WSM

WORKSHOP MANUAL
DIESEL ENGINE

DIESEL PARTICULATE FILTER HANDLING MANUAL

Kubota

KiSC issued 10, 2012 A

TO THE READER

This Workshop Manual tells the servicing personnel about the servicing and maintenance of the Diesel Particulate Filter. It contains 2 parts: **"Information"** and **"Servicing"**.

■ **Information**
This section contains information below.
- Safety First

■ **Servicing**
This section contains information below.
- Servicing

All illustrations, photographs and specifications contained in this manual are of the newest information available at the time of publication.

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Since this manual includes many models, information or illustrations and photographs can show more than one model.

August, 2012

KiSC issued 10, 2012 A

I INFORMATION

INFORMATION

CONTENTS

1. SAFETY FIRST

⚠ SAFETY FIRST

- **This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.**
- **It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.**

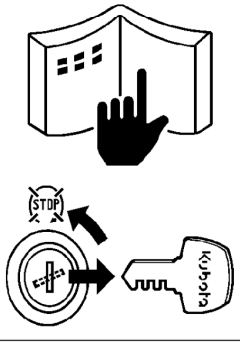
⚠ DANGER
- **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

⚠ WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ CAUTION
- **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

■ IMPORTANT
- **Indicates that equipment or property damage could result if instructions are not followed.**

■ NOTE
- **Gives helpful information.**



IBM001A

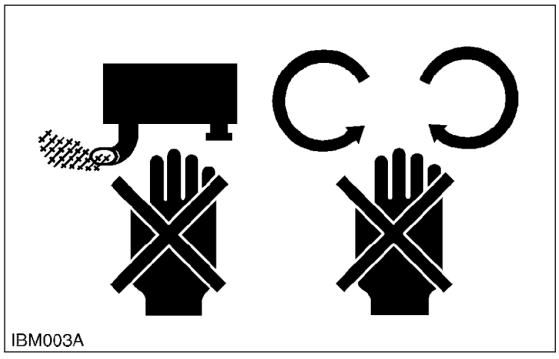

IBM011A

BEFORE YOU START SERVICE

- Read all instructions and safety instructions in this manual and on your engine safety decals.
- Clean the work area and engine.
- Park the machine on a stable and level ground.
- Let the temperature of the engine decrease before you start a job.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a **"DO NOT OPERATE"** tag in the operator station.

START SAFELY

- Do not do the procedures below when you start the engine.
  - short across starter terminals
  - bypass the safety start switch
- Do not make unauthorized modifications to the engine. This can cause damage and decrease the engine life.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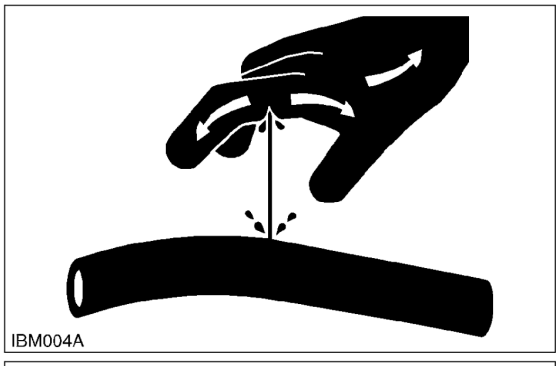
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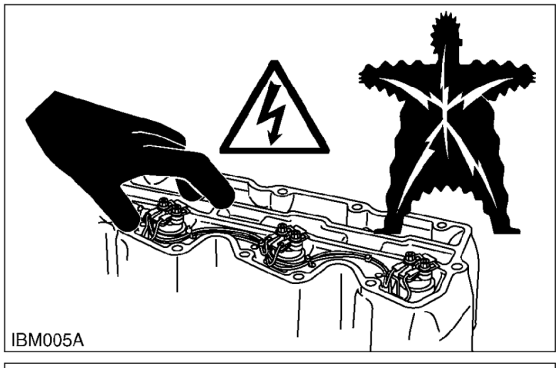
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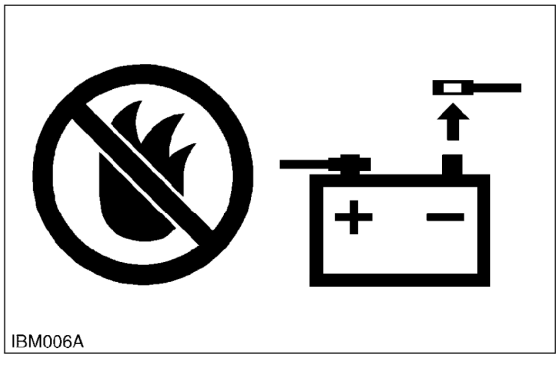
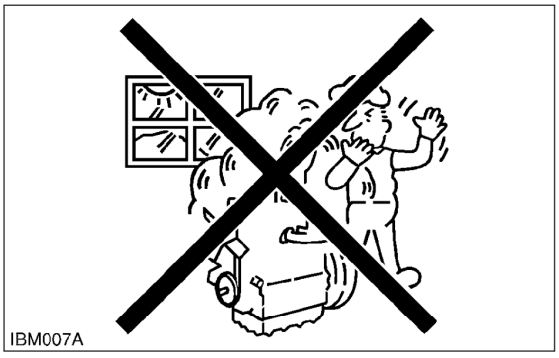

