



Doosan Infracore

VBO Diagnostic Tools Manual (DX350LC-3/DX380LC-3)

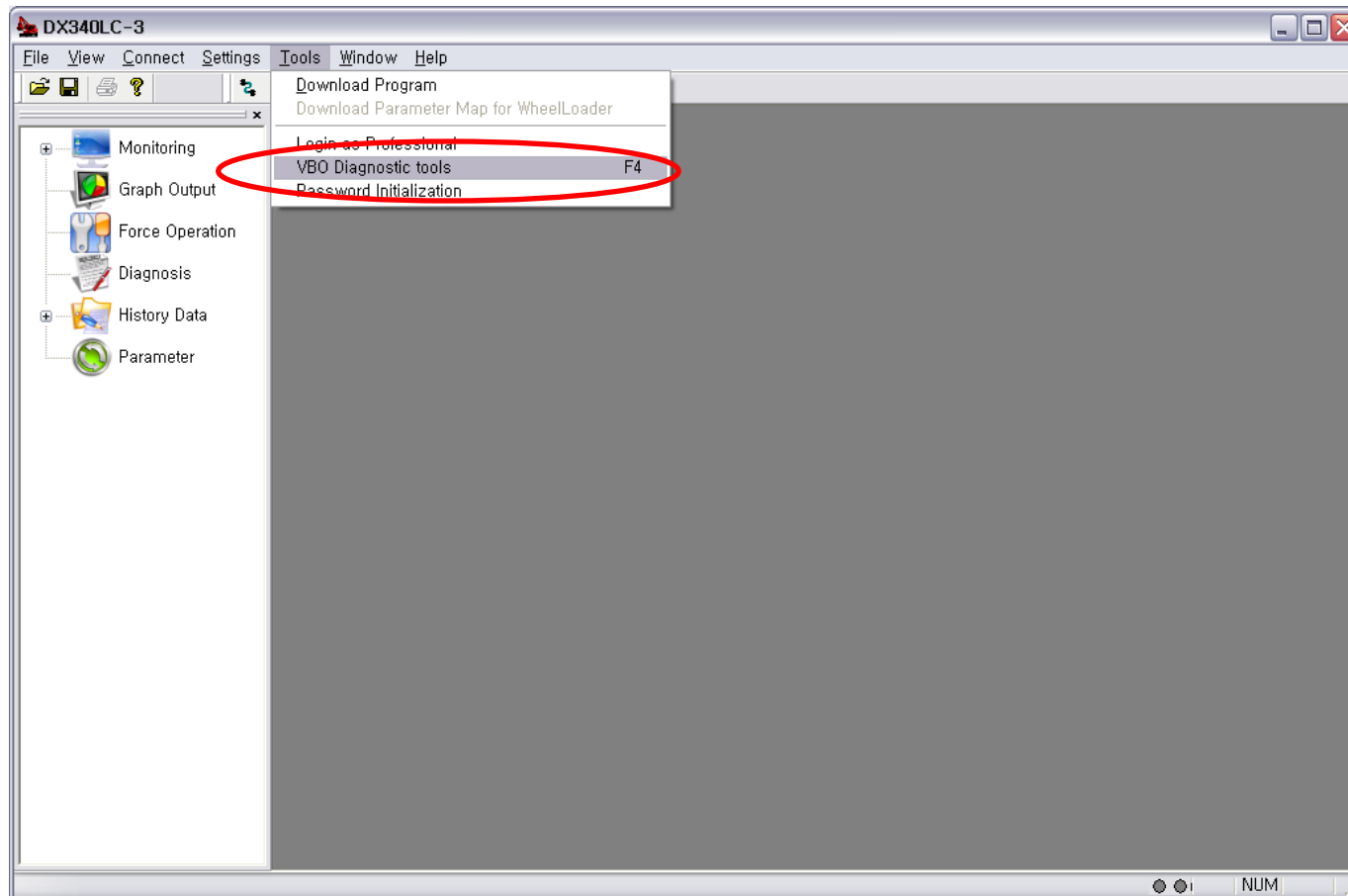
Corporate Research & Development Division
Electrical & Electronics Center

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Ver. 3.0

- 1. Joystick Check**
- 2. Angle Check**
- 3. EPPR V/V Check**
- 4. Main Pressure Check**
- 5. Relief Pressure Check**

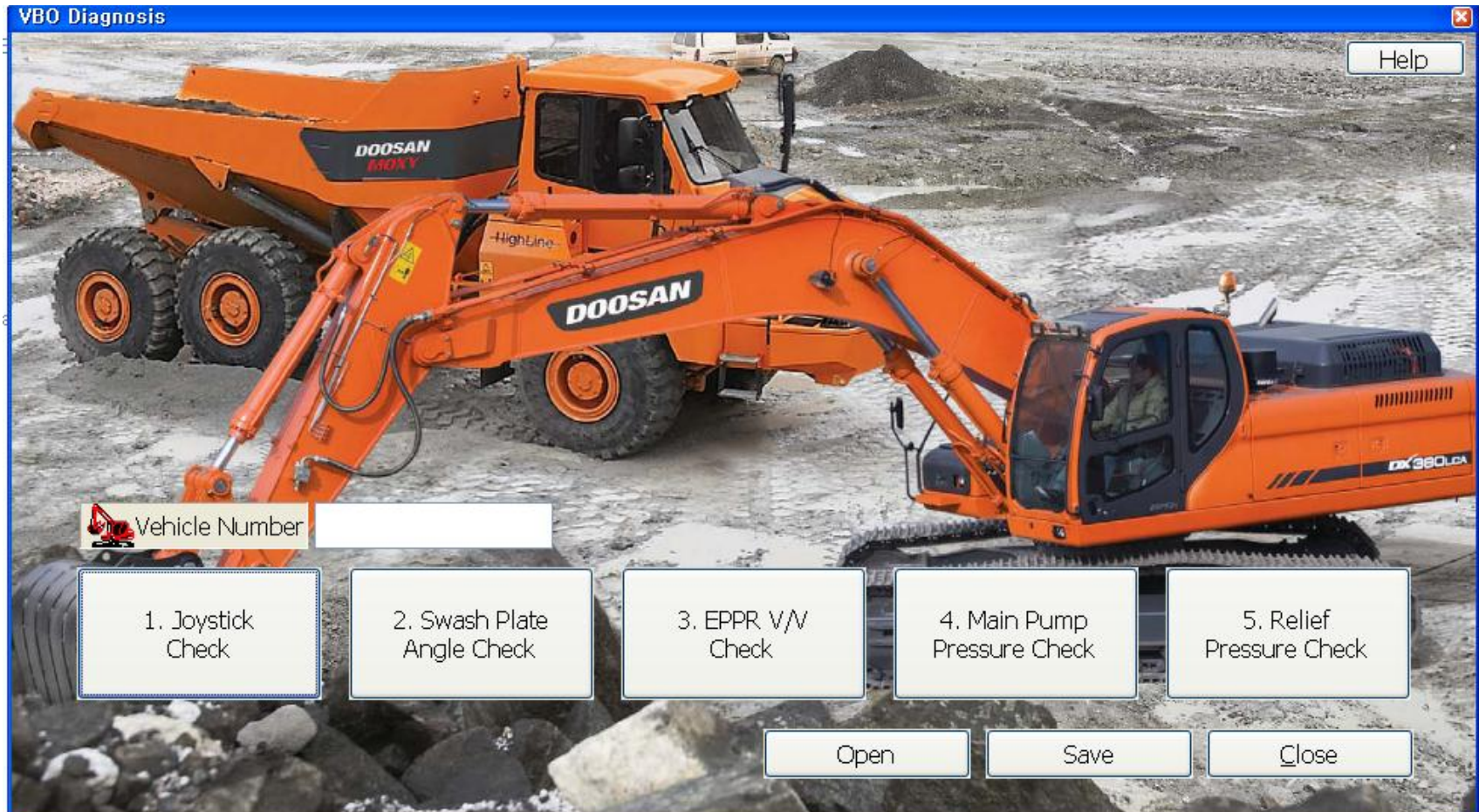
VBO Diagnostic Tools Run

Click [Tools – VBO Diagnostic Tools] or Press F4
for the VBO system diagnosis



VBO Diagnostic Tools Run

<VBO Diagnostic Tools Main Screen>



VBO Diagnostic Tools Run

| No | Name | Function |
|----|--------------------------|--|
| 1 | Joystick Check | <ul style="list-style-type: none">– Check the pressure depending on joystick operation– Boom Up, Boom Down, Arm In, Arm Out, Bucket Crowd, Bucket Dump, Travel Right, Travel Left, Swing Pressure |
| 2 | Swash Plate Angle Check | <ul style="list-style-type: none">– Swash Plate Angle Check– Front pump Angle volt, Rear Pump Angle volt |
| 3 | EPPR V/V Check | <ul style="list-style-type: none">– EPPR V/V Check– Power Shift P/V 1, Power Shift P/V2 |
| 4 | Main Pump Pressure Check | <ul style="list-style-type: none">– Main Pump Pressure Check– Front Pump Pressure, Rear Pump Pressure |
| 5 | Relief Pressure Check | <ul style="list-style-type: none">– Relief Pressure Check– Front Pump Pressure, Rear Pump Pressure |

VBO Diagnostic Check List

❖ Joystick Check List

| Contents | Reference | Green | Red |
|---------------------------|-----------|-------------|-------------|
| Max | 30 bar | Reference ↓ | Reference ↑ |
| Min | 5 bar | Reference ↓ | Reference ↑ |
| Rising Time (Min to Max) | 0.5 sec | Reference ↓ | Reference ↑ |
| Falling Time (Max to Min) | 0.5 sec | Reference ↓ | Reference ↑ |

❖ EPPR V/V Current Check List

| Reference | Green | Yellow | Red |
|-----------|----------|-----------|-----------|
| 100 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 200 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 300 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 500 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 700 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 800 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 850 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |

❖ Swash Plate Angle Check List

| criteria | Green | Yellow | Red |
|-------------------------------------|---------|------------------|-------------|
| Max (4450 mV) | ±10 mV | +20mV -120mV | > Yellow |
| Min (600mV) | ±10 mV | +100mV -140mV | > Yellow |
| Rising Time (current(400 mA) to 4V) | 1.2 sec | Reference ↓ | Reference ↑ |

❖ Main Pump Pressure Check List

| Command (bar) | Reference(bar) | | |
|---------------|----------------|--------|---------|
| | Green | Yellow | Red |
| 45 | ±3 | ±25 | >Yellow |
| 100 | | ±24 | |
| 200 | | ±22.5 | |
| 250 | | ±21.5 | |
| 300 | | ±21 | |
| 350 | | ±20 | |

1. Joystick Check

2. Angle Check

3. EPPR V/V Check

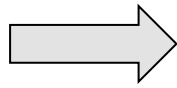
4. Main Pressure Check

5. Relief Pressure Check

1. Joystick Check

❖ Joystick Check Screen Description

1. Joystick Check



| No | Name | Function |
|-----|-----------------------------|---|
| (1) | Test Contents | • Select the Joystick Operation Test |
| (2) | Graph | • The graph displays real-time operation • Tests are marked with different colors |
| (3) | Status Before the test | • Display The Engine RPM, Battery Voltage, Hydraulic Temp |
| (4) | Status and results of tests | • Status of the Results of the operation – Minimum Pressure, Maximum Pressure – Up Time, Down Time. – Coloring for Pass / Fail |


※ Test Result

| Contents | Reference | Green | Red |
|-----------|-----------|-------------|-------------|
| Max | 30 bar | Reference ↓ | Reference ↑ |
| Min | 5 bar | Reference ↓ | Reference ↑ |
| Up Time | 0.5 sec | Reference ↓ | Reference ↑ |
| Down Time | 0.5 sec | Reference ↓ | Reference ↑ |

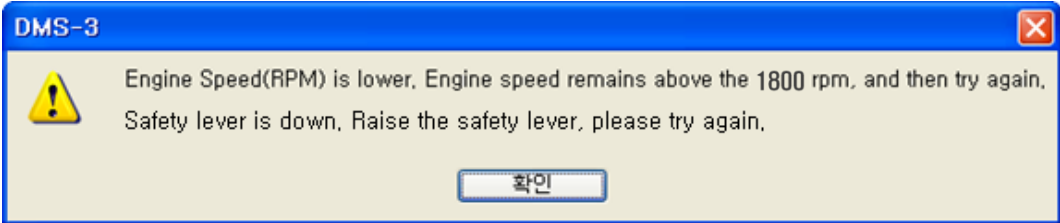
1. Joystick Check

❖ Settings before the Joystick Check test

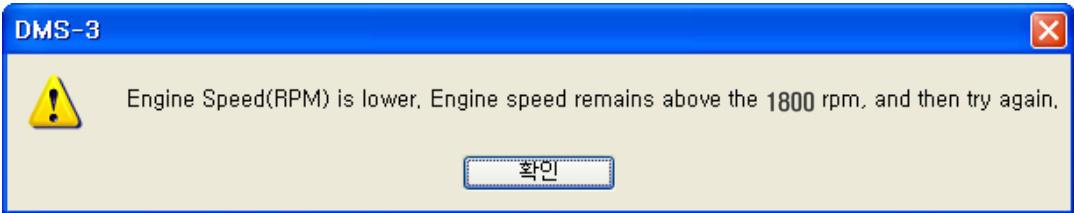
Settings before the test

- Over Engine RPM1800 (Auto idle OFF) Engine RPM: 1850
- Put the Safety lever up (Bypass Cut S/V Off) 
- Read the current fault information, Check the pressure sensor failure
- Maintain the battery Voltage is 27.0V or more Battery Voltage: 28.1 v
- Maintain the oil temperature is 20 degrees or more Hydraulic Oil Temp.: 41 °C

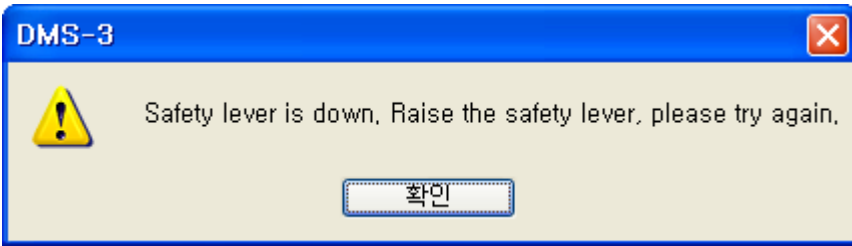
Pop-Up creation if doesn't check the Engine RPM ,safety lever



Pop-Up creation if the engine RPM is low



Pop-Up creation if doesn't check the safety lever




1. Joystick Check

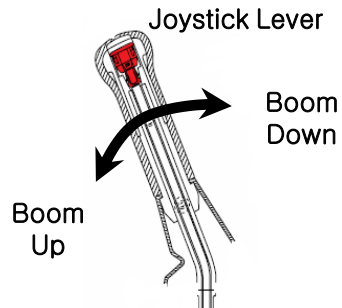
❖ The progress of the Joystick Check test

