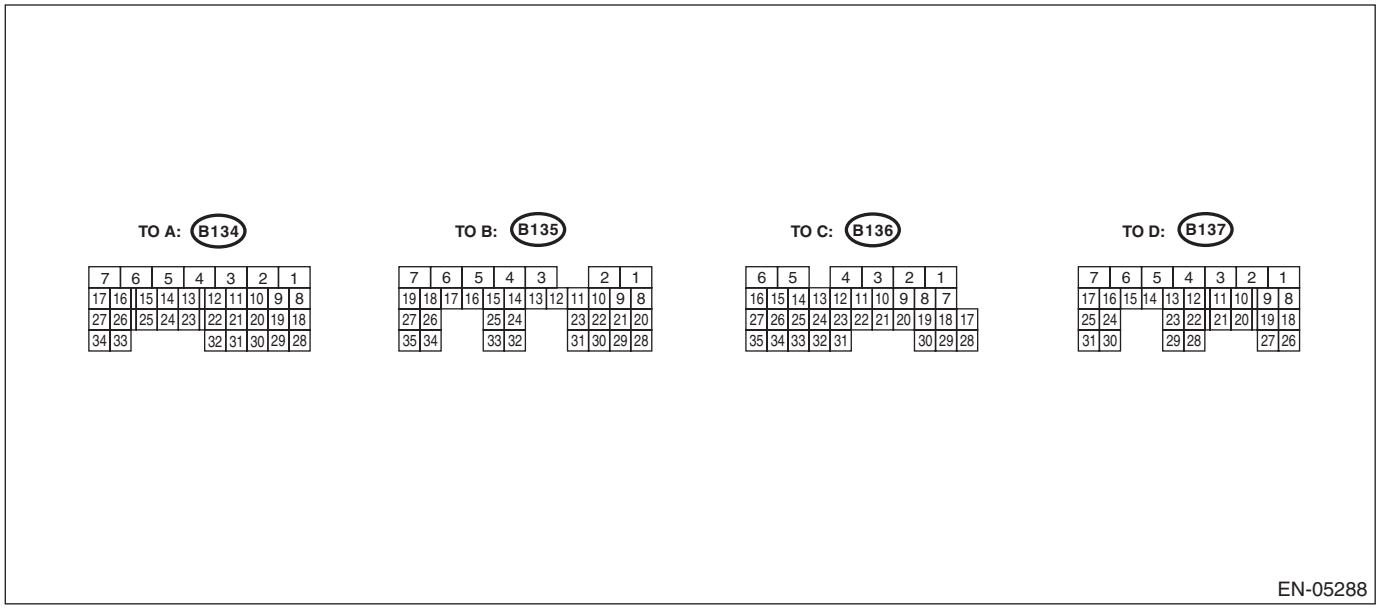
5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B137	17	0	–7 — +7	Waveform
	Signal (–)	B137	25	0	0	—
	Shield	B137	31	0	0	—
Front oxygen (A/F) sensor	Signal (+)	B136	19	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B136	18	2.4 — 2.7	2.4 — 2.7	—
Rear oxygen sensor	Signal	B136	20	0	0 — 0.9	—
Oxygen sensor	Shield	B136	9	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	6	—	—	Waveform
	Signal 2	B136	5	—	—	Waveform
Rear oxygen sensor heater signal		B135	6	0 — 13	12 — 14	Waveform
Engine coolant temperature sensor	Signal	B137	22	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
Air flow sensor	Signal	B136	22	—	0.3 — 4.5	—
	Shield	B136	10	0	0	—
	Ground	B136	11	0	0	—
Intake air temperature sensor signal		B136	31	0.3 — 4.6	0.3 — 4.6	—
Wastegate control solenoid valve		B134	33	0 or 10 — 13	0 or 12 — 14	Waveform
Starter switch		B136	16	0	0	Model without push button start Cranking: 8 — 14 Model with push button start Cranking: waveform

