

Parts Catalog

Broce Broom



MK-1 Model Broce Transfer Sweeper

Serial Numbers: 500133-500162

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**Broce Manufacturing Company, Inc.
WARRANTY REGISTRATION**

Purchased From (Dealership)	
Company:	_____
Address:	_____
City:	_____ State: _____ ZIP: _____
Delivery Date to Dealer:	___ / ___ / ___ Unit Hours: _____
Model Number:	_____ Serial Number: _____

Purchaser	
Company:	_____
Address:	_____
City:	_____ State: _____ ZIP: _____
Delivery Date to Owner:	___ / ___ / ___ Unit Hours: _____

Purchaser - Type of Business				
Construction/Highway		Rental		Asphalt Contractor
Equipment Dealer		Municipality		Other

1. *The Purchaser has been instructed and/or has read the manual and understands proper preventive maintenance, operation and safety precautions.*
2. *The Warranty and Limitations of Liability are found in the Warranty pages enclosed in the Parts and Operators Manuals.*
3. *Broce Manufacturing Co. Inc. reserves the right to make design changes or modifications to Broce products at any time without incurring any obligation to make similar changes or modifications to previously sold units.*
4. *If this Document is not signed and returned to Broce Manufacturing Co. Inc., the warranty begins at the date of delivery to the Dealership.*

I hereby acknowledge acceptance of above and conditions in the Warranty Policy

Purchaser/Owner: _____
 Dealer Representative: _____

Broce Manufacturing Co. Inc.
 1460 South 2nd Avenue
 Dodge City, KS 67801
 (877) 227-8811

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BROCE MANUFACTURING COMPANY

BROCE BROOM LIMITED TWELVE MONTH WARRANTY

For a period of twelve (12) months or 1,000 hours whichever comes first, from the date of delivery of product to the original user, Broce Manufacturing of Dodge City, Kansas warrants each product to be free from manufacturing defects, subject to the limitations contained in this policy. This limited warranty covers parts and labor.

This warranty does not apply to defect caused, in whole or in part, by unreasonable use while in the possession of the user, including, but not limited to, failure to properly set up product, failure to provide reasonable and necessary maintenance, normal wear, routine tune ups or adjustments, improper handling, accidents, operation at speed or load conditions contrary to published specifications, improper or insufficient lubrication, or improper storage. This warranty is not a guarantee that the performance of each product will meet the expectations of the purchaser.

Broce Manufacturing shall not be liable for consequential damage of any kind, including, but not limited to: consequential labor costs or transportation charges in connection with the replacement or repair of defective parts, lost time or expense which may have accrued because **of said defects. In no event shall Broce Manufacturing's total liability hereunder exceed the product purchase price.**

Many components used by Broce Manufacturing are subject to the warranties of their respective manufacturers. If their warranty differs in any way such as length of time or hours of usage, whether higher or lower, that warranty supersedes the Broce 12 month, 1,000 hour standard. These warranties will be considered void if the product is modified or repaired in any way not expressly authorized, or if closed components are disassembled prior to return. Closed components include, but are not limited to gearboxes, hydraulic pumps, motors, cylinders and actuators.

Our obligation under the warranty is expressly limited, at our option, to the replacement or repair at Broce Manufacturing of Dodge City, KS or at a service facility designated by us. We are not responsible for unauthorized repairs or replacements. Any implied or statutory warranties, including any warranty of merchantability or fitness for a particular purpose, are expressly limited to duration of this written warranty. We make no other express warranty. This warranty cannot be extended, broadened, or changed except in writing by an authorized officer of Broce Manufacturing. Broce Manufacturing reserves the right to make changes or improvements in its products in the future without incurring obligations to make these changes and improvements to products previously supplied.

Broce Manufacturing Co. Inc.
1460 South 2nd Avenue
Dodge City, KS 67801
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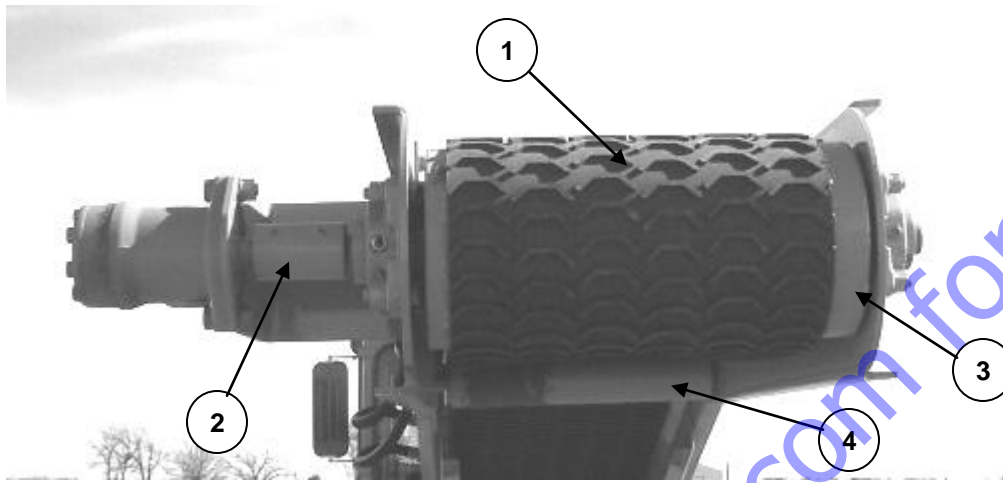
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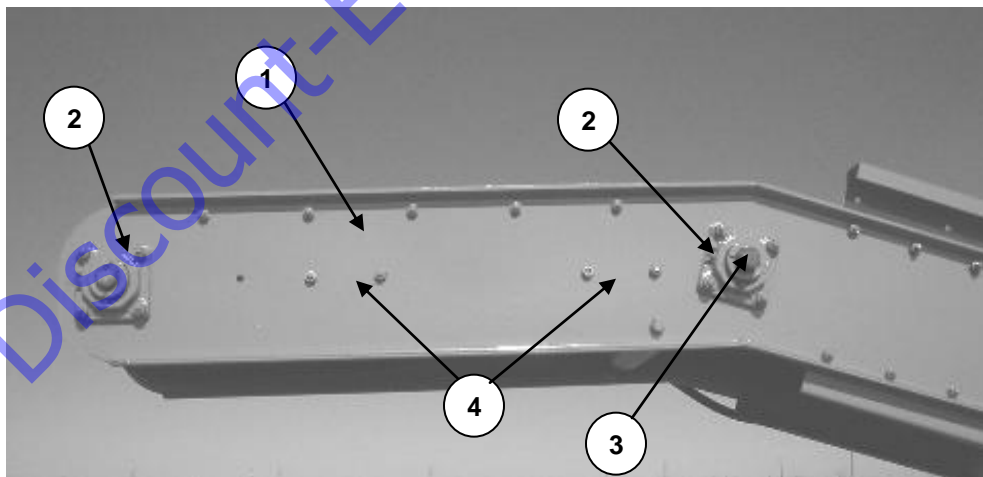
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BELT CONVEYOR - TOP END VIEW



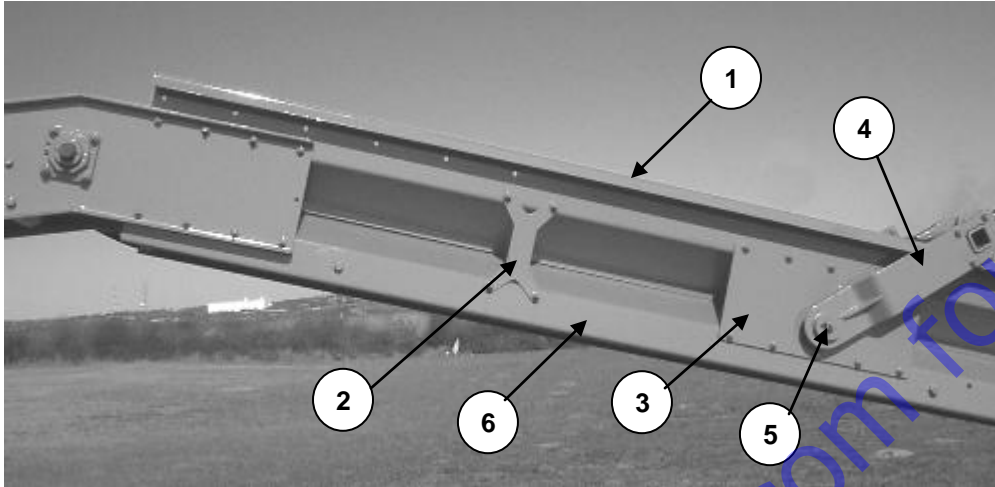
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	320629	Conveyor Belting, 12" x 33' 4"	1
2	205076	Conveyor Drive Coupling	1
3	320601	Head Pulley w/ Shaft	1
4	320622	Return Rollers	4

BELT CONVEYOR - TOP LEFT SIDE



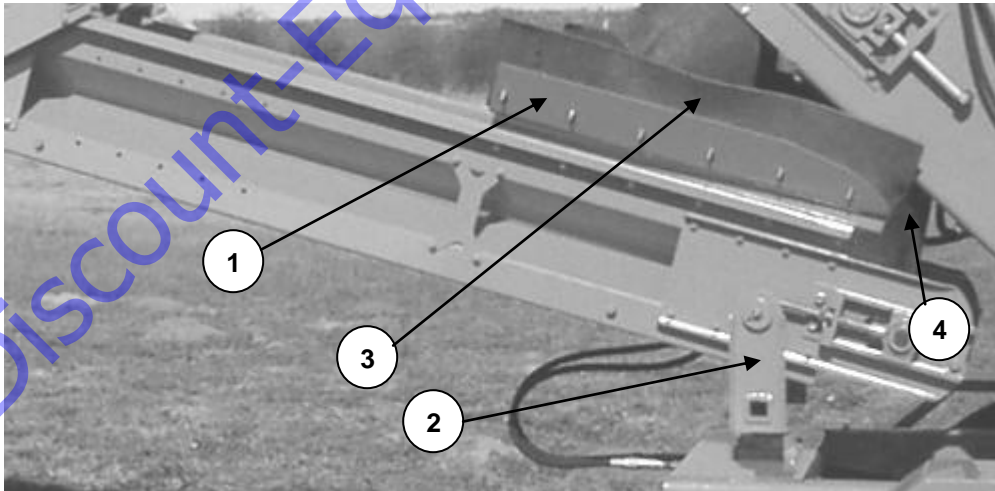
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205084	LH Upper Side Frame, 17.5°	1
2	320600	Head and Center Conveyor Bearings	4
3	320602	Center Wing Pulley w/ Shaft	1
4	205082	Conveyor Cross Member	2

BELT CONVEYOR – MIDDLE LEFT SIDE



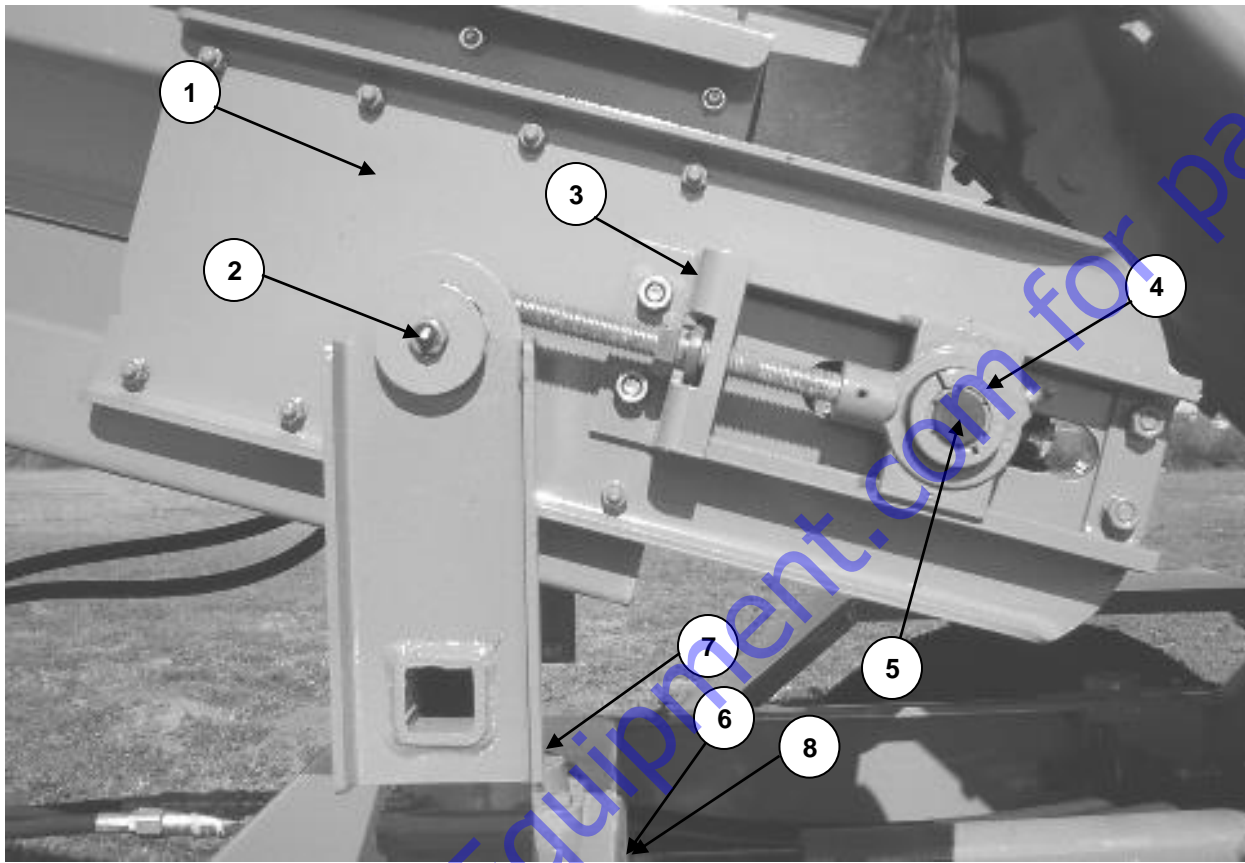
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205061	Upper Side Sheet	2
2	205060	Side Gusset	4
3	855066	Center Side Plate w/ bushing	2
4	855067	Lift Side Bracket	2
5	205086	1/2" x 1" Cap Screw w/ Zerk, LH & RH	2
6	205063	Return Sheet	1

BELT CONVEYOR – LOWER LEFT SIDE



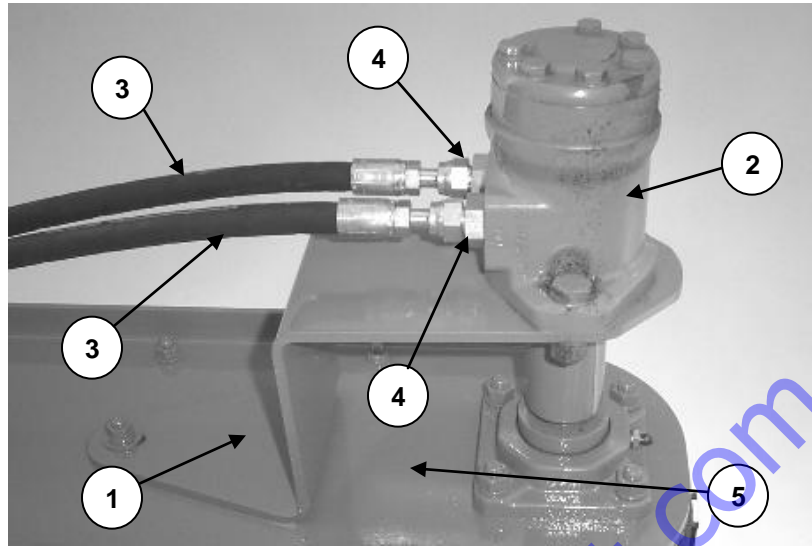
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205062	Lower Deflector, LH	1
2	855291	Conveyor Cross Tube w/Left Side Support & Splined Shaft	1
3	205229	Belt Conveyor Wing Rubber	2
4	205230	Lower Belt Conveyor Rubber	1

BELT CONVEYOR – BOTTOM LEFT SIDE



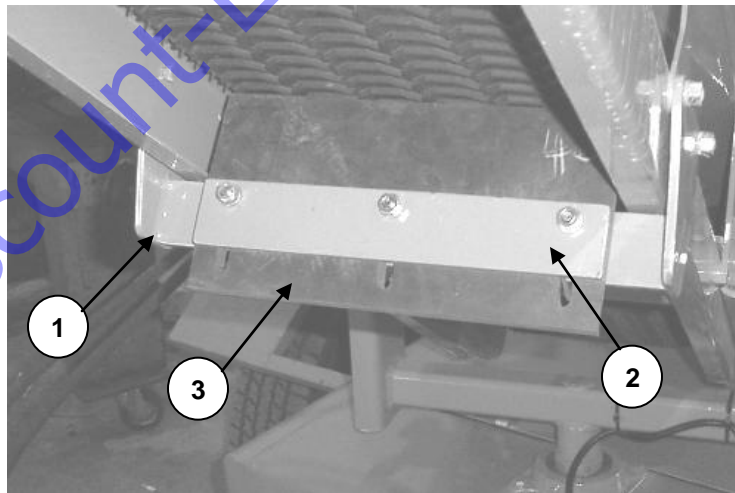
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855077	Take-Up Side Plate – Lower, LH	1
2	205086	1/2" x 1" Cap Screw w/ Zerk, LH & RH	2
3	320604	Lower Take-up Frame	2
4	320605	Lower Take-up Bearing	2
5	320603	Wing Pulley w/ Shaft	1
6	320611	Swing Bearing, Lower	1
7	320636	Swing Bearing, Upper	1

BELT CONVEYOR - TOP RIGHT SIDE



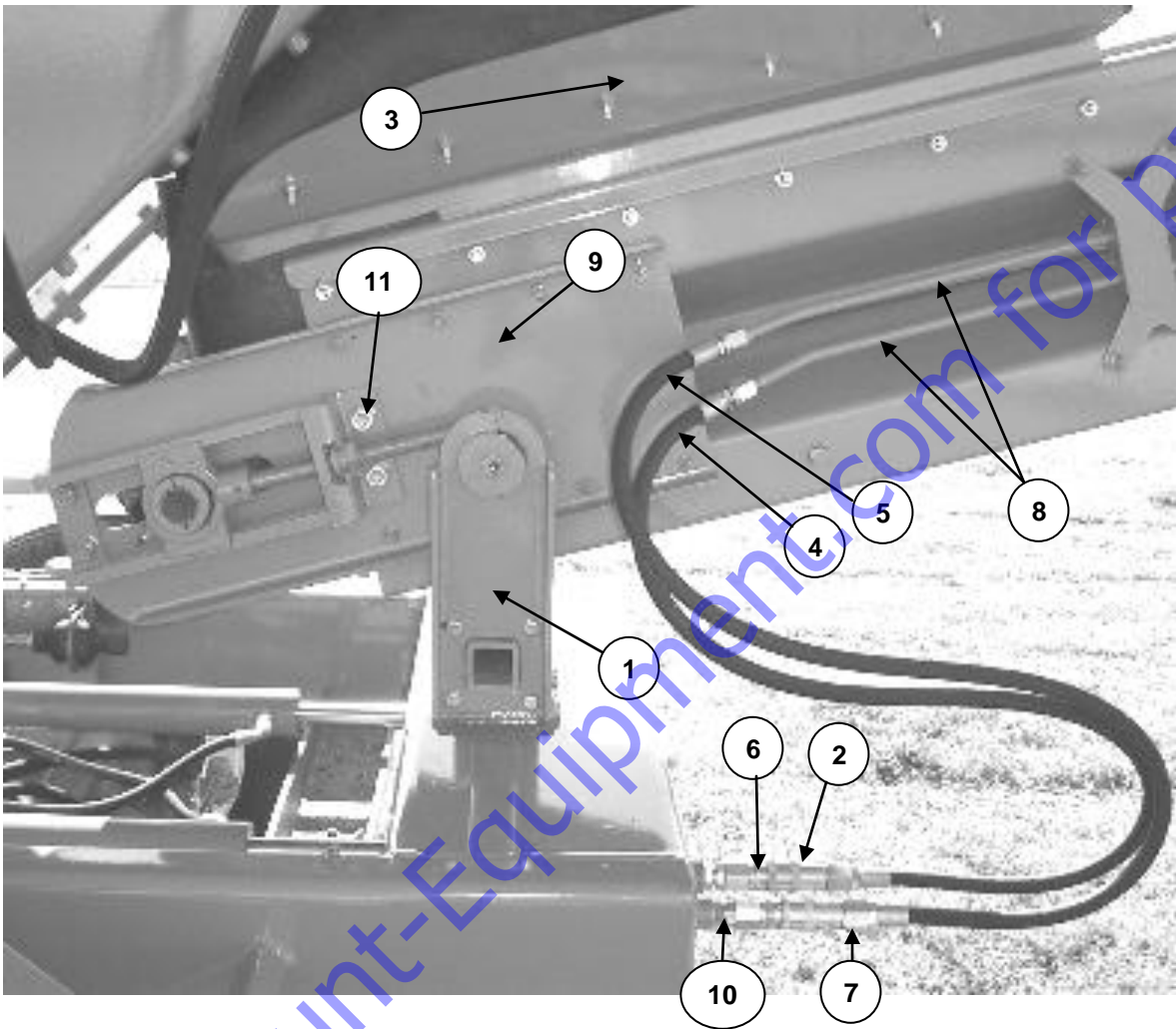
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205078	Conveyor Hydraulic Motor Mount	1
2	325008	Belt Conveyor Motor	1
3	N/A	Hydraulic Hose Assembly, 52" – 1AA8MR6 & 1AA6FR6	2
4	N/A	Hydraulic Adapter Fitting – FF1852T0610S	2
5	205083	RH Upper Side Frame, 17.5°	1

BELT CONVEYOR – BELT CLEANER



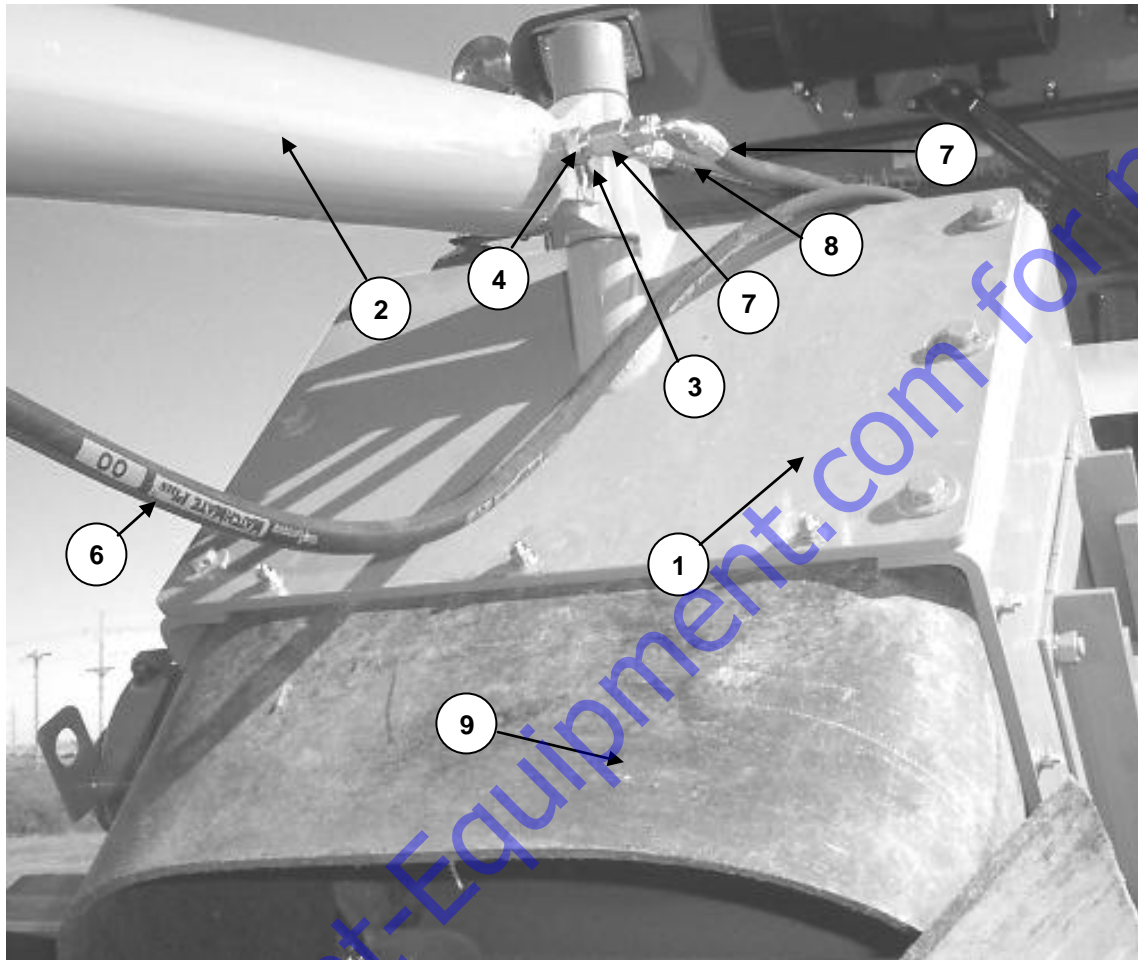
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855233	Belt Conveyor Cross Member	1
2	205235	Belt Conveyor Cleaner Blade Retainer	1
3	205232	Belt Conveyor Cleaner Blade	1

BELT CONVEYOR – BOTTOM RIGHT SIDE



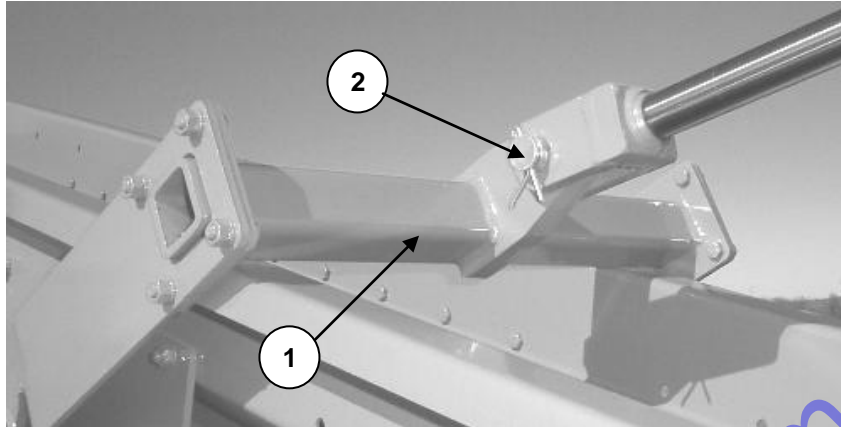
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855052	Right Side Support Bracket w/ Bushing	1
2	N/A	Quick Coupler – Female FD49-1005-08-06	2
3	205064	Lower Deflector, RH	1
4	N/A	Hydraulic Hose Assembly, 46" – 1AA8MB6 & 1AA8MR6	1
5	N/A	Hydraulic Hose Assembly, 44" – 1AA8MB6 & 1AA8MR6	1
6	N/A	Quick Coupler – Male FD49-1004-08-06	2
7	N/A	Hydraulic Adapter, 3474-08-08	2
8	N/A	Steel Hydraulic Line – 114"	2
9	855088	Take Up Side Plate - Lower, RH	1
10	N/A	Hydraulic Fitting	2
11	205087	Rear Belt Conveyor Cross Member (inside – not visible in photo)	1

BELT CONVEYOR – LIFT CYLINDER MOUNT



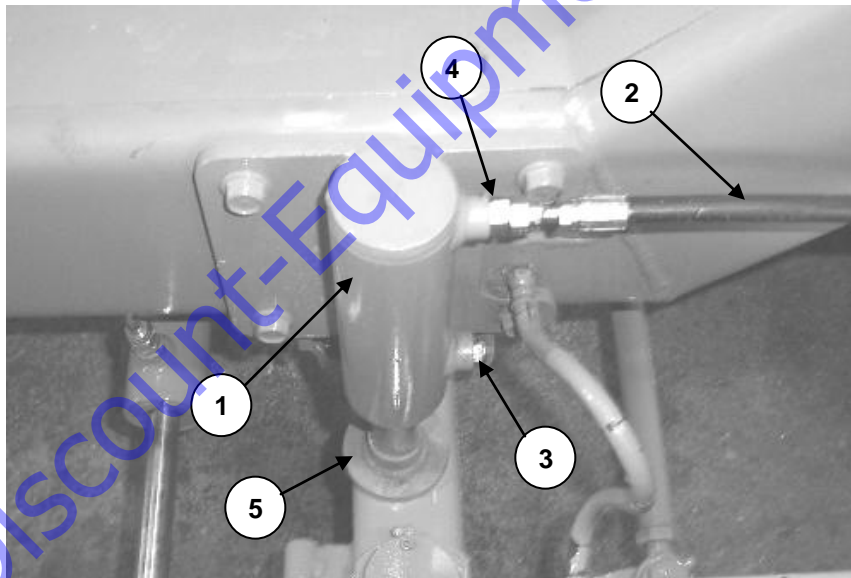
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855030	Bottom Lift Support w/ Bushings & Shaft	1
2	325012	Belt Conveyor Lift Cylinder, 3" x 29 5/8"	1
3	RC-19	Cylinder Pin	1
4	N/A	Hydraulic Fitting, FF1868T0406S	2
5	N/A	Hydraulic Hose Assembly, 115" – 1AA4FR4 & 1AA6FRB4	1
6	N/A	Hydraulic Hose Assembly, 84" – 1AA4FR4 (2)	1
7	N/A	Hydraulic Adapter Tee, FF1865T0406S	1
8	N/A	Hydraulic Hose Assembly, 52" – 1AA4FRB4 (2)	1
9	205231	Slat Conveyor Discharge Deflector (Rubber)	1

BELT CONVEYOR – LIFT CROSS TUBE



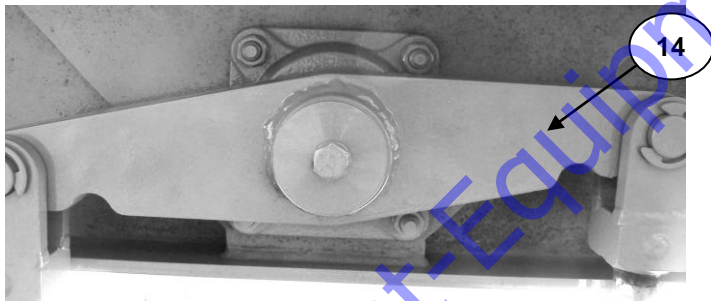
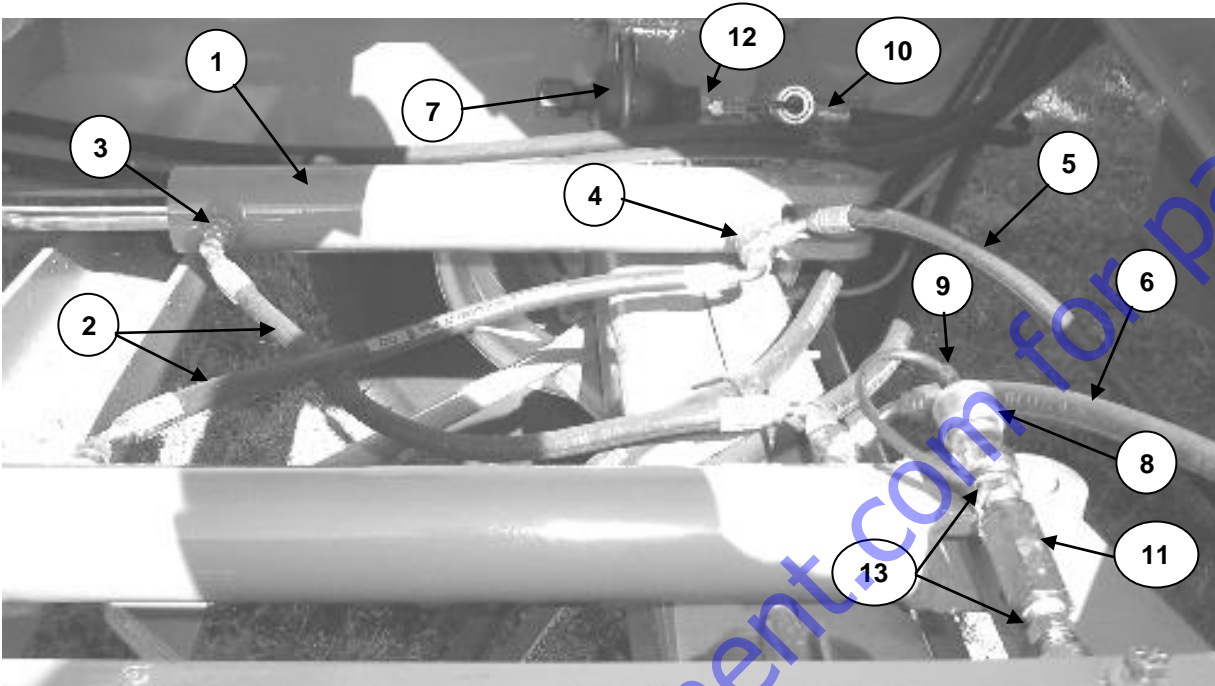
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855068	Belt Conveyor Lift Cylinder Cross Tube	1
2	RC-19	Cylinder Pin	1

LEVELING CYLINDER VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325023	Leveling Cylinder Assembly w/ Mount Plate, LH	1
	325022	Leveling Cylinder Assembly w/ Mount Plate, RH	1
2	N/A	Hydraulic Hose Assembly, 21" – 1AA4FR4 & 1AA6FR4	2
3	N/A	Vent, BV-SAE-6	2
4	N/A	Hydraulic Fitting, FF1852T0406S	2
5	855092	Leveling Cylinder Foot	2
NS	325029	Seal Kit for Leveling Cylinder	1
NS	K00025	Cylinder Charge Kit	1

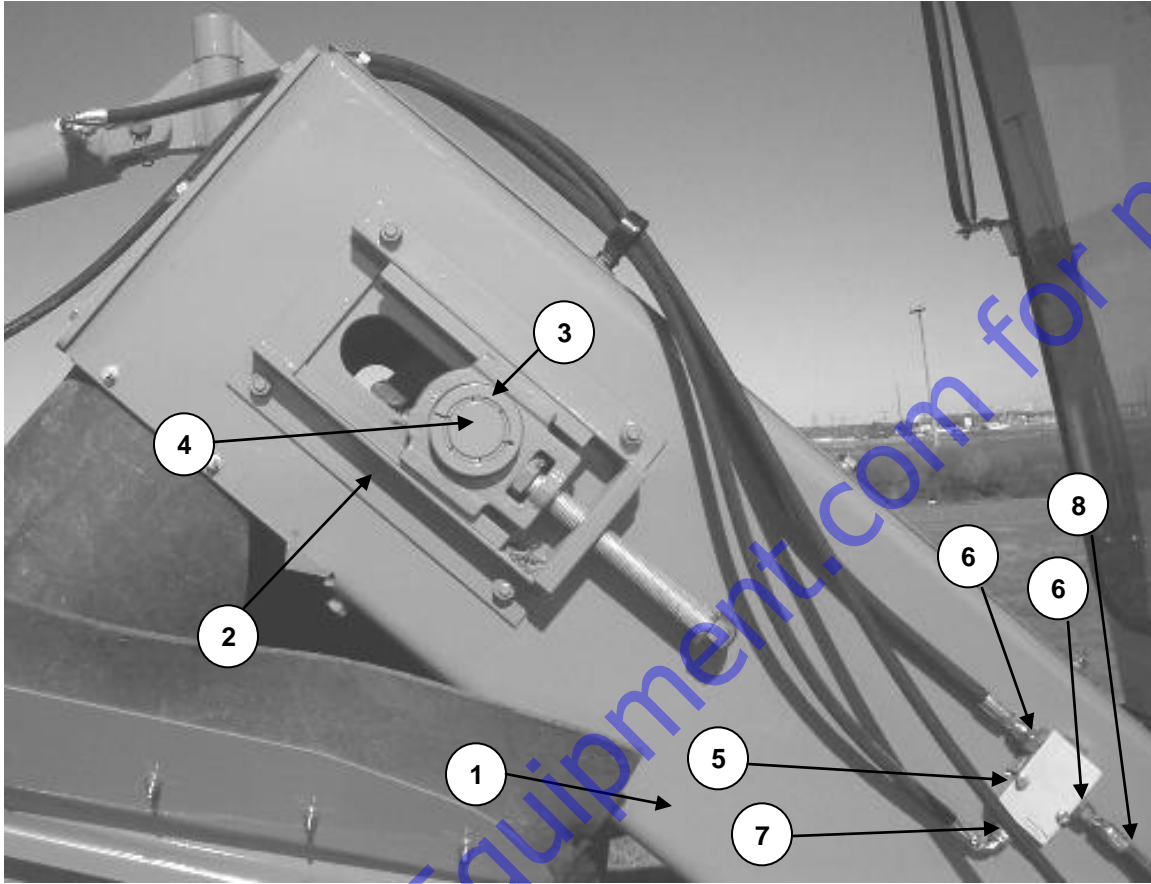
BELT CONVEYOR – PIVOT CYLINDER VIEW



UNDERSIDE VIEW

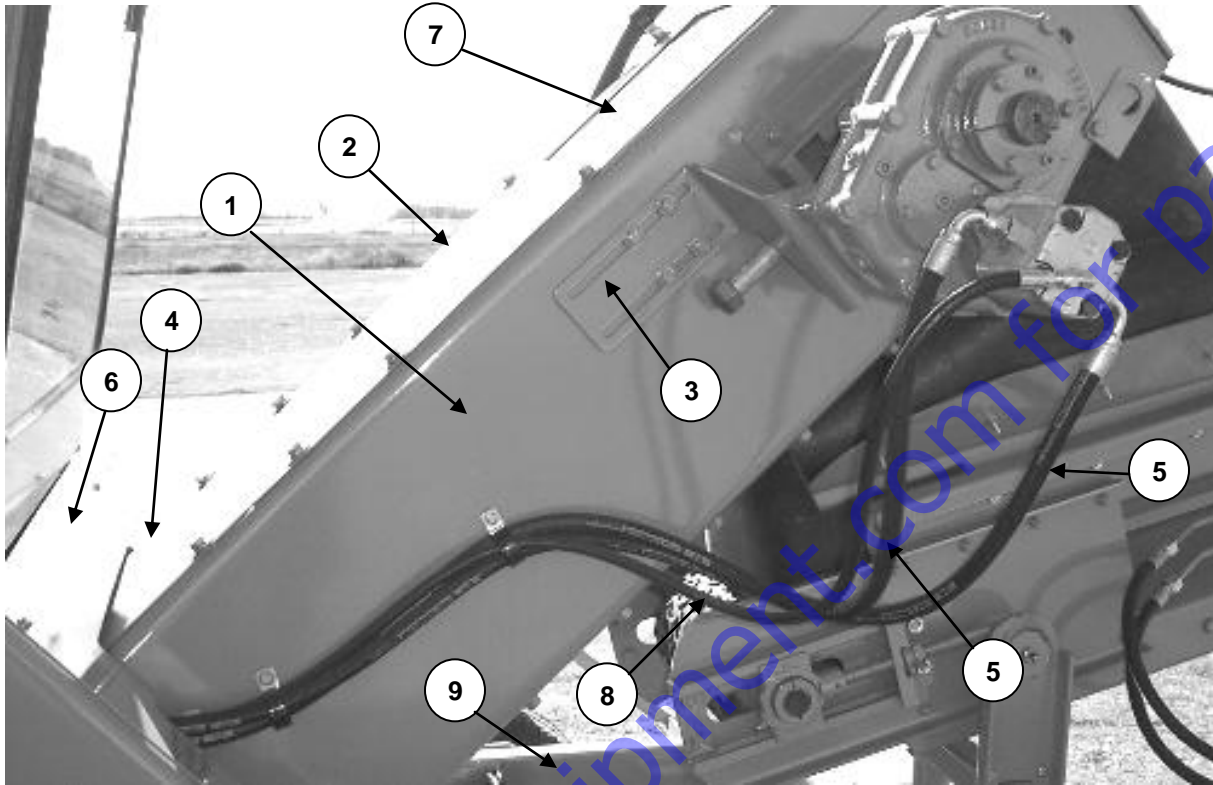
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325013	Swing Cylinder, 2" x 12"	2
2	N/A	Hydraulic Hose Assembly, 16" – 1AA4FRA4 & 1AA4FRB4	2
3	N/A	Hydraulic Fitting, FF1852T0406S	2
4	N/A	Hydraulic Fitting, FF1865T0406S	2
5	N/A	Hydraulic Hose Assembly, 92" – 1AA4FRA4 & 1AA6FRC4	1
6	N/A	Hydraulic Hose Assembly, 80" – 1AA4FRA4 & 1AA6FRB4	1
7	N/A	Accumulator	2
8	N/A	Female Quick Coupler, 5601-4-4S	2
9	N/A	Plug, 5659-4	2
10	N/A	CAT Tee, 8T2352	2
11	N/A	Check Valve, C20S-1/4"	2
12	N/A	Hydraulic Adapter, FF1852T0606S	2
13	N/A	Nipples, 2083-4-4S	4
14	855290	Lever Circle Cylinder with Splines	1

SLAT CONVEYOR – LEFT SIDE VIEW



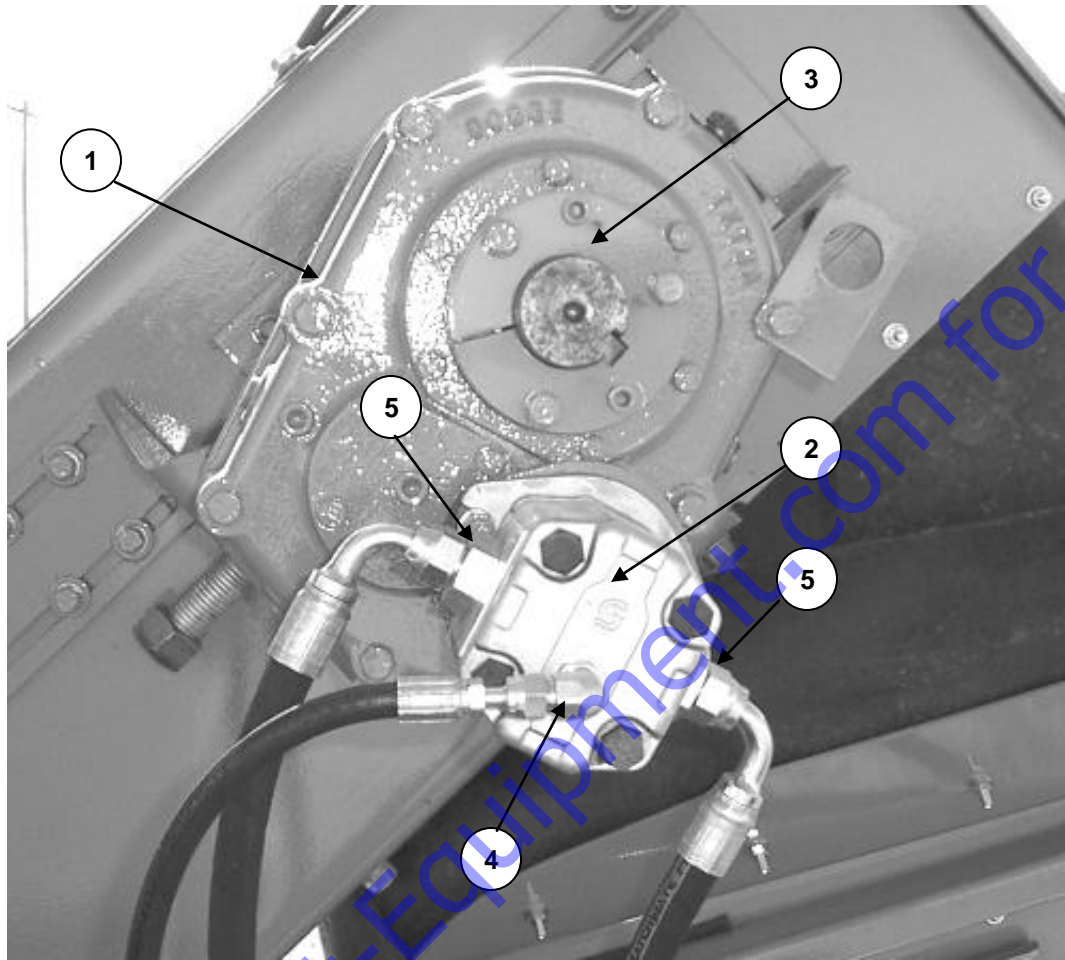
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205020	Slat Conveyor Side, LH	1
2	320607	Slat Conveyor Take-up Frame	2
3	320606	Slat Conveyor Take-up Bearing	2
4	205025	Slat Conveyor Head Shaft	1
5	325011	Load Holding Valve	1
6	N/A	Hydraulic Adapter, FF1852T0408S	2
7	N/A	Hydraulic Adapter, FF1852T0404S	1
8	N/A	Hydraulic Hose Assembly, 61" – 1AA4FR4 & 1AA6FRC4	1