<Boom Up Pressure[F1]>

➤ STEP 1 – Select the Test

Click  or press F1

➤ STEP 2 – Tests performed actions



Joystick Lever Boom Up Quickly

Waiting one second

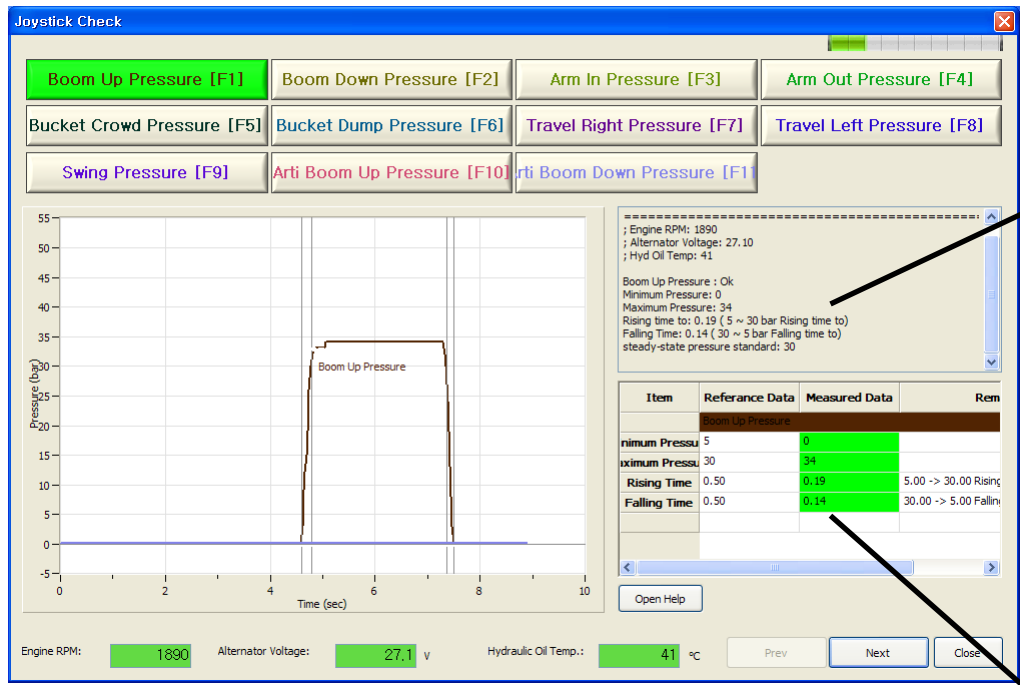
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Boom Up Pressure[F1]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress



※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | Rem |
|------------------|----------------|---------------|-----------------------|
| Boom Up Pressure | | | |
| Minimum Pressu | 5 | 0 | |
| Maximum Pressu | 30 | 34 | |
| Rising Time | 0.50 | 0.19 | 5.00 -> 30.00 Rising |
| Falling Time | 0.50 | 0.14 | 30.00 -> 5.00 Falling |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

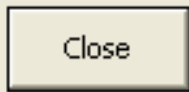
1. Joystick Check

❖ The progress of the Joystick Check test

<Boom Up Pressure[F1]>

➤ STEP 4 – Move the test menu

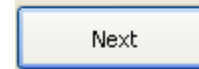
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

※ Etc.

1. Results Unit indicates until the second decimal point.
2. Sampling time is less than the 20 ms.
3. test result data subsequently can use the TMS server transfer function.

1. Joystick Check

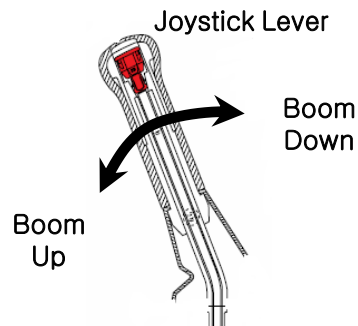
❖ The progress of the Joystick Check test

<Boom Down Pressure[F2]>

➤ STEP 1 – Select the Test

Click **Boom Down Pressure [F2]** or press F2

➤ STEP 2 – Tests performed actions



Joystick Lever Boom Down Quickly

Waiting one second

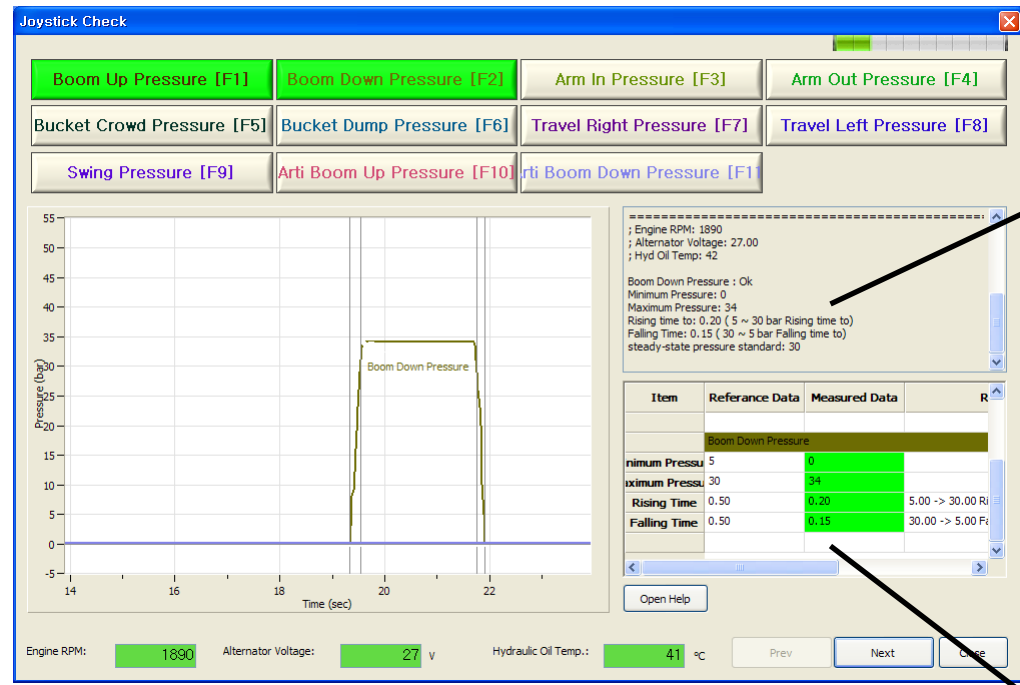
Return to neutral

Return to neutral after waiting one second after Joystick Lever Boom Down Quickly

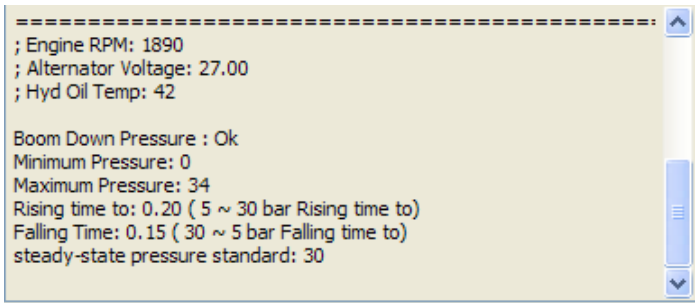
1. Joystick Check

❖ The progress of the Joystick Check test <Boom Down Pressure[F2]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress



※ Criteria
 Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
 Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|--------------------|----------------|---------------|------------------|
| Boom Down Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 34 | |
| Rising Time | 0.50 | 0.20 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.15 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

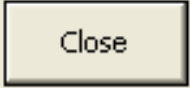
- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

1. Joystick Check

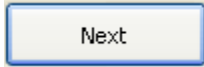
❖ The progress of the Joystick Check test

<Boom Down Pressure[F2]>

➤ STEP 4 – Move the test menu

Click  at the end of the Joystick Check
➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click
➔ **Move to Swash Plate Angle Check**



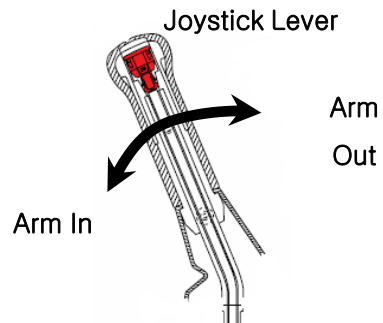
1. Joystick Check

❖ The progress of the Joystick Check test <Arm In Pressure[F3]>

➤ STEP 1 – Select the Test

Click  or press F3

➤ STEP 2 – Tests performed actions



Joystick Lever Arm In Quickly

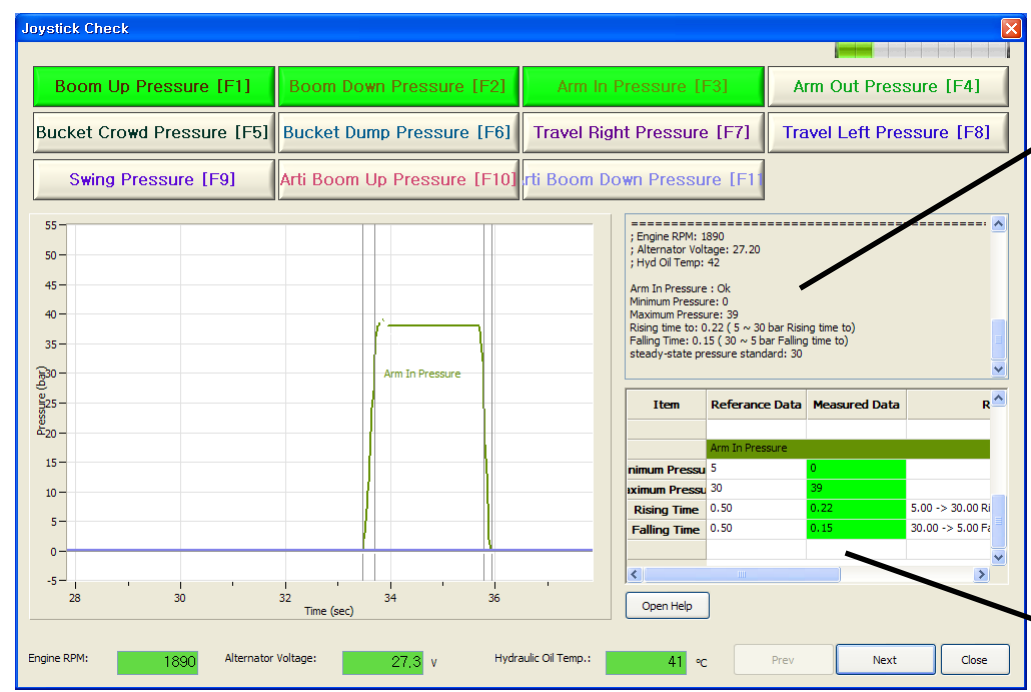
Waiting one second

Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test <Arm In Pressure[F3]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress



❖ Criteria
 Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
 Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|------------------------|----------------|---------------|------------------|
| Arm In Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 39 | |
| Rising Time | 0.50 | 0.22 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.15 | 30.00 -> 5.00 Fa |

❖ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

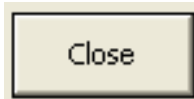
1. Joystick Check

❖ The progress of the Joystick Check test

<Arm In Pressure[F3]>

➤ STEP 4 – Move the test menu

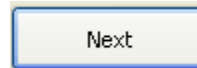
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

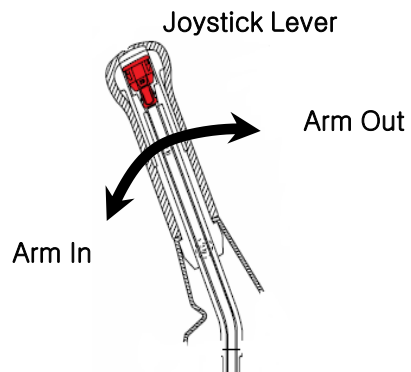
❖ The progress of the Joystick Check test

<Arm Out Pressure[F4]>

➤ STEP 1 – Select the Test

Click **Arm out Pressure [F4]** or press F4

➤ STEP 2 – Tests performed actions



Joystick Lever Arm Out Quickly

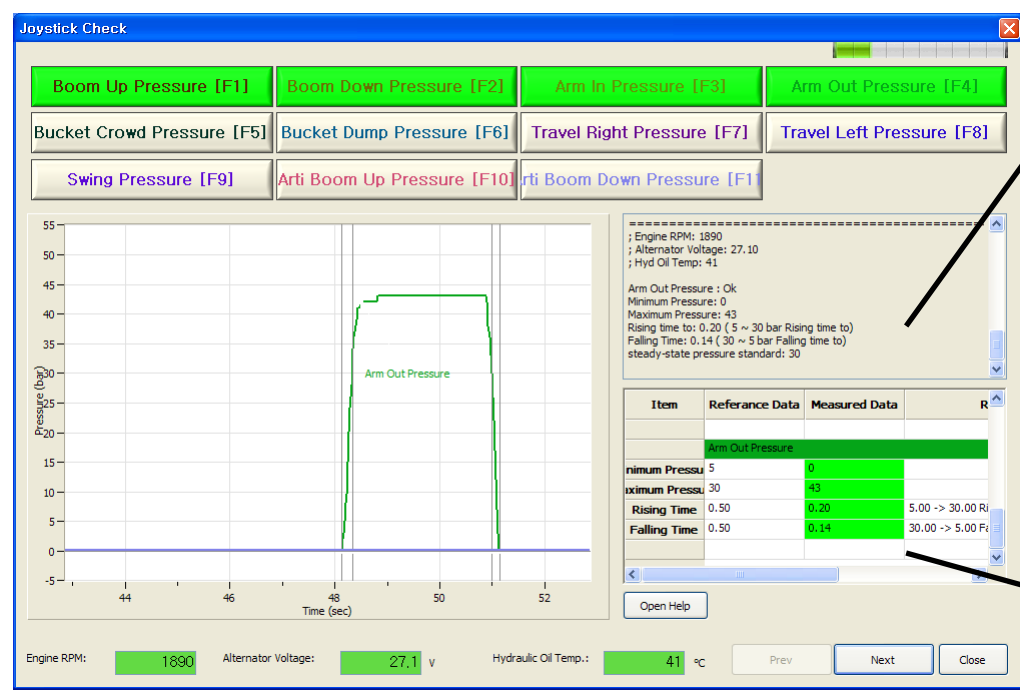
Waiting one second

Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test <Arm Out Pressure[F4]>

➤ STEP 3 – Display Test results and Status



- Display the test progress

```

=====
; Engine RPM: 1890
; Alternator Voltage: 27.10
; Hyd Oil Temp: 41

Arm Out Pressure : Ok
Minimum Pressure: 0
Maximum Pressure: 43
Rising time to: 0.20 ( 5 ~ 30 bar Rising time to)
Falling Time: 0.14 ( 30 ~ 5 bar Falling time to)
steady-state pressure standard: 30
    
```

- ※ Criteria
Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

- Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|------------------|----------------|---------------|------------------|
| Arm Out Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 43 | |
| Rising Time | 0.50 | 0.20 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.14 | 30.00 -> 5.00 Fa |

- ※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

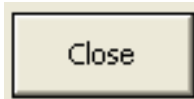
1. Joystick Check

❖ The progress of the Joystick Check test

<Arm Out Pressure[F4]>

➤ STEP 4 – Move the test menu

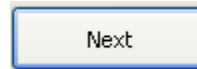
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

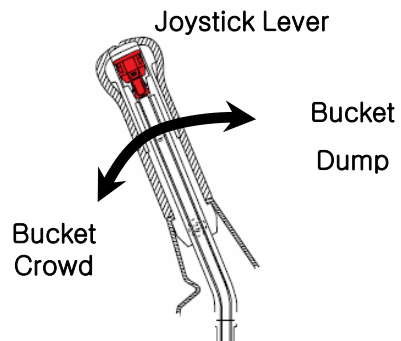
❖ The progress of the Joystick Check test

