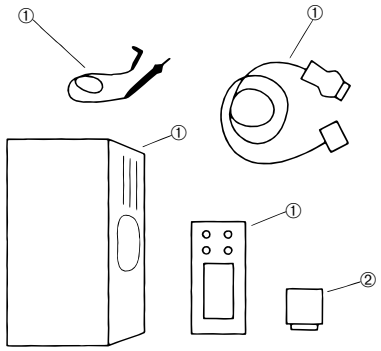
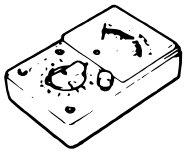
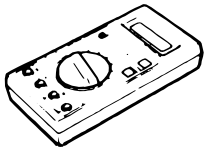
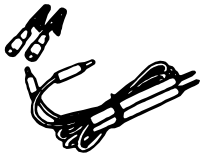
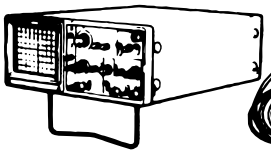
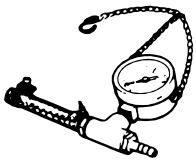
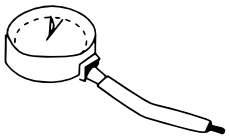
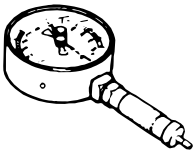
2 EGI SYSTEM

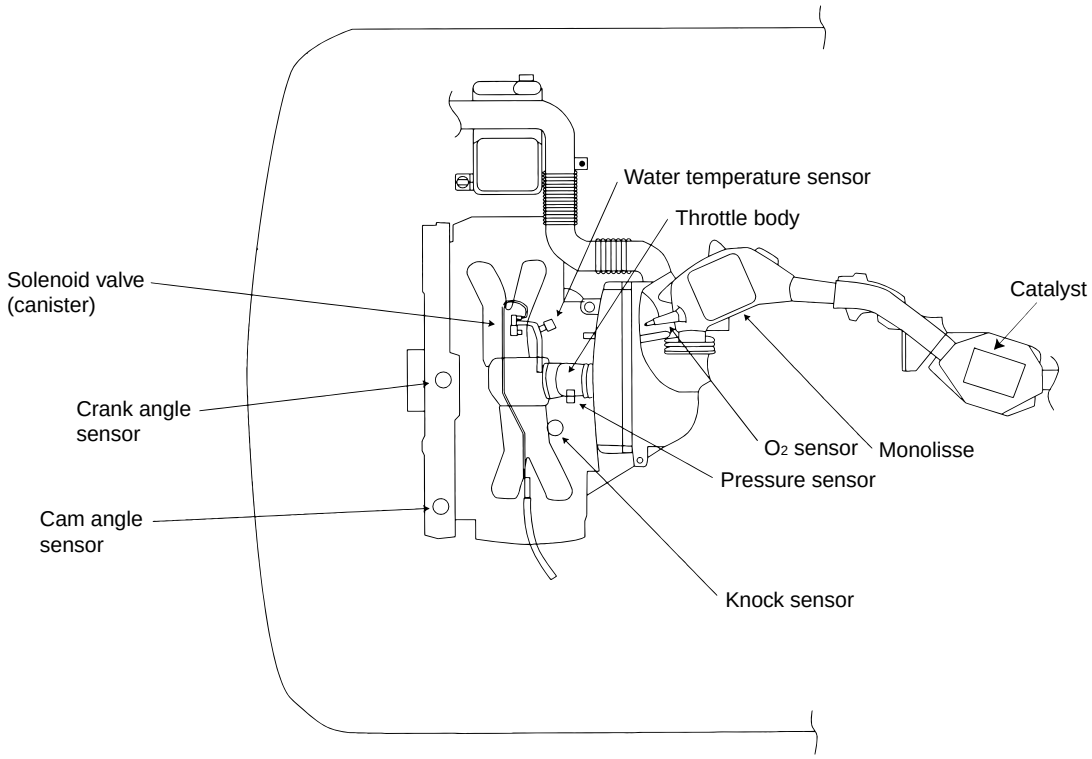
2–1 Preparation of instruments

ST		①	SUBARU select monitor kit 22771AA010	Monitors input/output signals and diagnoses failed line.
		②	Cartridge for SUBARU select monitor 2482AA100	
Instrument	 Circuit tester (analogue type)			Measurement of each voltage and circuit resistance
	 Circuit tester (Digital type)			
	 Test lead wire, alligator clip			
	 Oscilloscope Probe			Observation of each signal undulation
	 Fuel pressure gauge			For measuring fuel pressure
	 Vacuum gauge (negative pressure gauge)			For measuring intake manifold negative pressure
	 Compound gauge (Nissalco EG1508)			For measuring super and charge pressure

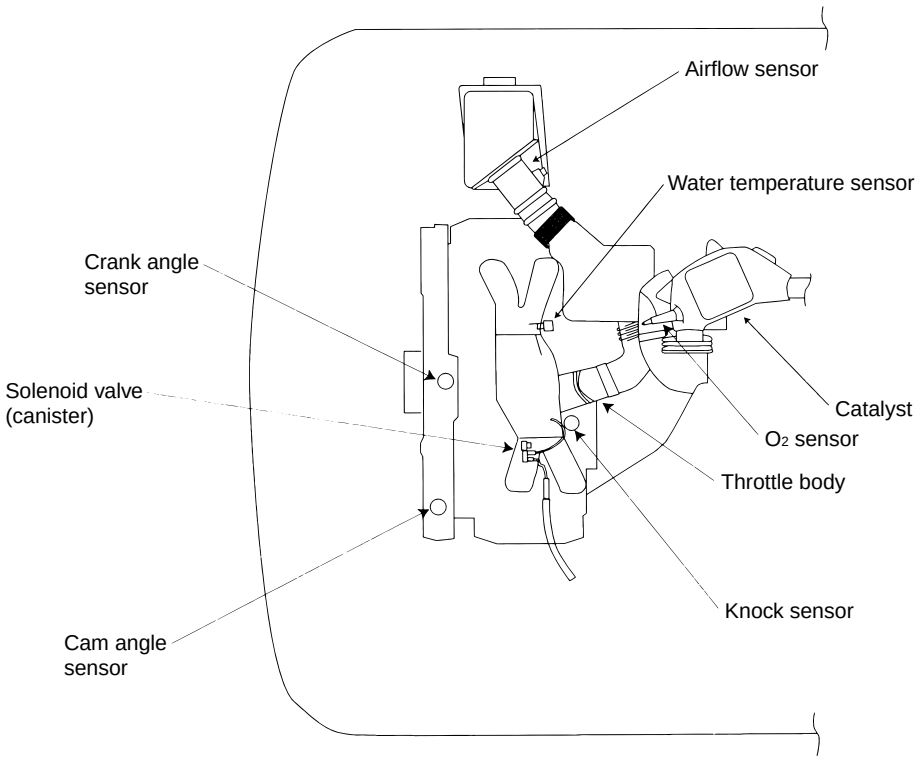
2–2 Outline of system

[1] Layout of parts

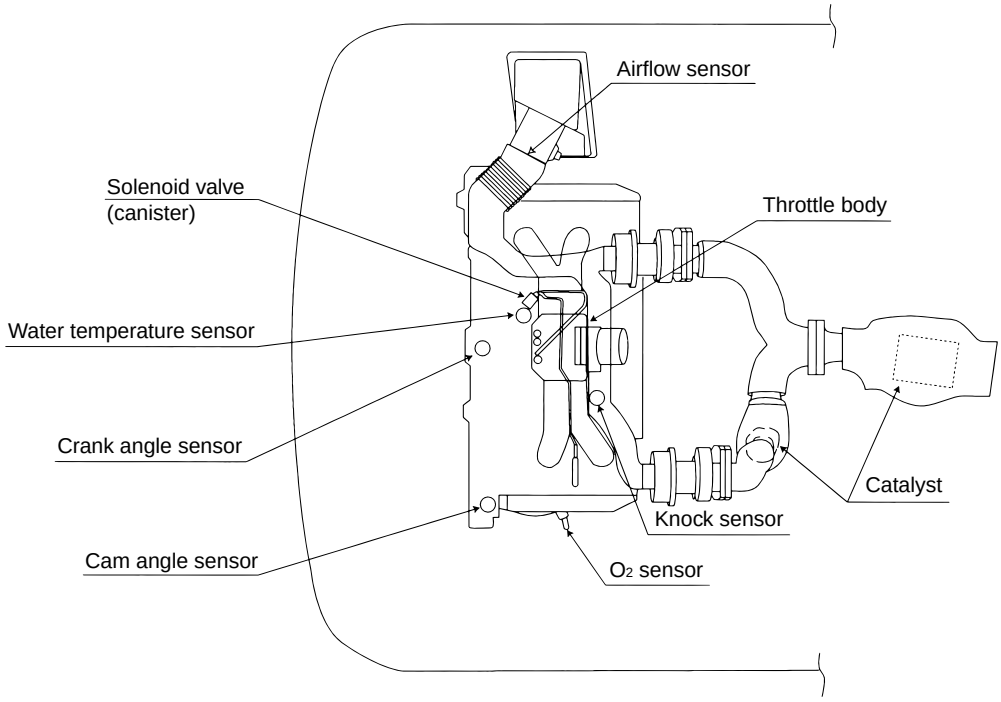
<2 l SOHC vehicles>



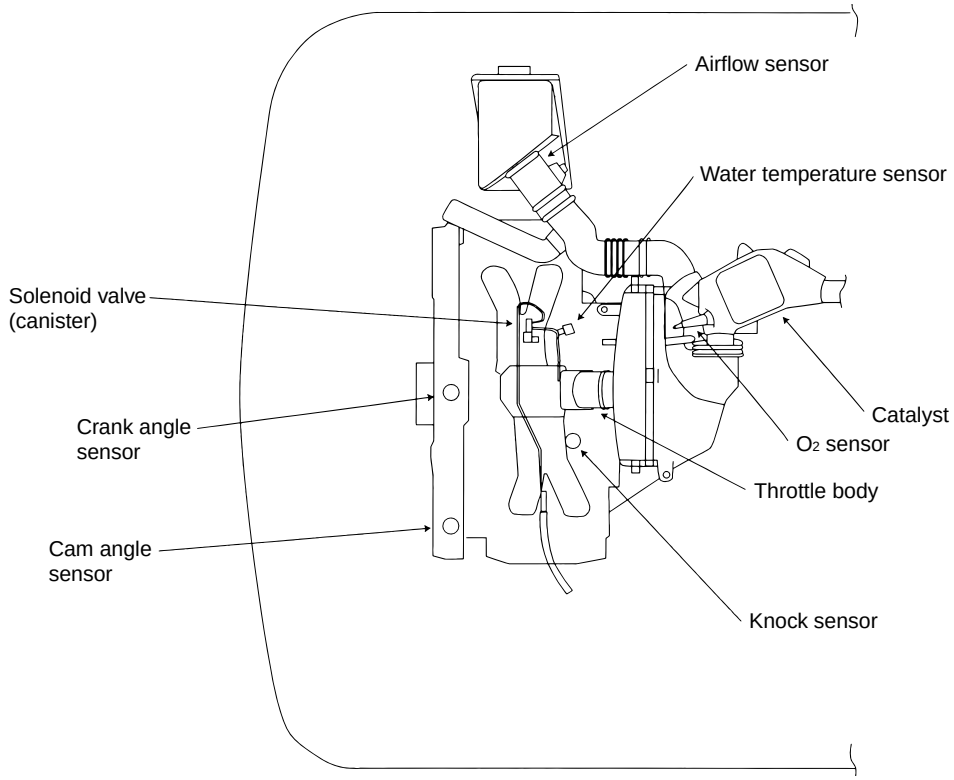
<2 l DOHC vehicles>



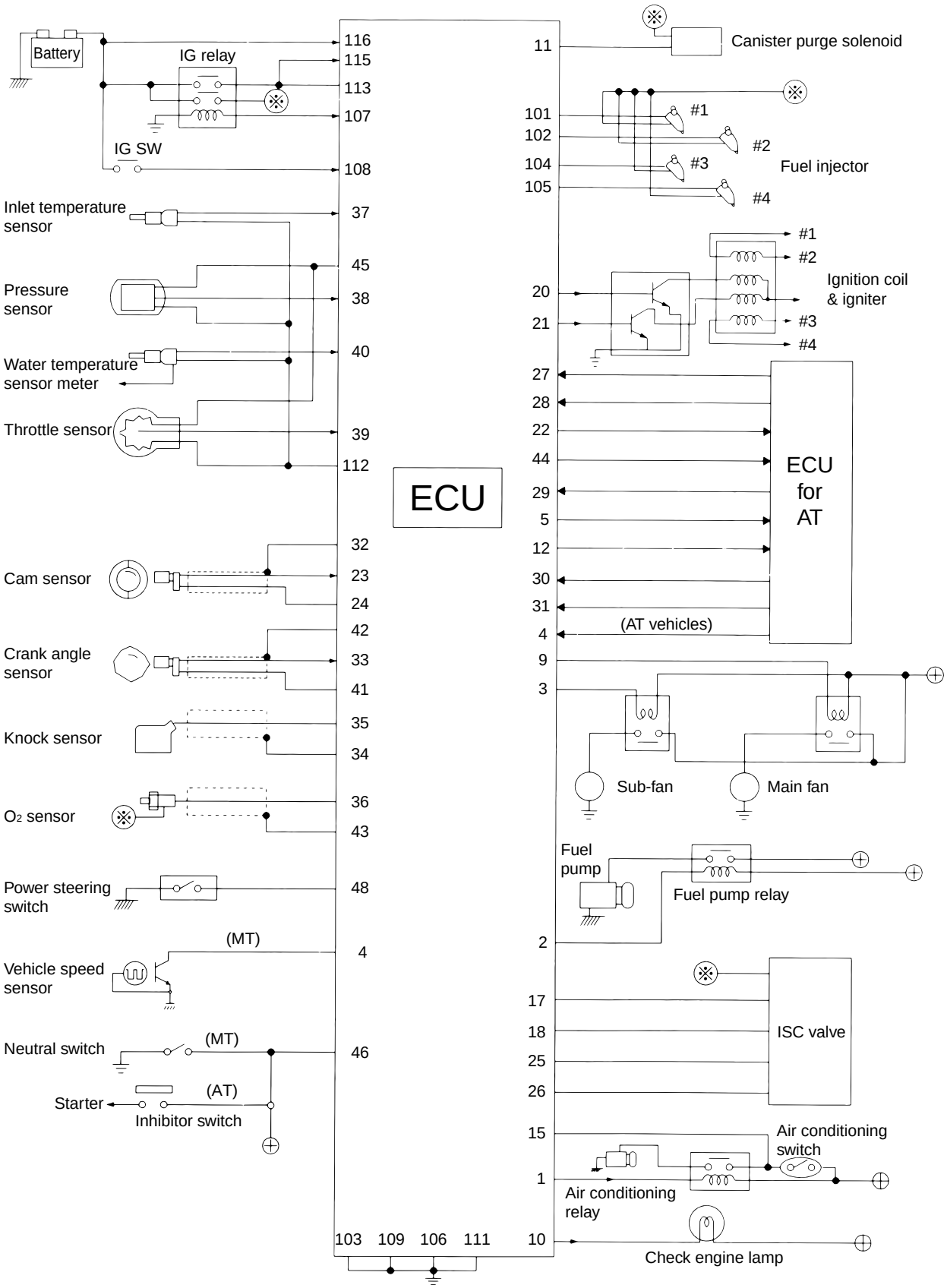
<2 l turbo vehicles>



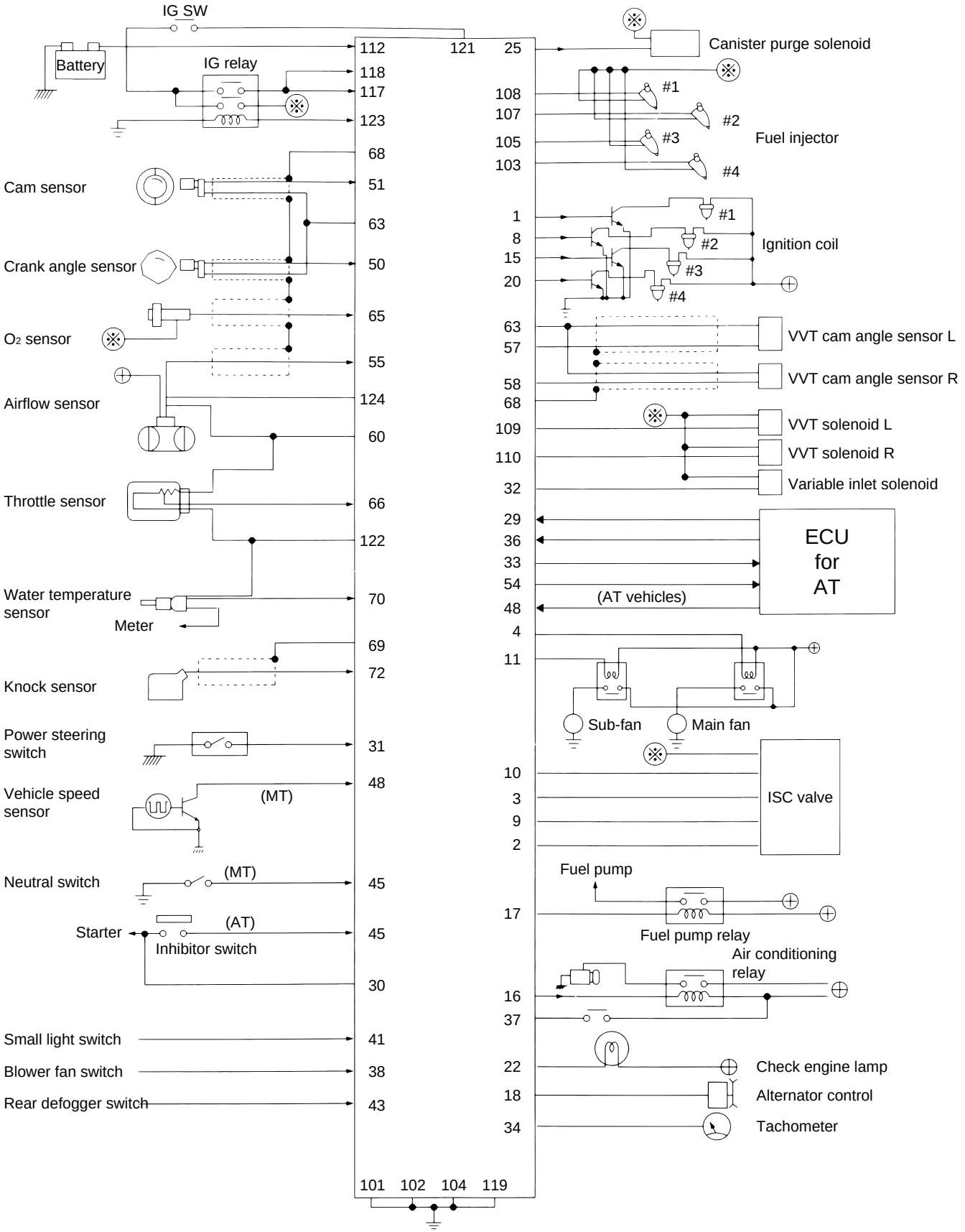
<2.5 l DOHC vehicles>



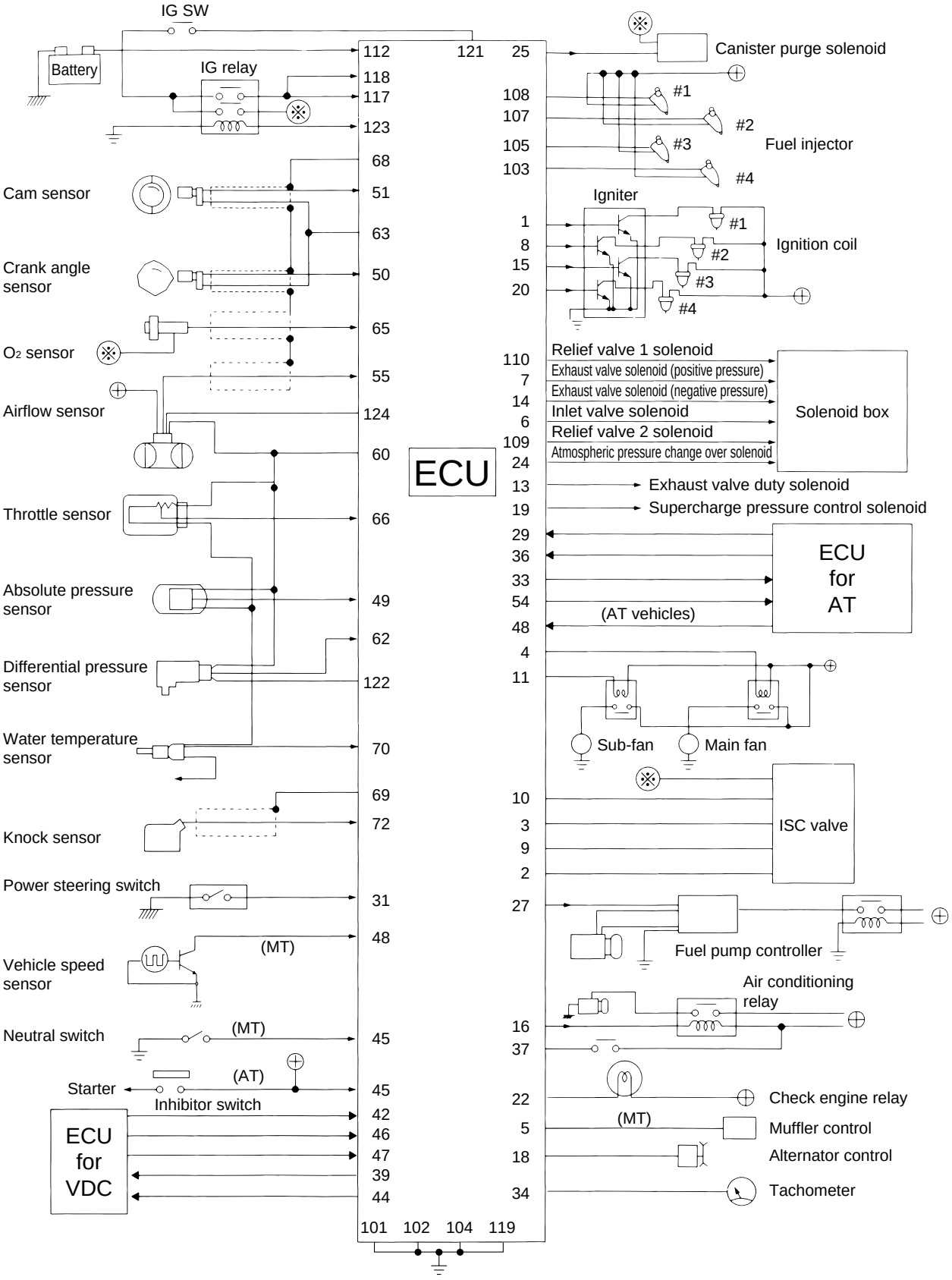
[2] Input/output diagram (2.0 l, SOHC vehicles)



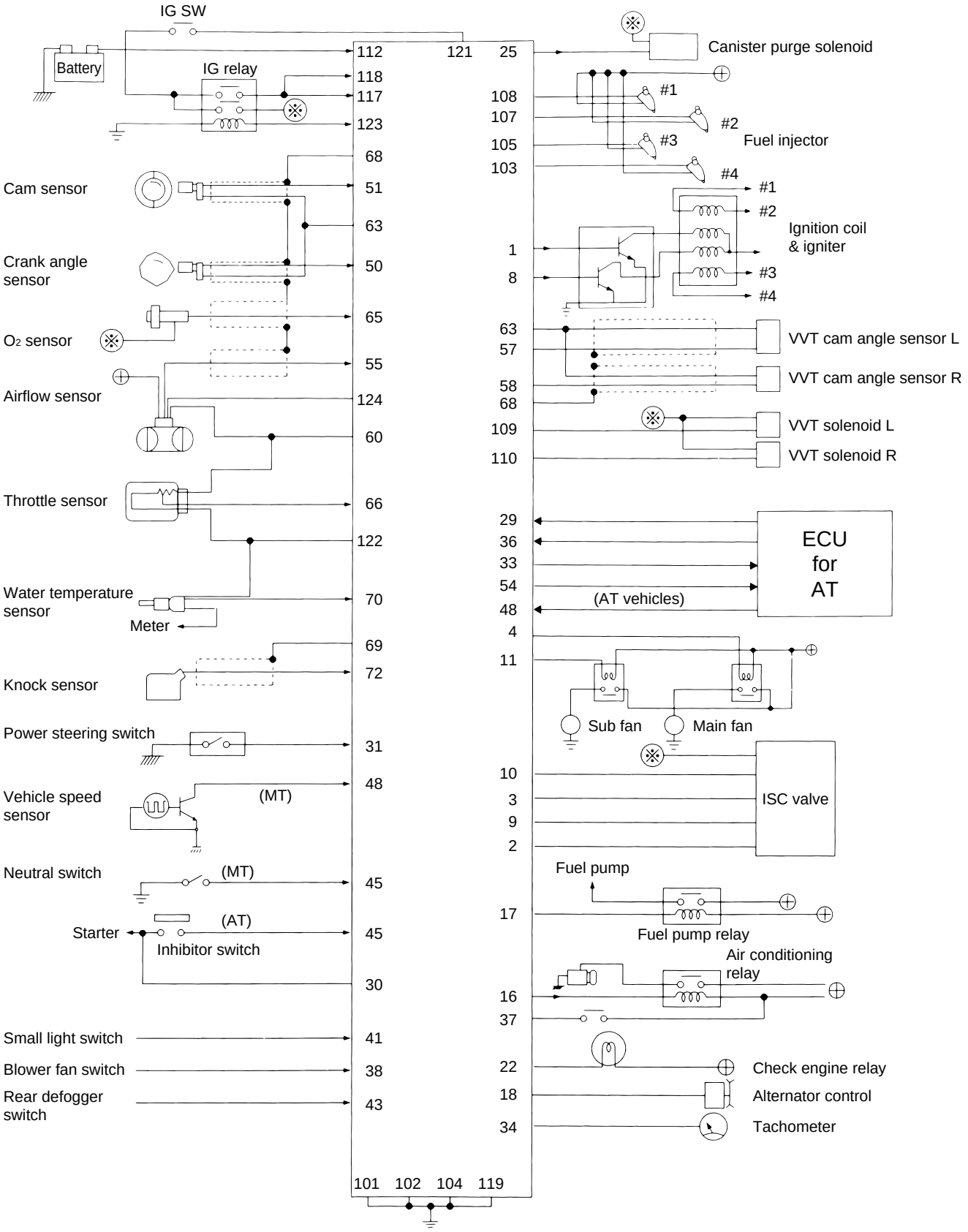
Input/output diagram (2.0 l, DOHC vehicles)



Input/output diagram (2.0 l turbo vehicles)

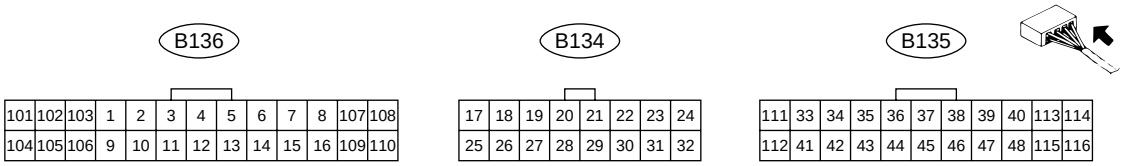


Input/output diagram (2.5 l DOHC vehicles)



[3] Input/output voltage (2.0 l, SOHC vehicles)

<Layout of ECU connector terminals>

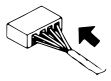


Classification	Terminal to inspect		Measuring terminal: Terminal number	Measuring terminal: Wire color	Voltage (V): Ignition switch turned ON (Engine stopped)	Voltage (V): Idling	Remark
Input	ECU power source		113	YL	10 ~ 13	13 ~ 14	
	Ignition switch		108	GR	10 ~ 13	13 ~ 14	
	Sensor power source		45	RB	5	5	
	Pressure sensor		38	Lg	4.3 ~ 4.4	0.9 ~ 1.4	
	Inlet temperature sensor		37	WL	3.0 (20 ˚C)	1.9 (40 ˚C)	
	O_2 sensor		36	W	Less than 0.7	Varies between 0.01 ~ 0.9	
	Crank angle sensor	+	33	W	0	Crank angle sensor waveform	Inspection using an oscilloscope
		–	41	B	0	0	
	Cam angle sensor	+	23	L	0	Cam angle sensor waveform	Inspection using an oscilloscope
		–	24	P	0	0	
	Water temperature sensor		40	BrW	0.6 ~ 4.5	0.6 (90 ˚C)	
	Knock sensor		35	W	2.5	2.5	
	Throttle sensor		39	LgY	Fully closed: 0.5 Fully opened: 4.3	0.5	
	Vehicle speed sensor		4	GB	0 or 5	0 or 5	
	Air conditioning switch		15	Br	OFF: 0 ON: 10 ~ 13	OFF: 0 ON: 13 ~ 14	
	Neutral switch		46	BG	N: 5 other than N: 0	N: 5 Other than N: 0	(Reverse polarity for MT-AT)
	Power steering switch		48	B	ON: 0 OFF: 5	ON: 0 OFF: 5	
	Torque down 1		27	P	5	5	For AT only
	Torque down 2		28	WR	↑	↑	↑
	Lock up		29	YR	0 or 5	0 or 5	↑
	Gear position 1		30	Lg	↑	↑	↑
	Gear position 2		31	WL	↑	↑	↑
	Small light switch		14	BW	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Blower fan switch		13	VY			
	Rear defogger switch		47	RL	OFF: 0 ON: 10 ~ 13	OFF: 0 ON: 13 ~ 14	

Classification	Terminal to inspect		Measuring terminal		Voltage (V)		Remark
			Terminal number	Wire color	Ignition switch turned ON (E/G stopped)	Idling	
Output	Ignition signal	#1, 2	20	RY	0	p-p4	Inspection using oscilloscope
		#3, 4	21	RB	↑	↑	
	Injector	#1	101	Br	10 ~ 13	0 or 13 ~ 14	
		#2	102	Lg	↑	↑	
		#3	104	LR	↑	↑	
		#4	105	LB	↑	↑	
	ISC. A	+	17	Br	0 or 10 ~ 13	0 or 13 ~ 14	
		–	18	OrG	↑	↑	
	ISC. B	+	25	LY	↑	↑	
		–	26	GY	↑	↑	
	Canister purge solenoid		11	RG	OFF: 10 ~ 13	0 or 13 ~ 14	
	Radiator fan relay	1	9	RL	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
		2	3	GR			
	Fuel pump relay		2	Lg	10 ~ 13	0	
	Air conditioning relay		1	LOr	10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Check engine lamp		10	RW	ON: 0	OFF: 13 ~ 14	
	Engine revolution signal		6	OrW	10 ~ 13	ON/OFF pulse	
	Torque down inhibition		22	Y	0	0 or 13 ~ 14	Only AT vehicles
	AT load		44	Or	4.3 ~ 1.4	0.9 ~ 1.4	↑
	Lean control		5	VR	0 or 10 ~ 13	0 or 13 ~ 14	↑
	Rich control		12	PL	↑	↓	↑
	Alternator control		19	BR	5 ~ 8	0 or 5 ~ 8	
	Test mode connector		8	Or	When connector is not connected 5	When connector is not connect 5	When connector is connected 0
	Read memory connector		16	PG			
	Sensor line ground		112	RG	0	0	
	Injector ground		106	BP	0	0	
	Power line ground		103	BW	0	0	
	Control line ground		111	BL	0	0	

Input/output voltage (2.0 l DOHC vehicles)

<Layout of ECU connector terminals>



B136

101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

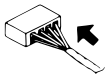
117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

Classification	Terminal to inspect		Measuring terminal: Terminal number	Measuring terminal: Wire color	Voltage (V): Ignition switch turned ON (Engine stopped)	Voltage (V): Idling	Remark
Input	ECU power source		117	YL	10 ~ 13	13 ~ 14	
	Ignition switch		121	GR	10 ~ 13	13 ~ 14	
	Sensor power source		60	RB	5	5	
	Airflow sensor	Signal	55	G	1.0	1.0 ~ 1.7	
		Ground	124	BG	0	0	
	O_2 sensor		65	W	Less than 0.7	Varies between 0.01 ~ 0.9	
	Crank angle sensor	+	50	W	0	Crank angle sensor waveform	Inspection using oscilloscope
		Ground	63	LgB	0	0	Used in common with cam angle sensor
	Cam angle sensor (+)		51	R	0	Cam angle sensor waveform	Inspection using oscilloscope
	Water temperature sensor		70	BrW	0.6 ~ 4.5	0.6 (90 ˚C)	
	Knock sensor		72	W	2.5	2.5	
	Throttle sensor		66	LgY	Fully closed: 0.5 Fully opened: 4.3	0.5	
	Vehicle speed sensor		48	GB	0 or 5	0 or 5	
	Air conditioning switch		37	PW	OFF:0 ON: 10 ~ 13	OFF: 0 ON: 13 ~ 14	
	Starter switch		30	WG	0	0	When cranking 9 ~ 12
	Neutral switch		45	WB	N: 5, other than N: 0	N: 5, other than N: 0	(Reverse polarity for MT-AT)
	Power steering switch		31	PB	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Torque down 1		29	P	5	5	AT vehicles only
	Torque down 2		36	WR	↑	↑	↑
	Small light switch		41	BW	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Blower fan switch		38	VY	↑	↑	
	Rear defogger switch		43	VG	↑	↑	
	Injector ground		101	BrW	0	0	
	Power line ground		102	BW	0	0	
	Ignition ground		104	B	0	0	
	Control line ground		119	BL	0	0	
	Sensor line ground		122	RG	0	0	

Classification	Terminal to inspect		Measuring terminal		Voltage (V)		Remark
			Terminal number	Wire color	Ignition switch turned ON (Engine stopped)	Idling	
Output	Injector	#1	108	Br	10 ~ 13	13 ~ 14	
		#2	107	Lg	↑	↑	
		#3	105	LR	↑	↑	
		#4	103	LB	↑	↑	
	Ignition signal	#1	1	YL	0	Ignition control waveform	Inspection using oscilloscope
		#2	8	YV	↑	↑	
		#3	15	R	↑	↑	
		#4	20	BR	↑	↑	
	ISC valve	1	10	G	0 or 10 ~ 13	0 or 13 ~ 14	
		2	3	OrL	↑	↑	
		3	9	LY	↑	↑	
		4	2	GY	↑	↑	
	Canister purge solenoid		25	WL	OFF: 10 ~ 13	0 or 13 ~ 14	Inspection in D check mode
	Radiator fan relay	1	4	RL	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
		2	11	GR			
	Fuel pump relay		17	LgB	OFF: 10 ~ 13	ON: 0	
	Air conditioning relay		16	LOr	10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Check engine lamp		22	RW	ON:0	OFF : 13 ~ 14	
	Engine revolution		34	Lg	10 ~ 13	ON/OFF pulses	
	Inlet air volume		54	Or	1.0	1.0 ~ 1.7	Only AT vehicles
	Torque down inhibition		33	Y	0	0 or 13 ~ 14	↑
	VVT	Cam angle sensor L	57	G	0	VVT cam angle sensor waveform	
		Cam angle sensor R	58	W	0	↑	
		Solenoid L	109	RL	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
		Solenoid R	110	LY	↑	↑	
	Variable inlet solenoid		32	RY	0	↑	
	Alternator		18	BR	4 ~ 5	4 ~ 5	
	Test mode connector		40	Or	When connector is not connected 5	When connector is not connected 5	When connector is connected 0
	Read memory connector		35	RB			

EGI SYSTEM (2.0 l DOHC vehicles)

<Layout of ECU connector terminals>



B136

101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

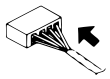
117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

