

ISUZU SERVICE TECHNICIAN EDUCATION PROGRAM

ISTEP – 1

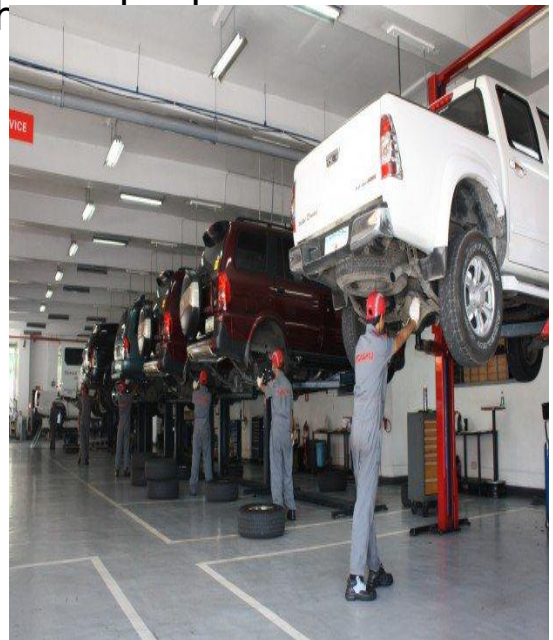
PERIODIC MAINTENANCE SERVICE

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INTRODUCTION

- A periodic maintenance describes the act of inspecting or testing the condition of car sub-systems (engine, transmission, underchassis, etc.) and servicing or replacing parts and fluids. Regular maintenance is critical to ensure the safety, reliability, drivability and comfort.
- Recommended the so-called extreme or the ideal service schedule based on impact parameters such as;
 - a. Number of trips and distance travelled per trip per day
 - b. Extreme hot or cold climate conditions
 - c. Normal paved, mountainous, dusty roads
 - d. Heavy stop-and-go as against long distance cruising
 - e. Towing a trailer or other h



BENEFITS OF PERIODIC MAINTENANCE SERVICE

- Lowers the utility costs by keeping your vehicle running at peak efficiency.
- Add years to the life of your vehicle, greatly reduce costly breakdowns, and ensure on-going efficiency.
- Minimizes emergency and unplanned repair costs.
- To maintain the vehicle performance to the best possible condition.
- Prevent small problems from becoming bigger.
- Ensure the vehicle safety.



PURPOSE OF PERIODIC MAINTENANCE SERVICE

- Periodic Maintenance Service (PMS) involves performing certain services to
a vehicle on regularly scheduled basis before there is any sign of trouble.
- A typical Periodic Maintenance Service recommends particular service based on
mileage or time intervals.
- Maintenance, including tests, measurements, adjustments, and parts
replacement, performed specifically to prevent faults from occurring.

DIFFERENCE BETWEEN PERIODIC, PREDICTIVE and CORRECTIVE MAINTENANCE SERVICE

1. Periodic Maintenance Service

- Preventive maintenance tasks are completed when the machines are shut down .
- Designed to preserve and restore equipment reliability by replacing worn components before they actually fail.

Example:

- a) Changing the engine oil in every 5,000 or 6 months.
- b) Changing transmission and differential oils every 20,000 km or 24 months.

2. Predictive Maintenance

- Designed to help determine the condition of in-service vehicle in order to predict when maintenance should be performed. This approach promises cost savings over routine or time- based preventive maintenance, because tasks are performed only when necessary.
- The main assurance of predictive maintenance is to allow convenient scheduling of corrective maintenance.

Example:

- a. Clutches
- b. Transmission
- c. Axle and Differentials
- d. Engine



Function and operation

3. Corrective Maintenance

- It is a maintenance task or operation done in order to identify or find, isolate or separate and rectify a particular fault. This is performed in order to restore the failed machine, equipment or system to an operational condition.

