

# Chapter 11

## POWER TAKE OFF (P.T.O.)

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1. TRANSMISSION P.T.O.
2. SPLIT SHAFT P.T.O.
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## 1. TRANSMISSION P.T.O.

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When P.T.O. is necessary for body or equipment mounting to Hino vehicles, contact directly in the nearby transmission manufacturer as following or HMC or Hino authorized dealer.

- In case of the vehicle equipped Allison automatic transmission, contact to ALLISON Transmission Division (ATD) distributors or dealers.

## 2. SPLIT SHAFT P.T.O.

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Be sure to observe the following precautions to prevent malfunction of vehicle control system when installing split shaft P. T. O..

### **Precaution for Installing or Modifying Split Shaft P.T.O.**

Do not modify parking lever switch and buzzer off switch related to parking brake circuit and parking brake circuit. If modify them, the parking condition of the vehicle can not be confirmed, and so the vehicle control system may not operate properly.

Since the split shaft P.T.O. is used while the vehicle is parked, and therefore, do not modify the vehicle which can run during the split shaft P.T.O. operation.

Should connect the P.T.O. switch circuit to the common rail ECU circuit for diagnosis of P.T.O. operating condition.

Refer to "COMMON RAIL CIRCUIT" in Chapter 7 and "CONNECTORS" in Chapter 12 for the connection destination and used connector of P.T.O. switch 1.

The vehicle system will not operate properly because the vehicle speed sensor is judged to be faulty if the operating condition of the P.T.O. can not be confirmed.

Customizing common rail ECU is required when installing Split Shaft P.T.O., please consult HMC for the detail.

### 3. TRANSMISSION MODELS TO BE INSTALLED HINO'S VEHICLES

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| MODEL        |      |     | NHC2                                    | NMC2                                    |
|--------------|------|-----|---|---|
| TRANSMISSION | AUTO | STD | Allison<br>3000RDS                      | Allison<br>3000RDS                      |
|              |      | OPT | Allison<br>3500RDS<br>Allison<br>3000HS | Allison<br>3500RDS<br>Allison<br>3000HS |

### 4. OTHER NOTICES

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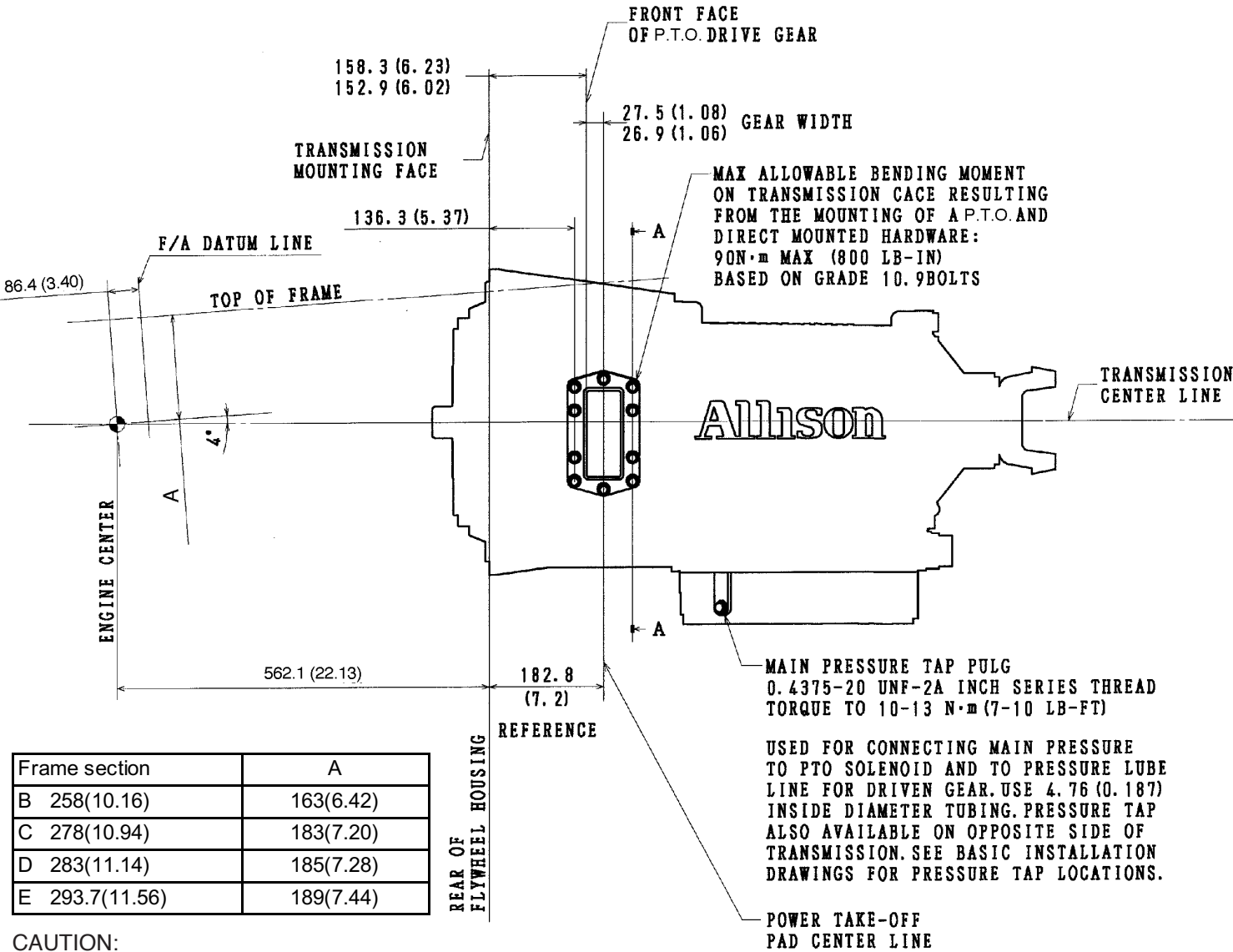
If a P.T.O. is installed make sure it works properly and meets the respective manufacturers guidelines for application, installation, and operation.