IBM006A

OPERATE SAFELY

- Do not use the machine after you consume alcohol or medication or when you are tired.
- Put on applicable clothing and safety equipment.
- Use applicable tools only. Do not use alternative tools or parts.
- When 2 or more persons do servicing, make sure that you do it safely.
- Do not touch the hot parts or parts that turn when the engine operates.
- Do not remove the radiator cap when the engine operates, or immediately after it stops. If not, hot water can spout out from the radiator. Only remove the radiator cap when it is at a sufficiently low temperature to touch with bare hands. Slowly loosen the cap to release the pressure before you remove it fully.
- Released fluid (fuel or hydraulic oil) under pressure can cause damage to the skin and cause serious injury. Release the pressure before you disconnect hydraulic or fuel lines. Tighten all connections before you apply the pressure.
- Do not open a fuel system under high pressure. The fluid under high pressure that stays in fuel lines can cause serious injury. Do not disconnect or repair the fuel lines, sensors, or any other components between the fuel pump and injectors on engines with a common rail fuel system under high pressure.
- Put on an applicable ear protective device (earmuffs or earplugs) to prevent injury against loud noises.
- Be careful about electric shock. The engine generates a high voltage of more than DC100 V in the ECU and is applied to the injector.

PREVENT A FIRE

- Fuel is very flammable and explosive under some conditions. Do not smoke or let flames or sparks in your work area.
- To prevent sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- The battery gas can cause an explosion. Keep the sparks and open flame away from the top of battery, especially when you charge the battery.
- Make sure that you do not spill fuel on the engine.


IBM007A

KEEP A GOOD AIRFLOW IN THE WORK AREA

- If the engine is in operation, make sure that the area has good airflow. Do not operate the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.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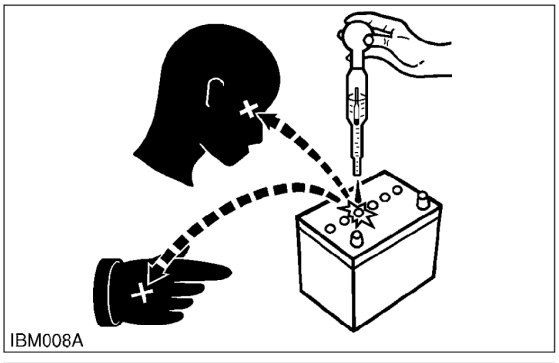
DISCARD FLUIDS CORRECTLY

- Do not discard fluids on the ground, down the drain, into a stream, pond, or lake. Obey related environmental protection regulations when you discard oil, fuel, coolant, electrolyte and other dangerous waste.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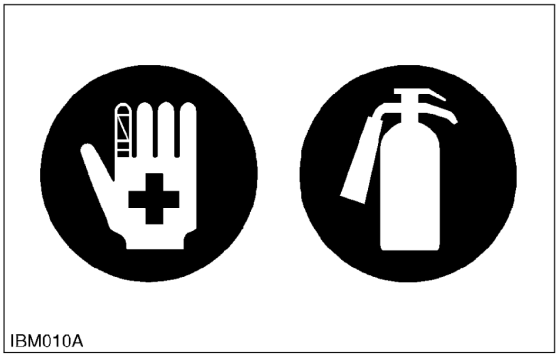
PREVENT ACID BURNS

- Keep electrolyte away from your eyes, hands and clothing. Sulfuric acid in battery electrolyte is poisonous and it can burn your skin and clothing and cause blindness. If you spill electrolyte on yourself, clean yourself with water, and get medical aid immediately.


