Technical Note 045

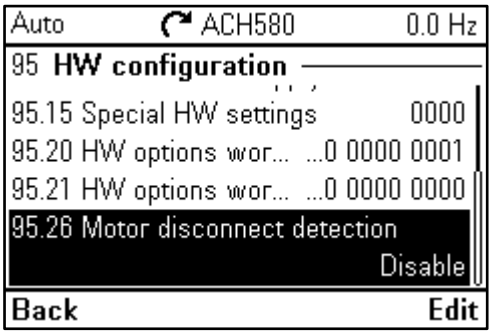
Motor disconnect detection

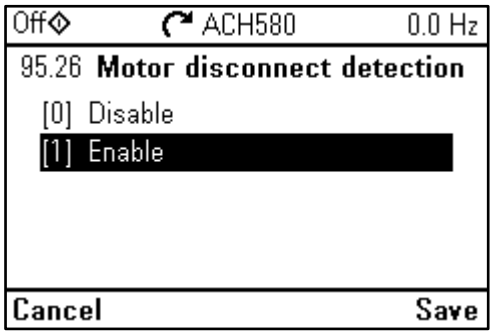
Monitor a disconnect without an auxiliary contact

Installation conditions may require a variable frequency drive to control a piece of equipment that is located some distance away from the drive. Some of those installations will place that piece of equipment out of the line of sight from the operator and drive. When the drive is not within the line of sight of the equipment, per NFPA 70 NEC, a separate motor disconnect is required located within sight of the driven equipment. When this application occurs today, it is recommended to have motor disconnect auxiliary contacts wired back to the drive, allowing the drive to monitor the disconnect' s open/closed status. The drive disables its output when the disconnect is open. Failure to follow this control scheme will likely result in the drive faulting on "overcurrent" once the disconnect is closed, which could lead to premature drive failure. When using these auxiliary contacts, additional control wiring and conduit is required, which then increases the cost of installation.

The ABB 580 series, along with the ACS380 and ACH180, has a motor disconnect detection feature that enables the drive to detect when an output disconnect is opened. The 580 series is made up of the ACH580, ACQ580 and ACS580. The use of this feature eliminates the need for a disconnect to have an auxiliary contact wired back to the drive.

The motor disconnect detection configuration is found in Group 95. An ACH580 is used as an example in the following images. Parameter 95.26 *Motor disconnect detection* is shown. There is only one step to configure this feature in the drive. Set parameter 95.26 to be **[1] Enable**.





The motor disconnect detection works by monitoring the current on all three phases to the motor. If the current on all three phases were to drop out at approximately the same time, the drive determines that a motor disconnect has been opened. Once that determination has been made, the drive displays a "A784 motor disconnect" warning. The warning message remains until the motor disconnect is closed. The drive will automatically sense the motor is again connected and will ramp the motor back up to the commanded speed. No manual reset of the drive is required.

This feature is different from the drive's motor phase loss detection. Motor phase loss detection works by monitoring the current for any one phase to drop out or fall below a threshold. When either of those events occur and parameter 31.19 *Motor phase loss* is configured to fault, the drive will register an output phase loss fault. Table 1 displays how the drive will react based on the configuration of parameters 31.19 and 95.26.

Table 1

Parameter 31.19	**Parameter 95.26**			
Motor Phase Loss	Motor Disconnect Detection	1-Phase Loss	3-Phase Loss	Expected Result
Fault	Disabled	FALSE	FALSE	Running
Fault	Disabled	---	TRUE	Output phase loss fault
Fault	Disabled	TRUE	FALSE	Output phase loss fault
Fault	Enabled	FALSE	FALSE	Running
Fault	Enabled	---	TRUE	Motor Disconnect Warning
Fault	Enabled	TRUE	FALSE	Output phase loss fault
No Action	Disabled	FALSE	FALSE	Running
No Action	Disabled	---	TRUE	No Action[1]
No Action	Disabled	TRUE	FALSE	No Action[1]
No Action	Enabled	FALSE	FALSE	Running
No Action	Enabled	---	TRUE	Motor Disconnect Warning
No Action	Enabled	TRUE	FALSE	No Action

[1] Vector mode operation may result in a fault, such as overspeed.

