Illustra Pro Flex Camera Hardening guide

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Introduction

Our solution provides peace of mind to our customers with a holistic cyber mind set beginning at initial design concept, continues through product development, and is supported through deployment, including a rapid incident response to meet the comprehensive and evolving cybersecurity environments.

The Hardening Guide intends to provide cybersecurity guidance used in planning, deployment, and maintenance periods.

As cybersecurity threats have become a risk impacting all connected devices, it is important to ensure that cybersecurity is considered throughout the planning, deployment and maintenance phases associated with a solution's functional operation.

This guide provides hardening guidance for configuration and maintenance, including the user accounts, permissions and roles, and backup and restore.

This Johnson Controls **Illustra Pro Flex Camera Hardening guide** is broken down into three main sections depicting the overall process for hardening:

1. Planning	2. Deployment	3. Maintain
Provides an introduction, general knowledge, and overall guidance for you to prepare your system for security and hardening	Guides you through the execution and hardening steps based on the products and security features of the target system components	Provides a checklist for future checkpoints to keep your system safe and secure

Appendixes are included at the end for additional information about account access, event actions, settings, health monitor and log files.

Legal disclaimer

The cybersecurity practices described in this guide are recommended practices to facilitate the secure installation and configuration of the products described herein. However, Johnson Controls cannot guarantee that the implementation of the cybersecurity practices or recommendations described in this guide will ensure the security of the relevant product or system, or prevent, or alter the potential impact of, any unauthorised access or damage caused by a cybersecurity incident. This guide is provided “as is”, and Johnson Controls makes no representation or warranty, express or implied, as to the efficacy of the cybersecurity practices or recommendations described in this guide. Johnson Controls disclaims all liability for any damages that may occur as a result of, or despite, reliance on this guide or compliance with any cybersecurity practices or recommendations set forth herein.

1 Planning

Use this section to plan for deployment functions including:

- How to assure compliance with the cybersecurity criteria that governs the target environment.
- How to design the deployment architecture.
- Reference for settings made during deployment.

1.1.0 Illustra overview

Illustra cameras are Internet Protocol (IP) video surveillance devices that use Ethernet communications.

Illustra IP cameras integrate seamlessly with Johnson Control hardware and software video clients such as victor, VideoEdge, and exacqVision. The native support in victor and VideoEdge means you can access video and audio using high-performance streaming and leverage its most advanced features including motion meta-data.

Illustra IP cameras are part of an end-to-end security and surveillance solution to keep what you value safe and enables your business to operate effectively.

1.1.1 Deployment architecture

Illustra cameras can be deployed in many ways. Figures 1.1.1.1 and 1.1.1.2 illustrate architectures using an internal network or connectivity to the internet.

Figure 1.1.1.1 Typical Illustra deployment architecture.

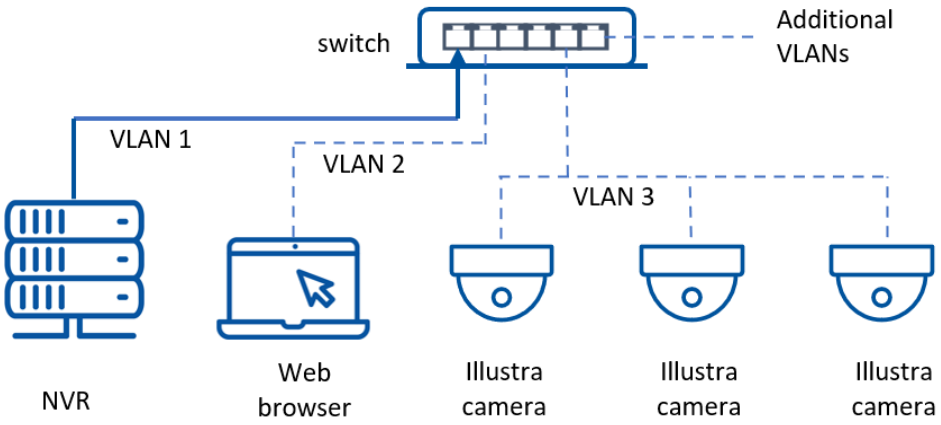
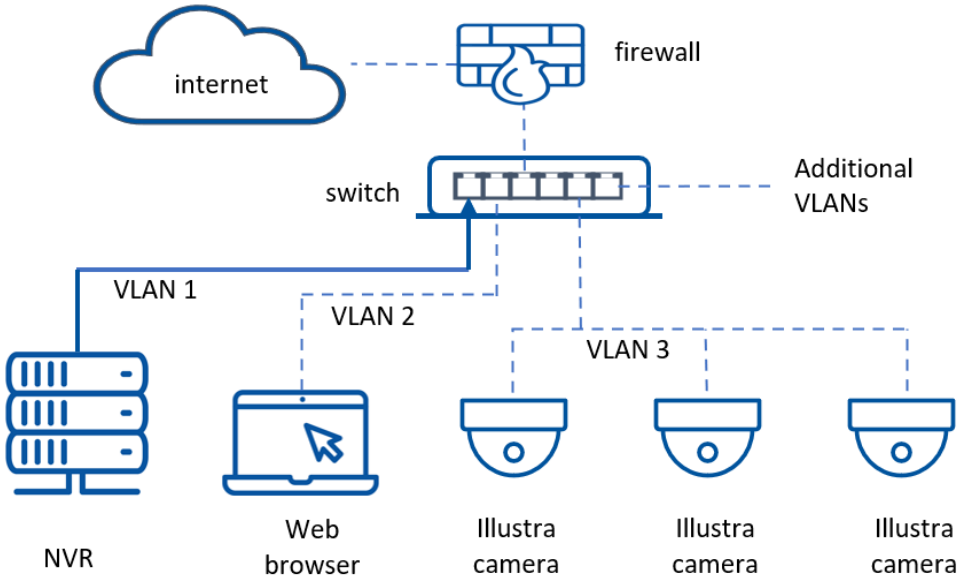


Figure 1.1.1.2 Illustra deployment with Internet connectivity.



1.1.2 Components

Illustra Pro Flex Camera. A motorized variable-focus (V/F) Infrared (IR) Smart Dome Camera by Tyco comes with several intelligent functions built-in for high-quality video surveillance. Additionally, this high definition (HD) camera comes with a rich feature-set that includes true Wide Dynamic Range (WDR), Power-Over-Ethernet (PoE), and 3D Digital Noise Reduction (DNR) to meet a wide variety of video surveillance applications capturing high quality, color images in back light environment.

1.1.3 Supporting components

Illustra cameras seamlessly integrate with Johnson Controls components but can also work with third party components and systems.

NVR. A Network Video Recorder (NVR) may connect to one or many Illustra cameras. Illustra cameras work with a wide range of NVRs including the Johnson Controls NVRs; VideoEdge and exacqVision.

Web Browser. You can configure an Illustra camera through a web browser. See the compatibly list included with the datasheet for the supported web browsers. You can find this on the Illustra website at https://illustracameras.com/cameras/.

Switch. A network switch connects Illustra cameras to a network. It is best practice to segment the network to isolate video on a dedicated local area network (LAN) for both performance and security reasons. You can use a networking switch that has PoE ports to power Illustra models that support PoE.

1.2.0 Security feature set

This document details the extensive security features available across the Illustra product range.

Individual features may vary, depending on camera model and firmware version.

