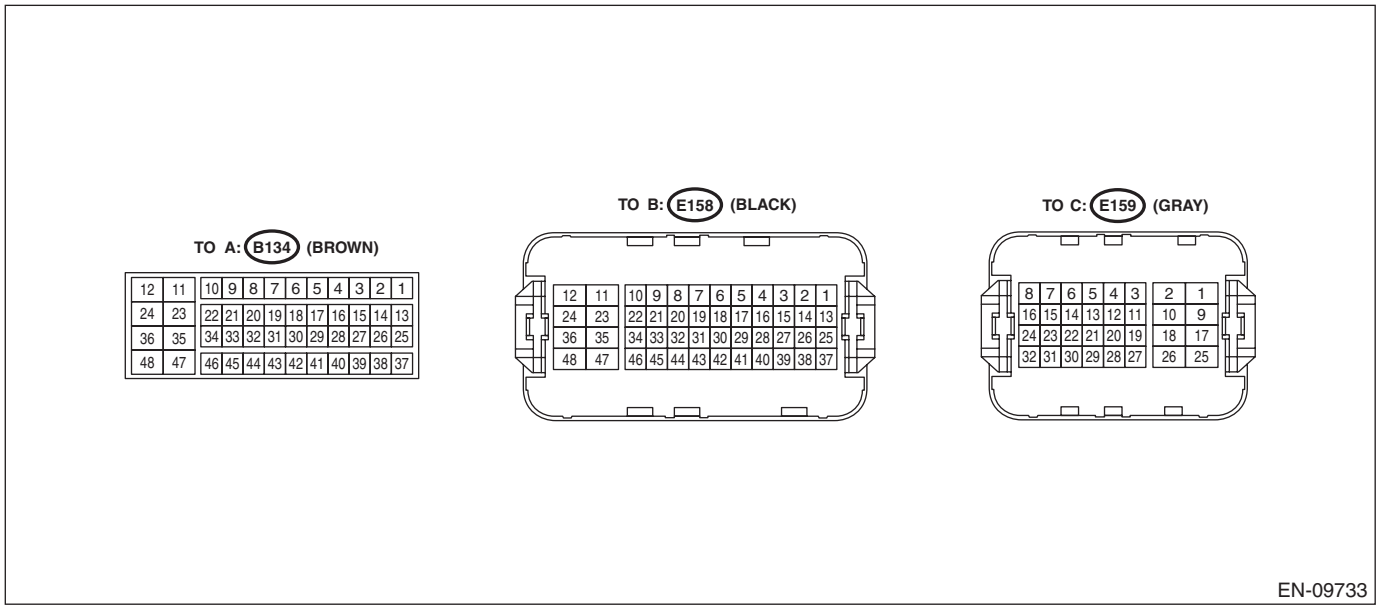
5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal	E158	19	0 or 5	0 or 5	Waveform
	Ground	E158	31	0	0	—
Intake camshaft position sensor (LH)		E158	21	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		E158	20	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (LH)		E158	33	0 or 5	0 or 5	Waveform
Exhaust camshaft position sensor (RH)		E158	32	0 or 5	0 or 5	Waveform
Camshaft position sensor ground		E158	34	0	0	—
Front oxygen (A/F) sensor	IP+ signal	E158	15	1.7	3.3	Waveform
	VS+ signal	E158	27	2.2	4	Waveform
	COM signal	E158	39	9.8	3.6	Waveform
	Heater signal	E159	9	12 — 15	0 or 12 — 15	Waveform
Rear oxygen sensor	+ signal	E158	16	2.0 — 3.0	2.0 — 3.0	Waveform
	– signal	E158	42			
	Heater signal	E159	3	12 — 15	0 or 12 — 15	Waveform
Air flow sensor	Signal	B134	16	0.3	1.2	—
	Ground	B134	28	0	0	—
Intake air temperature sensor (integrated with air flow sensor)		E158	5	2.7	3	After engine is warmed up.
Engine coolant temperature sensor		E158	38	2.7	1.8	After engine is warmed up.
Engine oil temperature sensor		E158	2	2.9	2.1	After engine is warmed up.
Manifold absolute pressure sensor		E158	4	1.9	0.8	After engine is warmed up.

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Intake air temperature sensor (integrated with manifold absolute pressure sensor)		E158	25	3	3	After engine is warmed up.
Fuel pressure sensor		E158	6	2	1	After engine is warmed up.
