

Batch Troubleshooting Guide

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Chapter 1 Introduction

This document has been prepared to help people understand how to perform typical troubleshooting of an Exaquantum/Batch system.

It is designed around R3.30 but many of the techniques would be equally valid on earlier versions.

In many ways this manual can be thought of as showing best practices as it clearly defines what problems can arise if things are not set up correctly or an attempt to do things which although might seem plausible may cause problems.

All things that seem possible may not always work and may not be supported.

The term **supported** in this context always means things that have been part of a rigorous testing regime during a formal release of the product.

The document is divided into sections corresponding to each major function within the product.

1. Automatic Batch Data Collection
2. Custom Batch Data Collection
3. Report Manager
4. Batch Web and the Web Server

A section on troubleshooting the installation is also provided.

The document will draw together information from all existing documentation. References will be provided but, in most cases for clarity some of the text may be provided verbatim with augmentation where required.

1.1 Glossary

Name	Definition
Automatic Batch Data Collection ABDC	The name given to the function of Exaquantum/Batch which supports CENTUM CS3000 and CENTUM VP Batch systems and Exaopc/Batch OPC Server. This is often abbreviated to ABDC.
Batch or Batches	Name given to Control Recipes and the collected data in Exaquantum/Batch. (see Control Recipe for details).
Batch Reservation	A Batch (or Control Recipe) is reserved using the Recipe Overview (.RO) screen on the active Batch Server HIS. This will create a copy of the Master Recipe and allow the operator to make certain changes to Formula Item Data and to specify the Units that are to be used to run the Batch. This will then be either Manually or Automatically downloaded into a Field Control Station which will then manage the Batch. A reserved batch will have a status of RESERVED which will go to ACTIVE once it has been downloaded to the FCS and started.
BatchRPE	Every batch has associated Unit Recipe, Operations and Phases (SP88). These are referred to in EQB as BatchRPE where RPE is an abbreviation for Recipe Procedural Elements. EQB currently only fully support Unit Recipe level RPE data but does record the Operation Names from the Master Recipe. No information in regard to Phases is currently recorded. Phase level detail is ignored during master recipe processing.
Batch Servers	<p>HISs used to monitor and control Batch Manufacturing for a part of the plant. In many Batch Manufacturing plants two Batch Servers are defined a primary and a Standby. Switch over is a manual process.</p> <p>Batches from different Recipe Groups may be controlled by different Batch Servers.</p> <p>Exaquantum/Batch monitors all configured Batch Servers using File Watches for downloads from the Engineering Workstation.</p>
BatchWeb	The Exaquantum/Batch Web Application. This is the main user interface for the Exaquantum/Batch system. It provides a number of pages in four distinct areas (Batches (Home Page), Equipment, Recipes (Master Recipes) and Reports). Each page has a number of other pages referred to as Related Views.
CENTUM CENTUM CS3000 CENTUM VP	Distributed control systems provided by Yokogawa. CENTUM CS3000 is an older version but is still supported, as there is a plant upgrade path required between CENTUM CS3000 and CENTUM VP. Both these control systems have a Batch module which if installed is usually referred to as CENTUM CS3000 Batch or CENTUM VP Batch. If the Batch module is installed Exaquantum/Batch can use ABDC to obtain Master Recipe, Equipment and Batch information. If the Batch module is not installed, then Exaquantum/Batch can only use CBDC to collect Batch Information although Master Recipe and Equipment Names can also be obtained.
Common Blocks	DCS name for Formula Item Data (see Formula Item Data for details).

Name	Definition
Control Recipe	Control Recipes is an S88 term and is refers to the actual recipe being used during the Manufacturing Process. It is a copy of a Master Recipe, which has been downloaded into a Control System. In Exaquantum/Batch these are usually referred to as Batches or Batch when referring to a specific Control Recipe.
Custom Batch Data Collection CBDC	The name given to the function of Exaquantum/Batch, which allows collection of Batch Data from non-Yokogawa Batch Systems. This uses Exaquantum Tags obtained by any OPC DA server to both trigger data collection and supply data which is then stored in the QBatch Database. This is often abbreviated to CBDC.
Custom Views	Custom Views are database Views created using the Formula Selection View Manager to make it easier to use Formula Item Data in reports. It provides easy access to a subset of the Formula Item Data associated with a Master Recipe. It will be specific to a Master Recipe Version. The view will not work on any other version of that recipe. It will need to be recreated if the master recipe is uploaded. A Custom View will contain a subset of all the Formula Item Data associated with the Master Recipe. This allows the user to define those items which are actually used within the common block making it easier to extract the important information in Batch Reports.
Engineering Workstation EWS	The HIS used to create and modify master recipes. Used by EQB to obtain Master Recipe information. This is usually the machine accessed by EQB to obtain new Master Recipe information. However, this is system specific, and it is possible that the actual files reside not on the Engineering Workstation but on a File Server. The actual location of the Master Recipe Files needs to be configured as the Recipe Path in the System Configuration Tool.
Equipment	This is an S88 term defining physical hardware in the plant. There are a number of different types of Equipment Entities but the important one for Exaquantum/Batch is the UNIT. Exaquantum/Batch monitors the usage of UNIT's.
Equipment reconciliation	The process by which Exaquantum/Batch ensures that the Equipment Hierarchy stored in the QBatch database is the same as that in the Exaopc/Batch OPCBPhysicalModel. This must be disabled if the Train/Path and Custom Plant Hierarchy are not configured in the Control System (see 5.5.2 for details).
Exaopc Exaopc/Batch	An OPC server supplied by Yokogawa. It supports the OPC DA, OPC AE, OPC HDA and OPC Batch classic protocols of the OPC Foundation plus an extension called HAE which is a Yokogawa only function. It supports different functionality via a mechanism called Cassettes. The presence of a Cassette is usually referenced by an extension to the name for example Exaopc/Batch is Exaopc with the Batch Cassette installed. Multiple Cassettes can be installed in one installation of Exaopc.
Exaquantum/Batch EQB	An extension of Exaquantum with added features to support Batch or Discrete Manufacturing Processes. Often abbreviated to EQB or just Batch depending on context.

Name	Definition
ExaquantumHome	This is what is referred to as the Legacy Exaquantum/Web. If Exaquantum/Batch is not installed, then this provides an older web interface for Exaquantum. After Exaquantum/Batch has been installed this will link to exactly the same pages as BatchWeb. (See Batch Web for more details).
File Watchers	File Watchers are software modules (usually running in a separate thread) which monitor the files or folders in the Windows File System for any modification. When a modification of the monitored file system object is detected, an event is generated to alert the main processing thread that the change has occurred. Exaquantum/Batch uses File Watchers to capture modifications to existing recipes as well as the creation or deletion of master recipes. There are separate File Watcher for each configured Batch HIS.
Formula Item Data	Formula Item Data is data, which ABDC reads from the control system. This is specific to the master recipe and can store anything that is required during the running of the batch and for reporting the results of a Batch. Formula Item Data is represented in the DCS by Common Blocks, which are created using the Common Block Builder. Common Blocks can be defined on the Control System at Batch, Unit Recipe, Operation and Phase level. Phase level Control Blocks are only available on Control systems running CENTUM VP R6.06 or later. Two types of Formula Item Data can be defined: Scaler and Array. These are stored in different tables, but can all be accessed using the BatchFormulaReportView, BatchFormulaReportViewEx, UnitRecipeFormulaReportView, and OperationFormulaReportView for actual batches. There are also the MasterRecipeFormulaReportView, MRUnitFormulaReportView and MROperationFormulaReportView views which record those formula item data items which are defined in the Master Recipe. Formula Item data recorded in the Master Recipe Tables are referred to as default values and may be changed when a batch is reserved.
Human Interface Station HIS	The part of the Control System from where the Operator Monitors and Controls the Manufacturing process. Different HIS's can provide specific functions depending on which features of the control system is licensed on that machine. Two such functions the Engineering Workstation (EWS) and Batch Servers are using by ABDC to collect Master Recipe data. In some case a HIS acting as a File Server may also need to be accessed by ABDC.
Master Recipe Recipe	The term Master Recipe sometimes abbreviated to Recipe in EQB is an S88 term and refers to the production template. It specifies the Unit Recipes, Operations and Phases to be used during production and can also specify the Train, Paths and Equipment to be used. In most plants, definition of the Train, Paths, and Equipment to be used will be defined when the Master Recipe is used. (see also Control Recipe).

Name	Definition
QBatch Database	A highly normalized SQL Server databased used by EQB to store batch data. It also provides a large number of published views, which can be used to produce customized reports.
Legacy Model Security LEGACY Model Security LEGACY	This is a security model within which EQB can run. This is configured during installation or by using the Yokogawa IT Security Setting tool supplied with the Exaquantum product. It defines a series of user groups, which govern the access rights to features in EQB. It provides a single service user called QuantumUser the password of which is entered during installation or in the Yokogawa IT Security Setting tool.
S88	International standard published by the ISO (International Standards Agency) which defines the terminology and functions used in and provided for Batch Manufacturing Processes.
SEBOL	Programming Language used in CENTUM CS3000 Batch and CENTUM VP Batch. It is a BASIC like language with added control methods.
Standard Model Security STANDARD Model Security STANDARD	This is a security model within which EQB can run (R3.10 and later). This is configured during installation or by using the Yokogawa IT Security Setting tool supplied with the Exaquantum product. It defines a series of Users know as Services Users with unpublished complex passwords and user groups which govern the access rights to features in EQB. The passwords of some of the service user can be changed but need to be the same everywhere they are used.
Unit Recipes	A Unit Recipe is part of a Recipe. A Recipe will always have 1 or more Unit Recipes. A Unit Recipe is a distinct part of the processing and will run on a particular Physical Unit (see Equipment). Units can be assigned to units either in the Master Recipe or when the Batch is registers or dynamically allocated by an operator. This will depend on the recipe logic.
Windows Error Reporting Dr Watson	The Windows Error Reporting Mechanism or Dr Watson is a mechanism provided in Windows to provide information, which can be used to help diagnose a problem within the operating system and various other Microsoft features. On Exaquantum/Batch systems this must be disabled as it can cause problems with reporting.
ZOPBCH	The OPC Batch process of an Exaopc/Batch OPC Server. Only present if the Batch Cassette has been licensed and necessary configuration has been completed on the Control System.
ZOPBCHClient	An Unsupported and Undocumented Client application which can be used to investigate problems with, and view data supplied by Exaopc/Batch.
ZOPBCHMon	An Unsupported and Undocumented application to Monitor the function of Exaopc/Batch. Shows all items registered for updates by EQB. This will include all Physical Units in the Equipment Hierarchy and all active Batches.

Chapter 2 – Troubleshooting Flow

Exaquantum/Batch Issues tend to be reported quite specifically so the area of investigation is usually well defined.

If you look at the list of recently logged calls in Chapter 10 you will see titles like

- Batch Services not starting
- Reports not being generated
- Batch End Times not being received
- No data being received
- Report Manager Service not starting

In most cases, this will tell whether the problem is likely to be an installation, data collection or report generation issue.

For all issues you must establish the version of Exaquantum/Batch installed as well as which patches have been installed.

When logging calls it is quite possible that customer will use the Exaquantum version rather than the Exaquantum/Batch version. Calls logged in CRM may actually be logged against R2.50 with no indication as to whether this is running on a machine running R2.50, R2.60 or R2.70 of Exaquantum.

Version of Exaquantum/Batch	Mandatory Patch	Exaquantum Version
R2.50		R2.50
R2.50	R2.50.03	R2.60
R2.50	R2.50.10	R2.70
R2.50.30		R2.85
R2.50.40		R2.85
R3.10		R3.10
R3.10	R3.10.10	R3.20
R3.30		R3.30

Note: If the customer is running R2.50.30 we would always recommend an upgrade to at least R2.50.40. Some problems were found in the product just after the release of R2.50.30 and were fixed in R2.50.40.

By default, informational and error messages are logged to the standard Windows Event log. However, all the major components have the ability to be configured to provide enhanced logging. In the case of ABDC and CBDC this is configured using an XML formatted configuration file, but the Report Manager has a registry switch. ABDC and CBDC enhanced logging provides extra messages which are logged into the event log but also logs data in text files in a configured location. All Report Manager logging is to the Standard Windows Event log.

See Chapter 5 for details of ABDC and CBDC enhanced logging and 6.1 for the Report Manager enhanced logging.

2.1 Problems with Data Collection

There are two types of Data Collection. All existing customers use Automatic Batch Data Collection. We have had a few customers use Custom Batch Data Collection in the past but currently there are no active systems that use it. CBDC is a separately licensed feature so you can check in CRM whether they have the CBDC licensed.

You should note that not all customers who have CBDC licensed will be actively using it.

ABDC and CBDC can be used together but it very difficult to use. It is also not actually clear what the support status of this is. There is some documentation providing help when doing this but there are clearly others where it says it is not supported.

In nearly all cases therefore issues will be with Automatic Batch Data Collection at this time.

2.1.1 Automatic Batch Data Collection (ABDC)

For ABDC always check the Exaopc/Batch and CENTUM/VP or CENTUM CS 3000 versions in case you need to reproduce the issue. This should also include patches. All patches can be obtained from the SYSQA Website

http://gomweb.jp.ykgw.net/Web01/A/IAQA_GBL/QA_Etop_page.htm

Other things that need checking include:

- Messages is the event log
- Network connection
- Service account user and groups on Exaquantum/Batch, Exaopc/Batch Server and all the HIS's machines configured in the System Configuration Tool
- Database access and security
- HIS Share access permissions
- Exaopc Access
- Does the Exaopc/Batch server have data
- Has the Exaquantum Service been restarted since the failure and what were the results
- Has the Exaopc/Batch Server been rebooted and what was the result

NOTE: Restarting the Automatic Batch Data collection service or rebooting the Exaopc/Batch server will cause the Automatic Batch Service to restart. Unless there is a connection problem between the Exaopc/Batch Server and the Exaquantum/Batch Server, this will cause missing data still available on the HIS Batch Servers to be recovered.

Batches that have been delete from the Control System but not captured by ABDC will be lost.

