# PARTS & SERVICE NEWS

| REF NO. | AT03007 |
|---|---|
| DATE | Feb. 17, 2003 |



**SUBJECT:** REPAIR PROCEDURE OF NOISE AND SHIFT LAG AT DIRECTION CHANGE ON WA380/400/430/450/470/480-5

**PURPOSE:** To introduce modification procedure to prevent occurrence of abnormal noise right after making the F and R direction shifts and occurrence of time lag when speed shifts are made on WA380-5, WA400-5, WA430-5, WA450-5, WA470-5 and WA480-5 wheel loaders

**APPLICATION:** See next page.

**FAILURE CODE:** 1500MC

**DESCRIPTION:**

1. Introduction
   On the wheel loaders of the aforementioned models, there is a possibility of occurrence of the following abnormal phenomena.
   When any of these abnormal phenomena has occurred, replace the transmission control valve (ECMV) and the transmission controller to the improved parts.

   <Abnormal phenomena>
   (1) A shock combined with abnormal noise occur right after making F and R direction shifts (F, R lever).
   Speed shifting patterns: Start (N ⇒ F or N ⇒ R) and shifting between F and R (F ⇒ R or R ⇒ F)

   (2) Time lag occurs when speed shifts are made.
   Speed shifting patterns: Start (N ⇒ F1, N ⇒ F2, N ⇒ R1 or N ⇒ R2), Acceleration and deceleration (F2 ⇒ F3, F3 ⇒ F4, F4 ⇒ F3 or F3 ⇒ F2), shifting between F and R (F ⇒ R or R ⇒ F) and Kickdown (F2 ⇒ F1)

<Supplement>
(1) The abnormal phenomena described in section (1) can be temporarily eliminated by carrying out the initial teaching procedure for the transmission controller, but similar abnormal noise and shock will recur later.

Table of serial numbers of the applicable machines and already modified machines

| | Machine model | Serial numbers of the applicable machines | |
|---|---|---|---|
| | | Already shipped machines | Already modified factory shipment new machines |
| ECMV | WA380-5 | #60001 – #60060<br>#60062 – #60069<br>( – T/M No. 010142) | #60061<br>#60070 –<br>(T/M No. 010143 – ) |
| | WA400-5 | #70001 – #70003<br>( – T/M No. 010003) | #70004 –<br>(T/M No. 010004 – ) |
| | WA430-5 | — | #60001 –<br>(T/M No. 010[illegible] – ) |
| | WA470-5 | #70001 – #70057<br>#70062<br>#70068 – #70070<br>( – T/M No. 010243) | #70058 – #70061<br>#70063 – #70064<br>#7007[illegible] –<br>(T/M No. 010244 – ) |
| | WA480-5 | #80001 – #80017<br>( – T/M No. 010243) | #80018 –<br>(T/M No. 010244 – ) |
| Transmission controller | WA470-5 | #70001 – #70106<br>#70113 – #70114<br>#70118 | #70107 – #70112<br>#70115 – #70117<br>#70119 – |
| | WA480-5 | #80001 – #80027<br>#80029 | #80028, #80030 – |

Note 1: Be careful since the serial numbers of the applicable machines differ between the ECMV and the transmission controller.

Note 2: Although the transmission controller is common among the WA380-5, WA400-5, WA430-5, WA450-5, WA470-5 and WA480-5, the machine models with which replacement of the transmission controller becomes necessary for repair of this malfunction are the WA450-5, WA470-5 and WA480-5 only.

2. List of parts

2.1 Applicable machine model: WA380-5 and WA400-5

| Part No. | Part Name | Purpose of part | Q'ty | Remarks |
|---|---|---|---|---|
| 714-12-20000<br>(714-12-20000) | Transmission Ass'y<br>(Transmission Ass'y) | Rework | 1<br>(1) | WA380-5 |
| 714-12-20001<br>(714-12-20001) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |
| 714-12-20010<br>(714-12-20010) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | WA380-5-LC |
| 714-12-20011<br>(714-12-20011) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |
| 714-12-20100<br>(714-12-20100) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | WA380-5Y<br>Tachograph spec. machines |
| 714-12-20101<br>(714-12-20101) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |
| 714-12-20110<br>(714-12-20110) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | WA380-5Y-LC<br>Tachograph spec. machines |
| 714-12-20111<br>(714-12-20111) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |
| 714-12-20200<br>(714-12-20200) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | WA400-5 |
| 714-12-20201<br>(714-12-20201) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |
| 714-12-20210<br>(714-12-20210) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | WA400-5-LC |
| 714-12-20211<br>(714-12-20211) | Transmission Ass'y<br>(Transmission Ass'y) | | 1<br>(1) | |

