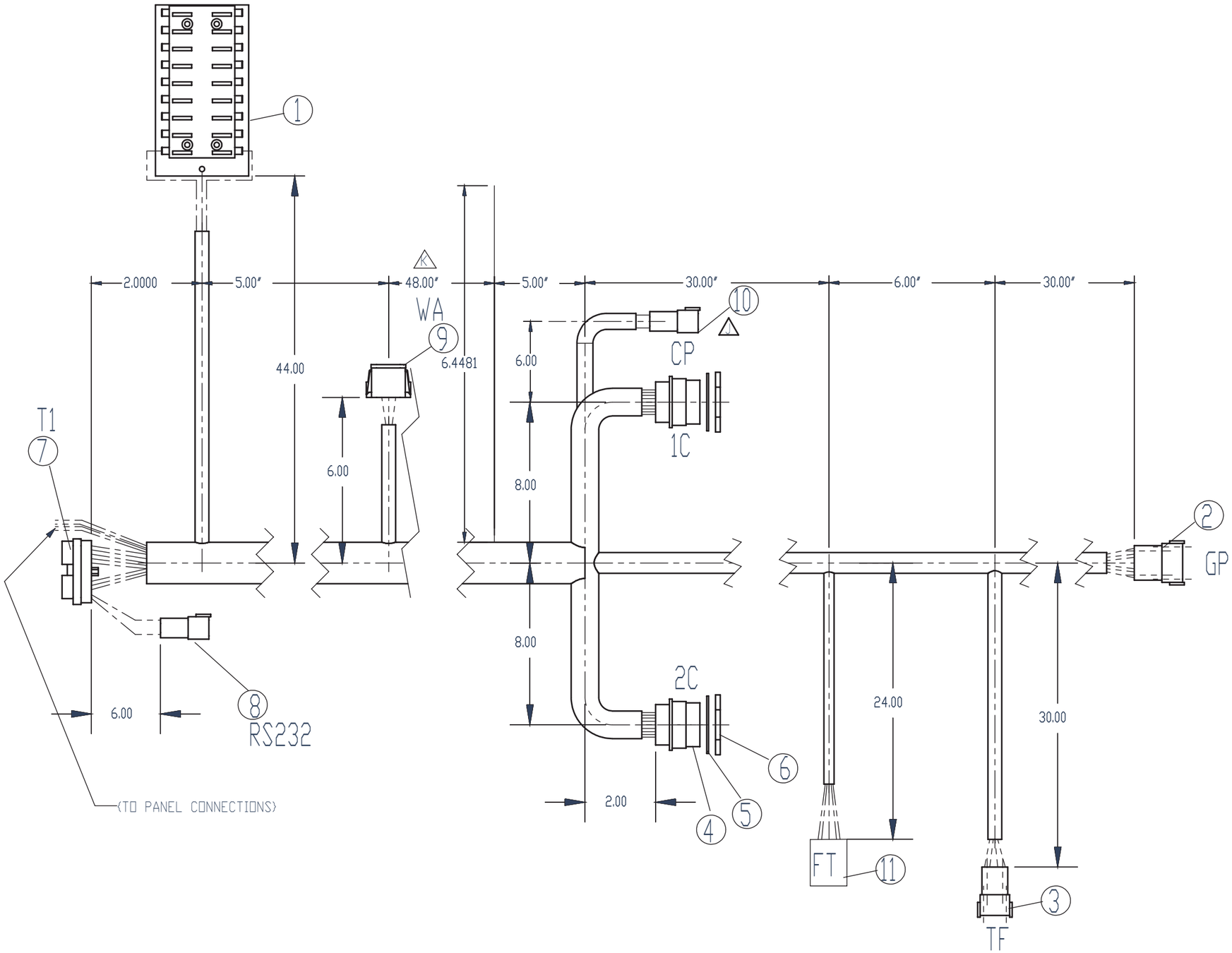
ITEM NO.	PART NUMBER	QTY	DESCRIPTION
1	985443	1	PL,PANEL,SIDE,785,EATON SW
2	984265	1	CONTROL,ELEC SHIFT,6FWD/3REV
4	73200	1	GAUGE,WARNING LIGHTS,ENG
5	982874	1	ELEC, THROTTLE, CONTROLLER
6	39146-14	1	SWITCH,IGN,W/HEAT ST
7	987325	1	CONTROLLER,TRANS,APC70
8	985746	1	FUSE/RELAY PANEL,MINI
9	981507	1	SWITCH, EMERGENCY STOP
10	985744	8	SWITCH,GANG MOUNT,CENTER
11	985743	4	SWITCH,GANG MOUNT,END
12	985731	1	SWITCH,ROCKER,BEACON
13	985732	1	SWITCH,ROCKER,FR WASHER/WIPER
14	985733	1	SWITCH,ROCKER,RR WASHER/WIPER
15	985734	1	SWITCH,INDICATOR,BRAKE,TRANS
16	985735	1	SWITCH,INDICATOR,ACCUM/FILTER
17	985745	2	SWITCH,PLUG
18	985736	1	SWITCH,ROCKER,BLADE SHIFT
19	985737	1	SWITCH,ROCKER,DIFF LOCK
20	985738	1	SWITCH,ROCKER,AUTO/MANUAL
21	985739	1	SWITCH,ROCKER,LIGHTS HI/LO
22	985740	1	SWITCH,ROCKER,WORK LIGHT FR/RR

Wiring Side Panel 1 of 9

Figure 9-9

Wiring Side Panel 2 of 9

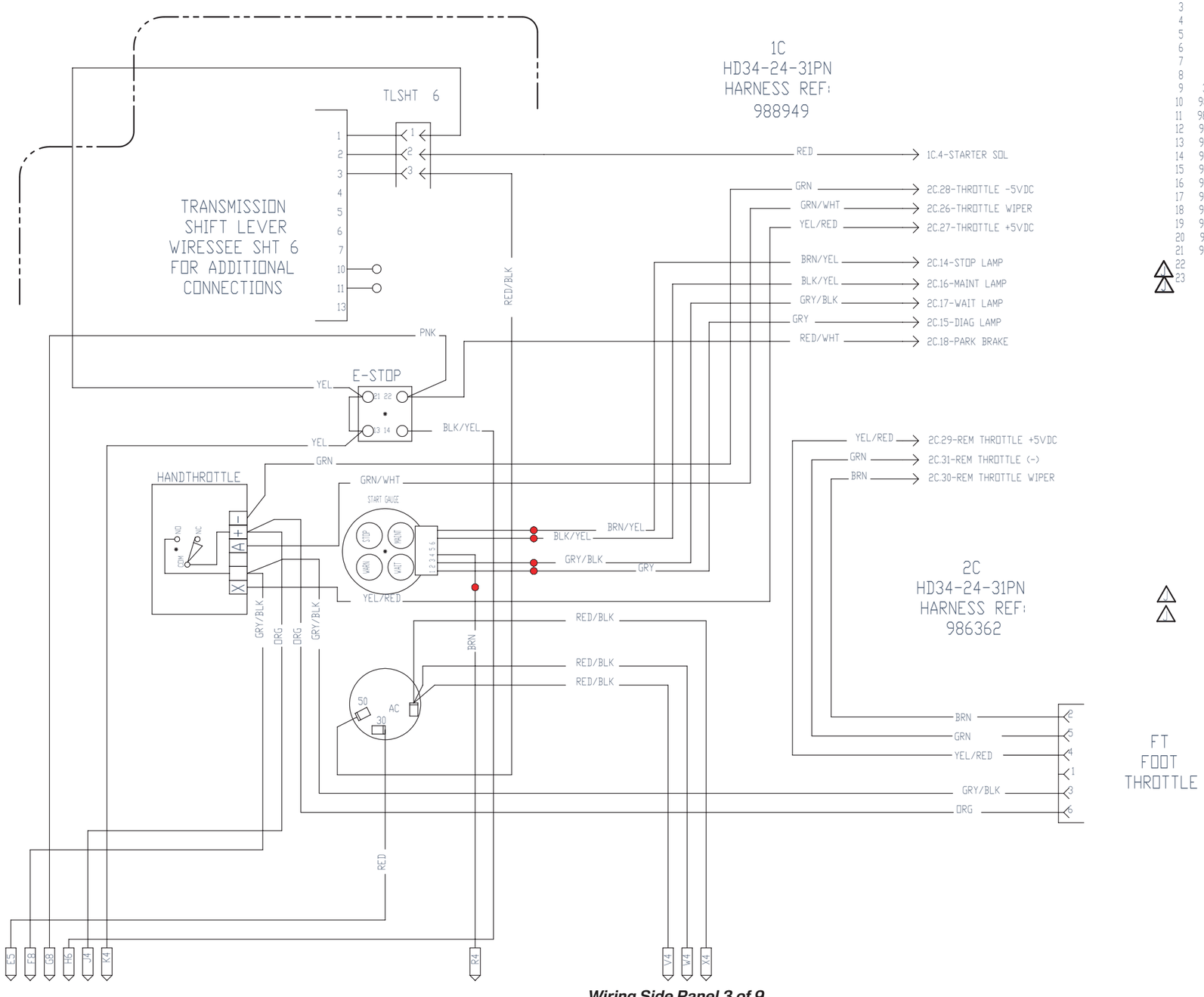
ITEM	P/N	QTY	UM	DESC
1	685060	1	EA	FUSE BLOCK,BLADE,18-GANG
2	983207	1	EA	CONN,SOC,DT04-12P,DEUTSCH
3	982455	1	EA	CONN,SOC,DT04-8P,DEUTSCH
4	981916	2	EA	CONN,RECPT,31-PIN,,DEUTSCH
5	981916-02	2	EA	CONN,WASHER,24 SHELL,DEUTSCH
6	981916-01	2	EA	CONN,NUT,24 SHELL,DEUTSCH
7	985516	1	EA	CONN,METRI-PAK,30-PIN,GRAY
8	983202	1	EA	CONN,SOC,DT04-4P,DEUTSCH
9	982446	1	EA	CONN,PLUG,DT06-12S,DEUTSCH
10	1003791	1	EA	CONN,SOC,DTP04-49-L012
11	983102	1	EA	CONN,AMP 1-963212-1



Wiring Side Panel 2 of 9

Figure 9-10

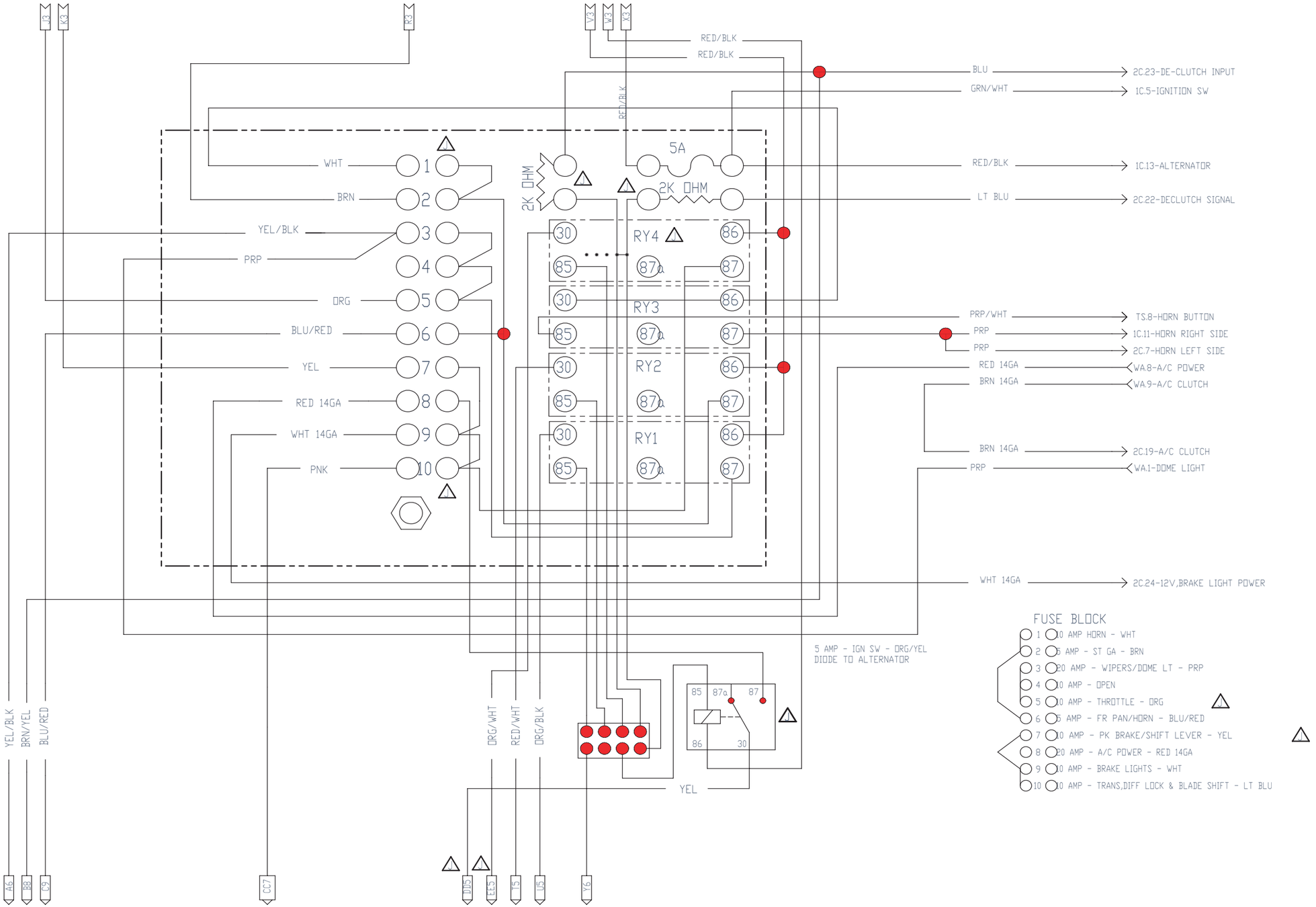
ITEM	P/N	QTY	UM	DESC
1	160035	1	EA	FLASHER, TURN SIGNAL 635/685
2	33600	1	EA	TERM,PUSH-ON,.25,FEM,16-14 GA
3	33687	1	EA	TURN SIGNAL W/HAZARD,7-WIRE
4	36340	3	EA	FUSE,BLADE,10AMP,ATC-10
5	36348	4	EA	TERM,PUSH-ON,.25,M,18-14,SLV
6	36694	1	EA	FUSE BLOCK,BLADE-TYPE,10 POS
7	37303	3	EA	FUSE,BLADE,25AMP,ATC-25
8	38897	4	EA	FUSE,BLADE,7.5AMP,ATC-7.5
9	39102	2	EA	RESISTOR,2K OHM,25 WATT
10	982448	18	EA	TERM,SOC,DEUTSCH,14-16AWG
11	982449	2	EA	CONN,SOC,DEUTSCH,8P,TYPE A
12	982456	14	EA	TERM,PIN,DEUTSCH,14-16AWG
13	983216	2	EA	CONN,WEDGE,RECP,8P,DEUTSCH
14	983218	2	EA	CONN,WEDGE,PLUG,8P,DEUTSCH
15	985593	4	EA	RELAY,DPDT,MICRO,OMRON
16	985741	10	EA	CONN,SWITCH,SVR
17	985742	70	EA	TERM,SVR CONNECTOR
18	985747	5	EA	FUSE,BLADE,MINI,5A
19	985748	4	EA	FUSE,BLADE,MINI,10AMP
20	985749	2	EA	FUSE,BLADE,MINI,20AMP
21	985759	6	EA	CONN,BUSS,8-GANG,WAGO
22	36085	1	EA	RELAY,12VDC,20/30A
23	36086	1	EA	BRACKET,RELAY MOUNT



Wiring Side Panel 3 of 9

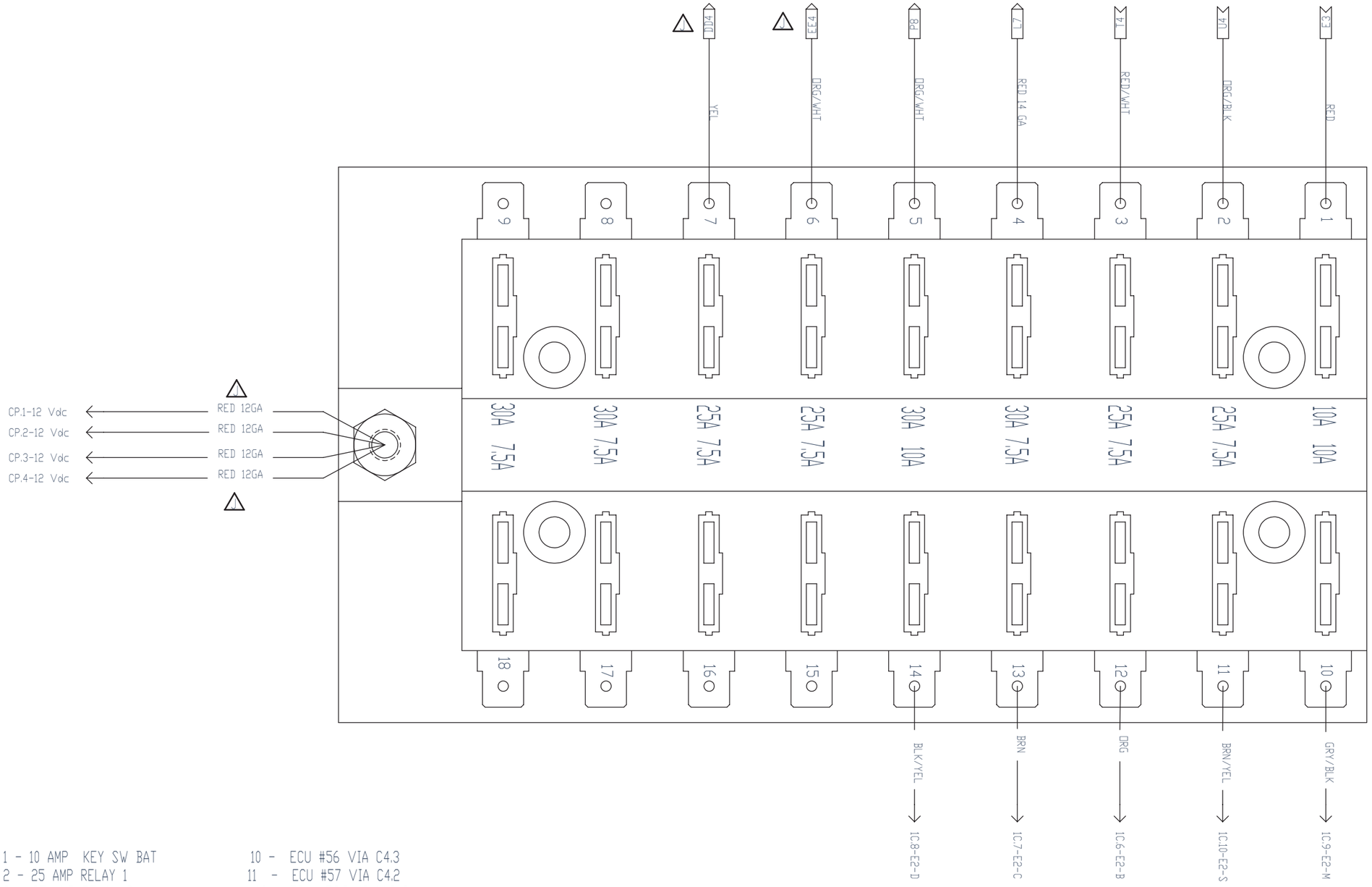
Figure 9-11

Wiring Side Panel 4 of 9



Wiring Side Panel 4 of 9

Figure 9-12

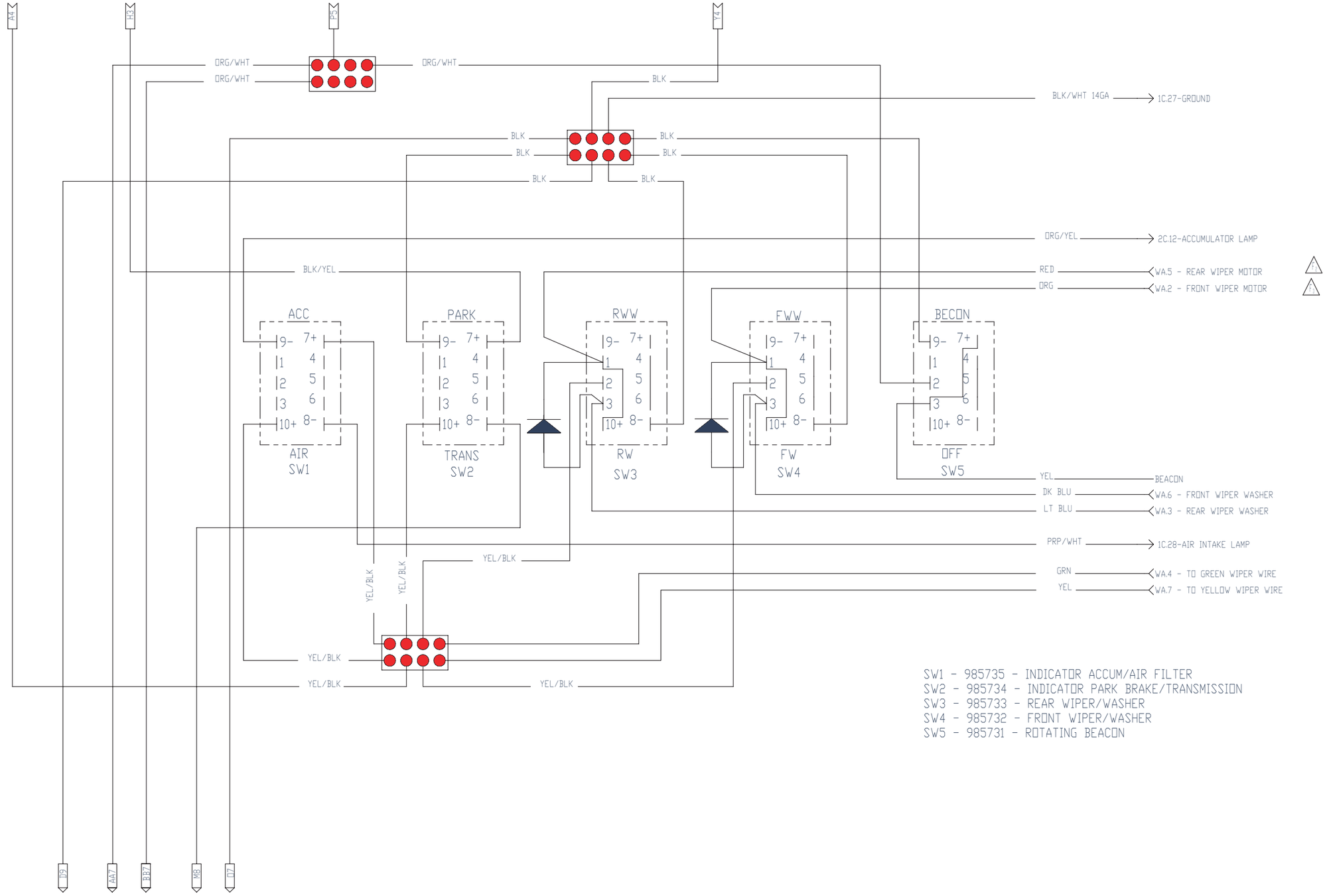


1 - 10 AMP KEY SW BAT
2 - 25 AMP RELAY 1
3 - 25 AMP RELAY 2
4 - 30 AMP LIGHTS HI/LO & TURN
5 - 30 AMP BEACON & WORK LIGHTS
6 - 25 AMP RELAY 4
7 - 25 AMP A/C RELAY
10 - ECU #56 VIA C4.3
11 - ECU #57 VIA C4.2
12 - ECU #E2.B (CUMMINS)
13 - ECU #E2.C (CUMMINS)
14 - ECU #E2.D (CUMMINS)

Wiring Side Panel 5 of 9

Figure 9-13

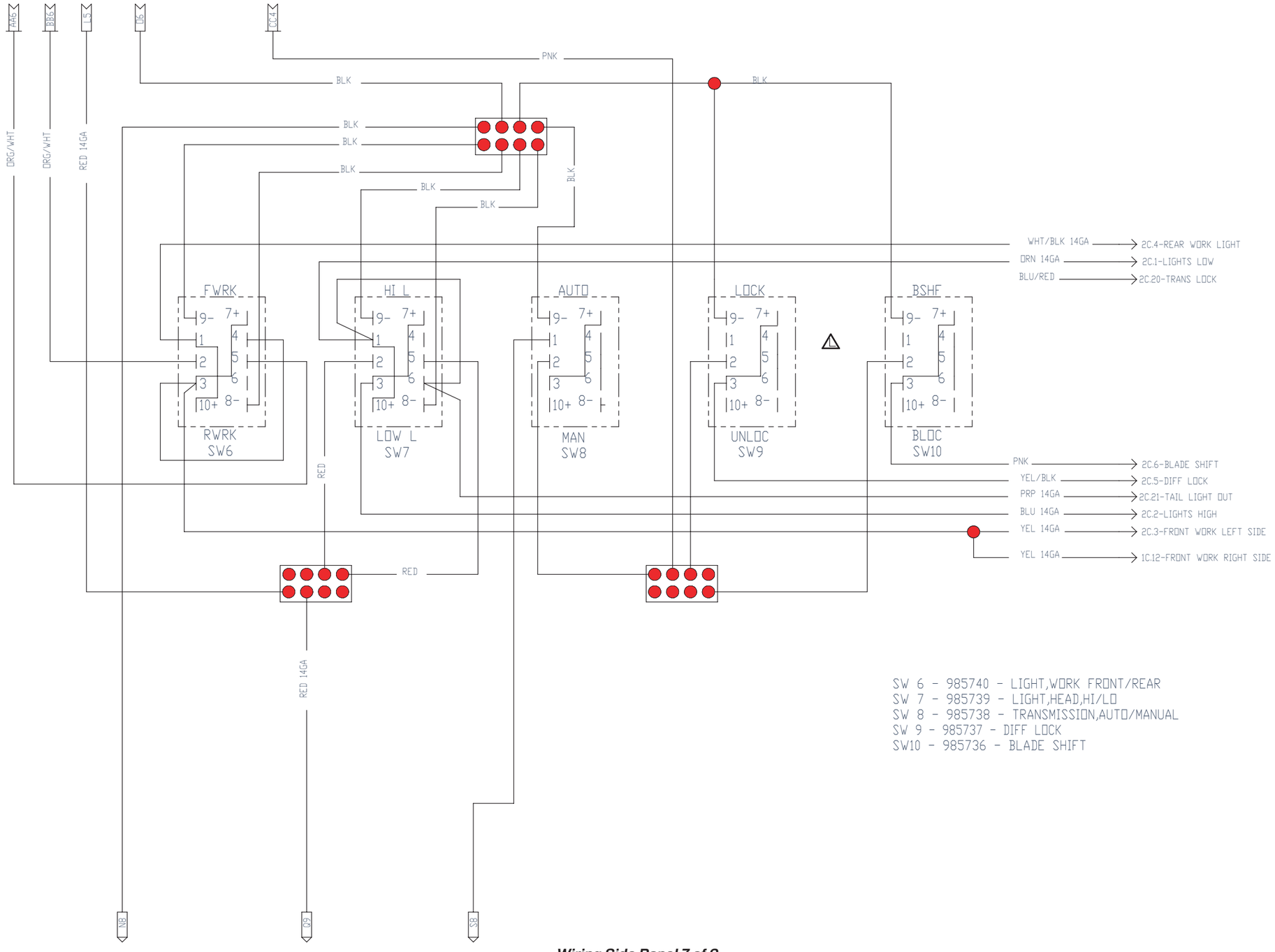
Wiring Side Panel 6 of 9



Wiring Side Panel 6 of 9

Figure 9-14

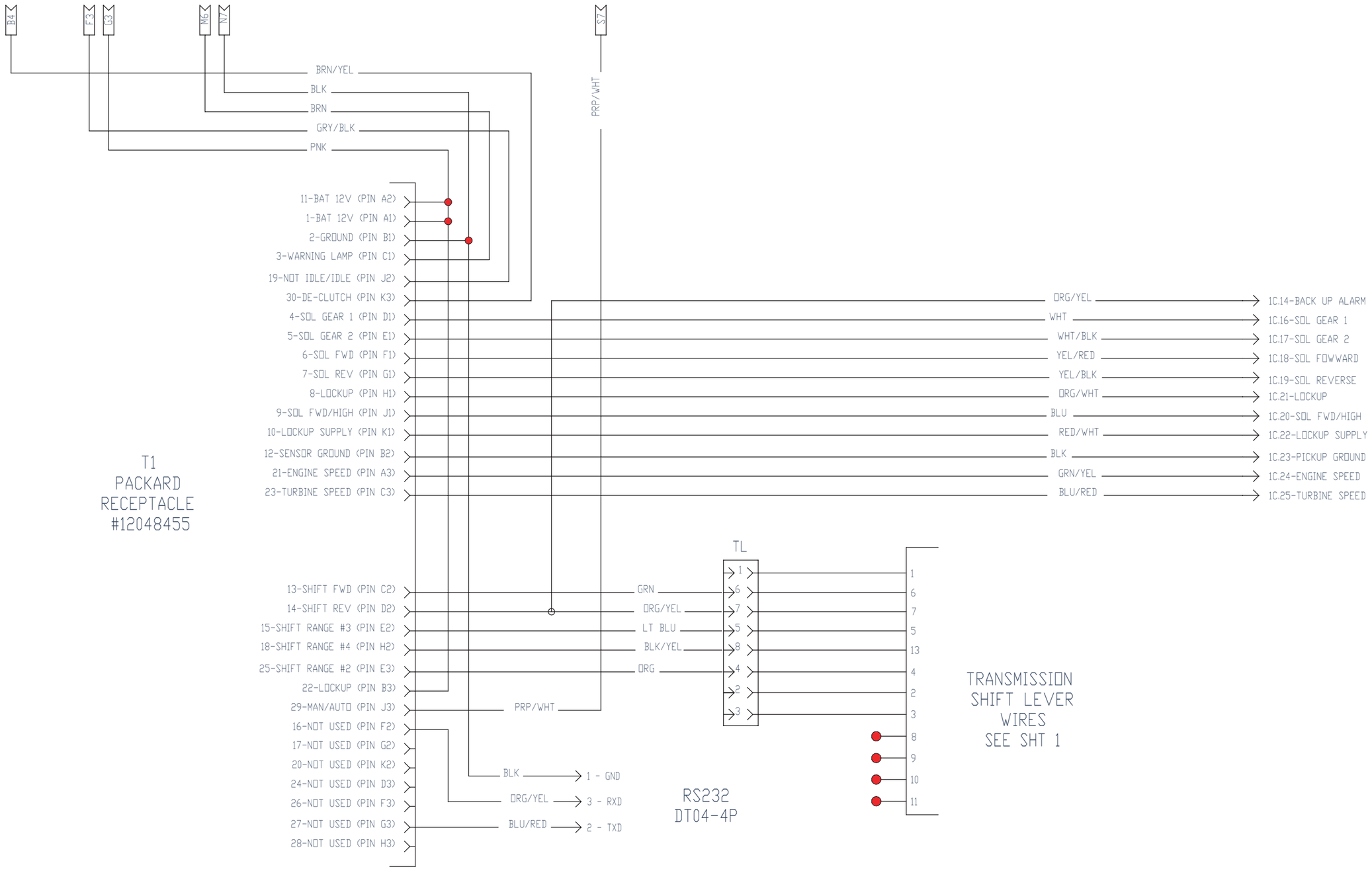
Wiring Side Panel 7 of 9



Wiring Side Panel 7 of 9

Figure 9-15

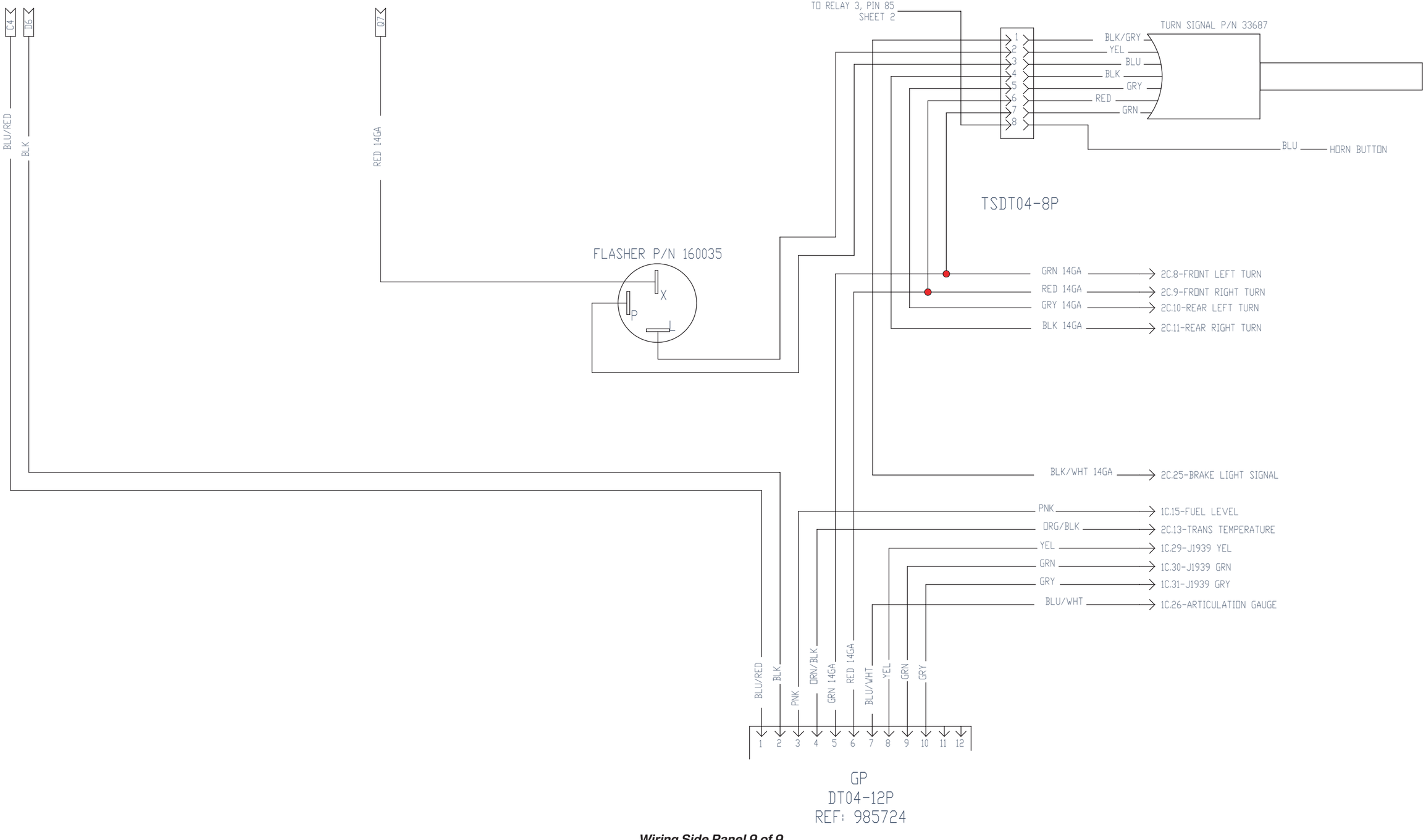
Wiring Side Panel 8 of 9



Wiring Side Panel 8 of 9

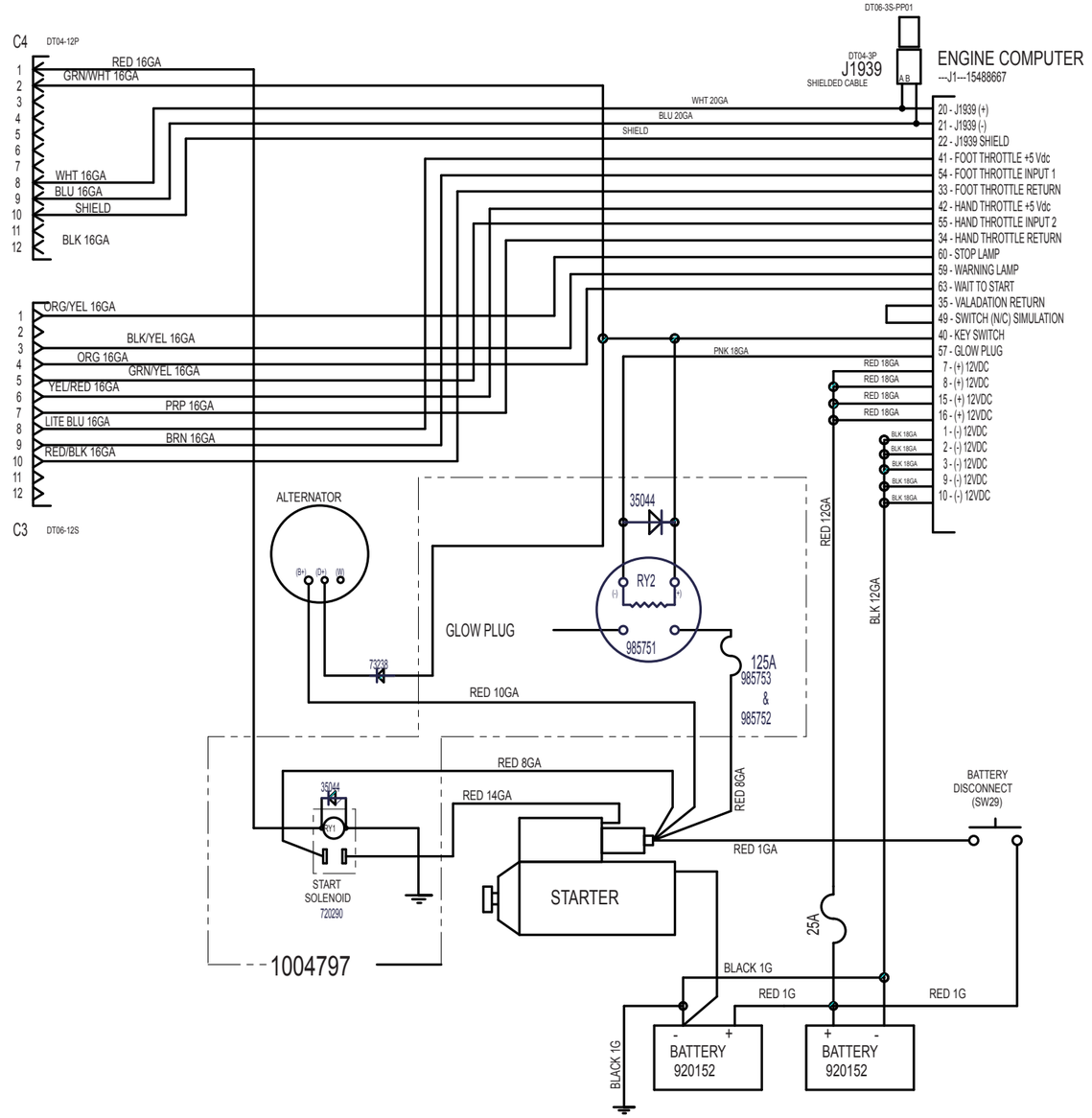
Figure 9-16

Wiring Side Panel 9 of 9



Wiring Side Panel 9 of 9

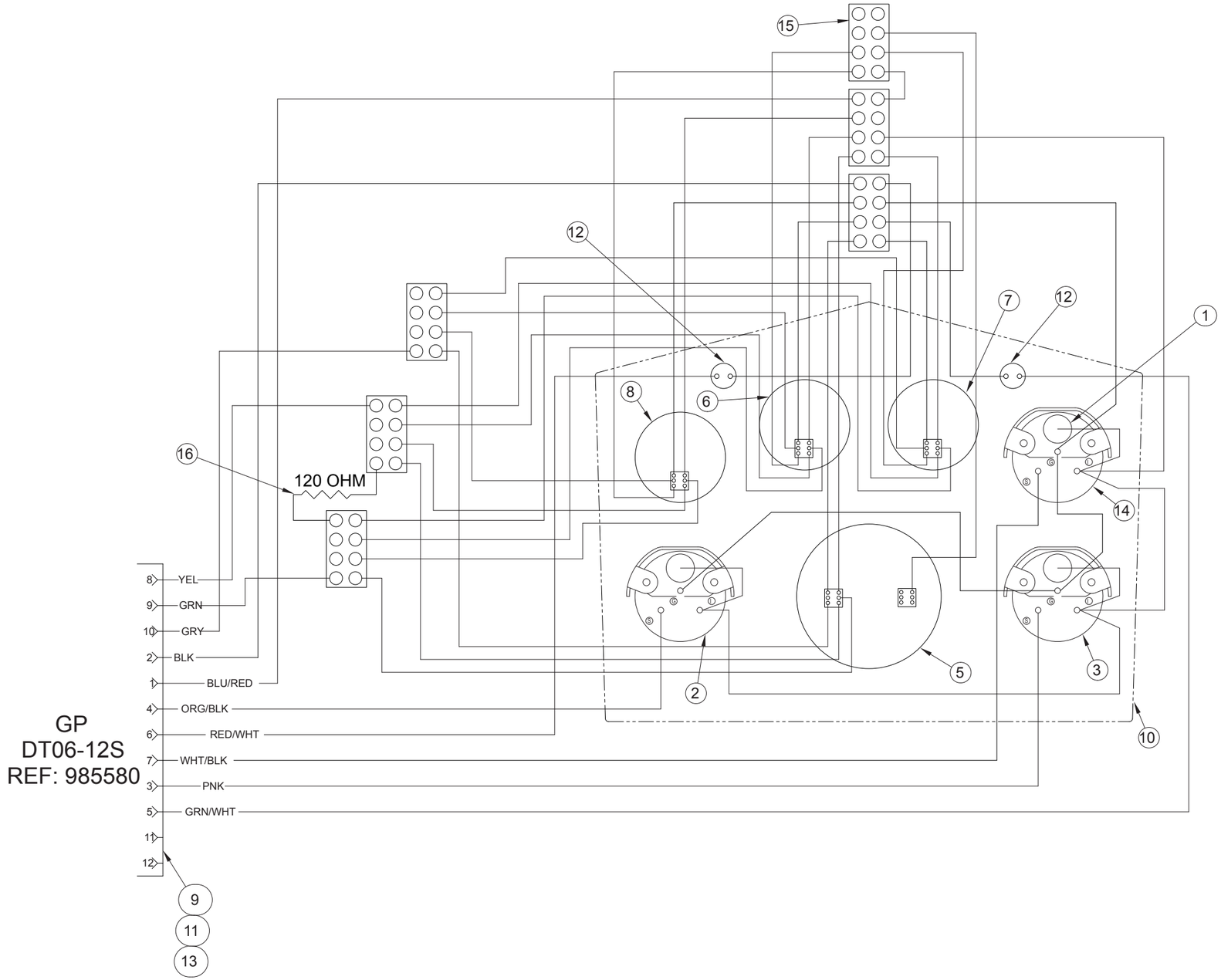
Figure 9-17



Wiring Engine Relay Panel, Cat

Figure 9-18

Wiring, Top Ctr, 785,Turn Lts

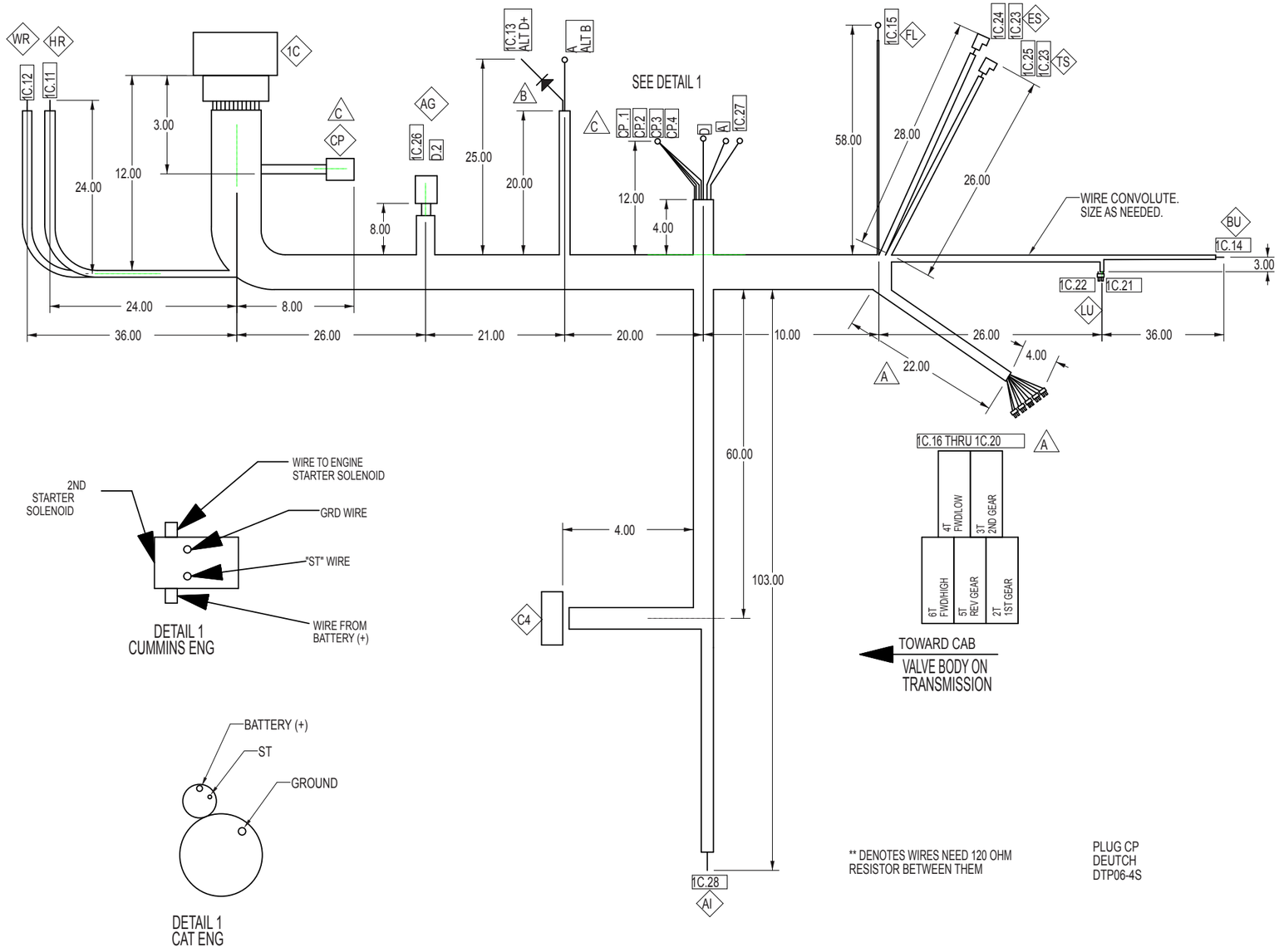


ITEM	PART NO.	QTY	DESCRIPTION
1	33435	3.00	LIGHT & SOCKET,12V,2.00 GAUGE
2	35365	1.00	GAUGE,TEMP,HYD OIL
3	35366	1.00	GAUGE,FUEL
4	35367	1.00	SENDER,TEMP GAUGE,08 MP
5	985852	1.00	GAUGE,TACH/HOUR,J1939
6	985853	1.00	GAUGE,ENG OIL PRESS,J1939
7	985855	1.00	GAUGE,COOLANT TEMP,J1939
8	985854	1.00	GAUGE,VOLTMETER,J1939
9	982448	10.00	TERM,SOC,DEUTSCH,16AWG
10	982850	1.00	PLATE, CENTER GAUGE MOUNT
11	982446	1.00	CONN,PLUG,12-PIN,DEUTSCH
12	31985	2.00	LIGHT,GREEN,DASH
13	982453	1.00	CONN,WEDGE,PLUG,12P,DEUTSCH
14	984471	1.00	GAUGE,ARTICULATION,785
15	985759	6.00	CONN,BUSS,8-GANG,WAGO
16	73289	1.00	RESISTOR,120 OHM,1/2 WATT
17	73192-02	8.00	PLUG,CAVITY,DEUTSCH

Wiring, Top Ctr, 785,Turn Lts

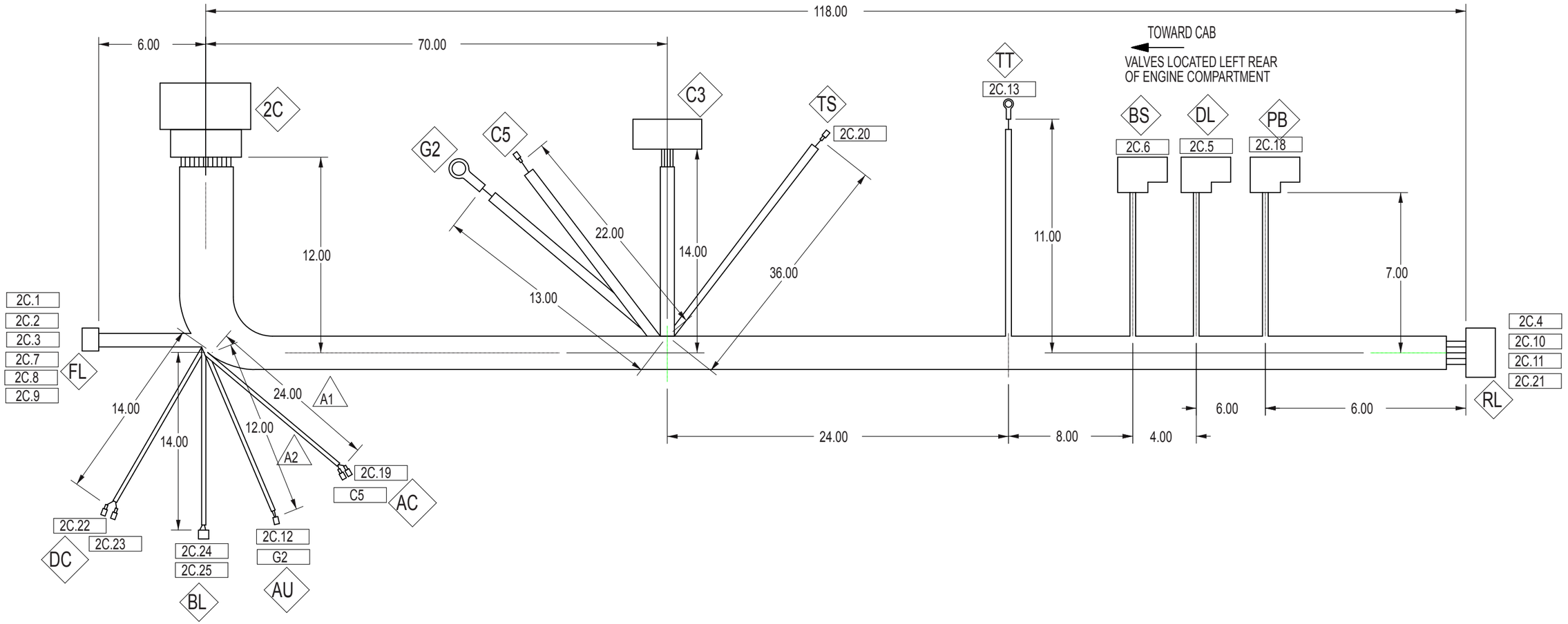
Figure 9-19

Harness, R.S. Under Carriage,785, New Deutsch Conn For Trans



Harness, R.S. Under Carriage,785, New Deutsch Conn For Trans

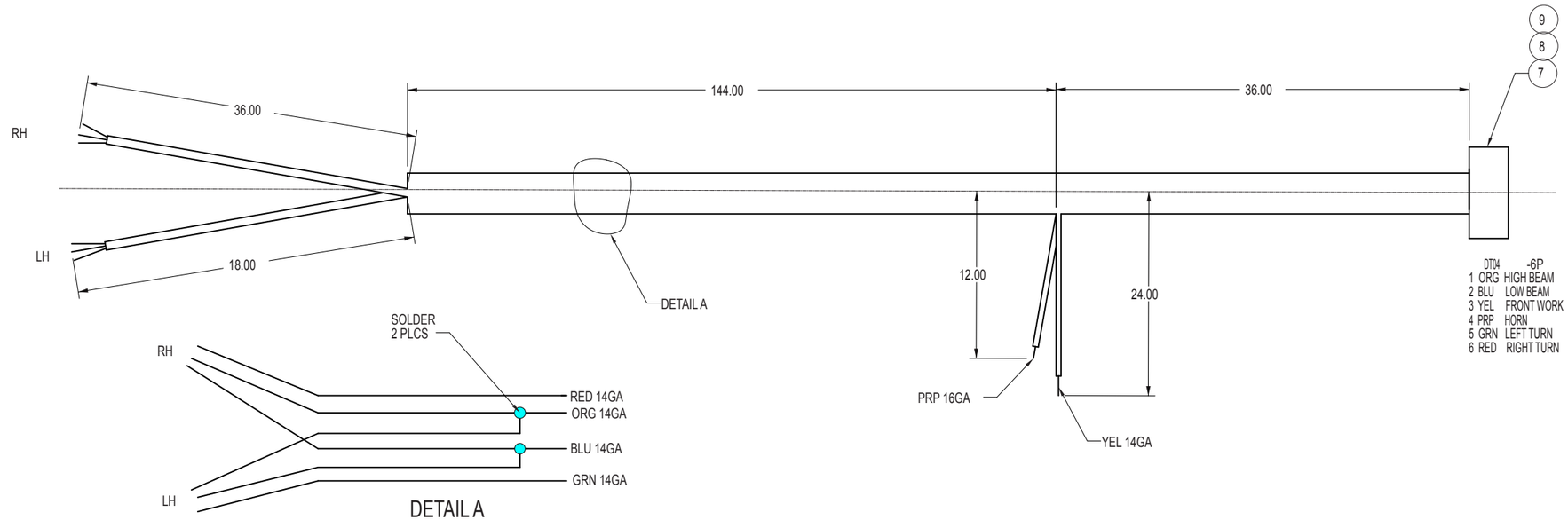
Figure 9-20



9

Harness, L.S. Under Carriage,785

Figure 9-21



9

Harness, Front Lights, 785

Figure 9-22

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INTRODUCTION

GENERAL INFORMATION

This Illustrated Parts List (IPL), as part of the Operations, Service and Parts Manual, is intended for use in identifying and requisitioning replacement parts.

NUMERICAL INDEX

A numerical index is provided to supplement the detailed parts list. Part number arrangement begins at the extreme left-hand position and continues from left to right, one position at a time. The order of precedence is as follows: Letters A through Z; Numerals 0 through 9. The alpha "O" shall be considered as a numeric zero. Each part number provides a reference to its appearance in the IPL by figure and item number.

EQUIPMENT DESIGNATOR INDEX

If equipment designators are used in place of part numbers at any place in the IPL, an Equipment Designator Index is provided listing all equipment designators listed in the illustrated parts list.

DETAILED PARTS LIST

How to Use the IPL

(1) The figure number refers to the corresponding illustration.

(2) The item number corresponds to the item number shown for the part in the illustration.

(3) If standard parts (those with AN, MS, NAF, NAS prefixes) are used the standard part number is listed in the part number column.

(4) Part quantities listed are for one component or subcomponent. For example, if the parts list shows two platform assemblies, the quantities shown for the parts in the platform assembly is for one platform assembly.

(5) Attaching parts are captioned ATTACHING PARTS and are listed immediately following the part(s) attached. The -----*----- symbol follows the last item of the attaching parts group. The quantity listed for the attaching parts is the quantity required to attach one item.

(6) Parts with item numbers preceded with a dash are not illustrated.

(7) If a company other than Leeboy is referred to as the original manufacturer of some of the parts, these parts may carry the original manufacturers part number or a Leeboy part number. These manufacturers are identified by an appropriate vendor code following the nomenclature. If the part number in the part number column is a Leeboy part number, the original manufacturer's part number is given after his vendor code. Vendor codes are in accordance with the current issue of Cataloging Handbook "Commercial and Government Entity" (H4-1 and H4-2) and are preceded by the capital letter "V".

(8) When a Vendor Code cannot be obtained from the H4-1 and H4-2 Cataloging Handbook, the manufacturer's full name and address is included in the parts list. Government standard parts, such as, AN, MS, NAF, and NAS parts are not identified with a Vendor Code.

General System of Assembly Order - Detailed Parts List

The indenture system used in the Detailed Parts List shows relationship of parts and assemblies to next higher assemblies or installations, as follows:

1 2 3 4 5 6 7

Installation

- Detail parts for installation
- Assembly
- Attaching parts for assemblies
- • Detail parts for assembly
- • Sub-assembly
- • Attaching parts for sub-assembly
- • • Detail parts for sub-assembly
- • • Assembly
- • • Attaching parts for sub-sub-assembly
- • • • Detail parts for sub-sub-assembly

Front Scarifier & Front Axle

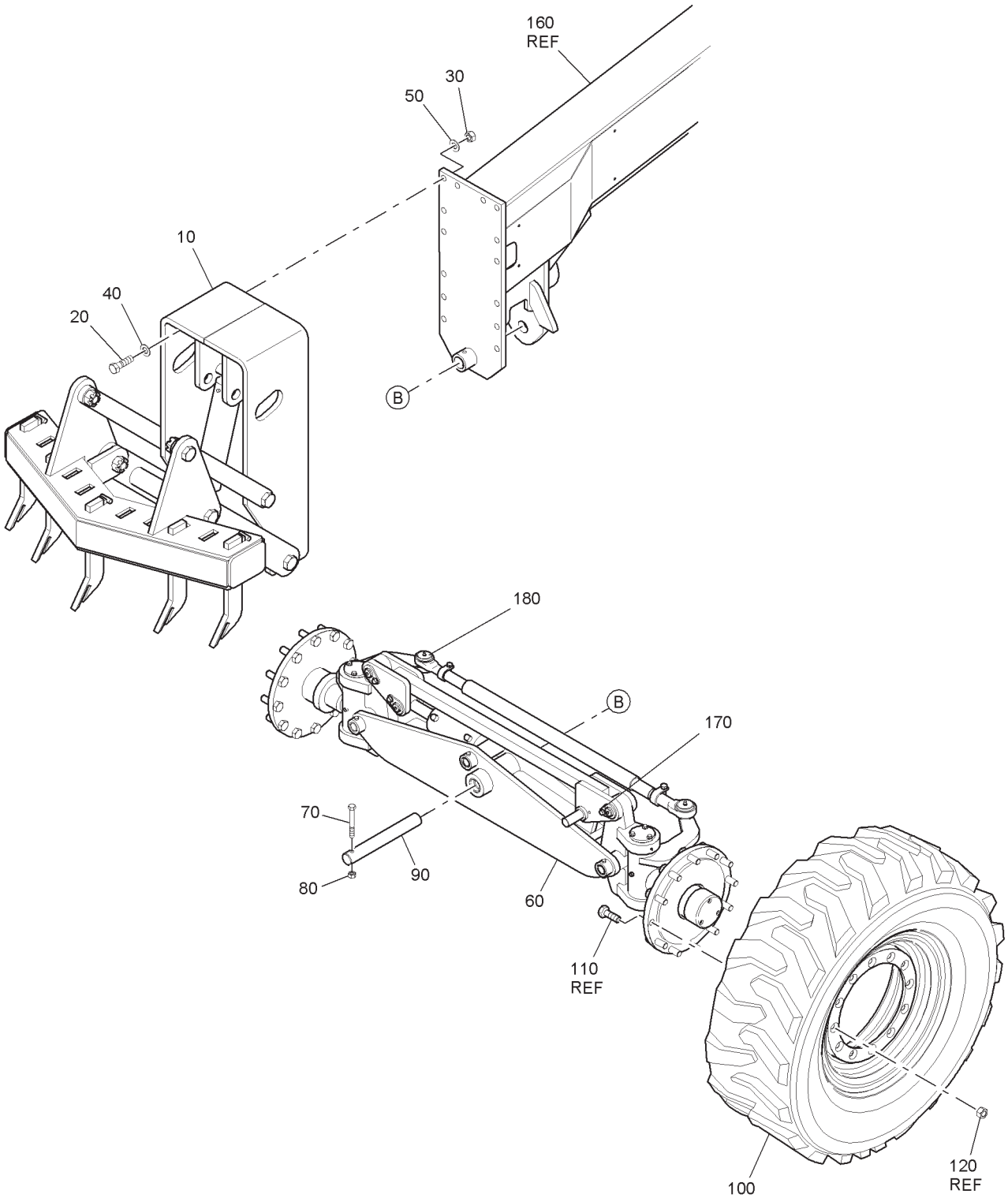


Figure 10-1

Front Scarifier & Front Axle Parts List

Item No.	Part Number	Qty.	Description	Remarks
1				
10	982184	1	• FRONT SCARIFIER ASSEMBLY (SEE IPL Figure 10-7 FOR BREAKDOWN)	
20	81058	14	• CAP SCREW, 7/8"-9 X 3.0, HEX, GRADE 5	
30	116-9	14	• NUT, 7/8"-9 HEX	
40	81059	14	• WASHER, FLAT, 7/8"	
50	118-9	14	• LOCKWASHER, 7/8"	
60	982900	REF	• FRONT AXLE ASSY (SEE IPL Figure 10-8 FOR BREAKDOWN)	
70	80289	1	• CAP SCREW, 5/8"-11 X 3.50, HEX, GRADE 5	
80	80356	1	• NUT, FLEXLOC, 5/8"-11	
90	981339	1	• SHAFT, CENTER PIVOT PIN	
100	985849	1	• TIRE AND WHEEL ASSEMBLY, LEFT-HAND, 15.5 X 25.0	
-	985850	1	• TIRE AND WHEEL ASSEMBLY, RIGHT-HAND, 15.5 X 25.0	
110	982883	REF(12)	• STUD, WHEEL, M22 X 1.5-INCH	
120	983552	REF(12)	• NUT, WHEEL, FLAT, M22	
-130	982879	1	• TIRE AND WHEEL COMBO, RIGHT-HAND, 13.0 X 24.0	
-140	982883	REF(12)	• STUD, WHEEL, M22 X 1.5-INCH	
-150	983552	REF(12)	• NUT, WHEEL, FLAT, M22	
160	983108	REF	• BOOM WELDMENT AND COVER ASSEMBLY (SEE IPL Figure 10-6 FOR BREAKDOWN)	
170	981883	3	• PLATE, CYL END CAP	
180	130060	REF	• BALL JOINT, MOLDBOARD LIFT	

Yoke & Moldboard Assembly

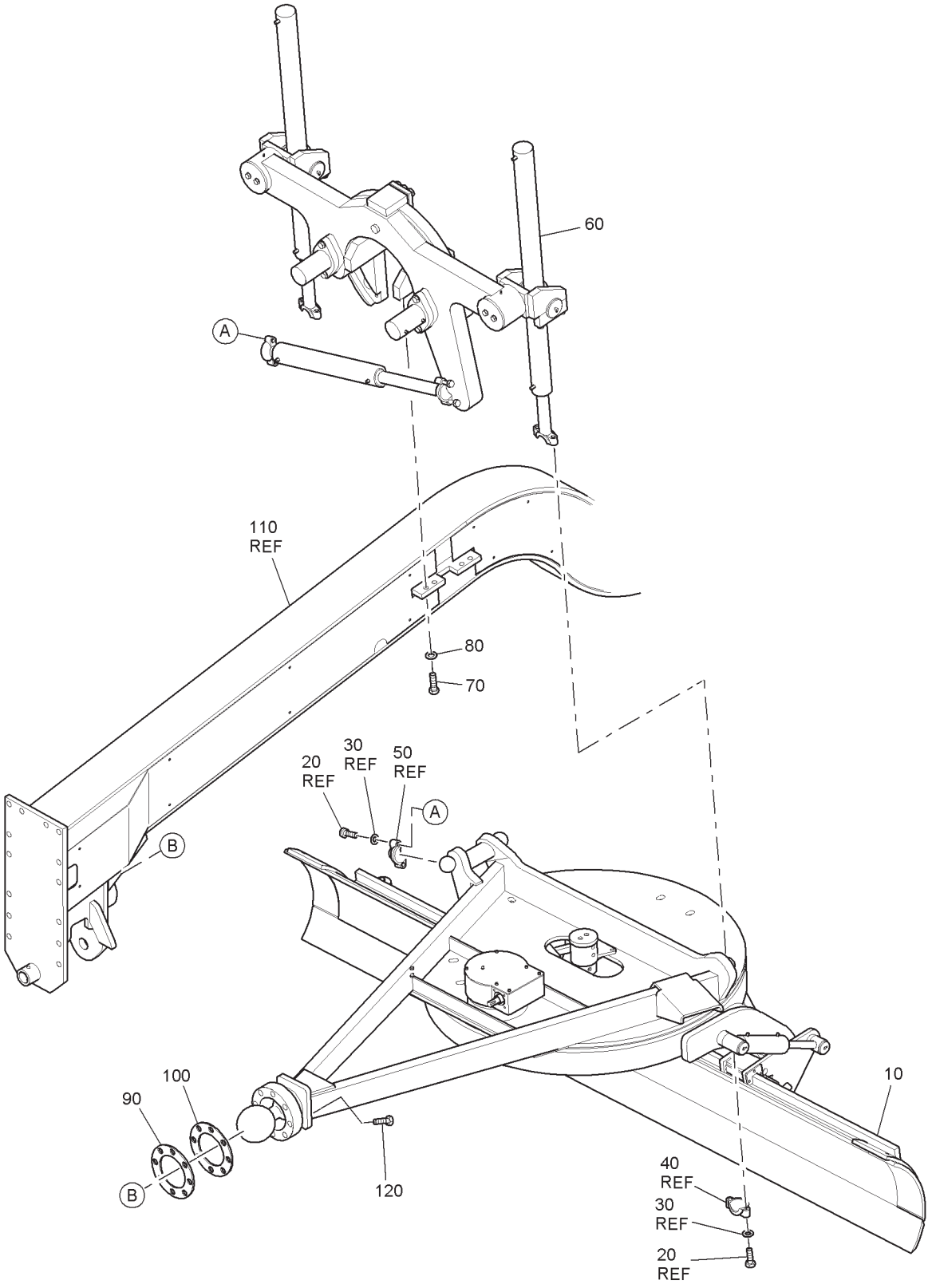


Figure 10-2

Yoke & Moldboard Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
2				
10	985152	1	• MOLDBOARD ASSEMBLY (SEE IPL Figure 10-16 FOR BREAKDOWN)	
20	811358	REF(6)	• CAP SCREW, 5/8"-11 X 3.0, HEX, GRADE 8	
30	118-7	REF(6)	• LOCKWASHER, 5/8"	
40	981874	REF(2)	• BEARING CAP (PART OF HYDRAULIC CYLINDER)	
50	981875	REF(1)	• BEARING CAP (PART OF HYDRAULIC CYLINDER)	
60	-	1	• YOKE ASSY (SEE IPL Figure 10-14 FOR BREAKDOWN)	
70	102-709-1A	8	• CAP SCREW, 3/4"-10 X 2, HEX	
80	118-8	8	• LOCKWASHER, 3/4"	
90	981717	AR	• SHIM, DRAWBAR	
100	982888	AR	• SHIM, DRAWBAR	
110	983108	REF	• BOOM WELDMENT AND COVER ASSEMBLY (SEE IPL Figure 10-6 FOR BREAKDOWN)	
120	-	8	• ALLEN HEAD BOLT, 5/8X2”	STANDARD