- User accounts, including roles
- User account management
- Password strength enforcement
- IP address allow list or deny list
- MAC address allow list or deny list
- Encrypted communication
- Network protocol configuration
- Logging

Table 1.2.0.1 Security features

Section	Type	Feature name
1.2.1	Dashboard	Security overview
1.2.2	User Account Support	User accounts
1.2.3		User authorization
1.2.4		Automatic Logoff feature
1.2.5	User Password Support	User password policy
1.2.6		User authentication
1.2.7	Authentication safeguards	Machine authorization
1.2.8		Network Time Protocol
1.2.9	Secure Communications	Secure Communications
1.2.10		Digital certificate management
1.2.11		Encryption/hash algorithms
1.2.12	Alarms and Events	Logs
1.2.13		Alarms and alerts
1.2.14		Timely response to events
1.2.15	Backup and Restore	Availability assurance
1.2.16		Resource availability
1.2.17	Software updates	Encrypted software updates

1.2.1 Security overview

The web GUI shows the security status, and security options of your camera. For more information on managing security settings see section 2.2.2.1.

1.2.2 User accounts

Illustra supports user accounts with varying levels of privilege. Each account is given a user type for separation of duties dependent upon the functionality required to perform necessary tasks. For more information on the benefits and best practices to observe, see sections 2.2.4 and 2.2.5.

1.2.3 User authorization

To control the level of user authorization, use the principle of separation of duties and divide accounts into user types. For more information see sections 2.2.4 and 2.2.5.

1.2.4 Automatic Logoff feature

Illustra has an automatic logoff feature. For more information see section 2.2.2.4

1.2.5 User password policy

Illustra enforces strong passwords by default. Passwords must be 8 – 32 characters long (Johnson Controls recommends a minimum of 15) and have at least four characters from the following character groups:

- Upper case letters

- Lower case letters
- Numbers
- Special characters

Illustra does not allow passwords to contain the username.

1.2.6 User authentication

User authentication requires a username and password combination across all functions, by default, this includes video streaming.

1.2.7 Machine authorization

Illustra allows for certificate-based device authentication. For more information see section 2.4.3.

1.2.8 Network Time Protocol (NTP)

Illustra has a Network Time Protocol (NTP) synchronization feature.
For more information see section 2.2.2.5

1.2.9 Secure communications

Illustra supports TLS 1.2, SNMPv3, and has a set of built-in firewall capabilities. See section 2.4.2 for SNMP configuration and section 2.4.5 for built-in firewall configuration. If paired with a compatible system encrypted video streaming is available.

1.2.10 Digital certificate management

Customers should install a suitable certificate signed by a Certificate Authority (CA). You can update this certificate, see section 2.4.3. Web browsers highlight self-signed certificates as insecure because they are inadequate for authentication. The certificates are valid for encryption purposes.

1.2.11 Encryption/hash algorithms

Here are the supported ciphers for TLS v1.2:

- TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256

1.2.12 Logs

The following logs are enabled by default: Audit, Fault, System, and Boot. You can also create user defined Event Logs that use advanced features, for example, motion detection. For more information about specific logs see section 2.5.0.

1.2.13 Alarms and alerts

You can implement alarms and alerts that correspond to user defined parameters. You can view alarms and alerts in the logs if the camera is paired with a compatible system or on the web GUI.

1.2.14 Timely response to events

If the device is integrated with a supported system, alerts and events may appear immediately to operators of those systems. Email alert functionality, transfer of events to network storage, and alarm output is also available.

1.2.15 Availability assurance

You can back up the camera configuration to a text file. To restore camera configuration, upload a valid configuration text file.

1.2.16 Resource availability

To export camera settings, navigate to the Back Up and Restore page on the web GUI. You can restore settings using an exported file.

To record video, use an SD card. You can configure video to respond to events including analytics triggers and alarm input. If the camera is integrated with an NVR, you can use the NVR to record video. If equipped with an SD card and with NVR access video backfill may be used. If the network connection is lost, the backfill will continue to record video locally. When the network connection is restored, the video data will be requested from the camera and transferred on to the NVR.

1.2.17 Encrypted software updates

Software upgrades are provided as an encrypted and signed file. For more information on the update procedure see section 2.3.0.

1.3.0 Intended environment

You can install Illustra cameras in a range of environments, including internally and externally to a building. It is important that a qualified installer provides and defines physical mounting and network infrastructure.

1.3.1 Internet connectivity

Connecting any Operational Technology (OT) system to the internet always increases cybersecurity risk. Illustra cameras do not need Internet connectivity to function. To harden your system, Johnson Controls recommends that you do not connect Illustra cameras to the internet. Illustra cameras need access to a local area network (LAN) to leverage the full feature set. The camera may require Internet connectivity to allow the function of optional features, such as dynamic DNS.

1.3.2 Integration with IT networks

You may integrate Illustra cameras into standard IT deployments, but it is best practice to deploy Illustra systems and any supporting components to a dedicated and isolated network.

1.3.3 Integration with external systems

Integration with external systems is optional, for example using an NVR, or external NTP.
If NTP is required, a default server of us.pool.ntp.org is provided. This URL setting can be modified by the customer as necessary.

1.4.0 Patch policy

It is best practice to upgrade the camera with the latest Illustra firmware to install the most recent security fixes.

Illustra firmware support is provided for the latest version of the current release. Any updates will be provided in a subsequent release. When we discover a critical security vulnerability, we use commercially reasonable efforts to:

- Issue a **critical update** for the current version of the product as soon as is reasonably practicable

When we discover non-critical security vulnerability, we use commercially reasonable efforts to:

- Apply fixes for **high severity** vulnerabilities in the next immediate release

This policy is limited to commercial life of the product whereby Illustra cameras based on a particular hardware design or model are commercially available.

Note: Illustra cameras do not have a backport policy. Updates are only applied to the latest version of the released product.

1.4.1 Release schedule

An update to Illustra including new features and security fixes is released approximately every 6–8 months. No Illustra update is released without undergoing extensive quality assurance testing.

1.5.0 Hardening methodology

Illustra has many on board security safeguards, including many secure-by-default settings. However, Johnson Controls recommends that the device is hardened according to the guidance outlined in section 2 Deployment. Generally, a defence-in-depth strategy employing standard IT hardening methods and compensating controls as needed to complement the base security features of each component.

