



VALCON PLUS V-CAM SYSTEM STEP 1 INSTRUCTION MANUAL

NAME OF PRODUCT	RB26 V-CAM SYSTEM STEP1
USE	AUTOMOBILE PARTS
PART NUMBER	22007-AN002 TYPE A 22007-AN003 TYPE B
MAKE	NISSAN SKYLINE GT-R
ENGINE	RB26DETT
YEAR	AUG. 1989 - DEC. 1994 (BNR32) JAN. 1995 - DEC. 1998 (BCNR33) JAN. 1999 - AUG. 2002 (BNR34)
REMARKS	<ul style="list-style-type: none">• Type A cannot be used with an engine which cylinder head's bottom side is modified.• To install Type B, HKS Forged Piston Kit for RB26DETT is required in addition. (Please see the instruction "Before the Installation" below.)• Additional piping for oil is required to install this product.• The camshaft for the exhaust side is not included in this kit.

NOTICE

This manual assumes that you have and know how to use the tools and equipment necessary to safely perform service operations on your vehicle. This manual assumes that you are familiar with typical automotive systems and basic service and repair procedures. Do not attempt to carry out the operations shown in this manual unless these assumptions are correct. Always have access to a factory repair manual. To avoid injury, follow the safety precautions contained in the factory repair manual.

THIS MANUAL & THIS PRODUCT

This manual indicates items you need to pay attention to in order to install this product safely and lists precautions to avoid any possible damage and/or accidents.

The installation must be done by referring to the factory manual. If the factory manual is not available, please purchase it from the dealer.

To use this product on the public road, follow the necessary procedures if there are any regulations for a tuned vehicle.

HKS will not be responsible for any damage caused by incorrect use or use after modification and/or dismantling of this product.

This product was designed for installation and use on a factory vehicle or a vehicle using other HKS products. The performance and/or safety cannot be guaranteed if this product is installed onto other vehicles than mentioned above.

This product is designed for use in Japan only. It must not be used in any other country.

The specifications of this product, including installation, components, etc are subject to be changed without notice.

This manual is subject to be revised without notice.

PRODUCT CHARACTERISTICS

This product is to add the variable valve timing system to the RB26 engine. This system continuously sets the valve timing to the value which was calculated from the preset map utilizing the engine oil's pressure.

By changing the intake camshaft's valve timing corresponding to the engine conditions, the slip-back of the air-fuel mixture made at low-mid RPM can be reduced; it improves the charging rate in the cylinder and increases the torque. Also, tuning the valve timing and the engine RPM can improve the torque in all RPM level.

The increased combustion gas can raise the boost faster even with a large size turbo.

At idle, the overlap becomes smaller. It stabilizes the combustion, reduces the engine vibration, and produces a cleaner exhaust gas mixture.

Type A was designed to work with Nissan stock pistons. The kit works only by replacing the stock camshaft to HKS V-cam. However, the maximum variable angle was set up to 30°; therefore, Type B shows better torque improvement at low RPM.

The maximum variable angle for Type B was set up to 50°; therefore the pistons must be replaced to HKS Forged Piston Kit. Modification to the cylinder head and/or replacing valve train parts is not necessary.

USAGAE CONDITIONS

WARNING	Over-Revving may cause damage to the engine. Avoid over-revving on downshifts, etc.
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Type A was designed to be installed onto the stock engine. Therefore, if the bottom side of the cylinder head was modified, the cylinder head gasket is thinner, and/or the valve recess is shallower than the stock, Type A cannot be used.

The following parts are required to use Type B: HKS Forged Piston Kit for RB26DETT (P.N. 2103-RN017, etc)

The allowable engine RPM to use the stock valve spring is 8,000 rpm.

The following operations must be done to install this product:

- Measuring the valve timing
- Measuring and adjusting the valve clearance
- Measuring V-P (the clearance between a valve and a piston)

The following operations must be done to preserve the product's performance and safe use:

- Setting the fuel injection volume and ignition timing.
- Correcting the valve timing map



This product adjusts the valve timing by the engine oil's pressure. In any of the following case, the oil pressure is decreased the best fuel injection volume and ignition timing cannot be set:

- The oil pump cannot provide sufficient amount of flow due to too low engine RPM.
- The low viscosity oil is used.
- The oil becomes high temperature. The high temperature oil lowers the viscosity and decreases the oil pressure.
- The engine oil is degraded.
- The abrasion of the oil pump widens the clearance.
- The oil pump inhales air at rapid acceleration or circuit driving.