<Bucket crowd Pressure[F5]>

➤ STEP 1 – Select the Test

Click **Bucket crowd Pressure [F5]** or press F5

➤ STEP 2 – Tests performed actions



Joystick Lever Bucket Crowd Quickly

Waiting one second

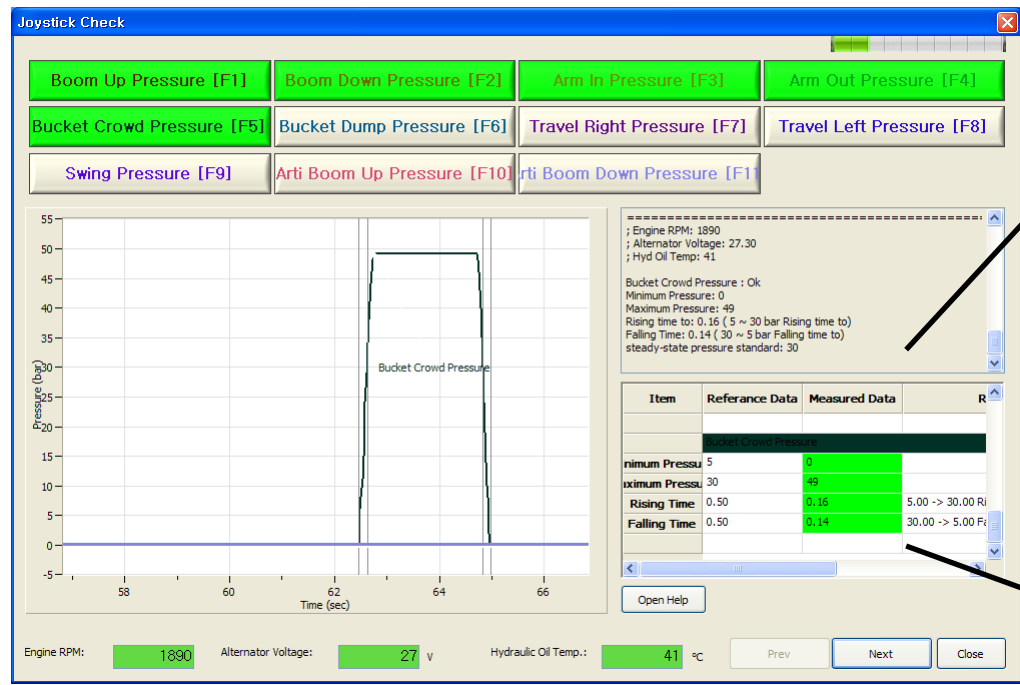
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Bucket crowd Pressure[F5]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress

```

=====
; Engine RPM: 1890
; Alternator Voltage: 27.30
; Hyd Oil Temp: 41

Bucket Crowd Pressure : Ok
Minimum Pressure: 0
Maximum Pressure: 49
Rising time to: 0.16 ( 5 ~ 30 bar Rising time to)
Falling Time: 0.14 ( 30 ~ 5 bar Falling time to)
steady-state pressure standard: 30
    
```

※ Criteria
 Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
 Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|-----------------------|----------------|---------------|------------------|
| Bucket Crowd Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 49 | |
| Rising Time | 0.50 | 0.16 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.14 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

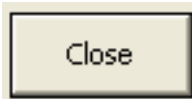
1. Joystick Check

❖ The progress of the Joystick Check test

<Bucket crowd Pressure[F5]>

➤ STEP 4 – Move the test menu

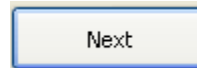
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

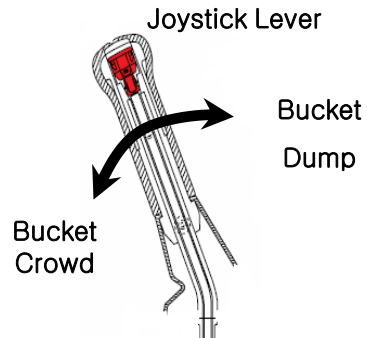
❖ The progress of the Joystick Check test

<Bucket Dump Pressure[F6]>

➤ STEP 1 – Select the Test

Click **Bucket dump Pressure [F6]** or press F6

➤ STEP 2 – Tests performed actions



Joystick Lever Bucket Dump Quickly

Waiting one second

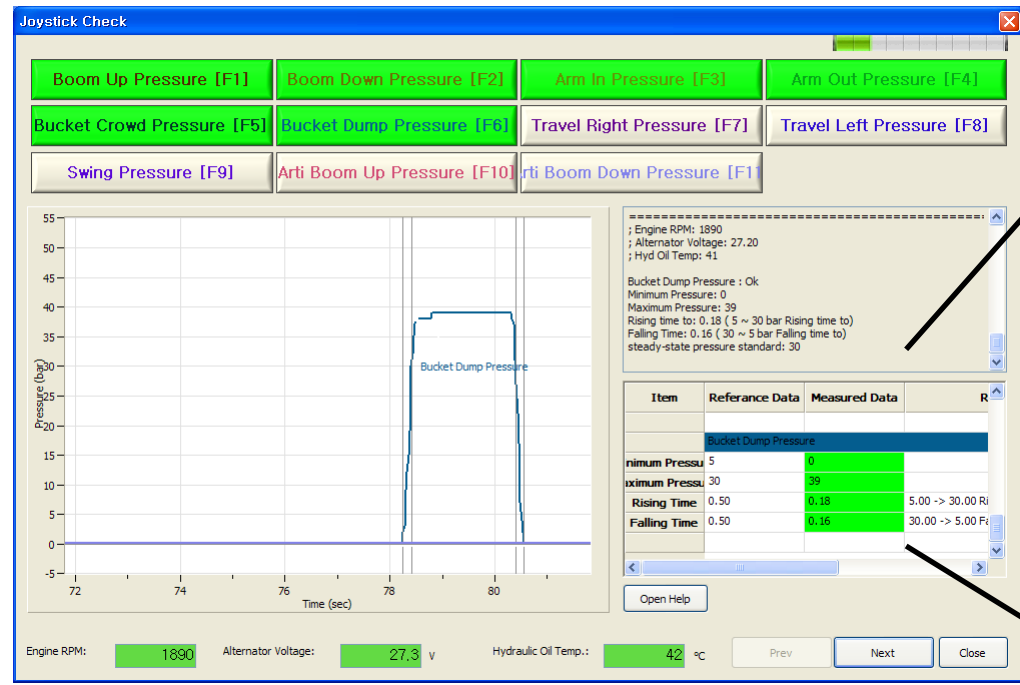
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Bucket Dump Pressure[F6]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress

```

-----
; Engine RPM: 1890
; Alternator Voltage: 27.20
; Hyd Oil Temp: 41

Bucket Dump Pressure : Ok
Minimum Pressure: 0
Maximum Pressure: 39
Rising time to: 0.18 ( 5 ~ 30 bar Rising time to)
Falling Time: 0.16 ( 30 ~ 5 bar Falling time to)
steady-state pressure standard: 30
    
```

※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|-----------------------------|----------------|---------------|------------------|
| Bucket Dump Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 39 | |
| Rising Time | 0.50 | 0.18 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.16 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

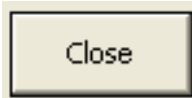
1. Joystick Check

❖ The progress of the Joystick Check test

<Bucket Dump Pressure[F6]>

➤ STEP 4 – Move the test menu

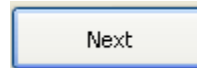
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

❖ The progress of the Joystick Check test

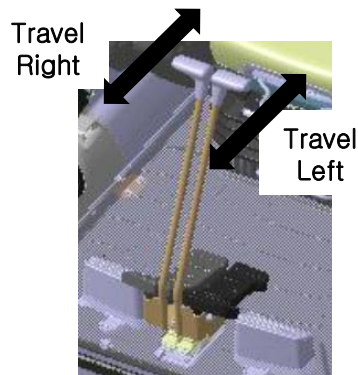
<Travel Right Pressure[F7]>

➤ STEP 1 – Select the Test

Click **Travel Right Pressure [F7]** or press F7

➤ STEP 2 – Tests performed actions

Joystick Lever[Pedal]



Operate Joystick Lever[Pedal] Travel Right Quickly

Waiting one second

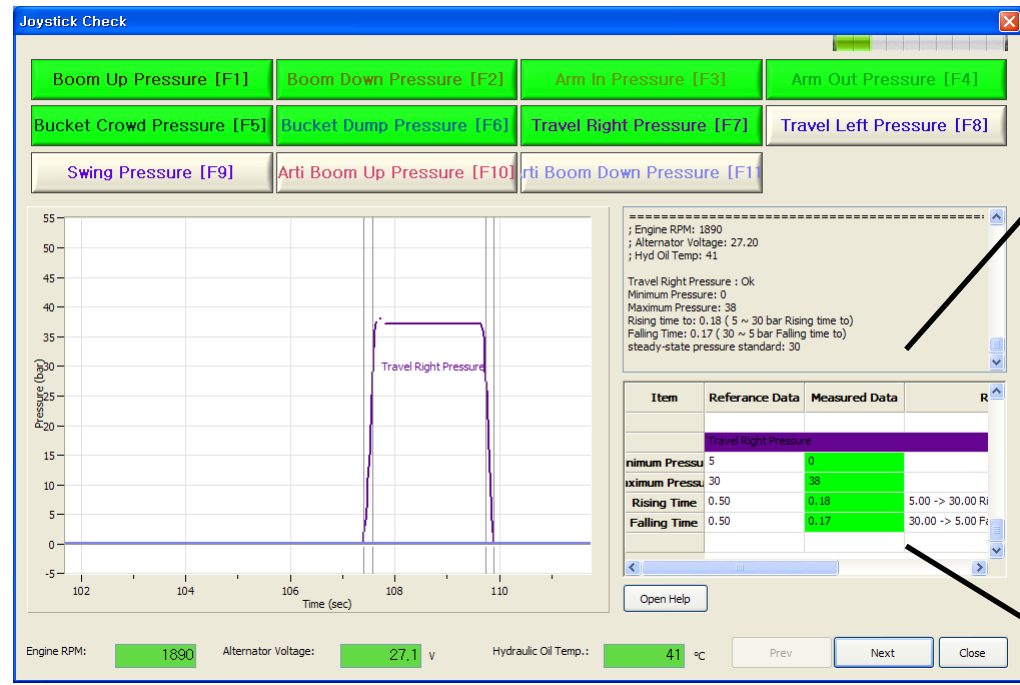
Return to neutral

1. Joystick Check

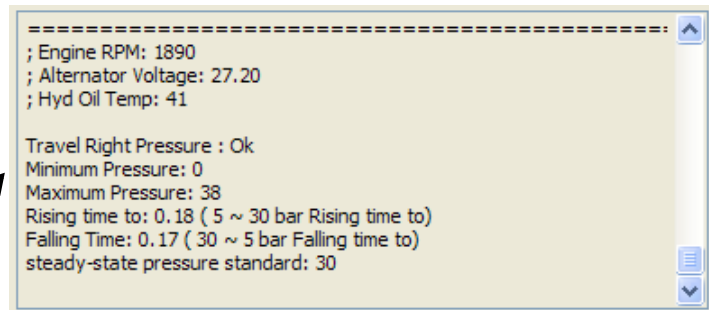
❖ The progress of the Joystick Check test

<Travel Right Pressure[F7]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress



※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|-----------------------|----------------|---------------|------------------|
| Travel Right Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 38 | |
| Rising Time | 0.50 | 0.18 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.17 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

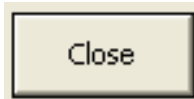
1. Joystick Check

❖ The progress of the Joystick Check test

<Travel Right Pressure[F7]>

➤ STEP 4 – Move the test menu

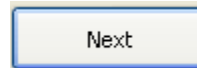
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

❖ The progress of the Joystick Check test

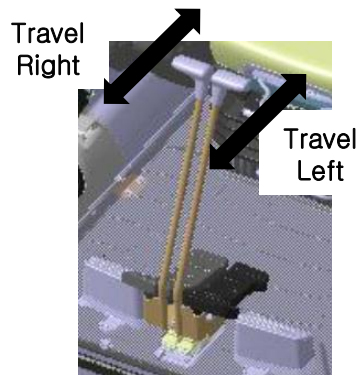
<Travel Left Pressure[F8]>

➤ STEP 1 – Select the Test

Click **Travel Left Pressure [F8]** or press F8

➤ STEP 2 – Tests performed actions

Joystick Lever[Pedal]



Operate Joystick Lever[Pedal] Travel Left Quickly

Waiting one second

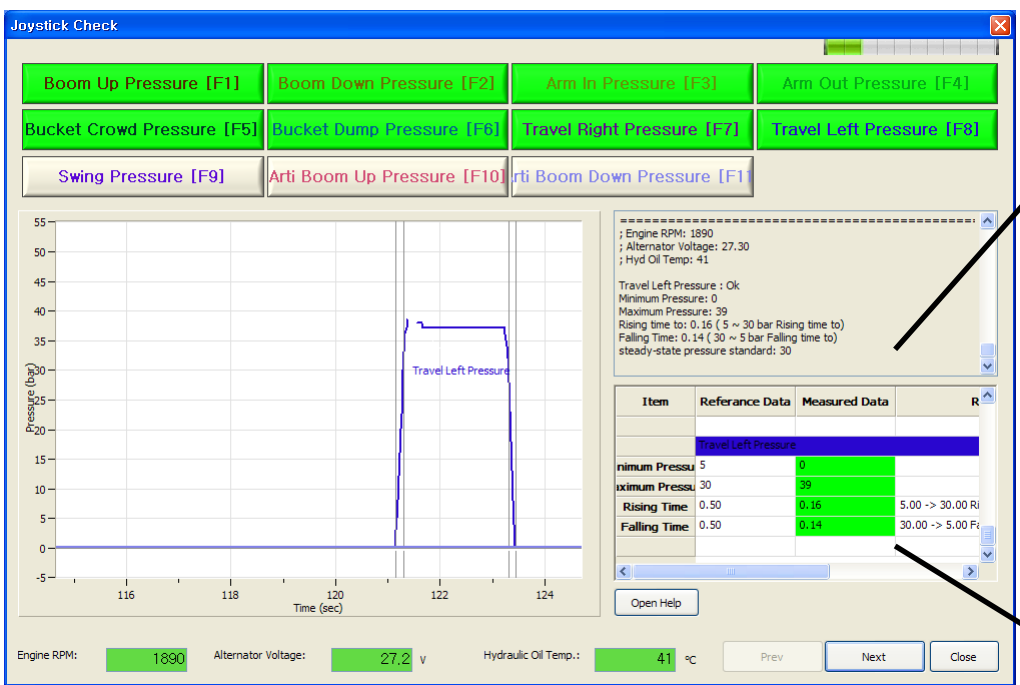
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Travel Left Pressure[F8]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress



※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|----------------------|----------------|---------------|------------------|
| Travel Left Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 39 | |
| Rising Time | 0.50 | 0.16 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.14 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

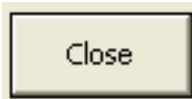
1. Joystick Check

❖ The progress of the Joystick Check test

<Travel Left Pressure[F8]>

➤ STEP 4 – Move the test menu

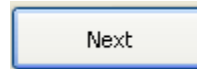
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

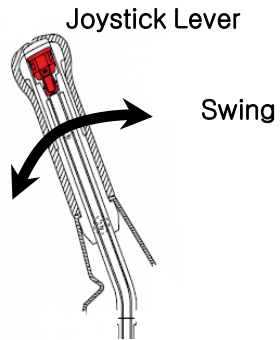
❖ The progress of the Joystick Check test