NOTE : 3000HS does not have P.T.O. gear.

For installing P.T.O. , please contact HMC.

5. MOUNTING POSITION OF TRANSMISSION P.T.O. ASSY

• TRANSMISSION MODEL : ALLISON 3000RDS AND 3500RDS



CAUTION:

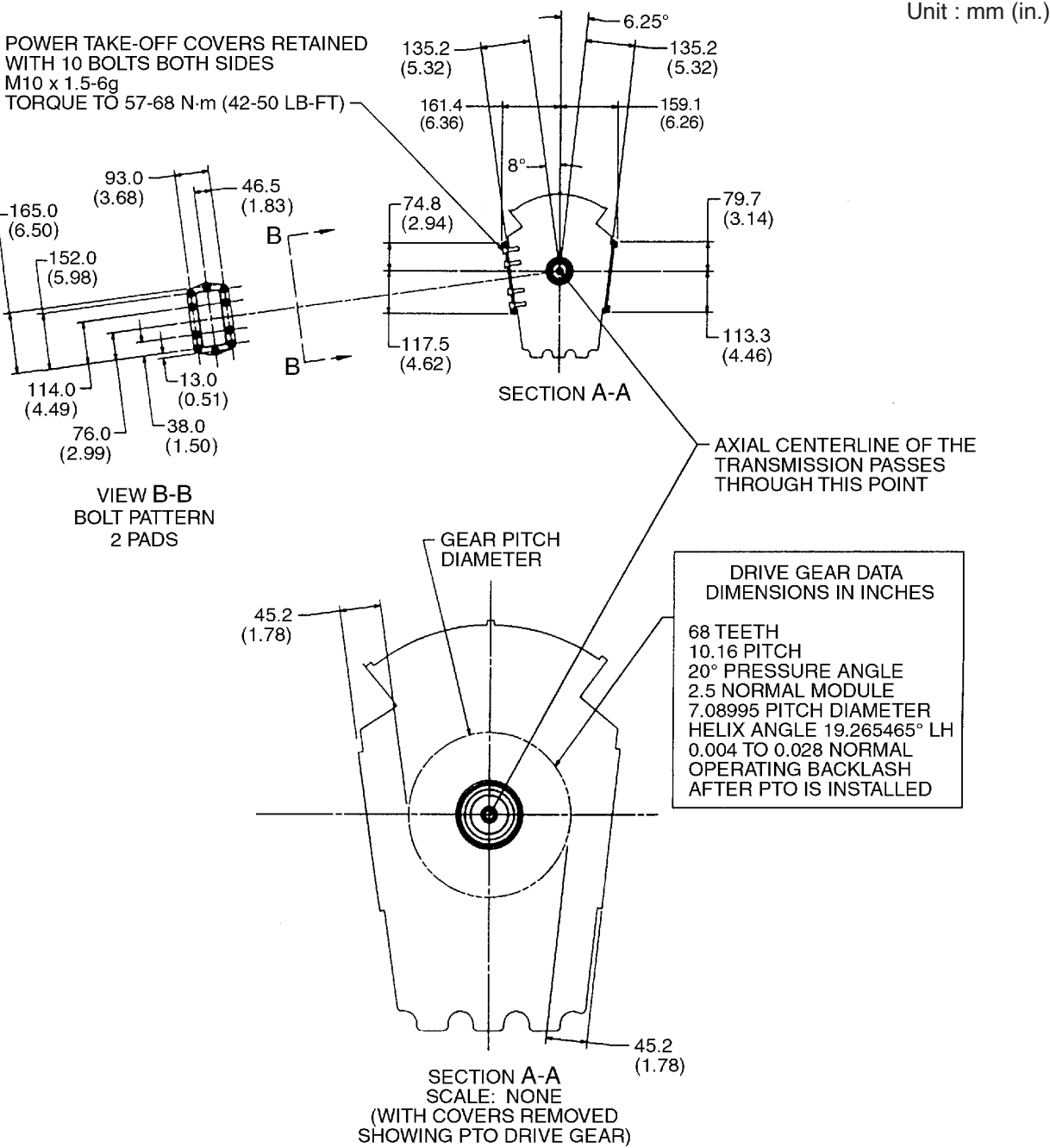
Torques shown for customer-furnished fasteners and threaded components are for plain (non-plated) threads. Torque requirements should be reviewed if plated items will be used. Consult the supplier.

P.T.O. output speed (rpm):

Engine speed x  $\frac{\text{Drive gear}}{\text{Driven gear}} \times \frac{\text{P.T.O. input gear}}{\text{P.T.O. output gear}}$

• POWER TAKE OFF DRIVE GEAR RATINGS

| TRANSMISSION CONFIGURATION               | VALUE          | UNIT             |
|--|----------------|------------------|
| Drive Gear Torque (Continuous Operation) |                |                  |
| With P.T.O. on One Side                  | 660 (485) Max. | N·m (pound-foot) |
| With P.T.O. on Both Sides                | 930 (685) Max. | N·m (pound-foot) |



## 6. ENGINE REV. CONTROL FOR MOUNTING OF BODY OR EQUIPMENT

### Overview

The PTO feature, which includes Cab PTO, Remote PTO, maintains engine speed at an operator-selectable speed.

An engine controlled by the PTO feature is typically used to drive an on-board or off-board PTO device. The PTO feature can be split into two types; cab PTO and remote PTO.

### Operation (Cab PTO) (Please refer to the Cummins manual for details.)

#### Activation Conditions

The Cab PTO feature will not activate when any of the following conditions are true:

- The ECM has an active vehicle speed sensor fault (unless the Ignore Vehicle Speed Source in PTO parameter is enabled).
- The vehicle speed is above the PTO Maximum Vehicle Speed parameter.
- The clutch pedal is pressed (unless the PTO Clutch Override parameter is disabled).
- The service brake pedal is pressed (unless the PTO Service Brake Override parameter is disabled).
- The parking brake is not set (unless the Parking Brake Interlock parameter is set to Remote Only or None).
- The transmission is not in neutral (unless the Transmission Interlock Function parameter is disabled).

#### Deactivation

The user may manually deactivate the PTO feature by placing the CC/PTO On/Off switch to OFF.

This will typically return engine fueling control to the idle governor.