IBM010A

PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher ready at all times.
- Keep the emergency contact telephone numbers near your telephone at all times.

1 ENGINE

SERVICING

CONTENTS

1. FUNCTION OF DIESEL PARTICULATE FILTER (DPF)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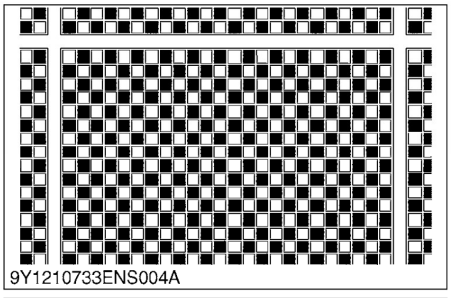
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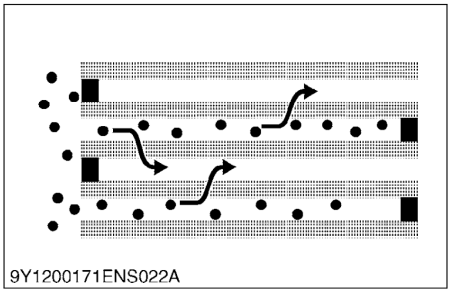
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The Diesel Particulate Filter (hereinafter referred to as the "DPF") is a filter to capture fine particles (soot and ash) contained in the exhaust gas of a diesel engine.

The ash content is mainly metallic additives contained in burnt lubricating oil.

The filter has a honeycomb structure with adjacent cell holes alternately closed.

In addition, by alternately closing the inlet side and the outlet side of the exhaust gas, the thin ceramics wall is used as a filter.

As shown in the figure, fine particles in the exhaust gas are captured when they pass through this thin wall, and the exhaust gas is discharged as clean gas.

2. DPF REGENERATION AND DPF CLEANING

As mentioned above, the filter is a device to capture fine particles.
The filter is clogged with the increase of the engine operating time.
When this occurs, the filter is "regenerated" by burning and removing soot.
However, since ash cannot be removed by the regeneration of the filter, there is a need for "cleaning" of the filter by removing ash at regular intervals by a cleaning contractor using specialized equipment.

1. **DPF Regeneration**
   The engine has the DPF regeneration mode described below (function to burn and remove deposited soot).

(a)	Automatic regeneration	Regeneration by automatic control is performed using post injection. The operation of the product can be continued.
(b)	Parked regeneration	If regeneration cannot be carried out depending on the situation of the work, the operation of the installed product is stopped to carry out regeneration.
(c)	Manual regeneration with a diagnosis tool (Diagmaster)	Such regeneration is performed as urgent measures in the event of abnormal soot deposition.

