

HOW TO CONTROL KUBOTA STANDARD DPF CRS SYSTEM			Confidential
BUEN-19-0003	BUSINESS UNIT ENGINE EUROPE	Revised Date	March 18, 2019

HOW TO CONTROL KUBOTA STANDARD DPF CRS ENGINE

Version 1.00

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1. Introduction

1.1. Purpose of this document

This document is for application engineers in BUEE in order to explain to the OEM software engineer how to control Kubota Standard DPF Common Rail System. Most piece of information in this document is on Kubota Application manual. This document is intend to provide summarized information and missing information of Kubota Application manual.

In case of the spec engine, it can be different.

1.2. Notes

- This document is applied for E5-DPF models for the OEM.
- The information in this document subject to change without notice.
- The latest information is available on the KISS (**K**ubota engine **I**ntegrated **S**ervice **S**ystem).

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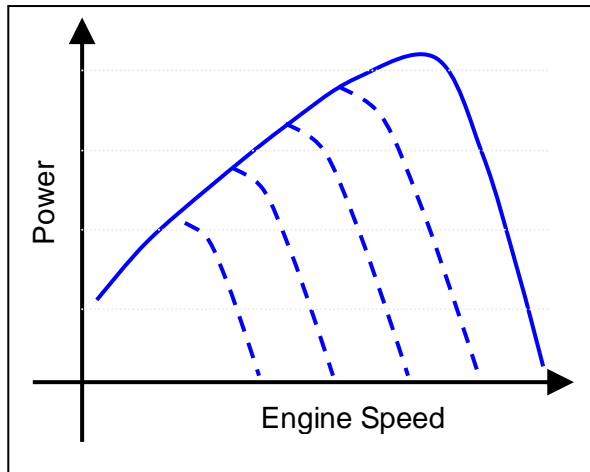
2. Engine Governor Control Mode

Kubota CRS engines can be controlled in 2 modes as follows.

2.1. Droop Control Mode

The droop control mode is like a mechanical engines governor characteristics. The engine speed follows **“Accelerator Pedal Position [%] (0% - 100%)”**.

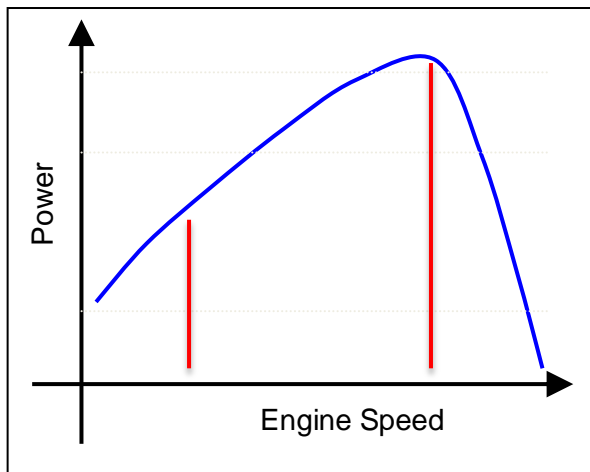
However, when the load is increased, the engine speed drops like a mechanical engine.



2.2. Isochronous Control Mode

The engine speed follows **“Target Engine Speed [rpm]”**. Even if the load is increased, the engine speed is controlled to a constant speed. However, if the load demand is bigger than the maximum power curve, the engine cannot keep the engine speed in a constant speed.

The lowest engine speed and the highest engine speed are specified by each engine models.



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3. Engine Speed Control

In case of the standard engine, only CAN communication control is available.

3.1. Kubota Proprietary CAN message

3.1.1. General

The engine speed can be controlled by **Kubota Proprietary CAN message**.

Message Name: PGN65363
 Message ID: \$18FF53VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 10 msec

Start Byte Position	Bit Length	SPN	Message	Notes
2.1	16	-	ICR Target Engine Speed	0 to 64255rpm, 1rpm/bit, 0 offset
4.1	2	-	Governor Characteristic Info.	00=Droop, 01=Isochronous
4.7	2	-	Engine Stop Info.	00=Not Stop, 01=Stop
5.1	16	-	Accelerator Pedal Position	0 to 100%, 0.1%/bit, 0 offset

*Unused bit must be "0".

