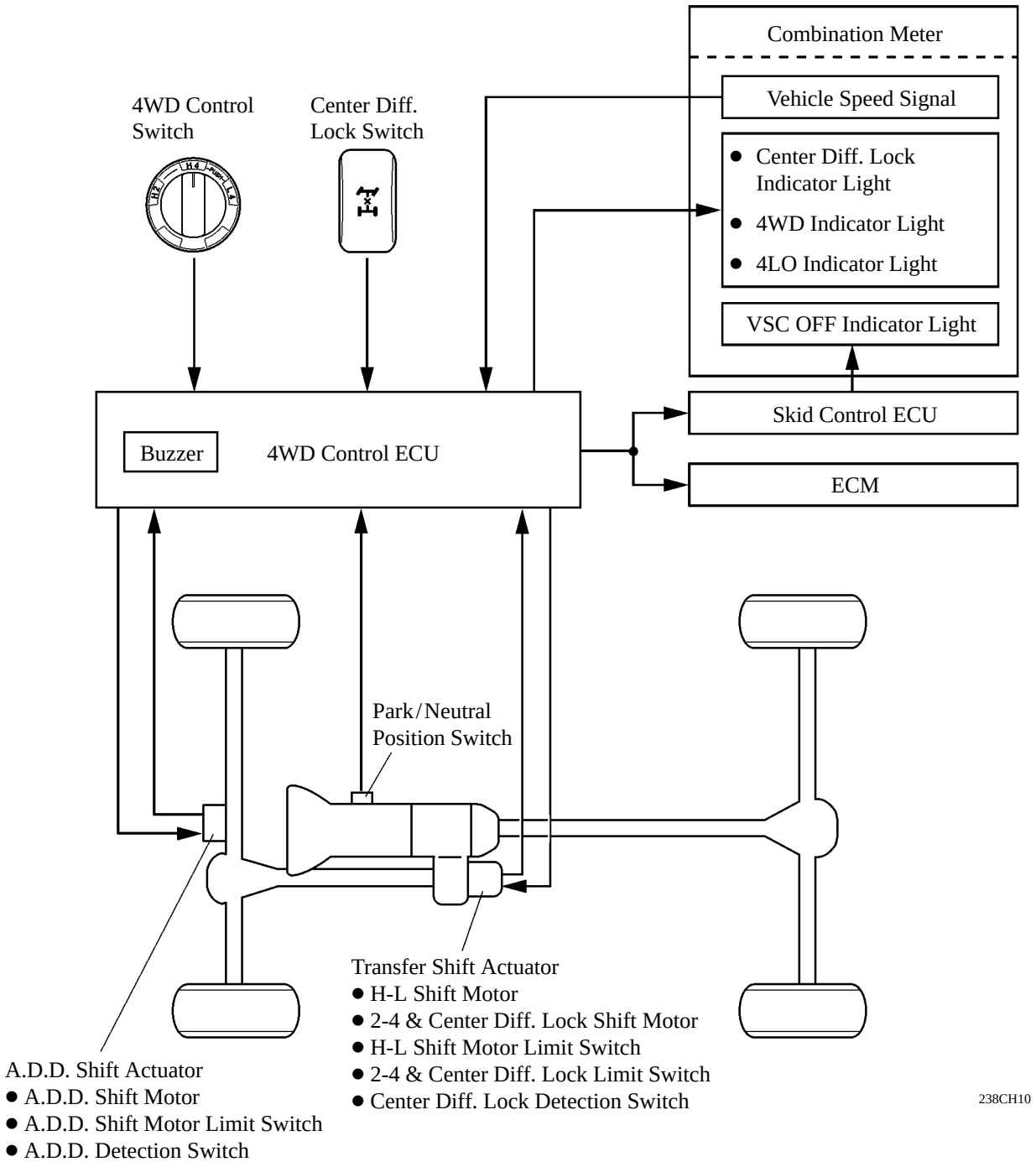
■4WD SYSTEM

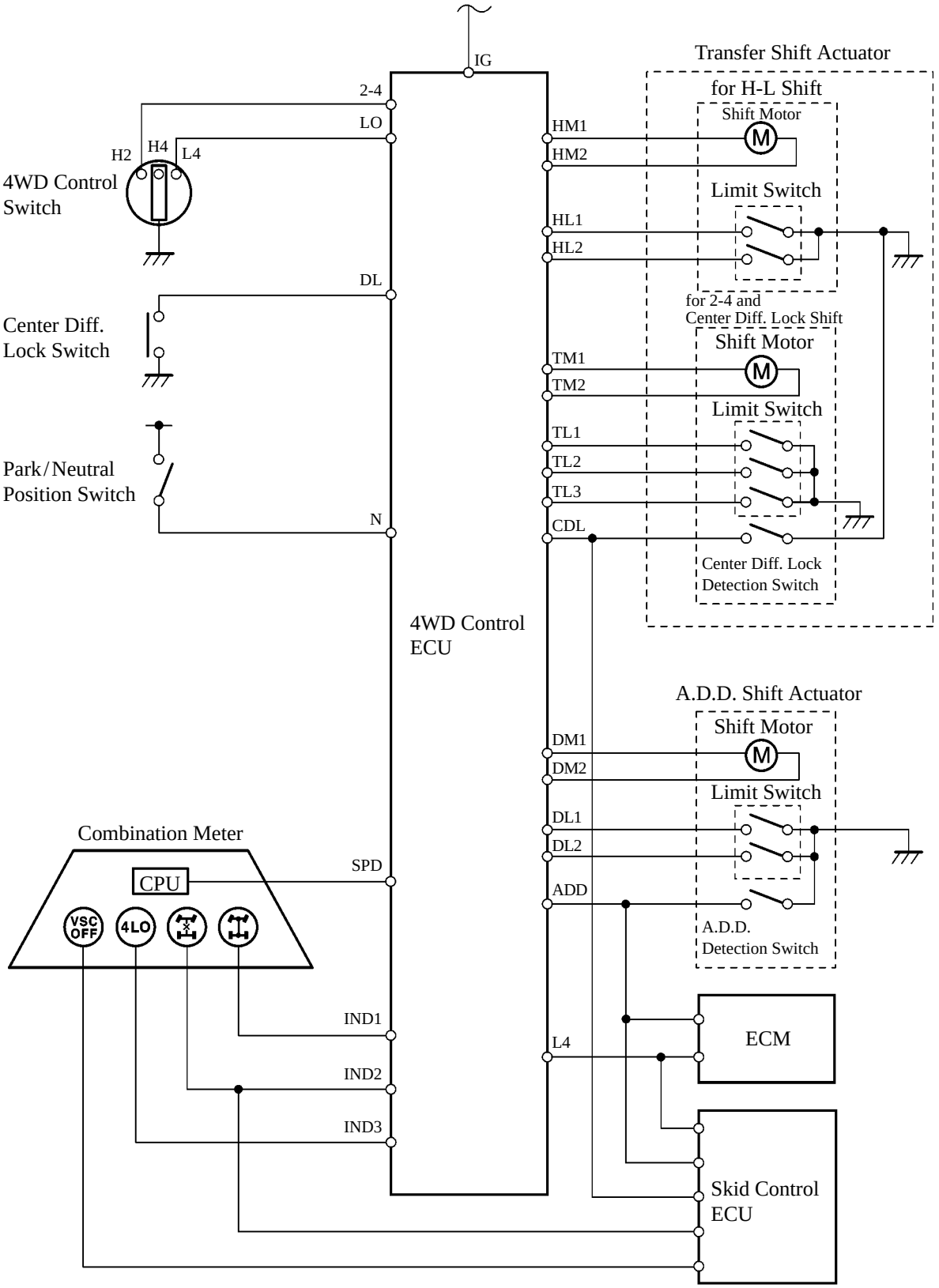
1. General

- Through the combination of the VF4AM transfer and A.D.D. (Automatic Disconnecting Differential), the multi-mode 4WD system maximizes the dynamic performance and achieves an efficient run by enabling an optimal driving mode to be selected from the 5 types of driving mode (in the H2, H4F, H4L, L4F and L4L ranges) in accordance with the road conditions, by operating the 4WD control switch and the center differential lock switch.
- Through these switch signals, the 4WD control ECU actuates the 2 shift motors in the transfer shift actuator and 1 shift motor in the A.D.D. shift actuator.

