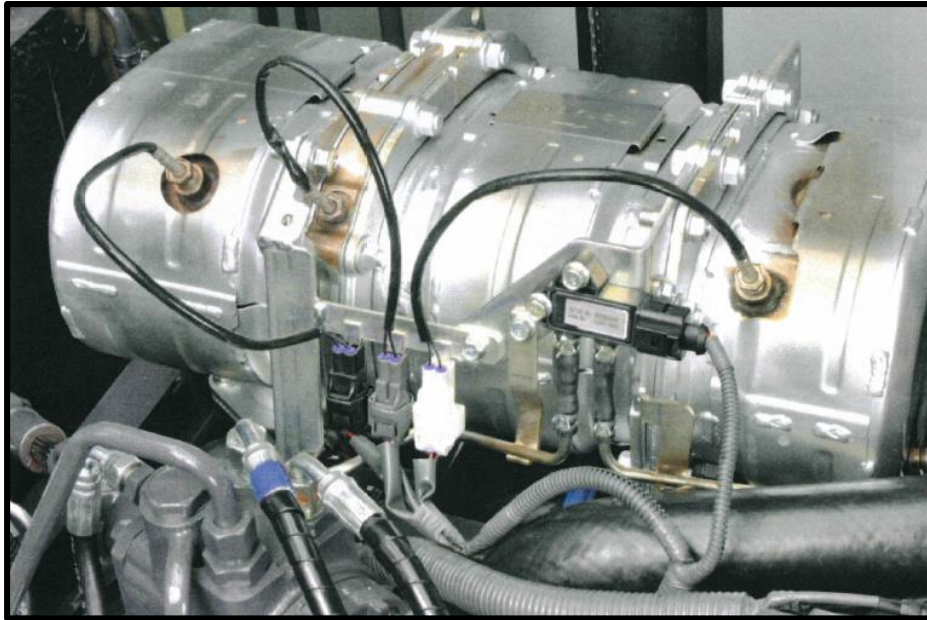


BARONESS

Quality on Demand

Technical Information Leaflet

TIL: 044



LM3210 & GM2810

Understanding & Maintaining the Diesel Particulate Filter

DESCRIPTION

The latest Tier 4/Stage IIIB legislation stipulates that any diesel engine over 50 horsepower must have an engine system that reduces the harmful diesel emission that are discharged into the atmosphere.

There are many engine components that together perform this task, but whilst most of them function automatically, the Diesel Particulate Filter (DPF) can need some operator input in order to keep it maintained to a suitable standard.

WARNING

During some stages of the engines operation the temperature of the exhaust components and gases can reach very high levels of up to 625°C. To prevent burns do not touch any of the exhaust components and do not place any part of your body into the path of the exhaust gases. To prevent fire, make sure that the engine area is kept clean of grass clippings and other flammable debris.

CAUTION

When operating either the LM3210 or the GM2810:

- Always perform the machines required daily checks.
- Do not allow the engine to idle for prolonged periods of time.
- Always keep the engine bay area clean and make sure that grass clippings and other flammable debris are not allowed to build up near the exhaust components.
- Always use a clean and fresh 'Ultralow Sulphur' diesel fuel (below S15 ppm).
- Always use the correct Low Ash engine oil (CJ-4 grade SAE10W-30).
- Always check the Water Separator for water and drain if any is found.
- Always service the engine in accordance with the recommended Kubota schedule.

THE IMPORTANCE OF PDF MAINTENANCE

A DPF needs to be kept clean in order for the engine to function correctly and reliably.

If simple operator maintenance is carried out on the DPF when the onboard display requested it, then the DPF can have a service life of over 3,000 hours. But if service requests are ignored then soot levels will continue to accumulate until the DPF requires a specialist repair or even part replacement.

REGENERATION

Regeneration is the term given to the process that cleans the DPF. The DPF is cleaned by substantially increasing the temperatures inside it which in turn burns away the soot build-up on the filter. There are several types of Regeneration:

Automatic Regeneration: The DPF is cleaned automatically as the machine is operated.

Parked Regeneration: The DPF is cleaned only when the operator requests it.

