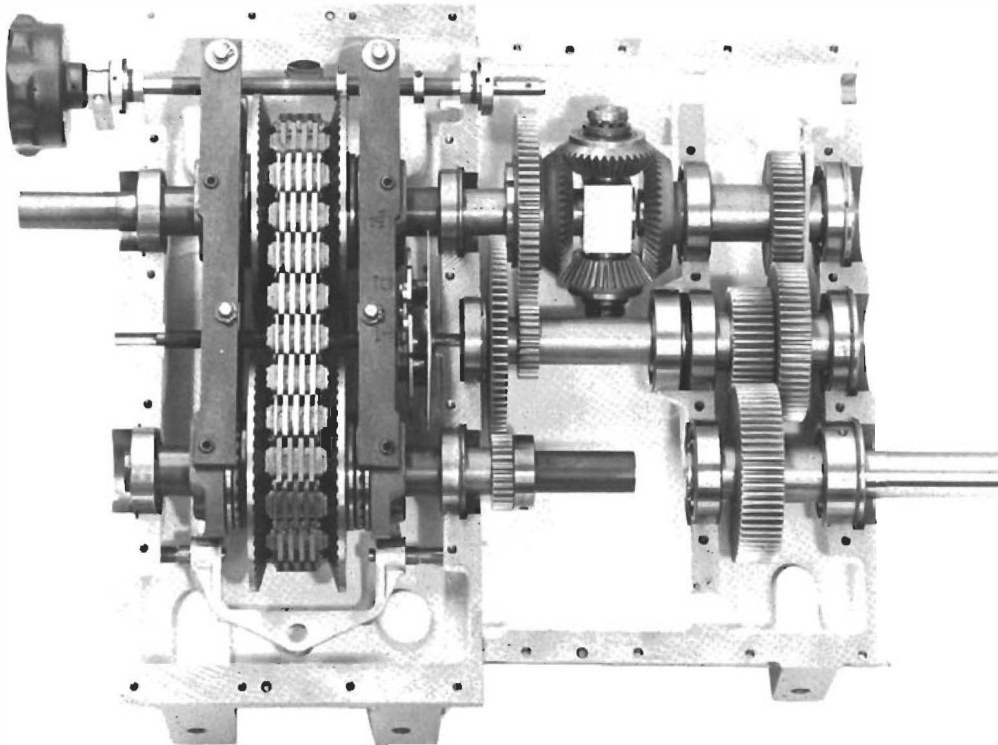


DIFFERENTIAL DRAW TRANSMISSIONS

Installation, Operating and Maintenance Instructions



The Differential Draw Transmission compresses the speed range of a variable speed device (VARI-CHAIN) by connection to differential gearing

Principles of Operation

The basic components of the Specon Draw Transmission are a 4:1 infinitely variable all metal chain and pulley combination and a bevel gear differential assembly. The input to the transmission drives the constant speed pulleys of the variable element and one member of the differential. By controlling the speed of a second element of the differential through reduction gearing from the adjustable 4:1 shaft of the variable chain connection, the third or output gear of the differential is controlled within a highly compressed speed range.

The output speed range is a function of the reduction incorporated between the variable speed shaft of the variable element and the variable speed differential gear. The higher the reduction the narrower the speed range and, consequently, the greater the accuracy.

For operating accuracy and torque capacity information see Specon Catalogs 201, 207 and 203.

Installation

Mount unit securely on a flat, rigid foundation without any flexing. Mounting pads of transmission must rest firmly on the foundation before bolting down. Shims should be used for leveling.

All Specon VARI-CHAIN transmissions are shipped without oil. Before starting, add the specified quantity of oil. Use an AGMA 4 EP grade oil. (See Table 1 for acceptable oils.) Check oil level at the sight gage. Oil should be at the specified level with the transmission stationary. After the first fifty hours of operation and every 2000 hours thereafter, change the oil. Oil can be added to the transmission either through the breather plug on the top or through the inspection cover. Before refilling with new oil, flush the transmission with a lightweight machine oil. Do not use any paraffin oil or solvents.