Cab Mounting Assembly

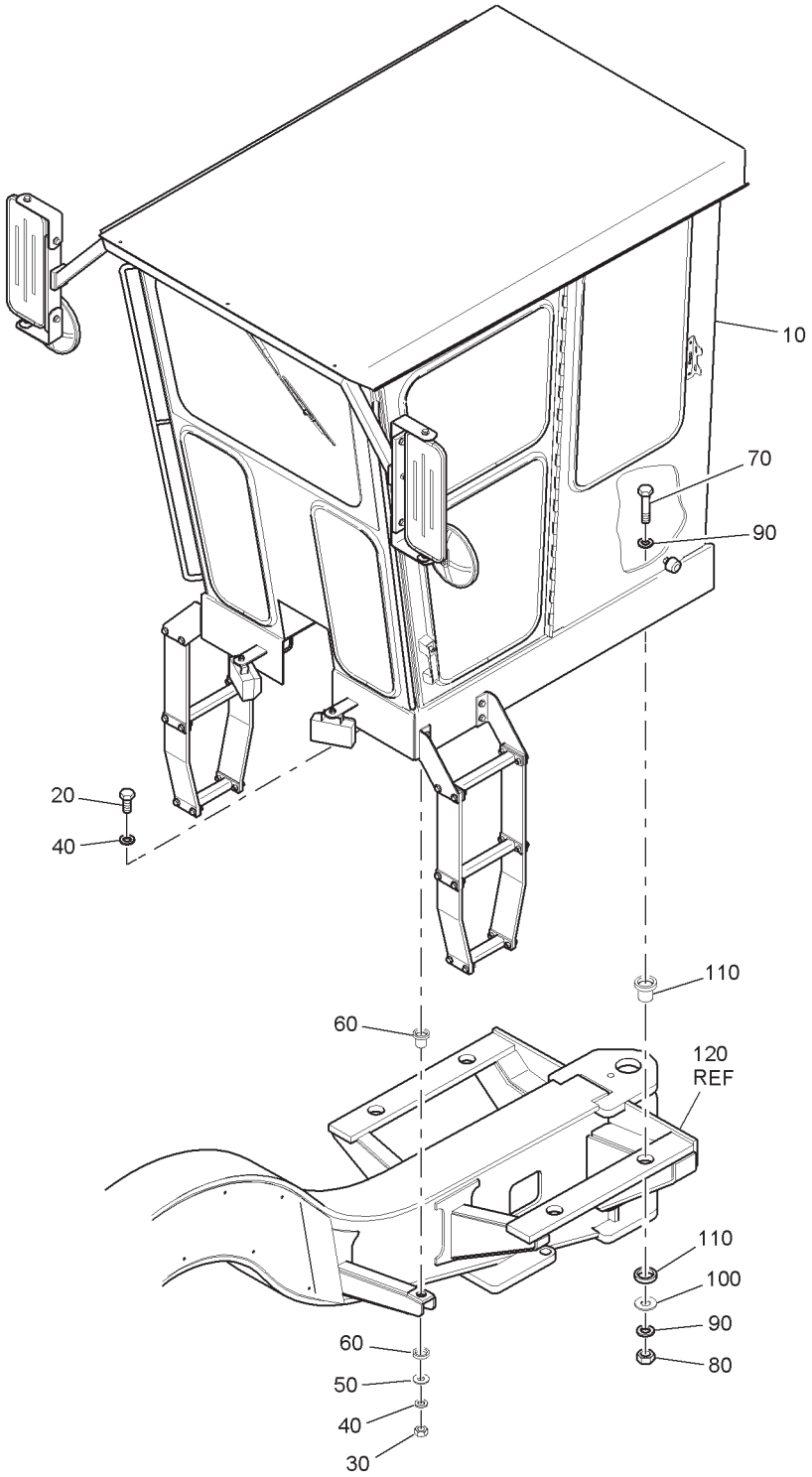


Figure 10-3

Cab Mounting Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
3				
10	982700	1	• CAB ASSEMBLY (SEE IPL Figure 10-21, Figure 10-22 5-22, Figure 10-23, Figure 10-24, AND Figure 10-25 FOR BREAKDOWN)	
20	102-423-1A	2	• CAP SCREW, 1/2"-13 X 5.50 HEX	
30	143-5	2	• LOCKNUT, 1/2"-13 HEX	
40	119-5	4	• FLAT WASHER, 1/2" SAE	
50	982324	2	• WASHER, MOUNT	
60	982322	2	• RUBBER MOUNT, TWO-PIECE	
70	102-831-1A	4	• CAP SCREW, 7/8"-9 X 7.50 HEX	
80	143-9	4	• LOCKNUT, 7/8"-9 HEX	
90	120-9	8	• FLAT WASHER, 7/8" SAE	
100	982326	4	• WASHER, MOUNT	
110	982323	4	• RUBBER MOUNT, TWO-PIECE	
120	983108	REF	• BOOM WELDMENT AND COVER ASSEMBLY (SEE IPL Figure 10-6 FOR BREAKDOWN)	

Articulation Group

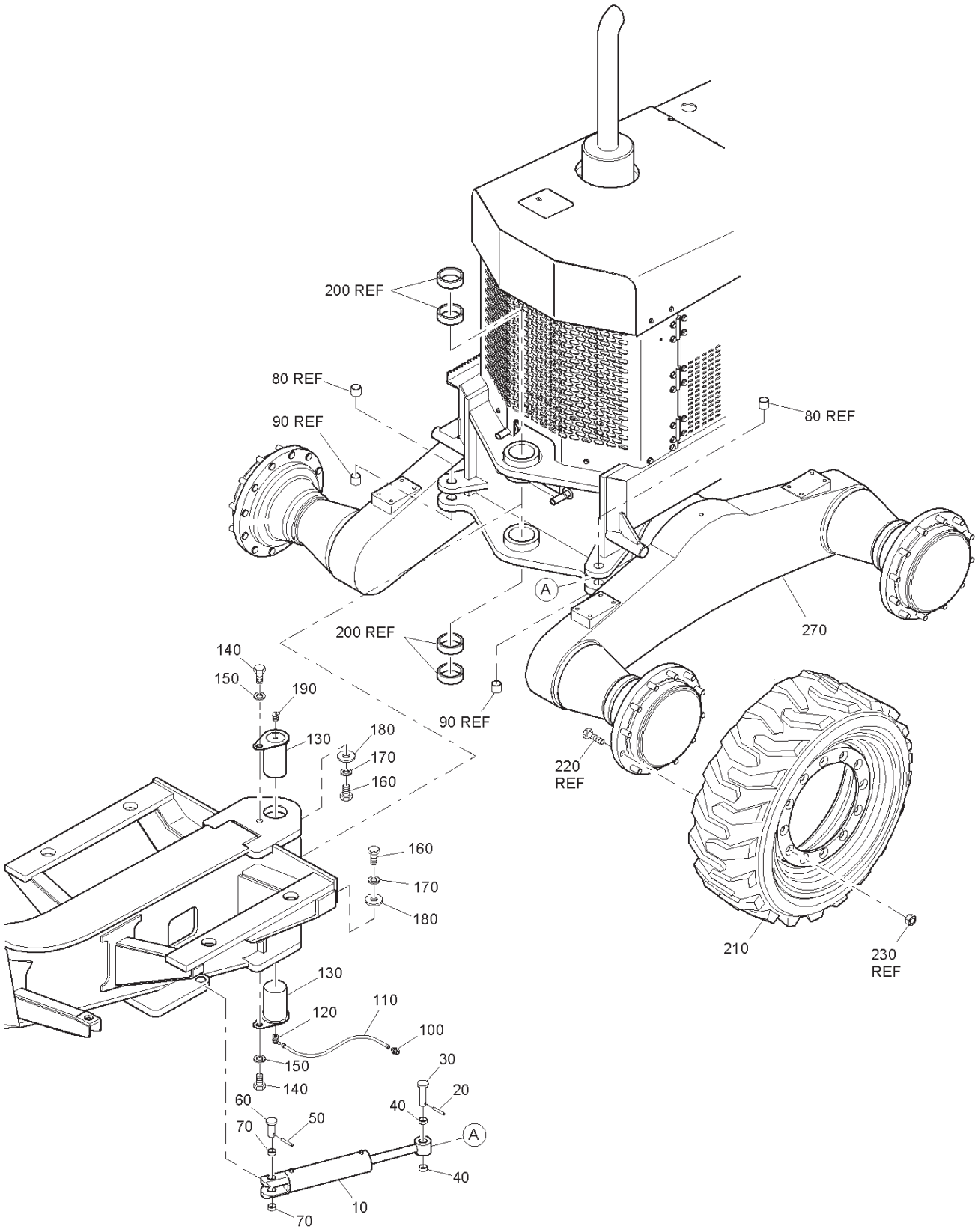


Figure 10-4

Articulation Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
4				
10	981877	2	• HYDRAULIC CYLINDER, 3.50 X 10.00", 2500 PSI	
20	871081835	1	• ROLL PIN, 0.375 X 2.00"	
30	981819	1	• PIN, ARTICULATING CYLINDER	
40	110130	2	• BUSHING, WHEEL LEAN TIE ROD	
50	871081835	1	• ROLL PIN, 0.375 X 2.00"	
60	981822	1	• PIN, ARTICULATING CYLINDER	
70	110130B	2	• BUSHING, WHEEL LEAN PIN, 1.25"	
80	110130	REF(2)	• BUSHING, WHEEL LEAN TIE ROD	
90	983379	REF(2)	• BUSHING, STEEL, 1.5 X 1.25 X 1.25"	
100	985094	1	• GREASE FITTING, 1/8" NPT STRAIGHT	
110	520210	1	• HOSE, 400 REAR DRUM BEARING	
120	37311	1	• FITTING, 90° BRASS, 02MP-02FP	
130	985673	2	• PIN ASSEMBLY, ARTICULATION JOINT	
140	102-909-1A	1	• CAP SCREW, "1-8 X 2.0 HEX	
150	118-10	1	• LOCKWASHER, 1.0"	
160	102-909-1A	1	• CAP SCREW, 1"-8 X 2.0 HEX	
170	118-10	1	• LOCKWASHER, 1.0"	
180	981398	1	• WASHER, ARTICULATING SHAFT	
190	985095	1	• GREASE FITTING, 1/8", 90° NPT	
200	983376	REF(4)	• BUSHING, STEEL, 4.0 X 3.5 X 2.5" LONG	
210	982878	2	• TIRE AND WHEEL ASSEMBLY	
220	982883	REF(12)	• STUD, WHEEL, M22 X 1.5-INCH	
230	983552	REF(12)	• WHEEL NUT, FLAT, M22	
-240	982879	2	• TIRE AND WHEEL COMBO, RIGHT-HAND, 13.0X24.0	
-250	982883	REF(12)	• STUD, WHEEL, M22 X 1.5-INCH	
-260	983552	REF(12)	• NUT, WHEEL, FLAT, M22	
270	987322		• AXLE ASSEMBLY, DRIVE	
	985849		TIRE & WHEEL ASSY, LH, 15.5 X 25	
	985850		TIRE & WHEEL ASSY, RH, 15.5 X 25	

Rear Frame & Scarifier Assembly

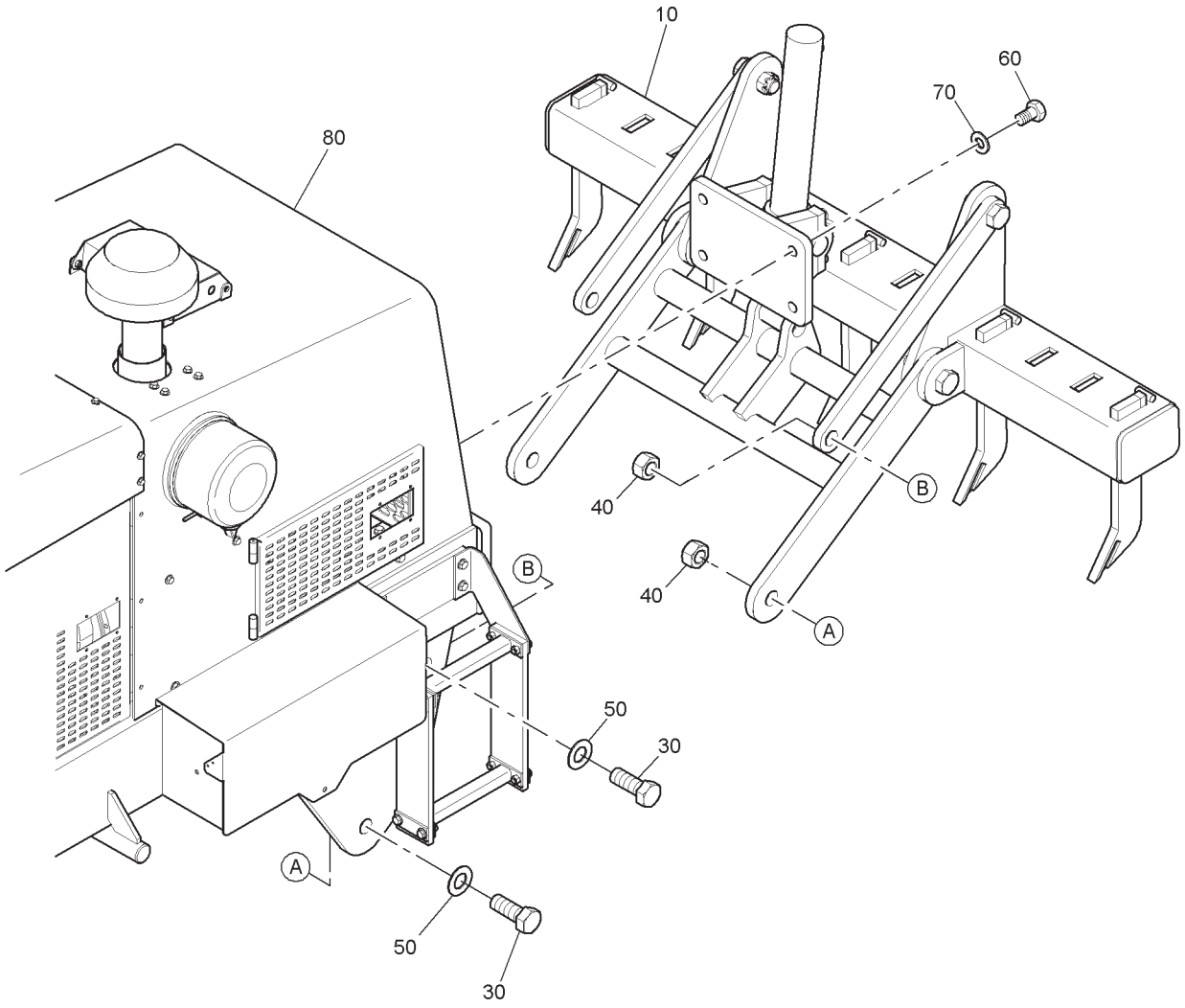


Figure 10-5

Rear Frame & Scarifier Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
5				
10	982238	1	• REAR SCARIFIER ASSEMBLY (SEE IPL FIGURE 5-56 FOR BREAKDOWN)	
30	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
40	1006056	2	• LOCKNUT, 1.5"-6 HEX	
50	119-14	2	• FLAT WASHER, 1.5" SAE	
60	102-909-1A	4	• CAP SCREW, 1"-8 X 2.0 HEX	
70	118-10	4	• LOCKWASHER, 1"	

Boom Weldment & Cover Assembly

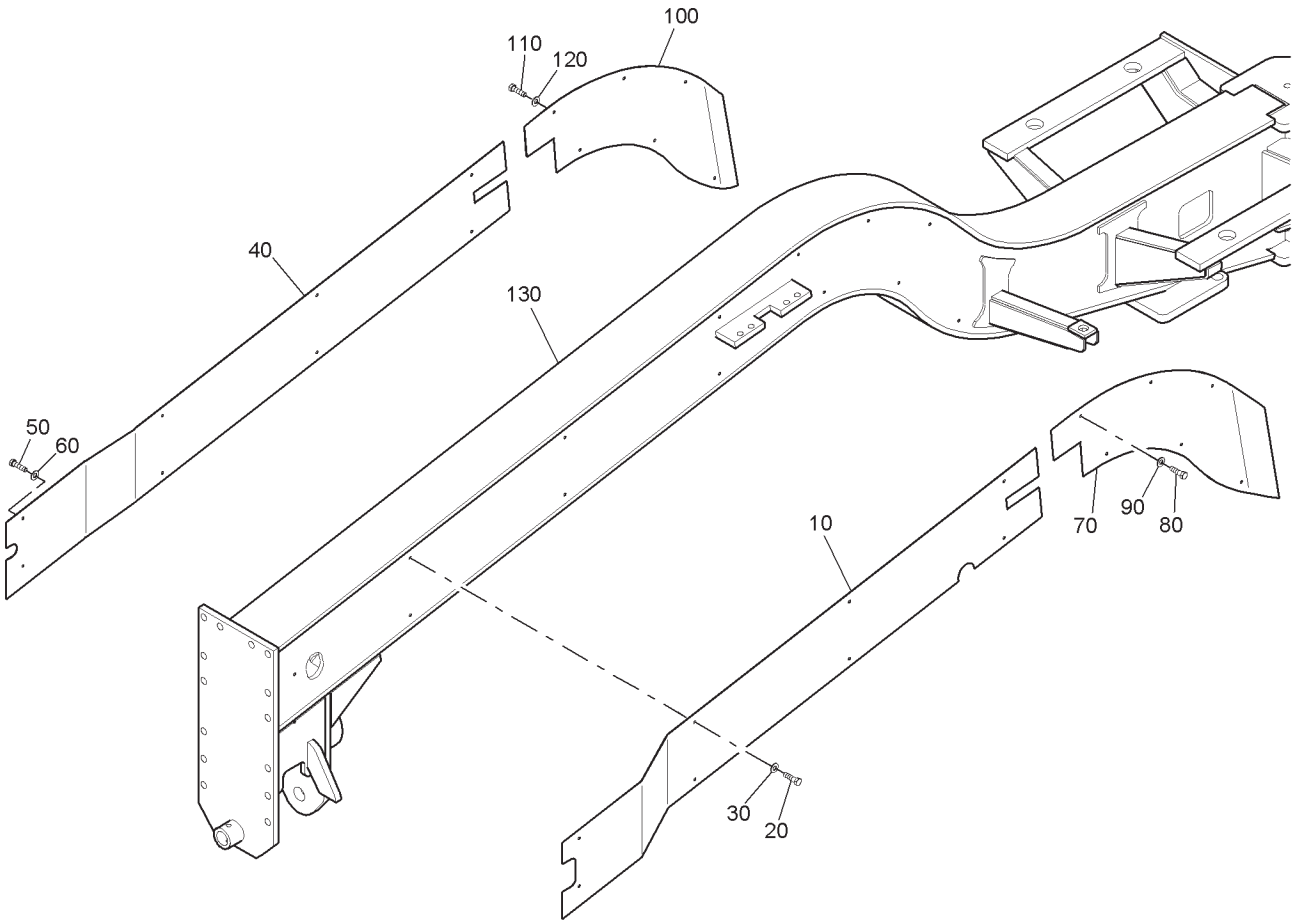


Figure 10-6

Boom Weldment & Cover Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
6				
-1	983108	REF	BOOM WELDMENT AND COVER ASSEMBLY (SEE IPL Figure 10-1, Figure 10-2, Figure 10-3 AND Figure 10-4 FOR NHA)	
10	982541	1	• COVER PLATE, LEFT-HAND BOOM	
20	102-203-1A	8	• CAP SCREW, 3/8"-16 X 3/4 HEX	
30	118-3	8	• LOCKWASHER, 3/8"	
40	982544	1	• COVER PLATE, RIGHT-HAND BOOM	
50	102-203-1A	8	• CAP SCREW, 3/8"-16 X 3/4 HEX	
60	118-3	8	• LOCKWASHER, 3/8"	
70	982543	1	• COVER PLATE, REAR, LEFT-HAND BOOM	
80	102-203-1A	6	• CAP SCREW, 3/8"-16 X 3/4 HEX	
90	118-3	6	• LOCKWASHER, 3/8"	
100	982545	1	• COVER PLATE, REAR, RIGHT-HAND BOOM	
110	102-203-1A	6	• CAP SCREW, 3/8"-16 X 3/4 HEX	
120	118-3	6	• LOCKWASHER, 3/8	
130	983108	1	• BOOM WELDMENT	

Front Scarifier Assembly

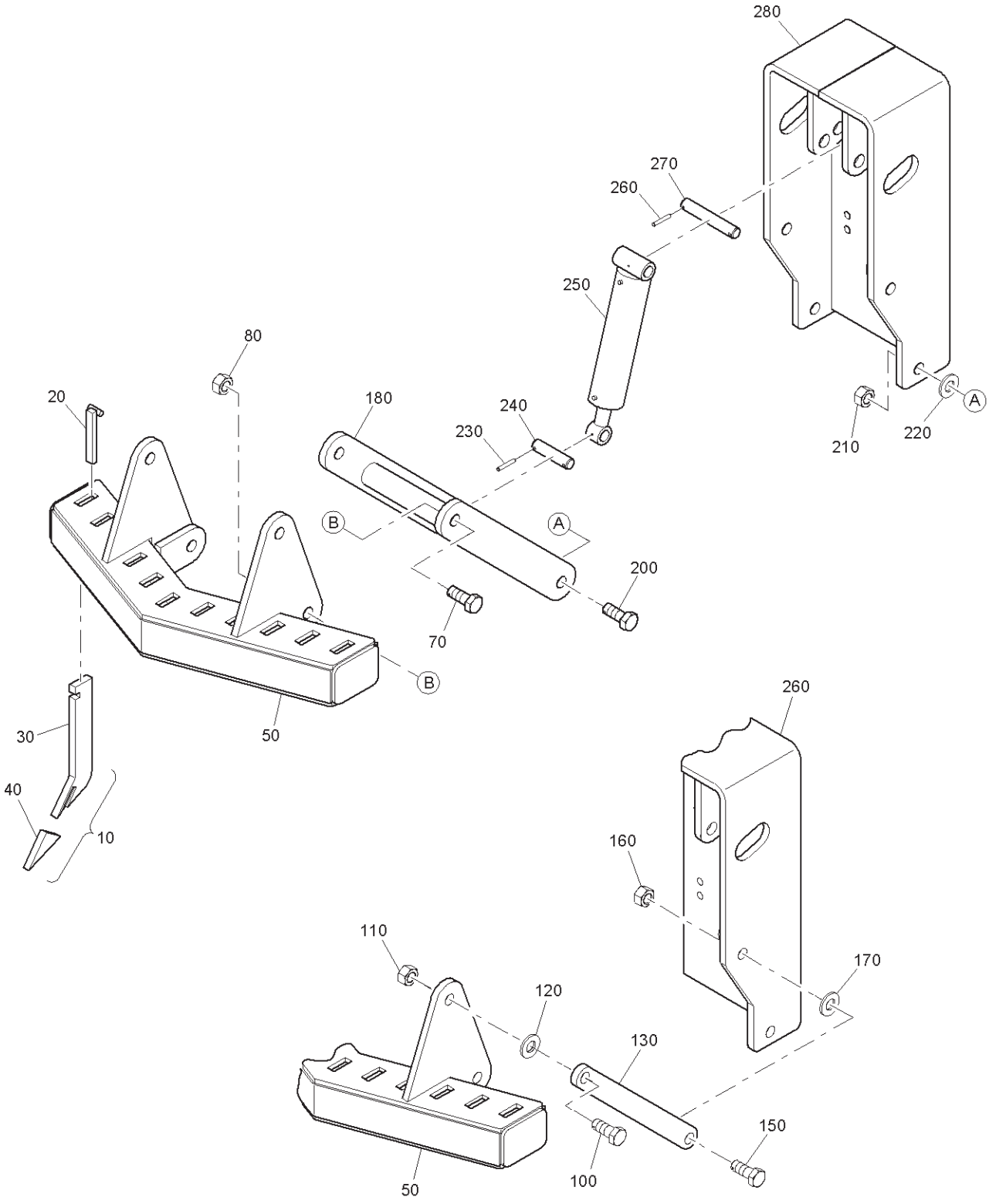


Figure 10-7

Front Scarifier Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
7				
-1	982184	REF	FRONT SCARIFIER ASSY (SEE IPL Figure 10-1FOR NHA)	
10	983100SRV	10	• SHANK AND TOOTH ASSEMBLY, SCARIFIER	
20	982829	1	• RETAINER, SHANK	
30	982243	10	• • SHANK, SCARIFIER	
40	983095	10	• • TOOTH, SCARIFIER	
50	982831	1	• SCARIFIER WELDMENT, FRONT	
70	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
80	115-14-2	2	• LOCKNUT, 1.5"-6 HEX	
100	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
110	115-14-2	2	• LOCKNUT, 1.5"-6 HEX	
120	119-14	2	• FLAT WASHER, 1.5" SAE	
130	982220	2	• BAR, TOP SUPPORT ARM	
150	988928	1	• CAP SCREW, 1.5"-6 X 4.0 HEX	
160	115-14-2	1	• LOCKNUT, 1.5"-6 HEX	
170	119-14	1	• FLAT WASHER, 1.5" SAE	
180	982830	1	• SUPPORT FRAME, FRONT SCARIFIER	
200	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
210	115-14-2	2	• LOCKNUT, 1.5"-6 HEX	
220	119-14	2	• FLAT WASHER, 1.5" SAE	
230	871081835	2	• ROLL PIN, 0.375 X 2.00"	
240	982526	1	• SCARIFIER PIN, LOWER FRONT	
250	981878	1	• CYLINDER, HYDRAULIC, 4.00 X 14.00", 2500 PSI	
260	871081835	2	• ROLL PIN, 0.375 X 2.00"	
270	982525	1	• SCARIFIER PIN, UPPER FRONT	
280	985761	1	• MOUNTING FRAME, SCARIFIER	
290	102-913-1A	8	• CAPSCREW, 1”-8 X 3”	
300	118-10	8	• LOCKWASHER, 1”	
310	116-10	8	• NUT, 1”-8	

Front Axle Assembly (Sheet 1 Of 6)

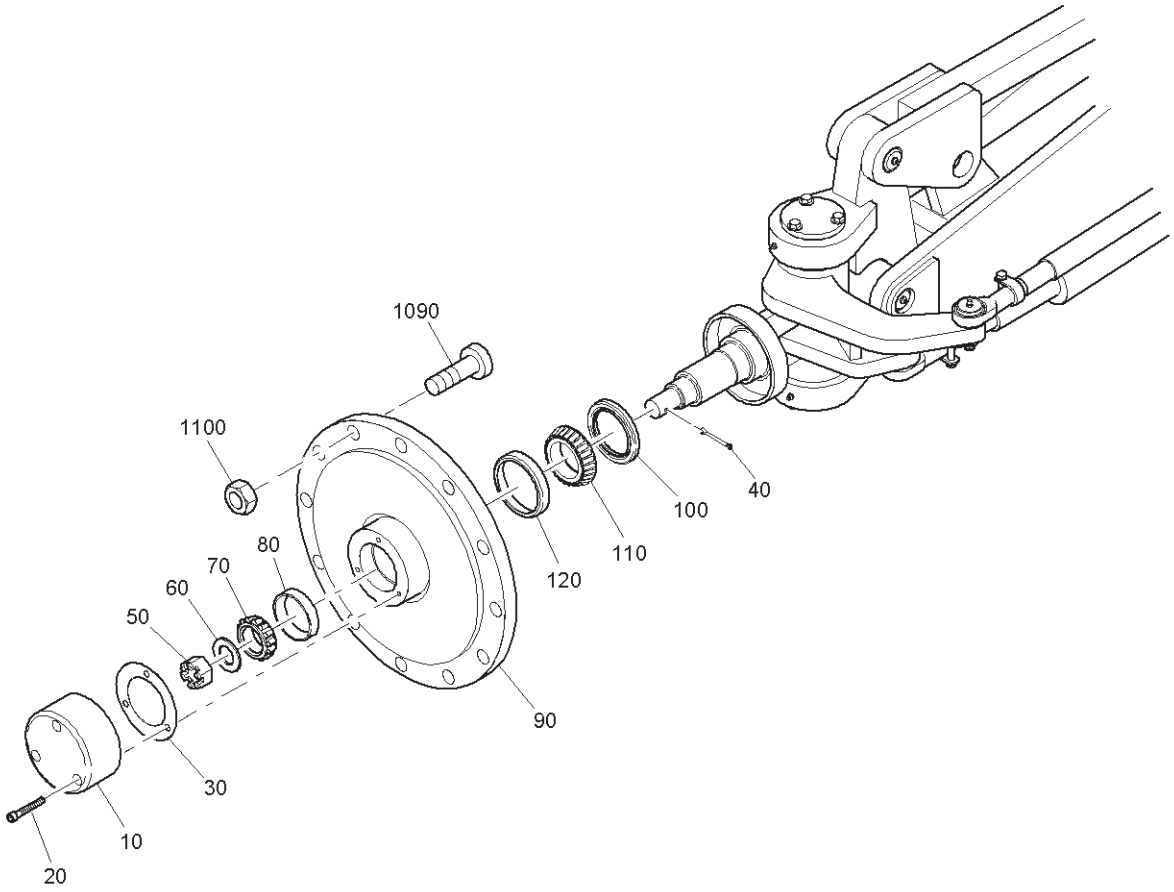


Figure 10-8

Front Axle Assembly (Sheet 1 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
8				
-1	982900	REF	FRONT AXLE ASSEY (SEE IPL Figure 10-1 FOR NHA)	
10	981402	1	• HUB CAP, WHEEL	
20	110-207	3	• CAP SCREW, 3/8"-16 X 1.5 HEX	
30	983104	1	• GASKET, HUB CAP	
40	984892	1	• COTTER PIN, 0.25 X 3.00"	
50	115-11-2	1	• NUT, CASTLE, 1-1/8"-13	
60	119-14	1	• FLAT WASHER, 1.5" SAE	
70	610210	1	• BEARING CONE	
80	610200	1	• BEARING CUP	
90	981654	1	• HUB ASSEMBLY, WHEEL	
100	120060A	1	• SEAL, TANDEM AXLE	
110	210180A	1	• BEARING CONE	
120	210190A	1	• BEARING CUP	
1090	982883	24	• STUD, WHEEL, M22 X 1.5"	
1100	983552	24	• NUT, WHEEL, FLAT, M22	

Front Axle Assembly (Sheet 2 Of 6)

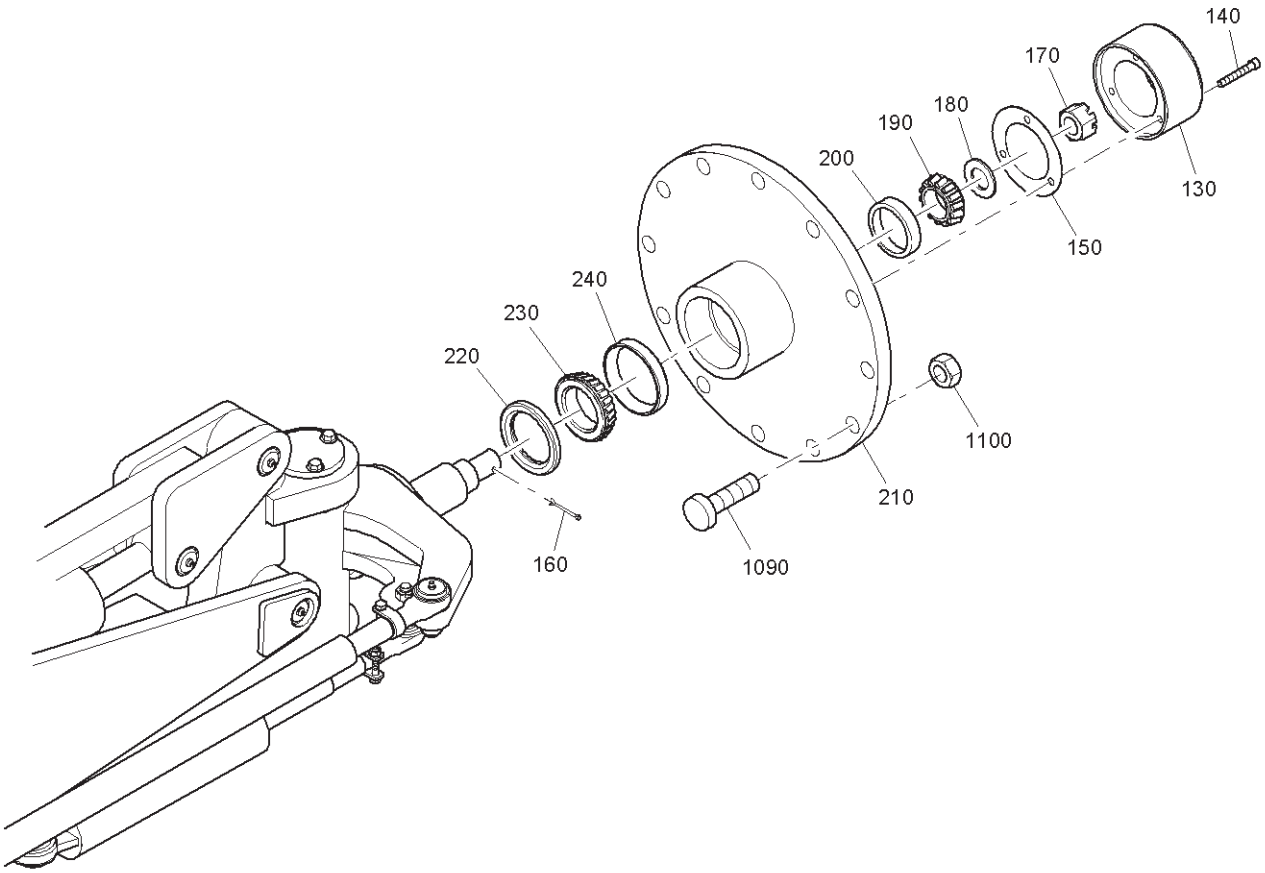


Figure 10-9

Front Axle Assembly (Sheet 2 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
9				
130	981402	1	• HUB CAP, WHEEL	
140	110-207	3	• CAP SCREW, 3/8"-16 X 1.5	
150	983104	1	• GASKET, HUB CAP	
160	984892	1	• COTTER PIN, 0.25 X 3.00"	
170	115-11-2	1	• NUT, CASTLE, 1-1/8-13	
180	119-14	1	• FLAT WASHER, 1.5" SAE	
190	610210	1	• BEARING CONE	
200	610200	1	• BEARING CUP	
210	981654	1	• HUB ASSEMBLY, WHEEL	
220	120060A	1	• SEAL, TANDEM AXLE	
230	210180A	1	• BEARING CONE	
240	210190A	1	• BEARING CUP	
1090	982883	24	• STUD, WHEEL, M22 X 1.5"	
1100	983552	24	• NUT, WHEEL, FLAT, M22	

Front Axle Assembly (Sheet 3 Of 6)

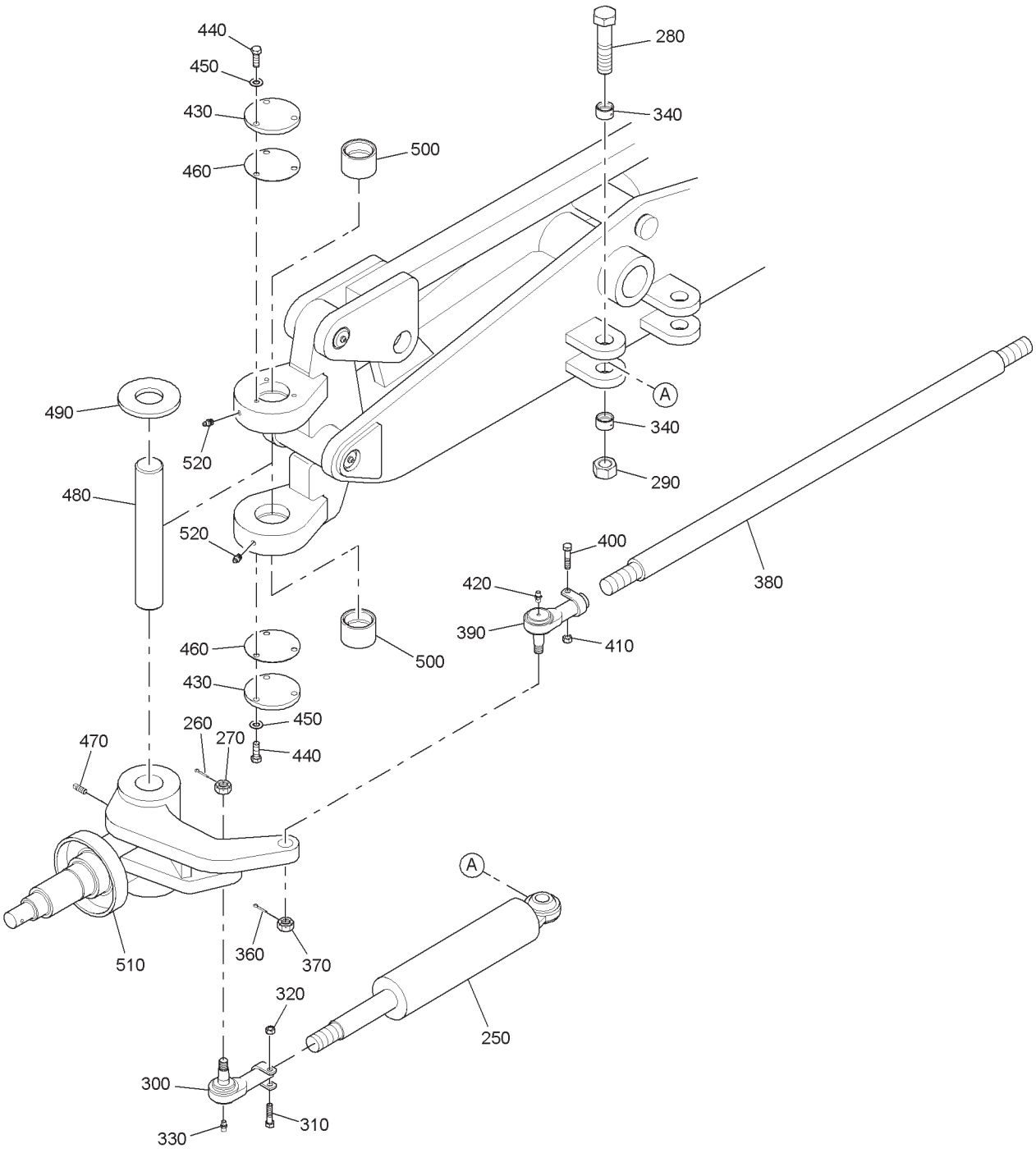


Figure 10-10

Front Axle Assembly (Sheet 3 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
10				
250	981872	1	• CYLINDER, HYDRAULIC, 3.00 X 9.87"	
260	871082603	1	• COTTER PIN, 1/8 X 1-3/4"	
270	115-9-2	1	• NUT, CASTLE, 7/8"-14	
280	102-919-1A	1	• CAP SCREW, 1"-8 X 4.5 HEX	
290	143-10	1	• LOCKNUT, 1"-8 HEX	
300	130060	1	• BALL JOINT	
310	102-613-1A	1	• CAP SCREW, 5/8"-11 X 3.0 HEX	
320	116-7	1	• NUT, 5/8-11 HEX	
330	140610	1	• GREASE FITTING, 1/4"-28	
340	982887	2	• BUSHING, 1.25 OD X 1.0 ID X 0.75" L	
-350	130060	1	• BALL JOINT ASSEMBLY	
360	871082603	1	• COTTER PIN, 1/8 X 1-3/4"	
370	115-9-2	1	• NUT, CASTLE, 7/8"-14	
380	981810	1	• SHAFT, TIE ROD	
390	130060	1	• BALL JOINT	
400	102-613-1A	1	• CAP SCREW, 5/8"-11 X 3.0 HEX	
410	116-7	1	• NUT, 5/8"-11 HEX	
420	140610	2	• GREASE FITTING, 1/4-28	
430	981353	2	• COVER PLATE, KINGPIN	
440	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1.0 HEX	
450	118-3	3	• LOCKWASHER, 3/8"	
460	982884	2	• SEAL RUBBER, KINGPIN	
470	108-412	1	• SETSCREW, SQUARE HEAD, 1/2"-13 X 3.75	
480	981391	1	• SHAFT, SPINDLE PIN	
490	982851	1	• SPACER, WHEEL HUB	
500	210010	2	• BUSHING, DRAWBAR	
510	982895SRV	1	• HUB AND LEVER ARM ASSEMBLY	
520	985094	2	• GREASE FITTING, STRAIGHT, 1/8 NPT	

Front Axle Assembly (Sheet 4 Of 6)

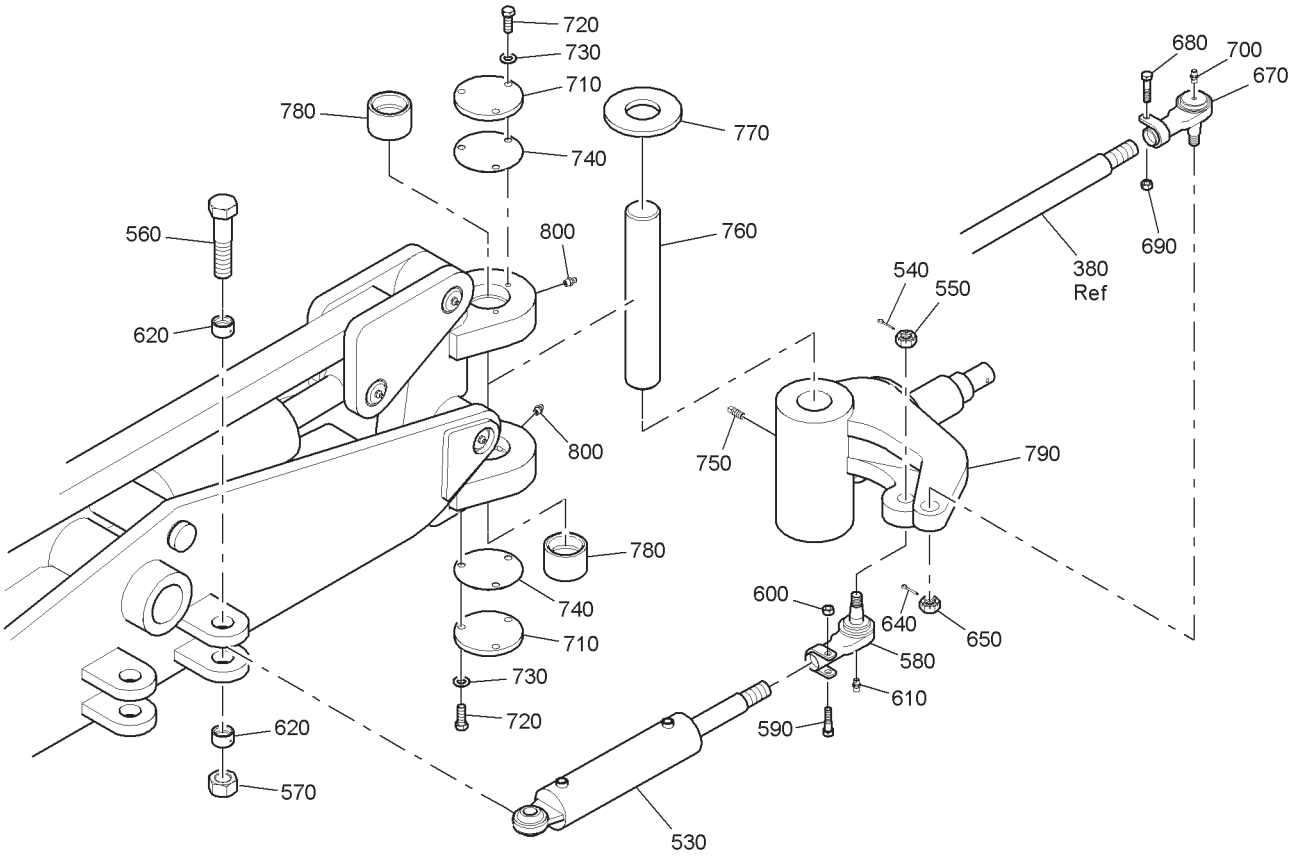


Figure 10-11

Front Axle Assembly (Sheet 4 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
11				
380	981810	1	• SHAFT,TIE ROD	
530	981872	1	• CYLINDER, HYDRAULIC, 3.00 X 9.87"	
540	871082603	1	• COTTER PIN, 1/8 X 1-3/4"	
550	115-9-2	1	• NUT, CASTLE, 7/8"-14	
560	102-919-1A	1	• CAP SCREW, 1"-8 X 4.5 HEX	
570	143-10	1	• LOCKNUT, 1"-8	
580	130060	1	• BALL JOINT	
590	102-613-1A	1	• CAP SCREW, 5/8"-11 X 3.0 HEX	
600	116-7	1	• NUT, 5/8"-11 HEX	
610	140610	1	• GREASE FITTING, 1/4-28	
620	982887	2	• BUSHING, 1.25 OD X 1.0 ID X 0.75" L	
-630	130060	1	• BALL JOINT ASSEMBLY	
640	871082603	1	• COTTER PIN, 1/8 X 1-3/4"	
650	115-9-2	1	• NUT, CASTLE, 7/8"-14	
670	130060	1	• BALL JOINT	
680	102-613-1A	1	• CAP SCREW, 5/8"-11 X 3.0 HEX	
690	116-7	1	• NUT, 5/8"-11 HEX	
700	140610	1	• GREASE FITTING, 1/4-28	
710	981353	2	• COVER PLATE, KINGPIN	
720	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1.0 HEX	
730	118-3	3	• LOCKWASHER, 3/8"	
740	982884	2	• SEAL RUBBER, KINGPIN	
750	108-412	1	• SETSCREW, SQUARE HEAD, 1/2"-13 X 3.75	
760	981391	1	• SHAFT, SPINDLE PIN	
770	982851	1	• SPACER, WHEEL HUB	
780	210010	2	• BUSHING, DRAWBAR	
790	982894SRV	1	• HUB AND LEVER ARM ASSEMBLY	
800	985094	2	• GREASE FITTING, STRAIGHT, 1/8 NPT	

Front Axle Assembly (Sheet 5 Of 6)

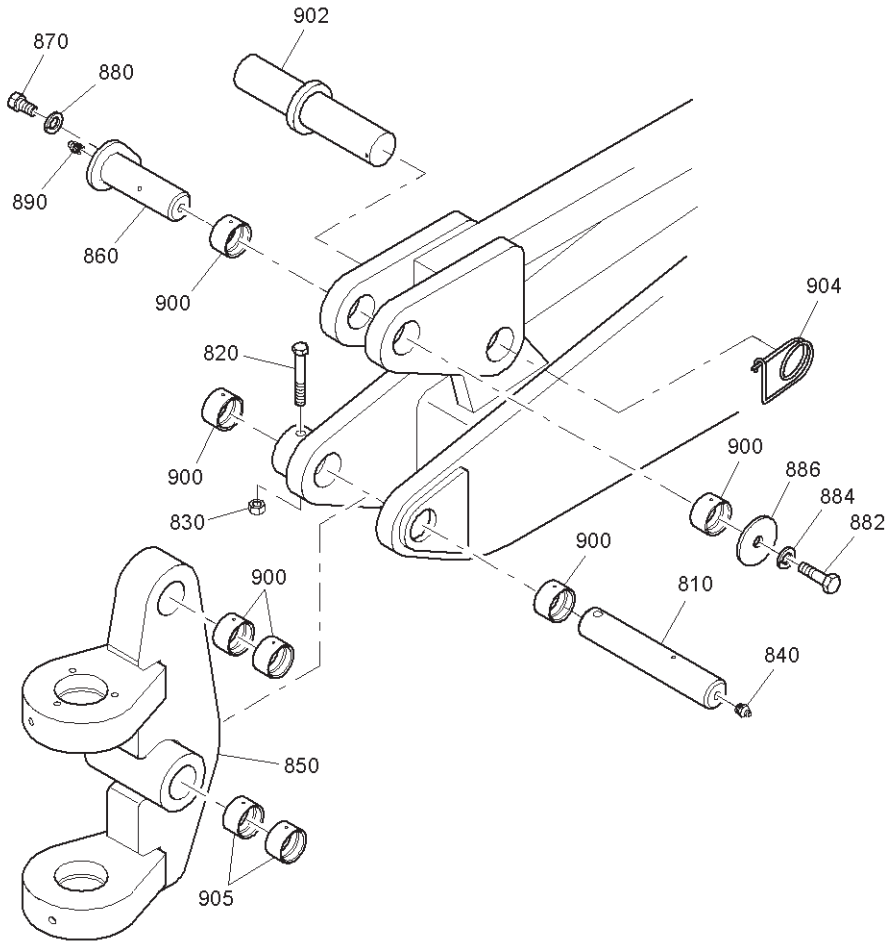


Figure 10-12

Front Axle Assembly (Sheet 5 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
12				
810	981392	1	• SHAFT, SPINDLE PIN	
820	102-213-1A	1	• CAP SCREW, 3/8" X 16 X 3.0 HEX	
830	143-3	1	• LOCKNUT, 3/8-16" HEX	
840	985094	1	• GREASE FITTING, STRAIGHT, 1/8 NPT	
850	982896	1	• MOUNT ASSEMBLY, STEERING SPINDLE	
860	982898	1	• RETAINER PIN ASSEMBLY	
870	102-403-1A	1	• CAP SCREW, 1/2"-13 X 0.75 HEX	
880	118-5	1	• LOCKWASHER, 1/2"	
882	102-406-1A	1	• CAP SCREW, 1/2"-13 X 1-1/4, HEX	
884	118-5	1	• LOCKWASHER, 1/2"	
886	981883	1	• FLAT WASHER	
890	985094	2	• GREASE FITTING, STRAIGHT, 1/8 NPT	
900	982886	6	• BUSHING, 1.75 OD X 1.5 ID X 1.0" L	
902	983105	1	• LOCKING PIN ASSEMBLY	
904	983103	1	• LOCKING PIN	
905	110130A	2	• BUSHING, 1.75 OD X 1.5 ID X 1.25" L	

Front Axle Assembly (Sheet 6 Of 6)

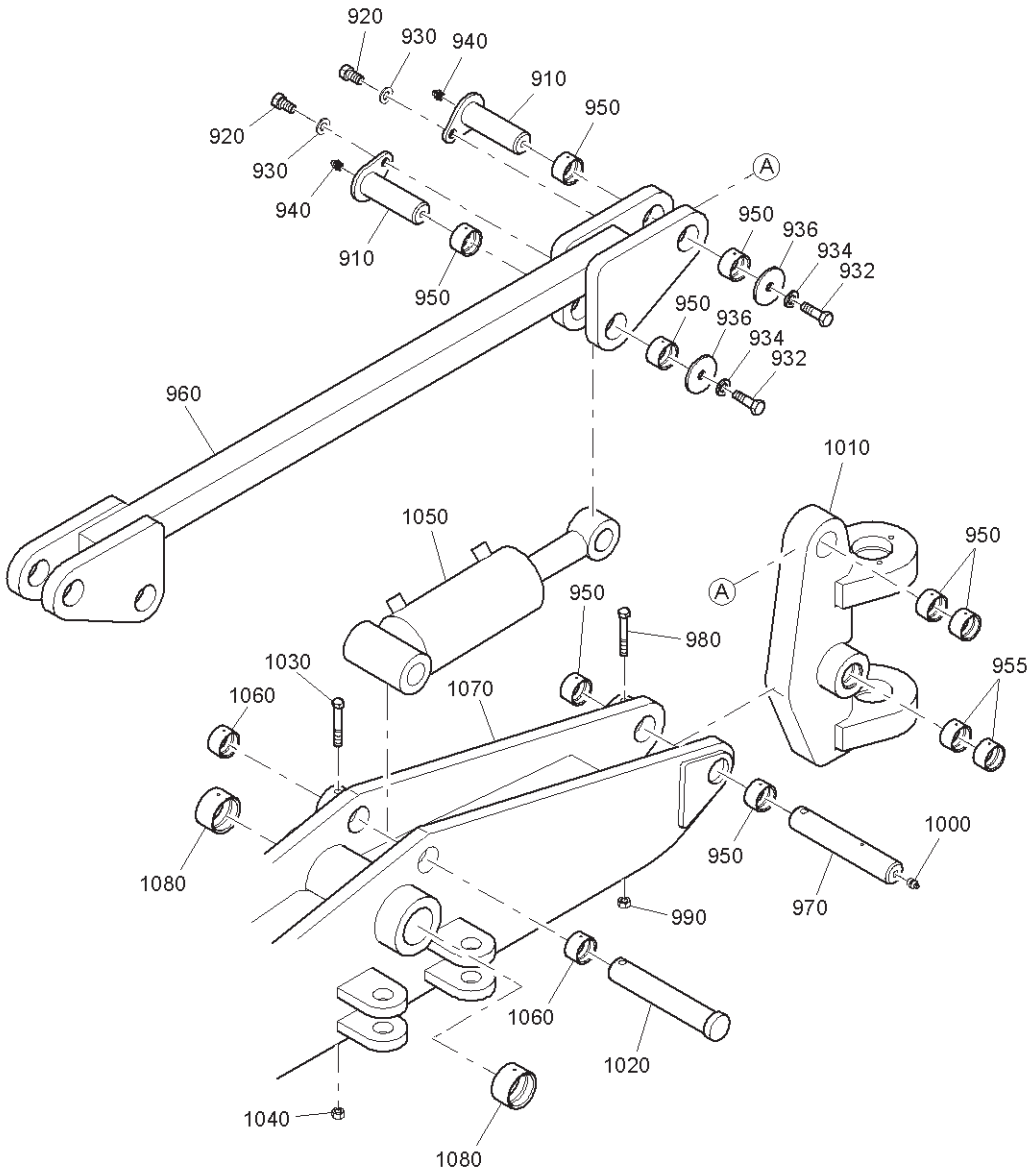


Figure 10-13

Front Axle Assembly (Sheet 6 Of 6) Parts List

Item No.	Part Number	Qty.	Description	Remarks
13				
910	982898	2	• PIN ASSEMBLY, RETAINER	
920	102-403-1A	1	• CAP SCREW, 1/2"-13 X 0.75 HEX	
930	118-5	1	• LOCKWASHER, 1/2"	
932	102-406-1A	1	• CAP SCREW, 1/2"-13 X 1-1/4, HEX	
934	118-5	1	• LOCKWASHER, 1/2"	
936	981883	2	• FLAT WASHER	
940	985094	4	• GREASE FITTING, STRAIGHT, 1/8 NPT	
950	982886	8	• BUSHING, 1.75 OD X 1.5 ID X 1.0" L	
955	110130A	2	• BUSHING, 1.75 OD X 1.5 ID X 1.25" L	
960	982897	1	• CROSSBAR ASSEMBLY, WHEEL LEAN	
970	981392	1	• SHAFT, SPINDLE PIN	
980	102-213-1A	1	• CAP SCREW, 3/8" X 16 X 3.0 HEX	
990	143-3	1	• LOCKNUT, HEX, 3/8"-16	
1000	985094	1	• GREASE FITTING, STRAIGHT, 1/8 NPT	
1010	982896	1	• MOUNT ASSEMBLY, STEERING SPINDLE	
1020	982852	1	• PIN SHAFT, WHEEL LEAN	
1030	102-213-1A	1	• CAP SCREW, 3/8" X 16 X 30 HEX	
1040	143-3	1	• LOCKNUT, HEX, 3/8"-16	
1050	981873	1	• CYLINDER, HYDRAULIC, 4.00 X 6.00", 2500 PSI	WHEEL LEAN
1060	982886	2	• BUSHING, 1.75 OD X 1.5 ID X 1.0" L	
1070	982903	1	• CROSSMEMBER ASSEMMBER, FRONT END	
1080	210010	2	• BUSHING, DRAWBAR	

Yoke Assembly (Sheet 1 Of 2)

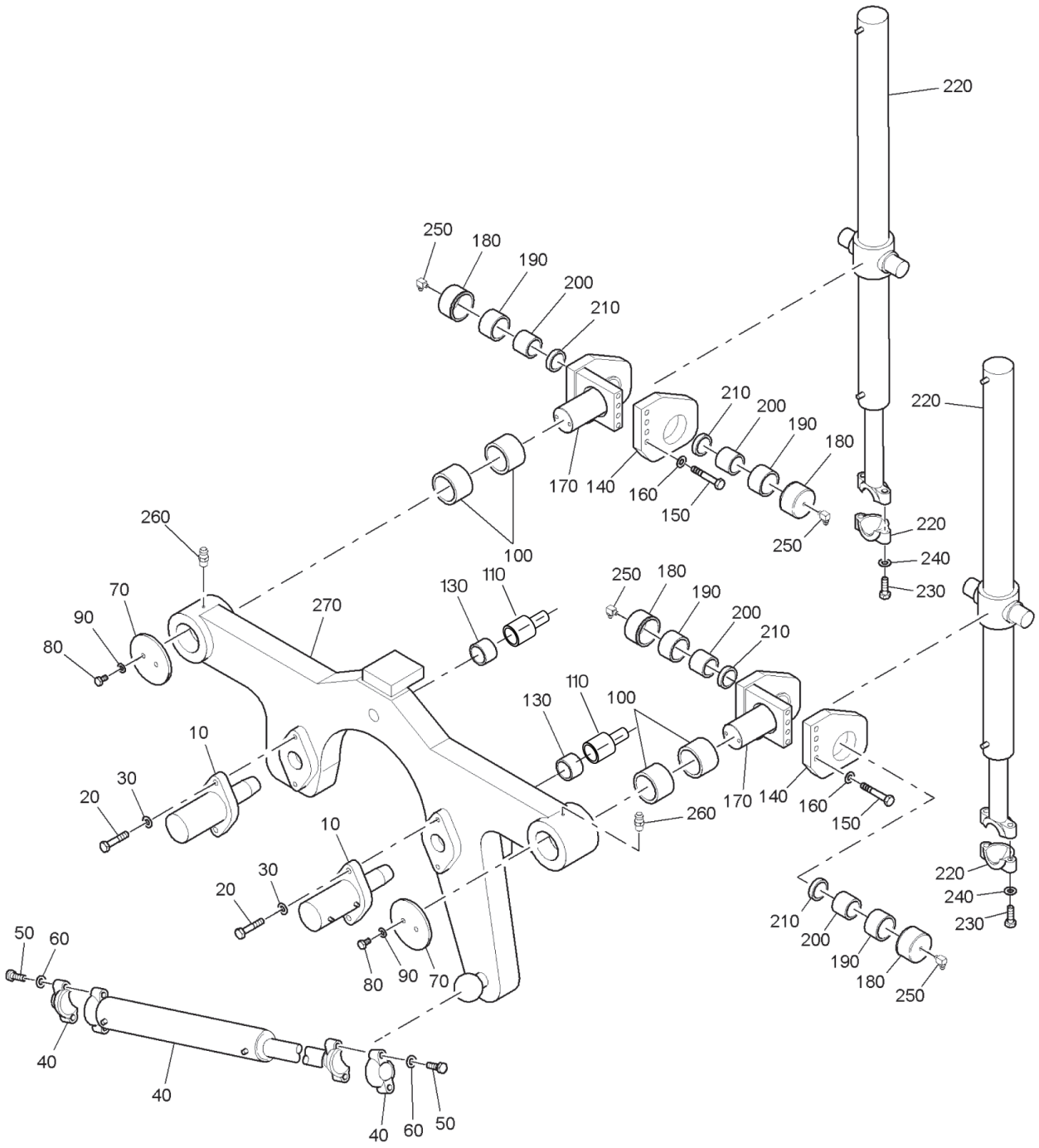


Figure 10-14

Yoke Assembly (Sheet 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
14				
10	981876	2	• CYLINDER, HYDRAULIC 3" X 2.5", MOLDBOARD CIRCLE	
20	102-609-1A	2	• CAP SCREW, 5/8"-11 X 2, HEX	
30	118-7	2	• LOCKWASHER, 5/8"	
40	981875	1	• CYLINDER, HYDRAULIC (INCLUDES BEARING CAPS), 3.00 X 23.00", 2500 PSI	
50	102-614-1A	4	• CAP SCREW, 5/8"-11 X 3-1/4, HEX	
60	118-7	4	• LOCKWASHER, 5/8"	
70	981911	2	• CAP PLATE, CYLINDER SHAFT	
80	102-406-1A	2	• CAP SCREW, 1/2"-13 X 1-1/4, HEX	
90	118-5	2	• LOCKWASHER, 1/2"	
100	983381	4	• BUSHING, STEEL	
110	981912	2	• TUBE, SWIVEL CYLINDER	
130	983366	1	• BUSHING, BRONZE, 2.5 X 2.0 X 2.5"	
140	985763	4	• TRUNION PLATE, LIFT CYLINDER.	
150	811352	4	• CAP SCREW, 5/8"-11 X 2.25, HEX, GRADE 8	
160	118-5	4	• LOCKWASHER, 1/2"	
170	986265	2	• TRUNION ASSEMBLY, LIFT CYLINDER	
180	981910	4	• END CAP, CYLINDER	
190	983380	4	• BUSHING, STEEL, 3.0 X 2.5 X 1.5"	
200	210010	4	• BUSHING, DRAWBAR	
210	983377	4	• SEAL, OIL, 3.0 X 2.5 X 0.25"	
220	981874	2	• CYLINDER, HYDRAULIC (INCLUDES BEARING CAPS), 3.00 X 48.00", 2500 PSI, MOLDBOARD LIFT	
230	102-614-1A	2	• CAP SCREW, 5/8"-11 X 3-1/4, HEX	
240	118-7	2	• LOCKWASHER, 5/8"	
250	985095	4	• GREASE FITTING, 1/8" NPT, 90 DEGREE	
260	140620	2	• GREASE FITTING, 1/4-28, W90	
270	985104	1	• PLATE ASSEMBLY, BOOM CYLINDER	

Yoke Assembly (Sheet 2 Of 2)

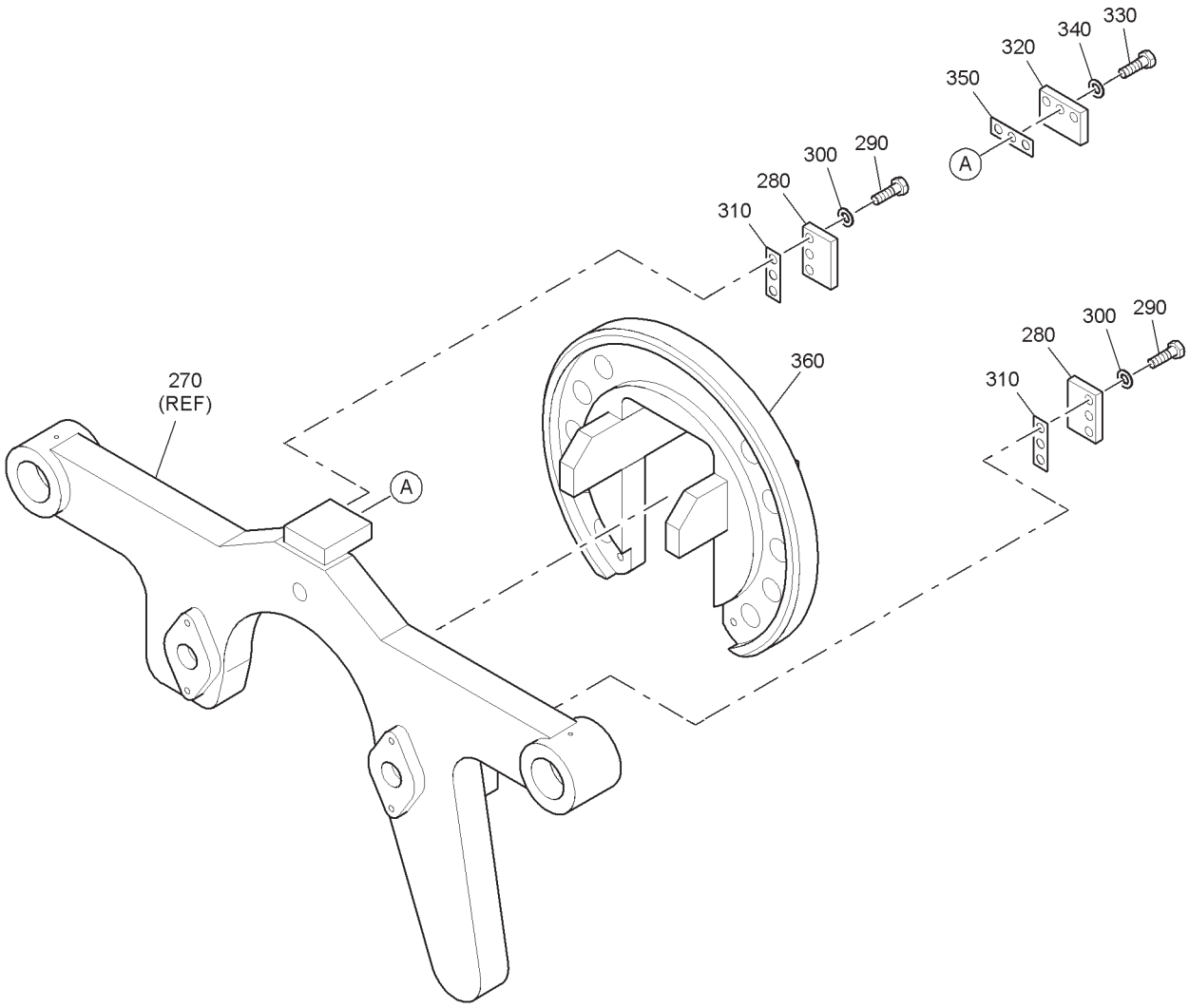


Figure 10-15

Yoke Assembly (Sheet 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
15				
270	985104	1	• PLATE ASSEMBLY, BOOM CYLINDER	
280	981908	2	• RETAINER BAR, RING	
290	102-709-1A	3	• CAP SCREW, 3/4"-10 X 2.0, HEX	
300	118-8	3	• LOCKWASHER, 3/4"	
310	981907	2	• SHIM PLATE, SWIVEL RING	
320	981908	1	• RETAINER BAR, RING	
330	102-709-1A	3	• CAP SCREW, 3/4"-10 X 2.0, HEX	
340	118-8	3	• LOCKWASHER, 3/4"	
350	981907	1	• SHIM PLATE, SWIVEL RING	
360	985103	1	• SADDLE ASSEMBLY, BOOM	

