Activation of a split shaft power take-off

Function

The function is intended to activate the power take-off from the driver area and from outside the cab. The power take-off is controlled by the BCI control unit. For the control of the power take-off to work correctly, the power take-off must always be connected via Scania’s bodywork interface. Adjustment of parameters is done using SDP3 (Scania Diagnos & Programmer 3).

The split shaft power take-off is mainly used when very large power outputs are required. The advantage is that the half shafts are disengaged and all power can be used to drive the power take-off. The power take-off is located between the gearbox and the rear axle.

More information on how power take-offs can be combined is found in the document Power take-off combinations under Power take-offs and hydraulics.
Activation

There are different conditions to activate the power take-off. Depending on the power take-off type there may be permanent activation conditions and selectable activation conditions. The selectable activation conditions' parameters can be set as required for the particular installation. The activation conditions are there to protect the bodywork equipment.

If all activation conditions are fulfilled, the function can be activated via BIC (Bodywork Interface Configuration) and External CAN.

The switch must be of the 2-position switch type.

**Permanent activation conditions**
- The vehicle is stationary

**Selectable activation conditions**
- Applied parking brake conditions

If the vehicle is equipped with BCI functionality, then the following activation conditions can also be used.
- Neutral position conditions
- Reverse gear conditions
- Upper engine speed limit for activation
- Lower engine speed limit for activation
**Activation settings**

There are 3 different activation settings.¹

- **Manual**
- **Automatic**
- **Drive position**

**Manual**

For activation using the Manual setting, the activation conditions must be fulfilled before the power take-off can be activated with the switch. If the switch is on when the activation conditions are fulfilled, the switch must be switched off and on again to activate the power take-off.

**Automatic**

For activation using the Automatic setting, activation can take place using the switch before other activation conditions are fulfilled. The voltage must be on before the switch is switched on, otherwise the switch must be switched off and then be reactivated. The power take-off is activated when all activation conditions are fulfilled.

**Drive position**

When activating with the Drive position setting, the same preconditions apply as for Automatic activation, although the voltage does not need to be switched on before the power switch.

---

¹ BCI functionality is required to change the settings. Activation with the Manual setting is standard from the factory.
Deactivation

The request for deactivation is made by interrupting the activating input signal from the switch, or via an External CAN request. The power take-off is automatically dis-engaged as soon as one of the deactivation conditions is fulfilled.

Selectable deactivation conditions

- Parking brake conditions
- Neutral position conditions
- Reverse gear conditions
- Upper engine speed limit for deactivation
- Lower engine speed limit for deactivation
- Upper vehicle speed limit for deactivation
- Lower vehicle speed limit for deactivation

Operation with the vehicle in motion and stationary

Normally the function is used for stationary operation as the power transmission to the half shafts is disengaged.

Operation with the vehicle in motion is possible, on vehicles intended for street cleaning, for example. In this case a power source other than the ordinary engine must be engaged to the vehicle half shafts, a hydraulic drive for example.
Direct gear

It is very important that the direct gear be used in the main gearbox to minimise the heat generated in the gearbox during power take-off operation. Direct gear means that the gear is selected so that the gearbox has a gear ratio of 1:1.

- For a gearbox with overdrive (GRSO) the next highest gear should be used.
- For a gearbox without overdrive (GR, GRS) the highest gear should be used.
- On Allison gearboxes 4th is the direct gear.

When the power take-off is engaged in accordance with the instructions in this document, the Opticruise or Allison control unit will engage the direct gear automatically if the following conditions have been fulfilled:

- The BCI control unit has received an acknowledgement signal indicating that the split shaft power take-off has been activated.
- The gear lever has been moved to position D and the automatic position (Opticruise) or Drive position (Allison).
- The clutch has been depressed (when there is a clutch pedal).

If the gear lever has been moved to the D position before the BCI control unit has received an acknowledgement signal, the normal starting gear will be engaged. If another gear than the direct gear is required, this can be adjusted with a parameter in SDP3.

This activation means that the driver does not need to change up to the direct gear each time the power take-off is activated.
Activation of a split shaft power take-off

Engine speed control

If the split shaft power take-off has been installed according to the instructions in this document, not all normal safety conditions apply to the powertrain. This is necessary to control the engine speed for this application.

Scania recommends the Control of engine speed function for engine speed control together with split shaft power take-offs.