3.1.2. Droop Control Mode

To control the engine in the droop mode, the machine ECU needs to send **"00"** by **"Governor Characteristic Info."**. Then, the engine speed follows **"Accelerator Pedal Position"**.

3.1.3. Isochronous Control Mode

To control the engine in the isochronous mode, the machine ECU needs to send **"01"** by **"Governor Characteristic Info."**. Then, the engine speed follows **"ICR Target Engine Speed"**.

3.1.4. Engine Stop

The machine ECU may stop the engine via CANBUS by **"Engine Stop Info."**. This message is option. If this message is not necessary, the OEM does not need to use this message. Normally, the OEM can stop the engine by turning IG off.

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3.2. TSC1 message override control (Optional)

3.2.1. General

The TSC1 message is an option. If the TSC1 message is not necessary, the OEM does not need to use the TSC1 message. In majority case, the TSC1 message is used for regulating the engine speed or the engine torque by overriding when errors are occurred for example. When the OEM uses the TSC1 messages, the machine ECU has to transmit PGN65363 (Kubota Proprietary CAN message) as well.

Message Name: TSC1
 Message ID: \$0C0000VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 10 msec

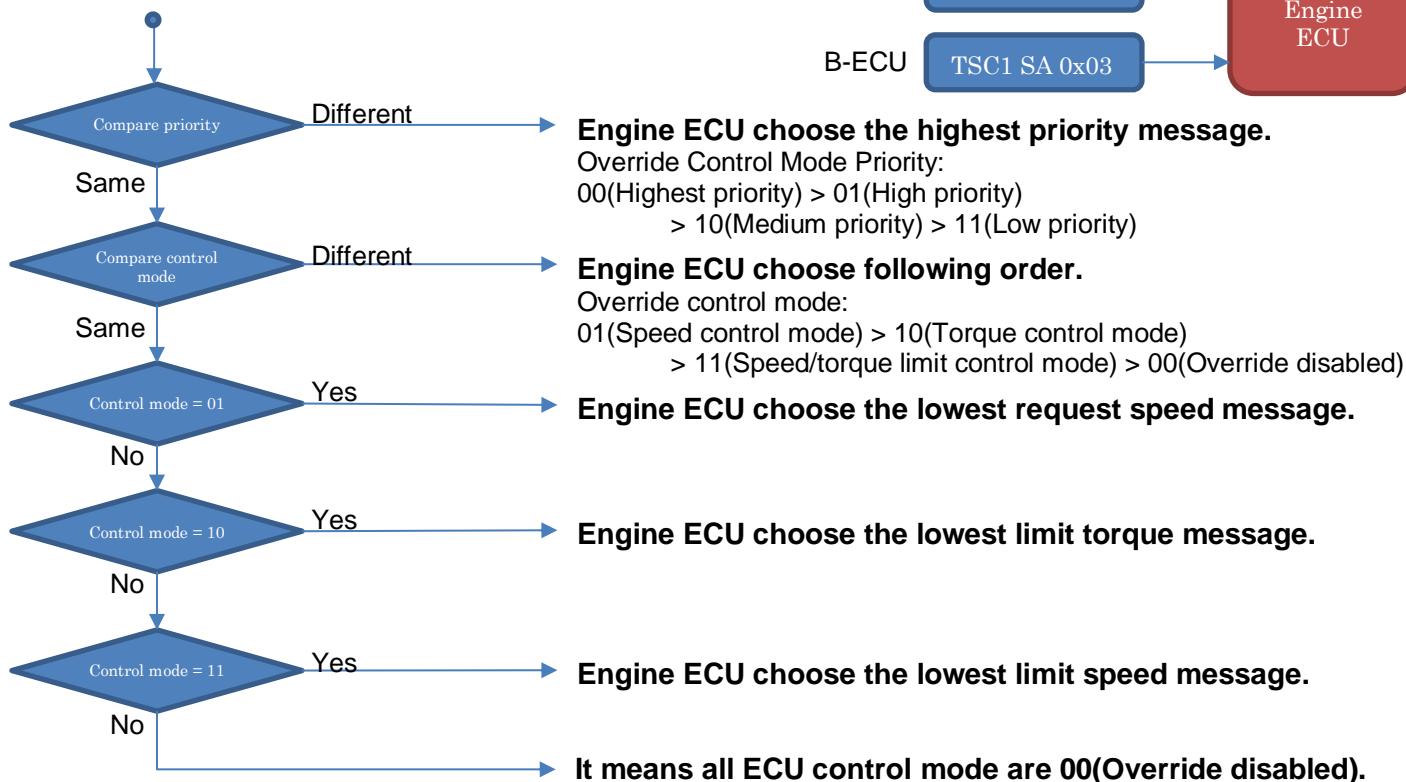
Start Byte Position	Bit Length	SPN	Message	Notes
1.1	2	695	Override Control Mode	00:override disable, 01:Spd Ctrl, 10:Trq Ctrl, 11:Spd/Trq limit ctrl
1.5	2	897	Override Control Mode Priority	00:Highest, 01:High, 10:Medium, 11:Low
2.1	16	898	Engine Requested/Limit Speed control	0 to 8031.875rpm, 0.125rpm/bit, 0 offset
4.1	8	518	Engine Requested/Limit Torque control	-125% to 125%, 1%/bit, -125% offset