Unlike ordinary Exaopc process data access, Exaopc/Batch does not store data locally. Data is always obtained either from the FCS if the batch is active or from the HIS Batch Server when the batch is in a RESERVED, COMPLETED or ABORTED state.

More detailed information about troubleshooting ABDC can be found in Chapter 4.

2.1.2 Custom Batch Data Collection (CBDC)

Custom Batch Data Collection is used for systems when CENTUM CS3000/Batch or CENTUM VP/Batch is not available.

CBDC uses any OPC server and configured triggers to collect specific Batch Parameters and Formula Item Data. Both Triggers and collected data are obtained from Exaquantum Tags.

Any number of triggers can be configured but there will usually be at least 2 (Batch Start and Batch End).

Every implementation will be different.

In some sense, troubleshooting CBDC is the same as troubleshooting Exaquantum itself.

The tags need to be configured and to receive data from the OPC Server. CBDC also works across a shut down as on startup it will move forward in time from the shutdown time collecting the required data specified for any triggers that have be missed. This does, of course assume that HDA is correctly configured on the OPC Server to allow process data to be obtained after the shutdown.

Triggers can also be configured using event message as Exaquantum/Batch installs an application into the Exaquantum Event Handler. When the configured event is raised it will cause the trigger tag to change its value to trigger the appropriate data collection.

You should note that if the Exaquantum Database are recreated using the Database Creation Wizard the event handler will need to be reinstalled using the InstallEQBap tool.

2.2 Report Manager Problems

The Report Manager is probably the most problematic part of the product. We use Excel Automation, which means that it is possible for the product to run in to difficulties due to something configured in the template.

The way the Exaquantum/Batch reporting works is as follows:

1. Using a Exaquantum/Batch tool called the Report Template Manager users create Report Templates from a default template shipped with the product.

When the new template option is selected, Excel will automatically open with several options disabled. This forces the user to only save their templates in the database.

The Master Report Template can also be accessed outside of Excel from the following location under the main install directory which is different for 2.xx and 3.xx version of the product.

Data Collection Components\AddInMaster Template.xls

If a template is created outside the Report Template Manager, then this needs to be imported in order for it to be used.

Note: You must use the option in the Template Ribbon in order to save the template to the database and close Excel.

There is currently very little in the way of restrictions to what can be done in a template. There are a number of guidelines both in the Batch Help and FAQ's but in some cases, these are not as strongly worded as they might (see Chapter 7 for details).

Templates must have at least one sheet called the Parameters sheet, which must always be the first sheet in the workbook. How many parameters are actually configured into this sheet will depend on how the report is scheduled (see Section 7.3 for details).

2. Once the template is ready for release it needs to be approved before it can be used. This needs to be done by a user in the Report Template Approvers and Exaquantum Administrators group (see Chapter 8 for details in regard to user Security).
Only the latest approved version of any report template is used to create reports.
3. Templates can then be scheduled either to run at Batch End, Unit Recipe End or on a timed basis.

When a scheduled report is run by the report manager it copies the template into the service user's temp folder. It then populates the parameter sheet with the parameters specified when the report was scheduled.

Depending on the configuration of the report macros or excel formula will cause cells in the template to be updated with the correct data according to the developer's specification.

Problems can therefore arise in several areas.

1. Creation of the report in the Report Template Manager
2. The scheduling mechanism
3. Running the report
4. Rendering the report into PDF
5. Viewing the report in BatchWeb

In most cases however the problem is reported as reports not produced and there is a need to work out exactly where the problem is occurring.

The reason we use Excel is that it is a very flexible, easy to use and well-known product. This makes it ideal for dealing with the many different needs that customer has for reporting. It is however this very flexibility that can lead to problems.

In most cases a need to have the customers template which produces the report that is not being generated is required.

Note: It may also be necessary to have a copy of the customers QBatch database as problems may be data related.

One of the first things to establish is what version of Excel they are using as this may be important, particularly if there is a need to reproduce the fault.

Another thing that is important is whether no reports are being generated or whether it is limited to one particular template or one master recipe.

It may also be important whether the problem is with periodically scheduled reports or Batch/Unit Recipe scheduled reports.

Chapter 3 Troubleshooting the installation

Exaquantum/Batch installation is always performed on a system already installed with a particular version of Exaquantum.

It cannot be installed on any other version of Exaquantum neither newer nor older.

It is recommended to install all mandatory and recommended Exaquantum patches prior to installing Exaquantum/Batch.

It is always recommended to ensure that the Exaquantum system at least starts without any errors prior to installing Exaquantum/Batch.

Logging into the server as a user in the Exaquantum User Group (QTM_DATA_READ (STANDARD) or QUserGroup (LEGACY) and connecting to the ExaquantumHome web site is also recommended, as there is no point in installing Exaquantum/Batch if there is a Web Server problem.

During Installation of Exaquantum/Batch, it is not possible to change the security model. It will always use the one selected when the underlying Exaquantum system was installed. It is therefore a good idea to ensure that the system is running in the correct security model before starting the installation of Exaquantum/Batch.

NOTE: Prior to Exaquantum/Batch R3.10 only legacy module security was supported.

Exaquantum/Batch requires there to be a licensed web server, which may be combined with the data server or installed on a separate machine.

If the Exaquantum system starts and the ExaquantumHome web page works correctly then installation of the Exaquantum/Batch software should install without difficulty.

NOTE: Remember to ensure that Exaquantum is stopped and that all the major processes have shut down prior to installing Exaquantum/Batch.

There is also one other thing which is not actually documented but is highly recommended, that is that all the Exaquantum/Batch services should be configured to automatically restart on all failures. This will ensure that should a service crash for any reason it will attempt to restart. This is particularly important when the Exaquantum/Batch system is not regularly monitored or when personnel responsible for the server are not on duty.

3.1 Hardware and Windows platform

In general, Exaquantum/Batch supports the same hardware and Windows platforms as the supported version of Exaquantum. There are, however, some differences due to increased loading etc. the General Specification (GS 36J04B10-01E) should always be consulted when specifying the hardware and Windows platform.

It should be noted that the specifications provided are minimum and in any given installation, better specifications may be required.

Never cut corners with performance and specify the best possible configuration that the customer is prepared to purchase.

For practical reasons the information recorded on page 5 and 6 of the General Specification is not recorded here and readers are asked to refer to this directly.

3.2 Exaquantum/Batch Prerequisites

Besides the correct version of Exaquantum, there are always other prerequisites to be installed prior to installing Exaquantum/Batch.

In particular a supported version of Excel and the Adobe Acrobat Reader DC are required and should be installed prior to Exaquantum/Batch.

Each version of Exaquantum/Batch is tested against particular version of CENTUM and Exaopc Batch. This is document in the compatibility matrix on the support web site.

<https://ymx.yokogawa.com/content/S636718295742505299/Batch%20Compatibility.pdf>

The Release Notes for the version you are installing should be consulted to find which versions are supported by the Exaquantum/Batch Release being installed.

3.3 Mandatory Post Installation Configuration

There are a number of tasks, which need to be performed after the Exaquantum/Batch software has been installed. These are documented in two places, however there is no one place that will cover all the necessary configurations.

It is common for these to get overlooked and may cause problems.

3.3.1 Services will not start when the Exaquantum/Batch Server is not connected to the internet

Because Exaquantum/Batch uses a Network Setting Service in order to connect to the database when the machine is not connected to the database the default settings will cause all the services to fail. This is noted as item 10 in Section 1 of the release notes.

Up to version R3.10, changes to the network settings needed to be done using the Internal Options dialog. From R3.10 this configuration is performed dynamically using config files and this is covered in Chapter 4 – Troubleshooting Start-Up Failures.

3.3.2 BatchWeb slow to start when Exaquantum/Batch Server is not connected to the internet

Because Exaquantum/Batch uses a Network Setting Service in order to connect to the database when the machine is not connected to the internet, the default settings will cause the loading of the BatchWeb website to be very slow. To change the setting start the Internet Options applet, click on the Advanced Tab, scroll down to the security options and uncheck the “check publisher’s certificate revocation” and “check for server certificate revocation” options.

3.3.3 Windows Error Reporting

The Windows Error Reporting mechanism has been known to cause the Exaquantum/Batch Report Server to hang. It is therefore important that this is disabled. This is documented in the help files but is reproduced here for completeness.

Under certain conditions, Microsoft Excel will generate an error, which will be trapped by the Microsoft Error Reporting mechanism. If this sort of error occurs when it is being used by the Exaquantum/Batch Report Manager, then this may cause the Report Manager to stall. It is therefore important that the Microsoft Error Reporting Mechanisms are disabled. To disable the Microsoft Error Reporting Mechanism, perform the following:

1. Run the Regedit application either via the RUN option on the Start Menu or using the Search facility
2. Ensure that the following registry values exist and have the specified value.

NOTE: If they do not exist then you will need to add a value with the specified name, type and value.

NOTE: For string values if there is nothing in the Value field then the value of the registry value should be left blank.

Path	Value	Type
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\Windows Error Reporting\DisableQueue (see note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\Windows Error Reporting\DisableArchive (See note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\Windows Error Reporting\DontShowUI (see note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug\Auto	1	STRING
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug\Debugger		STRING
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\PCHealth\ErrorReporting\DoReport	0	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\PCHealth\ErrorReporting\ShowUI	0	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows\Windows Error Reporting\DisableQueue (see note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows\Windows Error Reporting\DisableArchive (see note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows\Windows Error Reporting\DontShowUI (see note below)	1	DWORD
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows NT\CurrentVersion\AeDebug\Auto	1	STRING
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows NT\CurrentVersion\AeDebug\Debugger		STRING

NOTE: Do not mistake the Microsoft\Windows\Windows Error Reporting registry key with Microsoft\Windows Error Reporting. These two keys are different. You need to add the registry values in steps 7, 8 and 9 in the Windows Error Reporting Key under Microsoft\Windows\Windows Error Reporting.

3. Rename the following Registry Key

HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\PCHealth\ErrorReporting\DW\Installed

NOTE: If you have to repair your Office installation or if you upgrade to a new version of Office you will need to repeat this step again.

Chapter 4 Troubleshooting Start-Up Failures

In this case, the customer will normally report the issue in one of two ways:

1. Exaquantum/Batch services not starting or all Exaquantum Services not starting.
2. Specific services are not starting, for example Report Service not starting or Automatic Batch Data Collection Service not starting.

If all services are not starting, then start by checking that all the post installation tasks have been performed correctly.

If some services are starting but others are not, then issues with the particular service should be investigated.

Troubleshooting the Installation is covered in Chapter 3.

KB-0042-22 Exaquantum Batch Services Not Starting (<https://ymx.yokogawa.com/content/S637811319937418813/KB-0042-22%20Exaquantum%20Batch%20Services%20Not%20Starting.pdf>) might also be relevant when troubleshooting start-up failures.

4.1 Services Failing to Start

In the case when both of the following conditions are true it will take longer for the Exaquantum/Batch services to start

- Server is registered in a Domain
- Server has no access to the Internet

This is due to the fact that when the Exaquantum/Batch services start they attempt to verify the Publisher information to ensure that it is valid. This requires access to the internet. As the timeout for the network access request is greater than the service start timeout, the service fails to start.

On systems running R3.10 or later this will be less of a problem due to the changes made to the config files described in section 3.3 above.

The following three services are affected by this problem:

- Exaquantum/Batch Automatic BDC
- Exaquantum/Batch Custom BDC
- Exaquantum/Batch Report Server

4.1.1 Required Configuration Changes

As the request for Publisher verification cannot be made under these circumstances it is necessary to disable this check. To disable this for all three services follow the procedure below. This procedure will only work for R3.10. Earlier versions do not have the config files on the disk so will require manual creation.

Note: For R3.10.10 and above these configuration files are installed by default.

1. Log in to the Exaquantum/Batch Data Collection Server as a user with Administrator rights.
2. Mount the Exaquantum/Batch Installation Media.

- Copy the following files from the “<Installation Media>:\Tools\Config files” folder on the installation media to the correct folder.

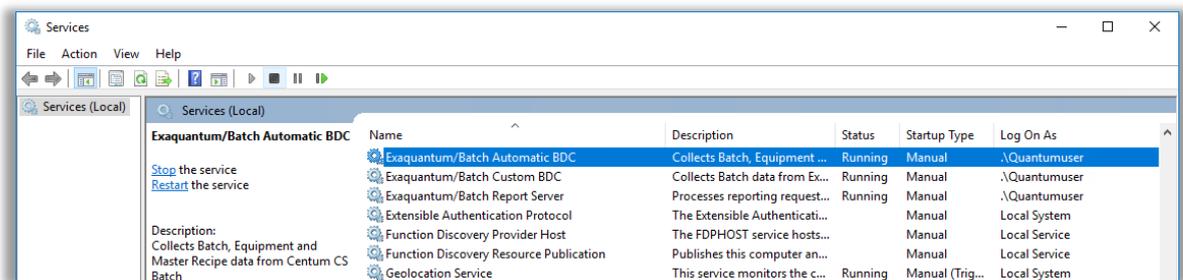
Config File Name	Target Location
QBAutoBDC.exe.config	<InstallDir>\Data Collection Components
QBCustomBDC.exe.config	<InstallDir>\Data Collection Components
QBReportServer.exe.config	<InstallDir>\Report Server

Where <InstallDir> is the folder where Exaquantum/Batch is installed
 (By default, “C:\Program Files(x86)\Yokogawa\Exaquantum Batch”)

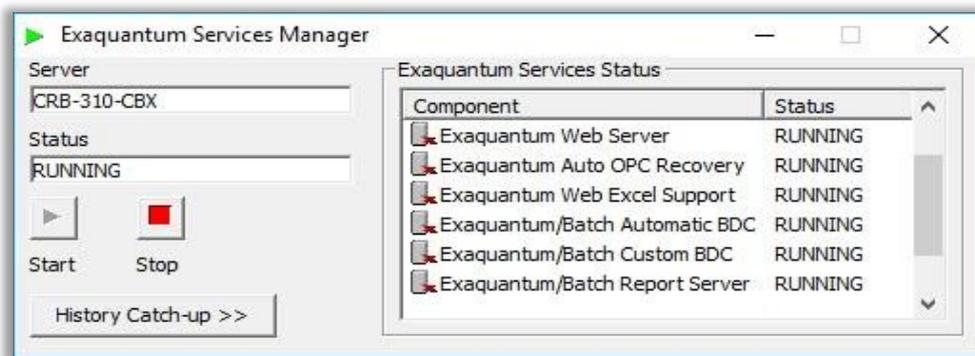
4.1.2 Restarting Exaquantum/Batch Services

After the configuration changes detailed in Section 4.1.1 have been made, the Exaquantum/Batch Services can be manually re-started individually using the Windows ‘Services’ manager or all the services can be stopped and then restarted with the Exaquantum Services Manager.

