Vol. 63

PRODUCT BULLETIN

DATSUN

1981 Model Introduction

280ZX TURBO

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THE NAME OF QUALITY

NISSAN

NISSAN MOTOR CO. LTD

FOREWORD

This product bulletin has been prepared to provide information necessary for smooth and efficient service activities on the DATSUN 280ZX TURBO models. Please read this bulletin thoroughly in order to gain a proper understanding of the features, specifications and mechanism of this new model.

In this bulletin, emphasis is placed on the description of those points that have been changed or modified from the DATSUN 1981 former models. Unless otherwise specified, the interchangeability of parts is noted between the DATSUN 1981 former and new models.

The descriptions and specifications contained in this bulletin are based on the car at the time it newly entered production.

Rights for alteration of specifications at any time are reserved.

The new DATSUN 280ZX TURBO model entered production starting with the following vehicle identification numbers (VIN):

JN1CZ04S9BX255015

 Printed in Japan

CONTENTS

MODEL VARIATION

Destination		Model	Engine	Trans-mission	Differential carrier	Road wheel size ... offset mm (in)	Tire size
U.S.A.	California	HLS130 JATV	L28ET	3N71B	R200	6JJ-15 *1 ... 10 (0.39) 5J-14 *2 ... 15 (0.59)	P205/60R15 C78-14 *2
		KHLS130 JATV					
	Non-Cali-fornia	HLS130 JATU					
		KHLS130 JATU					
Canada		HLS130 JATN					
		KHLS130 JATN					

*1: Equipped with aluminum wheel

*2: Equipped with Space Saver Spare tire and Foldable Spare tire

Prefix and suffix designations

K H L G S130 J A T V B C

- K : T-bar roof
- □ : Non T-bar roof
- H : L28 engine
- L : L.H. drive
- G : 2+2 seater model
- □ : 2 seater model

- C : Air conditioner (Manual control)
- CI : Air conditioner (Auto temperature control)
- B : Power steering
- □ : Manual steering
- V : California model
- U : Non-California model for U.S.A.
- N : Canada model
- T : Turbocharger
- □ : Non-turbocharger
- A : Automatic transmission model
- F : Manual 5-speed transmission model
- J : Grand Luxury model
- □ : Deluxe model

□: means no indication

TECHNICAL FEATURES

A turbocharged L28 engine (model L28ET engine) has been added to the DATSUN 280ZX series.
This turbocharged engine displays a greatly enhanced power performance without any deterioration in fuel consumption rates.
In addition, the Electronic Concentrated engine Control System (E.C.C.S.) has been utilized in order to improve low speed torque and engine response, as well as overall performance and fuel economy.
Corresponding to the improvements in performance, the suspension system has been retuned in detail to improve driving stability.

DYNAMIC PERFORMANCE

ENGINE PERFORMANCE

When the turbocharger is added to the engine, its maximum output (horsepower) increases by 25%, while maximum torque increases by 30%.

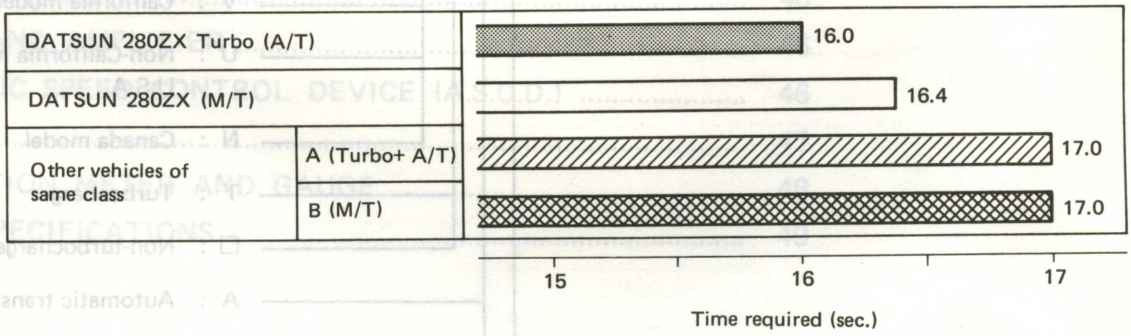
Item \ Engine model		L28ET	L28E
Maximum horsepower	HP/rpm (SAE net)	180/5,600	145/5,200
Maximum torque	N·m (kg-m, ft-lb)/rpm (SAE net)	275 (28, 203)/2,800	211 (21.5, 156)/4,000
Compression ratio		7.4	8.8

ACCELERATION

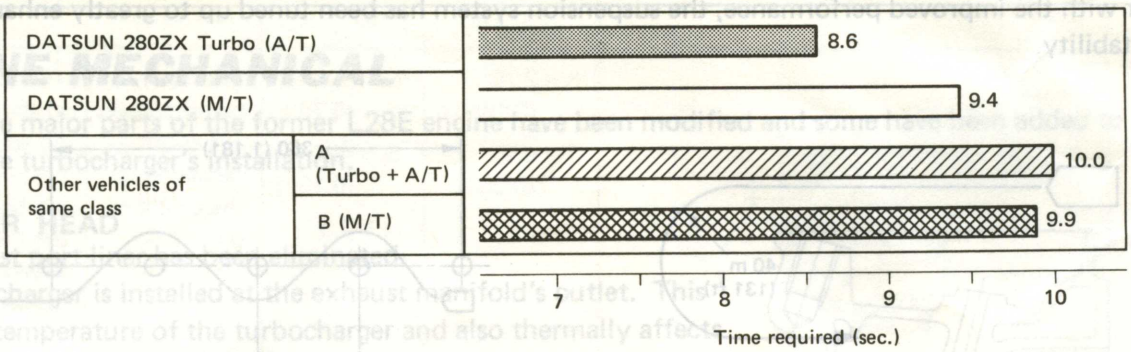
The addition of the turbocharger has also improved both standing start and passing acceleration.

STARTING ACCELERATION

SS 0 - 400 m (0 - 1/4 mile):



SS 0 - 100 km/h (0 - 62 MPH):



PASSING ACCELERATION

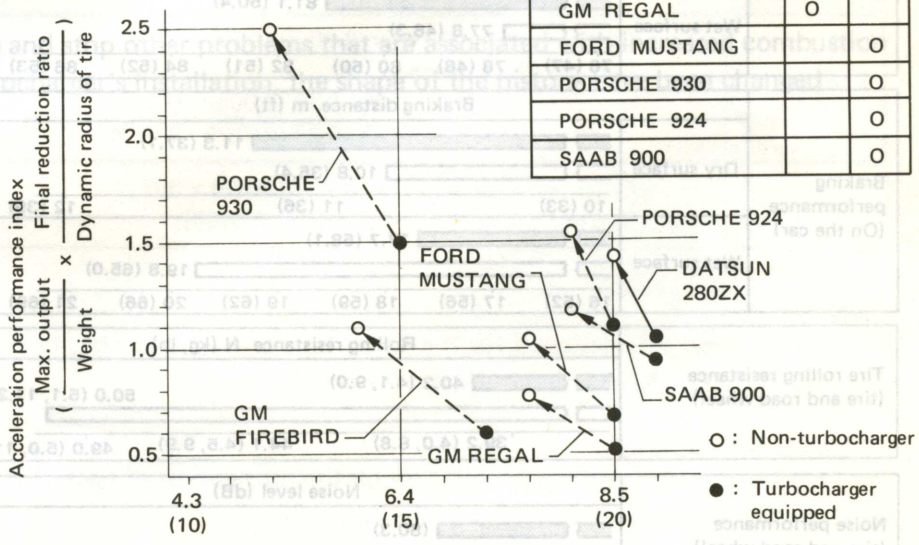
Unit: sec

Model \ Passing Acceleration km/h (MPH)	40 - 60 (25 - 37)	60 - 80 (37 - 50)	80 - 100 (50 - 62)	100 - 120 (62 - 75)
DATSUN 280ZX Turbo (A/T)	2.7	3.2	3.4	4.7
DATSUN 280ZX (A/T)	2.7	4.0	4.0	6.9
DATSUN 280ZX (M/T)	3rd 3.3/4th 4.4	3rd 3.3/4th 4.4	3rd 3.5/4th 4.7	3rd 4.5/4th 4.8

FUEL CONSUMPTION

Not only has the DATSUN 280ZX TURBO model's power performance been improved but its fuel consumption rate is superior to most other vehicles.

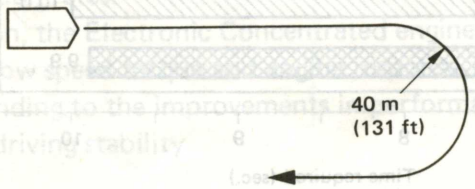
Model \ Transmission	A/T	M/T
DATSUN 280ZX	O	
GM FIREBIRD	O	
GM REGAL	O	
FORD MUSTANG		O
PORSCHE 930		O
PORSCHE 924		O
SAAB 900		O



City fuel consumption - acceleration performance

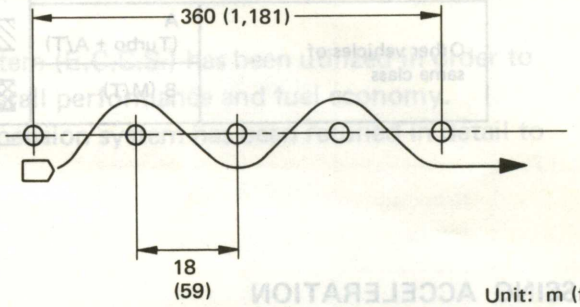
DRIVEABILITY

Together with the improved performance, the suspension system has been tuned up to greatly enhance driving stability.



280ZX TURBO: Max. 64.0 km/h (39.8 MPH)
280ZX : Max. 60.5 km/h (37.6 MPH)

Critical cornering performance



Unit: m (ft)

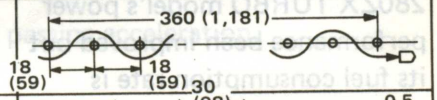
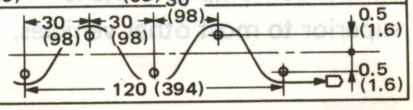
280ZX TURBO: Max. 59 km/h (37 MPH)
280ZX : Max. 55 km/h (34 MPH)

Steering performance

TIRE PERFORMANCE

The P205/60R15 tire, which is used on the DATSUN 280ZX TURBO model displays superior driving stability, braking performance, and rolling resistance and is very quiet.

: P205/60R15 : Wing Foot

		Mean passing speed km/h (MPH)	Method of measurement Unit: m (ft)
Driving stability (On the car)	Dry surface	58.8 (36.5) 54.7 (34.0) 50 (31) 52 (32) 54 (34) 56 (35) 58 (36) 60 (37)	
	Wet surface	81.1 (50.4) 77.8 (48.3) 76 (47) 78 (48) 80 (50) 82 (51) 84 (52) 86 (53)	

		Braking distance m (ft)	Method of measurement km/h (MPH)
Braking performance (On the car)	Dry surface	11.3 (37.1) 10.8 (35.4) 10 (33) 11 (36) 12 (39)	Brake applied at 50 (31)
	Wet surface	17.7 (58.1) 19.8 (65.0) 16 (52) 17 (56) 18 (59) 19 (62) 20 (66) 21 (69)	Brake applied at 60 (37)

	Rolling resistance N (kg, lb)	Conditions of measurement
Tire rolling resistance (tire and road wheel)	40.2 (4.1, 9.0) 50.0 (5.1, 11.2) 39.2 (4.0, 8.8) 44.1 (4.5, 9.9) 49.0 (5.0, 11.0)	Tire pressure: 196 kPa (2 kg/cm², 28 psi) Load applied: 350 kg (772 lb) Speed : 50 km/h (31 MPH)

	Noise level (dB)	Conditions of measurement
Noise performance (tire and road wheel)	(80.3) (81.5) 80 81	Tire pressure: 196 kPa (2 kg/cm², 28 psi) Load applied: 350 kg (772 lb) Speed : Average 40 - 100 km/h (25 - 62 MPH)

Comparison between the P205/60R15 (BS) and Wing Foot (Good Year) tires

L28ET ENGINE

ENGINE MECHANICAL

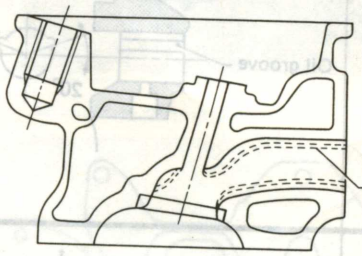
Most of the major parts of the former L28E engine have been modified and some have been added to conform to the turbocharger's installation.

CYLINDER HEAD

The exhaust port liner has been eliminated.

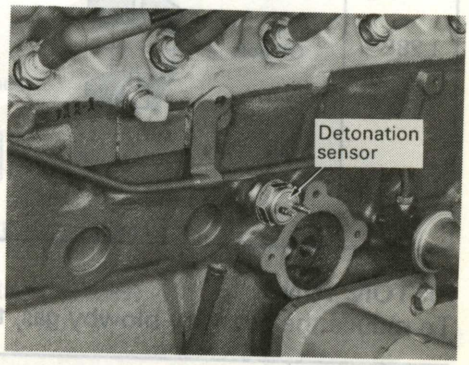
The turbocharger is installed at the exhaust manifold's outlet. This raises the temperature of the turbocharger and also thermally affects the turbine wheel and surrounding parts. The port liner was eliminated to lower the temperature of the exhaust gas.

The cylinder head bolts have been changed from 12T to 13T to increase strength.



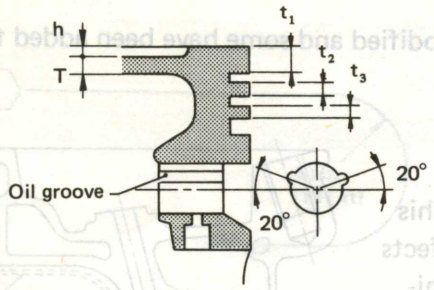
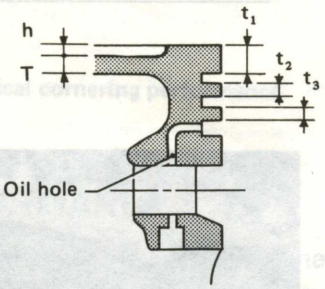
CYLINDER BLOCK

The detonation sensor mounting studs are installed in the cylinder block on the oil filter side.



PISTON

To prevent the pistons from cracking and stop other problems that are associated with increased combustion pressure, which is a result of the turbocharger's installation, the shape of the pistons have been changed somewhat.

	Shape	Crown mm (in)	Land mm (in)	Pin lubrication	Pin boss and rib
L28ET		h = 2.78 (0.1094) T = 6.7 (0.264)	t_1 = 7.2 (0.283) t_2 = 4.0 (0.157) t_3 = 2.5 (0.098)	Lubricated by oil grooves cut at 20° radials from the center of pin.	The corner radius of the piston boss rib and the lower portion of the pin boss have been enlarged to alleviate stress concentration.
L28E		h = 2.16 (0.0850) T = 7.14 (0.2811)	t_1 = 7.2 (0.283) t_2 = 3.5 (0.138) t_3 = 2.5 (0.098)	Lubricated by two holes that meet at right angles above the pin bore.	—

PISTON RING

To reduce the quantity blowby gas, the top ring and 2nd ring have been modified.

	Top ring mm (in)	2nd ring
L28ET	Outer periphery chamfer 0.15 (0.0059) x 30° End gap (C) selection Bore grade 1-2: 0.25 - 0.33 (0.0098 - 0.0130) Bore grade 3-5: 0.19 - 0.27 (0.0075 - 0.0106)	With under-cut, chrome plated
L28E	Outer periphery chamfer 0.20 (0.0079) x 30° End gap (C) 0.25 - 0.40 (0.0098 - 0.0157)	No plating

FAN BELT

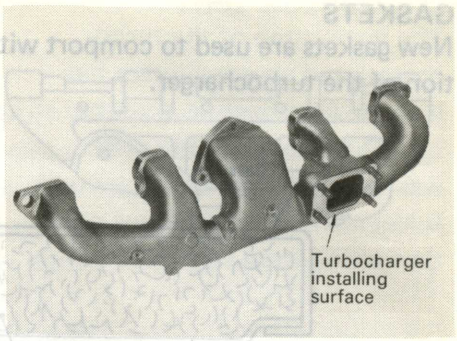
The fan belt that was designed for the L28E California models has been adopted for use in all models. [48,000 km (30,000 miles) no-adjustment type]

INTAKE MANIFOLD

Air distribution has been improved through the unification of each cylinder's branc ratio length and by expanding the passage sectional area in the collector.

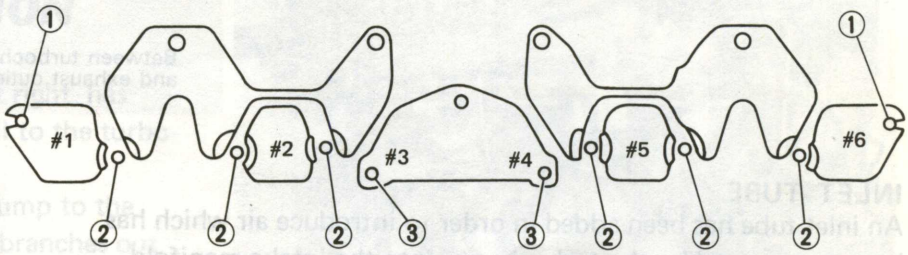
EXHAUST MANIFOLD

To reduce loss in manifold heat and improve the turbine's response, the design of the exhaust manifold has been modified so that the turbocharger could be installed close to the manifold's outlet. Ductile cast iron, which has superior resistance to increase thermal loads, is now used to construct the exhaust manifold.



EXHAUST MANIFOLD STUD BOLTS

The sequence in which the bolts are tightened is shown in the figure.



#1 - #6: Cylinders

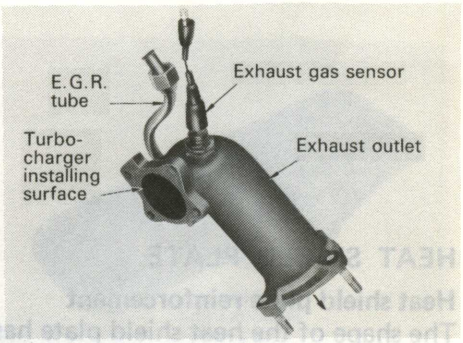
① (Same as L28E)

② (Different from L28E)

③ (Same as L28E)

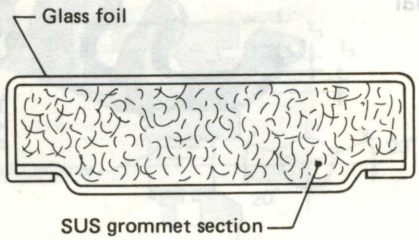
EXHAUST OUTLET

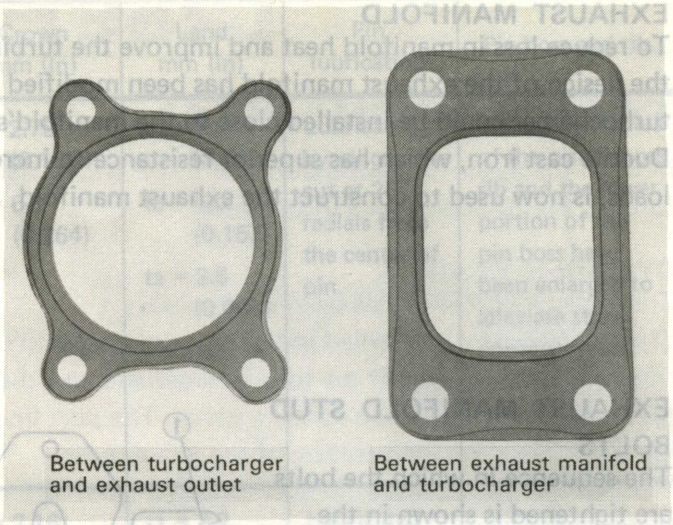
The exhaust outlet has been designed to conform to the turbocharger's installation.