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Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accessory cut request		B135	32	10 — 13	12 — 14	Model with push button start Cranking: 0
Starter switch 2		B136	27	0	0	Model with push button start Cranking: 8 — 14
Starter cut relay		B135	34	0	0	Model with push button start Cranking: 8 — 14
Ignition switch		B136	30	10 — 13	12 — 14	—
Neutral position switch		B136	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Delivery mode switch		B136	34	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B137	2	2.45 — 2.55	2.45 — 2.55	—
	Shield	B137	8	0	0	—
Back-up power supply		B136	2	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B136	1	10 — 13	12 — 14	—
		B137	7	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
		B135	22	5	5	—
Ignition control	#1	B134	21	0	0 or 5	Waveform
	#2	B134	22	0	0 or 5	Waveform
	#3	B134	31	0	0 or 5	Waveform
	#4	B134	32	0	0 or 5	Waveform
Fuel injector	#1	B134	10	10 — 13	1 — 14	Waveform
	#2	B134	11	10 — 13	1 — 14	Waveform
	#3	B134	12	10 — 13	1 — 14	Waveform
	#4	B134	13	10 — 13	1 — 14	Waveform
Fuel pump control unit	Control	B136	33	0 or 5	0 or 5	Waveform
	Diagnostic signal	B135	10	10 — 13	12 — 14	—
A/C relay control		B135	35	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Main fan relay control		B135	12	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Sub fan relay control		B135	11	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Engine speed output		B135	15	—	0 — 13 or more	Model with push button start Waveform
Purge control solenoid valve 1		B137	6	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Purge control solenoid valve 2		B137	15	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Manifold absolute pressure sensor	Signal	B137	20	1.7 — 2.4	1.1 — 1.6	—
Power steering oil pressure switch		B137	28	10 — 13	ON: 0 OFF: 12 — 14	—
SSM/GST communication line		B135	14	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Intake camshaft position sensor (LH)		B137	16	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B137	24	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (LH)		B137	29	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (RH)		B137	23	0 or 5	0 or 5	Waveform
Camshaft position sensor ground		B137	30	0	0	—
Electronic Throttle	Main	B134	18	Approx. 0.9 (After engine is warmed up.)	Approx. 0.6 — 0.7 (After engine is warmed up.)	Fully closed: Approx. 0.6 Fully open: Approx. 4.0
	Sub	B134	28	Approx. 1.7 (After engine is warmed up.)	Approx. 1.5 — 1.6 (After engine is warmed up.)	Fully closed: Approx. 1.5 Fully open: Approx. 4.2
Electronic throttle control motor (+)		B134	2	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B134	1	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B135	7	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON
Intake oil flow control solenoid valve (LH)	Signal (+)	B134	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	16	0	0	—
Intake oil flow control solenoid valve (RH)	Signal (+)	B134	34	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	27	0	0	—
Exhaust oil flow control solenoid valve (LH)	Signal (+)	B134	5	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	14	0	0	—
Exhaust oil flow control solenoid valve (RH)	Signal (+)	B134	7	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	15	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 0.4 — 1.0 Fully opened: 2.4 — 3.7	Fully closed: 0.4 — 1.0 Fully opened: 2.4 — 3.7	—
	Main power supply	B135	21	5	5	—
	Ground (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 0.3 — 1.1 Fully opened: 2.3 — 3.8	Fully closed: 0.3 — 1.1 Fully opened: 2.3 — 3.8	—

