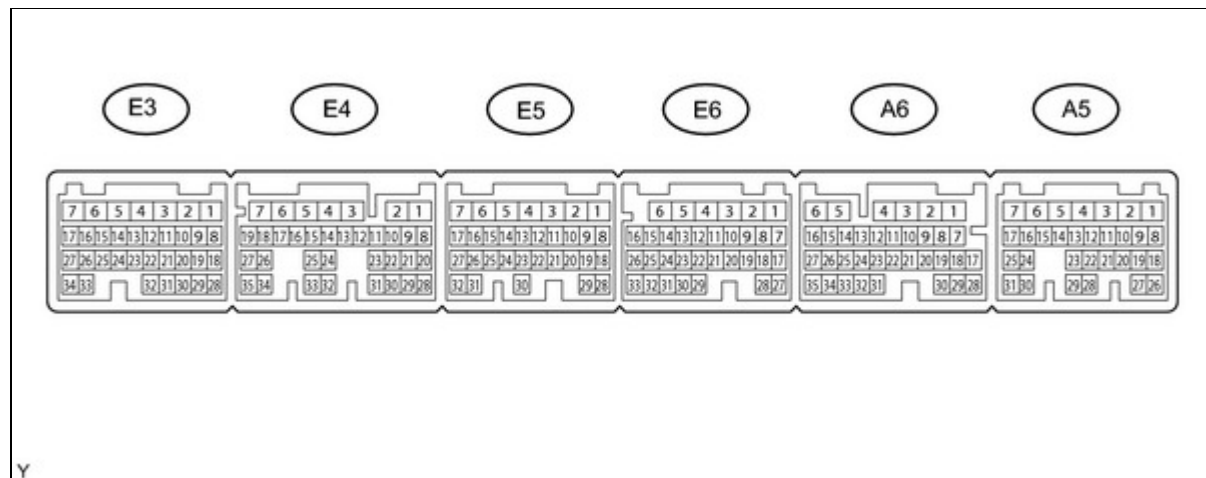


Last Modified: 4-24-2018	6.8:8.0.48	Doc ID: RM000000PDH00JX
Model Year Start: 2006	Model: IS250	Prod Date Range: [08/2005 -]
Title: 4GR-FSE ENGINE CONTROL SYSTEM: SFI SYSTEM: TERMINALS OF ECM; 2006 MY IS250 [08/2005 -]		

TERMINALS OF ECM



HINT:

The standard normal voltage between each pair of the ECM terminals is shown in the table below. The appropriate conditions for checking each pair of the terminals are also indicated. The result of checks should be compared with the standard normal voltage for that pair of terminals, displayed in the Specified Condition column. The illustration above can be used as a reference to identify the ECM terminal locations.

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
BATT (A5-4) - E1 (E4-7)	L - BR	Battery (for measuring battery voltage and for ECM memory)	Always	9 to 14 V
+BM (E3-5) - E1 (E4-7)	P - BR	Power source of throttle motor	Always	9 to 14 V
IGSW (A5-17) - E1 (E4-7)	B-W - BR	Engine switch	Engine switch on (IG)	9 to 14 V
+B (A5-6) - E1 (E4-7)	B-R - BR	Power source of ECM	Engine switch on (IG)	9 to 14 V
+B1 (A5-5) - E1 (E4-7)	B-R - BR	Power source of ECM	Engine switch on (IG)	9 to 14 V
OC1+ (E3-34) - OC1- (E3-33)	W - L	Camshaft timing oil control valve (OCV) (Intake side (bank 1))	Engine switch on (IG)	Pulse generation (see waveform 1)
OC2+ (E5-9) - OC2- (E5-8)	P - R	Camshaft timing oil control valve (OCV) (Intake side (bank 2))	Engine switch on (IG)	Pulse generation (see waveform 1)