Lubrication

Table 1 — Acceptable Oils

Name of Manufacturer	Name of Lubricant*
Amoco	Permagear EP70
Atlantic Richfield Co	Pennant NL S-700
Boron Oil Company	Gearep 85
Exxon Company, USA	Spartan EP 150
Gulf	S 70
Mobil Oil Company	Mobilgear 629
Shell Oil Company	Omala 69
	Chevron NL Gear
Standard Oil Co. of CA	Compound 150
Sun Oil Co.	Sunep 1060
Texaco Inc.	Meropa 150

*All oils meet current standards for AGMA 4 EP gear lubricants.

Adjustment

Adjustments to the VARI-CHAIN unit are described in Bulletin 207 IOM and 207-84 IOM.

Operation

The Specon MD or MDD Draw Transmission is a self-contained unit which includes the VARI-CHAIN. In order to vary the output ratio (percent of draw for MDD Transmission or speed for MD Transmission) turn the control handwheel to the desired setting. Vary the ratio **ONLY** when the drive is in operation.

Maintenance — VARI-CHAIN

(Typical for -66, 72, 79 configuration)

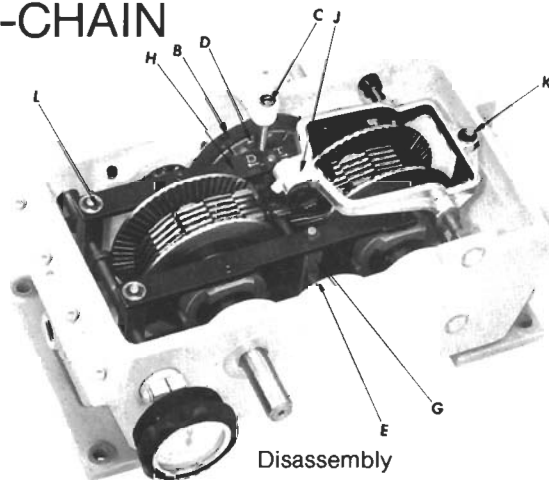


Figure 1

In addition to the oil changes, as mentioned under lubrication, the chain wear indicator must be periodically checked. To inspect indicator, remove VARI-CHAIN housing cover and note indicator wear, 0, 1/4, 1/2, 3/4, and 4/4 wear as shown on disc. Chain wear automatically causes the spiral spring to turn the tension shaft, thus maintaining proper chain tension. Full chain wear is indicated by 4/4 (1 revolution of disc). At this setting the fully worn chain must be replaced.

To remove the upper housing, take off inspection cover and remove blocking screw (C) (Figure 1). Remove the bolts at each end of the transmission and eight bolts inside the transmission. Six of these bolts can be removed through the inspection cover. The remaining two can be reached through the oil breather plug hole on each side of the nameplate. The top shoe (J) will be removed with the upper half of the housing. Caution should be exercised in removing the spring support rod (K) to retain the spring and washer with the spring support rod.

The entire internal assembly can now be removed from the lower housing. The control screw assembly can now be removed by removing the snap rings from each end of the control pivot blocks (L). With the control assembly removed, care should be exercised so as not to destroy the position relationship of the two control pivot blocks. Do not turn one pivot block independent of the other. In order to complete the disassembly of the internals, the control levers (H) must be removed. Remove only the top set or bottom set of control levers at any given time. This retains the position relationship of the adjustable pivots (G) on the pivot block screw (E). If it is necessary to remove both top and bottom control levers, exercise care to maintain the relative position of the two adjustable pivots on the pivot block screw. During disassembly, note should be taken of the relative location of all parts so that each individual part can be reassembled correctly to the correct adjoining part.

Reassembly

Reassemble the individual internal assembly taking care to insure that individual parts are assembled into the exact location from which they were removed. The entire internal assembly including the control screw can be made up before it is inserted into the lower housing.

The wave spring washer (53), (Parts list Size 1-5) on the control screw bushings (56), must go on the outside of the transmission housing and care must be taken to insure that they are not pinched between the housing halves. (This applies to Sizes 1-5 only.)