SLAT CONVEYOR – RIGHT SIDE VIEW



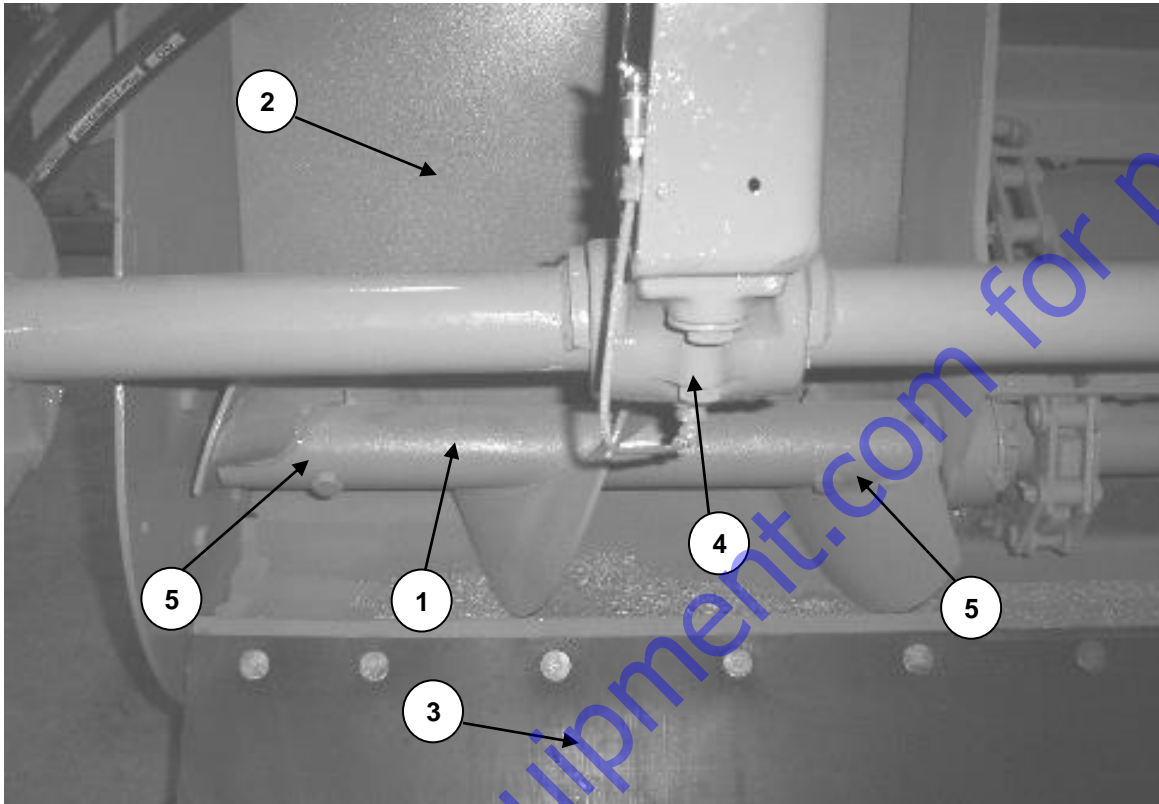
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205019	Slat Conveyor Side, RH	1
2	205031	Slat Conveyor Top Cover, Upper	1
3	205039	Speed Reducer Bracket	1
4	205032	Slat Conveyor Top Cover, Lower	1
5	N/A	Hydraulic Hose Assembly, 121" – 1AA8FRB8 (2)	2
6	205098	Front Frame Cover, Top	1
7	205040	Slat Conveyor Window	1
8	N/A	Hydraulic Hose Assembly, 190" – 1AA4FR4 & 1AA6FRC4	1
9	205099	Front Frame Cover, Bottom	1

SLAT CONVEYOR – DRIVE SIDE VIEW



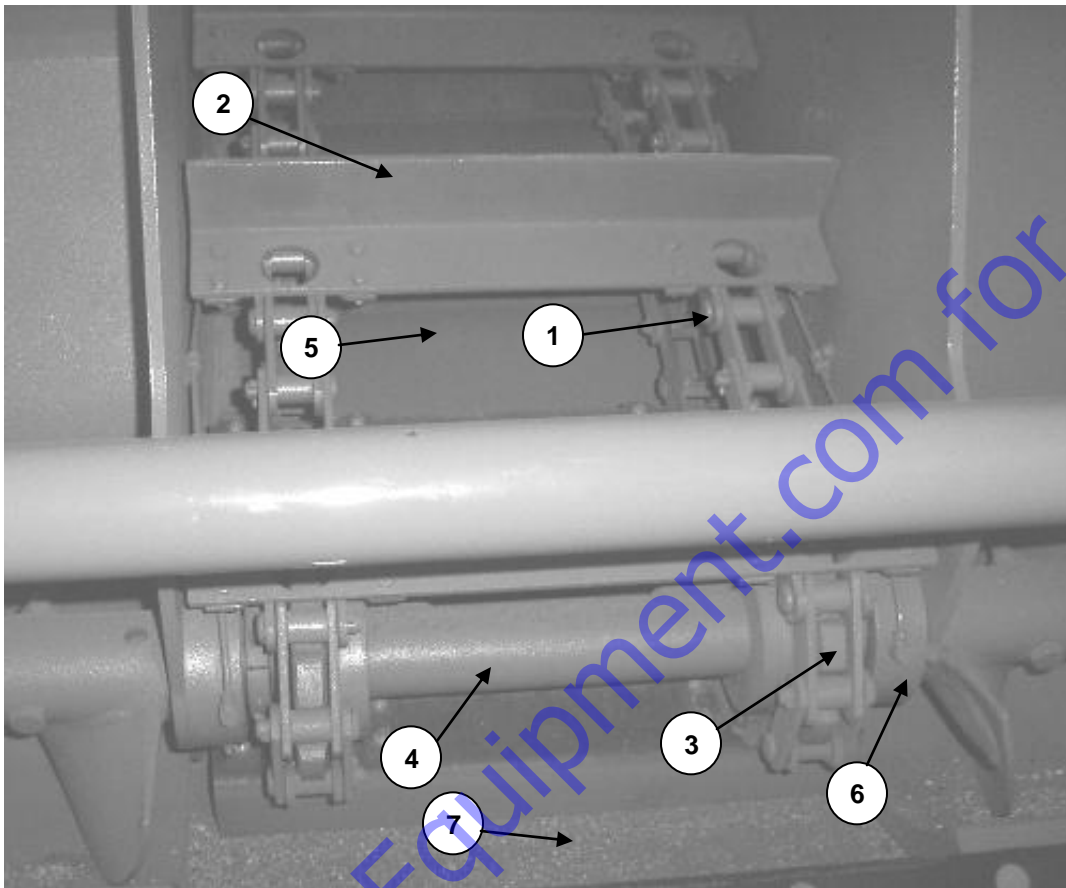
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	320615	Dodge Speed Reducer	1
2	325007	Slat Conveyor Motor	1
3	320616	Speed Reducer Shaft Adapters, Set of 2	1
4	N/A	Hydraulic Adapter, FF1868T0406S	1
5	N/A	Hydraulic Adapter, FF1852T0810S	2

SCREW CONVEYOR - LEFT SIDE VIEW



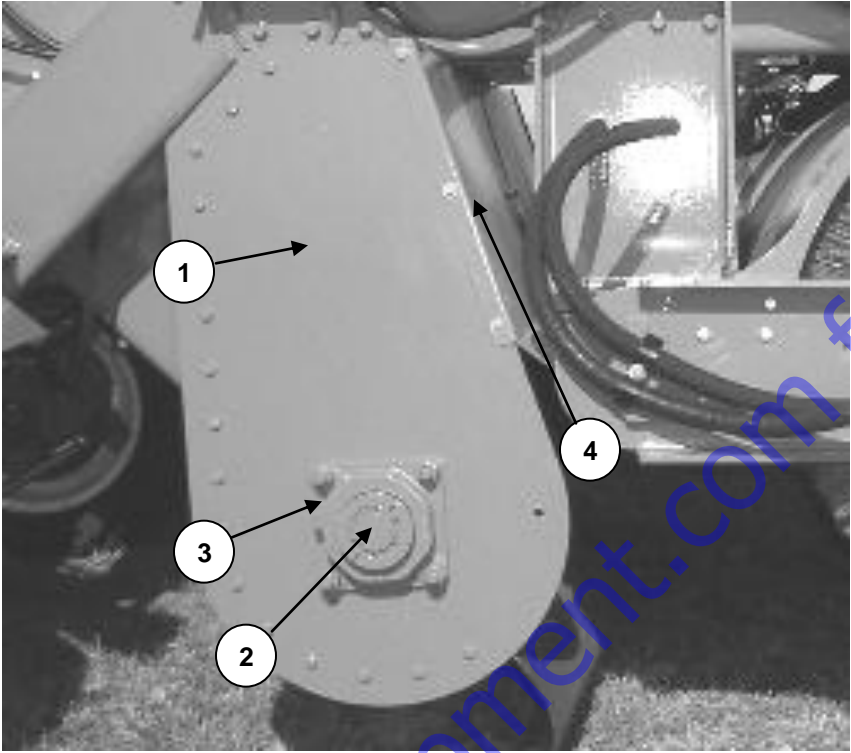
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	320618	Screw Conveyor, 25" – RH	1
	320619	Screw Conveyor, 25" – LH	1
2	855027	Screw Conveyor Box, LH	1
	855026	Screw Conveyor Box, RH	1
3	205227	Rock Shield, 14" x 7'	1
4	320609	Core Frame Support Bearing, LH & RH	2
5	320625	Auger Wedge Cutout (2 LH & 2 RH)	4

SCREW CONVEYOR – CENTER VIEW



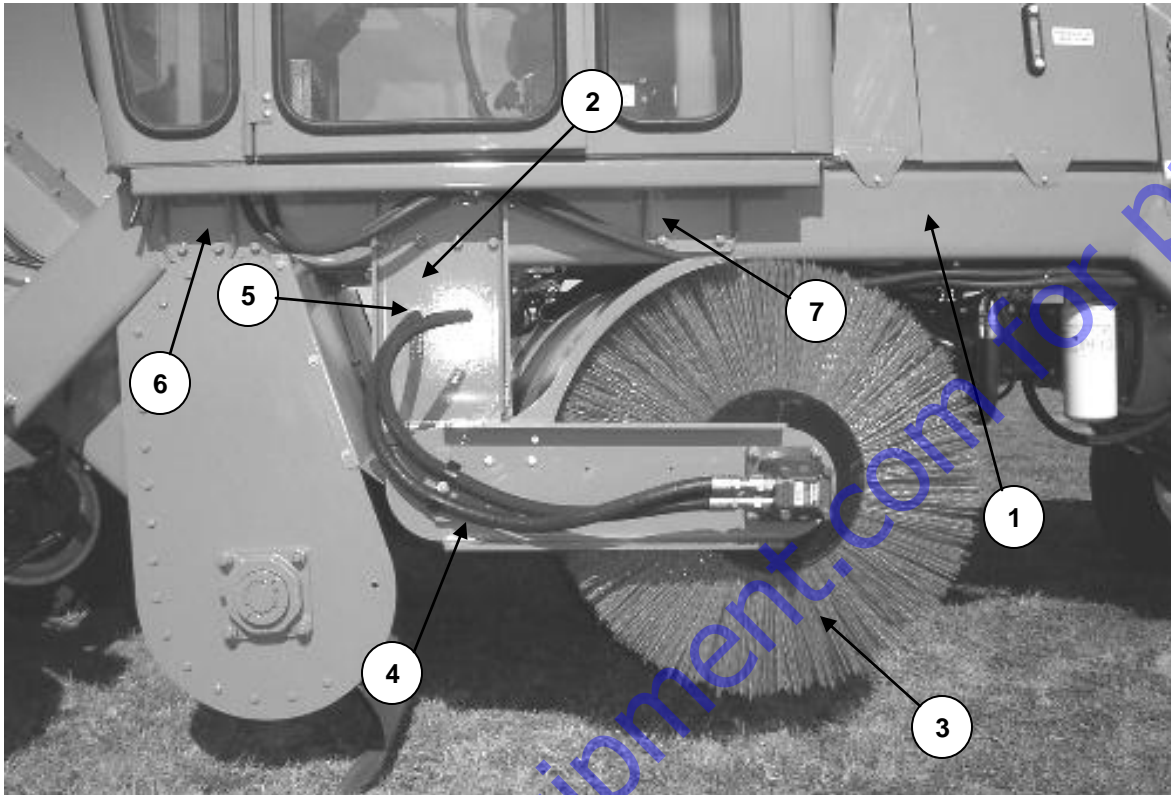
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	320621	Slat Conveyor Chain	2
2	205029	Slat	16
3	320620	Sprockets	4
4	205024	Center Conveyor Shaft	1
5	205028	Slat Conveyor Floor	1
6	320608	Lower Slat Conveyor Bearing	2
7	855021	Slat Conveyor Floor Connector Assembly	1

SCREW CONVEYOR – LEFT OUTER VIEW



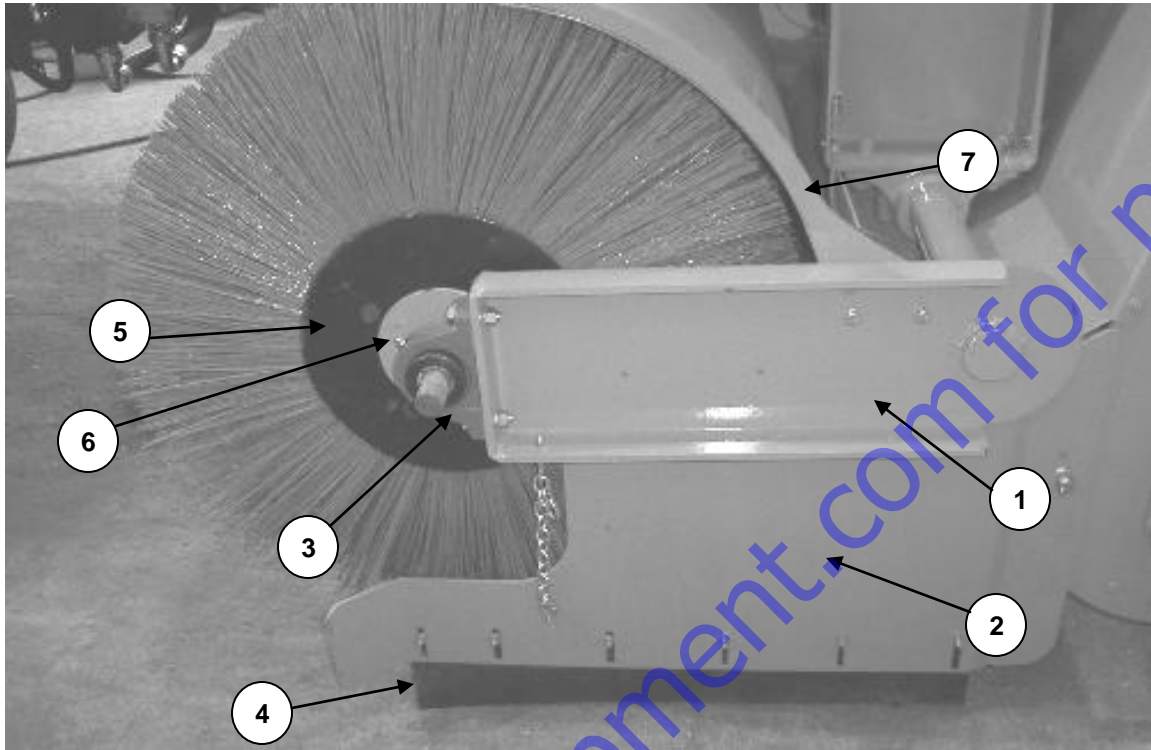
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	205016	Auger Conveyor End Plate, LH & RH	2
2	205023	Outboard Screw Conveyor Stub Shaft, LH & RH	2
3	320613	Outboard Auger Bearings	2
4	855141	Dust Shield, LH	1
	855140	Dust Shield, RH (Not Shown)	1

LEFT SIDE VIEW – BELOW CAB



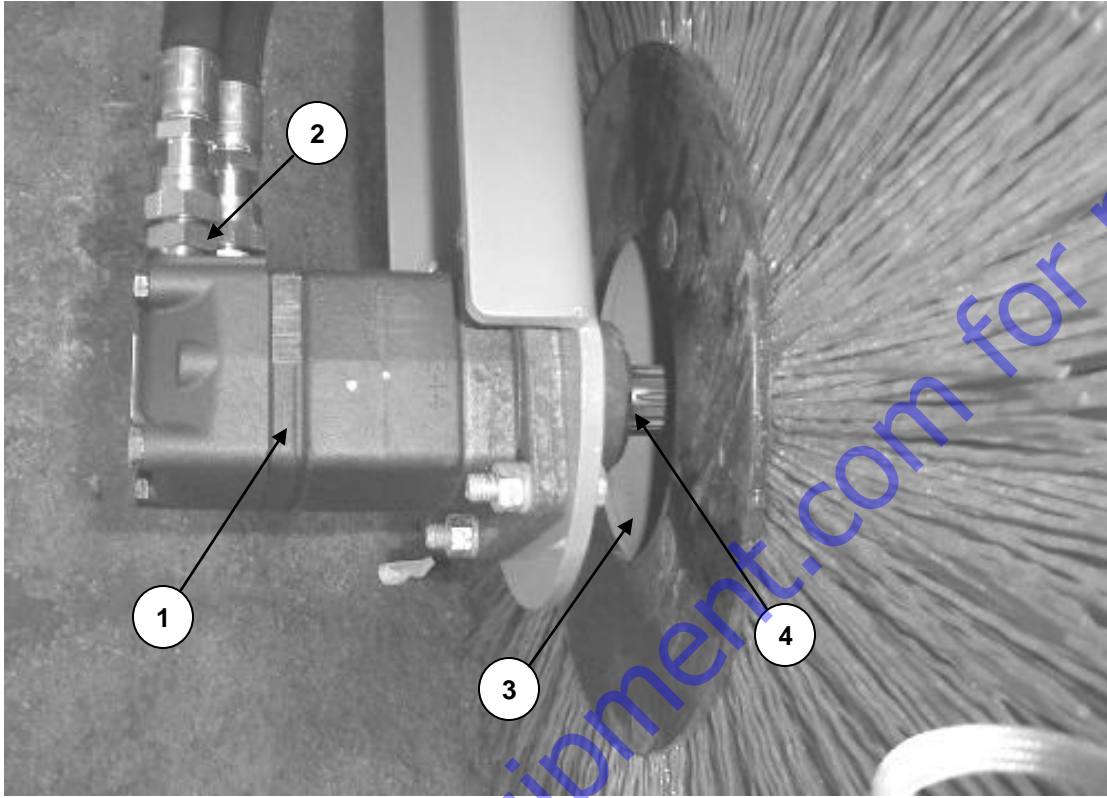
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855001	Frame Assembly	1
2	204999	Brush Support Bracket RH	1
	205000	Brush Support Bracket LH	1
3	RW-500	8' Set, Poly Wafers w/ Spacers	1
	RW-502	8' Set, Half Poly & Half Wire Wafers w/ Spacers	1
4	N/A	Hydraulic Hose Assembly, 46" – 1AA12FR12	2
5	N/A	Hydraulic Fitting, FF1944T1212S	2
6	205161	Front ROPS Attaching Bracket, LH	1
	205160	Front ROPS Attaching Bracket, RH	1
7	205162	Rear ROPS Attaching Bracket	2

RIGHT SIDE VIEW – BROOM CORE



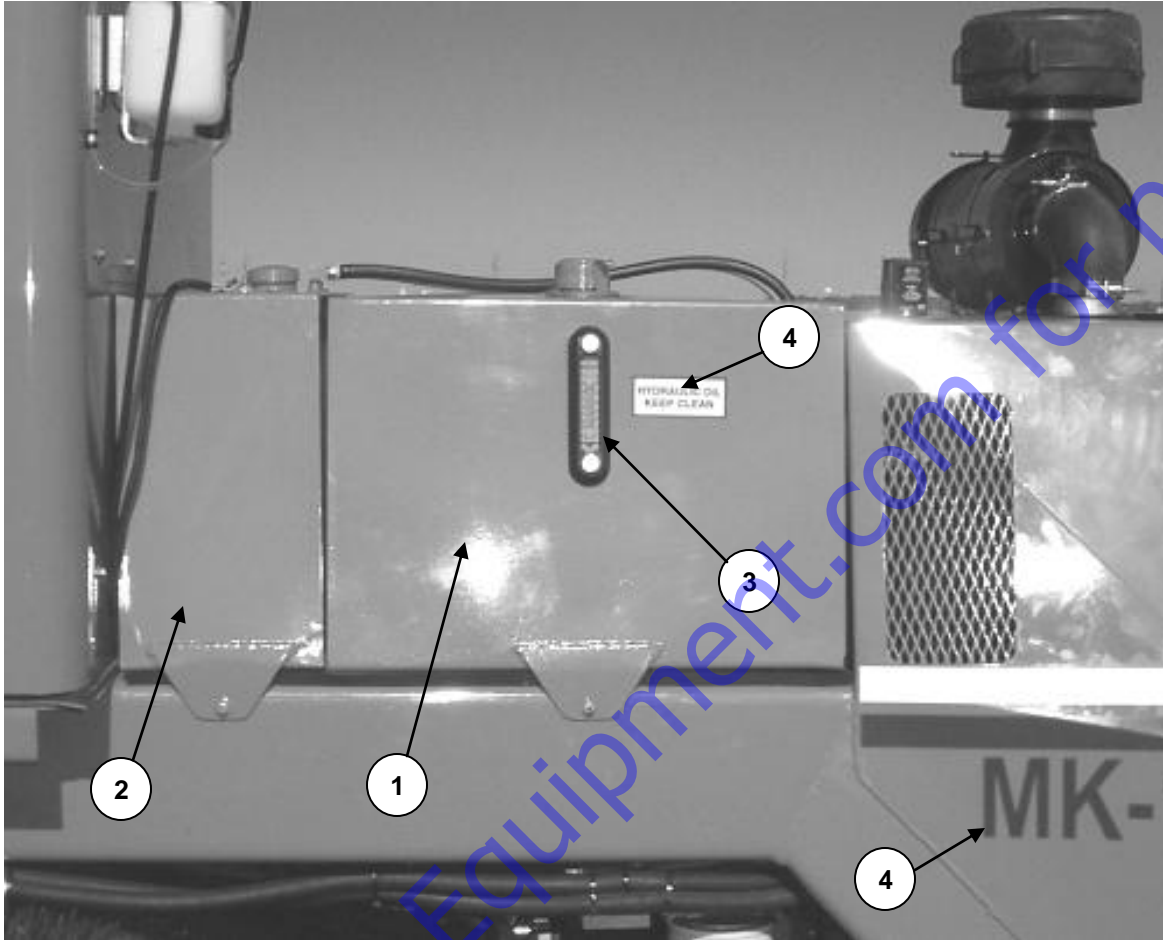
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855004	Core Frame Assembly	1
2	205043 205044	Brush End Gate, RH Brush End Gate, LH	1 1
3	320610	Core Support Bearing, RH	1
4	205228	Core Side Sheet Rubber	2
5	203010	End Plate	2
6	D-17	Core Idle Assembly	1
7	855037	Core Cover Assembly	1

CORE MOTOR VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325010	Core Motor OMSW 400	1
2	N/A	Hydraulic Fitting, FF1852T1210S	2
3	855005	Core Assembly	1
4	DD-257-R	Core Drive Assembly (Splined Hub)	1

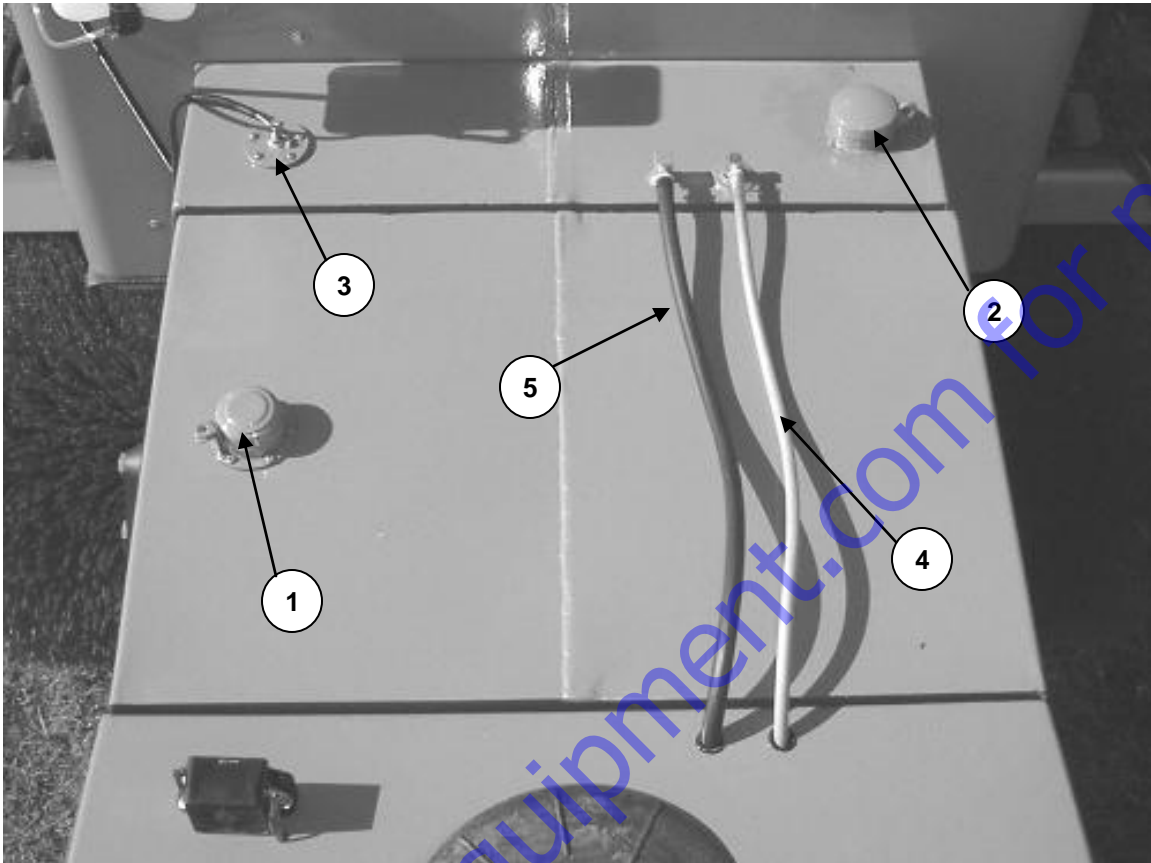
MIDDLE LEFT SIDE VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855153	Hydraulic Tank Assembly	1
2	855158	Fuel Tank Assembly	1
3	305505	Sight Glass	1
4	311665	Decal Kit	1

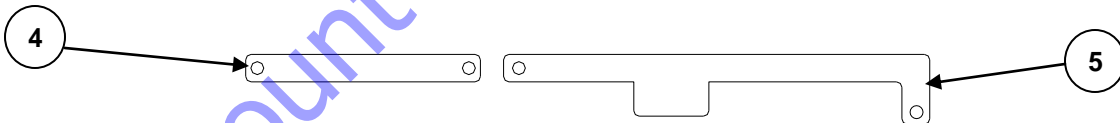
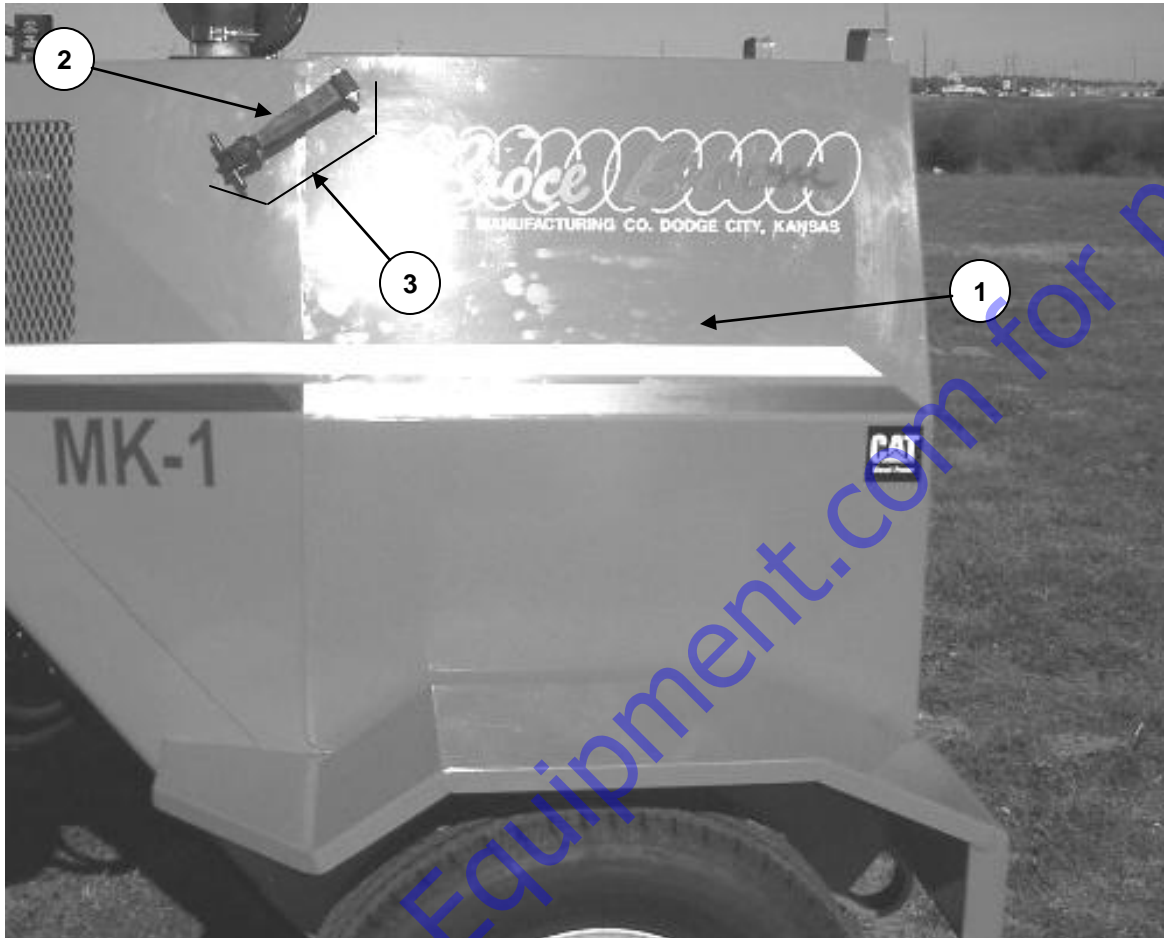
NOTE: Decal Kit includes all exterior decals including safety stickers. Decals may be ordered separately. Request individual decals when ordering.

FUEL/HYDRAULIC TANK TOP VIEW



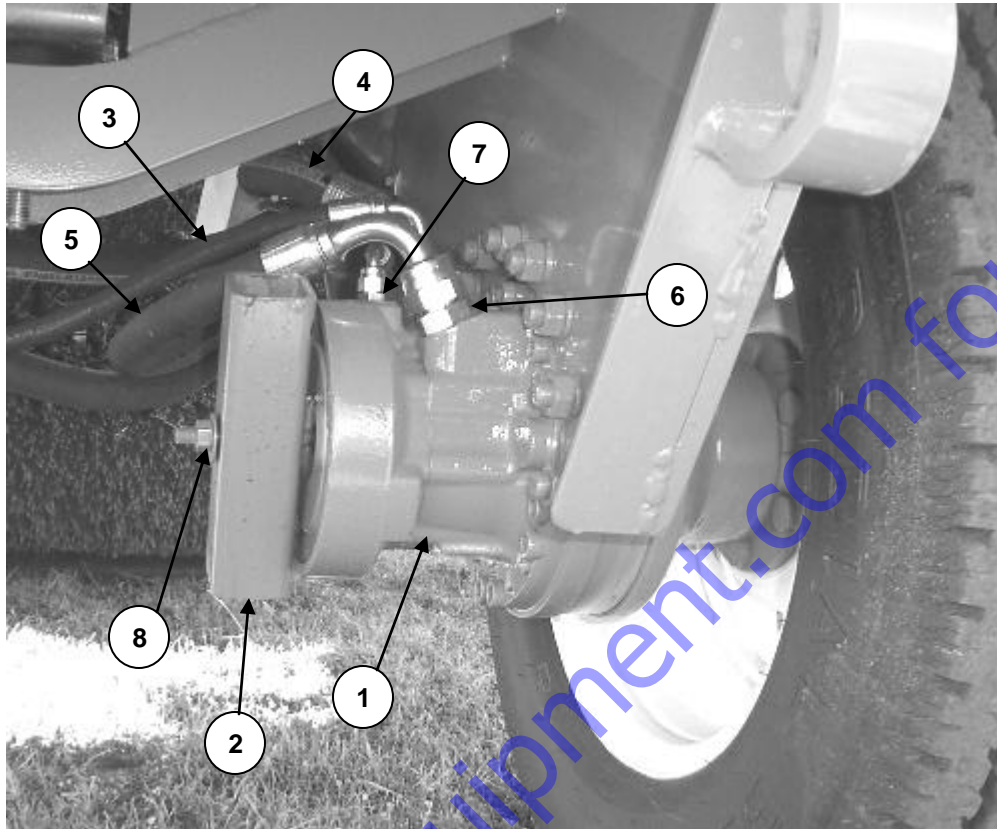
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	T-703-BA	Hydraulic Cap	1
2	T-702-B	Fuel Cap	1
3	344175	Fuel Gauge Assembly	1
4	304172	3/8" Fuel Hose, 48"	1
5	304172	3/8" Fuel Hose, 60"	1

REAR LEFT SIDE VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855215	Hood Assembly	1
2	VF-803-R	Hood Catch (Rubber Strap Only)	2
3	VF-319-RA	Catch Assembly (Complete)	2
4	205221	Front Hood Retract Support Linkage	2
5	203274	Rear Hood Retract Support Linkage	2
NS	VF-317-B	Hinge, Set of 2	1

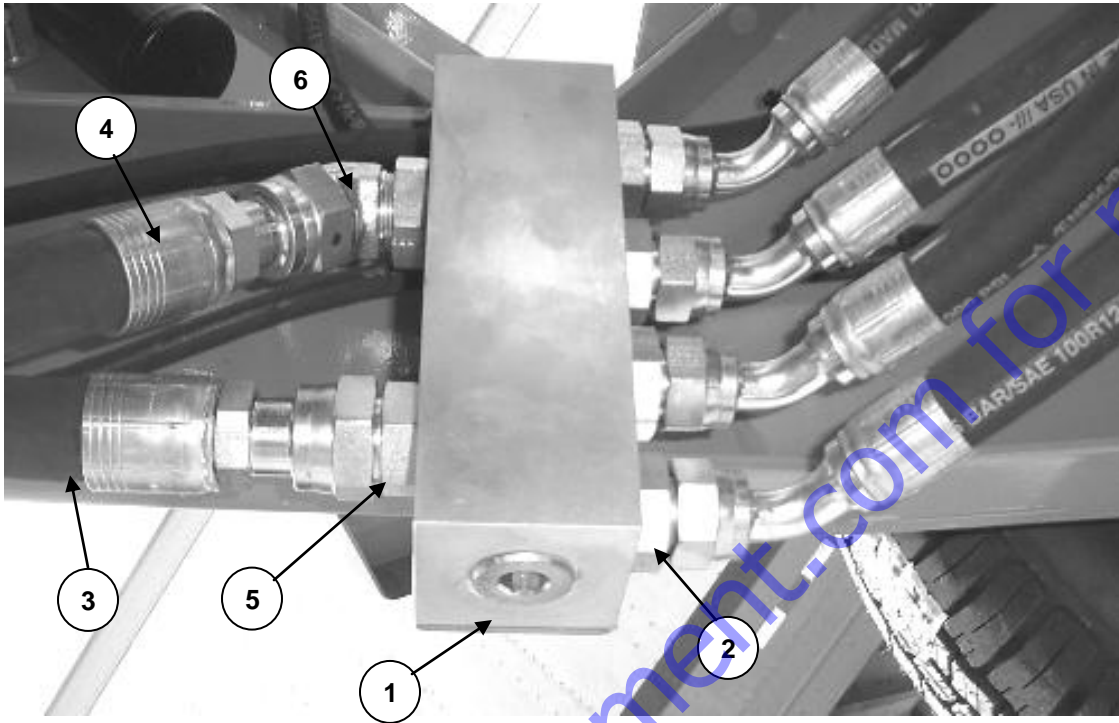
REAR DRIVE VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325002 325001	Poclain 34ci Motor with parking brake, LH and RH Poclain 34ci Motor, no brake S/N 500001-500050, LH only	2 1
2	K00024	Brake Release, 2" x 2" Square Tube, RH Only	1
3	N/A	Hydraulic Hose Assy., 68" – 1AA6FRA6 & 1AA6FRC6, RH Hydraulic Hose Assy., 25" – 1AA6FRA6 & 1AA6FRC6, LH	1 1
4	N/A	Hydraulic Hose Assy., 10.5" – 1BA12FRA12 (2) (R-Port, RH) Hydraulic Hose Assy., 50" – 1BA12FRA12 (2) (R Port, LH)	1 1
5	N/A	Hydraulic Hose Assy., 19" – 1BA12FRA12 & 1BA12FRB12 (L-Port, RH) Hydraulic Hose Assy., 46.5" – 1BA12FRA12 (R-Port, LH)	1 1
6	N/A	Hydraulic Fitting, FF1852T1212S (2 per Side, L & R-Port)	4
7	N/A	Hydraulic Fitting,	2
8	Included in Item 2	Brake Release, 12mm x 110 mm Stud	1

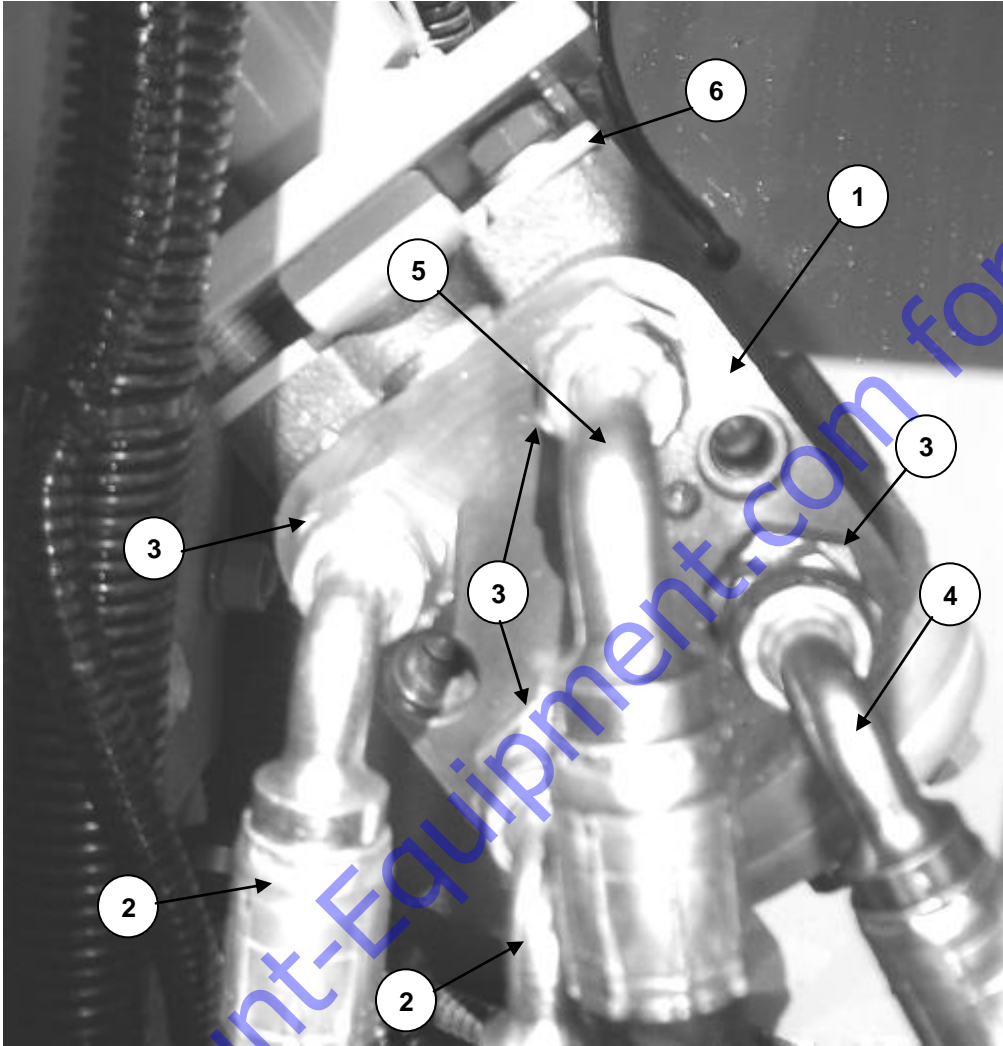
Note: Picture shows RH Rear Drive Motor with brake release assembly attached. Brake release, Items #2 & #8, are to be used only to release Drive Motor Brake if needed. Items must be removed for normal operation.

