

Software House, a brand of Tyco Security Products

iSTAR Edge Door Controller

Hardware Model Numbers: ESTAR001, ESTAR001-POE1, ESTAR002, ESTAR002-POE1, and ESTAR004

Firmware Version: 6.1

Label Part Number: STAR-FIPS-LBLS

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1 Introduction

1.1 Purpose

This is a non-proprietary Cryptographic Module Security Policy for the following product line from Software House, a brand of Tyco Security Products:

- iSTAR Edge Door Controller
 - Hardware Model Numbers: ESTAR001, ESTAR001-POE1, ESTAR002, ESTAR002-POE1, and ESTAR004
 - Firmware Version: 6.1

This Security Policy describes how the iSTAR Edge Door Controllers meet the security requirements of Federal Information Processing Standards (FIPS) Publication 140-2, which details the U.S. and Canadian Government requirements for cryptographic modules. More information about the FIPS 140-2 standard and validation program is available on the National Institute of Standards and Technology (NIST) and the Communications Security Establishment (CSE) Cryptographic Module Validation Program (CMVP) website at <http://csrc.nist.gov/groups/STM/cmvp>.

This document also describes how to run the module in a secure FIPS-Approved mode of operation. This policy was prepared as part of the Level 2 FIPS 140-2 validation of the module. The iSTAR Edge Door Controllers are also referred to in this document as the iSTAR Edge, the cryptographic module, or the module.

1.2 References

This document deals only with operations and capabilities of the module in the technical terms of a FIPS 140-2 cryptographic module security policy. More information is available on the module from the following sources:

- The Software House website (<http://www.swhouse.com>) contains information on the full line of products from Software House.
- The CMVP website (<http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/140val-all.htm>) contains contact information for individuals to answer technical or sales-related questions for the module.

1.3 Document Organization

The Security Policy document is one document in a FIPS 140-2 Submission Package. In addition to this document, the Submission Package contains:

- Vendor Evidence document
- Finite State Model document
- Other supporting documentation as additional references

This Security Policy and the other validation submission documentation were produced by Corsec Security, Inc. under contract to Software House. With the exception of this Non-Proprietary Security Policy, the FIPS 140-2 Submission Package is proprietary to Software House and is releasable only under appropriate non-disclosure agreements. For access to these documents, please contact Software House.

2 iSTAR Edge Door Controllers

2.1 Overview

The iSTAR Edge Door Controllers are hardware devices which are connected to at least one card reader and a door. After a card is swiped through a connected card reader, the information contained on the card about the person to whom the card is assigned is transmitted to the door controller. The door controller then consults its database and determines whether to allow access to the person by opening the door. The door controller will then send a message to open the door if access is allowed. If access is not allowed, then the door will not open and the user is denied entry.

These powerful IP¹ edge devices provide a strong feature set to secure any door. These features include peer-to-peer communication, intrusion zones and keypad commands, extended card numbers, advanced door monitoring, and anti-passback. Multiple iSTAR Edge Door Controllers can be networked into user-defined, logical groups called clusters. Each controller in the cluster is called a cluster member, and each cluster has one controller that serves as the Master Controller.

NOTE: *FIPS mode is set at the cluster level; thus, every controller in the cluster will reflect the same FIPS status. For this validation, however, it is critical to note that a cluster can consist of a single controller. In a single-controller cluster, the lone controller acts as the Master Controller. Thus, any discussion in this document referencing “clusters” (except where multi-controller configurations are expressly stated) refers to a single-controller cluster, which represents the module.*

The iSTAR Edge Door Controller (see Figure 1) is a one-reader, two-reader, or four-reader device. Its optional Power over Ethernet (PoE) module provides ample power for two doors, and allows the iSTAR Edge to leverage existing network infrastructure. The two- and four-reader models employ the same hardware; differences in capabilities are based on licensing and are set at the factory.