Locate lower end of spring support rod (24) (Parts list Size 0-1/2 and Size 1-5) in the hole of bottom shoe bracket (18). Compress spring and washer until drilled hole in rod is exposed and insert a piece of wire to hold the compression allowing wire to lay across top of chain. Apply non-hardening permatex to the mating surfaces of both housing halves. While lowering top half of housing, locate upper end of shoe lever rod in hole of upper shoe bracket.

Insert dowel pins (7). Secure bolts and remove wire from transmission. Recheck chain tensioner setting in accordance with chain tensioner instructions.

Installing New Chain

- Set transmission at 1:1 ratio, indicator setting at zero. (Remember change ratio only when transmission is running.)
- Disconnect motor or drive.
- Remove inspection plate.
- Support upper shoe (J) (Figure 1) in position away from chain. (Except Size 0, which has no tensioning shoes.)
- Remove blocking screw (C).
- Turn-tension flange (D) in direction marked "D" as shown on control lever (H) to slacken chain. (Use screwdriver in slots of flange.)
- Using blocking pin as reference, rotate flange through two revolutions.
- Locate connecting pin in chain and remove.
- Using old connecting pin, attach one end of new chain to end of old chain.
- Pull old chain out of transmission and thread new chain around wheel faces into transmission.
- Withdraw old connecting pin, separating old and new chain.
- Connect the ends of new chain with the new connecting pin using new washer and cotter pin.
- Turn tension flange in direction marked "T" (clockwise rotation) until wheel faces are snug against the chain. For VARI-CHAIN models 1 thru 5 continue clockwise rotation of the tension flange (using screwdriver in slots) until ratchet sounds cease indicating the automatic tension spring is fully loaded. Back off tension flange to line up stops with blocking screw. For VARI-CHAIN models 0 and 1/2, proceed by inserting blocking screw into the outside tension flange, thus blocking rotation of the outside tension flange and releasing outside ratchet. Finally load spiral spring by turning the inside tension flange in a counter-clockwise direction until ratchet sounds cease. Rotate the transmission by hand during this setting.
- Continue to rotate the transmission a few times by hand to free the slats. For transmissions equipped with the indicator disc, the "0" mark on the indicator should be positioned just to the left of the blocking screw. After running approximately one hour, recheck indicator plate and reset "0" slightly to the left of the blocking screw if necessary. (This will prevent premature chain wear indications.)
- Replace inspection cover, reconnect motor or drive and proceed with normal usage.

