

V-Belt Drive Instruction Manual

These instructions must be read thoroughly before installation or operation. This instruction manual was accurate at the time of printing. Please see dodgeindustrial.com for updated instruction manuals.

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

WARNING: All products over 25 kg (55 lbs) are noted on the shipping package. Proper lifting practices are required for these products.

CONSIDERATIONS BEFORE INSTALLATION

- Be sure the set is matched properly (if multiple set), with the same manufacturer and be sure it is the proper size and cross section.
- When installing new belts on a drive, always replace all the belts. Combining old and new belts may shorten the life of the new belt.

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

INSTALLATION

REMOVING WORN BELTS

1. Most drives have two sheaves, one on the motor and one on the driven machine. The motor base usually has slotted holes to allow for adjustment toward and away from the driven machine. Loosen the motor hold down bolts and move the motor toward the drive machine to the inner end of the adjustment to release tension on the belts. Use a pry bar against the motor base, if needed. The belts should now be quite loose. If the drive has an idler instead of an adjustable motor base, loosen the hold down bolts and swing the idler away from the belts, allowing them to hang loose. Be sure to use all the adjustment in the drive to loosen belts completely.
2. Now remove the belts carefully from each sheave. Do not move motor or machine after belt removal. Do not pry belts OFF drive or attempt to roll them OFF by rotating sheaves. Doing this can result in serious personal injury.

CHECK CONDITION OF SHEAVES

Check the sheaves carefully for worn grooves or damage. (Safety tip: Always use gloves or a cleaning rag when checking the inside of grooves to avoid being cut by nicks or burrs.)

Worn sheaves can seriously shorten the life of V-belts, especially the joined, POLYBAND® form. The POLYBAND belts will ride lower in the grooves, forcing the tie band against the sheave land. This will reduce the wedging effect, or if severe enough, cut the tie band, destroying the advantage of a joined belt.

Before a new set of V-belts are installed, check the condition of the sheaves. Dirty or rusty sheaves impair the drive's efficiency and abrade the belts, which result in premature failure.

Worn sheaves shorten belt life as much as 50%. If the grooves are worn to where the belt bottoms, slippage may result and burn the belts. If the sidewalls are "dished out," the bottom shoulder ruins the belts prematurely by wearing off the bottom corners.

Table 1 - Center Distance Allowance for Installation and Take-Up Inches - Narrow Belts

Standard Length	Minimum Allowance Below Standard Center Distance for Installation of Belts						Minimum Allowance Above Standard Center Distance for Maintaining Tension, (All Cross Sections)
	3V 3VX	3V 3VX Poly-band	5V 5VX	5V 5VX Poly-band	8V	8V Polyband	
Up to and including 475	0.5	1.2	---	---	---	---	1.0
Over 475 to and including 710	0.8	1.4	1.0	2.1	---	---	1.2
Over 710 to and including 1060	0.8	1.4	1.0	2.1	1.5	3.4	1.5
Over 1060 to and including 1250	0.8	1.4	1.0	2.1	1.5	3.4	1.8
Over 1250 to and including 1700	0.8	1.4	1.0	2.1	1.5	3.4	2.2
Over 1700 to and including 2000	---	---	1.0	2.1	1.8	3.6	2.5
Over 2000 to and including 2360	---	---	1.2	2.4	1.8	3.6	3.0
Over 2360 to and including 2650	---	---	1.2	2.4	1.8	3.6	3.2
Over 2650 to and including 3000	---	---	1.2	2.4	1.8	3.6	3.5
Over 3000 to and including 3550	---	---	1.2	2.4	2.0	4.0	4.0
Over 3550 to and including 3750	---	---	---	---	2.0	4.0	4.5
Over 3750 to and including 5000	---	---	---	---	2.0	4.0	5.5

Table 2 - Center Distance Allowance for Installation and Take-Up Inches - Classic Belts

