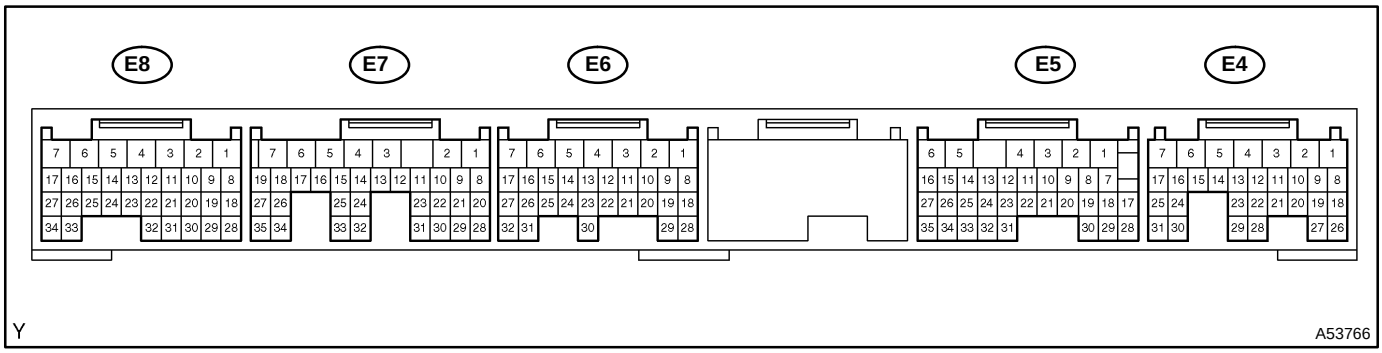
05LK5–03

TERMINALS OF ECM



HINT:

The standard normal voltage between each pair of ECM terminals is shown in the table below. The appropriate conditions for checking each pair of terminals is also indicated.

The result of checks should be compared with the standard normal voltage for that pair of terminals, displayed in the STD Voltage column.

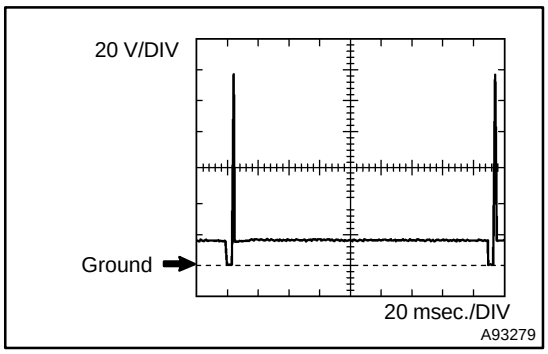
The illustration above can be used as a reference to identify the ECM terminal locations.

Symbols (Terminals No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
BATT (E4–3) – E1 (E6–1)	V – L	Battery (for measuring battery voltage and for ECM memory)	Always	Between 9 V and 14 V
+BM (E5–6) – E1 (E6–1)	BR – L	Power source of throttle motor	Always	Between 9 V and 14 V
IGSW (E4–9) – E1 (E6–1)	G – L	Ignition switch	Ignition switch ON	Between 9 V and 14 V
+B (E4–1) – E1 (E6–1)	B – L	Power source of ECM	Ignition switch ON	Between 9 V and 14 V
MREL (E4–8) – E1 (E6–1)	O – L	EFI relay	Ignition switch ON	Between 9 V and 14 V
VC (E8–18) – E2 (E8–28)	V – R	Power source of sensor (specific voltage)	Ignition switch ON	Between 4.5 V and 5.5 V
VTA1 (E8–21) – E2 (E8–28)	LG – R	Throttle position sensor (for engine control)	Ignition switch ON, Accelerator pedal fully released	Between 0.4 V and 1.0 V
VTA1 (E8–21) – E2 (E8–28)	LG – R	Throttle position sensor (for engine control)	Ignition switch ON, Accelerator pedal fully depressed	Between 3.2 V and 4.8 V
VTA2 (E8–31) – E2 (E8–28)	BR – R	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal fully released	Between 2.1 V and 3.1 V
VTA2 (E8–31) – E2 (E8–28)	BR – R	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal fully depressed	Between 4.5 V and 5.5 V
VPA (E4–22) – EPA (E4–28)	W – BR	Accelerator pedal position sensor (for engine control)	Ignition switch ON, Accelerator pedal fully released	Between 0.5 V and 1.1 V
VPA (E4–22) – EPA (E4–28)	W – BR	Accelerator pedal position sensor (for engine control)	Ignition switch ON, Accelerator pedal fully depressed	Between 2.5 V and 4.6 V
VPA2 (E4–23) – EPA2 (E4–29)	V – R	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal fully released	Between 1.5 V and 2.9 V
VPA2 (E4–23) – EPA2 (E4–29)	V – R	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal fully depressed	Between 3.5 V and 5.5 V
VCPA (E4–26) – EPA (E4–28)	L – BR	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	Between 4.5 V and 5.5 V