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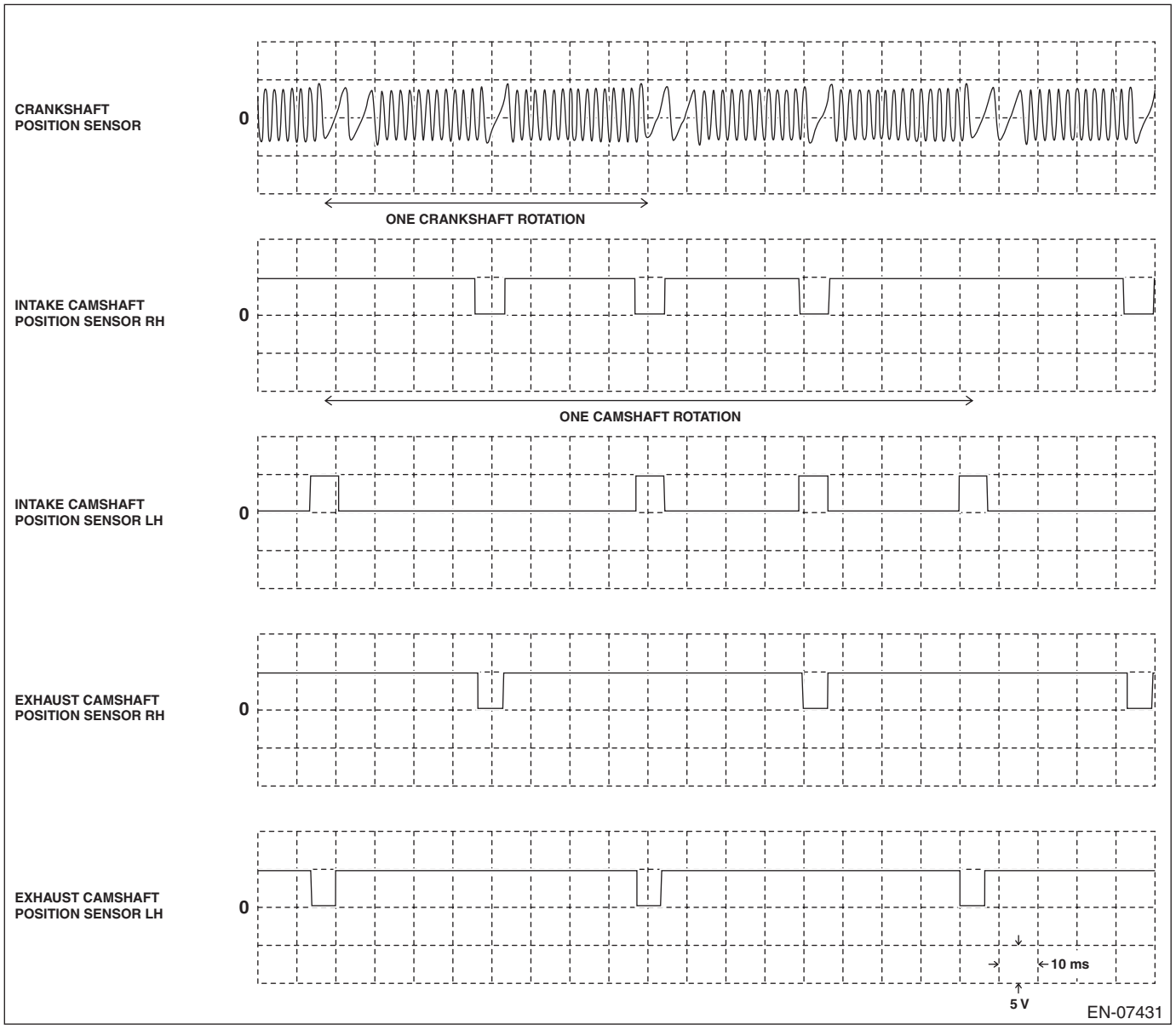
Description	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Starter relay	B135	26	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	ON: cranking
A/C middle pressure switch	B136	7	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch	B135	9	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—
Brake switch 1 (brake switch)	B136	15	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2 (stop light switch)	B136	3	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—
Cruise control command switch	B136	12	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Cruise control main switch	B136	13	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Immobilizer signal	B135	25	—	—	—
CAN communication (Hi)	B136	17	—	—	—
CAN communication (Lo)	B136	28	—	—	—
Blow-by leak diagnosis	B137	12	0	0	At the time of open circuit (fault): 5
Tumble generator valve position sensor signal (RH)	B137	11	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve position sensor signal (LH)	B137	10	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve (RH closed)	B134	26	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (LH closed)	B134	24	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (RH open)	B134	25	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (LH open)	B134	23	0 or 10 — 13	0 or 12 — 14	—
Secondary air pipe pressure sensor Signal	B137	9	2.2 — 2.8	2.2 — 2.8	When secondary air is inducted: 3.2 — 4.9
Secondary air combination valve relay 1	B135	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

