

# Propeller Shafts

## PROPELLER SHAFT ALIGNMENT

All Models

### DESCRIPTION

Propeller shafts are balanced, one piece, tubular shafts with universal joints at each end. Number in vehicle varies: one shaft, two shafts with center bearing, and three shafts in four-wheel drive applications. Location of slip joints varies with model and manufacturer. See Fig. 1.

### INSPECTION

Vibration can come from many sources. Before overhauling driveline, other sources of possible vibration should be checked first.

**Tires and Wheels** — Check tire inflation and wheel balance. Check for foreign objects in tread, damaged tread, mismatched tread patterns or incorrect tire size.

**Center Bearing** — Tighten drive shaft center bearing mounting bolts. If bearing insulator is deteriorated or oil soaked, it should be replaced.

**Engine and Transmission Mountings** — Tighten mounting bolts. If mountings are deteriorated, they should be replaced.

**Propeller Shaft** — Check propeller shaft for damage or dents that could affect balance. Check for undercoating adhering to shafts. If present, shafts should be thoroughly cleaned.

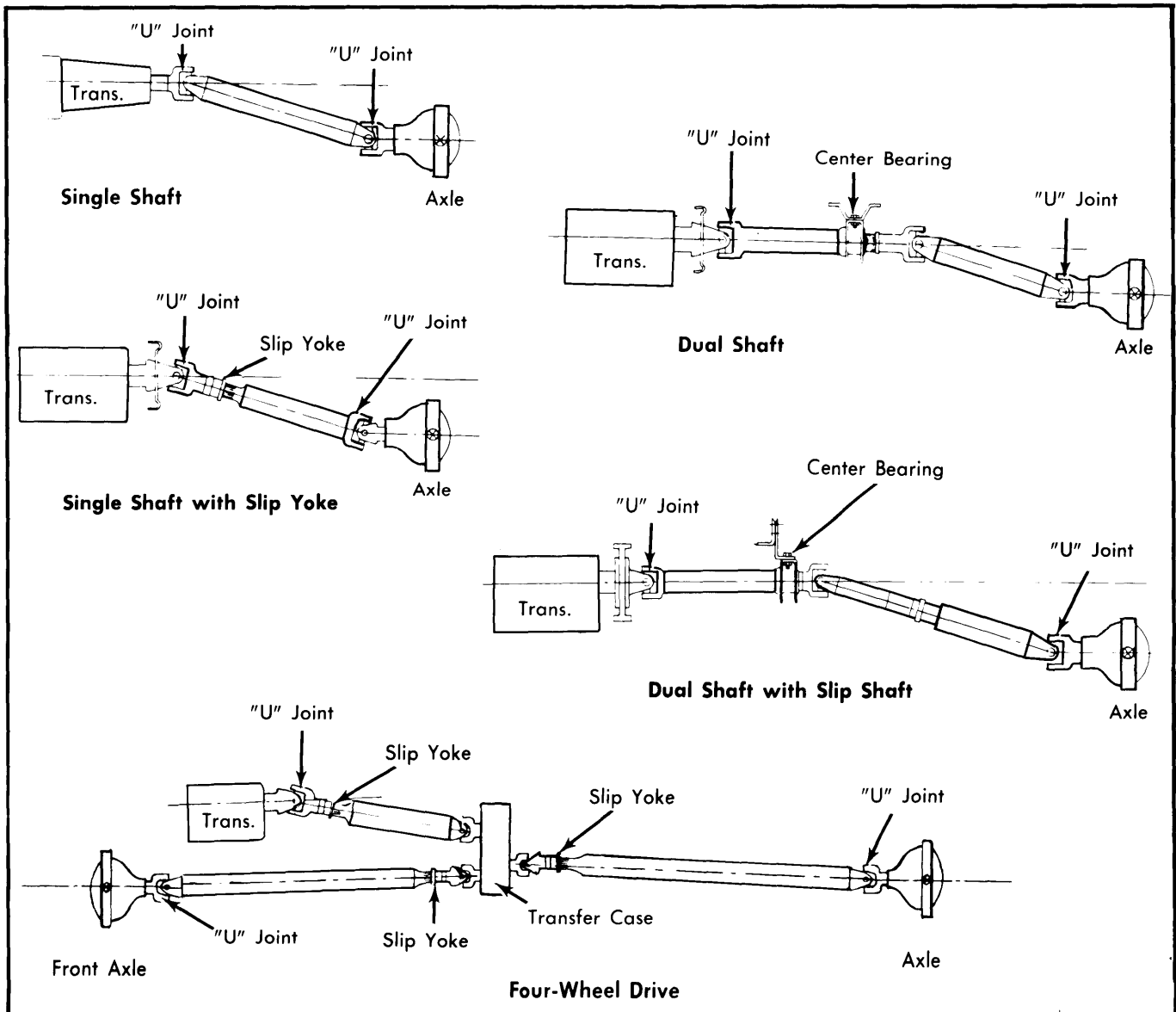


Fig. 1 Five Typical Propeller Shaft Combinations

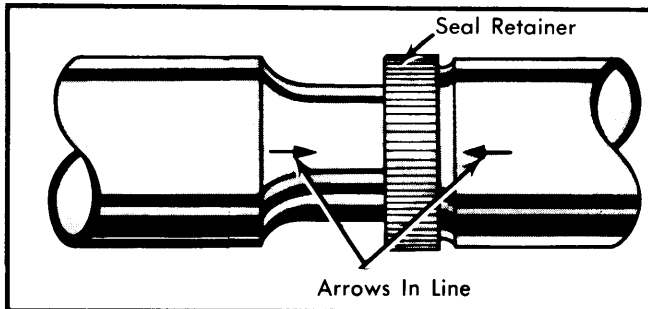
## PROPELLER SHAFT ALIGNMENT (Cont.)

**Universal Joints** — Check for foreign material stuck in joints. Check for loose bolts and worn bearings.

### ADJUSTMENTS

**Propeller Shaft Phasing (Chevrolet & GMC)** — All models with 32 splines use an alignment key and can mate in correct position only. On "C" and "P" models with two piece shafts, proper phasing is accomplished with a alignment key on spline and can mate in correct position only. On "G" and "K" models with two piece shafts, rotate transmission yoke until trunnion is in vertical position. Install front prop shaft with "U" joint trunnion in horizontal position. Install bearing support to crossmember. Align rear prop shaft with "U" joint trunnion to horizontal position and install shaft.

**Propeller Shaft Phasing (All Others)** — Check that flanges on either end of drive shaft are in same plane. Often there are arrows on slip joint and drive shaft to aid in alignment. If flanges are not in same plane, disassemble universal joint and align.



**Fig. 2 View Showing Typical Slide Joint Alignment Arrows**

**Propeller Shaft Balance** — 1) Often propeller shaft imbalance can be cured by disconnecting shaft and rotating it 180° in relation to other components. Test by raising rear wheels off ground and turning shaft with engine.