Example:

- a. Engine overhauling and repair
- b. Pull down transmission and replace clutch

Important Facts about Periodic Maintenance

Service

- Trained, qualified mechanic with the expertise and equipment to do the job correctly should perform most of the maintenance on vehicle.
- Save hundreds of pesos a year by keeping an auto maintenance schedule comprised of simple checks and procedures.
- Warranty Booklet of a vehicle will provide a maintenance schedule for specific make and model.
- If, for any reason, your maintenance history does not meet or exceed the recommended minimums, warranty claims will be denied by the manufacturer.
If this happens, the customer may have to pay for costly repairs.
- Some car buyers are fanatical about maintenance, periodic maintenance is preserving the resale value of your vehicle.
- Maintenance items and service intervals are studied and determined from an engineering point of view based on the following method:
 - a. Climate
 - b. Condition of usage

CATEGORIES OF VEHICLE MAINTENANCE

1. General Maintenance

- Also known as the “Do-It-Yourself Maintenance”
- The following items generally included as “Do-it-yourself” items;



Oil level checking



Check brake and clutch fluid level



Coolant level



Battery electrolyte level



Turn signal and lighting check



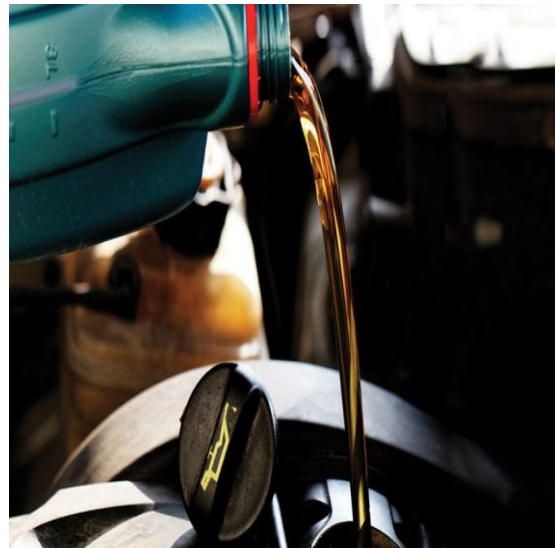
Tire check

CATEGORIES OF VEHICLE MAINTENANCE

2. Periodic Maintenance Service (PMS)

- Includes items required to be serviced at regular intervals in any authorized Isuzu dealership.
- Replacement parts are those which cannot avoid material deterioration due to aging and need to be replaced at a certain period of time.

The following items are generally included as periodic maintenance items:



Engine Filter and Oil Replacement

MAINTENANCE IN SEVERE DRIVING CONDITION

1. More frequent service interval are advised for vehicle that are used or operated in severe condition such as;

- Towing a trailer
- Dusty road
- Driving in sand, mud or deep water (e.g. wheel hub).



2. Items for maintenance are:

- Brake pads, linings, discs and drums
- Brake lines and hoses
- Wheel bearing grease and free- run grease
- Differential, transmission and transfer case
- Air cleaner filter
- Clutch housing (check water level)



ISUZU PERIODIC MAINTENANCE SERVICE MENU

ISUZU CROSSWIND / D-MAX / mu-X / ALTERRA / N-SERIES / F-SERIES

Legend:

I : Inspect and correct or replace as necessary

A : Adjust

T : Tighten to the specified torque

R : Replace

C : Clean / Check

D : Drain

L : Lubricate

S/N	SERVICE ITEM	every 5K	every 10K	every 20K
1	Engine oil	R	R	R
2	Engine oil filter	R	R	R
3	Engine oil leakage and contamination	I	I	I
4	Engine Idling speed and acceleration	I	I	I
5	Fan belt tension and damage	I / A	I / A	I / A
6	All hoses and pipes in engine compartment for leak of damage	I	I	I
7	Valve clearance (Common Rail Engine)			I / A
8	Valve clearance (Non-Common Rail Engine)		I / A	I / A
9	Air cleaner element	I / C	I / C	R
10	Fuel filter		R	R
11	Drain fuel sedimentor	D / C	D / C	D / C

ISUZU PERIODIC MAINTENANCE SERVICE MENU

ISUZU CROSSWIND / D-MAX / mu-X / ALTERRA / N-SERIES / F-SERIES

S/N	SERVICE ITEM	every 10,000 km	every 10,000 mi	every 100,000 km
14	Clutch fluid	I	I	R
15	Clutch pedal travel and free play	I	I	I
16	Clutch system	I	I	I
17	[M/T] Manual transmission oil			R
18	[4WD M/T] Transfer case oil			R
19	[4WD M/T] Manual transmission and transfer case oil leakage	I	I	I
20	[A/T] Automatic transmission fluid	I	I	R
	[A/T] Automatic transmission fluid			
22	[4WD A/T] Transfer case oil			R
23	[4WD A/T] Automatic transmission and transfer case oil leakage	I	I	I
24	Propeller shaft loose connections		I	I
25	Propeller shaft universal joints and splines for wear		I	I
26	[4WD] Propeller shaft universal joints and sliding sleeve		L	L
27	Differential gear oil (Front and rear)			R
28	Front and rear axle oil leakage	I	I	I
	[4WD] Shift on the fly system			

