FINN®
CORPORATION
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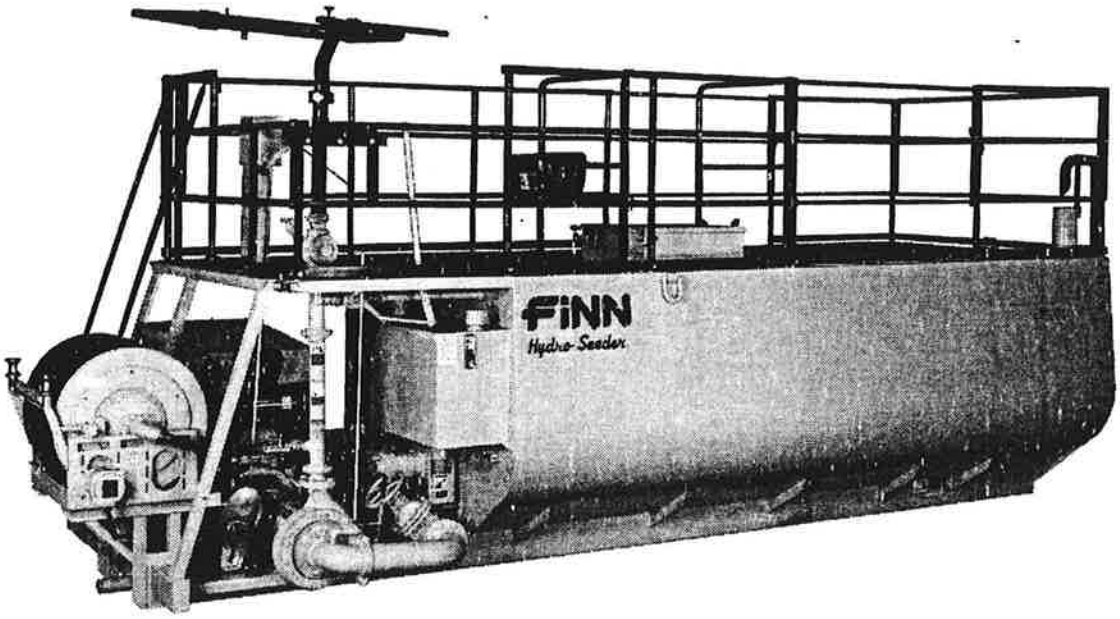

T280/330 HydroSeeder® Parts Manual

Model SS Serial No. _____

WARRANTY

Finn warrants to the original Purchaser for use (or rental to others for use) all new construction machinery and attachments therefore manufactured by Finn to be free from defects in material and workmanship for a period of 12 months from date of purchase or 1200 hours of use, whichever comes first. Replacement parts provided under the terms of this warranty are warrante for the remainder of the warranty period applicable to the product in which installed, as if such parts were original components of that product. Finn makes no warranty with respect to (a) allied equipment or trade accessories not manufactured by it (such as, but not limited to tires, ignitions, starters, hose, batteries, magnetos, carburetors, engines or like or unlike equipment or accessories), such being subject to the warranty, if any, provided by their respective manufactures; or (b) secondhand, used, altered, or rebuilt machines. Further, the warranty herein expressed shall be rendered null and void to the extent any defect or failure of the products warranted hereby arises out of or is caused by accessories or component parts not manufactured or supplied by Finn, whether same are supplied by Purchaser, dealers or any other party. THE WARRANTY DESCRIBED IN THIS PARAGRAPH SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Upon notification of Finn during the above-stated warranty period of any failure to conform to this warranty, and upon inspection by Finn to verify said nonconformity and verify the continuing existence of the warranty period, Finn will provide a new part or a repaired part, whichever Finn elects, to replace the part found to be defective. Such parts will be provided without charge to the Purchaser during normal working hours at a place of business of a Finn dealer or other establishment authorized by Finn to effect said repairs or replacements, but Purchaser shall bear all costs of transporting the product to and from such place of business or establishment. Correction of nonconformities, in the manner and for the period time provided above, shall constitute fulfillment of all liabilities of Finn under this contract.

THE REMEDIES OF THE USER SET FORTH HEREIN ARE EXCLUSIVE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERABLE OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT TO THE PURCHASER. The essential purpose of this exclusive remedy shall be to provide the Purchaser with repair or replacement of parts that prove to be defective within the period and under the conditions previously set forth. This exclusive remedy shall not have failed of its essential purpose (as that term is used in the Uniform Commercial Code) provided Finn remains willing to repair or replace defective parts within a commercially reasonable time after it obtains actual knowledge of the existence of a particular defect.

IN NO EVENT SHALL FINN BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR INDIRECT DAMAGES, INCLUDING LOST PROFITS OR LOST COMMERCIAL OPPORTUNITIES, WITH RESPECT TO THE SALE OF THE ABOVE WARRANTED PRODUCT OR ANYTHING DONE IN CONNECTION THEREWITH, OR FOR PROPERTY DAMAGE SUSTAINED BY A PERSON CLAIMING TO BE A THIRD PART BENEFICIARY OF A SURVIVING WARRANTY UNDER THE LAW OF ANY JURISDICTION.

NOTICE

FINN CORPORATION URGES THE USE OF ONLY FINN CORPORATION SUPPLIED PARTS AND ATTACHMENTS TO ASSURE PROPER PERFORMANCE AND SAFE OPERATION OF FINN CORPORATION EQUIPMENT. INSIST ON PARTS AND ATTACHMENTS MANUFACTURED OR SUPPLIED BY FINN CORPORATION WHEN YOU PURCHASE, REPAIR OR REPLACE YOUR FINN EQUIPMENT AND ATTACHMENTS.

BECAUSE FINN CORPORATION CANNOT ASSURE THAT PARTS AND ATTACHMENTS NOT MANUFACTURED OR SUPPLIED BY FINN MEET FINN CORPORATION'S QUALITY STANDARDS, SPECIFICATIONS, OR OPERATING REQUIREMENTS, OUR WARRANTY IS NOT EFFECTIVE TO THE EXTENT ANY FAILURE OF OR DEFECT IN A FINN CORPORATION PRODUCT ARISES FROM OR IS CAUSED BY PARTS, ATTACHMENTS OR COMPONENTS NOT ORIGINATING WITH FINN CORPORATION. USE OF FINN CORPORATION EQUIPMENT WITH PARTS AND ATTACHMENTS NOT MANUFACTURED OR SUPPLIED BY FINN COULD RESULT IN PERSONAL INJURY.

Effective December 8, 1995

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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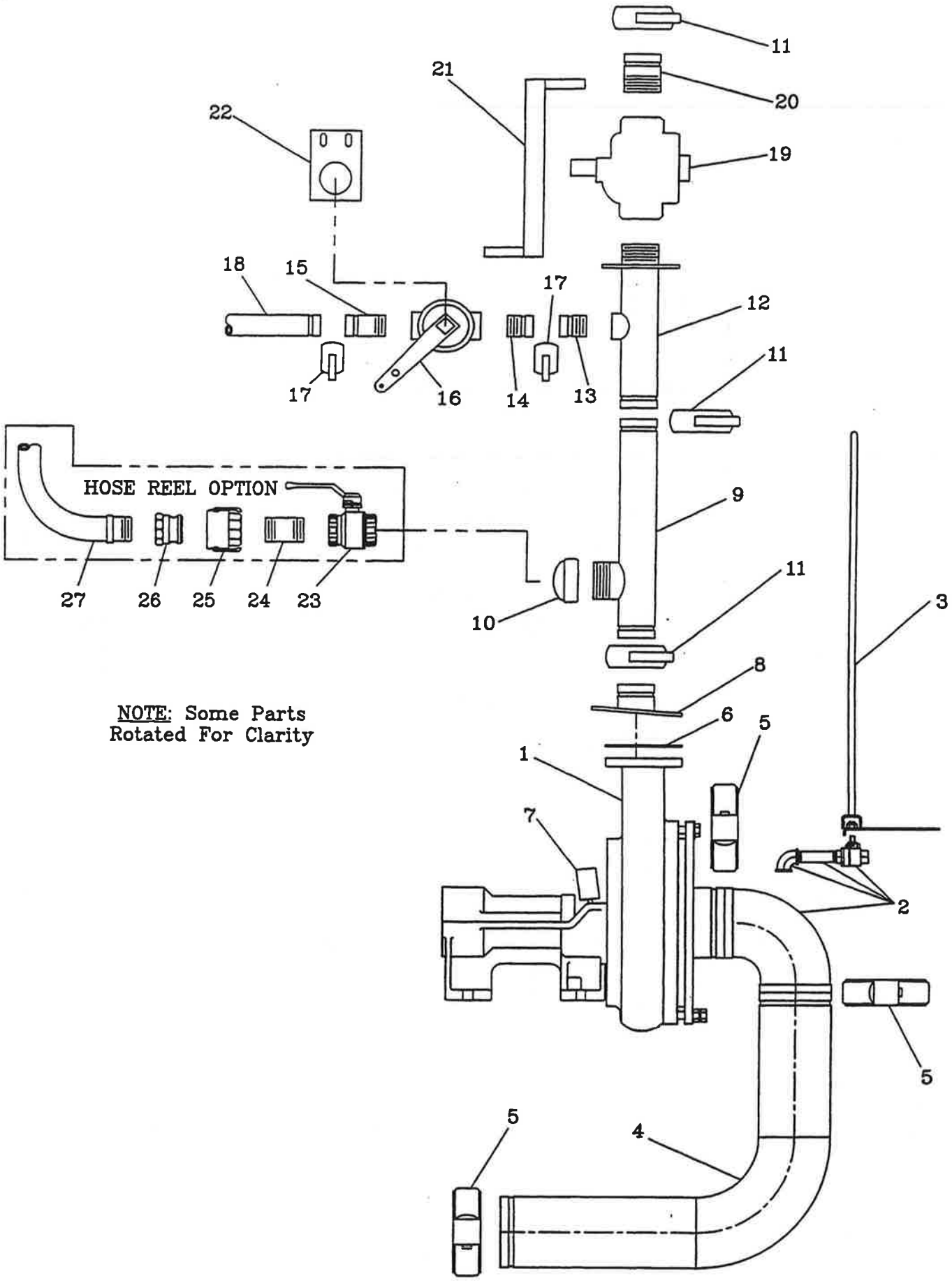

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

PUMP, PIPING, AND DISCHARGE ASSEMBLY

(See Page 6 For Discharge Boom)

Ref. No.	Part Number	Description	No. Req'd
1	011756	Pump Assembly (See pg. 7 for Parts)	1
2	012491	Suction Elbow/Bleed Valve Assembly	1
	012491-02	Suction Elbow	1
	160006	Pipe Elbow	1
	160428	Pipe Nipple	1
	012457	½" Bleeder Valve	1
3	012493-02	Bleeder Valve Handle	1
	012493-09	Handle Pad	1
4	012460	Suction Pipe	1
5	011736	Pipe Clamp	3
	011919	Seal, Pipe Clamp	3
6	011787	Discharge Flange Gasket	1
7	002383	Pressure Lubricator	1
	008189	Plunger	1
	008190	Screw, Nut, Follower and Spring	1
	160160	Coupling	1
	160389	Pipe Nipple	1
8	011726-08	Discharge Flange	1
9	011726-12	Lower Discharge Pipe	1
10	160263	Pipe Cap (Standard)	1
11	002771	Pipe Clamp	1
	002820	Seal, Pipe Clamp	3
12	011726-04	Upper Discharge Pipe	3
13	011727-09	Recirculation Nozzle	1
14	011727-10	Valve Inlet Nozzle	1
15	011727-11	Valve Outlet Nozzle	1
16	011776	Recirculation Valve	1
	011909	Handle	1
	004962	Lube Screw	1
	011950	Gasket	1
	011951	Spring	1
17	006721	Pipe Clamp	2
	006722	Seal, Pipe Clamp	2
18	012462	Recirculation Pipe	1
	005703-02	Recirculation Discharge Elbow	1
19	011777	Discharge Valve	1
	004962	Lube Screw	1
	011952	Gasket	1
	011953	Spring	1
20	011882	Discharge To Boom Connector	1
21	011822	Valve Control Foot Pedal	1
	Z0612SCP	Set Screw	2
22	F330-0011-01	Valve Stabilizer Plate	1
		HOSE REEL OPTION ONLY	
23	007710	Ball Valve	1
24	160568	Nipple	1
25	002158	Brass Male Adapter	1
26	001207	Male Adapter	1
27	012531	Lead-In Hose	1

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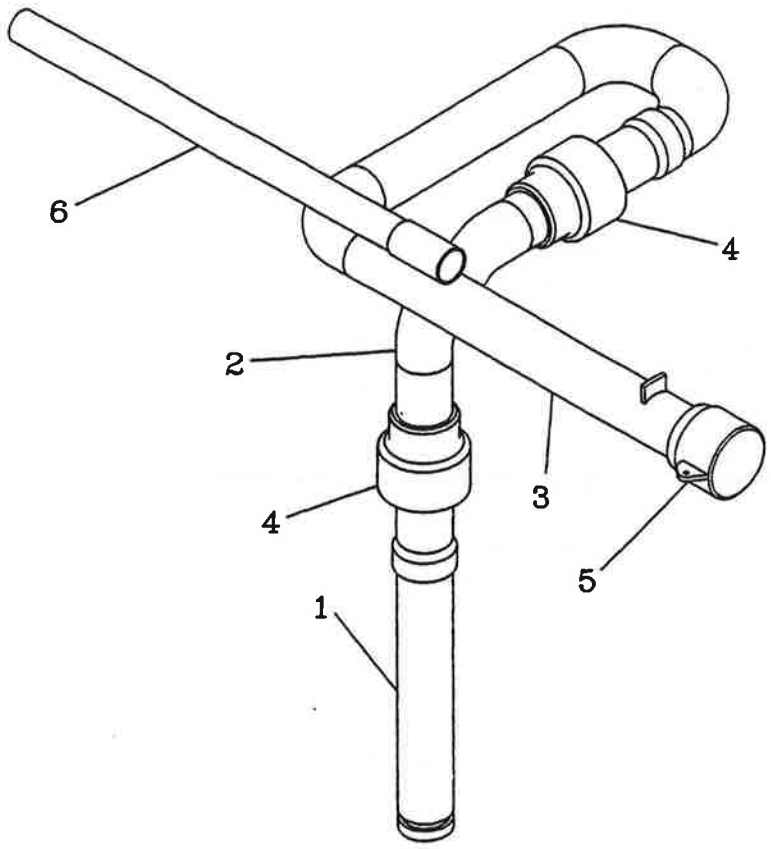
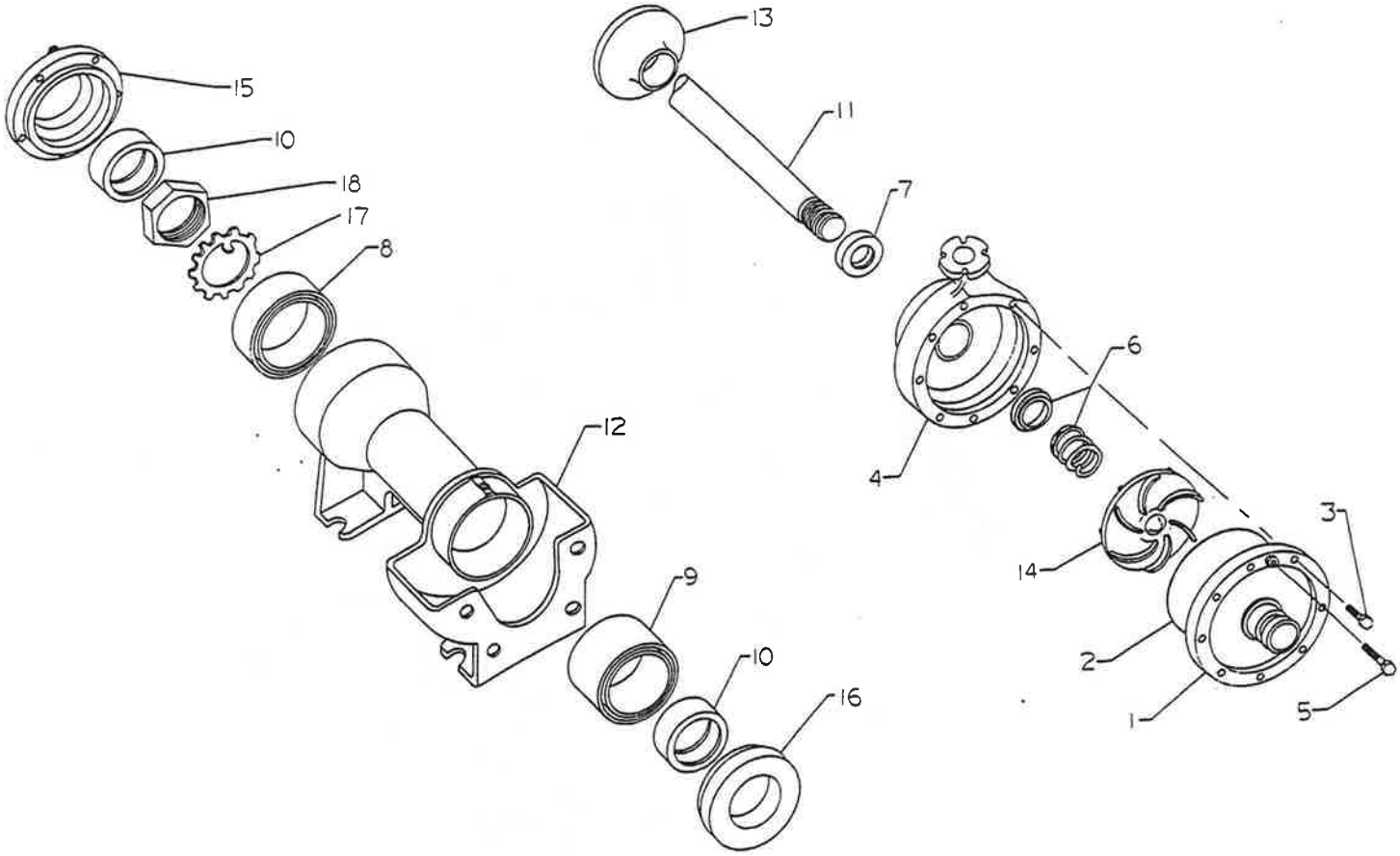


DISCHARGE BOOM ASSEMBLY

Ref. No.	Part Number	Description	No. Req'd
	012489	Discharge Boom Assembly Includes:	1
1	012489-16	Stand Pipe	1
2	012489-02	Lower Boom Pipe	1
3	012489-01	Upper Boom Pipe	1
4	012283	Swivel	2
5	010544	Brass Female Coupler	1
	006513	Gasket, Coupler	1
6	012489-19	Boom Handle	1
	011914	Knob, Handle Locking	1
	012397*	Swivel Repair Kit	2

*Not Included with Assembly #012489

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE



PUMP PARTS

Ref. No.	Part Number	Description	No. Req'd
	011756	Pump Assembly Consisting of:	1
1	011759	Suction Cover	1
2	011920	O-Ring, Suction Cover	1
3	X0824SS	Bolt, Suction Cover	12
4	011757	Pump Casing	1
5	X0828SS	Bolt, Adjusting	6
6	006443	Seal Assembly	1
7	006444	Seal, Grease Retainer	1
8	006446	Thrust Bearing	1
9	006445	Radial Bearing	1
10	006447	Seal, Grease Retainer	1
11	002945	Shaft	1
12	002960	Frame	1
13	006450	Slinger, Radial Bearing	1
14	011758	Impeller	1
15	002961	Retainer, Thrust Bearing	1
16	006537	Retainer, Radial Bearing	1
17	007366	Bearing Lock Washer	1
18	007367	Bearing Lock Nut	1

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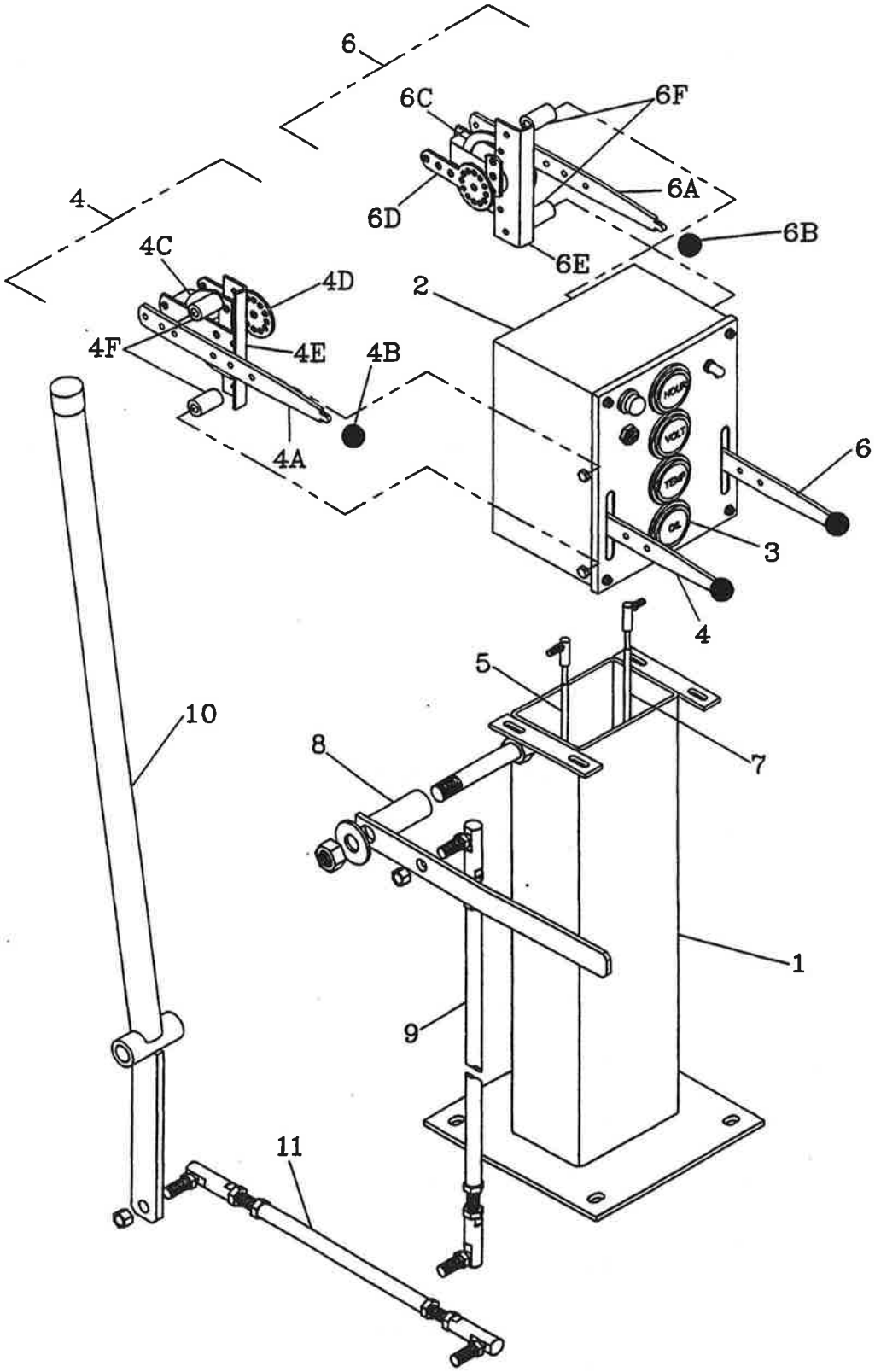

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

CONTROLS

Ref. No.	Part Number	Description	No. Req'd
	012566-02	Control Tower Assembly (Includes Items 1-7)	1
1	011795	Control Tower	1
2	F330-0026-01	Control Box w/ Cover (less components)	1
3		Gauges, Switches, and Tower Wiring Harness (Order Separately-See pages 16-17)	
4	008474	Throttle Control Assembly	1
4A	008475	Input Lever	1 per
4B	011954	Knob	1 per
4C	011912	Control Locking Unit	1 per
4D	011918	Output Lever	1 per
4E	011212	Mounting Bracket	1 per
4F	011796-05	Spacers	2 per
5	023639	Throttle Cable	1
	007675	Ball Joint	2
6	011785	Agitator Control Assembly	1
6A	008475	Input Lever	1 per
6B	011954	Knob	1 per
6C	011211	Control Locking Unit	1 per
6D	011918	Output Lever	1 per
6E	011212	Mounting Bracket	1 per
6F	011796-05	Spacers	2 per
7	006596	Agitator Control Cable	1
	007675	Ball Joint	2
8	011823	Clutch Control Handle	1
	000427	Handle Grip	1
9	011820	Clutch Control Linkage	1
	006737	Ball Joint	2
10	011051	Recirculation Valve Handle	1
	022871	Plastic Cap	1
11	011818	Valve Control Linkage	1
	006737	Ball Joint	2

