



QUANTUM3D®
Delivering Affordable Reality

Independence® IDX 4000 Image Generator User Manual

Operating Your Independence Image Generator



Quantum3D, Inc.
6330 San Ignacio Avenue
San Jose, CA 95119-1209 USA

Telephone (408) 361-9999
Facsimile (408) 361-9980

General <http://www.quantum3d.com>
Support <http://www.quantum3d.com/support>

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Save these instructions.

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A *lithium ion* battery is included with all Independence computers and some components. These batteries are used for the real-time clock circuits. The expected lifetime of these batteries is approximately five (5) years. There is a danger of explosion if these batteries are incorrectly replaced. Replace only with the same or equivalent type recommended by the motherboard manufacturer. Dispose of used batteries according to the manufacturer's instructions.

There are no user-serviceable parts in the power supply. Refer all servicing of the power supply to qualified service personnel.

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Chapter 1

Introduction

1.1 Welcome

Welcome to the Independence[®] Series Image Generator (IG). The model IDX 4000 in the Independence[®] family of IG Solutions are designed to meet the demands of today's most advanced real-time synthetic environment visual simulation and training applications. The Independence IG architecture combines the latest in extended-life-cycle advanced PC technologies with value-added software and hardware in a unique System Level Parallel Rendering Architecture (SLPRA). With its Mantis[®] Realtime Scene Management Software and IGM[™] IG Management System Administration Software Suite, the Independence IG includes a comprehensive and essential IG feature set that is required by demanding real-time visual simulation and training applications. These features include compatibility with important visual simulation standards (such as CIGI), four-nines (99.99%) of effective hardware availability, unmatched technology insertion capabilities, low total cost of ownership, as well as industry leading image quality, visual acuity, and performance.

The Independence IG is designed to sustain 60 Hz performance (or 120 Hz for stereo applications) when configured with high resolution, geospecific or geotypical databases produced using COTS tools. The Independence family of IGs is ideally suited for a wide range of real-time, mission-critical civilian and military visual simulation and training applications.

1.2 About This Manual

This manual provides an overview of your Independence IG, along with detailed procedures for its setup and operation. The manual is valid for IDX Platform Release 4.14 or later. The main chapters and appendixes include the following:

- Document conventions used in this manual, system terminology, and support contact information
- System overview and a description of the system architecture including typical configurations
- Procedures for setting up and turning on your Image Generator
- IG Manager administration and operation
- Using the IG Commander to control system features in detail
- Monitoring system status, replicating files, and scripting processes
- Installing applications and databases, and backing up your system
- Virtual Network computing, disk tray handling, debugging, and model cross reference chart
- Table of the graphical figures and glossary of all special terms used within this manual

1.3 Documentation Conventions

The following are general documentation conventions used in this manual.

Font Formatting

Font formatting indicates that the text serves a particular function.

- **Bold** font style highlights document titles, command-line and Graphical User Interface (GUI) captions, heightened emphasis, and program elements.
- *Italic* font style indicates emphasis, document title references, parameters, and placeholders.
- ***Bold Italic*** font style indicates critical information.
- **Menu** → **Command** indicates a menu command sequence or the path used to navigate through a hierarchical tree structure.
- **Note** *Indicates important background information with technical emphasis.*
- **TIP** Indicates information that might be useful, but is not critical for safe or trouble-free operation.
- Monospaced font styles indicate program listings, command line entries, and file folders.

Icon



The exclamation icon and accompanying bold italic text indicate critical information to avoid a major malfunction or prevent hazardous conditions.

Interface Terminology

The following terms describe actions you may perform with your mouse. If you use another pointing device or have interchanged the effect of the left and right buttons, adjust your usage accordingly.

- **Click** Point to the indicated item (or in the indicated area), and then press and release the *left* mouse button.
- **Right-click** Point to the indicated item (if any), and then press and release the *right* mouse button.
- **Double-click** Point to (or in) the indicated item, and then press and release the *left* mouse button twice in rapid succession.
- **Drag** Point to the indicated item, press and hold the *left* mouse button, move the mouse pointer to the destination, and then release the button.
- **Scroll** Point to a scroll bar, press and hold the *left* mouse button, move the mouse pointer within the scroll box until the desired content is displayed, and then release the button.
- **Rotate** Turn the mouse wheel button, if your mouse is so equipped, until the desired content or option is displayed.

1.4 Acronyms

A number of short-form terms (initialisms, abbreviations, and acronyms) associated with the Independence IG appear frequently in this manual. It would be helpful to become familiar with them. For a more inclusive list, see Appendix G, Glossary on page 201.

AM	Auxiliary Mission Function Processor An equivalent to MFP.
AR	Auxiliary Radar Channel A radar channel contains the same hardware as an AV channel, but includes optional radar simulation software in lieu of Mantis IG software.
AV	Auxiliary Visual Channel An AV channel is a visual channel that uses the output directly from the IGU to drive a display device without the video going through a channel compositor.
CC	Channel Compositor A hardware device that can receive up to eight digital inputs and combine them to create a single visual channel output. There are three types of Channel Compositors supported: CC-STD, which supports up to four digital inputs; CC-EXT, which supports up to eight digital inputs; and CC-QST, which provides sensor simulation post processing functions.
ChDS	Channel Display Switch A KVM the operator uses to select the output from any of the Independence IG graphics channels to display on the operator's channel display device.
CoDS	Console Display Switch A KVM that enables the operator to access and control each of the IGUs that make up the Independence IG by using a single keyboard, video monitor, and mouse. It presents the desktop associated with the currently selected system on an operator's console display device.
CSA	Centralized Storage Architecture The CSA subsystem provides diskless IGU support to the Independence IG. The CSA architecture contains a dedicated gigabit Ethernet switch and software that enables the IGUs to run the boot sequence and run remotely without local disk storage.
CSA1	Centralized Storage Architecture Release 1 The first form of CSA, which included an Independence Centralized Server (ICS) unit.
CSA2	Centralized Storage Architecture Release 2 The second form of CSA in which the ICS functionality is merged into the IGC.
DHCP	Dynamic Host Configuration Protocol DHCP is a protocol used to assign dynamic IP Addresses to devices on a network.
EMS	Environmental Management System A rack mounted system that continuously monitors environmental conditions and controls essential functions needed to ensure system availability.
ICS	Independence Centralized Server Used in conjunction with CSA1, the ICS served the data base to the IGRs.
IG	Image Generator An integrated set of hardware and software subsystems that produces unvarying frame rate visual graphics for real-time simulation applications.
IGC	Image Generator Controller The central computer that directs operations and controls all of the other subsystems within an Independence IG.

IGM	Image Generator Manager A software application that runs on the IGC that enables the operator to control and manage the Independence IG.
IGR	IG Renderer An IGU that performs rendering functions.
IGU	IG Unit Generic reference to any computer in the IG other than the IGC.
IV	Independence Visual Channel A visual channel that uses a CC-STD or CC-EXT to provide output to an external display device.
KVM	Keyboard Video Mouse A hardware device that enables a user to control multiple computers from a single keyboard, video monitor, and mouse.
LRU	Line Replaceable Unit A field service term that describes items in the IG that if ever required are replaced in whole (rather than at the internal, component level). For example, all IGUs in the IG are LRUs.
MFP	Mission Function Processor An IGU that processes mission functions and does not perform any 3D rendering.
SR	Subchannel Renderer An IGU that generates any portion of an image forming a graphics channel. The outputs from one or more SRs are combined using a Channel Compositor (CC).
VDisk	Virtual Disk A virtual disk acts just like a physical disk drive, but is created and maintained using the Ardence software. The Independence IG supports two types of VDisks, private and shared.

1.5 Contacting Quantum3D Customer Support

Quantum3D customer support provides a web-based online problem tracking and reporting system. Hardware and software products are only covered during their warranty or maintenance period. We recommend that you review the warranty documentation that accompanied your system and be prepared to provide proof of warranty coverage to Quantum3D upon request. Warranty information can also be found on the Quantum3D website.

Quantum3D customers and authorized representatives may visit our online support system at:

<http://www.quantum3d.com/support>

You should request an account in the online support system as soon as possible after receiving your Quantum3D product. To request your account, follow these instructions, and an account will be created for you:

1. Click this link to [Customer Support](#), or type <http://www.quantum3d.com/support> into your web browser, and then click the **Online Support Database** link to view our online problem reporting system.
2. Have the following information available, and then click the **Support Login Request** link to prepare an email to us:
 - First and last name
 - Company
 - Mailing address
 - Telephone number

- Email address
 - Quantum3D products used
 - Quantum3D product serial number
3. You will receive an email within 48 hours providing your login credentials and instructions for using the system.

Note *Your User ID is case sensitive. Your Password is case-sensitive and stored in clear text. Support administrators will have access to your password.*

1.6 Overview

System Architecture

The Independence IG has a patent-pending System Level Parallel Rendering Architecture that combines multiple, precision synchronized Image Generator Renderers (IGRs) using a Channel Compositor (CC) on a per-channel basis. Independence IGRs are synchronized both within a channel and between channels through nVSync™, Quantum3D's patented precision synchronization technology.

SLPRA enables the Independence IG to deliver outstanding performance simultaneously with unmatched image quality plus optimal object recognition and detection. The Independence IG utilizes Clarity™, Quantum3D's patented real-time image processing technique. Clarity renders multiple sub-pixel samples (SPS) in parallel on each IGR within a channel and combines them within the attached Channel Compositor (CC). This exploits sub-pixel information, while minimizing latency and performance impacts.

The Independence IG supports *performance tiling*, which subdivides a channel into multiple viewport tiles. This effectively reduces the resolution per IGR, increasing the channel's effective fill rate and overall IG throughput. Performance tiling, combined with Clarity Full Scene Anti-Aliasing (FSAA), delivers unmatched performance while maintaining high image quality.

With SLPRA and nVSync, the Independence IG supports channels with differing levels of FSAA, resolution, and frame rates, while maintaining precision synchronization to ensure IG-wide load management and a minimum of distracting artifacts. System integrators can scale their IG configuration to match precise requirements, and because the components for each channel utilizing SLPRA are identical, channel-specific spares are unnecessary.

System Features

These system features provide superior performance and ease of use:

- Nominal IG end-to-end (host command to last pixel out) transport delay for 60 Hz applications is less than 52 ms (milliseconds).
- The Microsoft® Windows® operating system-based hierarchical graphical user interface (GUI) enables system administrators to maintain and update the system easily at the subsystem, channel, or IG level.
- The Independence IG supports Line Replaceable Unit (LRU) insertion to enable minor upgrades in CPU, memory, and in many cases GPU technology. Enduring components such as the Cabinet and IG Infrastructure, IGC, and CCs remain largely unaffected.
- IGRs are software compatible, further supporting LRU upgrades.

Centralized Storage Architecture

Centralized Storage Architecture (CSA) is Quantum3D's unique solution that centralizes the disk drives for all of the PC-based subsystems within an Independence IG. With CSA, all of the IGUs that make up

the IG are diskless and turn on remotely from the IGC by using a dedicated gigabit IG LAN. The CSA subsystem uses virtual disks to replace the large number of physical disks normally required in a clustered computing system. In the CSA subsystem, there are no physical disks directly connected to the IGUs. Instead, IGUs access database information stored on the IGC through a separate CSA gigabit Ethernet LAN. The IGUs pull data from the IGC, which acts as a Network Attached Storage device for the IG synthetic environment terrain database. The CSA subsystem employs RAID 5 configured drive subsystems to ensure enhanced reliability. For convenience—especially in secure environments or environments where different databases are required for different training missions, the disk drives for the entire IG are housed in the IGC.

Independence IDX 4000 Features

The Independence IDX 4000 IG continues the tradition of System Level Parallel Rendering Architecture that provides the foundation for the Independence IG family. IDX 4000 includes technology refreshment of essential PC components in the system's rendering subsystems, along with upgrades of value-added IG system and software components. New features are:

- The sole architecture available is CSA2, in which the functionality of the ICS is merged into the IGC, eliminating the ICS computer.
- The new IGC4 can accommodate up to five terabytes (TB) of database storage plus one terabyte of system storage by using 1-terabyte hard disk drives configured as two separate RAID arrays for increased reliability. The drive bays are physically identical to those of the CatalystSE 4000 DBGS enabling databases to be interchanged between it and the IG by simply moving disk sets.
- The new IGR5 contains a dual-core Xeon processor and incorporates the latest generation of COTS PCI Express graphics adapter (NVIDIA Quadro FX 5600).



Figure 1-1 IGR5 with front cover attached



Figure 1-2 IGR5 with front cover removed

- A rack mounted environmental management system (EMS) monitors and controls essential functions needed to ensure system availability. The EMS continuously monitors environmental conditions, such as temperature, humidity, and vibration, comparing them to specified acceptable criteria.