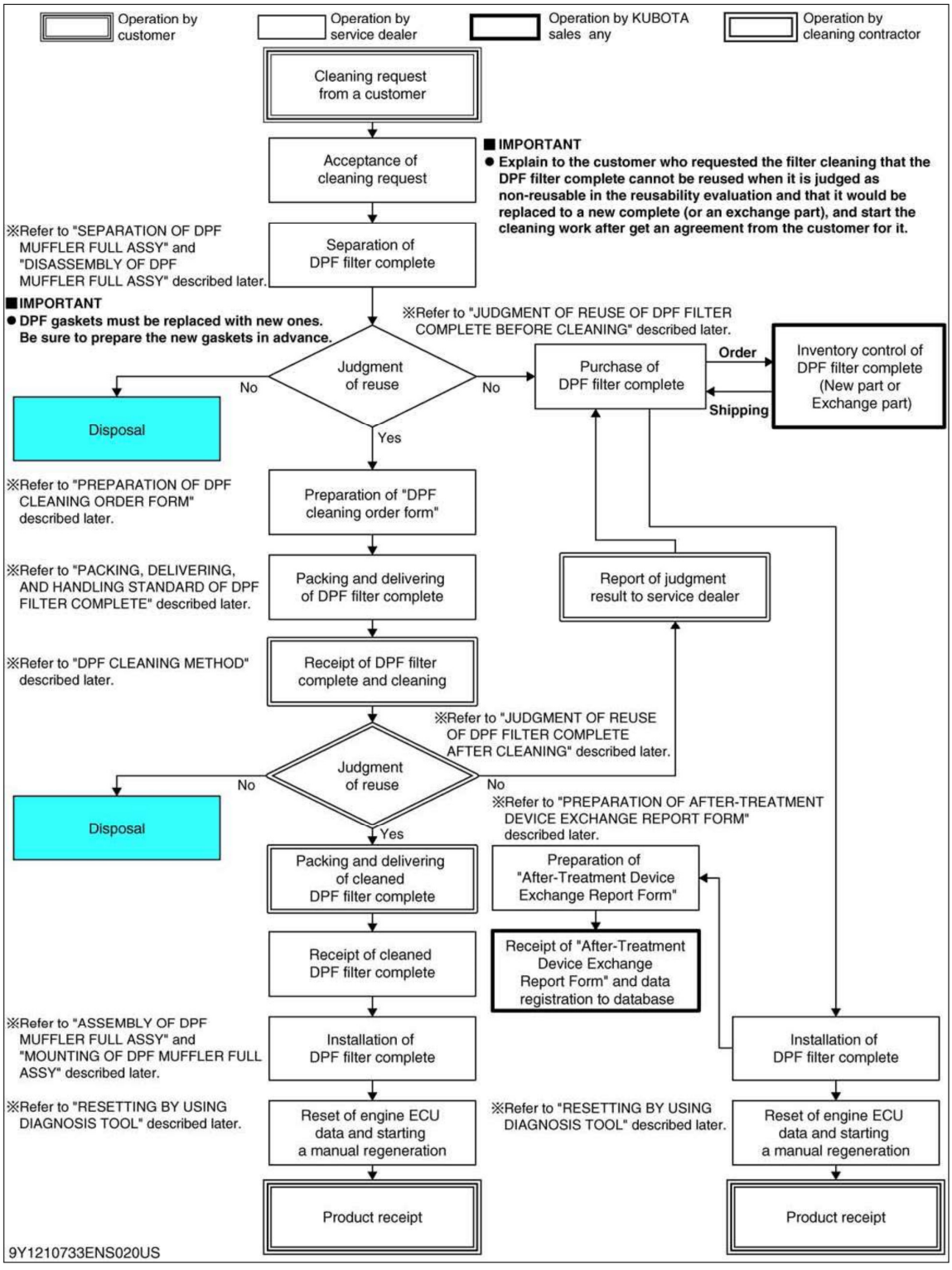
2. **Cleaning of ash based on maintenance intervals**
   Since ash deposited in the filter cannot be removed by regeneration, periodical cleaning is required.
   There is a need to clean the filter at the pre-determined maintenance intervals (3,000 hours) by a cleaning contractor using the specialized equipment by removing the DPF filter complete from the DPF muffler full assy.
3. **Cleaning of heavy soot and ash accumulation on filter**
   a) In the case of cleaning request due to heavy soot accumulation
   b) In the case of cleaning request due to increase the frequency of regeneration
   In this case, there is a need to clean the filter by a cleaning contractor using the specialized equipment by removing the DPF filter complete from the DPF muffler full assy.