<Swing Pressure[F9]>

➤ STEP 1 – Select the Test

Click  or press F9

➤ STEP 2 – Tests performed actions



Joystick Lever Swing Quickly

Waiting one second

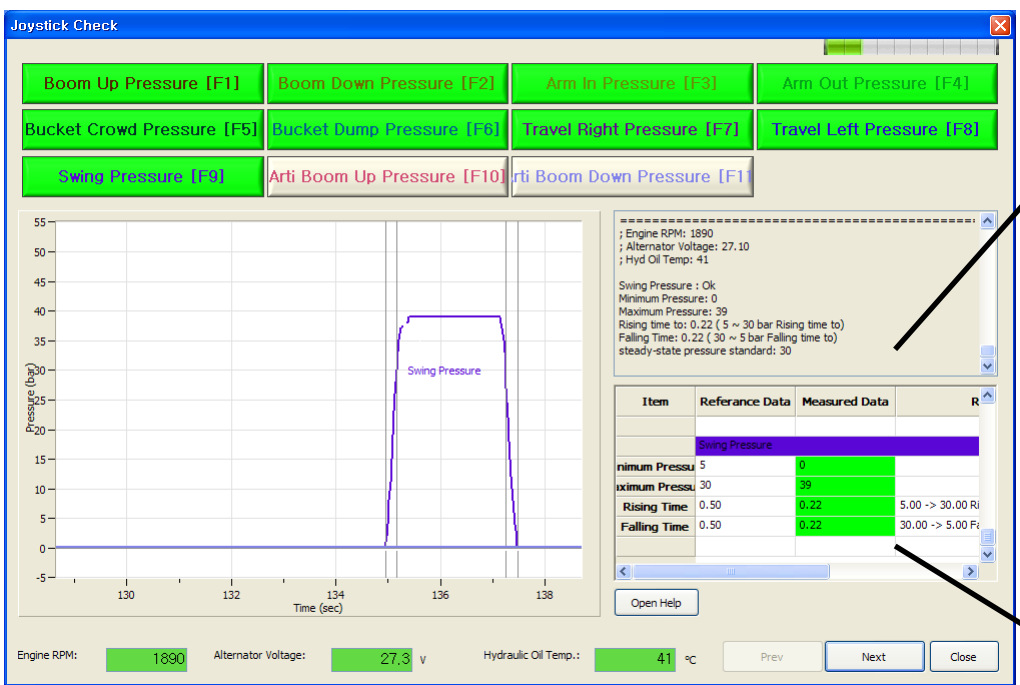
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Swing Pressure[F9]>

➤ STEP 3 – Display Test results and Status



- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

▪ Display the test progress

```

=====
; Engine RPM: 1890
; Alternator Voltage: 27.10
; Hyd Oil Temp: 41

Swing Pressure : Ok
Minimum Pressure: 0
Maximum Pressure: 39
Rising time to: 0.22 ( 5 ~ 30 bar Rising time to)
Falling Time: 0.22 ( 30 ~ 5 bar Falling time to)
steady-state pressure standard: 30
    
```

※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|------------------|----------------|---------------|------------------|
| Swing Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 39 | |
| Rising Time | 0.50 | 0.22 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.22 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

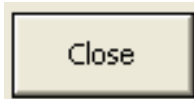
1. Joystick Check

❖ The progress of the Joystick Check test

<Swing Pressure[F9]>

➤ STEP 4 – Move the test menu

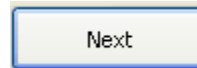
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

❖ The progress of the Joystick Check test

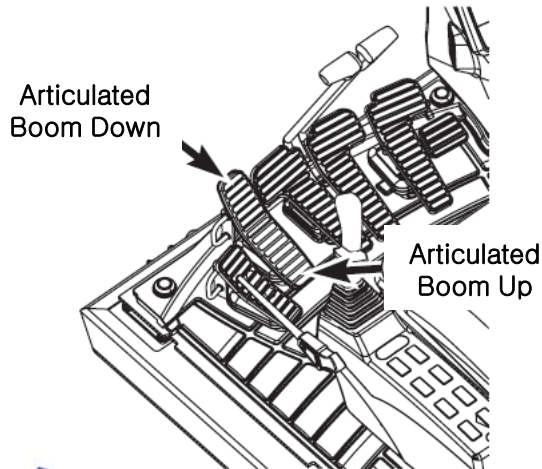
<Arti Boom Up Pressure[F10]>

➤ STEP 1 – Select the Test

Click **Arti Boom Up Pressure [F10]** or press F10

➤ STEP 2 – Tests performed actions

Joystick Lever



Joystick Lever[Pedal] Articulated Boom Up Quickly

Waiting one second

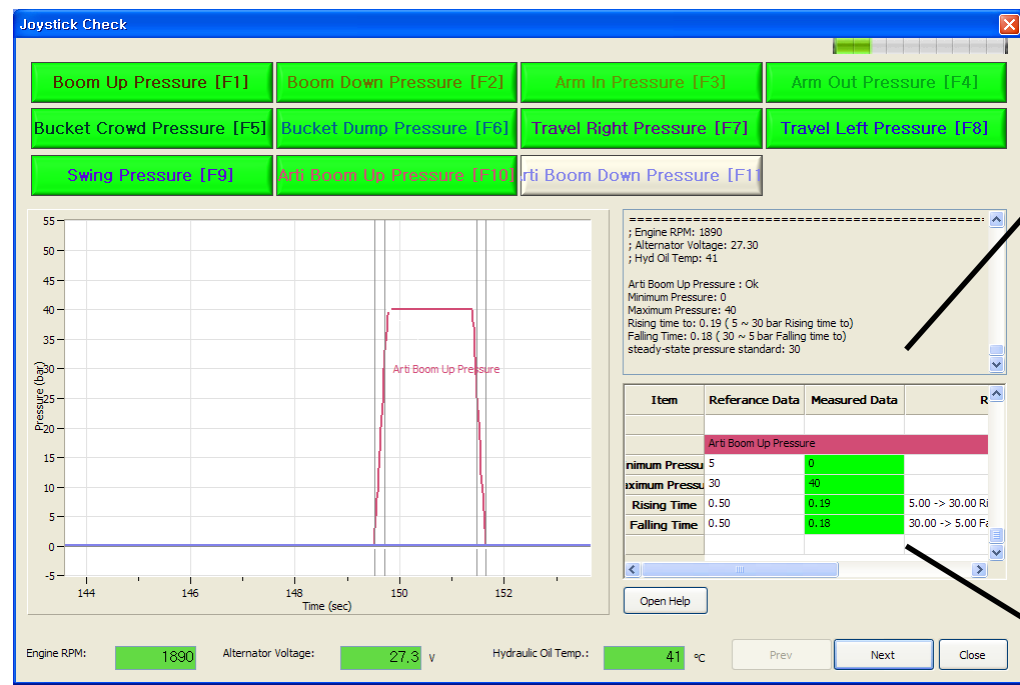
Return to neutral

1. Joystick Check

❖ The progress of the Joystick Check test

<Arti Boom Up Pressure[F10]>

➤ STEP 3 – Display Test results and Status



▪ Display the test progress

```

=====
; Engine RPM: 1890
; Alternator Voltage: 27.30
; Hyd Oil Temp: 41

Arti Boom Up Pressure : Ok
Minimum Pressure: 0
Maximum Pressure: 40
Rising time to: 0.19 ( 5 ~ 30 bar Rising time to)
Falling Time: 0.18 ( 30 ~ 5 bar Falling time to)
steady-state pressure standard: 30
    
```

※ Criteria

Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
 Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

▪ Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|-----------------------|----------------|---------------|------------------|
| Arti Boom Up Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 40 | |
| Rising Time | 0.50 | 0.19 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.18 | 30.00 -> 5.00 Fa |

※ Shown in red on fail

- Boom Up Pressure
- Bucket Crowd Pressure
- Boom Down Pressure
- Bucket Dump Pressure
- Arm In Pressure
- Travel Right Pressure
- Arm Out Pressure
- Travel Left Pressure
- Swing Pressure
- Arti Boom Up Pressure
- Arti Boom Down Pressure

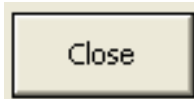
1. Joystick Check

❖ The progress of the Joystick Check test

<Arti Boom Up Pressure[F10]>

➤ STEP 4 – Move the test menu

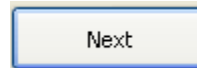
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

❖ The progress of the Joystick Check test

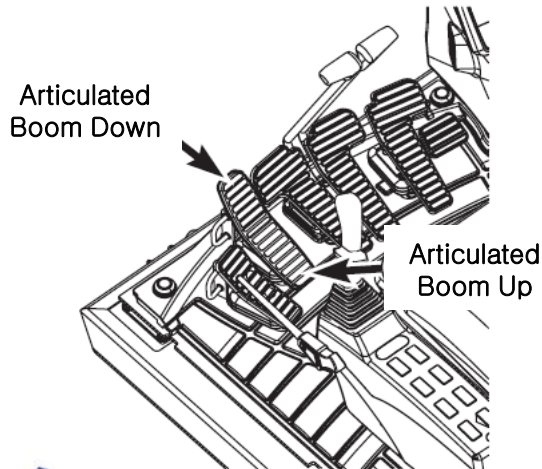
<Arti Boom Down Pressure[F11]>

➤ STEP 1 – Select the Test

Click **Arti Boom Down Pressure [F11]** or press F11

➤ STEP 2 – Tests performed actions

Joystick Lever



Joystick Lever[Pedal] Articulated Boom Down Quickly

Waiting one second

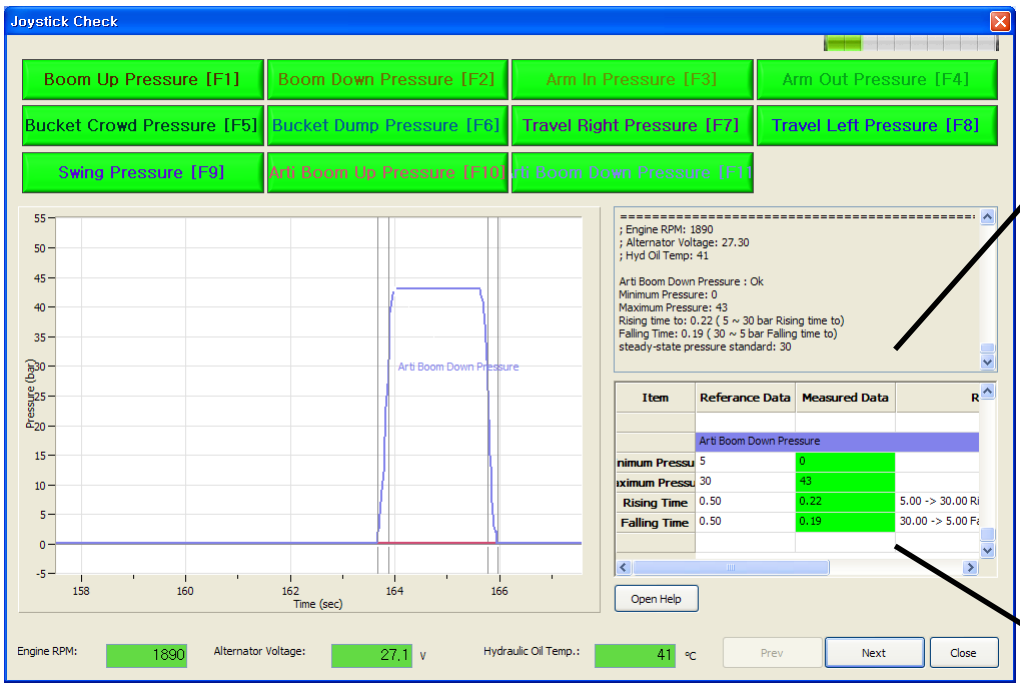
Return to neutral

1. Joystick Check

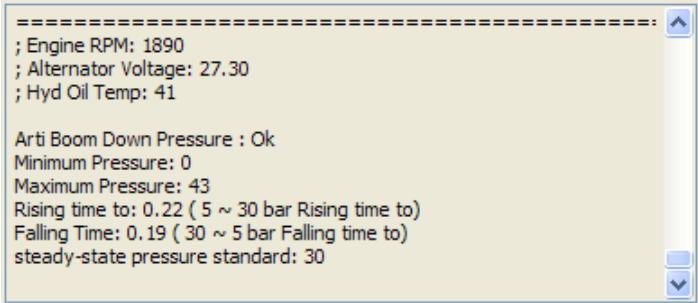
❖ The progress of the Joystick Check test

<Arti Boom Down Pressure[F11]>

➤ STEP 3 – Display Test results and Status



- Display the test progress



- ※ Criteria
Minimum pressure: 5 bar ↓, Maximum pressure: 30 bar ↑
Quick Operation (0.5 sec ↓) Operating: 0 ~ 30 bar

- Display the Status Test Results

| Item | Reference Data | Measured Data | R |
|-------------------------|----------------|---------------|------------------|
| Arti Boom Down Pressure | | | |
| Minimum Pressure | 5 | 0 | |
| Maximum Pressure | 30 | 43 | |
| Rising Time | 0.50 | 0.22 | 5.00 -> 30.00 Ri |
| Falling Time | 0.50 | 0.19 | 30.00 -> 5.00 Fa |

- ※ Shown in red on fail

- Boom Up Pressure
 - Boom Down Pressure
 - Arm In Pressure
 - Arm Out Pressure
 - Swing Pressure
- Bucket Crowd Pressure
 - Bucket Dump Pressure
 - Travel Right Pressure
 - Travel Left Pressure
 - Arti Boom Up Pressure
 - Arti Boom Down Pressure

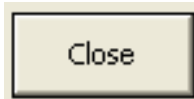
1. Joystick Check

❖ The progress of the Joystick Check test

<Arti Boom Down Pressure[F11]>

➤ STEP 4 – Move the test menu

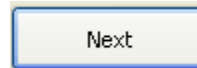
Click on



at the end of the Joystick Check

➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(Swash Plate Angle Check), Click



➔ **Move to Swash Plate Angle Check**

1. Joystick Check

2. Angle Check

3. EPPR V/V Check

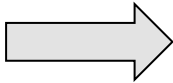
4. Main Pressure Check

5. Relief Pressure Check

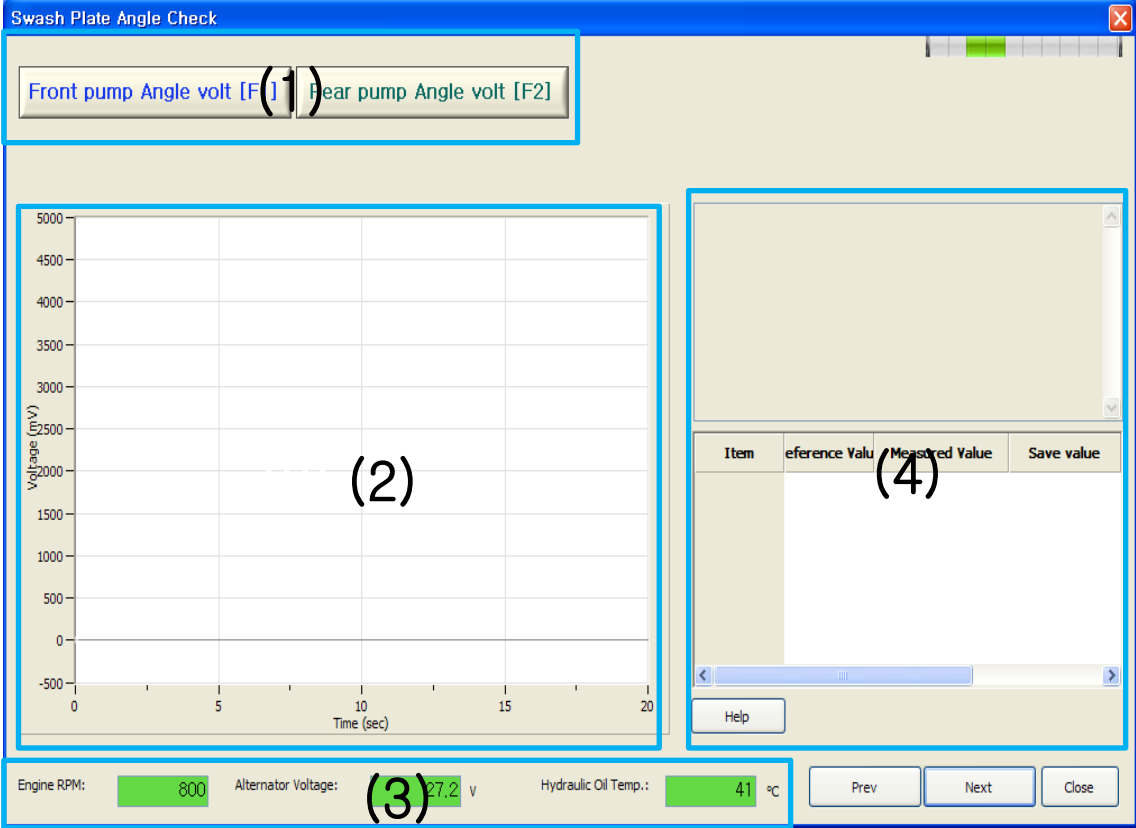
2. Swash Plate Angle Check

❖ Swash Plate Angle Check Screen Description

2. Swash Plate Angle Check



| No | Name | Function |
|-----|-----------------------------|---|
| (1) | Test Contents | <ul style="list-style-type: none"> Select the Angle Check Test |
| (2) | Graph | <ul style="list-style-type: none"> The graph displays real-time operation Tests are marked with different colors |
| (3) | Status Before the test | <ul style="list-style-type: none"> Display The Engine RPM, Battery Voltage, Hydraulic Temp |
| (4) | Status and results of tests | <ul style="list-style-type: none"> Status of the Results of the operation <ul style="list-style-type: none"> Minimum Pressure, Maximum Pressure Up Time, Down Time. Coloring for Pass / Fail Shown in red on fail |