GASKETS

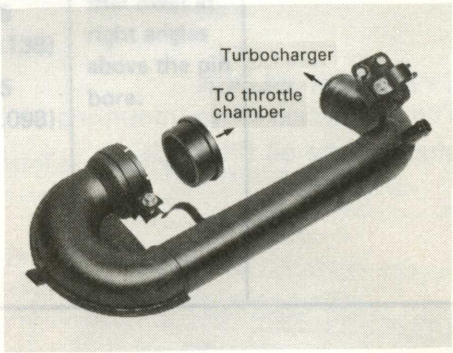
New gaskets are used to comport with the installation of the turbocharger.





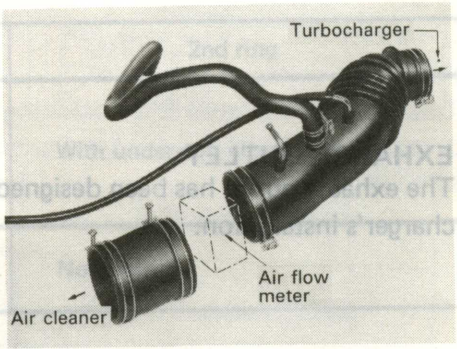
INLET TUBE

An inlet tube has been added in order to introduce air which has been compressed by the turbocharger into the intake manifold.



SUCTION HOSE

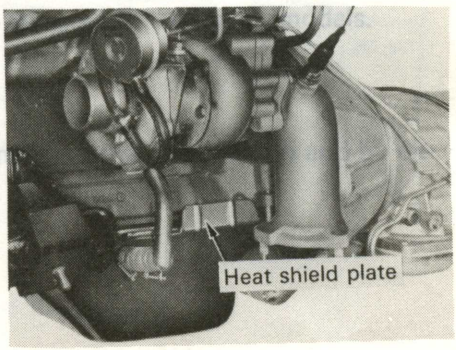
A suction hose has been installed to conform to the turbocharger's installation.



HEAT SHIELD PLATE

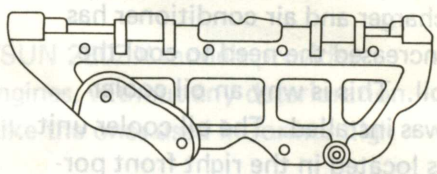
Heat shield plate reinforcement

The shape of the heat shield plate has been modified to protect the turbocharger lubricating oil return hose.



Sub heat shield plate

A sub heat shield plate has been added to the exhaust manifold to protect the blowby hose from heat radiated by the exhaust manifold.

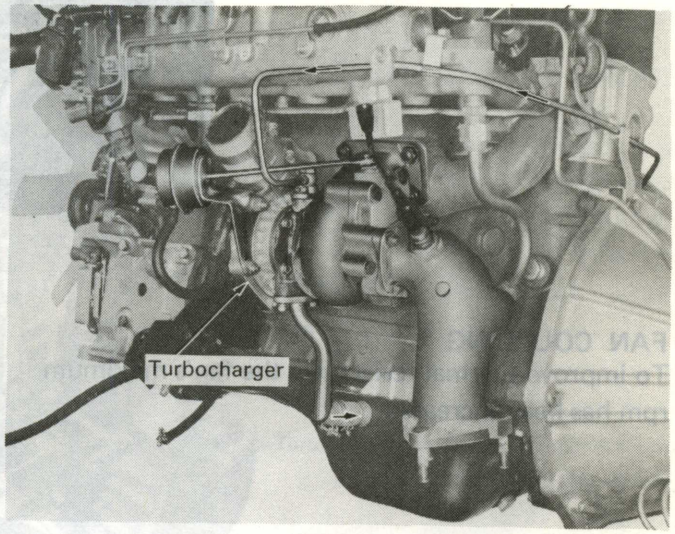


ENGINE LUBRICATION

LUBRICATING OIL PASSAGE

A lubricating oil passage, as shown at right, has been newly added in order to feed oil to the turbocharger.

Lubrication oil is sent from the oil pump to the cylinder block main gallery where it branches out to various parts of the engine and the turbocharger.

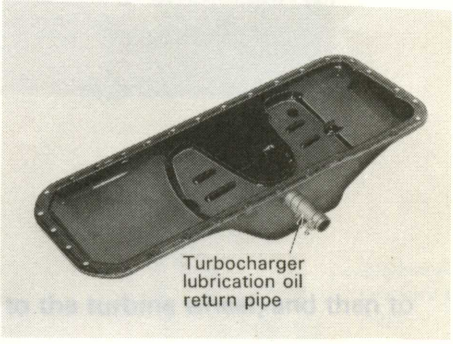


OIL PUMP

The oil pump's discharge has been increased by enlargening the width of the oil pump gear from 35 to 40 mm (1.38 to 1.57 in) in order to ensure an adequate supply of lubrication oil to the turbocharger. [Discharge: 14.5 mℓ (0.49 US fl oz, 0.51 Imp fl oz)/rev to 16.4 mℓ (0.55 US fl oz, 0.58 Imp fl oz)/rev.]

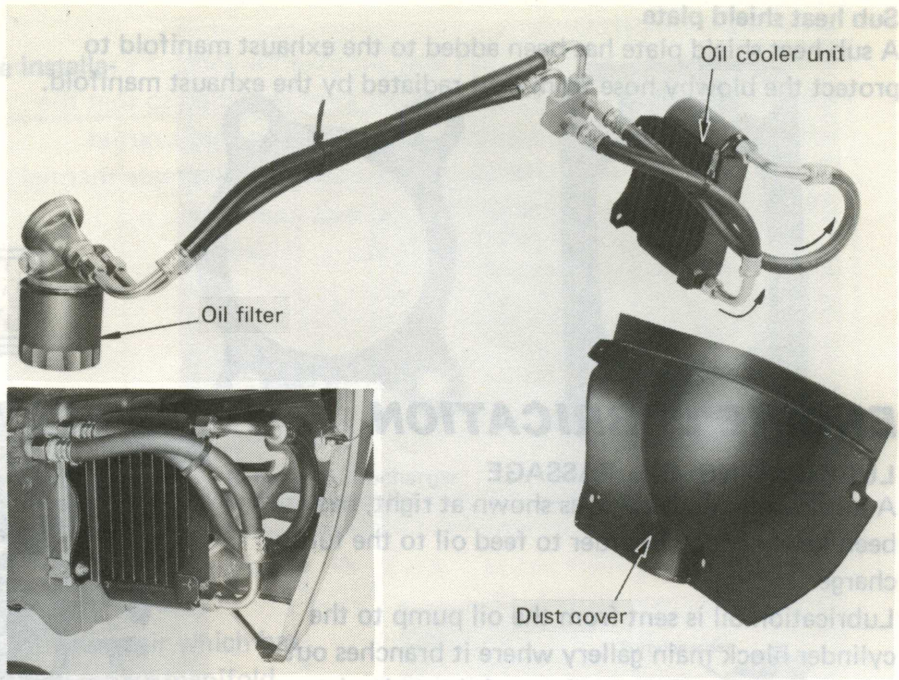
OIL PAN

An oil return connector has been added. It returns the oil after the turbocharger has been lubricated.



OIL COOLER UNIT

The installation of the turbocharger and air conditioner has increased the need to cool the oil. This is why an oil cooler was installed. The oil cooler unit is located in the right front portion of the front fender.



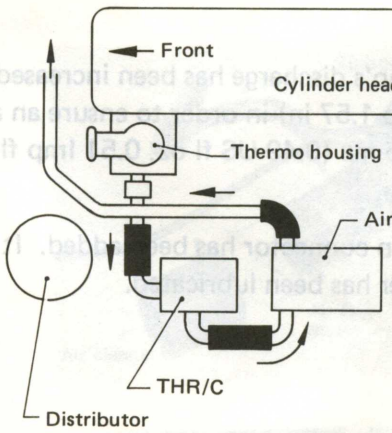
FAN COUPLING

To improve thermal resistance, the fan's maximum rpm has been increased.

	L28ET	L28E
Type	Tem-coupling	Tem-coupling
Max. rpm	2,700	2,450

HOT WATER PIPING

The hot water piping is now integral to the air regulator body. The piping layout is shown in the figure at right.

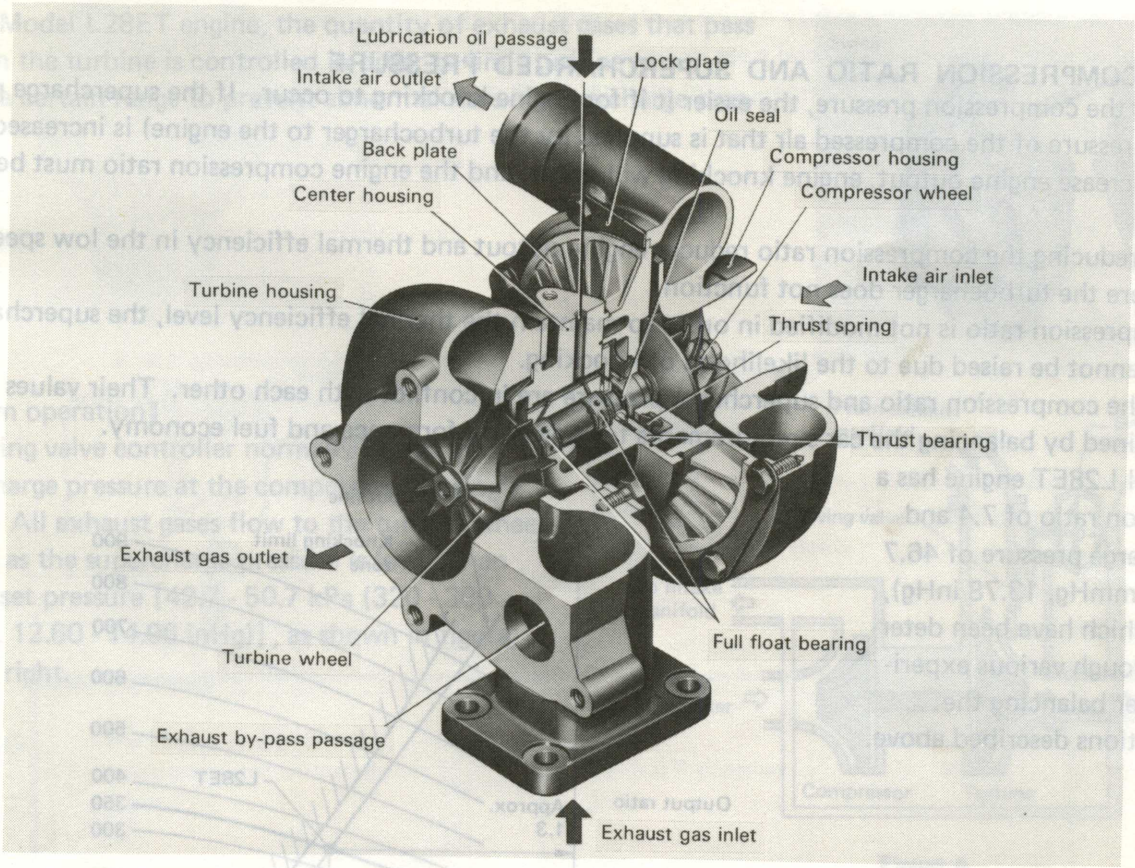


ENGINE FUEL

TURBOCHARGER

The turbocharged engine (Model L28ET) that was developed for the DATSUN 280ZX models provides greatly improved power performance compared to existing Model L28E engines, without any deterioration in fuel economy. This engine does not require complicated mechanisms, like the ones used in former high output engine designs, to satisfy emission control requirements.
The engine has been designed so that the turbocharger's effects can be fully displayed in the low and middle speed ranges.

TURBOCHARGER CONSTRUCTION



Construction of the turbocharger

The turbocharger consists of the following components

Turbine housing:
The turbine housing directs the exhaust gases from the exhaust manifold to the turbine wheel, and then to the exhaust outlet where they are discharged.

Turbine wheel:
The turbine wheel is rotated by the engine exhaust gases.

Compressor wheel:
The compressor wheel is mounted on the same shaft as the turbine wheel, and is used to compress suction air.

Compressor housing:
The compressor housing directs suction air to the compressor wheel, and then supplies compressed air to the throttle chamber.

Center housing:
The center housing contains the bearings for the rotor shaft that connects the turbine and compressor wheels, and lubricating passages.

Although of relatively simple in construction, the turbocharger is a very elaborate precision unit and consists of turbine and compressor wheels that rotate at speeds of up to 100,000 rpm, while being subjected to temperatures as high as 900° C (1,652° F). Consequently, when the turbocharger fails, it must be replaced as unit.

ENGINE COMPRESSION RATIO AND SUPERCHARGED PRESSURE

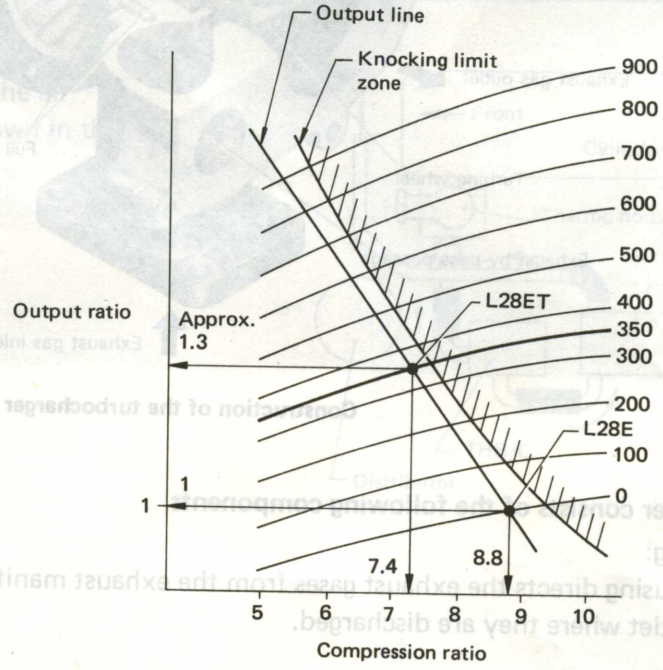
The higher the compression pressure, the easier it if for engine knocking to occur. If the supercharge pressure (the pressure of the compressed air that is supplied by the turbocharger to the engine) is increased in order to increase engine output, engine knocking will occur, and the engine compression ratio must be lowered.

However, reducing the compression ratio reduces engine output and thermal efficiency in the low speed range, where the turbocharger does not function.

If the compression ratio is not modified in order to maintain the thermal efficiency level, the supercharge pressure cannot be raised due to the likelihood of knocking.

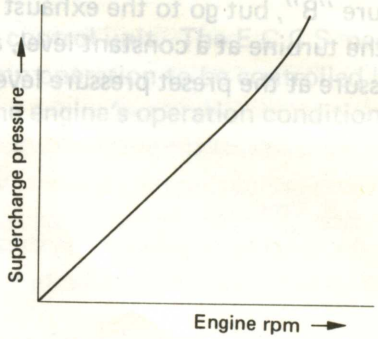
In short, the compression ratio and supercharge pressure are in conflict with each other. Their values must be determined by balancing the car's requirements for power performance and fuel economy.

The model L28ET engine has a compression ratio of 7.4 and a supercharge pressure of 46.7 kPa (350 mmHg, 13.78 inHg), both of which have been determined through various experiments after balancing the considerations described above.

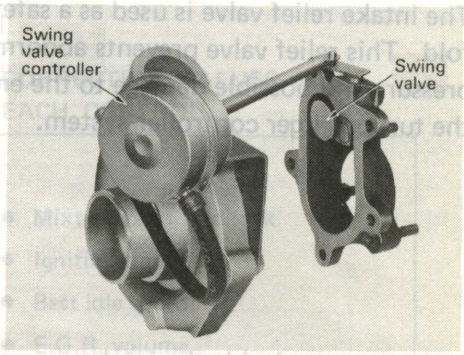


TURBOCHARGER CONTROL

The quantity of exhaust gases increases in proportion to engine rpm and load, as shown at right. This also increases turbine and compressor wheel rpm and supercharge pressure. If the supercharge pressure rises too much, engine knocking will occur, and damage the engine.



In this Model L28ET engine, the quantity of exhaust gases that pass through the turbine is controlled in order to limit turbine rpm within a certain range to prevent abnormal rises in supercharge pressure.



[System operation]

The swing valve controller normally senses the supercharge pressure at the compressor housing's outlet. All exhaust gases flow to the turbine wheel as long as the supercharge pressure is lower than the preset pressure [42.7 - 50.7 kPa (320 - 380 mmHg, 12.60 - 14.96 inHg)], as shown in figure "A" at right.

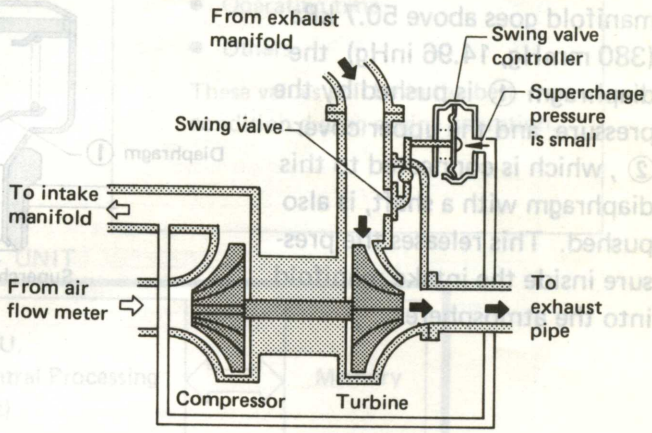


Figure A

When engine rpm increases and the supercharge pressure reaches the preset level, the diaphragm of the swing valve controller is pushed open by the supercharge pressure.