Standard Length Designation	Minimum allowance Below Standard Center Distance for Installation of Belts								Min. Allowance Above Standard Center Distance for Maintaining Tension All Cross Sections
	A AX	A, AX Polyband	B BX	B, BX Polyband	C CX	C, CX Polyband	D	D Polyband	
Up to and incl. 35	0.75	1.20	1.00	1.50	---	---	---	---	1.00
Over 35 to and incl. 55	0.75	1.20	1.00	1.50	1.50	2.00	---	---	1.50
Over 55 to and incl. 85	0.75	1.30	1.25	1.60	1.50	2.00	---	---	2.00
Over 85 to and incl. 112	1.00	1.30	1.25	1.60	1.50	2.00	---	---	2.50
Over 112 to and incl. 144	1.00	1.50	1.25	1.80	1.50	2.10	2.00	2.90	3.00
Over 144 to and incl. 180	---	---	1.25	1.80	2.00	2.20	2.00	3.00	3.50
Over 180 to and incl. 210	---	---	1.50	1.90	2.00	2.30	2.00	3.20	4.00
Over 210 to and incl. 240	---	---	1.50	2.00	2.00	2.50	2.50	3.20	4.50
Over 240 to and incl. 300	---	---	1.50	2.00	2.00	2.50	2.50	3.50	5.00
Over 300 to and incl. 390	---	---	---	---	2.00	2.70	2.60	3.60	6.00
Over 390	---	---	---	---	2.50	2.90	3.00	4.10	1.5% of belt length

Table 3 - Minimum Belt Deflection Force in lbs. - Classic Belts

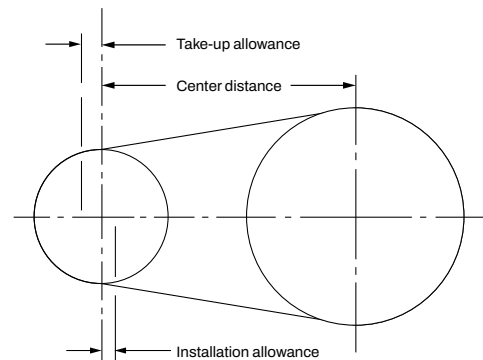
V-Belt Section	Small Sheave		Deflection Force In Lbs. For Drive Speed Ratio of:			
	Speed Range	Diameter	1.0	1.5	2.0	4.0 +
A (AP)	1800-3600	3.0	2.0	2.3	2.4	2.6
	1800-3600	4.0	2.6	2.8	3.0	3.3
	1800-3600	5.0	3.0	3.3	3.4	3.7
	1800-3600	7.0	3.5	3.7	3.8	4.3
B (BP)	1200-1800	4.6	3.7	4.3	4.5	5.0
	1200-1800	5.0	4.1	4.6	4.8	5.6
	1200-1800	6.0	4.8	5.3	5.5	6.3
	1200-1800	8.0	5.7	6.2	6.4	7.2
C (CP)	900-1800	7.0	6.5	7.0	8.0	9.0
	900-1800	9.0	8.0	9.0	10.0	11.0
	900-1800	12.0	10.0	11.0	12.0	13.0
	700-1500	16.0	12.0	13.0	13.0	14.0
D (DP)	900-1500	12.0	13.0	15.0	16.0	17.0
	900-1500	15.0	16.0	18.0	19.0	21.0
	700-1200	18.0	19.0	21.0	22.0	24.0
	700-1200	22.0	22.0	23.0	24.0	26.0
AX	1800-3600	3.0	2.5	2.8	3.0	3.3
	1800-3600	4.0	3.3	3.6	3.8	4.2
	1800-3600	5.0	3.7	4.1	4.3	4.6
	1800-3600	7.0	4.3	4.6	4.8	5.3
BX	1200-1800	4.6	5.2	5.8	6.0	6.9
	1200-1800	5.0	5.4	6.0	6.3	7.1
	1200-1800	6.0	6.0	6.4	6.7	7.7
	1200-1800	8.0	6.6	7.1	7.5	8.2
CX	900-1800	7.0	10.0	11.0	12.0	13.0
	900-1800	9.0	11.0	12.0	13.0	14.0
	900-1800	12.0	12.0	13.0	13.0	14.0
	700-1500	16.0	13.0	14.0	14.0	15.0
DX	900-1500	12.0	16.0	18.0	19.0	20.0
	900-1500	15.0	19.0	21.0	22.0	24.0
	700-1200	18.0	22.0	24.0	25.0	27.0
	700-1200	22.0	25.0	27.0	28.0	30.0

CHECK SHEAVE ALIGNMENT

Sheave alignment should be checked by placing a straight edge or tight cord across the sheave faces so that it touches all four points of contact. Ordinarily, a misalignment of more than one-half of one degree (one eighth inch in one foot) will adversely affect belt life. Improper sheave alignment produces uneven wear on one side of the belt, causes the belt to roll over in the sheaves or throws all the load on one side of the belt, stretching or breaking the cords on that side.