When the valve timing variable setting is not sufficient, it's recommended to replace the oil pump to the large capacity pump such as HKS Oil Pump Upgrade (P.N.2503-RN001).

This product was developed to improve engine output. Improving engine output may affect the oil and/or water temperature, the oil pressure, and the fuel volume. To preserve engine performance, maintain engine conditions when driving.

PARTS LIST

NO.	PART NUMBER	DESCRIPTIONS	QT	IMAGE	REMARKS
1		Cylinder Head Cover	1		Intake Side
2	G89841-N21010-00	Oil Control Valve (OCV)	1		
3	G89431-N21010-00	Camshaft Angle Sensor	1		
4	91112-155100	Flange Bolt	2		M6 x 14
5	G14532-K00010-00	Adaptor Connector	1		M16-NPT1/8
6	G14539-K00010-00	Oil Filter	1		
7	FCM2001	Straight Connector	1		NPT1/8-AN4
8	G11231-N48010-00	Head Cover Gasket	1		
9	24003-AK001	Oil Filler Cap	1		
10	E11210-K00010-00	Name Plate	1		
11		Camshaft STEP1	1		248 ° -8.6 mm
12	G13574-K00010-00	Flange Bolt w/ Through-hole	1		M12 x 35
13	G14510-N48020-00	Variable Valve Timing Unit A	1		For Type A Only
13	G14510-N48030-00	Variable Valve Timing Unit B	1		For Type B Only
14	G14513-K00010-00	Cover Plate	1		
15	G90191-051001-A2	Extra Low Head Cap Screw	3		M5 x 10
16	G14532-N48020-00	Oil Line Adaptor	1		
17	G14551-N48020-00	Joint Pipe	2		
18	G96216-150055-00	O-ring	4		I.D.φ5.5
19	G14534-N48020-00	Adaptor Mounting Plate	1		
20	G13574-N48040-00	Cam Cap Bolt	4		
21	94110-061006	Self Lock Nut	4		M6

PARTS LIST

NO.	PART NUMBER	DESCRIPTIONS	QT	IMAGE	REMARKS
22	G90311-062101-0A	Plain Washer	4		M6
23	G11335-N48020-00	Spacer	1		
24	G91421-700815-C0	Flat Head Bolt	1		M8 x 15
25	G90315-120001-00	Rubber Washer	1		φ22 x φ12 x 3
26		Controller, Wiring Diagram, Manual	1		For RB26 Only
27	E04121-N48031-00	Instruction Manual	1		

Installation

1. Before the Installation

(1) Parts necessary for the installation

- Oil lines (Diameter should be larger than AN4) and the exit of oil.
The exit of oil must be located after the stock oil filter and where can maintain the oil pressure. (e.g. Connector of the stock oil pressure sensor or filter replacing type)
The oil filter included in this kit cannot filter small debris. If the exit of oil is in before the stock oil filter, add a fine meshed filter in the oil line.

Oil resisting hose must be used for oil lines. (e.g. HKS Flexible Hose)

- To use Type B, use one of following piston kits:

HKS Forged Piston Kit Series for RB26DETT

Part Number: 2103-RN020

Part Number: 2103-RN019

Part Number: 2103-RN021

Part Number: 2103-RN017

Part Number: 2103-RN018

Part Number: 2103-RN013

Part Number: 2103-RN015 (2.8L STEP2)

Part Number: 2103-RN016 (2.8L STEP3)

*Please refer to the instruction attached each kit for the installation of the piston kit.

