

# INJECTION PUMP TEST SPECIFICATIONS



096500-0110

INJECTION PUMP	096500-011# (VE4/12E2100RND011)	Governor	Electronical control
		Timer	Electronical control
MANUFACTURER	TOYOTA	Rated Voltage	14V
ENGINE TYPE	1KZ-TE	Rotation	Clockwise viewed from drive side
VEHICLE MODEL	LAND CRUISER	Injection Order	A - B - C - D
Pump Select Switch No. (ECD Controller)	1	Injection Interval	90°

## 1. TEST CONDITIONS

1) Nozzle	093400-0540 (DN12SD12A)	4) Feed Pressure	0.2 kgf/cm <sup>2</sup>
2) Nozzle Opening Pressure	150 ± 1 kgf/cm <sup>2</sup>	5) High Pressure Pipe	Ø2 × Ø6 × 840 mm
3) Test Oil	SAE J967 (ISO4113)	6) Fuel Temperature	40 - 43 °C (104 - 109.4 °F)

## 2. BREAK-IN DRIVE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Condition	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
1200	—	9E5	—	—	No fuel leaks, no abnormal noise, and no abnormal temperature rising.	Drive more than 5 minutes.

## 3. INSPECTION OF FUEL TEMPERATURE SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Resistance (kΩ)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
—	FUEL TEMPERATURE	—	—	—	1.15 ± 1.5	

## 4. INSPECTION OF Ne SENSOR

Pump Speed (rpm)	ECD CONTROLLER SETTING				Sensor Output Voltage (V)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
100	Np	—	—	—	0.1 or more	

## 5. ADJUSTMENT OF PUMP INTERNAL PRESSURE

Pump Speed (rpm)	ECD CONTROLLER SETTING				Internal Pressure (kgf/cm <sup>2</sup> )	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
2000	—	8F0	0	—	9.1 - 9.4	By the regulating valve
500	—	9C8	0	—	6.6 - 8.8	

## 6. OVERFLOW QUANTITY CHECK

Pump Speed (rpm)	ECD CONTROLLER SETTING				Overflow Quantity (cc/1000st)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
2000	—	8F0	0	—	375 - 583	The overflow valve belonging to the pump should be used for checking.

**7. ADJUSTMENT OF TIMER**

Pump Speed (rpm)	ECD CONTROLLER SETTING				Timer Stroke (mm)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
2000	—	8F0	0	—	10.3 ± 0.24	Select shim
500	—	9C8	0	—	10.3 ± 0.24	
500	—	9C8	50	—	7.0 ± 3.5	
500	—	9C8	100	—	0	
200	—	A88	0	—	3.60 or more	
100	—	A88	0	—	0.40 or more	

**8. ADJUSTMENT OF FUEL DELIVERY**

Pump Speed (rpm)	ECD CONTROLLER SETTING				Fuel Delivery (cc/200st.cyl.)	Max. Spread In Delivery (cc)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch			
100	—	A88	0	—	17.7 - 20.1	1.2	
350	—	96C	0	—	3.1 - 3.5	0.5	By replacing $\theta$ correction resistor
500	—	9C8	0	—	11.1 - 11.8	0.5	
900	—	955	0	—	10.1 - 11.1	—	
1000	—	9E5	0	—	20.0 - 20.7	0.5	
1800	—	8CC	0	—	11.4 - 12.0	0.5	By adjusting screw
2300	—	777	0	—	4.5 - 7.5	—	
2350	—	4E0	0	—	2.0 or less	—	

 **$\theta$  Correction Resistor**

Resistance Value (k $\Omega$ )	Mark (Last 3 Digits)	Parts No.	Resistance Value (k $\Omega$ )	Mark (Last 3 Digits)	Parts No.
0.154	001	096526-0011	0.681	017	096526-0171
0.174	002	096526-0021	0.732	018	096526-0181
0.196	003	096526-0031	0.782	019	096526-0191
0.221	004	096526-0041	0.866	020	096526-0201
0.243	005	096526-0051	0.931	021	096526-0211
0.267	006	096526-0061	1.020	022	096526-0221
0.294	007	096526-0071	1.100	023	096526-0231
0.316	008	096526-0081	1.210	024	096526-0241
0.348	009	096526-0091	1.330	025	096526-0251
0.383	010	096526-0101	1.430	026	096526-0261
0.412	011	096526-0111	1.580	027	096526-0270
0.453	012	096526-0121	1.780	028	096526-0281
0.487	013	096526-0131	1.960	029	096526-0291
0.523	014	096526-0141	2.210	030	096526-0301
0.576	015	096526-0151	2.490	031	096526-0311
0.619	016	096526-0161			

**NOTE :**

When the resistance value of  $\theta$  correction resistor is raised by 1 level, the injection quantity is increased as follows, 0.08 cc/200st (pump speed at 350 rpm), 0.12 cc/200st (pump speed at 1000 rpm).