INSTALLATION AND TAKE-UP ALLOWANCES

After calculating a center distance from a standard pitch length, make provision for adjusting the center distance as in sketch below. This will allow for proper installation of the belt(s) without damage or personal injury, proper tensioning, and maintenance of proper tension through out the life of the belt.



PLACING BELTS ON SHEAVES

Shorten the center distance of the drive until the belts can be put on the sheaves without forcing. Forcing the belts can cause internal injury to the belts. (Refer to Tables 1 and 2 for values.)

TENSIONING THE NEW V-BELTS

With the sheaves or idler moved to minimum center distance for belt removal as described above, the new belts can be easily placed over the sheaves and dropped into the grooves. (If motor has been moved, readjust it to provide slack for easy installation.)

TENSIONING A DRIVE

General Rules of Tensioning–

1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.
2. Check tension frequently during the first 24-48 hours of run-in operation.
3. Over tensioning shortens belt and bearing life.
4. Keep belts free from foreign material which may cause slip.
5. Make V-Drive inspection on a periodic basis. Tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure.

TIPS ON PROPER SHEAVE MOUNTING

TL & QD* sheaves are attached as follows:

NOTE: With either type of sheave, always make sure that the mating surfaces of the sheave and hub are free of all foreign substances such as dirt, grease or paint.

After sheaves and bushing are on the shaft, align them before final tightening of bushings to recommended torque in Table 4 or 5. Install belts.

Refer to the individual Taper-Lock and QD Bushings manuals for installation instructions

Tighten Torque Installation Screws for QD and Taperlock Bushings to the recommended torque value in Table 4 (QD) and Table 5 (Taper Lock).

Table 4 - Recommended Torque				
QD Bushings	Cap Screws		Key Seat Set Screws	
	Size	lb-in	Size	lb-in
QT	1/4-20 × 7/8	90	#10-24	36
JA	#10-24 × 1	60	#10-24	36
SH	1/4-20 × 1-3/8	108	1/4-20	87
SDS	1/4-20 × 1-3/8	108	1/4-20	87
SD	1/4-20 × 1-7/8	108	1/4-20	87
SK	5/16-18 × 2	180	1/4-20	87
SF	3/8-16 × 2	360	5/16-18	165
E	1/2-13 × 2-3/4	720	3/8-16	290
F	9/16-12 × 3-5/8	900	3/8-16	290
J	5/8-11 × 4-1/2	1620	3/8-16	290
M	3/4-10 × 7	2700	3/8-16	290
N	7/8-9 × 8	3600	1/2-13	620
P	1-8 × 9-1/2	5400	5/8-11	1325
W	1-1/8-7 × 11-1/2	7200	1-8	5000
S	1-1/4-7 × 15-1/2	9000	1-1/4-7	7600

*Q-D is a registered trademark of Emerson Electric Co.

Table 5 - Recommended Torque		
TL BUSHING NO.	Lb-IN*	Nm*
1008, 1108	55	6,2
1210, 1215, 1310	175	19,9
1610, 1615	175	19,9
2012	280	31,8
2517, 2525	430	48,8
3020, 3030	800	90,8
3535	1000	114
4040	1700	193
4545	2450	278
5050	3100	352
6050, 7060, 8065	7820	888
10085, 12010	13700	1556