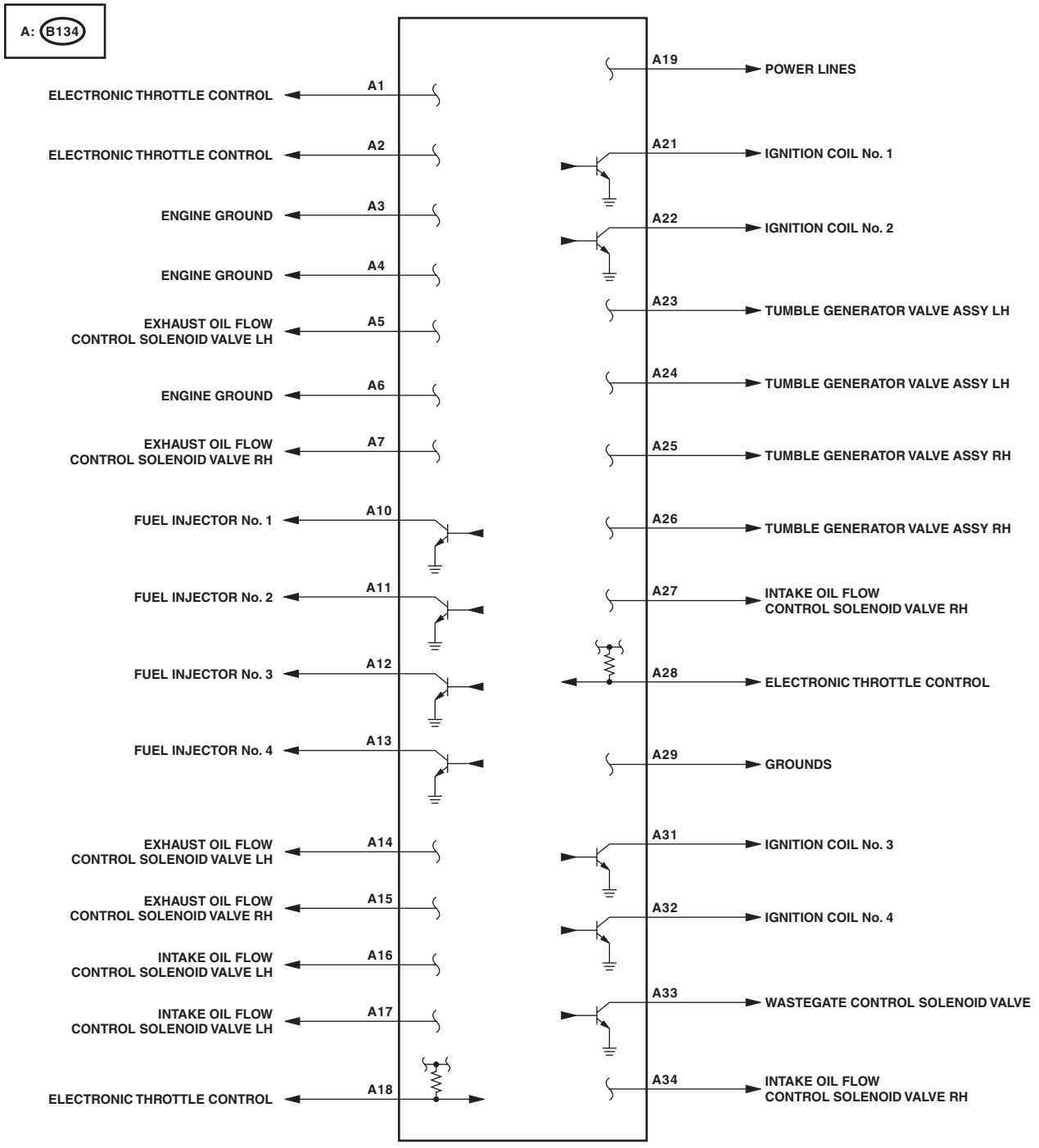
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Secondary air combination valve relay 2		B135	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B135	27	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Self-shutoff control		B135	13	10 — 13	12 — 14	—
ELCM	Switching valve	B135	4	10 — 13	12 — 14	Operating: 0
	Pressure sensor	B136	21	1 — 4	1 — 4	When ignition switch is turned to ON: atmospheric pressure
	Vacuum pump	B137	27	10 — 13	12 — 14	Operating: 0
Ground (engine 1)		B134	6	0	0	—
Ground	Sensor	B134	29	0	0	—
		B135	30	0	0	—
	Engine 1	B134	6	0	0	—
	Engine 2	B134	4	0	0	—
	Engine 3	B134	3	0	0	—
	Engine 4	B137	1	0	0	—
	Engine 5	B137	3	0	0	—
	Body	B136	4	0	0	—