Figure 1 – iSTAR Edge

¹ IP – Internet Protocol

The iSTAR Edge has expansion capability for up to two input/output modules, and consists of five models:

- ESTAR001 – One-reader model
- ESTAR001-POE1 – One-reader model with PoE module
- ESTAR002 – Two-reader model
- ESTAR002-POE1 – Two-reader model with PoE module
- ESTAR004 – Four-reader model

The iSTAR Edge is managed using the following tools:

- C●CURE – C●CURE is a Windows-based administration application for managing iSTAR devices. It is installed on an external host server and connects to the iSTAR controllers via an Ethernet network. A single C●CURE host server can be used to manage one or more clusters.
- iSTAR Configuration Utility (ICU) – ICU provides configuration, diagnostic, and troubleshooting options. The ICU is included as part of the C●CURE installation, and is used to designate the Master Controller, define Master IP² addresses, and define the IP address of the host server. Since other configuration information is defined and downloaded from the C●CURE host server, the information that is entered in the ICU must match the information that is entered in C●CURE to ensure correct configuration.

The Master Controller handles the communication of all event and cardholder data between the cluster and a C●CURE host server. Each cluster member communicates to the other cluster members through the Master to link events and share cardholder status and location to mitigate the occurrence of such activities as “tailgating” (following another cardholder into a secured area without presenting a separate badge) and “passback” (passing back a card to another person to use) in the area secured by this cluster of controllers. The iSTAR Edge features strong 256-bit AES³ network encryption for both controller-to-host communications and controller-to-controller communications.

The iSTAR Edge Door Controllers are validated at the FIPS 140-2 section levels shown in Table 1.

Table 1 – Security Level Per FIPS 140-2 Section

Section	Section Title	Level
1	Cryptographic Module Specification	2
2	Cryptographic Module Ports and Interfaces	2
3	Roles, Services, and Authentication	2
4	Finite State Model	2
5	Physical Security	2
6	Operational Environment	N/A
7	Cryptographic Key Management	2
8	EMI/EMC	2
9	Self-tests	2
10	Design Assurance	2

² IP – Internet Protocol

³ AES – Advanced Encryption Standard

Section	Section Title	Level
11	Mitigation of Other Attacks	2

2.2 Module Specification

The iSTAR Edge is a multi-chip standalone hardware module that meets overall Level 2 FIPS 140-2 requirements. The cryptographic boundary of the iSTAR Edge is defined by the hard metal chassis, which surrounds all the hardware and firmware components.

The module is composed of the following hardware components:

- **Main Processing Board** – The iSTAR Edge employs a board that provides the primary logic and functionality of the controller. The board contains a 180 MHz Atmel 9260 ARM-based CPU⁴ with 64MB⁵ RAM⁶ and 128MB of flash EEPROM⁷. It runs Microsoft Windows CE 5.0; it includes the module's various data ports and interfaces; and it controls the input and output to and from all the attached card readers.
- **LCD⁸ Display and LEDs⁹** – The LCD Display is a display that is used during setup and configuration of the module to monitor the status of the device and the self-tests. The LCD Display panel is located on the inside of the iSTAR Edge enclosure. The LCD display provides clear startup and troubleshooting information. The LED displays power, LAN¹⁰ activity, serial port activity, and output status.
- **Tamper Switch** – The Tamper Switch detects attempts at unauthorized entry into the controller enclosure, and provides alerts to the management station when such attempts are detected.
- **Power over Ethernet (PoE) module** – Mounted to the Main Processing Board, the PoE module allows the door controller to power 2-to-4 network-attached access control devices (NOTE: the PoE module is not available on the iSTAR Edge four-reader model).

Approved security functions and function components (and their associated algorithm/CVL¹¹ implementation certificate numbers) offered by the module are listed in Table 2 below.

