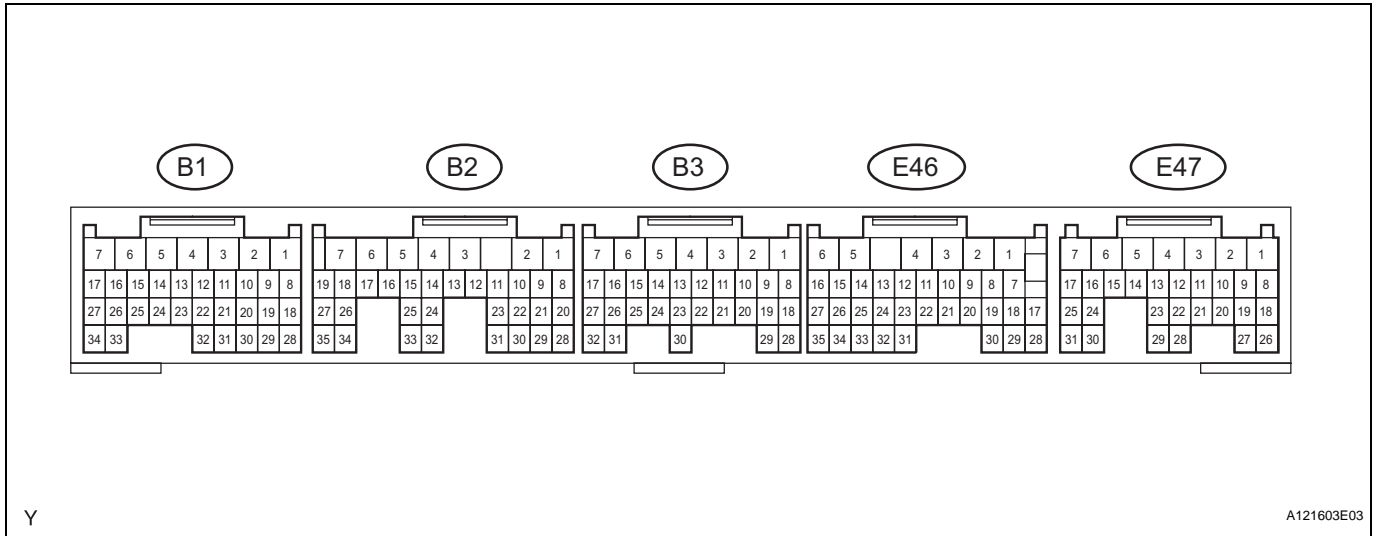


TERMINALS OF ECM



ES

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 are also indicated.

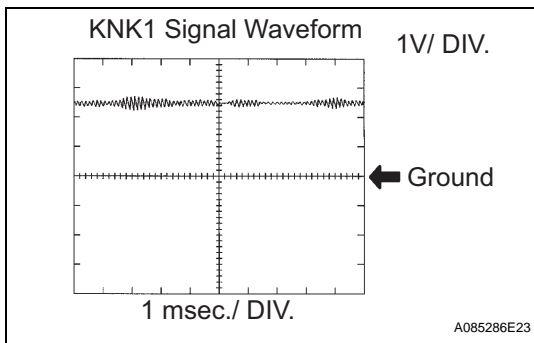
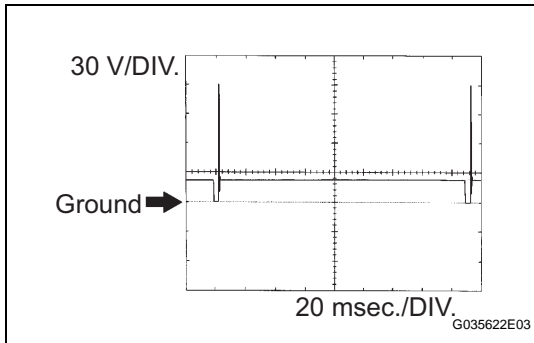
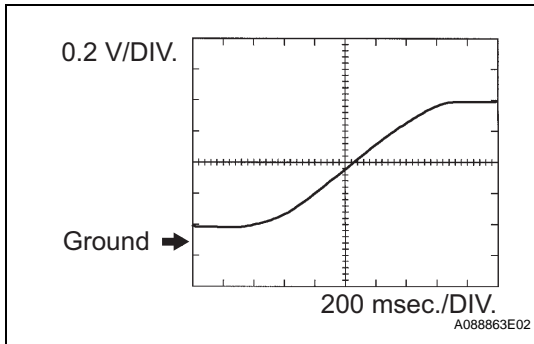
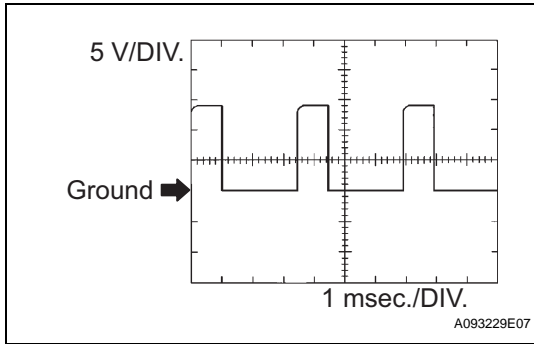
The result of checks should be compared with the standard normal voltage for that pair of terminals, displayed in the STD Voltages column.