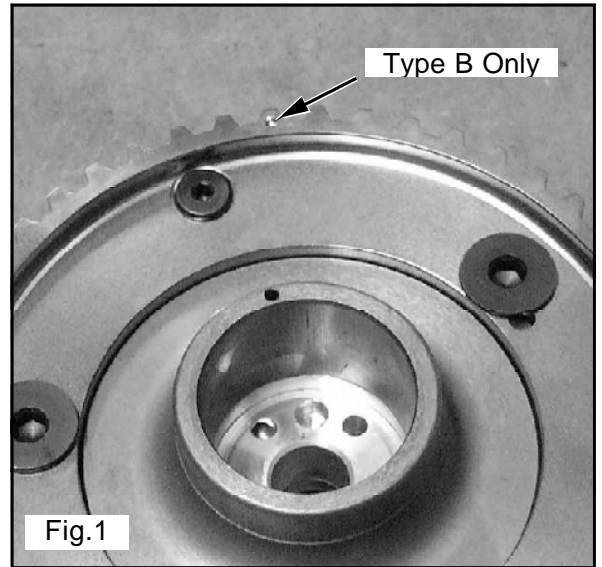
(2) Tools necessary for the installation

- Silicone grease (relevant to Three Bond 1855)
- Torque Wrench (Torque Spec.: 3.0 Nm - 90 Nm)
- Vernier Caliper
- Dial Gauge
- Magnet Stand
- Graduation Plate
- Thickness Gauge

Installation must be done by referring to the factory manual.

2. Checking the Included Parts

- (1) Check if there is any missing parts or shortage referring to the parts list.
The pulley for Type B unit has a dimple mark on the back. (See Fig.1)
- (2) Remove all sensors temporarily installed on the included head cover.

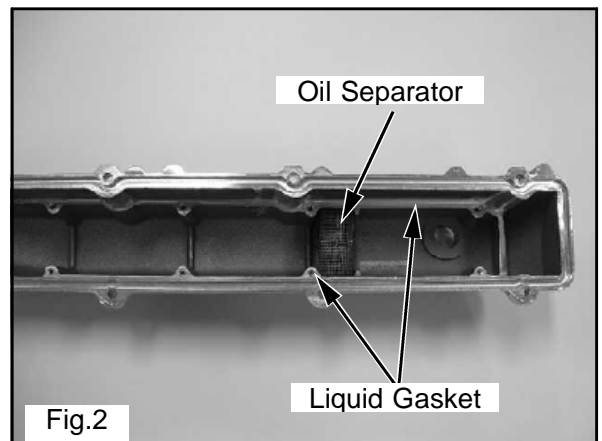


3. Cleaning Parts

- (1) Clean the inner of a pipe or adaptor where oil goes through.

4. Replacing Baffle Plate

- (1) Remove the baffle plate from the stock head cover.
Make sure not to bend the plate.
- (2) Clean the oil separator and baffle plate.
- (3) Fix a bend of the removed baffle plate if necessary.
- (4) Apply small amount of liquid gasket to the inside of the cylinder head; then, insert the oil separator. Secure the baffle plate with the stock bolt. (See Fig.2)



5. Removing the intake camshaft

- (1) Follow the instructions of the factory manual.
- (2) Inspect the removed intake camshaft, cam cap, and lifter. If any defect is found, make sure what the cause is. Replace the parts if necessary.

6. Confirming the Valve Clearance of the Exhaust Camshaft

- (1) Follow the instructions of the factory manual.
- (2) Turn the crankshaft and lower the piston from the top dead center so that the exhaust camshaft can be turned.
- (3) Adjust the valve clearance to be within the standard value.

Exhaust Side: 0.35 - 0.41mm (under cold condition)

- (4) After the adjustment, leave the exhaust camshaft uninstalled.

7. Adjusting the Valve Clearance by V-Cam

- (1) Follow the instructions of the factory manual to install the V-Cam.

ATTENTION

When tightening the cam cap, make sure the V-Cam is placed parallel.
If not, the V-Cam may be broken.

- (2) Adjust the valve clearance to be within the standard value.