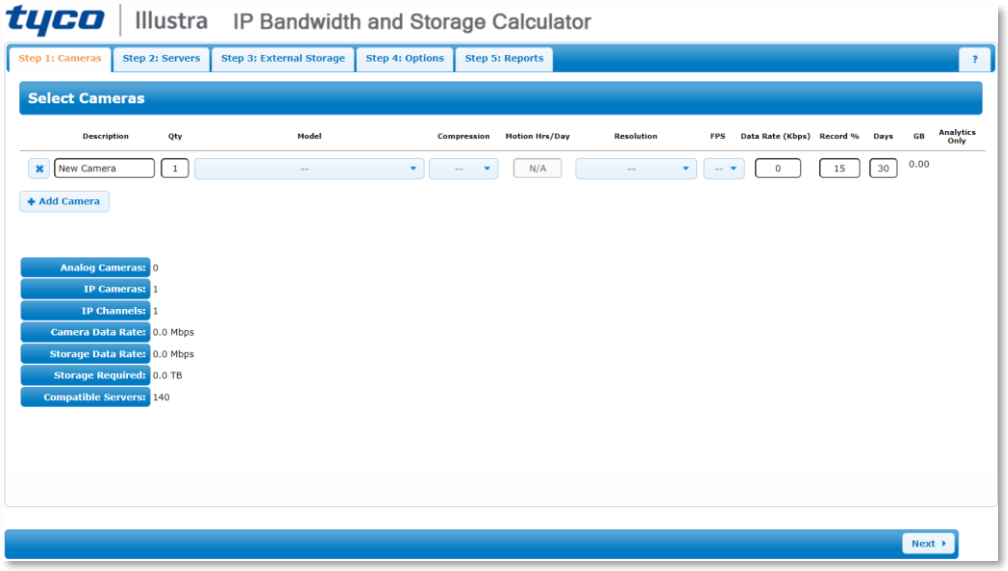
1.6.0 Communication paths table

Protocol	Function	Default State	Required	Configurable	Type	Default Port	Configurable Port Range
DDNS	Dynamic IP address mapping to hostname	Disabled	No	Yes	UDP or TCP	Dependent upon provider	N/A
FTP	Sending of events and events triggered video captures	Disabled	No	Yes	TCP	21	0 – 65535
SSH	Reserved for Tyco technical support	Disabled	No	No	TCP	22	N/A
SFTP	Secure sending of events and events triggered video captures	Disabled	No	Yes	TCP	22	0 – 65535
SMTP	Sending of security events	Disabled	No	Yes	TCP	25	10 – 65535
DNS	Automatic IP address configuration	Enabled	No	No	UDP or TCP	53	N/A
HTTP	Communication to the Web GUI	Enabled	Yes	Yes	TCP	80	1 – 65535
HTTP	Video streaming	Disabled	No	No	TCP	85	N/A
HTTPS	Encrypted video streaming	Disabled	No	No	TCP	86	N/A
NTP	Network time synchronisation	Disabled	No	Yes	UDP	123	N/A
SNMP	Network management	Disabled	No	Yes	UDP	161	N/A
HTTPS	Secure communication to the Web GUI	Enabled	No	Yes	TCP	443	1 – 65535
CIFS	Network storage of event logs	Disabled	No	Yes	TCP	445	N/A
RTSP	Video streaming	Enabled	Yes	Yes	TCP or UDP	554	1 – 65535
ONVIF	Camera discovery and setup	Disabled	No	Yes	UDP	3702	N/A
HTTP	EXACQ Audio	Disabled	No	Yes	TCP	3000 and 8089	N/A
SIP	Duplex audio	Disabled	No	Yes	TCP	46833	N/A
UPnP	Automatic IP discovery and setup	Enabled	Yes	Yes	TCP or UDP	49152 1900	N/A

1.7.0 Bandwidth requirements table or calculator

Bandwidth requirements depend on the video settings applied to the camera and on the number of cameras installed.

A bandwidth calculator is available at the following:
https://tycosecurityproducts.com/calculators/ipconfig/index.html



1.8.0 Network planning

A qualified provider must install and design the network infrastructure tailored to the specific needs of the customer.

2 Deployment

Use this section to initiate secure deployment for new installations, harden Illustra and complete additional steps after commissioning required before turning over to runtime operations.

2.1.0 Deployment overview

A deployment of Illustra should employ a VLAN with access restricted to systems and components required for operation. See section 1.1.1 for examples of deployment.

2.1.1 Getting started

Before installing an Illustra camera, consider the guidance outlined in the following sections.

2.1.2 Physical installation considerations

Cameras are designed to be placed in open areas where they can capture the best video footage. The physical access to the device and physical installation of the device can impact the cybersecurity. When possible, install cameras in a location that is difficult to reach without a ladder or has added physical protection which does not obstruct the camera's line of sight.

2.1.2.1 Tamper detection

You can configure tamper detection as a blur detection analytics event, see appendix B.3.

2.1.3 Default security behavior

On initial start-up a standard login page appears. Use the login page to access the camera using the default credentials.

At this point the default password must be changed. Password restrictions ensure password strength.

2.1.4 Resetting factory defaults

If the camera was previously used as part of another installation or test environment it must be reset to factory defaults before redeployment. To reset the camera, complete the following steps:

1. Navigate to the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Maintenance**.
   Optional: select **Preserve IP address**.
4. Click **Reset**.

There is also a hardware reset button. See the User Guide for details on its operation and location.

2.1.5 Considerations for commission

In the commissioning phase, you can use a less secure configuration before the full infrastructure is available or to speed up the deployment process for example, using Wi-Fi Maintenance Mode. Once the commissioning phase is complete, you must harden the system further before turning over to full runtime operations.

2.1.6 Recommended knowledge level

The person executing the proper hardening steps in this guide must have Illustra administration and networking technologies experience.

2.1.7 Least functionality

Least functionality is a security measure designed to limit functions only to those that the target application and communication sessions require at a given time. When you apply least functionality when you configure components you reduce the attack surface and minimize the risk of a cybersecurity breach.

2.2.0 Hardening

While the camera has several secure-by-default safeguards, to meet the security requirements of the target environment, we must harden the Illustra camera.

2.2.1 Hardening checklist

To harden this product, complete the following tasks:

- Hardening Step 1: Change all default credentials
- Hardening Step 2: Perform firmware updates
- Hardening Step 3: Disable unused ports
- Hardening Step 4: Enable RTSP authentication with Digest
- Hardening Step 5: Encrypted Communications
    - Hardening Step 5.1: Setup HTTPS
    - Hardening Step 5.2: Setup Secure FTP
    - Hardening Step 5.2: Setup SNMPv3
- Hardening Step 6: Update the SSL certificate
- Hardening Step 7: Enable IEEE 802.1X
- Hardening Step 8: Backup and restore camera setting

2.2.2 Administration

To access Illustra settings complete the following steps:

1. Navigate to the web GUI
2. Log on as an administrator
3. Navigate to the **Web User Interface** banner and click **Setup**

There are six main areas of administration, **Event and Actions, Security, Network, Maintenance, System** and **Storage**:

- Use the **Event and Actions** menu to configure motion detection and so on
- Use the **Security** menu to configure various security settings and add or modify user accounts
- Use the **Network** menu to configure basic network settings, networking protocols, and allowing individual protocols to be enabled or disabled
- Use the **Maintenance** menu to upgrade or reboot the camera and so on
- Use the **System** menu to configure options for maintenance and monitoring
- Use the **Storage** menu to manage SD card and so on

2.2.2.1 Security

To access security settings, complete the following steps:

1. Navigate to the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Security**.
4. Click **Security Status**.

You can change the security mode and enable or disable video authentication. You can also view information on network protocols. To access user account information and communications settings use the **Security** menu.

2.2.2.2 Network

To access the **Network** settings, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Network**

The **Network** submenu has a list of user configurable network protocols.

2.2.2.3 System

To access the **System** settings, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **System**

The **System** submenu has options for **Maintenance** including backup or upgrades, **Date Time** configuration, logs (see section 2.5.0), and system information.

2.2.2.4 Automatic Logoff feature

To configure automatic log off complete the following steps:

1. Open the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Security.**

4. Click **Session Timeout.**
5. Use the slider to adjust the **Session Timeout (mins)**

Note: The default value is 10 minutes.

2.2.2.5 Network Time Protocol

To configure NTP time synchronization, complete the following steps:

1. Open the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **System.**
4. Click **Date Time.**
5. Select **Set Time**, **via NTP.**

Optional: To change the NTP server click **NTP Server Name** and type in a new server name.