Knock sensor 1		E158	14	2.5	2.5	Waveform
Knock sensor 2		E158	26	2.5	2.5	Waveform
Accelerator pedal position sensor	Main power supply	B134	30	5	5	—
	Main signal	B134	17	Fully closed: 0.4 — 1.0 Fully opened: 2.4 — 3.7	Fully closed: 0.4 — 1.0	—
	Main ground	B134	31	0	0	—
	Sub signal	B134	29	Fully closed: 0.4 — 1.0 Fully opened: 2.4 — 3.7	Fully closed: 0.4 — 1.0	—
Tumble generator valve actuator (LH)	Position signal	E158	41	2.38 — 3.93	In closing direction: 0.43 — 1.19 In opening direction: 2.83 — 3.93	—
	Motor open	E159	6	10 — 13	0 or 12 — 15	Waveform
	Motor closed	E159	22	10 — 13	0 or 12 — 15	Waveform
Tumble generator valve actuator (RH)	Position signal	E158	40	0.43 — 1.19	In closing direction: 2.83 — 3.93 In opening direction: 0.43 — 1.19	—
	Motor open	E159	14	10 — 13	0 or 12 — 15	Waveform
	Motor closed	E159	30	10 — 13	0 or 12 — 15	Waveform
Intake oil control solenoid (LH)		E159	15	10 — 13	0 or 12 — 15	Waveform
Intake oil control solenoid (RH)		E159	7	10 — 13	0 or 12 — 15	Waveform
Exhaust oil control solenoid (LH)		E159	31	10 — 13	0 or 12 — 15	Waveform
Exhaust oil control solenoid (RH)		E159	23	10 — 13	0 or 12 — 15	Waveform
Wastegate control solenoid valve		E159	11	10 — 13	12 — 15	—
Canister purge control solenoid valve 1		E159	4	10 — 13	0 or 12 — 15	Waveform
Canister purge control solenoid valve 2		E159	12	10 — 13	0 or 12 — 15	Waveform
Ignition control	#1	E159	8	0	0 or 5	Waveform
	#2	E159	16	0	0 or 5	Waveform
	#3	E159	24	0	0 or 5	Waveform
	#4	E159	32	0	0 or 5	Waveform
EGR control valve	A+	E159	5	10 — 13	0 or 12 — 15	—
	A-	E159	21	10 — 13	0 or 12 — 15	—
	B+	E159	13	10 — 13	0 or 12 — 15	—
	B-	E159	29	10 — 13	0 or 12 — 15	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Fuel pump control unit	Control signal	B134	40	10 — 13	0 or 12 — 15	Waveform
	Diagnostic signal	B134	44	0	12 — 15	—
High-pressure fuel pump (Hi)		E158	10	2.4 — 2.5	0 or 12 — 15	Waveform
High-pressure fuel pump (Lo)		E158	22	2.4 — 2.5	0	Waveform
Fuel injector	Power supply 1	B134	36	10 — 13	12 — 15	—
	Power supply 2	B134	48	10 — 13	12 — 15	—
	#1 (+)	E158	11	0	—	Measurement is prohibited while the engine is running.
	#1 (–)	E158	12	0	—	
	#2 (+)	E158	23	0	—	
	#2 (–)	E158	24	0	—	
	#3 (+)	E158	35	0	—	
	#3 (–)	E158	36	0	—	
	#4 (+)	E158	47	0	—	
	#4 (–)	E158	48	0	—	
Electronic throttle control	Sensor power supply	E158	18	5	5	—
	Main signal	E158	17	Fully closed: Approx. 0.7 Fully open: Approx. 3.9	Fully closed: Approx. 0.7	After engine is warmed up.
	Sub signal	E158	29	Fully closed: Approx. 4.4 Fully open: Approx. 1.1	Fully closed: Approx. 4.4	After engine is warmed up.