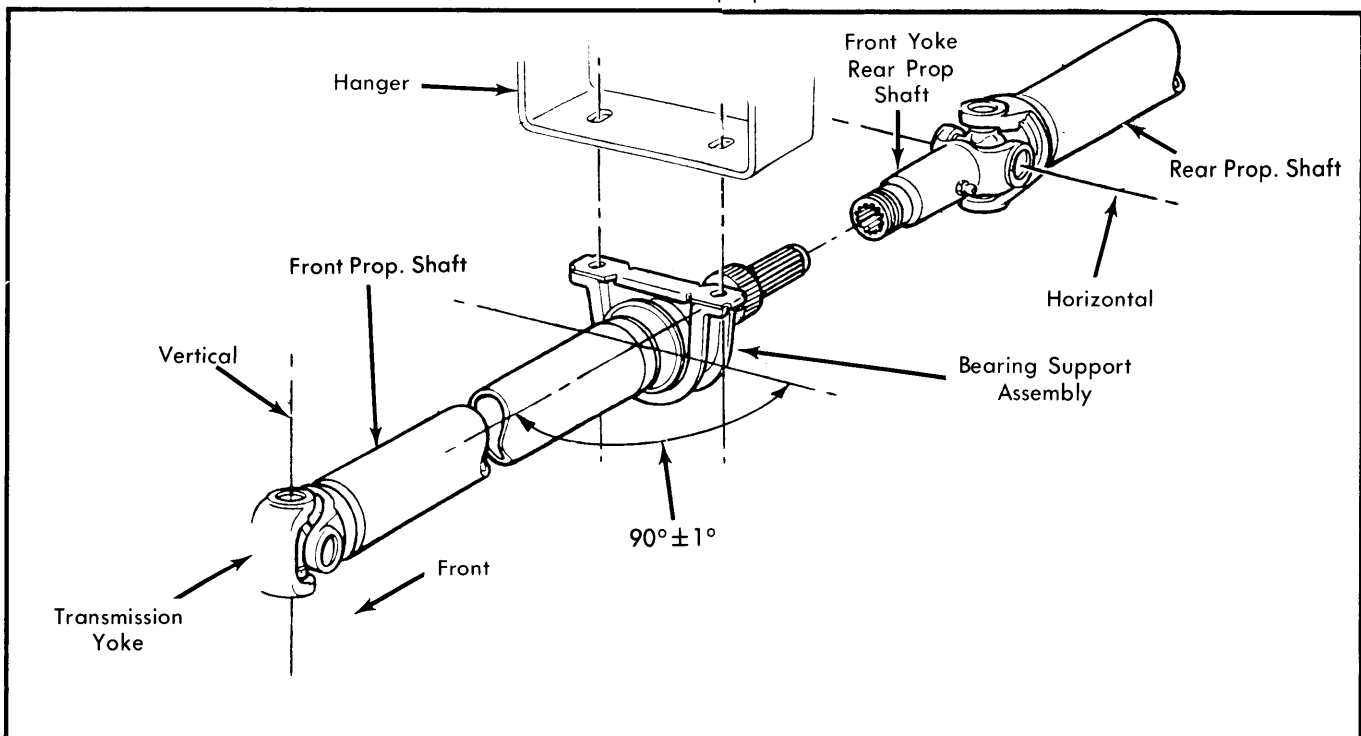
**CAUTION** — Do not run engine with transmission engaged for prolonged periods as overheating of engine or transmission may occur.

2) On most models, balancing may be done by marking shaft in four positions, 90° apart. Place marks approximately 6" forward of weld at rear end of shaft and number marks 1 through 4.

3) Place a screw type hose clamp in No. 1 position and rotate shaft with engine. If there is little or no change, move clamp to No. 2 position and repeat test. Continue procedure until vibration is at lowest level. If no difference is noted with clamp moved to all four positions, vibrations may not be propeller shaft imbalance.

4) If vibration is lessened but not completely gone, place two clamps at that point and run test again. The combined weight of clamps in one position may worsen vibration. If so, rotate clamps 1/2" apart, above and below best position, and repeat test. Continue to rotate clamps as necessary until vibration is at lowest point.

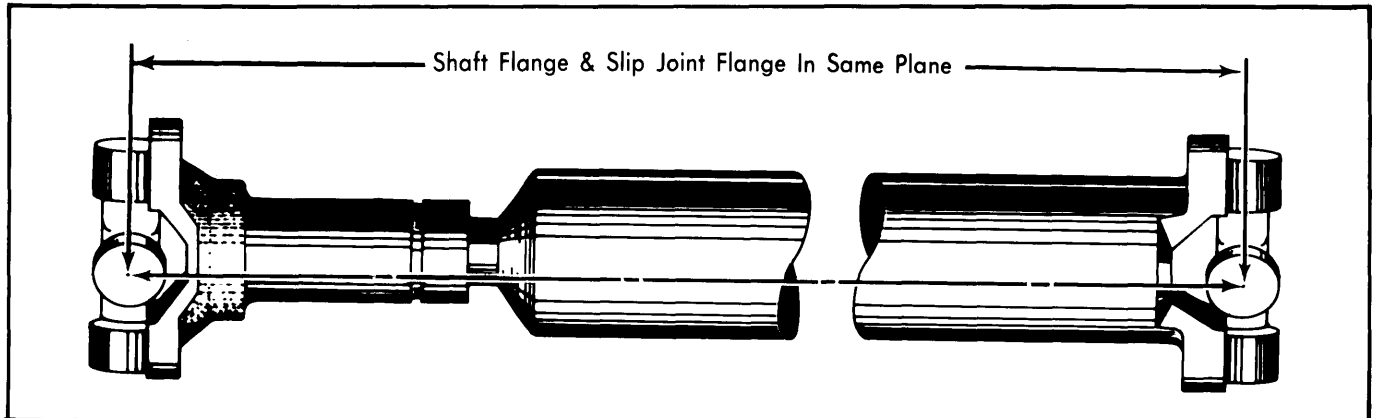
5) When point is reached where vibration has been eliminated, bend end of clamp so it will not loosen. If vibration level is still unacceptable, repeat procedure at front end of propeller shaft.