Table 6 - Min Belt Deflection Force (lbs.) - Narrow Belts						
V-Belt Section	Small Sheave		Deflection Force in Lbs. for Drive Speed Ratio of:			
	Speed Range	Diameter	1.0	1.5	2.0	4.0+
3VX	1200-3600					
	1200-3600	2.2	2.2	2.5	2.7	3.0
	1200-3600	2.5	2.6	2.9	3.1	3.6
	1200-3600	3.0	3.1	3.5	3.7	4.2
	1200-3600	4.1	3.9	4.3	4.5	5.1
	1200-3600	5.3	4.6	4.9	5.1	5.7
	1200-3600	6.9	5.0	5.4	5.6	6.2
	1200-3600					
5VX	1200-3600					
	1200-3600	4.4	6.5	7.5	8.0	9.0
	1200-3600	5.2	8.0	9.0	9.5	10.0
	1200-3600	6.3	9.5	10.0	11.0	12.0
	1200-3600	7.1	10.0	11.0	12.0	13.0
	1200-3600	9.0	12.0	13.0	14.0	15.0
	1200-3600	14.0	14.0	15.0	16.0	17.0
	900-1800					
8VX	900-1800	12.5	18.0	21.0	23.0	25.0
	900-1800	14.0	21.0	23.0	24.0	28.0
	700-1500	17.0	24.0	26.0	28.0	30.0
	700-1500	21.2	28.0	30.0	32.0	34.0
	400-1000	24.8	31.0	32.0	34.0	36.0
5V	900-1800	7.1	8.5	9.5	10.0	11.0
	900-1800	9.0	10.0	11.0	12.0	13.0
	900-1800	14.0	12.0	13.0	14.0	15.0
	700-1200	21.2	14.0	15.0	16.0	17.0
8V	900-1800	12.5	18.0	21.0	23.0	25.0
	900-1800	14.0	21.0	23.0	24.0	28.0
	700-1500	17.0	24.0	26.0	28.0	30.0
	700-1200	21.2	28.0	30.0	32.0	34.0
	400-1000	24.8	31.0	32.0		36.0

Notes: Use approximately 130% of above values to tension a new set of belts.
Use closest sheave dia. for sizes not shown

Table 7 - POLYBAND Plus Belt Deflection Force (lbs.) (Force is pounds for one belt only)				
Cross Section	Small Sheave Diameter Range	"RPM Range"	Belt Deflection Force*	
			Normal	New Belt
5VF	7.1-10.9	200-700	21.1	30.9
		701-1250	18.0	26.3
		1251-1900	16.7	23.4
		1901-3000	15.8	23.0
5VF	11.8-16.0	200-700	26.8	39.5
		701-1250	23.5	34.7
		1251-2100	22.7	33.3
8VF	12.5-20.0	200-500	44.7	65.8
		501-850	38.5	56.6
		851-1150	35.2	51.6
		1151-1650	33.5	49.0
8VF	21.2-25.0	200-500	65.9	97.6
		501-850	61.2	90.6
		851-1200	57.0	84.3

* Multiply the force required for one belt by the number of belts in the Polyband Plus unit to get total force to apply.
Example: New 8VF drive with a small sheave dia. equal to 20".
The rpm of the sheave is 1000.
The belt to be installed is 8/8VF4000.
Total deflection force = table value x 8 = 51.6 x 8 = 413 lbs.

BELT PULL AND BEARING LOADS

Belt Pull Calculations—The following method of calculating belt pull is found to be the most convenient and accurate for drives operating at design loads and tensions:

$$T_1 + T_2 = 33,000 (2.5 - G) \left(\frac{HP}{GV} \right)$$

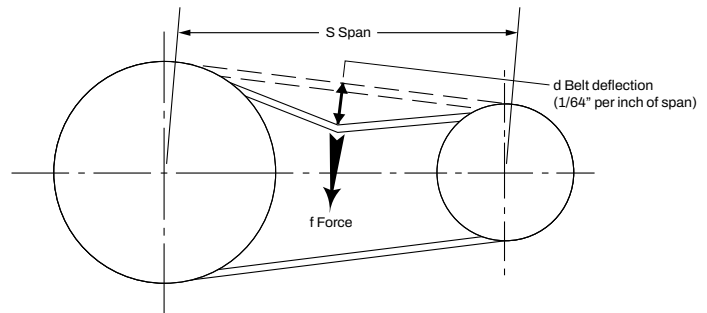
WHERE:

T1 = Tight side tension, pounds
T2 = Slack side tension, pounds
HP = Design horsepower
V = Belt speed, feet per minute = (PD) (RPM) (.262)
G = Arc of contact correction factor

Table 8 - Arc of Contact Factors					
D-d C	Arc of Contact	Factor G	D-d C	Arc of Contact	Factor G
.00	180°	1.00	.80	133°	.87
.10	174°	.99	.90	127°	.85
.20	169°	.97	1.00	120°	.82
.30	163°	.96	1.10	113°	.80
.40	157°	.94	1.20	106°	.77
.50	151°	.93	1.30	99°	.73
.60	145°	.91	1.40	91°	.70
.70	139°	.89	1.50	83°	.65
Arc of contact is on small sheave D=Diam. of large sheave.			d= Diam. of small sheave C=Center distance		