	Ground	E158	30	0	0	—
	Motor power supply	B134	11	10 — 13	12 — 15	—
Electronic throttle control motor (+)		E159	2	0	0 or 12 — 15	—
Electronic throttle control motor (–)		E159	1	0	0 or 12 — 15	—
Electronic throttle relay control		B134	39	0	0	—
Starter relay control		B134	14	2.9	2.9	—
Self-shutoff relay control		B134	38	0	0	—
Starter cut relay control		B134	13	0	0	Model with push button start
Main fan relay control		B134	37	10 — 13	0 or 12 — 15	—
Sub fan relay control		B134	25	10 — 13	0 or 12 — 15	—
A/C relay control		B134	1	10 — 13	0 or 12 — 15	—
Starter switch		B134	45	0	0	Model with push button start Cranking: waveform
Starter switch 2		B134	8	0	0	Cranking: 8 — 14
Ignition switch		B134	32	10 — 13	12 — 15	—
Pressure switch		B134	7	10 — 13	12 — 15	—

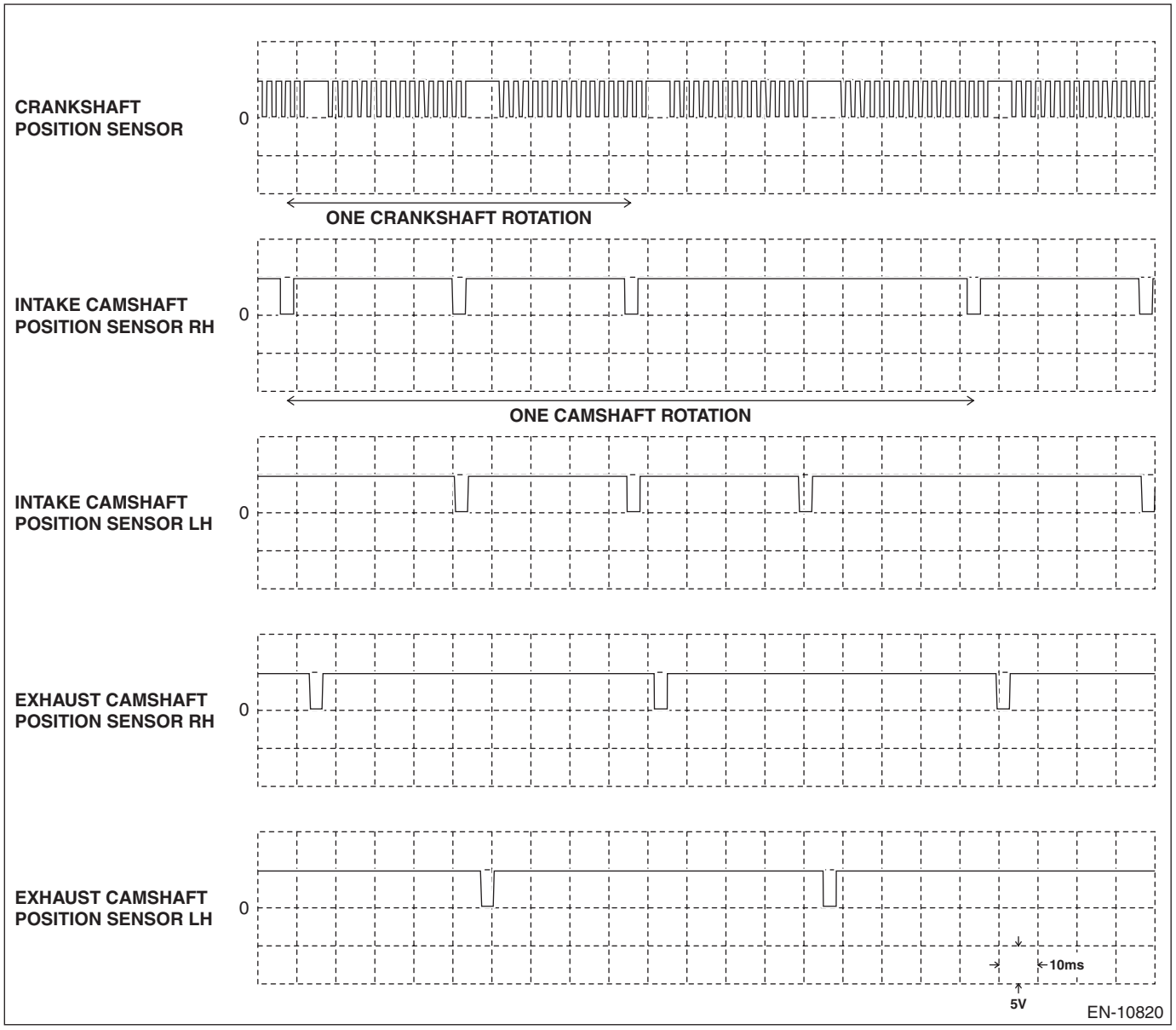
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Neutral position switch		B134	33	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 15	Switch is ON when select lever is in “P” range or “N” range.
Cruise control	Main switch	B134	20	ON: 0 OFF: 5	ON: 0 OFF: 5	—
	Command switch	B134	6	When operating nothing: 3.5 — 4.5 When operating RES/+: 2.5 — 3.5 When operating DISTANCE: 1.5 — 2.5 When operating SET/–: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/+: 2.5 — 3.5 When operating DISTANCE: 1.5 — 2.5 When operating SET/–: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Clutch switch		B134	34	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 — 15	MT model
Brake switch 1 (brake switch)		B134	43	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	—
Brake switch 2 (stop light switch)		E158	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	—
Oil level switch		E158	44	0	0	Oil level LOW: 10 — 14
Accessory cut request		B134	2	10 — 13	12 — 15	Model with push button start Cranking: 0
Engine speed output		B134	4	10 — 13	0 or 12 — 15	Model with push button start Waveform
Generator control		B134	26	1.8	1.8	After engine is warmed up.