PRESSURE MANIFOLD VIEW



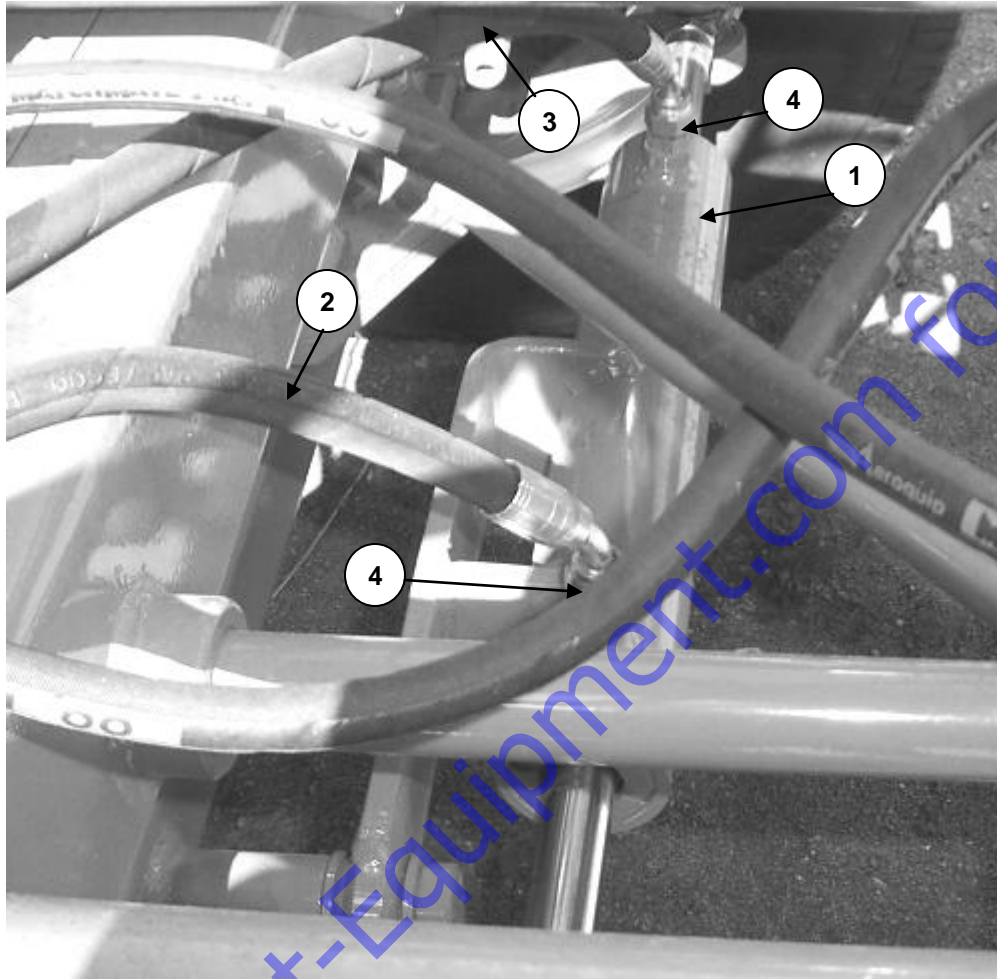
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325017	Pressure Manifold	1
2	NA	Hydraulic Fitting, FF1852T1216S	4
3	NA	Hydraulic Hose Assy., 27" – 1BA16FR16 & 1BA16FRB16	1
4	NA	Hydraulic Hose Assy., 28" – 1BA16FR16 & 1BA16FRB16	1
5	NA	Hydraulic Fitting, FF1852T1616S	1
6	NA	Hydraulic Fitting, FF2068T1616S	1

STEERING MOTOR VIEW



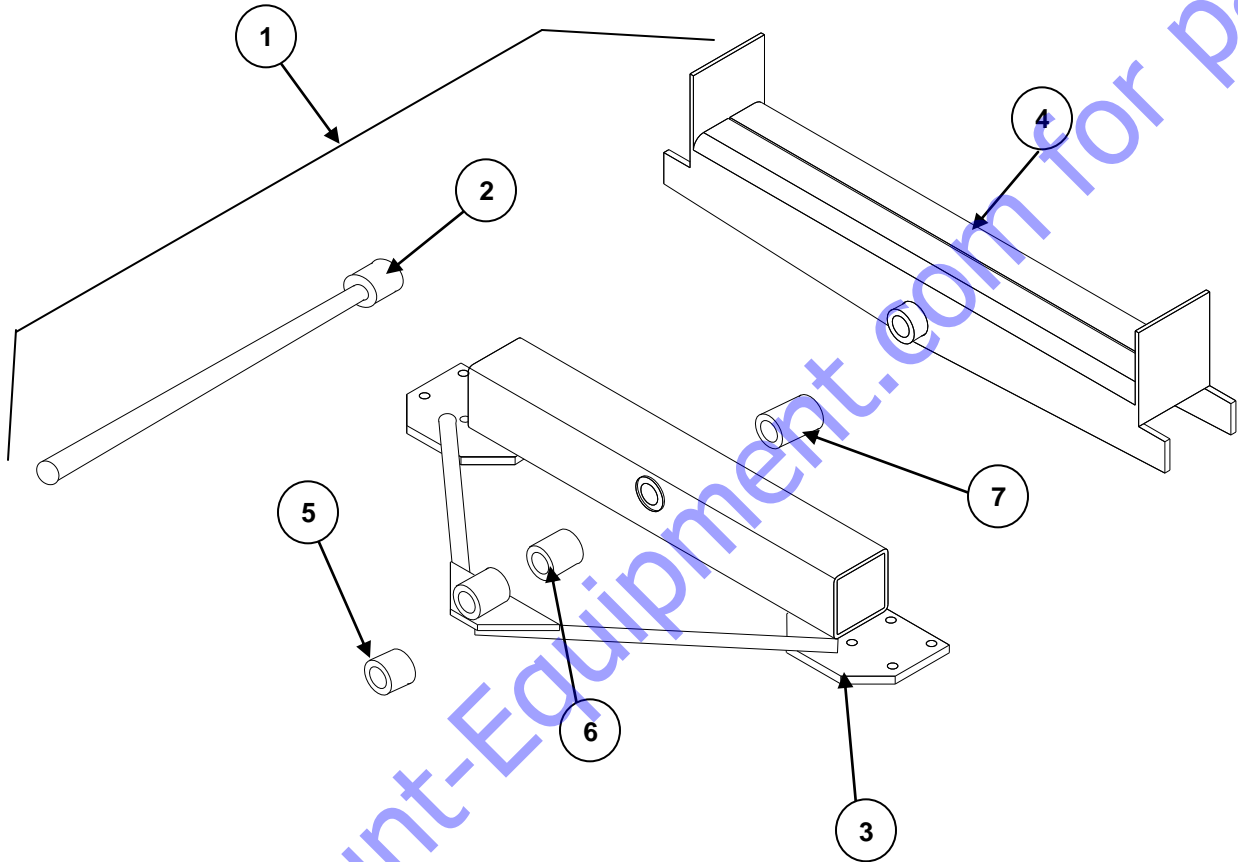
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325009	Steering Motor	1
	325036	Steering Motor (with Curb & Gutter Option)	1
2	NA	Hydraulic Hose Assembly, 20" – 1AA6FR6 & 1AA6FRB6	2
3	NA	Hydraulic Fitting, FF1852T0608S	4
4	NA	Hydraulic Hose Assembly, 18" – 1AA6FR6 & 1AA6FRB6	1
5	NA	Hydraulic Hose Assembly, 12" – 1AA6FRB6 & 1AA6FRC6	1
6	203250	Power Steering Unit Mount	1

STEERING CYLINDER VIEW



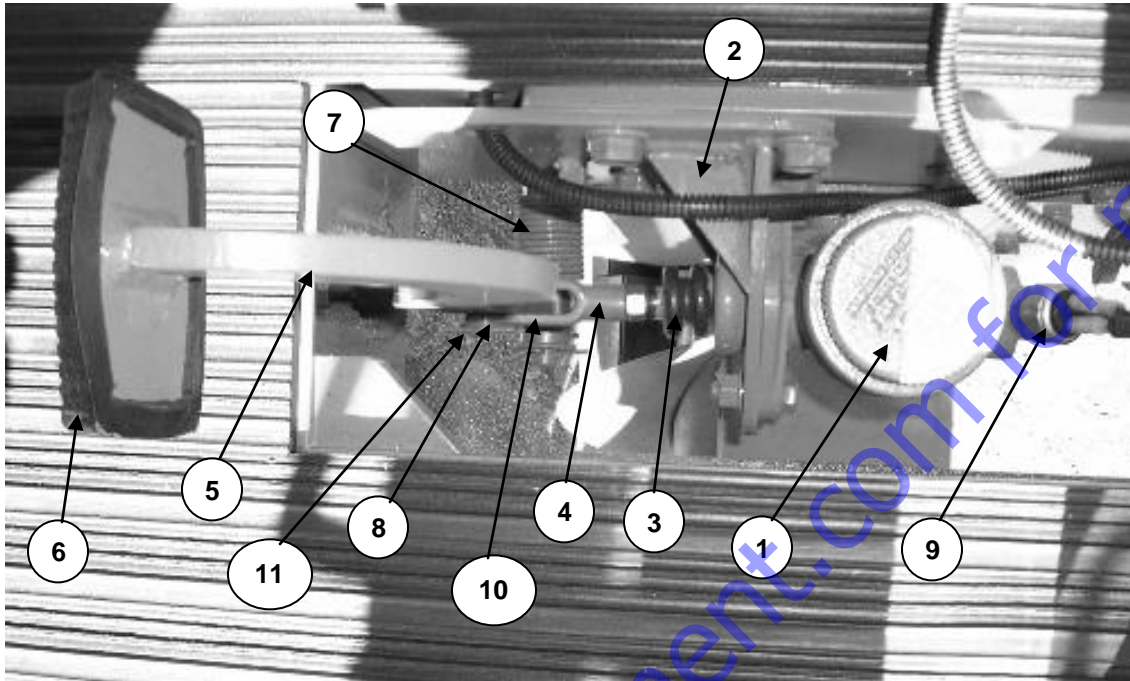
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	See Front Axle View	Steering Cylinder	1
2	NA	Hydraulic Hose Assembly, 66" – 1AA6FRA6 & 1AA6FRB6	1
3	NA	Hydraulic Hose Assembly, 74" – 1AA6FRA6 & 1AA6FRB6	1
4	NA	Hydraulic Fitting, FF1852T0606S	2

BOLSTER ASSEMBLY



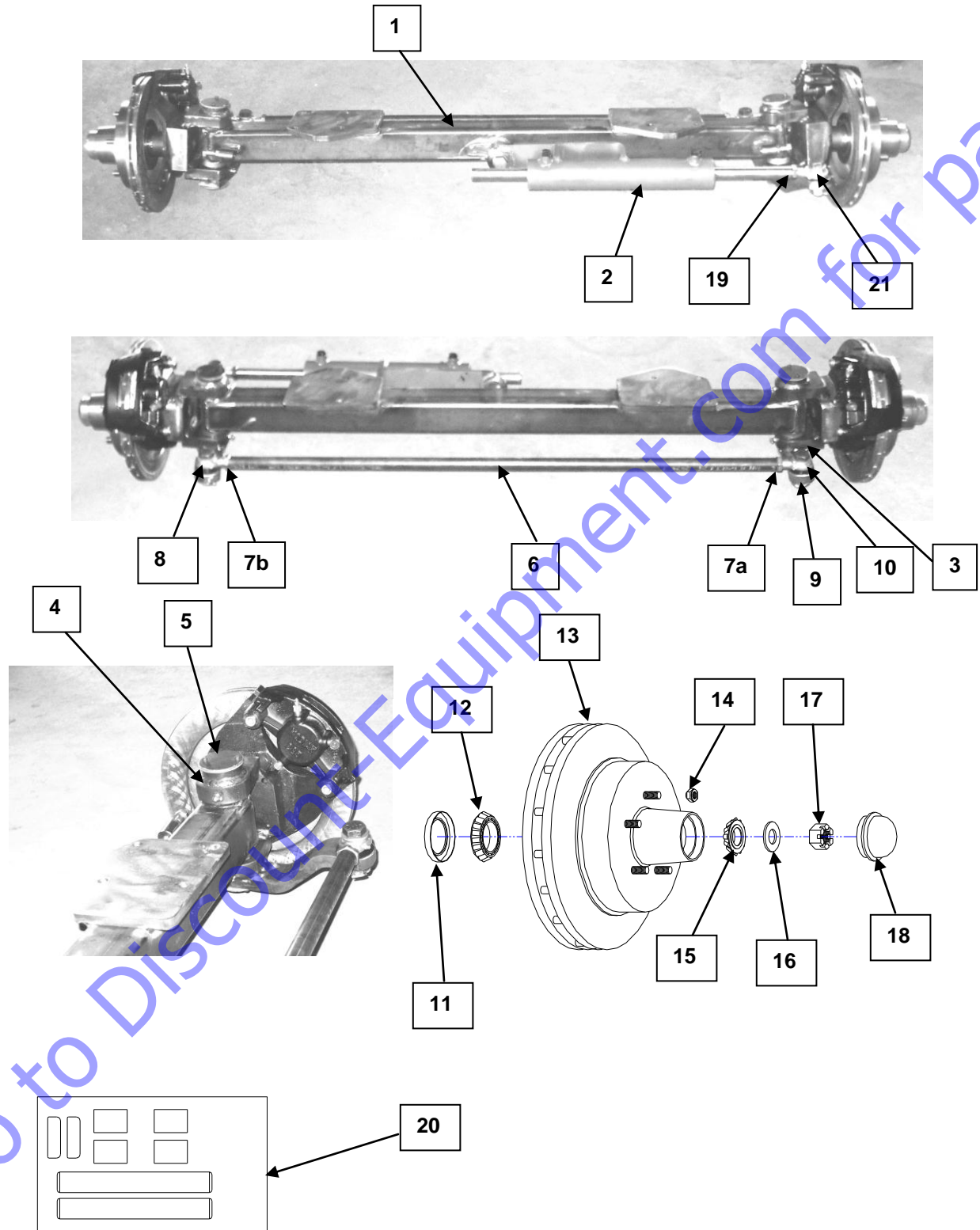
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	752002	Bolster Assembly, Complete	1
2	203002	Bolster Pin	1
3	852002	Bolster A-Frame Assembly	1
4	852003	Bolster Support	1
5	309507	Oil Light Bushing, 1 1/4" x 1 1/2" x 1 1/2"	1
6	309505	Oil Light Bushing, 1 1/4" x 1 1/2" x 2"	1
7	309506	Oil Light Bushing, 1 1/4" x 1 1/2" x 2 1/4"	1

BRAKE CONTROL ASSEMBLY



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	B-240-R	Master Cylinder	1
2	855188	Master Cylinder Mount	1
3	B-284	Rubber Boot	1
4	401216	Push Rod	1
5	855191	Brake Pedal	1
6	B-241-R	Brake Pedal Pad	1
7	344460	Tension Spring	1
8	205197	Pedal Bushing	2
9	BLS-15	Brake Light Switch	1
10	B-27084A	Clevis	1
11	HC-229-R	Clevis Pin	1

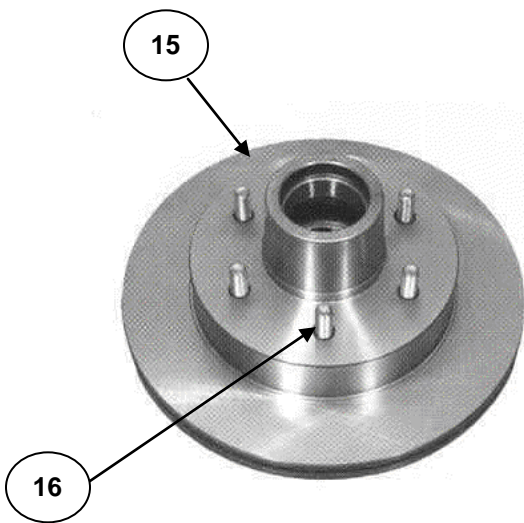
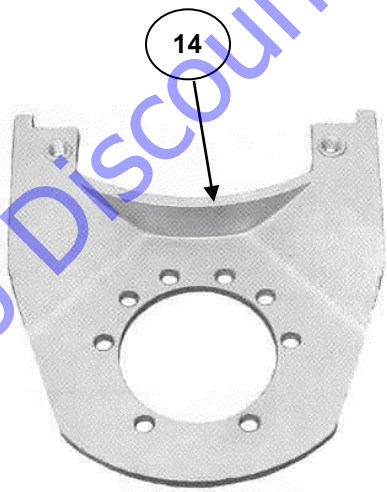
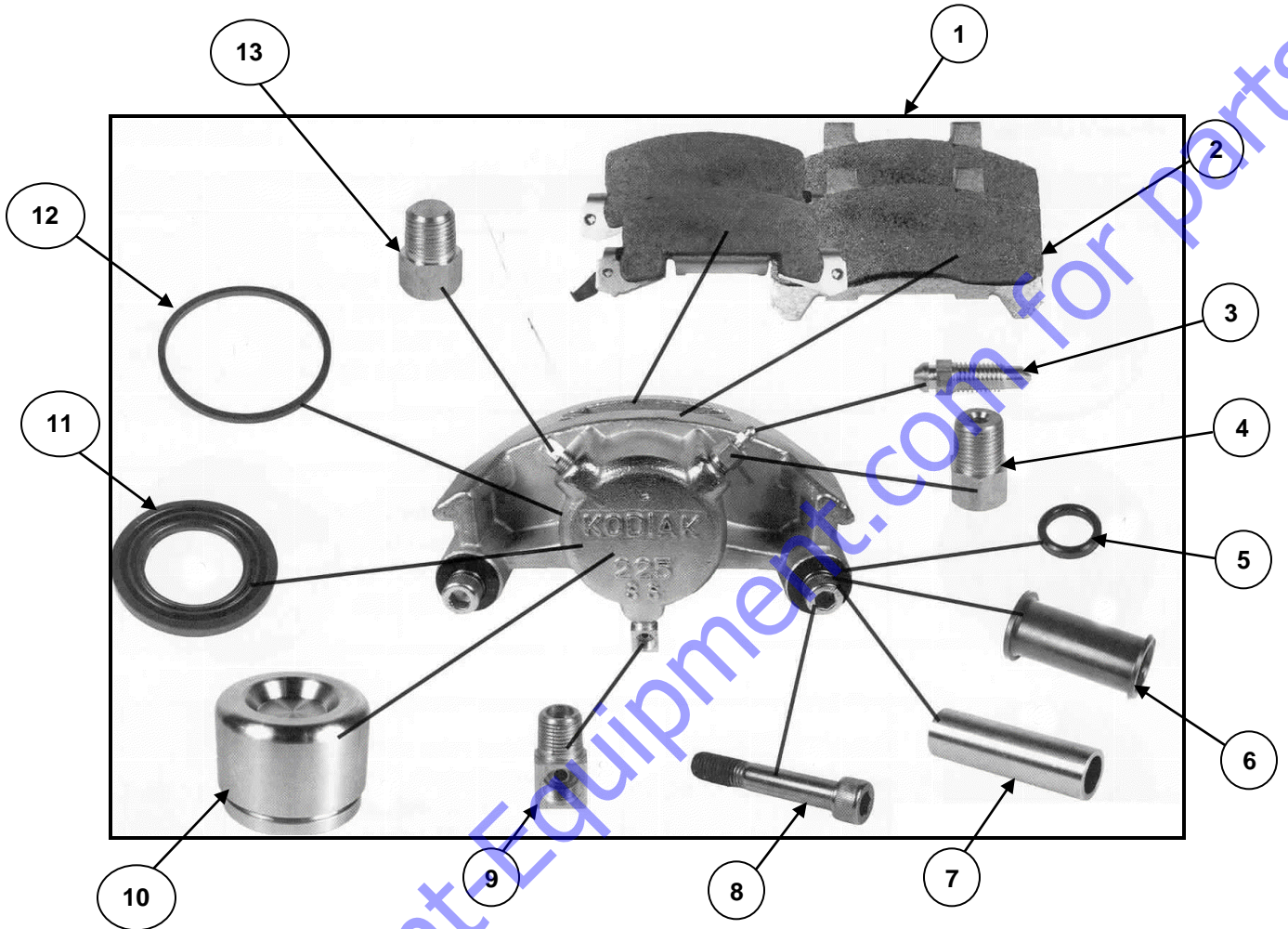
FRONT AXLE ASSEMBLY



FRONT AXLE ASSEMBLY

Reference	Part No.	Description	Qty.
1	403090	Front Axle Assembly (6 Lug x 5 1/2)	1
2	203526	Steering Cylinder Assembly	1
4	403091	Knuckle w/Spindle, LH	1
	403092	Knuckle w/ Spindle, RH	1
5	BF4454	King Pin Cap	2
6	403093	Tie Rod Tube	1
7a	BF4470	Jam Nut, RH Thread	1
7b	BF4471	Jam Nut, LH Thread	1
8	BF4465L	Tie Rod End, RH Thread	1
9	203523	Lock Nut	2
10	BF4465R	Tie Rod End, LH Thread	1
11	BF4460	Seal	2
12	BF4461X	Inner Bearing Kit (w/Race)	2
13	203544	Hub Assembly, (6 Lug x 5 1/2)	2
14	69957B	Lug Nut	10
15	752547	Outer Bearing Kit (w/Race)	2
16	400195	Washer	2
17	203549	Lock Nut	2
18	203550	Hub Cap	2
19	BF4470	Jam Nut, RH Thread	1
20	BF4455	King Pin Kit	1
21	203520	Steering Cylinder Heims End	1
Not Shown	203553	Steering Cylinder Seal Kit	1
Not Shown	304039	Wheel - 6 Lug	1

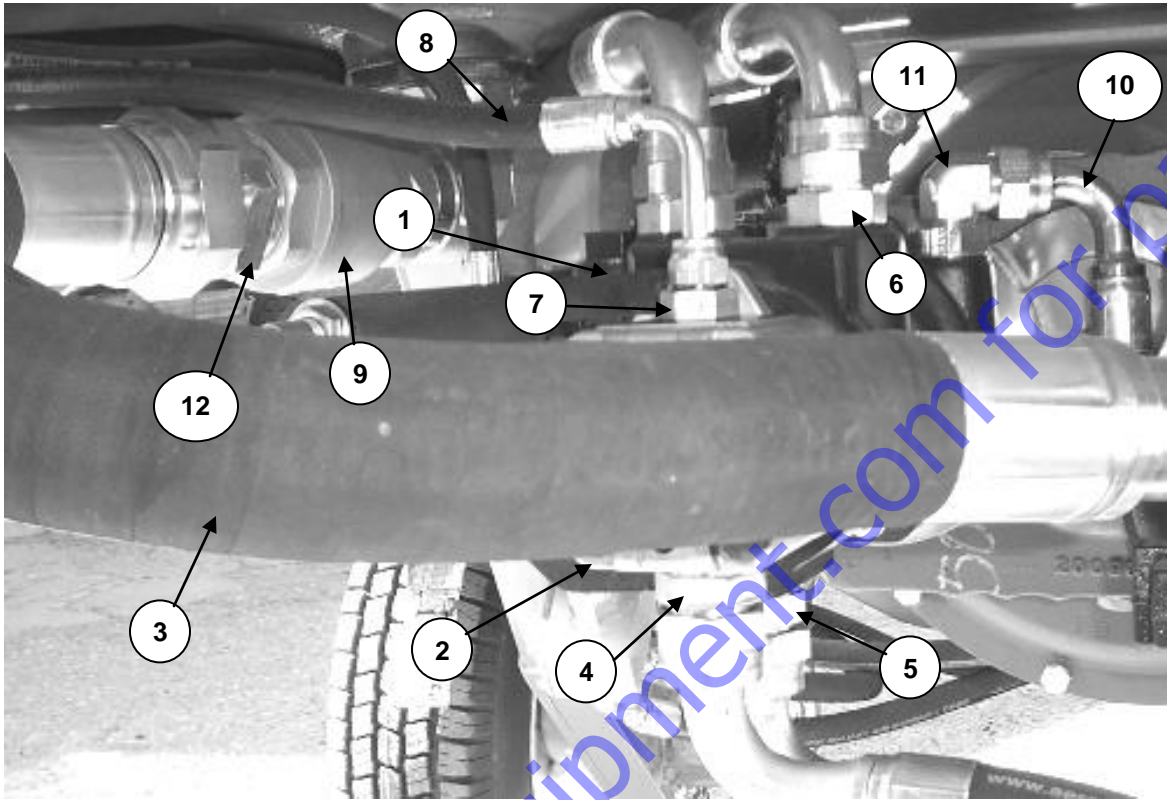
5200-6000 LB FRONT BRAKE ASSEMBLY



5200-6000 LB FRONT BRAKE ASSEMBLY

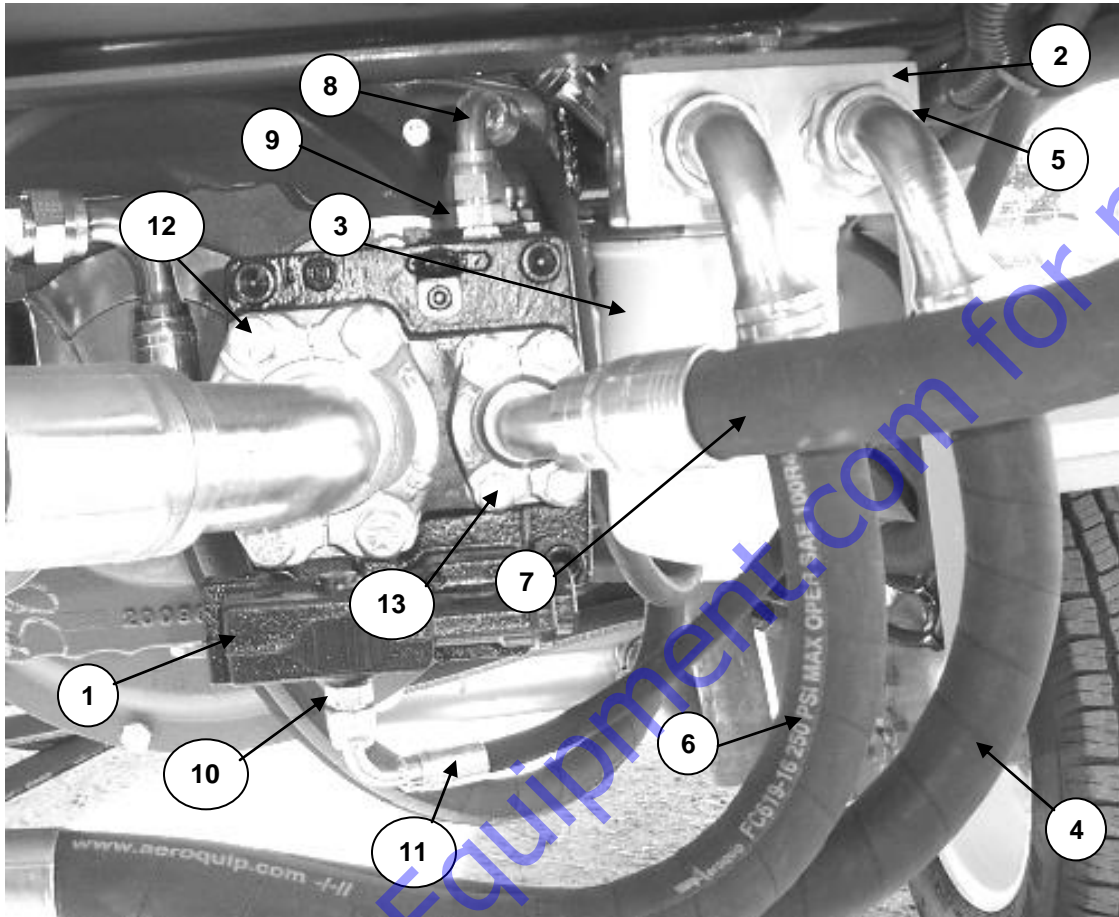
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	203554	Complete Caliper Assembly w/ Pads	1
2	203530	Friction Pads, Organic	1
3	203531	Brass Bleed Screw, 1/4" – 28	1
4	203532	Brass Bleed Screw Adapter, 1/8"	1
5	203533	Guide Bolt Sleeve O-Ring	1
6	203534	Guide Bolt Rubber Sleeve	1
7	203535	Guide Bolt Stainless Steel Sleeve	1
8	203536	Guide Bolt (M11 x 1.5) w/ Thread Locker	1
9	203537	90° 1/8" NPT to 3/16" F.I.F.	1
10	203538	Caliper Piston, 2 1/4" Stainless Steel	1
11	203539	Rubber Dust Boot	1
12	203540	Piston Rubber Seal	1
13	203541	1/8" NPT Brass Plug	1
14	203542	Caliper Mounting Bracket	1
15	203543	12" Integral Rotor w/ Hub, 5 Lug x 5 1/2"	1
	203544	12" Integral Rotor w/ Hub, 6 Lug x 5 1/2"	1
16	203555	Wheel Stud	5 or 6
NS	FA-306-R	Brake Hose	2

M-46 HYDROSTAT VIEW



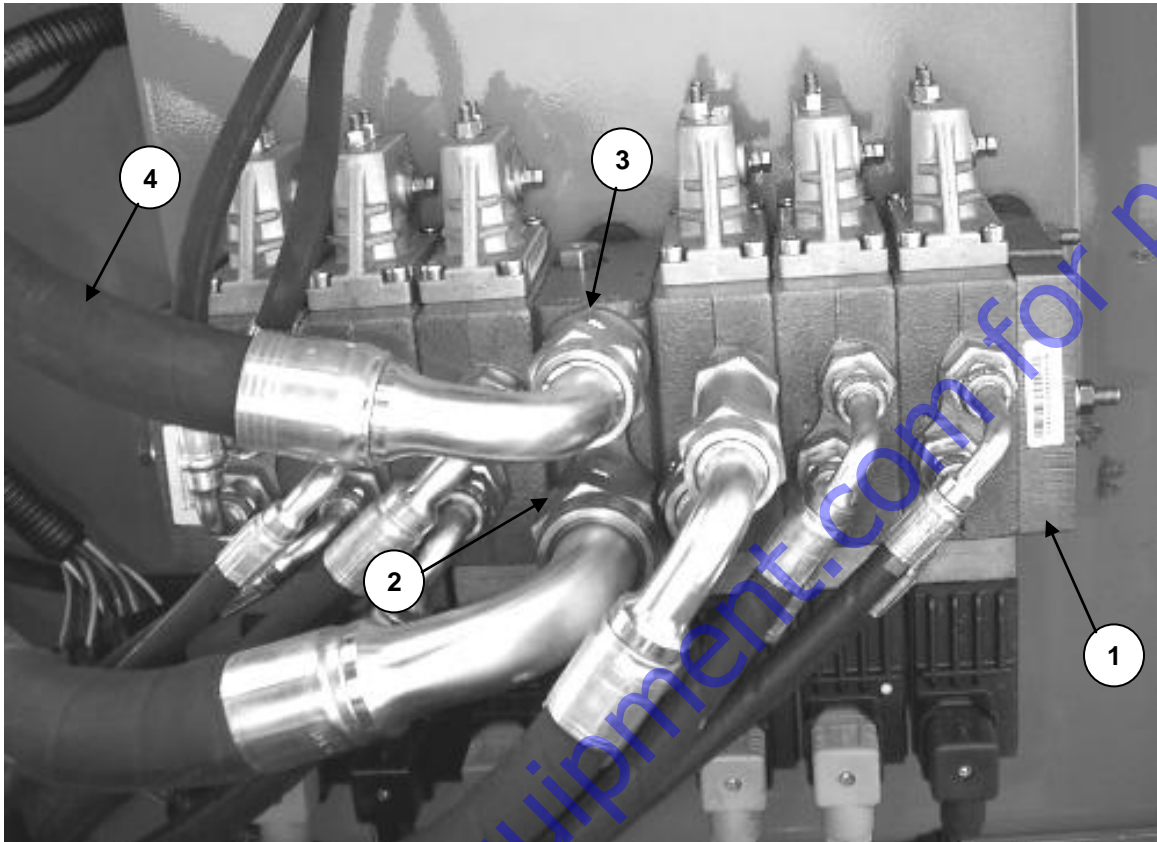
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325003	M-46 Hydrostat	1
2	325005	Steering Pump	1
	325035	Steering Pump (with Curb & Gutter Brush Option)	1
3	N/A	Hydraulic Hose Assy., 25" – 1GA32FJ32 & 1 G32FLA32	1
4	N/A	Hydraulic Fitting, FF1852T1612S	1
5	N/A	Hydraulic Fitting, FF1852T1616S	1
6	N/A	Hydraulic Fitting, FF1852T1216S	2
7	N/A	Hydraulic Fitting, FF1852T0610S	1
8	N/A	Hydraulic Hose Assy., 76" – 1AA6FRB6 & 1AA6FRC6	1
9	N/A	2" Ball Valve	1
10	N/A	Hydraulic Hose Assy., 28" – 1AA12FRB12 (2)	1
11	N/A	Hydraulic Fitting, FF1868T1212S	1
12	N/A	Hydraulic Fitting, 2021-32-32	1

M-45 PISTON PUMP VIEW



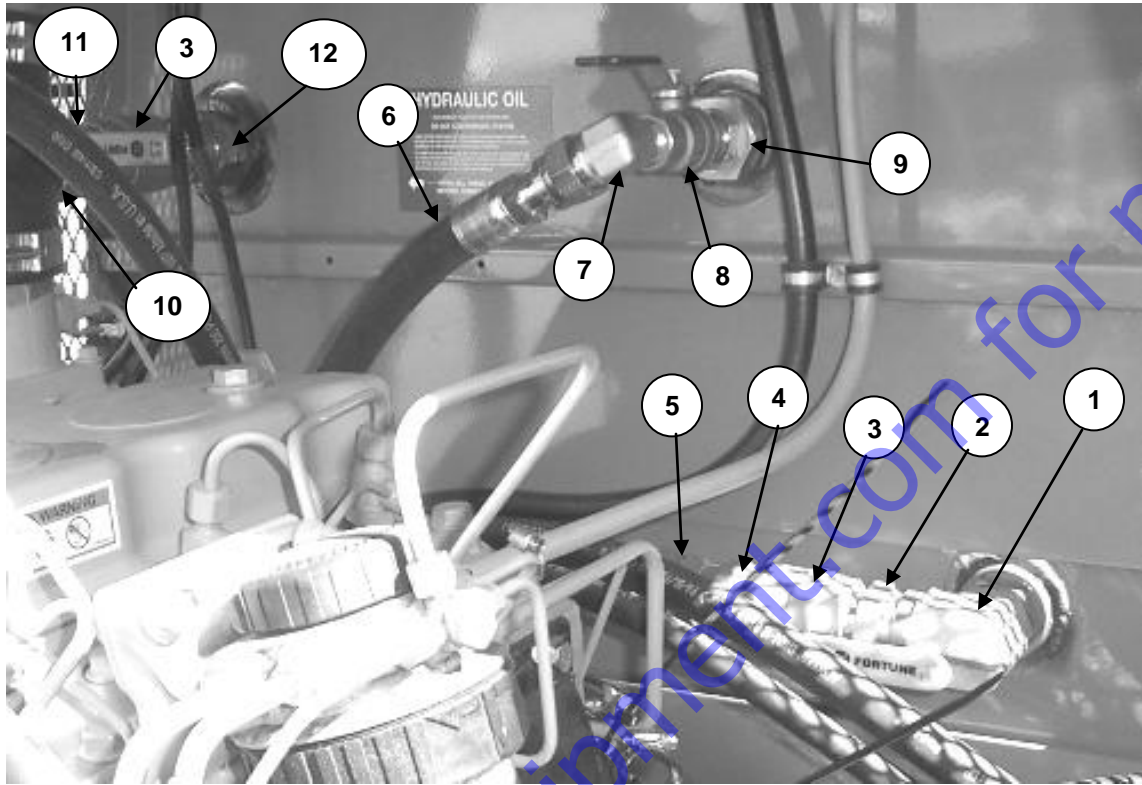
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325004	M-45 Piston Pump, 75cc	1
2	325015	Suction Manifold	1
3	325020	Hydraulic Oil Filter	2
4	N/A	Hydraulic Hose Assy., 22" – 1GA16FRB16 (2)	1
5	N/A	Hydraulic Fitting, FF1852T1616S	2
6	N/A	Hydraulic Hose Assy., 19" – 1GA16FRB16	1
7	N/A	Hydraulic Hose Assy., 48.5" – 1BA16FRB16 & 1B16FLA16	1
8	N/A	Hydraulic Hose Assy., 27" – 1AA8FRB8 (2)	1
9	N/A	Hydraulic Fitting, FF1852T0810S	1
10	N/A	Hydraulic Fitting, FF1852T0404S	1
11	N/A	Hydraulic Hose Assy., 76" – 1AA4FRB4 & 1AA4FRC4	1
12	N/A	Flange Kit, FF593-449-74446-32	1
13	N/A	Flange Kit, FF593-449-74446-16	1

PVG VALVE VIEW



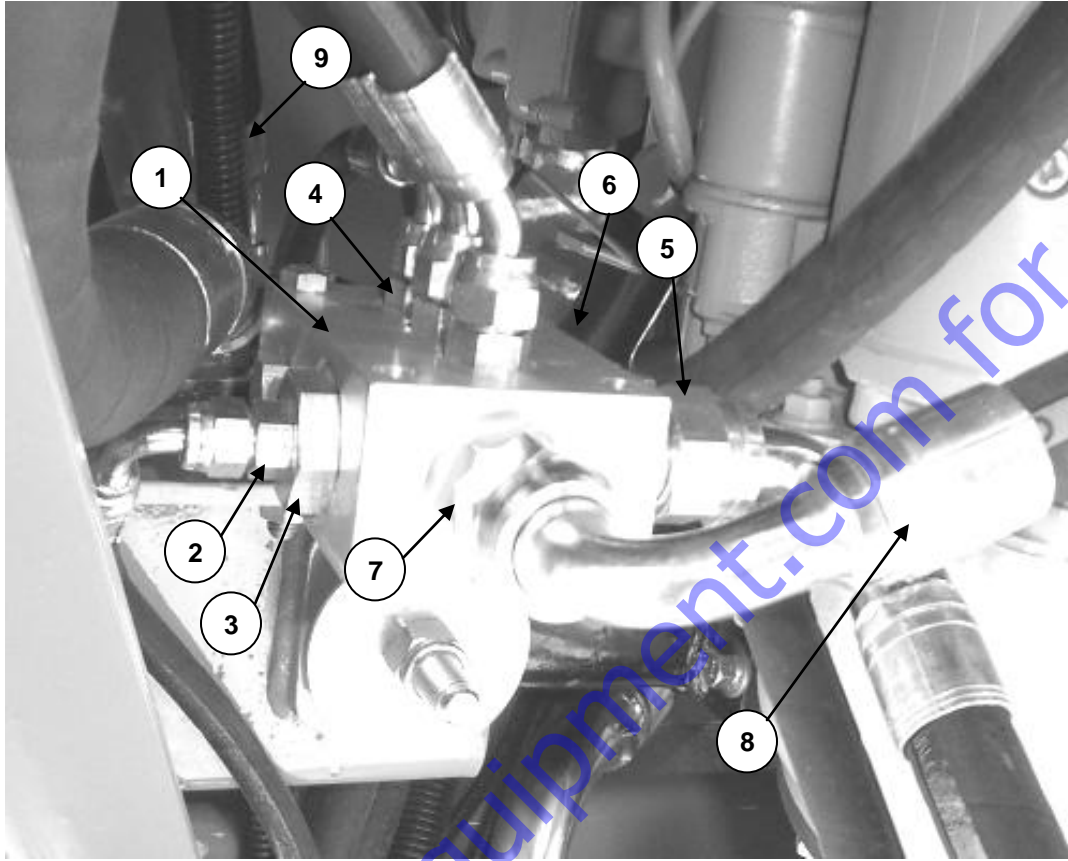
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325006	PVG32/6 Control Valve	1
2	N/A	Hydraulic Fitting, FF1852T1616S	1
3	N/A	Hydraulic Fitting, FF1852T2016S	1
4	N/A	Hydraulic Hose Assy., 7.5" – 1GA20FR20 & 1GA20FRB20	1

HYDRAULIC TANK VIEW



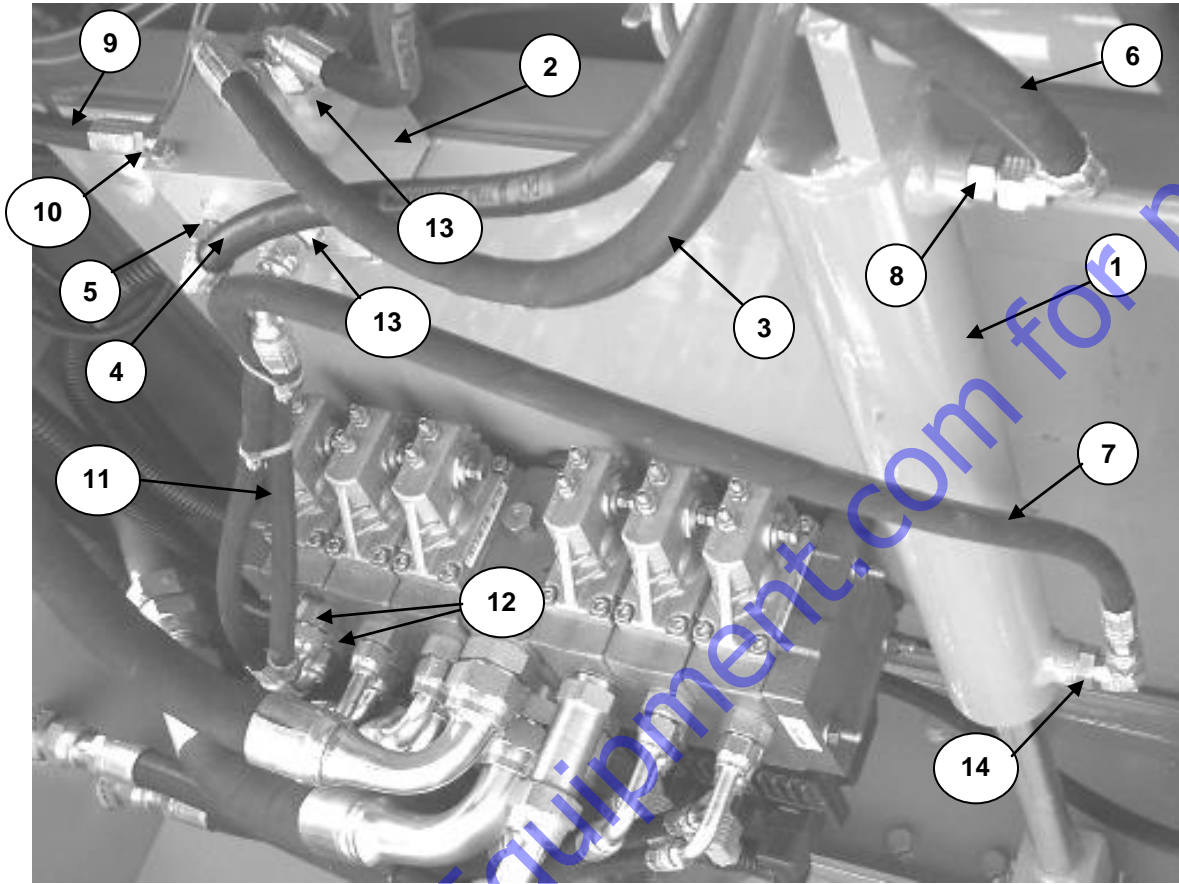
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	N/A	Hydraulic Fitting – Elbow, 6805-20-20FG	1
2	N/A	Hydraulic Fitting, 2083-20-20S	1
3	306538	1 1/4" Ball Valve – 1/4 Turn Valve	1
4	N/A	Hydraulic Fitting, FF2031T2020S	1
5	N/A	Hydraulic Hose Assy., 12"–1GA20FR20 & 1GA20FRB20	1
6	N/A	Hydraulic Hose Assy., 65" – 1AA12FR12 (2)	1
7	N/A	Hydraulic Fitting, FF2032T1212S	1
8	306535	3/4" Ball Valve	1
9	N/A	Hydraulic Adapter Fitting, 6401-12-12	1
10	N/A	Hydraulic Hose Assy., 26" – 1GA20FR20 & 1GA20FRA20	1
11	N/A	Hydraulic Adapter Fitting, FF2031T2020S	1
12	N/A	Hydraulic Adapter Fitting, 6401-20-20	1