If the Exaquantum/Batch Services are started manually, then this should result in the Windows Services Manager screen looking similar to the example that is shown below, with the Exaquantum/Batch Services shown as ‘Running’.



If the Exaquantum/Batch Services are Stopped/Started using the Exaquantum Services Manager, then the resulting Exaquantum Services Manager screen should look similar to the example that is shown below, with the Exaquantum/Batch Services shown as ‘Running’.



Chapter 5 Troubleshooting ABDC

Automatic Batch Data Collection is used when the data is to be collected from a Control System running either CENTUM CS3000 Batch or CENTUM VP Batch.

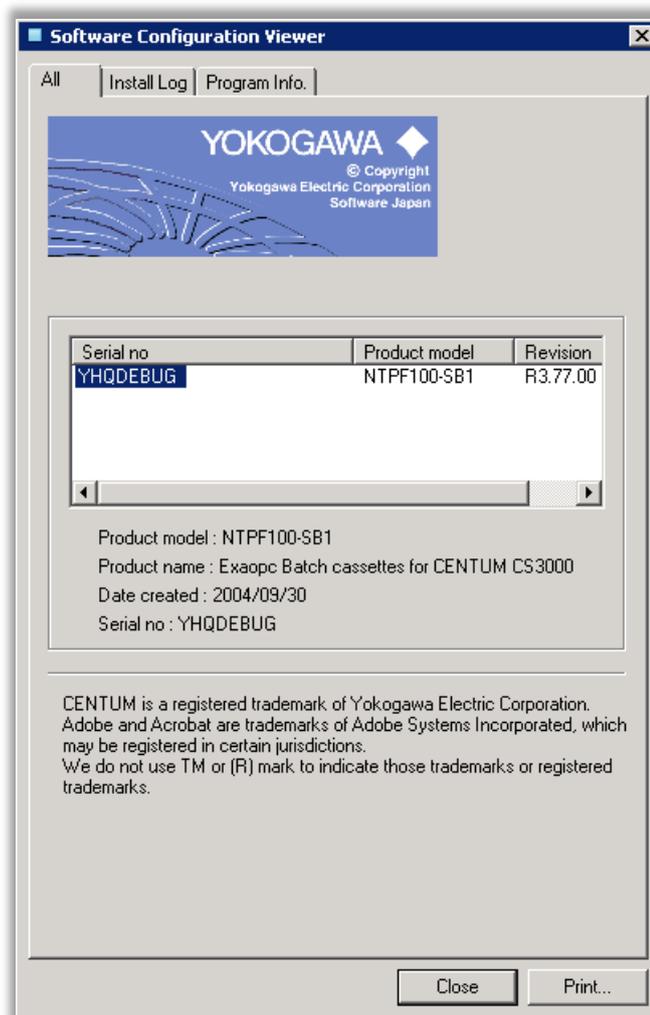
Every version of Exaquantum/Batch will have been tested against the latest available version of CENTUM available at the time of the release.

See <https://ymx.yokogawa.com/content/S636718295742505299/Batch%20Compatibility.pdf> for details.

This does not mean that it will not work on earlier or later version it just has not been tested. If a problem is reported it is always worth asking for the version of CENTUM being used just in case, it is necessary to reproduce the problem.

However, support for other releases than those tested can never be guaranteed.

ABDC also requires a specific Exaopc Cassette to be licensed. The product model displayed in the Software Configuration Viewer must be NTPF100-SB1. If this is not the case, then ABDC will not function correctly.



Exaquantum/Batch will always be tested against the latest version of Exaopc/Batch available at the time of product release.

See <https://ymx.yokogawa.com/content/S636718295742505299/Batch%20Compatibility.pdf> for details.

It does not mean that it will not work with earlier or later releases, but this cannot be guaranteed.

In particular there is a known issue with Exaopc/Batch which was patched in release R3.73 (R3.73.03). It is therefore recommended that all systems should be updated to at least R3.74 if possible (see section 5.3 for more details of this fault).

It is always worth obtaining the version of Exaopc/Batch being used on site.

There is also certain specific configuration on the CENTUM Project in order that the Exaopc/Batch server has the necessary information in its address space (see section 5.5).

5.1 Connection problems with CENTUM CS3000 or CENTUM VP HIS's

Exaquantum/Batch obtains Master Recipe information from CENTUM CS3000 Batch or CENTUM VP Batch Human Interface stations (HIS) via specific windows shares using standard FileSystemObject code and a concept known as a File Watcher.

File Watcher monitor a particular folder for a change. When a change occurs, an event is generated and master recipe data is read and updated in the database accordingly.

This will require access to the Recipe Manager Server (normally the Engineering Workstation but can be a dedicated File Server) and several Batch Servers (primary and optionally secondary servers for each of the recipe groups in use).

NOTE: CENTUM defines a maximum of 16 recipe groups not all are used by all customers. It is possible to have a separate set of HIS's monitoring each group but in most cases the recipe groups will be grouped in some way. It is therefore possible for Exaquantum/Batch to be monitoring/getting data from as few as 2 up to 33 different HIS's.

The filename used (except on test systems) will always be of the form HISddss where dd is the DCS domain number and ss is station number. Normal conversion is to make the Engineering workstation stations number 64 and then the other HIS machines are numbered from 63 down. The actual HIS's in service as Batch Servers may in general be any of the HIS's defined but quite commonly be 62 and 63. The domain used will vary depending on the project specific requirements. On multi-project systems more than one domain will be in use within the project. Exaquantum/Batch will only connect to one domain.

Note currently multi-projects are not supported by a single Exaquantum/Batch Server. More than one Exaquantum/Batch system will be required to handle these types of projects.

The actual HIS machine that are being used to gather Master Recipe Information is configured on the System Configuration tool (in the Exaquantum Batch group on the start menu).

When using the System Configuration tool, the HIS machines must be accessible from the Exaquantum/Batch server.

Note

No error message will be raised if access is denied to the Engineering HIS. It is only when ABDC logging is enabled (See Chapter 6) with the MRCTraceSwitch value set to 4 that this problem can be observed.

The presence of the service user not being created on or not in the correct groups on the Engineering HIS should always be checked if Master Recipe collection is not being performed.

On test systems it is possible to have the PC's called something other than HISddss but the name must be shorter than 8 characters. Experience says however that if you can keep them the same as that defined in the project then it causes less complication to the setup.

There are two main issues with Master Recipe collection.

1. Access to the Machine and/or Shares plus the files it contains.
2. File watchers crash, hang or stop working.

5.1.1 Checking Access to the Shares

There are three shares involved in Master Recipe collection.

1. CTMRMNG – CENTUM Master Recipe Management
2. CTMRECP – Master Recipe Download Location
3. CS1000PJT – Top Level Project folder

The system uses the CS1000PJT share to check that we are connecting to a machine with CENTUM Batch software installed and the project is correct.

The File Watchers are created on all the Batch Servers using the CTMRECP share.

There are actually, two File Watchers per Batch Server one to watch for new/deleted master recipes and the other to watch for changes to existing master recipes.

Data is then read from the Engineering stations using the CTMRMNG share.

In theory, Exaquantum/Batch only needs read access to these shares and its underlying files. This means that the Exaquantum/Batch server user needs to be in the correct groups to allow that access. This is a particular important when the CENTUM server is running in Standard Security (See section 5.4).

Note: If ABDC is not able to access the shares then Master Recipe information will not be available, but this will not stop batch information being recorded. The actual behavior will depend on

- a. Whether the master recipe is new
- b. An updated version of an existing master recipe.

In the first case an error message will be raised saying that it could not connect the batch to a master recipe. In the second case it will be connected to an incorrect version of the master recipe, but no error will be raised.

Checking a user in the same groups as the services user can access shares on the HIS's and also copy and read files in folders pointed to by that share should be investigated. It is not enough just to check that the shares are accessible.

Obviously, it would be better to use the service user account, but it is quite possible that this is locked out of use and the password not published so a different user in the same groups as the service user will be needed. This may need to be created on the Exaquantum Server and all the HIS's concerned.

If there is a firewall between the HIS and the Exaquantum/Batch server then this needs to be configured to allow the Exaquantum/Batch server to access the machine and the file and printer sharing port needs to be open (see below for the port numbers).

- UDP 138, File and Printer Sharing (NB-Datagram-In)

- UDP 137, File and Printer Sharing (NB-Name-In)
- TCP 139, File and Printer Sharing (NB-Session-In)
- TCP 445, File and Printer Sharing (SMB-In)

5.1.2 File Watchers crash or stop functioning

This is actually a difficult issue to spot. It may result in the Master Recipe Collection Thread to abort but in some cases, the only symptom is that the Master Recipe Collection has stopped. The Automatic Batch Data Collection Service does not currently monitor this thread. This has been raised as an enhancement request in TFS.

If this is suspected, then it will be necessary to restart the Automatic Batch Data Collection Service.

Care needs to be taken with a Thread Abort as a normal shutdown will also cause a Thread Abort event to be raised by the Master Recipe Collection thread.

5.2 Connection Problems with the Exaopc/Batch server

If there is a problem with connection between the Exaquantum/Batch Server and the Exaopc server then, in most cases this is an easy thing to see.

The Automatic Batch Data Collection service has a health check thread, which is constantly monitoring the connection. If this detects a failure, it will perform an internal shutdown. This will stop all processing threads in the same way as a service shutdown except for the health check thread, which will continue to check the connection. As soon as the connection is restored the normal start-up processing will commence.

Things to check when this happened are the usual network things and access security (see section 5.4).

If this is OK, then you should check that the Exaopc/Batch server process is actually running. This is called ZOPBCH. Connection issue of this sort will normally be flagged by an error in the event log, which says that the interface does not exist. If this process is not running, then the connection with the VNET needs to be checked as well as the configuration in the CENTUM Project (see section 5.5.3 for more details).

5.3 Incorrect status information being logged

One other known issue that causes problems with EQB is when the Exaopc/Batch server reads what is known as a partial batch list.

This has been more of a problem when using Exaopc release prior to R3.74 (R3.73 with patch R3.73.03 also has this fix).

The issue is not fully understood as it is really an issue with the control system and Exaopc/Batch, not an issue with EQB.

We do however know of one cause, and this is when the operators switch the master Batch Server HIS.

This is a manual operation and for up to 30 seconds there will be no Batch Server present at all.

EQB is reading the Batch List on a maximum rate of once every 10 seconds. This means that it is possible at least one of the scans will obtain a partial batch list.

The Exaopc/Batch server should still have these batches on what is called the Magenta List in EQB. It is actual a list which has been cached by the OPC Server. Batches on this list will have a property called the wrong batch property set to true.

This means that instead of ABDC marking the batches as DELETED it will mark them as OFFLINE.

This then allows for recovery once the full batch list has been re-established.

The problem in the past and occasionally still occurs is that for some reason the batch does not appear on the Magenta List or the Wrong Batch property is not set to true.

This means that instead of correctly setting the batch as OFFLINE it sets it to DELETED.

Once a batch is marked as deleted then it will be ignored even if it reappears on the batch list.

Note, there is a user story that this behavior should be changed so that if it does reappear and can be confirmed to be the same batch, the current status should be assigned to the batch, and it be re-registered in order to received future status changes.

A status of OFFLINE therefore is a valid status although it is indicating that for some reason the Exaopc/Batch list has only a partial active list. The batch should go back to ACTIVE status once the full batch list has been restored. It is however still not a good state to be in and should only be a transitory state. The complete Execution Status History of the batch should be investigated.

A specially configured report, which will capture all the status history and compare it with the Mode Status Change event message store in the QHistorianData database can be obtained from the Useful Tools/Scripts Section on the Affiliate Portal (see section 5.6.2.2 for more details).

See also *KB-0045-22 Batch Deleted Status*
(<https://ymx.yokogawa.com/content/S637811337025170865/KB-0045-22%20Batch%20Deleted%20Status.pdf>)

5.4 Connecting Using Standard Security Model

In order to connect to any OPC server it is necessary to ensure that the Exaquantum/Batch Service user is created on the Exaopc and CENTUM VP HIS in order that data can be obtained.

If using Standard Model Security on the Exaquantum/Batch Server, then the tools provided on the Exaquantum Software Installation DVD (Disk 2) must be used (See the User Account Creation Tools section (page 2-11) of the Exaquantum Installation Guide (IM 36J04A13-01E 17th Edition Issue 1).

NOTE: If using Exaopc R3.77 or CENTUM VP R6.06 then the C++ 2008 runtime support also needs to be installed prior to running the tools discussed above. The installer for this can be found in the Misc\CPP2008 folder of the Exaquantum Prerequisite Installation DVD (Disk 1).

5.4.1 Connection to Exaopc using the Standard Security Model

In order for Exaquantum/Batch to communicate with Exaopc, which is, using Standard Security Model then as well as the Exaquantum Service User existing on the ExaOPC server it must be a member of the appropriate groups.

For Standard Standalone the user must be a member of the following groups:

- EXA_MAINTENANCE
- OPC_ENGINEER
- OPC_MAINTENANCE
- OPC_USER

For Standard Domain the user must be a member of the following groups:

- EXA_MAINTAINANCE_LCL
- OPC_USER_LCL

5.4.2 Connection to CENTUM VP using Standard Security Model

In order for Exaquantum/Batch to communicate with CENTUM VP, which is using Standard Security Model then as well as the Exaquantum Service User existing on the CENTUM VP HIS it must be a member of the appropriate groups.