**9. INSPECTION OF FUEL CUT SOLENOID**

— : Not Applicable

Pump Speed (rpm)	ECD CONTROLLER SETTING				Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch	
—	—	—	—	—	—

**10. ADJUSTMENT OF CAM ANGLE**

Pump Speed (rpm)	ECD CONTROLLER SETTING				Cam Angle (°)	Remarks
	Display Selector	Injection Quantity Command	Duty Ratio Command	FCV Switch		
350	CAM ANGLE	96C	100	—	Shown in display	Q = 3.5 ± 0.4 cc/200st

**Adjustment :**

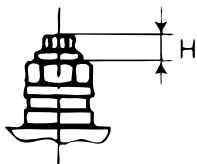
Select the cam angle correction resistor ( $\tau$ ) so that the difference between the cam angle shown on display and CA in the table below is -0.5 to 0.5.

CA (°)	$\tau$ Correction Resistor Parts No.	Resistance Value (k $\Omega$ )	CA (°)	$\tau$ Correction Resistor Parts No.	Resistance Value (k $\Omega$ )
12.48	096525-0230	0.068	15.73	096525-0081	0.453
12.87	096525-0240	0.085	15.89	096525-0091	0.487
13.10	096525-0250	0.100	16.12	096525-0101	0.523
13.22	096525-0260	0.121	16.29	096525-0111	0.576
13.44	096525-0270	0.133	16.52	096525-0121	0.619
13.63	096525-0280	0.154	16.69	096525-0131	0.681
13.83	096525-0290	0.174	16.86	096525-0141	0.732
14.04	096525-0300	0.196	17.03	096525-0151	0.787
14.22	096525-0310	0.221	17.08	096525-0161	0.866
14.41	096525-0011	0.243	17.25	096525-0171	0.931
14.60	096525-0021	0.267	17.46	096525-0181	1.020
14.75	096525-0031	0.294	17.62	096525-0191	1.100
14.96	096525-0041	0.316	17.83	096525-0201	1.210
15.18	096525-0051	0.348	18.02	096525-0211	1.330
15.34	096525-0061	0.384	18.17	096525-0221	1.430
15.56	096525-0071	0.412			

**11. SERVICE STANDARD**

Dimension KF (mm) :	6.3 ± 0.1	Drive Shaft Diameter (mm) :	Ø20
Dimension K (mm) :	3.3 ± 0.1	Delivery Valve Holder Installation Torque (kgf·m) :	6.0 ± 0.5
Timing mark re-marking position : Based on cylinder A, cam lift distance (plunger) should be 2.46 mm			

**12. NOTES FOR ADJUSTMENT**

	Keep the height of the SPV screw (shown in the figure) at 3.0 - 5.2 mm.
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## Parts List