Engine Control Module (ECM) I/O Signal

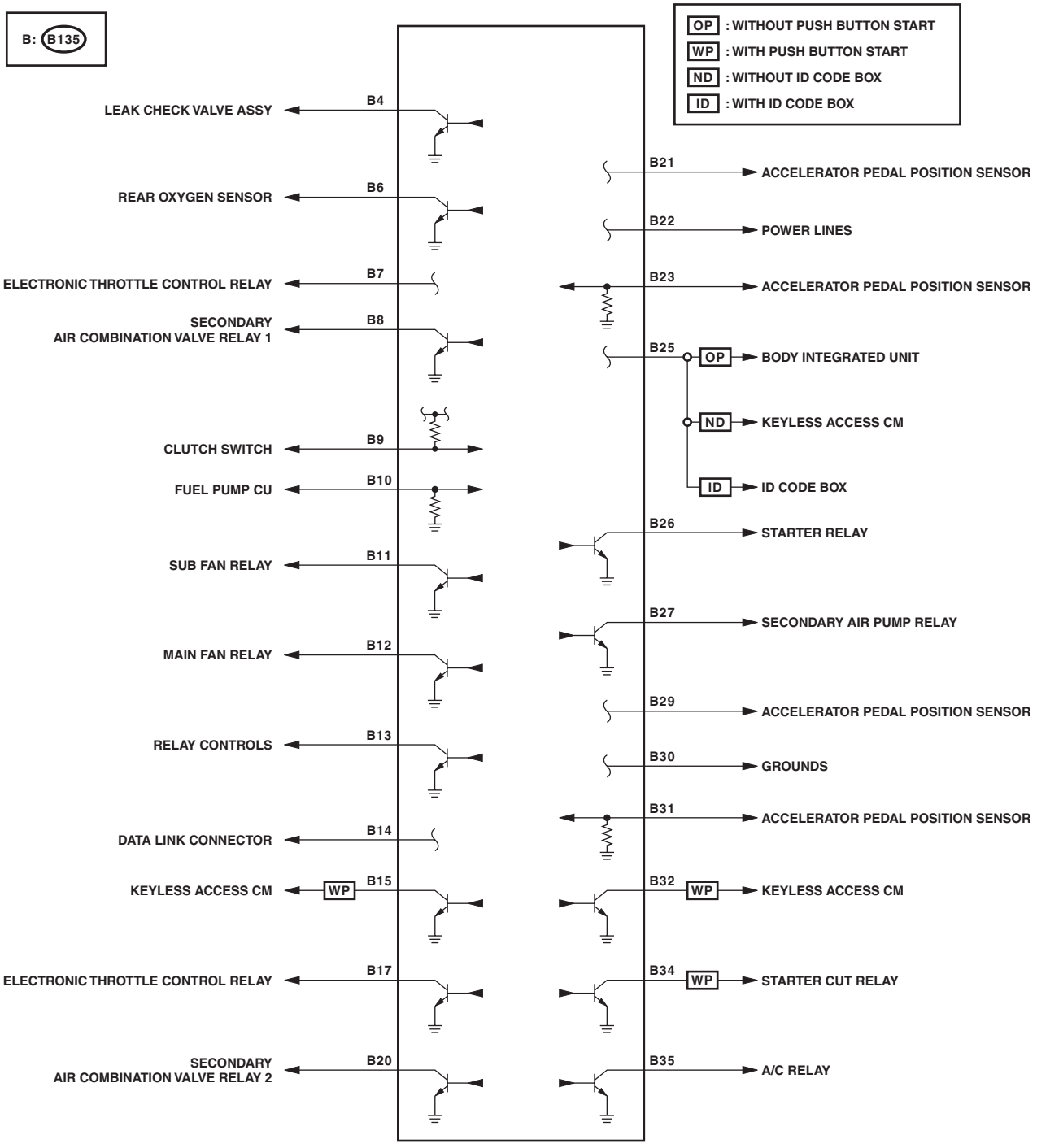
Input/output name:
- Crankshaft position sensor
- Intake camshaft position sensor RH
- Intake camshaft position sensor LH
- Exhaust camshaft position sensor RH
- Exhaust camshaft position sensor LH

