

**ANDREWS** PRODUCTS, INC.

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**Cams & Gears**

MOTORCYCLES

ANDREWS Products, Inc.



## Andrews Products is committed to the motorsports industry for the long haul.

Andrews Products was founded in the spring of 1972 and for 34 years has specialized in making camshafts and transmission gears for the performance motorcycle market.

On behalf of the entire Andrews Products organization, we proudly present this catalog to all motorcycle enthusiasts and to the many designers and builders of performance motorcycle engines and transmissions.

Please review the pages of this catalog and see how Andrews Products can help you get the most out of the engine and transmission in your bike.

While we started making motorcycle transmission gears and shafts, performance camshafts and related valve gear parts soon became additional, distinct product lines.

More new gear sets with better ratios soon followed. The results were gears which easily out-performed anything else available. Their superior performance was quickly recognized by everyone who tried them. The novelty and uniqueness of both the cams and gears resulted in a wave of demand for new Andrews Products cams and gears. And that was only the beginning.

Today, Andrews Products is recognized throughout the Motor Sports world as an industry leader. We utilize state-of-the-art engineering design and manufacturing technology for producing superior quality camshafts and transmission gears for both street and racing applications. As an industry leader, we at Andrews Products understand what keeps us on top also keeps our customers on top. Over the years and to this day, Andrews Products has made significant investments in new computer controlled production machinery and inspection equipment. Some of these machines are pictured in this catalog.

Strategic purchases in the latest technologies keeps us and our customers right at the leading edge. With Andrews Products' unique and proprietary processing, innovative design and strict quality control, we can consistently deliver the highest quality camshafts and transmission gears.

Many of the customers we now work with include the top NASCAR Cup and Busch racing teams as well as other builders of racing engines for the automotive and motorcycle high performance markets. This is a very demanding group

of people for whom second best is not an option; they simply demand the best.

At Andrews Products, we share with our customers a passion for excellence and will not accept second place. Our customers rely on us to help them achieve top performance. This culture is well established throughout Andrews Products, its people and processes. And whether we are working with top race teams or making parts for street motorcycles, the same technology is used.

The entire Andrews Products Team looks forward to helping you achieve top performance and take the checkered flag as leaders.

In November of 2002, Andrews Products moved into a brand new 45,000 square foot facility in Mt. Prospect, Illinois. The two illustrations on this page show our new building. As a result, we now operate out of a fully equipped air conditioned facility with everything under one roof.

Our main office and manufacturing plant is eleven miles north of the Chicago, O'Hare International Airport. We are in one of the world's great manufacturing areas with easy access to efficient transportation and shipping to anywhere in the US and most foreign countries.

We are better equipped than ever to serve all of our customers with the first class quality and support that all of you deserve.



In November of 2002, Andrews Products moved into a brand new 45,000 square foot facility in Mt. Prospect, Illinois. As a result, we now operate out of a fully equipped air conditioned facility with everything under one roof.

### Ordering Information

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### Your Customer Number:

### Customer Technical Service

Available for customers during listed hours:

Morning  
9:00am - 10:00am (Central Time)

Afternoon  
3:00pm - 4:00pm (Central Time)

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## Performance Cams (all 2007 and 2006 Dyna)



Camshafts on 2006 Dynas engines and ALL 2007 Twin cam engines use new roller chain drives instead of silent chains. Camshafts made for 1999-2006 engines will not fit the 2007 engines or the 2006 Dyna engines. All 2006 Road Glides, Road Kings, ElectraGlides and Softail motors run earlier silent chain drives. Cam grinds listed below are designed for use with stock H/D hydraulic lifters. Roller chain camshafts will have performance characteristics similar to the earlier chain drive cams.

Matching EZ-install pushrods kits are also available from Andrews Products. EZ-install pushrods do not require removal of gas tanks or rocker boxes when installing bolt-in camshafts.

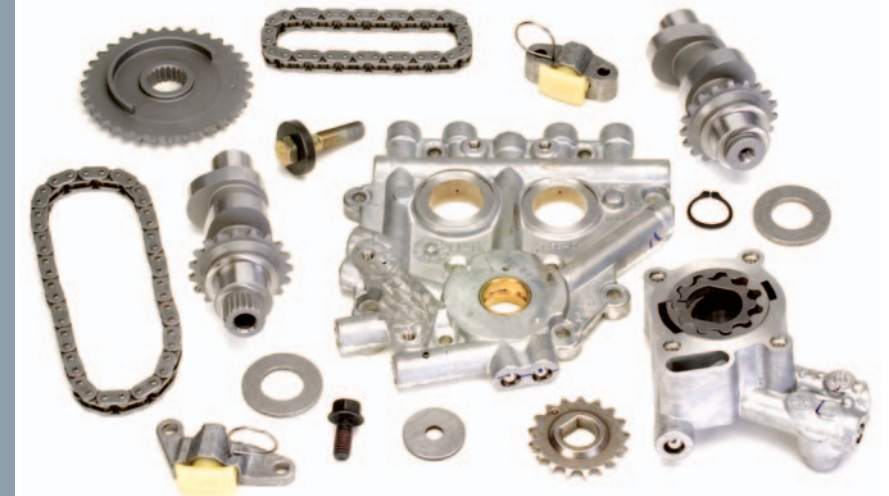
Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
Stock	Intake Exhaust	02/34 36/04	216.5 219.5	256 259	.474 .474	.087 .110	Stock	Stock 2006 cam data listed for reference: All 2006 Dynas are fuel injection only; no carburetors.
216321	21H	10/30 40/08	220 228	255 264	.498 .498	.134 .121	Stock	Bolt-in cam: More torque for all around riding with heavy bikes, stock compression ratios and stock pistons. Similar to #23 cam for EV80. (1700-4800 RPM).
216326	26H	11/35 41/09	226 230	262 266	.490 .490	.138 .120	Stock	Bolt-in cam 88-95 inches and stock compression ratio. Great for two up touring, this cam will add torque and HP at lower and middle RPM ranges. (1800-5200 RPM).
216331	31H	10/46 52/08	236 240	272 276	.510 .510	.131 .120	Stock	Great cam for motors with 95 inches and 9.8 to 10.2 CR. Lower TDC lift for easy installation. Similar to TW37 with different timing. (2000-5600 RPM).
216332	32H	10/46 52/08	236 240	272 276	.570 .570	.131 .120	Stock	High lift version of 31H. Much more power thru RPM range with 10:1+ Compression pistons. (2800-5600).
216337	37H	18/38 46/14	236 240	272 276	.510 .510	.174 .148	Stock	Hot street cams for 88 or 95 inches. 80+ rear wheel HP possible with well tuned 88 incher, more with 95. Smooth idle, broad torque (2200-5600 RPM). 9.0 to 9.5 CR.
216344	44H	21/41 49/17	242 246	279 283	.495 .495	.182 .158	Stock	For engines with 88 or 95 inches and compression ratios from 9.5 to 10.2; Max torque range; 2300-5800 RPM.
216350	50H	20/48 54/18	248 252	283 287	.510 .510	.184 .168	Stock	Designed for easy installation in 95 inch motors with stock heads and 9.5 to 9.8 CR. (2400 to 6000 RPM).
216355	55H	22/46 52/20	248 252	283 292	.550 .550	.197 .181	Hi-lift	Great cam for 95 inch engines with 9.8 to 10.2 CR. Max HP - torque at mid and upper RPMs. (2600-6200).
216360	60H	24/56 58/22	260 260	296 296	.560 .560	.205 .192	Hi-lift	For well prepped 95-103 inchers with 10.0 to 10.5 CR, 100+ HP is within reach. (2700-6500+ RPM).

(\*) Timing and duration listed for .053 cam lift.

## Twin 88 Conversion Camshafts (upgrade 1999-2005 engines to 2006 roller chain drives)

Camshafts on all 1999-2006 H/D 88 engines (except 2006 Dyna) can be updated with new 2007 type roller chain drives. All 2006 Road Glides, Road Kings, ElectraGlides and all Softail models still operate with spring loaded, silent chain drives. Cam grinds listed below are designed for use with stock H/D hydraulic lifters. Engines converted to 2006 roller chains will have performance similar to earlier bikes with the same cam grinds.

Installing 2007 roller cam chains on earlier engines requires two new series "N" Andrews camshafts as listed below. Stock H/D parts needed (from your dealer): 2006 cam support plate, 2006 oil pump, 2006 cam sprockets and chains and both 2006 hydraulic chain adjusters. Matching EZ-install pushrods kits are available from Andrews Products. EZ-install pushrods do not require removal of gas tanks or rocker boxes when installing bolt-in camshafts.



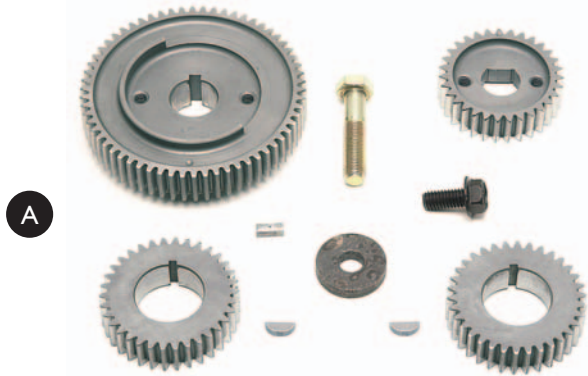
**NOTE:** Camshaft drive chains on any 1999-2006 Twin cam engine can be updated to new 2007 type roller chains with hydraulic chain tensioners. Instead of super powered spring adjusters, 2007 roller cam chain adjusters use engine oil pressure to maintain chain tension. (For 2006, only Dyna Glide engines were made with roller chain cam drives).

Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
Stock	Intake Exhaust	02/34 36/04	216.5 219.5	256 259	.474 .474	.087 .110	Stock	Stock 2006 Dyna cam data listed for reference: All 2006 Dynas were fuel injection only; no carburetors.
216812	12N	02/34 37/05	216 220	252 259	.489 .489	.091 .106	Stock	Bolt-in cam grind with the same output as a stock cam, Slight power increase <b>but no retuning necessary!</b>
216821	21N	10/30 40/08	220 228	255 264	.498 .498	.134 .121	Stock	Bolt-in cam: More torque for all around riding with heavy bikes, stock compression ratios and stock pistons. Similar to #23 cam for EV80. (1700-4800 RPM).
216826	26N	11/35 41/09	226 230	262 266	.490 .490	.138 .120	Stock	Bolt-in cam 88-95 inches and stock compression ratio. Great for two up touring, this cam will add torque and HP at lower and middle RPM ranges. (1800-5200 RPM).
216831	31N	10/46 52/08	236 240	272 276	.510 .510	.131 .120	Stock	Great cam for motors with 95 inches and 9.8 to 10.2 CR. Lower TDC lift for easy installation. Similar to TW37 with different timing. (2000-5600 RPM).
216837	37N	18/38 46/14	236 240	272 276	.510 .510	.174 .148	Stock	Hot street cams for 88 or 95 inches. 80+ rear wheel HP possible with well tuned 88 incher, more with 95. Smooth idle, broad torque (2200-5600 RPM). 9.0 to 9.5 CR.
216844	44N	21/41 49/17	242 246	279 283	.495 .495	.182 .158	Stock	For engines with 88 or 95 inches and compression ratios from 9.5 to 10.2; Max torque range; 2300-5800 RPM.
216850	50N	20/48 54/18	248 252	283 287	.510 .510	.184 .168	Stock	Designed for easy installation in 95 inch motors with stock heads and 9.5 to 9.8 CR. (2400 to 6000 RPM).
216855	55N	22/46 52/20	248 252	283 292	.550 .550	.197 .181	Hi-lift	Great cam for 95 inch engines with 9.8 to 10.2 CR. Max HP - torque at mid and upper RPMs. (2600-6200).

(\*) Timing and duration listed for .053 cam lift.

## Twin Cam Gear Installation Kits (1999-2006 except 2006 Dyna)

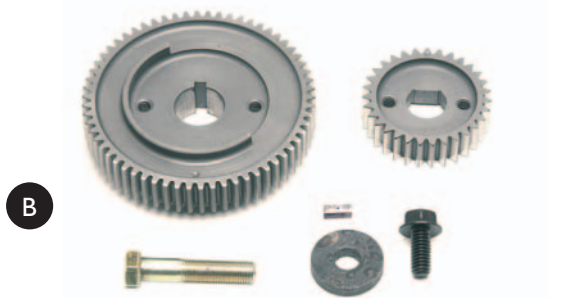
### Part Numbers



### (A) Outer Gears and Cam Gears

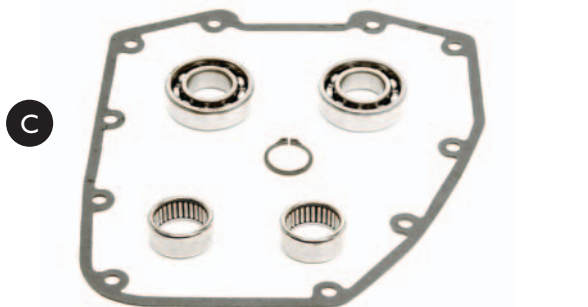
**Outer and Inner Drive Gear Kit** .....288908  
Complete kit includes four cam drive gears with two retaining cap screws, three drive keys and one thrust washer.

**Inner Cam Drive Gears (2 pcs)** .....288905  
Two inner cam drive gears are supplied with drive keys.



### (B) Outer Drive Gears

**Outer Drive Gear Kit** .....288903  
This kit includes the crankshaft drive gear, camshaft drive gear, two class 8 retaining cap screws, camshaft drive key and one heat treated camshaft end thrust washer.



### (C) Gaskets and Bearings Kit

**Gear Drive Installation Kit** (as shown) .....288901  
Replacement bearings only:  
**Camshaft Ball Bearings** .....388015  
**Inner Case Needle Bearings** .....388900

Gasket and bearings shown are necessary to complete the installation of gear drive camshafts. And yes, gear drive camshafts use ball bearings on both shafts.



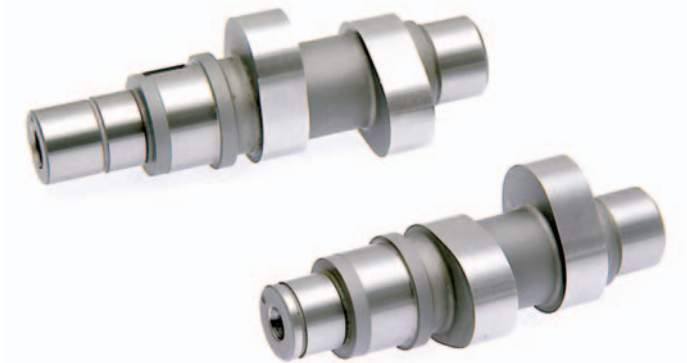
### (D) Twin Cam Pushrods

Shown from left to right:  
**Standard tip aluminum pushrods** .....292388  
**Standard tip chrome-moly pushrods** .....292288  
**EZ-install aluminum pushrods** .....292188  
**EZ-install chrome-moly pushrods** .....292088

Twin cam pushrods are available with EZ-install ends or standard adjustable tips. Both types are made in anodized aluminum or chrome moly steel. EZ-install pushrods can be installed without removing gas tanks or rocker boxes. If you are installing bolt-in cams, this is a big plus! Andrews pushrods are a great match for cams listed on the previous page. Extra long or short pushrods are available as specials. Call if you need them.

## Twin Cam: Gear Drive Cams (1999-2006 except 2006 Dyna)

Andrews gear drive camshafts are available to run with S & S gear drives. Engines with gear driven cams show a 4 hp gain over cams with chains. If less power is needed to turn the camshafts, more power gets to the rear wheel. Also, gear drive cams do not have chain tensioner shoes to wear out. When deciding what cam to use in your 88 engine (see page 10 also), the most important consideration is the proper match between compression ratio and intake cam duration. For best street performance, the static compression pressure should be around 175-180 PSI. Drag motors can handle still higher static pressures. Lower static pressure of 160 PSI are great for all around riding. For a more complete explanation of static compression pressure, see page 14 in this catalog.



Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
<b>Stock cam data for both carbureted engines and injected engines is listed on page 7.</b>								
288112G	12G	02/34 37/05	216 220	256 269	.474 .474	.088 .110	Stock	Bolt-in 88 cam: similar specs to 1999-2006 stock 88 cams. slight power increase but no retuning necessary.
288121G	21G	10/30 40/08	220 228	255 264	.498 .498	.134 .121	Stock	Bolt-in 88 cam: more torque for all around riding with heavy bikes, intended for stock compression ratio and pistons. Similar to #23 cam in EV80. (1700-4800 RPM). <i>21G cams run great with fuel injectors or carburetors!</i>
288126G	26G	11/35 41/09	226 230	262 266	.490 .490	.138 .112	Stock	Bolt-in cam for 88-95 inches - stock compression ratio. Great for two up touring, this cam will add torque and HP at lower and middle RPM ranges. (1800-5200). <i>26G cams run great with fuel injectors or carburetors!</i>
288131G	31G	10/46 52/08	236 240	272 276	.510 .510	.131 .120	Stock	Great cam for motors with 95+ inches and 10:1 CR. Lower TDC lift means easy installation. Similar to 37G but different timing. 2000-5800 RPM power range.
288132G	32G	10/46 52/08	236 240	272 276	.570 .570	.131 .120	Hi-lift	High lift version of 31HG. Much more power thru RPM range with 10:1 compression pistons. 2800-5800 RPM.
288137G	37G	18/38 46/14	236 240	272 276	.510 .510	.174 .148	Stock	Hot street cams for 88 or 95 inches. 80+ rear wheel HP possible with well tuned 88 motor; more with 95. Smooth idle, broad torque (2200-5600 RPM). Stock to 9.5 CR. <i>37G cams run great with fuel injectors or carburetors!</i>
288144G	44G	21/41 49/17	242 246	279 283	.495 .495	.182 .158	Stock	For 88 or 95 inches and 9.5 C.R. or higher. Max torque and HP at mid and upper RPM (2300-5800).
288150G	50G	20/48 54/18	248 252	283 287	.510 .510	.184 .168	Stock	Designed for easy installation in 95 inch motors with stock heads and 9.5 to 9.8 C.R. (2400 to 6000 RPM).
288155G	55G	22/46 52/20	248 252	283 292	.550 .550	.197 .181	Hi-lift	Great cam for 95 inch engines with 9.8 to 10.2 C.R. Max HP - torque at mid and upper RPMs (2600-6200).
288160G	60G	24/56 58/22	260 260	296 296	.560 .560	.205 .205	Hi-lift	For well prepped 95-103 inches with 10.0 to 10.5 CR, 100+ HP is within reach. (2700-6500+ RPM).
<b>The following three cam grinds are available for gear drive systems only!</b>								
288167G	67G	24/48 58/22	252 260	287 297	.570 .570	.209 .187	Hi-lift	Performance cams for 95-107+ inches, 10.0 to 10.8 C.R. with high flow head setup. (2600-6400+ RPM).
288159G	59G	29/57 63/27	266 270	303 307	.590 .590	.238 .218	Hi-lift	Great cam for 95-107+ inches with 10:2 C.R. or higher. Max torque and HP (2700-6500+ RPM).
288164G	64G	30/62 66/30	272 276	307 312	.640 .640	.262 .232	Hi-lift	Big cams for modified 95-116+ inch motors running 10:2 CR or higher. Heads must be set for .700 lift and modified for max air flow. (3000-6500+ RPM).

(\*) Timing and duration listed for .053 cam lift.

## Gear Drive Installation Kits (All 2007 and 2006 Dyna)

### Part Numbers

#### (A) Outer Gears and Cam Gears

**Outer and Inner Drive Gear Kit** .....216908  
Complete kit includes four cam drive gears with two retaining cap screws, three drive keys and one thrust washer.

**Inner Cam Drive Gears (2 pcs)** .....216905  
Two inner cam drive gears are supplied with drive keys.

#### (B) Outer Drive Gears

**Outer Drive Gear Kit** .....216903  
This kit includes the crankshaft drive gear, camshaft drive gear, two class 8 retaining cap screws, camshaft drive key and one heat treated camshaft end thrust washer.

#### (C) Gaskets and Bearings Kit

**Gear Drive Installation Kit (as shown)** .....216901  
Replacement bearings only:  
**Inner Case Needle Bearings** .....??

Gasket and bearings shown are necessary to complete the installation of gear drive camshafts. And yes, gear drive camshafts use ball bearings on both shafts.

#### (D) Twin Cam Pushrods

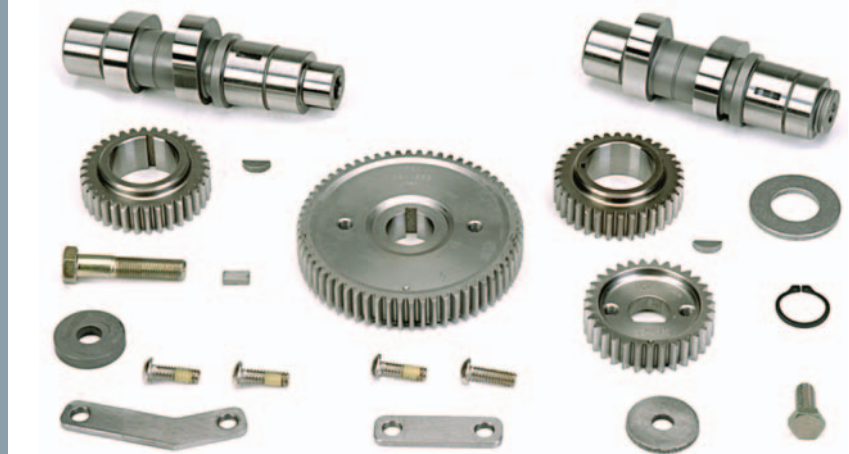
Shown from left to right:  
**Standard tip aluminum pushrods** .....292388  
**Standard tip chrome-moly pushrods** .....292288  
**EZ-install aluminum pushrods** .....292188  
**EZ-install chrome-moly pushrods** .....292088

Twin cam pushrods are available with EZ-install ends or standard adjustable tips. Both types are made in anodized aluminum or chrome moly steel. EZ-install pushrods can be installed without removing gas tanks or rocker boxes. If you are installing bolt-in cams, this is a big plus! Andrews pushrods are a great match for cams listed on the previous page. Extra long or short pushrods are available as specials. Call if you need them.

## Gear Drive Cams (All 2007 and 2006 Dyna)

Series "HG" gear drive cams are made for ALL 2007 Twin cam engines and 2006 DynaGlides. They are specifically designed to run with new S&S gear drives. The cams listed below are the same designs as gear drive cams that have been made for 1999-2006 engines. Gear drives made for 1999-2005 engines will not fit 2007 Twin cam engines or 2006 Dyna engines.

"HG" series cam kits also include two plates for closing lubricating oil feed holes which are intended for stock chains, not 2007 style gear drives. Performance with any of the "H" cams listed will be similar to the same grinds with earlier 1999-2005 engines.

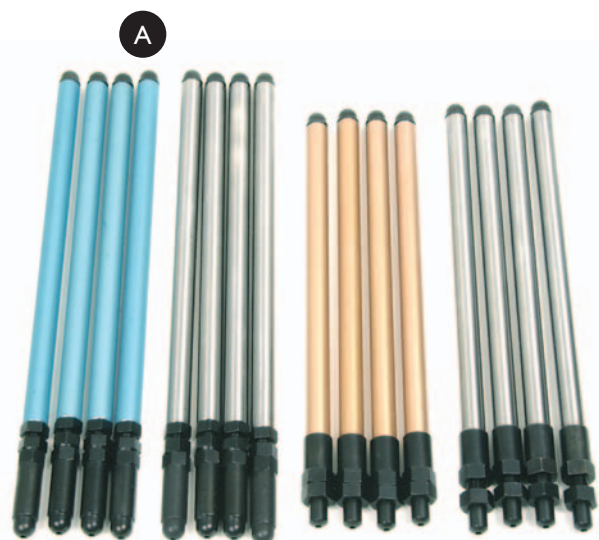


Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
216312G	12HG	02/34 37/05	216	256	.474	.088	Stock	Bolt-in 88 cam: similar specs to 1999-2006 stock 88 cams. slight power increase but no retuning necessary.
			220	269	.474	.110		
216321G	21HG	10/30 40/08	220	255	.498	.134	Stock	Bolt-in 88 cam: more torque for all around riding with heavy bikes, intended for stock compression ratio and pistons. Similar to #23 cam in EV80. (1700-4800 RPM).
			228	264	.498	.121		
216326G	26HG	11/35 41/09	226	262	.490	.138	Stock	Bolt-in cam for 88-95 inches - stock compression ratio. Great for two up touring, this cam will add torque and HP at lower and middle RPM ranges. (1800-5200).
			230	266	.490	.120		
216331G	31HG	10/46 52/08	236	272	.510	.131	Stock	Great cam for motors with 95+ inches and 10:1 CR. Lower TDC lift means easy installation. Similar to 37G but different timing. 2000-5800 RPM power range.
			240	276	.510	.120		
216332G	32HG	10/46 52/08	236	272	.570	.131	Hi-lift	High lift version of 31G. Much more power thru RPM range with 10:1+ comp. ratio. 2800-5800 RPM range.
			240	276	.570	.120		
216337G	37HG	18/38 46/14	236	272	.510	.174	Stock	Hot street cams for 88 or 95 inches. 80+ rear wheel HP possible with well tuned 88 motor; more with 95. Smooth idle, broad torque (2200-5600 RPM). Stock to 9.5 CR.
			240	276	.510	.148		
216344G	44HG	21/41 49/17	242	279	.495	.182	Stock	For 88 or 95 inches and 9.5 C.R. or higher. Max torque and HP at mid and upper RPM (2300-5800).
			246	283	.495	.158		
216350G	50HG	20/48 54/18	248	283	.510	.184	Stock	Designed for easy installation in 95 inch motors with stock heads and 9.5 to 9.8 C.R. (2400 to 6000 RPM).
			252	287	.510	.168		
216355G	55HG	22/46 52/20	248	283	.550	.197	Hi-lift	Great cam for 95 inch engines with 9.8 to 10.2 C.R. Max HP - torque at mid and upper RPMs (2600-6200).
			252	292	.550	.181		
216360G	60HG	24/56 58/22	260	296	.560	.205	Hi-lift	For well prepped 95-103 inches with 10.0 to 10.5 CR, 100+ HP is within reach. (2700-6500+ RPM).
			260	296	.560	.192		
<b>The following three cam grinds are available with gear drives only!</b>								
216367G	67HG	24/48 58/22	252	287	.570	.209	Hi-lift	Performance cams for 95-107+ inches, 10.0 to 10.8 C.R. with high flow head setup. (2600-6400+ RPM).
			260	297	.570	.187		
216359G	59HG	29/57 63/27	266	303	.590	.238	Hi-lift	Great cam for 95-107+ inches with 10:2 C.R. or higher. Max torque and HP (2700-6500+ RPM).
			270	307	.590	.218		
216364G	64HG	30/62 66/30	272	307	.640	.262	Hi-lift	Big cams for modified 95-116+ inch motors running 10:2 CR or higher. Heads must be set for .700 lift and modified for max air flow. (3000-6500+ RPM).
			276	312	.640	.232		

(\*) Timing and duration listed for .053 cam lift.

## Chain Drive Cams and Kits (Twin 88)

### Part Numbers



### (A) Twin Cam Pushrods (1999 and Up)

Shown from left to right:

<b>Standard tip aluminum pushrods</b> .....	<b>292388</b>
<b>Standard tip chrome-moly pushrods</b> .....	<b>292288</b>
<b>EZ-install aluminum pushrods</b> .....	<b>292188</b>
<b>EZ-install chrome-moly pushrods</b> .....	<b>292088</b>

Twin 88 pushrods are available with EZ-install ends or standard adjustable tips. Both types are made in anodized aluminum or chrome moly steel. EZ-install pushrods can be installed without removing gas tanks or rocker boxes. If you are installing bolt-in cams, this is a big plus! These pushrods are a great match for cams listed on the next page. Extra long or short pushrods are available as specials. Call if you need them.

### (B) Twin Cam Springs and Collars

<b>High Lift Springs</b> .....	<b>294150</b>
--------------------------------	---------------

Kit includes 4 inner and 4 outer springs. For valve lifts up to .560. Installation does not require head machining. High lift springs and collars make installing big cams a lot easier.

<b>Titanium Upper Spring Collars</b> .....	<b>293110</b>
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Designed to fit all Twin 88 engines. Provides .050" more spring travel than stock collars. Collars are stronger and 50% lighter than stock collars.

### (C) Twin 88 Cam Drive Sprocket Kits (Silent chain cam drive only)

Shown from left to right:

<b>34 tooth splined cam sprocket kit</b> .....	<b>288015</b>
<b>17 tooth steel crank sprocket</b> .....	<b>288020</b>
<b>34 tooth steel keyed cam sprocket kit</b> .....	<b>288010</b>

(with square key drive for 1999 engine only)

Andrews heat treated steel cam drive sprockets are an upgrade for rear camshafts on engines with silent chain cam drives. Kit includes three spacer shims and one grade 8 bolt and hardened washer. New sprockets can be set up to the same length specs as original stock sprockets. If you're into performance with an 88 engine and silent chains, steel sprockets are a must even with stock camshafts.

### Pretty hot runner for a street bike on pump gas!

Photo and data courtesy of Jelen Dewey



The 2002 DynaGlide shown here was setup by Mr. Dewey Jelen of Farmington, New Mexico. Specs are as follows:

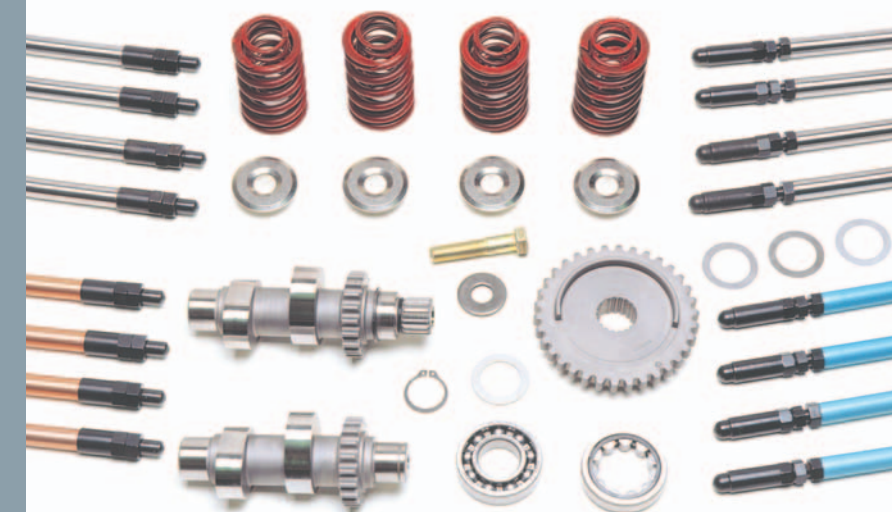
**Engine:** 107 inch T88  
**Exhaust:** Cycle Shack Modified Slip ons  
**Pistons:** Wiseco Flat Tops set for 10.4 compression  
**Fuel System:** Germalomy dual runner injectors  
**Heads:** Dewey's Pro-Street set-up  
**Camshaft:** Andrews Products 67G (S&S gear drives)  
**Fuel:** 91 octane pump gas

**Dyno run # 047, output –**  
**Max. Horsepower:**  
 123 HP @ 6000 RPM  
**Max. Torque:**  
 122 Ft. Lbs @ 4400 RPM

## Chain Drive Cams and Kits (Twin 88)

Want more power for your Twin cam 88 engine? Andrews Products has eight proven cam grinds to get you there. More HP and torque for stock or modified engines is within easy reach. All cam grinds listed are designed for use with stock H/D hydraulic lifters. Matching pushrods and heat treated steel sprockets are listed on the preceding page. For any bolt in cam grind, EZ-install pushrods do not require removal of gas tanks or rocker boxes for installation.

Also, see explanations regarding compression pressure, page 14, and picking cams on page 24.