Symbols (Terminals No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
VCP2 (E4–27) – EPA2 (E4–29)	P – R	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	Between 4.5 V and 5.5 V
VG (E8–30) – EVG (E8–29)	R – W	Mass air flow meter	Idling, Shift position P or N, A/C switch OFF	Between 0.5 V and 3.0 V
THA (E8–20) – E2 (E8–28)	L – R	Intake air temperature sensor	Idling, Intake air temperature 20˚C (68˚F)	Between 0.5 V and 3.4 V
THW (E8–19) – E2 (E8–28)	G – R	Engine coolant temperature sensor	Idling, Engine coolant temperature 80˚C (176˚F)	Between 0.2 V and 1.0 V
#1 (E8–1) – E01 (E8–7) #2 (E8–2) – E01 (E8–7) #3 (E8–3) – E01 (E8–7) #4 (E8–4) – E01 (E8–7)	L – B R – B Y – B W – B	Injector	Ignition switch ON	Between 9 V and 14 V
#1 (E8–1) – E01 (E8–7) #2 (E8–2) – E01 (E8–7) #3 (E8–3) – E01 (E8–7) #4 (E8–4) – E01 (E8–7)	L – B R – B Y – B W – B	Injector	Idling	Pulse generation (see waveform 1)
IGT1 (E8–8) – E1 (E6–1) IGT2 (E8–9) – E1 (E6–1) IGT3 (E8–10) – E1 (E6–1) IGT4 (E8–11) – E1 (E6–1)	G – L P – L B – L LG – L	Ignition coil with igniter (ignition signal)	Idling	Pulse generation (see waveform 2)
IGF1 (E8–24) – E1 (E6–1)	V – L	Ignition coil with igniter (ignition confirmation signal)	Ignition switch ON	Between 4.5 V and 5.5 V
IGF1 (E8–24) – E1 (E6–1)	V – L	Ignition coil with igniter (ignition confirmation signal)	Idling	Pulse generation (see waveform 2)
G2+ (E6–27) – NE– (E6–24)	P – G	Camshaft position sensor	Idling	Pulse generation (see waveform 3)
NE+ (E6–25) – NE– (E6–24)	R – G	Crankshaft position sensor	Idling	Pulse generation (see waveform 3)
FC (E4–10) – E1 (E6–1)	L – L	Fuel pump control	Ignition switch ON	Between 9 V and 14 V
M+ (E6–3) – E01 (E8–7)	B – B	Throttle actuator	Idling	Pulse generation (see waveform 4)
M– (E6–2) – E01 (E8–7)	W – B	Throttle actuator	Idling	Pulse generation (see waveform 5)
A1A+ (E7–23) – E1 (E6–1)	O – L	A/F sensor	Always (Ignition switch ON)	3.3 V fixed
A1A– (E7–31) – E1 (E6–1)	W – L	A/F sensor	Always (Ignition switch ON)	3.0 V fixed
OX1B (E7–29) – O1B– (E7–2)	B – W	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up sensor	Pulse generation (see waveform 6)
HA1A (E7–5) – E04 (E7–7)	G – W–B	A/F sensor heater	Idling	Below 3.0 V
HA1A (E7–5) – E04 (E7–7)	G – W–B	A/F sensor heater	Ignition switch ON	Between 9 V and 14 V
HT1B (E7–21) – E03 (E6–7)	L – BR	Heated oxygen sensor heater	Idling	Below 3.0 V
HT1B (E7–21) – E03 (E6–7)	L – BR	Heated oxygen sensor heater	Ignition switch ON	Between 9 V and 14 V
KNK1 (E7–1) – EKNK (E7–28)	R – G	Knock sensor	Maintain engine speed at 4,000 rpm after warming up engine	Pulse generation (see waveform 7)
OC1+ (E6–16) – OC1– (E6–15)	Y – W	Camshaft timing oil control valve (OCV)	Ignition switch ON	Pulse generation (see waveform 8)
PRG (E8–34) – E01 (E8–7)	R – B	EVAP VSV	Ignition switch ON	Between 9 V and 14 V
PRG (E8–34) – E01 (E8–7)	R – B	EVAP VSV	Idling	Pulse generation (see waveform 9)