When replacing the ECMV, applicable parts to “714-12-20000, 20001, 20100, 20101, 20200 and 20201”.

| | | | | |
|---|---|---|---|---|
| 714-12-25500<br>(714-07-25501) | Valve<br>(Valve) | Replacement | 6<br>(6) | |
| 07000-72015 | O-ring | | 24 | Consumable parts to replace when making this modification |
| 07000-71007 | O-ring | | 6 | |

When replacing the ECMV, applicable parts to “714-12-20010, 20011, 20110, 20111, 20210 and 20211” (for overseas markets).

| | | | | |
|---|---|---|---|---|
| 714-12-25500<br>(714-07-25501) | Valve<br>(Valve) | Replacement | 7<br>(7) | |
| 07000-72015 | O-ring | | 28 | Consumable parts to replace when making this modification |
| 07000-71007 | O-ring | | 7 | |

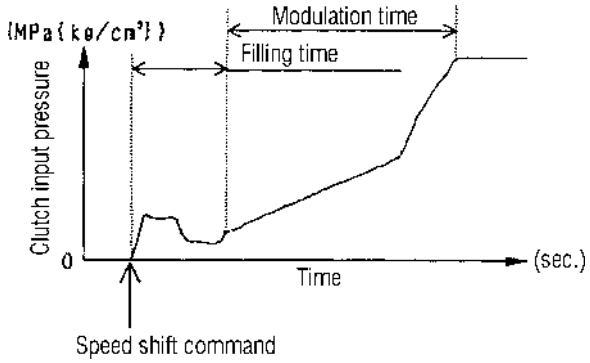
2.2 Applicable machine model: WA450-5, WA470-5 and WA480-5

| Part No. | Part Name | Purpose of part | Q'ty | Remarks |
|---|---|---|---|---|
| 714-07-20000<br>(714-07-20000) | Transmission Ass'y<br>(Transmission Ass'y) | Rework | 1<br>(1) | WA450/470/480-5 |
| 714-07-20010<br>(714-07-20010) | Transmission Ass'y<br>(Transmission Ass'y) | Rework | 1<br>(1) | WA450/470/480-5-LC |
| When replacing the ECMV, applicable parts to “714-07-20000” | | | | |
| 714-12-25500<br>(714-07-25501) | Valve<br>(Valve) | Replacement | 6<br>(6) | |
| 07000-72015 | O-ring | | 24 | Consumable parts to replace when making this modification |
| 07000-71007 | O-ring | | 6 | Consumable parts to replace when making this modification |
| When replacing the ECMV, applicable parts to “714-07-20010” (for overseas markets). | | | | |
| 714-12-25500<br>(714-07-25501) | Valve<br>(Valve) | Replacement | 7<br>(7) | |
| 07000-72015 | O-ring | | 28 | Consumable parts to replace when making this modification |
| 07000-71007 | O-ring | | 7 | Consumable parts to replace when making this modification |
| Transmission controller | | | | |
| 7823-32-2008<br>(7823-32-2007) | Controller<br>(Controller) | Replacement | 1<br>(1) | |
| 7823-32-2008<br>(7823-32-2006) | Controller<br>(Controller) | Replacement | 1<br>(1) | |
| 7823-32-2008<br>(7823-32-2005) | Controller<br>(Controller) | Replacement | 1<br>(1) | |
| 7823-32-2008<br>(7823-32-2004) | Controller<br>(Controller) | Replacement | 1<br>(1) | |
| 7823-32-2008<br>(7823-32-2003) | Controller<br>(Controller) | Replacement | 1<br>(1) | |
| 7823-32-2008<br>(7823-32-2002) | Controller<br>(Controller) | Replacement | 1<br>(1) | |

3. Details of the modification of the ECMV (Applicable machine model: WA380-5, WA400-5, WA450-5, WA470-5 and WA480-5)

3-1) Details of the modification

The hydraulic pressure settings corresponding to the command current from the ECMV (electronic control modulation valve) have been increased to shorten the filling time which is taken from issuance of the speed shifting command for the transmission clutch until actual start of the modulation.