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
OE1+ (E3-9) - OE1- (E3-8)	R - Y	Camshaft timing oil control valve (OCV) (Exhaust side (bank 1))	Engine switch on (IG)	Pulse generation (see waveform 1)
OE2+ (E5-24) - OE2- (E5-23)	W - R	Camshaft timing oil control valve (OCV) (Exhaust side (bank 2))	Engine switch on (IG)	Pulse generation (see waveform 1)
MREL (A5-13) - E1 (E4-7)	Y - BR	EFI MAIN relay	Engine switch on (IG)	9 to 14 V
VC (E3-29) - E2 (E3-28)	LG - BR	Power source for sensors (specific voltage)	Engine switch on (IG)	4.5 to 5.0 V
VC2 (E5-29) - E3 (E5-30)	L - BR	Power source for sensors (specific voltage)	Engine switch on (IG)	4.5 to 5.0 V
VG (E5-27) - E2G (E5-26)	G - V	Mass air flow meter	Idling, Shift lever position P or N, A/C switch OFF	0.5 to 3.0 V
THA (E5-25) - E3 (E5-30)	L - BR	Intake air temperature sensor	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4 V
THW (E5-20) - E2 (E3-28)	Y - BR	Engine coolant temperature sensor	Idling, Engine coolant temperature 80°C (176°F)	0.2 to 1.0 V
VTA1 (E3-23) - E3 (E5-30)	LG - BR	Throttle position sensor (for engine control)	Engine switch on (IG), Throttle valve fully closed	0.5 to 1.2 V
VTA1 (E3-23) - E3 (E5-30)	LG - BR	Throttle position sensor (for engine control)	Engine switch on (IG), Throttle valve fully open	3.2 to 4.8 V
VTA2 (E3-22) - E3 (E5-30)	P - BR	Throttle position sensor (for sensor malfunction detection)	Engine switch on (IG), Accelerator pedal released	2.1 to 3.1 V
VTA2 (E3-22) - E3 (E5-30)	P - BR	Throttle position sensor (for sensor malfunction detection)	Engine switch on (IG), Accelerator pedal depressed	4.5 to 5.0 V
VPA (A6-33) - EPA (A6-34)	G-W - L-Y	Accelerator pedal position sensor (for engine control)	Engine switch on (IG), Accelerator pedal released	0.5 to 1.1 V
VPA (A6-33) - EPA (A6-34)	G-W - L-Y	Accelerator pedal position sensor (for engine control)	Engine switch on (IG), Accelerator pedal depressed	2.6 to 4.5 V
VPA2 (A6-32) - EPA2 (A6-26)	P-L - G-B	Accelerator pedal position sensor (for sensor malfunctioning detection)	Engine switch on (IG), Accelerator pedal released	1.2 to 2.0 V
VPA2 (A6-32) - EPA2 (A6-26)	P-L - G-B	Accelerator pedal position sensor (for sensor malfunctioning detection)	Engine switch on (IG), Accelerator pedal depressed	3.4 to 5.0 V
VCPA (A6-35) - EPA2 (A6-26)	P - G-B	Power source of accelerator pedal position sensor (for VPA)	Engine switch on (IG)	4.5 to 5.0 V

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
VCP2 (A6-27) - EPA2 (A6-26)	G-R - G-B	Power source of accelerator pedal position sensor (for VPA2)	Engine switch on (IG)	4.5 to 5.0 V
HA1A (E6-6) - E04 (E6-5) HA2A (E6-4) - E05 (E6-3)	V - W-B R - W-B	A/F sensor heater	Idling	Below 3.0 V
HA1A (E6-6) - E04 (E6-5) HA2A (E6-4) - E05 (E6-3)	V - W-B R - W-B	A/F sensor heater	Engine switch on (IG)	9 to 14 V
A1A+ (E6-18) - E1 (E4-7)	R - BR	A/F sensor	Engine switch on (IG)	3.3 V*
A2A+ (E6-28) - E1 (E4-7)	B - BR	A/F sensor	Engine switch on (IG)	3.3 V*
A1A- (E6-17) - E1 (E4-7)	G - BR	A/F sensor	Engine switch on (IG)	2.9 V*
A2A- (E6-27) - E1 (E4-7)	W - BR	A/F sensor	Engine switch on (IG)	2.9 V*
HT1B (A6-2) - E03 (E3-6)	L-R - W-B	Heated oxygen sensor heater	Idling	Below 3.0 V
HT2B (A6-1) - E1 (E4-7)	L-W - BR	Heated oxygen sensor heater	Idling	Below 3.0 V
HT1B (A6-2) - E03 (E3-6)	L-R - W-B	Heated oxygen sensor heater	Engine switch on (IG)	9 to 14 V
HT2B (A6-1) - E1 (E4-7)	L-W - BR	Heated oxygen sensor heater	Engine switch on (IG)	9 to 14 V
OX1B (A6-28) - O1B- (A6-29) OX2B (A6-17) - O2B- (A6-18)	R - G B - W	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up sensor	Pulse generation (see waveform 2)
#10 (E3-15) - E1 (E4-7) #20 (E5-17) - E1 (E4-7) #30 (E3-14) - E1 (E4-7) #40 (E5-16) - E1 (E4-7) #50 (E3-13) - E1 (E4-7) #60 (E5-15) - E1 (E4-7)	R - BR GR - BR L - BR P - BR B - BR Y - BR	Injector	Engine switch on (IG)	0 to 5 V