If another engine speed control option is used (for example Hand throttle), the following may occur:

- The engine control unit switches to controlling vehicle speed rather than controlling engine speed if the anticipated vehicle speed is higher than 20 km/h. This takes place if the road speed sensor is not moved. See next section.
- Touching the clutch and brake pedals deactivates engine speed control.

1. Normal safety conditions lower the engine speed to idle to prevent the engine and brakes from counteracting each other. For more information on safety functionality, see section Safety functionality in the "Control of engine speed" document.
Moving the road speed sensor

The road speed sensor must be located on the propeller shaft after the split shaft power take-off for the following reasons:

- The road speed sensor will indicate the correct speed during power take-off operation as well.
- The tachograph will register the correct vehicle use.
- Temporary fault codes in the brake and gearbox control units will be avoided. These fault codes do not impede operation, but do make it more difficult to identify real faults.
- Opticruise allows the driver to change gear as long as no propeller shaft speed is being registered.

Road speed sensor

Scania recommends that the same number of teeth as on the original pulse wheel are used when the road speed sensor is moved to the output propeller shaft.

If the number of teeth (pulses per revolution) is changed, the SOPS file must be updated using SDP3 (Scania Diagnos & Programmer 3). The following variants are available:

<table>
<thead>
<tr>
<th>Option</th>
<th>Pulses per revolution</th>
<th>Variant code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotational speed constant for road speed sensors</td>
<td>10</td>
<td>1541A</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1541D</td>
</tr>
</tbody>
</table>

The 1541B variant code for transfer gearbox is not shown in the table as Scania does not recommend the combination of transfer gearbox and split shaft power take-off.
Fully automated Opticruise

On vehicles with fully automated Opticruise, the accelerator pedal controls the clutch. The following applies to the clutch control:

- The clutch closes when the accelerator pedal is depressed.
- Closing of the clutch is controlled by how much the accelerator pedal is depressed. The more the accelerator pedal is depressed, the quicker it closes.
- The clutch opens if the accelerator pedal is released before the clutch is fully closed.
- Put the drive mode selector in position N (neutral) to disengage the driving of the power take-off.

Note:
The parameter value Braking in operation with split shaft power take-off controls whether the clutch should open when the brake pedal is applied or whether it should remain closed. The default value is for the clutch to open.
Protection logic for disengagement

When the power take-off is disengaged and the driving axles are re-engaged, the torque and rotational speed of the propeller shaft from the main gearbox must be reduced to levels which are sufficiently low for engagement and disengagement. Normally the user does this by engaging neutral in the main gearbox before switching off the power take-off switch.

Note:

Scania recommend that a protection circuit is connected to protect the vehicle against operator faults which may cause mechanical damage. The function of the protection circuit is to keep the power take-off engaged until the output rotational speed is sufficiently low.
Miscellaneous

Information that the power take-off is activated is sent to other control units and is also displayed in the instrument cluster.

Acknowledgement

The driver receives an acknowledgement that one of the power take-offs is activated when the indicator lamp in the instrument cluster comes on. The indicator lamp is not unique and is used by all power take-offs in the vehicle. The driver can therefore not determine which power take-off is active.

If the vehicle has BCI functionality, it is possible to use status and warning lamps 2, 8, 9 and 10 to indicate to the driver which of the power take-offs is activated. The indicator lamp is set with parameters in SDP3.

Each power take-off has a unique acknowledgement signal which is sent to other systems in the vehicle when they need to know which power take-off is activated.

Cylinder balancing

The cylinder balancing function governs the quantity of fuel injected into each cylinder to reduce engine vibrations at low engine speeds. In certain cases, the load in combination with cylinder balancing can cause engine vibration to intensify. In these cases, the function can be deactivated with the Cylinder balancing parameter in SDP3.

