

ENGINE CONTROL (4A-FE)

SYSTEM OUTLINE

THE ENGINE CONTROL SYSTEM UTILIZES A MICROCOMPUTER AND MAINTAINS OVERALL CONTROL OF THE ENGINE ETC. AN OUTLINE OF ENGINE CONTROL IS GIVEN HERE.

1. INPUT SIGNALS

- (1) WATER TEMP. SIGNAL SYSTEM
THE WATER TEMP. SENSOR DETECTS THE ENGINE COOLANT TEMP. AND HAS A BUILT-IN THERMISTOR WITH A RESISTANCE WHICH VARIES ACCORDING TO THE WATER TEMP. THUS THE WATER TEMP. IS INPUT IN THE FORM OF A CONTROL SIGNAL TO **TERMINAL THW** OF THE ECU.
- (2) INTAKE AIR TEMP. SIGNAL SYSTEM
THE INTAKE AIR TEMP. SENSOR IS DETECTS THE INTAKE AIR TEMP., WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF THE ECU.
- (3) OXYGEN SENSOR SIGNAL SYSTEM
THE OXYGEN DENSITY IN THE EXHAUST EMISSIONS IS DETECTED AND INPUT AS A CONTROL SIGNAL TO **TERMINAL OX** OF THE ECU.
- (4) RPM SIGNAL SYSTEM
CRANKSHAFT POSITION AND ENGINE RPM ARE DETECTED BY THE PICK-UP COIL INSTALLED INSIDE THE DISTRIBUTOR. CRANKSHAFT POSITION IS INPUT AS A CONTROL SIGNAL TO **TERMINAL G1** OF THE ECU, AND RPM IS INPUT TO **TERMINAL NE**.
- (5) THROTTLE SIGNAL SYSTEM
THE THROTTLE POSITION SENSOR DETECTS THE THROTTLE VALVE OPENING ANGLE, WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL PSW** OF THE ECU, OR WHEN THE VALVE IS FULLY CLOSED, TO **TERMINAL IDL**.
- (6) VEHICLE SPEED SIGNAL SYSTEM
THE SPEED SENSOR, INSTALLED INSIDE THE COMBINATION METER, DETECTS THE VEHICLE SPEED AND INPUTS A CONTROL SIGNAL TO **TERMINAL SPD** OF THE ECU.
- (7) NEUTRAL START SW SIGNAL SYSTEM
THE NEUTRAL START SW DETECTS WHETHER THE SHIFT POSITION IS IN NEUTRAL OR NOT, AND INPUTS A CONTROL SIGNAL TO **TERMINAL NSW** OF THE ECU.
- (8) A/C SW SIGNAL SYSTEM
THE OPERATING VOLTAGE OF THE A/C MAGNET CLUTCH IS DETECTED AND INPUT IN THE FORM OF A CONTROL SIGNAL TO **TERMINAL A/C** OF THE ECU.
- (9) BATTERY SIGNAL SYSTEM
VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ECU. WHEN THE IGNITION SW IS TURNED TO ON, VOLTAGE FOR ECU OPERATION IS APPLIED VIA THE EFI MAIN RELAY TO **TERMINALS +B** AND **+B1** OF THE ECU.
- (10) INTAKE AIR VOLUME SIGNAL SYSTEM
INTAKE AIR VOLUME IS DETECTED BY THE VACUUM SENSOR AND IS INPUT AS A CONTROL SIGNAL TO **TERMINAL PIM** OF THE ECU.
- (11) STA SIGNAL SYSTEM
TO CONFIRM THAT THE ENGINE IS CRANKING, THE VOLTAGE APPLIED TO THE STARTER MOTOR DURING CRANKING IS DETECTED AND IS INPUT AS A CONTROL SIGNAL TO **TERMINAL STA** OF THE ECU.
- (12) ELECTRICAL LOAD SIGNAL SYSTEM
THE SIGNAL WHEN SYSTEMS SUCH AS THE REAR WINDOW DEFOGGER, HEADLIGHTS, ETC. WHICH CAUSE A HIGH ELECTRICAL BURDEN ARE ON IS INPUT TO **TERMINAL ELS** AS A CONTROL SIGNAL.