2.2.3 Enhanced Security Mode

Illustra is in **Enhanced Security** mode by default, it is recommended that this is unchanged. To change the state of **Enhanced Security** complete the following steps:

1. Navigate to the **Security Overview** page.
    a. To disable Enhanced Security, clear the **Enable Enhanced Security** check box.
    b. To enable Enhanced Security, check the **Enable Enhanced Security** check box.
2. Click **Apply**.

2.2.4 User management overview

Hardening Step 1: Change all default credentials.

Create unique user accounts for each operator of the camera. A role-based access control (RBAC) feature set controls operator functions. With RBAC, a user is assigned a role in which they acquire the permissions associated with that role.

There are three user roles: admin, operator, and normal user. The roles are briefly outlined here, for a detailed list of permissions, Appendix A.

- **Admin** – This user has access to the full functionality of the camera and may change any setting. Only use admin roles when absolutely necessary.
- **Operator** – This user can change non-security-based configuration. For example, video and picture settings.
- **Normal user** – This user is limited to read access.

To ensure you follow security best practices configure individual user accounts properly. Best practices for account management are described in section 2.2.5.

2.2.5 User management best practices

To improve the security for Illustra cameras, follow best practices for managing user accounts, their credentials, and authorizations (permissions).

2.2.5.1 No shared accounts

Do not use shared accounts. Each user or system entitled to access the camera must have individual login credentials. Adding separate accounts for each user ensures the principle of least privilege and separation of

duties but also allows for finer granularity in logging and when paired with good System Information and Event Monitoring practices system administrators can detect potential issues.

2.2.5.2 Least privilege

Least privilege is when only the minimum necessary rights are assigned to a subject that requests access to a resource and should be in effect for the shortest duration necessary (remember to relinquish privileges). Granting permissions to a user beyond the scope of the necessary rights of an action means the user may obtain or change information in unwanted ways. Careful delegation of access rights can limit attackers from damaging a system. For example, a user who needs to view a camera stream and change picture settings should not have administrative privileges, with which they can add or modify other user accounts. Following this practice reduces the potential for attacks, malfeasance, or accidental system damage.

2.2.5.3 Separation of duties

This is like but distinct from least privilege. Separation of duties involves creating accounts for specified purposes. For example, accounts with administrative access must not be used for common day-to-day tasks such as viewing video streams. Instead, separate accounts should be used for these different tasks. This helps prevent attacks that take advantage of ongoing connections and allow event monitoring to detect suspicious administrative actions more easily.

2.2.5.4 Strong passwords

By default, the camera enforces a strong password policy for users. It is recommended that this is unchanged. Strong passwords help to prevent attacks by making a password difficult to guess and to deny easy access to would-be attackers.

2.2.5.5 Password policy

While Illustra cameras include safeguards to prevent the use of weak passwords, it is recommended that an organizational password policy is defined and followed to educate operators on the benefits of a strong password and avoid common mistakes that can weaken security.

2.2.6 User management

A user must have administrative privileges to manage users. To manage users, complete the following steps:

1. Navigate to the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Security**.
4. Click **Users**.
   Optional: To add a user click **Add User**.
   Optional: To change a password click **Change Password**.

Use unique accounts during all phases of operation for Illustra. Installers, technicians, auditors, and other deployment phase users must not share common user accounts to ensure a non-reputable audit trail of their actions.

2.2.6.1 OS level accounts

Only Johnson Controls Technical Support use OS level accounts.

2.2.6.2 Password policy configuration

By default, Illustra follows a strong password policy. If Enhanced Security is disabled, the password policy is weakened. It is not best practice to disable Enhanced Security.

2.2.6.3 Change default passwords

During initial commissioning the user is asked to change the password for the default admin account once they log on to the web GUI. For further user accounts that are added to Illustra it is advised that the user manually change their own password on initial log on.

2.2.6.4 Assign roles

Roles limit the actions a user can take, see section 2.2.4. Roles can be assigned when user accounts are created.

2.3.0 Updating firmware process

Use Illustra firmware to upgrade the firmware or through Illustra Connect. Refer to the Illustra Connect User Guide for further information.

Note: All existing camera settings are maintained when the firmware is upgraded.

Hardening Step 2: Perform firmware updates

To manually update the firmware, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **System**
4. Click **Maintenance**
5. Click **Browse**. The Choose file to Upload dialog displays.
6. Browse to the firmware file
7. Click the firmware file
8. Click **Open**
9. Click **Upload**

The file transfer begins. Do not disconnect power to the camera during the upgrade process. The camera restarts automatically after the updates, this can take from 1 to 10 minutes. Once complete the Log in page displays.

2.4.0 Communication hardening

Communication hardening limits an attacker's ability to gain access to Illustra. Attackers look for weaknesses in communication protocols, and unencrypted/unauthenticated communications. Implement the following techniques to harden the communication interfaces and the transmission of data.

2.4.1 Communication port configuration

Ensure that the ports corresponding to your Illustra camera from section 1.6.0 are open that need to be open based on the features being used. Unused ports should be blocked unless they are specifically needed.

Hardening Step 3: Disable unused ports

To harden your system, block all ports that are not in use.

The **Security Overview** displays a list of configurable ports. To open **Security Overview** complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click on **Security**

4. Click on **Security Status**

By default, the minimum number of ports for essential functionality are open. To harden security do not enable additional ports unless necessary, disable any services not required during operation, and to enable encryption wherever possible.

2.4.1.1 RTSP Authentication

Hardening Step 4: Enable RTSP authentication with Digest

By default, access to Real Time Streaming Protocol (RTSP) streams require user authentication. To change the status of RTSP authentication, navigate to the **Security Overview** page.

- The **Authenticate Video** check box indicates the status of video authentication, enabled or disabled.
- The **Authentication** drop down menu displays the current RTSP authentication method.

To enable video authentication, complete the following steps:

1. Select **Authenticate Video**
2. Click **Apply**

To disable video authentication complete the following steps:

1. Deselect **Authenticate Video**
2. Click **Apply**

To change authentication method:

1. Click the **Authentication** dropdown menu
2. Click the authentication method
3. Click **Apply**

It is best practice to use digest authentication to enable RTSP authentication.

2.4.1.2 Wi-Fi Maintenance Mode

During the commissioning phase of Illustra, you may enable Wi-Fi Maintenance Mode to ease installation. When in operation this should be disabled, see section 2.1.5.

2.4.1.3 Firewall/router configuration

To increase security use a firewall or router, dependent upon vendor, to restrict communications to known addresses. Illustra also provides built-in firewall with basic filters and allow listing or deny listing functionality. See section 2.4.5 for further details on Illustra's built-in firewall.

2.4.1.4 Network isolation

It is best practice to deploy Illustra cameras to an isolated network to restrict available communication paths and prevent access to the wider Internet. Consult with a network professional for advice on how to provide this within the deployment environment of the camera.

2.4.1.5 Proxy Configuration

Illustra Insight allows configuration of communication to the cloud-based facial recognition server through a proxy. To configure the proxy, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Network**
4. Click **Proxy**
5. To enable the proxy select **Enable**

6. Click the **Authentication** dropdown menu
7. Click the authentication method
8. If prompted type the domain in the **Domain** textbox
9. Type the **Host**
10. Type the **Port**
11. Type the **Username**
12. Type the **Password**
13. Click **Apply**

2.4.2 Encrypted communications

Hardening Step 5: Encrypted Communications

Encrypted communications can help prevent attacks by preventing simple connection eavesdropping. Access to Illustra should be through HTTPS. If your deployment requires FTP or SNMP, it is best practice to use Secure FTP and SNMPv3.