CASE DRAIN MANIFOLD VIEW



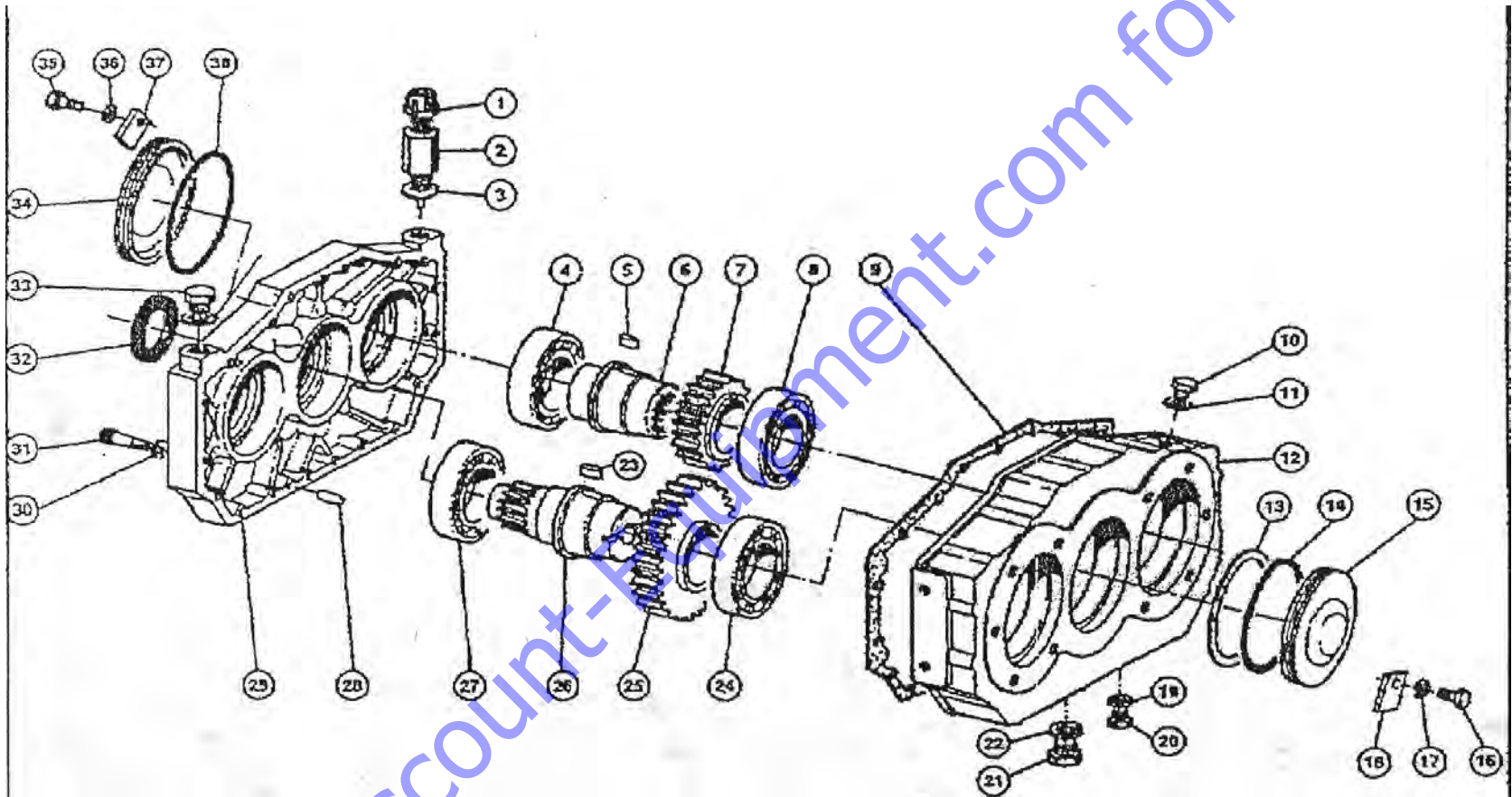
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325016	Case Drain Manifold	1
2	N/A	Hydraulic Adapter, FF1852T0406S	1
3	N/A	Hydraulic Bushing, FF1010-1206S	1
4	N/A	Hydraulic Fitting, FF1852T0606S	3
5	N/A	Hydraulic Fitting, FF1852T1212S	1
6	N/A	Hydraulic Fitting (Port 7), FF1852T0812S	1
7	N/A	Hydraulic Fitting, FF1852T1212S (3054B Cat Engine Only)	1
7	N/A	Hydraulic Fitting, FF1868T1212S (3054C Cat Engine Only)	1
8	N/A	Hydraulic Hose Assy., 40" – 1AA12FR12 & 1AA12FRB12	1
9	N/A	Hydraulic Hose Assy., 93" – 1AA6FRA6 & 1AA6FRB6 Hydraulic Fitting (Port 5), FF1852T0612S	1 1

CORE LIFT CYLINDER VIEW



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	325014	Core Lift Cylinder, 2" x 12"	1
2	325019	Dual Locking Valve – Lift Lock Solenoid	1
3	N/A	Hydraulic Hose Assy., 43" – 1AA4FR4 & 1AA4FRB4	1
4	N/A	Hydraulic Hose Assy., 88" – 1AA4FRB4	1
5	N/A	Hydraulic Fitting, FF1852T0406S	1
6	N/A	Hydraulic Hose Assy., 20" – 1AA4FRB4 (2)	1
7	N/A	Hydraulic Hose Assy., 39.5" – 1AA4FR4 & 1AA6FRB4	1
8	N/A	Hydraulic Fitting, FF1852T0406S	1
9	N/A	Hydraulic Hose Assy., 63" – 1AA4FR4 & 1AA4FRB4	1
10	N/A	Hydraulic Fitting, FF1852T0406S	1
11	N/A	Hydraulic Hose Assy., 14" – 1AA4FRB4 & 1AA6FRB4	1
12	N/A	Hydraulic Fitting, FF1852T0610S	2
13	N/A	Hydraulic Fitting, FF1852T0406S	1
14	N/A	Hydraulic Fitting, FF1868T0406S	1

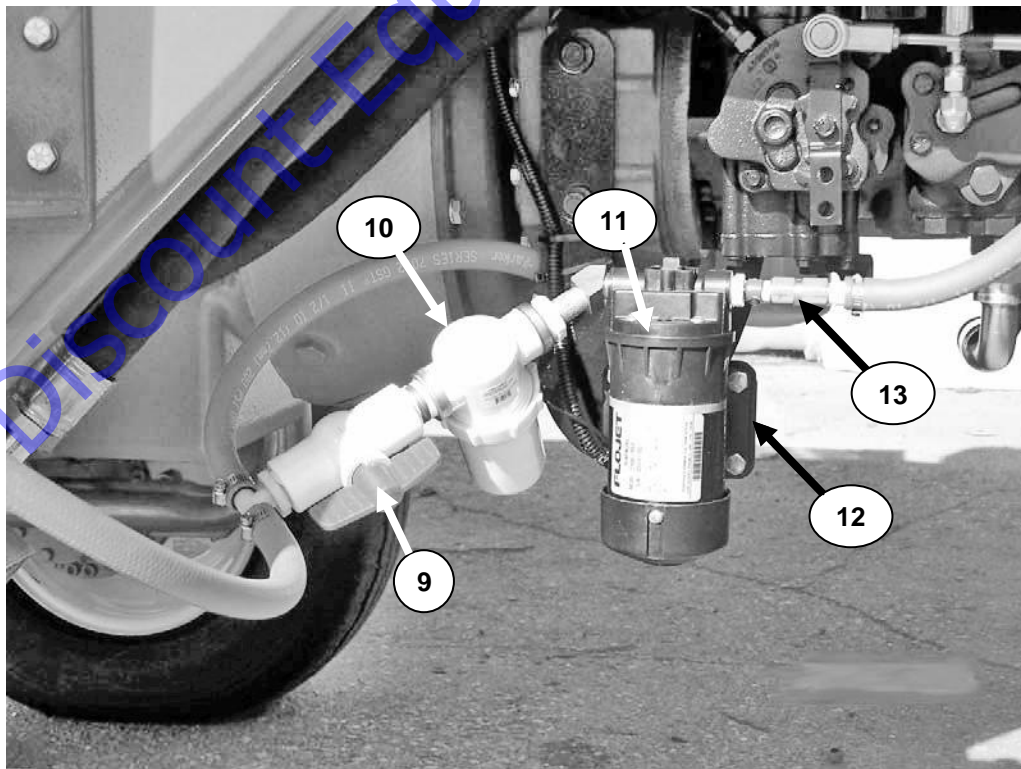
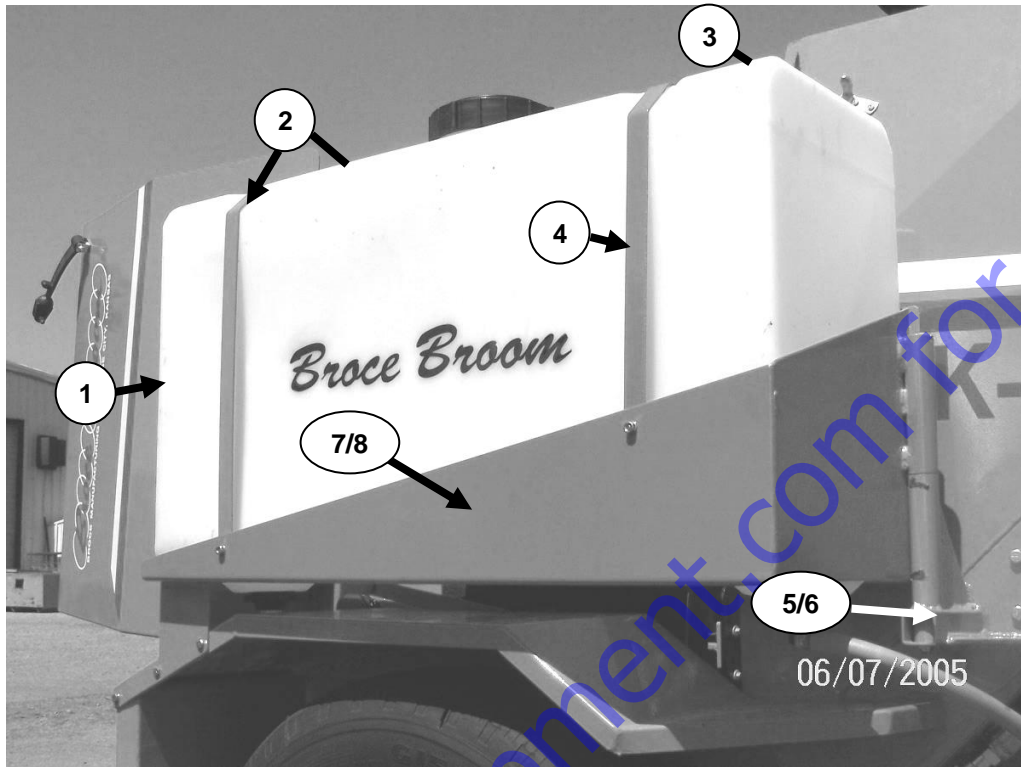
GEAR BOX ASSEMBLY



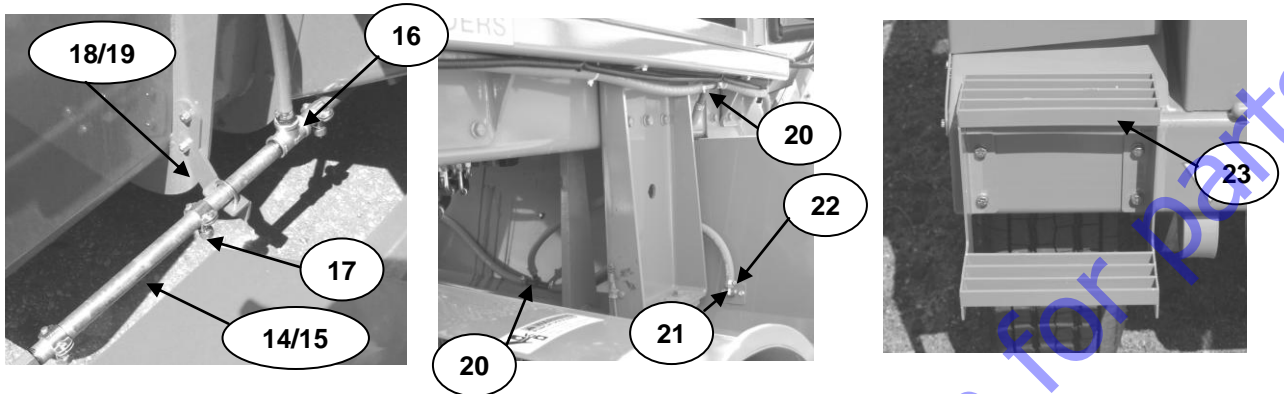
GEAR BOX ASSEMBLY

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	2070106	Oil Gauge	1
4	4605257	Ball Bearing	2
5	4620054	Key	2
6	2021180	Driven Shaft	2
7	2061243	Gear	2
8	4605257	Ball Bearing	2
9	4574013	Silicone Sealant Tube	1
12	2009044	Housing	1
13	2013240	Shim	X
14	4598030	O-Ring	1
15	2010119	Plate	1
21	4588040	Plug	1
22	4609020	Washer	1
23	4620054	Key	1
24	4605257	Ball Bearing	1
25	2061243	Gear	1
26	2021179	Main Shaft	1
27	4605257	Ball Bearing	1
28	4614014	Pin	1
29	2010117	Cover	1
30	4611108	Washer	19
31	4615227	Screw	19
32	4597165	Oil Seal	1
33	4588040	Plug	1
39	4609020	Washer	1

WATER SPRAY SYSTEM

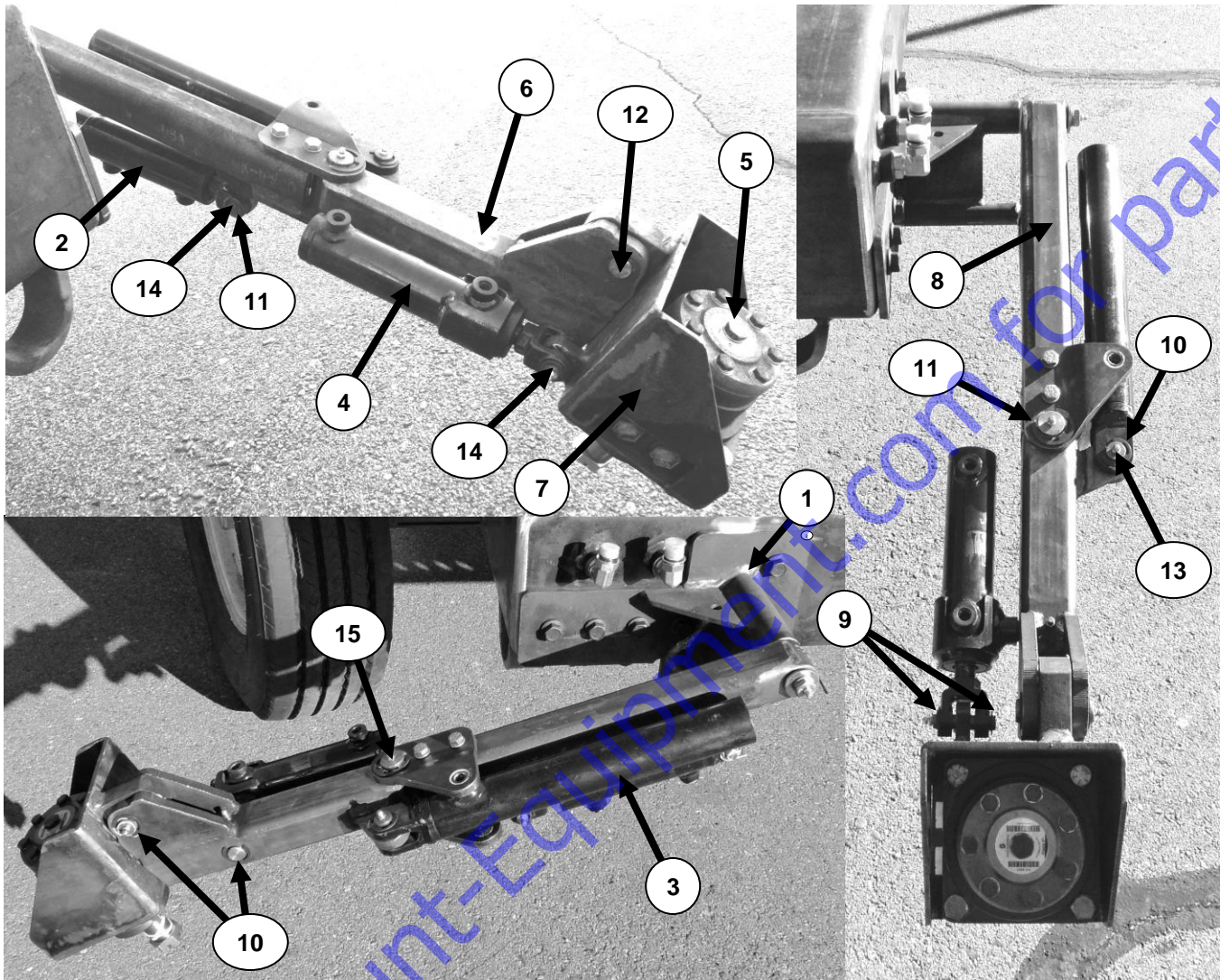


WATER SPRAY SYSTEM



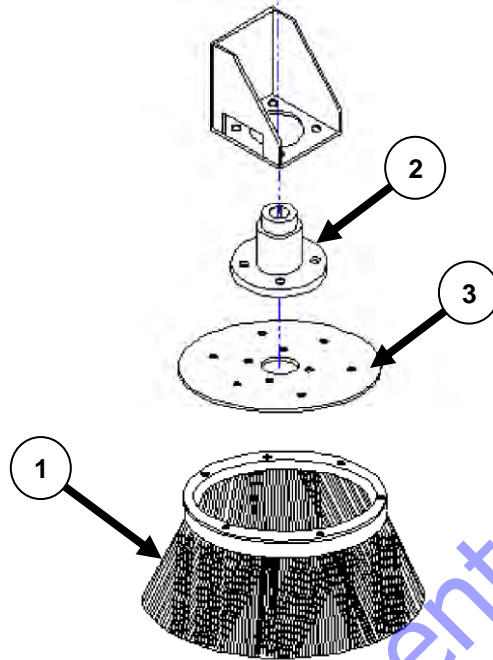
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	344178	Water Tank	2
2	205254	Tank Strap Rear	4
3	205255	Tank Strap Front Inside	2
4	205253	Tank Strap Front Outside	2
5	855251	Frame Bracket Assembly RH	1
6	855252	Frame Bracket Assembly LH	1
7	855249	Tank Basket Assembly RH	1
8	855250	Tank Basket Assembly LH	1
9	344254	Ball Valve	1
10	WS-148	Inline Strainer, Complete	1
NS	1700-0044	Strainer Gasket	1
NS	3800-0025	Strainer Screen	1
NS	3351-0005	Strainer Cup	1
11	302402	Pump	1
12	205262	Pump Mounting Bracket	1
13	306950	Check Valve	1
14	205247	Spray Bar RH	1
15	205248	Spray Bar LH	1
16	306125	T-Fitting	1
17	WS-155	Nozzle Assembly	9
NS	WS-158	Nozzle Screen	9
NS	TP8002	Nozzle Spray Tip	9
NS	1458	Nozzle Cap	9
18	205245	Bracket RH	1
19	205246	Bracket LH	1
20	306901	Barb Tee 1/2"	2
21	306925	Brass Nozzle Housing	2
22	345007	Fitting, Hose Barb to 1/2 FNPT 90 Deg	2
23	855270	Water System Step	2

CURB/GUTTER BRUSH OPTION



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855300	Mount	1
2	325039	Cylinder, Lift Arm	1
3	325037	Cylinder, Spring Return	1
4	305913	Cylinder, Tilt	1
5	305916	Brush Motor	1
6	854001	Main Lift Arm	1
7	854003	Motor Mount	1
8	854004	Tilt Arm	1
9	400912	C-Clips	2
10	400911	C-Clips	5
11	400910	C-Clips	4
12	204019	Motor Mount Pin	1
13	204018	Spring Cylinder Pin	1
14	204017	Lift and Tilt Cylinders Pin	2
15	204016	Center Pivot Pin	1

CURB/GUTTER BRUSH OPTION

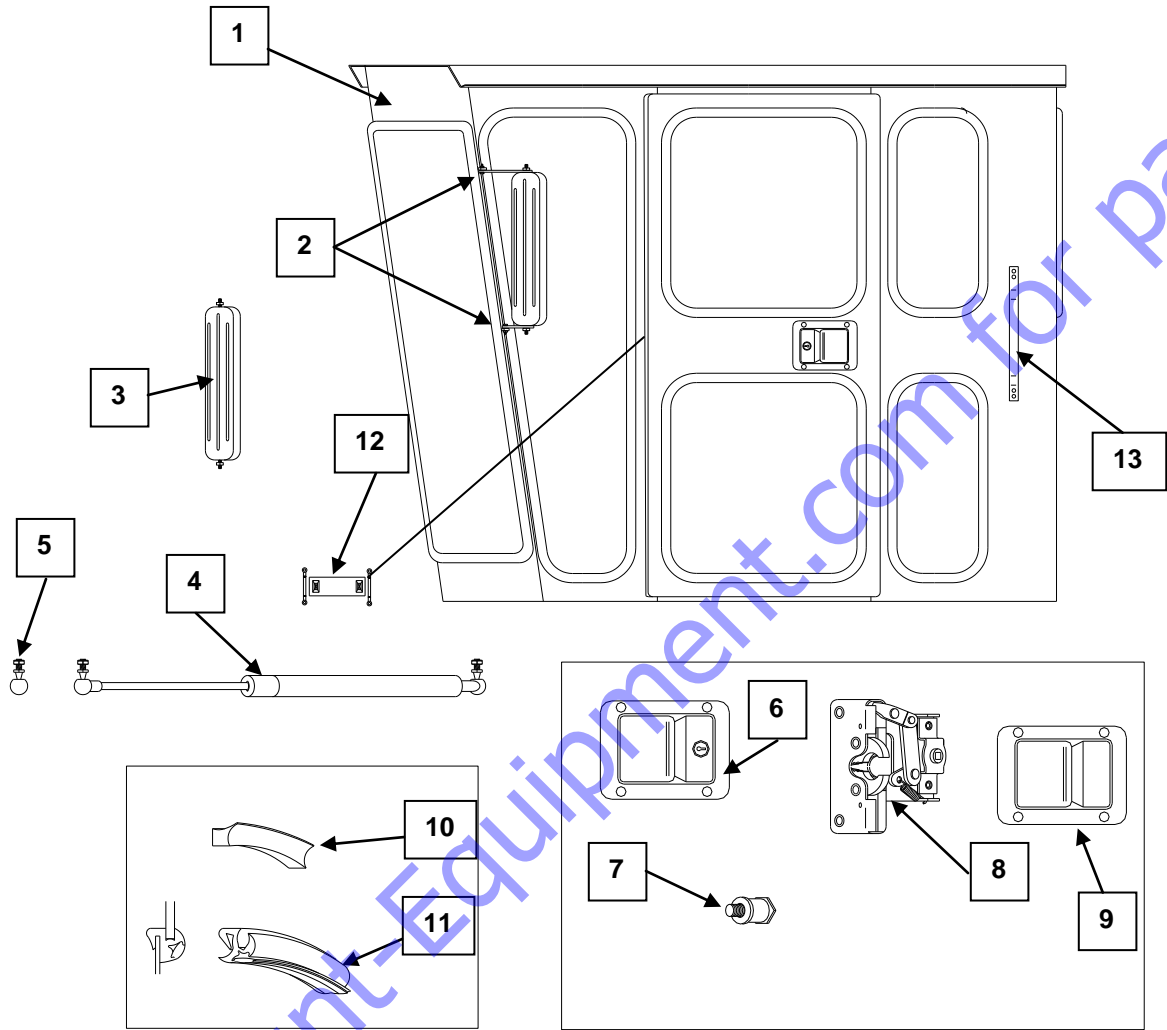


ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	304299 304296	Curb Brush (Wire) or Curb Brush (Poly)	1
2	854006	Hub Extension	1
3	204027	Brush Mounting Plate	1



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
4	305980	Variable Speed Controller	1
5	320637	Joystick Control	1
6	307071	Switch, Toggle	1

CAB ASSEMBLY

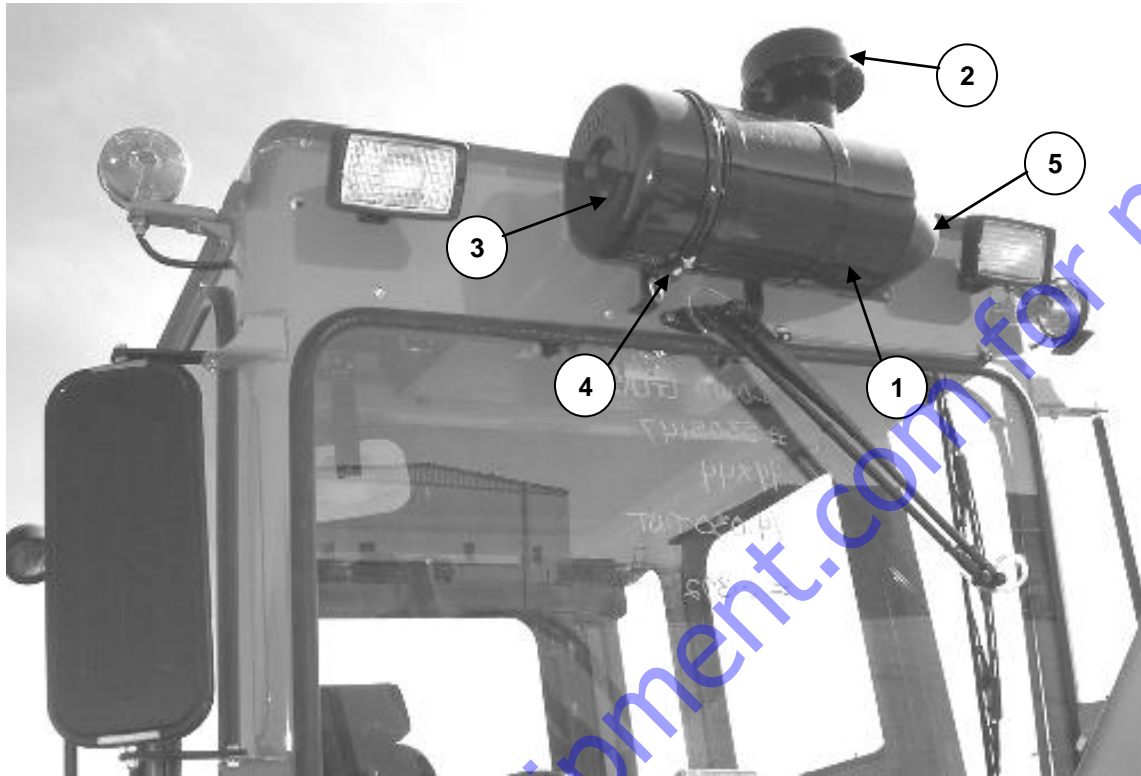


CAB ASSEMBLY

Reference	Part No.	Description	Qty.
1	P-315-B	Cab Assembly, Complete	1
	345055	Cab Keys, (Sold as a Pair)	1
2	202116	Mirror Bracket, (2 per Side)	4
3	P-353-R	West Coast Style Mirror (1 per Side)	2
4	P-352-B	Strut, (1 per Side)	2
5	309406	Ball for Strut	2
6	345051	Outside Door Handle (Paddle Style)	2
7	P-320-B	Striker Assembly	2
8	345053	Latch Assembly	2
9	345050	Inside Door Handle (Paddle Style)	2
10	304089	Door Seal, 14' per door	1
11	P-325-R	Window Rubber Molding, (As Required)	1
	P-316-R	Floor Mat, 5' x 4' Blank	1
12	K00002	Door Tether Strap, Inside (1 per Side)	2
13	B239920C	Outside Grab Handle	1
Not Shown	345052	Inside Grab Handle	2
Not Shown	AC-708-R	Air Cleaner Assembly	1
Not Shown	AC-785-R	Air Cleaner Bonnet (Top Cap)	1
Not Shown	P10-3113	Air Cleaner End Cap	1
Not Shown	P00-3951	Air Cleaner Clamp	2
Not Shown	110-20027	Air Cleaner Flex Hose	1
Not Shown	P10-2114	Air Cleaner Vent	1
Not Shown	AC-709-R	Air Cleaner Filter	1

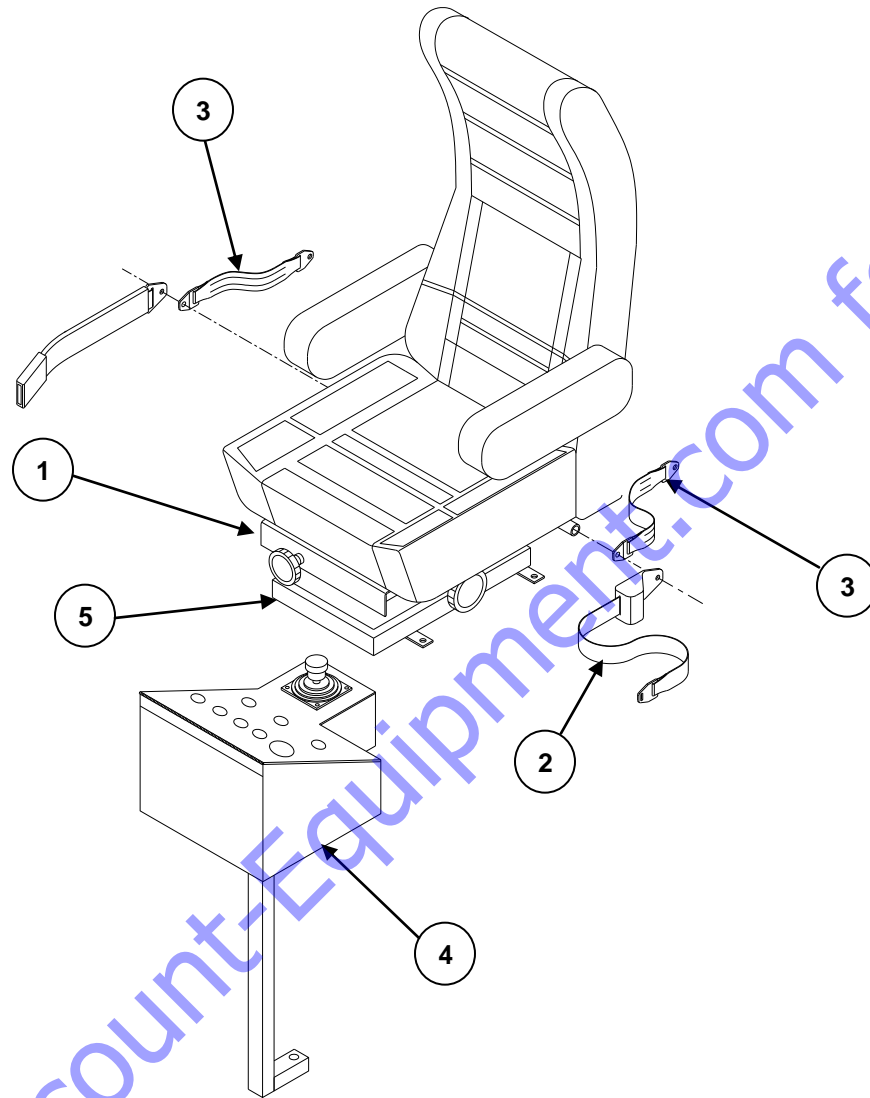
Note: Items 10 & 11 are sold by the foot. Floor mat is a "Cut to Fit" item.

CAB – FRONT VIEW



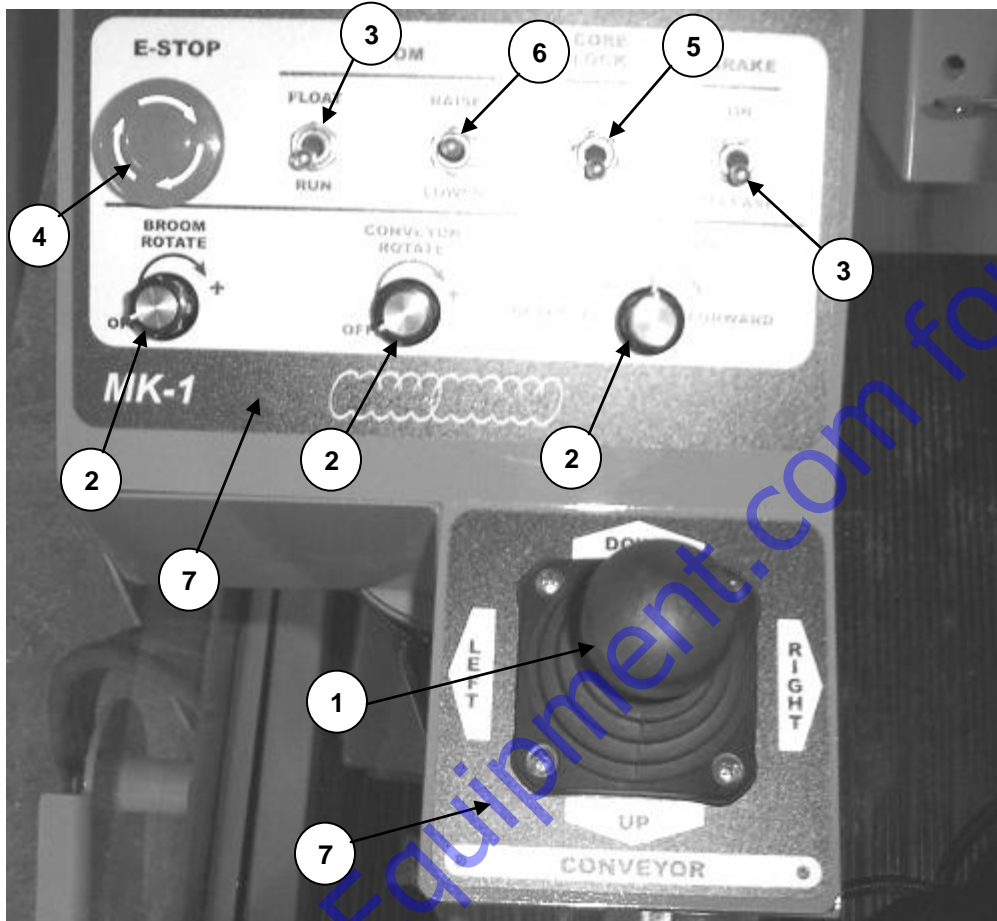
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	AC-708-R	Air Cleaner Assembly	1
2	AC-785-R	Bonnet	1
3	P10-3113	End Cap	1
4	P00-3951	Clamp	1
5	110-20027	Flex Hose	1
NS	P10-2114	Vent	1
NS	AC-709-R	Filter	1

SEAT AND SUSPENSION COMPONENTS



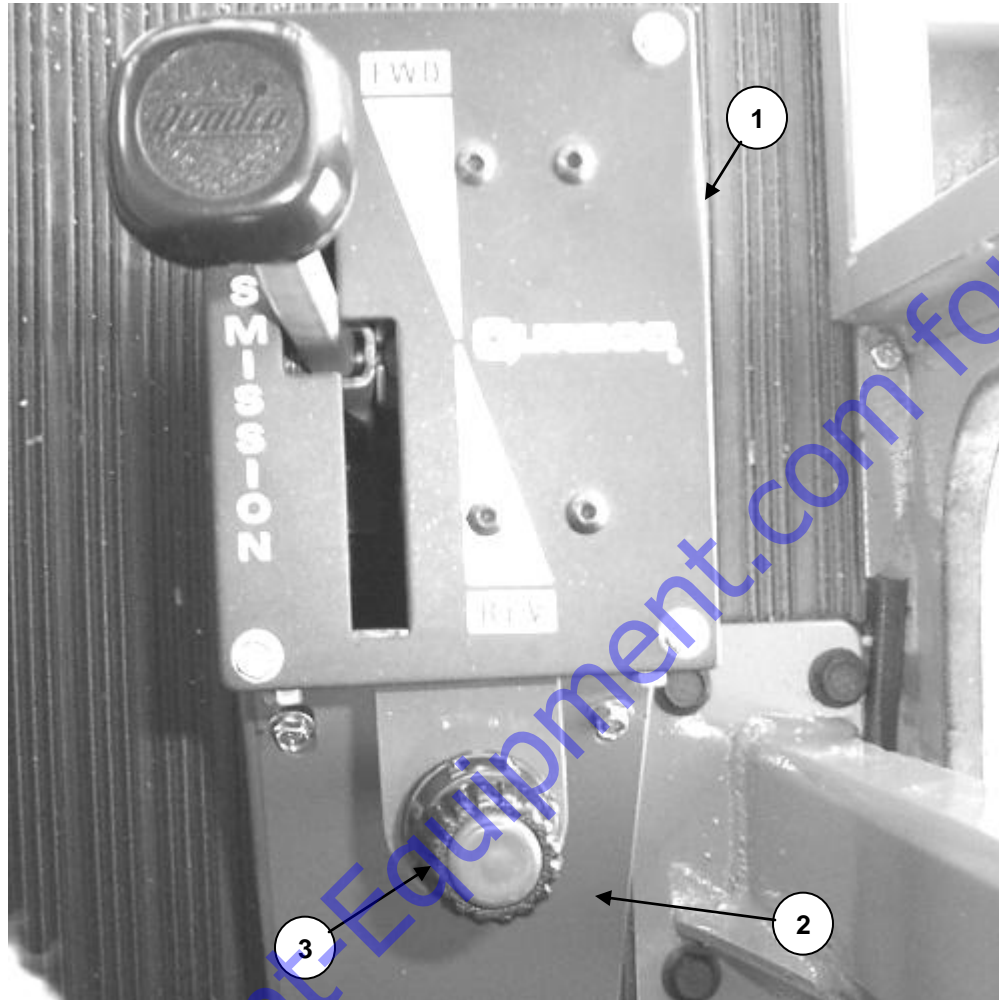
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	BS-1050	Seat	1
2	C-211-R	Retractable Seat Belt (Shown)	1
	C-211-SH	Retractable Seat Belt w/ Shoulder Harness (Not Shown)	1
3	C-211-RT	Tether Strap Set (for use w/ Suspension Seat)	1
4	855182	Control Box Assembly	1
5	BS-1054	Suspension Assembly	1

BROOM/CONVEYOR CONTROL BOX



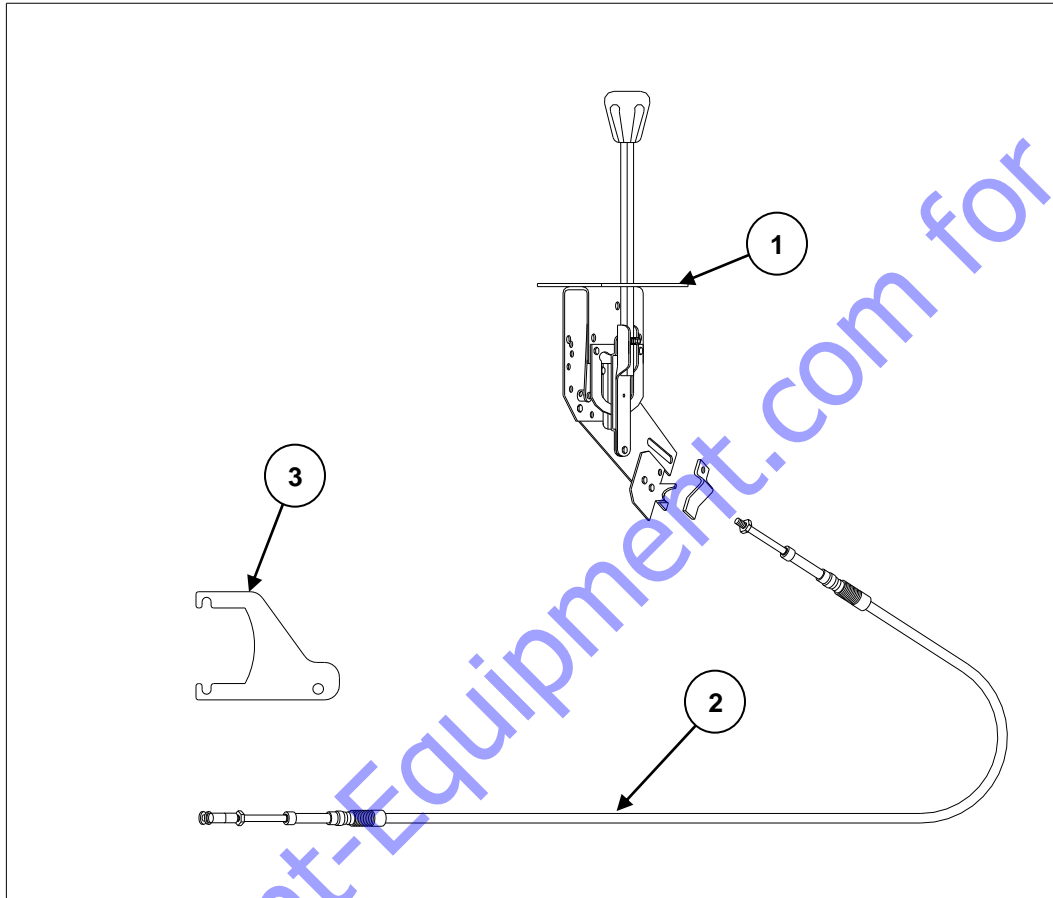
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	307432	Conveyor Joystick Control	1
2	307417	Broom, Conveyor, & Auger Speed Pot Control	3
3	307416	Broom Float/Run & Emergency Brake Switches	2
4	307427	Emergency Stop Switch	1
5	307071	Core Lock On/Off Switch	1
6	307415	Broom Raise/Lower	1
7	311165	Control Panel Decals (Set of 2)	1

TRANSMISSION CONTROL BOX



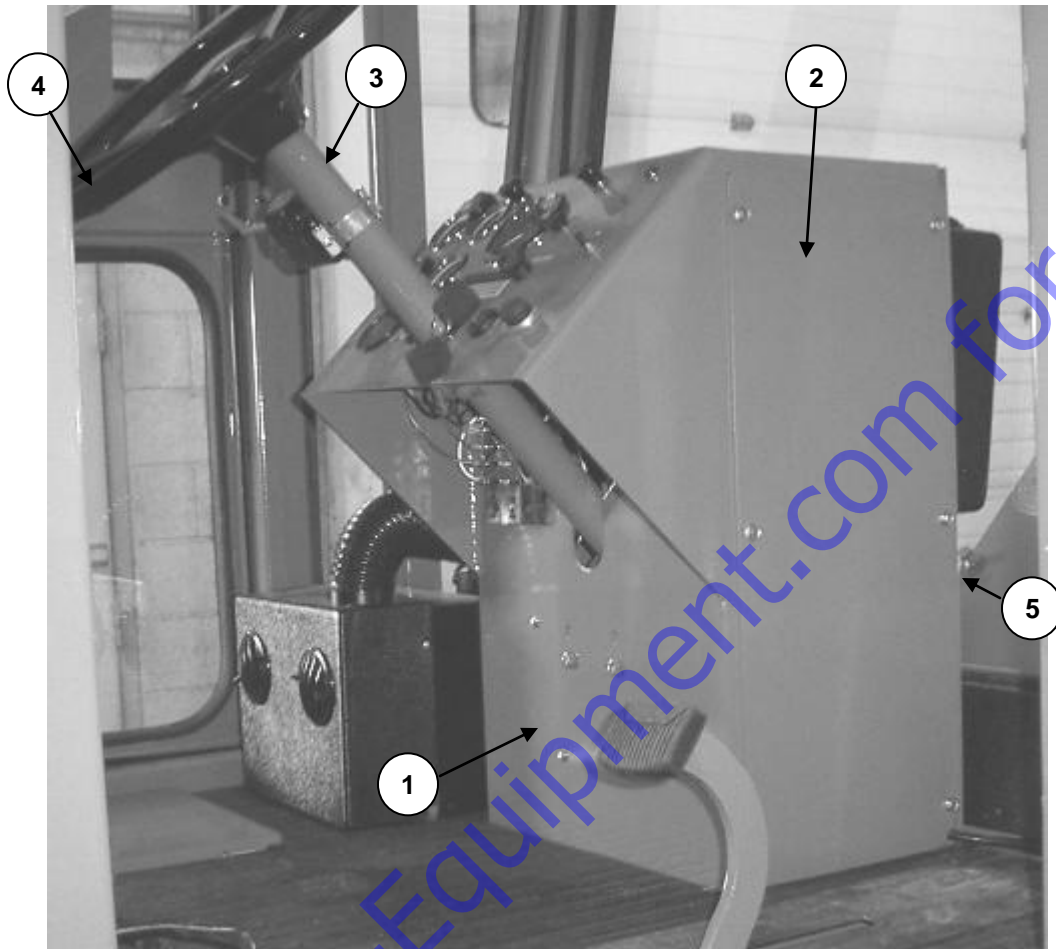
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855171	Transmission Hand Control Box	1
2	855172	Hand Control Box Cover	1
3	309456	Throttle Cable	1

