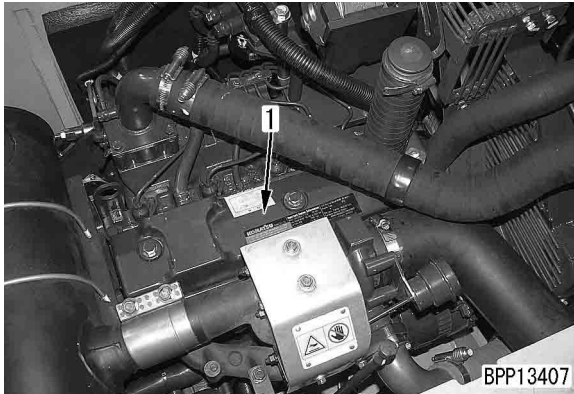


ADJUSTING VALVE CLEARANCE

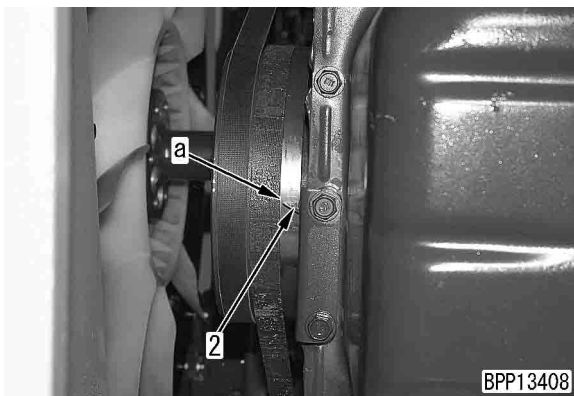
★ Adjusting instrument for valve clearance

Symbol	Part No.	Part name
B	Commercially available	Feeler gauger

1. Open the engine hood and remove all cylinder head covers (1).



2. Remove the engine undercover (on the radiator side).
3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
 - ★ Crank the crankshaft with the crank pulley mounting bolt.
 - ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
 - ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



4. While the No. 1 cylinder is at the compression top dead center, adjust the valve clearances marked with ● in the valve arrangement drawing according to the following procedure.

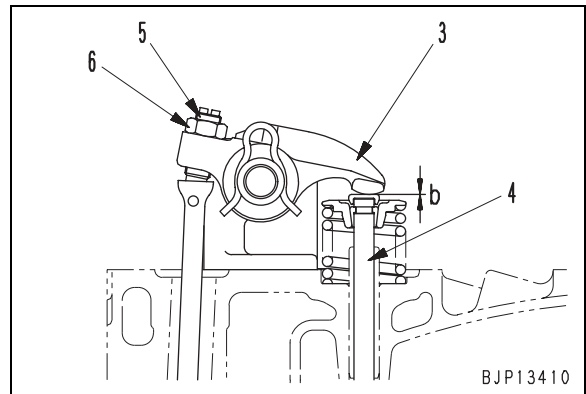
No.	1	2	3	4
EX	●	●	○	○
IN	●	○	●	○

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
- 1) Insert feeler gauge **B** in clearance (b) between rocker arm (3) and valve stem (4) and adjust the clearance with adjustment screw (5).
- 2) Secure adjustment screw (5) and tighten locknut (6).

⚙️ Locknut: **39.2 – 49 Nm {4 – 5 kgm}**

- ★ After tightening the locknut, check the valve clearance again.
- ★ After adjusting all of the valves marked with ●, go to the next procedure.



5. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 4 cylinder to the compression top dead center.

6. While the No. 4 cylinder is at the compression top dead center, adjust the valve clearances marked with ○ in the valve arrangement drawing.
 - ★ Adjust the valve clearance according to step 4 above.
7. After finishing adjustment, return the removed parts.
 -  Cylinder head cover mounting bolt:
7.84 – 9.8 Nm {0.8 – 1.0 kgm}

