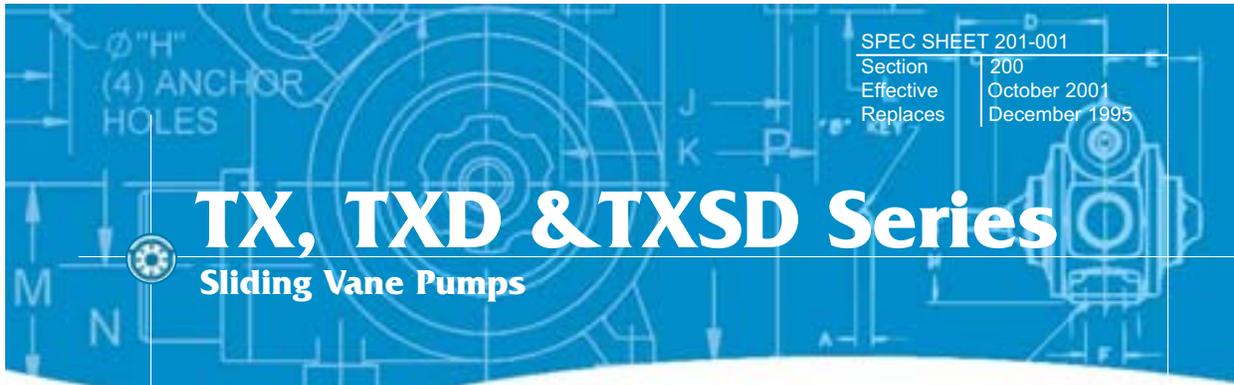


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Ø"H"  
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Section 200  
Effective October 2001  
Replaces December 1995

## TX, TXD & TXSD Series

### Sliding Vane Pumps

#### Reliability

Durable pumps for fast and quiet operation. Sliding-vane design provides sustained performance and trouble free operation.

#### Unique Features

Adjustable relief valve protects pump from excessive pressure. Optional air operated diaphragm relief valve offers easy hose and nozzle handling. T-Type strainers are available to protect pumping systems from damage caused by welding slag and foreign matter in the piping and tanks.

#### Sizing Options

Available in 1.5, 2, 2.5, 3, and 4 inch port sizes with flow rates from 10 to 500 U.S. gallons (2 to 113 m<sup>3</sup>/H) and pressures up to 125 PSI (8.6 bar).

#### Applications

Fuel oil delivery truck, fleet refueling, lube oil, aviation refuelers, transports of petro chemical, gasoline, solvents, and many more.



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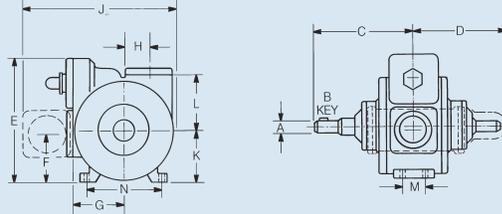
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## TX, TXD & TXSD Series

Sliding Vane Pumps

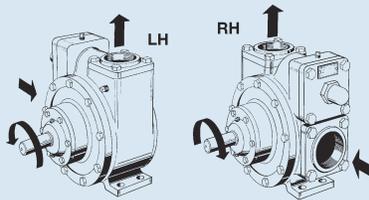


Dimensions

PUMP MODEL		A	B	C	D	E	F	G	H	J	K	L	M	N	Weight
TX1.5	IN	1.125	0.25	7.8125	5.0625	8.5	4	4.375	2.25	10.5625	4	4	1.625	5	61 lbs.
TX1.5	MM	28.6	6.35	198.4	128.6	215.9	101.6	111.1	57.1	268.3	101.6	101.6	41.2	127	27kgs.
TX(S)D2	IN	1.125	0.25	8	8.75	8.6875	3.5	4	1.5	12.125	4	4.125	1.625	5	67 lbs.
TX(S)D2	MM	28.6	6.35	203.2	222.2	220.6	88.9	101.6	38.1	308	101.6	104.7	41.2	127	31 kgs.
TX(S)D2.5	IN	1.125	0.25	8.75	9.5	9.625	3.75	4.3125	1.75	13.25	4	5.0625	3	5.5	94 lbs.
TX(S)D2.5	MM	28.6	6.35	222.2	241.3	244.5	95.2	109.5	45.5	336.5	101.6	128.6	76.2	139.7	43 kgs.
TX(S)D3	IN	1.125	0.25	9.625	10.625	12.25	4.625	5	2.5	15.25	5.375	5.25	2.5	6	152 lbs.
TX(S)D3	MM	28.6	6.35	244.4	269.9	311.1	117.5	127	63.5	387.3	136.5	133.3	63.5	152.4	69 kgs.
TX4	IN	1.5	0.375	11	8.125	15.5	5	7.375	2.5	16.9375	6.375	8	4.5	8	310 lbs.
TX4	MM	38.1	9.5	279.4	206.4	393.7	127	187.3	63.5	430.2	161.9	203.2	114.3	203.2	141 kgs.

### Pump Rotation

Blackmer TX(S)D models are equipped with a double-ended drive shaft for either clockwise (RH) or counterclockwise (LH) rotation. Standard rotation for the TX1.5 is counterclockwise (LH) when viewed from the drive shaft. Standard rotation for the TX4 model is clockwise (RH).



### Options

- Viton or Teflon O-rings
- Mechanical seals with stainless steel stationary seats
- Laminate vanes
- Pneumatic relief valve
- Hydraulic Motor Adapters
- Strainers
- DMX Air Elimination System

### Sales Information and Equipment Application Assistance

Blackmer has a world wide distribution network to assist you in specifying any of our family of pumps, compressors and other equipment for your application.

For more information or to find the distributor nearest to you, please contact us at the telephone, fax or internet address listed below.

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## BLACKMER PARTS LIST

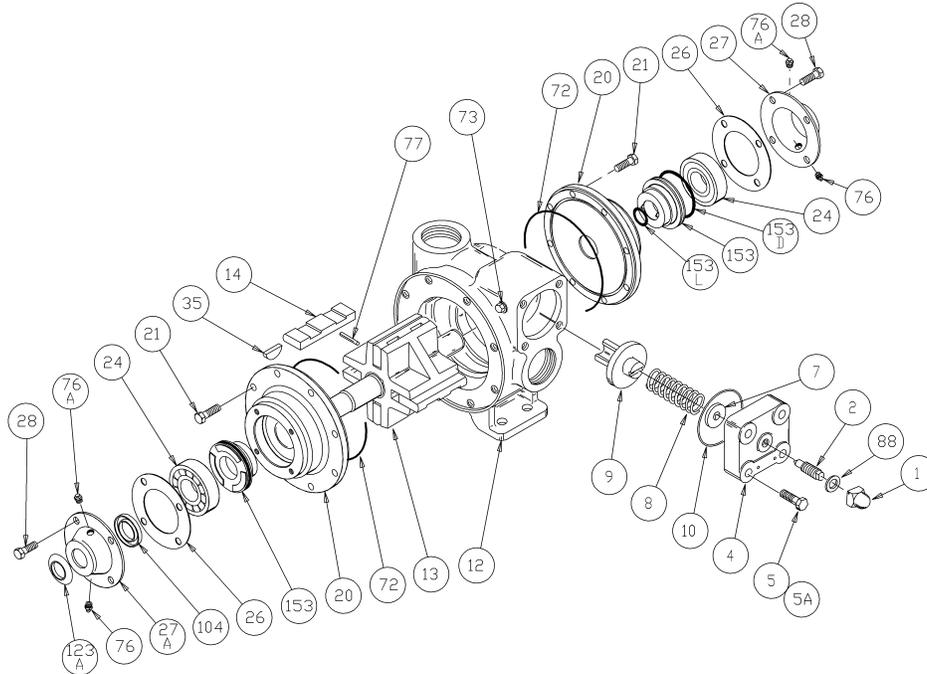
### PUMP MODEL: TX1.5

(See Instructions 201-A00 for Installation, Operation and Maintenance)

961223  
Page 1 of 2

**PARTS LIST**  
**201-A01**

Section	201
Effective	February 2003
Replaces	January 2003



Ref. No.	Description	Parts Per Pump	Part No.	Ref. No.	Description	Parts Per Pump	Part No.
1	Cap – Relief Valve (R/V)	1	411453	20	Head	2	031207
2	Adjusting Screw – R/V	1	431401	21	Capscrews – Head	16	920331
4	Cover – R/V	1	411469	24	Ball Bearing	2	<sup>1</sup> 903156
5	Capscrew – R/V Cover	3	920316	26	Gasket- Bearing Cover	2	<sup>1</sup> 381406
5A	Capscrew w / Hole – R/V Cover	1	920310	27	Bearing Cover – Outboard	1	041433
7	Spring Guide – R/V	1	423955	27A	Bearing Cover – Inboard	1	041431
8	Spring – R/V (51-75 psi)	1	471420	28	Capscrews – Bearing Cover	8	920285
	Spring – R/V (76-100 psi) (Std.)		471425	35	Key – Shaft	1	<sup>1</sup> 909130
	Spring – R/V (101-125 psi)		471430	72	O-Ring – Head (Buna-N)	2	<sup>1</sup> 702228
	SS Spring – R/V (51-75 psi)		471418		O-Ring – Head (Viton®)		702229
	SS Spring – R/V (76-100 psi)		471427		O-Ring – Head (Teflon®)		702230
SS Spring – R/V (101-125 psi)	471429	73	Gage Plug	2	908198		
9	Valve – R/V	1	451416	76	Grease Fitting	2	317815
	Valve – R/V (Nickel Plated)		451414	76A	Grease Relief Fitting	2	701992
10	O-Ring – R/V Cover (Buna-N)	1	<sup>1</sup> 702211	77	Push Rods	2	<sup>1</sup> 123305
	O-Ring – R/V Cover (Viton®)		702212	88	Gasket – R/V Cap	1	<sup>1</sup> 701981
	O-Ring – R/V Cover (Teflon®)		702213	104	Grease Seal	1	<sup>1</sup> 331918
12	Cylinder	1	021203	123A	Dirt Shield	1	<sup>1</sup> 701480
14	Rotor & Shaft	1	261205	153	Mechanical Seal	2	See Backside
	Vane – Duravane (Std.)		<sup>1</sup> 091219		Kit - Maintenance		898949
	Vane – Laminate		093351				
	Vane – Bronze	4	093328				

<sup>1</sup> Included in Maintenance Kit

SS = Stainless Steel

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Keep this parts list with Installation, Operation and Maintenance Instructions.