Symbols (Terminals No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
VPMP (E8–27) – E1 (E6–1)	LG – L	Vent valve (built into pump module)	Ignition switch ON	Between 9 V and 14 V
MPMP (E4–4) – E1 (E6–1)	L – L	Vacuum pump (built into pump module)	• Vacuum pump OFF • Vacuum pump ON	Between 0 V and 3 V Between 9 V and 14 V
PPMP (E4–21) – E1 (E6–1)	LG – L	Pressure sensor (built into pump module)	Ignition switch ON	Between 3 V and 3.6 V
STA (E8–17) – E1 (E6–1)	B – L	Starter signal	Shift position N, Ignition switch START	6.0 V or more
STP (E5–19) – E1 (E6–1)	L – L	Stop lamp switch	Brake pedal depressed	Between 9 V and 14 V
STP (E5–19) – E1 (E6–1)	L – L	Stop lamp switch	Brake pedal released	Below 1.5 V
ST1– (E5–12) – E1 (E6–1)	L – L	Stop lamp switch	Ignition switch ON, Brake pedal depressed	Below 1.5 V
ST1– (E5–12) – E1 (E6–1)	L – L	Stop lamp switch	Ignition switch ON, Brake pedal released	Between 7.5 V and 14 V
W (E4–11) – E01 (E8–7)	G – B	MIL	Idling	Between 9 V and 14 V
W (E4–11) – E01 (E8–7)	G – B	MIL	Ignition switch ON	Below 3.0 V
ELS (E4–12) – E1 (E6–1)	P – L	Electric load	Taillamp switch ON, Defogger switch ON	Between 7.5 V and 14 V
ELS (E4–12) – E1 (E6–1)	P – L	Electric load	Taillamp switch OFF, Defogger switch OFF	Between 0 V and 1.5 V
TACH (E4–5) – E1 (E6–1)	B – L	Engine speed	Idling	Pulse generation (see waveform 10)
SPD (E5–17) – E01 (E8–7)	V – B	Speed signal from combination meter	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (see waveform 11)
TC (E4–20) – E1 (E6–1)	R – L	Terminal TC of DLC3	Ignition switch ON	Between 9 V and 14 V
SIL (E4–18) – E1 (E6–1)	W – L	Terminal SIL of DLC3	Connect intelligent tester II to DLC3	Pulse generation (see waveform 12)
PSW (E6–10) – E1 (E6–1)	R – L	Power steering oil pressure switch	While turning steering wheel	Below 1.5 V
F/PS (E4–14) – E1 (E6–1)	Y – L	Airbag sensor assembly	Ignition switch ON	Pulse generation (see waveform 13)

*1: The ECM terminal voltage is constant regardless of the output voltage from the sensor.



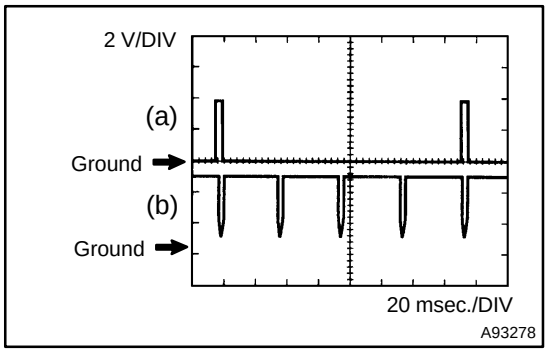
WAVEFORM 1

Fuel injector

ECM Terminal Names	Between #10 (to 40) and E01
Tester Ranges	20 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



WAVEFORM 2

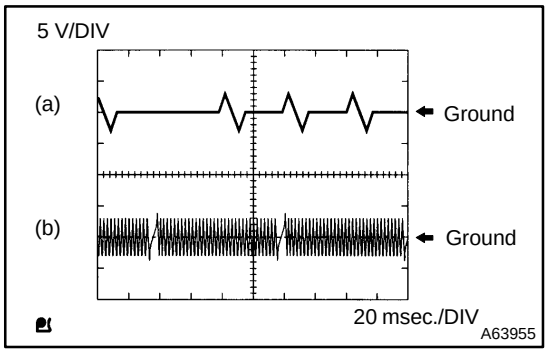
(a) Igniter IGT signal (from ECM to igniter)

(b) Igniter IGF signal (from igniter to ECM)

ECM Terminal Names	(a) Between IGT (1 to 4) and E1 (b) Between IGF1 and E1
Tester Ranges	2 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