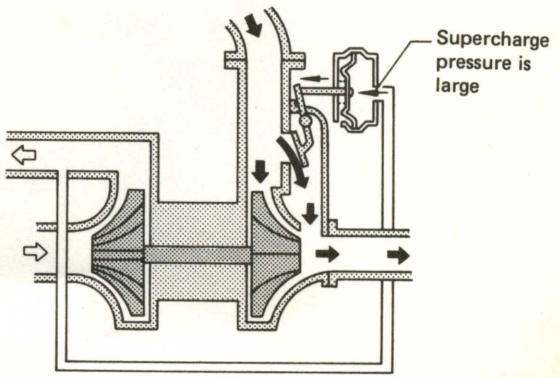
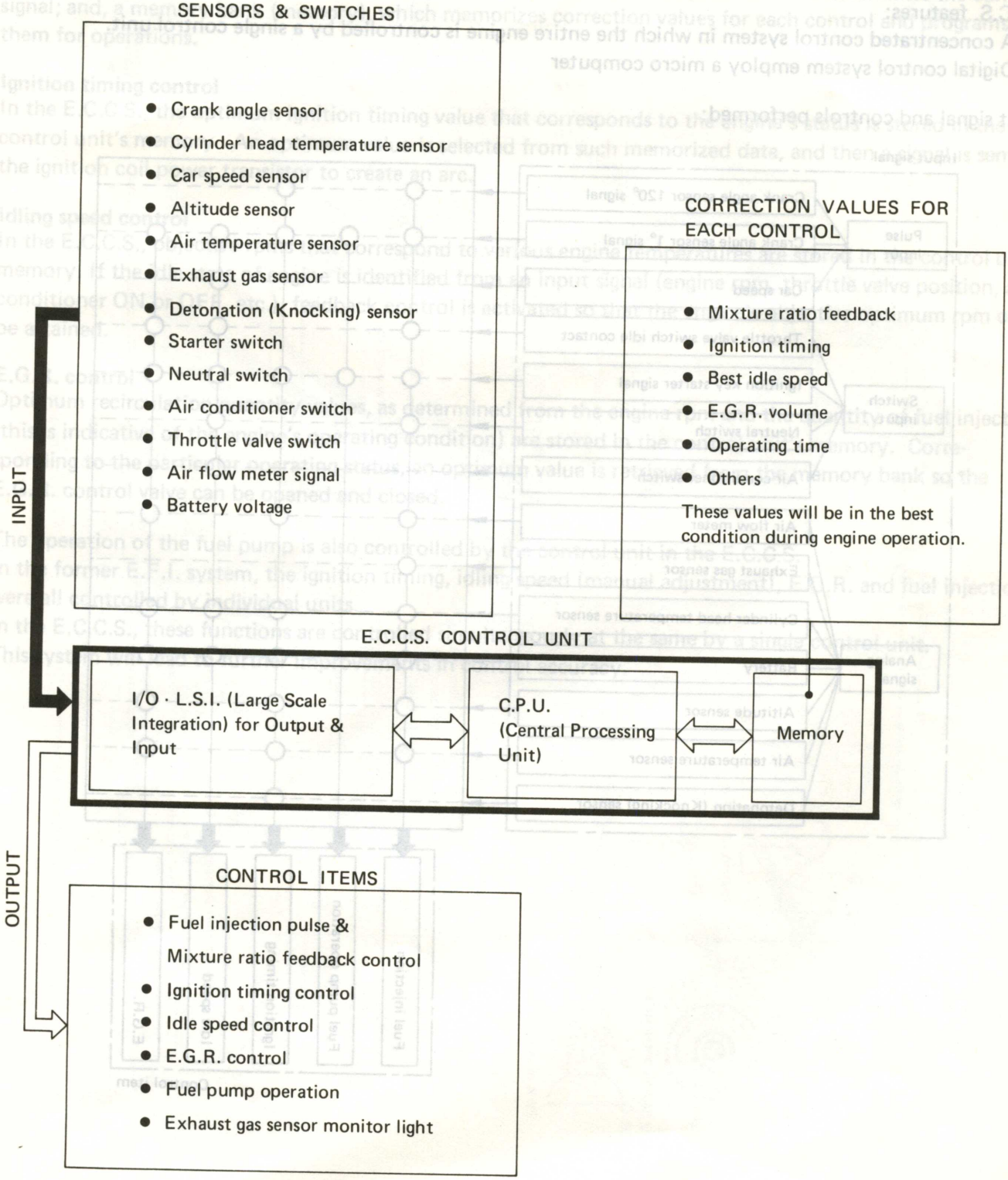


Figure B

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.)

DESCRIPTION

In conventional E.F.I. engines, only fuel injection is controlled by the E.F.I. control unit. The E.C.C.S. permits fuel injection, ignition timing, idling speed, E.G.R. control and fuel pump operation to be controlled by a micro computer. This permits optimum control and is keyed directly to the engine's operation conditions. The E.C.C.S. is illustrated below.



Effects of E.C.C.S.:

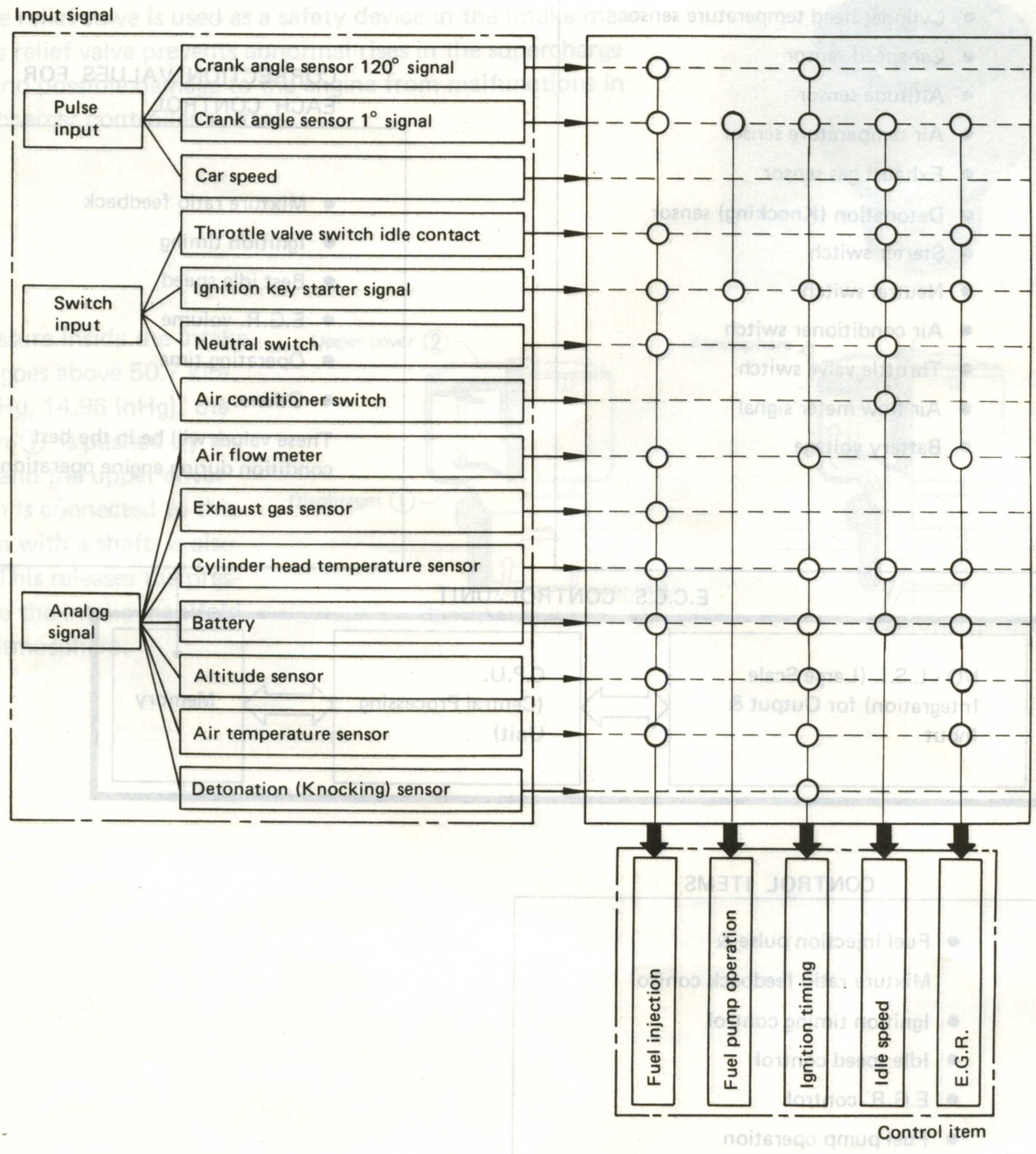
The optimum engine state is maintained by the control unit and has the following effects:

- Improved fuel consumption
- Improved startability and warm-up
- Improved stability at idling
- Improved acceleration and deceleration response

E.C.C.S. features:

- A concentrated control system in which the entire engine is controlled by a single control unit.
- Digital control system employ a micro computer

Input signal and controls performed:



Fuel injection control
Basically, the quantity of fuel injected is controlled by the control unit, as in the former E.F.I. system. However, the determination of basic fuel injection amounts in relation to the quantity of air drawn in and various correcting computations to correct for engine temperature are performed by a micro computer, which then sends an activation signal to the injector.
This micro computer consists of input/output parts (I/O, L.S.I.), which deals with each signal's inputs and outputs; a central processing unit (C.P.U.), which performs various computations and determines the control signal; and, a memory bank (memory), which memorizes correction values for each control and programs them for operations.

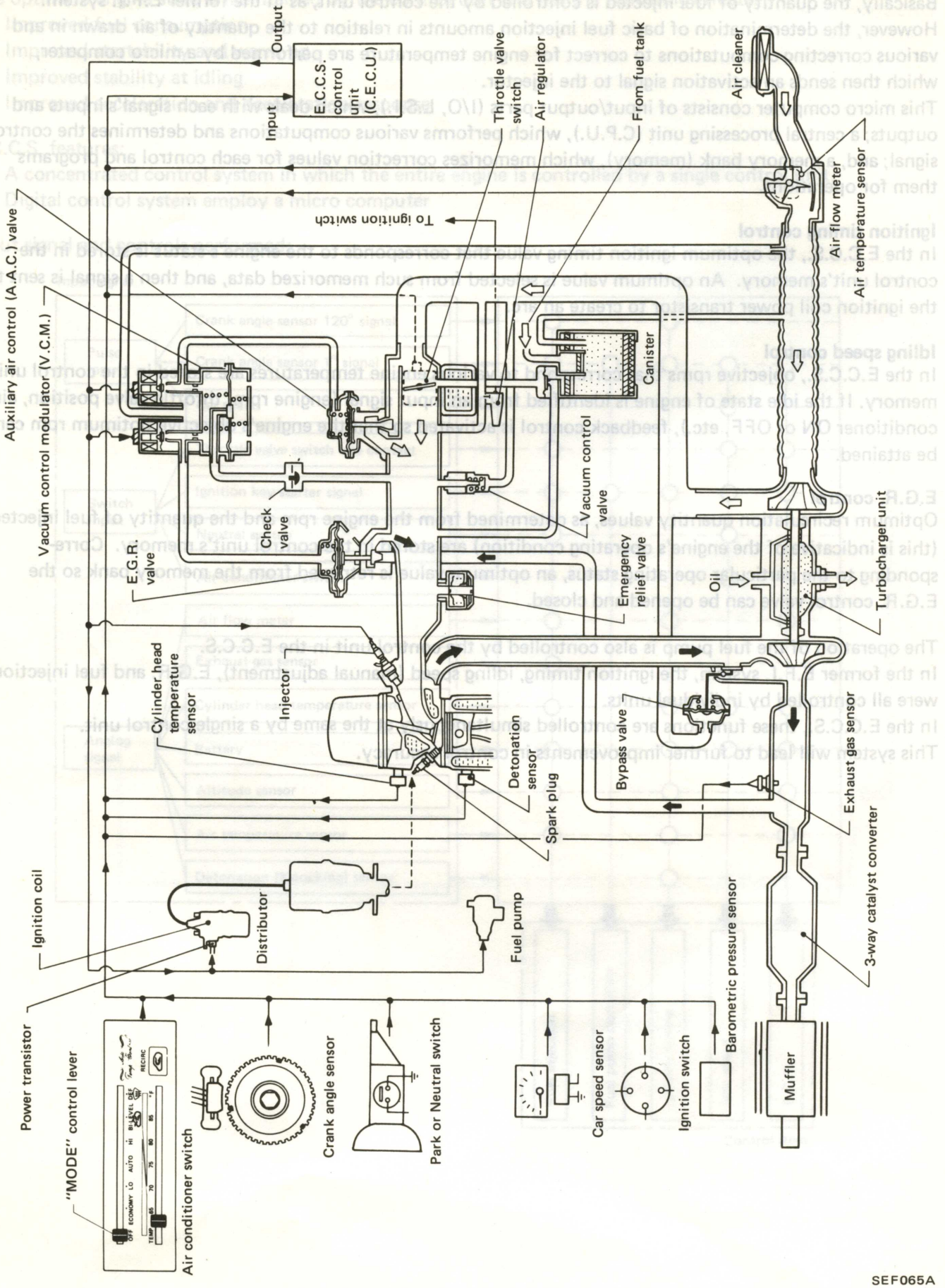
Ignition timing control
In the E.C.C.S., the optimum ignition timing value that corresponds to the engine's status is stored in the control unit's memory. An optimum value is selected from such memorized data, and then a signal is sent to the ignition coil power transistor to create an arc.

Idling speed control
In the E.C.C.S., objective rpms that correspond to various engine temperatures are stored in the control unit's memory. If the idle state of engine is identified from an input signal (engine rpm, throttle valve position, air conditioner ON or OFF, etc.), feedback control is activated so that the engine's objective optimum rpm can be attained.

E.G.R. control
Optimum recirculation quantity values, as determined from the engine rpm and the quantity of fuel injected, (this is indicative of the engine's operating condition) are stored in the control unit's memory. Corresponding to the particular operating status, an optimum value is retrieved from the memory bank so the E.G.R. control valve can be opened and closed.

The operation of the fuel pump is also controlled by the control unit in the E.C.C.S.
In the former E.F.I. system, the ignition timing, idling speed (manual adjustment), E.G.R. and fuel injection were all controlled by individual units.
In the E.C.C.S., these functions are controlled simultaneously at the same by a single control unit.
This system will lead to further improvements in control accuracy.

E.C.C.S. diaphragm



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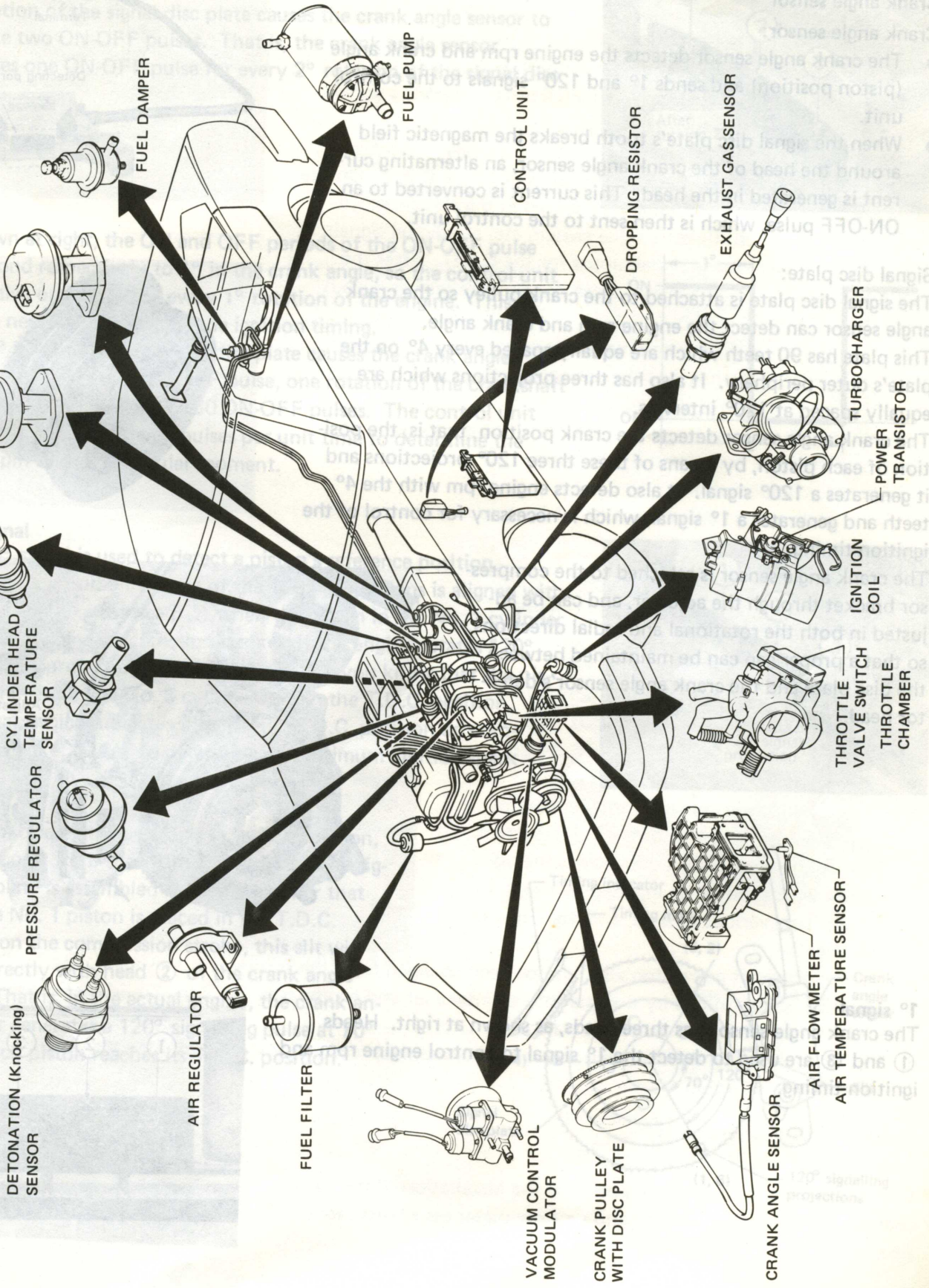
E.C.C.S. parts configuration diagram



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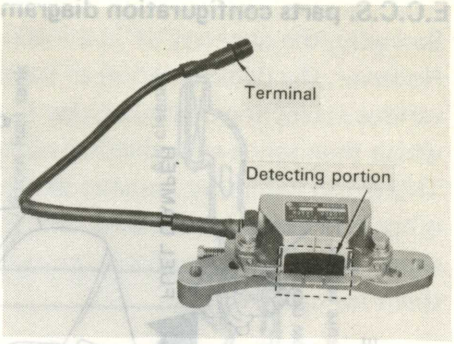
ENGINE CONTROL BY E.C.C.S.

Crank angle sensor

Crank angle sensor:

- The crank angle sensor detects the engine rpm and crank angle (piston position) and sends 1° and 120° signals to the control unit.
- When the signal disc plate's tooth breaks the magnetic field around the head of the crank angle sensor, an alternating current is generated in the head. This current is converted to an ON-OFF pulse, which is then sent to the control unit.