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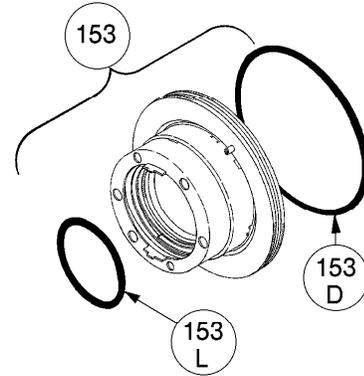
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## MECHANICAL SEALS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
153	Mechanical Seal Complete (Std.) Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2	<sup>1</sup> 331601
	Mechanical Seal Complete - Cast Iron Stationary Seat, Viton® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IVCT)		331628
	Mechanical Seal Complete - Cast Iron Stationary Seat, Buna-N O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (INCT)		331602
	Mechanical Seal Complete - Cast Iron Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IACT)		331673
	Mechanical Seal Complete - Stainless Steel Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (WACT)		331648
153D	O-Ring - Stationary (Buna-N)	2	701934
	O-Ring - Stationary (Viton®)		701921
	O-Ring - Stationary (Teflon®)		702056
153L	O-Ring - Rotating (Buna-N)	2	701922
	O-Ring - Rotating (Viton®)		701980
	Seal Ring - Rotating (Teflon®)		**

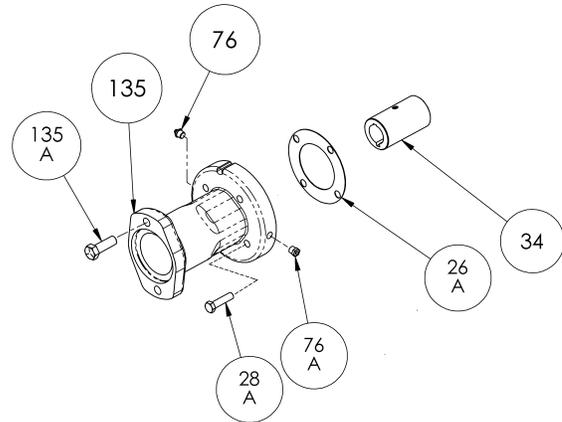


<sup>1</sup> Included in Maintenance Kit

\*\* Teflon® Rotating Seal Ring is not available as a separate part.

## OPTIONAL HYDRAULIC MOTOR ADAPTER PARTS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
See Below	Hydraulic Motor Adapter Kit *	See Below	891205
26A	Gasket – Hydraulic Motor Adapter	1	383940
28A	Capscrew – Hydraulic Motor Adapter / head	4	920369
34	Coupling w/ Setscrew	1	906966
76	Grease Fitting	1	317815
76A	Grease Relief Fitting	1	701992
135	Hydraulic Motor Adapter	1	041827
135A	Capscrew – Adapter / Motor	2	920510



Hydraulic Motor Adapter Kits shipped before Spring 2002 were of a two piece design – refer to page 206-B00.

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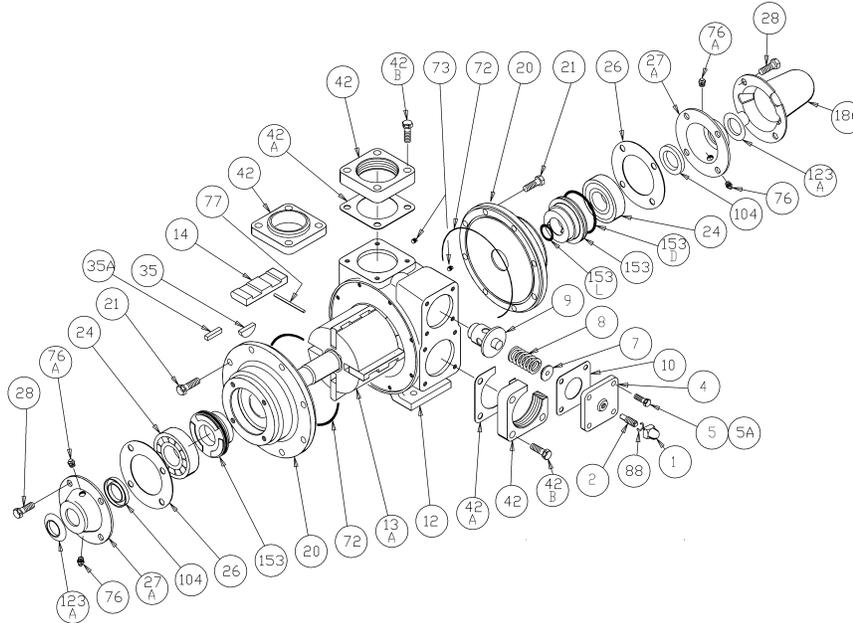
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## BLACKMER PARTS LIST PUMP MODEL: TXD2A, TXSD2A

(See Instructions 201-A00 for Installation, Operation and Maintenance)

961415      **PARTS LIST**  
Page 1 of 2      **201-A02**

Section      201  
Effective      February 2003  
Replaces      January 2003



Ref. No.	Description[DAS1]	Parts Per Pump	Part No.	Ref. No.	Description	Parts Per Pump	Part No.
1	Cap – Relief Valve (R/V)	1	411453	24	Ball Bearing	2	<sup>1</sup> 903156
2	Adjusting Screw – R/V	1	431401	26	Gasket – Bearing Cover	2	<sup>1</sup> 381406
4	Cover – R/V	1	411401	27A	Bearing Cover	2	041431
5	Capscrew – R/V Cover	3	920316	28	Capscrews – Bearing Cover	8	920285
5A	Capscrew w / Hole – R/V Cover	1	920310	35	Key – Shaft	1	<sup>1</sup> 909130
7	Spring Guide – R/V	1	423955	42	Flange – 2" NPT	1 - 2	651411
	Spring – R/V (51-75 psi)	1	471420		Flange – 2" Weld		654405
	Spring – R/V (76-110 psi) (Std.)		471425	42A	Gasket – Flange	2	<sup>1</sup> 381421
	Spring – R/V (111-125 psi)		471428	42B	Capscrew – Flange	8	920351
	SS Spring – R/V (51-75 psi)*		471418	72	O-Ring – Head (Buna-N) (Std. TXD)	2	<sup>1</sup> 701947
	SS Spring – R/V (76-110 psi)*		471427		O-Ring – Head (Viton®) (Std. TXSD)		701914
	SS Spring – R/V (111-125 psi)*		471429		O-Ring – Head (Teflon®)		702242
9	Valve – R/V (Std. TXD)	1	451417	73	Gage Plug	2	908198
	Valve – R/V (Ni Plated) (Std. TXSD)		451415	76	Grease Fitting	2	317815
10	Gasket – R/V Cover	1	<sup>1</sup> 531421	76A	Grease Relief Fitting	2	701992
12	Cylinder	1	021403	77	Push Rod	2	<sup>1</sup> 123905
13A	Rotor & Shaft – Double Ended (Std.)	1	261411	88	Gasket – R/V Cap	1	<sup>1</sup> 701981
	Vane – Duravane (Std.)	4	<sup>1</sup> 091419	104	Grease Seal	2	<sup>1</sup> 331918
14	Vane – Bronze		093924	123A	Dirt Shield	2	<sup>1</sup> 701480
	Vane – Laminate		091429	186	Shaft Protector	1	341601
20	Head (Std.)	2	031425		Air Valve Kit		891454
	Head with Drain		031426		Hydraulic Motor Adapter Kit		See Backside
21	Capscrews – Head	16	920331		Kit - Maintenance		898950

<sup>1</sup> Included in Maintenance Kit

\* Stainless Steel Spring available for TXSD Models Only.

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Keep this parts list with Installation, Operation and Maintenance Instructions.

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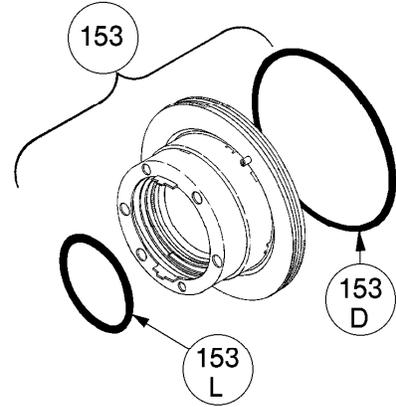
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## MECHANICAL SEALS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
153	Mechanical Seal Complete - Std. TXD Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2	1 331601
	Mechanical Seal Complete - Std. TXSD Cast Iron Stationary Seat, Viton® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IVCT)		331628
	Mechanical Seal Complete - Cast Iron Stationary Seat, Buna-N O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (INCT)		331602
	Mechanical Seal Complete - Cast Iron Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IACT)		331673
	Mechanical Seal Complete - Stainless Steel Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (WACT)		331648
153D	O-Ring – Stationary (Buna-N)	2	701934
	O-Ring – Stationary (Viton®)		701921
	O-Ring – Stationary (Teflon®)		702056
153L	O-Ring – Rotating (Buna-N)	2	701922
	O-Ring – Rotating (Viton®)		701980
	Seal Ring – Rotating (Teflon®)		**

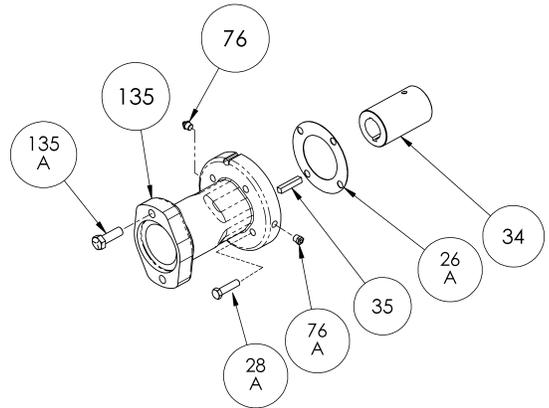


<sup>1</sup> Included in Maintenance Kit

\*\* Teflon® Rotating Seal Ring is not available as a separate part.

## OPTIONAL HYDRAULIC MOTOR ADAPTER PARTS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO. 1-1/4" Hyd Motor Shaft	PART NO. 1" Hyd Motor Shaft
See Below	Hydraulic Motor Adapter Kit *	See Below	891458	891205
26A	Gasket – Hydraulic Motor Adapter	1	383940	383940
28A	Capscrew – Hydraulic Motor Adapter / Head	4	920369	920369
34	Coupling w/ Setscrew	1	906967	906966
35	Key – Coupling	1	909184	N/A
76	Grease Fitting	1	317815	317815
76A	Grease Relief Fitting	1	701992	701992
135	Hydraulic Motor Adapter	1	041828	041827
135A	Capscrew – Adapter / Motor	2	920510	920510



\* Hydraulic Motor Adapter Kits shipped prior to Spring 2002 were of a two piece design – refer to page 206-B00.