Moldboard Assembly

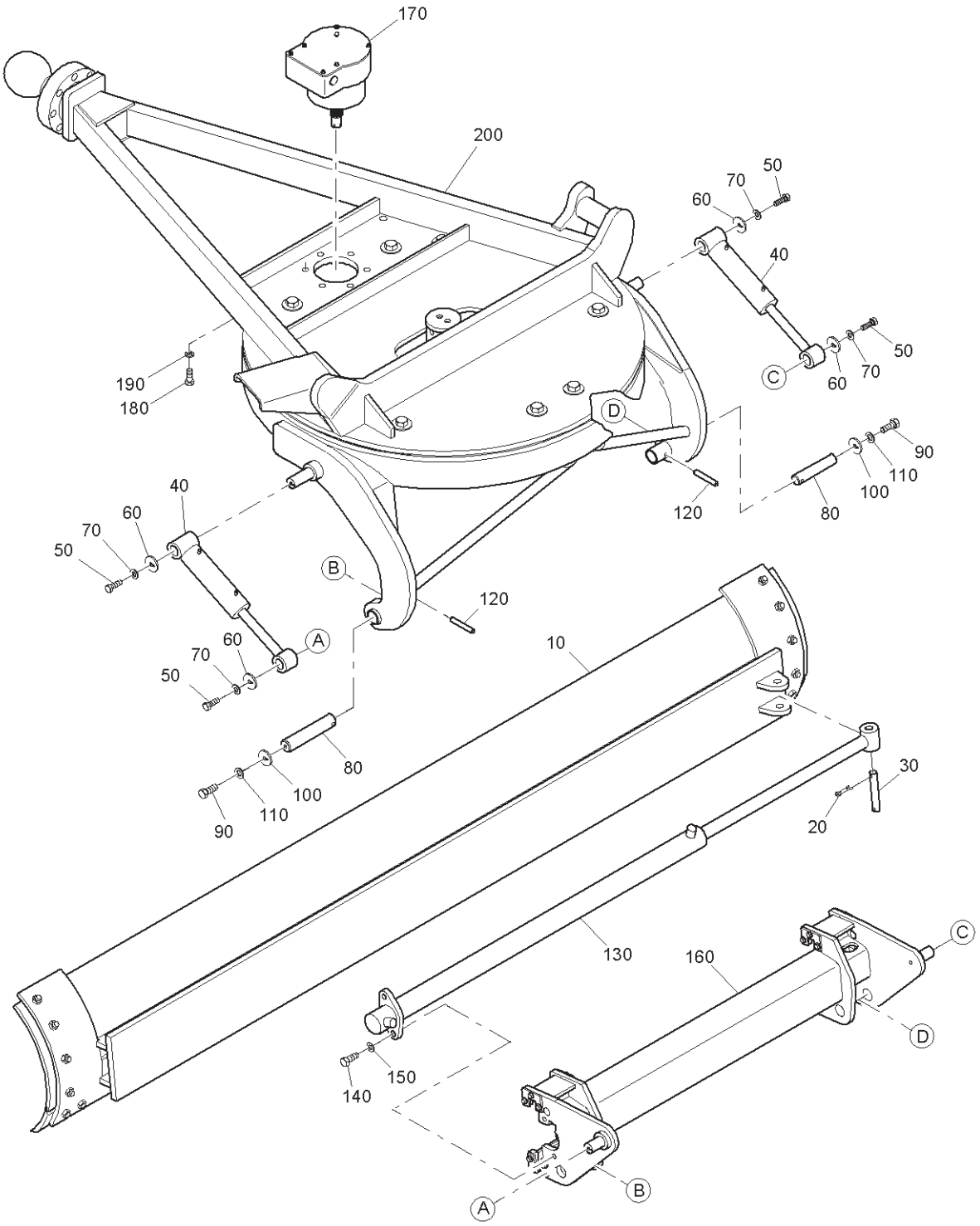


Figure 10-16

Moldboard Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
16				
-1	985152	REF	MOLDBOARD ASSEY (SEE IPL Figure 10-2 FOR NHA)	
10	983149SRV	1	• MOLDBOARD AND BLADE ASSEMBLY, 12 FT. (SEE IPL Illustrated Parts List (IPL) FOR BREAKDOWN)	
20	871081835	2	• ROLL PIN, 0.375 X 2.00"	
30	981856	1	• MOUNTING PIN, SLIDE CYLINDER	
40	981860	2	• CYLINDER, HYDRAULIC, 2.50 X 7.00", 2500 PSI	
50	102-407-1A	2	• CAP SCREW, 1/2"-13 X 1.50 HEX	
60	981883	2	• PLATE, CYLINDER END CAP	
70	118-5	2	• LOCKWASHER, 1/2"	
80	981859	2	• SHAFT, BLADE SLIDE PIN	
90	102-407-1A	1	• CAP SCREW, 1/2"-13 X 1.50 HEX	
100	981833	1	• PLATE, CYLINDER END CAP	
110	118-5	1	• LOCKWASHER, 1/2"	
120	72161	1	• ROLL PIN, 0.375 X 3.00", STL ZPL	
130	981837	1	• CYLINDER, HYDRAULIC, 2.50 X 58.00", 2500 PSI, MOLDBOARD SLIDE	
140	102-707-1A	2	• CAP SCREW, 3/4"-10 X 1.50 HEX	
150	118-8	2	• LOCKWASHER, 3/4"	
160	983150	1	• SLIDE ASSEMBLY (SEE IPL Figure 10-18 FOR BREAKDOWN)	
170	985479	1	• GEARBOX ASSEMBLY, 54" TURNTABLE (SEE IPL Illustrated Parts List (IPL) FOR BREAKDOWN)	
180	100-609-1A	5	• CAP SCREW, 5/8"-18 X 2, HEX, GRADE 8	
190	118-7	5	• LOCKWASHER, 5/8", GRADE 8	
200	983151	1	• TURNTABLE ASSEMBLY (SEE IPL Figure 10-20 FOR BREAKDOWN)	

Moldboard & Blade Assembly, 12-Foot

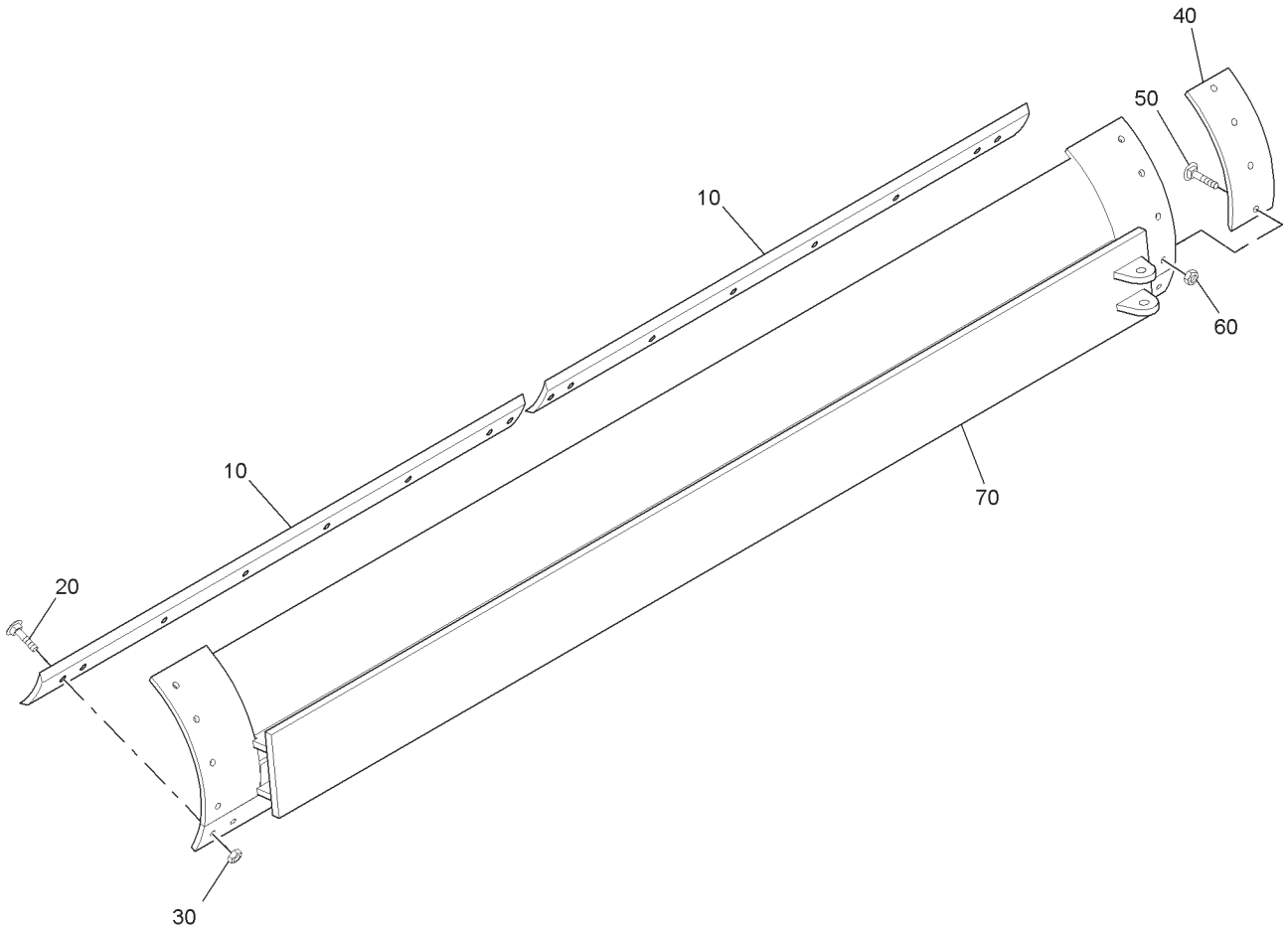


Figure 10-17

Moldboard & Blade Assembly, 12-Foot Parts List

Item No.	Part Number	Qty.	Description	Remarks
17				
-1	983149	REF	MOLDBOARD AND BLADE ASSEMBLY, 12-FOOT (SEE IPL Figure 10-16 FOR NHA)	
10	853860	2	• CUTTING EDGE, 6-FOOT	
20	130220	8	• BOLT, PLOW, 5/8-11 X 2-INCHES	
30	116-7	8	• NUT, 5/8"-11 HEX	
40	130180	2	• END BIT, CURVED, MOLDBOARD	
50	130220	4	• BOLT, PLOW, 5/8-11 X 2-INCHES	
60	116-7	4	• NUT, 5/8"-11 HEX	
70	985460		• MOLDBOARD WELDMENT	

Slide Assembly

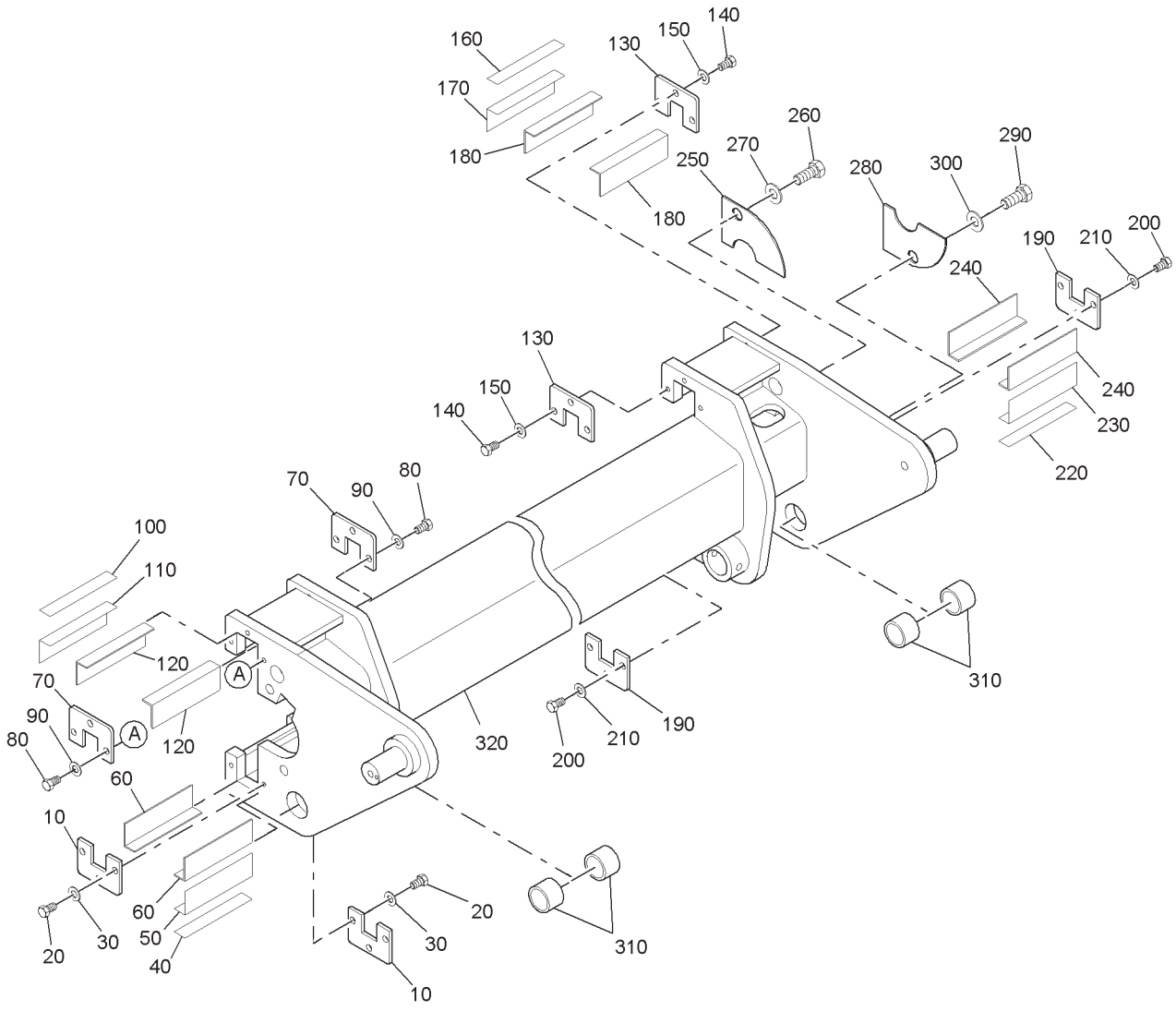


Figure 10-18

Slide Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
18				
-1	983150	REF	SLIDE ASSEMBLY (SEE IPL Figure 10-16 FOR NHA)	
10	981857	2	• COVER PLATE, WEAR BAR	
20	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1 HEX	
30	118-3	3	• LOCKWASHER, 3/8"	
40	983551	1	• SHIM PLATE, FLAT SLIDE	
50	983554	1	• SHIM PLATE, L-SHAPED SLIDE	
60	982899	2	• GUIDE, BRONZE SLIDE	
70	981857	2	• COVER PLATE, WEAR BAR	
80	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1 HEX	
90	118-3	3	• LOCKWASHER, 3/8"	
100	983551	1	• SHIM PLATE, FLAT SLIDE	
110	983554	1	• SHIM PLATE, L-SHAPED SLIDE	
120	982899	2	• GUIDE, BRONZE SLIDE	
130	981857	2	• COVER PLATE, WEAR BAR	
140	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1 HEX	
150	118-3	3	• LOCKWASHER, 3/8"	
160	983551	1	• SHIM PLATE, FLAT SLIDE	
170	983554	1	• SHIM PLATE, L-SHAPED SLIDE	
180	982899	2	• GUIDE, BRONZE SLIDE	
190	981857	2	• COVER PLATE, WEAR BAR	
200	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1 HEX	
210	118-3	3	• LOCKWASHER, 3/8"	
220	983551	1	• SHIM PLATE, FLAT SLIDE	
230	983554	1	• SHIM PLATE, L-SHAPED SLIDE	
240	982899	2	• GUIDE, BRONZE SLIDE	
250	982864	1	• COVER PLATE, UPPER SLIDE	
260	985440	1	• CAP SCREW, 3/4"-10 X 0.625 HEX	
270	118-8	1	• LOCKWASHER, 3/4"	
280	982865	1	• COVER PLATE, BOTTOM SLIDE	
290	985440	1	• CAP SCREW, 3/4"-10 X 0.625 HEX	
300	118-8	1	• LOCKWASHER, 3/4"	
310	982886	4	• BUSHING, 1.75 OD X 1.50 ID X 1.00" LG	
320	983150-01	1	• HOUSING ASSEMBLY, SLIDE	

Gearbox Assembly

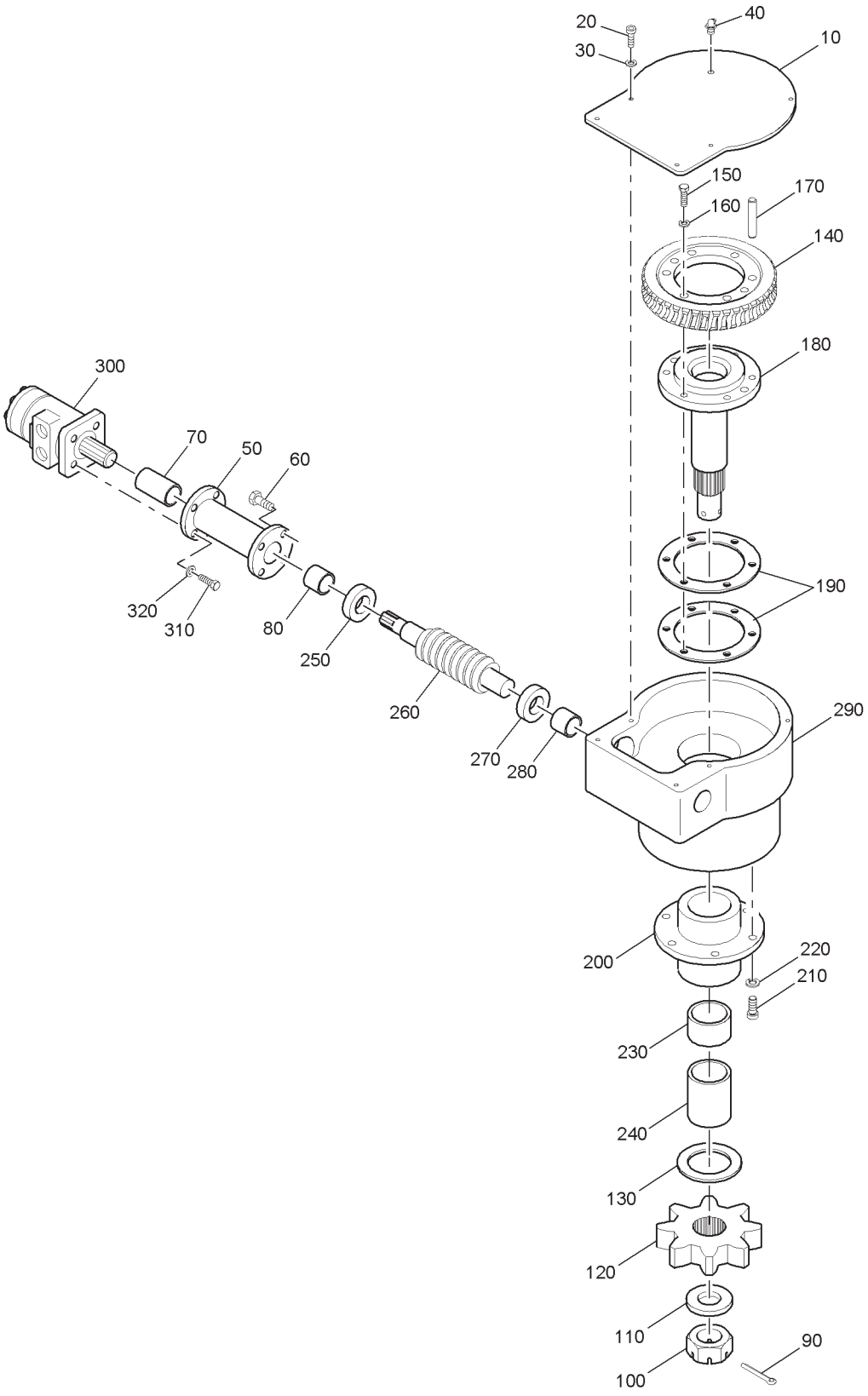


Figure 10-19

Gearbox Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
19				
-1	985479	REF	TURNTABLE GEARBOX ASSEMBLY (SEE IPL Figure 10-16 FOR NHA)	
10	983137	1	• COVER, GEARBOX	
20	102-103-1A	9	• CAP SCREW, 5/16"-18 X 3/4 HEX	
30	118-2	9	• LOCKWASHER, 5/16"	
40	852460	1	• GREASE FITTING, WITH RELIEF	
50	983130	1	• ADAPTER, HYDRAULIC MOTOR	
60	110-301-1A	4	• CAP SCREW, 7/16"-14 X 1 HEX	
70	983136	1	• ADAPTER, SPLINED	
80	983139	1	• BUSHING, WORM GEARSHAFT	
90	984892	1	• COTTER PIN, 1/4 X 3.0"	
100	6383	1	• NUT, HEX, SLOTTED, 1.5-6	
110	984969	1	• SPACER	
120	982857	1	• SPROCKET	
130	984968	1	• SPACER	
140	983135	1	• GEAR, TURNTABLE WORM DRIVE	
150	110-406	6	• CAP SCREW, 1/2"-13 X 1.25 SOCKET	
160	118-5	6	• LOCKWASHER, 1/2"	
170	985439	2	• PIN, DOWEL, 1/2 X 1.25"	
180	983132	1	• OUTPUT SHAFT, TURNTABLE GEAR	
190	983141	2	• SHIM, TURNTABLE OUTPUT SHAFT	
200	983129	1	• FLANGE	
210	110-406	6	• CAP SCREW, 1/2"-13 X 1.25 SOCKET	
220	118-5	6	• LOCKWASHER, 1/2"	
230	983140-01	1	• BUSHING, OUTPUT SHAFT SHORT	
240	983140	1	• BUSHING, OUTPUT SHAFT LONG	
250	983138	1	• BEARING, THRUST	
260	983134	1	• GEARSHAFT, WORM	
270	983138	1	• BEARING, THRUST	
280	983139	1	• BUSHING, WORM GEARSHAFT	
290	983128	1	• HOUSING, TURNTABLE GEARBOX	
300	988547	1	• MOTOR, HYDRAULIC	
310	102-206-1A	4	• CAP SCREW, 3/8"-16 X 1.25 SOCKET	
320	118-3	4	• LOCKWASHER, 3/8"	

Turntable Assembly

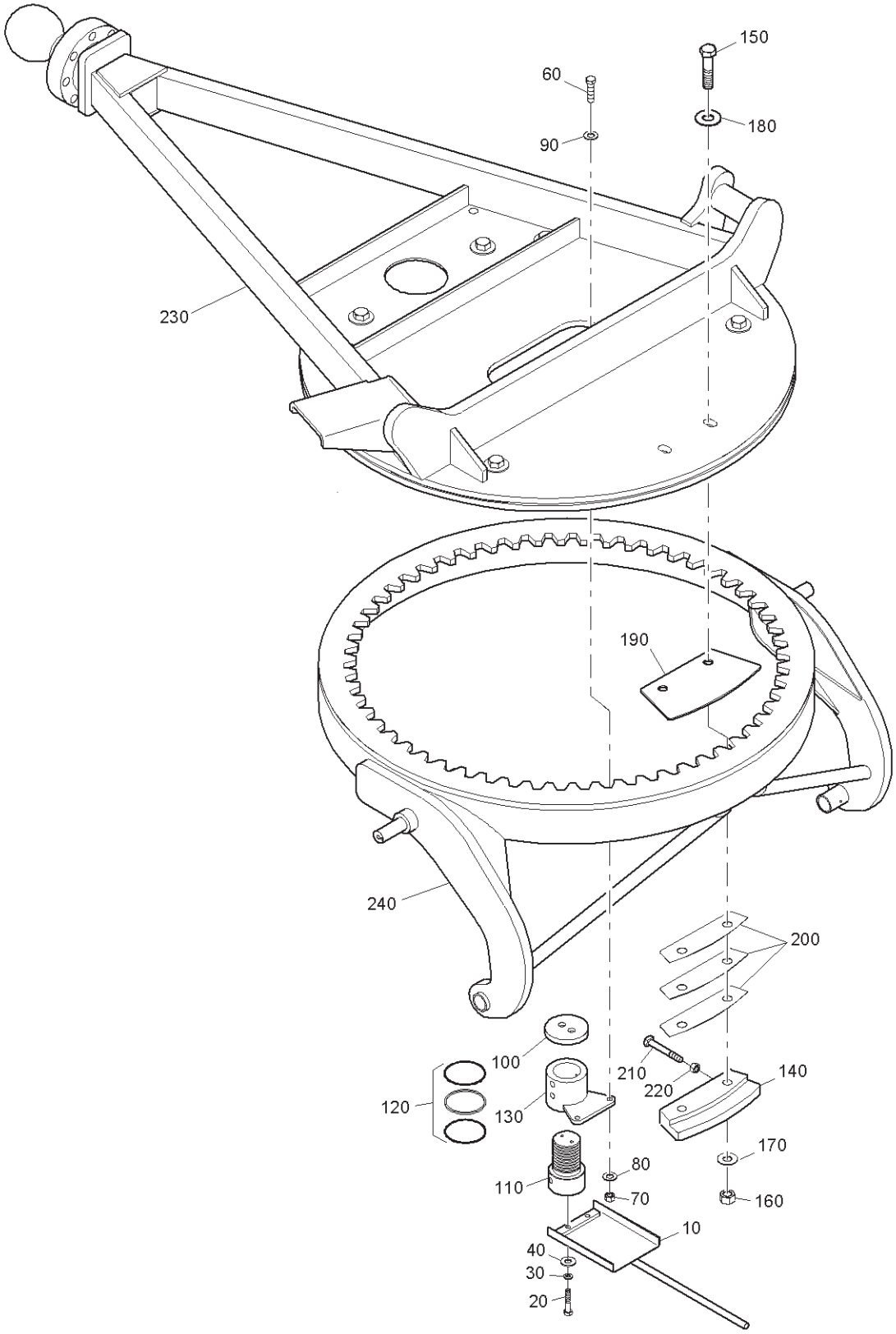


Figure 10-20

Turntable Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
20				
-1	983151	REF	TURNTABLE ASSEY (SEE IPL Figure 10-16 FOR NHA)	
10	985458	1	• SWIVEL ASSEMBLY, CIRCLE MOUNT	
20	102-207-1A	2	• CAP SCREW, 3/8"-16 X 1.5 HEX	
30	118-3	2	• LOCKWASHER, 3/8"	
40	119-3	2	• FLAT WASHER, 3/8" SAE	
-50	982495	1	• SWIVEL ASSEMBLY, HYDRAULIC	
60	102-409-1A	2	• CAP SCREW, 1/2"-13 X 2.0 HEX	
70	116-5	2	• NUT, 1/2"-13 HEX	
80	118-5	2	• LOCKWASHER, 1/2"	
90	119-5	2	• FLAT WASHER, 1/2" SAE	
100	982498	1	• • SWIVEL CAP, TOP	
110	982496	1	• • LOWER OUTLET, SWIVEL	
120	983101	1	• • T-SEAL, HYDRAULIC SWIVEL	
130	985459	1	• • MOUNTING HOUSING, SWIVEL	
140	981892	5	• MOUNT PLATE, WEAR	
150	102-919-1A	2	• CAP SCREW, 1-8" X 4.5 HEX	
160	116-10	2	• NUT, HEX, 1"-8	
170	118-10	2	• LOCKWASHER, 1.0"	
180	120-10	2	• FLAT WASHER, 1.0" USS	
190	981893	5	• WEAR PLATE, TURNTABLE	
200	982539	AR	• SHIM, WEAR PLATE	
210	81069	10	• SETSCREW, 3/4"-10 X 3.5	
220	116-8	10	• NUT, 3/4"-10 HEX	
230	985465	1	• DRAWBAR ASSEMBLY, MOLDBOARD	
240	985466SRV	1	• CIRCLE ASSEMBLY, MOLDBOARD	

Cab Assembly (Left Side View) (Sh. 1 Of 4)

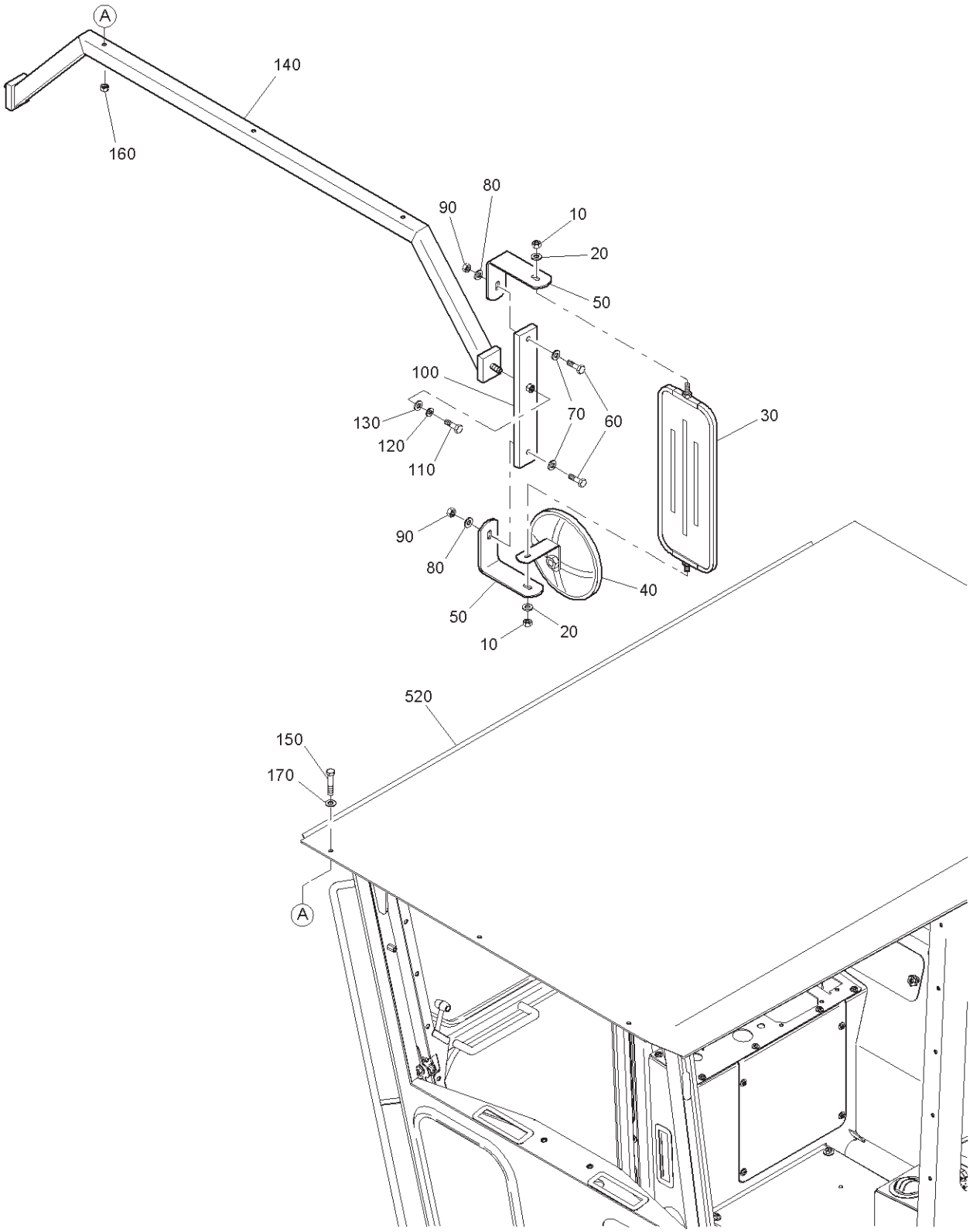


Figure 10-21

Cab Assembly (Left Side View) (Sh. 1 Of 4) Parts List

Item No.	Part Number	Qty.	Description	Remarks
21				
-1	982700	REF	CAB ASSEMBLY (SEE IPL Figure 10-3 FOR NHA)	
10	143-3	4	• LOCKNUT, 3/8"-16 HEX	
20	119-3	4	• FLAT WASHER, 3/8" SAE	
30	852570	2	• MIRROR HEAD, WEST COAST	
40	151370	2	• MIRROR	
50	856987	4	• MOUNTING BRACKET, MIRROR	
60	102-208-1A	1	• CAP SCREW, 5/16"-18 X 1.75 HEX	
70	119-3	2	• FLAT WASHER, 3/8" SAE	
80	118-3	1	• LOCKWASHER, 3/8"	
90	116-3	1	• NUT, 3/8"-16 HEX	
100	856896	2	• MOUNTING BAR, MIRROR GROUP	
110	102-406-1A	1	• CAP SCREW, 1/2"-13 X 1.25 HEX	
120	118-5	1	• LOCKWASHER, 1/2"	
130	119-5	1	• FLAT WASHER, 1/2" SAE	
140	985624	1	• MOUNTING BAR, MIRROR	
150	102-211-1A	3	• CAP SCREW, 3/8"-16 X 2.50 HEX	
160	143-3	3	• LOCKNUT, 3/8"-16	
170	119-3	3	• FLAT WASHER, 3/8" SAE	
520	982701	1	• CAB WELDMENT	

Cab Assembly (Left Side View) (Sh. 2 Of 4)

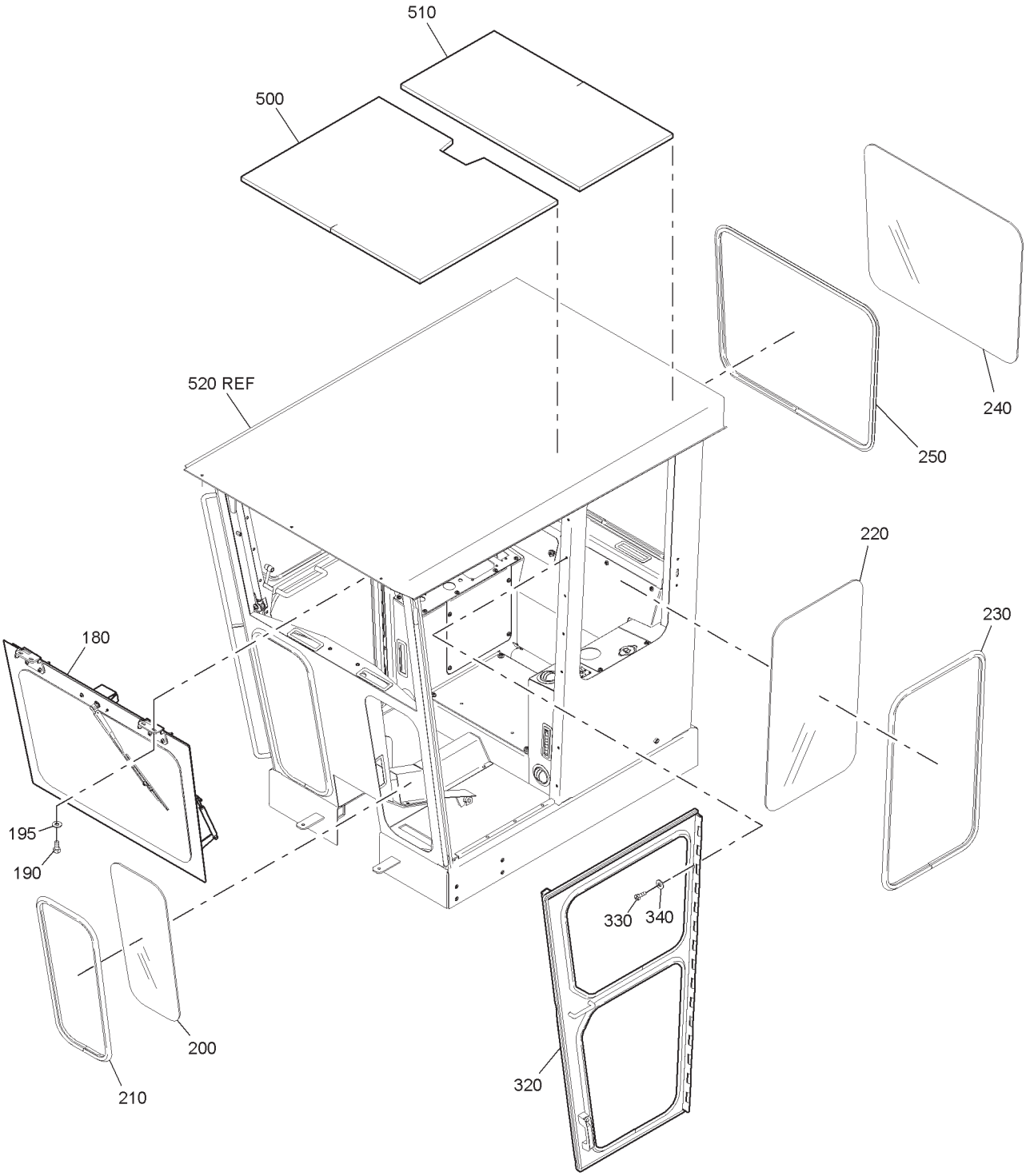


Figure 10-22

Cab Assembly (Left Side View) (Sh. 2 Of 4) Parts List

Item No.	Part Number	Qty.	Description	Remarks
22				
180	982734	1	• WINDSHIELD ASSEMBLY (SEE IPL Figure 10-26 FOR BREAKDOWN)	
190	102-203-1A	4	• CAP SCREW, 3/8"-16 X 3/4 HEX	
195	119-3	4	• FLAT WASHER, 3/8" SAE	
200	982728	1	• WINDOW, LOWER	
210	982360-89	1	• GASKET, LOWER WINDOW	
220	982608	1	• WINDOW, SIDE	
230	982360-122	1	• GASKET, SIDE WINDOW	
240	982787	1	• WINDOW, REAR	
250	982360-127	1	• GASKET, REAR WINDOW	
320	982695	1	• DOOR ASSEMBLY, LEFT-HAND (SEE IPL Figure 10-27 FOR BREAKDOWN)	
330	102-3-1A	12	• CAP SCREW, 1/4"-20 X 3/4 HEX	
340	119-1	12	• FLAT WASHER, 1/4" SAE	
500	982735	1	• ROOF PANEL, FRONT	
510	982376	1	• ROOF PANEL, REAR	
520	982701	1	• CAB WELDMENT	

Cab Assembly (Left Side View) (Sh. 3 Of 4)

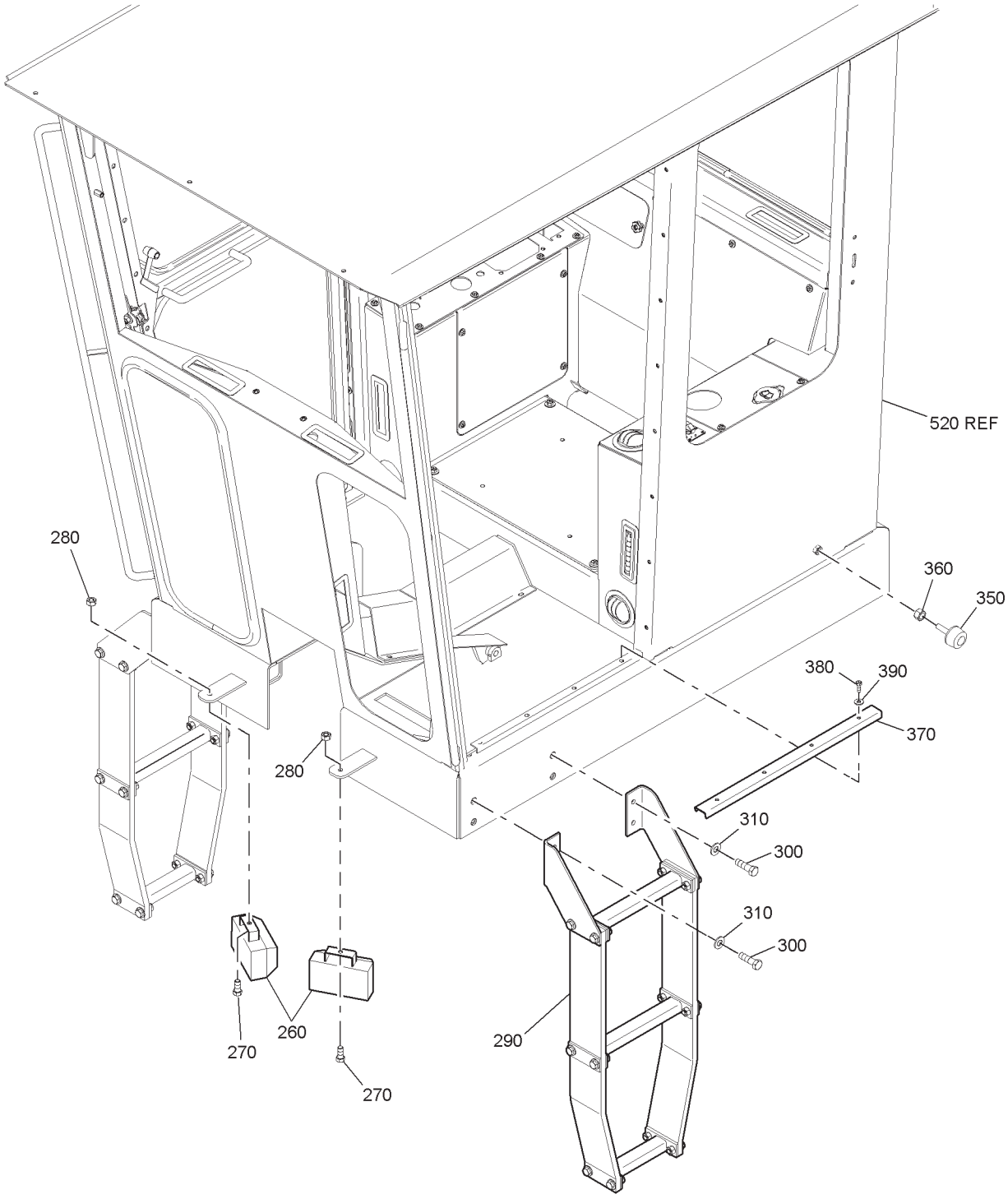


Figure 10-23

Cab Assembly (Left Side View) (Sh. 3 Of 4) Parts List

Item No.	Part Number	Qty.	Description	Remarks
23				
260	160040A	2	• WORK LIGHT	
270	102-205-1A	1	• CAP SCREW, 3/8"-16 X 1.0 HEX	
280	143-3	1	• LOCKNUT, 3/8"-16	
290	985625	1	• LADDER, CAB ENTRY (SEE IPL Figure 10-31 FOR BREAKDOWN)	
300	102-406-1A	4	• CAP SCREW, 1/2"-13 X 1.25 HEX	
310	116-5	4	• LOCKNUT, 1/2"-13	
350	982668	1	• BUMPER, DOOR	
360	116-5	1	• LOCKNUT, 1/2"-13	
370	982640	1	• DOORSILL	
380	102-1-1A	4	• CAP SCREW, 1/4"-20 X 1/2 HEX	
390	119-1	4	• FLAT WASHER, 1/4" SAE	
520	982701	1	• CAB WELDMENT	

Cab Assembly (Left Side View) (Sh. 4 Of 4)

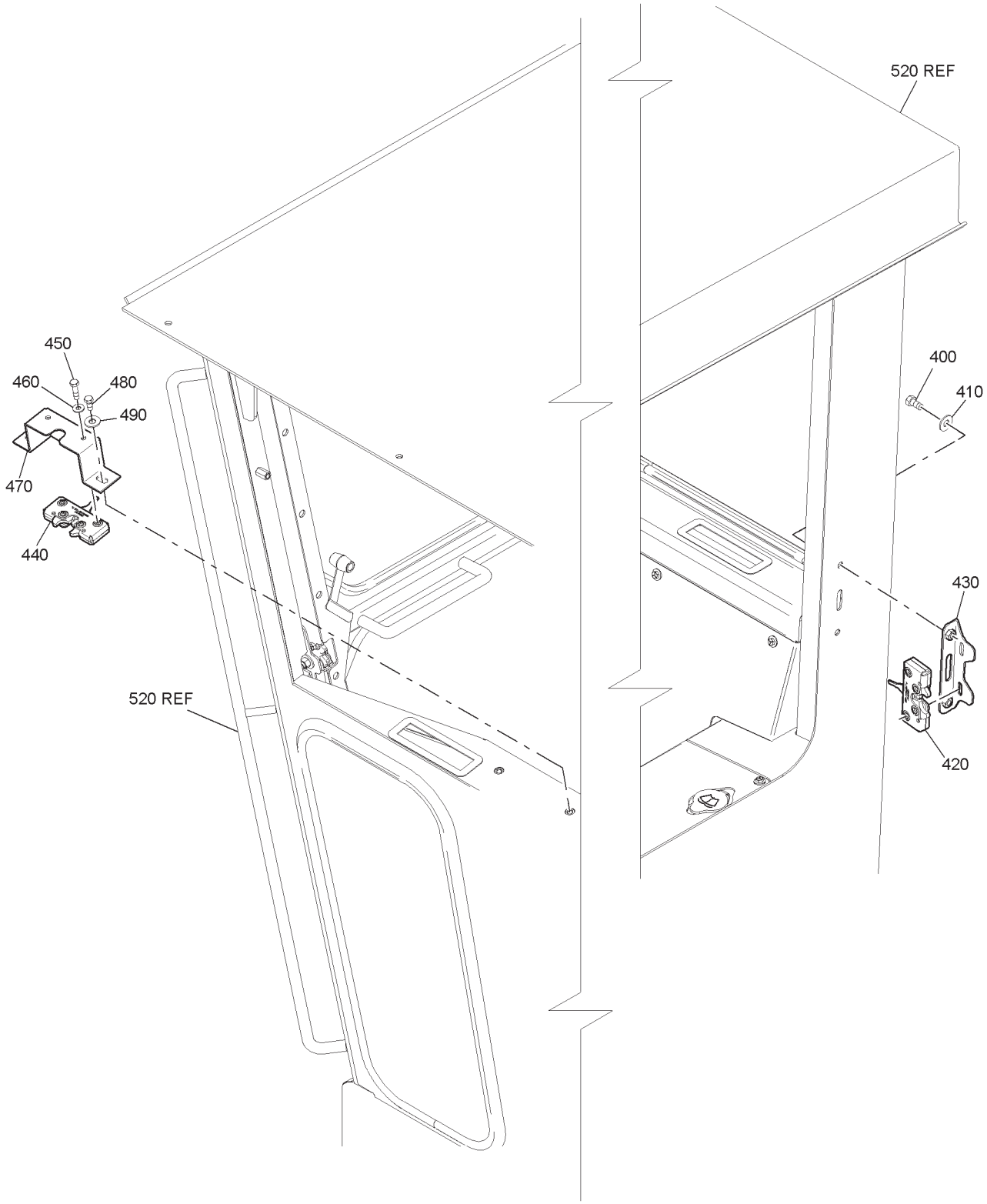


Figure 10-24

Cab Assembly (Left Side View) (Sh. 4 Of 4) Parts List

Item No.	Part Number	Qty.	Description	Remarks
24				
400	102-203-1A	2	• CAP SCREW, 3/8"-16 X 3/4 HEX	
410	119-3		• FLAT WASHER, 3/8" SAE	
420	983458	1	• LATCH, DOOR OPEN	
430	982680	1	• BRACKET, LATCH	
440	982679	1	• LATCH, WINDOW	
450	102-5-1A	2	• CAP SCREW, 1/4"-20 X 1.0 HEX	
460	119-1	2	• FLAT WASHER, 1/4" SAE	
470	982666	1	• BRACKET, WINDOW LATCH	
480	102-203-1A	2	• CAP SCREW, 3/8"-16 X 3/4 HEX	
490	119-3	2	• FLAT WASHER, 3/8"	
520	982701	1	• CAB WELDMENT	

Cab Assembly (Right Side View)

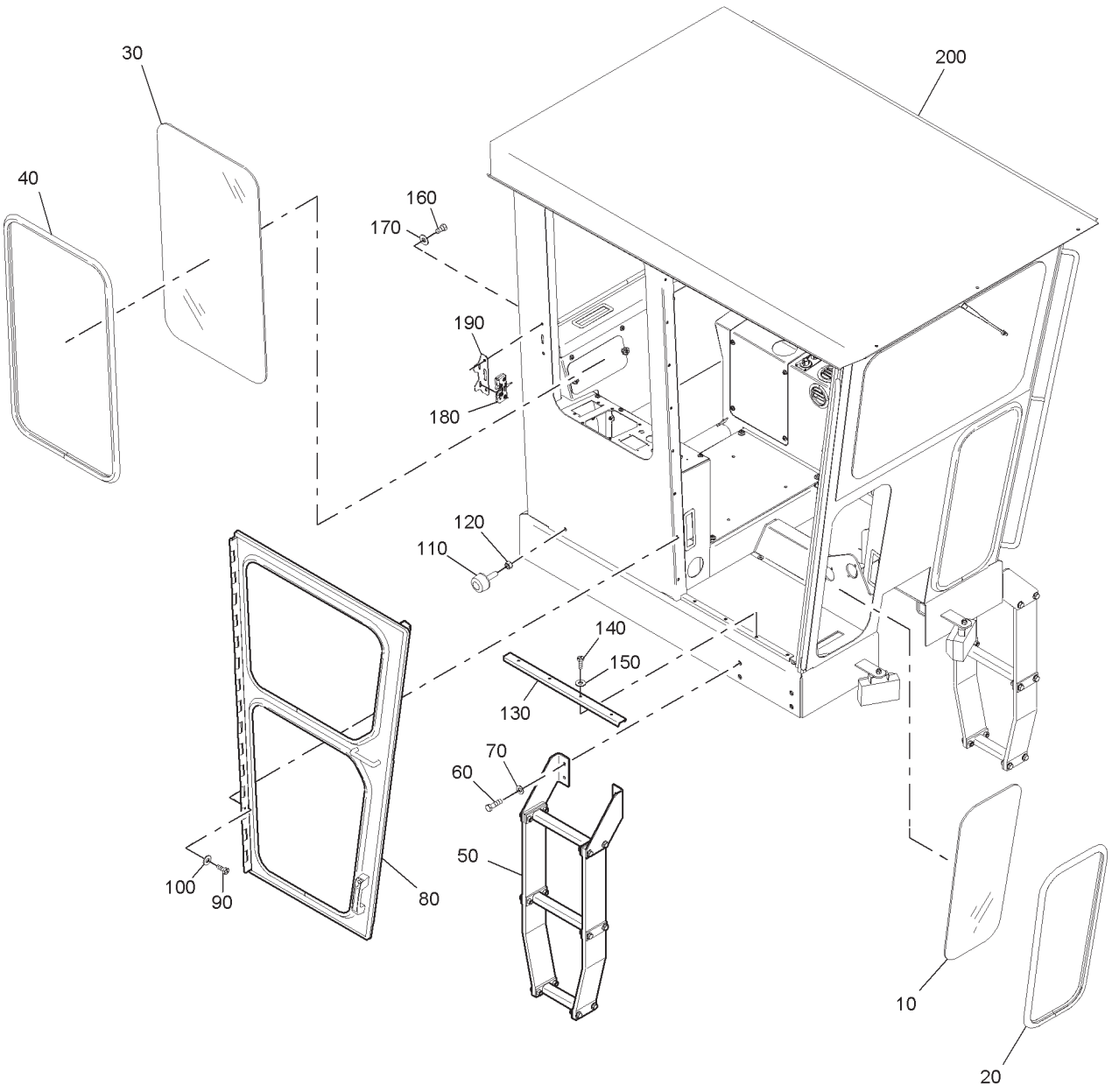


Figure 10-25

Cab Assembly (Right Side View) Parts List

Item No.	Part Number	Qty.	Description	Remarks
25				
-1	982700	REF	CAB ASSEMBLY (SEE IPL Figure 10-3 FOR NHA)	
10	982728	1	• WINDOW, LOWER	
20	982360-89	1	• GASKET, LOWER WINDOW	
30	982608	1	• WINDOW, SIDE	
40	982360-122	1	• GASKET, SIDE WINDOW	
50	985625	1	• LADDER, CAB ENTRY (SEE IPL Figure 10-31 FOR BREAKDOWN)	
60	102-406-1A	4	• CAP SCREW, 1/2"-13 X 1.25 HEX	
70	116-5	4	• LOCKNUT, 1/2"-13	
80	982694	1	• DOOR ASSEMBLY, RIGHT-HAND (SEE IPL Figure 10-29 FOR BREAKDOWN)	
90	102-3-1A	12	• CAP SCREW, 1/4"-20 X 3/4 HEX	
100	119-1	12	• FLAT WASHER, 1/4" SAE	
110	982668	1	• BUMPER, DOOR	
120	116-5	1	• LOCKNUT, 1/2"-13	
130	982640	1	• DOORSILL	
140	102-1-1A	4	• CAP SCREW, 1/4"-20 X 1/2 HEX	
150	119-1	4	• FLAT WASHER, 1/4" SAE	
160	102-203-1A	2	• SCREW, HEX CAP, 3/8-16 X 3/4-INCH	
170	119-3		• WASHER, FLAT, 3/8-INCH SAE	
180	983458	1	• LATCH, DOOR OPEN	
190	982680	1	• BRACKET, LATCH	
200	982701	REF	• CAB WELDMENT	

Windshield Assembly

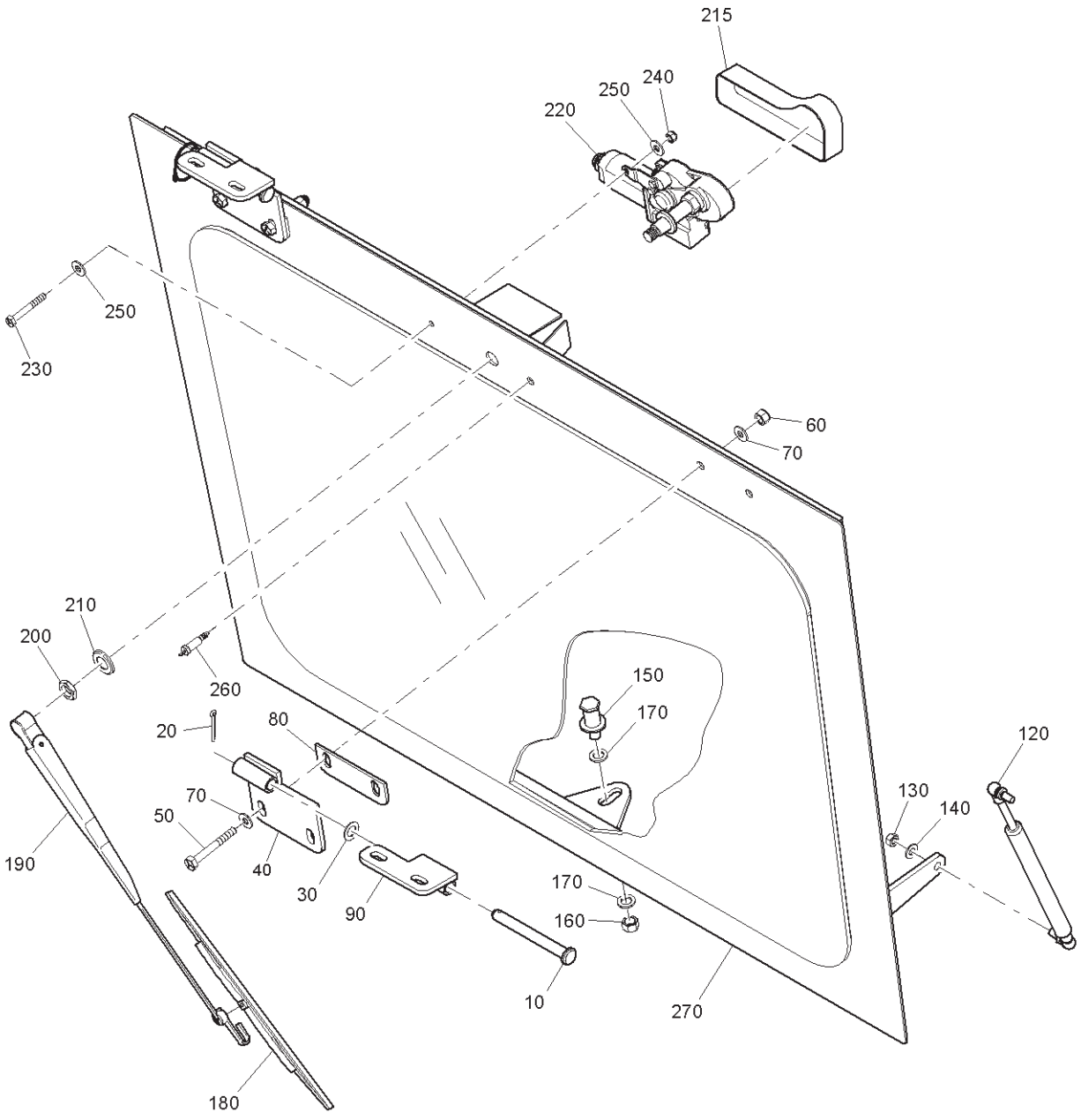


Figure 10-26

Windshield Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
26				
-1	982734	REF	WINDSHIELD ASSEY (SEE IPL Figure 10-22 FOR NHA)	
10	982598	1	• PIN, CLEVIS	
20	80389	1	• PIN, COTTER, 1/8 X 1.00"	
30	119-5	1	• WASHER, FLAT, 1/2-INCH	
40	982405	1	• HINGE BLADE, WINDOW	
50	102-210-1A	2	• CAP SCREW, 1/4"-16 X 2.25 HEX	
60	143-3	2	• NUT, SELF-LOCKING, 3/8-16	
70	119-1	4	• FLAT WASHER, 3/8" SAE	
80	982404	1	• HINGE SHIM, WINDOW	
90	982408	1	• HINGE BLADE, ROOF	
100	102-203-1A	2	• CAP SCREW, 3/8"-16 X 3/4 HEX	
110	119-3	2	• FLAT WASHER, 3/8" SAE	
120	982600	1	• SPRING, GAS	
130	143-2	1	• LOCKNUT, 5/16"	
140	119-2	1	• FLAT WASHER, 5/16" SAE	
150	982416	1	• BOLT, STRIKER, 2.025"	
160	116-4	1	• NUT, 7/16"-14 HEX	
170	120-4		• FLAT WASHER, 7/16" USS	
180	982403	1	• WIPER BLADE, 18"	
190	982400-17	1	• WIPER ARM, 17"	
200	982399-01	1	• NUT, WIPER ARM RETAINING	
210	982399-02	1	• WASHER, FLAT	
215	982401	1	• COVER, WIPER MOTOR	
220	982399	1	• WIPER MOTOR, 12-VOLT, 2" SHAFT, 85*	
230	102-10-1A	1	• CAP SCREW, 1/4" 20 X 2.25 HEX	
240	143-1	1	• LOCKNUT, 1/4"-20	
250	119-1	2	• FLAT WASHER, 1/4" SAE	
260	982740	1	• BULKHEAD FITTING KIT	
270	982362		• WINDSHIELD	

Left-Hand Door Assembly (Sh. 1 Of 2)

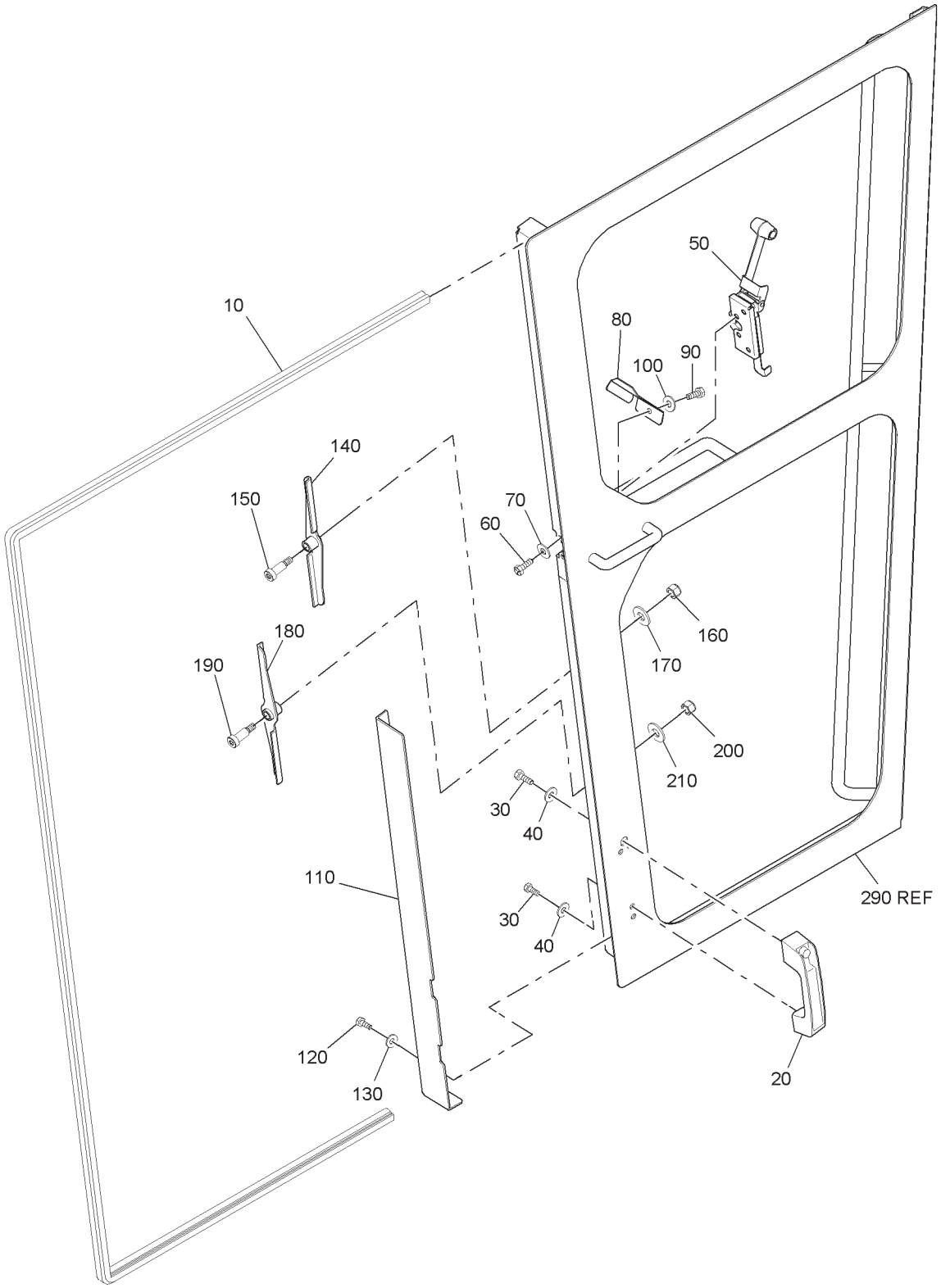


Figure 10-27

Left-Hand Door Assembly (Sh. 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
27				
-1	982695	REF	DOOR ASSEMBLY, LEFT-HAND (SEE IPL Figure 10-22 FOR NHA)	
10	982359	1	• SIDE BULB SEAL, DOOR EDGE, RUBBER	
20	982415	1	• DOOR HANDLE, PUSHBUTTON	
	982415-01		KEY, DOOR LATCHH	
30	102-M06X16-1A	2	• CAP SCREW, 6 X 16 MILLIMETER HEX	
40	119-A	2	• FLAT WASHER, M6	
50	982716	1	• DOOR LATCH, LEFT-HAND	
60	102-3-1A	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
70	119-1	2	• FLAT WASHER, 1/4" SAE	
80	982630	1	• LATCH COVER, DOOR, LEFT-HAND	
90	102-3-1A	1	• CAP SCREW, 1/4"-20 X 3/4 HEX	
100	119-1	1	• FLAT WASHER, 1/4" SAE	
110	982720	1	• LINKAGE COVER, DOOR, LEFT-HAND	
120	102-3-1A	5	• CAP SCREW, 1/4"-20 X 3/4 HEX	
130	119-1	5	• FLAT WASHER, 1/4" SAE	
140	982649	1	• LINKAGE WELDMENT, UPPER LATCH, LEFT-HAND	
150	80973	1	• SCREW, SHOULDER, 1/2 X 1.00 X 3/8-16	
160	143-3	1	• LOCKNUT, 3/8"-16	
170	119-3	1	• FLAT WASHER, 3/8"	
180	983456	1	• LINKAGE WELDMENT, LOWER LATCH, LEFT-HAND	
190	80973	1	• SCREW, SHOULDER, 1/2 X 1.00 X 3/8-16	
200	143-3	1	• LOCKNUT, 3/8"-16	
210	119-3	1	• FLAT WASHER, 3/8"	
290	982697	1	• DOOR FRAME, LEFT-HAND	

Left-Hand Door Assembly (Sh. 2 Of 2)

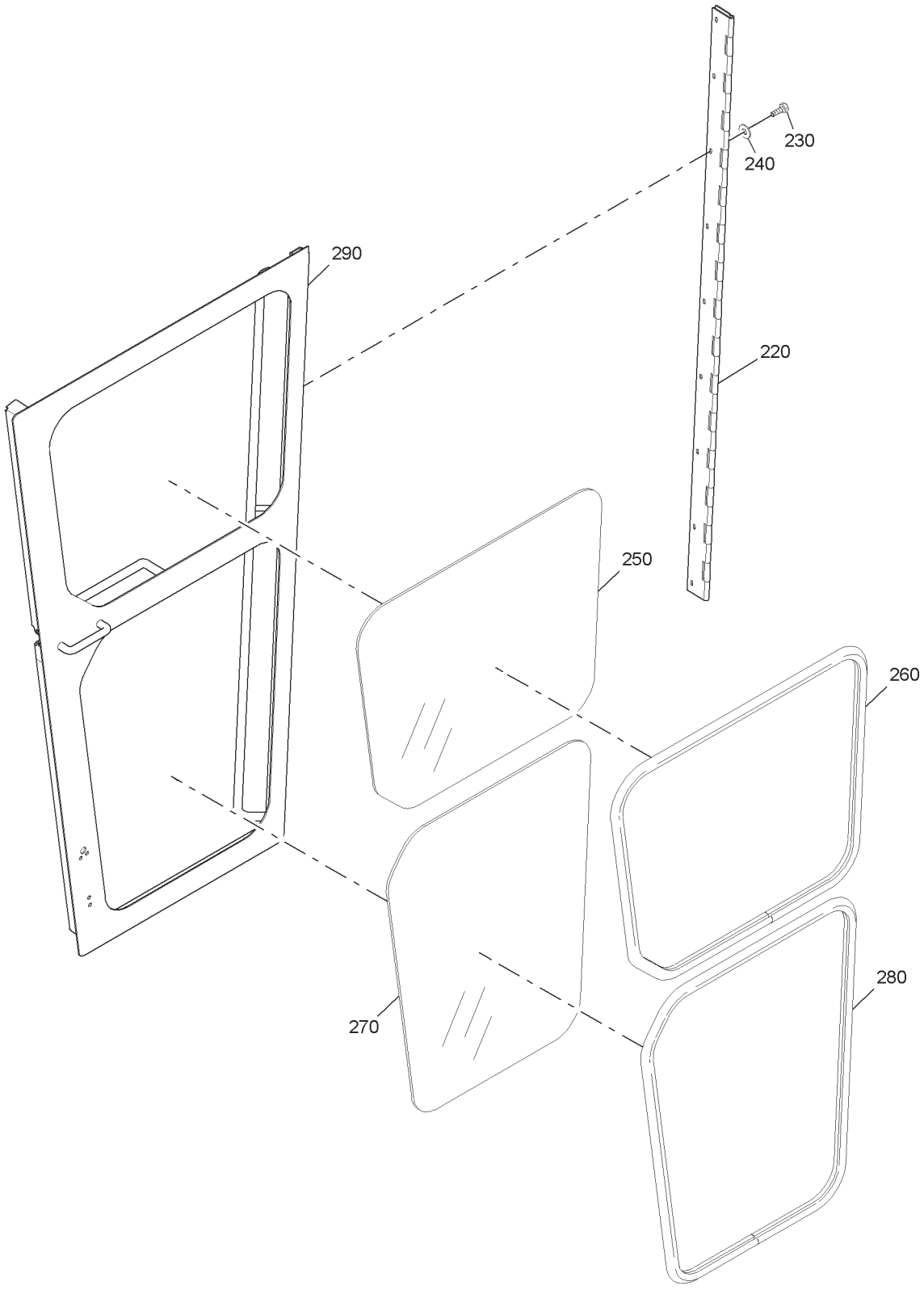


Figure 10-28

Left-Hand Door Assembly (Sh. 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
28				
220	982693	1	• HINGE, STAINLESS, 1/4-INCH DIAMETER PIN	
230	102-3-1A	9	• CAP SCREW, 1/4"-20 X 3/4 HEX	
240	119-1	9	• FLAT WASHER, 1/4" SAE	
250	982721	1	• DOOR GLASS, UPPER, 1/4-INCH, TEMPERED	
260	982360	1	• SEAL, UPPER WINDOW	
270	982722	1	• DOOR GLASS, LOWER, 1/4-INCH, TEMPERED	
280	982360	1	• SEAL, LOWER WINDOW	
290	982697	1	• DOOR FRAME, LEFT-HAND	

Right-Hand Door Assembly (Sh. 1 Of 2)