Measuring condition:
- After warming-up
- At idling

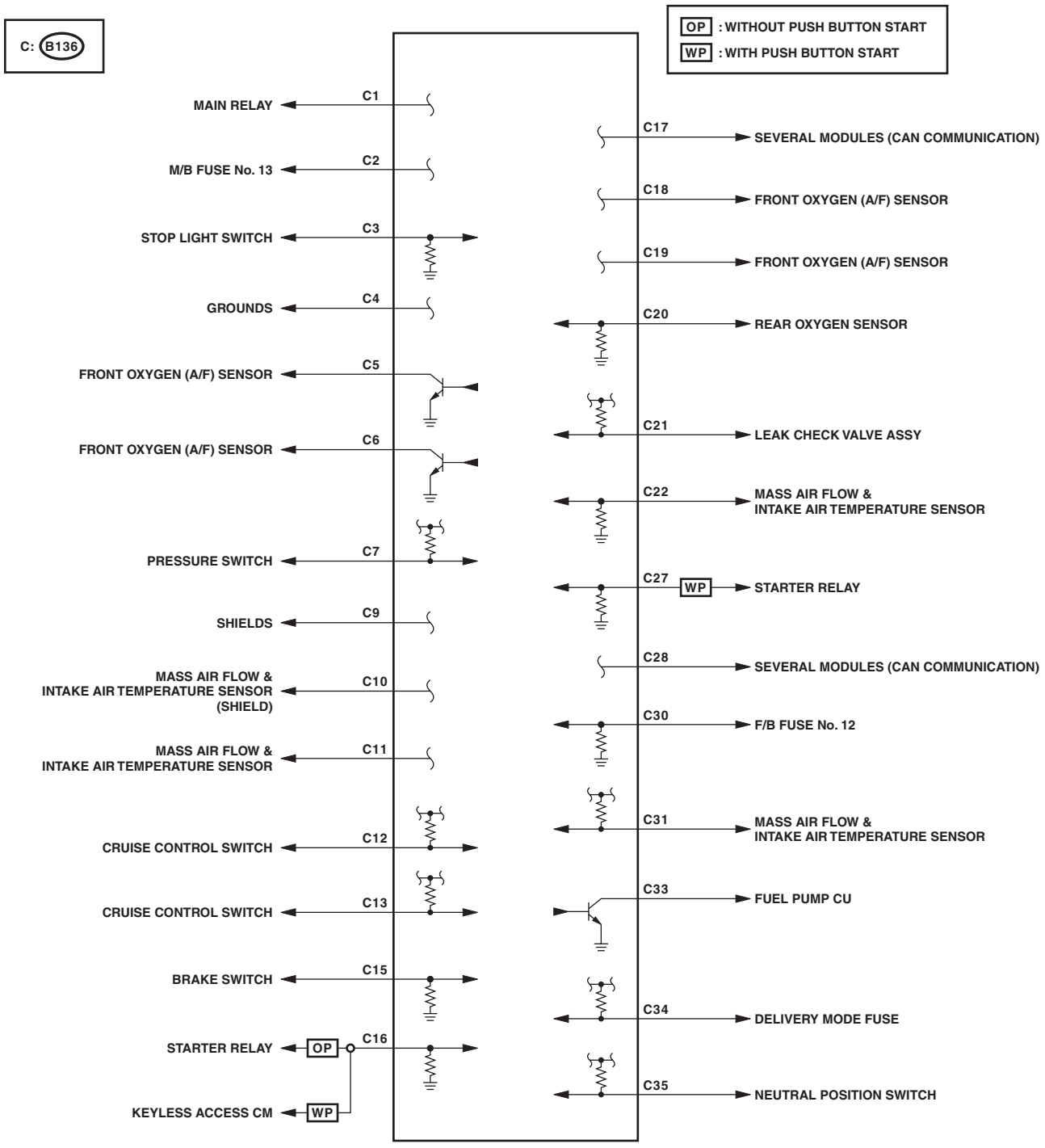



A: B134
ELECTRONIC THROTTLE CONTROL
A1
ELECTRONIC THROTTLE CONTROL
A2
ENGINE GROUND
A3
ENGINE GROUND
A4
EXHAUST OIL FLOW CONTROL SOLENOID VALVE LH
A5
ENGINE GROUND
A6
EXHAUST OIL FLOW CONTROL SOLENOID VALVE RH
A7
FUEL INJECTOR No. 1
A10
FUEL INJECTOR No. 2
A11
FUEL INJECTOR No. 3
A12
FUEL INJECTOR No. 4
A13
EXHAUST OIL FLOW CONTROL SOLENOID VALVE LH
A14
EXHAUST OIL FLOW CONTROL SOLENOID VALVE RH
A15
INTAKE OIL FLOW CONTROL SOLENOID VALVE LH
A16
INTAKE OIL FLOW CONTROL SOLENOID VALVE LH
A17
ELECTRONIC THROTTLE CONTROL
A18
A19
POWER LINES
A21
IGNITION COIL No. 1
A22
IGNITION COIL No. 2
A23
TUMBLE GENERATOR VALVE ASSY LH
A24
TUMBLE GENERATOR VALVE ASSY LH
A25
TUMBLE GENERATOR VALVE ASSY RH
A26
TUMBLE GENERATOR VALVE ASSY RH
A27
INTAKE OIL FLOW CONTROL SOLENOID VALVE RH
A28
ELECTRONIC THROTTLE CONTROL
A29
GROUNDS
A31
IGNITION COIL No. 3
A32
IGNITION COIL No. 4
A33
WASTEGATE CONTROL SOLENOID VALVE
A34
INTAKE OIL FLOW CONTROL SOLENOID VALVE RH