CAN communication	(Hi)	B134	10	—	—	—
	(Lo)	B134	9	—	—	—
LIN communication		E158	3	—	—	—
Immobilizer communication		E158	43	—	—	—
Delivery mode switch		E158	45	10 — 13	12 — 15	—
Control module power supply		B134	12	10 — 13	12 — 15	—
		B134	24	10 — 13	12 — 15	—
Back-up power supply		B134	23	10 — 13	12 — 15	—
Sensor power supply		B134	18	5	5	—
		E159	19	5	5	—
ELCM	Switching valve	B134	27	10 — 13	12 — 14	Operating: 0
	Pressure sensor	B134	15	1 — 4	1 — 4	When ignition switch is turned to ON: atmospheric pressure
	Vacuum pump	B134	3	10 — 13	12 — 14	Operating: 0

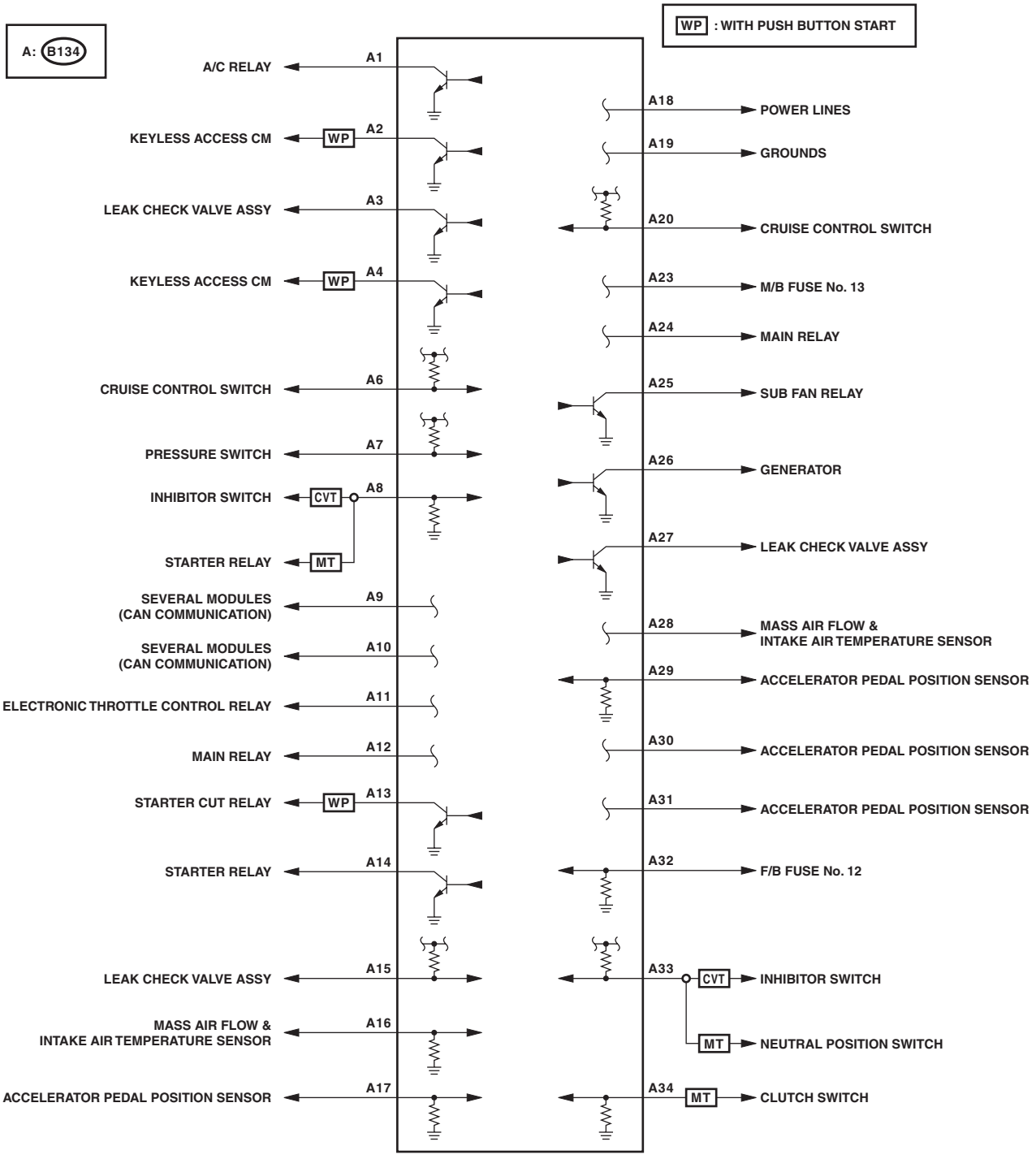
Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Brake booster pressure sensor		E158	13	0.8 — 1.2	1.0 — 1.6	After engine is warmed up. When brake pedal is released.
