

1GR-FE ENGINE MECHANICAL VALVE CLEARANCE ADJUSTMENT

PROCEDURE

1.DRAIN ENGINE COOLANT

Click here [Engine / Hybrid System>1GR-FE COOLING>COOLANT>REPLACEMENT](#)

2.REMOVE INTAKE AIR SURGE TANK

17129

Click here [Engine / Hybrid System>1GR-FE INTAKE / EXHAUST>INTAKE MANIFOLD>REMOVAL](#)

3.REMOVE IGNITION COIL ASSEMBLY

19500

Click here [Engine / Hybrid System>1GR-FE ENGINE CONTROL>IGNITION COIL AND SPARK PLUG>REMOVAL](#)

4.REMOVE SPARK PLUG

19100P

Click here [Engine / Hybrid System>1GR-FE ENGINE CONTROL>IGNITION COIL AND SPARK PLUG>REMOVAL](#)

5.REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

11201

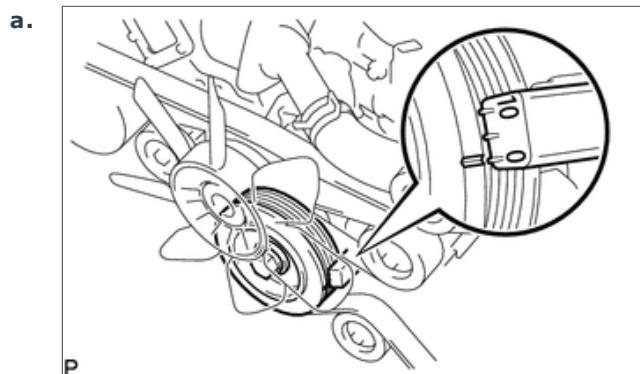
Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>ENGINE UNIT>DISASSEMBLY](#)

6.REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH

11202

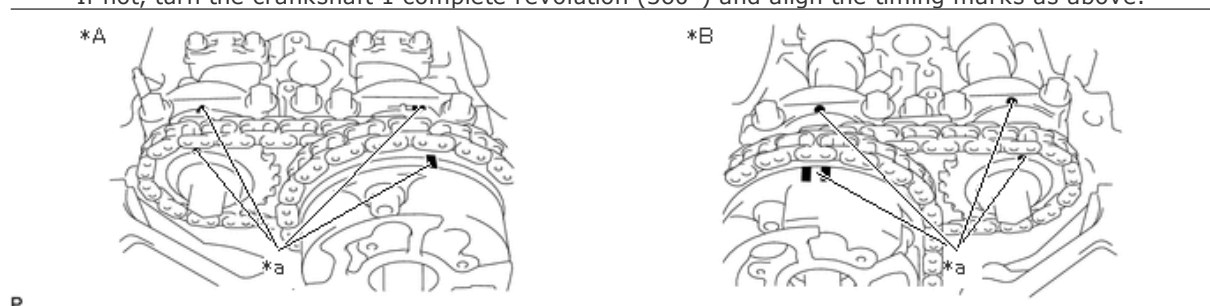
Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>ENGINE UNIT>DISASSEMBLY](#)

7.SET NO. 1 CYLINDER TO TDC/COMPRESSION



Turn the crankshaft and align its groove with timing mark "0" of the timing chain cover sub-assembly.

- b. Check that the timing marks of the camshaft timing gears and sprockets are aligned with the timing marks of the bearing caps as shown in the illustration.
If not, turn the crankshaft 1 complete revolution (360°) and align the timing marks as above.



*A	for Bank 1	*B	for Bank 2
*a	Timing Mark	-	-

8.INSPECT VALVE CLEARANCE

- a. Using a feeler gauge, measure the valve clearance indicated in the illustration.

*A
*b
*a

←

1
2
3

*B
*a
*b

←

1
2
6

P

*A	for Bank 1	*B	for Bank 2
*a	Intake Side	*b	Exhaust Side
	Engine Front Side	-	-

Standard Valve Clearance (Cold):

Item	Specified Condition
Intake Side	0.15 to 0.25 mm (0.00591 to 0.00984 in.)
Exhaust Side	0.29 to 0.39 mm (0.0114 to 0.0154 in.)

Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.

- b. Turn the crankshaft 2/3 of a revolution (240°).
- c. Using a feeler gauge, measure the valve clearance indicated in the illustration.