▶ System Diagram ◀



▶ Wiring Diagram ◀



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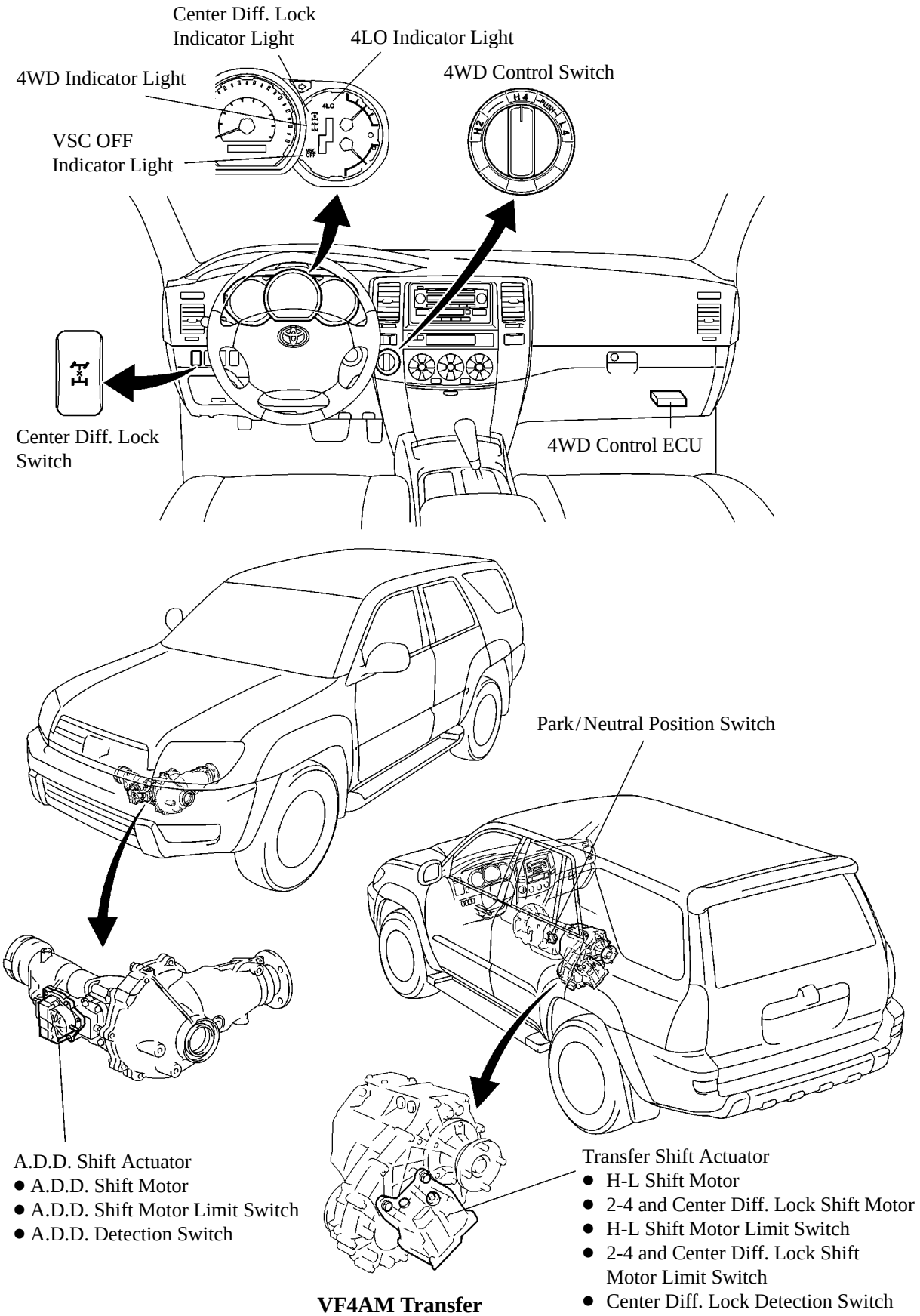
2. Layout of Main Component



VF4AM Transfer

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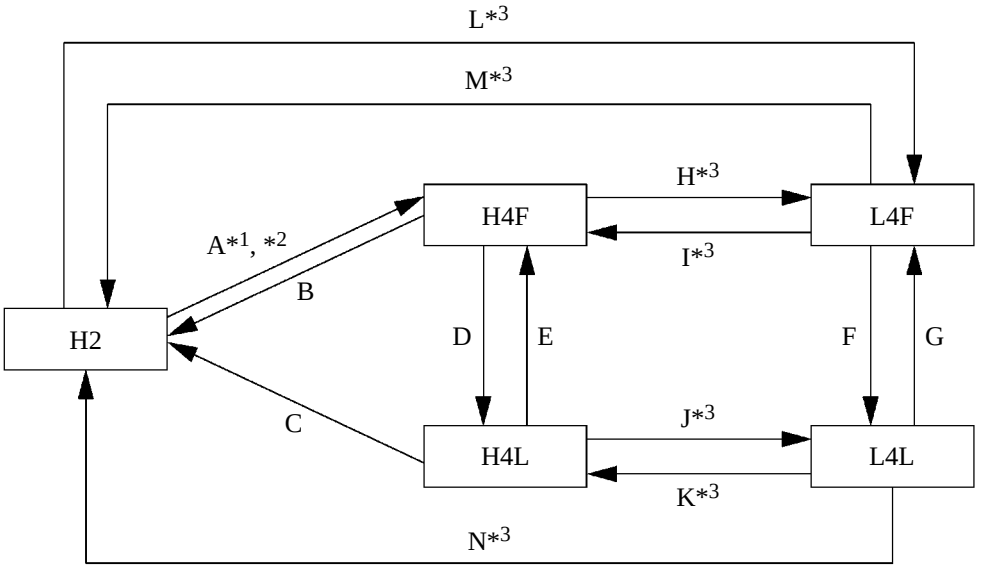
3. System Operation

General

As indicated by the 4WD mode switching pattern illustrated below, the 4WD control switch and the center differential lock switch do not operate simultaneously while switching H-L.

- This signal becomes inactive even if the center differential lock switch is turned ON during H-L switching.
- When the driver switches H-L while the center differential lock is switching, the actual H-L switching takes place after the center differential has been locked.

▶ 4WD Mode Switching Pattern ◀



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H2: High Speed 2WD
H4F: High Speed 4WD & Center Differential Free
H4L: High Speed 4WD & Center Differential Lock
L4F: Low Speed 4WD & Center Differential Free
L4L: Low Speed 4WD & Center Differential Lock

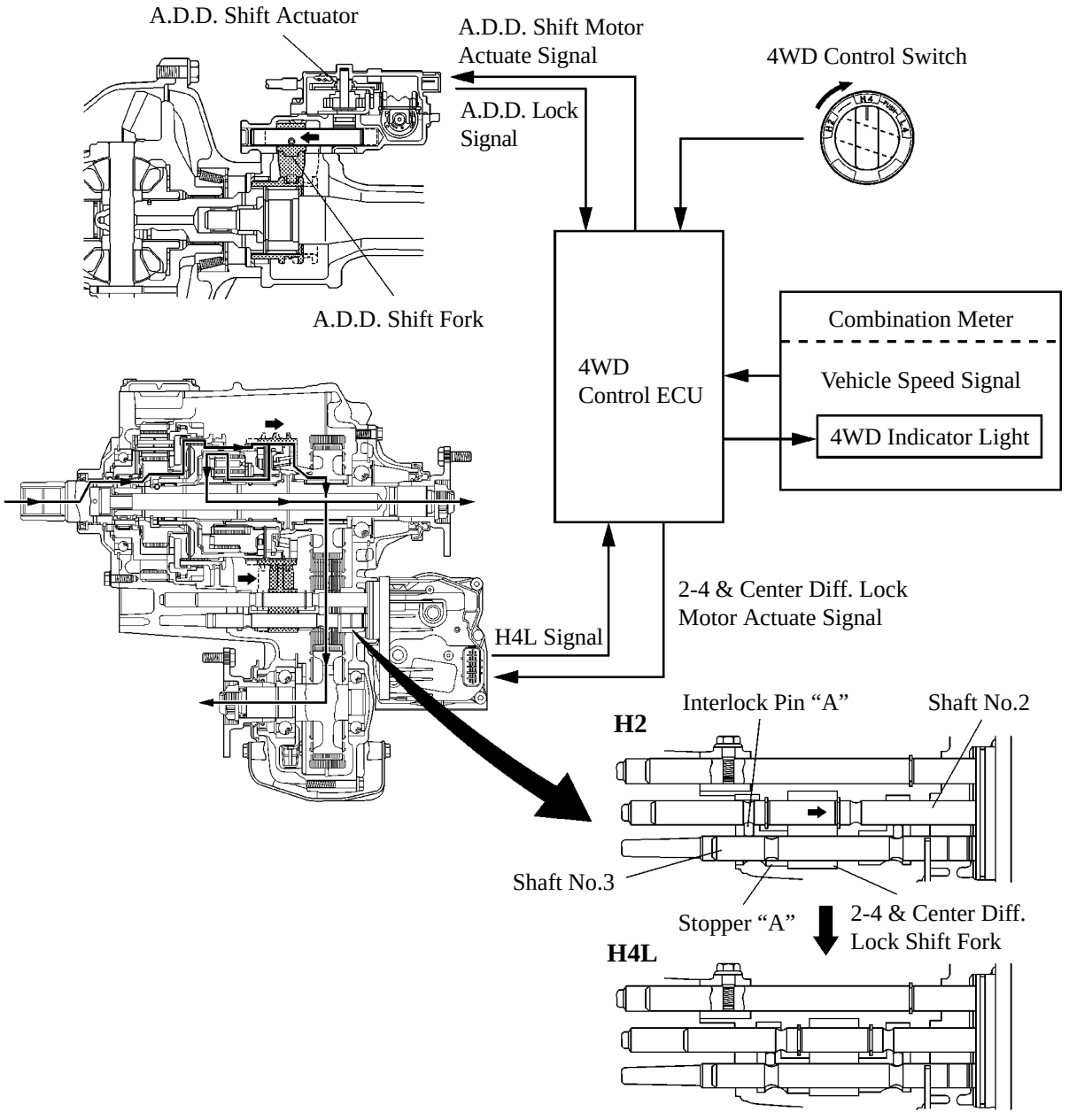
*1: If the center differential switch is turned ON while switching from H2 to H4F, it will proceed directly to the H4L mode without engaging the H4F mode.

*2: H2 → H4F switching cannot be made unless the vehicle speed is less than 100 km/h (62 mph).
If H2 → H4F switching is operated in any other condition, the 4WD indicator light and center differential lock indicator light blinks and the buzzer sounds in the 4WD control ECU. (To cancel: 4WD control switch is returned to its original position.)

