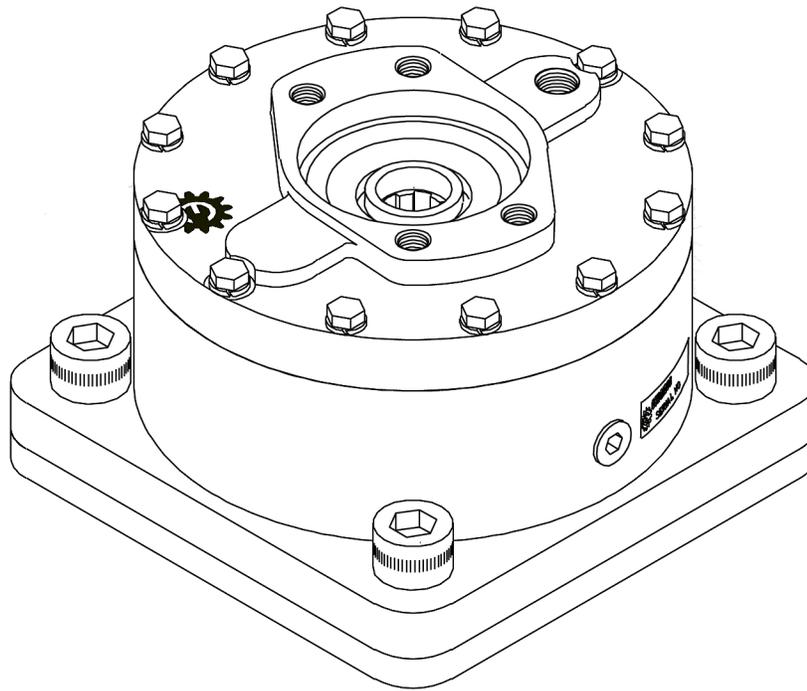




ESKRIDGE



Example Part Number

28	M	D9	A	3	20	-	S
Model	Gear Drive Mounting	Output Shaft	Input Mounting	Input Spline	Ratio		Options

THIS SERVICE MANUAL IS EFFECTIVE
FROM:..... S/N 23042, AUGUST 1995
TO: CURRENT
REF: SM28M2-AB

M28 MODEL SERVICE MANUAL

SINGLE & DOUBLE STAGE PLANETARY GEAR DRIVE

This manual will primarily assist in disassembly and assembly procedures of major components for the Series M28 Planetary Gearbox, including double and single planetary models. Item numbers, indicated in parentheses throughout this manual, refer to the Eskridge Model M28 exploded parts breakdown drawing.

For any spare or replacement parts, contact your distributor or equipment manufacturer. Always try to have available the gear drive unit part number, serial number and date code on the serial tag; this information may be necessary for verification of any component part numbers. Component part numbers and/or manufacturing lot numbers may be stamped on individual parts; this information may also be helpful in identifying replacement components.

NOTE: The Model M28 is not a stand alone unit. It is only provided as an additional reduction stage on a larger (parent) geardrive; its part number, serial number and date code are of that parent unit.

LUBRICATION & MAINTENANCE

Change the oil after the first 50 hours of operation. Oil should be changed at 500 hour intervals thereafter. Use a GL-5 grade EP 89/90 gear oil (EP = "Extreme Pressure"). The gear drive should be partially disassembled to inspect gears and bearings at 1000 hour

<u>Operating Position</u>	<u>Ratio</u>	<u>Oil Capacity*</u>	<u>Oil Level</u>
Horizontal Shaft	Single	1.00 pint / 0.5 liters	To horizontal centerline of gear drive
Vertical Shaft	Single	1.75 pints / 0.9 liters	To midway on upper/primary gear set
Horizontal Shaft	Double	1.25 pints/ 0.6 liters	To horizontal centerline of gear drive
Vertical Shaft	Double	2.25 pints/ 1.1 liters	To midway on upper/primary gear set

*If provided with an optional output lip seal (30).



WARNING: While working on this equipment, use safe lifting procedures, wear adequate clothing and wear hearing, eye and respiratory protection.

