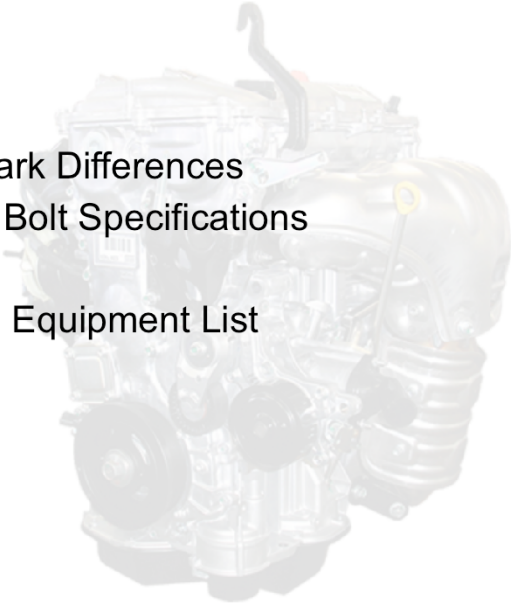
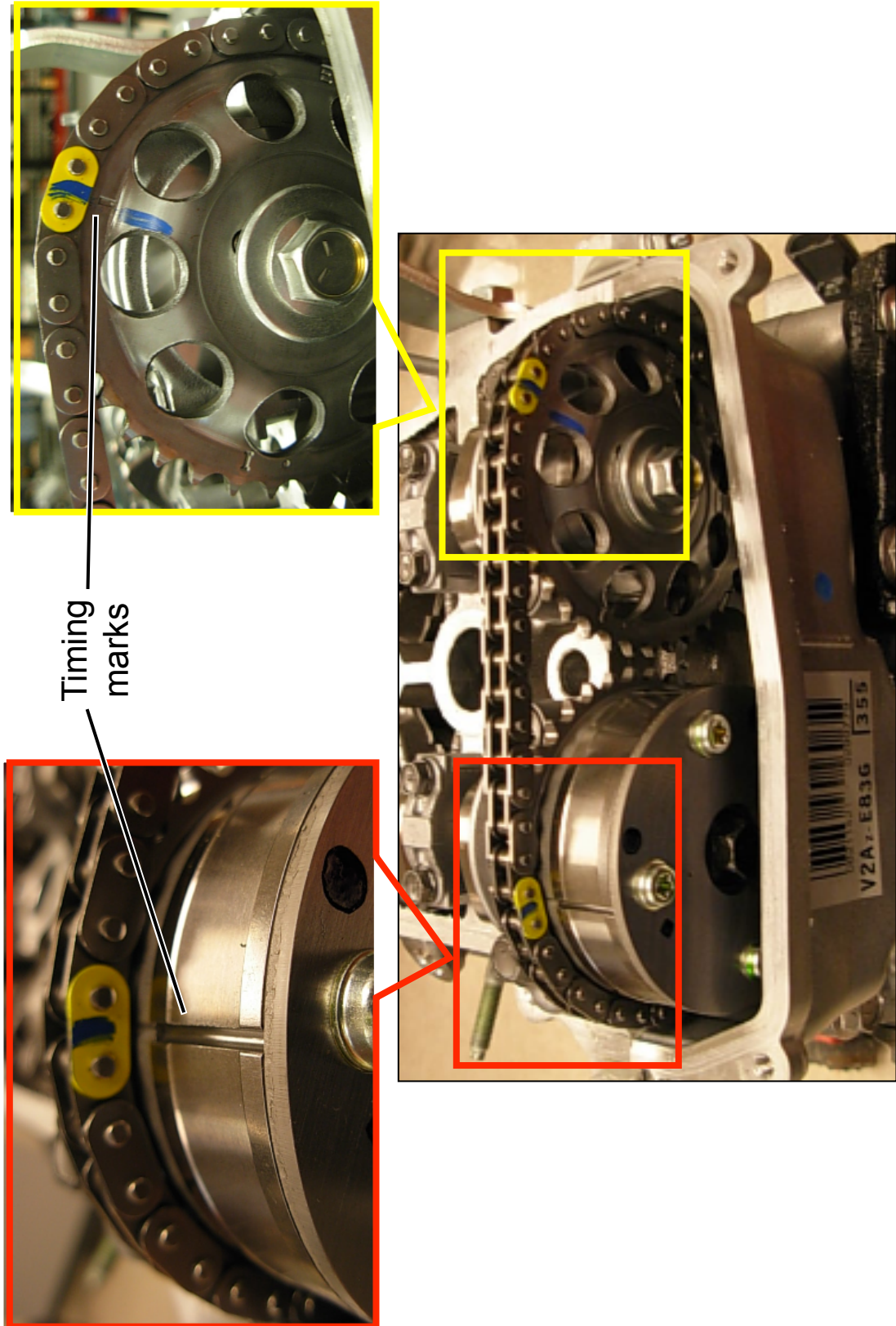