Classification	Position to inspect		Measuring terminal		Voltage (V)		Remark
			Terminal number	Wire color	IG SW ON (E/G stopped)	Idling	
Input	ECU power source		117	YL	10 ~ 13	13 ~ 14	
	Ignition switch		121	GR	10 ~ 13	13 ~ 14	
	Sensor power source		60	RB	5	5	
	Airflow sensor	Signal	55	G	1.0	1.0 ~ 1.7	
		Ground	124	BG	0	0	
	O_2 sensor		65	W	Less than 0.7	Varies between 0.01 ~ 0.9	
	Crank angle sensor	+	50	W	0	Crank angle sensor waveform	Inspection using an oscilloscope
		Ground	63	LgB	0	0	Used in common with cam angle sensor
	Cam angle sensor (+)		51	R	0	Cam angle sensor waveform	Inspection using an oscilloscope
	Water temperature sensor		70	BrW	0.6 ~ 4.5	0.6 (90 ˚C)	
	Knock sensor		72	W	2.5	2.5	
	Throttle sensor		66	LgY	Fully closed: 0.5 Fully opened: 4.3	0.5	
	Absolute pressure sensor		49	YW	2.3 ~ 2.7	1.4 ~ 1.6	
	Differential pressure sensor		62	LG	2	2	
	Vehicle speed sensor		48	GB	0 or 5	0 or 5	
	Air conditioning switch		37	PW	OFF: 0 ON: 10 ~ 13	OFF: 0 ON: 13 ~ 14	
	Starter switch		30	WG	0	0	
	Neutral switch		45	WB	N: 5, other than N: 0	N: 5, other than N: 0	When cranking 9 ~ 12
	Power steering switch		31	PB	ON: 0 OFF: 5	ON: 0 OFF: 5	(Reverse polarity for MT-AT)
	Torque down 1		29	P	5	5	
	Torque down 2		36	WR	↑	↑	AT vehicles only
	Small light switch		41	BW	ON: 0 OFF: 0 ~ 13	ON: 0 OFF: 13 ~ 14	↑
	Blower fan switch		38	VY	↑	↑	
	Rear defogger switch		43	VG	↑	↑	
	VDC	AEB	42	YB	↑	↑	VDC vehicles only
		AEC	46	OrB	↑	↑	↑
		AET	47	BrR	VDC vehicles: 5 Others: 0	VDC vehicles: 5 Others: 0	

Classification	Terminal to inspect		Measuring terminal		Voltage (V)		Remark
			Terminal number	Wire color	IG SW ON (E/G stopped)	Idling	
Output	Injector	#1	108	Br	10 ~ 13	13 ~ 14	
		#2	107	Lg	↑	↑	
		#3	105	LR	↑	↑	
		#4	103	LB	↑	↑	
	Ignition signal	#1	1	RY	0	Ignition control waveform	Inspection using oscilloscope
		#2	8	YV	↑	↑	
		#3	15	RB	↑	↑	
		#4	20	BOr	↑	↑	
	ISC valve	1	10	BR	0 or 10 ~ 13	0 or 13 ~ 14	
		2	3	OrG	↑	↑	
		3	9	LW	↑	↑	
		4	2	GY	↑	↑	
	Canister purge solenoid		25	RG	OFF: 10 ~ 13	0 or 13 ~ 14	Inspection in D check mode
	Super charge pressure solenoid		19	BY	OFF: 10 ~ 13	OFF: 13 ~ 14	
	Exhaust valve duty solenoid		13	WOr	↑	↑	
	Relief valve 1 solenoid		110	GY	↑	↑	
	Relief valve 2 solenoid		109	L	↑	↑	
	Exhaust valve (positive pressure) solenoid		7	OrL	↑	↑	
	Exhaust valve (negative pressure) solenoid		14	BrL	↑	↑	
	Inlet valve solenoid		6	LB	↑	↑	
	Atmospheric pressure change over solenoid		24	BrB	↑	↑	
	Muffler control		5	OrL	OFF: 2 ~ 4	OFF: 2 ~ 4	
	Radiator fan relay	1	4	RL	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
		2	11	GR			
	Fuel pump control		27	Lg	OFF: 0	1.7	
	Air conditioning relay		16	LOr	10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Check engine lamp		22	RW	ON:0	OFF: 13 ~ 14	
	Engine revolution		34	OrW	10 ~ 13	ON/OFF pulse	
	Intake air volume		54	Or	1.0	1.0 ~ 1.7	AT vehicles only
	Torque down inhibition		33	Y	0	0 or 13 ~ 14	↑
	VDC	EAC	39	R	10 ~ 13	13 ~ 14	VDC vehicles only
		EAS	44	L	↑	↑	↑
	Alternator control		18	BR	4 ~ 5	4 ~ 5	
	Injector ground		101	BP	0	0	
	Power line ground		102	BW	0	0	
	Ignition ground		104	B	0	0	

Input/output voltage (2.5 l DOHC vehicles)

<Layout of ECU connector terminals>



B136

101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

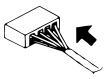
B134

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

Classification	Terminal to inspect		Measuring terminal: Terminal number	Measuring terminal: Wire color	Voltage (V): IG SW ON (E/G stopped)	Voltage (V): Idling	Remark
Input	ECU power source		117	YL	10 ~ 13	13 ~ 14	
	Ignition switch		121	GR	10 ~ 13	13 ~ 14	
	Sensor power source		60	RB	5	5	
	Airflow sensor	Signal	55	G	1.0	1.0 ~ 1.7	
		Ground	124	BG	0	0	
	O_2 sensor		65	W	Less than 0.7	Varies between 0.01 ~ 0.9	
	Crank angle sensor	+	50	W	0	Crank angle sensor waveform	Inspection using an oscilloscope
		Ground	63	LgB	0	0	Used in common with cam angle sensor
	Cam angle sensor (+)		51	R	0	Cam angle sensor waveform	Inspection using oscilloscope
	Water temperature sensor		70	BrW	0.6 ~ 4.5	0.6 (90 ˚C)	
	Knock sensor		72	W	2.5	2.5	
	Throttle sensor		66	LgY	Fully closed: 0.5 Fully opened: 4.3	0.5	
	Vehicle speed sensor		48	GB	0 or 5	0 or 5	
	Air conditioning switch		37	PW	OFF: 0 ON: 10 ~ 13	OFF:0 ON: 13 ~ 14	
	Starter switch		30	WG	0	0	When cranking 9 ~ 12
	Neutral switch		45	WB	N: 5, other than N: 0	N: 5, other than N: 0	(Reverse polarity for MT-AT)
	Power steering switch		31	PB	ON: 0 OFF: 5	ON: 0 OFF:5	
	Torque down 1		29	P	5	5	AT vehicles only
	Torque down 2		36	WR	↑	↑	↑
	Small light switch		41	BW	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Blower fan switch		38	VY	↑	↑	
	Rear defogger switch		43	VG	↑	↑	
	Injector ground		101	BrW	0	0	
	Power line ground		102	BW	0	0	
	Ignition ground		104	B	0	0	
	Control line ground		119	BL	0	0	
	Sensor line ground		122	RG	0	0	

Classification	Terminal to check		Measuring terminal		Voltage (V)		Remark
			Terminal number	Wire color	Ignition switch turned ON (Engine stopped)	Idling	
Output	Injector	#1	108	Br	10 ~ 13	13 ~ 14	
		#2	107	Lg	↑	↑	
		#3	105	LR	↑	↑	
		#4	103	LB	↑	↑	
	Ignition signal	#1, 2	1	YG	0	Ignition control waveform	Inspection using oscilloscope
		#3, 4	8	Sb	↑	↑	
	ISC valve	1	10	Br	0 or 10 ~ 13	0 or 13 ~ 14	
		2	3	OrG	↑	↑	
		3	9	LW	↑	↑	
		4	2	GY	↑	↑	
	Canister purge solenoid		25	RG	ON: 0	0 or 13 ~ 14	Inspection in D check mode
	Radiator fan relay	1	4	RL	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
		2	11	GR			
	Fuel pump relay		17	Lg	OFF: 10 ~ 13	ON: 0	
	Air conditioning relay		16	LOr	10 ~ 13	ON: 0 OFF: 13 ~ 14	
	Check engine lamp		22	RW	ON: 0	OFF : 13 ~ 14	
	Engine revolution		34	OrW	10 ~ 13	ON/OFF pulse	
	Inlet air volume		54	Or	1	1.0 ~ 1.7	Only AT vehicles
	Torque down inhibition		33	Y	0	0 or 13 ~ 14	↑
	VVT Cam angle sensor L		57	G	0	VVT cam angle sensor waveform	
	VVT Cam angle sensor R		58	W	0	↑	
	VVT Solenoid L		109	Br	ON: 0 OFF: 10 ~ 13	ON: 0 OFF: 13 ~ 14	
	VVT Solenoid R		110	LY	↑	↑	
	Variable inlet solenoid		18	BR	4 ~ 5	4 ~ 5	
	Test mode connector		40	Or	When connector is not connected 5	When connector is not connected 5	When connector is connected 0
	Read memory connector		35	PG			

[4] Input/output signal



B136

101	102	103	1	2	3	4	5	6	7	8	107	108
104	105	106	9	10	11	12	13	14	15	16	109	110

B134

17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

B135

111	33	34	35	36	37	38	39	40	113	114
112	41	42	43	44	45	46	47	48	115	116

2 l SOHC vehicles

B136

101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

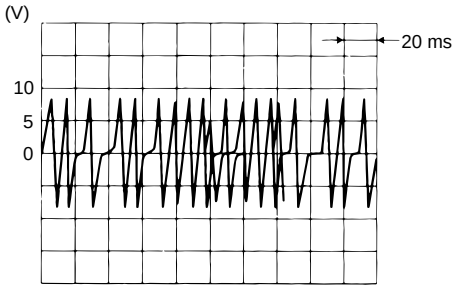
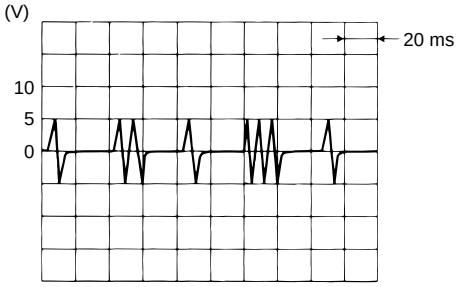
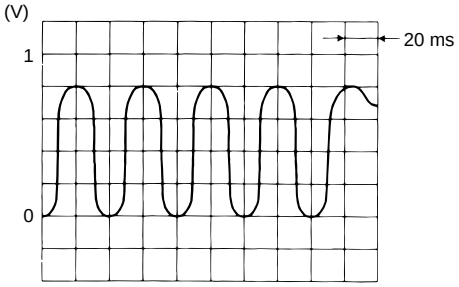
109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

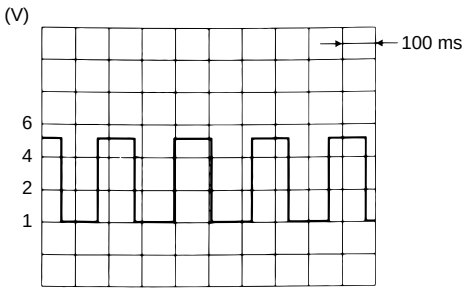
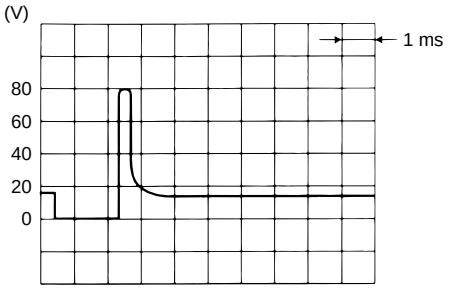
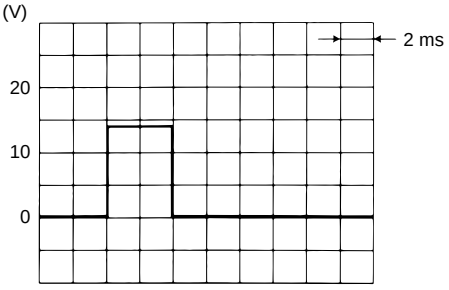
B134

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

2 l DOHC vehicles
2 l turbo vehicles
2.5 l DOHC vehicles

- Example of waveform of ECU terminal by oscilloscope

Name of signal	Idling
Crank angle sensor	
Cam angle sensor	
O_2 sensor	

Signal namel	Idling
Vehicle speed sensor	
Injection pulse	
Ignition signal	

[5] How to carry out self-diagnosis

■ Method using Check Engine Lamp

<Read memory>

(1) Connect the read memory connector (black, 1 pole) with ignition switch OFF.
(2) Ignition switch turned ON (engine stopped)
(3) Check if the check engine lamp blinks.
(4) Inspection
① The lamp does not turn on.
.....Check an abnormality of the check lamp.
② The lamp blinks (without display of DIAG code)
.....No display of DIAG code in the past → Perform D check and confirm the current failure.
③ The lamp blinks (with display of DIAG code)
.....Display of DIAG code experienced in the past → Perform checking based upon the DIAG code.

<D check>

(1) Engine warming up
(2) Ignition switch turned OFF
(3) Connection of test mode connector (green 2 poles)
(4) Ignition switch ON (Engine stops)
(5) Check engine lamp turning ON
Confirm that the check engine lamp turns ON.
(6) Inspection of the fuel pump
Confirm that functioning noise of the fuel pump can be heard for 2 seconds after IG SW ON. You can perform this check up from the pulses by touching the fuel hose in the engine room.
If it is NG, check the fuel pump circuit.
(7) Inspection of solenoid valve
Confirm that functioning noise of canister purge solenoid (clicking noise) can be heard. If it is NG, check the solenoid valve circuit line.
(8) Inspection of radiator fanConfirm that the radiator fan functions intermittently. If it is NG, check the radiator fan line circuit.
(9) Signal input to throttle sensor
Fully depress the accelerator pedal slowly, and then release it.
(10)Starting the engine

Caution

In the case of vehicles with AT, be sure to start the engine in P range.
If the engine does not start, check the engine for the disable starting.

(11)Vehicle speed sensor signal input
Run your vehicle at the speed of 10 km/h.
(12)O_2 sensor signal input
Activate O_2 sensor by keeping the engine revolution between 2,000 ~ 3,000 rpm for more than 1 minute.
(13)Check lighting of Check Engine Lamp.
(Normal) ..... Blinking
(Abnormal) .... Display of DIAG code

In the event that several DIAG codes are displayed, diagnose the failure one by one starting with smaller number. After one repair (check) has been finished, perform D check to see if the DIAG code has disappeared. If other codes are displayed, proceed to the said failure diagnosis.

■ Method using Select Monitor

<Read memory>

(1) Ignition switch turned OFF. Connection of the Select Monitor
(2) Ignition switch turned ON (engine stopped)
(3) Select Monitor switched ON
(4) Perform operations according to the screen display. Select "CHECK ALL DIAG CODE" or "CHECK DIAG CODE" of individual system and confirm the diagnosis code.

Note

For details of Select Monitor operating procedure, refer to "Separate volume: Select Monitor Handling Procedure".

<D check>

(1) ~ (4): Same procedures as the ones for the method using Check Engine.
(5) Select Monitor switch ON.
(6) Operate according to the screen display. Select "D check of individual system and perform D check.

[6] Function of Select Monitor

■ Outline of function

Select Monitor can be effectively utilized to diagnose a trouble in electronic control systems. It can be used for measuring the items described below.

Data display	Can directly display input/output signal data and determine sensor signal system disconnection, short-circuit and sensor malfunction by comparing the data with standard data ones.
LED display	Allows determination of input/output signal ON/OFF status according to LED ON/OFF condition.
DIAG code display1	Displays the diagnosis codes in the backup memory.
Memory Clear	To delete the diagnosis codes in the backup memory.
D check	D check displays the diagnosis code after performing the procedures of self-diagnosis.

Measure the characteristics of the sensors and actuators by "Data display" function of the Select Monitor, compare them with the standard data, and check the items that constitutes the cause of trouble.

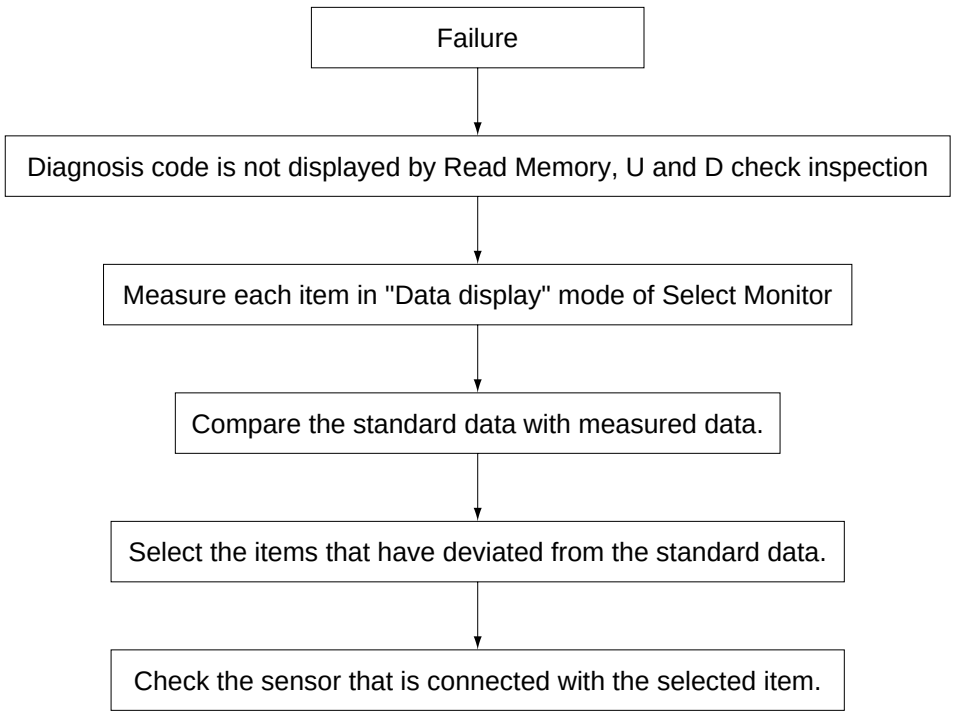
Contents of diagnosis

- Abnormality of characteristics in the sensor or actuator lines

Phenomenon of failure

- Case where the diagnosis code is not displayed by Read memory, U and D check inspection and yet failure has occurred in the present and the past.

Procedure of inspection



● Data display

Input/output signal Item to measure	Contents of display, etc	Remark
Battery voltage	Battery voltage (V) supplied to control unit	
Vehicle speed	Vehicle speed (km/h) which is input to the control unit	
Engine revolution	Engine revolution (rpm) which is input from the crank angle sensor	
Engine water temperature	Coolant water temperature (˚C) which is input from the water temperature sensor	
Ignition timing	displays the angle (deg.) of ignition timing defined by each sensor signal	
Airflow voltage	Voltage (V) which is input from the airflow meter	Not applicable to SOHC vehicles
Throttle voltage	Voltage (V) which is input by the throttle opening sensor	
Fuel injection pulse width	Time (msec) during which current is supplied to the injector	
ISC step	Number of steps (STEP) of the step motor which drives ISC valve	
O_2 sensor	Voltage (v) which is output from the O_2 sensor	
A/F compensation	Air/fuel compensation ratio according to O_2 sensor signal	
Knock compensation	Displays the angle (deg.) of ignition timing compensation based upon the signal input from knock sensor	
CPC duty	Duty control rate (%) of the canister purge control	
Inlet pipe pressure	Inlet pipe pressure (mmHg) which is input from the pressure sensor	Applicable to SOHC vehicles only
		Applicable to SOHC vehicles only
Lean burn proportion	Proportion (%) which makes Air/fuel ratio lean	Applicable to SOHC vehicles only
Gear position	Displays gear position (on AT vehicles, the display is done with gear position + 1)	Applicable to SOHC vehicles only
ALT duty	Duty control rate (%) of Alternator adjustment voltage	Not applicable to SOHC vehicles
AVCS advance angle R	Right bank advance angle (deg.) which is input from AVCS cam angle sensor right	Applicable to DOHC vehicles only
AVCS advance angle L	Left bank advance angle (deg.) which is input from AVCS cam angle sensor left	Applicable to DOHC vehicles only
OCV solenoid duty R	Duty control rate (%) of right bank OCV solenoid	Applicable to DOHC vehicles only
OCV solenoid duty L	Duty control rate (%) of left bank OCV solenoid	Applicable to DOHC vehicles only
OCV electric current R	Electric current (mA) of right bank OCV solenoid	Applicable to DOHC vehicles only
OCV electric current L	Electric current (mA) of Left bank OCV solenoid	Applicable to DOHC vehicles only

Input/output signal Item to measure	Contents of display, etc	Remark
Atmospheric pressure	Atmospheric pressure (mmHg) which is input from pressure sensor	Applicable to turbo vehicles only
Inlet pipe relative pressure	Inlet pipe pressure (mmHg) that is input from pressure sensor	Applicable to turbo vehicles only
Primary supercharge pressure control	Duty control rate (%) of the solenoid which activates the waste gate	Applicable to turbo vehicles only
Secondary supercharge pressure control	Duty control rage (%) of the solenoid which activates the exhaust valve	Applicable to turbo vehicles only
Differential pressure sensor voltage	Voltage (V) which is output from the differential pressure	Applicable to turbo vehicles only
Duel pump duty	Duty proportion (%) of the current that is supplied to the fuel pump controller	Applicable to turbo vehicles only

● LED display

Signal name	Lighting up condition of LED	Remark
Ignition switch	When ignition switch is turned ON	
Test mode terminal	When test mode terminal is connected	
Read memory terminal	When read memory terminal is connected	
Neutral switch	When neutral switch is turned ON	MT vehicles: Position N AT vehicles: position PN
Power steering pressure switch	When power steering	
Air conditioning switch	When air conditioning switch is turned ON	
Air conditioning relay	When air conditioning relay is turned	
Fuel pump relay	When fuel pump is operating	Except turbo vehicles.
Knock signal	When knocking occurs	
Radiator fan relay 1	When radiator fan relay 1 is operating	
Radiator fan relay 2	When radiator fan relay 2 is operating	
AT coordination request signal 1	When torque down is requested	Applicable to AT vehicles
AT coordination request signal 2	When torque down is requested	Applicable to AT vehicles
AT coordination inhibition signal	When the AT coordination is inhibited	Applicable to AT vehicles
O_2 monitor	When O_2 sensor is rich	
AT/MT identification	AT vehicles	
Crank angle signal	When crank angle sensor signal exists	
Cam angle signal	When cam angle sensor signal exists	
Starter switch	When starter switch is turned ON	
Rear defogger switch	When rear defogger switch is turned ON	
Blower fan switch	When blower fan switch is turned ON	
Light switch	When small light switch is turned ON	
Electric load signal	When electric load switch is turned ON (small rear diff., or Blower).	Applicable to SOHC vehicles only
Canister purge output	Blinks when purge is operating	Applicable to SOHC vehicles only

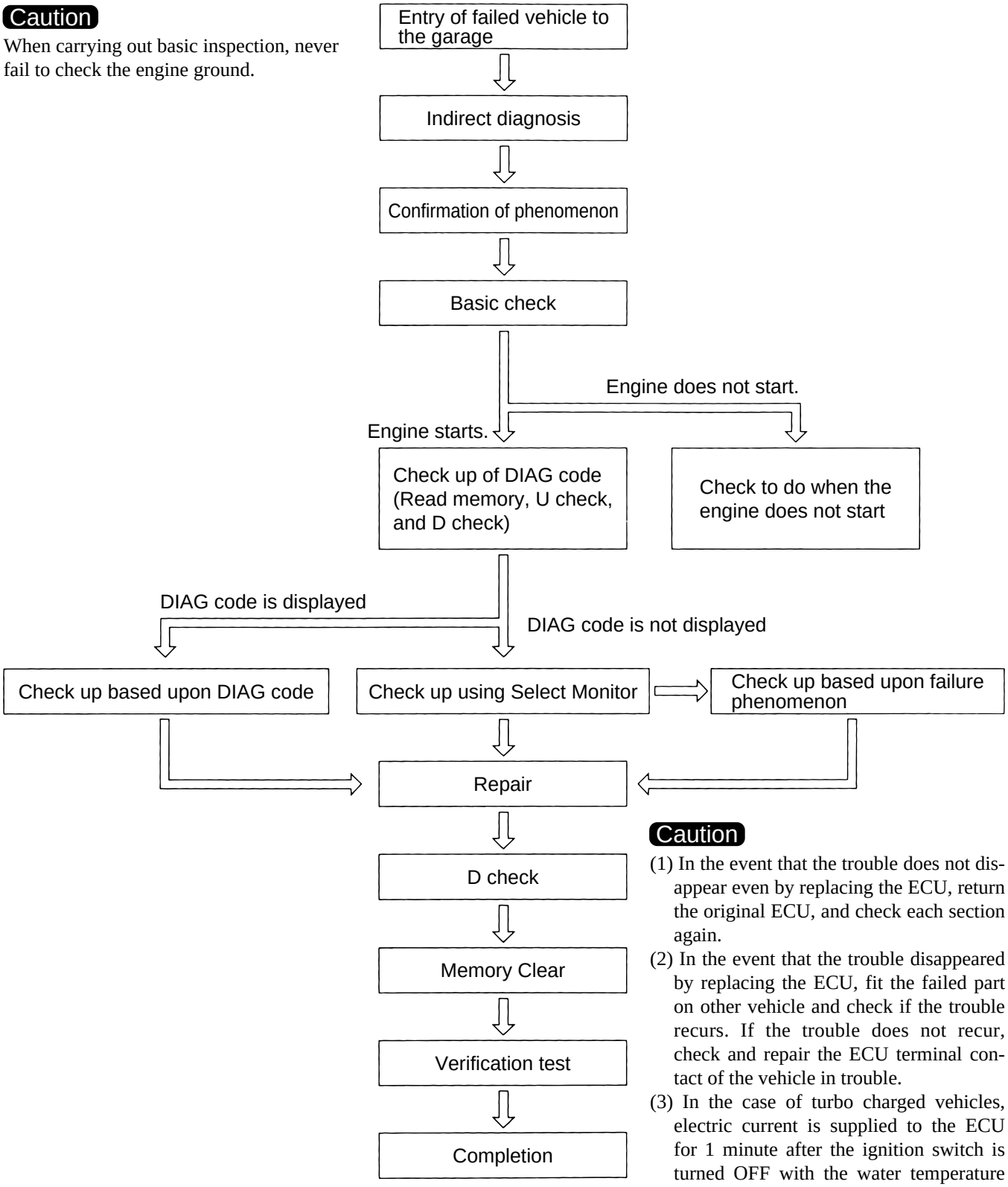
Signal name	Lighting up condition of LED	Remark
Lock up signal	When the AT is locked up	Applicable to SOHC AT vehicles only
Lean burn signal	When lean burn is in operation	Applicable to SOHC AT vehicles only
Rich spike signal	When the rich spike is in operation	Applicable to SOHC AT vehicles
Variable inlet solenoid	When inlet solenoid is turned ON	Applicable to 2 l SOHC vehicles only
Atmospheric pressure change over solenoid	When atmospheric pressure change over solenoid is turned ON	Applicable to turbo vehicles only
Relief valve solenoid 1	When relief valve solenoid is turned ON	Applicable to turbo vehicles only
Relief valve solenoid 2	When relief valve solenoid 2 is turned ON	Applicable to turbo vehicles only
TSC relief valve solenoid	When TSC relief valve solenoid is turned ON	Applicable to turbo vehicles only
Exhaust positive pressure solenoid	When exhaust positive pressure solenoid is turned ON	Applicable to turbo vehicles only
Exhaust negative pressure solenoid	When exhaust negative pressure solenoid is turned ON	Applicable to turbo vehicles only
Inlet valve solenoid	When inlet valve solenoid is turned ON	Applicable to turbo vehicles only
Muffler control	When the muffler is open	Applicable to turbo vehicles only
AET signal	When VDC does not operate	Applicable to turbo vehicles only

2–3 Carrying out failure diagnosis

■ Flow of failure diagnosis

Caution

When carrying out basic inspection, never fail to check the engine ground.



Caution

(1) In the event that the trouble does not disappear even by replacing the ECU, return the original ECU, and check each section again.

(2) In the event that the trouble disappeared by replacing the ECU, fit the failed part on other vehicle and check if the trouble recurs. If the trouble does not recur, check and repair the ECU terminal contact of the vehicle in trouble.

(3) In the case of turbo charged vehicles, electric current is supplied to the ECU for 1 minute after the ignition switch is turned OFF with the water temperature lower than 35 ˚C, detach the ECU connector after having confirmed turning OFF of the ignition relay.

[1] Basic check

■ Check procedure

1. Battec ry voltage and specific gravity
2. Condition of fuses and fusible links
3. Check if each cap is securely tightened.
4. Negative pressure at IN manifold
5. Check of engine ground
6. Check of fuel pressure
7. Check of compression pressure
8. Check the ignition timing

1) Measurement of ignition timing (when using a timing light)
   a Engine warming up
   b Ignition switch turned OFF
   c Connect an alligator clip to the outer casing of the No.1 cylinder spark plug code.
   d Idling, radiator fan stopped and A/C turned OFF.
   e Measurement of ignition timing using the timing light
2) Measurement of ignition timing (using the Select Monitor)
   a Engine warming up
   b Connection of the Select Monitor
   c When the engine is idling, the radiator fan is turned OFF and the A/C is turned OFF
   d Select "Data Display" and measure ignition timing

< Standard Data ignition timing BTDC/rpm >

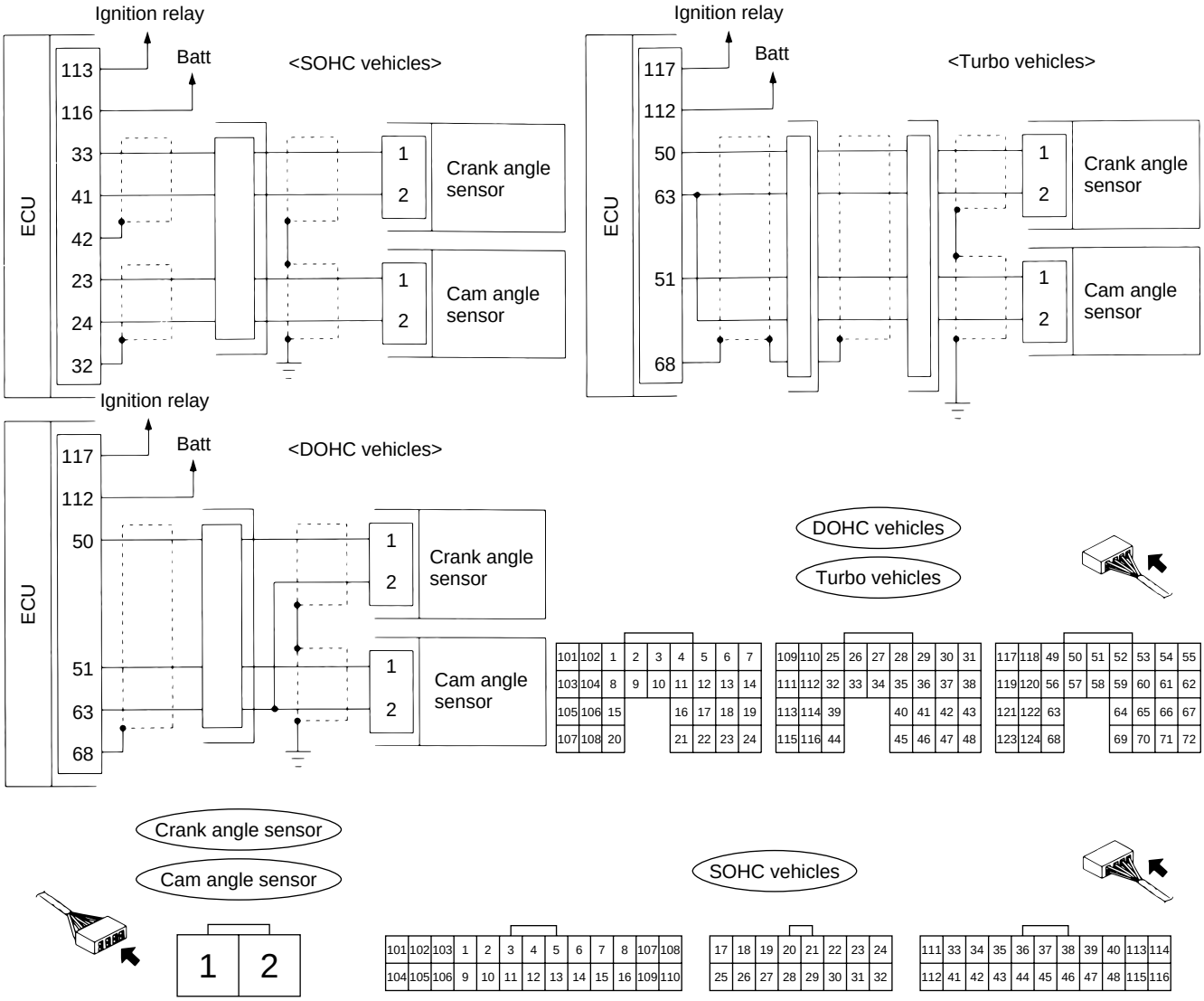
vehicle model / Engine	MT vehicles	AT vehicles
EJ201	10±3/600	10±3/670
EJ204	14±3/650	20±3/670
EJ206	————	14±3/670
EJ208	14±3/750	————
EJ254	15±3/670	15±3/670

[2] Check to do when the engine does not start

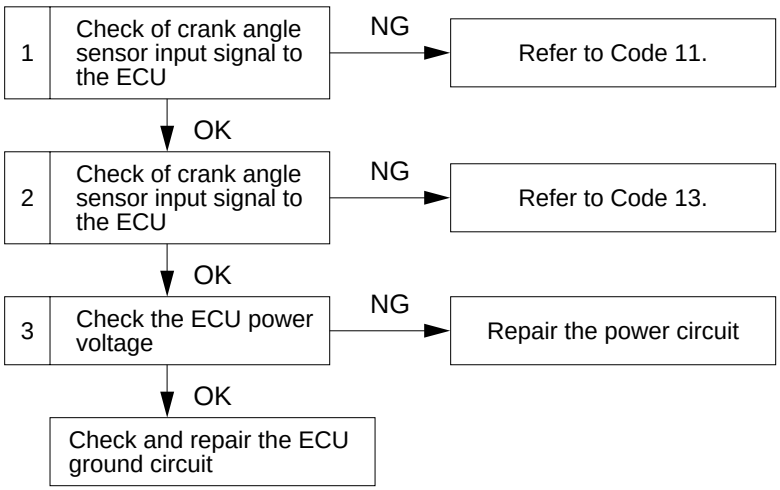
• When cranking is possible but the engine does not start, perform check up according to the following procedure.

1	Check power source line, crank angle sensor and cam angle sensor.
2	Check ignition system
3	Check fuel pump circuit.
4	Check injector circuit
	Measurement of fuel pressure

1. Check of power source line, crank angle sensor and cam angle sensor



• Perform check up according to the flow chart and the procedure on the right page.