3. DPF MAINTENANCE FLOW

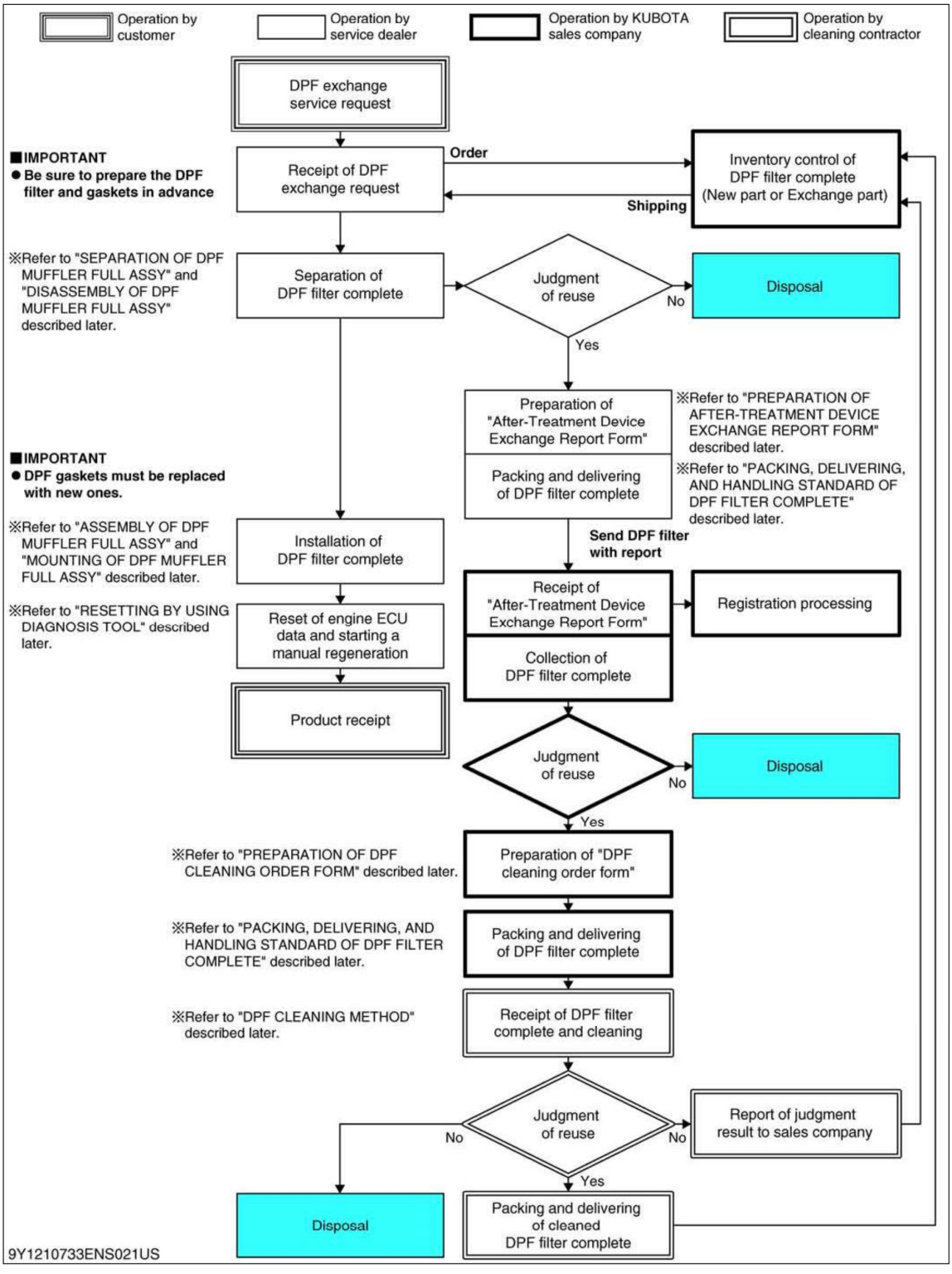
When the following condition happened, DPF need to have cleaning or exchange.There are two types of maintenance flow as "Clean & Return" and "Exchange". Please execute the correct maintenance according to distributor's instructions.

(1) Every 3,000 hours of operation (Scheduled maintenance)
(2) Cleaning request due to heavy soot accumulation (P-Code:P3008, J1939:3701-0)
(3) Cleaning request due to increase the frequency of regeneration (P-Code:P3024, J1939:523602-0)

[1] CLEANING & RETURN FLOW (REFERENCE)



[2] DPF EXCHANGE FLOW (REFERENCE)



4. DPF CLEANING PROCEDURE

[1] TO ENSURE SAFETY AND GOOD PERFORMANCE IN DPF CLEANING PROCEDURE

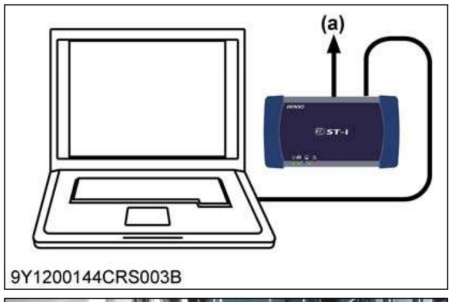
(1) Always work in the workshop equipped with a electric hoist (including mobile hoist).
(2) Put a product (engine) on a stable ground, and set the parking brake.
(3) As the DPF muffler full assy is hot just after the engine shutdown, make sure to start operation after it gets cool.
(4) Make sure not to let any foreign substances enter the opening section during the operation.
(5) Make sure not to damage the DPF muffler full assy by falling or impact as it contains a ceramic filter.