Intake Side: 0.42 - 0.48mm (under cold condition)

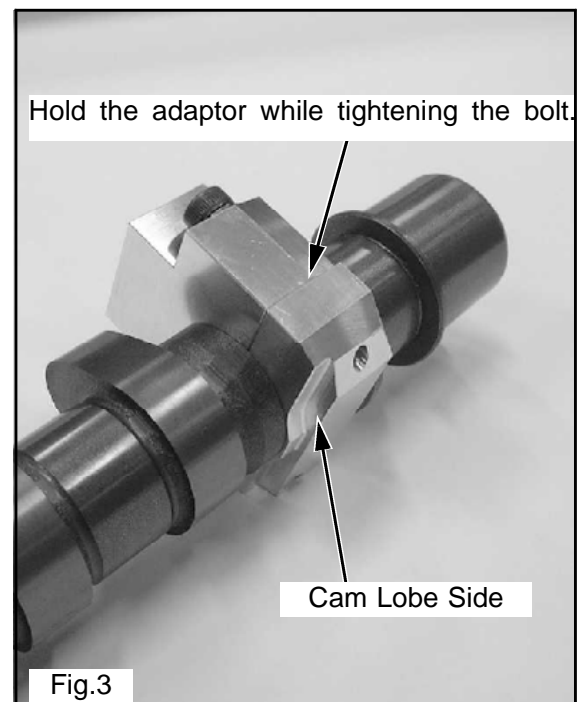
- (3) Make sure if the V-Cam is rotated smoothly; then remove it.

8. Installing Oil Line Adaptor

- (1) Make sure there is no dust and/or scratch on the journal.
- (2) Apply engine oil to the journal.
- (3) Place the oil line adaptor as shown in Fig.3.
- (4) Tighten the bolt with hand till the bolt reaches to the bottom. Then, hold the mating side of the oil line adaptor from side to the V-Cam. Tighten the bolt equally at the point where there is no gap between the cap and the camshaft.

Torque Spec.N·m(kgf·m) T=2.7 - 3.3 (0.3)

- (5) Make sure the oil line adaptor can be rotated lightly. If the adaptor does not rotate, reinstall it from the beginning. If not, it may cause seizure.



9. Installing the V-Cam

- (1) Replace the stock cam cap bolt of the journal #1 and #2 (4 pcs) to the bolts included in the kit.
- (2) Follow the instructions of the factory manual to install the V-Cam. Make sure the oil line adaptor does not get caught in the cylinder head.

Torque Spec.N·m(kgf·m) T=9 - 12 (0.92 - 1.2)

- (3) Make sure the oil line adaptor does not come in contact with the cylinder head when the mating side is put together with the upper side of the cylinder head.

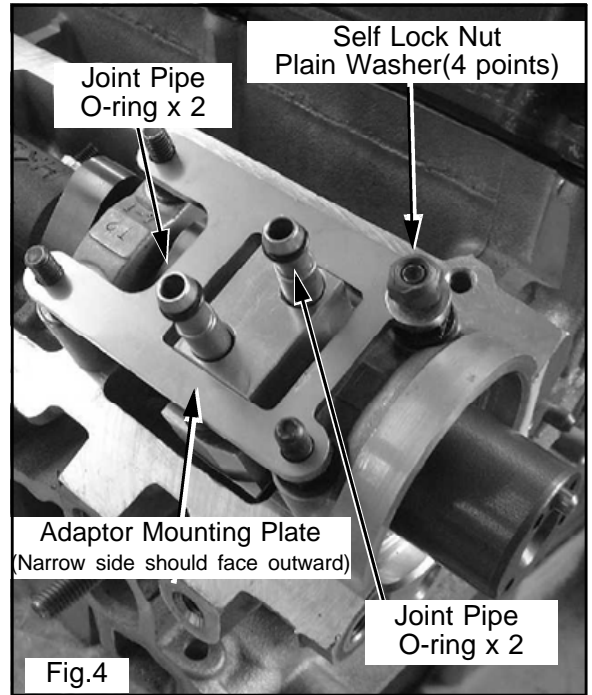
10. Installing the Adaptor Mounting Plate

- (1) Set the adaptor mounting plate after making sure the direction of the plate is correct. (See Fig.4)
- (2) If the oil line adaptor does not rotate at all, it may come in contact with the cylinder head. If so, remove the camshaft with the adaptor, and shave the portion which comes in contact with the cylinder head.
- (3) Install the adaptor mounting plate using the plain washers (4 pcs) and the self lock nuts (4 pcs). (See Fig.4)

Torque Spec.N·m(kgf·m) T=7 - 8 (0.71 - 0.82)

11. Installing the Joint Pipe

- (1) Clean the joint pipe. Install the O-ring onto the both ditches of the joint pipe. (See Fig.4)
- (2) Apply silicone grease to the O-rings. Make sure they can be inserted into the hole on the head cover side. If the rings cannot be inserted, modify the edge part of the taper.
- (3) Install the joint pipe onto the hole of the oil line adaptor. (Fig.4)



12. Installing the Exhaust Camshaft

- (1) Follow the instructions of the factory manual to install the exhaust camshaft.