Maintenance — Differential

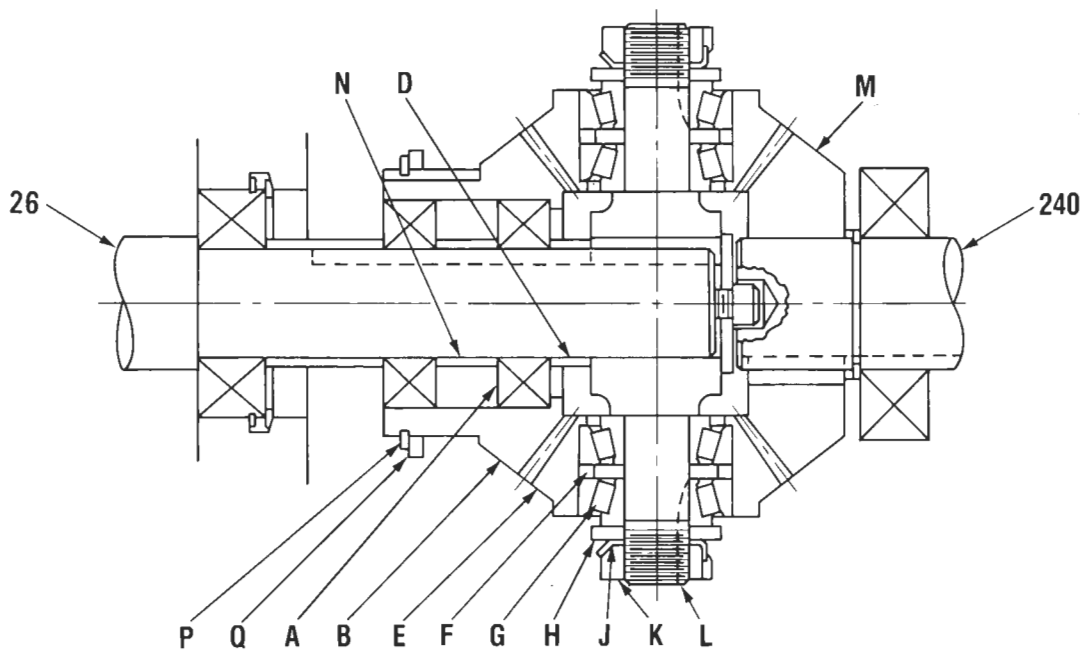


Figure 2

Table I

Differential Size	Backlash/Mesh (Assembled)	
00	.002	.004
0	.002	.004
1	.002	.004
3	.003	.006
5	.003	.006
7	.004	.009

The assembly and disassembly of differential transmissions involve procedures for

- (1) Spider Assembly
- (2) Side Gear and Worm Assembly
- (3) Final Assembly

These procedures are basic to all differential transmissions. The procedures for removal and replacement of the additional step-up and/or step-down gearing which are part of a specific transmission are considered to be within the skills of a competent mechanic.

Figure 2 represents a typical differential assembly as used in the MDD. The assembly instructions which follow apply to all other transmission arrangements for spider assembly, side gear and worm assembly and final assembly.

1. Spider Assembly (Figure 2)

- A. Push tapered roller bearing (G) outer races with standard spacer (F) into each differential pinion. Note that the angles converge between the bearings.
- B. Press a tapered roller inner race onto both spider journals (L), the large end toward the center of the spider.
- C. Place pinion gears (E) on spider.
- D. Press tapered roller inner race onto both ends.
- E. Add hardened washer (H), lock washer (J), and lock-nut (K) to both ends.
- F. Tighten lock-nuts tight with spanner wrench to squeeze out all play and to firmly seat lock washer.
- G. Back lock-nuts off and press off, or carefully tap pinions back toward their respective lock-nuts with a brass mallet ($\frac{1}{16}$ inch is sufficient).
- H. Retighten lock-nuts to the point that bearings run free, but no end play can be felt when spider assembly is shaken, holding pinion gear.
- I. Tap one tine of each lock washer into a mating groove in the lock-nut and the spider assembly is complete.

2. Side Gear Assembly

- A. The lash on the bearing-mounted side gear (B) is controlled by a spacer (D, Figure 2) between the inner ball bearing (A) and the spider. The need to change this spacer is unlikely. The table gives the backlash in inches for the assembled unit related to diametral pitch of the gear in the unit.
- B. Mounting procedure is as follows: On a push fit dummy shaft similar to the shaft that holds the differential, push on bearing to shaft shoulder, add the inner race spacer, then push on the second bearing.
- C. The side gear (N) is then pushed on over the bearing's outer race.
- D. The outer race spacer, if used in original assembly, can be discarded as it serves no useful purpose.
- E. Next, push the spider assembly onto the shaft.
- F. Considering the slight accumulative eccentricity determine the point of tightest mesh. White lead paste is used as a visual aid if desired.

G. Once the tight point is determined and marked, back the spider assembly off slightly and insert a narrow .002 feeler gage blade into the tight mesh spot.

H. Push the spider assembly back firmly locking the feeler gage blade in the mesh.

I. At this point the space between the inner bearing's inner race and the spider can be checked with telescope gage and micrometer. Should a new spacer be required, the ends must be parallel to each other and square with the axis. Surface grinding is recommended. Be sure to deburr the new spacer.

J. Recheck the fit using the spacer, then disassemble and repeat the mounting procedure on the actual input shaft (25 Figure 2).

K. This time press fits are involved on both the bearings and the spider. A tube that fits loosely on the shaft must be used so that only the inner race is pressed.