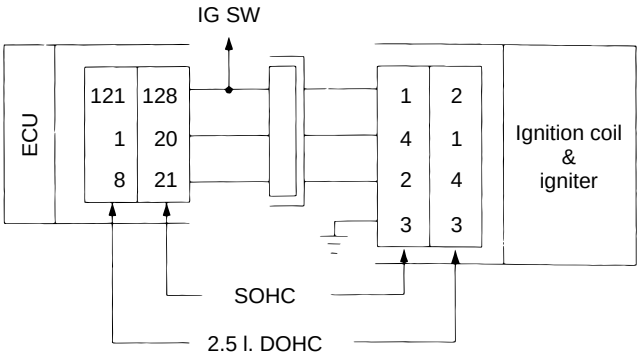
1. Checking the crank angle sensor input signal to the ECU	(1) Separate the ECU connector (2) Connect oscilloscope between the ECU connector terminals and check waveform. SOHC : Terminal (33) and (41) Turbo : Terminal (50) and (63) DOHC : Terminal (50) and (63)

2. Checking the cam angle sensor input signal to the ECU.	(1) Separate the ECU connector (2) Connect oscilloscope between the ECU connector terminals and check waveform. SOHC : Terminal (23) and (24) Turbo : Terminal (51) and (63) DOHC : Terminal (51) and (63)

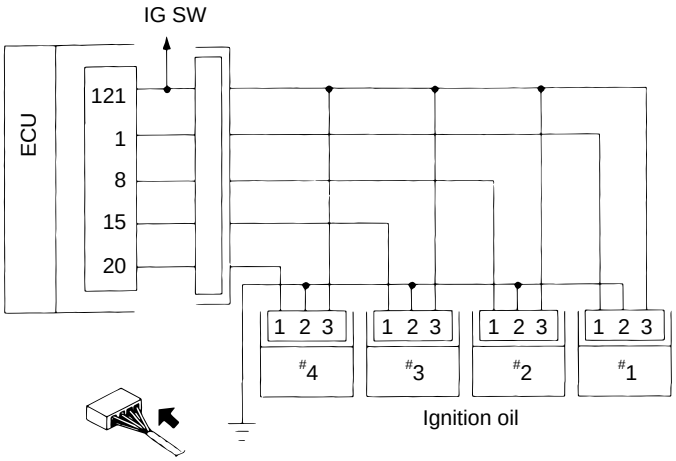
3. Checking the ECU power voltage	(1) Turn ON the ignition switch (2) Measure the voltage between the ECU connector terminal and the ground SOHC : Terminal (113), (116) and the body ground Turbo : Terminal (117), (112) and the body ground DOHC : Terminal (117), (112) and the body ground

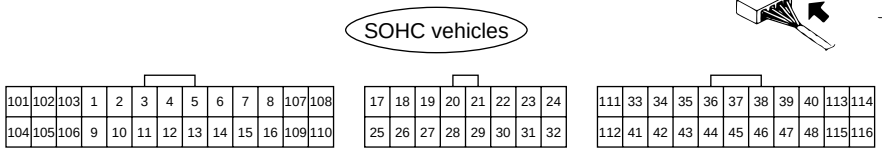
2. Check of ignition system

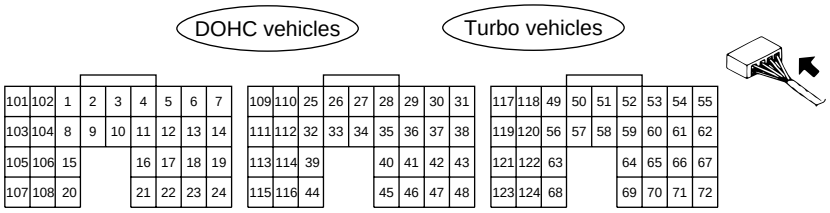
<2 l SOHC, 2.5 l DOHC vehicles>

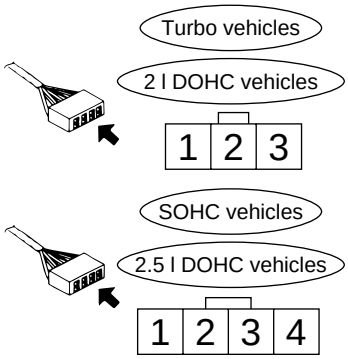


<2 l turbo, 2 l DOHC vehicles>

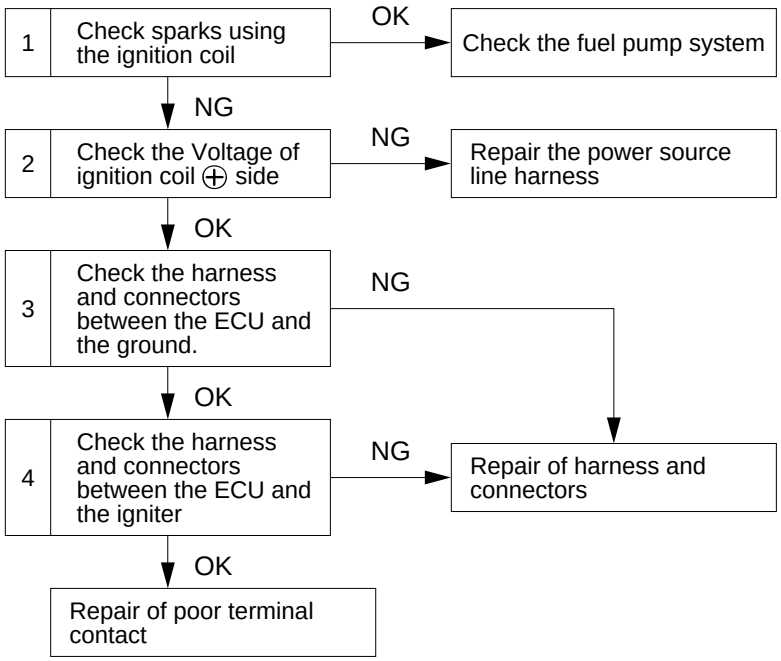








• Perform check up according to the flow chart and the procedure on the right page.



1. Spark check using ignition coil	• 2 l SOHC and 2.5 l DOHC vehicles (1) Remove plug code from each spark plug. (2) Separate injector connector (of all 4 cylinders) (3) Mount another plug on the plug cap. (4) Leave the original plug mounted on the engine and ground threaded section of the plug to the engine. (5) Crank the engine and check if good spark is obtained at each cylinder. • 2 l turbo, 2 l DOHC NA vehicles (1) Prepare single spark plug and ignition coil. (2) Separate injector connector (of all 4 cylinders) (3) Separate the injector connector and connect it to the single ignition coil. (4) Fit the plug on the ignition coil and ground the threaded portion of the plug to the engine. (5) Crank the engine and check if good spark is obtained at each cylinder.

2. Voltage check of Ignition coil ⊕ side	• NA vehicles, turbo vehicles (1) Separate ignition coil connector. (2) Turn ON the ignition switch. (3) Measure the voltage between the connector terminal and the ground SOHC, turbo, 2 l DOHC : Terminal (1) and the body ground 2.5 l DOHC : Terminal (2) and the body ground Standard Data: Battery voltage

3. Check of harness and connectors between the ECU and the Ground.	(1) Separate the ECU connector (2) Measure the resistance between the ECU connector terminal and the ground. 2 l SOHC vehicles : Terminal (111) and the body ground 2 l DOHC vehicles : Terminal (104) and the body ground 2 l turbo vehicles : Terminal (104) and the body ground 2.5 l DOHC vehicles : Terminal (104) and the body ground Standard Data: 0 Ω

4. Check of harness and connectors between the ECU and the igniter or the ignition coil

• NA vehicles and turbo vehicles

(1) Separate the ECU connector, ignition coil connector and the igniter connector

(2) Check if they are open.Measure the resistance between the following connector terminals.

SOHC vehicles

ECU terminal ~ Ignition coil & Igniter terminal

Terminal (20) and (4)

Terminal (21) and (2)

2.5 l DOHC vehicles

ECU terminal~ Ignition coil & Igniter terminal

Terminal (1) and (20)

Terminal (8) and (4)

Turbo, 2 l DOHC vehicles

ECU terminal ~ Ignition coil terminal

Terminal (1) and (1)

Terminal (8) and (1)

Terminal (15) and (1)

Terminal (20) and (1)

Standard Data	0 Ω

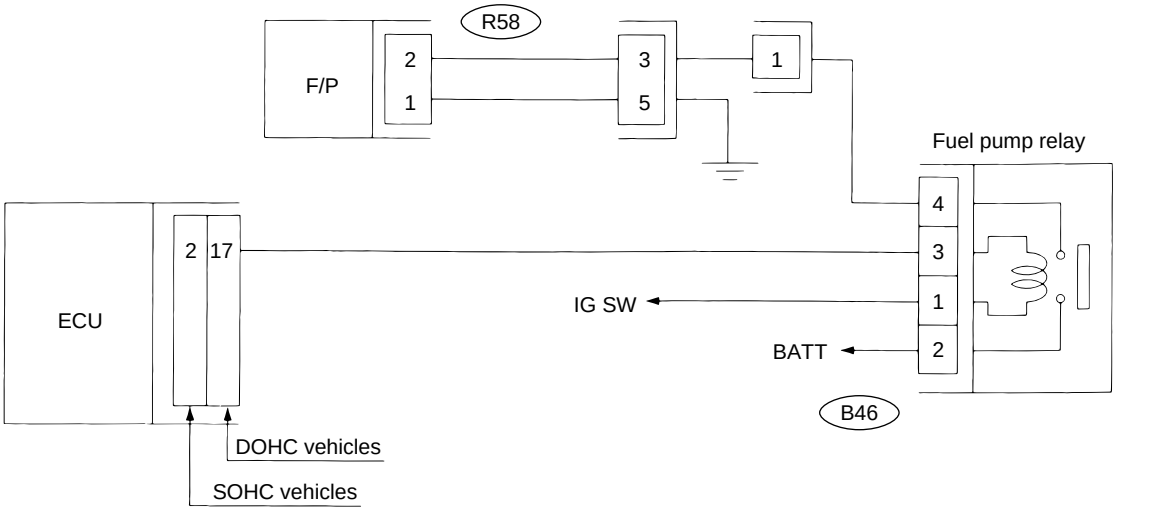
(3) Check the short circuit

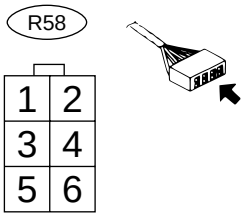
Measure resistance between the ECU terminal for which open check has been conducted, igniter terminal, ignition coil terminal and the ground.

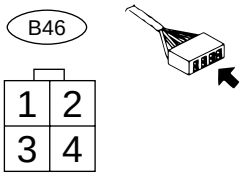
Standard Data	More than 1 MΩ

MEMO

3. Carrying out failure diagnosis







• Perform check up according to the flow chart and the procedure on the right page.

1	Check fuel pump operating noise. (D check mode)	OK	Check the fuel pump system
		NG	
2	Check operating noise of the fuel pump	OK	to 6
		NG	
3	Fuel pump relay only	NG	Replace the fuel pump relay
		OK	
4	Fuel pump supply noise	NG	Repair the power source line harness
		OK	
5	Check ECU output signal	NG	Faulty ECU ground, faulty ECU terminal contact, repair harness and connector between the ECU and the fuel pump relay
		OK	
6	Check fuel pump supply voltage.	NG	Repair the harness and the connector between the fuel pump relay and fuel pump
		OK	
7	Check the fuel pump only	NG	Replace the fuel pump
		OK	
	Repair the fuel pump ground circuit.		

1. Checking the fuel pump operating noise (D check mode)

(1) Connect D check connector and turn On the ignition switch.
(2) Check operating noise of the fuel pump.

Standard Data	Operating noise can be heard.

2. Checking the of fuel pump relay operating noise

(1) Connect D check connector and turn ON the ignition switch.
(2) Check operating noise of the fuel pump relay.

Standard Data	Operating noise can be heard at each two seconds.

3. Checking the fuel pump relay only

(1) Separate the fuel-pump relay connector, and remove the relay only.
(2) Measure the resistance between the relay terminal (1) and (3)

Standard Data	Approx. 90 Ω

(3) Connect a battery to the fuel pump relay terminals, check the functioning of the relay and measure the resistance between the contact points.

Battery connecting terminals — Terminal (1) and (3)
Terminals to measure resistance — Terminal (2) and (4)

Standard Data	The resistance of both the terminals 0 Ω (during the fuel pump os actuating.)

4. Checking the supply voltage to the fuel pump relay

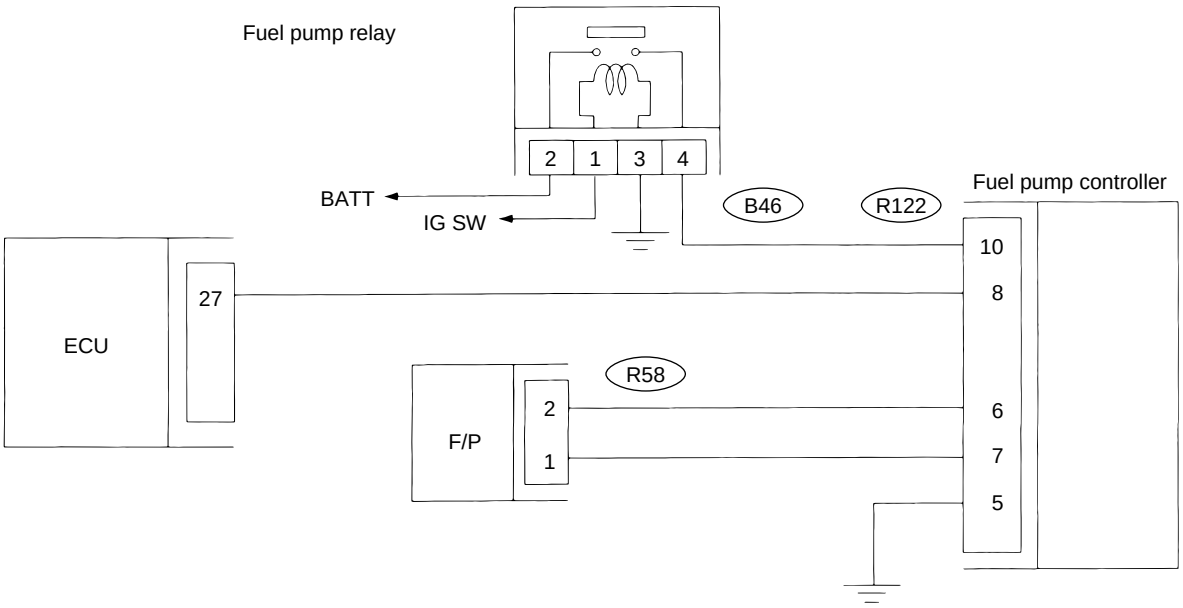
(1) Separate the fuel pump relay connector
(2) Turn ON the ignition switch.
(3) Measure both the resistances between the fuel pump connector terminal (2) or (1) and the ground.

Standard Data	Voltage of the battery

5. Checking the ECU output signal	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU terminal and the ground. SOHC : Terminal (2) and the body ground DOHC : Terminal (17) and the body ground Standard Data: Voltage of the battery (3) Measure the voltage of the fuel pump connector terminal when cranking the engine. Standard Data: 0 V
6. Checking the supply voltage to the fuel pump	(1) Separate the fuel pump connector. (2) Measure the voltage of the connector terminal and the body ground when cranking the engine. Connector terminal (2) and the body ground Standard Data: Voltage of the battery
7. Checking the fuel pump only	(1) Separate the fuel pump connector. (2) Prepare the battery and apply 12 V directly to the fuel pump to operate it. Standard Data: Operating noise can be heard

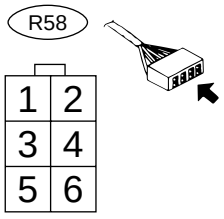
MEMO

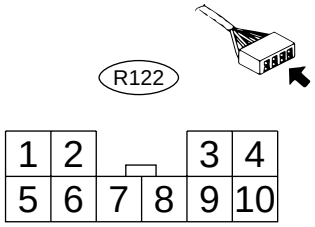
3. Check up of fuel pump circuit (turbo vehicles)

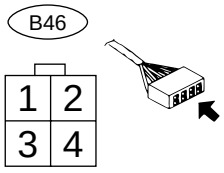


• Perform check up according to the flow chart and the procedure shown on the right page.

1	Check fuel pump operating noise. (D check mode)	OK	Check injector circuit
		NG	
2	Fuel pump only	NG	Replace the fuel pump relay
		OK	
3	Supply voltage to the fuel pump relay	NG	Repair power supply line harness.
		OK	
4	Check supply voltage to fuel pump controller.	NG	Repair the harness and the connector between the fuel pump relay and the controller.
		OK	
5	Check input signal to fuel pump controller	NG	Repair the harness and the controller between the ECU and the fuel pump controller
		OK	
6	Check supply voltage to the fuel pump.	NG	Repair the harness and the connector between the fuel pump controller and the fuel pump.
		OK	
7	Check the fuel pump only.	NG	Replace the fuel pump
		OK	
	Repair the fuel pump ground circuit		







1. Checking the fuel pump operating noise (D check)

(1) Connect D check connector and turn ON the ignition switch.
(2) Check operating noise of the fuel pump.

Standard Data	Operating noise must be heard periodically.

2. Checking the fuel pump relay only

(1) Separate the fuel and pump connector and dismount the relay only.
(2) Measure the resistance between the relay terminals (1) and (3).

Standard Data	Approx. 90 Ω

(3) Connect a battery to the fuel pump relay terminals, check the functioning of the relay and measure the resistance between the contact points.

Battery connecting terminals — Terminal (1) and (3)
Resistance measuring terminal — Terminal (2) and (4)

Standard Data	The resistance of both the terminals 0 Ω (during the fuel pump is actuating.)

3. Checking the fuel pump relay supply voltage

(1) Separate the fuel pump relay connector.
(2) Turn ON the ignition switch.
(3) Measure both the resistances between the fuel pump relay connector terminal (1) or (2) and the body ground.

Standard Data	Voltage of battery

4. Checking the fuel pump controller supply voltage

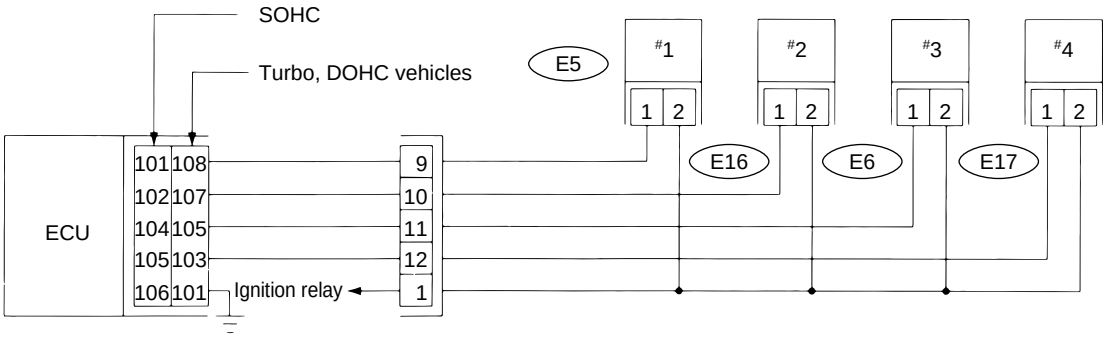
(1) Separate the fuel pump controller connector.
(2) Measure voltage both the terminal (10) of the fuel-pump controller connector and the ground, while cranking the engine.
(10) and the body ground

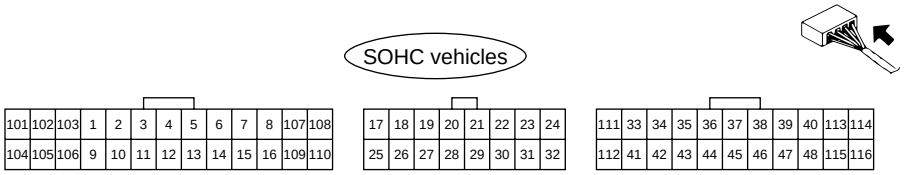
Standard Data	Voltage of the battery

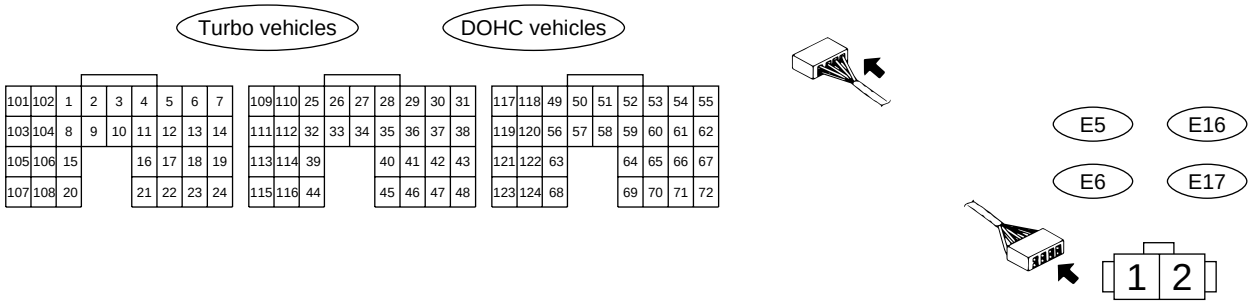
5. Checking the input signal to fuel pump controller.	(1) Turn ON the ignition switch. (2) Measure the voltage between the connector terminal (8) of the fuel pump controller and the ground. (8) and the body ground Standard Data: 5 V (3) Measure the voltage of the same terminals while cranking the engine. Standard Data: 0 V
6. Checking the supply voltage to the fuel pump	(1) Separate the fuel pump connector. (2) Measure the voltage between the terminals (1) of the fuel pump connector and the round, while cranking the engine. Terminal (1) and the body ground Standard Data: Voltage of the battery
7. Checking the fuel pump only	(1) Separate the fuel pump connector. (2) Prepare a battery and directly apply 12 V to the fuel pump to operate it. Standard Data: Operating noise must be heard.

MEMO

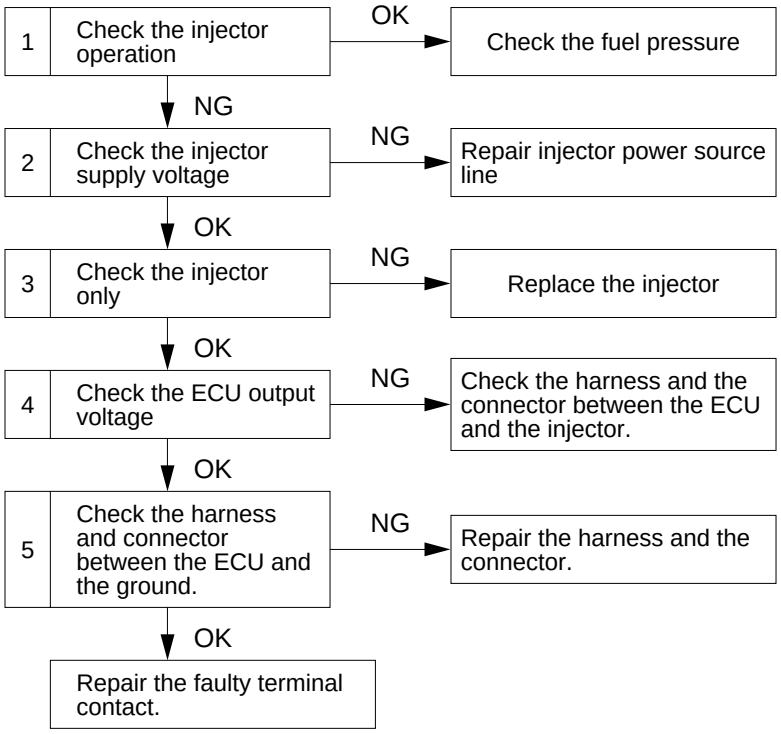
4. Check up of injector circuit







• Perform check up according to the flow chart and the procedure on the right page.



1. Checking the injector operation

(1) Connect the terminals of the oscilloscope with the ECU terminal and the cylinder block ground.
SOHC : Terminal (101), (102), (104), (105) and Cylinder-block
Turbo, DOHC : Terminal (108), (107), (105), (103) and Cylinder-block.
(2) Check each injector while cranking the engine.
(3) Apply a sound scope or a driver to the injector to hear an operating noise.

Standard Data	Clicking operating noise must be heard

2. Checking the injector supply voltage

(1) Separate the injector connector.
(2) Measure the voltage between the connector terminal (2) of each injector and the body

Standard Data	Voltage of the battery

3. Checking the injector only

(1) Separate the injector connector.
(2) Measure the resistance between the injector terminals (1) and (2)

Standard Data	11 to 12 Ω

4. Checking the ECU output voltage

(1) Connect the injector connector.
(2) Measure the voltage between the ECU terminal and the body.
SOHC : Terminal (101), (102), (104), (105) and the body ground
Turbo, DOHC : Terminal (108), (107), (105), (103) and the body ground

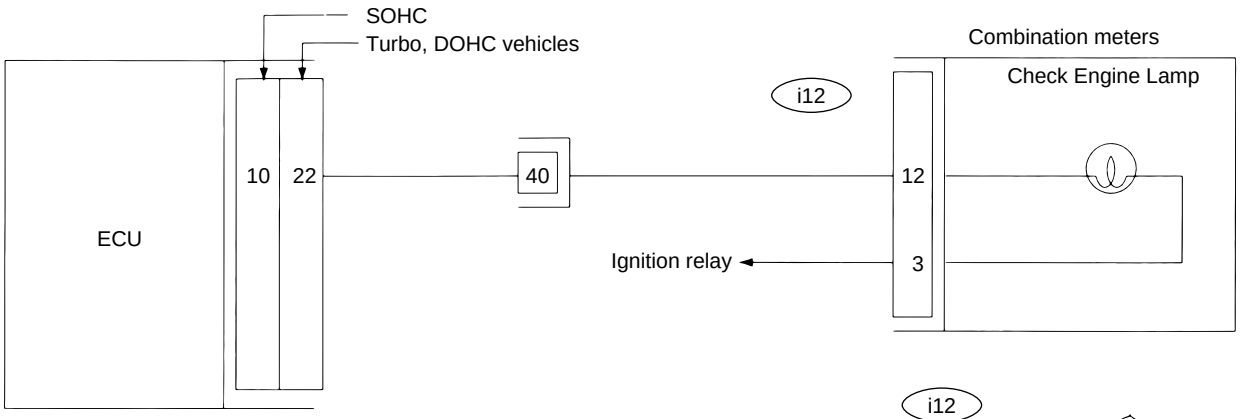
Standard Data	Voltage of the battery

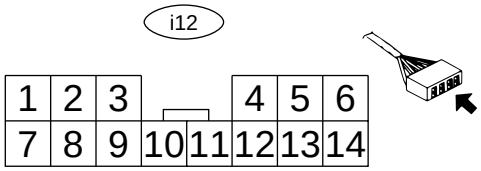
5. Checking the harness and connector between the ECU and the ground

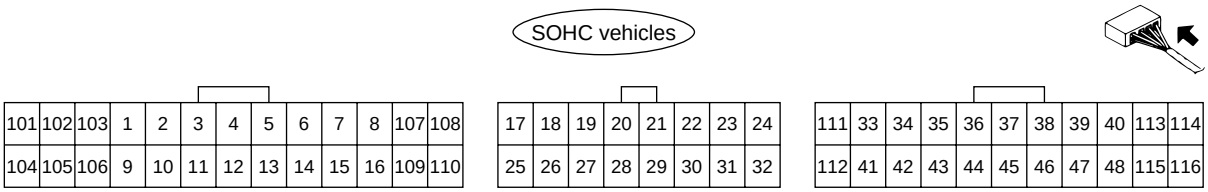
(1) Separate the ECU connector.
(2) Measure the resistance between the ECU connector terminal and the body.
SOHC : Terminal (106) and the body ground
Turbo, DOHC : Terminal (101) and the body ground

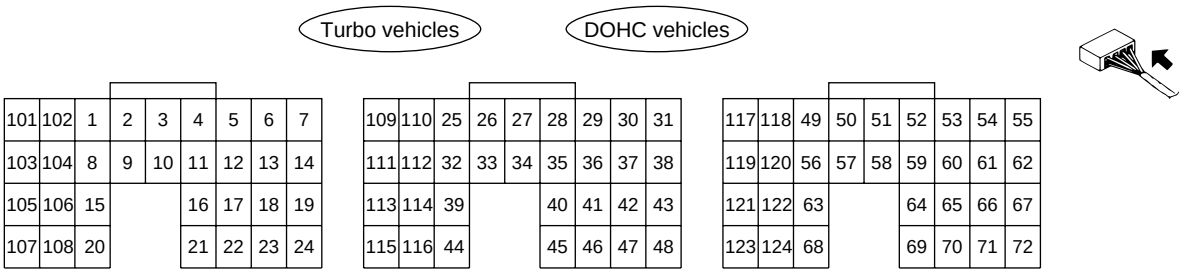
Standard Data	0 Ω

[3] Check to do when the Check Engine Lamp does not turn ON.

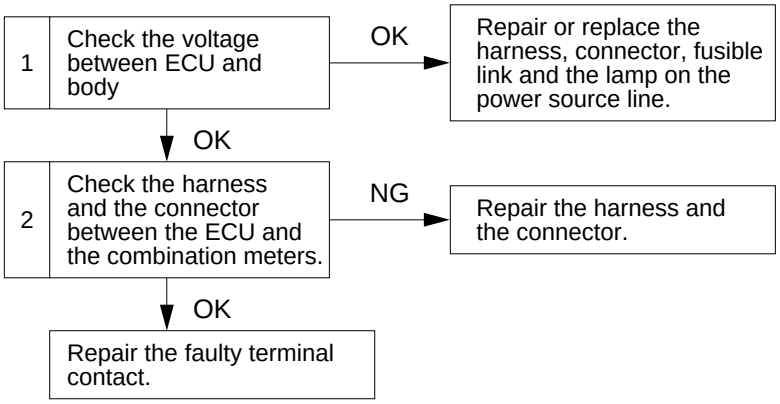








• Perform check up according to the flow chart and the procedure in the right page



1. Check the voltage between the ECU and the body	(1) Separate the ECU connector. (2) Turn ON the ignition switch. (3) Measure the voltage between the ECU connector terminal (10) or (22) and the body. Standard Data: Voltage of the battery

2. Checking the harness and the connector between the ECU and the combination meters	(1) Separate the ECU connector. (2) Separate the connector of the combination meters (3) Measure the resistance between the ECU connector terminal and the connector terminal of the combination meters. SOHC : Terminal (10) and (12) Turbo, DOHC : Terminal (22) and (12) Standard Data: 0 Ω

MEMO

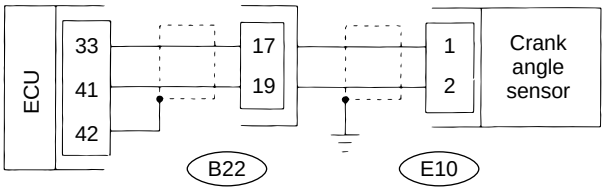
[4] Check up based on the DIAG codes

■ List of DIAG codes

Code	Item to diagnose	Failure phenomenon	2 l			2.5 l
			SOHC	Turbo	DOHC	
11	Crank angle sensor	Engine stall and difficulty to restart	○	○	○	○
12	Starter switch	Faulty engine starting	—	○	○	○
13	Cam angle sensor	Engine stall and difficulty to restart	○	○	○	○
21	Water temperature sensor	Malfunctioning in idling, faulty drivability and difficulty to start	○	○	○	○
22	Knock sensor	Faulty acceleration	○	○	○	○
23	Airflow sensor	Malfunctioning in idling, poor drivability	—	○	○	○
	Pressure sensor	Malfunctioning in idling, poor drivability	○	—	—	—
24	ISC valve	Malfunctioning in idling, hunting of engine revolution, engine stall	○	○	○	○
26	Inlet temperature sensor	Malfunctioning in idling, engine stall	○	—	—	—
31	Throttle sensor	Malfunctioning in idling, engine stall	○	○	○	○
32	O_2 sensor	Malfunctioning in idling, poor drivability	○	○	○	○
33	Vehicle speed sensor	Malfunctioning in idling, poor drivability, engine stall	○	○	○	○
35	Canister purge solenoid	Malfunctioning in idling	○	—	—	—
38	AT coordination control	Gearshift shock	○	○	○	○
44	Supercharge pressure SOL	Poor acceleration	—	○	—	—
45	Absolute pressure sensor Atmospheric pressure change over solenoid	Poor acceleration	—	○	—	—
51	Neutral switch	Malfunction in idling	○	○	○	○
54	Abnormality in inlet line	Rise of idling revolution	○	—	—	—
61	Inlet control solenoid	Poor acceleration	—	○	—	—
62	Exhaust control solenoid (negative pressure)	Poor acceleration	—	○	—	—
63	Relief solenoid 1	Poor acceleration	—	○	—	—
64	Relief solenoid 2	Poor acceleration	—	○	—	—
65	Differential pressure sensor	Poor acceleration	—	○	—	—
66	Twin and turbo system	Poor acceleration, involuntary fuel cut	—	○	—	—
67	Exhaust control solenoid (positive pressure)	Poor acceleration	—	○	—	—
68	Exhaust valve duty solenoid	Poor acceleration	—	○	—	—
85	Charging line	Poor acceleration	○	○	○	○
87	Variable inlet solenoid	Poor drivability	—	—	○	—
89	AVCS system	Poor drivability	—	—	○	○
91	TCS relief valve solenoid	Poor drivability	—	○	—	—

Code 11 Crank angle sensor line

<SOHC vehicles>



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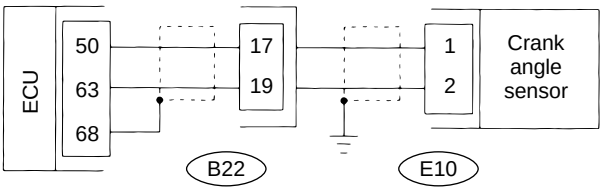
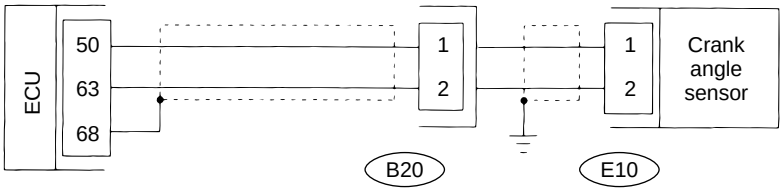
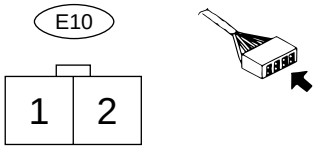
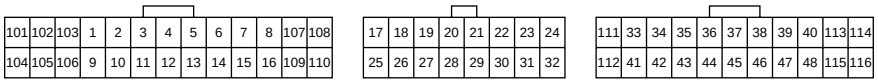


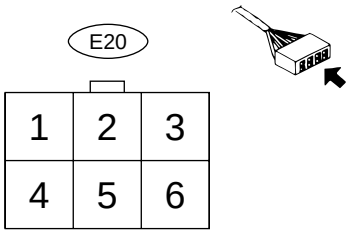
<Turbo vehicles>



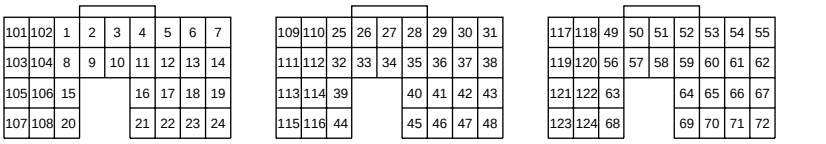


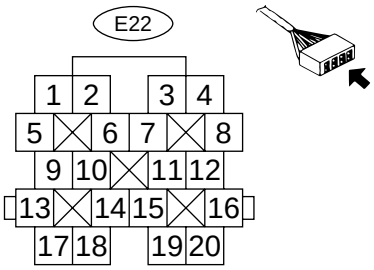
SOHC vehicles



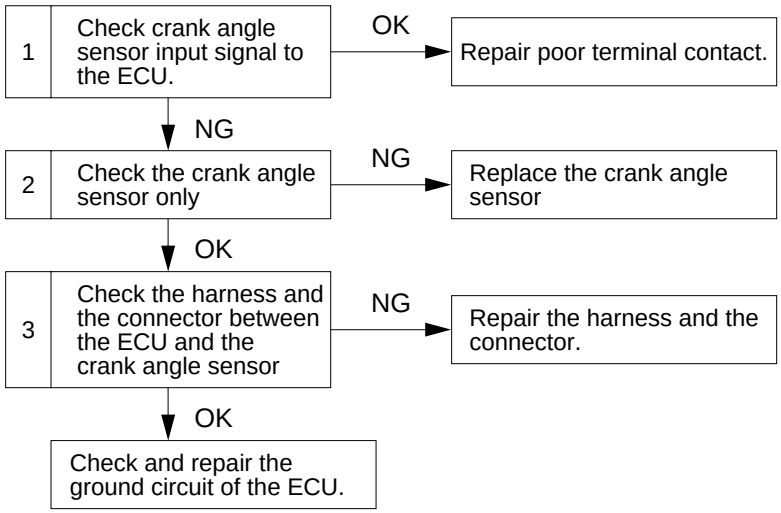


DOHC vehicles Turbo vehicles





• Perform check up according to the flow chart and the procedure in the right of the page