2. CONTROL SYSTEM

* EFI (ELECTRONIC FUEL INJECTION) SYSTEM

THE EFI SYSTEM MONITORS THE ENGINE REVOLUTIONS THROUGH THE SIGNALS EACH SENSOR (INPUT SIGNALS (1) TO (11)) INPUTS TO THE ECU. BASED ON THIS DATA AND THE PROGRAM MEMORIZED IN THE ECU, THE MOST APPROPRIATE FUEL INJECTION TIMING IS DECIDED AND CURRENT IS OUTPUT TO **TERMINALS #10** AND **#20** OF THE ECU, CAUSING THE INJECTORS TO OPERATE IT (TO INJECT FUEL). IT IS THIS SYSTEM WHICH, THROUGH THE WORK OF THE ECU, FINELY CONTROLS FUEL INJECTION IN RESPONSE TO DRIVING CONDITIONS.

DURING ENGINE CRANKING (SIGNAL INPUT TO **TERMINAL STA**) OR FOR APPROX. 2 SECONDS AFTER NE SIGNAL INPUT, ECU OPERATION ENERGIZES (POINT CLOSED) THE FUEL PUMP CIRCUIT INSIDE THE CIRCUIT OPENING RELAY, CAUSING THE FUEL PUMP TO OPERATE.

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE REVOLUTIONS USING THE SIGNALS (INPUT SIGNALS (1, 4, 5, 10, 11)) INPUT TO THE ECU FROM EACH SENSOR. BASED ON THIS DATA AND THE PROGRAM MEMORIZED IN THE ECU, THE MOST APPROPRIATE IGNITION TIMING IS DECIDED AND CURRENT IS OUTPUT TO **TERMINAL IGT** OF THE ECU. THIS OUTPUT CONTROLS THE IGNITER TO PRODUCE THE MOST APPROPRIATE IGNITION TIMING FOR THE DRIVING CONDITIONS.

* IDLE-UP SPEED CONTROL SYSTEM

THE IDLE-UP SYSTEM USES THE AIR CONTROL VALVE FOR IDLE-UP TO INCREASE THE RPM AND PROVIDE STABLE IDLING WHEN THE IDLE SPEED DROPS DUE TO THE ELECTRICAL LOAD, ETC. THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS (1, 4 TO 8)), CURRENT IS OUTPUT TO **TERMINAL V-ISC** AND CONTROLS THE VSV.

* EGR CUT CONTROL SYSTEM

THE EGR CUT CONTROL SYSTEM CONTROLS THE VSV (FOR EGR) BY EVALUATING THE SIGNALS FROM EACH SENSOR INPUT TO THE ECU (INPUT SIGNALS (1, 5, 6, 9)) AND BY SENDING OUTPUT TO **TERMINAL EGR** OF THE ECU.

* A/C CUT CONTROL SYSTEM

WHEN THE VEHICLE SUDDENLY ACCELERATES FROM LOW ENGINE SPEED, THIS SYSTEM CUTS OFF AIR CONDITIONER OPERATION FOR A FIXED PERIOD OF TIME IN RESPONSE TO THE VEHICLE SPEED, THROTTLE VALVE OPENING ANGLE AND INTAKE MANIFOLD PRESSURE IN ORDER TO MAINTAIN ACCELERATION PERFORMANCE.

THE ECU RECEIVES INPUT SIGNALS ((4, 5, 6, 7 AND 10)), AND OUTPUTS SIGNALS TO **TERMINAL ACT**.

* OVERDRIVE CONTROL SYSTEM

THE ECU CONTROLS THE O/D SOLENOID OF THE AUTOMATIC TRANSAXLE IN RESPONSE TO SIGNALS FROM EACH SENSOR (INPUT SIGNALS (1, 4, 5, 6 AND 10)) IN ORDER TO MAINTAIN DRIVABILITY AND ACCELERATION PERFORMANCE.