※ Results
Min, Max Value(Refer Value) Conversion Time (Refer Time)

| criteria | Green | Yellow | Red |
|---------------|--------|------------------|----------|
| Max (4450 mV) | ±10 mV | +20mV -120mV | > Yellow |
| Min (600mV) | ±10 mV | +100mV -140mV | > Yellow |

2. Swash Plate Angle Check

❖ Settings before the Angle Check test

Settings before the test

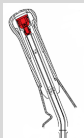
Joystick lever neutral

Under Engine RPM1000
(Auto idle OFF)

Maintain the battery
Voltage is 27.0V or more

Maintain the oil temperature
is 20 degrees or more


Put the Safety lever down
(Bypass Cut S/V ON)



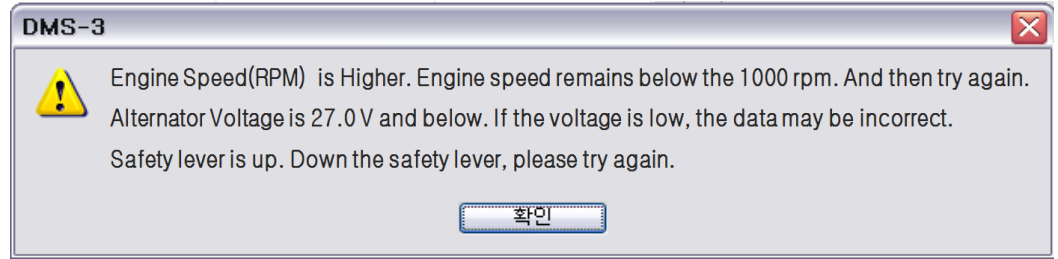
Engine RPM: 800

Battery Voltage: V

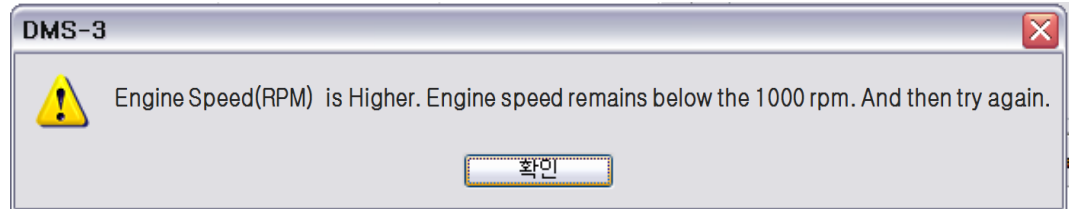
Hydraulic Oil Temp.: 41 °C



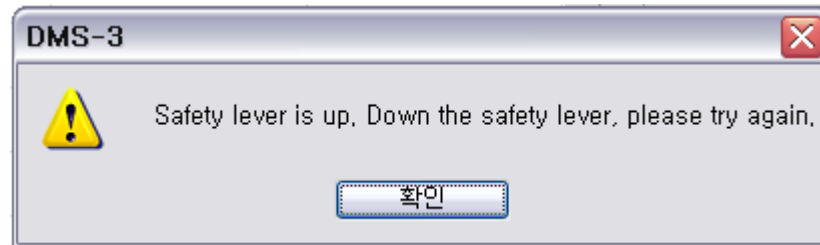
Pop-Up creation if doesn't check the Engine RPM ,safety lever and Alternator voltage.



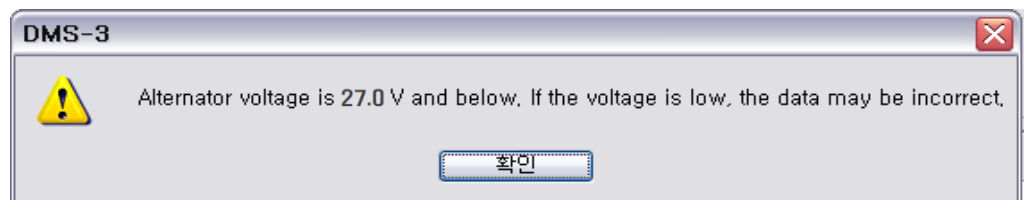
Pop-Up creation if the engine RPM is low



Pop-Up creation if doesn't check the safety lever



Pop-Up creation if doesn't check the Alternator voltage.



2. Swash Plate Angle Check

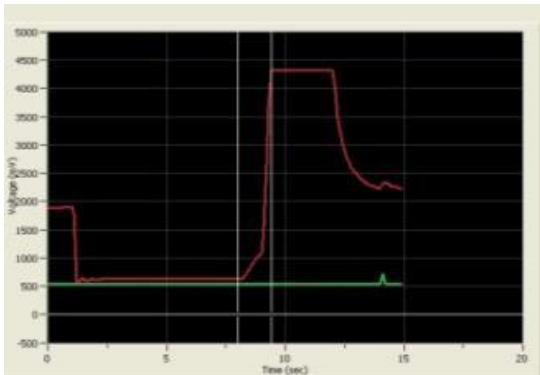
❖ The progress of the Angle Check test

<Front Pump Angle volt [F1]>

➤ STEP 1 – Select the Test

Click **Front pump Angle volt [F1]** or press F1

➤ STEP 2 – Tests performed actions

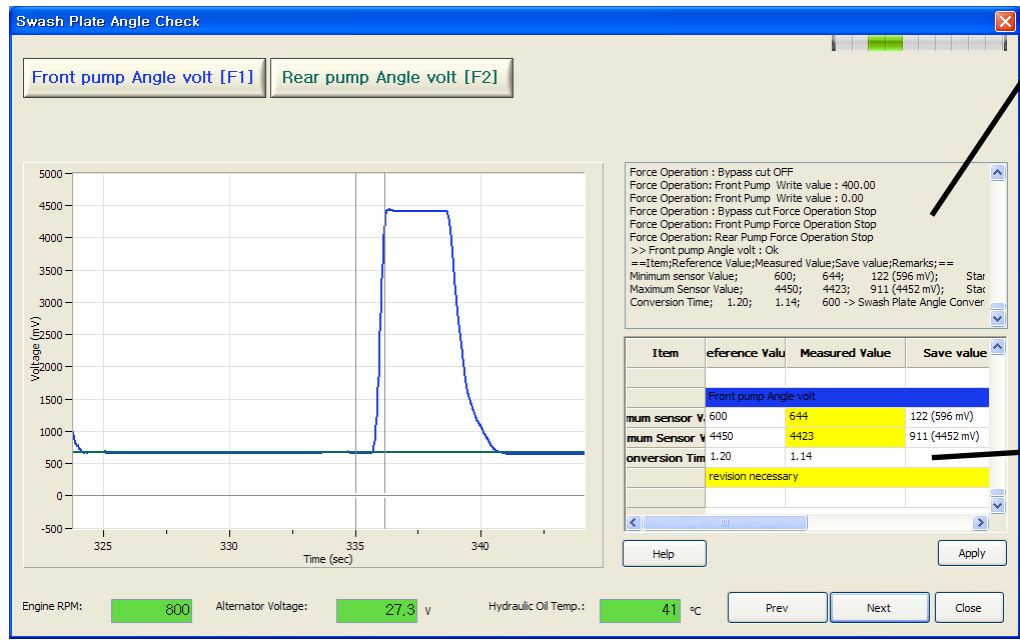


VBO diagnostic program will automatically run the Front Pump Angle Volt

2. Swash Plate Angle Check

❖ The progress of the Angle Check test
 <Front Pump Angle volt [F1]>

➤ STEP 3 – Display Test results and Status



• Display the test progress

```
Force Operation : Bypass cut OFF
Force Operation: Front Pump Write value : 400.00
Force Operation: Front Pump Write value : 0.00
Force Operation : Bypass cut Force Operation Stop
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
>> Front pump Angle volt : Ok
==Item;Reference Value;Measured Value;Save value;Remarks;==
Minimum sensor Value; 600; 644; 122 (596 mV); Star
Maximum Sensor Value; 4450; 4423; 911 (4452 mV); Star
Conversion Time; 1.20; 1.14; 600 -> Swash Plate Angle Conver
```

※ Criteria
 Min Voltage: 0.43V – 0.7V, Max Voltage: 4.33V – 4.47V
 Transition time(1.2sec , Forced Current (400mA) -> 4.0V)

• Display the Status Test Results

| Item | Reference Value | Measured Value | Save value |
|-----------------------|-----------------|----------------|---------------|
| Front pump Angle volt | | | |
| Minimum sensor V | 600 | 644 | 122 (596 mV) |
| Maximum Sensor V | 4450 | 4423 | 911 (4452 mV) |
| Conversion Tim | 1.20 | 1.14 | |
| revision necessary | | | |

※ Results
 Min, Max Value(Refer Value) Conversion Time (Refer Time)

| criteria | Green | Yellow | Red |
|---------------|--------|------------------|----------|
| Max (4450 mV) | ±10 mV | +20mV -120mV | > Yellow |
| Min (600mV) | ±10 mV | +100mV -140mV | > Yellow |

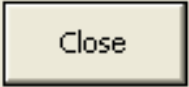
Front Pump Angle Voltage
 Rear Pump Angle Voltage

2. Swash Plate Angle Check

❖ The progress of the Angle Check test

<Front Pump Angle volt [F1]>

➤ STEP 4 – Move the test menu

Click on  at the end of the Angle Check
➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test(EPPR V/V Check), Click 
➔ **Move to EPPR V/V Check**

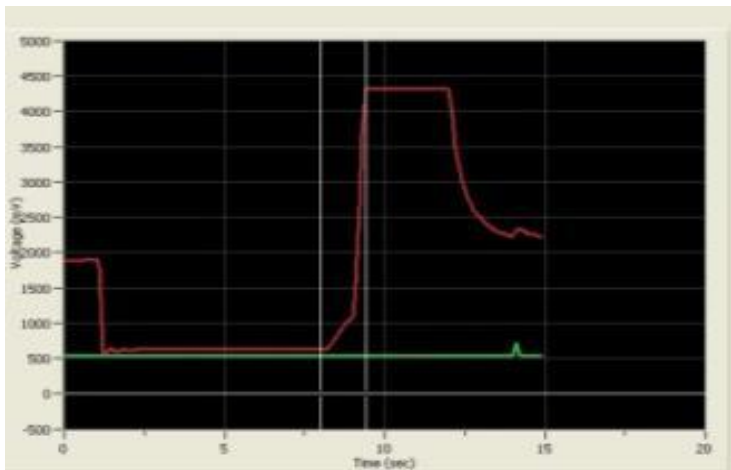
2. Swash Plate Angle Check

- ❖ The progress of the Angle Check test
<Rear Pump Angle volt [F2]>

- STEP 1 – Select the Test

Click **Rear pump Angle volt [F2]** or press F2

- STEP 2 – Tests performed actions

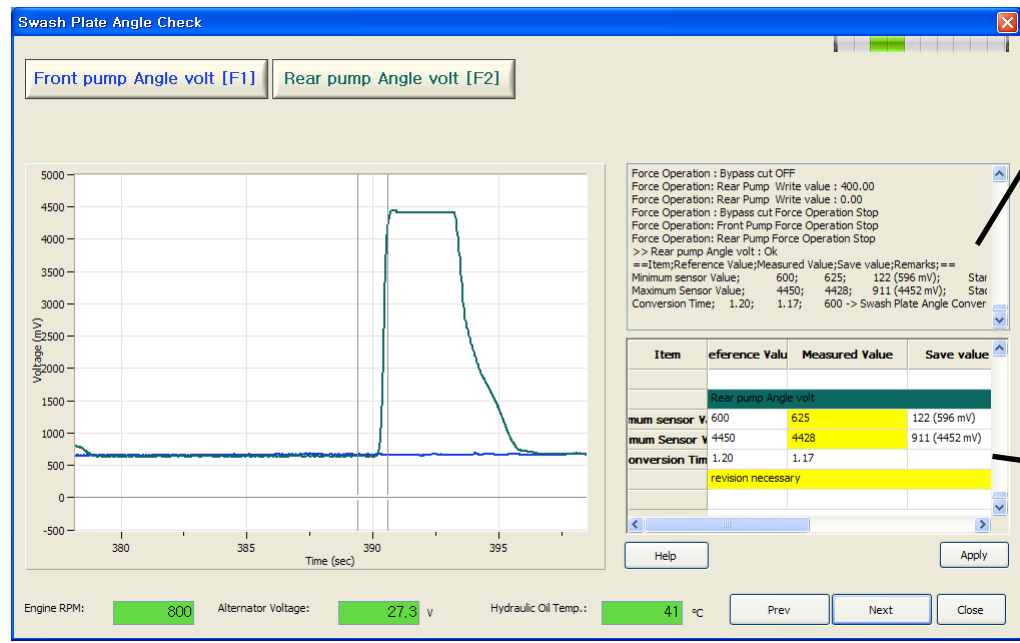


VBO diagnostic program will automatically run the Rear Pump Angle Volt

2. Swash Plate Angle Check

❖ The progress of the Angle Check test
 <Rear Pump Angle volt [F2]>

➤ STEP 3 – Display Test results and Status



Front Pump Angle Voltage
 Rear Pump Angle Voltage

• Display the test progress

```
Force Operation : Bypass cut OFF
Force Operation: Rear Pump Write value : 400.00
Force Operation: Rear Pump Write value : 0.00
Force Operation : Bypass cut Force Operation Stop
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
>> Rear pump Angle volt : Ok
==Item;Reference Value;Measured Value;Save value;Remarks;==
Minimum sensor Value; 600; 625; 122 (596 mV); Star
Maximum Sensor Value; 4450; 4428; 911 (4452 mV); Star
Conversion Time; 1.20; 1.17; 600 -> Swash Plate Angle Conver
```