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## BLACKMER PARTS LIST

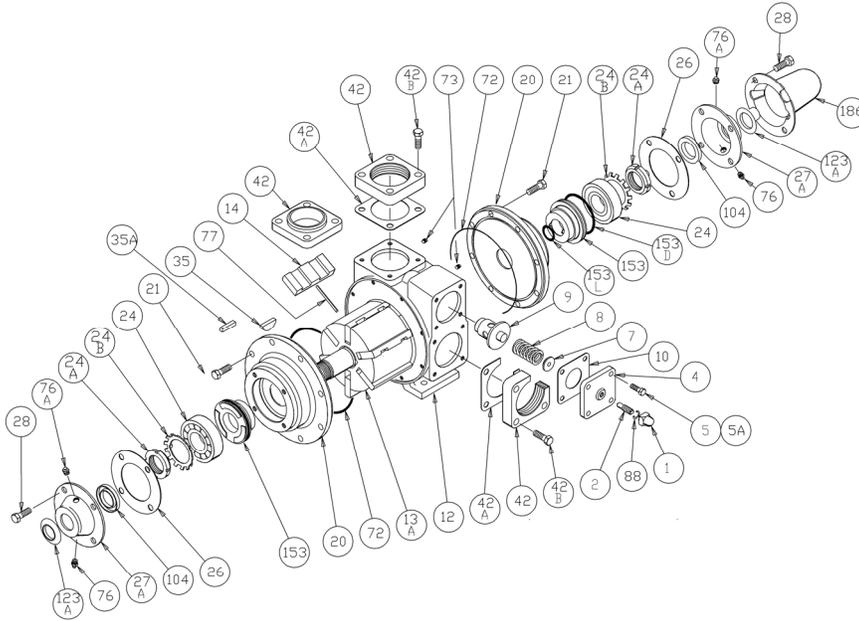
### PUMP MODEL: TXD2.5A, TXSD2.5A

(See Instructions 201-A00 for Installation, Operation and Maintenance)

961615  
Page 1 of 2

**PARTS LIST**  
**201-A03**

Section Effective Replaces	201 February 2003 January 2003
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Ref. No.	Description	Parts Per Pump	Part No.	Ref. No.	Description	Parts Per Pump	Part No.
1	Cap – Relief Valve (R/V)	1	411453	26	Gasket – Bearing Cover	2	<sup>1</sup> 381406
2	Adjusting Screw – R/V	1	431401	27A	Bearing Cover – Inboard	2	041431
4	Cover – Relief Valve	1	411607	28	Capscrews – Bearing Cover	8	920285
5	Capscrew – R/V Cover	3	920316	35	Key – Shaft	1	<sup>1</sup> 909130
5A	Capscrew w / Hole – R/V Cover	1	920310	42	Flange – 2" NPT	1 - 2	651603
7	Spring Guide – R/V	1	423955	42	Flange – 2 1/2" NPT		651611
8	Spring – R/V (41-50 psi)	1	471608	42	Flange – 2 1/2" Weld		651608
	Spring – R/V (51-75 psi)		471631	42A	Gasket – Flange	2	<sup>1</sup> 381650
	Spring – R/V (76-110 psi) (Std.)		471631		Capscrews – 2" NPT Flange		920471
	Spring – R/V (111-125 psi)		471614	42B	Capscrews – 2 1/2" NPT Flange	4 - 8	920532
	SS Spring – R/V (41-50 psi) *		471610		Capscrews – 2 1/2" Weld Flange		920491
	SS Spring – Valve (111-125 psi) *		471632	72	O-Ring – Head (Buna-N) (Std. TXD)		<sup>1</sup> 701947
	SS Spring – Valve (111-125 psi) *		471615		O-Ring – Head (Viton®) (Std. TXSD)	2	701914
9	Valve – R/V (Std. TXD)	1	451623		O-Ring – Head (Teflon®)		702242
	Valve – R/V (Nickel Plated) (Std. TXSD)		451624	73	Gage Plug	2	908198
10	Gasket – R/V Cover	1	<sup>1</sup> 531603	76	Grease Fitting	2	317815
12	Cylinder – Pump	1	021605	76A	Grease Relief Fitting	2	701992
13A	Rotor & Shaft Asy. - Double Ended (Std.) (Includes Ref. Nos. 24A & 24B)	1	261665	77	Push Rod	3	<sup>1</sup> 121607
14	Vane – Duravane (Std.)	6	<sup>1</sup> 091619	88	Gasket – R/V Cap	1	<sup>1</sup> 701981
	Vane – Bronze		091624	104	Grease Seal	2	<sup>1</sup> 331918
	Vane – Laminate		091627	123A	Dirt Shield	2	<sup>1</sup> 701480
20	Head (Std.)	2	031425	186	Shaft Protector	1	341601
	Head with Drain		031426		Air Valve Kit		891696
21	Capscrews – Head	16	920331		Hydraulic Motor Adapter Kit		See Backside
24	Ball Bearing	2	<sup>1</sup> 903156		Tool - Locknut		903091
24A	Locknut – Bearing	2	903521		Kit - Maintenance		898951
24B	Lockwasher – Bearing	2	<sup>1</sup> 903522				

<sup>1</sup> Included in Maintenance Kit

\* Stainless Steel Spring available for TXSD Models Only. Viton® and Teflon® are Registered Trademarks of E.I. DuPont. Keep this parts list with Installation, Operation and Maintenance Instructions.

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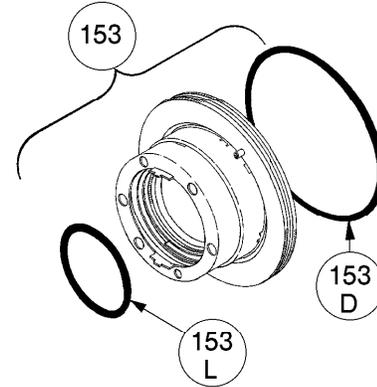
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## MECHANICAL SEALS - TX(S)D2.5A MODELS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
153	Mechanical Seal Complete - <b>Std. TXD</b> Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2	<sup>1</sup> 331601
	Mechanical Seal Complete - <b>Std. TXSD</b> Cast Iron Stationary Seat, Viton® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IVCT)		331628
	Mechanical Seal Complete – Cast Iron Stationary Seat, Buna-N O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (INCT)		331602
	Mechanical Seal Complete – Cast Iron Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IACT)		331673
	Mechanical Seal Complete – Stainless Steel Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (WACT)		331648
153D	O-Ring – Stationary (Buna-N)	2	701934
	O-Ring – Stationary (Viton®)		701921
	O-Ring – Stationary (Teflon®)		702056
153L	O-Ring – Rotating (Buna-N)	2	701922
	O-Ring – Rotating (Viton®)		701980
	Seal Ring – Rotating (Teflon®)		**

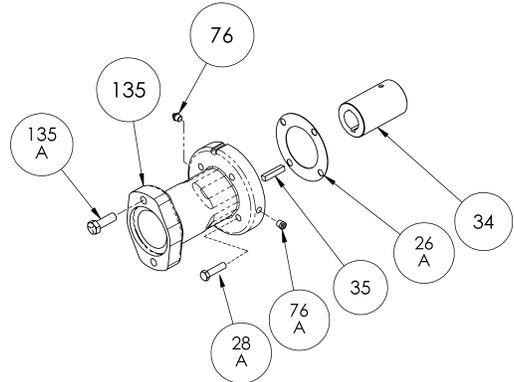


<sup>1</sup> Included in Maintenance Kit

\*\* Teflon® Rotating Seal Ring is not available as a separate part.

## OPTIONAL HYDRAULIC MOTOR ADAPTER PARTS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO. 1-1/4" Hyd Motor Shaft	PART NO. 1" Hyd Motor Shaft
See Below	<b>Hydraulic Motor Adapter Kit *</b>	See Below	891458	891205
26A	Gasket – Hydraulic Motor Adapter	1	383940	383940
28A	Capscrew – Hydraulic Motor Adapter / Head	4	920369	920369
34	Coupling w/ Setscrew	1	906967	906966
35	Key – Coupling	1	909184	N/A
76	Grease Fitting	1	317815	317815
76A	Grease Relief Fitting	1	701992	701992
135	Hydraulic Motor Adapter	1	041828	041827
135A	Capscrew – Adapter / Motor	2	920510	920510



\* Hydraulic Motor Adapter Kits shipped prior to Spring 2002 were of a two piece design – refer to 206-B00.

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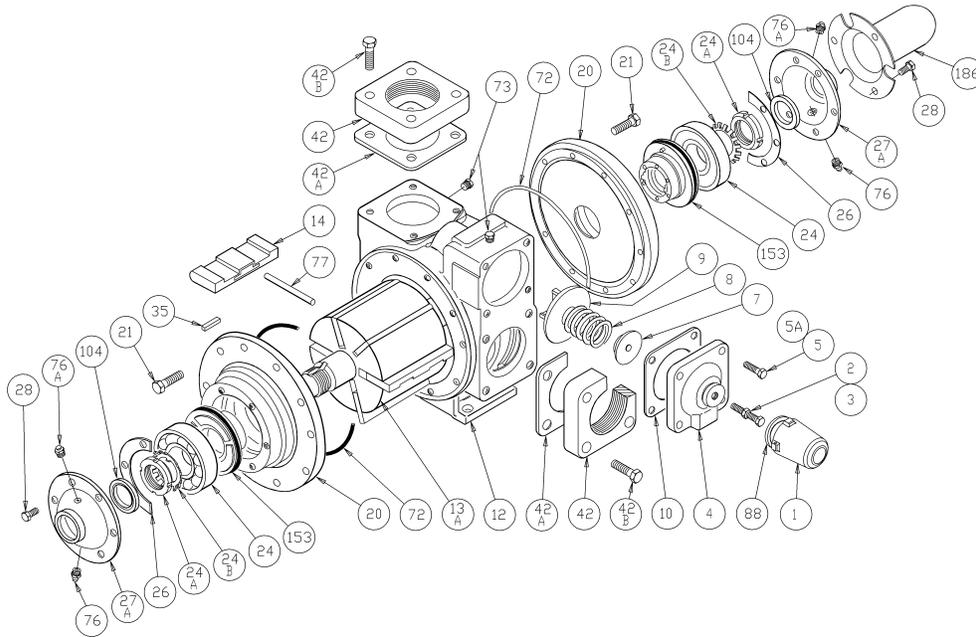
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## BLACKMER PARTS LIST PUMP MODEL: TXD3E, TXSD3E

(See Instructions 201-A00 for Installation, Operation and Maintenance)