Monitor of motor disconnect detection status

In some applications, there is a desire for remote control systems, such as a building automation system, to monitor the status of motor disconnect detection. The ACH580's relay output can be programmed to indicate motor disconnect detection status. This is accomplished by having the relay output function point to an event word, and then trigger the relay output when the drive enters an "A784 motor disconnect" event. Reference Appendix A for step by step instructions to program relay output 1 to indicate this status.

Firmware versions

The motor disconnect detection feature is available in vector mode with firmware 2.20 or newer, and available in scalar mode in the following firmware versions:

- ACH580 v2.12 or newer
- ACQ580 v2.12 or newer
- ACS580 v2.14 or newer
- ACS380 v2.13 or newer
- ACH180 v2.20 or newer

Bypass

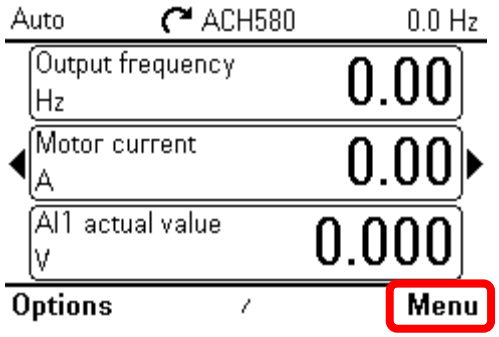
The ACH580 drives are available with a bypass option. The motor disconnect detection feature is not active in bypass mode. This feature is not a requirement for bypass mode, as the bypass contactors are sized for across-the-line starting. However, motor disconnect switches must also be sized to handle the inrush current of across-the-line starting once the disconnect switch is closed.

Summary

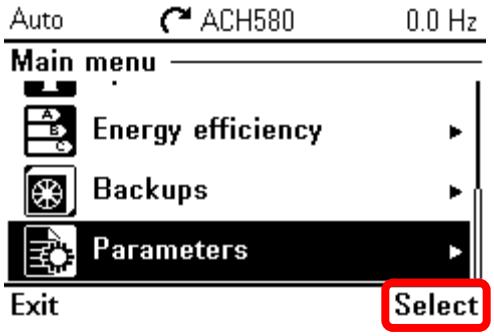
Parameter 95.26 *Motor disconnect detection* is a simple one-step setup feature that eliminates the need to add an auxiliary contact, wiring, and conduit to systems that utilize a motor disconnect detection. Designing systems around this feature reduces system hardware and labor cost while improving drive longevity.

Appendix A: Configuring RO1 to indicate motor disconnect detection

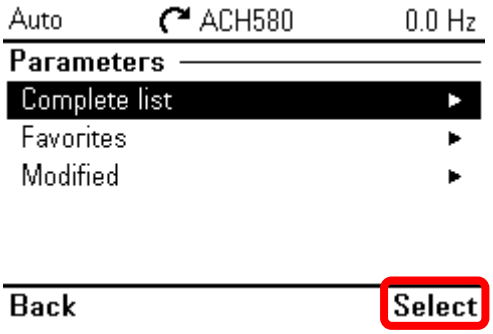
1) Starting at the home screen, press **Menu:**



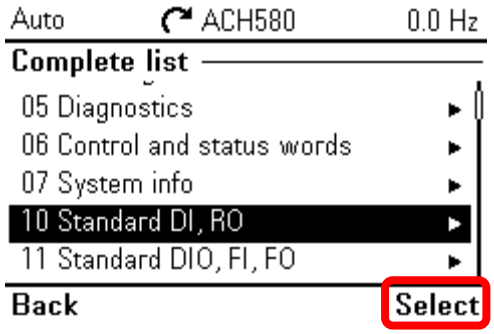
2) Navigate to **Parameters**, and press **Select:**