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

Symbols (Terminal No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
BATT (E47-3) - E1 (B3-1)	L - BR	Battery (for measuring the battery voltage and for the ECM memory)	Always	11 to 14 V
+BM (E47-7) - E1 (B3-1)	GR - BR	Power source of throttle motor	Always	11 to 14 V
IGSW (E47-9) - E1 (B3-1)	B-O - BR	Ignition switch	Ignition switch ON	11 to 14 V
+B (E47-1) - E1 (B3-1)	B - BR	Power source of ECM	Ignition switch ON	11 to 14 V
+B2 (E47-2) - E1 (B3-1)	B - BR	Power source of ECM	Ignition switch ON	11 to 14 V
OC1+ (B3-17) - OC1- (B3-16)	G-Y - L-B	Camshaft timing oil control valve (OCV)	Ignition switch ON	Pulse generation (see waveform 1)
OC2+ (B3-15) - OC2- (B3-14)	L-W - L-R	Camshaft timing oil control valve (OCV)	Ignition switch ON	Pulse generation (see waveform 1)
MREL (E47-8) - E1 (B3-1)	W-G - BR	EFI relay	Ignition switch ON	11 to 14 V
VC (B1-23) - E2 (B1-28)	L-R - W-G	Power source of sensor (specific voltage)	Ignition switch ON	4.5 to 5.5 V
VG (B1-30) - E2G (B1-29)	R - R-W	Mass air flow meter	Idling, Shift lever position P or N, A/C switch OFF	0.5 to 3.0 V
THA (B1-22) - E2 (B1-28)	R-B - W-G	Intake air temperature sensor	Idling, Intake air temperature 20°C (68°F)	0.5 to 3.4 V
THW (B1-21) - E2 (B1-28)	B - W-G	Engine coolant temperature sensor	Idling, Engine coolant temperature 80°C (176°F)	0.2 to 1.0 V
VTA1 (B1-20) - E2 (B1-28)	G-B - W-G	Throttle position sensor (for engine control)	Ignition switch ON, Throttle valve fully closed	0.5 to 1.2 V
			Ignition switch ON, Throttle valve fully open	3.2 to 4.8 V