13. Install the Cam Oil Seal

- (1) Apply silicone grease to the inside oil seal; then install it onto the cylinder head.

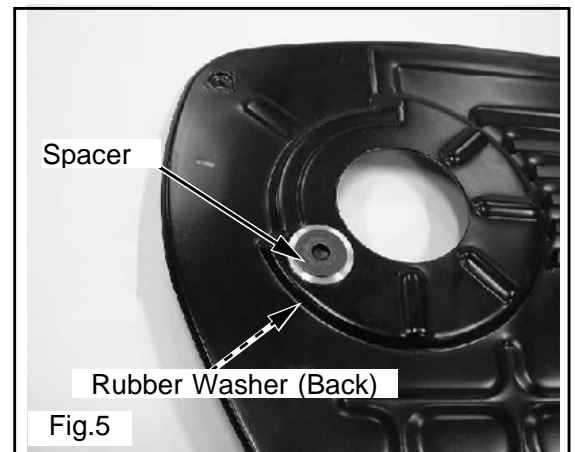
ATTENTION

Do not drive in the oil seal too much. It may cause oil leakage since the length of the portion the oil seal and the variable valve timing unit are connected is not long enough.

14. Installing the Rear Belt Cover

- (1) Remove the grommet and collar of the M8 bolt attached onto the rear belt cover.
- (2) Insert the included spacer and install the included rubber washer. (See Fig.5)
- (3) Secure the rear cover using the included dish bolt. (See Fig.5)

Torque Spec.N·m(kgf·m) T=16 - 22 (1.6 - 2.2)



15. Installing the Variable Valve Timing Unit

- (1) Degrease the edge of V-Cam and the mating side of the variable valve timing unit.
- (2) After making sure the dowel pin and the dowel pin hose position are correct, insert the variable valve timing unit into the V-Cam. (See Fig.6)
(Since the clearance of the shaft is narrow, insert the unit carefully not to make scratch.)
- (3) After the dowel pin is inserted completely, install the included flange bolt w/ through-hole.
- (4) Tighten the flange bolt w/ through-hole while the variable valve timing unit is turned to right slightly and hold it. To hold the unit, use the octagonal part of the camshaft's center. Do not put force toward the turning direction on the unit.

Torque Spec.N· m(kgf· m) T=85 - 95 (8.7 - 9.7)

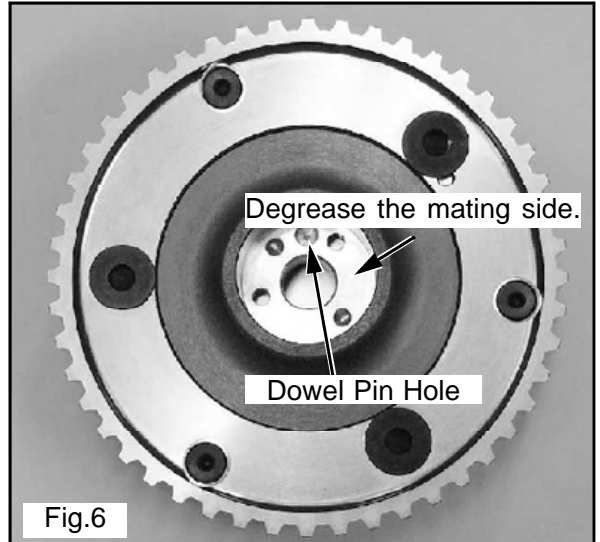


Fig.6

ATTENTION

Do not loosen the bolt on the back of the variable valve timing unit. It may cause malfunction to the unit.

