Renishaw plc
New Mills, Wotton-under-Edge
Gloucestershire, GL12 8JR
United Kingdom

T: +44 (0)1453 524524
F: +44 (0)1453 524901
E: UK@renishaw.com
www.renishaw.com

RENISHAW
apply innovation™

Encoder Products Division
TECHNICAL NOTE – TN 048/01

Product: **RESOLUTE Readhead. (DRIVE-CLiQ Protocol)**

Title: **RESOLUTE DRIVE-CLiQ - Timing and Topology Issues**

Originator: Ian Paradine

Reviewer: Will Paul

Distribution: Internal
Subsidiaries
Customers

Date: 15-Mar-2017

Summary:

This document explains two solutions to overcome a sample rate / topology issue with RESOLUTE DRIVE-CLiQ and Siemens DRIVE-CLiQ controllers.

Background

Siemens motion systems, that include the SINAMICS and SINUMERIK controllers, utilise the DRIVE-CLiQ interface to not only communicate between drives and encoders, but all peripheral equipment.

All periphery equipment that can be connected to a controller are known as drive objects. The DRIVE-CLiQ system operates as a communications bus, where all components on each communications line must respond in turn within the defined sample period.

Customers can connect several drive objects to each controller line and can select from several available sample rates for requesting data from each line.

Example sample rates are:

Name	Sample Rate
Standard	125 µs
High	62.5 µs

According to the Siemens controller documentation, a maximum of 3 drive objects (drives and/or encoders) can be connected to each line when a high sample rate of 62.5 µs is selected (Fig 1).

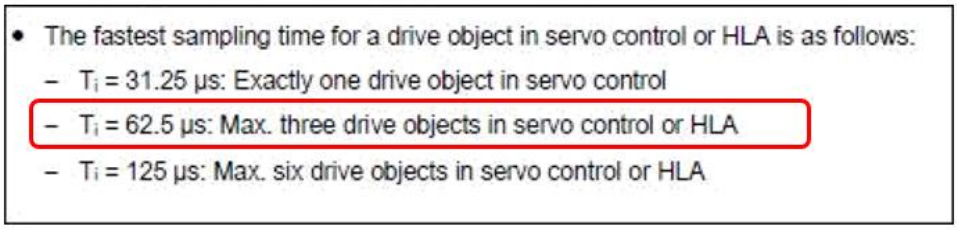

Fig 1

Renishaw plc
New Mills, Wotton-under-Edge
Gloucestershire, GL12 8JR
United Kingdom

T: +44 (0)1453 524524
F: +44 (0)1453 524901
E: UK@renishaw.com
www.renishaw.com

Although this statement is true, it can be misleading to assume that 3 drive objects will always work.

For the system to work, the total response time of the drive objects must be less than the selected sample rate.

We know that RESOLUTE DRIVE-CLiQ has a total response rate of 27 µs and therefore this can present our customers with a problem.

How the controller works

In this example, the controller has 4 available lines. Each line will be polled for its data. The returned data from each line must be completed within the selected high sample rate of 62.5 µs (Fig 2).

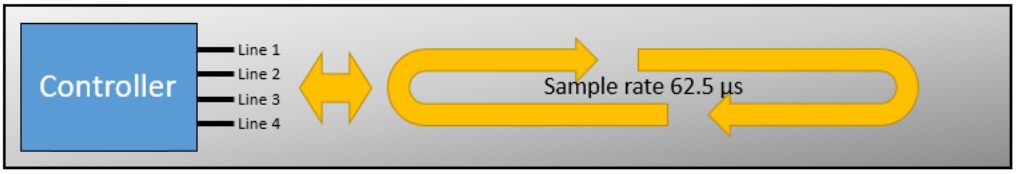

Fig 2

If a controller line has several drive objects connected (in this case, the drive unit + encoder 1 + encoder 2) then the total time for the 3 responses must be less than the sample rate of 62.5 µs.