Symbols (Terminal No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
VTA2 (B1-19) - E2 (B1-28)	G-W - W-G	Throttle position sensor (for sensor malfunction detection)	Ignition switch ON, Throttle valve fully closed	2.1 to 3.1 V
			Ignition switch ON, Throttle valve fully open	4.5 to 5.0 V
VPA (E47-18) - EPA (E47-20)	W-R - LG-B	Accelerator pedal position sensor (for engine control)	Ignition switch ON, Accelerator pedal fully released	0.5 to 1.1 V
			Ignition switch ON, Accelerator pedal fully depressed	2.6 to 4.5 V
VPA2 (E47-19) - EPA2 (E47-21)	R-B - V-W	Accelerator pedal position sensor (for sensor malfunction detection)	Ignition switch ON, Accelerator pedal fully released	1.2 to 2.0 V
			Ignition switch ON, Accelerator pedal fully depressed	3.4 to 5.0 V
VCPA (E47-26) - EPA (E47-20)	B-Y - LG-B	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	4.5 to 5.5 V
VCP2 (E47-27) - EPA2 (E47-21)	W-L - V-W	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5 V
HA1A (B2-2) - E04 (B2-7) HA2A (B2-1) - E05 (B2-6)	R-L - W-B B-W - W-B	A/F sensor heater	Idling	Below 3.0 V
			Ignition switch ON	11 to 14 V
A1A+ (B2-22) - E1 (B3-1)	P - BR	A/F sensor	Ignition switch ON	3.3 V*1
A2A+ (B2-23) - E1 (B3-1)	Y - BR	A/F sensor	Ignition switch ON	3.3 V*1
A1A- (B2-30) - E1 (B3-1)	L - BR	A/F sensor	Ignition switch ON	2.9 V*1
A2A- (B2-31) - E1 (B3-1)	BR - BR	A/F sensor	Ignition switch ON	2.9 V*1
HT1B (B1-1) - E1 (B3-1) HT2B (B2-5) - E1 (B3-1)	G - BR L - BR	Heated oxygen sensor heater	Idling	Below 3.0 V
			Ignition switch ON	11 to 14 V
OX1B (B1-18) - E2 (B1-28) OX2B (B2-33) - E2 (B1-28)	W - W-G B - W-G	Heated oxygen sensor	Maintain engine speed at 2,500 rpm for 2 minutes after warming up	Pulse generation (see waveform 2)
#10 (B3-2) - E01 (B1-7) #20 (B3-3) - E01 (B1-7) #30 (B3-4) - E01 (B1-7) #40 (B3-5) - E01 (B1-7) #50 (B3-6) - E01 (B1-7) #60 (B3-7) - E01 (B1-7)	R-L - BR G - BR R - BR W - BR Y - BR L - BR	Injector	Ignition switch ON	11 to 14 V
			Idling	Pulse generation (see waveform 3)
			Maintain engine speed at 4,000 rpm after warming up	Pulse generation (see waveform 4)
			Maintain engine speed at 4,000 rpm after warming up	Pulse generation (see waveform 4)
			Variable valve timing (VVT) sensor	Pulse generation (see waveform 5)
			Variable valve timing (VVT) sensor	Pulse generation (see waveform 5)
NE+ (B3-21) - NE- (B3-20)	B - W	Crankshaft position sensor	Idling	Pulse generation (see waveform 5)
IGT1 (B1-8) - E1 (B3-1) IGT2 (B1-9) - E1 (B3-1) IGT3 (B1-10) - E1 (B3-1) IGT4 (B1-11) - E1 (B3-1) IGT5 (B1-12) - E1 (B3-1) IGT6 (B1-13) - E1 (B3-1)	Y-R - BR G - BR B-W - BR Y-G - BR GR - BR L - BR	Ignition coil with igniter (ignition signal)	Idling	Pulse generation (see waveform 6)