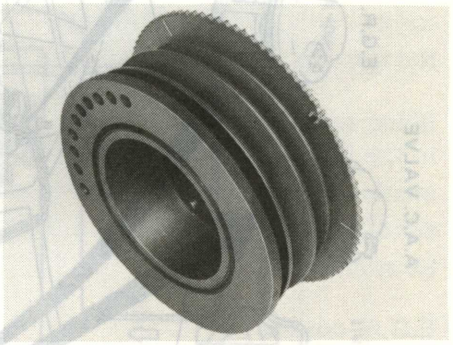


Signal disc plate:

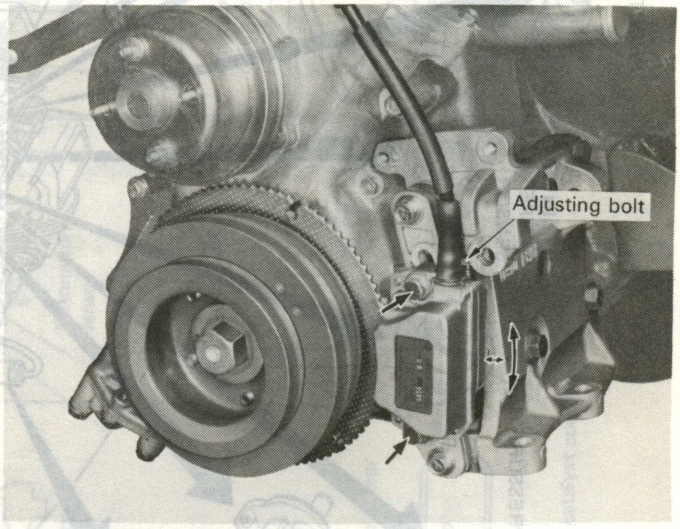
The signal disc plate is attached to the crank pulley so the crank angle sensor can detect the engine rpm and crank angle.

This plate has 90 teeth which are equally spaced every 4° on the plate's outer periphery. It also has three projections which are equally spaced at 120° intervals.

The crank angle sensor detects the crank position, that is, the position of each piston, by means of these three 120° projections and it generates a 120° signal. It also detects engine rpm with the 4° teeth and generates a 1° signal, which is necessary for control of the ignition timing.

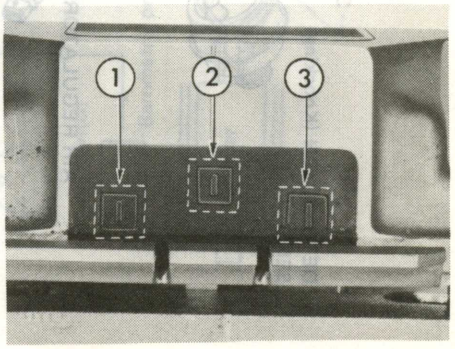


The crank angle sensor is attached to the compressor bracket through the adjuster, and can be adjusted in both the rotational and radial directions, so that a proper gap can be maintained between the disc plate and the crank angle sensor's detector head.

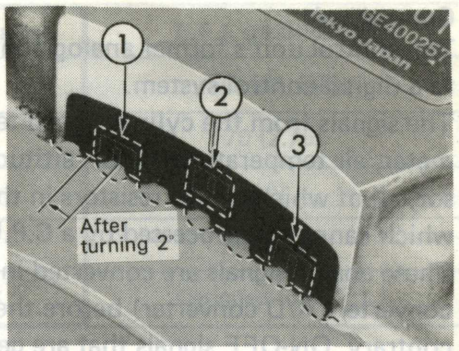


1° signal

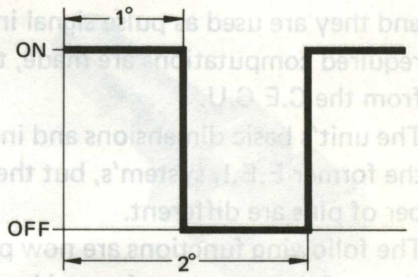
The crank angle sensor has three heads, as shown at right. Heads ① and ③ are used to detect the 1° signal to control engine rpm and ignition timing.



The signal disc plate has teeth placed at 4° intervals. Two of the crank angle sensor's heads correspond to these teeth. Therefore, 4° rotation of the signal disc plate causes the crank angle sensor to generate two ON-OFF pulses. That is, the crank angle sensor generates one ON-OFF pulse for every 2° rotation of the signal disc plate.

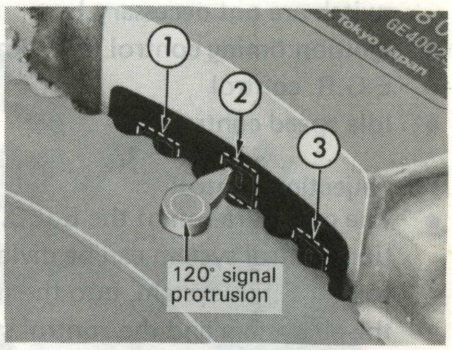


As shown at right, the ON and OFF periods of the ON-OFF pulse correspond respectively to 1° in the crank angle, so the control unit can receive one signal for every 1° rotation of the engine. This 1° signal is necessary to control the ignition timing.
Since 2° rotation of the signal disc plate causes the crank angle sensor to generate one ON-OFF pulse, one rotation of the crankshaft results in the generation of 180 ON-OFF pulses. The control unit counts the number of such pulses per unit time to determine the engine rpm at that particular moment.

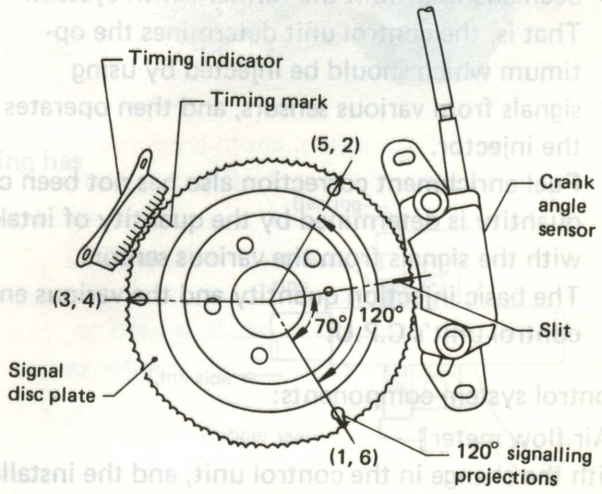


120° signal

The 120° signal is used to detect a piston's reference position. For example, assume that one of the 120° projections is aligned with the crank angle sensor head ② when the piston in the No. 1 cylinder is at T.D.C. on the compression stroke. If the engine rotates 120° and the next projection aligns with head ②, you know that the pistons in the No. 2 and No. 5 cylinders are in the T.D.C. position. This signal, which indicates the piston's T.D.C. position on compression stroke, is used to determine the optimum ignition spark timing.

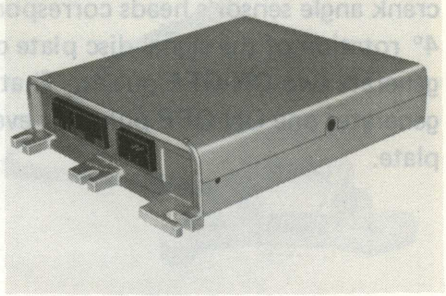


The signal disc plate has a slit at the 70° position, which is apart from the 120° projections. The signal disc plate is assembled in such a manner that when the No. 1 piston is placed in the T.D.C. position on the compression stroke, this slit will align correctly with head ② of the crank angle sensor. That is, in the actual engine, the crank angle sensor generates a 120° signalling pulse at 70° before each piston reaches its T.D.C. position.



Control unit

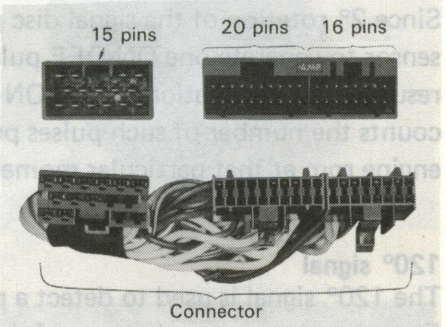
The control unit's former analog control system has been changed to a digital control system.



The signals from the cylinder head temperature sensor, air flow meter, air temperature sensor, altitude sensor and exhaust gas sensor, all of which utilize resistors in their circuits, are analog signals which cannot be processed by a C.P.U.

These analog signals are converted into digital signals in the digital converter (A/D converter) before they are sent to the C.P.U. On the contrary, ON-OFF signals that are generated in the vehicle speed sensor, neutral switch, throttle valve switch, etc. are digital signals, and they are used as pulse signal inputs for the C.P.U. After the required computations are made, these signals were sent as output from the C.E.C.U.

The unit's basic dimensions and installation are unchanged from the former E.F.I. system's, but the connector design and the number of pins are different.

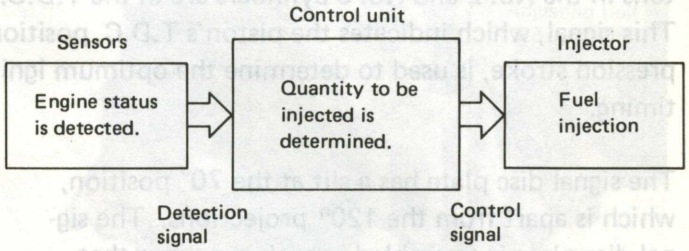


The following functions are now performed by the control unit. None of these were performed by the former E.F.I. system.

- Altitude compensation
- Cold weather start enrichment (Cold start valve and thermotime switch are not necessary.)
- Ignition timing control (with knock control)
- E.G.R. control
- Idle speed control

Fuel injection control

- The configuration of the E.C.C.S. fuel injection control system can be divided, like the former E.F.I. system, into the fuel system, the air system and the control system.
- The fuel injection control principle has not been changed from the former E.F.I. system. That is, the control unit determines the optimum which should be injected by using signals from various sensors, and then operates the injector.

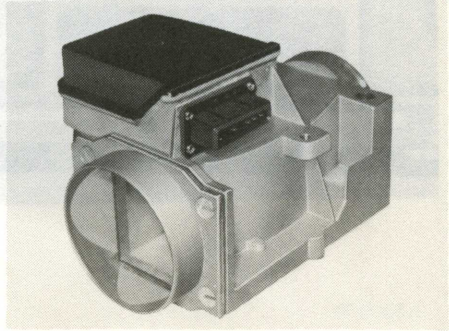


- Fuel enrichment correction also has not been changed from the former E.F.I. system. The basic injection quantity is determined by the quantity of intake air and engine rpm. It is then modified in accordance with the signals from the various sensors.
- The basic injection quantity and the various enrichment corrections are computed simultaneously by the control unit's C.P.U.

Control system components:

[[Air flow meter]]

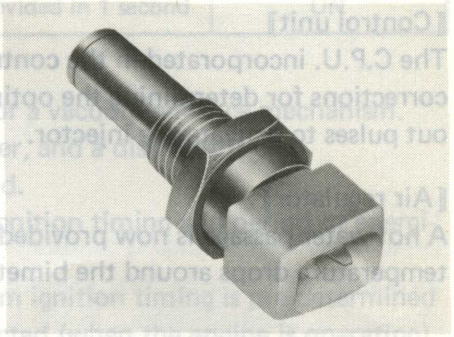
With the change in the control unit, and the installation of the turbocharger, the connector portion and air flow meter have been modified.



		Turbo + E.C.C.S. specification	E.F.I. specification
Nominal air flow	m^3/h (cu ft/h)	550 (19, 421)	470 (16, 596)
Suction port dia.	mm (in)	80 (3.15)	70 (2.76)
Case material		Zn	Al
Flap balancer		Not provided	Provided
Internal circuit		Designed for E.C.C.S.	Designed for E.F.I.

[Cylinder head temperature sensor]

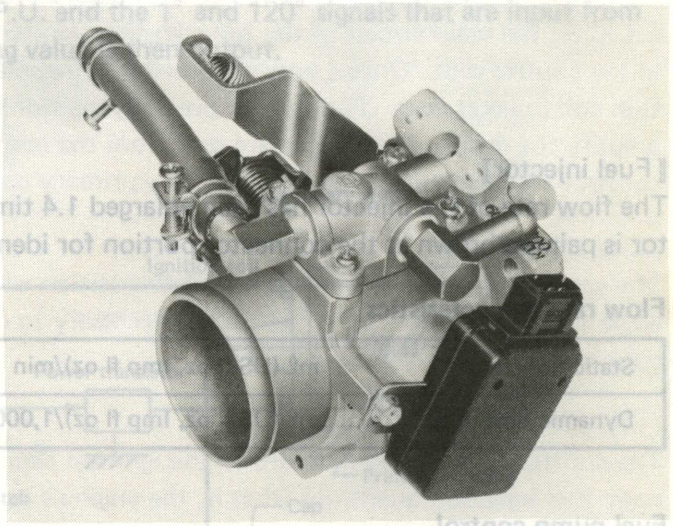
The cylinder head temperature sensor is unchanged from that used in the former E.F.I. system.
Analog signals from this sensor are converted into digital signals in the A/D converter. These signals are used to control fuel injection, but also control engine idling speed, E.G.R. and ignition timing.



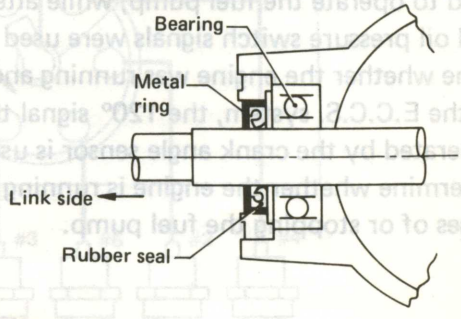
[Throttle chamber]

Ignition timing and E.G.R. are controlled by E.C.C.S. Accordingly, the following changes have been made:

- Distributor VC connector eliminated
- E.G.R. VC connector eliminated

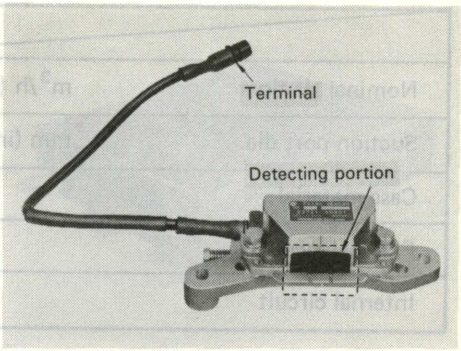


Along with the installation of the turbocharger, a metal ring has been added to the bearing rubber seal.



[Crank angle sensor]

In the former E.F.I. system, the engine rpm signal that was necessary for control of fuel injection was input from the ignition coil's negative terminal. In the new E.C.C.S., the engine rpm signal is detected by the 1° signal from the crank angle sensor, and is then sent to the control unit. Together with the signal from the cylinder head temperature sensor, this engine rpm signal are the signals used for a variety of control operations.

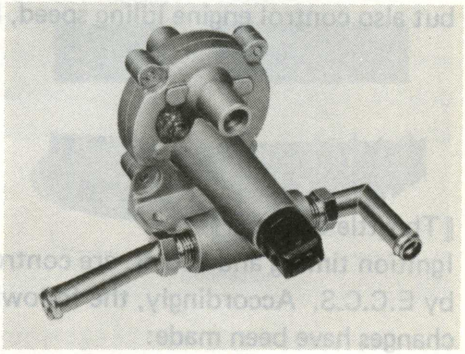


[Control unit]

The C.P.U. incorporated in the control unit computes basic injection quantities, and various fuel enrichment corrections for determining the optimum injection quantity at a given status of the engine, as well as sends out pulses to activate the injector.

[Air regulator]

A hot water passage is now provided in the air regulator to prevent temperature drops around the bimetal.



[Fuel injector]

The flow rate of the injector has been enlarged 1.4 times over the former E.F.I. system's. The new fuel injector is painted brown at the connector portion for identification purposes.

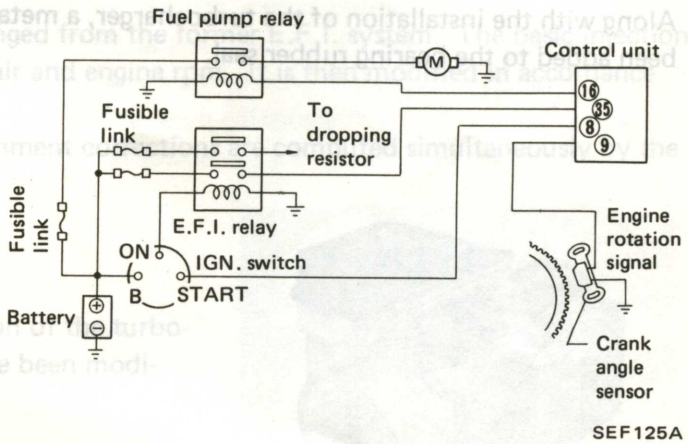
Flow rate characteristics

Static flow rate	mℓ (US fl oz, Imp fl oz)/min	246 - 262 (8.3 - 8.9, 8.7 - 9.2)
Dynamic flow rate	mℓ (US fl oz, Imp fl oz)/1,000 st	7.08 - 8.06 (0.24 - 0.27, 0.25 - 0.28)

Fuel pump control

In the former E.F.I. system, another circuit was used to operate the fuel pump, while alternator and oil pressure switch signals were used to determine whether the engine was running and stop. In the E.C.C.S. system, the 120° signal that is generated by the crank angle sensor is used to determine whether the engine is running for purposes of or stopping the fuel pump.

