Mark VIe Interoperable Controller
Installation and Upgrade
Instruction Guide

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## Related Documents

<table>
<thead>
<tr>
<th>Doc #</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEH-6703</td>
<td>ToolboxST User Guide for Mark Vle Controls Platform</td>
</tr>
<tr>
<td>GEH-6721_Vol_II</td>
<td>Mark Vle and Mark VleS Control Systems Volume II: General-purpose Applications System Guide</td>
</tr>
</tbody>
</table>
Safety Symbol Legend

**Warning**
Indicates a procedure or condition that, if not strictly observed, could result in personal injury or death.

**Caution**
Indicates a procedure or condition that, if not strictly observed, could result in damage to or destruction of equipment.

**Attention**
Indicates a procedure or condition that should be strictly followed to improve these applications.
## Contents

1 Overview .......................................................................................................................... 5  
2 Prerequisites .................................................................................................................... 6  
3 Upgrade UCSB Controllers to ControlST Version that Supports Controller Interoperability .................................................. 7  
4 Interoperable Controller Selection .................................................................................. 8  
5 Replace UCSB with UCSC in Interoperable Redundant Controller Set ............................... 10  
6 Controller Password Synchronization .............................................................................. 24
1 Overview

The UCSC controller is used in most new Mark* V1e control systems. It is available in multiple hardware versions for use in multiple applications, including UCSCH1A, UCSCH1B, UCSCH1C, and UCSCH2A. However, only the UCSCH2A controller may be used to replace failed UCSBH1A or UCSBH4A controllers. The Controller Interoperability feature allows the UCSCH2A to interoperate with UCSBH1A or UCSBH4A controllers, but not both, in a redundant (TMR or Dual) controller set. Beginning with ControlST* Software Suite V07.04, if one controller in an interoperable set fails, operators can replace it with the same or a different supported controller type while the process being controlled is still running, without losing plant control. (The ToolboxST* application supports online replacement.)

Examples of interoperable controllers are:

- UCSBH1A, UCSCH2A
- UCSBH4A, UCSCH2A

**Note** Controller interoperability is only supported when replacing a UCSBH1A or UCSBH4A controller with a UCSCH2A controller. All other versions of controllers or configurations are not interoperable.

**Note** For Simplex configurations, only one controller platform is displayed in ToolboxST and controller interoperability is not available.

This document provides the instructions to install and upgrade a Mark VIe interoperable controller.
2 Prerequisites

Customers should evaluate the maturity of their controllers and the risk to operation in the event of a controller failure. Consideration should include type and quantity of spare controllers and tolerance for down time. GE recommends that a software upgrade be considered as part of regularly scheduled outage planning. A software upgrade will minimize the potential for down time (or compromised redundancy) in the event of controller failure.

The required ControlST upgrade (V07.04 or higher) will require a full ControlST Software Suite upgrade, resulting in the reboot of all three controllers in a TMR set. GE recommends that this upgrade occurs when the system is not active. Once the initial upgrade is complete, the system can support online upgrade or replacement of a single controller in a TMR or Dual set.

The following software and hardware is needed to perform the procedures in this document:

- ControlST V07.04 or later installed and running
- Interoperable controllers: UCSBH1A or UCSBH4A and UCSCH2A
3 Upgrade UCSB Controllers to ControlST Version that Supports Controller Interoperability

Beginning with ControlST Software Suite V07.04, the Mark VIe control supports controller interoperability. In order to upgrade the controllers, users must perform a full upgrade to ControlST V07.04.

View the currently installed ControlST version to determine if an upgrade is required to replace a UCSBH1A or UCSBH4A controller with an interoperable controller (UCSCH2A).

➢➢ To view a complete list of installed ControlST versions: from the Start menu, select All Programs, GE ControlST, and Versions.

The ControlST Versions dialog box provides the following tabs:

- **Tree View** tab displays all installed products, their individual versions, and the installed-by version of ControlST.
- **Form View** tab displays complete information for all installed products in a table format that can be copied and pasted into a spread sheet.
- **DVD Tree View** tab displays a list of products installed from the ControlST DVD.