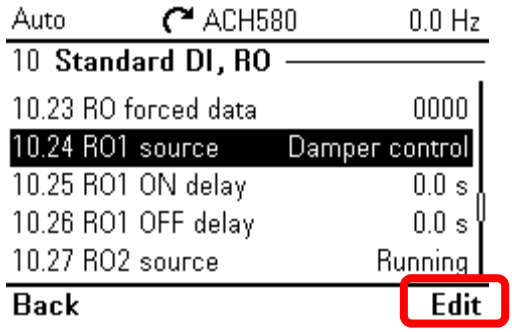
3) With **Complete list** highlighted, press **Select**:



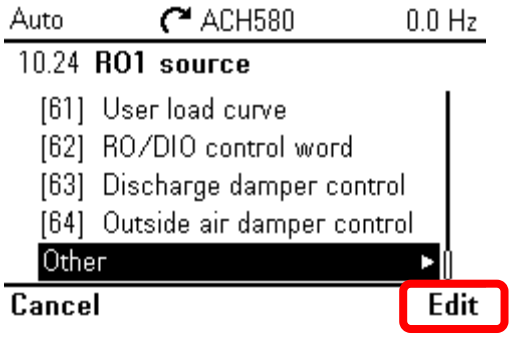
4) Navigate to Group 10 **Standard DI, RO**, press **Select**:



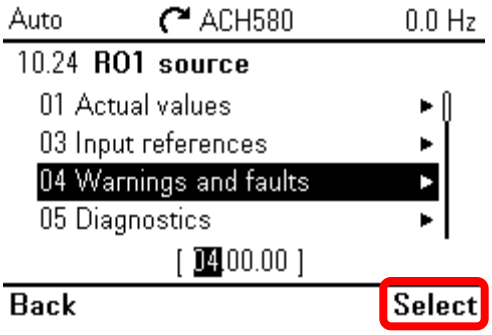
5) Scroll to parameter **10.24 RO1 Source**, press **Edit:**



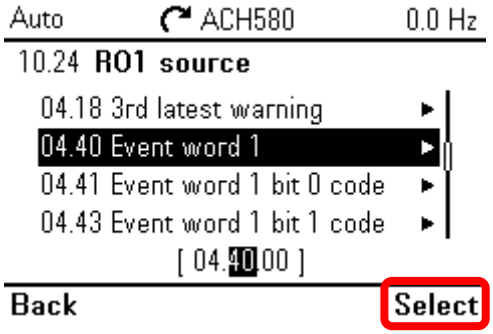
6) Go to **Other**, and press **Edit**:



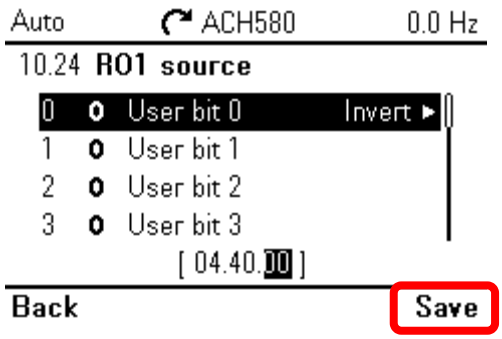
7) Go to Group 04 **Warnings and faults**, press **Select**:



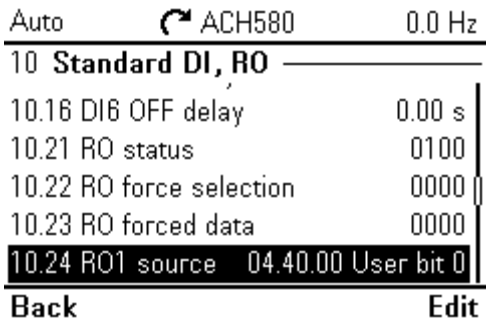
8) Navigate to 04.40 **Event word 1**, and press **Select**:



9) With **User bit 0** highlighted, press **Save**:



10) Parameter 10.24 **RO1 Source** should look like the below:



11) Event word 1 bit 0 now needs to be set to the warning code for motor disconnect open A784 Hex. The following three screen shots show how to do this.