Retrofitting control units

If a power take-off is retrofitted, the BCI control unit must be installed and the SOPS file (Scania On-board Product Specification) be updated. If the vehicle does not have a BCI control unit, it can be retrofitted. Contact a Scania workshop for assistance with retrofitting a BCI control unit.
## Chassis conditions

### Vehicle production period

<table>
<thead>
<tr>
<th>Production site</th>
<th>Chassis serial number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-11-17 -</td>
<td></td>
</tr>
<tr>
<td>Södertälje</td>
<td>2105883 -</td>
</tr>
<tr>
<td>Zwolle</td>
<td>5371386 -</td>
</tr>
<tr>
<td>Angers</td>
<td>9192404 -</td>
</tr>
<tr>
<td>2015-02-02 -</td>
<td></td>
</tr>
<tr>
<td>São Bernardo do Campo</td>
<td>3872427 -</td>
</tr>
</tbody>
</table>

### Preparations from the factory

<table>
<thead>
<tr>
<th>Option</th>
<th>Alternative</th>
<th>Variant code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical preparation for split shaft power take-off</td>
<td>With</td>
<td>3545A</td>
</tr>
</tbody>
</table>

### If required

<table>
<thead>
<tr>
<th>If required</th>
<th>Alternative</th>
<th>Variant code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCI functionality</td>
<td>With</td>
<td>5837A</td>
</tr>
<tr>
<td>Bodywork cable harness from cab to frame</td>
<td>7+7+7-pin</td>
<td>2411F</td>
</tr>
<tr>
<td>Bodywork cable harness in frame</td>
<td>2 m</td>
<td>3023A</td>
</tr>
<tr>
<td></td>
<td>8 m</td>
<td>3023D</td>
</tr>
<tr>
<td></td>
<td>12 m</td>
<td>3023C</td>
</tr>
</tbody>
</table>
## Parameters that can be adjusted using SDP3

If there is no access to SDP3, contact a Scania dealer.

The parameters are adjusted under functions in SDP3.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Possible value</th>
<th>Basic setting</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions for parking brake</td>
<td>Without Activate Activate/Deactivate</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td>Cylinder balancing</td>
<td>Active Inactive Inactive when power take-off is in use Inactive when power take-off is in use or the vehicle is moving</td>
<td>Inactive when power take-off is in use or the vehicle is moving</td>
<td></td>
</tr>
<tr>
<td>Engine speed limitation for split shaft power take-off</td>
<td>500-3,000 rpm</td>
<td>3,000 rpm</td>
<td>Power-train</td>
</tr>
<tr>
<td>Power take-off adaptation</td>
<td>Active Inactive</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>Braking in operation with split shaft power take-off</td>
<td>Open clutch Keep the clutch closed</td>
<td>Open clutch</td>
<td></td>
</tr>
<tr>
<td>Power take-off, preselected gear</td>
<td>Not activated For all gearboxes except GR: 1-12 GR 1-8</td>
<td>Not activated</td>
<td></td>
</tr>
</tbody>
</table>
Activation of a split shaft power take-off

The following parameters can be adjusted if the vehicle is equipped with BCI functionality:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Possible value</th>
<th>Basic setting</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator lamp</td>
<td>Without</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indicator lamp 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indicator lamp 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indicator lamp 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indicator lamp 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of activation</td>
<td>Manual</td>
<td>Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drive position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions for neutral position</td>
<td>Without</td>
<td>Without</td>
<td>Power-train</td>
</tr>
<tr>
<td></td>
<td>Activate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activate/Deactivate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions for reverse gear</td>
<td>With</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper engine speed limit</td>
<td>500-5,000 rpm</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td>for permitted activation</td>
<td>Without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower engine speed limit</td>
<td>500-5,000 rpm</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td>for permitted activation</td>
<td>Without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper engine speed limit</td>
<td>500-5,000 rpm</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td>for deactivation</td>
<td>Without</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Activation of a split shaft power take-off

Parameters that can be adjusted using SDP3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Possible value</th>
<th>Basic setting</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower engine speed limit for deactivation</td>
<td>500-5,000 rpm</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper vehicle speed limit for deactivation</td>
<td>1-150 km/h</td>
<td>Without</td>
<td>Power-train</td>
</tr>
<tr>
<td></td>
<td>Without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower vehicle speed limit for deactivation</td>
<td>1-150 km/h</td>
<td>Without</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Without</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activation of a split shaft power take-off

Connecting and activating a function

Examples of activation of the function

The installation of the split shaft power take-off is carried out by the bodybuilder.

Split shaft power take-offs must always have an acknowledgement sensor on the bodywork. The sensor is then connected to the acknowledgement signal in the BCI control unit and controls the indication in the instrument cluster.

To install a split shaft power take-off, the road speed sensor must be moved, see Moving the road speed sensor section.