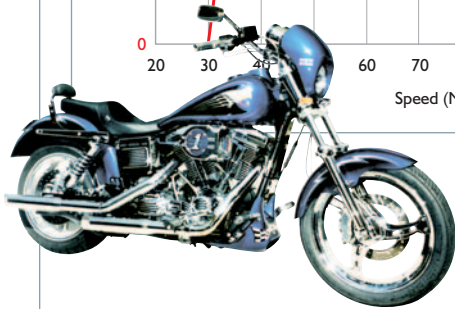
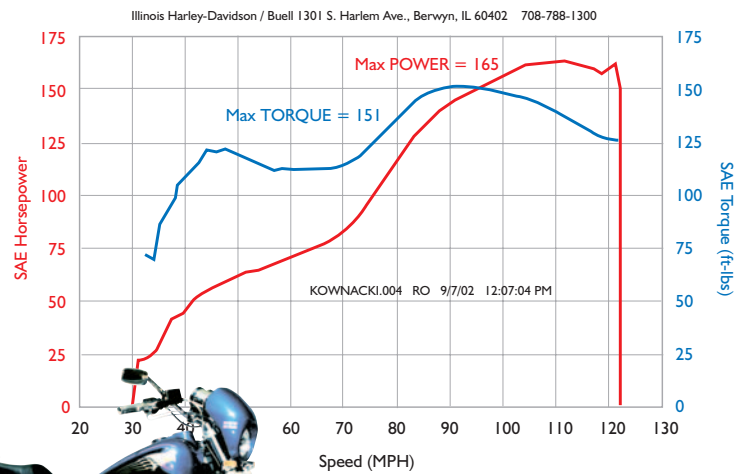


### Touring and Performance Cams

Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
Stock Carburetors	(A)	-02/38 36/04	216 220	257 260	.473 .473	.072 .110	Stock	Carbureted engine: stock cam data listed for reference. (Stock engine output is approximately 62 HP).
Stock Injectors	(B)	02/34 36/04	216 220	257 260	.473 .473	.087 .110	Stock	Fuel injected engine: stock cam data listed for reference. (Stock engine output is approximately 62 HP).
<b>288121</b>	<b>TW21</b>	10/30 40/08	220 228	255 264	.498 .498	.134 .121	Stock	Bolt-in cam: More torque for all around riding with heavy bikes, stock compression ratios and stock pistons. Similar to #23 cam for EV80. (1700-4800 RPM). <i>TW21 cams run great with fuel injectors or carburetors!</i>
<b>288126</b>	<b>TW26a</b>	11/35 41/09	226 230	262 266	.490 .490	.138 .112	Stock	Bolt-in cam 88-95 inches and stock compression ratio. Great for two up touring, this cam will add torque and HP at lower and middle RPM ranges. (1800-5200 RPM). <i>TW26 cams run great with fuel injectors or carburetors!</i>
<b>288131</b>	<b>TW31s</b>	10/46 52/08	236 240	272 276	.510 .510	.131 .120	Stock	Great cam for motors with 95 inches and 9.8 to 10.2 CR. Lower TDC lift for easy installation. Similar to TW37 with different timing. (2000-5600 RPM). <i>TW31 cams run great with fuel injectors or carburetors!</i>
<b>288137</b>	<b>TW37b</b>	18/38 46/14	236 240	272 276	.510 .510	.174 .148	Stock	Hot street cams for 88 or 95 inches. 80+ rear wheel HP possible with well tuned 88 incher, more with 95. Smooth idle, broad torque (2200-5600 RPM). 9.0 to 9.5 CR.. <i>TW37 cams run great with fuel injectors or carburetors!</i>
<b>288144</b>	<b>TW44</b>	21/41 49/17	242 246	279 283	.495 .495	.182 .158	Stock	For 88 or 95 inches, CR 9.5 to 10.2. Max torque and HP at mid and upper RPM - (2300-5800).
<b>288150</b>	<b>TW50</b>	20/48 54/18	248 252	283 287	.510 .510	.184 .168	Stock	Designed for easy installation in 95 inch motors with stock heads and 9.5 to 9.8 CR. (2400 to 6000 RPM).
<b>288155</b>	<b>TW55</b>	22/46 52/20	248 252	283 292	.550 .550	.197 .181	Hi-lift	Great cams for 95 inch engines with 9.8 to 10.2 CR. Max HP and torque at mid & upper RPMs (2600-6200).
<b>288160</b>	<b>TW60a</b>	24/56 58/22	260 260	296 296	.560 .560	.205 .192	Hi-lift	For well prepped 95-103 inchers with 10.2 to 10.5 CR and head work, 100+ HP is within reach. (2700-6500+).

(\*) Timing and duration listed for .053 cam lift.

## Let's Talk Horsepower (165hp and 151ft. lbs. torque!)



On September 7, 2002, at Illinois Harley Davidson, John Kownacki again won the dyno horsepower shootout with an astounding 165hp and 151ft. lbs. of torque running an S & S 113 engine in a 1994 FX frame. The bike is owned by John Kownacki of Chicago and ridden on the street. Together with Kownacki's legendary tuning skill and a custom designed Andrews camshaft, the bike has won every shootout contest it has entered; 20 for 20! (20 shootouts: 20 wins). The sound and power of this engine has to be seen up close to be truly appreciated.

Every camshaft listed in this catalog has the same engineering design know how and built-in quality that helped this engine pull 165 horses. Think of what an Andrews cam can do for your bike!

### Part Numbers

#### (A) Evolution 80 Pushrods

Shown from left to right:

**Standard tip aluminum pushrods** .....292110

**Standard tip chrome-moly pushrods** .....292140

**EZ-install aluminum pushrods** .....292215

**EZ-install chrome-moly pushrods** .....292245

Evolution 80 pushrods are available with EZ-install ends or standard adjustable tips. Both types are made in anodized aluminum or chrome moly steel. EZ-install pushrods can be installed without removing gas tanks or rocker boxes. If you are installing bolt-in cams, this is a big plus! These pushrods are a great match for cams listed on the next page. Extra long or short pushrods are available as specials. Call if you need them.

#### (B) Evolution 80 Springs and Collars

**High Lift Springs** .....294150

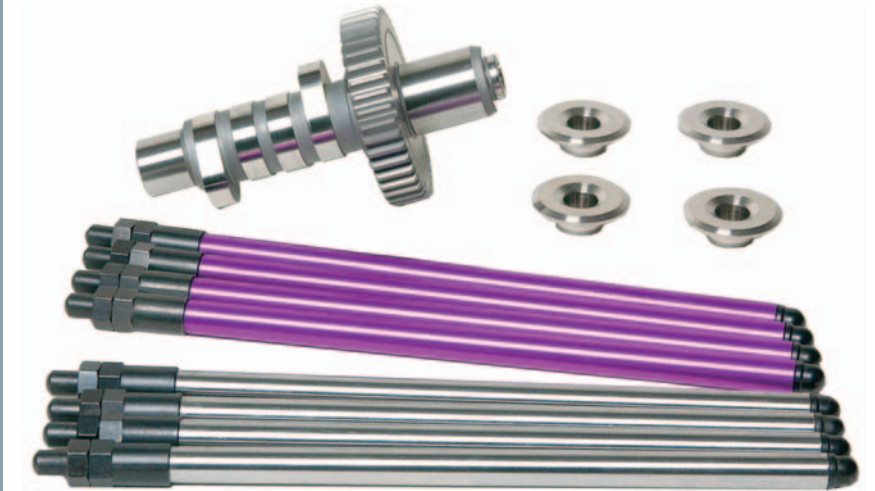
4 inner and 4 outer springs: For Evolution engines used with titanium spring collars, cam lifts of .550+ can be accommodated. Installation does not require head machining.

**Titanium Upper Spring Collars** .....293110

4 titanium upper spring collars for all Evolution 80 engines. Provides .050" more spring travel than stock collars. Collars are stronger and 50% lighter than stock collars.

## Evolution 80 Camshafts

Andrews Products performance cams mean extra power for Evolution engines. H/D hydraulic lifters are capable of 6000+ RPM with stock springs and no valve float. Aluminum (T7) or chrome-moly pushrods (EZ-install type) are available to match any of our camshafts. Aluminum pushrods are lighter while the chrome-moly steel pushrods are more rigid for high performance.



### Touring and Performance Cams

Part#	Grind	Timing(*)	.053	.020	Valve Lift	Lift @ TDC	Springs	Application
Stock 1988-1991	(L)	01/37 53/-01	218 232	266 280	.495 .495	.091 .083	Stock	Listed for reference. 1984-1987 cam is 212 deg. in-take, 202 deg. exhaust, .472" lift on both valves.
Stock 1992-up (carburetors)	(N)	-02/30 31/-09	208 202	250 242	.472 .472	.070 .049	Stock	Listed for reference. "N" cam is close to 1984-1987 specs. Fuel Injector "O" cams are 200 deg int. and 216 exh.
<b>291117</b>	<b>EV31</b>	10/46 52/08	236 240	270 274	.495 .495	.133 .122	Stock	Super power for supercharged engines; Basically an EV27 cam with timing set for superchargers or big inch motors with 10.5+ compression ratio.
<b>291123</b>	<b>EV23</b>	10/30 40/08	220 228	255 264	.498 .498	.134 .121	Stock	Mild bolt-in street cam with more torque and HP for all around riding with stock comp ratio. Similar to stock L cam but more output. Pulls from 1800-5200 RPM. <i>OK with fuel injectors or carburetors!</i>
<b>291113</b>	<b>EV13</b>	15/31 45/13	226 238	.270 .280	.485 .495	.161 .148	Stock	Bolt-in street/touring cam for heavy bikes. Much more low and mid-range power than either stock cam. Best cam for 2 up riding with camping gear and side cars. <i>OK with fuel injectors or carburetors!</i>
<b>291127</b>	<b>EV27</b>	20/36 46/14	236 240	270 274	.495 .495	.182 .166	Stock	A great bolt in cam for stock EV80 engines using state of the art design. Very strong, broad torque band which will pull hard from 2000 to 5500 RPM. <i>OK with fuel injectors or carburetors!</i>
<b>291130</b>	<b>EV3</b>	21/37 43/15	238 238	280 280	.495 .495	.197 .159	Stock	Bolt-in street cam for light bikes (FXRS, etc.). Lots more mid-range and upper end power. Smooth idle 2800 to 6500 RPM cam with stock heads and springs.
<b>291146</b>	<b>EV46</b>	25/41 49/17	246 246	283 283	.495 .495	.207 .163	Stock	Bolt-in performance cam; state of the art ramp design. Longer duration than EV3 but higher static comp. pressure; wide torque band; 2600 to 6000+ RPM.
<b>291151</b>	<b>EV51</b>	28/44 54/22	252 256	286 290	.510 .510	.233 .195	Stock	Easy installation; longer duration for modified street engines with hydraulic lifters and 9.0 or higher compression ratio. Power range from 2800-6500 RPM.
<b>291159</b>	<b>EV59</b>	28/48 56/24	256 260	290 294	.560 .560	.236 .208	Hi-lift	Upgraded EV57, fast ramps for modified 80 to 88 inch motors. Use with AP springs and collars. Very broad power band; 6000 RPM. OK for hydraulic lifters.
<b>291172</b>	<b>EV72</b>	30/54 60/28	264 268	298 302	.560 .560	.246 .230	Hi-lift	Upgraded EV7, for 92 in. + street motors. For use with Andrews springs and titanium collars. Very broad power band, 2800-6000 RPM. OK for hydraulic lifters.

(\*) Timing and duration listed for .053 cam lift.

Special cams can be made to order with 2 front head set-ups, etc.  
Call for information & prices!

## Static Compression Pressure; What is It?

Static or cranking compression pressure is what each cylinder experiences when the starter motor is turning the engine or when the engine is running at idle RPM. Please don't confuse static compression with "compression ratio" which has to do with how much volume remains in the cylinder combustion chamber when the piston is at the top of its' stroke. Static compression and compression ratio are related but the definition of each is different.

Compression pressures that are too high can result in difficult starting and detonation or "pinging" which in turn can cause engine damage.

Modifying an engine by changing pistons, camshafts or compression ratios will all have a direct effect on static or cranking compression pressure. If the static compression pressure is too high or too low, the engine will not run as well as it should and in some cases, the resulting problems can be serious. Static or cranking compression can easily be measured with a compression testing gauge. Cost is usually less than \$25.00 and most auto supply stores or well equipped motorcycle shops sell them. When installing cams with high lifts and long durations, a few general observations are worth keeping in mind. Remember that additional cam duration can produce more usable power but too much duration may actually hurt overall performance. The problem of poor engine response begins when too much duration results in lower cylinder compression pressure (at low RPM) which in turn can greatly reduce low RPM engine torque and power. Too much duration in a camshaft is not necessarily a good thing.

### What causes high static compression pressures:

1. Compression ratio set too high.
2. Intake cam duration too short.
3. Intake cam closing point advanced too much.

Compression pressures which are too high can result in detonation or "pinging" and possible rapid starter motor wear.



### What causes low static compression pressures:

1. Compression ratio set too low.
2. Intake cam duration too long.
3. Intake cam closing point set too late.
4. Worn piston rings and/or burned valves.

Compression pressures which are too low will result in poor low RPM torque and throttle response.

### How to measure compression pressure:

With a warm engine(not hot, just warm), static compression pressure can be measured using the following procedure:

1. Turn off fuel valve
2. Make sure choke is off
3. Transmission in neutral
4. Remove both spark plugs
5. Insert pressure gage adapter into one head
6. Hold throttle wide open
7. Turn engine with starter motor (or kick start bar)
8. Measure cylinder pressure
9. Repeat procedure for second cylinder

**Important note:** If the throttle is not held wide open and the choke is not off, the resulting pressure measurement will show a false low reading. Also some gauges have a rubber tip instead of a screw in adapter. Using either type of gauge, measuring static pressure in your engine is not difficult.

## Static Compression Pressure and Engine Performance

The figures below give some idea as to the significance of different pressure readings. Generally, higher static pressures mean more torque at lower RPM ranges. The trade off is that above a certain point (around 185 PSI) detonation enters the picture. What happens at higher RPM is less predictable and can't be easily determined from a static pressure reading. For the best overall engine performance, compression ratio, cam timing, duration and fuel system tuning must be correctly matched.

1. Less than 115 psi: poor low speed response, hard starting. Pistons and cams not well matched or worn rings, valves.
2. 125 to 145 psi: OK for stock or modified street motors. On the low end for a stock street motor.

3. 145 to 165 psi: OK for modified street motors. Static pressures in this range will be very good for street motors.
4. 165 to 185 psi: Marginal for large displacement street motors, possible hard starting, detonation and overheating.
5. Over 185 psi: High performance numbers. Motors over 185 PSI may need compression releases and/or octane booster.

The above recommendations are not absolute but the point is that static compression is important. Proper matching of cams and compression ratios will allow engines to be modified for more performance and still run smoothly in street applications.

## Big Twin Transmission Belt Pulleys (1999-2007)

More teeth on pulleys means higher MPH and less RPM. Fewer teeth means higher RPM and more power than a stock 32 tooth pulley. Pulleys are available to fit all EV80, Twin 88 and Twin 96 transmissions. Pulley have tooth counts of 29, 30, 31, 33 & 34 for 5 speeds and 30 or 34 for new 6 speeds.

**Note:** All 2007 Twin 96 and 2006 Dynas **MUST** use the new part number pulleys. Pulleys made for 5 speed transmissions will not fit H/D 6 speed transmissions!

Pulleys - 1999-2006  
(except 2006 Dyna)



Pulleys - 2007 and 2006 Dyna  
(30T & 34T)



### Overdrive Belt Pulleys

34T Teeth, 6% Less RPM (180 RPM drop in engine RPM @ 60 MPH)

All 2007 & 2006 Dyna .....	<b>290346</b>
1994 - 2006* .....	<b>290344</b>
1985 - 1993 .....	<b>290340</b>

33T Teeth, 3% Less RPM

1994 - up .....	<b>290334</b>
1985 - 1993 .....	<b>290330</b>

### Power Pulleys

30 Teeth, 6% More RPM

All 2007 & 2006 Dyna .....	<b>290306</b>
1994 - 2006 .....	<b>290304</b>
1985 - 1993* .....	<b>290300</b>

29 Teeth, 9% More RPM

1985 - 1993 .....	<b>290290</b>
1994 - up .....	<b>290294</b>

### Sprocket Tooth Counts & Ratios 1994 - 2001

(36 T clutch-25 T engine sprocket)		
Transmission	Rear Wheel	Overall
29	70	3.48
30	70	3.36
31	70	3.25
32 (Stock)	70	3.15
33	70	3.05
34	70	2.96
29	65 (1995 softail)	3.23
30	65 (1995 softail)	3.12
31	65 (1995 softail)	3.02
32 (Stock)	65 (1995 softail)	2.93
33	65 (1995 softail)	2.83
34	65 (1995 softail)	2.75

### Power Pulleys

31T Teeth, 3% More RPM

1994 - 2006 .....	<b>290314</b>
1985 - 1993 .....	<b>290310</b>

NOTE: Pulleys for 2006 Dyna & all 2007 Twin 96s are only available with 30 & 34 teeth.

\* All EV80 and 2006 Twin 88s (except 2006 DynaGlide) use these part numbers

Andrews sprocket pulleys match 1994 style design. This arrangement has the advantage of 50% longer internal spline length compared to the early design. 1994 style pulleys will fit both early (1985-1993) and late transmission shafts. Overall Belt drive ratio changes of 3%, 6% or 9% are very noticeable to a rider! All 1985 - 1993 pulley kits have new style spacer, lock ring, retainer bolts and seals included as part of the kit. Pulley kits for 1994 - up must use original stock seal and lock ring.

### Sprocket Tooth Counts & Ratios 1985 - 1993

(37 T clutch-24 T engine sprocket)		
Transmission	Rear Wheel	Overall
29	70	3.72
30	70	3.60
31	70	3.48
32 (Stock)	70	3.37
33	70	3.27
34	70	3.17
29	61 (1993 softail)	3.24
30	61 (1993 softail)	3.13
31	61 (1993 softail)	3.03
32 (Stock)	61 (1993 softail)	2.94
33	61 (1993 softail)	2.85
34	61 (1993 softail)	2.76

### Belt Drive Sprockets - Installation Notes

Installing a transmission pulley with more or less teeth than stock requires adjusting the rear axle forward (for more teeth on sprocket) or backwards (for less teeth on sprocket).