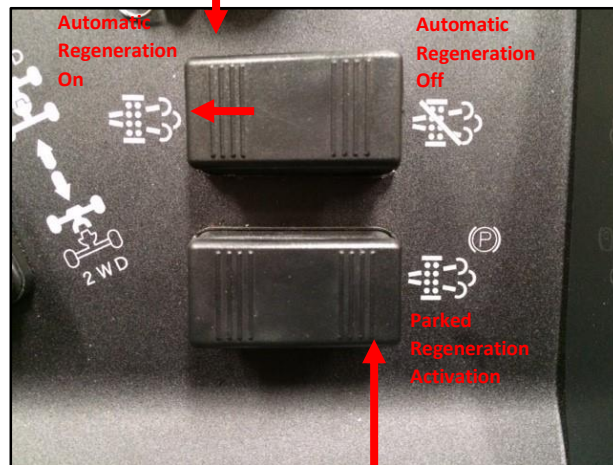
Manual Regeneration: The DPF is cleaned by a Kubota Engine Specialist.

SWITCH POSITIONS

There are two switches for managing the 'DPF Regeneration system':

The switch shown at the top of the photograph switches the 'Automatic Regeneration System' on and off. If the forward most end of the switch is depressed (as indicated by the arrow) then 'Automatic Regeneration' is selected. If the back end of the switch is depressed, then 'Automatic Regeneration' is turned off (Inhibited).

Note: 'Automatic Regeneration On' should always be selected, unless the conditions are extremely dry and a risk of a ground fire exists, in which case it should be switched to 'Automatic Regeneration Off'.



This switch is used to activate a 'Parked Regeneration' if 'Automatic Regeneration' has either been turned off due to a potential fire risk, or if the automatic system has not been able to cope with keeping the DPF clean on its own.

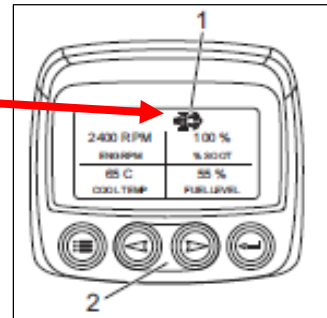


This is the standard (Default) LCD Screen Display.

Note: In this case the Soot levels are only 18% which is not high enough to require the DPF to need cleaning and therefore no Icon is displayed.

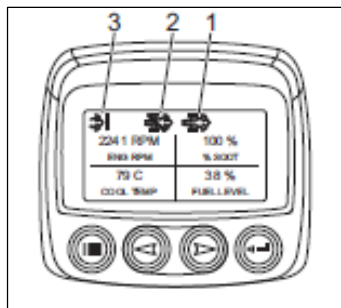
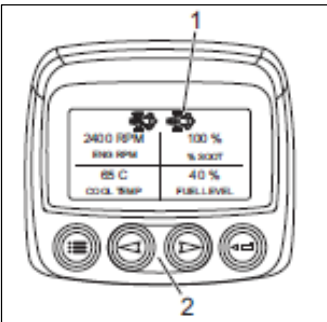
If a non-flashing 'Regeneration Icon' appears on the LCD Display (figure 1) when 'Automatic Regeneration' is switched on, then this only means that 'Automatic Regeneration' is being performed.

This Icon will disappear after the 'Automatic Regeneration' has completed. No further action is required.



If 'Automatic Regeneration' is switched off, then this Icon is displayed on the LCD Screen.

If when 'Automatic Regeneration' is switched off a flashing 'Regeneration Icon' appears alongside icon the 'Regeneration Off' icon (figure 2), then this indicates that a 'Parked Regeneration' is immediately required.



If during any 'Regeneration' process (automatic or parked) a 'Thermometer Icon' should appear on the LCD display (figure 3) then this is to warn the operator that very hot components or exhaust gases currently exist.

SYSTEM OPERATION

Automatic Regeneration Switched 'On'

This setting has two automatic stages. 'Passive Regeneration' is where the Catalytic Converter automatically cleans the Nitrogen Oxide gases and the Soot Particles through chemical reaction.

If 'Passive Regeneration' fails to keep the DPF clean then 'Active Regeneration' is automatically activated. In this phase, extra fuel is injected into the engine which raises the temperature inside the DPF thus burning out the Soot Particles and keeping the DPF clean.