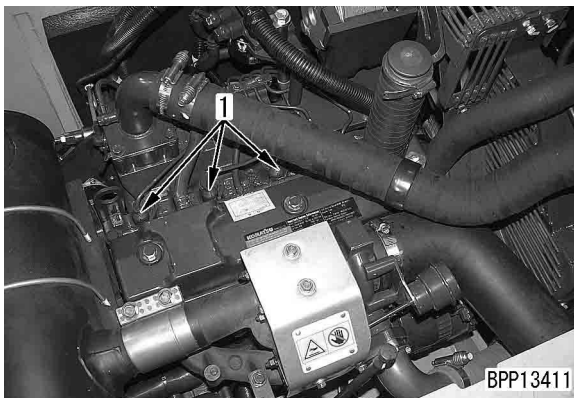
MEASURING COMPRESSION PRESSURE

★ Measuring instruments for compression pressure


Symbol	Part No.	Part name
C	795-502-1205	Compression gauge
	795-502-1370	Adapter
	6204-11-3880	Gasket

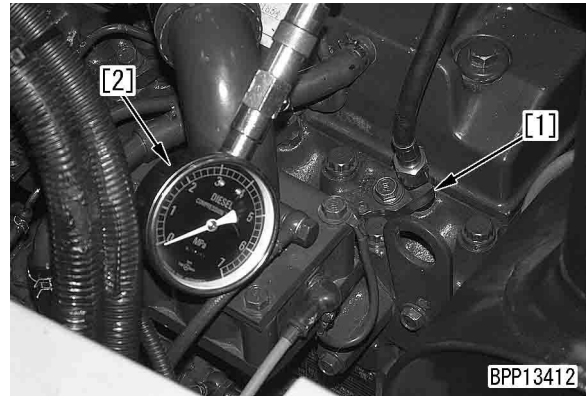
★ When measuring the compression pressure, take care not to burn yourself on the exhaust manifold, muffler, etc. or get caught in a rotating part.

1. Adjust the valve clearance.
 - ★ See Adjusting valve clearance.
2. Warm up the engine until the engine oil temperature is 40 – 60°C.
3. Prepare for measuring the engine speed.
 - ★ See Testing and adjusting engine speed.
4. Open the engine hood and remove nozzle holder (1) of the cylinder to measure the compression pressure.

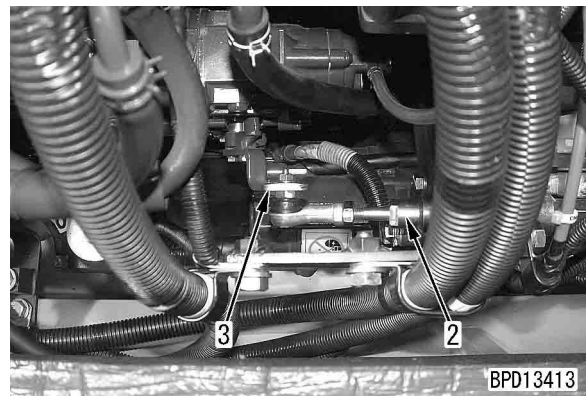


5. Install adapter [1] of compression gauge C to the mounting part of the nozzle holder and connect gauge [2].
 - ★ Install the gasket to the end of the adapter.
 - ★ Secure the adapter with the clamping holder and mounting bolt for the nozzle holder.

 Mounting bolt: **39.2 – 49 Nm {4 – 5 kgm}**



6. Remove governor spring (2).
7. Put governor lever (3) of the fuel injection pump to the STOP side stopper and fix it.



8. Crank the engine with the starting motor and measure the compression pressure.
 - ★ Read the compression gauge when its pointer is stabilized.
 - ★ When measuring the compression pressure, measure the engine speed, too, and check that it is in the measurement condition range.
9. After finishing measurement, remove the measuring instruments and return the removed parts.
 - ★ Check that the fulcrum of the clamping holder for the nozzle holder is seated on the cylinder head, and then tighten the mounting bolt.

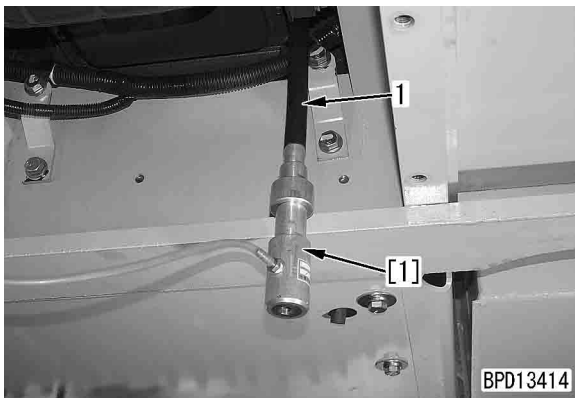
 Mounting bolt: **39.2 – 49 Nm {4 – 5 kgm}**