Compo. P/N: 096500-0111

Assy P/N: 096500-0111

S	M	Illust.No.	Part Name	DENSO P/N	Manu. P/N	QTY	I/C	Start	End	Remarks
		0	PUMP ASSY, INJECTI	096500-0111	22100-67030	01				ECD-V3
*		1	HOUSING SUB-ASSY,	096110-1030		01			9310	NO SUPPLY
		1	HOUSING SUB-ASSY,	096110-1070		01	D	9311		+(62)=A
		2	HEAD SUB-ASSY, DIS	096400-1441		01				
		3	SENSOR ASSY, CRANK	029600-0230	89284-60010	01				NE SENSOR
		3-1	O-RING	90801-20210		01			9607	ID20.8
		3-1	O-RING	029475-0080		01	B	9608		ID20.8
		4	SHAFT SUB-ASSY, DR	096120-0070		01				MARK 13
S		5	RING SUB-ASSY, ROL	096180-0240		01				
		6	COVER SUB-ASSY, GO	096440-0651		01			9401	
		6	COVER SUB-ASSY, GO	096440-1520		01	B	9401		
		7	VALVE ASSY, SPILL	096600-0033	23032-54020	01				
		8	COVER, TIMER	096218-0890	22612-67030	01				
S		9	SENSOR, FUEL TEMPE	179730-0011	89454-60010	01				
S		10	PLUG, DISTRIBUTIVE	096417-0110	22176-67030	01				
		12	NUT, CAP	949055-0300	90099-05161	01				M12
		13	BOLT, SOCKET	096449-0110	22395-56351	04				M6,L16
		14	VALVE SUB-ASSY, SN	096430-0150	22190-6A290	04				
S		15	SPRING, DELIVERY V	096427-0010	22148-54010	04				
		16	VALVE SUB-ASSY, DI	096420-0550	22104-17010	04				
		17	GASKET, DELIVERY V	096426-0070	22149-56351	04				
S		19	CAMPLATE SUB-ASSY,	096230-0350	22130-67040	01				
S		20	PLATE, PLUNGER, LW	096245-0020	22163-54010	01				
S		21	PLATE, PLUNGER, UP	096244-0040	22162-54010	01				
		22	SPRING, COUPLING	096224-0081	22659-58650	01				
		23	COUPLING	096222-0050	22632-56350	01				
S		24	FILTER, SUB-ASSY	096530-0041		01			9501	
S		24	FILTER, SUB-ASSY	096530-0100	22602-54581	01	A	9502		
		25	WASHER, DRIVE SHAF	096125-0010	22161-54010	01				
S		26	COVER, FEED PUMP	096147-0040	22511-54020	01				
		27	KEY, WOODRUFF	949130-0260	90099-13017	01				
		28	NUT, HEXAGON	949050-4840		01				
		29	WASHER	096064-0091	22689-5B302	01			9501	DISCONTINUED
S		30	SEAL, OIL	096039-0040	22544-64740	01				
		31	PISTON, TIMER	096201-1070		01				
		32	SUB-PISTON, TIMER	096213-0020	22657-54010	01				
		33	PIN, TIMER SLIDE	096205-0020	22655-54010	01				
		34	STOPPER, TIMER SLI	096216-0020	22658-54010	01			9510	
		34	STOPPER, TIMER SLI	096216-0120	22658-17840	01	A	9510	9801	L16.4
		34	STOPPER, TIMER SLI	096216-0140		01	D	9802		L16.0
		35	CLIP, TIMER	096211-0050	22656-54010	01			9510	
		35	CLIP, TIMER	096211-0080	22656-17840	01	A	9510	9801	L/ DITCH

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S	M	Illust.No.	Part Name	DENSO P/N	Manu. P/N	QTY	I/C	Start	End	Remarks
		35	CLIP, TIMER	096211-0090		01	D	9802		W/ DITCH
		36	COVER, TIMER	096218-0270	22612-56350	01				
		37	O-RING	096049-0330	22193-5B302	01				ID14.4
		38	O-RING	949140-5820	90099-14105	02				ID26.3
S		39	PLUG, DISTRIBUTIVE	096417-0070	22176-54640	01				
		41	COLLAR, SMOKE SET	096448-0312		01				L18.6
		42	O-RING	949140-2970	90099-14052	01			9906	ID30
		42	O-RING	096049-0510	22193-54772	01	A	9906		ID30
S		43	SHEET, PLUNGER SPR	096247-0010	22145-54010	01				
		44	GUIDE SUB-ASSY, PL	096237-0010	22192-54010	02				
		45	SPRING, PLUNGER	096236-0040	22144-54190	02				K10
		46	SHEET, PLUNGER SPR	096246-0010	22143-54010	02				
S		48	FILTER, SUB-ASSY	096530-0071	22602-56350	01				
		49	O-RING	949140-2980	90099-14053	01				ID60
		50	O-RING	096049-0220	22193-5B303	01				ID 28.2
		51	BOLT, SOCKET	096449-0020	22395-54010	04				M6,L35
		52	WASHER	096064-0110	22689-56350	01				T0.2
		53	SCREW SUB-ASSY, OV	096020-0221	22160-67030	01				W/FILTER
		54	WASHER, AIR BLEEDE	090241-0010	22119-77020	05				T1.6
		55	O-RING	096049-0320	22193-67030	01				ID 9.8
		56	SCREW, COUNTERSUNK	949002-0420	90099-00723	02				M4,L28
		58	GASKET, GOVERNOR C	096446-0100	22774-54270	01				
		59	SCREW, HOLLOW	949180-0770	90099-18022	01				M12,L43.5
		61	BOLT, SOCKET	096449-0070	22395-58200	04				M6,L45
S		62	VALVE SUB-ASSY, RE	096160-0061	22180-54270	01			9310	
S		62	VALVE SUB-ASSY, RE	096160-0290		01	D	9311		+(1)=A
		62-1	O-RING	096049-0180	22193-54561	01				ID10
		62-2	O-RING	949140-2920	90099-14080	01			9607	ID7.5
		62-2	O-RING	096049-0500		01	A	9607		ID7.5
		63	PUMP SUB-ASSY, FUE	096140-0030	22505-54010	01				
		64	SHIM, PLUNGER SPRI	096248-0010	22182-54010	2C				T0.5
		64	SHIM, PLUNGER SPRI	096248-0020	22183-54010	2C				T0.8
		64	SHIM, PLUNGER SPRI	096248-0030	22184-54010	2C				T1.0
		64	SHIM, PLUNGER SPRI	096248-0040	22185-54010	2C				T1.2
		64	SHIM, PLUNGER SPRI	096248-0050	22186-54010	2C				T1.5
		64	SHIM, PLUNGER SPRI	096248-0060	22187-54010	2C				T1.8
		64	SHIM, PLUNGER SPRI	096248-0070	22188-54010	2C				T2.0
		64	SHIM, PLUNGER SPRI	096248-0080	22182-17010	2C				T0.9
		64	SHIM, PLUNGER SPRI	096248-0090	22182-17011	2C				T1.1
		64	SHIM, PLUNGER SPRI	096248-0100	22182-17012	2C				T1.3
		64	SHIM, PLUNGER SPRI	096248-0110	22182-17013	2C				T1.4
		65	SHIM, PLUNGER ADJU	096406-0020	22179-54010	1C				T1.9 *1