WAVEFORM 3

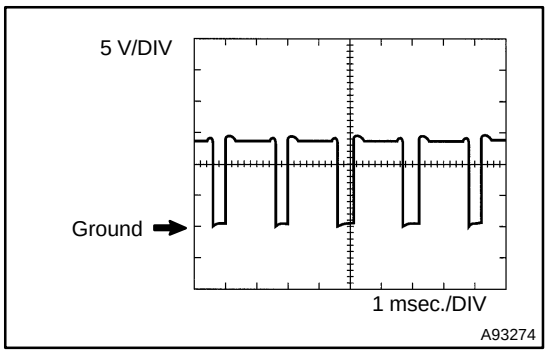
(a) Camshaft position sensor

(b) Crankshaft position sensor

ECM Terminal Names	(a) Between G2+ and NE– (b) Between NE+ and NE–
Tester Ranges	5 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



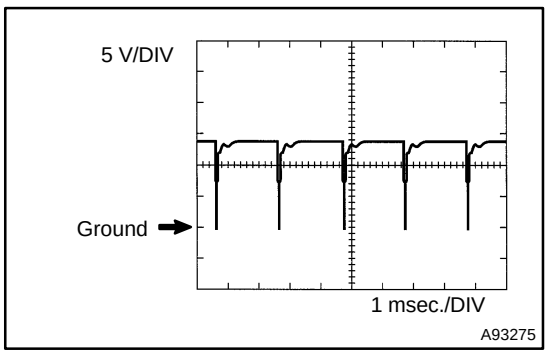
WAVEFORM 4

Throttle actuator positive terminal

ECM Terminal Names	Between M+ and ME01
Tester Ranges	5 V/DIV, 1 msec./DIV
Conditions	Idling with warm engine

HINT:

The duty ratio varies depending on the throttle actuator operation.



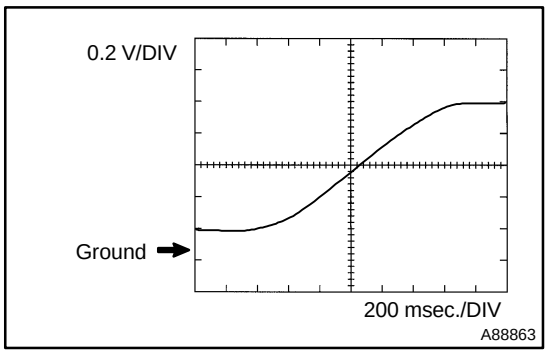
WAVEFORM 5

Throttle actuator negative terminal

ECM Terminal Names	Between M– and ME01
Tester Ranges	5 V/DIV, 1 msec./DIV
Conditions	Idling with warm engine

HINT:

The duty ratio varies depending on the throttle actuator operation.



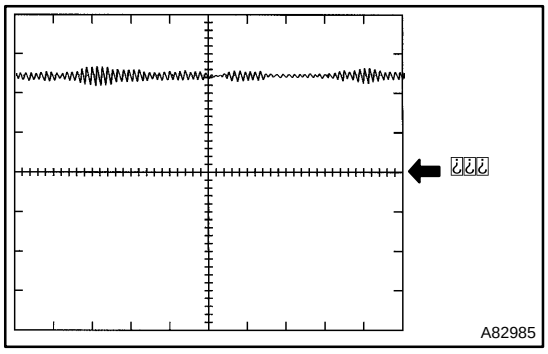
WAVEFORM 6

Heated oxygen sensor

ECM Terminal Names	Between OX1B and E2
Tester Ranges	0.2 V/DIV, 200 msec./DIV
Conditions	Engine speed maintained 2,500 rpm for 2 minutes after warming up sensor

HINT:

In the DATA LIST, item O2S B1S2 shows the ECM input values from the heated oxygen sensor.



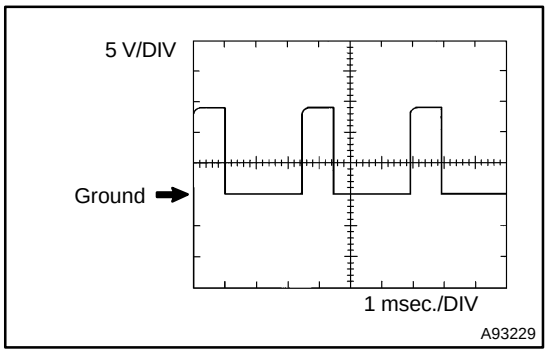
WAVEFORM 7

Knock sensor

ECM Terminal Names	Between KNK1 and EKNK
Tester Ranges	0.01 to 10 V/DIV, 0.01 to 10 msec./DIV
Conditions	Maintain engine speed 4,000 rpm after warming up engine

HINT:

- The wavelength becomes shorter as the engine rpm increases.
- The waveforms and amplitudes displayed differ slightly depending on the vehicle.