*A
*b
*a

←

2
3
5

*B
*a
*b

←

1
2
4

P

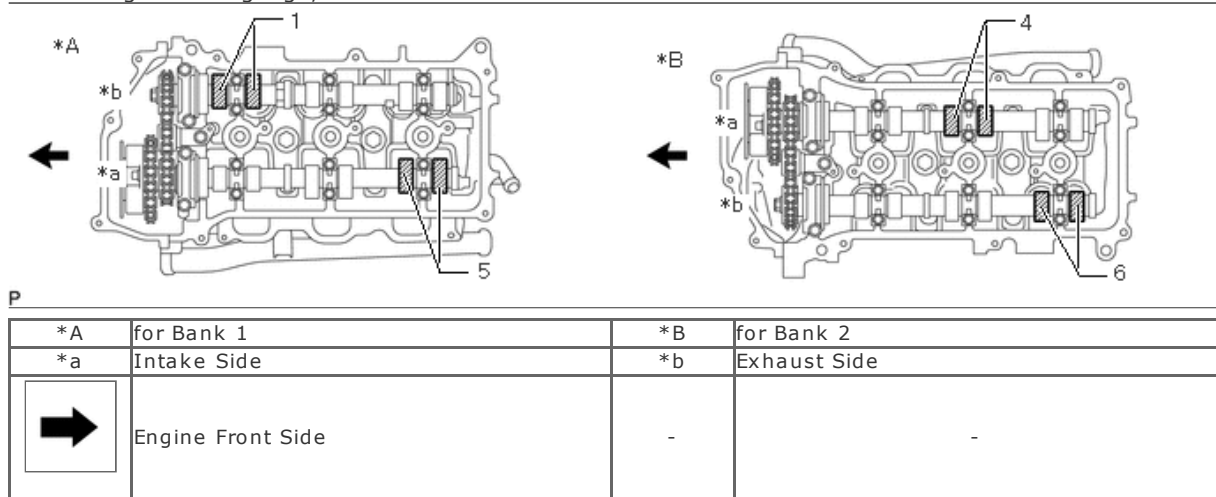
*A	for Bank 1	*B	for Bank 2
*a	Intake Side	*b	Exhaust Side
	Engine Front Side	-	-

Standard Valve Clearance (Cold):

Item	Specified Condition
Intake Side	0.15 to 0.25 mm (0.00591 to 0.00984 in.)
Exhaust Side	0.29 to 0.39 mm (0.0114 to 0.0154 in.)

Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.

- d. Turn the crankshaft 2/3 of a revolution (240°).
- e. Using a feeler gauge, measure the valve clearance indicated in the illustration.



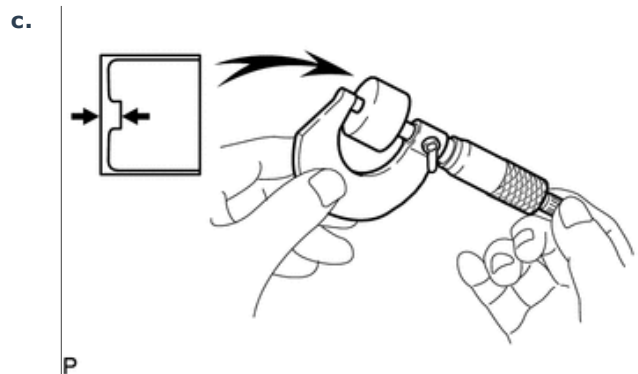
Standard Valve Clearance (Cold):

Item	Specified Condition
Intake Side	0.15 to 0.25 mm (0.00591 to 0.00984 in.)
Exhaust Side	0.29 to 0.39 mm (0.0114 to 0.0154 in.)

Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement valve lifter.

9.ADJUST VALVE CLEARANCE

- a. Remove the camshafts.
Click here[Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>CAMSHAFT>REMOVAL](#)
- b. Remove the 24 valve lifters from the cylinder head LH and RH.



Determine the size of the valve lifter to be installed according to the following formulas and charts.

- Using a micrometer, measure the thickness of the removed valve lifter.
- Calculate the thickness of a new valve lifter so that the valve clearance comes within the specified range.

T:
Thickness of removed valve lifter

A:
Measured valve clearance

N:
Thickness of new valve lifter

Intake:
 $N = T + (A - 0.20 \text{ mm (0.00787 in.)})$

Exhaust:
 $N = T + (A - 0.34 \text{ mm (0.0134 in.)})$

- iii. Select a new valve lifter with a thickness as close as possible to the calculated value.

HINT:

Lifters are available in 35 sizes in increments of 0.020 mm (0.000787 in.), from 5.060 mm (0.1992 in.) to 5.740 mm (0.2260 in.).