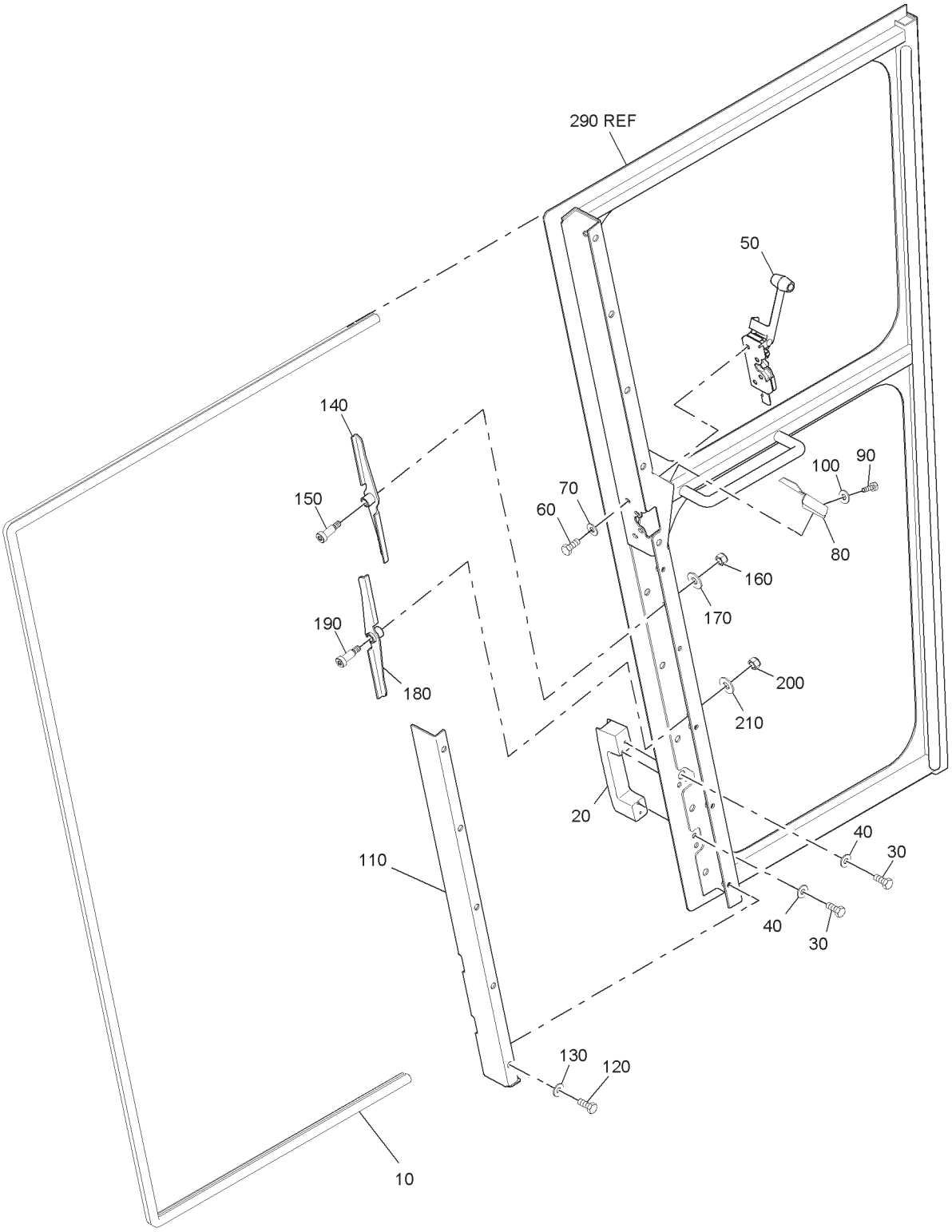


Figure 10-29

Right-Hand Door Assembly (Sh. 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
29				
-1	982694	REF	DOOR ASSEMBLY, RIGHT-HAND (SEE IPL Figure 10-25 FOR NHA)	
10	982359	1	• SIDE BULB SEAL, DOOR EDGE, RUBBER	
20	982415	1	• DOOR HANDLE, PUSHBUTTON	
30	102-M06X16-1A	2	• CAP SCREW, 6 X 16 MILLIMETER HEX	
40	119-A	2	• FLAT WASHER, M6	
50	982715	1	• DOOR LATCH, RIGHT-HAND	
60	102-3-1A	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
70	119-1	2	• FLAT WASHER, 1/4" SAE	
80	982630	1	• LATCH COVER, DOOR, LEFT-HAND	
90	102-3-1A	1	• CAP SCREW, 1/4"-20 X 3/4 HEX	
100	119-1	1	• WASHER, 1/4" FLAT SAE	
110	982719	1	• LINKAGE COVER, DOOR, RIGHT-HAND	
120	102-3-1A	5	• CAP SCREW, 1/4"-20 X 3/4 HEX	
130	119-1	5	• WASHER, 1/4" FLAT SAE	
140	982657	1	• LINKAGE WELDMENT, UPPER LATCH, RIGHT-HAND	
150	80973	1	• SCREW, SHOULDER, 1/2" X 1.00 X 3/8-16	
160	143-3	1	• LOCKNUT, 3/8"-16	
170	119-3	1	• FLAT WASHER, 3/8" SAE	
180	982656	1	• LINKAGE WELDMENT, LOWER LATCH, RIGHT-HAND	
190	80973	1	• SCREW, SHOULDER, 1/2" X 1.00 X 3/8-16	
200	143-3	1	• LOCKNUT, 3/8"-16	
210	119-3	1	• FLAT WASHER, 3/8" SAE	
290	982696	1	• DOOR FRAME, RIGHT-HAND	

Right-Hand Door Assembly (Sh. 2 Of 2)

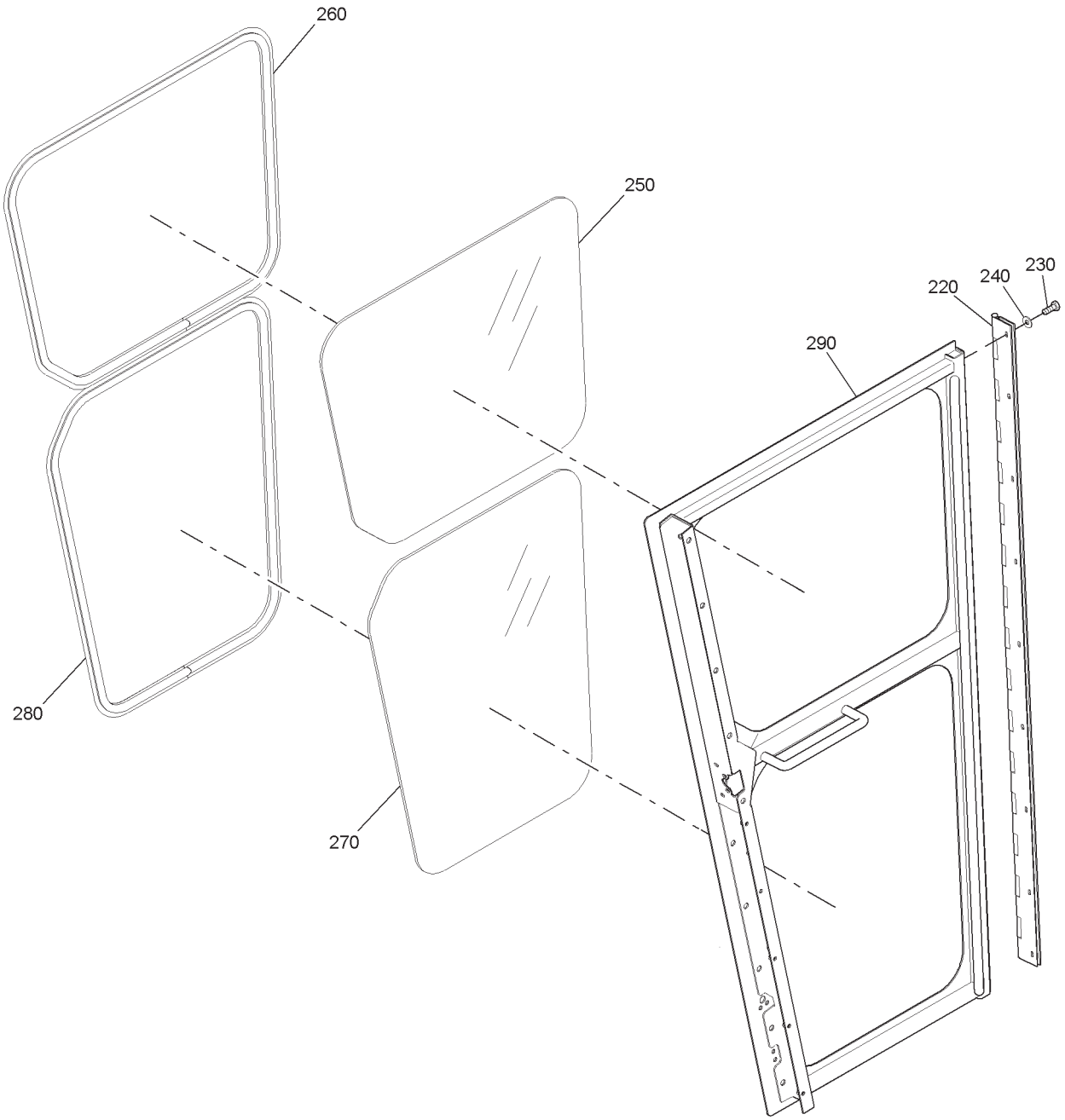


Figure 10-30

Right-Hand Door Assembly (Sh. 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
30				
220	982693	1	• HINGE, STAINLESS, 1/4-INCH DIAMETER PIN	
230	102-3-1A	9	• CAP SCREW, 1/4"-20 X 3/4 HEX	
240	119-1	9	• FLAT WASHER, 1/4" SAE	
250	982721	1	• DOOR GLASS, UPPER, 1/4-INCH, TEMPERED	
260	982360	1	• SEAL, UPPER WINDOW	
270	982722	1	• DOOR GLASS, LOWER, 1/4-INCH, TEMPERED	
280	982360	1	• SEAL, LOWER WINDOW	
290	982696	1	• DOOR FRAME, RIGHT-HAND	

Cab Entry Ladder

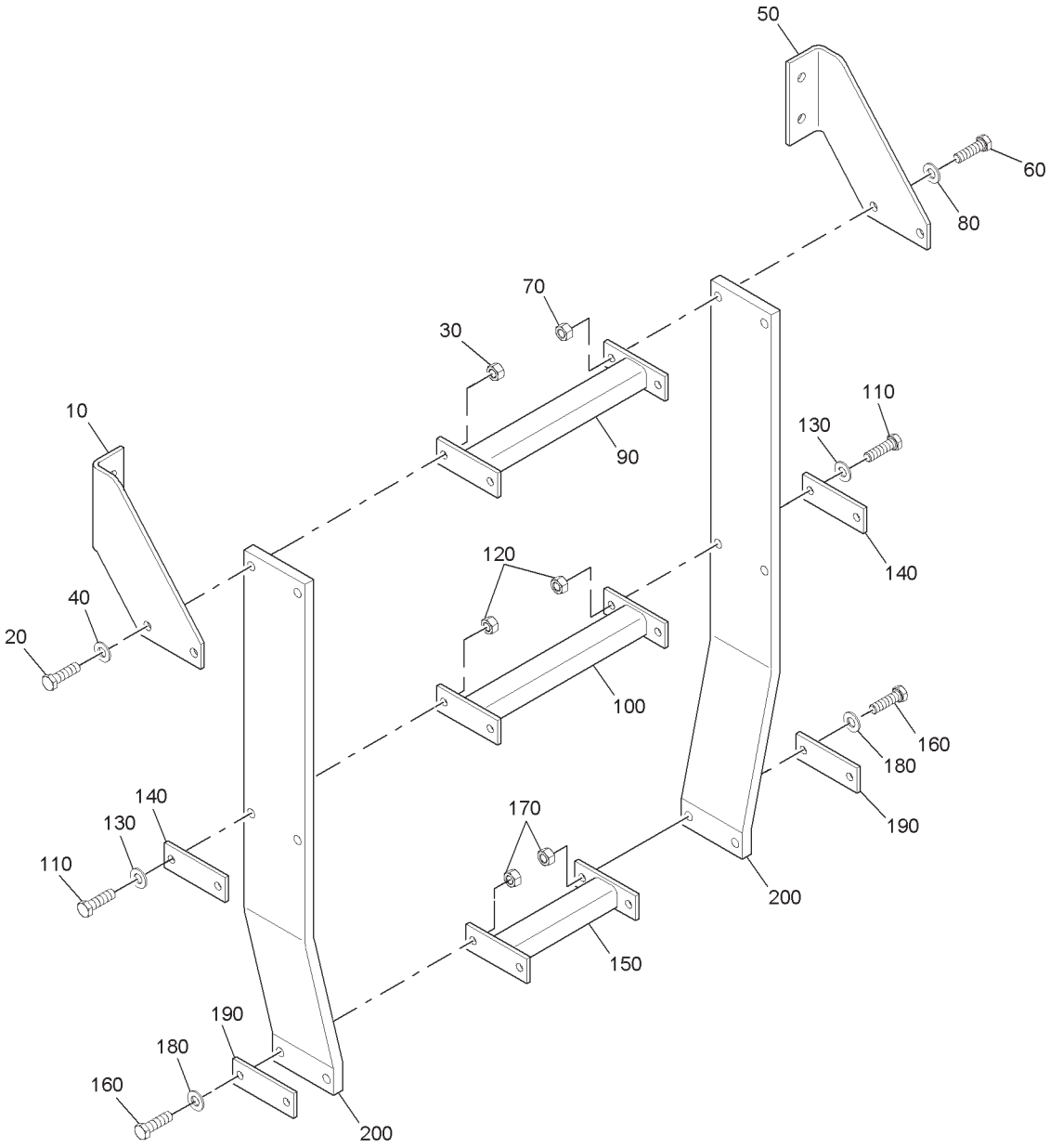


Figure 10-31

Cab Entry Ladder Parts List

Item No.	Part Number	Qty.	Description	Remarks
31				
-1	985625	REF	LADDER, CAB ENTRY (SEE IPL Figure 10-23 AND Figure 10-25 FOR NHA)	
10	982841	1	• STEP MOUNT, CAB, LEFT-HAND	
20	102-207-1A	2	• CAP SCREW, 3/8"-16 X 1.50 HEX	
30	143-3	2	• LOCKNUT, 3/8"-16	
40	119-3	2	• FLAT WASHER, 3/8" SAE	
50	982839	1	• STEP MOUNT, CAB, RIGHT-HAND	
60	102-207-1A	2	• CAP SCREW, 3/8"-16 X 1.50 HEX	
70	143-3	2	• LOCKNUT, 3/8"-16	
80	119-3	2	• FLAT WASHER, 3/8" SAE	
90	985512	1	• STEP, CAB	
100	985512	1	• STEP, CAB	
110	102-207-1A	4	• CAP SCREW, 3/8"-16 X 1.50 HEX	
120	143-3	4	• LOCKNUT, 3/8"-16	
130	119-3	4	• FLAT WASHER, 3/8" SAE	
140	982838	2	• MOUNT BAR, END STEP	
150	985513	1	• STEP, CAB	
160	102-207-1A	4	• CAP SCREW, 3/8"-16 X 1.50 HEX	
170	143-3	4	• LOCKNUT, 3/8"-16	
180	119-3	4	• FLAT WASHER, 3/8" SAE	
190	982838	2	• MOUNT BAR, END STEP	
200	982840	2	• CAB STEP SUPPORT, RUBBER	

Control Group

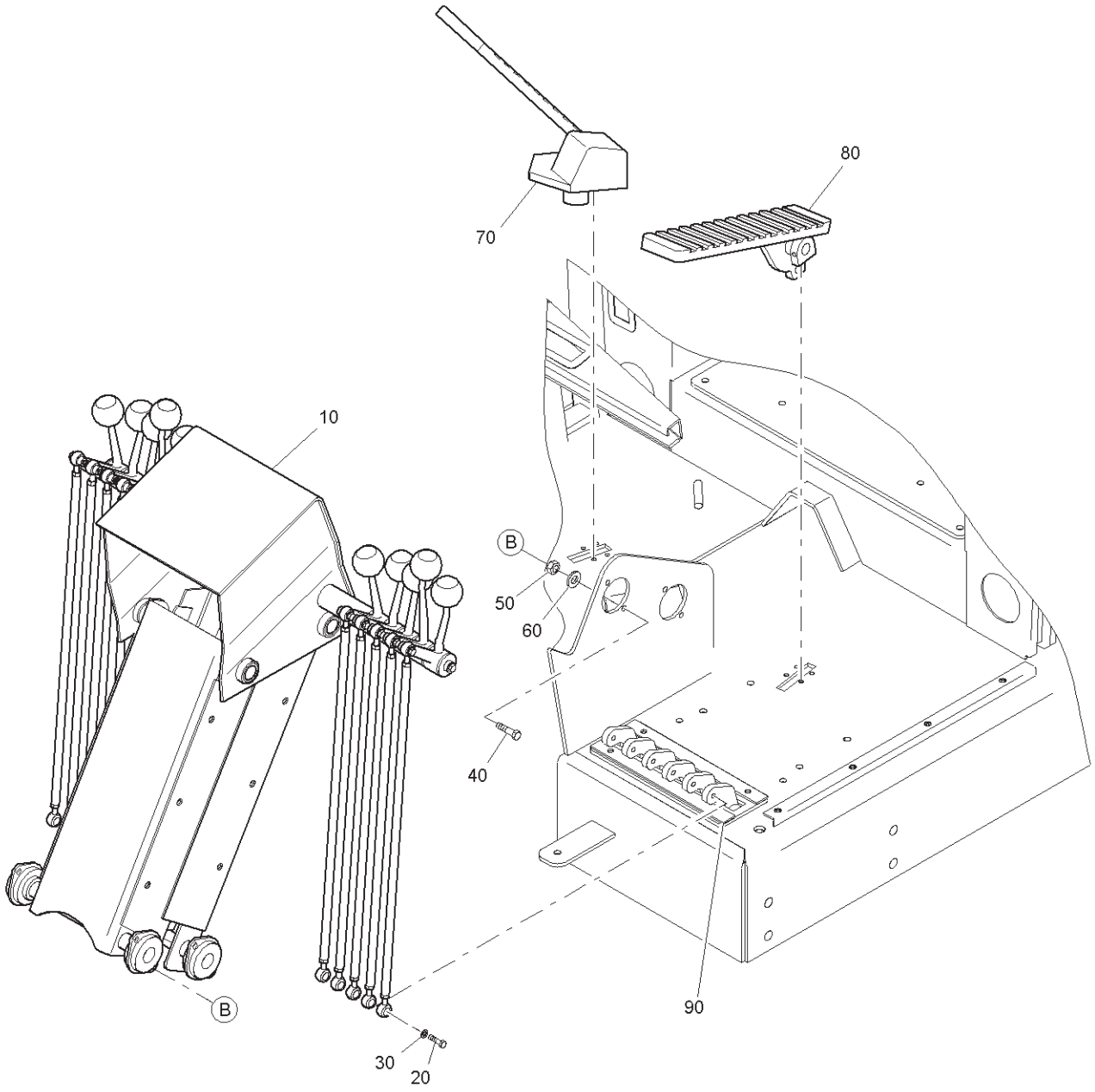


Figure 10-32

Control Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
32				
10	-	1	• CONTROL HANDLE ASSEMBLY (SEE IPL Figure 10-33 FOR BREAKDOWN)	
20	102-103-1A	10	• CAP SCREW, 5/16"-18 X 3/4 HEX	
30	118-2	10	• LOCKWASHER, 5/16"	
40	102-105-1A	4	• CAP SCREW, 5/16"-18 X 1.0 HEX	
50	116-2	4	• NUT, 5/16"-18 HEX	
60	118-2	4	• LOCKWASHER, 5/16"	
70	981781	1	• PEDAL ASSEMBLY, ACCELERATOR (COVER IS NOT PART OF ASSEMBLY)	
80	985520	1	• PEDAL ASSEMBLY, BRAKE (COVER IS NOT PART OF ASSEMBLY) (SEE IPL Figure 10-37 FOR BREAKDOWN)	
90	982901	1	• VALVE ASSEMBLY, LEFT HAND (SEE IPL Figure 10-36 FOR BREAKDOWN)	
-100	982877	1	• VALVE ASSEMBLY, RIGHT HAND (SEE IPL Figure 10-36 FOR BREAKDOWN)	

Control Handle Assembly

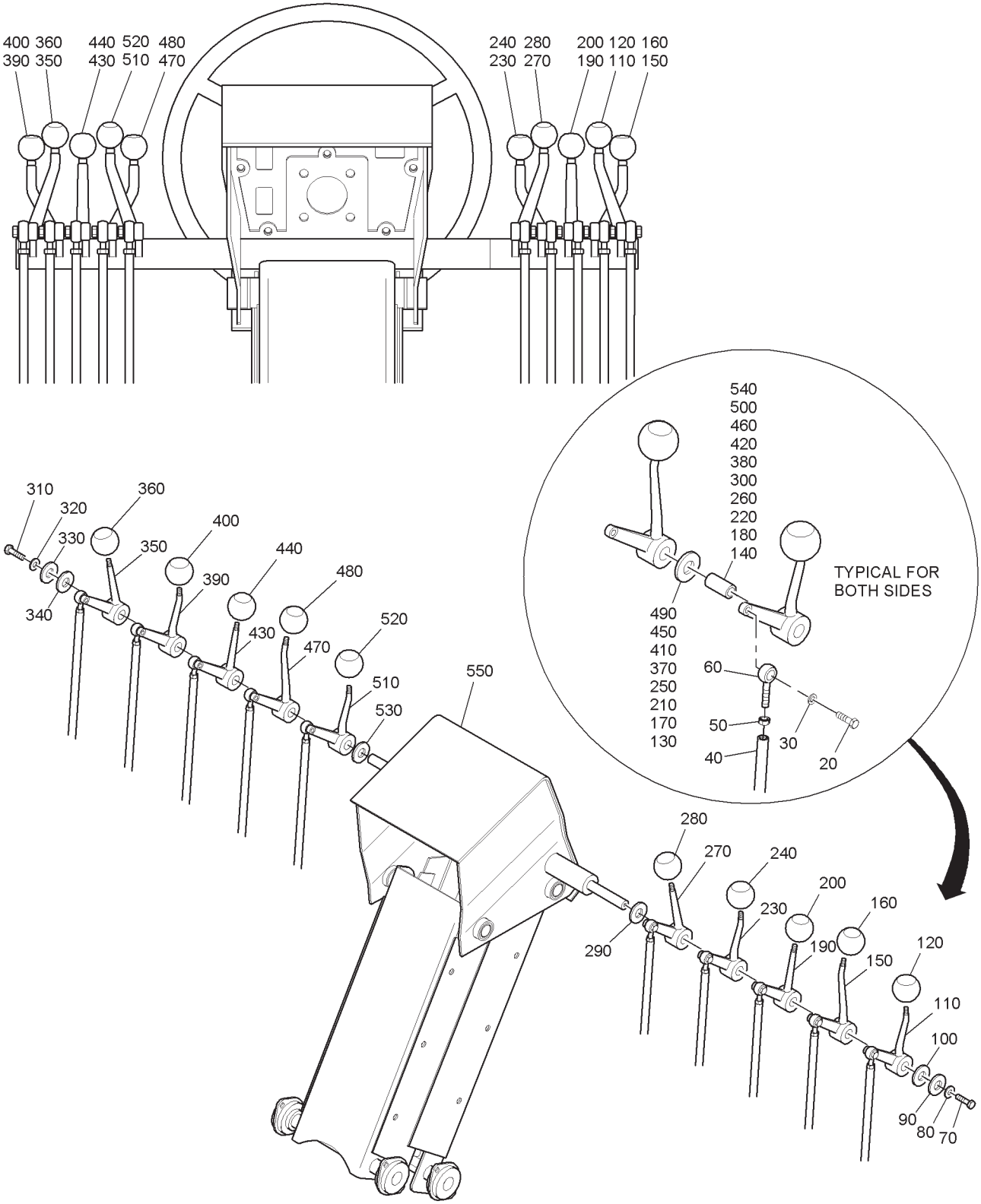


Figure 10-33

Control Handle Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
33				
-10	-	10	• ROD ASSEMBLY, VALVE LEVER (SEE IPL Figure 10-32 FOR NHA)	
20	100-103-1A	1	• CAP SCREW, 5/16" X 1/2 HEX	
30	118-2	1	• LOCKWASHER, 5/16"	
40	983382	10	• ROD, VALVE LEVER	
50	115-2	10	• NUT, 5/16"-24 HEX	
60	983370	10	• HEIM JOINT, ROD END	
70	102-103-1A	1	• CAP SCREW, 5/16"-18 X 3/4 HEX	
80	118-2	1	• LOCKWASHER, 5/16"	
90	981511	1	• FENDER WASHER, 3/8"	
100	985045	1	• SPACER, VALVE LEVER	
110	982881-5	1	• LEVER, VALVE HANDLE	
120	983115	1	• KNOB, FRONT SCARIFIER	
130	985045	1	• SPACER, VALVE LEVER	
140	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
150	982881-4	1	• LEVER, VALVE HANDLE	
160	983117	1	• KNOB, LEFT-HAND BLADE LIFT	
170	985045	1	• SPACER, VALVE LEVER	
180	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
190	982881-3	1	• LEVER, VALVE HANDLE	
200	983116	1	• KNOB, BLADE EXTENSION	
210	985045	1	• SPACER, VALVE LEVER	
220	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
230	982881-1	1	• LEVER, VALVE HANDLE	
240	983112	1	• KNOB, CIRCLE DRIVE	
250	985045	1	• SPACER, VALVE LEVER	
260	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	

Control Handle Assembly

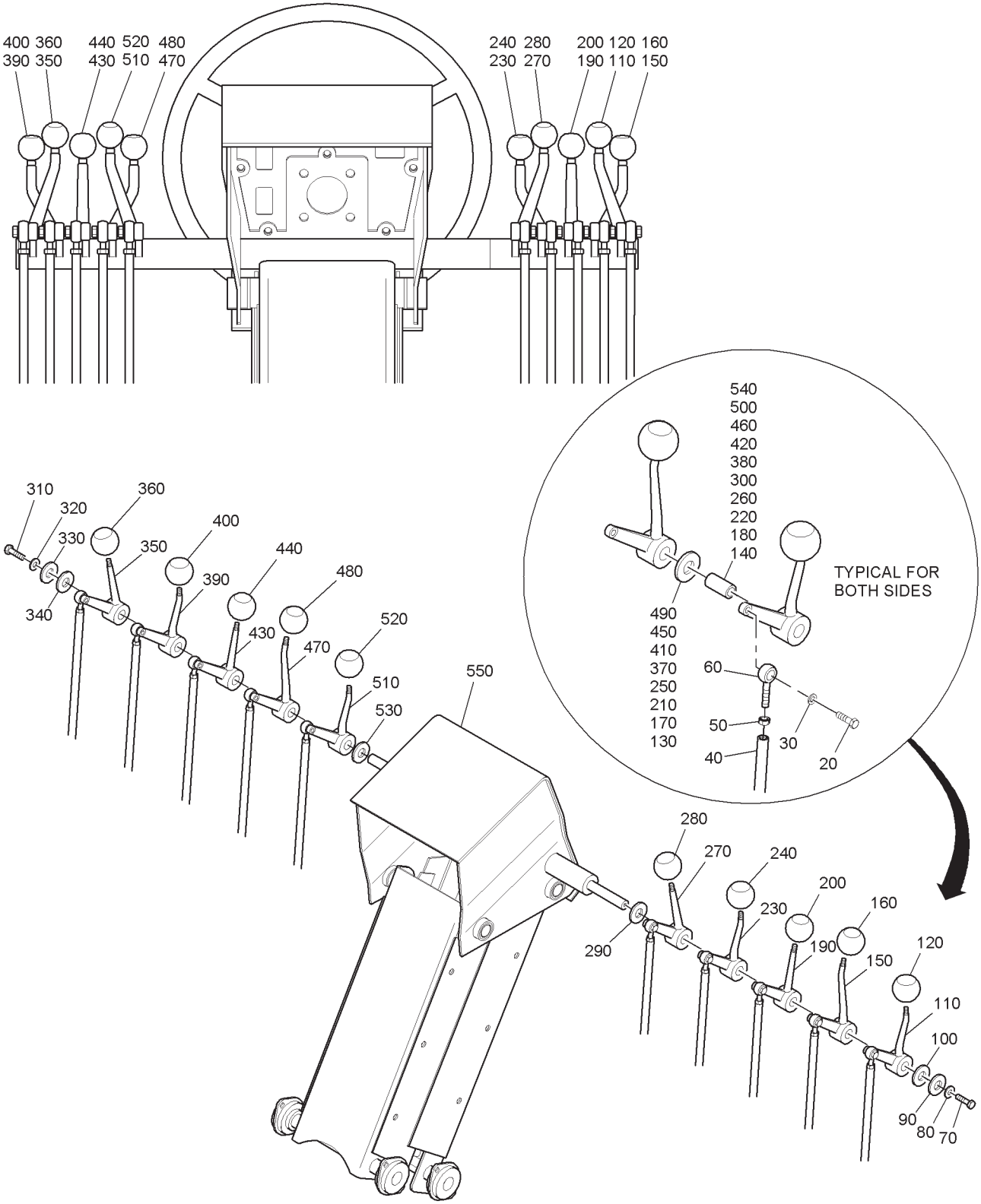


Figure 10-33

Control Handle Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
33				
270	982881-2	1	• LEVER, VALVE HANDLE	
280	983113	1	• KNOB, BLADE TILT	
290	985045	1	• SPACER, VALVE LEVER	
300	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
310	102-103-1A	1	• CAP SCREW, 5/16"-18 X 3/4 HEX	
320	118-2	1	• LOCKWASHER, 5/16"	
330	981511	1	• FENDER WASHER, 3/8"	
340	985045	1	• SPACER, VALVE LEVER	
350	982881-2	1	• LEVER, VALVE HANDLE	
360	984276	1	• KNOB, PLAIN HANDLE MOUNT	
370	985045	1	• SPACER, VALVE LEVER	
380	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
390	982881-1	1	• LEVER, VALVE HANDLE	
400	983118	1	• KNOB, RIGHT-HAND BLADE LIFT	
410	985045	1	• SPACER, VALVE LEVER	
420	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
430	982881-3	1	• LEVER, VALVE HANDLE	
440	983120	1	• KNOB, WHEEL LEAN	
450	985045	1	• SPACER, VALVE LEVER	
460	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
470	982881-4	1	• LEVER, VALVE HANDLE	
480	983119	1	• KNOB, SIDE SHIFT	
490	985045	1	• SPACER, VALVE LEVER	
500	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
510	982881-5	1	• LEVER, VALVE HANDLE	
520	983114	1	• KNOB, BOOM ARTICULATION	
530	985045	1	• SPACER, VALVE LEVER	
540	982882	1	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	
550	983153	1	• CONSOLE GROUP (SEE IPL Figure 10-35 FOR BREAKDOWN)	

Console Group (Sh 1 Of 2)

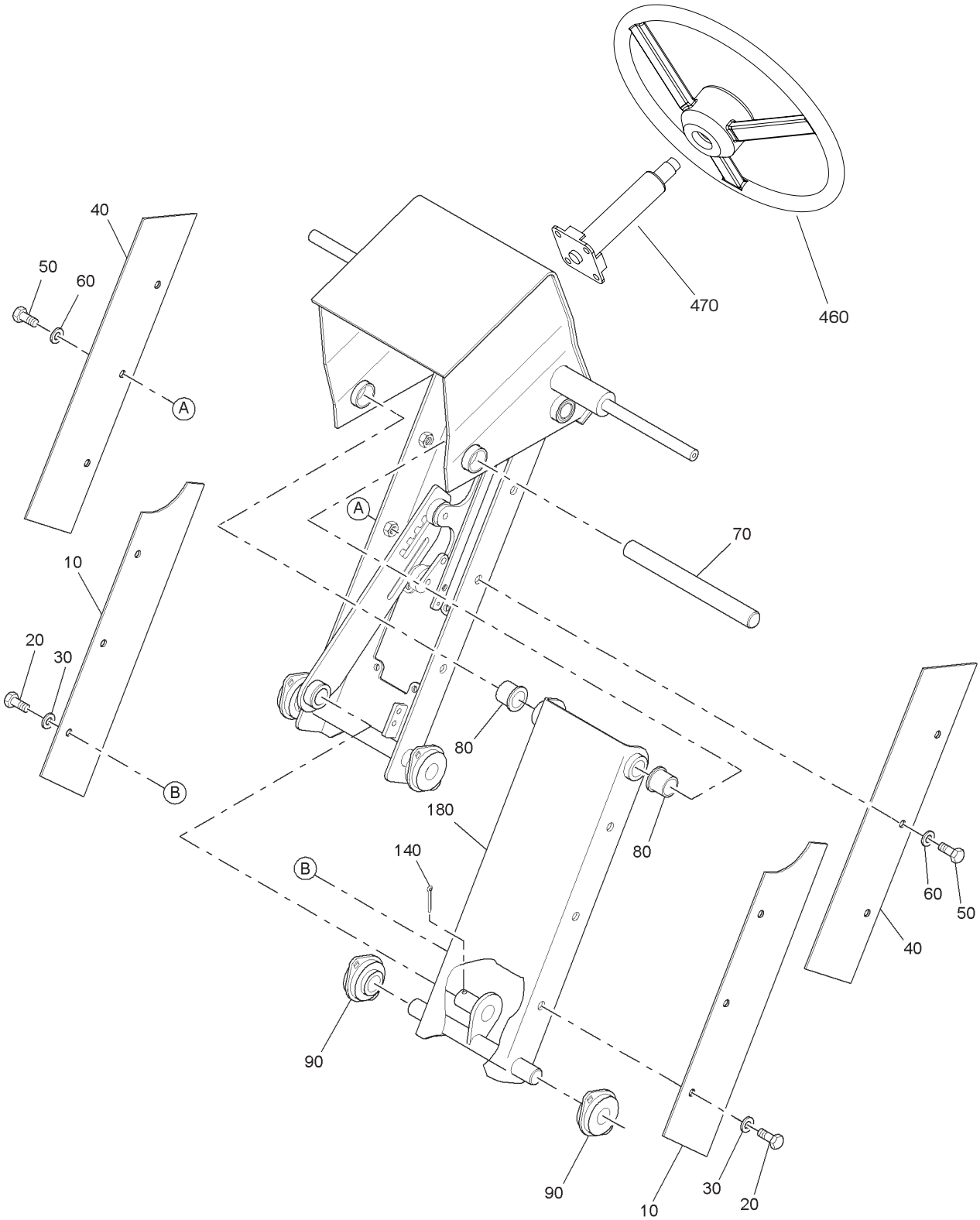


Figure 10-34

Console Group (Sh 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
34				
-1	983153	REF	CONSOLE GROUP (SEE IPL Figure 10-32 FOR NHA)	
10	981803	2	• COVER PLATE, TILT CONSOLE	
20	102-103-1A	3	• CAP SCREW, 5/16"-18 X 3/4 HEX	
30	118-2	3	• LOCKWASHER, 5/16"	
40	981802	2	• COVER PLATE, TILT CONSOLE	
50	102-103-1A	3	• CAP SCREW, 5/16"-18 X 3/4 HEX	
60	118-2	3	• LOCKWASHER, 5/16"	
70	981793	1	• SHAFT, UPPER TILT CONSOLE	
80	981804	2	• BUSHING, COMPOSITE, 1.5 X 1.0 X 1.12"	
90	983374	2	• BALL BEARING, MOUNTED	
140	930039	1	• COTTER PIN, 3/16 X 2.0"	
180	985488	1	• TILT FRAME	
460	982170	1	WHEEL, STEERING	
470	982871	1	STEERING COLUMN	

Console Group (Sh 2 Of 2)

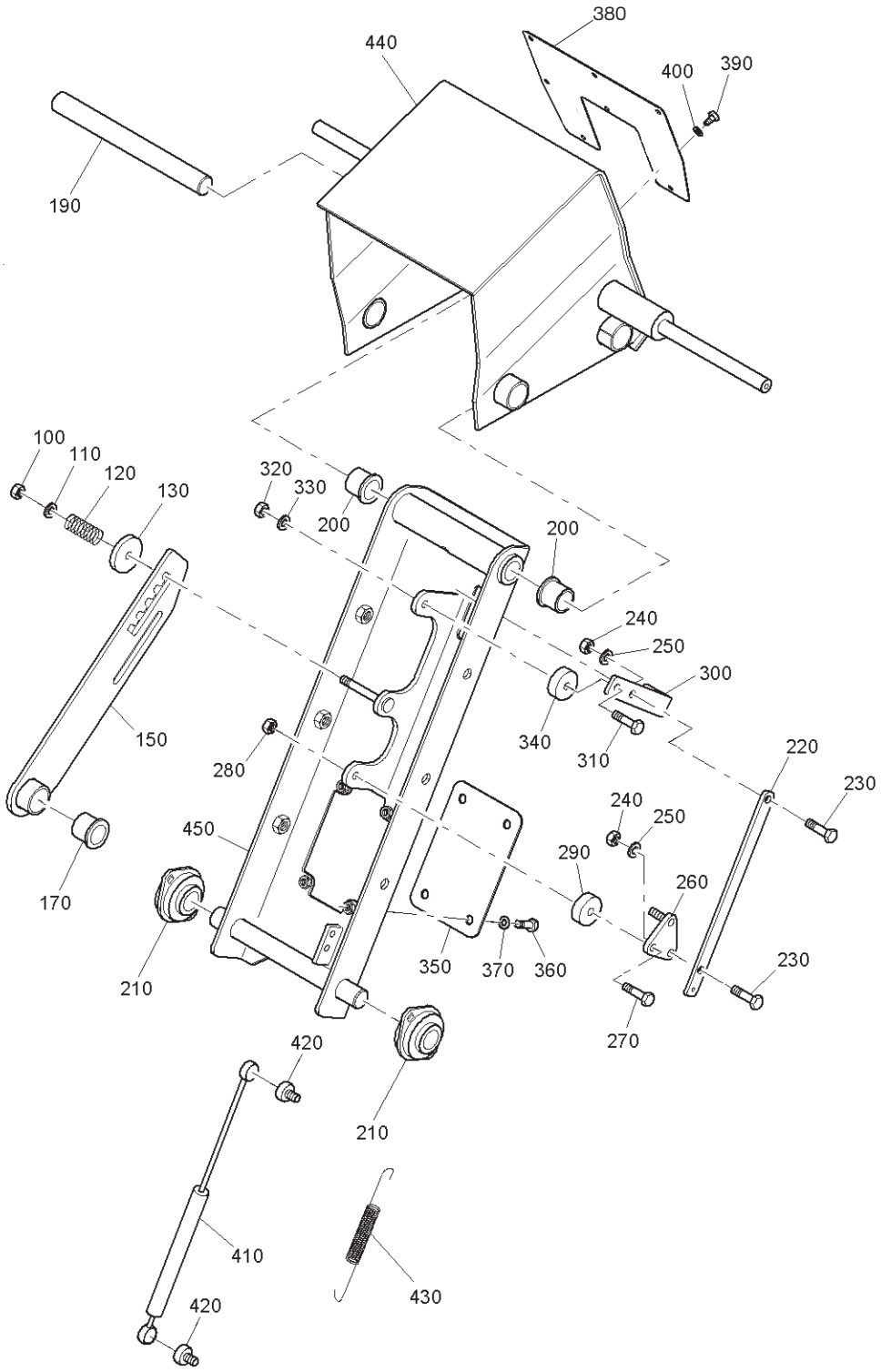


Figure 10-35

Console Group (Sh 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
35				
100	143-3	1	• LOCKNUT, 3/8"-16	
110	119-3	1	• FLAT WASHER, 3/8" SAE	
120	670060	1	• SPRING, COMPRESSION, 0.38 ROD X 0.53 OD X 3.156" LG	
130	858953	1	• WASHER, FLAT, 2.50 OD X 0.438 ID C 0.188 THK	
150	985490	1	• LEVER, TILT LINKAGE	
170	981804	1	• BUSHING, COMPOSITE, 1.5 X 1.0 X 1.12"	
190	981793	1	• SHAFT, UPPER TILT CONSOLE	
200	981804	2	• BUSHING, COMPOSITE, 1.5 X 1.0 X 1.12"	
210	983374	2	• BALL BEARING, MOUNTED	
220	981796	1	• BAR, TILT LINKAGE	
230	102-206-1A	2	• CAP SCREW, 3/8"-16 X 1.25 HEX	
240	143-3	2	• LOCKNUT, 3/8"-16	
250	119-3	2	• FLAT WASHER, 3/8" SAE	
260	985491	1	• BELL CRANK	
270	102-207-1A	1	• CAP SCREW, 3/8"-16 X 1.25 HEX	
280	143-3	1	• LOCKNUT, 3/8"-16	
290	119-3	1	• FLAT WASHER, 3/8" SAE	
300	981801	1	• BAR, TILT HANDLE	
310	102-207-1A	1	• CAP SCREW, 3/8"-16 X 1.25 HEX	
320	143-3	1	• LOCKNUT, 3/8"-16	
330	119-3	1	• FLAT WASHER, 3/8" SAE	
340	981800	1	• SPACER, TILT LINKAGE	
350	981805	1	• PLATE, CONSOLE PANEL	
360	102-3-1A	4	• CAP SCREW, 1/4"-20 X 0.75 HEX	
370	118-1	4	• LOCKWASHER, 1/4"	
380	986608	1	• PLATE, LIGHT PANEL	
390	102-3-1A	8	• CAP SCREW, 1/4"-20 X 0.75 HEX	
400	118-1	8	• LOCKWASHER, 1/4"	
410	853610	1	• CYLINDER, GAS SPRING	
420	853620	2	• BALL STUD	
430	250170	1	• SPRING, CONVEYOR BELT WIPER	
440	985493	1	• HOUSING, TILT PANEL	
450	985489	1	• CONSOLE ASSEMBLY, REAR TILT	
-480	982870	1	MOTOR, STEERING	N/S

Valve Group

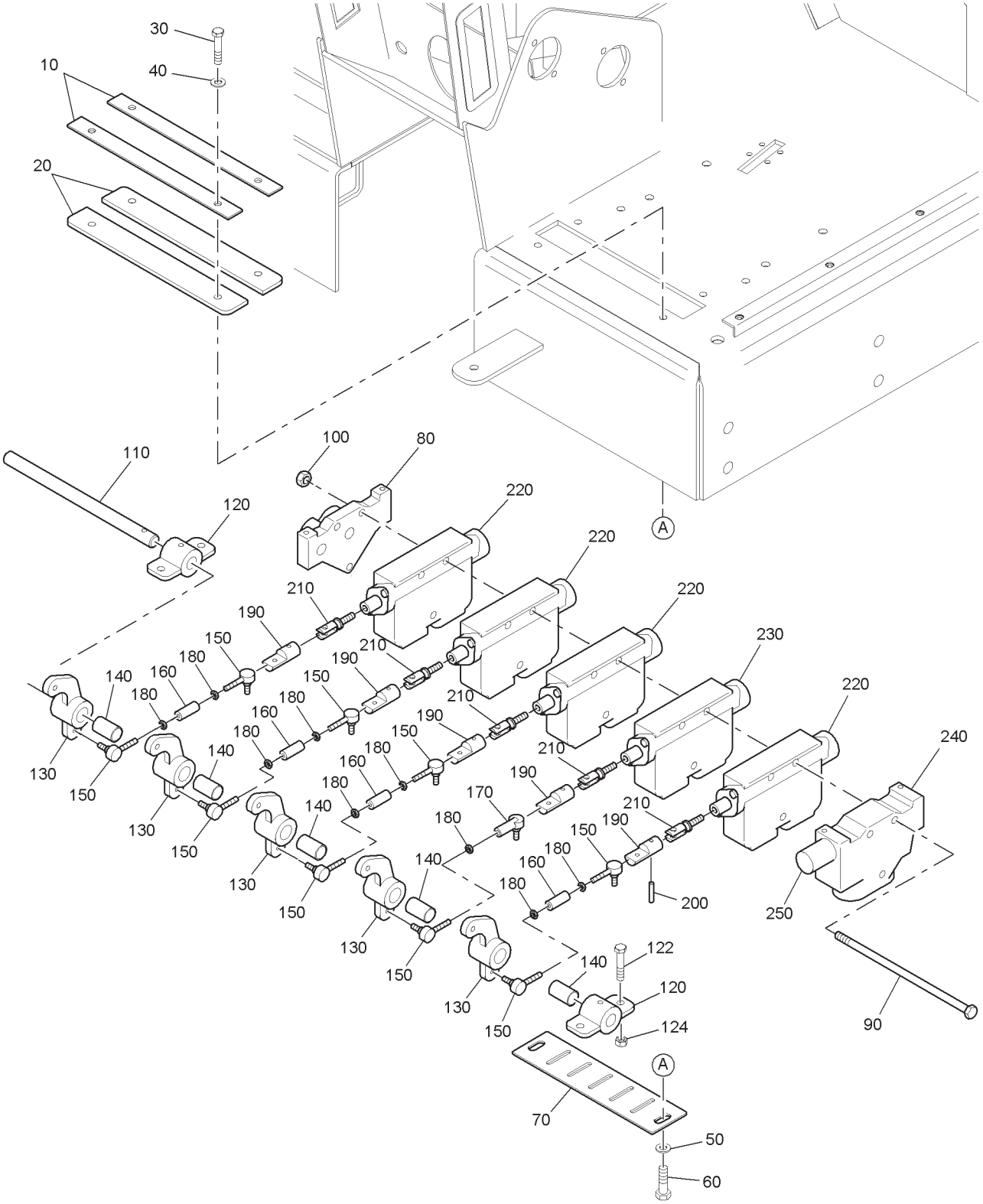


Figure 10-36

Valve Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
36				
-1	982901	REF	VALVE ASSEMBLY, LEFT HAND (SEE IPL Figure 10-32 FOR NHA)	
-2	982877	REF	VALVE ASSEMBLY, RIGHT HAND (SEE IPL Figure 10-32 FOR NHA)	
10	984278	2	• BAR, RUBBER HOLDDOWN	
20	983126	2	• RUBBER, VALVE LEVER	
30	102-206-1A	4	• CAP SCREW, 3/8"-16 X 1-1/4 HEX	
40	119-3	4	• FLAT WASHER, 1/8" SAE	
50	118-3	4	• LOCKWASHER, 3/8"	
60	102-206-1A	4	• CAP SCREW, 3/8"-16 X 1-1/4 HEX	
70	983123	1	• PLATE, VALVE PIN GUIDE	
80	982901-03	1	• COVER, VALVE OUTLET	
90	100-242-1A	3	• CAP SCREW, 3/8"-24 X 10.25 HEX	
100	115-3	3	• NUT, 3/8"-24 HEX	
110	981863	1	• SHAFT, LEVER MOUNT	
120	985586	2	• SHAFT RETAINER ASSEMBLY, VALVE LEVER	
122	102-09-1A	4	• CAP SCREW, 1/4"-20 X 2.0 HEX	
124	116-1	4	• NUT, 1/4"-20 HEX	
130	985585	5	• LEVER ARM ASSEMBLY, FLOOR MOUNT	
140	982882	5	• BUSHING, COMPOSITE, 0.813 x 0.688 x 1.0"	
150	9833371	9	• HEIM JOINT, BALL STUD	
160	981871	4	• TUBE, BALL JOINT MOUNT	
170	983372	1	• HEIM JOINT, FEMALE BALL	
180	80055	9	• NUT, 0.312"-24 HEX	
190	981868	5	• SHAFT, VALVE MOUNT	
200	871081813	5	• ROLL PIN, 0.188" x 2.00"	
210	982901-07	5	• CLEVIS, VALVE SPOOL	
220	982901-01	4	• VALVE SECTION, WITH SPRING	
230	982901-02	1	• VALVE SECTION, WITH FLOAT	
240	982901-04	1	• COVER, VALVE INLET	
250	982901-05	1	• VALVE, RELIEF	
-260	982901-06	5	• SEAL KIT	

Brake Pedal Assembly

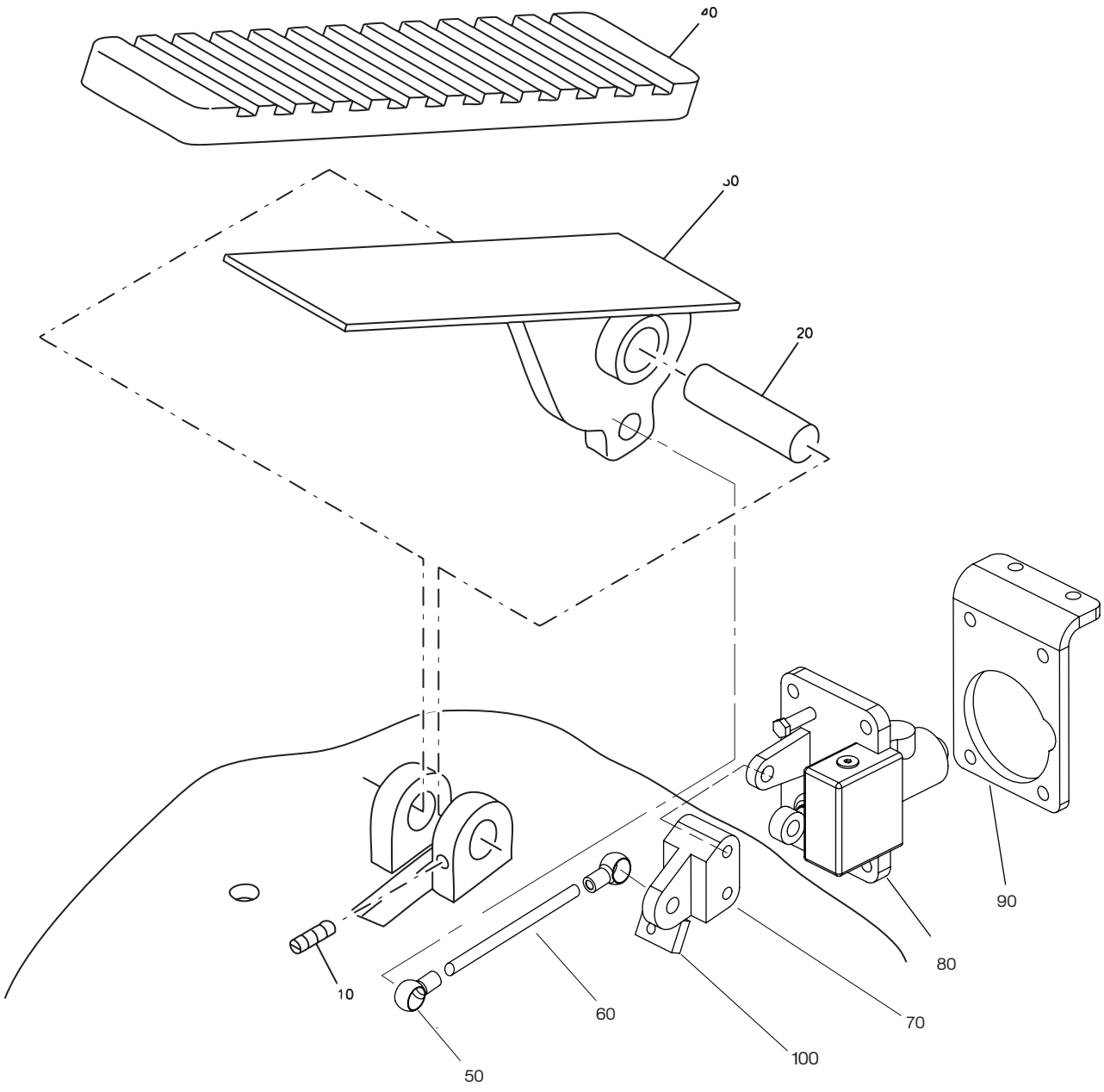


Figure 10-37

Brake Pedal Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
37				
-1	985520	REF	BRAKE PEDAL ASSEMBLY (SEE IPL Figure 10-32 FOR NHA)	
10	80408	1	• SETSCREW, HEX SOCKET, 0.312-18 X 3/4-INCH	
20	982791	1	• ROD, PEDAL MOUNT	
30	985520	1	• PEDAL, BRAKE	
40	982863	1	• PEDAL COVER, BRAKE	
50	983373	2	• BALL JOINT, .500, FEMALE, W/STUD	
60	984269	1	• ROD, BRAKE LINNKAGE	
70	982578	1	• MOUNT,PEDAL VAVLE ROD	
80	982873	1	• PEDAL, BRAKE, ELECTRIC	
90	982914	1	• PLATE,PEDAL MOUNT	
100	985046	1	• BAR, BRAKE MOUNT	

Cab Assembly

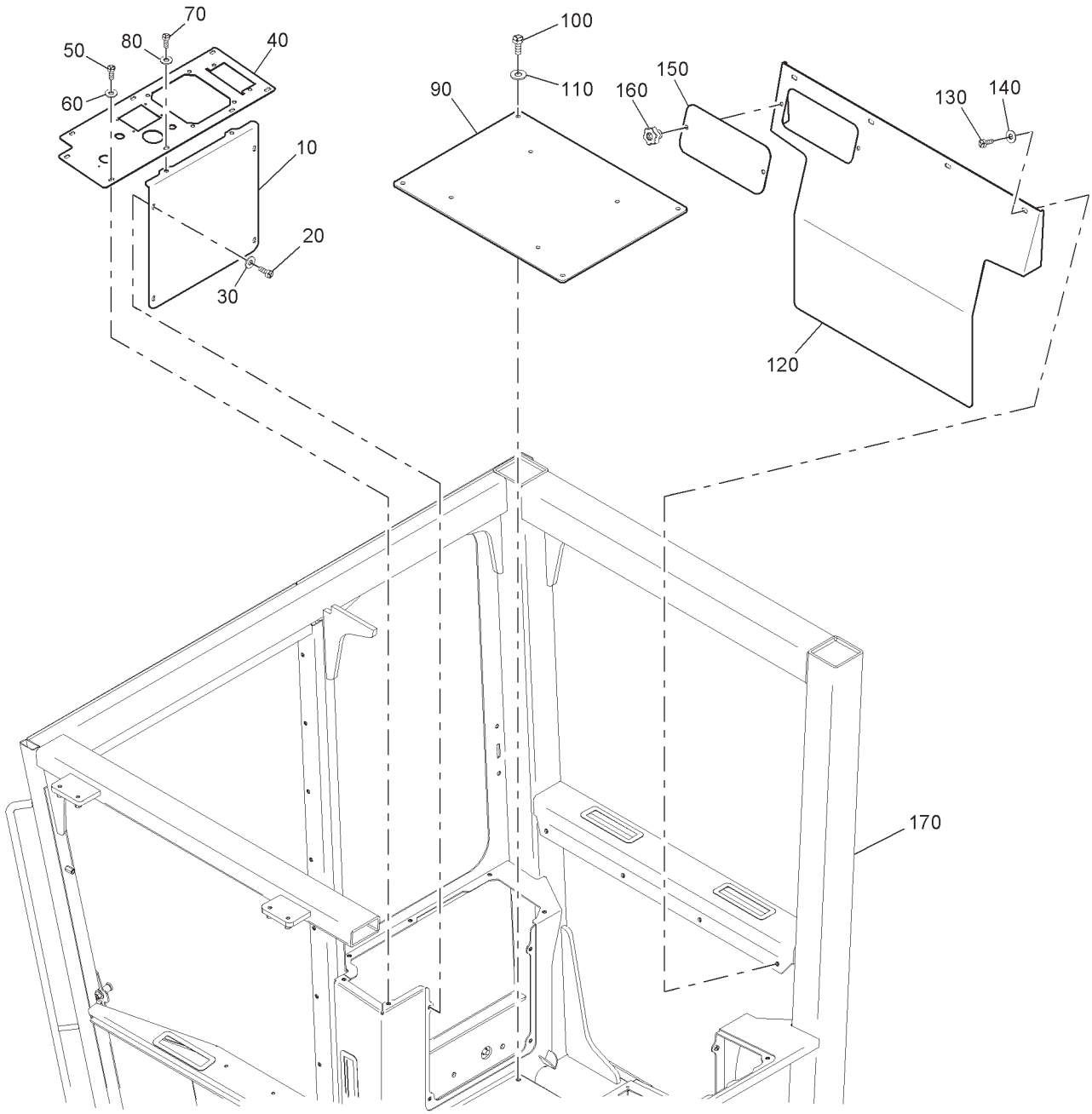


Figure 10-38

Cab Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
38				
-1	982700	REF	CAB ASSEMBLY (SEE IPL Figure 10-3 FOR NHA)	
10	982373	1	• FRONT PANEL, RIGHT-HAND CONSOLE	
20	102-3-1A	4	• CAP SCREW, 1/4"-20 X 3/4 HEX	
30	119-1	4	• FLAT WASHER, 1/4" SAE	
40	985443	1	• TOP PLATE, RIGHT-HAND CONSOLE	
50	102-3-1A	7	• CAP SCREW, 1/4"-20 X 3/4 HEX	
60	119-1	7	• FLAT WASHER, 1/4" SAE	
70	102-3-1A	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
80	119-1	2	• FLAT WASHER, 1/4" SAE	
90	982688	1	• FLOOR PANEL	
100	102-205-1A	4	• CAP SCREW, 3/8"-16 X 1.0 HEX	
110	119-3	4	• FLAT WASHER, 3/8" SAE	
120	982418	1	• PANEL, CAB REAR	
130	102-3-1A	4	• CAP SCREW, 1/4"-20 X 3/4 HEX	
140	119-1	4	• FLAT WASHER, 1/4" SAE	
150	982419	1	• PLATE, PANEL ACCESS	
160	983467	2	• NUT, PLATE RETAINING	
170	982701	1	• CAB WELDMENT	

Cab Assembly

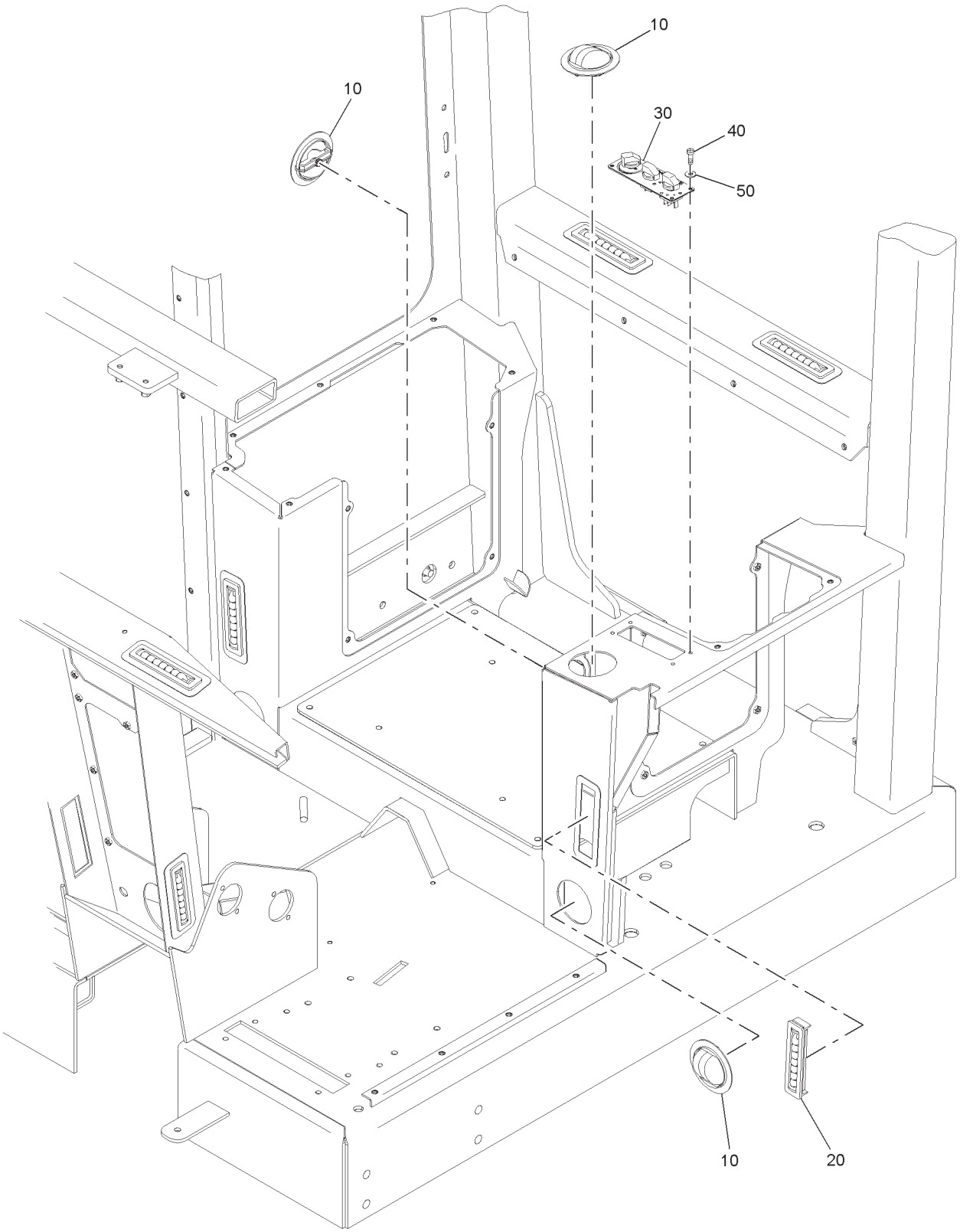


Figure 10-39

Cab Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
39				
-1	982700	REF	CAB ASSEMBLY (SEE IPL Figure 10-3 FOR NHA)	
10	405688	4	• VENT, DIRECTIONAL	
20	405450	8	• VENT, FIXED	
30	503985	1	• PANEL, SELECTOR MOUNT	
40	900074	4	• SCREW, MACHINE, 10-32 X 5/8"	
50	119-A	4	• FLAT WASHER, 3/16"	

Cab Assembly

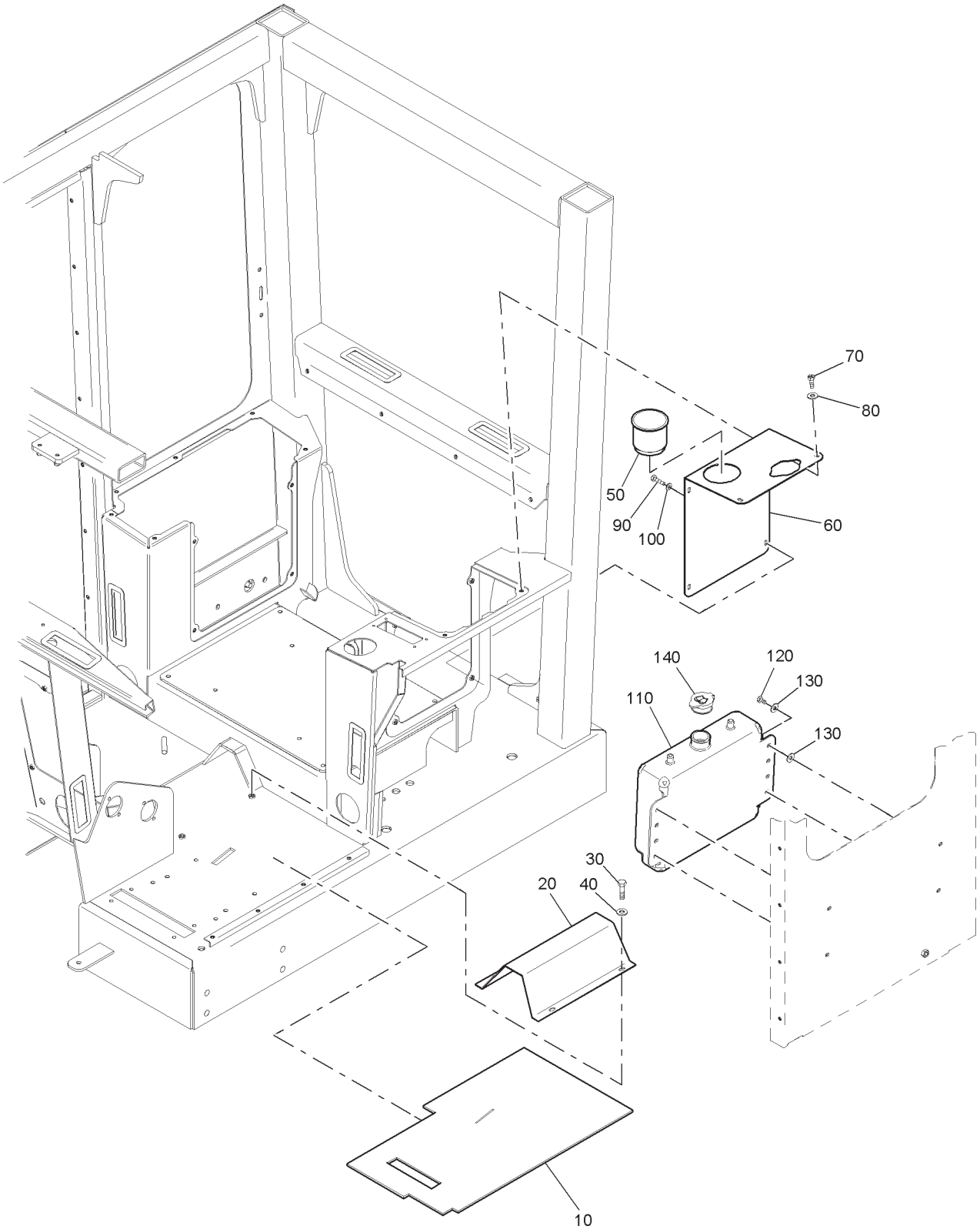


Figure 10-40

Cab Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
40				
-1	982700	REF	CAB ASSEMBLY (SEE IPL Figure 10-3 FOR NHA)	
10	982739	1	• FLOOR MAT	
20	982729	1	• HOUSING, CENTER	
30	102-105-1A	4	• CAP SCREW, 5/16"-18 X 1.0" HEX	
40	119-2	4	• FLAT WASHER, 5/16" SAE	
50	982689	1	• CUP HOLDER	
60	982607	1	• COVER PANEL, LEFT-HAND CONSOLE	
70	102-3-1A	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
80	119-1	2	• FLAT WASHER, 1/4" SAE	
90	102-3-1A	4	• CAP SCREW, 1/4"-20 X 3/4 HEX	
100	119-1	4	• FLAT WASHER, 1/4" SAE	
110	982738	1	• RESERVOIR	
120	102-1-1A	4	• CAP SCREW, 1/4"-20 X 1/2 HEX	
130	119-1	8	• FLAT WASHER, 1/4" SAE	
140	982738-01	1	• CAP, RESERVOIR	
	982700--1		VALVE, HEATER ELECTRONIC, 12V	

