ALL MODELS
TRANSMISSION SHIMMING PROCEDURES

Proper transmission shimming during reassembly is essential for proper operation and long transmission life, particularly on the large-displacement performance models. This bulletin provides information for proper transmission shimming. (This information was originally provided as part of the Powerplants 2 service school.) A listing of available shims is also included for easy reference.

AFFECTED MODELS

All Models

TRANSMISSION SHIMMING

Transmission shimming is a commonly used term which refers to the spacing of the transmission gears and shafts to allow smooth, precise shifting and proper gear engagement. In the past, transmission shimming was a common practice which was performed during any major engine repair. Today's improved machining techniques have greatly reduced the need for this. (However, you should be familiar with the steps which must be performed to do this operation correctly.) If transmission parts must be replaced, transmission shimming should be checked. This is assuming, of course, that all external shifting components have been inspected first. Refer to the appropriate service manual for this information.

The drive axle and individual gears must have minimum side-to-side play to insure proper engagement. In many cases, shims are installed at the factory. These can be identified by the codes U.R. or U.N. (use as required or use as necessary). A list at the end of this bulletin gives the available shim sizes and their part numbers.

MEASURING INDIVIDUAL GEAR SIDE PLAY

A spinning gear is usually held in place either by, 1) a circlip and shim on both sides, or 2) a circlip and shim on one side with a shouldered section of the axle on the other side. Any spinning gear should have between 0.08mm (0.003") to 0.13mm (0.005") side play for maximum efficiency. If there is no side play, the gear will bind up. If there is too much side play, the gear will move over when the sliding gear tries to engage it.

This can cause the engaging dogs to become rounded. If a shim is needed, measure the axle diameter, select the proper shim from the following list (arranged by shim sizes), and install so the spinning gear is moved toward the sliding gear that engages it (to maintain complete engagement).

WARNING

It is very important that all clearances be within specification and that all gears engage properly. Serious damage and/or injury could be done as a result of improper transmission adjustment.

MAIN AXLE SPACING

Since tightening the clutch retaining nut pulls the main axle completely to one side, adjustment of this axle is normally not necessary. (Axle cannot move from side to side.) That is, however, as long as factory installed shims are kept in place on the right end of the axle. Refer to the parts microfiche to verify size and location.

MEASURING DRIVE AXLE SIDE PLAY

On horizontally-split engines, measuring drive axle side play is a relatively easy operation since both transmission shafts can be placed in the lower engine case and the transmission operated. On vertically split engines, however, a slightly more complicated procedure is required.

1. Measure the distance between axle bearings in the case. Measure the depth of each case, from the top of the case down to the transmission bearing inner race. Adding the depth of both case halves (subtracting thickness of flat edge laid across case to assist in measurement) will give total distance between bearings.

2. Measure transmission shaft length. Measure transmission axle length from one bearing contact surface to the other bearing contact surface (across gears and circlips, if any on the outer ends.) Include standard shims that are usually included in the engine and listed in the parts book.

3. Combine measurements to determine side play. Subtract transmission axle length from total case depth. The remainder will be the amount of the side play.

EXAMPLE:

Total case depth	= 155.2mm (6.111")
Axle length	= 155.0mm (6.100")
Side-to-side play	= .20mm (.011")

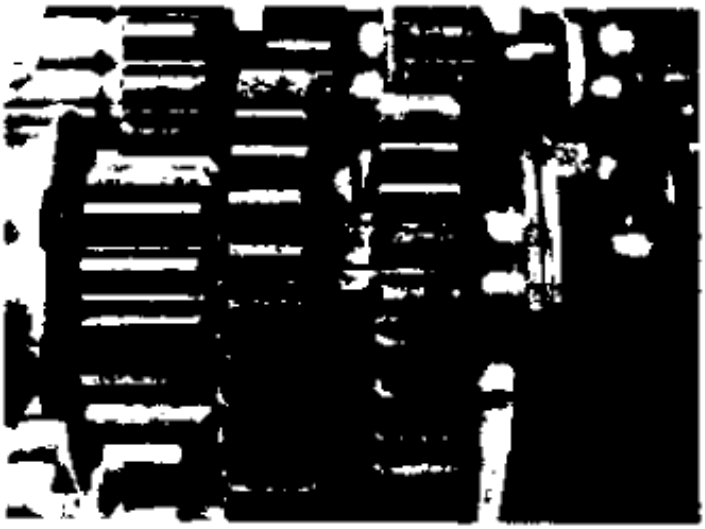
RESULTS:

.20mm (.011")	Is excessive
.08mm (.003")	recommended side play
.12mm (.008")	must be taken up

As a general rule, half the excessive side play should be taken up at each end of the axle. Select the proper shims from the parts list, combining some if necessary. If the model in question is not listed, then measure the diameter of the axle and match it with a shim of similar inner diameter and appropriate thickness.

FINAL TRANSMISSION SPACING CHECK

Whenever possible, install assembled gears and shift drum assembly into a case and rotate through all gears. Check that you have 50-75% engagement of the dogs into the slots or into the corresponding dogs.



The amount of engagement can be adjusted, either by shimming the individual gear more toward the sliding gear, or shimming the drive axle. As the axle moves over, it carries the circlipped spinning gear (or gears) toward the sliding gear(s).

TROUBLESHOOTING TRANSMISSION PROBLEMS

Less than 50% engagement of the gear dogs and slots can eventually cause the gears to separate under load, which will in turn bend the shift fork that moves the sliding gear. This will lead to frequent gear disengagement. The normal correction procedure is to replace the shift fork, sliding gear, and corresponding spinning gear. Check the guide bar for bends (straighten or replace) and shift drum fork groove for scoring or chips (replace if any noticeable damage). Be sure to replace all circlips with new ones, and install them with the rounded edge towards the gear. Next, carefully space the transmission. If all damaged parts are not replaced and tramission spacing corrected, the problem will occur again.

IMPORTANT NOTICE: Disengagement can also occur as the axle moves because of insufficient support at one end. If a transmission bearing circlip is left off, if the left-hand drive axle bearing comes loose in the case, or if a bearing retaining plate becomes bent, then additional parts must be checked and possibly replaced.

MOTORCYCLE	DATE	BUL

PARTS INFORMATION

ID (mm)	OD (mm)	THICKNESS (mm)	PART NUMBER
[illegible]	[illegible]	[illegible]	[illegible]
15.2	30.0	0.4	164-17427-00-04
15.2	30.0	0.6	164-17427-00-06
15.2	30.0	0.8	164-17427-00-08
15.2	30.0	1.0	164-17427-00-10
15.2	30.0	1.2	164-17427-00-12
[illegible]	[illegible]	[illegible]	[illegible]
17.0	26.0	0.6	156-17427-00-06
17.0	26.0	0.7	156-17427-00-07
17.0	26.0	0.8	156-17427-00-08
17.5	26.0	1.0	90201-17255-00
17.5	28.0	0.6	90201-17327-00
[illegible]	[illegible]	[illegible]	[illegible]
20.0	25.0	1.0	90201-20266-00
20.2	30.0	1.5	90201-20278-00
20.2	30.1	1.0	90201-20276-00
20.2	33.0	0.6	137-17427-00-06
20.2	33.0	0.9	137-17427-00-09
[illegible]	[illegible]	[illegible]	[illegible]
25.0	32.0	1.0	90201-25490-00
25.0	34.0	0.3	168-17428-01-03
25.0	34.0	0.5	168-17428-01-05
25.1	31.0	0.1	156-17417-00-01
25.1	31.0	0.2	156-17417-00-02
[illegible]	[illegible]	[illegible]	[illegible]
25.4	37.0	6.0	170-16154-02-00
26.2	34.0	1.0	256-17236-00-10
26.2	34.0	1.2	256-17236-00-12
27.2	34.0	1.0	90201-27349-00
28.2	34.0	1.0	90201-28665-00
30.0	44.0	0.3	156-11564-00-03

PARTS INFORMATION

ID (mm)	OD (mm)	THICKNESS (mm)	PART NUMBER
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
30.0	44.0	0.7	156-11564-00-07
30.2	36.0	1.0	90201-30398-00
30.2	40.0	2.0	90201-30602-00
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
35.2	45.0	2.0	90201-35668-00