16. Measuring the V/P

- (1) Set the dial gauge to the intake side lifter. (See Fig.7)
- (2) Rotate the crankshaft, and set the piston at the top dead center.
- (3) Rotate the V-Cam slowly. Note the lift value on the dial gauge when you feel a response.
- (3) Reverse the V-Cam and reposition to the original position.
- (5) Make sure the dial gauge is reset.
- (6) For the Type A, the lift value should be more than 4.4mm.
For the Type B, it should be more than 6.7mm.
- (7) Remove the dial gauge, and install the exhaust camshaft.

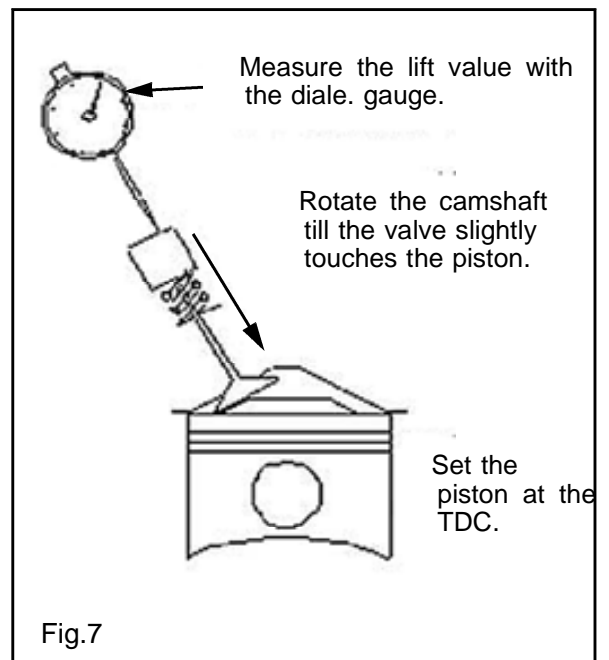


Fig.7

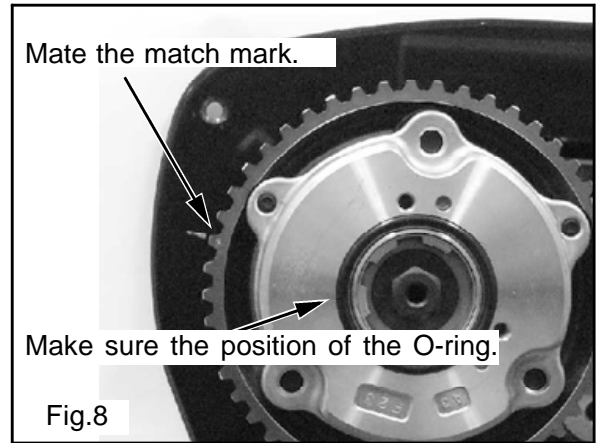
17. Installing the Timing Belt

- (1) Install the timing belt mating the match mark.
(See Fig.8)

ATTENTION

Type A was designed to be used with the stock pistons; however, at the most advance angle, the gap between the valve and the piston becomes very narrow. Therefore, if the belt's position is wrong even by one tooth of the gear, the engine may get damaged at the most advance angle.

- (2) Adjust the tension of the timing belt precisely referring to the factory manual.



ATTENTION

If the timing belt is pulled too much, it may cause noise after the engine is started or damage to the camshaft.

- (3) Install the cover plate using the included extra low head cap screw after making sure the O-ring was installed correctly. Do not use a generic bolt. It may come in contact with the timing belt cover.

Torque Spec. N·m(kgf·m) T=2.7 - 3.3 (0.3)

18. Measuring the Valve Timing

- (1) Set the graduations plate and the dial gauge. Measure the valve timing in correct rotating direction.
- (2) Measure the valve timing at 1 mm lift. Calculate the median value.