**Fig. 3 Propeller Shaft Phase Alignment Chevrolet and GMC Models ("G" & "K" Two Piece Shaft)**

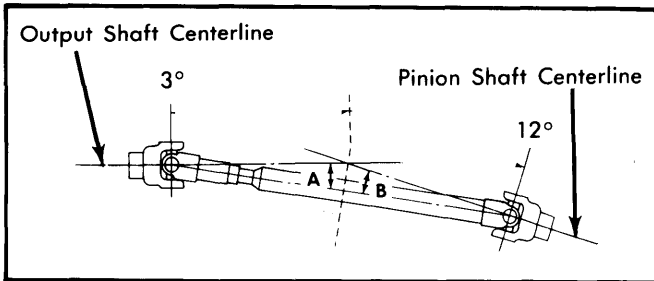
# Propeller Shafts

## PROPELLER SHAFT ALIGNMENT (Cont.)



**Fig. 4 View Showing Propeller Shaft Phase Alignment**

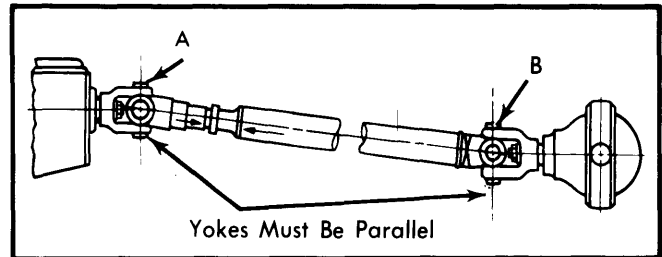
**Flange Alignment & Runout** — 1) All flanges must be perpendicular in both vertical and horizontal planes to engine crankshaft. The only exception is "broken back" type driveline which has flanges that are not perpendicular in vertical plane. See Fig. 5.



**Fig. 5 View Showing Typical "Broken Back" Type Propeller Shaft Alignment**

2) With nonparallel or "broken back" type installation, working angles of universal joints of a given drive shaft are equal. See Fig. 7. Angle A = Angle B. This is calculated as follows: Angle of output shaft centerline is subtracted from angle of drive shaft. Difference should equal angle of drive shaft subtracted from pinion shaft angle.

3) Parallel type joints maintain a constant velocity between output shaft and pinion shaft. Vibration is minimized and component life maximized when universal joints are parallel.