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
#10 (E3-15) - E1 (E4-7) #20 (E5-17) - E1 (E4-7) #30 (E5-14) - E1 (E4-7) #40 (E5-16) - E1 (E4-7) #50 (E3-13) - E1 (E4-7) #60 (E5-15) - E1 (E4-7)	R - BR GR - BR L - BR P - BR B - BR Y - BR	Injector	Idling	Pulse generation (see waveform 3)
KNK1 (E4-28) - EKNK (E4-30)	B - W	Knock sensor	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (see waveform 4)
KNK2 (E4-29) - EKN2 (E4-31)	R - G	Knock sensor	Maintain engine speed at 4,000 rpm after warming up	Pulse generation (see waveform 4)
VV1+ (E3-21) - VV1- (E3-20)	Y - P	Variable valve timing (VVT) sensor (Intake side (bank 1))	Idling	Pulse generation (see waveform 5)
VV2+ (E3-19) - VV2- (E3-18)	G - W	Variable valve timing (VVT) sensor (Intake side (bank 2))	Idling	Pulse generation (see waveform 5)
NE+ (E3-32) - NE- (E3-31)	R - G	Crankshaft position sensor	Idling	Pulse generation (see waveform 5, 6)
EV1+ (E5-19) - EV1- (E5-18)	W - G	Variable valve timing (VVT) sensor (Exhaust side (bank 1))	Idling	Pulse generation (see waveform 6)
EV2+ (E6-13) - EV2- (E6-12)	W - B	Variable valve timing (VVT) sensor (Exhaust side (bank 2))	Idling	Pulse generation (see waveform 6)
IGT1 (E5-13) - E1 (E4-7) IGT2 (E3-17) - E1 (E4-7) IGT3 (E5-10) - E1 (E4-7) IGT4 (E5-12) - E1 (E4-7) IGT5 (E3-27) - E1 (E4-7) IGT6 (E3-26) - E1 (E4-7)	GR - BR G - BR B - BR L - BR B - BR BR - BR	Ignition coil (ignition signal)	Idling	Pulse generation (see waveform 7)
IGF1 (E5-7) - E1 (E4-7)	G - BR B - BR	Ignition coil (ignition confirmation signal)	Engine switch on (IG)	4.5 to 5.0 V

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
IGF2 (E5-6) - E1 (E4-7)				
IGF1 (E5-7) - E1 (E4-7) IGF2 (E5-6) - E1 (E4-7)	G - BR B - BR	Ignition coil (ignition confirmation signal)	Idling	Pulse generation (see waveform 7)
PRG (E3-11) - E1 (E4-7)	W - BR	EVAP VSV	Engine switch on (IG)	9 to 14 V
PRG (E3-11) - E1 (E4-7)	W - BR	EVAP VSV	Idling	Pulse generation (see waveform 8)
SPD (A5-22) - E1 (E4-7)	Y-G - BR	Speed signal from combination meter	Engine switch on (IG), Rotate driving wheel slowly	Pulse generation (see waveform 9)
STA (A5-12) - E1 (E4-7)	R - BR	Starter signal	Cranking	9 to 14 V
STAR (E4-4) - E1 (E4-7)	L - BR	Park/neutral position switch signal	Engine switch on (IG), Other shift position in P or N	0 to 3.0 V
STAR (E4-4) - E1 (E4-7)	L - BR	Park/neutral position switch signal	Cranking, Shift position in P or N	9 to 14 V
STSW (A5-19) - E1 (E4-7)	Y-B - BR	Engine switch signal	Shift lever position P or N, engine switch START	6.0 V or more
STP (A6-4) - E1 (E4-7)	R-B - BR	Normally open switch	Brake pedal depressed	7.5 to 14 V
STP (A6-4) - E1 (E4-7)	R-B - BR	Normally open switch	Brake pedal released	Below 1.5 V
ST1- (A5-8) - E1 (E4-7)	G-W - BR	Normally closed switch	Engine switch on (IG), Brake pedal depressed	Below 1.5 V
ST1- (A5-8) - E1 (E4-7)	G-W - BR	Normally closed switch	Engine switch on (IG), Brake pedal released	7.5 to 14 V
M+ (E3-2) - ME01 (E3-4)	B - W-B	Throttle actuator	Idling with warm engine	Pulse generation (see waveform 10)
M- (E3-1) - ME01 (E3-4)	W - W-B	Throttle actuator	Idling with warm engine	Pulse generation (see waveform 11)
FC (A5-14) - E1 (E4-7)	R-G - BR	Fuel pump control	Engine switch on (IG)	9 to 14 V
FC (A5-14) - E1 (E4-7)	R-G - BR	Fuel pump control	Idling	0 to 3 V
FPR (A5-15) - E1 (E4-7)	B-Y - BR	Fuel pump control	Cranking	9 to 14 V