THE ECU OUTPUTS A SIGNAL FROM **TERMINAL OD** TO CONTROL THE O/D SOLENOID.

3. DIAGNOSIS SYSTEM

WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTIONING IN THE ECU SIGNAL SYSTEM, THE MALFUNCTION SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN THEN BE FOUND BY READING THE DISPLAY (CODE) OF THE CHECK ENGINE WARNING LIGHT.

4. FAIL-SAFE SYSTEM

WHEN A MALFUNCTION OCCURS IN ANY SYSTEM, IF THERE IS A POSSIBILITY OF ENGINE TROUBLE BEING CAUSED BY CONTINUED CONTROL BASED ON THE SIGNALS FROM THAT SYSTEM, THE FAIL-SAFE SYSTEM EITHER CONTROLS THE SYSTEM BY USING DATA (STANDARD VALUES) RECORDED IN THE ECU MEMORY OR ELSE STOPS THE ENGINE.

SERVICE HINTS

E 5, E 8 ENGINE ECU

VOLTAGE AT ECU WIRING CONNECTORS

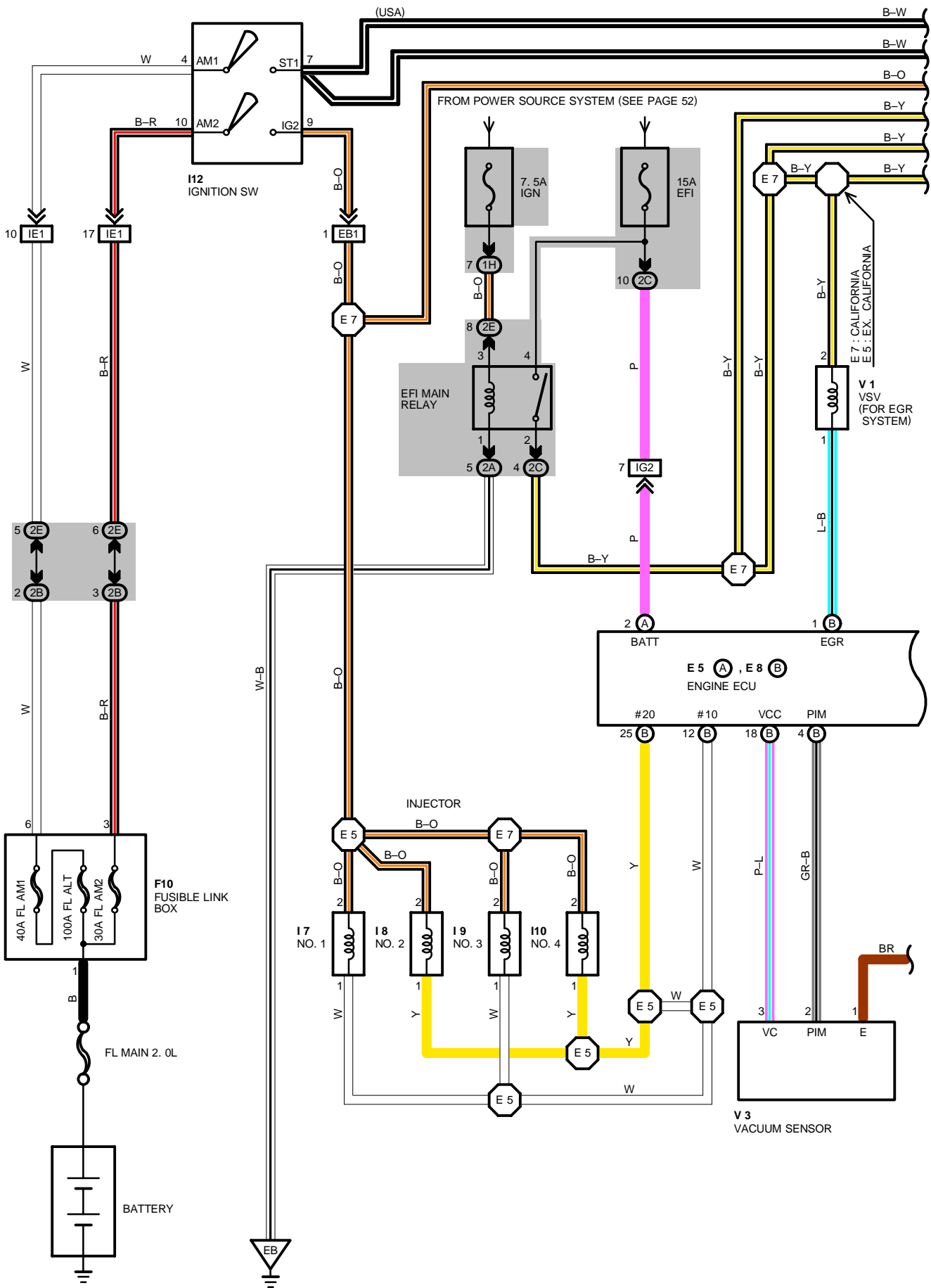
BATT-E1	: ALWAYS 10.0-14.0 VOLTS
+B-E1	: 10.0-14.0 VOLTS (IGNITION SW AT ON POSITION)
+B1-E1	: 10.0-14.0 VOLTS (IGNITION SW AT ON POSITION)
IDL-E1	: 8.0-14.0 VOLTS (IGNITION SW ON AND THROTTLE VALVE OPEN)
PSW-E1	: 4.0-5.0 VOLTS (IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED)