*3: H-L switching cannot be made unless the vehicle speed is 5 km/h (3 mph) or less and the A/T shift position is N.
If the 4WD control switch is operated in any other condition, the 4LO indicator light blinks and the buzzer sounds in the 4WD control ECU. (To cancel: 4WD control switch is returned to its original position.)

A. H2 → H4F

- When the driver switches the 4WD control switch to the H4 position, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in the transfer shift actuator in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the right.
- In the H2 position, the stopper “A” is coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) by the interlock pin “A”. Therefore, stopper “A” moves to the right in the same manner as the 2-4 & center differential lock shift fork shaft (Shaft No.2), thus moving the 2-4 & center differential lock shift fork in the same direction. At this time, the interlock pin “A”, which had the stopper “A” coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) drops into the groove of the transfer shift shaft (Shaft No.3), causing them to become uncoupled. As a result, the center differential becomes locked and transfers momentarily to the H4L mode.
- After the transfer to the H4L mode has been completed, the 4WD control ECU actuates the A.D.D. shift motor in the A.D.D. shift actuator. Accordingly, the A.D.D. shift motor moves the A.D.D. shift fork to the left, causing the front wheels and the drivetrain to become coupled.



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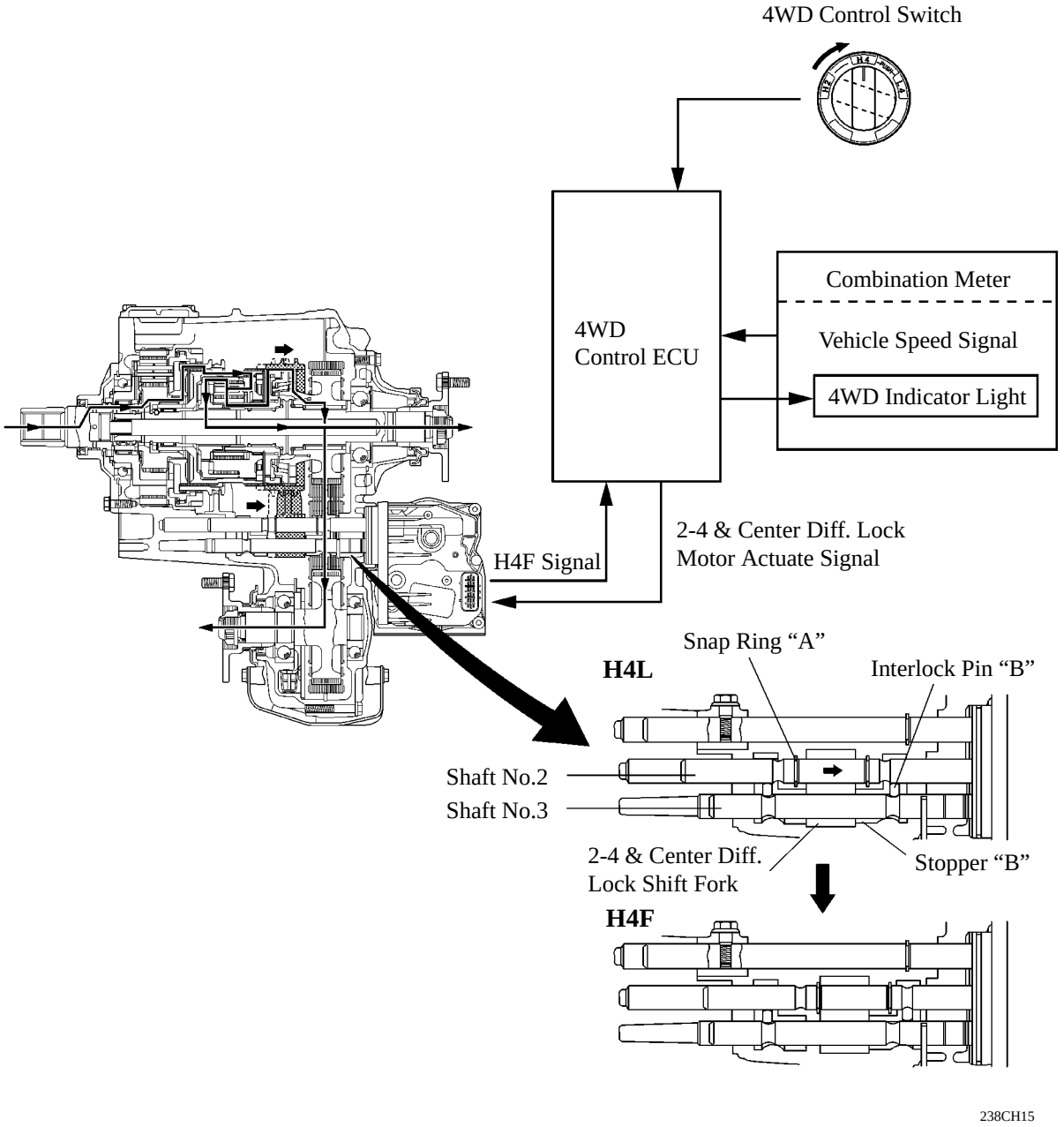
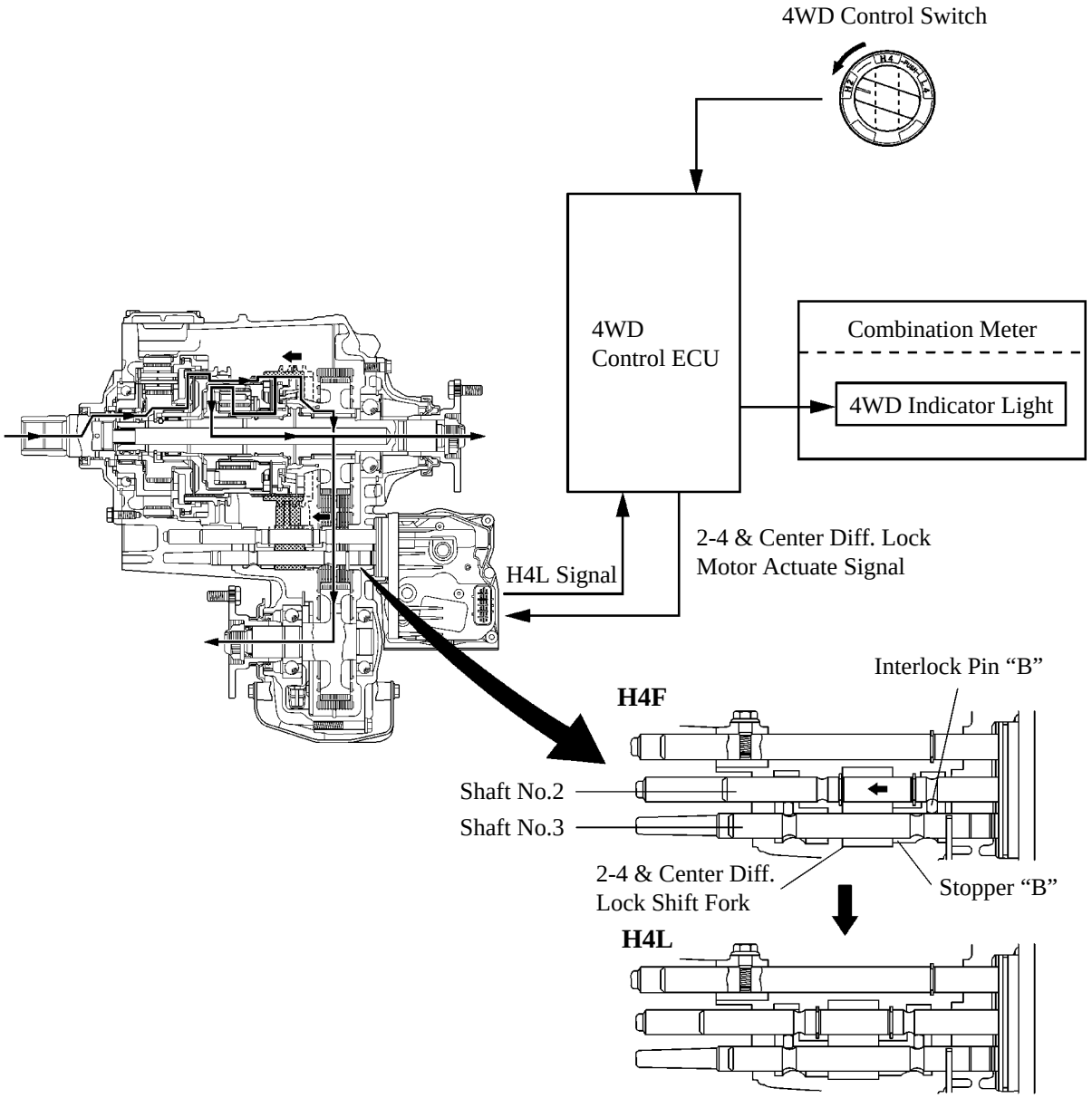
- After the front drive train has been coupled, the 4WD control ECU actuates the 2-4 & center differential lock shift motor again, in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) further to the right. This causes the interlock pin “B” to drop into the groove of the 2-4 & center differential lock shift fork shaft (Shaft No.2). As a result, the stopper “B” and the 2-4 & center differential lock shift fork shaft (Shaft No.2) become coupled, and at the same time, the snap ring “A” on the 2-4 & center differential lock shift fork shaft (Shaft No.2) pushes against the 2-4 & center differential lock shift fork. Consequently, the 2-4 & center differential lock shift fork moves to the right while pushing on the stopper “B”, causing the center differential to unlock, and thus completing the transfer to the H4F mode.
- The 4WD control ECU causes the 4WD indicator light to blink during switching, and turn ON when the transfer to the H4F mode has been completed.