Fuel pump control in E.C.C.S.:

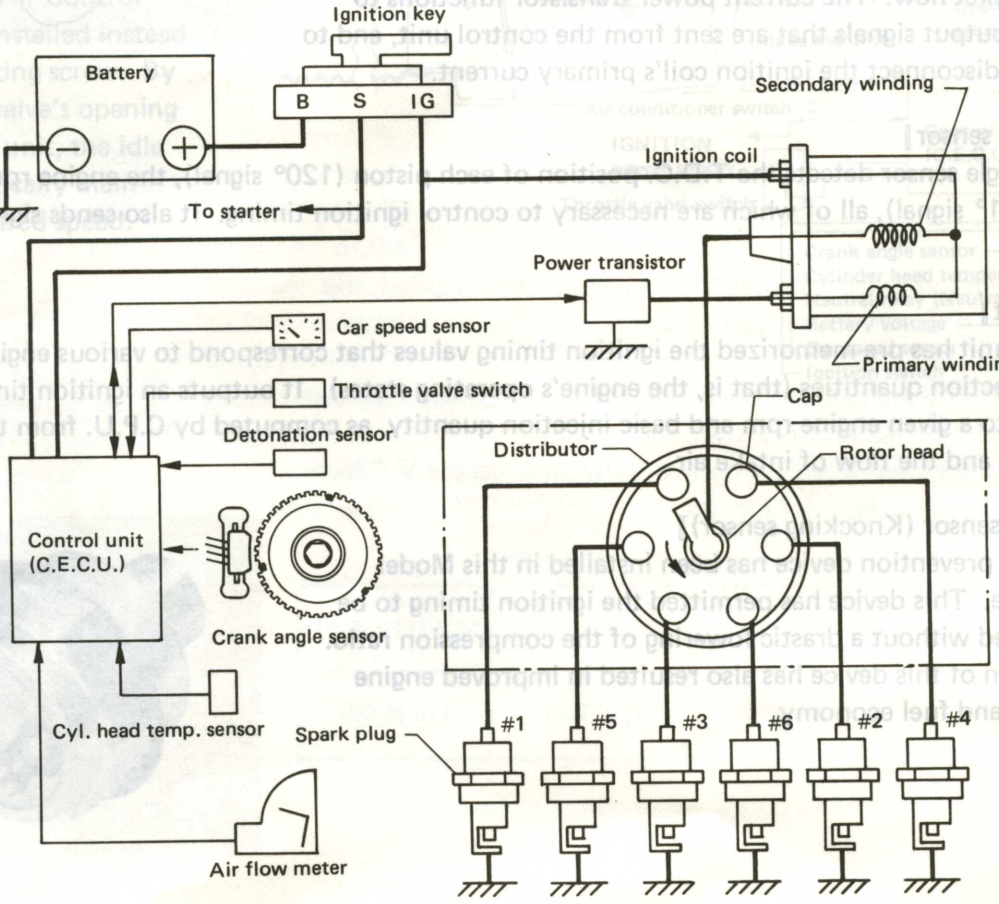


Fuel pump operation in E.C.C.S.:

Ignition switch position	Fuel pump operation	Engine speed	Crank angle sensor signal (received by control unit)	Fuel pump relay state
ON	Operates for 5 seconds	Stops	120° signal: None	ON for 5 seconds
START	Stops	Below 20 rpm	120° signal: None for 1 second	OFF
	Operates	Above 20 rpm	120° signal: Provided in 1 second	ON
ON	Stops	Below 20 rpm	120° signal: None for 1 second	OFF
	Operates	Above 20 rpm	120° signal: Provided in 1 second	ON

Ignition timing control

- In the E.C.C.S., the distributor does not have a governor mechanism or a vacuum advance mechanism. It only has a rotor, which produces sparks sequentially in each cylinder, and a distributor cap.
- A power transistor has replaced the igniter unit that was formerly used.
- The control unit sends signals to the power transistor to control the ignition timing and period of energization.
- Data on ignition timing is memorized in the control unit, and optimum ignition timing is pre-determined to correspond to the engine rpm and basic quantity of fuel being injected (when the engine is operating).
- The control unit selects the optimum ignition timing value from the memorized data in accordance with the basic injection quantity, as computed by the C.P.U. and the 1° and 120° signals that are input from the crank angle sensor. The optimum ignition timing value is then output.



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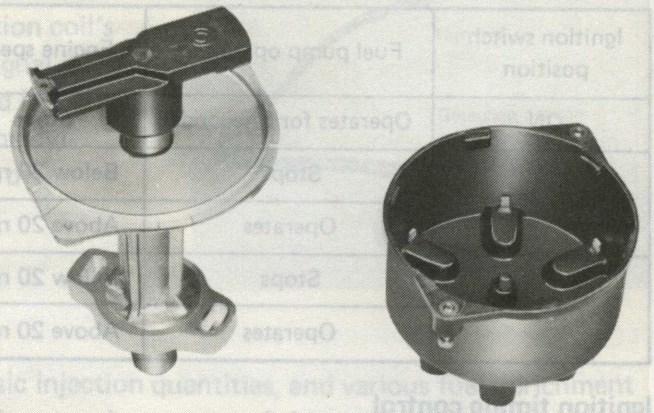
Ignition timing control system component parts:

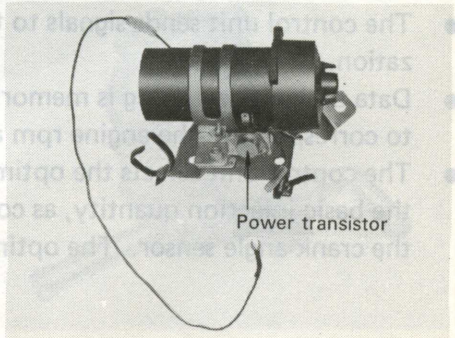
[Distributor]

In the E.C.C.S., ignition timing and energization periods are controlled by the control unit and power transister of the ignition coil, so only a rotor and distributor cap are included in the distributor.



[Ignition coil]

Greater ignition voltage is required at high speed area because of the turbocharger's installation. Consequently, the ignition coil has been changed to increase output in the high speed range.
The full-transistor igniter that was installed on the outside of the distributor in the former E.F.I. system has been eliminated. In the E.C.C.S., the main circuit of the full-transistor igniter is now located in the control unit. Only a power transistor is installed on the ignition coil bracket now. The current power transistor functions to amplify the output signals that are sent from the control unit, and to connect and disconnect the ignition coil's primary current.



[Crank angle sensor]

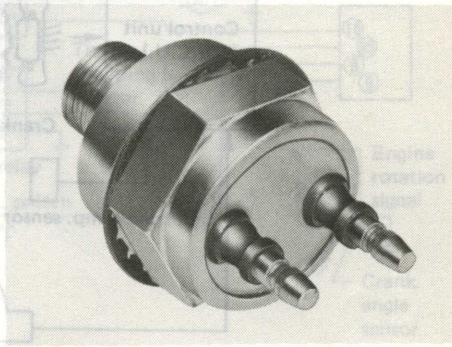
The crank angle sensor detects the T.D.C. position of each piston (120° signal), the engine rpms and the angle signal (1° signal), all of which are necessary to control ignition timing. It also sends signals to the control unit.

[Control unit]

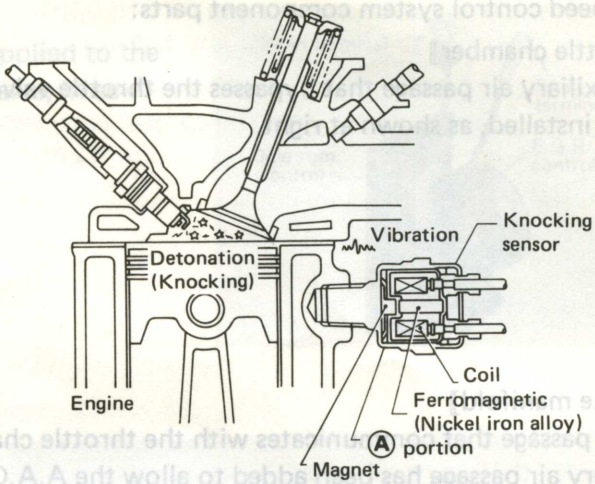
The control unit has pre-memorized the ignition timing values that correspond to various engine rpms and basic fuel injection quantities (that is, the engine's operating states). It outputs an ignition timing value that corresponds to a given engine rpm and basic injection quantity, as computed by C.P.U. from the crank angle sensor signals and the flow of intake air.

[Detonation sensor (Knocking sensor)]

A detonation prevention device has been installed in this Model L28ET engine. This device has permitted the ignition timing to be ideally selected without a drastic lowering of the compression ratio. The utilization of this device has also resulted in improved engine performance and fuel economy.



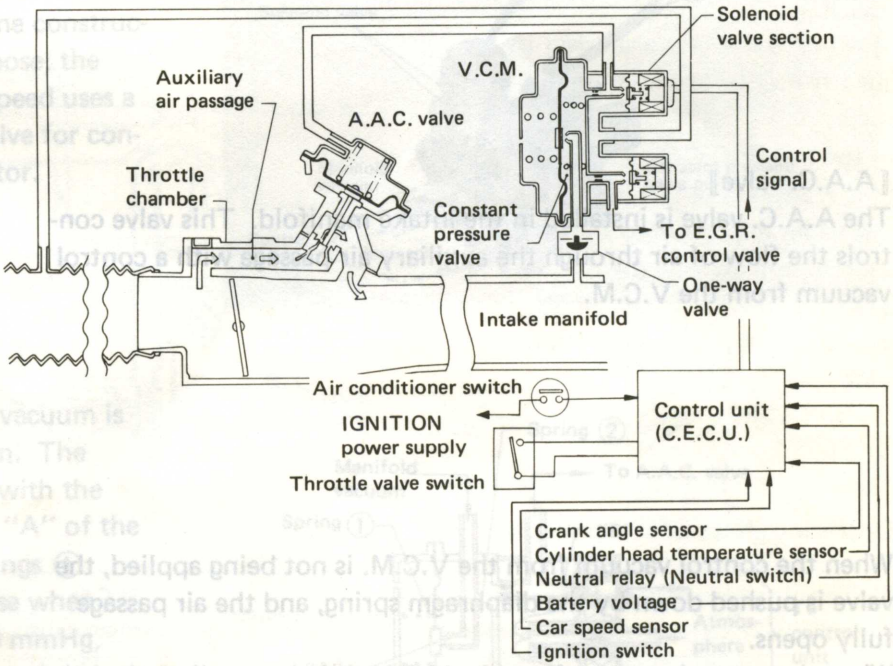
The detonation sensor has a ferromagnetic core which is excited by a magnet. If knocking vibrations are transmitted from the cylinder block to this core, a distortion is created. This distortion changes the core's permeability. The density of the magnetic flux passing through the core then changes, and this causes a voltage to be generated in the coil that surrounds the core. This voltage is then sent to the control unit.



Idle speed control

In the former E.F.I. system, the idle adjustment screw was located in the idle adjusting screw unit that by-passed the throttle valve, and idle speed was adjusted manually.

In the new E.C.C.S., an A.A.C. valve (Auxiliary Air Control valve) has been installed instead of the idle adjusting screw. By controlling this valve's opening with the control unit, the idle speed is automatically maintained at the desired speed.



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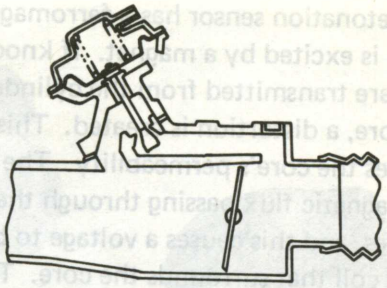
Idle speed control system component parts:

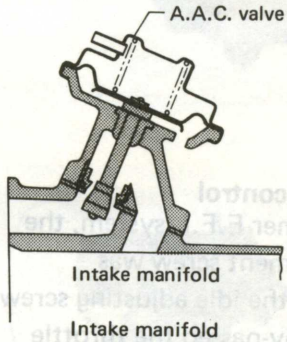
[Throttle chamber]

An auxiliary air passage that bypasses the throttle valve has been newly installed, as shown at right.



[Intake manifold]

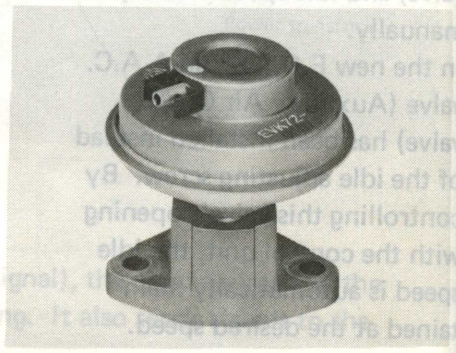
An air passage that communicates with the throttle chamber auxiliary air passage has been added to allow the A.A.C. valve to be installed in order to vary the air flow rate.



Intake manifold and A.A.C. valve

[A.A.C. valve]

The A.A.C. valve is installed in the intake manifold. This valve controls the flow of air through the auxiliary air passage with a control vacuum from the V.C.M.

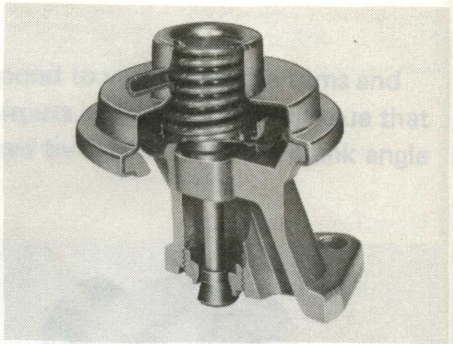


When the control vacuum from the V.C.M. is not being applied, the valve is pushed down by the diaphragm spring, and the air passage fully opens.

When the control vacuum from the V.C.M. is being applied, the valve is pulled up, and the air passage closes.

The valve is fully closed when the control vacuum from the V.C.M. is −16.0 kPa (−120 mmHg, −4.72 inHg).

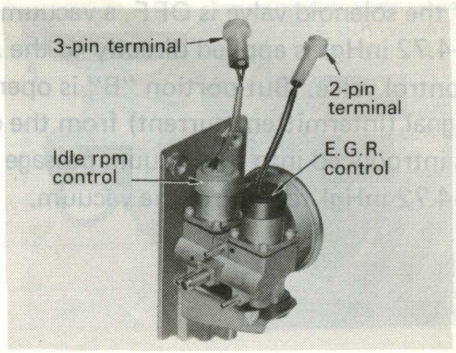
Characteristics



Vacuum −kPa (−mmHg, −inHg)	0 (0, 0)	6.0 (45, 1.77)	14.7 (110, 4.33)
Air flow ℓ (cu ft)/min	165 (5.83)	220 (7.77)	115 (4.06)

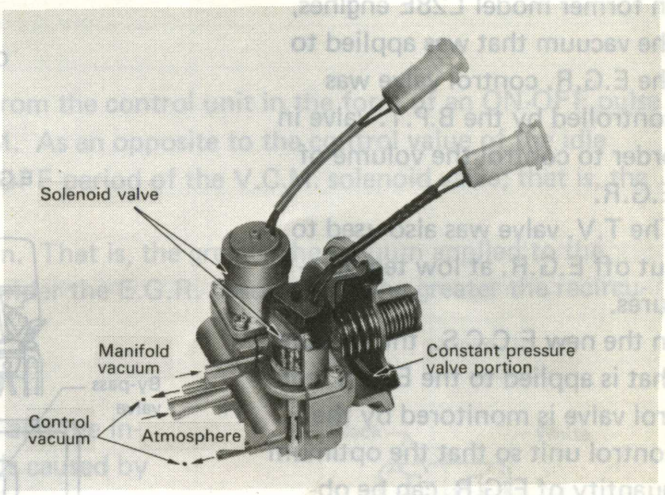
[V.C.M. solenoid valve]

The V.C.M. solenoid valve controls the vacuum that is applied to the diaphragm of the A.A.C. valve and the E.G.R. control valve, in accordance with the signals from the control unit.



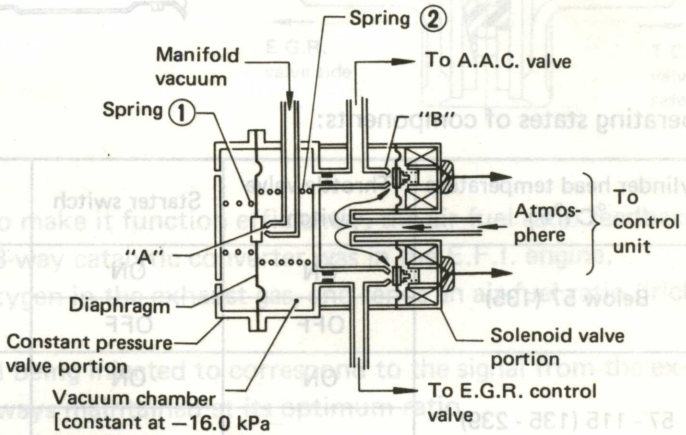
– Construction –

As shown at right, the V.C.M. consists of a diaphragm type constant pressure valve, which maintains the manifold vacuum at a constant level, and two solenoid valves to control the vacuum that is applied to the A.A.C. and E.G.R. control valves. These two solenoid valves have the same construction. However, for identification purpose, the solenoid valve for control of the idle speed uses a 3-pin connector, while the solenoid valve for control of the E.G.R. uses a 2-pin connector.

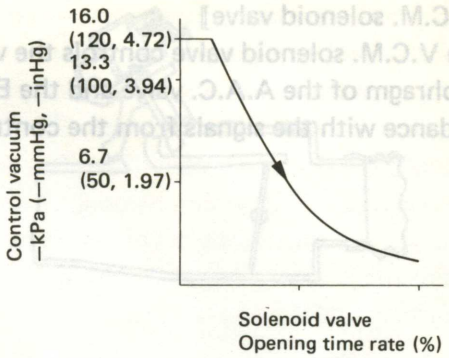


– Operation –

When the engine operates, a manifold vacuum is generated and acts upon the diaphragm. The nature of the manifold vacuum varies with the engine's operating condition. Portion "A" of the valve is constructed by combining springs ① and ② so that the diaphragm will close when the vacuum exceeds –16.0 kPa (–120 mmHg, –4.72 inHg). Accordingly, the vacuum chamber in the constant pressure valve is maintained at –16.0 kPa (–120 mmHg, –4.72 inHg) even if the manifold vacuum is higher than –16.0 kPa (–120 mmHg, –4.72 inHg).



If the solenoid valve is OFF, a vacuum of −16.0 kPa (−120 mmHg, −4.72 inHg) is applied directly to the A.A.C. valve or the E.G.R. control valve. But portion "B" is opened or closed depending on the signal (intermittent current) from the control unit, and atmosphere is introduced into the vacuum passage of −16.0 kPa (−120 mmHg, −4.72 inHg) to control the vacuum.

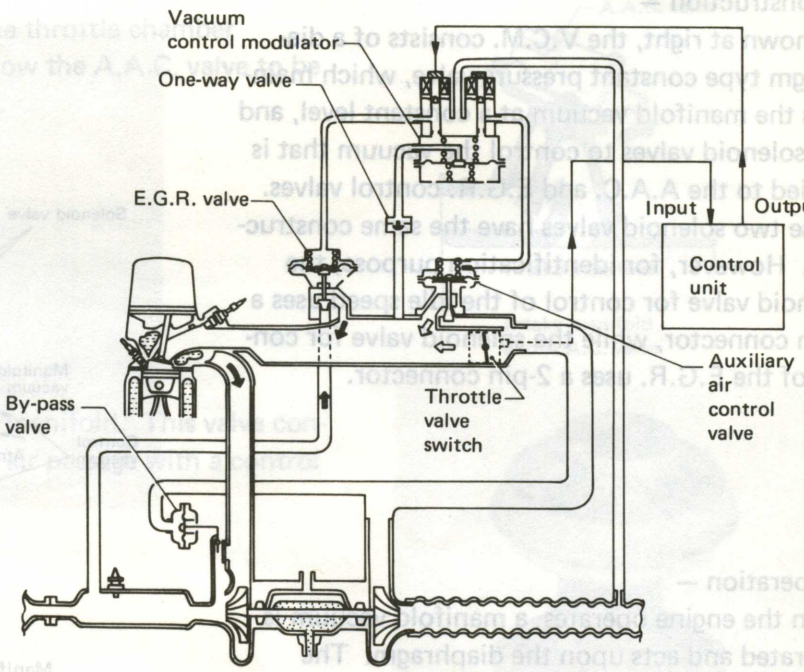


E.G.R. control

In former model L28E engines, the vacuum that was applied to the E.G.R. control valve was controlled by the B.P.T. valve in order to control the volume of E.G.R.

The T.V. valve was also used to cut off E.G.R. at low temperatures.