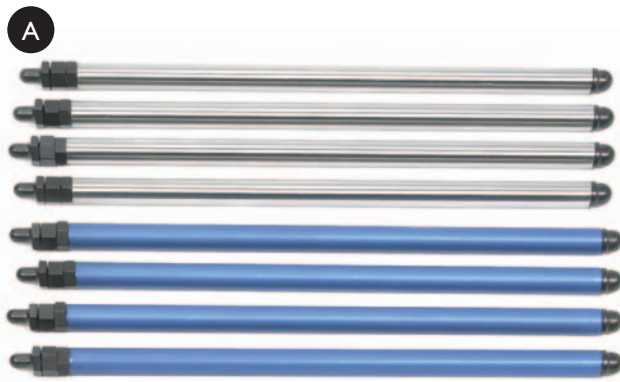
**Rear axle position adjustment for each one tooth change on transmission sprocket = + / - .125 inches (3.2mm).**

**Rear axle position adjustment for each one tooth change in belt length = + / - .280 inches (7.1 mm).**

If there is not enough axle adjustment at the rear frame, it may be necessary to use a belt with more or less teeth than the stock belt.



## Shovel Pushrods, Valve Springs and Collars



### Part Numbers

#### Shovel Pushrods

Andrews Products pushrods are available for all Shovel engines using stock diameter tubing so there is no cover tube interference. Extra long or short pushrods can be made up to order. Call us if you need them.

- A. Aluminum Pushrods and Adjusters .....240055**  
4 aluminum pushrods and adjusters - quiet operation.
- B. Chrome-Moly (4130) Steel Pushrods .....240030**  
4 steel pushrods and adjusters - maximum strength.

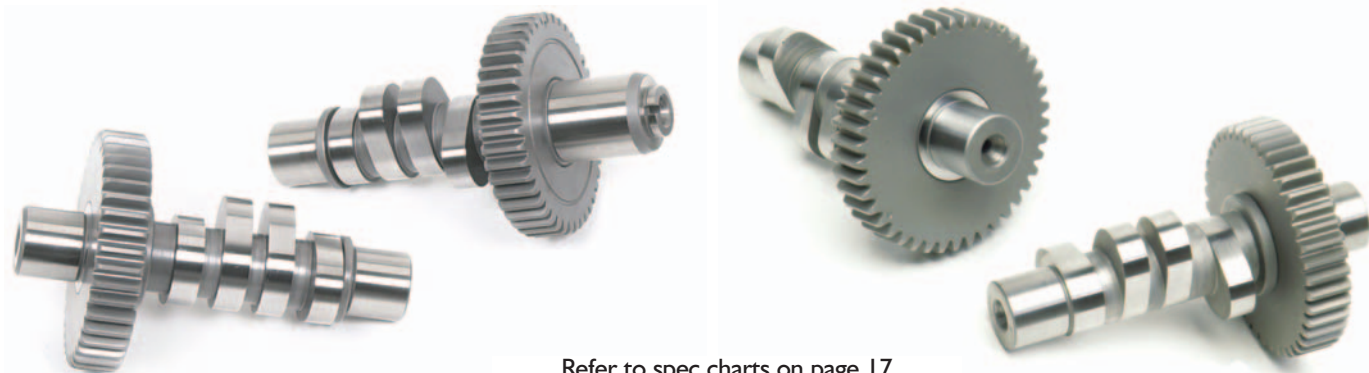
#### Shovel Valve Springs and Collars

If you are installing cams in a shovel engine, the valve spring collars and related parts shown at below will make things go a lot smoother. Our springs and collars are designed for easy installation and maximum reliability.

- A. High Lift Upper Spring Collars .....271100**  
High lift spring collars: 74/80 inch motors. Used with high-lift springs, .600 lift cams can be installed. Made of T6 aluminum, collars are light, hard coated and very strong.
- B. High Lift Springs .....272110**  
4 high lift springs - 74/80 inch motors; will provide correct spring force for any of our performance cams. Installation of these springs does not require complicated machining.
- C. Medium Lift Upper Spring Collars .....276150**  
4 medium lift upper collars for 74/80 inch motors; intended to work with stock springs and add .060" spring travel with no other modification. This is the easy way to install B grind or #2 cams in stock heads.
- D. Low Profile Lower Spring Collars .....273120**  
4 low profile lower collars for 74/80 motors; similar to stock 1980 style parts but low profile for easy high lift cam installation. Required parts for 1980 style valve guides which utilize "K" line stem seals. Made from heat treated steel.



## Shovel and Pan Camshafts / Cams for Knuckle Engines



Refer to spec charts on page 17

## Shovel and Pan Camshafts

Whether you want a good street cam for a stock motor, a big cam for a dragster or something in between, Andrews Products can supply it. All of our cams for these engines are computer designed and precision ground from alloy steel billets. The rocker arm ratios are: Shovel: 1.42, Pan: 1.5 and Knuckle: 1.00

Part#	Year	Grind	Timing(*)	Duration		Valve Lift		Lift (**) TDC	Application
				.053	.020	Shovel	Pan		
Stock	(Front cyl)	H	-06/46 44/20	220 244	256 282	.390 .390	.412 .412	.051 .176	Stock H/D front cylinder timing listed for comparison. Later stock "S" grind cams have similar specs.
Stock	(Rear cyl)	H	14/38 44/20	232 244	274 282	.390 .390	.412 .412	.129 .176	Stock H/D rear cylinder timing listed for comparison. Later stock "S" grind cams have similar specs.
212011	(1948-1969)	J	21/41	242	292	.405	.425	.154	Mild street: Pans and Shovels, smooth idle, more power through RPM range. Bolts in with no head work. OK for stock heads.
212020	(1970-1977)		41/21	242	292	.405	.425	.154	
212030	(1978-1984)								
212270	(1948-1969)	A	21/43	244	296	.450	.470	.156	Street/drags: Bolts into Shovels (except 1980-1981) with no head work. More mid-range and high end power. Idle unaffected. (Head setup req'd on 1980 & 1981). (See note 1).
212280	(1970-1977)		43/21	244	296	.450	.470	.156	
212290	(1978-1984)								
212130	(1948-1969)	I	16/36	232	288	.427	.450	.136	This is the low compression piston version of an "A" grind cam for 74 - 80 engines with 7.5 to 1 pistons.
212140	(1970-1977)		36/16	232	288	.427	.450	.136	
212150	(1978-1984)								
212330	(1948-1969)	2	15/35	230	288	.490	.512	.133	Low compression version of a "B" grind cam. More power through RPM range for engines with 7.5 pistons.
212340	(1970-1977)		35/15	230	288	.490	.512	.133	
212350	(1978-1984)								
212360	(1948-1969)	B	26/50	256	298	.485	.507	.182	Street/drags: Much more mid-range and high end power. Idle smoothness unaffected. Best cam for modified 74/80 inchers and small strokers. Spring spacing required.
212370	(1970-1977)		50/26	256	298	.485	.507	.182	
212380	(1978-1984)								
212420	(1948-1969)	BH	24/52	256	302	.450	.470	.156	Hydraulic version of a "B" cam. Usually a bolt-in but spring spacing required on stock '80 - '81 Shovel heads.
212430	(1970-1977)		52/24	256	302	.450	.470	.156	
212440	(1978-1984)								
212510	(1948-1969)	6	32/56	268	325	.510	.535	.190	Hotter version of B grind. Great street cam especially for 84/88 inch strokers: maximum torque available from 2500 to 6500 RPM.
212520	(1970-1977)		56/32	268	325	.510	.535	.190	
212530	(1978-1984)								
212600	(1948-1969)	C	37/61	278	318	.525	.550	.234	Best production cam made for big street engines. strokers from 84 to 96 inches will really turn on with this grind. Broad torque range pulls from 2000 - 7000+ rpm.
212610	(1970-1977)		61/37	278	318	.525	.550	.234	
212620	(1978-1984)								

Note (1); 1980 and 1981 engines: The height of original stock H/D valve guides restricts spring travel (and cam lift) to .430 or less!

(\*) Timing listed at .053 cam lift. (\*\*) TDC Shovel lift listed: TDC Pan lift will be 5% higher.

## Cams for Knuckle Engines

Amazing but there are still a lot of Knuckle engines going strong. Some of them have been around for more than 65 years! How many other bikes can make this kind of a claim for long life and durability.

Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.053	.020				
212965	N	13/41 44/16	234 240	270 276	.348 .348	.089 .105	Stock	Stock Knuckle replacement cam. For stock motors and restorations, this is the cam to use.
212970	S	27/55 55/27	262 262	308 308	.370 .370	.130 .130	Stock	Bolt-in Knuckle performance cam for stock motors, smooth idle, strong pull to 6000 rpm. This cam is the Knuckle equivalent of a "B" cam in a shovel motor.
212980	K	35/63 63/35	278 278	318 318	.368 .368	.156 .156	Stock	Knuckle perf cam for stroked motors; strong pull to 6000 rpm. This is the Knuckle equivalent of a "C" cam.

Knuckle cam bearings are ground to .8115 to fit stock bushings. (\*) Timing listed at .053 cam lift.

## 42 Tooth Gear Sizes for 4 Lobe Cams

### Camshaft Gears: Size Information

Andrews Products standard sized cam gears (with one groove) will be correct size for most engines. For a small number of engines made with oversized drive gears (green or black color codes), large size Andrews cam gears (part #212077) may be needed for quiet operation. There are four basic differences in late cam gears (1990-1999) and early cam gears (1989-earlier):

- Starting in 1990 stock H/D 42 tooth drive gears have 2 grooves on face of gear while 1977-1989 have one groove. Andrews drive gears (one groove) are designed to work with all EV80 type engines 1984-1989 and 1990-1999.
- For 1990, the difference between the largest and smallest gears was reduced from .006 to .003 inches. The largest gears for all years are the same (green or black color codes).
- Measuring pin diameters in H/D service books were changed in 1990 from .105 to .108 inches. Measuring the same gear with .108 pins will show a .012 larger measurement than a measurement with .105 pins.
- Beginning in 1992, stock cam gear outer diameters were reduced by .025 inches. Andrews cam gears as well as earlier stock cam gears are interchangeable with later gears.

### Evolution Camshaft Drive Gears (Undersize – Oversize)

Gear	Size*	Size**	Color	Part#
Oversize	2.7384	2.7495	Black	212077
	2.7394	2.7505		
Undersize	2.7324	2.7455	Orange	212033
	2.7334	2.7465		
H/D Stock	2.7354	2.7487	Red	—
Andrews Std.	2.7365	2.7485	—	212055
	2.7364	2.7491		

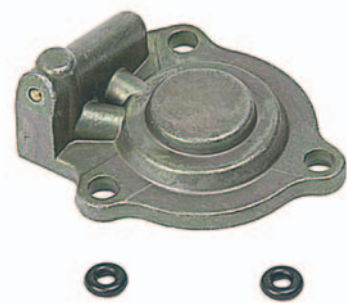
(\*) Using .105" dia. pins. Gage pins: Part #212105 (set of 2 pins – .105 dia.)  
 (\*\*) Using .108" dia. pins. Gage pins: Part #212116 (set of 2 pins – .108 dia.)

### Shovel Camshaft Drive Gears (Undersize – Oversize)

Gear	Size	Early Color	Part#	Size	Late Color	Part#
Cam gear sizes: measured over .105 pins						
Oversize	2.7700	Yellow	212088	2.7384	Black	212077
	2.7705			2.7394		
Undersize	2.7670	Black	212044	2.7324	Orange	212033
	2.7675			2.7334		
H/D Stock	2.7690	Green	—	2.7364	Red	—
Andrews Std.	2.7690	—	212066	2.7365	—	212065

Gage pins: Part #212105 (set of 2 pins – .105 diameter)

## Hi-Flow Accelerator Pump (1980-1988)



Not intended for 1989 and later CV carburetors.

**Hi-Flow accelerator pump** .....269050

For all 1980 through 1988 H/D bikes with STOCK Keihin carburetors, this kit is an easy, inexpensive performance upgrade. Removing the float bowl and drilling one hole is all that's required. The carb body does not have to be removed. On 1980-1988 carbs, the stock accelerator pump is restricted by eliminating check valves in the pump. A high flow accelerator pump puts them back. The result is increased fuel flow through the pump and greatly improved low end and mid range throttle response.

## Pushrod Adjustments and Hydraulic Lifters

Because we make many camshafts and pushrod sets for the H/D accessory market, we frequently hear the following question: **“What is the proper procedure for adjusting the pushrods on my bike?”**

The diagram at the right shows a cutaway schematic view of an adjustable pushrod and hydraulic lifter assembly. Labels identify some of the components. (Note that for this explanation, no check valve is shown but it is part of the lifter).

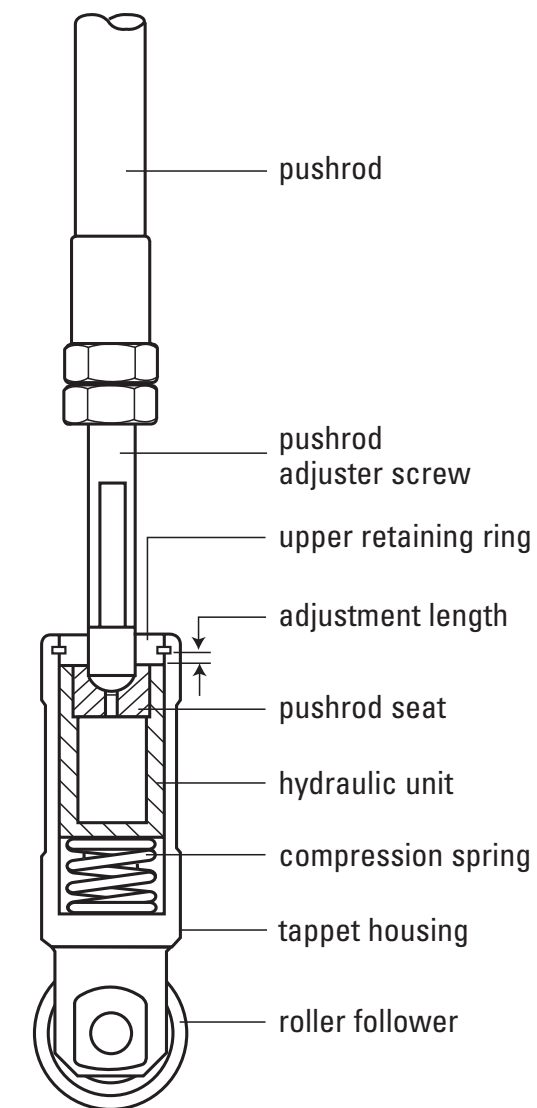
When hydraulic lifter units are first assembled (with no pushrod present), the compression spring pushes the hydraulic unit and pushrod seat upwards until the pushrod seat contacts the lower edge of the retaining ring. At this point the hydraulic unit cannot move any further upwards.

It can however move down approximately .150 inches. This downward travel is the adjustment range. In other words, the adjustment length starts at 0.0 and can be as much as .150 inches. A correctly set adjustment positions the hydraulic unit in the middle of the .150 travel range.

For hydraulic lifters to function correctly, the engine oiling system must operate with at least 10 to 15 psi oil pressure. Pressurized oil will then fill the area around the compression spring. And as far as hydraulic lifters are concerned, more oil pressure will not make the lifters run better.

Pushrod adjustments may now be completed. First, lengthen the adjuster screw by hand until it makes tight contact with the pushrod seat in the lifter. Then, extend the adjuster screw down (making the pushrod longer) 3 or 4 full turns. (The exact number of turns is not critical). Andrews Products adjuster screws for EV80 and T88 pushrods are manufactured with (5/16 x 32) threads so 3 turns will extend the pushrod length by .093 inches. (3 x 1/32 = .093 inches). Each turn of the adjuster screw changes the pushrod length by .032 inches.

The pushrod seat and hydraulic unit will now operate in a correct position and will move up or down to compensate for engine expansion due to warming up or cooling down of the engine. As long as the hydraulic unit and pushrod seat can move up and down and not touch the upper retaining ring or “bottom out” during operation, the pushrod length has been correctly set and the lifters will function normally.

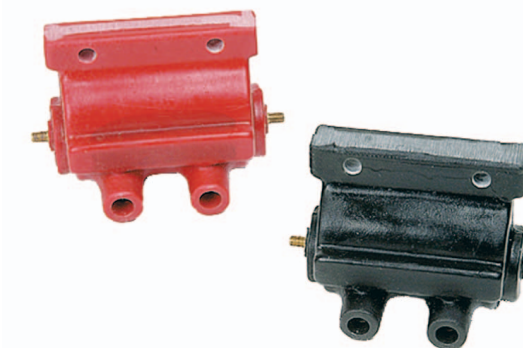


## High Performance Ignition Coils

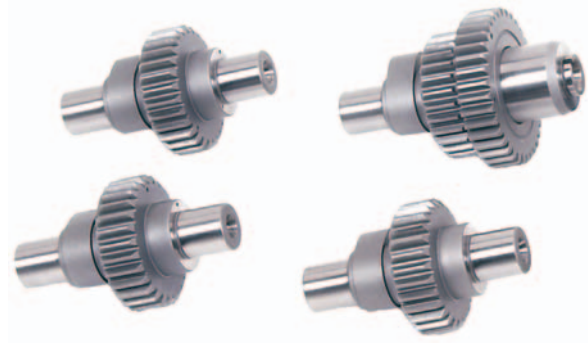
**Black color coil, 4.8 ohms** ..... 237230  
**Red color coil, 2.8 ohms** ..... 237240

Replacement coils for Harley Davidson engines. Andrews SuperVolt Coils deliver 30,000+ volts. Models are available for both electronic (pointless) systems as well as earlier conventional battery and point ignitions.