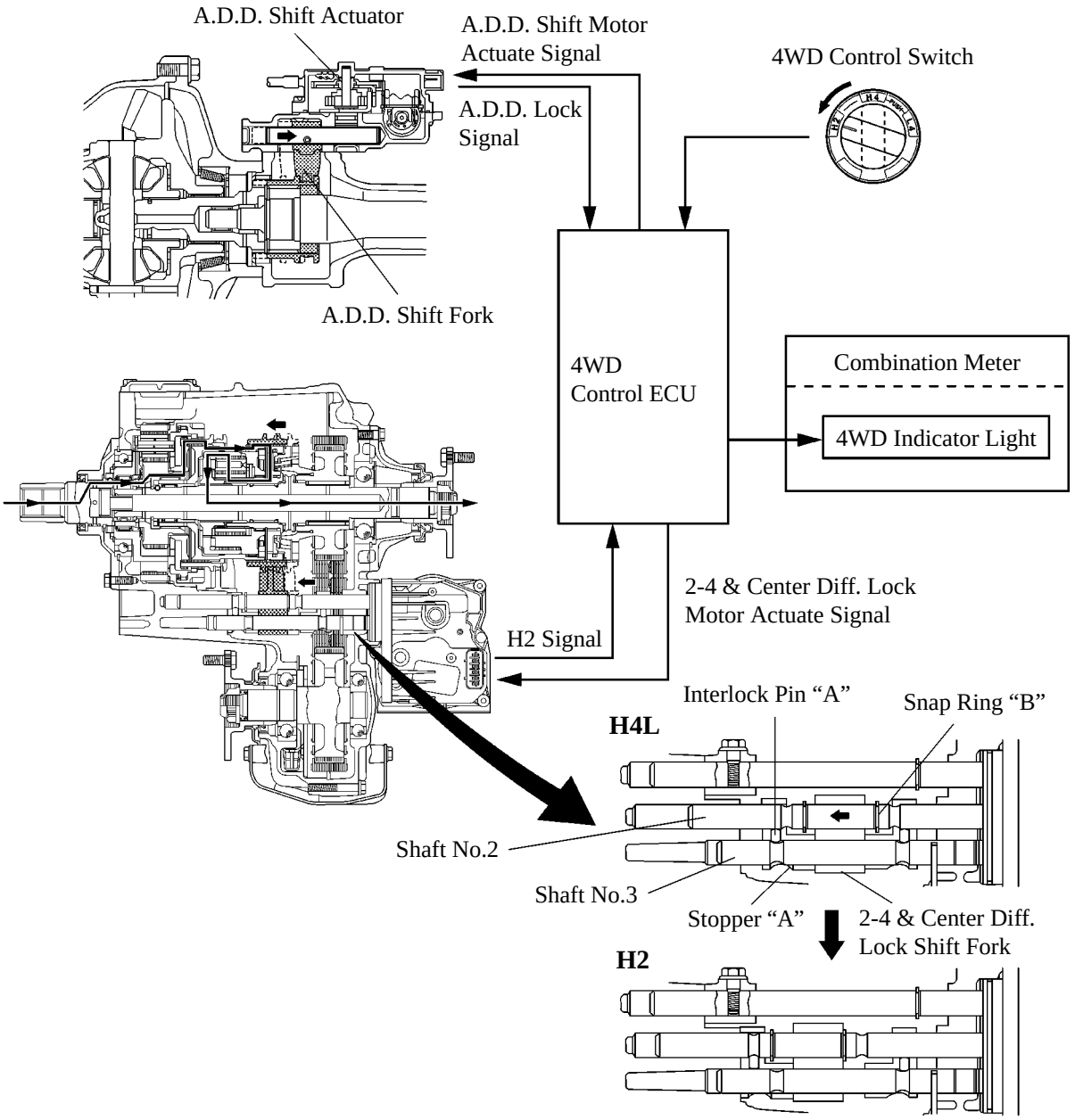


B. H4F → H2

- When the driver switches the 4WD control switch to the H2 position, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the left.
- In the H4F position, the stopper “B” is coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) by the interlock pin “B”. Therefore, stopper “B” moves to the left in the same manner as the 2-4 & center differential lock shift fork shaft (Shaft No.2), thus moving the 2-4 & center differential lock shift fork (Fork No.2) in the same direction. At this time, the interlock pin “B”, which had the stopper “B” coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) drops into the groove of the transfer shift shaft (Shaft No.3), causing them to become uncoupled. As a result, the center differential becomes locked and transfers momentarily to the H4L mode.

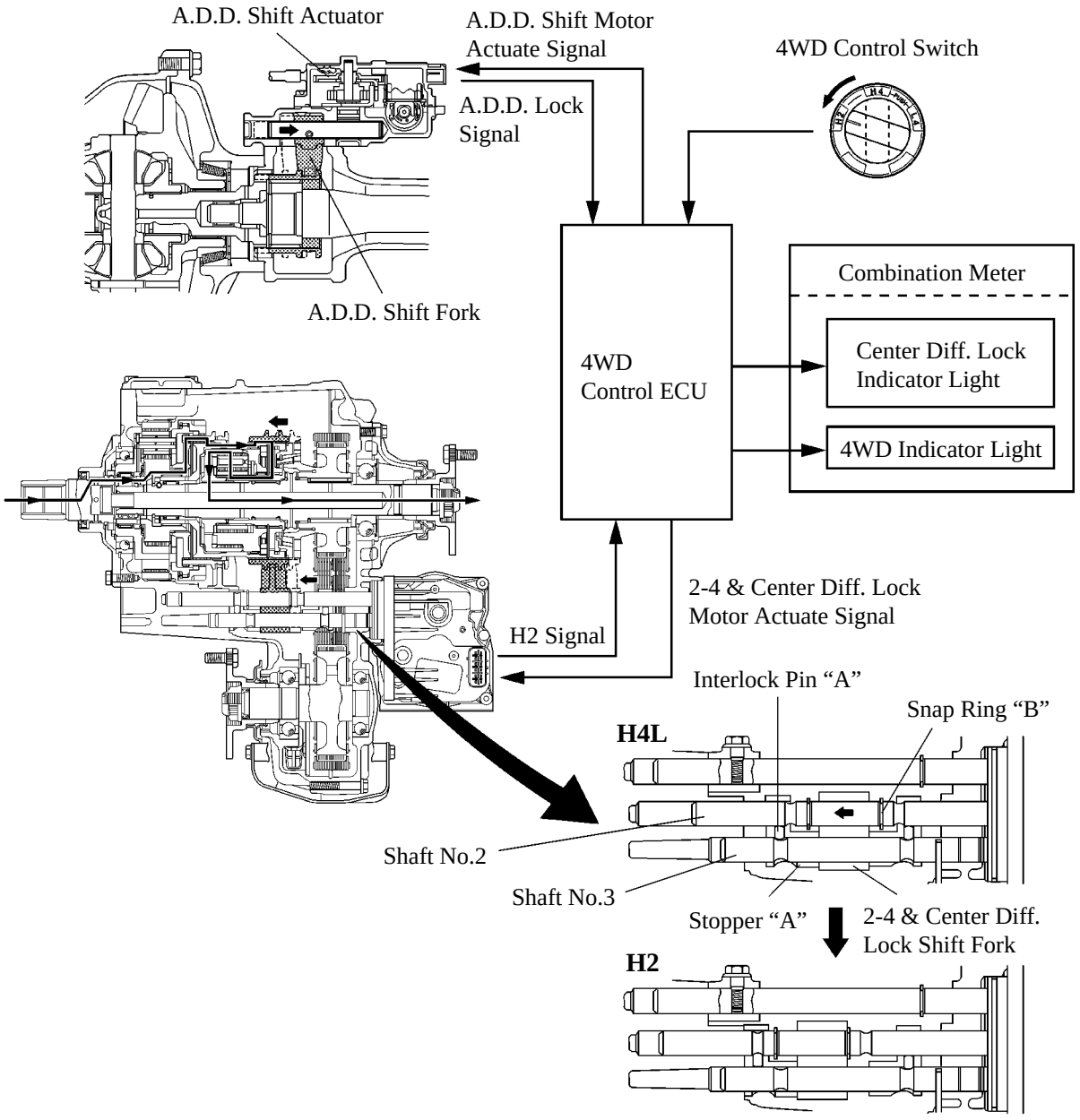


- Upon completing the transfer to the H4L mode, the 4WD control ECU actuates the 2-4 & center differential lock shift motor again in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) further to the left. This causes the interlock pin “A” to drop into the groove of the 2-4 & center differential lock shift fork shaft (Shaft No.2). As a result, the stopper “A” and the 2-4 & center differential lock shift fork shaft (Shaft No.2) become coupled, and at the same time, the snap ring “B” on the 2-4 & center differential lock shift fork shaft (Shaft No.2) pushes against the 2-4 & center differential lock shift fork. Consequently, the 2-4 & center differential lock shift fork moves to the left while pushing on the stopper “A”, causing the center differential to unlock and transfer to the H2 mode.
- Upon transferring to the H2 mode, the 4WD control ECU actuates the A.D.D. shift motor. Accordingly, the A.D.D. shift motor moves the A.D.D. shift fork to the right, thus uncoupling the front wheels from the drivetrain. This completes the transfer to the H2 mode.
- The 4WD control ECU causes the 4WD indicator light to blink during switching and turn OFF when the transfer to the H2 mode has been completed.