Deactivation will automatically occur when any of the following conditions are true:

- The ECM has an active vehicle speed sensor fault (unless the Ignore Vehicle Speed Source in PTO parameter is enabled).
- The vehicle speed is above the PTO Maximum Vehicle Speed parameter (unless the IgnoreVehicle Speed Source in PTO parameter is enabled).
- The clutch pedal is pressed (unless the PTO Clutch Override parameter is disabled).
- The service brake pedal is pressed (unless the PTO Service Brake Override parameter is disabled).
- The parking brake is not set (unless the Parking Brake Interlock parameter is disabled).
- The transmission is not in neutral (unless the Transmission Interlock Function parameter is disabled).

### Remote PTO (Please refer to the Cummins manual for details.)

#### Activation Conditions

The Remote PTO feature will not activate when any of the following conditions are true:

- The ECM has an active vehicle speed sensor fault (unless the Ignore Vehicle Speed Source in PTO parameter is enabled).
- The vehicle speed is above the PTO Maximum Vehicle Speed parameter.
- The parking brake is not set (unless the Parking Brake Interlock parameter is set to Cab Only or None).
- The transmission is not in neutral (unless the Transmission Interlock Function parameter is disabled).

#### Deactivation

The operator may deactivate the Remote PTO feature using the Remote PTO switch. This will typically return engine control to the idle governor.

Deactivation will automatically occur when any of the following conditions are true:

- The ECM has an active vehicle speed sensor fault (unless the Ignore Vehicle Speed Source in PTO parameter is enabled).
- The vehicle speed is above the PTO Maximum Vehicle Speed parameter (unless the Ignore Vehicle Speed Source in PTO parameter is enabled).
- The parking brake is not set (unless the Parking Brake Interlock parameter is disabled).
- The transmission is not in neutral (unless the Transmission Interlock Function parameter is disabled).

## (ENGINE ACCELERATOR PROVIDED HINO GENUINE BY OPTION)

Engines which are mounted to the Hino truck models are controlled by a electric computer. Make sure following procedure how to control of engine revolution (speed) hereinafter collectively referred engine revolution when provide power take off device (ex. Transmission P.T.O.) in order to control mounted body or equipment.

The engine accelerator unit, related parts and extension wire are available from Hino authorized dealer.

Connect the connector of Engine accelerator unit with spare connector which is provided inside of right member near No.3 crossmember at chassis frame.

(Refer to chapter 7 "ELECTRICAL POWER SOURCES" for details of specifications and installed position.)

### Detail of related parts

| PART NAME                 | PART NUMBER |
|---------------------------|-------------|
| Link Assy., Accelerator   | 78100-E0040 |
| Lever assy., control      | 78130-E0010 |
| Harness sub assy., extend | S8207-11470 |

### Range of control

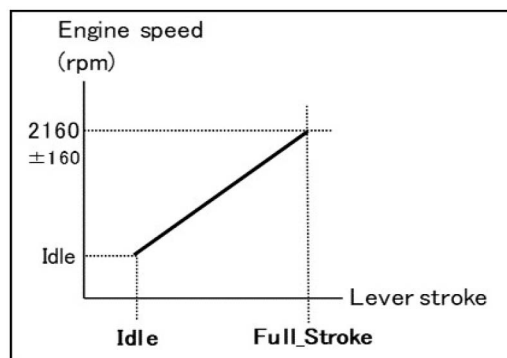
Refer to below chart. (Can be controlled variable revolution.)

### Condition of operation

- Vehicle speed must be less than 20km/h (32mile/h).
- Transmission must be in neutral position.
- Engine speed must be reduced to idle.
- Engine accelerator unit must be idle position.
- P.T.O. engagement signal must be connected to Engine Control ECU.

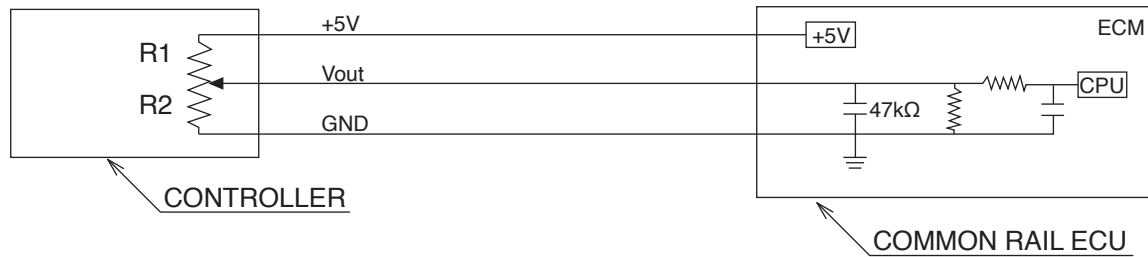
Engine speed will be controlled when the above conditions are met.