L. Note that the key, $\frac{3}{16} \times \frac{3}{15} \times 1\frac{1}{4}$, must also be a tight fit to preclude any looseness in the assembly.

M. Add the cap screw and washer to the shaft where it extends through the spider.

3. Final Assembly (Figure 2)

A. With the assembly to this point assembled in the housing, the bearing retainer holding the snap ring bearing bolted in place, the next step is the shaft mounted differential side gear (M) first assuming the gear to be too long.

B. Press the gear onto its shaft (240 Figure 2) journal firmly against the shaft shoulder with the shaft bearings in their positions.

C. Lay the assembly in the housing, rotating it to find the point of tightest mesh as before.

D. Using once again the .002 feeler gage, insert it into the tight mesh point and push the assembly in to hold the feeler gage blade.

E. Now with another feeler gage set determine the distance between the machined face of the housing and the inside edge of the bearing snap ring—a snug fit. The resultant figure is the amount that must be surface ground from the back of the gear hub. Once done and re-assembled the unit is ready to run.

F. Now assuming that the gear length over all is too short, the snap ring will have to be removed from the bearing to seize the feeler gage in the mesh.

G. In this position use a depth micrometer from the outer surface of the bearing to the machined surface of the housing for one figure.

H. Reinstall the bearing snap ring, push it up tight to housing, and measure with micrometer for the second figure.

I. The difference will be the thickness of steel shim needed between the gear hub and the shaft shoulder.

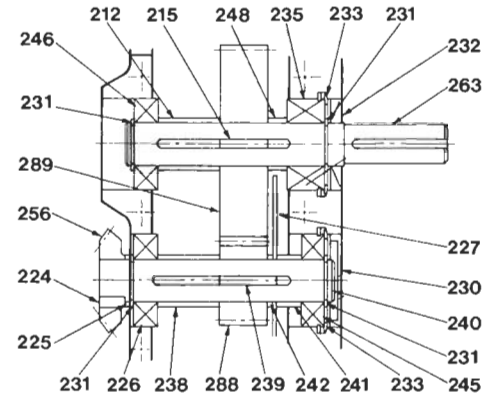
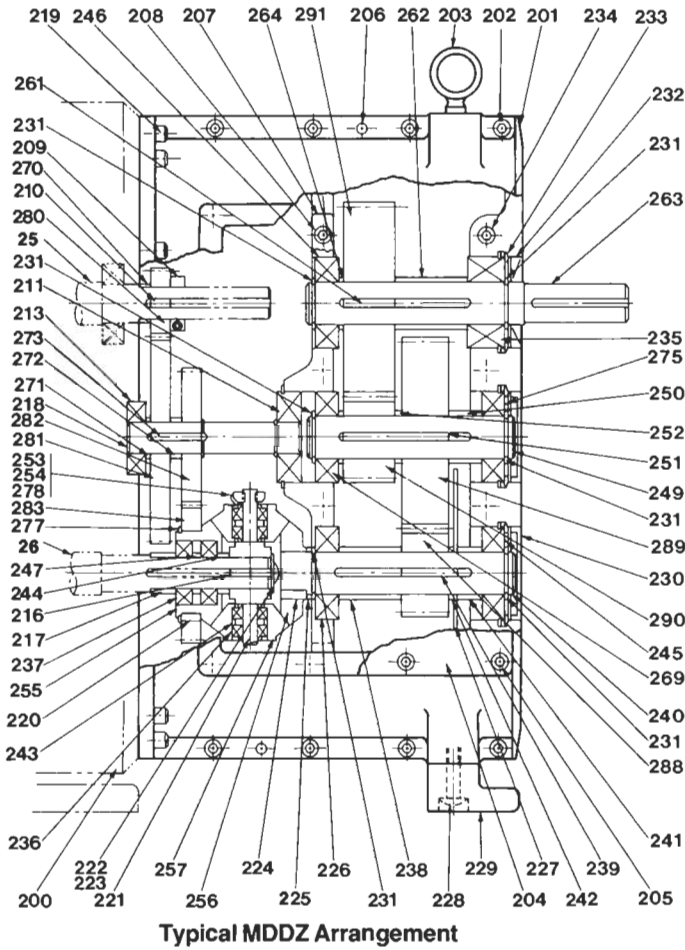
J. In cutting this shim to the necessary washer shape, be certain that it fits freely on the shaft so that no added thickness will be incurred in final assembly.