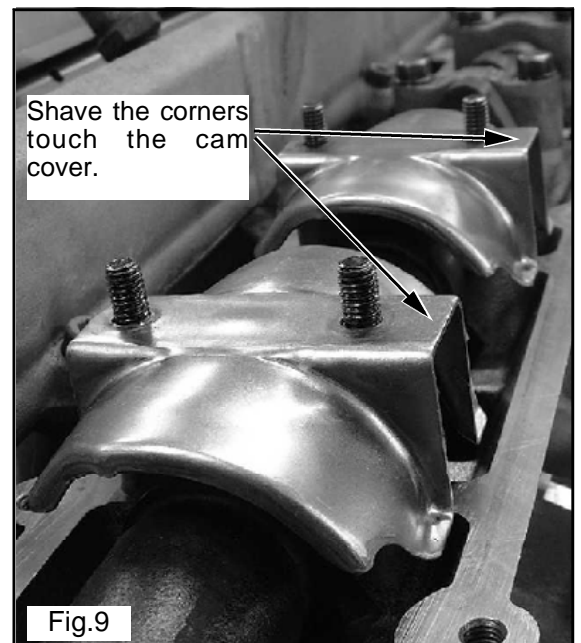
Type A ATDC: more than 120°

Type B ATDC: more than 125°

- (3) When the value is different more than 10°, the pulley's position is needed to be confirmed.
1 gear of the pulley is equivalent to 15° of the crankshaft's angle.

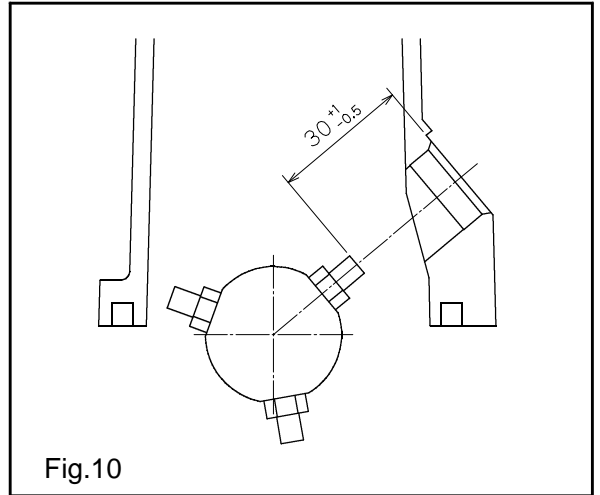
19. Installing the Head Cover

- (1) Install the gasket onto the ditch in the bottom of the head cover.
- (2) Make sure all necessary parts have installed.
Carefully install the head cover placing it parallel to the cylinder head. Maintain the force onto the head cover not to damage the O-ring of the joint pipe.
- (3) Make sure there is no gap between head cover gasket and the cylinder head.
- (4) Make sure positions of the head cover's hole and the tapped hole in the cylinder head side are matched.
Then, tighten the bolt.
- (5) If the holes are not matched, there is a possibility that somewhere inside of the head cover is in contact with the baffle plate on the cam cap #3 and #4. If so, remove the cam cover and the baffle plate. Shave the portion of the baffle plate which is touching the cam cover. Reinstall the cam cover and the baffle plate. (See Fig.9)



20. Installing the Camshaft Angle Sensor

- (1) Measure the position of the trigger's tip. The distance between the mount surface and the tip should be from 29.5 to 31.0 mm. (See Fig.10) If the actual distance is not within this range, check the gasket's condition or if the head cover is in contact with other parts of the vehicle.



- (2) Apply silicone grease to the O-ring; then insert the camshaft angle sensor. Tighten the bolt. (See Fig.11)

Torque Spec.N·m(kgf·m) T=4.5 - 5.5 (0.46-0.56)

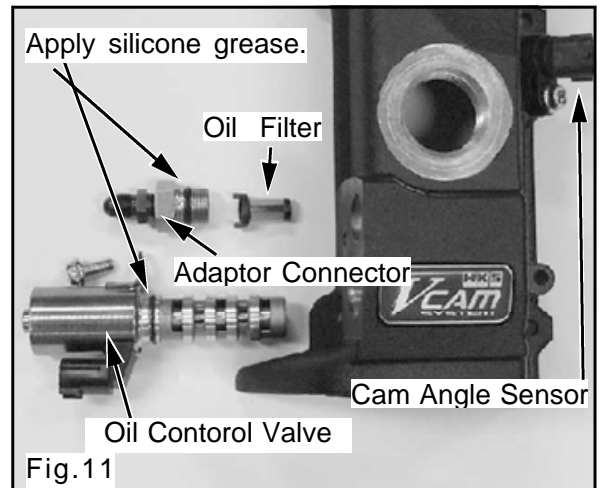
21. Assembling the Oil Flow Parts.

