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Revised: April 2018
Issued: July 2016


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Document Updates

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<tr>
<td>C</td>
<td>HA Control Server, Server Setup</td>
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<td>Simplex Control Server, Server Setup</td>
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<td>B</td>
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<td>Added the new section Verify Connectivity to the Servers containing the procedure to verify connectivity to the supplied servers.</td>
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Related Documents

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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.
The procedures and methods described in this document apply to the standard Control Server product as originally designed by GE. However, there may be deviations from the standard feature set installed and configured at the time of shipment. Refer to plant-specific documentation provided by your GE representative at the time of installation and commissioning for alternative or supplemental instructions for your application.

Note

1. Disconnect the equipment from the power supply by removing the plug from the socket-outlet, which is installed near the equipment and easily accessible.

2. There are no serviceable parts. Replace faulty sub-assembly and return defective material to GE Automation & Controls.

Waste Disposal:  ■ This mark or symbol on any electrical or electronic product indicates that this product cannot be disposed of in a trash bin. Such products must be returned to the original vendor or to a properly authorized collection point. The black bar under the waste bin symbol shows that the product was placed on the market after 13 August 2005.

Batteries are not meant to be replaced by an operator. A coin cell battery is included in the servers and in the firewall device, and the original manufacturer documentation should be referenced for any applicable end-of-life removal instructions.
1 Overview

The Control Server consists of a product line that can be combined in different configurations to meet the needs of individual sites. The basic architecture consists of one or more server class computers each running a hypervisor. The Virtual Machines (VMs) that run on the hypervisor(s) perform the site functions.

The Control Server product architecture consists of two layers. Within each layer multiple products are available to meet a site's feature, redundancy, size, and workload requirements.

The Control Server Core is the lower architectural layer. It includes the server hardware and the hypervisor software that runs on the server to provide the platform for hosting virtual machines. Various core architectures and options are available to meet a site's redundancy and performance requirements.

The Control Server Module is the upper architecture layer. Various modules supply different types of virtual machines to meet the site's application requirements, and multiple modules can be supported at the same time. Within each module there are typically options for the number and size of VMs supplied, such as the number of HMI VMs supplied, the number of Virtual Field Agent VMs supplied, or the number of Thin Client Terminals that must be supported.

The following sections provide additional information on the Control Server Cores and Control Server Modules that are available.
1.1 Control Server Core

The Control Server Core is the lower architectural layer. It includes the server hardware and the hypervisor software that runs on the server to provide the platform for hosting virtual machines.

There are two Control Server Core architectures available:

- **Simplex Core**: This core supplies a single server where all the Virtual Machines run. Various options are available controlling the size of this server. This core is typically used when the functions that it provides do not need to be redundant.

- **High Availability (HA) Core**: This core supplies a pair of redundant servers and a high-speed interconnection between them to support both manual and automatic failover capability. Virtual Machines can be migrated between the servers, and if one server fails or is shut down then the VMs will run on the remaining server.

A site's redundancy requirements tend to drive the Core selection (Simplex or HA), and its anticipated workloads tend to drive the selection of Platform and Options within the selected Core.

The following sections provide additional information about the Control Server Core products.

1.1.1 Simplex Core

The Simplex Core provides a single server class computer upon which to run VMs. The VMware ESXi hypervisor is used to host one or more VMs to meet the site's application needs.

The Simplex Core product is further subdivided into the Platform and Options available:

- The **Platform** selects the base type of server used. The Platform selection tends to focus on the features and expandability that is available in the platform. Low end platforms may not supply redundant power supplies, and may be more limited in their expandability. Higher end platforms tend to include redundant power supplies and have greater flexibility and range with respect to the CPU power, memory, and disk drive capacities available.

- Various **Options** are available within any one Platform selection. These options control items such as the CPU power, memory, and disk drive capacities available. The site's anticipated workload (number and types of VMs) typically drive the sizing option selection.

1.1.2 High Availability (HA) Core

High Availability (HA) Core supplies a pair of redundant servers and a high-speed interconnection between them to support both manual and automatic failover capability. The VMware ESXi hypervisor is used to host one or more VMs to meet the site's application needs.

Various Options are available to control items such as the CPU power, memory, and disk drive capacities available. The site's anticipated workload (number and types of VMs) typically drive the sizing option selection. Both physical machines must have the same options selected to support the failover options.

The VMware Virtual SAN product is used with the high-speed interconnection between the servers to mirror the virtual hard drives used in each VM on each server and provide failover capability. VMs can be migrated from one host to another without clients even recognizing that a transfer has taken place. In case of a sudden server failure preventing graceful migration, the client may need to reconnect to the VM after it restarts itself on the remaining host - a process that typically takes 15-30 seconds for a typical HMI. Depending upon the platform sizing options selected, a single server running all the VMs may exhibit reduced performance over the normal case of both servers in operation and the site load distributed between them.
1.2 Control Server Modules

The **Control Server Module** is the upper architecture layer. Various modules supply different types of virtual machines to meet the site's application requirements. Multiple modules and/or multiple instances of a single module are supported, with the platform sizing and performance requirements being the limiting factor. There are three basic modules available, and within each module there are typically options on the number and type of VMs supplied.

### 1.2.1 Domain Services Module

The **Domain Services Module** provides a pair of redundant Domain Controller VMs and a Certificate Authority VM to establish a Microsoft® Active Directory domain at the site. The domain provides for centralized management of users and roles and typically all Windows based VMs are joined to this domain. Computer Hardening is accomplished by joining computers (or VMs) to the domain and using domain Group Policies to apply the hardening policies. Services in the Domain Controllers and Certificate Authority are also used by devices outside of the domain for user identity management and access control.

The Domain Services Module supplies the following Virtual Machines:

- **DC1**: This is the primary Domain Controller. It provides the domain services listed below.
- **DC2**: This is the backup Domain Controller. It provides the same features as the primary Domain Controller.
- **CA1**: This is the Certificate Authority. It provides the Certificate and Public Key Infrastructure (PKI) services listed below.

The Domain Controllers provide the following domain services:

- Microsoft Active Directory Domain Services
- Microsoft RADIUS Server
- Microsoft DNS Server
- Microsoft DHCP Server

The Certificate Authority supports the following domain services:

- Microsoft Active Directory Certificate Authority
- Microsoft Network Device Enrollment Service

The Domain Services Module does not have options for the number and type of VMs supplied, a pair of redundant Domain Controllers and the Certificate Authority (three VMs total) are always supplied.

The Domain Services Module does not have any other core or module dependencies, although using this module in a Simplex Core environment prevents splitting the redundant Domain Controllers across multiple servers.
1.2.2 Thin Client HMI Module

The Thin Client HMI Module provides one or more Virtual Machines typically used for supervisory level control. This includes the HMI, Historian, and Gateway VMs used to configure, monitor, and operate the control system. The VMs in this module are normally accessed by using Thin Client Terminals as the user interface.

The Thin Client HMI Module supplies the following types of VMs:

- **Engineering Workstation (EWS):** This VM type supplies the programming tools and typically acts as the master repository for the control configuration information. (See below for more details)
- **HMI:** This VM type is used for the Operator Interface. In addition to the Operator Interface software it also has the full programming and communication capability. There are typically multiple HMI VMs at a site for redundancy or to segment the operator displays for handling separate plant areas.
- **Historian (HST):** This VM type supplies the Proficy Historian with the Proficy Historian Analysis package. If required, there is typically only one VM of this type at a site.
- **Gateway:** This VM type is used as an interface between control systems or DCS layers. It provides the communication interface between control systems using an agreed upon standard protocol, such as Modbus, GSM, OPC DA, OPC AE, or OPC UA. If required, there are typically two of these VMs supplied for redundancy.
- **Application Server (AppServ):** This VM type is used as a host for control applications, such as a Configuration Management System or an Alarm Server. This VM comes with the communication layers needed to exchange control information, but not the Operator Interface tools or Configuration Tools.
- **Windows Server (WinServ):** This VM type is essentially a Windows Server VM with antivirus software. It has no additional control software on it for communications and is available for loading any site specific applications.

The EWS VM type is unique in that this VM includes software that is typically only installed on one VM at a site. This VM also has a special IP address that, in conjunction with the NetworkST 4.x access control lists, allows it to communicate with and configure network equipment that other VMs cannot reach. The functions that are typically supplied only on this VM type include:

- CMS Server: This provides the central repository for the Configuration Management System (CMS) and the CMS Server that clients use to access it.
- Proficy Licensing Server: This provides the licensing server that coordinates the GE Proficy licenses across all other VMs.
- Microsoft Terminal Services License Server: This (optional) component is used to coordinate licenses across all instances of Terminal Services across all other VMs. This is only required in Many-to-One configurations (see definition below).
- Thin Client Configuration Server: This provides the programming tools, services, and files needed to configure Thin Client Terminals. This includes the Thin Client Terminals firmware and configurations. For some Thin Client Terminal types this information is pushed from this VM to the Thin Client Terminals, in others the Thin Client Terminals are configured to pull the information from this VM.
- Thin Client Module Information: This VM holds a set of sharenames that provide scripts and online documentation for the Thin Client Module.

There are typically two schemes used for connecting Thin Client Terminals to the Thin Client HMI VMs. The selection is typically made based upon the site size, cost targets, redundancy requirements, and the desired relationship between the number of Thin Client Terminals and the number of VMs:

- One-to-One: This scheme supports a single Thin Client Terminal logged into a VM at any one time. Multiple Thin Client Terminals are supported, but each VM can only support one logged in user at a time.
- Many-to-One: This scheme supports multiple Thin Client Terminals to be logged into a single VM concurrently. The maximum number of Thin Client Terminals that can be logged in is determined by performance and the sizing of the VM, and enforced by the Terminal Services Licensing.

The Thin Client HMI Module supports many options for defining the number and type of VMs to be supplied. The options to select are based upon each site's requirement as to the number and type of VMs along with its One-to-One or Many-to-One configuration. In the Many-to-One configurations, the CPU power and memory to be allocated to each VM may be adjusted within the total limits imposed by the Platform Options selected. This balancing can be done after the initial creation of the VMs and is not required at the time of placing the order. Verify that the Platform Options supply sufficient resources, and those resources can be reallocated or balanced between VMs at any time.
The Thin Client HMI Module requires that the Domain Services Module be installed as it makes extensive use of the Domain Services that it provides. All VMs in this module must be joined to the Domain Services domain.

### 1.2.3 Virtual Field Agent Module

The Virtual Field Agent (VFA) Module provides one or more VMs used for hosting Predix™ applications. The VMs in this module primarily interact with the control system, but applications may also provide an interface (such as a Web Server) for direct access. Various network connectivity options are available to meet the needs of site applications and to address site security policies.

The VFA Module supports the creation of multiple VMs, each running their own Predix applications. This split may be done for performance reasons, or the applications may be split among multiple VMs due to the data that they are dealing with, segmenting different plant areas into their own VMs. The maximum number of VMs is defined by the resource demands of the applications that are run within the VM versus the platform options and the site's performance requirements.

The base VFA Module does not have any other core or module dependencies, but individual Predix applications may add their own dependencies. These may include items such as additional security capability through the Domain Module, or a user interface accessed through the Thin Client Module.
2 Control Server

This chapter covers the unpacking, setup, powerup, and initial checkout of the Control Server(s). There are two sections, one for Simplex and one for HA. Follow the appropriate instructions for your site configuration.

Prerequisites
To perform the procedures in this document, you will need the following resources:

- Windows computer with built-in Remote Desktop client (RDP)
- Windows computer with vSphere client (Simplex server only)
- Ethernet cable for PDH connection
- List of all VMs and their associated PDH IP addresses
- Passwords for the following accounts:
  - MC3\admin for MC3 (Local administrator account)
  - HMI\admin for all other VMs
  - vSphere client root account (only required if one or more VMs do not start automatically)

Note Refer to Appendix A Hardware Specifications for additional mechanical and environmental specifications for the Control Server. Refer to Appendix B Server Rack Information for information on the server rack.
2.1 HA Control Server

There are a minimum of three server boxes. The Management Computer (MC2) server is smaller in size than the other two servers. The Hypervised Server 1 and 2 (HS1) and (HS2) are physically identical.

---

**Attention**

Inspect the system for damage. If the system was damaged during shipment, stop unpacking and contact GE.

---

2.1.1 Server Unpacking

➢➢➢ To unpack the HS1 and HS2 servers

1. Using a box cutter, carefully open the HS1 or HS2 box (one of the larger sized boxes).
2. Remove and open the top cardboard compartment that contains two power cords, product documentation, the bezel, and a smaller box containing the rack mounting rails.

---

3. Verify that one of the two server boxes (HS1 or HS2) also contain two cross over cables.

---
4. Open the box of rack mounting rails, and identify the A7 Dell™ ReadyRails™ II Skidding Rail Assemblies, the rack installation instructions, and two Velcro straps (for cable management).

**Note** If the HS1 and HS2 servers are to be installed into a rack, use the vendor supplied *Rack Installation Instructions* for proper mounting.

---

*Rack Mounting Kit for HS1 or HS2*

**Note** Mounting racks may already be installed if a server rack was purchased with the system.
5. Remove the top protective foam pieces and remove the server.

6. Use the configuration tag to identify the HS1 or HS2 server.

Contact GE for assistance if you find any broken or damaged parts.
➢ **To unpack the MC2 Server**

1. Using a box cutter, carefully open the MC2 box (the smaller box).

2. Remove and open the top cardboard compartment that contains the power cord, product documentation, operating system DVDs, and a smaller box containing the rack mounting rails.

3. Open the smaller rack mounting box to identify the MC2 racks, velcro straps (for cable management), and MC2 rack installation instructions.

   **Note** If the MC2 server is to be installed into a rack, use the vendor supplied *Rack Installation Instructions* for proper mounting.

![Rack Mounting Kit for MC2](image)

**Rack Mounting Kit for MC2**

**Note** Mounting racks may already be installed if a server rack was purchased with the system.

4. Remove the top protective foam pieces and remove the server.
5. Use the configuration tag to identify the MC2 server.
2.1.2 Server Setup

**Note** Complete the network connections to the Control Server servers as per the supplied GE 4108 diagram. If the diagram is not available, review the completed engineering drawings as prepared by the responsible engineering party. When attaching network connections, note that the Network Configuration tag identifies which ports are configured for the Plant Data Highway (PDH) or Unit Data Highway (UDH) to guide connection.

**Note** Actual server layouts may vary.

The labels on the top cover of each server identify configured ports and the networks. The following figures provide example labels for an HA configuration.

**Note** Actual server layouts may vary.
The following photo displays a fully connected Control Server.

➢➢

To set up the HS1 and HS2 Servers

1. Insert the Ethernet cables for PDH 1 into port 2 and PDH 2 into port 4.
2. Insert the Ethernet cables for UDH 1 into port 1 and UDH 2 into port 3.
3. Connect the other end of each PDH Ethernet cable to appropriate port on the network switch.
4. Connect the other end of each UDH Ethernet cable to appropriate port on the network switch.
5. Insert each power cable into the HS1 power sockets, but to do not plug them into a powered outlet.
6. Repeat steps 1 – 5 for the HS2 server.
The following figure displays the HS1 or HS2 with proper Ethernet and power connections.

**Note** The HS1 and HS2 servers each require four Ethernet cables, two to connect to the PDH and two to connect to the UDH. Cables must be long enough to reach the network server designated in the engineering drawings (GE 4108).

➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢➢�
3. Use the following figure to properly connect the crossover cable.

   ![Crossover Cable Connection Diagram]

   a. On HS1, insert the first crossover cable into SFP Port 1.
   b. On HS2, insert the other end of this same crossover cable into SFP Port 1.
   c. On HS1, insert the second crossover cable into SFP Port 2.
   d. On HS2, insert the other end of the second crossover cable into SFP Port 2.
➢ To set up the MC2 Server

1. Insert the PDH Ethernet cables into Gb 1 and Gb 2.

   Ethernet Port 1 (Gb 1) and Ethernet Port 2 (Gb 2)

   **Note** The MC2 server requires two Ethernet cables to connect to the PDH. Cables must be long enough to reach the network switch designated in the engineering drawings (GE 4108).

2. Connect the other end of each PDH Ethernet cable to the appropriate port on the network switch.

3. Insert power cable into MC2 power socket, but to **do not** plug into a powered outlet.
2.1.3 Server Power On

➢ To properly power on the HA control server

**Note** The order in which you start the three servers does not matter, however, all three servers must be started for normal operation to continue.

1. Verify that the necessary network switches have been installed and powered up before attempting to power on the Control Server.

2. Plug the power cord from MC2 and each power cord from HS1 and HS2 into powered outlets. HS1 and HS2 have redundant power supplies. To ensure redundancy, servers with two power connections should have each one fed from a separate power source.

3. The three servers may power on automatically. If any of the three power buttons on the top left (or top right on some models) of the servers display a yellow light, press the power button. It will display a green light and begin to power on.

2.1.4 Verify Server Connectivity

➢ To verify connectivity to the supplied servers (HS1, HS2, and MC2)

1. **Establish a PDH connection.**

2. **Ping** the HS1 server (typical address is 172.16.199.8).
   a. If the ping successfully replies, continue to step 3.
   b. If the ping does not respond (or replies with Destination host unreachable), check the network connections and ping again.

3. Repeat steps 1 and 2 for HS2 (typical address is 172.16.199.9) if supplied.

4. Repeat steps 1 and 2 for MC2 (typical address is 172.16.199.11) if supplied.
2.2 Simplex Control Server

The Simplex Control Server consists of one server box.

These instructions assume a Dell R430 server is being used. If another platform is used there may be slight variations in the locations of the server connectors. Reference the tag on the server for the exact port locations.

These instructions are used to set up the first Simplex server (HS1) at a site. If setting up additional Simplex servers (HS2, HS3, and so forth), adjust the names accordingly.

The number of Ethernet ports supplied may vary, including the number of expansion cards supplied. Follow the information on the server tag when making network connections.

---

**Attention**

Inspect the system for damage. If the system has been damaged during shipment, stop unpacking and contact GE for assistance.

---

2.2.1 Server Unpacking

➢➢

To unpack the HS1 server

---

**Attention**

Contact GE for assistance if you find any broken or damaged parts.

---

1. Using a box cutter, carefully open the HS1 box.

2. Remove and open the top cardboard compartment that contains two power cords, product documentation, the bezel, and a smaller box containing the rack mounting rails.

   ![Image with labeled components: Product Documentation, Two Power Cords, Bezel]

3. Open the box of rack mounting rails, and identify the A7 Dell™ ReadyRails™ II Skidding Rail Assemblies, the rack installation instructions, and two Velcro straps (for cable management).

   **Note** If the HS1 server is to be installed into a rack, use the vendor supplied *Rack Installation Instructions* for proper mounting.
Rack Mounting Kit for HS1

**Note** Mounting racks may already be installed if a server rack was purchased with the system.

4. Remove the top protective foam pieces and remove the server.

**Note** Use the configuration tag to identify the HS1 server.
2.2.2 Server Setup

**Note** Complete the network connections to the Control Server in accordance with the supplied GE 4108 diagram. If the diagram is not available, review the completed engineering drawings as prepared by the responsible engineering party. When attaching network connections, note that the Network Configuration tag identifies which ports are configured for the Plant Data Highway (PDH) or Unit Data Highway (UDH) to guide connection.

**Note** Actual server layouts may vary.

![Control Server Connections - Dell R430](image1)

The labels on the top cover of each server identify configured ports and the networks. The following figure provides an example label for a Simplex configuration.

**Note** Actual server layouts may vary.

![Typical Simplex HS1 Label](image2)
➢ To set up the HS1 servers

1. Insert the Ethernet cables for PDH 1 into port 2 and PDH 2 into port 4.
2. Insert the Ethernet cables for UDH 1 into port 1 and UDH 2 into port 3.
3. Connect the other end of each PDH Ethernet cable to appropriate port on the network switch.
4. Connect the other end of each UDH Ethernet cable to appropriate port on the network switch.
5. Insert each power cable into the HS1 power sockets, but to *do not* plug them into a powered outlet.

The following figure displays the HS1 server with proper Ethernet and power connections.

![HS1 server with proper Ethernet and power connections](image)

*Note* The HS1 server requires four Ethernet cables, two to connect to the PDH and two to connect to the UDH. Cables must be long enough to reach the network switch designated in the engineering drawings (GE 4108).

### 2.2.3 Server Power On

➢ To properly power on the control server

1. Verify that the necessary network switches have been installed and powered up before attempting to power on the Control Server.
2. Plug the power cord from HS1 into powered outlets. HS1 has redundant power supplies. To ensure redundancy, servers with two power connections should have each one fed from a separate power source.
3. The server may power on automatically. If the power button on the top left of the server displays a yellow light, press the power button. It will display a green light and begin to power on.

![Front of HS1 Control Server - Dell R430](image)

### 2.2.4 Verify Server Connectivity

➢ To verify connectivity to the server

1. *Establish a PDH connection.*
2. *Ping* the HS1 server (typical address is 172.16.199.8).
   a. If the ping successfully replies, you are connected.
   b. If the ping does not respond (or replies with Destination host unreachable), check the network connections and ping again.
3 Domain Services

Domain Services is an optional module that provides domain controller VMs and a certificate authority VM. The procedures in this section are used to verify that the VMs have been started and are available on the network.

3.1 Verify Domain Services VMs Are Running

Note After turning on the supplied servers, it may take up to 5 minutes before the MC3 VM is running.

Typical IP Addresses

- DC1: 172.16.201.101
- DC2: 172.16.201.102
- MC3: 172.16.199.5

➢➢ To verify that DC1 is running

1. Ping the VM.
2. If no response, start the VM.
3. Wait for the VM to start.
4. Repeat steps 1–3 for DC2.
5. Repeat steps 1–3 for MC3.

3.2 Verify the Domain Configuration of Domain Services VMs

➢➢ To verify DC1 configuration

1. RDP to the VM.
2. Restart the VM.
3. Verify that the VM categorizes the PDH as a Domain Network.
4. Repeat steps 1–3 for DC2.
5. Repeat steps 1–3 for MC3.
3.3 Verify the Domain Configuration of Process VMs

➢ To verify if a VM’s network adapter is configured for a domain:

1. **Ping** the VM.
2. If no response, **start the VM**.
3. **Wait for the VM to start**.
4. **RDP** to the VM.
5. **Verify that the VM categorizes the PDH as a Domain Network**.
6. If the PDH port is not configured for the domain, perform the following:
   a. **Restart the VM**.
   b. **RDP** to the VM.
   c. **Verify that the VM categorizes the PDH as a Domain Network**.
7. Repeat steps 1–6 for all Process VMs.

---

**Note**  DC1, DC2, MC3, HC1, and HW1 are not Process VMs.
4 Thin Client Terminal

The optional Thin Client module supplies Thin Client VMs and Thin Client Terminals.
The Control Server currently supports Dell Wyse Thin Client Terminals (model Z50Qq and model D50D).

<table>
<thead>
<tr>
<th>Thin Client Terminal Model Monitor Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Z50Qq</td>
</tr>
<tr>
<td>D50D</td>
</tr>
</tbody>
</table>

Note Several Thin Client Terminals may be delivered in one large box.

4.1 Verify Connectivity to Thin Client VMs

If Domain Services is not supplied, verify that all Thin Client VMs are running and their network adapters are properly configured.

➢➢➢➢➢ To verify if a VM is running and its network adapter is configured correctly:

1. Ping the VM.
2. If no response, start the VM.
3. Wait for the VM to start.
4. RDP to the VM.
5. Repeat steps 1–4 for all Thin Client VMs.

Note DC1, DC2, MC3, HC1, and HW1 are not Thin Client VMs.
4.2 Unpack the Thin Client Terminal

➢ To unpack the Thin Client Terminal
1. Using a box cutter, carefully open the Thin Client Terminal box, and remove the contents.
2. Review the system for damage as you unpack it. If you determine the system has been damaged during shipment, stop unpacking and contact GE for assistance.
3. Use the following figure to identify the parts as follows:
   A) keyboard
   B) display power connector
   C) client device power connector
   D) DVI to VGA adapter
   E) mouse
   F) vertical stand
   G) vertical stand screws
   H) documentation
   I) Thin Client Terminal

Note With Thin Client model Z50Qq, three DisplayPort-to-DVI and three DisplayPort-to-VGA adapters are included (not shown in previous photo). With Thin Client model D50D, one DisplayPort-to-DVI and one DisplayPort-to-VGA adapter are included (not shown in previous photo).

4.3 Set Up the Thin Client Terminal

The Thin Client Terminal requires one Ethernet cable to connect to the PDH (not included). The cable must be long enough to reach the network switch designated in the network topology drawing (GE 4108). A Thin Client Terminal will be connected to a video monitor. The video monitor and video cable may or may not have been purchased with the Control Server.
**Note**  Windows Thin Client Terminals are distinguished by a sticker on the side of the unit identifying them as having a Microsoft Windows Embedded operating system.

➢➢

**To set up the Thin Client Terminal**

1. Using the two vertical stand screws and a #2 Phillips screwdriver, install the vertical stand to the bottom of the Thin Client Terminal.

   ![Vertical Stand Installed](image)

2. Connect the mouse and keyboard to the USB 2.0 ports on either the front or the back of the Thin Client Terminal.
3. Insert the PDH Ethernet cable (displayed as blue) into the Ethernet port.

4. Connect the Display Power Connector to the Client Device Power Connector and connect them to the Thin Client Terminal. Plug the power cord into a powered outlet.

5. Connect monitor(s) to the Thin Client Terminal using the DVI and / or DisplayPort connectors on the back of the Thin Client Terminal.
4.4 Start Up the Thin Client Terminal

For system integrators, refer to the following documents:

- Control Server Dell Windows Thin Client HMI System Support and Maintenance Guide (GEH-6849), the section System Configuration and Maintenances Use Cases
- Control Server Dell Wyse Thin Client HMI System Support and Maintenance Guide (GEH-6842), the section Commission or Replace a Dell Wyse Thin Client

For users, refer to the Operation chapter in the following documents:

- Control Server - Thin Client Dell Wyse Enhanced SUSE Linux Enterprise Thin Clients User Guide (GEH-6841)
5 Common Procedures

5.1 Establish a PDH Connection

Note Skip this procedure if there is an available computer on the PDH network.

➢➢ To set up a computer on the PDH network

1. Contact the site network administrator or reference drawing 4108 for an available PDH IP address and available PDH port on the network switch.

2. Configure a physical network adapter for the PDH network from the Control Panel Internet Protocol Version 4 (TCP/IPv4) Properties dialog box as follows:

Note If your network is already configured for a specific IP address, record the values for IP address, subnet mask, default gateway, preferred DNS server, and alternate DNS server. You will need to reset these fields once you are done configuring the PDH.

a. Select the Use the following IP address: radio button and enter the following information:
   • IP address: (PDH IP address) 172.16.199.xx (xx is an available IP address on the PDH)
   • Subnet mask: 255.255.240.0

b. Select the Use the following DNS server addresses: radio button and leave all other entries blank.
c. Click **OK** and close all open network configuration windows.

3. Plug an Ethernet cable into the computer and into the specified PDH port on the PDH network switch.
5.2 Remote Desktop (RDP)

➢ To connect to a device remotely using RDP

1. From the Start menu, select All Programs, Accessories, then select Remote Desktop Connection.
2. Enter the IP address of the device and click on Connect.

3. Enter your credentials and Click OK.
4. If the Certificate Authentication dialog box displays, click Yes to continue.

5. If the User Account Control dialog box displays, click Yes to continue.
5.3 Ping

➢ To determine if a network connection exists to a device

1. From the Start menu, select All Programs, Accessories, then select Command Prompt to open a Command Prompt window.

2. Ping the device by entering the command ping followed by the IP address of the device.

![Command Prompt Ping Example]

3. If it successfully replies (as shown in the example), your network connection is good. If it does not successfully respond (replies with Destination host unreachable), check the network connections and ping again.

5.4 Wait for the VM or Server to Start

➢ To determine if a network device is running

1. From the Start menu, select All Programs, Accessories, then select Command Prompt to open a Command Prompt window.

2. Enter the command: Ping xxx.xxx.xxx.xxx -t (x’s represent the IP address).

3. The ping will continue forever. Wait for a successful reply indicating that the device is running.

4. Enter CNTRL-C to stop the ping command.
5.5 **Start or Restart the VM**

5.5.1 **Start the VM**

➢ To start a VM

1. Using an administrator account, log into a computer with the VMware vSphere Client installed (such as MC3).

2. Start the **VMware vSphere Client** by double-clicking on the desktop icon.

3. Enter the following information to connect to the server on which the VM resides (HS1 or HS2):
   - **IP address**: typically 172.16.199.8 for HS1 and 172.16.199.9 for HS1
   - **User name**: root
   - **Password**: correct password for the specified account
4. Click **Login**.

5. If a *Security Warning* dialog box displays, click **Ignore**.

6. If a Warning message displays, click **OK**.

7. Click **Inventory**.

![Diagram of vSphere Client interface]

8. From the Navigator pane, expand the Tree View to display the VMs residing on the server. If the desired VM is not found, repeat steps 2-8 on the other server.

![Diagram of vSphere Client interface with VMs listed]
9. Right-click the desired VM, select **Power**, then select **Power On**.

---

### 5.5.2 Restart the VM

➢ **To restart a VM:** from the **Start** menu, right-click and/or (depending on your operating system) select **Shut down or sign out**, then select **Restart**.
5.6 Verify the VM Categorizes the PDH as a Domain Network

➢ To verify that a VM categorizes the PDH as a domain network

1. Using RDP, connect to the desired VM.
2. Log on using the HMI\admin account.
3. From within the remote desktop window, perform the following:
   a. Open the Control Panel.
   b. Select Network and Sharing Center (view by small icons).
   c. In the View your active networks area, verify that the PDH connection displays as HMI.local Domain network.

![HMI.local Domain Network Displayed as Active Network]
5.7 Configure a Physical Network Adapter

➢ To configure a physical network adapter
1. Open the Control Panel and select Network and Sharing Center.
2. Select the Change adapter settings link (on the left panel).
3. From the Network Connections window, right-click the network adapter for your physical Ethernet port and select Properties.
4. If the User Account Control dialog box displays, click Yes to display the Local Area Connection Properties dialog box.
5. Select **Internet Protocol Version 4 (TCP/IPv4)**, then select **Properties** to display the **Internet Protocol Version 4 (TCP/IPv4)** dialog box.

6. Enter the appropriate configuration.

7. Click **OK** and close all open network configuration windows.
Appendix A Hardware Specifications

Information provided from third-party applications can vary due to updates. Consult the third-party documentation included with the Control Server for the latest information. Application vendors retain trademark and copyright protections as permitted by law or contract.

This document provides unpacking and initial installation steps for the Control Server as shipped from a GE-approved integrator. The Control Server shall be stored and operated within the following physical environment.

Control Server Environment Specifications

<table>
<thead>
<tr>
<th>Temperature (system inlet / sea level)</th>
<th>Operating</th>
<th>10 to 35°C (50 to 95°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-operating</td>
<td>-40 to 65°C (-40 to 149°F)</td>
</tr>
<tr>
<td>Relative Humidity (non-condensing)</td>
<td>Operating</td>
<td>10 to 80%</td>
</tr>
<tr>
<td></td>
<td>Non-operating</td>
<td>5 to 95%</td>
</tr>
</tbody>
</table>

Note Refer to the documentation for each Control Server component for additional specifications and details.

The Control Server product can contain a combination of the following servers:

- The MC2 server provides the administrative functions. The box has dimensions of 825.5 x 609.6 x 254 mm (32.5 x 24 x 10 in).
- The HS1 and HS2 servers provide a redundant framework for the application. These boxes each have dimensions of 889 x 609.6 x 241.3 mm (35 x 24 x 9.5 in).

An optional server rack, would be mounted on a standard pallet. A standard socket set is required for unpacking a rack from a pallet. A #2 Phillips screwdriver is required to connect a server to the rail kit and to connect the vertical base to a Thin Client Terminal.

If purchased, additional boxes would contain Thin Client Terminals with dimensions of 495.3 x 279.4 x 114.3 mm (19.5 x 11 x 4.5 in), or monitors and video cables.
Appendix B Server Rack Information

Note  If you have not purchased a server rack, continue to the next section of this document.

For 120 V power source, the following Tripp Lite components are supplied:

- SR42UB - 42U SmartRack Standard-Depth Server Rack Enclosure Cabinet with doors and side panels
- PDU1215 - 1.8 kW Single-Phase 120 V Basic PDU, 13 NEMA 5-15R Outlets, NEMA 5-15P Input, 15 ft. Cord, 1U Rack-mount
- SRFANROOF - SmartRack Roof-Mounted Fan Panel with six 120 V high-performance fans; 630 CFM, 5-15P plug

For 240 V power source, the following Tripp Lite components are supplied:

- SR42UB - 42U SmartRack Standard-Depth Server Rack Enclosure Cabinet with doors and side panels
- PDU12IEC - 1.6/3.8 kW Single-Phase 100–240 V Basic PDU, 14 Outlets (12 C13 & 2 C19), C20 16A Input, 1U Rack-Mount
- SRFANROOF - SmartRack Roof-Mounted Fan Panel with six 208/240V high-performance fans; 420 CFM; C14 inlet

Note  For detailed information about these products, go to https://www.tripplite.com.