SIMPLE TENSIONING PROCEDURE

1. Measure the span length.



1. At the center of the span apply a force (perpendicular to the span) large enough to deflect the 1/64, for every inch of span length. For example, one deflection of a 100 inch span would be 100/64 or 1-9/16 inches.
2. Compare the force you have applied with the values given in Tables 3, 6 or 7. If the force is between the values for normal tension, and 1-1/2 times normal tension, the drive tension should be satisfactory. A force below the value for normal tension indicates an undertensioned drive. If the force exceeds the value for 1-1/2 times normal tension, the drive is tighter than it needs to be.
3. After the proper operating tension has been applied to the belts, a double-check should be made of the following:
 - a. Parallel position of the sheave shafts.
 - b. Correct alignment of sheave grooves.

TROUBLE SHOOTER AND SERVICE GUIDE			
	TROUBLE AREA AND OBSERVATION	CAUSE	REMEDY
BELT STRETCH BEYOND TAKE-UP	Belt stretch unequally.	Misaligned drive, unequal work done by belts.	Realign and re-tension drive.
		Belt tensile member broken from improper installation.	Replace all belts with new set properly installed.
	All belts stretch about equally.	Insufficient take-up allowance.	Check take-up and follow allowance on page.
		Greatly overloaded or under-designed drive.	Redesign.
SHORT BELT LIFE	Relatively rapid failure; no visible reason.	Tensile members damaged through improper installation.	Replace with all new matched set, properly installed.
		Worn sheave grooves (check with groove gauge)	Replace sheaves.
		Under-designed drive.	Redesign.
	Sidewalls soft and sticky. Low adhesion between cover plies. Cross-section swollen.	Oil or grease on belts or sheaves.	Remove source of oil or grease. Clean belts and grooves with cloth moistened with alcohol.
	Sidewalls dry and hard. Low adhesion between cover plies. Bottom belt cracked.	High temperatures.	Remove source of heat. Ventilate drive better.
	Deterioration of rubber compounds used in belt	Belt dressing.	Never use dressing on V-belts. Clean with cloth moistened with alcohol. Tension drive properly to prevent slip.
	Extreme cover wear.	Belts rub against belt guard or other obstruction.	Remove obstruction or align drive to give needed clearance.
	Spin burns on belt.	Belts slip under starting or stalling load.	Tighten drive until slipping stops.
	Bottom of belt cracked.	Too small sheaves.	Redesign for larger sheaves.
	Broken belts.	Object falling into or hitting drive.	Replace with new matched set of belts. Provide shield for drive.
BELT TURN OVER	Belt Turn Over	Excess lateral belt whip.	Use Polyband belt.
		Foreign material in grooves.	Remove material—shield drive.
		Misaligned sheaves.	Realign the drive.
		Worn sheave grooves (check with groove gauge).	Replace sheave.
		Tensile member broken through improper installation.	Replace with new set properly installed.
		Incorrectly placed flat idler pulley.	Carefully align flat idler on slack side of drive as close as possible to driver sheave.
BELT NOISE	Belt Noise	Belt slip.	Retension drive until it stops slipping.
IMPROPER DRIVEN SPEED	Incorrect driveR-driveN ratio.	Design error.	Use correct sheave sizes.
	Spin burns on belt.	Belt slip.	Retension drive until belt stops slipping.
HOT BEARINGS	Drive over-tensioned.	Worn grooves-belts bottoming and will not transmit power until over-tensioned.	Replace sheaves. Tension drive properly.
		Improper tensioning.	Retension drive.
	Sheaves too small.	Motor manufacturers sheave diameters not followed.	Redesign drive.
	Poor bearing condition.	Under designed bearing or poor bearing maintenance.	Observe recommended bearing design and maintenance.
	Sheaves out too far on shaft.	Error or obstruction problem.	Place sheaves as close as possible to bearings. Remove any obstruction preventing this.
	Drive under-tensioned.	Belts slipping and causing heat build-up.	Retension drive.