Brake vacuum pump		E158	1	0	0	After engine is warmed up.
Brake vacuum pump relay		E158	37	10 — 13	12 — 15	After engine is warmed up.
Sensor ground		B134	19	0	0	—
		E159	27	0	0	—
Ground	Engine 1	B134	35	0	0	—
	Engine 2	B134	47	0	0	—
	Engine 3	E159	10	0	0	—
	Engine 4	E159	18	0	0	—
	Engine 5	E159	26	0	0	—
	Engine 6	E159	17	0	0	—
	Engine 7	E159	25	0	0	—

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




WP : WITH PUSH BUTTON START
A: B134
A/C RELAY
A1
KEYLESS ACCESS CM
WP
A2
LEAK CHECK VALVE ASSY
A3
KEYLESS ACCESS CM
WP
A4
CRUISE CONTROL SWITCH
A6
PRESSURE SWITCH
A7
INHIBITOR SWITCH
CVT
A8
STARTER RELAY
MT
SEVERAL MODULES (CAN COMMUNICATION)
A9
SEVERAL MODULES (CAN COMMUNICATION)
A10
ELECTRONIC THROTTLE CONTROL RELAY
A11
MAIN RELAY
A12
STARTER CUT RELAY
WP
A13
STARTER RELAY
A14
LEAK CHECK VALVE ASSY
A15
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
A16
ACCELERATOR PEDAL POSITION SENSOR
A17
A18
POWER LINES
A19
GROUNDS
A20
CRUISE CONTROL SWITCH
A23
M/B FUSE No. 13
A24
MAIN RELAY
A25
SUB FAN RELAY
A26
GENERATOR