Approx. filling time
Current parts: 0.3 to 1.0 sec.
New parts: 0.2 to 0.5 sec.

Fig. 1 Waveform image graph for the hydraulic pressure modulations

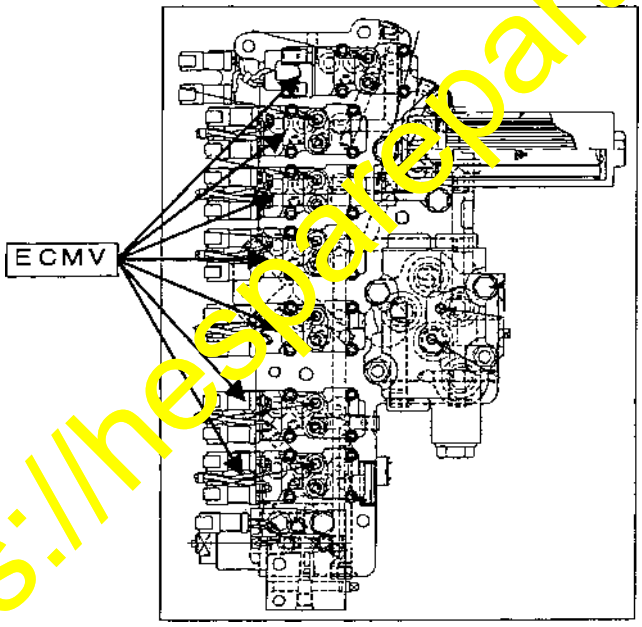


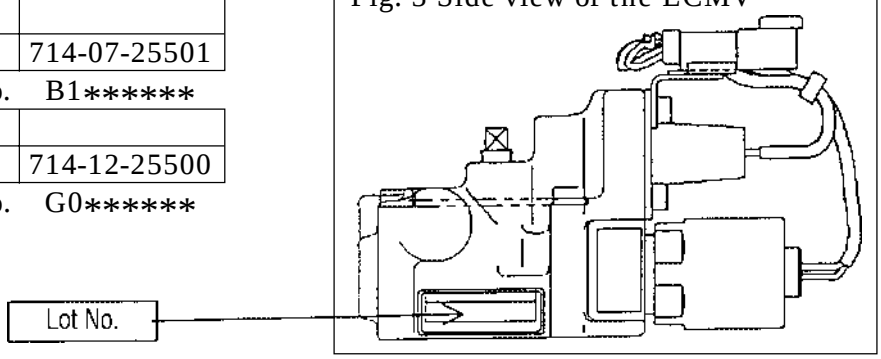

Fig. 2 Transmission control valve ass'y

3-2) Identification method for the new and current parts

They can be identified them by the Production Lot No. indicated on the side surface of the valve.

| | | |
|---|---|---|
| Current parts | Part No. | 714-07-25501 |
| | Production Lot No. | B1****** |
| ↓ | | |
| New parts | Part No. | 714-12-25500 |
| | Production Lot No. | G0****** |

Fig. 3 Side view of the ECMV



3-3) Modification procedure

When carrying out the replacement work, be careful of sand and dust not to enter into the hydraulic circuits.