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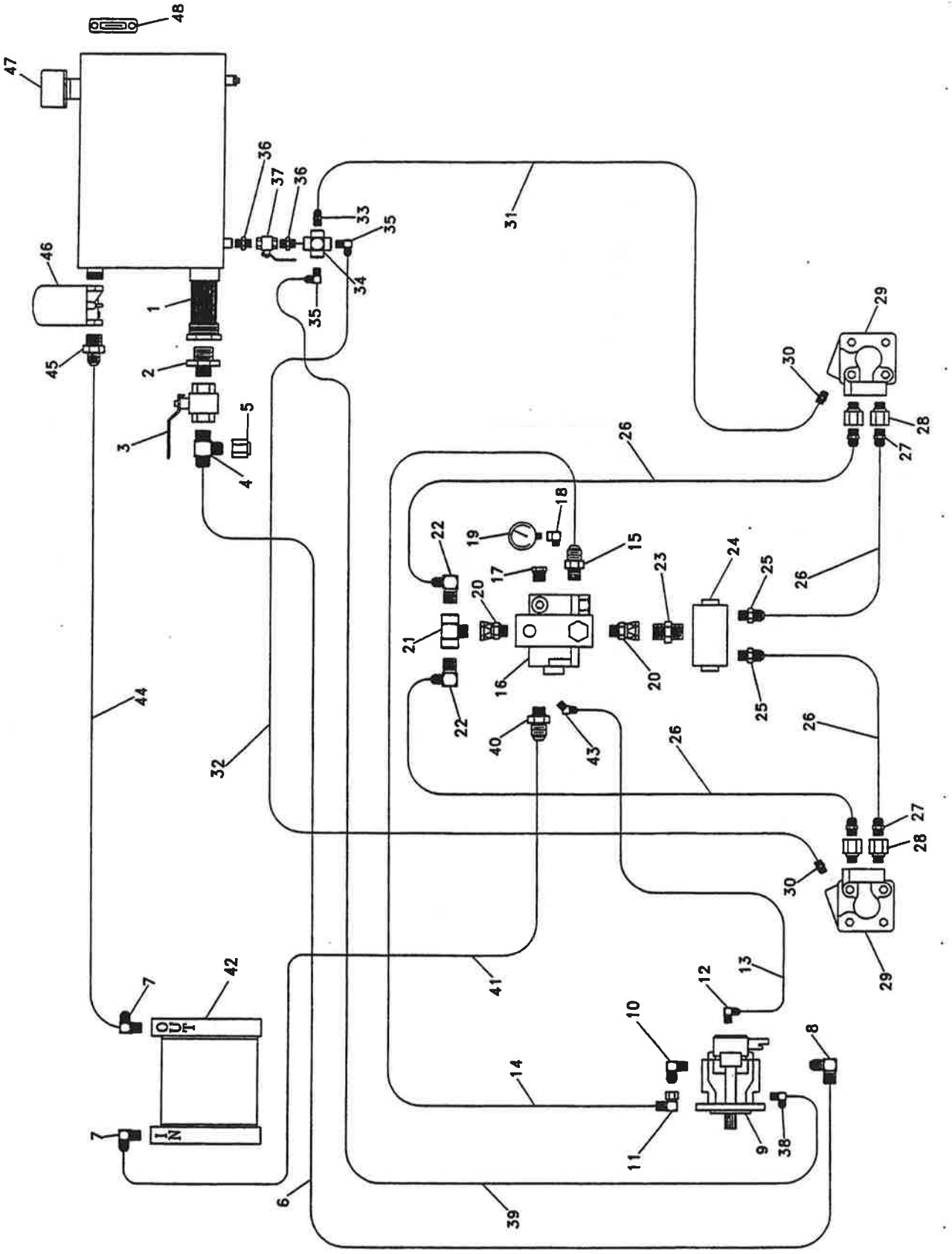
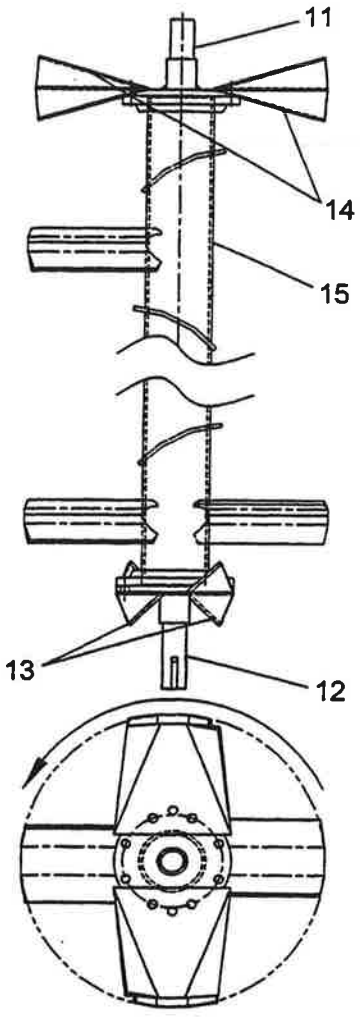


WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

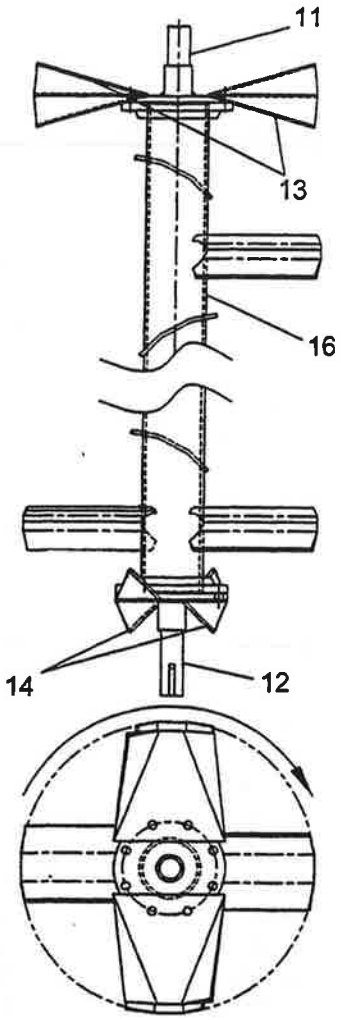
HYDRAULIC SYSTEM

Ref. No.	Part Number	Description	No. Req'd
1	011927	Suction Strainer	1
2	012361	Reducer Nipple	1
3	007710	Ball Valve	1
5	012359	Pipe Cap	1
6	012508	Suction Hose	1
7	023620	90° Male Adapter	2
8	012517	90° Male Adapter	1
9	011922	Hydraulic Pump	1
10	012088	Straight Adapter	1
11	FW71492	90° Adapter Union	1
12	055274	Male 90° Elbow Adapter	1
13	012511	Load Sensor Hose	1
14	012510	Pressure Hose	1
15	012087	Straight Male Adapter	1
16	012336	Hydraulic Valve	1
	012350-03	Hydraulic Valve Handle	1
17	012362	Plug	1
18	FW71892	90° Adapter Elbow	1
19	012044	Pressure Gauge	1
20	012357	Straight Adapter Union	2
21	011625	Female Run Tee	1
22	085013	Male 90° Adapter Elbow	2
23	023186	Straight Male Adapter	1
24	012334	Flow Divider	1
25	041053	Straight Male Adapter	2
26	012366	Hydraulic Motor Work Hose	4
27	055395	Straight Male Adapter	4
28	008562	Straight Male Adapter Union	4
29	012333	Hydraulic Motor	2
30	055308	Straight Male Adapter	2
31	012369	Case Drain Hose	1
32	012368	Case Drain Hose	1
33	055272	Straight Male Adapter	1
34	055271	Female Cross	1
35	055273	Male 90° Adapter Elbow	2
36	022263	Straight Male Adapter	2
37	012365	Ball Valve	1
38	FW65216	Straight Male Adapter	1
39	012509	Case Drain Hose	1
40	FW65225	Straight Male Adapter	1
41	012600	Cooler Hose	1
42	FW75186	Hydraulic Oil Cooler	1
43	012516	45° Male Adapter	1
44	012601	Return Hose	1
45	041152	Straight Male Adapter	1
46	011868	Return Line Filter	1
	011869	Filter Element	1
47	011783	Filler / Breather Cap	1
	011784	Filter Element	1
48	080329	Sight Gauge	1

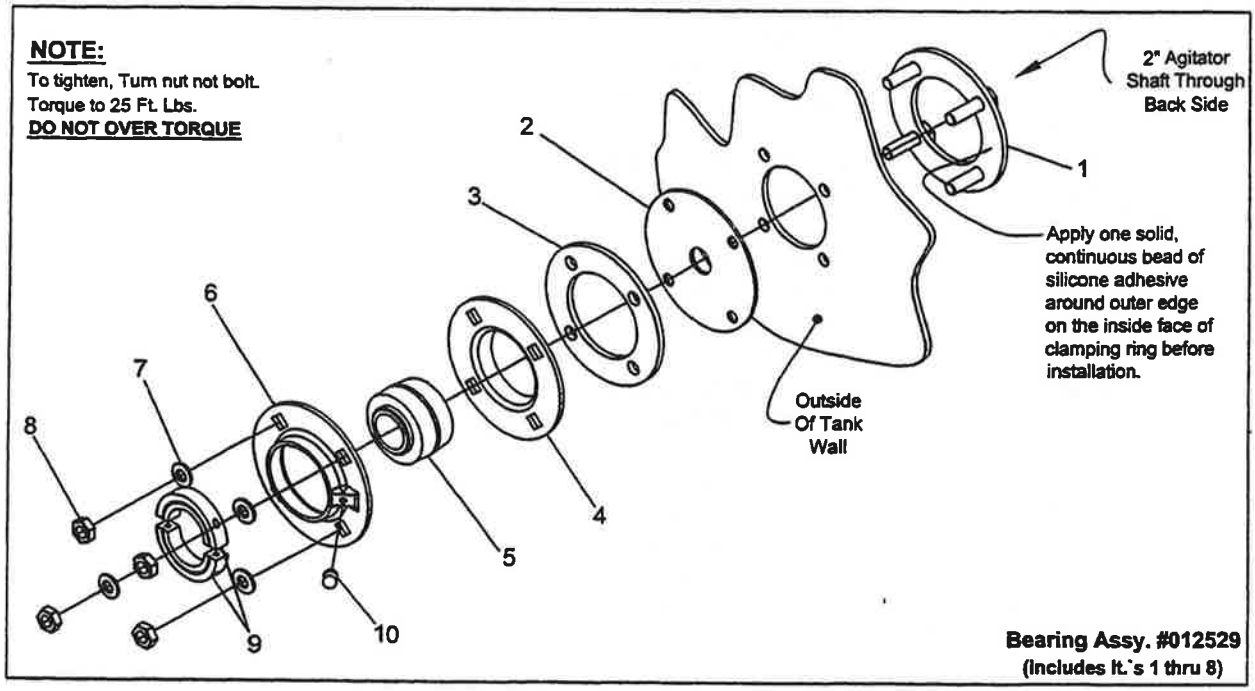


Left-Hand Agitator

DRIVE END



Right-Hand Agitator



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AGITATOR AND SEAL ASSEMBLY

Ref. No.	Part Number (T-280)	Part Number (T-330)	Description	No. Req'd (T-280)	No. Req'd (T-330)
	012529	012529	Bearing and Seal Assembly Includes:	4	4
1	012527	012527	Inner Clamping Ring w/Studs	1per	1per
2	012528	012528	Agitator Shaft Seal	1per	1per
3	012525	012525	Outer Clamping Ring	1per	1per
4	012451	012451	Flangette	1per	1per
5	012450	012450	Bearing	1per	1per
6	012452	012452	Flangette w/Lube Coupling	1per	1per
	008154	008154	Lube Coupling Adapter	1per	1per
7	012465	012465	Agitator Seal Washer	4per	4per
8	Y08	Y08	Agitator Nut	4per	4per
9	012625	012625	Set Lock Collar (Not included in Assy)	4	4
10	007705	007705	Grease Fitting	4	4
	012519	012519	Grease Line Elbow (Not Shown)	4	4
	012520	012520	Bulk Head Fitting (Not Shown)	4	4
	012521	012521	Grease Line Hose (Not Shown)	4	4
	012503-02	012504-02	Left-Hand Agitator Assembly Includes:	1	1
11	012496-01	012496-01	Idle Stub Shaft	1	1
12	012495-01	012495-01	Drive Stub Shaft	1	1
13	F330-0010-01	F330-0010-01	Bolt-On Paddle	2	2
14	F330-0010-02	F330-0010-02	Bolt-On Paddle w/ Identification Hole	2	2
15	012501-02	012500-02	Left-Hand Agitator Section	1	1
	012503-01	012504-01	Right-Hand Agitator Assembly Includes:	1	1
11	012496-01	012496-01	Idle Stub Shaft	1	1
12	012495-01	012495-01	Drive Stub Shaft	1	1
13	F330-0010-01	F330-0010-01	Bolt-On Paddle	2	2
14	F330-0010-02	F330-0010-02	Bolt-On Paddle w/ Identification Hole	2	2
16	012501-01	012500-01	Right-Hand Agitator Section	1	1

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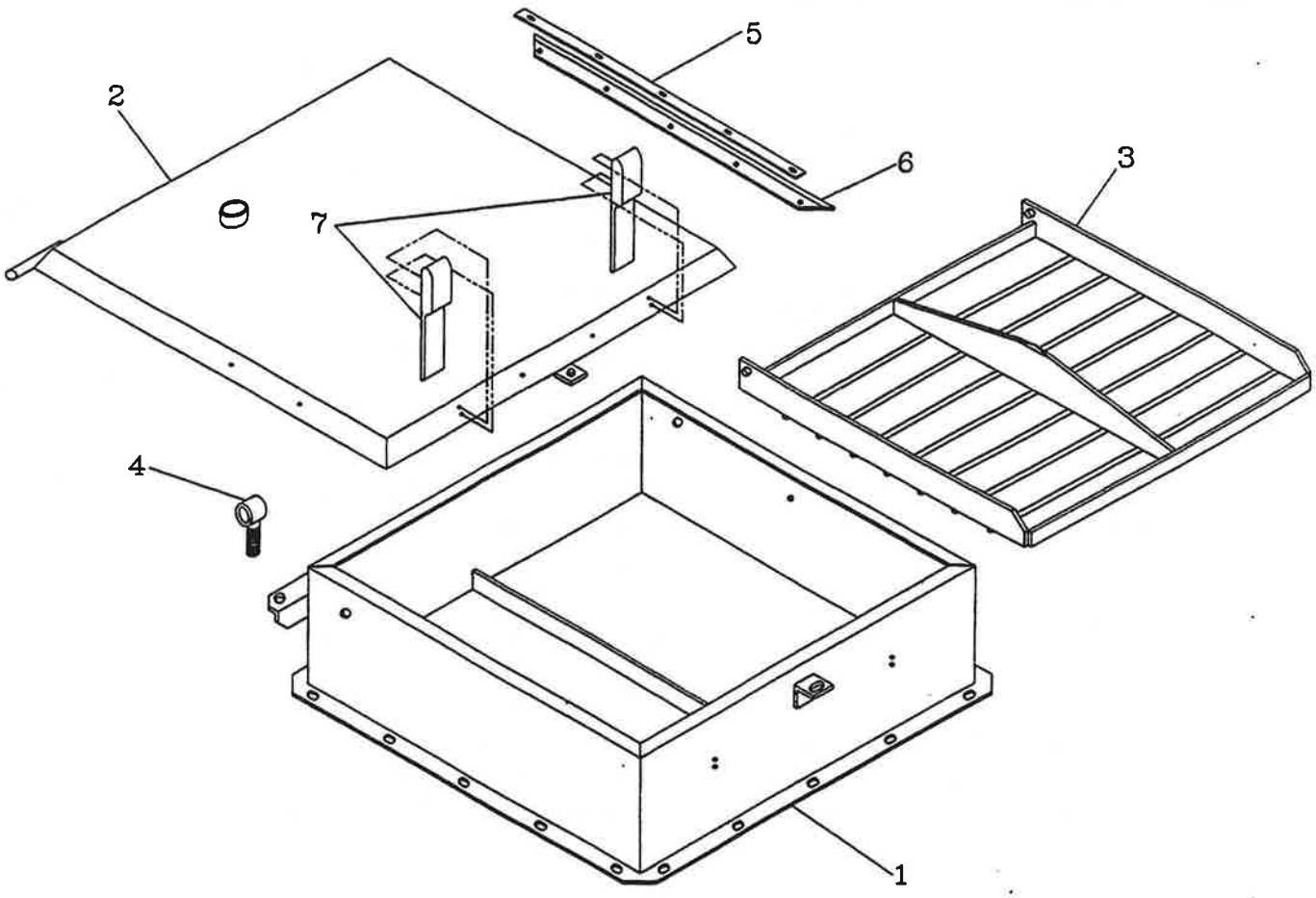

HATCH ASSEMBLY

Ref. No.	Part Number	Description	No. Req'd
	012557	Hatch Assembly Includes:	1
1	005486	Hatch Liner	1
2	005488	Hatch Lid	1
3	005484	Bag Cutter	1
	X0848SS	Stainless Steel Bolt	2
	012589	Stainless Steel Nylon Lock Nut	2
	W08LSS	Stainless Steel Flat Washer	2
	008008	Rubber Washer	2
4	070627	Hatch Lid Hinge	2
5	005487-03	Seal Backing Strip	4
6	005487-04	Hatch Lid Seal	4
7	005433	Soft Latch	2
	002909	Handle	1

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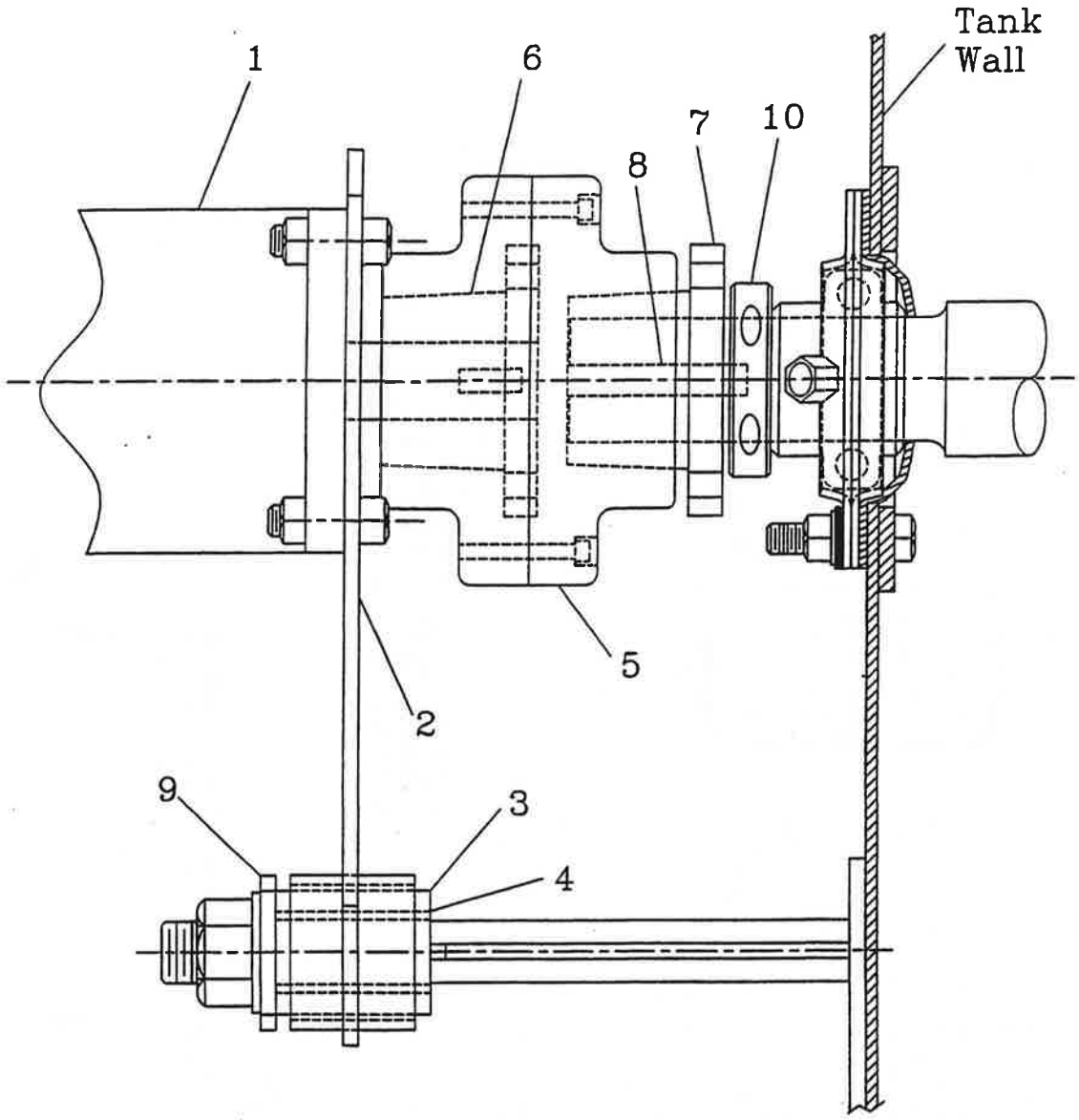

HYDRAULIC AGITATOR DRIVE

Ref. No.	Part Number	Description	No. Req'd
1	012333	Hydraulic Motor	2
2	012354	Hydraulic Motor Mount	2
3	012522-02	Rubber Bushing	2
4	012522-04	Insert	2
5	011780	Rigid Coupling	2
6	003055B	Motor Bushing	2
7	055103	Agitator Bushing	2
8	190127-40	Key	2
9	012522-01	Torsion Bar	1
10	012625	Set Lock Collar	4

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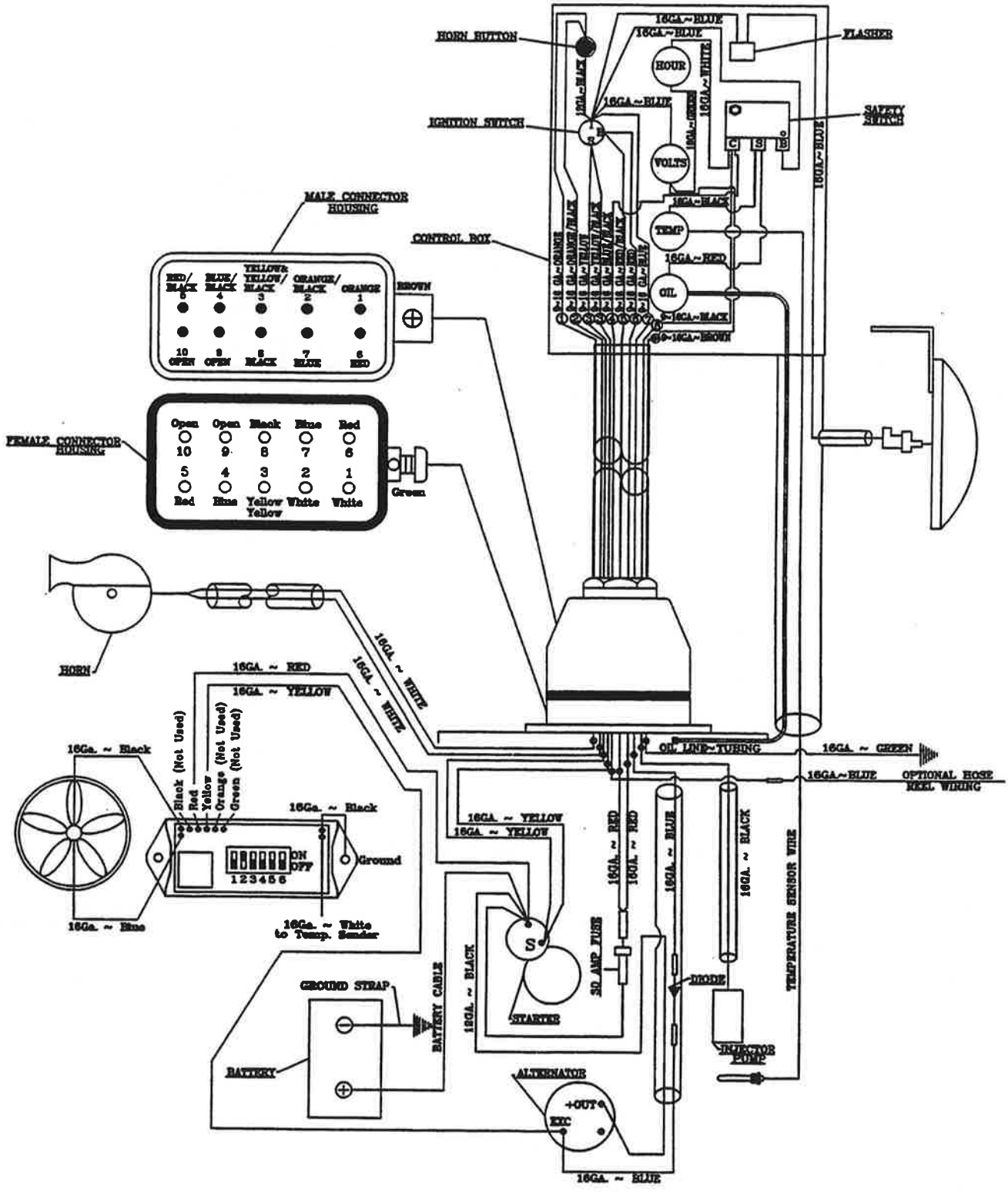

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ELECTRICAL SYSTEM

Ref. No.	Part Number	Description	No. Req'd
	012560	Tower Wiring Harness	1
	012604	Engine Wiring Harness	1
	012604-01	Horn Wiring Harness (T-280 Only)	1
	012604-02	Horn Wiring Harness (T-330 Only)	1
1	020886	Horn Button	1
2	052076	Ignition Switch	1
3	F330-0026-01	Control Box (See Pg. 8-9)	1
4	022119	Safety Switch	1
5	021198	Flasher w/Bracket	1
6	007274	Hourmeter	1
7	007958	Voltmeter	1
8	011489	Temperature Gauge	1
	012537	Temperature Adapter Kit	1
9	007706	Oil Pressure Gauge	1
	008473	Oil Pressure Line Kit	1
10	007336	Flashing Light	1
11	006499	Horn	1
12	022425	Diode	1
13	JDAT173624A	Alternator/Regulator Assembly	1
14	011851	Battery	1
	080220	Battery Holddown	1
	011770	Battery Box	1
15	008171	Battery Cable	1
16	007091	Engine Ground Strap	1
	000241	Ground Cable (Not Shown)	1
17	023601	Male Insert	1
	023604	Male Hood	1
18	023602	Female Insert	1
	005561	Female Housing	1
19	012595	Electric Fan Control Kit	1
	023076	Ignition Key	