*a	*b																																					*c																																																																																																																																																																																																																																																																																																																		
72	70	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36	34	32	30	28	26	24	22	20	18	16	14	12							5.060 (0.1992)																																																																																																																																																																																																																																																																																																																			
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EXAMPLE:

A 5.250 mm (0.2067 in.) lifter is installed and the measured clearance is 0.400 mm (0.0157 in.). Replace the 5.250 mm (0.2067 in.) lifter with a No. 46 lifter.

New Lifter Thickness:

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 mm (0.1992 in.)	30	5.300 mm (0.2087 in.)	54	5.540 mm (0.2181 in.)
08	5.080 mm (0.2000 in.)	32	5.320 mm (0.2094 in.)	56	5.560 mm (0.2189 in.)
10	5.100 mm (0.2008 in.)	34	5.340 mm (0.2102 in.)	58	5.580 mm (0.2197 in.)
12	5.120 mm (0.2016 in.)	36	5.360 mm (0.2110 in.)	60	5.600 mm (0.2205 in.)
14	5.140 mm (0.2024 in.)	38	5.380 mm (0.2118 in.)	62	5.620 mm (0.2213 in.)
16	5.160 mm (0.2031 in.)	40	5.400 mm (0.2126 in.)	64	5.640 mm (0.2220 in.)
18	5.180 mm (0.2039 in.)	42	5.420 mm (0.2134 in.)	66	5.660 mm (0.2228 in.)
20	5.200 mm (0.2047 in.)	44	5.440 mm (0.2142 in.)	68	5.680 mm (0.2236 in.)
22	5.220 mm (0.2055 in.)	46	5.460 mm (0.2150 in.)	70	5.700 mm (0.2244 in.)
24	5.240 mm (0.2063 in.)	48	5.480 mm (0.2157 in.)	72	5.720 mm (0.2252 in.)
26	5.260 mm (0.2071 in.)	50	5.500 mm (0.2165 in.)	74	5.740 mm (0.2260 in.)
28	5.280 mm (0.2079 in.)	52	5.520 mm (0.2173 in.)	-	-