ISUZU PERIODIC MAINTENANCE SERVICE MENU

ISUZU CROSSWIND / D-MAX / mu-X / ALTERRA / N-SERIES / F-SERIES

S/N	SERVICE ITEM	every 10,000 km	every 1 year	every 20,000 km
31	Power steering fluid			R
32	Power steering oil leakage			
33	Steering Column bolts for looseness or damage			
34	Power steering hose			
35	Steering wheel play			
36	Steering function			
37	Right and left turning radius			
38	Steering joint ball for oil leakage or damage			
39	Brake fluid			R
40	Brake system for fluid leakage			
41	Brake function			
43	Rear brake lining and drum wear			
44	Brake pedal travel and play			
45	Brake pipes and hoses for loose connections or damage			
46	Parking brake function & cables for looseness or damage			
47	Leaf/coil springs for damage			
	Suspension mount for looseness or			

ISUZU PERIODIC MAINTENANCE SERVICE MENU

ISUZU CROSSWIND / D-MAX / mu-X / ALTERRA / N-SERIES / F-SERIES

S/N	SERVICE ITEM	every 10,000	every 20,000	every 30,000
50	Shock absorbers mount for looseness		I	I
51	Rubber bushes of suspension wear or damage		I	I
52	Grease, Hub Bearing			R
53	Tire air pressure and damage	C	C	C
54	Tire rotation		P	P
55	Bolts and Nuts on chassis and body	T	T	T
56	[F Series] Front brake lining and drum wear		I	I
57	[F Series] Rear brake lining and drum wear		I	I
58	[F Series] King Pin	L	L	L
59	[F Series] Center Bearing, Propeller Shaft	L	L	L
60	[F Series] Bushing, Leaf Spring	L	L	L
61	[F Series] Water Pump	L	L	L
62	[F Series] Brake Lining Adjust /Thickness	I	I	I

ISUZU PERIODIC MAINTENANCE SERVICE MENU

ISUZU HEAVY DUTY TRUCKS (C & E SERIES)

Legend:

I : Inspect and correct or replace as necessary

A :

Adjust

T : Tighten to the specified torque

R :

Replace

C : Clean / Check

D : Drain

L : Lubricate

P :

Perform

S/N	SERVICE ITEM	every 5K	every 10K	every 20K
1	Engine oil		R	R
2	Engine oil filter - Main		R	R
3	Engine oil filter - Partial		R	R
4	Engine oil leakage and contamination	I	I	I
5	Engine idling speed and acceleration	I	I	I
6	Fan belt tension and damage	I / A	I / A	I / A
7	All hoses and pipes in engine compartment for leak and damage	I	I	I
8	Valve clearance (Common Rail Engine)			I / A
9	Air cleaner element	I / C	I / C	R
10	Main fuel filter			R
11	Pre-fuel filter element			R
12	Engine coolant (Replace every two yrs)	I	I	R (@2yrs)

ISUZU PERIODIC MAINTENANCE SERVICE MENU

S/N	SERVICE ITEM	every 5K	every 10K	every 20K
14	Clutch fluid			R
15	Clutch pedal travel and free play	I	I	I
16	Clutch system	I	I	I
17	Transmission gear oil			R
18	Propeller shaft loose connections	I	I	I
19	Propeller shaft universal joints and spline for wear			I
20	Propeller shaft universal joints and	I	I	I
22	Front and rear axle oil leakage			R
23	Power steering fluid			R
24	Power steering oil leakage	I	I	I
25	Steering column bolts for looseness or damage	I	I	I
26	Power steering hose	I	I	I
27	Steering wheel free-play	I	I	I
28	Steering function		I	I
29	Right and left turning radius	I	I	I
30	Steering ball joint for oil leakage or damage		I	I