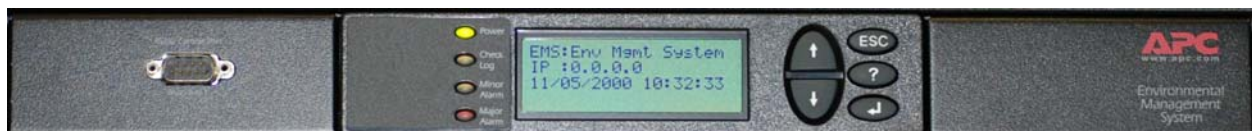


Figure 1-3 Environmental management system (EMS)

- A unit identifier button is located on the front of each IGU. Push the button to light LEDs on the front and the back of the IGU for easy identification in the rack.

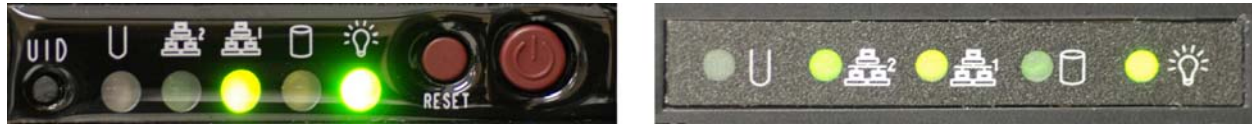


Figure 1-4 IGR front buttons and indicators

The left portion of Figure 1-4 above shows (from left to right): the unit identifier button, the unit identification LED, the CSA network activity LED, the IG network activity LED, the hard drive activity LED, the IGR power status LED, The IGR reset button, and the IGR power button. The right portion of the figure shows the IGR cover, which reveals the status of the five corresponding IGR LEDs.

- A half-size 18U cabinet is available for smaller IG configurations.

KVM Control

The Keyboard Video Mouse (KVM) control enables you to access the multiple computers that make up your Independence IG. You use the Image Generator Manager (IGM) application running on the Image Generator Controller (IGC) computer to access all the Independence IG hardware and control all subsystems within the IG. When necessary, you can directly access and control each of the IGU computers with the Console Display Switch (CoDS) at the Operator's Console Display. Use the Channel Display Switch (ChDS) to view the 3D output from any of the graphics channels and display that output on the Operator's Channel Display. The channel display switch is accessible only through IGM.

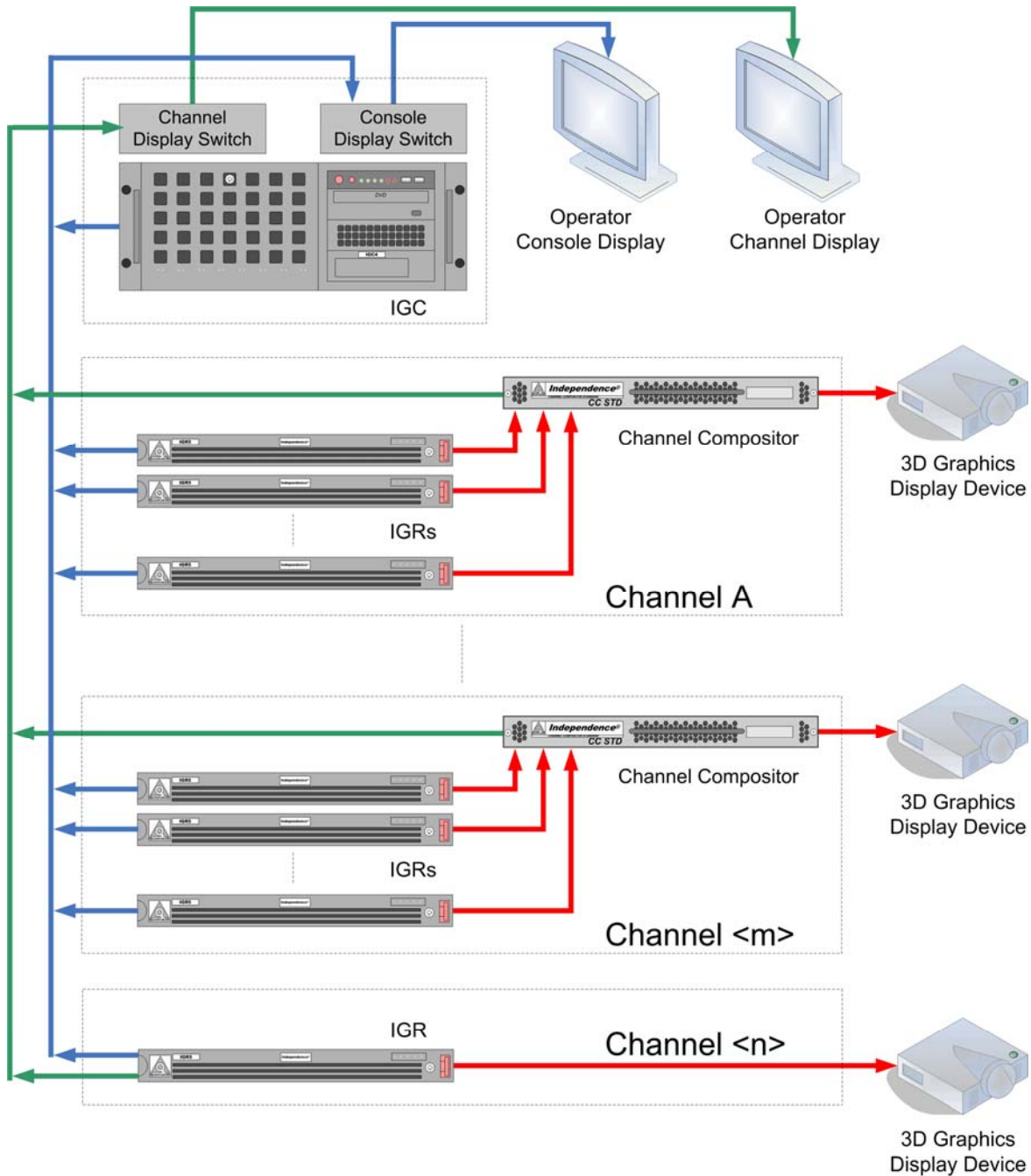


Figure 1-5 KVM control path for the Independence IG architecture

The Console Display Switch is set by default to access the IGC, but another user may have modified the environment so that the operator's console display is currently controlling one of the other subsystems. If you are unsure, you can access the on-screen display by pressing the CTRL key on the operator's keyboard twice in succession.

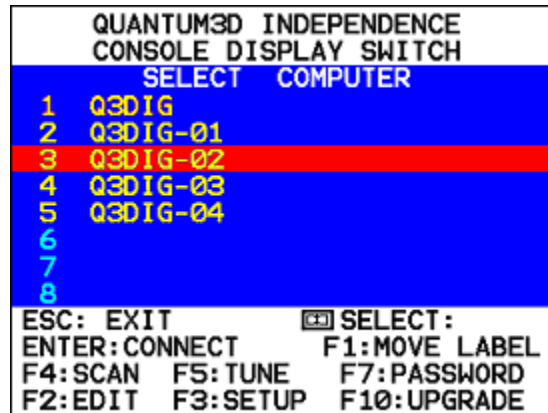


Figure 1-6 An Independence IG configuration containing a single IGC and four IGUs

If the IGC (called *Q3DIG* in this example) is not selected in the on-screen display, use the UP ARROW or DOWN ARROW keys on the operator's keyboard to highlight the IGC. Press the ENTER key to connect to this system.

Note The default password for the KVM is **admin** in lower case.

Reset KVMs

If your keyboard locks up or your mouse freezes, you must use the *Reset KVMs* utility. Usually, one of the input devices will remain active when the other one fails, and you can reset the KVM from the local computer.

To reset the KVM, from the **Start** menu (or from the icon on the desktop) click **Reset KVMs**. If the mouse stops working, use your keyboard to navigate to the utility.

If neither the mouse nor keyboard are working, use the information in Appendix A, "Virtual Network Computing (VNC)" on page 175 to access the machine and start the *Reset KVMs* utility to reset the KVM.

1.7 Visual Channel Configurations

A channel's 3D graphics output comes from either a Channel Compositor (CC) or directly from an IGR. For channels that use a CC, the outputs of the IGRs are connected to the inputs of the CC, and the output of the CC is connected to the 3D graphical display device. Visual channels that use a CC are named *IV5-nyy*, where 5 represents the channel model generation, *n* represents the number of sub-channel renderers, and *yy* is reserved for internal naming. For channels that do not use a CC, the output of the IGR is connected directly to the 3D graphical display device. Visual channels that take their output from the IGR are named *AV5-1yy*.

Centralized Storage Architecture

Centralized Storage Architecture (CSA) is the subsystem that enables the Independence IG to support diskless IGUs. It removes the requirement that each IGU have a physical disk either locally or remotely mounted. The CSA subsystem uses virtual disks (VDIs) to manage the storage operations that normally require a large number of physical disks in a clustered computing system. The CSA subsystem reduces the number of physical disks in the IG and thereby increases its reliability. Databases are stored on the IGC, and then accessed remotely by the IGUs via a dedicated network, the CSA network.

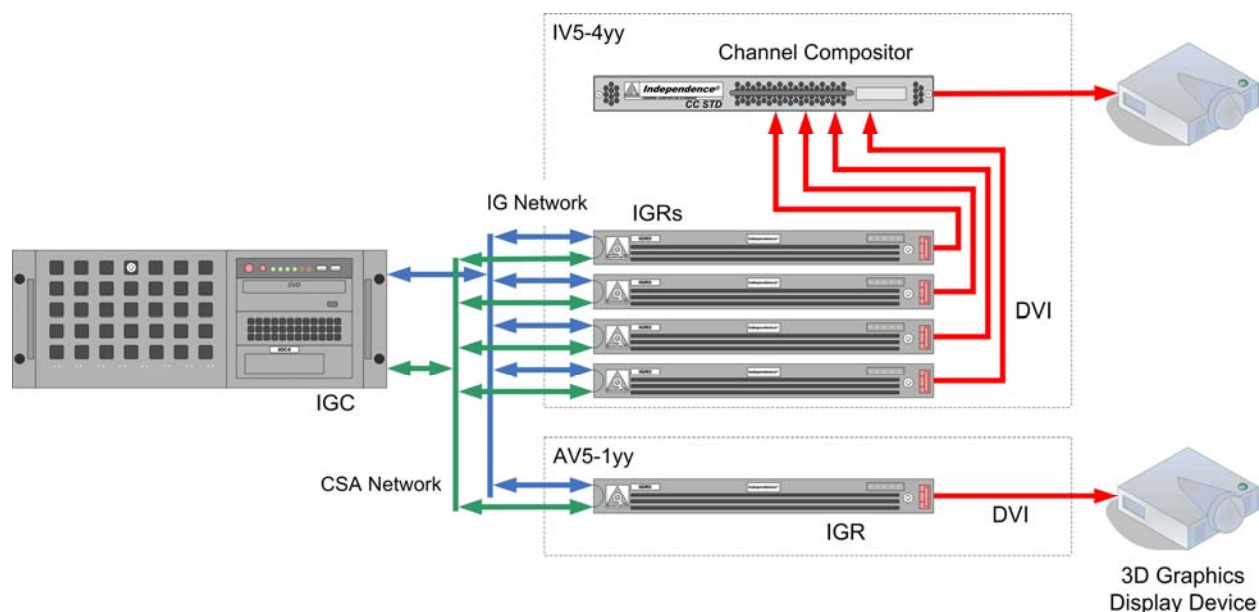


Figure 1-7 IV5-4yy and AV5-1yy with CSA2 architecture

CSA uses a Client/Server model in which the clients boot from the server remotely. The IGC is the boot server and the IGUs are boot clients. IGUs use a PXE service supported by their network device to request a DHCP IP address from the IGC. After communications are established, the IGUs obtain a bootstrap file and virtual disk assignment, and then start the Windows operating system. CSA uses Virtual Disks (VDIs) to replace the functionality of hard disks in the IGUs.

The IGC does not have a virtual disk; it starts directly from its own local, physical disk subsystem. The IGC, however, does provide the centralized location for the VDIs that are used to start the IGUs. The VDIs are located on the IGC in the folder `G:\Q3D\VDIs\Current`. The number of VDIs on a system is configuration dependent and is determined by the number of private and shared VDIs required to support your configuration.

New for IDX 4000 is CSA2, in which the IGC also houses the physical disks that make up the data drive. The data drive is shared and accessible by all other computers in the IG as drive D. It holds all the databases that are used by the IGC and IGUs. In the previous CSA version, CSA1, an ICS provided this functionality.

The IGUs in a CSA configuration are all clients of the remote boot software service and start from virtual disk images that are located on the IGC. IGUs can have either a private VDI or a shared VDI.

Virtual Disks (VDisks)

There are two types of Virtual Disks (VDisks) used to start devices in the Independence IG, Private and Shared.