961815      PARTS LIST  
Page 1 of 2      201-A04

Section      201  
Effective      January 2003  
Replaces      June 2002



Ref. No.	Description	Parts Per Pump	Part No.	Ref. No.	Description	Parts Per Pump	Part No.
1	Cap – Relief Valve (R/V)	1	413957	26	Gasket – Bearing Cover	2	381817
2	Adjusting Screw – R/V	1	431808	27A	Bearing Cover – Inboard	2	041815
3	Locknut – Adjusting Screw	1	922923	28	Capscrews – Bearing Cover	12	920285
4	Cover – R/V	1	411807	35	Key – Shaft (Std.)	1	909178
5	Capscrew – R/V Cover	3	920331	42	Flange – 3" NPT	1 - 2	651803
5A	Capscrew w / Hole – R/V Cover	1	920330	42	Flange – 3" Weld		655102
7	Spring Guide – R/V	1	421805	42A	Gasket – Flange	2	381816
8	Spring – R/V (51-110 psi)(Std.)	1	471806	42B	Capscrew – NPT Flange	4 - 8	920532
	Spring – R/V (111-125 psi)		471809		Capscrew – Weld Flange		920510
	SS Spring – R/V (51-110 psi)*		471807	72	O-Ring - Head (Buna-N) (Std. TXD)	2	701944
	SS Spring – R/V (111-125 psi)*		471808		O-Ring - Head (Viton®) (Std. TXSD)		711938
9	Valve - R/V (Std. TXD)	1	451807			702233	
	Valve - R/V (Nickel Plated) (Std. TXSD)		451808	73	Gage Plug	2	908198
10	Gasket – R/V Cover	1	531803	76	Grease Fitting	2	317815
12	Cylinder	1	021805	76A	Grease Relief Fitting	2	701992
13A	Rotor & Shaft Asy. - Double Ended (Std.) (Includes Ref. Nos. 24A & 24B)	1	261837	77	Push Rod	3	121807
14	Vane – Duravane (Std.)	6	091819	88	Gasket - R/V Cap	1	533908
	Vane – Bronze		091804	104	Grease Seal	2	331908
	Vane – Laminate		091829	186	Shaft Protector	1	341801
20	Head	2	031815				891798
21	Capscrews – Head	20	920369				See Backside
24	Ball Bearing	2	903172				903091
24A	Locknut – Bearing	2	903523				898952
24B	Lockwasher – Bearing	2	903524				

<sup>1</sup> Included in Maintenance Kit

\* Stainless Steel Spring available for TXSD Models Only. Viton® and Teflon® are Registered Trademarks of E.I. DuPont. Keep this parts list with Installation, Operation and Maintenance Instructions.

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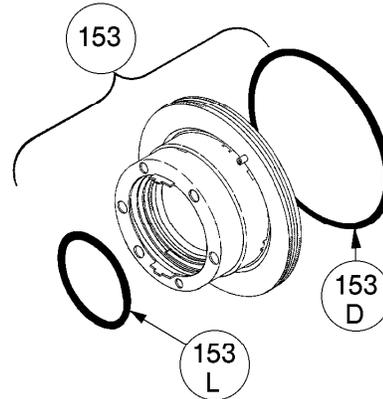
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## MECHANICAL SEALS - TX(S)D3E MODELS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
153	Mechanical Seal Complete - <b>Std. TXD</b> Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2	1 331880
	Mechanical Seal Complete - <b>Std. TXSD</b> Cast Iron Stationary Seat, Viton® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IVCT)		331872
	Mechanical Seal Complete - Cast Iron Stationary Seat, Buna-N O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (INCT)		331882
	Mechanical Seal Complete - Cast Iron Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IACF)		331873
	Mechanical Seal Complete - Stainless Steel Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (WACT)		331899
153D	O-Ring - Stationary (Buna-N)	2	701936
	O-Ring - Stationary (Viton®)		711931
	O-Ring - Stationary (Teflon®)		702080
153L	O-Ring - Rotating (Buna-N)	2	711912
	O-Ring - Rotating (Viton®)		701962
	Seal Ring - Rotating (Teflon®)		**

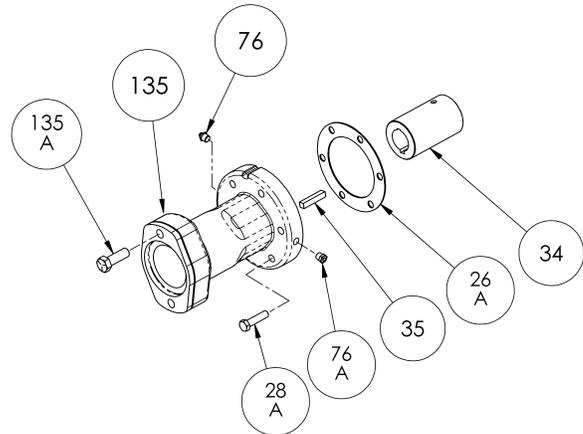


<sup>1</sup> Included in Maintenance Kit

\*\* Teflon® Rotating Seal Ring is not available as a separate part.

## OPTIONAL HYDRAULIC MOTOR ADAPTER PARTS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
See Below	<b>Hydraulic Motor Adapter Kit</b> *	See Below	895140
26A	Gasket – Hydraulic Motor Adapter	1	381817
28A	Capscrew – Hydraulic Motor Adapter / head	6	920369
34	Coupling w/ Setscrew	1	906967
35	Key - Coupling	1	909184
76	Grease Fitting	1	317815
76A	Grease Relief Fitting	1	701992
135	Hydraulic Motor Adapter	1	041831
135A	Capscrew – Adapter / Motor	2	920510



\* Hydraulic Motor Adapter Kits shipped after Spring 2002 were of a two piece design – refer to page 206-B00.

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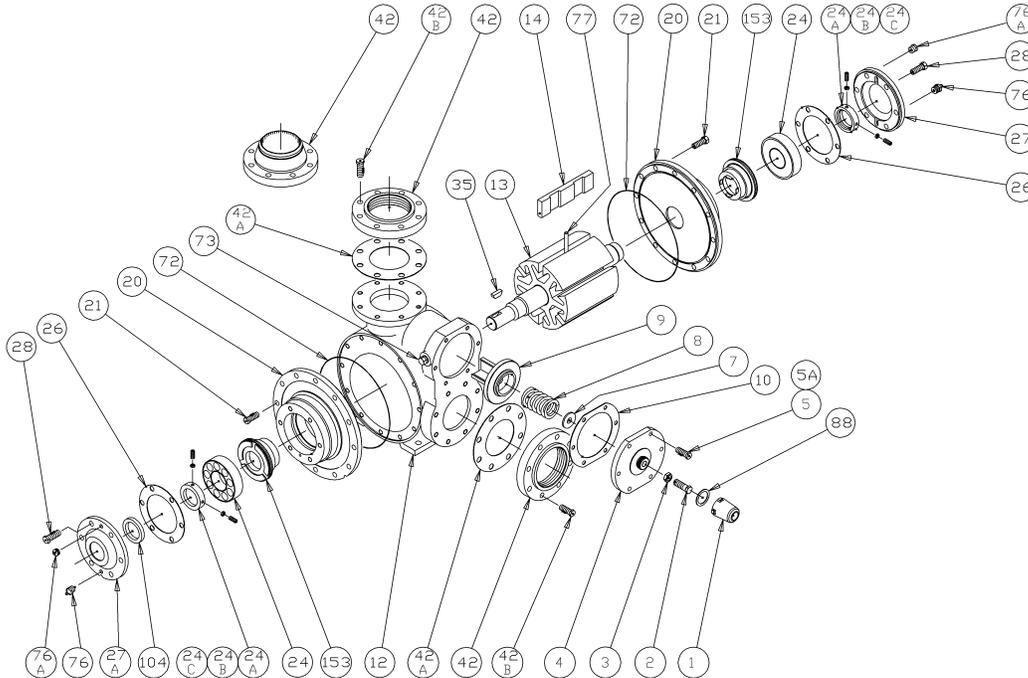
## BLACKMER PARTS LIST

### PUMP MODEL: TX4A

(See Instructions 201-A00 for Installation, Operation and Maintenance)

960286      **PARTS LIST**  
Page 1 of 2      **201-A05**

Section	201
Effective	February 2003
Replaces	January 2003



Ref. No.	Description	Parts Per Pump	Part No.	Ref. No.	Description	Parts Per Pump	Part No.
1	Cap – Relief Valve (R/V)	1	413957	24	Ball Bearing	2	903182
2	Adjusting Screw – R/V	1	436307	24A	Lock Collar – Bearing	2	721937
3	Locknut – Adjusting Screw	1	436355	24B	Setscrew	4	922104
4	Cover – R/V	1	411903	24C	Jam Nut	4	922923
5	Capscrew – R/V Cover	5	920351	26	Gasket – Bearing Cover	2	386950
5A	Capscrew w / Hole – R/V Cover	1	920348	27	Bearing Cover – Outboard	1	041905
7	Spring Guide – R/V	1	426355	27A	Bearing Cover – Inboard	1	041903
8	Spring – R/V (35-50 psi)	1	476303	28	Capscrews – Bearing Cover	12	920491
	Spring – R/V (51-75 psi)		476310	35	Key – Shaft	1	909135
	Spring – R/V (76-125 psi)(Std.)		476305	42	Flange – 4" NPT	1-2	651900
	SS Spring – R/V (35-50 psi)*		476320	42	Flange – 4" Weld		651905
	SS Spring – R/V (51-75 psi)*		476314	42A	Gasket – Flange	2	381903
SS Spring – R/V (76-125 psi)*	476321	42B	Capscrew – Flange	16	920532		
9	Valve – R/V (Std.)	1	456315	72	O-Ring – Head (Buna-N) (Std)	2	702023
	Valve – R/V (Nickel Plated)		456300	72	O-Ring – Head (Teflon®)		702093
10	Gasket – R/V Cover	1	531903	73	Gage Plug	2	908198
12	Cylinder	1	021906	76	Grease Fitting	2	317815
13	Rotor & Shaft	1	261950	76A	Grease Relief Fitting	2	701992
	Vane – Duravane (Std.)		091924	77	Push Rod	3	121905
	Vane – Laminate		091931	88	Gasket – R/V Cap	1	533908
14	Vane – Bronze	6	091953	104	Grease Seal	1	904190
	Head		031908		Kit - Maintenance		898953
21	Capscrews – Head	24	920510				

<sup>1</sup> Included in Maintenance Kit

\* Stainless Steel Spring

Viton® and Teflon® are Registered Trademarks of E.I. DuPont.

Keep this parts list with Installation, Operation and Maintenance Instructions.

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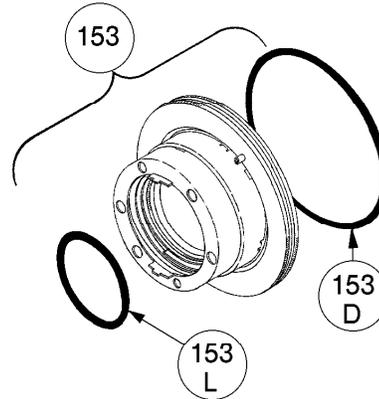
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## MECHANICAL SEALS – TX4A MODELS

REF. NO.	PART NAME	PARTS PER PUMP	PART NO.
153	Mechanical Seal Complete – Std. Cast Iron Stationary Seat, Carbon Seal Face, Buna-N O-Rings. (INCN)	2	<sup>1</sup> 336958
	Mechanical Seal Complete - Cast Iron Stationary Seat, Teflon® O-Ring, Carbon Seal Face w/ Teflon® Seal Ring. (IACT)		331973
153D	O-Ring - Stationary (Buna-N)	2	701945
	O-Ring - Stationary (Viton®)		711932
	O-Ring - Stationary (Teflon®)		702090
153L	O-Ring - Rotating (Buna-N)	2	701933
	O-Ring - Rotating (Viton®)		701967
	Seal Ring - Rotating (Teflon®)		**



<sup>1</sup> Included in Maintenance Kit

\*\* Teflon® Rotating Seal Ring is not available as a separate part.

