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Technical Note 038

How to use the checksum feature
Quickly verify parameter settings

The 580 series drives have a powerful feature called checksum. This feature continuously monitors the settings of all the parameters in the drive. If a single parameter setting is adjusted, the checksum feature can be configured to alert the appropriate personnel of the change. The 580 series consists of the ACH580, ACQ580 and ACS580 variable frequency drives.

Traditional solutions

When troubleshooting problems related to a drive that has been working fine, a question that is often asked is "What changed?" Was a parameter setting in the drive changed, and when did it change? Most drives are installed in areas that are accessible to a variety of different people throughout the day. It is not uncommon to hear stories about unqualified people pushing buttons on a drive control panel.

The traditional solutions to prevent or track unauthorized parameter modifications are:

- Remove the drive's control panel to eliminate the manual access point. Unfortunately, now the control panel may not be readily available when needed, such as scenarios where a drive must be run manually due to an external control system failure.
- Lock the control panel with a passcode, so only qualified people can access the drive. Sometimes this is not a practical solution, due to the concern the passcode may be lost or forgotten over the years.
- Record the "known good" modified parameters list. This list includes all the parameters that are different from the factory default settings. This solution requires routine manual comparison of the drive's current modified parameter list to the previously recorded "known good" list.
- Monitor each parameter setting over a communication network. This solution requires significant programming in the main controller and it is bandwidth intensive, thus may not be practical on large installations.

While the above traditional solutions are possible and in use today, each has its own challenges. The checksum feature is a solution without any of those challenges.

Checksum

Checksum views each parameter's setting in the drive and generates a unique eight-digit hexadecimal number. The generated hexadecimal number will change whenever a parameter change occurs. If for example, parameter 28.72 "Freq acceleration time 1" changes by even one thousandth (0.001) of a second, the generated checksum value changes. Once a drive has been commissioned, this hexadecimal number can then be saved as an approved value. Afterwards, if any parameter in the drive changes, the actual checksum number changes, causing a discrepancy between the approved and actual checksum numbers. When this discrepancy occurs, this feature allows for several different options to notify the appropriate personnel a drive parameter has changed. The notification options include logging an event, creating a warning, or stopping and generating a fault. These notifications can then easily be monitored over a communication network. The following are images that demonstrate the notifications saved in the drive's diagnostics, along with a time and date stamp of when the event occurred.

Auto ⤴ 31.7 Hz
Other events ───────
ⓘ Checksum mis... 10:57:18 a.m.
⚠ Start interlock 1 10:56:39 a.m.
ⓘ Checksum mis... 10:56:25 a.m.
⚠ Start interlock 1 10:54:55 a.m.
⚠ Start interlock 1 10:54:55 a.m.
Back   10:57 a.m.   Details

Auto ⤴ 31.7 Hz
Event details ───────
Base Code: Checksum mismatch
(B686 hex)
Aux Code: 0000 0000 hex
Time Start: 03/20/2020 10:57:18 a.m.
Drive On Time: 1 03:22:00 p.m.
Back   10:57 a.m.   How to fix

Checksum is also a powerful feature that allows drives to be compared to each other. Many facilities have identical or redundant drive applications such a certain pumping or fan applications. In some cases, these similar drives have every parameter setting the same, except for the communication node address parameter, such as parameter 58.03. In other cases, the differences may also include motor data.

Although certain parameters will always have different settings, such as the node address, most drive parameters will be the same. To address this difference, two different checksum values are generated. Checksum "A" includes all user editable drive parameters excluding fieldbus communication settings, while checksum "B" also excludes parameter groups related to motor data and energy saving settings. Checksum A is used when comparing drives of the same size, while checksum B is used to compare drives of different sizes.

Checksum parameters

There are six parameters that involve the checksum feature:

- 96.54 Checksum action
    - Determines how the drive should react to a checksum mismatch. The drive may record the mismatch as an event, warning only, warning and prevent a start command, fault, or take no action.
- 96.55 Checksum control word
    - Selects if checksum A (bit 8) or checksum B (bit 9) is to be used.
    - Saves the value of the checksum A (bit 12) or checksum B (bit 13).
- 96.68 Actual checksum A
    - Read-only parameter that displays the actual (real-time) checksum value.
- 96.69 Actual checksum B
    - Read-only parameter that displays the actual (real-time) checksum value.
- 96.71 Approved checksum A
    - Read-only parameter that displays the saved approved checksum A. This is treated as a known good value. The drive continuously compares 96.68 to 96.71.
- 96.72 Approved checksum B
    - Read-only parameter that displays the saved approved checksum B. This is treated as a known good value. The drive continuously compares 96.69 to 96.72.

Steps to activate checksum

The following steps describe how to active the checksum feature. These steps should be done after all other commissioning has been completed. Steps 1 and 2 create a notification if a parameter changed. Step 3 is optional and is used when comparing multiple different sized drives to each other.

Step 1: Set parameter 96.54 to the preferred action when a mismatch occurs between 96.68 and 96.71. Any of parameter 96.54 settings [1-4] will log with a date and time stamp in the "Diagnostics-> Fault & event log," when a checksum discrepancy occurs. Note if parameter 96.54 = Fault [4] this will instantly stop the drive from running the motor.

Step 2: Set parameter 96.55 bit 8 to 1 to activate checksum A. Set parameter 96.55 bit 12 to 1 to copy the actual checksum A value (96.68) to the approved checksum A value (96.71). Note that parameter 96.55 bit 12 will not stay at a value of 1 and reverts to 0 after the copy takes place.

Step 3: This optional step with checksum B is used to compare setup of multiple drives of varying horsepower. Set parameter 96.55 bit 9 to 1 to activate checksum B. Set parameter 96.55 bit 13 to 1 to copy the actual checksum B value (96.69) to the approved checksum B value (96.72). Note that parameter 96.55 bit 13 will not

stay at a value of 1 and reverts to 0 after the copy takes place.

If parameter(s) must be changed on the drive for proper operation after the initial activation of checksum, then parameter 96.55 bit 12 or bit 13 need to be set to 1 to set parameters 96.71 or 96.72 to the new approved checksum number.

In addition to setting up an action in parameter 95.54, it is also possible to use the read only parameter 96.68 to read the actual checksum over a communication link. A control system can record the actual checksum value after the final drive commissioning. Then the control system can continuously read the actual checksum value, and compare it to the previously stored value. This will verify if the drive has had a parameter change or not.

The checksum feature in the 580 series drives is a powerful tool to help manage parameter settings in drives spread throughout a facility or buildings. It provides notification and information of when a parameter is changed, so proper corrective action can be taken for any unauthorized parameter changes.