<table>
<thead>
<tr>
<th>Type of activation</th>
<th>Activation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIC (Bodywork Interface Configuration)</td>
<td>Via pin in C259 or another signal in BIC.</td>
</tr>
<tr>
<td>External CAN</td>
<td>Bodywork PTO Control: PTO SplitShaft Request</td>
</tr>
</tbody>
</table>
Activation of a split shaft power take-off

Electrical preparations from the factory

To facilitate the installation of power take-offs there are electrical preparations for power take-offs, refer to preparations from the factory under chassis conditions.

The power take-off control is included in the electrical preparations in the BCI control unit and the cable harness from the cab to the frame. The cable harness is fitted at the factory and allows the bodywork to connect directly to a connector on the frame.

Part information and connection positions

<table>
<thead>
<tr>
<th></th>
<th>Switch</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Closing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fitted by the bodybuilder</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Confirmation sensor</td>
<td>Fitted by the bodybuilder</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Solenoid valve</td>
<td>Fitted by the bodybuilder</td>
<td></td>
</tr>
</tbody>
</table>

Connectors V151/V152 and B106 are located on the inside of the left frame member.

Information on how the power take-off is connected to C259 is found in the document Combinations of power take-offs under Power take-offs and hydraulics.

Connection list split shaft power take-off electrical preparation

<table>
<thead>
<tr>
<th>Signal</th>
<th>Connector</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgement signal to control unit</td>
<td>B106</td>
<td>2</td>
</tr>
<tr>
<td>Ground for acknowledgement sensor</td>
<td>B106</td>
<td>1</td>
</tr>
<tr>
<td>Signal to solenoid valve</td>
<td>V151/V152</td>
<td>1</td>
</tr>
<tr>
<td>Ground for solenoid valve</td>
<td>V151/V152</td>
<td>2</td>
</tr>
</tbody>
</table>
Example of connection for manual gearbox with or without Opticruise

This description shows a connection inside the cab. Information on how to make the connection with an extension harness on the chassis is found under the heading Electrical preparation from the factory and in the document Cable harness cab and frame (22:10-080).

Connection using BICT, +24 V and ground

Proceed as follows:

- Connect the electrical cable from the switch to any input pin in connector C259.
- Connect the electrical cable from the acknowledgement sensor to any input pin in connector C259.
- Connect the solenoid valve to any output pin in connector C259.
- By using BICT (Bodywork Interface Configuration Tool) the acknowledgement signal is allocated to the selected pin.

1. Switch for power take-off to input on C259 with +24 V or Ground
2. Connector C259 in the bodywork interface
3. BCI control unit
4. Solenoid valve for power take-off to output on C259
5. Acknowledgement sensor, input on C259
### Activation of a split shaft power take-off

**Connecting and activating a function**

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Activation method</th>
</tr>
</thead>
</table>
| Pin (BWE)   | +24 V to selected pin on C259  
  or  
  Grounding of selected pin on C259 |

**BCI**

1. The pin selected to activate the power take-off
2. Function object for split shaft power take-off
3. Pin for connection of solenoid valve
4. Pin for connection of acknowledgement sensor
Activation of a split shaft power take-off

Connection via External CAN

This description shows a connection inside the cab. Information on how to make the connection with an extension harness on the chassis is found under the heading Electrical preparation from the factory and in the document Cable harness cab and frame (22:10-080).

To be able to make a connection via External CAN, the following is required:

- The vehicle is equipped with BCI functionality variant code 5837A
- The parameter for External CAN is activated

The connection is made directly to connector C493 (External CAN-low to pin 3 and External CAN-high to pin 4).

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN</td>
<td>Bodywork PTO Control: PTO SplitShaft Request</td>
</tr>
</tbody>
</table>

Proceed as follows:

- Connect the electrical cable from the acknowledgement sensor to any output pin in connector C259.
- Connect the solenoid valve to any output pin in connector C259.
- Using BICT (Bodywork Interface Configuration Tool), the acknowledgement signal is allocated to the selected pin.

More information on CAN is found in the CAN documents under Electrical systems.