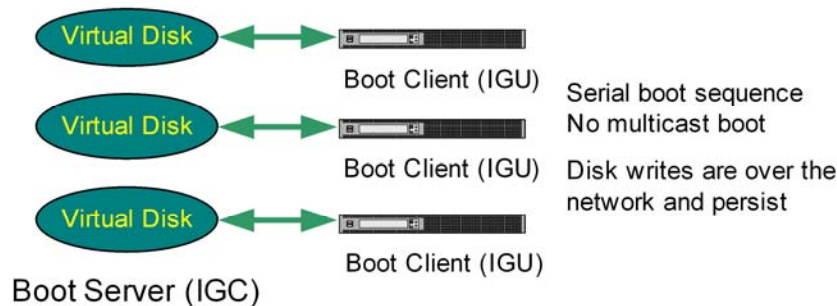


Figure 1-8 Private VDisk Model

The Private VDisk is a disk image that can only be assigned to one IGU; multiple IGUs cannot start from the same private VDisk. CSA requires one private VDisk for each IGU role type in the Independence IG. Subsequent IGUs of similar role type are assigned Shared VDisks. By assigning one IGU a private VDisk, the operating system can make any persistent changes made to the IGU back to the private VDisk. Unique IGM software can then apply these changes to all other IGUs with the same role types, but which were constrained by using Shared VDisks.

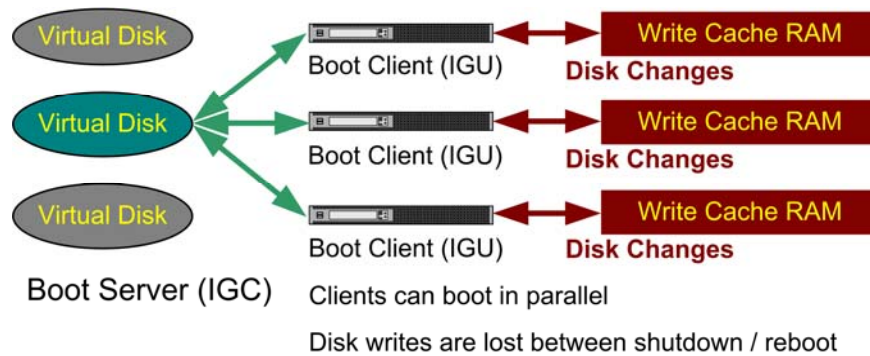


Figure 1-9 Shared VDisk Model

CSA does not support multiple IGUs writing to the same Private VDisk as this could result in data corruption. The shared VDisk is a disk image that supports multiple IGUs assigned to the same VDisk. IGUs that use a shared VDisk are configured with their disk write cache in memory. Using an in-memory write cache for the shared VDisk ensures that any disk writes performed by the IGU are stored in RAM rather than on the VDisk. Because disk writes are saved in volatile memory, any changes made to an IGU that uses a shared VDisk will be lost after the next system restart when the memory cache is cleared. Unique IGM software applies IGM-specific changes that must persist between restarts.

VDisks are named uniquely for quick and easy identification. The VDisk naming convention uses the following format:

<Computer Model Name>+<Computer Role>.[private | shared]

<Computer Model Name> IGR5

<Computer Role> one of {SD5, ND5, VD5, MD5}

Independence IG Rack Configurations

The Independence IG is a complete visual system solution, deliverable in a variety of channel configurations. The Independence IG consists of a primary cabinet along with optional auxiliary cabinets. Depending on your configuration, you may or may not need the auxiliary cabinets.

The minimum Independence IG configuration consists of a primary cabinet containing a single visual channel, along with the required IGC subsystem and ancillary equipment. The number of cabinets required in a fully configured Independence IG system depends on the number of channels purchased and the types of each of the channels. Other component-level hardware may be required to support the different channel types.

The base primary cabinet contains a fan assembly, Environmental Management System (EMS), network switch, IGC, Console Display Switch, Channel Display Switch, AC on/off switch, Power Distribution Unit (PDU), and optional Uninterruptible Power Supply (UPS).

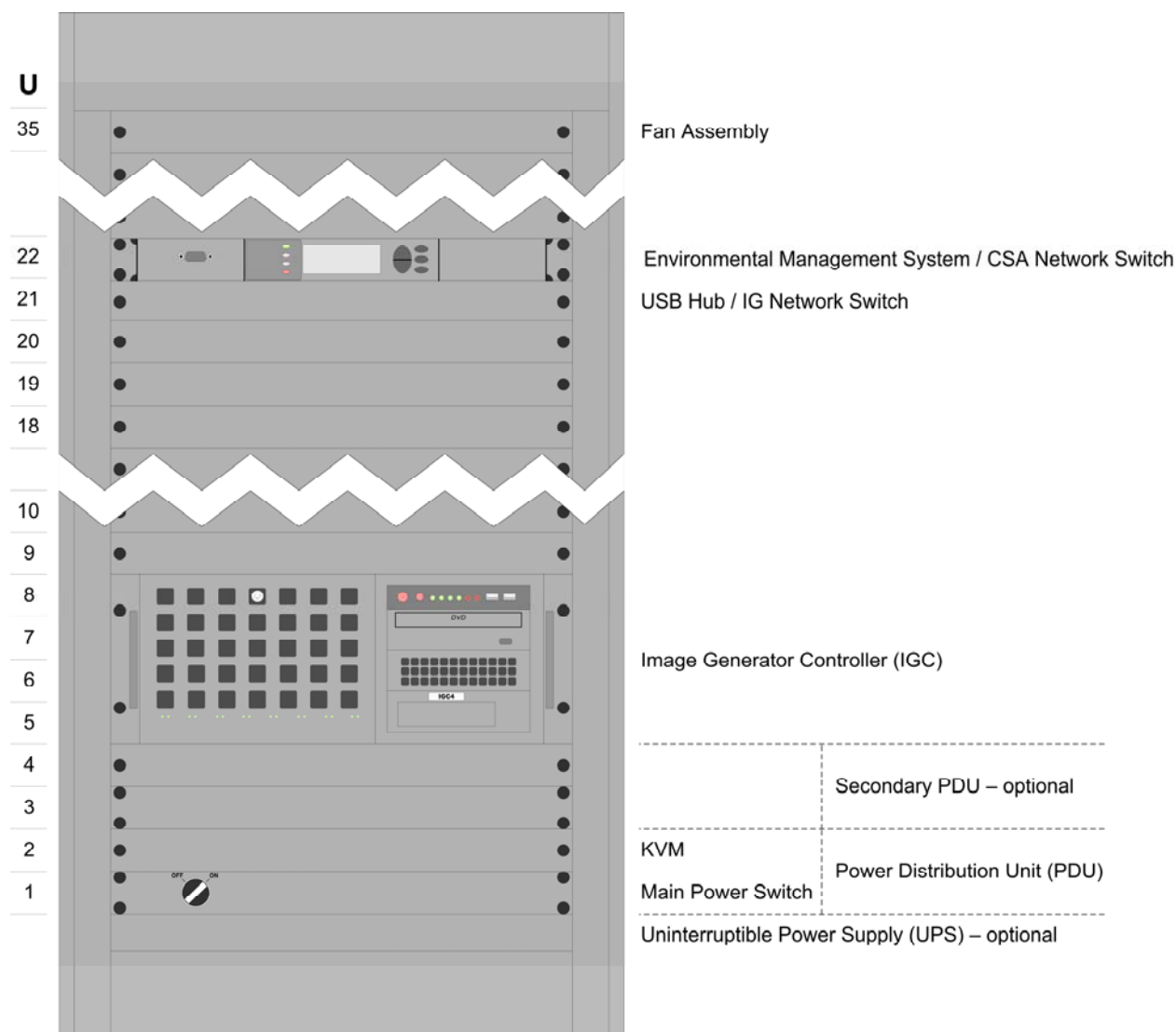


Figure 1-10 Base primary cabinet configuration without Visual Channels

Independence IG Channel Configurations

Independence IG 3D graphics channels consist of IV, IS, AV, AM, and AR channels. An IV graphics channel can include up to eight IGUs, with each IGU providing input to a channel compositor (CC) subsystem. Each IGU generates a portion of the image that forms an IV Channel. The CC takes the digital outputs from each of the IGUs and combines them to produce a high-fidelity, 3D picture that can be displayed in real time on a graphical display device.

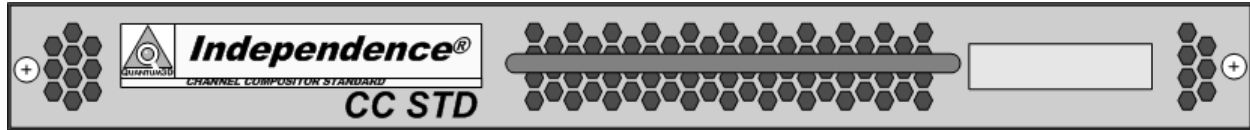


Figure 1-11 Channel compositor

Every IS graphics channel includes up to four IGUs. The CC-QST takes the digital outputs from each of the IGUs and combines them to produce a high-fidelity, 3D, sensor simulated picture that can be displayed in real time on a graphical display device.

Every AV graphics channel contains only one IGU. The IGU generates the entire 3D picture that can be displayed in real time on a graphical display device. The output from the IGU drives a single video output and creates a single visual channel.

Every AM channel contains only one IGU. The IGU processes Mission Functions. The AM channel does not generate visual output for display on an output device, but it is synchronized with the rest of the system. This channel is also referred to as a Mission Function Processor (MFP).

Every AR channel contains only one IGU. The IGU generates the entire radar picture that can be displayed in real time on a graphical display device. The output from the IGU drives a single video output and creates a single radar channel.

A generic description for an IV channel is $IV5-nyy$, where n is the number of IGU computers that make up the channel. An IV Channel that includes two IGU computers is called a 2-IGU Visual Channel, or $IV5-2yy$. We use a similar naming convention for IS channels, so a 4-IGU Sensor Simulation channel is called, $IS5-4yy$. In this way, we can describe the IG by its channel types. For example, an IG might be referred to as a nine channel system consisting of three channels of $IV5-4yy$, three channels of $IV5-2yy$, one channel of $IS5-2yy$, one channel of $AV5-1yy$, and an MFP ($AM5-1yy$).

Independence IG channels come in various configurations that support your requirements for image quality, graphics processing power, form factor, and budget constraints. The figures below highlight three different types of visual channels using 1, 2, 4, and 8 renderers. They are shown as individual channels outside the cabinet.

U

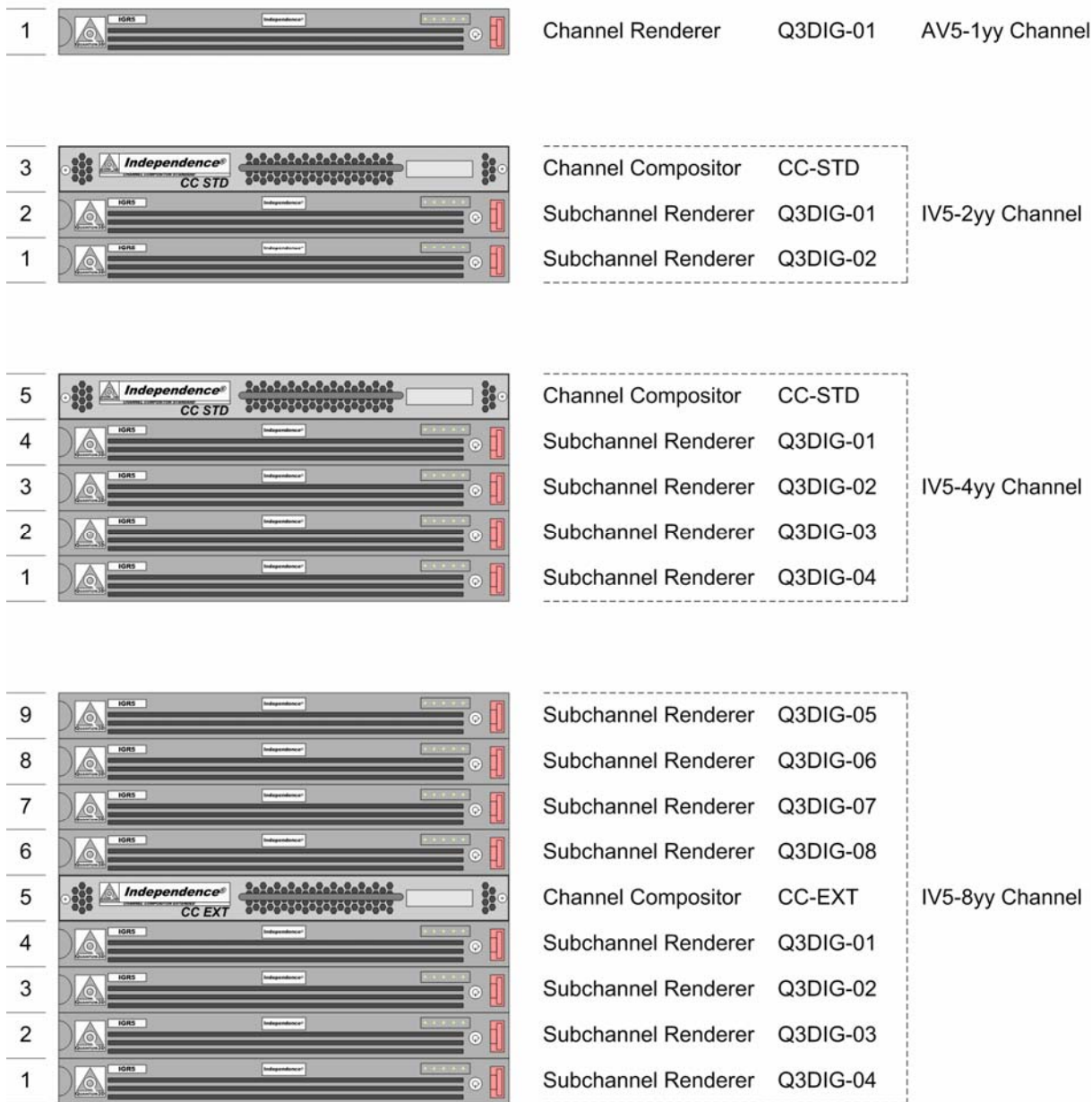


Figure 1-12 Single-channel configurations having 1, 2, 4, and 8 renderers

An Independence IG Configuration with Primary and Auxiliary Cabinet

In addition to the primary cabinet, an Independence IG may require one or two auxiliary cabinets to house additional channels as specified by the configuration. The configuration depicted in Figure 1-13 on page 15 and Figure 1-14 on page 16 consists of one IV5-8yy Visual Channel, one IV5-4yy Visual Channel, one IV5-2yy Visual Channel, ten AV5-1yy Visual Channels, and two AM5-1yy Mission Function Processors.