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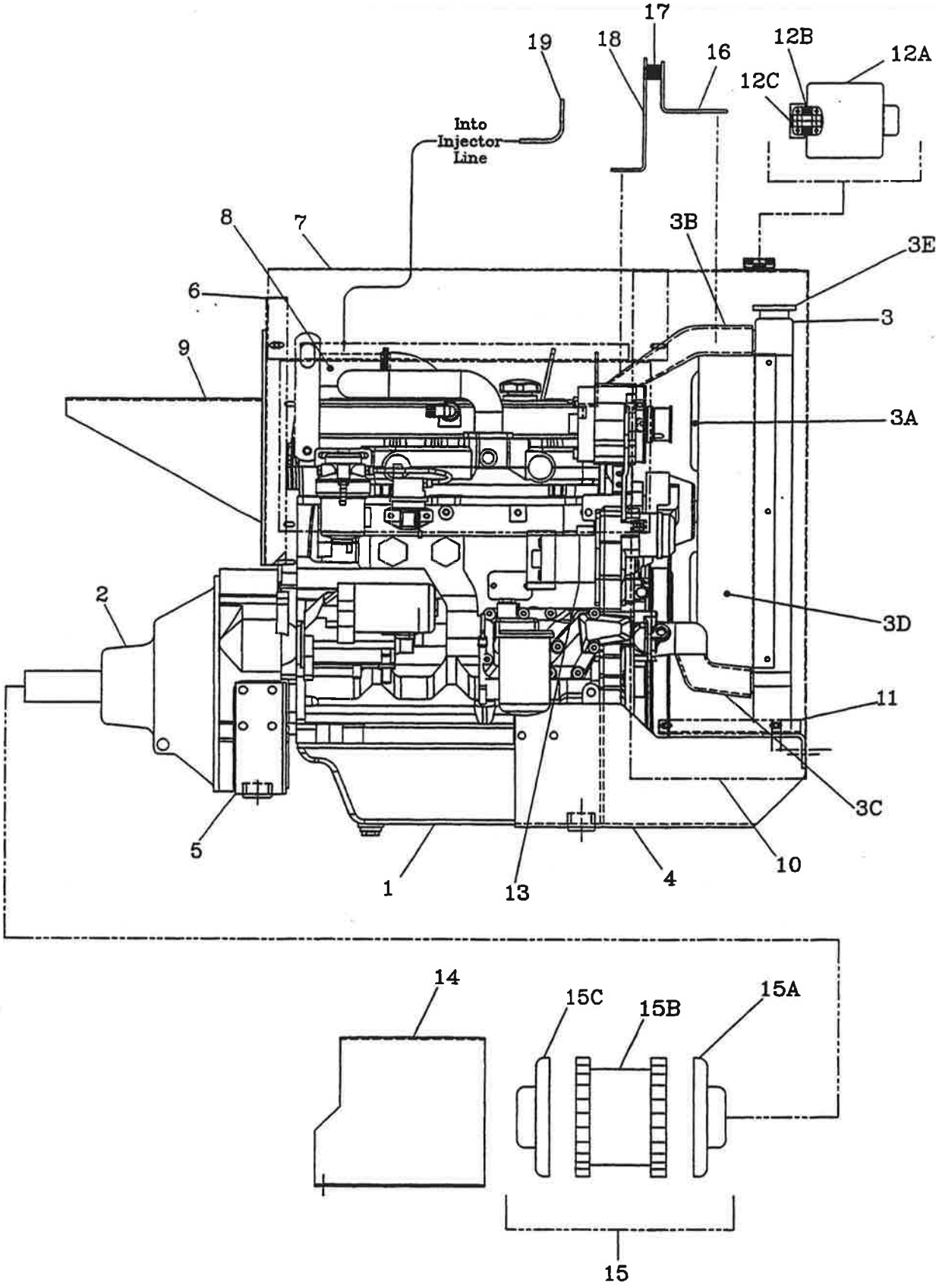

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POWER SYSTEM

Ref. No.	Part Number	Description	No. Req'd
1	012449	Turbo Engine Assembly	1
2	012069A	Clutch Assembly (See page 22-23)	1
	022314	Pilot Bearing	1
3	012620	Radiator	1
	012610	Rubber Mount	2
3A	011747	Fan	1
3B	JDR128455	Upper Radiator Hose	1
	022450	Hose Clamp	2
3C	JDR54534	Lower Radiator Hose	1
	022450	Hose Clamp	2
3D	023806	Fan Shroud	1
3E	023807	Radiator Cap	1
4	012618	Front Engine Foot	1
	007433	Rubber Shock Mount	2
	007887	Snubbing Washer	2
5	052397	Rear Engine Foot	2
	007433	Rubber Shock Mount	1per
	007887	Snubbing Washer	1per
6	F330-0033	Rear Engine Panel	1
	052398-08	Rear Panel Spacer	2
7	F816-0016	Top Cover	1
8	F330-0034	Side Panel	1
9	012626	Air Cleaner Mount	1
10	F816-0015	Radiator Shroud	1
11	F330-0038	Air Deflector	1
12A	F260-0006-02	Radiator Cap Cover	1
12B	055669	Lock Positioning Hinge	1
12C	F260-0006-03	Hinge Spacer	1
13	011922	Hydraulic Pump	1
14	F330-0013	Clutch Drive Coupling Guard	1
15	011771	Coupling Assembly	1
15A	011773	Engine Coupling Half	1
15B	011774	Coupling Insert	1
15C	011772	Pump Coupling Half	1
16	052398-06	Radiator Stay Arm	1
17	023438	Shock Mount	1
18	023812-02	Rear Radiator Mount	1
19	190032	Copper Tubing	3"
	190124-32	Keyway Pump Shaft	
	011441	Keyway Engine Shaft **ATTED**	
	012611	Oil Fill Extension	1
	JDR136495	Oil Fill Gasket	2
	023639	Throttle Cable (See Pg. 9)	1
	007675	Ball Joint (See Pg. 9)	2
	012588	Throttle Cable Mount	1
	008451	Fuel Tank	1
	011867	Fuel Gauge	1
	007914	Fuel Tank Cap	1
	F816-0008-01	Fan Guard	1
	F816-0008-02	Fan Guard Mounting Strap	1

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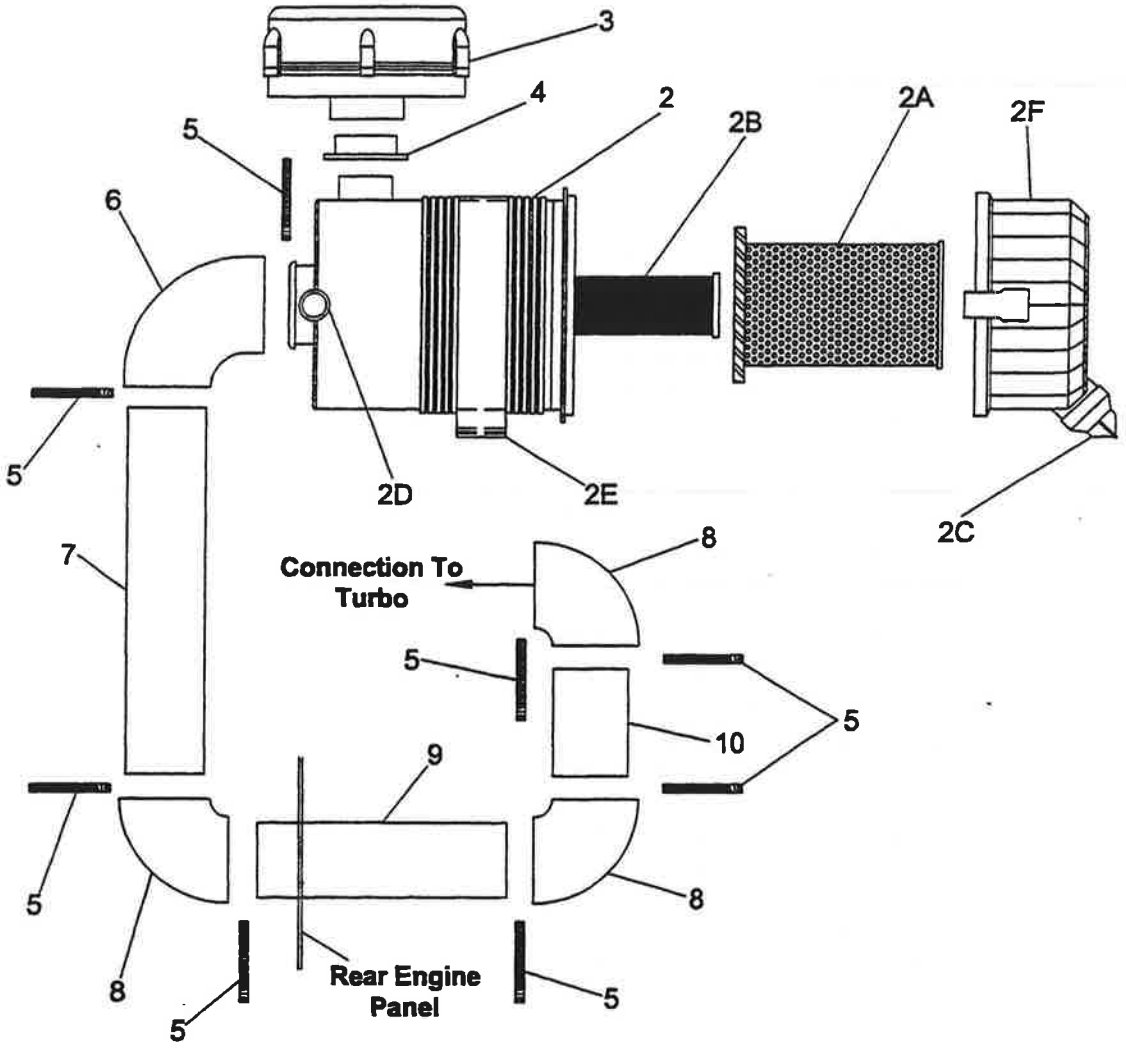
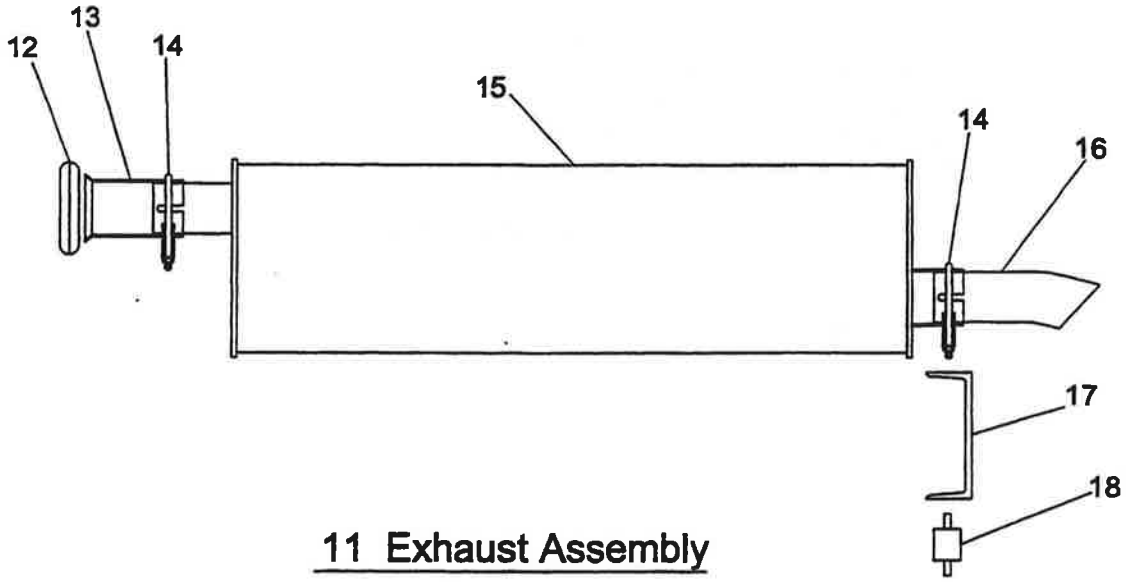


1 Air Intake Assembly



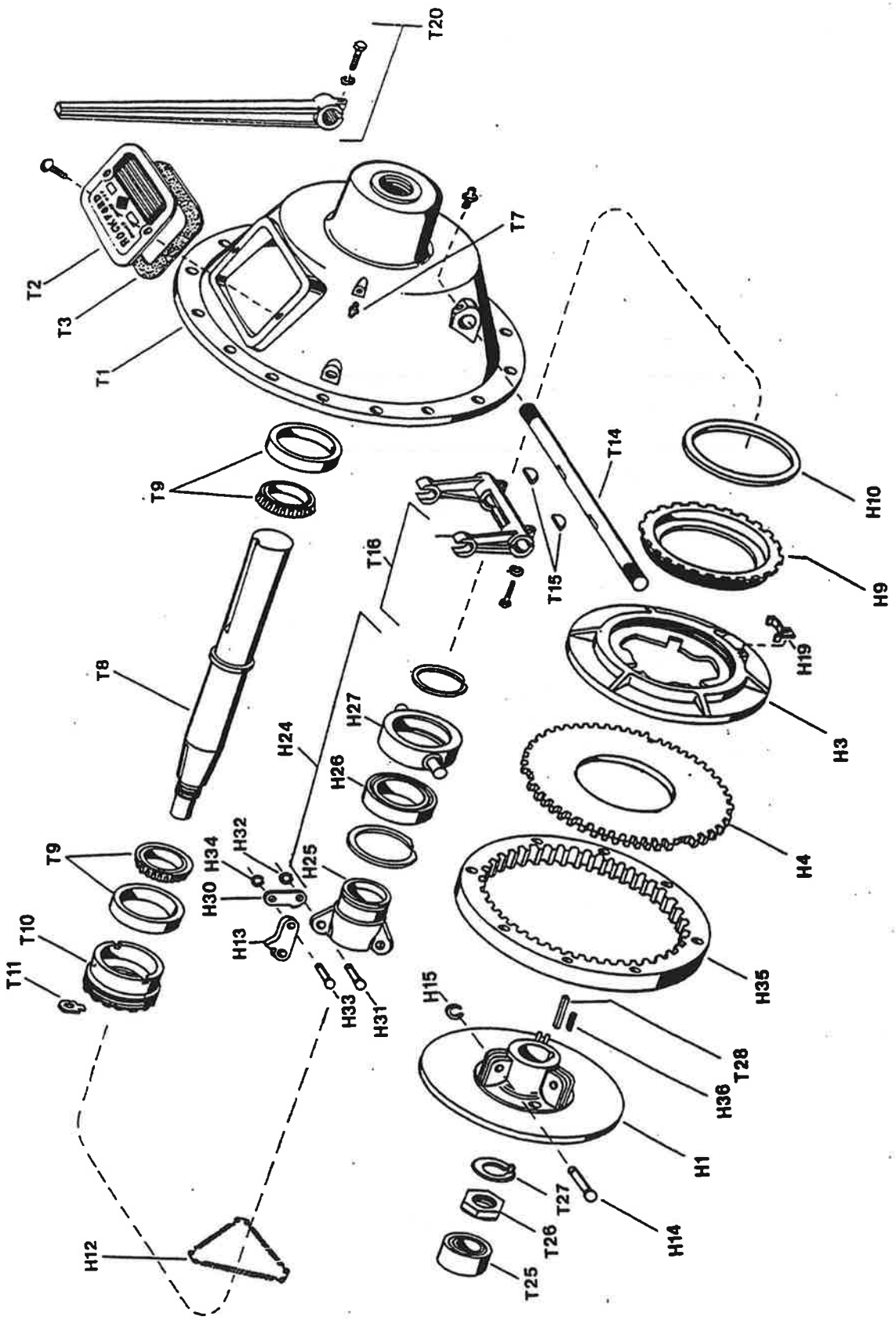
11 Exhaust Assembly

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

AIR INTAKE AND EXHAUST SYSTEMS

Ref. No.	Part Number	Description	No. Req'd
1	012626	Air Intake Assembly (Includes Items 2-10)	1
2	012621	Air Cleaner Assembly	1
2A	012622	Main Filter Element (3.75-E1)	1 per
2B	012623	Safety Filter Element (3.75-E2)	1 per
2C	012621A	Flapper Valve	1 per
2D	012621B	Dust Load Indicator Gauge	1 per
2E	012621C	Spring Loaded Mount	1 per
2F	012621D	Filter Cap	1 per
3	012608	Pre-Cleaner	1
4	012609	Pre Cleaner Adapter	1
5	022657	Clamp	8
6	060325	Reducer Rubber Elbow	1
7	012616-04	Long Extension Pipe	1
8	011852	Rubber Elbow	3
9	012617-02	Air Cleaner Tube w/Panel Bracket	1
10	012616-02	Short Extension Tube	1
11	012565-02	Exhaust Assembly (Includes Items 12-18)	1
12	023800	V-Band Clamp	1
13	023799	Flared Adapter	1
14	023801	Muffler Clamp	2
15	012506	Muffler	1
16	012526	Exhaust Turn Down	1
17	012480-15	Support Channel	1
18	023438	Rubber Mount	1

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE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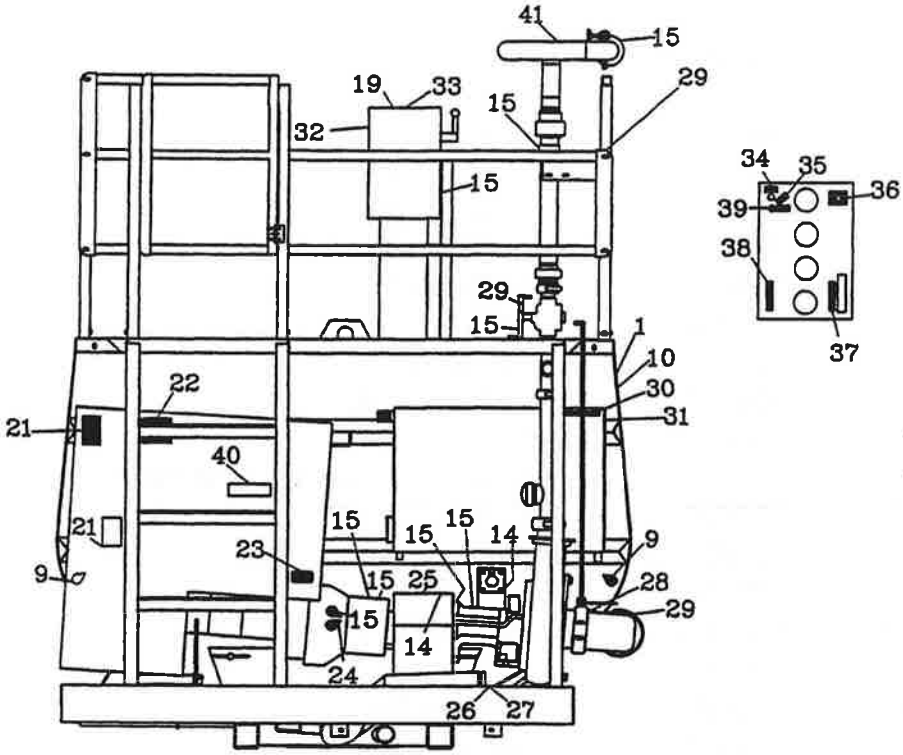
H12
T26
T25

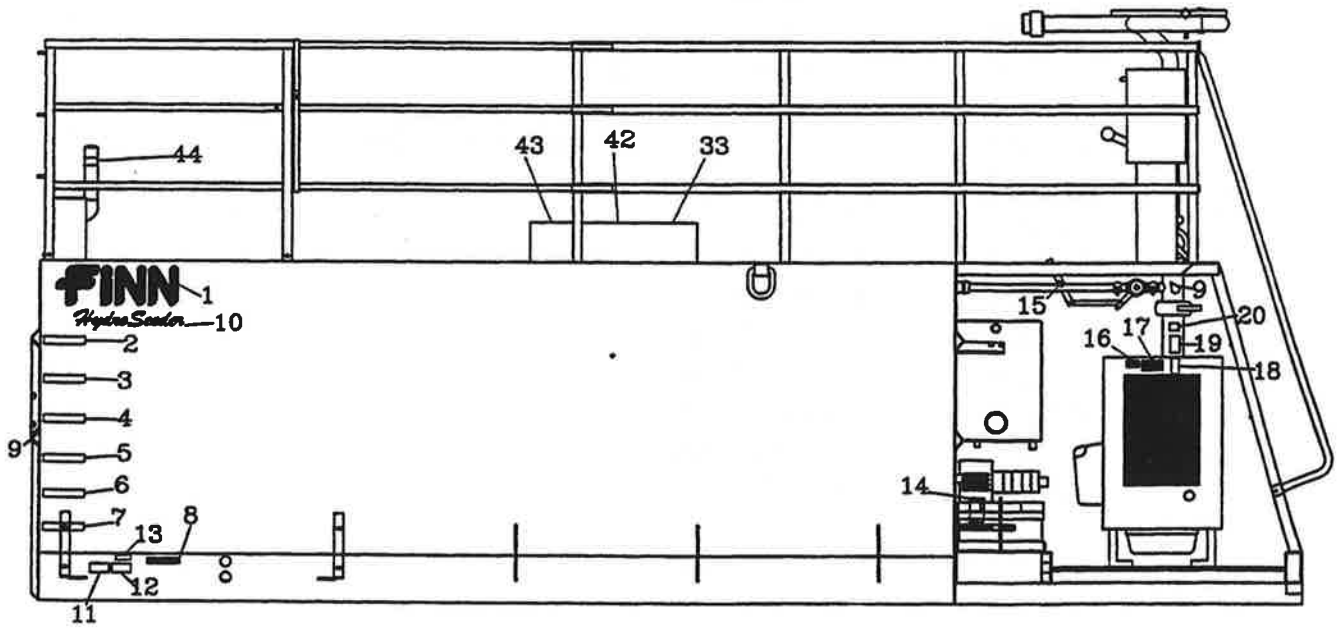
POWER TAKE-OFF ASSEMBLY

Ref. No.	Part Number	Description	No. Req'd
	012069A	Power Take Off, Include	1
H1	100011	Clutch Body	1
H3	100028	Pressure Plate	1
H4	100341	Clutch Facin	1
H9	100013	Adjusting	1
H10	100032	Ring W	1
H12	100026	Spri	1
H13	100018		3
H14	100010		3
H15	100007		3
H19	10002	ock	1
H24	10	Sleeve and Bearing Assembly	1
H25		ase Sleeve	1
H26		elease Bearing	1
H27	10	Carrier Bearing	1
H30	1000	Connecting Link	6
H31,H33	100009	Link Pin	6
H32,H34	100008	Retaining Ring	6
H35	100003	Driving Ring	1
H36	100017	Separator Spring	3
All H's	100340	Clutch Assembly	1
T1	100304	Clutch Housing	1
T2	100063	Instruction Plate	1
T3	100054	Cover Gasket	1
T7	100043	Lubrication Fitting	1
T8	012591	Drive Shaft	1
T9	100052	Bearing Cup and Cone (394A-390)	2
T10	100048	Retainer Bearing	1
T11	100039	Retainer Lock	1
T14	100040	Yoke Shaft	1
T15	100305	Woodruff Key	2
T16	100323	Clutch Yoke	1
T20	010284	Shifting Lever	1
T25	022314	Pilot Bearing	1
T26	100307	Drive Nut Shaft	1
T27	100308	Lock Washer	1
T28	100061	Clutch Key	1
T31	100224	Yoke Shaft Lube Fitting	2

Please do not use this page to obtain clutch part numbers. See the Clutch Addendum Manual

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE





WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

DECALS

Ref. No.	Part Number	Description	No. Req'd
1	023174	"FINN" Decal	2
2	011793	Decal "3000 Gallons"	1
3	011792	Decal "2500 Gallons"	1
4	011791	Decal "2000 Gallons"	1
5	011790	Decal "1500 Gallons"	1
6	005188	Decal "1000 Gallons"	1
7	005186	Decal "500 Gallons"	1
8	023391	Decal "DIESEL FUEL ONLY"	1
9	007230	Decal "SERVICE DAILY"	4
10	011595	Decal "HYDRO SEEDER"	2
11	011690	FINN NAME PLATE"	1
12	011662	Decal "PATENT NUMBERS"	1
13	020976	Decal "PATENT INFRINGEMENT"	1
14	012179	Decal "WARNING! DO NOT RUN WITHOUT GAURDS"	3
15	007231	Decal "SERVICE WEEKLY"	10
16	007429	Decal "RADIATOR PROTECTION"	1
17	012279	Decal "WARNING! RADIATOR"	1
18	011569	Decal "CAUTION! REMOVE VAVLE & HOSE REEL"	1
19	005216	Decal "DANGER! OPEN RECIRCULATION"	2
20	008209	Decal "DANGER! BEFORE LOOSENING CLAMP"	1
21	012251	Decal "WARNING! ROTATING FAN"	1
22	022357	Decal "WARNING! TURN OFF ENGINE"	1
23	012278	Decal "DANGER! HOT EXHAUST"	1
24	007351	Decal "HAND GUN ONLY"	1
25	031297	Decal "CLUTCH OPERATION"	1
26	006869	Decal "PRESSURE LUBRICATOR"	1
27	004661	Decal "CLUTCH ENGAGEMENT"	1
28	012180	Decal "TO AVOID DAMAGE TO SUCTION COVER"	1
29	012031	Decal "VALVE OPERATION"	3
30	012272	Decal "HYDRAULIC OIL ONLY"	1
31	021665	Decal "HYDRAULIC INSTRUCTIONS"	1
32	012260	MAINTAIN SAFETY DECAL PLATE	1
33	023519	Decal "CAUTION! WEAR EYE PROTECTION"	2
34	006870-HORN	Decal "HORN"	1
35	006870-IGN	Decal "IGN"	1
36	022082	Decal "HOLD BUTTON IN"	1
37	008286	Decal "AGITATOR SPEED"	1
38	007535	Decal "THROTTLE"	1
39	006870-START	Decal "START"	1
40	007607	Decal "DRAIN WATER DAILY"	1
41	011567	Decal "DANGER! DO NOT AIM STREAM"	1
42	008097	Decal "DANGER! BEFORE ENTERING THE TANK"	1
43	012041	Decal "OPERATING INSTRUCTIONS"	1
44	012597	Decal "THIS IS A VENT"	1
			1

Note: Safety Decals must be purchased as a kit
Part # 012820

WH... ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

DISCHARGE HOSE EXTENSIONS

Part Number	Description	No. Req'd
	TOWER TAKE OFF SYSTEM	
007930-02	Hose Assembly, Discharge Extension - Tower	As Ordered
007929	1-1/2" Hose w/ Nipples, 50 ft.	1 per
002191	Adapter	1 per
160768	Reducer Bushing	1 per
010544	Coupler	1 per
006513	Gasket	1 per
	PUMP TAKE OFF SYSTEM	
007930-01	Hose Assembly, Discharge – Pump Remote	As Ordered
007929	1-1/2" Hose w/ Nipples, 50 ft.	1 per
001207	Adapter	1 per
002158	Coupler	1 per
006515	Gasket	1 per
011908	Remote Valve Operation – Heavy Duty	1
007711	Pump Take Off Valve Assembly	1
007710	Valve	1
002158	Coupler	1
160540	Nipple	1
007740	Remote Valve Assembly	1
003242	Valve	1
003243	Pipe	1
160309	Nipple	1
160763	Bushing	1
006102	Coupler	1
001207	Adapter	1
006621	Wide Ribbon Nozzle Assembly	1
006604	Nozzle, Wide Ribbon	1
006096	Adapter	1
160761	Reducer Bushing	1
006622	Narrow Ribbon Nozzle Assembly	1
006605	Nozzle, Narrow Ribbon	1
006096	Adapter	1
160761	Reducer Bushing	1