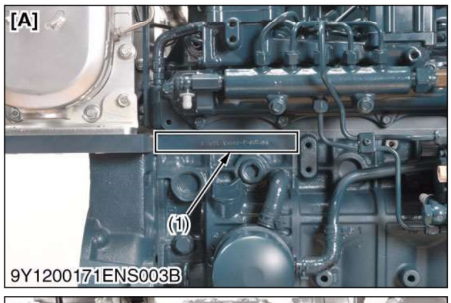
■ **IMPORTANT**

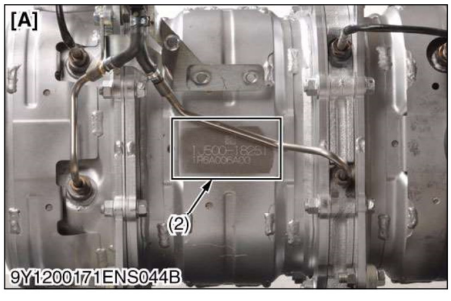
- **Since the DPF that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**

[2] SEPARATION OF DPF MUFFLER FULL ASSY

Follow the procedures below to separate DPF muffler full assy from a product (engine).

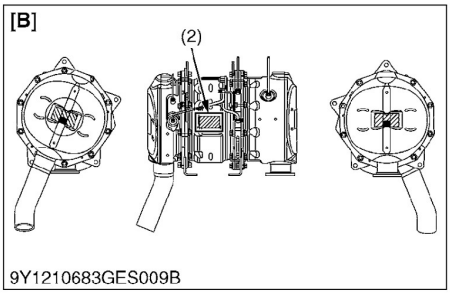






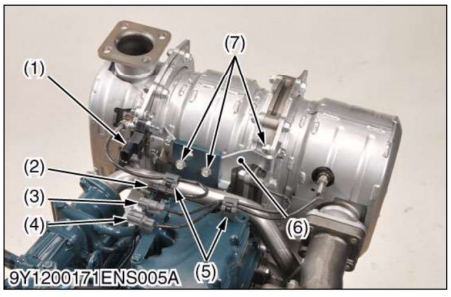
Prior Arrangement for Installation and Removal of DPF

1. Before removing the DPF muffler full assy from a product (engine), connect the diagnosis tool (Diagmaster), check the failure history (DTC), and save to the "Project" on the Diagmaster.
   Before removing the DPF for cleaning, keep the records of the engine serial number, DPF filter complete part number, DPF filter complete serial number, and engine operating time, which are required in preparing the DPF cleaning order form.
   Record the engine operating time by checking the “Hourmeter” on the data monitor of the diagnosis tool (Diagmaster).



(1) Engine Serial Number
(2) DPF Filter Complete Part Number / DPF Filter Complete Serial Number

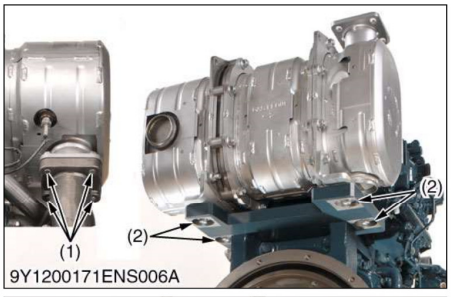
(a) CAN Communication Connector (For Servicing)
[A] V3800
[B] V6108

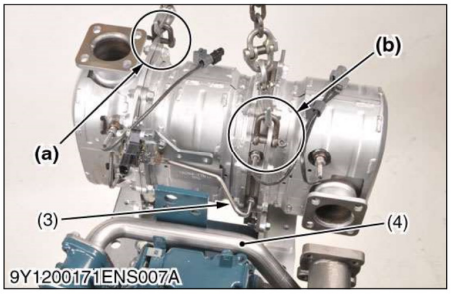


Connector of Exhaust Temperature Sensor, Differential Pressure Sensor and DPF Stay 1

1. Disconnect connectors of exhaust temperature sensor and differential pressure sensor from wiring harness.
2. Remove connectors (2), (3), (4) of exhaust temperature sensor and clamps (5).
3. Unscrew stay mounting bolt (7), and remove DPF stay 1 (6).