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Unit Disassembly Procedure

(Refer to exploded view drawings on Pages 6–7)

All parts should be carefully inspected as they are removed from unit. Scribe across mounting case (1) and cover (2) joint on outside of gearbox to assure proper orientation of oil fill and drain plugs, motor mounting, etc., as unit is reassembled.

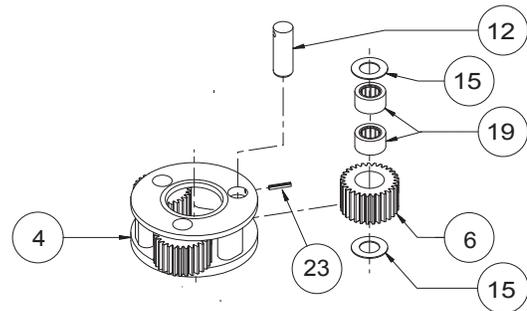
- 1) Remove hydraulic motor and Eskridge Brake from gearbox. Drain oil.
- 2) Support the gearbox by the case (1) with the output shaft (3) free from weight of gearbox.
- 3) Remove the six 5/16 hex cap screws (22) and 5/16 lock washers (26), which retain cover (2) to mounting case (1).
- 4) Lift cover (2) off of unit and remove input gear (11), input thrust washer (21), and *thrust bearing (32).
- *5) Primary planet subassembly is now ready for removal (includes Items 5, 7, 13, 16, 20 & 24). Secondary sun gear (10) is splined to primary carrier (5) and may come out when removing planetary assembly; if not, remove sun gear. Remove thrust bearing (32). Remove primary ring gear (31).
- 6) The secondary planet assembly (includes Items 4, 6, 12, 14, 15, 19 & 23) is splined to the output shaft (3). It may now be lifted, by hand, from output shaft spline.
- 7) Flip case shaft-up and press shaft (3) and ball bearing (18) out of case.
- 8) Press out old seal (30).
- 9) If ball bearing (18) needs replacing, it will need to be pressed off of output shaft (3).

The unit is now disassembled into subassemblies.

The area(s) requiring repair or service should be identified by thorough inspection of the parts after they have been washed in solvent. If repair is necessary, refer to the individual repair section to follow.

Secondary Planet Carrier Subassembly

(Items 4, 6, 12, 15, 19 & 23)



Disassembly

Rotate planet gears (6) to check for any abnormal noises or roughness in the planet bearings (19). At the same time, inspect planet gears for any damage or worn teeth. If replacement or further inspection is required, proceed as follows.

- 1) Drive the roll pins (23) completely into the planet shafts (12) using a 3/16" diameter punch. Press planet shafts out of carrier (4).

NOTE: Support only the carrier (4) while pressing out planet shafts.

- 2) Remove planet gears (6) and planet washers (15) from carrier (4).
- 3) If any of the planet bearings (19) need replacing, press them out of the planet gears.
- 4) Check planet shafts (12) for any abnormal wear, especially ones in which bearings needed to be replaced. If any abnormal wear is found, replace planet shaft.
- 5) Using a 3/16" diameter punch, drive roll pins out of planet shafts.
- 6) If required, press new planet bearings (19) into planet gears.
- 7) With a planet washer (15) on both sides of planet gear (6) and bearings (19) installed, slide gear into carrier (4). Insert planet shaft (12) through the carrier, planet gear and washers. During planet shaft installation, align roll pin hole in planet shaft with chamfered edge facing out, to the roll pin hole in outside diameter of carrier.

NOTE: Inserting a 3/16" diameter punch in the planet shaft roll pin hole will help in the alignment of holes between planet shaft and carrier during Step 7.

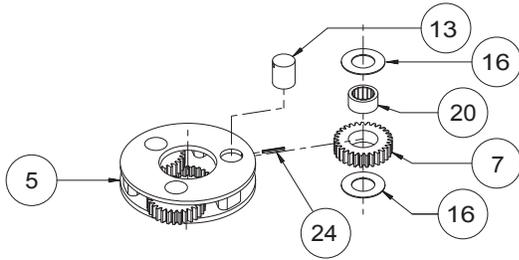
- 8) Once holes are properly aligned, drive a roll pin (23) through primary carrier and into planet shaft to retain parts. Use a drift to drive roll pin flush to carrier and to prevent striking planet gear teeth.