For Standard Standalone the user must be a member of the following groups:

- CTM_OPC
- CTM_ENGINEER

For Standard Domain the user must be a member of the following groups:

- CTM_OPC_LCL
- CTM_MAINTENANCE_LCL

5.5 Data not as expected

Once any connection issues are fixed, the next possible set of errors is that the data received is not as expected.

5.5.1 Master Recipe Data

There have been very few reported issues with Master Recipe Data being incorrect other than when it could not be collected at all due to access issues or that a problem with the File Watchers means that changes to Master Recipes are not being received.

We currently do not have a tool, which enables us to read the master recipe data from the HIS outside of Automatic Batch Data Collection, so it is difficult to confirm that the data we have has been correctly parsed from the file.

The data copied from the HIS is placed in a subfolder of the service user's Temp folder. If for any reason this is unavailable or write permission has been denied for some reason this will fail and will cause the Master Recipe Collection thread to malfunction.

For systems, running R2.50.40 then you should check to see that patch R2.50.41 and R2.50.43 are also installed as there was a problem where the Master Recipe Collection thread crashed due to a conflict in the temp directory.

CENTUM VP 6.xx introduced support for Phases this caused problems with Exaquantum/Batch. In R2.50.30 changes to ABDC were made to correctly skip this level of detail in the Master Recipe. This means that versions for Exaquantum/Batch release prior to that would not support CENTUM VP 6.xx and the customer would need to upgrade to the latest release.

There is currently no tool available to duplicate the functionality of the Master Recipe Collection thread.

To verify access to the file shares, do the following:

1. Log on to the Batch server as service user or an account with the same rights as the service user.
2. With the Windows file explorer ensure that each of the required HIS stations may be accessed and contain the current .rp recipe files. The location of these files varies with the selected configuration as follows:

Configuration	HIS share places
Target mode (Non-FDA option)	\\<HIS PC name>\CTMRECP\DBFile\<Recipe Group number>\ e.g. \\BatchServer1\CTMRECP\DBFile\05\ <HIS PC name> is the <i>Server 1/2 HIS PC</i> specified in the HIS Batch Servers grid in the system configuration tool.

Configuration	HIS share places
Target or test mode (FDA option)	<p>\\<FDA Recipe Path>\ RCP\<PJT>\DATA\<PJT>\ Recipe\<Recipe Group number>\<Recipe number>\</p> <p>e.g.</p> <p>\\Server1\FDADATA\RCP\Project1\DATA\Project1\ Recipe\05\0001\</p> <p><FDA Recipe Path> is the <i>FDA Recipe Path</i> specified in the system configuration tool.</p> <p><PJT> is the <i>Project Name</i> specified in the system configuration tool.</p>
Test mode (Non-FDA option)	<p>\\<Project Path>\ TestMaster\<HIS>\Recipe\DBFile\ <Recipe Group number>\</p> <p>e.g.</p> <p>\\Server1\ProjectHome1\TestMaster\05\Recipe\DBFile\ 05\</p> <p>< Project Path> is the <i>Project Path</i> specified in the system configuration tool.</p> <p><HIS> is the <i>Server 1/2 HIS</i> specified in the HIS Batch Servers grid in the system configuration tool.</p>

NOTE: If the recipe builder (RecipeView database) is managed on a separate PC, then with the Windows file explorer ensure that the recipe database files can be accessed at the share location specified in the Recipe Path field in the system configuration tool.

5.5.2 Equipment reconciliation

On start-up and then at a default rate of once a minute ABDC reads the plant hierarchy via Exaopc/Batch.

This can be read using the ZOPBCHClient application, which you can find in the EXA\exaopc\tool folder on the Exaopc/Batch server. This tool is not available on the Exaquantum/Server although it will work if copy from the Exaopc/Batch server. It is recommended that it is located in the same location as all the other OPC tools (Exaquantum PIMS\Exaopc\exaopc\tool) if so copied.

Note: Depending on the operating system being used copying into this location will be protected and it may be easier storing it in a different location. This location however should be easily identified and not be a user's desktop or documents folder.

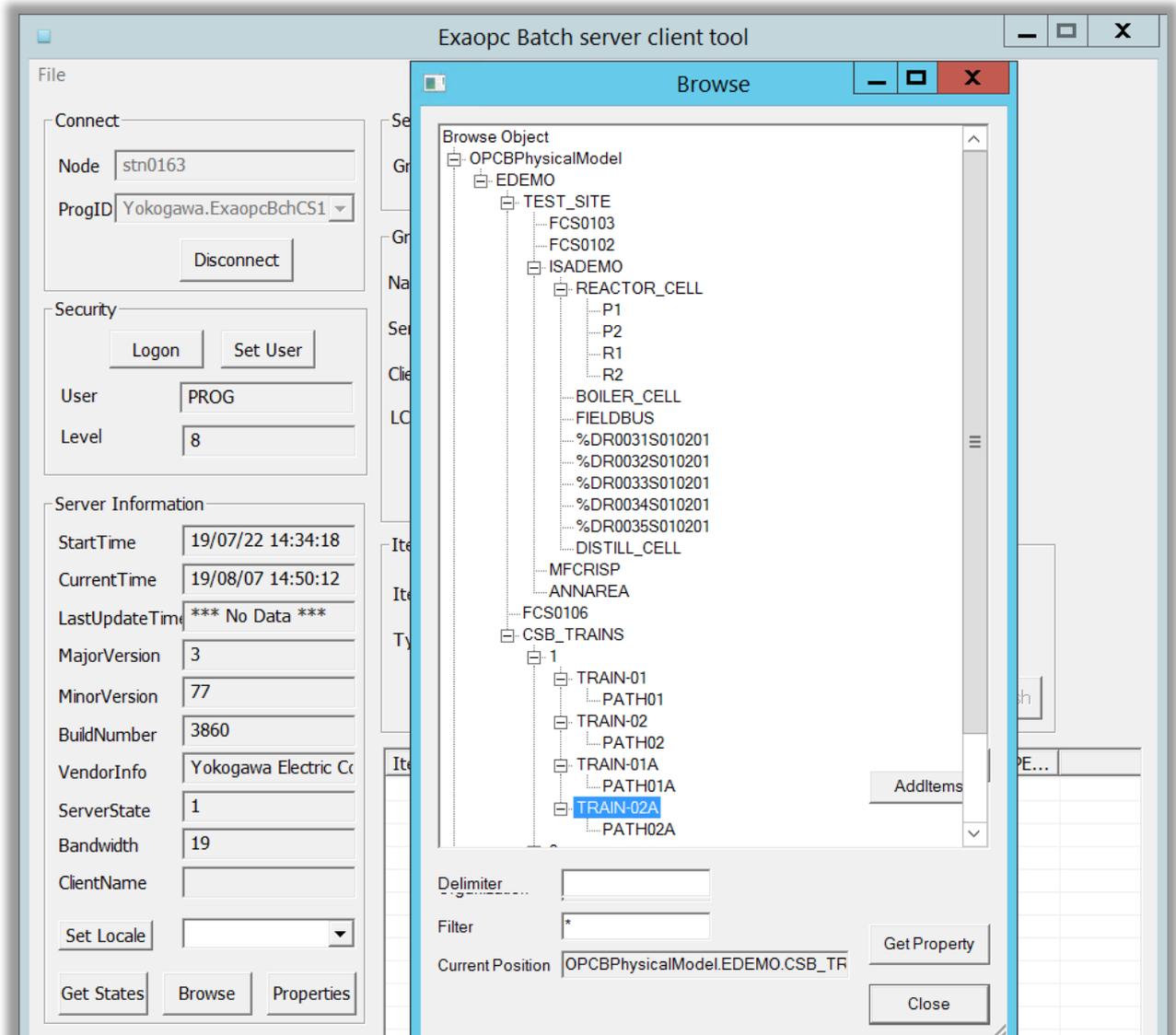
To display the hierarchy which should be known to Exaopc/Batch, enter the hostname of the Exaopc/Batch Server (unless running on the Exaopc/Batch Server itself) and click connect, then click the Browse button. You should be able to expand the tree under OPCBPhysicalModel to see the configured plant hierarchy (See below).

In order to work correctly, the plant hierarchy needs to be defined in the Project using the Custom Plant Builder (See Appendix A).

The Exaquantum/Batch system allows for historization of changes to the plant hierarchy but currently any changes in the hierarchy will result in existing entries being marked as deleted and new version being created. Change information is not actually available in Exaopc/Batch.

To view the hierarchy on Exaquantum/Batch you can use BatchWeb (<http://servername:portn/BatchWeb>). Click on the Equipment link at the top of the page and then select the Equipment Hierarchy link in the Related Views.

This default poll rate can be changed by modifying the EquipmentPollRate field in the AutoBDC table of the QBatch Database. The value is in milliseconds.



If either the Custom Plant Hierarchy and/or the Train/Patch configuration has not been configured for any reason, then the Equipment Reconciliation must be disabled. If not, then every time it runs it will mark the configuration created on the last poll as deleted then create a new configuration. If this is left unchecked, then it will result in ABDC crashing due to running out of memory space.

Note: It is not uncommon for the Custom Plant Hierarchy not to be configured so this always needs to be checked.

To disable Equipment Reconciliation, create the following DWORD registry value and set the value to 1.

HKLM\SOFTWARE\Wow6432Node\YOKOGAWA\Iccap\ABDC_STOP_EQUIPMENT_RECON

For further information and instructions as to how to clear invalid entries in the database created due to this issue please read the FAQ "What is the effect on ABDC if there is no Train/Path Hierarchy Configured?" from the web site at

<https://ymx.yokogawa.com/content/S636746931430867775/eu-supfaqbatchmaintenance6.pdf> or from the FAQ section of the help system.

5.5.3 Batch Data Collection

Batch Data Collection is the large part of the function of Exaquantum/Batch. Data is collected several times during the running of a Batch.

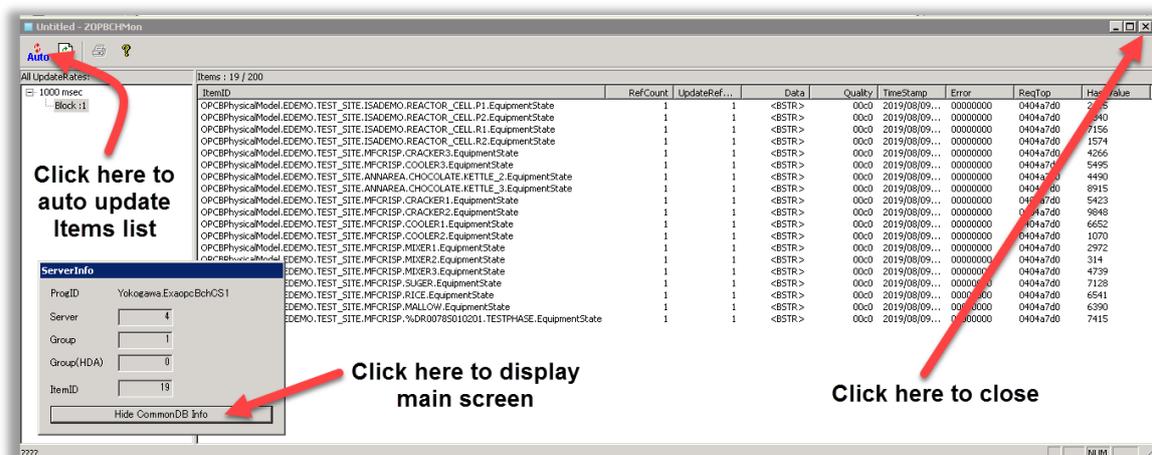
1. When EQB first sees a new batch
2. When a Unit Recipe Starts
3. When a Unit Recipe Ends
4. When the Batch Completes or is Aborted

The information is read using the OPCBatchModel node on the OPC Batch data tree. Browsing this node using the ZOPBCHClient tool will show what Batches are still currently known to the control system. These may actually be active but could also have been completed or aborted but not yet deleted from the control system.

Batch Data is read synchronously from the OPC Server but changes in status of a Batch/Unit Recipe is received by Exaquantum/Batch as a notification in much the same way as Tag Value update is received.

It is possible to check what has actually been registered for notifications by running the ZOPBCHMon application on the Exaopc/Batch server. The interface is a little strange as you need to display the full data screen in order to exit the application. You also need to select the interface, however there will only ever be one. You will find the ZOPBCHMon application in the EXA\exaopc\tool folder.

Note you cannot run the ZOPBCHMon application anywhere other than on an Exaopc/Batch Server.



A number of different errors can occur during Batch Data Collection. These will be logged in the event log using specific Event ID's.

NOTE: Most events logged by ABDC have an Event ID of 0. These are the only ones currently that do have a non-zero ID.

Event ID	Description	Event Data
12048	This error is logged for each irrecoverable error.	Batch [Batch Number] Irrecoverable error reading [Common Block Data Item] - Error [OPC Error number]
12049	This error is logged when the retry count is exceeded for any recoverable error.	Batch [Batch Number] Retry Exceeded reading [Common Block Data Item] - Error [OPC Error Number]
12050	If Read Errors exists for a batch when a batch or unit recipe ends it is possible to configure ABDC not to schedule any batch end reports (see the 'Automatic Batch Report Generation Override' Help topic for details). When this occurs, this event will be logged.	Batch End Event Data = Batch [Batch Number] had [Error Count] errors in data collection - Report creation overridden Unit Recipe End Event Data = Batch [Batch Number] had [Error Count] errors in data collection - Report creation overridden for Unit Recipe [Unit Recipe Name]
12051	If the Initial Property Read for a Batch fails, then this error will be raised and the read will be retried again on the next cycle. Retries will continue each cycle until the reread timeout defined in the registry elapses. See the 'User Configurable Registry Values' Help topic for details.	Event Data = Batch [Batch Number] : Initial read failed - will be retried on next cycle Note: Additionally, one of the following will also be logged as text in this event Batch [Batch Number]: Error collecting initial batch details - aborting creation of new batch Batch [Batch Number]: Error collecting initial batch formula item data - aborting creation of new batch

Event ID	Description	Event Data
12052	If the initial properties for a batch has still not been collected after the reread timeout has elapsed then the batch will be added to the database anyway with errors. To indicate this an event log message will be created in the Windows Application event log as follows:	Batch [Batch Number] Initial read failed for the defined retry period - Batch being added with errors

There are also a number of things that need to be configured on the Control System in order for the Exaopc/Batch server to be able to read the Data. This is also covered in the Batch help as well as in the following FAQ

What must be configured on the Engineering Workstation in order for Exaquantum/Batch Automatic Batch Data Collection to collect all the information?