C. H4L → H2

- When the driver switches the 4WD control switch to the H2 position, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the left. This causes the interlock pin "A" to drop into the groove of the 2-4 & center differential lock shift fork shaft (Shaft No.2). As a result, the stopper "A" and the 2-4 & center differential lock shift fork shaft (Shaft No.2) become coupled, and at the same time, the snap ring "B" on the 2-4 & center differential lock shift fork shaft (Shaft No.2) pushes against the 2-4 & center differential lock shift fork. Consequently, the 2-4 & center differential lock shift fork moves to the left while pushing on the stopper "A", causing the center differential to unlock and transfer to the H2 mode.
- Upon transferring to the H2 mode, the 4WD control ECU actuates the A.D.D. shift motor. Accordingly, the A.D.D. shift motor moves the A.D.D. shift fork to the right, thus uncoupling the front wheels from the drivetrain. This completes the transfer to the H2 mode.
- The 4WD control ECU causes the 4WD indicator light and the center differential lock indicator light to blink during switching and turn OFF when the transfer to the H2 mode has been completed.



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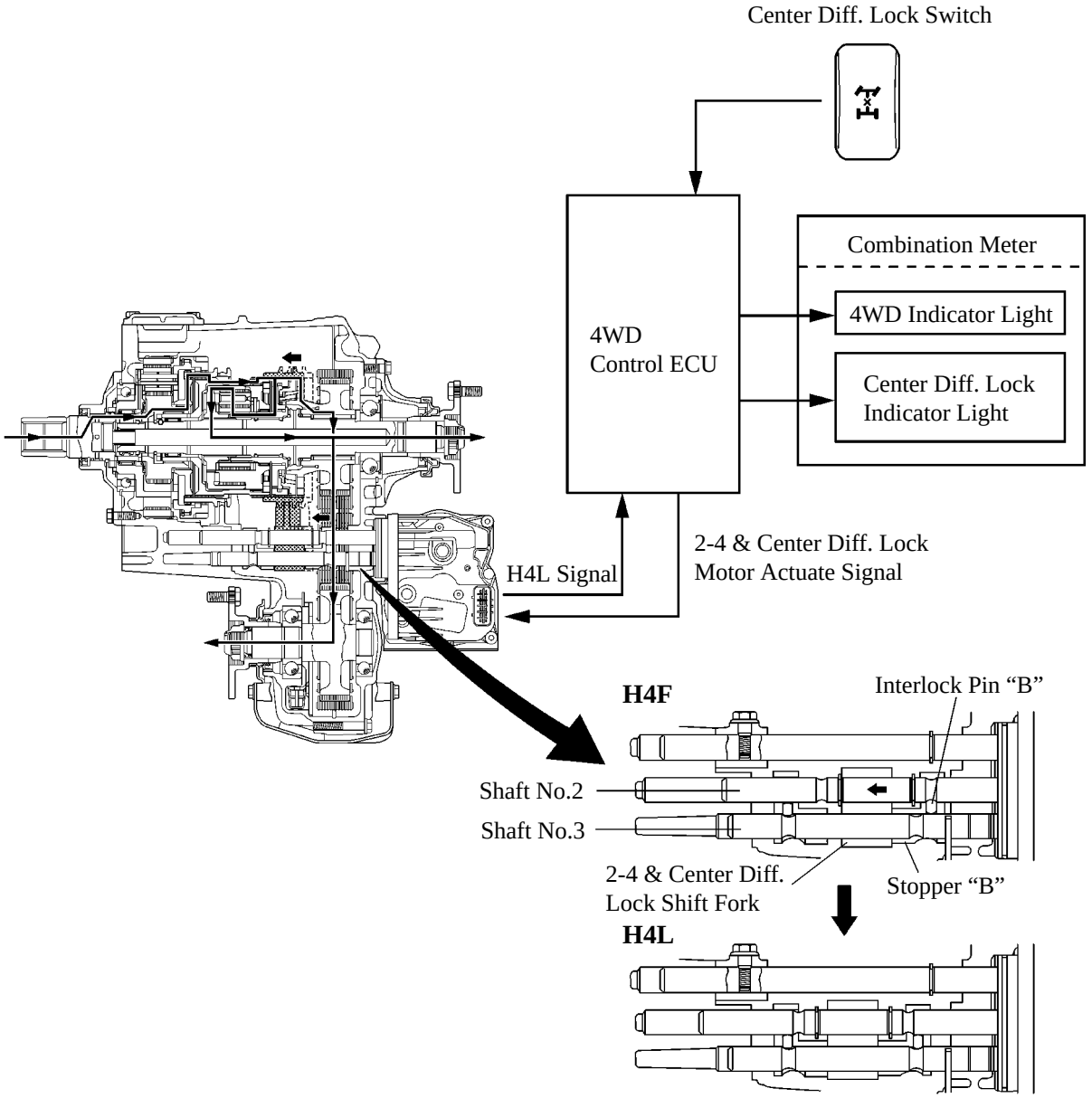
D. H4F → H4L

- When the center differential lock switch is turned ON, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the left.
- In the H4 position, the stopper “B” is coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) by the interlock pin “B”. Therefore, stopper “B” moves to the left in the same manner as the 2-4 & center differential lock shift fork shaft (Shaft No.2), thus moving the 2-4 & center differential lock shift fork (Fork No.2) in the same direction. At this time, the interlock pin “B”, which had the stopper “B” coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) drops into the groove of the transfer shift shaft (Shaft No.3), causing them to become uncoupled. As a result, the center differential becomes locked and transfers momentarily to the H4L mode.
- The 4WD control ECU causes the center diff. lock indicator light to blink during switching, and to turn ON when the center differential is locked.



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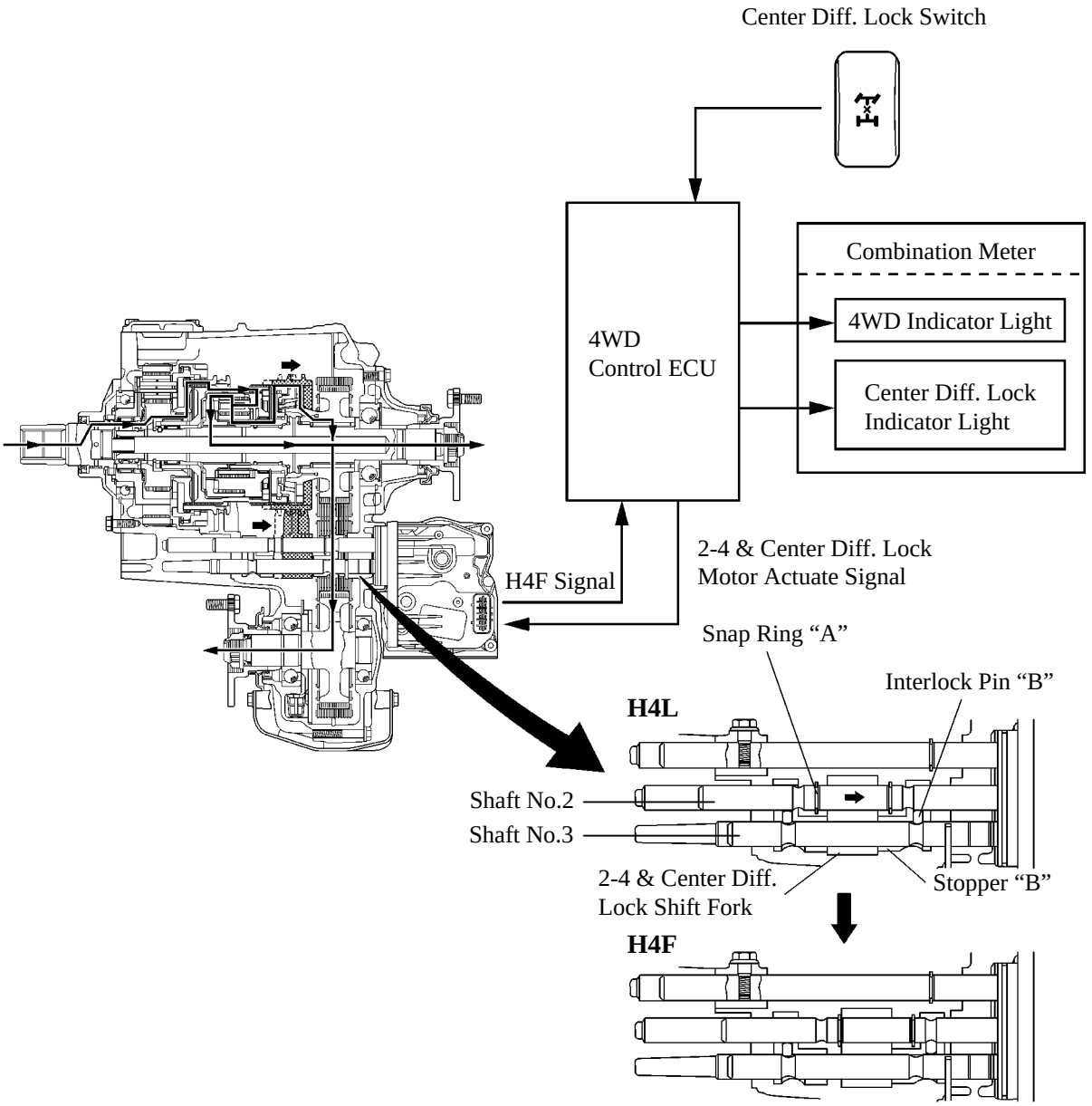
E. H4L → H4F

- When the center differential lock switch is turned OFF, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the right. This causes the interlock pin "B" to drop into the groove of the 2-4 & center differential lock shift fork shaft (Shaft No.2). As a result, the stopper "B" and the 2-4 & center differential lock shift fork shaft (Shaft No.2) become coupled, and at the same time, the snap ring "A" on the 2-4 & center differential lock shift fork shaft pushes against the 2-4 & center differential lock shift fork. Consequently, the 2-4 & center differential lock shift fork moves to the right while pushing on the stopper "B", causing the center differential to unlock, and thus completing the transfer to the H4F mode.
- The 4WD control ECU causes the center diff. lock indicator light to blink during switching, and to turn OFF when the center differential is freed.