HYDROSTATIC CONTROL ASSEMBLIES



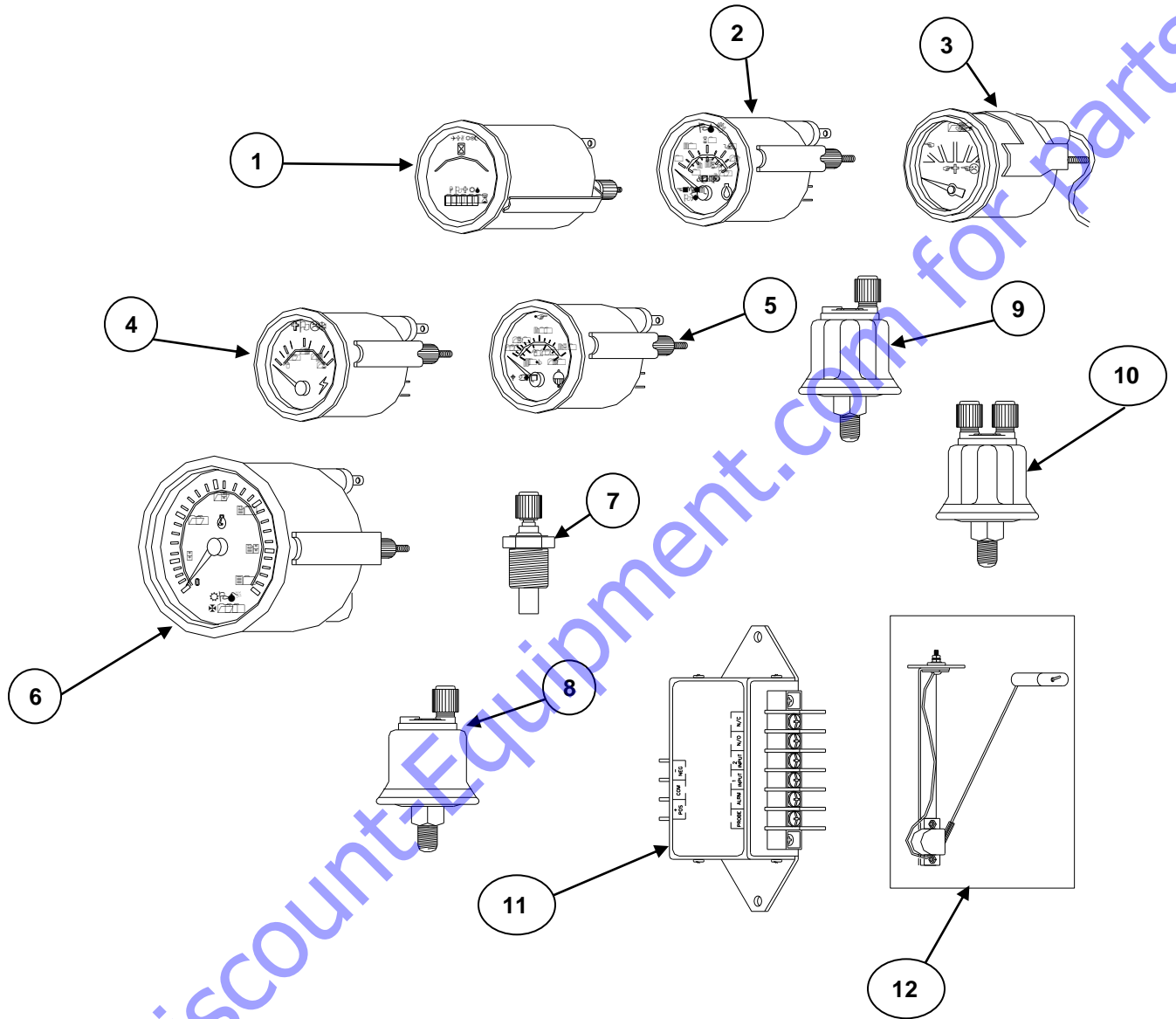
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	403035	Hand Control Kit	1
2	309470	Hand Control Cable	1
3	205175	Bracket	1

DASH/STEERING ASSEMBLY



ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	855168	Dash Housing	1
2	205169	Dash Side Cover	1
3	305945	Steering Column	1
4	S-253-R	Steering Wheel Assembly	1
5	001665	Dash Back Cover	1

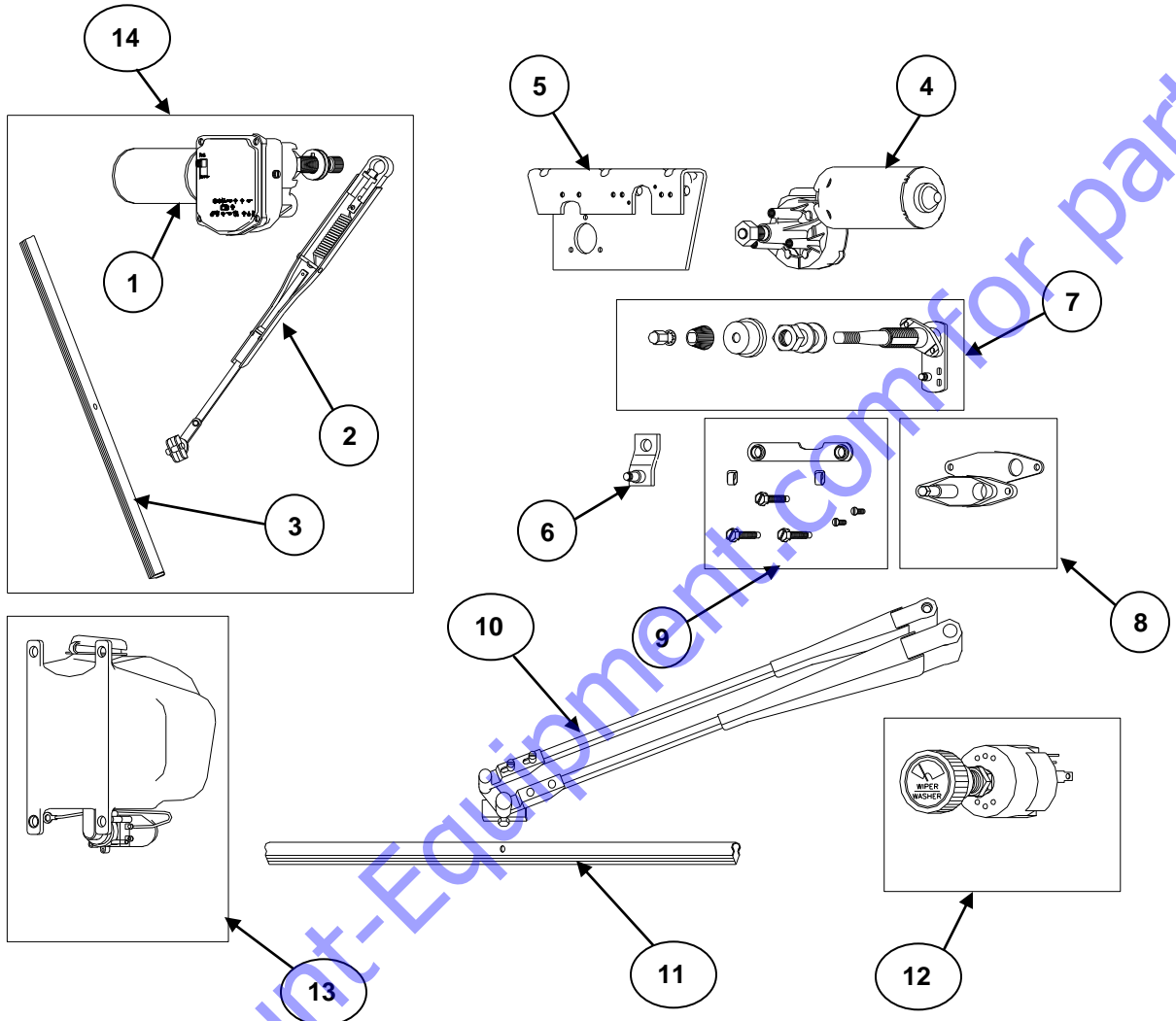
GAUGES AND SENDERS



GAUGES AND SENDERS

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	I-222-HO	Hour Meter	1
2	I-221-R	Oil Pressure Gauge	1
3	I-223-R	Fuel Gauge	1
4	I-220-V	Voltmeter	1
5	I-219-R	Temperature Gauge (Engine)	1
6	I-222-B	Tachometer	1
7	IS-219-R	Temperature Sender	1
8	76502	Hour Meter Sending Unit	1
9	IS-221-R	Oil Pressure Sender	1
10	IS-221-WC	Pressure Sender w/ Contact Note: Use w/ warning or shutdown system	1
11	W117	Murphy Switch, Engine shutdown system	1
12	344175	Fuel Sender	1
NS	IS-219-WC	Warning Shutdown Water Sender	1

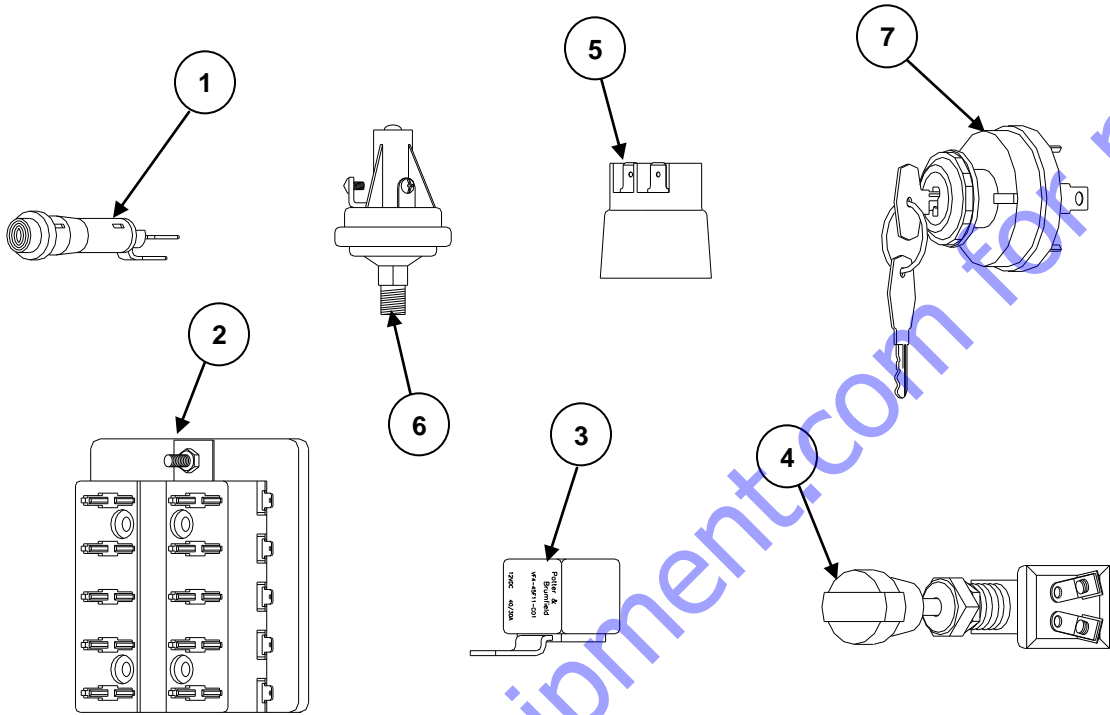
WINDSHIELD WIPERS & WASHER



WINDSHIELD WIPERS & WASHER

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	1-182-54MO	Wiper Motor	1
2	LE581022-1	Drive Arm	1
3	2-615-2218	18" Blade (Canopy Windshield)	1
	2-615-2214	14" Blade (Rear)	
4	2-615-15	Wiper Motor	1
5	BK721005	Wiper Motor Mount	1
6	2-615-19	Wiper Drive Arm (Tapered Motor Shaft)	1
7	2-615-60	Wiper Shaft & Arm Assembly	1
8	2-615-17	Pantograph Adapter & Gasket	1
9	721014	Link & Bolt Kit (Includes Bolts, Washers, & Clips)	1
10	2-615-24	Pantograph Drive Arm	1
11	2-615-2226	26" Blade	1
12	2-686-67	Two Speed Wiper Switch	1
13	66-01	Washer Pump & Reservoir	1
	66-01A	Washer Kit (Includes Tubing & Hardware)	1
14	1-182-54	Wiper Kit – Canopy Windshield (Motor, Blade, Arm)	1
	1-182-54R	Wiper Kit – Rear (Motor, Blade, Arm)	1

MISC. SWITCHES, FUSES, ETC.

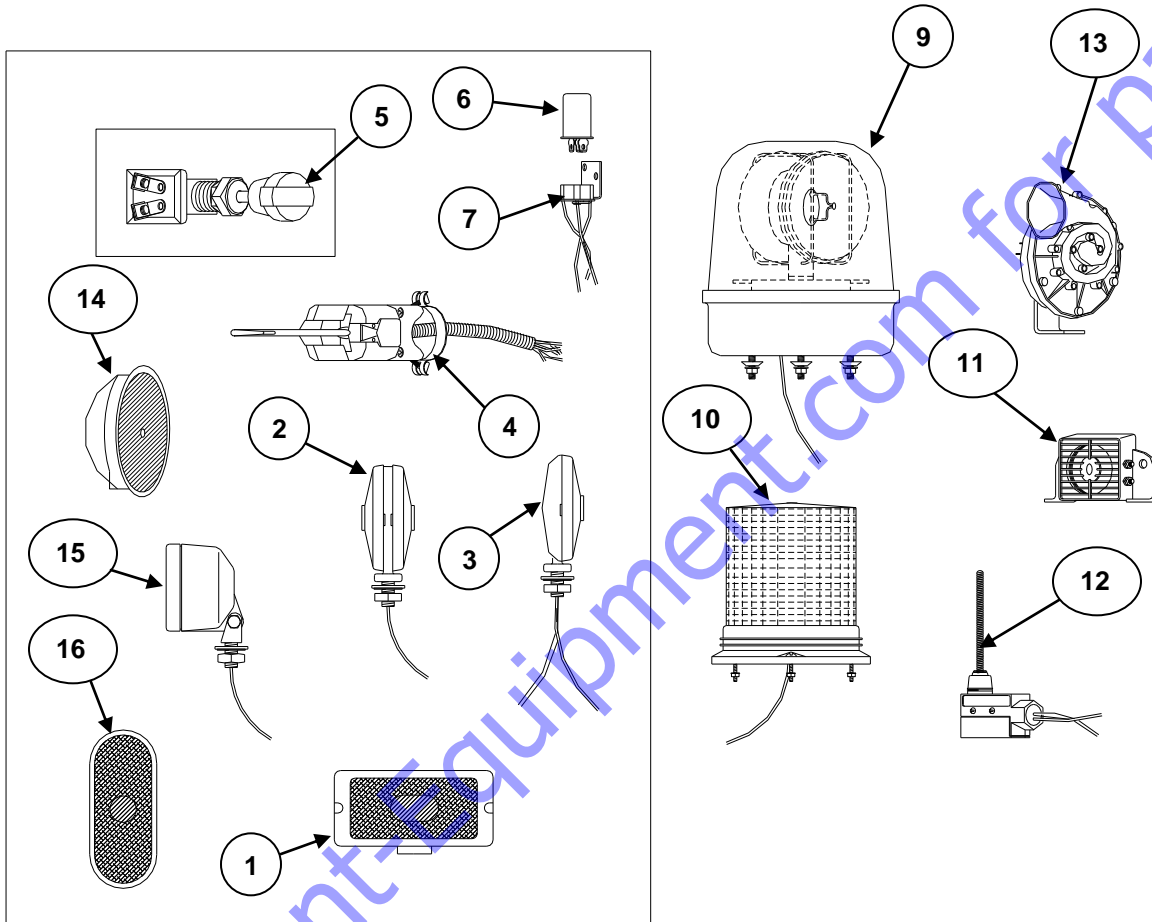


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MISC. SWITCHES, FUSES, ETC.

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	PBL-12	Warning Light	1
2	46050-12	Fuse Block (12 Fuse Capacity)	1
	46050-10	Fuse Block (10 Fuse Capacity)	1
3	WH4411201	Relay – Air Conditioning Shutoff	1
4	23836	Universal Accessory Switch	1
5	X770050	Air Restrictor Sender (Air Cleaner Ind.)	1
6	76052	Pressure Switch (Air Conditioner Shutoff)	1
7	307044	Ignition Switch	1
	307045	Key (Pair)	1
NS	307235	Push Button Switch for Preheat	1

LIGHTS – HORNS

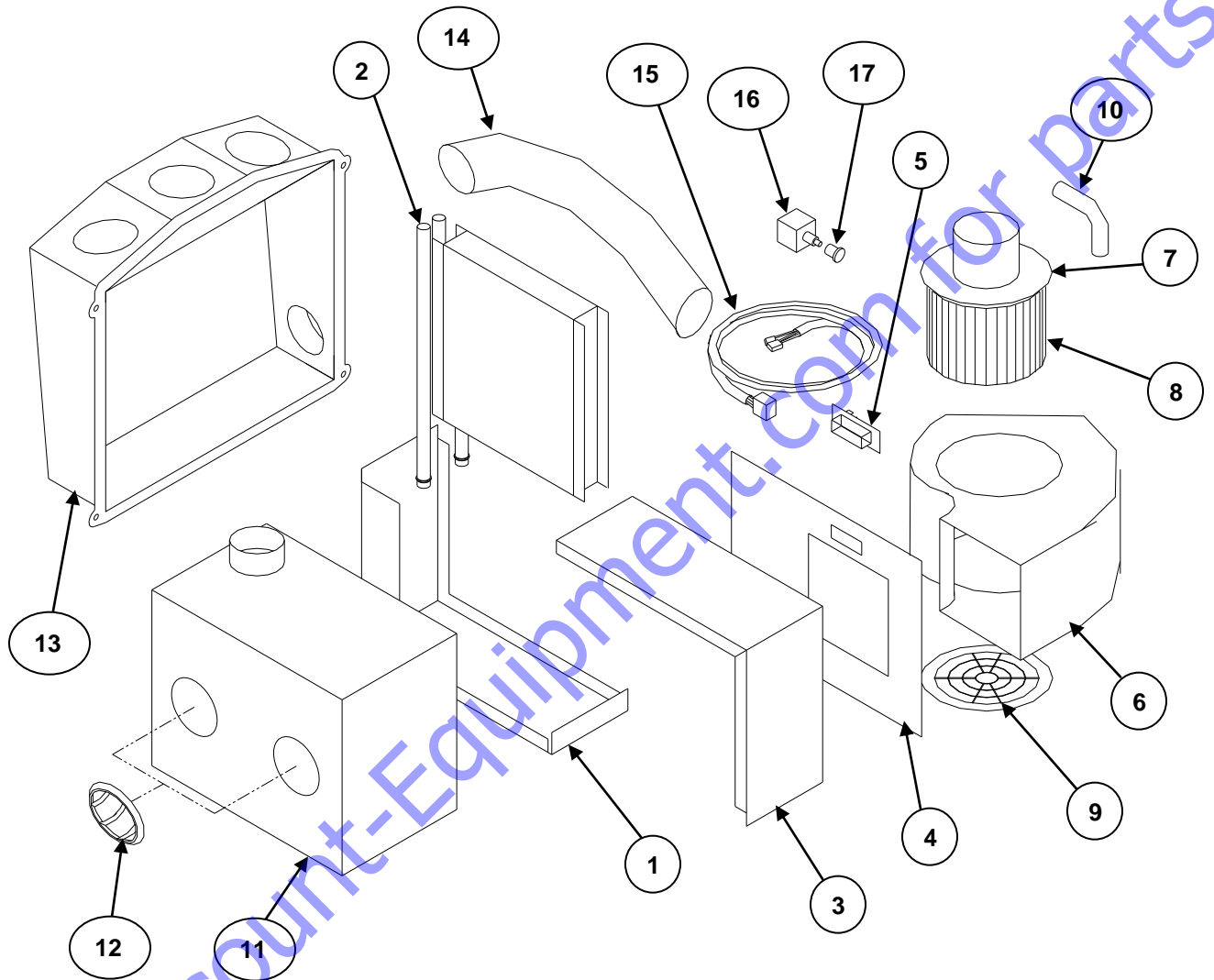


LIGHTS - HORNS

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	9-50004-SBA	Driving Light	A/R
2	4-75001	Turn Signal	2
3	6-70001	Stop/Turn Signal	2
4	16-35800	Turn Signal Switch	1
5	23836	Universal Accessory Switch	1
6	550	Flasher	1
7	550FH	Flasher Socket	1
8	LG-100-SBA	Light Group Kit w/ 950004-SBA Driving Lights	See Note
9	7-40004	Amber Beacon	A/R
10	3614A	Amber Strobe Light	A/R
11	RH-250	Reverse Alarm	1
12	LDA-50-1R	Reverse Alarm Switch	1
13	4-302	Traffic Horn	1
14	307031	Flush Mount Tail/Brake Lights	2
15	108-00-132	Work Light	A/R
16	307228	Back Up Light	2

Note: Light Group Kit, Part Number LG-100-SBA, contains all signals, switches, lights, and wiring harness required for field installation.

HEATER/DEFROSTER SYSTEM



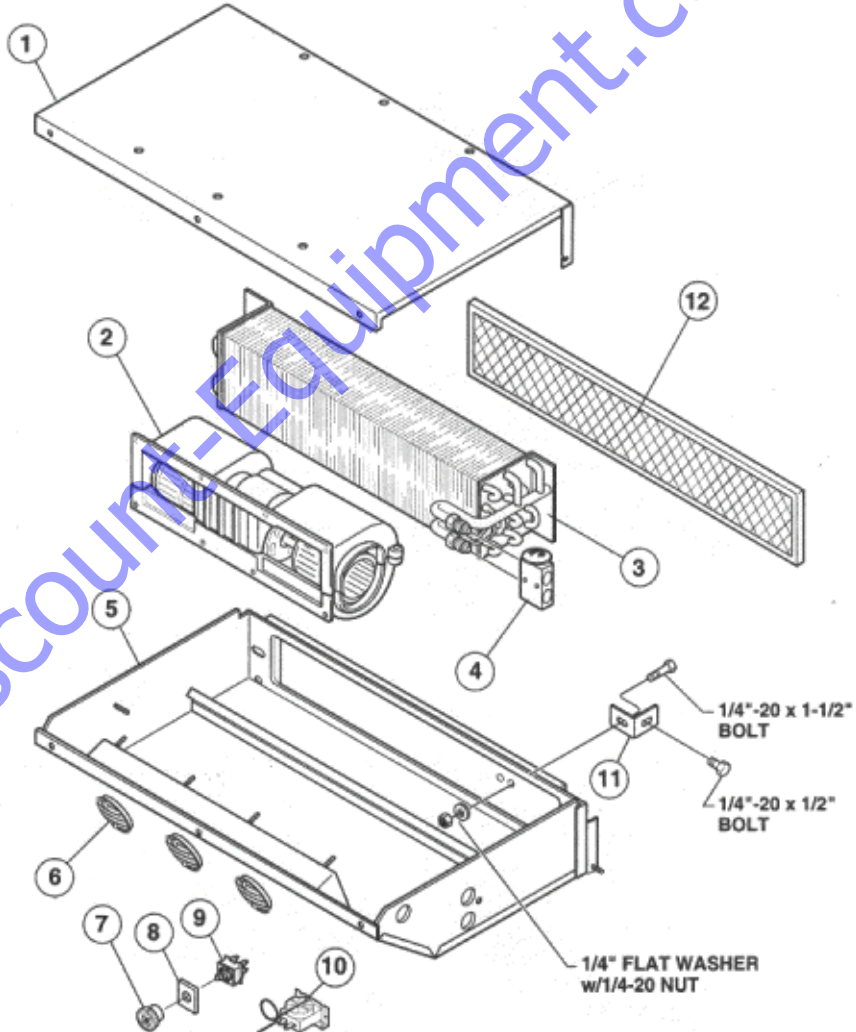
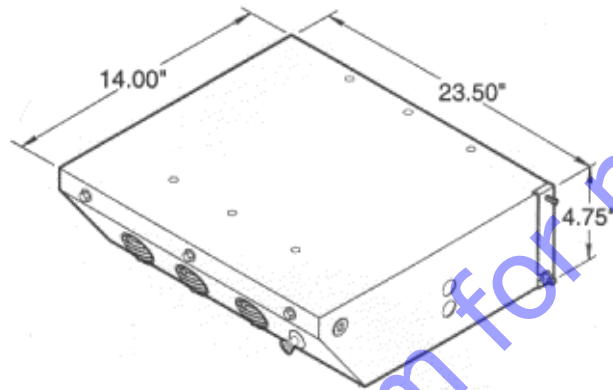
HEATER/DEFROSTER SYSTEM

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	403153	Case, Bottom/Side	1
2	403154	Coil	1
3	403155	Cast, Top/Side	1
4	403156	Panel, Blower	1
5	403157	Resistor, 3-Speed	1
6	403158	Housing, Blower	1
7	403159	Motor, CCW	1
8	403160	Wheel, Blower	1
9	403161	Ring, Venturi	1
10	403162	Hose, Vent Motor Blower	1
11	Call	Plenum, Heater	1
12	403164	Louver, 3" Round	1
13	403193	Plenum, Defrost	1
14	403166	Hose – Flex, Wire, Metal, 2.5" Dia.	1
15	403167	Wire Harness – Heater	1
16	403168	Switch, 4 Position Rot.	1
17	403169	Knob – Rotary Switch	1
KIT	Call	Heater/Defroster Kit, CAT 3054B & 3054C	1

AIR CONDITIONING SYSTEM

Features:

- 255 CFM
- Heavy Duty Powder Coated Finish all steel case.
- Low Profile for maximum headroom.
- Filtered, recirculated air.



AIR CONDITIONING SYSTEM

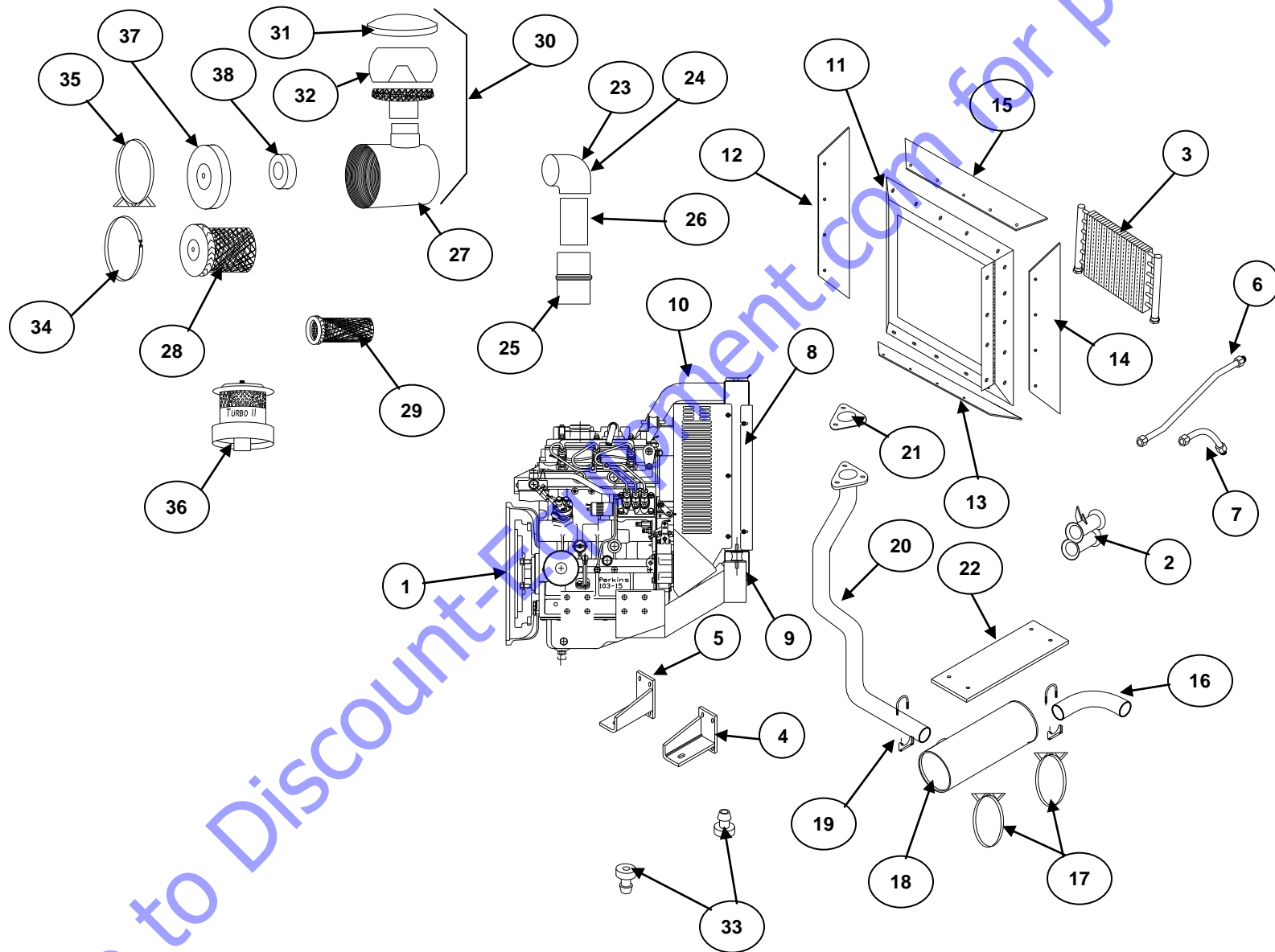
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	403184	Cover, Evaporator	1
2	403180	Blower Assembly	1
3	403175	Coil, Evaporator	1
4	403174	Valve, Exp., Block, R134a	1
5	403183	Housing, Evaporator	1
6	403164	Louver, 3" Round	1
7	403177	Knob, Fan	1
8	403181	Decal, Fan	1
9	403173	Switch, Rotary	1
10	403176	Thermostat	1
11	403187	Bracket, Mounting, Exp. Valve	1
12	403178	Filter	1
NS	403182	TSTAT Knob	1
NS	403185	Binary Switch	1

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ENGINES AND RELATED PARTS

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3054B ENGINE AND RELATED PARTS

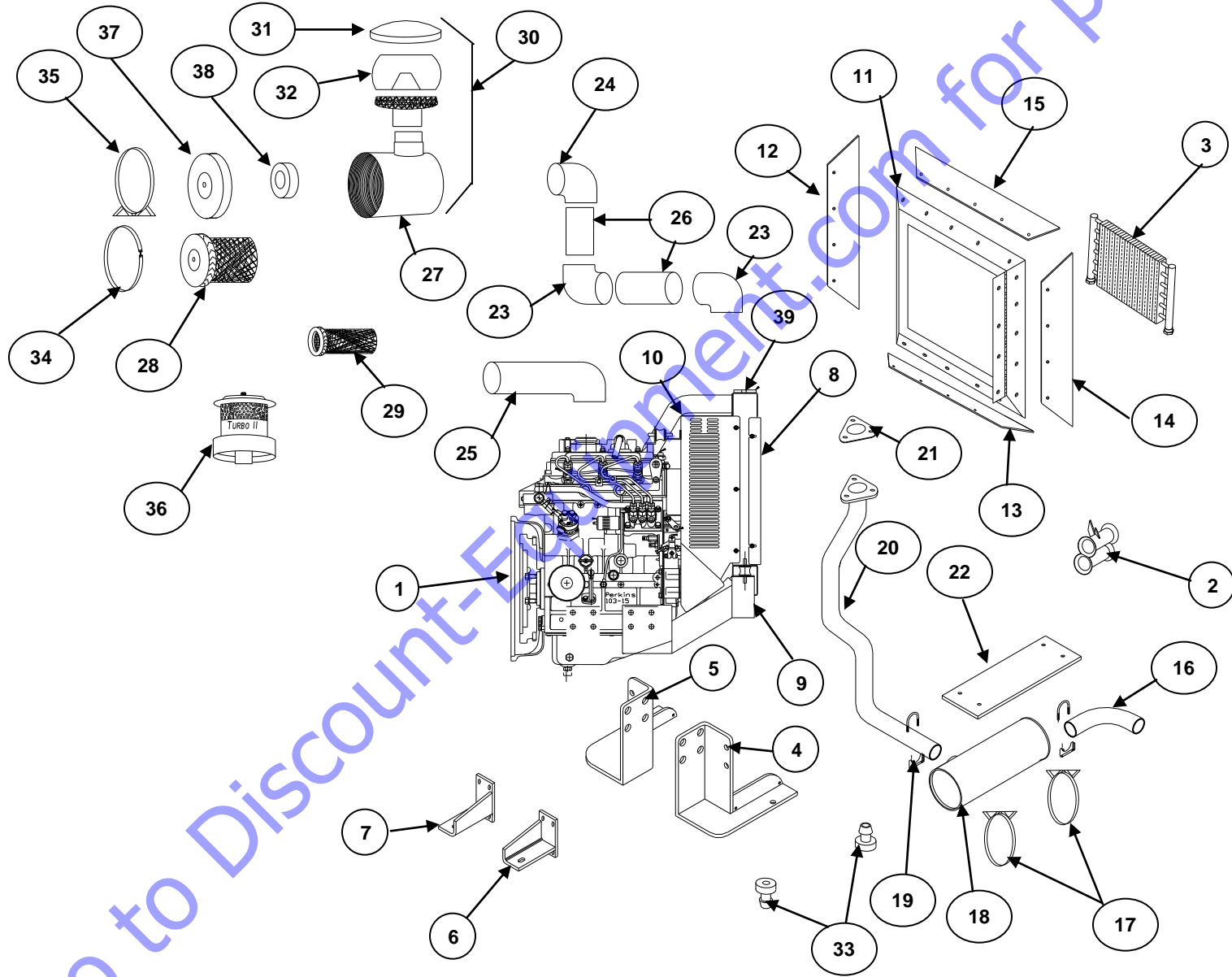


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3054B ENGINE AND RELATED PARTS

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	344062	CAT 3054B Diesel Engine	1
2	852045	Oil Cooler Sleeve	1
3	305766	Oil Cooler	1
4	852043	Right Rear Motor Mount (front of broom)	1
5	852042	Left Rear Motor Mount (front of broom)	1
6	852051	Oil Cooler Tube, 23 1/2"	1
7	852052	Oil Cooler Tube, 6 1/2"	1
8	163-1934	Radiator Assembly	1
9	344506	Lower Radiator Hose	1
10	344505	Upper Radiator Hose	1
11	852075	Oil Cooler Mount	1
12	203193	Right Side Oil Cooler Seal	1
13	203190	Lower Seal (Rubber)	1
14	203192	Left Side Oil Cooler Seal	1
15	203191	Upper Seal (Rubber)	1
16	344040	Tail Pipe	1
17	203123	Muffler Clamp	2
18	JE-705-B	Muffler	1
19	JE-758-B	Head Pipe Clamp	2
20	853605	Exhaust Pipe	1
21	344031	Exhaust Gasket	1
22	203105	Exhaust Heat Shield	1
23	AC-760-R	Rubber Elbow, 3" x 3"	2
24	AC-760-B	Rubber, 3.5" x 3"	1
25	304061	Rubber Hump Hose, 3" x 3"	1
26	AC-763-R	Connecting Tube, Short	1
27	DE-770-R	Air Cleaner (Dual Element)	1
28	P182059	Service Element	1
29	P119410	Safety Element	1
30	PC-710-B	Precleaner, 4"	1
31	PC-765-R	Precleaner, Top	1
32	PC-711-R	Precleaner Bowl	1
33	304095	Engine Isolator Kit	4
34	P003951	Clamp	1
35	AC-764-R	Strap	2
36	TT-771-R	Turbo II Precleaner	1
37	P103113	Cup	1
38	P102980	Air Cleaner Baffle	1
NS	344507	CAT Fan	1
NS	344504	Fan Belt	1
NS	304027	Compressor Belt, A/C Only	1
NS	344079	Fuel Filter	1
NS	344078	Oil Filter	1

C4.4 ENGINE AND RELATED PARTS



Go to Discount-Engine.com for parts

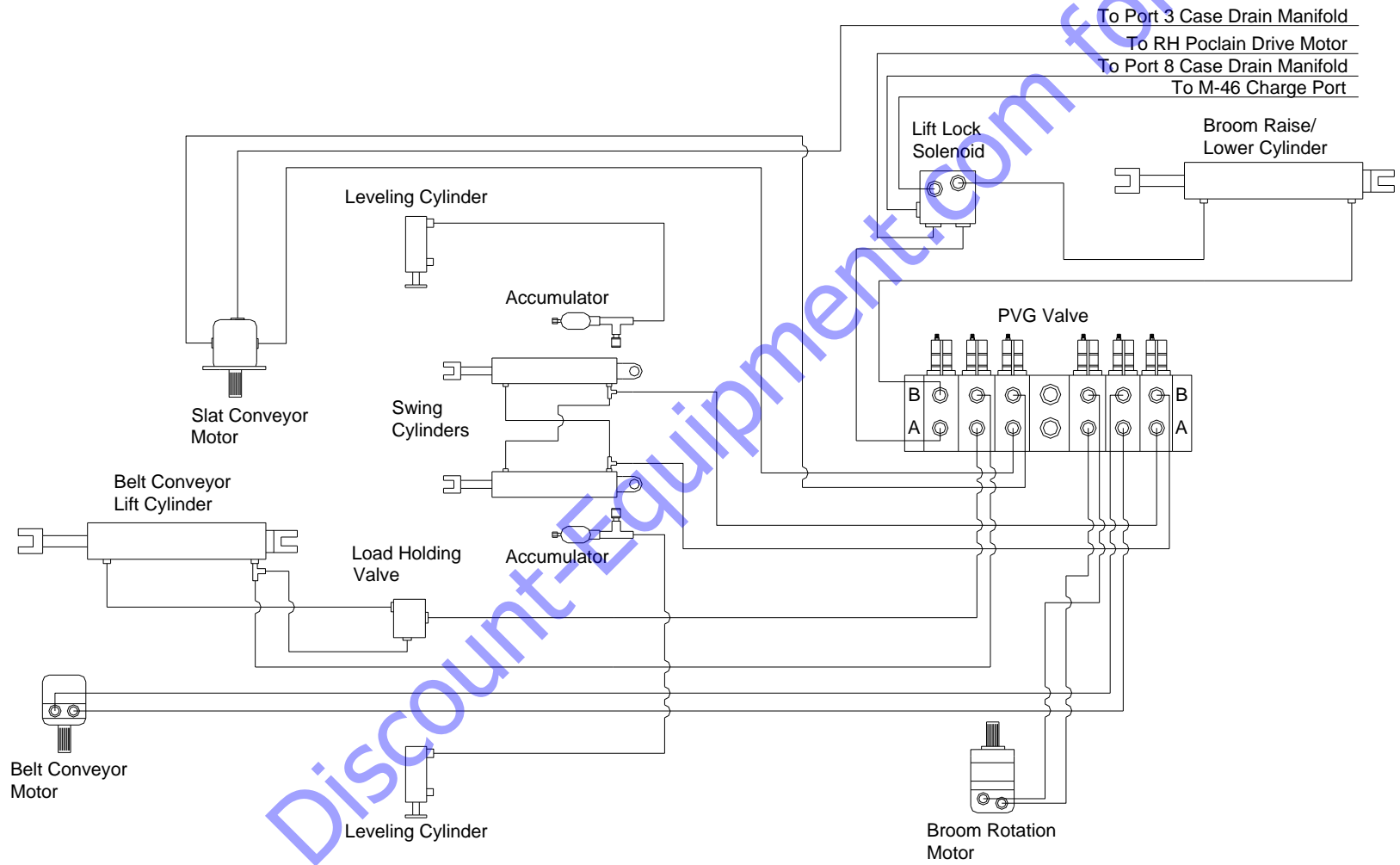
C4.4 ENGINE AND RELATED PARTS

ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	344062	CAT C4.4 Diesel Engine	1
2	852045	Oil Cooler Hose Guide Sleeve	1
3	325027	Oil Cooler	1
4	203600	Right Front Motor Mount	1
5	203601	Left Front Motor Mount	1
6	852042	Right Rear Motor Mount	1
7	852043	Left Rear Motor Mount	1
8	344508	Radiator Assembly	1
9	344511	Lower Radiator Hose	1
10	344510	Upper Radiator Hose	1
11	853606	Oil Cooler Mount	1
12	205336	Right Side Oil Cooler Seal	1
13	205338	Lower Seal (Rubber)	1
14	205337	Left Side Oil Cooler Seal	1
15	205335	Upper Seal (Rubber)	1
16	344010	Tail Pipe	1
17	203123	Muffler Clamp	2
18	JE-705-B	Muffler	1
19	JE-758-B	Head Pipe Clamp	2
20	853605	Exhaust Pipe	1
21	344031	Exhaust Gasket	1
22	203105	Exhaust Heat Shield	1
23	AC-760-R	Rubber Elbow, 3" x 3"	2
24	AC-760-B	Rubber Elbow, 3.5" x 3"	1
25	304195	Heater Hose	1
26	202152	Connecting Tube, Short	2
27	DE-770-R	Air Cleaner (Dual Element)	1
28	P182059	Service Element	1
29	P119410	Safety Element	1
30	PC-710-B	Precleaner, 4"	1
31	PC-765-R	Precleaner, Top	1
32	PC-711-R	Precleaner Bowl	1
33	304095	Engine Isolator Kit	4
34	P003951	Clamp	1
35	AC-764-R	Strap	2
36	TT-771-R	Turbo II Precleaner	1
37	P103113	Cup	1
38	P102980	Air Cleaner Baffle	1
39	344509	Radiator Cap	1
NS	101-3770	CAT Fan	1
NS	5M8155	Fan Belt	1
NS	304196	Compressor Belt, A/C Only	1
NS	344079	Fuel Filter	1
NS	344078	Oil Filter	1

HYDRAULIC DIAGRAMS

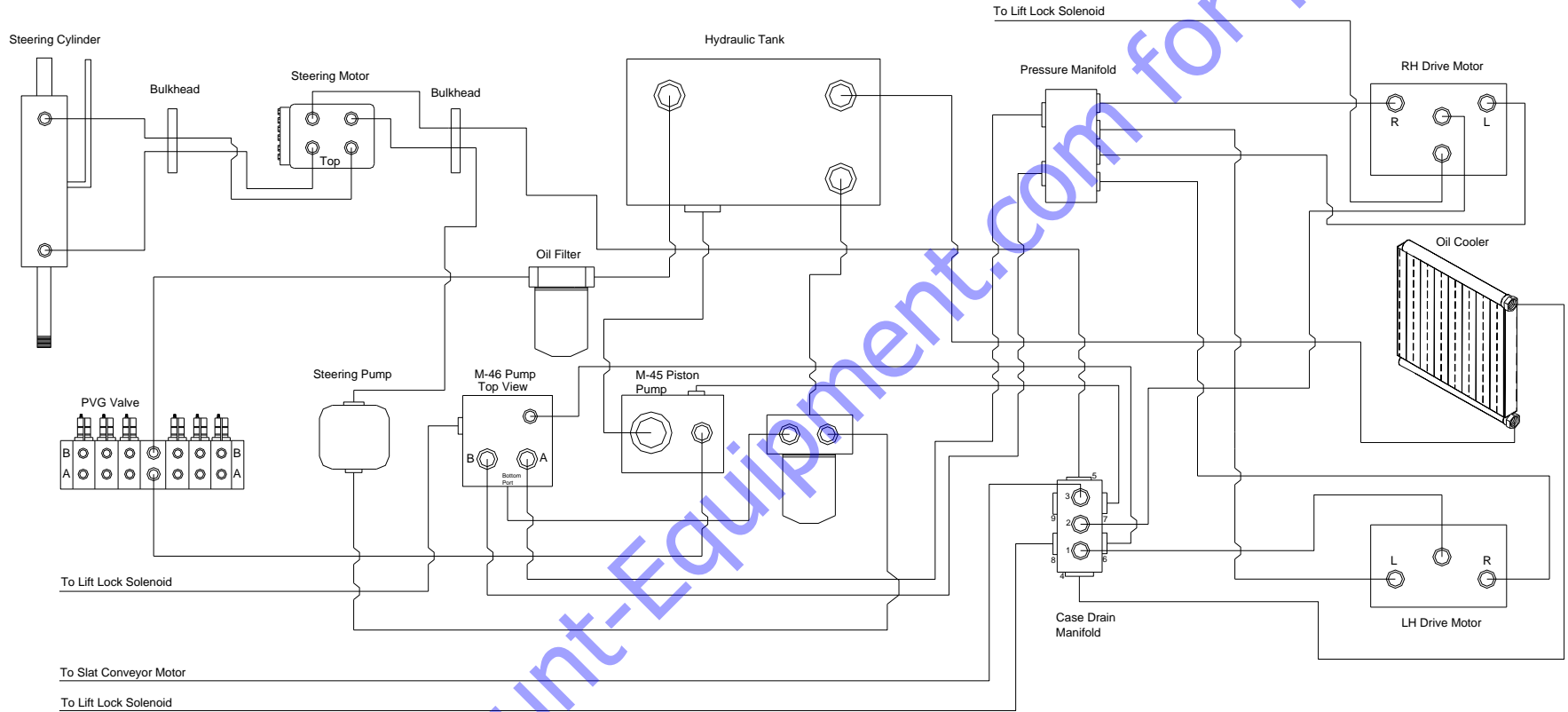
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HYDRAULIC VALVE DIAGRAM