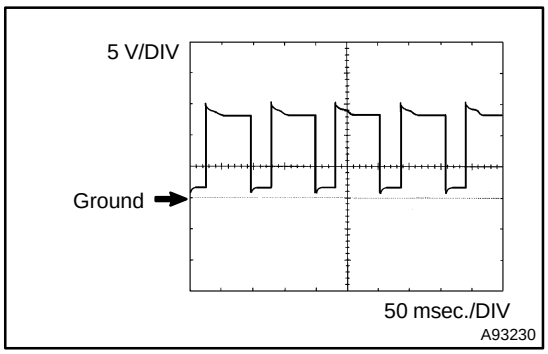
WAVEFORM 8

Camshaft timing oil control valve (OCV)

ECM Terminal Names	Between OC1+ and OC1–
Tester Ranges	5 V/DIV, 1 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



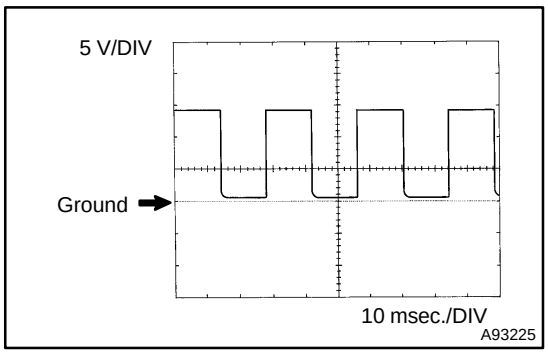
WAVEFORM 9

EVAP VSV

ECM Terminal Names	Between PRG and E01
Tester Ranges	5 V/DIV, 50 msec./DIV
Conditions	Idling

HINT:

If the waveform is not similar to the illustration, check the waveform again after idling for 10 minutes or more.



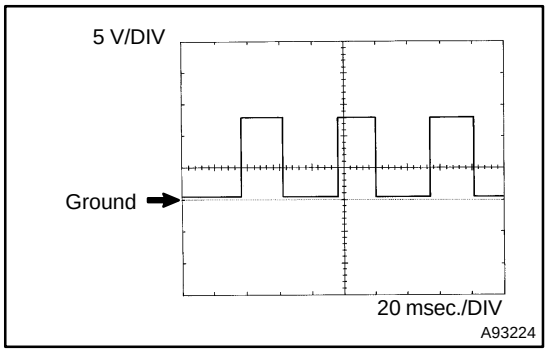
WAVEFORM 10

Engine speed signal

ECM Terminal Names	Between TACH and E1
Tester Ranges	5 V/DIV, 10 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



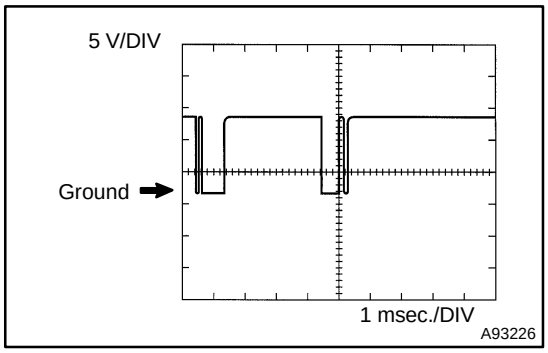
WAVEFORM 11

Vehicle speed signal

ECM Terminal Names	Between SPD and E1
Tester Ranges	5 V/DIV, 20 msec./DIV
Conditions	Driving at 12 mph (20 km/h)

HINT:

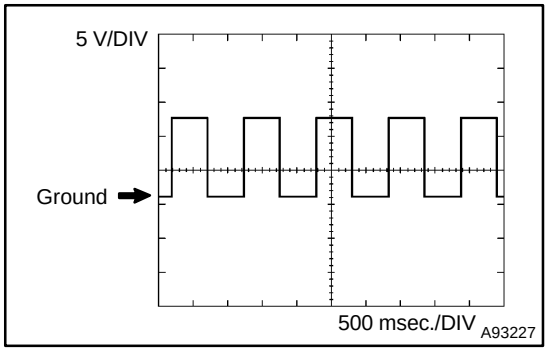
The wavelength becomes shorter as the vehicle speed increases.



WAVEFORM 12

Terminal SIL of DLC3

ECM Terminal Names	Between SIL and E1
Tester Ranges	5 V/DIV, 1 msec./DIV
Conditions	Connect hand–held tester or OBD II scan tool to DLC3



WAVEFORM 13

Airbag sensor assembly

ECM Terminal Names	Between F/PS and E1
Tester Ranges	5 V/DIV, 500 msec./DIV
Conditions	Idling with warm engine