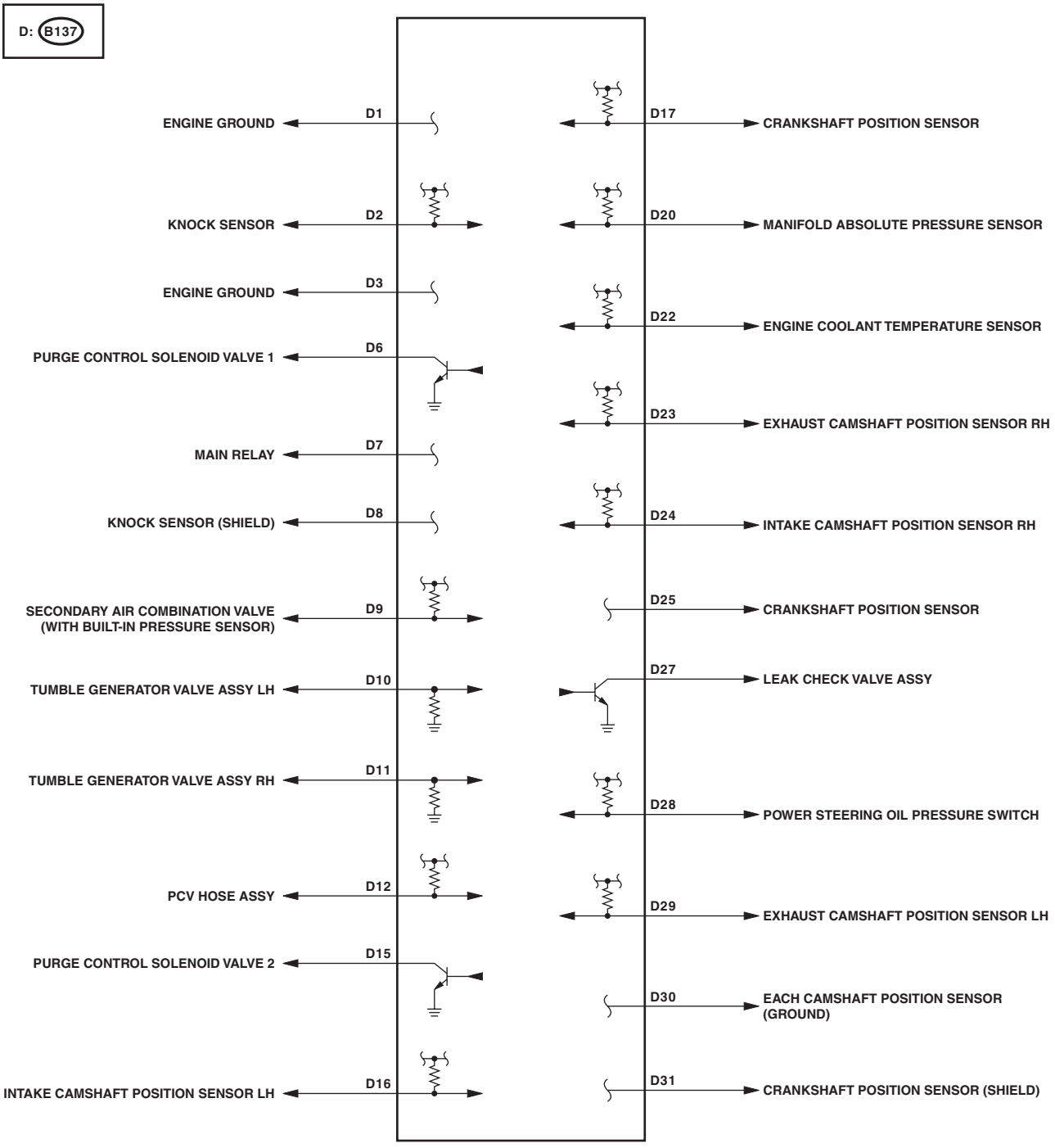
EN-10846


B: B135
OP : WITHOUT PUSH BUTTON START
WP : WITH PUSH BUTTON START
ND : WITHOUT ID CODE BOX
ID : WITH ID CODE BOX
B4
LEAK CHECK VALVE ASSY
B6
REAR OXYGEN SENSOR
B7
ELECTRONIC THROTTLE CONTROL RELAY
B8
SECONDARY AIR COMBINATION VALVE RELAY 1
B9
CLUTCH SWITCH
B10
FUEL PUMP CU
B11
SUB FAN RELAY
B12
MAIN FAN RELAY
B13
RELAY CONTROLS
B14
DATA LINK CONNECTOR
B15
WP
KEYLESS ACCESS CM
B17
ELECTRONIC THROTTLE CONTROL RELAY
B20
SECONDARY AIR COMBINATION VALVE RELAY 2
B21
ACCELERATOR PEDAL POSITION SENSOR
B22
POWER LINES
B23
ACCELERATOR PEDAL POSITION SENSOR
B25
OP
BODY INTEGRATED UNIT
ND
KEYLESS ACCESS CM
ID
ID CODE BOX
B26
STARTER RELAY
B27
SECONDARY AIR PUMP RELAY
B29
ACCELERATOR PEDAL POSITION SENSOR
B30
GROUNDS
B31
ACCELERATOR PEDAL POSITION SENSOR
B32
WP
KEYLESS ACCESS CM
B34
WP
STARTER CUT RELAY
B35
A/C RELAY

EN-10847


C: B136
OP : WITHOUT PUSH BUTTON START
WP : WITH PUSH BUTTON START
C1
MAIN RELAY
C2
M/B FUSE No. 13
C3
STOP LIGHT SWITCH
C4
GROUNDS
C5
FRONT OXYGEN (A/F) SENSOR
C6
FRONT OXYGEN (A/F) SENSOR
C7
PRESSURE SWITCH
C9
SHIELDS
C10
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR (SHIELD)
C11
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
C12
CRUISE CONTROL SWITCH
C13
CRUISE CONTROL SWITCH