Symbols (Terminal No.)	Wiring Colors	Terminal Descriptions	Conditions	STD Voltages
IGF1 (B1-24) - E1 (B3-1)	W-R - BR	Ignition coil with igniter (ignition confirmation signal)	Ignition switch ON	4.5 to 5.5 V
			Idling	Pulse generation (see waveform 6)
PRG (B1-34) - E01 (B1-7)	G-Y - BR	Purge VSV	Ignition switch ON	11 to 14 V
			Idling	Pulse generation (see waveform 7)
SPD (E46-8) - E1 (B3-1)	V-R - BR	Speed signal from combination meter	Ignition switch ON, Rotate driving wheel slowly	Pulse generation (see waveform 8)
STA (B3-11) - E1 (B3-1)	B-Y - BR	Starter signal	Cranking	11 to 14 V
STP (E47-15) - E1 (B3-1)	G-Y - BR	Stop light switch	Brake pedal depressed	7.5 to 14 V
			Brake pedal released	Below 1.5 V
ST1- (E47-16) - E1 (B3-1)	R-L - BR	Stop light switch (opposite to STP terminal)	Ignition switch ON, Brake pedal depressed	Below 1.5 V
			Ignition switch ON, Brake pedal released	7.5 to 14 V
NSW (B2-8) - E1 (B3-1)	L-Y - BR	Park/Neutral position switch	Ignition switch ON, Shift lever position in P or N	Below 3.0 V
			Ignition switch ON, Shift lever position other than P and N	11 to 14 V
M+ (B1-5) - ME01 (B2-3)	P - W-B	Throttle motor	Idling with warm engine	Pulse generation (see waveform 9)
M- (B1-4) - ME01 (B2-3)	L - W-B	Throttle motor	Idling with warm engine	Pulse generation (see waveform 10)
FC (E47-10) - E1 (B3-1)	GR-B - BR	Fuel pump control	Ignition switch ON	11 to 14 V
FPR (B3-30) - E1 (B3-1)	Y-B - BR	Fuel pump control	Ignition switch ON	11 to 14 V
W (E46-30) - E1 (B3-1)	R-B - BR	MIL	Ignition switch ON	Below 3.0 V
			Idling	11 to 14 V
ELS (E46-13) - E1 (B3-1)	Y-B - BR	Electric load	Defogger or taillight switch OFF	0 to 1.5 V
			Defogger or taillight switch ON	7.5 to 14 V
ELS2 (E46-12) - E1 (B3-1)	Y-G - BR	Electric load	Voltage inverter OFF	0 to 1.5 V
			Voltage inverter ON	7.5 to 14 V
TC (E47-23) - E1 (B3-1)	P-L - BR	Terminal TC of DLC 3	Ignition switch ON	11 to 14 V
TACH (E46-1) - E1 (B3-1)	B-W - BR	Engine speed	Idling	Pulse generation (see waveform 11)
ACIS (B1-33) - E1 (B3-1)	W-L - BR	VSV for ACIS	Ignition switch ON	11 to 14 V
PSW (B3-10) - E1 (B3-1)	G-W - BR	P/S pressure switch	Ignition switch ON	11 to 14 V
VPMP (E47-5) - E1 (B3-1)	R-G - BR	Vent valve (built into canister pump module)	Ignition switch ON	11 to 14 V
MPMP (E47-6) - E1 (B3-1)	O - BR	Leak detection pump (built into canister pump module)	Leak detection pump OFF	0 to 3 V
			Leak detection pump ON	11 to 14 V
PPMP (E47-22) - E2 (B1-28)	R - W-G	Canister pressure sensor (built into canister pump module)	Ignition switch ON	3 to 3.6 V
F/PS (E46-32) - E1 (B3-1)	L - BR	Airbag sensor assembly	Idling with warm engine	Pulse generation (see waveform 12)
CANH (E46-33) - E1 (B3-1)	W - BR	CAN communication line	Ignition switch ON	Pulse generation (see waveform 13)
CANL (E46-34) - E1 (B3-1)	R - BR	CAN communication line	Ignition switch ON	Pulse generation (see waveform 14)



*1: 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 Names	Between OC1+ and OC1- or OC2+ and OC2-
Tester Ranges	5 V/DIV, 1 msec./DIV
Conditions	Idling

HINT:
The wavelength becomes shorter as the engine rpm increases.

**2. WAVEFORM 2
Heated oxygen sensor**

ECM Terminal Names	Between OX1B and E2 or OX2B and E2
Tester Ranges	0.2 V/DIV, 200 msec./DIV
Conditions	Engine speed maintained at 2,500 rpm for 2 minutes after warming up sensor

HINT:
In the DATA LIST, item O2S B1S2 or O2S B2S2 shows the ECM input values from the heated oxygen sensor.

**3. WAVEFORM 3
Fuel injector**

ECM Terminal Names	Between #10 (to 60) and E01
Tester Ranges	30 V/DIV, 20 msec./DIV
Conditions	Idling

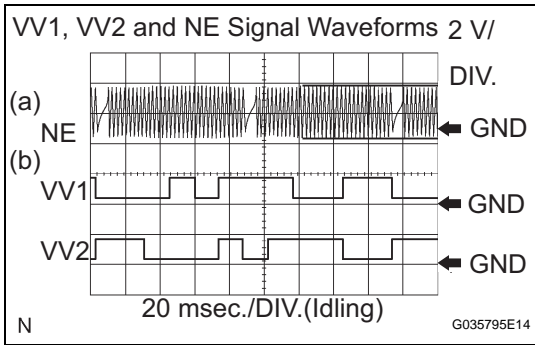
HINT:
The wavelength becomes shorter as the engine rpm increases.