※ Criteria
 Min Voltage: 0.43V – 0.7V, Max Voltage: 4.33V – 4.47V
 Transition time(1.2sec , Forced Current (400mA) -> 4.0V)

• Display the Status Test Results

| Item | Reference Value | Measured Value | Save value |
|----------------------|-----------------|----------------|---------------|
| Rear pump Angle volt | | | |
| Minimum sensor Value | 600 | 625 | 122 (596 mV) |
| Maximum Sensor Value | 4450 | 4428 | 911 (4452 mV) |
| Conversion Time | 1.20 | 1.17 | |
| revision necessary | | | |

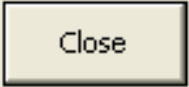
※ Results
 Min, Max Value(Refer Value) Conversion Time (Refer Time)

| criteria | Green | Yellow | Red |
|---------------|--------|------------------|----------|
| Max (4450 mV) | ±10 mV | +20mV -120mV | > Yellow |
| Min (600mV) | ±10 mV | +100mV -140mV | > Yellow |

2. Swash Plate Angle Check

❖ The progress of the Angle Check test
<Rear Pump Angle volt [F2]>

➤ STEP 4 – Move the test menu

Click on  at the end of the Angle Check
➔ Go to the VBO Diagnostic Tools Main Screen

In order to check the next Test(EPPR V/V Check), Click 
➔ Move to EPPR V/V Check

1. Joystick Check

2. Angle Check

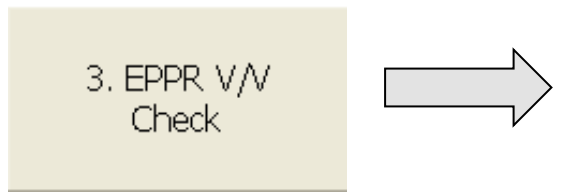
3. EPPR V/V Check

4. Main Pressure Check

5. Relief Pressure Check

3. EPPR V/V Check

❖ EPPR V/V Check Screen Description



| No | Name | Function |
|-----|-----------------------------|--|
| (1) | Test Contents | • Select the EPPR V/V Check Test |
| (2) | Graph | • The graph displays real-time operation • Tests are marked with different colors |
| (3) | Status Before the test | • Display The Engine RPM, Battery Voltage, Hydraulic Temp |
| (4) | Status and results of tests | • Display The Engine RPM, Battery Voltage, Hydraulic Temp – Display to command , output, error for each command * Status |

*** Status**

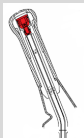
| Reference | Green | Yellow | Red |
|-----------|----------|-----------|-----------|
| 100 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 200 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 300 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 500 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 700 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 800 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 850 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |

3. EPPR V/V Check

❖ Settings before the EPPR V/V Check test

Settings before the test

Joystick lever neutral



Over Engine RPM 1800
(Start-up is ON)

Engine RPM:

Maintain the battery
Voltage is 27.0V or more


Battery Voltage:

 V

Maintain the oil temperature
is 20 degrees or more

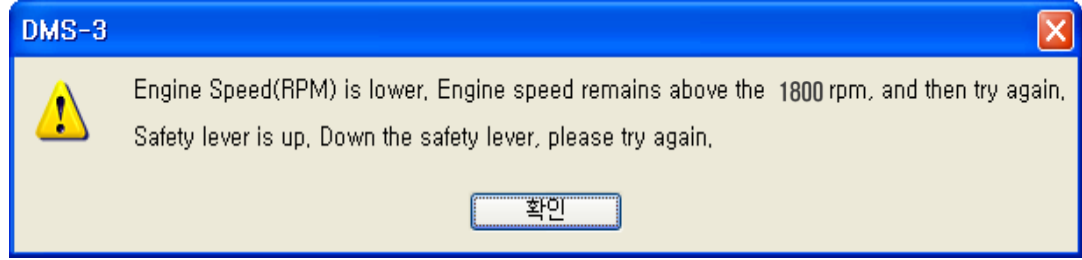
Hydraulic Oil Temp.:

41 °C



Put the Safety lever down
(Bypass Cut S/V ON)

Pop-Up creation if doesn't check the Engine RPM ,safety lever



Pop-Up creation if doesn't check the safety lever



3. EPPR V/V Check

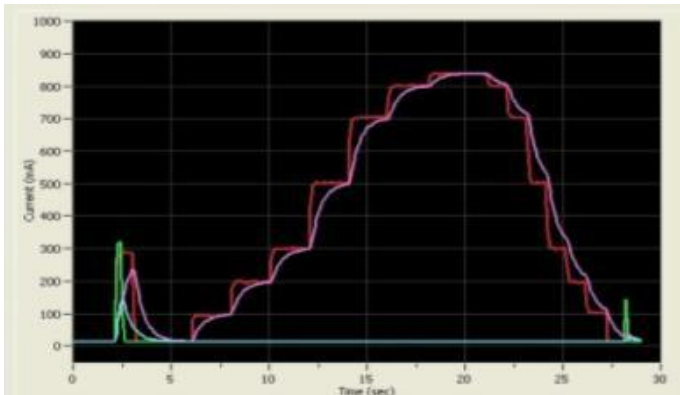
❖ The progress of the EPPR V/V Check test

<Power Shift P/V 1 [F1]>

➤ STEP 1 – Select the Test

Click  or press F1

➤ STEP 2 – Tests performed actions

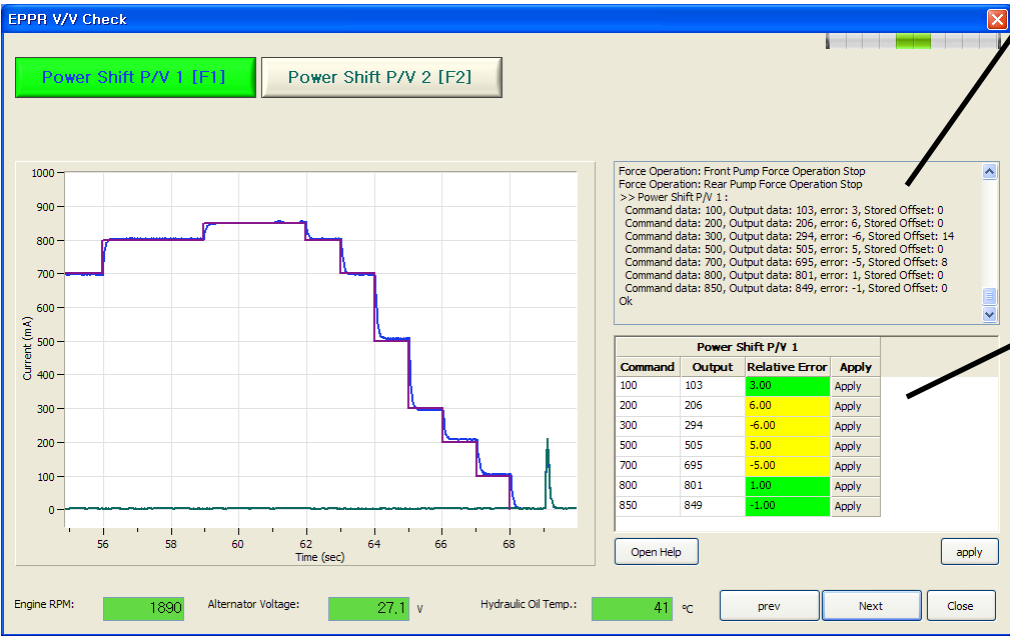


VBO diagnostic program will automatically run the EPPR V/V Check

3. EPPR V/V Check

❖ The progress of the EPPR V/V Check test <Power Shift P/V 1 [F1]>

➤ STEP 3 – Display Test results and Status



- Power Shift P/V 1
- Power Shift P/V 2
- Force Operation Command

• Display the test progress

```
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
>> Power Shift P/V 1 :
Command data: 100, Output data: 103, error: 3, Stored Offset: 0
Command data: 200, Output data: 206, error: 6, Stored Offset: 0
Command data: 300, Output data: 294, error: -6, Stored Offset: 14
Command data: 500, Output data: 505, error: 5, Stored Offset: 0
Command data: 700, Output data: 695, error: -5, Stored Offset: 8
Command data: 800, Output data: 801, error: 1, Stored Offset: 0
Command data: 850, Output data: 849, error: -1, Stored Offset: 0
Ok
```

• Display the Status Test Results

| Power Shift P/V 1 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 103 | 3.00 | Apply |
| 200 | 206 | 6.00 | Apply |
| 300 | 294 | -6.00 | Apply |
| 500 | 505 | 5.00 | Apply |
| 700 | 695 | -5.00 | Apply |
| 800 | 801 | 1.00 | Apply |
| 850 | 849 | -1.00 | Apply |

- ※ Results
- Display to command , output, error for each command
- ※ Status

| Reference | Green | Yellow | Red |
|-----------|----------|-----------|-----------|
| 100 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 200 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 300 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 500 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 700 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 800 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 850 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |

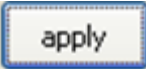
3. EPPR V/V Check

❖ The progress of the EPPR V/V Check test

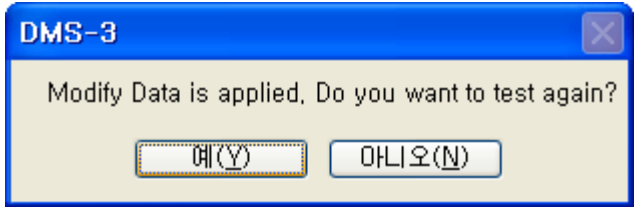
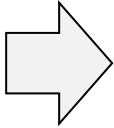
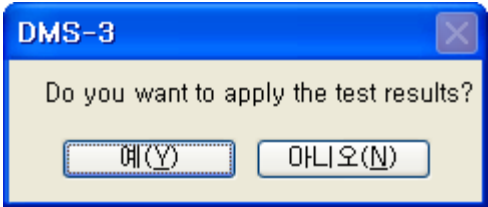
<Power Shift P/V 1 [F1]>

➤ STEP 4 – Apply modified value

If you want to have to retake the modified values, click



Retest

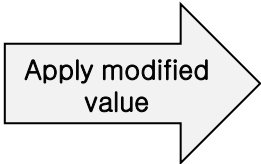


➤ STEP 5 – Retest results

Retested with the modified value (the test results confirmed changes)

Before Retest

| Power Shift P/V 1 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 103 | 3.00 | Apply |
| 200 | 206 | 6.00 | Apply |
| 300 | 294 | -6.00 | Apply |
| 500 | 505 | 5.00 | Apply |
| 700 | 695 | -5.00 | Apply |
| 800 | 801 | 1.00 | Apply |
| 850 | 849 | -1.00 | Apply |



After Retest

| Power Shift P/V 1 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 98 | -2.00 | Apply |
| 200 | 200 | 0.00 | Apply |
| 300 | 298 | -2.00 | Apply |
| 500 | 500 | 0.00 | Apply |
| 700 | 700 | 0.00 | Apply |
| 800 | 799 | -1.00 | Apply |
| 850 | 849 | -1.00 | Apply |

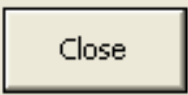


3. EPPR V/V Check

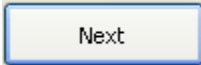
❖ The progress of the EPPR V/V Check test

<Power Shift P/V 1 [F1]>

➤ STEP 6 – Move the test menu

Click on  at the end of the EPPR V/V Check
➔ **Go to the VBO Diagnostic Tools Main Screen**


In order to check the next Test (Main Pump Check), Click
➔ **Move to Main Pump Check**



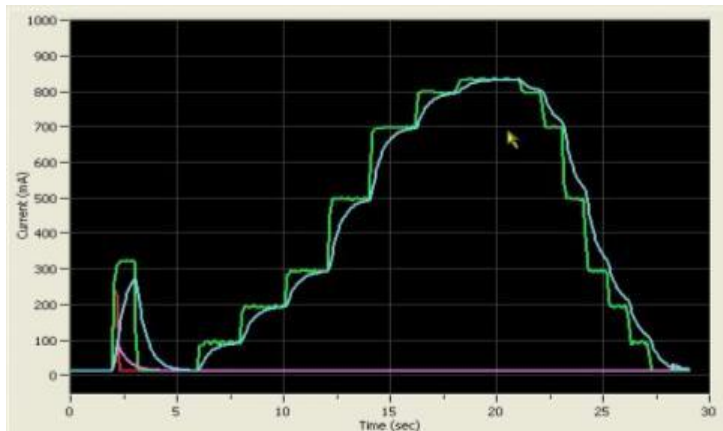
3. EPPR V/V Check

- ❖ The progress of the EPPR V/V Check test
<Power Shift P/V 2[F2]>

➤ STEP 1 – Select the Test

Click  or press F2

➤ STEP 2 – Tests performed actions

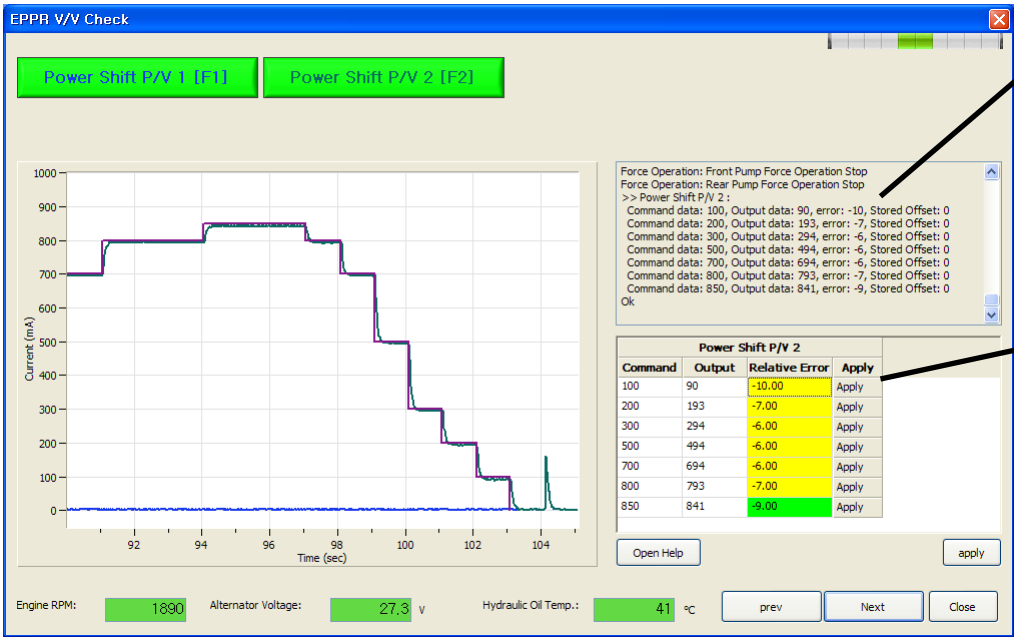


VBO diagnostic program will automatically run the EPPR V/V Check

3. EPPR V/V Check

❖ The progress of the EPPR V/V Check test <Power Shift P/V 2[F2]>

➤ STEP 3 – Display Test results and Status



- Power Shift P/V 1
- Power Shift P/V 2
- Force Operation Command

• Display the test progress

```
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
>> Power Shift P/V 2 :
Command data: 100, Output data: 90, error: -10, Stored Offset: 0
Command data: 200, Output data: 193, error: -7, Stored Offset: 0
Command data: 300, Output data: 294, error: -6, Stored Offset: 0
Command data: 500, Output data: 494, error: -6, Stored Offset: 0
Command data: 700, Output data: 694, error: -6, Stored Offset: 0
Command data: 800, Output data: 793, error: -7, Stored Offset: 0
Command data: 850, Output data: 841, error: -9, Stored Offset: 0
Ok
```