Red coils fit 1985 and up engines. Black coils fit all H/D bikes thru 1980 with point type ignition sets. All of these coils will produce more voltage than stock coils.



## Sportster Evolution and Buell 1200 Cams



Andrews Products performance cams are available for all EV Sportster engines. The cams listed below will run to 6500 RPM with stock hydraulic lifters. H/D hydraulic lifters are very proven units and we recommend that they not be changed to solid lifters. Our EV Sportster cams use stock base circle sizes so stock (nonadjustable) pushrods can be used (except V9 or BV). Adjustable aluminum or chrome-moly steel pushrods are also available. *Note: #2 cam drive gears used in 2000 and up EV Sportster cams uses 46 teeth; the 1991-1999 #2 gear has 36 teeth. 46 tooth gears will fit 1991-1999 #2 cams.*

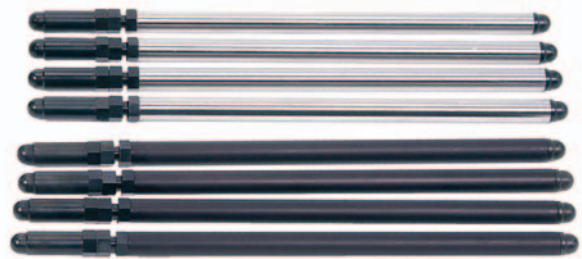
### Touring and High Performance Cams

Part#	Year	Grind	Timing(*)	Duration		Max Lift	Lift @ TDC	Application
				.053	.020			
Stock	(1986-1991)	<b>D</b> <b>D</b>	02/41 41/02	223 223	270 270	.458 .458	.094 .094	Listed for comparison. V series cams listed fit 1986-1990 engines. (Note: 1986-1987 exhaust cam lift is .414).
Stock	(1991-up)	<b>W</b> <b>W</b>	08/26 36/14	234 230	272 270	.470 .470	.122 .138	Late Sportster cam data listed for comparison. Late cams marked "D" (1991 and later) have same specs as "W" cams.
<b>298120</b> <b>298125</b> <b>298130</b>	(1986-1990) (1991-1999) (2000-up)**	<b>V2</b> <b>N2</b>	22/38 46/18	240 244	290 290	.465 .440	.180 .155	Bolt in cams for stock 883, 1100 or 1200 engines. More duration and lift means extra power thru RPM range. Stock springs and hydraulic lifters recommended. 2000-6000 RPM.
<b>298135</b>	(2005-up) 2005 & 2006 only!	<b>N3</b> <b>N3</b>	17/33 43/11	230 234	278 270	.465 .482	.216 .216	Bolt in power for 2005 883/1200 engines with stock springs and heads. NOTE: cams for 2005 heads with more than .515 lift may need different valves, springs and collars.
<b>298140</b> <b>298145</b> <b>298150</b>	(1986-1990) (1991-1999) (2000-up)**	<b>V4</b> <b>N4</b>	30/46 52/24	256 256	296 296	.490 .490	.216 .189	Street/drags: Stock or modified 883/1100/1200. Slightly higher idle speed but stock springs-hydraulic lifters are recommended. RPM range: 2000-6000.
<b>298180</b> <b>298185</b> <b>298190</b>	(1986-1990) (1991-1999) (2000-up)**	<b>V8</b> <b>N8</b>	32/44 56/28	256 264	296 302	.490 .500	.226 .212	Modified 1100-1200, stroked 883's with stock springs and hydraulic lifters. Same intake cam as N4 but more exhaust cam duration. Great mid-range power: 2000-6500 RPM.
<b>298160</b> <b>298165</b> <b>298170</b>	(1986-1990) (1991-1999) (2000-up)**	<b>V6</b> <b>N6</b>	34/50 56/28	264 264	302 302	.500 .500	.241 .212	Modified 1200s to 80 inches and/or high comp. pistons. Stock springs and hydraulic lifters are recommended: RPM range: 2500-6800.
<b>214210</b> <b>214215</b> <b>214219</b>	(1986-1990) (1991-1999) (2000-up)**	<b>V9</b> <b>N9</b>	33/53 53/33	266 266	309 309	.555 .555	.240 .240	Med. lift cams for stroked engines from 80-88 inches. Broad torque range to 6000+ RPM with hydraulics. Andrews springs, collars and pushrods required. (1991-up need longpushrods).
<b>214265</b> <b>214268</b> <b>214272</b>	(1986-1990) (1991-1999) (2000-up)**	<b>BV</b> <b>NV</b>	35/59 59/35	274 274	316 316	.590 .590	.260 .260	Hi-lift cams for 88+ inches. Andrews pushrods, springs and collars required. BV/NV cams start easy and run strong; 2000-6000+ RPM with hyd. lifters. (1991-up need long pushrods.)

(\*) Timing listed for .053 lift figures.

(\*\*) Model year 2000-up Sportster engines require a different #2 drive gear than 1991-1999 engines.

### EV Sportster Pushrods

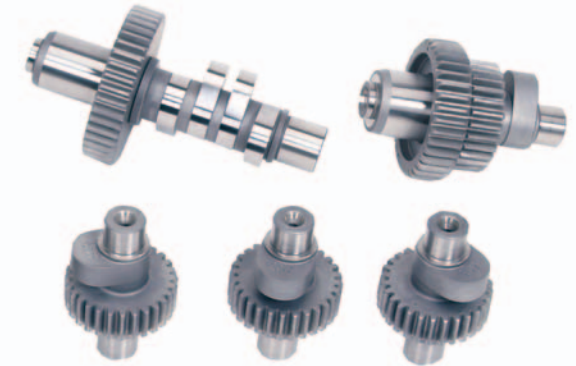


**EV Sportster Adjustable Length Pushrods**  
 4 aluminum pushrods; 1986-1990 . . . . . **292020**  
 4 chrome-moly steel rods; 1986-1990 . . . . . **292090**  
 4 aluminum pushrods; 1991 up . . . . . **292030**  
 4 chrome-moly steel rods; 1991 up . . . . . **292085**

**EV Sportster Fixed Length Pushrods**  
 4 aluminum pushrods; 1991 up . . . . . **292025**  
 4 chrome-moly steel rods; 1991 up . . . . . **292095**

## Cams for Drags and High Performance

For big engines (96+ cubic inches) or highly modified smaller motors and running compression ratios of 10.5 or higher, Andrews Products has high lift cams available which will put more usable power at the rear wheel than anything else going. These grinds are specially designed for highly modified motors.



Installation requires expert knowledge and machining capability!

Part#	Grind	Timing	Duration		Valve Lift	Lift @ TDC	Springs	Application	
			.053	.020					
<b>Evolution 80 Cams (Rocker ratio = 1.63) Timing @ .053 cam lift</b>									
<b>291581</b>	<b>EV81</b>	32/60 66/30	272 276	306 310	.610 .610	.262 .244	HI-LIFT 160 Lbs.	For 80-88 inches, 10.5+ C.R., head work. Broad nose, quick ramps for wide torque band. 6500+RPM.	
<b>291584</b>	<b>EV84</b>	32/64 70/30	276 280	310 314	.640 .640	.269 .246	HI-LIFT 160 Lbs.	Quick ramps, broad nose type design means more power for 90-100 inch motors. 6500+ RPM.	
<b>291588</b>	<b>EV88</b>	34/70 76/32	284 288	318 322	.680 .680	.288 .264	HI-LIFT 160 Lbs.	Same as above but more stuff for 100+ inch motors. Expert installation knowledge required. 6500+RPM.	
<b>Evolution Sportster Cams (Rocker ratio = 1.63) Timing @ .053 cam lift</b>									
<b>298880</b> <b>298885</b>	(1986) (1991)	<b>V80</b> <b>N80</b>	32/60 66/30	272 276	306 310	.600 .600	.264 .244	HI-LIFT 160 Lbs.	.600 lift for Sportsters with 10.5+ C.R. and head flow work will pull strong to 6500+ RPM. 61-77 inches.
<b>298830</b> <b>298835</b>	(1986) (1991)	<b>V83</b> <b>N83</b>	32/64 70/30	276 280	310 314	.630 .630	.267 .248	HI-LIFT 160 Lbs.	For 80 to 96 inch motors with head work and 10.5+ compression. Quick ramps for 6500+RPM.
<b>298870</b> <b>298875</b>	(1986) (1991)	<b>V87</b> <b>N87</b>	34/70 76/32	284 288	318 322	.670 .670	.283 .269	HI-LIFT 160 Lbs.	Still more stuff for 100+ cubic inches. Quick ramp, broad tip design will pull strong to 6500+RPM.
<b>Shovelhead Cams (Rocker ratio = 1.43) Timing @ .053 cam lift</b>									
<b>212823</b> <b>212825</b>	(1970) (1978)	<b>S82</b>	32/60 66/30	272 276	306 310	.590 .590	.237 .220	HI-LIFT 160 Lbs.	74-84 inch Shovels with 10.5+ C.R. New design technique for wide, strong power band. 6500+RPM.
<b>212834</b> <b>212836</b>	(1970) (1978)	<b>S84</b>	32/64 70/30	276 280	310 314	.630 .630	.241 .223	HI-LIFT 160 Lbs.	Shovels: 84-96 inches, 10.5+ pistons and head flow work for max HP in these larger engines. 6500+RPM.
<b>212855</b> <b>212857</b>	(1970) (1978)	<b>S86</b>	34/70 76/32	284 288	318 322	.660 .660	.254 .235	HI-LIFT 160 Lbs.	100+ inch Shovels will benefit most from this quick ramp design. Broad power band to 6500+RPM.

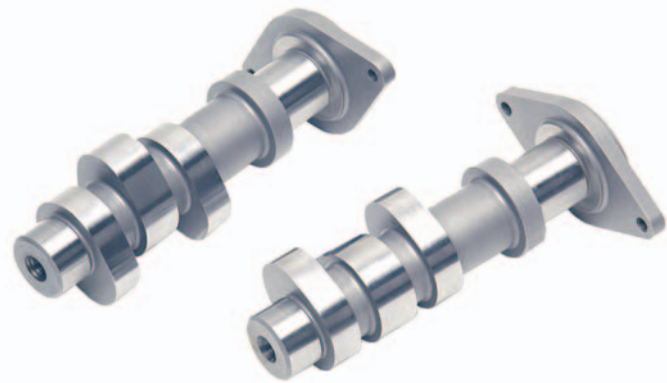
### EV Sportster Springs and Collars

**High Lift Evolution Springs** . . . . . **294150**  
 4 inner and 4 outer springs. When used with titanium spring collars, cam lifts of .550+ can easily be accommodated. Head machining is not required.

**Titanium Upper Spring Collars** . . . . . **293110**  
 4 titanium upper spring collars. Fit all Evolution Sportster engines. They are stronger than stock, .050" more spring travel, 50% lighter and install with stock keepers.



## Polaris Camshafts 2002-UP (Freedom Engine)



Polaris engines have a lot of potential. With 92 cubic inches, 4 valve heads and a 9.2 compression ratio, more performance is only a pair of camshafts away. The 438 makes a great setup with a street bike with stock engine or a tuned engine with stock or larger displacement.

The 460 cams are a perfect match for the factory 100 kits.

Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application +
			.050	.020				
—	Stock	08/40 40/04	228 224	255 253	.388 .386	.078 .076	Stock	Stock cams; valve event specs listed for comparison.
268450	V-438	17/45 46/11	242 236	269 265	.412 .406	.108 .085	Stock	More valve lift and duration means extra power thru RPM (2000-6000+) range for bolt-in or modified engines. Piston-valve clearance should be checked.
268460	V-460	18/54 48/16	252 244	282 276	.434 .426	.113 .107	Hi-lift	Higher lift cams for modified Freedom motors with big cylinders and higher comp. ratio. More torque and HP with factory 100 kits. RPM range (2200-6500+).

## Polaris Camshafts 1998-2001 (Victory Engine)



Don't be misled by the conservative ratings of the Polaris Victory V twins. With 4 valve cylinder heads and a big bore 1507cc engine, more power is now a readily available option. Victory engines can be tuned to output a lot more useable power by just changing camshafts.

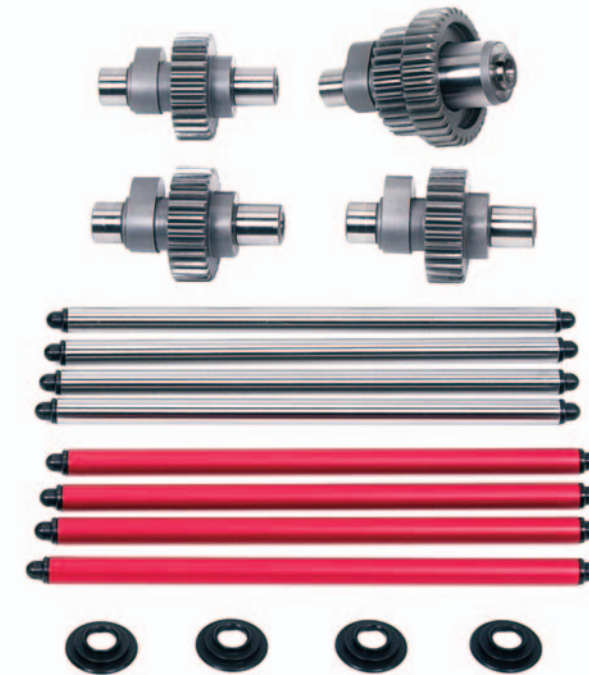
If you want more performance from your Victory bike, the first thing on your list of modifications should be a new set of Andrews Victory camshafts.

Part#	Grind	Timing(*)	Duration		Valve Lift	Lift @ TDC	Springs	Application
			.050	.020				
Stock	—	-04/34 34/-04	210 210	240 240	.433 .433	.037 .042	Stock	Stock cams specs listed for comparison. Centerline angles are intake=109; exhaust=109.
268402	PL402	13/37 41/09	230 230	258 258	.402 .402	.095 .080	Stock	Easy installation (no head work) with big boost in HP and torque over the entire RPM range.
268420	PL420	04/32 36/00	216 216	244 244	.420 .420	.062 .050	Stock	Similar to stock cams but timing advanced for more torque and HP at low and middle RPM speeds.
268440	PL440	12/48 48/12	240 240	260 260	.440 .440	.091 .091	Stock	Long duration cams for engines with higher comp. ratios and low restriction exhausts. Big boost in HP and torque at middle and upper RPM speeds.

(\*) Timing data listed for .050 lift at VALVE

## Sportster Cams (Iron Head)

Pictured is a late style Sportster cam gear kit, lower collars and pushrods made from either steel or aluminum. Steel pushrods are the best choice for stroker motors and drag applications where the greatest strength is needed. For street applications where quiet operation is desired, aluminum pushrods are the recommended choice. Both pushrod kits are made from 7/16" diameter tubing which will not interfere with rod covers. Lower spring collars are similar to late style H/D parts and will provide .060 more spring travel over stock collars. High lift cams are easier to install with these collars.



- 4 steel pushrods ..... 240040
- 4 aluminum pushrods ..... 240060
- 4 lower spring collars ..... 277160

### Touring and High Performance Cams

Part#	Year	Grind	Timing(*)	Duration		Max Lift	Lift @ TDC	Application
				.053	.020			
Stock	(1976-1985)	Q	10/32 35/07	222 222	262 262	.400 .380	.114 .114	Specifications for stock Q cams are listed for reference and comparison purposes.
214010	(1957-1970)	P	34/40	254	294	.400	.200	4/I kit; exhaust cams only for use with stock P intakes. Bolt-in power for all iron head Sportsters with no head work. (Stock P exhaust is .380 lift, 242 deg. duration).
214014	(1971-1980)	PB+	43/31	254	298	.410	.192	
214020	(1981-1984)**							
214055	(1984-1985)***							
214040	(1957-1970)	PB+	34/40	254	298	.410	.208	Bolt-in replacement cams for stock 'P' or 'Q' cams; more horse power and torque thru RPM range with this great street grind. Stock springs will rev. to 7000 RPM.
214045	(1971-1980)		43/31	254	298	.410	.208	
214050	(1981-1984)**							
214055	(1984-1985)***							
214075	(1957-1970)	Y	35/47	262	310	.425	.206	Street 900/1000: Biggest cam available for no headwork installation. Stock springs OK. Great mid-range and upper end power. Needs 9.0 or higher C.R. pistons for best output.
214080	(1971-1980)		53/29	262	310	.425	.182	
214085	(1981-1984)**							
214090	(1984-1985)***							
214105	(1957-1970)	R5	33/41	254	306	.445	.209	Street/Drags: Modified 900/1000 motors and strokers. Big boost in torque over stock cams (2000-7500 rpm). Stock springs are OK, but checking valve clearances required.
214110	(1971-1980)		43/31	254	306	.445	.200	
214115	(1981-1984)**							
214120	(1984-1985)***							
214135	(1957-1970)	X	35/55	270	314	.450	.210	Street/Drags: For stroker motors to 76 inches. More mid range and upper end power. Lower lift means easier installation in 1977 and later engines. Stock springs OK. Needs 9.0 compression minimum.
214140	(1971-1980)		57/33	270	314	.450	.206	
214145	(1981-1984)**							
214150	(1984-1985)***							
214190	(1957-1970)	V9	32/52	264	311	.490	.207	Street/Drags: Excellent cams for 65-76 inches. High lift short duration for broad RPM torque range: 2500-7000+ rpm.
214195	(1971-1980)		52/32	264	311	.490	.207	
214200	(1981-1984)**							
214210	(1984-1985)***							

(\*) Timing listed for .053 lift figures.