With 'Automatic Regeneration' selected the system will automatically switch between 'Passive' and 'Active' in order to clean the DPF.

'Automatic Regeneration' should be selected at all times apart from in extremely dry weather conditions when there is a ground fire risk. It is hardly noticeable when the system switches from 'Passive' to 'Active' Regeneration and so the machine can be used normally.

Automatic Regeneration Switched 'Off'

When Regeneration takes place, very high exhaust gas temperatures are emitted from the exhaust system. If the machine is to be used in very hot countries then this could pose a fire risk which is when 'Automatic Regeneration' should be switched off (Inhibited). In the UK it is very rare to get such weather conditions and so the 'Automatic Regeneration' Switch should nearly always be selected to 'On'.

Parked Regeneration

If 'Automatic Regeneration' is switched off (inhibit) then soot particles will slowly build up in the DPF. If these are not cleaned then serious damage can occur to the DPF.

Also, if 'Automatic Regeneration' is selected, but the machine is used under light load or with dirty fuel and oil, then the DPF can become contaminated even with 'Automatic Regeneration' selected.

In either of these two scenarios a 'Parked Regeneration' is required once the soot levels reach a certain point as indicated by the 'Regeneration Request Icon' appearing on the LCD display.

Performing a Parked Regeneration

You will need to perform a 'Parked Regeneration' when the soot levels in the DPF reach a specific point and a flashing 'Regeneration Icon' appears in the LCD display. Once this flashing icon appears then a 'Parked Regeneration' must be performed as soon as possible. If it is not performed within 1 ½ hours then a 'Manual Regeneration' will need to be performed by a recommended Kubota Service Agent.

- Once the flashing 'Regeneration Icon' appears, drive the machine to a safe area with no fire risk.
- Park the machine and apply the parking break.
- Reduce the engine speed to idle.
- Switch the 'Automatic Regeneration Switch' to the off position (back end down).
- Depress the back edge of the 'Parked Regeneration Switch'
- 'Parked Regeneration' will commence with the throttle setting being automatically controlled.
- **Do not turn the machine off or use it again until the engine revs have returned to idle and the 'Regeneration icon' has stopped flashing.**

STAGES OF REGENERATION

Level 0

Whilst the mower is being operated normally with the 'Automatic Regeneration Switch' turned on, 'Passive Regeneration' is keeping the DPF clean by using a chemical reaction in the Catalytic Converter.

Level 1

When 'Passive Regeneration' alone is no longer able to keep the DPF clean, 'Level 1' is reached which is when the system automatically switches to 'Active Regeneration'. During 'Active Regeneration' extra fuel is injected into the engine which will substantially increase the temperature inside the DPF, thus burning away the soot build up and cleaning the DPF. An 'Automatic Regeneration Icon' will be displayed in the LCD screen to show that 'Automatic Regeneration' is taking place.

Level 2

If Soot continues to build up, despite the 'Automatic Regeneration' being switched on, then 'level 2' will be reached. At this stage the 'Regeneration Icon' will flash indicating that a 'Parked Regeneration' is required in order to clean the DPF. This must be performed as soon as possible and definitely within 1 ½ hours of the Icon starting to flash.

Level 3

If the 'Parked Regeneration' request from 'Level 2' is ignored and the machine continues to be operated then it quickly reaches Level 3. When level 3 is reached 'Excessive PM3' is displayed on the LCD display, the Yellow LED light is illuminated and the engine is restricted to 50% power. A 'Parked Regeneration' must be performed immediately and the machine should no longer be used. If it is continued to be used then a Service Call by a Kubota Service Engineer will be required.

Level 4

If the request from level 3 is ignored and the machine continues to be used at 50% engine power then 'Level 4' will quickly be reached. At this stage it is no longer possible for the Operator to perform a 'Parked Regeneration' in order to clean the DPF and a Kubota Service Engineer will need to be called in order to perform a 'Manual Regeneration'. **Note: This 'Manual Regeneration' must be performed immediately if serious damage to major components is to be avoided.**

Level 5

If Level 4 is ignored and the machine continues to be used then Level 5 will be reached. If level 5 is reached then the expensive DPF will need to be replaced by a Kubota Service Engineer.

Note:

If a DPF is maintained correctly it should have a service life of about 3,000 hours.