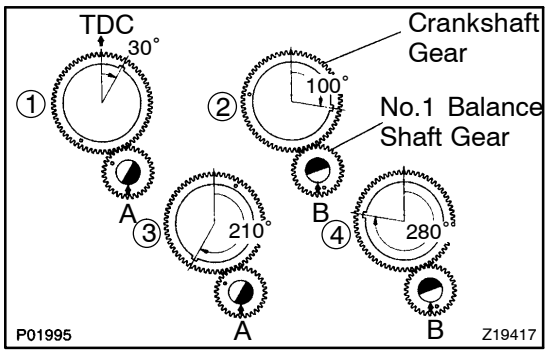
BALANCE SHAFT BACKLASH

EM082–06

ON–VEHICLE INSPECTION

1. **REMOVE OIL PAN AND OIL STRAINER (See page LU–7)**



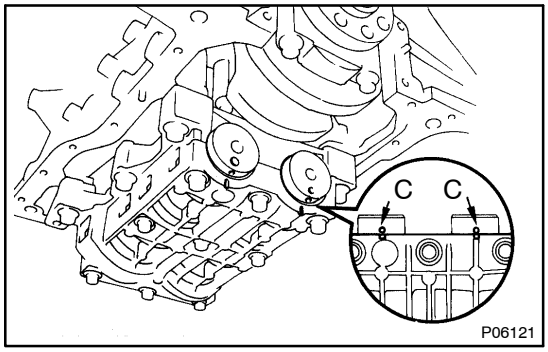
2. **INSPECT BACKLASH OF CRANKSHAFT GEAR AND NO.1 BALANCE SHAFT GEAR**

NOTICE:

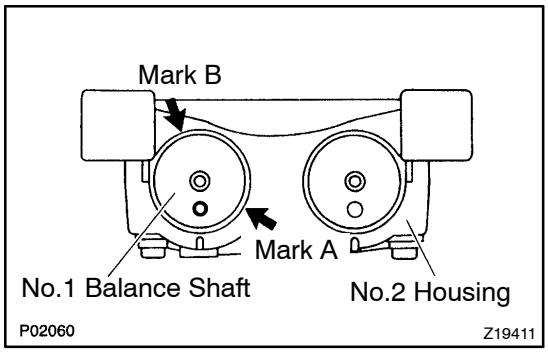
Backlash between the crankshaft gear and No.1 balance shaft gear varies with the rotation of the balance shaft and the deviation of the crankshaft gear. Accordingly, it is necessary to measure the backlash at the 4 points shown in the illustration on the left.

(a) Turn the crankshaft 2 or 3 times to settle the crankshaft gear and No.1 balance shaft gear.

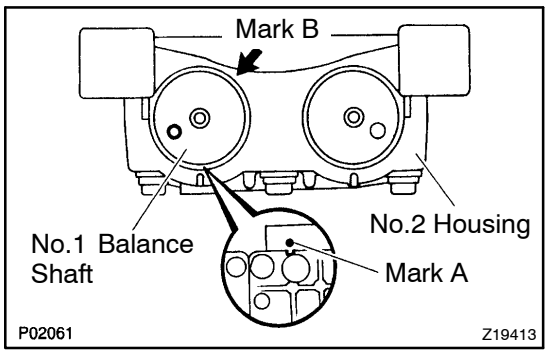
(b) When No.1 piston is at TDC, check that the punch marks C shown in the illustration of the balance shafts are aligned with the grooves of the No.2 housing.

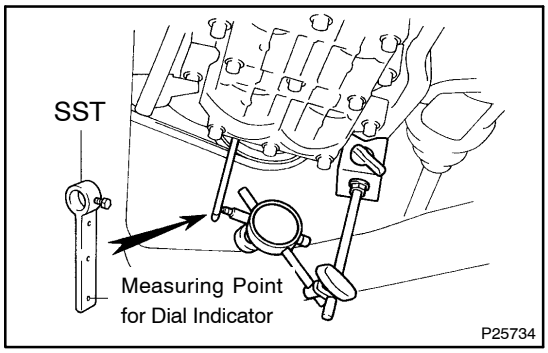


(c) Check that punch marks A and B are at the positions on the No.1 balance shaft indicated in the illustration.



(d) First turn the crankshaft clockwise, and align the groove of the No.2 balance shaft housing with punch mark A of the No.1 balance shaft.

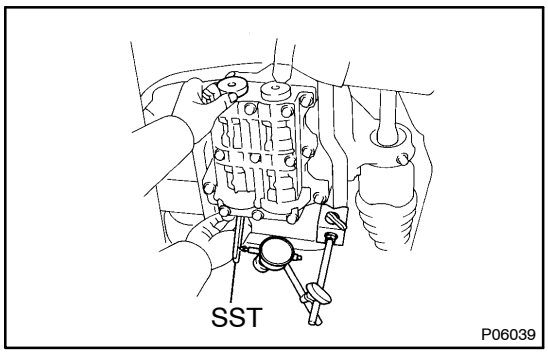




(e) Set SST and a dial indicator as shown in the illustration.
SST 09224–74010

HINT:

Make sure that the stem of the dial indicator is perpendicular to the SST and that it is placed in the middle of the 3rd indentation.