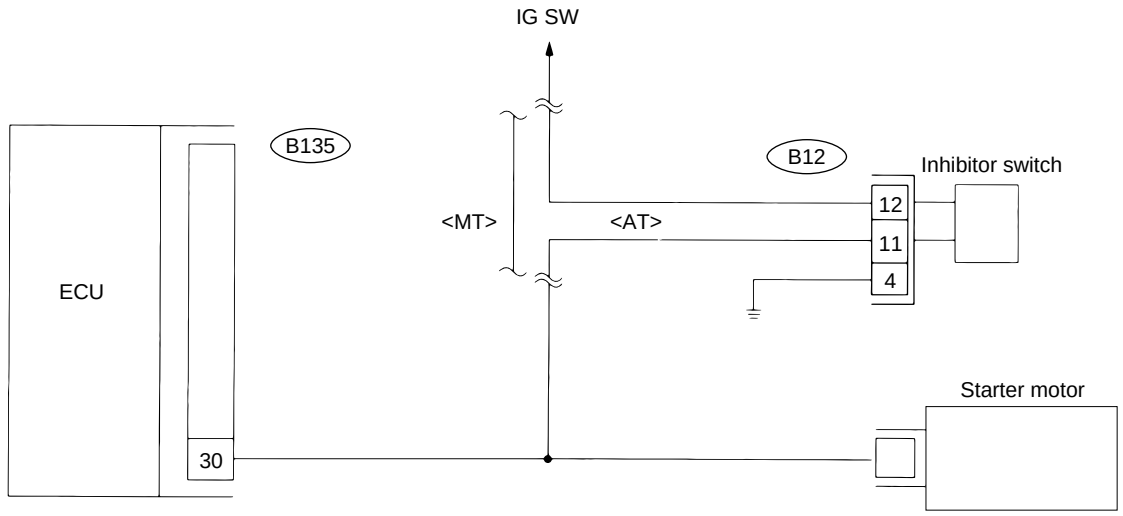
1. Checking the crank angle sensor input signal to the ECU	(1) Separate the ECU connector. (2) Connect a probe of oscilloscope between the ECU connector terminals. SOHC : Terminal (33) and (41) Turbo, DOHC : Terminal (50) and (63)

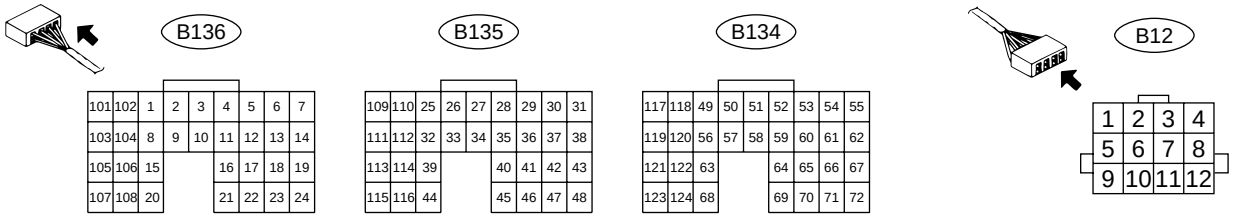
2. Checking the crank angle sensor only	(1) Separate the connector of crank angle sensor. (2) Connect the probes of oscilloscope with both the terminals (1) and (2) of the crank angle sensor. (3) Check the waveform of the crank angle sensor while cranking the engine. (4) Measure the resistance of both the terminals (1) and (2) of the crank angle sensor. Standard Data: 2040 ± 200 Ω

3. Checking the harness and connector between the ECU and the crank angle sensor	(1) Separate the crank angle sensor, engine and body coupling position and each connector of the ECU. (2) Measure the resistance between the terminal of the ECU and the terminal of the crank angle sensor connector (to check the circuit open). SOHC : Terminal (33) and (17), Terminal (17) and (1) Terminal (41) and (19), Terminal (19) and (2) DOHC : Terminal (50) and (17), Terminal (17) and (1) Terminal (63) and (19), Terminal (19) and (2) Turbo : Terminal (50) and (1), Terminal (1) and (1) Terminal (63) and (15), Terminal (12) and (2), Terminal (2) and (2) Standard Data: 0 Ω (3) Measure the resistance between the following connector terminals (to check short circuit) SOHC : Terminal (33) or (41) and the body ground Turbo, DOHC : Terminal (50) or (63) and the body ground Standard Data: More than 1 MΩ (4) Connect all the connectors. (5) Measure the resistance between the ECU connector terminal and the ground. SOHC : Terminal (42) and the body ground Turbo, DOHC : Terminal (68) and the body ground Standard Data: 0 Ω

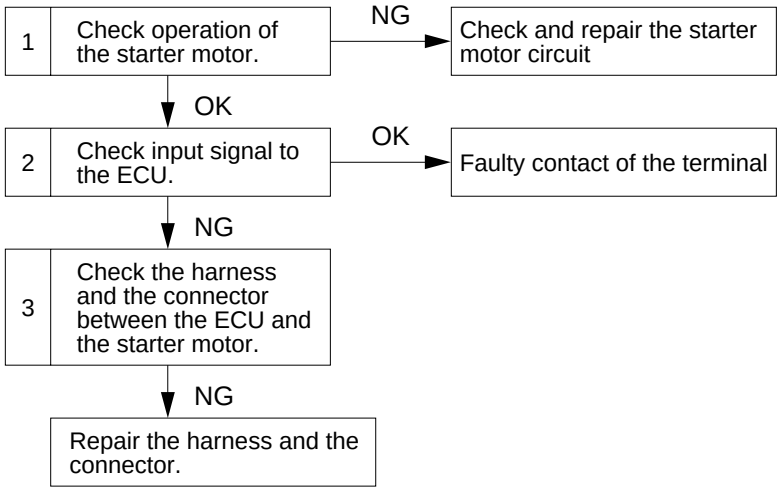
Code 12 Starter switch line

<Turbo, DOHC vehicles>





• Perform check up according to the flow chart and the procedure in the right of the page



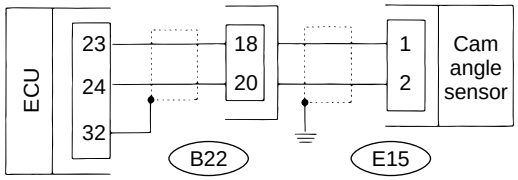
1. Confirmation of starter motor operation	• Check the operation by the Ignition switch (start).

2. Checking the input signal to the ECU	• Measure the voltage between the ECU terminal (30) and the body. Standard Data: 9 ~ 12V

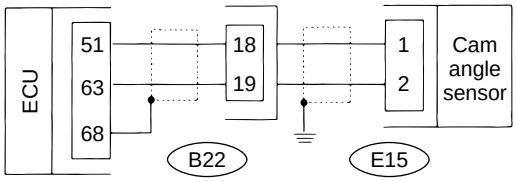
3. Checking the harness and connector between the ECU and the starter motor	(1) Separate the ECU, starter motor and the connector. (2) Check circuit open • Measure the voltage both the terminal (30) of the ECU connector, and terminal of the starter motor connector Standard Data: 0 Ω (3) Check short circuit. • Measure the resistance of the terminal (30) of the ECU connector or the starter motor connector and the body ground. Standard Data: More than 1 MΩ

Code 13 Cam angle sensor line

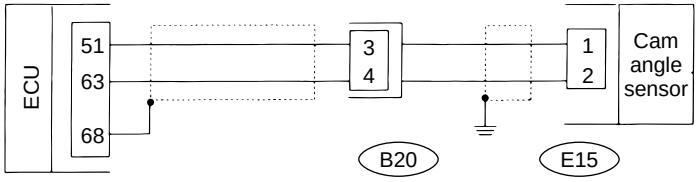
<SOHC vehicles>

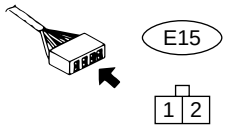


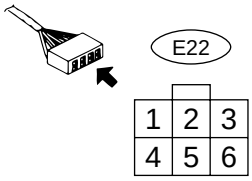
<DOHC vehicles>



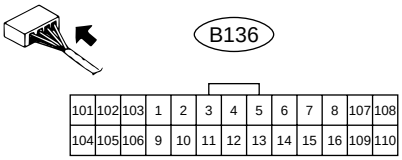
<Turbo vehicles>



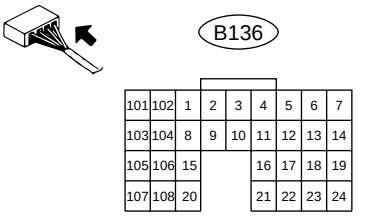


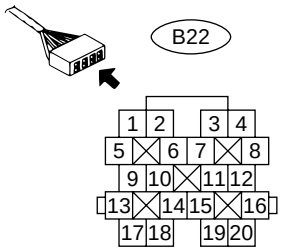


<SOHC vehicles>

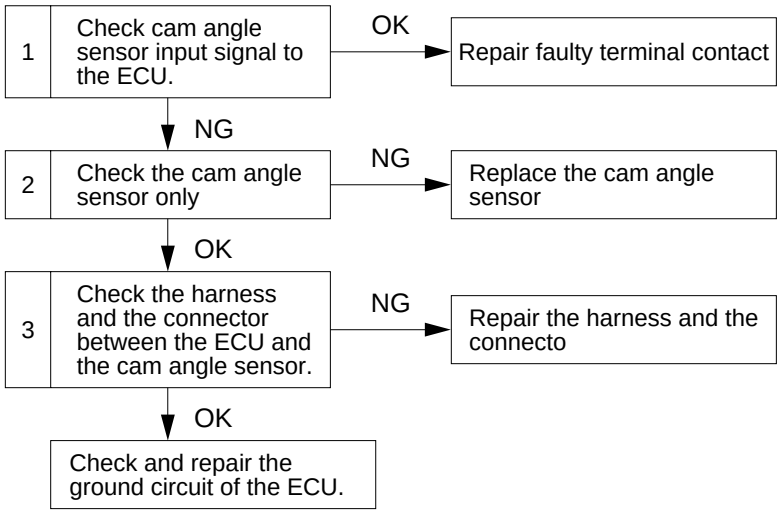


<DOHC, turbo vehicles>





• Perform check up according to the flow chart and the procedure on the right page.



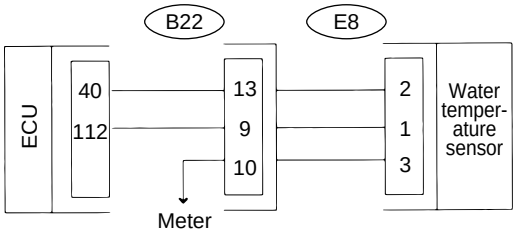
1. Checking the cam angle sensor input signal	(1) Separate the ECU connector. (2) Connect an oscilloscope between the ECU terminals and check the waveform. SOHC : Terminal (23) and (24) Turbo, DOHC : Terminal (51) and (63)

2. Checking the cam angle sensor only	(1) Separate the cam angle sensor connector. (2) Connect oscilloscope probes with the terminals (1) and (2) of the cam angle sensor. (3) Check the waveform of the cam angle sensor while craning the engine. (4) Measure the resistance of both terminals (1) and (2) of the cam angle sensor. Standard Data: 2040 ± 200 Ω

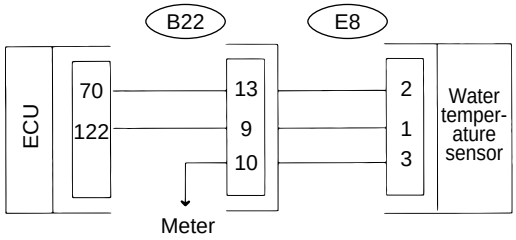
3. Checking the harness and connector between the ECU and the cam angle sensor	(1) Separate the connectors of the cam angle sensor, engine and body coupling position, and each connector of the ECU. (2) Measure the resistance between the terminals of the ECU and the cam angle connector. SOHC : Terminal (23) and (18), Terminal (18) and (1) Terminal (24) and (20), Terminal (20) and (2) DOHC : Terminal (51) and (18), Terminal (18) and (1) Terminal (63) and (19), Terminal (19) and (2) Turbo : Terminal (51) and (3), Terminal (3) and (10) Terminal (63) and (15), Terminal (13) and (6), Terminal (6) and (2) Standard Data: 0 Ω (3) Measure the resistance between the following terminals (to check short circuit) SOHC : Terminal (23) or (24) and the body ground Turbo, DOHC : Terminal (51) or (63) and the body ground Standard Data: More than 1 MΩ (4) Connect all the connectors. (5) Measure the resistance between the ECU connector terminal and the ground. SOHC : Terminal (32) and the body ground Turbo, DOHC : Terminal (68) and the body ground Standard Data: 0 Ω

Code 21 WATER TEMPERATURE SENSOR LINE

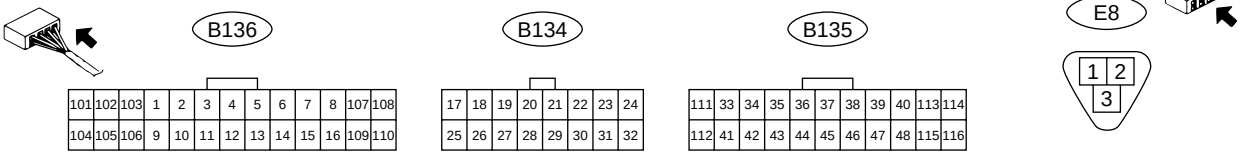
<SOHC vehicles>



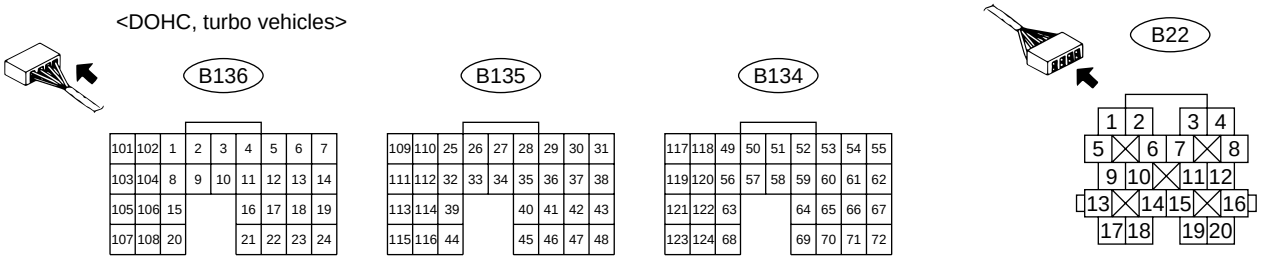
<DOHC vehicles>



<SOHC vehicles>



<DOHC, turbo vehicles>



• Perform check up according to the flow chart and the procedure on the right page.

1	Check operation of water temperature sensor (when being cooled)	NG	To 3
	OK		
2	Check operation of water temperature (in warming up)	NG	To 3
	OK		
3	Check harness and connector between the ECU and the water temperature sensor	NG	Check the harness and the connector.
	OK		
4	Check water temper-ature sensor only	NG	Replace the water temperature sensor
	OK		
	Pay attention to faulty terminal contact.		

1. Checking the water temperature sensor operation (in cold)

(1) With engine in cold, check the water temperature using the Select Monitor.

Standard Data	Water temperature in cold must be displayed.

2. Checking the water temperature sensor operation (in warming up)

(1) Warm up the engine until the pointer of the water temperature gauge comes almost to the center.
(2) With the engine in revolution, check the water temperature by means of the Select Monitor.

Standard Data	80 ~ 100˚C

3. Checking the harness and connector between ECU and water temperature sensor

(1) Turn OFF the ignition switch.
(2) Separate the ECU connector and the water temperature connector.
(3) Check the resistance between the terminals of the ECU connector and the water temperature connector.
- Checking the open circuit

SOHC : Terminal (40) and (13), Terminal (13) and (2),
Terminal (112) and (9), Terminal (9) and (1)
Turbo, DOHC : Terminal (70) and (13), Terminal (13) and (2),
Terminal (122) and (9), Terminal (9) and (1)

Standard Data	0 Ω

- Checking the short circuit

SOHC : Terminal (40) and the body ground
Turbo, DOHC : Terminal (70) and the body ground

Standard Data	More than 1 MΩ

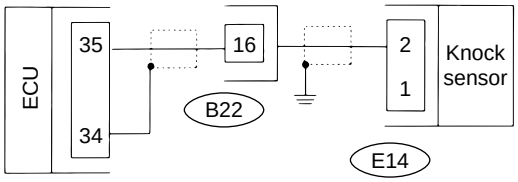
4. Checking the water temperature sensor only

(1) Dismount the main unit of water temperature sensor from the engine.
(2) Measure the resistance by submerging the heat sensible portion of the water temperature sensor in water or hot water.

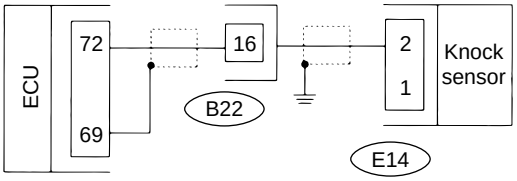
	Temperature ˚C	Resistance (KΩ)
Standard Data	20	2.1 ~ 2.9
	50	0.68 ~ 1.0
	90	0.236 ~ 0.26

Code 22 KNOCK SENSOR LINE

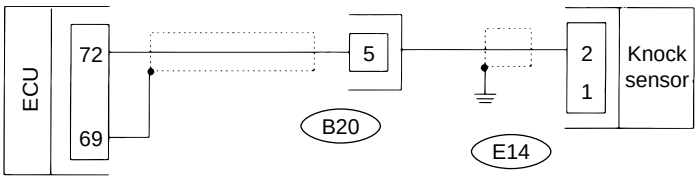
<SOHC vehicles>

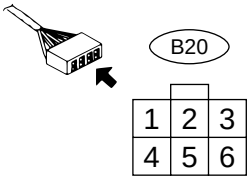


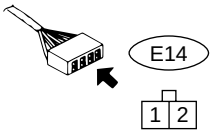
<DOHC vehicles>



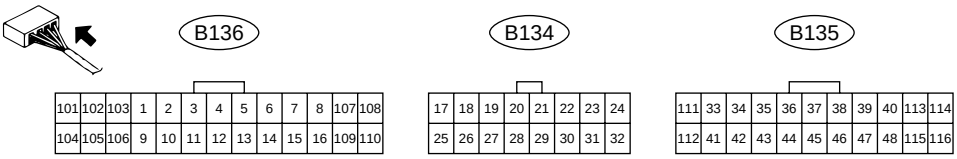
<SOHC vehicles>

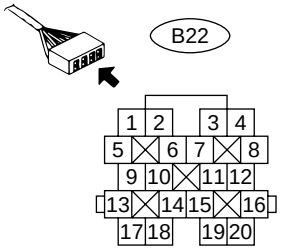




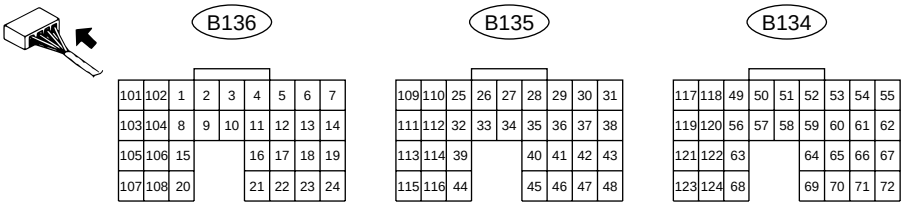


<SOHC vehicles>

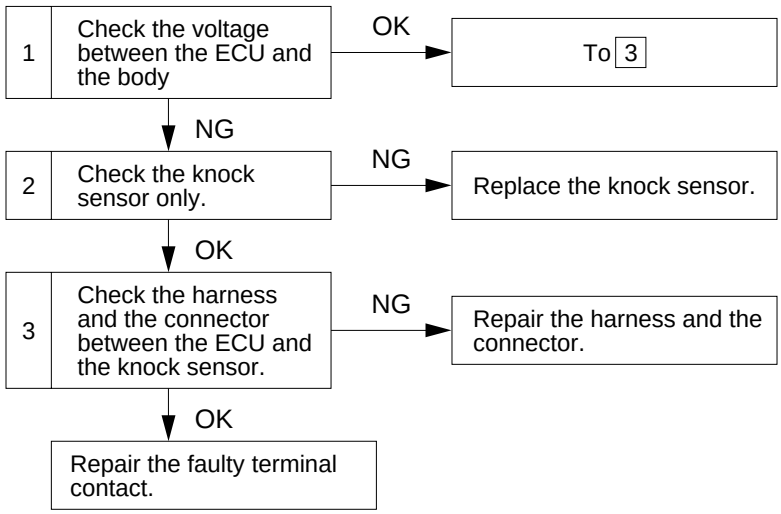




<DOHC, turbo vehicles>



• Perform check up according to the flow chart and the procedure on the right page.

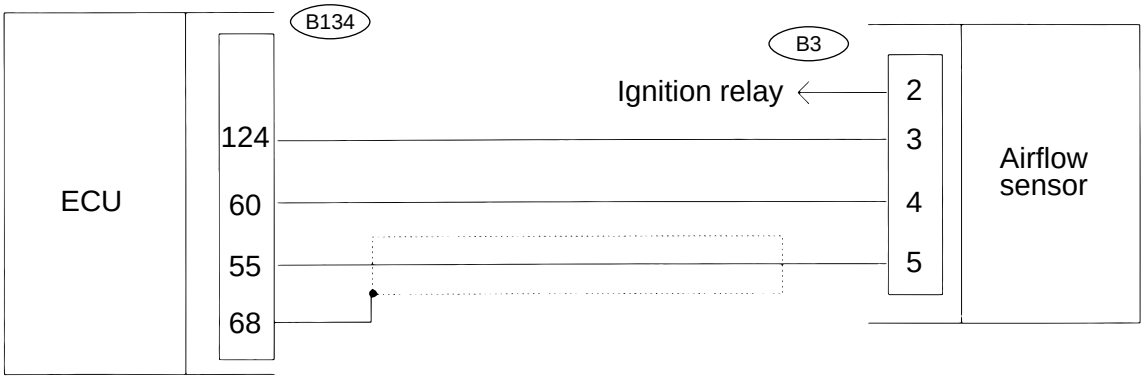


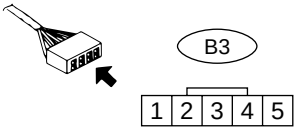
1. Checking the voltage between ECU and body	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU terminal and the ground. SOHC : Terminal (35) and the body ground Turbo, DOHC : Terminal (72) and the body groundand the body ground Standard Data: 2.5 V

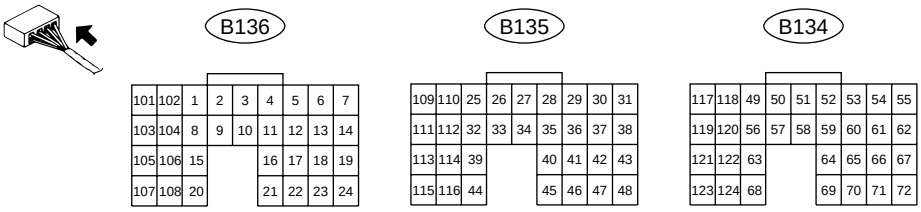
2. Checking the knock sensor only	(1) Separate the knock sensor. (2) Measure the resistance between the knock sensor terminal (2) and the cylinder block. Standard Data: Approx. 560 KΩ (3) Connect an oscilloscope between the knock sensor terminal (2) and the cylinder block. (4) With the engine in idling, lightly tap the cylinder block near the knock sensor and check the waveform.

3. Checking the harness and connector between ECU and knock sensor	(1) Turn ON the ignition switch. (2) Separate the ECU connector and the knock sensor connector. (3) Measure the resistance between the terminals of the ECU connector and the knock sensor connector. SOHC : .Terminal (35) and (16), Terminal (16) and (2) DOHC : .Terminal (72) and (16), Terminal (16) and (2) Turbo : .Terminal (72) and (5), Terminal (5) and (2) Standard Data: 0 Ω

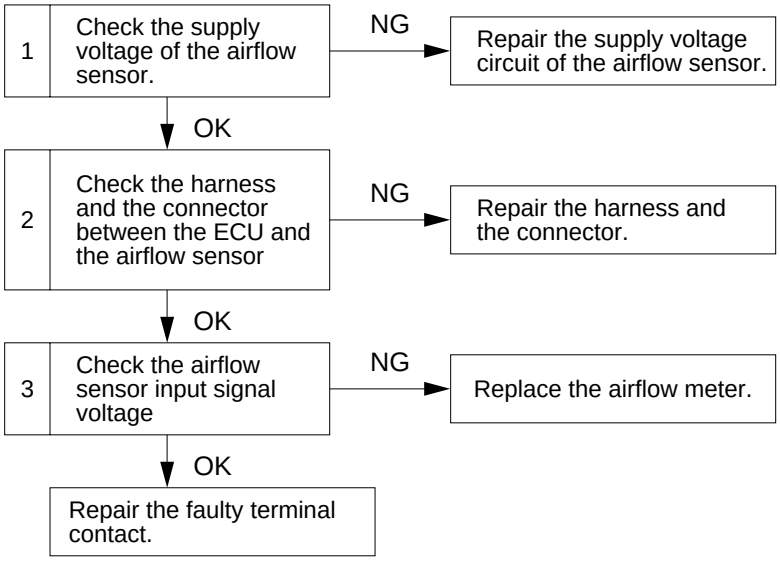
Code 23 Airflow sensor line





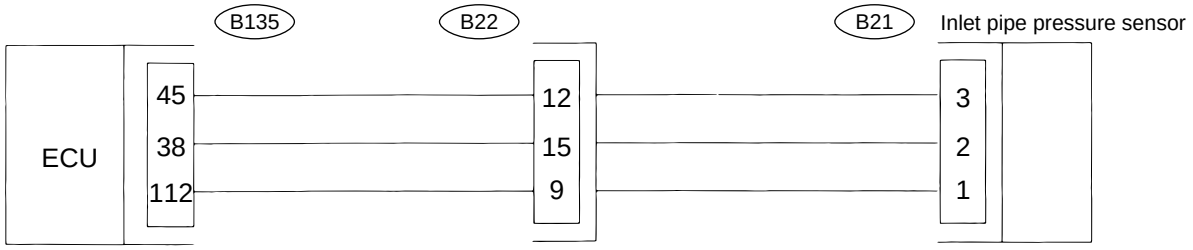


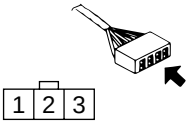
• Perform check up according to the flow chart and the procedure on the right page.

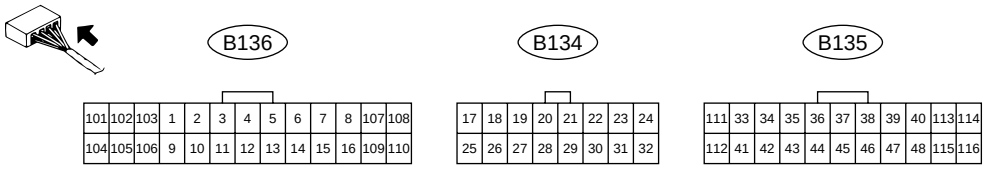


1. Checking the supply voltage of airflow sensor	(1) Turn ON the ignition switch. (2) Measure the voltage between the connector terminal (2) of the airflow sensor and the ground. Standard Data: Voltage of the battery
2. Checking the harness and connector between the ECU and the airflow sensor	(1) Separate the ECU connector and the airflow sensor connector. (2) Measure the resistance between the ECU terminal and the airflow sensor connector terminal. Terminal (124) and (3) Terminal (60) and (4) Terminal (55) and (5) Standard Data: 0 Ω (3) Measure the resistance between the ECU connector terminal (68) and the ground. Standard Data: More than 1 MΩ
3. Checking the airflow sensor input signal voltage	(1) Connect all connectors and after warming up, run the engine in idling. (2) Measure the voltage between the terminal (5) of airflow sensor and the ground. Standard Data: 2 l, 2.5 l DOHC: 1.0 ~ 1.7 V 2 l turbo: 1.1 ~ 1.3 V

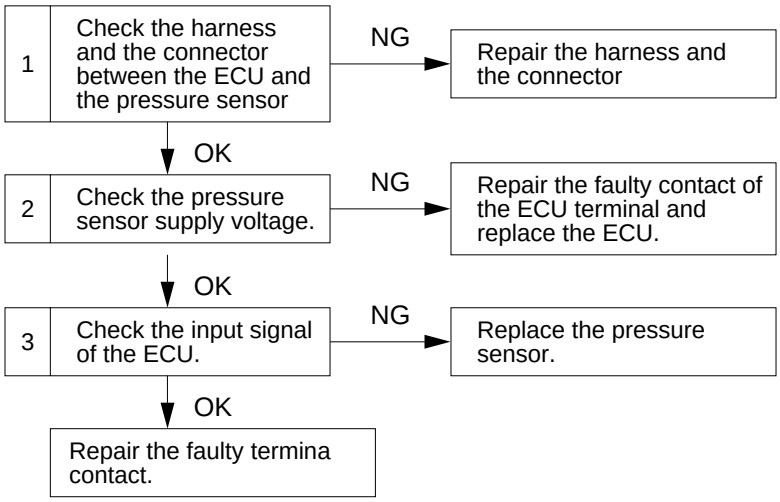
Code 23 Pressure sensor line





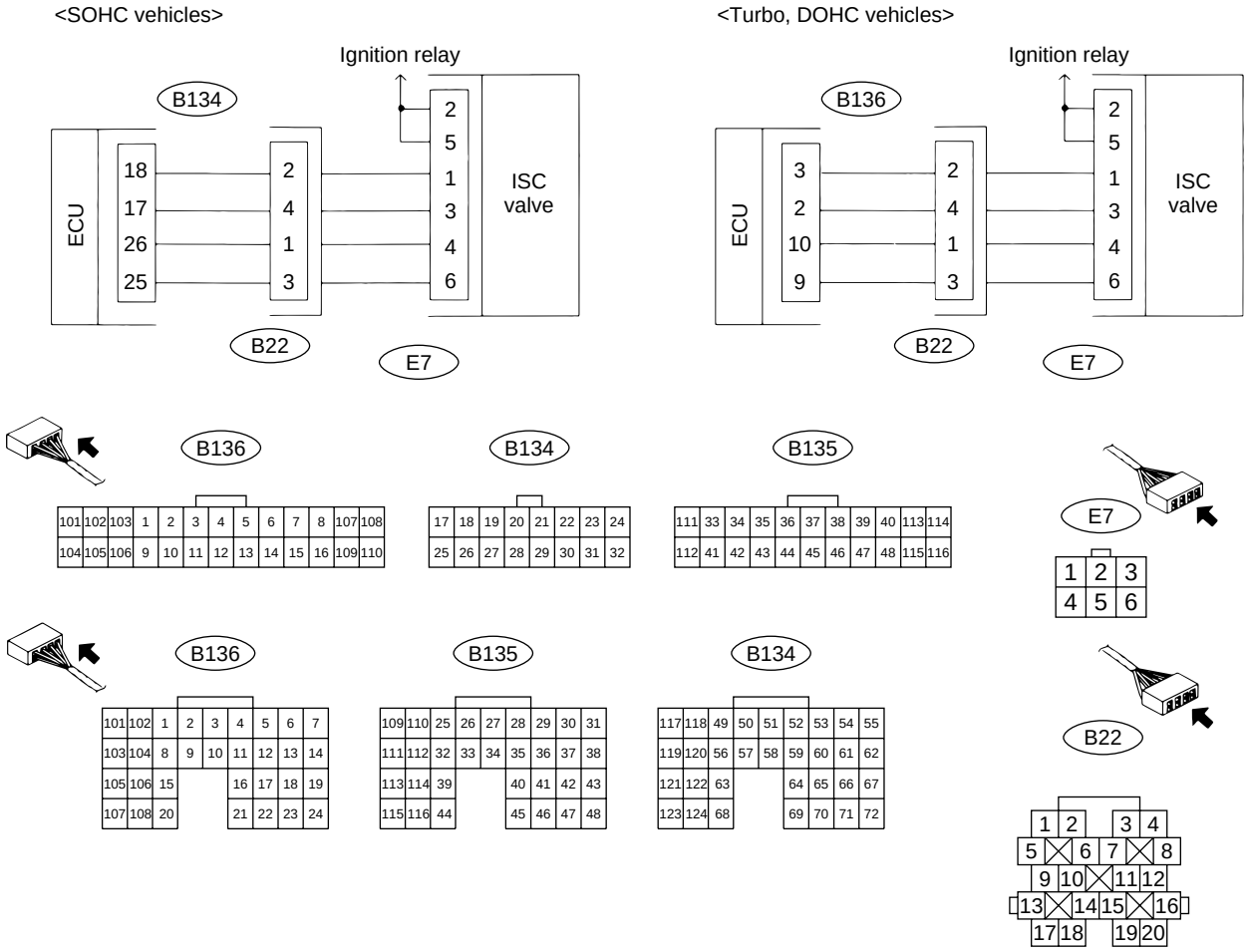


• Perform check up according to the flow chart and the procedure on the right page.

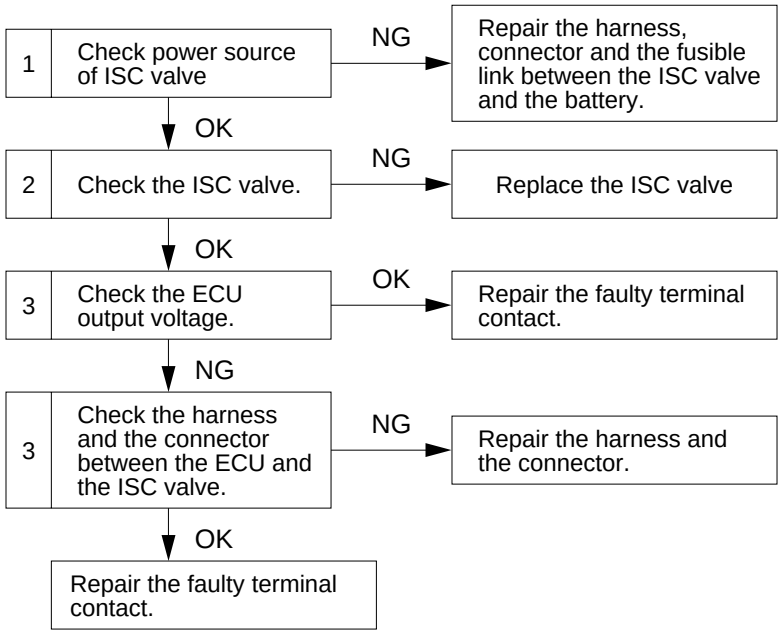


1. Checking the harness and connector between ECU and pressure sensor	(1) Separate the ECU connector and the pressure sensor connector. (2) Measure the resistance between the terminals of the ECU connector and the pressure sensor connector. Terminal (45) and (3) Terminal (38) and (2) Terminal (112) and (1) Standard Data: 0 Ω (3) Measure the resistance between the pressure sensor connector terminal and the ground Terminal (3) and Body ground Terminal (2) and Body ground Terminal (1) and Body ground Standard Data: More than 1 MΩ
2. Checking the pressure voltage of pressure sensor	(1) Separate the pressure sensor connector. (2) Turn ON the ignition switch. (3) Measure the voltage between the terminal (3) of pressure sensor connector and the ground. Standard Data: 5.0 V
3. Checking the ECU input signal	(1) Measure the voltage between the ECU connector terminal (38) and the ground. Standard Data: When the ignition switch is turned ON: 4.3 ~ 4.4 V When the engine is in idling: 0.9 ~ 1.4 V

Code 24 ISC valve line



• Perform check up according to the flow chart and the procedure on the right page.



