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| A picture containing graphical user interface  Description automatically generated |  |

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# Introduction

This document outlines the redundancy system architecture to to improve the reliability and availability of Baxter MES system.

The Sterilizer Management System has been in successful operation at the Castlebar Plant since 2021. The system will be upgraded to ensure that, in the event of the primary server(s) not being available, that the sterilization process can continue.

Currently, IECAAPP014 is the primary SMS historian server. IECAAPP017 is the secondary historian server, which contains critical tags. If existing server, IECAAPP014 was unavailable, the cycle data would be viewed from the secondary server, IECAAPP017. However, if IECAAPP014 was not available, it would not be possible to view the sterilizer status mimics or start sterilizer cycles.

If IECADBS008 was unavailable, it would not be possible to set up new sterilizer cycles, by sending e-batch information to the Sterilizer PLC's via the SMS or to read Cycle start times, Cycle OK / NOT Ok or Rules/Alerts broken.

Three new SMS servers will be introduced as part of this upgrade:

IECAAPPSMS001 (IP21 Secondary)

IECADBSSMS001 (SQL Server Secondary)

IECAWEBSMS001 (Web Server Secondary)

IECAAPP017 will be replaced by IECAAPPSMS001, which will have the same functionality as IECAAPP014. Following the upgrade IECAAPP017 no longer be in service.

The model of redundancy is based on Hot standby

* Cold Standby

The secondary unit is powered off, thus preserving the reliability of unit

* Hot Standby

The secondary unit is powered on and running in parallel

Diagram

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# Redundancy System Overview

Diagram

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Redundancy system with New OPS HTML5 User Interface

Diagram

Description automatically generated

Redundancy system with SSRS Reporting

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **IP21 Historian Server (VM)** | **SQL Database Server (VM)** | **SSRS Server (VM)** | **Application / Web server (VM)** | **CIMIO / Kepware Server** | **Oracle  E-Batch** |
| **Primary** | IECAAPP014 | IECADBS008 | IECADBS008 | IECAAPP015 | IECA0290DQ | IECASQL1 |
| **Secondary** | IECAAPPSMS001 | IECADBSMS001 | IECADBSMS001 | IECAWEBSMS001 | IECA0291DQ |  |

# Redundancy system architecture

## Failover Tag in PLC for Redundancy

A tag will be set up in the PLC. This tag will be used to indicate when primary IP21 is active or secondary IP21 is active.

* Failover = 0 (Primary is active)
* Failover = 1 (Secondary is active)

## IP21 Redundancy

IECAAPP014 (Primary) and IECAAPPSMS001 (Secondary) are running in parallel.

Both servers are identical and collect signal (Tags) from Active CIM IO.

## E-Batch Interface Redundancy

Compqueries below are the ip21 script to interface with the E-Batch system.

The scripts are disabled when IP21 server is in Standby mode and will be enabled when the server become Active server. So only Active IP21 server will communicate with E-Batch System

|  |  |  |
| --- | --- | --- |
| Interface to E-Batch | Queries | Ref |
| Cycle start time | EbatchWriteCycSt (compquery) | Cycle\_Start\_Timetable |
| Cycle OK Flag | EbatchWriteCycOK (compquery) | N/A |
| Writing Rules/Alerts Broken | EbatchWriteAberr | N/A |

## Steam management

The compquery SteamManagement will be disabled when IP21 server is in Standby mode and will be enabled when the server become Active server. So only Active IP21 server will communicate with PLC.

## E-batch interface Configure Timers in PLC

The compquery EbatchConfigTime will be disabled when IP21 server is in Standby mode and will be enabled when the server become Active server. So only Active IP21 server will communicate with PLC

## Intouch Interface Redundancy

### Kepware

There are two channels (Primary and Secondary) configured on both Primary and secondary Kepware servers.