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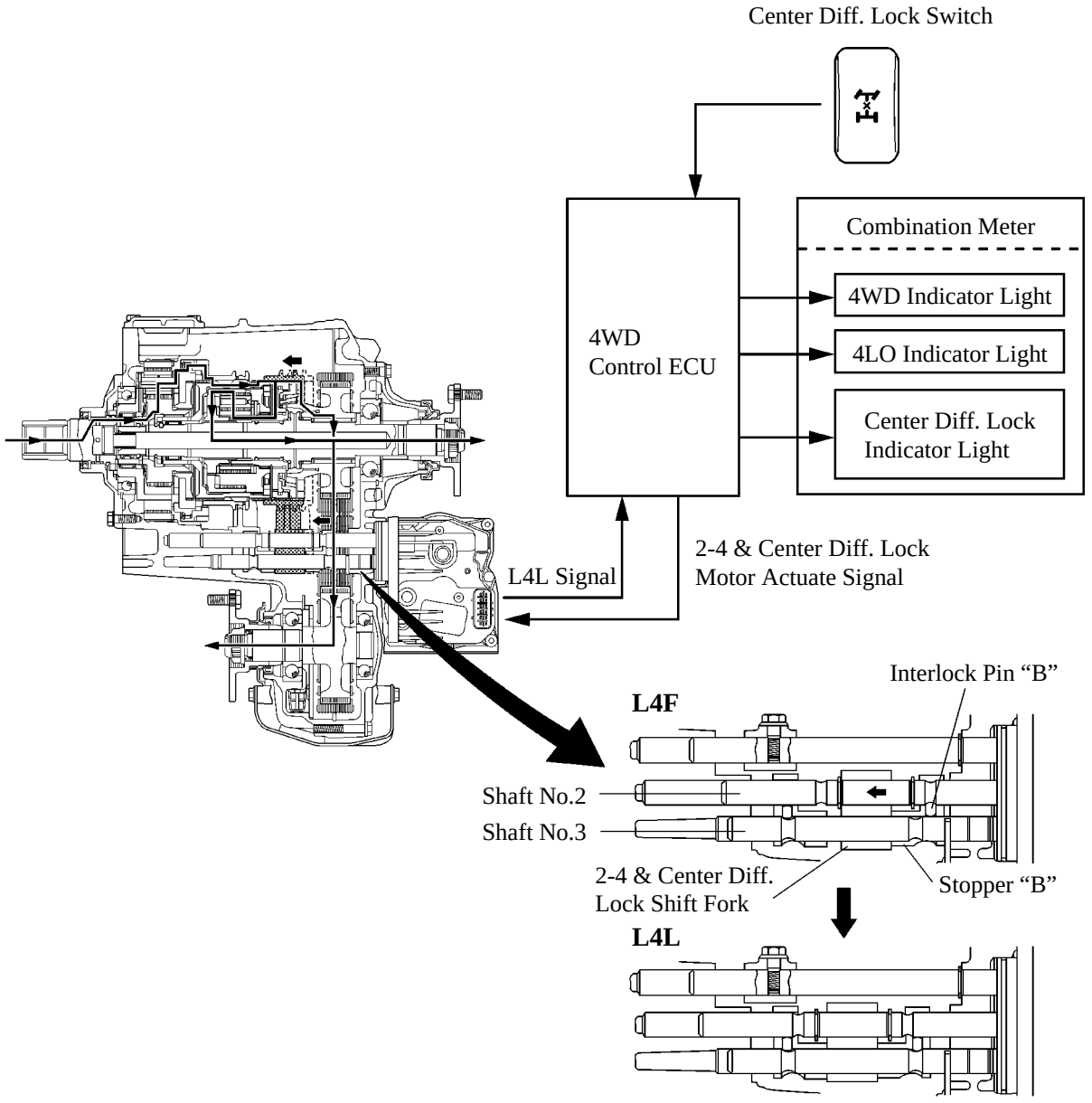
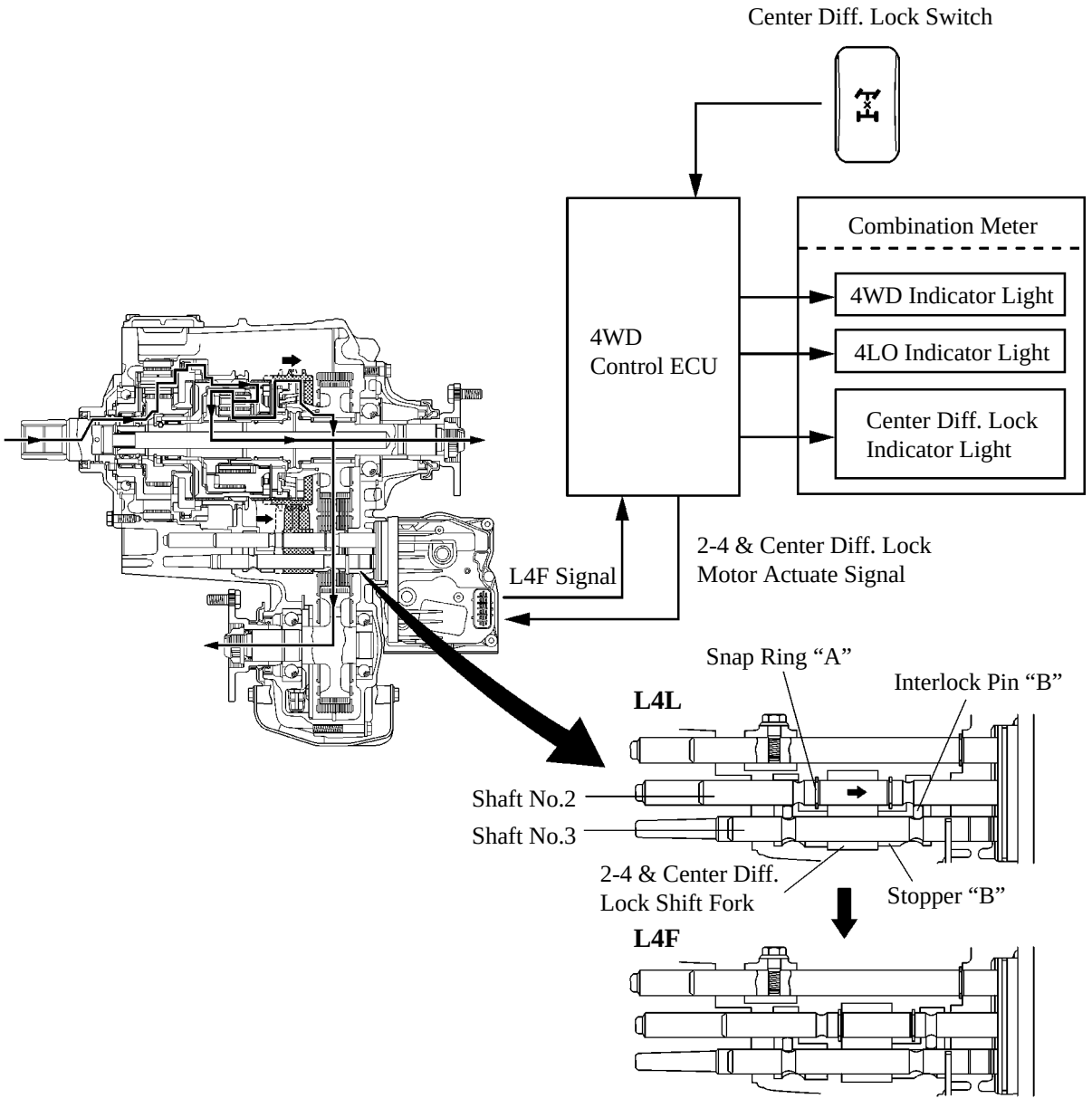
F. L4F → L4L

- When the center differential lock switch is turned ON, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the left.
- In the H4 position, the stopper "B" is coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) by the interlock pin "B". Therefore, stopper "B" moves to the left in the same manner as the 2-4 & center differential lock shift fork shaft (Shaft No.2), thus moving the 2-4 & center differential lock shift fork (Fork No.2) in the same direction. At this time, the interlock pin "B", which had the stopper "B" coupled to the 2-4 & center differential lock shift fork shaft (Shaft No.2) drops into the groove of the transfer shift shaft (Shaft No.3), causing them to become uncoupled. As a result, the center differential becomes locked and transfers momentarily to the L4L mode.
- The 4WD control ECU causes the center diff. lock indicator light to blink during switching, and to turn ON when the center differential is locked.