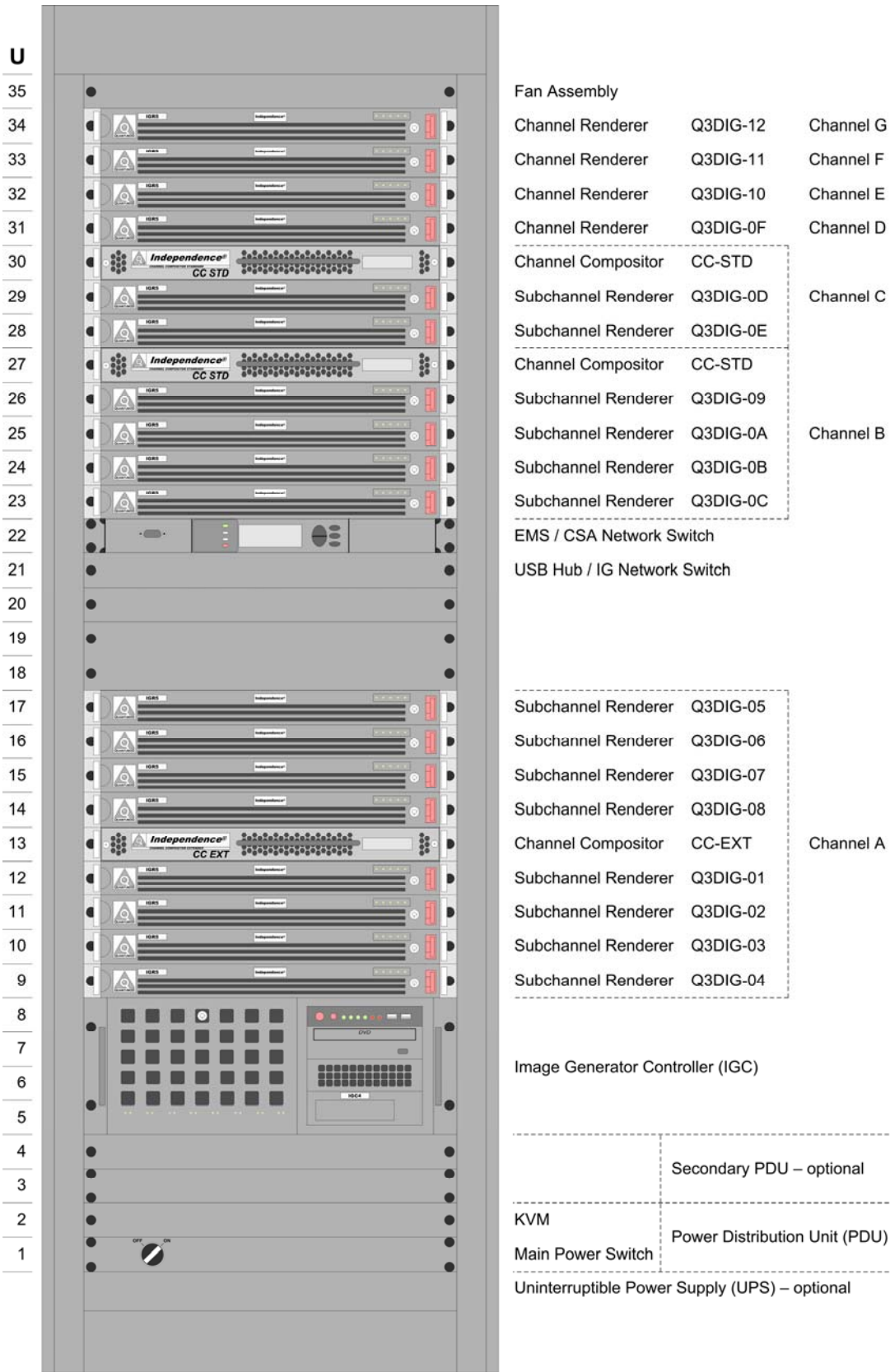


Figure 1-13 A primary Independence IG cabinet with seven visual channels

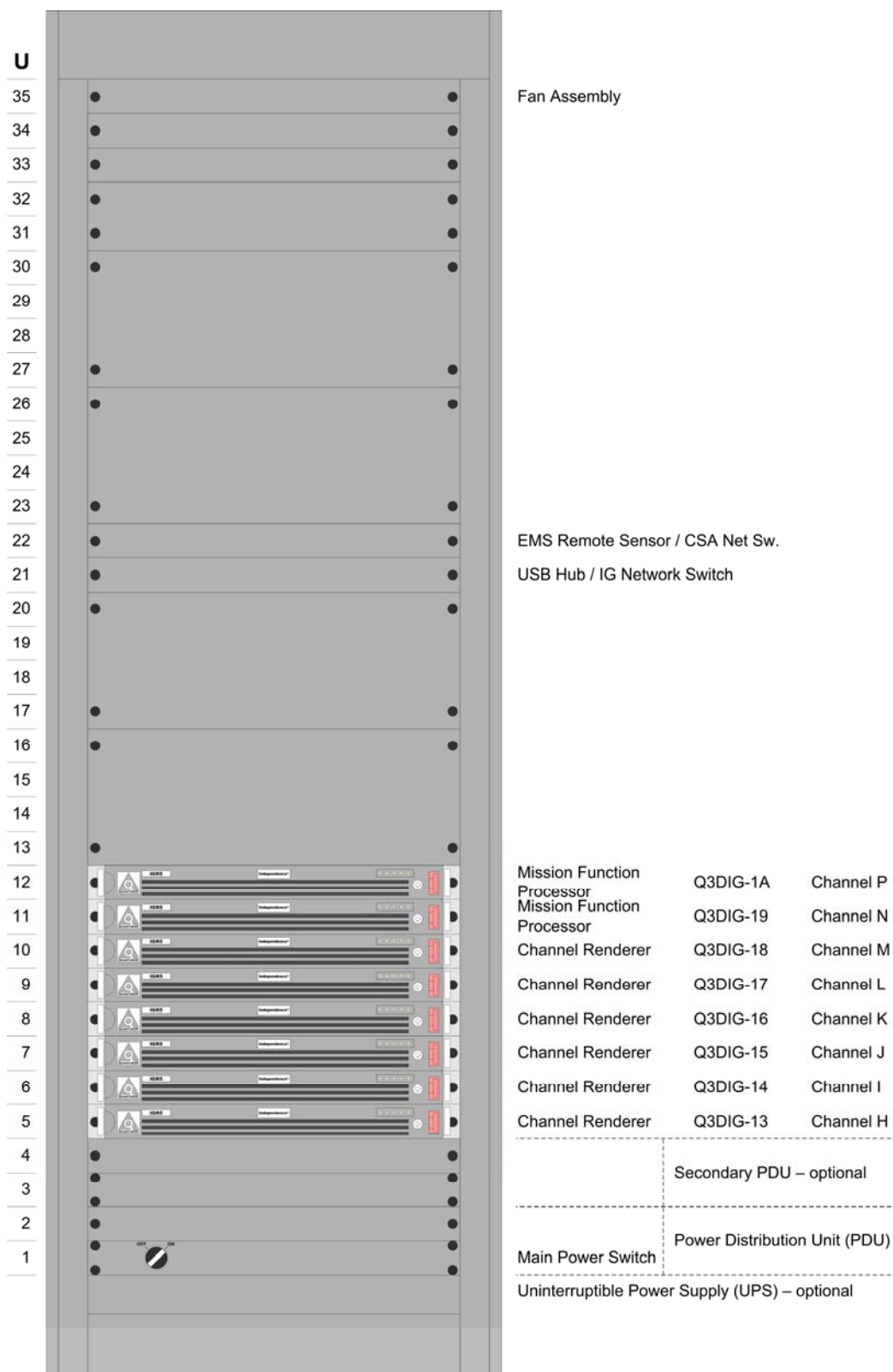


Figure 1-14 An auxiliary Independence IG cabinet with six visual channels and two MFPs

Chapter 2

Setting Up Your Independence IG

To install, set up, and connect the Independence IG primary and auxiliary cabinets at your facility, follow the procedures in the *Independence IDX® 4000 Image Generator Site Preparation Guide*.

Your Independence IDX 4000 IG contains a ReadMe file with current information for the IDX Platform release installed on your IG. The file is located on your system at C:\Q3D\Install\ReadMe.htm. You should review the contents of this file to become familiar with the IDX Platform software installed on your IG.

2.1 Confirming Contents

Primary Cabinet Accessory Boxes

Confirm the contents of the accessory boxes and ensure that each part is free of damage. The contents for a typical Independence IG system configuration include the following items:

- A bootable CD labeled: *Independence CSA System Partition Imaging CD*
- Drive carrier door keys
- Cabinet door keys
- Keyboard and mouse
- Keyboard and mouse extender cables
- Two KVM terminators
- One DVI (male) to VGA (male) cable *per channel*
- One DVI (male) to VGA (female) adapter *per channel*
- Two VGA (male) to VGA (female) Monitor extender cables
- Chassis ground cable
- 1.44 MB USB floppy drive
- Independence IDX 4000 Image Generator User Manual
- Mantis® unlock keys floppy disk

Remove, inspect, and confirm these contents and return the empty accessory boxes to the main shipping box. The shipping crate and associated materials are specifically designed for shipping Independence IG systems. Store them for future use.

Auxiliary Cabinet Accessory Boxes

If you receive an auxiliary cabinet, confirm the contents of its accessory boxes and ensure that each part is free of damage. A typical Independence IG auxiliary cabinet includes the following items:

- USB 2.0 cable
- Two nVSync cables
- Two KVM cables
- Network cable
- Cabinet door keys
- One DVI (male) to VGA (male) cable *per channel*
- One DVI (male) to VGA (female) adapter *per channel*
- Chassis ground cable

Remove, inspect, and confirm these contents and return the empty accessory boxes to the main shipping crate. The shipping crate and associated materials are specifically designed for shipping Independence IG systems. Store them for future use.

Additional Equipment Required

Depending on your applications, you may require additional equipment. Examples are discussed below. Quantum3D makes no claim that any specific customer-supplied equipment, including that discussed below, will be compatible with an Independence IG. It is your responsibility to determine the compatibility of any such equipment for use with an Independence IG. Improper use of customer-supplied equipment with an Independence IG may void the manufacturer's warranty.

In addition to your Independence IG, you will need the following equipment:

- **Operator's Console Display Device (2D Graphics)**
A multi-sync monitor is required for the primary Microsoft® Windows® display capable of supporting a resolution of at least 1280×1024 at 60 Hz.
- **Operator's Channel Display and 3D Display Devices (3D Graphics)**
Each standard Independence IG 3D Visual graphics channel is capable of driving resolutions up to 2048×1536 at 60 Hz. You will need a DVI-to-DVI or DVI-to-analog cable to connect the output from each channel to its associated display device. It is important that you ensure that each channel's display settings are compatible with the display device you intend to use with that channel.



If you are using a fixed-frequency monitor or display device, you must configure the channel driving that device prior to testing the display. Failure to configure a channel's video timing to match its associated display device can result in permanent damage to the display device. Be careful, especially when using older projector systems that are not multi-sync compatible.

- **100/1000 Ethernet**
Connection with an RJ45 cable if you need a network link.

2.2 Using the Patch Panels to Connect Primary and Auxiliary Cabinets

The Patch Panels connect input and output devices to your Independence IG and also connect the primary and auxiliary Independence IG cabinets to each other.

The following instructions are provided in case you wish to relocate your Independence IG system. To do this, you must disconnect the Patch Panels connecting the primary and auxiliary cabinets, move the system, and then re-connect the Patch Panel connecting cables.