Cab Assembly

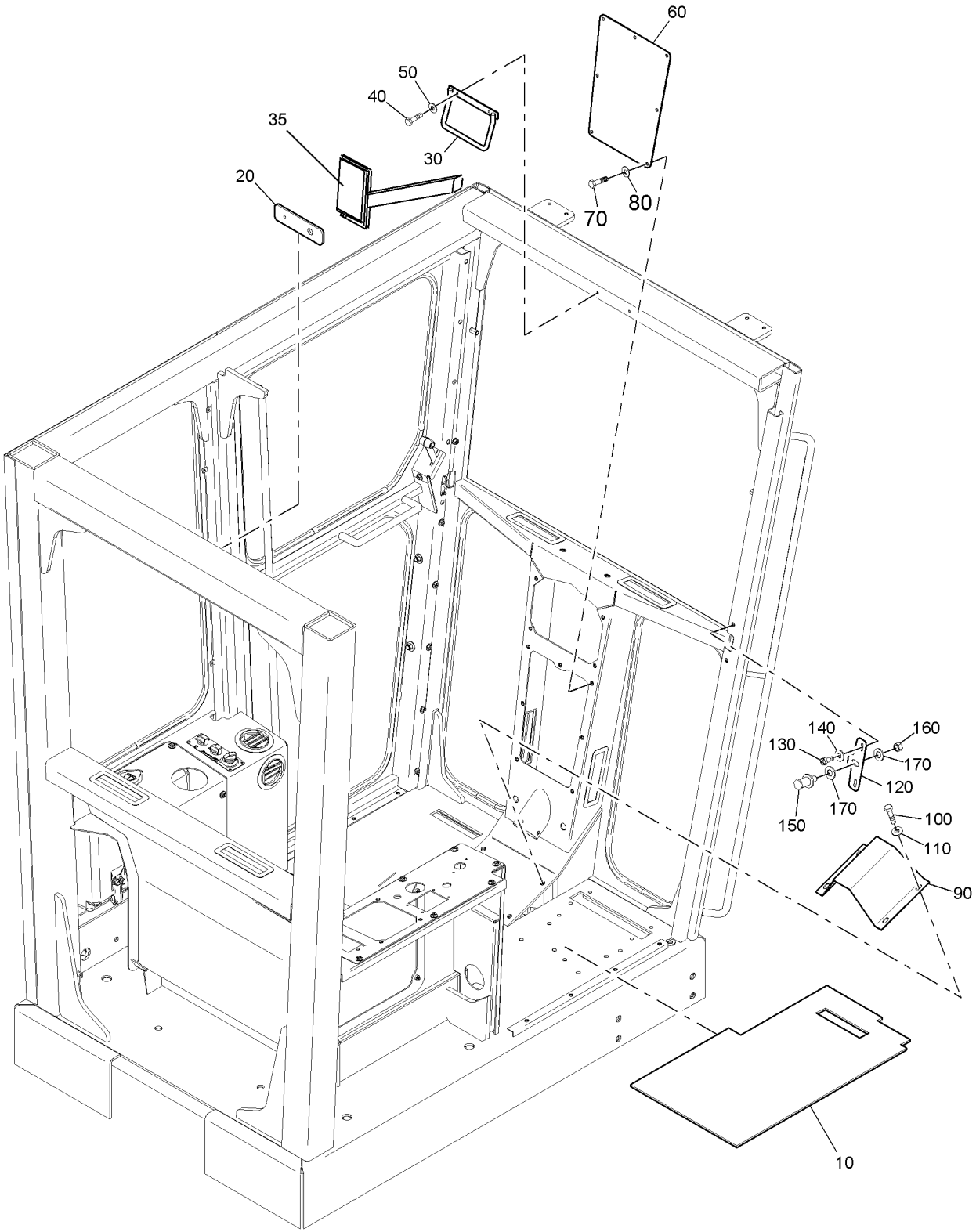


Figure 10-41

Cab Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
41				
-1	982700	REF	CAB ACCESSORIES (SEE IPL Figure 10-3 FOR NHA)	
10	982737	1	• FLOOR MAT	
20	982731	1	• SPACER PLATE, REAR WIPER	
30	1001418	1	• BRACKET ASSEMBLY, INSIDE CAB MIRROR	
35	1001416	2	• BRACKET ASSEMBLY, OUTSIDE CAB MIRROR	
40	102-205-1A	2	• CAP SCREW, 3/8"-16 X 1.0 HEX	
50	119-3	2	• FLAT WASHER, 3/8" SAE	
60	982390	1	• ACCESS COVER, DASH	
70	102-3-1A	7	• CAP SCREW, 1/4"-20 X 3/4 HEX	
80	119-1	7	• FLAT WASHER, 1/4" SAE	
90	982730	1	• DEFROST COVER, DASH FLOOR PANEL	
100	102-205-1A	4	• CAP SCREW, 3/8"-16 X 1.0 HEX	
110	119-3	4	• FLAT WASHER, 3/8" SAE	
120	982698	1	• BOLT PLATE, STRIKER	
130	102-5-1A	2	• CAP SCREW, 1/4"-20 X 1.0 HEX	
140	119-1	2	• FLAT WASHER, 1/4" SAE	
150	982416	1	• BOLT, STRIKER, 2.025"	
160	116-4	1	• NUT, 7/16"-14 HEX	
170	120-4	1	• FLAT WASHER, 7/16" USS	

Articulation Sensor Assembly

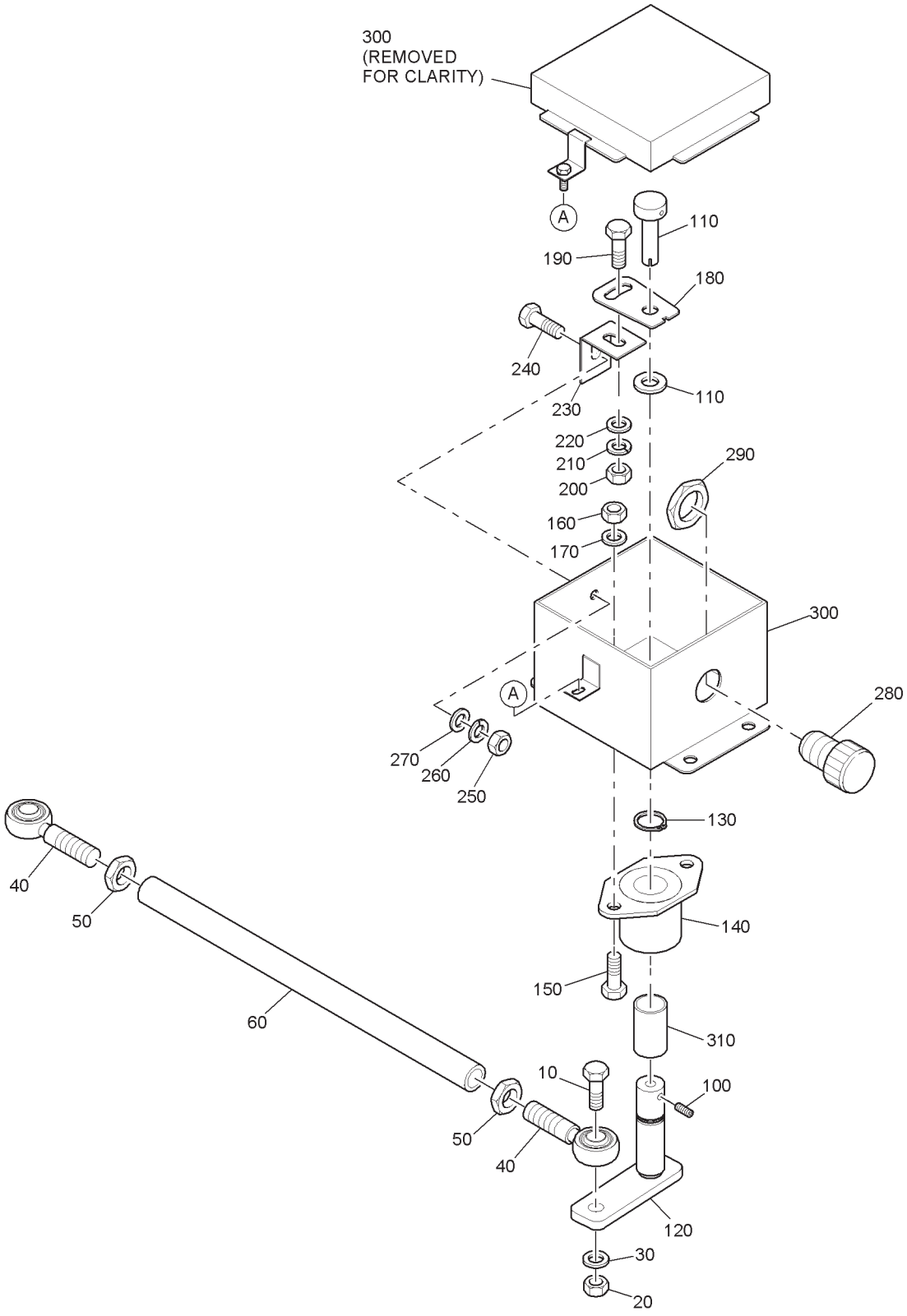


Figure 10-42

Articulation Sensor Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
42				
-1	30NONUMBER2	REF	ARTICULATION SENSOR ASSEMBLY	
10	102-106-1A	1	• CAP SCREW, 5/16"-18 X 1-1/4 HEX	
20	143-2	1	• LOCKNUT, 5/16" HEX	
30	119-2	1	• FLAT WASHER, 5/16" SAE	
40	983370	2	• HEIM JOINT, ROD END	
50	115-2	2	• NUT, 5/16"-24 JAM	
60	984266	1	• ROD, ARTICULATION LEVER	
100	81204	1	• SETSCREW, HEX SOCKET, 10-24 X 0.25", CUP	
110	34477	1	• POTENTIOMETER WITH WASHER, 250 OHM	
120	985784	1	• PIN ASSEMBLY, ARTICULATION ROD MOUNTING	
130	985786	1	• RETAINING RING, EXTERNAL, 0.625"	
140	985785	1	• POD ASSEMBLY, ARTICULATION ROD	
150	81057	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
160	116-1	2	• NUT, 1/4'-20 HEX	
170	119-1	2	• FLAT WASHER,1/4'' SAE	
180	983558	1	• ADJUSTER PLATE, ARTICULATION SENSOR	
190	102-3-1A	2	• CAP SCREW, 1/4"-20 X 3/4 HEX	
200	116-1	2	• NUT, 1/4-20 HEX	
210	118-1	2	• LOCKWASHER, 1/4"	
220	119-1	2	• FLAT WASHER, 1/4" SAE	
230	983557	1	• ANGLE, SENSOR MOUNTING	
240	102-3-1A	1	• CAP SCREW, 1/4"-20 X 3/4 HEX	
250	116-1	1	• NUT, 1/4-20 HEX	
260	118-1	1	• LOCKWASHER, 1/4"	
270	119-1	1	• FLAT WASHER, 1/4" SAE	
280	3200DI	1	• CONNECTOR, WATER TIGHT, 1/2 X 1/2"	
290	LN010	1	• LOCKNUT, 1/2" CONDUIT	
300	984433	1	• ENCLOSURE, FUSE PANEL, 4" X 6"	
310	982882	1	• BUSHING, T85 VALVE LEVER, COMPOSITE 0.813x0.688x1.0	

Rear Frame Assembly

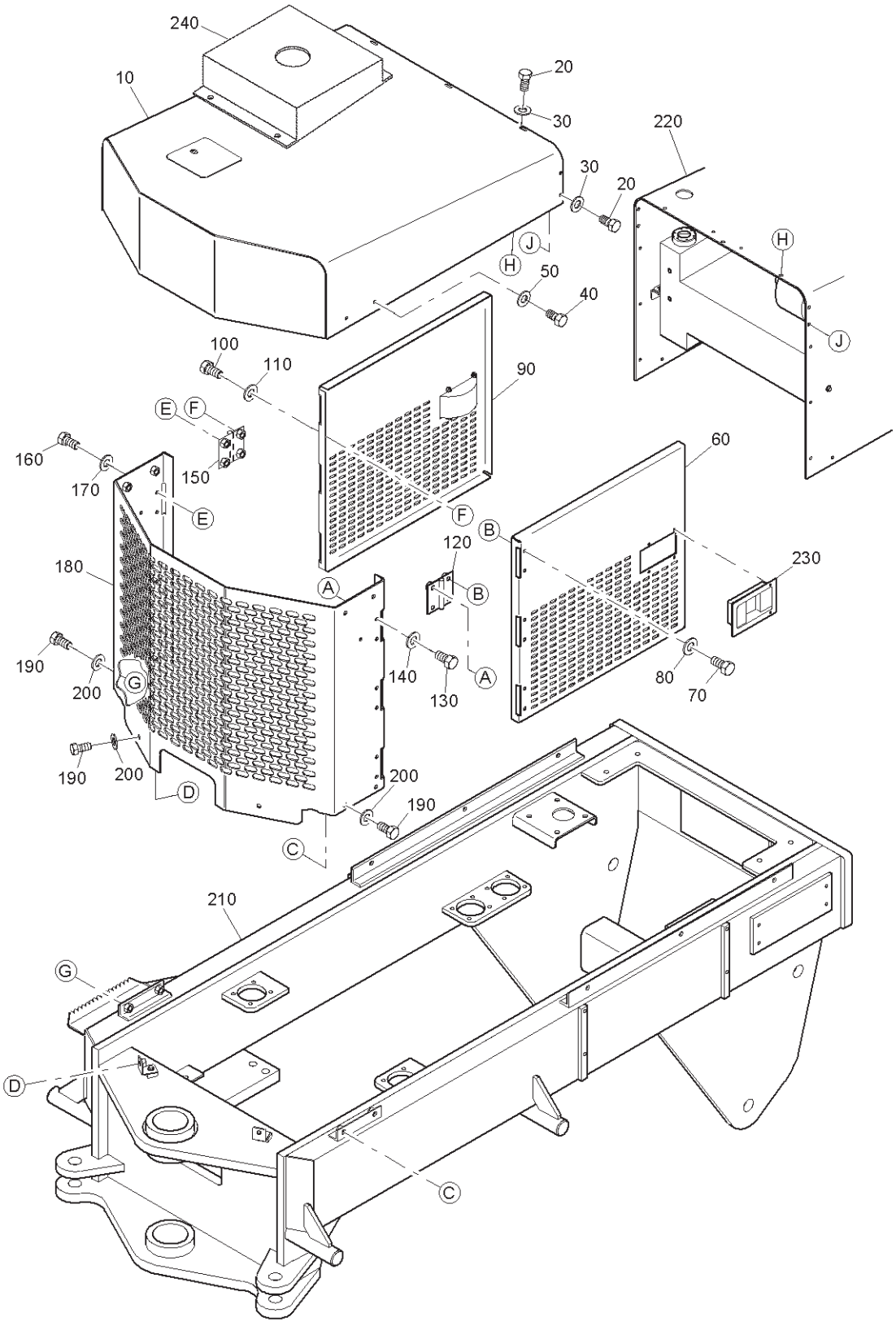


Figure 10-43

Rear Frame Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
43				
-1	5NONUMBER80	REF	REAR FRAME ASSEY (SEE IPL Figure 10-5 FOR NHA)	
10	983357	1	• HOOD, FRONT ENGINE	
20	102-205-1A	7	• CAP SCREW, 3/8"-16 X 1.0 HEX	
30	118-3	7	• LOCKWASHER, 3/8"	
40	102-405-1A	4	• CAP SCREW, 1/2"-13 X 1.0 HEX	
50	118-5	4	• LOCKWASHER, 1/2"	
60	981641	1	• PLATE, ACCESS DOOR, LEFT-HAND	
70	102-205-1A	6	• CAP SCREW, 3/8"-16 X 1.0 HEX	
80	118-3	6	• LOCKWASHER, 3/8"	
90	981482	1	• PLATE, ACCESS DOOR, RIGHT-HAND	
100	102-205-1A	6	• CAP SCREW, 3/8"-16 X 1.0 HEX	
110	118-3	6	• LOCKWASHER, 3/8"	
120	980316	3	• HINGE, COVER	
130	102-405-1A	2	• CAP SCREW, 1/2"-13 X 1.0 HEX	
140	118-5	2	• LOCKWASHER, 1/2"	
150	980316	3	• HINGE, COVER	
160	102-405-1A	2	• CAP SCREW, 1/2"-13 X 1.0 HEX	
170	118-5	2	• LOCKWASHER, 1/2"	
180	981478	1	• PLATE, RADIATOR GUARD	
190	102-405-1A	4	• CAP SCREW, 1/2"-13 X 1.0 HEX	
200	118-5	4	• LOCKWASHER, 1/2"	
210	982849	1	• FRAME WELDMENT	
220	983360	1	• HOOD ASSEMBLY, REAR FRAME MOUNT	
230	160450	2	• LATCH, ENGINE ACCESS PANEL	
240	1001085	1	• MOUNT, W//M, 785 MUFFLER	
	983124		KIT, INSULATION, COVERS	

Rear Frame Assembly

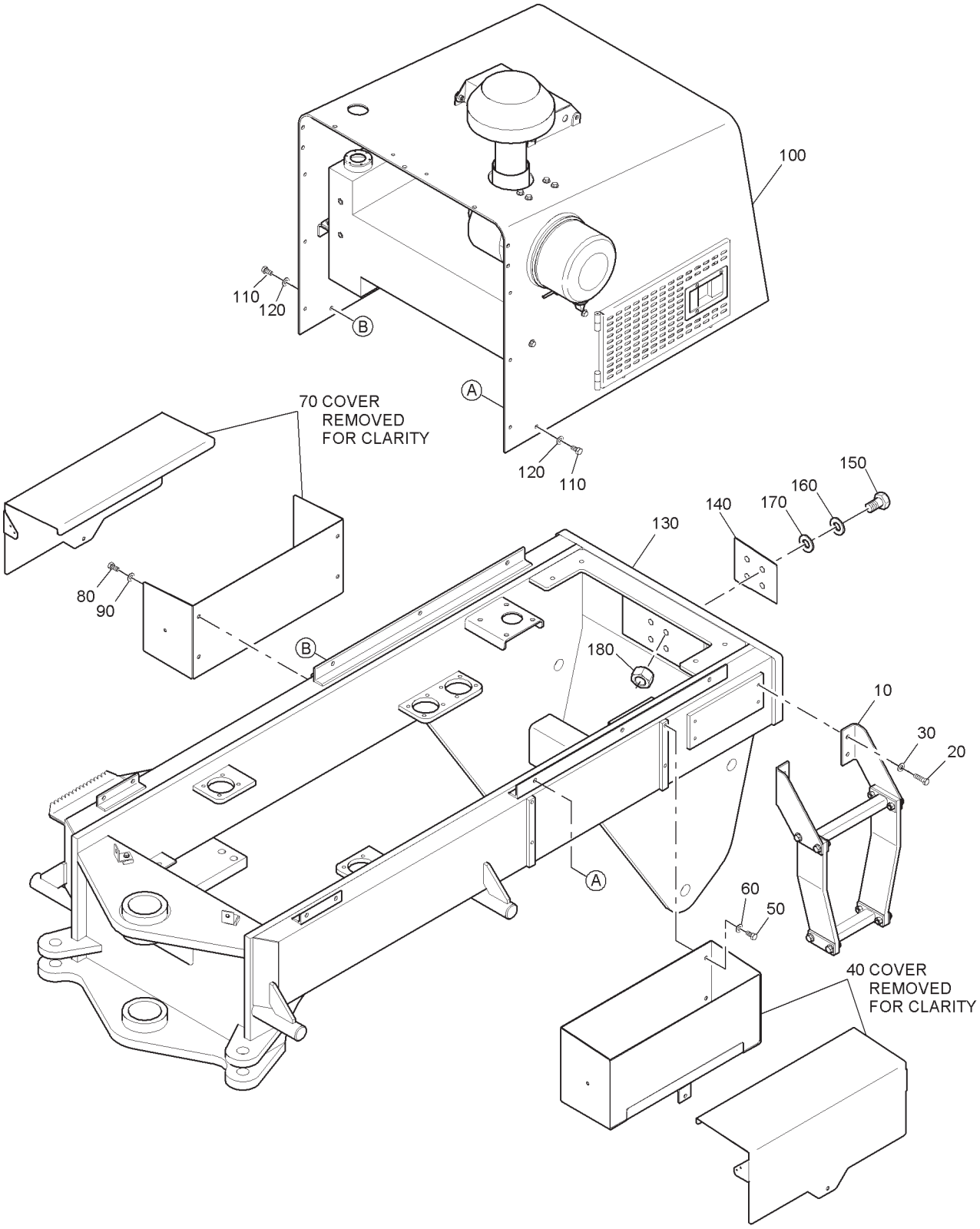


Figure 10-44

Rear Frame Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
44				
-1	5NONUMBER80	REF	REAR FRAME ASSY (SEE IPL Figure 10-5 FOR NHA)	
10	983367	1	• REAR STAIRWAY ASSEMBLY (SEE IPL Figure 10-54 FOR BREAKDOWN)	
20	102-303-1A	4	• CAP SCREW, 7/16"-14 X 3/4 HEX	
30	118-4	4	• LOCKWASHER, 7/16"	
40	982522	1	• TOOLBOX ASSEMBLY, FRAME-MOUNTED (SEE IPL Figure 10-37 FOR BREAKDOWN)	
50	102-403-1A	4	• CAP SCREW, 1/2"-13 X 3/4 HEX	
60	118-5	4	• LOCKWASHER, 1/2"	
70	982255	1	• BOX ASSEMBLY, BATTERY (SEE IPL Figure 10-37 FOR BREAKDOWN)	
80	102-403-1A	4	• CAP SCREW, 1/2"-13 X 3/4 HEX	
90	118-5	4	• LOCKWASHER, 1/2"	
100	983360	1	• HOOD ASSEMBLY, REAR FRAME (SEE IPL Figure 10-18 FOR BREAKDOWN)	
110	102-405-1A	6	• CAP SCREW, 1/2"-13 X 1.0 HEX	
120	118-5	6	• LOCKWASHER, 1/2"	
130	982849	REF	• FRAME WELDMENT	
140	100180	1	• PINTLE HITCH	
150	102-408-1A	4	• CAP SCREW, 1/2”-13 X 1 3/4” HEX	
160	118-5	4	• LOCKWASHER, 1/2”	
170	119-5	4	• FLAT WASHER, 1/2”	
180	143-5	4	• LOCKNUT, 1/2”-13 HEX	

Engine, Transmission, & Radiator Mount (Sh. 1 Of 3)

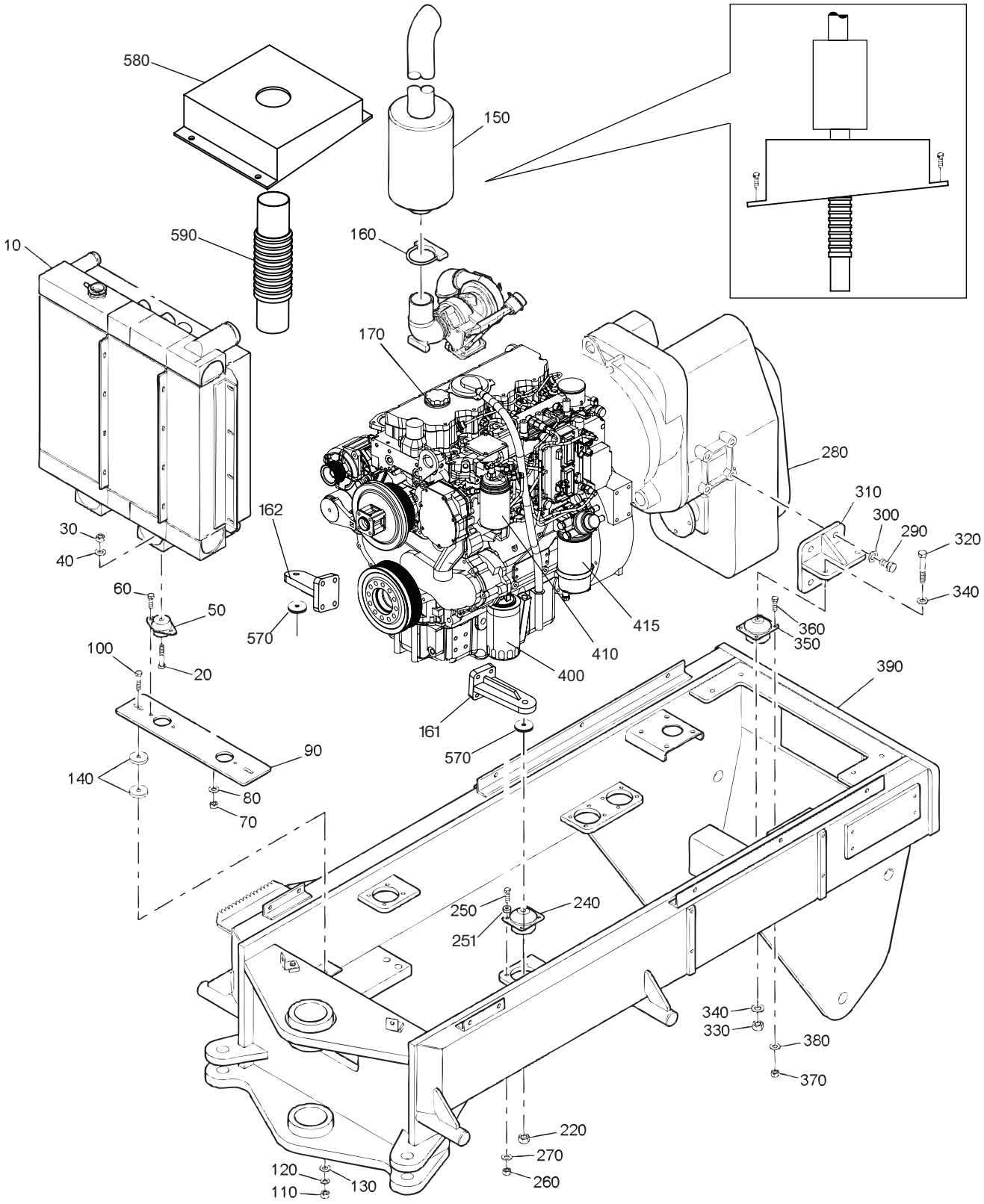


Figure 10-45

Engine, Transmission, & Radiator Mount (Sh. 1 Of 3) Parts List

Item No.	Part Number	Qty.	Description	Remarks
45				
-1	5NONUMBER80.	REF	REAR FRAME AND ENGINE ASSEY (SEE IPL Figure 10-5 FOR NHA)	
10	982876	1	• RADIATOR ASSEMBLY, CHARGE AIR (SEE IPL Gearbox Assembly FOR BREAKDOWN)	
20	102-413-1A	2	• CAP SCREW, 1/2"-13 X 3.0 HEX	
30	116-5	2	• NUT, 1/2"-13 HEX	
40	118-5	2	• LOCKWASHER, 1/2"	
50	700580	2	• MOUNTING PAD, RADIATOR (635B)	
60	102-206-1A	2	• CAP SCREW, 3/8"-16 X 1.25 HEX	
70	116-3	2	• NUT, 3/8"-16 HEX	
80	118-3	2	• LOCKWASHER, 3/8"	
90	981806	1	• SUPPORT PLATE, RADIATOR	
100	102-410-1A	2	• CAP SCREW, 1/2"-13 X 2.25 HEX	
110	116-5	2	• NUT, 1/2"-13 HEX	
120	118-5	2	• LOCKWASHER, 1/2"	
130	119-5	2	• FLAT WASHER, 1/2" SAE	
140	853393	4	• FLAT WASHER, 2.25 OD X 5/8" ID	
150	1001086	1	• MUFFLER ASSEMBLY, 3.0 X 24-INCH TAILPIPE	
160	161250	1	• CLAMP, MUFFLER, 3.0"	
161	986324	1	• ENGINE MOUNT,RH ASSY	
162	986325	1	• ENGINE MOUNT,LH ASSY	
170	988536	1	• ENGINE ASSEMBLY, 130 HP, CAT	Up to SN 71490
170	1006641	1	• ENGINE ASSEMBLY, 130 HP, CAT	After SN 71491
220	143-7	2	• LOCKNUT, 5/8"-11	
240	982891	2	• ENGINE ISOLATOR, RUBBER	
250	102-206-1A	2	• CAP SCREW, 3/8"-16 X 1.25 HEX	
251	986332	4	• SPACER,ENGINE MOUNT,3054CAT	
260	116-3	2	• NUT, 3/8" HEX	
270	118-3	2	• LOCKWASHER, 3/8"	
280	987322	1	• TRANSMISSION, POWER SHIFT, 2400	
290	102-709-1A	8	• CAP SCREW, 3/4"-10- X 2.0 HEX	
300	118-8	8	• LOCKWASHER, 3/4"	
310	985755	2	• MOUNT ASSEMBLY, TRANSMISSION	
320	102-619-1A	2	• CAP SCREW, 5/8"-11 X 4.5 HEX	
330	143-7	2	• LOCKNUT, 5/8"-11	
340	119-7	4	• FLAT WASHER, 5/8" SAE	
350	982891	4	• ENGINE ISOLATOR, RUBBER	
360	102-206-1A	2	• CAP SCREW, 3/8"-16 X 1.25 HEX	

Engine, Transmission, & Radiator Mount (continued) (Sh. 1 Of 3)

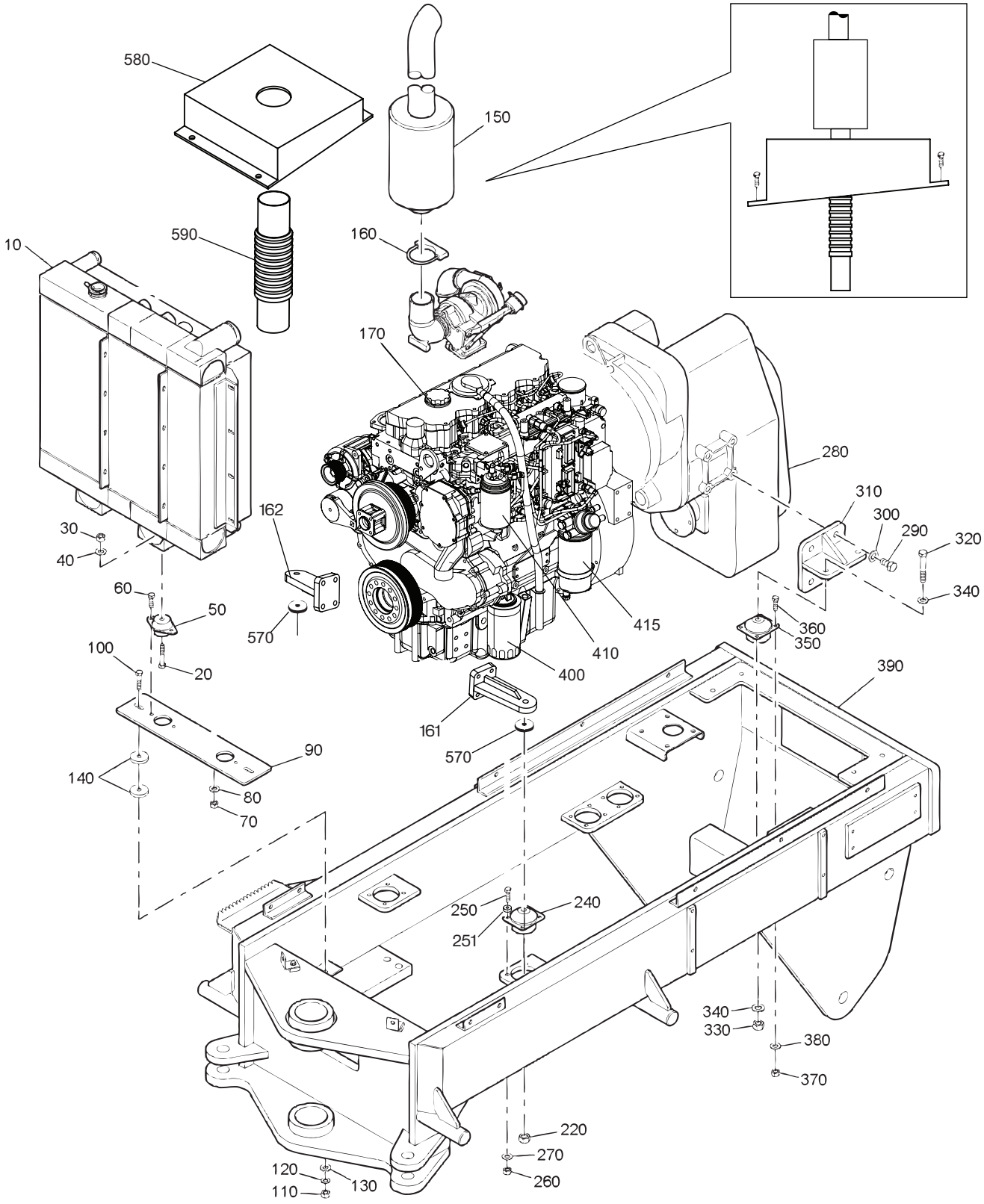


Figure 10-45

Engine, Transmission, & Radiator Mount (continued) (Sh. 1 Of 3) Parts List

Item No.	Part Number	Qty.	Description	Remarks
370	116-3	2	• NUT, 3/8"-16 HEX	
380	118-3	2	• LOCKWASHER, 3/8"	
390	982849	REF	• FRAME WELDMENT	
400	988536-02	1	• FILTER, ENGIN OIL	
410	988536-03	1	• FILTER, FUEL	
415	988536-04	1	• FILTER, WATER SEPERATOR	
-560	989781	REF(1)	• COMPRESSOR ASSEMBLY	
570	986332	2	• SPACER	
580	1001085	1	• MOUNT, W/M, 785 MUFFLER	
590	160240-12	1	• PIPE, EXH, FLEXIBLE, 3.00 X 12.00 | 685	

Engine, Transmission, & Radiator Mount (Sh. 2 Of 3)

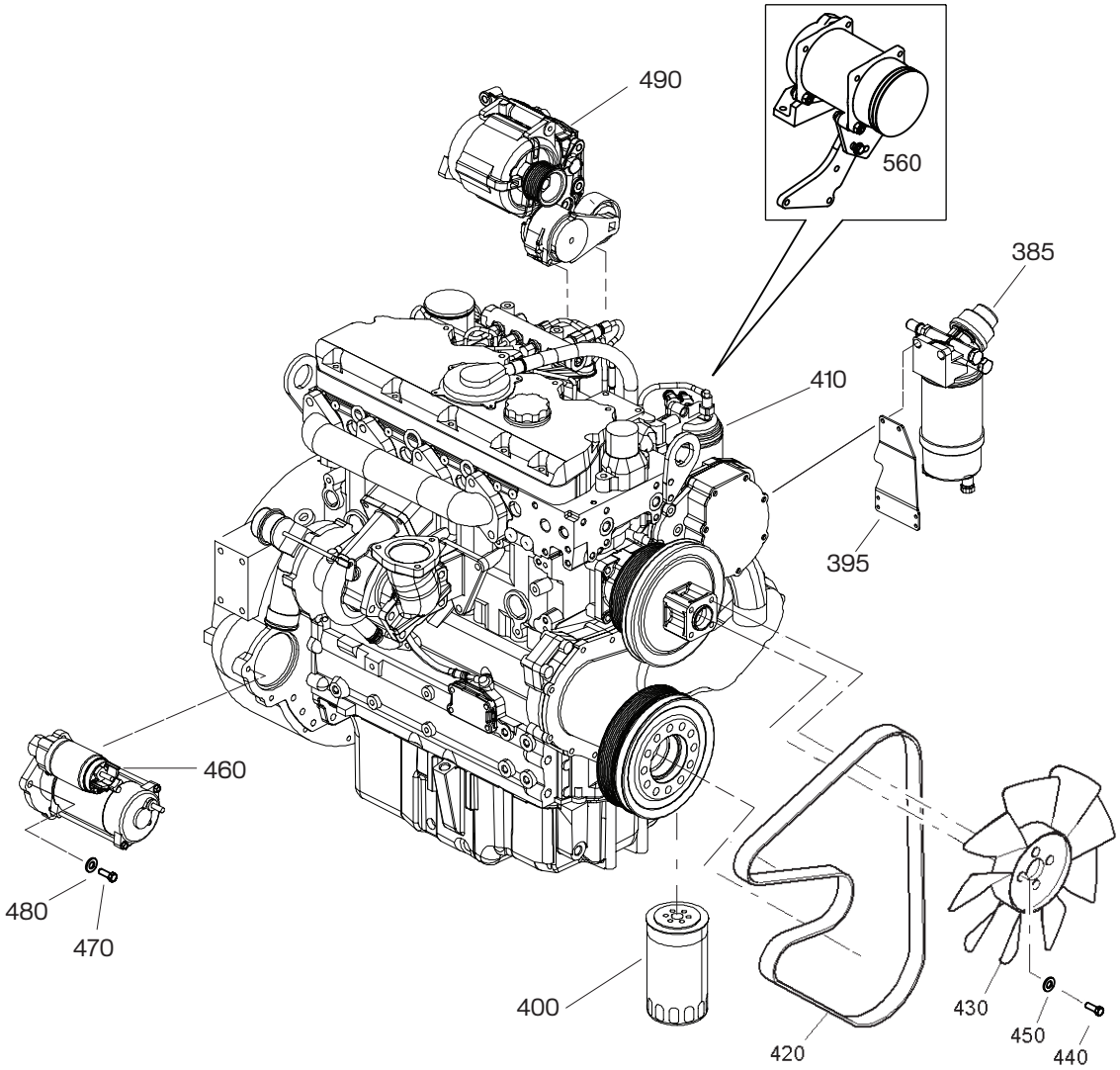


Figure 10-46

Engine, Transmission, & Radiator Mount (Sh. 2 Of 3) Parts List

Item No.	Part Number	Qty.	Description	Remarks
46				
385	988536-03	REF	• FILTER, FUEL	
395	1001575	1	• FUEL FILTER MOUNTING PLATTE	
400	988536-02	REF	• FILTER, ENGIN OIL	
420	988536-05	1	• DRIVE BELT, ENGINE, CAT T3	
430	987137	1	• FAN, ENGINE, 23-INCH	
440	80946	4	• CAP SCREW, M10-1.50 X 75MM HEX	
450	320142	4	• LOCKWASHER, M10	
460	982859-04	1	• STARTER, ELECTRIC	
470	80516	4	• CAP SCREW, M10-1.5 X 30MM HEX	
480	320142	4	• LOCKWASHER, M10	
490	982859-02	1	• ALTERNATOR	
-500	80515	1	• CAP SCREW, M10-1.5 X 25MM HEX	
-510	320142	1	• LOCKWASHER, M10	
-520	80517	1	• CAP SCREW, M08-1.25 X 80MM HEX	
-530	320142	1	• LOCKWASHER, M10	
560	-	1	• COMPRESSOR ASSEMBLY	

Engine, Transmission, & Radiator Mount (Sh. 3 Of 3)

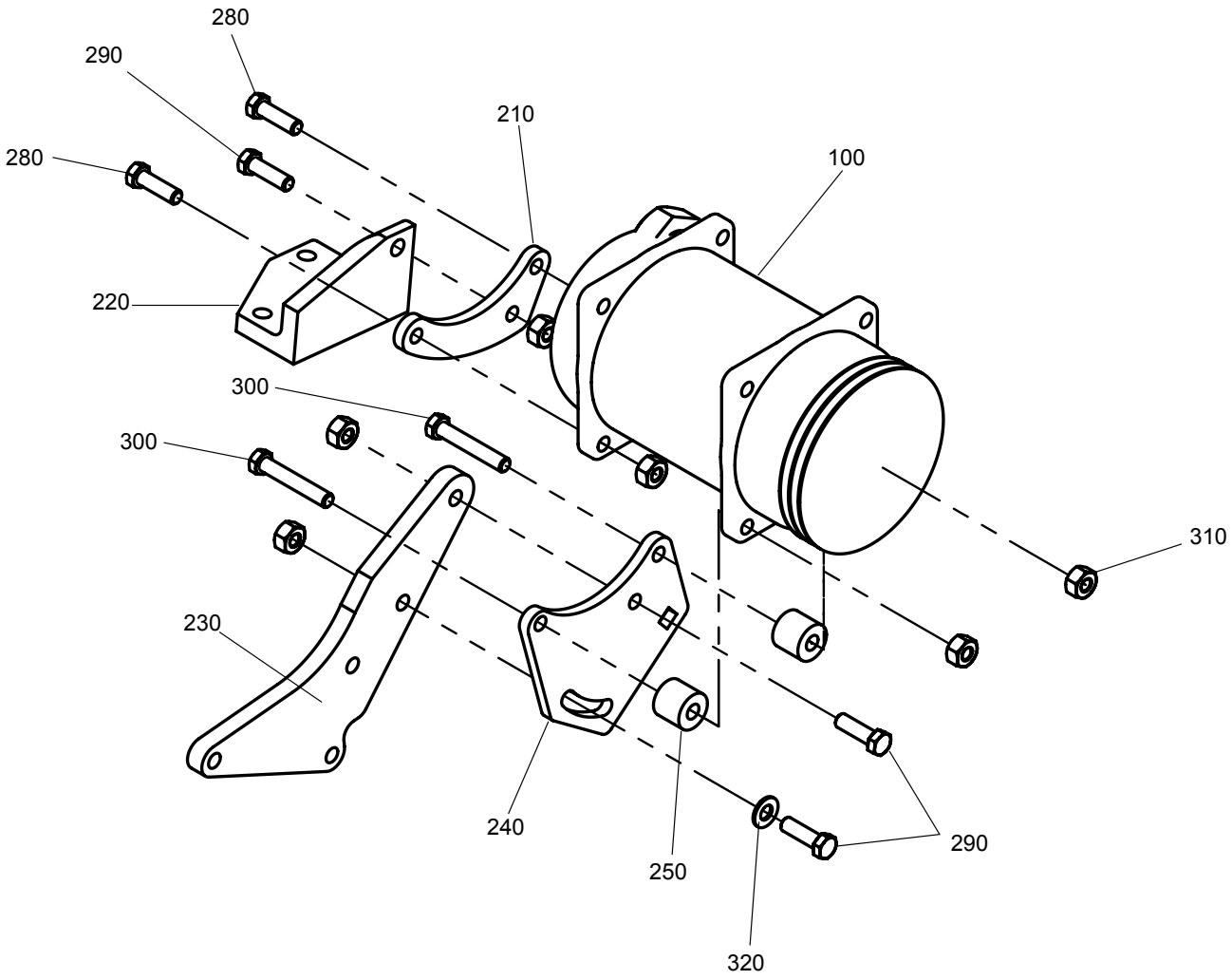


Figure 10-47

Engine, Transmission, & Radiator Mount (Sh. 3 Of 3) Parts List

Item No.	Part Number	Qty.	Description	Remarks
47				
-	5NONUMBER80.	REF	COMPRESSOR ASSEMBLY	
100	P204324	1	• AIR COMPRESSOR UNIT	
210	986303	1	• PLATE, A/C COMP MOUNT	
220	1001171	1	• BRKT, A/C COMP REAR, CAT, T3	
230	1000202	1	• PLATE, A/C COMP FRONT MOUNT, T3	
240	986304	1	• PLATE, A/C COMP BRKT	
250	1001172	1	• TUBE, A/C SPACER, CAT, T3	ID:0.41"
260	982555	1	• TUBE, CONDENSER MOUNT	ID:5/16"
270	989271	1	• V BELT, AIR COMPRESSOR DRIVE, CAT - T3	
280	102-207-1A	2	CSHH,.375-16X1.50,GR5	
290	102-206-1A	3	CSHH,.375-16X1.25,GR5	
300	102-210-1A	2	CSHH,.375-16X2.25,GR5	
310	143-3	6	NUT,LOCK,.375-16	
320	119-3	1	WASHER,FLAT,SAE,.375	

Rear Axle & Frame Assembly

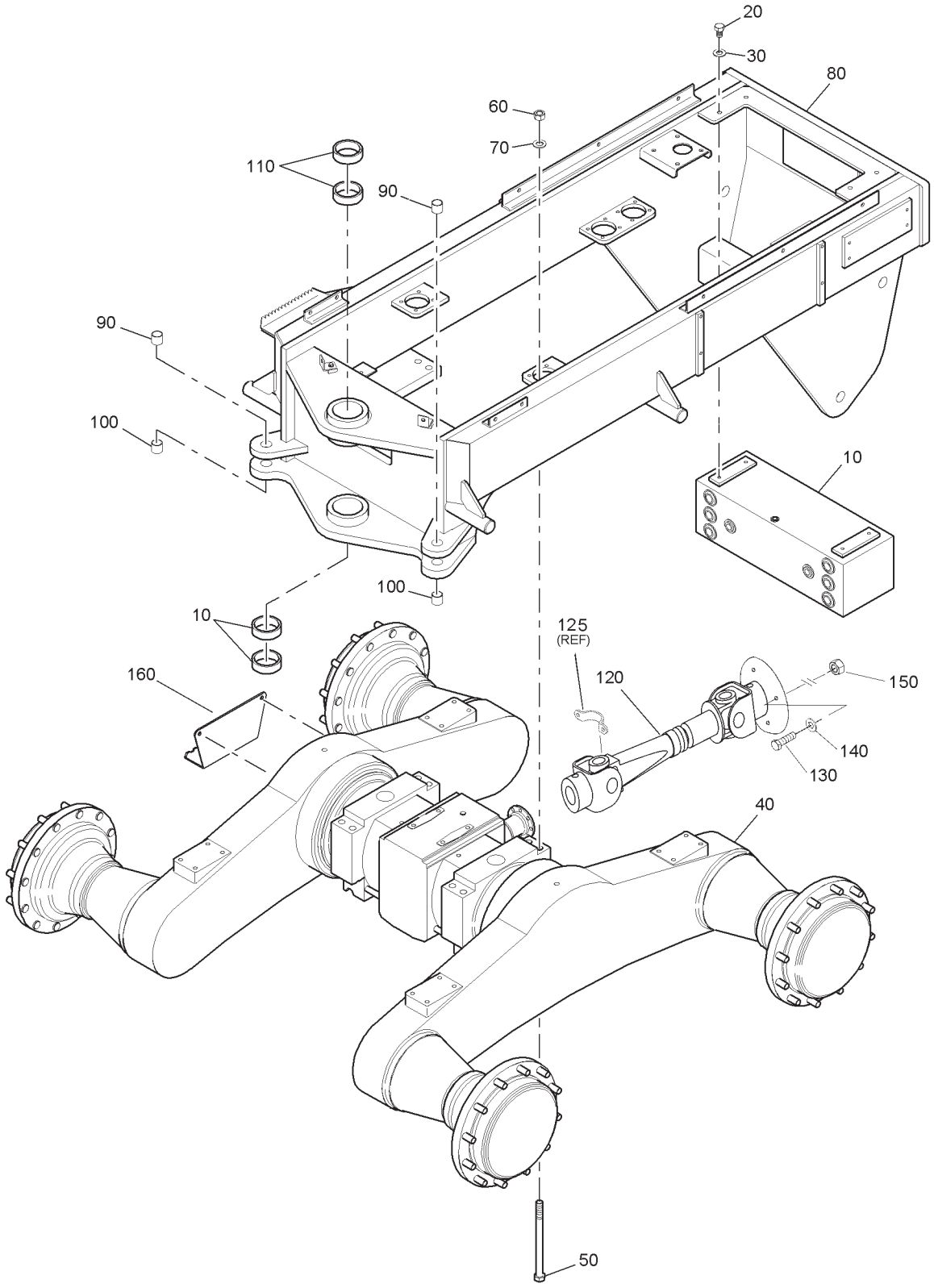


Figure 10-48

Rear Axle & Frame Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
48				
-1	5NONUMBER80	REF	REAR FRAME AND ENGINE ASSEMBLY (SEE IPL Figure 10-4 FOR NHA)	
10	981818	1	• HYDRAULIC TANK ASSEMBLY, LOWER	
20	102-405-1A	4	• CAP SCREW, 1/2"-13 X 1.0 HEX	
30	118-5	4	• LOCKWASHER, 1/2"	
40	987317	REF	• AXLE ASSEMBLY, DRIVE	
50	100-850-1A	8	• CAP SCREW, 7/8"-9 X 12.25 HEX	
60	142-9	8	• LOCKNUT, 7/8"-9	
70	119-9	8	• FLAT WASHER, 7/8"	
80	982849	REF	• FRAME WELDMENT	
90	110130	REF(2)	• BUSHING, WHEEL LEAN TIE ROD	
100	983379	REF(2)	• BUSHING, STEEL 1.5”X1.25”X1.25”	
110	983376	REF(4)	• BUSHING, STEEL 4.0”X3.5”X2.5”	
120	982875	1	• REAR DRIVE SHAFT	
125	72535	1	• KIT, AXLE STRAP & BOLT (AXLE END)	
130	102.403.1A	4	• CAP SCREW, 1/2”-13 X	
140	119-5	4	• WASHER, FLAT, 1/2”	
150	116-5	4	• LOCK NUT, 1/2”	
160	982560	1	• PLATE, AXLE MOUNTED STEP	

Hood Assembly

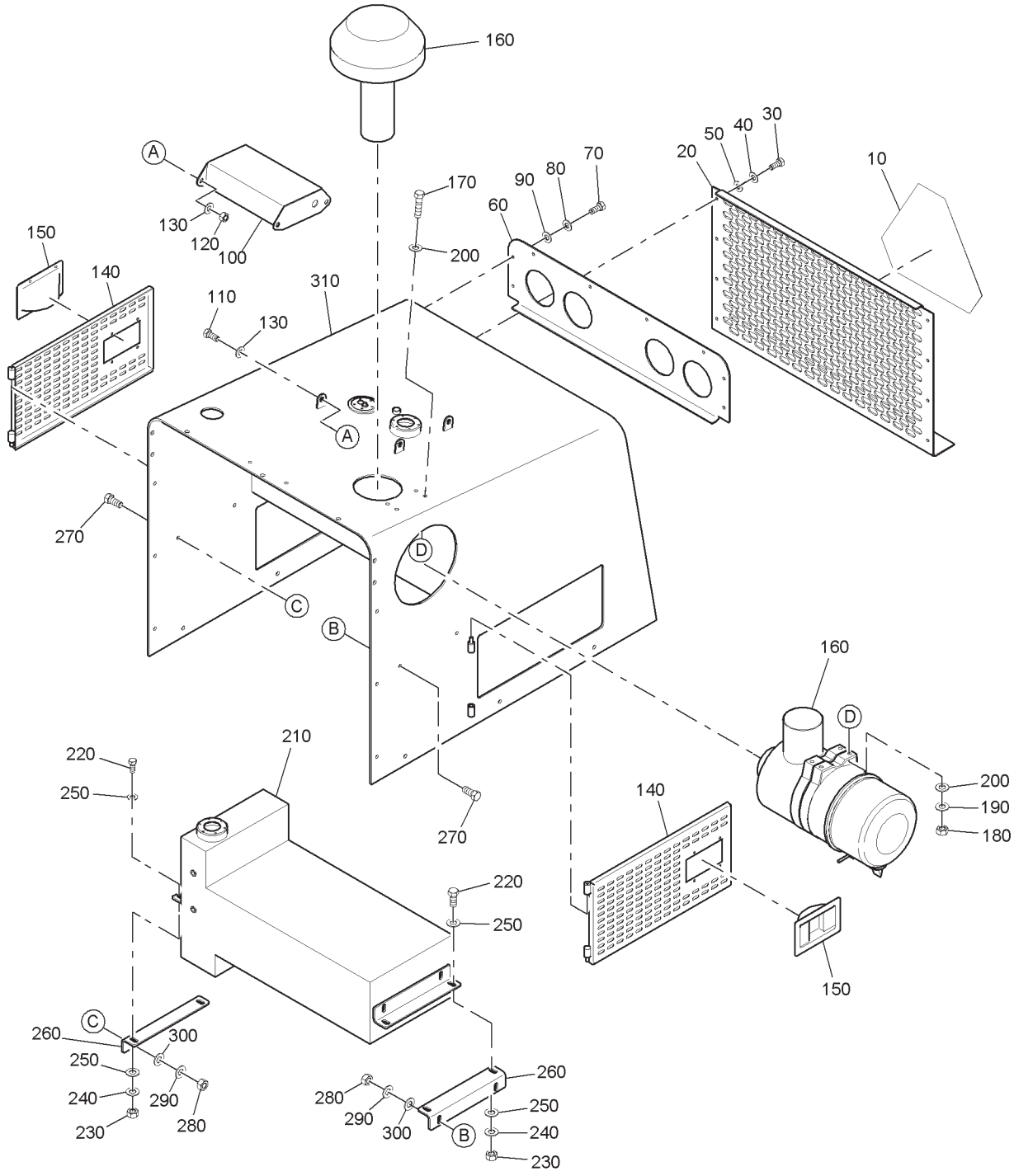


Figure 10-49

Hood Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
49				
-1	983360	REF	HOOD ASSEMBLY, REAR FRAME (SEE IPL Figure 10-44 FOR NHA)	
10	P70036	1	• SIGN, SLOW MOVING VEHICLE	
20	981651	1	• PLATE, REAR GRILL	
30	102-205-1A	8	• CAP SCREW, 3/8"-16 X 1 HEX	
40	118-3	8	• LOCKWASHER, 3/8"	
50	119-3	8	• FLAT WASHER, 3/8" SAE	
60	981650	1	• PLATE, TAIL LIGHT MOUNT	
70	102-205-1A	8	• CAP SCREW, 3/8"-16 X 1 HEX	
80	118-3	8	• LOCKWASHER, 3/8"	
90	119-3	8	• FLAT WASHER, 3/8" SAE	
100	982798		• COVER	
110	102-406-1A	2	• CAP SCREW, 1/2"-13 X 1-1/4 HEX	
120	143-5	2	• LOCK NUT, 1/2"-13	
130	119-5	4	• FLAT WASHER, 1/2" SAE	
140	982837	2	• PLATE, REAR ACCESS DOOR	
150	160450	2	• LATCH, ENGINE ACCESS PANEL	
160	983543	1	• AIR CLEANER AND INLET ASSEMBLY (SEE IPL Figure 10-44 FOR BREAKDOWN)	
170	102-209-1A	4	• CAP SCREW, 3/8"-16 X 2 HEX	
180	116-3	4	• NUT, 3/8"-16 HEX	
190	118-3	4	• LOCKWASHER, 3/8"	
200	119-3	8	• FLAT WASHER, 3/8" SAE	
210	981647		• TANK ASSEMBLY, UPPER HYDRAULIC (SEE IPL Figure 10-36 FOR BREAKDOWN)	
220	102-406-1A	4	• CAP SCREW, 1/2"-13 X 1-1/4 HEX	
230	116-5	4	• NUT, 1/2"-13 HEX	
240	118-5	4	• LOCKWASHER, 1/2"	
250	119-5	8	• FLAT WASHER, 1/2" SAE	
260	981648	2	• MOUNTING PLATE, HYDRAULIC TANK	
270	102-406-1A	2	• CAP SCREW, 1/2"-13 X 1-1/4 HEX	
280	116-5	2	• NUT, 1/2"-13 HEX	
290	118-5	2	• LOCKWASHER, 1/2"	
300	119-5	2	• FLAT WASHER, 1/2" SAE	
310	983360	1	• HOOD ASSEMBLY, REAR FRAME MOUNT	
	160030A		LIGHT, TAIL, RED	
	160030A2		PIGTAIL, TAIL LAMP	

Air Cleaner Assembly

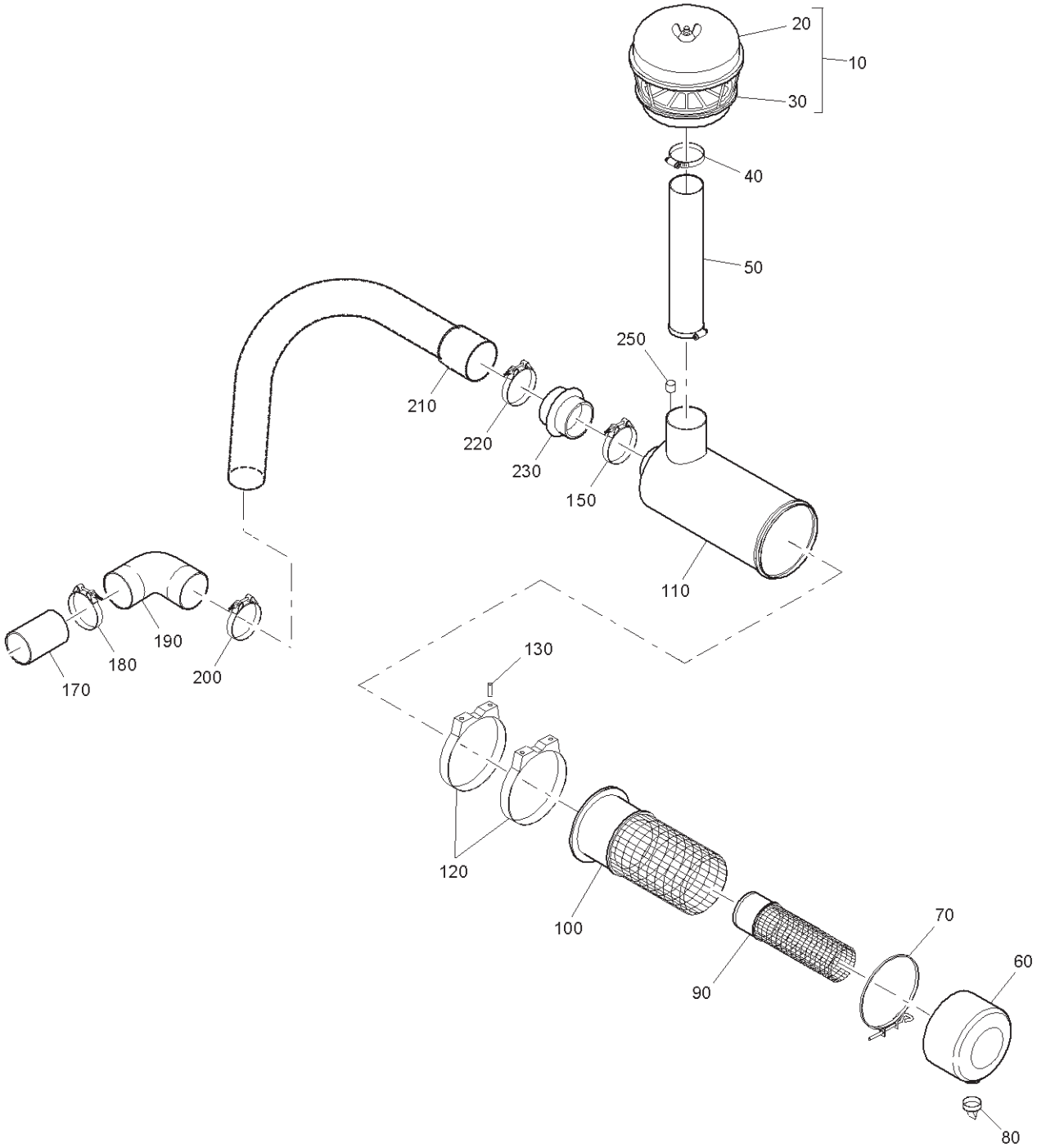


Figure 10-50

Air Cleaner Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
50				
-1	953521247	REF	AIR CLEANER ASSEMBLY (SEE IPL Figure 10-49 FOR NHA)	
-10	983546	1	• INTAKE ASSEMBLY	
20	983543-07	1	• COVER, INTAKE	
30	983543-06	1	• INTAKE HOUSING	
40	851437	1	• HOSE CLAMP, SCREW TYPE	
50	983545	1	• INLET TUBE, FLEXIBLE	
60	983543-04	1	• CAP, AIR CLEANER	
70	983543-03	1	• CLAMP BAND, CAP	
80	983543-05	1	• VACUATOR VALVE, AIR CLEANER	
90	983543-02	1	• AIR CLEANER, INNER	
100	983543-01	1	• AIR CLEANER, OUTER	
110	983543	1	• HOUSING, AIR CLEANER	
120	983544	2	• MOUNTING BAND, AIR CLEANER	
130	28905	4	• SCREW	
150	853521170	1	• FITTING, DOUBLE MALE	
170	986891	1	• ADAPTER, INSERT	
180	953521243	1	• CLAMP, SCREW-TYPE	
190	987528	1	• ELBOW, REDUCER	
200	953521243	1	• CLAMP, SCREW-TYPE	
210	986939-04	1	• INTAKE TURBO (KIT ITEM SEE IPL Figure 10-55)	
220	953521243	1	• CLAMP, SCREW-TYPE, 3”	
240	953521243	1	• CLAMP, SCREW-TYPE, 4”	
250	983275	1	• INDICATOR, AIR RESTRICTION	

Upper Hydraulic Reservoir Assembly

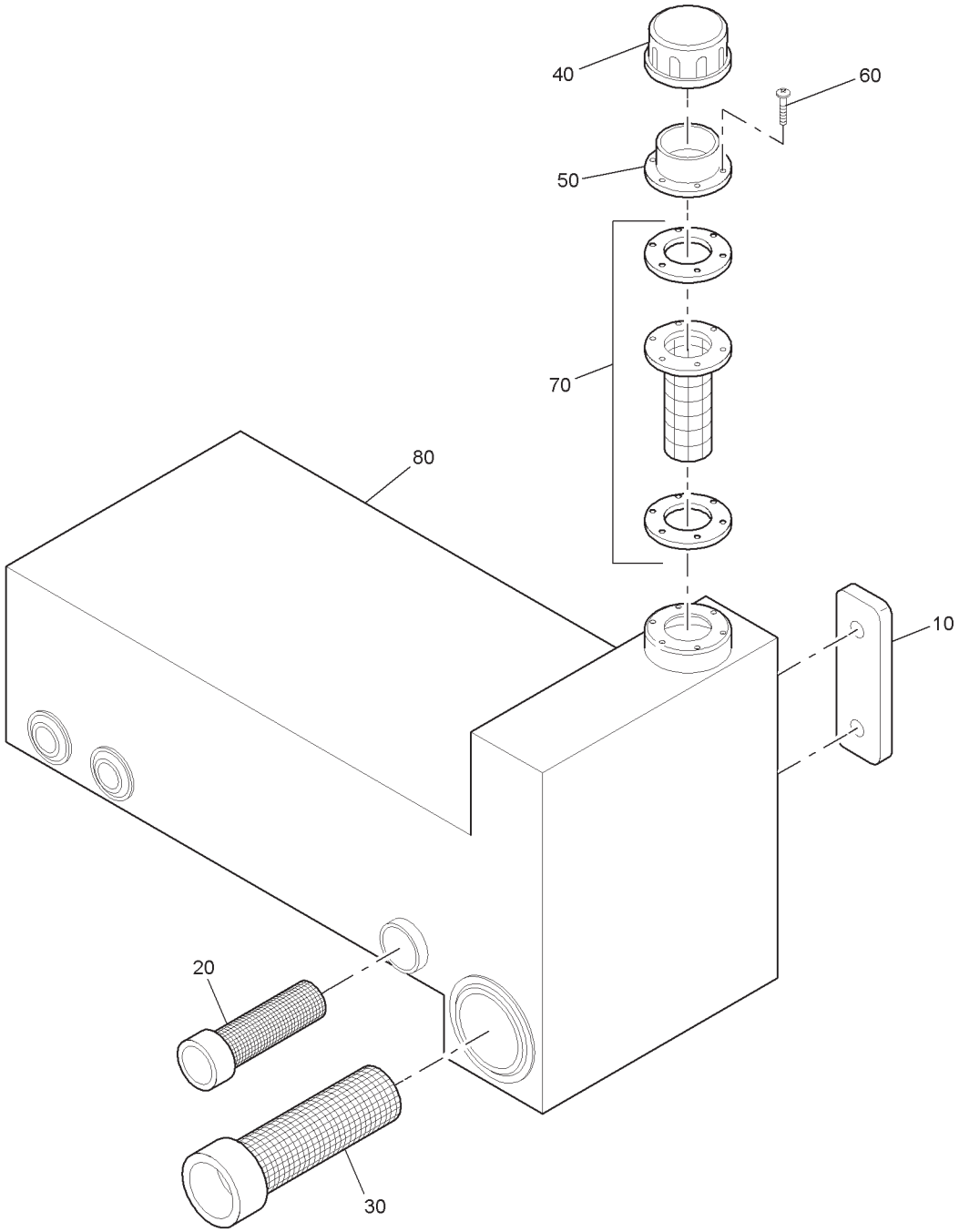


Figure 10-51

Upper Hydraulic Reservoir Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
51				
-1	981647	REF	UPPER HYDRAULIC RESERVOIR ASSEMBLY (SEE IPL Figure 10-49 FOR NHA)	
10	500070	1	• GAUGE, HYDRAULIC OIL LEVEL AND TEMPERATURE	
20	36123	1	• STRAINER, HYDRAULIC OIL SUCTION	
30	980630	1	• FILTER, STRAINER	
40	140030HL	1	• CAP, LOCKABLE HYDRAULIC OIL TANK	
50	140030FN	1	• FILLER NECK, HYDRAULIC OIL/FUEL CAP	
60	81160	6	• SCREW, SELF TAPPING, 10 X 1.0"	
70	140030GK	1	• STRAINER AND GASKET KIT	
80	981647	1	• TANK, HYDRAULIC	

Battery Box & Tool Box Assemblies (Sh. 1 Of 2)

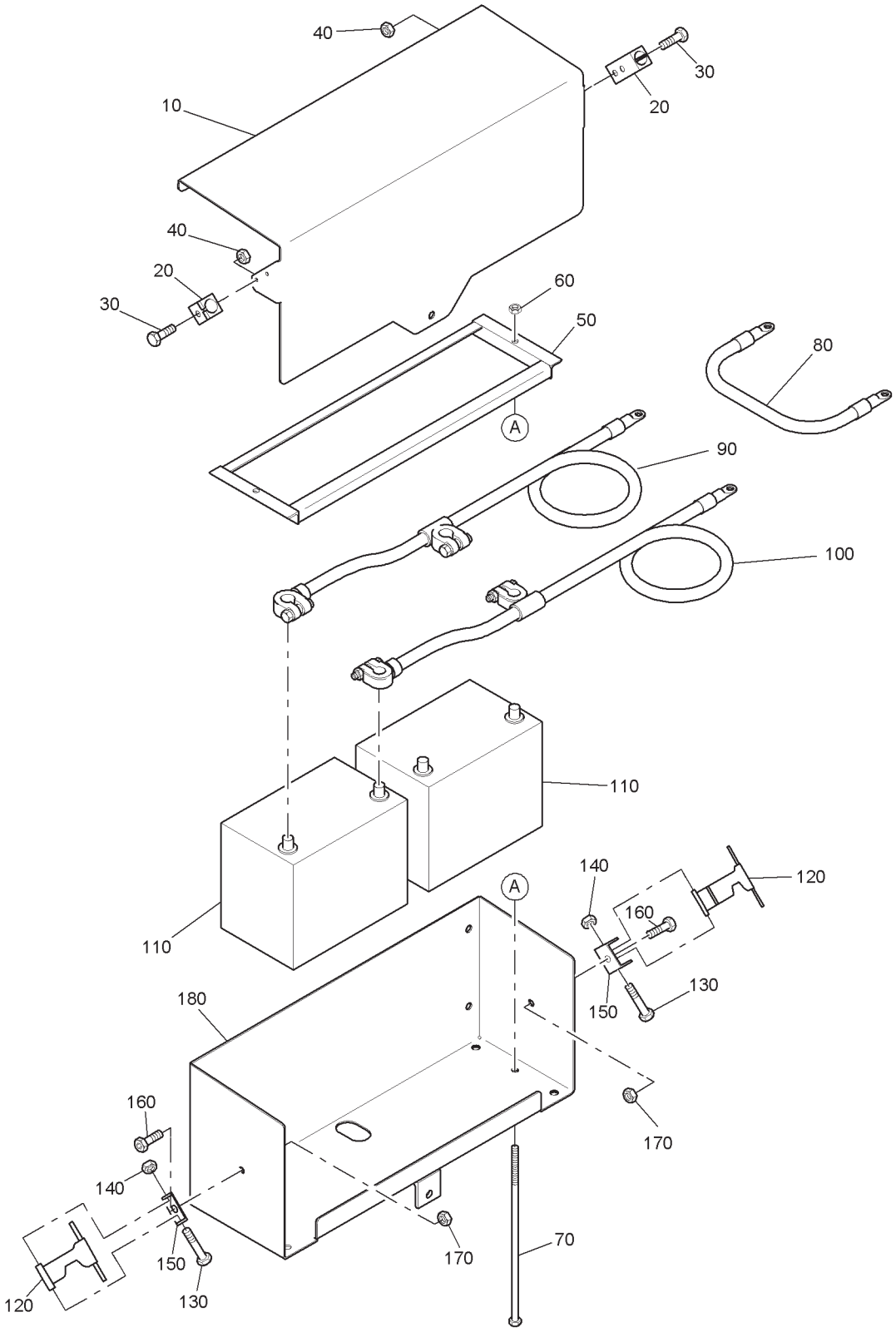


Figure 10-52

Battery Box & Tool Box Assemblies (Sh. 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
52				
-1	38NONUMBER1	REF	BATTERY BOX AND TOOL BOX ASSEMBLIES (SEE IPL Figure 10-44 FOR NHA)	
10	982254	1	• TOP PLATE, BATTERY BOX	
20	007020098	2	• BRACKET, HOOD	
30	871052400	2	• MACHINE SCREW, RIGHT-HAND, 10-24 X 0.50"	
40	80924	2	• NUT, FLEXLOC, 10-24, FULL	
50	982962	1	• HOLDDOWN ASSEMBLY, BATTERY	
60	143-3	2	• LOCKNUT, 3/8"-16 HEX	
70	80393	2	• CAP SCREW, 3/8"-16 X 9.5 HEX	
80	983561	1	• GROUND CABLE, CAB NEGATIVE	
90	983562	1	• BATTERY CABLE, NEGATIVE	
100	983563	1	• BATTERY CABLE, POSITIVE	
110	920152	2	• BATTERY, 12 VOLT, 750 CCA	
120	007020096	2	• HOOK, RUBBER	
130	102-09-1A	4	• CAP SCREW, 1/4"-20 X 2” HEX	
140	143-1	1	• LOCKNUT, 1/4”-20	
150	007020097	2	• BRACKET, ANCHOR	
160	102-103-1A	1	• CAP SCREW, 5/16" X 3/4 HEX	
170	143-2	1	• LOCKNUT, 1/4"-20, HEX, GRADE 5	
180	982255	1	• BOX ASSEMBLY, BATTERY	