(1) Remove the cover positioned on the LH side of the rear frame of the machine.
(2) Clean to remove mud and sand stuck to the ECMV and its neighborhood sufficiently.
(3) Disconnect the connectors of the ECMV at 12 places (at 14 places in case of the lockup clutch spec. machines).
(4) First, remove the ECMV (②) for the R. clutch from the valve seat.
(5) Apply masking tape on the valve seat surface.
(6) Then, remove the ECMV (①) for the F. clutch.
(7) Replace the O-rings with new ones.
(8) Install the ECMV (①) for the F. clutch and, after that, install the ECMV (②) for the R. clutch.
Tightening torque: 7.8 – 9.8 Nm {0.8 – 1.0 kgm}
(9) Regarding other ECMV's (③ thru ⑦), replace them one by one from above.
Tightening torque: 7.8 – 9.8 Nm {0.8 – 1.0 kgm}
(10) Connect the connectors of the ECMV at 12 places (at 14 places in case of the lock up clutch spec. machines).
(11) Start the engine and turning OFF the transmission cutoff switch, perform speed shifting operations while depressing the brake pedal.
(12) Stop the engine and check for oil leakage.
(13) Install the cover to its original position on the LH side of the rear frame of the machine.
(14) After finishing the replacement work for the valve, perform initial learning of the transmission controller.
(15) After complation of the initial learning of the transmission, make sure that the indication sign that the initial learning has been completed is appearing on the real time monitor display. (Indication "TUNED")

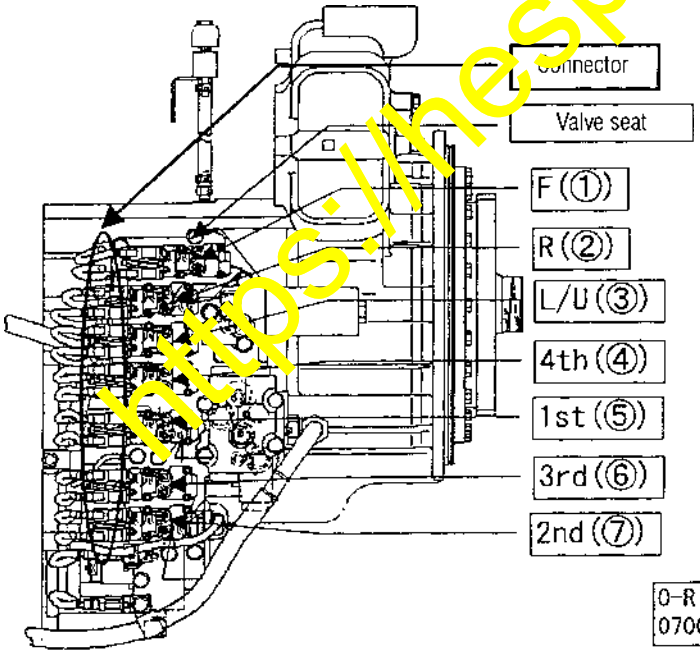



Fig. 4 Side view of the transmission control valve

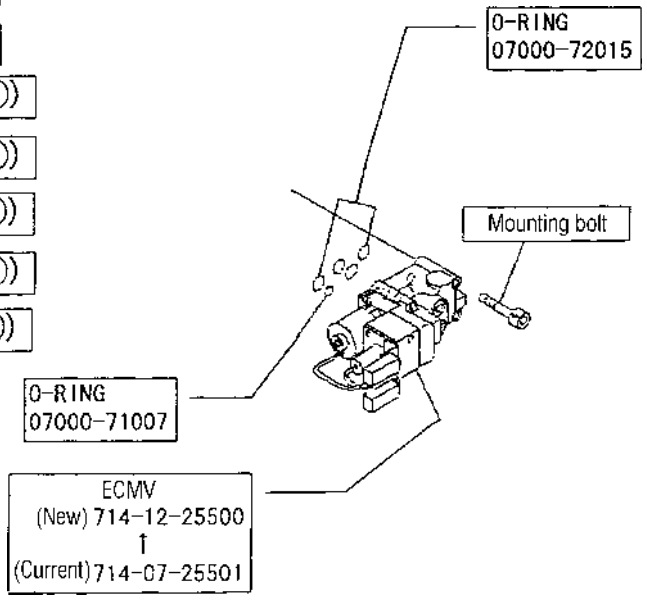



Fig. 5 Installation procedure drawing for the ECMV

3-4) Initial learning procedure of the transmission



**T/M initial learning setting**

Learning for correcting the solid difference of transmission

1. Learning data reset
   Issue the learning data reset command to reset all learning data stored in the non-volatile memory.