In the new E.C.C.S., the vacuum that is applied to the E.G.R. control valve is monitored by the control unit so that the optimum quantity of E.G.R. can be obtained for any given operating state.



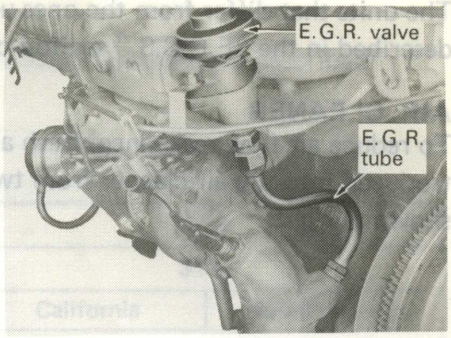
Operating states of components:

Cylinder head temperature °C (°F)	Throttle valve switch	Starter switch	V.C.M. solenoid valve	E.G.R. control valve	E.G.R.
Below 57 (135)	ON	ON	ON	Closed	Not actuated
	OFF	OFF			
57 - 115 (135 - 239)	ON	ON	ON	Closed	Not actuated
	OFF	OFF	ON-OFF (control vacuum)	Open	Actuated
Above 115 (239)	ON	ON	ON	Closed	Not actuated
	OFF	OFF			

E.G.R. control system components:

[E.G.R. control valve and E.G.R. tube]

The construction of the E.G.R. control valve has not changed from the one used in the former E.F.I. system, but its characteristics have.



[V.C.M. valve]

See "Idle Speed Control".

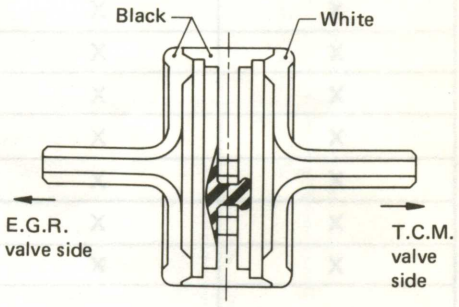
[Control unit]

Like the idle rpms control, the control value is output from the control unit in the form of an ON-OFF pulse to open or close the solenoid valve portion of the V.C.M. As an opposite to the control value of the idle rpms control, this E.G.R. control value determines the OFF period of the V.C.M. solenoid valve; that is, the valve close period ratio.

This is a result of the E.G.R. control valve's construction. That is, the greater the vacuum applied to the valve (the longer the solenoid valve's OFF period), the wider the E.G.R. passage, and the greater the recirculated quantity.

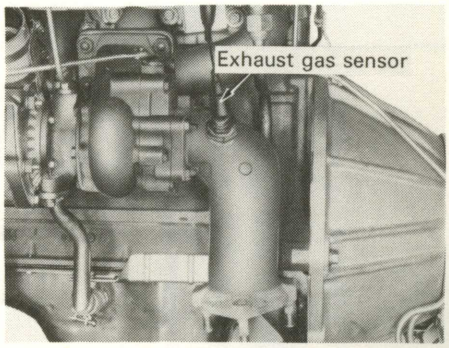
[One-way valve]

A one-way valve has been installed between the V.C.M. and the intake manifold to control the supercharge pressure that is caused by the turbocharger's operation.



Air-fuel ratio feedback control

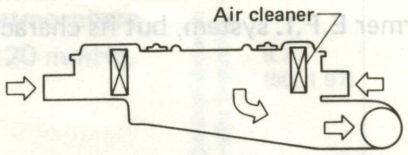
- The E.C.C.S. uses a 3-way catalytic onverter. To make it function efficiently, the air-fuel ratio feedback is controlled in the same manner as the former 3-way catalytic converter was in the E.F.I. engine.
- The exhaust gas sensor detects the density of oxygen in the exhaust gas, and sends an air-fuel ratio "rich" or "lean" signal to the control unit.
- The control unit then varies the quantity of fuel being injected to correspond to the signal from the exhaust gas sensor. Thus the air-fuel mixture is always maintained at its optimum ratio.
- The exhaust gas sensor unit has not been changed from the one used in the E.F.I. system.
- The exhaust gas sensor inspection lamp that is installed in the control unit is different from the former one; that is, the new lamp can monitor only the exhaust gas sensor's operation, but the circuit and/or the control unit cannot be inspected because of the change from the former E.F.I. system to the new E.C.C.S.

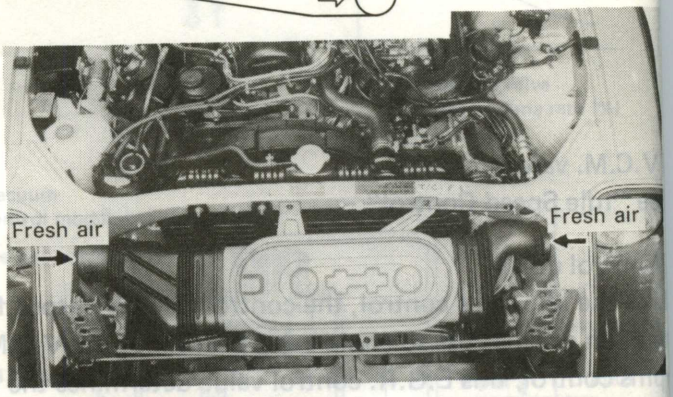


The units that differ from the ones used in the E.F.I. system are mentioned below, except those already described in the "E.C.C.S." section of this bulletin.

AIR CLEANER

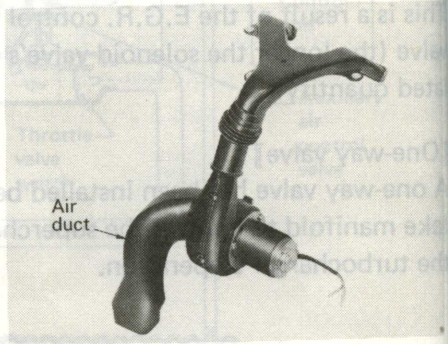
To reduce air flow resistance, fresh air is now introduced into the air cleaner from two ports, as shown at right.





AUXILIARY COOLING

An air duct has been newly added, as shown at right.



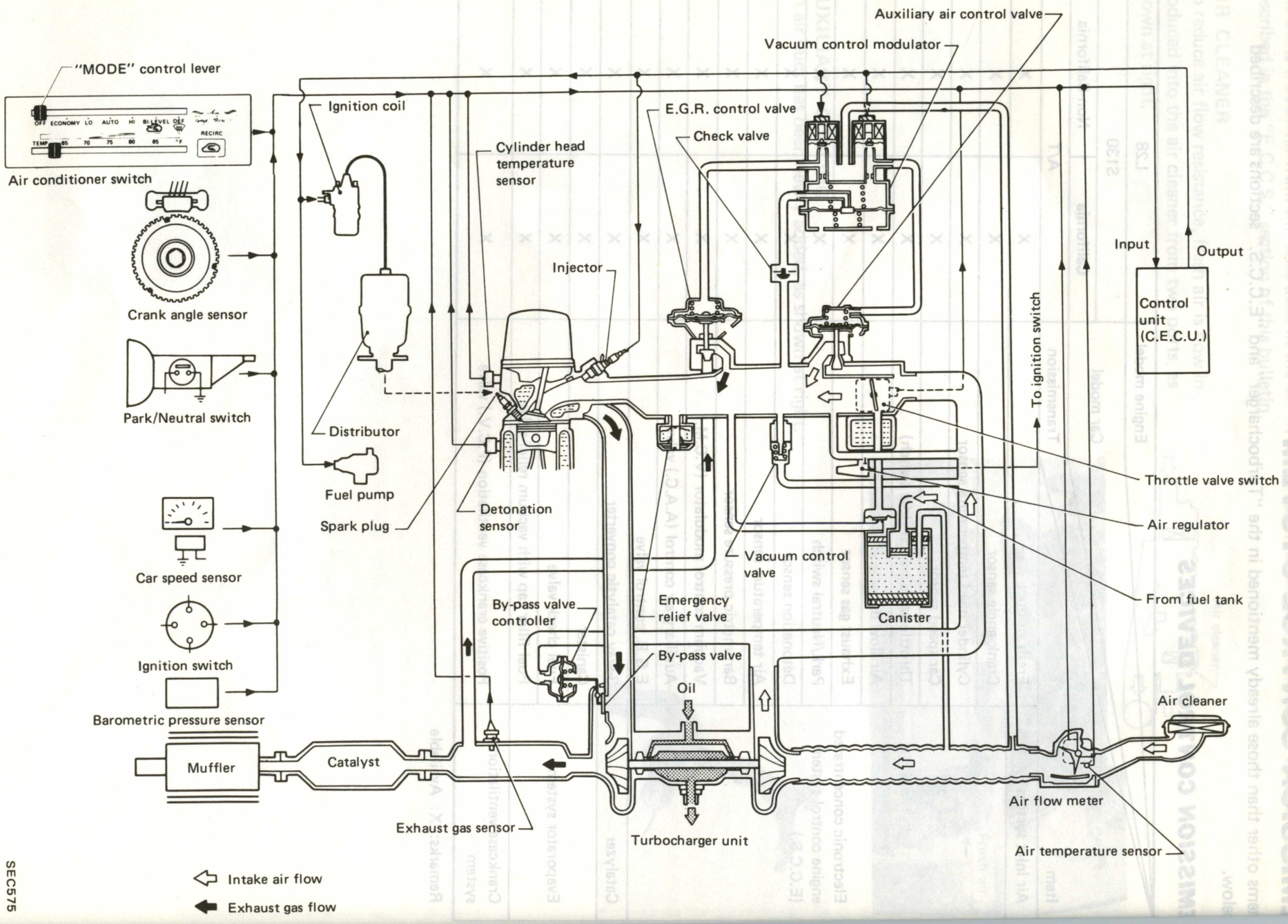
EMISSION CONTROL SYSTEM

Items other than those already mentioned in the "Turbocharger" and "E.C.C.S." sections are described below.

EMISSION CONTROL DEVICES

Item	Engine model	L28	
	Car model	S130	
		California	Non-California
	Transmission	A/T	
Air inlet system	Fresh air duct	X	X
Electronic concentrated engine control system (E.C.C.S.)	Crank angle sensor	X	X
	Cylinder head temperature sensor	X	X
	Car speed sensor	X	X
	Throttle valve switch (Idle switch)	X	X
	Air flow meter	X	X
	Exhaust gas sensor	X	X
	Park/Neutral switch	X	X
	Detonation sensor	X	X
	Air temperature sensor	X	X
	Barometric pressure sensor	X	X
	Vacuum control modulator (V.C.M.)	X	X
	Auxiliary air control (A.A.C.) valve	X	X
	E.G.R. control valve	X	X
Catalyzer	3-way catalytic converter	X	X
Evaporator system	Canister	X	X
	Fuel check valve	X	X
	Fuel filler cap with vacuum relief valve	X	X
Crankcase ventilation system	Positive crankcase ventilation (P.C.V.) valve	X	X

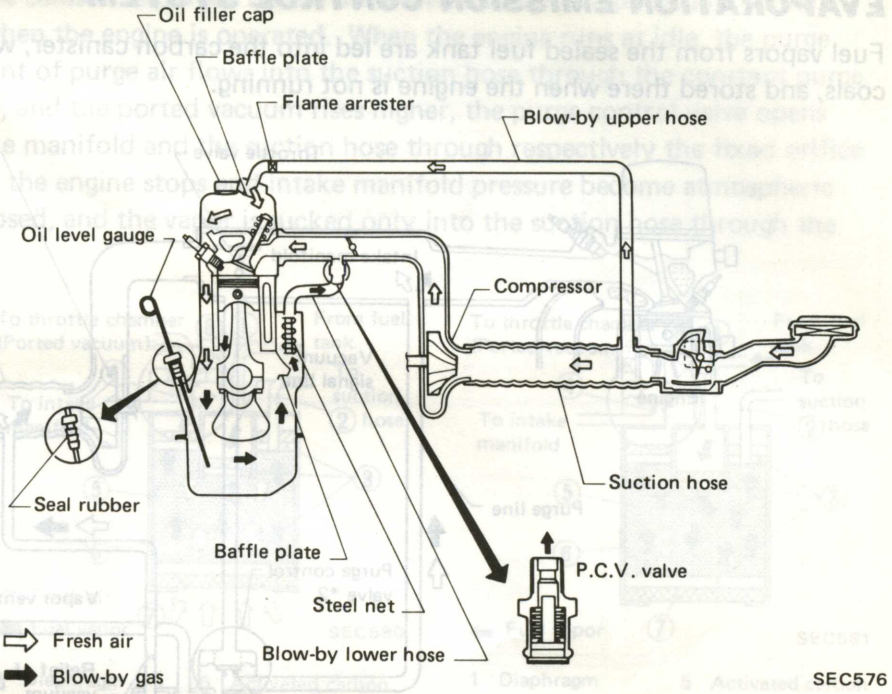
Remarks: X: Available


"MODE" control lever
Air conditioner switch
Crank angle sensor
Park/Neutral switch
Car speed sensor
Ignition switch
Barometric pressure sensor
Ignition coil
Distributor
Fuel pump
Spark plug
Cylinder head temperature sensor
Injector
Detonation sensor
E.G.R. control valve
Check valve
Auxiliary air control valve
Vacuum control modulator
Input
Output
Control unit (C.E.C.U.)
To ignition switch
Throttle valve switch
Air regulator
From fuel tank
Vacuum control valve
Emergency relief valve
Canister
By-pass valve controller
By-pass valve
Oil
Air cleaner
Air flow meter
Air temperature sensor
Turbocharger unit
Exhaust gas sensor
Muffler
Catalyst
Intake air flow
Exhaust gas flow

SEC575

CRANKCASE EMISSION CONTROL SYSTEM

This system returns blow-by gas to both the suction hose and the intake manifold.
Since a vacuum is normally kept in the portion between the air cleaner and suction hose, blow-by gas in the rocker cover is sucked into the turbocharger from the suction hose, and is then sent into the intake manifold through the throttle chamber where it is burnt in the engine.
Blow-by gas located in the crankcase flows into the intake manifold through the positive crankcase ventilation (P.C.V.) valve in the blow-by lower hose when vacuum is maintained in the intake manifold. If positive pressure exists in the intake manifold, any blow-by gas in the crankcase is led to the blow-by upper hose, which prevents an abnormal rise in crankcase pressure.



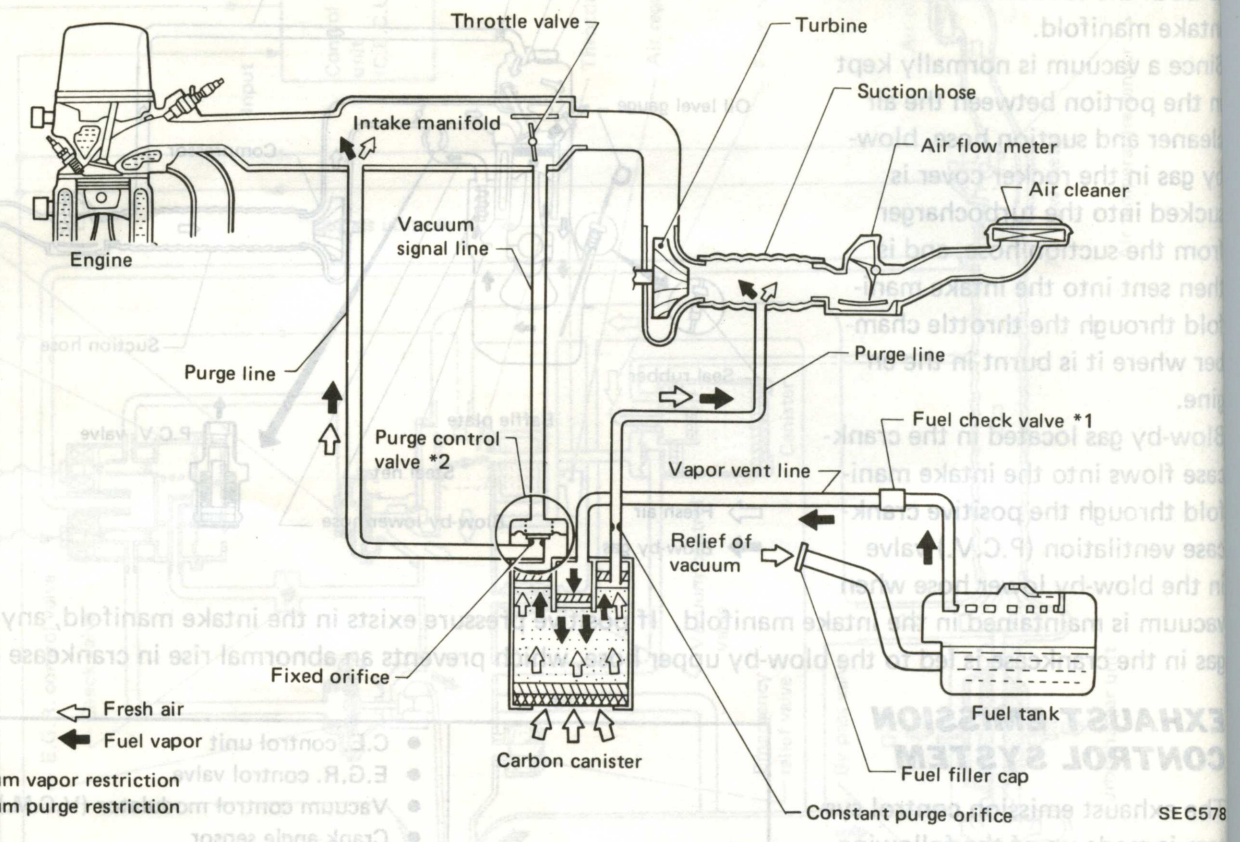
EXHAUST EMISSION CONTROL SYSTEM

The exhaust emission control system is made up of the following.

E.G.R. system	• C.E. control unit • E.G.R. control valve • Vacuum control modulator (V.C.M.) • Crank angle sensor • Cylinder head temperature sensor • Throttle valve switch (Idle switch) • Air flow meter • Air temperature sensor • Barometric pressure sensor
Spark timing control system	• C.E. control unit • Crank angle sensor • Throttle valve switch • Air flow meter • Detonation sensor • Air temperature sensor • Barometric pressure sensor
Mixture ratio feedback system	• C.E. control unit • Exhaust gas sensor
Catalytic converter	• 3-way catalytic converter

EVAPORATION EMISSION CONTROL SYSTEM

Fuel vapors from the sealed fuel tank are led into the carbon canister, which is filled with activated charcoals, and stored there when the engine is not running.