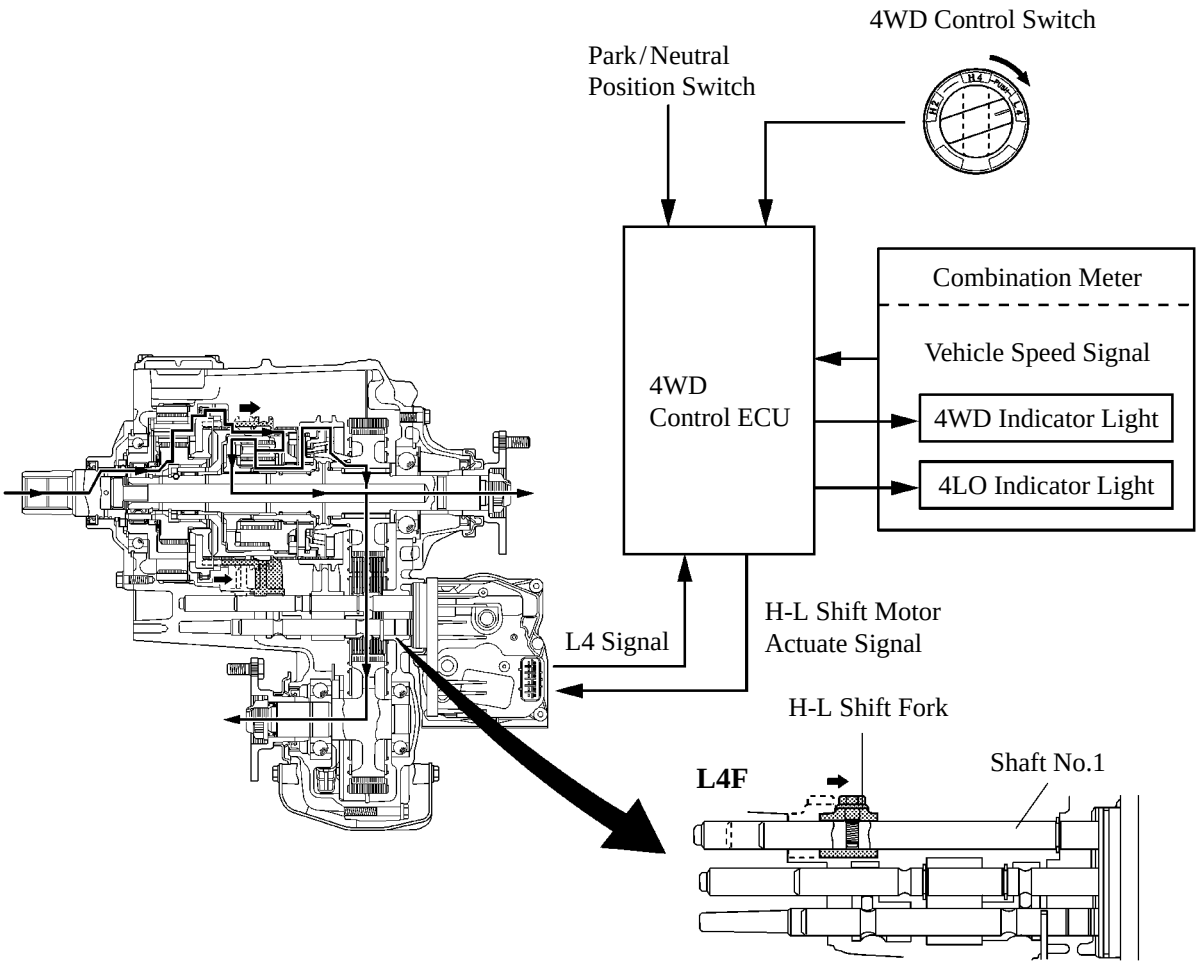
G. L4L → L4F

- When the center differential lock switch is turned OFF, the 4WD control ECU actuates the 2-4 & center differential lock shift motor in order to move the 2-4 & center differential lock shift fork shaft (Shaft No.2) to the right. This causes the interlock pin “B” to drop into the groove of the 2-4 & center differential lock shift fork shaft (Shaft No.2). As a result, the stopper “B” and the 2-4 & center differential lock shift fork shaft (Shaft No.2) become coupled, and at the same time, the snap ring “A” on the 2-4 & center differential lock shift fork shaft pushes against the 2-4 & center differential lock shift fork. Consequently, the 2-4 & center differential lock shift fork moves to the right while pushing on the stopper “B”, causing the center differential to unlock, and thus completing the transfer to the L4F mode.
- The 4WD control ECU causes the center diff. lock indicator light to blink during switching, and to turn OFF when the center differential is freed.



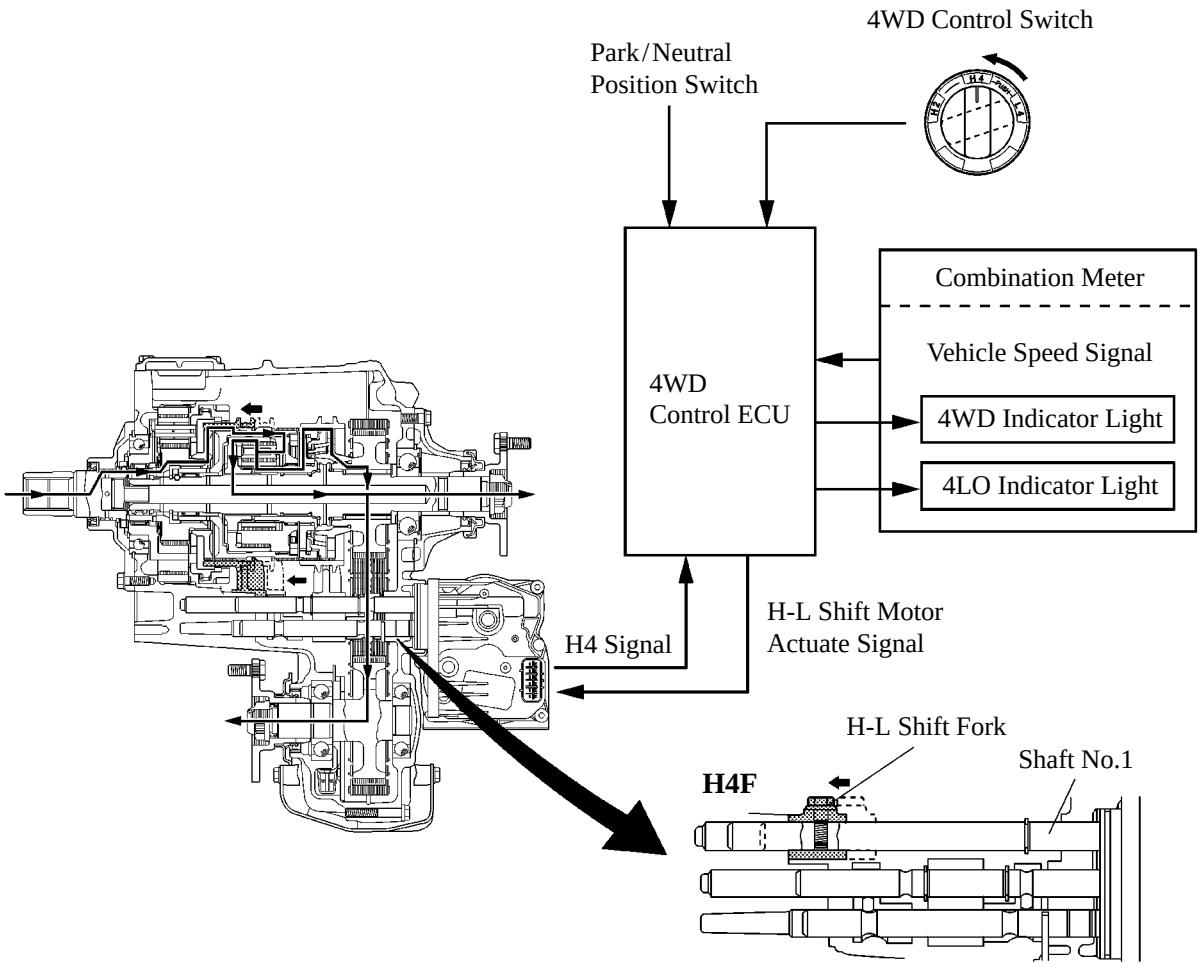
H. H4F → L4F

- When the 4WD control switch turns to L4 position, this signal, vehicle speed signal [5 km/h (3 mph) or less], and park/neutral position switch (N position) signal are input into the 4WD control ECU, and the 4WD control ECU actuates the H-L shift motor in the transfer shift actuator.
  Accordingly, the H-L shift motor moves the H-L shift fork on the H-L shift fork shaft (Shaft No.1) to the right. This completes the transfer to the L4F mode.
- The 4WD control ECU causes the 4LO indicator light to blink during switching, and to turn ON when the transfer to the L4F mode has been completed.



I. L4F → H4F

- When the 4WD control switch turns to H4 position, this signal, vehicle speed signal [5 km/h (3 mph) or less], and park/neutral position switch (N position) signal are input into the 4WD control ECU, and the 4WD control ECU actuates the H-L shift motor.
  Accordingly, the H-L shift motor moves the H-L shift fork on the H-L shift fork shaft (Shaft No.1) to the left. This completes the transfer to the H4F mode.
- The 4WD control ECU causes the 4LO indicator light to blink during switching, and to turn OFF when the transfer to the H4F mode has been completed.