The Patch Panels are located at the bottom of the rear of each Independence IG cabinet. Although the Patch Panels on the primary and auxiliary cabinets appear similar, some of the connectors have different functions. These are illustrated in Figure 2-1 and Figure 2-2 below:

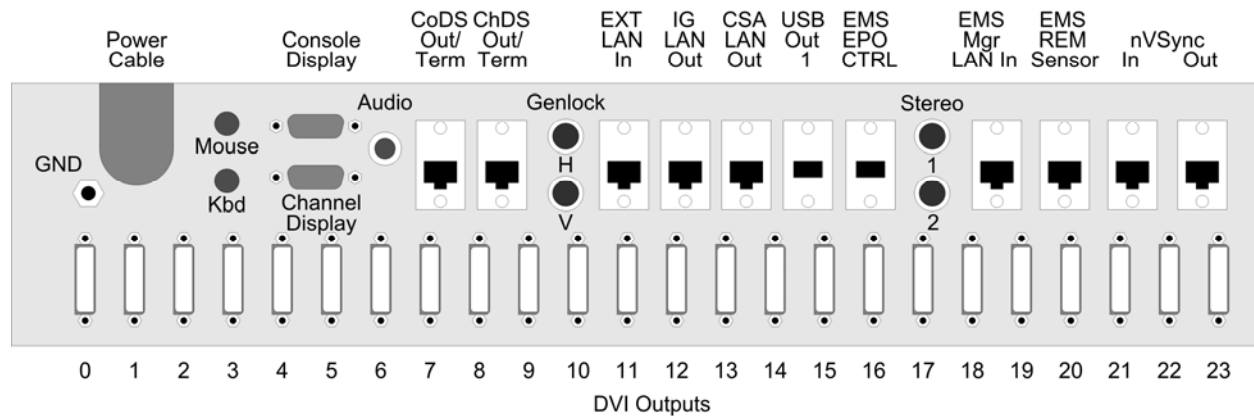


Figure 2-1 Primary cabinet patch panel



The power cable can produce electrical interference. Route power cables to avoid monitors and other wiring, especially nVSync and USB connectors.

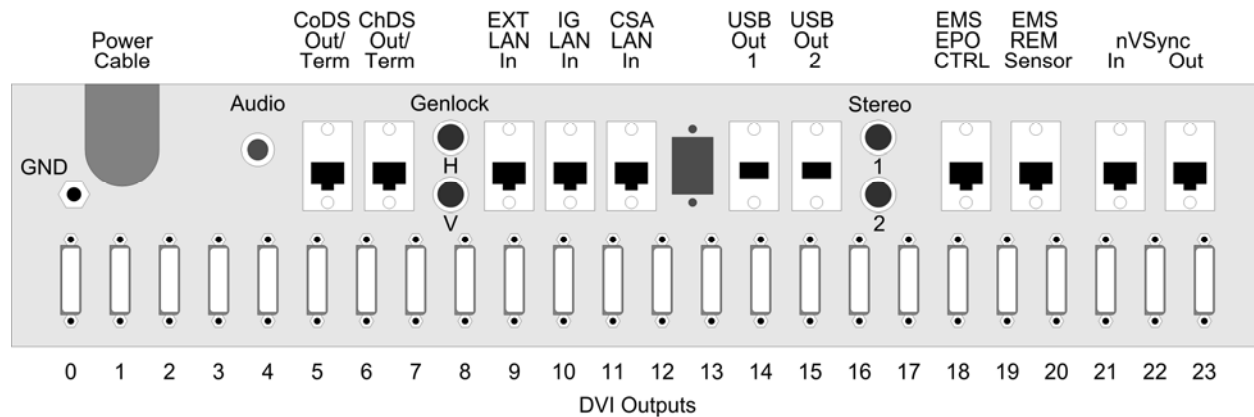


Figure 2-2 Auxiliary cabinet patch panel

Note If your configuration includes one or more auxiliary cabinets, you must connect their grounds to the primary cabinet. Use the provided ground strap(s) to connect the GND posts together.

The following table details the interconnections among the primary and auxiliary cabinets. Labels correspond to the panel connections in Figure 2-1 and Figure 2-2 on page 19.

	Primary	Auxiliary
No Auxiliary Cabinet	CoDS Out/Term [Console Display Switch Out or Termination] Terminator	
	ChDS Out/Term [Channel Display Switch Out or Termination] Terminator	
	Ext LAN In [from the outside world]	
	[Other connections] N/A	
One Auxiliary Cabinet	CoDS Out/Term	CoDS In
		CoDS Out/Term Terminator
	ChDS Out/Term	ChDS In
		ChDS Out/Term Terminator
	IG LAN Out	IG LAN In
	CSA LAN Out	CSA LAN In
	EMS EPO CTRL	EMS EPO CTRL
	EMS REM Sensor	EMS REM Sensor
	nVSync Out	nVSync In
	nVSync In	nVSync Out

Table 2-1 Patch panel configurations

2.3 Starting the System

Follow the instructions in this section to start your Independence IG. We recommend that you read the entire section before beginning. The first step in starting the Independence IG is to turn on the AC power. Use the switches at the front-bottom-left of each cabinet. If you have both primary and auxiliary cabinets, ensure that the cabinets are grounded together with the chassis ground cable provided in the auxiliary cabinet accessory box.

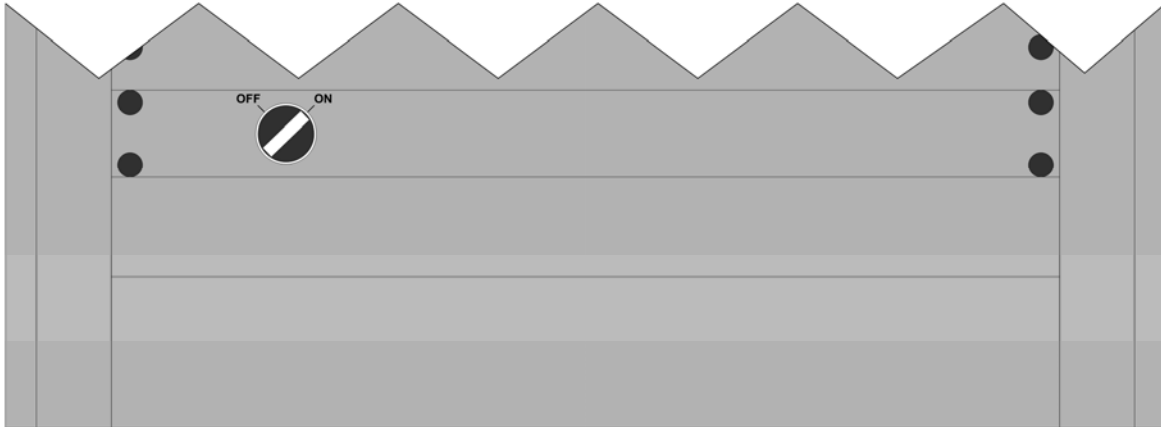


Figure 2-3 An AC power on/off switch is located at the front-bottom-left of each cabinet

Overload circuit protection breakers are provided for manual on/off switching. The breakers will trip if an overload condition occurs. They are located in the bottom rear of the rack on the power distribution unit.



You must wait a minimum of one minute before turning on the power with the AC power on/off switch after turning off the system.

First, turn on AC power to any auxiliary cabinets associated with your Independence IG configuration. Then, turn on AC power to the primary cabinet. After AC power has been applied, the IGC, Channel Compositor(s), and IGUs power on automatically.

Starting the IGC

The IGC includes a front cover panel designed to protect the hard disk drives it contains. It is shown in Figure 2-4 below.

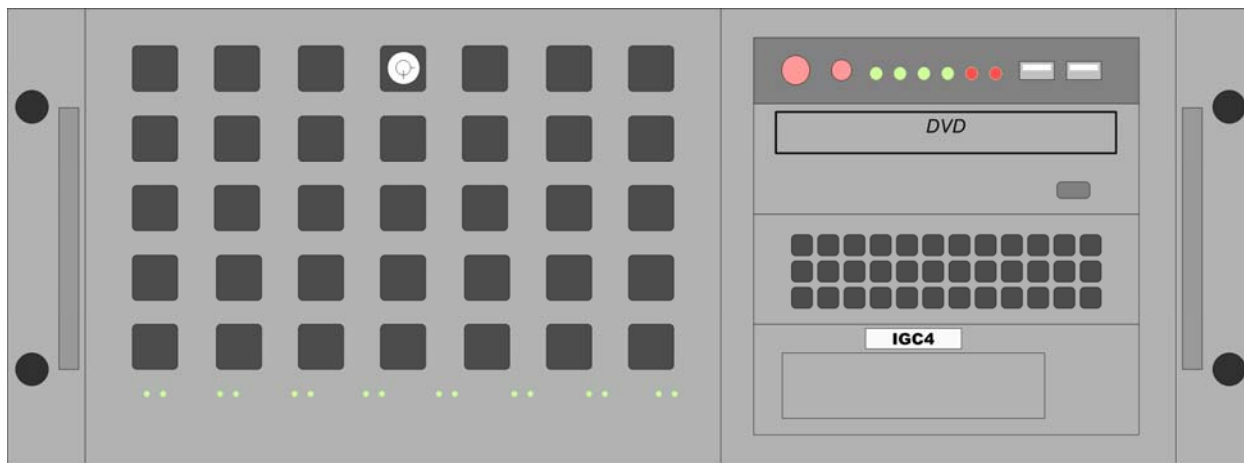


Figure 2-4 Image Generator Controller (IGC) with front cover closed

Your IGC is configured to turn on when you turn power on using the front panel on/off switch. Also, the IGC must have been turned off properly or it may not turn on automatically when you apply power to the rack. If the IGC does not turn on automatically, press the IGC power button. When power is applied to the system, the green power indicator LED will light up.

The IGC with the front cover panel open is shown in Figure 2-5 below.

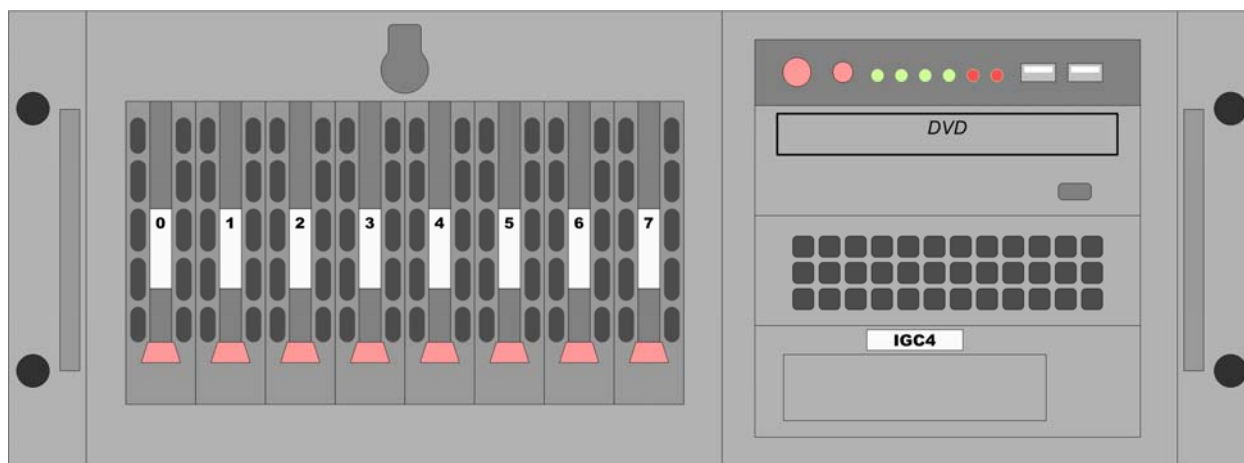


Figure 2-5 Image Generator Controller (IGC) with front cover open

2.4 Using the Operator's Console Display Switch

The mouse and keyboard are attached to the IGC by way of the Console Display Switch (CoDS). In normal operation, the mouse and keyboard can access the IGC. The operator's CoDS is mainly used to display the interface for the Image Generator Manager (IGM) application running on the Image Generator Controller (IGC), but it also can access any of the IGU subsystems. Normal operation of the Independence IG does not require that you access individual IGUs. During setup, however, you may need to change system default settings on the IGU subsystems. For these operations, use the CoDS to access the IGUs separately.

TIP Console Display Switch (CoDS)

The CoDS must be set to access the IGC or a desired subsystem. The IGC is the default, but a user may have modified the environment so that the operator's console currently controls another subsystem. To view the CoDS, press the CTRL key twice in succession. In the example of Figure 2-6 below, the IGC (called Q3DIG) is not selected. Press the UP ARROW or DOWN ARROW key to highlight the desired system, and then press ENTER to connect to that system.

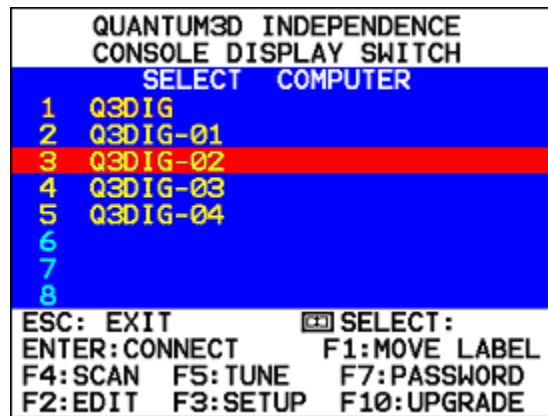


Figure 2-6 Independence IG configuration containing a single IGC and four IGUs

2.5 Logging On for the First Time

The first time your Independence IG is turned on, the *Windows Setup Wizard* steps you through the process of setting up your system. Take the following steps to set up your system:

1. The **Windows Setup Wizard** introduces you to the procedure. Click **Next** to continue.
2. Read the **License Agreement** information. If you agree, click the **I accept this agreement** option button, and then click **Next** to continue.

Note The License Agreement you are accepting applies to all of the computers in the IG, as well as the software applications delivered with the IG.

3. The **Regional and Language Options** are set to *English (United States)*, and the location is set to *United States*. The IGC must use these settings because the IGUs are set up to use the English (United States) keyboard. Click **Next** to continue.
4. Under **Personalize Your Software**, type your name and organization in the **Name** and **Organization** boxes, and then click **Next** to continue.

5. Under **Date and Time Settings**, set the correct **Date**, **Time**, and **Time Zone**, and then click **Next** to continue.

The system restarts. Log on to the system as *Administrator* using the password, *Afford:Real*.



Do not change the administrator password until you complete this chapter. After you verify the system is working correctly, you should change your administrator password before placing the IG on your network.

Two windows open on the screen:

- A command window with the title bar **Q3dImageRestoreFixup**.
- A Notepad window displaying the file **Q3dFirstBootFixups.txt**.

One of the windows may be underneath the other and hidden from view. Q3dImageRestoreFixup automatically fixes a number of things required when booting the first time from an image, including the drive letter assignments. For the changes to take effect, you must restart the system, but first, follow the instructions in the Q3dFirstBootFixups.txt file:

1. Enable the BNVendor BNVirtualSCSIHBA SCSI Disk Device:
 - a. Right-click the **Q3DIG** icon, and then select **Manage** to open the **Computer Management** panel.
 - b. In the left pane, click **Device Manager**.
 - c. If **BNVendor BNVirtualSCSIHBA SCSI Disk Device** is disabled, right-click it, and then click **Enable**.
2. Change the drive letter of the removable disk to Y:
 - a. If the **Computer Management** panel was closed, right-click the **Q3DIG** icon, and then select **Manage** to reopen the **Computer Management** panel.
 - b. In the left pane, click **Disk Management**.
 - c. Right-click **Disk 2**, and then click **Change Drive Letter and Paths**.
 - d. Click **Change**, and then select drive letter **Y** from the list.
 - e. Close the **Computer Management** panel.
3. Rename the network connections and disable any that are unused:
 - a. Right-click **My Network Places**, and then select **Properties**.
 - b. Rename **Local Area Connection 2** to **External Network Connection**.
 - c. Rename **Local Area Connection 3** to **CSA Network Connection**.
4. Reorder network connection priorities:
 - a. In the **Network Connections** window, from the **Advanced** menu, click **Advanced Settings**.
 - b. On the **Adapters and Bindings** tab, click the arrow buttons to reorder the **Connections** to be in the order:
 - IG Network Connection**
 - CSA Network Connection**
 - External Network Connection**
 - (Remote Access Connections)**
 - c. Click **OK**.
5. Confirm that any unused connections are set up to obtain their network addresses automatically (via DHCP). *There will be no unused connections, so you may ignore this step in the file.*

6. Enable Wake-on-LAN on the external connection.
 - a. In the Network Connections window, right-click External Network Connection, and then select **Properties** → **Configure** → **Power Management**.
 - b. Select the check boxes for:
 - Wake on Directed Packet
 - Wake on Magic Packet
 - Wake on Magic Packet from power off state
7. Delete the file **C:\Program Files\Q3D\IGM\Q3dStartupIG.skip**.
 - a. Double-click the **Q3DIG** icon, and browse to **C:\Program Files\Q3D\IGM**.
 - b. Right-click **Q3dStartupIG.skip** and select **Delete**.
8. Restart the IG, and then log on to the system as Administrator using the password, *Afford:Real*.

After you login as *Administrator*, a status window indicates that the IG is initializing as the IGUs come on line, and channel initialization takes place. Wait for all IGUs to become ready, and for all channels to initialize. A message appears temporarily to notify you when the system is ready.

2.6 Setting the System Time Zone

The IGM software synchronizes the time of all computers in the Independence IG, however, it cannot synchronize the time zones. Your Independence IG requires that the IGC and IGUs have the same time zone. If a different time zone is required, change the time zone on the IGC and on each IGU that has a private VDisk by performing the following steps:

1. On the taskbar, click **Start** → **Control Panel** → **Date/Time** to display the **Date and Time Properties** dialog box.

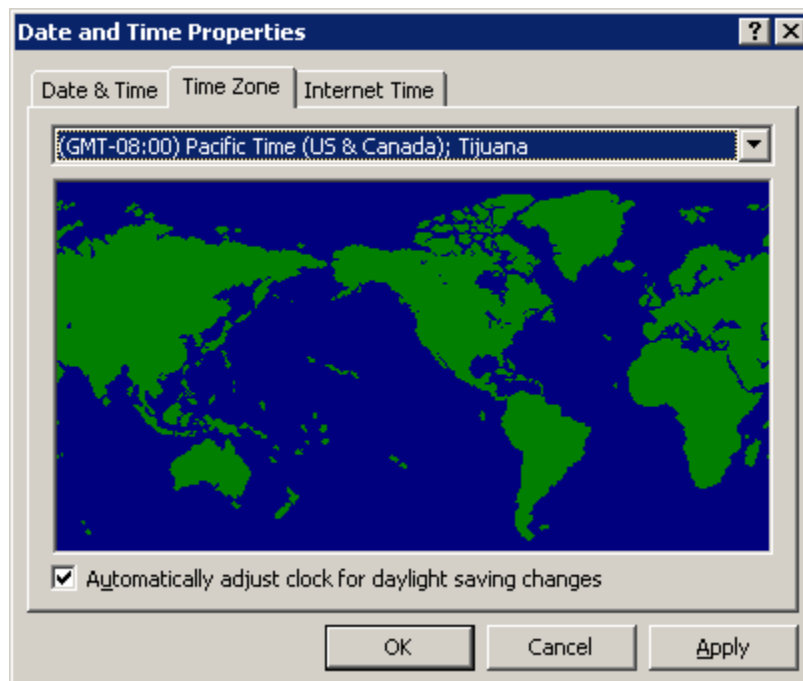


Figure 2-7 Date and Time Properties dialog box

2. Click the **Time Zone** tab.
3. From the drop-down list box, select the appropriate time zone.
4. Click the **Apply** button.

On the IGC only:

5. Click the **Date & Time** tab, and then if the date and time are not accurate, update them.
You do not need to set the date and time on the IGUs. They will automatically synchronize their dates and times to the IGC.

2.7 Changing the Administrator Password

You must use the IGM software to change the administrator password. Changing the administrator password on the Independence IG requires that the password be updated on all Independence IGUs and on the IGC. If you try to change the password manually, the Independence IG will be inoperable. Ensure that all IGUs are online and operating correctly. Before changing the password, check the Health & Status panel to verify that all of the IGUs are online.

For more information see Section 6.2 “IG Commander – Health & Status” on page 58.

After you have confirmed that all systems are online, start IGM. (For more information, see Section 4.1, “Starting IGM” on page 44.) Navigate to the *User Manager*. (For more information, see Section 5.1, “User Manager” on page 47.) Ensure that the *Administrator* user account is selected, and then click **Set Password**. Create a new administrator password.

After the command completes, log off. Log on again as *Administrator* using the new password.

2.8 Renaming the IG

You must use IGM to rename your IG. If you try to rename the IG without using IGM, your Independence IG will stop working correctly. If you are unfamiliar with IGM, see Chapter 4, “Introducing IGM” and Chapter 5, “IGM – Administration” before proceeding.

Before renaming the IG, check the **Health & Status** panel to verify that all of the IGUs are online. For more information, see Section 6.2 “IG Commander – Health & Status” on page 58.

1. Navigate to the **Configuration** panel, and then click the **Rename IG** button to display the **Rename IG** dialog box.

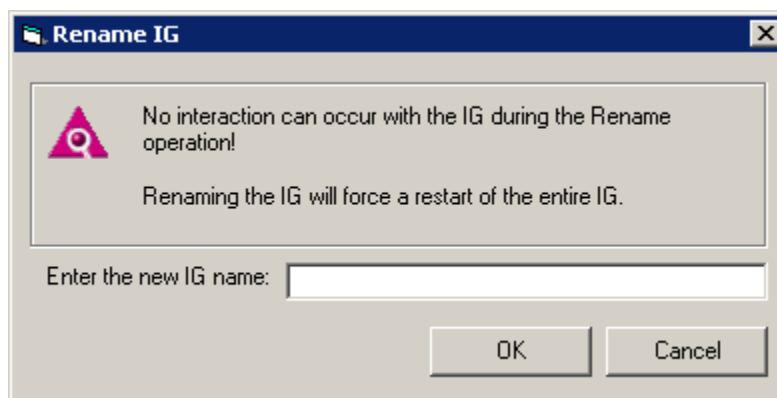


Figure 2-8 Rename IG dialog box

2. Enter the new hostname for the IG (an alphanumeric string not exceeding 11 characters containing no spaces or special characters apart from hyphens), and then click **OK**.

Do not interact with the IG during this process.

Renaming the IG sets the IGC computer name to the IG name. It also renames all of the IGUs and changes their workgroup to be the IG name appended with “-WG”. For example, renaming the IG to Q3DIG2 automatically changes the IGUs to Q3DIG2-01, Q3DIG2-02, Q3DIG2-03, and so on. The workgroup changes to Q3DIG2-WG.

Note *IGU naming uses a hexadecimal-based numbering system, where the last two digits represent a hexadecimal number from 01 to FF.*

2.9 Connecting to a Network

The Independence IG is a network of computers, thus, it has special networking requirements that you need to consider before placing the IG onto your local area network. The IGC uses a hosts file to resolve TCP/IP addresses for the IGUs in the system. In addition, IGUs may have specially assigned TCP/IP addresses in the network configuration.



Do not change the TCP/IP addresses in the IGC's hosts file or on any IGU in the Independence IG. Changing the TCP/IP addresses will cause the IG to stop working properly. The Configure IG process rebuilds the hosts file, so any manual additions that might have been made to this file will be lost.

A connection for an external LAN is provided on the patch panel labeled, *Ext. LAN*, in Figure 2-1 on page 19. Before connecting your Independence IG to your external network, ensure that you are not using the range of addresses: 192.168.0.x or 192.168.1.x in your network. Your Independence IG uses these ranges of addresses to communicate to the IGUs in the system. If it finds other systems with addresses in these ranges on the network, your Independence IG will not operate properly.

Independence IGs ship from the factory with the same name. Duplicate IGC computer names will cause problems on your external network. To prevent the existence of duplicate names on the external network, rename each Independence IG with a unique name.



You must use the Rename IG command within IGM to rename your Independence IG. If you try to rename the IG manually using standard Windows methods, your IG will not function properly.

For more information, see Section 6.1, “IG Commander – Configuration”, especially “Renaming Channels” on page 56.

Connecting the IGC to a Local Area Network

You can connect your Independence IG to a Local Area Network (LAN) by configuring the network on the IGC. Follow the instructions below as there are certain restrictions in placing the IG on the network.

Do not add the IGC into a Windows domain. Do not change the name of the workgroup for the IGUs.

The IGC and IGUs can reside in different workgroups. If you renamed your IG as required above, the IGC and IGUs will have the correct names and workgroups already assigned. If you must place the IGC into a different workgroup, follow the procedure described in the section “Changing the IGC Workgroup” on page 32.

The external network TCP/IP is configured to obtain an IP address automatically from your network that has been attached to the Independence IG system's external network connection. If a specific address is required, use the following process to specify this address:

1. On the desktop, right-click the **My Network Places** icon, and then click **Properties**.

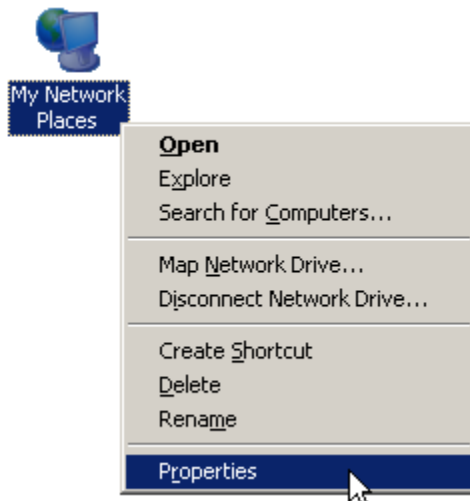


Figure 2-9 Accessing My Network Places properties

- Depending on your system configuration, you may see different icons listed, but this procedure only involves the External Connection.