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HYDRAULIC DIAGRAM

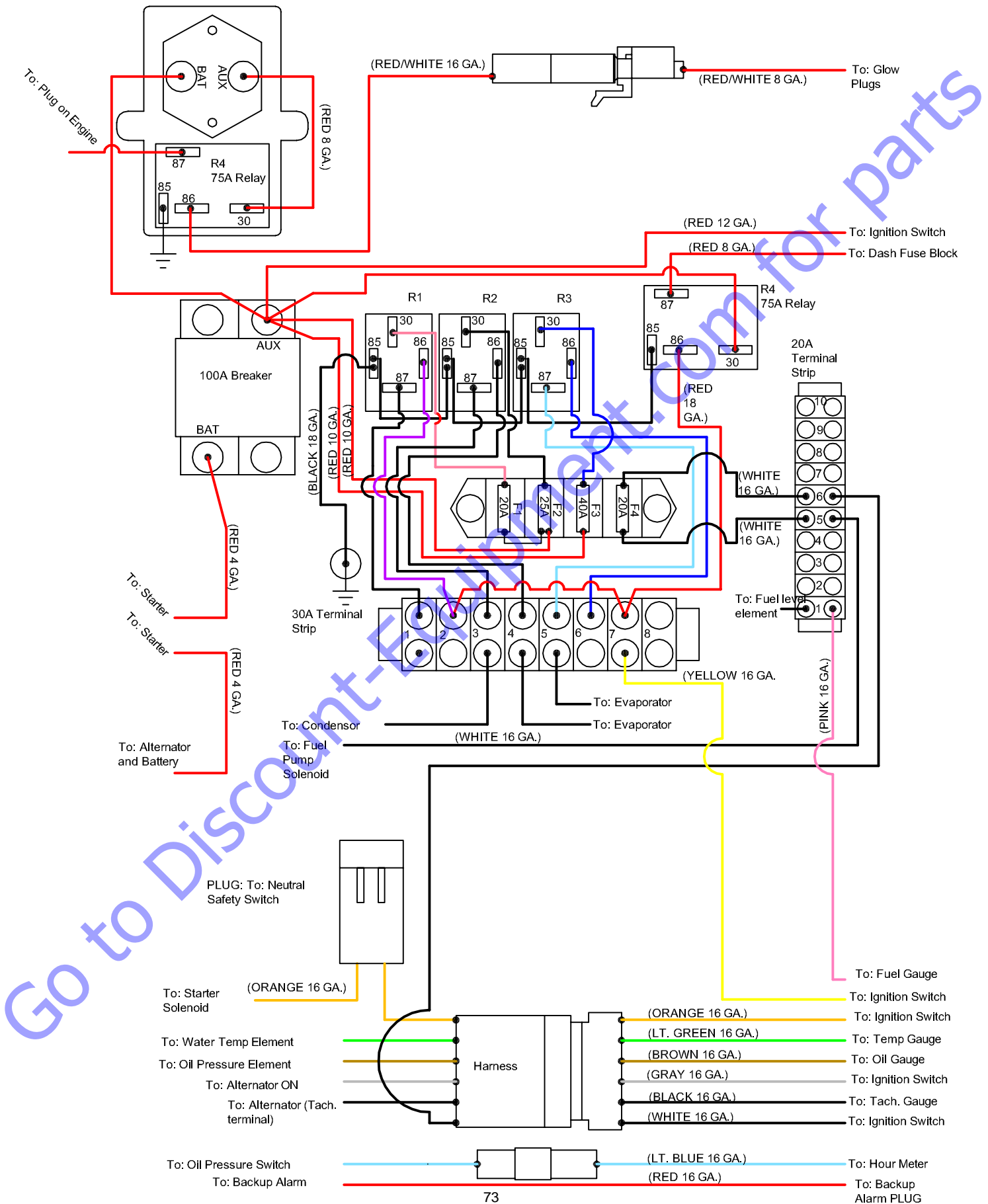


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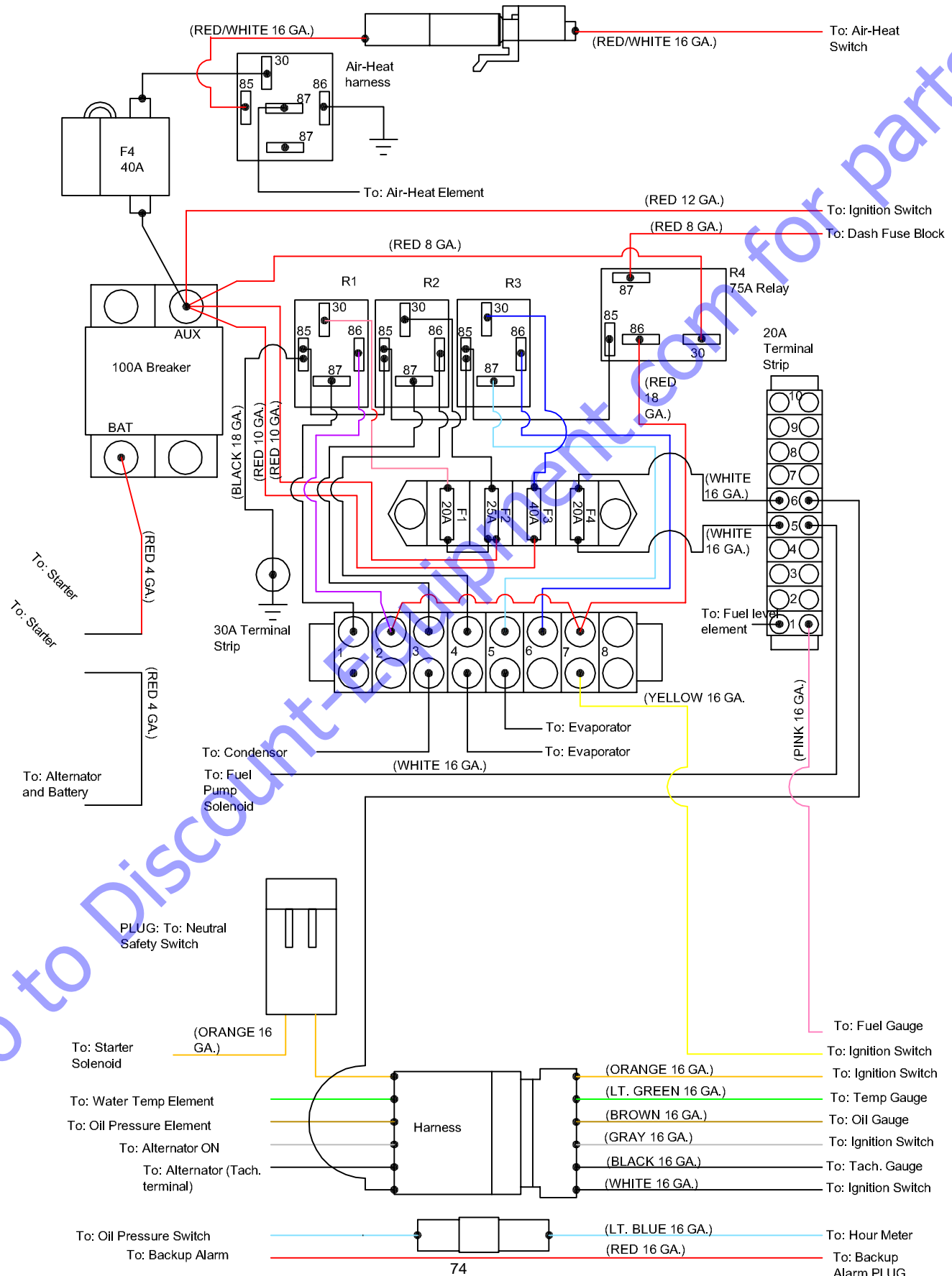
WIRING DIAGRAMS

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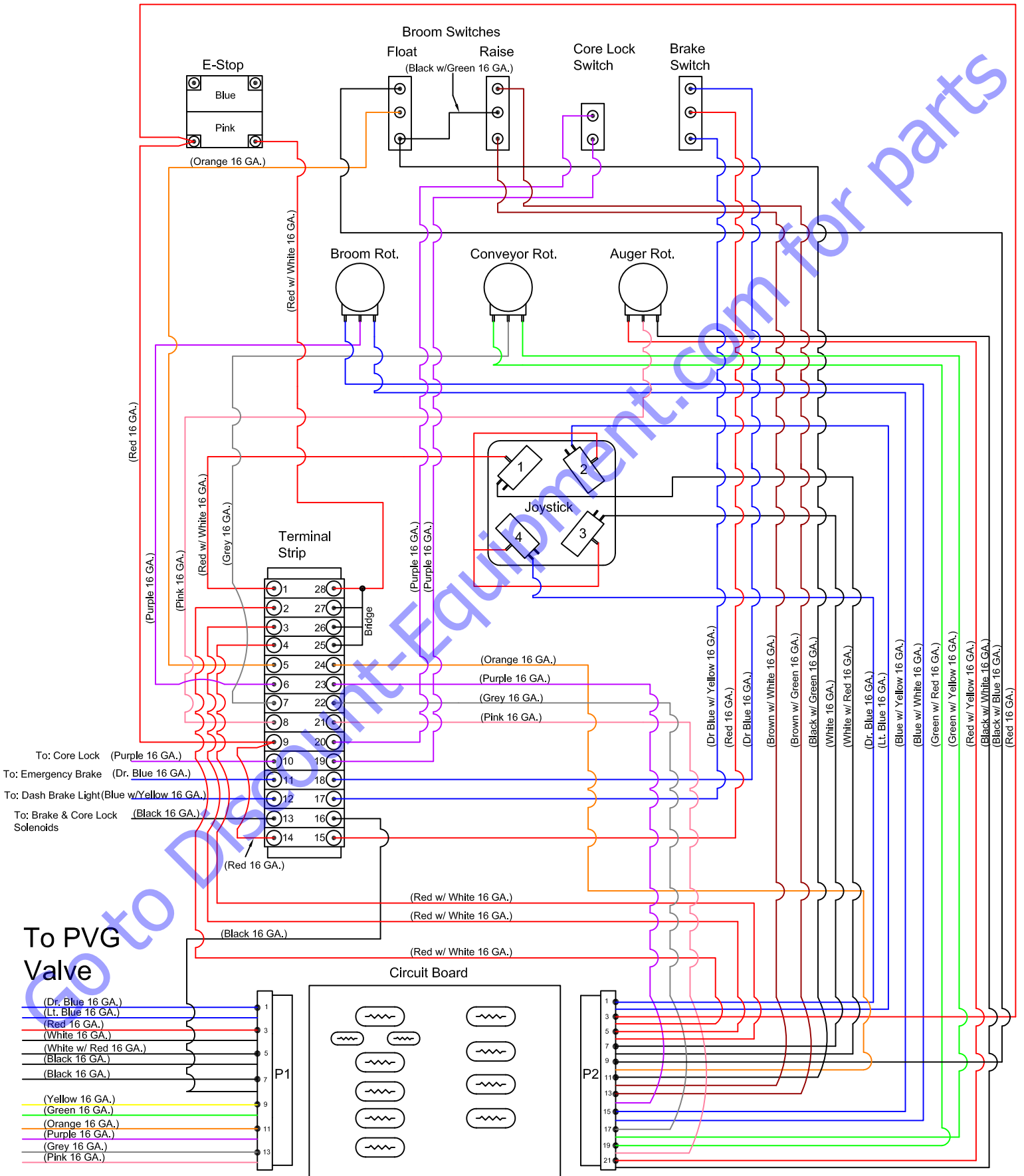
Broce Broom Wiring Diagram Engine Wiring-CAT 3054C



Broce Broom Wiring Diagram MK-1 Engine Wiring-CAT 3054B



Broce Broom Wiring Diagram MK-1 Control Panel Wiring



Terminal Strip Identification

12v to Joystick (Red w/ White)	1	3A	28	12v from E-stop (Red w/ White)
12v to Circuit board P2-4 (Red w/ White)	2		27	12v from E-stop (Bridge Strip)
12v Broom & Conveyor rotation solenoid P2-5 (Red w/ White)	3	3A	26	12v from E-stop (Bridge Strip)
12v Auger rotation & Broom up/down solenoid P2-6 (Red w/ White)	4	3A	25	12v from E-stop (Bridge Strip)
From Float switch (Orange)	5	3A	24	Core up/down solenoid P2-10 (Orange)
From Broom rotation dial (Purple)	6	3A	23	Broom rotation solenoid P2-14 (Purple)
From Conveyor rotation dial (Gray)	7	3A	22	Conveyor rotation solenoid P2-17 (Grey)
From Auger rotation dial (Pink)	8	3A	21	Auger rotation solenoid P2-20 (Pink)
12v From E-stop (Red)	9	3A	20	12v to core lock switch (Purple)
To Core lock solenoid (Purple)	10		19	12v from Core lock switch (Purple)
To Brake lock solenoid (Dr. Blue)	11		18	12v from Brake lock switch (Dr. Blue)
To Dash brake light (Blue w/ Yellow)	12		17	12v from Brake lock switch (Dr. Blue w/ Yellow)
Ground to Core & Brake lock solenoids (Black)	13		16	Ground for Core & Brake lock solenoids P1-8 (Black)
12v From E-stop (Red)	14	3A	15	12v to Parking brake switch (Red)

Circuit Board Connector Identification

CONNECTOR P1

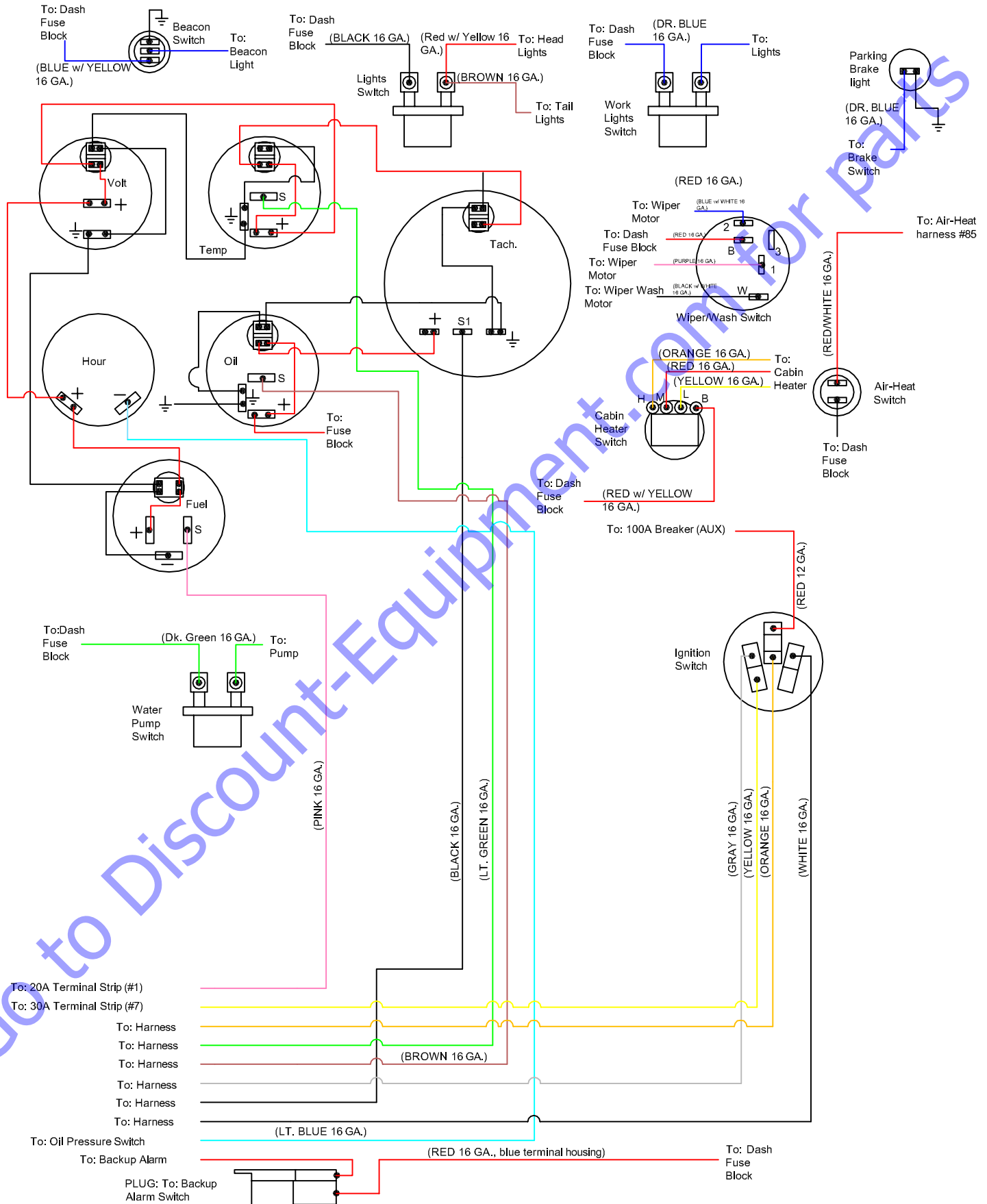
- 1 12V Conveyor Solenoid Left/Right (Dr. Blue)
- 2 12V Conveyor Solenoid Left/Right (Lt. Blue)
- 3 12V Battery (Red)
- 4 12V Conveyor Solenoid Raise/Lower (White)
- 5 12V Conveyor Solenoid Raise/Lower (White w/ Red)
- 6 Ground (Black)
- 7 Solenoid ground (Black)
- 8 Brake and Core lock Ground (Black)
- 9 12V Conveyor Rotation And Broom Rotation Solenoid (Yellow)
- 10 12V Auger Rotation & Conveyor Raise/lower Solenoid (Green)
- 11 Varing Voltage for Core Up/Down/Float (Orange)
- 12 Varing Voltage for Broom Rotation (Purple)
- 13 Varing Voltage for Conveyor Rotation (Grey)
- 14 Varing Voltage for Auger Rotation (Pink)

CONNECTOR P2

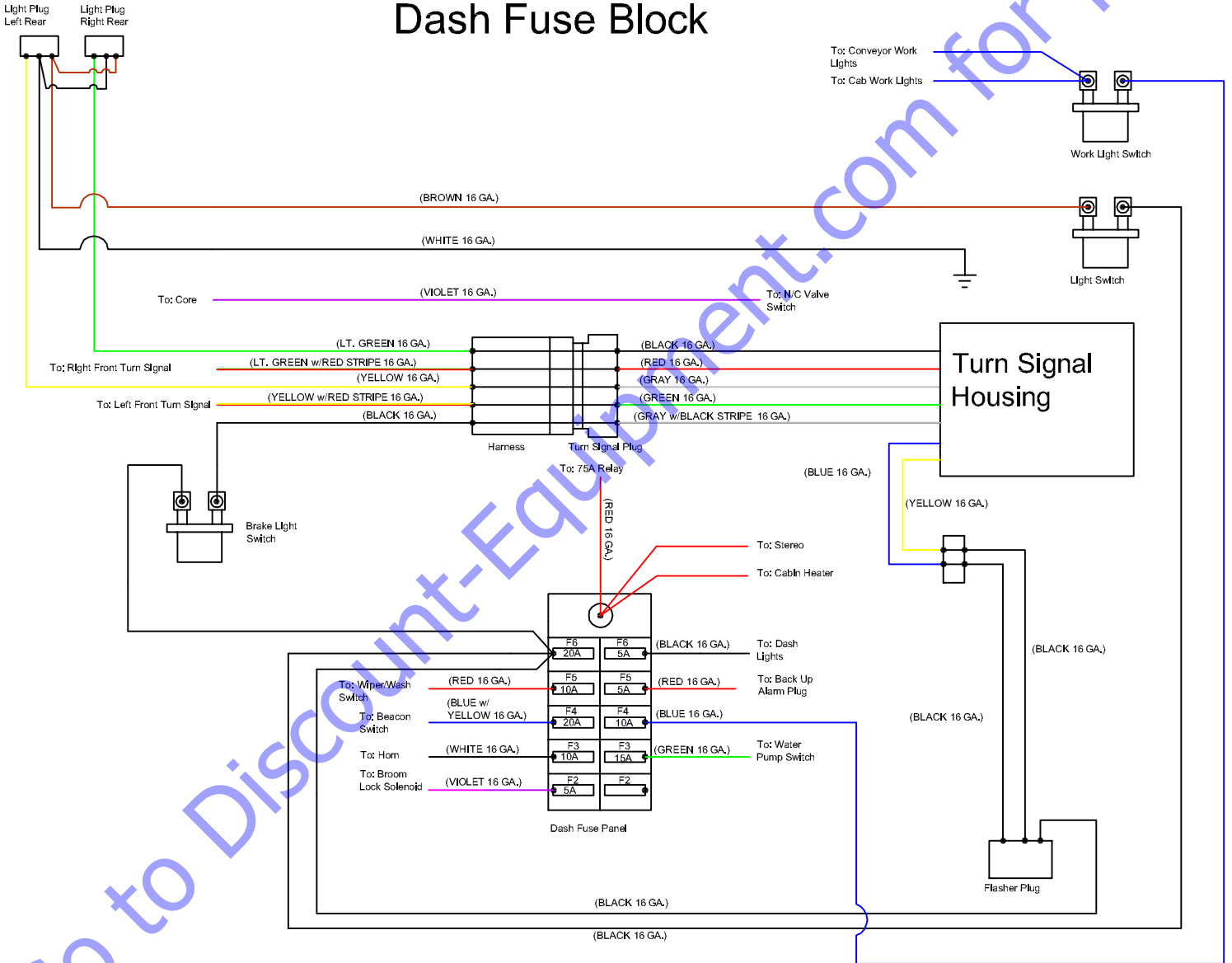
- 1 12V from Conveyor joystick (right) (Dr. Blue)
- 2 12V from Conveyor joystick (left) (Lt. Blue)
- 3 12V Battery (Red w/ White)
- 4 12V from Terminal Strip 2-27 (Red w/ White)
- 5 12V from Terminal Strip 3-26 (Red w/ White)
- 6 12V from Terminal Strip 4-25 (Red w/ White)
- 7 12V from Conveyor joystick (lower) (White)
- 8 12V from Conveyor joystick (raise) (White w/ Red)
- 9 9V to Float switch (Black w/ Blue)
- 10 Varing Voltage from Broom Raise/Lower & Float switch (Orange)
- 11 6V to Float switch & Broom up/down switch (Black w/ Green)
- 12 8V to Broom Raise/Lower switch (Brown w/ White)
- 13 4.5V to Broom Raise/Lower switch (Brown w/ Green)
- 14 Varing Voltage from Broom Rotation switch (Purple)
- 15 8.6V to Broom Rotation switch (Blue w/ Yellow)
- 16 5.7V to Broom Rotation switch (Blue w/ White)
- 17 Varing Voltage from Conveyor Rotation switch (Gray)
- 18 8.6V to Conveyor Rotation switch (Green w/ Yellow)
- 19 5.7V to Conveyor Rotation switch (Green w/ Red)
- 20 Varing Voltage from Auger Rotation switch (Pink)
- 21 9V To Auger Rotation switch (Red w/ Yellow)
- 22 2.8V to Auger Rotation switch (Black w/ White)

Broce Broom Wiring Diagram

MK-1 Dash Wiring Diagram

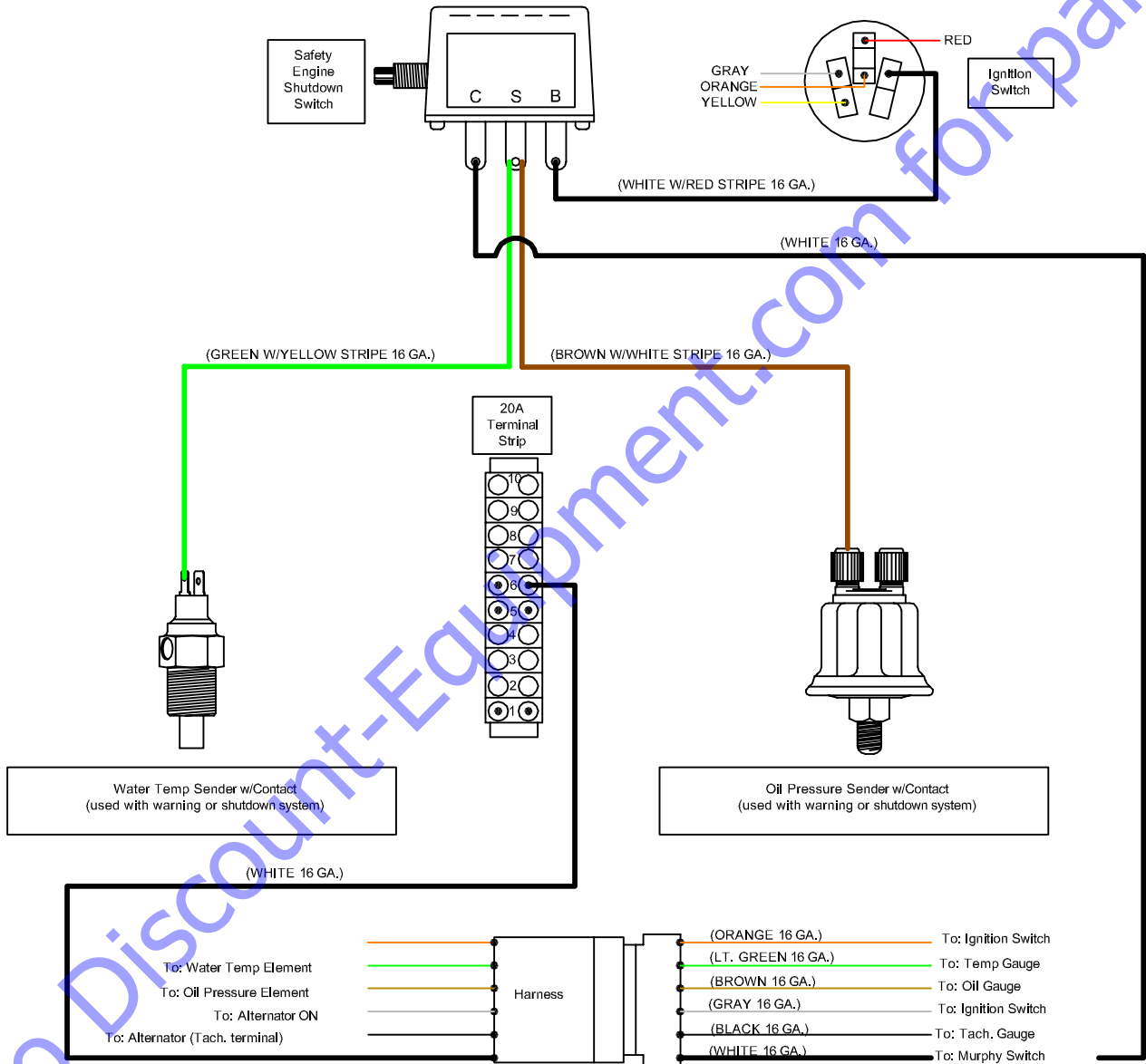


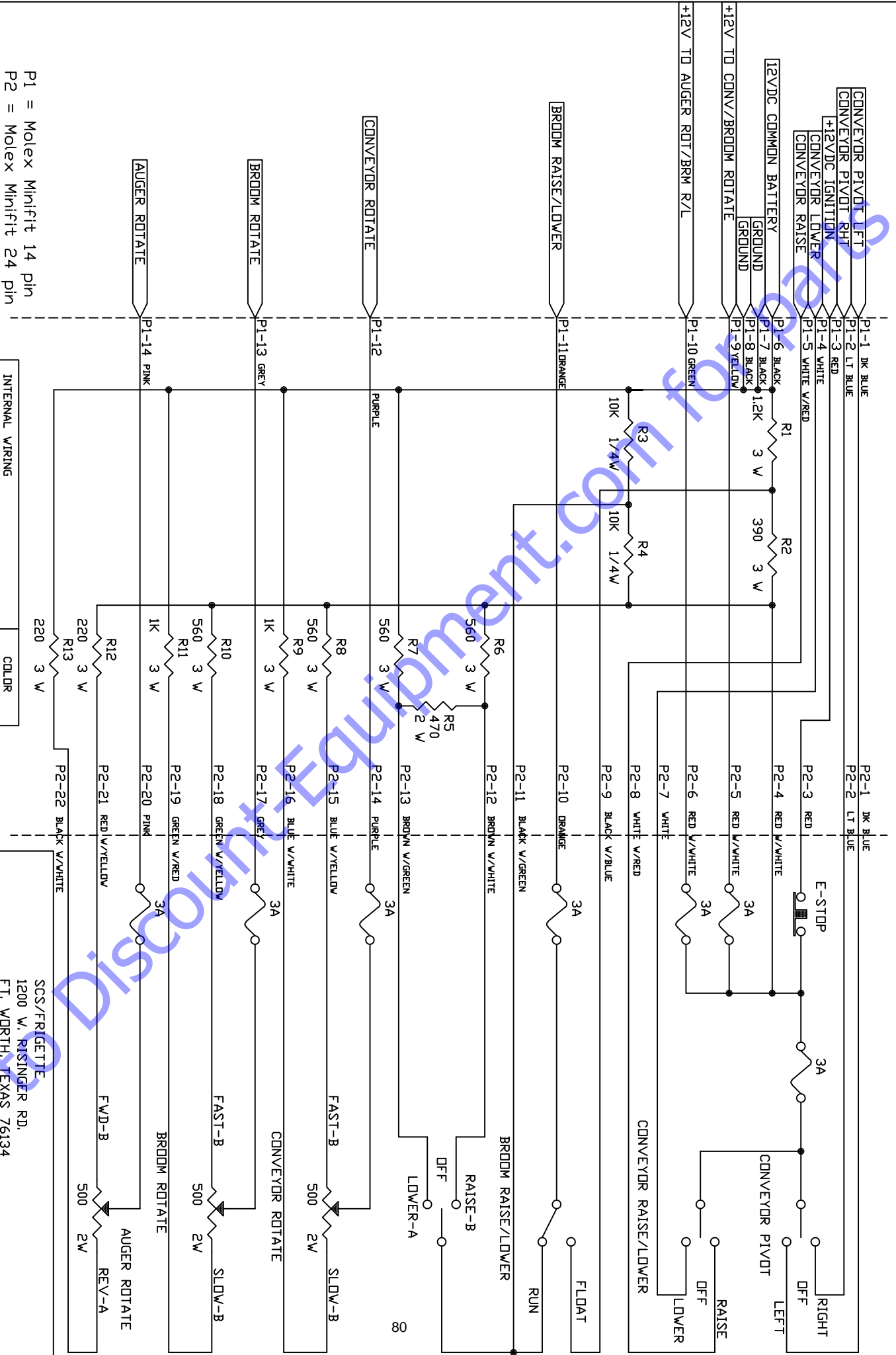
Broce Broom Wiring Diagram Light Wiring Diagram Dash Fuse Block



Broce Broom Wiring Diagram

MK-1 Safety Engine Shutdown System





P1 = Molex Minifit 14 pin
P2 = Molex Minifit 24 pin

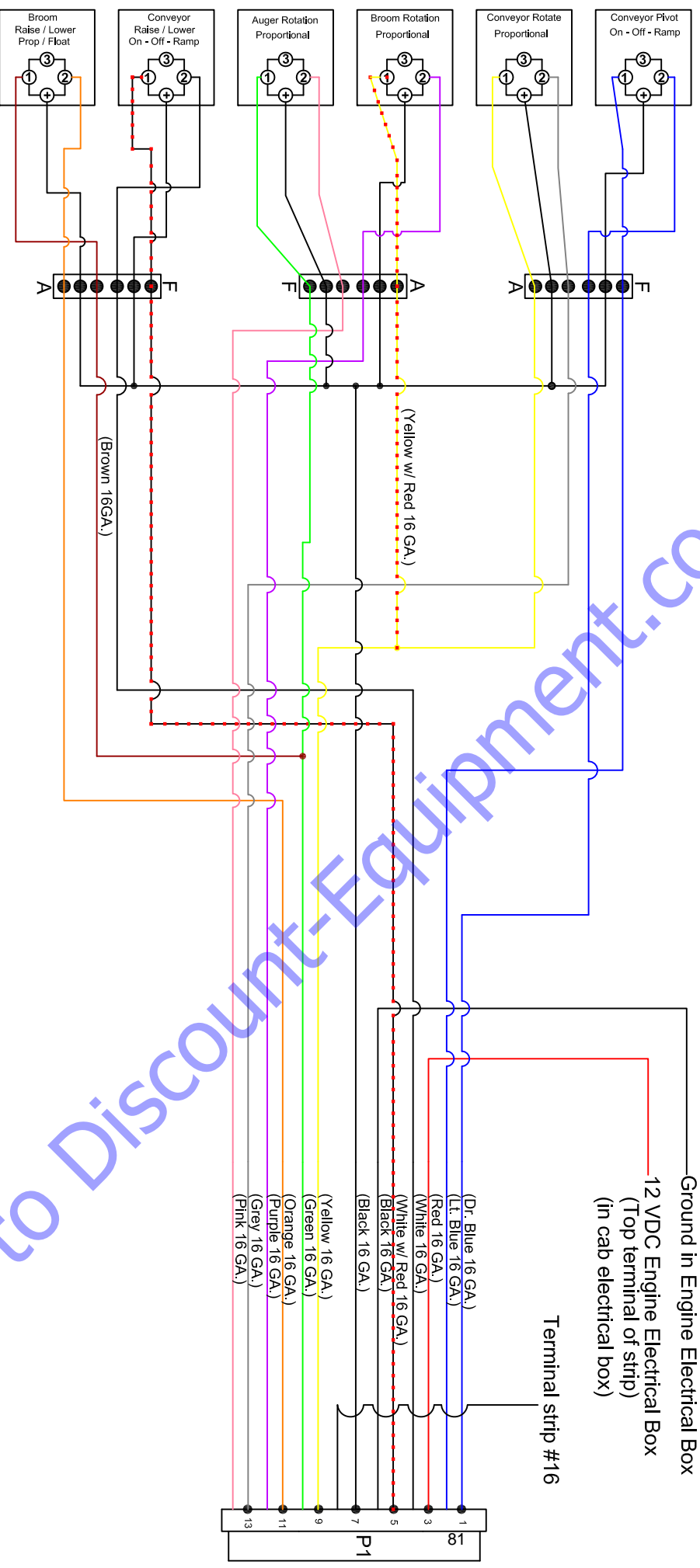
- 305-2592 PCB
- 501-1851 A/W PCB
- 501-1852 A/W S/M
- 501-1853 A/W S/S

INTERNAL WIRING	COLOR
E-STOP TO TERMINAL #9	RED
E-STOP TO TERMINAL #28	RED W/WHITE
JUMPER #9 TO #14 DN TERMINAL STRIP	RED
#15 DN TERMINAL STRIP TO CENTER POST DN EMERGENCY BRAKE SWITCH	RED

SCS/FRIGETTE 1200 W. RISINGER RD. FT. WORTH, TEXAS 76134	
Title	WIRING FOR PVG32
Size	Document Number PVG32-2.SCH
A	REV
Date: February 17, 2004	Sheet of

Broce Broom Wiring Diagram

MK-1 PVG Wiring



PVG Wiring Pin Out Values						
Function	Wire Color	Pin Hirschman Connector	Normal Voltage	Operation Voltage		
Conveyor Pivot	Dk Blue	2	0	12v right		
	Lt Blue	1	0	12v left		
	Black	(+)	grounded			
Conveyor Rotate	Gray	2	5.7v	6 to 9v		
	Yellow	1	12v			
	Black	(+)	grounded			
Broom Rotate	Purple	2	5.7v	6 to 9v		
	Yellow/Red	1	12v			
	Black	(+)	grounded			
Auger Rotation	Pink	2	5.7v	2.8v forward	9.1v reverse	
	Green	1	12v			
	Black	(+)	grounded			
Conveyor Raise/Lower	White	2	0	12v lower		
	White/Red	1	0	12v raise		
	Black	(+)	grounded			
Broom Raise/Lower	Orange	2	6v	4.5v up	8v down	9v float
	Brown	1	12v			
	Black	(+)	grounded			

CHAIN CARE & TROUBLE SHOOTING



Stress Corrosion

Stress Corrosion and Hydrogen Embrittlement

These closely related failures are similar in appearance and nature. They appear as cracks which initiate at the point of highest stress and tend to extend in an arc-like path parallel to the rolling grain of the material. Often, more than one crack will appear on a side plate.

This type of failure can be caused by operating in an acidic or caustic medium or atmosphere. Carbon steel and certain grades of stainless steel are subject to stress corrosion cracking when exposed to a corrosive environment. Also, exposure of carbon steel chain to moisture can lead to rusting and stress corrosion cracking.

The reactions of many chemical agents with metals liberate hydrogen, which attacks and weakens the metal grain structure.

If stress corrosion failure occurs, check the installation to see if the chain is exposed to chemicals, gases, moisture, or other possible causes. If the chain has been cleaned with a detergent solution, the detergent could be at fault. For cleaning purposes, use only detergent-free fluids. Never use acids, such as in acid bath degreasing.



Fatigue Failure



Bushing Fatigue

Fatigue Failure

Fatigue failures are a result of repeated cyclic loading beyond the chain's endurance limit, or rated capacity. Extent of the overload and frequency of its occurrence are factors which determine when fatigue will occur. The overloading can be continuous or intermittent.

Continuous overloading may be caused by worn teeth or pocket buildup, imposing overloads with each cycle. Impulse overloads can be from motor overload torque, dynamic overloading due to sudden stops, or impact loading on conveyors.

Generally, a fatigue crack starts at the point of highest stress, which is the aperture of the pin or bushing plate. Repeated cyclic stresses cause the crack to extend approximately perpendicular to the pitch line of the chain until the plate breaks. Unlike a pure tension failure, there is no noticeable yielding (stretch) of the material.

When fatigue failure occurs, the application should be examined for continuous or impulse overloading conditions. Determine the cause of the overload and eliminate it if possible. (Be sure to check sprockets for worn teeth or pocket buildup.) If the cause cannot be eliminated, determine the extent of the overload and increase chain size (capacity) to accommodate the operating conditions.

Bushing fatigue is another type of fatigue failure. Such fatigue manifests itself as circumferential cracks near the bushing link plate or longitudinally along the length of the bushing. Both types of cracks may also appear in the same bushing. If bushing cracks are evident, do not try to repair the chain. Determine and correct the cause of the failure, then replace the entire chain.

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CHAIN CARE & TROUBLE SHOOTING

Tension Failure

This type of failure occurs when the ultimate tensile strength of a chain is exceeded (when the chain is subjected to a one-time load greater than it can withstand). Normally, tension failure can be identified by fractured side plates showing a definite yield in the metal itself.

Pin fracture, either near the center of the pin or a pin shear failure between the side plates, can also be a result of tension failure. When a chain breaks because of shocks or overloads, all of its components are affected, even though the unbroken parts may appear sound. To avoid repetitive failures, the entire chain should be replaced.

Tension failures can result from any condition which creates improper engagement between links and sprockets, characterized by the chain riding up on the sprocket teeth.

In addition, dirt and foreign matter buildup in the sprocket tooth pockets will prevent proper seating of the chain, creating an overload condition between link and tooth. Sprockets should be checked periodically; if any foreign material has accumulated, it should be promptly removed.

Another variation of tension failure is cracked bushings. In applications contaminated by dirt or grit, abrasive material may penetrate the links. When it reaches the inside and outside bushing surfaces, this material literally grinds into the bushings during articulation, reducing their wall thickness and lowering chain tensile strength. Eventually the bushings crack under load.

Galling (Abnormal Wear)

Galling, or the tearing away of metal particles from the load-bearing surfaces, occurs as a result of inadequate lubrication or excessive operating speed. The mating surfaces of the pins and bushings actually weld together, then break away as the joints flex over the sprockets. Once started, galling accelerates rapidly and is highly destructive.

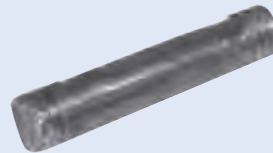
Galling can occur at high speed (within allowable speed limits) if lubrication is inadequate or misdirected. Check lubrication system to be sure that: a) proper type of lubricant is being used; b) lubricant flow is not obstructed; c) lubricant is penetrating chain joints.

Galling at speeds beyond allowable limits cannot be solved by lubrication changes. It can be prevented only by making necessary design changes to comply with speed limitations.

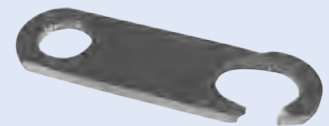
Importance of Lubrication

One of the most important, but overlooked, factors affecting chain life is proper lubrication. Besides minimizing metal-to-metal contact, lubrication provides cooling and impact damping at high speeds. It also reduces corrosion and carries away foreign matter, which is vital in abrasive environments.

Pin Galling



Side Plate Fracture Due to Tension Failure



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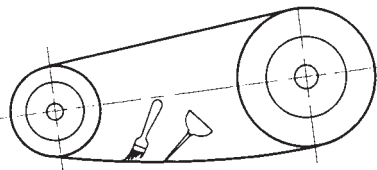
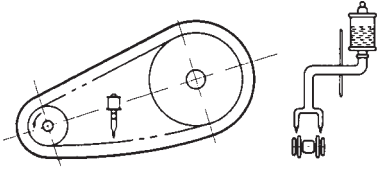
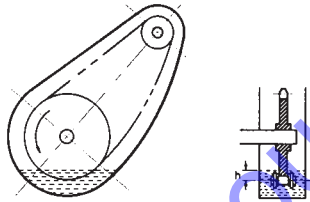
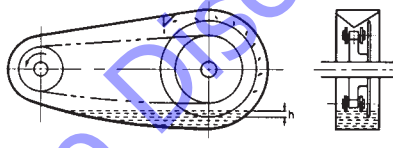
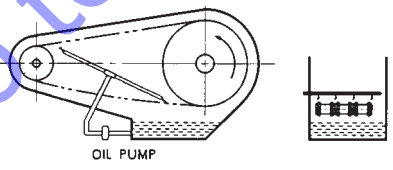
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CHAIN CARE & TROUBLE SHOOTING



Lubrication plays an important role for chain life because chain wear and its stretch results from friction in the area between pin and bushing. Proper lubrication is necessary to reduce metal to metal contact and interference at chain joints.

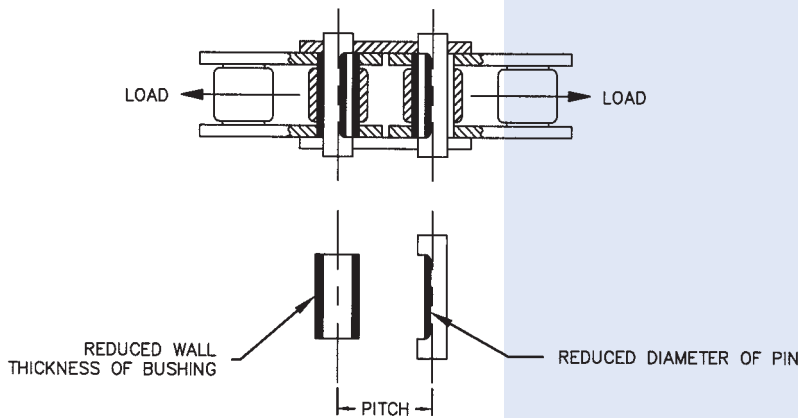
Method and amount of lubrication

Type	Method	Amount
A	 <p>Apply oil with a brush or spout can aiming at clearance between pins and roller links on the slack side of chain in operation.</p>	periodically to keep chain joints from drying (generally about every 8 hours)
	 <p>Drip lubrication Use simple casing and apply oil drops from a drip cup.</p>	at a rate of 5 to 20 drops per minute for each strand of chain, the higher the speed the more the drops per minute.
B	 <p>Oil bath lubrication Chain runs through an oil reservoir kept in leak-proof casing.</p>	too much oil kept in reservoir (if h dimension is too high) can generate heat in oil and deteriorate its quality, therefore oil level should be kept in such a way as to maintain h dimension to be about 6 to 12mm.
	 <p>Slinger disc lubrication Oil disc mounted on lower sprocket picks up oil from the oil reservoir kept in leak-proof casing and splashes it on chain. Disc should run at rim speed of more than 200 meters per minute. If chain width exceeds 125mm, oil disc should be used on both sides of chain.</p>	Oil level should be kept lower than chain lowest point to maintain h dimension to be about 12 to 25mm
C	 <p>Forced lubrication Oil pump is used to force continuous spray of oil after cooling to chain within a leak-proof casing. No. of spray oil holes should be $N+1$ if the number of chain strand is N.</p>	

In all types of lubrication, roller chain should be cleaned periodically using light oil or gasoline. In order to see if lubrication is performed satisfactorily, remove chain from drive and check its pin and bushing. If pin and bushing show flaking or being colored to red or dark brown, poor lubrication generally exists.