**4. WAVEFORM 4
Knock sensor**

ECM Terminal Names	Between KNK1 and EKNK or KNK2 and EKN2
Tester Ranges	1 V/DIV, 0.01 to 1 msec./DIV
Conditions	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 on the tester differ slightly depending on the vehicle.



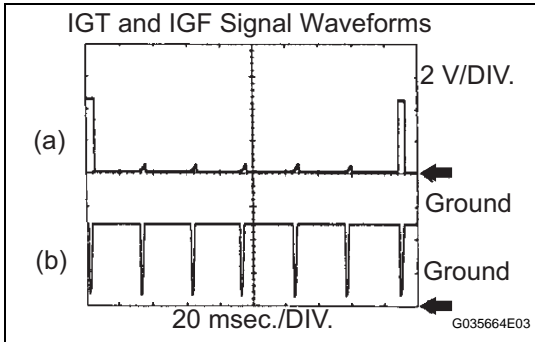
5. WAVEFORM 5

- (a) VVT sensor
- (b) Crankshaft position sensor

ECM Terminal Names	(a) Between NE+ and NE- (b) Between VV1+ and VV1- or VV2+ and VV2-
Tester Ranges	2 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



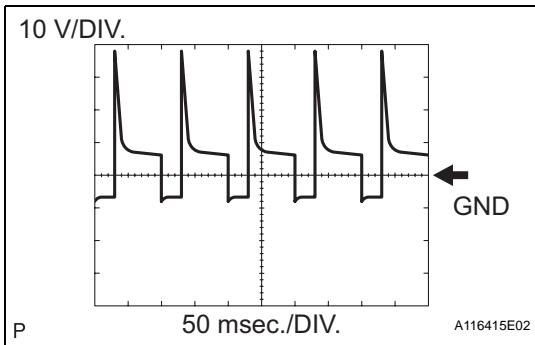
6. WAVEFORM 6

- (a) Igniter IGT signal (from ECM to igniter)
- (b) Igniter IGF signal (from igniter to ECM)

ECM Terminal Names	(a) Between IGT (1 to 6) and E1 (b) Between IGF1 and E1
Tester Ranges 2	2 V/DIV, 20 msec./DIV
Conditions	Idling

HINT:

The wavelength becomes shorter as the engine rpm increases.



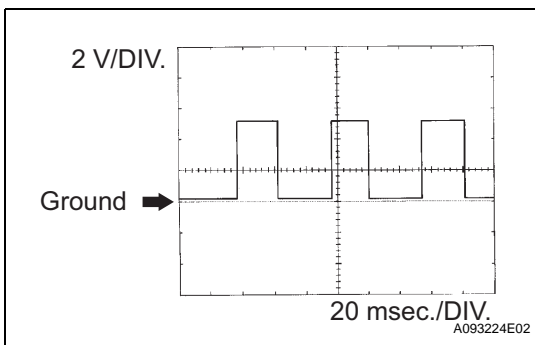
7. WAVEFORM 7

Purge VSV

ECM Terminal Names	Between PRG and E01
Tester Ranges	10 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.



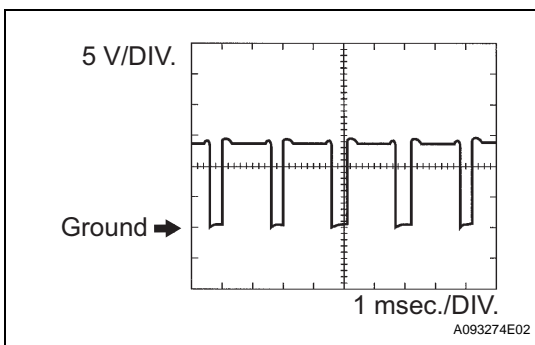
8. WAVEFORM 8

Vehicle speed signal

ECM Terminal Names	Between SPD and E1
Tester Ranges	2 V/DIV, 20 msec./DIV
Conditions	Driving at 12 mph (20 km/h)

HINT:

The wavelength becomes shorter as the vehicle speed increases.