2. Right-click **External Network Connection**, and then click **Properties**.

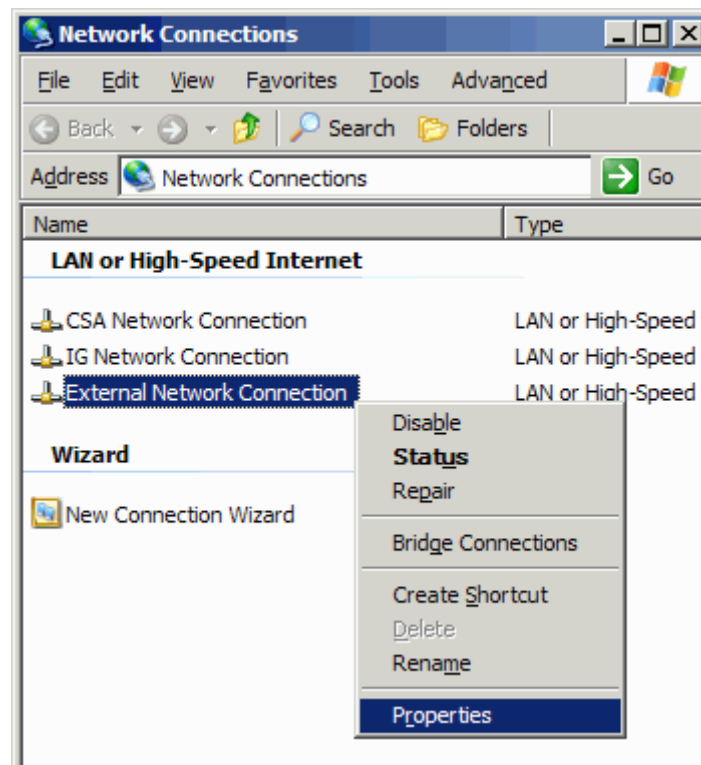


Figure 2-10 Network Connections dialog box

3. Select **Internet Protocol (TCP/IP)**, and then click **Properties**.

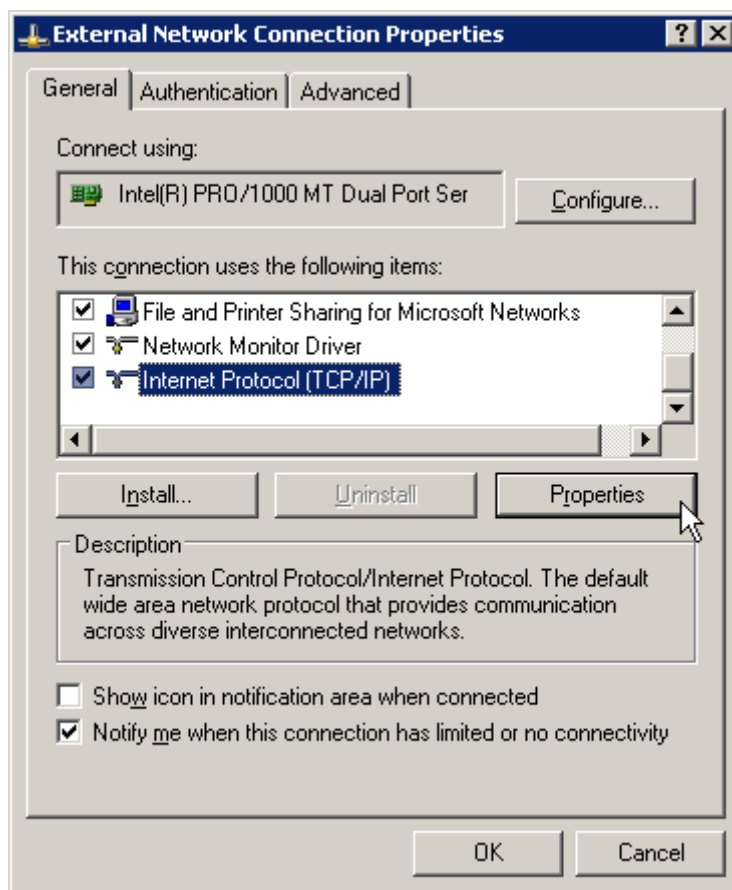


Figure 2-11 External Network Connection Properties dialog box

4. Specify the IP settings.

To use DHCP addressing (default)	To use a static IP Address
Select Obtain an IP address automatically .	Select Use the following IP address , and then enter the appropriate IP address , Subnet mask , and Default gateway . Do <i>not</i> assign static IP address from the 192.168.0.xxx and 192.168.1.xxx subnet to this connection.
Select Obtain DNS Server address automatically .	Select Use the following DNS server address , and then enter the Preferred DNS server and Alternate DNS server addresses.
Click OK .	Click OK .

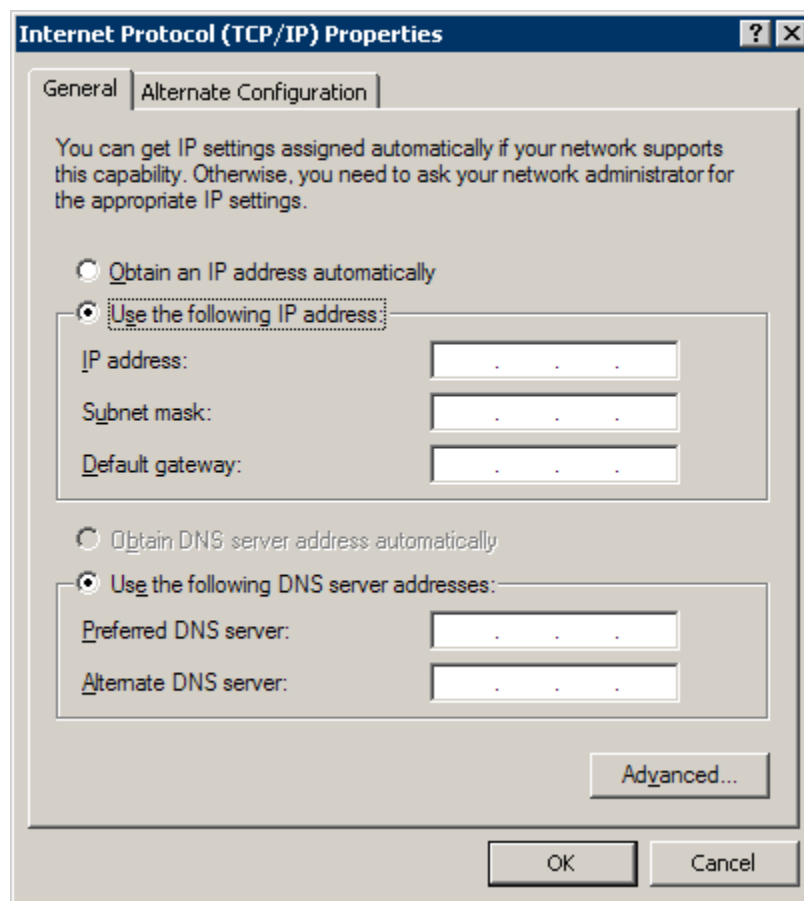


Figure 2-12 Internet Protocol (TCP/IP) Properties dialog box

Changing the IGC Workgroup

The IGC and IGUs can reside in different workgroups. The following procedure describes how to change the IGC workgroup.

This procedure is for the IGC only; your IG will not function correctly if you use this procedure to try to change the IGU workgroup.

1. On the desktop, right-click the **Q3DIG \ Administrator** icon, and then click **Properties**.

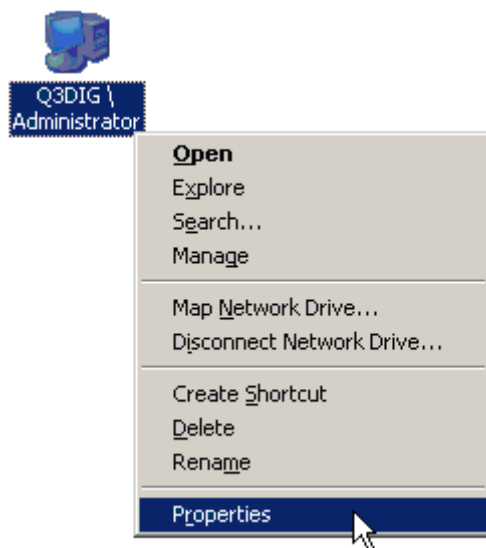


Figure 2-13 Accessing Q3DIG \ Administrator properties

2. In the **System Properties** dialog box, click the **Computer Name** tab and click **Change**.

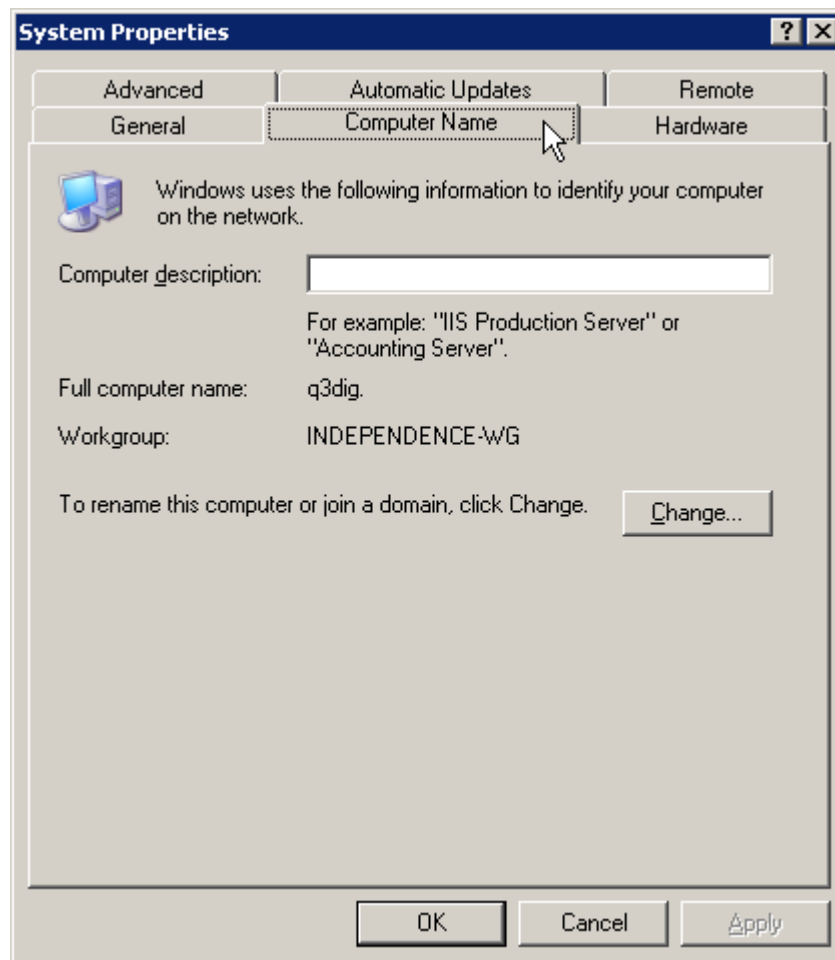


Figure 2-14 System Properties dialog box



Do NOT change the Computer Name, because this will cause your Independence IG system to stop working.

3. Select **Workgroup**, and then enter the name of the workgroup for this IG.
4. Click **OK**.

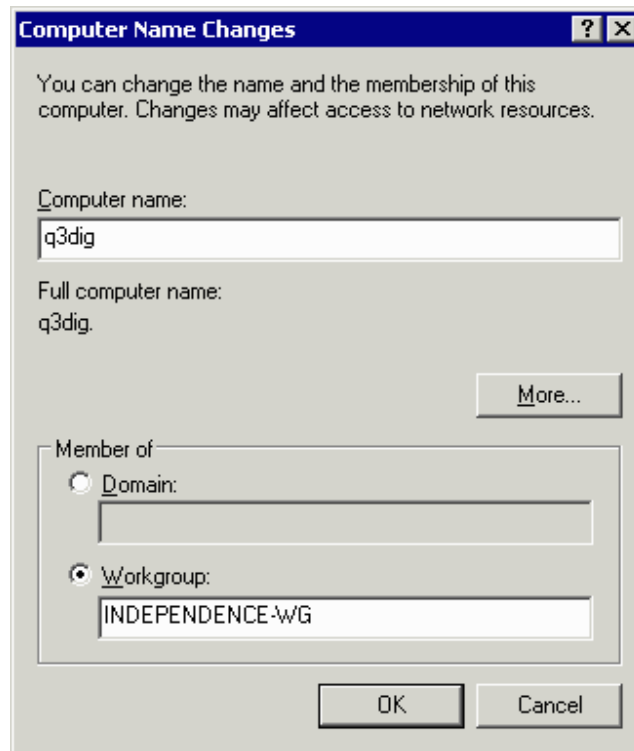


Figure 2-15 Computer Name Changes dialog box

5. Click **OK** to acknowledge the message that you must restart the system for these changes to take effect.
6. In the **System Properties** dialog box, click **OK**.
7. When the system prompts you to restart the system for the computer name change to take effect, click **Yes**.