**IP21\_Primary channel**

opc.tcp://iecaapp014:63500/InfoPlus21/OpcUa/Server

**IP21\_Secondary channel**

opc.tcp://iecaapp027:63500/InfoPlus21/OpcUa/Server

Both channels are running in parallel and Intouch is connected to both channels. Intouch script will check the Failover PLC tag, when this failover tag = 0, Intouch will display the tags from IP21\_Primary Channel, when failover tag = 1, Intouch will displays the tags from IP21\_Seconday Channel.

Graphical user interface, text, application

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|  |  |
| --- | --- |
| OPC UA Channel | OPC UA Endpoint URL |
| IP21\_Primary | opc.tcp:// IECAAPP014:63500/InfoPlus21/OpcUa/Server |
| IP21\_Secondary | opc.tcp:// IECAAPPSMS001:63500/InfoPlus21/OpcUa/Server |

Graphical user interface, application

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Graphical user interface, text, application

Description automatically generated

A picture containing timeline

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* When Primary is set (failover tag = 0) then display IP21 tags from the IP21\_Primary OPC UA
* Otherwise display from IP21\_Secondary OPC UA

### FS Gateway

Intouch communicates to Kepware using Wonderware FSGateway. The FSGateway will be updated with the new IP21\_Secondary OPC UA.

Graphical user interface, text, application

Description automatically generated

## OPS Integration Redundancy

OPS Integration runs on both Primary and Secondary Database server and write OPS Batch to Primary and Secondary OPS Database respectively

## OPS Database Redundancy

Both Primary and Secondary runs in parallel and collect data from Primary and Secondary OPS Integration respectively.

IECADBS008 (Primary)

IECADBSMS001 (Secondary)

## OPS Web service and UI Redundancy

There are two Web services and UIs as follows.

|  |  |  |
| --- | --- | --- |
|  | Web Service URL | OPS UI URL |
| Primary | http://IECAAPP015:60820/ws | http://IECAAPP015:60820/ui/app |
| Secondary | http://IECAWEBSMS001:60820/ws | http://IECAWEBSMS001:60820/ui/app |

A picture containing scatter chart

Description automatically generated

Primary and secondary OPS Web site setting.

OPS UI URL(Uniform Resource Locator) is the web application address.

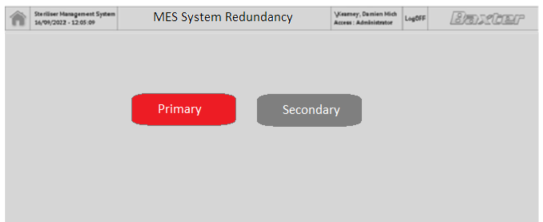
Graphical user interface, application, Teams

Description automatically generated

Example of OPS HTML5 UI

# User Interface

Intouch scada will provide user interface to switch over between hot and standby



## Workflow

When active is changed to Secondary server

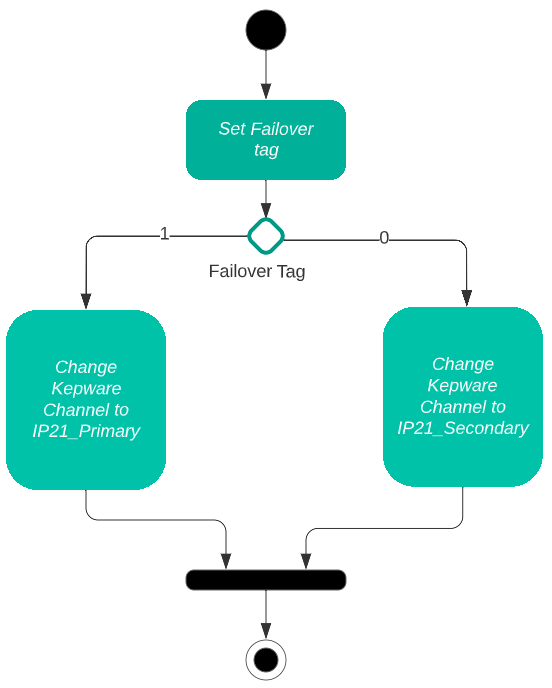
The workflow diagram below shows how both IP21 and Intouch screen switched over to the secondary server.