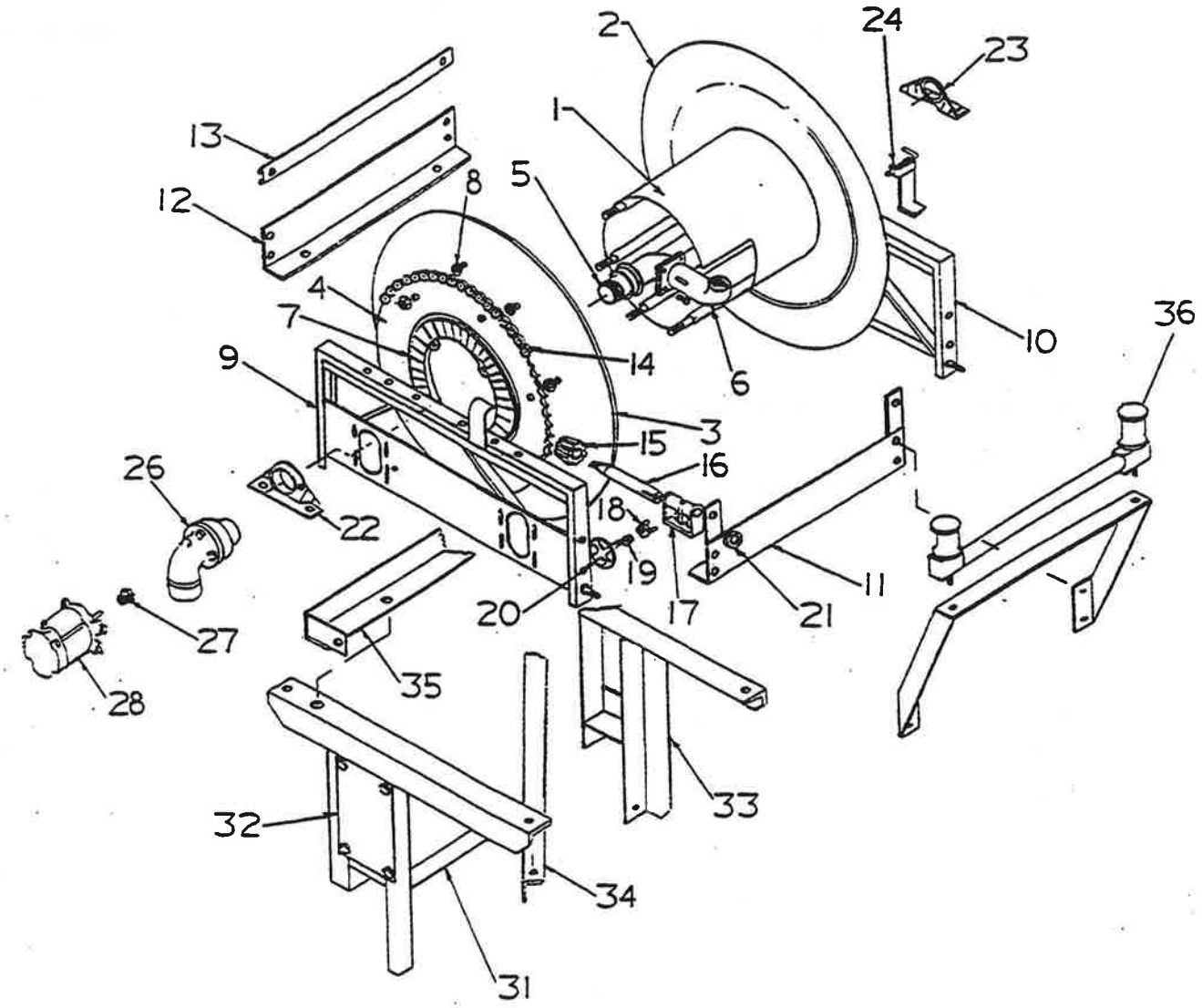
WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

RECOMMENDED SPARE PARTS, REPAIR KITS AND MISCELLANEOUS PARTS

Part Number	Description	No. Req'd
	SPARE PARTS	
000698	Grease, Pump Seal Lubricator	2
011919	Suction Pipe Seal	3
002820	Discharge Pipe Seal	3
006722	Recirculation Pipe Seal	2
006513	Nozzle Coupler Gasket	2
007469	Lube Sticks, Recirculation and Discharge Valves	4
011858	Air Cleaner Element	1
JDR123454	Fan Belt	1
JDRE60021	Fuel Filter	1
JDRE59754	Oil Filter	1
031245	Snapper Pin – Boom Holddown	1
	REPAIR KITS	
012397	Swivel Repair Kit	
011975	Pump Seal Kit Consisting of:	
011920	O-Ring	1
006443	Mechanical Seal Assembly	1
006444	Grease Retainer	1
006447	Grease Seal	2
012384	Hydraulic Motor Seal Kit	
	MISCELLANEOUS PARTS	
002190	Tank Drain Cap	1
002191	Tank Drain Coupling	1
002290	Rear Marker Light	2
190018	Safety-Walk On Ladder	As Req'd

NOTE: Recommended spare parts are available to avoid unnecessary down time. Repair kits are available to recondition parts, which periodically need service.

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE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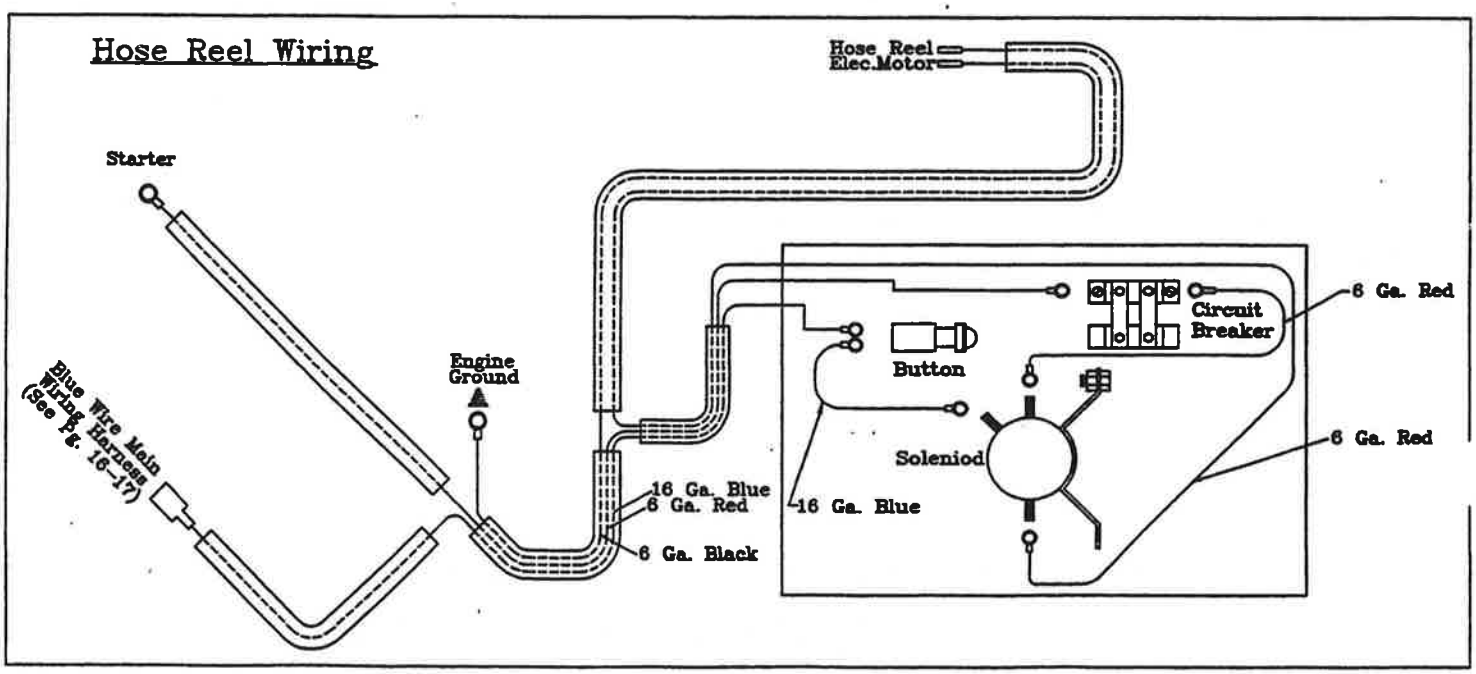

Hose Reel Wiring
Hose Reel Elec.Motor
Starter
Engine Ground
Blue Wire Main Wiring Harness (See Pg. 16-17)
16 Ga. Blue
6 Ga. Red
6 Ga. Black
16 Ga. Blue
Button
Circuit Breaker
6 Ga. Red
Soleniod
6 Ga. Red

HOSE REEL ASSEMBLY

Ref. No.	Part Number	Description	No. Req'd
	008212	Hose Reel Assembly Includes:	1
1		Drum	1
2		Back Disc	1
3		Front Disc	1
4		Disc Sprocket	1
5		Hub, Less Riser	1
6		Flanged Riser	1
7	008144	Ring Gear	1
8		Spacer	1
9		Front Frame	1
10		Back Frame	1
11		Front Foot	1
12		Back Foot	1
13		Back Brace	1
14	008200	Chain with Connecting Link	1
15		Pinion Gear	1
16		Pinion Shaft	1
17		Side Bearing	1
18	008111	Brake Pad	1
19	008112	Brake Spring	1
20	008109	Brake Well	1
21		Pinion Shaft - Collar and Set Screw	1
22	008314	Drive Side Bearing	1
23	008313	Idle Side Bearing	1
24	008433	Pin Lock Assembly with Brackets	1
26	008210	Swivel Joint	1
27	008199	Chain Sprocket - 11 Tooth	1
28	008188	Explosion Proof Motor	1
31	012583-01	Left Mounting Frame	1
32	011915-01	Control Panel without Switches	1
33	012583-02	Right Mounting Frame	1
34	012582-11	Cross Angle	1
35	012524	Top Connecting Angle	1
36	011894	Hose Rewind Guide	1
	012531	Lead-In Hose	1
	001207	Adapter	1
	011977	Wiring Harness	1
	011955-01	Panel with Switches	1
	008420	70 Amp Circuit Breaker	1
	008419	30 Amp Circuit Breaker	1
	011654	40 Amp Circuit Breaker	1
	012592	Bridge Strap	
	2		
	020886	Button	1
	008135	Solenoid	1

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

TOOL KIT

Part Number	Description	No. Req'd
011775	Nozzle, Long Distance	1
011703	Nozzle Assembly, Long Distance	1
001042	Nozzle, Long Distance	1
006512	Gasket, Nozzle	1
002191	Brass Male Adapter	1
160540	Close Nipple	1
160768	Reducer Bushing	1
011706	Nozzle Assembly, Wide Ribbon-Small	1
006604	Nozzle, Wide Ribbon-Small (50500)	1
002191	Brass Male Adapter	1
160766	Reducer Bushing	1
011707	Nozzle Assembly, Narrow Ribbon-Small	1
006605	Nozzle, Narrow Ribbon-Small (25500)	1
002191	Brass Male Adapter	1
160766	Reducer Bushing	1
011890	Nozzle Assembly, Wide Ribbon-Large	1
011861	Nozzle, Wide Ribbon-Large (501500)	1
002191	Brass Male Adapter	1
160769	Reducer Bushing	1
011891	Nozzle Assembly, Narrow Ribbon-Large	1
011860	Nozzle, Narrow Ribbon-Large (251500)	1
002191	Brass Male Adapter	1
160769	Reducer Bushing	1
021375	Grease Gun	1
020365	Grease Cartridge	1
000698	Grease, Pressure Lubricator	1
007469	Lube Sticks, Discharge and Recirculation Valves	1
002190	Cap with Gasket, Main Tank Drain	1
006513	Gasket, Coupler	1
005220	Impeller Wrench	1
FW71883	Touch-Up Paint	1
	Engine Parts Manual	1
	Engine Operator's Manual	1
	Hydroseeder® Parts Manual	1
	Hydroseeder® Operator's Manual	1

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

FINN®
CORPORATION

9281 LeSaint Drive • Fairfield, Ohio 45014
Phone (513) 874-2818 • Fax (513) 874-2914
Toll Free (800) 543-7166

FINN T170

FINN T280

FINN T330

Operator's Manual

Model No. RB-55 Serial No. _____

INDEX

SAFETY FIRST

With any piece of equipment, new or used, the most important part of its operation is SAFETY!

Finn Corporation encourages you and your employees to familiarize yourselves with your new equipment and to stress safe operation.

The first four pages of this manual are a summary of all the main safety aspects associated with this unit. Be sure to read completely before operation of machine.

This symbol is used throughout the operation and maintenance sections of this manual to call attention to safety procedures.
- Pay Attention -

DANGER: Immediate hazards which WILL result in severe personal injury or death.

WARNING: Hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION: Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

IMPORTANT: Indicates that equipment or property damage could result if instructions are not followed.

NOTE: Gives helpful information.

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

P/N 12304

Finn Corporation

HYDROSEEDER® SAFETY SUMMARY SECTION

It is important that all operators of this machine are familiar with all of the safety aspects mentioned below and have read the eritire Operator's Manual before operating the machine. Always keep a copy of this manual with the machine. It is the responsibility of the operator of the machine to fully understand this safety sheet. Remember that YOU are the key to safety. Good safety practices protect not only you but also the people working with and around you. Keep in mind that this safety sheet is written for this type of machine only. Practice all other usual and customary safe working precautions; and above all, remember that safety is up to you.

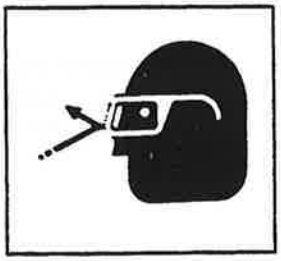
The FINN HydroSeeder® is designed to mix and apply water, seed, fertilizer, agricultural lime and hydraulic mulch to the prepared seedbed. The resultant slurry from mixing one or more of the above materials may react causing harmful or deadly gasses within the tank. Heat, evaporation or extended emptying period can/will accelerate the formation of these gasses. Please contact your supplier(s) of these slurry components regarding their potential reactivity.

I. PRE-START EQUIPMENT CHECK (equipment check is to be made with the engine off):

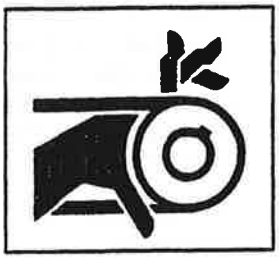
1. Check devices securing HydroSeeder® to the truck frame.
2. Make sure loading hatch bag cutter is in place and secure.
3. Check that all guard railing is in place and secure.
4. Verify that all guards are in place.
5. With the ignition switch on, verify that the signal horn is operating correctly.
6. By carefully looking down through the loading hatch, inspect the slurry tank for foreign objects. Never enter the tank without following the procedures described in #3 of the Maintenance section in this sheet.
7. Remove unnecessary objects (or material) from the tank top.
8. Make sure no one is working on or inside the machine. Signal "All Clear" before starting the engine.
9. Inspect all hydraulic hoses for cracks, bulges or damage. If hoses are bad replace immediately.
10. Inspect all discharge hoses for cracks, bulges or damage. If hoses are bad replace immediately.

II. MACHINE OPERATION:

1. Always wear safety goggles when operating the machine. Other safety attire such as safety shoes, ear protection, gloves, hard hats, dust masks, etc. should be worn as required by warning decals on machine, operator's manuals or job site requirements. Remove rings, watches, etc. Avoid loose fitting clothing that may get caught in rotating machinery.



2. Do not operate the machine without all guards in place.



3. Do not load unit while in transit. Load only when parked and unit is as level as possible. Take care not to drop pens, lighters, etc. or pieces of paper or plastic bags into the tank, as these objects might plug the slurry system. Should any object be dropped into the tank, do NOT reach into the tank to retrieve the foreign object. See #3 under Maintenance before allowing any personnel to enter the tank.

4. Make sure area to be sprayed is clear of all persons, animals, etc.
5. The driver of the towing vehicle is responsible for the safety of the operator(s) of the machine. Make sure the driver is aware and avoids all possible hazards to the operator(s) of the machine, such as low tree limbs, low power lines, etc. Vehicles on

which equipment is mounted must be stopped and started gradually. Avoid abrupt starts or stops. Never operate on a slope or a hill that may endanger the driver and/or the operator(s). All personnel should review and be familiar with stop/start signals between the driver and operator(s) before going into operation. Only the operator should be located on the platform during operation.

6. Operator(s) of equipment should never ride on the machine at speeds of greater than 5 MPH.

7. Never operate machine in an enclosed area without venting the engine exhaust of both the equipment and vehicle on which the equipment is mounted. Deadly carbon monoxide fumes can accumulate.

8. Never operate this or any other machinery when fatigued, tired, under the influence of alcohol, illegal drugs or medication. You must be in good physical condition and mentally alert to operate this machine.

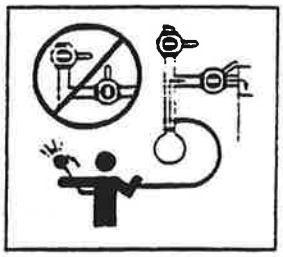
9. Never modify the machine. Never remove any part of the machine (except for service and then reinstall before operating).

10. Use proper means (steps, ladder) for mounting and dismounting of the machine. Never mount or dismount a moving machine.

III. SLURRY APPLICATION:

1. Do not aim discharge spray toward power-lines, transformers, or other high voltage electrical conductors. Also do not aim discharge spray towards people, animals or anything other than the intended application area.

2. Never engage the clutch when both the recirculation and discharge valves are closed. Operation with both valves closed will result in extreme heat generation that could cause severe bodily injury and damage to the equipment.

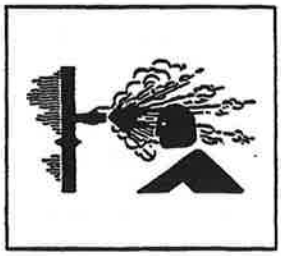


3. Recirculation valve must be open and material flowing back into the tank when using the remote valve. A closed or plugged recirculation line will cause extreme heat in the pump or discharge lines which will result in severe bodily injury and damage to the equipment.

4. During application through a hose, high pressure can be exerted at the end of the hose. Hose holding personnel must establish good footing. The operator should apply gradual pressure to the hose only after hose holding personnel are firmly positioned and have firm control of the hose. Additional personnel to direct hose may be necessary if working on slopes. The proper technique for hose holding personnel is to firmly grasp the hose over the shoulder or under both arms. Never hold the hose so it goes between the legs. If the hose holding personnel finds that it is uncomfortable for him to handle the hose by himself additional hose holders should be positioned at the end of the hose.

5. Plan application so that the furthest area is covered first; working back toward the HydroSeeder®, so that the individuals are not walking back over slippery ground.

6. Before opening any valves or pipe clamps shut machine down and check if material in the pipe is hot. If hot, do NOT open valve or pipe clamps as the hot material may cause severe personal injury. Allow to cool and open with caution.

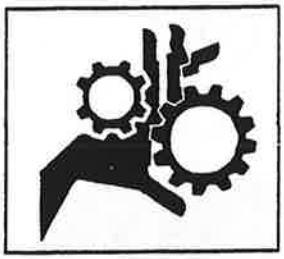


7. Except when loading materials keep loading hatch lid closed to protect operator and prevent splashing of wet material onto the tank top.

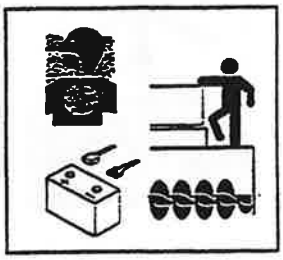
8. Wash off spillage of slippery mulch or slurry additive from the tank top and platform before operating equipment.

IV. MAINTENANCE:

1. Before servicing the machine, turn off engine and allow all moving parts to stop. To prevent accidental starting disconnect battery cables. Tag the engine operating area to show that the machine is being serviced. Use lockout/tagout procedure (OSHA 29 CFR 1910.147).

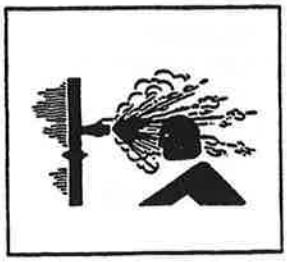


2. Certain hydroseeding amendments, when combined with or without the addition of water or heat or the element of time, may react causing harmful pr deadly gasses! Consult your material suppliers regarding reactivity information. The slurry tank must be flushed and drained after each day of operation.



3. Your slurry tank may be considered a confined space by OSHA under 29 CFR 1910.146. Before entering any confined space, your company must develop a procedure for safe entry. Make sure your company's plan meets all the requirements of 29 CFR 1910.146. including the following:
   a) Drain, flush and ventilate tank interior.
   b) Turn off engine and disconnect battery cables and perform lockout/tagout procedures. (29 CFR 1910.147)
   c) Provide continuous ventilation or proper breathing apparatus.
   d) If tank must be entered, personnel entering the tank must be tethered to a lifeline.
   e) Provide stand-by individual outside of tank able to communicate with person inside and able to haul him out with lifeline if necessary.

4. Before loosening any clamps or opening any valves, determine if material in the line is hot by feeling the pipe. Do NOT allow material to come in contact with personnel. Severe bodily injury could result.



5. Radiator maintenance: Liquid cooling systems build up pressure as the engine gets hot. Before removing radiator cap, stop the engine and let the system cool. Remove radiator cap only after the coolant is cool.

6. Battery maintenance: Lead-acid batteries contain sulfuric acid, which damage eyes of skin on contact. Always wear a face shield to avoid acid in the eyes. If acid contacts the eyes, flush immediately with clean water and get medical attention. Wear rubber gloves and protective clothing to keep acid off skin. Lead acid batteries produce flammable and explosive gasses. Keep arcs, sparks, flames and lighted tobacco away.

7. Filling of fuel: Never fill the tank with the engine running, while smoking or when near an open flame. Never smoke while handling fuel or working on the fuel system. The fumes in an empty container are explosive. Never cut or weld on fuel lines, tanks or containers. Move at least 10 feet (3 meters) away from fueling point before starting engine. Wipe off any spilled fuel and let dry before starting engine.

NOTE: Be careful not to allow fuel, lubricant, hydraulic fluid or cooling fluids to penetrate into the ground or be discharged into the water system. Collect all fluids and dispose of them properly.

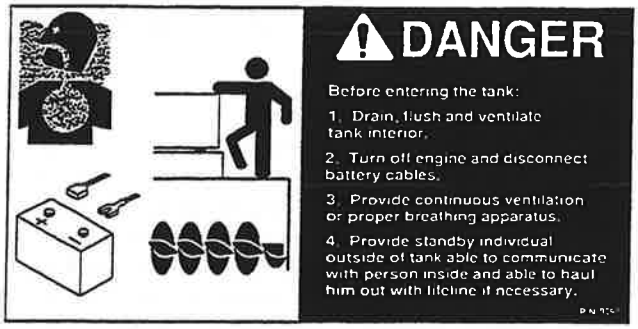
9. It is recommended that only authorized genuine FINN replacement parts be used on the machine.

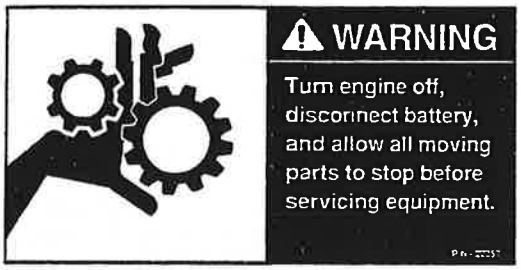
10. Do not use either cold start fluid if engine is equipped with glow plug type preheater or other intake manifold type preheater. It could cause an explosion or fire and severe injury or death.

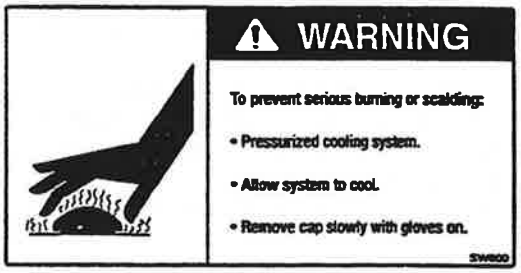
11. Diesel fuel or hydraulic fluid under pressure can penetrate the skin or eyes and cause injury, blindness or death. Pressure may build up in the hydraulic system; use caution when removing the cap.

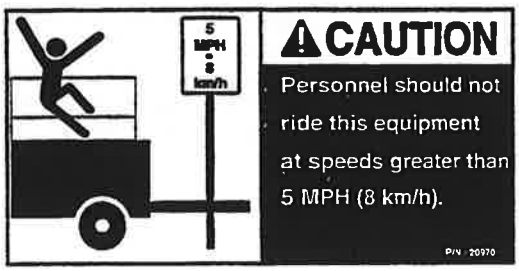
12. Make certain that all decals on the machine are maintained in good legible condition. Replacement decals are available through Finn Corporation by specifying part number shown in the lower right hand corner of the decal. See page 5 for the current safety decals mounted on the unit. See pages 70-71 in the Parts Manual for the location and quantity of all decals on this unit.

CURRENT SET OF SAFETY DECALS









OPERATION AND MAINTENANCE MANUAL FOR FINN T170, T280 & T330 HYDROSEEDERS®

This manual gives you step by step instructions for the operation and maintenance of the Finn HydroSeeder®. For best results and to insure longer life of the equipment, please follow the instructions carefully. For your safety read the entire manual before operation of this unit.

DEFINITION OF HYDROSEEDING:

Hydroseeding is the process whereby seed, fertilizer and/or lime and wood fiber mulch (using water as a carrying medium) are applied on the soil to establish vegetation.

THE FINN HYDROSEEDER® AND HOW IT WORKS:

The Finn HydroSeeder® will apply seed, fertilizer and/or lime, wood fiber mulch, or stabilizing materials in any prescribed or desired combination. The materials placed in the HydroSeeder® slurry-tank are mixed with water and kept in suspension by a dual agitation process, recirculation of slurry and mechanical agitation, thus forming a slurry that is pumped to the discharge assembly and directed onto the seed bed by the operator. This equipment is designed to accomplish hydroseeding in one easy operation with maximum efficiency.