MEASURING BLOW-BY PRESSURE

★ Measuring instruments for blow-by pressure

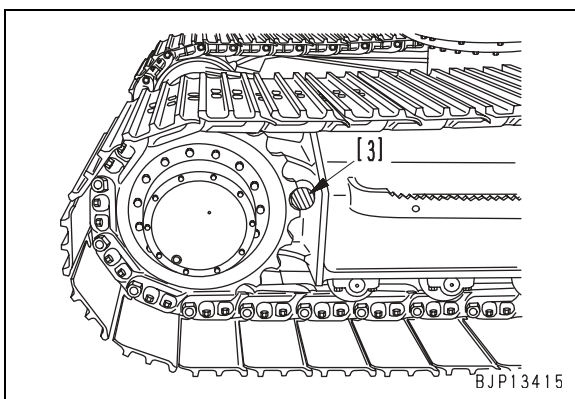
Symbol	Part No.	Part name
D	799-201-1504	Blow-by checker

1. Remove the engine undercover (on the flywheel side).
2. Install nozzle [1] of blow-by checker C to the end of blow-by hose (1) and connect it to gauge [2].



3. Start the engine and lock the travel mechanism.

⚠ Put pin [3] between the sprocket and track frame to lock the travel mechanism securely.



4. Start the engine and warm it up to the operating range.
 - Engine coolant temperature: Within operating range
 - Hydraulic oil temperature: 45 – 55°C

5. Run the engine at high idling and measure the blow-by pressure.
 - Working mode: A
 - Work equipment, swing, and travel circuit: Relieve the travel circuit.



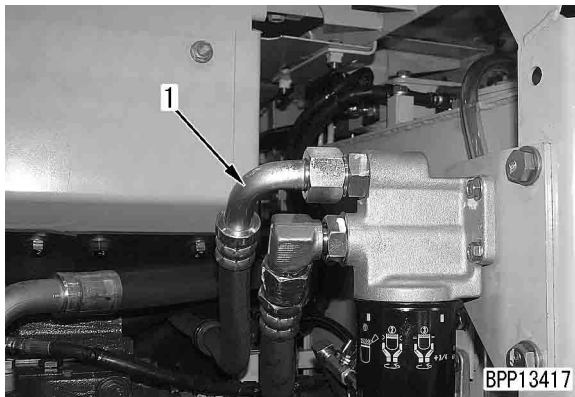
6. After finishing measurement, remove the measuring instruments and return the removed parts.

MEASURING ENGINE OIL PRESSURE

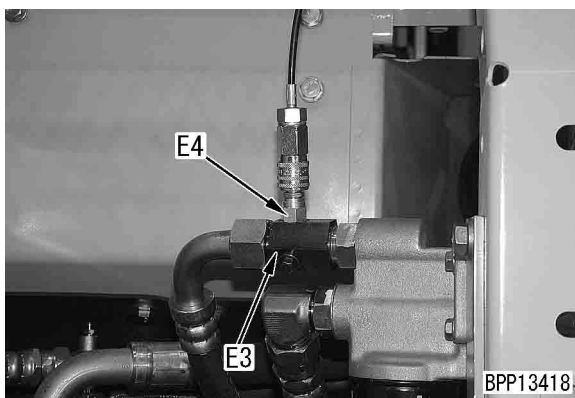
★ Measuring instruments for engine oil pressure

Symbol	Part No.	Part name	
E	1	799-101-5002	Hydraulic tester
		790-261-1203	Digital hydraulic tester
	2	799-401-2320	Hydraulic tester
	3	799-401-3500	Adapter (Size: 06)
	4	799-101-5220	Nipple (10 x 1.25 mm)
		07002-11023	O-ring

1. Open the pump room cover and disconnect outlet hose (1) of the engine oil filter.



2. Install adapter **E3** and connect the disconnected hose again.
3. Install nipple **E4** and connect it to hydraulic tester **E2**.