If any condition noted in the listed above is not met, engine speed control will normal be operated by accelerator pedal.



## SPECIFICATION OF THE ENGINE SPEED CONTROLLER

(MADE/PROCURED BY BODYBUILDER)



### calculation ;

$$V_{out} = 5 \times R / (R1 + R)$$

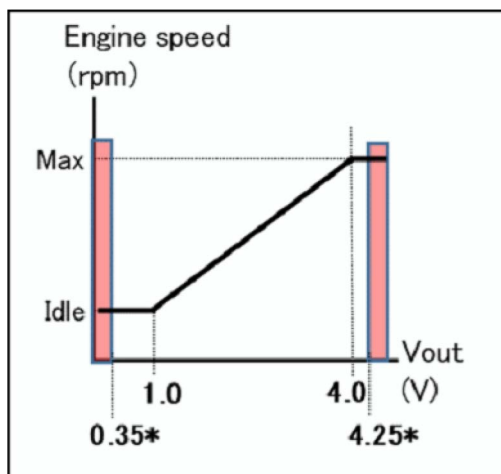
$$1/R = (1/R2) + (1/47) \text{ [k}\Omega\text{]}$$

$$\text{Note ; } R1 + R2 = 2 \text{ k}\Omega$$

| R1(Ω) | R2(Ω) | Vout(V) |
|-------|-------|---------|
| 1650  | 350   | 0.87    |
| 1600  | 400   | 0.99    |
| 1500  | 500   | 1.24    |
| 1400  | 600   | 1.49    |
| 1300  | 700   | 1.73    |
| 1200  | 800   | 1.98    |
| 1100  | 900   | 2.23    |
| 1000  | 1000  | 2.47    |
| 900   | 1100  | 2.72    |
| 800   | 1200  | 2.97    |
| 700   | 1300  | 3.22    |
| 600   | 1400  | 3.47    |
| 500   | 1500  | 3.72    |
| 400   | 1600  | 3.97    |
| 350   | 1650  | 4.10    |

\*note:  $V_{out} < 0.35\text{V}$  /  $V_{out} > 4.25\text{V}$  is prohibited that cause undervoltage / overvoltage diagnosis detection.