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Compo. P/N: 096500-0111

Assy P/N: 096500-0111

S	M	Illust.No.	Part Name	DENSO P/N	Manu. P/N	QTY	I/C	Start	End	Remarks
		65	SHIM, PLUNGER ADJU	096406-0170	22179-54013	1C				T2.2
		65	SHIM, PLUNGER ADJU	096406-0270	22179-54015	1C				T2.4
		65	SHIM, PLUNGER ADJU	096406-0420	22179-54018	1C				T2.7
		65	SHIM, PLUNGER ADJU	096406-0520	22179-54020	1C				T2.9
		66	BOLT	949046-2710		02				M5,L20
		68	KEY, WOODRUFF	949130-0300	90099-13018	01				
		69	SPRING, TIMER, OUT	096208-1620		01				K1.3
		70	SCREW, W/WASHER	949007-5490		04				M5,L11
		71	VALVE ASSY, TIMING	096360-0240	23010-67030	01				TCV
		71-1	O-RING	096049-0070		01				ID23.5
		72	BOLT, SOCKET	096449-0190	22395-54640	05			9403	M6,L12
		72	BOLT, SOCKET	096449-0100	22395-56352	05	B	9404		M6,L10
		73	CLIP, CONNECTOR SU	096029-1481	22172-67030	01				
		74	WASHER, TIMER SENS	096214-0030	22625-54270	2C				T0.1
		74	WASHER, TIMER SENS	096214-0040	22625-54271	2C				T0.2
		74	WASHER, TIMER SENS	096214-0050	22625-54272	2C				T0.5
		74	WASHER, TIMER SENS	096214-0060	22625-54273	2C				T0.6
		74	WASHER, TIMER SENS	096214-0070	22625-54274	2C				T0.7
		74	WASHER, TIMER SENS	096214-0080	22625-54275	2C				T0.8
		74	WASHER, TIMER SENS	096214-0090	22625-54276	2C				T0.9
		74	WASHER, TIMER SENS	096214-0100	22625-54277	2C				T1.0
		76	RESISTOR ASSY, PUM	096525-0011		1C				243 OHM
		76	RESISTOR ASSY, PUM	096525-0021		1C				267 OHM
		76	RESISTOR ASSY, PUM	096525-0031		1C				294 OHM
		76	RESISTOR ASSY, PUM	096525-0041		1C				316 OHM
		76	RESISTOR ASSY, PUM	096525-0051		1C				348 OHM
		76	RESISTOR ASSY, PUM	096525-0061		1C				384 OHM
		76	RESISTOR ASSY, PUM	096525-0071		1C				412 OHM
		76	RESISTOR ASSY, PUM	096525-0081		1C				453 OHM
		76	RESISTOR ASSY, PUM	096525-0091		1C				487 OHM
		76	RESISTOR ASSY, PUM	096525-0101		1C				523 OHM
		76	RESISTOR ASSY, PUM	096525-0111		1C				576 OHM
		76	RESISTOR ASSY, PUM	096525-0121		1C				619 OHM
		76	RESISTOR ASSY, PUM	096525-0131		1C				681 OHM
		76	RESISTOR ASSY, PUM	096525-0141		1C				732 OHM
		76	RESISTOR ASSY, PUM	096525-0151		1C				787 OHM
		76	RESISTOR ASSY, PUM	096525-0161		1C				866 OHM
		76	RESISTOR ASSY, PUM	096525-0171		1C				931 OHM
		76	RESISTOR ASSY, PUM	096525-0181		1C				1020 OHM
		76	RESISTOR ASSY, PUM	096525-0191		1C				1100 OHM
		76	RESISTOR ASSY, PUM	096525-0201		1C				1210 OHM
		76	RESISTOR ASSY, PUM	096525-0211		1C				1330 OHM