Display of T/M initial learning and procedure for resetting data

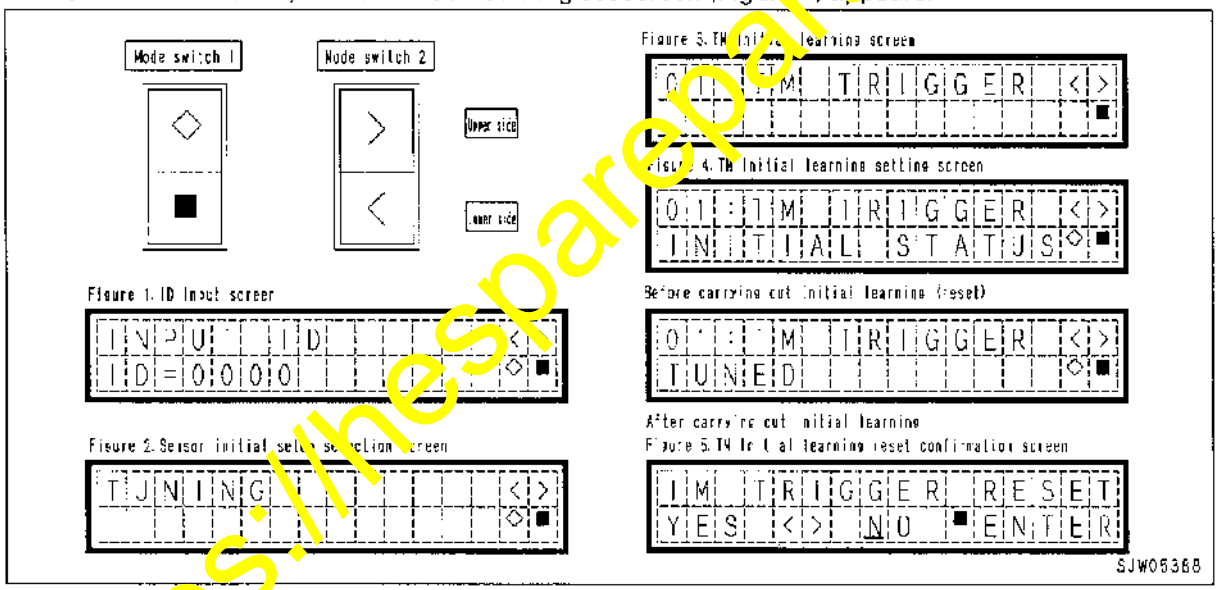
① Hold down the ■SW and < SW for 5 seconds or more at the same time, and change to the ID entry screen. (Figure 1)

② Use the < and > SW to enter ID, and press the ◇SW to enter the service person screen.

③ Use the < and > SW to display the sensor initialization selection screen (Figure 2), and press the ◇SW to decide the value.

④ Use the < and > SW to display the T/M initial learning screen (Figure 3) of set item 1.

⑤ Press the ◇SW; the T/M initial learning set screen (Figure 4) appears.




⑥ -1 When the initial learning is not executed, the initial learning reset screen (Figure 4) appears.

⑥-2 When the initial learning is executed, the initial learning set screen (Figure 4) appears.

⑦ If the ■SW is pressed here, the initial learning reset confirmation screen (Figure 5) appears.

⑧ -1 When resetting, use the < switch to select [YES], then press the ■SW.

⑧-2 When not resetting, select NO, then press the ■SW.

⑨ Press the ■SW: the learning state set or reset screen (Figure 4) appears.

Press the ■SW, and confirm that the monitor indicator is in the initial learning reset state (Figure 4). Resetting is then completed.
If the initial learning is required, reset once even when the monitor indicator first displays the learning reset state.