C15
BRAKE SWITCH
C16
STARTER RELAY
OP
KEYLESS ACCESS CM
WP
C17
SEVERAL MODULES (CAN COMMUNICATION)
C18
FRONT OXYGEN (A/F) SENSOR
C19
FRONT OXYGEN (A/F) SENSOR
C20
REAR OXYGEN SENSOR
C21
LEAK CHECK VALVE ASSY
C22
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
C27
WP
STARTER RELAY
C28
SEVERAL MODULES (CAN COMMUNICATION)
C30
F/B FUSE No. 12
C31
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
C33
FUEL PUMP CU
C34
DELIVERY MODE FUSE
C35
NEUTRAL POSITION SWITCH

EN-10848


D: B137
ENGINE GROUND
D1
KNOCK SENSOR
D2
ENGINE GROUND
D3
PURGE CONTROL SOLENOID VALVE 1
D6
MAIN RELAY
D7
KNOCK SENSOR (SHIELD)
D8
SECONDARY AIR COMBINATION VALVE (WITH BUILT-IN PRESSURE SENSOR)
D9
TUMBLE GENERATOR VALVE ASSY LH
D10
TUMBLE GENERATOR VALVE ASSY RH
D11
PCV HOSE ASSY
D12
PURGE CONTROL SOLENOID VALVE 2
D15
INTAKE CAMSHAFT POSITION SENSOR LH
D16
D17
CRANKSHAFT POSITION SENSOR
D20
MANIFOLD ABSOLUTE PRESSURE SENSOR
D22
ENGINE COOLANT TEMPERATURE SENSOR
D23
EXHAUST CAMSHAFT POSITION SENSOR RH
D24
INTAKE CAMSHAFT POSITION SENSOR RH
D25
CRANKSHAFT POSITION SENSOR
D27
LEAK CHECK VALVE ASSY
D28
POWER STEERING OIL PRESSURE SWITCH
D29
EXHAUST CAMSHAFT POSITION SENSOR LH
D30
EACH CAMSHAFT POSITION SENSOR (GROUND)
D31
CRANKSHAFT POSITION SENSOR (SHIELD)

EN-10849