PIM-E2	: 3.3-3.9 VOLTS (IGNITION SW AT ON POSITION)
VCC-E2	: 4.5-5.5 VOLTS (IGNITION SW AT ON POSITION)
#10, #20-E01, E02	: 10.0-14.0 VOLTS (IGNITION SW AT ON POSITION)
THA-E2	: 1.0-3.0 VOLTS (IGNITION SW ON AND INTAKE AIR TEMP. 20°C (68°F))
THW-E2	: 0.1-1.0 VOLTS (IGNITION SW ON AND COOLANT TEMP. 80°C (176°F))
STA-E1	: 6.0-14.0 VOLTS (ENGINE CRANKING)
IGT-E1	: 0.7-1.0 VOLTS (ENGINE CRANKING OR IDLING)
W-E1	: 10.0-14.0 VOLTS (IGNITION SW ON, NO TROUBLE AND ENGINE RUNNING)
A/C-E1	: 8.0-14.0 VOLTS (IGNITION SW ON AND AIR CONDITIONING ON)
ACT-E1	: 4.0-6.0 VOLTS (IGNITION SW ON AND HEATER BLOWER SW ON)
T-E1	: 10.0-14.0 VOLTS (IGNITION SW ON AND CHECK CONNECTOR T-E1 NOT CONNECTED)
	: 0.5 OR LESS (IGNITION SW ON AND CHECK CONNECTOR T-E1 CONNECTOR)
NSW-E1	: 0-2.0 VOLTS (IGNITION SW ON AND NEUTRAL START SW POSITION P OR N RANGE)
	: 10.0-14.0 VOLTS (IGNITION SW ON AND EX. NEUTRAL START SW POSITION P OR N RANGE)
V-ISC-E1	: 10.0-14.0 VOLTS (ORANKING FOR 10 SECONDS AFTER STARTING)