In this case, the time taken is longer than 62.5 µs and the system will not work (Fig 3).

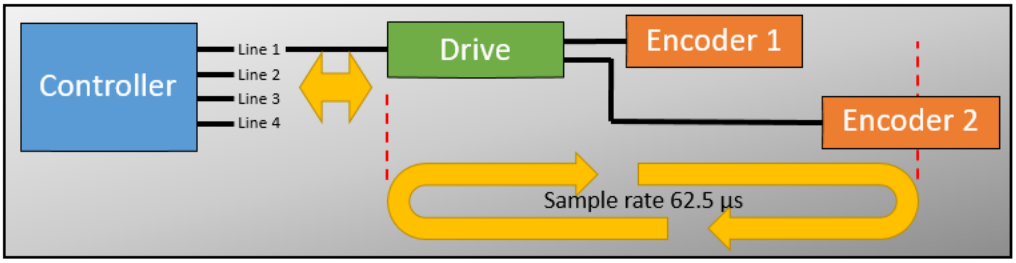

Fig 3

Renishaw plc
New Mills, Wotton-under-Edge
Gloucestershire, GL12 8JR
United Kingdom

T: +44 (0)1453 524524
F: +44 (0)1453 524901
E: UK@renishaw.com
www.renishaw.com

Solutions

There are two possible solutions to this problem:

Solution 1 – Adjust the Sample Rate

Increasing the sample rate to 125 µs will allow time for the 3 drive objects to return their data within the specified time of 125 µs (Fig 4).

This solution may not be possible for some customers as they may want to stay with the high sample rate of 62.5 µs.

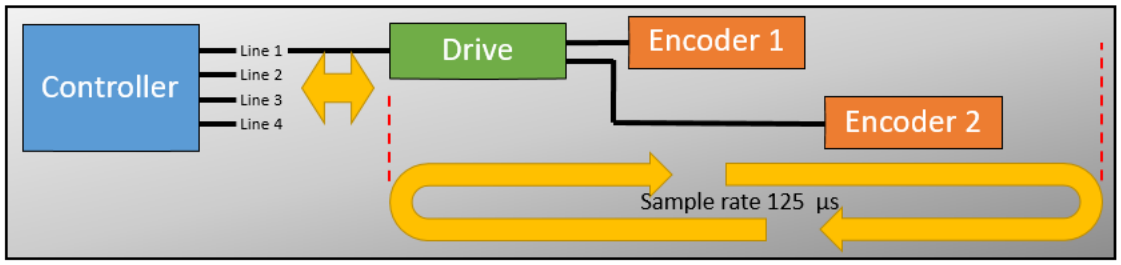

Fig 4

Solution 2 – Adjust the Topology

Adjusting the topology to reduce the number of drive objects on each line can be done by moving encoder 2 to an empty controller line.

Each line will now be able to return its data within the specified high sample rate of 62.5 µs (Fig 5).

This solution may not be possible as the customer may not have a spare line.

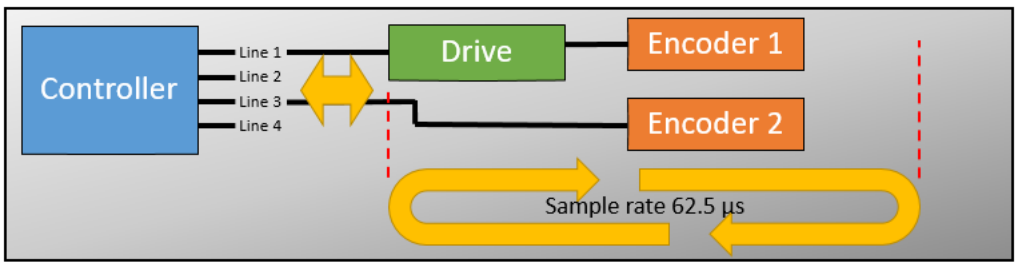

Fig 5

Report ends