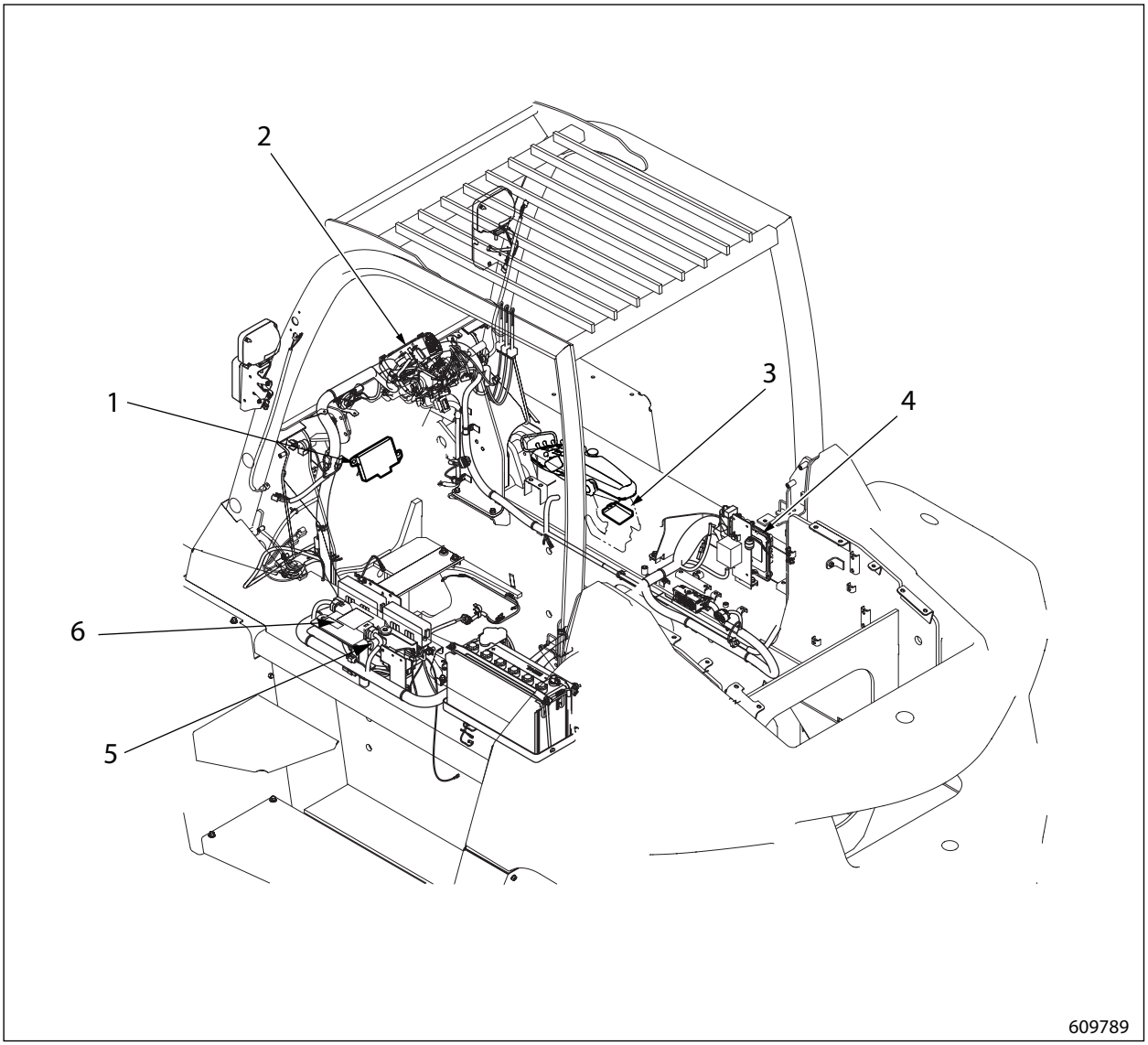
Chapter 4 CONTROLLER

1. Outline

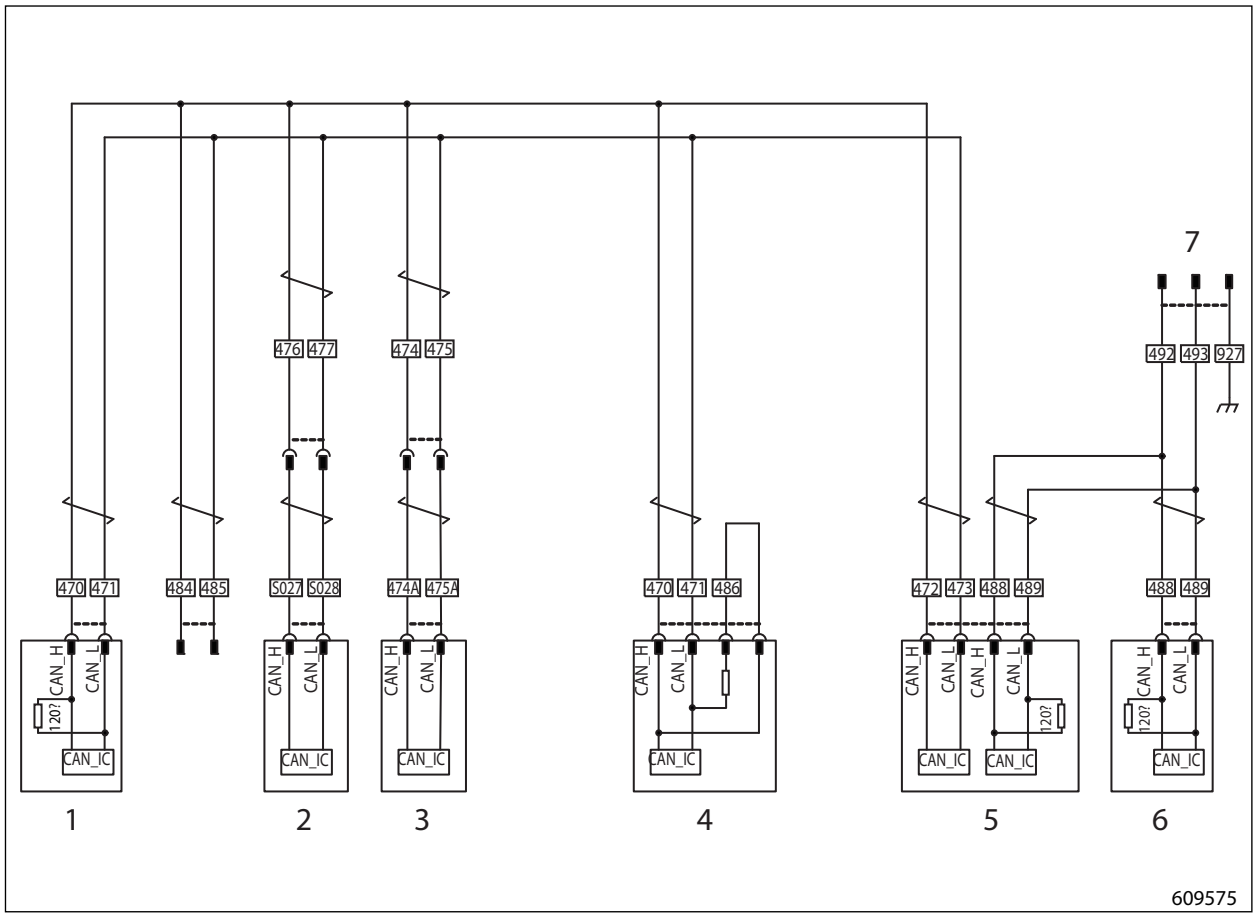
The controllers control the forklift truck and engine.
Each controller is located as shown below.



1. Output unit
2. Meter Panel
3. Input unit
4. ECM
5. Gateway
6. VCM-6 (Vehicle Control Module)

2. Main Functions of Controllers

Each controller connects into a CAN network, and information is exchanged between controllers through the CAN network. VCM-6 (vehicle control module) controller controls the whole forklift truck system, and the other controllers control relevant components.



1. VCM-6
2. Input unit
3. Output unit
4. Meter panel
5. Gateway
6. ECM
7. Connector

Primary function of each control is described below:

2.1 Meter Panel

The meter panel is located below the steering wheel. It displays fuel gauge, water temperature gauge, travel speed, clock time, and self-diagnostic information.
For the other functions, see "3. ELECTRICAL SYSTEM".

2.2 VCM-6 (Vehicle Control Module)

The VCM-6 controller is located on the left side of the forklift truck and controls the whole forklift truck system (driving/ mast interlock system, steering knob deviation correction, etc.)

2.3 ECM (Engine Control Module)

The ECM controller is located on the left side of the forklift truck and controls the engine. For more information, see Engine Service Manual.

2.4 Input and Output Units

The input/output units are mounted on the forklift truck, and read signals from FC lever and control the FC control valve.

2.5 Gateway

Located on the left side of forklift truck, the gateway transforms signals of the ECM and VCM-6.

2.6 GSE Connector

When using service tool, the GSE connector is used to connect PC and the forklift truck. The GSE connector is located under the cup holder on the right side of dashboard.

(1) Pull up the upper side rim of the cup holder.

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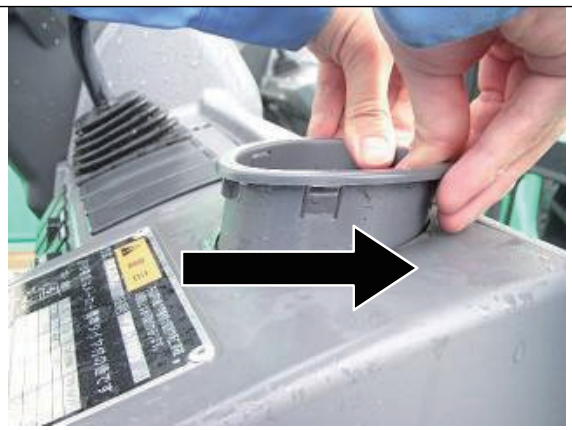
(2) With the rim of the cup holder raised, push the cup holder in the direction of the mast.



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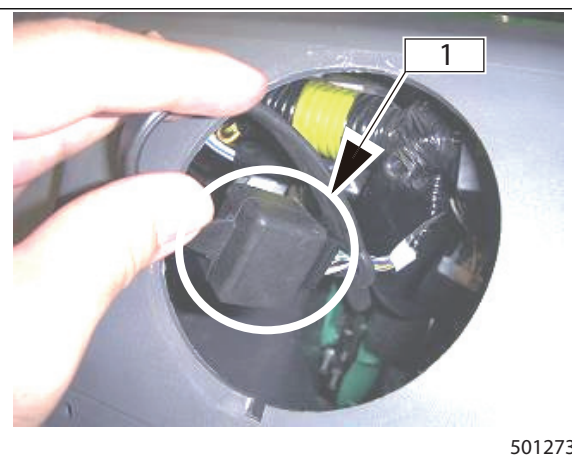
(3) Remove the cup holder and remove the GSE connector from inside.



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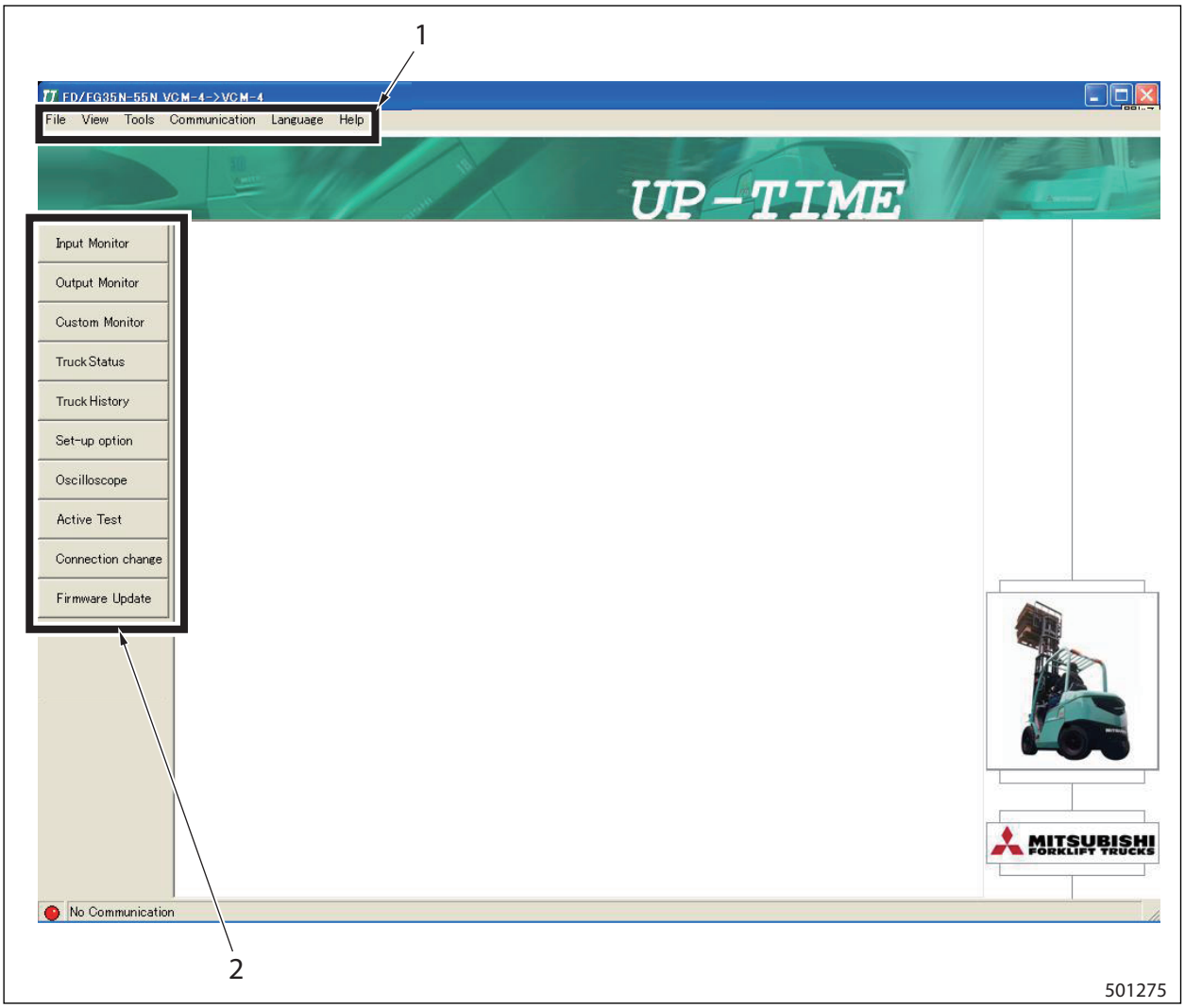
1. GSE connector

3. Service Tool

3.1 Service Tool Menus

Select functions from the main menu window.



1. Menu items
2. Tool bar

File menu

- Print: allows you to print the screen being displayed.
- Exit: allows you to terminate the application.

Monitor menu

- Input monitor: allows you to monitor input values.
- Output monitor: allows you to monitor output values.
- Custom monitor: allows you to monitor customized input/output values.
- Truck status: allows you to monitor the current truck conditions.
- Truck history: allows you to check the past history.

Monitor menu

- Set-up option: allows you to monitor or change setup values.
- Oscilloscope: allows you to view a graph of input/ output values. Also allows you to store the graph being displayed. Thus, a graph stored in memory can be redisplayed.
- Active test: operating conditions can be checked by outputting signals.
- Destination change: allows you to change the controller to connect and the controller to control.
- Firmware update: allows you to update the firmware of controller being connected.

Communication menu

- Setup: allows you to setup communication port, communication speed, and flow control.

Language menu

- allows you to select a language in the language menu.

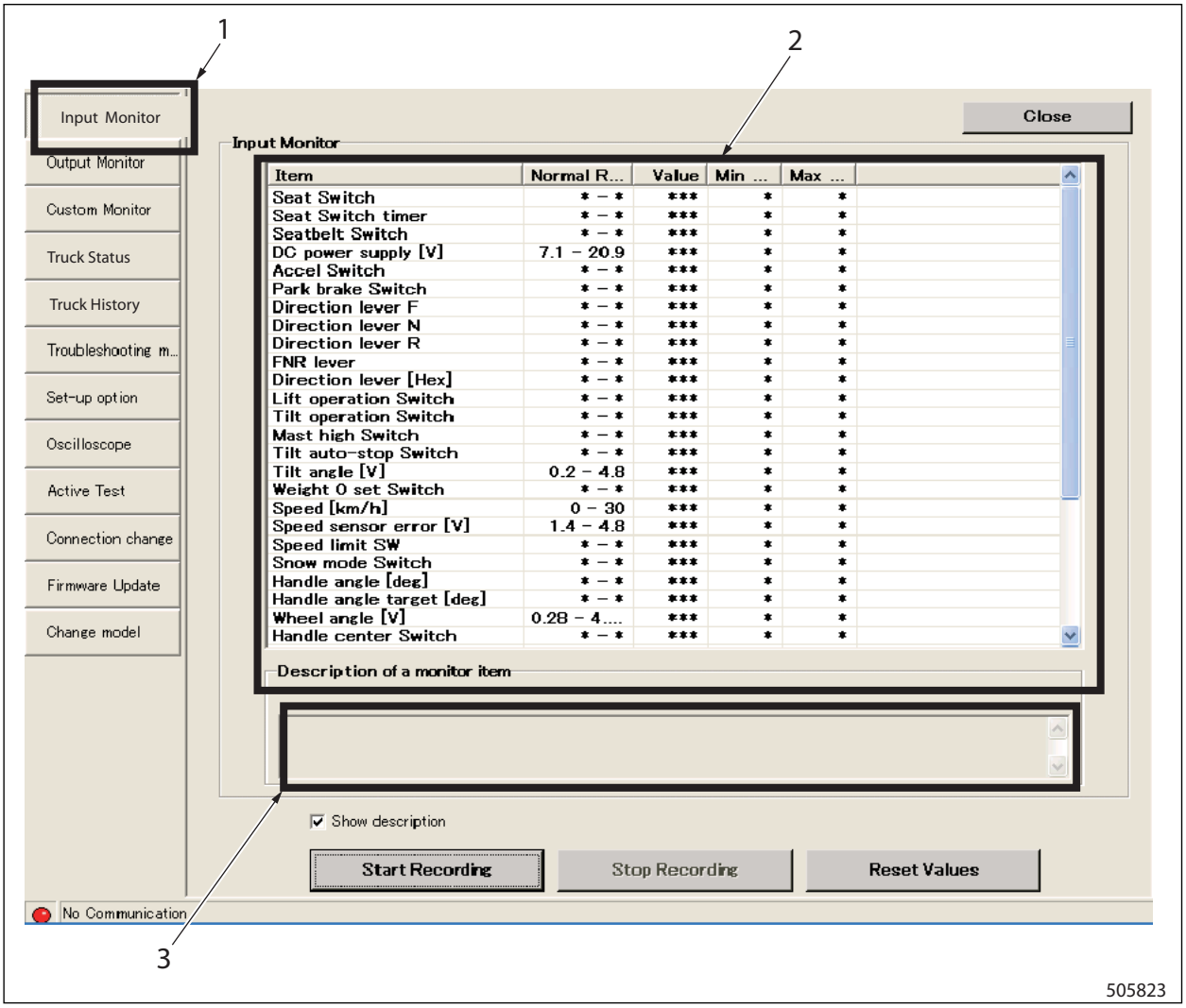
Help menu

- Contents: allows you to view contents of help menu.
- Topics: allows you to search help topics.
- Pop up display: allows you to have a pop-up display of item name/button name.
- Version information: allows you to check version information.

3.2 Outline of Toolbox

Input monitor

The monitor is used to check input status of sensors and switches.

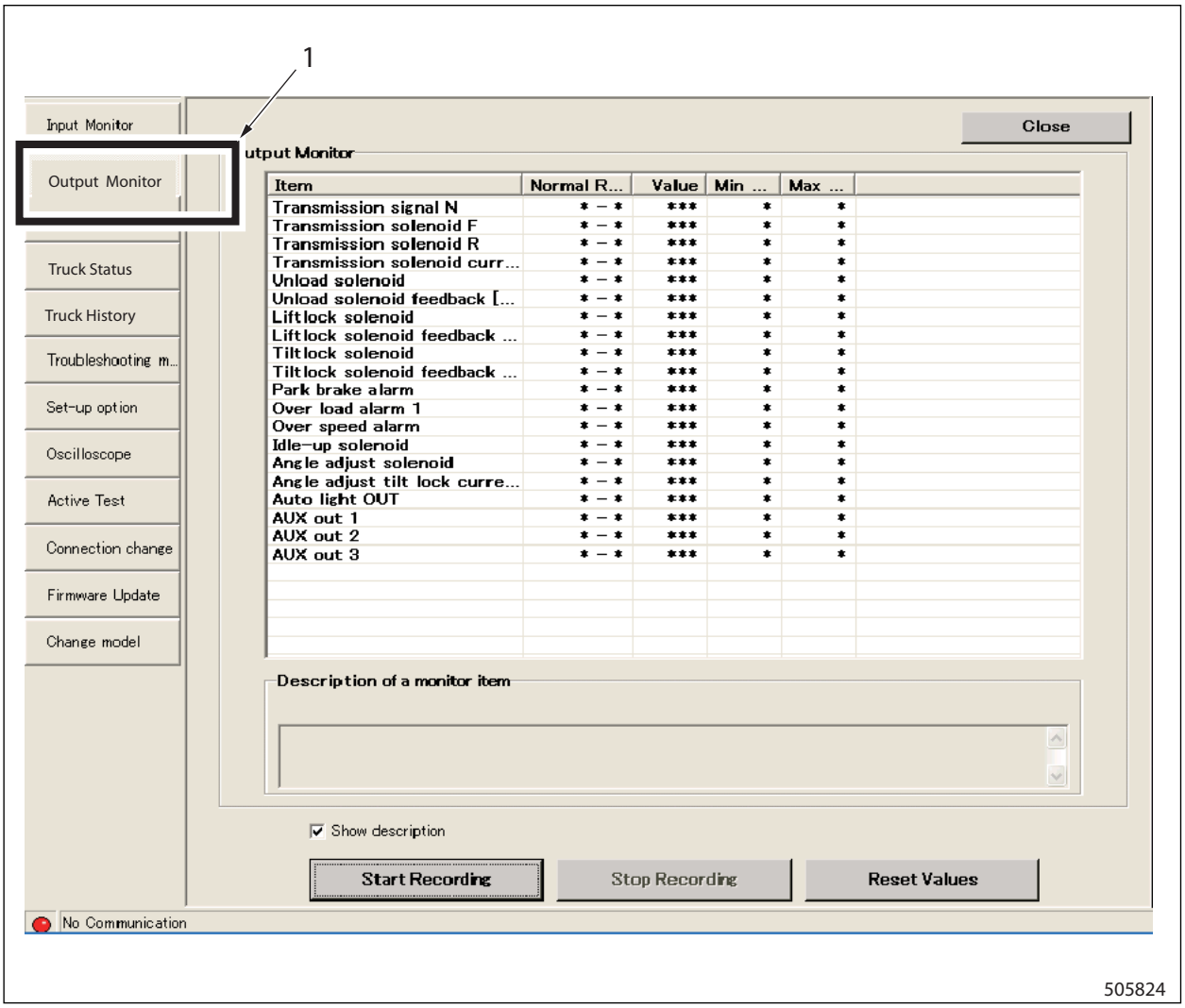


1. Input monitor button
2. Monitor window
3. Description of the monitor item

Item		Item	
Seat switch	ON/OFF	4V-5V changeover switch	ON/OFF
Seat switch timer	ON/OFF	IN-UNIT status (RIO2)	Normal/ Faulty
Seat belt switch	ON/OFF	Lowering speed switch	ON/OFF
DC power supply [V]		Lift operation switch	ON/OFF
Direction lever F	ON/OFF	Tilt operation switch	ON/OFF
Direction lever N	ON/OFF	Mast high switch	ON/OFF
Direction lever R	ON/OFF	Tilt auto-stop switch	ON/OFF
FNR lever		Tilt angle [V]	
Joystick (Lift lever 1) signal [%]		Weight 0 set switch	ON/OFF
Joystick (Lift lever 1) status		Speed [km/h]	
Joystick (Lift lever 2) signal [%]		Speed sensor error [V]	
Joystick (Lift lever 2) status		Speed limit SW	
Joystick (Tilt lever 1) signal [%]		Power/Soft mode switch	ON/OFF
Joystick (Tilt lever 1) status		Handle angle [deg]	
Joystick (Tilt lever 2) signal [%]		Handle angle target [deg]	
Joystick (Tilt lever 2) status		Auto light signal	ON/OFF
Joystick (ATT1 lever 1) signal [%]		Coolant low level switch	ON/OFF
Joystick (ATT1 lever 1) status		Air cleaner switch	ON/OFF
Joystick (ATT1 lever 2) signal [%]		Transmission warning switch	ON/OFF
Joystick (ATT1 lever 2) status		Fuel warning switch	ON/OFF
Joystick (ATT2 lever 1) signal [%]		Oil temperature switch	ON/OFF
Joystick (ATT2 lever 1) status		Mode select switch	ON/OFF
Joystick (ATT2 lever 2) signal [%]		Oil pressure LIFT [MPa]	
Joystick (ATT2 lever 2) status		AUX AI [HEX]	

Output monitor

The monitor is used to check the output status of sensors and switches.