*Unused bit must be "1".

3.2.2. Priority

For example, if there is 2 ECUs sending the TSC1 message with different CAN source address, the engine ECU prioritize it as follows.

Ex. Machine has 2 ECUs to send TSC1 message



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3.2.3. Override control Mode

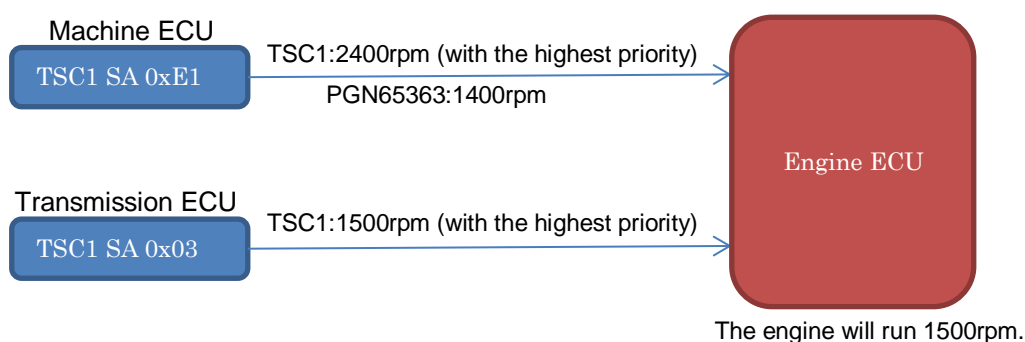
The TSC1 message is not always enable. The validity of the TSC1 message depends on whether the engine governor control mode is the isochronous mode or the droop mode as follows.

Override Control Mode	Droop	Isochronous
01:Spd Ctrl	Not supported	Supported
10:Trq Ctrl	Supported as Trq limit	Supported as Trq limit
11:Spd/Trq limit Ctrl	Not supported	Supported as Spd limit and Trq limit

3.2.3.1. Speed control mode (01:Spd Ctrl)

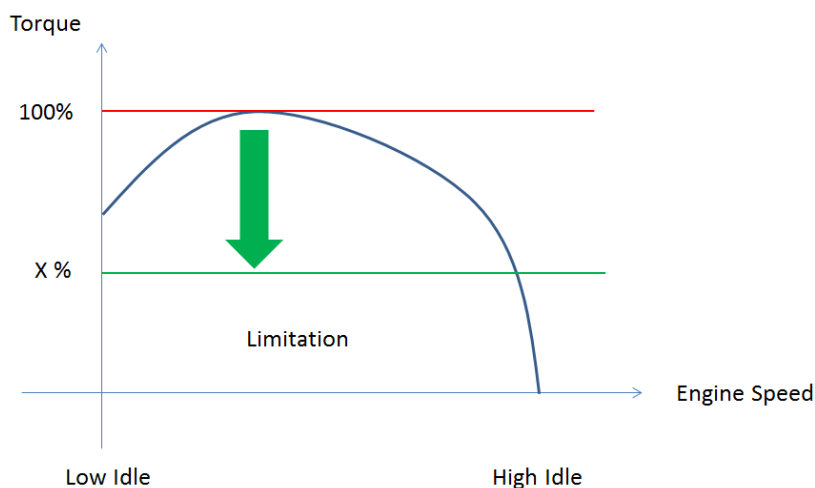
This mode is same control as the isochronous mode.
The TSC1 can overwrite the speed request of PGN65363.
However, **this mode is disabled at the droop control mode.**

Ex: In case, there are 2 controllers on the machine side.
The machine ECU sends 1400rpm by PGN65363 and 2400rpm by SPN898 (TSC1).
The transmission ECU sends 1500rpm by SPN898 (TSC1).
The engine ECU choses the lowest request speed of the TSC1 for the isochronous control.
The engine speed goes to 1500 rpm.