Repeat the same procedure for remaining gears.

*Step applies only to double planetary models.

*Primary Planet Carrier Subassembly

(Items 5, 7, 13, 16, 20 & 24)

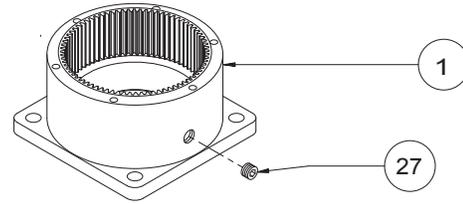


Disassembly & Repair

Follow the same procedure as that for the Secondary Planet Carrier Subassembly, except substitute item numbers as indicated: primary carrier (5), primary planet gear (7), primary planet shaft (13), primary planet washer (16), primary planet bearing (20) and primary roll pin (24). Note that roll pins are 1/8" in diameter.

Case Subassembly

(Items 1 & 27)



Disassembly & Repair

Clean all foreign material from magnetic oil plug (27) located inside of mounting case (1). Add a small amount of pipe thread compound to pipe plug before installing back into case.

All subassembly service or repairs should be complete at this time. Continue to Unit Assembly.

*Step applies only to double planetary models.

Unit Reassembly

(Refer to exploded drawings on Pages 6–7)

- 1) If equipped with optional seal (30), turn case (1) upside down and position it so that the side with the threaded holes is resting on the press table. Press shaft seal (30) into case until it is flush with bottom of counterbore. Use a press fixture, if possible, to eliminate distorting seal. If press fixture is not available, a hammer and flat-ended drift may be used by tapping outer edge of seal lightly and alternating sides.
- 2) Turn case input-side up supported 2" off of table. Install shaft (3), bearing (18), and retaining ring (25) assembly by pressing outer race of bearing into case bore. Make sure that lip seal (30) is properly seated on shaft.
- 3) Place carrier thrust bearing (32) on internal end of the shaft. Install secondary carrier (4) assembly into unit; carrier assembly should be installed with hub side down (24 tooth spline). Rotate carrier assembly back and forth to mesh secondary planet gear teeth (6) with case (1) teeth. Once teeth mesh, let secondary carrier slide down until it makes contact with the output shaft spline. The carrier splined hub (4) should spline onto output shaft (3). Carrier hub will rest on top of retaining ring (25) when splines are fully engaged. Install carrier thrust washer (14).
- *4) Install sun gear (10) in secondary carrier. Install primary carrier assembly in unit so that its splined hub meshes with sun gear.
- 5) Install input gear (11) in unit. Refer to the exploded view drawing (Pages 6–7) for proper orientation.
- *6) Place thrust bearing (33) over input gear (11).
- 7) Place input thrust washer (21) over input gear (11).
- *8) Grease a new o-ring (29) and install in bottom (internal stepped) end of ring gear (31). Refer back to scribe marks made across external join prior to Disassembly Procedure. Line up scribe marks between cover and case (1), so that orientation of motor mount holes and oil plugs are back to their original positions. Place ring gear over primary carrier onto top of case (1) so that it meshes with planet gears (7).
- 9) Fill unit with proper level of a GL-5 grade EP 80-90 gear oil; see Page 2 for details. Proper oil level will measure to middle of primary planet gears.
- 10) Grease a new o-ring (29) and install into bottom of cover (2). Refer back to scribe marks made across external joint prior to Disassembly Procedure. Line up scribe marks between cover and case (1) so that orientation of motor mount holes and oil plugs are back to their original positions.

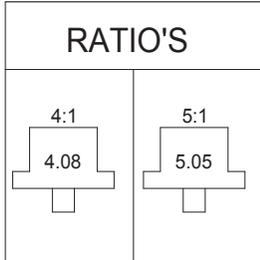
NOTE: Be certain o-ring (29) stays seated in cover during Step 10.

- 11) Install all six of the 5/16 lock washers (26) and the 5/16 hex cap screws (22) and torque to 20 ft-lbs.

THE GEARBOX IS NOW READY TO USE.

*Step applies only to double planetary models.