4. Start the engine and heighten the engine coolant temperature to the operating range.

5. Measure the oil pressure during low idling and high idling.



6. After finishing measurement, remove the measuring instruments and return the removed parts.

TESTING AND ADJUSTING FOR FUEL INJECTION TIMING

★ Testing and adjusting instruments for fuel injection timing (for delivery valve method)

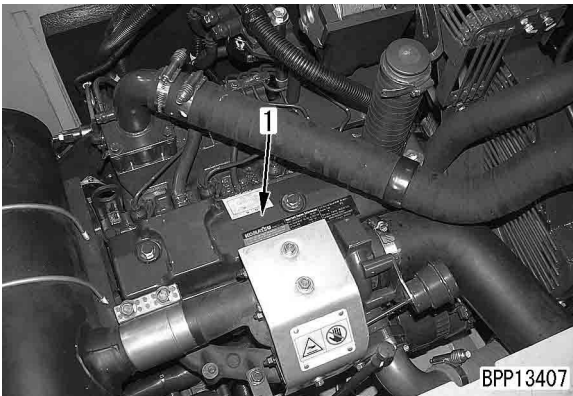
Symbol	Part No.	Part name
F	1	795-102-2103 Spring pusher
	2	Commercially available Dial gauge

TESTING AND ADJUSTING BY MATCH MARK METHOD

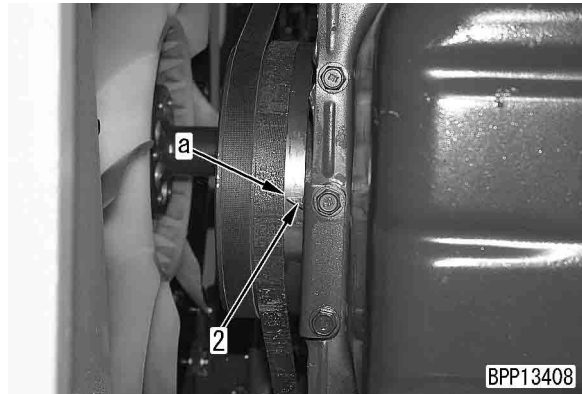
★ After removing and installing the fuel injection pump without repairing it or when only checking the injection timing, test and adjust the injection timing according to the following procedure.

TESTING

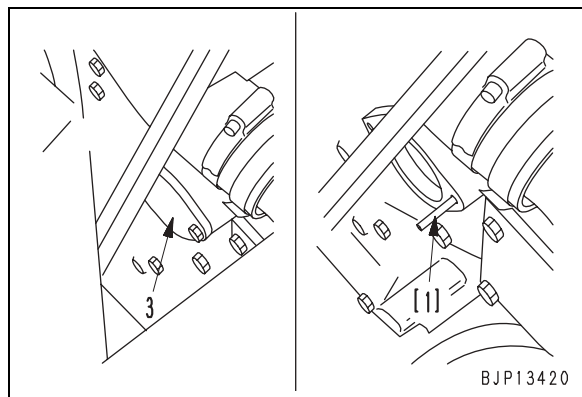
1. Open the engine hood and remove all cylinder head covers (1).



2. Remove the engine undercover (on the radiator side).
3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
 - ★ Crank the crankshaft with the crank pulley mounting bolt.
 - ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
 - ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



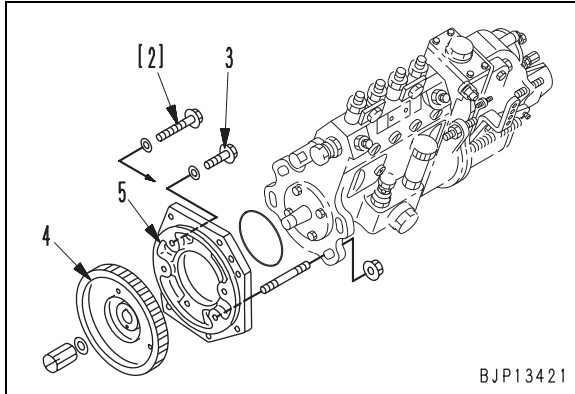
4. Remove cover (3) of the fuel injection pump drive shaft.
5. Insert pin [1] in the mounting bolt hole of the front cover (on the outside of the engine) to check the fuel injection timing.
 - ★ Use a pin 4.0 – 4.5 mm in diameter and about 80 mm in length.
 - ★ If the pin enters smoothly to inside of the drive gear of the fuel injection pump, the fuel injection timing is normal. In this case, return the removed parts.
 - ★ If the pin touches the drive gear of the fuel pump, the fuel injection timing is abnormal. In this case, adjust the fuel injection timing.