3.2.3.2. Torque limit control mode (10:Trq Ctrl)

The engine ECU controls the engine power as a torque limit mode.
The ECU cuts the fuel for a torque limitation.
If the machine ECU sends the TSC1 message and “Override control mode” is set to 10 and “Engine Requested/Limit Torque” set to X%, the engine behaves as following figure.



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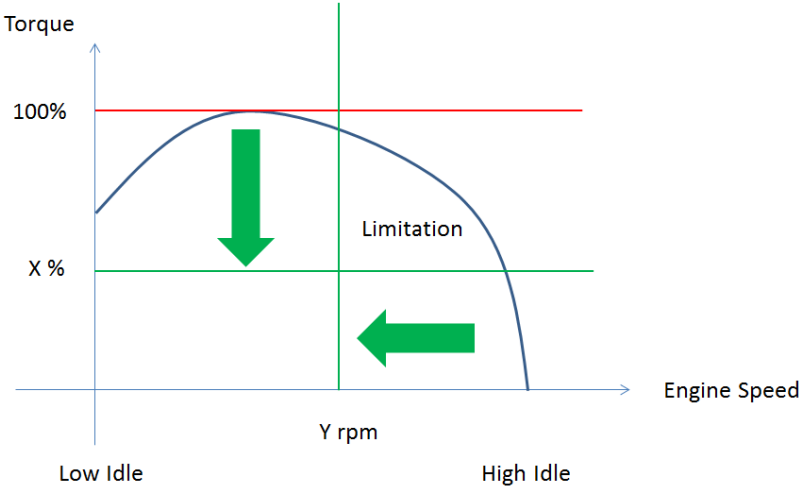
3.2.3.3. Speed / Torque limit control mode (11:Spd/Trq limit Ctrl)

The engine ECU cuts the fuel for a Speed/torque limitation.

If the machine ECU sends TSC1 message, “Override control mode” is set to 11, “Engine Requested/Limit Torque control” is set to X% and “Limit Speed control” is set to Yrpm, the engine behaves as following figure.

If the machine ECU sends PGN65363 and “ICR Target Engine Speed” is to a high idle rpm, engine goes to Y rpm.

However, **this mode is disabled at the droop control mode.**



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4. DPF Control

4.1. General

First of all, please refer to Kubota Application manual "DPF Regeneration control strategy" on the KISS (Kubota engine Integrated Service System).

This document explains a minimum requirement to control Kubota DPF system.

4.2. DPF regeneration

4.2.1. Items to display

The machine display panel needs to show the operator following 3 lamps which are transmitted by the engine ECU via CANBUS.





Message Name: DPFC1
 Message ID: \$18FD7C00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	3	3697	Diesel Particulate Filter Lamp Command	000: Off, 001: On - solid, 100: On - fast blink (1 Hz), others reserved
3.3	2	3703	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit switch	00: not inhibited, 01: inhibited, others reserved
7.3	3	3698	Exhaust Gas High Temperature Lamp Command	000: Off, 001: On-solid, others reserved

The following figure is a part of Kubota Application manual as of March 6, 2019.

Those visualized 3 lamps on the display panel are necessary to notify the operator that the DPF regeneration is being requested or the DPF regeneration is in progress.

Lamp sequence recommended by Kubota

				
LEVEL 0: Passive Regeneration Only				
(Regeneration not needed)	ON	OFF	OFF	OFF
CAN: 64892 3703 01	64892 3698 000	64892 3697 000	N/A	
(Regeneration not needed)	OFF	OFF	OFF	OFF
CAN: 64892 3703 00	64892 3698 000	64892 3697 000	N/A	
LEVEL 1: Active Regeneration				
(Active regeneration needed)	ON	OFF	SOLID LIGHTING	OFF
CAN: 64892 3703 01	64892 3698 000	64892 3697 001	N/A	
(Active regeneration occurring)	OFF	SOLID LIGHTING	SOLID LIGHTING	OFF
CAN: 64892 3703 00	64892 3698 001	64892 3697 001	N/A	
LEVEL 2: Active or Parked regeneration				
(Active regeneration needed)	ON	OFF	BLINKING LIGHT	OFF
CAN: 64892 3703 01	64892 3698 000	64892 3697 100	N/A	
(Active regeneration occurring)	OFF	SOLID LIGHTING	SOLID LIGHTING	OFF
CAN: 64892 3703 00	64892 3698 001	64892 3697 001	N/A	
LEVEL 3: De-rating power				
(Parked regeneration needed)	ON	OFF	BLINKING LIGHT	ON
CAN: 64892 3703 01	64892 3698 000	64892 3697 100	SPN: 3701 FMI: 15	
(Parked regeneration occurring)	OFF	SOLID LIGHTING	SOLID LIGHTING	ON
CAN: 64892 3703 00	64892 3698 001	64892 3697 001	SPN: 3701 FMI: 15	
LEVEL 4: De-rating power				
(Parked regeneration needed by service tool)	ON	OFF	BLINKING LIGHT	ON
CAN: 64892 3703 01	64892 3698 000	64892 3697 100	SPN: 3701 FMI: 16	
(Parked regeneration occurring by service tool)	OFF	SOLID LIGHTING	SOLID LIGHTING	ON
CAN: 64892 3703 00	64892 3698 001	64892 3697 001	SPN: 3701 FMI: 16	
LEVEL 5: Engine stop				
(DPF service required)	ON	OFF	BLINKING LIGHT	ON
CAN: 64892 3703 01	64892 3698 000	64892 3697 100	SPN: 3701 FMI: 00	
(Active & Parked regeneration disabled)	OFF	OFF	BLINKING LIGHT	ON
CAN: 64892 3703 00	64892 3698 000	64892 3697 100	SPN: 3701 FMI: 00	

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4.2.2. Necessary Input

The machine ECU should transmit following information via CANBUS.

The parking brake switch is one of the safety condition to perform the DPF parked regeneration.

Message Name: CCVS
 Message ID: \$18FEF2VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 100 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.3	2	70	Parking Brake Switch	00: Parking brake not set, 01: Parking brake set, 10: Error, 11: Not available

*Unused bit must be "1".

The neutral switch is one of the safety condition to perform the DPF parked regeneration.

Message Name: ETC5
 Message ID: \$1CFEC3VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 100 msec

Start Byte Position	Bit Length	SPN	Message	Notes
2.3	2	604	Transmission Neutral Switch	00: Off, 01: On, 10: Error, 11: Not available

*Unused bit must be "1".

The regeneration inhibit switch should be prepared for the operator to prohibit the DPF regeneration in term of the safety.

The DPF parked regeneration force switch activates the DPF parked regeneration by a positive edge when the DPF parked regeneration is available. This switch also can inactivate the DPF parked regeneration by a positive edge during the DPF parked regeneration.

Message Name: CM1
 Message ID: \$18E000VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
6.1	2	3695	Diesel Particulate Filter Regeneration Inhibit Switch	00: not active, 01: active, 10: error, 11: not available
6.3	2	3696	Diesel Particulate Filter Regeneration Force Switch	00: not active, 01: active, 10: error, 11: not available

*Unused bit must be "1".

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4.3. DPF Ash Monitoring (Optional)

This function is an optional.

The following sentences are a part of Kubota Application manual as of March 6, 2019.

CAN message for DPF ash load percent (SPN 3720) can be used as DPF cleaning alarm.

- SPN 3720 indicates 4 level DPF cleaning index (100, 75, 50 and 0%) based on DPF ash accumulation amount estimated by DPF regeneration conditions.

DPF cleaning index

100%: DPF cleaning is required level

ash accumulation time less than 3000 hours: 0% (fixed value)

ash accumulation time more than 6000 hours: 100% (fixed value)

- DPF ash accumulation time and estimation amount are reset by service tool.
- If the machine organize the system to alert user for DPF cleaning requirement (DPF cleaning alarm system), DPF cleaning interval is can be extended maximum 6000 hours.
 - Clean the DPF in case of an alarm or every 6000 DPF operating hours whichever comes earlier.
 - DPF cleaning interval is depending on engine operating conditions.
- If the machine does not have DPF cleaning alarm system, clean the DPF every 3000 operating hours.

***The machine display panel needs to notify the operator in visually when the ash amount is 100%. On the other hand, it is not necessary to notify the operator when the ash amount is 75%, 50% or 0%.**

Message Name: AT1S
 Message ID: \$18FD7B00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: On Request

Start Byte Position	Bit Length	SPN	Message	Notes
2.1	8	3720	Diesel Particulate Filter 1 Ash Load Percent	1 %/bit, 0 offset; 4 level DPF cleaning index: 100%, 75%, 50%, and 0%

The engine ECU does not transmit "AT1S" periodically. The machine ECU has to send "RQST" message first to get this information based on SAE J1939 standard.

Message Name: RQST
 Message ID: \$18EA00VA* or \$18EAFVFA*
 Communication: From the machine ECU to the engine ECU
 Data length: 3 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	24	2540	Parameter Group Number (RQST)	

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5. Pump learning

5.1. General

Kubota has 2 types of a common rail system, Denso system and Bosch system. Denso system is used for 05-CRS, 07-CRS and V3-CRS. Bosch system is used for 03-CRS. Bosch system does not need this pump learning function, so if the OEM has 03-CRS, this content can be skipped.

Only Denso system needs to apply the pump learning.

5.2. Necessary Input

The vehicle speed is one of the safety condition to perform the pump learning.

Message Name: CCVS

Message ID: \$18FEF2VA*

Communication: From the machine ECU to the engine ECU

Data length: 8 byte

Period: 100 msec

Start Byte Position	Bit Length	SPN	Message	Notes
2.1	16	84	Vehicle Speed	0 to 250.996 km/h, 1/256 km/h per bit, 0 offset

*Unused bit must be "1".

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6. Diagnostic Trouble Code Information

6.1. General

First of all, please refer to Kubota Application manual “ECU DTC list” on the KISS (Kubota engine Integrated Service System).

If the engine ECU detects a DTC, the engine ECU will transmit information of the DTC by “DM1” message via CANBUS based on SAE J1939. The machine display panel should read this DTC information and notify the operator in visually.

6.2. DM1 message

The active DTC is transmitted by “DM1” message up to 5 DTCs based on SAE J1939-73.

Message Name: DM1
 Message ID: \$18FECA00
 Communication: From the engine ECU to the machine ECU
 Data length: Depending on number of the DTC
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.3	2	624	Amber Warning Lamp	00: Lamp Off, 01: Lamp On, 10: Reserved, 11: Not available
1.5	2	623	Red Stop Lamp	00: Lamp Off, 01: Lamp On, 10: Reserved, 11: Not available
3.1	4	-	DTC1	
7.1	4	-	DTC2	
11.1	4	-	DTC3	
15.1	4	-	DTC4	
19.1	4	-	DTC5	

If there are more than 2 DTCs, “DM1” message is transmitted by the CAN transport protocol based on SAE J1939-21.

Message Name: TP_CM
 Message ID: \$1CECFF00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	8	2556	Control Byte (TP.CM)	Kubota uses 32 (dec) - Broadcast Announce Message
2.1	16	2567	Total Message Size (TP.CM_BAM)	
4.1	8	2568	Total Number of Packets (TP.CM_BAM)	
6.1	24	2569	Parameter Group Number of the packeted message (TP.CM_BAM)	

Message Name: TP_DT
 Message ID: \$1CEBFF00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	8	2572	Sequence Number (TP.DT)	Sequence Number (TP.DT)
2.1	56	2573	Packetized Data (TP.DT)	Relevant data for this PGNs unique use.

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7. PCD / NCD for EU StageV

7.1. General

First of all, please refer to Kubota Application manual “DPF Regeneration control strategy” on the KISS (Kubota engine Integrated Service System).

The following sentences are a part of Kubota Application manual as of March 6, 2019.

Where the engine is to be operated within the European Union on diesel or non-road gas-oil (In order to comply with EU Stage V emission regulations), engine warning signal for emission failure which includes both NOx control diagnosis (NCD) and PM control diagnosis (PCD) must be indicated to a machine operator.

Definitions and abbreviation on regulation

‘NOx Control Diagnostic system (NCD)’ means a system on-board the engine which has the capability of

- (a) detecting a NOx Control Malfunction
- (b) identifying the likely cause of NOx control malfunctions by means of information stored in computer memory and/or communicating that information off-board

‘Particulate Control Diagnostic system (PCD)’ means a system on-board the engine which has a capability of:

- (a) detecting a Particulate Control Malfunction
- (b) identifying the likely cause of particulate control malfunctions by means of information stored in computer memory and/or communicating that information off-board

***If there is PCD / NCD DTC happened, the machine display panel must notify the operator in visually in the different way from other DTCs in order to clarify that there is critical emission failure.**

7.2. PCD / NCD related DTCs

7.2.1. PCD DTCs

DTC	ISO 14229 P-Code	J1939-73		DTC set parameter	Limp Home Action by engine ECU (system action)
		SPN	FMI		
Removal of DPF system (PCD)	P1A28	3936	7	Exhaust temperature sensor T0, T1, and T2 and Differential Pressure sensor are fault (open circuit)	No inducement
Differential pressure sensor 1: High Failures of PCD system (PCD)	P2455	3251	3	DPF differential pressure sensor voltage: 4.7 V or more	0 kPa (0.0 kgf/cm ² , 0.0 psi) [default value] Output limitation: Approximately 75% of normal condition
Loss of Function of DPF system (PCD)	P3015	3936	2	Abnormal low output of differential pressure sensor continues more than a certain period	No inducement

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7.2.2. NCD DTCs

DTC	ISO 14229 P-Code	J1939-73		DTC set parameter	Limp Home Action by engine ECU (system action)
		SPN	FMI		
No communication with EGR Removal of EGR system (NCD)	U0076	523578	2	Interruption of CAN	Output limitation: Approximately 75% of normal condition EGR stop NCD inducement pattern
MAF sensor: Low Removal of MAF sensor (NCD)	P0102	132	4	Mass air flow sensor voltage: 0.1 V or less	Sensor output: 0.7 times of target value at normal condition [default value] Output limitation: Approximately 75% of normal condition EGR stop Intake throttle 100% open NCD inducement pattern

7.3. Optional CAN message

Kubota proprietary CAN message for PCD / NCD is available.

Message Name: PGN65361

Message ID: \$18FF5100

Communication: From the engine ECU to the machine ECU

Data length: 8 byte

Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	1	-	PCD error status flag	0: No PCD error, 1: PCD related error happened
1.2	1	-	EGR-System tampering flag	0: No NCD error, 1: NCD related error happened
1.3	1	-	PCD 1	Removal of DPF system - P1A28
1.4	1	-	PCD 2	Loss of Function of DPF system – P3015
1.5	1	-	PCD 3	Failure of the PCD system – P2455
1.6	1	-	NCD 1	Removal of EGR system – U0076
1.7	1	-	NCD 2	Removal of MAF sensor – P0102

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8. CAN Communication

8.1. General

First of all, please refer to Kubota Application manual "J1939 CAN Table" on the KISS (Kubota engine Integrated Service System).

The Kubota CAN communication respects SAE J1939 standard. Please refer to your "J1939 Standards Collection" document issued by SAE for the detail.

The Kubota standard ECU ignore the source address. In other word, the Kubota standard ECU receive all registered messages regardless of the source address.

8.2. Necessary messages

8.2.1. Need to be transmitted from the machine side

8.2.1.1. PGN65363

Message Name: PGN65363
 Message ID: \$18FF53VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 10 msec

Start Byte Position	Bit Length	SPN	Message	Notes
2.1	16	-	ICR Target Engine Speed	0 to 64255rpm, 1rpm/bit, 0 offset
4.1	2	-	Governor Characteristic Info.	00=Droop, 01=Isochronous
4.7	2	-	Engine Stop Info.	00=Not Stop, 01=Stop
5.1	16	-	Accelerator Pedal Position	0 to 100%, 0.1%/bit, 0 offset

*Unused bit must be "0".

8.2.1.2. CCVS

Message Name: CCVS
 Message ID: \$18FEF2VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 100 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.3	2	70	Parking Brake Switch	00: Parking brake not set, 01: Parking brake set, 10: Error, 11: Not available
2.1	16	84	Vehicle Speed	0 to 250.996 km/h, 1/256 km/h per bit, 0 offset *Not necessary for Bosch system

*Unused bit must be "1".

8.2.1.3. CM1

Message Name: CM1
 Message ID: \$18E000VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
6.1	2	3695	Diesel Particulate Filter Regeneration Inhibit Switch	00: not active, 01: active, 10: error, 11: not available
6.3	2	3696	Diesel Particulate Filter Regeneration Force Switch	00: not active, 01: active, 10: error, 11: not available

*Unused bit must be "1".

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8.2.1.4. ETC5

Message Name: ETC5
 Message ID: \$1CFEC3VA*
 Communication: From the machine ECU to the engine ECU
 Data length: 8 byte
 Period: 100 msec

Start Byte Position	Bit Length	SPN	Message	Notes
2.3	2	604	Transmission Neutral Switch	00: Off, 01: On, 10: Error, 11: Not available

*Unused bit must be "1".

8.2.1.5. RQST

If the OEM wants to receive the message which should be requested, this message should be transmitted.

Message Name: RQST
 Message ID: \$18EA00VA* or \$18EAFVVA*
 Communication: From the machine ECU to the engine ECU
 Data length: 3 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	24	2540	Parameter Group Number (RQST)	

8.2.2. Need to be received by the machine side

8.2.2.1. DPFC1

Message Name: DPFC1
 Message ID: \$18FD7C00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	3	3697	Diesel Particulate Filter Lamp Command	000: Off, 001: On - solid, 100: On - fast blink (1 Hz), others reserved
3.3	2	3703	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit switch	00: not inhibited, 01: inhibited, others reserved
7.3	3	3698	Exhaust Gas High Temperature Lamp Command	000: Off, 001: On-solid, others reserved

8.2.2.2. DM1

Message Name: DM1
 Message ID: \$18FECA00
 Communication: From the engine ECU to the machine ECU
 Data length: Depending on number of the DTC
 Period: 1000 msec

Start Byte Position	Bit Length	SPN	Message	Notes
1.3	2	624	Amber Warning Lamp	00: Lamp Off, 01: Lamp On, 10: Reserved, 11: Not available
1.5	2	623	Red Stop Lamp	00: Lamp Off, 01: Lamp On, 10: Reserved, 11: Not available
3.1	4	-	DTC1	
7.1	4	-	DTC2	
11.1	4	-	DTC3	
15.1	4	-	DTC4	
19.1	4	-	DTC5	

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8.2.2.3. TP_DT

Message Name: TP_DT
 Message ID: \$1CEBFF00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	8	2572	Sequence Number (TP.DT)	Sequence Number (TP.DT)
2.1	56	2573	Packetized Data (TP.DT)	Relevant data for this PGNs unique use.

8.2.2.4. TP_CM

Message Name: TP_CM
 Message ID: \$1CECFF00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: -

Start Byte Position	Bit Length	SPN	Message	Notes
1.1	8	2556	Control Byte (TP.CM)	Kubota uses 32 (dec) - Broadcast Announce Message
2.1	16	2567	Total Message Size (TP.CM_BAM)	
4.1	8	2568	Total Number of Packets (TP.CM_BAM)	
6.1	24	2569	Parameter Group Number of the packeted message (TP.CM_BAM)	

8.2.2.5. AT1S

If the OEM wants to extend the DPF cleaning interval, this message should be received.

Message Name: AT1S
 Message ID: \$18FD7B00
 Communication: From the engine ECU to the machine ECU
 Data length: 8 byte
 Period: On Request

Start Byte Position	Bit Length	SPN	Message	Notes
2.1	8	3720	Diesel Particulate Filter 1 Ash Load Percent	1 %/bit, 0 offset; 4 level DPF cleaning index: 100%, 75%, 50%, and 0%

8.3. Other requirement

***The engine ECU stops CAN communication during the ECU reflashing. Please do not power supply off to the engine ECU even if the CAN communication is stopped from the engine ECU. Otherwise, the engine ECU could not be reflashed in the aftermarket.**

***The machine ECU should start CAN communication within 2 sec after the engine ECU wakes up. Otherwise, the engine ECU would detect the CAN communication error.**

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9. Revised history

Date	Ver	Author	Remark
March 06, 2019	1.00	Tatsuhiko Horita	First version