Battery Box & Tool Box Assemblies (Sh. 2 Of 2)

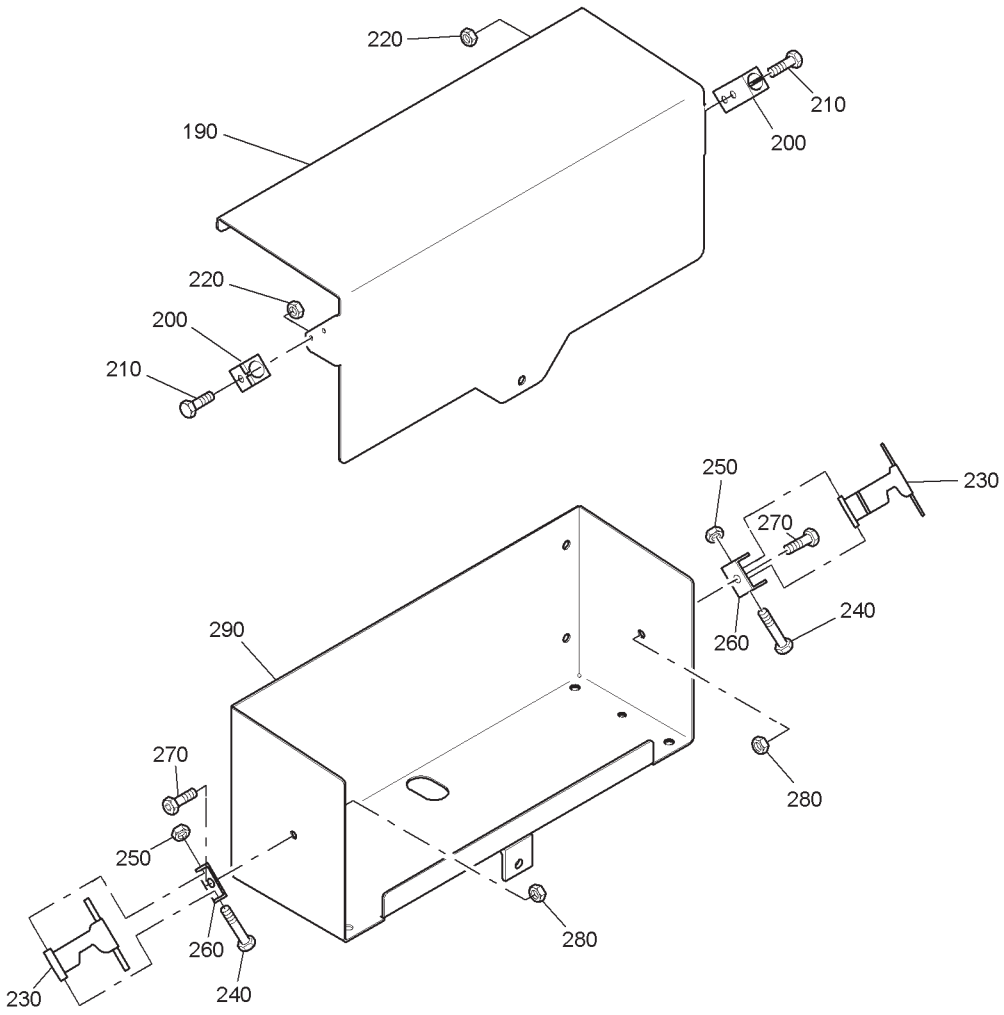


Figure 10-53

Battery Box & Tool Box Assemblies (Sh. 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
53				
190	982254	1	• TOP PLATE, TOOL BOX	
200	007020098	2	• BRACKET, HOOD	
210	871052400	2	• MACHINE SCREW, RIGHT-HAND, 10-24 X 0.50"	
220	80924	2	• NUT, FLEXLOC, 10-24, FULL	
230	007020096	2	• HOOK, RUBBER	
240	102-109-1A	1	• CAP SCREW, 5/16"-18 X 2 HEX	
250	143-2	1	• LOCKNUT, 5/16"-18	
260	007020097	2	• BRACKET, ANCHOR	
270	102-1-1A	1	• CAP SCREW, 1/4"-20 X 1/2 HEX, GRADE 5	
280	143-1	1	• LOCKNUT, 1/4"-20, HEX, GRADE 5	
290	982522	1	• TOOLBOX ASSEMBLY, FRAME MOUNT	

Rear Stairway Assembly

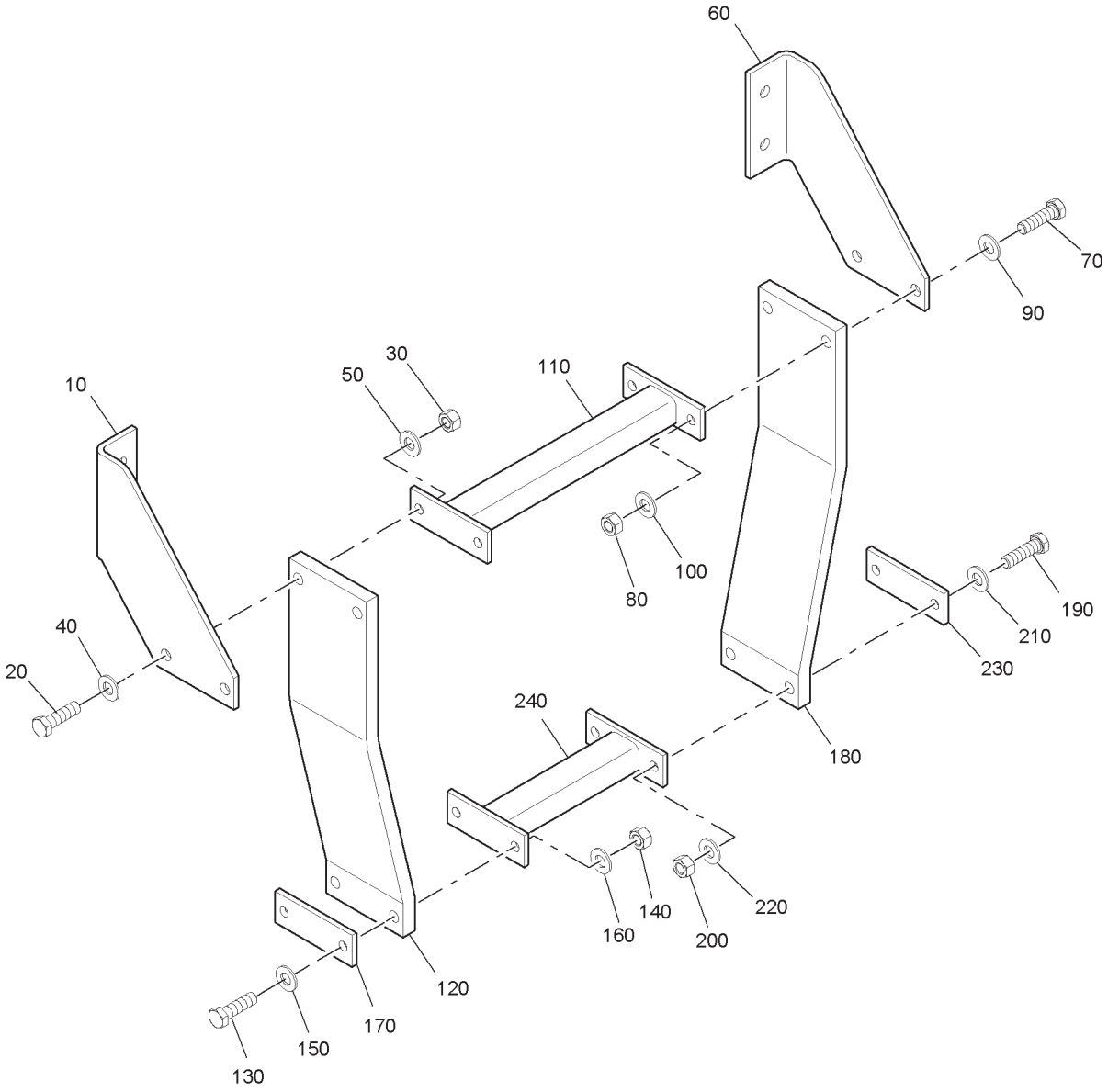


Figure 10-54

Rear Stairway Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
54				
-1	983367	REF	REAR STAIRWAY ASSEMBLY (SEE IPL Figure 10-44 FOR NHA)	
-10	982841	1	• MOUNT PLATE, LH CAB STEP	
20	102-202-1A	2	• CAP SCREW, 3/8"-16 X 1/2 HEX	
30	116-3	2	• NUT, HEX, 3/8"-16	
40	119-3	2	• FLAT WASHER, 3/8" SAE	
50	118-3	2	• LOCKWASHER, 3/8"	
60	982839	1	• MOUNT PLATE, RH CAB STEP	
70	110-208	2	• CAP SCREW, 3/8"-16 X 1 3/4" HEX	
80	116-3	2	• NUT, HEX, 3/8"-16	
90	119-3	2	• FLAT WASHER, 3/8" SAE	
100	118-3	2	• LOCKWASHER, 3/8"	
110	985512	1	• STEP, CAB	
120	983383	1	• RUBBER, FRAME STEP, 5-PLY	
130	102-202-1A	2	• CAP SCREW, 3/8"-16 X 1/2 HEX	
140	116-3	2	• NUT, HEX, 3/8"-16	
150	119-3	2	• FLAT WASHER, 3/8" SAE	
160	118-3	2	• LOCKWASHER, 3/8"	
170	982838	1	• MOUNT BAR, END STEP	
180	983383	1	• RUBBER, FRAME STEP, 5-PLY	
190	110-207	2	• CAP SCREW, 3/8"-16 X 1 1/2" HEX	
200	116-3	2	• NUT, HEX, 3/8"-16	
210	119-3	2	• FLAT WASHER, 3/8" SAE	
220	118-3	2	• LOCKWASHER, 3/8"	
230	982838	1	• MOUNT BAR, END STEP	
240	985513	1	• STEP, CAB	

Radiator & Hose Assembly

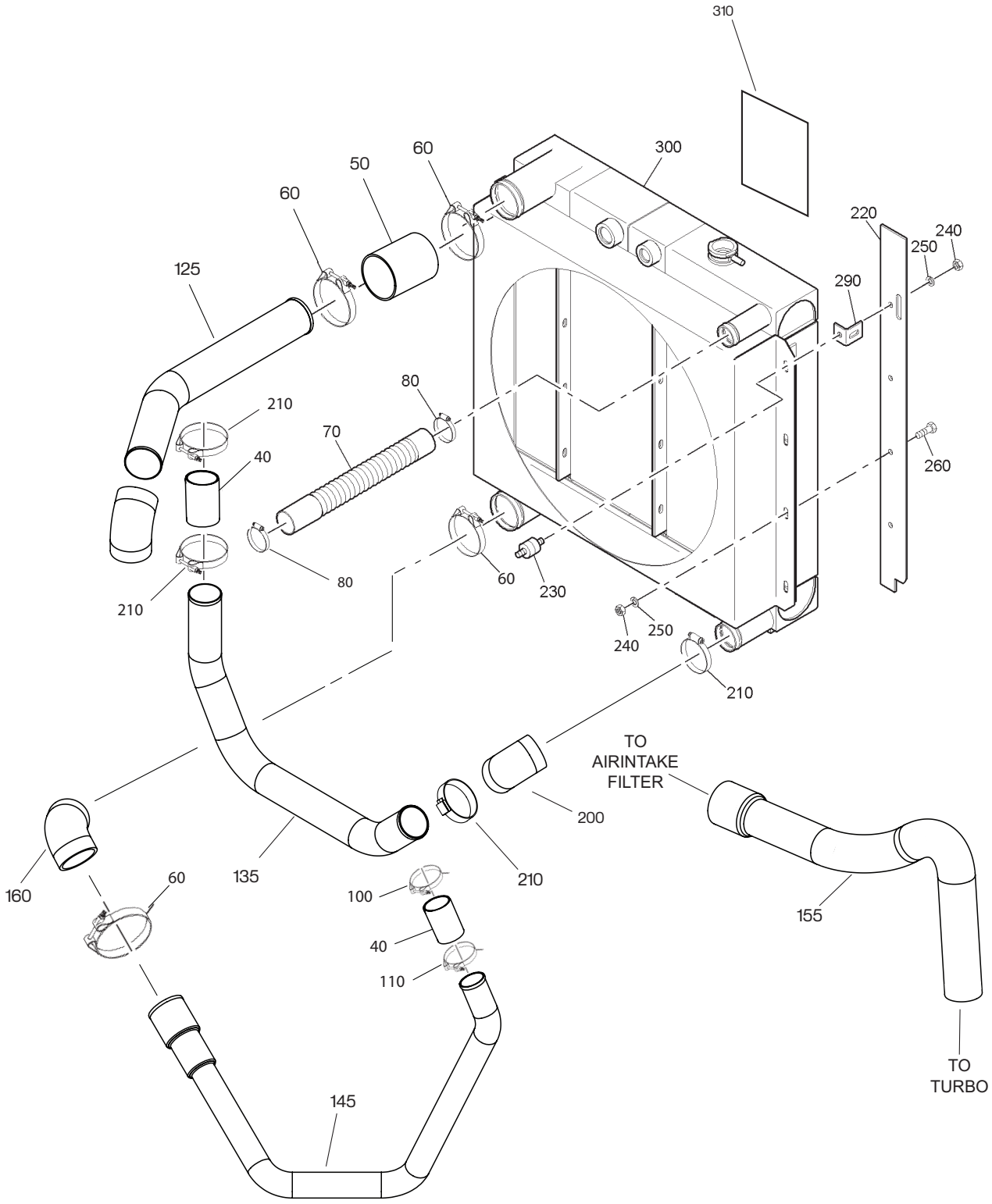


Figure 10-55

Radiator & Hose Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
55				
-1	982876	REF	RADIATOR AND HOSE ASSEMBLY (SEE IPL Figure 10-45 FOR NHA)	
40	982780	2	• REDUCER TUBE, CHARGE AIR	
50	982779	1	• ELBOW, CHARGE AIR, 45 DEGREE	
60	36045	4	• CLAMP, T-BOLT, 2-3/4" NOMINAL	
70	986892	1	• RADIATOR HOSE, UPPER	
80	230240	2	• CLAMP, HOSE, 3/4" (SIZE 10)	
100	38268	1	• CLAMP, T-BOLT, 2-1/4" NOMINAL	
110	36045	1	• CLAMP, T-BOLT, 2-3/4" NOMINAL	
-	986939	-	• KIT,CHARGE AIR TUBES,785CAT	
125	986939-1	1	• • KIT ITEM, AIR TUBE	
135	986939-2	1	• • KIT ITEM, AIR TUBE	
145	986939-3	1	• • KIT ITEM, AIR TUBE	
155	986939-4	1	• • KIT ITEM, AIR TUBE	
160	982779	1	• CHARGE AIR TUBE, 45 DEGREE	
200	984262	1	• RADIATOR ELBOW, LOWER, 60 DEGREE, 2.25" ID	
210	500230	4	• HOSE CLAMP, 2-1/2" (SIZE 36)	
220	982564	2	• RADIATOR MOUNT, RUBBER	
230	440040	1	• SHOCK MOUNT, ENGINE SEAT	
240	116-3	2	• NUT, 3/8"-16 HEX	
250	118-3	2	• LOCKWASHER, 3/8"	
260	102-205-1A	3	• CAP SCREW, 3/8"-16 X 1.0 HEX	
290	981833	2	• MOUNT PLATE, RADIATOR	
300	982876	1	• RADIATOR ASSEMBLY, CHARGE AIR	
310	983096	1	• CONDENSOR	

Rear Scarifier Assembly

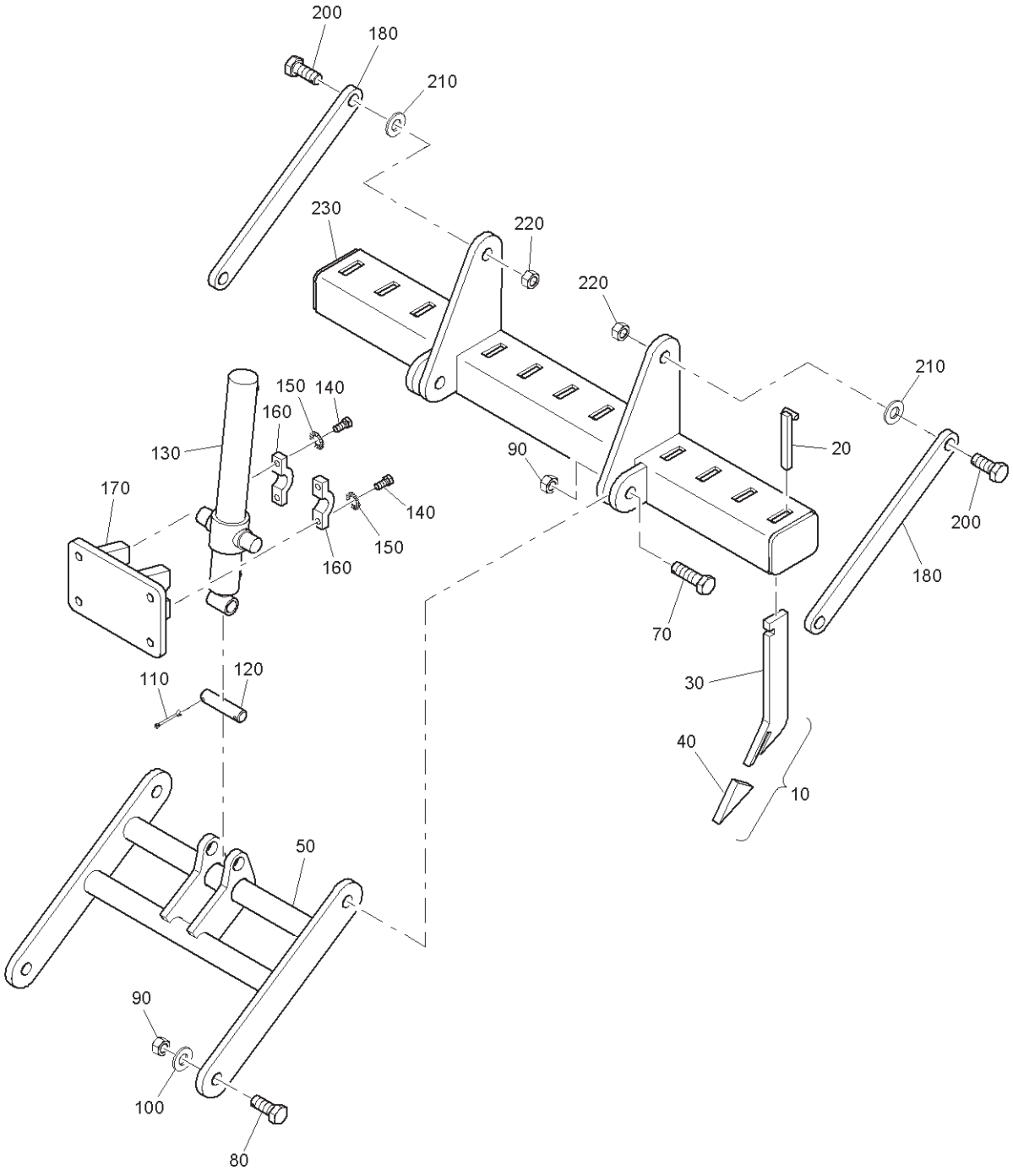


Figure 10-56

Rear Scarifier Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
56				
-1	982238	REF	REAR SCARIFIER ASSEMBLY (SEE IPL Figure 10-5 FOR NHA)	
10	983100	11	• SHANK AND TOOTH ASSEMBLY, SCARIFIER	
20	982829	1	• RETAINER, SHANK	
30	982243	11	• • SHANK, SCARIFIER	
40	983095	11	• • TOOTH, SCARIFIER	
50	986152	1	• FRAME	
70	985093	2	• BOLT W/HOLE, 1.5"-6 X 5.0 HEX	
80	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
90	1006056	4	• LOCKNUT, 1.5"-6 HEX	
100	119-14	2	• FLAT WASHER, 1.5" SAE	
110	871081835	2	• ROLL PIN, 0.375 X 2.0"	
120	985105	1	• PIN, REAR SCARIFIER	
130	982826	1	• CYLINDER, HYDRAULIC, 3.00 X 25.00", 2500 PSI	
140	102-709-1A	4	• CAP SCREW, 3/4"-10 X 2.0, HEX	
150	118-8	4	• LOCKWASHER, 3/4"	
160	983094	2	• MOUNTING COLLAR, CYLINDER	
170	986154	1	• MOUNTING PLATE, CYLINDER	
180	982220	2	• BAR, TOP SUPPORT ARM	
200	988928	2	• CAP SCREW, 1.5"-6 X 4.0 HEX	
210	119-14	2	• FLAT WASHER, 1.5" SAE	
220	1006056	2	• LOCKNUT, 1.5"-6 HEX	
230	986151	1	• SCARIFIER FRAME	

Air Conditioning Group

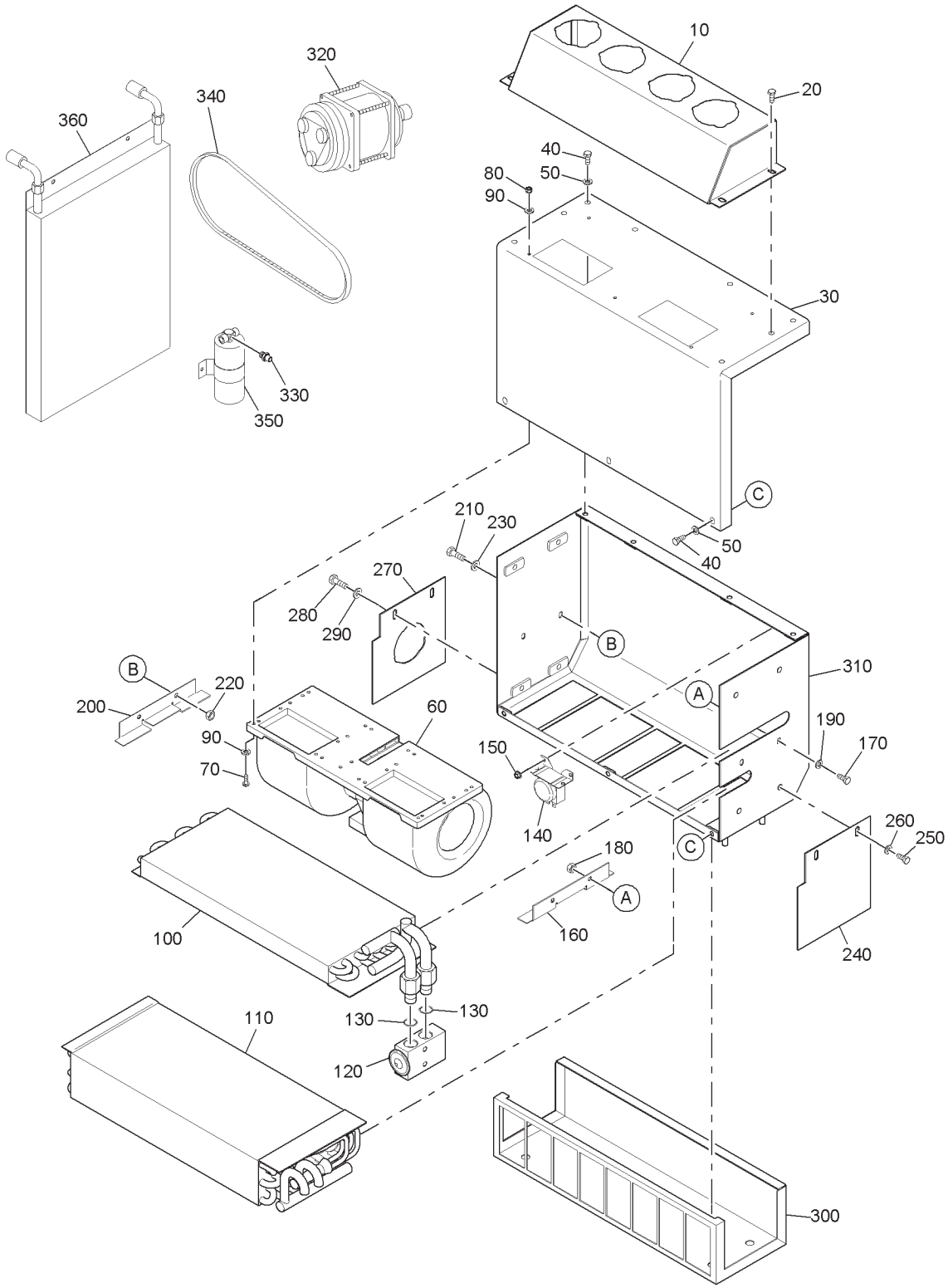


Figure 10-57

Air Conditioning Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
57				
-1	982726	REF	AIR CONDITIONING GROUP	
10	982726-15	1	• PLENUM, AIR DISTRIBUTION	
20	80321	4	• SCREW, SELF-TAPPING, 10 X 1/2"	
30	982726-05	1	• COVER, AIR CONDITIONING GROUP	
40	80465	6	• SCREW, M06-1 X 20 MM, HEX	
50	80472	6	• WASHER, FLAT, M06, SAE	
60	982726-09	1	• BLOWER UNIT	
70	90074	5	• SCREW, MACHINE, 10-32 X 0.50"	
80	80494	5	• NUT, 10, HEX	
90	80995	10	• WASHER, FLAT, 10 SAE	
100	982726-12	1	• EVAPORATOR, AIR CONDITIONER	
110	982276-11	1	• HEATER CORE	
120	982726-08	1	• VALVE, THERMAL EXPANSION	
130	982276-10	2	• O-RING	
140	982276-07	1	• THERMOSTAT	
150	81007	3	• NUT, HEX, M05-80	
160	982726-04	1	• MOUNTING PLATE	
170	80465	2	• SCREW, M06-1 X 20 MM, HEX	
180	80453	2	• NUT, HEX, M06-1	
190	80472	2	• WASHER, FLAT, M06, SAE	
200	982726-06	1	• MOUNTING PLATE	
210	80465	2	• SCREW, M06-1 X 20 MM, HEX	
220	80453	2	• NUT, HEX, M06-1	
230	80472	2	• WASHER, FLAT, M06, SAE	
240	982726-15	1	• END PLATE	
250	80465	2	• SCREW, M06-1 X 20 MM, HEX	
260	80472	2	• WASHER, FLAT, M06, SAE	
270	982726-16	1	• END PLATE	
280	80465	2	• SCREW, M06-1 X 20 MM, HEX	
290	80472	2	• WASHER, FLAT, M06, SAE	
300	982726-17	1	• TRAY, AIR INTAKE	
310	982726-03	1	• HOUSING, AIR CONDITIONING GROUP	
320	P204324	1	• COMPRESSOR	
330	P204291	1	• MOUNT, COMPRESSOR	
340	685070	1	• BELT, COMPRESSOR DRIVE	
350	982726-14	1	• FILTER/DRYER ASSEMBLY	
360	983096	1	• CONDENSER	
	982700-1		HEATER SWITCH	

Control Group

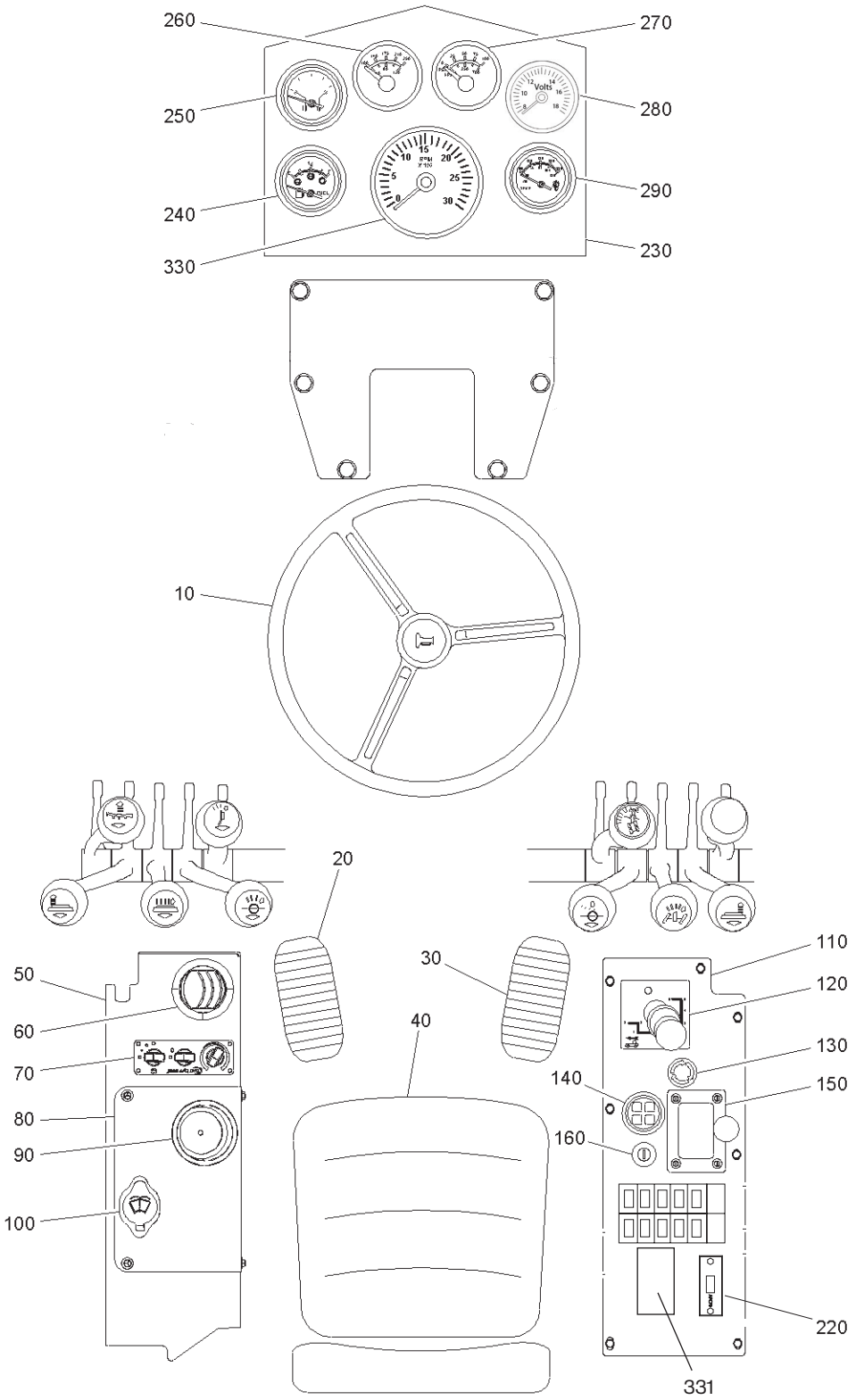


Figure 10-58

Control Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
58				
-1	43NONUMBER1	REF	CONTROL GROUP	
10	982170	1	• STEERING WHEEL	
20	985520	1	• PEDAL, BRAKE	
30	981781	1	• PEDAL, ACCELERATOR	
40	982325	1	• SEAT, MECHANICAL SUSPENSION	
50	982384	1	• ACCESSORY BOX	
60	982726-02	1	• LOUVER VENT, CIRCULAR	
70	982726-01	1	• CONTROL PANEL, HVAC UNIT	
80	982607	1	• ACCESS PANEL, LEFT-HAND	
90	982689	1	• CUP HOLDER	
100	982738	1	• WASHER BOTTLE, 10 LITER	
110	985443	1	• CONSOLE PLATE, RIGHT-HAND SIDE	
120	984265	1	• SHIFTER, ELECTRIC	
130	981507	1	• SWITCH, EMERGENCY STOP	
140	73200	1	• GAUGE, WARNING LIGHTS	
150	982874	1	• CONTROLLER, THROTTLE	
160	39146-14	1	• SWITCH, IGN	
220	987325	1	• CONTROLLER, TRANSMISSION	
230	982850	1	• MOUNT PLATE, CENTER GAUGE	
240	35366	1	• GAUGE, FUEL	
250	984471	1	• GAUGE, ARTICULATION	
260	73255-02	1	• GAUGE, COOLANT TEMPERATURE	
270	73255-01	1	• GAUGE, ENGINE OIL PRESSURE	
280	73255	1	• GAUGE, DISPLAY MODULE	
290	35365	1	• GAUGE, OIL TEMPERATURE	
330	73255-07	1	• TACHOMETER	
331	985746	1	• FUSE / RELAY PANEL WITH COVER	
-	985593	4	• RELAY	
	36694		FUSE BLOCK, 10 GANG, ATC	BEHIND SEAT
	982169		HORN, BUTTON	
	982870		POWER STEERING MOTOR, HYD.	
	852520		ALARM, BACKUP	
	33964		SWITCH, BACKUP ALARM	

Cab Hydraulic Components

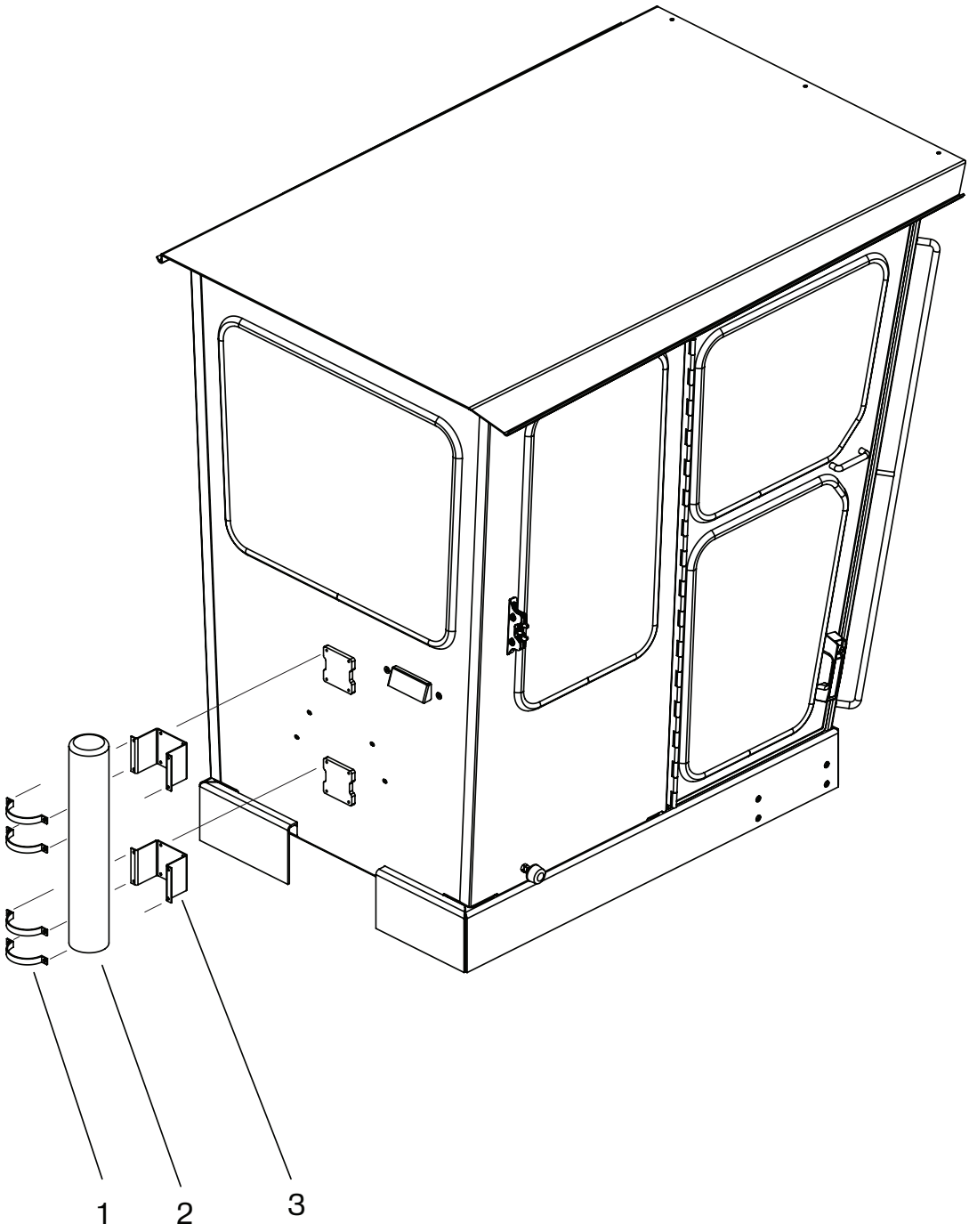


Figure 10-59

Cab Hydraulic Components Parts List

Item No.	Part Number	Qty.	Description	Remarks
59				
1	982520	4	• MOUNT, ACCUMULATOR CLAMP	
2	855064	1	• ACCUMULATOR,BRAKE SYS	
3	982519	2	• MOUNT, ACCUMULATOR BASE	

Frame Hydraulic Components

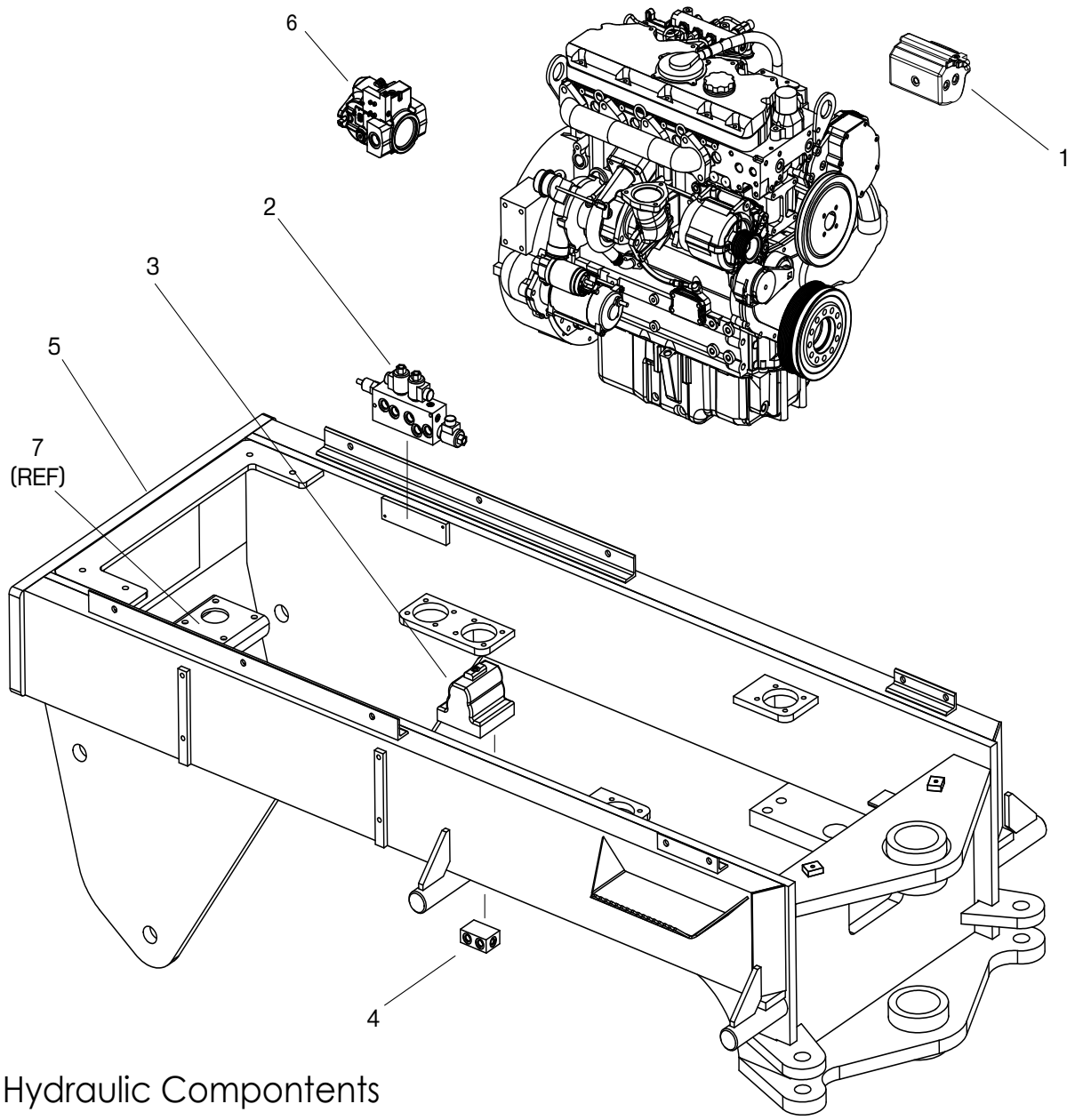


Figure 10-60

Frame Hydraulic Components Parts List

Item No.	Part Number	Qty.	Description	Remarks
60				
1	986789	1	• STEERING PUMP	Up to SN 71490
1	1000694	1	• STEERING PUMP	After SN 71491
2	983099	1	• MANIFOLD, HYD	
3	852740	1	• VALVE,BRAKE CHARGE	
4	750602	1	• MANIFOLD, W/ RELIEF, 3000 BRAKE	
5	982849	1	• FRAME W/M,REAR,785	
6	982872	1	• PUMP, PRESS COMP W/ LOAD SENSE	
-	100-405-1A	2	• BOLT 0.5" x 1"	
-	118-5	2	• WASHER, LOCK, .500"	
-	36808	1	• O-RING (ON PUMP)	
7(REF)	4200813(REF)	1	• A LOCKUP & VALVE (REFERNCE SPICER)	

ALPHABETICAL PART INDEX

IPL PART LIST

Part Number	Description	Figure Number (10-*)
4200813(REF)	• **A LOCKUP & VALVE**	60
982390	• **ACCESS COVER, DASH**	41
982384	• ACCESSORY BOX	58
855064	• ACCUMULATOR,BRAKE SYS	59
983130	• ADAPTER, HYDRAULIC MOTOR	19
986891	• ADAPTER, INSERT	50
983136	• ADAPTER, SPLINED	19
983558	• ADJUSTER PLATE, ARTICULATION SENSOR	42
983543	• AIR CLEANER AND INLET ASSEMBLY	49, 50
953521247	• AIR CLEANER ASSEMBLY	50
983543-02	• AIR CLEANER, INNER	50
983543-01	• AIR CLEANER, OUTER	50
P204324	• AIR COMPRESSOR UNIT	47, 57
982726	• AIR CONDITIONING GROUP	57
982859-02	• ALTERNATOR	46
983557	• ANGLE, SENSOR MOUNTING	42
987317	• AXLE ASSEMBLY, DRIVE	48
987322	• AXLE ASSEMBLY, DRIVE	4, 45, 60
983374	• BALL BEARING, MOUNTED	34, 35
130060	• BALL JOINT	1, 10, 11
983373	• BALL JOINT, .500, FEMALE, W/STUD	37
853620	• BALL STUD	35
985046	• BAR, BREAK MOUNT	37
984278	• BAR, RUBBER HOLDDOWN	36
981801	• BAR, TILT HANDLE	35
981796	• BAR, TILT LINKAGE	35
982220	• BAR, TOP SUPPORT ARM	7, 56
983562	• BATTERY CABLE, NEGATIVE	52
983563	• BATTERY CABLE, POSITIVE	52
920152	• BATTERY, 12 VOLT, 750 CCA	52
610210	• BEARING CONE	8
610210	• BEARING CONE	9
210180A	• BEARING CONE	8, 9
610200	• BEARING CUP	8, 9
210190A	• BEARING CUP	8, 9
983138	• BEARING, THRUST	19
985491	• BELL CRANK	35
685070	• BELT, COMPRESSOR DRIVE	57
982726-09	• BLOWER UNIT	57
100-405-1A	• BOLT 0.5" x 1"	60

IPL PART LIST

Part Number	Description	Figure Number (10-*)
982698	• BOLT PLATE, STRIKER	41
985093	• BOLT W/HOLE, 1.5"-6 X 5.0 HEX	56
130220	• BOLT, PLOW, 5/8-11 X 2-INCHES	17
982416	• BOLT, STRIKER, 2.025"	26, 41
983108	• BOOM WELDMENT AND COVER ASSEMBLY	1, 2, 3, 6
982255	• BOX ASSEMBLY, BATTERY	44, 52
1001418	• BRACKET ASSEMBLY, INSIDE CAB MIRROR	41
1001416	• BRACKET ASSEMBLY, OUTSIDE CAB MIRROR	41
7020097	• BRACKET, ANCHOR	52, 53
7020098	• BRACKET, HOOD	52, 53
982680	• BRACKET, LATCH	24 ,25
982666	• BRACKET, WINDOW LATCH	24
1001170	• BRKT, A/C COMP REAR, CAT, T3	47
982740	• BULKHEAD FITTING KIT	26
982668	• BUMPER, DOOR	23, 25
982887	• BUSHING, 1.25 OD X 1.0 ID X 0.75" L	10, 11
982886	• BUSHING, 1.75 OD X 1.5 ID X 1.0" L	12, 13, 18
110130A	• BUSHING, 1.75 OD X 1.5 ID X 1.25" L	12, 13
983366	• BUSHING, BRONZE, 2.5 X 2.0 X 2.5"	14
982882	• BUSHING, COMPOSITE, 0.813 OD X 0.688 ID X 1.0"	33, 36, 42
981804	• BUSHING, COMPOSITE, 1.5 X 1.0 X 1.12"	34, 35
210010	• BUSHING, DRAWBAR	10, 11, 13 , 14
983140	• BUSHING, OUTPUT SHAFT LONG	19
983140-01	• BUSHING, OUTPUT SHAFT SHORT	19
983381	• BUSHING, STEEL	14
983379	• BUSHING, STEEL 1.5”X1.25”X1.25”	4, 48
983376	• BUSHING, STEEL 4.0”X3.5”X2.5”	4, 48
983380	• BUSHING, STEEL, 3.0 X 2.5 X 1.5"	14
110130B	• BUSHING, WHEEL LEAN PIN, 1.25"	4
110130	• BUSHING, WHEEL LEAN TIE ROD	4, 48
983139	• BUSHING, WORM GEARSHAFT	19
982700	• CAB ASSEMBLY	3, 21, 25, 38, 39, 40, 41
982840	• CAB STEP SUPPORT, RUBBER	31
982701	• CAB WELDMENT	21, 22, 23, 24, 25, 38
981911	• CAP PLATE, CYLINDER SHAFT	14
102-909-1A	• CAP SCREW, 1”-8 X 2.0 HEX	4, 5
102-913-1A	• CAP SCREW, 1”-8 X 3.0 HEX	7
988928	• CAP SCREW, 1.5”-6 X 4” HEX	5, 7, 56
102-919-1A	• CAP SCREW, 1"-8 X 4.5 HEX	10, 11, 20
102-403-1A	• CAP SCREW, 1/2"-13 X 0.75 HEX	12, 13, 44

Part Number	Description	Figure Number (10-*)
102-405-1A	• CAP SCREW, 1/2"-13 X 1.0 HEX	43, 44, 48
102-406-1A	• CAP SCREW, 1/2"-13 X 1.25 HEX	12, 13, 14, 21, 25, 49
102-406-1A	• CAP SCREW, 1/2"-13 X 1.25 HEX	23
110-406	• CAP SCREW, 1/2"-13 X 1.25 SOCKET	19
102-407-1A	• CAP SCREW, 1/2"-13 X 1.50 HEX	16
102-403-1A	• CAP SCREW, 1/2”-13 X 1.75 HEX	48
102-409-1A	• CAP SCREW, 1/2"-13 X 2.0 HEX	20
102-410-1A	• CAP SCREW, 1/2"-13 X 2.25 HEX	45
102-413-1A	• CAP SCREW, 1/2"-13 X 3.0 HEX	45
102-423-1A	• CAP SCREW, 1/2"-13 X 5.50 HEX	3
102-10-1A	• CAP SCREW, 1/4" 20 X 2.25 HEX	26
102-210-1A	• CAP SCREW, 1/4"-16 X 2.25 HEX	26
102-3-1A	• CAP SCREW, 1/4"-20 X 0.75 HEX	25, 27, 28, 29, 30, 35, 38, 40, 41, 42
102-5-1A	• CAP SCREW, 1/4"-20 X 1.0 HEX	24, 41
102-1-1A	• CAP SCREW, 1/4"-20 X 1/2 HEX	23, 25, 40, 53
102-09-1A	• CAP SCREW, 1/4"-20 X 2.0 HEX	36, 52
81057	• CAP SCREW, 1/4"-20 X 3/4 HEX	42
102-3-1A	• CAP SCREW, 1/4"-20 X 3/4 HEX	22
985440	• CAP SCREW, 3/4"-10 X 0.625 HEX	18
102-707-1A	• CAP SCREW, 3/4"-10 X 1.50 HEX	16
102-709-1A	• CAP SCREW, 3/4"-10 X 2, HEX	2, 45, 56
102-709-1A	• CAP SCREW, 3/4"-10 X 2.0, HEX	15
102-213-1A	• CAP SCREW, 3/8" X 16 X 3.0 HEX	12, 13
102-205-1A	• CAP SCREW, 3/8"-16 X 1 HEX	10, 11, 38, 41, 43, 49, 55
102-205-1A	• CAP SCREW, 3/8"-16 X 1 HEX	18, 23
102-206-1A	• CAP SCREW, 3/8"-16 X 1.25 HEX	19, 35, 36, 45
102-207-1A	• CAP SCREW, 3/8"-16 X 1.25 HEX	20, 31, 35
110-207	• CAP SCREW, 3/8"-16 X 1.5	8, 9, 54
110-208	• CAP SCREW, 3/8”-16 X 1.75 HEX	54
102-209-1A	• CAP SCREW, 3/8"-16 X 2 HEX	49
102-211-1A	• CAP SCREW, 3/8"-16 X 2.50 HEX	21
102-203-1A	• CAP SCREW, 3/8"-16 X 3/4 HEX	6, 22, 24, 25, 26
80393	• CAP SCREW, 3/8"-16 X 9.5 HEX	52
100-242-1A	• CAP SCREW, 3/8"-24 X 10.25 HEX	36
100-103-1A	• CAP SCREW, 5/16" X 1/2 HEX	33
102-105-1A	• CAP SCREW, 5/16"-18 X 1.0" HEX	32, 40
102-208-1A	• CAP SCREW, 5/16"-18 X 1.75 HEX	21
102-106-1A	• CAP SCREW, 5/16"-18 X 1-1/4 HEX	42
102-109-1A	• CAP SCREW, 5/16"-18 X 2 HEX	53

Part Number	Description	Figure Number (10-*)
102-103-1A	• CAP SCREW, 5/16"-18 X 3/4 HEX	19, 32, 33, 34, 52
102-609-1A	• CAP SCREW, 5/8"-11 X 2, HEX	14
811352	• CAP SCREW, 5/8"-11 X 2.25, HEX, GRADE 8	14
102-613-1A	• CAP SCREW, 5/8"-11 X 3.0 HEX	10, 11
811358	• CAP SCREW, 5/8"-11 X 3.0, HEX, GRADE 8	2
80289	• CAP SCREW, 5/8"-11 X 3.50, HEX, GRADE 5	1
102-614-1A	• CAP SCREW, 5/8"-11 X 3-1/4, HEX	14
102-614-1A	• CAP SCREW, 5/8"-11 X 3-1/4, HEX	14
102-619-1A	• CAP SCREW, 5/8"-11 X 4.5 HEX	45
100-609-1A	• CAP SCREW, 5/8"-18 X 2, HEX, GRADE 8	16
102-M06X16-1A	• CAP SCREW, 6 X 16 MILLIMETER HEX	27, 29
110-301-1A	• CAP SCREW, 7/16"-14 X 1 HEX	19
102-303-1A	• CAP SCREW, 7/16"-14 X 3/4 HEX	44
100-850-1A	• CAP SCREW, 7/8"-9 X 12.25 HEX	48
81058	• CAP SCREW, 7/8"-9 X 3.0, HEX, GRADE 5	1
102-831-1A	• CAP SCREW, 7/8"-9 X 7.50 HEX	3
80517	• CAP SCREW, M08-1.25 X 80MM HEX	46
80515	• CAP SCREW, M10-1.5 X 25MM HEX	46
80516	• CAP SCREW, M10-1.5 X 30MM HEX	46
80946	• CAP SCREW, M10-1.50 X 75MM HEX	46
983543-04	• CAP, AIR CLEANER	50
140030HL	• CAP, LOCKABLE HYDRAULIC OIL TANK	51
982738-01	• CAP, RESERVOIR	40
982779	• CHARGE AIR TUBE, 45 DEGREE	55
985466	• CIRCLE ASSEMBLY, MOLDBOARD	20
983543-03	• CLAMP BAND, CAP	50
230240	• CLAMP, HOSE, 3/4" (SIZE 10)	55
161250	• CLAMP, MUFFLER, 3.0"	45
171090	• CLAMP, SCREW-TYPE	50
953521243	• CLAMP, SCREW-TYPE	50
38268	• CLAMP, T-BOLT, 2-1/4" NOMINAL	55
36045	• CLAMP, T-BOLT, 2-3/4" NOMINAL	55
981901-07	• CLEVIS, VALVE SPOOL	36
989781	• COMPRESSOR ASSEMBLY	45
983096	• CONDENSOR	55, 57
3200DI	• CONNECTOR, WATER TIGHT, 1/2 X 1/2"	42
985489	• CONSOLE ASSEMBLY, REAR TILT	35
983153	• CONSOLE GROUP	33, 34
985443	• CONSOLE PLATE, RIGHT-HAND SIDE	38, 58
982726-01	• CONTROL PANEL, HVAC UNIT	58

Part Number	Description	Figure Number (10-*)
982874	• CONTROLLER, THROTTLE	58
987325	• CONTROLLER, TRANSMISSION	58
984892	• COTTER PIN, 0.25 X 3.00"	8, 9
984892	• COTTER PIN, 1/4 X 3.0"	19
871082603	• COTTER PIN, 1/8 X 1-3/4"	10, 11
930039	• COTTER PIN, 3/16 X 2.0"	34
982798	• COVER	49
982607	• COVER PANEL, LEFT-HAND CONSOLE	40, 58
982865	• COVER PLATE, BOTTOM SLIDE	18
981353	• COVER PLATE, KINGPIN	10, 11
982541	• COVER PLATE, LEFT-HAND BOOM	6
982543	• COVER PLATE, REAR, LEFT-HAND BOOM	6
982545	• COVER PLATE, REAR, RIGHT-HAND BOOM	6
982544	• COVER PLATE, RIGHT-HAND BOOM	6
981802	• COVER PLATE, TILT CONSOLE	34
981803	• COVER PLATE, TILT CONSOLE	34
982864	• COVER PLATE, UPPER SLIDE	18
981857	• COVER PLATE, WEAR BAR	18
982726-05	• COVER, AIR CONDITIONING GROUP	57
983137	• COVER, GEARBOX	19
983543-07	• COVER, INTAKE	50
982901-04	• COVER, VALVE INLET	36
982901-03	• COVER, VALVE OUTLET	36
982401	• COVER, WIPER MOTOR	26
982897	• CROSSBAR ASSEMBLY, WHEEL LEAN	13
982903	• CROSSMEMBER ASSEMMBER, FRONT END	13
982689	• CUP HOLDER	40, 58
853860	• CUTTING EDGE, 6-FOOT	17
853610	• CYLINDER, GAS SPRING	35
981875	• CYLINDER, HYDRAULIC, 3.00 X 23.00", 2500 PSI	2, 14
981874	• CYLINDER, HYDRAULIC, 3.00 X 48.00", 2500 PSI	2, 14
981876	• CYLINDER, HYDRAULIC 3" X 2.5"	14
981860	• CYLINDER, HYDRAULIC, 2.50 X 58.00", 2500 PSI	16
982826	• CYLINDER, HYDRAULIC, 3.00 X 25.00", 2500 PSI	56
981872	• CYLINDER, HYDRAULIC, 3.00 X 9.87"	10, 11
981878	• CYLINDER, HYDRAULIC, 4.00 X 14.00", 2500 PSI	7
981873	• CYLINDER, HYDRAULIC, 4.00 X 6.00", 2500 PSI	13
982730	• DEFROST COVER, DASH FLOOR PANEL	41
982695	• DOOR ASSEMBLY, LEFT-HAND	22, 27
982694	• DOOR ASSEMBLY, RIGHT-HAND	25, 29

Part Number	Description	Figure Number (10-*)
982697	• DOOR FRAME, LEFT-HAND	27, 28
982696	• DOOR FRAME, RIGHT-HAND	29, 30
982722	• DOOR GLASS, LOWER, 1/4-INCH, TEMPERED	28, 30
982721	• DOOR GLASS, UPPER, 1/4-INCH, TEMPERED	28, 30
982415	• DOOR HANDLE, PUSHBUTTON	27, 29
982716	• DOOR LATCH, LEFT-HAND	27
982715	• DOOR LATCH, RIGHT-HAND	29
982640	• DOORSILL	23, 25
985465	• DRAWBAR ASSEMBLY, MOLDBOARD	20
988536-05	• DRIVE BELT, ENGINE, CAT T3	46
987528	• ELBOW, REDUCER	50
984433	• ENCLOSURE, FUSE PANEL, 4" X 6"	42
130180	• END BIT, CURVED, MOLDBOARD	17
981910	• END CAP, CYLINDER	14
982726-15	• END PLATE	57
982726-16	• END PLATE	57
988536	• ENGINE ASSEMBLY, 130 HP, CAT	45
982891	• ENGINE ISOLATOR, RUBBER	45
986325	• ENGINE MOUNT,LH ASSY	45
986324	• ENGINE MOUNT,RH ASSY	45
982726-12	• EVAPORATOR, AIR CONDITIONER	57
987137	• FAN, ENGINE, 23-INCH	46
981511	• FENDER WASHER, 3/8"	33
140030FN	• FILLER NECK, HYDRAULIC OIL/FUEL CAP	51
988536-02	• FILTER, ENGIN OIL	45, 46
988536-03	• FILTER, FUEL	45, 46
980630	• FILTER, STRAINER	51
988536-04	• FILTER, WATER SEPERATOR	45
982726-14	• FILTER/DRYER ASSEMBLY	57
37311	• FITTING, 90° BRASS, 02MP-02FP	4
853521170	• FITTING, DOUBLE MALE	50
983129	• FLANGE	19
120-10	• FLAT WASHER, 1.0" USS	20
119-14	• FLAT WASHER, 1.5" SAE	5, 7, 56
119-14	• FLAT WASHER, 1.5" SAE	8, 9
119-5	• FLAT WASHER, 1/2" SAE	3, 20, 21, 26, 44, 45, 48, 49
119-1	• FLAT WASHER, 1/4" SAE	23, 24, 25, 26, 27, 28, 29, 30, 38, 40, 41, 42
119-1	• FLAT WASHER, 1/4" SAE	22

Part Number	Description	Figure Number (10-*)
119-3	• FLAT WASHER, 1/8" SAE	20, 21, 24, 26, 27, 29, 31, 35, 36, 38, 41, 49, 54
853393	• FLAT WASHER, 2.25 OD X 5/8" ID	45
119-A	• FLAT WASHER, 3/16"	27, 29, 39
119-3	• FLAT WASHER, 3/8" SAE	22
119-2	• FLAT WASHER, 5/16" SAE	26, 40, 42
119-7	• FLAT WASHER, 5/8" SAE	45
120-4	• FLAT WASHER, 7/16" USS	26, 41
119-9	• FLAT WASHER, 7/8"	48
120-9	• FLAT WASHER, 7/8" SAE	3
982739	• FLOOR MAT	40
982737	• FLOOR MAT	41
982688	• FLOOR PANEL	38
986152	• FRAME	56
982849	• FRAME WELDMENT	43, 44, 45, 48, 60
982900	• FRONT AXLE ASSEMBLY	1
982900	• FRONT AXLE ASSEMBLY	8
982373	• FRONT PANEL, RIGHT-HAND CONSOLE	38
982184	• FRONT SCARIFIER ASSEMBLY	1, 7
1001575	• FUEL FILTER MOUNTING PLATTE	46
985746	• FUSE / RELAY PANEL WITH COVER	58
983104	• GASKET, HUB CAP	8, 9
982360-89	• GASKET, LOWER WINDOW	25
982360-89	• GASKET, LOWER WINDOW	22
982360-127	• GASKET, REAR WINDOW	22
982360-122	• GASKET, SIDE WINDOW	25
982360-122	• GASKET, SIDE WINDOW	22
984471	• GAUGE, ARTICULATION	58
73255-02	• GAUGE, COOLANT TEMPERATURE	58
73255	• GAUGE, DISPLAY MODULE	58
73255-01	• GAUGE, ENGINE OIL PRESSURE	58
35366	• GAUGE, FUEL	58
500070	• GAUGE, HYDRAULIC OIL LEVEL AND TEMPERATURE	51
35365	• GAUGE, OIL TEMPERATURE	58
73200	• GAUGE, WARNING LIGHTS	58
983135	• GEAR, TURNTABLE WORM DRIVE	19
985479	• GEARBOX ASSEMBLY, 54" TURNTABLE	16, 19
983134	• GEARSHAFT, WORM	19
140610	• GREASE FITTING, 1/4"-28	10, 11
140620	• GREASE FITTING, 1/4-28, W90	14

Part Number	Description	Figure Number (10-*)
985095	• GREASE FITTING, 1/8", 90° NPT	4, 14
985094	• GREASE FITTING, STRAIGHT, 1/8 NPT	4, 10, 11, 12, 13
852460	• GREASE FITTING, WITH RELIEF	19
983561	• GROUND CABLE, CAB NEGATIVE	52
982899	• GUIDE, BRONZE SLIDE	18
982276-11	• HEATER CORE	57
9833371	• HEIM JOINT, BALL STUD	36
983372	• HEIM JOINT, FEMALE BALL	36
983370	• HEIM JOINT, ROD END	33, 42
982408	• HINGE BLADE, ROOF	26
982405	• HINGE BLADE, WINDOW	26
982404	• HINGE SHIM, WINDOW	26
980316	• HINGE, COVER	43
982693	• HINGE, STAINLESS, 1/4-INCH DIAMETER PIN	28, 30
982962	• HOLDDOWN ASSEMBLY, BATTERY	52
983360	• HOOD ASSEMBLY, REAR FRAME MOUNT	43, 44, 49
983357	• HOOD, FRONT ENGINE	43
7020096	• HOOK, RUBBER	52, 53
500230	• HOSE CLAMP, 2-1/2" (SIZE 36)	55
851437	• HOSE CLAMP, SCREW TYPE	50
520210	• HOSE, 400 REAR DRUM BEARING	4
983150-01	• HOUSING ASSEMBLY, SLIDE	18
982726-03	• HOUSING, AIR CONDITIONING GROUP	57
982729	• HOUSING, CENTER	40
985493	• HOUSING, TILT PANEL	35
983128	• HOUSING, TURNTABLE GEARBOX	19
982895	• HUB AND LEVER ARM ASSEMBLY	10
982894	• HUB AND LEVER ARM ASSEMBLY	11
981654	• HUB ASSEMBLY, WHEEL	8, 9
981402	• HUB CAP, WHEEL	8, 9
981877	• HYDRAULIC CYLINDER, 3.00 X 10.00", 2500 PSI	4
981818	• HYDRAULIC TANK ASSEMBLY, LOWER	48
983275	• INDICATOR, AIR RESTRICTION	50
983545	• INLET TUBE, FLEXIBLE	50
983546	• INTAKE ASSEMBLY	50
983543-06	• INTAKE HOUSING	50
986939-1	• KIT ITEM, AIR TUBE	55
986939-2	• KIT ITEM, AIR TUBE	55
986939-3	• KIT ITEM, AIR TUBE	55
986939-4	• KIT ITEM, AIR TUBE (FROM TURBO TO AIR INTAKE)	50, 55

Part Number	Description	Figure Number (10-*)
72535	• KIT, AXLE STRAP & BOLT	48
986939	• KIT,CHARGE AIR TUBES,785CAT	55
983116	• KNOB, BLADE EXTENSION	33
983113	• KNOB, BLADE TILT	33
983114	• KNOB, BOOM ARTICULATION	33
983112	• KNOB, CIRCLE DRIVE	33
983115	• KNOB, FRONT SCARIFIER	33
983117	• KNOB, LEFT-HAND BLADE LIFT	33
984276	• KNOB, PLAIN HANDLE MOUNT	33
983118	• KNOB, RIGHT-HAND BLADE LIFT	33
983119	• KNOB, SIDE SHIFT	33
983120	• KNOB, WHEEL LEAN	33
985625	• LADDER, CAB ENTRY	23, 25, 31
982630	• LATCH COVER, DOOR, LEFT-HAND	27, 29
983458	• LATCH, DOOR OPEN	24, 25
160450	• LATCH, ENGINE ACCESS PANEL	43, 49
982679	• LATCH, WINDOW	24
985585	• LEVER ARM ASSEMBLY, FLOOR MOUNT	36
985490	• LEVER, TILT LINKAGE	35
982881-1	• LEVER, VALVE HANDLE	33
982881-2	• LEVER, VALVE HANDLE	33
982881-3	• LEVER, VALVE HANDLE	33
982881-4	• LEVER, VALVE HANDLE	33
982881-5	• LEVER, VALVE HANDLE	33
982720	• LINKAGE COVER, DOOR, LEFT-HAND	27
982719	• LINKAGE COVER, DOOR, RIGHT-HAND	29
983456	• LINKAGE WELDMENT, LOWER LATCH, LEFT-HAND	27
982656	• LINKAGE WELDMENT, LOWER LATCH, RIGHT-HAND	29
982649	• LINKAGE WELDMENT, UPPER LATCH, LEFT-HAND	27
982657	• LINKAGE WELDMENT, UPPER LATCH, RIGHT-HAND	29
983103	• LOCKING PIN	12
983105	• LOCKING PIN ASSEMBLY	12
143-10	• LOCKNUT, 1"-8 HEX	10, 11
1006056	• LOCKNUT, 1.5”-6 HEX	5, 7, 56
LN010	• LOCKNUT, 1/2" CONDUIT	42
116-5	• LOCKNUT, 1/2"-13	23
143-5	• LOCKNUT, 1/2"-13 HEX	3, 44, 49
143-1	• LOCKNUT, 1/4"-20	26, 52, 53
143-3	• LOCKNUT, 3/8"-16	23
143-3	• LOCKNUT, 3/8"-16 HEX	12, 13, 21, 26, 27, 29, 31, 35, 52