<https://ymx.yokogawa.com/content/S636746927850846724/eu-supfaqbatchinstall7.pdf>

There are also a number of other FAQ's, which are useful when troubleshooting Data Access issues. These are listed in the following table.

A list of all the Batch FAQ's can be viewed from the following URL.

<https://ymx.yokogawa.com/knowledge-base>

Title	URL
What data is read and when by Automatic Batch Data Collection (ABDC)?	https://ymx.yokogawa.com/content/S636746878380443844/eu-supfaqbatchabdc7.pdf
What data does Automatic Batch Data Collection collect and from what source?	https://ymx.yokogawa.com/content/S636746877810735496/eu-supfaqbatchabdc6.pdf
Running Batches can be seen in Exaopc Batch namespace, but data is not available in Exaquantum/Batch.	https://ymx.yokogawa.com/content/S636746877193603452/eu-supfaqbatchabdc5.pdf

5.5.4 Property Read Performance

Batch Data collection takes time. It is quite common for a recipe to have many hundreds of Formula Data Items which must be read when the batch is first seen by ABDC and then again when a Batch ends. It is always possible that there is a performance issue, which means that this process takes longer that a customer says it should. To check what the read times actually are, a tool called BatchPropertyReadTimings available from the Useful Tools/Scripts Section on the Affiliate Portal can be used. This needs to be installed and therefore care needs to be taken in its use as again it may have impact on customers security particularly on systems which are 21 CFR Part 11 regulated.

This tool allows continuous reading of one or more batch property.

Installation and use of this tool is documented in a document that is also provided with the tool.

5.6 Normal operation

5.6.1 Start up

On start up the AutomaticBDCService will log an information event to say that Service Start was successful.

The Exaopc/Batch Health Monitor thread is started, and this will perform the Startup Health Check. If this is successful, then it will log an event similar to that below:

```

Message: OPC Startup Health Check Complete

Additional Info:

General OPC Server Info: Yokogawa Electric Corporation Exaopc OPC Interface
Package ver:3.77.3860

OPC Server State: OPC_STATUS_RUNNING

CallingAssembly.FullName: QBAutoBDC, Version=3100.0.0.0, Culture=neutral,
PublicKeyToken=8af1292f2966aa15
  
```

If the health test fails, then a message similar to the following will be logged.

```

General Information
*****

Additional Info:

OPC Server CLSID: Yokogawa.ExaopcBchCS1

OPC Server Location: STN0163

CallingAssembly.FullName: QBAutoBDC, Version=3100.0.0.0, Culture=neutral,
PublicKeyToken=8af1292f2966aa15

ExceptionManager.MachineName: RGLEXA310

ExceptionManager.TimeStamp: 09/08/2019 12:54:00

ExceptionManager.FullName: Microsoft.ApplicationBlocks.ExceptionManagement,
Version=3100.0.0.0, Culture=neutral, PublicKeyToken=8af1292f2966aa15

ExceptionManager.AppDomainName: QBAutoBDC.exe

ExceptionManager.ThreadIdentity:

ExceptionManager.WindowsIdentity: RGLEXA310\Quantumuser

1) Exception Information
*****
  
```

Exception Type: System.Exception

Message: Failed to Connect to OPC - The Service will continue to attempt to connect until stopped

Data: System.Collections.ListDictionaryInternal

TargetSite: NULL

HelpLink: NULL

Source: NULL

2) Exception Information

Exception Type: System.Exception

Message: Unable to connect to OPC Server

Data: System.Collections.ListDictionaryInternal

TargetSite: Void Connect(System.String, System.String, Boolean, System.String, System.String)

HelpLink: NULL

Source: Yokogawa.IceCap.DataAccess.OPC.OPCServer

StackTrace Information

at Yokogawa.IceCap.DataAccess.OPC.OpcServer.Connect(String clsID, String serverName, Boolean logonCheck, String logonUser, String logonPassword)

*at
Yokogawa.IceCap.BusinessLayer.AutomaticBDCService.StartupOPCHealthCheck()*

3) Exception Information

Exception Type: System.Runtime.InteropServices.COMException

ErrorCode: 2147220992

Message: Exception from HRESULT: 0x80040200

Data: System.Collections.ListDictionaryInternal

TargetSite: Void ThrowExceptionForHRInternal(Int32, IntPtr)

HelpLink: NULL

Source: mscorlib

StackTrace Information

*at System.Runtime.InteropServices.Marshal.ThrowExceptionForHRInternal(Int32
errorCode, IntPtr errorInfo)*

*at Yokogawa.IceCap.DataAccess.OPC.OpcServer.Connect(String clsID, String
serverName, Boolean logonCheck, String logonUser, String logonPassword)*

This actually gives a large amount of information, but it is, in some cases provided from a programmer's point of view rather than a service engineer.

The first thing it specifies is information as to how, where and who is making the connection.

This is then followed by several Exception Information entities.

1. This is will always be the same and just indicates that the health check has finished and that it will continue to check until it can make a connection

Message: Failed to Connect to OPC - The Service will continue to attempt to connect until stopped

This attempt will be made every minute.

2. The second exception information entity shows where in the code it has failed and again will tend to be the same in most cases. The message again is simply confirmation that it has failed.

Unable to connect to OPC Server

3. The final exception information entity gives more detail as to the failure. The above example we have a COM exception, which indicates that the OPC Server is not actually running on the remote machine. The 0x80040200 error number is a general COM error which can indicate that the interface is not registered or not running or not even installed. See section 5.2 above for troubleshooting techniques.

Automatic Batch Data collection will not go any further than this until the health check succeeds.

Note the health check thread will continue check the connection once a minute during normal operation. If a connection issue is discovered, an event will be logged similar to that above and normal operation will stop.

If all is well, the next thing that occurs is that the Equipment Reconciliation thread is started. This will browse the OPCBPhysicalModel from the OPC Server looking for changes that occurred whilst the system was down. This only logs an informational event if ABDC logging has been enabled (See Chapter 6 for details). It will however log errors such as that below. These will have an event ID of 12048 which is a property read error

*GetValueProperty Call Failed – Detail as follows – ITEM ID:
OPCBPhysicalModel.EDEMO.TEST_SITE.MFCRISP.MALLOW PROPERTY
NUMBER: Multiple ERROR CODE: C0040007*

Error codes returned by Exaopc are documented in the NTPF100 Exaopc OPC Interface Package Guide Manual (IM 36J02A11-01E). You will need to obtain the correct version for the release of Exaopc/Batch being used.

The above example is a typical error code and indicates that the item for which data is requested is not in the Exaopc/Batch Servers address space.

Once the equipment is up to date then the service will start the Master Recipe Collection thread. When EQB is starting it will not know if any Master Recipes have been updated whilst the system was down. In this case it needs to download everything and check to see what has been missed.

Note that if multiple batch servers have been provided it will check both servers. You will see informational messages being logged. For each recipe group and each batch server configured. Examples of these are provided below.

```
Message: [START], Master Recipe Collection Starts -----:
Message: [OK ], (connect )
\\HIS0124\CS1000PJT\TestMaster\HIS0124\Recipe\DBFile:Yokogawa.IceCap.BusinessLayer.MRCollection.DownloadMon
Message: [OK ], (EDF Access) Gr.01 at
\\HIS0124\CTMRMNG:Yokogawa.IceCap.BusinessLayer.MRCollection.DownloadMon
Message: [OK ], (EDF Access) Gr.01 at
\\HIS0124\CTMRMNG:Yokogawa.IceCap.BusinessLayer.MRCollection.DownloadMon
Message: [OK ], (EDF Access) Gr.03 at
\\HIS0124\CTMRMNG:Yokogawa.IceCap.BusinessLayer.MRCollection.DownloadMon
```

The File Watchers will also be started at this time.

Finally, Batch Catch-up is started, During catch-up each batch in the batch list will be checked to see what the current states is, and any required processing will be performed. This is performed one batch at a time so depending on how long the system has been down and the amount of activity on the Plant this can take some time.

At this time ABDC will register all batches and their unit recipes found on the Exaopc/Batch active list and not in a COMPLETE or ABORTED state. This can be viewed using the ZOPBCHMon application (see section 5.5.3).

Once Catch up is complete polling will commence. When this occurs an information event is logged to say that this has occurred.

Message: Polling has started

Additional Info:

OPC Batch Server location: STN0163

Poll rate: 10000

Equipment Poll rate: 600000

OPC Notification Rate: 1000

CallingAssembly.FullName: QBAutoBDC, Version=3100.0.0.0, Culture=neutral, PublicKeyToken=8af1292f2966aa15

During catch-up, errors may be recorded for Batches that were deleted whilst the system was down. These will have an 12048 event ID and have a similar text to that below.

The description for Event ID (12048) in Source (QBAutoBDC.exe) could not be found. It contains the following insertion string(s)

Batch REP110000002628 GetValueProperty Call Failed – Detail as follows – ITEM ID: OPCBatchModel.REP110000002628 PROPERTY NUMBER: 5019 ERROR CODE: C0040007

Like the deleted Equipment, deleted Batches will also cause messages with an Error Code of C0040007 to be logged.

5.6.2 Normal Operation

Once Polling has commenced there are four basic threads of operation. Two are controlled by polling and the other two are event driven.

5.6.2.1 Polled activity

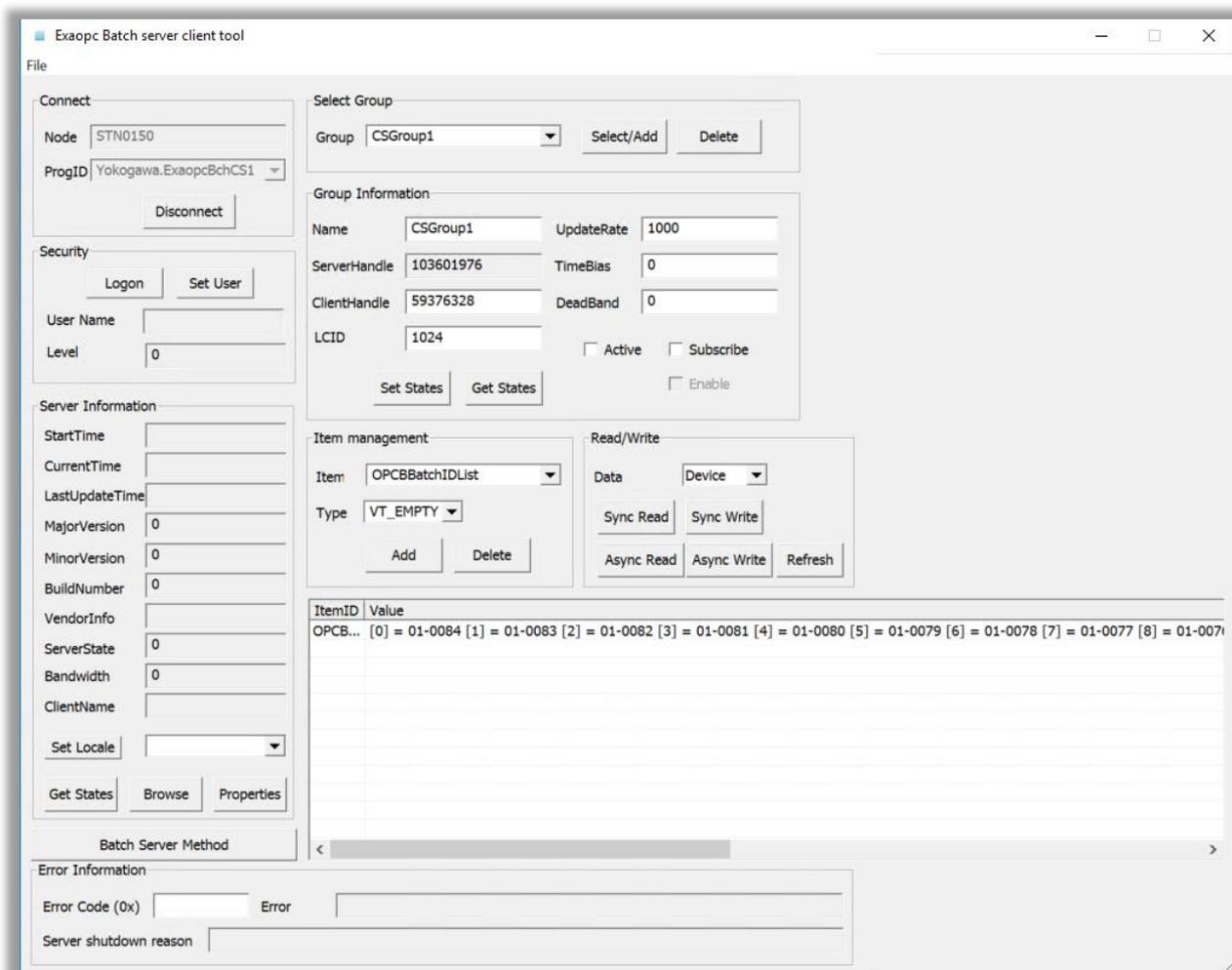
1. Batch List Processing

Batch List processing is controlled by a poll timer. This poll by default occurs once every 10 seconds.

Note if a data collection is in operation when the timer triggered the actual polling, mechanism will not take place. This can be seen if ABDC logging is enabled.

Every time a poll is triggered, ABDC will read the OPCBatchIDList and compare this with the list of Batches stored in the AutoBDCBatchList table in the QBatch database.

Note: The contents of the OPCBatchIDList cannot be Browsed using the ZOPBCHClient test applications Browse dialog. You can however see some of its contents by creating a read group and entering OPCBatchIDList (see below):



When comparing the two it is not enough to just take the name into account as Batch Names are not considered to be Unique. It is not possible to have two active batches on the DCS with the same name, but it is always possible for a Batch to have been completed or aborted and another batch with the same name registered before ABDC notices.