*a

		*b		*c	
0.000 - 0.020 (0.0000 - 0.000787)		0.000 - 0.020 (0.0000 - 0.000787)			
0.021 - 0.040 (0.00827 - 0.0157)		0.021 - 0.040 (0.00827 - 0.0157)			
0.041 - 0.060 (0.0161 - 0.0236)		0.041 - 0.060 (0.0161 - 0.0236)			
0.061 - 0.080 (0.0240 - 0.0315)		0.061 - 0.080 (0.0240 - 0.0315)			
0.081 - 0.100 (0.0319 - 0.0394)		0.081 - 0.100 (0.0319 - 0.0394)			
0.101 - 0.120 (0.0398 - 0.0472)		0.101 - 0.120 (0.0398 - 0.0472)			
0.121 - 0.140 (0.0476 - 0.0551)		0.121 - 0.140 (0.0476 - 0.0551)			
0.141 - 0.160 (0.0555 - 0.0630)		0.141 - 0.160 (0.0555 - 0.0630)			
0.161 - 0.180 (0.0634 - 0.0709)		0.161 - 0.180 (0.0634 - 0.0709)			
0.181 - 0.200 (0.0713 - 0.0787)		0.181 - 0.200 (0.0713 - 0.0787)			
0.201 - 0.220 (0.0791 - 0.0866)		0.201 - 0.220 (0.0791 - 0.0866)			
0.221 - 0.240 (0.0870 - 0.0945)		0.221 - 0.240 (0.0870 - 0.0945)			
0.241 - 0.260 (0.095 - 0.102)		0.241 - 0.260 (0.095 - 0.102)			
0.261 - 0.280 (0.103 - 0.110)		0.261 - 0.280 (0.103 - 0.110)			
0.281 - 0.299 (0.111 - 0.114)		0.281 - 0.299 (0.111 - 0.114)			
0.290 - 0.390 (0.114 - 0.154)		0.290 - 0.390 (0.114 - 0.154)			
0.391 - 0.410 (0.154 - 0.161)		0.391 - 0.410 (0.154 - 0.161)			
0.411 - 0.430 (0.162 - 0.169)		0.411 - 0.430 (0.162 - 0.169)			
0.431 - 0.450 (0.170 - 0.177)		0.431 - 0.450 (0.170 - 0.177)			
0.451 - 0.470 (0.178 - 0.185)		0.451 - 0.470 (0.178 - 0.185)			
0.471 - 0.490 (0.185 - 0.193)		0.471 - 0.490 (0.185 - 0.193)			
0.491 - 0.510 (0.193 - 0.201)		0.491 - 0.510 (0.193 - 0.201)			
0.511 - 0.530 (0.201 - 0.209)		0.511 - 0.530 (0.201 - 0.209)			
0.531 - 0.550 (0.209 - 0.217)		0.531 - 0.550 (0.209 - 0.217)			
0.551 - 0.570 (0.217 - 0.224)		0.551 - 0.570 (0.217 - 0.224)			
0.571 - 0.590 (0.225 - 0.232)		0.571 - 0.590 (0.225 - 0.232)			
0.591 - 0.610 (0.233 - 0.240)		0.591 - 0.610 (0.233 - 0.240)			
0.611 - 0.630 (0.241 - 0.248)		0.611 - 0.630 (0.241 - 0.248)			
0.631 - 0.650 (0.248 - 0.256)		0.631 - 0.650 (0.248 - 0.256)			
0.651 - 0.670 (0.256 - 0.264)		0.651 - 0.670 (0.256 - 0.264)			
0.671 - 0.690 (0.264 - 0.272)		0.671 - 0.690 (0.264 - 0.272)			
0.691 - 0.710 (0.272 - 0.280)		0.691 - 0.710 (0.272 - 0.280)			
0.711 - 0.730 (0.280 - 0.287)		0.711 - 0.730 (0.280 - 0.287)			
0.731 - 0.750 (0.288 - 0.296)		0.731 - 0.750 (0.288 - 0.296)			
0.751 - 0.770 (0.296 - 0.303)		0.751 - 0.770 (0.296 - 0.303)			
0.771 - 0.790 (0.304 - 0.311)		0.771 - 0.790 (0.304 - 0.311)			
0.791 - 0.810 (0.311 - 0.319)		0.791 - 0.810 (0.311 - 0.319)			
0.811 - 0.830 (0.319 - 0.327)		0.811 - 0.830 (0.319 - 0.327)			
0.831 - 0.850 (0.327 - 0.335)		0.831 - 0.850 (0.327 - 0.335)			
0.851 - 0.870 (0.335 - 0.343)		0.851 - 0.870 (0.335 - 0.343)			
0.871 - 0.890 (0.343 - 0.350)		0.871 - 0.890 (0.343 - 0.350)			
0.891 - 0.910 (0.351 - 0.358)		0.891 - 0.910 (0.351 - 0.358)			
0.911 - 0.930 (0.359 - 0.366)		0.911 - 0.930 (0.359 - 0.366)			
0.931 - 0.950 (0.367 - 0.374)		0.931 - 0.950 (0.367 - 0.374)			
0.951 - 0.970 (0.374 - 0.382)		0.951 - 0.970 (0.374 - 0.382)			
0.971 - 0.990 (0.382 - 0.390)		0.971 - 0.990 (0.382 - 0.390)			
0.991 - 1.010 (0.390 - 0.398)		0.991 - 1.010 (0.390 - 0.398)			
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12				5.060 (0.1992)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14				5.080 (0.2000)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16				5.100 (0.2008)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18				5.120 (0.2016)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20				5.140 (0.2024)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22				5.160 (0.2031)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24				5.180 (0.2039)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26				5.200 (0.2047)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28				5.210 (0.2051)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28				5.220 (0.2055)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30				5.230 (0.2059)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30				5.240 (0.2063)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32				5.250 (0.2067)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32				5.260 (0.2071)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34				5.270 (0.2075)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34				5.280 (0.2079)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36				5.290 (0.2083)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36				5.300 (0.2087)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38				5.310 (0.2091)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38				5.320 (0.2094)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40				5.330 (0.2098)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40				5.340 (0.2102)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42				5.350 (0.2106)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42				5.360 (0.2110)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44				5.370 (0.2114)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46 44				5.380 (0.2118)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48 46				5.390 (0.2122)	
72 70 68 66 64 62 60 58 56 54 52 50 48 46				5.400 (0.2126)	
74 72 70 68 66 64 62 60 58 56 54 52 50 48				5.410 (0.2130)	
72 70 68 66 64 62 60 58 56 54 52 50 48				5.420 (0.2134)	
74 72 70 68 66 64 62 60 58 56 54 52 50				5.430 (0.2138)	
72 70 68 66 64 62 60 58 56 54 52 50				5.440 (0.2142)	
74 72 70 68 66 64 62 60 58 56 54 52				5.450 (0.2146)	
72 70 68 66 64 62 60 58 56 54 52				5.460 (0.2150)	
74 72 70 68 66 64 62 60 58 56 54				5.470 (0.2154)	
72 70 68 66 64 62 60 58 56 54				5.480 (0.2157)	
74 72 70 68 66 64 62 60 58 56				5.490 (0.2161)	
72 70 68 66 64 62 60 58 56				5.500 (0.2165)	
74 72 70 68 66 64 62 60 58				5.510 (0.2169)	
72 70 68 66 64 62 60 58				5.520 (0.2173)	
74 72 70 68 66 64 62 60				5.530 (0.2177)	
72 70 68 66 64 62 60				5.540 (0.2181)	
74 72 70 68 66 64 62				5.550 (0.2185)	
72 70 68 66 64 62				5.560 (0.2189)	
74 72 70 68 66 64				5.570 (0.2193)	
72 70 68 66 64				5.580 (0.2197)	
74 72 70 68 66				5.590 (0.2201)	
72 70 68 66				5.600 (0.2205)	
74 72 70 68				5.620 (0.2213)	
72 70 68				5.640 (0.2220)	
74 72 70				5.660 (0.2228)	
72 70				5.680 (0.2236)	
74 72				5.700 (0.2244)	
72 70				5.720 (0.2252)	
74 72				5.740 (0.2260)	

*a	Valve Lifter Selection Chart (Exhaust)	*b	Measured Clearance mm (in.)
*c	Installed Lifter Thickness mm (in.)	-	-

Exhaust valve clearance (Cold):
0.29 to 0.39 mm (0.0114 to 0.0154 in.)

EXAMPLE:

A 5.340 mm (0.2102 in.) lifter is installed and the measured clearance is 0.480 mm (0.0189 in.). Replace the 5.340 mm (0.2102 in.) lifter with a No. 48 lifter.

New Lifter Thickness:

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
06	5.060 mm (0.1992 in.)	30	5.300 mm (0.2087 in.)	54	5.540 mm (0.2181 in.)
08	5.080 mm (0.2000 in.)	32	5.320 mm (0.2094 in.)	56	5.560 mm (0.2189 in.)

Lifter No.	Thickness	Lifter No.	Thickness	Lifter No.	Thickness
10	5.100 mm (0.2008 in.)	34	5.340 mm (0.2102 in.)	58	5.580 mm (0.2197 in.)
12	5.120 mm (0.2016 in.)	36	5.360 mm (0.2110 in.)	60	5.600 mm (0.2205 in.)
14	5.140 mm (0.2024 in.)	38	5.380 mm (0.2118 in.)	62	5.620 mm (0.2213 in.)
16	5.160 mm (0.2031 in.)	40	5.400 mm (0.2126 in.)	64	5.640 mm (0.2220 in.)
18	5.180 mm (0.2039 in.)	42	5.420 mm (0.2134 in.)	66	5.660 mm (0.2228 in.)
20	5.200 mm (0.2047 in.)	44	5.440 mm (0.2142 in.)	68	5.680 mm (0.2236 in.)
22	5.220 mm (0.2051 in.)	46	5.460 mm (0.2150 in.)	70	5.700 mm (0.2244 in.)
24	5.240 mm (0.2063 in.)	48	5.480 mm (0.2157 in.)	72	5.720 mm (0.2252 in.)
26	5.260 mm (0.2071 in.)	50	5.500 mm (0.2165 in.)	74	5.740 mm (0.2260 in.)
28	5.280 mm (0.2079 in.)	52	5.520 mm (0.2173 in.)	-	-

- d. Install the camshafts.
Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>CAMSHAFT>INSTALLATION](#)
- e. Check the valve clearance.
If the result is not as specified, adjust the valve clearance.

10.INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH 11202

Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY](#)

11.INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY 11201

Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>ENGINE UNIT>REASSEMBLY](#)

12.INSTALL SPARK PLUG 19100P

Click here [Engine / Hybrid System>1GR-FE ENGINE CONTROL>IGNITION COIL AND SPARK PLUG>INSTALLATION](#)

13.INSTALL IGNITION COIL ASSEMBLY 19500

Click here [Engine / Hybrid System>1GR-FE ENGINE CONTROL>IGNITION COIL AND SPARK PLUG>INSTALLATION](#)

14.INSTALL INTAKE AIR SURGE TANK 17129

Click here [Engine / Hybrid System>1GR-FE INTAKE / EXHAUST>INTAKE MANIFOLD>INSTALLATION](#)

15.ADD ENGINE COOLANT

Click here [Engine / Hybrid System>1GR-FE COOLING>COOLANT>REPLACEMENT](#)

16.INSPECT FOR COOLANT LEAK

Click here [Engine / Hybrid System>1GR-FE COOLING>COOLING SYSTEM>ON-VEHICLE INSPECTION](#)

17.INSPECT IGNITION TIMING

Click here [Engine / Hybrid System>1GR-FE ENGINE MECHANICAL>ENGINE>ON-VEHICLE INSPECTION](#)