CHAIN CARE & TROUBLE SHOOTING



Bushing and Pin Wear Surfaces

Excessive Wear

If the load-bearing surfaces show discoloration (brown-red oxide), lubrication is insufficient. Fretting corrosion has set in, and the abrasive oxide produced will greatly increase the wear rate. Among other causes of excessive wear are:

- **Tight Chain**—insufficient sag in the slack strand. Lessen idler tension or distance between sprockets until slack is 2% to 3% of the sprocket center-to-center distance.
- **Excessive Slack**—chain whips and creates noise. Adjust idlers or sprocket distances for proper slack.
- **Worn or Misaligned Sprockets**—can cause chain overloads and accelerate the wear rate. Replace sprockets when teeth show excessive wear or are hook-shaped.

Proper sprocket size is also important to minimize the wear rate. Use sprockets with a minimum of fifteen teeth for smoothest operation and longest life. The fewer teeth there are in a sprocket, the greater the wear rate because of the high angle of articulation.

Normal Wear

Wear normally takes place in the pin and bushing load-bearing areas. As they wear, the chain gradually elongates. The rate of chain wear is greatly affected by lubrication. When properly lubricated, load-bearing surfaces of the pin and bushing will look shiny and smooth.

Tips on Trouble Shooting Chain Life Expectancy

Chain life expectancy can be expressed as a maximum percent of elongation. When using up to 67-tooth sprockets, normal life expectancy is approximately 3% elongation. Thus, to avoid sudden tension failure, chain should be replaced when its length increases 0.36" per foot on the average. When using sprockets with over 67 teeth, life expectancy is reduced in relationship to the following formula: permissible chain elongation = $\frac{200}{N}$

where N is the number of teeth in the larger sprocket.

$$\text{Example } \frac{200}{N} = 1.8\%$$

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CHAIN CARE & TROUBLE SHOOTING



CHAIN CARE & TROUBLESHOOTING

Problem	Possible Causes	What To Do
Excessive noise	<ul style="list-style-type: none"> ■ Misalignment of sprocket ■ Loose casings or bearings ■ Too little or too much slack ■ Chain and/or sprocket wear ■ Inadequate lubrication or no lubrication ■ Chain pitch size too large 	<ul style="list-style-type: none"> ■ Realign sprockets and shafts ■ Tighten set-bolts ■ Adjust center or idler take-up ■ Replace chain and/or sprocket ■ Lubricate properly ■ Check chain drive recommendation
Chain vibration	<ul style="list-style-type: none"> ■ Resonance to the vibration cycle of machine to be installed ■ High load fluctuation 	<ul style="list-style-type: none"> ■ Change vibration cycle of chain or machine ■ Use torque converter or fluid coupling
Wear on inside of link plate and one side of sprocket teeth	<ul style="list-style-type: none"> ■ Misalignment 	<ul style="list-style-type: none"> ■ Realign sprockets and shafts
Chain climbs sprockets	<ul style="list-style-type: none"> ■ Excessive chain slack ■ Heavy overload 	<ul style="list-style-type: none"> ■ Adjust center or idler take-up ■ Reduce load or install stronger chain
Broken pins, bushings or rollers	<ul style="list-style-type: none"> ■ Chain speed too high for pitch and sprocket size ■ Heavy shock or suddenly applied loads ■ Material build-up in sprocket tooth pockets ■ Inadequate lubrication ■ Chain or sprocket corrosion 	<ul style="list-style-type: none"> ■ Use shorter pitch chain or install larger diameter sprockets ■ Reduce shock load or install stronger chain ■ Remove material build-up or install side gashed sprockets ■ Lubricate properly ■ Install anti-corrosive chain or sprockets
Chain clings to sprocket	<ul style="list-style-type: none"> ■ Center distance too big or high load fluctuation ■ Excessive chain slack 	<ul style="list-style-type: none"> ■ Adjust the center distance or install idler take-up ■ Same as above
Chain gets stiff	<ul style="list-style-type: none"> ■ Misalignment ■ Inadequate lubrication ■ Corrosion ■ Excessive load ■ Material build-up in chain joint ■ Peening of link plate edges 	<ul style="list-style-type: none"> ■ Realign sprockets and shafts ■ Lubricate properly ■ Replace with anti-corrosive chain ■ Reduce load or replace with chain of suitable strength ■ Shield drive from foreign matter ■ Check for chain interference
Breakage of link plate	<ul style="list-style-type: none"> ■ Subjected to shock load ■ Vibration ■ Moment of load inertia is too big 	<ul style="list-style-type: none"> ■ Reduce shock (e.g., install a shock absorber) ■ Install a device to absorb vibration (e.g., tightener, idler wheel) ■ Chain section should be checked (increase number of strands or select next larger size chain)

INSTRUCTION MANUAL

DODGE® GRIP-TIGHT ADAPTER MOUNT BALL BEARINGS

⚠ WARNING

To ensure that drive is not unexpectedly started, turn off, lock out, and tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

Shaft & Mounting Surface Inspection

Shaft should be smooth, straight, & within commercial tolerances (Table 1). Remove burrs & align mounting surfaces within 2 degrees.

Assemble Adapter & Bearing

1) If the locknut is loose from the bearing, **FIRST** place locknut into bearing inner ring groove, **THEN** insert adapter into bearing bore until it rests against the locknut. Rotate locknut clockwise to engage adapter sleeve.



Pillow Blocks & Tapped Base Housings

NOTE: For Tapped Base (TB) housings drill mounting holes with 1/16" minimum bolt clearance to assist with proper installation.

2) During installation it is best practice is to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insure the dead weight on the bearing during installation does not exceed the values listed in Table 2.

Series	Maximum Dead Load Per Bearing (lbs)
203-206	60
207-210	65
211-214	70
215-218	75

3) Slide the unit into position onto the shaft. If the unit will not slip onto the shaft, turn locknut counter-clockwise to expand adapter sleeve.

4) Wearing gloves, rotate locknut clockwise, by hand, as tight as possible until adapter sleeve grips and does not spin on the shaft or move axially. If needed, tap on locknut outer diameter while turning locknut to assist with this step. Scribe the line on the locknut above the adapter sleeve slot.

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 3. NOTE: The use of air chisels is not recommended.

6) Center housing & mounting bolts over mounting holes & tighten bolts to proper torque (Table 4). Tighten locknut setscrew until 3/32" Allen key bends (25 in-lbs).

7) Repeat above steps for mounting 2nd housing. **Do not tighten mounting bolts on 2nd housing until second bearing has been completely locked to the shaft.** Bolts must fit freely between housing & mounting surface. If the mounting bolts do not fit freely, loosen mounting bolts on **both** housings & center both units. If the bolts still will not fit freely, remove one unit from the shaft, reposition housing, & reinstall.

Shaft Size (in)	Commercial Shaft Tolerances (in)
Up to 1 1/2"	+0.000" / - 0.002"
1 5/8" - 2 1/2"	+0.000" / - 0.003"
2 11/16" - 3 7/16"	+0.000" / - 0.004"

Series	Shaft Size GT (Normal Duty)	Shaft Size GTM (Medium Duty)	Locknut Rotation
203 - 204	1/2" - 3/4" 17 - 20 mm	---	1/2 Turn
205 - 210	7/8" - 1 3/4" 25 - 45 mm	3/4" - 1 1/2" 20 - 40 mm	2/3 Turn
211 - 218	1 15/16" - 2 15/16" 50 - 75 mm	1 11/16" - 3 1/2" 45 - 85 mm	1 Turn

Metal Housings		Non-Metallic Polymer Housing			
All Housing Types		Pillow Block, 2 & 4 Bolt Flange, Flange Bracket		Tapped Base	
Bolt Size (in)	Dry Torque (in lbs)	Bolt Size (in)	Dry Torque (18-8 Stainless) (in lbs)	Bolt Size (in)	Dry Torque (18-8 Stainless) (in lbs)
3/8	240	3/8	225	3/8	175
7/16	384	7/16	350	7/16	350
1/2	600	1/2	500	1/2	400
5/8	1200	9/16	650		
3/4	2100	5/8	1000		
7/8	2040				



⚠ WARNING

Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that the correct procedure be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance, and operating procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to ensure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted, and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and potential hazards involved. When risk to persons or property may be involved, a holding device or shear bars must be an integral part of the driven equipment.

All Flange Housings

WARNING: Special attention to the installation procedure for flange bearings is necessary to maintain the proper internal clearance & achieve maximum life. The installation of the first flange differs from the installation of the second flange.

(See step 1 **Assemble Adapter & Bearing** page 1)

2) During installation it is best practice is to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insure the dead weight on the bearing during installation does not exceed the values listed in Table 2.

3) Slide the FIRST unit into position onto the shaft. If the bearing will not slip onto the shaft or more axially, turn locknut counter clockwise to expand adapter sleeve.

4) (Using gloves) rotate locknut clockwise by hand until it is tight & adapter sleeve grips & does not spin on the shaft. This is the starting point. Scribe a line on the locknut above the adapter sleeve slot.

(If needed, tap on locknut outer diameter while turning locknut to assist with this step.)

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 2. NOTE: The use of air chisels is not recommended.

6) Tighten locknut setscrew until 3/32" Allen key bends (or 25 in-lbs). Tighten housing bolts to proper torque (Table 3).

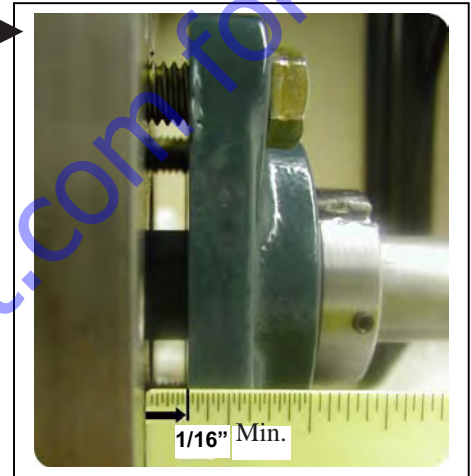
7) Slide the **SECOND** flange onto the shaft and hand tighten as in step 4 but leave 1/16" minimum gap between the flange housing & the mounting surface. See picture to the right.

8) It is important to note that the 1/16" minimum gap between the flange housing and the mounting surface must be maintained while getting the bearing hand tight to the shaft. Wearing gloves, rotate the locknut clockwise, by hand, until adapter sleeve grips and does not spin or move axially on the shaft. If needed, tap on the locknut outer diameter while turning the locknut to assist with this step. At this point you should have difficulty in rotating the locknut by hand and you should not be able to move the bearing axially along the shaft by hand. If the bearing can be moved axially along the shaft by hand then continue rotating the nut gradually until it grips the shaft. Scribe a line on the locknut above the adapter sleeve slot.

9) Insert housing bolts & pull the housing flush with mounting surface by alternately tightening the bolts to the proper torque (Table 4).

10) Lock bearing to shaft by rotating locknut, with a spanner wrench or drift pin & hammer, clockwise by amount shown in Table 3. Tighten locknut setscrew until 3/32" Allen key bends (25 in-lbs).

11) Rotate the shaft by hand, no binding or excessive drag should be felt. If excessive drag is felt, loosen the second bearing & reinstall starting at step 8.



Dismounting All Units

1) Remove all weight from the bearing via slings or jacks & secure the shaft from rotation.

2) **LOOSEN THE HOUSING MOUNTING BOLTS & COMPLETELY REMOVE SETSCREW IN THE LOCKNUT.**

3) Rotate locknut counter clockwise with spanner wrench or drift pin & hammer until bearing is free.

Hours Run Per Day	RPM							
	1 to 250 RPM	251 to 500 RPM	501 to 750 RPM	751 to 1000 RPM	1001 to 1500 RPM	1501 to 2000 RPM	2001 to 2500 RPM	2500 to Max RPM
8	12	12	10	7	5	4	3	3
16	12	7	5	4	2	2	1	1
24	10	5	3	2	1	1	1	1

Lubrication: (Use compatible Lithium base NGLI #2 grease & see Table 5)

The Dodge Grip-Tight bearing has been greased from the factory & is shaft ready. When re-lubricating slowly add grease until fresh grease is seen purging past the seal. In the higher speed ranges, excess grease may cause temporary bearing overheating. The amount of grease a bearing will take for a specific high speed application is best determined by experience. When establishing a re-lubrication schedule, note that a small amount of grease at frequent intervals is preferred to a large amount of grease at infrequent intervals.

Lubrication recommendations are intended for standard products applied in general operating conditions. For modified products, high temperature applications, and other anomalous applications contact product engineering at 864-284-5700



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This material is not intended to provide operational instructions. Appropriate instruction manuals and precautions should be studied prior to installation, operation or maintenance of equipment.



IM499312



Parts Replacement Manual

For

HYDROIL™

TORQUE-ARM™

Speed Reducers

Taper Bushed

**For Char-Lynn H, S, T and 2000 Series
6B Spline Motors**

**SIZES: HXT325A
HXT425A/HXT415A
HXT525B**

WARNING: Because of the possible danger to persons(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.



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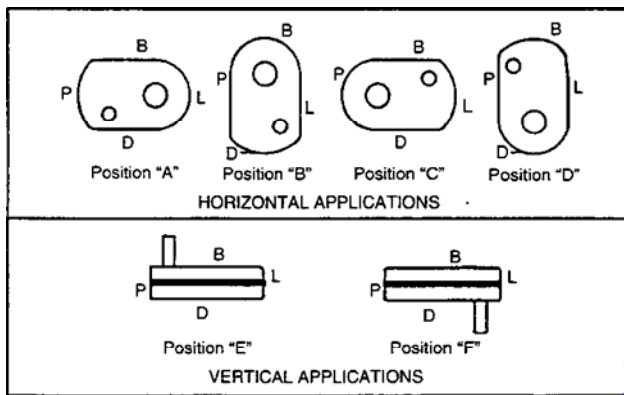
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06/30/09

REDUCER INSTALLATION

1. On sizes HXT3A, HXT4A, and HXT5B, replace the plastic plug that protects the threaded hole in the reducer housing with the eyebolt supplied with the reducer.
2. Determine the running position of the reducer (see Fig. 1). Note that the reducer is supplied with either 4 or 7 plugs; 4 around the sides for horizontal installations and 1 on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

Horizontal Installations—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filler/ventilation plug in shipment and install plug in topmost hole. Of the 3 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.



B: Breather; D: Drain; L: Oil Level Plug; P: Plug

Fig. 1 — Mounting Positions

The running position of the reducer in a horizontal application is not limited to the four positions shown in Figure 1. However, if running position is over 20° either way from sketches, the oil level plug cannot be safely used to check the oil level, unless during the checking the torque arm is disconnected and the reducer is swung to within 20° in positions “B” and “D” or 5° in positions “A” and “C” of the positions shown in Figure 1. Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication fitting holes furnished along with other standard pipe fittings, stand pipes and oil level gages as required.

WARNING

To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

3. Mount Taper Bushed reducer on driven shaft per instruction sheet No. 499629 packed with tapered bushings.
4. Install torque arm and adapter plates using the long reducer bolts. The bolts may be shifted to any of the holes on the input end of the reducer.
5. Install torque arm fulcrum on a rigid support so that the torque arm will be approximately at right angles to the center line through the driven shaft and the torque arm anchor screw.

CHAR-LYNN H, S, T AND 2000 SERIES 6B SPLINE MOTOR INSTALLATION

Consult the local Char-Lynn Motor dealer for hydraulic motor information.

REDUCER LUBRICATION

CAUTION

Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Use a high grade petroleum base, rust and oxidation inhibited (R & O) gear oil—see tables. Follow instructions on reducer nameplate, warning tags, and in the installation manual.

Under average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

CAUTION

Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe these precautions could result in damage to or destruction of the equipment.

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months depending on severity of conditions.

Table 1 – Oil Volumes

Reducer Size	Volume of Oil Required to Fill Reducer to Oil Level Plug											
	† Position A			† Position B			† Position C			† Position D		
	Fluid Ounces (Approx)	Quarts (Approx)	▲ Liters (Approx)	Fluid Ounces (Approx)	Quarts (Approx)	Liters (Approx)	Fluid Ounces (Approx)	Quarts (Approx)	Liters (Approx)	Fluid Ounces (Approx)	Quarts (Approx)	Liters (Approx)
HXT315A HXT325A	48	1½	1.42	48	1½	1.42	24	¾	.71	72	2¼	2.13
HXT415A HXT425A	60	1⅞	1.77	72	2¼	2.13	40	1¼	1.18	56	1¾	1.66
HXT515B HXT525B	104	3¼	3.08	128	4	3.79	104	3¼	3.08	128	4	3.79

†† Refer to Fig. 1 on page 2 for mounting positions.

▲ U.S. Measure: 1 quart = 32 fluid ounces = .94646 liters.

Note: If reducer position is to vary from those shown in Figure 1 either more or less oil may be required. Consult factory.

CAUTION

Extreme pressure (EP) lubricants are not recommended for average operating conditions. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

CAUTION

Do not use oils containing slippery additives such as graphite or molybdenum disulphide in the reducer when backstop is used. These additives will destroy sprag action. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Minimum Oil Recommendations for Average Operating Conditions

Table 2 – Lubrication Recommendations – ISO Grades for Ambient Temperatures of 15° to 60°

Output RPM	Reducer Size														
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	
301-400	220	220	150	150	150	150	150	150	150	150	150	150	150	150	
201-300	220	220	150	150	150	150	150	150	150	150	150	150	150	150	
151-200	220	220	150	150	150	150	150	150	150	150	150	150	150	150	
126-150	220	220	220	150	150	150	150	150	150	150	150	150	150	150	
101-125	220	220	220	220	150	150	150	150	150	150	150	150	150	150	
81-100	220	220	220	220	220	150	150	150	150	150	150	150	150	150	
41-80	220	220	220	220	220	150	150	150	150	150	150	150	150	150	
11-40	220	220	220	220	220	220	220	220	220	150	150	150	150	150	
1-10	220	220	220	220	220	220	220	220	220	220	220	220	220	220	

Below – 23°F call application engineering.
20°F to -22°F use Mobil SHC 627.
Above 125°F use Mobil SHC 634.

NOTE:

Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.

Table 3 – Lubrication Recommendations – ISO Grades for Ambient Temperatures of 50° to 125°

Output RPM	Reducer Size														
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	
301-400	320	320	220	220	220	220	220	220	220	220	220	220	220	220	
201-300	320	320	220	220	220	220	220	220	220	220	220	220	220	220	
151-200	320	320	220	220	220	220	220	220	220	220	220	220	220	220	
126-150	320	320	320	220	220	220	220	220	220	220	220	220	220	220	
101-125	320	320	320	320	220	220	220	220	220	220	220	220	220	220	
81-100	320	320	320	320	320	220	220	220	220	220	220	220	220	220	
41-80	320	320	320	320	320	220	220	220	220	220	220	220	220	220	
11-40	320	320	320	320	320	320	320	320	320	320	320	320	320	320	
1-10	320	320	320	320	320	320	320	320	320	320	320	320	320	320	

See page 8 for lubricant viscosity classification equivalents.

Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer's representative for his recommendation.

GUIDELINES FOR TORQUE-ARM REDUCER LONG-TERM STORAGE

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to the lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

Preparation

1. Drain the oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 3.
2. Seal the unit air tight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover the shaft extension with a waxy rust preventative compound that will keep oxygen away from the bare metal (Non-Rust X-110 by Daubert Chemical Co.).
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside or cover the unit with a durable waterproof cover which can keep moisture away.

5. Protect the reducer from dust, moisture, and other contaminants by storing the unit in a dry area.
6. In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

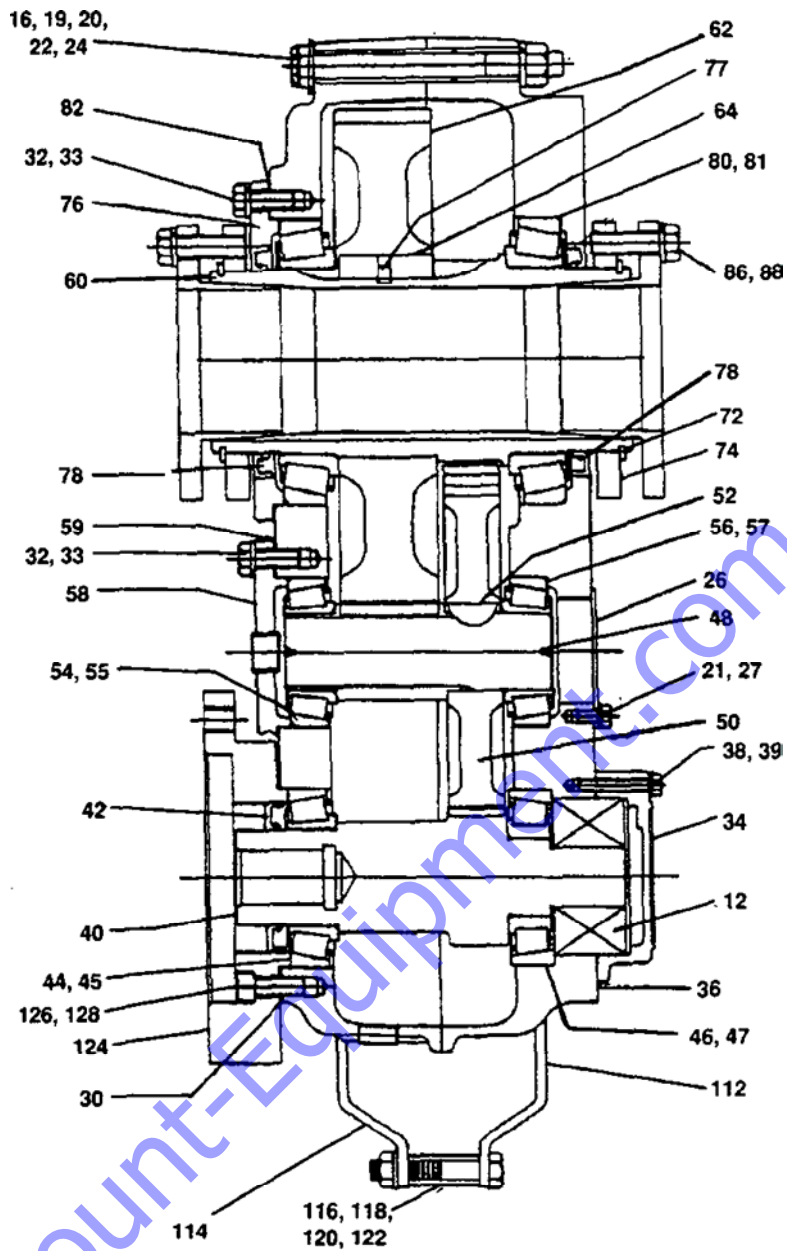
When Placing the Reducer into Service

1. Assemble the vent plug into the proper hole.
2. Clean the shaft extensions with a suitable solvent.
3. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
4. Follow the installation instructions provided in this manual.

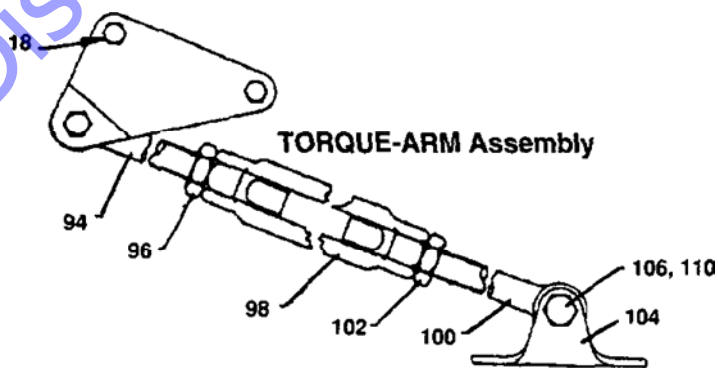
Table 4 – Quantities of VCI #105 Oil

Case Size	Quarts or Liters
HXT3A	.1
HXT4A	.2
HXT5B	.3

VCI #105 & #10 are interchangeable.
VCI #105 is more readily available.



Taper-Bushed



Note: The two-digit numbers are for reference only. Order parts by the six-digit numbers in the Parts List. Each six-digit number is a complete identification of the part or assembly

Reference	Name of Part	No. Req'd	HXT3A Part No.	HXT4A Part No.	HXT5B Part No.	Reference	Name of Part	No. Req'd	HXT3A Part No.	HXT4A Part No.	HXT5B Part No.
12	Backstop Assembly	1	243106	244106	245154		SEAL KIT ^v *	1	389720	389721	389722
	HOUSING	1	243534	244567	245587	36*	▲ Backstop Cover Gasket	1	243561	244593	245220
16	Air Vent	1	241237	241237	245237	42*	▲ Input Shaft Seal	1	243558	244524	355011
18	Housing Bolt	6	411440	411442	411464	78*	▲ Output Hub Seal	2	243578	244673	245545
19	Adapter Housing Bolt	2	411442	411444	411466		● RTV Sealant, Tube	1	465044	465044	465044
20	Washer	4	419094	419094	419096						
20	Lockwasher	6	419012	419012	419013						
22	Hex Nut	8	407089	407089	407091						
24	Dowel Pin	2	420055	420055	420110						
●	Pipe Plug	2	430031	430031	430033						
●	Magnetic Plug	1	430060	430060	430062						
21	Countershaft Cover Screws (Backstop Side)	4	416524	411035	411394						
26	Countershaft Brg. Cover (Backstop Side)	1	243559	244574	244574	84	USHING ASSEMBLY ^v	1	243270	244089	245084
27	Lockwasher	4	419007	419009	419009						
30*	Input Shaft Bearing Shim Pack	2†	389704	389711	389732						
32	Carrier and Cover Screws	10	411390	411407	411407						
33	Lockwasher	10	419010	419011	419011						
34	Backstop Cover	1	243560	244493	245547						
38	Backstop Cover Screw	4	416524	411035	411406						
39	Lockwasher	4	419007	419009	419009						
40*	Input Shaft	1	243498	244587	245641	86	▲ Bushing Screw	6	411407	411408	411435
44*	Input Shaft Brg. Cone	1	402204	402280	402144	88	▲ Lockwasher	6	419011	419011	419012
45*	Input Side Cup	1	403139	403027	403104						
46*	Input Shaft Brg.+ Cone	1	402273	402142	402269						
47*	Backstop Side Cup	1	403094	403102	403073						
48	COUNTERSHAFT ASSEMBLY ^v 25:1 Ratio	1	389701	389708	389715						
50*	▲ Countershaft with Pinion	1	243555	244590	245596						
50*	▲ First Reduction: 25: 1 Ratio	1		244214							
52*	▲ Gear 25:1 Ratio	1	243239	244212	245212	90	▲ Key, Bushing to Shaft	1	443267	443255	443251
52*	▲ Key	1	243215	244215	244215						
54*	Countershaft Brg. Cone	1	402273	402000	402203						
55*	Input Side Cup	1	403094	403000	403027						
56*	Countershaft Brg. Cone	1	402273	402000	402203						
57*	Backstop Side Cup	1	403094	403000	403027						
58	Countershaft Brg. Cover (Input Side)	1	243545	244578	245594						
59*	Countershaft Brg. Shim Pack	2†	389705	389712	389718						
60*	OUTPUT HUB ASSEMBLY ^v Taper Bushed	1	389703	389710	389717						
62*	▲ Output Hub Taper Bushed	1	243556	244588	245590						
62*	▲ Output Gear	1	243570	244188	245186						
64*	▲ Output Gear Key	2	243216	244217	355064						
72	Bushing Back-up Plate	2	243308	244099	245114	94	TORQUE-ARM ASSEMBLY ^v	1	243097	245097	245097
74	Retaining Ring	2	421109	421108	421107	96	▲ Rod End	1	243245	245245	245245
76	Output Hub Seal Carrier (Input Side)	1	243547	244591	245592	98	▲ Hex Nut	1	407095	407097	407097
77	Roll Pin	1	409022	409022	409022	98	▲ Turnbuckle	1	243246	245246	245246
80*	Output Hub	2	402272	402286	402193	100	▲ Extension	1	243247	245247	245247
81*	Bearing Cone	2	403127	403163	403016	102	▲ L.H. Hex Nut	1	407244	407246	407246
82*	Output Hub Bearing Shim Pack	2†	389706	389713	389719	104	▲ Fulcrum	1	243249	246249	246249
						106	▲ Fulcrum Screw	1	411484	411484	411484
						110	▲ Hex Nut	1	407093	407093	407093
						112	ADAPTER ASSEMBLY ^v	1	259153	259154	259155
						114	▲ R.H. Adapter Plate	1	243242	244244	245242
						116	▲ L.H. Adapter Plate	1	243241	244243	245241
						118	▲ Adapter Bushing	1	243243	245243	245243
						120	▲ Adapter Bolt	1	411437	411460	411460
						122	▲ Lockwasher	1	419012	419013	419013
						122	▲ Hex Nut	1	407089	407091	407091
						124	Motor Adapter 25:1 Ratio	1	243467	244573	245643
						126	Adapter Screw	⑤	417081	417108	417108
						128	Lockwasher	4	419046	419047	419047

^v Includes parts listed immediately below marked "▲" Housing assembly also includes a two-piece housing. Bushing assemblies include 2 bushings.
 ▲ Parts marked "▲" make up the assemblies under which they are listed.
 * Not shown on drawing.
 † Part No. 402266 for HXT525B.
 ‡ See last paragraph under "ORDERING PARTS."
 † Recommended spare parts
 Ⓜ On size HXT3A for 1 7/16" thru 1 3/4" bores and HXT5B for 1 7/16" thru 2 1/4" bores.
 Ⓢ 5 Required for HXT5B, 4 required for HXT3A and HXT4A

REPLACEMENT OF PARTS

A DODGE TORQUE-ARM Speed Reducer can be disassembled and reassembled by careful attention to the instructions following, using tools normally found in a maintenance department.

Cleanliness is very important to prevent the introduction of dirt into the bearings and other parts of the reducer. A tank of clean solvent, an arbor press, and equipment for heating bearings and gears should be available for shrinking these parts on shafts.

Our factory is prepared to repair reducers for customers who do not have proper facilities or who for any reason desire factory service.

The oil seals are of the rubbing type and considerable care should be used during disassembly and reassembly to avoid damage to the surface on which the seals rub.

The keyseat in the input shaft as well as any sharp edges on the output hub should be covered with tape or paper before disassembly or reassembly. Also be careful to remove any burrs or nicks on surfaces of the input shaft or output hub before disassembly or reassembly.

ORDERING PARTS:

When ordering parts for reducer, specify reducer size number, reducer serial number, part name, part number and quantity.

It is strongly recommended that when a pinion or gear is replaced, the mating gear or pinion be replaced also.

If the large gear on the output hub must be replaced, it is recommended that an output hub assembly with a gear assembled on the hub be ordered to secure undamaged surfaces on the output hub where the oil seals rub. However, if it is desired to use the old output hub, press the gear and bearing off and examine the rubbing surface under the oil seal carefully for possible scratching or other damage resulting from the pressing operation. To prevent oil leakage at the shaft oil seals the smooth surface of the output hub must not be damaged.

If any parts must be pressed from a shaft or from the output hub, this should be done before ordering parts to make sure that none of the bearings or other parts are damaged in removal. Do not press against outer race of any bearing.

Because old shaft oil seals may be damaged in disassembly it is advisable to order replacements for these parts.

If replacing a bearing or a shaft, it is advisable to order a set of shims for adjustment of bearings on the shaft assembly. If replacing a housing, a set of shims should be ordered for each shaft assembly because the adjustment of the bearings on each shaft assembly is affected.

REMOVING TAPER BUSHED REDUCER FROM SHAFT:

WARNING

To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

WARNING

External loads may cause machine movement. Block machine before removing any drive train components. Failure to observe these precautions could result in bodily injury.

1. Remove bushing screws.
2. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws make sure screw threads and threaded holes in bushing flanges are clean.
3. Remove the outside bushing, the reducer and then the inboard bushing.

DISASSEMBLY:

1. Remove all bolts from housing. Drive back hollow dowel pins on either side of housing. Remove back-up plates and snap rings on the output hub on taper-bushed reducers. Open housing evenly to prevent damage to parts inside.
2. Lift shaft, gear and bearing assemblies from housing.
3. Remove seals, seal carriers and bearing cups from housing.

REASSEMBLY:

1. **Output Hub Assembly:** Heat gear to 325° to 350°F for shrinking onto output hub. Heat bearing cones to 270° to 290°F for shrinking onto output hub.
2. **Countershaft Assembly:** Heat gear to 325° to 350°F and bearing cones to 270° to 290°F for shrinking onto shaft.
3. **Input Shaft Assembly:** Shaft and pinion are integral. Heat bearing cones to 270° to 290°F for shrinking onto shaft.
4. Drive the dowel pins back into position in the right-hand housing half.
5. Install countershaft cover in right-hand housing half. Place housing half on blocks to allow for protruding end of output hub. Install bearing cups in right-hand housing half making sure they are properly seated.
6. Mesh output hub gear and small countershaft gear together and set in place in housing. Set input shaft assembly in place in the housing. Make sure bearing rollers (cones) are properly seated in their cups. Set bearing cups for left-hand housing half in place on their rollers.
7. Clean housing flange surfaces on both halves, making sure not to nick or scratch flange face. Place a new bead of gasket eliminator on flange face and spread evenly over entire flange leaving no bare spots. Place other housing half into position and tap with a soft hammer (rawhide not lead hammer) until housing bolts can be used or draw housing halves together. Torque housing bolts per torque values listed below.

8. Place output hub seal carrier in position without slims and install two carrier screws diametrically opposed. Torque each screw to 25 lb.-ins. Rotate the output hub to roll in the bearings and then torque each screw once to 50 lb.-ins. **Do not retorquer screws.** Again turn output hub to roll in the bearings. With a feeler or taper gage, measure the gap between the housing and the carrier, clockwise from and next to each screw. To determine the required shim thickness, take the average of the two feeler gage readings. Remove carrier and install the required shims. Note: Total shim thickness per carrier should not include more than .009" plastic shims and each plastic shim should be inserted between two metal shims. Place a 1/8" diameter bead of Dow Corning RTV732 sealant on the face around the I.D. of the end shim (sealant is to be between reducer housing and shim) and install carrier on reducer housing. Torque carrier bolts to value shown in Table 5. Output hub should have an axial end play of .001" to .003".
9. Adjust the countershaft bearings using the same method as in step 8 above. The axial end play should be .001" to .003".

Table 5 – Bolt Tightening Torque Values

Reducer Size	Housing Bolts (in.-lbs.)	Seal Carrier Bolts (in.-lbs.)
HXT309A HXT315A HXT325A	600	204
HXT409A HXT415A HXT425A	600	360
HXT509B HXT515B HXT525B	900	360

Table 6 – Manufacturers' Part Numbers For Replacement Output Hub Bearings

TORQUE-ARM Reducer Drive Size	Output Hub Bearing	
	DODGE Part Number	Timken Part Number
HXT315A	402272	LM814849
HXT325A	403127	LM814810
HXT415A	402268	498
HXT425A	403163	492A
HXT515B	402193	42381
HXT525B	403016	42584

10. Again using the same procedure as in step 8, adjust the input shaft bearings, except the axial end play should be .002" to .004".
11. Apply sealant to the input shaft cover gasket and install input shaft cover in right-hand housing half. Install input and output seals. Extreme care should be used when installing seals to avoid damage due to contact with sharp edges on the input shaft or output hub. This danger of damage and consequent oil leakage can be decreased by covering all sharp edges with tape or paper prior to seal installation. Fill cavity between seal lips with grease. Seals should be pressed or tapped with a soft hammer evenly into place in the carrier applying pressure only on the outer edge of the seals. A slight oil leakage at the seals may be evident during initial running in but should disappear unless seals have been damaged.
12. Install bushing back-up plate and snap rings.

Table 7 – Manufacturers' Part Numbers For Replacement Countershaft Bearings

TORQUE-ARM Reducer Size	Countershaft Bearing Input Side		Countershaft Bearing Adapter Side	
	DODGE Part No.	Timken Part No.	DODGE Part No.	Timken Part No.
HXT315A	402273	15102	402273	15012
HXT325A	403094	15245	403094	15245
HXT415A	402000	M86649	402000	M86649
HXT425A	403000	M86610	403000	M86610
HXT515B	402203	2789	402203	2789
HXT525B	403027	2720	403027	2720

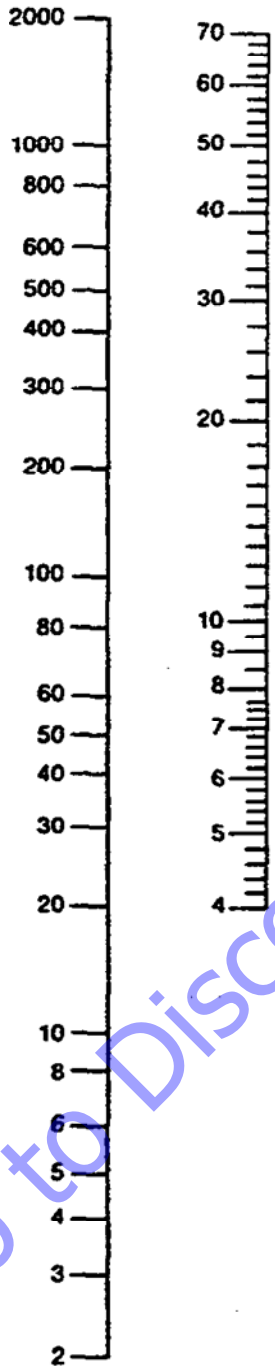
Table 8 – Manufacturers' Part Numbers For Replacement Input Shaft Bearings

TORQUE-ARM Reducer Size	Input Bearing Input Side		Input Bearing Adapter Side	
	DODGE Part No.	Timken Part No.	DODGE Part No.	Timken Part No.
HXT315A	402204	LM48548A	402273	15102
HXT325A	403139	LM48510	403094	15245
HXT415A	402280	2788	402142	26118
HXT425A	403027	2720	403102	26283
HXT515B	402144	28579	402269	350
HXT525B	403104	28521	403073	352
	402144	28579	402266	350A
	403104	28521	403073	352

Viscosity Classification Equivalents

KINEMATIC VISCOSITIES

cSt/40°C cSt/100°C



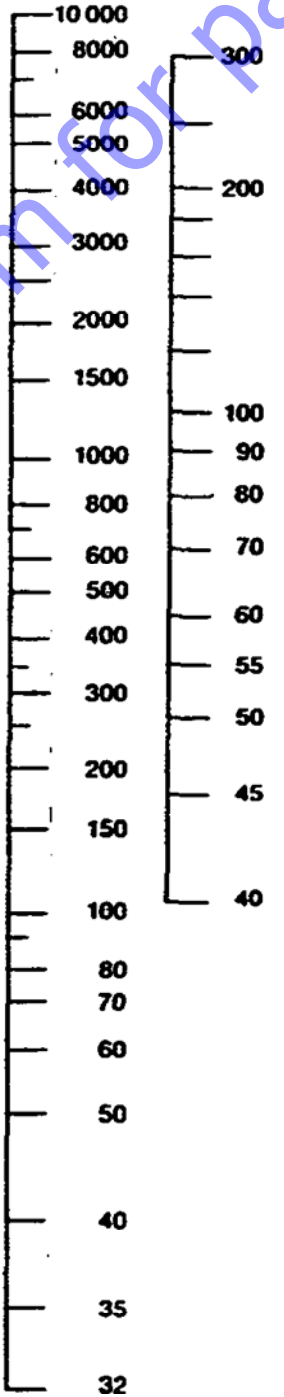
ISO VG

AGMA GRADES

SAE GRADES
GEAR OILS

SAYBOLT VISCOSITIES

SUS/100°F SUS/210°F



ISO VG	AGMA GRADES	SAE GRADES GEAR OILS
1500		250
1000	8A	
680	8	140
460	7	
320	6	90
220	5	
150	4	85W
100	3	80W
68	2	
46	1	75W
32		
22		
15		
10		
7		
5		
3		
2		

Viscosities can be related horizontally only.
 Viscosities based on 96 VI single grade oils.
 ISO are specified at 40°C.
 AGMA are specified at 40°C.
 SAE 75W, 80W, 85W and 5W & 10W specified at low temperature. Equivalent viscosities for 100 and 210°F are shown.
 SAE 90 to 250 and 20 to 50 specified at 100°C.



Accoppiatori - manuale di servizio Pump Drives - service manual Boites de Repartition - manuel d'utilisation

GENERALITÀ

- Il moto viene trasmesso dall'albero centrale dell'accoppiatore agli alberi laterali che comandano le pompe.
- Il senso di rotazione delle uscite è contrario a quello dell'albero di entrata.
- Il collegamento con le pompe viene effettuato a mezzo di manicotti scanalati.

INSTALLAZIONE

- La posizione di lavoro dell'accoppiatore è quella indicata a catalogo. Per posizioni diverse interpellare il servizio tecnico Technodrive.
- Staffaggio

Nel caso di collegamento diretto sulla campana coprivolano del motore diesel, l'accoppiatore deve essere staffato rigidamente allo stesso basamento a cui è staffato il motore. Nel caso di montaggio indipendente di un accoppiatore con frizione "BDS 145" o "BDS 290" occorre staffare, oltre che sui piani laterali dell'accoppiatore, anche sui due piani laterali della frizione. Per i modelli con frizione "BDS 2200" e "BDS 3300" occorre staffare sui piani laterali dell'accoppiatore e sul centraggio Ø 205 mm lato albero di entrata frizione.

- Montaggio pompe: l'accoppiatore viene fornito con i supporti pompa montati sulle prese. Qualora si dovesse smontare una presa pompa per sostituirla con altra, occorre fare attenzione che il nuovo supporto non carichi assialmente i cuscinetti (fra anello esterno del cuscinetto e supporto pompa deve esserci un gioco di $0,10 \div 0,20$ mm).

I manicotti di collegamento delle pompe devono essere montati con i relativi anelli di fermo, o con vite e rosetta di fissaggio in testa all'albero pompa, facendo attenzione che non vengano indotti carichi assiali sugli alberi a causa di errata posizione di un anello di fermo.

La tenuta olio è realizzata sul supporto pompa con anello OR o con guarnizione.

- L'accoppiatore viene fornito senza olio.
Prima della messa in funzione procedere al riempimento sino al massimo indicato sull'asta di livello. Negli accoppiatori provvisti di impianto di raffreddamento occorre riverificare il livello olio dopo aver avviato l'accoppiatore e riempito scambiatore e tubazioni.
- Nel caso di accoppiatori provvisti di impianto di raffreddamento assicurarsi che il senso di rotazione in entrata all'accoppiatore sia quello previsto per la pompa di circolazione dell'olio; in caso contrario invertire i collegamenti con la pompa.
- Assicurarsi che la temperatura dell'olio non superi, in esercizio, i 105° C.
Qualora tale valore venga superato occorre prevedere un raffreddamento più efficace dell'accoppiatore.
- L'albero di entrata degli accoppiatori, sia in versione "B" che in versione "BDS", non accetta carichi radiali o assiali, è quindi sconsigliato l'azionamento con puleggia.

- Gli accoppiatori con frizione "BDS" devono essere azionati tramite un giunto che non induca sforzi radiali o assiali sull'albero.

Il montaggio del semigiunto sull'albero della frizione deve essere effettuato a caldo.

Il semigiunto deve avere una lunghezza utile del foro superiore a quella dell'albero e deve essere fissato assialmente con vite e rondella in testa all'albero.

Curare l'allineamento nel collegamento all'albero di entrata della frizione.

- Per il montaggio degli accoppiatori con frizione "BD" procedere come segue:

a) la frizione viene fornita in posizione innestata e con leva di comando smontata; non disinnestare sino a quando non si è ultimato il montaggio sul motore.

b) Posizionare il cuscinetto pilota sull'alloggiamento del volano. Il cuscinetto pilota deve essere a doppio schermo ingrassato a vita.

Il cuscinetto pilota è di solito montato con interferenza sull'alloggiamento volano e con gioco sull'albero frizione. Qualora non ci fosse interferenza sull'alloggiamento volano occorre bloccare il cuscinetto con "loctite" (o similare) sull'anello esterno per evitarne lo sfilamento.

c) Posizionare la corona dentata sul centraggio del volano e stringere le viti di fissaggio.

d) Posizionare il gruppo accoppiatore sul motore facendo attenzione ad inserire i denti del disco frizione nelle cave della corona dentata senza danneggiarli e ad infilare il cuscinetto pilota con l'estremità dell'albero facendo scorrere la frizione verso il motore sino a quanto possibile.

e) Montare le viti di fissaggio della campana serrandole gradualmente a croce.

f) Posizionare la leva di comando e disinnestare la frizione verificando che le uscite dell'accoppiatore ruotino liberamente.