Part Number	Description	Figure Number (10-*)
143-2	• LOCKNUT, 5/16"-18	26, 42, 52, 53
143-7	• LOCKNUT, 5/8"-11	45
142-9	• LOCKNUT, 7/8"-9	48
143-9	• LOCKNUT, 7/8"-9 HEX	3
118-10	• LOCKWASHER, 1.0"	4, 5, 7, 20
118-5	• LOCKWASHER, 1/2"	12, 13, 14, 16, 19, 20, 21, 43, 44, 45, 48, 49, 60
118-1	• LOCKWASHER, 1/4"	35, 42
118-8	• LOCKWASHER, 3/4"	2, 16, 18, 45, 56
118-8	• LOCKWASHER, 3/4"	15
118-3	• LOCKWASHER, 3/8"	6, 10, 11, 18, 19, 20, 21, 36, 43, 45, 49, 54, 55
118-3	• LOCKWASHER, 3/8"	18
118-2	• LOCKWASHER, 5/16"	19, 32, 33, 34
118-7	• LOCKWASHER, 5/8"	2, 14
118-7	• LOCKWASHER, 5/8"	14, 16
118-4	• LOCKWASHER, 7/16"	44
118-9	• LOCKWASHER, 7/8"	1
320142	• LOCKWASHER, M10	46
982726-02	• LOUVER VENT, CIRCULAR	58
982496	• LOWER OUTLET, SWIVEL	20
871052400	• MACHINE SCREW, RIGHT-HAND, 10-24 X 0.50"	52, 53
983099	• MANIFOLD, HYD	60
750602	• MANIFOLD, W/ RELIEF, 3000 BRAKE	60
151370	• MIRROR	21
852570	• MIRROR HEAD, WEST COAST	21
983149	• MOLDBOARD AND BLADE ASSEMBLY, 12 FT.	16, 17
985152	• MOLDBOARD ASSEMBLY	2, 16
985460	• MOLDBOARD WELDMENT	17
988547	• MOTOR, HYDRAULIC	19
982870	• MOTOR, STEERING	35
982896	• MOUNT ASSEMBLY, STEERING SPINDLE	12, 13
985755	• MOUNT ASSEMBLY, TRANSMISSION	45
982838	• MOUNT BAR, END STEP	31, 54
982850	• MOUNT PLATE, CENTER GAUGE	58
982841	• MOUNT PLATE, LH CAB STEP	31, 54
982839	• MOUNT PLATE, RH CAB STEP	31, 54
981892	• MOUNT PLATE, WEAR	20
982519	• MOUNT, ACCUMULATOR BASE	59
982520	• MOUNT, ACCUMULATOR CLAMP	59

Part Number	Description	Figure Number (10-*)
P204291	• MOUNT, COMPRESSOR	57
982578	• MOUNT,PEDAL VAVLE ROD	37
1001085	• MOUNT, W/M, 785 MUFFLER	43, 45
983544	• MOUNTING BAND, AIR CLEANER	50
985624	• MOUNTING BAR, MIRROR	21
856896	• MOUNTING BAR, MIRROR GROUP	21
856987	• MOUNTING BRACKET, MIRROR	21
983094	• MOUNTING COLLAR, CYLINDER	56
985761	• MOUNTING FRAME, SCARIFIER	7
985459	• MOUNTING HOUSING, SWIVEL	20
700580	• MOUNTING PAD, RADIATOR (635B)	45
981856	• MOUNTING PIN, SLIDE CYLINDER	16
982726-04	• MOUNTING PLATE	57
982726-06	• MOUNTING PLATE	57
986154	• MOUNTING PLATE, CYLINDER	56
981648	• MOUNTING PLATE, HYDRAULIC TANK	49
1001086	• MUFFLER ASSEMBLY, 3.0 X 24-INCH TAILPIPE	45
80055	• NUT, 0.312"-24 HEX	36
116-5	• NUT, 1/2"-13	20, 25, 45, 48, 49
116-1	• NUT, 1/4"-20 HEX	36, 42
80494	• NUT, 10, HEX	57
115-14-1	• NUT, 1-1/2 - 12 HEX JAM	19
116-8	• NUT, 3/4"-10 HEX	20
116-3	• NUT, 3/8"-16 HEX	21, 45, 49, 54, 55
115-3	• NUT, 3/8"-24 HEX	36
116-2	• NUT, 5/16"-18 HEX	32
115-2	• NUT, 5/16"-24 HEX	33, 42
116-7	• NUT, 5/8"-11 HEX	10, 11, 17
116-4	• NUT, 7/16"-14 HEX	26, 41
116-9	• NUT, 7/8"-9 HEX	1
115-11-2	• NUT, CASTLE, 1-1/8"-13	8, 9
115-9-2	• NUT, CASTLE, 7/8"-14	10, 11
80924	• NUT, FLEXLOC, 10-24, FULL	52, 53
80356	• NUT, FLEXLOC, 5/8"-11	1
116-10	• NUT, HEX, 1"-8	11, 20
81007	• NUT, HEX, M05-80	57
80453	• NUT, HEX, M06-1	57
983467	• NUT, PLATE RETAINING	38
983552	• NUT, WHEEL, FLAT, M22	1, 4, 8, 9
982399-01	• NUT, WIPER ARM RETAINING	26

Part Number	Description	Figure Number (10-*)
982276-10	• O-RING	57
36808	• O-RING	60
983132	• OUTPUT SHAFT, TURNTABLE GEAR	19
982418	• PANEL, CAB REAR	38
503985	• PANEL, SELECTOR MOUNT	39
981781	• PEDAL ASSEMBLY, ACCELERATOR	32, 58
985520	• PEDAL ASSEMBLY, BRAKE	32, 37, 58
982863	• PEDAL COVER, BRAKE	37
982873	• PEDAL, BRAKE, ELECTRIC	37
985673	• PIN ASSEMBLY, ARTICULATION JOINT	4
985784	• PIN ASSEMBLY, ARTICULATION ROD MOUNTING	42
982852	• PIN SHAFT, WHEEL LEAN	13
981819	• PIN, ARTICULATING CYLINDER	4
981822	• PIN, ARTICULATING CYLINDER	4
982598	• PIN, CLEVIS	26
80389	• PIN, COTTER, 1/8 X 1.00"	26
985439	• PIN, DOWEL, 1/2 X 1.25"	19
985105	• PIN, REAR SCARIFIER	56
100180	• PINTLE HITCH	44
160240-12	• PIPE, EXH, FLEXIBLE 3.00 X 12.00 | 685	45
985104	• PLATE ASSEMBLY, BOOM CYLINDER	14, 15
986304	• PLATE, A/C COMP BRKT	47
1000202	• PLATE, A/C COMP FRONT MOUNT, T3	47
986303	• PLATE, A/C COMP MOUNT	47
981641	• PLATE, ACCESS DOOR, LEFT-HAND	43
981482	• PLATE, ACCESS DOOR, RIGHT-HAND	43
982560	• PLATE, AXLE MOUNTED STEP	48
981805	• PLATE, CONSOLE PANEL	35
981883	• PLATE, CYL END CAP	1, 12 ,13 ,16
981833	• PLATE, CYLINDER END CAP	16, 55
986608	• PLATE, LIGHT PANEL	35
982419	• PLATE, PANEL ACCESS	38
981478	• PLATE, RADIATOR GUARD	43
982837	• PLATE, REAR ACCESS DOOR	49
981651	• PLATE, REAR GRILL	49
981650	• PLATE, TAIL LIGHT MOUNT	49
983123	• PLATE, VALVE PIN GUIDE	36
982914	• PLATE,PEDAL MOUNT	37
985785	• POD ASSEMBLY, ARTICULATION ROD	42
34477	• POTENTIOMETER WITH WASHER, 250 OHM	42

Part Number	Description	Figure Number (10-*)
982872	• PUMP, PRESS COMP W/ LOAD SENSE	60
982876	• RADIATOR AND HOSE ASSEMBLY	45, 55
984262	• RADIATOR ELBOW, LOWER, 60 DEGREE, 2.25" ID	55
986892	• RADIATOR HOSE, UPPER	55
982564	• RADIATOR MOUNT, RUBBER	55
982875	• REAR DRIVE SHAFT	48
982238	• REAR SCARIFIER ASSEMBLY	5, 56
983367	• REAR STAIRWAY ASSEMBLY	44, 54
982780	• REDUCER TUBE, CHARGE AIR	55
985593	• RELAY	58
982738	• RESERVOIR	40, 58
981908	• RETAINER BAR, RING	15
982898	• RETAINER PIN ASSEMBLY	12, 13
982829	• RETAINER, SHANK	7, 56
985786	• RETAINING RING, EXTERNAL, 0.625"	42
984266	• ROD, ARTICULATION LEVER	42
984269	• ROD, BRAKE LINNKAGE	37
982791	• ROD, PEDAL MOUNT	37
983382	• ROD, VALVE LEVER	33
871081813	• ROLL PIN, 0.188" x 2.00"	36
871081835	• ROLL PIN, 0.375 X 2.00"	4, 7, 16, 56
72161	• ROLL PIN, 0.375 X 3.00", STL ZPL	16
982735	• ROOF PANEL, FRONT	22
982376	• ROOF PANEL, REAR	22
982322	• RUBBER MOUNT, TWO-PIECE	3
982323	• RUBBER MOUNT, TWO-PIECE	3
983383	• RUBBER, FRAME STEP, 5-PLY	54
983126	• RUBBER, VALVE LEVER	36
985103	• SADDLE ASSEMBLY, BOOM	15
986151	• SCARIFIER FRAME	56
982526	• SCARIFIER PIN, LOWER FRONT	7
982525	• SCARIFIER PIN, UPPER FRONT	7
982831	• SCARIFIER WELDMENT, FRONT	7
28905	• SCREW	50
80465	• SCREW, M06-1 X 20 MM, HEX	57
90074	• SCREW, MACHINE, 10-32 X 0.50"	57
900074	• SCREW, MACHINE, 10-32 X 5/8"	39
81160	• SCREW, SELF TAPPING, 10 X 1.0"	51
80321	• SCREW, SELF-TAPPING, 10 X 1/2"	57
80973	• SCREW, SHOULDER, 1/2 X 1.00 X 3/8-16	27, 29

Part Number	Description	Figure Number (10-*)
982901-06	• SEAL KIT	36
982884	• SEAL RUBBER, KINGPIN	10, 11
982360-109	• SEAL, LOWER WINDOW	28, 30
983377	• SEAL, OIL, 3.0 X 2.5 X 0.25"	14
120060A	• SEAL, TANDEM AXLE	8, 9
982360-104	• SEAL, UPPER WINDOW	28, 30
982325	• SEAT, MECHANICAL SUSPENSION	58
81069	• SETSCREW, 3/4"-10 X 3.5	20
80408	• SETSCREW, HEX SOCKET, 0.312-18 X 3/4-INCH	37
81204	• SETSCREW, HEX SOCKET, 10-24 X 0.25", CUP	42
108-412	• SETSCREW, SQUARE HEAD, 1/2"-13 X 3.75	10, 11
985586	• SHAFT RETAINER ASSEMBLY, VALVE LEVER	36
981859	• SHAFT, BLADE SLIDE PIN	16
981339	• SHAFT, CENTER PIVOT PIN	1
981863	• SHAFT, LEVER MOUNT	36
981391	• SHAFT, SPINDLE PIN	10, 11
981392	• SHAFT, SPINDLE PIN	12, 13
981810	• SHAFT, TIE ROD	10, 11
981793	• SHAFT, UPPER TILT CONSOLE	34, 35
981868	• SHAFT, VALVE MOUNT	36
983100	• SHANK AND TOOTH ASSEMBLY, SCARIFIER	7, 56
982243	• SHANK, SCARIFIER	7, 56
984265	• SHIFTER, ELECTRIC	58
983551	• SHIM PLATE, FLAT SLIDE	18
983554	• SHIM PLATE, L-SHAPED SLIDE	18
981907	• SHIM PLATE, SWIVEL RING	15
981717	• SHIM, DRAWBAR	2
982888	• SHIM, DRAWBAR	2
983141	• SHIM, TURNTABLE OUTPUT SHAFT	19
440040	• SHOCK MOUNT, ENGINE SEAT	55
982359	• SIDE BULB SEAL, DOOR EDGE, RUBBER	27, 29
982539	• SIDE BULB SEAL, DOOR EDGE, RUBBER	20
P70036	• SIGN, SLOW MOVING VEHICLE	49
983150	• SLIDE ASSEMBLY	16, 18
984968	• SPACER	19
984969	• SPACER	19
982731	• SPACER PLATE, REAR WIPER	41
985045	• SPACER, VALVE LEVER	33
982851	• SPACER, WHEEL HUB	10, 11
986332	• SPACER,ENGINE MOUNT,3054CAT	45

Part Number	Description	Figure Number (10-*)
670060	• SPRING, COMPRESSION, 0.38 ROD X 0.53 OD X 3.156" LG	35
250170	• SPRING, CONVEYOR BELT WIPER	35
982600	• SPRING, GAS	26
982857	• SPROCKET	19
982859-04	• STARTER, ELECTRIC	46
982871	• STEERING COLUMN	34
982170	• STEERING WHEEL	58
985512	• STEP, CAB	31, 54
985513	• STEP, CAB	31, 54
140030GK	• STRAINER AND GASKET KIT	51
36123	• STRAINER, HYDRAULIC OIL SUCTION	51
982883	• STUD, WHEEL, M22 X 1.5"	1, 4, 8, 9
982830	• SUPPORT FRAME, FRONT SCARIFIER	7
981806	• SUPPORT PLATE, RADIATOR	45
981507	• SWITCH, EMERGENCY STOP	58
3914674	• SWITCH, IGN	58
985458	• SWIVEL ASSEMBLY, CIRCLE MOUNT	20
982495	• SWIVEL ASSEMBLY, HYDRAULIC	20
982498	• SWIVEL CAP, TOP	20
73255-07	• TACHOMETER	58
981647	• TANK ASSEMBLY, UPPER HYDRAULIC	49, 51
982276-07	• THERMOSTAT	57
985488	• TILT FRAME	34
982878	• TIRE AND WHEEL ASSEMBLY	4
985849	• TIRE AND WHEEL ASSEMBLY, LEFT-HAND, 15.5 X 25.0	1
985850	• TIRE AND WHEEL ASSEMBLY, RIGHT-HAND, 15.5 X 25.0	1
982879	• TIRE AND WHEEL COMBO, RIGHT-HAND, 13.0 X 24.0	1, 4
982522	• TOOLBOX ASSEMBLY, FRAME MOUNT	44, 53
983095	• TOOTH, SCARIFIER	7, 56
982254	• TOP PLATE, BATTERY BOX	52, 53
982726-17	• TRAY, AIR INTAKE	57
986265	• TRUNION ASSEMBLY, LIFT CYLINDER	14
985763	• TRUNION PLATE, LIFT CYLINDER.	14
983101	• T-SEAL, HYDRAULIC SWIVEL	20
1001172	• TUBE, A/C SPACER, CAT, T3	47
981871	• TUBE, BALL JOINT MOUNT	36
982555	• TUBE, CONDENSER MOUNT	47
981912	• TUBE, SWIVEL CYLINDER	14
983151	• TURNTABLE ASSEMBLY	16, 20
989271	• V BELT, AIR COMPRESSOR DRIVE, CAT - T3	47

Part Number	Description	Figure Number (10-*)
983543-05	• VACUATOR VALVE, AIR CLEANER	50
982901	• VALVE ASSEMBLY, LEFT HAND	32, 36
982877	• VALVE ASSEMBLY, RIGHT HAND	32, 36
982901-02	• VALVE SECTION, WITH FLOAT	36
982901-01	• VALVE SECTION, WITH SPRING	36
982901-05	• VALVE, RELIEF	36
982726-08	• VALVE, THERMAL EXPANSION	57
852740	• VALVE,BRAKE CHARGE	60
405688	• VENT, DIRECTIONAL	39
405450	• VENT, FIXED	39
981398	• WASHER, ARTICULATING SHAFT	4
982399-02	• WASHER, FLAT	26
80995	• WASHER, FLAT, 10 SAE	57
858953	• WASHER, FLAT, 2.50 OD X 0.438 ID C 0.188 THK	35
81059	• WASHER, FLAT, 7/8"	1
80472	• WASHER, FLAT, M06, SAE	57
982324	• WASHER, MOUNT	3
982326	• WASHER, MOUNT	3
981893	• WEAR PLATE, TURNTABLE	20
982170	• WHEEL, STEERING	34
982728	• WINDOW, LOWER	22, 25
982787	• WINDOW, REAR	22
982608	• WINDOW, SIDE	22, 25
982362	• WINDSHIELD	26
982734	• WINDSHIELD ASSEMBLY	22, 26
982400-17	• WIPER ARM, 17"	26
9892403	• WIPER BLADE, 18"	26
982399	• WIPER MOTOR, 12-VOLT, 2" SHAFT, 85*	26
160040A	• WORK LIGHT	23

TRANSMISSION ASSEMBLY

Transmission Assembly Overview

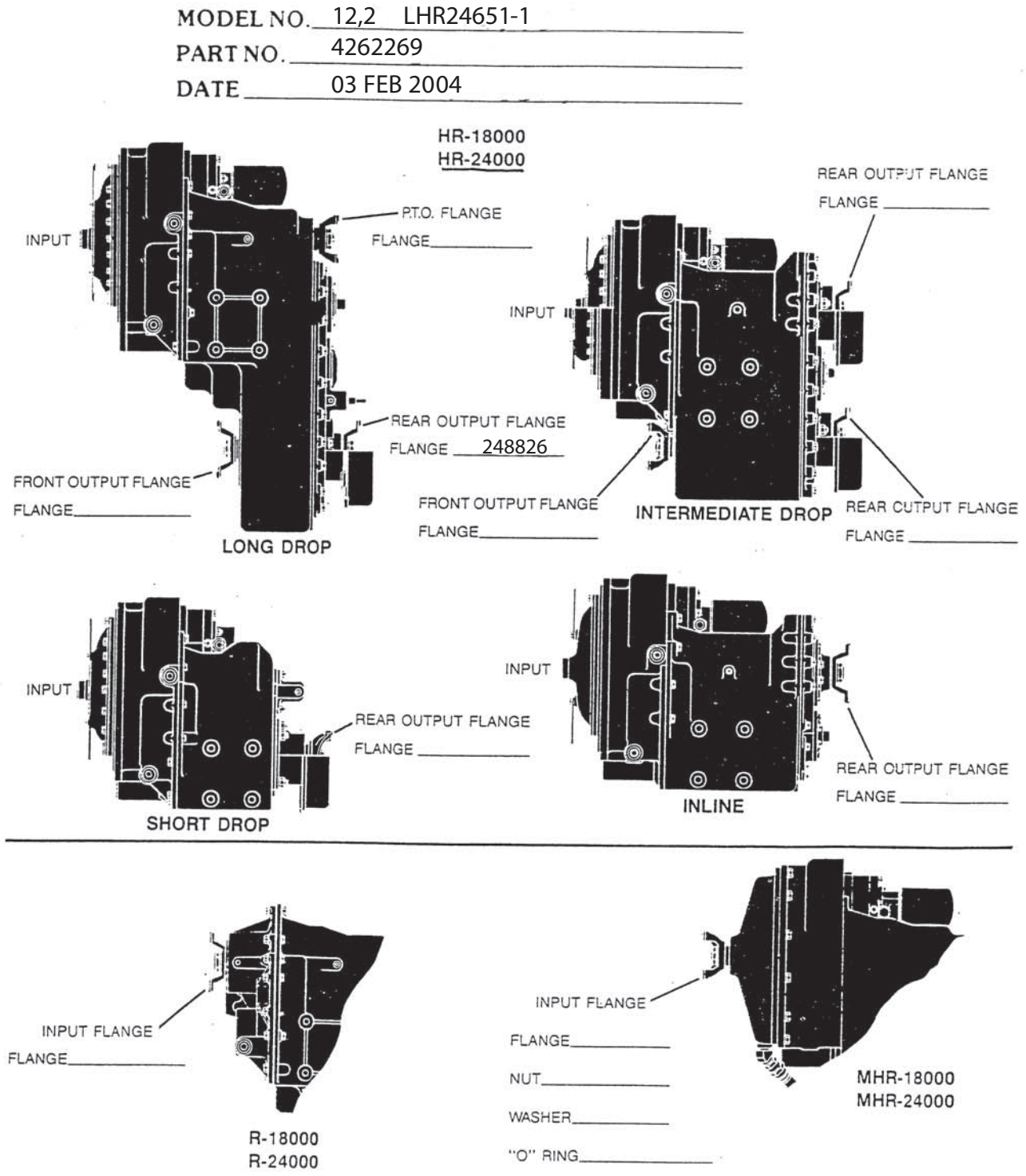


Figure 10-61

Transmission Assembly Overview Parts List

Item No.	Part Number	Qty.	Description	Remarks
61				
-	246826	1	FLANGE-OUTPUT 1480/1550 FRONT	

Transmission Housing

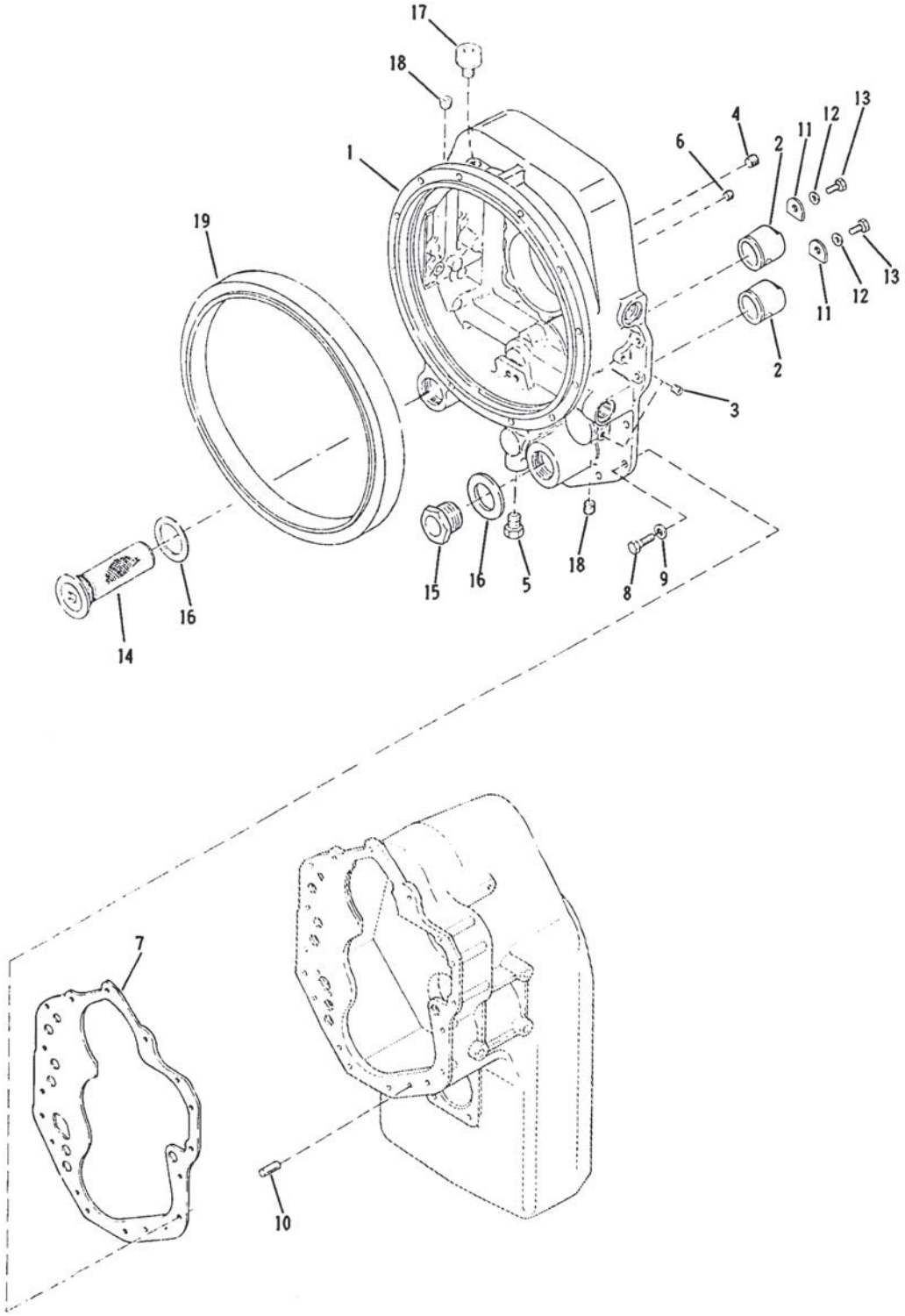


Figure 10-62

Transmission Housing Parts List

Item No.	Part Number	Qty.	Description	Remarks
62				
1	4203321	1	• ASSEMBLY-CONVERTER HOUSING	
2	248612	2	• SLEEVE-CONVERTER HOUSING	
3	239243	2	• PLUG-PIPE	
4	11F8	1	• PLUG-PIPE TEMP PICKUP	
5	24K6	1	• PLUG	
6	239244	2	• PLUG-PIPE	
7	241279	1	• GASKET-CONV HSG TO TRANS CASE	
8	17C720	17	• SCREW-CONV HSG TO TRANS CASE	
9	4.00E+07	17	• LOCKWASHER-CONV HSG TO TRANS CASE SCREW	
10	214295	1	• PIN-CONV HSG TO TRANS CASE DOWEL	
11	230851	2	CLIP	
12	1C510	2	• SCREW-CLIP	
13	4.00E+05	2	• LOCKWASHER-CLIP SCREW	
14	231390	1	• ASSEMBLY-SCREEN	
15	219370	1	• PLUG-CASE ASSEMBLY HOLE LOWER	
16	219373	2	• GASKET-SCREEN ASSEMBLY	
17	238535	1	• BREATHER-AIR	
18	47K5	2	• PLUG-LUBE PRESSURE & CLUTCH PRESSURE	
19	232424	1	• RING-CONVERTER HOUSING ADAPTER	
-	4202312	1	• BUSHING-SPEED SENSOR	
-	4202388	-	• SPACER-SPEED SENSOR	
-	248167	-	• SHIM-WASHER	
-	1KM18	1	• PLUG-SENSOR HOLE	
-	60K30020	1	• 0" RING-SPEED SENSOR HOLE "	
-	16F4	2	• PLUG-PIPE	

Transmission Care And Rear Cover

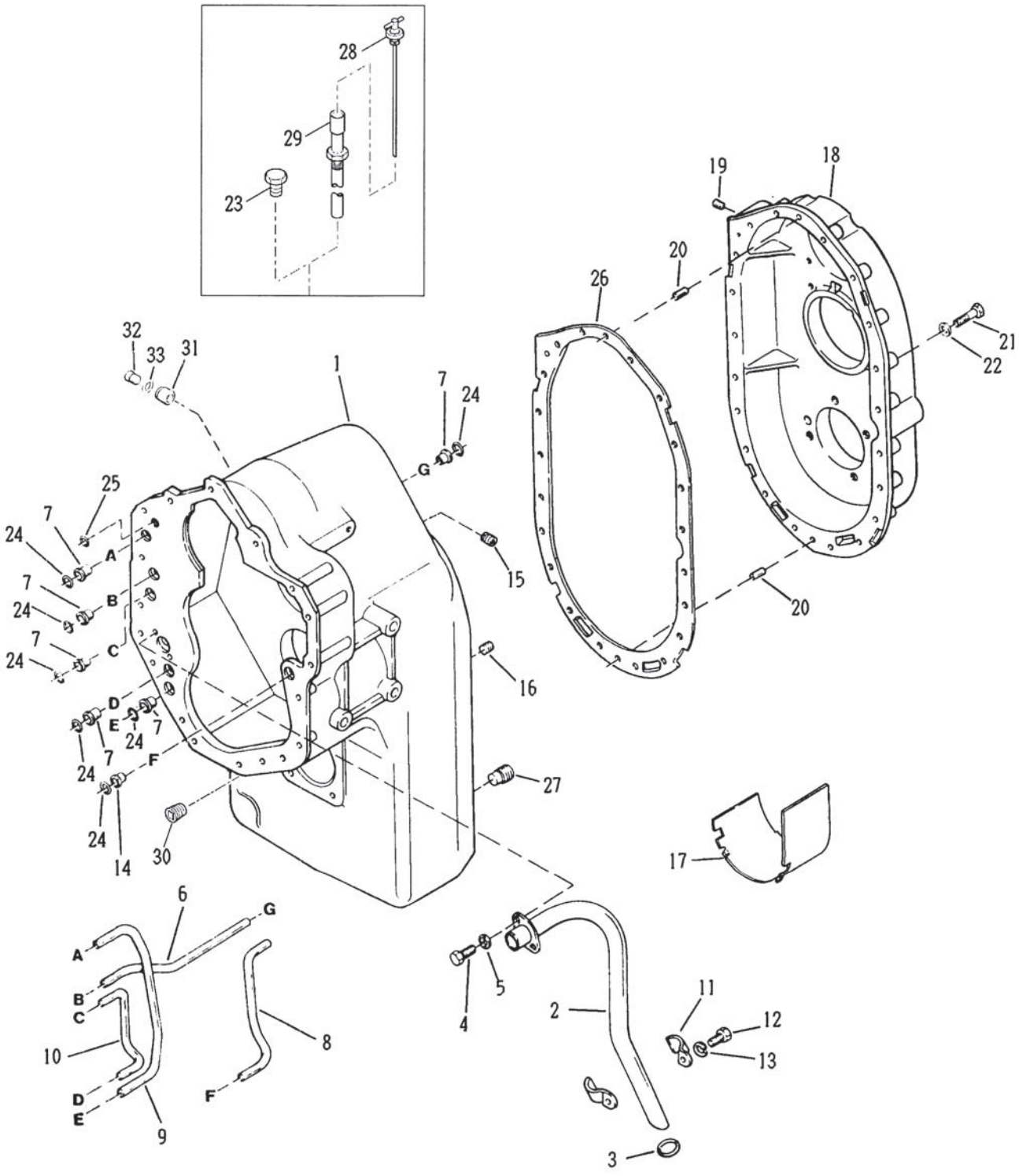


Figure 10-63

Transmission Care And Rear Cover Parts List

Item No.	Part Number	Qty.	Description	Remarks
63				
1	4203669	2	• ASSY-TRANSM.CASE & TUBE-INCL.ITEMS 2 THRU 14	
2	242667	1	• ASSY-SUCTION TUBE -PART OF ITEM 1	
3	60K40104	1	• 0 RING - PART OF ITEM 1	
4	1C510	2	• CAPSCREW - PART OF ITEM 1	
5	4.00E+05	2	• LOCKWASHER - PART OF ITEM 1	
6	242639	1	• TUBE-LOW SPEED CLUTCH PRESSURE-PART OF ITEM 1	
7	222067	4	• SLEEVE-PRESS & LUBR.TUBE - PART OF ITEM 1	
8	245163	1	• TUBE LUBE - PART OF ITEM 1	
9	241319	1	• TUBE-3RD CLUTCH - PART OF ITEM 1	
10	241318	1	• TUBE-HIGH CLUTCH - PART OF ITEM 1	
11	242670	2	• CLIP-SUCTION TUBE - PART OF ITEM 1	
12	1C612	1	• CAPSCREW - PART OF ITEM 1	
13	4.00E+06	1	• LOCKWASHER - PART OF ITEM 1	
14	221871	1	• TUBE SLEEVE - PART OF ITEM 1	
15	16F4	1	• PLUG-PIPE	
16	16F6	1	• PLUG-PIPE	
17	248613	1	• BAFFLE-OIL	
18	244385	1	• ASSY-REAR COVER & PLUG- INCL. ITEM 19	
19	239244	1	• PLUG - PART OF ITEM 18	
20	214295	2	• PIN-TRANSMISSION CASE TO REAR COVER DOWEL	
21	17C740	20	• SCREW-REAR COVER TO CASE	
22	4.00E+07	20	• LOCKWASHER-REAR COVER TO CASE SCREW	
23	-	-	Not Used On This Model	
24	60K40026	7	• 0" RING-CLUTCH PRESSURE TUBE "	
25	60K30018	1	• 0" RING-CLUTCH PRESSURE "	
26	236646	1	• B GASKET-REAR COVER TO TRANSMISSION CASE	
27	215757	2	• PLUG-MAGNETIC DRAIN	
28	242603	1	• DIPSTICK	
29	236669	1	• ASSEMBLY-DIPSTICK TUBE	
30	11F16	1	• PLUG-DRAIN BACK HOLE	
31	248166	1	• BUSHING-SPEED SENSOR	
31A	248167	-	• B SHIM-WASHER	
32	1KM18	1	• PLUG-SPEED SENSOR PORT	
33	60K30020	1	• B 0" RING-SPEED SENSOR PORT "	
-	40K4	1	• PLUG-PIPE LOCKUP PORT	

Turbine Shaft, Stator Support & Oil Baffle

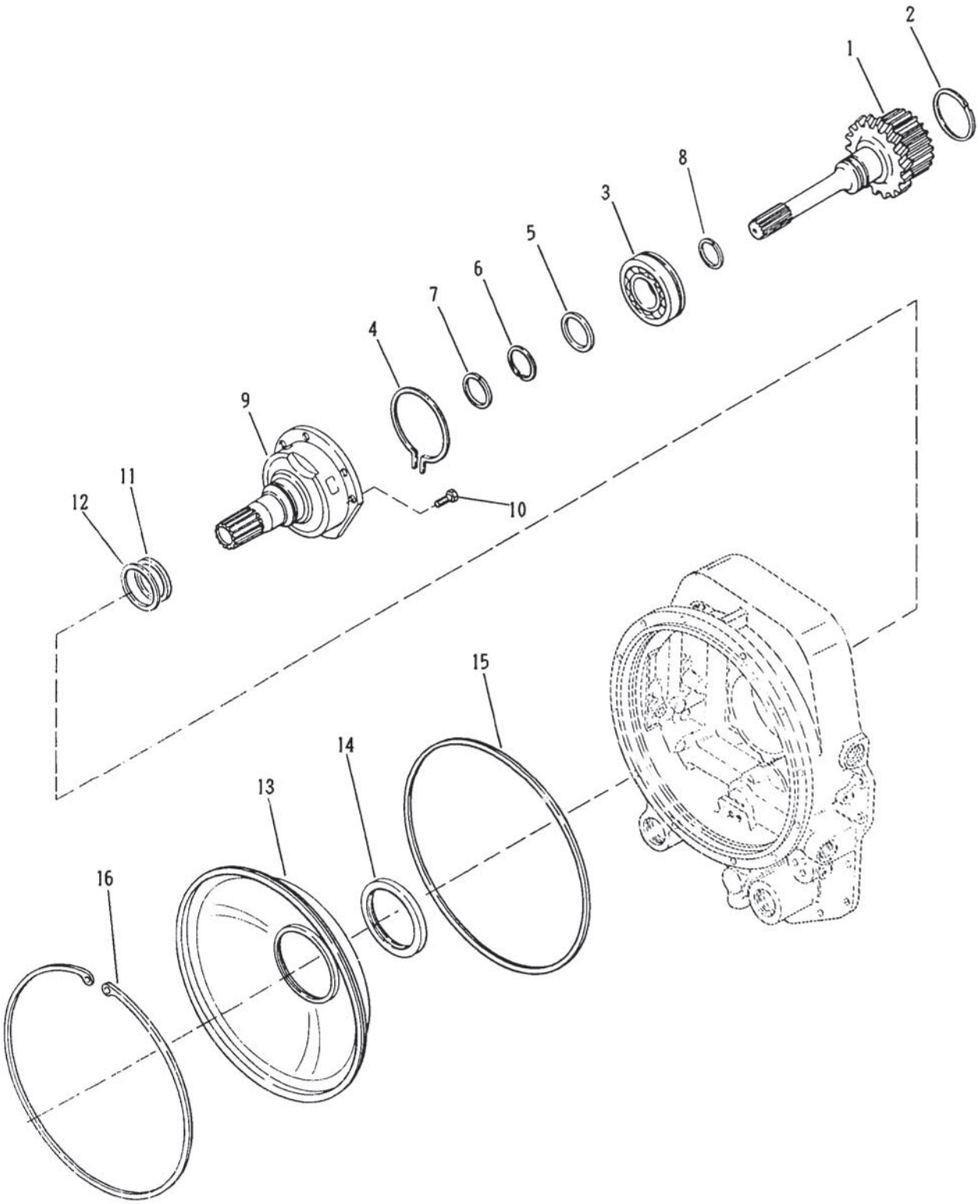


Figure 10-64

Turbine Shaft, Stator Support & Oil Baffle Parts List

Item No.	Part Number	Qty.	Description	Remarks
64				
1	242820	1	• ASSY-TURBINE SHAFT RET RING-INCL.ITEM 2	
2	240617	1	• RING-RETAINING - PART OF ITEM 1	
3	239742	1	• BEARING-TURBINE SHAFT	
4	234229	1	• SNAP RING EXTERNAL-SPECIAL	
5	234230	1	• WASHER-BEARING SUPPORT	
6	231776	1	• BEARING RETAINING RING	
7	223085	1	• PISTON RING	
8	209781	1	• PUMP SHAFT PISTON RING INNER	
9	246102	1	• STATOR SUPPORT	
10	241308	6	• SCREW-STATOR SUPPORT	
11	245772	1	• RING-PISTON	
12	249124	1	• SPRING-PISTON RING EXPANDER	
13	242831	1	• ASSY-OIL BAFFLE-INCLUDING ITEM 14	
14	4204710	1	• SEAL-OIL BAFFLE - PART OF ITEM 13	
15	241237	1	• RING-OIL BAFFLE SEAL	
16	245787	1	• RING-OIL BAFFLE RETAINING	

Driver Plate

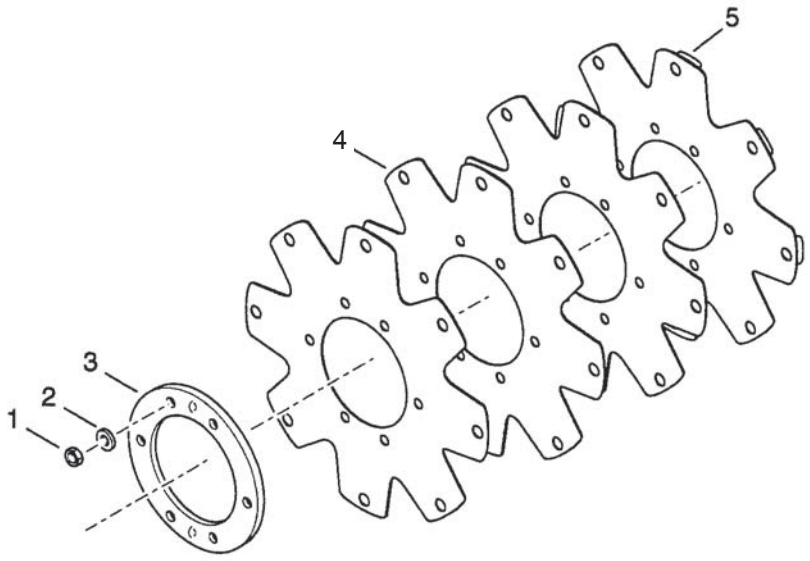


Figure 10-65

Driver Plate Parts List

Item No.	Part Number	Qty.	Description	Remarks
65				
1	8D6	10	• NUT	
2	4.00E+06	10	• LOCKWASHER	
3	246615	1	• RING-BACKING	
4	Not Sold Separately	3	• PLATE-DRIVE - INCL. IN ITEM 5	
5	000802214000E	1	• KIT-ASSY DRIVE PLATE-INCL.ITEMS 1 THRU 4	

Torque Converter Assembly

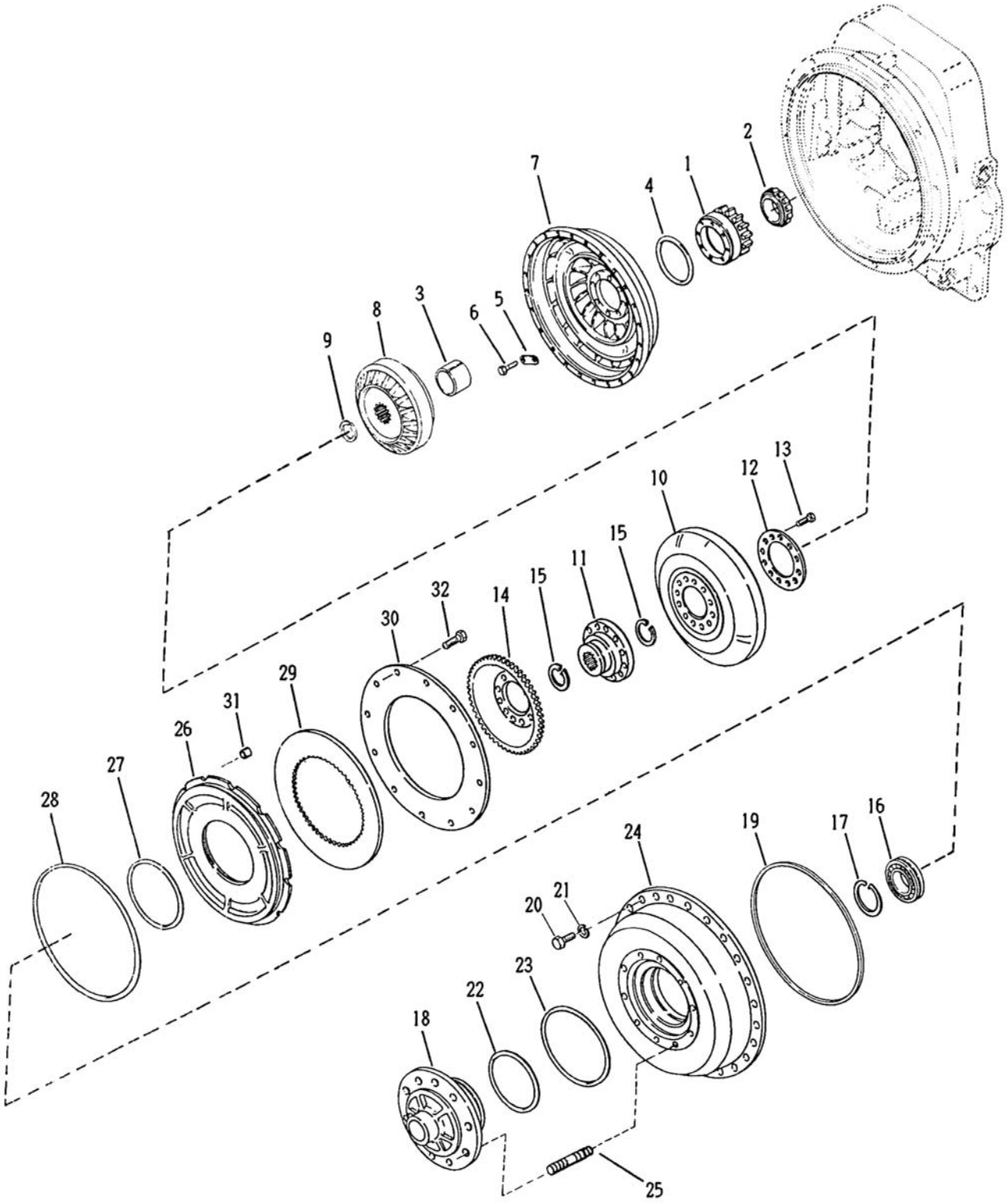


Figure 10-66

Torque Converter Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
66				
1	242996	1	• GEAR-IMPELLER HUB 36T-10P	
2	242997	1	• BEARING-IMPELLER HUB BEAR RN2010ECM	
3	246105	1	• SPACER-IMPELLER HUB BEARING	
4	234973	1	• 0" RING-IMPELLER HUB "	
5	234210	4	• TAB-IMPELLER TO HUB SCREW LOCK	
6	242046	8	• SCREW-IMPELLER TO HUB	
7	234238	1	• IMPELLER	
8	242846	1	• MEMBER-REACTION 15 BLADES	
9	243260	1	• RING-REACTION MEMBER RETAINING	
10	242850	1	• TURBINE 18 BLADES	
11	245146	1	• HUB-TURBINE	
12	242851	1	• RING-TURBINE TO HUB SCREW	
13	242892	12	• SCREW-TURBINE TO HUB	
14	242782	1	• GEAR-DRIVE	
15	1902877	2	• RING-TURBINE RETAINING 5160-137 653517	
16	242828	1	• BEARING-TURBINE HUB 211SG L.I.F.	
17	244409	1	• SNAP RING-TURBINE HUB BEARING	
18	242779	1	• COVER-IMPELLER	
19	232535	1	• 0" RING-IMPELLER TO DRIVE DISC "	
20	1C618	24	• SCREW-IMPELLER TO COVER	
21	4.00E+06	24	• LOCKWASHER-IMPELLER TO COVER	
22	60K40400	1	• 0" RING-IMPELLER COVER TO DRIVE DISC BORE "	
23	60K40520	1	• 0" RING-IMPELLER COVER TO DRIVE DISC FACE "	
24	246005	1	• ASSY-DRIVE DISC AND STUD-INCL.ITEM 25	
25	245533	10	• STUD - PART OF ITEM 24	
26	247160	1	• PISTON-CLUTCH	
27	60K40428	1	• 0 RING	
28	60K40908	1	• 0 RING	
29	232432	1	• PLATE-DRIVE CLUTCH	
30	234026	1	• PLATE-END	
31	242864	12	• SLEEVE-DRIVE	
32	8C618	12	• SCREW-CAP	

Gear Group

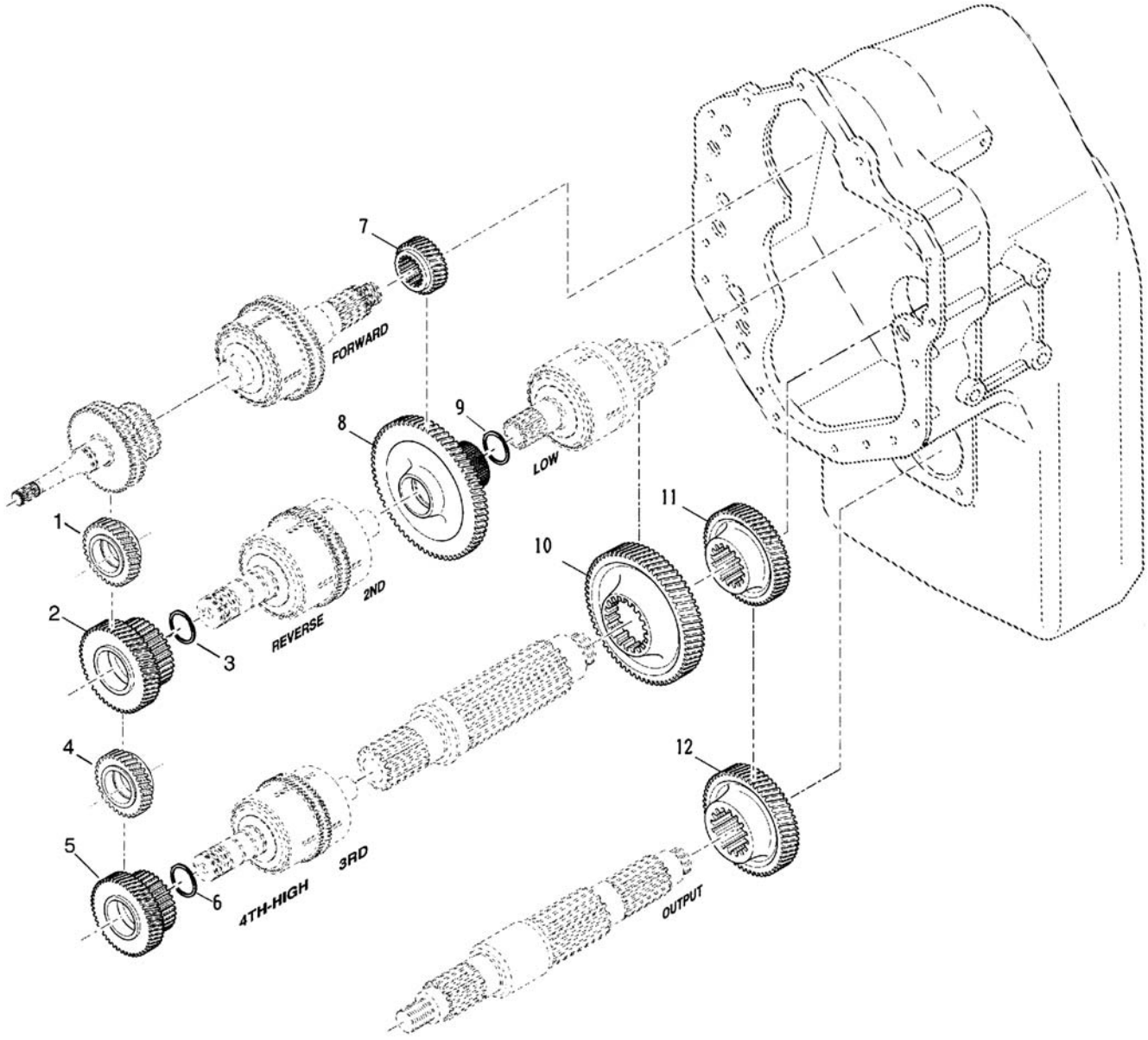


Figure 10-67

Gear Group Parts List

Item No.	Part Number	Qty.	Description	Remarks
67				
4	247705	1	• GEAR-IDLER 43T	
5	243060	1	• ASSY-FWD HI CL GEAR, HUB&RET RING-INCL.ITEM 6	
6	240617	1	• RING-RETAINING - PART OF ITEM 5	
7	241175	1	• GEAR-FORWARD SHAFT 26T	
8	4208021	1	• GEAR-LOW CLUTCH	
9	-	-	Not Used On This Model	
10	242947	1	• GEAR-IDLER SHAFT 51T	
11	243067	1	• GEAR-IDLER SHAFT 45T	
12	243068	1	• GEAR-OUTPUT 47T	

Auxiliary Pump Drive

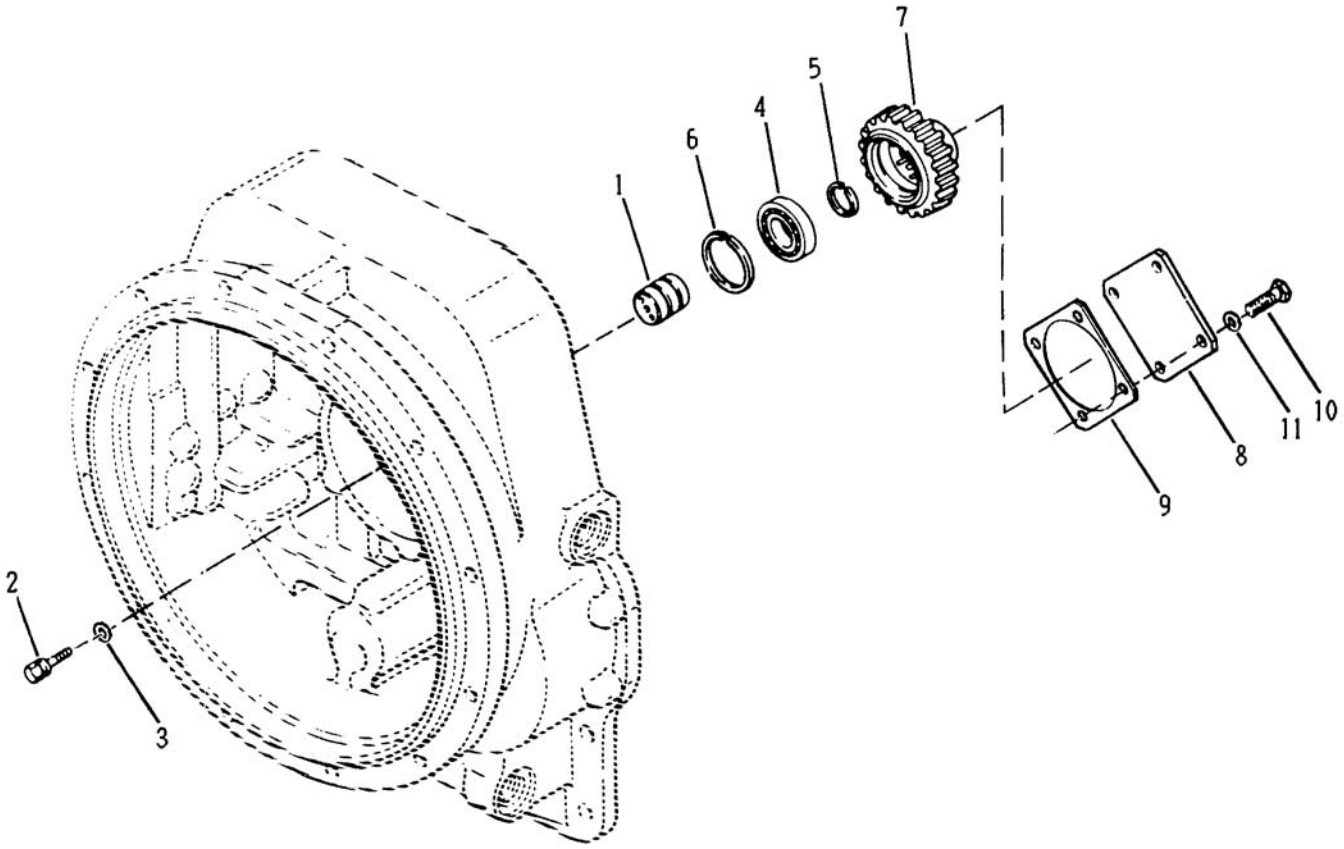


Figure 10-68

Auxiliary Pump Drive Parts List

Item No.	Part Number	Qty.	Description	Remarks
68				
1	234327	1	• SUPPORT-PUMP DRIVE BEARING	
2	1C620	2	• SCREW-BEARING SUPPORT	
3	4.00E+06	2	• LOCKWASHER-BEARING SUPPORT	
4	238222	1	• BEARING-PUMP DRIVE GEAR 207-M	
5	234908	1	• RING-DRIVE GEAR BEARING LOCATING	
6	223878	1	• RING-DRIVE GEAR BEARING RETAINING	
7	239571	1	• GEAR-PUMP DRIVE 36T-10P 13T-16/32	
8	3614642	1	• COVER-PUMP MOUNTING PERMANENT	
9	4205272	1	• GASKET-SHIPPING COVER	
10	1C816	2	• CAPSCREW-PUMP MOUNTING PERMANENT COVER	
11	4.00E+08	2	• LOCKWASHER-PUMP COVER SCREW	

Changing Pump Drive

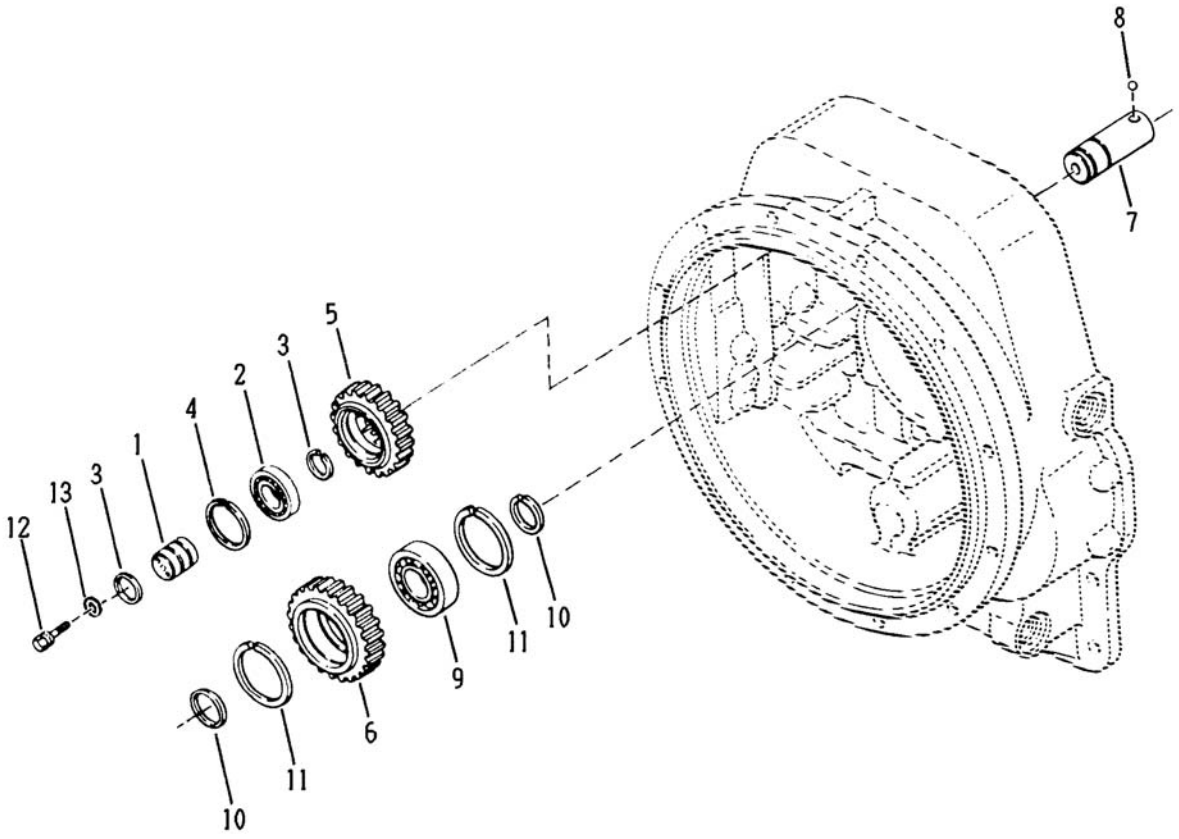


Figure 10-69

Changing Pump Drive Parts List

Item No.	Part Number	Qty.	Description	Remarks
69				
1	234327	1	• SUPPORT-PUMP DRIVE BEARING	
2	247584	1	• BEARING-PUMP DRIVE GEAR 107KS	
3	234908	2	• RING-DRIVE GEAR BEARING LOCATING	
4	223922	1	• RING-DRIVE GEAR BEARING RETAINING	
5	238212	1	• GEAR-PUMP DRIVE 36T-10P	
6	238211	1	• GEAR-PUMP DRIVE IDLER 40T-10P	
7	238215	1	• SHAFT-IDLER GEAR STUB	
8	1OJ8	1	• BALL-IDLER SHAFT LOCK	
9	238223	1	• BEARING-IDLER GEAR STUB SHAFT 307M	
10	234908	2	• RING-IDLER GEAR BEARING LOCATING	
11	223964	2	• RING-IDLER GEAR BEARING RET.	
12	1C620	2	• SCREW-BEARING SUPPORT	
13	4.00E+06	2	• LOCKWASHER-BEARING SUPPORT	

Forward Shaft

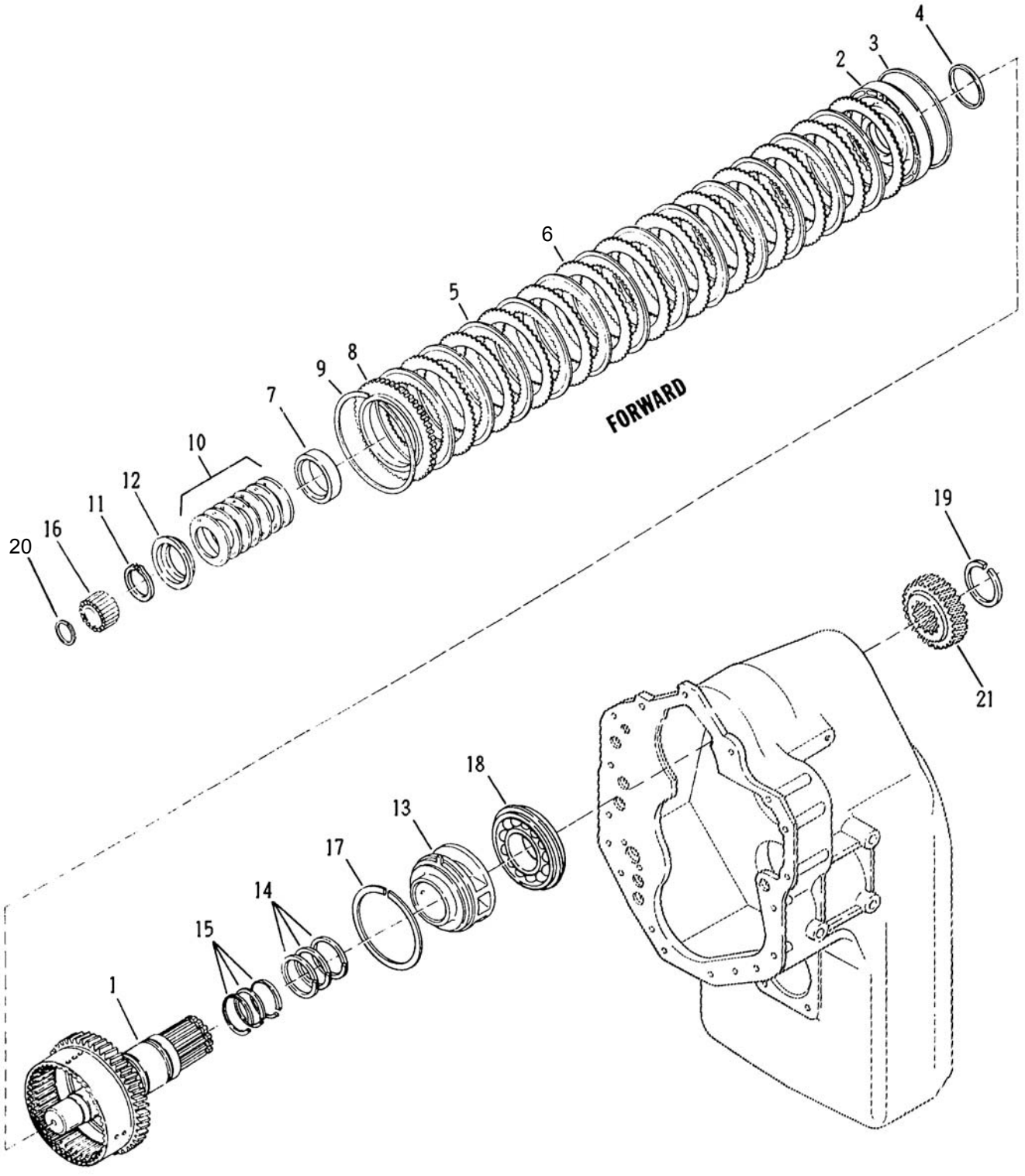


Figure 10-70

Forward Shaft Parts List

Item No.	Part Number	Qty.	Description	Remarks
70				
1	242824	1	• ASSEMBLY-FORWARD SHAFT, DRUM & PLUG	
2	4207357	1	• ASSY-CLUTCH PISTON AND SEALS-INCL.ITEMS 3 &	
3	237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 2	
4	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 2	
5	237016	12	• DISC-CLUTCH INNER	
6	234109	12	• DISC-CLUTCH OUTER	
7	237442	1	• SPACER-PISTON RETURN SPRING	
8	242650	1	• PLATE-CLUTCH DISC BACKING	
9	234111	1	• SNAP RING-BACKING PLATE	
10	247657	1	• ASSY-DISC SPRING - INCL. 7 WASHERS	
11	234350	1	• SNAP RING-SPRING RETAINER	
12	241313	1	• RETAINER-SPRING	
13	241037	1	• SLEEVE-PISTON RING	
14	242651	4	• RING-FORWARD SHAFT PISTON	
15	237378	4	• SPRING-FORWARD SHAFT PISTON RING EXPANDER	
16	235763	1	• BEARING-FORWARD SHAFT PILOT WJ283412	
17	235764	1	• RING-PISTON RING SLEEVE RETAINER	
18	241819	1	• BEARING-FORWARD SHAFT REAR 213SG	
19	238034	1	• RING-GEAR RETAINING	
20	209781	1	• RING-PISTON	
21	-	-	• FORWARD SHAFT GEAR - SEE GEAR GROUP	

Reverse Idler

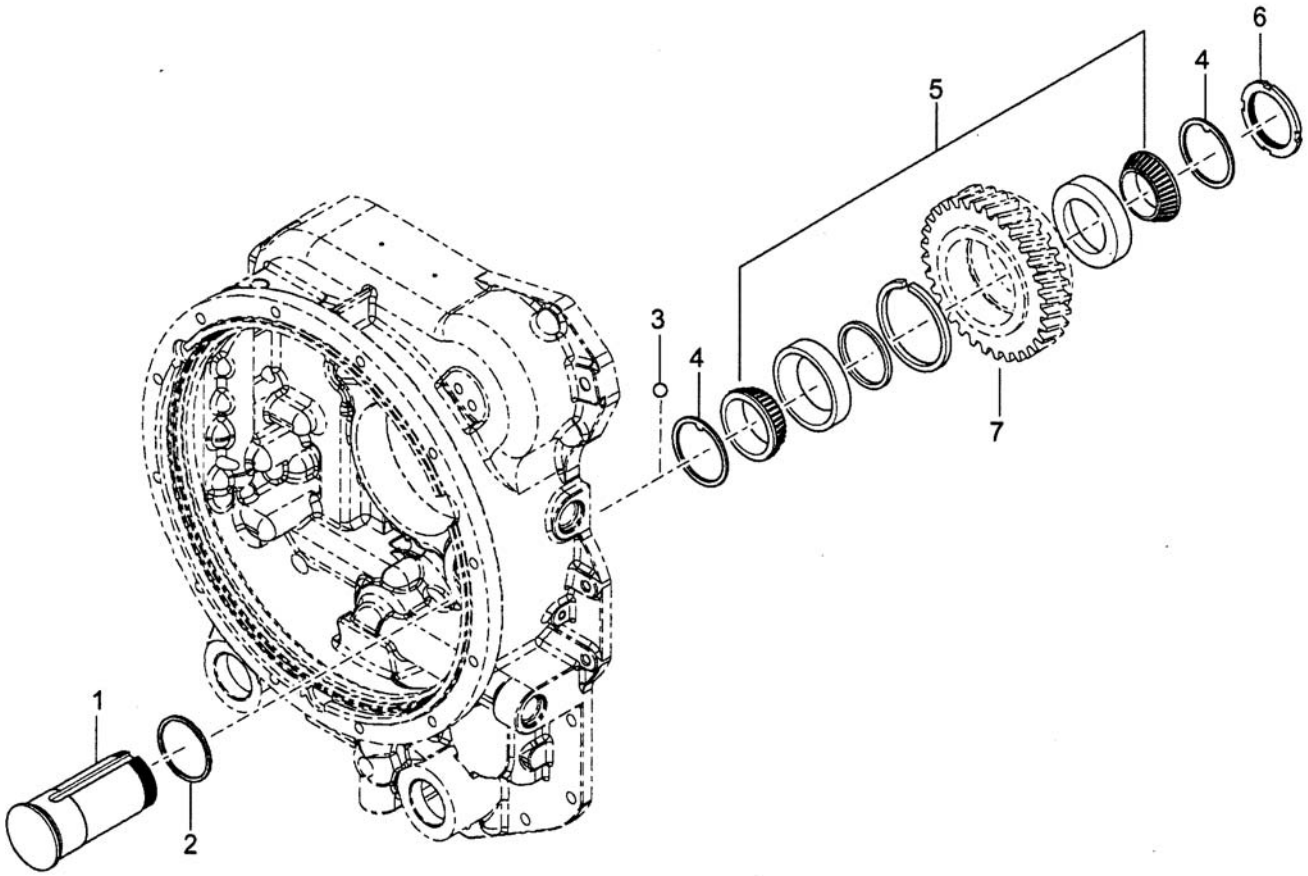


Figure 10-71

Reverse Idler Parts List

Item No.	Part Number	Qty.	Description	Remarks
71				
1	242872	1	• SHAFT-REVERSE IDLER	
2	76K223	1	• 0" RING-IDLER SHAFT "	
3	10J10	1	• BALL	
4	238911	2	• WASHER TANGED	
5	247664	1	• ASSY-BEARING	
6	201700	1	• NUT-BEARING RETAINING PLATE	
7	-	-	• GEAR-REVERSE IDLER - SEE GEAR GROUP	