• Display the Status Test Results

| Power Shift P/V 2 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 90 | -10.00 | Apply |
| 200 | 193 | -7.00 | Apply |
| 300 | 294 | -6.00 | Apply |
| 500 | 494 | -6.00 | Apply |
| 700 | 694 | -6.00 | Apply |
| 800 | 793 | -7.00 | Apply |
| 850 | 841 | -9.00 | Apply |

- ※ Results
- Display to command , output, error for each command
- ※ Status

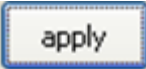
| Reference | Green | Yellow | Red |
|-----------|----------|-----------|-----------|
| 100 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 200 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 300 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 500 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 700 | ± 3 mA ↓ | ± 20 mA ↓ | ± 20 mA ↑ |
| 800 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |
| 850 | ± 5 mA ↓ | ± 25 mA ↓ | ± 25 mA ↑ |

3. EPPR V/V Check

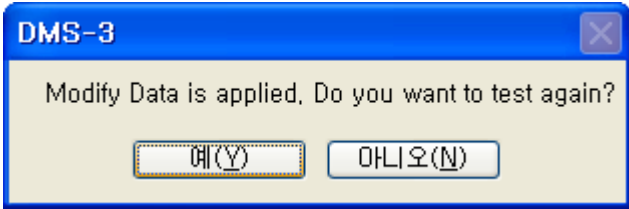
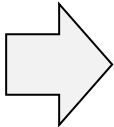
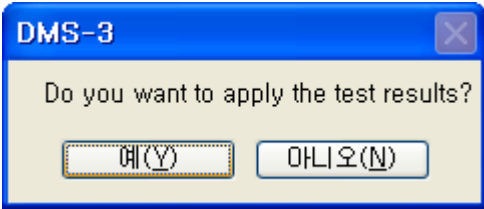
❖ The progress of the EPPR V/V Check test
 <Power Shift P/V 2[F2]>

➤ STEP 4 – Apply modified value

If you want to have to retake the modified values, click



Retest

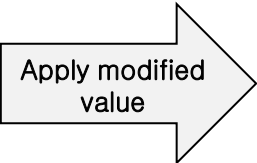


➤ STEP 5 – Retest results

Retested with the modified value (the test results confirmed changes)

Before Retest

| Power Shift P/V 2 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 90 | -10.00 | Apply |
| 200 | 193 | -7.00 | Apply |
| 300 | 294 | -6.00 | Apply |
| 500 | 494 | -6.00 | Apply |
| 700 | 694 | -6.00 | Apply |
| 800 | 793 | -7.00 | Apply |
| 850 | 841 | -9.00 | Apply |



After Retest

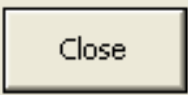
| Power Shift P/V 2 | | | |
|-------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 100 | 99 | -1.00 | Apply |
| 200 | 199 | -1.00 | Apply |
| 300 | 300 | 0.00 | Apply |
| 500 | 499 | -1.00 | Apply |
| 700 | 700 | 0.00 | Apply |
| 800 | 800 | 0.00 | Apply |
| 850 | 842 | -8.00 | Apply |

3. EPPR V/V Check

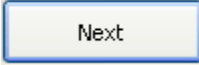
❖ The progress of the EPPR V/V Check test

<Power Shift P/V 2[F2]>

➤ STEP 6 – Move the test menu

Click on  at the end of the EPPR V/V Check
➔ **Go to the VBO Diagnostic Tools Main Screen**

In order to check the next Test (Main Pump Check), Click
➔ **Move to Main Pump Check**



1. Joystick Check

2. Angle Check

3. EPPR V/V Check


4. Main Pressure Check

5. Relief Pressure Check



4. Main Pump Pressure Check

❖ Settings before the Main Pump Pressure Check test

Settings before the test


- Joystick lever neutral 
- Over Engine RPM1800 (Auto idle OFF)
 Engine RPM:
- Maintain the oil temperature is 40 degrees or more
 Hydraulic Oil Temp.: °C

Check before the test

- Bypass Cut Valve Check
  Solenoid valve
- Pump Pressure Sensor Check
  Pressure sensor

Pop-Up creation if doesn't check the Engine RPM ,safety lever

DMS-3 ✖

 Engine Speed(RPM) is lower, Engine speed remains above the 1800 rpm, and then try again.
Safety lever is up, Down the safety lever, please try again.

Pop-Up creation if the engine RPM is low

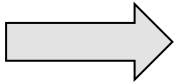
DMS-3 ✖

 Engine Speed(RPM) is two low, Engine speed remains above the 1800 rpm, and then try again.

4. Main Pump Pressure Check

❖ Main Pump Pressure Check Screen Description

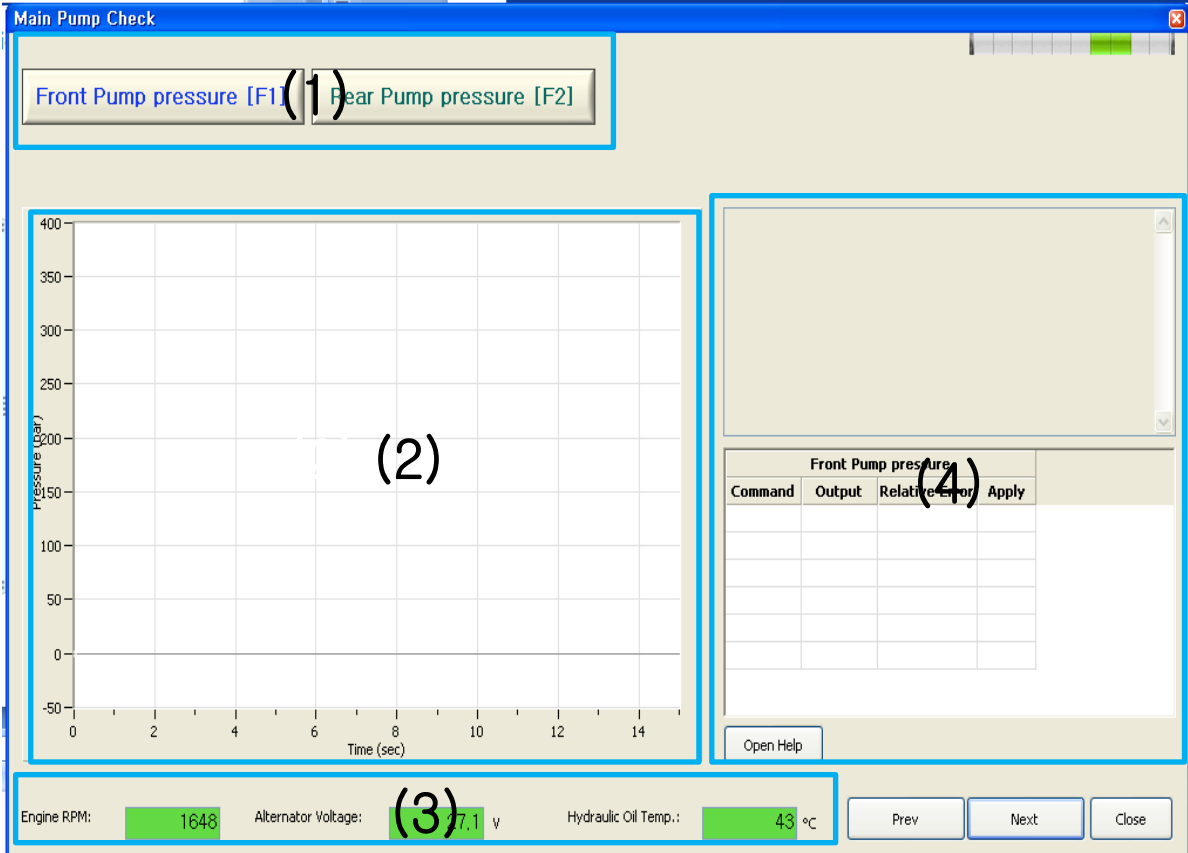
Main Pump Pressure Check



| No | Name | Function |
|-----|-----------------------------|---|
| (1) | Test Contents | • Select the Joystick Operation Test |
| (2) | Graph | • The graph displays real-time operation • Tests are marked with different colors |
| (3) | Status Before the test | • Display The Engine RPM, Battery Voltage, Hydraulic Temp |
| (4) | Status and results of tests | • Display The Engine RPM, Battery Voltage, Hydraulic Temp –Display to command , output, error for each command * Status |

※ Status

| Command (bar) | Reference(bar) | | |
|---------------|----------------|--------|---------|
| | Green | Yellow | Red |
| 45 | ±3 | ±25 | >Yellow |
| 100 | | ±24 | |
| 200 | | ±22.5 | |
| 250 | | ±21.5 | |
| 300 | | ±21 | |
| 350 | | ±20 | |



※ (1) Hyd .Temp : pump pressure decreases by Raising the temperature

→ A reference temperature set to 40 °C.

(2) Correction of error : Yellow, (Complex tolerance of the vehicle.

Set up to by each single Pump tolerance)

4. Main Pump Pressure Check

❖ The progress of the Main Pump Pressure Check

<Front Pump Pressure [F1]>

➤ STEP 1 – Select the Test

Click **Front Pump pressure [F1]** or press F1

➤ STEP 2 – Tests performed actions

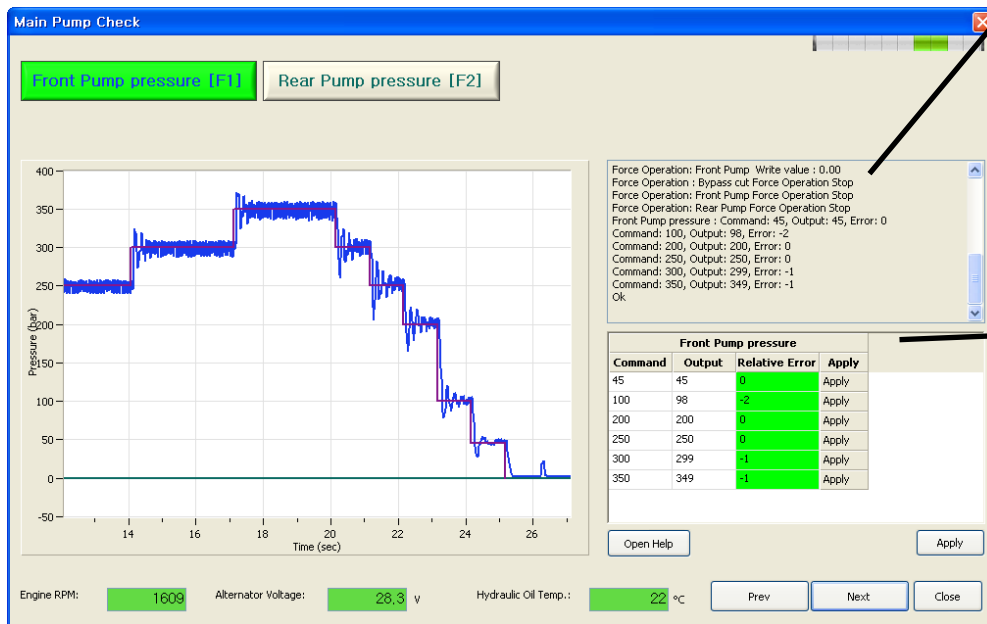


VBO diagnostic program will automatically run the Main Pressure Check

4. Main Pump Pressure Check

❖ The progress of the Main Pump Pressure Check <Front Pump Pressure [F1]>

➤ STEP 3 – Display Test results and Status



- Front Pump Pressure
- Rear Pump Pressure
- Force Operation Command

- Display the test progress

```
Force Operation: Front Pump Write value : 0.00
Force Operation : Bypass cut Force Operation Stop
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
Front Pump pressure : Command: 45, Output: 45, Error: 0
Command: 100, Output: 98, Error: -2
Command: 200, Output: 200, Error: 0
Command: 250, Output: 250, Error: 0
Command: 300, Output: 299, Error: -1
Command: 350, Output: 349, Error: -1
Ok
```

- Display the Status Test Results

| Front Pump pressure | | | |
|---------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 45 | 45 | 0 | Apply |
| 100 | 98 | -2 | Apply |
| 200 | 200 | 0 | Apply |
| 250 | 250 | 0 | Apply |
| 300 | 299 | -1 | Apply |
| 350 | 349 | -1 | Apply |

- ※ Display to command , output, error for each command
- ※ Status

| Command (bar) | Reference(bar) | | |
|---------------|----------------|--------|---------|
| | Green | Yellow | Red |
| 45 | ±3 | ±25 | >Yellow |
| 100 | | ±24 | |
| 200 | | ±22.5 | |
| 250 | | ±21.5 | |
| 300 | | ±21 | |
| 350 | | ±20 | |

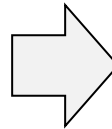
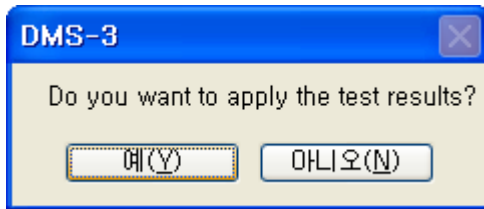
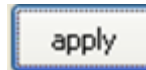
4. Main Pump Pressure Check

❖ The progress of the Main Pump Pressure Check

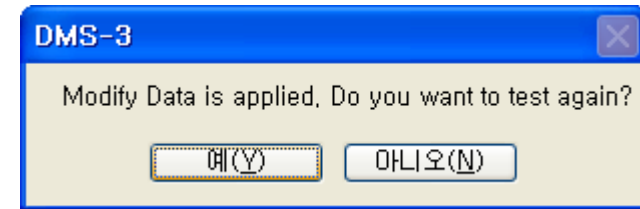
<Front Pump Pressure [F1]>

❖ STEP 4 – Apply modified value

If you want to have to retake the modified values, click



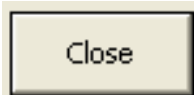
Retest



※Correction of error : Yellow, (Complex tolerance of the vehicle. Set up to by each single Pump tolerance)

❖ STEP 5 – Move the test menu

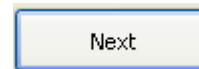
Click



at the end of the Main Pump Pressure Check

➔ Go to the VBO Diagnostic Tools Main Screen

In order to check the next Test (Relief Pressure Check), Click



➔ Move to Relief Pressure Check

4. Main Pump Pressure Check

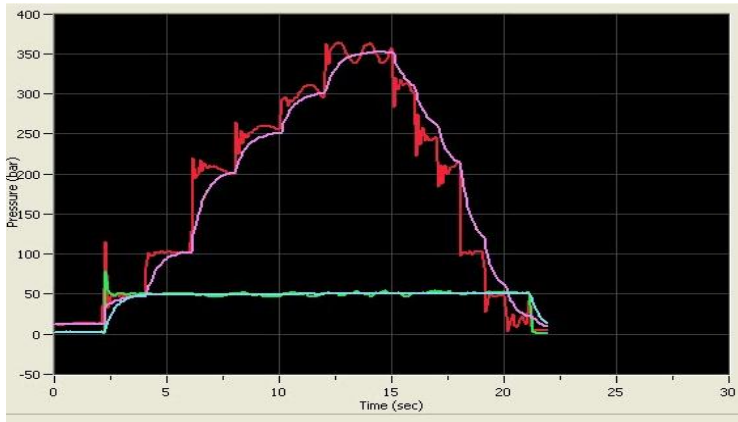
❖ The progress of the Main Pump Pressure Check

<Rear Pump Pressure [F2]>

➤ STEP 1 – Select the Test

Click **Rear Pump pressure [F2]** or press F1

➤ STEP 2 – Tests performed actions

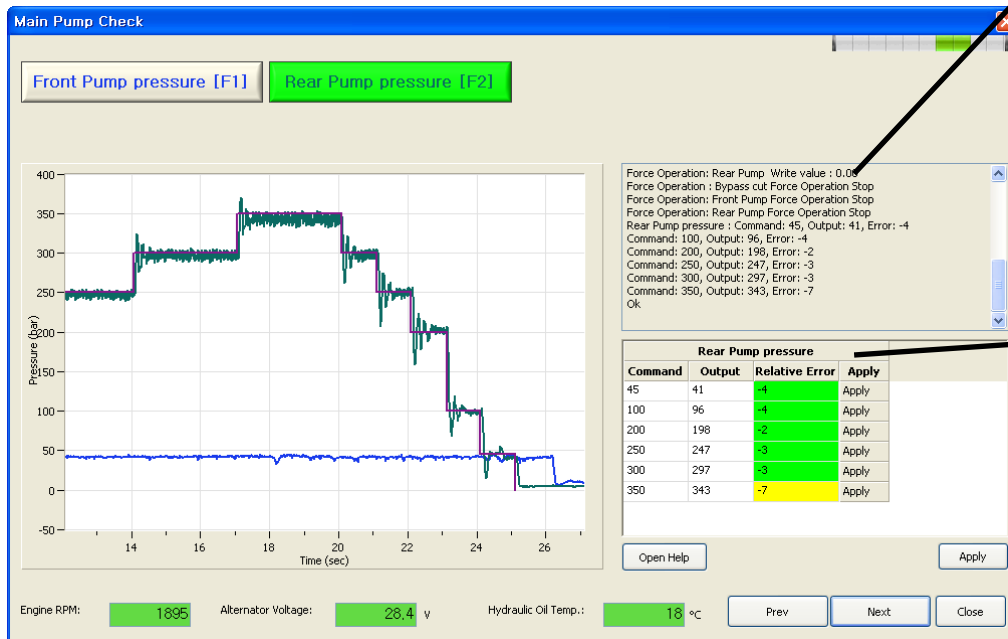


VBO diagnostic program will automatically run the Main Pressure Check

4. Main Pump Pressure Check

❖ The progress of the Main Pump Pressure Check <Rear Pump Pressure [F2]>

➤ STEP 3 – Display Test results and Status



- Front Pump Pressure
- Rear Pump Pressure
- Force Operation Command

- Display the test progress

```
Force Operation: Rear Pump Write value : 0.00
Force Operation : Bypass cut Force Operation Stop
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
Rear Pump pressure : Command: 45, Output: 41, Error: -4
Command: 100, Output: 96, Error: -4
Command: 200, Output: 198, Error: -2
Command: 250, Output: 247, Error: -3
Command: 300, Output: 297, Error: -3
Command: 350, Output: 343, Error: -7
Ok
```

- Display the Status Test Results

| Rear Pump pressure | | | |
|--------------------|--------|----------------|-------|
| Command | Output | Relative Error | Apply |
| 45 | 41 | -4 | Apply |
| 100 | 96 | -4 | Apply |
| 200 | 198 | -2 | Apply |
| 250 | 247 | -3 | Apply |
| 300 | 297 | -3 | Apply |
| 350 | 343 | -7 | Apply |

- ❖ Display to command , output, error for each command
- ❖ Status

| Command (bar) | Reference(bar) | | |
|---------------|----------------|--------|---------|
| | Green | Yellow | Red |
| 45 | ±3 | ±25 | >Yellow |
| 100 | | ±24 | |
| 200 | | ±22.5 | |
| 250 | | ±21.5 | |
| 300 | | ±21 | |
| 350 | | ±20 | |

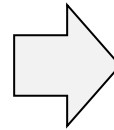
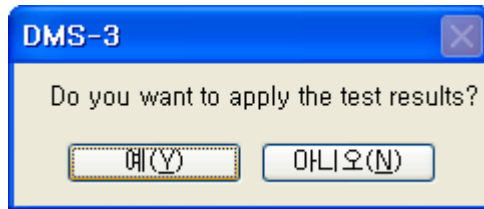
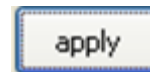
4. Main Pump Pressure Check

❖ The progress of the Main Pump Pressure Check

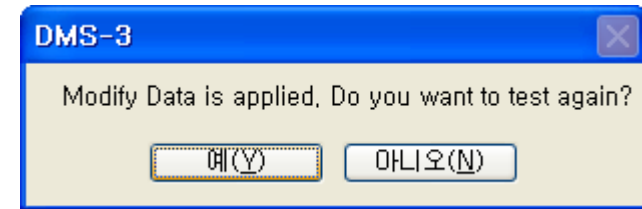
<Rear Pump Pressure [F2]>

❖ STEP 4 – Apply modified value

If you want to have to retake the modified values, click

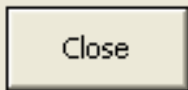


Retest

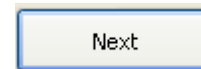


※Correction of error : Yellow, (Complex tolerance of the vehicle. Set up to by each single Pump tolerance)

❖ STEP 5 – Move the test menu

Click on  at the end of the Main Pump Pressure Check
➔ Go to the VBO Diagnostic Tools Main Screen

In order to check the next Test (Relief Pressure Check), Click
➔ Move to Relief Pressure Check



1. Joystick Check

2. Angle Check

3. EPPR V/V Check

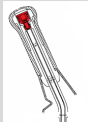
4. Main Pressure Check

5. Relief Pressure Check

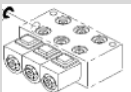

5. Relief Pressure Check

❖ Settings before the Relief Pressure Check Test

Settings before the test


- Joystick lever neutral 
- Over Engine RPM1800 (Auto idle OFF)
 Engine RPM:
- Maintain the oil temperature is 40 degrees or more
 Hydraulic Oil Temp.: °C

Check before the test

- Bypass Cut Valve Check
  Solenoid valve
- Pump Pressure Sensor Check
  Pressure sensor


Pop-Up creation if doesn't check the Engine RPM ,safety lever

DMS-3 ✖

 Engine Speed(RPM) is lower, Engine speed remains above the 1800 rpm, and then try again.
Safety lever is up, Down the safety lever, please try again.

Pop-Up creation if the engine RPM is low

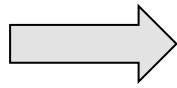
DMS-3 ✖

 Engine Speed(RPM) is two low, Engine speed remains above the 1800 rpm, and then try again.

5. Relief Pressure Check

❖ Relief Pressure Check Screen Description

5. Relief Pressure Check



| No | Name | Function |
|-----|-----------------------------|--|
| (1) | Test Contents | <ul style="list-style-type: none"> Select the Joystick Operation Test |
| (2) | Graph | <ul style="list-style-type: none"> The graph displays real-time operation Tests are marked with different colors |
| (3) | Status Before the test | <ul style="list-style-type: none"> Display The Engine RPM, Battery Voltage, Hydraulic Temp |
| (4) | Status and results of tests | <ul style="list-style-type: none"> Status of the test operation – Reference(350Bar) Swash Plate Tilting Angle , Leakage and Relief Pressure |

5. Relief Pressure Check

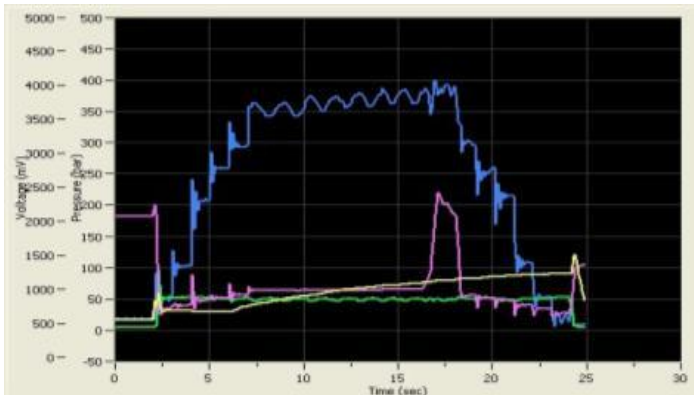
❖ The progress of the Main Pump Pressure Check Test

<Front Pump Pressure [F1]>

➤ STEP 1 – Select the Test

Click **Front Pump pressure [F1]** or press F1

➤ STEP 2 – Tests performed actions



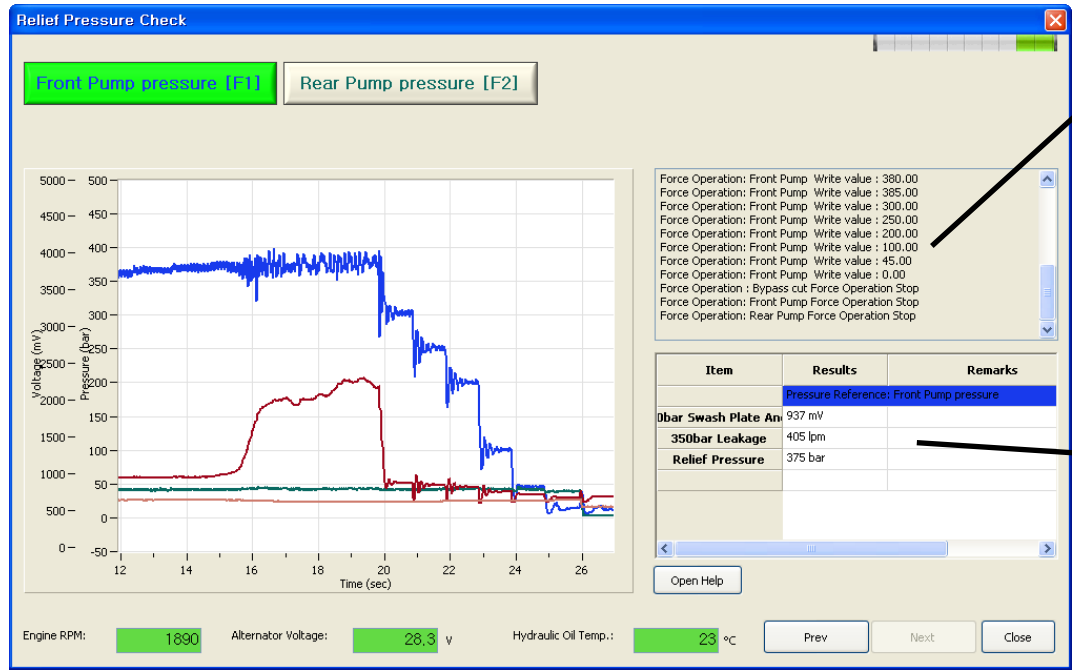
VBO diagnostic program will automatically run the Relief Pressure Check

5. Relief Pressure Check

❖ The progress of the Main Pump Pressure Check Test

<Front Pump Pressure [F1]>

➤ STEP 3 – Display Test results and Status



- Front Pump Pressure
- Rear Pump Pressure
- Front Pump Swash-plate angle Voltage
- Rear Pump Swash-plate angle Voltage

- Display the test progress

```
Force Operation: Front Pump Write value : 380.00
Force Operation: Front Pump Write value : 385.00
Force Operation: Front Pump Write value : 300.00
Force Operation: Front Pump Write value : 250.00
Force Operation: Front Pump Write value : 200.00
Force Operation: Front Pump Write value : 100.00
Force Operation: Front Pump Write value : 45.00
Force Operation: Front Pump Write value : 0.00
Force Operation : Bypass cut Force Operation Stop
Force Operation: Front Pump Force Operation Stop
Force Operation: Rear Pump Force Operation Stop
```

- Display the Status Test Results

| Item | Results | Remarks |
|---------------------|---|---------|
| | Pressure Reference: Front Pump pressure | |
| 0bar Swash Plate An | 937 mV | |
| 350bar Leakage | 405 lpm | |
| Relief Pressure | 375 bar | |

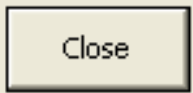
- ※ Results
- Reference(350Bar) Swash Plate Tilting Angle , Leakage and Relief Pressure

5. Relief Pressure Check

❖ The progress of the Main Pump Pressure Check Test

<Front Pump Pressure [F1]>

❖ STEP 4 – Move the test menu

Click on  at the end of the Relief Pressure Check
➔ Go to the VBO Diagnostic Tools Main Screen

5. Relief Pressure Check

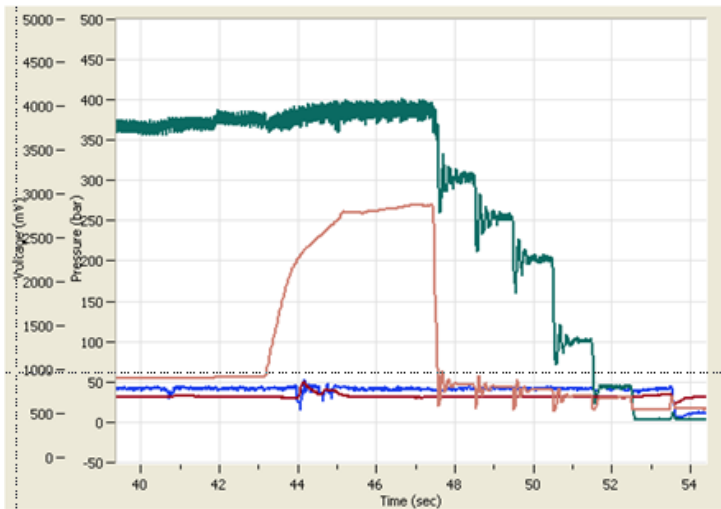
❖ The progress of the Main Pump Pressure Check Test

<Rear Pump Pressure [F2]>

➤ STEP 1 – Select the Test

Click **Rear Pump pressure [F2]** or press F2

➤ STEP 2 – Tests performed actions



VBO diagnostic program will automatically run the Relief Pressure Check

5. Relief Pressure Check

❖ The progress of the Main Pump Pressure Check Test

<Rear Pump Pressure [F2]>

➤ STEP 3 – Display Test results and Status



- Front Pump Pressure
- Rear Pump Pressure
- Front Pump Swash-plate angle Voltage
- Rear Pump Swash-plate angle Voltage

• Display the test progress

| | |
|-----------------------------|----------------------|
| Force Operation: Rear Pump | Write value : 385.00 |
| Force Operation: Rear Pump | Write value : 390.00 |
| Force Operation: Rear Pump | Write value : 300.00 |
| Force Operation: Rear Pump | Write value : 250.00 |
| Force Operation: Rear Pump | Write value : 200.00 |
| Force Operation: Rear Pump | Write value : 100.00 |
| Force Operation: Rear Pump | Write value : 45.00 |
| Force Operation: Rear Pump | Write value : 0.00 |
| Force Operation: Bypass cut | Force Operation Stop |
| Force Operation: Front Pump | Force Operation Stop |
| Force Operation: Rear Pump | Force Operation Stop |

▪ Display the Status Test Results

| Item | Results | Remarks |
|---------------------|---------|--|
| Relief Pressure | 375 bar | |
| | | Pressure Reference: Rear Pump pressure |
| 0bar Swash Plate An | 893 mV | |
| 350bar Leakage | 364 lpm | |
| Relief Pressure | 386 bar | |

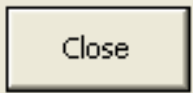
※ Results
 – Reference(350Bar) Swash Plate Tilting Angle ,
 Leakage and Relief Pressure

5. Relief Pressure Check

❖ The progress of the Main Pump Pressure Check Test

<Rear Pump Pressure [F2]>

❖ STEP 4 – Move the test menu

Click on  at the end of the Relief Pressure Check
➔ Go to the VBO Diagnostic Tools Main Screen