MOUNTING THE HYDROSEEDER®

For speed and mobility of operation, the HydroSeeder® should be mounted on a truck or trailer, however, it is important to select a carrier with sufficient capacity to handle the added weight.

DIMENSIONS, CAPACITIES, AND TRUCK REQUIREMENTS:

*CF - Back of cab to end of frame
C - Distance from HydroSeeder® front to center of gravity
*CA - Back of cab to center of rear axle or trunnion
*FE - Front axle weight – Empty
FL - Front axle weight – Loaded
G - Distance from center of bogie to HydroSeeder® Center of gravity
HW - HydroSeeder® weight
*RE - Rear axle weight – Empty
*RL - Rear axle weight – Loaded
*WB - Truck wheel base

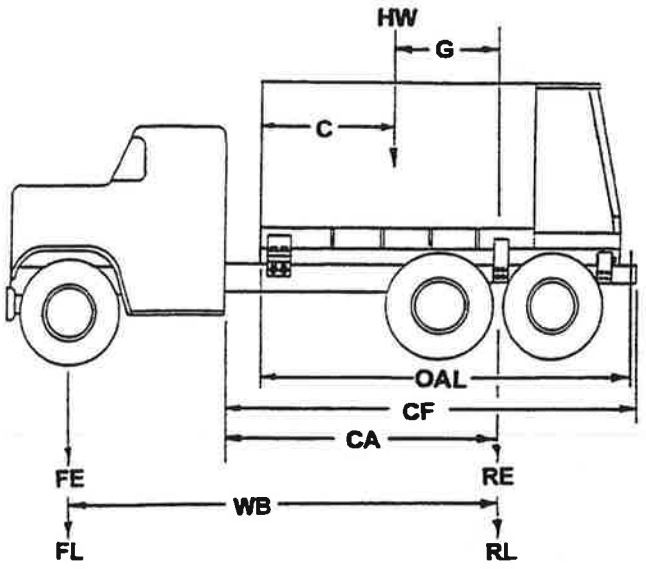
* These dimensions needed from the truck supplier as well as Front axle capacity and Rear axle capacity.

** Truck GVW depends on the truck weight. CA dimensions are approximate only, and depend on the front and rear axle capacities, as well as the front and rear empty axle weights.

*** Weight of HydroSeeder®, water, and full charge of granular solids only. No auxiliary equipment or loads included.

		T170	T280	T330
Truck GVW **	Pounds (kg)	33000 (14970)	48000 (21775)	56000 (25400)
CA **	inches (cm)	108+ (275+)	118+ (300+)	130+ (330+)
C	inches (cm)	71 (180)	82 (208)	95 (242)
OAL	inches (cm)	183 (465)	206 (524)	234 (595)
Water Only HW	Pounds (kg)	20700 (9390)	31000 (14060)	36200 (16420)
Full Load HW ***	Pounds (kg)	23600 (10705)	35640 (16165)	42000 (19050)

TRUCK MOUNTING CALCULATIONS:



$$\frac{(WB \times FL) - (WB \times FE)}{HW} = G$$

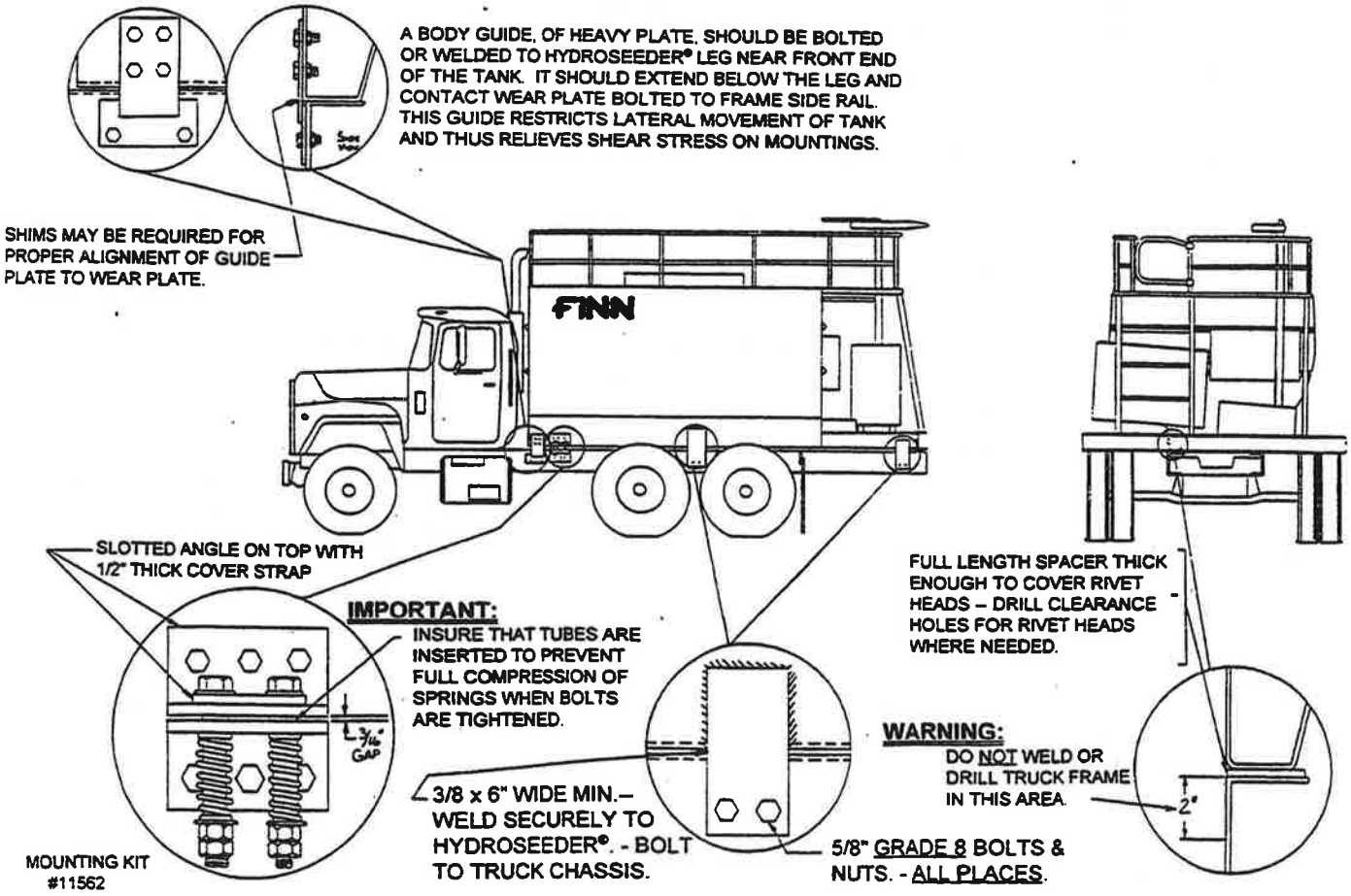
$$\frac{WB \times (RE + HW + RL)}{HW} = G$$

G + C must be equal to or less than CA

$$\frac{(WB \times FE) + (G \times HW)}{WB} = FL$$

$$\frac{(WB \times RE) + HW \times (WB - G)}{WB} = RL$$

GENERAL MOUNTING GUIDELINES:



Once the proper carrier has been selected, the HydroSeeder® must be securely mounted to it.

CAUTION: Your FINN HydroSeeder® should be mounted by a qualified truck body installer.

IMPORTANT: Mounting the HydroSeeder® to the truck must allow for tire clearance as well as frame twist. Place hard wood spacers along the length of truck rails or use Finn spring mounting kit (#011562) or equivalent.

ATTACHMENTS:

1. Extension hoses for reaching remote areas are available in 50 ft. (15m) lengths. All connections are camlock quick operating fittings. The hose is connected to the end of the discharge boom in place of a nozzle. The nozzle is connected to the end of the hose and controlled by the person on the ground. The flow is controlled by a second person on the HydroSeeder®. This allows for a full pressure and volume operation.

CAUTION: **Since the extension hose will be seeing the full output of the pump with the recirculation closed, the equipment operator and individual at the end of the hose should exercise extreme care when operating unit on high pressure. The high pressure on the hose can exert strong forces causing hose operator to lose control of hose or footing. The hose will require additional holders on slopes. Engage the clutch only after the hose operator is firmly positioned and has firm control of hose.**

2. For lower pressure applications, or for close up work, i.e. around buildings, the remote valve attachment can be used. The attachment includes semi-rigid hose with quick disconnect fittings along with a hand held valve which fits the end of the hose and accepts the standard nozzle assemblies. The hose is connected to the outlet on the discharge pipe above the pump. The machine is run at 1/2 to 3/4 throttle and material is applied where desired.

DANGER: **The recirculation valve must be open when using a remote valve. If valve is not open, extreme heat will occur resulting in damage and/or bodily injury.**

3. Hose Reel. The live hose reel will mount on the HydroSeeder® or on the truck frame. The 200 foot capacity electric rewind reel will wind up and store empty hose. It is electrically connected to the HydroSeeder® battery.

4. Hardened pump parts. Pump casing, impeller, and suction cover treated with special material designed to resist wear.

5. Rear spray bar. The spray bar option is not designed for slurry application but for the dispersion of liquids for dust control, watering, feeding and washing applications. Rear spray bar is arranged so that operation is remotely controlled from the truck cab.

PRE-START CHECK:

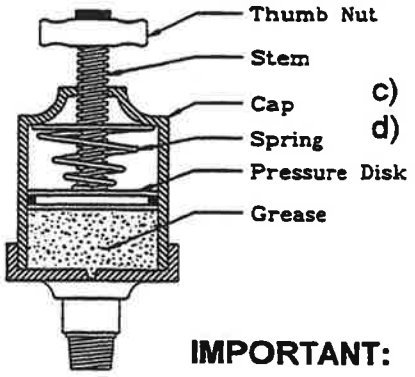
Safety check to insure operator safety:

1. Check condition of all mounting hardware securing HydroSeeder® to truck frame
2. Make sure bag cutter is in place and secure.
3. Inspect that all railings are in place and secure.
4. Insure that all guards are in place.
5. With the ignition switch on, see that the amber safety light under the operator's platform is flashing.

EQUIPMENT CHECK:

CAUTION: Equipment check is made with the engine off and all rotating parts stopped.

1. See that tool kit contains all the prescribed items (see tool kit list in parts book page 30).
2. Inspect the "slurry-tank" for foreign objects. See numbers 2 and 3 in Maintenance Section (IV) of the Safety Summary Section page 4.
3. Check fuel level.
4. Check the hydraulic oil level (see hydraulic system for oil specifications).
5. Check engine oil level...for oil type refer to the engine manual.
6. Check fluid level in radiator.
7. Inspect air cleaner for dust and dirt, clean if necessary.
8. Secure the drain plug on the outside-bottom of the slurry-tank.
9. Check to be certain pump drain plug is in place.
10. Lubricate equipment - See Lube Chart pages 30-31.
    - A. Each lubrication point is marked.
    - B. Check automatic pressure lubricator at pump. If the stem is fully extended with thumb nut all the way up then pressure lubricator contains lubricant - if not, lubricant must be replaced by the following procedure:



a) Turn thumb nut clockwise until stem rises to maximum height.
b) Remove cap and fill cap with sodium (water soluble) base grease. (FINN part number 000698). Do not use lithium base (chassis lube) grease.
c) Replace cap.
d) Turn thumb nut counter-clockwise until the thumb nut is at the top of the stem. The spring and pressure disc in the lubricator forces the grease, under pressure, to the pump seal.

IMPORTANT: When the thumb nut has moved down to within 1/2" (1.25 cm) of touching the cap reservice the automatic lubricator.

11. Engage and disengage clutch to determine if it "snaps" in and out.
12. Install discharge boom assembly (if stored in location other than standard operating position).

    A. Tighten the wing bolt at the opening around the top of the vertical pipe and insure that discharge boom is secure
    B. Check and clean nozzle of obstructions.

13. Check pump discharge and recirculation valve handles for free movement.

TWO VALVE OPERATION:

This HydroSeeder® is equipped with two independently operated plug valves to control slurry flow. One is located in the recirculation line below the platform, and the other is located in the discharge line above the platform. The valve handles should be positioned as shown in Figures 1-3 for the particular application required.

WARNING: Never engage the slurry pump clutch when both valve handles are positioned as shown Figure 1. Both valves are closed and will result in extreme heat generation that will cause damage or bodily injury if the slurry pump is running.

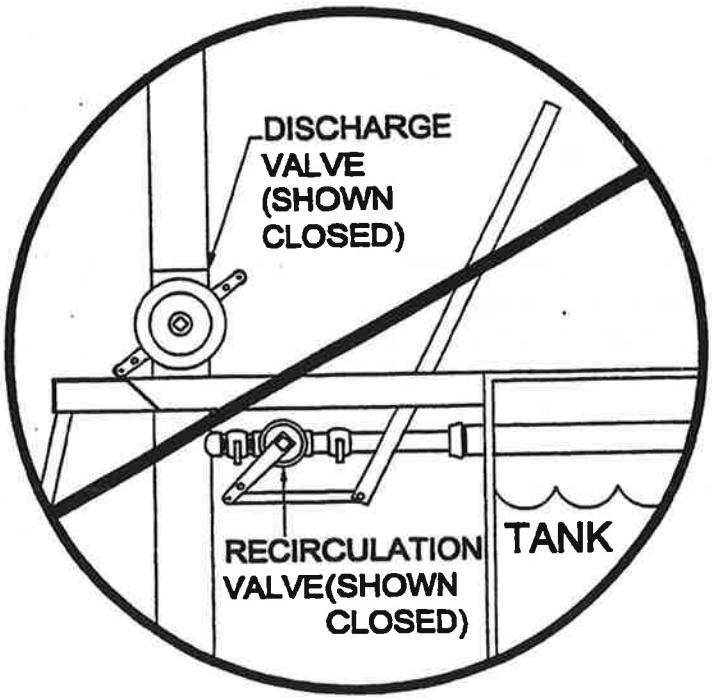


Figure 1

1. **Discharge Through Boom:**

Flow is through boom with no flow through closed recirculation valve (Figure 2). Flow through boom is controlled by engaging and disengaging slurry pump clutch. Do not use the discharge valve to control distance. Valve should be completely open. Control the spray volume and spray distance by adjusting the engine RPM.

2. **Extension Hose Through Boom:**

Flow is through boom with no flow through closed recirculation valve (Figure 2). Extension hose is connected to boom and flow is controlled by engaging and disengaging pump clutch, or controlling the speed of the engine.

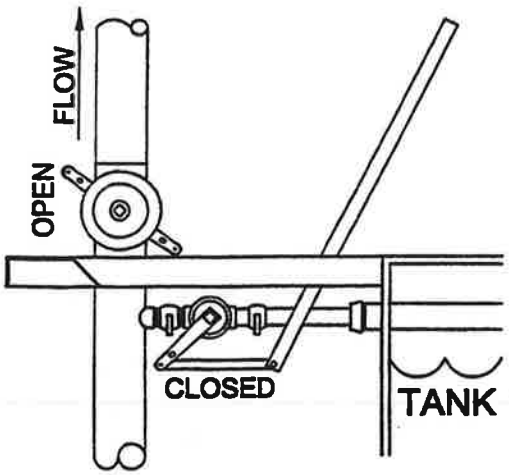


Figure 2

DANGER: **Do not use remote valve in this application.**

3. **Extension Hose or Hose Reel Through Remote Port:**

Flow is through recirculation with no flow through closed discharge valve (Figure 3). Flow through hose is controlled by engaging and disengaging slurry pump clutch, or by remote valve at end of hose. Open recirculation valve allows flow back into tank when the remote valve is closed.

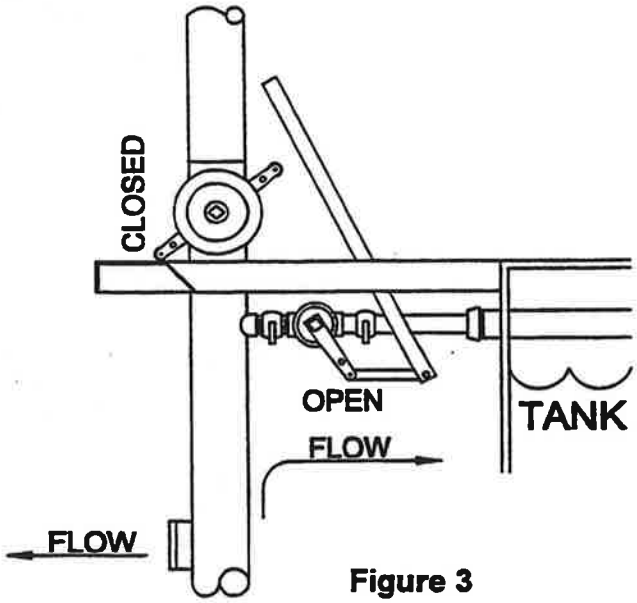


Figure 3

DANGER: **Recirculation valve must be open and material flowing back into tank when using a remote valve. A closed or plugged recirculation line will cause extreme heat resulting in damage and/or bodily injury.**

STARTING PROCEDURE:

CAUTION: **See safety section of the manual (pages 2-4) before operating the machine.**

Before starting, open the recirculation valve, close discharge valve, disengage clutch, and place the agitator control in the neutral position.

1. Set throttle about 1/4 open.
2. While holding in the safety switch button, turn the key clockwise until the starter engages, and the engine starts.
3. Continue to hold the safety switch in for approximately 10 seconds. Allow engine to warm up for 3 to 5 minutes.

NOTE: This engine has a safety system which will shut the engine off if the engine oil pressure drops below 7 psi. or if the water temperature reaches 230° Fahrenheit (110° Centigrade).

AREA COVERAGE - MATERIAL CAPACITY:

To determine the coverage per load for any HydroSeeder®, three questions must be answered prior to the application. First, is the job to be done "one step" (which is when the seed, fertilizer and mulch are applied proportionally per load) or "two step" (which is when the seed and fertilizer are applied alone and then covered by mulch as a second operation)? Second, at what rates (usually in pounds per 1000 square feet, or pounds per acre) are the seeding materials to be applied? Finally, what are the loading capacities of the HydroSeeder®?

Application rates vary for different geographic locations, but in general, seed is applied at 6-10 pounds per 1000 square feet; fertilizer is applied at a rate of approximately 400 pound per acre; and fiber mulch is applied at 1500 to 2000 pounds per acre. (Note: There are 43,560 square feet in an acre). Local agronomists, agricultural extension agents, or soil and water conservation officials should be contacted for more specific information on application rates for a given area.

The following tables show loading versus coverage rates for the Finn HydroSeeders®. Table A shows rates for "one step" applications. The coverage area is determined by the fiber mulch capacity of the HydroSeeder®, and the rate at which it is applied. Table B shows the area coverage when seeding only, where little or no mulch is applied. The coverage area is determined by the granular solids capacity of the HydroSeeder®, and the rate at which the solids are applied.

TABLE A

Using Seed, Fertilizer and Mulch

Unit	Amount of Material in Tank (pounds (kilograms)) Seed	Fertilizer	Mulch	Coverage Area (sq. ft.(sq. m.))
T170	172 (78)	200 (91)	750 (340)	21,780 (2023)
T280	287 (130)	333 (151)	1250 (567)	36,300 (3372)
T330	345 (156)	400 (181)	1500 (680)	43,560 (4046)

Above Table is based on 1500 pounds of mulch, 400 pounds of fertilizer and 345 pounds of seed (8 pounds/1000 square feet) per acre.

Table A Example: For T170

$$\frac{\text{750 pounds Mulch per Tank}}{\text{1500 Pounds Mulch per Acre}} = .5 \text{ Acre per Load}$$

400 Pounds Fertilizer per Acre x .5 Acre = 200 Pounds Fertilizer per Load
345 Pounds Seed per Acre x .5 Acre = 172 Pounds Fertilizer per Load

TABLE B

Seed and Fertilizer Only

Unit	Amount of Material in Tank (pounds (kilograms)) Seed	Fertilizer	Total	Coverage Area Sq. Ft. (Sq. m.)	Acreage (Hectare)
T170	1742 (790)	2000 (907)	3742 (1697)	217,800 (20,233)	5 (2.02)
T280	3136 (1422)	3600 (1633)	6736 (3055)	392,040 (36,420)	9 (3.64)
T330	3485 (1580)	4000 (1814)	7485 (3395)	435,600 (40,467)	10 (4.04)

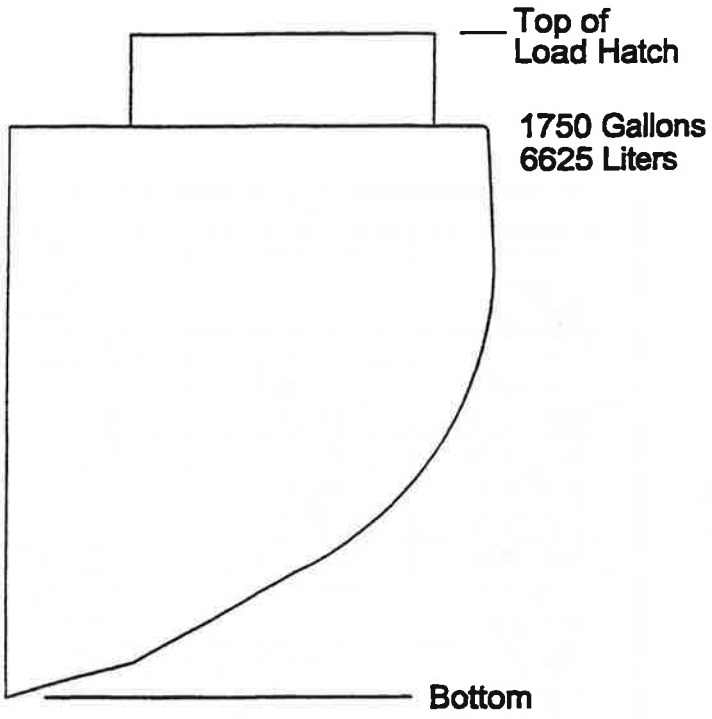
Above Table is based on rates of 8 pounds seed and 9.2 pounds fertilizer per 1000 square feet.

Table B Example: For T170

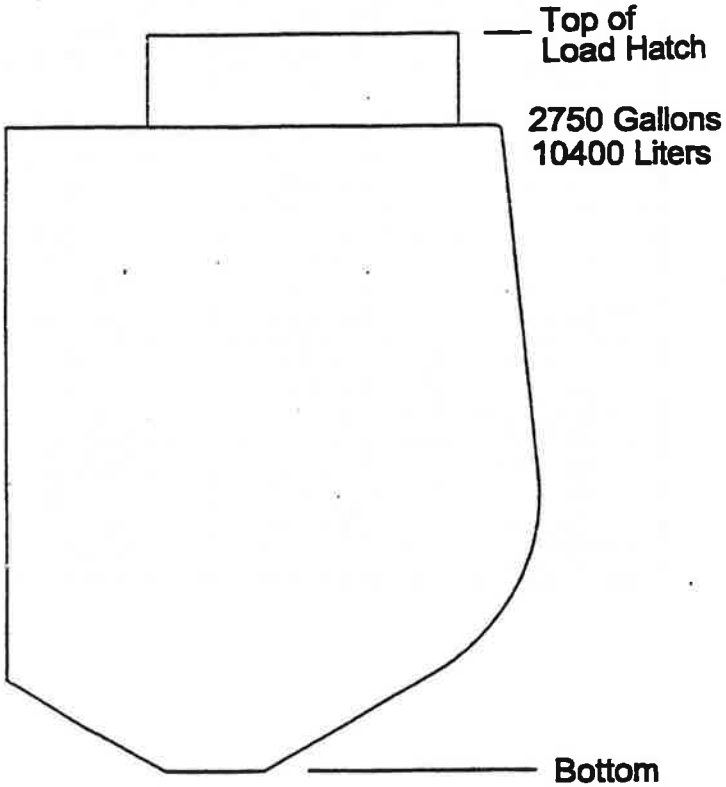
$$\frac{\text{3742 Pound Tank Capacity (Solids)}}{\text{8 Pounds (Seed) + 9.2 Pounds (Fertilizer) per 1000 Sq. Ft.}} = 217{,}800 \text{ Square Feet per Load}$$

$$\frac{\text{8 Pounds Seed}}{\text{1000 Sq. Ft.}} \times 217{,}800 \text{ Square Feet} = 1742 \text{ Pounds Seed per Tank}$$

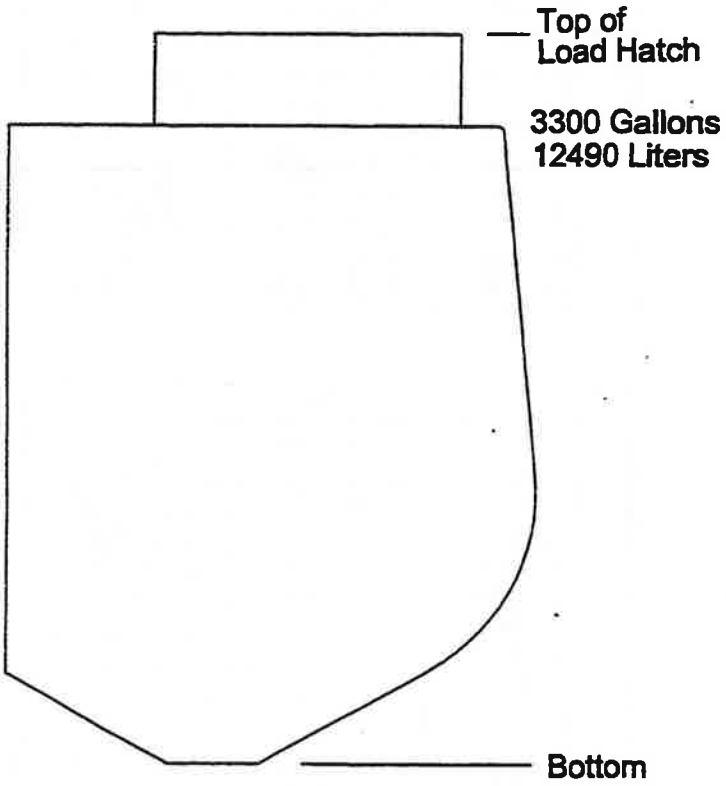
TANK CAPACITY CHARTS:



T170		
Gallons (Liters)	in. (cm) from top	in. (cm) from bottom
1700 (6435)	9.5 (24.1)	49.25 (125.1)
1600 (6055)	12 (30.5)	46.75 (118.7)
1500 (5675)	14.25 (36.2)	44.5 (113)
1400 (5300)	16.5 (42)	42.25 (107.3)
1300 (4925)	18.75 (47.6)	40 (101.6)
1200 (4545)	21.25 (54)	37.5 (95.25)
1100 (4165)	23.5 (59.7)	35.25 (89.5)
1000 (3785)	25.75 (65.4)	33 (83.8)
900 (3405)	28 (71.1)	30.75 (78.1)
800 (3025)	30 (76.2)	28.75 (73)
700 (2650)	32.5 (82.5)	26.25 (66.7)
600 (2270)	35.25 (89.5)	23.5 (59.7)
500 (1890)	37.75 (95.9)	21 (53.3)
400 (1515)	40.25 (102.2)	18.5 (47)
300 (1135)	43.25 (110)	15.5 (39.4)
200 (755)	46.75 (118.7)	12 (30.5)
100 (375)	50.25 (127.6)	8.5 (21.6)



T280		
Gallons (Liters)	in. (cm) from top	in. (cm) from bottom
2750 (10410)	8 (20.3)	58.5 (148.6)
2700 (10220)	11.75 (29.8)	54.75 (139.1)
2600 (9840)	13.75 (34.9)	52.75 (134)
2500 (9465)	15.5 (39.4)	51 (129.5)
2400 (9085)	17.75 (45.1)	48.75 (123.8)
2300 (8705)	19.5 (49.5)	47 (119.4)
2200 (8325)	21.25 (54)	45.25 (114.9)
2100 (7950)	23.25 (59)	43.25 (109.9)
2000 (7570)	25 (63.5)	41.5 (105.4)
1900 (7190)	26.75 (67.9)	39.75 (101)
1800 (6815)	28.75 (73)	37.75 (95.9)
1700 (6435)	30.75 (78.1)	35.75 (90.8)
1600 (6055)	32.5 (82.6)	34 (86.4)
1500 (5675)	34.25 (87)	32.25 (81.9)
1400 (5300)	36 (91.4)	30.5 (77.5)
1300 (4925)	38 (96.5)	28.5 (72.4)
1200 (4545)	39.75 (101)	26.75 (67.9)
1100 (4165)	41.75 (106)	24.75 (62.9)
1000 (3785)	43.25 (109.9)	23.25 (59.1)
900 (3405)	45 (114.3)	21.5 (54.6)
800 (3025)	47 (119.4)	19.5 (49.5)
700 (2650)	49 (124.5)	17.5 (44.4)
600 (2270)	50.75 (128.9)	15.75 (40)
500 (1890)	52.5 (133.4)	14 (35.6)
400 (1515)	54.5 (138.4)	12 (30.5)
300 (1135)	56.75 (144.1)	9.75 (24.8)
200 (755)	59 (149.9)	7.5 (19.1)
100 (375)	61.5 (156.2)	5 (12.7)



T330		
Gallons (Liters)	in. (cm) from top	in. (cm) from bottom
3300 (12490)	8 (20.3)	58.5 (148.6)
3200 (12115)	12.25 (31.1)	54.25 (137.8)
3100 (11735)	13.75 (34.9)	52.75 (134)
3000 (11360)	15.5 (39.4)	51 (129.5)
2900 (10975)	17 (43.2)	49.5 (125.7)
2800 (10600)	18.75 (47.6)	47.75 (121.3)
2700 (10220)	20.25 (51.4)	46.25 (117.5)
2600 (9840)	21.75 (55.2)	44.75 (113.7)
2500 (9465	23.5 (59.7)	43 (109.2)
2400 (9085)	25 (63.5)	41.5 (105.4)
2300 (8705)	26.5 (67.3)	40 (101.6)
2200 (8325)	28 (71.1)	38.5 (97.8)
2100 (7950)	29.75 (75.6)	36.75 (93.3)
2000 (7570)	31.25 (79.4)	35.25 (89.5)
1900 (7190)	32.75 (83.2)	33.75 (85.8)
1800 (6815)	34.25 (87)	32.25 (81.9)
1700 (6435)	35.75 (95.9)	30.75 (78.1)
1600 (6055)	37.25 (94.6)	29.25 (74.3)
1500 (5675)	38.75 (98.4)	27.75 (70.5)
1400 (5300)	40.25 (102.2)	26.25 (66.7)
1300 (4925)	41.75 (106)	24.75 (62.9)
1200 (4545)	43.25 (109.9)	23.25 (59.1)
1100 (4165)	44.75 (113.7)	21.75 (55.2)
1000 (3785)	46.75 (118.7)	19.75 (50.2)
900 (3405)	48 (121.9)	18.5 (47)
800 (3025)	49.25 (125.1)	17.25 (43.8)
700 (2650)	51 (129.5)	15.5 (39.4)
600 (2270)	52.5 (133.4)	14 (35.6)
500 (1890)	54.25 (137.8)	12.25 (31.1)
400 (1515)	56 (142.2)	10.5 (26.7)
300 (1135)	57.75 (146.7)	8.75 (22.2)
200 (755)	59.5 (151.1)	7 (17.8)
100 (375)	62 (157.5)	4.5 (11.4)

LOADING (For wood fiber mulch, if liming see page 20):

CAUTION: **Take care not to lose pens, lighters, etc. from shirt pockets or drop pieces of paper or plastic bags into the tank, as these might plug the slurry system.**

1. With clutch disengaged and agitator control in the neutral position, start engine and allow it to warm up (See starting procedure page 12).
2. Start filling the unit with water. When water reaches the top of the agitator shaft, move agitator control to full reverse position.
   Fill the tank with water from any stream or pond using a fill pump. When filling from a pond or stream be sure to use a suction strainer to filter out contaminants which could damage the pump and unit. Other sources of water:
   1. Any pressure source, e.g. fire hydrant. This unit is supplied with a 6" air gap fill port but it is necessary to consult with local authorities before using water main in order to abide to all local ordinances.
   2. Water tanker.
3. Piping System Cleanout Procedure (Purging Line):
   A. Remove discharge nozzle and gasket from discharge boom.
   B. Aim discharge boom assembly into an open area away from any persons, obstructions or high voltage power lines.
   C. Open discharge valve and close recirculation valve.
   D. Increase engine speed to approximately 1/2 to 3/4.
   E. Engage clutch with a firm snap. Do NOT slip clutch.
   F. When discharge stream is clear, open recirculation valve and close discharge valve. After recirculation stream is clear disengage clutch.
   G. Replace gasket in discharge boom.
4. Continue filling tank with water.
5. Increase engine speed to full RPM.
6. Start loading dry material, loading the lightest material first. Agitator control should be in full reverse for mixing.
   A. Seed - Cut the seed bag and dump contents into the slurry tank. (When using inoculant, add it in the tank along with the seed.) When using quick swelling seeds load them just prior to application.
   B. Wood Fiber Mulch - Empty the entire bag in or cut bag and drop in the sections of fiber. The amount of mulch to be used should be loaded by the time the water level is at 3/4 full. If agitator stalls or a high pitch squeal comes from the hydraulic system, reverse agitation to forward for a moment to clear the obstruction, then return agitation to reverse.

CAUTION: **Hydraulic system will overheat if agitator shaft is jammed for extended period. This will damage hydraulic oil and system components.**

C. Fertilizer - Stand over hatch opening and drop the bag onto the bag cutter. Grasp both ends of the bag and dump material.

D. All other additives - Consult with manufacturer for proper loading technique.

7. When all materials are loaded and in suspension, and the tank is full, move the agitator to neutral then full speed forward to insure all material is mixed. It may be necessary to change the agitator direction more than once to insure a thorough mixture.
8. After material is thoroughly mixed, slow agitator in forward direction to 1/2 to 3/4 speed or enough to create movement in all of the corners of the tank. Do not over agitate the slurry. Always discharge the material with the agitator control in forward position.
9. Close the hatch lid on the slurry tank.

NOTE: The slurry should not be recirculated for more than 15 minutes prior to discharge to reduce wear and keep seed from swelling.

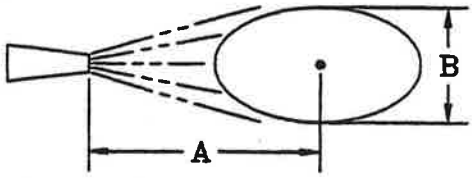
NOTE: If foaming occurs, reduce agitator speed.

PRIOR TO APPLICATION:

1. Operator should familiarize self with area to be seeded and develop a plan to insure uniform application.
2. Develop a plan for communication between operator and driver of the carrying or towing vehicle to signal for start, stop, turn, etc. through the use of the signal horn.
3. Operator takes up position on the platform. From this point application will be controlled by the use of the clutch, valve, discharge assembly and throttle.

DISCHARGE NOZZLE SELECTION:

Nozzles are stored in the toolbox. This HydroSeeder® is equipped with 6 nozzles - two long distance and four ribbon fan nozzles. The smaller long distance nozzle is generally better suited for seed, fertilizer and/or lime application while the large long distance nozzle is better for wood fiber mulch application. All of the ribbon fan nozzles are generally suited for both types of application.



Nozzle	Distance (A)	Width (B)	Discharge Time	
			T170	T330
Lg. Long Distance	Up to 230 ft (70m)	-	5.5 min.	7.5 min.
Sm. Long Distance	Up to 150 ft (46m)	-	19 min.	30 min.
Sm. Narrow Ribbon	Up to 75 ft (23m)	15 ft (4.6m)	19 min.	30 min.
Sm. Wide Ribbon	Up to 45 ft (14m)	25 ft (7.6m)	19 min.	30 min.
Lg. Narrow Ribbon	Up to 90 ft (28m)	23 ft (7m)	7.7 min.	10.6 min.
Lg. Wide Ribbon	Up to 84 ft (26m)	30 ft (9m)	7.7 min.	10.6 min.

APPLICATION OF SLURRY:

I. General Application Techniques

DANGER: **Do not spray toward power lines, transformers or other high voltage conductors.**

CAUTION: **The driver of the carrying vehicle should remain alert for hazards to the operator, such as low power lines, hanging branches, etc. Driver should never start or stop abruptly.**

1. Determine which nozzle would best suit the application needs according to the nozzle selection chart on page 17.
2. Application of seed, fertilizer and lime: Elevate discharge nozzle no less than 10° above the area to be sprayed, allowing the slurry to gently rain onto the seed bed.
3. Application of wood and paper fiber: Whenever possible aim the stream towards the ground to create a surface with small pock marks which help get seed in contact with ground. Do not allow the stream to blast away the surface of the seed bed.
4. Generally the most remote area of the seed bed should be covered first. Distance is controlled by engine speed and nozzle selection. Do NOT partially close the valve to control the distance.
5. While moving along area to be seeded, the operator should move the nozzle back and forth in a slow, even arc.
6. If application is to be interrupted for a short period of time, leave the valves open and disengage the clutch. Re-engage the clutch to continue application.
7. It may be necessary to slow the agitator as the tank empties to reduce foaming.

II. DISCHARGE THROUGH THE BOOM:

1. Move the discharge valve foot pedal to the open position, the recirculation valve handle to the closed position, and engage the clutch. At this time, should the operator want to stop spraying for a short period, disengage the clutch; then re-engage to continue spraying.
2. When the tank is empty, or when discontinuing discharge for an extended period of time, disengage the clutch, then immediately move the discharge valve to the closed position, and idle the engine. This will maintain moisture in the discharge piping and help prevent plugging. Move the agitator control to the neutral position.

III. PROCEDURES WHEN USING HOSES:

Always pump clear water through the hose before pumping mulch. If the inside hose liner is dry, it will dewater the mulch causing plugging.

A. PUMP TAKE OFF SYSTEM OR HOSE REEL WITH REMOTE VALVE:

1. Open recirculation valve and close discharge valve and close remote valve at the end of the hose.
2. Engage clutch. When stream is flowing freely through the recirculation line, open the pump take off valve.

CAUTION: **The high pressure on the hose can exert strong forces causing hose operator to lose control of hose or footing. The hose will require additional holders on slopes. Open the pump take off valve and the remote valve slowly and only after the hose operator is firmly positioned and has firm control of hose.**

3. With the engine at 3/4 speed, open the remote valve at the end of the hose to discharge the load.
4. When finished spraying, close the remote valve, disengage the clutch, and stop the engine. If using fiber mulch, retain as much water as possible in the hose by elevating the ends or by coupling the ends together.
5. If another load is to be done, see reloading procedure on page 20. If finished for the day, follow the clean up procedure and flush out the hose.

DANGER: **The recirculation valve must be open when using a remote valve. If not open, extreme heat which will cause damage and/or bodily injury will occur.**

B. EXTENSION HOSE SYSTEM - WITHOUT REMOTE VALVE:

1. Connect the extension hose into the end of the discharge boom.
2. A person controlling the end of the hose directs a second operator at the machine to control the clutch and adjust the engine speed.

CAUTION: **Since the extension hose will be seeing the full output of the pump with the recirculation closed, the equipment operator and individual at the end of the hose should exercise extreme care when operating unit on high pressure. The high pressure on the hose can exert strong forces causing hose operator to lose control of hose or footing. The hose will require additional holders on slopes. Engage the clutch only after the hose operator is firmly positioned and has firm control of hose.**

3. When hose operator is ready signal the second operator to engage clutch and slowly increase the engine RPM until the desired discharge pressure is reached.
4. When finished spraying, disengage the clutch, stop the engine, and close the discharge valve. If using fiber mulch, retain as much water as possible in the hose by elevating the ends or by coupling the ends together.
5. If another load is to be done, see reloading procedure on page 20. If finished for the day, follow the clean up procedure and flush out the hose.

RELOADING PROCEDURE:

1. Start at step 2 in loading procedure on page 16.
2. After last load of the day refer to the cleaning and maintenance section of the manual on pages 28-29.

LIMING WITH THE HYDROSEEDER®:

In using large concentrations of granular solids through the HydroSeeder®, it is advisable to keep the slurry moving through the pump at all times. This keeps the solids from settling in the lines, and creating a stoppage. This unit was designed for the application of agricultural grade lime only.

PROCEDURE:

1. With clutch disengaged and agitator control in neutral position, start engine and allow it to warm up (see starting procedure on page 12)
2. Start filling the unit with water. When water reaches the top of the agitator shaft move agitator control to approximately 1/2 speed reverse.
3. Open both the recirculation and discharge valves.
4. Remove the discharge nozzle and gasket from the discharge boom.
5. Aim the discharge boom assembly into an open area away from any persons, obstructions or high voltage power lines.
6. Move the throttle to approximately 1/2 engine speed.
7. Engage the clutch, and move the throttle to full engine speed. A stream of water should be coming from the end of the recirculation pipe beside the hatch opening, as well as from the boom.
8. As soon as both streams are clear, close the discharge valve and make sure water is being recirculated back to the tank.
9. Increase throttle to 3/4 speed. Increase agitator speed to full reverse. DO NOT DISENGAGE CLUTCH!
10. 20 pounds of granular solids displaces approximately 1 gallon of water. When filling the tank with water the volume of granular solids must be accounted for. For example; If using the maximum recommended capacity of 5000 pounds for a T170, 250 gallons (5000 ÷ 20) would have to be subtracted from the total tank capacity (1750 gallons - 250 gallons = 1500 gallons). If 1000 pounds of solids were used, 50 gallons (1000 ÷ 20) would have to be subtracted (1750 gallons - 50 gallons = 1700 gallons). Using the T280 maximum recommended capacity of 8000 pounds, 400 gallons (8000 ÷ 20) would have to subtracted (2750 gallons - 400 gallons = 2350 gallons). For the T330 maximum recommended capacity of 10000 pounds, 500 gallons (10000 ÷ 20) would have to be subtracted (3300 gallons – 500 gallons = 2800 gallons).
11. Fill the tank to the required capacity for the rate of granular solids to be applied.
12. Load the material (see "Loading" page 16, steps 5-8).
13. When ready to apply slurry, install gasket and nozzle into boom.
14. Move agitator control to 3/4 speed, forward.

15. With the clutch still engaged, open the discharge valve.

CAUTION: **To decrease pump wear and increase discharge distance, it may now be desirable to close the recirculation valve. However, the recirculation valve must be open BEFORE closing the discharge valve if the application of slurry is to be interrupted. Extreme heat, which will cause damage and/or bodily injury, will occur if both valves are closed.**

16. Apply the slurry (see "Application of Slurry" pages 18-19).
17. If another load is to be applied, start again at step "1". If finished, follow the clean-up procedure.

TROUBLE SHOOTING YOUR HYDROSEEDER®:

Because of the tremendous workload usually placed upon the HydroSeeder®, minor malfunctions will occur from time to time. If these are not remedied immediately, they could lead to poor performance and damage to the equipment. This section describes possible problems and the action to correct them.

1. Foam in the tank and air entrainment.

   The mixture of dry materials with water will sometimes cause excessive foaming while others will cause air entrainment. This is noticed primarily in the erratic discharge and a drop in pressure and distance.

   Some solutions are:
   A. As the slurry level drops in the tank, slow the agitator.
   B. Add 2 or 3 ounces (4 to 6 cl) of an antifoaming agent to the tank.
   C. If you can determine which additive is causing the air problem, either add it last or not at all - unless it's the water.
   D. Limit recirculation time as much as possible.
   E. Open pump suction bleed valve to exhaust air trapped in the pump or suction line. Close valve as soon as the air stops.
2. Plugging or clogging:

DANGER: **Turn off engine and disconnect battery cables before working on equipment. Serious injury or death can result from moving parts or high pressure spray.**

Sometimes when a stoppage occurs, you will not be able to find anything in the line. When this happens, it means that the system became airbound instead of plugged. To remedy this, open the air bleed valve, which will normally correct the problem; otherwise see the "Foaming" section. Plugging can occur in any one of four places; the valve and recirculation nozzle, the discharge nozzle, the pump area and the sump area. The plugging is caused by either foreign objects or dewatered fiber.

A. Obstruction in the discharge nozzle is determined by a change or stoppage of the spray pattern.

   a) Disengage clutch.
   b) Make certain that the pump has stopped rotating.
   c) Remove the nozzle, slowly and carefully.
   d) Clear the nozzle with the nozzle cleaning rod attached to the underside of the guardrail.

DANGER: **Severe injury can result from opening clamps when piping is hot. Before loosening any clamps, determine if the pipe is hot. If so, let it cool before attempting repair.**

B. If the recirculation system is not working:

   a) Disengage the clutch and shut down the engine.
   b) Remove the two clamps on each side of the recirculation valve.
   c) Slide the rubber seals back and remove the valve assembly.
   d) Check the valve assembly, the recirculation nozzle in the discharge pipe, and the recirculation pipe going into the tank. Clear any obstructions.
   e) Replace the valve assembly and slide the seals back into place. Lubricate the outside of the seals.
   f) Replace the clamps.

3. Obstruction in the pump, which can be determined by a drop in pressure. If the drop in pressure is accompanied by a frothy or whitish discharge stream, the blockage is in the suction line or sump area. To clear the pump:

A. Disengage the clutch and stop the engine.
B. Loosen the suction pipe clamps. If there is material in the tank, shut off the suction line valve
C. Remove the clamp closest to the pump.

NOTE: If no water comes out, it means that the obstruction is in the sump area.

E. Reach into the pump and remove the obstruction. If it is jammed, the pump suction cover may have to be removed.
F. Reassemble removing pipe "plug" in process.
G. Open suction line valve.

4. Obstruction in the sump area, which is located at the bottom of the tank on the inside where the suction pipe is attached:

A. The easiest way to clear the sump is to back flush through the discharge plumbing with the water supply hose. (Do not use a hydrant).
B. Another method is to remove the drain plug and run a long pole through the opening and into the sump area. Remove the obstruction and replace the drain cap.
C. Use a pipe or pole through the loading hatch opening to dislodge the obstruction

TROUBLE SHOOTING YOUR HYDROSEEDER®:

Problem	Probable Causes	Suggested Solutions
LEAKS:		
Tank bearing leaks.	Lack of lubrication - seal worn.	Replace seal and follow lube schedule.
	Bolts not tightened properly.	Tighten uniformly to 25 ft. lbs.
Pressure Clamps.	Rubber seal cracked, pinched or torn.	Replace, always grease seal before clamping shut.
Suction.	Rubber seal cracked, pinched or torn.	Replace, always grease seal before clamping shut.
Discharge Swivels.	Not greased often enough.	Rebuild swivels w/repair kit (part #12397, 2 required).
Pump Shaft.	Pressure lubricator not serviced.	Replace pump seal, service pressure lubricator daily.
Pump Suction Cover.	Cover O-Ring bad.	Replace cover O-Ring, use grease when replacing.
Discharge Boom or Nozzle Camlock Fittings.	Worn or no gasket.	Replace gasket.
MACHINE JUMPS DURING OPERATION:		
Agitator.	Agitator bent by heavy object falling on it.	Straighten agitator or shim, so it runs true.
Bent Paddles.	Loading wood fiber mulch into tank before tank is half full.	Straighten agitator paddle, realign agitator to run true.

Problem	Probable Causes	Suggested Solutions
FOAMING OF SOLUTION AND LACK OF DISTANCE:		
Pump looses prime-lacks distance-leaves excessive amount in tank. (100 gal (378 liters) or more).	Sucking air in suction. lines.	Check all suction connections to see that rubber seals are in good shape. Grease seals before replacing clamps.
	Air entrainment.	See page 21.
	Low engine RPM. (Below 2750 RPM-No load)	Check throttle cable and linkage, See authorized engine dealer.
	Soft water.	Slow agitator.
	Too much agitation.	Slow the agitator.
	Pump worn.	Reset pump tolerance page 34.
	Suction partially plugged.	Clean out machine see page 28.
	Nozzle worn or plugged.	Clean nozzles, replace if necessary.
	Fertilizer.	Change type.
	Clutch slippage	Readjust clutch page 36.
VALVE:		
Valve stuck.	Frozen.	Thaw out ice, lubricate. Leave in discharge position during storage.
Constant plugging during operation.	Foreign material in slurry.	Drain and clean out tank. Check storage for foreign materials.
Constant plugging during loading and discharging.	Loading HydroSeeder® before tank is half full of water.	Reinstruct your operator. (See page 16).
	Incorrect loading procedure.	Review loading procedure page 16.

Problem	Probable Causes	Suggested Solutions
	Improper operation by operator.	Reinstruct your operator. (Review Operator's Manual).
	Clutch slipping.	Readjust clutch, see page 36.
	Not moving valve handle far enough.	Valve should be fully open.
	Machine not being flushed out prior to reloading.	See page 16.
	Machine not being run at correct RPM during loading.	Reinstruct your operator. (See page 16).
Extension hose plugs after use.	Letting water run out, leaving wood fiber mulch to dry out.	If hose has to be uncoupled, seal ends to keep water in hose and prevent wood fiber mulch from drying out.
CLUTCH:		
Does not pull load or overheats.	Out of adjustment.	Readjust clutch, instruction on page 36.
Jumps out of engagement.	Too loose or too tight.	Readjust clutch, see page 36.
PUMP:		
Excessive wear.	Fertilizer with highly abrasive filler.	Change fertilizer. Avoid abrasive fillers.
	Overloading machine with dry material.	Load machine to recommended capacities.
	Too much time allowed between loading and discharging.	After loading and mixing has been completed, set agitator at 1/2 speed in reverse and disengage pump.
	Recirculating all the time.	Close recirculation valve when discharging through the boom.

Problem	Probable Causes	Suggested Solutions
Will not turn.	Frozen.	Warm housing to melt ice.
	Jammed with fertilizer or lime.	Remove cover and clean interior.
	Impeller rusted to suction cover plate.	Pull cover and remove rust.

CAUTION: **Do not turn the shaft backwards with a pipe wrench - this will unscrew the impeller from the shaft. Consequently, when clutch is engaged, the impeller will screw onto the shaft with force, great enough to break the impeller.**

CLEANING AND MAINTENANCE:

AFTER FIRST 4 - 8 HOURS OF OPERATION:

1. Check and adjust clutch - see page 36.

DAILY:

1. Cleaning the HydroSeeder®
   A. Fill the slurry tank to the center of the agitator shaft.
   B. Move agitator lever to full speed to flush off inside of tank top and walls.
   C. Remove discharge nozzle and gasket from discharge boom.
   D. While pointing discharge toward an open area, move discharge valve handle to discharge position and engage clutch. Allow to discharge until clear water is coming out.
   E. Move recirculation valve handle to recirculation and allow to run momentarily.
   F. Disengage clutch, idle the engine, move valve handle to discharge position, move agitator handle to neutral and turn off the engine.
   G. Always remove the drain cap and allow the tank to drain.
   H. In freezing weather leave main tank drain cap out and remove pump drain plug. Move all slurry valves to open position.
   I. Wash the outside of the HydroSeeder®, including the radiator, to remove any corrosive materials.
   J. If using lime - the daily maintenance should be performed after every load.
   K. Cleaning out extension hoses.

2. Lubricating the HydroSeeder® (see lube chart pages 30-31).

   IMPORTANT: Lubrication should be performed IMMEDIATELY AFTER cleaning of equipment. Engine not running.

   A. Lubricate the agitator shaft bearings located on the outside front and rear of the slurry-tank.
   B. Service the automatic lubricator on the pump as needed (for service see page 9).
   C. Check the engine oil and replenish when necessary. Change oil and filter after first 100 hours then 250 hours thereafter. Consult the engine operator's manual for the correct grade of oil and the engine break-in procedure.
   D. Lubricate the swivels on the discharge assembly and the swivel on the hose reel.