1. CAN interface, External CAN
2. Connector C493 for External CAN connection
3. BCI control unit
4. Connector C259 in the bodywork interface
5. Solenoid valve for power take-off to output on C259
6. Acknowledgement sensor, input on C259
Activation of a split shaft power take-off

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Acknowledgement signal, activation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin (BWE)</td>
<td>+24 V to selected pin on C259</td>
</tr>
<tr>
<td></td>
<td>or Grounding of selected pin on C259</td>
</tr>
</tbody>
</table>

**BCI**

1. Pin for connection of acknowledgement sensor
2. Function object for split shaft power take-off
3. Pin for connection of solenoid valve
Example of connection for automatic gearbox

This description shows a connection inside the cab. Information on how to make the connection with an extension harness on the chassis is found under the heading Electrical preparation from the factory and in the document Cable harness cab and frame (22:10-080).

Connection using BICT, +24 V and ground

Proceed as follows:

- Connect the electrical cable from the switch to any input pin in connector C259.
- Connect the electrical cable from the acknowledgement sensor to any input pin in connector C259.
- Connect the solenoid valve to any output pin in connector C259.
- Install a relay to inform the gearbox’s control unit that the power take-off is engaged.
- By using BICT (Bodywork Interface Configuration Tool) the function is allocated to the selected pin.

1. Switch for power take-off to input on C259 with +24 V or Ground
2. Connector C259 in the bodywork interface
3. BCI control unit
4. Solenoid valve for power take-off to output on C259
5. Acknowledgement sensor, input on C259
6. Connector C449 in the bodywork interface
7. Relay
Activation of a split shaft power take-off

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Acknowledgement signal, activation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin (BWE)</td>
<td>+24 V to selected pin on C259 or Grounding of selected pin on C259</td>
</tr>
</tbody>
</table>

**BCI**

1. The pin selected to activate the power take-off
2. Function object for split shaft power take-off
3. Pin for connection of solenoid valve
4. Pin for connection of acknowledgement sensor
5. Information signal Split shaft power take-off engaged
6. Pin for connection of relay
Activation of a split shaft power take-off

Example of connection via External CAN

This description shows a connection inside the cab. Information on how to make the connection with an extension harness on the chassis is found under the heading Electrical preparation from the factory and in the document Cable harness cab and frame (22:10-080).

To be able to make a connection via External CAN, the following is required:

- The vehicle is equipped with BCI functionality variant code 5837A
- The parameter for External CAN is activated

The connection is made directly to connector C493 (External CAN-low to pin 3 and External CAN-high to pin 4).

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN</td>
<td>Bodywork PTO Control: PTO SplitShaft Request</td>
</tr>
</tbody>
</table>

Proceed as follows:

- Connect the electrical cable from the acknowledgement sensor to any input pin in connector C259.
- Connect the solenoid valve to any output pin in connector C259.
- Install a relay to inform the gearbox's control unit that the power take-off is engaged.
- Using BICT (Bodywork Interface Configuration Tool), the acknowledgement signal is allocated to the selected pin.

More information on CAN is found in the CAN documents under Electrical systems.

1. CAN interface, External CAN
2. Connector C493 for External CAN connection
3. BCI control unit
4. Connector C259 in the bodywork interface
5. Solenoid valve for power take-off to output on C259
6. Acknowledgement sensor, input on C259
7. Connector C449 in the bodywork interface
8. Relay
## Activation of a split shaft power take-off

**Signal type** | **Acknowledgement signal, activation method**  
--- | ---  
Pin (BWE) | +24 V to selected pin on C259  
| or | Grounding of selected pin on C259 

### C259 pin (1–10)

1. Pin for connection of acknowledgement sensor  
2. Function object for split shaft power take-off  
3. Pin for connection of solenoid valve  
4. Information signal Split shaft power take-off engaged  
5. Pin for connection of relay
Reprogramming the Allison gearbox

The Allison gearbox control unit must be reprogrammed to a Vocation package designed for the purpose, which includes a Pump Mode Program. Reprogramming is carried out by an Allison dealer or workshop. This example is based on Allison Vocation Package 124, Fire and Emergency Vehicles. The advantage of this example is that all the necessary electrical cables and pins are accessible through connector C449. Other options require pins to be switched.

Always compare with Allison’s connection instructions for the relevant Vocation Package.

Note:
SDP3 will only recognise a Vocation Package which has been programmed by Scania. The reason is that the part number is not valid. Fault codes can be read but not their explanatory text.

Protective logic for disengagement

Protective logic can be connected to protect the gearbox. Protective logic prevents disengagement being carried out before the gearbox rotational speed is sufficiently low.

Contact a Scania dealer for more information.

Example: Concrete pump truck