USO

- Accoppiatori con frizione "BD" o "BDS"

La frizione deve essere innestata unicamente con il motore al minimo o comunque non al disopra dei 1000 giri/1'.

L'innesto deve essere effettuato velocemente. Non fermarsi con la leva in posizione intermedia.

Le stesse norme valgono per il disinnesto.

MANUTENZIONE

- Gli accoppiatori sono forniti senza olio. Prima della messa in funzione procedere al riempimento sino al massimo indicato sull'asta di livello.
- Usare olio per ingranaggi con additivi EP, indice di viscosità minimo 95.
Il tipo di olio può essere selezionato, in funzione della temperatura ambiente, sulla tabella A.
- Effettuare il primo cambio olio dopo 50 ore di funzionamento; i successivi ogni 1000 ore di funzionamento (in ogni caso non oltre i 12 mesi).
- Controllare periodicamente il livello olio.
- Assicurarsi che la temperatura dell'olio non superi, in esercizio, i 105°C.
- Per la lubrificazione delle frizioni usare grasso al litio di consistenza NLGI-2. I punti di lubrificazione, con riferimento alle figure 5-6-7, sono i seguenti:
 - a) albero di comando (A25, Fig. 5): ingrassare ogni 300 ore.
 - b) Collare di comando (A11, Fig. 5): ingrassare ogni 300 ore sulle frizioni "BD 145", "BD 290", "BDS 145", "BDS 290". Su queste frizioni l'ingrassatore (A11) è posizionato sul collare di comando (A10) ed è raggiungibile solo togliendo il coperchio di ispezione (A19).
Sulle frizioni "BD 2000", "BD 3300", "BDS 2200", "BDS 3300": l'ingrassatore (A11) è posizionato sull'esterno della campana (A16) ed occorre ingrassare ogni 100 ore.
 - c) Levette di comando (A43) (solo su "BD 2200", "BD 3300", "BDS 2200", "BDS 3300"): ingrassare ogni 600 ore.
 - d) Cuscinetti in entrata per "BDS 2200", "BDS 3300", (C12, Fig. 7): ingrassare ogni 100 ore; l'ingrassatore è sull'esterno della campana (C11, Fig. 7).
- Regolazione della frizione (accoppiatori "AM... BD...", "AM... BDS...").
La corretta regolazione della frizione è fondamentale per ottenere una durata soddisfacente della stessa ed è responsabilità dell'operatore verificarla periodicamente.
La regolazione della frizione (o la verifica) va' effettuata unicamente a motore fermo.
Con riferimento alle Fig. 1, Fig. 5:
togliere il coperchio di ispezione (A19) e, con la frizione innestata, misurare con uno spessimetro la distanza A (Fig. 1).
Qualora tale distanza sia superiore a 1,3 mm occorre procedere alla regolazione della frizione riportando il valore di A a $0,5 \div 0,7$ mm nel seguente modo:
disinserire la frizione spingendo la leva (A13) in direzione opposta al motore, fare arretrare con un cacciavite il perno (A36), ruotare il dispositivo di regolazione (A34) in senso orario, battendolo, con un martello ed un' asta di metallo tenero, per un numero di tacche sufficienti a ripristinare la corretta regolazione della frizione.

RICAMBI

Per ordinare i ricambi specificare il tipo di accoppiatore, il rapporto, il numero di serie, il numero di riferimento dell'esplosivo e la quantità.

GENERAL INFORMATION

- The motion is transmitted by the pump drive central shaft to the lateral shafts which operate the pumps.
- The rotation direction of the outputs is opposite to that of the input shaft.
- Coupling with the pumps is done by means of splined sleeves.

INSTALLATION

- The working position of the pump drive is as shown on the catalogue. For a different position call upon Technodrive technical service.
- Mounting on a bracket system.
In case of direct connection to the flywheel housing of the diesel engine, the pump drive must be firmly mounted with a bracket system to the base to which the engine is also bracketed.
When a pump drive is independently mounted with a clutch "BDS 145" or "BDS 290" it is necessary to fit bracket supports on the pump drive sides and also on the clutch sides.
For the models with clutch "BDS 2200" and "BDS 3300" bracketing should be done onto the lateral pump drive surfaces and on the match diam. 205 mm on the input side of the clutch.
- Pump assembly:
The pump drive is supplied with the pump supports already assembled onto the pump drive outputs.
If a pump support must be dismantled for replacement, particular attention should be given to the new support as it must not axially load the bearings (there must be a clearance of $0.10 \div 0.20$ mm between the bearing external ring and the pump support).
The connecting sleeves of the pumps must be assembled with their retaining rings, or with the fixing screw and washer, on the pump shaft top; check that axial loads are not produced on the shafts caused by incorrect positioning of a retaining ring.
The oil sealing is guaranteed on the pump holder by an O-ring or a gasket.
- The pump drive is supplied without oil.
Before start up, fill it up to the maximum level indicated by the oil dipstick.
For the pump drives equipped with a cooling system, check the oil level again after the pump drive has been started and the exchanger and pipings have been filled.
- For the pump drives equipped with a cooling system, check that the rotation direction at the pump drive input is as expected for the oil circulating pump; if not, invert the wirings to the pump.
- Ensure that the oil temperature, when operating, is no higher than 105°C.
If the temperature is higher, select a more efficient cooling system for the pump drive.
- The input shaft of the pump drive, both versions "B" and "BDS", will not bear radial or axial loads. For this reason the pulley drive should not be used.
- The pump drive with clutch "BDS" must be driven by a coupling not producing radial or axial load on the shaft.

The coupling flange is to be heated when being mounted on the clutch shaft.

The useful length of the coupling flange hole must be bigger than the useful length of the clutch shaft; the coupling flange must be axially fixed by a screw and a washer on the shaft top.

Carefully align when connecting to the input shaft of the clutch.

- For the assembly of the pump drives with "BD" clutch proceed as follows:

- a) The clutch is supplied in engaged position and the operating lever is not mounted on; do not disengage until the assembly to the engine is finished.
- b) Place the pilot bearing on the engine flywheel bore. The pilot bearing must be double screen type and greased for life-time. The pilot bearing is usually mounted with interference on the flywheel housing and clearance on the clutch shaft. If there is no interference on the flywheel housing, the bearing should be blocked with "loctite" sealant (or similar product) on the external ring to prevent it slipping off.
- c) Place the crown wheel on the flywheel centering and tighten the fixing screws.
- d) Place the pump drive set on the engine, paying attention when inserting the teeth of the clutch disk in the crown wheel slots, without damaging them, and when inserting the pilot bearing with the shaft making the clutch slip towards the engine as much as possible.
- e) Fit the fixing screws of the housing and gradually cross-tighten them.
- f) Place into right position the operating lever and disengage the clutch by checking that the pump drive outputs rotate freely.

USE

- Pump drives with clutch "BD" or "BDS".

The clutch must be engaged only with the engine idling or, however, not more than 1000 rpm.

The engagement must be quickly effected.

Do not hesitate with the operating lever in an intermediate position.

The same recommendations must be applied for disengagement.

MAINTENANCE

- The pump drives are supplied without oil.

Before their start up fill them up to the maximum level indicated by the oil dipstick.

- Use oil for gears with EP additives, minimum viscosity index 95.

Oil type can be chosen, depending on the ambient temperature, on Table A.

- Effect the first oil replacement after 50 working hours; next ones each 1000 working hours (or, at the longest, every 12 months).

- Periodically check the oil level.

- Ensure that the oil temperature, when working, is not higher than 105°C.

- For clutches lubrication use lithium grease with consistency NLGI-2.

Lubrication points, referred to Fig. 5-6-7, are the following:

a) Cross shaft (A25, Fig. 5): lubricate each 300 hours.

b) Drive sleeve (A11, Fig.5): lubricate each 300 hours on clutches "BD 145", "BD 290", "BDS 145", "BDS 290". On these clutches the grease nipple (A11) is located on the drive sleeve (A10) and is possible to be accessed only by taking the inspection cover (A19) off. On clutches "BD 2200", "BD 3300", "BDS 2200", "BDS 3300": the grease nipple (A11) is located on the outside of the housing (A16) and greasing is required each 100 working hours.

c) Control levers (A43) (only on "BD 2200", "BD 3300", "BDS 2200", "BDS 3300"): lubricate every 600 working hours.

d) Input shaft bearings for "BDS 2200", "BDS 3300", (C12, Fig. 7): lubricate each 100 working hours; the grease nipple is on the outside of the housing (C11, Fig. 7).

- Clutch adjustment (pump drives "AM...BD...", "AM...BDS...").

A correct adjustment of the clutch is of fundamental importance to obtain a satisfactory duration of the same and it is the responsibility of the operator to check it periodically.

The clutch adjustment (or checking) must only be effected with the engine stopped.

Referring to Fig. 1, Fig. 5:

take the inspection cover (A19) off and, with the clutch engaged, measure the distance A (Fig. 1) using a thickness gauge.

If such a distance is more than 1.3 mm it is necessary to adjust the clutch, by resetting distance A to 0.5 ÷ 0.7 mm in the following way: disengage the clutch by pressing the lever (A13) opposite to the engine, using a screwdriver move back the pin (A36), rotate the adjusting device (A34) clockwise, striking it with a hammer and a soft metal rod, for a number of lock grooves sufficient to reset the correct adjustment of the clutch.

SPARE PARTS

When ordering spare parts specify pump drive model, ratio, serial number, reference number indicated on the exploded view and desired quantity.

GENERALITES

- Le mouvement est transmis par l'arbre central de la boîte aux arbres latéraux qui commandent les pompes.

- Le sens de rotation des sorties est opposé à celui de l'arbre d'entrée.

- Le raccordement avec les pompes est réalisé au moyen des manchons cannelés.

INSTALLATION

- La position de travail de la boîte est celle indiquée dans le catalogue.

Pour des positions autres s'adresser au Service Technique TECHNODRIVE.

- Bridage

Dans le cas d'accouplement direct sur la cloche couvre-volant du moteur diesel, la boîte doit être bridée solidement au même soubassement que le moteur.

Dans le cas de montage indépendant d'une boîte avec embrayage type "BDS 145" - "BDS 290", il faut brider non seulement sur les plans latéraux de la boîte mais aussi sur les plans latéraux de l'embrayage.

Pour les modèles avec embrayage type "BDS 2200" et "BDS 3300", il faut brider sur les plans latéraux de la boîte et sur le centrage Ø 205mm du côté de l'arbre d'entrée de l'embrayage.

- Montage de pompes:

La boîte est fournie avec les supports de pompe montés sur les prises.

En cas de nécessité de démontage d'une prise de pompe pour la remplacer par une autre, il faut faire attention à ce que le nouveau support ne charge pas les roulements en direction axiale (entre la bague externe du roulement et le support de la pompe, il doit y avoir un jeu de $0,10 \pm 0,20\text{mm}$).

Les manchons de raccordement des pompes doivent être montés avec leurs bagues d'arrêt ou avec vis et rondelles de fixation en tête de l'arbre de pompe, en faisant attention à ce qu'il n'y ait pas création de charges axiales sur les arbres provoquées par la position erronée d'une bague d'arrêt.

La tenue de l'huile est réalisée sur le support de la pompe à l'aide d'un joint torique ou d'une garniture.

La boîte est livrée sans huile.

Avant la mise en service, procéder au remplissage de l'huile jusqu'au niveau maximum indiqué sur la jauge.

Pour les boîtes équipées de système de refroidissement, il faut vérifier le niveau de l'huile après avoir fait démarrer la boîte et rempli l'échangeur et les conduites.

- Dans le cas de boîtes équipées de systèmes de refroidissement, s'assurer que le sens de rotation à l'entrée de la boîte soit le même que celui prévu pour la pompe de circulation d'huile; dans le cas contraire inverser les raccordements de la pompe.

S'assurer que la température en exercice ne dépasse pas les 105°C.

Si cette limite devait être dépassée, il faut prévoir un système de refroidissement plus efficace de la boîte.

- L'arbre d'entrée des boîtes dans la version "B" tout comme dans la version "BDS" n'accepte pas de charges radiales ou axiales.

L'entraînement au moyen de poulies est donc déconseillé.

- Les boîtes avec embrayage "BDS" doivent être actionnées au moyen d'un accouplement qui ne provoque pas de forces radiales ou axiales sur l'arbre.

Le montage du demi-accouplement sur l'arbre de l'embrayage doit être effectué à chaud.

Le demi-accouplement doit avoir une longueur d'alésage supérieure à celle de l'arbre et il doit être fixé axialement en tête de l'arbre et à l'aide d'une vis et d'une rondelle.

Veiller à l'alignement lors du raccordement à l'arbre d'entrée de l'embrayage.

- Pour le montage des boîtes avec embrayage "BD" procéder comme suit:

a) L'embrayage est livré dans la position embrayée avec le levier de commande démonté, ne pas débrayer tant que le montage sur le moteur n'est pas terminé.

b) Positionner le roulement pilote sur l'emplacement du volant. Le roulement pilote doit avoir deux déflecteurs et doit être graissé à vie (type 2RS).

Le roulement pilote est généralement monté avec interférence sur le siège du volant et avec du jeu sur l'arbre de l'embrayage.

Dans le cas d'absence d'interférence sur le siège du volant, il faut bloquer le roulement au moyen de loctite (ou similaire) sur la bague externe pour éviter sa sortie.

c) Positionner la couronne d'entrée sur le centrage du volant et serrer les vis de fixation.

d) Positionner le groupe embrayage sur le moteur en faisant attention de ne pas endommager les dents du disque d'embrayage lors de leur introduction dans les rainures de la couronne dentée et d'enfiler le roulement pilote avec l'extrémité de l'arbre en faisant coulisser l'embrayage en direction du moteur tant que cela est possible.

e) Monter les vis de fixation de la cloche en les serrant graduellement en croix.

f) Positionner le levier de commande et se mettre en position débrayée pour vérifier que les sorties de la boîte tournent librement.

EMPLOI

- Boîtes avec embrayages type "BD" ou "BDS"

N'embrayer que si le moteur tourne au minimum ou ne dépasse pas les 1000 tours/minute.

L'embrayage doit être effectué rapidement et fermement.

Ne pas s'arrêter avec le levier en position intermédiaire.

Les mêmes règles sont valables pour le débrayage.

ENTRETIEN

- Les boîtes sont livrées sans huile.

Avant la mise en service, procéder au remplissage de l'huile jusqu'au niveau maximum indiqué sur la jauge.

- Utiliser de l'huile pour engrenages avec additifs EP, indice de viscosité minimum 95.

Pour la sélection du type d'huile en fonction de la température ambiante, consulter le tableau A.

- Effectuer la première vidange après 50 heures de fonctionnement et les vidanges suivantes toutes les 1000 heures de fonctionnement (dans tous les cas ne jamais laisser passer plus de 12 mois).

- Effectuer un contrôle périodique du niveau d'huile.

- S'assurer que la température de l'huile en exercice ne dépasse pas les 105°C.

- Pour la lubrification des embrayages, utiliser de la graisse au lithium de consistance NL-GI-2

Les parties à lubrifier indiquées sur les figures 5-6-7 sont les suivantes:

Arbre de commande (A25, fig.5), graisser toutes les 300 heures.

Pour les embrayages "BD 145" - "BD 290" - "BDS 145" - "BDS 290" le graisseur (A11) est positionné sur le collier de commande (A10)

et l'on ne peut y accéder qu'en retirant le couvercle d'inspection (A19), et le graissage est recommandé toutes les 300 heures. Pour les

embrayages "BD 2200" - "BD 3300" - "BDS 2200" - "BDS 3300", le graisseur est positionné sur la partie externe de la cloche (A16) et le

graissage est recommandé toutes les 100 heures.

- Levier de commande (A43) sur "BD 2200" - "BD 3300" - "BDS 2200" - "BDS 3300" (uniquement) graisser toutes les 600 heures. Roulement en entrée pour "BDS 2200" - "BDS 3300" (C1, fig. 7) graisser toutes les 100 heures; le graisseur est situé sur la partie externe de la cloche (C11 fig. 7).
- Réglage de l'embrayage (boite "AM...BD", "AM...BDS...").

Un réglage correct de l'embrayage est fondamental pour une durée de vie satisfaisante de ce dernier.

L'opérateur est responsable de son contrôle périodique.

Le réglage de l'embrayage (ou son contrôle) ne peut être effectué que si le moteur est à l'arrêt. Référence fig. 1 et fig. 5: retirer le couvercle d'inspection (A19), embrayer et mesurer à l'aide d'un jeu de câles la distance A (fig. 1).

Si cette distance dépasse 1,3mm, il faut régler l'embrayage en abaissant la valeur de A à $0,5 \pm 0,7$ mm, en procédant comme suit:

- débrayer en poussant le levier (A13) dans la direction opposée du moteur,
- faire reculer le pivot (A36) au moyen d'un tournevis,
- faire tourner le dispositif de réglage (A34) dans le sens de aiguilles d'une montre, en utilisant un marteau et une tige en métal tendre, la rotation doit être d'un nombre de crans suffisants pour obtenir le réglage correct de l'embrayage.

PIÈCES DÉTACHÉES

Pour les commande de pièces détachées, veuillez spécifier la type de la boîte, le rapport, le numéro de série, le numéro de rep.de l'éclaté ainsi que la quantité.

OLIO - OIL - HUILE

Temperatura ambiente Ambient temperature Temperature ambiante		-20°C/+5°C	+5°C/+40°C	-30°C/+65°C
Viscosità Viscosity Viscosité	ISO 3448	VG 100	VG 150	VG 150 - 220
	IV min	95	95	165
AGIP		BLASIA 100	BLASIA 150	BLASIA 220
BP MACH		GR XP 100	GR XP 150	SGR XP 220
CASTROL		ALPHA SP 100	ALPHA SP 150	ALPHA SN 6
ELF		REDUCTELF SP 100	REDUCTELF SP 150	ORITIS 125 MS
ESSO		SPARTAN EP 100	SPARTAN EP 150	C. OIL LG 150
I.P.		MELLANA 100	MELLANA 150	TELESIA OIL 150
SHELL		OMALA OIL 100	OMALA OIL 150	
TOTAL		CARTER EP 100N	CARTER EP 150	

Tab. A

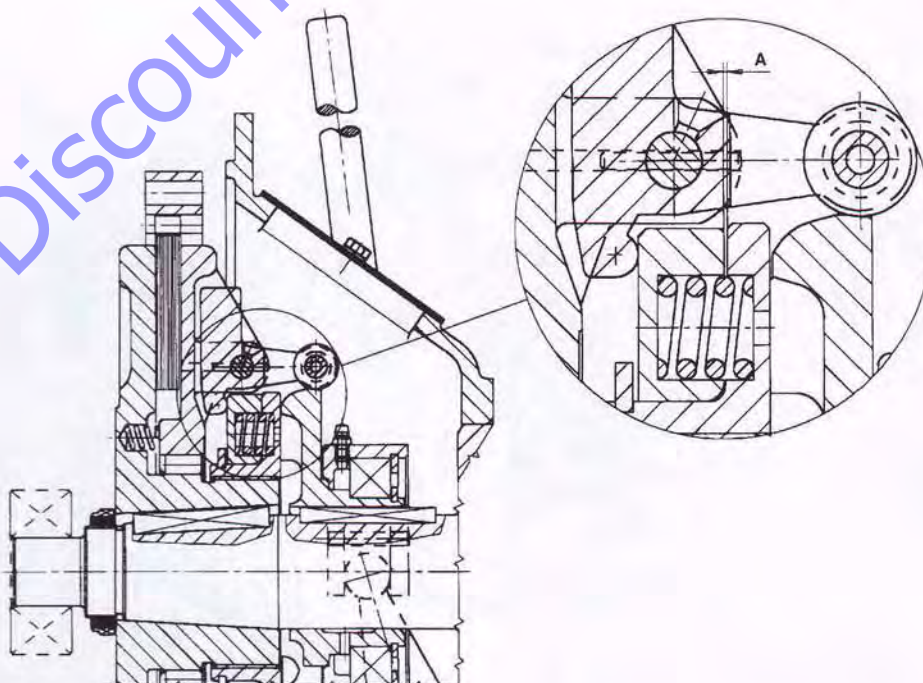


Fig. 1

Accoppiatori a 2 prese
 Double pump drives
 Boites 2 sorties

- AM 216B
- AM 220B
- AM 230B
- AM 232B

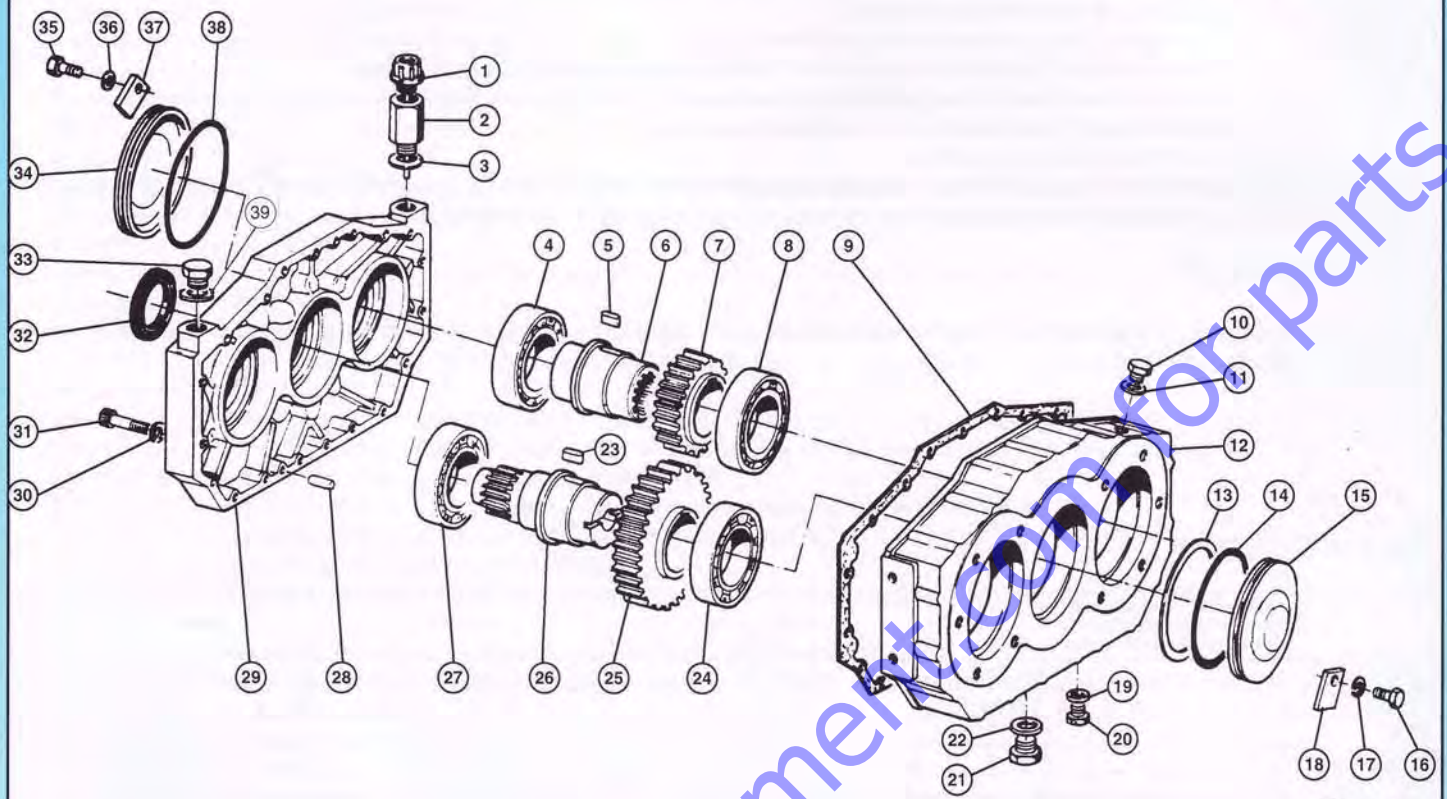


Fig. 2

Accoppiatori a 3 prese
 Triple pump drives
 Boites 3 sorties

- AM 320B
- AM 330B
- AM 345B
- AM 365

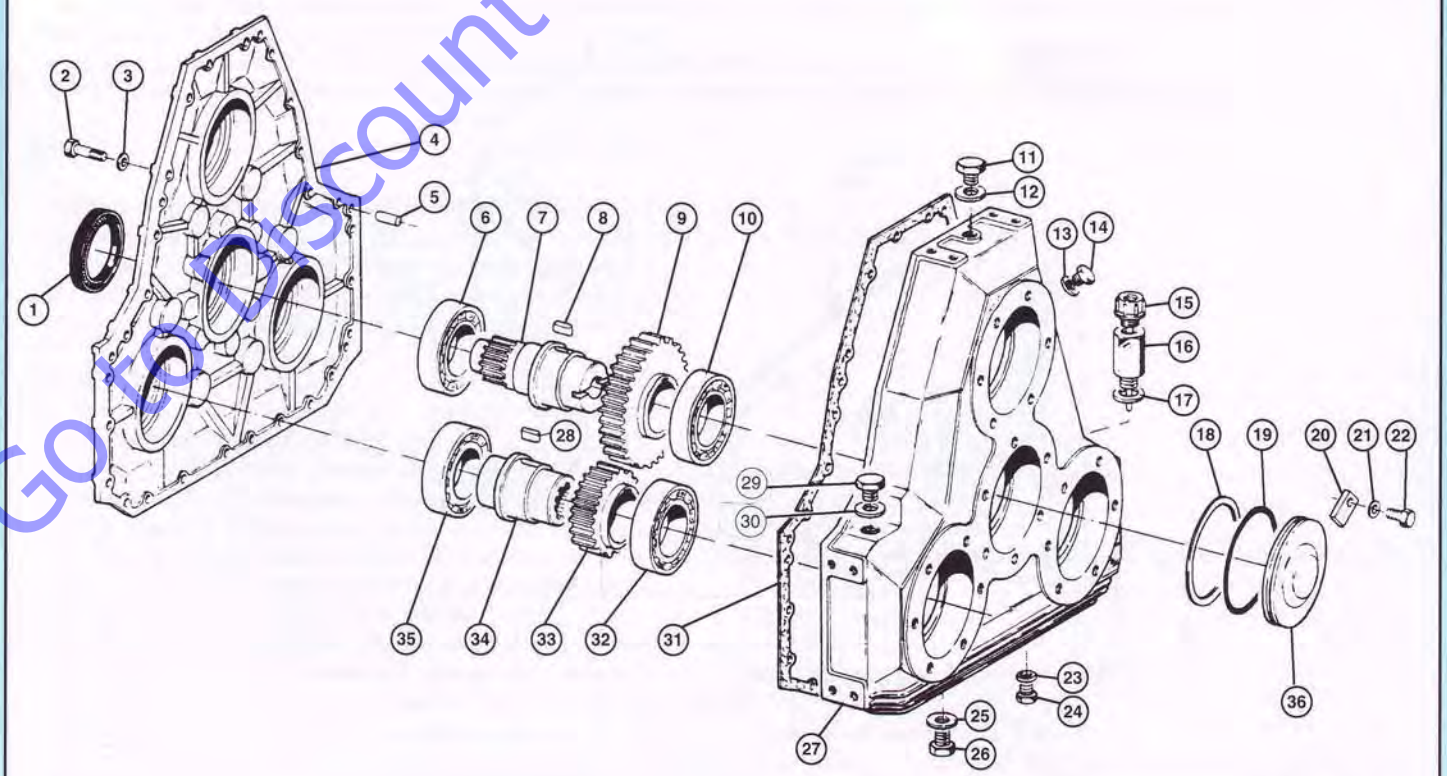


Fig. 3

Accoppiatore a 4 prese
 Four pump drive
 Boite 4 sorties

AM 450

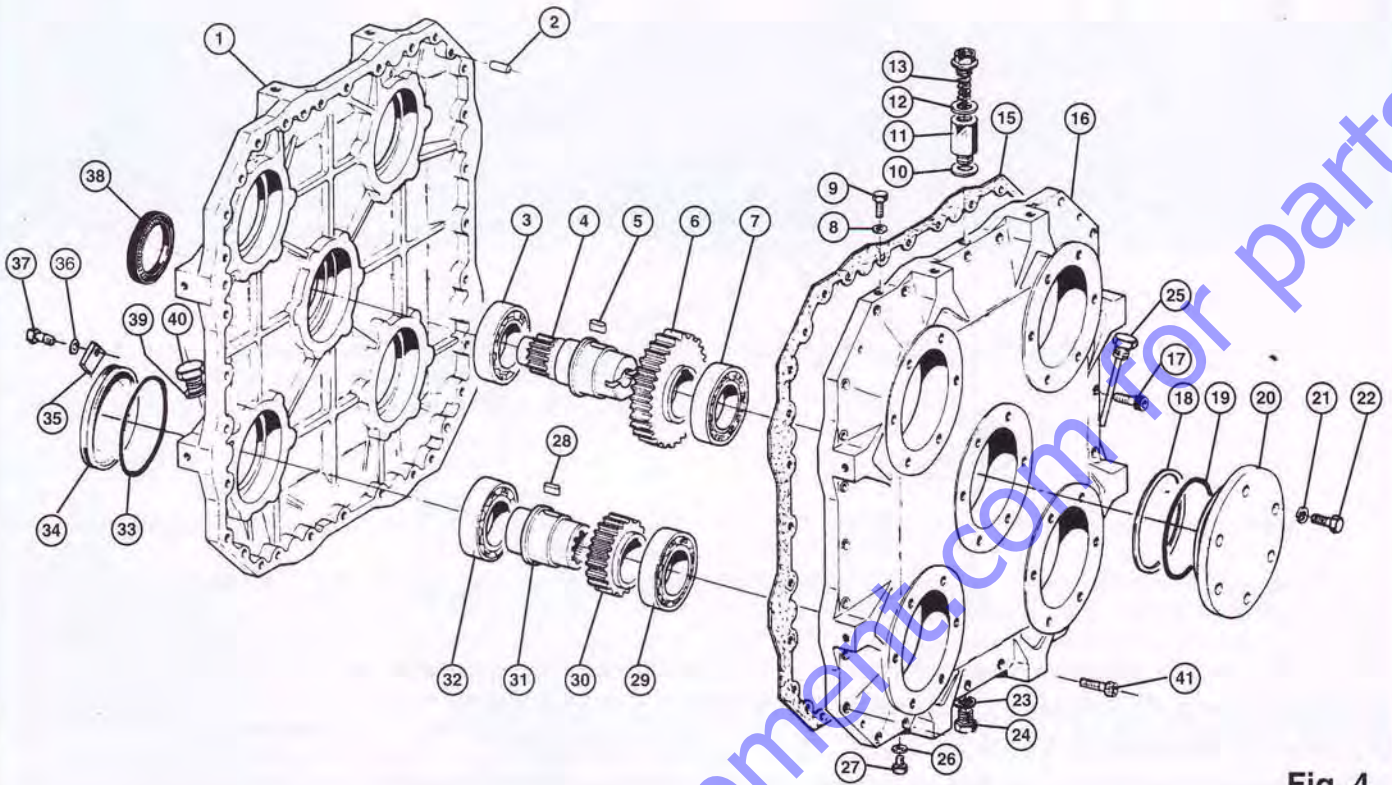


Fig. 4

Accoppiatori con frizione
 Clutch driven pump drives
 Boites de repartition avec embrayage

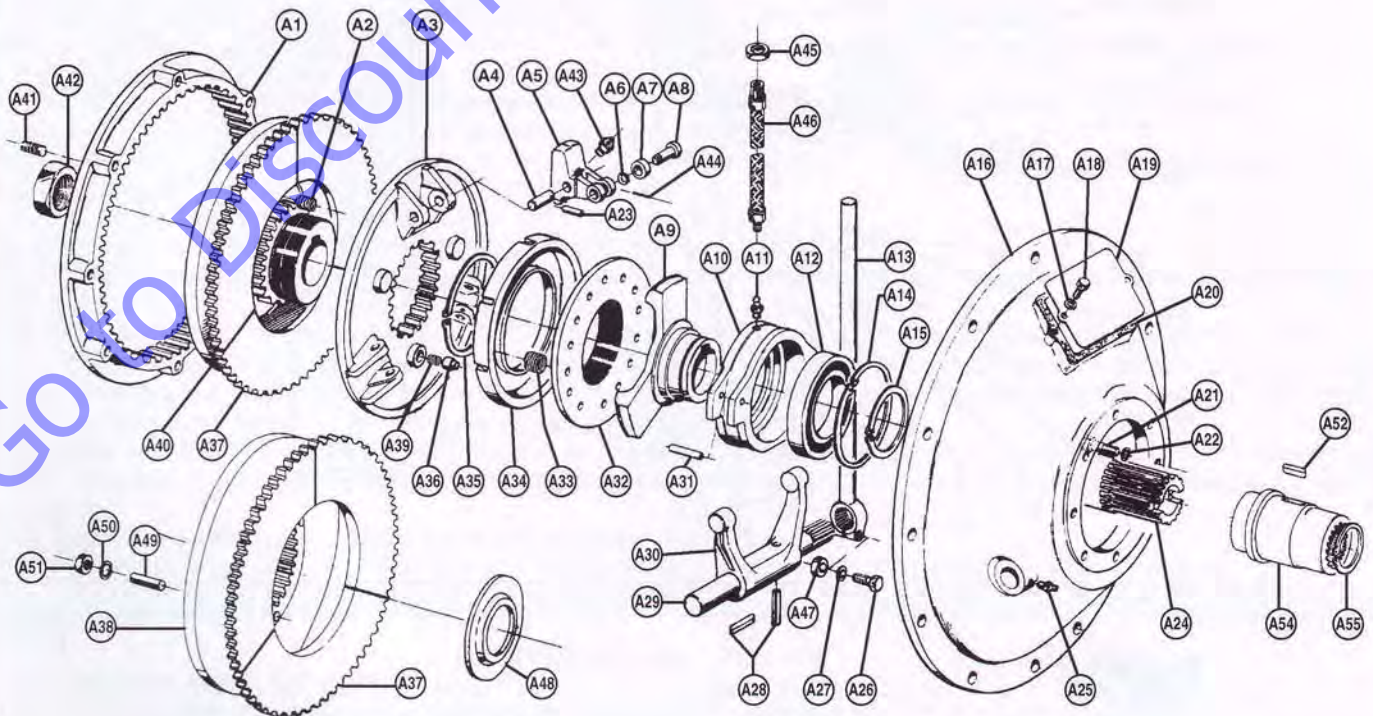


Fig. 5

Accoppiatori con frizione "BDS 145", "BDS 290".
 Clutch driven pump drives, "BDS 145" and "BDS 290" versions.
 Boites de repartition avec embrayage "BDS 145", "BDS 290".

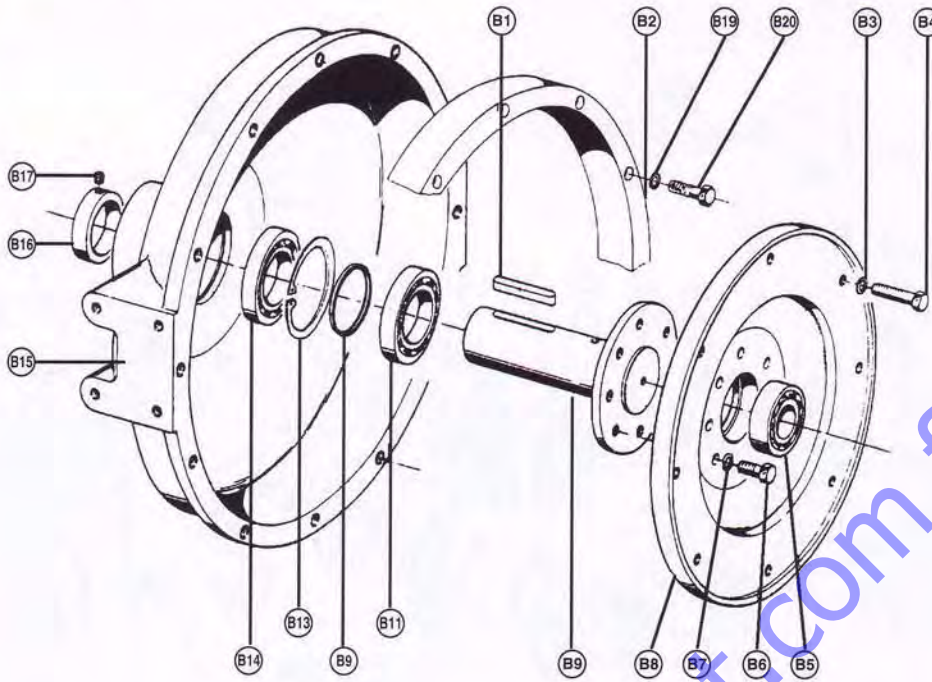


Fig. 6

Gruppo albero di entrata: valido per "BDS 2200" e "BDS 3300"
 Input shaft assembly: valid for "BDS 2200" and "BDS 3300"
 Grupe arbre d'entrée pour les modeles "BDS 2200" et "BDS 3300"

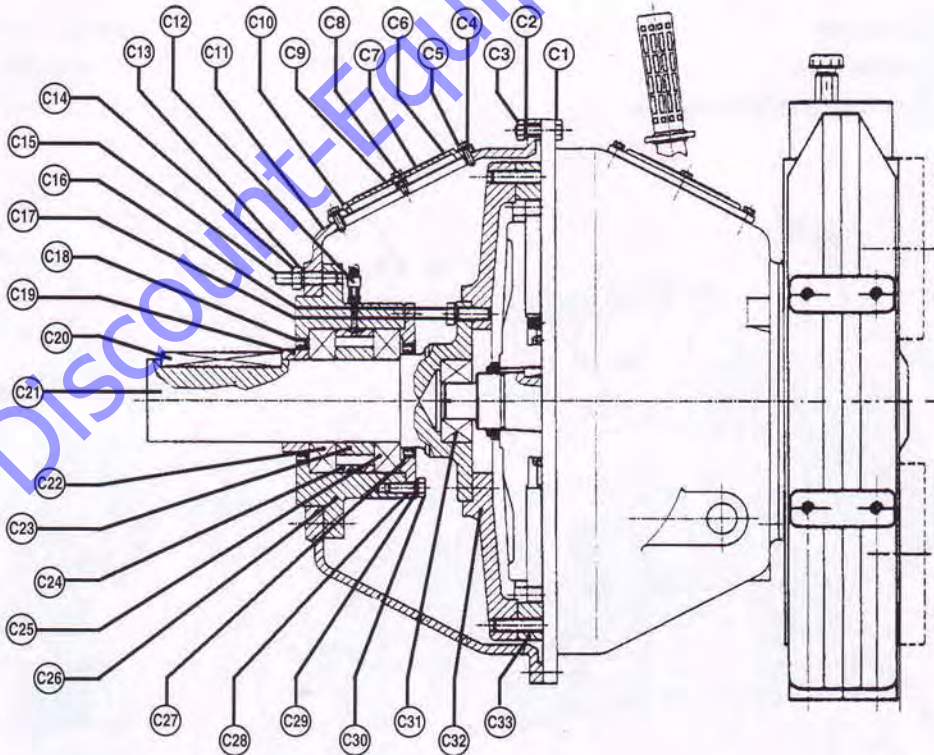


Fig. 7

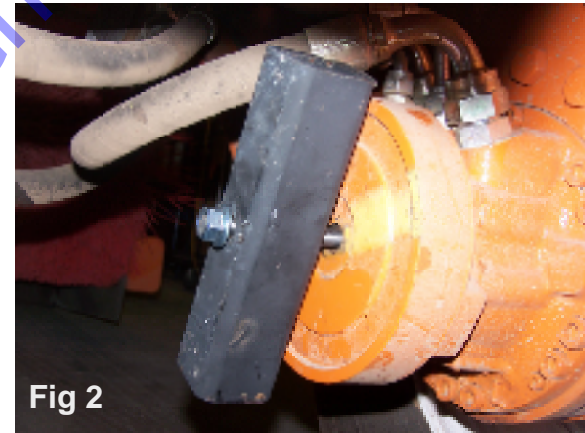


TWIN DISC TECHNODRIVE S.r.l.
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 Tel. 0039.051/6819711 - Fax 0039.051/6824234 - 6825814
 Email: info@technodrive.it
 Internet: www.technodrive.it

Broce MK-1 Rear Drive Motor Emergency Brake Release Procedure

This procedure to be used only under emergency or service situations such as, moving a disabled vehicle to a safe location.

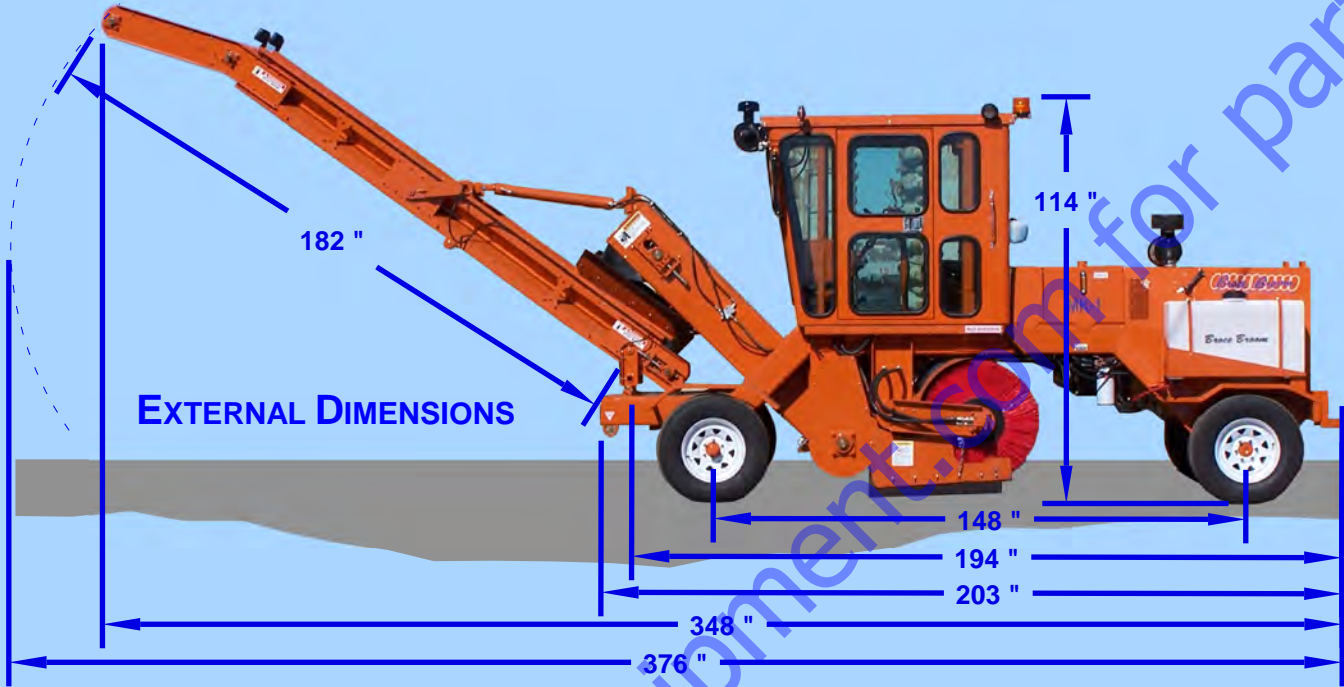
1. Shut off engine and block wheels to prevent vehicle from rolling.
2. Remove Rubber Dust Plug in rear Drive Motors (Fig 1)
3. Install Brake Release Tool in Drive Motor (Fig 2)
4. Tighten 12mm nut to release brakes (Fig 3)
5. Brake Release Tool must be removed for safe normal operation
6. Reinstall Rubber Dust Plug



WARNING

Vehicle will roll freely with Brake Release Tool installed. Vehicle braking ability will be greatly reduced or disabled. Serious injury or death can occur.

BROCE MK-1 MODEL TRANSFER SWEEPER



FRONT AXLE	CG	REAR AXLE
5,910 LBS.	10,260 LBS. TOTAL	4,350 LBS.
WEIGHTS (EMPTY WATER TANKS, NO OPERATOR)		

PARTS FINDER

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We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, Stow, Wacker, Sakai, Mi-T-M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, Amida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, APT, Wylie, Ingersoll Rand / Doosan, Innovatech, Con X, Ammann, Mecalac, Makinex, Smith Surface Prep, Small Line, Wanco, Yanmar