(\*\*) 1981-early 1984 cam gear kits (with generators) do not have tachometer drive gears.

(\*\*\*) Late 1984 to 1985 cam gear kits (with alternators) do not have generator drive gears.

## Choosing a Cam

The question “*What cam should I buy for my bike?*” is one we often hear. While there are no hard and fast rules for picking a cam for a specific application, some basic guidelines are worth considering. Keep in mind that performance camshafts are usually chosen for the basic purpose of producing more power from your engine. The three questions to answer before choosing a new cam are:

- 1. Primary application:** Is the bike going to be used for all around street riding or is the goal to have an engine which is running at maximum torque and horse power for track or drag racing?
- 2. Type of riding:** Do you spend a lot of your time riding two up on highway trips or is it more important to have the most power you can get. In other words is your riding style conservative or more aggressive?
- 3. Engine/Bike combination:** This question relates to displacement (cubic inches), compression ratio, bike weight and what kind of cylinder head modifications have been done. Have the intake and exhaust ports been changed to result in better flow efficiency? Does the engine have a higher than stock compression ratio to take advantage of a longer duration cam? Is the bike lighter like a Dyna or a heavy bagger?

To get the best cam for your bike all of these factors have to be taken into account. Almost every type of engine modification imaginable has been performed on H/D type engines. Here is a short summary of modifications listed in order of increasing cost and installation complexity.

1. Relieved air cleaners
2. Higher output ignitions
3. Free flow exhaust system
4. Performance camshafts
5. Modified fuel injections
6. Larger carburetors
7. High compression pistons
8. Big bore cylinders and pistons
9. Long stroke flywheels

It is important to note that too much cam sometimes results in poor low RPM power.

Street bikes will often perform better with a mild cam than more radical cams. While bigger cams may have a higher peak horsepower, more conservative cams may feel stronger to a street rider because the max torque occurs at lower RPM. Changing cams is the easy way to more torque in the 2000-4000 RPM range. A cam with a longer intake duration will reduce static compression pressure at low speed which in turn will tend to reduce low RPM torque. But with a longer duration cam and a higher compression ratio, power at middle and high speeds will be increased which is what you wanted all along. This is the main benefit of a good performance camshaft and a properly tuned engine.

For an engine with a cam properly matched to the displacement and compression ratio, the net result will be more power at middle and higher engine speeds. In general, higher compression ratios need longer duration cams. Bolt in type cams are intended for stock compression ratios.

## Camshafts and Hydraulic Lifters

There has always been a great amount of interest regarding the application of hydraulic lifters with performance camshafts. On H/D engines, this attention relates to Twin 88s, EV80 big twins and Sportsters (1991 and later) since all of these engines now use hydraulic lifters as stock components.

Because we hear many questions about whether to use “solids” or “hydraulics” we felt that some discussion might help in deciding which type of lifter would be the best for specific applications. Each type of lifter design has distinct advantages.

First, all Andrews Products H/D camshafts will operate properly with hydraulic lifters *if the engine and heads are set up correctly.*

If hydraulic lifters are installed and correctly adjusted, they have some definite advantages:

- Quiet operation
- Long time service intervals
- No loss of lift and duration from heat expansion

For hydraulic lifters to operate properly in your engine, the most important point at the time of installation is to make sure that the oil feed holes in the lifter blocks are in position to feed oil to the lifters when the cam is positioned at the lowest lift point. For this to occur with high lift cams, it may be necessary to modify the lifter blocks or lifters so oil can flow into the lifter feed hole from the tappet body.

The real advantage of solid lifters relates to all out racing. For anything else including most street riding, we recommend that hydraulic lifters be used.

For dragsters, a properly designed cam with solid lifters will be the best choice. But for most street bikes, the idea of low maintenance hydraulic lifters is pretty attractive. New H/D hydraulic lifters work so well that unless you really need 6500+ RPM, don't bother with solid lifters on a street bike. Hydraulic lifters are a little harder to install and adjust, but you will end up with a quieter engine that needs less servicing.

## Cam Gear Noise – How To Find It and Eliminate It (EV80 and Shovel 74 & 80)

### Why Do Cam Gears Cause Noise?

In the last few years there has been more interest in quieter engines. Since cam gear noise can sound like bad lifters, we thought the following section would be appropriate.

Whenever the roller follower on a cam lobe passes the maximum lift point, the forces on the cam drive gear tooth changes direction. If more than .002 inches (.005mm) backlash is present between the cam and pinion gear, this directional change of force will result in an audible “click” as the backlash moves from the back side of each gear tooth to the front side.

While some positive backlash is necessary to prevent localized gear tooth overloads, excess backlash (and “clicking”) may sound annoying but won't hurt anything.

Tight fitting gears will cause very noticeable whining which is definitely a more serious problem. Gear tooth and bearing damage can result from running zero backlash. In this case, a smaller cam gear or pinion gear would be required.

Different size gears permit custom fitting for a specific engine. By choosing two gears which are compatible sizes for a given engine, gear backlash can be minimized so that gears will not whine or click but just run quietly.

If you need them, Andrews Products makes cam gears one size larger than standard and one size smaller. H/D makes pinion gears in a range of sizes.

If you are working with an engine that does not have quiet running cam gears to use as a starting point, another method may be used to size drive gears when installing new cams.

In this case it will be necessary to use either a larger cam gear, a larger pinion gear, (or both) to correct noisy gears. If the problem is excess whining, a smaller pinion or cam gear will be needed.

Measure pinion and cam gear sizes (over pins) as in diagram. Look in H/D service manual for part numbers listed by pin sizes. A decision must now be made regarding what size pinion or cam gear to choose. Our recommendation would be to pick 2 sizes larger (to correct clicking) or 2 sizes smaller (to correct whining) as a starting point.

If both gears are sized properly for the engine, a very slight whine is normal. Only a small percentage of engines are made with larger size cam drive gears. The two largest sizes of cam drive gears will be color coded green or black. If a particular engine has a stock cam with one of these color codes, matching cam drive gears and pinions for correct backlash can result in a quieter running engine whenever a new camshaft is installed.

Engines having cam gears color coded red or blue should not require any cam or pinion gear changes.

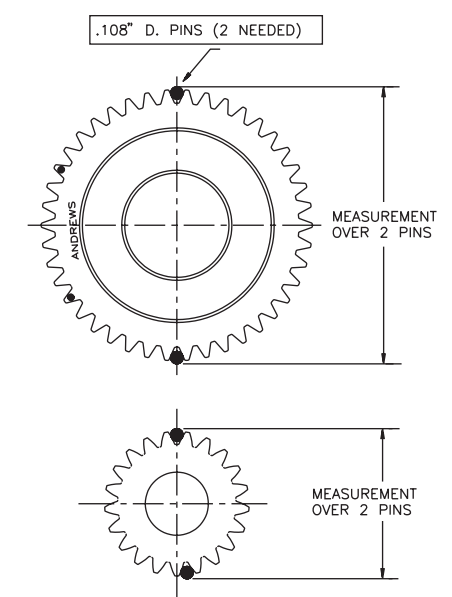
### What Can Be Done To Reduce The Noise

The factory service manual for Shovel and EV big twin engines lists different size pinion and cam gears. We are recommending that service manuals be used for reference. If you have changed cams and now notice that your engine makes noise like lifters out of adjustment, the noise is most likely a result of excessive pinion-cam gear backlash. There are several possible techniques for reducing gear noise.

1. Remove the stock cam gear and press it onto the new camshaft. Stock gears will work OK with Andrews Products camshafts. To press a new gear onto a camshaft, the center of the 1/4" keyway (in the camshaft) must be exactly 180 degrees (21 teeth) from the pinion timing mark on the drive gear.

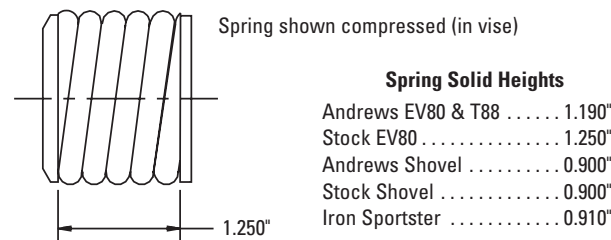
OR

2. Measure the stock cam gear and pinion gear (over pins) as shown in the diagram. Write down the measurements.
3. Now measure the new cam gear (over pins) and write down that number also.
4. Subtract the new gear size from the stock size.
5. If the new cam gear is smaller than the stock gear (for clicking), add the difference (from 4) to the size of the pinion gear to obtain a new (larger) pinion gear size.
6. If the new cam gear is larger than the stock gear (for whining), subtract the difference (from 4) from the size of the pinion gear to obtain a new (smaller) pinion gear size.
7. Then match this size to a new pinion gear part number in the H/D manual and install it.
8. Remember to use the same size pins as the manual lists for measuring your gears! (.108" D. or .105" D.)



## Engine Tuning Information

### How to Figure Out What the Installed Spring Height Should Be



#### Spring Solid Heights

Andrews EV80 & T88	1.190"
Stock EV80	1.250"
Andrews Shovel	0.900"
Stock Shovel	0.900"
Iron Sportster	0.910"

#### Measure solid length of spring only

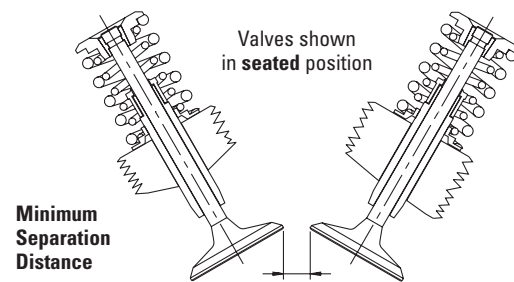
Spring Loads	Solid Height + .060*	Solid Height + .560*
Shovel	350 lbs	160 lbs
Evolution & T88	350 lbs	210 lbs

\*Andrews Products springs

- Using both top and bottom collars, place spring assembly in a small vise and close the vise until the outer spring is solid. Be careful when compressing springs in a vise!

- Now measure the distance between spring lands as in diagram and write down the number for later use. This is the Solid Height.
- Calculate INSTALLED SPRING HEIGHT (min.) as follows:  
INSTALLED HT. = Solid Height + .060 + Max. Valve Lift
- Max. valve lift can be taken from catalog figures. For example, max. valve lift for an EV59 cam is .560.
- For an EV51 cam, using Andrews Products springs and collars; INSTALLED SPRING HEIGHT = 1.190 + .060 + .510 = 1.760
- This technique will work for any cam and spring system as long as measurements are carefully made.
- At time of installation, make sure that .050 (minimum) clearance is present between top of valve guide and bottom of upper spring collar at maximum cam lift.
- "Solid height + .560" (diagram at left) refers to spring forces when the valve is seated. (.560 is an assumed spring travel).

### How to Check for Possible Valve to Valve Interference



If your heads have large valves or new seats installed or if a new performance cam has been installed, being able to easily check for possible valve to valve interference is helpful. For all H/D heads (EV, FL, XL, etc.), a simple calculation can be done to see if valve to valve interference might be a problem which will need correcting before proceeding.

- Andrews Products lists valve lifts at TDC (Top Dead Center) on all cam instruction sheets. Write down the number for your cam. For an EV51 cam, the TDC lift = .233" (see data on page ??)
- Minimum valve to valve clearance should be .060".
- Calculate the minimum valve separation distance as follows:  
Minimum Valve Separation Distance = TDC lift + clearance.
- For EV51 cams, Minimum Valve Sep. Dist. = .233 + .060 = .293"
- Measure the minimum separation between the two valves when they are seated (as in diagram). If actual measurement is not at least .293, modifications will be necessary to avoid valve to valve interference. (Cut seats deeper or back cut valves)
- Remember, this technique is NOT for piston to valve clearance.

### Compression Ratio Changes

One of the best ways to increase the efficiency of any internal combustion engine is to raise the compression ratio. As long as fuel with a high enough octane rating is available (so it will burn without detonation), raising the compression ratio can be a very effective performance boost.

The amount of material which must be milled from heads (or cylinders) to change compression ratios may be easily determined. Although the formula listed in the next column may look strange (or too simple) it is correct and it does work!

Only the stroke length, the original and new compression ratios need to be known. As an example, how much must be milled off EV80 heads to raise the compression ratio from 8.5 to 9.73? Stroke length = 4.25 for a stock EV80. With this formula, T = .080 (see table in next column). All of the values in the following table were calculated with this formula. This formula also assumes that combustion chamber volumes and cylinder bores are not changed for this calculation.

Knowing only this information, the exact thickness, (T) to mill from the heads (or cylinders) can be calculated:

$$\text{Stroke Length} \times \left( \frac{1}{\text{original CR}-1} - \frac{1}{\text{new CR}-1} \right)$$

$$T = 4.25 \times \left( \frac{1}{7.5} - \frac{1}{8.73} \right) = .080 \text{ in. (EV80; 9.73:1)}$$

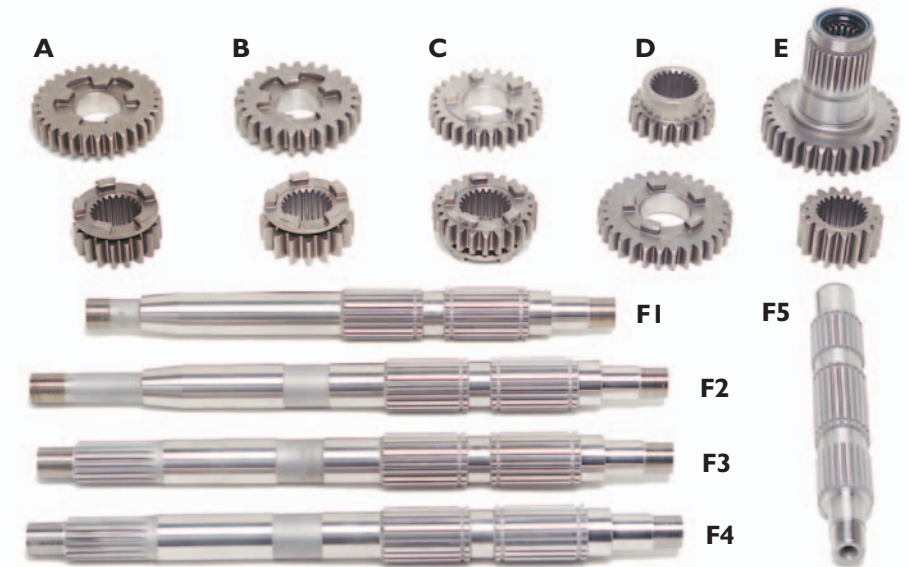
$$T = 4.00 \times \left( \frac{1}{8.0} - \frac{1}{9.09} \right) = .060 \text{ in. (TW88; 10.09:1)}$$

#### For EV80 and Twin 88 (Stock bore & stroke)

Head Milling (T)	Compression Ratio	
	EV80	Twin 88
.000	8.50	9.00
.020	8.77	9.33
.040	9.07	9.69
.060	9.39	10.09
.080	9.73	10.52
.100	10.11	11.00

## 5 Speed Transmission Gears (Big Twin 88 and 1340)

The EV Big Twin 5 speed gear box has been around since 1984 but the growing number of modifications for the 1340 engine continues to create more interest. In addition to close ratio first gears, Andrews Products also makes stock replacement gears for 1st, 2nd, 3rd, 4th and 5th gears. All Andrews Products 5 speed gears are made from high nickel alloy and heat treated and shot-peened to give maximum durability and strength. Also, where applicable, lead-in ramps have been machined into most gears to improve shifting and reduce wear on drive dogs and drive slots.