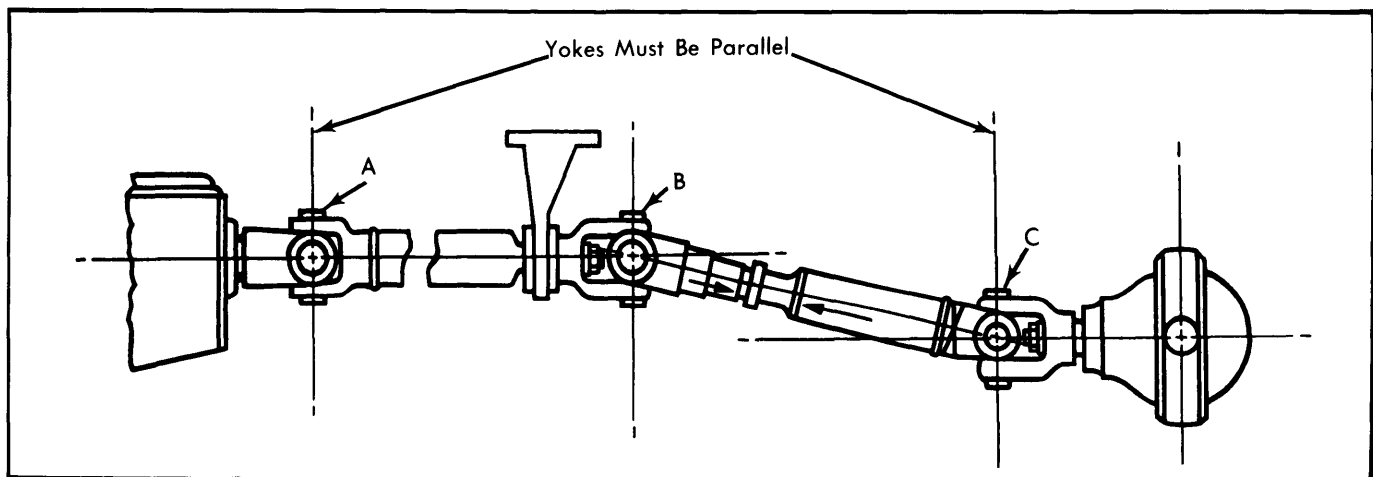


**Fig. 7 View Showing One-Piece Shaft Flange Alignment**

4) Using dial indicator, measure runout of transmission flange, center bearing flange, and pinion flange. If runout exceeds .003-.005", replace flange. If dial indicator cannot be used, push a rod with a slip fit through flange bearing bore and see if it aligns with opposite bore. If not, replace flange.

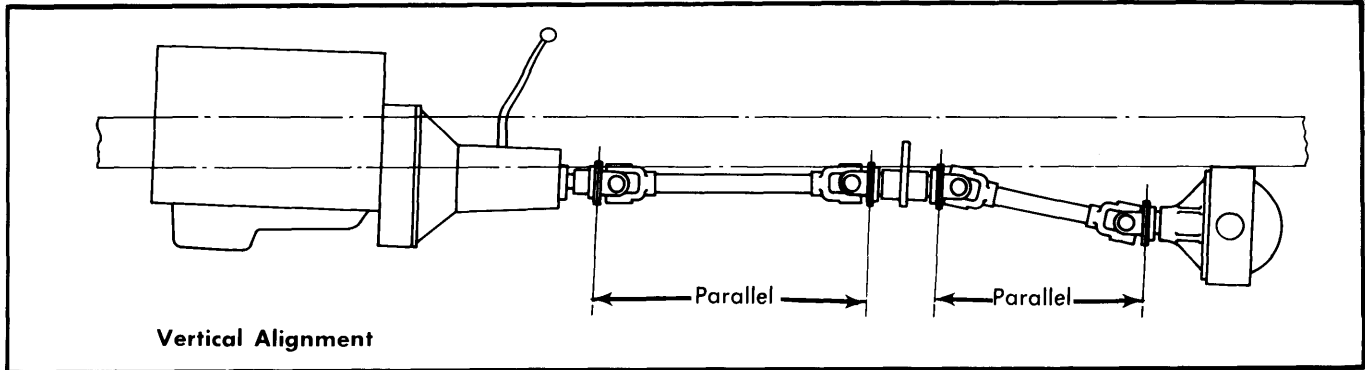
5) Rotate transmission flange until it is vertical, measuring from side. Check center bearing and pinion flanges; they cannot be more than 1° off vertical.