2.10 Configuring the EMS

You can use a DHCP server to configure the TCP/IP settings for the EMS. For additional information, see “DHCP Configuration” in the *APC Environmental Management System* documentation. If you use a static IP address, set the address accordingly. The default static IP address is set to **192.168.0.10**

1. Insert the *Environmental Management System Utility CD* into the IGC or an external PC or laptop. The CD shipped with the IG and is located in one of the white pack out kits.
2. Load and start the **APC Device IP Configuration Wizard** and wait for it to detect the un-configured EMS management card.



Figure 2-16 APC Device IP Configuration Wizard panel

The EMS sends out a DHCP request that uses the following to identify itself:

- A vendor class identifier (APC by default)
 - A client identifier (by default, the EMS's MAC address value)
 - A user class identifier (by default, the identification of the EMS's application firmware)
3. A properly configured DHCP server responds with a DHCP offer that includes all of the settings that the EMS needs for network communication. The DHCP offer also includes the Vendor Specific Information option (DHCP option 43). By default, The EMS will ignore DHCP offers that do not encapsulate the APC cookie in the Vendor Specific Information option using the following hexadecimal format:

Option 43 = 01 04 31 41 50 43

where

- The first byte (01) is the code.
- The second byte (04) is the length.
- The remaining bytes (31 41 50 43) are the APC cookies.

4. See your DHCP server documentation to add code to the Vendor Specific Information option.
5. If you are using a static IP address, enter it. The following IP address, subnet mask, and gateway are default values.
 IP Address **192.168.0.10**
 Subnet Mask **255.255.255.0**
 Default Gateway **192.168.0.10**
6. Open a web browser, and then in the address bar, type:
//192.168.0.10
7. Enter the **User name** and **Password**. By default, for an administrator these are **apc** and **apc**.
8. Change the IP address to match the IP address of the old EMS unit. If the old unit had no defined IP address, leave the IP address as set in step 5 above. You can access the EMS unit from the IP address to monitor the temperature, humidity, and vibration.

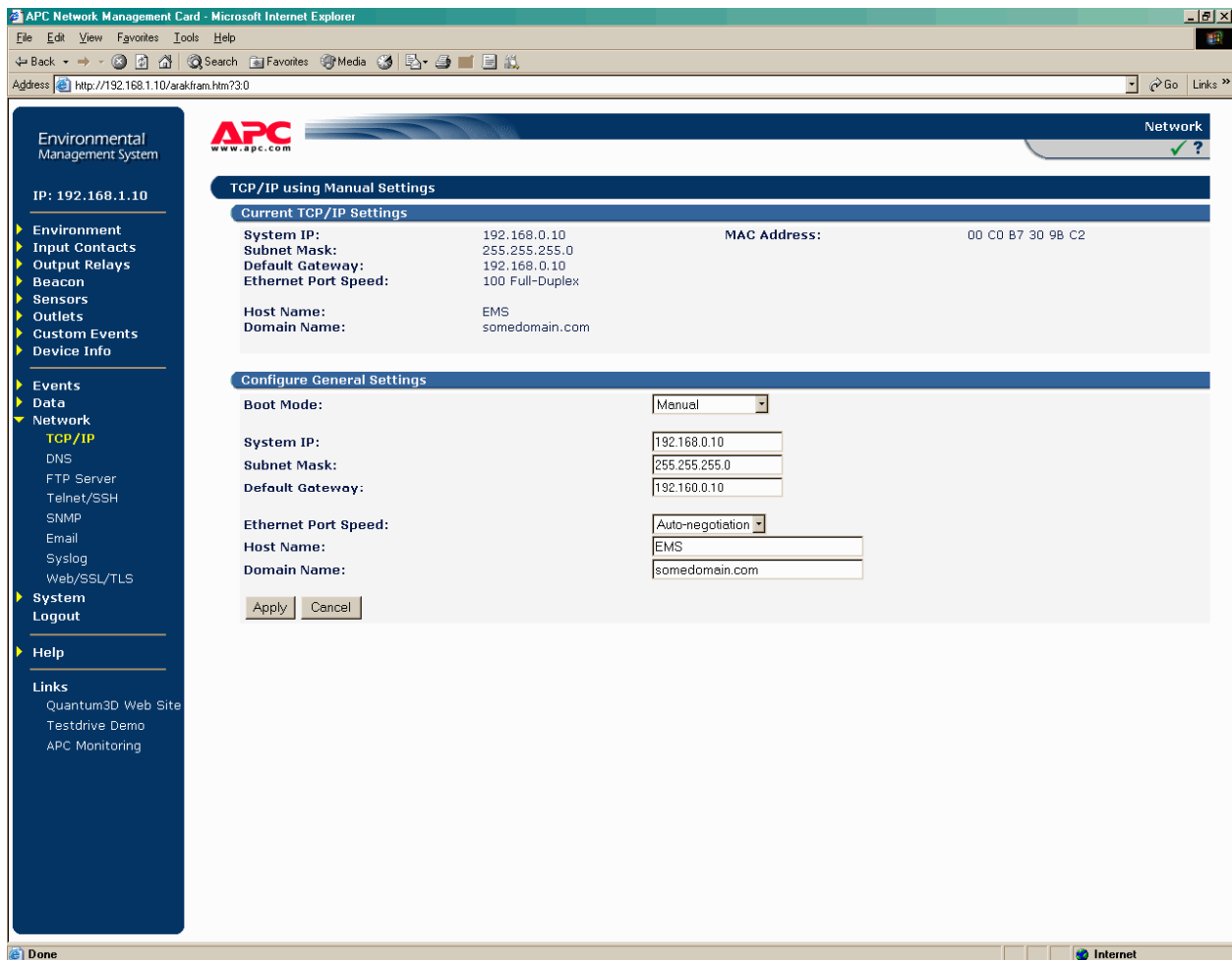


Figure 2-17 EMS web interface for setting the IP address

2.11 Preserving System Information

We recommend that you create recovery images and backup media of them whenever you add new files, applications, or data to your system partitions (drives C) of the IG computers, or whenever you change system parameters that cannot be recovered from the current recovery image. For more information about creating recovery images, see Chapter 12, “IG Recovery and Updating” on page 123.



Some USB hard drives, for example 2.5 inch hard drives without external power adapters, may not function properly when connected to the front panel USB connectors on the IGC. If this happens, connect the external drive to any of the available USB ports on the rear of the system.

This page concludes
Setting Up Your Independence IG.

Chapter 3

Turning On and Off

You should always take proper steps to turn on and off your Independence IG. If you remove power from your Independence IG while it is turning off, file corruption might occur. Turning off the Independence IG properly is very simple and *performed entirely from the IGC*.

You can use any of the standard Windows shutdown commands to turn off the Independence IG. For example, on the taskbar, click **Start**, and then click **Shut Down**.



Figure 3-1 Start menu Shut Down command

Alternatively, you can press CTRL+ALT+DEL, and when the **Windows Security** dialog box appears, click **Shut Down**.



Figure 3-2 Windows Security dialog box

The IGC will turn off all the other IGU computers in the Independence IG. After the other IGU computers have turned off, it then starts its own shutdown process. After the IGC turns off, other component systems will remain on. To turn off these systems, turn off the power.

3.1 Turning Off AC Power

Confirm that the IGC and all IGU computers have been turned off. The power LEDs (Light Emitting Diodes) associated with each system should be off; the power LEDs are labeled with a light bulb icon.

To turn off power to the Independence IG, use the AC power on/off switch at the front-bottom-left of the primary and auxiliary cabinets. After turning off the system, wait a minimum of one minute before turning on the power again with the AC power on/off switch.

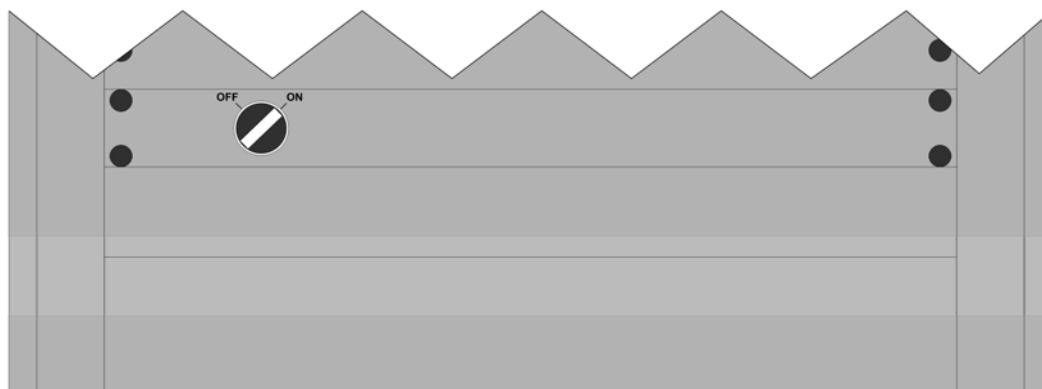


Figure 3-3 AC power on/off switch located at the front-bottom-left of each cabinet

3.2 Turning On AC Power

To turn on AC power, use the switch at the front-bottom-left of each cabinet, as shown in Figure 3-3 above. If you have both a primary and auxiliary cabinet, ensure that the two cabinets are grounded together with the chassis ground cable provided in the auxiliary cabinet accessory box. **Always turn on power to the auxiliary racks first and the primary rack last.**

Overload circuit protection breakers are provided for manual on/off switching. The breakers will trip in an overload condition. They are located in the bottom rear of the rack on the power distribution unit.



You must wait a minimum of one minute before turning on the power with the AC power on/off switch after turning off the system.

First, turn on AC power to any auxiliary cabinets associated with your Independence IG configuration. Then, turn on AC power to the primary cabinet. After AC power has been applied, the IGC, Channel Compositor(s), and IGUs power on automatically.

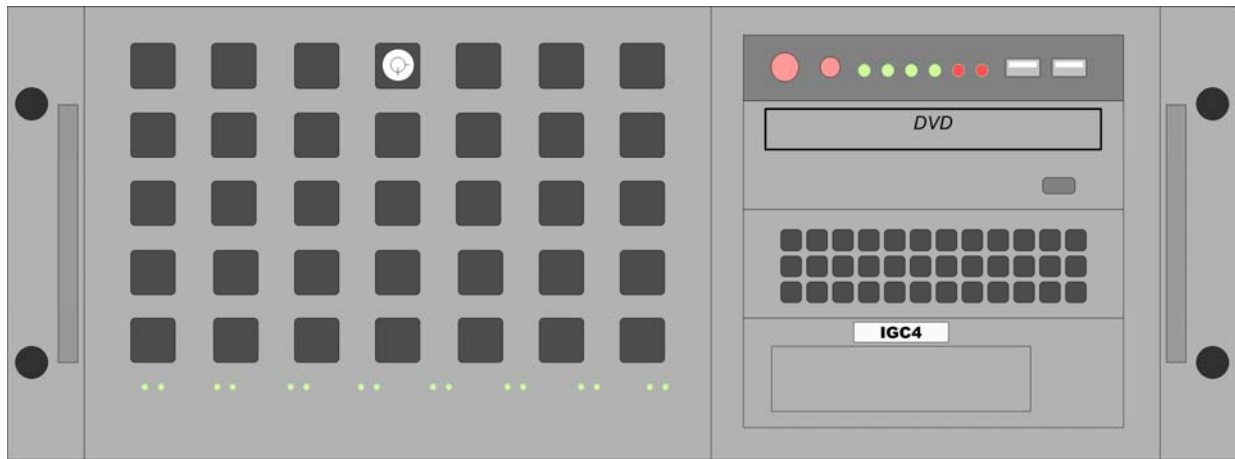


Figure 3-4 Image Generator Controller (IGC) – front panel

Your IGC is configured to turn on when you turn power on using the front panel on/off switch. Also, the IGC must have been turned off properly or it may not turn on automatically when you apply power to the rack. If the IGC does not turn on automatically, press the IGC power button. When power is applied to the system, the green power indicator LED will light up.

Wait for the IGC to start. When the IGC presents you with the logon screen, log on to Windows. The IGC displays a progress indicator as the system turns on. Let the initialization process finish before using the Independence IG.



Do not leave a USB drive plugged into an IGU while it starts. Windows will assign drive letter D to your drive and the automatic network mapping of drive D onto the IGC will fail.

Working with Channels or IGUs

You can only turn off or turn on the entire IG, *not* individual channels or IGUs.

Note *The Independence IG requires that the IGUs be turned off using the IGC. If you turn off power to an individual system using its power button, the system will not turn on automatically the next time you start your IG, and you will have to turn it on manually using its power button.*

This page concludes
Turning On and Off.