![ Installed ControlST Versions Example ]

**Note** If a ControlST upgrade is required, refer to the ControlST Software Suite Installation, Upgrade, and Compatibility Guide (GEI-100694) for detailed upgrade instructions.
4 Interoperable Controller Selection

Beginning with ControlST V07.04, Mark VIe TMR and Dual redundant configurations can support interoperable controllers, with different platform types interoperating in a redundant set. Each controller in the redundant set displays as a separate Platform entry in the ToolboxST Property Editor. If the <R> controller Platform is set to a controller type that is not interoperable, then only a single platform entry is provided for all controllers.

**Note** For Simplex configurations, only one platform displays and controller interoperability is not available.

For a TMR redundant set with an interoperable UCSBH4A controller selected for an <R> controller, ToolboxST provides individual controller selections for <S> and <T> controllers in the drop-down list.

The <R> controller Platform drop-down list provides all supported platform types.

For a TMR redundant set with an interoperable UCSBH4A controller selected for an <R> controller, ToolboxST provides individual controller selections for <S> and <T> controllers in the drop-down list.

<table>
<thead>
<tr>
<th>Platform R</th>
<th>Platform S</th>
<th>Platform T</th>
<th>Product Version</th>
<th>Profiler Enabled</th>
<th>Protection</th>
<th>Redundancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS420UCSBH4A</td>
<td>IS420UCSBH4A</td>
<td>IS420UCSBH4A</td>
<td></td>
<td>False</td>
<td>(Expand)</td>
<td>TMR</td>
</tr>
</tbody>
</table>

**TMR Configuration with Interoperable UCSBH4A Controllers**

The <R> controller Platform drop-down list provides all supported platform types.

<table>
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<tr>
<th>Platform R</th>
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<th>Platform T</th>
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<td>IS420UCSBH4A</td>
<td></td>
<td>False</td>
<td>(Expand)</td>
<td>TMR</td>
</tr>
</tbody>
</table>

**R Controller Platform Selections**

<S> and <T> controller platform selections are displayed when the <R> controller platform is set to an interoperable controller type. The <S> and <T> drop-down lists only display interoperable controller platforms.

<table>
<thead>
<tr>
<th>Platform S</th>
<th>Platform T</th>
<th>Product Version</th>
<th>Profiler Enabled</th>
<th>Protection</th>
<th>Redundancy</th>
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<td>IS420UCSBH4A</td>
<td>False</td>
<td>(Expand)</td>
<td>TMR</td>
</tr>
</tbody>
</table>

**S Controller Platform Selections**
Changing the <R> controller to an incompatible platform results in a major difference. ToolboxST displays a Warning to indicate that a reboot is required. Click **No** to select a valid, compatible platform. Click **Yes** to change platforms.

If the <R> controller is set to a non-interoperable platform then only a single controller platform selection is displayed for all redundant controllers.
5 Replace UCSB with UCSC in Interoperable Redundant Controller Set

Perform the following procedures to replace an interoperable UCSBH4A with a UCSCH2A in a TMR controller set in ToolboxST. These procedures also apply to Dual controller sets and UCSBH1A replacement.

Before beginning the replacement procedure, perform the following steps:

1. Make sure you begin with an interoperable redundant controller set.

**Note** The example in the replacement procedure provided in this document assumes TMR redundancy with interoperable UCSBH4A controllers installed and the <T> controller will be replaced with a UCSCH2A controller.

2. Before making any changes, check for any active controller and hardware I/O diagnostic alarms that could result in a loss of plant operation during controller replacement.

➢ To view current controller diagnostic alarms

1. From the ToolboxST Component Editor View menu, select Diagnostics, then select Controller Diagnostics.

2. Select Designated Controller and click OK.

3. Using the Channel drop-down list, view controller diagnostic alarms for each redundant controller.
### R Controller Diagnostic Viewer

<table>
<thead>
<tr>
<th>Channel</th>
<th>Refresh List</th>
<th>Show Actives Only</th>
<th>Reset Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Time | Number | Status | Description

### S Controller Diagnostic Viewer

<table>
<thead>
<tr>
<th>Channel</th>
<th>Refresh List</th>
<th>Show Actives Only</th>
<th>Reset Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Time | Number | Status | Description

---
4. Click the X in the upper right corner to close the Controller Diagnostic dialog box.

➢ To view current I/O diagnostic alarms
1. From the ToolboxST Component Editor View menu, select Diagnostics, then select I/O Diagnostics.

2. Click the X in the upper right corner to close the I/O Diagnostic Viewer dialog box.
➢ To replace a UCSB controller with a UCSC controller

1. From the ToolboxST Property Editor, change the \(<T>\) controller Platform property type from UCSBH4A to an interoperable replacement controller, UCSCH2A.

   ![Filtered Compatible Interoperable Controllers Platforms](image)

   **Filtered Compatible Interoperable Controllers Platforms**

   ![UCSB Platform Changed to UCSC Interoperable Controller Platform](image)

   **UCSB Platform Changed to UCSC Interoperable Controller Platform**

2. After changing the \(<T>\) Platform type, verify that the \(<R>\) and \(<S>\) controller equality is still Equal and Controlling while the \(<T>\) controller indicates the platforms are Unequal.

   ![Other Redundant Controllers Still Equal and Controlling](image)

   **Other Redundant Controllers Still Equal and Controlling**

3. After changing the platform of an interoperable controller, perform a Controller Setup to apply the necessary configuration to the new controller and enable communication with ToolboxST.

   **Note** Refer to the *Mark VIe and Mark VIeS Control Systems Volume II: General-purpose Applications System Manual* (GEH-6721_Vol_II), the section *UCSC Restore* for the restore procedure.
a. From the ToolboxST Component Editor **Device** menu, select **Download**, then select **Controller Setup**.

b. When the **Controller Setup Wizard Welcome** window displays, click **Next**.
c. Select **Initialize USB Flash Device**, then click **Next**.

d. Insert a non-encrypted USB 2.0 (only) flash device with a 4 GB minimum capacity into the HMI computer USB port.

e. Click **Scan** and select the available flash drive.
f. Select the **Channel** for the controller being replaced.

g. Click **Write**, then click **Next**.

h. Perform the controller restore as instructed on the **Controller Setup Wizard** window for the specific controller type, or follow the remaining steps in this procedure.

---

**USB Flash Device Instructions for UCSB and UCSC Controllers**
i. Remove the USB flash device from the HMI computer.

j. Remove power from the <T> UCSBH4A controller and physically replace it with a UCSCH2A controller.

k. Insert the USB flash device into either USB port of the controller.

l. For a UCSC controller, perform the following steps:
   i. Press and hold the **PHY PRES** button and apply power to the controller. Continue to hold in the **PHY PRES** button until the USB LED is lit (~ 15 seconds).
   ii. Release the **PHY PRES** button and wait for the process to complete. (The USB On LED remains lit to indicate that the restore is in progress. The procedure takes one to two minutes.) When the LED turns off, the restore has completed successfully.
   iii. Remove the USB flash device from the controller.
   iv. Shut down and restart the controller.

   **Note** If the LED flashes at a 1 Hz rate, a failure has occurred. Retry or remove the USB flash device.

m. For a UCSB controller, perform the following steps:
   i. Press and hold the **Backup/Restore** button.
   ii. Apply power to the controller while continuing to press the **Backup/Restore** button until the USB LED becomes solid green (3 seconds), then release the button.
      It takes three to five minutes for the process to complete; the USB LED then turns off.
   iii. Remove the USB device.

   **Note** A reboot of the controller is not required.

n. From the ToolboxST **Controller Setup Wizard** window, click **Finish**.
The new controller is now installed and ready for the firmware and application code to be downloaded.

The ToolboxST Component Editor does not display any live data for the replacement UCSC controller prior to download.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>R Controller</th>
<th>S Controller</th>
<th>T Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control State</td>
<td>Controlling</td>
<td>Controlling</td>
<td></td>
</tr>
<tr>
<td>Controller Equality</td>
<td>Equal</td>
<td>Equal</td>
<td></td>
</tr>
<tr>
<td>IO Equality</td>
<td>Equal</td>
<td>Equal</td>
<td></td>
</tr>
<tr>
<td>DDR Equality</td>
<td>Equal</td>
<td>Equal</td>
<td></td>
</tr>
<tr>
<td>Auto-Reconfiguration Equality</td>
<td>Disabled</td>
<td>Disabled</td>
<td></td>
</tr>
<tr>
<td>Designated Controller</td>
<td>R Controller</td>
<td>R Controller</td>
<td></td>
</tr>
<tr>
<td>Frame Synchronized</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>UDH Communicator</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>CDH Communicator</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**No Live data Displayed for Replacement UCSC Controller Prior to Download**
4. Perform a Build. From the ToolboxST Component Editor Device menu, select Build.