WEEKLY OR EVERY 40 HOURS OF OPERATING TIME:

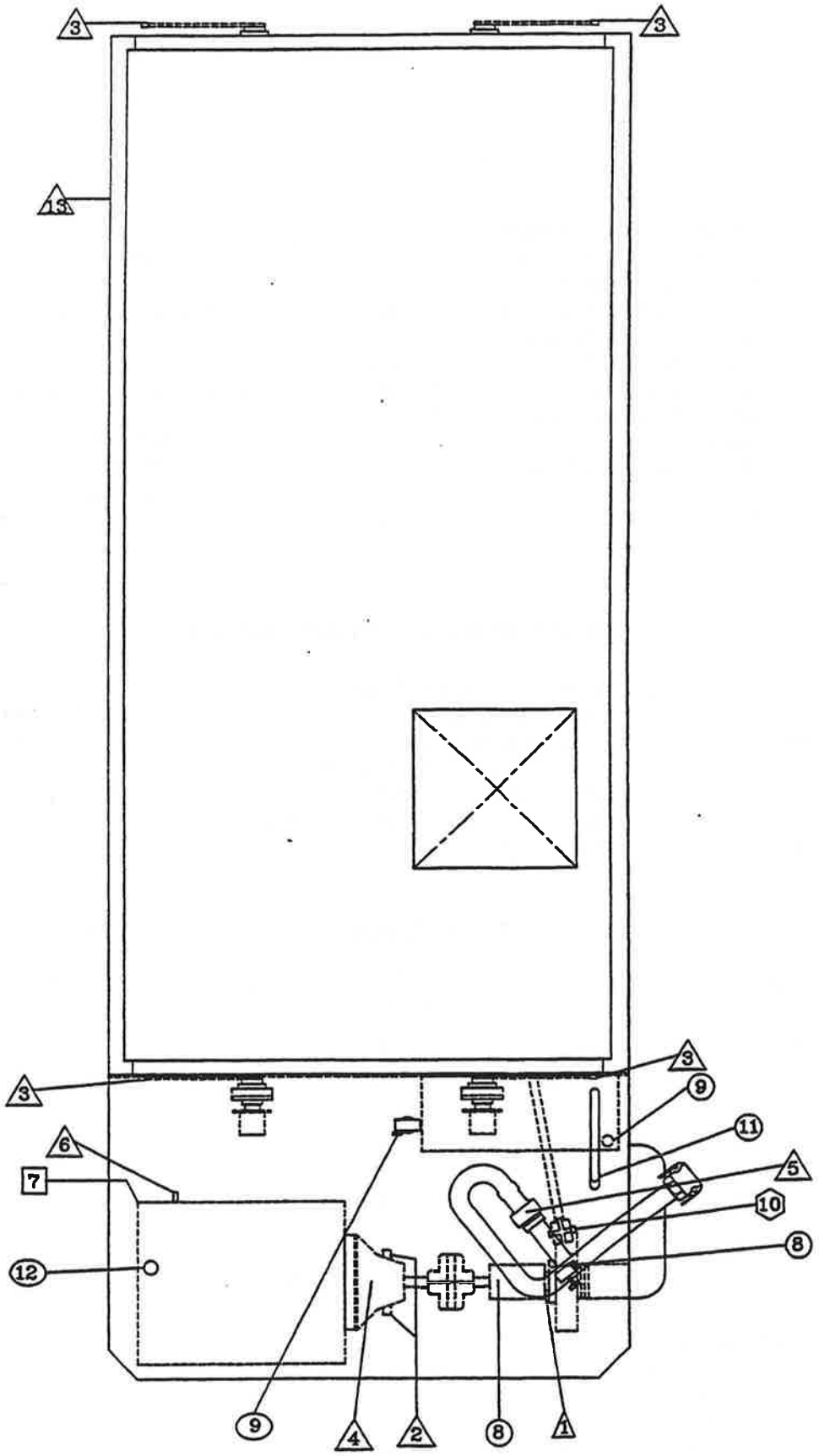
1. Clean the air cleaner following the instructions in the engine operator's manual.
2. Lubricate all the points on the HydroSeeder® as outlined in the daily maintenance section and, in addition, lubricate the four grease fittings on the clutch and pump.
3. Check the level in the hydraulic oil reservoir - maintain level at sight gauge.
4. Check the clutch adjustment to insure that it "snaps" in and out of engagement. Adjust the clutch with the engine off.
5. Check the anti-freeze in the radiator.
6. Inspect the slurry-tank for build up of residue in the suction area and clear if necessary.
7. Check and clean engine radiator. Flush with clear low pressure water and blow dry with compressed air. Do NOT use high pressure water spray.

SEASONAL AND WINTER STORAGE MAINTENANCE:

1. Drain the slurry tank of all water prior to storage and leave the drain cap disconnected.
2. If possible cover machine with tarp or park inside of an enclosure.
3. Store the HydroSeeder® with all slurry valve handles in the open position. To prevent damage from freezing, it is advisable to remove all slurry valves and store in a heated area.
4. Pour one quart of mineral oil or environmentally safe lubricant into the pump housing and spin pump by hand to prevent rust in the pump. Remove drain plug.
5. Chip and steel brush any interior rust spots in the slurry-tank and touch up with paint. See numbers 2 and 3 in Maintenance Section (IV) of the Safety Summary Section page 4.
6. Lubricate all fittings.
7. Check anti-freeze in radiator.
8. Lubricate equipment again just prior to starting operation after storage.
9. Change hydraulic oil and filter. (400 hours)
10. Disconnect battery cables. In cold weather, remove battery and store in safe warm place.
11. Add fuel stabilizer to fuel tank.

HYDRAULIC SYSTEM:

The hydraulic system on your Finn HydroSeeder® is designed to give trouble free service, if maintained. The most important areas of maintenance are the hydraulic oil and filtration. The reservoir holds 22 gallons for the T170 and 50 gallons for the T280/330 of SAE 10W/40 Service Class SE motor oil. The hydraulic oil should be replaced per the lubrication schedule or if the oil becomes milky or it gives off a burnt odor. The hydraulic oil filter must be replaced on schedule with a 10 micron filter - Finn part #021618 for the T170 and part #011869 for the T280/330. The hydraulic system relief is factory set at 2500 psi for the T170 and 3200 psi for the T280/330.



Note: T-330 Shown; Other Models May Vary Slightly

LUBRICATION AND FLUIDS CHART

Ref. No.	Location	Lubricant	Frequency	Number
1	Check Grease Level in Pressure Lubricator	BL	Daily	1
2	Check Clutch Lever Bearings	CL	Daily	2
3	Grease Agitator Shaft Bearings	CL	Daily	2(170) 4(280/330)
4	Grease Clutch Shaft Bearings	CL	Daily	1
5	Grease Discharge Swivels	CL	Daily	2
6	Check Engine Oil Level	MO	Daily	1
7	Check Engine Oil and Filter	MO	See Engine Manual	1
8	Grease Pump Bearings	BL	Weekly	2
9	Check Hydraulic Fluid Level	HO	Weekly	1
	Change Hydraulic Fluid and Filter	HO	Seasonally or 500 Hours	1
10	Grease Discharge and Recirculation Valves	SL	Each Load	2
11	Grease Valve Arm Lever	CL	Weekly	1
12	Change Engine Coolant	AF	Seasonally	1
13	Check Fuel Tank	DF	Daily	1

LUBRICANT OR FLUID USED

BL	Bearing Lube (Soda Base)
CL	Chassis Lubricant
MO	See Engine Manual
HO	Hydraulic Fluid 10W-40 SE Motor Oil
SL	Special Stick Lubricant
AF	50/50 Anti-Freeze and Water Mixture
DF	Diesel Fuel

TIME KEY

DAILY 

WEEKLY 

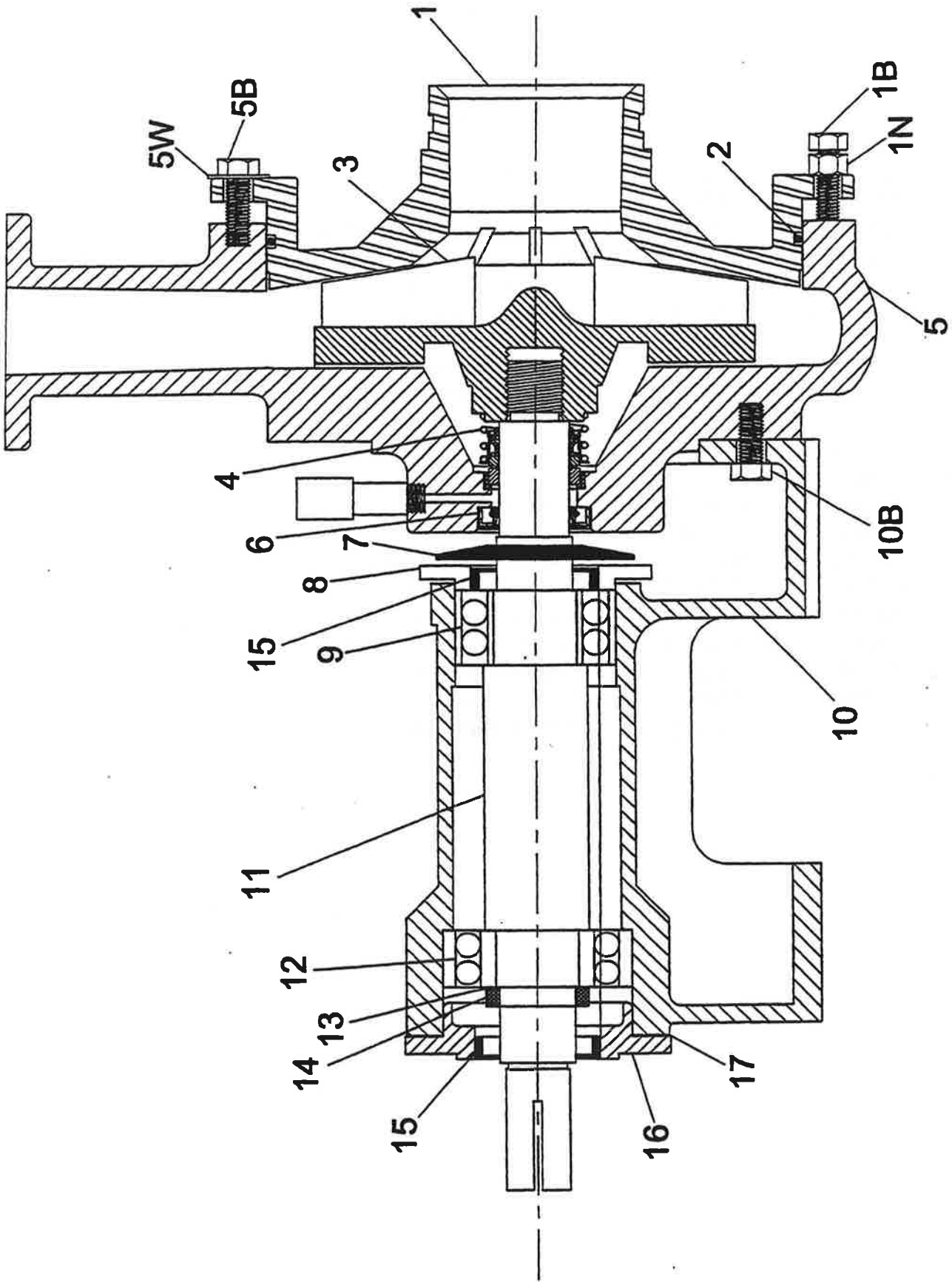
EACH LOAD 

SEASONALLY (500 hours) 

SEE ENGINE MANUAL 

FLUID CAPACITIES

Diesel Fuel - 41 Gallons
Engine Oil - See Engine Manual
Engine Coolant - 4 Gallons 50/50 Mix Only
Hydraulic Fluid - 22 Gallons (170)
- 50 Gallons (280/330)


1
5W
5B
3
2
1B
1N
5
4
6
7
8
15
9
10B
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11
12
13
14
15
16
17

PUMP PARTS

Ref. No.	Part Number		Description	No. Req'd
	T-170	T-280/330		
1	005146	011759	Suction Cover	1
1B	X0824SS	X0824SS	Suction Cover Bolt	4
1N	Y08SS	Y08SS	Suction Cover Nut	4
2	005150	011920	O-Ring	1
3	005145	011758	Impeller	1
4	006443	006443	Mechanical Seal Assembly	1
5	005144	011757	Pump Casing	1
5B	X0824SS	X0824SS	Suction Cover Bolt	8
5W	W08FSS	W08FSS	Suction Cover Washer	8
6	006444	006444	Grease Retainer Seal	1
7	006450	006450	Radial Bearing Slinger	1
8	006537	006537	Radial Bearing Retainer	1
9	006445	006445	Radial Bearing	1
10	002960	002960	Pump Frame	1
10B	X0820SS	X0820SS	Pump Frame Bolt	4
11	002945	002945	Pump Shaft	1
12	006446	006446	Thrust Bearing	1
13	007336	007336	Bearing Lock Washer	1
14	007367	007367	Bearing Lock Nut	1
15	006447	006447	Grease Retainer Seal	2
16	002961	002961	Thrust Bearing Retainer	1
17	012121	012121	Retainer Gasket	1
	012120	012120	Grease Fitting	2
	160234	160234	Pump Drain Plug	1

PUMP MAINTENANCE SECTION:

CAUTION: **Pump maintenance to be done only while engine is not running, and battery cables are disconnected.**

A. FACTORY-TOLERANCES.

1. To check pump tolerances loosen the two clamps on the pump suction piping and remove the inlet elbow. Through the pump suction hole, insert a feeler gauge between the pump impeller (3) and the suction cover (1). This measurement on a new pump is between .040-.045 of an inch (1.00-1.15 mm).

B. IMPELLER CLEARANCE - To bring the pump back to proper tolerance, proceed as follows:

1. Push suction cover (1) into casing (5) until suction cover hits impeller (3). Impeller should be in full contact with suction cover.
2. Tighten cap screws (5B) finger tight. Impeller should rub the suction cover and not turn easily through one revolution.
3. Tighten cap screws (1B) to 15 lb. ft. (165 kg/m). Impeller should turn freely through one revolution.
4. Back off cap screws (5B) 3/4 turn.
5. Tighten cap screws (1B) 3/4 turn and tighten nuts (1N) to 15 lb.ft. (165 kg/m).
6. Tighten cap screws (5B) to 15 lb. ft. Clearance gap should be about .040 inches (1.00 mm). Check to see if impeller turns freely through one revolution.

NOTE: Tightening of the cap screws should be in a criss-cross pattern. DO NOT TIGHTEN TO OVER 15 LB. FT. (165 kg/m). Doing so can crack the flange of the suction cover.

C. CLEANING.

1. To clean pump impeller (3), loosen the two victaulic pipe clamps and remove the suction pipe assembly. The eye of the impeller can then be seen through the suction cover plate (1) and is readily accessible for cleaning.
2. To remove impeller, remove the eight bolts (5B) holding the cover plate (1) in place. Remove cover plate, being careful not to damage the O-Ring gasket (2).
3. Take the impeller wrench, which is stored in the toolbox, and position it so that the hole is aligned with any of the eight tapped holes in the front of the pump casing (5). The 90° leg of the wrench should face in towards the impeller and be positioned between any two of the impeller fins. Bolt the wrench securely in place with one of the suction cover plate bolts (5B). Using a pipe wrench on the shaft (11), unscrew the impeller turning the shaft in a clockwise direction. Be careful not to unscrew the impeller too far before removing the puller wrench.

D. INSTALLING NEW SEAL ASSEMBLY (#4) (Do not unwrap the new seal assembly until you are ready to install. All parts of the assembly are packed in sequence of installation.)

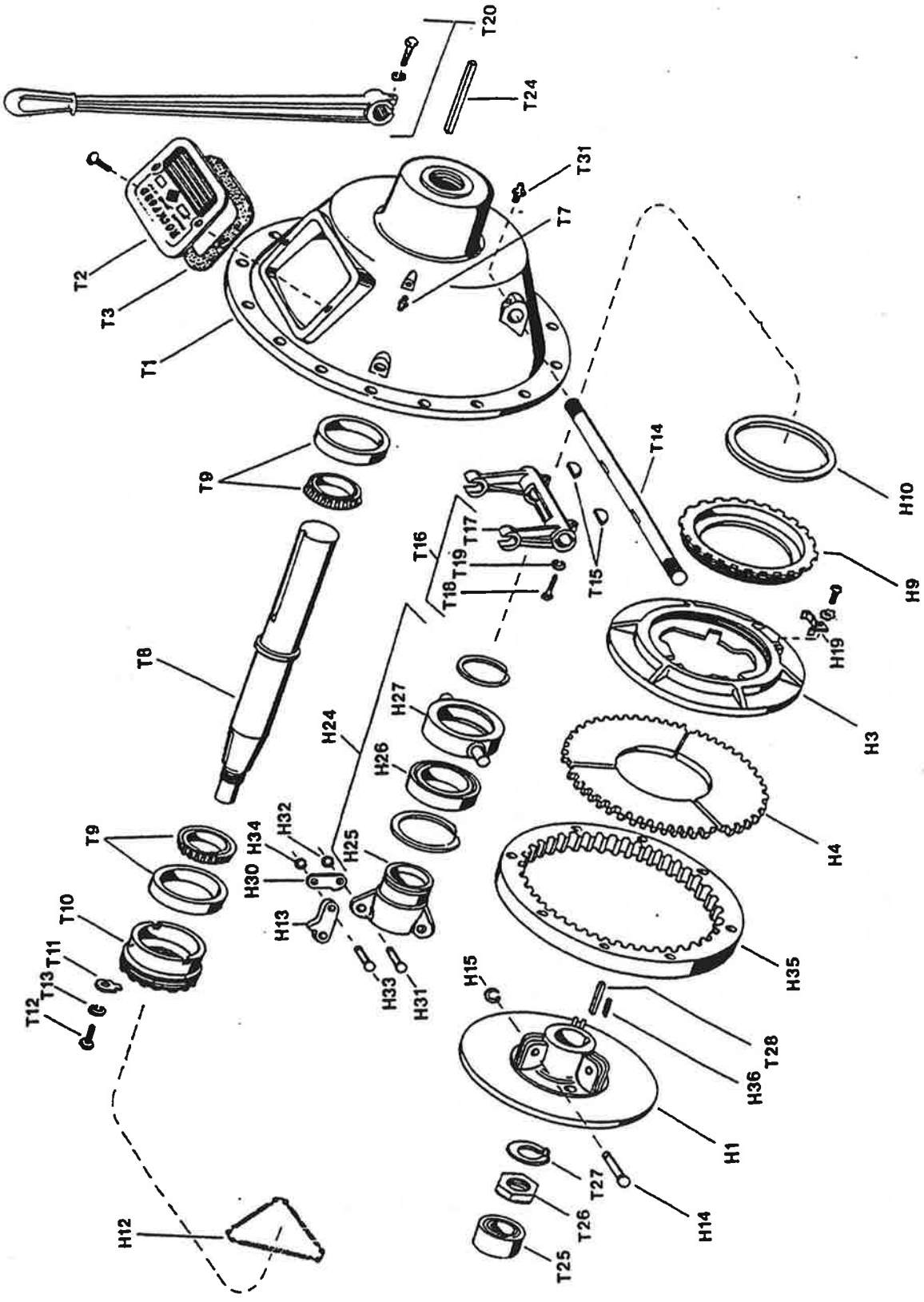
1. To replace the seal assembly (4), perform the above operations under cleaning and remove pump casing (5) by removing the three bolts (10B) holding the casing to the pump frame (10).

2. After cleaning all parts including pump shaft, begin the reassembly of the pump. Install seal grease retainer (6) with the cavity portion of the seal facing outward. Rebolt the casing onto the pump frame using the three cap screw (10B). Using a light oil lubricant (3 in 1), install the ceramic seat with its neoprene holder into the seal recess making sure it is square with the shaft. Lubricate the inside of the bellows assembly with a light oil and check to be sure the steel ring is stuck (glued) to the end of the assembly. Slide the bellows assembly onto the shaft and push till the steel ring is against the ceramic seat.

3. Install the seal spring on the hub of the impeller. After coating the threads on the pump shaft with an anti-seize compound, install the impeller - seating it securely.

4. Utilizing the rubber O-Ring gasket (2) reinstall suction cover using the eight cover bolts (5B). At this time, check to see that the pump runs freely. If the impeller rubs the cover plate, you do not have the impeller tight on the shaft or the cover plate needs readjustment - see "impeller clearance". Tighten these bolts uniformly using 15 ft. pounds (165 kg/m) on the torque wrench.

5. After reinstalling the suction pipe assembly, lubricate and tighten the victaulic clamps. Service the automatic lubricator.


T20
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T11
T13
H15
T12
H33
H31
T28
H36
H1
H12
T27
T26
H14
T25

Figure 4

POWER TAKE OFF ASSEMBLY

Ref. No.	Part Number	Description	No. Req'd
	012069A	Power Take Off Assembly includes:	
H1	100011	Clutch Body	1
H3	100028	Pressure Plate	1
H4	100341	Clutch Facing	1
H9	100013	Adjusting Ring	1
H10	100032	Ring Wear Plate	1
H12	100026	Spring Lever	1
H13	100018	Lever	3
H14	100010	Pivot Lever Pin	3
H15	100007	Retaining Ring	3
H19	100024	Adjusting Lock	1
H24	100071	Release Sleeve and Bearing Assembly	1
H25	100029	Release Sleeve	1
H26	100031	Release Bearing	1
H27	100030	Bearing Carrier	1
H30	100019	Connecting Link	6
H31,H33	100009	Link Pin	6
H32,H34	100008	Retaining Ring	6
H35	100003	Driving Ring	1
H36	100017	Separator Spring	3
All H's	100340	Clutch Assembly	1
T1	100304	Clutch Housing	1
T2	100063	Instruction Plate	1
T3	100054	Cover Gasket	1
T7	100043	Lubrication Fitting	1
T8	012591	Drive Shaft	1
T9	100052	Bearing Cup and Cone (394A-390)	2
T10	100048	Bearing Retainer	1
T11	100039	Retainer Lock	1
T14	100040	Yoke Shaft	1
T15	100305	Woodruff Key	2
T16	100323	Clutch Yoke	1
T20	010284	Shifting Lever	1
T25	022314	Pilot Bearing	1
T26	100307	Drive Shaft Nut	1
T27	100308	Lock Washer	1
T28	100061	Clutch Key	1
T31	100224	Yoke Shaft Lubrication Fitting	2

WHEN ORDERING PARTS, BE SURE TO STATE SERIAL NUMBER OF MACHINE

CARE AND OPERATION OF ROCKFORD POWER TAKE-OFF

The following brief instructions are a simple outline of duties that the owner and operator must perform for long and satisfactory service from any Rockford Power Take-Off.

CLUTCH ADJUSTMENT PROCEDURE:

Rockford power take-offs with HE clutches described in this manual do not automatically adjust to compensate for wear of the clutch facing(s). The operator must periodically adjust the clutch to ensure correct clutch operation.

The clutch should be adjusted if the force required to engage the clutch drops by 10-15% of the specified engagement force (see the table below). Clutch engagement force should be continually monitored so proper clutch adjustment is maintained. Destructive damage may have already occurred if engagement force is allowed to diminish to the point where the clutch fails to carry the load (slippage), if facing(s) have overheated, of if the clutch self-disengages (normally a result of improper clutch engagement).

Clutch Size	Reference Handle Length	Pressure at Lever
10"	10"	120-140#

NOTE: New clutches or new facings usually require several, frequent adjustments until the friction facing surfaces have "worn in". The clutch friction facing will become glazed, and possibly permanently damaged if the clutch is permitted to slip excessively.

ADJUST THE CLUTCH:

Remove the PTO nameplate, disengage the clutch and rotate it to gain access to the adjusting ring lock.

Remove the lock bolt and adjustment lock.

Rotate the adjusting ring counter-clockwise to tighten the clutch. Rotating the adjusting ring clockwise will loosen the clutch. Adjust to obtain the proper clutch handle engagement force.

When clutch is properly adjusted, reposition the locking finger in a slot. Tighten the adjustment lock bolt. Replace the PTO nameplate.

LUBRICATION:

LUBRICANT: Any high grade, Lithium Base #2, short fiber grease recommended for use in 2,100 RPM roller bearings operating at temperatures of 200° F (93° C).

NOTE: Do not mix Sodium or Calcium base grease with Lithium grease.

LUBRICATION INTERVALS:

The following lubrication intervals are suggested as guidelines. The operator is responsible for establishing lubrication intervals appropriate to the duty cycle and environmental operating conditions to which the PTO is subjected.

Main Bearings: Grease every 100 hours of operation or less. Add grease until grease is forced out the labyrinth seal(s) around the shaft. Manually (not by starting the engine) rotate the shaft while adding grease.

PTO Cross Shaft: Grease every 500 hours of operation. Add one or two pumps of grease from a hand operated grease gun.

Clutch Linkage and Levers: Lubricate with engine oil every 500 hours of operation.

The lubrication intervals and the amount of grease used should be adjusted to minimize the amount of grease forced out of the bearing housing. A small amount of grease driven from the bearing housing is an indication that enough grease is being provided.

Bearing Operating Temperatures:

The main bearing operating temperature range is normally between 170°F and 200°F (76.7°C to 93.3°C). Locations with high ambient temperatures such as desert climates will cause the bearings to run hotter. More frequent lubrication intervals and/or specialized grease designed for higher operating temperatures will be required.

NOTE: There is a tendency to test temperature with the hand. However, it is difficult to hold a hand on a bearing housing operating at 150°F (65.6°C) although that temperature is below the normal 170°F (76.7°C) operating temperature of the PTO. Therefore a thermometer (contact type) should be used to make reasonably accurate temperature measurements.

DISASSEMBLE THE POWER TAKE-OFF:

(Refer to Figure 4 on page 36 for parts call out).

1. Remove all accessories or drives attached to the output shaft.

ENGAGE THE CLUTCH.

- Disconnect any linkage that may be attached to the clutch-actuating handle.
- Loosen the bolt that fastens the handle to the cross-shaft.
- Match-mark the handle and cross shaft so that the handle can be reinstalled at the same place on the shaft.
- Slide the handle off the cross shaft spline.

2. Remove the power take-off from the engine.

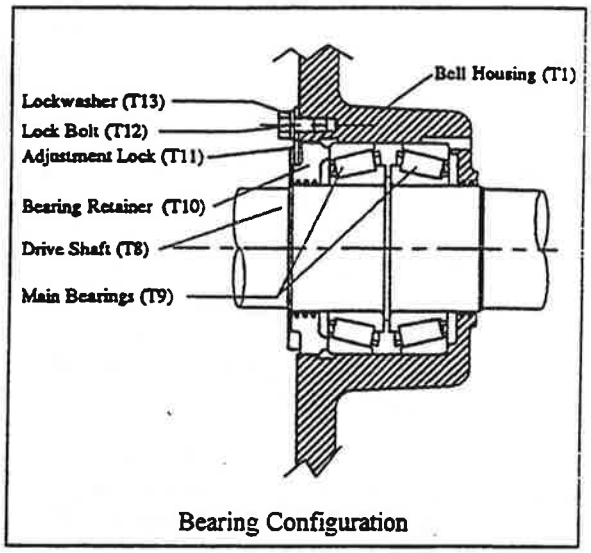
- Attach a hoist or other suitable lifting device to the power take-off. Attach at three points spanning the center of gravity to hold the shaft in a horizontal position during removal.
- Remove the mounting bolts, removing those located near the top last. The PTO should separate from the flywheel housing. If the PTO does not separate, install two 3/8"-16 UNC bolts in the threaded holes in the flange. Tighten the bolts alternately and evenly until the housing is removed from the engine flywheel housing pilot diameter.
- Exercise caution when removing the PTO from the engine to avoid damage to the grease fittings, facing(s), and pilot bearing.