ADJUSTING


- ★ If the fuel injection timing is abnormal, adjust it according to the following procedure.
1. Remove the fuel pump, holder, and drive gear together.
 - ★ See DISASSEMBLY AND ASSEMBLY, Removal, installation of fuel pump assembly.

2. Remove bolt (3) and fix drive gear (4) to holder (5) with fixing bolt [2].
 - ★ As fixing bolt [2], use a bolt 6 mm in thread diameter and 35 mm in length.
 - ★ Pass the fixing bolt through the screw hole of bolt (3) and tighten it into the screw hole of the drive gear, and the fuel injection pump is fixed in the fuel injection timing.



3. Install the fuel injection pump, holder, and drive gear together.
 - ★ See DISASSEMBLY AND ASSEMBLY, Removal, installation of fuel pump assembly.
 - ★ After installing the fuel injection pump temporarily, check the fuel injection timing according to the above described procedure.
4. After finishing adjustment, remove the measuring tools and return the removed parts.

 Be sure to remove pin [1] and fixing bolt [2].

 Cylinder head cover mounting bolt:
7.84 – 9.8 Nm {0.8 – 1.0 kgm}

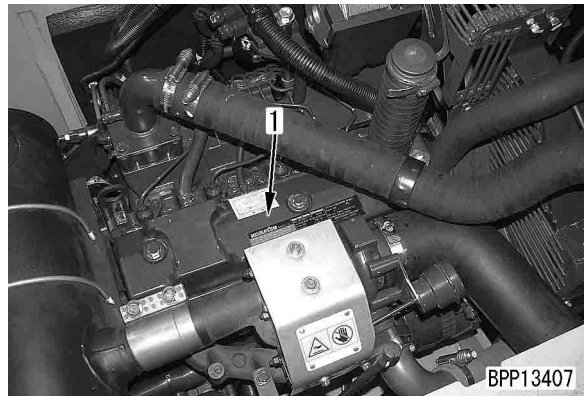
ADJUSTING BY DELIVERY VALVE METHOD

- ★ After repairing or replacing the fuel injection pump or timing gear, adjust the injection timing according to the following procedure.

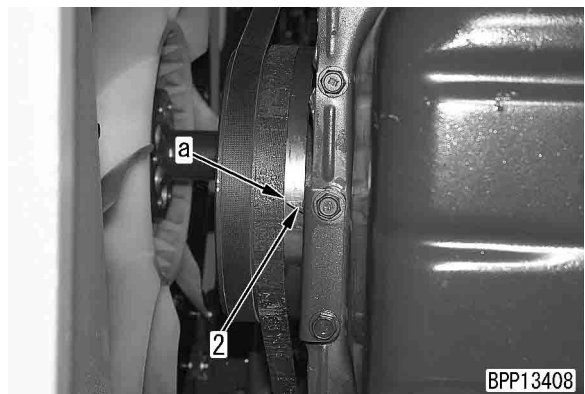
ADJUSTING

- ★ Apply the delivery valve method to only adjustment of the injection timing.

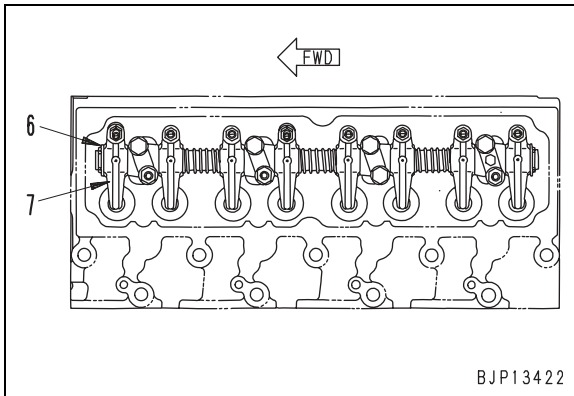
1. Open the engine hood and remove all cylinder head covers (1).