K. Once reassembled with the shim in place the transmission is ready to go back together.

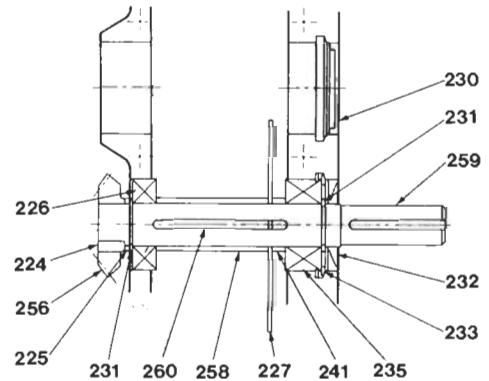
Repair Parts List

When ordering repair parts specify model number and serial number of the transmission and part number from bill of materials.

SPECON MDD-66 TYPE A



Typical MDDX Arrangement



Typical MDDY Arrangement

Note: 1. Refer to unit serial number when ordering parts.
2. Refer to Bulletin 207 IOM for Vari-Chain parts.

COMMON PARTS

Loc. No.	Description	Quan.
25	Variable Speed Shaft	1
26	Constant Speed Shaft	1
200	See VARI-CHAIN Transmission Parts List	1
201	Housing Assembly	1
202	Socket Head Cap Screw	10
203	Eye Bolt	1
204	Inspection Cover	1
205	Socket Head Cap Screw	10
206	Dowel	2
207	Bearing Bridge	1
208	Socket Head Cap Screw	4
209	Split Clamp	1
210	Key	1
211	Bearing	1
213	Bearing	1
216	Key	1
217	Spacer	1
218	Shaft	1
219	Socket Head Cap Screw	16
220	Key	1
221	Differential Spider	1
222	Button Head Cap Screw	1
223	Washer	1
224	Key	1
225	Spacer	1
226	Bearing	1
227	Oil Slinger	1
228	Button Head Cap Screw	4
229	Mounting Foot	1
230	Closure	2
232	Seal	1
234	Socket Head Cap Screw	4
235	Bearing	1
236	Bearing	4
237	Bearing	2

Loc. No.	Description	Quan.
241	Spacer	1
243	Spacer	2
244	Spacer	1
247	Spacer	1
253	Lock-Nut	2
254	Lock Washer	2
255	Differential Side Gear	1
256	Differential Side Gear	1
257	Differential Pinion Gear	2
270	Spacer	1
271	Spacer	1
272	Spacer	1
273	Key	1
277	Snap Ring	1
278	Hardened Washer	2
280	Connecting Gear	1
281	Connecting Gear	1
282	Connecting Gear	1
283	Connecting Gear	1