3. Remove the clutch from the PTO shaft.

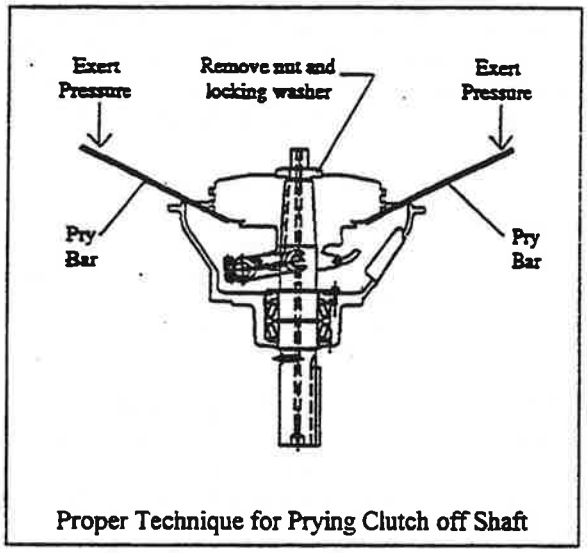
- Remove the pilot bearing (T25) from the drive shaft with a bearing puller.
- Position the PTO with the pilot bearing end up, resting with support beneath the end of the output shaft.
- Bend the locking plate (T27) away from nut (T26), and remove the nut and locking plate.
- Place pry bars under the pressure plate. While exerting pressure on the pry bars, strike the end of the shaft with a soft mallet to "jar" the clutch loose. Pull the clutch from the shaft. Use caution not to damage the end of the shaft.

4. Remove the shaft and bearings from the bearing housing.

- Remove lock bolt (T12), lockwasher (T13) and adjustment lock (T11).
- Rotate the bearing retainer (T10) counterclockwise and remove it.



Bearing Configuration



Proper Technique for Prying Clutch off Shaft

- Lift the drive shaft (T8) with bearings (T9) from the bearing housing (a hoist may be needed).
- One tapered roller bearing cup will have remained in the bearing housing. Remove the bearing cup from the bearing housing. Insert a small punch through the three holes provided in the rear of the bearing housing and drive the cup out. (Some units have threaded plugs, which first must be removed from the holes).

5. Remove the main bearings from the drive shaft.

Wash the bearings with clean fuel oil or solvent. Dry and carefully examine for wear, corrosion, or rough spots. If it determined the bearings must be replaced, remove from shaft.

- Place the shaft in a press with a split-plate resting on the bed of the press, positioned under the top bearing inner race.

CAUTION: *Place a block of wood beneath the shaft to prevent it from being damaged as it falls loose.*

CAUTION: *If the inner race of the pilot bearings is still on the shaft (roller bearing style) place a plug on the end of the shaft to prevent pressing against the pilot bearing inner race.*

- Turn the shaft over and repeat the previous steps to remove the remaining bearing.

6. Remove the cross shaft.

- Loosen (2) bolts securing the yoke assembly (T16) to the cross shaft.
- Slide the cross shaft through the housing until the yoke rests against a block of wood placed between the yoke and the housing.
- With a soft mallet, drive the cross shaft out of the yoke just far enough to expose the two woodruff keys (T15).
- Remove the woodruff keys.
- Slide or tap the cross shaft out of the yoke and housing.

INSPECT THE PTO COMPONENTS:

Tapered Roller Bearings: Visually examine for indications of wear, corrosion, brinelling or pitting on races or rollers. Bearing cups and cones must not exhibit signs of pitting, scuffing or tracking. Lightly oil the races with clean oil, hold one race stationary while slowly rotating the other race against it. Rough spots or sticking indicate need for replacement. Races must be smooth and unworn.

Bell Housing:

- Check the bearing fit. Bearing races usually are designed with a sliding or slightly snug fit in the housing bore. They should not have side movement in the bore. Labyrinth seal bores at the output end of the bearing housing should be round, not oval and should be approximately .020"-.025" (.508mm-.635mm) diameter larger than the drive shaft.
- If a bearing failure has occurred, be sure the bearing has not spun in the housing, destroying the shoulder or bore contacted by the bearing.
- The mounting pilot O.D. and mounting face must be free of protruding metal, rust corrosion etc., which would prevent the housing from locating properly in the flywheel housing bore or against the bearing house face. An improper fit causes misalignment. Misalignment is a major cause of power take-off failure. The snapring should restrict bearing movement to .015" (.381 mm) maximum.
- Cross shaft holes should not be worn more than .015" (.381 mm) out of round. A little wear does not render the parts unserviceable, but excessive wear can cause binding of the cross shaft under load during clutch engagement.

Cross Shaft:

- Be sure the cross shaft moves freely in the bell housing. Remove rust or corrosion from the cross shaft and the holes in the bell housing. Wear on the cross shaft does not become detrimental until it inhibits smooth rotation during clutch engagement (creates a false clutch engagement pressure reading) or allows moisture, dirt, or other corrosives to enter the housing. This can be prevented by ample greasing through the grease fittings to keep the cross shaft lubed. If the cross shaft is excessively worn on only one side, it can be reinstalled with the worn area 180° from its original position. Most Rockford cross shafts are splined on both ends and may be reversed in the housing.
- Woodruff key slots must hold the keyways straight. If the release yoke has been loose on the cross shaft the keyways may have one side worn at an angle.

Clutch Release Yoke:

- Keyways must not be worn excessively.
- Replace if width of cradles is over .875" (22.22 mm).

Drive Shaft:

- Pilot bearing journal must not be worn. A new pilot bearing should have a sliding-but-snug fit or tight fit. Finn recommends that a new pilot bearing is installed whenever the PTO assembly is completely taken apart.
- Threads must not be damaged.
- Keyways must not be worn so as to allow side movement of keys.
- Clutch taper should not be worn, although a small amount of wear, if worn evenly 360° around the shaft may be serviceable as long as the clutch will seat securely and squarely and the jam nut will tighten against the clutch body. If too much wear has occurred the clutch will slide too far onto the taper and the jam nut will bottom out on the thread or shoulder before it contacts the clutch body.

DISASSEMBLE THE CLUTCH:

1. Preparation for disassembly.

   - Disengage the clutch.
   - Match -mark the clutch body (H1), pressure plate (H3), and release sleeve (H25).

2. Remove the release sleeve and bearing sub-assembly.

   - Remove the lever spring (H12).
   - Notice the direction of the clevis pins (H31 and H33) are installed. Upon reassembly of the clutch they must be installed from the same side so the head leads the direction of clutch rotation.
   - Remove retainers (H34) and clevis pins (H33) to separate the links (H30) from the levers (H13).

3. Disassemble the sleeve and bearing sub-assembly.

   - Remove the three retainers (H32) and clevis pins (H31) to remove the links from the release sleeve (H25).
   - Remove the external snapring (H28) from the release sleeve.
   - Using a split plate, support beneath the release bearing (H26) on the bed of a press. Press the release sleeve from the bearing.
   - Remove the internal snapring (H29).
   - Tap the bearing carrier (H27) off the bearing.

4. Remove the levers.

   - Note the direction the clevis pins (H14) are installed so they can be reinstalled in the same direction. Remove three retainers (H15) and clevis pins (H14) to separate the levers from the clutch body.

5. Remove and disassemble the pressure plate sub-assembly.

   - Lift the pressure plate sub-assembly from the clutch body.
   - Remove the wear ring (H9) from inside the adjusting ring.
   - Remove the adjustment lock bolt, lockwasher and adjustment lock (H19) from the pressure plate.
   - Rotate the adjusting ring counter-clockwise to remove it from the pressure plate.

6. Complete the disassembly of the clutch.

   - Remove the facing disc (H4).
   - Remove three separator springs (H36) from the pockets in the clutch body.

INSPECT THE CLUTCH COMPONENTS:

Clutch Body:

- Friction surfaces must not have heat cracks, must be smooth and must be flat within .005" (.127mm).
- Drive bosses must not have wear marks exceeding .003" (.076mm) depth due to wear from the pressure plate or center plate.
- Keyway must not be worn.
- Tapered bore must fit snugly and securely on shaft.

Pressure Plate:

- Friction surface must not have heat cracks, must be smooth and must be flat within .005" (.127mm).
- Drive slots must not be excessively worn. Measure the width of the clutch body drive lug in the worn contact area. Measure the width of the pressure plate drive slot in the (worn) contact area. If the difference between the two readings exceeds .012" (.305mm) the worn component(s) must be replaced.
- Threads for adjusting ring must not be damaged.

Release Sleeve:

- No fractures should exist in the bosses.
- Clevis pin holes must not be worn excessively. A small amount of wear is normal and will not be detrimental.
- The release sleeve bore should not be worn beyond the limits shown below:

Basic Size	Max. Allowable Dia.
7/8" (22.23mm)	.883" (22.43mm)
1-1/4" (31.75mm)	1.258" (31.95mm)
1-3/8" (34.93mm)	1.387" (35.23mm)
1-3/4" (44.45mm)	1.759" (44.68mm)
2" (50.80mm)	2.012" (51.10mm)
2-1/4" (57.15mm)	2.259" (57.38mm)
2-1/2" (63.50mm)	2.509" (63.73mm)

- Snapring groove must not be damaged or worn beyond:

Clutch Size	Max. Allowable Width
6-1/2" clutch	.130" (3.30mm)
8" clutch	.145" (3.68mm)
10" &11-1/2" clutches	.155" (3.94mm)

- Ball bearing must fit tight on the release sleeve.

Release Bearing. Hold the inner race and slowly rotate the outer race, feeling and listening for rough spots, catches or a sticking condition.

Bearing Carrier:

- Flat areas are usually worn on the trunnions. Measure across a worn and an unworn area for comparison. Maximum allowable wear is .015" (.38mm).
- The snapring groove must securely hold the snapring. Measure the dimension from the bearing shoulder inside the carrier to the farthest edge of the snapring groove and compare with below.

Clutch Size	Maximum Width
6-1/2"-8" clutches	.700" (17.78mm)
10" & 11-1/2" clutches	.814" (20.68mm)
or	.891" (22.63mm)

- The bearing fit may be a sliding fit, but must be snug. A slightly tight fit is desirable.

Facing Discs:

- Must be free of oil or grease. Must not be burned. Once burned, they normally are incapable of holding torque.
- Measure the amount of wear that has occurred on each friction surface (2 surfaces per facing disc). Total wear allowable in any clutch (add 2 or 4 surfaces together) is approximately ¼" (6.35mm). Thickness of a new facing plate is .437" (11.10mm).
- Teeth must not be worn excessively or broken.

ASSEMBLE THE CLUTCH:

1. Assemble the sleeve and bearing sub-assembly.

   - Install the release bearing (H26) in the bearing carrier (H27). The fit should be a snug sliding fit or a light press fit.
   - Install the internal snapring (H29).
   - Press the release bearing onto the release sleeve with the snapring located on the side nearest the three bosses of the release sleeve. Be sure to press against the inner race of the bearing - **do not** support, press or tap against the outer race (bearing carrier). Damage to the bearing could result.
   - Install external snapring (H28).
   - Place two links on one side of the bosses of the release sleeve (one on either side of the boss). The travel stop protruding from one side of each link should point toward the bottom of the release sleeve and must rest against the release sleeve.
   - Install the clevis pin (H31) through both links and the lever boss.

   NOTE: The clevis pin must be installed as previously noted so the head will lead the direction of clutch rotation.

   - Securely install the retainer (H32) in the groove of the clevis pin.
   - Repeat the previous 3 steps to install links on the remaining 2 lever bosses.

2. Assemble the clutch body sub-assembly.

   - Place the clutch body (H1) on the bench with the friction surface up.
   - Install three separator springs (H36) in the spring pockets of the clutch body.
   - Place one facing plate (H4) on the clutch body.
   - Thread the adjusting ring (H9) into the pressure plate (H3) *almost* to the bottom of the thread.
   - Place the wear ring in the adjusting ring.

3. Install the release levers.
   - Position the three levers (H13) in the lever bosses with the protruding tang against the wear ring up and the "long end" up.
   - Press down on the pressure plate to compress the separator springs and allow the clevis pin (H14) to be inserted through the lever and clutch body.

   NOTE: Be sure the clevis pins are installed so the heads will lead the direction of clutch rotation.

   - Securely install retainers (H15) on the clevis pins.

4. Install the release sleeve and bearing sub-assembly on the clutch.

   - Position the sleeve and bearing sub-assembly on the clutch so the links align with the levers.
   - Align the clevis pin holes and install a clevis pin (H33) through the links and levers so the head of the clevis pin will lead the direction of rotation during clutch operation.
   - Securely install the retainer (H34) in the groove of the clevis pin.
   - Repeat at remaining lever positions.
   - Install the lever spring over the release bearing. Locate a connector of the spring over each of two levers, and then stretch the spring to get it onto the third lever.
   - Using the drive ring as a gage, perfectly center the facing disc(s) relative to the clutch body.
   - Engage the clutch by pressing the release sleeve and bearing down to the stop. If the facings are not clamped tight, disengage the clutch, rotate the adjusting ring counter-clockwise and reengage the clutch. Repeat until the clutch is adjusted tight enough to hold the facings aligned.

NOTE: If the facings are not perfectly aligned in the clutch, mounting the PTO onto the engine will be restricted by interference between the facing teeth and the teeth of the drive ring.

- Insert the adjustment lock in a slot of the adjusting ring. Install the lock bolt and lockwasher. Tighten finger tight.

NOTE: Do not disengage the clutch until after the PTO has been mounted on the engine. Should the facings become misaligned repeat the procedure explained above for aligning the facings.

ASSEMBLE THE POWER TAKE-OFF:

1. Install the main bearings on the drive shaft.

   - Start one bearing cone (T9) on the shaft with the wide face of the inner race facing the shoulder on the drive shaft.
   - Place a steel ring approximately ¼" thick over the shaft resting against the narrow race of the bearing cone.

     CAUTION: Do not allow any pressure to be applied against the bearing cage at any time. A damaged cage will cause bearing failure.

   - Support beneath the steel ring on the bed of a press. Press the drive shaft into the bearing until the shoulder on the shaft is tight against the bearing inner race.

     NOTE: If the inner race of a roller type pilot bearing is on the shaft, place a plug on the end of the shaft to prevent pressing directly against the inner race.

   - Turn the shaft over in the press. Press the second bearing onto the shaft just as described above.

2. Install the drive shaft in the bearing housing.

   - Support beneath the bearing housing with the bore up.
   - Install one bearing cup in the bore. (If necessary, gently tap the cup to the bottom of the bore).
   - Install the shaft and bearing in the bore.
   - Place the second bearing cup onto the exposed bearing cone. (If necessary, gently tap on the outer edge of the cup using a hard dowel to seat the cup against the bearing cone. Under no circumstances should abusive force be used. Excessive force can damage the roller surface of the bearing cup, causing bearing failure).
   - Thread the bearing retainer (T10) into the bearing housing until it is snugly tightened against the bearing cup. Rotate the drive shaft while tightening the bearing retainer to determine when "zero" bearing clearance exists. When the bearing cups are seated the "zero"
   - After "zero" bearing clearance has been obtained, back the bearing retainer out 2 or 3 notches using the adjustment lock bolt hole as a reference point.

     NOTE: This is a preliminary adjustment. Final measurement and adjustment will be made in the next section.

   - Position the adjustment lock (T11) tab in a notch, align the bolt hole with the hole in the housing, and install the adjustment lock bolt and lockwasher (T12 & T13).

3. Install the cross shaft and clutch release yoke.

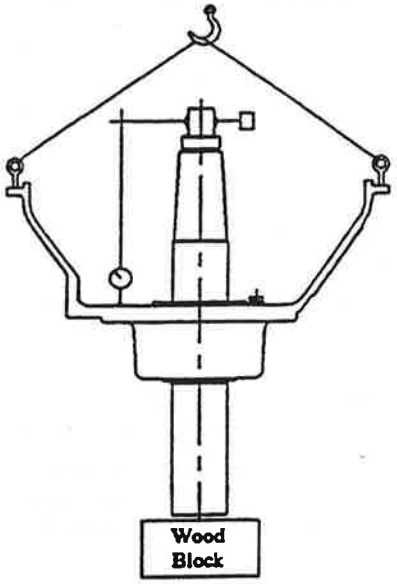
   - Lubricate the cross shaft holes in the bell housing. Slide the cross shaft (T14) through one hole.
   - Slide the clutch release yoke (T16) onto the cross shaft. The bolt holes (unthreaded end) should face outward (toward the flywheel). Slide the cross shaft through the release yoke and into the other cross shaft hole in the bell housing.
   - Rotate and position the cross shaft so one keyway is exposed in the middle of the release yoke. The other keyway will be located outside the yoke. Install two woodruff keys (T15) in the cross shaft.
   - Slide the cross shaft and woodruff keys into the keyways of the release yoke until the keys are centered on the yoke.
   - Install two bolts and lockwashers in the clutch release yoke. Tighten and torque to 17-20 ft. lbs. (23-27 Nm).

4. Complete the assembly of the housing unit.

   - Install all pipe plugs and fittings to complete assembly of the bearing housing and bell housing.
   - Install grease fittings in the shaft and housings.

ADJUST THE MAIN BEARING END PLAY:

1. Support the PTO with a sling and chain hoist as illustrated.



2. Raise the PTO high enough for access to the output end of the drive shaft. Using a soft, but heavy mallet against a hard wood block, strike the end of the shaft to seat the front bearing cup.
3. Lower the PTO and repeat the procedure in step 2 on the front end of the drive shaft to seat the rear-bearing cup.

CAUTION: Sufficient force must be used to securely seat the cups, but abusive force can damage the roller surface of the cups, resulting in bearing failure.

4. Insert 4 pieces of shim stock between the shaft and the bearing retainer to fill the gap and minimize sideways movement of the shaft.
5. Attach a dial indicator to the shaft as shown. Position the point on a smooth surface inside the bell housing, as close to the shaft as possible (but not on the bearing retainer). Set the dial indicator to "0".
6. Lower the PTO so the shaft rests on a wood block. Allow a small amount of slack in the lifting strap. Tap lightly on the bell housing to move it downward. Read the dial indicator. The amount of bearing end play will be indicated.
7. Raise the PTO off the wood block. Lightly tap on the pilot bearing end of the drive shaft to move it downward against the rear-bearing cup.
8. Again read the dial indicator. It should have returned to "0". If it didn't, repeat steps 5 through 7 to obtain an accurate reading.

Main bearing end play should be:
Grease lubricated bearings: .004"-.008" (loose)

9. If adjustment is necessary, proceed as follows: Rotate the bearing retainer clockwise to decrease or counterclockwise to increase the setting, then repeat steps 6 through 8 to verify the proper setting has been attained.
10. Install the adjustment lock.

INSTALL THE CLUTCH ON THE DRIVE SHAFT:

1. Support the PTO under a hoist, with the output end of the drive shaft resting on a hard wood block. Carefully lower the clutch onto the drive shaft. As the release bearing approaches the clutch release yoke, rotate the yoke upward to engage the bearing carrier trunnions in the cradles of the release yoke.
2. Just before the clutch becomes seated on the taper of the drive shaft, rotate the clutch to align the keyways and install the key ½ way into the keyway.

NOTE: If the key is installed in the bottom of the keyway before the clutch is completely seated, it may restrict proper seating of the clutch.

3. Seat the clutch on the drive shaft.
4. Drive the key the rest of the way into the keyway.
5. Place the locking washer (T27) on top of the clutch. Locate the tab in the keyway.
6. Install and tighten nut (T26) against the locking washer. Torque to:

6-1/2",7-1/2",8" HE	165-170 lb.-ft.(224-231 Nm)
10" and 11-1/2" HE	175-180 lb.-ft. (237-244 Nm)
11-1/2" HE(DP)	225-230 lb.-ft. (305-312 Nm)

7. Using a soft but heavy mallet, strike the clutch body to drive it down onto the drive shaft. Check the torque on the nut to be sure that it has not loosened.

CAUTION: Be sure the drive shaft is resting on the wood block before striking the clutch body so the force of the impact can be absorbed by the wood block rather than by the bearing races.

WARRANTY

Finn warrants to the original Purchaser for use (or rental to others for use) all new construction machinery and attachments therefore manufactured by Finn to be free from defects in material and workmanship for a period of 12 months from date of purchase or 1200 hours of use, whichever comes first. Replacement parts provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed, as if such parts were original components of that product. Finn makes no warranty with respect to (a) allied equipment or trade accessories not manufactured by it (such as, but not limited to tires, ignitions, starters, hose, batteries, magnetos, carburetors, engines or like or unlike equipment or accessories), such being subject to the warranty, if any, provided by their respective manufactures; or (b) secondhand, used, altered, or rebuilt machines. Further, the warranty herein expressed shall be rendered null and void to the extent any defect or failure of the products warranted hereby arises out of or is caused by accessories or component parts not manufactured or supplied by Finn, whether same are supplied by Purchaser, dealers or any other party. THE WARRANTY DESCRIBED IN THIS PARAGRAPH SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Upon notification of Finn during the above-stated warranty period of any failure to conform to this warranty, and upon inspection by Finn to verify said nonconformity and verify the continuing existence of the warranty period, Finn will provide a new part or a repaired part, whichever Finn elects, to replace the part found to be defective. Such parts will be provided without charge to the Purchaser during normal working hours at a place of business of a Finn dealer or other establishment authorized by Finn to effect said repairs or replacements, but Purchaser shall bear all costs of transporting the product to and from such place of business or establishment. Correction of nonconformities, in the manner and for the period time provided above, shall constitute fulfillment of all liabilities of Finn under this contract.

THE REMEDIES OF THE USER SET FORTH HEREIN ARE EXCLUSIVE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERABLE OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT TO THE PURCHASER. The essential purpose of this exclusive remedy shall be to provide the Purchaser with repair or replacement of parts that prove to be defective within the period and under the conditions previously set forth. This exclusive remedy shall not have failed of its essential purpose (as that term is used in the Uniform Commercial Code) provided Finn remains willing to repair or replace defective parts within a commercially reasonable time after it obtains actual knowledge of the existence of a particular defect.

IN NO EVENT SHALL FINN BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR INDIRECT DAMAGES, INCLUDING LOST PROFITS OR LOST COMMERCIAL OPPORTUNITIES, WITH RESPECT TO THE SALE OF THE ABOVE WARRANTED PRODUCT OR ANYTHING DONE IN CONNECTION THEREWITH, OR FOR PROPERTY DAMAGE SUSTAINED BY A PERSON CLAIMING TO BE A THIRD PART BENEFICIARY OF A SURVIVING WARRANTY UNDER THE LAW OF ANY JURISDICTION.

NOTICE

FINN CORPORATION URGES THE USE OF ONLY FINN CORPORATION SUPPLIED PARTS AND ATTACHMENTS TO ASSURE PROPER PERFORMANCE AND SAFE OPERATION OF FINN CORPORATION EQUIPMENT. INSIST ON PARTS AND ATTACHMENTS MANUFACTURED OR SUPPLIED BY FINN CORPORATION WHEN YOU PURCHASE, REPAIR OR REPLACE YOUR FINN EQUIPMENT AND ATTACHMENTS.

BECAUSE FINN CORPORATION CANNOT ASSURE THAT PARTS AND ATTACHMENTS NOT MANUFACTURED OR SUPPLIED BY FINN MEET FINN CORPORATION'S QUALITY STANDARDS, SPECIFICATIONS, OR OPERATING REQUIREMENTS, OUR WARRANTY IS NOT EFFECTIVE TO THE EXTENT ANY FAILURE OF OR DEFECT IN A FINN CORPORATION PRODUCT ARISES FROM OR IS CAUSED BY PARTS, ATTACHMENTS OR COMPONENTS NOT ORIGINATING WITH FINN CORPORATION. USE OF FINN CORPORATION EQUIPMENT WITH PARTS AND ATTACHMENTS NOT MANUFACTURED OR SUPPLIED BY FINN COULD RESULT IN PERSONAL INJURY.

Effective December 8, 1995

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

EQUIPMENT REGISTRATION
(SECOND OWNER)

To enable FINN CORPORATION to maintain a record of equipment owners for parts assistance, FINN information and other purposes, we request the completion and return of this form. THANK YOU FOR YOUR COOPERATION.

EQUIPMENT _____ MODEL _____ SERIAL # _____

DATE OF PURCHASE _____ PURCHASED FROM _____

NEW OWNER _____ PHONE ( ) _____

STREET ADDRESS _____ MAIL ADDRESS _____

CITY _____ STATE _____ ZIP _____

DO YOU OWN OTHER FINN EQUIPMENT? ❑ YES ❑ NO

MODEL AND SERIAL NUMBER(S) _____

_____

DO YOU OWN OTHER COMPETITIVE EQUIPMENT? ❑ YES ❑ NO BRAND _____

WHAT IS YOUR PRIMARY BUSINESS? _____

_____

WHEN COMPLETED, PLEASE RETURN PROMPTLY. POSTAGE NOT REQUIRED.

EQUIPMENT REGISTRATION
(FIRST OWNER)

To enable FINN CORPORATION to maintain a record of equipment owners for parts assistance, FINN information and other purposes, we request the completion and return of this form. THANK YOU FOR YOUR COOPERATION.

EQUIPMENT _____ MODEL _____ SERIAL # _____

DATE OF PURCHASE _____ PURCHASED FROM _____

OWNER _____ PHONE ( ) _____

STREET ADDRESS _____ MAIL ADDRESS _____

CITY _____ STATE _____ ZIP _____

DO YOU OWN OTHER FINN EQUIPMENT? ❑ YES ❑ NO

MODEL AND SERIAL NUMBER(S) _____

_____

DO YOU OWN OTHER COMPETITIVE EQUIPMENT? ❑ YES ❑ NO BRAND _____

WHAT IS YOUR PRIMARY BUSINESS? _____

_____

PLEASE COMPLETE THE FIRST OWNER REGISTRATION AND RETURN PROMPTLY. POSTAGE NOT REQUIRED.
SECOND OWNER COPY TO REMAIN IN PARTS MANUAL.

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