Caution

Be sure to check the ON/OFF function of the ignition switch after replacing the ISC valve and connecting the test mode connector

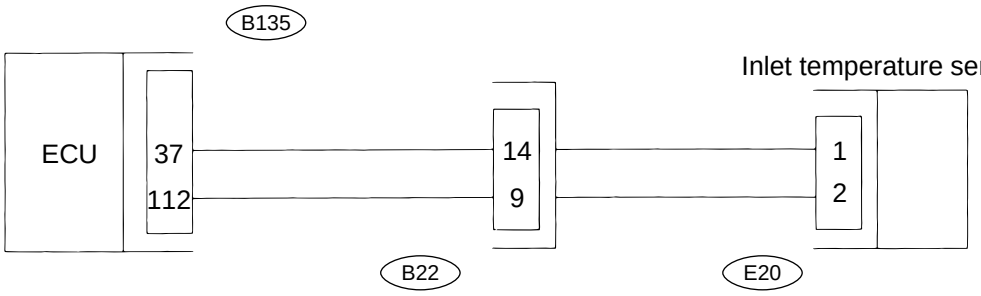
1. Checking the power supply voltage of ISC valve	(1) Separate the ISC valve connector. (2) Turn ON the ignition switch. (3) Measure both the voltages between the ISC valve connectors (2) or (5) and the ground. Standard Data: Voltage of the battery
2. Checking the ISC valve	(1) Separate the ISC valve connector. (2) Measure the resistance between terminals of the ISC valve main body. Terminal (2) and (1), Terminal (2) and (3) Terminal (5) and (4), Terminal (5) and (6) Standard Data: SOHC: Approx. 22 Ω Turbo, DOHC: Approx. 50 Ω
3. Checking the ECU output voltage (current)	(1) Connect the ISC valve connector. (2) For 1 second during IG SW OFF → ON (3) Measure the voltage between the ECU connector terminal and the ground SOHC : Terminal (18), (17), (26), (25) and the body ground Turbo, DOHC : Terminal (3), (2), (10), (9) and the body ground Standard Data: Pulse waveform of 0 ↔ 12V

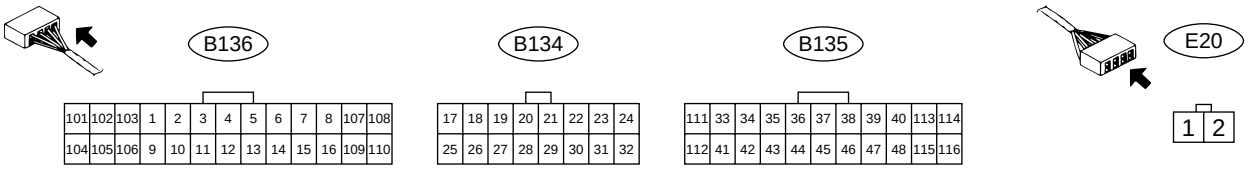
4. Check the harness and connector between ECU and ISC valve	(1) Separate the connectors of the ECU and the ISC valve. (2) Check the circuit open Measure the resistance between the ECU connector terminal and the ISC valve connector terminal. SOHC : Terminal (18) and (1), Terminal (17) and (3) Terminal (26) and (4), Terminal (25) and (6) Turbo, DOHC : Terminal (3) and (1), Terminal (2) and (3) Terminal (10) and (4), Terminal (9) and (6) Standard Data: 0 Ω (3) Check the short circuit. Measure the resistance between the ECU connector terminal or ISC valve connector terminal and the ground. SOHC : Terminal (18) or (1) and the body ground, Terminal (17) or (3) and the body ground Terminal (26) or (4) and the body ground, Terminal (25) or (6) and the body ground Turbo, DOHC : Terminal (3) or (1) and the body ground, Terminal (2) or (3) and the body ground Terminal (10) or (4) and the body ground, Terminal (9) or (6) and the body ground Standard Data: More than 1 MΩ

MEMO

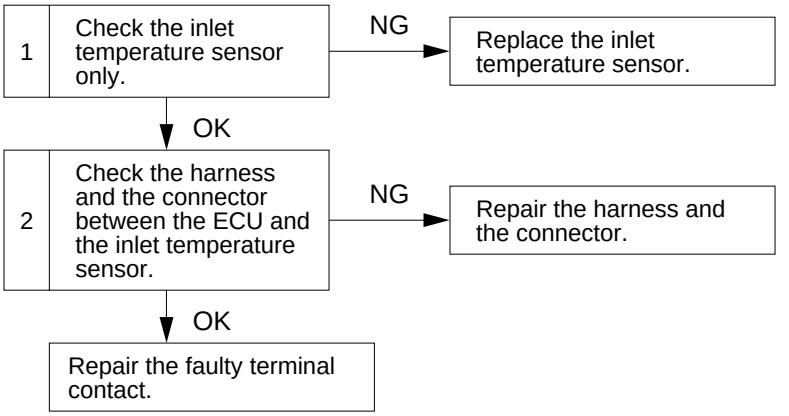
CODE 26 Inlet temperature sensor line

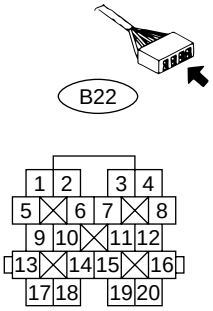
<SOHC vehicles>





• Perform check up according to the flow chart and the procedure on the right page.

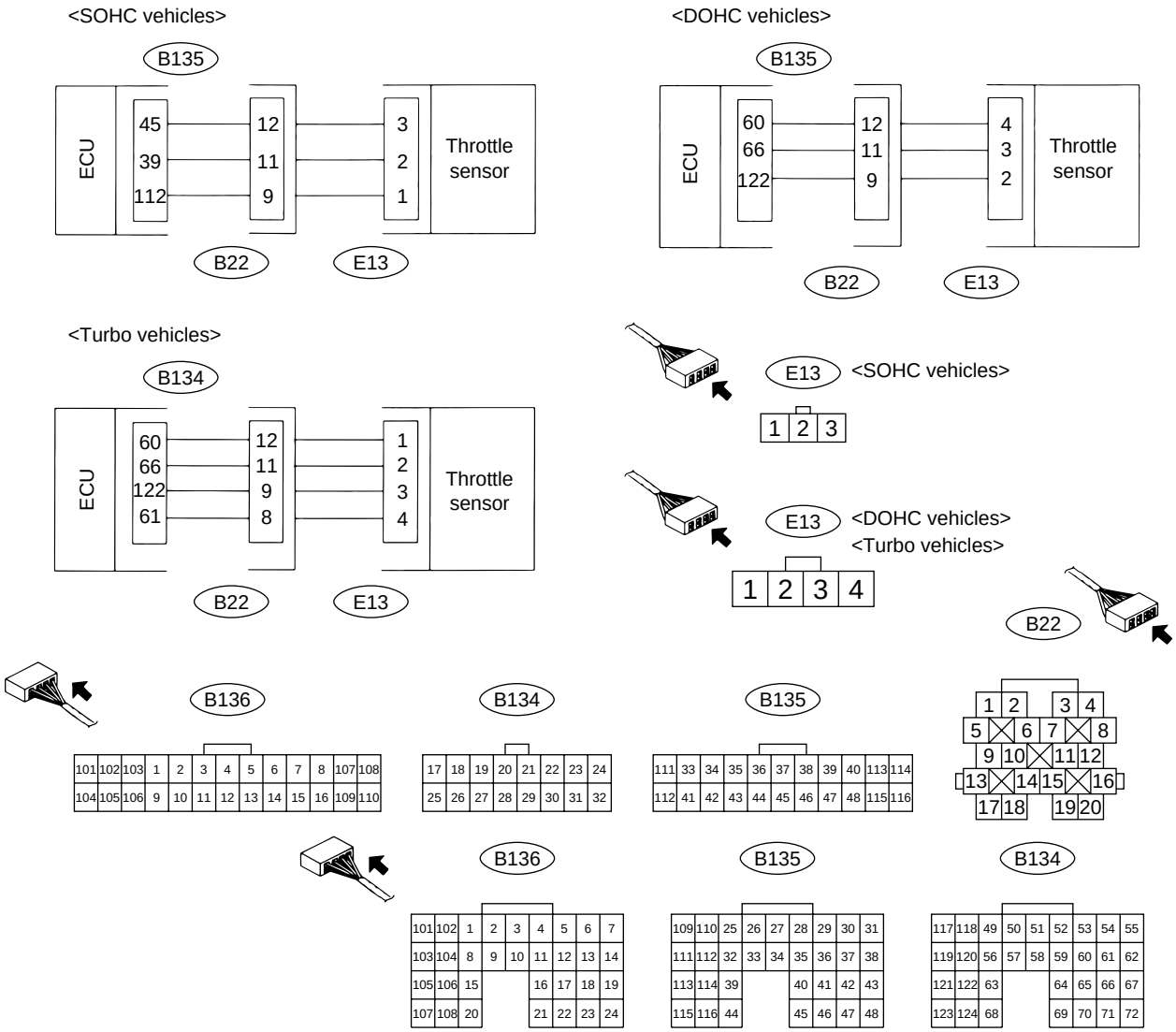




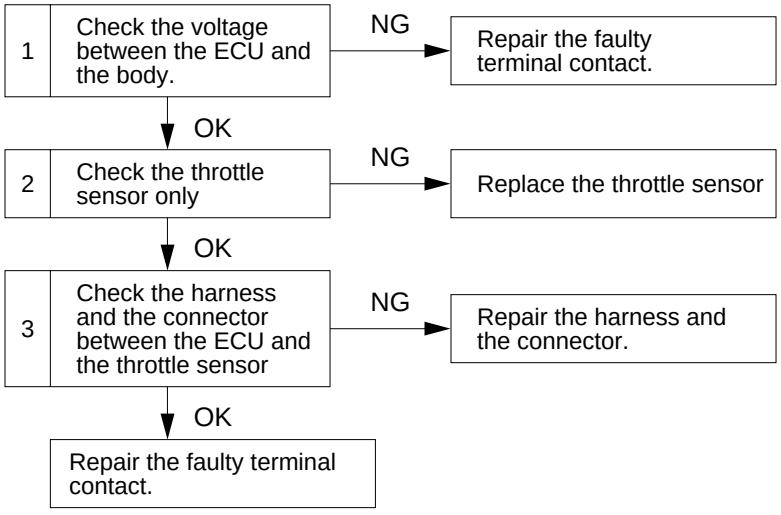
1. Checking the inlet temperature sensor only	(1) Separate the inlet temperature sensor. (2) Measure the resistance between the terminals of the inlet sensor main body. Terminal (1) and (2) Standard Data: At 20 ˚C: 2.45 KΩ; At 80 ˚C: 0.32 KΩ

2. Checking the harness and connector between ECU and inlet temperature sensor	(1) Separate the inlet temperature connector sensor. (2) Check the circuit open Measure the resistance between the ECU connector terminal and the inlet temperature sensor connector terminal. Terminal (37) and (1) Terminal (112) and (2) Standard Data: 0 Ω (3) Check the short circuit. Measure the resistance between the ECU connector terminal or the inlet temperature sensor connector terminal and the body. Terminal (37) or (1) and the body ground Terminal (112) or (2) and the body ground Standard Data: More than 1 MΩ

Code 31 Throttle sensor line



• Perform check up according to the flow chart and the procedure on the right page.



1. Checking the voltage between ECU and Body

(1) Turn ON the ignition switch.
(2) Measure the voltage between the ECU terminals.
SOHC : Terminal (39) and (112)
Turbo, DOHC : Terminal (66) and (122)

Standard Data	Accelerator fully closed:	Approx. 0.5 V
	Accelerator fully opened:	Approx. 4.3 V

(3) Measure the voltage between the ECU terminal and the ground.
SOHC : Terminal (45) and the body ground
Turbo, DOHC : Terminal (60) and the body ground

Standard Data	Approx. 5.1 V

2. Checking the throttle sensor only

(1) Separate the throttle sensor connector.
(2) Measure the resistance between the throttle sensor terminals when the throttle fully closed → fully opened.
SOHC : Terminal (3) and (2)
Turbo : Terminal (1) and (2)
DOHC : Terminal (4) and (3)

		SOHC	Turbo, DOHC
Standard Data	When fully closed	Approx. 4.5 KΩ	Approx. 0.7 KΩ
	When fully open	Approx. 0.5 KΩ	Approx. 4.5 KΩ

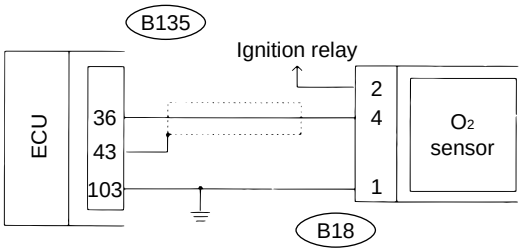
3. Checking the harness and connector between ECU and throttle sensor

(1) Separate the ECU connector and the throttle sensor connector.
(2) Measure the resistance between the terminals of the ECU connector and the throttle sensor connector.
SOHC : Terminal (45) and (3), Terminal (39) and (2),
Terminal (112) and (1)
DOHC : Terminal (60) and (1), Terminal (66) and (2),
Terminal (112) and (3)
Turbo : Terminal (60) and (4), Terminal (66) and (3),
Terminal (112) and (2)

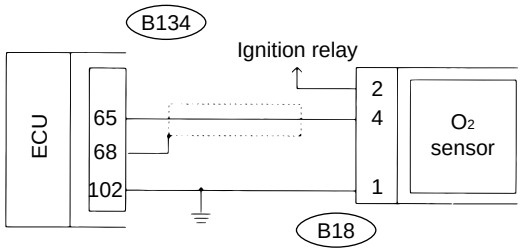
Standard Data	0 Ω

Code 32 O_2 SENSOR LINE

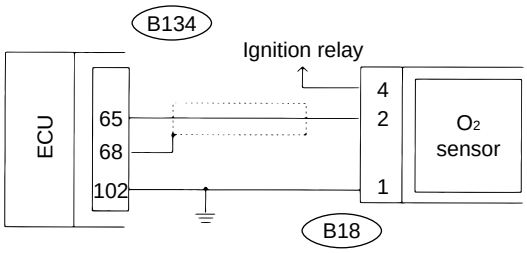
<SOHC vehicles>

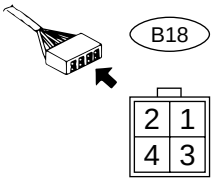


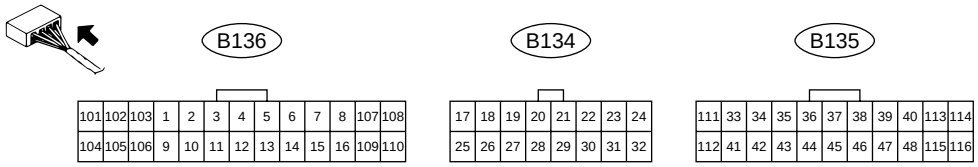
<DOHC vehicles>

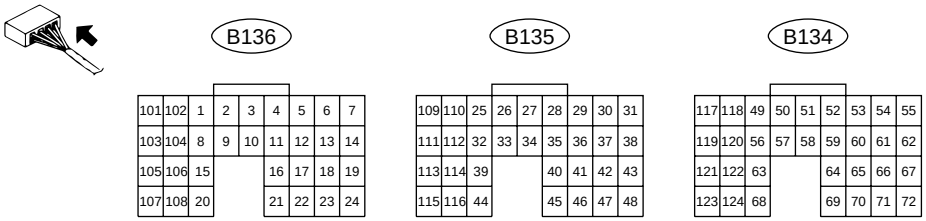


<Turbo vehicles>

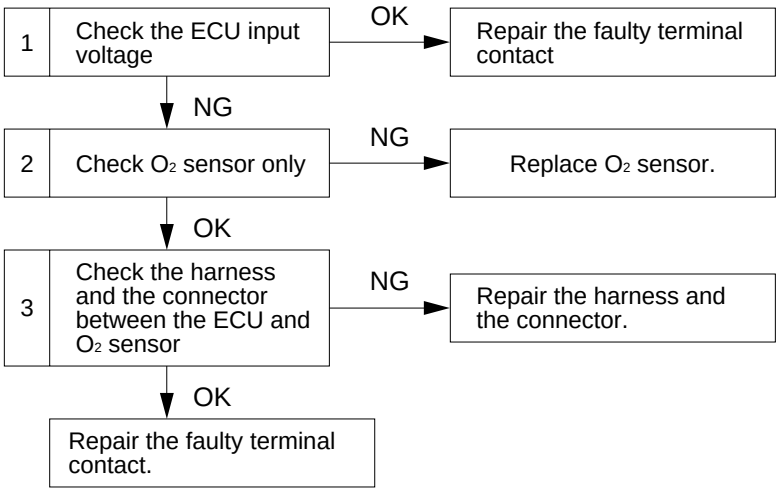








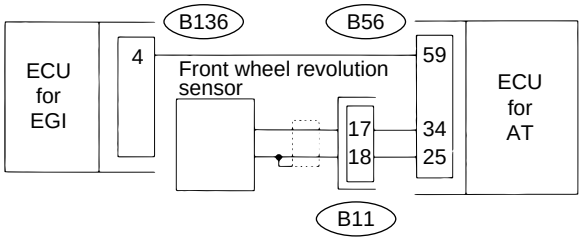
• Perform check up according to the flow chart and the procedure on the right page.



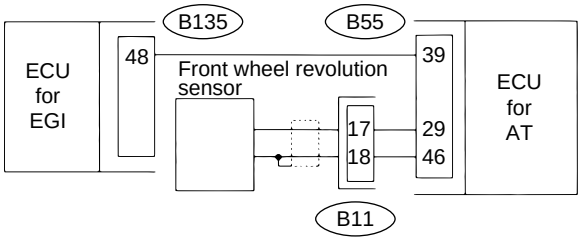
1. Checking the ECU input voltage	(1) After warming up complete, keep the engine at idling. (2) Measure the voltage between the ECU terminal and the ground. SOHC : Terminal (36) and the body ground Turbo, DOHC : Terminal (65) and the body ground Standard Data: 0 ~ 1.0 Ω
2. Checking the O_2 sensor only	(1) After warming up complete, keep the engine on idling. (2) Separate the O_2 sensor connector. (3) Connect a probe of an oscilloscope between the O_2 sensor terminals and check the waveform. SOHC : Terminal (4) and (1) Turbo : Terminal (2) and (1) DOHC : Terminal (4) and (1)
3. Check the harness and connector between the ECU and the O_2 sensor.	(1) Separate the ECU connector and the O_2 sensor connector. (2) Check the circuit open. (Measure the resistance between the following terminals) SOHC : Terminal (36) and (4) Turbo : Terminal (65) and (2) DOHC : Terminal (65) and (4) Standard Data: 0 Ω (3) Check the short circuit. (Measure the resistance between the following terminals.) SOHC : Terminal (36) or (4) and the body ground Turbo : Terminal (65) or (2) and the body ground DOHC : Terminal (65) or (4) and the body ground Standard Data: 1 MΩ

Code 33 Vehicle speed sensor line (AT vehicles)

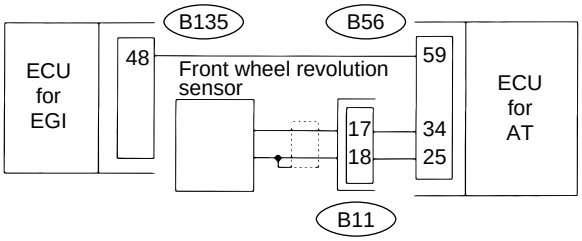
<SOHC vehicles>



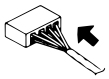
<DOHC vehicles>



<Turbo vehicles>



AT SOHC vehicles Turbo vehicles



B54

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

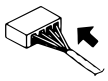
B55

25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42
43	44	45				46	47	48

B56

49	50	51	52	53	54	55	56	57
58	59	60	61	62	63	64	65	66
67	68	69				70	71	72

EGI SOHC vehicles



B136

101	102	103	1	2	3	4	5	6	7	8	107	108
104	105	106	9	10	11	12	13	14	15	16	109	110

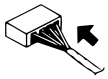
B134

17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

B135

111	33	34	35	36	37	38	39	40	113	114		
112	41	42	43	44	45	46	47	48	115	116		

EGI DOHC vehicles Turbo vehicles



AT DOHC vehicles

B54

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21				22	23	24

B55

25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42
43	44	45				46	47	48

B136

101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

• Perform check up according to the flow chart and the procedure on the right page.

1 Check the harnessand the connector between the ECU for EGI and the ECU for AT.
NG → Repair the harness and the connector.

OK

2 Check the input signal of the ECU for EGI.
NG → Perform the trouble diagnosis of the sensor line of the front wheel revolution of AT.

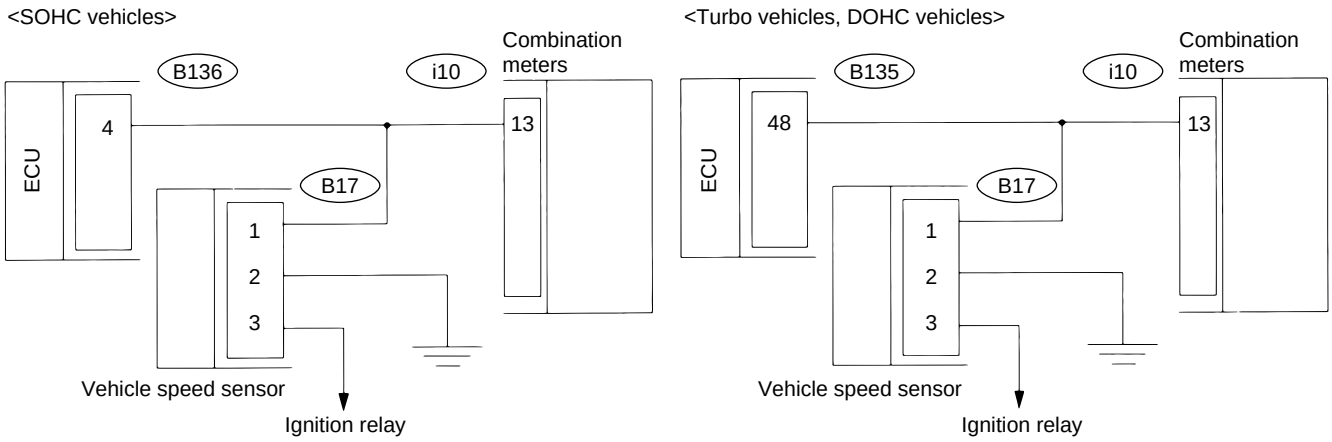
OK

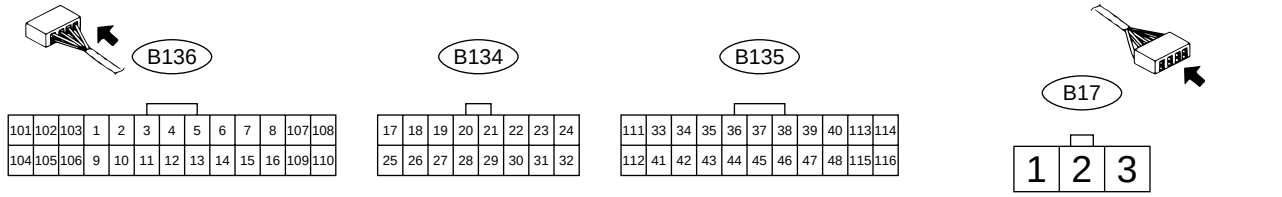
Repair the faulty terminal contact.

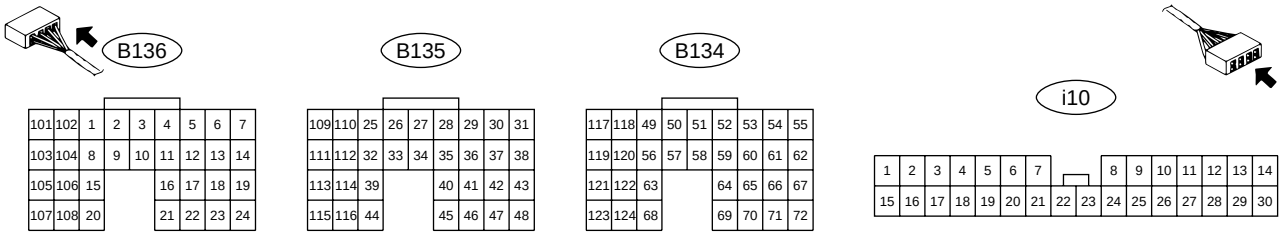
1. Check the harness and connector between the ECU for EGI and the ECU for AT	(1) Separate the ECU connector for EGI and the ECU connector for AT. (2) Measure the resistance between the ECU connector terminal for EGI and the ECU connector terminal for AT. SOHC : Terminal (4) and (59) Turbo : Terminal (48) and (59) DOHC : Terminal (48) and (39) Standard Data: 0 Ω (3) Measure the resistance between the ECU connector terminal for EGI or the ECU connector terminal for AT and the ground. SOHC : Terminal (4) or (59) and the body ground Turbo : Terminal (48) or (59) and the body ground DOHC : Terminal (48) or (39) and the body ground Standard Data: More than 1 MΩ

2. Checking the input signal of the ECU for EGI	(1) Lift up vehicle test. (2) Start the engine and rotate the tires. (3) Connect an oscilloscope between the ECU terminal and the ground and check the waveform. SOHC : Terminal (4) and the body ground Turbo, DOHC : Terminal (48) and the body ground Standard Data: Repeat approx. 0 ~ 5 V

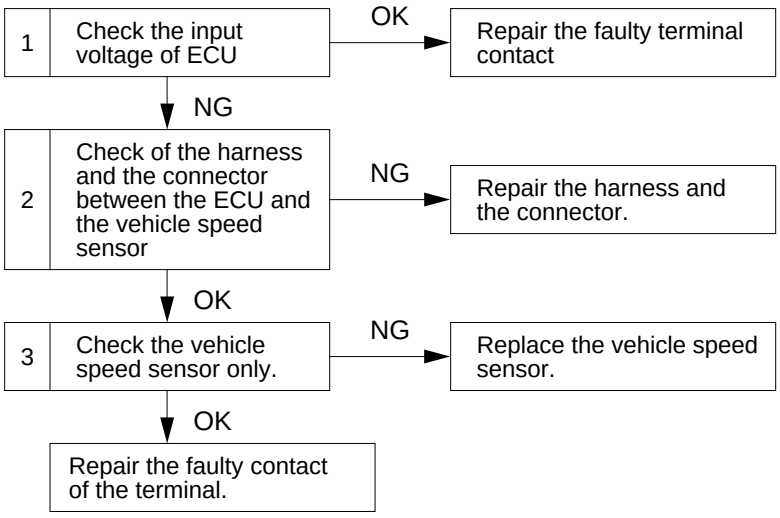
Code 33 Vehicle speed sensor line (MT vehicles)







• Perform check up according to the flow chart and the procedure on the right page.

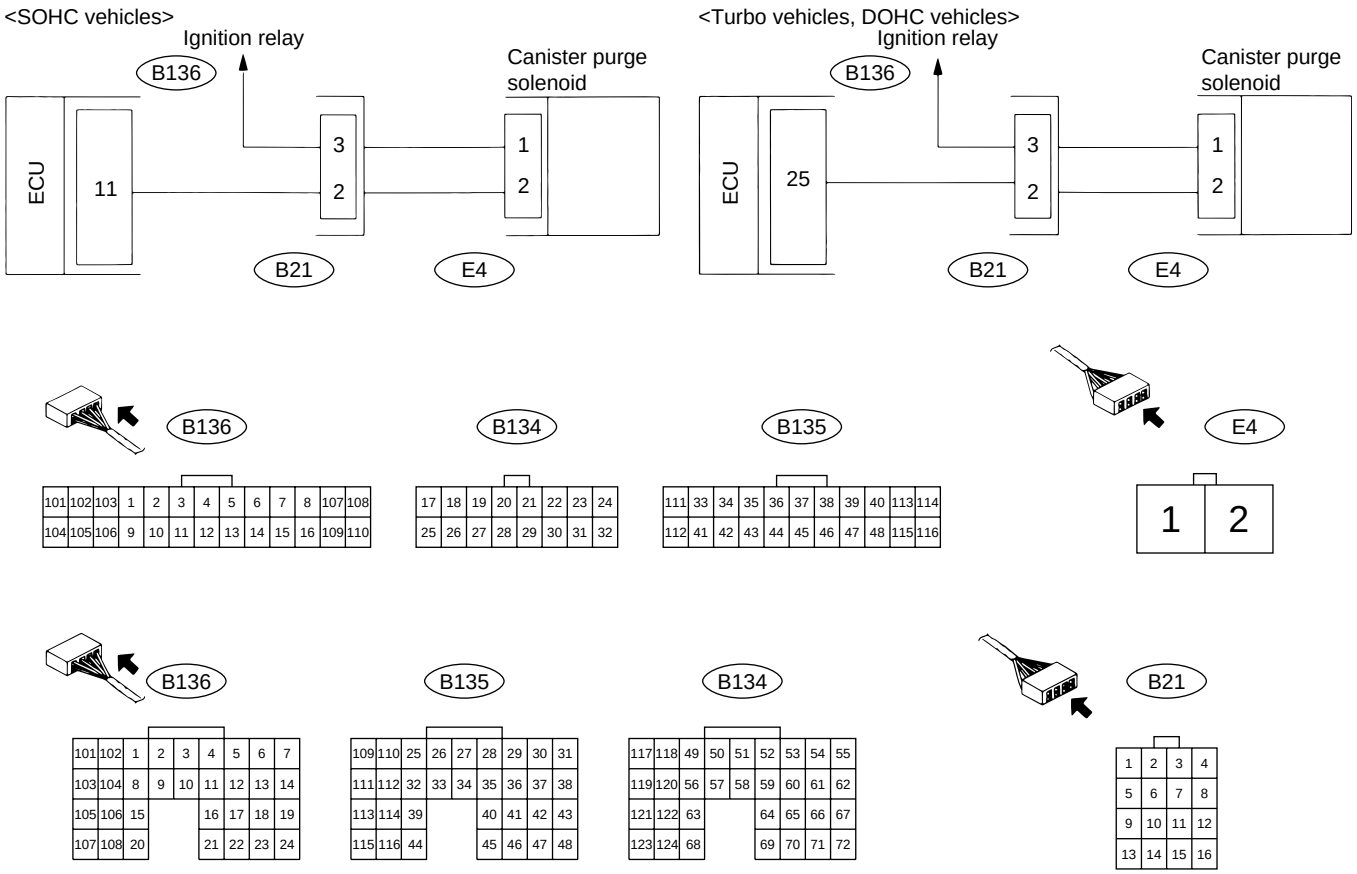


1. Checking the ECU input voltage	(1) Lift up vehicle test (refer to the procedures in Service manual.) (2) Start the engine, rotate the tire, and rotate the tires. (3) Connect an oscilloscope between the ECU terminal and the ground and check the waveform. SOHC : Terminal (4) and the body ground Turbo, DOHC : Terminal (48) and the body ground Standard Data: Repeat of approx. 0 ~ 5 V

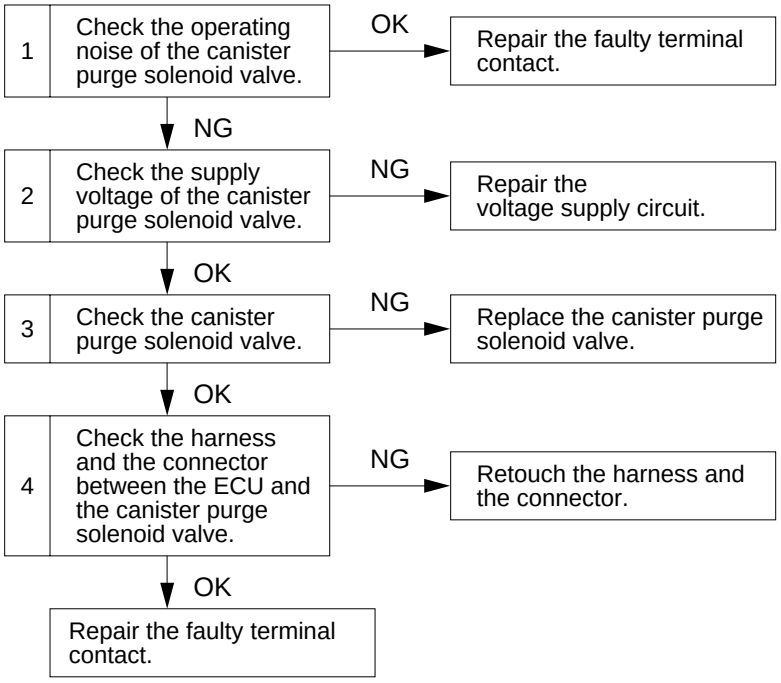
2. Checking the harness and the connector between the ECU and the vehicle speed sensor	(1) Separate the each connector of the ECU, the combination meters, and the vehicle speed sensor. (2) Measure the resistance between the ECU connector terminal and the vehicle speed sensor connector. SOHC : Terminal (4) and the body ground Turbo, DOHC : Terminal (48) and the body ground Standard Data: More than 1 MΩ (3) Measure the resistance between the ECU connector terminal and the vehicle speed sensor terminal. SOHC : Terminal (4) and (1) Turbo, DOHC : Terminal (48) and (1) Standard Data: 0 Ω

3. Checking the vehicle speed sensor only	(1) Lift up vehicle test. (2) Start the engine and rotate the tires. (3) Connect an oscilloscope between the vehicle speed sensor terminal (1) and the ground. Standard Data: Repeat of approx. 0 ~ 5 V

Code 35 Canister purge solenoid valve line

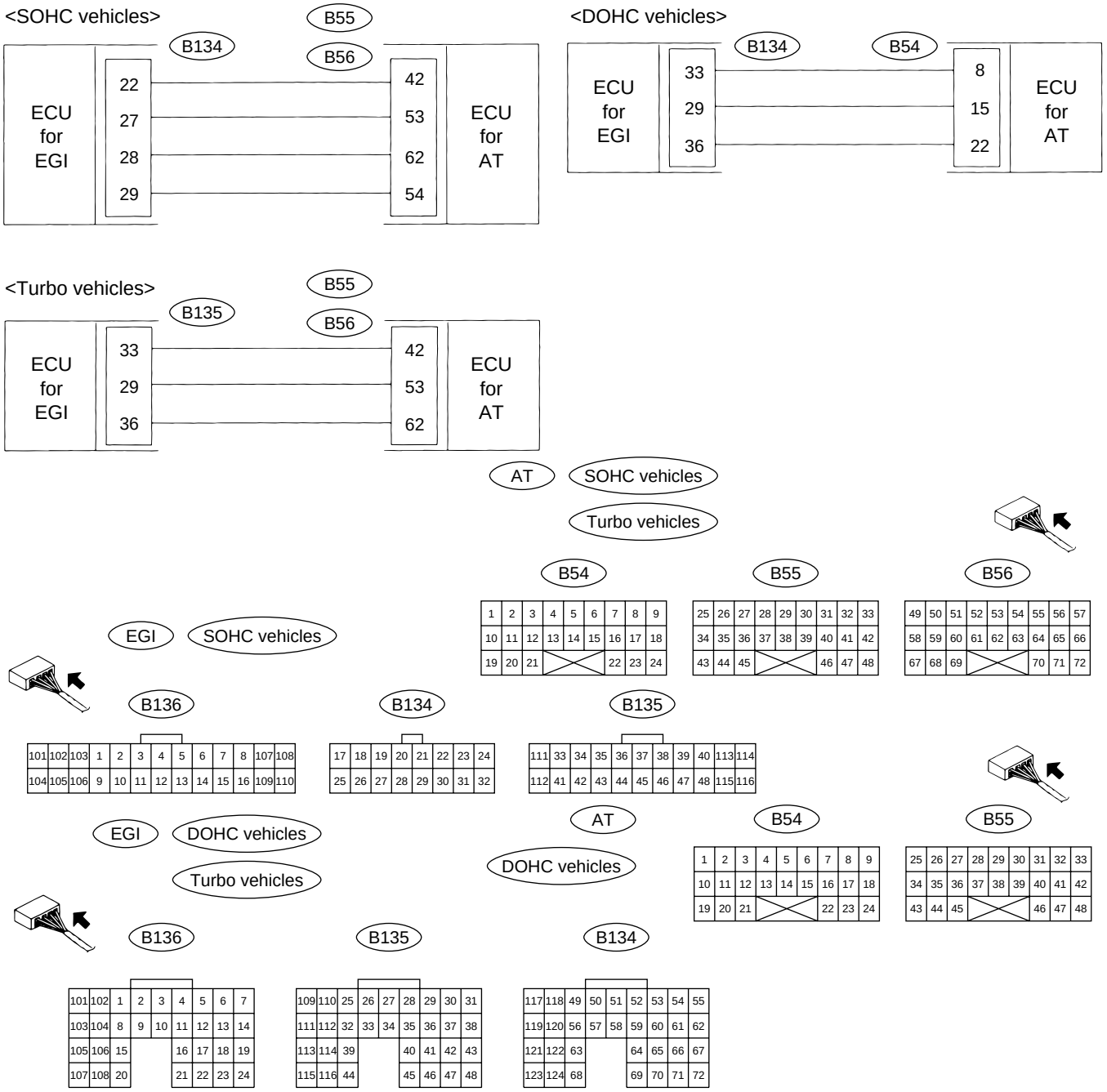


• Perform check up according to the flow chart and the procedure on the right page.