### • The graph in relation with ENGINE SPEED and Vout (for reference)

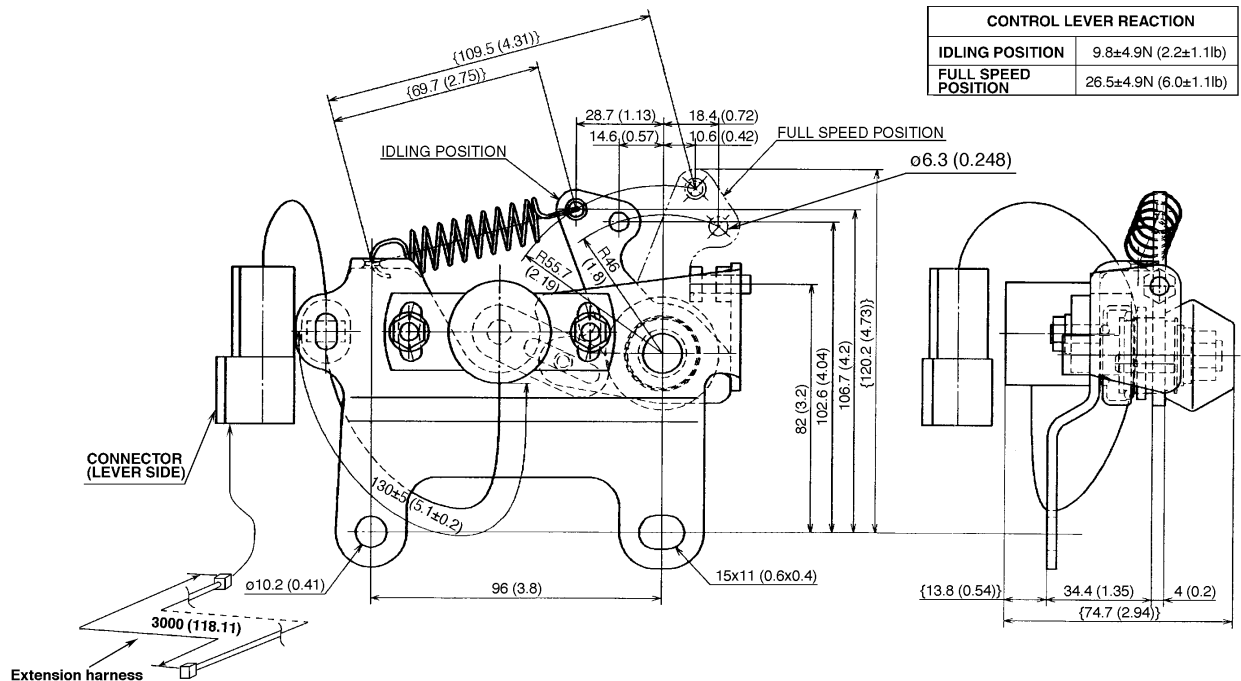


\*note:  $V_{out} < 0.35\text{V}$  /  $V_{out} > 4.25\text{V}$  is prohibited that cause undervoltage / overvoltage diagnosis detection.

## How to install the engine accelerator

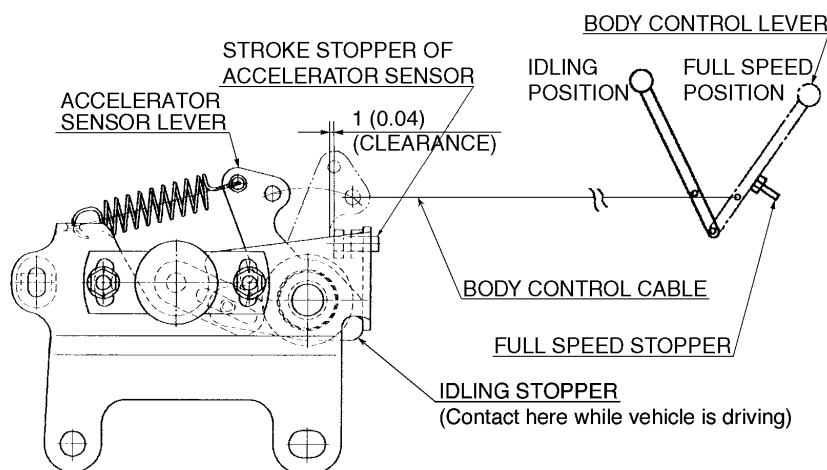
Outline figure of Engine Accelerator

Unit : mm (in.)



### How to install

- Ensure that the body control lever is equipped with a full speed stopper, in order to control the stroke of the sensor lever.
- Adjust the body control lever so that the full speed stopper makes contact earlier than the stroke stopper of accelerator sensor.
- Ensure that the accelerator sensor lever will be in contact with the idling stopper by adjusting the speed control lever when the P.T.O. or equipment is not operating (during normal driving).