Diagram

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IP21 to E-Batch Redundancy

Primary IP21  
- When still live  
 Disable E-Batch interface queries  
  
- When restart  
 Check ip21 failover tag   
 Enable if failover tag is 0  
 Disable if failover tags is 1



Intouch Screen Redundancy

# Intouch Modification

The following modifications will take place in Wonderware Intouch Windowmaker. The last section will describe the change for the Stage tag on the symbol AP\_MainDetail on the SMS\_Overview screen.

## Access name

Intouch will be updated with new Access Names IP\_STER2A, IP\_STER2D, IP\_STER2T with new FSGateway connections to Secondary OPC UA IP21.

Graphical user interface, text, application

Description automatically generated

Figure : Example Access Name in Intouch

## Tagname Dictionary

The Intouch Tagname Dictionary will be updated with the following tags from Secondary IP21.

|  |  |
| --- | --- |
| New Access Name | Tags to be added to tagname dictionary and associated to this access name. |
| IP\_STER2D | CHARTOnPri, CHARTOnSec,  IP21OnPrim, IP21OnSec,  OPC1FSGATE, OPC1KEPWAR, OPC2FSGATE, OPC2KEPWAR, OPCUA, OPSBATCH,  PLC01STAT, PLC01STAT, PLC02STAT, PLC02STAT, PLC03STAT, PLC03STAT, PLC04STAT, PLC04STAT, PLC05STAT, PLC05STAT, PLC06STAT, PLC06STAT,  PLC07STAT, PLC07STAT, PLC08STAT, PLC08STAT, PLC09STAT, PLC09STAT, PLC10STAT, PLC10STAT, PLC11STAT, PLC11STAT, PLC12STAT, PLC12STAT,  PLC13STAT, PLC13STAT, PLC14STAT, PLC14STAT, PLC15STAT, PLC15STAT, PLC16STAT, PLC16STAT, PLC17STAT, PLC17STAT, PLC18STAT, PLC18STAT,  PLC19STAT, PLC19STAT, PLC20STAT, PLC20STAT, PLC21STAT, PLC21STAT, PLC22STAT, PLC22STAT, PLC23STAT, PLC23STAT, PLC24STAT, PLC24STAT,  PLC25STAT, PLC25STAT, PLC26STAT, PLC26STAT, PLC27STAT, PLC27STAT, PLC40STAT, PLC40STAT, PLC41STAT, PLC41STAT,  TER1ALM, TER2ALM, CHARTSERV, IP21BadTag, IP21GdTag, IP21LatTag, IP21SERV, IP21TotTag, MESDEVSERV, MSSQLSERV,  OPC1SERV, OPC2SERV, TER1SERV, TER2SERV, WEBSERV, WONDEVSERV  V01\_MainMode, V01\_SterIn2, V01\_Stage, V01\_EBatchEnab, V01\_QueuePosit, V01\_Trial,  V02\_MainMode, V02\_SterIn2, V02\_Stage, V02\_EBatchEnab, V02\_QueuePosit, V02\_Trial,  V03\_MainMode, V03\_SterIn2, V03\_Stage, V03\_EBatchEnab, V03\_QueuePosit, V03\_Trial,  V04\_MainMode, V04\_SterIn2, V04\_Stage, V04\_EBatchEnab, V04\_QueuePosit, V04\_Trial,  V05\_MainMode, V05\_SterIn2, V05\_Stage, V05\_EBatchEnab, V05\_QueuePosit, V05\_Trial,  V06\_MainMode, V06\_SterIn2, V06\_Stage, V06\_EBatchEnab, V06\_QueuePosit, V06\_Trial,  V07\_MainMode, V07\_SterIn2, V07\_Stage, V07\_EBatchEnab, V07\_QueuePosit, V07\_Trial,  