Appendix

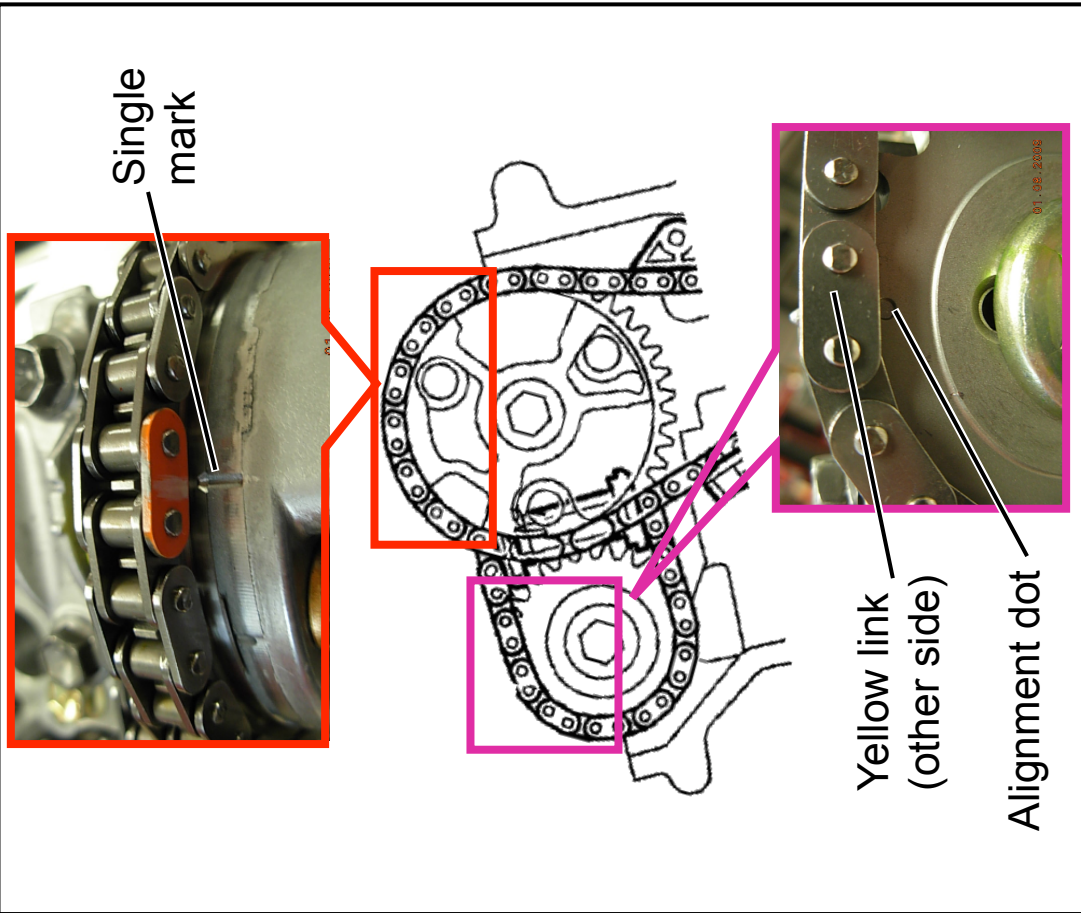
- 
- ▶ Timing Mark Differences
 - ▶ Standard Bolt Specifications
 - ▶ Tools and Equipment List