Hardening Step 5.1: Setup HTTPS

To access HTTP/HTTPS configuration complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Security**
4. Click **HTTP/HTTPS**

Here you can change port numbers and upload certificates. For more information see section 2.4.3.3.

Hardening Step 5.2: Setup Secure FTP

To configure FTP, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Network**
4. Click **FTP**

Hardening Step 5.3: Setup SNMPv3

To configure SNMP, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Network**
4. Click on **SNMP**

2.4.3 Communication certificate support

HTTPS encrypts web traffic but does not verify the identity of the remote host without a properly configured digital certificate. Create a certificate that is unique to the individual camera so that your web browser or client can verify its identity. You may self-sign the certificate, or for more security-conscious customers, a trusted certificate authority can sign it.
Note: Johnson Controls recommends using a trusted certificate authority.

Hardening Step 6: Update the SSL certificate

The next two sections will guide you through the process for doing the following:

- Upload a signed certificate

- Generate a certificate request

Signed Certificate

To upload a signed certificate, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the Web User Interface banner and click Setup
3. Click **Security**
4. Click **HTTP/HTTPS**
5. Click **Upload** and browse to the certificate location
6. Select the file and click **Open**

Note: The camera only accepts .pem format certificates. The certificate must have the server certificate and private key combined. The private key must NOT be password protected.

Generating a Certificate Signing Request

The camera may also create a Certificate Signing Request that may be given to a signing authority.

1. Navigate to the web GUI
2. Navigate to the Web User Interface banner and click **Setup**
3. Click **Security**
4. Click **Generate CSR**
5. Complete the following fields (no field is mandatory)
    a. Two letter **Country** code
    b. **Province**
    c. **Locality**
    d. **Organization**
    e. **Organizational Unit**
    f. **Common Name**
6. The first **Subject Alternative Name** drop-down menu and textbox contain text. To add further entries complete the following steps:
    a. Click the **Subject Alternative Name** drop-down menu and choose from **IP** or **DNS** for IP address or domain name respectively
    b. Type the IP address or domain name into the textbox
7. Click **Apply**

A certificate request generates in the text field on the right of the page. This can be sent to a signing authority. A signed certificate is uploaded using the same procedure outlined in the steps to upload a certificate.

Note: The certificate from the signing authority does not contain a private key. You can ignore the private key requirement for certificates generated from a Certificate Signing Request.

2.4.4 802.1X configuration

The IEEE 802.1X security feature provides port-based network access control typically used when securing corporate networks from the attachment of unauthorised devices.

Hardening Step 7: Enable IEEE 802.1X

To enable IEEE 802.1X complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Security**
4. Click **IEEE 802.1x**

5. To enable IEEE802.1x security select **Enable IEEE802.1x**
6. Click the **EAPOL Version**
7. Click the **EAP Method**
8. In the **EAP Identify** field type the EAP Identify name
9. Click **Upload** and browse to the CA Certificate location
10. Click the file and click **Open**
11. Click **Upload**
12. If **PEAP** is selected
    a. Type the PEAP **Password**
13. If **TLS** is selected
    a. Click **Upload** and browse to the Client Certificate location
    b. Click the Client Certificate and click Open
    c. Click **Upload**
    d. Type the **Private Key Password**

2.4.5 Built-in firewall

Illustra' s built-in firewall provides basic filters and allow listing or deny listing functionality that filters device access by IP address.

2.4.5.1 Basic Filters

The following filters are offered:

- ICMP Blocking,
- RP Filtering, and
- SYN cookie verification.

Internet Control Message Protocol (ICMP) Blocking prevents devices from establishing if the camera is online by using methods such as a ping test.

Reverse Path (RP) Filtering will disallow packets from addresses that are not reachable. For example, if the camera has an IP address of 10.10.10.2 and RP filtering is enabled, do not allow packets from 192.168.1.3 to work with the camera.

SYN cookie verification prevents a SYN flood, a type of denial-of-service attack.

It is best practice to enable ICMP Blocking, RP Filtering, and SYN cookie verification in the firewall **Basic Filtering** page. To access the Basic Filtering page, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Security**
4. Click **Firewall**

2.4.5.2 Address Filtering

Address filtering can be accessed with the following steps:

1. Navigate to the web GUI
2. Navigate to the Web User Interface banner and click **Setup**
3. Click **Security**
4. Click **Firewall**
5. Click **Address Filtering**

To enable address filtering, complete the following steps:

1. Choose one of the following options:
   - To disable address filtering click **Off**
   - To allow address filtering for specified addresses click **Allow**
   - To deny address filtering for specified addresses click **Deny**
2. If address filtering has been set to Allow or Deny:
   a. Type an IP or MAC Address to allow/deny in the IP or MAC Address field in the following format xxx.xxx.xxx.xxx
   b. Click **Add**
   c. Click **Apply**

2.4.6 Mass configuration

Mass configuration simplifies the management of components connected to the system and reduces the risk of misconfiguration. For mass configuration Illustra cameras may be configured using Illustra Connect. Refer to the Illustra Connect User Guide for further information.

2.5.0 Security monitoring features

Illustra includes a Health Monitor, has support for Simple Network Management Protocol (SNMP) as well as featuring logs for Security, Audit, Fault, System, and Boot. Each of these logs enable a user to inspect the activity of an Illustra camera separated by key area. User defined Event Logs may also be created that use advanced features, for example, motion detection, see Appendix B.

Logs may be downloaded through FTP, CIFS, or delivered by email using SMTP. These must be configured before use, see Appendices C through E.

2.5.1 Health monitor

The Health Monitor provides visibility on the health status of popular device parameters. A full list of displayed information is listed in Appendix G. It can be accessed by completing the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **System**
4. Click **Health Monitor**

2.5.2 Security log

Changes to the security mode, protocol settings, and user accounts are recorded in the Security Log. To view the Security Log complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Security**
4. Click **Security Status**
5. Click **Security Log**

2.5.3 Audit log

The Audit Log will log details of changes made to network settings, picture settings, and maintenance events. To view the Audit Log complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**

3. Click **System**
4. Click **Logs**
5. Click **Audit Log**

For a full list of actions recorded by the Audit Log see Appendix G.

2.5.4 Fault log

Any system or environmental faults experienced by the camera are displayed in the Fault Log. To view the Fault Log:

1. Navigate to the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Events and Actions**.
4. Click **Event Logs**.
5. Click **Fault Log**.

For details of events logged by the Fault Log see Appendix H.

2.5.5 System Log

The system log gives the most recent messages from the unix /var/log/messages file. Information includes the following:

- Messages about system behaviour such as process startup/shutdown
- Warnings about recoverable problems that processes encounter
- Error messages which the system encounters; Note: The system process has encountered an issue; however the process may continue to operate normally.

To view the **System Log** complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **System**
4. Click **Logs**
5. Click **System Log**

2.5.6 Boot log

The Boot Log is a log of the Linux operating system boot processes and is for Johnson Controls support engineers who require additional information on the device.

To view the Boot Log complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **System**
4. Click **Logs**
5. Click **Boot Log**

2.5.7 Event log

When user-defined events are triggered, the resulting alarms are displayed in the Event Log. To create or edit Events see Appendix B. To view the Event Log complete the following steps:

1. Navigate to the web GUI.
2. Navigate to the **Web User Interface** banner and click **Setup**.
3. Click **Events and Actions**.
4. Click **Event Logs**.
5. Click **Event Log**.