- (1) Install the AN4 connector onto the adaptor connector. The taper screw part is NPT1/8; therefore to avoid over-tightening, apply piping sealant or use seal tape.
- (2) Reinstall the oil filter and the adaptor connector following the reverse procedure of disassembling the temporary installed head cover. Apply silicone grease to the O-ring.
- (3) After applying silicone grease to the O-ring of the oil control valve (OCV), carefully insert it to the end. After making sure if the plate sits tightly, install the bolt.

Torque Spec.N·m(kgf·m) T=7 - 8 (0.71-0.82)

- (4) Connect the oil's exit and adaptor connector using oil piping. Secure the piping not to put excessive force put on the connection.

Please refer to "1. Before the Installation" about the exit of oil.



22. Assembling the Engine

- (1) Reconnect all wiring and piping to replace the camshaft.
- (2) Complete wiring referring to the instructions of the controller.

* Check the following after the installation process is complete and before starting the engine:

CHECK POINTS	CHECK
Make sure the valve clearance is within the standard value range.	
Make sure the valve timing is within the designated value range.	
Make sure the clearance between the valve and piston is more than the designated value.	
Make sure pipes and hoses are routed and connected correctly.	
Make sure pipes and hoses are not twisted or bent.	
Make sure the level gauge for the engine oil is between H - L.	
Make sure all bolts and nuts are tightened.	
Make sure installed components are not in contact with other parts of the vehicle.	

- (1) Check the oil and coolant.
- (2) Remove the coupler connecting to the oil control valve (OCV).

ATTENTION
<p>Once the coupler connecting the oil control valve (OCV), the camshaft's phase won't be advanced. To avoid possible damage to the engine, leave the coupler removed until the initial setting is complete.</p>

- (3) Before starting the engine, turn the cell motor on for a few second to increase the oil pressure without installing the spark plugs.

* Check the following after starting the engine:

CHECK POINTS	CHECK
Make sure oil is not leaking.	
Make sure air is not leaking.	
Make sure the installed parts are not hitting each other.	
Make sure all bolts and nuts are still tightened after stopping the engine.	

- (1) After idling, change the crank sensor's position and adjust the ignition timing.
- (2) Record the angle indicated in the controller.
 Make sure the angle is $\pm 5^\circ$ of the valve timing measured in sec.17.(2).
- (3) After stopping the engine, connect the oil control valve (OCV) and complete the initial setting of the controller referring to the instructions of the controller.
- (4) After restarting the engine, make sure the indicator works when increasing the RPM.
- (5) Complete setting of fuel, ignition, and valve timing.
- (6) The valve timing is changed when the installing position of the crankshaft's angle sensor is change.
 In this case, the resetting of the offset value of the controller is needed.
- (7) Do not drive in the high RPM right after installing the camshaft. Breaking-in must be done.

MAINTENACE

- Daily check-up on the vehicle must be done by the owner.
- Do not conduct any operation not stated in the user's manual. Contact your dealer.
- Choose the appropriate spark plug for your driving conditions. HKS Super Fire Racing Plug is recommended. Contact your dealer for selection.
- Change the engine oil regularly. Using HKS engine oil is recommended.
- Check the tension and abrasion of the timing belt every 10,000 km.

Pay attention the following while driving and after driving:

- Do Idling or after-idling be done if necessary.
- Do not raise the RPM rapidly or rev the engine a few times while in neutral when the engine is not warmed up.
- Even after the engine is warmed up, do not rev the engine a few times while in neutral to avoid possible damage to the engine.

WARNING

- If any leakage (Oil • Water) is noticed, do not start the engine.
- While driving, any unusual symptom such as rapid decline of the oil pressure is noticed, immediately stop driving. Make sure oil is not leaking. If oil is leaking, do not restart the engine.
 - Contact the dealer for repair the leakage.
 - Follow the dealer ' s instruction.
If the oil leakage is in a terrible condition, ask the dealer for the temporary measure. It may cause a fire.
- When any damage or unusual symptom is noticed, do not bring the vehicle to the dealer by driving to prevent additional damage.

Do not try to repair the vehicle by yourself. You must consult your dealer for repair. Any unusual noise, smell, vibration while driving is noticed, take necessary measure referring to the factory manual.