Exploded View Drawing – Single Stage

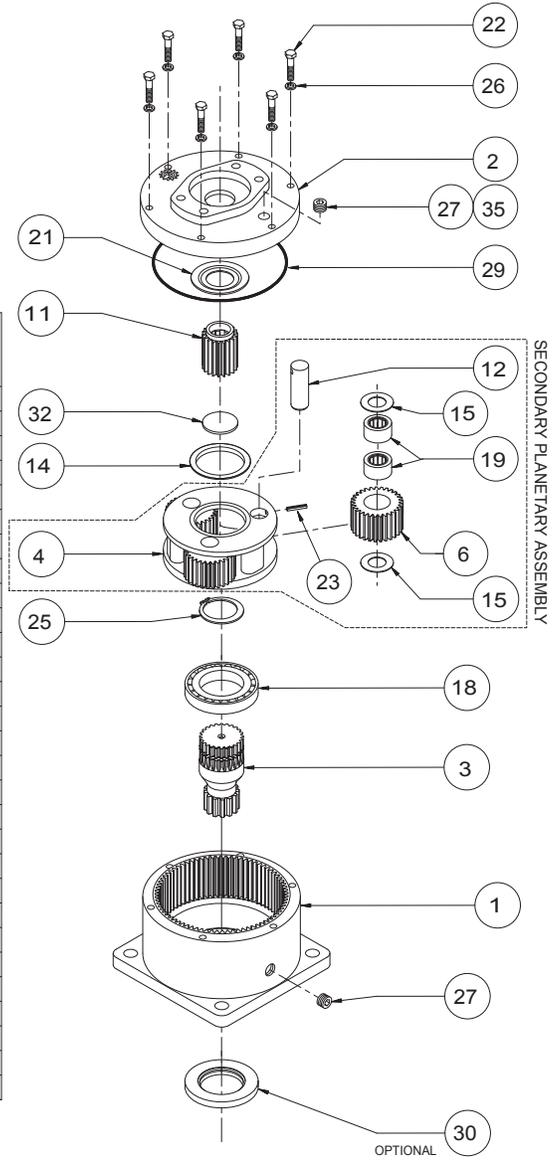


MODEL M28
SINGLE PLANETARY



EFFECTIVE
FROM: S/N 23042 08/25/95
TO: (CURRENT)

PART NUMBER	PART NUMBER	QTY.	ITEM	C O D E	DESCRIPTION
←	28-004-3624	1	1		M28 CASE
←	85-004-1513	1	2	A	COVER-SAE 'A'
←	85-004-1503			B	COVER-SAE 'B' 2-BOLT
←	28-004-1013			C	COVER-SAE 'C' 4-BOLT
←	28-004-4222	1	3		OUTPUT SHAFT
←	50-004-1062	1	4		CARRIER-SECONDARY
←	85-004-1051	3	6		PLANET GEAR-SEC.
←	85-004-1552	1	11	1	INPUT GEAR 21T,20/40 D.P.SPLINE
←	85-004-1382			2	INPUT GEAR 13T,16/32 D.P.SPLINE
←	85-004-1272			3	INPUT GEAR SAE 1"-6B SPLINE
←	85-004-1292			4	INPUT GEAR 14T,12/24 D.P.SPLINE
←	85-004-1562			5	INPUT GEAR 15T,16/32 D.P.SPLINE
←	85-004-1592			6	INPUT GEAR 1"DIA X .25" KEY
←	71-004-0121	3	12		PLANET SHAFT-SECONDARY
←	50-004-1011	1	14		THRUST WASHER-SEC.CUP
←	85-004-1181	6	15		THRUST WASHER-(SEC.PLANET GEAR)
←	01-100-0280	1	18		BEARING-BALL
←	01-105-0010	6	19		BEARING-SEC.PLANET
←	50-004-1091	1	21		THRUST WASHER-INPUT
←	01-150-1400	6	22		HEX CAPSCREW 5/16-18 X 1.5 GR8
←	01-153-0210	3	23		ROLLPIN-SECONDARY 3/16 X 7/8
←	01-160-0250	1	25		RETAINING RING
←	01-166-0110	6	26		LOCKWASHER 5/16 MED
←	01-207-0070	2	27		PIPE PLUG-MAG. 3/8 NPT-SOC HD
←	01-402-0560	1	29		O-RING 167 MM X 3 MM
←	01-405-0620	(1)	30		SEAL-SHAFT (OPTIONAL)
←	28-004-1021	1	32		THRUST BEARING
←	01-216-0070	(1)	35		AIR VENT 3/8 NPT (OPTIONAL)
←	-	-	-		-