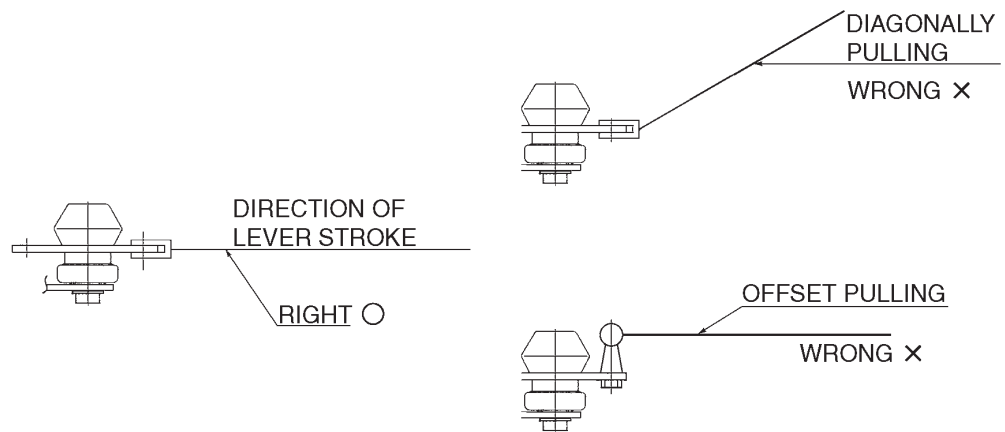


### [NOTE]

The clearance specified for the accelerator sensor stroke stopper is for reference only. If the sensor side stopper comes into contact earlier, stresses will be imposed upon the sensor shaft and may result in damage to the parts. Also, if the sensor lever does not come into contact with the idling stopper, it may result in improper engine operation during normal driving conditions.



- When installing the cable on the accelerator sensor lever, ensure that the cable pulls in a parallel direction to the lever stroke so that an imbalanced load is not applied to the sensor shaft. See the following figure.



### Cautions when installing the engine accelerator sensor

- Do not attempt to disassemble the sensor.
- Do not drop or otherwise shock the sensor, as this will lead to malfunction.
- Prevent water intrusion or direct splash.
- The sensor operating range is  $-30^{\circ}\text{C}$  to  $80^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$  to  $176^{\circ}\text{F}$ ) and should only be used in that range.
- Avoid mounting the sensor in an area that may receive casual impacts.
- The sensor must be located in an area free of oil, dust, humidity, chemicals and vibration.
- If a well protected location is not available, then a cover must be installed.
- Install the wiring harness so that it is secure and not able to twist or bend.
- Refer to the Chapter 7 for instructions regarding installation of the harness.
- If the sub-harness is not long enough, extending the harness must be completed using the same type of wire.

## 7. SIGNAL FOR ALLISON TRANSMISSION

A connector for P.T.O. control is provided.

Should connect the connector for P.T.O. information to transmission control ECU when installing P.T.O. to Allison transmission.

For control system data and other technical data related P.T.O. installation, contact to ALLISON Transmission Division (ATD) distributors or dealers.

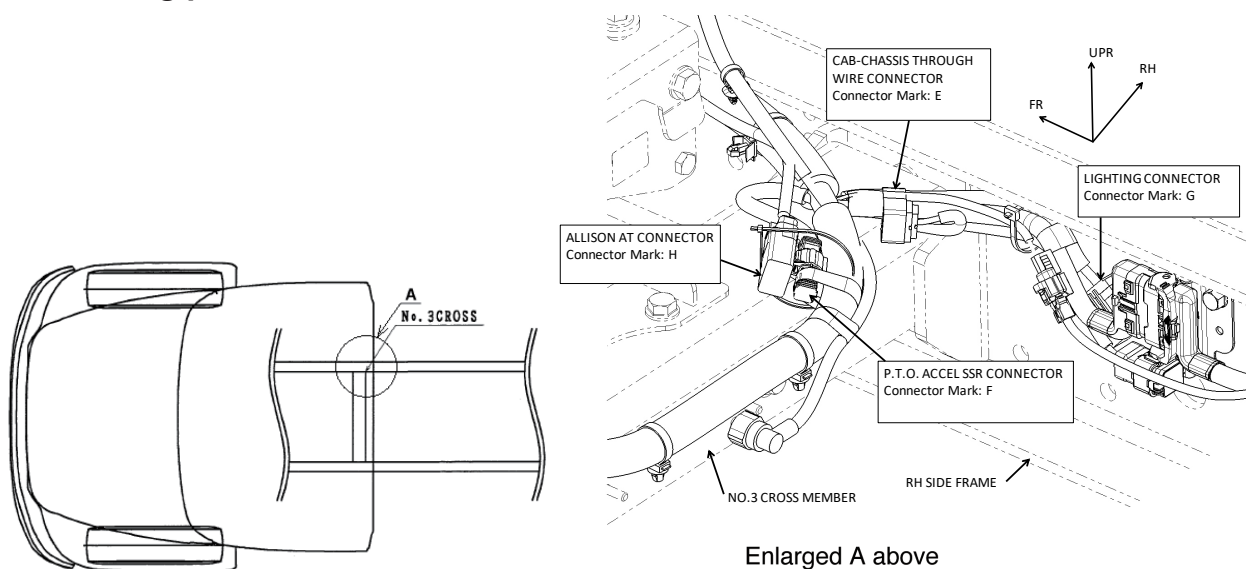
### Detail of Allison Transmission connector as shown in the table