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
FPR (A5-15) - E1 (E4-7)	B-Y - BR	Fuel pump control	Idling	9 to 14 V
W (A6-8) - E1 (E4-7)	R-L - BR	MIL	Engine switch on (IG)	Below 3.0 V
W (A6-8) - E1 (E4-7)	R-L - BR	MIL	Idling	0 to 3 V
TC (A6-3) - E1 (E4-7)	V - BR	Terminal TC of DLC 3	Engine switch on (IG)	9 to 14 V
TACH (A6-16) - E1 (E4-7)	R-W - BR	Engine speed	Idling	Pulse generation (see waveform 12)
ACIS (E5-3) - E1 (E4-7)	Y - BR	Intake air control valve actuator	Engine switch on (IG)	9 to 14 V
ACIS (E5-3) - E1 (E4-7)	Y - BR	Intake air control valve actuator	Engine RPM is 2,400 to 4,000 rpm and throttle opening percentage is 40 % or more	0 to 3 V
VPMP (A6-12) - E1 (E4-7)	W-L - BR	Vent valve (built into pump module)	Engine switch on (IG)	9 to 14 V
MPMP (A6-5) - E1 (E4-7)	P - BR	Vacuum pump (built into pump module)	Vacuum pump OFF	0 to 3 V
MPMP (A6-5) - E1 (E4-7)	P - BR	Vacuum pump (built into pump module)	Vacuum pump ON	9 to 14 V
PPMP (A6-25) - E2 (E3-28)	LG - BR	Pressure sensor (built into pump module)	Engine switch on (IG)	3 to 3.6 V
INJF (E6-26) - E1 (E4-7)	BR- BR	Injector injection confirmation signal	Idling	Pulse generation (see waveform 13)
FPF1 (E6-32) - E1 (E4-7)	W - BR	High pressure side fuel pump (Spill valve)	Idling	Pulse generation (see waveform 14)
FPD (E6-33) - E1 (E4-7)	G- BR	High pressure side fuel pump (Spill valve)	Idling	Pulse generation (see waveform 14)
PR (E6-25) - E2 (E3-28)	R- BR	Fuel pressure sensor	Idling	1.8 to 2.3 V
IAC1 (E6-31) - E1 (E4-7)	G - BR	SCV position sensor	Engine switch off to on (IG)	3.0 to 4.0 V
IA1+ (E6-2) - E01 (E5-2)	L - W-B	DC motor for SCV	Idling	Pulse generation (see waveform 15)

SYMBOLS (TERMINAL NO.)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
IA1- (E6-1) - E01 (E5-2)	W- W-B	DC motor for SCV	Idling	Pulse generation (see waveform 16)
STJ1 (E3-7) - E1 (E4-7)	G - BR	Cold start injector	Engine switch on (IG)	9 to 14 V
CANH (A5-25) - E1 (E4-7)	B - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 17)
CANL (A5-24) - E1 (E4-7)	W - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 18)

*1 : 2WD

*2 : 4WD

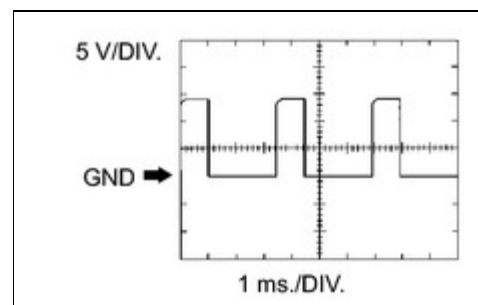
HINT:

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

1. WAVEFORM 1

Camshaft timing oil control valve (OCV):

ECM Terminal Name	Between OC1+ and OC1- or OC2+ and OC2- Between OE1+ and OE1- or OE2+ and OE2-
Tester Range	5 V/DIV, 1 ms./DIV
Condition	Idling



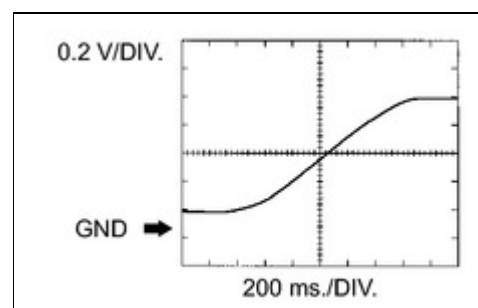
HINT:

The wavelength becomes shorter as the engine rpm increases.

2. WAVEFORM 2

Heated oxygen sensor:

ECM Terminal Name	Between OX1B and O1B- or OX2B and O2B-
Tester Range	0.2 V/DIV, 200 ms./DIV
Condition	Engine speed maintained at 2,500 rpm for 2 minutes after warming up engine



HINT:

In DATA LIST, item O2S B1 S2 shows the ECM input values from the heated oxygen sensor.

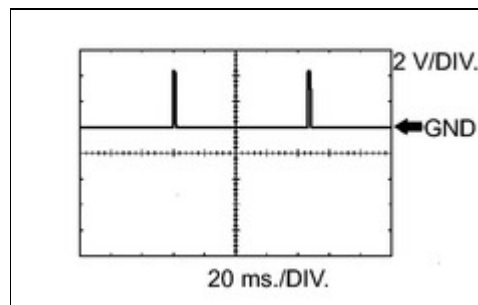
3. WAVEFORM 3

Injector No. 1 (to No. 6) injection signal:

ECM Terminal Name	Between #10 (to #60) and E1
Tester Range	2 V/DIV, 20 ms./DIV
Condition	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



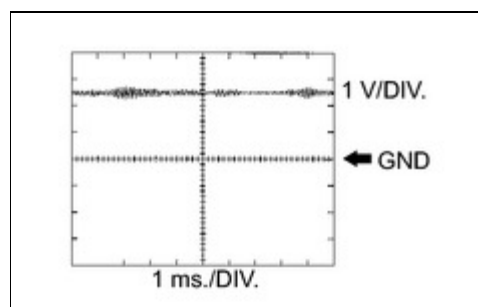
4. WAVEFORM 4

Knock sensor:

ECM Terminal Name	Between KNK1 and EKNK1 Between KNK2 and EKNK2
Tester Range	0.01 to 10 V/DIV, 0.01 to 10 ms./DIV
Condition	Engine speed maintained at 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.



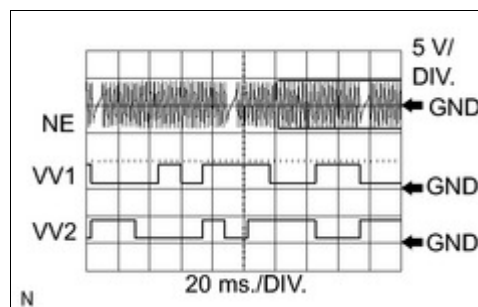
5. WAVEFORM 5

Crankshaft position sensor and VVT sensor for intake camshaft:

ECM Terminal Name	Between NE+ and NE- Between VV1+ and VV1- or VV2+ and VV2-
Tester Range	5 V/DIV, 20 ms./DIV
Condition	Idling

HINT:

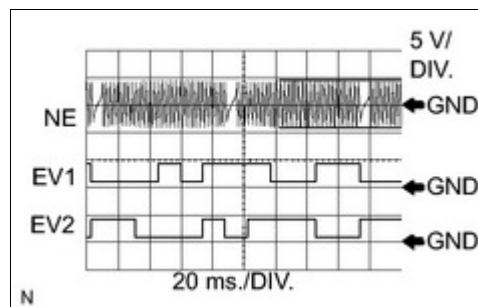
The wavelength becomes shorter as the engine rpm increases.