V08\_MainMode, V08\_SterIn2, V08\_Stage, V08\_EBatchEnab, V08\_QueuePosit, V08\_Trial,  V09\_MainMode, V09\_SterIn2, V09\_Stage, V09\_EBatchEnab, V09\_QueuePosit, V09\_Trial,  V10\_MainMode, V10\_SterIn2, V10\_Stage, V10\_EBatchEnab, V10\_QueuePosit, V10\_Trial,  V11\_MainMode, V11\_SterIn2, V11\_Stage, V11\_EBatchEnab, V11\_QueuePosit, V11\_Trial,  V12\_MainMode, V12\_SterIn2, V12\_Stage, V12\_EBatchEnab, V12\_QueuePosit, V12\_Trial,  V13\_MainMode, V13\_SterIn48, V13\_Stage, V13\_EBatchEnab, V13\_QueuePosit, V13\_Trial,  V14\_MainMode, V14\_SterIn48, V14\_Stage, V14\_EBatchEnab, V14\_QueuePosit, V14\_Trial,  V15\_MainMode, V15\_SterIn48, V15\_Stage, V15\_EBatchEnab, V15\_QueuePosit, V15\_Trial,  V16\_MainMode, V16\_SterIn48, V16\_Stage, V16\_EBatchEnab, V16\_QueuePosit, V16\_Trial,  V17\_MainMode, V17\_SterIn48, V17\_Stage, V17\_EBatchEnab, V17\_QueuePosit, V17\_Trial,  V18\_MainMode, V18\_SterIn48, V18\_Stage, V18\_EBatchEnab, V18\_QueuePosit, V18\_Trial,  V19\_MainMode, V19\_SterIn48, V19\_Stage, V19\_EBatchEnab, V19\_QueuePosit, V19\_Trial,  V20\_MainMode, V20\_SterIn48, V20\_Stage, V20\_EBatchEnab, V20\_QueuePosit, V20\_Trial,  V21\_MainMode, V21\_SterIn48, V21\_Stage, V21\_EBatchEnab, V21\_QueuePosit, V21\_Trial,  V22\_MainMode, V22\_SterIn48, V22\_Stage, V22\_EBatchEnab, V22\_QueuePosit, V22\_Trial,  V23\_MainMode, V23\_SterIn48, V23\_Stage, V23\_EBatchEnab, V23\_QueuePosit, V23\_Trial,  V24\_MainMode, V24\_SterIn48, V24\_Stage, V24\_EBatchEnab, V24\_QueuePosit, V24\_Trial,  V25\_MainMode, V25\_SterIn48, V25\_Stage, V25\_EBatchEnab, V25\_QueuePosit, V25\_Trial,  V26\_SterIn2, V26\_Stage,  V27\_MainMode, V27\_SterIn48, V27\_Stage, V27\_EBatchEnab, V27\_QueuePosit, V27\_Trial,  V40\_MainMode, V40\_SterIn2, V40\_Stage, V40\_EBatchEnab, V40\_QueuePosit, V40\_Trial,  V41\_MainMode, V41\_SterIn2, V41\_Stage, V41\_EBatchEnab, V41\_QueuePosit, V41\_Trial |
| IP\_STER2A | Boil2Cap, Boil6Cap  Boil7Cap, Boil9Cap  DesigSteam, TotalSteamAvailable  TotalSteamCapacity, 2TruckExposureSteam  2TruckHeatUpSteam, 4TruckExposureSteam  4TruckHeatUpSteam, 8TruckExposureSteam  8TruckHeatUpSteam, TotalSteamInUse  Boil6Cap, Boil7Cap, Boil9Cap |
| IP\_STER2T | PLCTIWAY,  V01\_CycStTime, V02\_CycStTime, V03\_CycStTime, V04\_CycStTime,  V05\_CycStTime, V06\_CycStTime, V07\_CycStTime, V08\_CycStTime,  V09\_CycStTime, V10\_CycStTime, V11\_CycStTime, V12\_CycStTime, V13\_CycStTime, V14\_CycStTime, V15\_CycStTime, V16\_CycStTime, V17\_CycStTime, V18\_CycStTime, V19\_CycStTime, V20\_CycStTime, V21\_CycStTime, V22\_CycStTime, V23\_CycStTime, V24\_CycStTime, V25\_CycStTime, V27\_CycStTime, V40\_CycStTime, V41\_CycStTime |