ISUZU PERIODIC MAINTENANCE SERVICE MENU

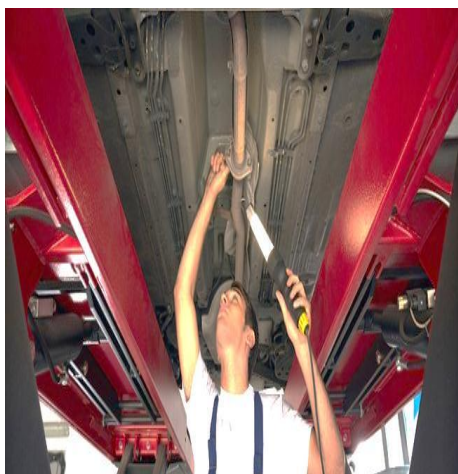
S/N	SERVICE ITEM	every 5K	every 10K	every 20K
31	Brake fluid	n/a		
32	Brake system for fluid leakage	I	I	I
33	Brake function	I	I	I
34	Brake pedal travel and free-play	I	I	I
35	Brake pipes and hoses for loose connections or damage	I	I	I
36	Parking brake function & cables for looseness or damage	I	I	I
37	Leaf / coil springs for damage		I	I
38	Suspension mount for looseness or damage		I	I
39	Shock absorbers for oil leakage		I	I
43	Tire air pressure and damage	C	C	C
44	Bolts and nuts on chassis / body	T	T	T
45	Front and rear brake lining wear	I	I	I
46	Front and rear drum wear			I
47	King pin	L	L	L
48	Center bearing, propeller shaft	L	L	L
49	Bushing, leaf spring	L	L	L

ISUZU PERIODIC MAINTENANCE SERVICE MENU

S/N	SERVICE ITEM	every 5K	every 10K	every 20K
50	Brake lining adjustment / thickness	I	I	I
51	Water pump (6WF1)	L	L	L
52	Air dryer	R – every two yrs		
53	Power steering fluid filter (* Every 50K)	*I		
54	Function of brake chamber	I	I	I
55	Brake chamber boots and diaphragm	*R- every two yrs		
56	Tierod end greasing (*every 25K)	*L- every 25K		
57	Function of brake valve	I	I	I
58	ABS Modulator	*R – every two yrs		
59	Electro-hydraulic cab tilt pump oil	*R – every two yrs		
60	Intake and exhaust manifold (*every 40K)	*T- every 40K		
61	Air compressor, governor and unloader valve functions (*every 40 K)	*T- every 40K		
62	Leaf spring U-bolt and nut			T

ISUZU PERIODIC MAINTENANCE SERVICE MENU

ADD ON SERVICE ITEMS		Remarks
1	Air-con General Service	Every 25K or 1 year, whichever comes first
2	Wheel Alignment	As needed
3	Injection timing (4JA1 / 4JB1 / 4HF1 / 4HG1)	As needed
4	Injector Nozzle Spray Pattern (4JA1 / 4JB1 / 4HF1 / 4HG1)	As needed
5	[F Series] Tire Rotation	As needed



Engine

Automobile Engines — engines designed to produce power and propel automobiles to be able to go from point a to point b.

Gasoline Engines

- Engines which uses gasoline fuels. Small-sized, high speed, high powered and light weight and are widely used for passenger cars, commercial vehicles and small trucks.



Diesel Engines

- Engines which uses light oil called diesel as fuel. Used in commercial vehicles like trucks and buses due to fuel economy and high thermal efficiency compared to gasoline engines.



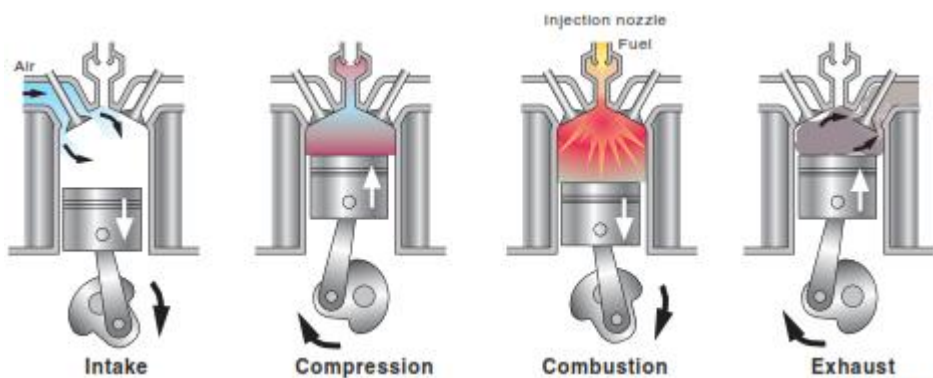
Engine

Fundamentals of Diesel Engines

- Designed by Rudolf Diesel in 1897, provides advantages of low fuel consumption and long durability.