E.C.N.2197
X28M1-AC DATE: 04-15-04

Exploded View Drawing – Double Stage

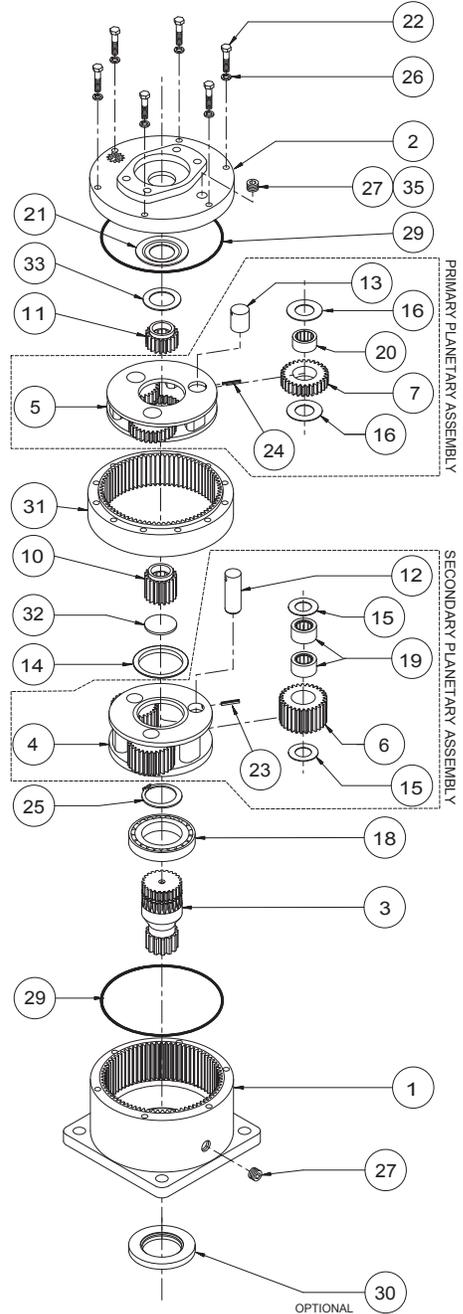
MODEL M28
DOUBLE PLANETARY



EFFECTIVE
FROM: S/N 23042 08/25/95
TO: (CURRENT)