(1) Differential Pressure Sensor
(2) Connector of Exhaust Temperature Sensor T2
(3) Connector of Exhaust Temperature Sensor T1
(4) Connector of Exhaust Temperature Sensor T0
(5) Clamp
(6) DPF Stay 1
(7) Stay Mounting Bolt





Separation of DPF Muffler Full Assy

1. Set chain sling by using shackle at two places **(a)** and **(b)** as shown in the photograph.
2. Unscrew mounting bolts (1) of exhaust manifold side.
3. Unscrew mounting bolts (2) of DPF muffler full assy.
4. Lift up DPF muffler full assy safely, and separate it from engine.

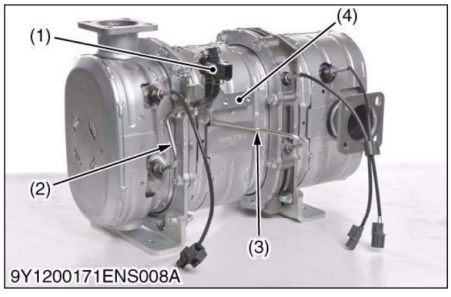
■ **NOTE**

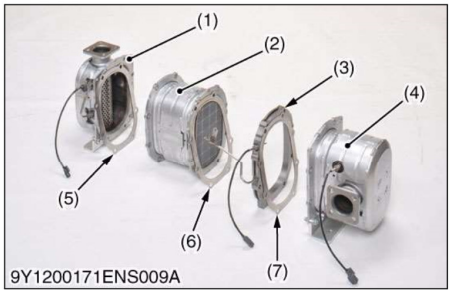
- **When lifting the DPF muffler full assy, use caution so that the pressure pipe 1 (3) does not hit the EGR pipe (4).**

(1) Mounting Bolt
(2) Mounting Bolt of DPF Muffler Full Assy
(3) Pressure Pipe 1
(4) EGR Pipe
(a) Shackle Set Position
(b) Shackle Set Position

[3] DISASSEMBLY OF DPF MUFFLER FULL ASSY

(1) V3800





Differential Pressure Sensor

1. Remove clamp, and disconnect tube from pressure pipe 1 (3).
2. Remove clamp, and disconnect tube from pressure pipe 2 (2).
3. Unscrew mounting bolts, and remove differential pressure sensor (1).
4. Unscrew fixed bolts of pressure pipe 1and 2.
5. Remove DPF stay 2 (4).

(1) Differential Pressure Sensor
(2) Pressure Pipe 2
(3) Pressure Pipe 1
(4) DPF Stay 2

DPF Filter Complete

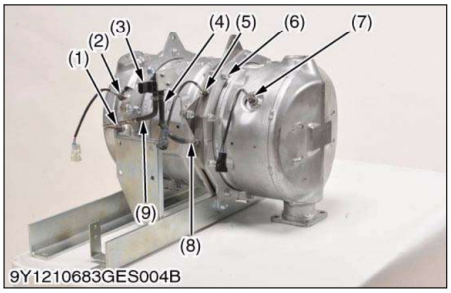
1. Loosen all bolts attached to the DOC catalyst complete, DPF filter complete and DPF outlet body.
2. Remove all bolts, and separate DOC catalyst complete, DPF filter complete and DPF outlet body.

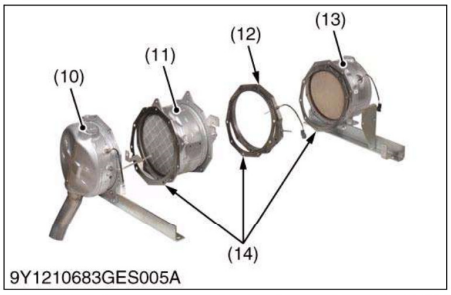
■ **NOTE**

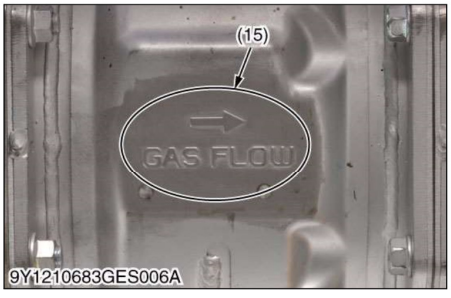
- **When disassembling, make sure not to damage pressure pipe and exhaust temperature sensor.**
  If damaged, replace with new ones.
- **Take good care of the DOC catalyst complete (4), DPF collar (3), and DPF outlet body (1) so as not to get dust, water, oil, and shock on them during storage.**
  As the honeycomb in the DOC catalyst is ceramic, take special care to handle it.
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe. If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.**