Reverse & 2Nd Shaft

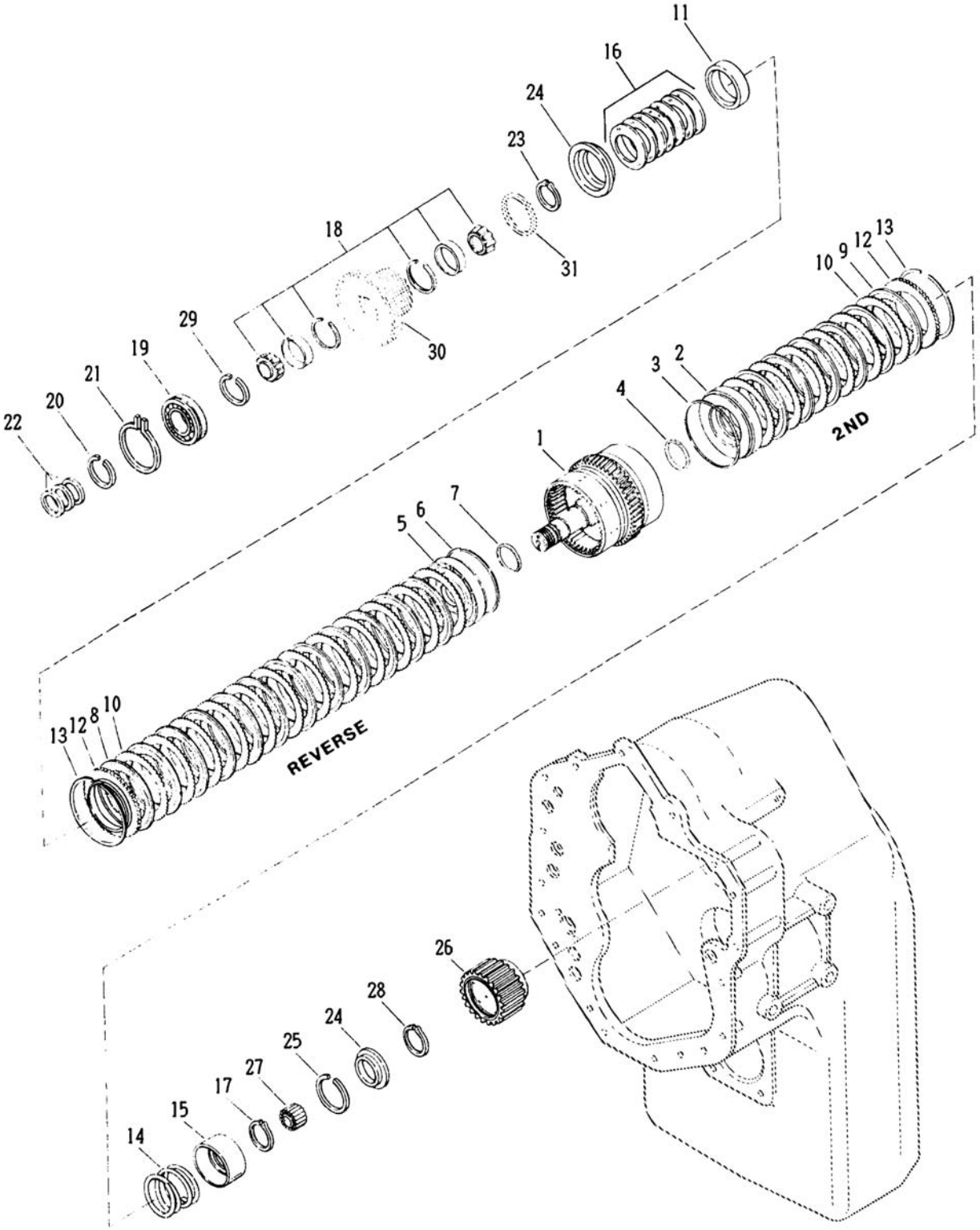


Figure 10-72

Reverse & 2Nd Shaft Parts List

Item No.	Part Number	Qty.	Description	Remarks
72				
1	246235	1	• ASSY-REV & 2ND SHAFT, DRUM & PLUG	
2	4207175	1	• ASSY-CL PISTON,BALL,SEAT&SEALS-INCL.ITEMS 3&4	
3	237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 2	
4	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 2	
5	4207357	1	• ASSY-CLUTCH PISTON AND SEALS-INCL.ITEMS 6 & 7	
6	237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 5	
7	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 5	
8	237016	12	• DISC-CLUTCH INNER	
9	237016	6	• DISC-CLUTCH INNER	
10	234109	18	• DISC-CLUTCH OUTER	
11	237442	1	• SPACER-PISTON RETURN SPRING	
12	242650	2	• PLATE-CLUTCH DISC BACKING	
13	234111	2	• SNAP RING-BACKING PLATE	
14	235960	1	• SPRING-PISTON RETURN	
15	235959	1	• RETAINER-SPRING	
16	247657	1	• ASSY-DISC SPRING - INCL. 7 WASHERS	
17	234350	1	• SNAP RING-SPRING RETAINER	
18	241278	1	• ASSY-CLUTCH DRIVEN GEAR BEARING	
19	241606	1	• BEARING-REVERSE & 2ND SHAFT FRONT	
20	246238	1	• SNAP RING-FRT BRG NEXT TO PISTON RING GROOVE	
21	230889	1	• SNAP RING-FRONT BEARING	
22	4208098	3	• PISTON-RING	
23	234350	1	• SNAP RING-SPRING RETAINER	
24	241313	2	• RETAINER	
25	241603	1	• SNAP RING-RETAINER	
26	4203200	1	• HUB-2ND CLUTCH	
27	233065	1	• BEARING-REVERSE & 2ND SHAFT REAR	
28	234350	1	• SNAP RING-2ND CLUTCH DISC HUB	
29	000802152000C	1	• KIT-RET-RING	
30	-	-	• REVERSE CL GEAR & HUB ASSY - SEE GEAR GROUP	
31	-	-	• RETAINING RING - SEE GEAR GROUP	

Low Shaft

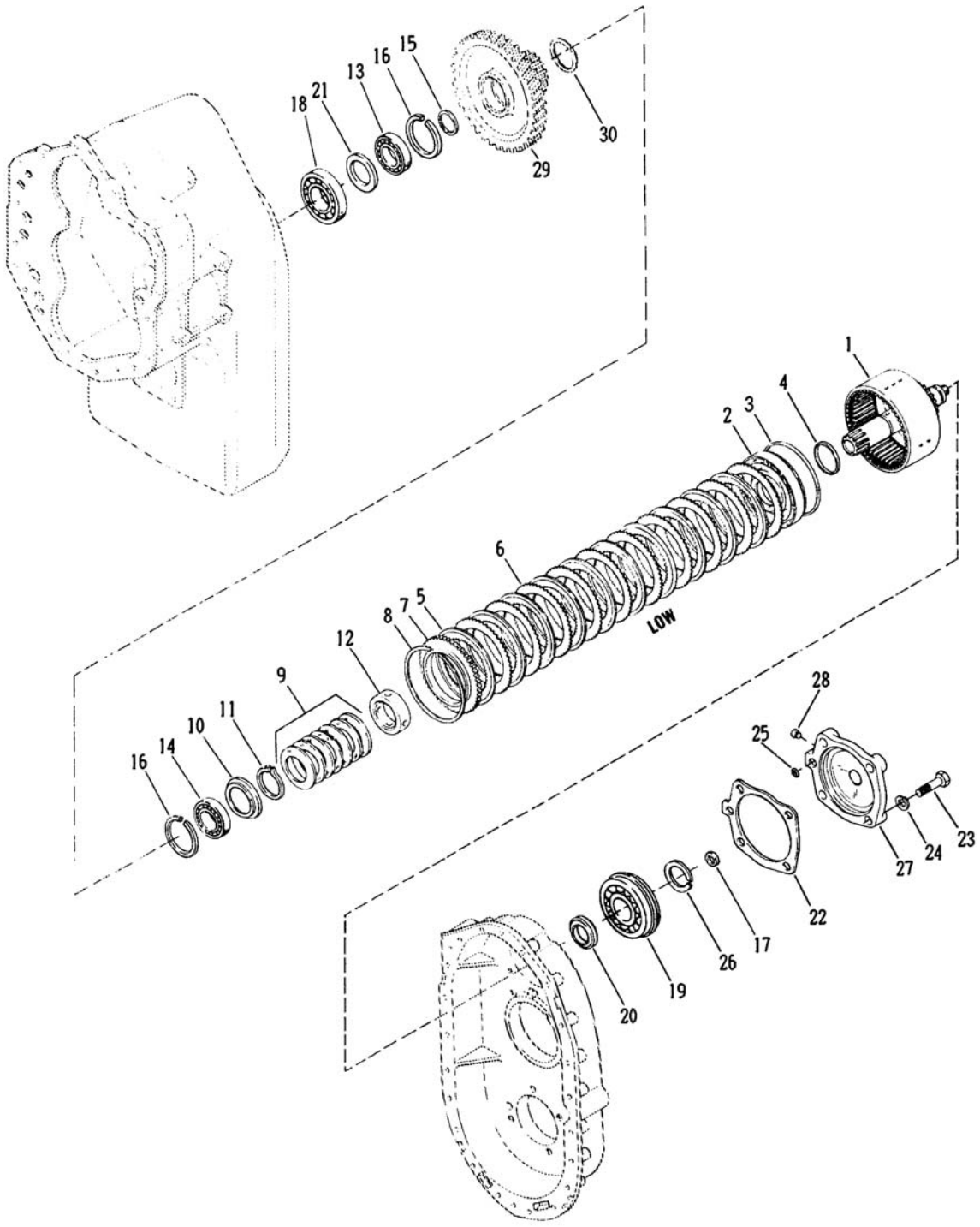


Figure 10-73

Low Shaft Parts List

Item No.	Part Number	Qty.	Description	Remarks
73				
1	242942	1	• ASSY-LOW CLUTCH SHAFT DRUM & BLEED VALVE	
2	4204050	1	• ASSY-CLUTCH PISTON & SEALS-INCL.ITEMS 3 & 4	
3	1237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 2	
4	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 2	
5	234336	10	• DISC-CLUTCH INNER	
6	234109	10	• DISC-CLUTCH OUTER	
7	242650	1	• PLATE-CLUTCH DISC BACKING	
8	234111	1	• SNAP RING	
9	247659	1	• ASSY-DISC SPRING - INCLUDING 7 WASHERS	
10	248095	1	• RETAINER-RING	
11	234350	1	• RING-RETAINING	
12	242658	1	• PISTON RETURN SPRING SPACER	
13	241818	1	• LOW SPEED GEAR BEARING	
14	230885	1	• BALL BEARING	
15	241259	1	• SPACER-LOW SPEED GEAR BEARING	
16	223881	2	• CLUTCH DRIVEN GEAR BRG SNAP RING	
17	250215	1	• RING-LOW SHAFT PISTON MELDIN	
18	239742	1	• BEARING-LOW SPEED CLUTCH SHAFT FRONT	
19	230968	1	• BEARING-LOW SPEED CLUTCH SHAFT REAR	
20	-	-	Not Used On This Model	
21	234145	1	• SPACER-FRONT BEARING	
22	242685	1	• GASKET-REAR BEARING CAP	
23	243090	4	• SCREW-REAR BEARING CAP	
24	4.00E+07	4	• LOCKWASHER-REAR BEARING CAP	
25	60K30012	1	• 0" RING-REAR BEARING CAP "	
26	232081	1	• RING-REAR BEARING RETAINING	
27	242686	1	• ASSY-REAR BEARING CAP & PLUG-INCL.ITEM 28	
28	24K2	1	• PLUG - PART OF ITEM 29	
29	-	-	• ASSY-LOW GEAR HUB & RING - SEE GEAR GROUP	
30	-	-	• RETAINING RING - SEE GEAR GROUP	

Forward - Hi & 3Rd Shaft Clutch

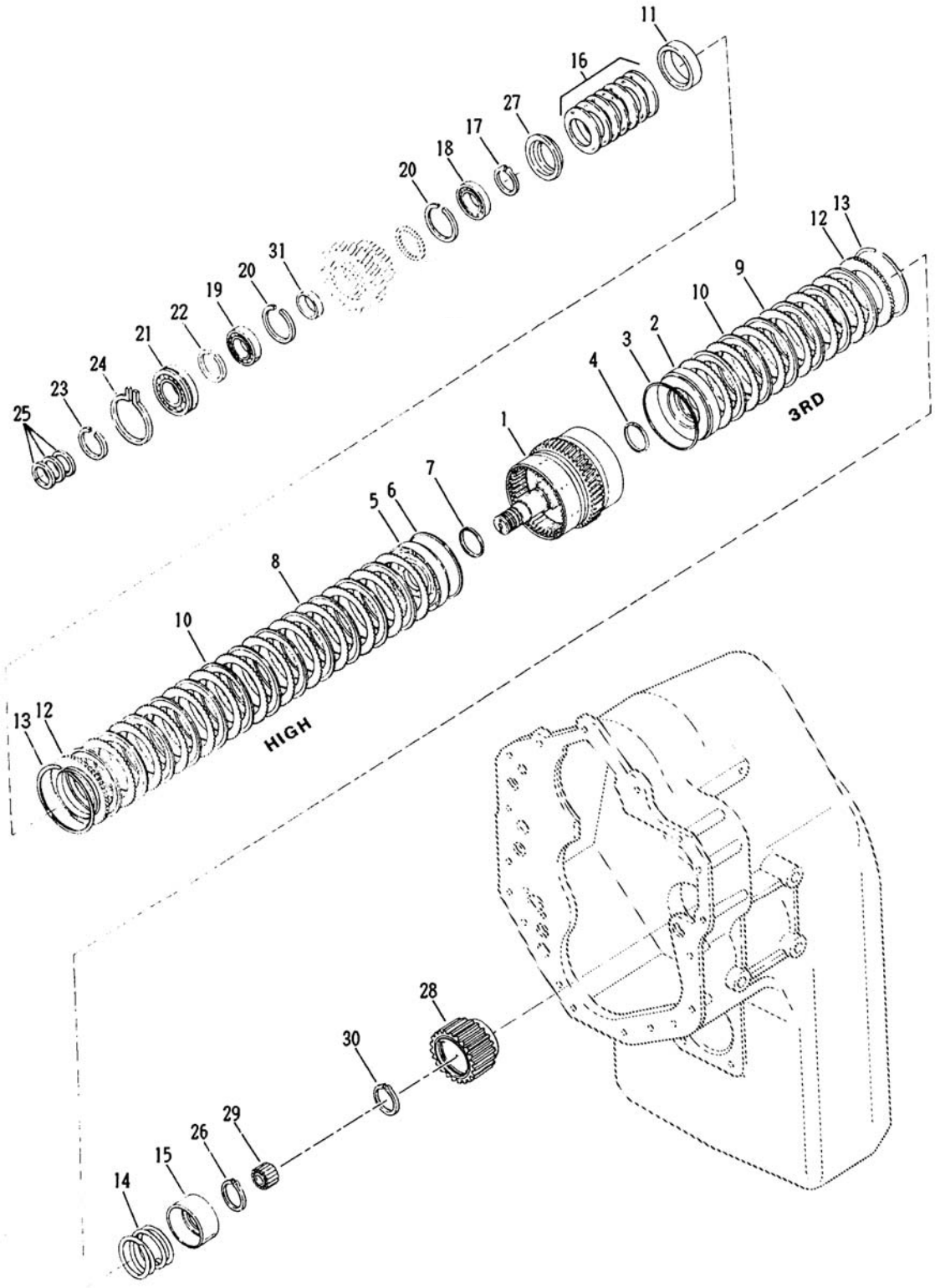


Figure 10-74

Forward - Hi & 3Rd Shaft Clutch Parts List

Item No.	Part Number	Qty.	Description	Remarks
74				
1	246222	1	• ASSY-FWD HI & 3RD SHAFT, DRUM & PLUG	
2	4207175	1	• ASSY-CL PISTON,BALL,SEAT&SEALS-INCL.ITEMS 3&4	
3	237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 4	
4	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 2	
5	4204045	1	• ASSY-CLUTCH PISTON AND SEALS-INCL.ITEMS 6 & 7	
6	237032	1	• SEAL-CLUTCH PISTON - OUTER - PART OF ITEM 5	
7	234113	1	• SEAL-CLUTCH PISTON - INNER - PART OF ITEM 5	
8	237016	12	• DISC-CLUTCH INNER	
9	237016	6	• DISC-CLUTCH INNER	
10	234109	18	• DISC-CLUTCH OUTER	
11	237442	1	• SPACER-PISTON RETURN SPRING	
12	242650	2	• PLATE-CLUTCH DISC BACKING	
13	234111	2	• SNAP RING-BACKING PLATE	
14	235960	1	• SPRING-PISTON RETURN	
15	235959	1	• RETAINER-SPRING	
16	247657	1	• ASSY-DISC SPRING - INCL. 7 WASHERS	
17	234350	1	• SNAP RING-SPRING RETAINING	
18	230829	1	• BEARING-CLUTCH DRIVEN GEAR	
19	233389	1	• BEARING-CLUTCH DRIVEN GEAR	
20	234141	2	• RING-CLUTCH GEAR BEARING RETAINING	
21	241606	1	• BRG-FWD HI & 3RD SHAFT FRONT	
22	247949	1	• SNAP RING-FRONT BRG REAR	
23	246238	1	• SNAP RING-FRONT BRG FRONT	
24	230889	1	• SNAP RING-FRONT BEARING	
25	4208098	3	• PISTON-RING	
26	234350	1	• SNAP RING-SPRING RETAINER	
27	241313	1	• RETAINER	
28	4203200	1	• HUB-3RD CLUTCH	
29	233065	1	• BRG-FWD HI & 3RD SHAFT REAR	
30	234350	1	• RING-3RD CLUTCH DISC HUB RETAINING	
31	234304	1	• SPACER-CLUTCH DRIVEN GEAR BEARING	

Idler Shaft

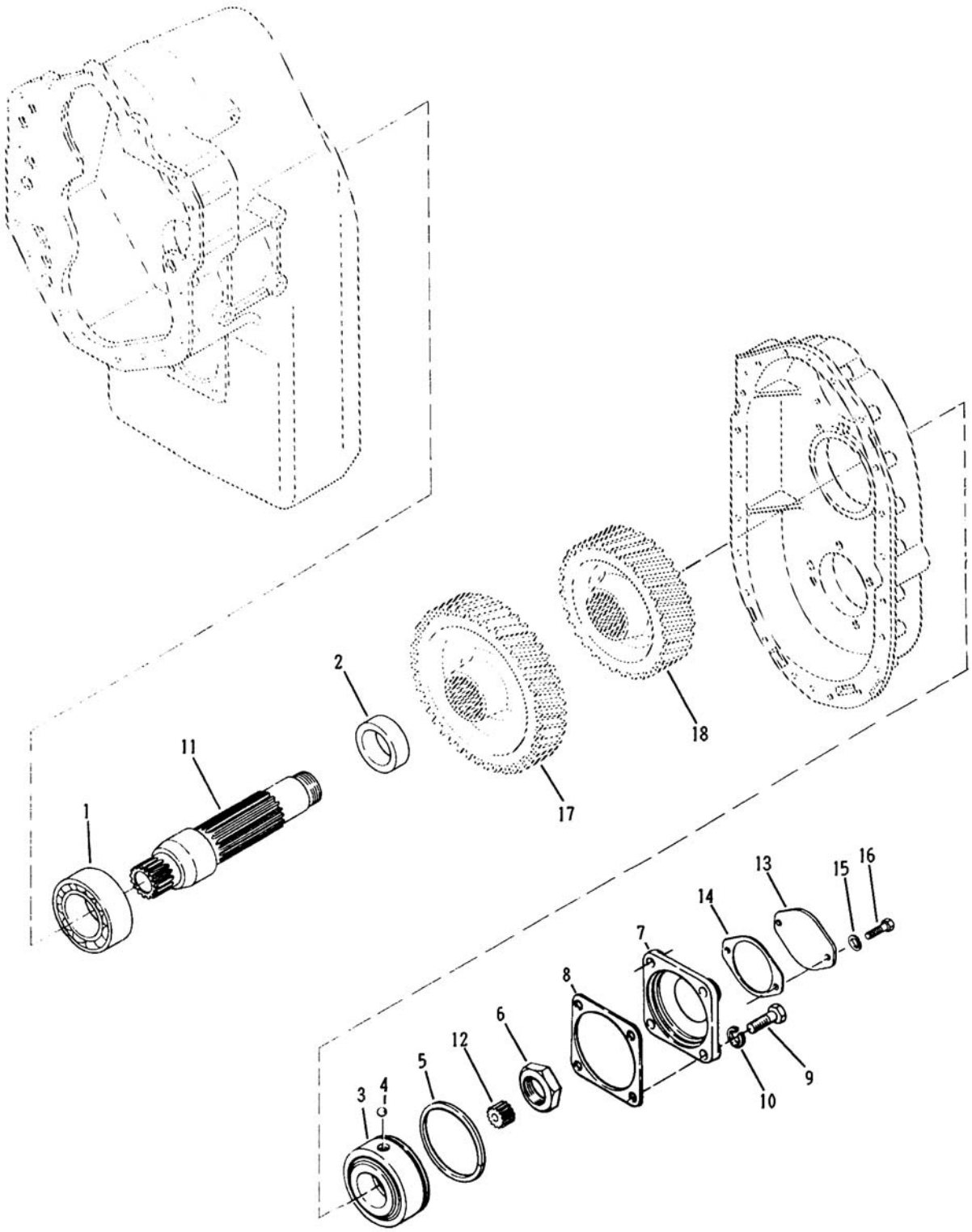


Figure 10-75

Idler Shaft Parts List

Item No.	Part Number	Qty.	Description	Remarks
75				
1	229862	1	• BEARING	
2	235910	1	• SPACER-OUTPUT SHAFT GEAR	
3	231646	1	• BEARING (ROLLER)	
4	1OJ15	1	• BALL	
5	230952	1	• SNAP RING	
6	215634	1	• NUT-IDLER SHAFT	
7	231412	1	• CAP-IDLER SHAFT REAR BEARING	
8	230918	1	• GASKET-IDLER SHAFT REAR BEARING CAP	
9	243340	4	• REAR BEARING CAP SCREW	
10	4E9H	4	• LOCKWASHER	
11	244326	1	• SHAFT-IDLER	
12	-	-	Not Used On This Model	
13	-	-	Not Used On This Model	
14	-	-	Not Used On This Model	
15	-	-	Not Used On This Model	
16	-	-	Not Used On This Model	
17	-	-	GEAR-IDLER SHAFT - SEE GEAR GROUP	
18	-	-	GEAR-IDLER SHAFT - SEE GEAR GROUP	

Output Shaft

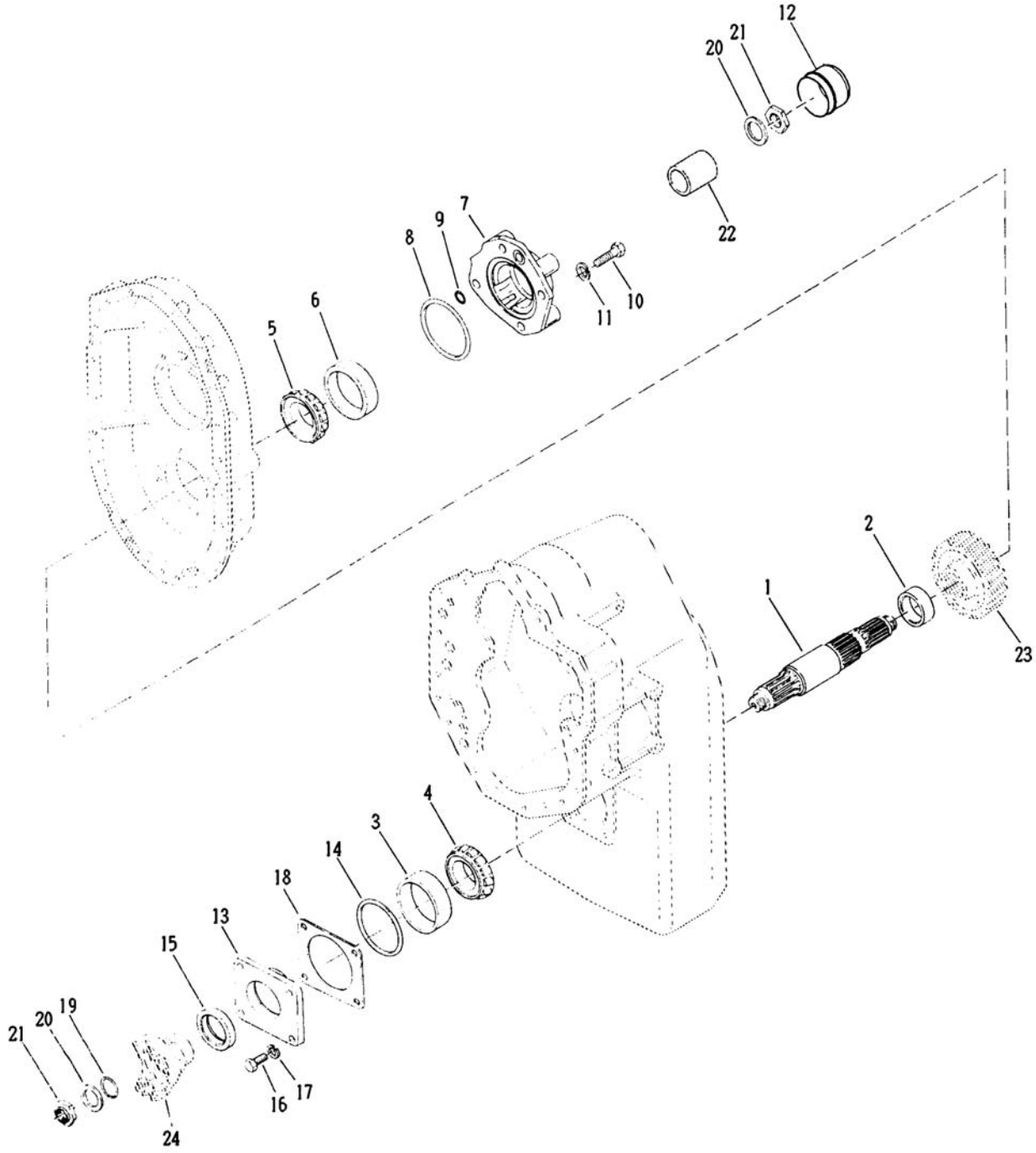


Figure 10-76

Output Shaft Parts List

Item No.	Part Number	Qty.	Description	Remarks
76				
1	243069	1	• SHAFT-OUTPUT	
2	235910	1	• SPACER-OUTPUT SHAFT GEAR	
3	243258	1	• CUP-BEARING	
4	247351	1	• CONE-BEARING	
5	243259	1	• CUP-BEARING	
6	247351	1	• CONE-BEARING	
7	231878	1	• CAP-OUTPUT SHAFT REAR BEARING	
8	60K40412	1	• 0" RING-REAR BEARING CAP "	
9	60K30026	1	• 0" RING-REAR BEARING CAP LUBE "	
10	243091	4	• SCREW-REAR BEARING CAP SCREW	
11	4.00E+09	4	• LOCKWASHER-REAR BEARING CAP SCREW	
12	231855	1	• BEARING CAP BORE PLUG	
13	231818	1	• CAP-FRONT BEARING	
14	60K40400	1	• 0" RING-FRONT BEARING CAP "	
15	230954	1	• SEAL-FRONT BEARING CAP OIL	
16	1C920	4	• SCREW-BEARING CAP	
17	4.00E+09	4	• LOCKWASHER-BEARING CAP SCREW	
18A	231848	AR	• SHIM DISCONNECT BEARING CAP (.004)	
18A	231849	AR	• SHIM DISCONNECT BEARING CAP (.007)	
18A	231850	AR	• SHIM DISCONNECT BEARING CAP (.010)	
18A	231851	AR	• SHIM DISCONNECT BEARING CAP (.020)	
19	60K60116	1	• 0" RING-FLANGE "	
20	222179	2	• WASHER-FLANGE	
21	222960	2	• NUT-FLANGE	
22	237166	1	• SPACER	
23	-	-	GEAR-OUTPUT - SEE GEAR GROUP	
24	-	-	FLANGE-OUTPUT FRONT - SEE GEAR GROUP	

Charging Pump & Filter Assy

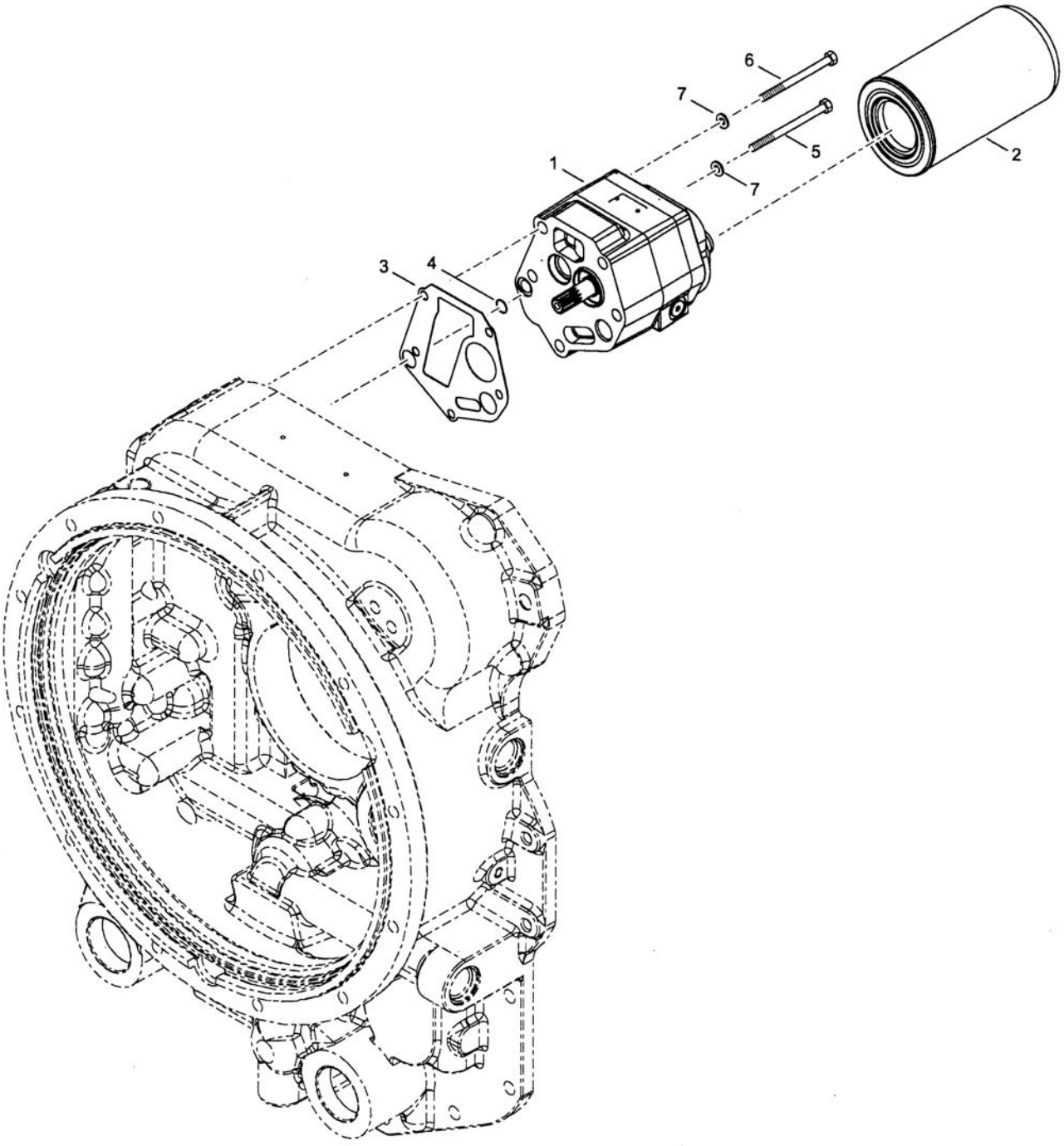


Figure 10-77

Charging Pump & Filter Assy Parts List

Item No.	Part Number	Qty.	Description	Remarks
77				
1	4206248	1	• ASSY-CHARGING PUMP	
2	247052	1	• ASSEMBLY-OIL FILTER	
3	235283	1	• GASKET-PUMP ASSEMBLY TO CONVERTER HOUSING	
4	60K30018	1	• 0 RING	
5	1C776	4	• SCREW-PUMP MOUNTING	
6	1C782	1	• SCREW-PUMP MOUNTING	
7	4.00E+07	5	• LOCKWASHER-PUMP MOUNTING SCREW	

Electric Control Valve Mounting

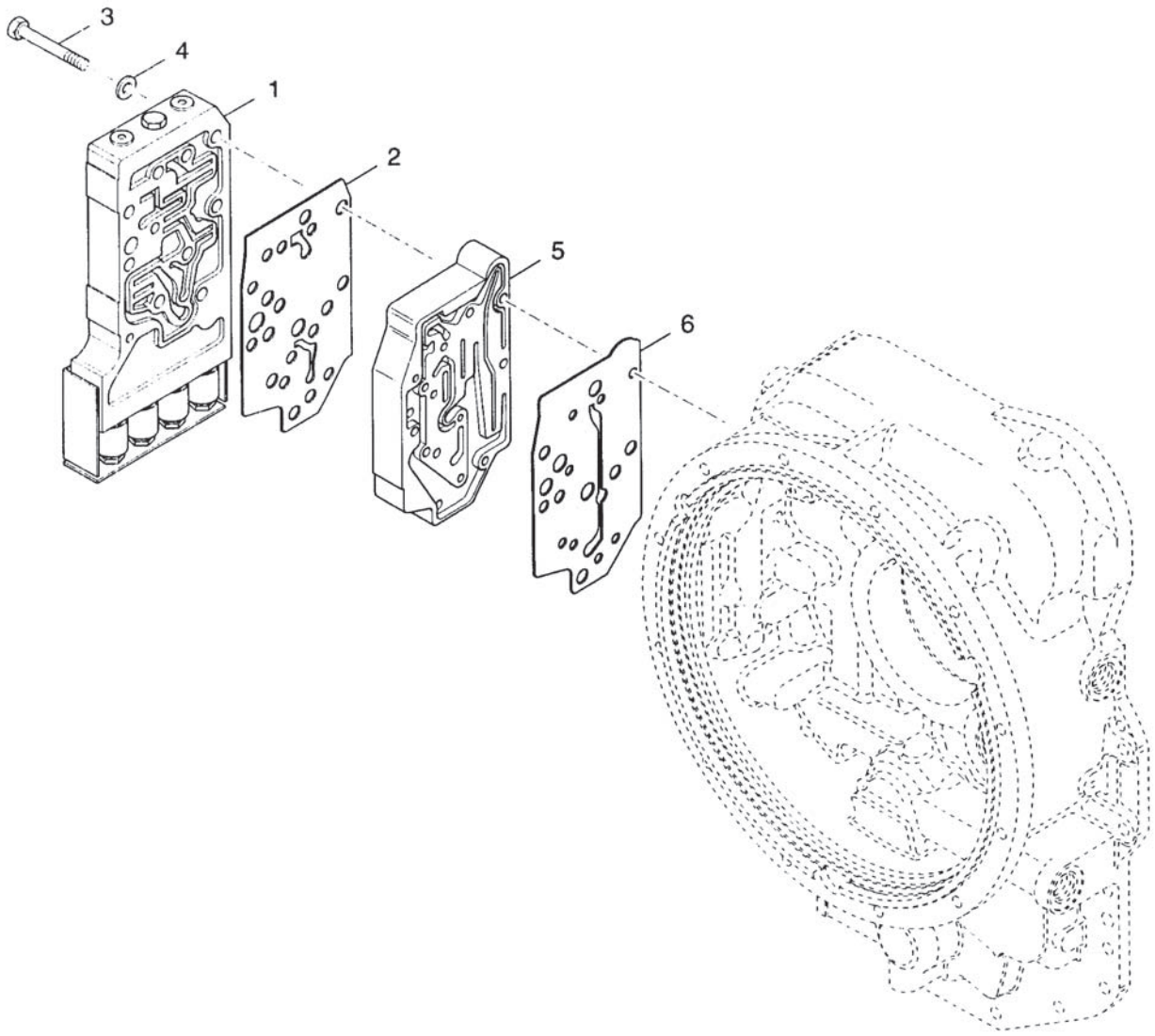


Figure 10-78

Electric Control Valve Mounting Parts List

Item No.	Part Number	Qty.	Description	Remarks
78				
1	4205594	1	• ASSY-CONTROL & SHUTTLE VALVES	
2	247666	1	• GASKET-CONTROL VALVE	
3	243093	4	• SCREW	
3A	241123	5	• SCREW	
4	4.00E+06	9	• LOCKWASHER	
5	244422	1	• ASSY-MODULATOR VALVE	
6	248006	1	• GASKET-MODULATION HSG TO CONV. HSG.	

34000 Lock-Up Modulator Valve Assembly

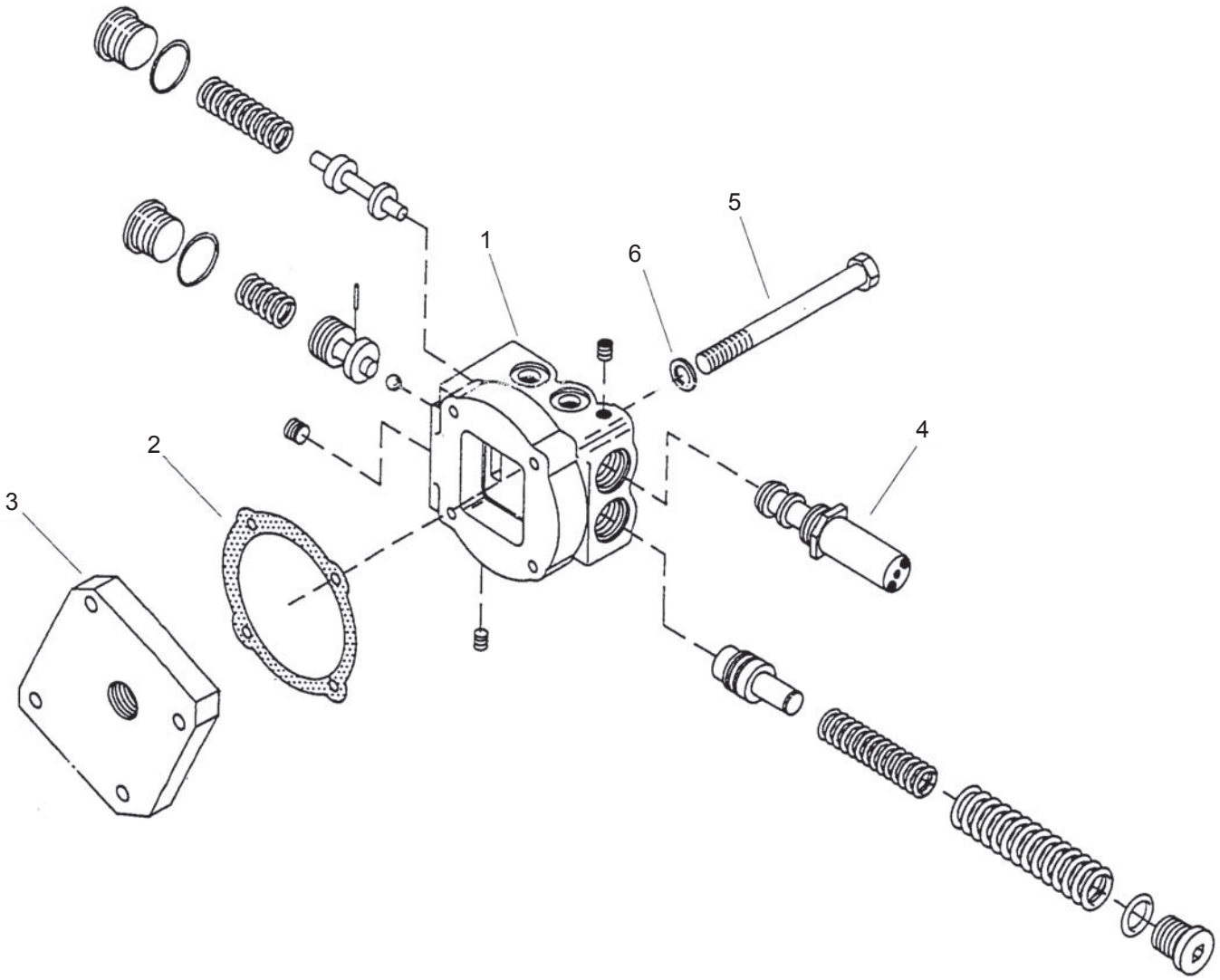


Figure 10-79

34000 Lock-Up Modulator Valve Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
79				
1	4200813	1	• ASSY-LOCKUP & MODULATOR VALVE.	
-	4200704	1	• GASKET - LOW SPEED DRIVE BEARING CAP	
3	237049	1	• PLATE - MOUNTING	
4	4206655	1	• ASSEMBLY-SOLENOID CARTRIDGE	
5	2C648	4	• SCREW - VALVE HOUSING TO PLATE	
6	4.00E+06	4	• LOCKWASHER	
-	16F16	1	• PLUG	

Electric Cab Control Single Lever

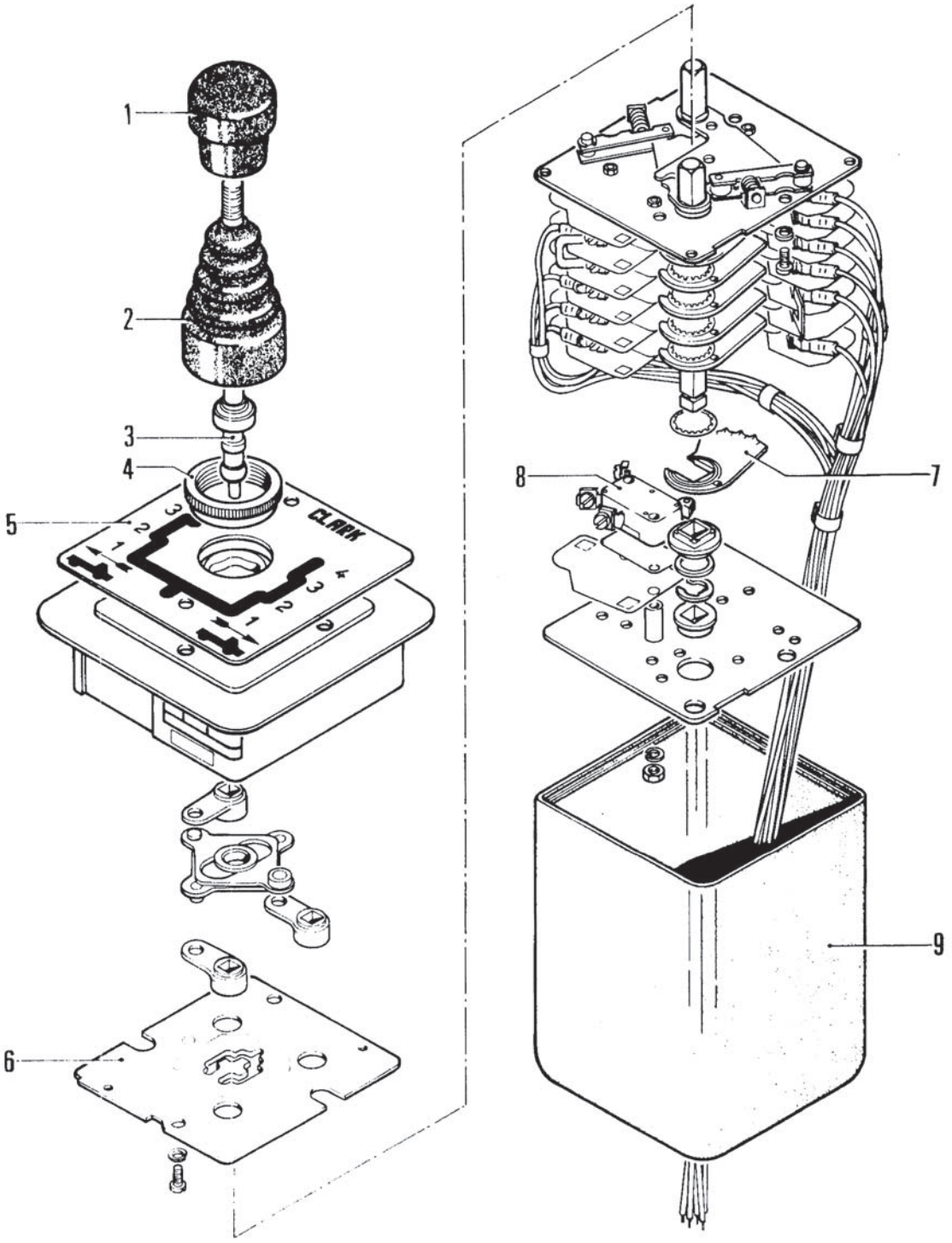


Figure 10-80

Electric Cab Control Single Lever Parts List

Item No.	Part Number	Qty.	Description	Remarks
80				
1	4200597	1	• KNOB	
2	4200599	1	• RUBBER GAITER	
3	4200598	1	• ASSY-SHIFT LEVER	
4	4200600	1	• KNURLED RING NUT	
5	4200616	1	• SHIFT PATTERN IDENT. PLATE	
6	4200610	1	• INTERNAL SHIFT PATTERN PLATE	
7	4200486	1	• CAM	
7A	4200487	1	• CAM	
7B	4200488	1	• CAM	
7C	4200489	1	• CAM	
7D	4200489	1	• CAM	
7E	4200489	1	• CAM	
7F	4200492	1	• CAM	
7G	4200493	1	• CAM	
7H	4200494	1	• CAM	
71	4200496	1	• CAM	
7J	4200497	1	• CAM	
7K	4200498	1	• CAM	
7L	4200499	1	• CAM	
8	4200501	13	• MICROSWITCH	
9	4200601	1	• BODY PROTECTION CAB	

Electronic Control Valve Assy (Sheet 1 Of 2)

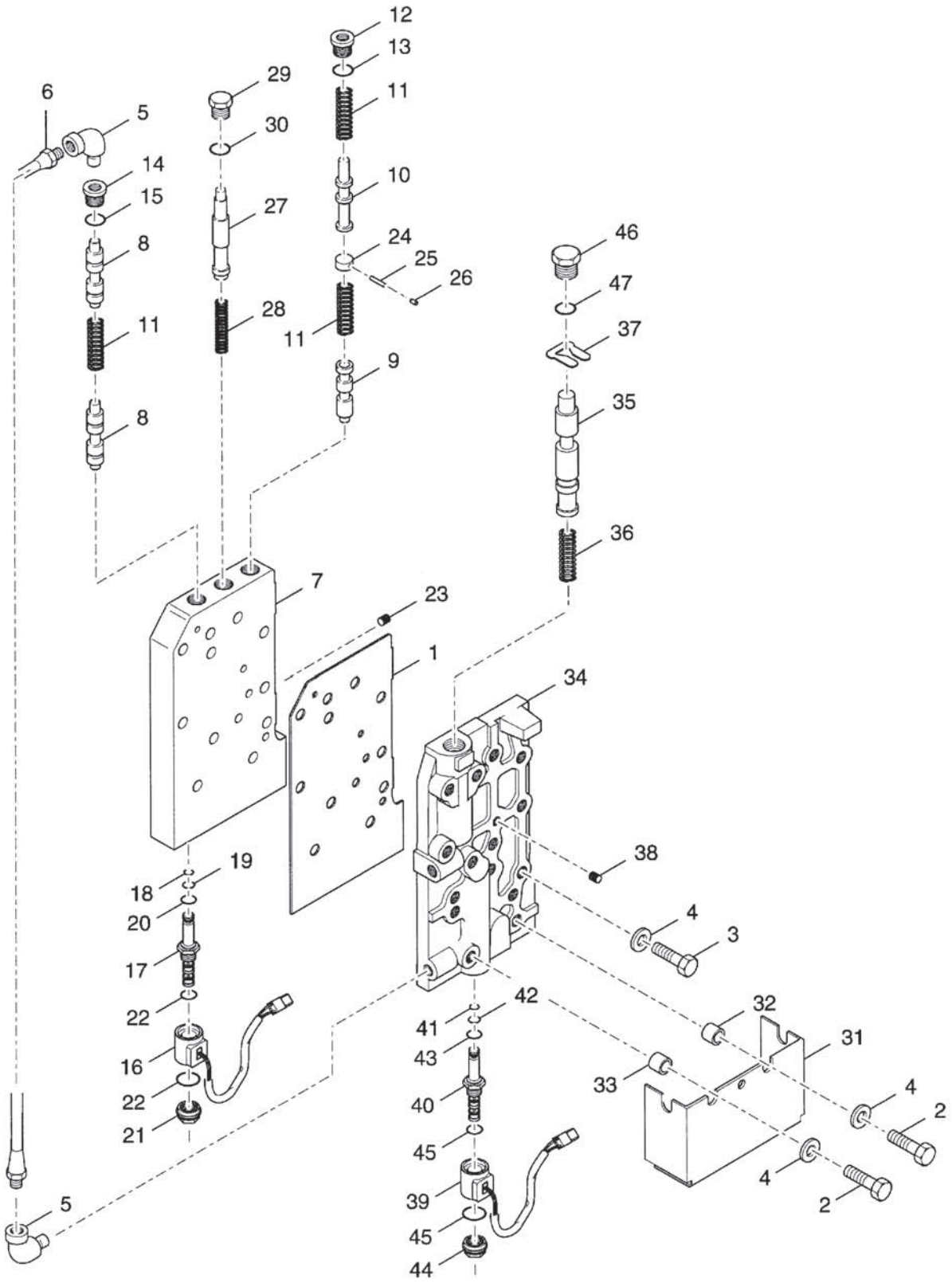


Figure 10-81

Electronic Control Valve Assy (Sheet 1 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
81				
1	248005	1	• GASKET-ELECTRIC SHIFT VALVE TO COVER	
2	1C644	2	• SCREW	
3	1C624	1	• SCREW	
4	4.00E+06	3	• LOCKWASHER	
5	731745	2	• ELBOW	
6	241583	1	• ASSY-FWD PILOT PRESSURE TUBE	
7	Not Sold Separately	1	• HOUSING-CONTROL VALVE	
8	246015	2	• SPOOL-FWD. & REV. SHIFT	
9	246018	1	• SPOOL-RANGE (1ST & 2ND)	
10	246017	1	• SPOOL-RANGE (3RD)	
11	246016	3	• SPRING	
12	47K6	1	• PLUG-VALVE HOUSING - INCLUDING ITEM 13	
13	91F6	1	• 0 RING - PART OF ITEM 12	
14	241323	1	• VALVE PLUG -INCLUDING ITEM 15	
15	91F6	1	• 0 RING - PART OF ITEM 14	
16	246324	4	• COIL 12V	
17	246356	4	• CARTRIDGE-BALL VALVE- INCL. ITEMS 18,19 &	
18	76K12	4	• 0 RING - PART OF ITEM 17	
19	76K13	4	• 0 RING - PART OF ITEM 17	
20	78K8	4	• 0 RING - PART OF ITEM 17	
21	249152	4	• NUT-SOLENOID	
22	76K20	8	• 0" RING - COIL TO NUT "	
23	239244	2	• PLUG	
24	241118	1	• STOP-SPOOL	
25	1JM5024	1	• PIN-ROLL	
26	4200274	1	• PLUG STOP	
27	234185	1	• SPOOL-FORWARD & REVERSE DECLUTCHING	
28	234181	1	• SPRING-DECLUTCH	
29	47K7	1	• PLUG - INCLUDE ITEM 30	
30	91F7	1	• 0 RING - PART OF ITEM 29	
31	4205611	1	• COVER-SOLENOID	
32	4205630	1	• SPACER-COVER	
33	4204759	1	• SPACER-COVER	
34	Not Sold Separately	1	• BODY-SHUTTLE VALVE	
35	246019	1	• SPOOL-HIGH & LOW SHUTTLE	

Electronic Control Valve Assy (Sheet 2 Of 2)

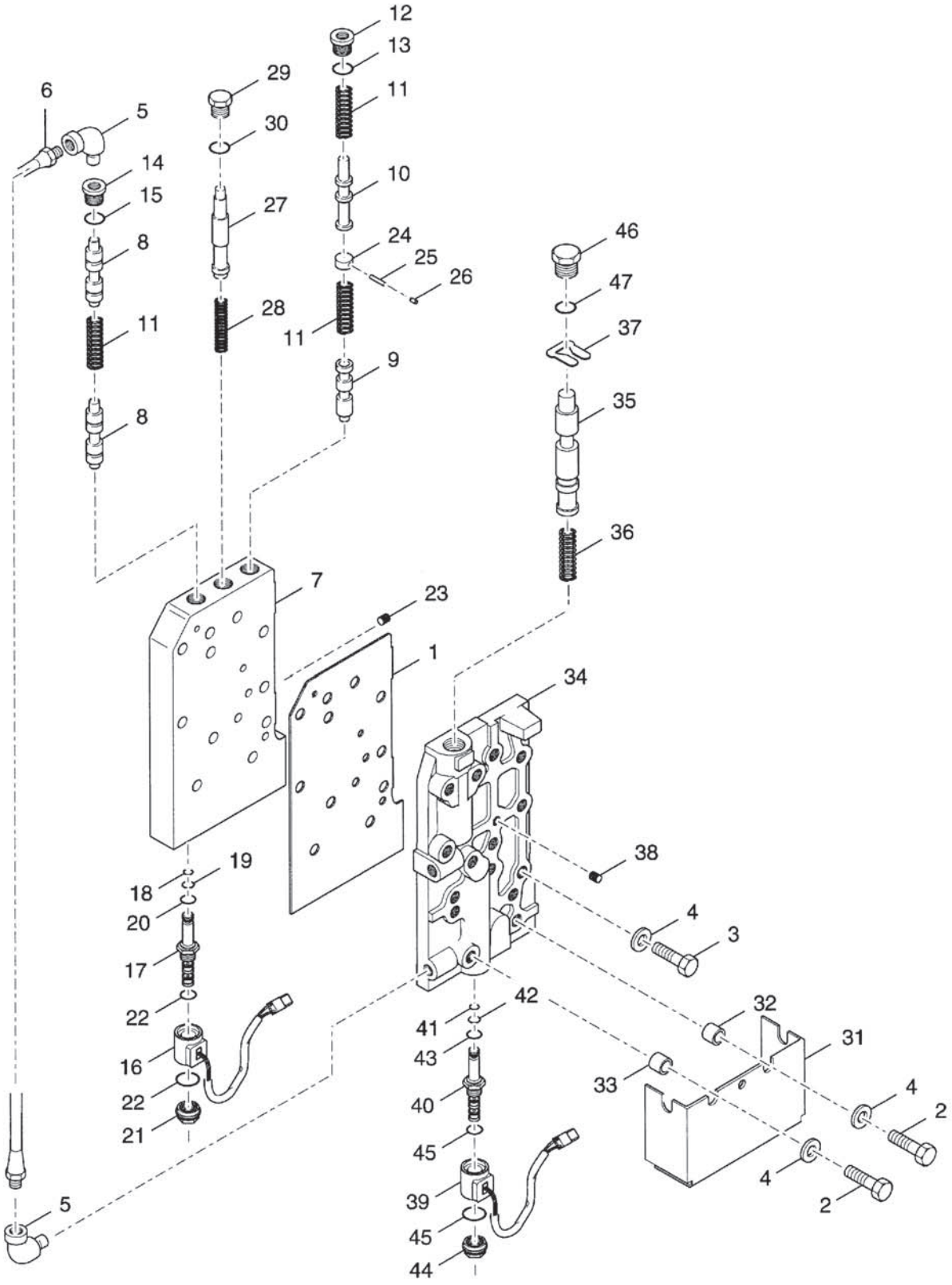


Figure 10-81

Electronic Control Valve Assy (Sheet 2 Of 2) Parts List

Item No.	Part Number	Qty.	Description	Remarks
81				
36	246016	1	• SPRING	
37	234170	1	• STOP-SPOOL & INCHING	
38	239244	7	• PLUG	
39	246324	1	• COIL 12V	
40	246356	1	• CARTRIDGE-BALL VALVE-INCL.ITEMS 41,42 &	
41	76K12	1	• 0 RING - PART OF ITEM 40	
42	76K13	1	• 0 RING - PART OF ITEM 40	
43	78K8	1	• 0 RING - PART OF ITEM 40	
44	249152	1	• NUT-SOLENOID	
45	76K20	2	• 0" RING - COIL TO NUT "	
46	24K7	1	• PLUG - INCLUDING ITEM 47	
47	91F7	1	• 0 RING - PART OF ITEM 46	

Modulator Valve Assembly

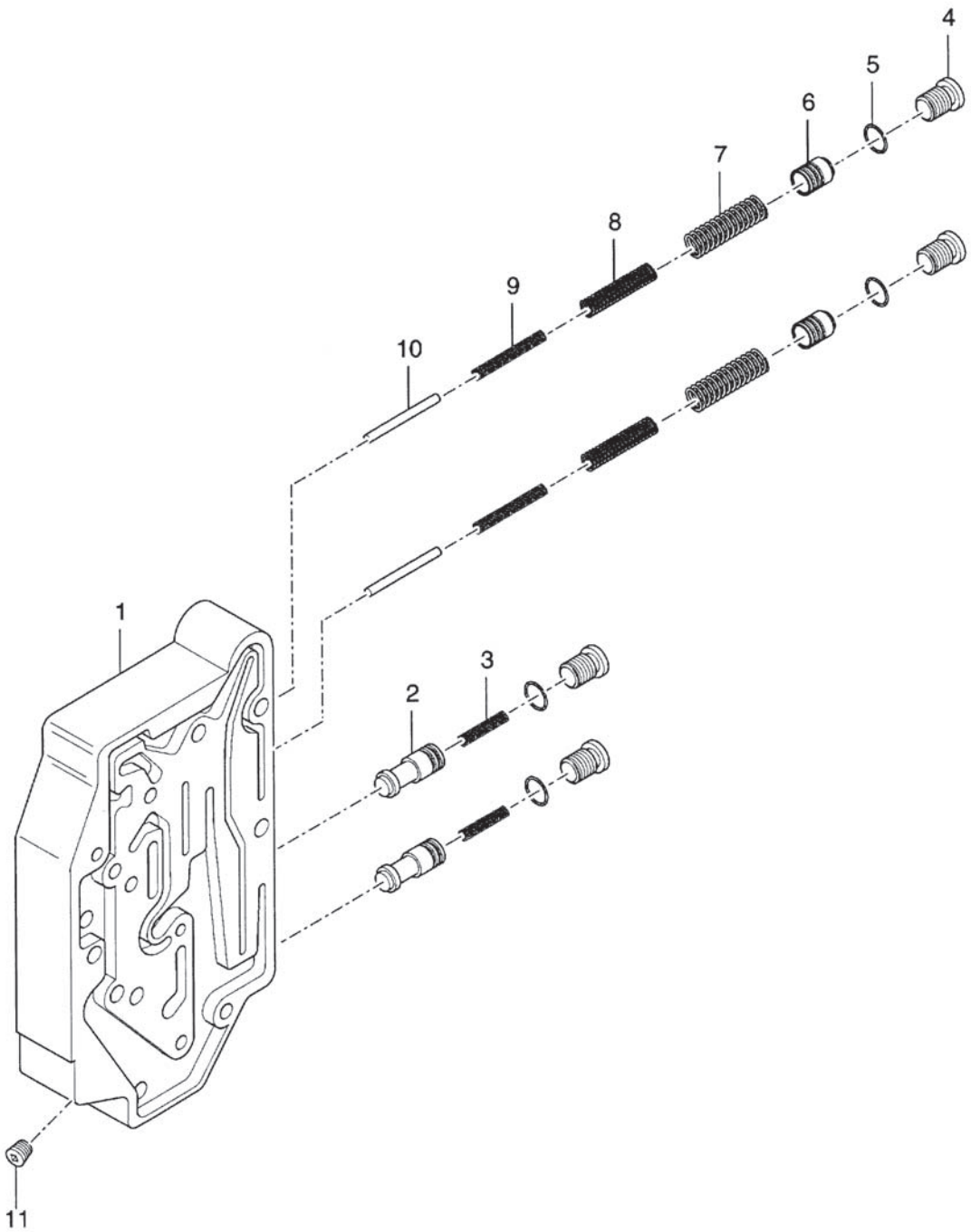


Figure 10-82

Modulator Valve Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
82				
1	Not Sold Separately	1	• HOUSING-MODULATOR - PART OF VALVE ASSEMBLY	
2	Not Sold Separately	2	• REGULATOR-SPOOL - PART OF VALVE ASSEMBLY	
3	241670	2	• SPRING-REGULATOR	
4	47K7	4	• PLUG - INCLUDING ITEM 5	
5	91F7	4	• 0" RING - PLUG - PART OF ITEM 4 "	
6	Not Sold Separately	2	• ACCUMULATOR-SPOOL - PART OF VALVE ASSEMBLY	
7	237878	2	• SPRING OUTER	
8	237879	2	• SPRING MIDDLE	
9	241666	2	• SPRING-INNER	
10	237881	2	• STOP PIN	
11	40K2	1	• PIPE PLUG	

36000 Lock-Up Modulator Valve Assembly

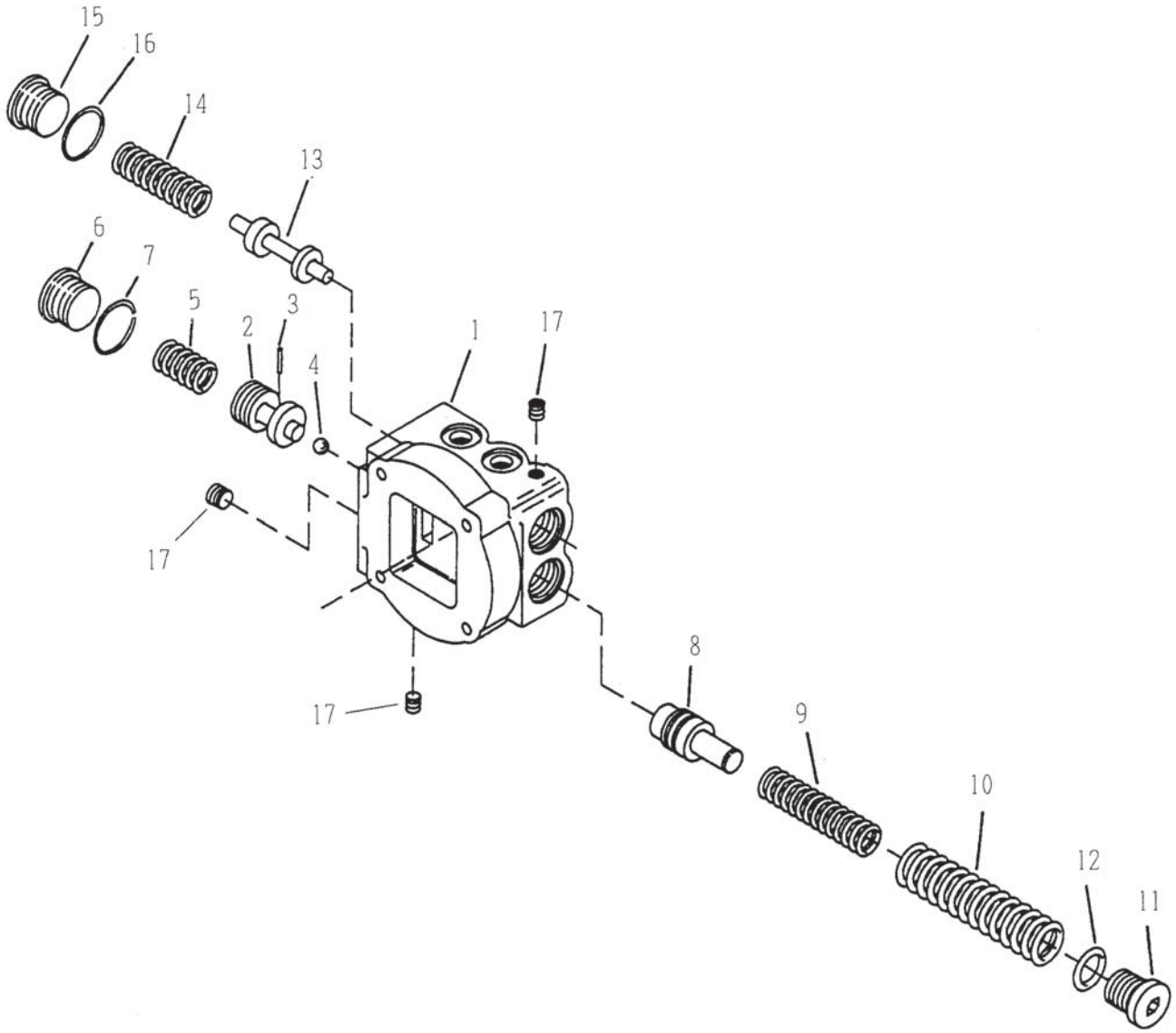


Figure 10-83

36000 Lock-Up Modulator Valve Assembly Parts List

Item No.	Part Number	Qty.	Description	Remarks
83				
1	4200814	1	• HOUSING-LOCKUP & MODULATOR VALVE	
2	247839	1	• ASSY-REGULATOR SPOOL - INCL. ITEM 3 & 4	
3	247841	1	• PLUG-REGULATOR SPOOL - PART OF ITEM 2	
4	1OJ6	1	• BALL - PART OF ITEM 2	
5	241670	1	• SPRING-REGULATOR	
6	47K7	1	• PLUG - INCLUDING ITEM 7	
7	91F7	1	• 0 RING - PART OF ITEM 6	
8	235965	1	• VALVE SPOOL	
9	246295	1	• SPRING ACCUMULATOR INNER	
10	246294	1	• SPRING ACCUMULATOR OUTER	
11	47K7	1	• PLUG - INCLUDING ITEM 12	
12	91F7	1	• 0 RING - PART OF ITEM 11	
13	4200815	1	• SPOOL	
14	240381	1	• SPOOL PISTON SPRING	
15	47K7	1	• PLUG - INCLUDING ITEM 16	
16	91F7	1	• 0 RING - PART OF ITEM 15	
17	239243	3	• PLUG	
-	47K5	2	• DETENT PLUG	
-	47K6	1	• VALVE HOUSING PLUG	
-	47K6	1	• VALVE HOUSING PLUG	





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