RATIO'S			
16.65:1 4.08 4.08	20.62:1 5.05 4.08	20.62:1 4.08 5.05	25.53:1 5.05 5.05
		INVERTED	

CODE	DESCRIPTION	ITEM	QTY.	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER
	M28 CASE	1	1	28-004-3624			
A	COVER-SAE 'A'			85-004-1513			
B	COVER-SAE 'B' 2-BOLT	2	1	85-004-1503			
C	COVER-SAE 'C' 4-BOLT			28-004-1013			
	OUTPUT SHAFT	3	1	28-004-4222			
	CARRIER-SECONDARY	4	1	50-004-1062	50-004-1052	50-004-1052	50-004-1052
	CARRIER-PRIMARY	5	1	50-004-1082	50-004-1072	50-004-1082	50-004-1072
	PLANET GEAR-SEC.	6	3	85-004-1051	85-004-1051	85-004-1041	85-004-1041
	PLANET GEAR-PRI.	7	3	85-004-1031	85-004-1021	85-004-1031	85-004-1021
	SUN GEAR-SECONDARY	10	1	85-004-1412	85-004-1092	85-004-1072	85-004-1072
1	INPUT GEAR 21T,20/40 D.P.SPLINE			85-004-1402		85-004-1402	N/A
2	INPUT GEAR 13T,16/32 D.P.SPLINE			85-004-1102	85-004-1062		85-004-1062
3	INPUT GEAR SAE 1"-6B SPLINE			85-004-1122	85-004-1112		85-004-1112
4	INPUT GEAR 14T,12/24 D.P.SPLINE			85-004-1533		85-004-1533	N/A
5	INPUT GEAR 15T,16/32 D.P.SPLINE			85-004-1542	85-004-1422		85-004-1422
5	INPUT GEAR 1"DIA X .25" KEY			85-004-1582		85-004-1582	N/A
	PLANET SHAFT-SECONDARY	12	3	71-004-0121			
	PLANET SHAFT-PRIMARY	13	3	81-004-0071			
	THRUST WASHER-SEC.CUP	14	1	50-004-1011			
	THRUST WASHER-(SEC.PLANET GEAR)	15	6	85-004-1181			
	THRUST WASHER-(PRI.PLANET GEAR)	16	6	81-004-1561			
	BEARING-BALL	18	1	01-100-0280			
	BEARING-SEC.PLANET	19	6	01-105-0010			
	BEARING-PRI.PLANET	20	3	01-105-0410			
	THRUST WASHER-INPUT	21	1	50-004-1091			
	HEX CAPSCREW 5/16-18 X 2.75 GR8	22	6	01-150-1490			
	ROLLPIN-SECONDARY 3/16 X 7/8	23	3	01-153-0210			
	ROLLPIN-PRIMARY 1/8 X 1	24	3	01-153-0080			
	RETAINING RING	25	1	01-160-0250			
	LOCKWASHER 5/16 MED	26	6	01-166-0110			
	PIPE PLUG-MAG. 3/8 NPT-SOC HD	27	2	01-207-0070			
	O-RING 167 MM X 3 MM	29	1	01-402-0560			
	SEAL-SHAFT (OPTIONAL)	30	(1)	01-405-0620			
	RING GEAR	31	1	85-004-1313			
	THRUST BEARING	32	1	28-004-1021			
	THRUST BEARING	33	1	01-112-0230			
	AIR VENT 3/8 NPT (OPTIONAL)	35	(1)	01-216-0070			
-	-	-	-	-	-	-	-



▽ FOR 20:1 RATIO, INPUT CODES 1, 4 AND 6 REQUIRE "INVERTED" RATIO CARRIER ASSEMBLIES.

ECN 2197
X28M2-AD DATE: 04-15-04

**ESKRIDGE FINISHED PRODUCT
LIMITED WARRANTY**

1.1 Scope of Warranty Coverage. Upon the terms and subject to the conditions set forth in this limited warranty:

(a) ESKRIDGE (referred to herein as “**ESKRIDGE**” or the “**Manufacturer**”) warrants to each initial end user customer (a “**Purchaser**”) of a new finished product together with any accessories manufactured and sold directly from ESKRIDGE (the “**Product**”) that the Product shall be free from defects in material and workmanship, under normal working and service conditions, for a period of eighteen (18) months from the date the Product is shipped from ESKRIDGE. (the “**Warranty Term**”). A Purchaser shall be eligible for an additional eighteen (18) months of coverage in addition to the Warranty Term (also referred to as the “**Standard (+) PLUS benefit**”) only if the Purchaser (i) complies with Section 1.2(a) and (ii) registers the Product during the Warranty Term at myproduct.eskridgeinc.com.

(b) Notwithstanding the foregoing, this warranty does not cover components damaged by accident, abuse, misuse, neglect, untrained operators, collision, overloading, modification, disassembly, rework, misapplication, improper installation, lack of lubrication or maintenance, or improper service. This warranty does not cover the paint or material finish, removal or reinstallation of the Product, or normal wear and tear and loss of functionality due to aging of the Product (which may include but is not limited to bearings, bushings, seals, O-rings, gaskets, brake material, motor brushes, electrical cables and more).

1.2 Eligibility of Warranty Coverage.

(a) A Purchaser shall be eligible for warranty coverage under this Limited Warranty during the Warranty Term only if:

(i) Prior to placing a Product in service, and throughout use of the Product during the Warranty Term, the Purchaser provides (or causes to be provided) proper storage such that foreign objects (e.g. rain or debris) cannot enter any Product through entry ports which are normally closed during operation.; and

(ii) The Purchaser maintains, or causes to be maintained, the Product according to commercially reasonable standards and utilizes the Product for the purposes for which it was created; and

(iii) No repairs or alterations have been made by any party other than ESKRIDGE, including Purchaser, unless otherwise authorized in writing by ESKRIDGE.