A27
LEAK CHECK VALVE ASSY
A28
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
A29
ACCELERATOR PEDAL POSITION SENSOR
A30
ACCELERATOR PEDAL POSITION SENSOR
A31
ACCELERATOR PEDAL POSITION SENSOR
A32
F/B FUSE No. 12
A33
CVT
INHIBITOR SWITCH
MT
NEUTRAL POSITION SWITCH
A34
MT
CLUTCH SWITCH

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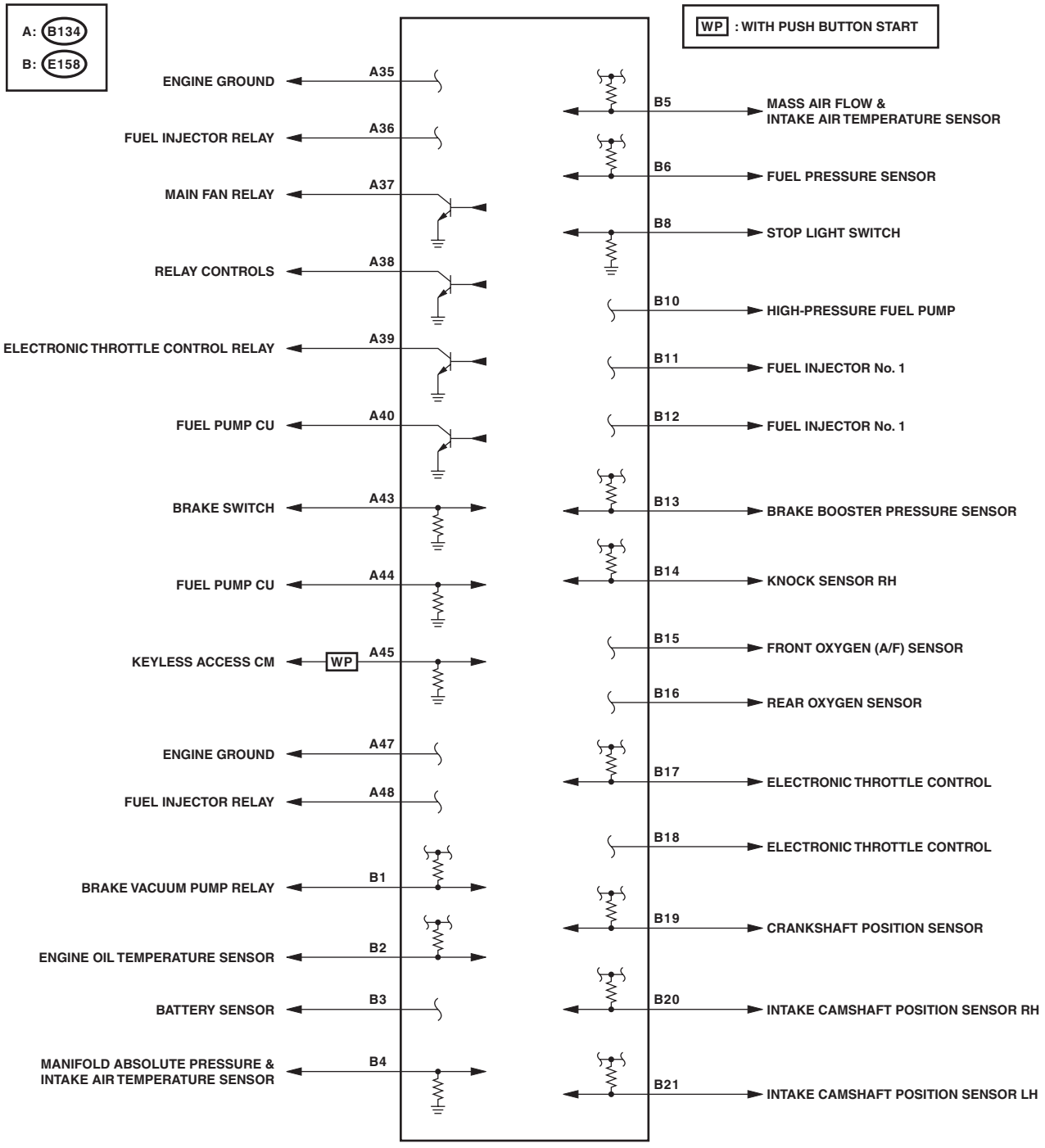
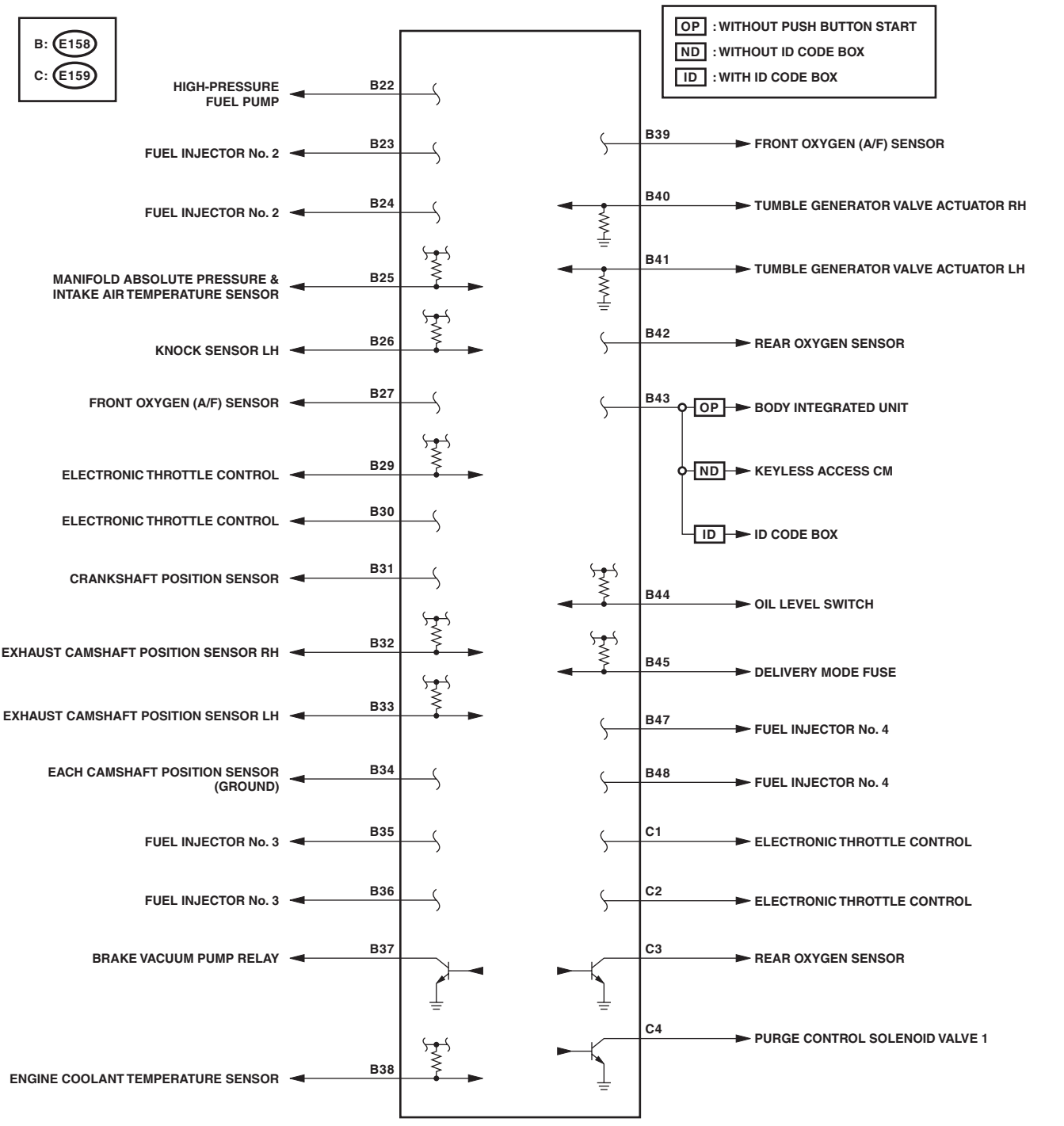
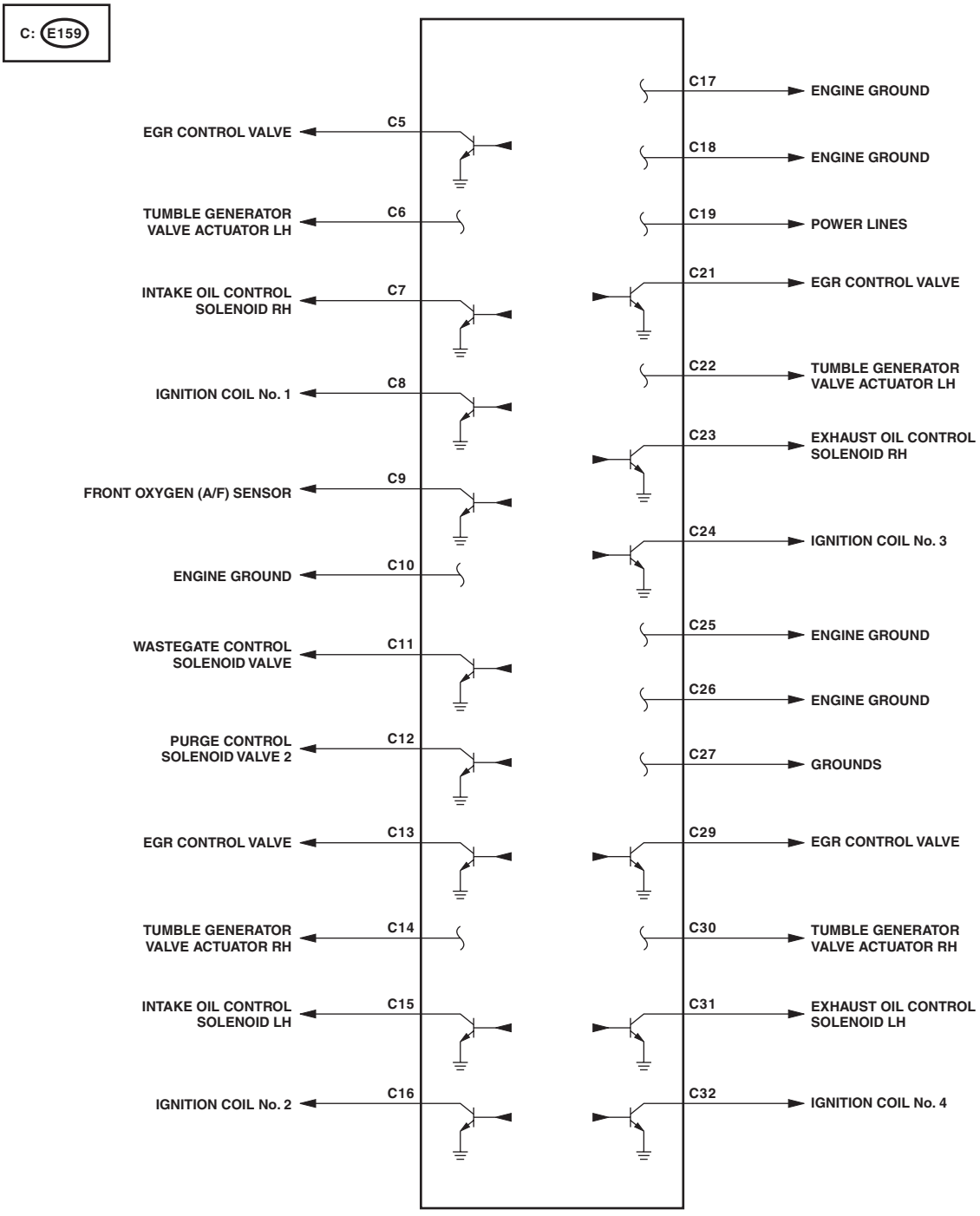

A: B134
B: E158
WP : WITH PUSH BUTTON START
ENGINE GROUND
A35
FUEL INJECTOR RELAY
A36
MAIN FAN RELAY
A37
RELAY CONTROLS
A38
ELECTRONIC THROTTLE CONTROL RELAY
A39
FUEL PUMP CU
A40
BRAKE SWITCH
A43
FUEL PUMP CU
A44
KEYLESS ACCESS CM
WP
A45
ENGINE GROUND
A47
FUEL INJECTOR RELAY
A48
BRAKE VACUUM PUMP RELAY
B1
ENGINE OIL TEMPERATURE SENSOR
B2
BATTERY SENSOR
B3
MANIFOLD ABSOLUTE PRESSURE &
INTAKE AIR TEMPERATURE SENSOR
B4
B5
MASS AIR FLOW &
INTAKE AIR TEMPERATURE SENSOR
B6
FUEL PRESSURE SENSOR
B8
STOP LIGHT SWITCH
B10
HIGH-PRESSURE FUEL PUMP
B11
FUEL INJECTOR No. 1