2.6.0 Availability hardening

Availability hardening is a process that ensures information the camera stores or creates is accessible. Illustra provides several features to ensure availability of data including, backup and restore functionality, network storage, and video backfill. If you need to restore or replace a camera it is important to have a backup of its configuration data to minimise the time it takes to restore functionality.

Hardening Step 8: Backup and restore camera setting

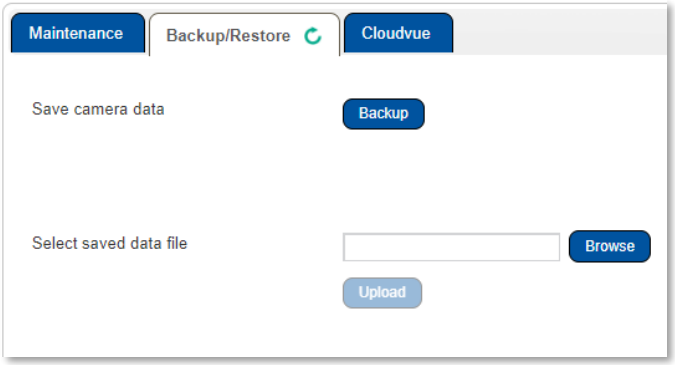
Backup

1. Navigate to the web GUI
2. Navigate to the Web User Interface banner and click **Setup**
3. Click **Maintenance**
4. Click **Backup & Restore** (as shown in figure 2.6.1)
5. Click **Backup** to save the file according to the company's backup policies

Restore

1. Navigate to the web GUI
2. Navigate to the Web User Interface banner and click **Setup**
3. Click **Maintenance**
4. Click **Backup & Restore** (as shown in figure 2.6.1)
5. **Browse** for, then select a file that was created during the backup process above
6. Click **Upload**

Figure 2.6.1



2.7.0 Privacy considerations

The capabilities and functionality of Illustra may require compliance by you or your organization with local, state, national and international laws, and regulations. You or your organization are obligated to learn about and are solely responsible for compliance with all applicable laws and regulations relating to your use of those functions, including but not limited to those laws and regulations pertaining to personal data protection, privacy and security, any laws relating to the collection and sharing of personal data, including video and face detection with third parties, or any laws requiring notice to or consent of persons with respect to your use of the Illustra capabilities and functionalities.

3 Maintain

In section 1 we learned that many components work together to provide a custom solution. This section addresses how to monitor for potential cybersecurity issues and maintain protection levels as conditions change. From the research gathered in Section 1, determine the items in table 3.1.1 that apply to your system and focus on only those items.

An audit that produces a report indicating low cybersecurity risk is a very positive result and suggests that the deployment was conducted with a high degree of care and consideration. However, new attack vectors combined enhanced hacking tools and more advanced testing techniques may, in the future, disclose vulnerabilities with the technologies used.

The impacted technologies and their implementation may have been previously well regarded by cybersecurity experts. The discovery of vulnerabilities post the final deployment audit may not reflect the quality of the audit at the time. You may require a higher degree of protection for Illustra' s deployment environment as policies and regulations change over time.

3.1.0 Cybersecurity maintenance checklist

Continuously or periodically practise the following cybersecurity maintenance items. The frequency of their execution depends on the policies and regulations which govern the site. The following maintenance periods are a starting point. Adjust to best suit the target conditions of the deployed environment:

Table 3.1.1

Item	Description	Immediate	Base on Priority	Daily	Weekly	Monthly	Quarterly	Annual
1	*Backup configuration data*						✓	
2	*Test backup data*						✓	
3	*Disable user accounts of terminated employees*	✓						
4	*Remove inactive user accounts*					✓		
5	*Update user account roles and permissions*						✓	
6	*Disable unused features, ports, and services*						✓	
7	Check for and prioritise advisories				✓			
8	Plan and execute advisory recommendations		✓					
9	Check and prioritise software patches and updates				✓			
10	Plan and execute software patches and updates		✓					
11	Review updates to organizational policies							✓
12	Review updates to regulations							✓
13	Update as-built documentation	✓					✓	
14	Conduct security audits							✓
15	Update password policies							✓
16	Update standard operating procedures							✓
17	Monitor for cyber attacks	✓						

3.1.1 Backup configuration data

To restore or replace a camera, it is important to have a backup of its configuration data to minimise the time required to restore functionality.

Action	Details	Suggested frequency
Backup configuration data	Create a backup of your data. See section 2.6.0 for additional details.	Quarterly

3.1.2 Test backup data

After completing step 3.1.1, test backups to provide assurance that the data backups contain the expected data and integrity.

Action	Details	Suggested frequency
Test backup data	Test the data created in step 3.1.1	Quarterly

3.1.3 Disable accounts on termination of employment

Disable user accounts of personnel who voluntarily or non-voluntarily are terminated from employment immediately.

Action	Details	Suggested frequency
Disable accounts	Disable user accounts that are no longer needed	Immediately

3.1.4 Remove inactive user accounts

While an employee may still be employed by an organization that owns, manages, or services the system, they may not have used it for a long period. This suggests that they do not have a need to use the system and you should remove their user account. This is sometimes referred to as a use it or lose it policy. This best practice reduced the amount of active user accounts in the system and therefore lowers the potential attack footprint.

Action	Details	Suggested frequency
Remove inactive user accounts	Disable or remove user accounts that are no longer needed. See section 2.2.6 for additional details.	Monthly

3.1.5 Update user account roles and permissions

While an employee may still be employed by an organisation that owns, manages, or services the system, they may have changed roles or have increased or decrease their need to use the system. When you add a role or a permission to a user's account when that user is granted new authorisations due to an organisational role change, be sure to remove the camera's roles and permissions no longer required or used in their new role.

Action	Details	Suggested frequency
Update user account roles and permissions	Review employee accounts and update as needed	Quarterly

3.1.6 Disable unused features, ports, and services

If you no longer require optional features, ports, and services disable them. This practice lowers the attack surface of Illustra resulting in a higher level of protection. Refer to section 2.4.1.

Action	Details	Suggested frequency
Disable unused features, ports, and services	Review features ports and services.	Quarterly

3.1.7 Check for and prioritise advisories

Find cybersecurity advisories for Illustra on www.illustracameras.com. Determine if Illustra is impacted by the conditions outlined in the advisories. Based on how you deploy, configure, and use Illustra system, the advisory may not be of concern. To help with your assessment refer to as-built documentation of the Illustra system. A good set of as-built documentation will identify the number of components impacted and when they are located. While advisories call attention to a cybersecurity issue, it is not always possible to take immediate action or execute the full recommendation described in the advisories. Address any impacting your system in

order of priority. Consult with the respective vendor to check for advisories from third party components such as networking equipment and operating systems.

Action	Details	Suggested frequency
Check for and prioritize advisories	Refer to the link above that hosts advisories and explore each week	Weekly

3.1.8 Plan and execute advisory recommendations

If Illustra is impacted by the conditions outlined in the advisories, including those from third party components, then action must be taken to mitigate the issues raised. The specific action is based upon the content of the advisories distributed and depends upon the environment Illustra is deployed into. Plans for executing the advisory recommendations must consider the operating environment and usage of Illustra.

Action	Details	Suggested frequency
Plan and execute advisory recommendations	Plan as described above and execute advisory recommendations	Based on priority

3.1.9 Check and prioritize patches and updates

While an Illustra patch or update may or may not relate to an advisory, it is always best practice to apply the most current patches and updates. These patches and updates can include cybersecurity enhancements and fixes to known issues. Review the release notes and prioritize the benefits of the patch or update. The overall benefit should include the improved protection that lowers the cybersecurity risk. Be sure also to check for updates and patches of third-party components such as networking equipment and operating systems by consulting with the respective vendor.