Note this is more likely to occur on start up after a shutdown but if the system was very slow or batches very large it would be possible at any time.

The reservation date is therefore used to ensure that any batch already recorded in EQB and a batch on the OPCBatchIDList is the same.

Reading reservation dates could cause errors if the batch stored in the AutoBDCBatchList has been deleted from the DCS between scans. These will all have an event ID of 12048.

There are three possible outcomes of the comparisons made during Batch list processing.

1. A batch is on the OPCBatchIDList but not on the AutoBDCBatchList. This is a new batch and EQB will perform Open Batch Processing.
2. A batch is on both the OPCBatchIDList and on the AutoBDCBatchList. This will only cause ABDC to do anything if it occurs during start-up as we already know about this batch. On start-up batches and unit recipes, which have not been completed will be registered with the OPC Server for updates.
3. A batch is on the AutoBDCBatchList but not on the OPCBatchIDList. This batch has been deleted from the Control system. ABDC will mark the batch as Deleted and will ignore this batch from this point on.

Note there have been instances particularly when using version of Exaopc/Batch prior to release 3.74 that batches are marked as deleted when they should not have been. ABDC ignore all batches on the OPCBatchList that have already been marked as deleted. It currently does not expect them to come back on to the list once they have been marked as deleted.

A partial fix for this issue was included in the Exaopc/Batch patch R3.73.03. This fix was incorporated into all release from R3.74 onwards.

2. Equipment Reconciliation

This activity continues on a regular cycle (see section 5.5.2). This is in order to ensure that the equipment hierarchy stored in EQB matches that on the control system. Any deleted equipment will be deregistered, and any new equipment register for status changes via the Exaopc/Batch server.

In theory, there is a mechanism to record equipment changes but currently in all cases, this will be recorded as new equipment and the old one deleted.

Note if Batch processing is still in progress, then Equipment Reconciliation will not be performed. This will be logged if ABDC logging is enabled.

5.6.2.2 Event drive processes

1. OPC Callback processing

ABDC registered all active batches, unit recipes and equipment on a one second update rate. Monitoring for changes in ExecutionState. This state change is referred to as a Mode State Change in CENTUM CS3000 and CENTUM VP. These can be monitored by looking at the events recorded in the Mode Status Change tables in the Exaquantum Historian.

A report (Batch Status Report v39.xlsm) is available from the Useful Tools/Scripts Section on the Affiliate Portal which will collect all the Batch recorded over a period and compare this to event stored in the Database. This is a useful check to see whether ABDC is missing data. This is based on the Batch Report Template but due to the amount of processing required will need to be run manually and will take some time. There is a notes Worksheet included in the Workbook showing what is required in order to generate the report.

There are three types of call back which are handled by different code within the call back thread

1. Batch Status Change
2. Unit Recipe Status Change
3. Equipment Status Change

All status changes will cause an entry in the appropriate Execution Status History Table (BatchExecStatusHistory(BatchStatusReportView), BatchRPEExecStatusHistory(UnitRecipeStatusReportView), EquipmentExecStatusHistory (No View available)).

If the new status is recorded as a Hold (as configured on the Batch States tab of the System Configuration tool) this will be added to the current Hold count. The time a batch/unit recipe is in hold is also calculated. The % time in hold is currently recorded in whole numbers so will show as 0% until the hold time reaches 1% and then remain 1% until the hold time reaches 2% etc.

If however, the new status is COMPLETED or an ABORT then unit/batch end processing will initiate.

Once a batch/unit recipe has been marked as COMPLETED or ABORTED the batch/unit recipe will be deregistered from the Exaopc Server.

2. Master Recipe change

The file watchers will raise an event whenever a new or modified master recipe is downloaded. This will cause the Master Recipe Collection Thread to copy the Master Recipe data from the location pointed to by the Recipe Path, configured in the System Configuration tool to the service user's temp folder. It will then parse this information and store it in the Database. If the Master Recipe already exists than this will be updated, if it is new, then an entry will be made in the MasterRecipeNamespace table and a New entry made.

5.6.3 Batch Open Processing

Batch Open Processing is the name given within the EQB Product for the necessary processing required when a batch is first encountered on the OPCBatchIDList.

The actual state a batch is in when EQB first encounters depends on a number of factors including

- Plant Operation
- EQB system performance
- EQB Shutdown

It is quite common that a batch moves very quickly between the Reserved State and the Active State. In this case, it is unlikely that EQB will ever see a batch in the Reserved State seeing it for the first time in the Active Status.

There is also a short live LOG state prior to the COMPLETED state being set. During the state the control system copies the final information from the Field Control station. Exaquantum/Batch may not record this status depending on how long the transfer takes and how busy the system is in general.

When the EQB system restarts after a shutdown, new batches may well have been running for some time whilst the system was down. These could have already been completed or be in a different state from Active.

The Batch State changes are not stored locally on the Exaopc/Batch Server nor the DCS, so it is not possible for ABDC to record any state changes that occur whilst it is shutdown. It can only record the current state batches are in when it starts up and any changes that occur when it is running.

It is therefore not necessary a product problem that status information is missing.

Open Batch Processing will also cause ABDC to gather the Formula Item Data from the DCS common blocks associates with the Batch. Not all the elements defined in the Common Block will be used by the Batch, but ABDC has no way of telling what is or is not used and therefore gathers every element contained within the configured Common Blocks.

It is possible to create Custom Views using the Formula Selection View Manager, which makes it easier to use Formula Item Data in batch reports (see reports section).

Batch Open will also cause all configured unit recipe information to be collected.

Finally Open Batch Processing registered with the Exaopc/Batch Server for changes in the ExecutionState property of the Batch and all configured Unit Recipes in order that ABDC can receive the status change events.

5.6.4 Batch and Unit Recipe End

When ABDC receives via OPC Callback an ExecutionState of COMPLETED or ABORTED at the Batch level, the system will reread all the properties and Formula Items it read when the Batch was opened.

When ABDC receives via OPC Callback an ExecutionState of COMPLETED or ABORTED at the Unit Recipe level, the system will reread the properties and Formula Items associated with that Unit Recipe in the Master Recipe.

It will also update Batch/Unit Recipe Metrics and schedule any configured Batch or Unit Recipe End reports.

It will also deregister the Batch/Unit Recipe from the Exaopc Server.

Chapter 6 Enhanced Data Collection Logging

Both ABDC and CBDC have enhance logging capabilities, which can be switched on. They are not switched on by default.

Enhanced logging can use up a lot of disk space very quickly so normally not all switches will be enabled every time or for extended period of time.

The extended logging mechanism writes debug output to a file. A mechanism was developed to make managing of the log files easier. However, this was not a formal part of the product until R3.10.10.

The necessary files for systems running R3.10 or earlier can be obtained from the Useful Tools/Scripts Section on the Affiliate Portal.

Note there are two version of the config files one for R3.10 and one for all earlier versions so it is important to know on which version you are going to deploy the logging.

The mechanism initially logs to a file called TEMP_FLUSH_FILE.txt. This file must not be opened while ABDC is logging data. An attempt to open this file whilst data is being logged may lock up the service or cause it to crash.

As soon as a write would take the log file over the maximum size specified in the config file, the TEMP_FLUSH_FILE.txt file is renamed and a new TEMP_FLUSH_FILE.txt opened. The name of the saved log file is made up of the Date (dd_mm_yyyy) and Time (HH_mm_ss) followed by a Globally Unique Identifier (GUID).

The amount of diskspace used by trace output log files can become large very quickly. Only enable logging for a short time while diagnosing a problem. When logging is no longer required either rename or remove your QBAutoBDC.exe.config file and restart the ABDC service. See section 6.3 for information regarding managing log file.

6.1 Automatic Batch Data Collection Logging Prior to R3.10.10

Obtain the **QBAutoBDC.exe.config** and **YMX.utilities.dll** files from Useful Tools/Scripts Section on the Affiliate Portal. These need to be copied into the Data Collection Components folder under the folder where Exaquantum/Batch has been installed.

An example of the QBAutoBDC.exe.config file is provided in section 6.1.1.

The file consists of a series of switches and a listener's section at the end inside the <trace ... /trace> elements.

In this section the trace output file location and maximum size of each log file may be specified with the initializeData attribute. In the example this is configured as:

```
"C:\Program Files\Yokogawa\Data Collection Components\Logs\,102400"
```

Note

The Settings above are for R2.50.40 or earlier running on a 32-Bit OS and will need to be changed for R3.10 as below

```
"C:\Program Files (x86)\Yokogawa\Exaquantum Batch\Data Collection Components\Logs\,102400"
```

The number specified at the end of the line is the maximum size of the log file is in bytes. In this example each log file will be about 1MB in size.

This can be increased but should not be too big as the files will become difficult to manage if they need to be sent to support.

If this is too small, then there will be too many log files which also becomes unmanageable.

If you have installed Exaquantum in the default folder and you have enough free space the log file location can be left as the default. If Exaquantum/Batch has been installed in a different location or if the space on the C drive is limited this will need to be changed. The log file folder must exist before switching on logging otherwise the ABDC service will not start.

To configure which information is to be logged a number of switches have been configured. These switches for the top part of the configuration file. Each switch has a name and a value.

The value of each switch can be 0, meaning logging is disabled or 4, meaning logging is enabled. See section 0.

Any time the configuration file is modified, the ABDC service must be stopped and restarted for the change to take effect.

6.1.1 QBAutoBDC.exe.config example

```
<configuration>

  <runtime>
    <generatePublisherEvidence enabled="false"/>
  </runtime>

  <system.diagnostics>
    <switches>
      <!--All switches can set to 4 (set to 0 for no
      logging) giving the highest level of tracing BEWARE if
      tracing is activated there is no tracking of the output
      log size -->
      <!-- Please note the default setting for the log
      file below - makes sure that the path exists and you
      have enough(??) room-->
      <!-- Setting autoflush to true will result in
      real-time logging to file but vastly reduced performance
      -->

      <!--Equipment Recon Transaction switch gives a
      high level of the equipment build process -->
      <add name="equipmentReconTransaction" value="0" />

      <!--OPC Physical model switch gives a mid-level
      view of the equipment browse - should be used in
      conjunction with the opc server trace for highest
      clarity -->
      <add name="opcPhysicalModel" value="0" />

      <!--OPC Batch model switch gives a mid-level view
      of the batch hierarchy browse - should be used in
```

```
conjunction with the opc server trace for highest
clarity -->
    <add name="opcBatchModel" value="0" />

    <!--Gives a mid-level view of calls shared by
batch and equipment browses-->
    <add name="opcModel" value="0" />

    <!--Batch Item switch provides detailed logging of
the batch insert process -->
    <add name="batchItem" value="0" />

    <!-- Update Transactions switch gives a high level
view of the updates process -->
    <add name="updateTransaction" value="4" />

    <!-- Poll switch gives a continuous trace of
polling-->
    <add name="poll" value="4" />

    <!-- Metrics -->
    <add name="metrics" value="4" />

    <!-- MRC -->
    <add name="MRCTraceSwitch" value="0" />

    <!-- OPCGroupListener switch outputs the events
instigated relating to the OPC
notifications/subscriptions etc-->
    <add name="opcGroupListener" value="0" />
    <add name="opcGroupListenerMonitor" value="0" />
</switches>

<trace autoflush="false" indentsize="4">
    <listeners>
        <add name="customListener"
type="YMX.Utilities.TraceLogger,YMX.Utilities"
initializeData="C:\Program Files\Yokogawa\Data Collection
Components\Logs\,1024000" />
    </listeners>
</trace>
</system.diagnostics>
</configuration>
```

6.1.2 Logging switches

Some logging is not controlled by the switches and therefore cannot be turned off.

The order in the table is the order they are listed in the example in section 6.1.1 above.

Switch	Logging
equipmentReconTransaction	Controls logging of the beginning and end of equipment polls to the Windows event log as informational messages.
opcPhysicalModel	Controls logging of OPC Server browse calls for equipment data. This shows ABDC walking through each of the items in the equipment hierarchy as is compares the OPC hierarchy with that stored in the QBatch database.
opcBatchModel	Controls the logging of detailed data collection activities when a new batch is collected to the log file.
opcModel	Gives a mid-level view of calls shared by batch and equipment browses. Sometime called the OPC Trace.
batchItem	This controls whether the batch data inserts are logged. It will normally be enabled if batch data collection is being investigated.
updateTransaction	An update Transaction occurs when ever ABDC receives an OPC notification. Enabling this switch provides a high-level view of this process.
poll	Controls logging of new batch detection polling activities to the log file. This shows how decisions are made by ABDC to create, update or delete interest in batches from EXAOPC.

Switch	Logging
metrics	<p>Controls logging of timing information in the Windows event log as informational messages as each batch is collected.</p> <p>A typical message in the event log is...</p> <p>Message: Batch Collection Performance Metrics</p> <p>Additional Info:</p> <p>Time to collect reference data: 0.0156251 Number of Batches collected: 1 Batches Processed: 05-00043175 Time taken to collect batches: 13.3125852 Time taken to add new subscriptions to OPC Server: 0.0468753</p> <p>This indicates that it took 13.3 seconds to collect batch 05-00043175.</p>
MRCTraceSwitch	<p>Controls logging of master receipt collection activities to the log file.</p>
opcGroupListener	<p>The OPC Group Listener is the part of ABDC that handles the registration and handling for OPC call backs. These are referred to as Subscriptions and Notifications respectively.</p>
opcGroupListenerMonitor	<p>This provides more detailed breakdown of the OPC Subscriptions and Notifications.</p>

6.2 Automatic Batch Data Collection Logging R3.10.10 or later

ABDC logging is controlled by a file called **QBAutoBDC.exe.config** installed in the following folder under where the software was installed.

```
Exaquantum Batch\Data Collection Components
```

This file is similar to that shown in section 6.1.1 and consists of three sections.