	Part Numbers
<b>(A) 3.24 Stock Ratio 1st Gears</b>	
1st counter - 31T.....	296120
(Replaces H/D 35622-79A)	
1st main - 18T.....	296125
(Replaces H/D 35025-79)	
<b>(B) 2.94 Closed Ratio 1st Gear Set</b>	
2 pieces.....	296110
2.94 1st gears provide close ratio shifting into 2nd. At peak RPM, 2.94 gears will run +5 mph over 3.24 ratio.	
<b>(C) Stock 2nd and 3rd Gears</b>	
2nd counter/3rd main.....	296330
(Replaces H/D 35027-79A)	
2nd main/3rd counter.....	296220
(Replaces H/D 35026-79A)	
<b>(D) Stock 4th Gears</b>	
4th main gear.....	296445
(Replaces H/D 35028-79)	
4th counter gear.....	296440
(Replaces H/D 35625-79A - 1987-up); also replaces gear/spacer in all earlier 5 speeds.	
<b>(E) Stock Main Drive Gears (Belt Drive)</b>	
Main drive-belt.....	296585
(Replaces H/D 35029-85)	
Main drive-belt.....	296591
(Replaces H/D 35029-91)	
Counter drive gear.....	296555
(Replaces H/D 35626-79A)	
<b>Stock Main Drive Gears (Chain Drive) - Not shown</b>	
Main drive-chain.....	296550
(Replaces H/D 35029-79)	

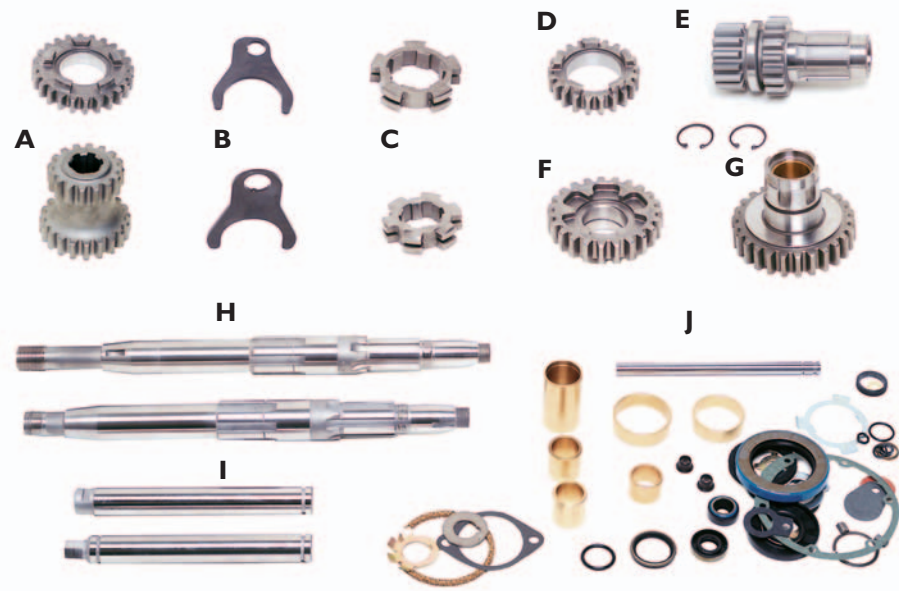
	Part Numbers
<b>(F) Transmission Shafts (All years)</b>	
<b>(F1) Chain drive mainshaft, 1981-1984</b> .....	296800
(Replaces H/D 35042-79)	
<b>(F2) Belt drive mainshaft, 1985-1989</b> .....	296850
(Replaces H/D 35042-85)	
<b>(F3) Belt drive mainshaft, 1990 only</b> .....	296900
(Replaces H/D 35042-90)	
<b>(F4) Belt drive mainshaft, 1991-up</b> .....	296910
(Replaces H/D 35042-91)	
<b>(F5) Countershaft-all years, 1984-up</b> .....	296700
(Replaces H/D 35632-79)	

#### Complete gear sets are available. Each set includes:

First gear (specify ratio) (counter & main).....	2 pcs
Second gear (counter & main).....	2 pcs
Third gear (counter & main).....	2 pcs
Fourth gear (counter & main).....	2 pcs
Fifth gear (counter & main).....	2 pcs
Countershaft.....	1 piece
Mainshaft.....	1 piece
Chain drive (1981-1984).....	296081
Belt drive (1985-1989).....	296085
Belt drive (1990 only).....	296090
Belt drive (1991-up).....	296091

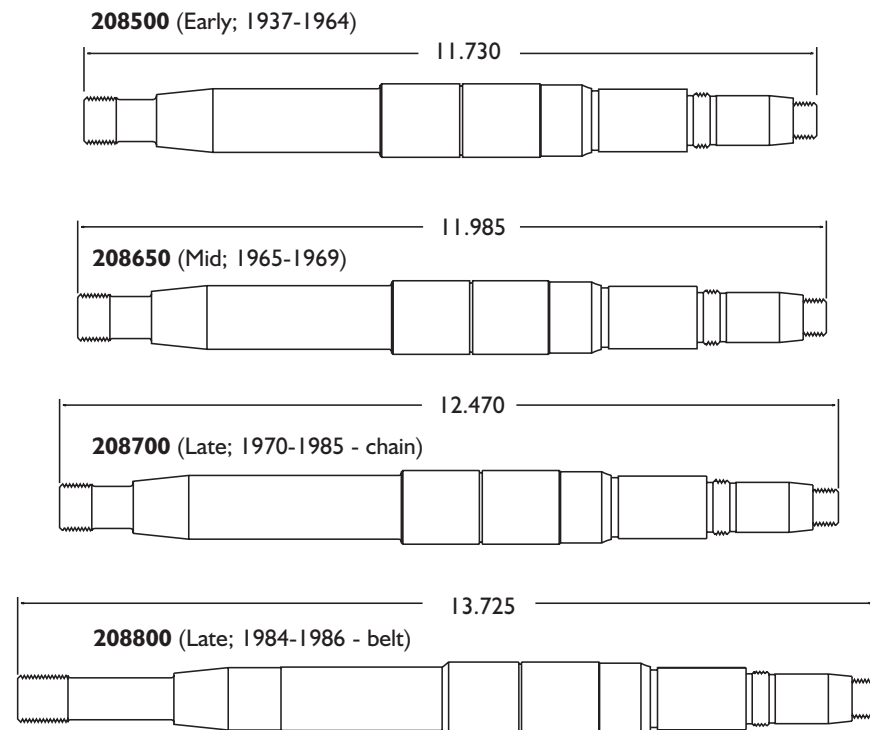
Price sheet shows complete listing of all combinations of gear kits with available ratios.

## 4 Speed Transmission Gear Sets (Big Twin)



Big Twin 4 speed transmissions have been built since 1936 in several versions. They were included on bikes with Knuckle engines, Pans, Shovels and some 1984 and 1985 Evolution 80's. They all used this transmission. With Andrews 4 speed gears, transmissions last longer, shift faster, and just plain run better. Bikes with Andrews gears feel so good that it's hard to believe until you experience the difference for yourself.

## 4 Speed Transmission Mainshaft Lengths



Andrews Products makes four different versions of 4 speed big twin transmission mainshafts.

For everyone who calls for transmission shaft lengths and asks us to look up blueprint dimensions, here they are!

Regarding one additional mainshaft: H/D part number **35039-84** fits belt drives. This is the same part as H/D **35039-85** except that **35039-85** uses a different drive key. It is very important that the correct drive key be used. The H/D part number for the drive key is **37523-85**. Andrews Products part number for the belt drive transmission shaft is **208800**.

## 4 Speed Transmission Gear Sets (Big Twin)

### Part Numbers

- (A) 2.44 1st Gear Set (1959 thru 1984)**  
Best choice for Superglides, choppers and lighter bikes with stock or smaller motor or trans sprockets. This is a 'no clunk' 48 mph, 1st gear. Installation in 1980-1984 FX requires a 21 tooth 2nd gear. (17T & 20T on cluster; 24T on counter gear).....**201105**
- 2.60 1st Gear Set (1959 thru 1984) – Not pictured (24T & 16T)**  
This ratio works best with "E" glides and heavier bikes with motor or trans sprockets having more teeth than stock sprockets. Installation in 1980-1984 FX requires 21T (1.82 ratio) 2nd gear for this 1st gear. (16T & 20T on cluster; 24T on counter gear).....**201145**
- 3.00 1st Gear Sets (Original stock ratio) – Not pictured (1959 thru 1984) (15T & 20T cluster; 26T counter gear).**  
.....**201090**  
(1936 thru 1958) (15T & 20T cluster; 26T counter gear).  
.....**201094**
- Stock ratio first cluster-counter gears. 1936 version has no rear counterbore and requires short length 3rd main gear. ....**206215**
- Combination 2.24 1st - 1.65 2nd Gear Set – Not pictured**  
If you want peak RPM thru the quarter mile, this gear set will provide the super close ratio shifting to handle it. OK for street or drags with any size motor.....**201020**
- (B) Shift Forks**  
1-2 fork (Replaces H/D 34159-36) .....**209750**  
3-4 fork (Replaces H/D 34158-36) .....**209760**  
One piece cold forged forks. Fully heat treated and black oxide coated, a must for all transmission rebuilds.
- (C) Shift Clutches**  
1-2 clutch (Replaces H/D 35665-36) .....**205120**  
3-4 clutch (Replaces H/D 35440-38) .....**205340**  
Replacement clutches are specially heat treated and shot peened for super durability. 3-4 clutches are face milled and have longer lead in ramps for more positive shifts.
- (D) Stock 2nd Gear (1.82 Ratio) (21T)**  
(Replaces H/D 35751-36) .....**202160**  
Stock 2nd gear with drive slots include lead in ramps for more positive 1-2 shifts. This 21 tooth gear fits 1941-1979. It will also fit later transmissions but requires one of the first gear sets shown above.
- (E & F) Close Ratio 3rd Set (1.35 Ratio) (18T & 23T)**  
(Early) Transmissions built before mid '76, to serial# U-8958 (or lower) with loose needle bearings. ....**203365**  
(Late) For transmissions built after mid 1976, from serial# U-8959 (or higher) with caged needle bearings. New design drive slots include lead in ramps for quicker, more positive shifting (same as stock 3rd and 4th gears).....**203375**

### Part Numbers

- (E & F) Stock 3rd (1.23 Ratio) – Not shown (17T & 24T)**  
Mainshaft 3rd (Replaces H/D 35306-59).....**206220**  
Mainshaft 3rd (Replaces H/D 35306-36).....**206215**  
This gear requires 1936-58 style cluster gear.  
Cluster: 1936-1976 .....**206330**  
(Replaces H/D 35700-36)  
Cluster: 1976-1986 (Replaces H/D 35700-76).....**206335**  
Replacements for stock main and countershaft 3rd. The design of drive slots on mainshaft gear has been upgraded to include lead-in ramps for quicker, more positive shifting.
- (G) Stock Main Drive Gear (4th)**  
1936-1976 – 26 Teeth .....**204260**  
(Replaces H/D 35065-65)  
1977-1986 – 26 Teeth .....**204280**  
(Replaces H/D 35067-77 and 35067-84)  
Replacement 4th gears are made with wider drive slots and steeper lead-in ramps for more positive 3-4 shifting. The "O" ring groove is a design update for all chain drive 4th gears from 1977 through 1984.
- (H) Transmission Mainshafts**  
Early 1937-1964 (Replaces H/D 35040-50) .....**208500**  
Mid 1965-1969 (Replaces H/D 35039-65) .....**208650**  
Late 1970-1985 chain  
(Replaces H/D 35039-70A) .....**208700**  
Late 1984-1986 belt drive  
(Replaces H/D 35039-85) .....**208800**  
Replacement mainshafts for all versions of big twin boxes. Made from aircraft alloy steel. Heat treated and finish ground to ensure maximum durability.
- (I) Transmission Countershafts**  
1941-early 1976 (Replaces H/D 35614-65).....**207650**  
Late 1976-1979 (Replaces H/D 35614-77) .....**207770**  
1980-1985 (Replaces H/D 35614-80) .....**207800**  
Three types of countershafts fit transmissions thru 1985. They are not interchangeable, so make sure before you order.
- (J) Transmission Rebuilding Kits (Small Parts)**  
Bushings, gaskets, locks, keys and ferrules for completing a 4 speed transmission rebuild. These parts are made by JIMS.  
1936-1976 .....**Kit 210925**  
1977-1979 .....**Kit 210950**  
1980-1984 .....**Kit 210975**
- Transmission Gear Kits**  
Gear kits must be ordered by part numbers listed below which specify year and 1st and 3rd ratios. Each gear kit includes 6 gears, 2 shift clutches and 2 forks as shown on previous page. (Shafts and small parts kits must be ordered separately).  
1936-1976 (2.44 1st, 1.35 3rd) .....**Kit 210150**  
1936-1976 (2.44 1st, 1.23 3rd) .....**Kit 210250**  
1936-1976 (2.60 1st, 1.35 3rd) .....**Kit 210350**  
1936-1976 (2.60 1st, 1.23 3rd) .....**Kit 210450**  
1977-1984 (2.44 1st, 1.35 3rd) .....**Kit 210550**  
1977-1984 (2.44 1st, 1.23 3rd) .....**Kit 210650**  
1977-1984 (2.60 1st, 1.35 3rd) .....**Kit 210750**  
1977-1984 (2.60 1st, 1.23 3rd) .....**Kit 210850**

## Sportster Cam Gear Noise

### What Causes Cam Gear Noise?

Whenever a roller lifter in a Sportster engine passes through maximum cam lift, the forces on the cam gear teeth change direction. If there is more than .002 backlash, the change of force and direction will result in an audible "click" as the backlash moves from one side of the tooth to the other. Gear noise always occurs at idle and lower engine RPM.

Stock EV Sportster cams are made with different gear sizes. They are color coded by size and selectively fitted to engines at the factory to a minimum backlash which results in reduced gear noise during engine operation.

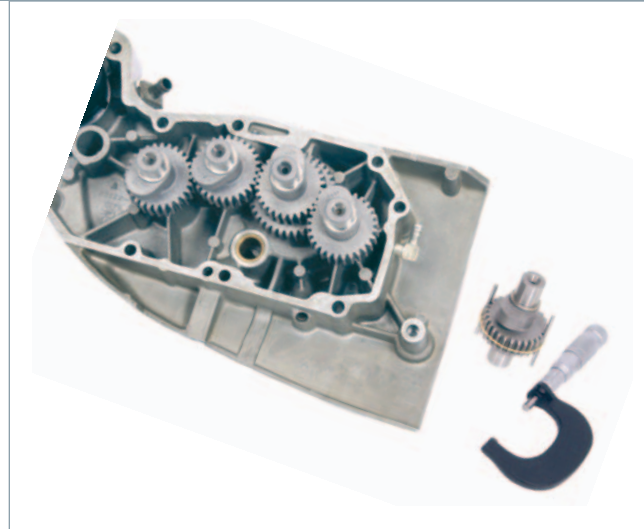
Andrews Products cam gears for EV Sportsters are made with gears in the middle of the size ranges so there is only a small chance of cam gears fitting too tight. Cam gears which have excess backlash may rattle or "click" during operation. This clicking sometimes sounds like lifter noise. Unlike whining gears, rattling gears will not cause gear tooth failure or engine damage. If you don't mind the noise, it won't cause any engine problems.

Gears which are operating without enough backlash (fitted too tightly) will whine during operation. This condition is serious and can cause localized gear overheating, tooth surface failure and engine damage. Cam gears which fit too tight must be corrected with smaller size cam gears.

To fit Andrews Products cams in your EV Sportster engine, a procedure will be described.

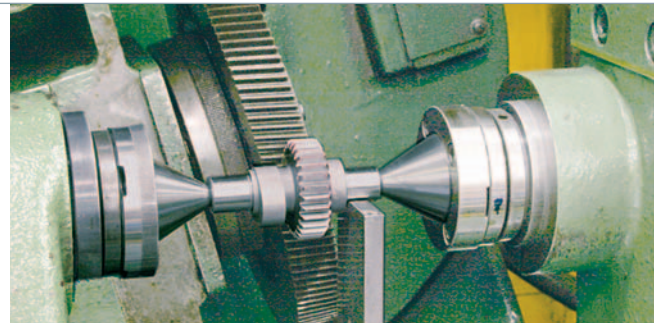
### Measuring Cam Gears for Proper Fit

1. Install all 4 cam gears in cover (see photo below) for a trial fit.
2. Manually turn all four gears and verify that they roll freely. If there is no tightness, proceed to step 6.
3. If there is any tightness, remove #4 cam, then #1, then #3, in that order so that the tight fitting parts can be identified.



4. Measure each new cam gear with a micrometer using .108" dia. pins. Do the same with the stock cam gears. Note any differences in size.
5. Andrews Products makes undersize and oversize cam gears for all 3 production EV cam grinds. Unused parts may be returned and exchanged for under or oversized cam gears.
6. Install the cover onto the engine with no pushrods and only the #2 cam gear. Verify that the engine now freely turns. If so, the cam gear backlash is correct and you can continue to reassemble the engine.
7. If the #2 cam drive gear is tight, a smaller pinion gear (from H/D) must be used. (See page 12 for a procedure to determine the correct size of new pinion).
8. Any 2 adjacent cam gears (1-2), (2-3), (3-4) can be installed in the cover to check for proper backlash by comparing the stock parts (2 at a time) to the new ones.
9. Any significant differences in sizes between the stock cam gears and new cam gears should be investigated and understood before proceeding.