Action	Details	Suggested frequency
Check and prioritize software patches and updates	Explore available patches and updates each week	Weekly

3.1.10 Plan and execute software patches and updates

Create a plan to apply software updates on a regular basis. This plan should include provisions for the unlikely event of service impact. Make considerations regarding schedule and deployed environment to minimise service disruptions. See section 2.3.0 for the firmware update process.

Action	Details	Suggested frequency
Plan and execute software patches and updates	Explore available patches and updates each week	Based on priority

3.1.11 Review organizational policy updates

Organizations may update their policies which include cybersecurity requirements. Changes to these policies can impact systems which complied prior to the change. Periodically check for policy changes and re-assess compliance with those policies.

Action	Details	Suggested frequency
Review updates to organizational policies	Collect most recent security policies for your organization	Annual

3.1.12 Review updates to regulations

If Illustra is deployed in a location that is governed by regulation, it is important to check to see if there are any updates to those regulations. In some cases, new regulations are introduced. Whether it is a review of an updated regulation to maintain compliance and a new regulation, an assessment of the changes should be conducted periodically.

Action	Details	Suggested frequency
Review updates to regulations	Collect most recent copies of regulations as applicable. Perform a gap analysis against the deployed configuration.	Annual

3.1.13 Update as-built documentation

As-built documentation refers to the environment the Illustra solution is deployed into, this may include but is not limited to network infrastructure and external integrations. Changes and updates to the operating environment should be recorded and assessed for potential security vulnerabilities. Schedule a full update of the as-built documentation on a regular basis to ensure that all changes are documented. Review the information in checklist item 3.1.7.

Action	Details	Suggested frequency
Update as-built documentation	Update as-built documentation if the system architecture or component configuration significantly changes	Immediate

3.1.14 Conduct security audits

Periodic security audits are necessary as cybersecurity guidance, organisational policies, regulations, auditing processes, system use and configuration, and threats have likely changed since the last audit. If you conduct periodic security audits, you can apply the latest knowledge and conditions and reveal gaps in protection previously undetected or created by changes in system use of configuration.

Action	Details	Suggested frequency
Conduct security audits	Perform the tasks listed on your Security audit checklist	Annual

3.1.15 Update password policies

Guidance on password policies evolves. Periodically re-assess password policies to make sure the right policy is in place for the target environment based on current organisational policies, regulations, and guidance from standards organisations such as NIST.

Action	Details	Suggested frequency
Update password policies	Review internal password policies and the section on passwords	Annual

3.1.16 Update standard operating procedures

Including best practices for cybersecurity in standard operating procedures can complement the protection that the system can deliver on its own. Depending on the procedures an operator uses they can prevent, create, or close a gap in protection. It is important to update standard operating procedures periodically.

Action	Details	Suggested frequency

Update standard operating procedures	Collect standard operating procedures for use within the organization	Annual

3.1.17 Monitor for cyber attacks

Monitor site perimeters, networks, and endpoints for cyber-attacks. Many tools are available to assist with real-time analytics-based detection.

Action	Details	Suggested frequency
Monitor for cyber attacks	Determine which security monitoring tools and services to implement	Run continuously once implemented

3.2.0 Recovery and factory reset

To recovery or factory reset the device use the web GUI or hardware reset button. For more information see section 2.1.4.

3.3.0 Illustra testing process

Vulnerability assessment is a continuous process in which the camera is subject to penetration testing and vulnerability scanning. This includes the use of tools including but not limited to: p0f, Nessus, and Black Duck.

3.3.1 Vulnerability assessment

Vulnerabilities discovered in Illustra proprietary software are assessed on the CVSS v3 score.

CVSS v3 Score	Assessment
≥ 9	Critical
≥ 7	High
< 7	Medium

3.3.2 Vulnerability assessment – third party components

Johnson Controls uses commercially reasonable efforts to monitor third party and open-source software included within Illustra for disclosed vulnerabilities from the product vendors and open-source communities. Vulnerabilities that are discovered and disclosed will be assessed first on its assigned CVSS v3 score from the product vendor or the National Vulnerability Database and then on the ability to be exploited within Illustra.

CVSS v3 Score	Exploitability	Assessment
≥ 9	Exploitable	Critical
≥ 9	Not Exploitable	High
≥ 7	Exploitable	High
≥ 7	Not Exploitable	Medium
< 7	Exploitable	Medium
< 7	Not Exploitable	Low

If a patch is not available to correct the vulnerability, Johnson Controls will use commercially reasonable efforts to mitigate the vulnerability within its capabilities.

3.4.0 Illustra vulnerability reporting

If you believe you have discovered a vulnerability in Illustra or any Johnson Controls product, contact the Cyber Protection Program through its website https://www.johnsoncontrols.com/cyber-solutions/cyber-response or at the email address productsecurity@jci.com. Additionally, Johnson Controls Technical Support staff have direct access to the Cyber Protection to help assess and resolve any issues (illustrasupport.tyco@jci.com).

Appendix A – User account access

Camera Menu	Sub Menu	Tab	Admin	Operator	User
Live View	Live View		X	X	X
Quick Start	Basic Configuration	TCP/IP	X		
		Video Stream Settings	X	X	
		Picture Basic	X	X	
		Picture Additional	X	X	
		Date/Time/OSD	X	X	
Video	Streams	Video Stream Settings	X	X	
	Picture Settings	Picture Basic	X	X	
		Picture Additional	X	X	
		Lens Calibration	X		
	Date/Time/OSD	Date/Time/OSD	X	X	
	Privacy Zones	Privacy Zones	X	X	
Events and Actions	Event Settings	SMTP	X		
		FTP	X		
		CIFS	X		
	Event Actions	Event Actions	X		
	Alarm I/O	Alarm I/O	X		
	Analytics	ROI	X		
		Motion Detection	X		
		Video Intelligence	X		
		Blur Detection	X		
	Event Logs	Event Log	X		
		Fault Log	X		
Applications	Applications	Applications	X		
	License	License	X		
Security		Security Status	X		
	Users	User	X	X	
		Add User	X	X	
		Change Password	X	X	X
	HTTP/HTTPS	HTTP/HTTPS	X		

	IEEE 802.1x	EAP Settings	X		
	Firewall	Basic Filtering	X		
		Address Filtering	X		
	Remote Access	Remote Access	X		
	Session Timeout	Session Timeout	X		
Network	TCP/IP	TCP/IP	X		
	Multicast	Multicast	X		
	FTP	FTP	X		
	SMTP	SMTP	X		
	SNTP	SNTP	X		
	CIFS	CIFS	X		
	Dynamic DNS	Dynamic DNS	X		
	SIP	SIP	X		
System	Maintenance	Maintenance	X		
		Backup / Restore	X		
	Date Time	Date Time	X		
	Audio	Audio	X	X	
		Audio Clips	X	X	
	Health Monitor	Health Monitor	X		
	Logs	System Log	X		
		Boot Log	X		
		Audit Log	X		
	About	Model	X	X	X
Edge Recording	SD Card Management	SD Card Management	X		
	Record Settings	Record Settings	X		
	Event Download	Event Download	X		

Note: The default admin account cannot be deleted. When creating a new account, an admin user can select the permission level for the new user (admin, operator, user).