1.3 Transferability of Warranty.

(a) This warranty is transferable only from the Purchaser to the first subsequent transferee (the “**Transferee**”) of the Product from Purchaser upon (i) written notification to ESKRIDGE and (ii) registration of the transfer, both within 30 days of such Product transfer.

(b) Upon satisfaction of transfer requirements set forth in Section 1.3(a), the Transferee shall succeed to all the rights and obligations of the Purchaser set forth in this Limited Warranty.

1.4 Certain Limitations on Scope of Warranty Service.

(a) Any obligation of ESKRIDGE under this warranty, statutory or otherwise, is limited to the repair of the Product, at its factory or Authorized Service Centers. Notwithstanding the foregoing, if field service or repair is performed by ESKRIDGE at the request of the Purchaser and no defect is found with material or workmanship of the Product, the Purchaser shall compensate ESKRIDGE for its time and expenses within thirty (30) days of delivery of an invoice relating to the same. If repair is determined by ESKRIDGE in its sole, absolute and uncontrolled discretion to be impossible or impractical, then ESKRIDGE may satisfy this warranty by replacing the Product. ESKRIDGE will not provide any cash payment or credits for defective materials or workmanship.

(b) Purchaser shall be responsible for any and all freight charges for any Product receiving warranty service under this limited warranty. Any travel time, transportation charges, freight charges, or similar costs incurred by ESKRIDGE in connection with the replacement or repair of defective parts, shall, be the responsibility of the Purchaser. If applicable, ESKRIDGE shall invoice Purchaser for the total amount of such charges within sixty (60) days of fulfilling its duties under this warranty, payable within thirty (30) days of delivery of such invoice. In no event shall ESKRIDGE be liable for bills for service, labor or other expenses that have been incurred by the Purchaser without approval or prior authorization by ESKRIDGE for inspection, maintenance, or repair of the Product.

(c) If a Product is found to be operable upon inspection, the Product, at Purchaser's election, may be either (1) returned to the Purchaser with a service charge from ESKRIDGE for inspection, cleaning, and routine replacement of all rubber components and any other parts that show wear; or (2) ESKRIDGE can dispose of the product safely.

1.5 Limitations of Liability. ESKRIDGE shall in no event be liable for punitive, special or consequential damages relating to the Product or this Warranty. ESKRIDGE makes no warranty in respect to third-party accessories, upgrades, or additions to the Product.

1.6 Improving Product. ESKRIDGE reserves the right to improve the Product through changes in design or materials as it may deem desirable or necessary without being obligated to incorporate, upgrade, or otherwise modify previously manufactured products.

1.7 Limitations of Warranty.

(a) THE WARRANTY SET FORTH ABOVE IS THE ONLY EXPRESS WARRANTY. ESKRIDGE HEREBY DISCLAIMS AND EXCLUDES ANY OTHER EXPRESS, IMPLIED, OR STATUTORY WARRANTIES, ARISING BY OPERATION OF LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE, OF TRADE, OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY.

(b) ANY IMPLIED WARRANTY WHICH BY LAW MAY NOT BE EXCLUDED IS LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF ORIGINAL RETAIL PURCHASE OF THE PRODUCT.

(c) This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

(d) This warranty is valid only in the U.S.A. and Canada. For warranty outside the U.S.A. and Canada contact your nearest Eskridge Distributor.

1.8 No Modifications to Warranty. No ESKRIDGE dealer, distributor, agent or employee is authorized to make any modification, extension or addition to this warranty.

1.9 How to Apply for Warranty Coverage.

All claims are handled by contacting your nearest Eskridge Distributor. For questions, please contact customer support: eskcustomersupport@ramseyindustries.com.

Visit [Dealer Locator - Eskridge](#) for Eskridge Distributor locations and contact information.

Additional warranty, service support, product information, and parts information can be found on www.eskridgeinc.com.