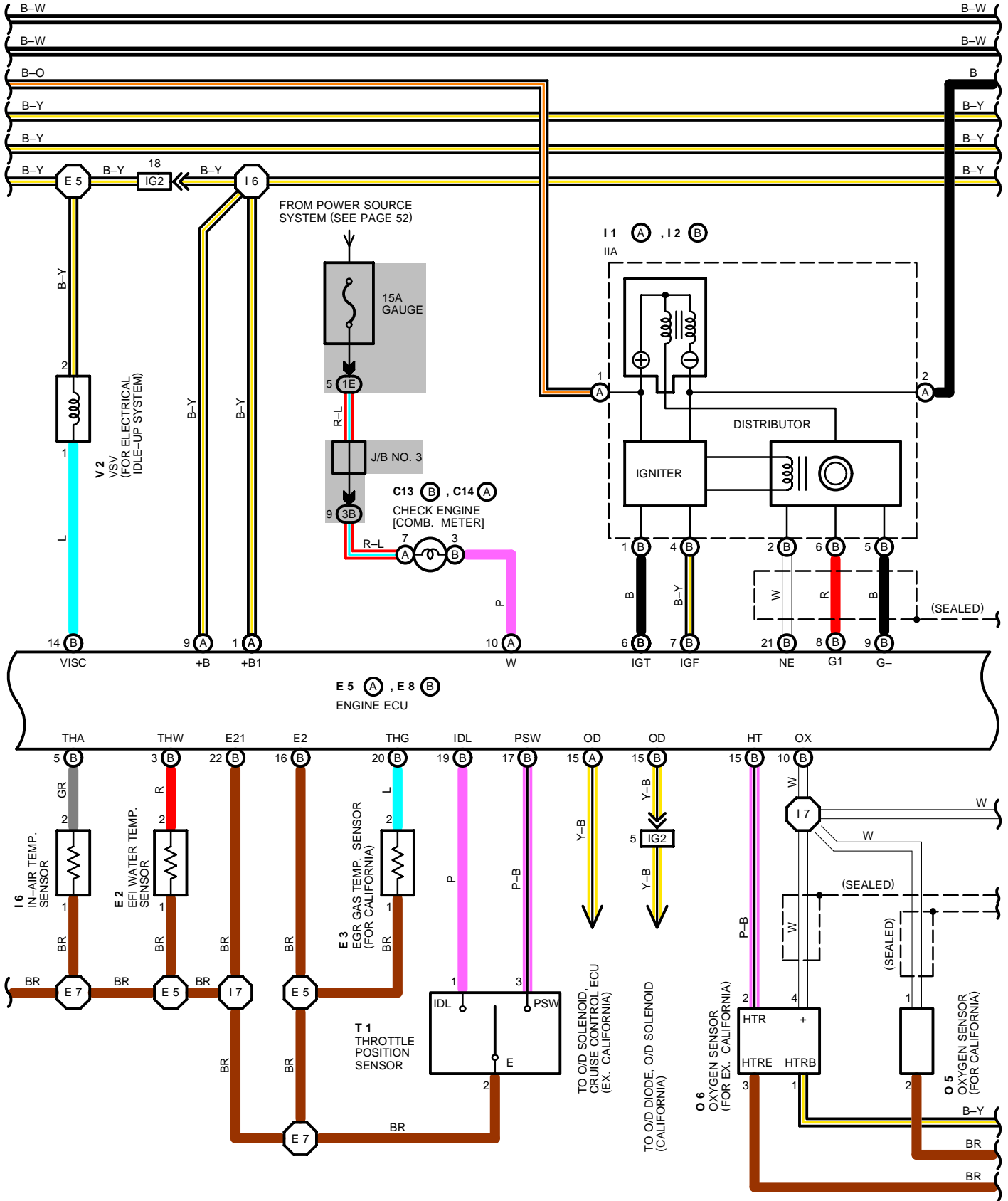
RESISTANCE AT ECU WIRING CONNECTORS

(DISCONNECT WIRING CONNECTOR)