**NOTE** — See *Propeller Shaft Phasing* in this Section.

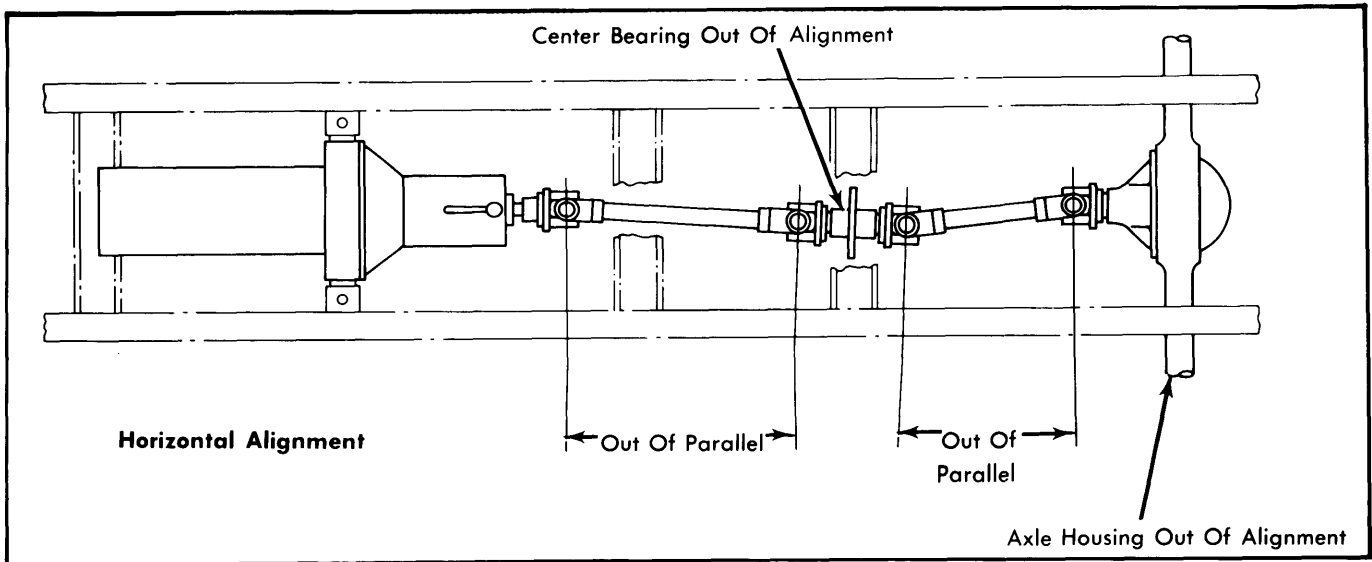


**Fig. 6 View Showing Two-Piece Shaft Flange Alignment**

## PROPELLER SHAFT ALIGNMENT (Cont.)



**Fig. 8 View Showing Propeller Shaft Vertical Alignment**



**Fig. 9 View Showing Propeller Shaft Horizontal Alignment**

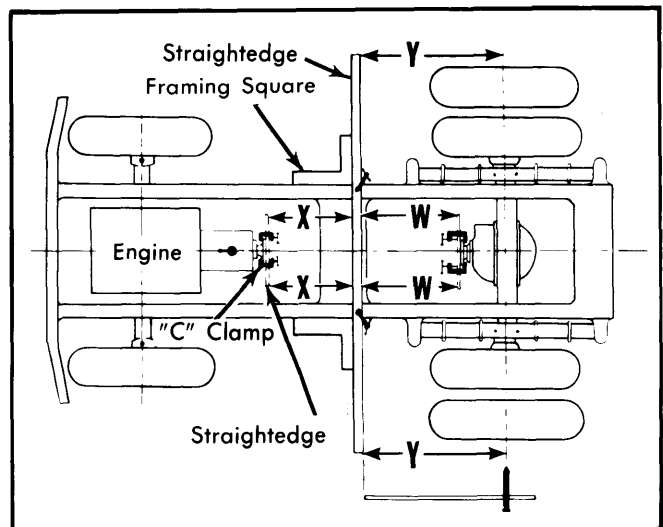
6) Rotate transmission flange until it is vertical, measuring from side. Then measure angle from end and record. Check all other flanges for same angle. They must be within  $\frac{1}{2}^\circ$  of each other. Adjust as required.

7) If difficulty is encountered when making above adjustments, horizontal alignment should be checked. As shown in illustration, even though vertical alignment is correct, horizontal alignment can be badly out of adjustment especially after major component replacement or serious accident.

8) To make horizontal alignment checks, set up straightedges as shown in Fig. 10. With transmission flange horizontal, clamp a straightedge to it, so that straightedge is horizontal. Do the same with pinion flange. Using a straightedge that is 12" longer than rear wheel track, clamp it to frame side rails using large framing squares to align.

9) Measure distance "X". If two dimensions are not within  $\frac{1}{16}$ " of each other, transmission flange is misaligned horizontally. Measure distance "W". If two dimensions are not within  $\frac{1}{16}$ " of each other, pinion flange is misaligned horizontally. Measure

distance "Y", from edge of straightedge to center of axle shaft. If two dimensions are not within  $\frac{1}{8}$ " of each other, axle housing is misaligned.



**Fig. 10 Correct Procedure to Check Horizontal Alignment**