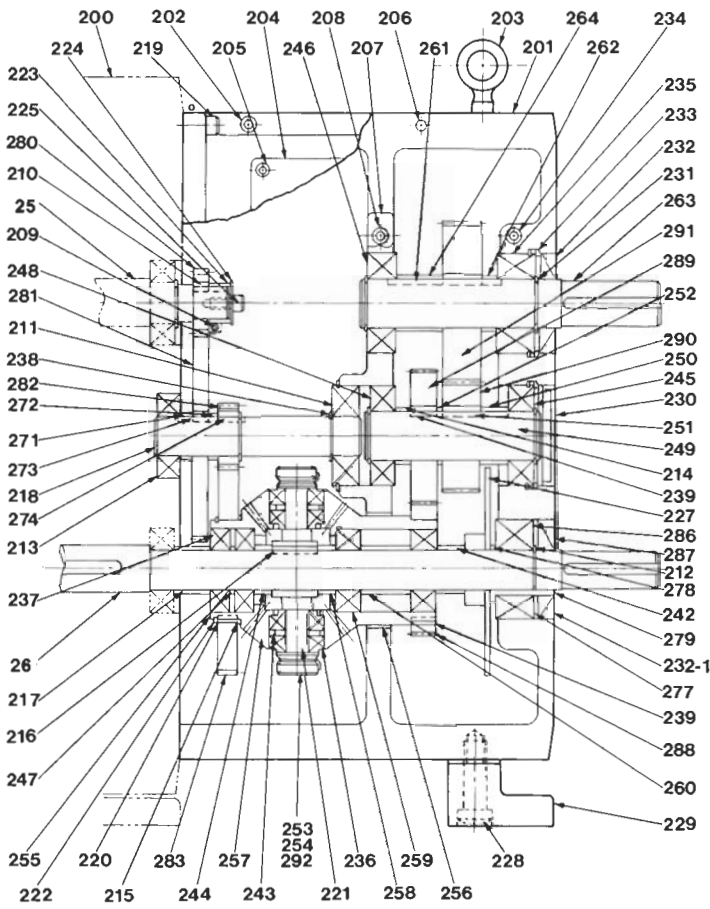
Loc. No.	Description	Quan.
212	Spacer	1
215	Key	1
231	Snap Ring	4
233	Bevel Snap Ring	2
238	Spacer	1
239	Key	1
240	Shaft	1
242	Spacer	1
245	Bearing	1
246	Bearing	1
248	Spacer	1
263	Output Shaft	1
288	Output Gear	1
289	Output Gear	1

Loc. No.	Description	Quan.
231	Snap Ring	2
233	Bevel Snap Ring	1
258	Spacer	1
259	Output Shaft	1
260	Key	1

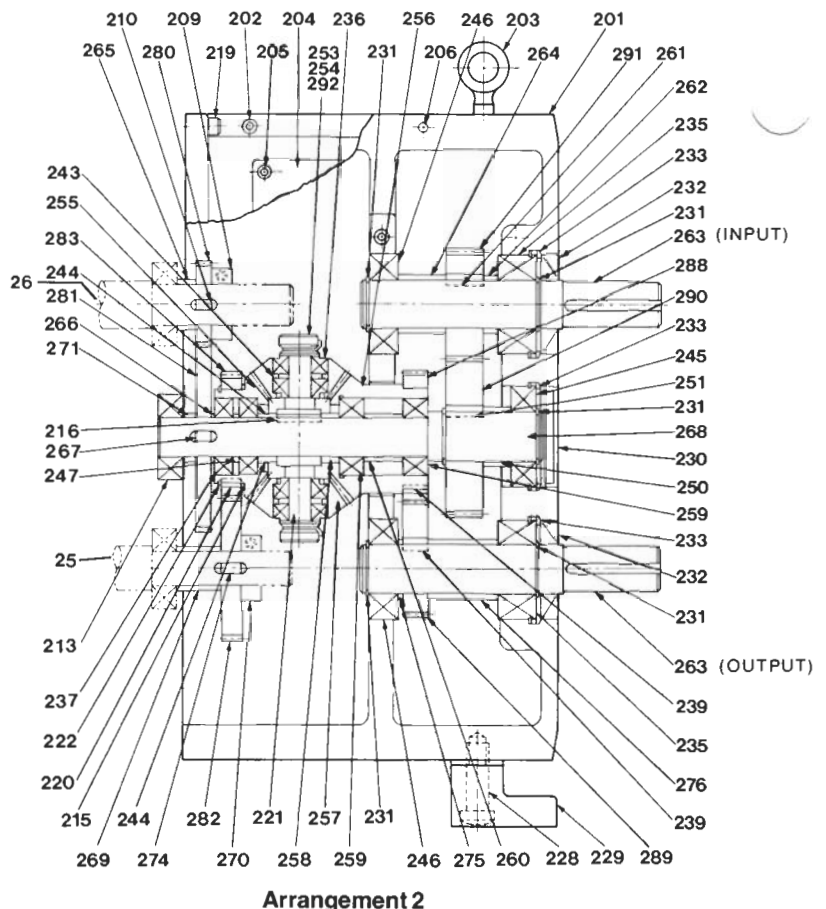
Loc. No.	Description	Quan.
231	Snap Ring	6
233	Bevel Snap Ring	3
238	Spacer	1
239	Key	1
240	Shaft	1
242	Spacer	1
245	Bearing	1
246	Bearing	1
249	Shaft	1
250	Spacer	1
251	Key	1
252	Spacer	1
261	Key	1
262	Spacer	1
263	Output Shaft	1
264	Spacer	2
269	Bearing	1
275	Bearing	1
288	Output Gear	1
289	Output Gear	1
290	Output Gear	1
291	Output Gear	1