2AZ-FE Timing Marks

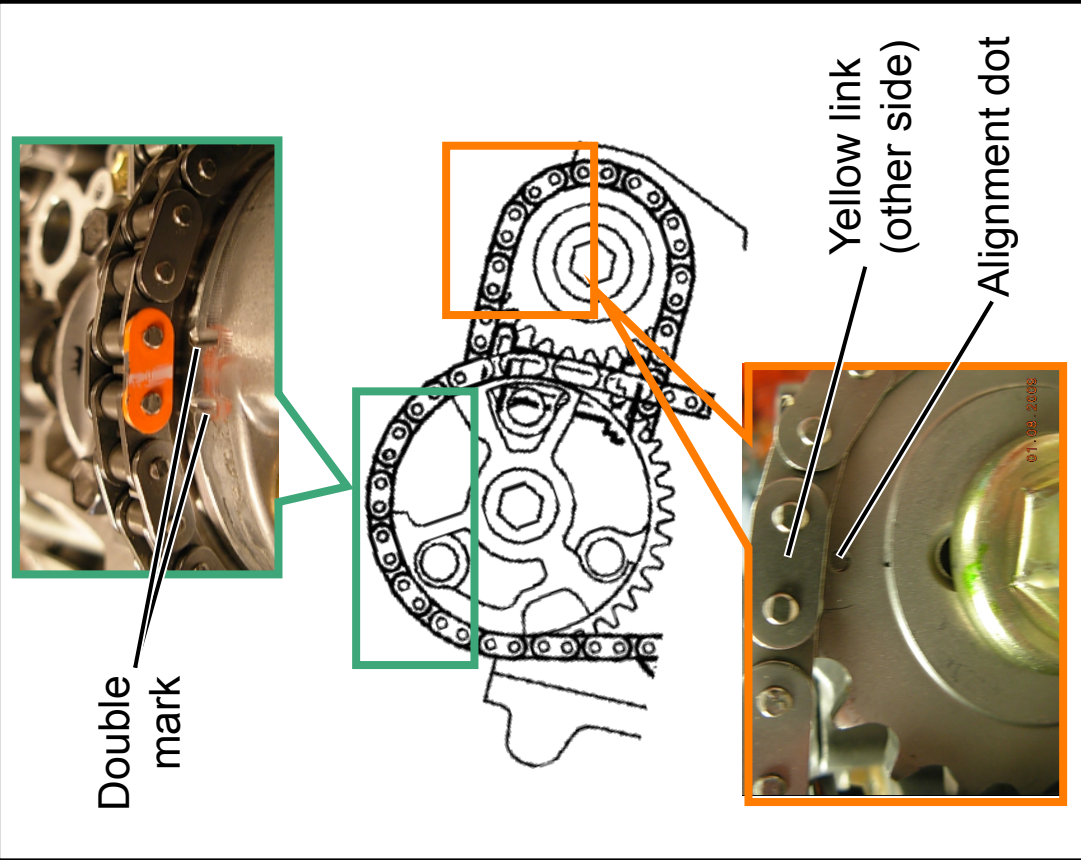


1GR-FE Timing Marks

Bank 1

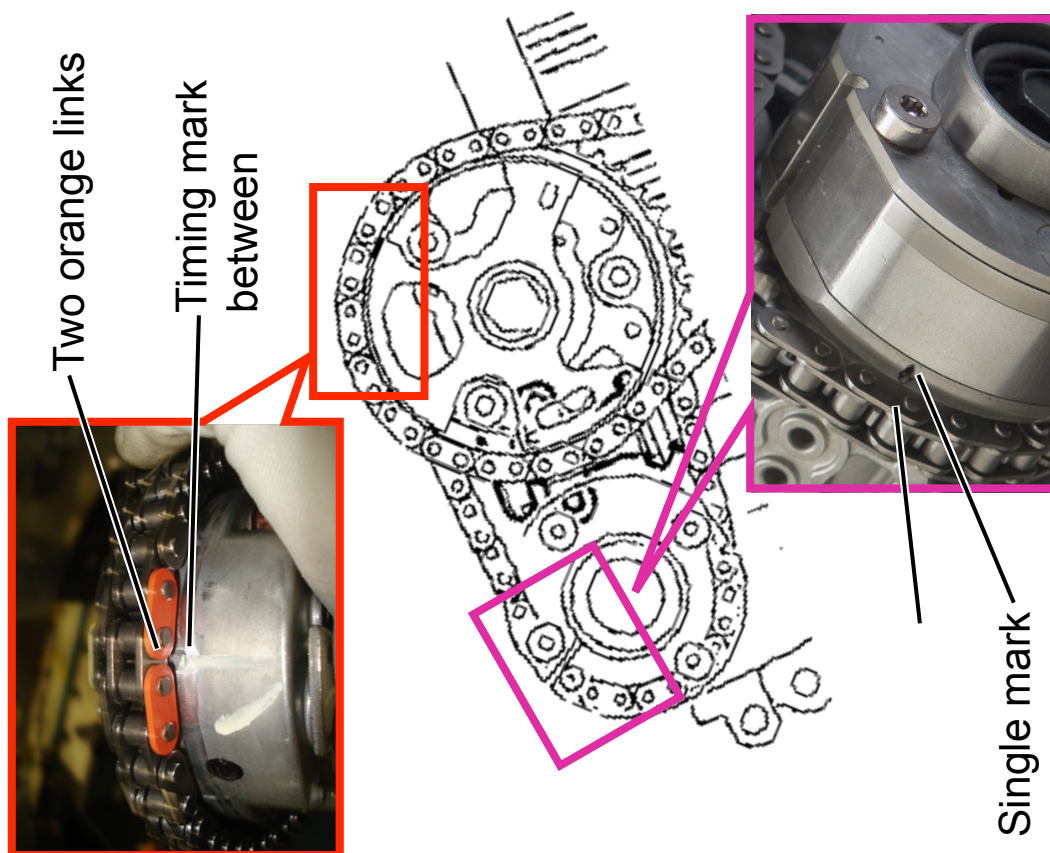


Bank 2

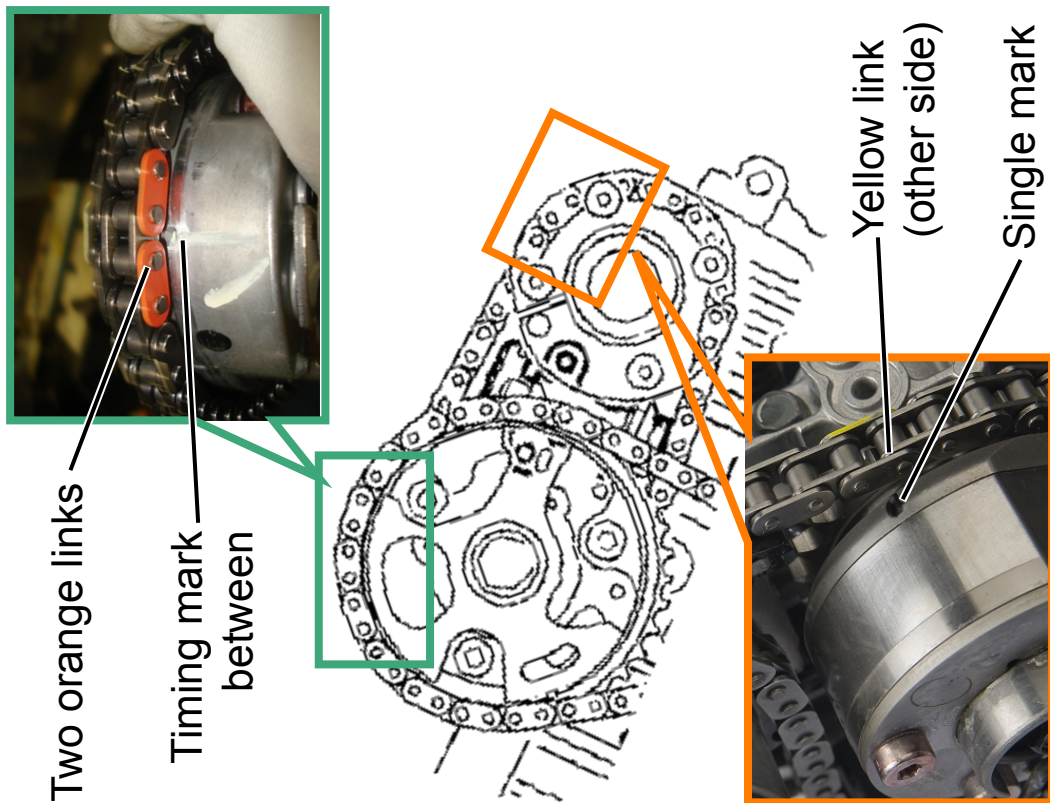


1UR-FE Timing Marks

Bank 1

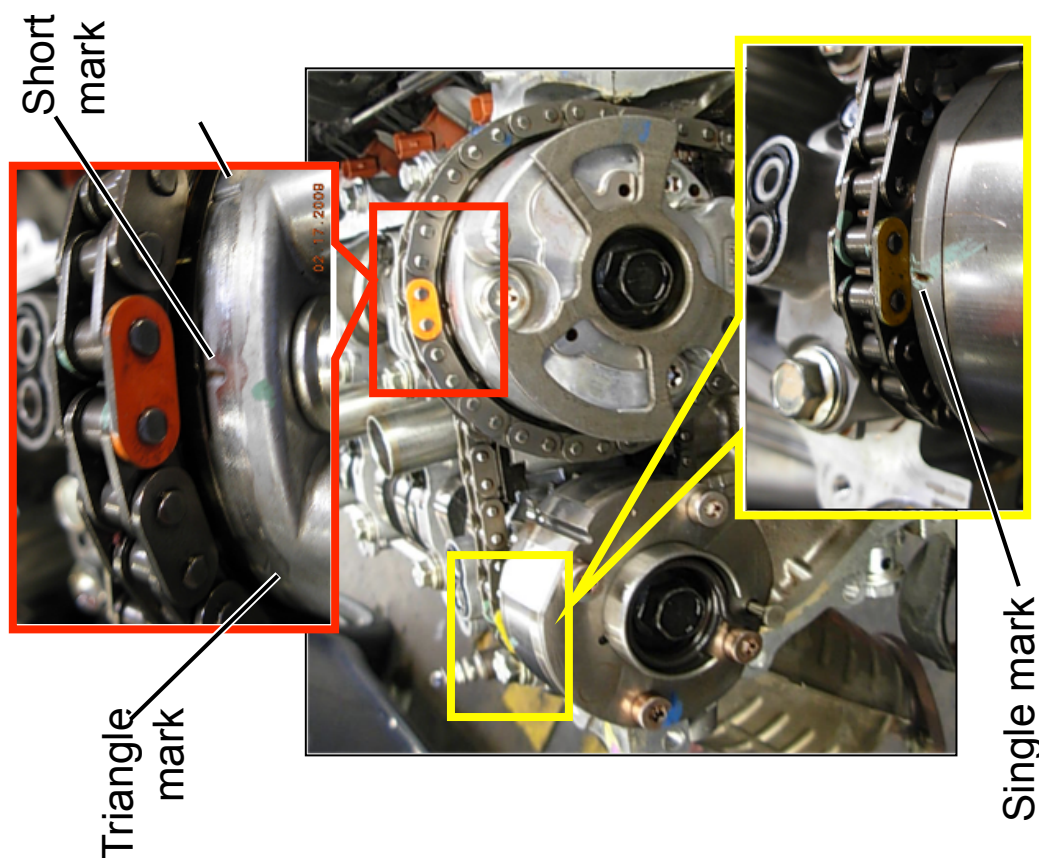


Bank 2