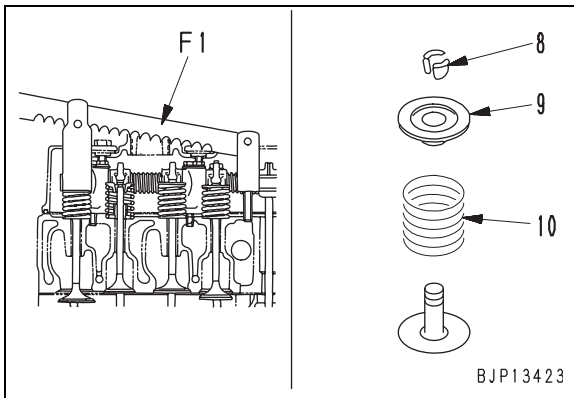
2. Remove the engine undercover (on the radiator side).
3. Rotate the crankshaft forward to bring the stamped "1.4TOP" line (a) of the crank pulley to pointer (2) and set the No. 1 cylinder to the compression top dead center.
 - ★ Crank the crankshaft with the crank pulley mounting bolt.
 - ★ There are 2 stamped "1.4TOP" lines on the crank pulley. Use the one at the diagonal position of "2.3TOP".
 - ★ When the No. 1 cylinder is at the compression top dead center, the rocker arm of the No. 1 cylinder can be moved by the valve clearance with the hand. If the rocker arm cannot be moved, the No. 1 cylinder is not at the compression top dead center. In this case, rotate the crankshaft one more turn.



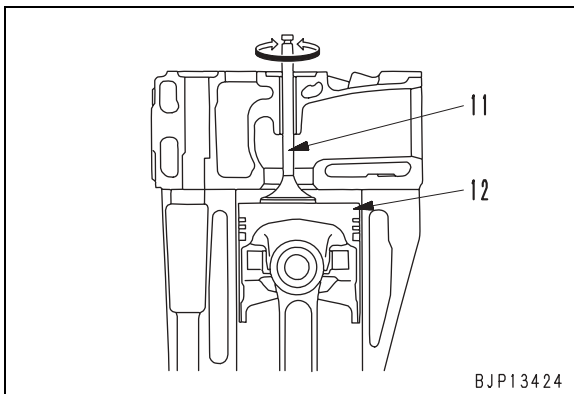
4. Remove snap ring (6) of the rocker arm shaft on the No. 1 cylinder side, and then remove rocker arm (7) of the No. 1 air intake valve.
 - ★ Remove the valve stem cap, too.



5. Using spring pusher **F1**, remove valve cotter (8) of the No. 1 air intake valve.
6. Loosen spring pusher **F1** and remove seat (9) and spring (10).



7. While No. 1 air intake valve (11) is in contact with the top of piston (12), turn the valve stem with the hand to press No. 1 air intake valve (11) against the piston.
 - ★ Since the piston stroke will be measured at the valve stem top, check that the valve bottom is in contact with the piston top securely.



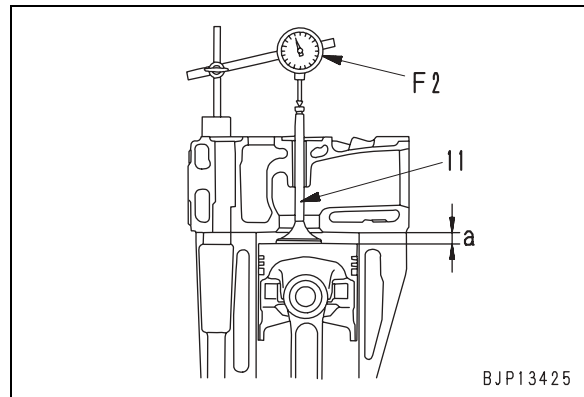
8. Install dial gauge **F2** on the valve stem of No. 1 air intake valve (11) and set it to the 0 point.
 - ★ Since the No. 1 cylinder is at the compression top dead center, set this point as the 0 point.

9. Rotate the crankshaft about 45° in reverse.

10. Rotate the crankshaft forward slowly so that dial gauge **F2** will indicate fuel injection timing dimension (a).

- ★ When adjusting the crankshaft to fuel injection timing dimension (a), be sure to rotate it forward so that the adjustment will not be affected by the backlash of the drive gear. (If the crankshaft passes the adjustment dimension, return it sufficiently, and then adjust it again forward.)
- ★ Fuel injection timing dimension (a) and fuel injection timing

Fuel injection timing dimension (a)	mm	0.42 ± 0.08
Fuel injection timing (Reference)	°	6 ± 0.75



11. Disconnect all of connected fuel injection tubes (12), if there are any.