Features of Diesel Engines

- It draws only air during intake stroke.
- There is no ignition system



Diesel Engine Operation

Intake Stroke - Air enters the engine as the piston goes down to BDC and Intake Valves open.

Compression Stroke – Air is being compressed as the piston goes up to TDC. Temperature and pressure of air increases as the volume of the cylinder decreases.

Combustion Stroke – fuel is injected into the combustion chamber and ignites as it mixes with the compressed and heated air, increases further its pressure and forces the piston to go down and rotates the crankshaft, providing power.

Exhaust Stroke – as the piston goes up again, exhaust valves open and exhaust gas exits the cylinder and out to exhaust pipe.

Engine

Comparison between Diesel and Gasoline Engines

Item	Diesel engine	Gasoline engine
Fuel	Light oil (Diesel fuel)	Gasoline
Intake gas	Air only	Mixture of air and gasoline
Fueling device	Injection nozzle (Injection pump)	Fuel injector (Carburetor)
Control of output	By changing the amount of fuel injected	By changing the amount of intake
Ignition	Self-ignition	Ignition by electrical spark
Compression ratio	High (15-23)	Low (7-12)
Compression pressure	High (19.6-29.4 bar, 20-30 kg/cm ² , 284-427 psi)	Low (9.8-14.7 bar, 10-15 kg/cm ² , 142-213 psi)
Combustion pressure	High (49.0-88.3 bar, 50-90 kg/cm ² , 711-1280 psi)	Low (29.4-49.0 bar, 30-50 kg/cm ² , 427-711 psi)
Engine speed	Low (700-5,000 rpm)	High (700-7,000 rpm)
Engine construction	Mechanical strength is large	Mechanical strength is small
Engine weight	Heavier than gasoline engine	Light
Noise	Greater than gasoline engine	Quiet

Chassis

Outline of Drivetrain Systems

- Description

Drivetrain systems transmit torque and power to rotate the wheels which consists of the following:

Clutch – Transmits or cuts engine torque to the transmission.

Propeller Shaft & Universal Joint – Transmits engine torque from the transmission to the final drive.

Final Gear – Torque from the propeller shaft is being transferred to the axle shaft and enables final speed reduction and increase tractability.

Differential Carrier – Creates rotation variation between left and right wheels to allow for smooth travel on rough roads and when making turns.

Drive Shaft – transmits torque from final drive to the wheels.

Chassis

Types of Drivetrain Configuration.

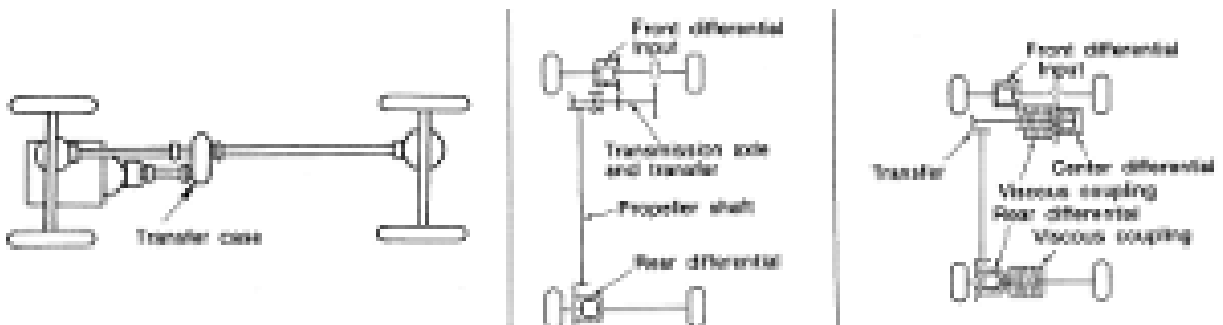
Front Engine Rear Drive

- Engine, clutch and transmission are placed as integrated unit in front of the vehicle while differential is placed at the rear.



Front Engine 4 Wheel Drive (4WD)

- Drive torque is distributed to each of the wheels using transfer assembly.



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