# Optidrive Applications Support Library

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| **Application Note** | **AN-ODV-3-009** |
| **Title** | **Programming the Drive Output Relays** |
| **Related Products** | **Optidrive Eco** |
| **Level** **1** | 1 – Fundamental - No previous experience necessary<br>2 – Basic – Some Basic drives knowledge recommended<br>3 – Advanced – Some Basic drives knowledge required<br>4 – Expert – Good experience in topic of subject matter recommended |

## Overview

The Optidrive Eco has two internal relays which can be programmed to open or close depending upon certain operating conditions within the drive. Other devices and controllers can then be integrated with the drive so that an action can be performed based upon the operating status of the drive.

This application note shows the parameter settings for the two relays and drive terminal connections.

## Parameters

### P2-15 User Relay 1 Output Function Select

The condition under which output relay 1 closes is programmed using this parameter.

When the relay is activated the normally open contact (T15) closes to the common contact (T14) and the normally closed contact (T16) opens from the common contact (T14).

The following options can be selected:

| P2-15 | Function | Explanation |
|---|---|---|
| 0 | Drive Enabled | The relay contacts close when the drive enable signal is present and the drive has gone to an enabled state (i.e. no trip or fault present, drive provides energy to the motor). |
| 1 | Drive Healthy | The relay contacts close when the drive is powered up and no fault exists. If the power is removed, or the drive trips, the relay contacts will open. |
| 2 | At Target Frequency | The relay contacts close when the drive output frequency matches the requested set-point frequency, within the tolerance band defined by P6-04, to allow some hysteresis and prevent relay chatter. |
| 3 | Output Frequency > 0.0 Hz | The relay contacts close when the drive output frequency exceeds 0.0Hz within the tolerance band defined by P6-04, to allow some hysteresis and prevent relay chatter. I.e. when the output is not at zero speed or disabled. |
| 4 | Output Frequency ≥ limit | The relay contacts close when the output frequency of the drive is greater than the limit programmed in P2-16 and reopen when the output frequency falls below the level programmed in P2-17. |
| 5 | Motor Current ≥ limit | The relay contacts close when the output current of the drive is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 6 | Motor Torque ≥ limit | The relay contacts close when the output torque of the drive is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 7 | Analog Input 2 ≥ limit | The relay contacts close when the value of analog input 2 is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 8 | Reserved | No Function |
| 9 | Fire Mode Active | The relay contacts close when the drive is operating in fire mode. |
| 10 | Maintenance Time Interval Expired | The relay contacts close when the drive maintenance interval time has expired in order to indicate that maintenance is due. |
| 11 | Drive Available | The relay contacts close when the drive is in Auto-mode, no trips are present, and the safety circuit is enabled indicating that drive is ready for automatic control |
| 12 | Drive Tripped | The relay contacts close when the drive is in a tripped state, and will open when the trip is reset |
| 13 | Hardware Inhibit | The relay contacts close when the drive is not in the inhibit state. If the STO circuit opens, and the drive displays “inhibit”, the contacts will open |
| 14 | PID Error ≥ Limit | The relay contacts will close when the error in the PI controller is greater than the limit programmed in P2-16 and reopen when the output frequency falls below the level programmed in P2-17. |

## P2-18 User Relay 2 Output Function Select

The condition under which output relay 2 closes is programmed using this parameter.

When the relay is activated the normally open contact (T18) closes to the common contact (T17).

The following options can be selected:

| P2-18 | Function | Explanation |
|---|---|---|
| 0 | Drive Enabled | The relay contacts close when the drive enable signal is present and the drive has gone to an enabled state (i.e. no trip or fault present). |
| 1 | Drive Healthy | The relay contacts close when the drive is powered up and no fault exists. If the power is removed, or the drive trips, the relay contacts will open. |
| 2 | At Target Frequency | The relay contacts close when the drive output frequency matches the requested set-point frequency. |
| 3 | Output Frequency > 0 | The relay contacts close when the drive output frequency exceeds 0.0Hz. I.e. when the output is not at zero speed or disabled. |
| 4 | Output Frequency ≥ limit | The relay contacts close when the output frequency of the drive is greater than the limit programmed in P2-16 and reopens when the output frequency falls below the level programmed in P2-17. |
| 5 | Motor Current ≥ limit | The relay contacts close when the output current of the drive is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 6 | Motor Torque ≥ limit | The relay contacts close when the output torque of the drive is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 7 | Analog Input 2 ≥ limit | The relay contacts close when the value of analog input 2 is greater than the limit programmed in P2-16 and reopen when the output current falls below the level programmed in P2-17. |
| 8 | Assist Pump 1 Control | Relay is used to select the first pump in a DOL Pump staging Cascade. |
| 9 | Fire Mode Active | The relay contacts close when the drive is operating in fire mode. |
| 10 | Maintenance Time Interval Expired | The relay contacts close when the drive maintenance interval time has expired in order to indicate that maintenance is due. |
| 11 | Drive Available | The relay contacts close when the drive is in Auto-mode, no trips are present, and the safety circuit is enabled indicating that drive is ready for automatic control |
| 12 | Drive Tripped | The relay contacts close when the drive is in a tripped state, and will open when the trip is reset |
| 13 | Hardware Inhibit | The relay contacts close when the drive is not in the inhibit state. If the STO circuit opens, and the drive displays “inhibit”, the contacts will open |
| 14 | PID Error ≥ Limit | The relay contacts will close when the error in the PI controller is greater than the limit programmed in P2-16 and reopen when the output frequency falls below the level programmed in P2-17. |

**P2-16 Adjustable Threshold 1 Upper Limit (For Relay 1)**
**P2-17 Adjustable Threshold 1 Lower Limit (For Relay 1)**
**P2-18 Adjustable Threshold 2 Upper Limit (For Relay 2)**
**P2-19 Adjustable Threshold 2 Lower Limit (For Relay 2)**

These parameters are used to define the closing and opening levels (limits) for relay 1 and relay 2 where the switching point is a variable or adjustable value. The parameters are active when P2-15 (User Relay 1 Output Function Select) or P2-18 (User Relay 2 Output Function Select) are set to a value between 4 and 7.

The adjustable threshold parameters are set as a percentage of the function selected in P2-15 / P2-18. The percentage values set relate to the following drive values:

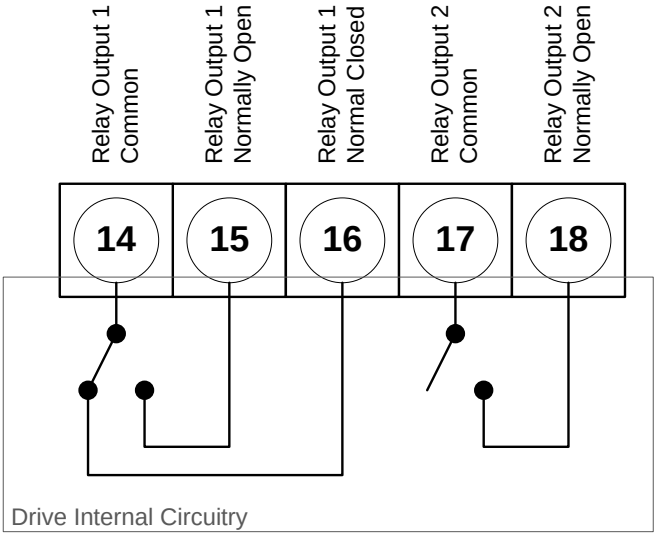
| P2-15<br>P2-18 | Function | P2-16 / P2-17 Settings<br>P2-19 / P2-20 Settings |
|---|---|---|
| 4 | Output Frequency ≥ limit | P2-16 and P2-17 are set as a percentage of P1-01 (Motor Maximum Speed). |
| 5 | Motor Current ≥ limit | P2-16 and P2-17 are set as a percentage of P1-08 (Motor Rated Current). |
| 6 | Motor Torque ≥ limit | P2-16 and P2-17 are set as a percentage of the motor rated torque |
| 7 | Analog Input 2 ≥ limit | P2-16 and P2-17 are set as a percentage of analog input 2 max value (viewed in P0-02). |

## Example:

If P2-15 is set to ‘4’ (Output Frequency ≥ limit) then P2-16 and P2-17 are set as a percentage of P1-01 (Motor Maximum Speed). Assuming P1-01 = 50Hz, P2-16 = 50.0%, P2-17 = 40%, then relay contacts will close when the output frequency is equal or above 25.0Hz, and reopens when the output frequency is less than 20.0 Hz.

## Terminals Configuration:

The relay terminals on Optidrive Eco are provided on a separate pluggable 5 way connector block. The terminal connections for the Optidrive Eco are illustrated below:




Note that when the drive is powered down, the contacts are always open.

## Relay Specifications

| Terminal | Short Name | Long Name | Contact Rating |
|---|---|---|---|
| 14 | RL1-C | Relay Output 1 Common | Relay contacts, 250V AC, 30V DC, 5A |
| 15 | RL1-NO | Relay Output 1 NO | Relay contacts, 250V AC, 30V DC, 5A |
| 16 | RL1-NC | Relay Output 1 NC | Relay contacts, 250V AC, 30V DC, 5A |
| 17 | RL2-A | Relay Output 2 Common | Relay contacts, 250V AC, 30V DC, 5A |
| 18 | RL2-B | Relay Output 2 NO | Relay contacts, 250V AC, 30V DC, 5A |

# Appendix

| Revision History | | | |
|---|---|---|---|
| Issue | Comments | Author | Date |
| 01 | Document Creation | KB | 01/04/15 |
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