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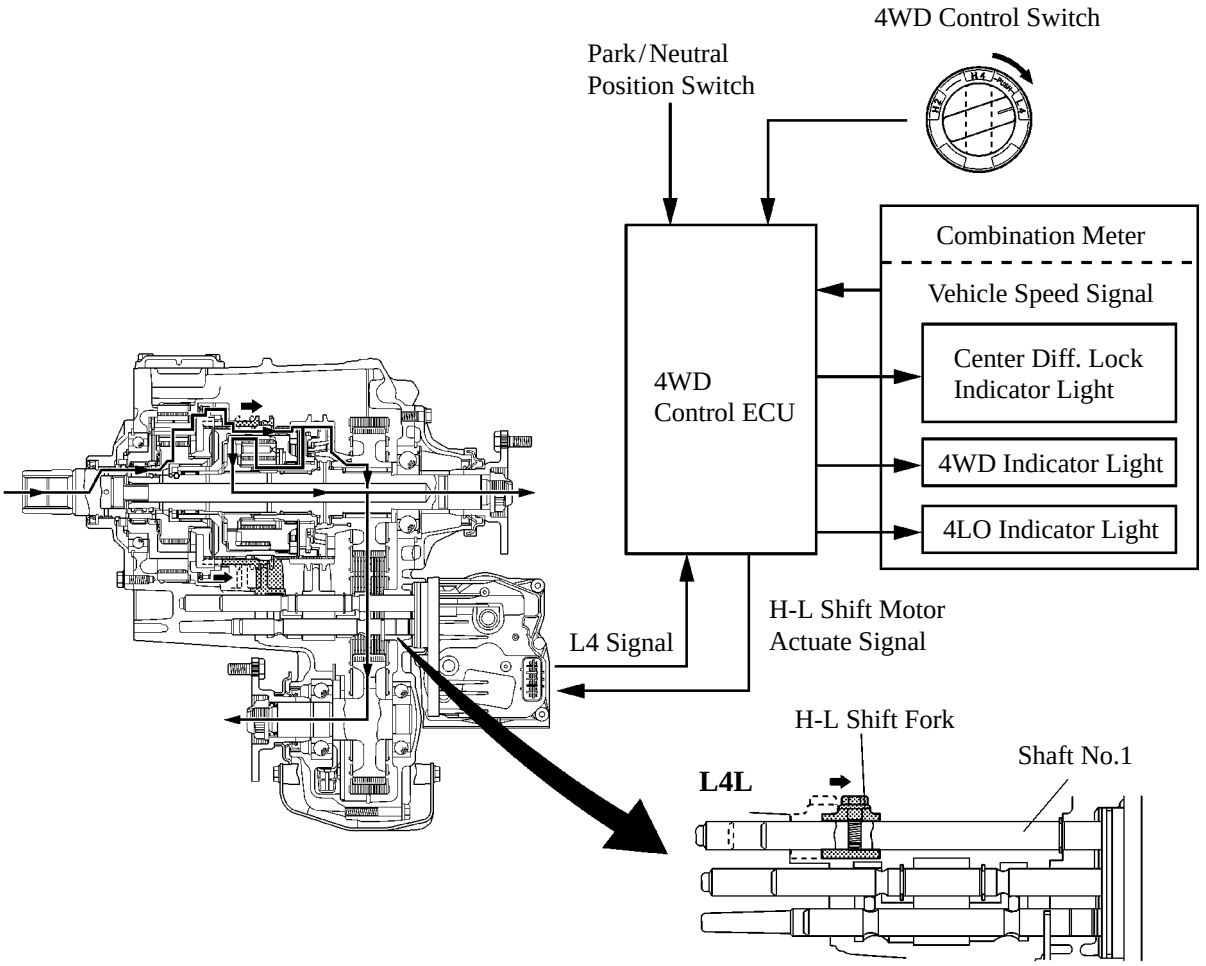
J. H4L → L4L

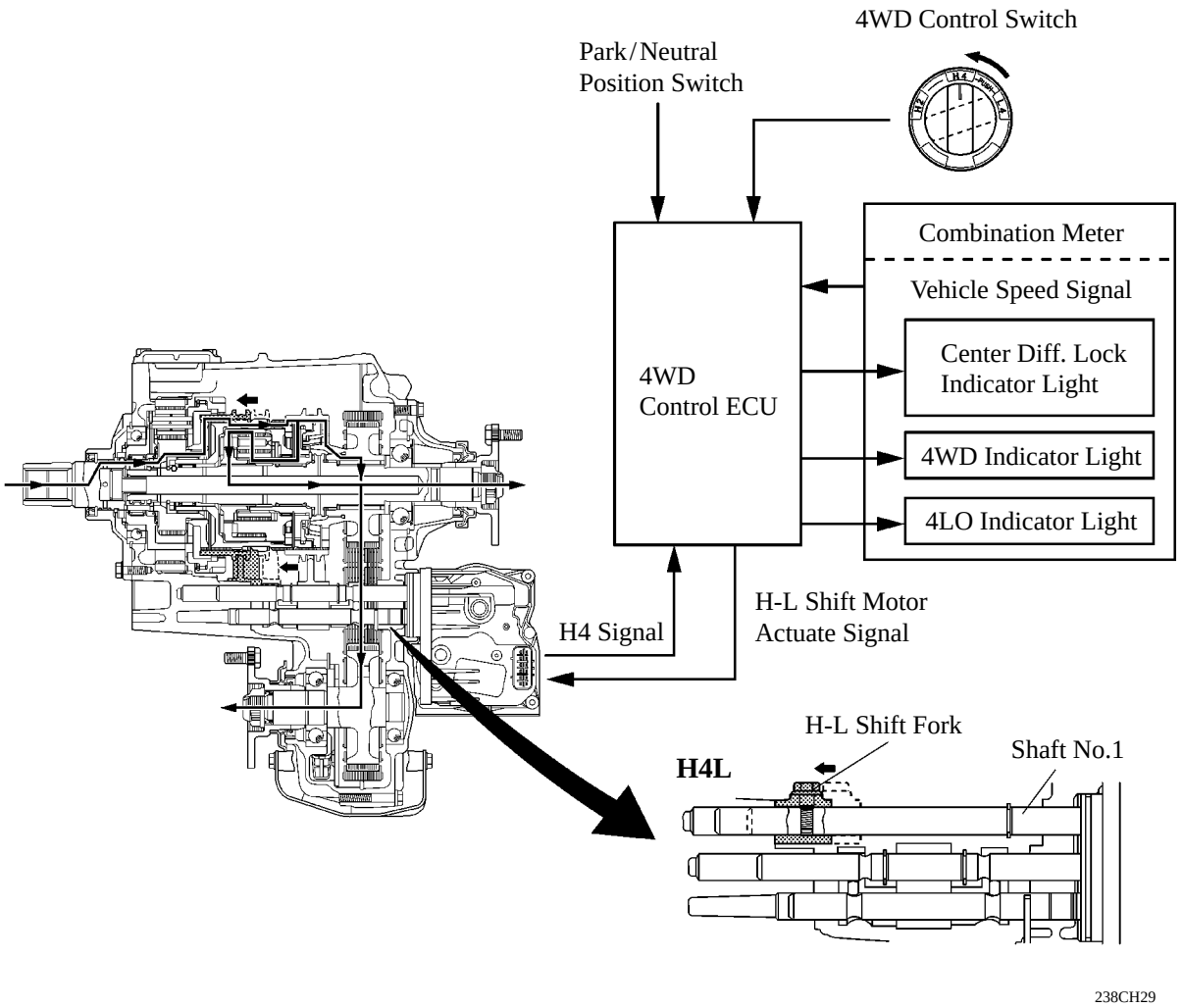
- When the 4WD control switch turns to L4 position, this signal, vehicle speed signal [5 km/h (3 mph) or less], and park/neutral position switch (N position) signal are input into the 4WD control ECU, and the 4WD control ECU actuates the H-L shift motor.
  Accordingly, the H-L shift motor moves the H-L shift fork on the H-L shift fork shaft (Shaft No.1) to the right. This completes the transfer to the L4L mode.
- The 4WD control ECU causes the 4LO indicator light to blink during switching, and to turn ON when the transfer to the L4L mode has been completed.



238CH28

K. L4L → H4L

- When the 4WD control switch turns to H4 position, this signal, vehicle speed signal [5 km/h (3 mph) or less], and park/neutral position switch (N position) signal are input into the 4WD control ECU, and the 4WD control ECU actuates the H-L shift motor.
  Accordingly, the H-L shift motor moves the H-L shift fork on the H-L shift fork shaft (Shaft No.1) to the left. This completes the transfer to the H4L mode.
- The 4WD control ECU causes the 4LO indicator light to blink during switching, and to turn OFF when the transfer to the H4L mode has been completed.



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L. H2 → L4F

When the driver moves the 4WD control switch from the H2 position to the L4 position, the 4WD control ECU effects the H2 → H4F switching control (see page 93). Then, it effects the H4F → L4F switching control (see page 102) in order to complete the transfer to the L4F mode.

M. L4F → H2

When the driver moves the 4WD control switch from the L4 position to the H2 position, the 4WD control ECU effects the L4F → H4F switching control (see page 103). Then, it effects the H4F → H2 switching control (see page 95) in order to complete the transfer to the H2 mode.

N. L4L → H2

When the driver moves the 4WD control switch from the L4 position to the H2 position, the 4WD control ECU effects the L4L → H4L switching control (see page 105). Then, it effects the H4L → H2 switching control (see page 97) in order to complete the transfer to the H2 mode.