## Custom Fitting Sportster Cam Gears



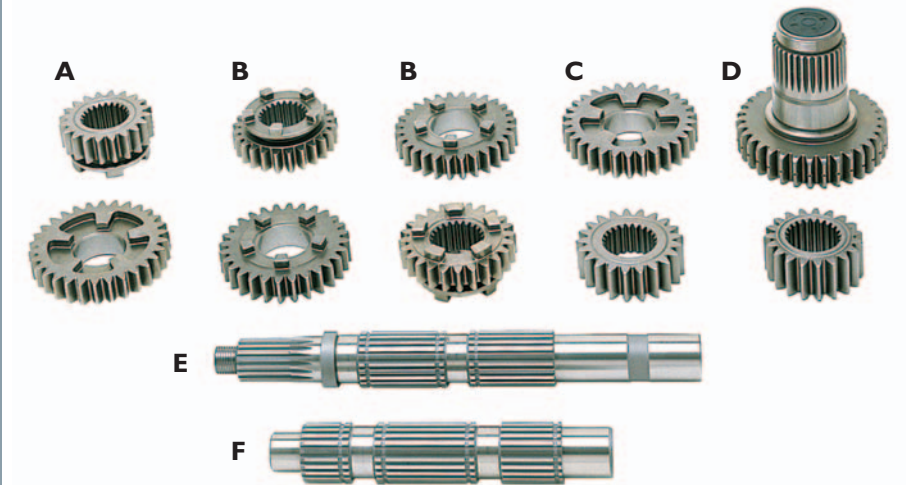
Sportster cam in GHH gear tooth hone machine.

If the above procedure for checking Sportster cams clearly identifies any cams which will not turn freely because of tight gears, the teeth can be honed to a smaller size to fit correctly. It is very unlikely that you will ever need to do this but if there is a problem, Andrews Products can custom fit cams to eliminate any binding.

Tooth sizing is performed on a National Broach GHH gear hone machine setup to process H/D Sportster cam gear teeth. Please call for a Return Authorization Number (RMA) before sending any parts.

## Sportster Gears (EV 5 Speed)

All 5 speed Sportster gears are made from high nickel alloy steel. Gears are then heat treated and shot-peened to give maximum durability and strength. Also, where applicable, drive dogs have milled lead-in ramps to improve shifting and reduce wear on drive dogs and slots.



- (A) 2.61 Close Ratio 1st Gear Set**  
(2 pieces) 2.61 .....**299110**  
1st gears provide true close ratio shifting into 2nd.  
Plus 7 mph of usable 1st gear. (20T & 30T)
- (B) Stock 2nd and 3rd Gears**  
2nd main / 3rd counter (H/D 35771-89) (24T & 28T) .....**299102**  
3rd main / 2nd counter) (H/D 35772-89) (28T & 24T) .....**299103**
- (C) Stock 4th Gears**  
4th main gear (H/D 35773-89) (30T) .....**299104**  
4th counter gear (H/D 35775-89) (21T) .....**299144**
- (D) Stock Main Drive Gears**  
Main drive (H/D 35034-89) (33T) .....**299105**  
Counter drive gear (H/D 35633-89) (19T).....**299155**
- (E) Transmission Mainshaft**  
Mainshaft (H/D 35640-89) .....**299180**

- (F) Transmission Countershaft**  
Countershaft (H/D 35641-89).....**299170**
- EV Sportster 5 Speed Gear Sets**  
1991-up .....**299900**  
5 speed EV Sportster transmission gear sets are available as complete kits. Each kit includes the parts as pictured: 1st, 2nd, 3rd, 4th, 5th gears, mainshaft and countershaft.

### Internal Transmission Ratios

Gear	Close First	% Change	Stock First	% Change
1st	2.605			2.779
2nd	2.026	22%	2.026	27%
3rd	1.489	27%	1.489	27%
4th	1.216	18%	1.216	18%
5th	1.000	18%	1.000	18%

## Special Ratio Sportster 5 Speed Racing Gears

- S Ratio Gears (1st and 2nd)**  
2 gears 2.368 1st gears. (22T & 30T) .....**299816**  
2 gears 1.876 2nd gears. (25T & 27T) .....**299724**
- Y Ratio Gears (1st, 2nd, 3rd, 4th)**  
2 gears 2.026 1st gears. (24T & 28T).....**299717**  
2 gears 1.670 2nd gears. (25T & 26T) .....**299727**  
2 gears 1.364 3rd gears. (22T & 28T).....**299737**  
2 gears 1.158 4th gears. (20T & 30T) .....**299747**

Grinding camshaft journal bearings

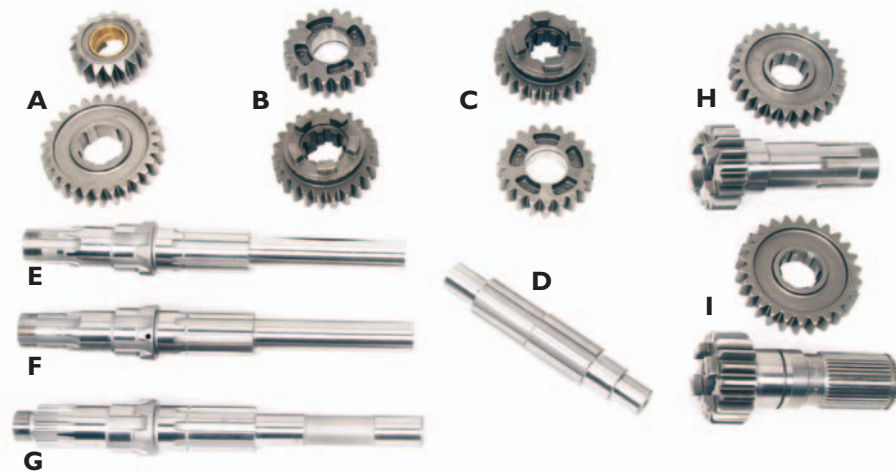
### Internal Transmission Ratios

Gear	S Ratio	% Change	Y Ratio	% Change
1st	2.368		2.026	
2nd	1.876	21%	1.670	17%
3rd	1.489	21%	1.364	18%
4th	1.216	18%	1.158	15%
5th	1.000	18%	1.000	14%

Ratio "S" includes 1st and 2nd gears (4 piece set).  
Ratio "Y" includes 1st, 2nd, 3rd and 4th (8 piece set).



## 4 Speed Sportster Gears



The gears listed on this page will fit Sportster 4 speed transmissions made from 1956 through 1990. All Andrews 4 speed Sportster gears are made from high nickel alloy steel which is heat treated and shot peened for maximum durability. Shot peening greatly improves the wear resistance of drive edges and slots. All Sportster gearboxes run better with Andrews gears.

### Part Numbers

#### (A) Stock 1st Gears

Main 1st (27T) (replaces 35277-52A).....**251050**  
 Counter 1st (17T) (replaces 35760-73 late only, 1973-1985) .....**251060**  
 To fit 1986 and later requires early countershaft ..**259010**

#### Wide Ratio 1st Gear Sets (Not pictured)

Changes 1st from 2.52 ratio to 2.68 for more low end torque with 21T or 22T trans sprockets.  
 Late only, 1973-1985 .....**251010**  
 To fit 1986 and later requires early countershaft ..**259010**

#### (B) Stock 2nd Gears

2nd main (23T) (replaces 35296-56 & 56A).....**252020**  
 2nd counter (20T) (replaces 35750-58 & 58A).....**252040**

#### (C) Stock 3rd Gears

3rd main (20T) (replaces 35305-56 & 56A) .....**253050**  
 3rd counter (23T) (replaces 35709-54A & 54B).....**253030**

#### Transmission Shafts

Replacement transmission shafts for standard H/D part numbers. Our shafts are made of super alloy material for maximum strength and durability on this most critical part.

#### (D) Countershaft (1956-mid-1984)

(replaces H/D 35613-58).....**259010**

#### (E) Early Mainshaft (1956-1969 kick start) (replaces 35044-56)

Drilled through for clutch rod .....**258080**

#### (F) Late Mainshaft (1971-mid-1984) (replaces 35046-71)

Solid shaft; no through hole .....**258120**

#### (G) Mainshaft (alternator) (mid-1984-1990)

(replaces 35036-84A) Solid shaft; no through hole...**258190**

### Part Numbers

#### (H) Evolution / Alternator "C" Ratio Gear Set

Mid 1984-1990 (26T and 18T) .....**254850**  
 This gear set fits all 1984-1990 alternator engines.  
 All 1987-1990 4 speed Sportsters have "C" ratio main drive gears as stock parts.

#### (I) "C" Ratio Main Drive Gear Sets

1971-1978 .....**254720**  
 1979-mid-84 .....**254740**

#### Stock Ratio Main Drive Gears (17T & 27T) Not pictured

Clutch gear (1971-1978) (replaces 37448-71).....**254710**  
 Clutch gear (1979-mid 1984) (replaces 37448-79).....**254730**  
 Countershaft gear (27T) (replaces 35695-58).....**255580**

#### Complete Gear Sets (includes the following parts):

"W" 1st, stock 4th (1973-1978) .....**250100**  
 "W" 1st, "C" 4th (1973-1978) .....**250200**  
 Stock 1st and 4th (1973-1978) .....**250300**  
 Stock 1st, "C" 4th (1973-1978) .....**250400**

Price sheet shows complete listing of all combinations of gear kits with available ratios for generator engines (1979-1984) and alternator engines (1984-1990).

#### Sportster Gear Ratios (Listed below for comparison)

	Stock ratios	"W" ratios <sup>(1)</sup>	"W" ratios <sup>(2)</sup>	"C" ratios
1st	2.52	2.68	2.44	2.29
2nd	1.83	1.83	1.66	1.66
3rd	1.38	1.38	1.26	1.26
4th	1.00	1.00	1.00	1.00

<sup>(1)</sup> "W" ratio 1st plus stock main drive (27/17 teeth)

<sup>(2)</sup> "W" ratio 1st plus "C" ratio main drive (26/18 teeth)

T-shirts Page

## Sales Policies

### Payment Terms:

Visa and Mastercard payments for orders are accepted. COD orders will be sent certified check or money order. COD orders sent company check OK must be approved by Andrews Products in advance.

### Ordering Cams Not Listed in This Catalog:

Cam grinds which are not currently listed in the catalog are available as special orders. Custom ground or special order cams are priced and quoted on an individual basis. Call for information.

### Foreign Shipments:

All foreign orders must be prepaid in U.S. dollars including freight and forwarding charges. Andrews Products, Inc., will provide bank wire transfer information for foreign orders upon request.

### Shipping Carrier:

All shipments will be sent United Parcel Service (UPS) ground service unless other arrangements have been agreed upon in advance. All overnight shipping expense will be charged to customer.

### Claims of Shortages:

Claims of shipment shortages should be made to Andrews Products, Inc., as soon as possible. Damaged shipment claims must be made directly to the shipping carrier.

### Returned Goods:

Any parts returned for credit, exchange or inspection should not be sent without calling for a returned merchandise authorization number (RMA). A 20% charge will be deducted from the original invoice price on all items accepted for return. Custom or obsolete parts will not be accepted for return credit or adjustment unless there is a warranty question. Andrews Products reserves the right to make changes to prices or sales policies at any time without notice.

### Shipping Charges for Returned Goods:

Shipments must be sent freight prepaid. Any shipments sent freight collect will be refused. Goods must be packed to prevent damage in transit. Goods damaged because of improper packing will not be accepted for credit.

## Limited Warranty Policy

Andrews Products, Inc. warrants that its products as shown in this catalog are free from defects in material and workmanship. The warranty extends to original retail purchasers only and is not transferable to anyone else.

The warranty extends for 90 days from the purchase date. Because of the great variety of possible modifications and changes made to motorcycles and/or engines which may affect the performance or durability of other related components, Andrews Products, Inc., obligation under this warranty extends only to the repair or replacement of parts specifically manufactured or sold by Andrews Products, Inc.

Not covered by warranty are parts which show evidence of misapplication, abuse, improper maintenance, any alterations from their original configuration, or failure to follow installation instructions.

In addition, Andrews Products, Inc., reserves the right to make changes to products or specifications at any time without obligation to modify previously manufactured parts.

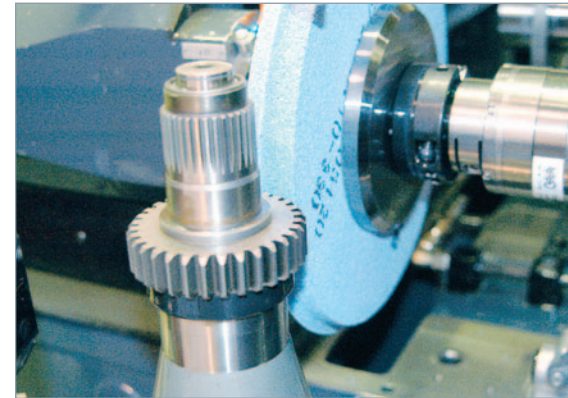
No person, company, or other organization is authorized to assume for Andrews Products, Inc., any warranty responsibility or make any binding judgements regarding warranties of any parts which may become the subject of a warranty claim.

If you feel that you have a valid warranty claim call for a returned merchandise authorization (RMA) number and then ship parts to Mount Prospect, Illinois, with proof of purchase included! No claims will be considered without valid proof of purchase documentation. Freight charges must be prepaid. Returned parts will NOT be accepted freight collect.

On specific parts which are returned showing damage due to normal wear, Andrews Products, Inc., may offer new replacement parts charged to the customer at a reduced cost.

Any parts which have been replaced for any reason become the property of Andrews Products, Inc., and will not be returned under any circumstances.

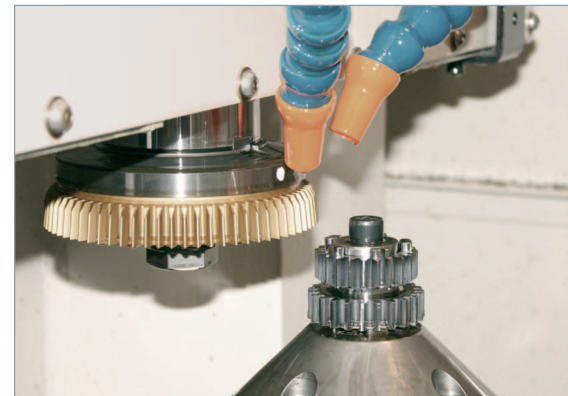
**Andrews Products** has been making cams and trans gears for H/D type engines for 30 years. We are the original maker of close ratio gears starting with 2.44 first gears for 4 speed gear boxes in 1972. The best gears and cams for American motorcycles continues to be Andrews. Our goal as a manufacturer is to maintain the highest level of quality and service for all of our customers.



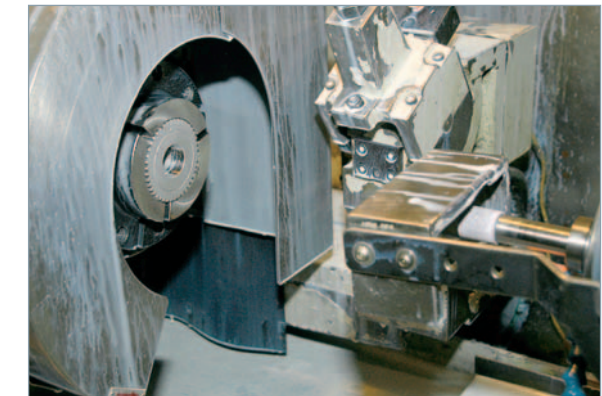
Finish grinding gear teeth on CNC tooth form grinder.



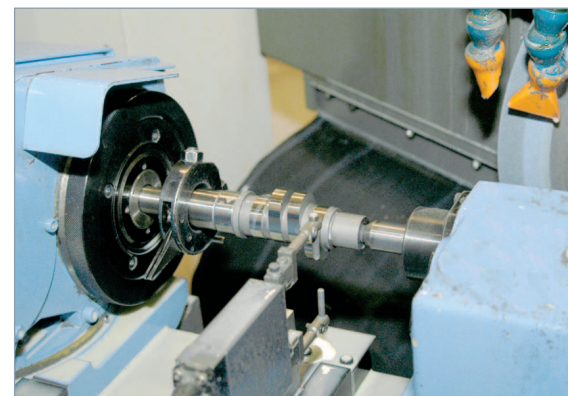
M & M 400 CNC gear inspection systems in temperature and humidity controlled room.



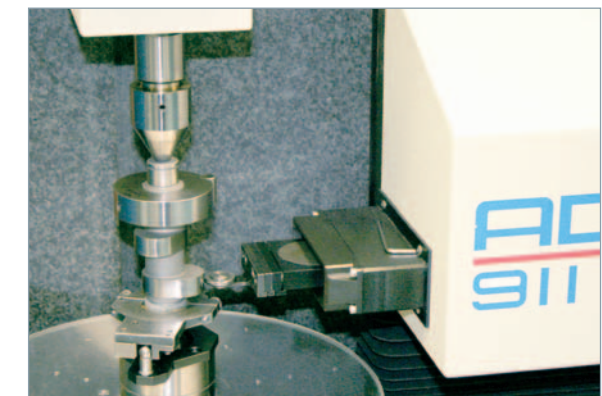
Cutting gear teeth with a Lorenz CNC gear shaper.



Grinding internal diameters on a programmable ID grinder.



Grinding camshaft journal bearings



Camshaft inspection on Adcole 911 Cam Gage.