## 1) Initial Learning Procedure

### Preparation for machine

1. Start the engine.
2. Display the transmission oil temperature on the real-time monitor.
3. Operate the gear shift lever and directional lever, and circulate the oil inside the transmission.

| Gear range | N2 → | F2 → | F1 → | F2 → | F3 → | F4 → | F3 → | F2 → | N2 → | R2 → | N2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Holding time | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec | 2 sec |

After holding each gear speed for the time specified or more, shift gears to the next range.
Operate the engine at low idling, place the shift mode switch in the MANUAL position and transmission cut- off switch in the OFF position (the lockup switch in the OFF position).

4. Increase the oil temperature of transmission to 55 - 70℃.
   Set the oil temperature to the specified temperature while learning operation.
   Check that the machine is in normal conditions (no fault is detected).

### Initial learning method

1. Carry out initial learning operation at the state of the machine mentioned above. (Do not stop the engine.)
2. Check that the oil temperature of transmission is in the range of 55 - 70℃ on the real-time monitor.
   If it is outside of the specified range, be sure to carry it out within the specified temperature range.
   ★ If the initial learning is carried out at the temperature outside of the specified range, it may cause time lag and gear shift shock.
3. Shift the transmission by operating the gear shift lever and directional lever.

| Gear range | N2 → | F2 → | F1 → | F2 → | F3 → | F4 → | F3 → | F2 → | N2 → | R2 → | N2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Holding time | 5 sec | 5 sec | 5 sec | 3 sec | 3 sec | 3 sec | 3 sec | 3 sec | 3 sec | 3 sec | 3 sec |

After holding each gear speed for the time specified or more, shift gears to the next range.
Operate the engine at low idling, place the shift mode switch in the MANUAL position, and the transmission cut-off switch in the OFF position (the lockup switch in the OFF position).
~~Carry out shifting operation in the actual travelling or skid travelling.~~

   ★ When setting to N2 initially, operate the directional lever by placing it in the N position following the F2 or R2 position.
   Even if the shift lever is changed to 2 after placing the directional lever in N, the gear will not change. Therefore, operate the directional lever by placing it in the N position after setting the gear shift lever to 2.
   When the directional lever is placed in the N position at the shift lever in other than 2, place the directional lever in the F or R position and then operate the directional lever in the N position following F2 or R2.
   ★ Hold the shift lever for the specified holding time or more for each speed of gear range.
   If the gear shift lever is operated for the holding time or less, completion of initial learning (display of TUNED) will not appear.
4. Check that completion of initial learning (display of TUNED) appears on the initial learning of transmission setting screen on the real-time monitor.
5. When the initial learning is not carried out (display of INITIAL STATUS), repeat operations mentioned in 3 and 4 until completion of initial learning (display of TUNED) appears.

Perform the speed shifting operations either while making actual travels of the machine or while depressing the brake pedal in case of test stand operations.

4. Details of the modification of the transmission controller (Applicable machine model: WA450-5, WA470-5 and WA480-5)

4-1) Details of the modification

The control command value for the clutch filling pressure has been brought up to raise the clutch pressure command values so that the filing time for the clutch can be shortened.

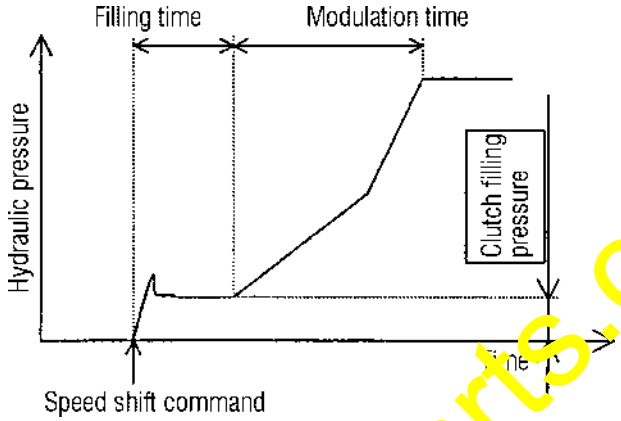



Fig. 6 Waveform images for the hydraulic pressure modulations

4-2) Modification procedure for the transmission controller

(1) Turn OFF the engine starting switch.

(2) Remove the covers Ⓐ, Ⓑ, Ⓒ.