Note: 1. Oil Slinger not used on all units.
2. Item 209 may be different on special units.

SPECON MDD-66 TYPE B



Arrangement 1



Arrangement 2

Note: 1. Refer to unit serial number when ordering parts.
2. Refer to Bulletin 207 IOM for Vari-Chain parts.

COMMON PARTS

Loc. No.	Description	Quan.	Loc. No.	Description	Quan.
25	Variable Speed Shaft	1	239	Key (Not Needed if Integral Gear)	2
26	Constant Speed Shaft	1	242	Spacer	1
200	See VARI-CHAIN Transmission Parts List	1	243	Spacer	2
201	Housing Assembly	1	244	Spacer	1
202	Socket Head Cap Screw	10	245	Bearing	1
203	Eye Bolt	1	247	Spacer	1
204	Inspection Cover	1	249	Shaft	1
205	Socket Head Cap Screw	10	250	Spacer	1
206	Dowel	2	251	Key	1
207	Bearing Bridge	1	252	Spacer	1
208	Socket Head Cap Screw	4	253	Lock-Nut	2
209	Split Clamp	1	254	Lock Washer	2
210	Key	1	255	Differential Side Gear	1
211	Bearing	1	256	Differential Side Gear (Gear May Be Integral with Loc. No. 288)	1
213	Bearing	1	257	Differential Pinion Gear	2
214	Spacer	1	258	Spacer	1
215	Spacer	1	259	Bearing	2
216	Key	1	260	Spacer	1
217	Spacer	1	261	Key	1
218	Shaft	1	262	Spacer	1
219	Socket Head Cap Screw	2	264	Spacer	1
220	Key	1	271	Spacer	1
221	Differential Spider	1	273	Key	1
222	Retaining Ring	1	274	Key	1
223	Spacer	1	280	Connecting Gear	1
224	Washer	1	281	Connecting Gear	1
225	Socket Head Cap Screw	1	282	Connecting Gear	1
227	Oil Slinger	1	283	Connecting Gear	1
228	Button Head Cap Screw	4	288	Output Gear	1
229	Mounting Foot	1	289	Output Gear	1
230	Closure	1	290	Output Gear	1
234	Socket Head Cap Screw	4	291	Output Gear	1
236	Bearing	4	292	Hardened Washer	2
237	Bearing	2			

NOTE: 1. Oil Slinger not used on all units.
2. Item 209 may be different on special units.

ARRANGEMENT #1

Loc. No.	Description	Quan.
212	Snap Ring	1
231	Snap Ring	4
232	Seal	1
232-1	Seal (Sizes 2-5)	1
233	Bevel Snap Ring	2
235	Bearing	1
238	Snap Ring	2
246	Bearing	1
248	Bearing	1
263	Output Shaft	1
272	Spacer	1
277	Bearing (Sizes 2-5)	1
278	Spacer (Sizes 1/2 & 1)	1
279	Sleeve (Sizes 2-5)	1
286	Bearing (Sizes 1/2 & 1)	1
287	Seal (Sizes 1/2 & 1)	1

ARRANGEMENT #2

Loc. No.	Description	Quan.
231	Snap Ring	5
232	Seal	2
233	Bevel Snap Ring	3
235	Bearing	2
246	Bearing	2
263	Output/Input	2
265	Spacer	1
266	Spacer	1
267	Key	1
268	Shaft	1
269	Spacer	1
270	Clamp	1
275	Spacer	1
276	Spacer	1