1. Checking the operating noise of the canister purge solenoid Valve	(1) Connect the test mode connector. (2) Turn ON the ignition switch. (3) Confirm the operating noise of the canister purge solenoid valve. Standard Data: Quick and continuous noise with a period of 0.1 second
2. Checking the supply voltage of the canister purge solenoid valve	(1) Separate the connector of the canister purge solenoid valve. (2) Turn ON the ignition switch. (3) Measure the voltage between the connector terminal (1) of the canister purge solenoid valve and the ground. Standard Data: Voltage of the battery
3. Checking the canister purge solenoid valve	(1) Separate the connector of the canister purge solenoid valve. (2) Measure the resistance of the canister purge solenoid valve. Terminal (1) and (2) Standard Data: 23 ~ 27 Ω
4. Check the harness and the connector between the ECU and the canister purge solenoid valve	(1) Separate the connectors at both ends. (2) Check the circuit open. (3) Measure the resistance between the ECU terminal (11) or (25) and the connector terminal (2) of the canister purge solenoid valve. Standard Data: 0 Ω (4) Check the short circuit. Measure the resistance both the terminals of the ECU connector or the connector of the canister purge solenoid valve, and the body. SOHC vehicles : Terminal (11) or (2) and the body ground Turbo vehicles, DOHC vehicles : Terminal (25) or (2) and the body ground Standard Data: More than 1 MΩ

Code 38 AT coordination control line



• Perform check up according to the flow chart and the procedure on the right page.

1	Check the input/output signals from E-4AT ECU to EGI ECU	OK	Repair the faulty terminal contact of the EGI ECU.
2	Check the harness between the EGI ECU and E-4AT ECU	NG	Repair the faulty contact of the harness and the connector

NG (from step 1)

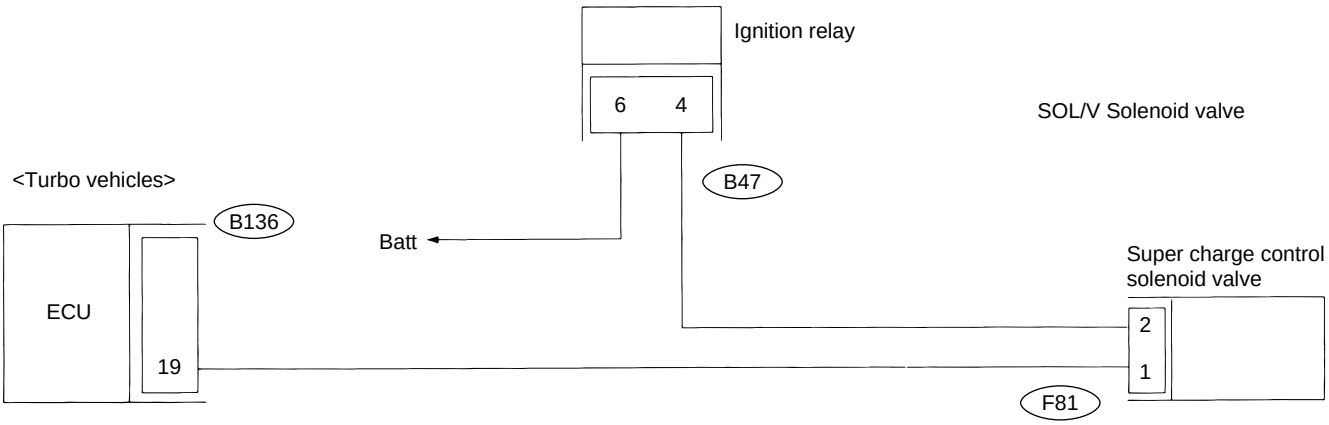
OK (from step 2)

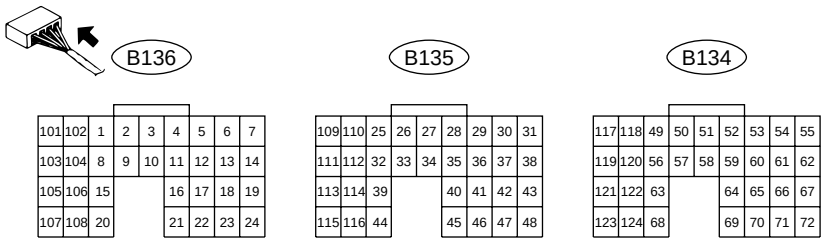
Repair the faulty terminal contact of E-4AT

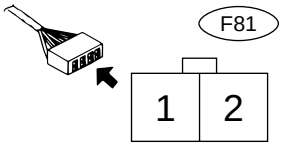
1. Checking the input/output signals from E-4AT ECU to EGI ECU	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU connector terminal. SOHC : Terminal (27), (28) and the body ground Turbo, DOHC : Terminal (29), (36) and the body ground Standard Data: Approx. 5 V SOHC : Terminal (22) and the body ground Turbo, DOHC : Terminal (33) and the body ground Standard Data: 0 V SOHC : Terminal (29) and the body ground Standard Data: Pulse waveform of 0 or 5 V

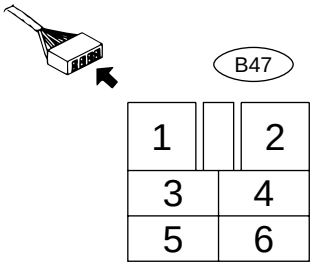
2. Checking the harness between the EGI ECU and E-4AT ECU	(1) Turn ON the ignition switch. (2) Separate the EGI ECU connector and the E-4AT ECU connector. (3) Separate the circuit open. Measure the resistance between the EGI ECU connector terminal and the E-4AT ECU connector terminal. SOHC : Terminal (22) and (42), Terminal (27) and (53), Terminal (28) and (62), Terminal (29) and (54) Turbo : Terminal (33) and (42), Terminal (29) and (53), Terminal (36) and (62) DOHC : Terminal (33) and (8), Terminal (29) and (15), Terminal (36) and (22) Standard Data: 0 Ω (4) Check the short circuit. Measure the resistance between the EGI ECU connector terminal the circuit open of which has been checked or E-4AT ECU Connector terminal and the ground. Standard Data: More than 1 MΩ

Code 44 Super charge pressure control solenoid valve line









• Perform check up according to the flow chart and the procedure on the right page.

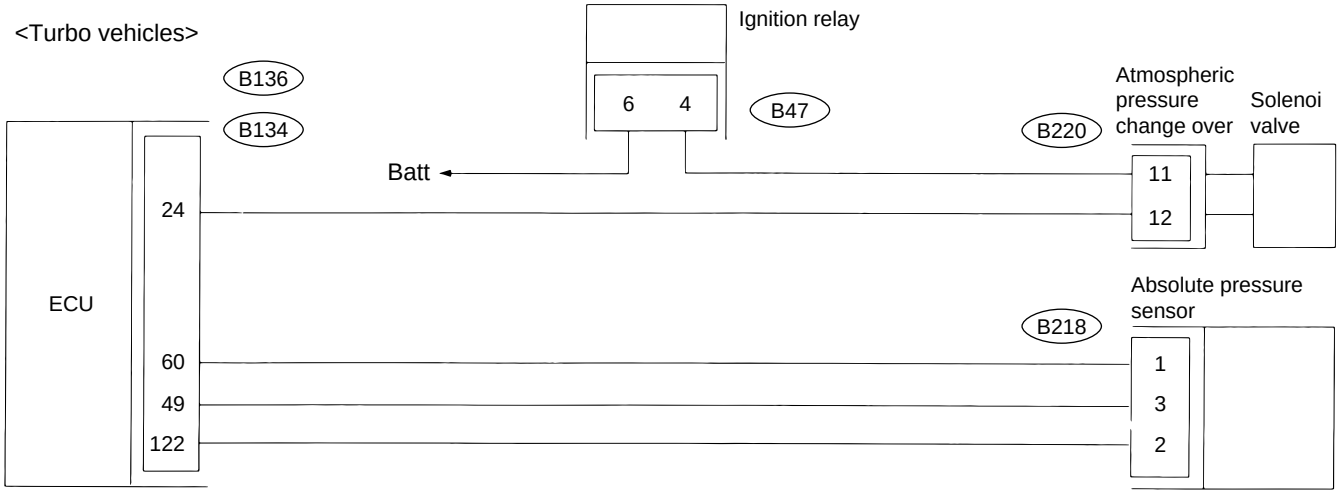
1	Check the voltage between the ECU and the body.	OK	Repair the faulty terminal contact.
		NG	
2	Check the super charge pressure control solenoid valve.	NG	Replace the super charge pressure control solenoid valve.
		OK	
3	Check the harness and the connector between the ECU and the battery.	NG	Repair the harness and the connector.
		OK	
	Memory clear		

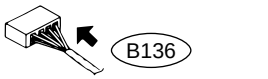
1. Check the voltage between the ECU and the body	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU connector terminal (19) and the body. Standard Data: Voltage of the battery

2. Checking the super charge pressure control solenoid valve	(1) Separate the connector of the super-charge pressure control valve. (2) Measure resistance of the super-charge pressure control solenoid valve. Standard Data: Approx. 17 to 21 Ω

3. Checking the harness and the connector between the ECU and the battery	• Checking to do between the ECU and the super-charge pressure control solenoid valve. (1) Separate the connectors at both ends. (2) Check the circuit open Measure the resistance between the ECU connector terminal (19) and the connector terminal on solenoid valve side (1). Standard Data: 0 Ω (3) Check the short circuit. Check the resistance both the terminals of the ECU connector or the connector on solenoid valve side, and the body. Standard Data: More than 1 MΩ • Checking to do between the supercharge pressure control solenoid valve and the battery (1) Separate the connector of the super-charge pressure control solenoid valve and the ignition relay connector. (2) Check the circuit open. Measure the resistance between the terminal (2) of the super-charge pressure control solenoid valve, and the terminal (4) of the ignition relay. Standard Data: 0 Ω

Code 45 Change over solenoid valve of absolute pressure sensor and atmospheric pressure





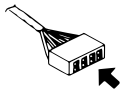
101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

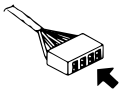


B47

1		2
3		4
5		6

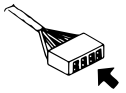
• Perform check up according to the flow chart and the procedure on the right page.

1	Check the absolute pressure sensor and the atmospheric pressure change over solenoid.	NG	Replace the piping for the absolute pressure sensor and the atmospheric pressure change over solenoid.
	OK		
2	Check the voltage between the ECU and the body.	OK	Repair the faulty terminal contact.
	NG		
3	Check the harness and the connector • between the ECU and the absolute pressure sensor, • between the ECU and the atmospheric pressure change over solenoid valve, • between the atmospheric pressure change over solenoid valve and the battery.	NG	Repair the harness and the connector.
	OK		
	Memory clear		



B220

1	2	3	4
5	6	7	8
9	10	11	12



B218

1	2	3

1. Checking the absolute pressure sensor and the atmosphere pressure change over solenoid valve	(1) Separate the connector of the absolute pressure sensor. (2) Connect the mighty pack to the piping fitting position of the absolute pressure sensor main body. (3) Load 5V power between the sensor terminals (1) and (2) with (1) as ⊕. (4) Measure the voltage when positive pressure and negative pressure are exerted. Standard Data: + 200 mmHg: Approx. 3.1 V 0 mmHg: Approx. 2.5 V 200 mmHg: Approx. 2.1 V (5) Separate the connector of the atmospheric pressure change over solenoid valve. (6) Measure the resistance between the solenoid terminals. Standard Data: 37 to 44 Ω (7) Check the detachment and the flaw, etc. of the piping to the absolute pressure sensor and the atmospheric pressure change over solenoid valve.

2. Check the voltage between the ECU and the body	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU terminal and the body. A : Terminal (24) and the body ground B : Terminal (60) and the body ground C : Terminal (49) and the body ground D : Terminal (122) and the body ground Standard Data: A : 0 or 10 ~ 13 V B : Approx. 5 V C : 2.4 ~ 2.7 V D : 0 V

3. Check the harness and the connectors.
   - Between the ECU and the absolute pressure sensor
   - Between the ECU and the atmospheric change over solenoid valve
   - Between the atmospheric pressure change over solenoid valve and the battery

• Check to do between the ECU and the absolute pressure sensor

(1) Separate the ECU connector and the absolute pressure sensor connector

(2) Check the circuit open.
Measure the resistance between the ECU connector terminal and the absolute pressure sensor connector terminal.

Terminal (60) and (1)
Terminal (49) and (3)
Terminal (122) and (2)

Standard Data	0 Ω

(3) Check the short circuit.
Measure the resistances between the terminals of the ECU connector or the absolute pressure sensor connector, and the body.

Terminal (60) or (1) and the body ground
Terminal (49) or (3) and the body ground
Terminal (122) or (2) and the body ground

Standard Data	More than 1 MΩ

• Check the resistance between the ECU and the solenoid valve for atmospheric pressure change

(1) Separate the ECU connector and the atmospheric pressure change over solenoid valve connector.

(2) Check the circuit open.
Measure the resistance between the ECU connector terminal and the connector of the atmospheric pressure change over solenoid valve.

Terminal (24) and (12)

Standard Data	0 Ω

(3) Check the short circuit.
Measure the resistance between the ECU connector terminal and the connector terminal of the atmospheric pressure change over solenoid valve.

Terminal (24) or (12), and the body ground.

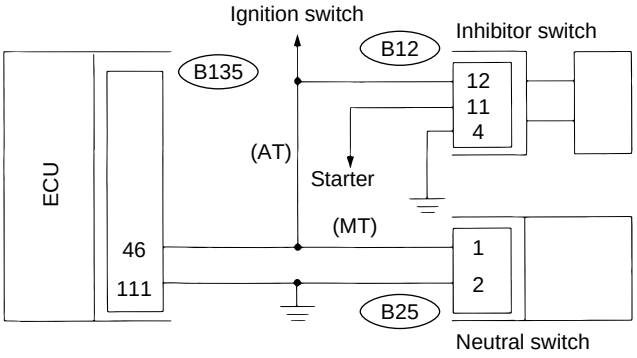
Standard Data	More than 1 MΩ

(Continued to the next page)

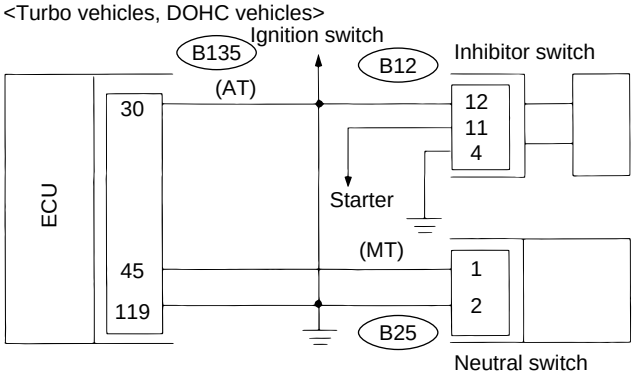
(Continued from the previous page)	• Check the resistance between the solenoid valve for atmospheric pressure switch and the battery (1) Separate the connector of the atmospheric pressure switch over solenoid valve and the ignition relay connector. (2) Check the circuit open. Measure the resistance between the connector terminal of the atmospheric pressure switch over solenoid valve and the connector terminal of the ignition relay. Terminal (11) and (4) Standard Data: 0 Ω

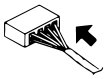
Code 51 NEUTRAL SWITCH LINE

<SOHC vehicles>



<Turbo vehicles, DOHC vehicles>





B136

101	102	103	1	2	3	4	5	6	7	8	107	108
104	105	106	9	10	11	12	13	14	15	16	109	110

B134

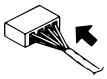
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32

B135

111	33	34	35	36	37	38	39	40	113	114
112	41	42	43	44	45	46	47	48	115	116

B25

1	2



B136

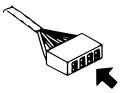
101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72



B12

1	2	3	4
5	6	7	8
9	10	11	12

• Perform check up according to the flow chart and the procedure on the right page.

1	Check the input voltage of the ECU	OK	Repair the faulty terminal contact.
	NG		
2	Check the neutral switch only	NG	Replace the neutral switch.
	OK		
3	Check the harness and the connector between the ECU and the neutral switch.	NG	Repair the harness and the connector.
	OK		
	Repair the faulty terminal contact.		

1. Checking the input voltage of the ECU	(1) Turn ON the ignition switch. (2) Measure the voltage between the ECU terminal (46) or (45) and the body ground. V <table><tr><td rowspan="4">Standard Data</td><td rowspan="2">M/T</td><td>N</td><td>Approx. 5</td></tr><tr><td>Other than N</td><td>0</td></tr><tr><td rowspan="2">A/T</td><td>P.N</td><td>0</td></tr><tr><td>Other than P.N</td><td>Approx. 5</td></tr></table>
2. Checking the neutral switch only	• Checking of MT vehicles (1) Separate the neutral switch connector. (2) Operate the shift lever and measure the resistance between the terminals of neutral switch unit. Terminal (1) and (2) <table><tr><td rowspan="2">Standard Data</td><td>In position N: More than 1 MΩ</td></tr><tr><td>When in other position than N: 0 Ω</td></tr></table> • Checking of AT vehicles (1) Separate the inhibitor switch connector. (2) Operate the select lever and measure the resistance of both terminals of the inhibitor switch unit. <table><tr><td rowspan="2">Standard Data</td><td>In position P or N: More than 1 MΩ</td></tr><tr><td>When in other position than P or N: More than 1 MΩ</td></tr></table>
3. Check the harness and the connector between the ECU and the neutral switch (Continued to the next page)	• Check the harness lines between the ECU and the neutral switch Ⓐ In the case of vehicles with MT (1) Separate the ECU connector and the neutral switch connector. (2) Check the circuit open. Measure the resistance between the terminals of the ECU connector and the neutral switch connector. SOHC : Terminal (46) and (1) Turbo, DOHC : Terminal (45) and (2) <table><tr><td>Standard Data</td><td>0 Ω</td></tr></table>

(Continued from the previous page)

(3) Checking the short circuit
Measure the resistance between the terminals of the ECU connector or neutral switch connector and the body.

SOHC : Terminal (46) or (1) and the body ground
Turbo, DOHC : Terminal (45) or (2) and the body ground

Standard Data	More than 1 MΩ

Ⓑ In the case of AT vehicles
(1) Separate the connectors of the ECU and the inhibitor switch.
(2) Check the circuit open.
Measure the resistance between the connector terminals of the ECU and the inhibitor switch.

SOHC : Terminal (46) and (12)
Turbo, DOHC : Terminal (45) and (12)

Standard Data	0 Ω

(3) Check the short circuit.
Measure the resistance between the terminals of the ECU connector or the inhibitor switch connector and the body.

SOHC : Terminal (46) or (12) and the body ground
Turbo, DOHC : Terminal (45) or (12) and the body ground

Standard Data	More than 1 MΩ

• Checking between the neutral switch and the ground
Ⓐ In the case of MT vehicles
(1) Separate the ECU connector and the neutral switch connector.
(2) Measure the resistance between the terminal (2) of neutral switch connector and the body ground.

Standard Data	0 Ω

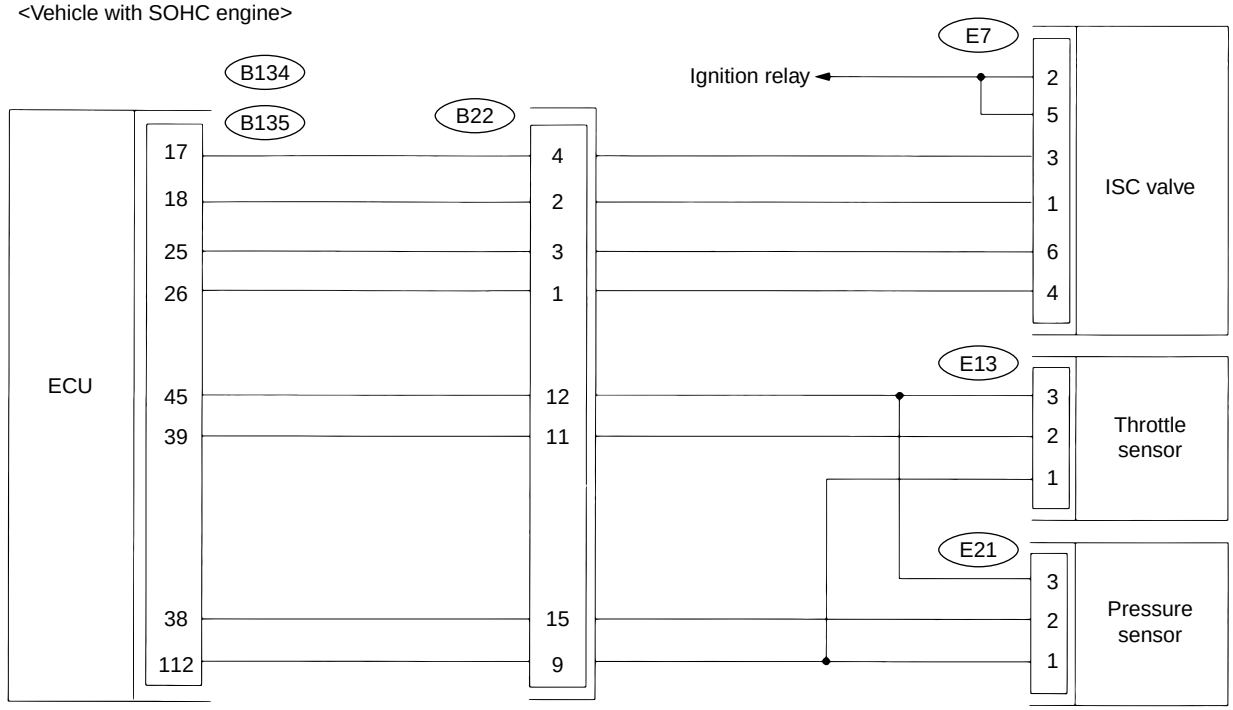
Ⓐ In the case of AT vehicles
(1) Separate the connectors of the ECU and the inhibitor switch.
Measure the terminal and the body.
Measure the resistance between the terminal (4) of inhibitor switch connector and the body ground.

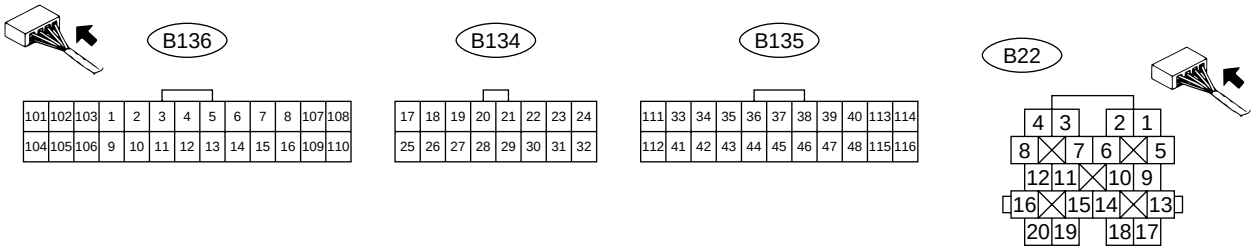
Standard Data	0 Ω

MEMO

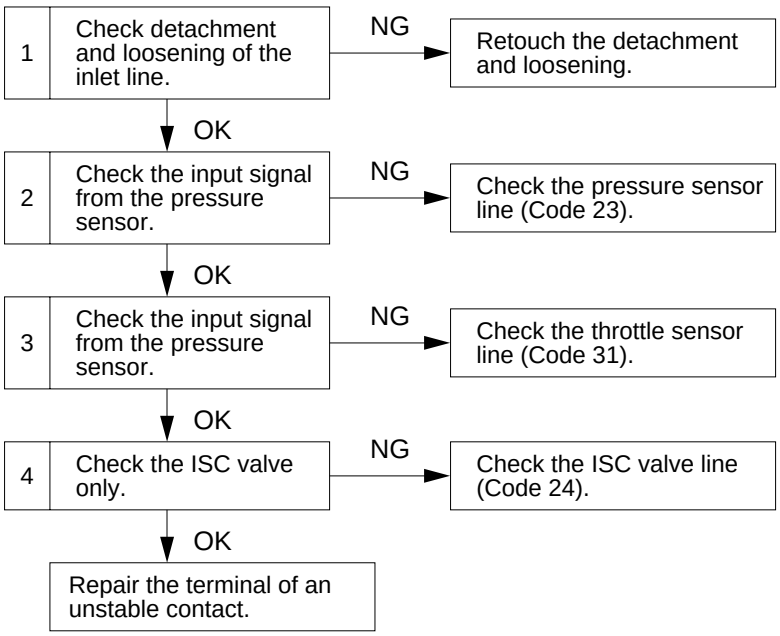
Code 54 Air Inlet line

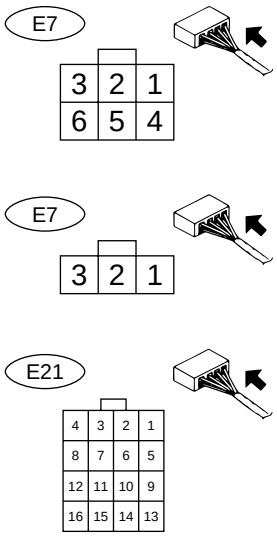
<Vehicle with SOHC engine>





• Check based on the flow chart and the procedure on the right page.





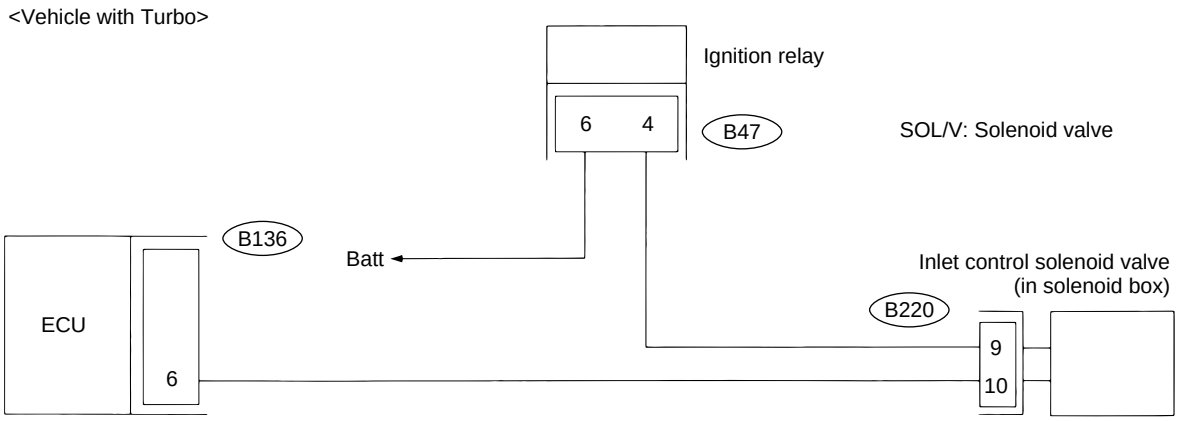
1. Checking the detachment and the loosening of the inlet line Check the following:	(1) Check if there is any crack, flaw, hole, etc. in the ducts and the chambers of the inlet line. (2) Check if there is any detachment of the ducts and the chambers of the inlet line. (3) Check if the ducts and the chambers are connected in the specified manner. (4) Check if the intake manifold is connected in the specified manner (Dropping off gasket, insufficient tightening torque, etc.). (5) Check if there is any coming off or slackening of hoses and nipples.

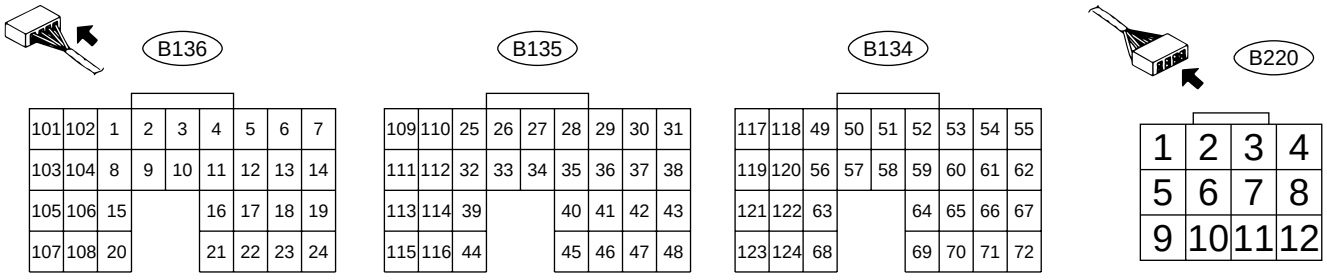
2. Checking the input signal from the pressure sensor	(1) Measure the voltage between the ECU connector terminal and the ground. Terminal (38) and the body ground Standard Data: When the ignition switch is turned ON: 3.4 ~ 3.6 V When the engine is in idling: 1.2 ~ 1.8 V

3. Checking the input signal from the throttle sensor	(1) Turn ON the ignition switch. (2) Measure the resistance of both the ECU terminals. Terminal (45) and (39) Standard Data: Accelerator fully closed: Approx. 0.6 V Accelerator fully opened: Approx. 4.0 V

4. Checking the ISC valve only	Standard Data: When touching the ISV valve under loaded condition, slight vibration must be felt for 1 second after the ignition switch is turned ON to OFF.

Code 61 Inlet control solenoid valve line





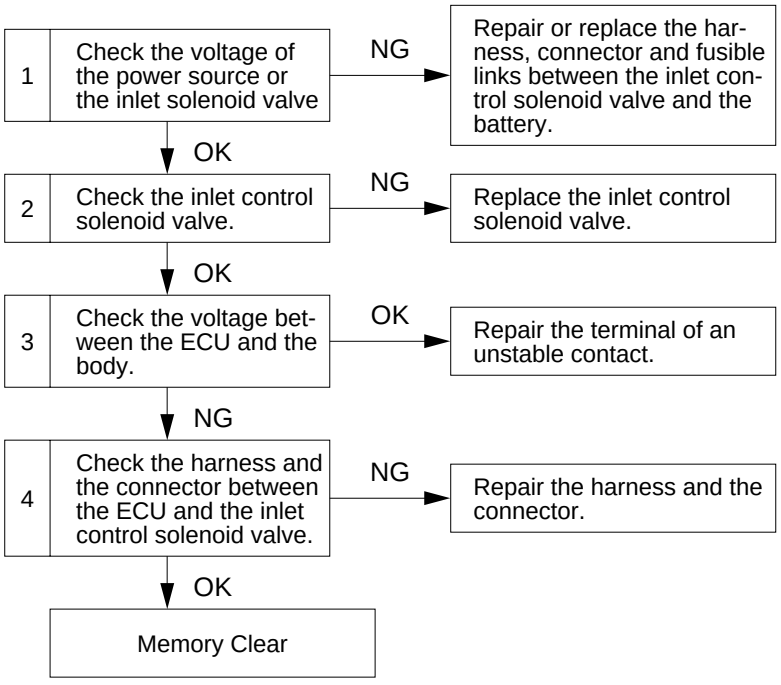
101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

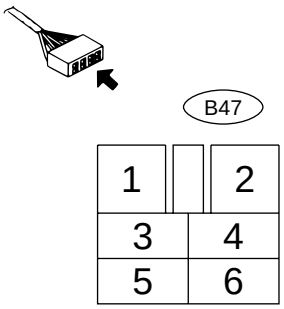
109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72

1	2	3	4
5	6	7	8
9	10	11	12

• Check based on the flow chart and the procedure on the right page.