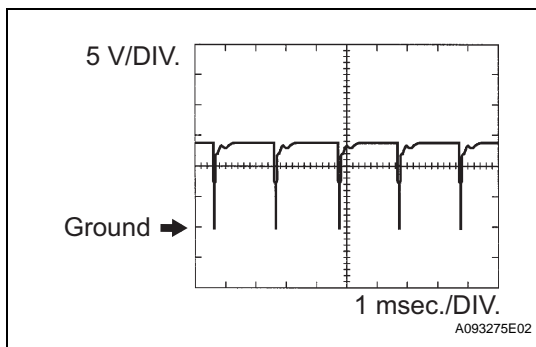
9. WAVEFORM 9

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:

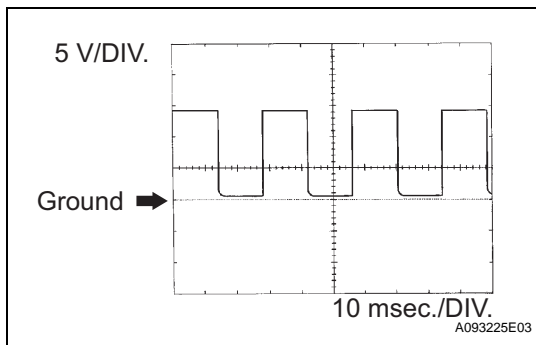
The duty ratio varies depending on the throttle actuator operation.



10. WAVEFORM 10
Throttle actuator negative terminal

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

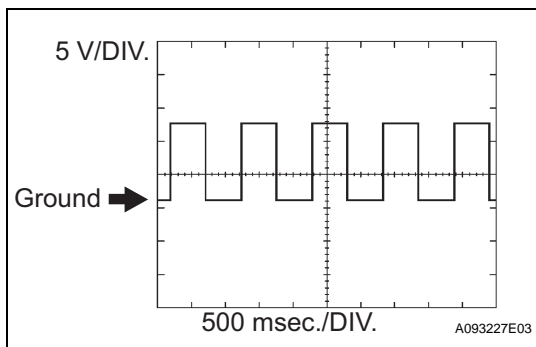
HINT:
The duty ratio varies depending on the throttle actuator operation.



11. WAVEFORM 11
Engine speed signal

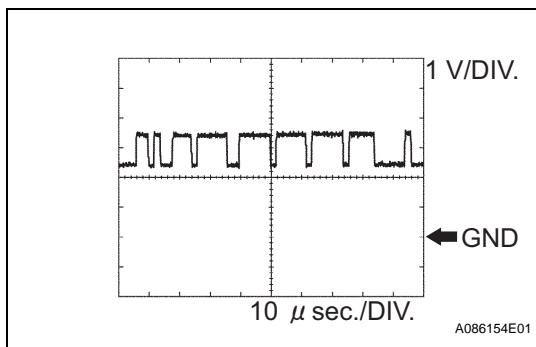
ECM Terminal Names	Between TACH and E1
Tester Ranges	5 V/DIV, 10 msec./DIV
Conditions	Idling

HINT:
The wavelength becomes shorter as the engine rpm increases.



12. WAVEFORM 12
Airbag sensor assembly

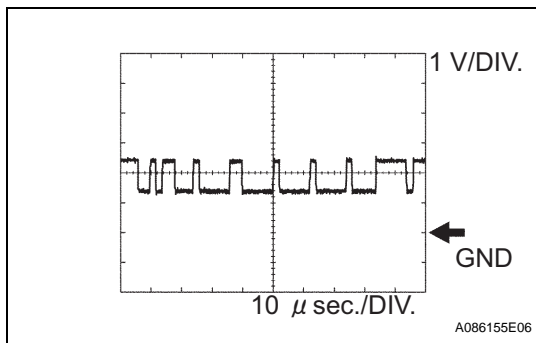
ECM Terminal Names	Between F/PS and E1
Tester Ranges	5 V/DIV, 500 msec./DIV
Conditions	Idling with warm engine



13. WAVEFORM 13
CAN communication signal (Reference)

ECM Terminal Names	Between CANH and E1
Tester Ranges	1 V/DIV, 10μsec./DIV
Conditions	Ignition switch ON

HINT:
The wavelength varies depending on the CAN communication signal.



14. WAVEFORM 14
CAN communication signal (Reference)

ECM Terminal Names	Between CANL and E1
Tester Ranges	1 V/DIV, 10μsec./DIV
Conditions	Ignition switch ON

HINT:
The wavelength varies depending on the CAN communication signal.

ES