(1) DPF Outlet Body
(2) DPF Filter Complete
(3) DPF Collar
(4) DOC Catalyst Complete
(5) DPF Gasket
(6) DPF Gasket
(7) DPF Gasket

(2) V6108 (REFERENCE)







Filter Complete (DPF)

■ **NOTE**

- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe. If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.**

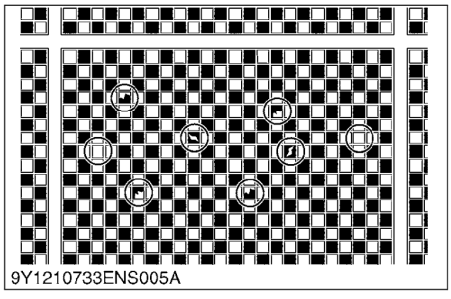
1. Remove the tube (4), (9) from the differential pressure pipe (1), (8).
2. Remove the differential pressure sensor (3).
3. Loosen the filter complete (DPF) mounting screw (6) and remove the filter complete (DPF) (11).

(1) Differential Pressure Pipe
(2) Temperature Sensor (T2)
(3) Differential Pressure Sensor
(4) Tube
(5) Temperature Sensor (T1)
(6) Filter Complete (DPF) Mounting Screw
(7) Temperature Sensor (T0)
(8) Differential Pressure Pipe
(9) Tube
(10) Body (DPF Outlet)
(11) Filter Complete (DPF)
(12) Collar (DPF)
(13) Catalyst (DOC)
(14) Gasket
(15) Gas Flow →

[4] JUDGMENT OF REUSE OF DPF FILTER COMPLETE BEFORE CLEANING

■ **IMPORTANT**

- **Before ordering to a cleaning contractor, follow the procedures below to make a judgment on whether the separated DPF filter complete is reusable.**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Judgment of Reuse by Service Dealer

1. Check to see that the surface of the removed DPF filter complete on the exhaust gas outlet side is not darkened.
2. Check whether there is no crack or loss of the sealing part of the cell holes on both ends of the filter (inlet side and outlet side).
   If the number of missing sealing parts exceeds the allowable limit, the filter complete cannot be reused even after cleaning.

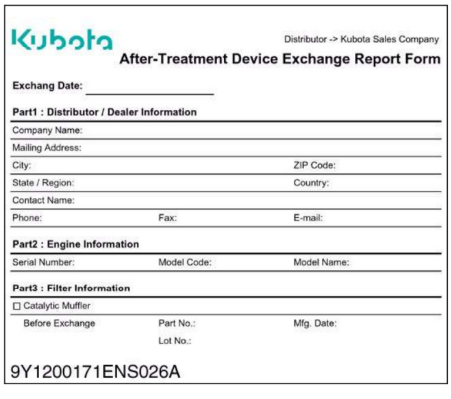
Number for judgment of non-reusability of filter	Allowable limit	V3800	Number of missing sealing parts: 15 or more
		V6108	Number of missing sealing parts: 30 or more

3. Check whether there is no crack and loss of the ceramics element.
   If there are any cracks or losses of the ceramics element, the DPF filter complete cannot be reused even if it is cleaned.
4. If it is judged that the DPF filter complete is not reusable, report the result of the evaluation to the customer that requested the filter cleaning, and replace the DPF filter complete with a new one.

[5] PREPARATION OF "AFTER-TREATMENT DEVICE EXCHANGE REPORT FORM"

■ **IMPORTANT**

- **When replacing the DPF filter complete with a new one because the DPF filter complete cannot be reused, make sure to prepare the "After-Treatment Device Exchange Report Form" and to send the report form to KUBOTA sales company.**


Kubota

Distributor -> Kubota Sales Company

After-Treatment Device Exchange Report Form

Exchang Date: _____

Part1 : Distributor / Dealer Information

Company Name:		
Mailing Address:		
City:		ZIP Code:
State / Region:		Country:
Contact Name:		
Phone:	Fax:	E-mail:

Part2 : Engine Information

Serial Number:	Model Code:	Model Name:

Part3 : Filter Information

☐ Catalytic Muffler

Before Exchange	Part No.:	Mfg. Date:
	Lot No.:	

9Y1200171ENS026A

Preparation of "After-Treatment Device Exchange Report Form"

1. Fill out the attached form (After-Treatment Device Exchange Report Form).
2. Send the report form to a service representative of KUBOTA sales company.