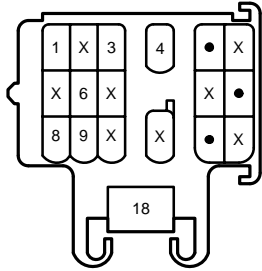
IDL-E2	: INFINITY (THROTTLE VALVE OPEN) 0 Ω (THROTTLE VALVE FULLY CLOSED)
PSW-E2	: 0 Ω (THROTTLE VALVE FULLY OPEN) INFINITY (THROTTLE VALVE FULLY CLOSED)
THA-E1	: 2.0 - 3.0 KΩ (INTAKE AIR TEMP. 20°C, 68°F)
THW-E1	: 0.2 - 0.4 KΩ (COOLANT TEMP. 80°C, 176°F)
G1, NE-G-E	: 0.17-0.21 KΩ
ISCC+B	: 19.-3-22.3 Ω
ISCO+B	

ENGINE CONTROL (4A-FE)

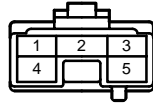




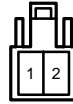
C 1 DARK GRAY



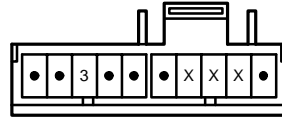
C10 DARK GRAY



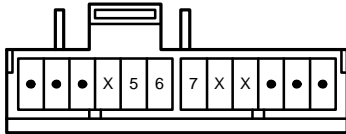
C12



C13 (B) BROWN



C14 (A)



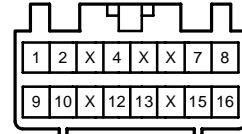
E 2 GREEN



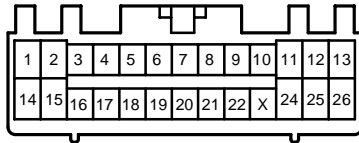
E 3 DARK GRAY



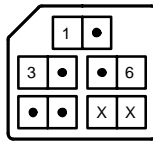
E 5 (A) DARK GRAY



E 8 (B) DARK GRAY



F10 BLACK



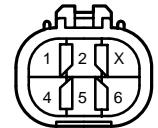
F16 DARK GRAY



I 1 (A) DARK GRAY



I 2 (B) DARK GRAY



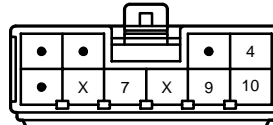
I 6 BLACK



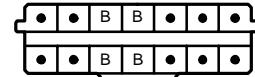
I 7, I 8, I 9, I 10 GRAY



I 12 BLACK

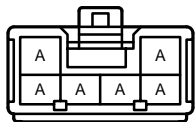


J 2



(HINT : SEE PAGE 7)

J 6



(HINT : SEE PAGE 7)

N 1 GRAY



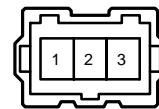
O 5 DARK GRAY



O 6 DARK GRAY



T 1 BLACK



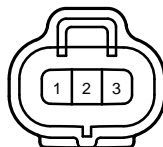
V 1 BROWN



V 2 BLUE



V 3 BLACK



ENGINE CONTROL (4A-FE)

SERVICE HINTS

E 5, E 8 ENGINE ECU

VOLTAGE AT ECU WIRING CONNECTORS

BATT-E1	: ALWAYS 10.0-14.0 VOLTS
+B-E1	: 10.0-14.0 VOLTS (IGNITION SW AT ON POSITION)
+B1-E1	: 10.0-14.0 VOLTS (IGNITION SW AT ON POSITION)
IDL-E1	: 8.0-14.0 VOLTS (IGNITION SW ON AND THROTTLE VALVE OPEN)
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T-E1	: 10.0-14.0 VOLTS (IGNITION SW ON AND CHECK CONNECTOR TE1-E1 NOT CONNECTED)
	: 0.5 OR LESS (IGNITION SW ON AND CHECK CONNECTOR TE1-E1 CONNECTOR)
NSW-E1	: 0-2.0 VOLTS (IGNITION SW ON AND NEUTRAL START SW POSITION P OR N RANGE)
	: 10.0-14.0 VOLTS (IGNITION SW ON AND EX. NEUTRAL START SW POSITION P OR N RANGE)
V-ISC-E1	: 10.0-14.0 VOLTS (CRANKING FOR 10 SECONDS AFTER STARTING)