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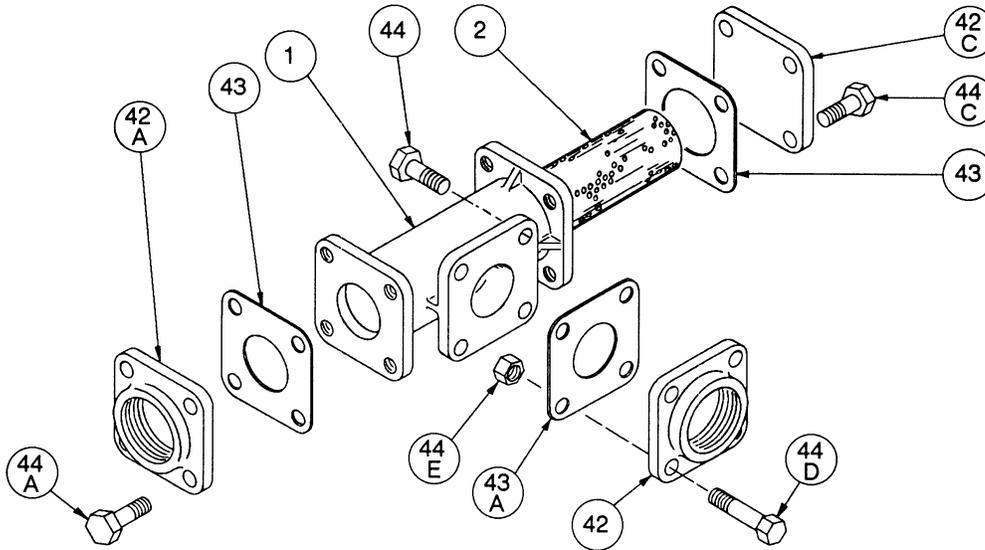
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## BLACKMER PARTS LIST

**With Installation and Maintenance Instructions**  
**T-TYPE TRUCK PUMP STRAINERS**  
**FOR PUMP SIZES: 2", 2.5", 3"**

960326      **PARTS LIST**  
 Page 1 of 2      **201-B00**

Section	201
Effective	July 2001
Replaces	286/C1 Nov97



Ref. No.	Description	Qty.	Part No. 2" Size	Part No 2.5" Size	Part No 3" Size
1	Strainer Assembly	1	740053	740056	740061
2	Strainer Basket	1	621608	621612	621801
42	Body Flange - Plain <sup>2</sup>	0 - 1	651411	651611	651803
42A	Inlet Flange - Plain	1	651603	651611	651803
42C	Strainer Cover	1	611431	611633	611831
43	Gasket - Inlet Flange, Strainer Cover	2	381650	381650	381816
43A	Gasket - Body Flange	1	381421	381650	381816
44	Capscrew - Strainer Body <sup>1</sup>	0 - 4	920331	920471	920491
44A	Capscrew - 2" Inlet Flange	4	920471	920471	—
	Capscrew - 2 1/2" Inlet Flange		—	920532	—
	Capscrew - 3" Inlet Flange		—	—	920532
44C	Capscrew - Strainer Cover	4	920471	920471	920491
44D	Mounting Bolt - Body Flange <sup>2</sup>	0 - 4	920381	920547	920547
44E	Nut - Mounting Bolt <sup>2</sup>	0 - 4	922841	922850	922850

<sup>1</sup> For direct pump mounting use Ref. Nos. 43A and 44.

<sup>2</sup> For intake line mounting use Ref. Nos. 42, 43A, 44D and 44E.

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## INSTALLATION

### SAFETY DATA

#### NOTICE:

Blackmer truck pumps **MUST** only be installed in systems which have been designed by qualified engineering personnel. The system **MUST** conform to all applicable local and national regulations and safety standards.

These instructions are intended to assist in the installation of Blackmer T-Type strainers, and **MUST** be kept with the pump.

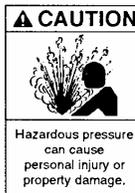
Blackmer truck pump service shall be performed by qualified technicians **ONLY**. Service shall conform to all applicable local and national regulations and safety standards.

Thoroughly review the pump manual, all instructions and hazard warnings, **BEFORE** performing any work on Blackmer truck pumps.

Maintain **ALL** system and Blackmer truck pump operation and hazard warning decals.



**FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.**



**FAILURE TO RELIEVE SYSTEM PRESSURE PRIOR TO PERFORMING PUMP SERVICE OR MAINTENANCE CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.**

#### NOTICE:

**THE APPROPRIATE BLACKMER PUMP MANUAL CAN BE OBTAINED BY CONTACTING BLACKMER CUSTOMER SERVICE AT THE ADDRESS OR TELEPHONE NUMBER PROVIDED.**

### PUMP INSTRUCTION SHEET AND PARTS LISTS

PUMP MODEL	PUMP INSTRUCTION SHEET	PUMP PARTS LIST
TX(S)D)2	285/C	285/C1
TX(S)D)2.5	285/C	285/C3
TX(S)D)3	285/C	285/C5

### STRAINER MOUNTING

Blackmer T-Type strainers are designed for direct mounting on Blackmer truck pumps, or as line strainers for use with Blackmer truck pumps or other makes of pumps. T-Type strainers are available in 2, 2.5 and 3-inch sizes.

For direct mounting on Blackmer 2, 2.5 and 3-inch truck pump models, the strainer takes the place of the intake pipe flange and bolts directly to the **INTAKE** port of the pump. To mount the strainer directly on the Blackmer pump, use four (4) strainer capscrews (Ref. No. 44) and flange gasket (Ref. No. 43A). See Figure 1.

When using the Blackmer T-Type strainer as a line strainer, 2, 2 1/2 and 3-inch NPT tapped pipe flanges are available to adapt the strainer for use in the intake line. To mount the strainer in the intake line, use the strainer body flange (Ref. No. 42), flange gasket (Ref. No. 43A), and four (4) mounting bolts and nuts (44D & 44E). See Figure 2.

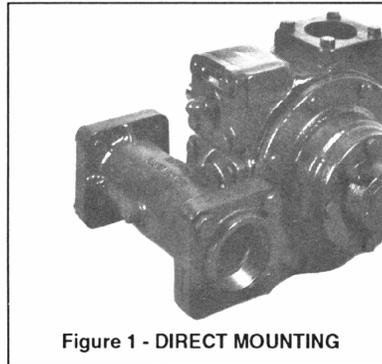


Figure 1 - DIRECT MOUNTING

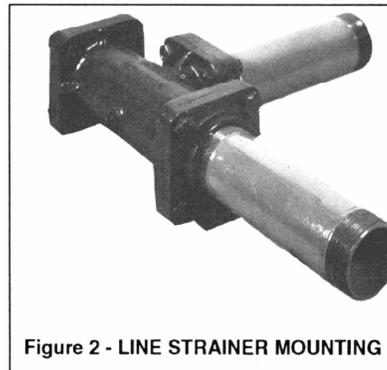


Figure 2 - LINE STRAINER MOUNTING

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## BLACKMER TRUCK PUMPS

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

**MODELS: TX, TXS, TXD, TXSD 1.5, 2A, 2.5A, 3E, 4A  
TXV 2.5B, 3B**

**and Discontinued TX(S) 2, 2½, 3; TXV 2(A)(B), 2½(A), 3(A) Models**

960280

**INSTRUCTIONS NO. 201-A00**

Page 1 of 12

Section	200
Effective	March 2003
Replaces	June 2001



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**NOTE:** Numbers in parentheses following individual parts indicate reference numbers on the corresponding Blackmer Parts Lists.

### SAFETY DATA



**This is a SAFETY ALERT SYMBOL.**

When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage.

**⚠ DANGER**

Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

**⚠ WARNING**

Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

**⚠ CAUTION**

Warns of hazards that **CAN** cause personal injury or property damage.

**NOTICE:**

Indicates special instructions which are very important and must be followed.

**NOTICE:**

**Blackmer truck pumps MUST only be installed in systems which have been designed by qualified engineering personnel. The system MUST conform to all applicable local and national regulations and safety standards.**

**This manual is intended to assist in the installation and operation of the Blackmer truck pumps, and MUST be kept with the pump.**

**Blackmer truck pump service shall be performed by qualified technicians ONLY. Service shall conform to all applicable local and national regulations and safety standards.**

**Thoroughly review this manual, all instructions and hazard warnings, BEFORE performing any work on the Blackmer truck pumps.**

**Maintain ALL system and Blackmer truck pump operation and hazard warning decals.**

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## SAFETY DATA

### ⚠ WARNING



Hazardous machinery can cause severe personal injury or property damage.

**FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.**

### ⚠ WARNING



Hazardous pressure can cause personal injury or property damage.

**DISCONNECTING FLUID OR PRESSURE CONTAINMENT COMPONENTS DURING PUMP OPERATION CAN CAUSE SERIOUS PERSONAL INJURY, DEATH OR MAJOR PROPERTY DAMAGE.**

### ⚠ CAUTION



Hazardous pressure can cause personal injury or property damage.

**FAILURE TO RELIEVE SYSTEM PRESSURE PRIOR TO PERFORMING PUMP SERVICE OR MAINTENANCE CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.**

### ⚠ WARNING



Hazardous or toxic fluids can cause serious injury.

**IF PUMPING HAZARDOUS FLUIDS SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING SERVICE.**

## PUMP DATA

### TECHNICAL DATA

	TX(S)(D) Models	TXV Models
Maximum Temperature*	300°F (149°C)	375°F (190°C)
Maximum Pump Speed	640 RPM <sup>1</sup>	
Maximum Viscosity*	50,000 SSU (10,800 cSt)	
Maximum Differential Pressure	125 psi (8.6 bar)	
Maximum Working Pressure (Inlet Pressure + Differential Pressure)	175 psi (12.1 bar)	

\* Optional materials of construction may be required to meet the operating limits listed above. Refer to Blackmer Material Specs 201/91-92 for TX(S)(D) models or 202/91-92 for TXV models.

<sup>1</sup> 780 RPM maximum pump speed for TX(S)(D)1.5, 2 and 2.5 models. 500 RPM maximum pump speed for TX4A pump models.

### INITIAL START UP INFORMATION

Model No. \_\_\_\_\_

Serial No. \_\_\_\_\_

Date of Installation: \_\_\_\_\_

Pressure Gauge Reading: \_\_\_\_\_

Vacuum Gauge Reading: \_\_\_\_\_

Flow Rate: \_\_\_\_\_

## INSTALLATION

### NOTICE:

**BLACKMER TRUCK PUMPS MUST ONLY BE INSTALLED IN SYSTEMS DESIGNED BY QUALIFIED ENGINEERING PERSONNEL. SYSTEM DESIGN MUST CONFORM WITH ALL APPLICABLE REGULATIONS AND CODES AND PROVIDE WARNING OF ALL SYSTEM HAZARDS.**

### ⚠ WARNING



Hazardous machinery can cause severe personal injury or property damage.

**FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.**

### PRE-INSTALLATION CLEANING

Foreign matter entering the pump WILL cause extensive damage. The supply tank and intake piping MUST be cleaned and flushed prior to pump installation and operation.

### LOCATION AND PIPING

An improperly designed piping system or unit installation WILL significantly reduce pump performance and life. Blackmer recommends the following piping system layout and unit installation.

1. To minimize intake losses, locate the pump as close as possible to the source of supply.
2. Piping MUST be properly supported to prevent any piping loads from being placed on the pump.
3. Intake piping and fittings MUST be at least as large in diameter as the pump intake connection.

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## INSTALLATION

4. Minimize the number of intake line fittings (valves, elbows, etc.) and piping turns or bends.
5. Temporarily install vacuum and pressure gauges in the 1/4" NPT intake and discharge ports located on the pump cylinder to check pump performance at start-up.
6. Install a strainer in the inlet line to protect the pump from foreign matter. Placement of intake strainers should facilitate frequent cleaning.
7. Intake and discharge piping MUST be free of all leaks.

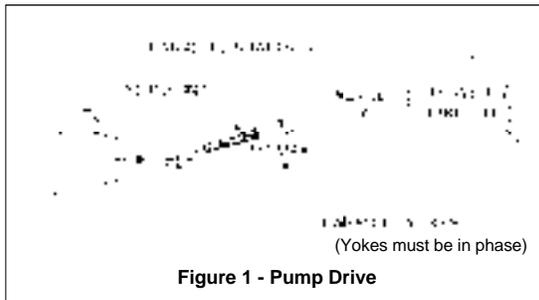
### TRUCK MOUNTING

The pump will operate satisfactorily in any position. Consult Blackmer factory for vertical shaft mounts. The pump can be bolted to the truck frame or on a saddle hung below the frame, and MUST be adequately supported. Mounting the pump with the cylinder feet down, or with the intake port up, is recommended for thorough draining of the pump.

### PUMP DRIVE

The pump may be driven by a power take-off through universal joints. When using universal joints, a splined slip joint, properly lubricated, must be used on the connecting jack shaft to prevent end thrust on the pump shaft.

It is very important to install a proper drive line to avoid excessive wear, vibration and noise (see Fig. 1 and Table 1).



Angle of Drive Shaft		
1° through 5°	6° through 10°	11° through 15°
Very Good	Good	Fair

Table 1

### General guidelines to follow for proper pump drive:

1. Do not use square slip joints.
2. Use the least number of jack shafts as is practical.
3. Use an even number of universal joints.
4. The pump shaft and power take-off shaft should be parallel in all respects. Use an angular level measuring device to ensure the PTO and pump shaft are parallel to each other. If necessary, the pump can be shimmed to correct any misalignment. The PTO shaft coming off at the transmission does not need to be perfectly horizontal as

long as the pump is shimmed to have its shaft parallel in all respects to the PTO shaft.

5. The yokes of the universals at both ends of the jack shaft must be parallel and in phase.
6. The maximum recommended angle between the jack shaft and the pump shaft is 15 degrees. Refer to Table 1.

Failure to follow any of these guidelines may result in a gallop or uneven turning of the pump rotor, which will in turn cause a surging vibration to the liquid stream and piping system. Contact the supplier of the drive line components for specific design assistance.

### Hydraulic Drive

The pump may also be driven hydraulically. Hydraulic motors must be well supported with their shafts parallel to the pump shaft in all respects. Blackmer provides an optional close-coupled hydraulic motor adapter. The adapter provides for straight alignment of a hydraulic motor drive through a solid coupling connected to a straight key pump shaft. This coupling connection requires grease lubrication every three months at **minimum**. Refer to the "Lubrication" section of this manual.

### PUMP ROTATION

#### NOTICE:

**CONFIRM CORRECT PUMP ROTATION BY CHECKING THE PUMP ROTATION ARROWS RESPECTIVE TO PUMP DRIVER ROTATION.**

### TO CHANGE PUMP ROTATION

#### TX(S)D and TXV Models

The TX(S)D and TXV pump models are equipped with a double ended rotor and shaft, enabling them to be driven from either shaft end. To change rotation, rotate the pump 180 degrees so that the opposite shaft becomes the driven shaft. On TX(S)D pump models, the shaft protector (186) MUST be mounted over the non-driven shaft end. On TXV pump models, the outboard bearing cover (27) MUST be mounted over the non-driven shaft end.

#### ⚠ WARNING



**OPERATION WITHOUT SHAFT PROTECTOR CAN CAUSE SERIOUS PERSONAL INJURY, MAJOR PROPERTY DAMAGE, OR DEATH.**

Do not operate without guard in place.

#### TX1.5, TX4 Models and Discontinued TX(S) Models

To reverse the pump rotation, remove the bearing covers, locknuts/lockwashers or lock collars (if equipped), from both inboard and outboard heads. Remove the inboard head assembly and reverse the rotor and shaft, so that the driven end of the shaft protrudes from the outboard head. Remove and replace the vanes so that the relief grooves face in the direction of pump rotation. Refer to the "Maintenance" Section of this manual for pump disassembly and assembly.

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## OPERATION

### PRE-START UP CHECK LIST

1. Check the alignment of the pipes to the pump. Pipes must be supported so that they do not spring away or drop down when the pump flanges or union joints are disconnected.
2. Temporarily install vacuum and pressure gauges in the 1/4" NPT ports located on the pump cylinder. These can be used to check the actual suction and discharge conditions after pump start-up.
3. Inspect complete piping system to ensure that no piping loads are being placed on the pump.
4. Secure appropriate hose connections.

### START UP PROCEDURES

#### **CAUTION**



Hazardous pressure can cause personal injury or property damage.

**PUMP OPERATING AGAINST A CLOSED VALVE CAN CAUSE SYSTEM COMPONENT FAILURE, PERSONAL INJURY AND PROPERTY DAMAGE.**

#### NOTICE:

**CONSULT THE "GENERAL PUMP TROUBLESHOOTING" SECTION OF THIS MANUAL IF DIFFICULTIES DURING START UP ARE EXPERIENCED.**

1. Start the pump. Priming should occur within one minute.
2. Check the vacuum and pressure gauges to ensure the system is operating within expected parameters. Record the gauge readings in the "Initial Start Up Information" section of this manual for future reference.
3. Inspect piping, fittings, and associated system equipment for leaks, noise, vibration and overheating.
4. Check the flow rate to ensure the pump is operating within the expected parameters.
5. Check the pressure setting of the relief valve by momentarily closing a valve in the discharge line and reading the pressure gauge. This pressure should be 15 - 20 psi (1.0 - 1.4 bar) higher than the maximum system operating pressure, or the external bypass valve setting (if equipped). **DO NOT operate the pump against a closed discharge valve for more than 15 seconds.** If adjustments need to be made, refer to the "Relief Valve Setting and Adjustment" section of this manual.

### PUMP SPEED

PTO and hydraulically driven units MUST contain speed control devices to prevent pump speeds above the maximum RPM specifications, regardless of the truck engine unloading speeds. Should fluid delivery be appreciably less than expected, see the "General Pump Troubleshooting" section.

### REVERSE ROTATION

#### NOTICE:

**PUMPS OPERATED IN REVERSE MUST HAVE A SEPARATE PRESSURE RELIEF VALVE INSTALLED TO PROTECT THE PUMP FROM EXCESSIVE PRESSURE.**

It may be desirable to run the pump in reverse rotation for system maintenance. The pump will operate satisfactorily in reverse rotation to strip lines, at a reduced performance level. When operating the pump in reverse, a separate bypass valve MUST be installed to protect the pump from excessive pressure.

### FLUSHING THE PUMP

#### NOTICE:

**IF FLUSHING FLUID IS TO BE LEFT IN THE PUMP FOR AN EXTENDED TIME, IT MUST BE A LUBRICATING, NON-CORROSIVE FLUID. IF A CORROSIVE, NON-LUBRICATING FLUID IS USED, IT MUST BE FLUSHED FROM THE PUMP IMMEDIATELY.**

**To flush the pump, use the following procedure:**

1. Allow the pump to evacuate as much fluid as possible.
2. Run cleaning fluid through the pump intake. The cleaning fluid must be compatible with the pump O-rings and vane material. When handling "sticky" fluids that solidify within the pump (i.e., waxes, adhesives, resins, asphalts, etc.), use a fluid that will prevent solidification of the fluid being transferred and facilitate flushing.
3. Operate the pump against a closed discharge for 15 seconds to allow the cleaning fluid to recirculate through the internal relief valve.

### RELIEF VALVE

#### NOTICE:

**THE PUMP INTERNAL RELIEF VALVE IS DESIGNED TO PROTECT THE PUMP FROM EXCESSIVE PRESSURE AND MUST NOT BE USED AS A SYSTEM PRESSURE CONTROL VALVE.**

Pumping volatile liquids under suction lift may cause cavitation. Partial closing of the discharge valve WILL result in internal relief valve chatter and must not be done. For these applications, install an external bypass valve, and any necessary piping, back to the storage tank. This bypass system must be used when operating for extended periods (more than 1 minute) against a closed discharge valve.

### RELIEF VALVE SETTING AND ADJUSTMENT

The relief valve pressure setting is marked on a metal tag attached to the valve cover. Generally, the relief valve should be set at least 15 - 20 psi (1.0 - 1.4 bar) higher than the operating pressure, or the external bypass valve setting (if equipped).

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## OPERATION

### Relief Valve Adjustment Procedure:

1. To **INCREASE** the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw *inward*, or clockwise. Replace the valve cap.
2. To **DECREASE** the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw *outward*, or counterclockwise. Replace the valve cap.

Refer to the individual Blackmer pump parts lists for various spring pressure ranges. The pumps are supplied from the factory with the relief valve adjusted to the mid-point of the spring range. If the pump is equipped with a Blackmer air valve, refer to setting and adjustment procedures covered in Blackmer Air Valve Instructions and Parts List No. 201-F00, 286/F or 201-B00.

### NOTICE:

**WHERE REGULATIONS REQUIRE, HOLES IN R/V CAP (1) AND CAPSCREW W / HOLE (5C) ARE USED BY THE WEIGHTS AND MEASURES OFFICIAL (S) TO APPLY A SECURITY SEAL OR TAG.**

### CAUTION



Hazardous pressure can cause personal injury or property damage.

**INCORRECT SETTINGS OF THE PRESSURE RELIEF VALVE CAN CAUSE SYSTEM COMPONENT FAILURE, PERSONAL INJURY AND PROPERTY DAMAGE.**

## MAINTENANCE

### NOTICE:

**MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.**

### WARNING



Hazardous machinery can cause severe personal injury or property damage.