## Intouch screen

The following Intouch screens with symbol will be modified for new tags:

|  |  |  |
| --- | --- | --- |
| **Screen Name** | **Symbol** | **Following tags on these screens will switch to secondary tags when Failover tag = 1** |
| System\_Status | IP21READSTATUS  TIWAYCHECK  TerminalServerCheck  TiwayButton  IP21CHECK  IP21OPC\_UA\_Connected\_Kepware  OPSBatchCheck  OPCCheckBar | CHARTOnPri, CHARTOnSec,  IP21OnPrim, IP21OnSec,  OPC1FSGATE, OPC1KEPWAR, OPC2FSGATE, OPC2KEPWAR, OPCUA, OPSBATCH,  PLC01STAT, PLC01STAT, PLC02STAT, PLC02STAT, PLC03STAT, PLC03STAT, PLC04STAT, PLC04STAT, PLC05STAT, PLC05STAT, PLC06STAT, PLC06STAT,  PLC07STAT, PLC07STAT, PLC08STAT, PLC08STAT, PLC09STAT, PLC09STAT, PLC10STAT, PLC10STAT, PLC11STAT, PLC11STAT, PLC12STAT, PLC12STAT,  PLC13STAT, PLC13STAT, PLC14STAT, PLC14STAT, PLC15STAT, PLC15STAT, PLC16STAT, PLC16STAT, PLC17STAT, PLC17STAT, PLC18STAT, PLC18STAT,  PLC19STAT, PLC19STAT, PLC20STAT, PLC20STAT, PLC21STAT, PLC21STAT, PLC22STAT, PLC22STAT, PLC23STAT, PLC23STAT, PLC24STAT, PLC24STAT,  PLC25STAT, PLC25STAT, PLC26STAT, PLC26STAT, PLC27STAT, PLC27STAT, PLC40STAT, PLC40STAT, PLC41STAT, PLC41STAT  TER1ALM, TER2ALM  PLCTIWAY,  CHARTSERV, IP21BadTag, IP21GdTag, IP21LatTag, IP21SERV, IP21TotTag, MESDEVSERV, MSSQLSERV,  OPC1SERV, OPC2SERV, TER1SERV, TER2SERV,  WEBSERV, WONDEVSERV, |
| SMS\_Overview | IP21READSTATUS  TIWAYCHECK  AP\_MainDetail  AP\_MainDetail\_Bolt | V01\_Stage, V02\_Stage, V03\_Stage, V04\_Stage, V05\_Stage, V06\_Stage, V07\_Stage, V08\_Stage, V09\_Stage, V10\_Stage, V11\_Stage, V12\_Stage, V13\_Stage, V14\_Stage, V15\_Stage, V16\_Stage, V17\_Stage, V18\_Stage, V19\_Stage, V20\_Stage,  V21\_Stage, V22\_Stage, V23\_Stage, V24\_Stage, V25\_Stage, V26\_Stage, V27\_Stage, V40\_Stage, V41\_Stage  PLCTIWAY  PLC01STAT to PLC41STAT |
| Steam\_MGMT |  | Boil2Cap, Boil6Cap, Boil7Cap, Boil9Cap  DesigSteam, TotalSteamAvailable  TotalSteamCapacity, 2TruckExposureSteam  2TruckHeatUpSteam,4TruckExposureSteam  4TruckHeatUpSteam,8TruckExposureSteam  8TruckHeatUpSteam, TotalSteamInUse |
| 2Place\_SterIN | SterSelection | V01\_SterIn2, V02\_SterIn2, V03\_SterIn2, V04\_SterIn2, V05\_SterIn2, V06\_SterIn2, V07\_SterIn2, V08\_SterIn2, V09\_SterIn2, V10\_SterIn2, V11\_SterIn2, V12\_SterIn2, V40\_SterIn2, V41\_SterIn2 |
| 4\_8\_Place\_SterIN | SterSelection | V13\_SterIn48, V14\_SterIn48, V15\_SterIn48, V16\_SterIn48, V17\_SterIn48, V18\_SterIn48, V19\_SterIn48, V20\_SterIn48, V21\_SterIn48, V22\_SterIn48, V23\_SterIn48, V24\_SterIn48, V25\_SterIn48, V27\_SterIn48, |
| Ster01\_Control | TrialControllerButton  Queue\_Postion  SteriliserBanner | V01\_MainMode, V01\_QueuePosit, V01\_Trial |
| Ster02\_Control | V02\_MainMode, V02\_QueuePosit, V02\_Trial |
| Ster03\_Control | V03\_MainMode, V03\_QueuePosit, V03\_Trial |
| Ster04\_Control | V04\_MainMode, V04\_QueuePosit, V04\_Trial |
| Ster05\_Control | V05\_MainMode, V05\_QueuePosit, V05\_Trial |
| Ster06\_Control | V06\_MainMode, V06\_QueuePosit, V06\_Trial |
| Ster07\_Control | V07\_MainMode, V07\_QueuePosit, V07\_Trial |
| Ster08\_Control | V08\_MainMode, V08\_QueuePosit, V08\_Trial |
| Ster09\_Control | V09\_MainMode, V00\_QueuePosit, V09\_Trial |
| Ster10\_Control | V10\_MainMode, V10\_QueuePosit, V10\_Trial |
| Ster11\_Control | V11\_MainMode, V11\_QueuePosit, V11\_Trial |
| Ster12\_Control | V12\_MainMode, V12\_QueuePosit, V12\_Trial |
| Ster13\_Control | V13\_MainMode, V13\_QueuePosit, V13\_Trial |
| Ster14\_Control | V14\_MainMode, V14\_QueuePosit, V14\_Trial |
| Ster15\_Control | V15\_MainMode, V15\_QueuePosit, V15\_Trial |
| Ster16\_Control | V16\_MainMode, V16\_QueuePosit, V16\_Trial |
| Ster17\_Control | V17\_MainMode, V17\_QueuePosit, V17\_Trial |
| Ster18\_Control | V18\_MainMode, V18\_QueuePosit, V18\_Trial |
| Ster19\_Control | V19\_MainMode, V19\_QueuePosit, V19\_Trial |
| Ster20\_Control | V20\_MainMode, V20\_QueuePosit, V20\_Trial |
| Ster21\_Control | V21\_MainMode, V21\_QueuePosit, V21\_Trial |
| Ster22\_Control | V22\_MainMode, V22\_QueuePosit, V22\_Trial |
| Ster23\_Control | V23\_MainMode, V23\_QueuePosit, V23\_Trial |
| Ster24\_Control | V24\_MainMode, V24\_QueuePosit, V24\_Trial |
| Ster25\_Control | V25\_MainMode, V25\_QueuePosit, V25\_Trial |
| Ster27\_Control | V27\_MainMode, V27\_QueuePosit, V27\_Trial |
| Ster40\_Control | V40\_MainMode, V40\_QueuePosit, V40\_Trial |
| Ster41\_Control | V41\_MainMode, V41\_QueuePosit, V41\_Trial |

## Intouch QuickFunctions

The following Intouch QuickFunctions will be modified

|  |  |  |
| --- | --- | --- |
| **QuickFunction** | **Screen where function is called** | **Reason** |
| CheckPLCReads | System\_Overview System\_Status | Checks each of these tags:  PLC01STAT, PLC01STAT, PLC02STAT, PLC02STAT, PLC03STAT, PLC03STAT, PLC04STAT, PLC04STAT, PLC05STAT, PLC05STAT, PLC06STAT, PLC06STAT,  PLC07STAT, PLC07STAT, PLC08STAT, PLC08STAT, PLC09STAT, PLC09STAT, PLC10STAT, PLC10STAT, PLC11STAT, PLC11STAT, PLC12STAT, PLC12STAT,  PLC13STAT, PLC13STAT, PLC14STAT, PLC14STAT, PLC15STAT, PLC15STAT, PLC16STAT, PLC16STAT, PLC17STAT, PLC17STAT, PLC18STAT, PLC18STAT,  PLC19STAT, PLC19STAT, PLC20STAT, PLC20STAT, PLC21STAT, PLC21STAT, PLC22STAT, PLC22STAT, PLC23STAT, PLC23STAT, PLC24STAT, PLC24STAT,  PLC25STAT, PLC25STAT, PLC26STAT, PLC26STAT, PLC27STAT, PLC27STAT, PLC40STAT, PLC40STAT, PLC41STAT, PLC41STAT |
| CheckTiway | System\_Overview  System\_Status | PLCTIWAY |
| MaintenanceModeScript | Ster01\_Control, Ster02\_Control, Ster03\_Control, Ster04\_Control  Ster05\_Control, Ster06\_Control, Ster07\_Control, Ster08\_Control  Ster09\_Control, Ster10\_Control, Ster11\_Control, Ster12\_Control  Ster13\_Control, Ster14\_Control, Ster15\_Control, Ster16\_Control  Ster17\_Control, Ster18\_Control, Ster19\_Control, Ster20\_Control  Ster21\_Control, Ster22\_Control, Ster23\_Control, Ster24\_Control  Ster25\_Control, Ster27\_Control, Ster40\_Control  Ster41\_Control | V01\_MainMode, V02\_MainMode,  V02\_MainMode, V03\_MainMode,  V04\_MainMode, V05\_MainMode,  V06\_MainMode, V07\_MainMode,  V08\_MainMode, V09\_MainMode,  V10\_MainMode, V11\_MainMode,  V12\_MainMode, V13\_MainMode,  V14\_MainMode, V15\_MainMode,  V16\_MainMode, V17\_MainMode,  V18\_MainMode, V19\_MainMode,  V20\_MainMode, V21\_MainMode,  V22\_MainMode, V23\_MainMode,  V24\_MainMode, V25\_MainMode,  V27\_MainMode  V40\_MainMode, V41\_MainMode, |
| MaintenanceModeResetScript | Same as above | Same as above |

## Symbol AP\_MainDetail

The symbol AP\_MainDetail is used on SMS\_Overview for each steriliser to display the steriliser stage and timers.

Graphical user interface, application, Word

Description automatically generated

Figure : AP\_MainDetail Symbol on SMS\_Overview

The following will be modified for the Stage section on this symbol: Clicking on the Stage text – the Visibility and String will be modified to check the Failover tag to decide on displaying Primary server stage tag value or Secondary server stage tag value

Diagram, table

Description automatically generated

Figure : Stage String on AP\_MainDetail symbol

* **String**: CALL ParseStageTagname(ST1\Unit\Stage)
* **NEW String:** IF (ST1\Secondary\Failover==0) ST1\Unit\Stage; ELSE ST1\Secondary\Stage
* **Visibility**: ST1\Unit\Stage.QualityStatus == 3
* **NEW Visibility**: IF (ST1\Secondary\Failover==0) ST1\Unit\Stage.QualityStatus == 3; ELSE ST1\Secondary\Stage.QualityStatus == 3