Appendix B Configuring event actions

You can configure the camera to carry out a specified operation when an analytic alert is triggered. Analytic alerts are defined using event actions. You can configure multiple event actions.

Use event actions to configure any combination of the following actions:

- Record a clip to microSD Card
- Send an external alarm using email that includes alarm detail, where to retrieve the AVI video file and one JPEG picture of the event if recording MJPEG to microSD Card. If MJPEG is not being recorded on microSD Card, then no JPEG picture is sent
- Send an AVI video file to a pre-configured external FTP server. The video file contains pre and post alarm video buffer

Note: You must use a microSD Card to send an SMTP email, video files and images from triggered analytic alerts.

Appendix B.1 Creating an event action

Configure an event action which can be triggered by an analytic alert

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click an event action and in the **Name** field type an event action name
6. To enable record settings select **Record**s
7. To send an email to the address configured in the **Configure SMTP Settings** procedure, select **Email**. See Appendix C
8. To send a video file to the FTP details configured in the **Configure FTP Server Settings** procedure, select **FTP**. See Appendix D
9. To send a video file to the SFTP details configured in the **Configure CIFS Server Settings** procedure select **CIFS**. See Appendix E

Notes:

- If **Record** is selected, the AVI clip is saved to the microSD card, and it must be removed from the camera to view the video file
- AVI clips can only be sent using FTP if a microSD card has been installed and FTP has been selected
- The selected pre and post event duration buffer is included in any video clips sent using FTP

Appendix B.2 Editing an event action

To modify the details of an existing event action, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click an entry on the event actions list, you can edit the following:
    - Name
    - Record - Enable/Disable
    - Email - Enable/Disable
    - FTP - Enable/Disable
    - CIFS - Enable/Disable

- Audio Playback - select the required audio

Appendix B.3 Supported events

Event Actions	Description
Output	The camera can enable an output for an event action
Record	Event to record upon fault action will be enabled
Email	Email notification of fault
FTP	FTP upload of fault notification
CIFS	Common Internet File System upload of fault notification
Analytics	**Description**
ROI	A region of interest is a defined area of the camera view which is higher priority than areas of non-interest
Motion Detection	Motion detection enables you to define a region of interest in the camera's view which can be used to trigger an Event Action
Blur Detection	The camera generates an alarm and then takes the action you specified during configuration when the Blur Detection feature is enabled and the camera detects incidents that make the video image blurred, (such as: redirection, blocking, or defocusing).

Appendix C Configure SMTP Settings

Configure the SMTP settings to allow email alerts sent from the camera when an analytic alert is triggered. To configure SMTP, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click **SMTP**
6. To enable SMTP select **Enable SMTP**.
7. In the **Mail Server** field type the mail server's IP Address
8. In the **Server Port** field type the server port
9. In the **From Address** field type the from email address
10. In the **Send Email** field type the email address to send alerts to
    Optional: To type authentication details select **Use authentication to log on to server**
    Optional: If **Use authentication to log on to server** is selected:
    a. In the **Username** field type the SMTP account username.
    b. In the **Password** field type the SMTP password.
11. Click **Apply**

Appendix D Configure FTP Settings

Configure the FTP settings for the FTP server this sends video files from triggered analytic alerts.

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click **FTP**
6. To enable FTP select **Enable**
   Optional: Select **Secure FTP**
7. In the **FTP Server** field type the IP address of the FTP Server
8. In the **Username** field type the name of the FTP username
9. In the **Password** field type the FTP password
10. In the **Upload Path** field type the FTP upload path

Appendix D.1 Configure FTP File Transfer Rate

To manage the FTP bandwidth limit the File Transfer Rate and assign a max transfer rate. To configure the File Transfer Rate, complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click **FTP**
6. You can enable or disable transfer rate limits:
   a. To limit the transfer rate select **Limit Transfer Rate**
   b. To disable limited transfer deselect **Limit Transfer Rate**
7. If you select **Limit Transfer Rate** navigate to the **Max Transfer Rate (Kbps)** field and type in the max transfer rate

Appendix D.2 Test the FTP Settings

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click **FTP**
6. Click **Test**

A sample text file is sent to the specified FTP destination to confirm that FTP settings are correct.

Appendix E Configure CIFS Settings

The CIFS feature permits files generated from the camera such as alarm related video to be directed to network attached file storage using the Common Internet File System protocol. This supplements existing distribution methods such as FTP, SFTP and email. To configure CIFS settings complete the following steps:

1. Navigate to the web GUI
2. Navigate to the **Web User Interface** banner and click **Setup**
3. Click **Events and Actions**
4. Click **Event Actions**
5. Click **CIFS**
6. You can enable or disable CIFS
    a. To enable CIFS select **Enable**
    b. To disable CIFS deselect **Enable**
7. In the **Network Path** field type the network path
8. In the **Domain Name** field type the domain name
9. In the **Username** field type the username
10. In the **Password** field type the password

Appendix F Health Monitor

The following list contains the information displayed by the Health Monitor:

- Total RAM
- Free RAM
- Total ROM
- Uptime
- Operating Time
- User Resets
- Power Resets
- Bandwidth
- CPU Usage
- Total Disk Size
- Disk Usage
- Internal Temperature
- Maximum Temperature
- Minimum Temperature
- Video Streams Playing
- Ethernet Status

Appendix G Audit Log Details

The Audit Log logs details of changes in the following format: source, class, result, user, and a description of the change. The audit log displays changes made in the following areas of the Web User Interface including:

- Changes in FTP, CIFS, SMTP, IPV4, IPV6, DNS and SNMP are logged under class **NETWORK**
- Changes in Stream are logged under class **VIDEO**
- Changes in Reboot, Reset and Upgrade are logged under class **MAINTENANCE**
- Changes in DIO and ROI are logged under **EVENT**

Appendix H Fault Log Details

Any system or environmental faults display in the Fault Log with the following information:

- # - details the fault index
- **Fault** - a description of the fault
- **Date created** - the time and date when the fault occurred
- **Component** - internal software component that raised the fault
- **Severity** - indicates how serious the fault is. The following are supported, in increasing order of severity, Clear, Warning, Critical and Error
- **Detail** - extra information that supplements the fault description

Appendix H.1 System Faults

The following system faults may be raised:

- **DiskUsage (Warning)** - this warning is raised when the disk utilisation rises above the threshold value “threshold2” held in SYSM.conf. Once an alarm is generated and the disk utilization decreases 1% below the threshold value, the fault is then automatically cleared. The default threshold value is 80%.
- **PowerSupplyAlarm (Error)** - this fault is raised when one or more of the internal DC power supplies voltage level is either too high or too low. Once an alarm is generated and the DC power voltage goes back into the proper range, the fault is then automatically cleared.

Appendix H.2 ENVM (Environmental Monitor) Component

The following environmental faults can be raised by the ENVM (Environmental Monitor) component:

- **TemperatureTooHigh (Warning)** - this fault is raised when the internal temperature of the enclosure is equal to or exceeds the value MAX_TEMPERATURE held in ENVM.conf. Once an alarm is generated and the temperature drops to a level 1 degree below the MAX_TEMPERATURE value the fault is then automatically cleared. This is to avoid transient changes in temperature around the threshold.
- **TemperatureTooLow (Warning)** - a fault is raised when the internal temperature of the enclosure is equal to or is below the value MIN_TEMPERATURE held in ENVM.conf. Once an alarm is generated and the temperature drops to a level 1 degree above the MIN_TEMPERATURE value the fault is then automatically cleared. This is to avoid transient changes in temperature around the threshold.