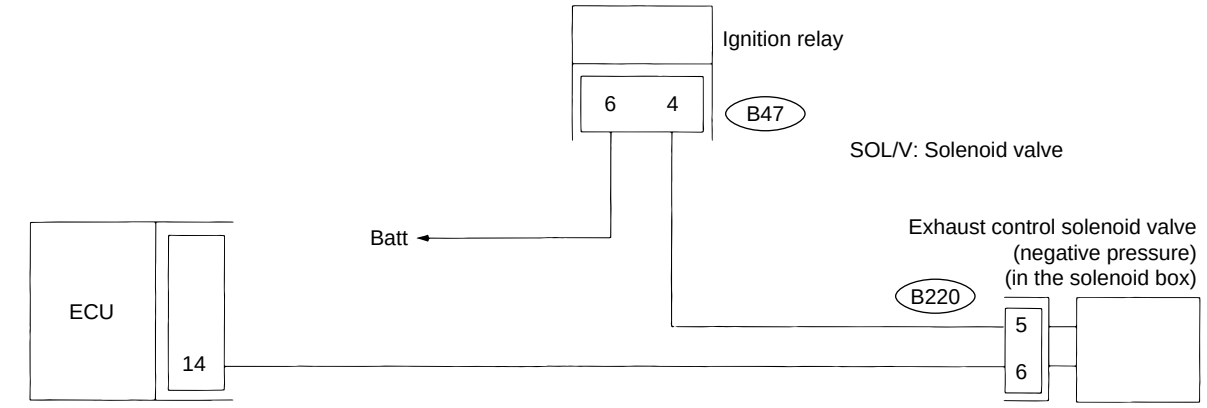


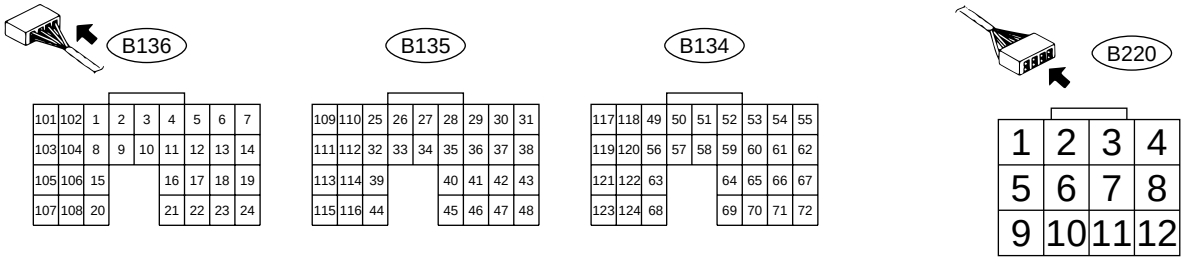
1		2
3		4
5		6

1. Checking the power source voltage of the inlet control solenoid valve	(1) Separate the solenoid box connector. (2) Turn ON the ignition switch (with the engine stopped) (3) Measure the voltage between the body side connector terminal and the body. Terminal (9) and the body ground Standard Data: 10 ~ 13 V
2. Checking the inlet control solenoid valve	(1) Separate the solenoid box connector. (2) Measure the resistance between the solenoid box side connector terminals. Terminal (9) and (10) Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage between the ECU terminal and the body. Terminal (6) and the body ground Standard Data: 10 ~ 13 V
4. Checking the harness and the connector between the ECU and the inlet control solenoid valve	(1) Separate the ECU connector and the solenoid box connector. (2) Measure the resistance between the ECU connector terminal and the solenoid box body side connector terminal. Terminal (6) and (10) Standard Data: 0 Ω

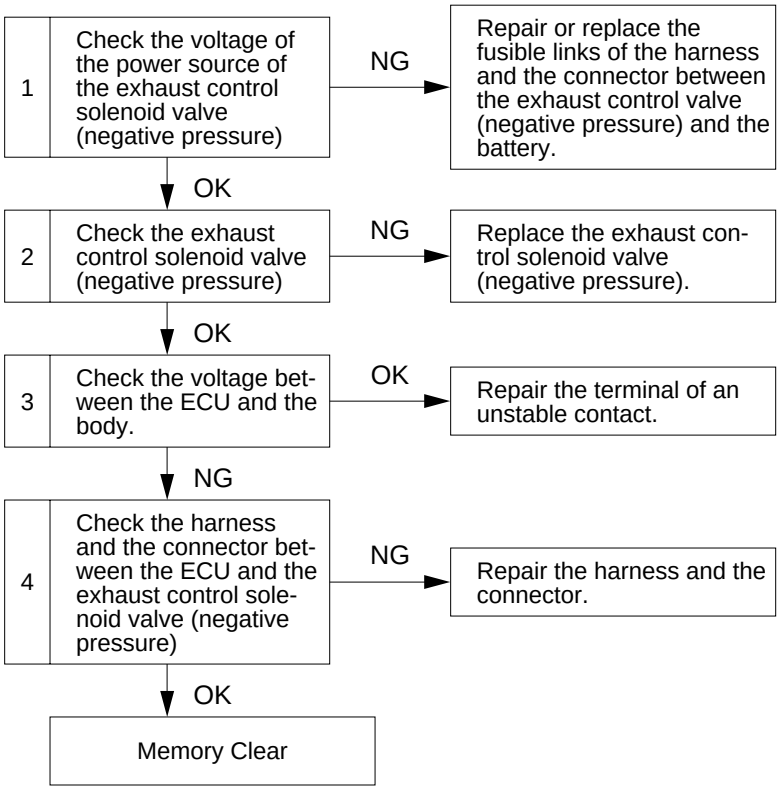
Code 62 Exhaust control solenoid valve (negative pressure) line

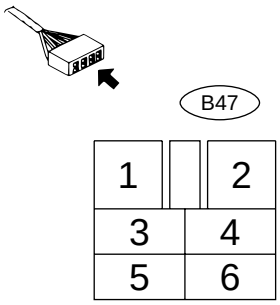
<Vehicle with Turbo>





• Check based on the flow chart and the procedure on the right page.

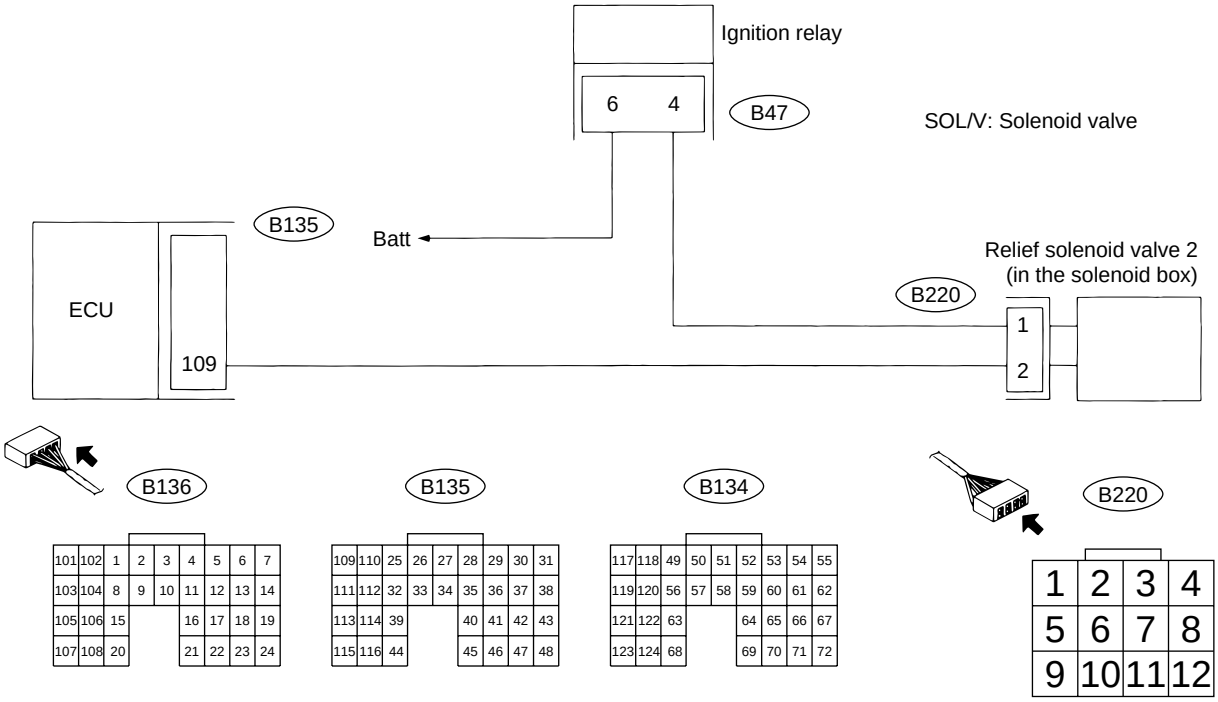




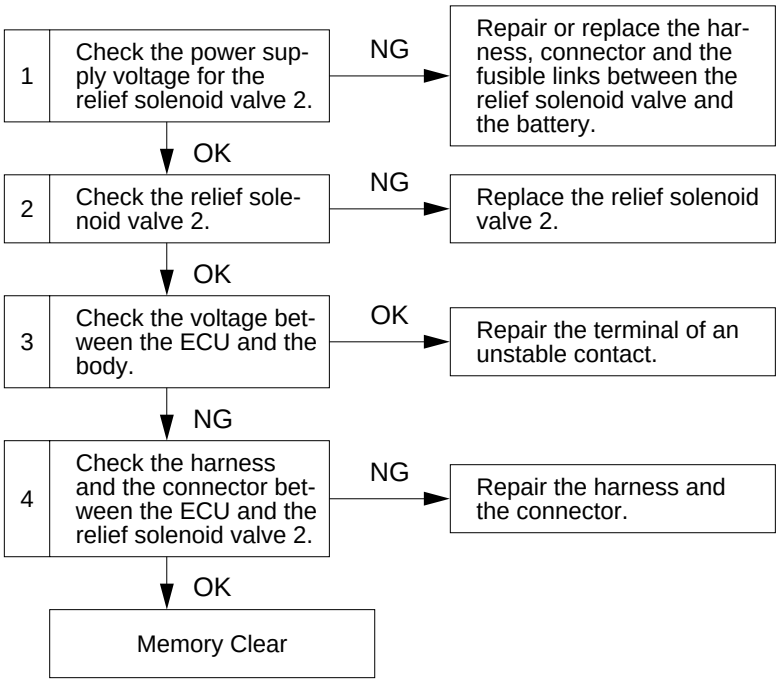
1. Checking the power source voltage of the exhaust control solenoid valve (negative pressure)	(1) Separate the solenoid box connector. (2) Turn ON the ignition switch (with engine stopped) (3) Measure the voltage between the body side connector terminal and the body ground. Terminal (5) and the body ground Standard Data: 10 ~ 13 V
2. Checking the exhaust control solenoid valve (negative pressure)	(1) Separate the solenoid box connector. (2) Measure the voltage between the connector terminals on solenoid box side. Terminal (5) and (6) Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage between the ECU terminal and the body. Terminal (14) and the body ground Standard Data: 10 ~ 13 V
4. Checking the harness and the connector between the ECU and the exhaust control solenoid valve (negative pressure)	(1) Separate the ECU connector and the solenoid box connector. (2) Measure the resistance of both the terminal (14) and (6) in the ECU and the connector of the body side solenoid box. Standard Data: 0 Ω

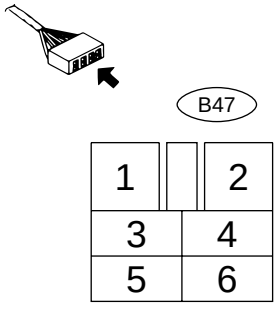
Code 63 Relief Solenoid Valve 2 Line

<Vehicle with Turbo>



• Check based on the flow chart and the procedure on the right page.

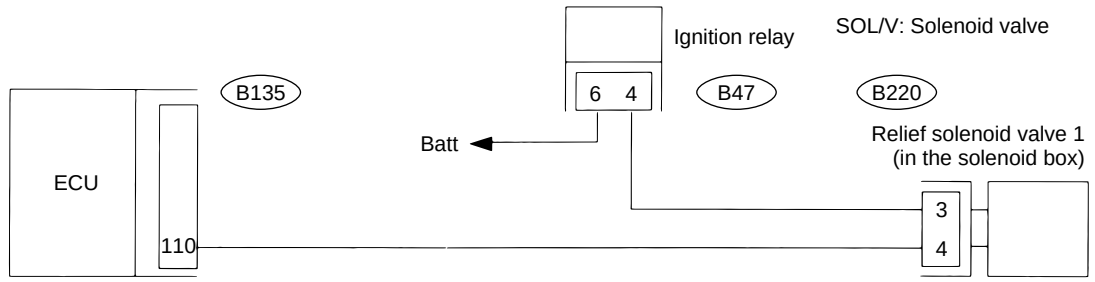


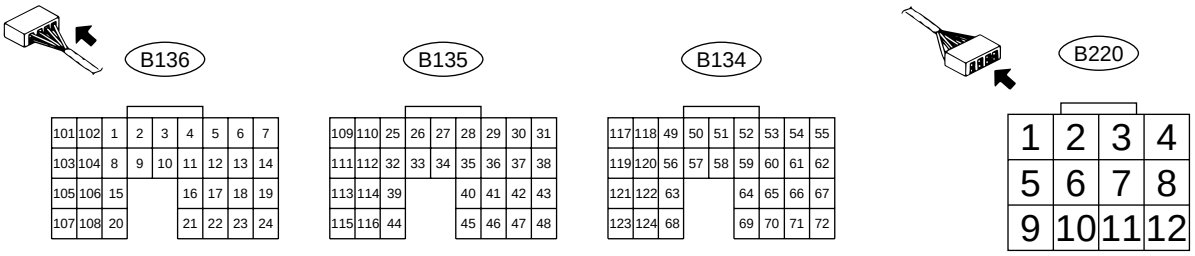


1. Checking the power source voltage of the relief solenoid valve 2	(1) Separate the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (1) in the body side connector and the body ground. Standard Data: 10 ~ 13 V
2. Checking the relief solenoid valve 2	(1) Separate the solenoid box connector. (2) Measure the resistance of both the terminal (1) and (2) in the solenoid box connector. Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (109) in the ECU connector and the body ground. Standard Data: 10 ~ 13 V
4. Checking the harness and the connector between the ECU and the relief solenoid valve	(1) Separate the ECU connector and the relief solenoid valve. (2) Measure the resistance of the terminal (109) in the ECU connector and the terminal (2) in the body side connector of the solenoid box. Standard Data: 0 Ω

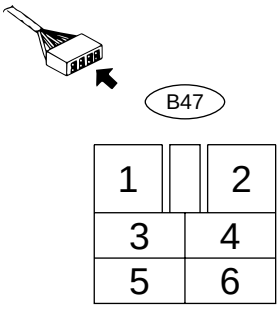
Code 64 Relief Solenoid Valve 1 Line

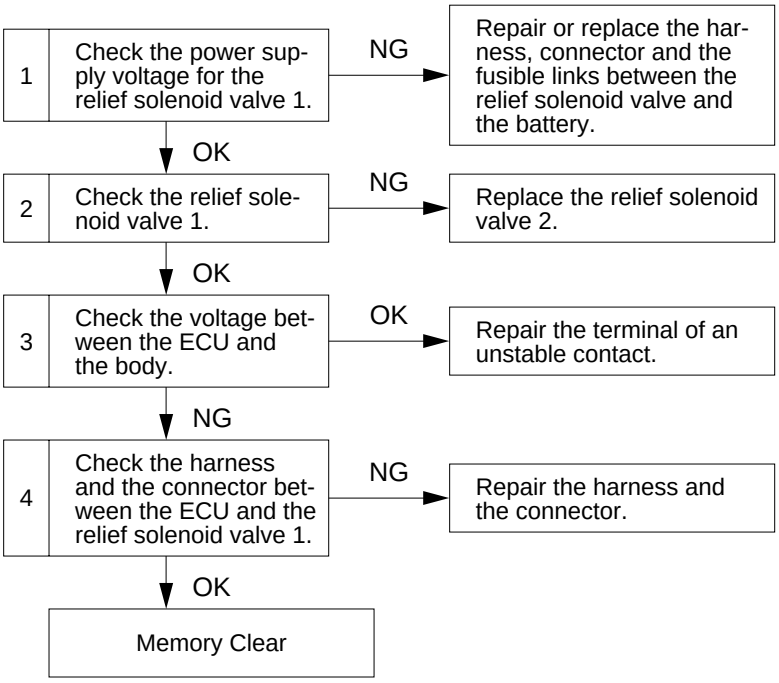
<Vehicle with Turbo>





• Check based on the flow chart and the procedure on the right page.

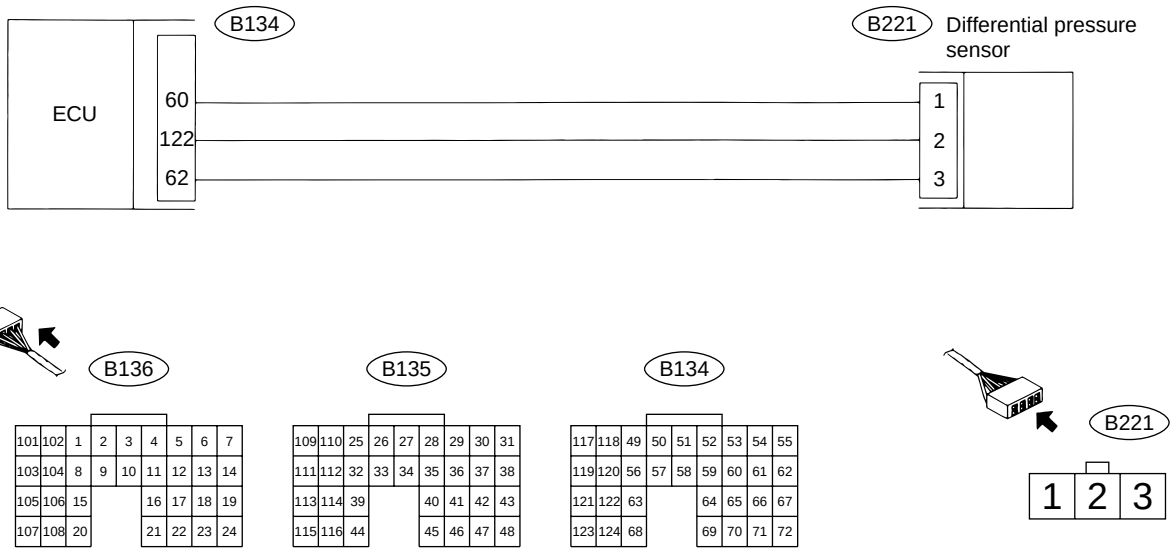




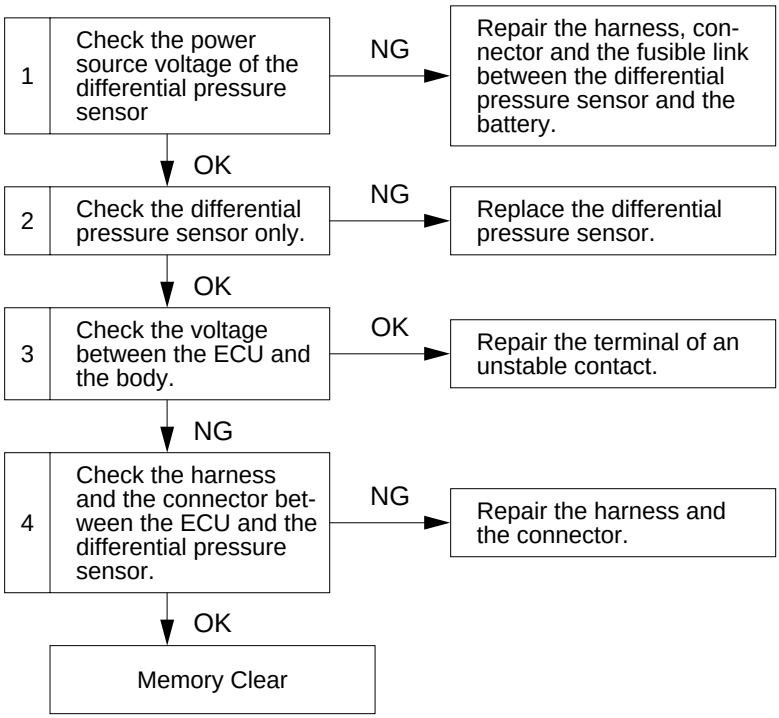
1. Checking the power source voltage of the relief solenoid valve 1	(1) Separate the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (3) in the body side connector and the body ground. Standard Data: 10 ~ 13 V
2. Checking the relief solenoid valve 1	(1) Separate the solenoid box connector. (2) Measure the resistance of both the terminal (3) and (4) in the solenoid box connector. Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (110) in the ECU connector and the body ground. Standard Data: 10 ~ 13 V
4. Checking the harness and the connector between the ECU and the relief solenoid valve 1	(1) Separate the ECU connector and the relief solenoid valve. (2) Measure the resistance both the terminal (110) in the ECU connector and the terminal (4) in the body side connector of the solenoid box Standard Data: 0 Ω

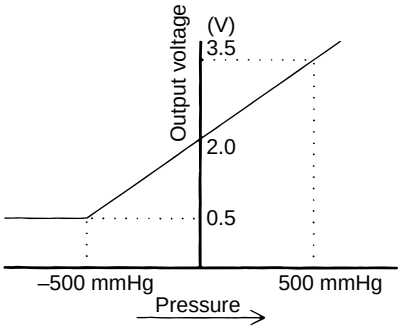
Code 65 Differential Pressure Sensor Line

<Vehicle with Turbo>



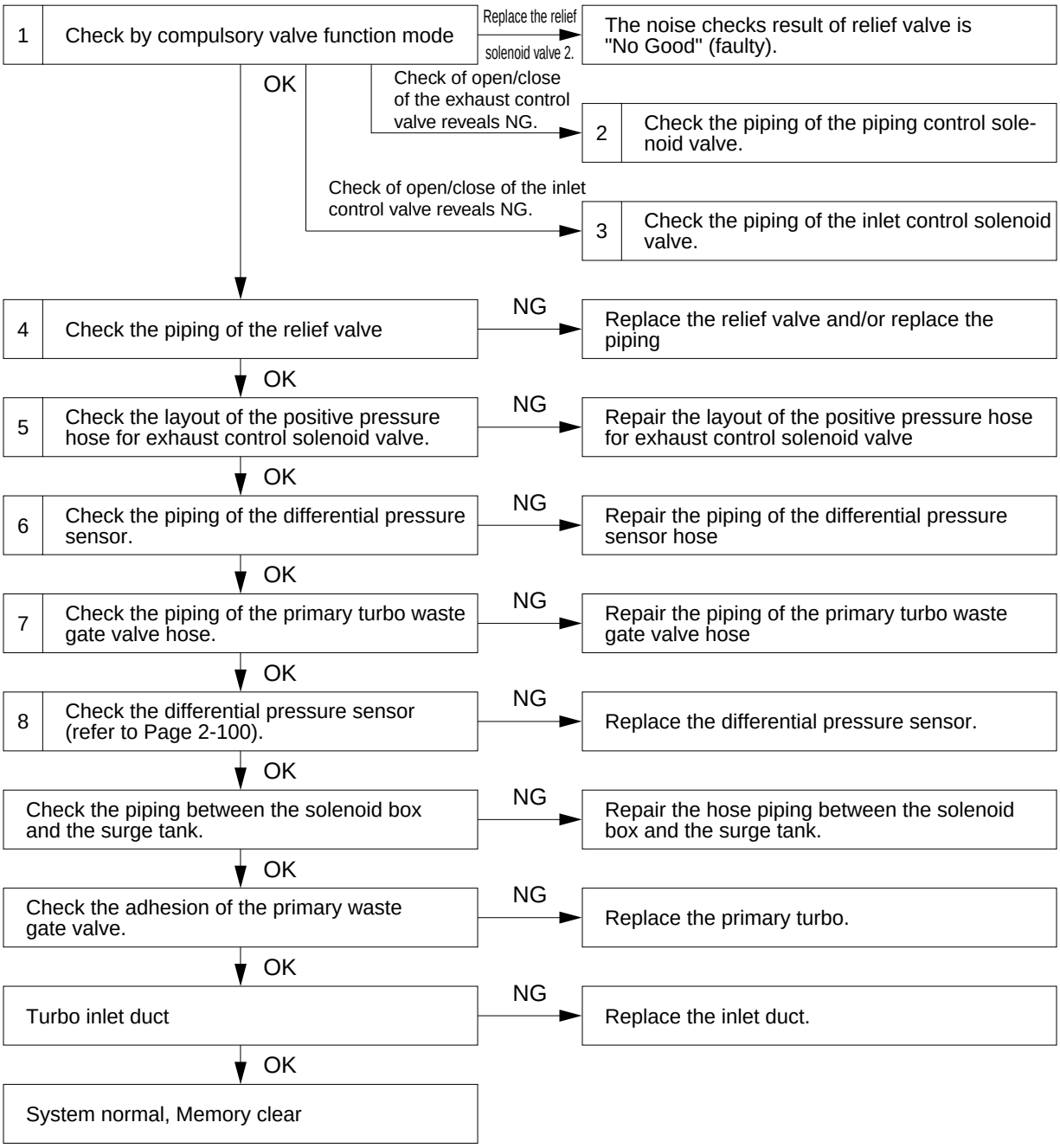
• Check based on the flow chart and the procedure on the right page.



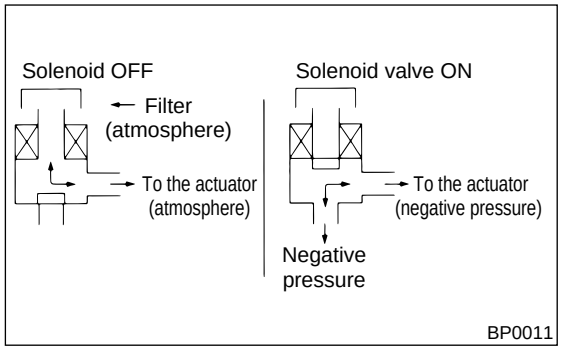
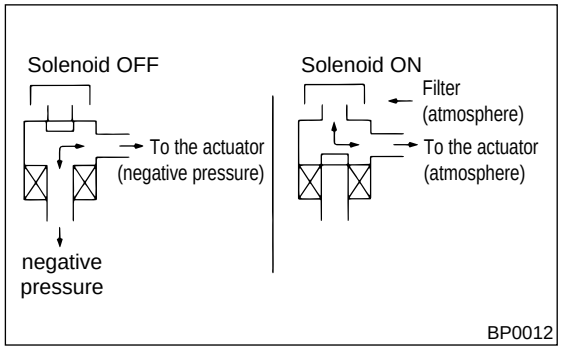
1. Checking the power source of the differential pressure sensor	(1) Separate the connector of the differential pressure sensor. (2) Turn ON the ignition switch. (3) Measure the voltage between the connector terminals (1) and (2) of the differential pressure sensor. Standard Data: Approx. 5 V
2. Checking the pressure sensor only	(1) Separate the differential pressure sensor. (2) Apply 5 V to The differential pressure terminals (1) ⊕ and (2) ⊖ (3) Connect Mighty Pack to the pressure introducing port. (4) Measure the voltage of both the terminal (3) and (2) of the differential pressure sensor. Standard Data: The output voltage should change as shown below. 
3. Checking the voltage between the ECU and the body.	(1) Connect the differential pressure sensor connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (60) in the ECU connector and the body ground. Standard Data: Approx. 5 V
4. Checking the harness and the connector between the ECU and the differential pressure sensor	(1) Separate the ECU connector and the differential pressure sensor connector. (2) Measure the resistance between the ECU connector terminal and the differential pressure sensor connector terminal. Terminal (60) and (1) Terminal (62) and (3) Terminal (122) and (2) Standard Data: 0 Ω

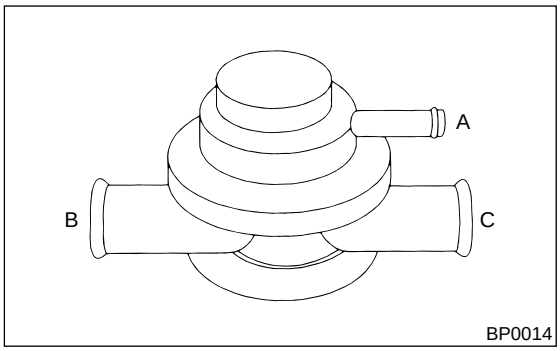
Code 66 Twin-turbo System

• Check based on the flow chart.



1. Check by compulsory valve function mode	(1) Preparatory stage ① Warm up the engine. ② Turn OFF the ignition switch. ③ Connect the D check connector. ④ Connect the Select Monitor. ⑤ Start the engine and run it in idling. (1) Operate the valve using the Select Monitor. • Select System Operation Check Mode and perform operation according to the screen display ① Checking the relief valve Check if operating noise of the relief solenoid valve is audible from the solenoid box. (The solenoid valve repeats ON/OFF with a cycle of 2 seconds.) ② Checking the exhaust control valve Check if the rod of the exhaust control valve main actuator is operating. (The rod operates repeatedly with a cycle of approx. 7 seconds, stroke being approx. 30 mm.) ③ Checking the inlet control valve Check if the rod of the inlet control valve main actuator is operating. (The rod operates repeatedly with a cycle of approx. 2 seconds, stroke being approx. 12 mm.) ④ End **Caution** The compulsory valve mood is temporally released, when the connector for D-check is separated, or the idling condition is released. <Reference> If the accelerator pedal is released during this operation mode, the valve ceases to operate, but it starts again to operate when it is released.

2. Checking the piping of the exhaust control solenoid valve	(1) Check the exhaust control solenoid valve (negative pressure)  Check if the solenoid valve operates as shown in the illustration above. (2) Check the negative pressure piping of the exhaust control valve. Check if the piping of the exhaust control valve negative pressure hose is correctly done and if there is any clogging of the piping. (3) Check the valve operation negative pressure piping. Check if the piping of the valve operation negative pressure hose is correctly done and if there is any clogging of the piping.
3. Checking the inlet control solenoid valve piping	(1) Check the inlet control solenoid valve.  Check if the solenoid valve operates as shown in the illustration above. (2) Check the vacuum piping of the inlet control valve. Check if the piping of the inlet control vacuum hose is correctly done and if there is any clogging of the piping. (3) Check the valve operation negative pressure piping. Check if the piping of the valve operation negative pressure hose is correctly done and if there is any clogging of the piping.

4. Relief	(1) Check of the relief valve vacuum piping Check if the relief valve vacuum hose is correctly done and if there is any clogging in the piping. (2) Check sticking of the relief valve.  ① Connect Mighty Pack to port A. ② Confirm that there is air conduction between B and C when a negative pressure of approx. 33.5 kPa (250 mmHg) is applied. (3) Check the relief valve operation negative pressure piping Check if the piping of the relief valve operation negative pressure hose is correctly done and if there is any clogging of the piping.

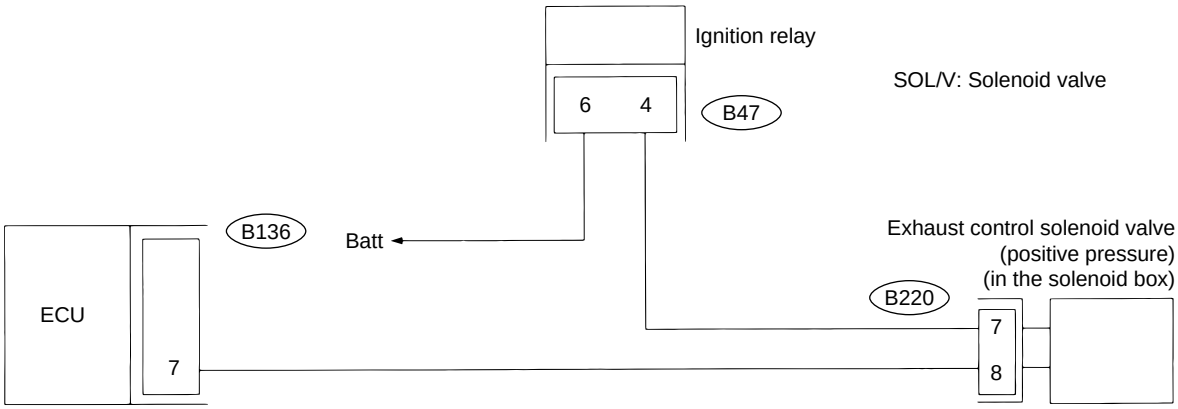
5. Checking the piping of the exhaust control solenoid valve (positive pressure) hose	• Check if the piping of the exhaust control solenoid valve (positive pressure) is correctly done and if there is any clogging of the piping.

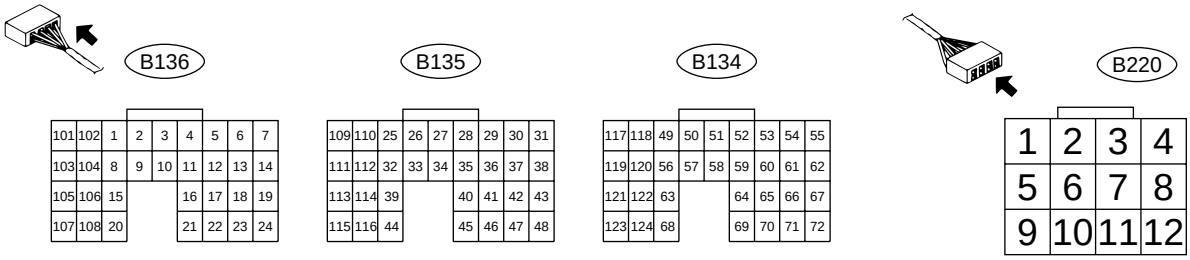
6. Checking the piping of the differential pressure sensor hose	• Check if the piping of the differential pressure sensor hose is correctly done and if there is any clogging of the piping.

7. Checking the piping of the primary turbo waste gate valve hose	• Check if the piping of the primary turbo waste gate valve hose is correctly done and if there is any clogging of the piping.

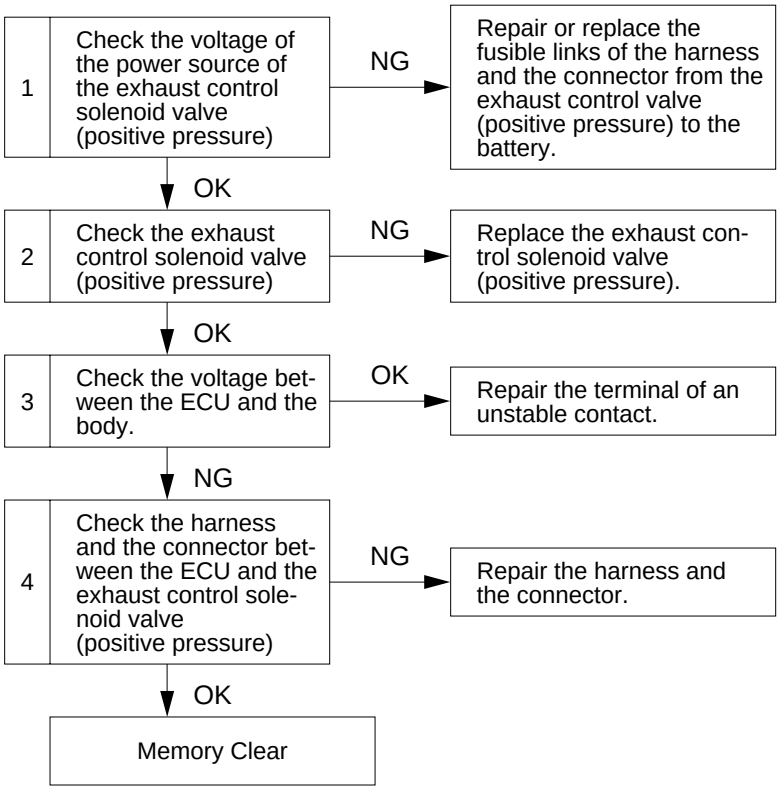
Code 67 Exhaust Control Solenoid Valve (Positive Pressure) Line

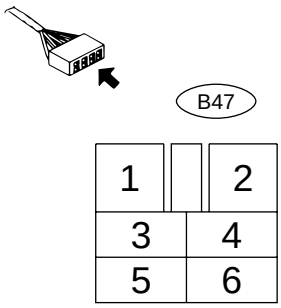
<Vehicle with Turbo>





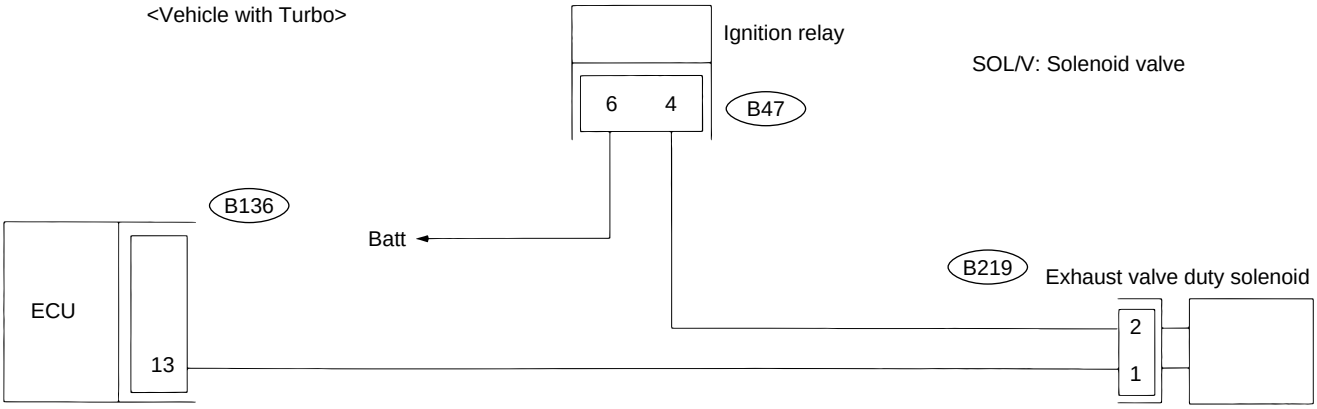
• Check based on the flow chart and the procedure on the right page.