**FAILURE TO SET THE VEHICLE EMERGENCY BRAKE AND CHOCK WHEELS BEFORE PERFORMING SERVICE CAN CAUSE SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.**

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### WARNING



Hazardous or toxic fluids can cause serious injury.

**IF PUMPING HAZARDOUS FLUIDS SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING SERVICE.**

### LUBRICATION

Ball bearings and hydraulic motor couplings (if equipped) must be lubricated every three months at a minimum. More frequent lubrication may be required, depending on the application and the operating conditions. TXV pump model bearings **MUST** be replaced after each 1000 hours of service if fluid temperature is greater than 250°F (120°C).

### Recommended Grease:

**TX(S)(D) Models** - Exxon (Esso) - Ronex MP or Mobile - Mobilith AW-2, or equivalent Lithium grease.

**TXV Models** - Exxon (Esso) - Polyres or Mobile - Mobile Poly 372, or equivalent Polyurea grease.

### Greasing Procedure:

1. Remove the grease relief fittings (76A) from the bearing covers (27 and 27A) or hydraulic motor adapter (135).
2. SLOWLY apply grease with a hand gun until grease begins to escape from the grease relief fitting port. Discard excess grease in accordance with the proper codes and regulations.
3. Replace the grease relief fittings (76A).

DO NOT overgrease pump bearings. While it is normal for some grease to escape from the grease tell-tale hole after lubrication, excessive grease on pumps equipped with mechanical seals can cause seal failure.

### VANE REPLACEMENT

### NOTICE:

**MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.**

1. Remove the head assembly from the **outboard** (non-driven) side of the pump according to steps 2 - 6 in the "Pump Disassembly" section of this manual.
2. Turn the shaft by hand until a vane comes to the top (12 o'clock) position of the rotor. Remove the vane.
3. Install a new vane, ensuring that the rounded edge is UP,

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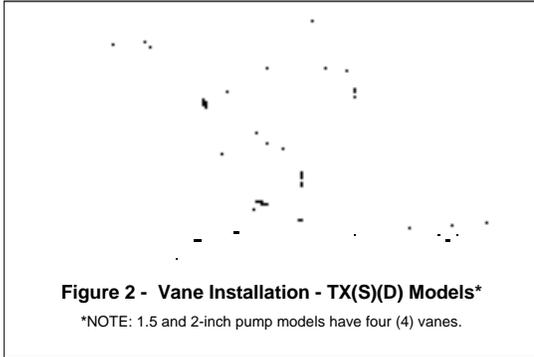
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## MAINTENANCE

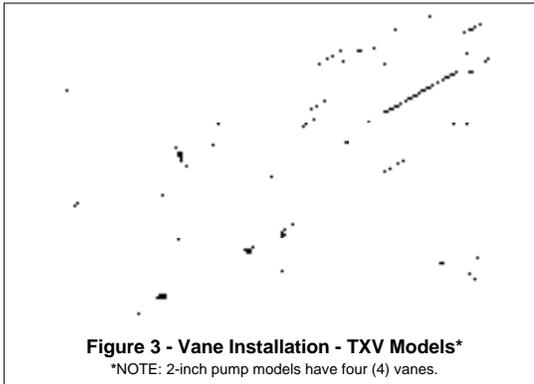
and the relief grooves are facing towards the direction of rotation. See Figures 2 and 3.

- Repeat steps 2 and 3 until all vanes have been replaced.
- Reassemble the pump according to steps 2 - 7 and 12 - 17 of the "Pump Assembly." section of this manual.



**Figure 2 - Vane Installation - TX(S)(D) Models\***

\*NOTE: 1.5 and 2-inch pump models have four (4) vanes.



**Figure 3 - Vane Installation - TXV Models\***

\*NOTE: 2-inch pump models have four (4) vanes.

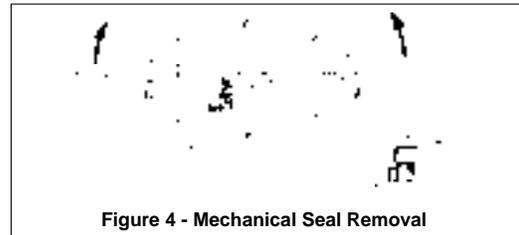
## PUMP DISASSEMBLY

### NOTICE:

**FOLLOW ALL HAZARD WARNINGS AND INSTRUCTIONS PROVIDED IN THE "MAINTENANCE" SECTION OF THIS MANUAL.**

- Starting on the **inboard** (driven) end of the pump, clean the pump shaft thoroughly, making sure the shaft is free of nicks and burrs. This will prevent damage to the mechanical seal or lip seal when the inboard head assembly is removed.
- Remove the inboard bearing cover capscrews (28) and slide the inboard bearing cover (27A) and gasket (26) off the shaft. Discard the bearing cover gasket. On the 1.5, 2, 2.5, and 3-inch pump models, the dirt shield (123A) will come off with the bearing cover.
- Remove the outboard bearing cover capscrews (28) and slide the outboard bearing cover (27) and gasket (26) off the shaft. Discard the bearing cover gasket.
- If equipped with locknuts and lockwashers (24A and 24B):

- Bend up the engaged lockwasher tang and rotate the locknut counterclockwise to remove it from the shaft
  - Slide the lockwasher off the shaft. Inspect the lockwasher for damage and replace as required.
  - Repeat steps a and b on the opposite shaft end.
- The TX(S)4-inch pump model is equipped with bearing lock collars (24A). To remove:
    - Remove the jam nuts (24C) and loosen the two set screws (24B).
    - Slide the lock collar off the shaft.
    - Repeat steps a and b on the opposite shaft end.
  - Remove the head capscrews (21) and carefully pry the head (20) away from the cylinder (12).
  - Slide the head off the shaft. The head O-ring (72), bearing (24), and mechanical seal (153) or lip seal (152) will come off with the head assembly. Remove and discard the head O-ring.
    - Pull the bearing (24) from the housing in the head (20).
    - To remove the mechanical seal (153), use two screw drivers to gently push the backside of the seal jacket to push the seal from the head (see Figure 4). Use care when placing the screw drivers to prevent damage to the seal faces. Remove and discard mechanical seal O-rings.



**Figure 4 - Mechanical Seal Removal**

- To remove the lip seal assembly (152), use a thin pry bar against the lip seal retaining ring to gently push the housing (152B) out of the head (20). Use care not to damage the lip seal (152A). To remove the lip seal (152A), remove the retaining ring (152D) from the housing, and gently pry the lip seal from the housing. Remove and discard the housing O-ring(s) (152C and 152E).
- Pull the rotor and shaft (13) from the cylinder (12). While one hand is pulling the shaft, the other hand should be cupped underneath the rotor to prevent the vanes (14) and push rods (77) from falling out. Carefully set the rotor and shaft aside for future vane replacement and reassembly.
  - Remove the remaining components from the outboard side of the pump, as instructed in steps 6 and 7 above.

## PUMP ASSEMBLY

**Before reassembling the pump, inspect all component parts for wear or damage, and replace as required. Wash out the bearing/seal recess of the head and remove any burrs or nicks from the rotor and shaft.**

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## MAINTENANCE

### 1. Reassemble the OUTBOARD side of the pump first:

- For a CLOCKWISE rotation pump, position the pump cylinder with the INTAKE port to the **left**.
- For a COUNTERCLOCKWISE rotation pump, position the pump cylinder with the INTAKE port to the **right**.

- Install a new head O-ring (72) in the groove on the inside face of the head (20). Lay the O-ring flat and start in on one side of the groove, stretching ahead with the fingers, as shown in Figure 5.

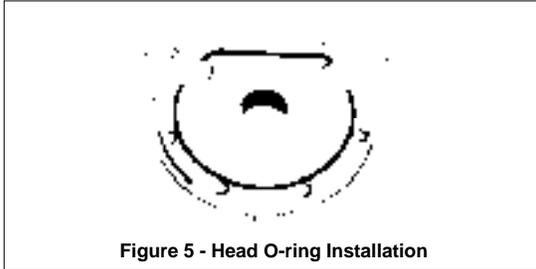


Figure 5 - Head O-ring Installation

- Install the head (20) on the outboard side of the cylinder (12). Install and uniformly tighten four head capscrews (21) 90° apart, torquing to 25 lbs ft (34 Nm).

### 4. MECHANICAL SEAL (if equipped)

Apply a small amount of motor oil in the head recess. Push the mechanical seal assembly (153) into the recess of the head with seal jacket drive tangs inward. The pin in the stationary seat must be between the lugs in the back of the head recess.

### 5. LIP SEAL ASSEMBLY (if equipped)

The lip seal assembly (152) consists of a metal housing with elastomer(s) around its outer diameter(s), and a teflon lip seal in its inner diameter. TXV "A" model pumps are equipped with spacer washers. Refer to Figures 6 and 7.

- Apply a small amount of light motor oil on the inner diameter of the lip seal housing (152B) to facilitate lip seal (152A) installation.

**Note: When installing the lip seal, be careful not to damage the lip seal O-ring.**

- On TXV "B" model pumps, push the lip seal (152A) squarely into the housing (152B) with the pin in the lip seal aligned with the hole in the back of the housing. The lip seal should seat flush or slightly recessed in the housing, around its **entire** diameter.
- On TXV "A" model pumps, insert the spacer washers (152F) into the housing, then push the lip seal (152A) squarely into the housing (152B) with flat side of the lip seal against the spacer washers. The lip seal should seat flush or slightly recessed in the housing, around its **entire** diameter. **Note:** If necessary, the spacer washers can also be located *after* the lip seal, as shown in Figure 7, to re-position the lip seal on the pump shaft.
- Insert the retaining ring (152D) into the groove in the housing.

- Install new housing O-ring(s) (152C and 152E) in the groove(s) of the housing. Lightly grease the housing O-ring(s) and push the lip seal and housing assembly into the head recess with the lip seal inward. The lips of the lip seal will face the rotor when the housing is installed. Make sure the housing is bottomed out in the back of the head (20).

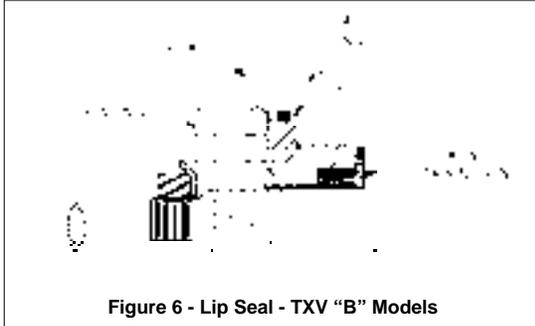


Figure 6 - Lip Seal - TXV "B" Models

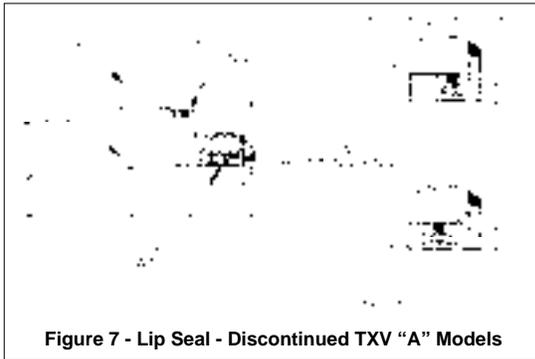


Figure 7 - Lip Seal - Discontinued TXV "A" Models

- Hand pack the ball bearing (24) with grease. Refer to the "Lubrication" section for the recommended grease.
- Install the bearing (24) into the head recess. The bearing balls must face outward, with the grease shield inward. Ensure the bearing is fully and squarely seated against the lip seal housing (152B) or mechanical seal (153). On TXV pump models, install two 3/8" (10 mm) washers and two bearing cover capscrews (28) to clamp the bearing and compress the lip seal housing inner O-ring (152E) for proper bearing locknut adjustment (see Figure 8). The washers and capscrews will be removed after the locknuts are adjusted.