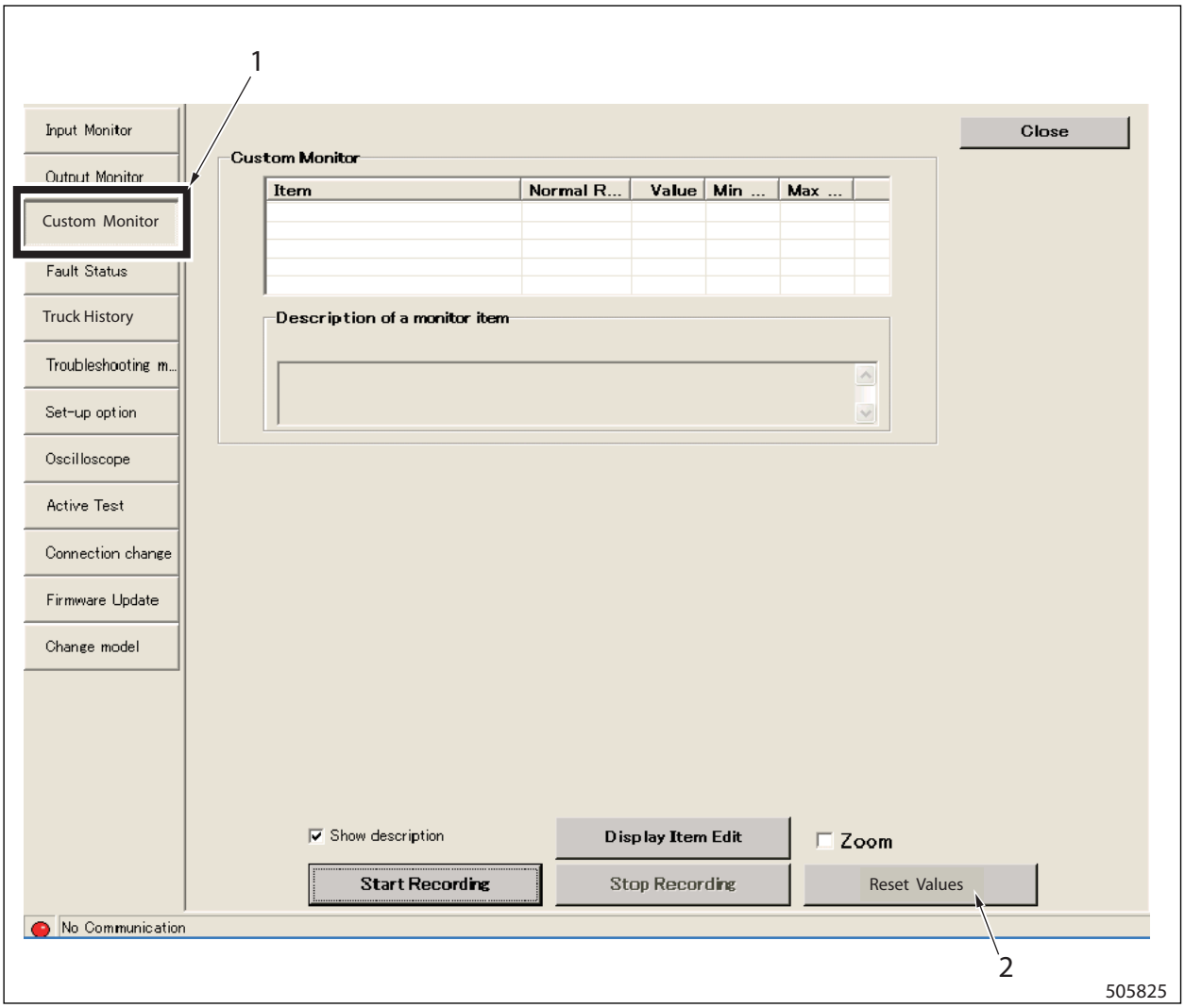
1. Output monitor button

Signals that can be monitored are listed below:

Item		Item	
Transmission signal N		Solenoid output (ATT3 valve 2) output [mA]	
Transmission solenoid F		Solenoid output (ATT3 valve) feedback [mA]	
Transmission solenoid R		Solenoid output (ATT3 valve 1) output	
Transmission solenoid current [mA]		Solenoid output (ATT3 valve 2) output	
Solenoid output (Lift valve 1) output [mA]		Solenoid output (ATT3 valve) status	
Solenoid output (Lift valve 2) output [mA]		PWM voltage (RIO1) [V]	
Solenoid output (Lift valve) feedback [mA]		PWM voltage (RIO1)	
Solenoid output (Lift valve 1) output [mA]		OUT-UNIT status (RIO1)	
Solenoid output (Lift valve 2) output [mA]		Unload solenoid	
Solenoid output (Lift valve) status		Unload solenoid feedback [mA]	
Solenoid output (Tilt valve 1) output [mA]		Lift lock solenoid	
Solenoid output (Tilt valve 2) output [mA]		Lift lock solenoid feedback [mA]	
Solenoid output (Tilt valve) feedback [mA]		Tilt lock solenoid	
Solenoid output (Tilt valve 1) output		Tilt lock solenoid feedback [mA]	
Solenoid output (Tilt valve 2) output		Park brake alarm	
Solenoid output (Tilt valve) status		Overload alarm	
Solenoid output (ATT1 valve 1) output [mA]		Overspeed alarm	
Solenoid output (ATT1 valve 2) output [mA]		Angle adjust solenoid	
Solenoid output (ATT1 valve) feedback [mA]		Angle adjust tilt lock current [mA]	
Solenoid output (ATT1 valve 1) output		Auto light OUT	
Solenoid output (ATT1 valve 2) output		Parking brake pressure leakage	
Solenoid output (ATT1 valve) status		AUX out 2	
Solenoid output (ATT2 valve 1) output [mA]		AUX out 3	
Solenoid output (ATT2 valve 2) output [mA]		Limp home	
Solenoid output (ATT2 valve) feedback [mA]		Shift solenoid 1 output status	ON/OFF
Solenoid output (ATT2 valve 1) output		Shift solenoid 1 feedback status	
Solenoid output (ATT2 valve 2) output		Parking brake solenoid	ON/OFF
Solenoid output (ATT2 valve) status		Parking brake solenoid feedback [mA]	
Solenoid output (ATT3 valve 1) output [mA]			

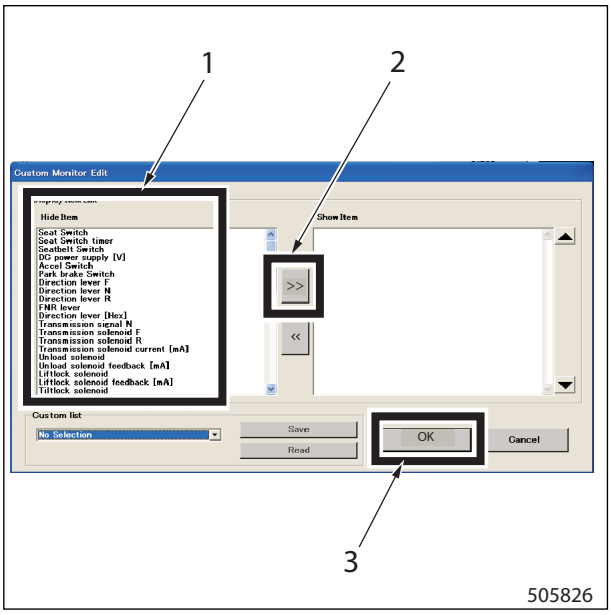
Custom monitor

Custom monitor screen allows you to select a monitor item you wish to view. The controller reads the value of selected item and displays it on the screen.

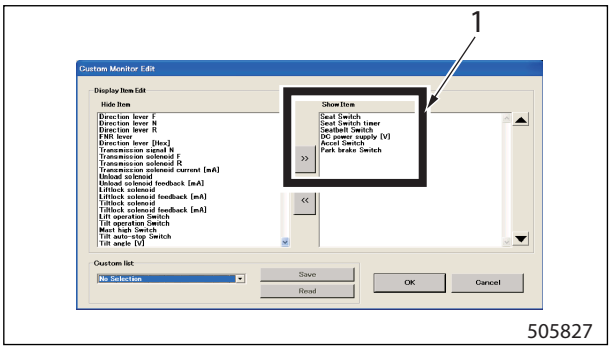


1. Custom monitor button
2. Reset values button

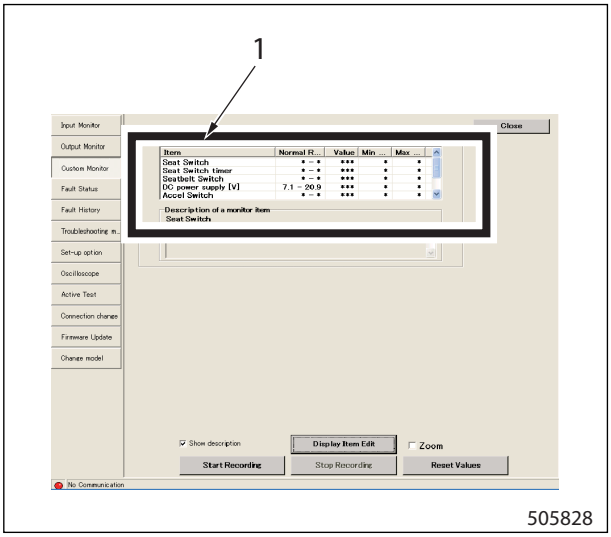
To select items, press the Display Item Edit Button to open the Display Item Window, and select items you need to check.



1. Selection items
2. Add button
3. OK button



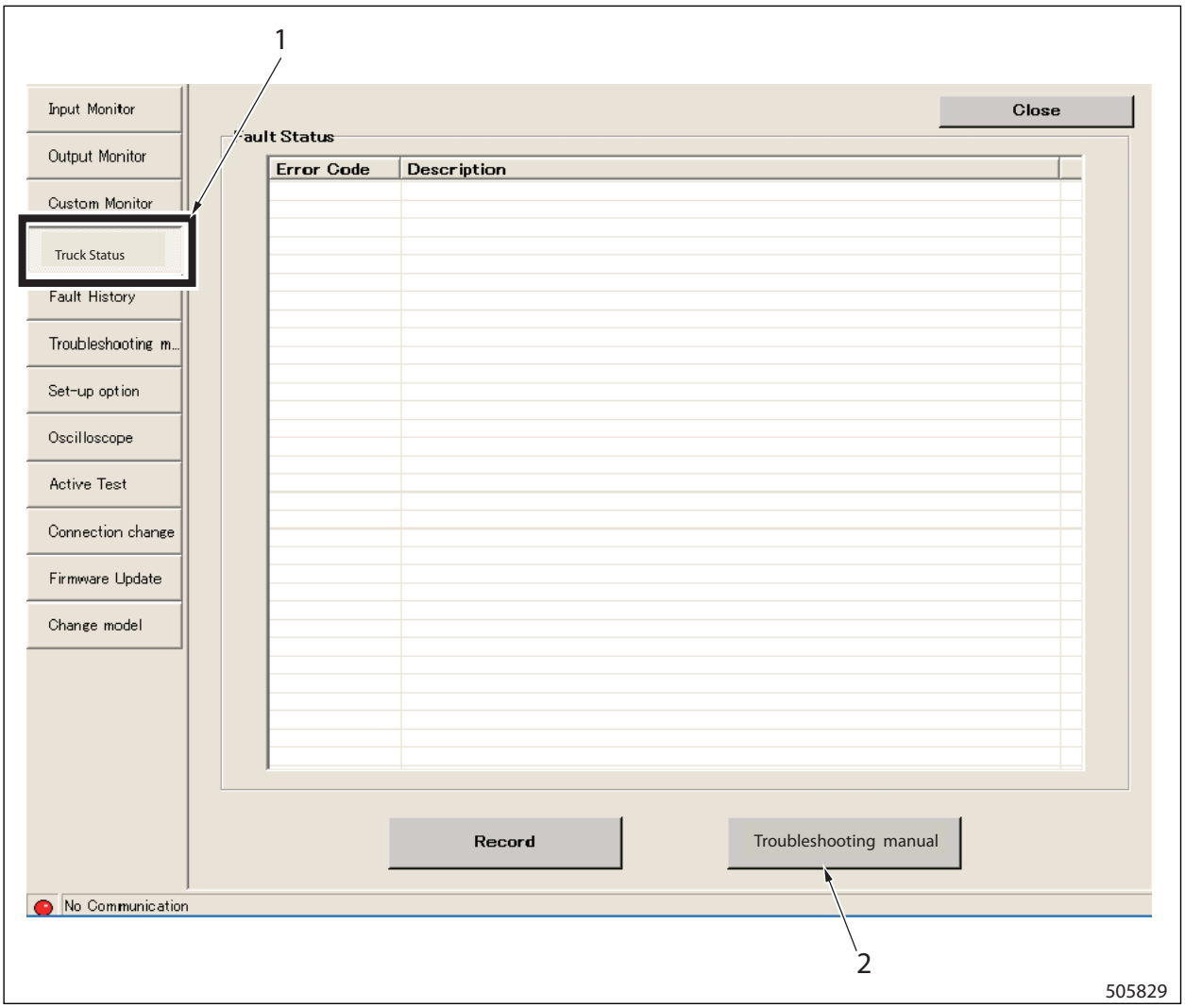
1. Items to be added



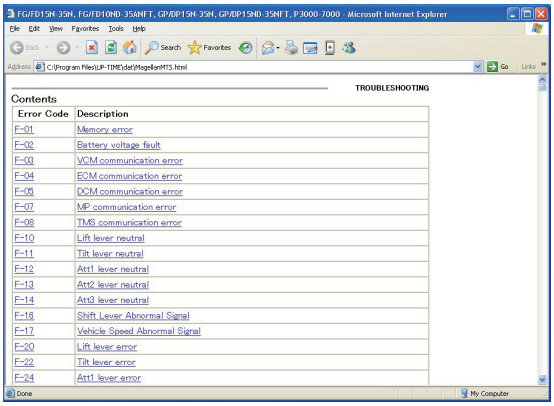
1. Added items

Truck status

Click the truck status button from the menu or toolbox to display the truck status monitor screen in the main window. In the truck status monitor screen, you can monitor a warning that has occurred. Pressing the troubleshooting manual button in the lower part of screen brings up a list of diagnostic code and the troubleshooting information.



1. Truck status button
2. Troubleshooting manual button



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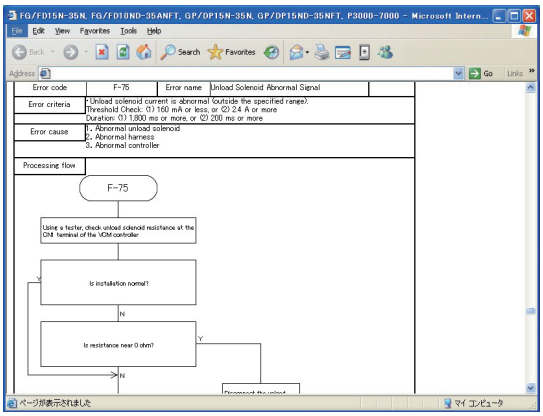

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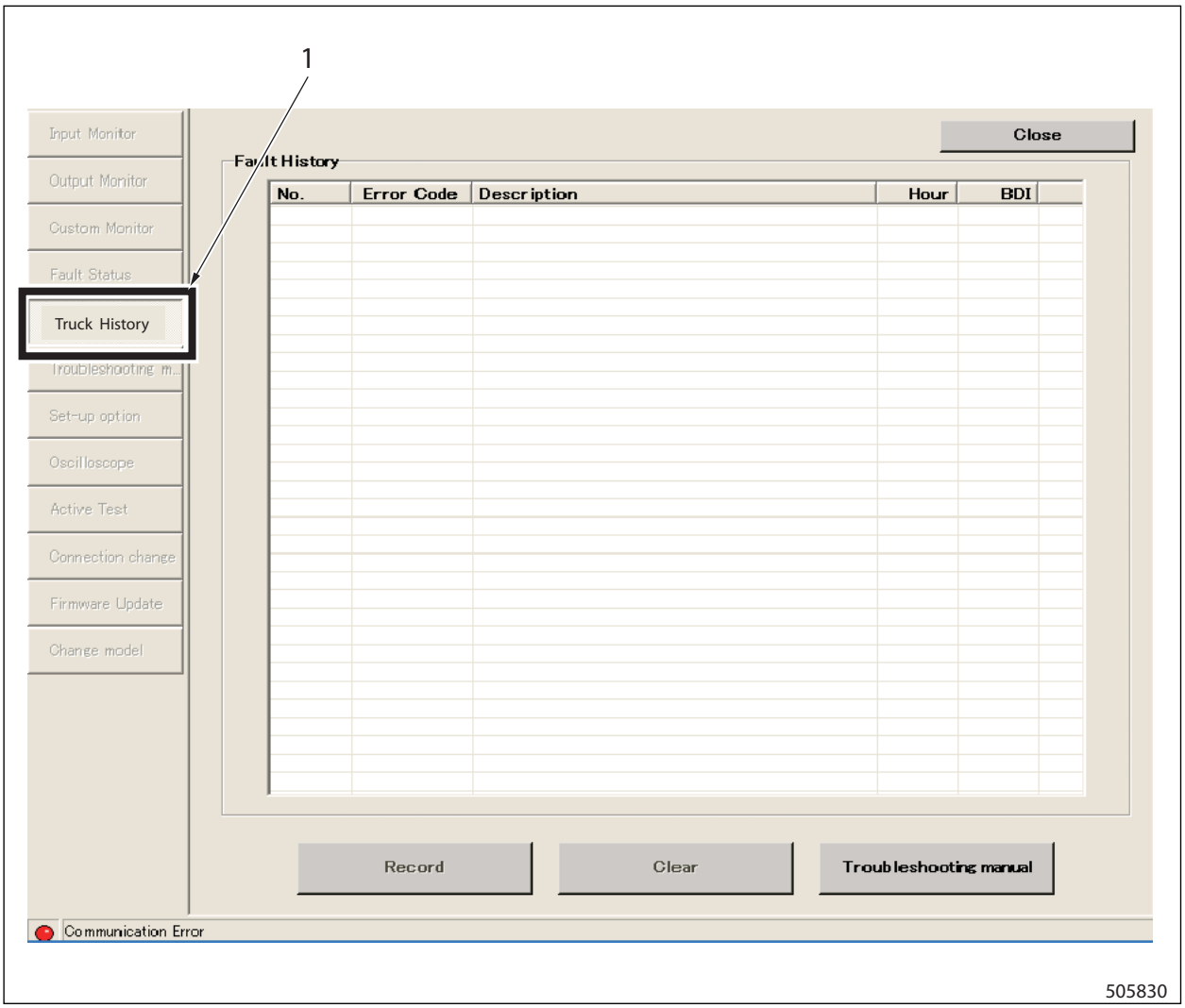
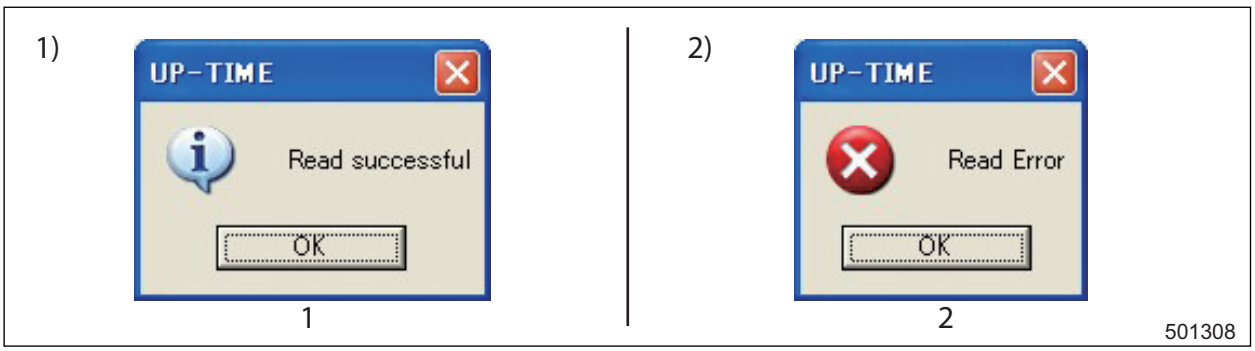
Truck history

Click the truck history button from the menu or toolbox to read past warnings stored in the memory of controller. If the read is successfully completed, the dialog box displays a “Read successful” message. If not, a “Read error” message is displaced. Then, the truck history monitor screen is displayed in the main windows.



1. Truck history button

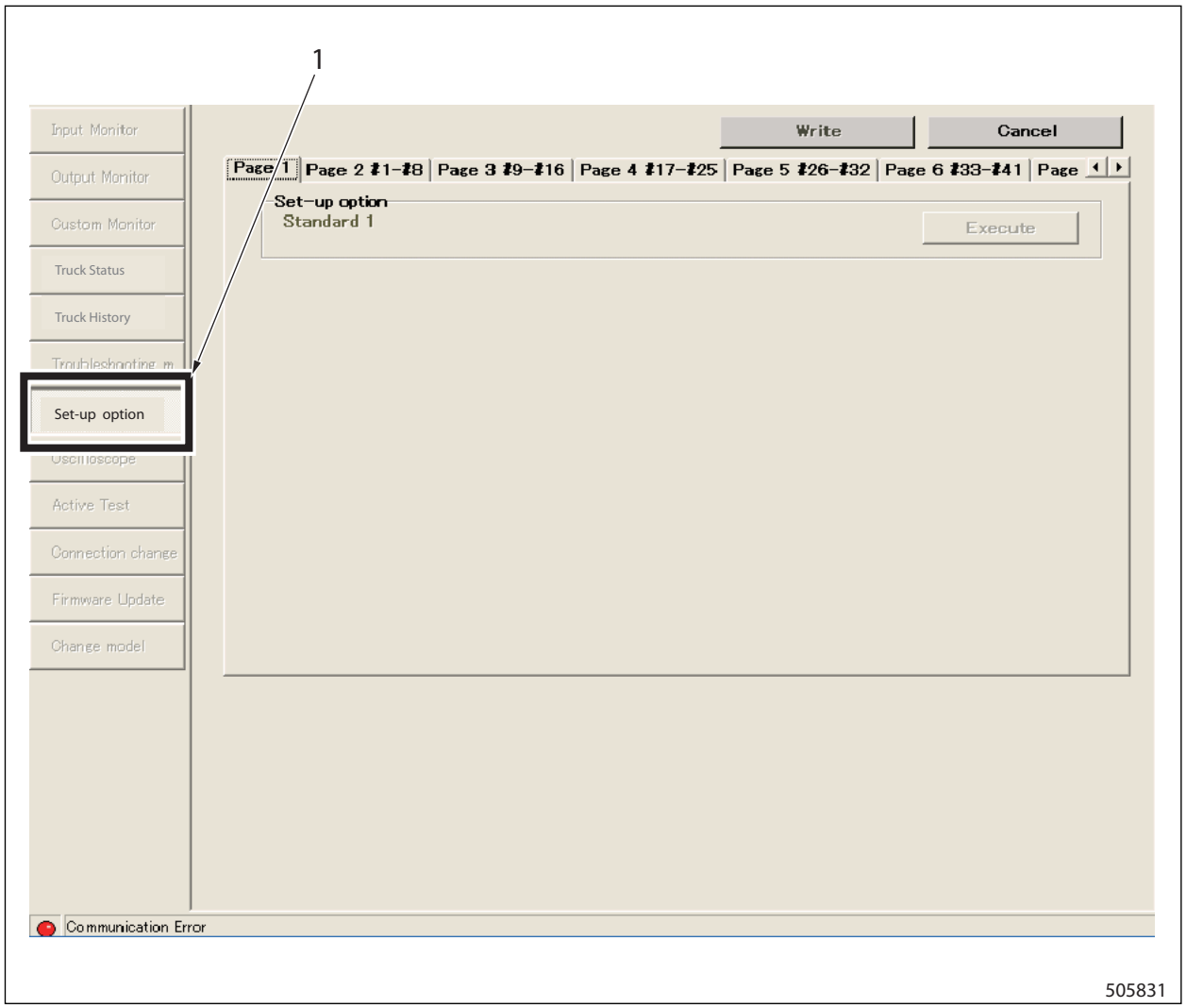


1) When the read is successful
1. Success dialog

2) When the read is unsuccessful
2. Error dialog

Set-up option

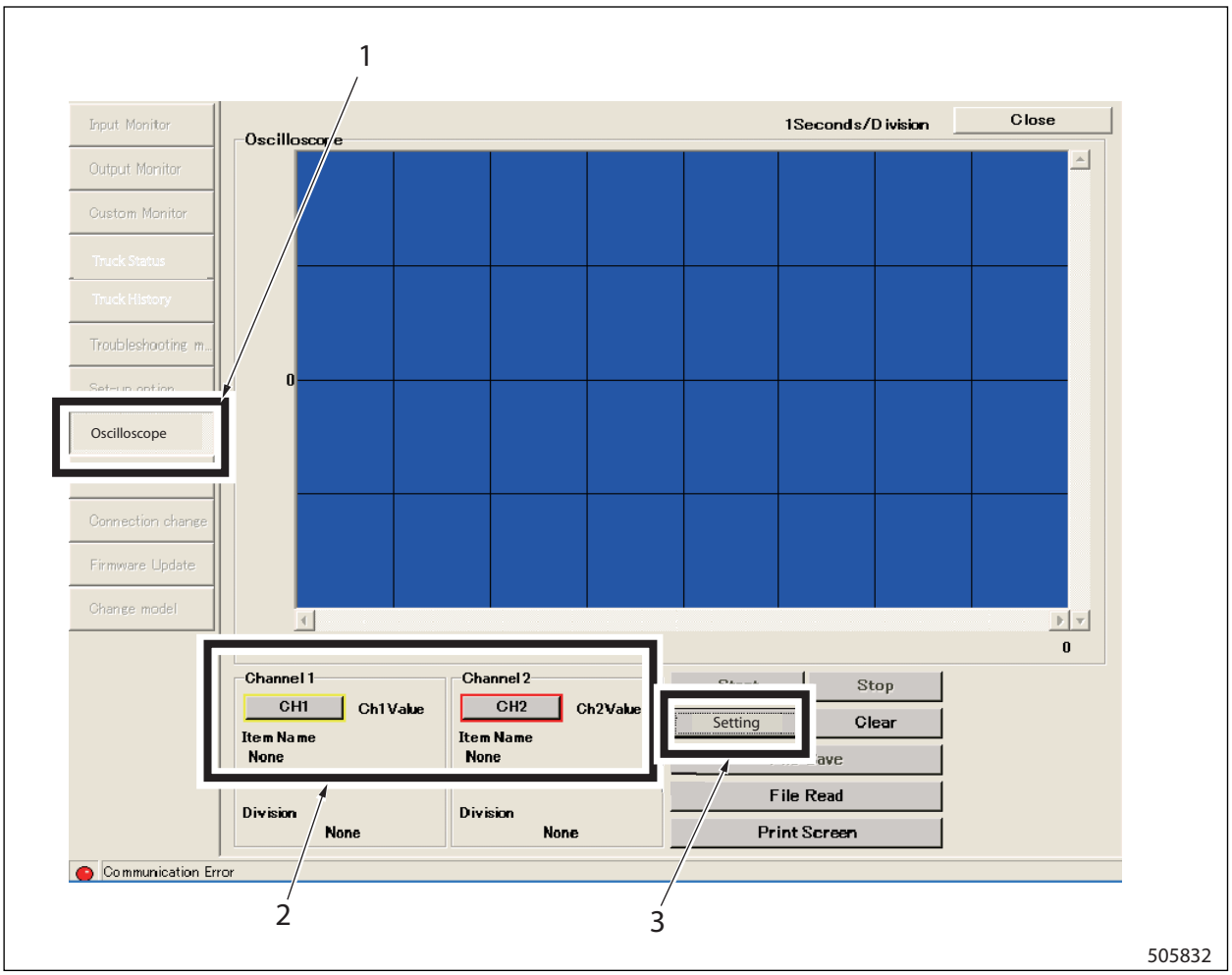
Click the set-up option button from the menu or toolbox to display the setup option screen in the main window. In the setup option screen, you can monitor the current setup values, or you can rewrite the setup values. Click the write button to save your changes.



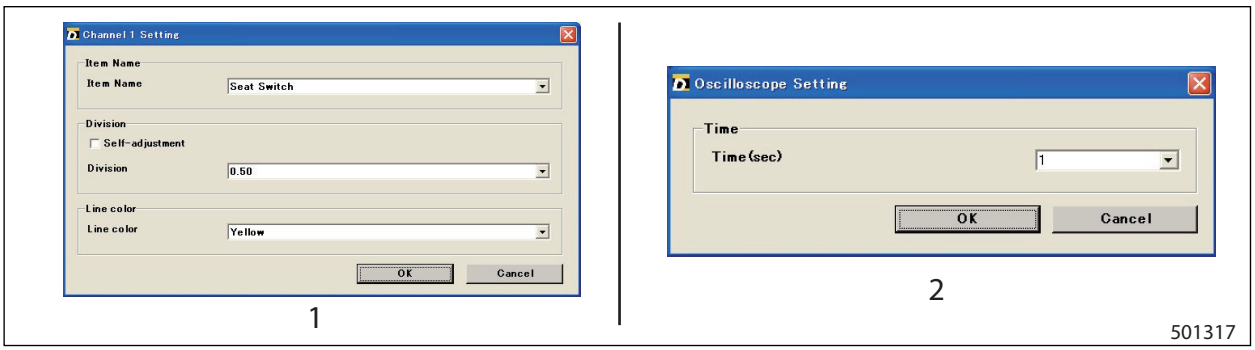
1. Set-up option button

Oscilloscope

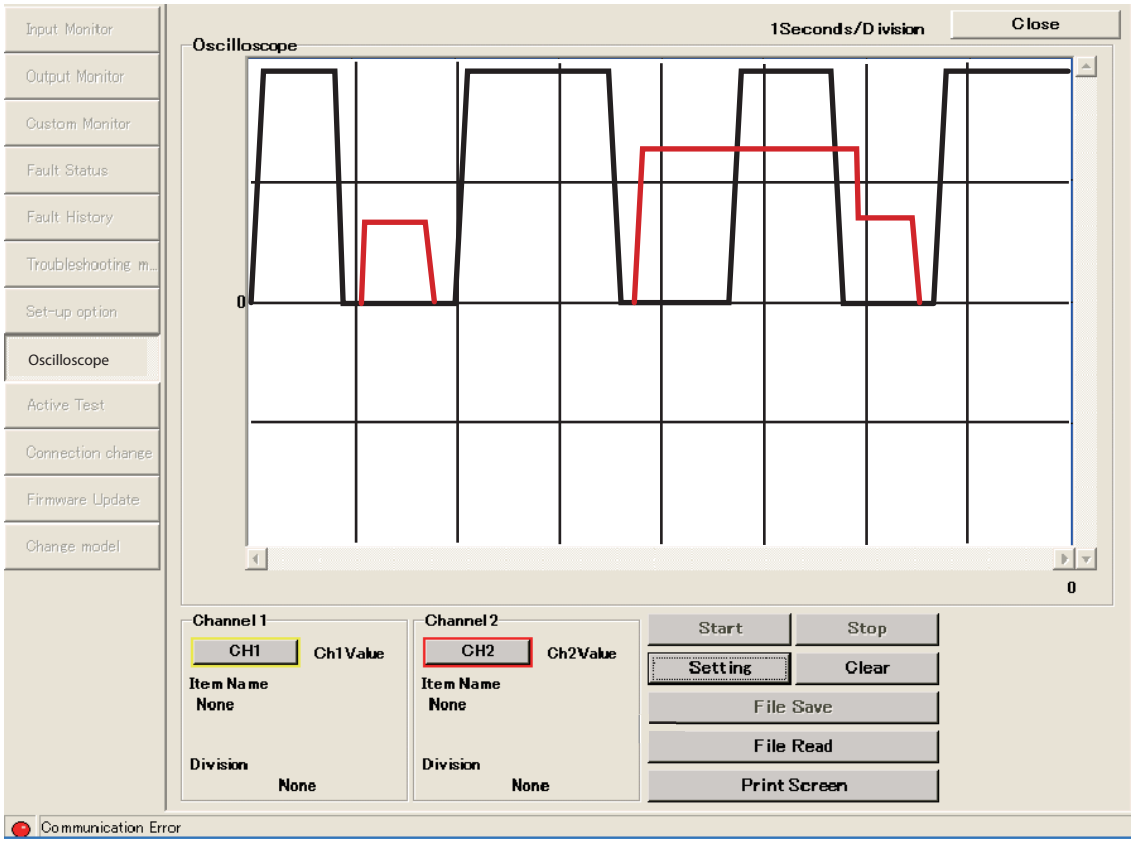
Click the oscilloscope button from the menu or toolbox to display the oscilloscope screen in the main window. The oscilloscope screen shows a graph of the input/output values you wish to check. The user can set up two items (CH1 and CH2) as input/output values to be expressed in the graph. The time axis of the graph is expressed in seconds. The user also can store the data of the graph being displayed on the screen, and display the graph by reading it from the memory. The graph screen can be printed out on a printer by clicking the Print Screen button. Note that these graphs will have some amount of lag in the wave pattern and a margin of error due to the simple function of an oscilloscope. To obtain an accurate wave pattern, use a dedicated measuring instrument.



1. Oscilloscope button
2. Input/output read set-up button
3. Time axis set-up button



1. Channel setting screen
2. Time axis set-up screen



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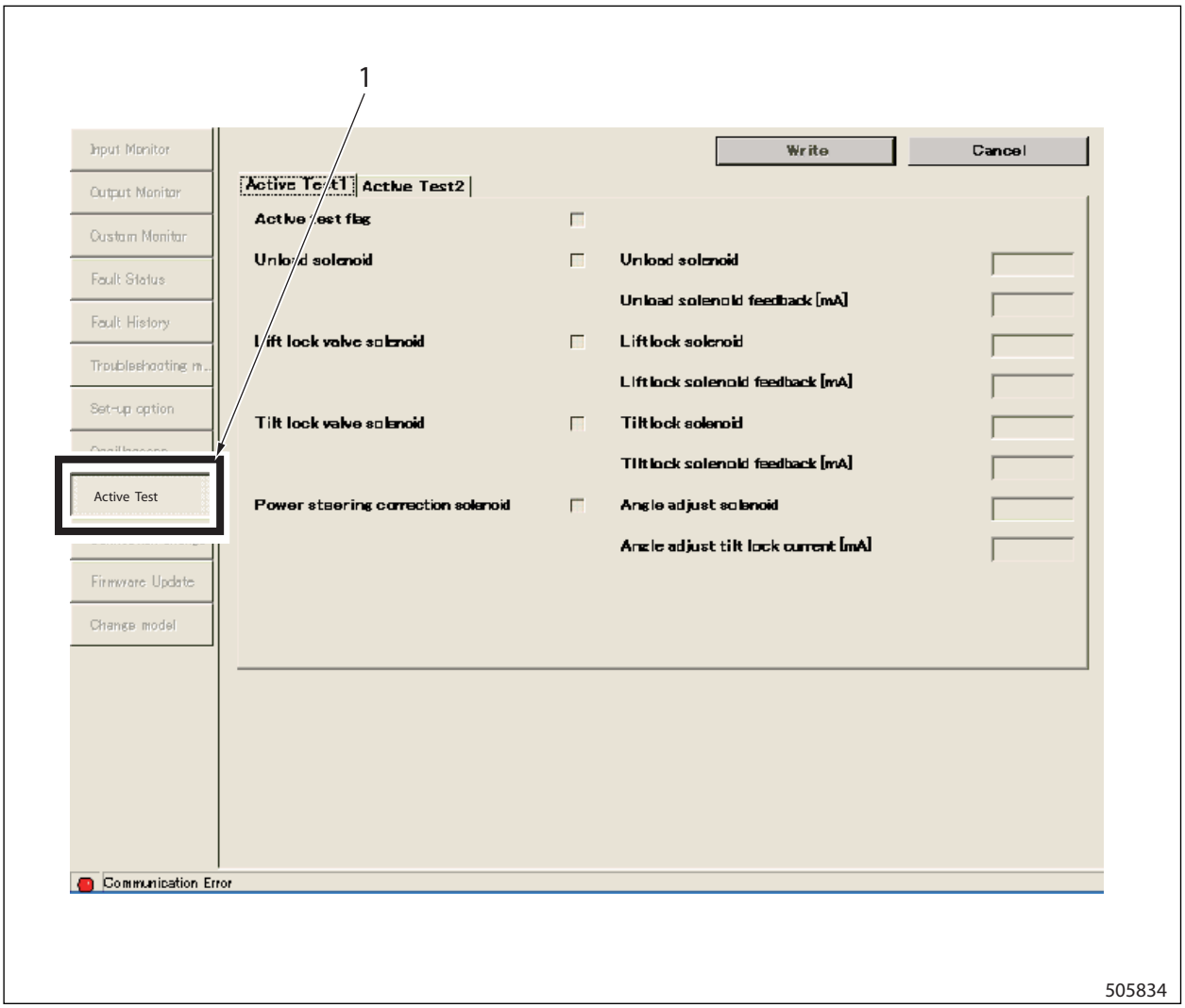
Active test

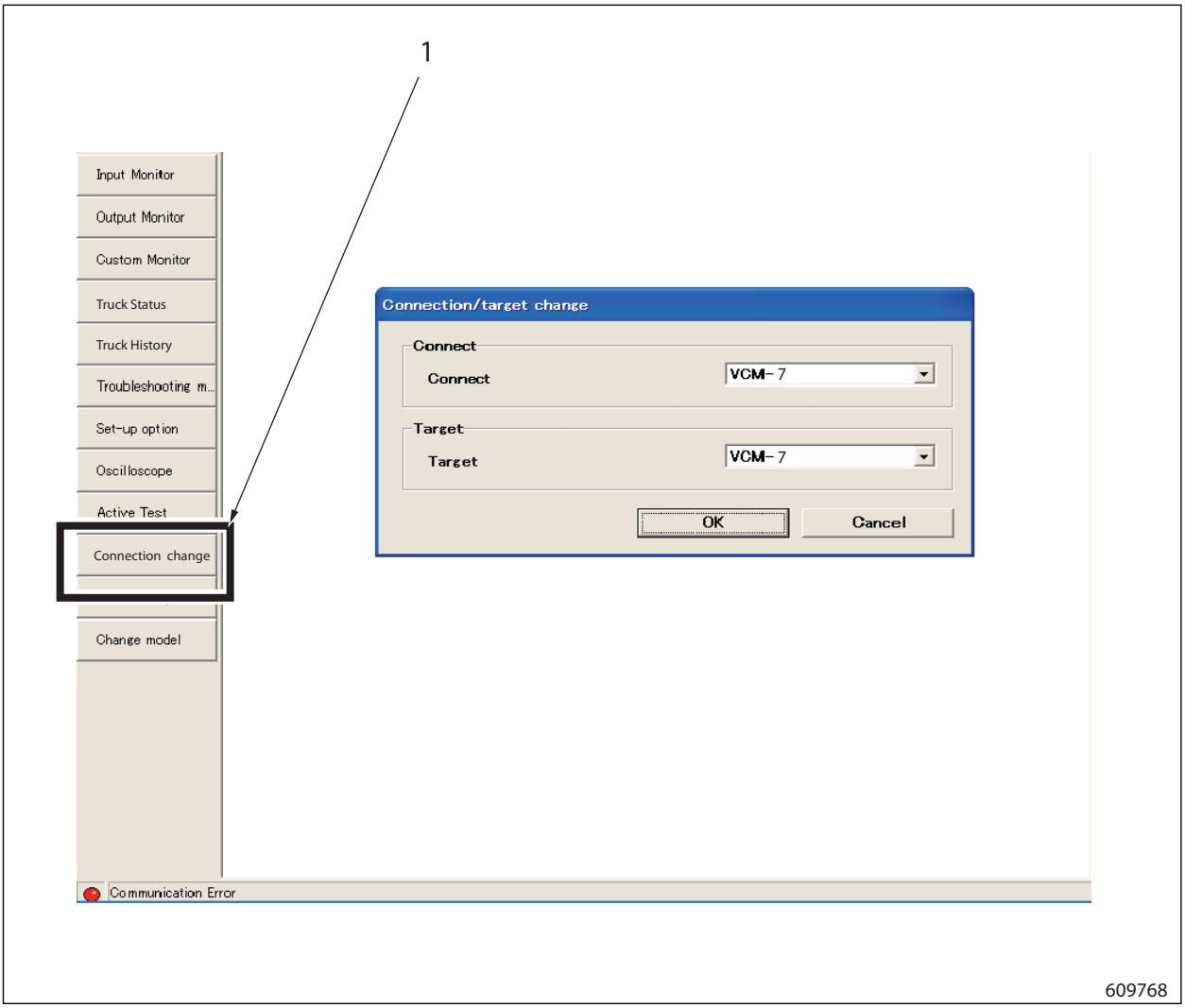
Click the active test button from the menu or toolbox to display the active test screen in the main window.
In active test screen, you can check the operating conditions by selecting signals you wish to confirm. The active test screen consists of the output signal names on the left side of screen and the monitored values on the right side of screen.



1. Active test button

Connection change

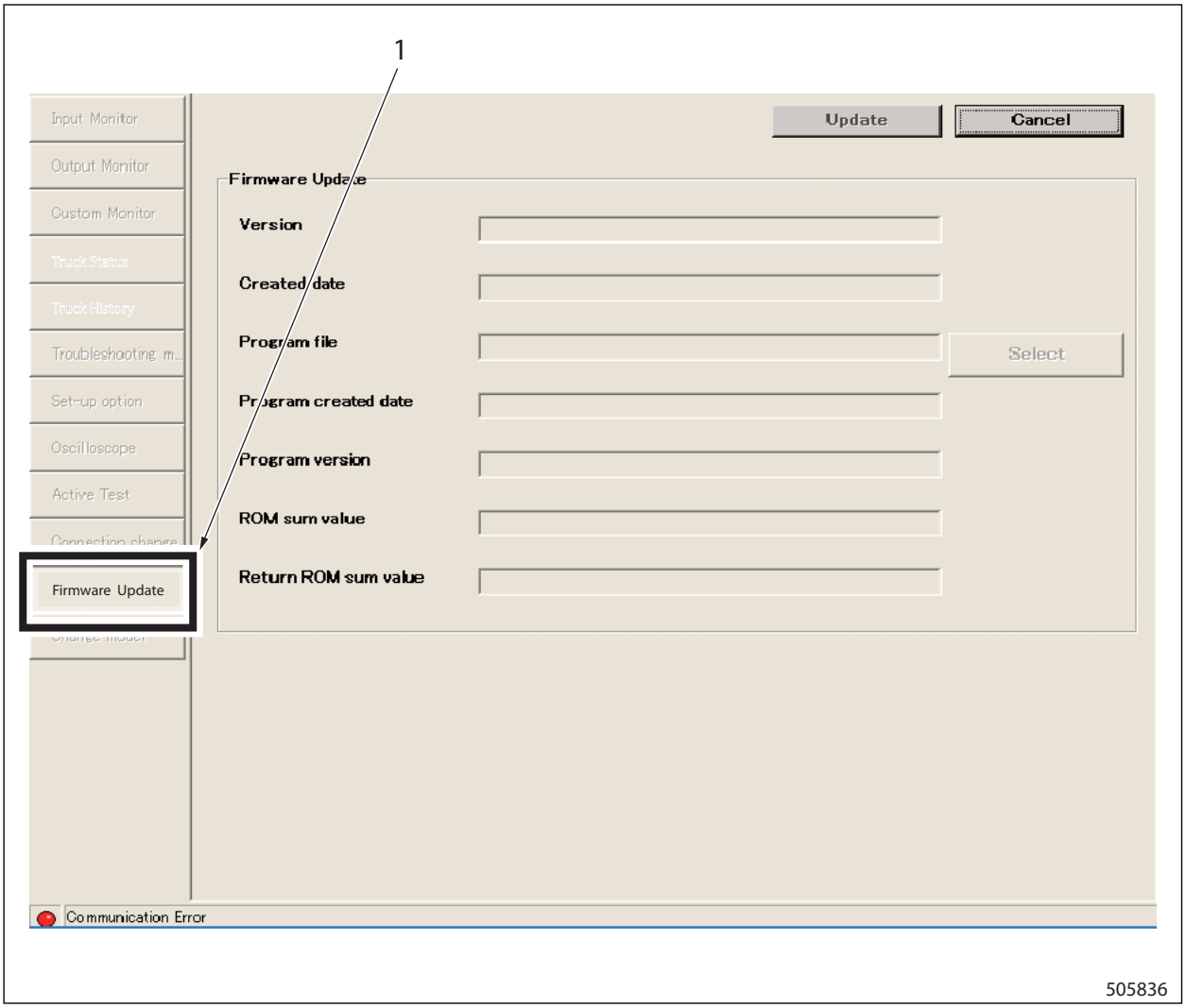
Click the connection change button from the menu or toolbox to display the connection/target change dialog box.
The connection/target change dialog box allows you to change the connecting controller and target controller. To change the connection, select the controller being connected to the cable from the selection box on the right. To change the target, select an appropriate controller from the selection box of target on the right. After the selection of the connection and target, click the OK button. Then the change of connection and target controllers will be executed. Click the cancel button if you wish it unchanged.



1. Connection change button

Firmware update

Click the firmware update on the menu or click the firmware update button of toolbox to display the firmware update screen. The displayed contents vary depending on the controller being connected. On firmware update screen, the user can select the software version of controller as well as write software, or can update the software. Firmware can be updated in a setup mode only. Note that updates are available at any time on the controller that does not have a setup mode.

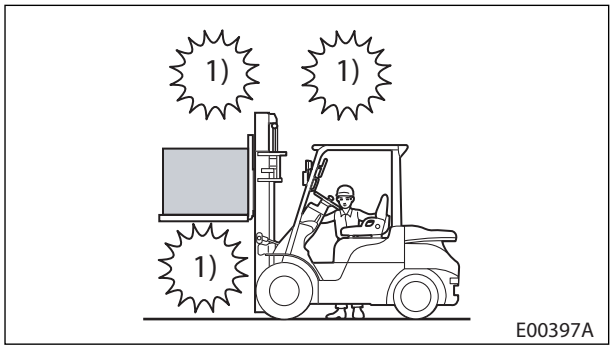


1. Firmware update button

4. Mast Interlock System

4.1 Function

When the operator leaves the operator seat while the engine is running, the built-in seat switch is activated to lock the mast. The mast will not move even if the lift or tilt lever is operated.



1) STOP

Key switch position	Engine status	Operator seat Vacant or Occupied	Meter panel	Control lever	
			Mast interlock icon	Lift	Tilt
○ (OFF)	Stop	**Occupied**	OFF	Not active	Not active
		Vacant	OFF	Not active	Not active
I (ON)	Stop	**Occupied**	OFF	Lowering only	Not active
		Vacant	Blinking	Not active	Not active
(START)	Running	**Occupied**	OFF	Active	Active
		Vacant	Blinking	Not active	Not active

Controller function

The controller monitors the seat switch and if the operator is not seated, the controller locks the lift and tilt motions.

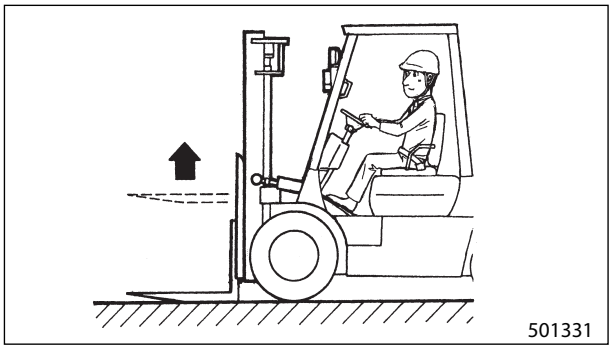
VCM-6 controller, mast interlock function

The VCM-6 controller interrupts electric current supply to the unload solenoid and the lift lock solenoid if the operator is not seated.

4.2 Checking the Operation of Mast Interlock System of VCM-6 Controller

Mast interlock system

- Raise the forks high enough to see them from the operator seat.
- Apply the parking brake and place the direction lever in the NEUTRAL position. Then, under the engine idling condition (the accelerator pedal not depressed condition), half rise from the operator seat.
- Make sure that the mast interlock icon blinks a few seconds later. Operate the lift lever to make sure that the forks will not move up and down.
- Operate the tilt lever to ensure the mast does not tilt forward or backward.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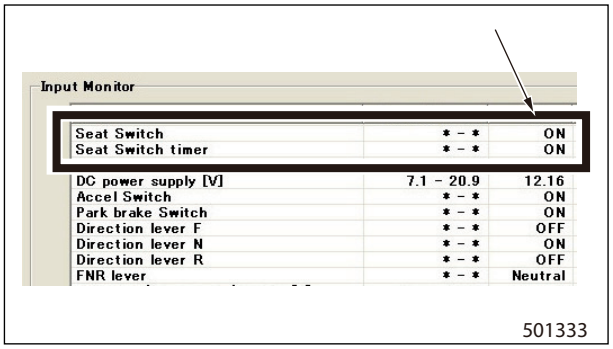
⚠ CAUTION

Make sure that sufficient space is available for the forklift truck to move around and that no one or no obstacle is around the forklift truck.

Checking the operation of mast Interlock System of VCM-6 Controller

(1) Connect the service tool to VCM-6 controller.
(2) Turn the key switch to the ON position and start the engine.
(3) Display the input monitor screen of the service tool.
(4) Sit in the operator seat and make sure that the seat switch status and the seat switch timer are ON on the input monitor screen.



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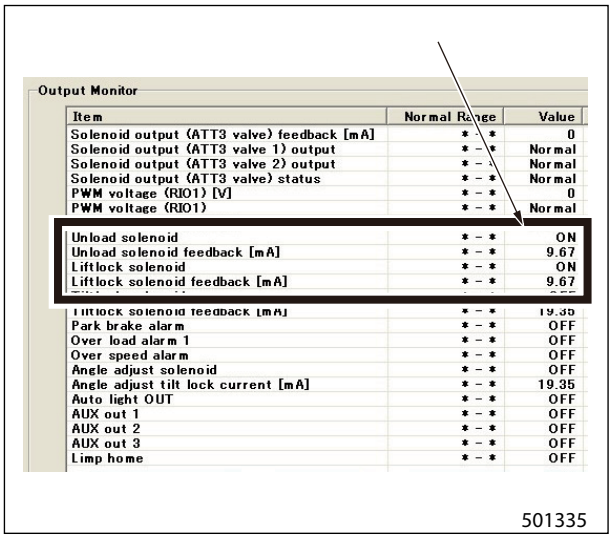
(5) Display the service tool output monitor screen. When the status of the seat switch timer is ON, the controller unlocks the mast interlock and turns the unload output and the lift lock output ON.
You can operate the mast system under this condition.



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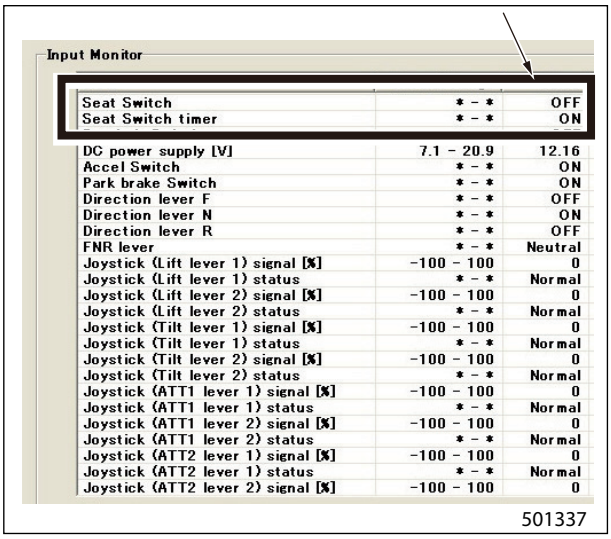
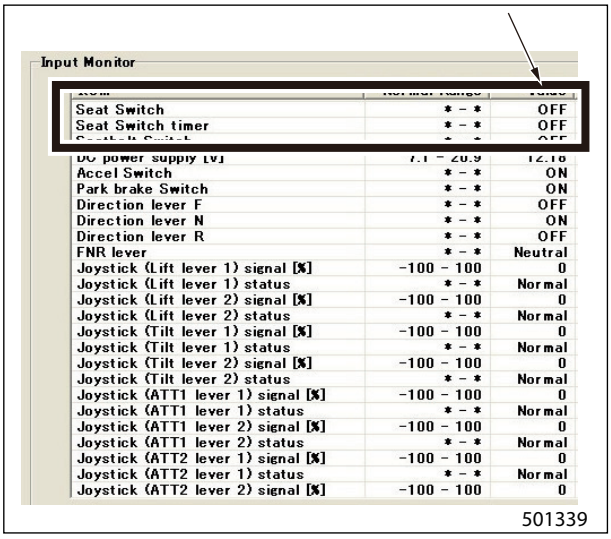
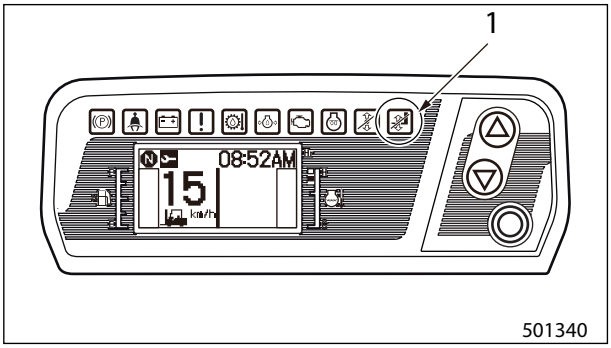
(6) Leave the operator seat, and make sure that the seat switch turns OFF on the input monitor screen and the seat switch timer turns OFF a few seconds later (function of seat delay counter).



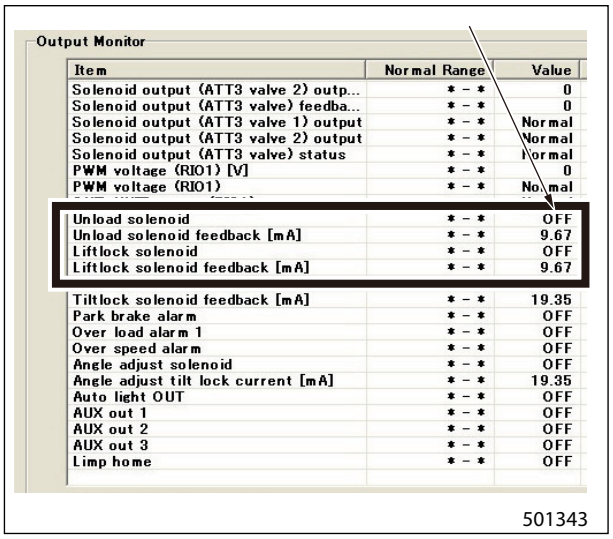


(7) Make sure that the mast interlock icon on the meter panel blinks.



1. Blinking

(8) The unload solenoid output and the lift lock solenoid output will turn OFF when the mast interlock system is activated.
Under this condition, operate the lift lever to make sure that the forks will not move up and down. Also operate the tilt lever to make sure that the mast will not tilt forward and backward.



If seat switch is not turned ON

Check the seat switch operation and wiring connections by referring to 4-41 "Harness Codes", 4-41 "VCM-6", and 4-58 "Seat Switch".

If unload solenoid is not turned ON

Check the solenoid output according to 4-26 "Active Test Inspection Procedure". If the solenoid output will not turn ON even after the active test inspection, see 4-62 "Truck Status Display and Troubleshooting" and check for the possible causes of the diagnostic code F-75 and F-79.

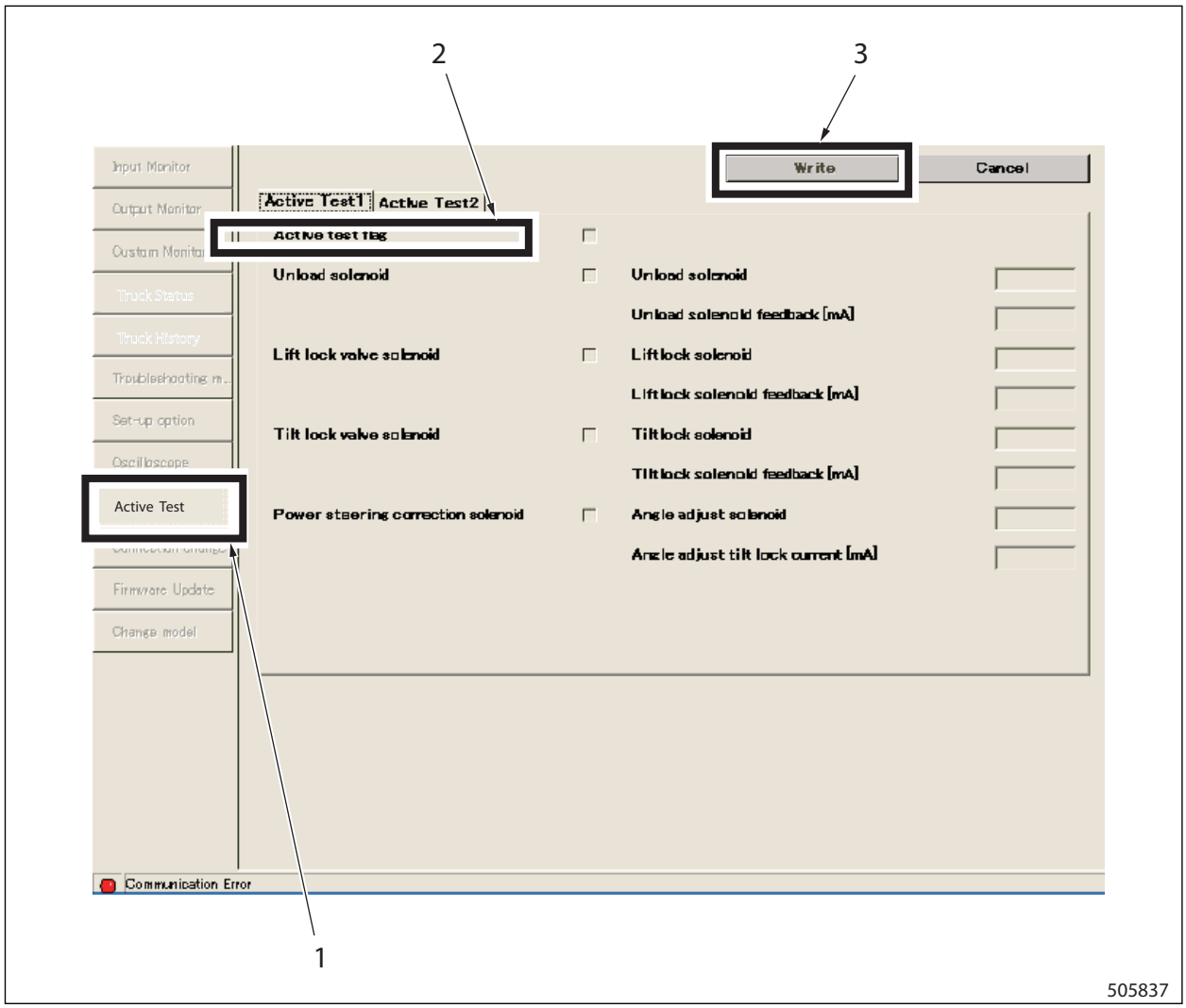
If lift lock solenoid is not turned ON

Check the solenoid output according to 4-26 "Active Test Inspection Procedure". If the solenoid output will not turn ON even after the active test inspection, see 4-62 "Truck Status Display and Troubleshooting" and check for the possible causes of the diagnostic code F-77 and F-79.

4.3 Active Test Inspection Procedure

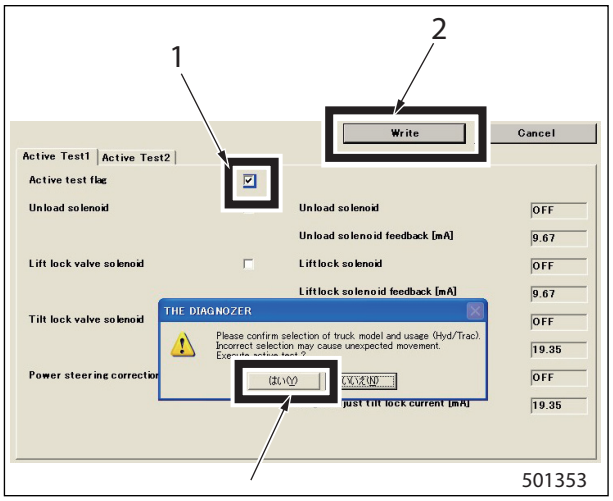
(1) Connect the service tool and turn the key switch to the ON position.
(Do not turn the engine ON.)

(2) Display the active test screen by pressing the active test button in the service tool screen.



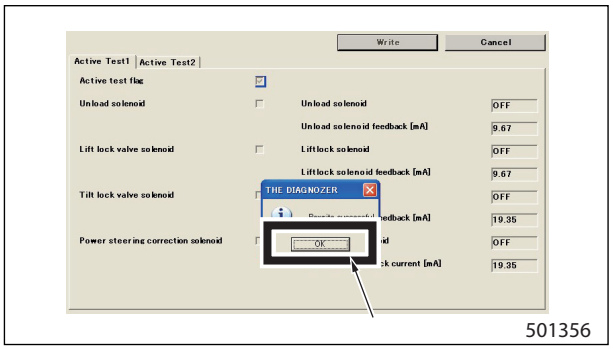
1) Active test screen
1. Active test flag
2. Active test
3. Write button

(3) Insert a check mark in the box of the active test flag, and press the write button.
When the write confirmation dialogue box is displayed, press the YES button.



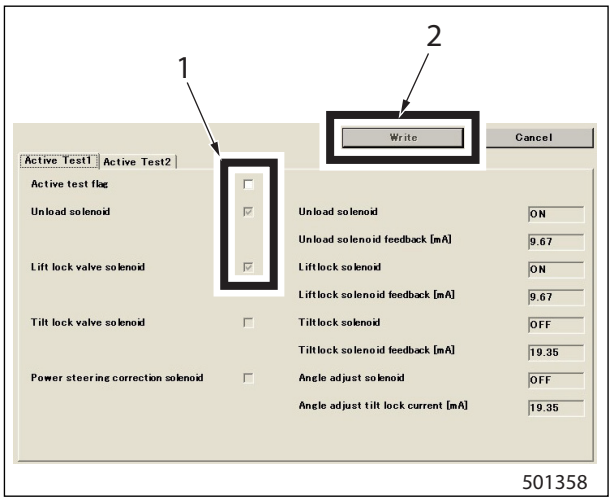
1. Checkmark 2. Write button

(4) When the write completed dialogue box is displayed, press the OK button.



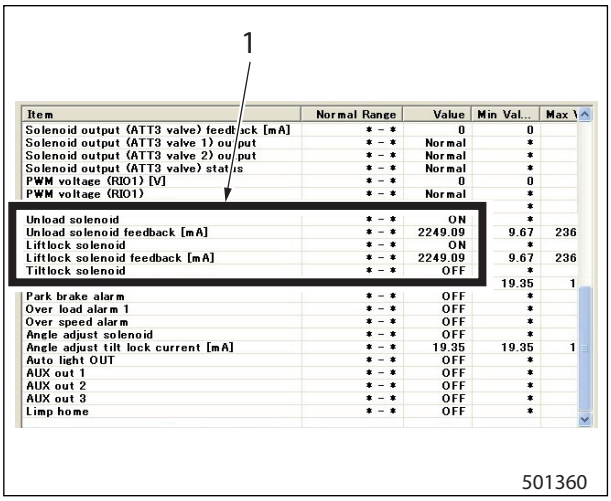
(5) Insert a check mark in the box of the unload solenoid/ lift lock valve solenoid, and press the write button.

(6) When the write confirmation dialogue box is displayed, press the YES button the same as (3) above, and when the write completed dialogue box is displayed, press the OK button to complete the set-up.



1. Checkmark 2. Write button

(7) Press the output monitor button on the service tool screen, and check the electrical current values of the unload solenoid and the lift lock valve solenoid. If the value is not close to 2500 mA, a defect is suspected.



1. Check current values

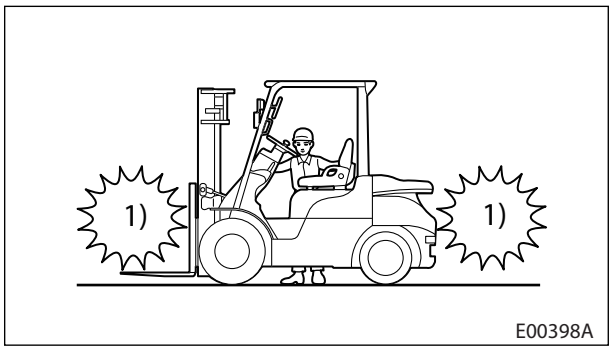
(8) After confirmation, turn the key switch to the OFF position to terminate the active test. (Be sure to turn OFF the key switch before moving on to the next operation).

Note: If a defect is found, see 4-62 "Truck Status Display and Troubleshooting" and check for the possible causes of the diagnostic code F-75, F-77, and F-79.

5. Driving Interlock System

5.1 Controller Function

(1) The controller monitors the conditions described below. If all the conditions are met, the controller activates the driving interlock system.
- The operator is not seated. (Seat switch and seat switch timer [OFF])
- Forklift truck speed is less than 4 km/h (2.5 MPH). (Speed sensor value)
- The parking brake is released (at pulled position). (Parking brake switch is ON)



1) No Power Travel

(2) The controlled condition by the driving interlock system will vary depending on forklift truck speed.
- If the speed is more than 4 km/h (2.5 MPH), the driving interlock control is de-activated.
- If the speed is less than 4 km/h (2.5 MPH), the transmission solenoid F and R are turned OFF, and the power from the engine is cut off.
- If the speed is less than 1 km/h (0.62 MPH), the parking brake solenoid is turned OFF, and the parking brake (negative brake) is activated to stop the forklift truck.

Note: Because the controller electrically controls the system, there is no physical movement of the direction lever and the parking brake lever.

⚠ CAUTION

(1) Be alert when the forklift truck is on a grade. The forklift truck may move and accelerate, instead of being stopped, depending on a road condition.

(2) Be sure to check the driving interlock function before operating the forklift truck.

(3) This interlock system is provided only for risk reduction in case of a contingency. Always drive the forklift truck properly with safety in mind.

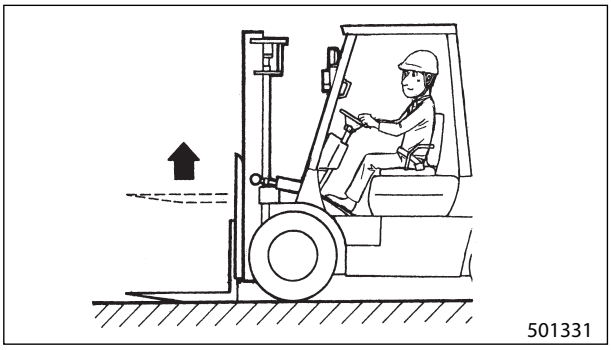
(4) When restoring the forklift truck to its normal driving condition, be sure to follow the instructions below:
- Sit properly in the operator seat.
- Depress the brake pedal and stop the truck completely.
- Place the direction lever in the NEUTRAL position once, and then shift it back to the FORWARD or REVERSE position.
- Pull the parking brake lever in the lock position, and then push it back to the released position.

(5) When replacing the operator seat with a new one, be sure to use a genuine Mitsubishi forklift truck seat with the operator presence switch.

5.2 Checking the Operation of Driving Interlock Function

Driving interlock system

(1) Slightly raise the forks from the ground.
(2) With the engine idling (do not depress the accelerator pedal), place direction selector lever to FORWARD or REVERSE position, and then half rise from the operator seat.
(3) Make sure the driving interlock indicator icon blinks several seconds later and the forklift truck stops.
(4) To restore the forklift truck to its normal driving condition, sit properly on the operator seat and depress the brake pedal to stop the forklift truck. Place the direction lever in the NEUTRAL position once, and then shift the direction lever to FORWARD or REVERSE position.

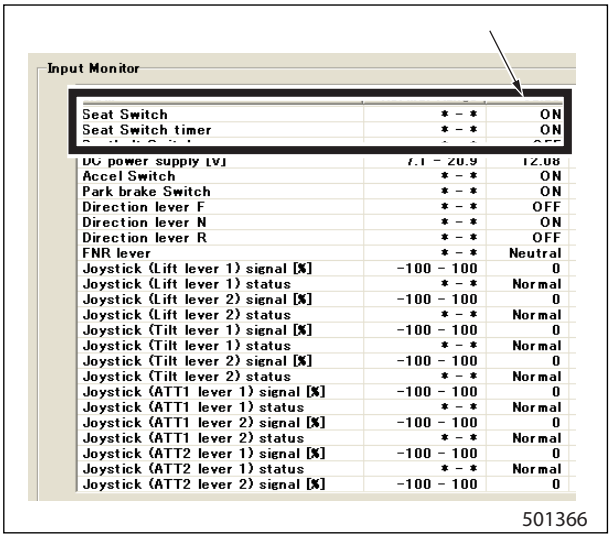

501331

⚠ CAUTION

- Be sure to check the driving interlock system on a hard and level surface. On grade or ramp, the forklift truck moves due to its own weight.
- Make sure that sufficient space is available for the forklift truck to move around and that no one or no obstacle is around the forklift truck.

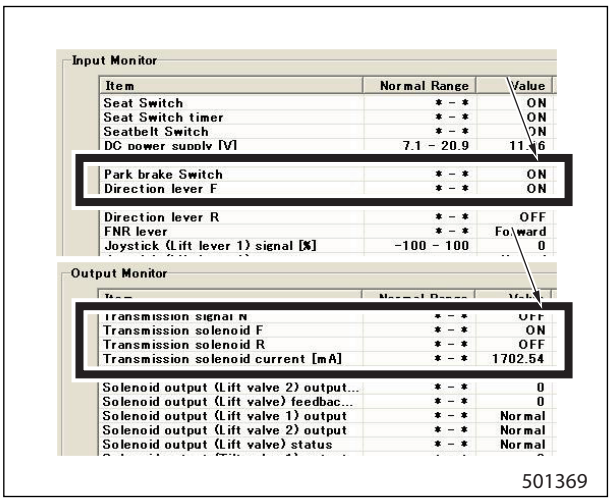
Checking the Operation of driving Interlock Function

(1) Connect the service tool to VCM-6 controller.
(2) Turn the key switch to the ON position and start the engine.
(3) Display the input monitor screen (VCM-6) of service tool.
(4) While sitting in the operator seat and monitoring the input monitor screen, make sure the seat switch and seat switch timer is turned ON.



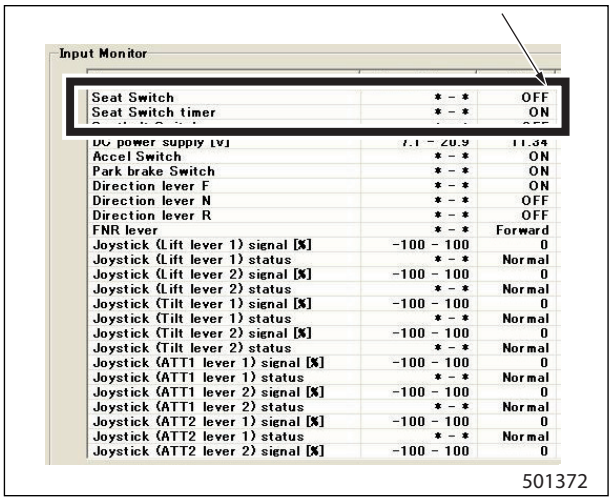
501366

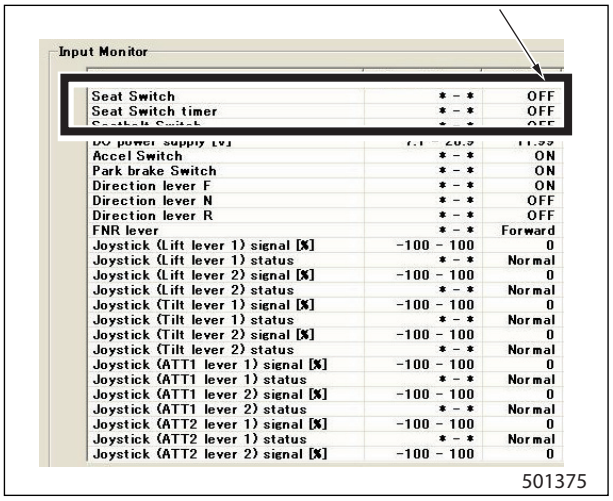
(5) Display the output monitor screen (VCM-6) of service tool.
(6) Place the direction lever in the FORWARD position. Make sure that shift lever (F) Input and T/M control valve (F) output are turned ON and the T/M control valve current is around 1000 mA on the screen.



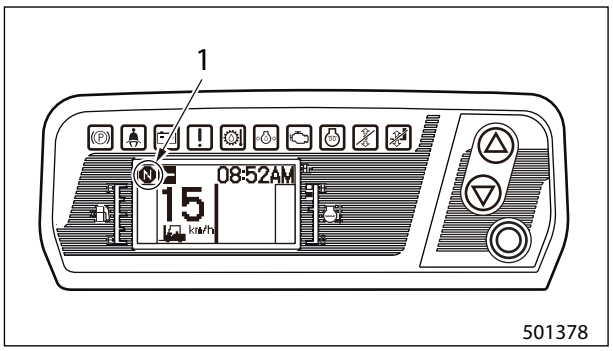
501369

(7) Leave the operator seat, and make sure that the seat switch turns OFF on the input monitor screen and the seat switch timer turns OFF a few seconds later (function of seat delay counter).



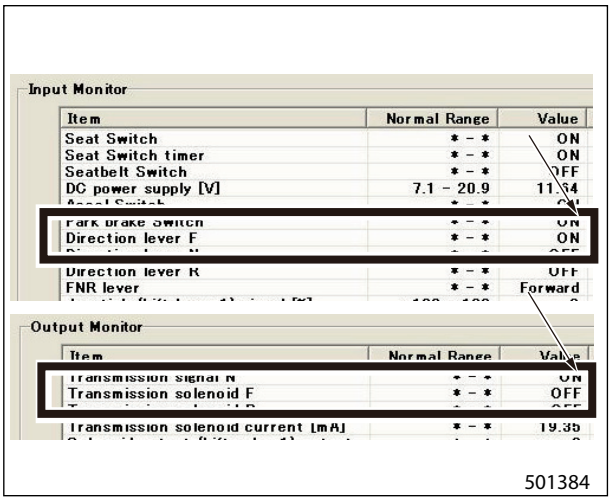


(8) Make sure that the neutral icon (N) on the meter panel blinks. Blinking of N icon means that the driving interlock is activated.



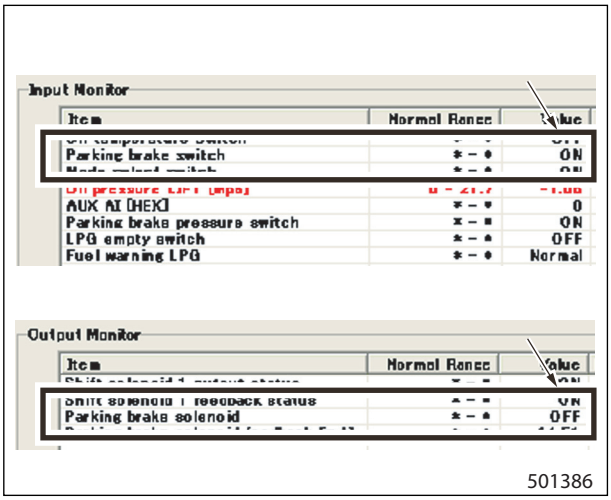
1. Blinking

(9) When the driving interlock is activated, T/M control valve (F) output is not turned ON even if the status of the direction lever (F) input is ON.



(10) When the driving interlock is activated, make sure that the parking brake solenoid is OFF even if the parking brake switch is ON.

Note: Because this forklift truck's parking brake is a negative type parking brake, the parking brake is activated when the solenoid is OFF.



(11) To unlock the driving interlock, sit on the operator seat and return the direction lever to the NEUTRAL position. At this time, make sure that the driving interlock indicating N icon changes from blinking to a steady glow.

If seat switch is not turned ON

Check the seat switch operation and wiring connections by referring to 4-41 "Harness Codes", 4-41 "VCM-6", and 4-58 "Seat Switch".

When T/M forward/backward solenoid warning occurs

Check the solenoid output by referring to 4-34 "Active Test Inspection Procedure". If the solenoid output will not turn ON even after the active test inspection, see 4-62 "Truck Status Display and Troubleshooting".

Check for the possible causes of the diagnostic code F-85, F-87 and F-89.

When a speed or speed sensor warning occurs

See 4-62 "Truck Status Display and Troubleshooting" to check for the possible causes of the diagnostic code F-17 and F-34.

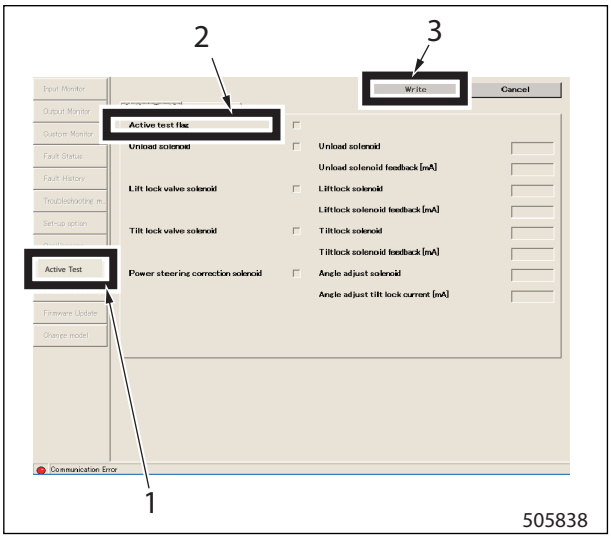
5.3 Active Test Inspection Procedure

⚠ CAUTION

During the active test inspection, the front wheels will rotate. To prevent the forklift truck from moving, be sure to block or raise the front wheels before conducting active test inspection.

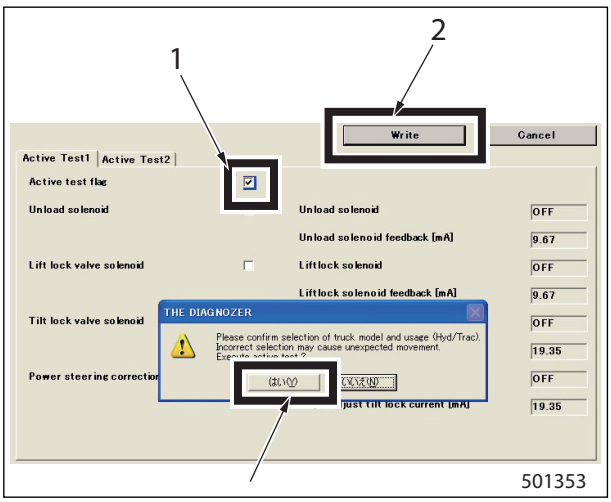
(1) Connect the service tool and turn the key switch to the ON position.
(Do not turn the engine ON.)

(2) Display the active test screen by pressing the active test button in the service tool screen.



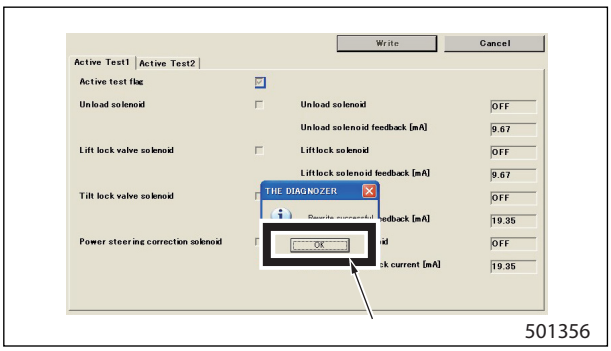
1. Active test
2. Active test flag
3. Write button

(3) Insert a check mark in the box of the active test flag, and press the write button. When the write confirmation dialogue box is displayed, press the YES button.



1. Checkmark
2. Write button

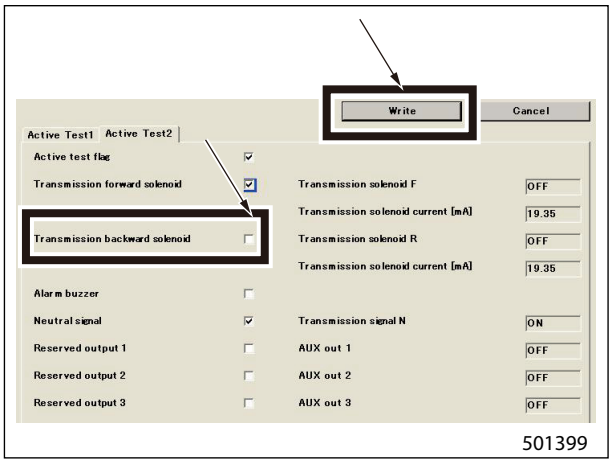
(4) When the write completed dialogue box is displayed, press the OK button.



(5) Insert a check mark in the box of either T/M solenoid F or T/M solenoid R, and press the write button.

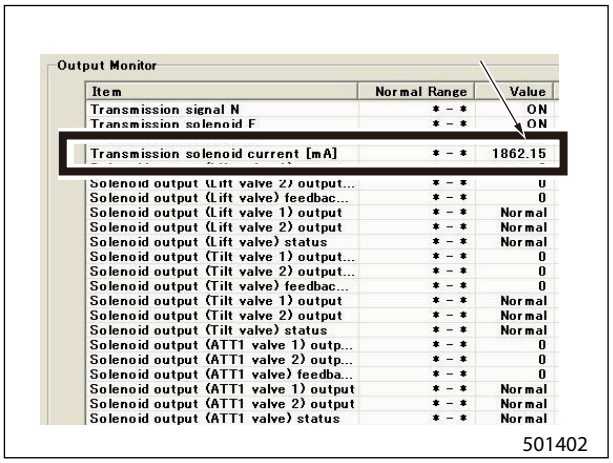
(6) When the write confirmation dialogue box is displayed, press the YES button the same as (4) above, and when the write completed dialogue box is displayed, press the OK button to complete the set-up.

Note: Do not check both boxes of T/M solenoid F or T/M solenoid R to avoid the controller damage.



501399

(7) Press the output monitor button in the service tool screen to display the output monitor screen.
Make sure that the T/M control valve current is 1000 mA or around.



501402

(8) After confirmation, turn the key switch to the OFF position to terminate the active test. (Be sure to turn OFF the key switch before moving on the next operation).

Note: If a defect is found, see 4-62 "Truck Status Display and Troubleshooting" and check for the possible causes of the diagnostic code F-85, F-87, and F-89.

6. Seat Belt Warning Icon

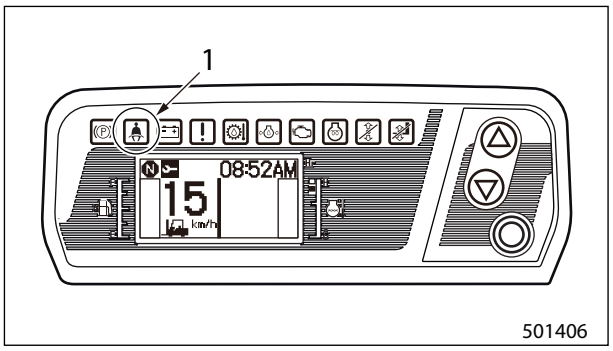
6.1 Function of Seat Belt Warning Icon

Seat belt warning icon

This icon blinks when the seat belt is not worn or not buckled properly.

Controller function

The controller sends a warning signal to the meter panel if the seat belt is not fastened.

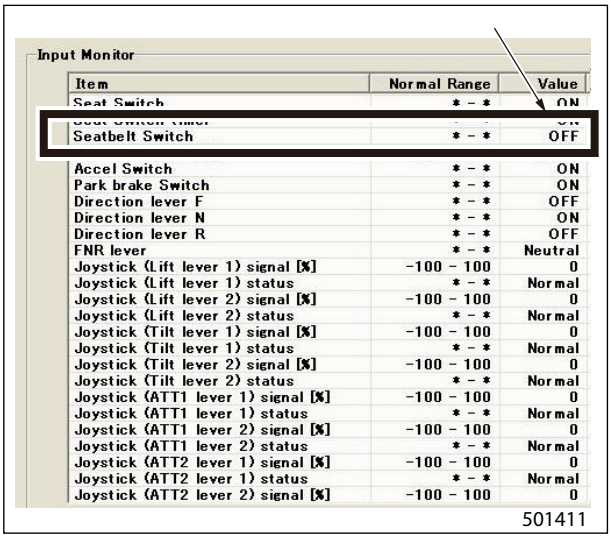


501406

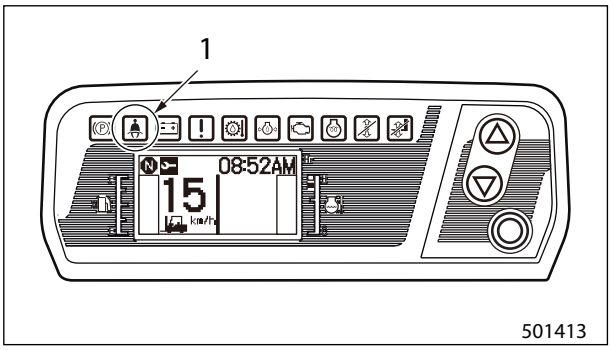
1. Seat belt warning icon

6.2 Checking the Operation of Seat Belt Warning Icon

(1) Connect the service tool to VCM-6 controller.
(2) Turn the key switch to the ON position and start the engine.
(3) Display the input monitor screen of the service tool.
(4) Make sure that the seat switch status is turned OFF when the seat belt is not fastened or not buckled properly.
Also check that the seat belt warning icon in the meter panel glows.



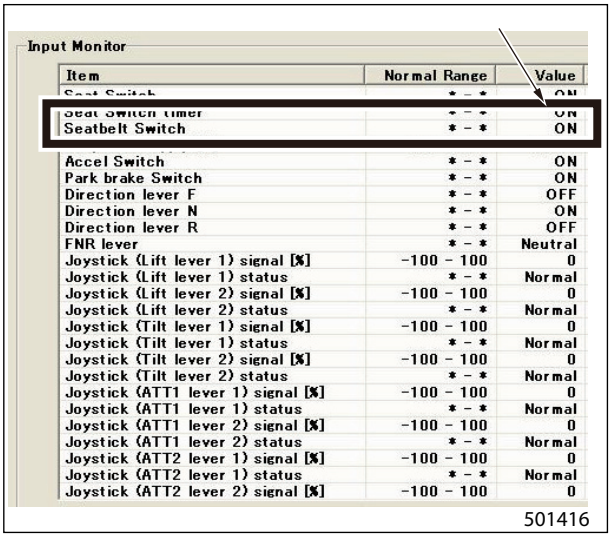
501411



501413

1. Illuminates

(5) Make sure that the seat belt switch turns ON and the seat belt warning icon in the meter panel goes out when the seat belt is properly fastened.

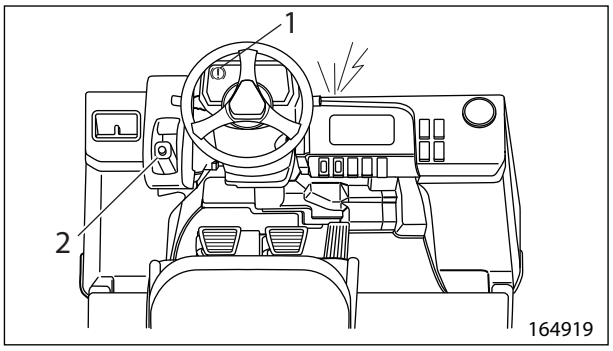


501416

7. Parking Brake Warning Alarm and Warning Icon

7.1 Checking the Operation of Parking Brake Warning Alarm/Warning Icon

Regardless whether the engine is stopped or running, leaving the operator seat with the parking brake released activates the operator presence switch to cause the warning alarm to sound.



1. Parking brake warning icon 2. Parking brake lever

⚠ CAUTION

(1) Before operating the forklift truck, be sure to check the parking brake warning icon and buzzer work properly.

(2) The warning alarm and the warning icon alert the operator to set the parking brake lever before leaving the forklift truck. Properly maintain the warning alarm and icon so that they function correctly.

(3) How to park the forklift truck:
- Park the forklift truck on a hard and level surface.
- Place the direction lever in the NEUTRAL position.
- Lower the forks until the fork tips touch the floor/ground.
- Apply the parking brake.
- Turn the engine OFF and remove the key.

(4) When replacing the operator seat with a new one, be sure to use a genuine Mitsubishi forklift truck seat with the operator presence switch.

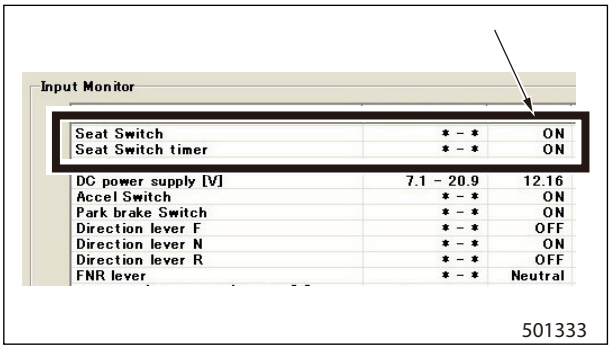
Controller function

With the key switch in the ON position, the controller turns the warning alarm output ON if it detects that the operator seat is vacant and the parking brake is released. (Warning alarm activates).

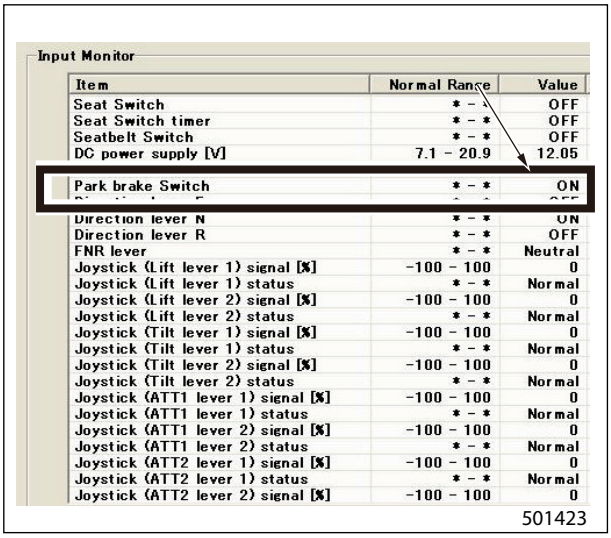
When the key switch is in the OFF position, the VCM-6 controller does not activate since the power to the controller is OFF. In this case, the relay circuit causes the warning alarm to activate.

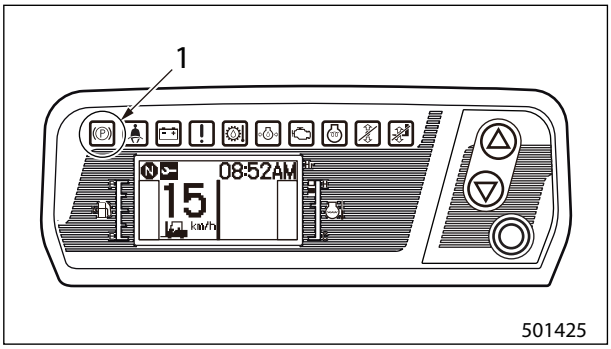
7.2 Parking Brake Warning Alarm

(1) Connect the service tool to the VCM-6 controller.
(2) Turn the key switch to the ON position and start the engine. (Keep the parking brake engaged).
(3) Display the input monitor screen of the service tool.
(4) Sit in the operator seat and make sure that the seat switch status and the seat switch timer are ON on the input monitor screen.



(5) Make sure the parking brake switch turns ON on the input monitor screen.
Also make sure the parking brake warning icon glows.

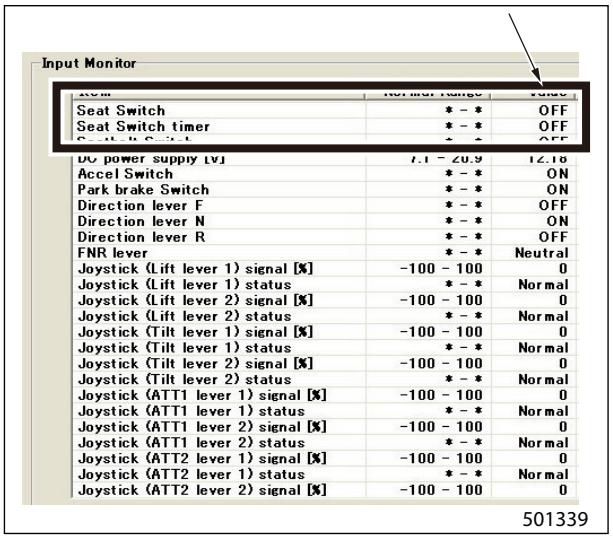


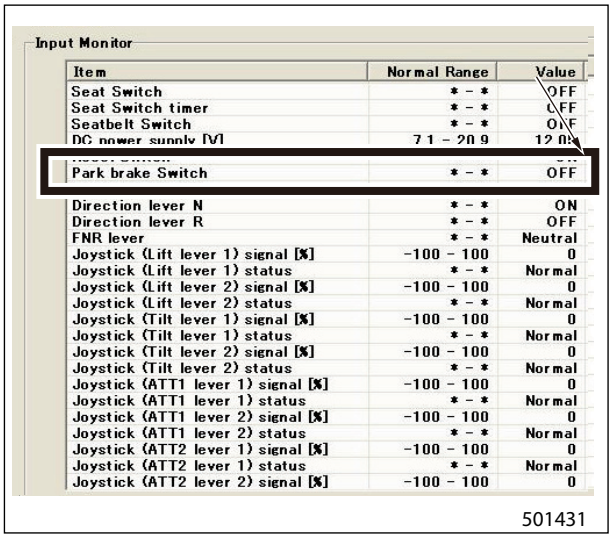


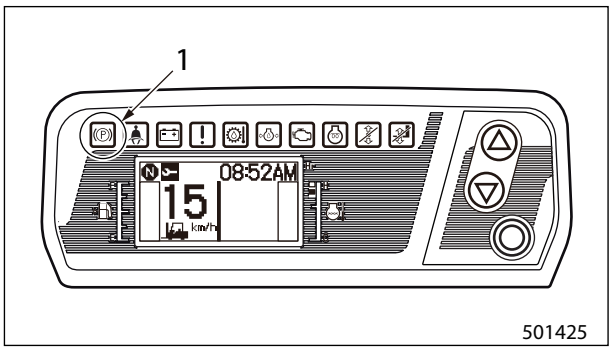
1. Illuminates

(6) Release the parking brake and leave the operator seat.

(7) Make sure that seat switch and the parking brake switch turn OFF in the input monitor screen.
Also make sure that the parking brake warning icon in the meter panel goes out and the warning alarm activates.







1. OFF

(8) Apply the parking brake. Make sure that the parking brake warning icon in the meter panel illuminates and the buzzer stops sounding.

7.3 Checking the Operation of Parking Brake Warning Alarm/Warning Icon With Key in OFF Position

(1) Lock the parking brake and keep it locked. Place the direction lever in NEUTRAL. Turn the key switch to the OFF position and turn OFF the engine. The power to the VCM-6 controller and meter panel will be turned OFF.
(2) Make sure that the parking brake warning alarm activates when the parking brake is released. (This function is not affected by the seat switch status).
(3) Make sure that the parking brake warning alarm stops when the parking brake is shifted to the locked position.

⚠ CAUTION

Be sure to park the forklift truck on a hard and level surface to check this function.

If seat switch is not turned ON

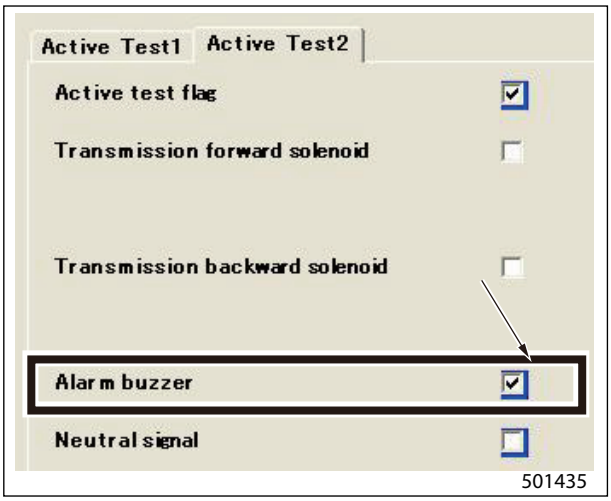
Check the seat switch operation and wiring connections by referring to 4-41 "Harness Codes", 4-41 "VCM-6", and "4-58 "Seat Switch".

If parking brake switch is not turned ON

Check the parking switch operation and wiring connections by referring to 4-41 "Harness Codes", 4-41 "VCM-6", and "4-58 "Parking Brake Switch".

If warning alarm is not turned ON

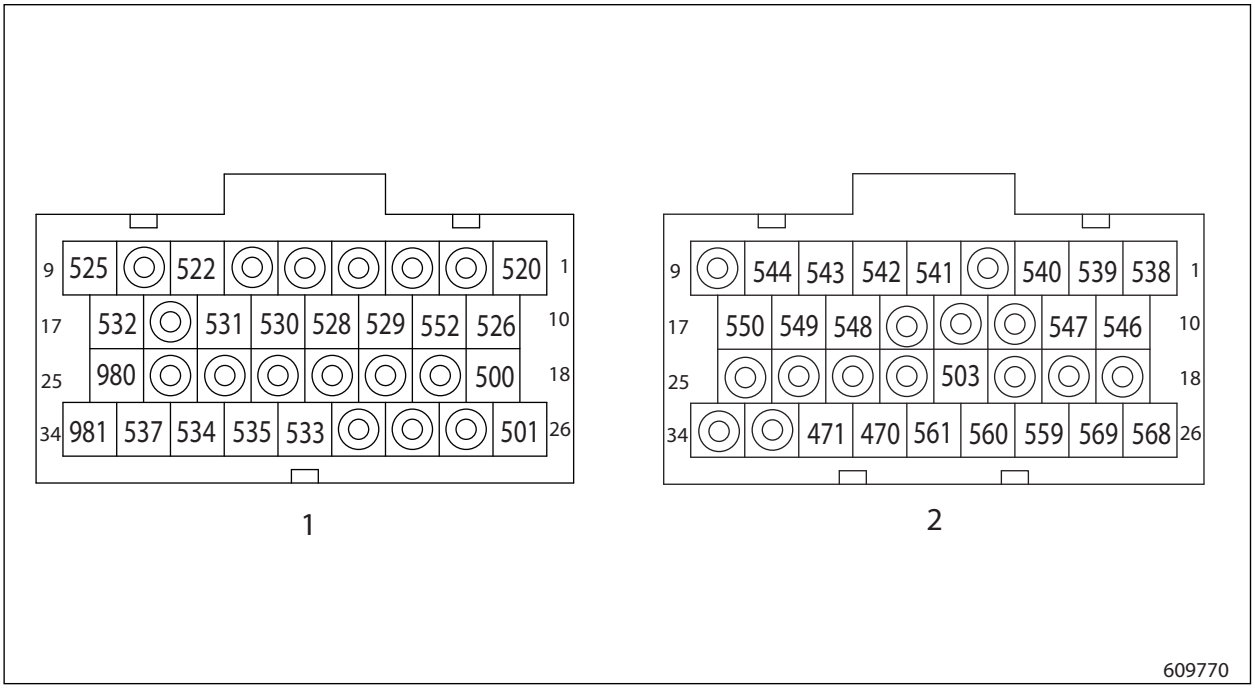
If the warning alarm is not turned ON, check the warning alarm output by referring to 4-26 "Active Test Inspection Procedure".
If the warning alarm does not activate even after the active test inspection, check the wiring connections by referring to 4-41 "Harness Codes", 4-41 "VCM-6", 4-60 "Warning Alarm", 4-60 "Warning Alarm Relay", and 4-61 "Warning Alarm Circuit".



8. Harness Codes

8.1 VCM-6

VCM-6 pin assignments



1. VCM-6 (E-01)
2. VCM-6 (E-02)

VCM-6 controller signal assignments (E-01)

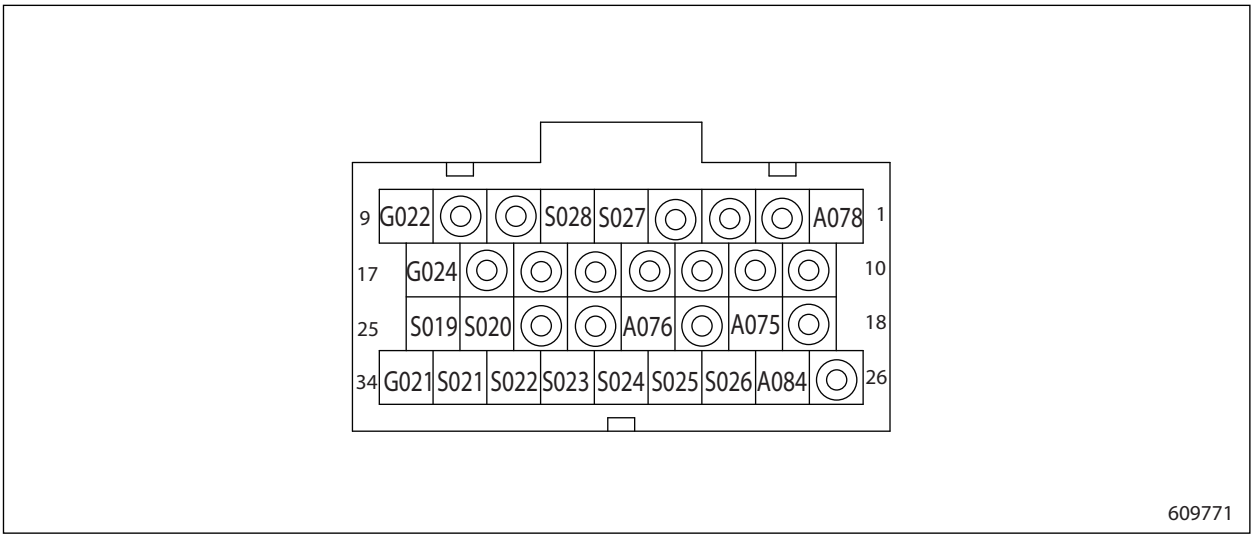
Pin No.	Wire No. (Wire Color)	Signal Name
1	520 (G)	Mode select switch
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	522 (W)	Power selector switch
8	-	-
9	525 (Br)	Direction lever switch (F)
10	526 (L/W)	Direction lever switch (R)
11	552 (L)	T/M shift solenoid output
12	529 (Y/R)	Auto light sensor (+)
13	528 (Y/b)	Auto light sensor (-)
14	530 (R/Y)	Oil pressure sensor (+5V)
15	531 (Y/L)	Oil pressure sensor signal
16	-	-
17	532 (L)	Oil pressure sensor GND
18	500 (2R)	Power supply (+12V)
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	980 (2B)	Power supply GND
26	501 (R)	Power supply (+12V)
27	-	-
28	-	-
29	-	-
30	533 (R/W)	Unload solenoid output (+)
31	535 (Y/W)	Lift lock solenoid (+)
32	534 (G/W)	Unload solenoid (-)
33	537 (Y)	Warning alarm output
34	981 (2B)	Power supply GND

VCM-6 controller signal assignments (E-02)

Pin No.	Wire No. (Wire Color)	Signal Name
1	538 (L/W)	Seat switch
2	539 (G/W)	Seat belt switch
3	540 (G/R)	Direction lever switch (N)
4	-	-
5	541 (Br)	Weight zero set switch
6	542 (Y/L)	Coolant low level switch
7	543 (R/Y)	Air cleaner clog switch
8	544 (Br/W)	Torque converter oil temperature switch
9	-	-
10	546 (G)	Speed sensor signal (+)
11	547 (G/B)	Speed sensor signal (-)
12	-	-
13	-	-
14	-	-
15	548 (W)	Transmission solenoid F (+)
16	549 (Y)	Transmission solenoid R (+)
17	550 (R/B)	Transmission solenoid (-)
18	-	-
19	-	-
20	-	-
21	503 (W/R)	Auto light relay (-)
22	-	-
23	-	-
24	-	-
25	-	-
26	568 (Y/B)	GND
27	569 (Y/R)	FWE
28	559 (W/L)	RX-232C TXD
29	560 (W/G)	RS-232C RXD
30	561 (L/B)	RX-232C GND
31	470 (P)	CAN H
32	471 (P/G)	CAN L
33	-	-
34	-	-

8.2 Input Unit and Output Unit (FC model)

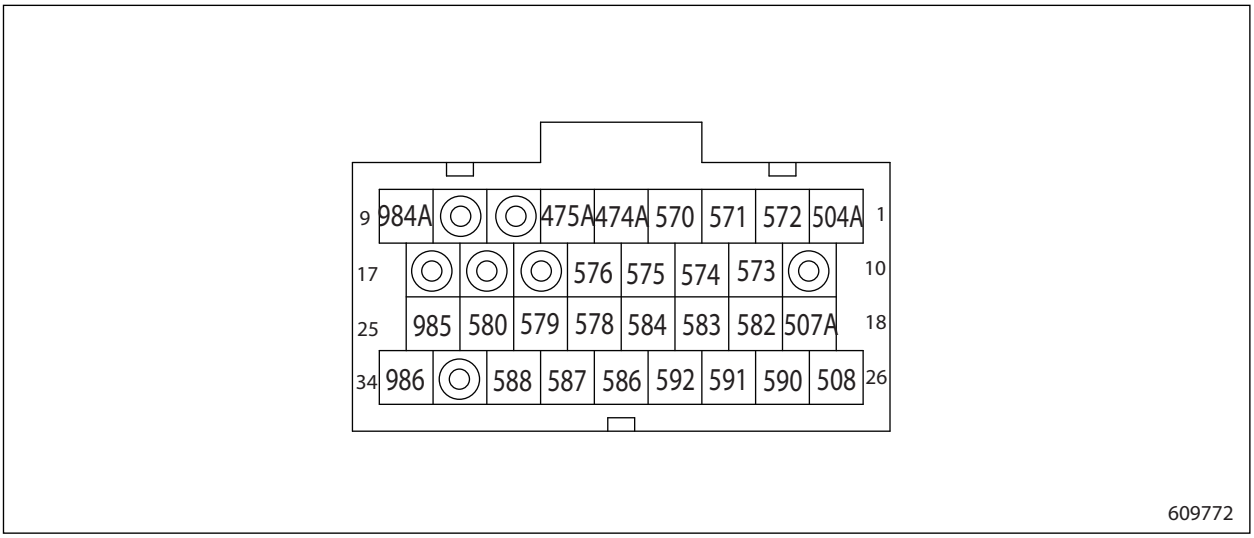
Input unit pin assignments



Input unit signal assignments (E-04)

Pin No.	Wire No. (Wire Color)	Signal Name
1	A078 (1.25 Y/B)	Power supply (+12V)
2	-	-
3	-	-
4	-	-
5	S027 (W/B)	CAN H
6	S028 (L/R)	CAN L
7	-	-
8	-	-
9	G022 (0.85 B)	GND
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	G024 (B/Y)	Switch GND
18	-	-
19	-	-
20	-	-
21	A076 (L/R)	Digital input 3
22	-	-
23	-	-
24	S020 (G/L)	Analog input 7/Attachment 2/3 lever (Option)
25	S019 (G/B)	Analog input 8/Attachment 2/3 lever (Option)
26	-	-
27	A084 (L/R)	Analog 5V (lift)
28	S026 (W/Y)	Analog input 1 (lift)
29	S025 (W/R)	Analog input 2 (lift)
30	S024 (Y/B)	Analog input 3 (tilt)
31	S023 (Y/L)	Analog input 4 (tilt)
32	S022 (L/Y)	Analog input 5/Attachment 1 lever (Option)
33	S021 (L/B)	Analog input 6/Attachment 1 lever (Option)
34	G021 (B/L)	Analog GND

Output pin assignments (E-03)

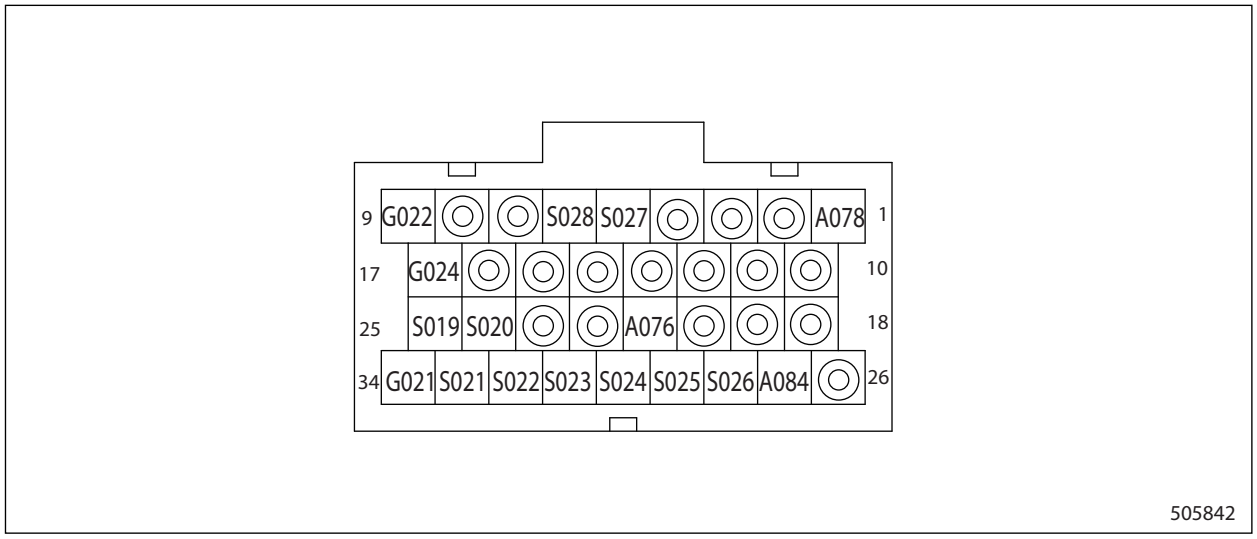


Output signal assignments

Pin No.	Wire No. (Wire Color)	Signal Name
1	504A (R/L)	Power supply (+12V)
2	-	-
3	-	-
4	-	-
5	474A (P)	CAN H
6	475A (P/G)	CAN L
7	-	-
8	-	-
9	984A (0.85B)	GND
10	-	-
11		-
12	574 (W/L)	Solenoid PMW 9 (+)
13	575 (W/R)	Solenoid PMW 10 (+)
14	576 (W/G)	Solenoid PMW 9 (-)/10 (-)
15	-	-
16	-	-
17	-	-
18	507A (R/B)	Emergency stop button
19	582 (G)	Solenoid PMW 5 (+) /Attachment 1 lever (Option)
20	583 (G/W)	Solenoid PMW 6 (+) /Attachment 1 lever (Option)
21	584 (G/B)	Solenoid PMW 5 (-), 6 (-) /Attachment 1 lever (Option)
22	578 (Y)	Solenoid PMW 7 (+) /Attachment 2 lever (Option)
23	579 (Y/L)	Solenoid PMW 8 (+) /Attachment 2 lever (Option)
24	580 (Y/B)	Solenoid PMW 7 (-), 8 (-) /Attachment 2 lever (Option)
25	985 (0.85 B/W)	GND (solenoid)
26	508 (R/B)	Emergency stop button
27	590 (Br)	Solenoid PMW 1 (+) /Lift up
28	591 (L)	Solenoid PMW 2 (+) /Lift down
29	592 (L/B)	Solenoid PMW 1 (-), 2 (-) /Lift up
30	586 (R/W)	Solenoid PMW 3 (+) /Tilt forward
31	587 (L/W)	Solenoid PMW 4 (+) /Tilt backward
32	588 (W/B)	Solenoid PMW 3 (-), 4 (-) /Tilt backward
33	-	-
34	986 (0.85B/W)	GND (solenoid)

8.3 Input Unit and Output Unit

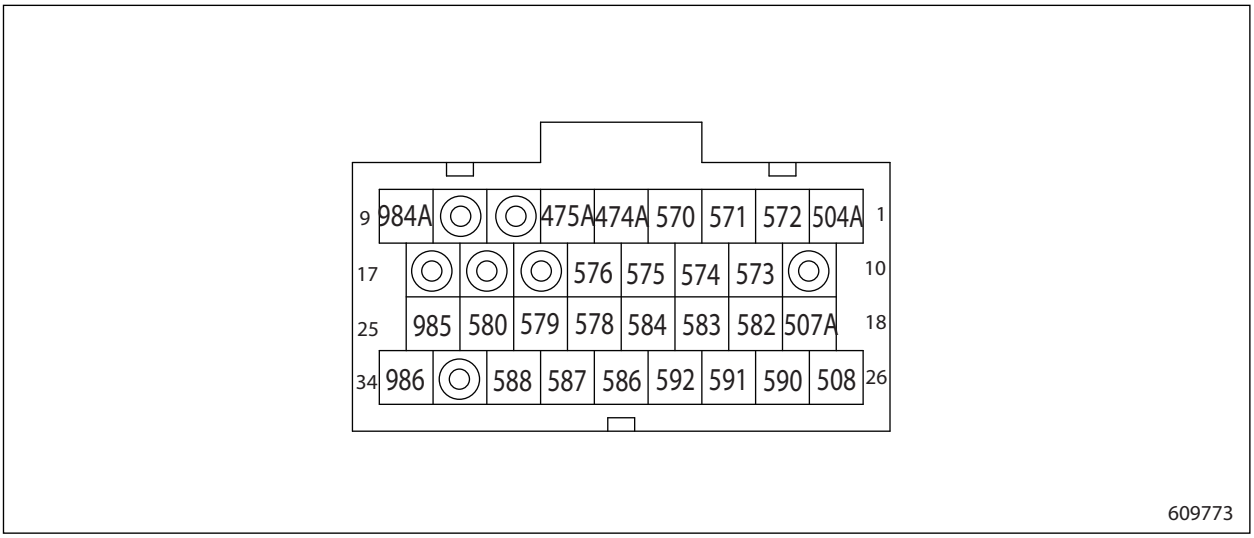
Input unit pin assignments



Input unit signal assignments (E-04)

Pin No.	Wire No. (Wire Color)	Signal Name
1	A078 (1.25 Y/B)	Power (+12V)
2	-	-
3	-	-
4	-	-
5	S027 (W/B)	CAN H
6	S028 (L/R)	CAN L
7	-	-
8	-	-
9	G022 (0.85 B)	GND
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	G024 (B/Y)	Switch GND
18	-	-
19	-	-
20	-	-
21	A076 (L/R)	Digital input 3
22	-	-
23	-	-
24	S020 (G/L)	Analog input 7 /Attachment 2/3 lever (option)
25	S019 (G/B)	Analog input 8 /Attachment 2/3 lever (option)
26	-	-
27	A084 (L/R)	Analog 5V (Lift)
28	S026 (W/Y)	Analog input 1 (Lift)
29	S025 (W/R)	Analog input 2 (Lift)
30	S024 (Y/B)	Analog input 3 (Tilt)
31	S023 (Y/L)	Analog input 4 (Tilt)
32	S022 (L/Y)	Analog input 5 /Attachment 1 lever (option)
33	S021 (L/B)	Analog input 6 /Attachment 1 lever (option)
34	G021 (B/L)	Analog GND

Output unit pin assignments (E-03)

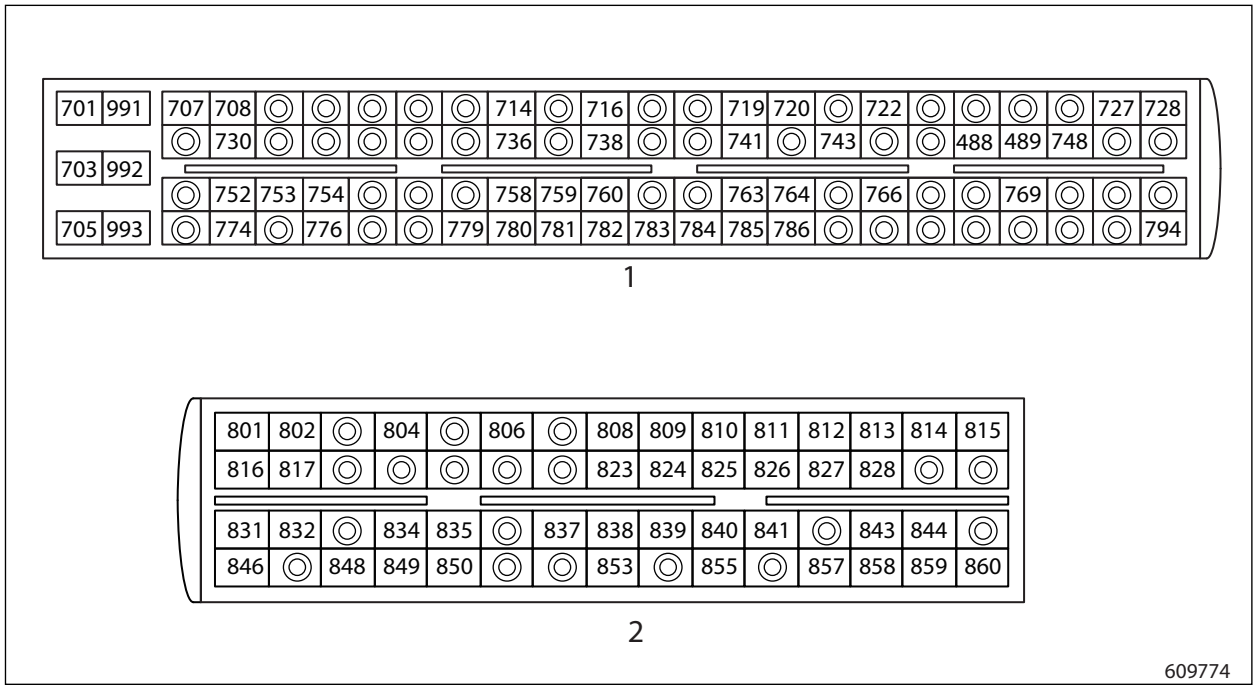


Output unit signal assignments

Pin No.	Wire No. (Wire Color)	Signal Name
1	504A (R/L)	Power (+12V)
2	-	-
3	-	-
4	-	-
5	474A (P)	CAN H
6	475A (P/G)	CAN L
7	-	-
8	-	-
9	984A (0.85B)	GND
10	-	-
11		-
12	574 (W/L)	Solenoid PMW 9 (+)
13	575 (W/R)	Solenoid PMW 10 (+)
14	576 (W/G)	Solenoid PMW 9 (-)/10 (-)
15	-	-
16	-	-
17	-	-
18	507A (R/B)	Emergency stop button
19	582 (G)	Solenoid PMW 5 (+) /Attachment 1 lever (option)
20	583 (G/W)	Solenoid PMW 6 (+) /Attachment 1 lever (option)
21	584 (G/B)	Solenoid PMW 5 (-), 6 (-) /Attachment 1 lever (option)
22	578 (Y)	Solenoid PMW 7 (+) /Attachment 2 lever (option)
23	579 (Y/L)	Solenoid PMW 8 (+) /Attachment 2 lever (option)
24	580 (Y/B)	Solenoid PMW 7 (-), 8 (-) / Attachment 2 lever (option)
25	985 (0.85 B/W)	GND (Solenoid)
26	508 (R/B)	Emergency stop button
27	590 (Br)	Solenoid PMW 1 (+) /Lift up
28	591 (L)	Solenoid PMW 2 (+) /Lift down
29	592 (L/B)	Solenoid PMW 1 (-), 2 (-) /Lift up
30	586 (R/W)	Solenoid PMW 3 (+) /Tilt forward
31	587 (L/W)	Solenoid PMW 4 (+) /Tilt backward
32	588 (W/B)	Solenoid PMW 3 (-), 4 (-) /Tilt backward
33	-	-
34	986 (0.85B/W)	GND (Solenoid)

8.4 ECM

ECM controller pin assignments



1. ECM (H-01)
2. ECM (H-02)

ECM controller signal assignments (H-01)

Pin No.	Wire No. (Wire Color)	Signal Name
1	701 (1.25 R/B)	Battery + (A)
2	991 (3B)	Battery - (1)
3	703 (3R)	Battery + (B)
4	992 (2B)	Battery - (2)
5	705 (2R)	Battery + (C)
6	993 (2B)	Battery - (3)
7	707 (Lg/Y)	Lambda sensor heating
8	708 (Y)	Start request input
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	714 (Br/B)	DPF pressure sensor supply
15	-	-
16	716 (R)	Throttle 1 5V supply
17	-	-
18	-	-
19	719 (G/R)	Air temperature signal

Pin No.	Wire No. (Wire Color)	Signal Name
20	720 (G/Y)	Air temperature GND
21	-	-
22	722 (L/W)	Glow plug control feedback
23	-	-
24	-	-
25	-	-
26	-	-
27	727 (Y/B)	Start control output battery (-)
28	728 (L)	Main relay
29		
30	730 (Y/W)	Water IN fuel switch
31		
32		
33		
34		
35		
36	736 (Br/Y)	DPF pressure sensor GND
37		
38	738 (B/W)	Throttle 1 GND
39		
40		
41	741 (L/B)	Glow plug control GND
42		
43	743 (L)	DPF force regeneration switch
44		
45		
46	488 (G)	CAN H
47	489 (G/W)	CAN L
48	748 (Y/G)	DPF disabled lamp
49		
50		
51		
52	752 (L/R)	Glow plug control command
53	753 (Y/R)	Start control output battery (+)
54	754 (Y/B)	IGN switch
55		
56		
57		

Pin No.	Wire No. (Wire Color)	Signal Name
58	758 (Br/R)	DPF pressure sensor signal
59	759 (R/B)	Manual regeneration interlock
60	760 (G)	Throttle 1 signal
61		
62		
63	763 (Lg/W)	Lambda voltage
64	764 (Lg)	Lambda sensor current pump
65		
66	766 (L/W)	Regeneration disable switch
67		
68		
69	769 (Y/R)	Oil pressure lamp
70		
71		
72		
73		
74	774 (Y/L)	HEST lamp
75		
76	776 (G/W)	Throttle 1 IVS signal
77		
78		
79	779 (Y/R)	DOC inlet temperature sensor GND
80	780 (Y)	DOC inlet temperature sensor signal
81	781 (L/B)	Exhaust gas temperature GND
82	782 (L/O)	Exhaust gas temperature signature
83	783 (Br/W)	DPF inlet temperature sensor GND
84	784 (Br)	DPF inlet temperature sensor signal
85	785 (Lg/R)	Lambda virtual GND
86	786 (Lg/B)	Lambda current adjust
87		
88		
89		
90		
91		
92		
93		
94	794 (Y/B)	DPF lamp

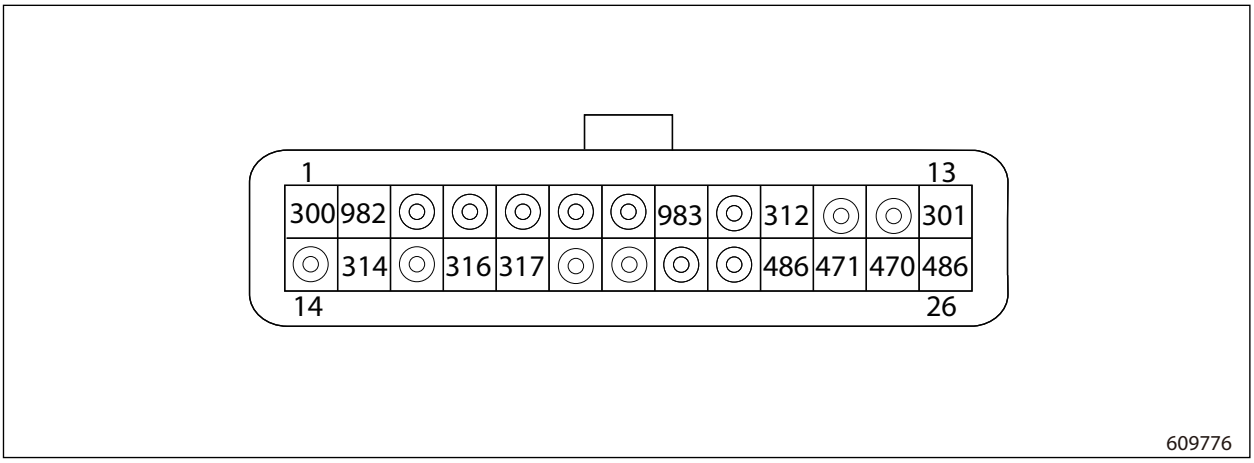
ECM controller signal assignments (H-02)

Pin No.	Wire No. (Wire Color)	Signal Name
1	801 (2 G/B)	Injector 1 HIGH bank 2
2	802 (2 Lg/R)	Injector 2 HIGH bank 2
3		
4	804 (Y)	Electric waste gate value actuator
5		
6	806 (L/R)	Oil pressure switch
7		
8	808 (Br)	TVA position sensor supply
9	809 (Y/G)	EGR position sensor supply
10	810 (G/R)	Boost pressure sensor supply
11	811 (L/O)	Fuel rail pressure sensor supply
12	812 (Lg/Y)	Exhaust gas absolute pressure sensor supply
13	813 (Br/R)	Camshaft speed sensor supply
14	814 (Br/B)	Camshaft speed sensor signal
15	815 (1.25 L)	Fuel metering unit supply
16	816 (2 G/Y)	Injector 1 HIGH bank 1
17	817 (2 Lg)	Injector 2 HIGH bank 1
18		
19		
20		
21		
22		
23	823 (G)	Fuel temperature sensor GND
24	824 (Y/W)	EGR position sensor GND
25	825 (G/B)	Boost pressure sensor GND
26	826 (L/Y)	Fuel rail pressure sensor GND
27	827 (Lg/B)	Exhaust gas absolute pressure sensor GND
28	828 (Br/Y)	Camshaft speed sensor GND
29		
30		
31	831 (2 G/L)	Injector 1 LOW bank 1
32	832 (2 G/R)	Injector 1 LOW bank 2
33		
34	834 (L/R)	TVA motor (-)
35	835 (Y/B)	EGR motor (-)
36		
37	837 (Br/B)	TVA position sensor GND
38	838 (G/W)	Fuel temperature sensor signal

Pin No.	Wire No. (Wire Color)	Signal Name
39	839 (Y/L)	EGR position sensor signal
40	840 (G/Y)	Boost pressure sensor signal
41	841 (L/B)	Fuel rail pressure sensor signal
42		
43	843 (Lg/W)	Exhaust gas absolute pressure sensor signal
44	844 (Br/W)	Crankshaft speed sensor (-)
45		
46	846 (2 Lg/B)	Injector 2 HIGH bank 2
47		
48	848 (2 Lg/Y)	Injector 2 LOW bank 2
49	849 (L)	TVA motor (+)
50	850 (Y/R)	EGR motor (+)
51		
52		
53	853 (Br/R)	TVA position sensor signal
54		
55	855 (G/L)	Turbo inlet temperature
56		
57	857 (Lg/R)	Coolant sensor signal
58	858 (Lg)	Coolant sensor GND
59	859 (Br)	Crankshaft speed sensor (+)
60	860 (1.25 L/W)	Fuel metering unit

8.5 Meter Panel

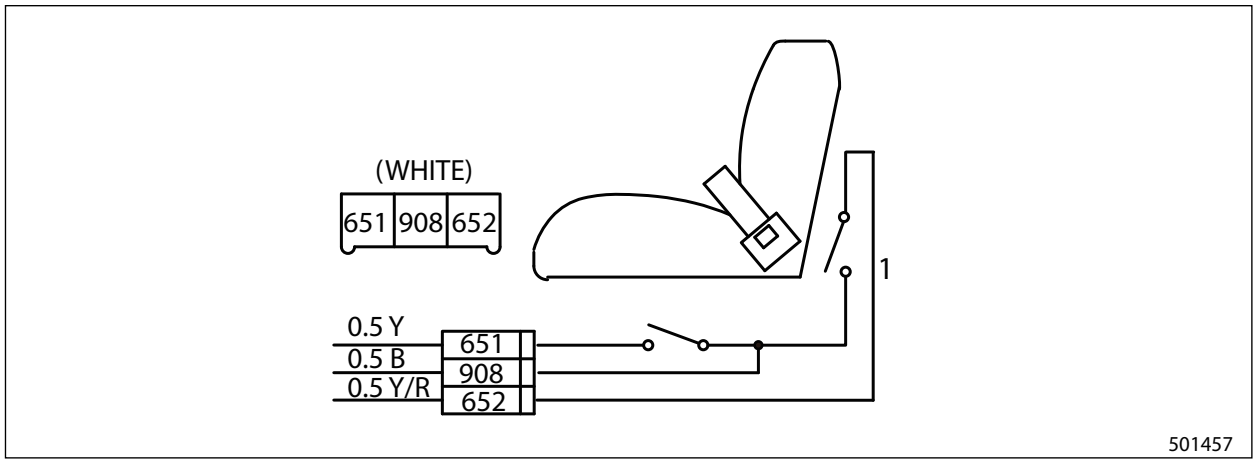
Meter panel pin assignments



Meter panel signal assignments (H-12)

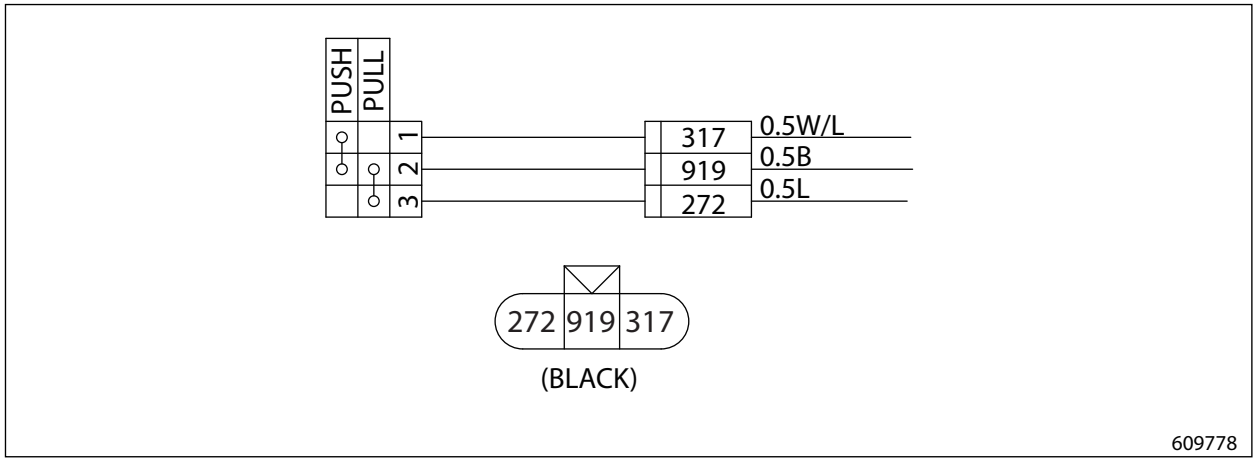
Pin No.	Wire No. (Wire Color)	Signal Name
1	300 (R/G)	Battery (+)
2	982 (B)	Truck body GND
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	983 (B)	Truck body GND
9	-	-
10	312 (G)	ALT L
11	-	-
12	-	-
13	301 (R/W)	IGN
14	-	-
15	314 (Y/B)	Fuel sensor
16	-	-
17	316 (W/R)	Brake fluid sensor
18	317 (L)	Parking brake
19	-	-
20	-	-
21	-	-
22	-	-
23	486 (P)	CAN terminal
24	471 (P/G)	CAN LOW
25	470 (P)	CAN HIGH
26	486 (P)	CAN terminal

8.6 Seat Switch

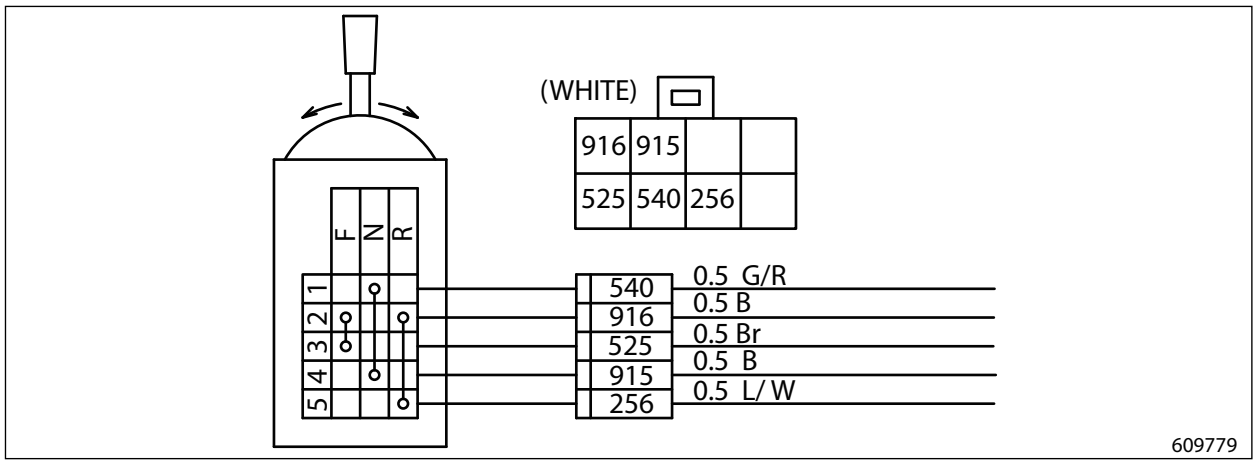


1. Seat belt

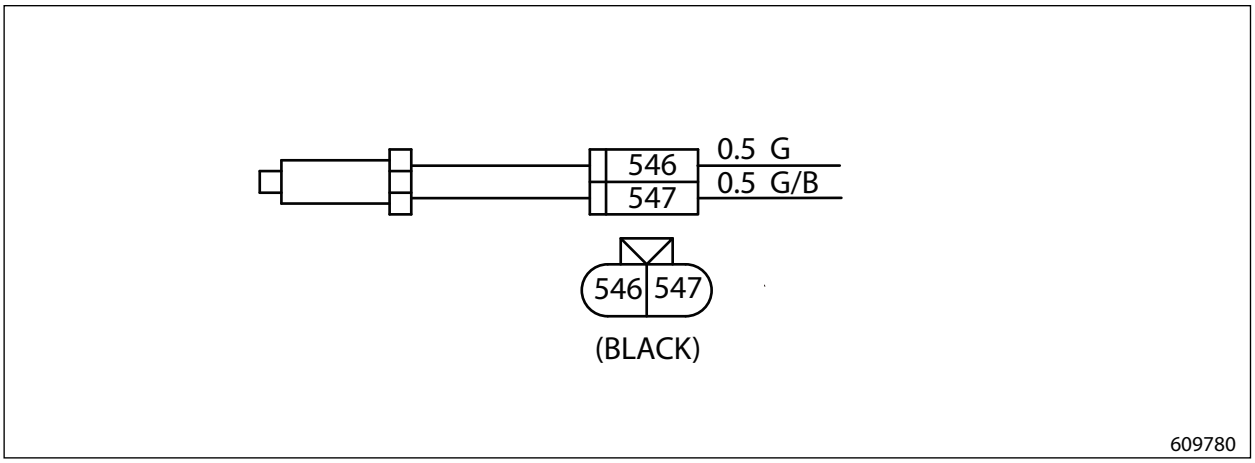
8.7 Parking Brake Switch



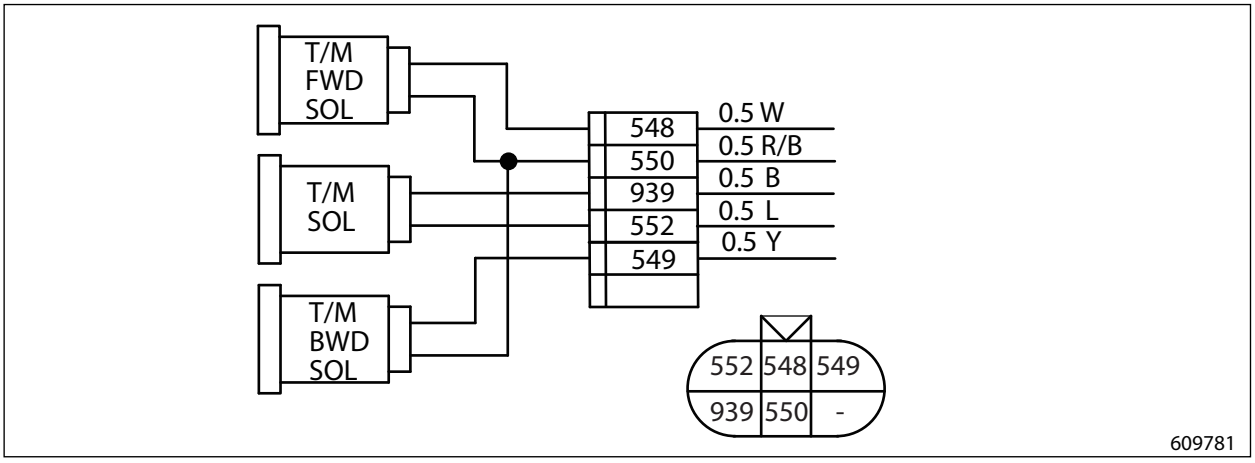
8.8 Direction Lever Switch



8.9 Travel Speed Sensor

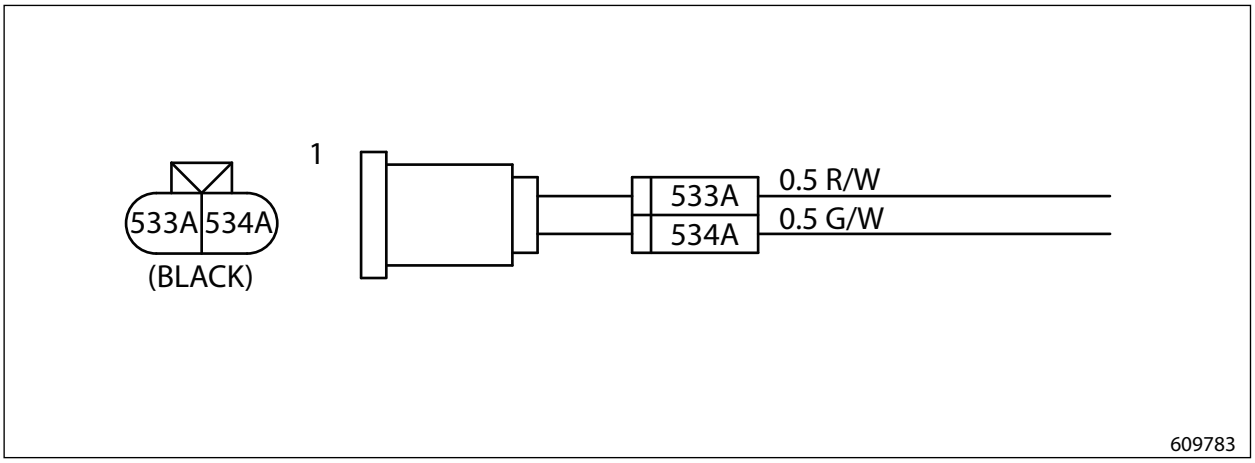


8.10 T/M Solenoid



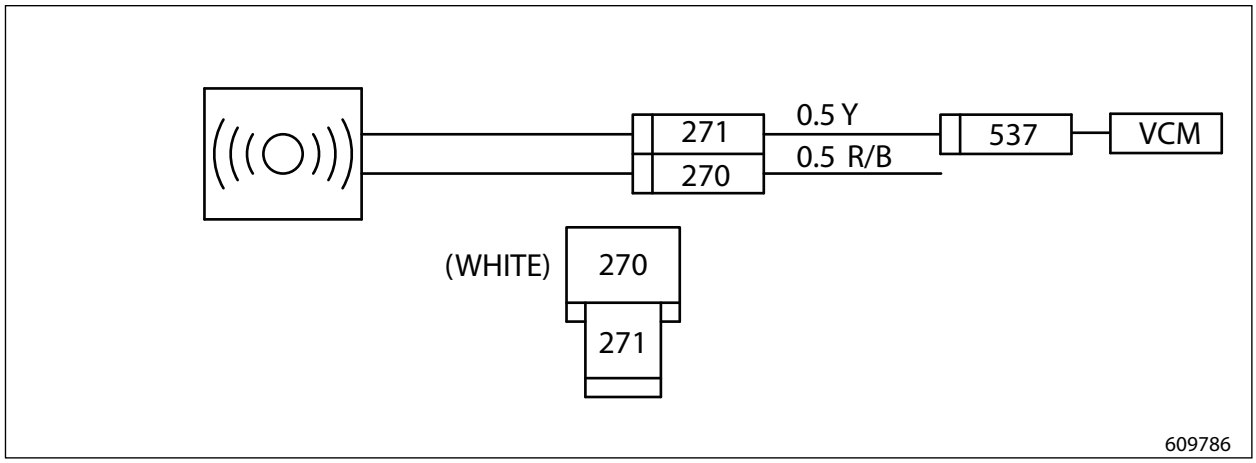
1. T/M forward/backward solenoid

8.11 Unload Solenoid



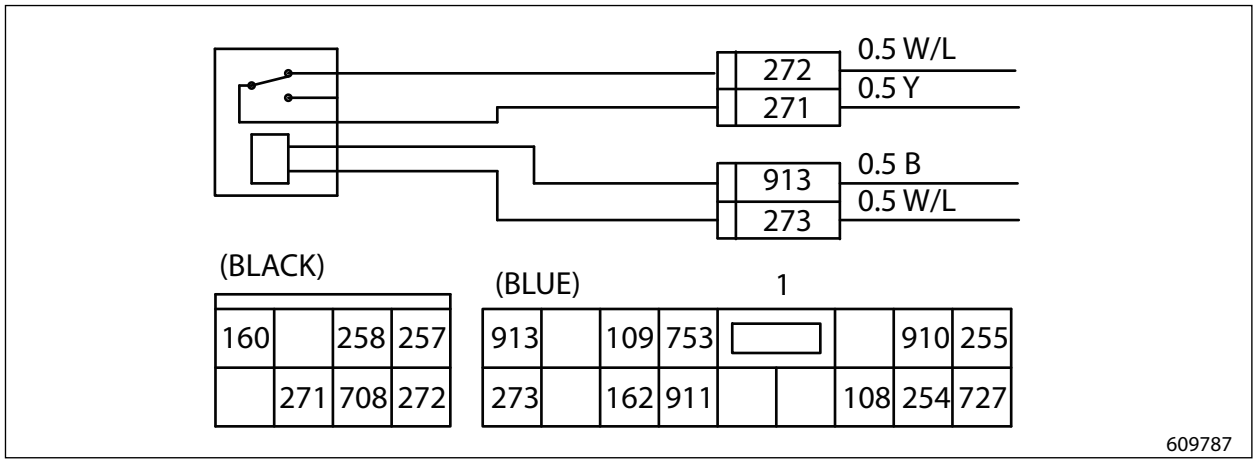
1. Unload solenoid

8.12 Warning Alarm



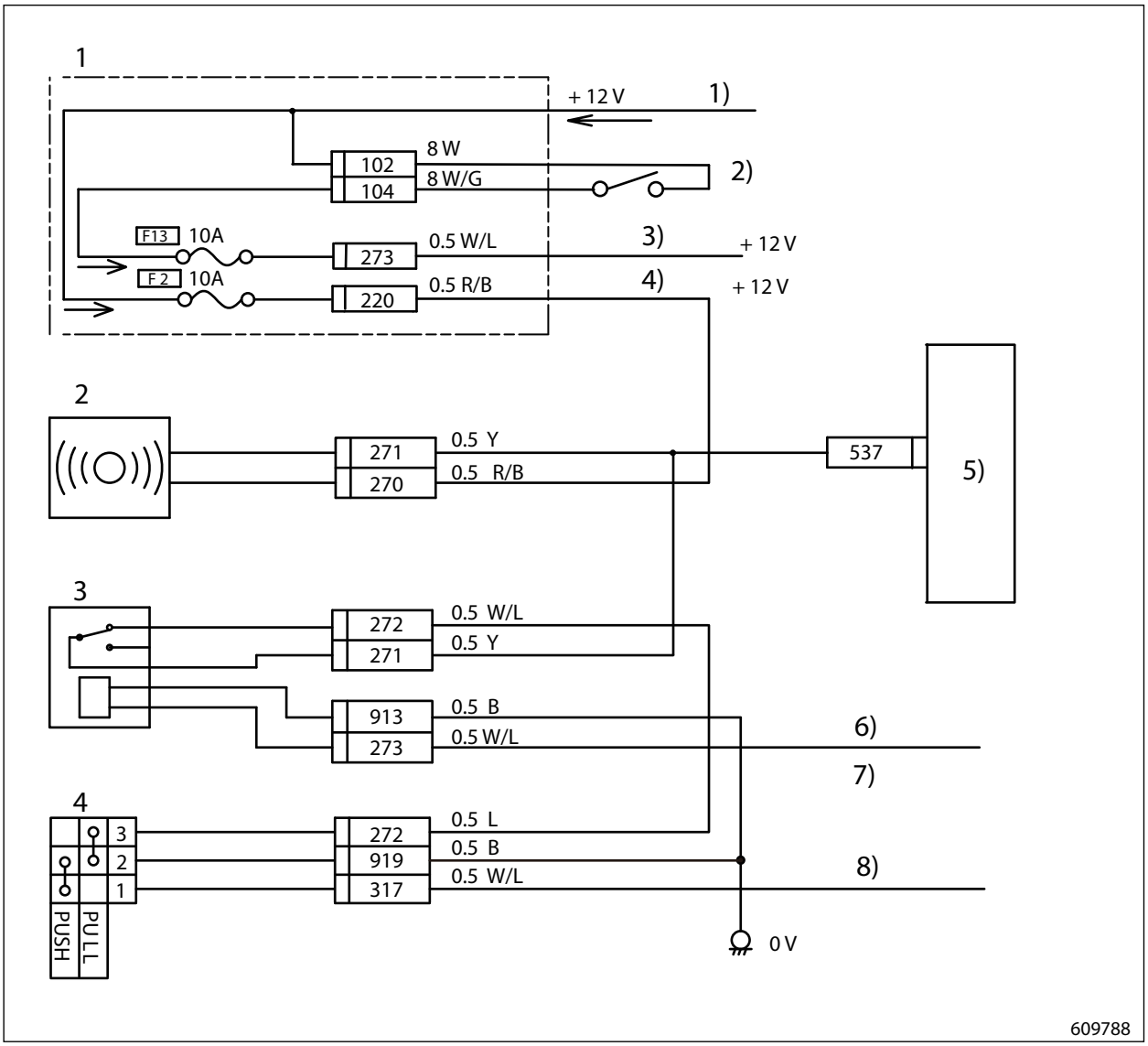
Note: Wire number 271 becomes 537 in the VCM-6 controller connector. (Wire harness branching)

8.13 Warning Alarm Relay



1. Relay box

8.14 Warning Alarm Circuit



1. Fuse box
2. Warning alarm
3. Warning alarm relay
4. Park brake switch

1) Always energized
2) Relay ON when key switch is ON
3) Warning alarm relay
4) Warning alarm
5) VCM-6 controller
6) To ECM
7) Parking brake buzzer activates if the key switch is turned OFF without applying the parking brake.
8) To meter panel and VCM-6

9. Truck Status Display and Troubleshooting

9.1 Truck Status Display

Truck status display

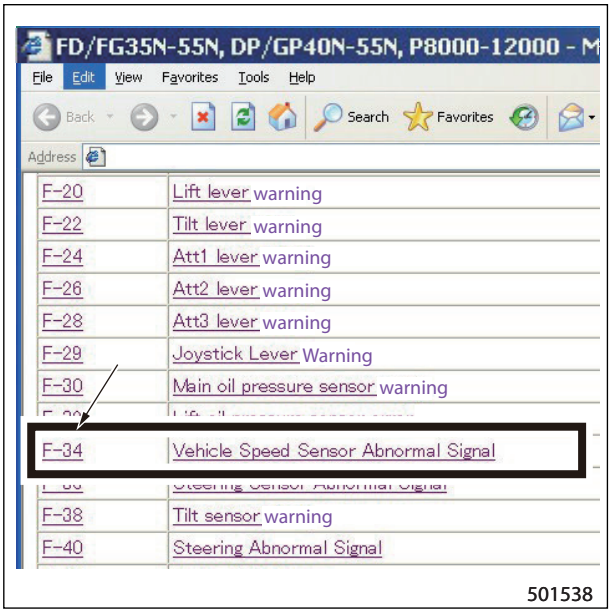
Warnings that have been present are displayed.

Troubleshooting

Display the truck status screen by clicking the truck status button either from the monitor menu or toolbox. When the screen is displayed, press the troubleshooting button on the bottom right of the screen to display a list of diagnostic codes and their descriptions.

Example: Diagnostic code 34 (Speed sensor warning)

(1) Connector contact bad
(2) Harness bad
(3) Speed sensor bad
(4) Controller bad



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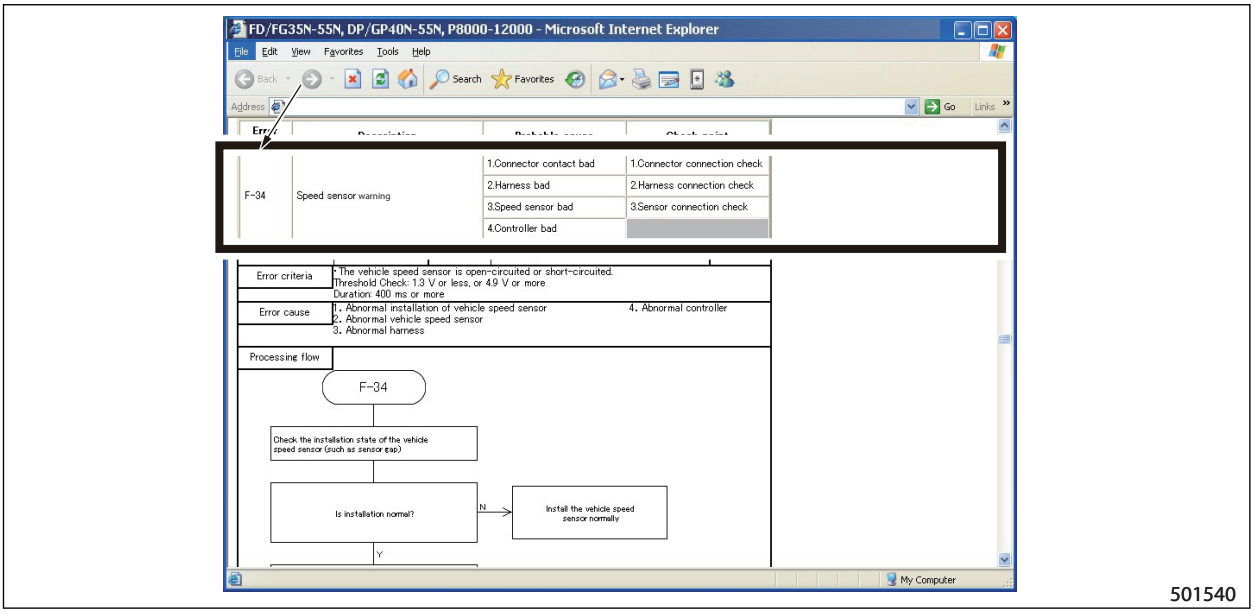
Check items

(1) Connector connection check
(2) Harness connection check
(3) Sensor connection check

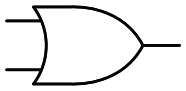
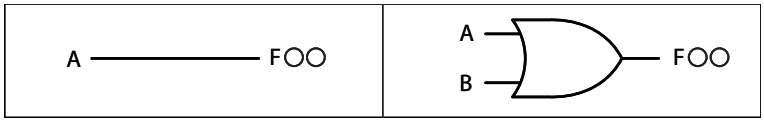


501540

9.2 Diagnosis Table (F Code)

Diagnostic code table

Diagnostic code descriptions

Diagnosis	Lift Lever Neutral Warning (F10) — Diagnostic name and diagnostic code
Logic conditions	· Input signal<2.3 V · Input signal>2.7V (when key switch is ON) — Diagnostic logic conditions  F10  Warning occurs under condition A Warning occurs under condition A or B
Recovery	Recovers automatically when the lever is placed in NEUTRAL. — Warning recovery condition
Action	· Turn OFF all solenoid outputs of operating functions. — Control action when warning occurs
LED blink pattern	C — See "LED blink pattern" on 4-75 "LED Blink Pattern"

Diagnosis	VCM Memory warning (F01)
Logic conditions	· EEPROM Sum check value (when key switch is ON) — F01
Recovery	Turn ON power again.
Action	· Stop the operation of controller (UP-TIME and CAN communication will not stop)
LED blink pattern	B

Diagnosis	VCM Battery voltage warning (F02)
Logic conditions	· Power supply voltage is 7 V or less (1-second continuity) · Power supply voltage is 21 V or more (1-second continuity) — F02
Recovery	Auto recovery
Action	· Turn OFF all solenoid outputs.
LED blink pattern	B

Diagnosis	VCM communication warning (F03)
Logic conditions	· CAN transmission from VCM-6 is not available. (2-second continuity) — F03
Recovery	Auto recovery
Action	· Warning indication only, the operation continues.
LED blink pattern	B

Diagnosis	ECM Communication warning (F04)
Logic conditions	· No CAN sent from ECM. (2-second continuity) — F04
Recovery	Auto recovery
Action	· Activates with default values of ECM incoming data.
LED blink pattern	B

Diagnosis	OCM communication warning (F06)
Logic conditions	· No CAN received from OCM. (2-second continuity) — F06
Recovery	Auto recovery
Action	· Activates with default values of OCM incoming data.
LED blink pattern	B

Diagnosis	MP Communication warning (F07)
Logic conditions	· No CAN received from meter panel. (2-second continuity) — F07
Recovery	Auto recovery
Action	· Activates with default values of metal panel incoming data.
LED blink pattern	B

Diagnosis	TMS communication warning (F08)
Logic conditions	· No CAN received from TMS. (2-second continuity) ——— F08
Recovery	Auto recovery
Action	· Activates with default values of TMS incoming data.
LED blink pattern	B

Diagnosis	Lift Lever Neutral Warning (F10)
Logic conditions	· Lift lever open angle is 20% or more. (when key switch is ON) ——— F10
Recovery	Auto recovery when the lever is placed in NEUTRAL.
Action	· Turn OFF all solenoid outputs of operating functions. · Turn OFF the unload solenoid.
LED blink pattern	C

Diagnosis	Tilt Lever Neutral Warning (F11)
Logic conditions	· Tilt lever open angle is 20% or more. (when key switch is ON) ——— F11
Recovery	Auto recovery when the lever is placed in NEUTRAL.
Action	· Turn OFF all solenoid outputs of operating functions. · Turn OFF the unload solenoid.
LED blink pattern	C

Diagnosis	Attachment 1 Lever Neutral Warning (F12)
Logic conditions	· Attachment 1 lever open angle is 20% or more. (when key switch is ON) ——— F12
Recovery	Auto recovery when the lever is placed in NEUTRAL.
Action	· Turn OFF all solenoid outputs of operating functions. · Turn OFF the unload solenoid.
LED blink pattern	C

Diagnosis	Attachment 2 Lever Neutral Warning (F13)
Logic conditions	· Attachment 2 lever open angle is 20% or more. (when key switch is ON) ——— F13
Recovery	Auto recovery when the lever is placed in NEUTRAL.
Action	· Turn OFF all solenoid outputs of operating functions. · Turn OFF the unload solenoid.
LED blink pattern	C

Diagnosis	Attachment 3 Lever Neutral Warning (F14)
Logic conditions	· Attachment 3 lever open angle is 20% or more. (when key switch is ON) — F14
Recovery	Auto recovery when the lever is placed in NEUTRAL.
Action	· Turn OFF all solenoid outputs of operating functions. · Turn OFF the unload solenoid.
LED blink pattern	C

Diagnosis	Shift Lever Warning (F16)
Logic conditions	· Shift lever overlap input · No shift lever signal (1800 ms continuity) — F16
Recovery	Auto recovery with shift lever in N position
Action	· Turn OFF the T/M forward/backward solenoids outputs.
LED blink pattern	C

Diagnosis	Vehicle Speed Warning (F17)
Logic conditions	· Speed>30 km/h (18.6 MPH) (400 ms continuity) — F17
Recovery	Auto recovery
Action	· With T/M shift lock control, neglects the speed. · Speed of 0 km/h (0 MPH) is sent to other controllers.
LED blink pattern	C

Diagnosis	Shift Lever Warning (F20)
Logic conditions	· CAN receiving of abnormal flag from input unit. — F20
Recovery	Turn ON power again.
Action	· Turn OFF the lift solenoid output. (Before 400-millisecond continuity, set the current command value to 0mA.)
LED blink pattern	D

Diagnosis	Tilt Lever Warning (F22)
Logic conditions	· CAN receiving of abnormal flag from input unit. — F22
Recovery	Turn ON power again.
Action	· Turn OFF the lift solenoid output. (Before 400-millisecond continuity, set the current command value to 0mA.)
LED blink pattern	D

Diagnosis	Attachment 1 Lever Warning (F24)
Logic conditions	· CAN receiving of abnormal flag from input unit. ——— F24
Recovery	Turn ON power again.
Action	· Turn OFF the lift solenoid output. (Before 400-millisecond continuity, set the current command value to 0mA.)
LED blink pattern	D

Diagnosis	Attachment 2 Lever Warning (F26)
Logic conditions	· CAN receiving of abnormal flag from input unit. ——— F26
Recovery	Turn ON power again.
Action	· Turn OFF the lift solenoid output. (Before 400-millisecond continuity, set the current command value to 0mA.)
LED blink pattern	D

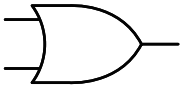
Diagnosis	Attachment 3 Lever Warning (F28)
Logic conditions	· CAN receiving of abnormal flag from input unit. ——— F28
Recovery	Turn ON power again.
Action	· Turn OFF the lift solenoid output. (Before 400-millisecond continuity, set the current command value to 0mA.)
LED blink pattern	D

Diagnosis	Joystick Lever redundant warning (F29)
Logic conditions	· Abnormal lever signals of both primary and secondary ——— F29
Recovery	Turn ON power again.
Action	· Indication only
LED blink pattern	D

Diagnosis	Sensor battery warning (F31)
Logic conditions	· Sensor battery is 2.5 V or less (20-millisecond continuity) ——— F31
Recovery	Turn ON power again.
Action	· Sensor battery is 2.5 V or less. · Photoelectronic sensor: Keep the status before warning occurs. · 12V DC power: Not considered as a fault. · Tilt angle sensor, Oil pressure sensor [lift]: No tilt auto-stop control, as it is not considered as a fault. · Speed sensor: not considered as a fault. Speed value is valid. · No warning detection is performed for current break, short, or leaks of solenoid [unload/lift lock], T/M control valve [F/R], power steering control valve/tilt lock solenoids (solenoid output status before warning is maintained). (20 ms continuity)
LED blink pattern	B

Diagnosis	Oil pressure sensor (lift) warning (F32)
Logic conditions	· Input signal is 0.1 V or less (400-millisecond continuity) · Input signal is 4.9 V or more (400-millisecond continuity)  F32
Recovery	Turn ON power again.
Action	· No tilt action with the load indication OFF and the tilt auto-stop SW ON.
LED blink pattern	D

Diagnosis	Vehicle Speed Sensor Warning (F34)
Logic conditions	· Input signal is 1.3V or less (400-millisecond continuity) · Input signal is 4.9 V or more (400-millisecond continuity)  F34
Recovery	Turn ON power again.
Action	· With T/M shift lock control, neglects the speed. · On the forklift trucks with ECM, maximum speed limit value plus 1 km/h (0.6 MPH) is transmitted. On non-electric control engine, 0km/h is transmitted.
LED blink pattern	D

Diagnosis	Tilt angle warning (F38)
Logic conditions	· Input signal is 0.1 V or less (400-millisecond continuity) · Input signal is 4.9 V or more (400-millisecond continuity)  F38
Recovery	Turn ON power again.
Action	· No tilt action with the tilt auto-stop ON.
LED blink pattern	D

Diagnosis	RI01 warning (F41)
Logic conditions	· CAN receiving of abnormal flag from output unit. F41
Recovery	Auto recovery
Action	· Indication only
LED blink pattern	B

Diagnosis	RI01 PWM power warning (F44)
Logic conditions	· CAN receiving of abnormal flag from output unit. F44
Recovery	Auto recovery
Action	· Indication only
LED blink pattern	B

Diagnosis	RI01 communication warning (F45)
Logic conditions	· Power supply voltage is 10V or more and No CAN received from output unit. (500ms continuity) ——— F45
Recovery	Auto recovery
Action	· Activates with default values of output unit incoming data.
LED blink pattern	B

Diagnosis	RI02 warning (F46)
Logic conditions	· CAN receiving of abnormal flag from input unit. ——— F46
Recovery	Auto recovery
Action	· Indication only
LED blink pattern	B

Diagnosis	RI02 communication warning (F49)
Logic conditions	· Power supply voltage is 10V or more and No CAN received from input unit. (100ms continuity) ——— F49
Recovery	Auto recovery
Action	· Activates with default values of output unit incoming data.
LED blink pattern	B

Diagnosis	Lift Up Solenoid Warning (F50)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F50
Recovery	Turn ON power again.
Action	· Set the lift current command value to 0 mA.
LED blink pattern	E

Diagnosis	Lift Down Solenoid Warning (F52)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F52
Recovery	Turn ON power again.
Action	· Set the lift current command value to 0 mA.
LED blink pattern	E

Diagnosis	Lift Solenoid Leak (F54)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F54
Recovery	Turn ON power again.
Action	· Set the current command value of all operating functions to 0 mA and turn OFF unload solenoid.
LED blink pattern	E

Diagnosis	Tilt Forward Solenoid Warning (F55)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F55
Recovery	Turn ON power again.
Action	· Set the lift current command value to 0 mA.
LED blink pattern	E

Diagnosis	Tilt Backward Solenoid Warning (F57)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F57
Recovery	Turn ON power again.
Action	· Set the lift current command value to 0 mA.
LED blink pattern	E

Diagnosis	Tilt Solenoid Leak (F59)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F59
Recovery	Turn ON power again.
Action	· Set the current command value of all operating functions to 0 mA and turn OFF unload solenoid.
LED blink pattern	E

Diagnosis	Attachment 1A Solenoid Warning (F60)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F60
Recovery	Turn ON power again.
Action	· Set Attachment 1 current command value to 0 mA.
LED blink pattern	E

Diagnosis	Attachment 1B Solenoid Warning (F62)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F62
Recovery	Turn ON power again.
Action	· Set Attachment 1 current command value to 0 mA.
LED blink pattern	E

Diagnosis	Attachment 1 Solenoid Leak (F64)
Logic conditions	· CAN receiving of abnormal flag from output unit. ▬▬▬▬ F64
Recovery	Turn ON power again.
Action	· Set the current command value of all operating functions to 0 mA and turn OFF unload solenoid.
LED blink pattern	E

Diagnosis	Attachment 2A Solenoid Warning (F65)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F65
Recovery	Turn ON power again.
Action	· Set Attachment 2 current command value to 0 mA.
LED blink pattern	E

Diagnosis	Attachment 2B Solenoid Warning (F67)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F67
Recovery	Turn ON power again.
Action	· Set Attachment 2 current command value to 0 mA.
LED blink pattern	E

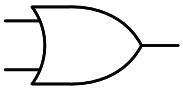
Diagnosis	Attachment 2 Solenoid Leak (F69)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F69
Recovery	Turn ON power again.
Action	· Set the current command value of all operating functions to 0 mA and turn OFF unload solenoid.
LED blink pattern	E

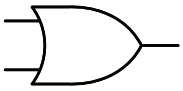
Diagnosis	Attachment 3A Solenoid Warning (F70)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F70
Recovery	Turn ON power again.
Action	· Set Attachment 3 current command value to 0 mA.
LED blink pattern	E

Diagnosis	Attachment 3B Solenoid Warning (F72)
Logic conditions	· CAN receiving of abnormal flag from output unit. ——— F72
Recovery	Turn ON power again.
Action	· Set Attachment 3 current command value to 0 mA.
LED blink pattern	E

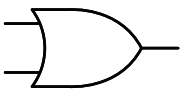
Diagnosis	Hour meter GAP warning (F73)
Logic conditions	· Hour meter difference between meter panel and VCM-6 is ± 24 hours or more. ——— F73
Recovery	Update #252 M/P hour meter with service tool.
Action	· VCM-6 sends zero to hour meter. · VCM-6 hour meter is not overwritten.
LED blink pattern	E

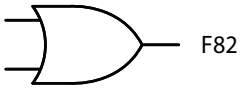
Diagnosis	Attachment 3 Solenoid Leak (F74)
Logic conditions	· CAN receiving of abnormal flag from output unit. F74
Recovery	Turn ON power again.
Action	· Set the current command value of all operating functions to 0 mA and turn OFF unload solenoid.
LED blink pattern	E

Diagnosis	Unload Solenoid Warning (F75)
Logic conditions	· Current value is 160 mA or less (1800-millisecond continuity) · Input signal is 2.4 A or more (200-millisecond continuity)  F75
Recovery	Turn ON power again.
Action	· Turn OFF the unload solenoid output.
LED blink pattern	E

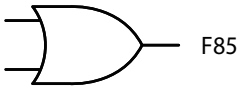
Diagnosis	Lift lock valve warning (F77)
Logic conditions	· Current value is 160 mA or less (1800-millisecond continuity) · Current value is 3.4A or more (200-millisecond continuity)  F77
Recovery	Turn ON power again.
Action	· Turn OFF the Lift lock valve output.
LED blink pattern	E

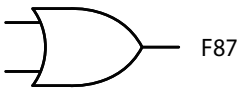
Diagnosis	Unload lift lock solenoid leak (F79)
Logic conditions	· Current value is 500 mA or more when output is OFF. (600-millisecond continuity) F79
Recovery	Turn ON power again.
Action	· Turn OFF all solenoid outputs of operating functions.
LED blink pattern	E

Diagnosis	Power steering control (correction) valve solenoid warning (F80)
Logic conditions	· Current value is 160 mA or less (400-millisecond continuity) · Current value is 3.54A or more (200-millisecond continuity)  F80
Recovery	Turn ON power again.
Action	· Turn OFF the power steering correction solenoid output.
LED blink pattern	E

Diagnosis	VCM tilt lock valve warning (F82)
Logic conditions	· Current value is 160 mA or less (1800-millisecond continuity) · Current value is 2.88A or more (200-millisecond continuity) 
Recovery	Auto recovery
Action	· Turn OFF the tilt lock valve output.
LED blink pattern	E

Diagnosis	Power steering correction solenoid leak (F84)
Logic conditions	· Current value is 180mA or more when output is OFF. (600-millisecond continuity)
Recovery	Turn ON power again.
Action	· Turn OFF the power steering correction solenoid output.
LED blink pattern	E

Diagnosis	T/M Forward Solenoid Warning (F85)
Logic conditions	· Current value is 250mA or less (1800-millisecond continuity) · Current value is 3.8 A or more (200-millisecond continuity) 
Recovery	Turn ON power again.
Action	· Turn OFF the T/M forward solenoid output.
LED blink pattern	E

Diagnosis	T/M Backward Solenoid Warning (F87)
Logic conditions	· Current value is 250mA or less (1800-millisecond continuity) · Current value is 3.8 A or more (200-millisecond continuity) 
Recovery	Turn ON power again.
Action	· Turn OFF the T/M backward solenoid output.
LED blink pattern	E

Diagnosis	Transmission Solenoid Leak (F89)
Logic conditions	· Current value is 280mA or more when output is OFF. (600-millisecond continuity)
Recovery	Auto recovery
Action	· Turn OFF the T/M forward and backward solenoids outputs.
LED blink pattern	E

Diagnosis	Parking seizure warning (F92) *Serious warning
Logic conditions	· Parking brake SW is ON when traveling at speed of 5 km/h (3.107 miles/h) or more. ——— F92
Recovery	Turn ON power again.
Action	· Serious warning mode of meter panel.
LED blink pattern	E

Diagnosis	Shift solenoid 1 warning (F93)
Logic conditions	· Current value is 600 mA or less when output is ON. (1800-millisecond continuity) ——— F93
Recovery	Turn ON power again.
Action	· Turn OFF the shift solenoid 1 output.
LED blink pattern	E

Diagnosis	M/P memory check warning (P01)
Logic conditions	· EEPROM Warning ——— P01
Recovery	Turn ON power again.
Action	· EEPROM initialization
LED blink pattern	-

Diagnosis	VCM communication warning signal (P03)
Logic conditions	· No CAN received from VCM-6 ——— P03
Recovery	Auto recovery
Action	· Warning indication only, the operation continues.
LED blink pattern	-

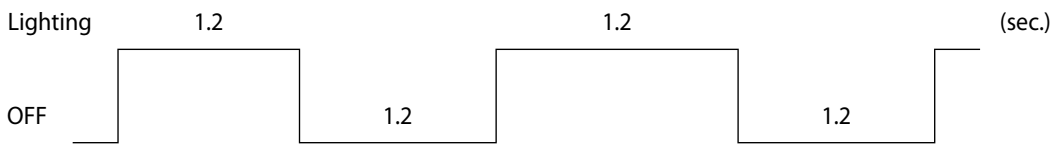
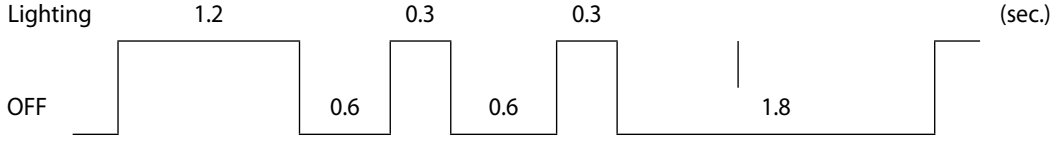
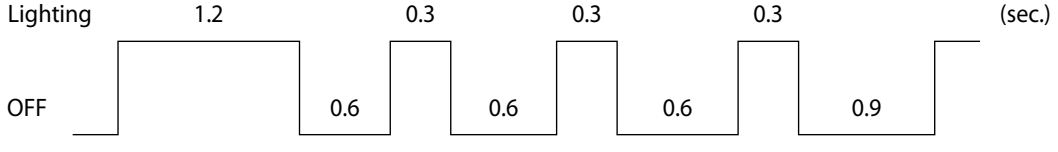
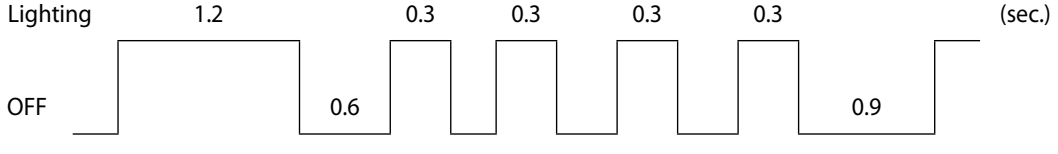
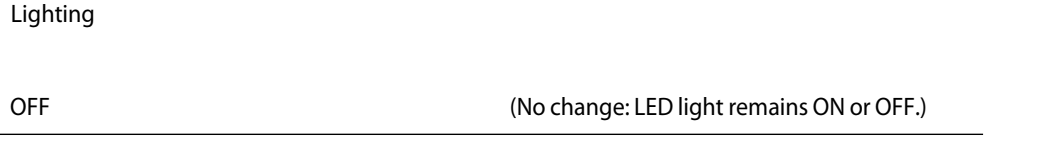
Diagnosis	ECM communication warning signal (P04)
Logic conditions	· No CAN received from ECM ——— P04
Recovery	Auto recovery
Action	· Warning indication only, the operation continues.
LED blink pattern	-

Diagnosis	M/P memory check warning signal (P07)
Logic conditions	· No CAN sending from M/P ——— P07
Recovery	Auto recovery
Action	· Warning indication only, the operation continues.
LED blink pattern	-

9.3 LED Blink Pattern

When diagnostic codes cannot be identified due to the following reasons; meter panel failure, VCM-6 communication circuit problem, GSE cable damage, or no presence of UP-TIME service tool, you can identify diagnostic codes to some extent by reading the LED blink patterns of the VCM-6 controller.

Note: Place the key switch in the ON position for checking.

LED blink pattern	LED blinking status
A	
B	
C	
D	
E	
F	

9.4 Diagnostic Codes and Troubleshooting

Note: See the engine service manual when the diagnostic code that starts with "D" is displayed on the meter panel screen.

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-01 D-51	Memory check warning	1. Controller bad	
F-02	Supply power voltage warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Controller bad	
F-03 D-53 L-03	VCM communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. VCM-6 Controller bad	3. Communication line check
		4. Controller bad	
F-04 D-54 L-04	ECM Communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. ECM Controller bad	3. Communication line check
		4. Controller bad	
F-07 D-57 L-07	MP Communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Meter panel defect	3. Communication line check
		4. Controller bad	
F-08 D-58 P-08 L-08	TMS communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. TMS Controller bad	3. Communication line check
		4. Controller bad	
F-09	Load type set warning	1. Controller setting failure	1. Check setting with service tool.
		2. Controller bad	
F-10	Lift lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Lift lever bad	3. Lever connection check
		4. Controller bad	
F-11	Tilt lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Tilt lever bad	3. Lever connection check
		4. Controller bad	
F-12	Attachment1 lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 2 lever bad	3. Lever connection check
		4. Controller bad	

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-13	Attachment 2 lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 2 lever bad	3. Lever connection check
		4. Controller bad	
F-14	Attachment 3 lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 3 lever bad	3. Lever connection check
		4. Controller bad	
F-16	Shift lever warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Shift lever bad	3. Shift lever check
		4. Controller bad	
F-17	Vehicle speed warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Vehicle speed sensor bad	3. Sensor connection check
		4. Controller bad	
F-20	Lift lever warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Lift lever bad	3. Lever connection check
		4. Controller bad	
F-22	Tilt lever warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Tilt lever bad	3. Lever connection check
		4. Controller bad	
F-24	Attachment 1 lever warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 1 lever bad	3. Lever connection check
		4. Controller bad	
F-26	Attachment 2 lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 2 lever bad	3. Lever connection check
		4. Controller bad	
F-28	Attachment 3 lever neutral warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Attachment 3 lever bad	3. Lever connection check
		4. Controller bad	

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-29	Joystick redundant warning	1. Joystick lever bad	1. Check if any other warnings are present (Examples: F20, F22, F24, F26 or F28)
		2. Input unit bad	2. Input unit check
		3. Harness bad	3. Harness connection check
F-31	Sensor voltage warning	1. Wheel angle sensor bad	1. Wheel angle sensor check
		2. VCM-6 bad	2. VCM-6 check
		3. Harness bad	3. Harness connection check
F-34	Vehicle speed sensor warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Vehicle speed sensor bad	3. Sensor connection check
		4. Controller bad	
F-38	Tilt angle sensor warning	1. Connector contact bad	1. Link connection and damage check
			2. Connector connection check
		2. Harness bad	3. Harness connection check
		3. Tilt angle sensor bad	4. Sensor connection check
		4. Controller bad	
F-40	Steering warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Wheel angle sensor bad	3. Sensor connection check
		4. Controller bad	
F-41	Output unit warning	1. Output unit bad	1. Output unit check
F-44	Output unit PWM voltage warning	1. Power shortage	1. Battery voltage check
		2. Output unit bad	2. Output unit check
		3. VCM-6 bad	3. VCM-6 check
		4. Harness bad	4. Harness connection check
F-45	Output unit communication warning	1. Output unit bad	1. Output unit check
		2. VCM-6 bad	2. VCM-6 check
		3. Harness bad	3. Harness connection check
F-46	Input unit warning	1. Input unit bad	1. Input unit check
F-49	Input unit communication warning	1. Input unit bad	1. Input unit check
		2. VCM-6 bad	2. VCM-6 check
		3. Harness bad	3. Harness connection check
F-50	Lift up solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Lift up solenoid bad	4. Lift up solenoid connection check
		5. Controller bad	

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-52	Lift down solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Lift up solenoid bad	4. Lift up solenoid connection check
		5. Controller bad	
F-54	Lift solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Lift up solenoid bad	4. Lift up solenoid connection check
		5. Controller bad	
F-55	Tilt FW solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Tilt FW solenoid bad	4. Tilt FW solenoid connection check
		5. Controller bad	
F-57	Tilt BW solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Tilt BW solenoid bad	4. Tilt BW solenoid connection check
		5. Controller bad	
F-59	Tilt solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Tilt lock solenoid bad	4. Tilt solenoid connection check
		5. Controller bad	
F-60	Attachment 1A solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 1A solenoid bad	4. Attachment 1A solenoid connection check
		5. Controller bad	
F-62	Attachment 1B solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 1B solenoid bad	4. Attachment 1B solenoid connection check
		5. Controller bad	

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-64	Attachment 1 solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 1 solenoid bad	4. Attachment 1 solenoid connection check
		5. Controller bad	
F-65	Attachment 2A solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 2A solenoid bad	4. Attachment 2A solenoid connection check
		5. Controller bad	
F-67	Attachment 2B solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 2B solenoid bad	4. Attachment 2B solenoid connection check
		5. Controller bad	
F-69	Attachment 2 solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 2 solenoid bad	4. Attachment 2 solenoid connection check
		5. Controller bad	
F-70	Attachment 3A solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 3A solenoid bad	4. Attachment 3A solenoid connection check
		5. Controller bad	
F-72	Attachment 3B solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 3B solenoid bad	4. Attachment 3B solenoid connection check
		5. Controller bad	
F-73	Hour meter gap warning	1. Hour meter time difference between VCM-6 and M/P.	1. Connect service tool and update #252 M/P hour meter.

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-74	Attachment 3 solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Attachment 3 solenoid bad	4. Attachment 3 solenoid connection check
		5. Controller bad	
F-75	Unload solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Unload solenoid bad	4. Unload solenoid connection check
		5. Controller bad	
F-77	Lift lock solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Lift lock solenoid bad	4. Lift lock solenoid connection check
		5. Controller bad	
F-78	Parking solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Parking solenoid bad	4. Parking solenoid connection check
		5. Controller bad	
F-79	Unload solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Unload solenoid bad	4. Unload solenoid connection check
		5. Controller bad	
F-80	Power steering correction valve solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Power steering correction valve solenoid bad	4. Power steering correction valve solenoid connection check
		5. Controller bad	
F-82	Lift lock solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Tilt lock solenoid bad	4. Tilt solenoid connection check
		5. Controller bad	

Diagnostic code	Diagnostic code name	Probable cause	Check items
F-84	Power steering correction valve solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Power steering correction valve solenoid bad	4. Power steering correction valve solenoid connection check
		5. Controller bad	
F-85	T/M forward solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. T/M forward solenoid bad	4. T/M FW solenoid connection check
		5. Controller bad	
F-87	T/M backward solenoid warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. T/M backward solenoid bad	4. T/M BW solenoid connection check
		5. Controller bad	
F-89	T/M solenoid leak	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. T/M solenoid bad	4. T/M solenoid connection check
		5. Controller bad	
F-92	Parking seizure warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. Parking switch bad	3. Switch connection check
		4. Controller bad	
F-93	Shift solenoid 1 warning	1. Connector contact bad	1. Connector connection check
		2. Diode bad	2. Diode connection check
		3. Harness bad	3. Harness connection check
		4. Shift solenoid bad	4. Shift solenoid connection check
		5. Controller bad	
D-01	Accelerator sensor 1 warning	1. Erratic, intermittent, or incorrect	1. Throttle switch circuit check
		2. Erratic, intermittent, or incorrect	2. Analog throttle position sensor circuit check
		3. Voltage above normal	3. Analog throttle position sensor circuit check
		4. Voltage below normal	4. Analog throttle position sensor circuit check
D-05	Fuel rail pressure warning (pump)	1. Fuel rail pressure relief valve is active	1. Fuel rail pressure problem

Diagnostic code	Diagnostic code name	Probable cause	Check items
D-07	Fuel rail pressure sensor warning	1. Pressure is high	1. Fuel rail pressure problem
		2. Pressure is low	2. Fuel rail pressure problem
		3. Voltage above normal	3. Engine pressure sensor open or short circuit check
		4. Voltage below normal	4. Engine pressure sensor open or short circuit check
D-09	Injector N/V-cylinder 1	1. Erratic, intermittent, or incorrect	1. Injector data incorrect check
		2. Current below normal	2. Injector solenoid circuit check
		3. Current above normal	3. Injector solenoid circuit check
D-10	Injector N/V-cylinder 2	1. Erratic, intermittent, or incorrect	1. Injector data incorrect check
		2. Current below normal	2. Injector solenoid circuit check
		3. Current above normal	3. Injector solenoid circuit check
D-11	Injector N/V-cylinder 3	1. Erratic, intermittent, or incorrect	1. Injector data incorrect check
		2. Current below normal	2. Injector solenoid circuit check
		3. Current above normal	3. Injector solenoid circuit check
D-12	Injector N/V-cylinder 4	1. Erratic, intermittent, or incorrect	1. Injector data incorrect check
		2. Current below normal	2. Injector solenoid circuit check
		3. Current above normal	3. Injector solenoid circuit check
D-21	Fuel control valve warning	1. Current below normal	1. Solenoid valve check
		2. Current above normal	2. Solenoid valve check
D-22	EGR inlet/outlet pressure warning	1. Voltage above normal	1. Engine pressure sensor open or short circuit check
		2. Voltage below normal	2. Engine pressure sensor open or short circuit check
		3. Calibration required	3. Sensor calibration required check
		4. Data drifted low	4. 5V sensor supply circuit check
D-24	Engine speed sensor warning	1. Abnormal frequency, pulse width, or period	1. Engine speed/timing sensor circuit check
		2. Engine speed is too high	2. Engine overspeeds
		3. Engine timing sensor defective	3. Engine speed/timing sensor circuit check
D-25	Engine over-run warning	1. Abnormal frequency, pulse width, or period	1. Engine speed/timing sensor circuit check
		2. Engine speed is too high	2. Engine overspeeds
D-26	Boost pressure sensor warning	1. Boost pressure is high	1. Intake manifold air pressure is high
		2. Boost pressure is low	2. Intake manifold air pressure is low
D-29	Atmospheric pressure sensor warning	1. Voltage above normal	1. Engine pressure sensor open or short circuit check
		2. Voltage below normal	2. Engine pressure sensor open or short circuit check
		3. Data drifted low	3. 5V sensor supply circuit check

Diagnostic code	Diagnostic code name	Probable cause	Check items
D-30	CAN signal warning	1. Abnormal update rate	1. CAN data link circuit check
D-31	Starter relay warning	1. Voltage above normal	1. Starter relay circuit check
		2. Current below normal	2. Starter relay circuit check
		3. Current above normal	3. Starter relay circuit check
D-32	Water temperature sensor warning	1. Temperature is high	1. Coolant temperature is too high
		2. Voltage above normal	2. Engine temperature sensor open or short circuit check (Passive sensors)
		3. Voltage below normal	3. Engine temperature sensor open or short circuit check (Passive sensors)
D-33	ECM system warning	1. Calibration memory is erratic, intermittent, or incorrect	1. Flash programming
		2. Calibration module is erratic, intermittent, or incorrect	2. ECM memory check
D-34	Injector circuit warning	1. Current above normal	1. Injector solenoid circuit check
		2. Not responding correctly	2. Injector solenoid circuit check
D-35	Fuel temperature sensor (inlet) warning	1. Voltage above normal	1. Engine temperature sensor open or short circuit check (Passive sensors)
		2. Voltage below normal	2. Engine temperature sensor open or short circuit check (Passive sensors)
		3. Temperature is high	3. Fuel temperature is high
D-37	EGR position sensor warning	1. Voltage above normal	1. Valve position sensor check
		2. Voltage below normal	2. Valve position sensor check
D-40	EGR warning	1. Current below normal	1. Motorized valve check
		2. Current above normal	2. Motorized valve check
		3. Not responding properly	3. Motorized valve check
D-43	ECM relay warning	1. Not responding correctly	1. Electric power supply check
		2. Special instruction	2. Electric power supply check
D-44	Glow plug warning	1. Not responding correctly	1. Glow plug starting aid check
D-48	Glow relay warning	1. Current above normal	1. Glow plug relay circuit check
D-52	Supply power voltage warning	1. Power input 1 is erratic, intermittent, or incorrect	1. Ignition keyswitch circuit and battery supply circuit check
		2. Voltage above normal	2. Ignition keyswitch circuit and battery supply circuit check
		3. Voltage below normal	3. Ignition keyswitch circuit and battery supply circuit check
D-63	Overheat warning (STEP 1)	1. Temperature is high	1. Coolant temperature is too high
		2. Voltage above normal	2. Engine temperature sensor open or short circuit check (Passive sensors)
		3. Voltage below normal	3. Engine temperature sensor open or short circuit check (Passive sensors)

Diagnostic code	Diagnostic code name	Probable cause	Check items
D-64	Overheat warning (STEP 2)	1. Temperature is high	1. Coolant temperature is too high
		2. Voltage above normal	2. Engine temperature sensor open or short circuit check (Passive sensors)
		3. Voltage below normal	3. Engine temperature sensor open or short circuit check (Passive sensors)
D-67	W/G bypass valve warning	1. Current below normal	1. Solenoid valve check
		2. Current above normal	2. Solenoid valve check
D-70	Sensor supply power voltage warning	1. Voltage is erratic, intermittent, or incorrect	1. 5V sensor supply circuit check
D-74	Lambda sensor warning	1. Voltage above normal	1. Oxygen level check
		2. Voltage below normal	2. Oxygen level check
		3. Current below normal	3. Oxygen level check
D-75	Idle switch warning	1. Erratic, intermittent, or incorrect	1. Idle validation switch circuit check
D-80	Air intake throttle position warning	1. Voltage above normal	1. Valve position sensor check
		2. Voltage below normal	2. Valve position sensor check
D-82	Exhaust temperature sensor warning	1. Voltage above normal	1. Engine temperature sensor open or short circuit check
		2. Voltage below normal	2. Engine temperature sensor open or short circuit check
D-83	DPF inlet temperature sensor warning	1. Voltage above normal	1. DPF temperature sensor open or short circuit check (Active sensors)
		2. Voltage below normal	2. DPF temperature sensor open or short circuit check (Active sensors)
		3. Temperature is low	3. DPF temperature is low
D-84	DPF absolute pressure sensor warning	1. Voltage above normal	1. Engine pressure sensor open or short circuit check
		2. Voltage below normal	2. Engine pressure sensor open or short circuit check
D-85	DPF differential pressure sensor warning	1. Abnormal rate of change	1. Differential pressure problem
		2. Pressure is high	2. DPF collects excessive soot
		3. Pressure is low	3. Differential pressure problem
D-87	DPF warning	1. Soot load percent is high	1. DPF collects excessive soot
D-89	Engine oil pressure sensor warning	1. Voltage above normal	1. Engine oil pressure sensor open or short circuit check
		2. Voltage below normal	2. Engine oil pressure sensor open or short circuit check
		3. Pressure is low	3. Low engine oil pressure
		4. Data drifted low	4. 5V sensor supply circuit check
D-90	Engine oil viscosity warning	1. Viscosity is low	1. Oil contains fuel
D-92	Intake manifold pressure sensor warning	1. Pressure is severely high	1. Intake manifold air pressure is high
		2. Pressure is severely low	2. Intake manifold air pressure is low

Diagnostic code	Diagnostic code name	Probable cause	Check items
D-93	Intake manifold temperature sensor warning	1. Voltage above normal	1. Intake manifold temperature sensor open or short circuit check (Passive sensors)
		2. Voltage below normal	2. Intake manifold temperature sensor open or short circuit check (Passive sensors)
		3. Temperature is high	3. Intake manifold air temperature is high
D-94	Air intake temperature sensor warning	1. Voltage above normal	1. Air take temperature sensor open or short circuit check (Passive sensors)
		2. Voltage below normal	2. Air take temperature sensor open or short circuit check (Passive sensors)
D-95	Fuel rail pressure sensor warning	1. Pressure is high	1. Fuel rail pressure problem
		2. Pressure is low	2. Fuel rail pressure problem
		3. Voltage above normal	3. Engine pressure sensor open or short circuit check
		4. Voltage below normal	4. Engine pressure sensor open or short circuit check
D-96	Fuel leak warning	1. Leakage is most severely high	1. Fuel rail pressure problem
D-97	ECM system warning	1. Calibration memory is erratic, intermittent, or incorrect	1. Flash programming
		2. Calibration module is erratic, intermittent, or incorrect	2. ECM memory check
D-98	DPF warning	1. Soot load percent is severely high	1. DPF collects excessive soot
P-03	VCM communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. VCM-6 Controller bad	3. Communication line check
		4. Controller bad	
P-06	OCM communication warning	1. Connector contact bad	1. Connector connection check
		2. Harness bad	2. Harness connection check
		3. OCM Controller bad	3. Communication line check
		4. Controller bad	