RESISTANCE AT ECU WIRING CONNECTORS

(DISCONNECT WIRING CONNECTOR)

IDL-E2	: INFINITY (THROTTLE VALVE OPEN) 0 Ω (THROTTLE VALVE FULLY CLOSED)
PSW-E2	: 0 Ω (THROTTLE VALVE FULLY OPEN) INFINITY (THROTTLE VALVE FULLY CLOSED)
THA-E1	: 2.0 - 3.0 KΩ (INTAKE AIR TEMP. 20°C, 68°F)
THW-E1	: 0.2 - 0.4 KΩ (COOLANT TEMP. 80°C, 176°F)
G1, NE-G-	: 0.17-0.21 KΩ
ISCC+B	: 19.3-22.3 Ω
ISCO+B	: 19.3-22.3 Ω

○ : PARTS LOCATION

CODE	SEE PAGE	CODE	SEE PAGE	CODE	SEE PAGE
C 1	27 (4A-FE)	F16	30 (L/B), 31 (C/P)	J 6	29
C10	28	I 1	A	N 1	27 (4A-FE)
C12	28	I 2	B	O 5	27 (4A-FE)
C13	B	16		O 6	27 (4A-FE)
C14	A	17		T 1	27 (4A-FE)
E 2	27 (4A-FE)	18		V 1	27 (4A-FE)
E 3	27 (4A-FE)	19		V 2	27 (4A-FE)
E 5	A	I10		V 3	27 (4A-FE)
E 8	B	I12			
F10	27 (4A-FE)	J 2			

○ : RELAY BLOCKS

CODE	SEE PAGE	RELAY BLOCKS (RELAY BLOCK LOCATION)
4	24	R/B NO. 4 (RIGHT KICK PANEL)

○ : JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

CODE	SEE PAGE	JUNCTION BLOCK AND WIRE HARNESS (CONNECTOR LOCATION)
1A	18	COWL WIRE AND J/B NO. 1 (LEFT KICK PANEL)
1E		
1H	18	ENGINE ROOM MAIN WIRE AND J/B NO. 1 (LEFT KICK PANEL)
2A	20	ENGINE ROOM MAIN WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2B	20	ENGINE WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2C		
2D	20	ENGINE ROOM MAIN WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2E		
3B	22	COWL WIRE AND J/B NO. 3 (BEHIND COMBINATION METER)

 : CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

CODE	SEE PAGE	JOINING WIRE HARNESS AND WIRE HARNESS (CONNECTOR LOCATION)
EB1	34 (4A-FE)	ENGINE WIRE AND COWL WIRE (REAR SIDE OF RIGHT FRONT FENDER)
IE1	36	ENGINE ROOM MAIN WIRE AND COWL WIRE (LEFT KICK PANEL)
IF1	36	FLOOR WIRE AND COWL WIRE (LEFT KICK PANEL)
IG1	36	ENGINE WIRE AND COWL WIRE (UNDER THE ENGINE ECU)
IG2		
IJ1	36	COWL WIRE AND A/C NO. 1 WIRE (BEHIND THE GLOVE BOX)

 : GROUND POINTS

CODE	SEE PAGE	GROUND POINTS LOCATION
EB	34 (4A-FE)	FRONT LEFT FENDER
EC	34 (4A-FE)	INTAKE MANIFOLD
ID	36	LEFT KICK PANEL
IG	36	R/B NO. 4 SET BOLT
BI	38 (L/B)	UNDER THE LEFT CENTER PILLAR

 : SPLICE POINTS

CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E 5	34 (4A-FE)	ENGINE WIRE	I 6	36	COWL WIRE
E 7			I 7	36	ENGINE WIRE
E 9			I 8	36	COWL WIRE
I 2	36	COWL WIRE			