**Note** If you replace a controller with a different controller type (such as UCSBH4A with UCSCH2A) and try to perform a Download without first performing a Build, you will be prompted to perform a Build. A Build is necessary because you are still controlling with the replaced controller type (UCSBH4A) as the Designated Controller (R).

5. Perform a Download to the replacement controller. The download will only affect the replacement controller <T> as follows.
   a. From the ToolboxST Component Editor Device menu, select Download, then select Download Wizard.

![Download Mark Vle Controller](image)
Note  Only the controller being replaced should require a download. However, in some instances and configurations (<R> controller replacement or auto-reconfiguration enabled), it may be necessary to download to the replacement controller more than once for all controllers to scan as green and Equal by the Download wizard.

b.  Click Next to proceed to the next step in the download process.

c.  Select to check the Download Backup File option, uncheck (deselect) the Restart Controller after Download option, then click Next.

Download Mark VIe Controller
d.  Click **Next** to acknowledge the shutdown Warning and begin the controller download process.

**Download Mark VIe Controller**

Downloading firmware will shut the selected controller(s) down. This will result in a process trip if no redundant system is continuously available during the download cycle. Ensure that the process is secure prior to continuing. All redundant systems used to backup the selected processor shut-downs MUST be clear of all faults prior to initiating the download.

Prior to downloading please ensure changes being applied are intended. Click [here](#) to view the change logs folder.

6.  Verify that the Download completes with 100% progress and 0 errors.

**Mark VIe Controller Download to Replaced Controller Only**
Following the download, the controller reboots automatically and comes to a Controlling state.

![Replaced Controller in Controlling State after Download](image)

The control system should now be operating with interoperable controllers in a redundant set. However, replacing a controller while the system is in operation generates a controller communication loss diagnostic alarm(s) as a result of powering down the replaced controller. The communication diagnostic should return to a 0 status (not active) once the replaced controller is in the Controlling state.

7. View communication lost diagnostic alarms for each controller.
   a. From the ToolboxST Component Editor **View** menu, select **Diagnostics**, then select **Controller Diagnostics**.
   b. Using the **Channel** drop-down list, view controller diagnostic alarms for each redundant controller.

![R Controller Communication Diagnostic Alarm](image)
8. The replaced controller (\(<T>\) for this example) generates a *Default user password detected* diagnostic alarm until the controller password is changed. Change the controller password to configure the replacement controller with the site-specific password and synchronize with the other controllers in the redundant set. Refer to the section *Controller Password Synchronization* for this procedure.
6 Controller Password Synchronization

When a failed controller in a redundant set is replaced, the replacement controller password is set to the factory default password and must be synchronized to the same password as the other controllers in the set. A diagnostic alarm message in the Status tab notifies the user that the default password has been detected for the replacement controller and prompts the user to change the password.

➢➢ To synchronize controller passwords

1. From the ToolboxST Component Editor Device menu, select Download, then select Change Controller Password….

2. Enter the default factory password as the Current Password.

3. Enter the same password that is used for the other controllers in the set as the New Password for the replacement controller.

4. Re-enter the new password for Confirm Password.

5. Click OK to complete the process and synchronize the controller password for all redundant controllers.

When the password for the replacement controller is successfully synchronized with the other controller passwords in the set, a password sync success message displays in the Log window as illustrated in the following figure.

```
Error,4:57:44 PM,Could not change password for controller 'TMRM6E-R': incorrect current password.
Error,4:57:44 PM,Could not change password for controller 'TMRM6E-S': incorrect current password.
Info,4:57:44 PM,Password changed successfully for controller 'TMRM6E-T'.
Error,4:57:44 PM,Password not changed for device 'TMRM6E'.
```

T Controller Password Sync Success Log Message

Note For additional information, refer to the ToolboxST User Guide for Mark Controls Platform (GEH-6703), the section Controller Password Change.