B12
FUEL INJECTOR No. 1
B13
BRAKE BOOSTER PRESSURE SENSOR
B14
KNOCK SENSOR RH
B15
FRONT OXYGEN (A/F) SENSOR
B16
REAR OXYGEN SENSOR
B17
ELECTRONIC THROTTLE CONTROL
B18
ELECTRONIC THROTTLE CONTROL
B19
CRANKSHAFT POSITION SENSOR
B20
INTAKE CAMSHAFT POSITION SENSOR RH
B21
INTAKE CAMSHAFT POSITION SENSOR LH

EN-10822


B: E158
C: E159
OP : WITHOUT PUSH BUTTON START
ND : WITHOUT ID CODE BOX
ID : WITH ID CODE BOX
HIGH-PRESSURE FUEL PUMP
B22
FUEL INJECTOR No. 2
B23
FUEL INJECTOR No. 2
B24
MANIFOLD ABSOLUTE PRESSURE & INTAKE AIR TEMPERATURE SENSOR
B25
KNOCK SENSOR LH
B26
FRONT OXYGEN (A/F) SENSOR
B27
ELECTRONIC THROTTLE CONTROL
B29
ELECTRONIC THROTTLE CONTROL
B30
CRANKSHAFT POSITION SENSOR
B31
EXHAUST CAMSHAFT POSITION SENSOR RH
B32
EXHAUST CAMSHAFT POSITION SENSOR LH
B33
EACH CAMSHAFT POSITION SENSOR (GROUND)
B34
FUEL INJECTOR No. 3
B35
FUEL INJECTOR No. 3
B36
BRAKE VACUUM PUMP RELAY
B37
ENGINE COOLANT TEMPERATURE SENSOR
B38
B39
FRONT OXYGEN (A/F) SENSOR
B40
TUMBLE GENERATOR VALVE ACTUATOR RH
B41
TUMBLE GENERATOR VALVE ACTUATOR LH