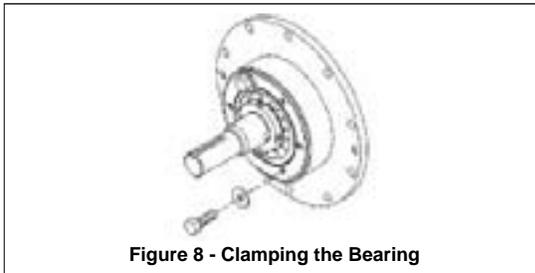


Figure 8 - Clamping the Bearing

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## MAINTENANCE

8. Turn the pump cylinder (12) around and begin assembly on the opposite, inboard end.
9. Remove the vanes (14) and push rods (77) from the rotor and shaft assembly (13). Inspect for wear and damage, and replace as follows:
  - a. Partially install the non-driven end of the rotor and shaft (13) into the open side of the pump cylinder (12).
  - b. Leave part of the rotor outside of the cylinder so that the bottom vanes (14) can be installed and held in place as the push rods (77) are installed in the push rod holes of the rotor. Insert the new vanes into the rotor slots with the rounded edges outward, and the vane relief grooves facing TOWARDS the direction of rotation. Refer to Figures 2 and 3.
  - c. After the bottom vanes (14) and push rods (77) are installed, insert the rotor and shaft (13) fully into the cylinder (12).
  - d. Install the remaining vanes (14) into the top positions of the rotor. **If equipped with a mechanical seal (153), rotate the shaft by hand to engage the drive tangs of the seal jacket in the rotor slots.**
10. Install the inboard head (20), mechanical seal (153) or lip seal (152), and bearing (24) as instructed in steps 2 through 7. Apply a thin coating of motor oil on the inboard shaft to aid installation.
11. Rotate the shaft by hand to engage the mechanical seal drive tangs (if equipped), and to test for binding or tight spots. If the rotor does not turn freely, lightly tap the rims of the heads (20) with a soft faced mallet until the correct position is found. Install all of the remaining head capscrews (21) for each head (20) and uniformly torque to 25 lbs ft (34 Nm).
12. **LOCKNUT INSTALLATION (if equipped)**

It is important that the bearing locknuts (24A) and lockwashers (24B) be installed and adjusted properly. Overtightening locknuts can cause bearing (24) failure or a broken lockwasher tang. Loose locknuts will allow the rotor (13) to shift against the heads, causing wear. See Figure 9.
- c. Loosen both locknuts (24A) one complete turn.
- d. Tighten one locknut (24A) until a slight rotor drag is felt when turning the shaft by hand.
- e. Back off the nut the width of one lockwasher tang "B". Secure the nut by bending the closest aligned lockwasher tang into the slot in the locknut. The pump should turn freely when rotated by hand.
- f. Tighten the opposite locknut (24A) by hand until it is snug against the bearing (24). Then, using a spanner wrench, tighten the nut the width of one lockwasher tang. Tighten just past the desired tang, then back off the nut to align the tang with the locknut slot. Secure the nut by bending the aligned lockwasher tang into the slot in the locknut. The pump should continue to turn freely when rotated by hand.
- g. To check adjustment, grasp the nut and washer with fingers and rotate back and forth. If this cannot be done, one or both locknuts (24A) are too tight and should be alternately loosened one stop at a time (.001") (25 microns). Begin by loosening the locknut adjusted last.
- h. On TXV pumps, after adjustment is complete, remove the bearing cover capscrews (28) and 3/8" washers from both ends of the pump.

### 13. LOCK COLLAR INSTALLATION - TX(S)4 Pump Models

- a. Slide the lock collar (24A) over the shaft and against the bearing (24), with the counterbored side towards the bearing.
  - b. Push the collar (24A) forcibly against the bearing (24) by hand, while tightening the two setscrews (24B). Install and tighten the two jam nuts (24C) against the collar.
  - c. Repeat this procedure on the opposite pump end. After installing both lock collars, verify the shaft turns freely when rotated by hand.
14. Inspect the grease seal (104) for wear or damage and replace as required. Grease the outside diameter of the grease seal and push it into the bearing cover (27 or 27A) with the lip of the seal inward. The lip will face outward when the bearing cover is installed on the head.
  15. Attach a new bearing cover gasket (26) and the bearing cover (27 or 27A) to the head (20). Install and torque the bearing cover capscrews (28) to 15 lbs ft (20 Nm).
  16. Follow steps 14 and 15 to install the grease seal (104) and bearing cover (27 or 27A) on the opposite side of the pump. On TXV pump models, the outboard bearing cover (27) is also a shaft protector and must be installed on the non-driven shaft end.
  17. On 1.5, 2 and 2.5-inch pump models, push the dirt shield (123A) over the inboard shaft and firmly against the bearing cover (27).
  18. On TX(S)D pump models, attach the shaft protector (186) on the non-driven shaft end.

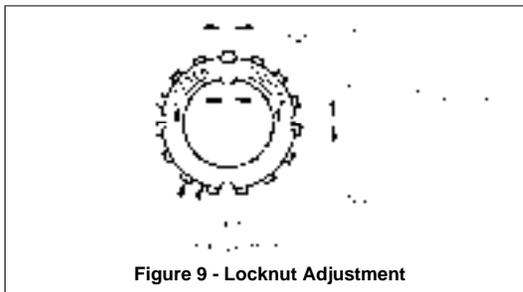


Figure 9 - Locknut Adjustment

- a. On both ends of the pump shaft, Install a lockwasher (24B) with the tangs facing outward, followed by a locknut (24A) with the tapered end inward. Ensure the inner tang "A" of the lockwasher is located in the slot in the shaft threads, bending it slightly, if necessary.
- b. Tighten both locknuts (24A) to ensure that the bearings (24) are bottomed in the head recess. **DO NOT** overtighten and bend or shear the lockwasher inner tang.

### ⚠ WARNING



Do not operate without guard in place.

**OPERATION WITHOUT SHAFT PROTECTOR CAN CAUSE SERIOUS PERSONAL INJURY, MAJOR PROPERTY DAMAGE, OR DEATH.**

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# Western Pacific Products, Inc.

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## GENERAL PUMP TROUBLESHOOTING

### NOTICE:

**MAINTENANCE SHALL BE PERFORMED BY QUALIFIED TECHNICIANS ONLY, FOLLOWING THE APPROPRIATE PROCEDURES AND WARNINGS AS PRESENTED IN THIS MANUAL.**

SYMPTOM	PROBABLE CAUSE
<b>Pump Not Priming</b>	<ol style="list-style-type: none"><li>1. Pump not wetted.</li><li>2. Worn vanes.</li><li>3. Suction valve closed.</li><li>4. Leaks in the suction line.</li><li>5. Strainer clogged.</li><li>6. Suction line or valves clogged or too restrictive.</li><li>7. Broken drive train.</li><li>8. Pump vapor-locked.</li><li>9. Pump speed too low for priming.</li><li>10. Relief valve partially open, worn or not seating properly.</li></ol>
<b>Reduced Capacity</b>	<ol style="list-style-type: none"><li>1. Pump speed too low.</li><li>2. Suction valves not fully open.</li><li>3. Leaks in the suction line.</li><li>4. Excessive restriction in the suction line (i.e.: undersized piping, too many elbows &amp; fittings, clogged strainer, etc.).</li><li>5. Damaged or worn parts.</li><li>6. Excessive restriction in discharge line causing partial flow through the relief valve.</li><li>7. Relief Valve worn, set too low, or not seating properly.</li><li>8. Vanes installed incorrectly (see "Vane Replacement").</li></ol>
<b>Noise</b>	<ol style="list-style-type: none"><li>1. Excessive vacuum on the pump due to:<ol style="list-style-type: none"><li>a. Undersized or restricted fittings in the suction line.</li><li>b. Pump speed too fast for the viscosity or volatility of the liquid.</li><li>c. Pump too far from fluid source.</li></ol></li><li>2. Running the pump with a closed discharge line.</li><li>3. Pump not securely mounted.</li><li>4. Improper drive line (see "Pump Drive").</li><li>5. Bearings worn or damaged.</li><li>6. Vibration from improperly anchored piping.</li><li>7. Bent shaft, or drive coupling misaligned.</li><li>8. Excessively worn rotor.</li><li>9. Malfunctioning valve in the system.</li><li>10. Relief valve setting too low.</li><li>11. Damaged vanes (see following category).</li></ol>
<b>Damaged Vanes</b>	<ol style="list-style-type: none"><li>1. Foreign objects entering the pump.</li><li>2. Running the pump dry.</li><li>3. Cavitation.</li><li>4. Viscosity too high for the vanes and/or the pump speed.</li><li>5. Incompatibility with the liquids pumped.</li><li>6. Excessive heat.</li><li>7. Worn or bent push rods, or worn push rod holes.</li><li>8. Settled or solidified material in the pump at start-up.</li><li>9. Hydraulic hammer - pressure spikes.</li><li>10. Vanes installed incorrectly (see "Vane Replacement").</li></ol>

*Troubleshooting continued on page 10.*

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## GENERAL PUMP TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE
<b>Broken Shaft</b>	<ol style="list-style-type: none"><li>1. Foreign objects entering the pump.</li><li>2. Viscosity too high for the pump speed.</li><li>3. Relief valve not opening.</li><li>4. Hydraulic hammer - pressure spikes.</li><li>5. Pump/driver misalignment.</li><li>6. Excessively worn vanes or vane slots.</li><li>7. Settled or solidified material in the pump at start-up.</li></ol>
<b>Lip Seal / Mechanical Seal Leakage</b>	<ol style="list-style-type: none"><li>1. O-rings not compatible with the liquids pumped.</li><li>2. O-rings nicked, cut or twisted.</li><li>3. Shaft at seal area damaged, worn or dirty.</li><li>4. Ball bearings overgreased.</li><li>5. Excessive cavitation.</li><li>6. Lip seal not seated properly.</li><li>7. Corrosion on lip seal housing.</li><li>8. Mechanical seal faces cracked, scratched, pitted or dirty.</li></ol>

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