1. The runtime section has nothing actually to do with logging and should never be changed. (See section 6.2.4)
2. The switches section which switches on or off logging for different area of the data collection process individual (see section 6.2.2).
3. The trace section controls where the logging file will be created and the maximum size of an individual log file (See section 6.2.3).

6.2.1 Enabling and Managing Logging

The logging mechanism is disabled by default. To enable logging, it is necessary to comment out the `<clear/>` tag in the trace section of the file (see section 6.2.3 for more details regarding this section).

Note: It can also just be deleted but in this case would need to be created again when logging is no longer required.

To comment out a tag you enclose in a start and end comment tag. When commented out this tag would look like that below.

```
<!-- <clear/> -->
```

The start and end comment tags can then just be removed when logging is no longer required.

Even with logging enabled however only a limited amount of information will be logged by default.

The amount of information being logged is control using switches (see section 6.1.2 and 6.2.4 for information regarding the available switches).

Each switch has a name and a value.

The value of each switch can be 0, meaning logging is disabled or 4 meaning logging is enabled. All switches have a value of 0 by default.

When logging is enabled the mechanism initial logs to a file called `TEMP_FLUSH_FILE.txt`.

Note: This file should **never be opened** whilst ABDC is configured to log data.

As soon as a write would take the log file over the maximum size this file is renamed and a new `TEMP_FLUSH_FILE.txt` opened.

The name of the saved log file is made up of the Date (`dd_mm_yyyy`) and Time (`HH_mm_ss`) followed by a Globally Unique Identifier (GUID).

Any time the configuration file is modified the ABDC service must be stopped and restarted for the change to take effect.

If full logging is enabled a lot of information will be logged which will mean that available disk space will quickly fill up unless the logging files are managed.

We only recommend having logging enabled for as short a time as possible in order to capture the problem under investigation.

In the case of an investigation that takes a longer time then it is recommended that a windows task be created to remove the oldest log files regularly (see section 6.3 for details).

6.2.2 Logging switches

All the switches supported by R3.10 and earlier are still supported on the later releases however there were improvements to logging implemented in R3.10.10 and more switches have been added.

The following table describes those switches which were added in R3.10.10.

Please see section 6.1.2 for details of the other supported switches.

It should be noted that not all the switches will be required to be enabled for every issue being investigated. It is better to selectively switch on parts of the logging so that unnecessary information does not cause difficulties during analysis.

Switch	Logging
batchList	This will cause the Batch List processing to be logged in full. As this can occur once every 10 seconds this will result in an extremely large amount of data being logged. Unless there is a problem with the logging of new batches or the marking of batches that have been delete from the DCS as deleted this switch should not be enabled.
batchReferenceData	This logs information regarding the scheduling of Batch Reports at the end of Batches and Unit Recipes.
createBatch	Logs records when a batch which is not known to ABDC has been found on the Batch List.
createBatchTransaction	This causes ABDC to output the duration of the of batch data set creation without timestamp. Unit Recipe Active Transaction duration also added without timestamp. This also causes the Batch End Transaction duration to be logged.
opcModelGetOPCItemProperties	Lists every single OPC Item Property read It has a timestamp and a BatchID. The Property ID is specified but not the values read. Transactions Timings are also listed.

Switch	Logging
Poll	Note this is a different switch to poll with a small p. This causes ABDC to when a poll starts and ends.
service1	<p>This controls whether ABDC logs service level information during startup.</p> <p>It is useful to capture instances when communication is recovered after a network disconnection between the OPC Server and the Exaquantum Server. Referred to as an internal start.</p> <p>If includes service starts, internal starts, OPC Monitor start, MRManage (Master Recipe Management thread) start, OPC Polling start</p>
serviceState	Causes ABDC to log timings for the updates of the AutoBDCBatchList table in the QBatch database. This is known as the Active Batch List.

6.2.3 The Trace Section

The trace section defines the output file location and maximum size of the log files.

It also governs whether logging is enabled or disabled.

The location and max size of the log files are controlled by the InitializeData attribute of the add custom listener tag.

By default, this is configured as:

```
"C:\Program Files (x86)\Yokogawa\Exaquantum Batch\Data Collection Components\Logs\,1024000"
```

The maximum size of the log file is in bytes. By default, the system will create logs files with a maximum size of 1 MB.

Note If any log entry being written by ABDC will cause the configured size to be exceeded the log file will be closed and a new one started. This means that in general the actual size of a closed log files will differ.

This can be increased but should not be too big as the files will become difficult to manage if they need to be sent to support.

If this is too small, then there will be too many log files which also becomes unmanageable.

If you have installed Exaquantum in the default folder and you have enough free space the log file location can be left however if Exaquantum Batch has been installed in a different location or if the space on the C drive is limited, then this will need to be changed.

The log file folder must exist before switching on logging otherwise the ABDC service will not start.

6.2.4 Runtime section configuration

This section is not relevant to the logging mechanism but is used to prevent ABDC from attempting to connect to the Internet. By default, certain network activity causes windows to make connections to the Internet to verify the publisher's identity. When a machine is not on the internet or if the internet access is slow then this check can cause the service to timeout. To prevent this the mechanism is always disabled. It should not be changed.

6.3 Managing the Disk Space used by Long Term Logging

Normally logging will only be required for a short period of time. Usually, to capture data for a problem that has been encountered. However, there are times when a problem is difficult to reproduce or only occurs at infrequent intervals.

Under these circumstances it may be necessary to enable logging for a longer period of time which means that it is necessary to manage the space used.

The best way to do this is to create a command file and execute this from a Windows Task.

The command file only needs a single line like that below

```
forfiles -P "C:\Program Files (x86)\Yokogawa\Exaquantum Batch\Data  
Collection Components\Logs" -S -M *.* -D -7 -C "cmd /c del /Q /S  
/F @Path >> %temp%\dellog.txt 2>&1"
```

This assumes that the log files are stored in the default log file.

This will delete all files in the log folder which have not been modified in the last seven days. To change the number of days, change the number after the -D switch.

The clause

```
>> %temp%\dellog.txt 2>&1
```

Provides a way of logging any messages or errors raised by the delete to be logged to a file in the user's temp folder.

This will need to be run by a user who has full control of the logging folder.

Chapter 7 Troubleshooting the Batch Reporting Mechanism

When troubleshooting the Reporting Mechanism is important to separate actual product issue and issues caused by user defined report templates.

There is always a difficulty in this area, what is support and what is consultancy. It may be a simply a matter of looking at the report to spot areas that will cause problems and to make suggestions that achieve the same result but would not cause the problem. It may however be that it is not possible to achieve what the customer wishes to do using the reporting mechanism and another way would need to be found.

Creating reports for a customer is not something that should be done under the AMC but guidance as to how the customer can create one is. If the customer wishes Yokogawa to create reports, then this would be a chargeable service.

Like all troubleshooting the Event Viewer is the first place to check to see whether there are any relevant events logged.

When troubleshooting the Batch Reporting Mechanism, there are a number of checks that can be made.

1. Does the template behave correctly when opened read only from the Report Template Manager? Use the View option from the pop-up menu, enter some suitable values into the parameter sheet and see if the report runs as expected.

Note report should be tested before they are approved but it is always worth checking. It is also very useful if the problem is only caused at specific times or with specific data.

The parameter sheet may actually be hidden and would need to be unhidden in order to perform this test.

The reason for using the view option means that any changes made during the tests will not be uploaded to the database by mistake.

It is worth confirming that the report is actually configured to run on the specified event (batch or unit recipe end) or at the specified time. It is very possible that the configuration was not changed when say a new master recipe was created.

2. It is possible to extract the latest version of the template from the Report Template Manager and then run it externally.
3. It is possible to schedule all reports manually via BatchWeb.

4. Periodically scheduled reports can also be scheduled at any time by manually running the appropriate SQL Server Job.

Note, all SQL Server jobs associated with Exaquantum/Batch Reporting are called IcecapReportsⁿ where ⁿ is the UId of a row in the ReportTimeSchedule table in the QBatch Database.

Reviewing the history of these jobs may also be helpful to see if periodical scheduled reports are actually being scheduled.

Obviously, this assumes that the jobs have been created correctly and that is therefore something that needs to be confirmed.

In some cases, it will be necessary to get a copy of the QBatch database. In most, although not all cases data used in reports will come from this database

The QBatch database can be very large and therefore difficult to send via email. The size depends on the number of unarchived Reports and Formula Item Data being stored.

7.1 Known Report Manager Problems

The following text has been extracted from the Batch Help for ease of access. When talking with customers this information can be pointed out to them

7.1.1 Use of the Exaquantum/Explorer Excel Add-In in Batch Reports

Use of the Exaquantum/Explorer Excel Add-in in Batch Reports is not recommended. Another way of obtaining the same data for example by using the Batch Trend mechanism, the Batch Query Add-in, Exaquantum Query Wizard (Exaquantum/Explorer User's Manual Volume 4 Chapter 6) or Exaquantum API should be used wherever possible. It does require some extra configuration including a macro in some cases, but it is less likely to cause a problem.

For examples of accessing process data, in Batch reports see the three Batch Trend Data report examples supplied in the Advanced Reports group of the Report Manger and the Exaquantum API Reference Manual.

Although not recommended if you wish to use the Exaquantum/Explorer Excel Add-in in your reports than there are three things that you need to bear in mind.

1. The Exaquantum/Batch Report Manager runs as the Exaquantum Service User, and this means that the Excel profile for this user must include the Exaquantum/Explorer Excel Add-in order for reports to function correctly.

This is not the case with the Exaquantum/Batch Add-in or Exaquantum Query Add-in, which use SQL Queries rather than Excel formulas and only need to be present when the report template is being configured.

2. The Exaquantum/Explorer Excel Add-in although simple and easy to use was not designed to be used within Exaquantum/Batch Reports.

It was designed to be used interactively and completes asynchronously and there is no way that the Report Manager can know when all the data has been received.

If the Report Rendering completes prior to all the data retrieved by the Exaquantum/Explorer Excel Add-in, then some cells will not be populated with data and will contain the #REGISTER status indicator.

If this is the case, then it may be necessary to increase the time that a report waits for queries to complete.

3. Due to the way that the Report Manager works the data update mechanism of the Exaquantum/Explorer Excel Add-in is switched off by default.

For more detailed information/instructions, please refer to the following Knowledge Base Article contained on the Affiliate Portal.

KB-0059-22 *Using the Exaquantum Explorer Excel Add-in within Batch Reports* (<https://ymx.yokogawa.com/content/S638003946480007925/KB-0059-22%20Using%20the%20ExaquantumExplorer%20Excel%20Add-in%20within%20Batch%20Reports.pdf>)

7.1.2 Report Time Out

It is impossible for the Report Manager to know exactly when a report is complete. To ensure that code loops and other things within the report template do not cause the Report Manager to Hang indefinitely it is necessary to have a time out mechanism which will abort the processing should it take longer than expected.

The time allowed for rendering the report in Excel is controlled by a Report Manager option. To change this, it is necessary to modify the xlsRenderTimeout field of the ReportInfo table manually using the SQL Server Management Studio. The value is in milliseconds and by default is configured to be 120000 (2 minutes).

If a report takes longer than this to run it will be timed out.

If a report does time out the report manager will re-try to create the report up to 3 times before removing it from the queue.

7.1.3 Reports not created and Excel processes remain in Task Manager

Because Exaquantum/Batch is running Excel in the background with no interactive user context it is possible for Excel to generate pop-up dialogs or cause the Microsoft Error Reporting Mechanism to be invoked. Although everything possible has been done to minimize this it is not possible to eliminate it completely. If reports are not being created, then the task manager should be used to check for Excel.exe running as the Exaquantum Service user and/or DW20.exe processes existing on the server. If they do, then these should be removed, and the Report Manager Service restarted.

The Microsoft Error Reporting Mechanism be disabled (see the section 3.3.3 for details).

If running In Legacy model it is important that Excel be run whilst logged in as the Exaquantum Service User prior to the Report Service being started to ensure that the required initial Excel configuration is performed, and the Office profile is created for that user.

See also section 7.1.5 below.

It is also worth noting that even when running in Standard Model Security there are times when it is necessary to log into the service user account during commissioning in order to configure certain things such as the default printer or when attempting to diagnose a possible fault.

Instructions on how to log in to this account are provided in the “Setting **Default Printer** in Standard Security” in the Batch on-line help and also in section 2.2 of the Knowledge Base

article KB-0059-22 Using the Exaquantum/Explorer Excel Add-in within Batch Reports (<https://ymx.yokogawa.com/content/S638003946480007925/KB-0059-22%20Using%20the%20ExaquantumExplorer%20Excel%20Add-in%20within%20Batch%20Reports.pdf>)

7.1.4 Not all required data is available in the report

During the report generation process the Report Manager will wait for macros and other mechanisms to complete. After this time has elapsed the report will be completed regardless as to whether all the data has been received or not.

By default, the Report Manager will wait for about 7 seconds. This includes a fixed wait of 2 seconds plus a configurable wait that by default is set to 5 seconds

If you have queries that take a very long time to complete, or you are using the QData function then you can increase the configurable wait by creating a new String (REG_SZ) registry value
HKEY_LOCAL_MACHINE\SOFTWARE\YOKOGAWA\Iccap\ReportCreationTime and assigning this the required value in milliseconds.

Care is required when changing this as if the wait causes the time to render the report to exceed the value configured in xlsRenderTimeout the report could be timed out before it completes.

Note: When using SQL queries in reports there is a trick that can be used to further improve the Report Managers rendering functionality. Before the Creation Time Out is applied however, the Report Manager will automatically refresh any SQL Queries defined in the Query Table of the template where the name is of the form EQBQUERY_n. Where n is a number starting at 1. These will be refreshed in numerical order and synchronously. If all the queries in the template are renamed to this format, then providing the xlsRenderTimeout is not exceeded all the queries should have completed prior to report being finalized.

7.1.5 Excel does not close correctly after report completion

In some circumstances when the Exaquantum/Explorer Excel Add-In is included in the Exaquantum Service User Profile Excel.exe process remains in the process list even after the report has been generated.

This will not log any event in the event log, but eventually insufficient resources will be available in order to run reports and report generation will fail.