B42
REAR OXYGEN SENSOR
B43
OP
BODY INTEGRATED UNIT
ND
KEYLESS ACCESS CM
ID
ID CODE BOX
B44
OIL LEVEL SWITCH
B45
DELIVERY MODE FUSE
B47
FUEL INJECTOR No. 4
B48
FUEL INJECTOR No. 4
C1
ELECTRONIC THROTTLE CONTROL
C2
ELECTRONIC THROTTLE CONTROL
C3
REAR OXYGEN SENSOR
C4
PURGE CONTROL SOLENOID VALVE 1

EN-10823


C: E159
EGR CONTROL VALVE
C5
TUMBLE GENERATOR VALVE ACTUATOR LH
C6
INTAKE OIL CONTROL SOLENOID RH
C7
IGNITION COIL No. 1
C8
FRONT OXYGEN (A/F) SENSOR
C9
ENGINE GROUND
C10
WASTEGATE CONTROL SOLENOID VALVE
C11
PURGE CONTROL SOLENOID VALVE 2
C12
EGR CONTROL VALVE
C13
TUMBLE GENERATOR VALVE ACTUATOR RH
C14
INTAKE OIL CONTROL SOLENOID LH
C15
IGNITION COIL No. 2
C16
C17
ENGINE GROUND
C18
ENGINE GROUND
C19
POWER LINES
C21
EGR CONTROL VALVE
C22
TUMBLE GENERATOR VALVE ACTUATOR LH
C23
EXHAUST OIL CONTROL SOLENOID RH
C24
IGNITION COIL No. 3
C25
ENGINE GROUND
C26
ENGINE GROUND
C27
GROUNDS
C29
EGR CONTROL VALVE
C30
TUMBLE GENERATOR VALVE ACTUATOR RH
C31
EXHAUST OIL CONTROL SOLENOID LH
C32
IGNITION COIL No. 4

EN-10230