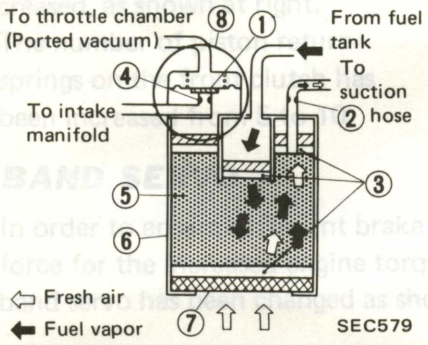


*1 Maximum vapor restriction
*2 Maximum purge restriction

VAPOR CANISTER

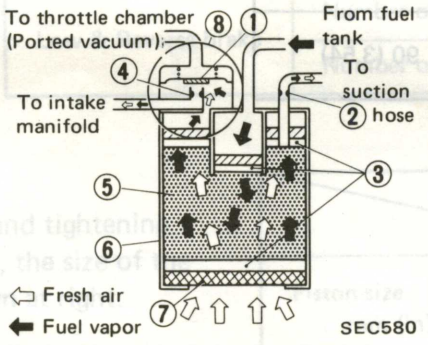
A purge connector has been added to enable purge to be performed even in the supercharge area. Purging the supercharge area can be accomplished by utilizing the vacuum in the suction hose located between the turbocharger and the air flow meter.

The canister retains the vapor until the canister is purged by the air drawn through the purge line to the intake manifold and the suction hose when the engine is operated. When the engine runs at idle, the purge control valve is closed. A small amount of purge air flows into the suction hose through the constant purge orifice. As the engine speed increases, and the ported vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold and the suction hose through respectively the fixed orifice and the constant purge orifice. When the engine stops and intake manifold pressure become atmospheric pressure, the purge control valve is closed, and the vapor is sucked only into the suction hose through the constant purge orifice.



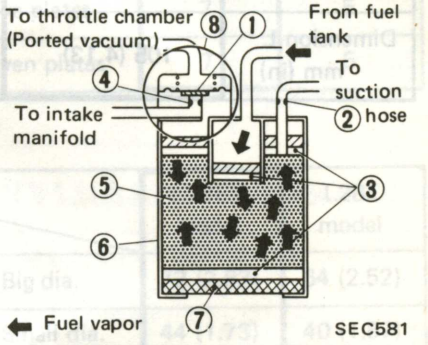
1 Diaphragm
2 Fixed orifice (Constant purge)
3 Filter
4 Fixed orifice
5 Activated carbon
6 Case
7 Filter
8 Purge control valve

Engine runs at idle



1 Diaphragm
2 Fixed orifice (Constant purge)
3 Filter
4 Fixed orifice
5 Activated carbon
6 Case
7 Filter
8 Purge control valve

Engine speed increases

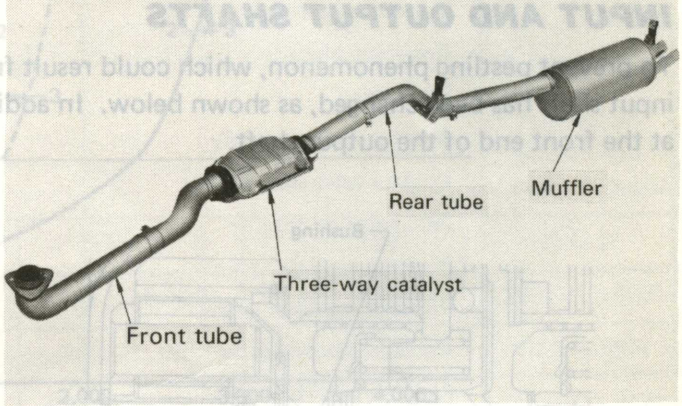


1 Diaphragm
2 Fixed orifice (Constant purge)
3 Filter
4 Fixed orifice
5 Activated carbon
6 Case
7 Filter
8 Purge control valve

Engine stops

EXHAUST SYSTEM

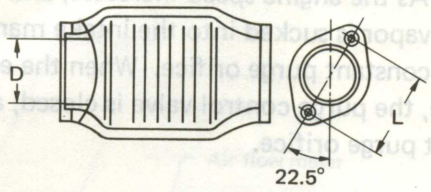
To reduce output loss at low speeds, the diameter of the exhaust system's tail pipe has been increased greatly. In order to maintain the temperature of the exhaust gas, a double pipe has been used for the front tube. Muffler capacity has also been increased from 10.1ℓ (0.357 cu ft) to 15.7ℓ (0.554 cu ft). The tail pipe is now a dual type.



CATALYST CONVERTER

The diameters of the converter's inlet and outlet have been increased in order to reduce the exhaust gas flow resistance and thus improve engine output.

	L28ET	L28E
Dimension D mm (in)	Over 64.6 (2.543)	Over 47.7 (1.878)
Dimension L mm (in)	105 (4.13)	90 (3.54)



CHASSIS

AUTOMATIC TRANSMISSION (Model: 3N71B)

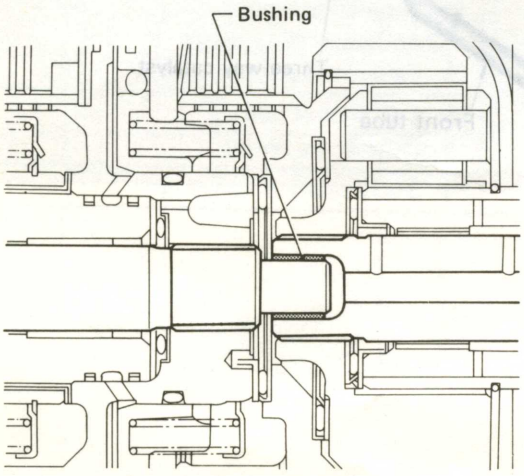
To comport to the installation of the L28ET engine, the automatic transmission has been modified as follows:

TORQUE CONVERTER

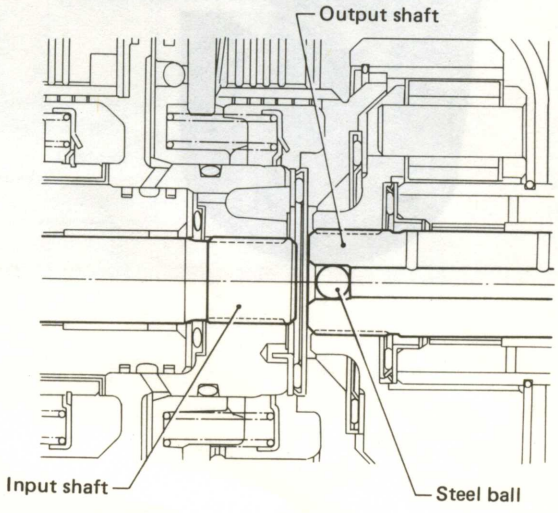
In order to assure a durability that is sufficient to cope with the increased engine torque, the method used to mount the torque converter blades has been changed from calking to blazing.

INPUT AND OUTPUT SHAFTS

To prevent pestling phenomenon, which could result from the increased engine torque, the design of the input shaft has been changed, as shown below. In addition, an input shaft support bushing has been installed at the front end of the output shaft.



L28ET model



L28E model

FRONT AND REAR CLUTCHES, AND LOW & REVERSE BRAKE

In order to assure enough clutch engaging force, the number of drive and driven plates on the front clutch, rear clutch and low & reverse brakes have been increased, as shown at right.
The number of piston return springs on the front clutch has been increased from 5 to 10.

		L28ET model	L28E model
Front clutch	Number of drive plates	4	3
	Number of driven plates	5	3
Rear clutch	Number of drive plates	6	5
	Number of driven plates	6	5
Low & Reverse brake	Number of drive plates	7	5
	Number of driven plates	7	5

BAND SERVO

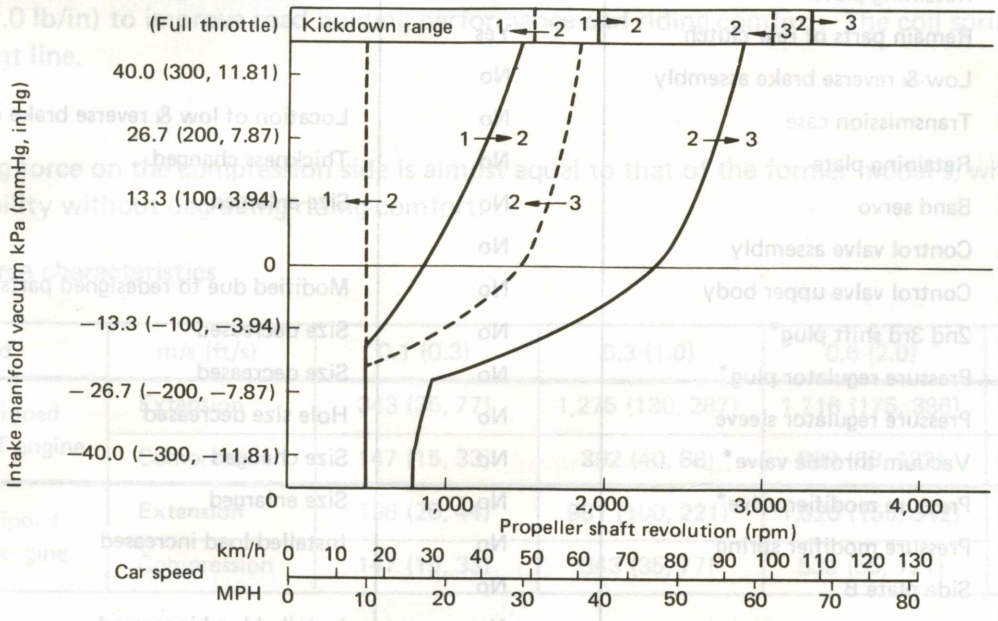
In order to ensure sufficient brake band tightening force for the increased engine torque, the size of the band servo has been changed as shown at right.

		L28ET model	L28E model
Piston size mm (in)	Big dia.	72 (2.83)	64 (2.52)
	Small dia.	44 (1.73)	40 (1.57)

CONTROL VALVE

To properly match the performance of the new L28ET engine, the control valve model has been changed from MEK to TRBK. Along with this change, the line pressure and shift schedule during idle, stall and gear shifting have all been changed.

SHIFT SCHEDULE



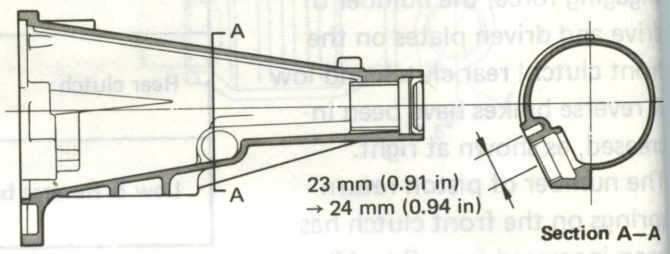
SAT222

VACUUM DIAPHRAGM

To cope with the positive pressure in the engine caused by the installation of turbocharger, the vacuum diaphragm characteristics have also been changed.

REAR EXTENSION

Corresponding to the change in the design of the output shaft and the resultant changes in the number of gears on the speedometer worm gear (6T to 7T), the dimensions of the speedometer pinion outlet in the rear extension have been changed, as shown at right.



Section A–A

INTERCHANGEABILITY

	Unit or parts	Interchangeability	Remarks
Automatic transmission	Automatic transmission assembly	No	
	Torque converter assembly	No	
	Input shaft	No	
	Output shaft	No	
	Front clutch assembly	No	
	Front clutch drum	No	
	Remain parts of front clutch	Yes	
	Rear clutch assembly	No	
	Retaining plate	No	Thickness changed
	Remain parts of rear clutch	Yes	
	Low & reverse brake assembly	No	
	Transmission case	No	Location of low & reverse brake changed
	Retaining plate	No	Thickness changed
	Band servo	No	Size enlarged
	Control valve assembly	No	
	Control valve upper body	No	Modified due to redesigned parts marked "*"
	2nd 3rd shift plug*	No	Size decreased
	Pressure regulator plug*	No	Size decreased
	Pressure regulator sleeve	No	Hole size decreased
	Vacuum throttle valve*	No	Size changed
	Pressure modifier valve*	No	Size enlarged
	Pressure modifier spring	No	Installed load increased
	Side plate B	No	
	Throttle relief check spring	No	Installed load increased
	Remain parts of control valve	Yes	Configuration changed
	Rear planetary carrier assembly	No	Material changed
	Vacuum diaphragm	No	
	Rear extension	No	
	All other parts	Yes	

PROPELLER SHAFT AND DIFFERENTIAL CARRIER

To accommodate the 30% increase in the maximum drive torque of the L28ET engine and increase strength, the following modifications have been made:

PROPELLER SHAFT

The tube's outside diameter and joint size have been changed as indicated in the chart below:

	Models equipped with L28ET engine	Models equipped with L28E engine
Model	2S71A	2S63A
Length mm (in)	575 (22.64)	580 (22.83)
Outer diameter mm (in)	75 (2.95)	63.5 (2.500)

DIFFERENTIAL CARRIER

The gear ratio has been increased to 3.545. However, the differential carrier is a model R200 model, which is similar to that used with the previous manual transmission.

FRONT AXLE AND FRONT SUSPENSION

The basic design of the front axle has been retained. However, front suspension components, such as the coil spring, strut, and stabilizer, have been tuned up for use with the L28ET engine, in order to improve steering stability. The suspension crossmember has also undergone some modifications to accommodate the utilization of the model IPRP15L power steering system.

COIL SPRING

The spring constant has been reduced from 22.16 N/mm (2.26 kg/mm, 126.6 lb/in) to 19.61 N/mm (2.00 kg/mm, 112.0 lb/in) to improve road holding performance and riding comfort. The coil spring is identified by a red paint line.

STRUT

The damping force on the compression side is almost equal to that of the former model's, which improves steering stability without degrading riding comfort.

Damping force characteristics

Unit: N (kg, lb)

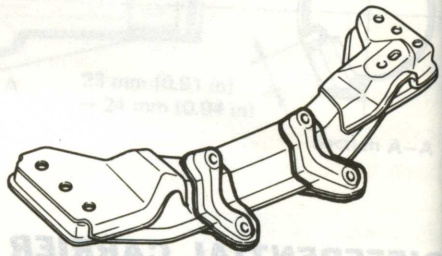
Piston speed	m/s (ft/s)	0.1 (0.3)	0.3 (1.0)	0.6 (2.0)	1.0 (3.3)
Models equipped with L28ET engine	Extension	343 (35, 77)	1,275 (130, 287)	1,716 (175, 386)	2,256 (230, 507)
	Compression	147 (15, 33)	392 (40, 88)	588 (60, 132)	883 (90, 198)
Models equipped with L28E engine	Extension	196 (20, 44)	981 (100, 221)	1,520 (155, 342)	1,961 (200, 441)
	Compression	147 (15, 33)	343 (35, 77)	539 (55, 121)	883 (90, 198)

STABILIZER BAR

The wire diameter has been enlarged from 22 mm (0.87 in) to 23 mm (0.91 in), to increase rolling rigidity, and provides roll-steer characteristics similar to the former model's.
Together with this change, the mounting bushing's inner diameter has also been increased from 21 mm (0.83 in) to 22 mm (0.87 in).

CROSSMEMBER

Due to the utilization of the model IPRP15L power steering system, and accommodate its steering gear, a mounting bracket has been added.



REAR AXLE AND REAR SUSPENSION

The performance characteristics of the shock absorbers and the coil springs have been enhanced on models equipped with the L28ET engine in order to improve their steering stability. Additionally, the bushings and other associated parts have been revised to reduce noise and vibration.

DRIVE SHAFT

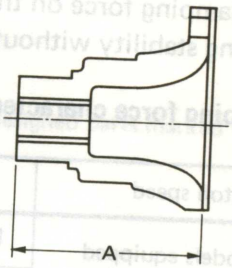
The drive shaft utilizes a tripod constant velocity design that is similar to the TFS50/56A model [which is used as the front drive shaft on the model 720 4WD (4-wheel drive)] vehicle. However, the model number is a 2T82S.
[This type of drive shaft cannot be disassembled. When the drive shaft must be serviced, extreme care must be taken so as not to damage the boot.]

REAR AXLE

Together with the changes in the drive shaft, the following modifications have been made:

- Rear axle flange
  Dimension "A" (in Figure at right) has been increased from 59 mm (2.32 in) to 79 mm (3.11 in).
- An "S" nut has replaced the rear wheel bearing lock nut that was used previously. This nut is similar in design to the one used in the 910 series.

  Do not re-use the "S" nut after it has been removed.



COIL SPRING

To increase road holding performance and improve riding comfort, the spring constant has been reduced from 24.62 to 19.61 N/mm (2.51 to 2.00 kg/mm, 140.6 to 112.0 lb/in).

SHOCK ABSORBER

The damping force characteristics of the shock absorber have been improved to make the ride more comfortable.

Damping force characteristics

Unit: N (kg, lb)

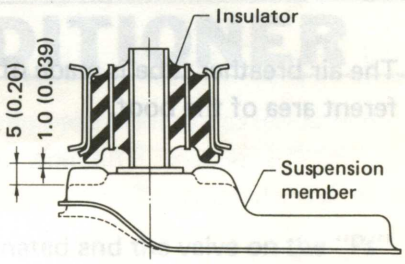
Piston speed	m/s (ft/s)	0.1 (0.3)	0.3 (1.0)	0.6 (2.0)	1.0 (3.3)
Models equipped with L28ET engine	Extension	539 (55, 121)	1,275 (130, 287)	2,158 (220, 485)	3,236 (330, 728)
	Compression	245 (25, 55)	392 (40, 88)	588 (60, 132)	883 (90, 198)
Models equipped with L28E engine	Extension	147 (15, 33)	834 (85, 187)	1,765 (180, 397)	2,354 (240, 529)
	Compression	147 (15, 33)	441 (45, 99)	736 (75, 165)	1,030 (105, 232)

SHOCK ABSORBER MOUNTING BUSHING

The dynamic spring constant has been reduced from 2,452 N/mm (250 kg/mm, 14,000 lb/in) to 1,648 N/mm (168 kg/mm, 9,408 lb/in), to minimize the transmission of road noise.

SUSPENSION MEMBER

The clearances between the suspension member and the insulators (upper and lower) have been reduced from 5 mm (0.20 in) to 1 mm (0.04 in) to improve steering stability.



Unit: mm (in)

INSULATOR

The insulators' spring constant has been lowered to reduce road noise and harshness.

Spring constant

Unit: N/mm (kg/mm, lb/in)

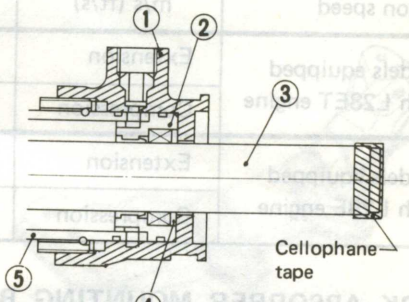
		Models equipped with L28ET engine	Models equipped with L28E engine
Static	Front and rear	441 (45, 2,520)	785 (80, 4,480)
	Left and right	1,226 (125, 7,000)	2,942 (300, 16,800)
	Up and down	78 (8, 448)	98 (10, 560)
Dynamic	Front and rear	471 (48, 2,688)	1,079 (110, 6,160)
	Up and down	147 (15, 840)	216 (22, 1,232)

STEERING SYSTEM

POWER STEERING (IPRP15L licensed by ZF)

The model IPRP15L power steering system is similar to the model IPRB56L. Its construction and operating principles are basically the same as those found in the 910 series.
The design of the power steering pump is also similar to former versions, except for the following:
Difference of model 910 series:

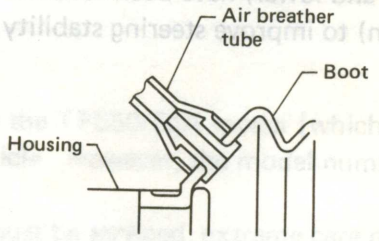
- The oil passage that runs from the control valve to the power cylinder is now separate from the cylinder.