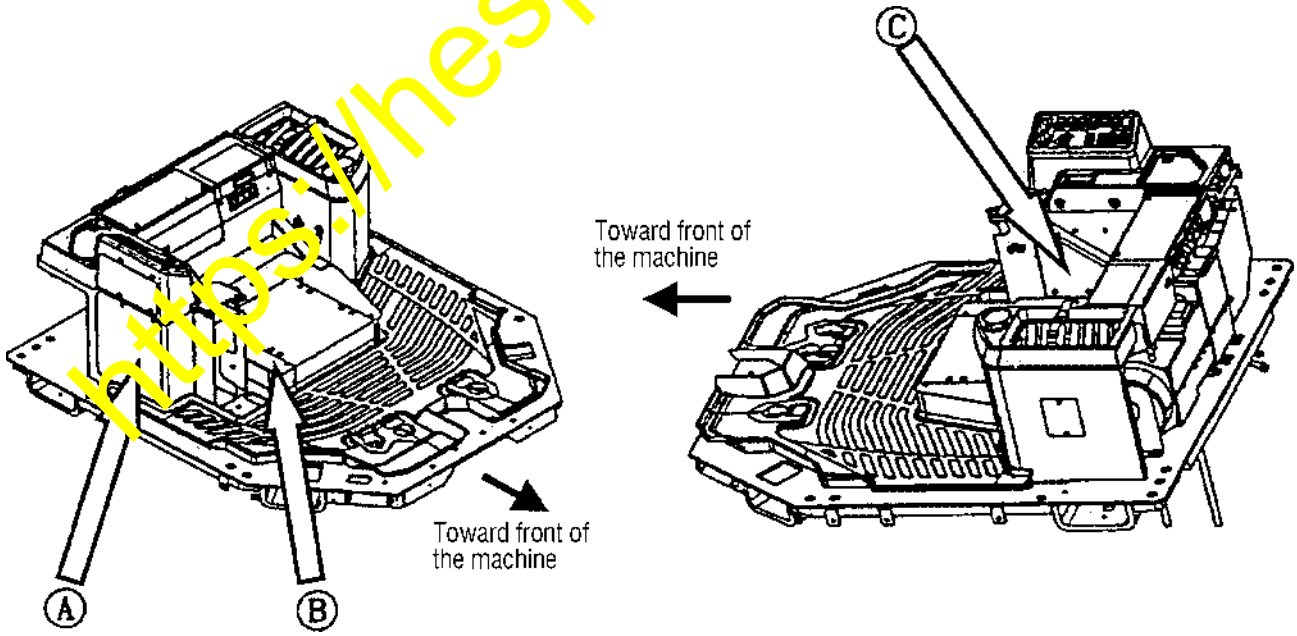



Fig. 7 Drawing for removal of the covers

(3) Remove the connector of the transmission controller (the controller being positioned toward front of the machine) by loosening the hexagon socket head cap screw positioned in the center of the connector.

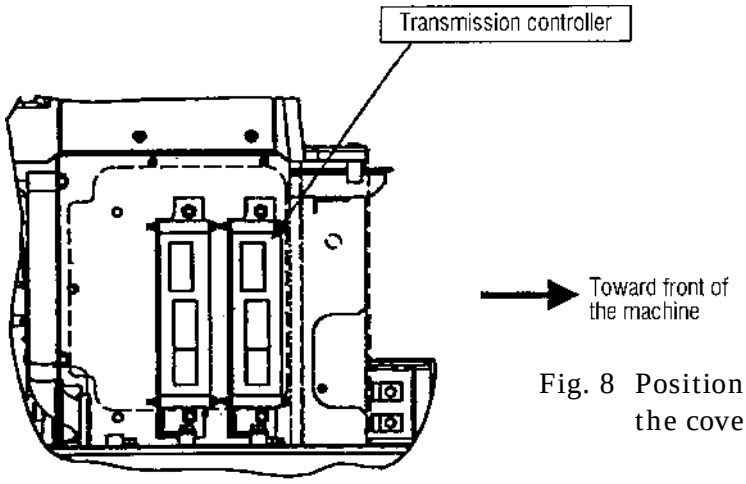



Fig. 8 Position of the controllers (shown with the cover Ⓐ removed)

(4) Remove the mounting bracket with the controllers being installed, then remove the transmission controller body to replace with the improved controller.