6. WAVEFORM 6

Crankshaft position sensor and VVT sensor for exhaust camshaft:

ECM Terminal Name	Between NE+ and NE- Between EV1+ and EV1- or EV2+ and EV2-
Tester Range	5 V/DIV, 20 ms./DIV



Condition	Idling
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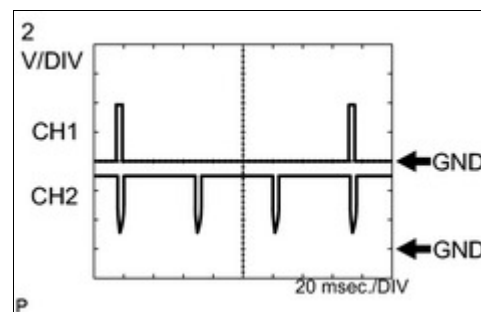
HINT:

The wavelength becomes shorter as the engine rpm increases.

7. WAVEFORM 7

Igniter IGT signal (from ECM to igniter) and Igniter IGF signal (from igniter to ECM):

ECM Terminal Name	Between IGT (1 to 6) and E1 Between IGF1 and E1 or IGF2 and E1
Tester Range	2 V/DIV, 20 ms./DIV
Condition	Idling

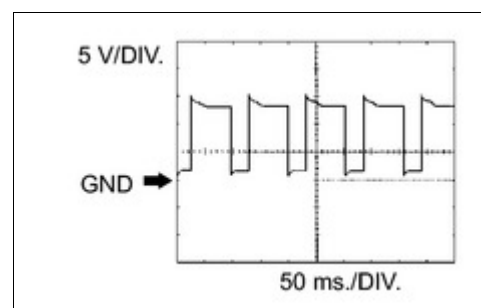
**HINT:**

The wavelength becomes shorter as the engine rpm increases.

8. WAVEFORM 8

EVAP VSV:

ECM Terminal Name	Between PRG and E1
Tester Range	5 V/DIV, 50 ms./DIV
Condition	Idling

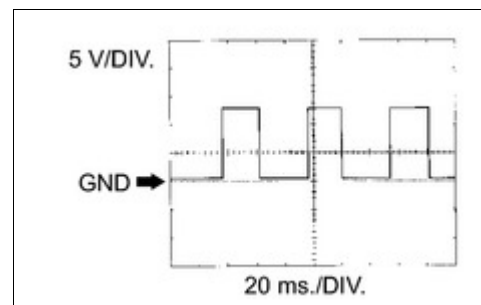
**HINT:**

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

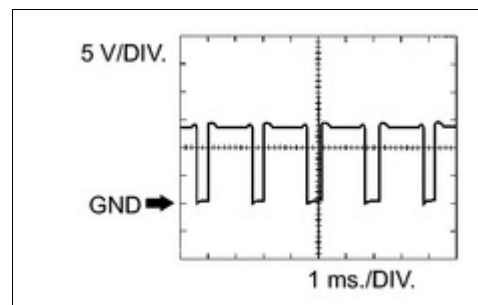
9. WAVEFORM 9

Vehicle speed signal:

ECM Terminal Name	Between SPD and E1
Tester Range	5 V/DIV, 20 ms./DIV
Condition	Driving at 12 mph (20 km/h)

**HINT:**

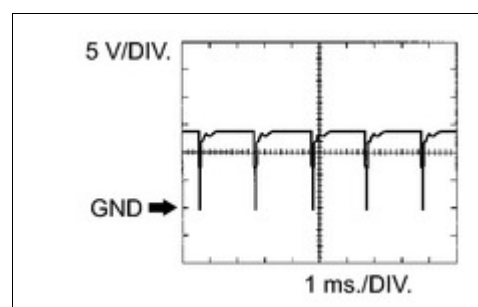
The wavelength becomes shorter as the vehicle speed increases.

10. WAVEFORM 10**Throttle actuator positive terminal:****11. WAVEFORM 11****Throttle actuator negative terminal:**

ECM Terminal Name	Between M- and ME01
Tester Range	5 V/DIV, 1 ms./DIV
Condition	Idling with warm engine

HINT:

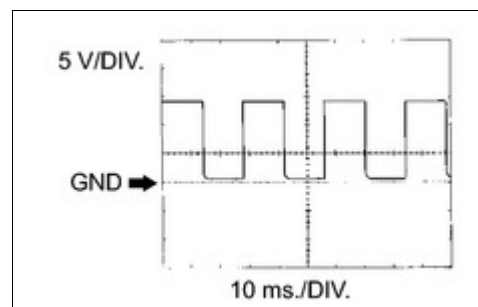
The duty ratio varies depending on the throttle actuator operation.