This will result in an error being raised in the Application Event log by the RunReport method of the modRptRender module of the QRptRender executable. The message will be similar to that below.

2015/05/30 02:01:34

QRptRender.modRptRender.Error In Main Proc Body (30/May/2015 02:01:34)
RunReport [11]

0529-2

Updating the metadata

QueueUId [48235], File stem was
[C:\Users\QUANTU~1\AppData\Local\Temp\rad351E4]

Error Number : 1004

Last Dll Error : 0

Error Description : Method'~' of object '~' failed

Error Source : QRptRender

In order to fix this problem all excel.exe processes started by the Exaquantum Service User must be manually ended using the Windows Task Manager.

7.2 Some reports will fail to execute as expected when using Excel 2016

During the testing of the R3.10 release, it was found that some of the supplied templates no longer operated as expected when the version of Excel used was Excel 2016. This turned out to be the way that Query Tables are updated which has been changed in Excel 2016.

By default, the External Data Properties are set such that if required individual cells are inserted for new data and unused cells are deleted. This is not a recommended option for Exaquantum/Batch report templates but as it is the default setting was used in some of the default reports. If using Excel 2016 or later however using this option which remains the default will cause reports to fail.

This issue may affect all reports that have been created on previous versions of Excel and then the office version upgraded.

It is therefore important that any existing template be checked after the upgrade. See item 9 of the Report Template Creation Guidelines topic in the Exaquantum/Batch Online Help for details).

7.3 Parameters and the Scheduling Mechanism

There are two scheduling mechanism used by Exaquantum Batch: Batch and Periodical.

Batch scheduling is performed by ABDC and CBDC at Batch and/or Unit Recipe End. When the services sees that a batch/unit recipe has ended the code will check to see if any reports have been configured and will place an entry on the ReportQueue (a table in QBatch database). It will schedule every report that is configured for that batch/unit recipe.

Note this does not start the report processing. This will be done by the Exaquantum/Batch Report Server Service.

Batch and Unit Recipe Ends are indicated in ABDC by receipt of either a COMPLETED or ABORTED status. For CBDC a similar thing will occur when the EndTime property is used in a trigger.

Periodic Scheduling is performed by SQL Server Agent jobs. There will be one job per configured period. (See note under item 4 in the previous section). When these jobs run, they will add an entry in the report queue for each report template configured to use that particular period.

Configuration for both Batch and Periodic Scheduling is performed with the Report Template Manager application. Accessed via the right mouse click menu from any Template Name in the tree view.

It is also accessible from the Template Menu when a template is selected.

If you right-click on a particular version of a template a different pop-up menu will be displayed.

7.4 Turning on Enhanced Report Manager Logging

Unlike the data collection service enhance logging in the report manager is not via a configuration file but just a single registry value.

In order to enable logging for the Exaquantum Batch Report Service, it is necessary to add the following DWORD registry key and set the value to 1.

HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\YOKOGAWA\cecap\ReportDebugFlg

Setting it to 0 or deleting the key will switch logging off.

When logging is enabled, more information is written to the event log than when it is not. The amount of information logged depends on the version of Exaquantum/Batch being used. Logging was enhanced in R3.10.10.

Chapter 8 Exaquantum/Batch Security

Security in Exaquantum/Batch system is vitally important, and care needs to be taken to not allow the customer to feel that anything that you may be doing will compromise that security.

This is particularly the case with customer's who plant is controlled under 21 CFR Part 11 regulations.

There is a section in the help file "Use of Exaquantum/Batch in Applications Regulated by FDA 21 CFR Part 11", which explains how Exaquantum/Batch may be used in a plant where FDA 21 CFR Part 11 regulations are enforced.

It is therefore important to know whether this is the case or not. This is a separately license feature of EQB and therefore checking the license is good place to start. It is however worth checking. A question like "I understand that the plant is controlled under 21 CFR Part 11 regulations is this correct?" is always a good one to ask in an initial response email.

As well as 21 CFR Part 11 support EQB provides a number of security groups that limit what any particular user can do.

The following sections are taken from the Batch Help and are added here for completeness.

8.1 User Groups

The table below shows the available Windows Groups to which users may be added and the privileges in Exaquantum/Batch that belonging to the Group provides.

8.1.1 Data and Web Server Groups

Windows Group (Standard)	Windows group (Legacy)	Exaquantum/Batch privilege
QTM_DATA_READ	QUserGroup	Gives access to use BatchWeb. All users should be members of this group.
QTM_MAINTENANCE	QAdministratorGroup	Gives administration rights for BatchWeb

8.1.2 Web Server Only Groups

Windows Group (Standard)	Windows group (Legacy)	Exaquantum/Batch privilege
QTB_FORMULAPARAMMOD	QBFormulaParamMod	Modify existing parameter formula item values in BatchWeb. (Electronic signature may be required). See also 'Access rights to modify Formula Items' Help topic.

Windows Group (Standard)	Windows group (Legacy)	Exaquantum/Batch privilege
QTB_FORMULARESULTMOD	QBFormulaResultMod	Modify existing result formula item values in BatchWeb. (Electronic signature may be required). See also 'Access rights to modify Formula Items' Help Topic
QTB_FORMULAALLWRITE	QBFormulaAllWritable	Override individual lockouts to change formula item values in BatchWeb. (Electronic signature may be required). See also 'Access rights to modify Formula Items' Help Topic
QTB_PERFRATINGMODIFY	QBPerfRatingModify	Modify performance rating values in BatchWeb. (Electronic signature may be required)
QTB_TRENDTMPLADMIN	QBTrendTplAdmin	Create, modify and delete batch trend templates in BatchWeb.
QTB_REPORTRUN	QBReportRun	Run reports in BatchWeb.
QTB_REPORTTMPLAPPR	QBReportTplApprove	Approve report templates in Report Template Manager. Only required on a Data or Combined Server.
QTB_REPORTAPPROVE	QBReportApprove	Approve reports in the report archive. (Electronic signature may be required).
QTB_REPORTCHECKOUT	QBReportCheckOut	Check out/in Excel based report files for modification in BatchWeb.

8.1.3 Extra groups created when using Domain Standard Security

When using Domain Standard Security the following extra groups are created on the Data and/or Web Server.

Windows Group	Exaquantum/Batch privilege
EXA_MAINTENANCE_LCL	The privilege is the same as EXA_MAINTENANCE, and this is used as an emergency group when domain controller is not available. All user accounts that belong to this group must belong to the local Administrator group. This group is only created in the Standard Domain model.

QTM_MAINTENANCE_LCL	Allows full access to all features - Overrides all other security mechanism - Allows local users to access Exaquantum/Batch features even when the domain controller is unavailable.
QTM_OPC_LCL	Allows access for local users to use the Exaquantum OPC Server - Exaquantum/Batch does not require users to be in this group.

For more details in regard to the Exaquantum Groups, see the Exaquantum Installation Manual

8.2 Domain or local accounts

There are three ways of allocating users to the specific Exaquantum/Batch user groups listed above:

1. **Local user accounts** - a user account on the local PC is added to a local user group (Server in Workgroup or Domain) (Standard Standalone and Legacy Model security only)
2. **Domain user accounts** - a user with an account on the appropriate domain is added to a local user group (Server must be in the Domain) (Standard Standalone and Legacy model security only) or Domain user groups (Standard Domain model security only).
3. **Domain groups** - a user group on the appropriate domain is added to a local user group (Server must be in the Domain) (Standard Standalone and Legacy model security only).

NOTE: It is possible to configure local users to have access to Exaquantum/Batch data, tools and utilities when using Domain management, but such users will have full access and it is therefore only recommended for users that need administrator rights. This mechanism gives access to users even if the Domain Controller is not available (See table above).

8.3 Adding Users

When a new user accesses BatchWeb for the first time (<http://<web server>:<portno>/batchweb/>), as long as they are members of the QTM_DATA_READ (Standard) or QUserGroup (Legacy) Group, they will automatically be added as a new BatchWeb User. If the number of users recorded in the FrameworkSchema database exceeds the number of licensed users a warning banner will appear in the banner of the BatchWeb Framework.

Note user licensing is the only licensing mechanism used specifically by EQB. If all users were to use the same account, no matter where they logged in from EQB would only see one user.

To view and manager currently registered users, use the Web Admin tool.

8.4 Adding Users to User Groups

Use either the Computer Management tool on the Data and/or Web Server to add local or domain users into local groups (Standard Standalone or Legacy Module Security) or Active Directory Users and Computers (Standard Domain).

8.5 Editing Users Privileges

User privileges are set by controlling the User Groups to which they belong. Editing a user's privileges is therefore a case of adding them to or removing them from the appropriate groups.

Remember that it is necessary to log out and log in again if the user changes their own rights or if the rights are changed for any user who is still logged in at the time.

8.6 Deleting Users

The Web Administration Tool provided with Exaquantum/Web can be used to delete users.

Chapter 9 Troubleshooting Batch Web

Troubleshooting web issues is a very difficult thing to do. There are not a lot of tools available in order to diagnose any problems.

It is possible to switch on Development mode in the web browser by using F12. This can be used to investigate performance issues for example.

There is a Web Server Manager client application which does provide some diagnostics in regard to connection to the Web Server

It should be noted that for the most part BatchWeb is a pure web application. The client posts requests to the server, which then gathers the data and sends a completed web page to the client.

There is, therefore, no dynamic elements to BatchWeb. It will always be necessary to refresh the web page in order to see new data.

There is also an annoying issue which although something which was designed as a security measure, does not function intuitively. If a web page is left open for any length of time a timeout will expire. This was designed to stop people looking at the data if the user should go away from the screen. Unfortunately, what actually happens is that when the user tries to navigate away for the current page or refresh the current page it will first show the timeout screen and will require the user to click the OK button to refresh the framework.

9.1 The ASP.Net worker process

BatchWeb runs inside the ASP.Net worker process that can be located in the windows task manager on the Web Server as 'aspnet_wp.exe'.

Administrators may need to kill this process if problems are experienced such as:

- aspnet_wp.exe uses an excessive amount of memory
- aspnet_wp.exe is holding on to a resource such as a database connection

Windows Task Manager can be used to kill this process if problems are experienced with BatchWeb.

When aspnet_wp.exe is killed the following will happen:

1. Any currently active BatchWeb sessions will get a "Server Application Unavailable" error and will need to restart BatchWeb.
2. A new copy of aspnet_wp.exe is automatically started up and starts accepting requests for BatchWeb users.

Chapter 10 – Case Studies

In 2022 there were 47 calls that were logged against the Exaquantum/Batch Products. Some of these were just product enquiries and “how to” type calls and required no actual diagnostic exercise. There was one call that was accidentally logged twice and some, which were, actually not related to Exaquantum/Batch directly and therefore out of the scope of this technical note.

The table lists all the calls that actually needed to be investigated.

Case Title	Case Number	Reason for Failure	Troubleshooting comments
Batch services not starting	YMX-07687	This was a problem with ABDC directly but a problem with Active Directory. A new machine was added to a domain with the same name as an existing one without the existing one being removed.	An issue like this is actually quite hard to troubleshoot. It was only the fact that it is known that security ID's do cause problems. Machines with the same name are not the same machine as far as windows is concerned otherwise it would be much easier to hack systems.
What does the OFFLINE Status mean	YMX-07705	This was not a failure. The system was behaving as expected.	This will not be an issue with EQB but it may well be worth checking things like was there a batch switch over and what version of Exaopc/Batch are they using. See section 5.3 for more details.
MEXICHEM: Upgrade EXAQ Batch Doubts	YMX-07744	No equipment configured in DCS	See section 5.5.2
Error in the process QBAutoBDC.exe associated with a timeout	YMX-07830	Network setting service not starting - Reinstalled fixed problem	The network setting service is used by EQB in order to improve the security. Access to data is via an account called icecap, which is a SQL Server account. The password for this is encrypted and this is decoded by the network settings service. All access needs to go via this service. If this is not running then the services will not start correctly and user access will be denied.
Support for Multi-Project	YMX-07838	Product Limitation	A user story has been raised for this issue.

Case Title	Case Number	Reason for Failure	Troubleshooting comments
Tag Panel Property, Exaquantum show the follow errors	YMX-07856	There were actually several issue in the single call. It was a performance issue, which was fixed by rebuilding the indexes. There was also a problem with one of the views.	There is a script in the Exaquantum Maintenance and Upgrade manual which can be used to rebuild the indexes on the QBatch database as well as the QHHistorianData database. It is only the database name specified in the USE statement that needs to change.
Batch Demo not working as expected	YMX-07876	Service User Password Changed	The help files says that this should not be done but it is possible although care needs to be taken. In R3.10 and later the IT Security tool should fix this. Prior to R3.10 it would still be necessary to use the IT Security tool but the batch lockdown procedure would also need to be run.
Report Templates unusable after upgrade	YMX-07878	Not enough space in the Temp folder	Remember the report manager uses the service users temp folder. If this is full then reporting will fail. This was quite a hard issue to diagnose as it just seems that the reports were failing for no apparent reason
Batch Report not generated / Batch End date not displayed in BatchWeb	YMX-07891	Data missing during the installation of security updates to SQL Server	These sorts of issues do come up from time to time. The customer is a large pharmaceutical company and are very worried about missed data. We needed to provide a way to update the database manually.
Custom Formula View Manager Error	YMX-07900	Bug in Product	We needed to reproduce this issue in order to diagnose what was going wrong. This problem has since been fixed.
No batch data being collected after restart	YMX-08154	Post installation task not done	See Chapter 3
Batch services do not start	YMX-08169	Post installation task not done	See Chapter 3

Case Title	Case Number	Reason for Failure	Troubleshooting comments
Exaquantum Batch Server not starting	YMX-08225	This was an old system but there was a permission issue on the HIS Batch Servers. There were many Batches that required to be recovered and the affiliate was unaware that catchup must complete before new batches can be handled. The lack of Equipment Hierarchy was also causing problems.	See 5.6 for details

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Highlights

The Highlights section gives details of the changes made since the previous issue of this document.

- **Summary of Changes**

This is Issue 1.0 of the document related to Product Library version 1.0.

- **Detail of Changes**

The changes are as follows:

Chapter/Section/Page	Change