(f) Lightly turn the No.1 balance shaft by hand until resistance is felt, and measure the backlash.

HINT:

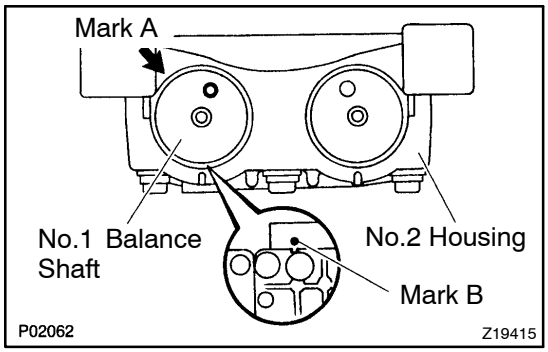
- Turn the No.1 balance shaft 4 or 5 times to provide a steady backlash reading.
- To prevent excessive backlash due to thrust clearance, measure the backlash while pressing on the rear of the No.1 balance shaft.

Standard backlash (at punch mark A):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)

NOTICE:

Do not turn the No.1 balance shaft strongly.

(g) Remove the dial indicator and SST.



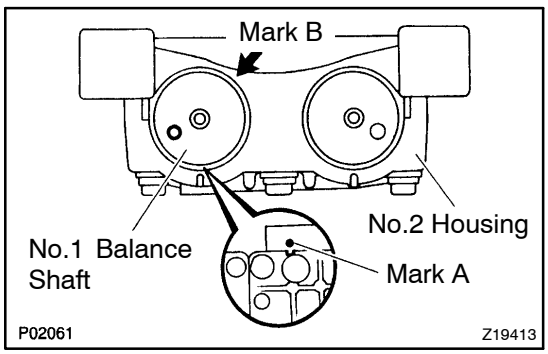
(h) Turn the crankshaft clockwise to align the groove of the No.2 housing with punch mark B.

(i) Set the dial indicator. (See step (e))

(j) Measure the backlash. (See step (f))

Standard backlash (at punch mark B):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)

(k) Remove the dial indicator.



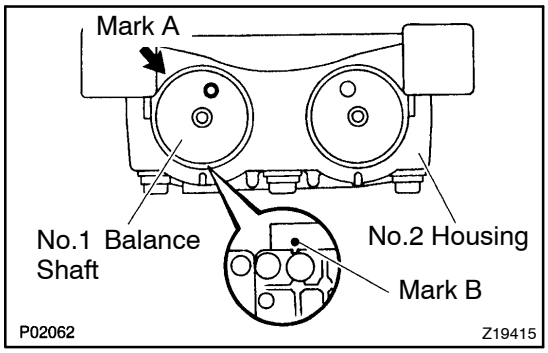
(l) Turn the crankshaft clockwise again to align the groove of the No.2 housing with punch mark A.

(m) Set the dial indicator. (See step (e))

(n) Measure the backlash. (See step (f))

Standard backlash (at punch mark A):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)

(o) Remove the dial indicator.

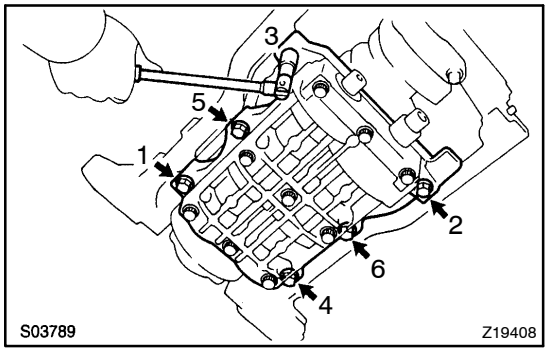


(p) Turn the crankshaft clockwise again to align the groove of the No.2 housing with punch mark B.
(q) Set the dial indicator. (See step (e))
(r) Measure the backlash. (See step (f))
Standard backlash (at punch mark B):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)
(s) Remove the dial indicator.

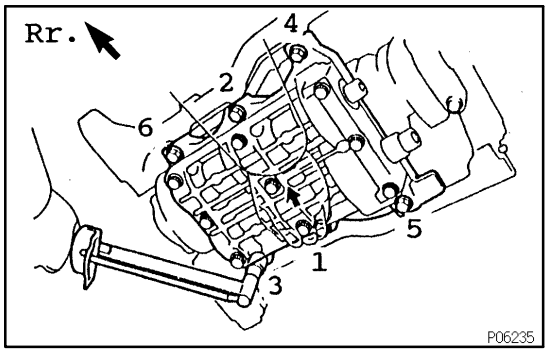
If even one of the 4 points measured above exceeds the backlash specification, adjust the backlash with new spacers.

NOTICE:
Use the same size spacers for both the left and right sides.

HINT:
- Varying the spacer thickness by 0.02 mm (0.0008 in.) changes the backlash by about 0.042 mm (0.0017 in.).
- If the backlash is greater than the permitted maximum, select a thinner shim.
- If the backlash is less than the specification, select a thicker shim.