**12. WAVEFORM 12****Engine speed signal:**

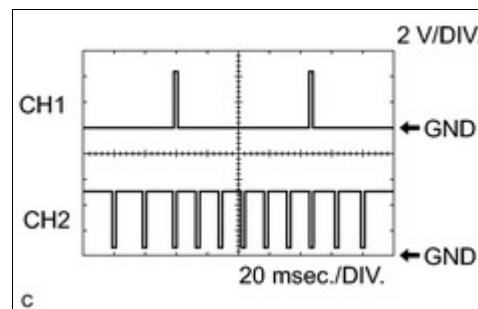
ECM Terminal Name	Between TACH and E1
Tester Range	5 V/DIV, 10 ms./DIV
Condition	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.

**13. WAVEFORM 13****Injector No. 1 (to No. 6) injection signal and Injection confirmation signal:**

ECM Terminal Name	CH1: Between #10 (to #60) and E1 CH2: Between INJF and E1
Tester Range	2 V/DIV, 20 ms./DIV
Condition	Idling with warm engine

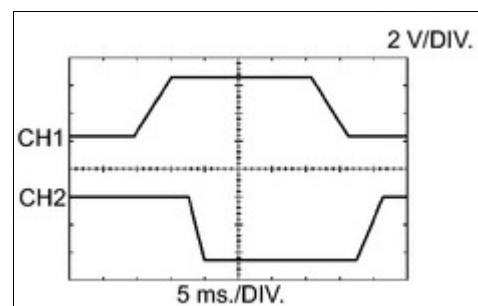
HINT:

The wavelength becomes shorter as the engine rpm increases.

14. WAVEFORM 14

High pressure side fuel pump (Spill valve):

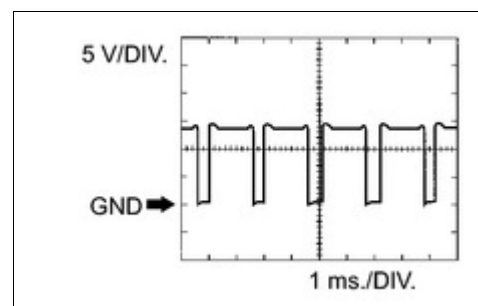
ECM Terminal Name	CH1: Between FPD and E1 CH2: Between FPF1 and E1
Tester Range	2 V/DIV, 5 ms./DIV
Condition	Idling with warm engine



15. WAVEFORM 15

DC motor for SCV positive terminal:

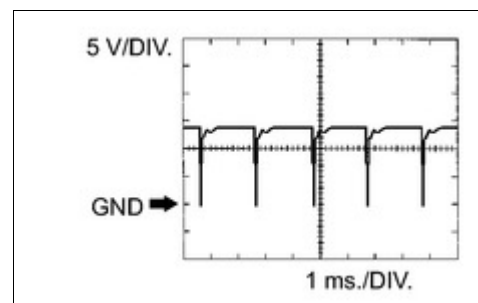
ECM Terminal Name	Between IA1+ and E01
Tester Range	5 V/DIV, 1 ms./DIV
Condition	Idling with warm engine



16. WAVEFORM 16

DC motor for SCV negative terminal:

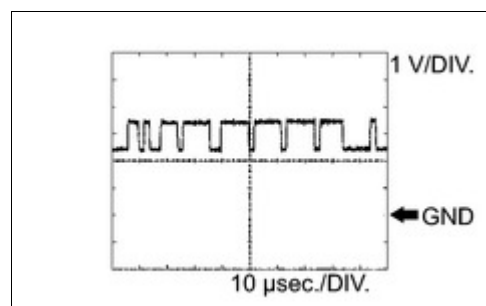
ECM Terminal Name	Between IA1- and E01
Tester Range	5 V/DIV, 1 ms./DIV
Condition	Idling with warm engine



17. WAVEFORM 17

CAN communication signal:

ECM Terminal Name	Between CANH and E1
Tester Range	1 V/DIV, 10 μ s/DIV
Condition	Stop engine and engine switch on (IG)



HINT:

The waveform varies depending on the CAN communication signal.

18. WAVEFORM 18

CAN communication signal:

