

Product: Kubota V6108-CR-TIE4 DIAGNOSIS MANUAL

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## DIAGNOSIS MANUAL COMMON RAIL SYSTEM

# V6108-CR-TIE4

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**Kubota**

KiSC issued 05, 2012 A

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# I INFORMATION

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KiSC issued 05, 2012 A

# INFORMATION

## CONTENTS

|                       |     |
|-----------------------|-----|
| 1. SAFETY FIRST ..... | I-1 |
|-----------------------|-----|

# 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

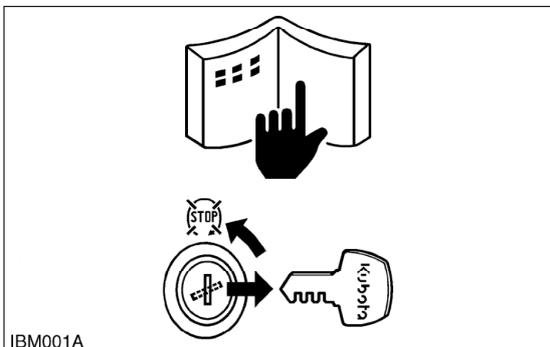
- Gives helpful information.

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## **BEFORE SERVICING AND REPAIRING**

- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.
- Hang a "**DO NOT OPERATE**" tag in operator station.

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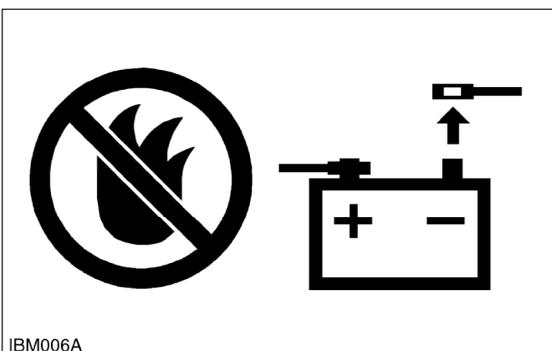
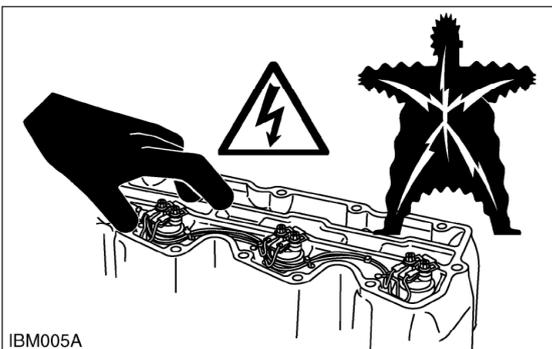
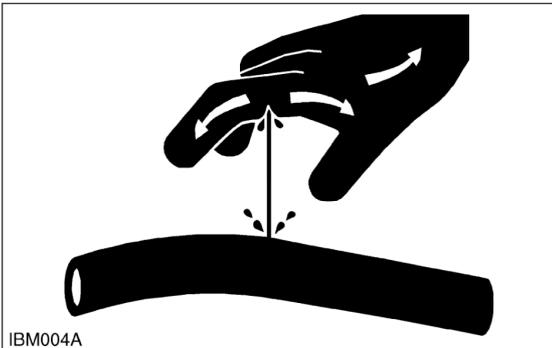
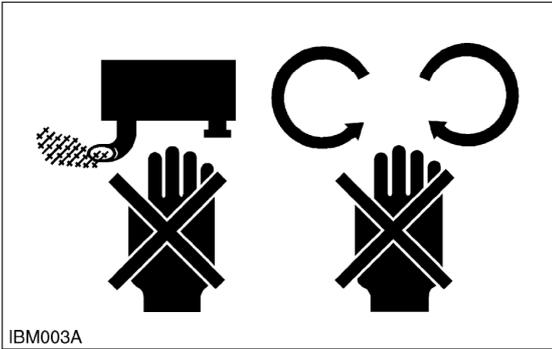
## **SAFETY STARTING**

- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.

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**SAFETY WORKING**

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt to repair fuel lines, sensors, or any other components between the high-pressure fuel feed pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU and injector. Pay sufficient caution to electric shock when performing work activities.

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**AVOID FIRES**

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.

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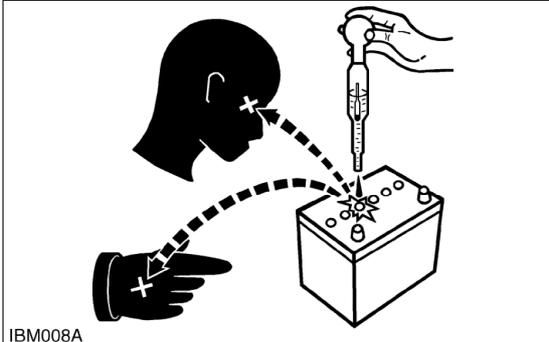


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**VENTILATE WORK AREA**

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

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**PREVENT ACID BURNS**

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.

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**DISPOSE OF FLUIDS PROPERLY**

- Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.

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**PREPARE FOR EMERGENCIES**

- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

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# **1 COMMON RAIL SYSTEM**

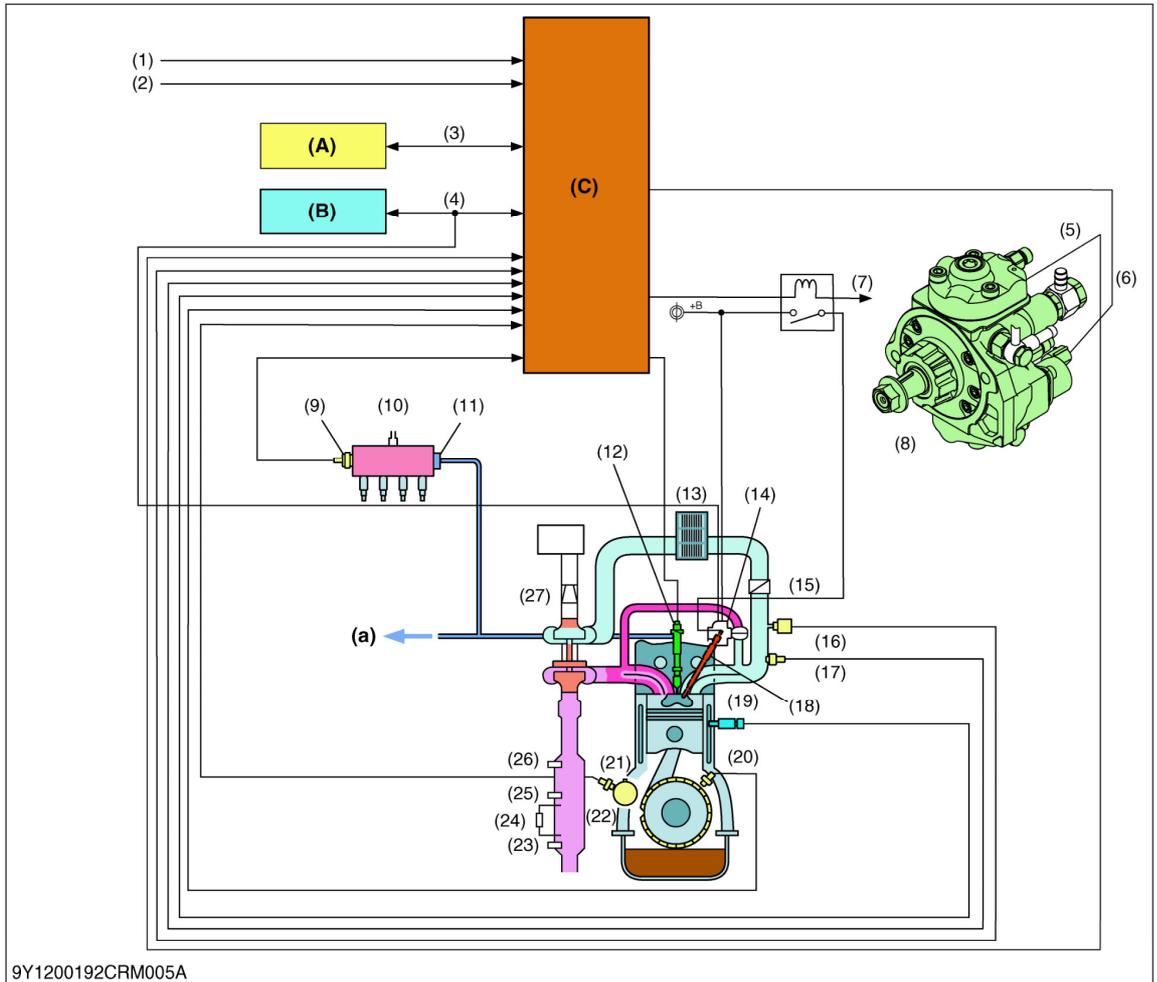
# MECHANISM

## CONTENTS

|  |       |
|--|-------|
| 1. BASIC SYSTEM INFORMATION .....                  | 1-M1  |
| [1] SYSTEM CONFIGURATION.....                      | 1-M1  |
| [2] FUEL SYSTEM.....                               | 1-M2  |
| [3] INTAKE AND EXHAUST SYSTEM .....                | 1-M3  |
| [4] WIRING DIAGRAM .....                           | 1-M4  |
| (1) System Wiring Diagram.....                     | 1-M4  |
| [5] AVAILABLE DATA MONITOR SIGNALS (LEVEL 2) ..... | 1-M5  |
| (1) Monitor Items.....                             | 1-M5  |
| (2) Normal Value.....                              | 1-M8  |
| [6] ECU TERMINAL LAYOUT .....                      | 1-M11 |
| (1) ECU Terminal Layout 1 (A: 96 Pins) .....       | 1-M11 |
| (2) ECU Terminal Layout 2 (B: 58 Pins) .....       | 1-M14 |

# 1. BASIC SYSTEM INFORMATION

## [1] SYSTEM CONFIGURATION



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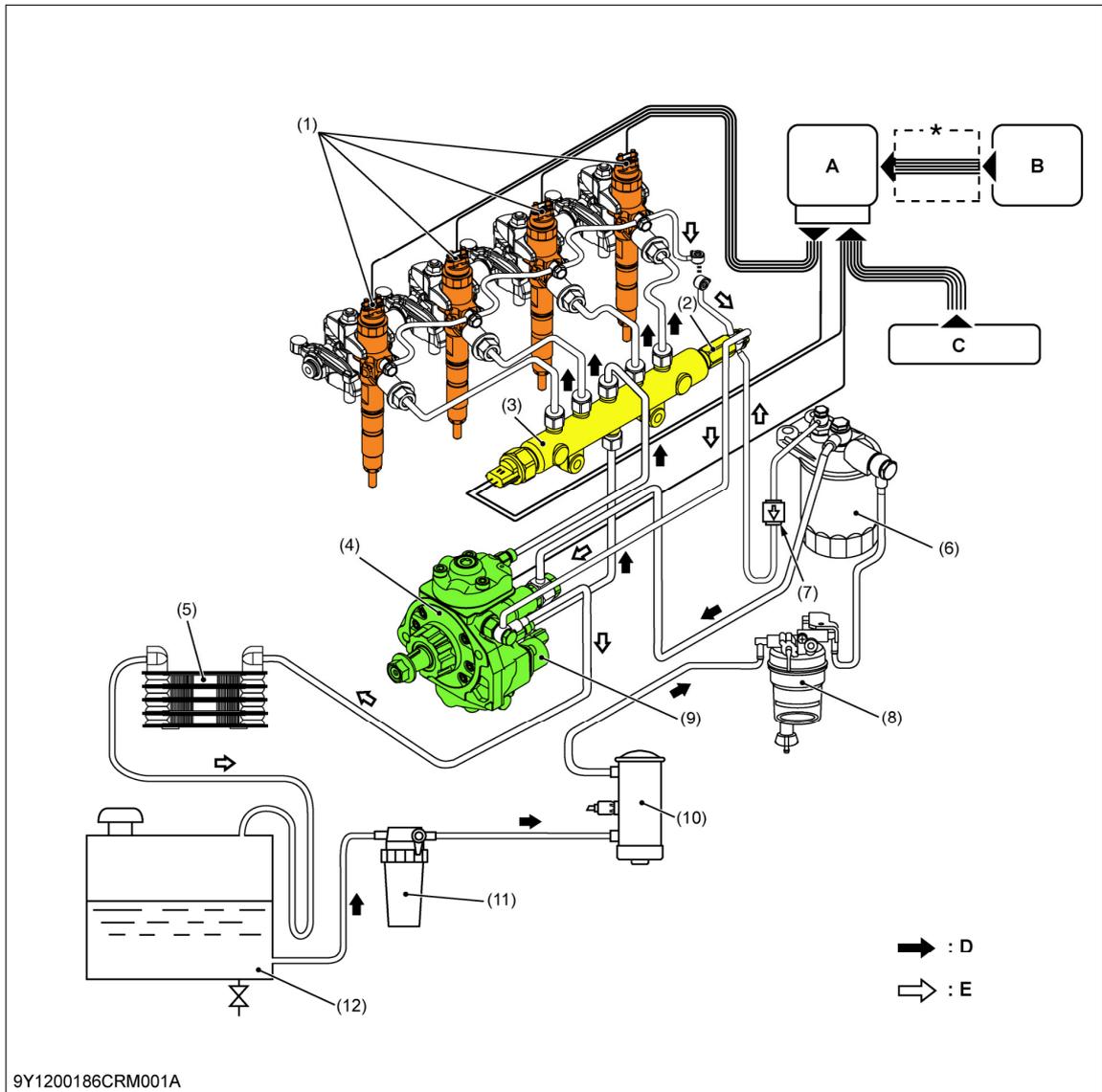
- |   |                                    |  |   |
|---|------------------------------------|--|---|
| (1) Key Switch ON Signal  | (9) Rail Pressure Sensor           | (21) Camshaft Position Sensor  | (26) Exhaust Gas Temperature Sensor0 (T0) (DOC Inlet Exhaust Gas Temperature) |
| (2) Starter Switch Signal   | (10) Rail                          | (22) Diesel Particulate Filter (Hereinafter Referred To As The "DPF") Muffler  | (27) Mass Air Flow Sensor   |
| (3) CAN Communication for tractor (Accelerator Position Signal*, Neutral Switch*, Machine Travel Speed Signal*) | (11) Pressure Limiter              | (23) Exhaust Gas Temperature Sensor2 (T2) (DPF Outlet Exhaust Gas Temperature) |   |
| (4) CAN Communication for Service   | (12) Injector                      | (24) Differential Pressure Sensor (DPF Differential Pressure) ( $\Delta P$ )   |   |
| (5) Fuel Temperature Sensor   | (13) Inter Cooler                  | (25) Exhaust Gas Temperature Sensor1 (T1) (DPF Inlet Exhaust Gas Temperature)  |   |
| (6) SCV (Suction Control Valve)   | (14) EGR DC Motor                  |  |   |
| (7) Glow Relay  | (15) Intake Throttle Valve         |  |   |
| (8) Supply Pump   | (16) Boost Pressure Sensor         |  |   |
|   | (17) Intake Air Temperature Sensor |  |   |
|   | (18) Glow Plug                     |  |   |
|   | (19) Coolant Temperature Sensor    |  |   |
|   | (20) Crankshaft Position Sensor    |  |   |
- (A) CAN2 Connector (For Tractor)  
 (B) CAN1 Connector (For Service)  
 (C) Engine ECU  
 (a) To Fuel Tank

■ NOTE

- The signals marked with \* are CAN communication.

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## [2] FUEL SYSTEM



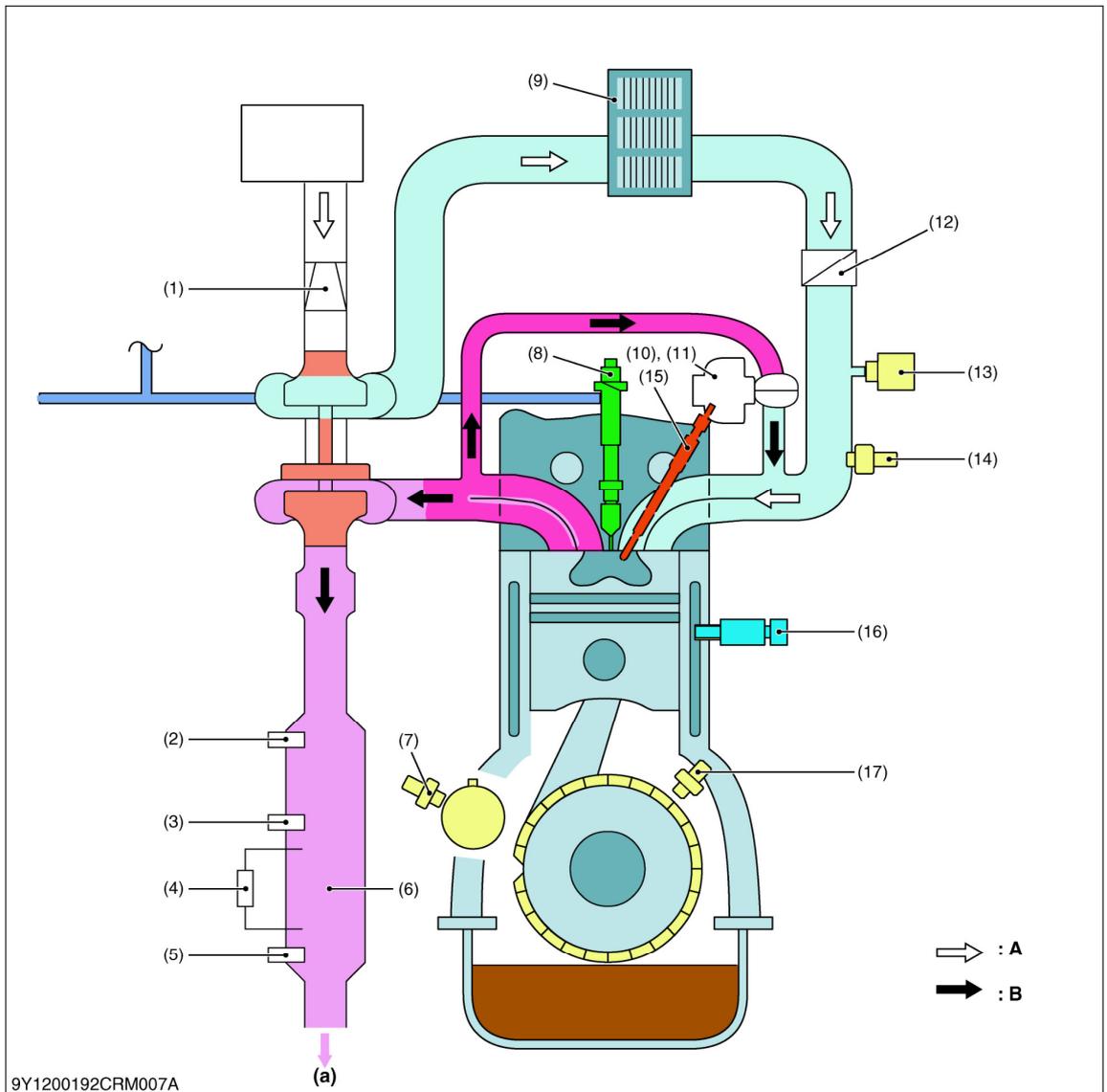
- |                      |                       |                                 |                              |
|----------------------|-----------------------|---------------------------------|------------------------------|
| (1) Injector         | (5) Fuel Cooler       | (9) SCV (Suction Control Valve) | <b>A: ECU for Engine</b>     |
| (2) Pressure Limiter | (6) Fuel Filter       | (10) Fuel Feed Pump             | <b>B: ECU for Tractor</b>    |
| (3) Rail             | (7) Check Valve       | (11) Water Separator 2          | <b>C: Sensors</b>            |
| (4) Supply Pump      | (8) Water Separator 1 | (12) Fuel Tank                  | <b>D: Injected Fuel Flow</b> |
|                      |                       |                                 | <b>E: Returned Fuel Flow</b> |

■ **NOTE**

- The signals marked with \* are CAN communication.

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### [3] INTAKE AND EXHAUST SYSTEM



- |  |   |                                    |                            |
|--|---|------------------------------------|----------------------------|
| (1) Mass Air Flow Sensor   | (5) Exhaust Gas Temperature Sensor2 (T2) (DPF Outlet Exhaust Gas Temperature) | (10) EGR DC Motor                  | <b>A: Intake Air Flow</b>  |
| (2) Exhaust Gas Temperature Sensor0 (T0) (DOC Inlet Exhaust Gas Temperature) | (6) Diesel Particulate Filter (Hereinafter Referred To As The "DPF") Muffler  | (11) EGR Lift Sensor               | <b>B: Exhaust Gas Flow</b> |
| (3) Exhaust Gas Temperature Sensor1 (T1) (DPF Inlet Exhaust Gas Temperature) | (7) Camshaft Position Sensor  | (12) Intake Throttle Valve         | <b>(a) To Muffler</b>      |
| (4) Differential Pressure Sensor (DPF Differential Pressure) ( $\Delta P$ )  | (8) Injector  | (13) Boost Pressure Sensor         |                            |
|  | (9) Inter Cooler  | (14) Intake Air Temperature Sensor |                            |
|  |   | (15) Glow Plug                     |                            |
|  |   | (16) Coolant Temperature Sensor    |                            |
|  |   | (17) Crankshaft Position Sensor    |                            |

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## [5] AVAILABLE DATA MONITOR SIGNALS (LEVEL 2)

### (1) Monitor Items

| Classification   |                       | Signal Name  | Unit                    | Terminal Name | Terminal No. |
|------------------|-----------------------|--|-------------------------|---------------|--------------|
| Input            | Pulse / Rotary signal | Engine speed active flag                             | –                       | –             | –            |
|                  |                       | Cam speed active flag                                | –                       | –             | –            |
|                  |                       | Engine speed   | min <sup>-1</sup> (rpm) | NE            | A-43         |
|                  |                       | Machine speed *                                      | km/h                    | –             | –            |
|                  | Analog signal         | Accelerator pedal position                           | %                       | –             | –            |
|                  |                       | Accelerator pedal position sensor 1 output voltage * | V                       | –             | –            |
|                  |                       | Accelerator pedal position sensor 2 output voltage * | V                       | –             | –            |
|                  |                       | Boost pressure                                       | kPa                     | –             | –            |
|                  |                       | Boost pressure sensor output voltage                 | V                       | PIM           | A-61         |
|                  |                       | Fuel temperature                                     | °C                      | –             | –            |
|                  |                       | Fuel temperature sensor output voltage               | V                       | THF           | A-31         |
|                  |                       | Coolant temperature                                  | °C                      | –             | –            |
|                  |                       | Coolant temperature sensor output voltage            | V                       | THW           | A-39         |
|                  |                       | Intake air temperature                               | °C                      | –             | –            |
|                  |                       | Intake air temperature sensor output voltage         | V                       | THA           | B-28         |
|                  |                       | Atmospheric pressure                                 | kPa                     | –             | –            |
|                  |                       | Atmospheric pressure sensor output voltage           | V                       | PATM          | –            |
|                  |                       | Battery voltage                                      | V                       | +BP           | B-5, B-6     |
|                  | Digital signal        | Key switch   | –                       | IG-SW         | B-47, B-48   |
|                  |                       | Starter switch                                       | –                       | STA-SW        | B-54         |
| Neutral switch * |                       | –  | –                       | –             |              |

#### ■ NOTE

- The signals marked with \* are inputs from ECU for machine through CAN. Terminal names and terminal numbers have become invalid.

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| Classification |                                       | Signal Name  | Unit                | Terminal Name | Terminal No. |
|----------------|---------------------------------------|--|---------------------|---------------|--------------|
| Output         | Basic control signal                  | Final fuel injection quantity                          | mm <sup>3</sup> /st | -             | -            |
|                |                                       | Target rail pressure                                   | MPa                 | -             | -            |
|                |                                       | Actual rail pressure MPa                               | MPa                 | -             | -            |
|                |                                       | Rail pressure sensor output voltage                    | V                   | PFUEL 1/2     | A-40 / A-41  |
|                |                                       | Target suction control valve (SCV) current             | mA                  | -             | -            |
|                |                                       | Actual suction control valve (SCV) current             | mA                  | SCV+ / -      | B-20/B-7     |
|                |                                       | Pump learning condition                                | -                   | -             | -            |
|                |                                       | Pump difference learning correction value              | mA                  | -             | -            |
|                |                                       | Pressure feedback integral guard flag                  | -                   | -             | -            |
|                |                                       | Engine stop flag                                       | -                   | -             | -            |
|                |                                       | Low temperature start mode flag                        | -                   | -             | -            |
|                |                                       | Registration history (#1 cylinder)                     | -                   | -             | -            |
|                |                                       | Registration history (#2 cylinder)                     | -                   | -             | -            |
|                |                                       | Registration history (#3 cylinder)                     | -                   | -             | -            |
|                |                                       | Registration history (#4 cylinder)                     | -                   | -             | -            |
|                |                                       | Number of registrations (#1 cylinder)                  | -                   | -             | -            |
|                |                                       | Number of registrations (#2 cylinder)                  | -                   | -             | -            |
|                |                                       | Number of registrations (#3 cylinder)                  | -                   | -             | -            |
|                | Number of registrations (#4 cylinder) | -  | -                   | -             |              |
|                | Actuator                              | Exhaust gas recirculation (EGR) valve target position  | %                   | -             | -            |
|                |                                       | Exhaust gas recirculation (EGR) valve actual position  | %                   | -             | -            |
|                |                                       | Exhaust gas recirculation (EGR) position sensor output | -                   | -             | (CAN)        |
|                |                                       | Glow relay   | -                   | GLRY          | A-90         |

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| Classification | Signal Name | Unit  | Terminal Name           | Terminal No. |      |
|----------------|-------------|---|-------------------------|--------------|------|
| Output         | DPF data    | Differential pressure 1 output voltage                | V                       | DPS          | A-66 |
|                |             | Exhaust gas temperature 0 output voltage              | V                       | IDOC         | A-38 |
|                |             | Exhaust gas temperature 1 output voltage              | V                       | ODOC         | A-36 |
|                |             | Exhaust gas temperature 2 output voltage              | V                       | ODPF         | A-62 |
|                |             | Intake air temperature built-in MAF output voltage    | V                       | IATS         | A-34 |
|                |             | Intake throttle valve lift output voltage             | V                       | ITS          | B-29 |
|                |             | Differential pressure 1                               | kPa                     | –            | –    |
|                |             | Exhaust gas temperature 0                             | °C                      | –            | –    |
|                |             | Exhaust gas temperature 1                             | °C                      | –            | –    |
|                |             | Exhaust gas temperature 2                             | °C                      | –            | –    |
|                |             | Mass air flow for intake throttle                     | kg/h                    | –            | –    |
|                |             | Intake air temperature built-in MAF                   | °C                      | –            | –    |
|                |             | Target intake throttle valve opening                  | %                       | –            | –    |
|                |             | Intake throttle final duty control quantity           | %                       | –            | –    |
|                |             | Intake throttle valve lift                            | %                       | –            | –    |
|                |             | PM sedimentation quantity 1                           | mg                      | –            | –    |
|                |             | PM sedimentation quantity 2                           | mg                      | –            | –    |
|                |             | Final fuel injection quantity multiplication quantity | L                       | –            | –    |
|                |             | Target mass air flow                                  | kg/h                    | –            | –    |
|                |             | Pump learning end time                                | h                       | –            | –    |
|                |             | Hour meter  | h                       | –            | –    |
|                |             | DPF auto regeneration last active time                | sec                     | –            | –    |
|                |             | Regeneration running time                             | min                     | –            | –    |
|                |             | Source address of TSC1                                | –                       | –            | –    |
|                |             | Parking SW  | –                       | –            | –    |
|                |             | Neutral SW  | –                       | –            | –    |
|                |             | DPF auto regeneration inhibit SW                      | –                       | –            | –    |
|                |             | DPF manual regeneration force SW                      | –                       | –            | –    |
|                |             | Oil pressure SW                                       | –                       | –            | –    |
|                |             | Target speed of isochronous control                   | min <sup>-1</sup> (rpm) | –            | –    |
|                |             | DPF regeneration control level                        | –                       | –            | –    |
|                |             | DPF regeneration control status                       | –                       | –            | –    |

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**(2) Normal Value**

| Classification |                       | Signal Name  | Unit                    | Engine Stops  | During Start-Up                       | Idling                     | During Acceleration | During No-load Maximum Speed |  |
|----------------|-----------------------|--|-------------------------|---|---------------------------------------|----------------------------|---------------------|------------------------------|--|
| In-put         | Pulse / Rotary signal | Engine speed                                       | min <sup>-1</sup> (rpm) | 0   | 0 → 800 to 850 (Ordinary temperature) | 800 to 850 (After warm-up) | 825 → 2400          | 2350 to 2400 (After warm-up) |  |
|                |                       | Engine speed active flag                           | –                       | OFF   | ON                                    | ON                         | ON                  | ON                           |  |
|                |                       | Cam speed active flag                              | –                       | OFF   | ON                                    | ON                         | ON                  | ON                           |  |
|                |                       | Machine speed                                      | km/h                    | Sensor unused by CAN input  |                                       |                            |                     |                              |  |
|                | Analog signal         | Final accelerator pedal position opening           | %                       | 0   | 0                                     | 0                          | 0 → 100             | 100                          |  |
|                |                       | Accelerator pedal position sensor 1 output voltage | V                       | Sensor unused by CAN input  |                                       |                            |                     |                              |  |
|                |                       | Accelerator pedal position sensor 2 output voltage | V                       |   |                                       |                            |                     |                              |  |
|                |                       | Boost pressure                                     | kPa                     | Approx. 100   | Approx. 100                           | Approx. 100                | –                   | –                            |  |
|                |                       | Boost pressure sensor output voltage               | V                       | Approx. 1.0   | Approx. 1.0                           | Approx. 1.0                | –                   | –                            |  |
|                |                       | Fuel temperature                                   | °C                      | Representative value:<br>Approx. 20 °C (68 °F) → Approx. 2.4 V  |                                       |                            |                     |                              |  |
|                |                       | Fuel temperature sensor output voltage             | V                       |   |                                       |                            |                     |                              |  |
|                |                       | Coolant temperature                                | °C                      | Representative value:<br>Approx. 20 °C (68 °F) → Approx. 2.4 V  |                                       |                            |                     |                              |  |
|                |                       | Coolant temperature sensor voltage output          | V                       |   |                                       |                            |                     |                              |  |
|                |                       | Intake air temperature                             | °C                      | Representative value:<br>Approx. 20 °C (68 °F) → Approx. 2.4 V  |                                       |                            |                     |                              |  |
|                |                       | Intake air temperature sensor output voltage       | V                       |   |                                       |                            |                     |                              |  |
|                |                       | Atmospheric pressure                               | kPa                     | Representative value:<br>Approx. 100 kPa → 3.7 V (Depending on the atmospheric pressure)  |                                       |                            |                     |                              |  |
|                |                       | Atmospheric pressure sensor output voltage         | V                       |   |                                       |                            |                     |                              |  |
|                |                       | Battery voltage                                    | V                       | When stopped: Approx. 12.5 V<br>When operating: Approx. 14 V<br>(Depends on the battery charging condition, whether or not there is a load voltage, rotation speed) |                                       |                            |                     |                              |  |
|                | Digital signal        | Key Switch   | –                       | ON  | ON                                    | ON                         | ON                  | ON                           |  |
|                |                       | Start switch                                       | –                       | OFF   | ON                                    | OFF                        | OFF                 | OFF                          |  |
|                |                       | Neutral switch                                     | –                       | Sensor unused by CAN input  |                                       |                            |                     |                              |  |

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| Classification |                      | Signal Name                                | Unit                | Engine Stops   | During Start-Up   | Idling                        | During Acceleration                | During No-load Maximum Speed  |  |
|----------------|----------------------|--|---------------------|--|---|-------------------------------|------------------------------------|-------------------------------|--|
| Output         | Basic control signal | Final fuel injection quantity              | mm <sup>3</sup> /st | 0<br>(Indication value - 50)   | 0 → 120<br>(Ordinary temperature)                                 | Approx. 12<br>(After warm-up) | Approx. 12 → 75<br>(After warm-up) | Approx. 30<br>(After warm-up) |  |
|                |                      | Target rail pressure                       | MPa                 | Depends on the rotation speed, load (After warm-up)<br>When idling: Approx. 40 to 50 MPa<br>(410 to 500 kgf/cm <sup>2</sup> , 5800 to 7200 psi)<br>During no-load maximum speed: 95.0 to 115 MPa<br>(969 to 1170 kgf/cm <sup>2</sup> , 13800 to 116600 psi)<br>During acceleration : 95.0 to 130 MPa<br>(969 to 1320 kgf/cm <sup>2</sup> , 13800 to 18800 psi) |   |                               |                                    |                               |  |
|                |                      | Actual rail pressure Mpa                   | MPa                 | –  | Approx. the same as the target value (Follow to the target value) |                               |                                    |                               |  |
|                |                      | Rail pressure sensor output voltage        | V                   | Depends on the rotation speed, load (After warm-up)<br>When stopped: Approx. 1.0 V<br>When idling: 1.65 to 1.80 V<br>During no-load maximum speed: 2.50 to 2.85 V<br>During acceleration: 2.5 to 3.3 V   |   |                               |                                    |                               |  |
|                |                      | Target suction control valve (SCV) current | mA                  | –  | 1700 to 2000  | Approx. 1800                  | Approx. 1400                       | Approx. 1600                  |  |
|                |                      | Actual suction control valve (SCV) current | mA                  | Approx. the same as the target value<br>(Follow to the target value)   |   |                               |                                    |                               |  |
|                |                      | Pump learning condition                    | –                   | Normally 2 or 3 <sup>*1</sup><br>Indicates the following depending on the learning status: 255 (Default value), 1 (Provisional learning completion), 0 (Actual learning), 2 (Actual learning completion), 3 (Relearning)   |   |                               |                                    |                               |  |
|                |                      | Pump deviation learning correction value   | mA                  | ±200 mA (Guideline <sup>*2</sup> )   |   |                               |                                    |                               |  |
|                |                      | Pressure feedback integral guard flag      | –                   | Normally OFF   |   |                               |                                    |                               |  |
|                |                      | Engine stop flag                           | –                   | ON   | OFF   | OFF                           | OFF                                | OFF                           |  |
|                |                      | Low temperature start mode flag            | –                   | OFF  | ON  | OFF                           | OFF                                | OFF                           |  |

■ NOTE

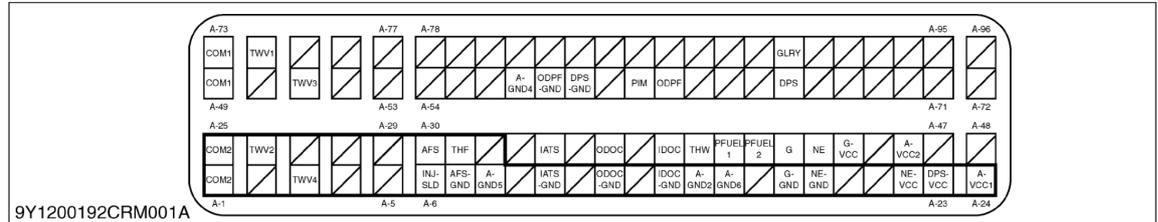
- **\*1: Very occasionally, it does not shift from 3 to 2. If there is an engine malfunction on the status above, perform the forced-relearning.**
- **\*2: As the following value of A varies depending on pump, the table above is for guideline. If the value of A has a wider gap than the initial learning value, there may be out of the range of the above table. A net normal value is the value that provided by the forced-learning several times: Compared with A 12 V spec:  $A - 100 \leq \text{normal value} \leq A + 50$   
The current shall be used as a reference (guideline) only as this value varies depending on the pump used.**

| Classification                            |          | Signal Name   | Unit          | Engine Stops   | During Start-Up | Idling   | During Acceleration | During No-load Maximum Speed |
|---|----------|---|---------------|--|-----------------|----------|---------------------|------------------------------|
| Out-put                                   | Actuator | Exhaust gas recirculation (EGR) valve target position     | %             | Depends on the rotation speed, load and temperature  |                 |          |                     |                              |
|   |          | Exhaust gas recirculation (EGR) valve actual position     | %             | Approx. the same as the target EGR position (Follow to the target value)   |                 |          |                     |                              |
|   |          | Exhaust gas recirculation (EGR) position sensor output    | –             | 16 to 106 (CAN communication data) (Valve lift : 0 to 10 mm)   |                 |          |                     |                              |
|   |          | Glow relay  | –             | Only during cold start-up (before-and-after): ON   |                 |          |                     |                              |
|   | DPF data | Differential pressure 1                                   | kPa           | Input range : –1.7 to 34.5 kPa<br>Output range : 0.5 to 4.5 V  |                 |          |                     |                              |
|   |          | Differential pressure 1 sensor output voltage             | V             |  |                 |          |                     |                              |
|   |          | Exhaust gas temperature 0                                 | °C            | Representative value:<br>Approx. 100 °C (212 °F) → Approx. 4.4 V<br>Representative value :<br>Approx. 250 °C (482 °F) → Approx. 2.3 V  |                 |          |                     |                              |
|   |          | Exhaust gas temperature 0 sensor output voltage           | V             |  |                 |          |                     |                              |
|   |          | Exhaust gas temperature 1                                 | °C            | Representative value :<br>Approx. 100 °C (212 °F) → Approx. 4.4 V<br>Representative value :<br>Approx. 250 °C (482 °F) → Approx. 2.3 V |                 |          |                     |                              |
|   |          | Exhaust gas temperature 1 sensor output voltage           | V             |  |                 |          |                     |                              |
|   |          | Exhaust gas temperature 2                                 | °C            | Representative value :<br>Approx. 100 °C (212 °F) → Approx. 4.4 V<br>Representative value :<br>Approx. 250 °C (482 °F) → Approx. 2.3 V |                 |          |                     |                              |
|   |          | Exhaust gas temperature 2 sensor output voltage           | V             |  |                 |          |                     |                              |
|   |          | Intake air temperature built-in MAF                       | °C            | Representative value :<br>Approx. 20 °C (68 °F) → Approx. 3.1 V<br>Representative value :<br>Approx. 80 °C (176 °F) → Approx. 0.9 V    |                 |          |                     |                              |
|   |          | Intake air temperature built-in MAF sensor output voltage | V             |  |                 |          |                     |                              |
|   |          | Mass air flow for intake throttle                         | kg/h          | 12.96 to 698.4 (1.239 to 4.598 V)  |                 |          |                     |                              |
|   |          | Intake throttle valve lift                                | %             | 100 (Full open)  | 100 (Full open) | 100 to 0 |                     |                              |
| Intake throttle valve lift output voltage | V        | Approx. 0.5 V   | Approx. 0.5 V | 0.5 to 4.375 V   |                 |          |                     |                              |

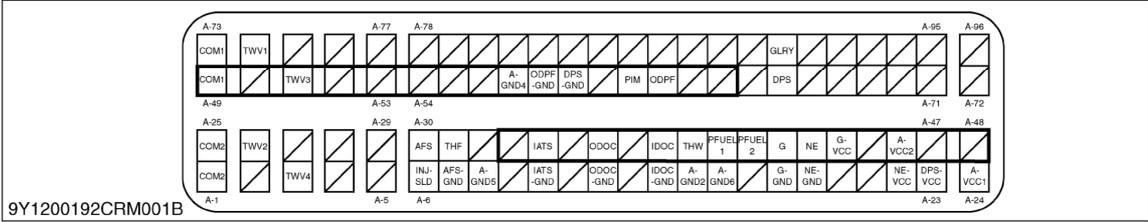
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## [6] ECU TERMINAL LAYOUT

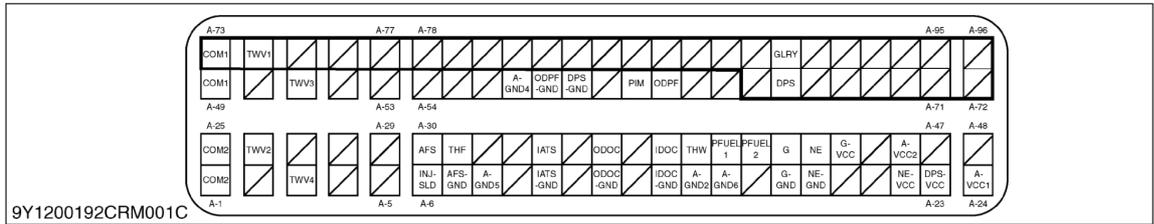
### (1) ECU Terminal Layout 1 (A: 96 Pins)



| No.  | Terminal Name | Signal Name  |
|------|---------------|--|
| A-1  | COM2          | INJ COMMON2  |
| A-2  | —             | —  |
| A-3  | TWV4          | INJ4 DRV TWV4  |
| A-4  | —             | —  |
| A-5  | —             | —  |
| A-6  | INJ-SLD       | SHILD-GND  |
| A-7  | AFS-GND       | AIR FLOW SENSOR GND                                  |
| A-8  | A-GND5        | FUEL TEMPERATURE SENSOR GND                          |
| A-9  | —             | —  |
| A-10 | IATS-GND      | INTAKE AIR TEMPERATURE SENSOR (AFS) GND              |
| A-11 | —             | —  |
| A-12 | ODOC-GND      | OUTLET DOC TEMP GND (EXHAUST GAS TEMPERATURE T1 GND) |
| A-13 | —             | —  |
| A-14 | IDOC-GND      | INLET DOC TEMP GND (EXHAUST GAS TEMPERATURE T0 GND)  |
| A-15 | A-GND2        | COOLANT TEMPERATURE SENSOR GND                       |
| A-16 | A-GND6        | RAIL PRESSURE SENSOR GND                             |
| A-17 | —             | —  |
| A-18 | G-GND         | CAMSHAFT POSITION SENSOR GND                         |
| A-19 | NE-GND        | CRANKSHAFT POSITION SENSOR GND                       |
| A-20 | —             | —  |
| A-21 | —             | —  |
| A-22 | NE-VCC        | CRANKSHAFT POSITION SENSOR VCC                       |
| A-23 | DPS-VCC       | DIFFERENTIAL PRESSURE SENSOR VCC                     |
| A-24 | A-VCC1        | RAIL PRESSURE SENSOR VCC                             |
| A-25 | COM2          | INJ COMMON2  |
| A-26 | TWV2          | INJ2 DRV TWV2  |
| A-27 | —             | —  |
| A-28 | —             | —  |
| A-29 | —             | —  |
| A-30 | AFS           | AIR FLOW SENSOR                                      |
| A-31 | THF           | FUEL TEMPERATURE SENSOR                              |
| A-32 | —             | —  |



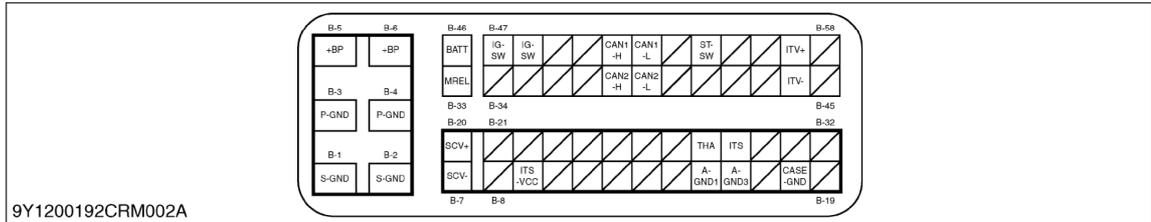
| No.  | Terminal Name | Signal Name  |
|------|---------------|--|
| A-33 | –             | –  |
| A-34 | IATS          | INTAKE AIR TEMPERATURE SENSOR (AFS)                    |
| A-35 | –             | –  |
| A-36 | ODOC          | OUTLET DOC TEMP (EXHAUST GAS TEMPERATURE T1)           |
| A-37 | –             | –  |
| A-38 | IDOC          | INLET DOC TEMP (EXHAUST GAS TEMPERATURE T0)            |
| A-39 | THW           | COOLANT TEMPERATURE SENSOR                             |
| A-40 | PFUEL1        | RAIL PRESSURE SENSOR 1                                 |
| A-41 | PFUEL2        | RAIL PRESSURE SENSOR 2                                 |
| A-42 | G             | CAMSHAFT POSITION SENSOR                               |
| A-43 | NE            | CRANKSHAFT POSITION SENSOR                             |
| A-44 | G-VCC         | CAMSHAFT POSITION SENSOR VCC                           |
| A-45 | –             | –  |
| A-46 | A-VCC2        | BOOST PRESSURE SENSOR VCC                              |
| A-47 | –             | –  |
| A-48 | –             | –  |
| A-49 | COM1          | INJ COMMON1  |
| A-50 | –             | –  |
| A-51 | TWV3          | INJ3 DRV TWV3  |
| A-52 | –             | –  |
| A-53 | –             | –  |
| A-54 | –             | –  |
| A-55 | –             | –  |
| A-56 | –             | –  |
| A-57 | A-GND4        | BOOST PRESSURE SENSOR GND                              |
| A-58 | ODPF-GND      | OUTLET DPF TEMP GND (EXHAUST GAS TEMPERATURE (T2) GND) |
| A-59 | DPS-GND       | DIFFERENTIAL PRESSURE SENSOR GND                       |
| A-60 | –             | –  |
| A-61 | PIM           | BOOST PRESSURE SENSOR                                  |
| A-62 | ODPF          | OUTLET DPF TEMP (EXHAUST GAS TEMPERATURE (T2))         |
| A-63 | –             | –  |
| A-64 | –             | –  |



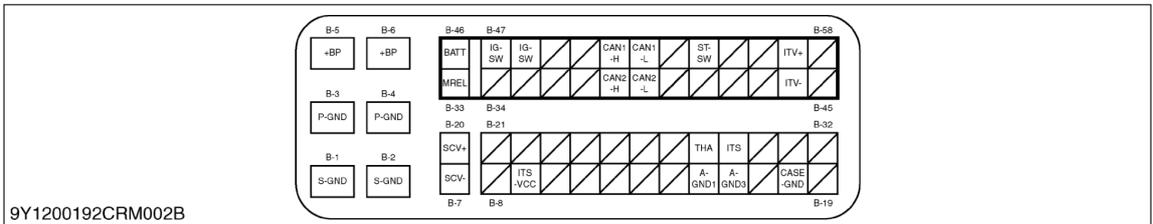
| No.  | Terminal Name | Signal Name                  |
|------|---------------|------------------------------|
| A-65 | —             | —                            |
| A-66 | DPS           | DIFFERENTIAL PRESSURE SENSOR |
| A-67 | —             | —                            |
| A-68 | —             | —                            |
| A-69 | —             | —                            |
| A-70 | —             | —                            |
| A-71 | —             | —                            |
| A-72 | —             | —                            |
| A-73 | COM1          | INJ COMMON1                  |
| A-74 | TWV1          | INJ1 DRV TWV1                |
| A-75 | —             | —                            |
| A-76 | —             | —                            |
| A-77 | —             | —                            |
| A-78 | —             | —                            |
| A-79 | —             | —                            |
| A-80 | —             | —                            |
| A-81 | —             | —                            |
| A-82 | —             | —                            |
| A-83 | —             | —                            |
| A-84 | —             | —                            |
| A-85 | —             | —                            |
| A-86 | —             | —                            |
| A-87 | —             | —                            |
| A-88 | —             | —                            |
| A-89 | —             | —                            |
| A-90 | GLRY          | GLOW RELAY                   |
| A-91 | —             | —                            |
| A-92 | —             | —                            |
| A-93 | —             | —                            |
| A-94 | —             | —                            |
| A-95 | —             | —                            |
| A-96 | —             | —                            |

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**(2) ECU Terminal Layout 2 (B: 58 Pins)**

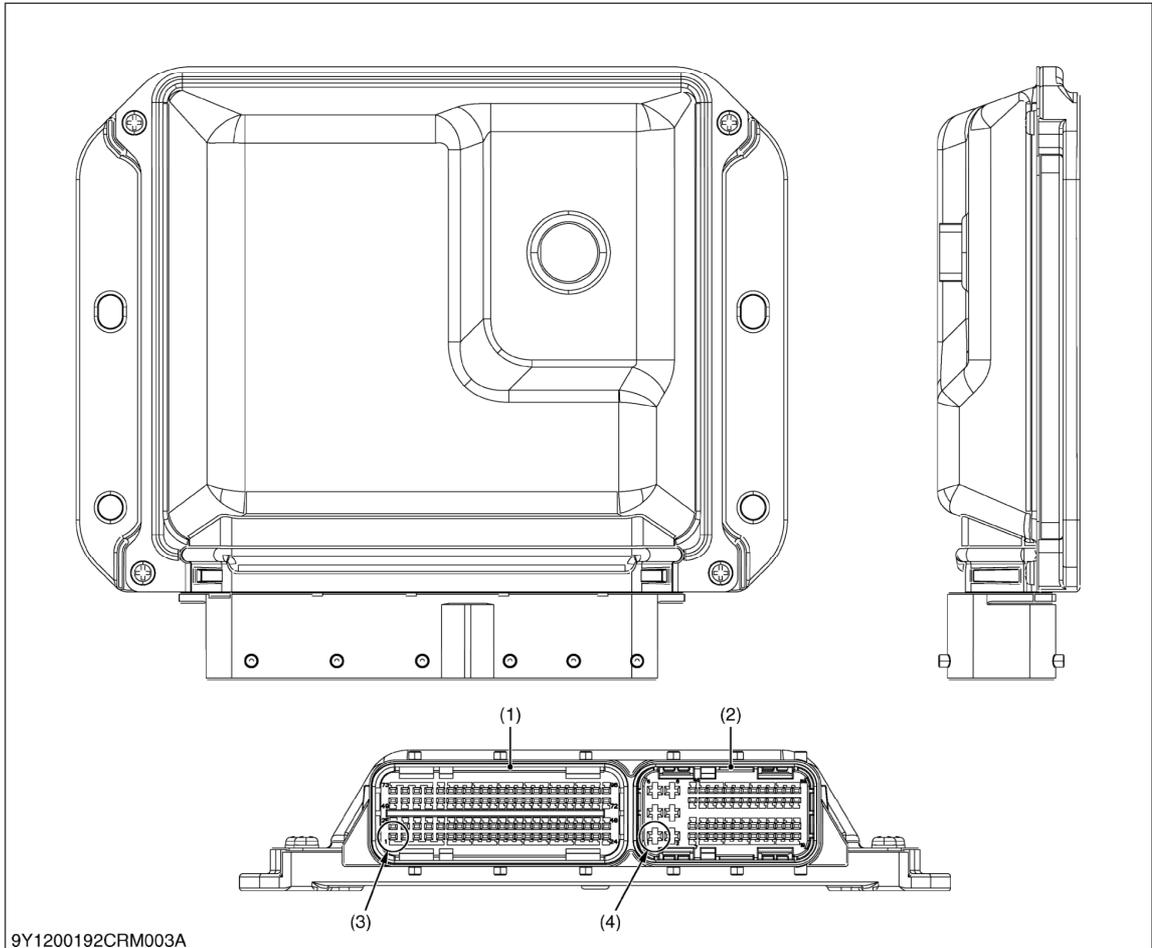


| No.  | Terminal Name | Signal Name                         |
|------|---------------|-------------------------------------|
| B-1  | S-GND         | SIGNAL GND                          |
| B-2  | S-GND         | SIGNAL GND                          |
| B-3  | P-GND         | POWER GND                           |
| B-4  | P-GND         | POWER GND                           |
| B-5  | +BP           | +BP                                 |
| B-6  | +BP           | +BP                                 |
| B-7  | SCV-          | SUCTION CONTROL VALVE (-)           |
| B-8  | -             | -                                   |
| B-9  | ITS-VCC       | INTAKE THROTTLE POSITION SENSOR VCC |
| B-10 | -             | -                                   |
| B-11 | -             | -                                   |
| B-12 | -             | -                                   |
| B-13 | -             | -                                   |
| B-14 | -             | -                                   |
| B-15 | A-GND1        | INTAKE AIR TEMPERATURE SENSOR GND   |
| B-16 | A-GND3        | INTAKE THROTTLE POSITION SENSOR GND |
| B-17 | -             | -                                   |
| B-18 | CASE-GND      | CASE GND                            |
| B-19 | -             | -                                   |
| B-20 | SCV+          | SUCTION CONTROL VALVE (+)           |
| B-21 | -             | -                                   |
| B-22 | -             | -                                   |
| B-23 | -             | -                                   |
| B-24 | -             | -                                   |
| B-25 | -             | -                                   |
| B-26 | -             | -                                   |
| B-27 | -             | -                                   |
| B-28 | THA           | INTAKE AIR TEMPERATURE SENSOR       |
| B-29 | ITS           | INTAKE THROTTLE POSITION SENSOR     |
| B-30 | -             | -                                   |
| B-31 | -             | -                                   |
| B-32 | -             | -                                   |



| No.  | Terminal Name | Signal Name                     |
|------|---------------|---------------------------------|
| B-33 | MREL          | MAIN RELAY                      |
| B-34 | —             | —                               |
| B-35 | —             | —                               |
| B-36 | —             | —                               |
| B-37 | —             | —                               |
| B-38 | CAN2-H        | CAN2-H (FOR MACHINE)            |
| B-39 | CAN2-L        | CAN2-L (FOR MACHINE)            |
| B-40 | —             | —                               |
| B-41 | —             | —                               |
| B-42 | —             | —                               |
| B-43 | —             | —                               |
| B-44 | ITV-          | INTAKE THROTTLE VALVE MOTOR (-) |
| B-45 | —             | —                               |
| B-46 | BATT          | BATTERY VOLTAGE                 |
| B-47 | IG-SW         | IGNITION SWITCH                 |
| B-48 | IG-SW         | IGNITION SWITCH                 |
| B-49 | —             | —                               |
| B-50 | —             | —                               |
| B-51 | CAN1-H        | CAN1-H (FOR SERVICE)            |
| B-52 | CAN1-L        | CAN1-L (FOR SERVICE)            |
| B-53 | —             | —                               |
| B-54 | ST-SW         | STARTER SWITCH                  |
| B-55 | —             | —                               |
| B-56 | —             | —                               |
| B-57 | ITV+          | INTAKE THROTTLE VALVE MOTOR (+) |
| B-58 | —             | —                               |

9Y1200192CRM0024US0



9Y1200192CRM003A

(1) ECU Connector 1 (96 Pin)

(2) ECU Connector 2 (58 Pin)

(3) A-1 Pin Position

(4) B-1 Pin Position

9Y1200192CRM0025US0

# SERVICING

## CONTENTS

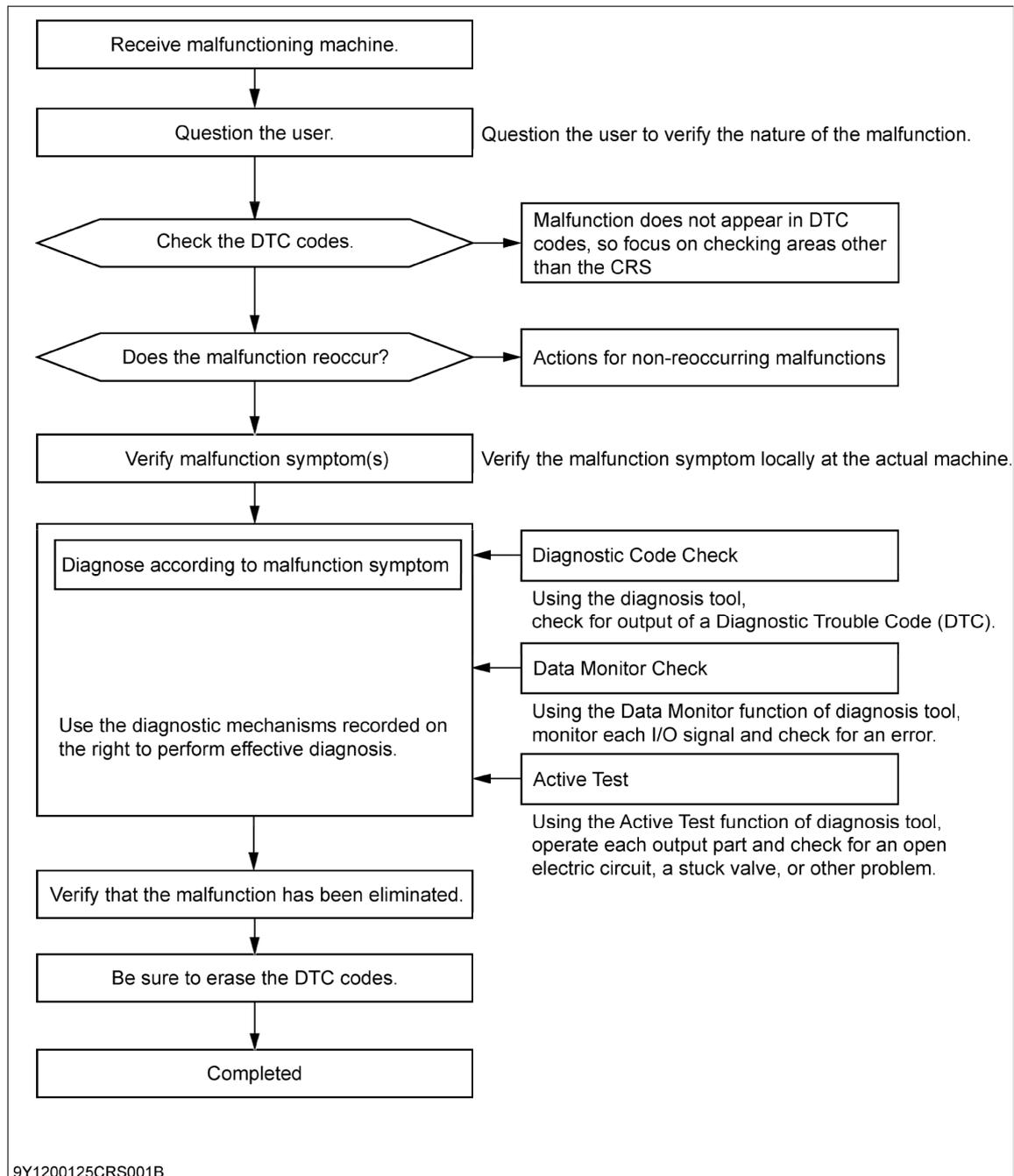
|   |        |
|---|--------|
| 1. GENERAL.....   | 1-S1   |
| [1] OVERALL DIAGNOSTIC PROCEDURE.....   | 1-S1   |
| [2] QUESTIONING .....   | 1-S2   |
| [3] LIST OF MALFUNCTION SYMPTOM.....  | 1-S5   |
| [4] ACTIONS FOR NON-REOCCURRING MALFUNCTIONS .....  | 1-S6   |
| 2. DIAGNOSTIC TOOL CONNECTION PROCEDURE .....   | 1-S8   |
| [1] DIAGNOSTIC CONNECTOR POSITIONS .....  | 1-S8   |
| [2] DIAGNOSTIC TOOL CONNECTION PROCEDURE .....  | 1-S8   |
| [3] CHECKING THE COMMUNICATION OPERATION OF THE INTERFACE (DST-i).....                                      | 1-S9   |
| [4] CHECKING THE OPERATION OF THE ECU .....   | 1-S10  |
| (1) Starting Diagmaster.....  | 1-S10  |
| (2) DST-i Communication Settings .....  | 1-S11  |
| 3. ACTIVE TEST AND SUPPLY PUMP DIFFERENCE LEARNING .....  | 1-S16  |
| 4. DIAGNOSIS BY MALFUNCTION SYMPTOM.....  | 1-S18  |
| [1] LIST OF MALFUNCTION CAUSES BY SYMPTOM .....   | 1-S18  |
| [2] DIAGNOSIS BY MALFUNCTION SYMPTOM.....   | 1-S22  |
| (1) Engine Warning Light Comes On .....   | 1-S22  |
| (2) Engine Does Not Start.....  | 1-S22  |
| (3) Takes A Long Time Before Engine Starts .....  | 1-S26  |
| (4) Idle Failure.....   | 1-S30  |
| (5) Engine Noise .....  | 1-S34  |
| (6) High fuel consumption.....  | 1-S36  |
| (7) Poor Acceleration (Insufficient Output).....  | 1-S41  |
| (8) Abnormal Black Smoke Emitted .....  | 1-S46  |
| (9) Abnormal White Smoke Emitted.....   | 1-S51  |
| (10)Engine Stalls On Deceleration .....   | 1-S56  |
| 5. DIAGNOSTIC PROCEDURE BY DTC .....  | 1-S60  |
| [1] DTC LIST.....   | 1-S60  |
| [2] DIAGNOSTIC PROCEDURE BY DTC .....   | 1-S115 |
| (1) NE - G Phase Shift (DTC P0016 / 636-7).....   | 1-S118 |
| (2) Intake Air Temperature Built-in MAF Sensor: Abnormality (DTC P0072 / 171-4,<br>DTC P0073 / 171-3) ..... | 1-S119 |
| (3) Pressure Limiter Emergency Open (DTC P0087 / 633-7).....  | 1-S122 |
| (4) High Rail Pressure (DTC P0088 / 157-0) .....  | 1-S127 |
| (5) SCV Stuck (DTC P0089 / 1347-7).....   | 1-S132 |
| (6) Fuel Leak (in High Pressured Fuel System) (DTC P0093 / 1239-1) .....                                    | 1-S137 |
| (7) Intake Air Volume: Low (DTC P0101 / 132-1) .....  | 1-S142 |
| (8) MAF Sensor Abnormality (DTC P0102 / 132-4, P0103 / 132-3).....  | 1-S143 |
| (9) Intake Air Temperature Error (DTC P0112 / 172-4, P0113 / 172-3).....                                    | 1-S145 |
| (10)Coolant Temperature Sensor Abnormality (DTC P0117 / 110-4, P0118 / 110-3).....                          | 1-S148 |
| (11)Fuel Temperature Sensor Abnormality (DTC P0182 / 174-4, P0183 / 174-3) .....                            | 1-S151 |
| (12)Rail Pressure Sensor Abnormality (DTC P0192 / 157-4, P0193 / 157-3) .....                               | 1-S154 |
| (13)Injector Charge Voltage: High (DTC P0200 / 523535-0).....   | 1-S158 |
| (14)Open Circuit of Harness/Coil (DTC P0201 / 651-3, P0202 / 653-3, P0203 / 654-3,<br>P0204 / 652-3).....   | 1-S160 |
| (15)Engine Overheat (DTC P0217 / 110-0).....  | 1-S163 |
| (16)Engine Overrun (DTC P0219 / 190-0).....   | 1-S165 |
| (17)Boost Pressure Sensor Abnormality (DTC P0237 / 102-4, P0238 / 102-3) .....                              | 1-S166 |

|   |        |
|---|--------|
| (18)Crankshaft Position Sensor (NE Sensor) Abnormality (DTC P0335 / 636-8, P0336 / 636-2) .....   | 1-S170 |
| (19)Camshaft Position Sensor (G Sensor) Abnormality (DTC P0340 / 723-8, P0341 / 723-2) .....      | 1-S175 |
| (20)Glow Relay Driving Circuit Abnormality (DTC P0380 / 523544-3 / 523544-4) .....                | 1-S179 |
| (21)EGR Actuator Abnormality (DTC P0403 / 523574-3, DTC P0404 / 523574-4, P0409 / 523572-4) ..... | 1-S182 |
| (22)Oil Pressure Error (P0524 / 100-1).....   | 1-S185 |
| (23)Exhaust Gas Temperature Sensor 1 (T1) Abnormality (DTC P0543 / 3242-4, P0544 / 3242-3).....   | 1-S187 |
| (24)Exhaust Gas Temperature Sensor 0 (T0) Abnormality (DTC P0546 / 4765-4, P0547 / 4765-3).....   | 1-S190 |
| (25)Battery Voltage Abnormality (DTC P0562 / 168-4, P0563 / 168-3).....                           | 1-S193 |
| (26)QR Data Abnormality (DTC P0602/523538-2, P0602/523538-7) .....                                | 1-S196 |
| (27)ECU Flash-ROM and CPU Abnormality (DTC P0605 / 628-2, P0606 / 1077-2, P0606/ 523527-2).....   | 1-S197 |
| (28)Injector Charge Voltage Abnormality (DTC P0611 / 523525-1) .....                              | 1-S199 |
| (29)SCV Drive System Abnormality (DTC P0628 / 1347-4, P0629 / 1347-3).....                        | 1-S201 |
| (30)Sensor Supply Voltage 1 Abnormality (DTC P0642 / 3509-4, P0643 / 3509-3).....                 | 1-S205 |
| (31)Sensor Supply Voltage 2 Abnormality (DTC P0652 / 3510-4, P0653 / 3510-3).....                 | 1-S207 |
| (32)Main Relay is Locked in Closed Position (DTC P0687 / 1485-2) .....                            | 1-S209 |
| (33)Pump Seizing (DTC P1274 / 523539-2, P1275 / 523540-2) .....                                   | 1-S212 |
| (34)Intake Throttle Feedback Error (DTC P2108 / 523580-2).....                                    | 1-S217 |
| (35)Accelerator Position Sensor Error (CAN) (DTC P2131 / 523543-2).....                           | 1-S219 |
| (36)Common 1 System Injector Drive Circuit Open (DTC P2146 / 523523-2) .....                      | 1-S221 |
| (37)Common 1 TWV Actuation System Short (DTC P2147 / 523523-4, P2148 / 523523-3) .....            | 1-S224 |
| (38)Common 2 System Injector Drive Circuit Open (DTC P2149 / 523524-2) .....                      | 1-S228 |
| (39)Common 2 TWV Actuation System Short (DTC P2150 / 523524-4, P2151 / 523524-3) .....            | 1-S231 |
| (40)Barometric Pressure Sensor Error (DTC P2228 / 108-4, P2229 / 108-3) .....                     | 1-S235 |
| (41)EGR (DC Motor) Abnormality (DTC P2413 / 523575-7, P2414 / 523576-2, P2415 / 523577-2) .....   | 1-S237 |
| (42)Exhaust Gas Temperature Sensor 2 (T2) Abnormality (DTC P242C / 3246-4, P242D / 3246-3) .....  | 1-S240 |
| (43)Differential Pressure Sensor 1 Abnormality (DTC P2454 / 3251-4, P2455 / 3251-3) ...           | 1-S243 |
| (44)Intake Throttle Lift Sensor Abnormality (DTC P2621 / 523583-4, P2622 / 523582-3) .....        | 1-S247 |
| (45)Emission Deterioration (DTC P3001 / 3252-0).....  | 1-S249 |
| (46)Exhaust Gas Temperature Sensor 0: Emergency High (DTC P3002 / 4765-0).....                    | 1-S251 |
| (47)Exhaust Gas Temperature Sensor 1: Emergency High (DTC P3003 / 3242-0).....                    | 1-S253 |
| (48)Exhaust Gas Temperature Sensor 2: Emergency High (DTC P3004 / 3246-0).....                    | 1-S255 |
| (49)Excessive PM3 (DTC P3006 / 3701-15) .....   | 1-S257 |
| (50)Excessive PM4 (DTC P3007 / 3701-16) .....   | 1-S258 |
| (51)Excessive PM5 (DTC P3008 / 3701-0) .....  | 1-S259 |
| (52)Boost Pressure Low (DTC P3011 / 132-15).....  | 1-S260 |
| (53)Low Coolant Temperature in Parked Regeneration (DTC P3012 / 523589-17).....                   | 1-S262 |
| (54)Parked Regeneration Time Out (DTC P3013 / 523590-16) .....                                    | 1-S263 |
| (55)All Exhaust Gas Temperature Sensor Failure (DTC P3018 / 523599-0) .....                       | 1-S265 |
| (56)High Frequency of Regeneration (DTC P3024 / 523602-0) .....                                   | 1-S266 |
| (57)CAN2 Bus Off (DTC U0075 / 523547-2) .....   | 1-S267 |
| (58)No Communication with EGR (DTC U0076 / 523578-2) .....  | 1-S269 |
| (59)CAN1 Bus Off (DTC U0077 / 523604-2) .....   | 1-S271 |
| (60)CAN2 Frame Error (DTC U0081 / 523548-2, U0082 / 523591-2, U0083 / 523592-2) ...               | 1-S272 |
| 6. INSPECTION PROCEDURE FOR EACH SYSTEM.....  | 1-S274 |
| [1] AIR INTAKE SYSTEM INSPECTION PROCEDURE .....  | 1-S274 |
| [2] FUEL SYSTEM INSPECTION PROCEDURE.....   | 1-S275 |
| [3] ELECTRIC SYSTEM INSPECTION PROCEDURE .....  | 1-S281 |
| (1) Basics Of Checking Electrical / Electronic Circuit Systems.....                               | 1-S281 |

|   |        |
|---|--------|
| (2) Connector Connection Fault Verification Method .....                | 1-S284 |
| (3) Checking The Power And Ground System (Main Relay, ECU Circuit)..... | 1-S285 |

# 1. GENERAL

## [1] OVERALL DIAGNOSTIC PROCEDURE



## [2] QUESTIONING

- Use the trouble check sheet to ensure that the customer's explanation is fully understood.
- Accurately judge information concerning the malfunction.

Grasp the situation firmly, using five 5W1H (Who, What, When, Where, Why, How) as a basis.

Ex: Low ambient temperature, starting, normal conditions, proximity to engine, metallic noise, etc.

### (Reference)

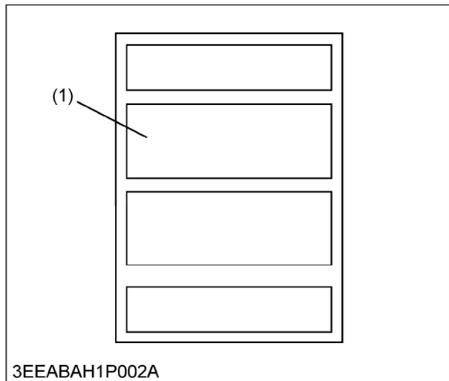
Do not ask random questions. Ask questions that will aid in narrowing down the possible malfunctioning system while making educated guesses based on the malfunction symptoms.

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### Questioning Points

|   |  |
|---|--|
| What?   | Malfunction symptom.                               |
| When?   | Date, time, frequency of occurrence.               |
| Where?  | Field conditions.                                  |
| What were conditions like at the time of malfunction? | Driving conditions, operating conditions, weather. |
| What happened?  | Type of malfunction.                               |

9Y1200192CRS0003US0



### Trouble Check Sheet for KUBOTA Common Rail System

When the machine is received from the customer, it is necessary to verify the "malfunction symptoms" and the "generated malfunction data" with the customer. This is performed based on the trouble check sheet.

(1) Trouble Check Sheet

### Because:

- The malfunction symptom may not be reproduced at the workshop.
- The customer's complaint does not always match the malfunction.
- If the person performing repairs is not working from the correct malfunction symptoms, man-hours will be wasted.

The question chart can aid the service person in diagnosing, repairing and verifying repair work.

9Y1200192CRS0004US0

| Trouble Check Sheet for KUBOTA Common Rail System |  |                                     |  |                                      |
|---|--|-------------------------------------|--|--------------------------------------|
| Tractor details                                   |  |                                     |  |                                      |
| Customer name                                     |  |                                     |  |                                      |
| Customer address                                  |  |                                     |  |                                      |
| Tractor model                                     |  | Tractor serial number               |  |                                      |
| Engine serial number                              |  | Purchase date                       |  |                                      |
| Repair date                                       |  | Hourmeter indicator                 | hours  |                                      |
| Warranty  |  |                                     |  |                                      |
| Warranty Judgment                                 | <input type="checkbox"/> Yes   |                                     | <input type="checkbox"/> No                        |                                      |
| Defective parts                                   | <input type="checkbox"/> Injector  |                                     | <input type="checkbox"/> Supply Pump               |                                      |
|   | <input type="checkbox"/> Common rail   |                                     | <input type="checkbox"/> Fuel Filter               |                                      |
|   | <input type="checkbox"/> Others ( )  |                                     |  |                                      |
| Replace parts details                             |  |                                     |  |                                      |
| Supply Pump                                       | Quantity   | Units                               | Part number  |                                      |
|   | Serial number  |                                     |  |                                      |
| Injector  | Quantity   | Units                               | Part number  |                                      |
|   | Serial number  | Cylinder 1 ( )                      |  | Cylinder 2 ( )                       |
|   |  | Cylinder 3 ( )                      |  | Cylinder 4 ( )                       |
|   | Defective injector   | <input type="checkbox"/> Injector 1 |  | <input type="checkbox"/> Injector 2  |
| <input type="checkbox"/> Injector 3               |  | <input type="checkbox"/> Injector 4 |  |                                      |
| Actual part replacement                           | <input type="checkbox"/> Injector  |                                     | <input type="checkbox"/> Supply Pump               |                                      |
|   | <input type="checkbox"/> Common rail   |                                     | <input type="checkbox"/> Fuel Filter               |                                      |
|   | <input type="checkbox"/> ECU   |                                     | <input type="checkbox"/> Others ( )                |                                      |
| Customer complaint                                |  |                                     |  |                                      |
| <input type="checkbox"/> 1. Engine no start       | <input type="checkbox"/> a. No initial combustion                                |                                     | <input type="checkbox"/> b. No complete combustion |                                      |
|   | <input type="checkbox"/> c. No cranking  |                                     |  |                                      |
| <input type="checkbox"/> 2. Difficult to start    | <input type="checkbox"/> a. Engine crank slowly                                  |                                     |  |                                      |
|   | <input type="checkbox"/> b. Others ( )   |                                     |  |                                      |
| <input type="checkbox"/> 3. Poor idling           | <input type="checkbox"/> a. Incorrect first idle                                 |                                     | <input type="checkbox"/> b. Noise                  |                                      |
|   | <input type="checkbox"/> c. Hunting idle from ( ) to ( ) min <sup>-1</sup> (rpm) |                                     |  |                                      |
|   | <input type="checkbox"/> d. High idling ( ) min <sup>-1</sup> (rpm)              |                                     |  |                                      |
|   | <input type="checkbox"/> e. Low idling ( ) min <sup>-1</sup> (rpm)               |                                     |  |                                      |
|   | <input type="checkbox"/> f. Rough  |                                     |  |                                      |
|   | <input type="checkbox"/> g. Others ( )   |                                     |  |                                      |
| <input type="checkbox"/> 4. Poor driveability     | <input type="checkbox"/> a. Hesitation   |                                     | <input type="checkbox"/> b. Surging                |                                      |
|   | <input type="checkbox"/> c. Knocking   |                                     | <input type="checkbox"/> d. Lack of power          |                                      |
|   | <input type="checkbox"/> e. Others ( )   |                                     |  |                                      |
| <input type="checkbox"/> 5. Abnormal smoke        | <input type="checkbox"/> a. Black  |                                     | <input type="checkbox"/> b. White                  |                                      |
|   | <input type="checkbox"/> c. Others ( )   |                                     |  |                                      |
| <input type="checkbox"/> 6. Fuel leakage          | <input type="checkbox"/> a. Large quantity                                       |                                     | <input type="checkbox"/> b. Blurred                |                                      |
|   | Leaking from:  | <input type="checkbox"/> Injector   |  | <input type="checkbox"/> Supply Pump |
|   |  | <input type="checkbox"/> Others ( ) |  |                                      |
| <input type="checkbox"/> 7. Engine not stop       |  |                                     |  |                                      |
| <input type="checkbox"/> 8. Engine stall          |  |                                     |  |                                      |
| <input type="checkbox"/> 9. Others                |  |                                     |  |                                      |

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