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Assy P/N: 096500-0111

S	M	Illust.No.	Part Name	DENSO P/N	Manu. P/N	QTY	I/C	Start	End	Remarks
		76	RESISTOR ASSY, PUM	096525-0221		1C				1430 OHM
		76	RESISTOR ASSY, PUM	096525-0230		1C				68 OHM
		76	RESISTOR ASSY, PUM	096525-0240		1C				85 OHM
		76	RESISTOR ASSY, PUM	096525-0250		1C				100 OHM
		76	RESISTOR ASSY, PUM	096525-0260		1C				121 OHM
		76	RESISTOR ASSY, PUM	096525-0270		1C				133 OHM
		76	RESISTOR ASSY, PUM	096525-0280		1C				154 OHM
		76	RESISTOR ASSY, PUM	096525-0290		1C				174 OHM
		76	RESISTOR ASSY, PUM	096525-0300		1C				196 OHM
		76	RESISTOR ASSY, PUM	096525-0310		1C				221 OHM
		77	RESISTOR ASSY, PUM	096526-0012		1C				154 OHM
		77	RESISTOR ASSY, PUM	096526-0022		1C				174 OHM
		77	RESISTOR ASSY, PUM	096526-0032		1C				196 OHM
		77	RESISTOR ASSY, PUM	096526-0042		1C				221 OHM
		77	RESISTOR ASSY, PUM	096526-0052		1C				243 OHM
		77	RESISTOR ASSY, PUM	096526-0062		1C				267 OHM
		77	RESISTOR ASSY, PUM	096526-0072		1C				294 OHM
		77	RESISTOR ASSY, PUM	096526-0082		1C				316 OHM
		77	RESISTOR ASSY, PUM	096526-0092		1C				348 OHM
		77	RESISTOR ASSY, PUM	096526-0102		1C				383 OHM
		77	RESISTOR ASSY, PUM	096526-0112		1C				412 OHM
		77	RESISTOR ASSY, PUM	096526-0122		1C				453 OHM
		77	RESISTOR ASSY, PUM	096526-0132		1C				487 OHM
		77	RESISTOR ASSY, PUM	096526-0142		1C				523 OHM
		77	RESISTOR ASSY, PUM	096526-0152		1C				576 OHM
		77	RESISTOR ASSY, PUM	096526-0162		1C				619 OHM
		77	RESISTOR ASSY, PUM	096526-0172		1C				681 OHM
		77	RESISTOR ASSY, PUM	096526-0182		1C				732 OHM
		77	RESISTOR ASSY, PUM	096526-0192		1C				787 OHM
		77	RESISTOR ASSY, PUM	096526-0202		1C				866 OHM
		77	RESISTOR ASSY, PUM	096526-0212		1C				931 OHM
		77	RESISTOR ASSY, PUM	096526-0222		1C				1020 OHM
		77	RESISTOR ASSY, PUM	096526-0232		1C				1100 OHM
		77	RESISTOR ASSY, PUM	096526-0242		1C				1210 OHM
		77	RESISTOR ASSY, PUM	096526-0252		1C				1330 OHM
		77	RESISTOR ASSY, PUM	096526-0262		1C				1430 OHM
		77	RESISTOR ASSY, PUM	096526-0272		1C				1580 OHM
		77	RESISTOR ASSY, PUM	096526-0282		1C				1780 OHM
		77	RESISTOR ASSY, PUM	096526-0292		1C				1960 OHM
		77	RESISTOR ASSY, PUM	096526-0302		1C				2210 OHM
		77	RESISTOR ASSY, PUM	096526-0312		1C				2490 OHM