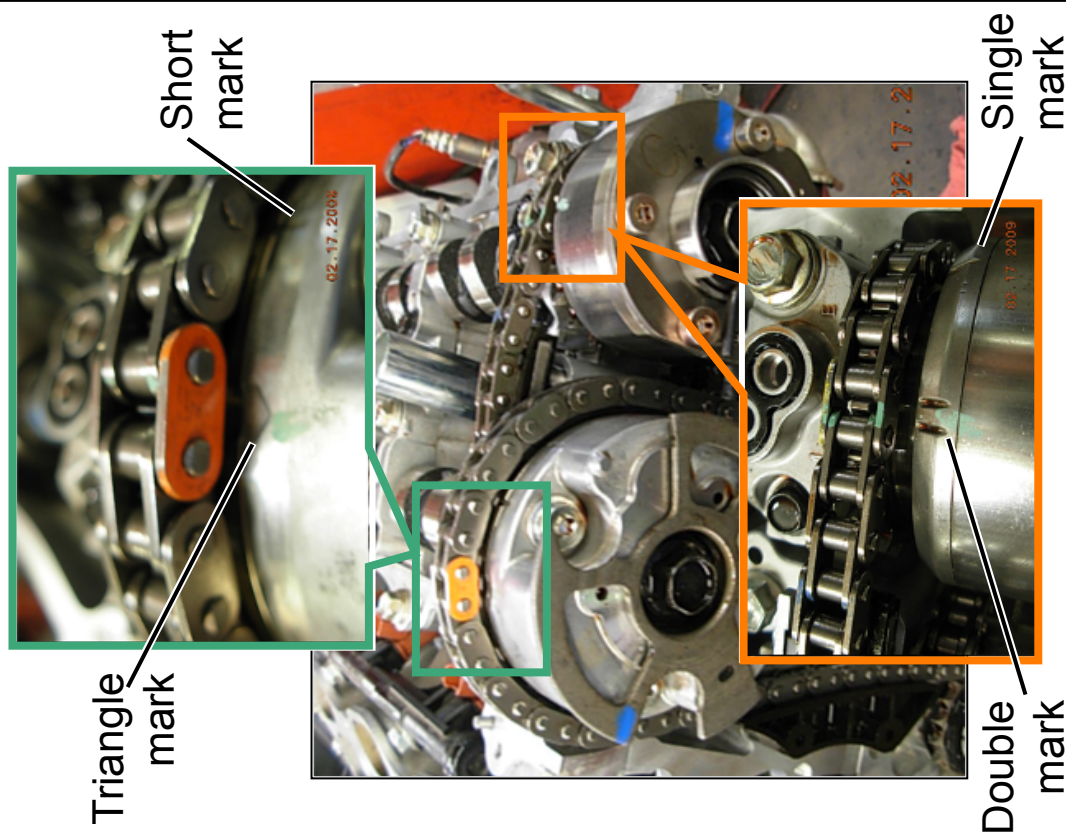


2GR-FE Timing Marks

Bank 1



Bank 2



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How to Determine Nut Strength (1 of 2)

Use a nut with the same nut strength classification number (or more) as the bolt strength classification number when tightening parts with a bolt and nut.

Example:

- Bolt = 4T
- Nut = 4N or more

Present Standard Hexagon Nut	Old Standard Hexagon Nut		Class
	Cold Forging Nut	Cutting Processed Nut	
No Mark 			4N
No Mark (w/washer) 	No Mark (w/washer) 	No Mark 	5N (4T)
  			6N
	 	 	7N (5T)

*: Nut with 1 or more marks on one side surface of the nut.

NOTES:

How to Determine Nut Strength (2 of 2)

Use a nut with the same nut strength classification number (or more) as the bolt strength classification number when tightening parts with a bolt and nut.

Example:

- Bolt = 4T
- Nut = 4N or more

Present Standard Hexagon Nut	Old Standard Hexagon Nut		Class
	Cold Forging Nut	Cutting Processed Nut	
 			8N
 	 	No Mark 	10N (7T)
 			11N
 			12N

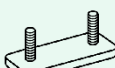
NOTES:

How to Determine Bolt Strength (1 of 2)

Use a nut with the same nut strength classification number (or more) as the bolt strength classification number when tightening parts with a bolt and nut.

Example:

- Bolt = 4T
- Nut = 4N or more

Hexagon Head Bolt			Stud Bolt	Weld Bolt	Class
Normal Recess Bolt	Deep Recess Bolt				
	 No Mark	 No Mark	 No Mark		4T
					5T
	 w/washer	 w/washer			6T
					7T

NOTES:

How to Determine Bolt Strength (2 of 2)

Use a nut with the same nut strength classification number (or more) as the bolt strength classification number when tightening parts with a bolt and nut.

Example:

- Bolt = 4T
- Nut = 4N or more

Hexagon Head Bolt		Stud Bolt	Weld Bolt	Class
Normal Recess Bolt	Deep Recess Bolt			
		 		8T
				9T
	 			10T
	 			11T

NOTES:

Specified Torque for Standard Bolts (1 of 2)

Class	Diameter (mm)	Pitch (mm)	Specified Torque	
			Hex Head Bolt Ft*LBF	Hex Flange Bolt Ft*LBF
4T	6	1	48 in*lbf	52 in*lbf
	8	1.25	9	10
	10	1.25	19	21
	12	1.25	35	39
	14	1.5	55	61
	16	1.5	83	--
5T	6	1	56 in*lbf	65 in*lbf
	8	1.25	12	13
	10	1.25	24	26
	12	1.25	43	48
	14	1.5	67	76
	16	1.5	101	--

Class	Diameter (mm)	Pitch (mm)	Specified Torque	
			Hex Head Bolt Ft*LBF	Hex Flange Bolt Ft*LBF
6T	6	1	69 in*lbf	78 in*lbf
	8	1.25	14	15
	10	1.25	29	32
	12	1.25	53	59
	14	1.5	80	90
	16	1.5	127	--
7T	6	1	8	9
	8	1.25	19	21
	10	1.25	38	43
	12	1.25	70	76
	14	1.5	108	123
	16	1.5	166	--

NOTES:

Specified Torque for Standard Bolts (2 of 2)

Class	Diameter (mm)	Pitch (mm)	Specified Torque	
			Hex Head Bolt Ft*LBF	Hex Flange Bolt Ft*LBF
8T	8	1.25	22	24
	10	1.25	45	50
	12	1.25	80	90
9T	8	1.25	25	27
	10	1.25	51	57
	12	1.25	94	105
10T	8	1.25	28	31
	10	1.25	58	64
	12	1.25	105	116
11T	8	1.25	31	35
	10	1.25	64	72
	12	1.25	116	130

NOTES:

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Required Tools and Equipment

Course Materials	Part #	Producer	Source	Quantity
Technician Handbooks	N/A	POD	Region	N/A

SSTs Required	Part #	Producer	Source	Quantity
Valve Spring Compressor	09202-43013-01	SPX	TMS	4
Crankshaft Pulley Holding Tool	09213-70011-01	SPX	TMS	2
Companion Flange Holding Tool	09330-00021	SPX	TMS	2
10 mm Bi-Hexagon Socket	09043-50100-01	SPX	TMS	4
Universal Puller Set C Drawer # 24	09950-50013	SPX	Region	1
Variable Pin Wrench Drawer # 1	09960-10010	SPX	Region	1
Valve Lifter Tool Drawer # 1	09276-75010	SPX	Region	1
Gasket Seal Cutter	09032-00100	SPX	Region	1

Tools Required:	Part #	Producer	Source	Quantity
Allen Wrench	AWM2/2D	Snap-on	TMS	8
Compression Tester	MT308M	Snap-on	TMS	4
Cylinder Bore Gauge	72-646-220	Fowler	TMS	2
Cylinder Head Organizing Tray	VTO-80	Goodson	TMS	4
Cylinder Head Stand Set	HH-100-G	Goodson	TMS	4
Part Tray Organizer	SPP804-1	Snap-on	TMS	4
Cylinder Leakage Tester	EEPV309A	Snap-on	TMS	1
Dial Indicator w/ Vise Grip	72-520-730	Fowler	TMS	2
Feeler Gauge Set (.05 - .10 mm)	FBM320	Snap-on	TMS	4
Inside Diameter Caliper Gauge	72-472-104	Fowler	TMS	4
Micrometers	72-229-220	Fowler	TMS	4
Piston Ring Compressor	RC40C	Snap-on	TMS	2
Ridge Reamer	WR30A	Snap-on	TMS	1
Metric Ruler	RULER602	Snap-on	TMS	4
Steel Square	FFL52432006	Snap-on	TMS	4
Straightedge	GA438A	Snap-on	TMS	4
Vernier Caliper	MCAL6A	Snap-on	TMS	4

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Required Tools and Equipment (cont'd)

Miscellaneous Tools & Equipment	Part #	Producer	Source	Quantity
3UR-FE Engine	N/A	TMMAL	TMS	2
Engine Stands (Crank Type)	N/A	N/A	Region	2
1GR-FE Cylinder Heads	N/A	TMMAL	TMS	4
Plastigage 0.018 – 0.045 mm	PL-X	Plastigauge	Region	1 Box
Prussian Blue	PTX-80038	Permatex	Region	4 Tubes
Toyota Genuine Seal Packing Black	00295-00103	Toyota	Region	1 Tube
Toyota Genuine Seal Packing 1282B	08826-00100	Toyota	Region	1 Tube
Lifter Buckets 5.06 mm	13751-46030	Toyota	TMS	8

3UR-FE Engine Parts	Part #	Producer	Source	Quantity
Piston Sub-Assy, W/Pin, Std	131010S011	Toyota	Region	N/A
Rod Sub-Assy, Connecting	132010S010	Toyota	Region	N/A
Lock, Valve Spring Retainer	90913A3001	Toyota	Region	N/A
Arm Sub-Assy, Valve Rocker	138010P010	Toyota	Region	N/A
Retainer, Valve Spring	137410P010	Toyota	Region	N/A
Cap, Valve Stem	1371675020	Toyota	Region	N/A
Spring, Compression	9050132065	Toyota	Region	N/A
Seal, Exhaust Valve Stem Oil	9008031101	Toyota	Region	N/A
Seal, Intake Valve Stem Oil	9008031043	Toyota	Region	N/A
Seat, Valve Spring	137340P010	Toyota	Region	N/A
Valve, Exhaust	137150S020	Toyota	Region	N/A
Valve, Intake	137110P010	Toyota	Region	N/A
Bolt, W/Washer	9011914120	Toyota	Region	N/A
Bolt, W/Washer	90119A0166	Toyota	Region	N/A
Hanger, Engine, No. 1	1228138150	Toyota	Region	N/A
Bolt (For Cylinder Head Set)	90910A2009	Toyota	Region	N/A
Washer, Plate (For Cylinder Head)	9020111034	Toyota	Region	N/A
Bolt, Connecting Rod	1326531020	Toyota	Region	N/A
Adjuster Assy, Valve Lash	137500P010	Toyota	Region	N/A

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Required Tools and Equipment (cont'd)

Company/Vendor	Contact Person	Phone	Website
SPX	N/A	1-800-933-8335	Toyota.spx.com
Snap-on	N/A	N/A	www.snapon.com
Fowler	N/A	1-800-788-2353	www.fvfowler.com
Permatex – Prussian Blue	N/A	877-376-2839	www.permatex.com
Plastigauge	Greg Fletcher	949-395-6918	www.plastigaugeusa.com

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