BELT WEAR RECOGNITION (SINGLE STRAND BELTS)			
	TROUBLE AREA AND OBSERVATION	CAUSE	REMEDY
BELT TURNOVER PATTERNS	Belt turns over and turns that way or may turn over and come off.	Foreign material in grooves.	Remove material -- shield drive
		Misaligned sheaves.	Realign the drive.
	Worn sheave grooves	Worn sheave grooves	Replace sheave
		Tensile member broken through improper installation.	Replace with new belt(s)
		Incorrectly aligned idler pulley.	Carefully align idler, checking alignment with drive loaded and unloaded.
BELT PULLED APART	Belt pulled apart.	Extreme shock load.	Remove cause of shock load.
		Belt came off drive.	Check drive alignment foreign material in drive, insure proper tension and drive alignment.
SEVERE CORNER & SURFACE WEAR PATTERNS	Severe wear on corners or surfaces of belt	Belt rubbing on some obstruction	Remove obstruction or align drive to give needed clearance
WORN SIDE PATTERN	Sides worn.	Constant slip.	Re-tension drive until belt stops slipping.
		Misalignment.	Realign sheaves.
		Worn sheaves.	Replace with new sheaves
		Incorrect belt.	Replace with new belt.
BOTTOM & SIDES BURNED	Sides and bottom of belt burned	Belt slipping under starting or stalling load.	Replace belt and tighten drive until slipping stops.
		Worn sheaves.	Replace sheaves.
BAND SIDEWALL FLAKING, STICKY OR SWOLLEN	Band (cover) has flaked off and the sides or sidewalls are soft and sticky. Low adhesion between cover plies. Cross section swollen	Oil or grease on belts or sheaves	Remove source of oil or grease. Clean belts and grooves with cloth moistened with non-flammable, non-toxic degreasing agent or commercial detergent and water.
BELT CUT ON BOTTOM	Belt cut on bottom	Belt ran over sheave and came off.	Check drive tension and alignment -- re-tension and align drive properly.
		Foreign material fell into belt drive making belt come off.	Shielding not in place.
		Belt forced over the sheave flange during installation without slacking off the drive.	Install new belts properly. Slack off belt drive.
BOTTOM OF BELT CRACKING	Bottom of belt cracking	Belt slipping, causing heat buildup and gradual hardening of undercord.	Install new belt, tension to prevent slip.
		Idler installed in wrong side of belt.	Refer to the Troubleshooter's Guide for V- Belts or contact your representative for products.
		Improper storage	Refer to belt storage.
POLYBAND BELTS TIE BAND SEPARATION	Tie band separating from belts	Worn sheaves	Gauge sheave grooves and replace with standard groove sheaves.

BELT WEAR RECOGNITION (SINGLE STRAND BELTS)			
	TROUBLE AREA AND OBSERVATION	CAUSE	REMEDY
BELT RIDING OUTSIDE SHEAVE GROOVE	<p>POLYBAND with one strand riding outside sheave grooves.</p> <p>NOTE: Distinct groove in sidewall of outside belt.</p> <p>NOTE: If above belt were permitted to run in this position, progressive failure would result.</p>	Possible misalignment, lack of tension or foreign object forced belt from sheave grooves.	Properly align drive, re-tension and remove any interference from foreign object.
ONE BELT SEPARATED FROM TIE BAND	Outside belt and belt adjacent to it have started to separate from POLYBAND belt.	POLYBAND belt has jumped one groove forcing outside belt out of sheave. Improper tension, misalignment or foreign object struck belt and forced it from normal path.	Replace POLYBAND belt and seat properly in aligned grooves. Tension properly.
ALL BELTS SEPARATED FROM TIE BAND	Belts has separated completely	Riding outside and above sheave grooves.	Proper maintenance of drive and installation of belt.
		Too loose, contacting shielding.	Adjust shields.
		Worn idler pulley	Replace
TOP OF TIE BAND FRAYED OR DAMAGED	Top of tie band frayed or damaged	Obstruction on machine interfering with normal operation of belt.	Realign drive and remove obstruction.
TOP OF TIE BAND BLISTERED OR PERFORATED	Large holes or blisters appear on tie band.	Trash and foreign material accumulated between belts of PowerBand.	Check shielding on drive.
BOTTOM OF BELT CRACKING	Bottom of belt cracking.	Belt slipping causing heat buildup and gradual hardening of undercord.	Check tension of POLYBAND belt.

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