3. REPLACE NEW SPACERS
(a) Uniformly loosen the 6 bolts in the sequence shown.
(b) Replace the spacers with new ones.



4. TIGHTEN BALANCE SHAFT ASSEMBLY
While pulling the center part of the engine balancer in the direction of the arrow, uniformly tighten the 6 bolts in several passes, in the sequence shown.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

5. INSPECT AND ADJUST BACKLASH OF CRANKSHAFT GEAR AND NO.1 BALANCE SHAFT GEAR (See step 2)

6. REINSTALL OIL STRAINER AND OIL PAN (See page LU–13)

Adjusting Spacer Selection Chart (On–Vehicle)

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
0.000 – 0.017 (0.0000 – 0.0007)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39				
0.018 – 0.038 (0.0008 – 0.0015)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39			
0.039 – 0.059 (0.0016 – 0.0023)	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39		
0.060 – 0.100 (0.0024 – 0.0039)																																								
0.101 – 0.121 (0.0040 – 0.0047)		01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39
0.122 – 0.142 (0.0048 – 0.0056)			01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37
0.143 – 0.163 (0.0057 – 0.0064)				01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37
0.164 – 0.184 (0.0065 – 0.0072)					01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35
0.185 – 0.205 (0.0073 – 0.0081)						01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35
0.206 – 0.226 (0.0082 – 0.0089)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33
0.227 – 0.247 (0.0090 – 0.0097)								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33
0.248 – 0.268 (0.0098 – 0.0105)									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31
0.269 – 0.289 (0.0106 – 0.0114)										01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31
0.290 – 0.310 (0.0115 – 0.0122)											01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29
0.311 – 0.331 (0.0123 – 0.0130)												01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29
0.332 – 0.352 (0.0131 – 0.0138)													01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27
0.353 – 0.373 (0.0139 – 0.0147)														01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27
0.374 – 0.394 (0.0148 – 0.0155)															01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25
0.395 – 0.415 (0.0156 – 0.0163)																01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25
0.416 – 0.436 (0.0164 – 0.0172)																	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23
0.437 – 0.457 (0.0173 – 0.0180)																		01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23
0.458 – 0.478 (0.0181 – 0.0188)																			01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21
0.479 – 0.499 (0.0189 – 0.0196)																				01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21
0.500 – 0.520 (0.0197 – 0.0205)																					01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19
0.521 – 0.541 (0.0206 – 0.0213)																						01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19
0.542 – 0.562 (0.0214 – 0.0221)																							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17
0.563 – 0.583 (0.0222 – 0.0230)																								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17
0.584 – 0.604 (0.0231 – 0.0238)																									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15
0.605 – 0.625 (0.0239 – 0.0246)																										01	01	03	03	05	05	07	07	09	09	11	11	13	13	15
0.626 – 0.646 (0.0247 – 0.0254)																											01	01	03	03	05	05	07	07	09	09	11	11	13	13
0.647 – 0.667 (0.0255 – 0.0263)																												01	01	03	03	05	05	07	07	09	09	11	11	13
0.668 – 0.688 (0.0264 – 0.0271)																													01	01	03	03	05	05	07	07	09	09	11	11
0.689 – 0.709 (0.0272 – 0.0279)																														01	01	03	03	05	05	07	07	09	09	11
0.710 – 0.730 (0.0280 – 0.0287)																															01	01	03	03	05	05	07	07	09	09
0.731 – 0.751 (0.0288 – 0.0296)																																01	01	03	03	05	05	07	07	09
0.752 – 0.772 (0.0297 – 0.0304)																																	01	01	03	03	05	05	07	07
0.773 – 0.793 (0.0305 – 0.0312)																																		01	01	03	03	05	05	07
0.794 – 0.814 (0.0313 – 0.0320)																																			01	01	03	03	05	05
0.815 – 0.835 (0.0321 – 0.0329)																																				01	01	03	03	05
0.836 – 0.856 (0.0330 – 0.0337)																																					01	01	03	03
0.857 – 0.877 (0.0338 – 0.0345)																																						01	01	03
0.878 – 0.898 (0.0346 – 0.0354)																																							01	01
0.899 – 0.919 (0.0355 – 0.0362)																																								01

Standard backlash (at punch mark A):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)
EXAMPLE: The No.25 spacers are installed,
and the measured backlash is 0.342 mm (0.0135 in.).
Replace the No.25 spacers with new No.13 spacers.

New spacer thickness mm (in.)

No.	Thickness	No.	Thickness	No.	Thickness	No.	Thickness
01	1.74 (0.0685)	11	1.84 (0.0724)	21	1.94 (0.0764)	31	2.04 (0.0803)
03	1.76 (0.0693)	13	1.86 (0.0732)	23	1.96 (0.0772)	33	2.06 (0.0811)
05	1.78 (0.0701)	15	1.88 (0.0740)	25	1.98 (0.0780)	35	2.08 (0.0819)
07	1.80 (0.0709)	17	1.90 (0.0748)	27	2.00 (0.0787)	37	2.10 (0.0827)
09	1.82 (0.0717)	19	1.92 (0.0756)	29	2.02 (0.0795)	39	2.12 (0.0835)

V01048