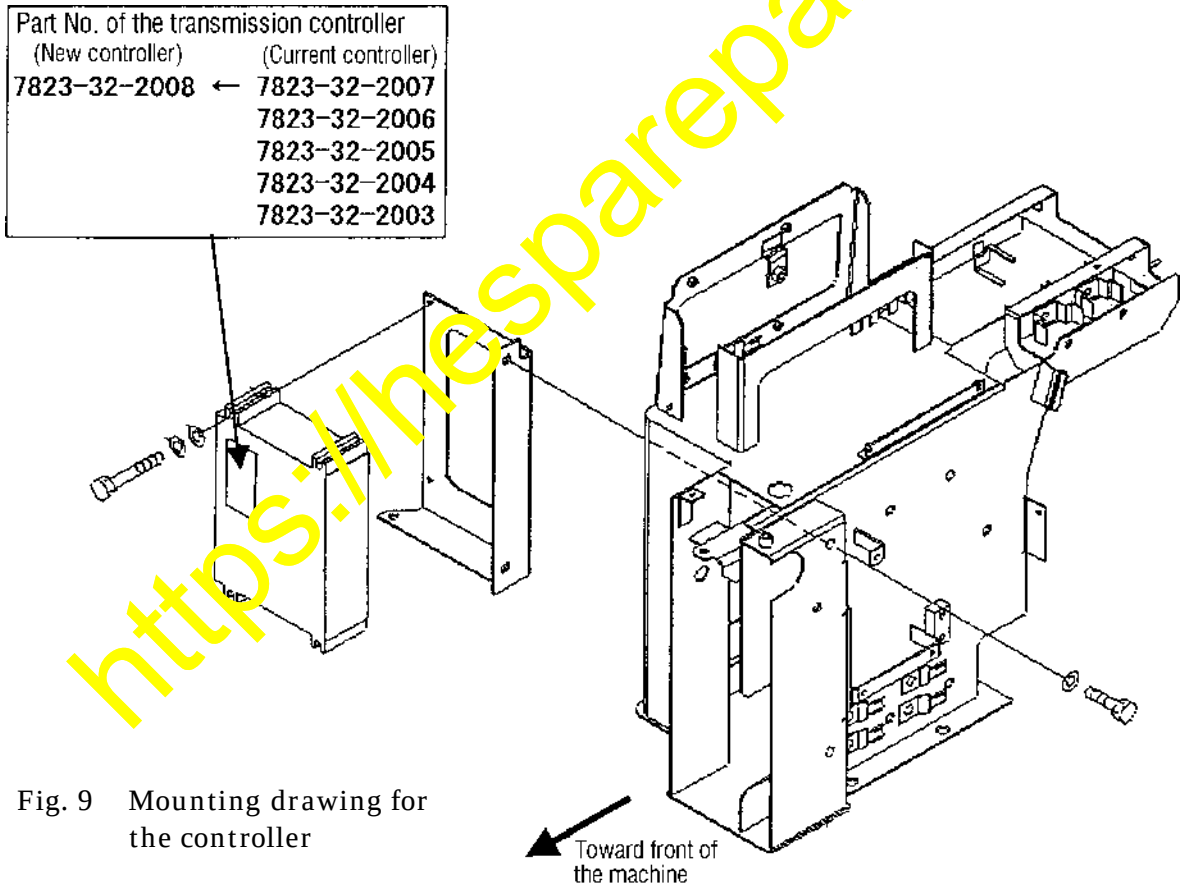



Fig. 9 Mounting drawing for the controller

(5) Reinstall the removed parts in the reversed procedure to the removal procedure described in (1) thru (4).
(6) After finishing the replacement work for the controller, perform “T/M initial learning”.
(7) After completion of the initial learning of the transmission, make sure that the indication sign that the initial learning has been completed is appearing on the real time monitor display. (Indication “TUNED”)