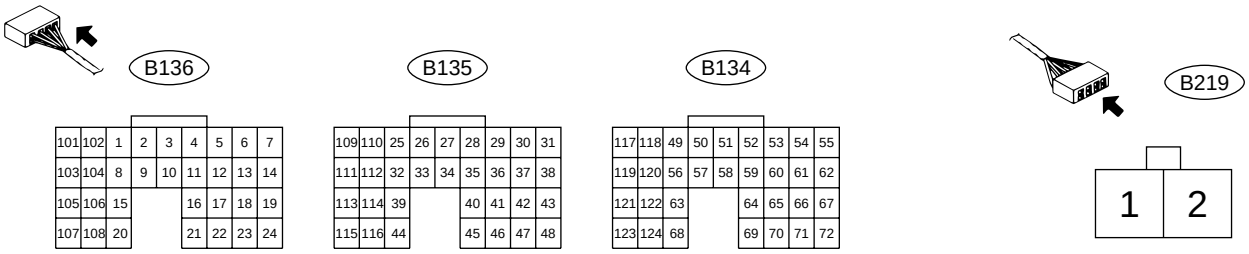


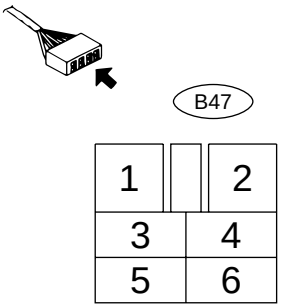


1. Checking the power source voltage of the exhaust control solenoid valve (positive pressure)	(1) Separate the solenoid box connector. (2) Turn ON the ignition switch (3) Measure the voltage of both the terminal (7) in body side connector and the body ground. Standard Data: 10 ~ 13 V
2. Checking the power source voltage of the exhaust control solenoid valve (positive pressure)	(1) Separate the solenoid box connector. (2) Measure the voltage of both the terminal (7) and (8) in the solenoid box side connector. Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the solenoid box connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (7) in the ECU and the body ground. Standard Data: 10 ~ 13 V
4. Checking the harness and the connector between the ECU and the exhaust control solenoid valve (positive pressure)	(1) Separate the ECU connector and the solenoid box connector. (2) Measure the resistance of both the terminal (7) and (8) in the ECU and the connector on the body side solenoid box. Standard Data: 0 Ω

Code 68 Exhaust Valve Duty Solenoid Line





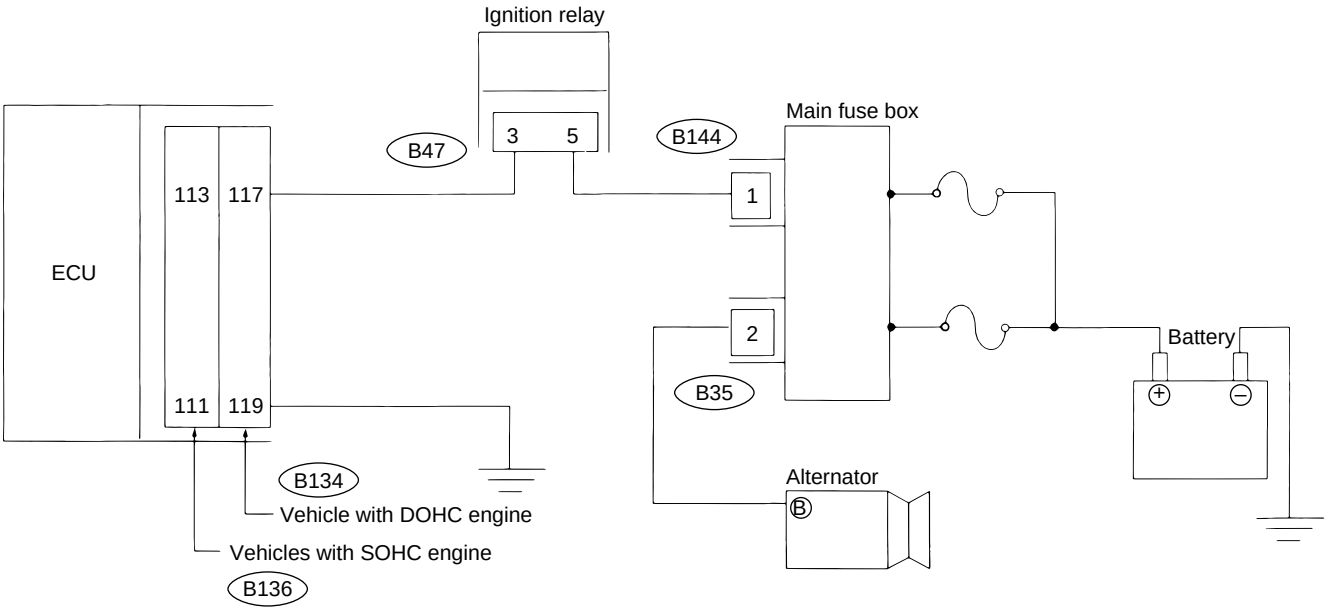


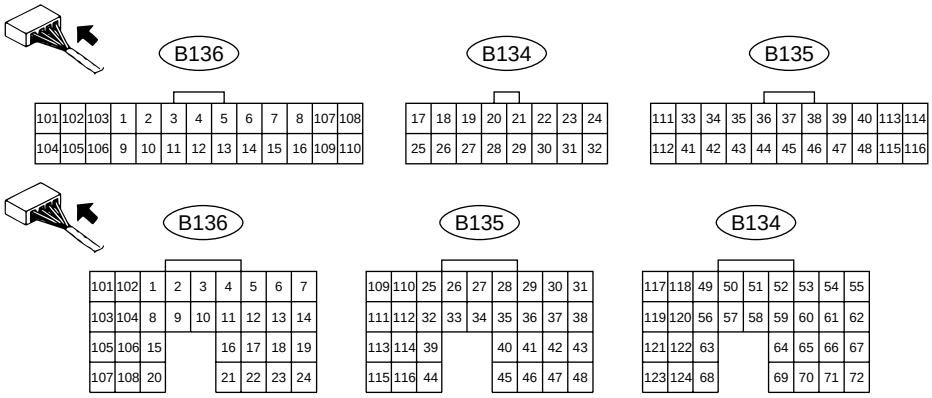
• Check based on the flow chart and the procedure on the right page.

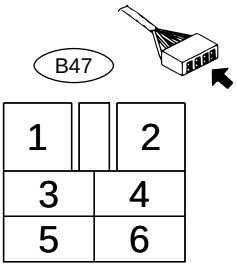
1	Check the voltage of both the terminals in the ECU and the body.	OK	Repair the terminal of an unstable contact.
		NG	
2	Check the exhaust valve duty solenoid valve.	NG	Replace the exhaust valve duty solenoid valve
		OK	
3	Check the harness and the connector between the ECU and the exhaust valve duty solenoid valve, as well as between the exhaust valve duty solenoid valve and the battery.	NG	Repair the harness and the connector.
		OK	
	Memory Clear.		

1. Checking the voltage between the ECU and the body	(1) Turn ON the ignition switch. (2) Measure the voltage of the terminals in the ECU and the body. Terminal (13) and the body ground Standard Data: 10 ~ 13 V
2. Checking the exhaust valve duty solenoid valve	(1) Separate the connector of the exhaust valve duty solenoid valve. (2) Measure the resistance of the terminal (2) and (1) in the solenoid valve. Standard Data: 17 ~ 21 Ω
3. Check the harness and the connector between the ECU and the exhaust valve duty solenoid valve, as well as between the exhaust valve duty solenoid valve and the battery.	• Check the harness and the connector between the ECU and the exhaust valve duty solenoid valve (1) Separate the connectors at both ends. (2) Check the disconnection of the harness line. Measure the resistance between the ECU connector terminal and the solenoid valve connector terminal. Terminal (13) and (1) Standard Data: 0 Ω (3) Check a short circuit. Measure the resistance of both the terminals in the ECU connector or the solenoid valve connector and the body. Terminal (13) or (1) and the body ground Standard Data: More than 1 MΩ • Check between the exhaust valve duty solenoid valve and the ignition relay (1) Separate the connectors at both ends. (2) Check the disconnection of the harness line. Measure the resistance between the solenoid valve connector terminal and the ignition relay connector terminal. Terminal (2) and (4) Standard Data: 0 Ω

Code 85 Charging Line

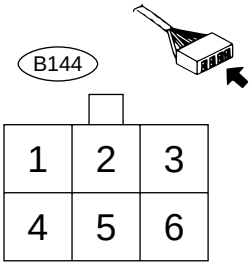


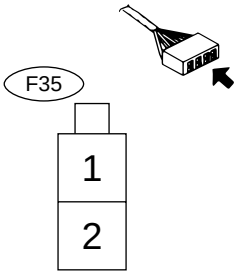




• Check based on the flow chart and the procedure on the right page.

1	Check the battery.	NG	Replace the battery.
	OK		
2	Check the alternator.	NG	Repair the alternator.
	OK		
3	Check the input voltage of the alternator.	NG	Repair the power source and the ground circuit.
	OK		
4	Check the terminal Ⓑ circuit of the alternator.	NG	Check the alternator circuit.
	OK		
	Repair the terminal of an unstable contact.		

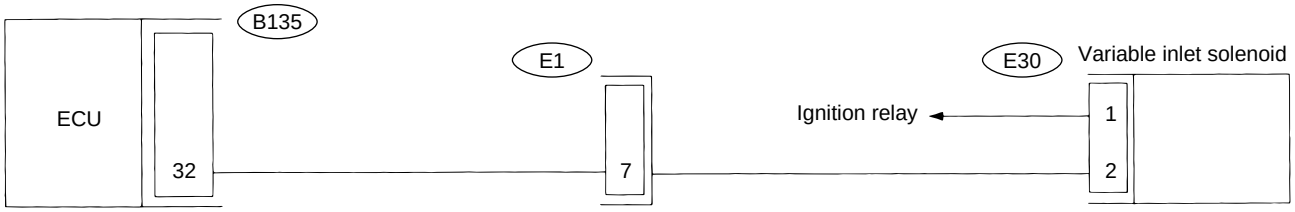


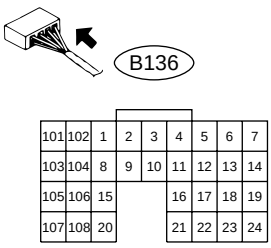


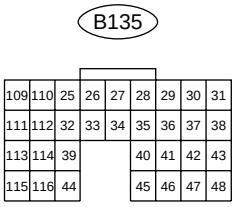
1. Check the battery	(1) Check the voltage and the density of the battery. Standard Data: Voltage 12 V; Liquid gravity 1.26
2. Checking the alternator	(1) Remove the terminal Ⓑ of the alternator. (2) Start the engine and keep it on idling. (3) Measure the voltage between the terminal Ⓑ of the alternator and the ground of the engine. Standard Data: 13 ~ 16 V
3. Check the input voltage of the ECU	(1) Separate the ECU connector. (2) Turn ON the ignition switch. (3) Measure the voltage of both the terminals in the ECU connector. Vehicle with SOHC engine :Terminal (113) and (111) Vehicle with DOHC engine :Terminal (117) and (119) Standard Data: Voltage of the battery (10 ~ 15 V)
4. Checking the terminal Ⓑ of the alternator	(1) Remove the terminal ⊖ of the battery. (2) Remove the terminal Ⓑ of the alternator. (3) Separate the F35 connector of the main fuse box. (4) Measure the resistance between the alternator side harness terminal and the F35 connector terminal. Standard Data: Conductivity (less than 0.5 Ω)

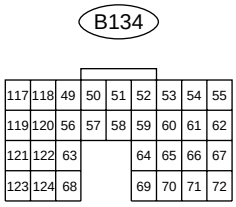
Code 87 Variable Inlet Air Solenoid Valve

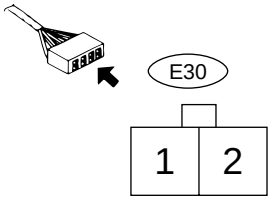
<2 l DOHC valve vehicle>



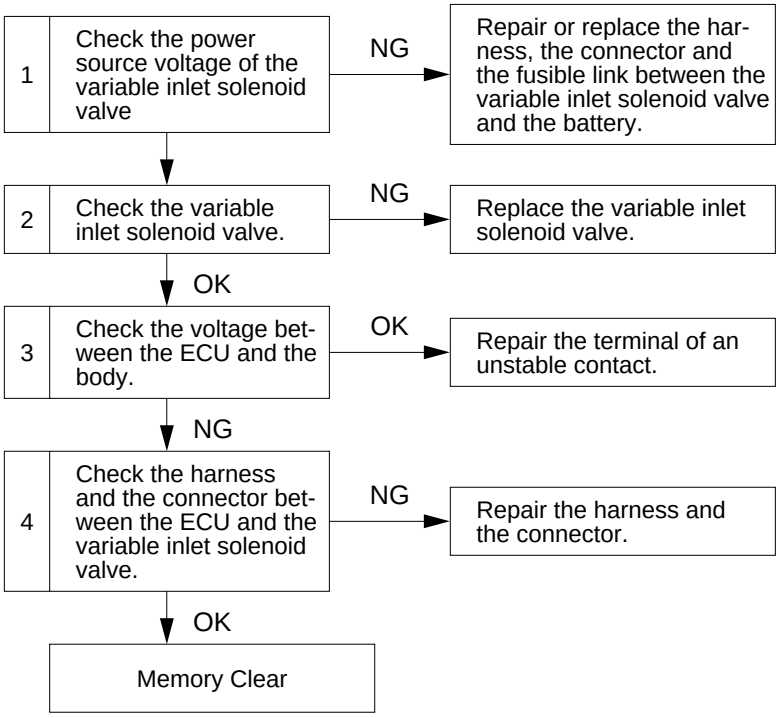


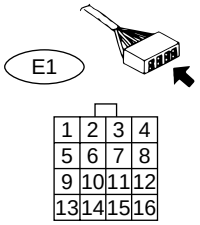






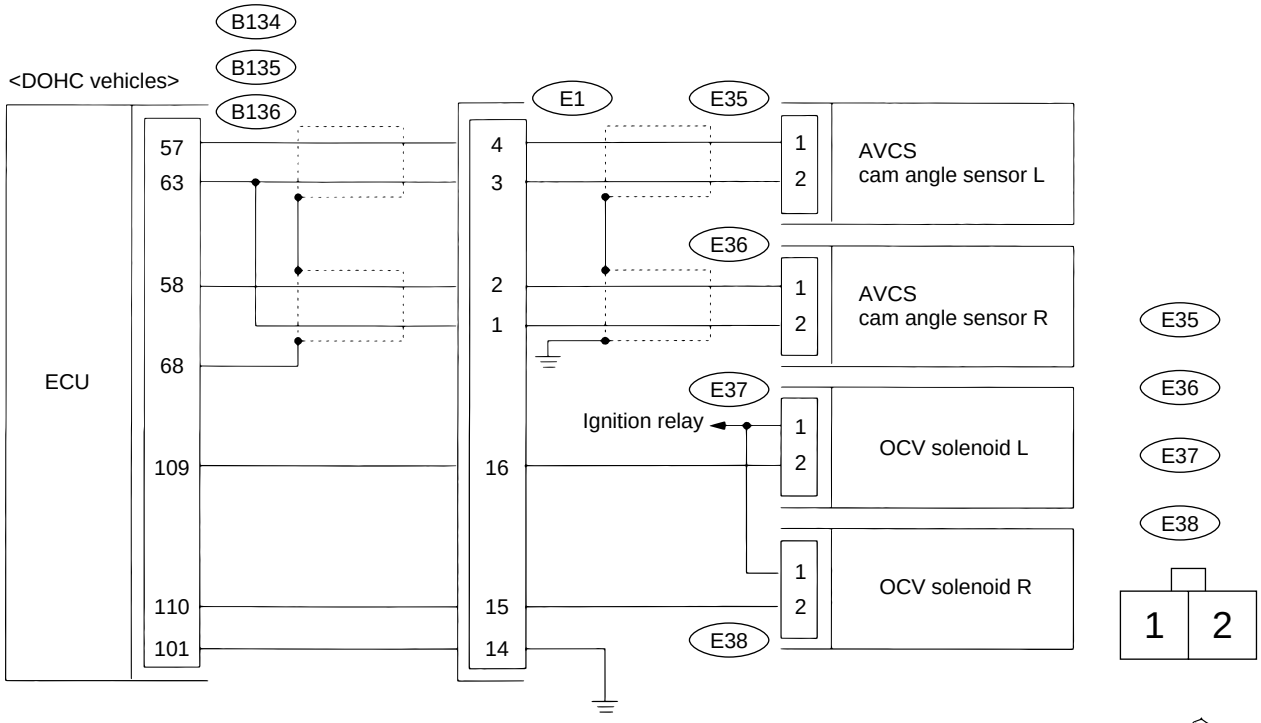
• Check based on the flow chart and the procedure on the right page.



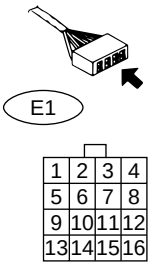


1. Checking the power source voltage of the variable inlet solenoid valve	(1) Separate the connector of the variable solenoid valve. (2) Turn ON the ignition switch (with engine stopped). (3) Check the voltage of the terminal (1) in the body side connector and the body ground. Standard Data: 10 ~ 13 V
2. Checking the variable inlet solenoid valve	(1) Separate the connector of the variable solenoid valve. (2) Measure the resistance between connector terminals of the variable inlet solenoid valve. Standard Data: 37 ~ 44 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the variable inlet valve connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (32) in the ECU terminal and the body ground. Standard Data: 10 ~ 13 V
4. Checking the harness and the connector	(1) Separate the ECU connector and the connector of the variable inlet solenoid valve. (2) Measure the resistance of both the terminals in the ECU connector and the connector of the variable inlet solenoid valve. Terminal (32) and (2) Standard Data: 0 Ω (3) Measure the voltage of the terminal (32) in the ECU connector and the body ground. Standard Data: More than 1 MΩ

Code 89 AVCS System



• Check based on the flow chart and the procedure on the right page.



1. Check the OCV solenoid using the SSM (Subaru Select Monitor).
   - OK → Pass down to the item 5
   - NG ↓
2. Check the voltage of the OCV solenoid.
   - NG → Repair the harness and the connector.
   - OK ↓
3. Check the harness and the connector from the ECU to the OCV solenoid.
   - NG → Repair the harness and the connector.
   - OK ↓
4. Check the OCV solenoid
   - NG → Replace the OCV solenoid
   - OK ↓

Repair the terminal of an unstable contact.

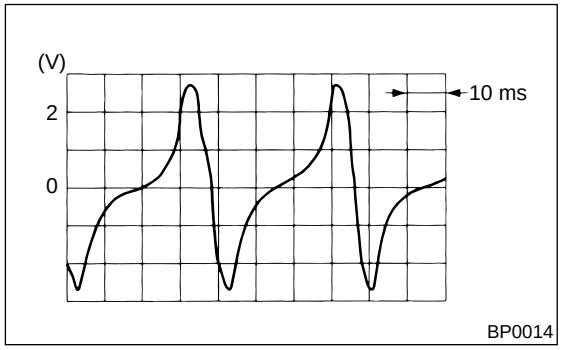
5. Check the cam-advanced angle by using the SSM.
   - OK → Repair the harness and the connector.
   - NG (Advanced angle changes, but it is out of standard range) → Check and repair sticking of OCV solenoid circuit as well as hydraulic circuit.
   - NG (No good) (Advance angle does not change.) ↓
6. Check the harness and the connector between the ECU and the AVCS cam angle sensor.
   - NG → Repair the harness and the connector.
   - OK ↓
7. Check the AVCS cam angle sensor.
   - NG → Replace the cam angle sensor.
   - OK ↓

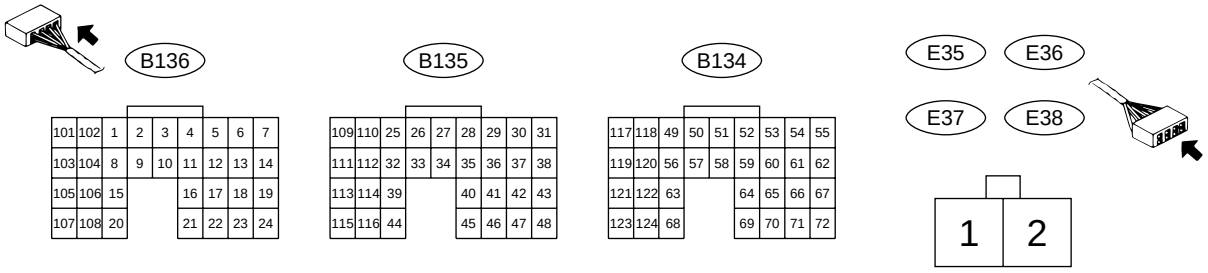
Check and repair the sticking of OCV solenoid valve, as well as the hydraulic circuit.

1. Checking the OCV solenoid using the SSM	(1) Warm up the engine. (2) Connect SSM (3) Select "Data display" of "the individual system". (4) Run the vehicle at the speed less than 30 km/h and then check both the current of the OCV solenoid duty (R & L) and the OCV current (R & L). Standard Data: Duty should change within the range of 30 ~ 50 %, while the current should change within the range of 100 ~ 300 mA. The current should increase when the duty decreases and the current should tend to decrease when the duty increases, it is confirmed by Comparing the duty L with the current L and the duty R with the current R.
2. Checking the voltage of the OCV solenoid	(1) Separate the OCV solenoid connector. (2) Turn ON the ignition switch. (3) Check the voltage of the terminal (1) in the OCV solenoid connector and the body ground. Standard Data: 10 ~ 13 V
3. Checking the harness and the connector between the ECU and the OCV solenoid	(1) Turn OFF the ignition switch. (2) Separate the ECU connector and the OCV solenoid connector. (3) Measure the resistance between the ECU connector terminal and the OCV solenoid connector terminal L : Terminal (109) and (2) R : Terminal (110) and (2) Standard Data: 0 Ω (4) Measure the resistance between the ECU connector terminal and the body ground. L : Terminal (109) or (2) and the body ground R : Terminal (110) or (2) and the body ground Standard Data: More than 1 MΩ
4. Checking the OCV solenoid	(1) Separate the OCV solenoid connector. (2) Measure the resistance between the terminals of the OCV solenoid main body. Standard Data: 6 ~ 12 Ω

5. Checking AVCS advance angle using the SSM	(1) Connect all the connectors. (2) Warm up the engine. (3) Connect the SSM. (4) Select the "Data display" of "the individual system". (5) Run the vehicle at the speed less than 30 km/h, and then check the AVCS advanced angle at this time. Standard Data: When idling : –25 ~ –15 deg. When running : –25 ~ +15 deg. It should change smoothly with the change of engine output.

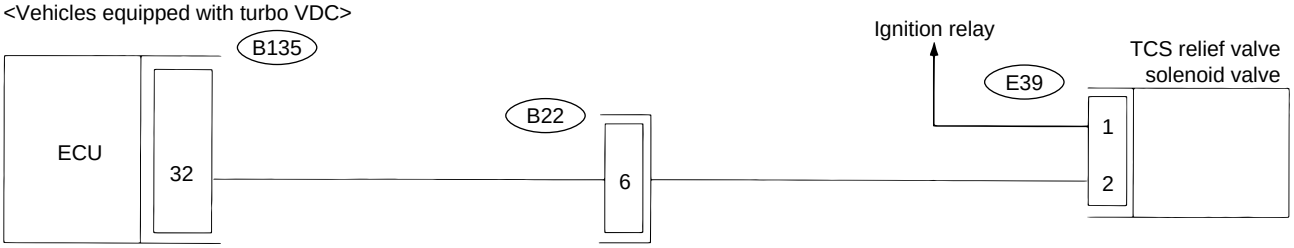
6. Check the harness and the connector between the ECU and the cam angle sensor	(1) Turn ON the ignition switch. (2) Separate both the connectors of the ECU and the AVCS cam angle sensor. (3) Measure the resistance of both the terminals in the ECU connector and the connector of AVCS cam angle sensor. L : Terminal (57) and (1) R : Terminal (58) and (1) Standard Data: 0 Ω (4) Measure the resistance of the terminal in the ECU connector and the ground. L : Terminal (57) and the body ground R : Terminal (58) and the body ground Standard Data: More than 1 MΩ

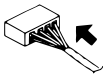
7. Checking the AVCS cam angle sensor.	(1) Separate the connector of the AVCS cam angle sensor. (2) Measure the resistance between the terminals of the AVCS cam angle sensor main body. Standard Data: 2040 ± 200 Ω (3) Connect all the connectors. (4) Lift up the vehicle and fix it firmly on the floor by using safety stands, etc. (5) Connect oscilloscope terminals to the terminals in ECU connector, and check the waveform. L : Terminal 57 and 63 R : Terminal 8 and 63 • Example of oscilloscope display (when idling) 



Code 91 TCS Relief Valve Solenoid Line

<Vehicles equipped with turbo VDC>





B136

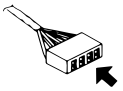
101	102	1	2	3	4	5	6	7
103	104	8	9	10	11	12	13	14
105	106	15			16	17	18	19
107	108	20			21	22	23	24

B135

109	110	25	26	27	28	29	30	31
111	112	32	33	34	35	36	37	38
113	114	39			40	41	42	43
115	116	44			45	46	47	48

B134

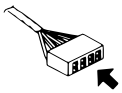
117	118	49	50	51	52	53	54	55
119	120	56	57	58	59	60	61	62
121	122	63			64	65	66	67
123	124	68			69	70	71	72



E39

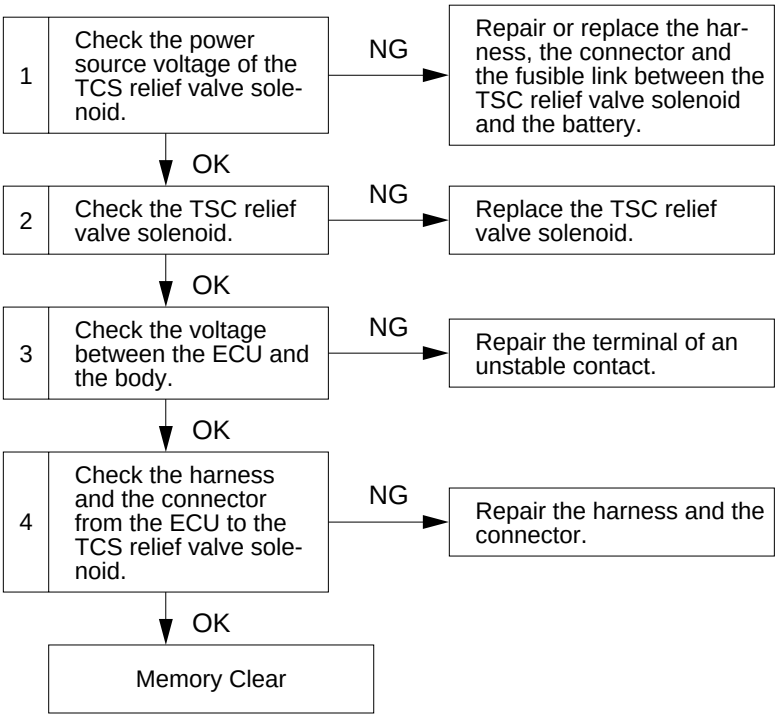
1	2

• Check based on the flow chart and the procedure on the right page.



B22

1	2		3	4
5		6	7	8
9	10		11	12
13		14	15	16
17	18		19	20



1. Checking the power source voltage of the TCS relief valve solenoid	(1) Separate the connector of TCS relief valve solenoid. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (1) in the connector of the TCS relief valve solenoid, and the body ground. Standard Data: 10 ~ 13 V
2. Check the TCS relief valve solenoid	(1) Separate the connector of the TCS relief valve solenoid. (2) Measure the resistance both the terminal (1) and (2) of the solenoid main body connector of the TCS relief valve. Standard Data: 30 ~ 36 Ω
3. Checking the voltage between the ECU and the body	(1) Connect the TCS relief valve solenoid connector. (2) Turn ON the ignition switch. (3) Measure the voltage of the terminal (32) in the ECU and the body ground. Standard Data: 10 ~ 13 V
4. Check the harness and the connector from the ECU to the TCS relief valve solenoid	(1) Separate the connectors of the ECU and the relief valve solenoid of the TCS. (2) Measure the resistance between the terminal (32) in the ECU connector and the terminal (2) in the connector of the TCS relief valve solenoid. Standard Data: 0 Ω

[5] Inspection using Select Monitor

■ Outline of the function

The Select Monitor is available for diagnosing the electronic control line by measuring the following items.

Data display	Directly displays the input/output signal data, makes it possible to diagnose the sensor signal lines by comparing them with standard data and to judge short circuit and abnormal characteristics of the sensors, etc.
LED display	Makes it possible to judge ON/OFF of the input/output signals and the operating condition by turning ON of the LED.
Diagnosis code display D check	Displays U check and D check by the diagnosis codes in the backup memory. In the case of D check, it displays the diagnosis code after having finished the self-diagnosis procedure.
Memory Clear	Can clear the memories the diagnosis codes in the backup memory.

It is possible to measure the characteristics of the sensors and the actuators, to compare them with the standard data. In addition, it is possible to check the items that are the causes of troubles, through selecting the items in "Data display" in the Select Monitor function.

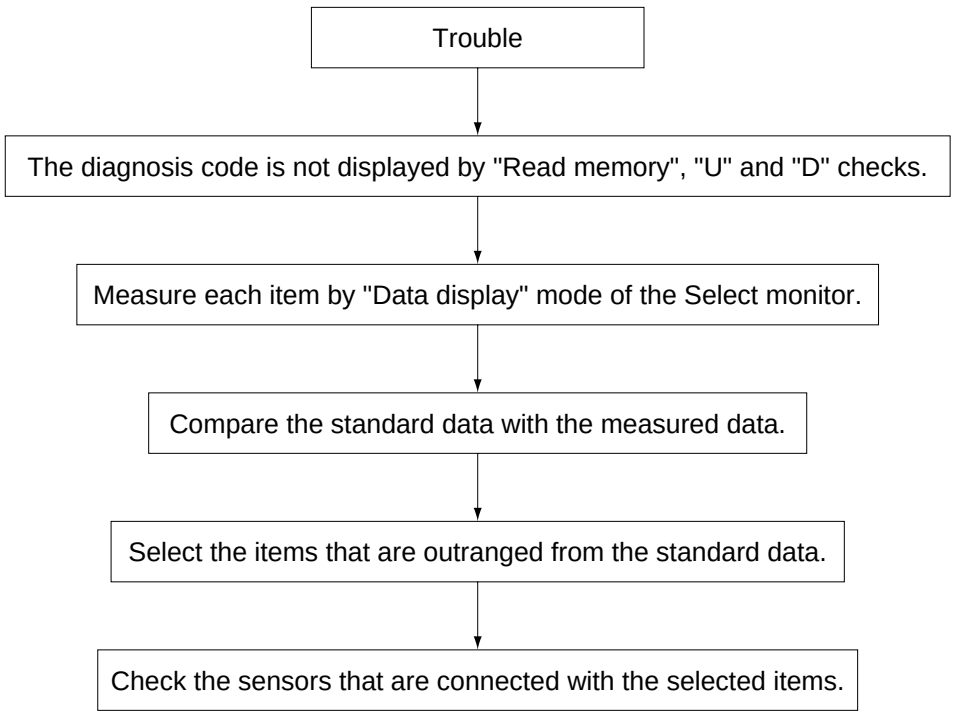
Contents of diagnosis

- Abnormal characteristic in the sensor or the actuator lines.

Phenomenon of the trouble

- Case where a diagnosis code is not displayed by Read memory, U and D checks and yet the trouble has occurred at present and in the past.

Checking procedure



■ Data display

Item to measure	Measuring condition	Standard data
Battery voltage (V)	Idling condition after warming up	13.5 ± 0.5
Vehicle speed (km/h)	Run the vehicle at the speed of 40 km/h by lifting up the vehicle, etc.	40 ± 2
Engine revolution (rpm)	Idling condition after warming up the engine	Refer to the section "Basic Inspection"
Water temperature (˚C)	Idling condition when warming up the engine	Should coincide with the indication of the water temperature gauge.
	In cold condition	Should coincide with the body temperature.
Ignition timing (deg.)	Idling condition when warming up the engine	Refer to the section "Basic Inspection"
Air flow (V)	Idling condition when arming up the engine with A/C OFF	1.0 ~ 1.7
Throttle (V)	Idling condition when warming up the engine (Should change smoothly.)	0.35 ~ 0.65 (fully closed) 3.9 ~ 4.5 (fully opened)
Injection time of injector (ms)	Idling condition when warming up the engine	2 ± 1
ISC step (STEP)	Idling condition when warming up the engine	MT: 3 ~ 5 AT: 5 ~ 20
O_2 sensor (V)	After warming up, engine revolution being 2000 rpm	0.01 ~ 0.9
A/F compensation (%)	After warming up, engine revolution being 2000 rpm	0 ± 20
CPC duty (%)	When racing after warming up with A/C OFF and N range	Less than 10 (fully closed). Should increase in accordance with the depressing (when the throttle is depressed).
Inlet pipe pressure (mmHg)	Idling after warming up	–600 ~ –800
Lean-burn rate	Constant running after warming up	0 % or 22 ~ 63 %
ALT duty (%)	When a small light turn ON, under the A/C is OFF and the rear defogger is OFF.	30 ~ 50 %. Should return to 0 % in a few seconds.
AVCS advance angle (deg.)	When idling after warming up	–25 ~ –15
OCV solenoid duty (%)	When running after warming up	10 ~ 60
OCV current (mA)	When running after warming up	0 ~ 500

[6] Inspection based upon trouble phenomenon

Item to check	contents of trouble													Remark
	Engine does not start.													
	No ignition	Only initial combustion took place.	Engine stalls after initial combustion	Unstable idling	Unstable speed running	Unstable acceleration or deceleration	Faulty return of idling revolution	Back fire or after fire	Generation of knocking	Aggravation of fuel consumption	Body quake can be felt while driving	Engine does not run up	Engine stalls.	
ECU power source and ground	1	1	1	3							2		3	
Airflow sensor		3	2	2	3	3	3		3	2		2	2	
Water temperature sensor	3	2	2	2	3	3	3		3	1		2		
Throttle sensor				3	3	2	2				2	2	3	
Fuel pump	2	3	3	3	3	2		3	2			2	3	
Pressure regulator	2	2	3	2	1	2		3	2	2	1	1		✻1
Fuel injector	3	3	3	3	2	2		2						
Igniter	3							3						
Ignition coil	3		2			2		3					3	
Ignition plug	3	1	2	1		1		1					2	
Knock sensor									2					
Cam angle sensor	2													
Crank angle sensor	2												3	
O_2 sensor				3										
ISC valve	3	3	3	2		3	2						3	
Supercharge pressure control valve						3			4					✻1
Vehicle speed sensor													3	
The disconnection between the engine and the body ground	1													
Valve clearance		3	3	2	3			3						
Leaving the check terminal connected				3			1							
Faulty adjustment of accelerator wire													2	
Auto transmission control unit													2	
Air leakage in inlet line				2			*2							✻1

✻1 Check the crack and detachment of hoses
*2 Vehicle with 2 l and SOHC engine

[7] Memory Clear

■ Procedure

<Method by using the Select Monitor>

(1) Turn on the ignition switch.

(2) Switch On the Select monitor.

(3) Select "MEMORY CLEAR" of "the individual system" and operate according to the screen display.

Caution

When Memory clear has been done, the idling revolution sometimes rises after removing the ECU and disconnecting the battery terminal but it is not abnormal.
This occurs due to the deletion of studied data of ISC step motor.
To return the idling revolution to the original one, turn the ignition switch OFF, wait about 10 seconds and then restart the engine.

<Method by coupling the connector>

(1) With the ignition switch turned OFF, connect each of the test mode connector (green: 2p) and the read memory connector (black: 1p) and perform the procedure of the D-Check.

(2) If the Check engine lamp blinks showing the normal status, the Memory clear mode is completed.
* If the diagnosis code is displayed, perform check again according to the code.

(3) Completion of the test procedure, after turning off the ignition switch, disconnecting the test mode connector and the read memory connector.

MEMO