| Connector Mark | Pole Code | Circuit                            | Max Capacity [A] | Wire Size & Color | Connector Part No.                                 | Coupling Connector Part No.                        | Description  |           |
|----------------|-----------|------------------------------------|------------------|-------------------|--|--|--|-----------|
|                |           |                                    |                  |                   |  |  | Circuit name   | Wire code |
| H              | SK9       | P.T.O. DRIVE INPUT                 | —                | 0.85 L-B          | Delphi PART No.54241631 (HINO PART No.S8281-E0M20) | Delphi PART No.54241601 (HINO PART No.S8281-E0M30) | P.T.O. DRIVE INTERFACE 1                             | 143       |
|                | SK8       | RANGE INDICATOR                    | —                | 0.85 B-R          |  |  | AUTOMATIC NEUTRAL - SINGLE INPUT FOR P.T.O. (OUTPUT) | 145       |
|                | SK7       | OUTPUT SPEED INDICATOR             | —                | 0.85 B-G          |  |  | OUTPUT SPEED INDICATOR A                             | 105       |
|                | SK6       | SIGNAL RETURN                      | —                | 0.85 B-Y          |  |  |  | 103       |
|                | SK5       | SECONDARY MODE INDICATOR           | —                | 0.85 G-R          |  |  | SECONDARY MODE INDICATOR                             | 113       |
|                | SJ9       | P.T.O. DRIVE INTERFACE 1 INDICATOR | —                | 0.85 P-           |  |  |  | 150       |
|                | SL4       | DIRECTION CHANGE ENABLE INPUT      | —                | 0.85 R-G          |  |  | DIRECTION CHANGE EABLE INPUT                         | 122       |
|                | SL3       | NEUTRAL AT STOP                    | —                | 0.85 R-L          |  |  | NEUTRAL AT STOP INPUT - STANDARD OR PREMIUM          | 123       |
|                |           |                                    |                  |                   |  |  | ①INTEGRATED WITH BRAKE SYSTEM COMPONENTS             |           |
|                |           |                                    |                  |                   |  |  | ②INTEGRATED WITH PROGRAMMABLE LOGIC CONTROLLER(PLC)  |           |
|                | SL2       | SUMP TEMPERATURE                   | —                | 0.85 V-           |  |  | SUMP/RETARDER TEMPERATURE INDICATOR                  | 164       |
|                | SL1       | AUTO MATIC NEUTRAL                 | —                | 0.85 BR-          |  |  | AUTOMATIC NEUTRAL - SINGLE INPUT FOR P.T.O. (INPUT)  | 117       |
|                | SL0       | RANGE INHIBIT INPUT                | —                | 0.85 L-R          |  |  | AUXILIARY FUNCTION RANGE INHIBIT - SINGLE INPUT      | 101       |
|                | SL6       | HOLD INPUT                         | —                | 0.85 L-           |  |  | AUXILIARY HOLD INPUT                                 | 142       |
|                | SKZ       | P.T.O. DRIVE OUTPUT                | —                | 0.85 B-R          |  |  | P.T.O. DRIVE INTERFACE 1                             | 130       |

## Detail of connector

| MARK | CONNECTOR  |  |
|------|--|--|
|      | VEHICLE SIDE   | COMPANION SIDE   |
| H    |  |  |
|      | Delphi PART No. 54241631<br>(HINO PART No.S8281 - E0M20) | Delphi PART No. 54241601<br>(HINO PART No.S8281 - E0M30) |

## Installing position of connector



DETAIL OF WIRING DIAGRAM

Allison transmission 3000 series