1 End housing
2 End bush
3 Rack
4 Back-up washer
5 Cylinder tube

SST760

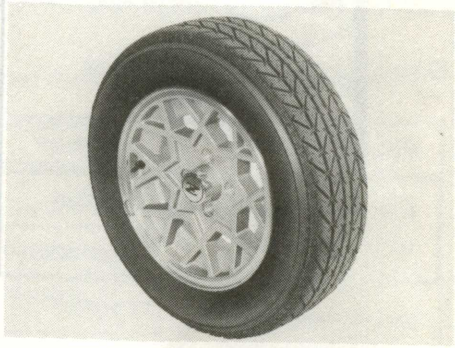
- The air breather tube is made of vinyl and it is located on a different area of the boot.



- The side rod had been newly designed.

TIRE AND WHEEL

Tire size is P205/60R15 while the road wheel size is 6-JJ-15 and is made from aluminum. These changes improve steering stability at high speeds and also improve riding comfort.



BODY

BODY FRONT END

HOOD

Due to the redesigned hood louver, hood rigidity has been increased somewhat.

HEATER AND AIR CONDITIONER

AIR CONDITIONER

COMPRESSOR

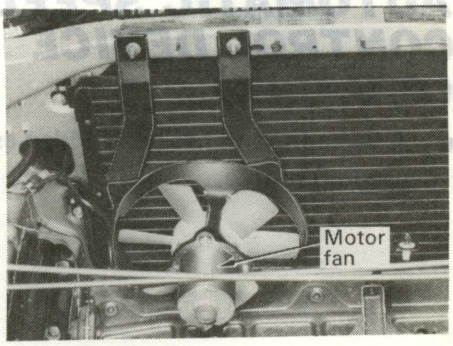
The check joint which was previously used on the "Pt" side has been eliminated and the valve on the "Ps" side has been redesigned.

CONDENSER AND MOTOR FAN

The layout of the inlet tube for the condenser has been modified and a motor fan has been added. It forcibly directs air to prevent the temperature of the water from rising.

MOTOR FAN

- This fan activates when the temperature of the water goes higher than 105° C (221° F) while the air conditioner is operating.
- The motor blower and the motor fan are both activated by a signal that is transmitted from the water temperature sensor.
- **The motor fan may sometimes operate if the ignition key is ON, even though the vehicle is at standstill. Check this point whenever the vehicle is serviced.**



Performance

Fan O.D., mm (in)	245 (9.65)
No. of fan blades	6
Input (at 12 volts)	Less than 110 watts
Air flow [at 0.069 kPa (7 mmAq, 0.28 inAq) static pressure]	6 m^3 (212 cu ft)/min.

AIR CONDITIONER HOSE AND PIPING

HOSE

The hose's design has been changed to accommodate the L28ET engine.

PIPING

A check joint has been installed to the piping on the "Pd" side, together with the changes that have been made in the compressor.

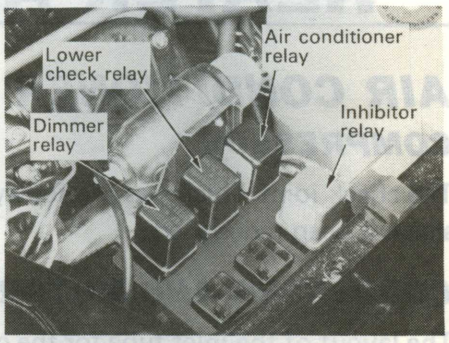
VACUUM TANK

A cut-out portion has been added to the vacuum hose connection, and a one-way valve has also been installed to ensure positive-pressure countermeasures during the operation of the turbocharger.

BODY ELECTRICAL

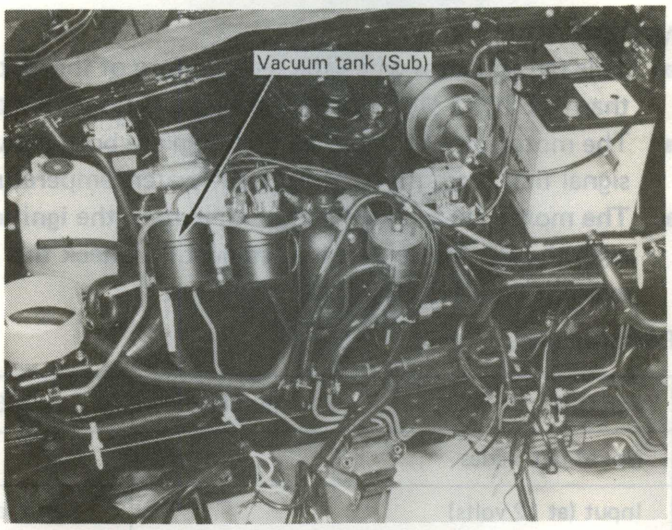
RELAYS AND AMPLIFIER

Two fuel pump relays have been eliminated due to the utilization of the E.C.C.S. system. The relay which drives the fuel pump directly is unchanged.



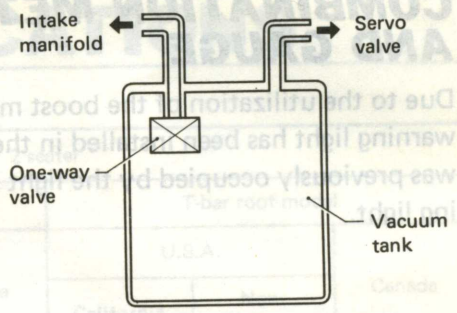
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

- A vacuum tank has been added as an additional vacuum source.



- A clamp has been attached to all of the vacuum hose connections between the intake manifold and vacuum tank in order to ensure positive-pressure countermeasures during the turbocharger operation.
- The material used to make the vacuum hose that runs between the intake manifold and vacuum tank has been changed from NBR to hydrin to increase its heat resistance.

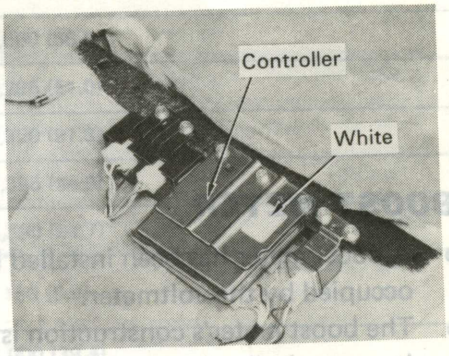
Never use an NBR vacuum hose on models equipped with the L28ET engine.



CONTROLLER

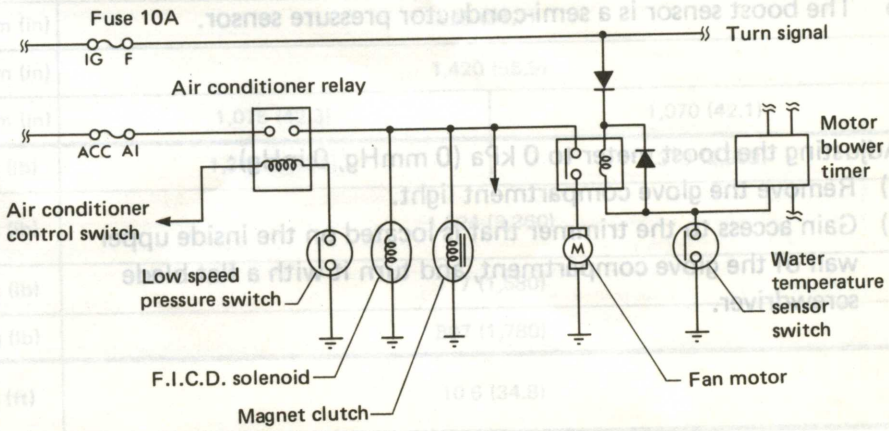
Both the gain and set current values have been changed to accommodate the highly responsive L28ET engine.

Do not install a controller whose gain and set current values are unchanged, since this could cause the engine to trouble.
The new controller is identified by a white part number plate.



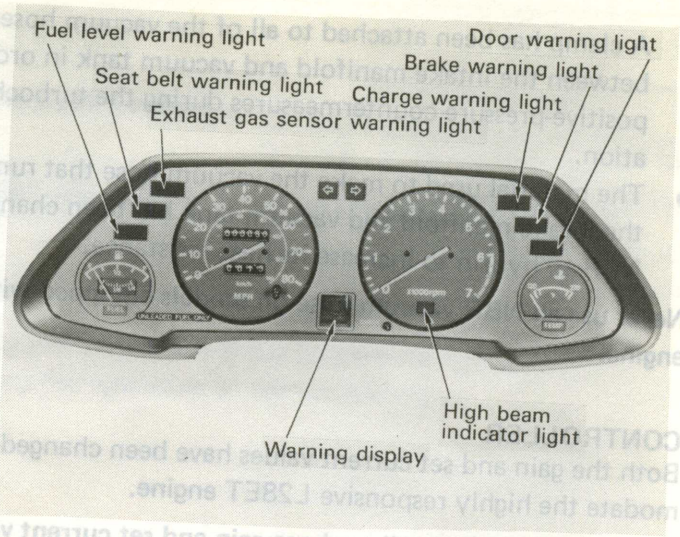
WIRING

- Due to the substitution of the E.C.C.S. for the E.F.I. system, the fusible link has been modified.
- To enhance the turbocharger, a boost meter and fan motor, and their respective circuits have been added.



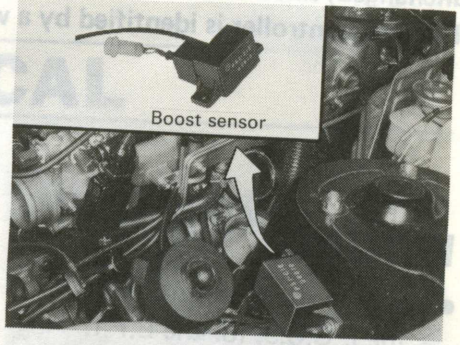
COMBINATION METER AND GAUGE

Due to the utilization of the boost meter, a charge warning light has been installed in the place that was previously occupied by the light & key warning light.



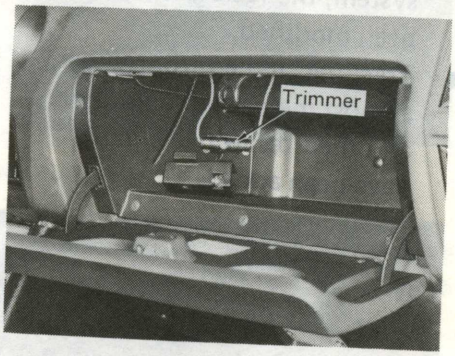
BOOST METER

- A boost meter has been installed in the place that was previously occupied by the voltmeter.
- The boost meter's construction is similar to the voltmeter's. Its meter indication ranges from –93.3 kPa (–700 mmHg, –27.56 inHg) to +93.3 kPa (+700 mmHg, +27.56 inHg).
- The boost sensor is a semi-conductor pressure sensor.



Adjusting the boost meter to 0 kPa (0 mmHg, 0 inHg):

1) Remove the glove compartment light.
2) Gain access to the trimmer that is located on the inside upper wall of the glove compartment, and turn it with a flat-blade screwdriver.



OIL TEMPERATURE GAUGE

An oil pressure gauge has been combined with the oil temperature gauge in a single unit. The oil temperature sensor is located behind the oil pan.

GENERAL SPECIFICATIONS

Item			Car model	2 seater					
				Standard model			T-bar roof model		
			Destination	U.S.A.		Canada	U.S.A.		Canada
				California	Non-California		California	Non-California	
Dimensions and weights	Overall length		mm (in)	4,420 (174.0)					
	Overall width		mm (in)	1,690 (66.5)					
	Overall height		mm (in)	1,295 (51.0)					
	Wheelbase		mm (in)	2,320 (91.3)					
	Tread	Front	mm (in)	1,395 (54.9)					
		Rear	mm (in)	1,390 (54.7)					
	Minimum ground clearance (At curb weight)		mm (in)	150 (5.9)					
	Overhang to the body front end		mm (in)	1,000 (39.4)					
	Overhang to the body rear end		mm (in)	1,100 (43.3)					
	Room space	Length	mm (in)	805 (31.7)					
		Width	mm (in)	1,420 (55.9)					
		Height	mm (in)	1,075 (42.3)			1,070 (42.1)		
	Curb weight		kg (lb)	1,311 (2,891)			1,319 (2,909)		
	Gross vehicle weight (G.V.W.R.)		kg (lb)	1,524 (3,360)					
	Gross axle weight rating (G.A.W.R.)	Front	kg (lb)	717 (1,580)					
		Rear	kg (lb)	807 (1,780)					
	Minimum turning radius (Wall to wall)		m (ft)	10.6 (34.8)					
Engine general specifications	Model			L28ET					
	Valve arrangement			O.H.C. (Overhead camshaft)					
	Bore x stroke		mm (in)	86 x 79 (3.39 x 3.11)					
	Displacement		cm^3 (cu in)	2,753 (168.0)					
	Compression ratio			7.4					
	Maximum horsepower (SAE NET)		HP/rpm	180/5,600					
	Maximum torque (SAE NET)		N·m (kg-m, ft-lb)/rpm	275 (28, 203)/2,800					
Lubrication system	Lubrication system			Pressure feed flow					
	Oil pump type			Trochoid gear					
	Oil filter type			Paper element (Cartridge)					

Item \ Car model / Destination			2 seater				
			Standard model			T-bar roof model	
			U.S.A.		Canada	U.S.A.	
			California	Non-California		California	Non-California
Cooling system	Cooling method		Water cooling, forced circulation				
	Engine coolant (Anti-freeze L.L.C./Water) %		50/50				
	Cooling fan (Fan dia. x number of blades) mm (in)		410 (16.14) x 8 ... With Tem-coupling				
	Motor fan (Sub) (Fan dia. x number of blades) mm (in)		245 (9.65) x 6				
	Radiator	Type	Corrugated fin and tube				
		Shroud size mm (in)	450 (17.72)				
	Water pump type		Centrifugal				
	Thermostat	Type	Wax-pellet				
		Temperature °C (°F)	82 (180)	88 (190)		82 (180)	88 (190)
Engine fuel system	Electronic fuel injection type		L-jetronic				
	Fuel pump type		Electrical				
	Air cleaner filter type		Viscous paper				
	Air flow meter	Type	Flap and potentiometer				
		Model	A31-624				
	Control unit model		A18-600	A18-000		A18-600	A18-000
	Injector	Type	Electromagnetic				
		Fuel pressure kPa (kg/cm^2, psi)	250 (2.55, 36.3)				
	Throttle chamber	Type	1 barrel				
	Air regulator type		Bimetal				
Battery	Model		N50Z, N70Z*	N70Z		N50Z, N70Z*	N70Z
	Capacity V-AH		12-60, 12-70*	12-70		12-60, 12-70*	12-70
	Ground polarity		Negative				
Alternator	Model		LR160-42B				
	Capacity V-A		12-60				
	Voltage regulator model		TR1Z-33				
Starter motor	Model		S114-254D				
	Capacity kW		1.4				

*: Optional

Item \ Car model / Destination			2 seater			
			Standard model		T-bar roof model	
			U.S.A.	Canada	U.S.A.	Canada
			California	Non-California	California	Non-California
Ignition system	Ignition method		Battery-coil			
	Firing order		1-5-3-6-2-4			
	Ignition coil model		E12-45			
	Distributor	Type	Pick-up coil type with power transistor			
		Model	D6P80-02	D6P80-03	D6P80-02	D6P80-03
	Spark plug model		BPR6ES-11 ... Standard type, BPR7ES-11 ... Cold type			
Automatic transmission	Model		3N71B			
	Model code number		X2770			
	Gear ratio	1st	2.458			
		2nd	1.458			
		3rd	1.000			
		Rev.	2.182			
Propeller shaft	Model		2S71A			
	Length x Outer diameter mm (in)		575 x 75 (22.64 x 2.95)			
Differential carrier	Type		Hypoid			
	Model		R200			
	Gear ratio (Number of teeth)		3.545 (39/11)			
	Gear type & number of pinion gears		Straight bevel gear, 2 side gears and 2 pinion mates			
Front axle and front suspension	Type		Independent strut with coil spring			
	Coil spring	Wire dia. x free length mm (in)	12.8 x 335 (0.504 x 13.19)			
		Spring constant N/mm (kg/mm, lb/in)	19.61 (2.00, 112.0)			
	Shock absorber	Type	Telescopic double acting, hydraulic			
		Damping force [0.3 m (1.0 ft)/sec] N (kg, lb)	Expansion ... 1,275 (130, 287), Compression ... 392 (40, 88)			
	Stabilizer bar	Type	Torsion bar			
		Diameter mm (in)	23 (0.91)			
Rear axle and rear suspension	Type		Independent semi-trailing arms with coil spring			
	Coil spring	Wire dia. x free length mm (in)	11.5 x 385 (0.453 x 15.16)			
		Spring constant N/mm (kg/mm, lb/in)	19.61 (2.00, 112.0)			

Item			Car model	2 seater				
				Standard model			T-bar roof model		
			Destination	U.S.A.		Canada	U.S.A.		Canada
				California	Non-California		California	Non-California	
Rear axle and rear suspension	Shock absorber	Type		Telescopic double acting, hydraulic					
		Damping force [0.3 m (1.0 ft)/sec] N (kg, lb)		Expansion ... 1,275 (130, 287), Compression ... 392 (40, 88)					
	Stabilizer	Type		Torsion bar					
		Diameter mm (in)		20 (0.79)					
Brake system	Model and type		Front	CL28V-Disc					
			Rear	AN14H-Disc					
	Pad dimension mm (in) (Width x thickness x length)		Front	49 x 11 x 118 (1.93 x 0.43 x 4.65)					
			Rear	42 x 10.3 x 56.8 (1.65 x 0.406 x 2.236)					
	Rotor outer diameter mm (in)		Front	252 (9.92)					
			Rear	269 (10.59)					
	Caliper cylinder inner diameter mm (in)		Front	60.6 (2.386)					
			Rear	42.8 (1.685)					
	Master cylinder inner diameter mm (in)			23.8 (15/16)					
	Brake booster	Model		M90					
		Diaphragm diameter mm (in)		228.6 (9)					
	Pressure control	Type		NP-valve					
		Split point x reducing ratio kPa (kg/cm^2, psi)		3,923 (40, 569) x 0.4					
	Parking brake type			Mechanically operated on rear wheel					
Wheel and tire	Road wheel size [Offset mm (in)]			6JJx15 Aluminum [10 (0.39)]					
	Tire size			P205/60R15					
Steering system	Type			Rack and pinion, Integral power steering					
	Model			IPRP15L					
	Gear ratio			∞					