⁴ CPU – Central Processing Unit

⁵ MB – Megabyte

⁶ RAM – Random Access Memory

⁷ EEPROM – Electrically Erasable Programmable Read-Only Memory

⁸ LCD – Liquid Crystal Display

⁹ LED – Light-Emitting Diode

¹⁰ LAN – Local Area Network

¹¹ CVL – Component Validation Listing

Table 2 – Approved Security Functions and Function Components

Approved Security Function/Component	Certificate Number
AES ¹² 256-bit in CBC ¹³ mode	#2856
SHA ¹⁴ -1, SHA-256, SHA-384, SHA-512	#2400
HMAC ¹⁵ with SHA-1, SHA-256, SHA-384, SHA-512	#1797
SP ¹⁶ 800-90A DRBG ¹⁷ (HMAC-based)	#506
ECDSA ¹⁸ Key Generation (B-571 Curve)	#506
ECDSA Signature Generation and Verification (B-571 Curve)	#506
CVL – ECC CDH ¹⁹ SP 800-56A (B-571 Curve)	#292
CVL – TLS v1.0/1.1/1.2 KDF ²⁰	#293

Additionally, the iSTAR Edge implements the following non-Approved algorithms:

- Hardware noise sources – for seeding the FIPS-Approved DRBG
- EC Diffie-Hellman – used for key agreement
- MD5 – used as part of the TLS handshake

2.2.1 Exclusions

The iSTAR Edge models include onboard batteries to power the backup-to-flash capability upon loss of main input power. These batteries are intended to be field-replaceable, and thus are also excluded from FIPS requirements. (NOTE: For guidance regarding battery replacement, please refer to section 3.1.5 of this document.)

2.3 Module Ports and Interfaces

Interfaces on the module can be categorized as the following FIPS 140-2 logical interfaces:

- Data Input Interface
- Data Output Interface
- Control Input Interface
- Status Output Interface
- Power Interface

The iSTAR Edge provides the ports and interfaces shown in Table 3 below.

¹² AES – Advanced Encryption Standard
¹³ CBC – Cipher Block Chaining
¹⁴ SHA – Secure Hash Algorithm
¹⁵ HMAC – Keyed-Hashed Message Authentication Code
¹⁶ SP – Special Publication
¹⁷ DRBG – Deterministic Random Bit Generator
¹⁸ ECDSA – Elliptic Curve Digital Signature Algorithm
¹⁹ ECC CDH – Elliptic Curve Cryptography Cofactor Diffie-Hellman
²⁰ KDF – Key Derivation Function

Table 3 – iSTAR Edge Ports and Interfaces

Port/Interface	Model		
	1-Reader	2-Reader	4-Reader
Wiegand Reader connectors	1	2	2
Supervised input ports	4	8	8
Special Purpose inputs (“Tamper Detect”, “AC Fail”, “Low Battery”)	Yes	Yes	Yes
Relay output ports	2	4	4
RS-485 Serial ports (for RMs, I/8-CSIs, and R/8s)	0	3	3
USB ports	0	3	3
Fire Alarm Input (FAI) connectors	Yes	Yes	Yes
Local LCD Display	Yes	Yes	Yes
LEDs (for power, LAN activity, serial port activity, and output status)	Yes	Yes	Yes
External Power interface	Yes	Yes	Yes
10/100 Ethernet port	1	1	1
Reset button	Yes	Yes	Yes
Auxiliary outputs (power)	1	2	2

For models with a PoE module, power is provided via Ethernet connection; otherwise, power is provided over a connection to an external power supply. The RS-485 Serial ports are used to communicate with RM card readers or I/8 or R/8 reader module boards. The USB ports can be used in provisioning or for connecting additional card readers. The Ethernet port is used for establishing TLS communications with other iSTAR Edge devices and with the C●CURE host server. The Direct Wiegand reader ports are used for connecting card readers directly to the module. The Supervised input ports and Relay output ports are for connecting other peripherals such as door sensors and audible alarms.

All of these physical interfaces map to logical interfaces (as defined by FIPS 140-2) as described in Table 4 below.

Table 4 – FIPS 140-2 Logical Interface Mappings

FIPS 140-2 Logical Interface	Module Interface
Data Input	Wiegand Reader connectors, Supervised input ports, RS-485 Serial ports, Ethernet port, USB ports
Data Output	Relay output ports, RS-485 Serial ports, Ethernet port
Control Input	Special purpose inputs, FAI connectors, Ethernet ports, Reset button
Status Output	Ethernet ports, LEDs, RS-485 Serial ports
Power Input	External Power interface, Battery power interface, Ethernet port (for models with PoE module)

The module is designed to accept access credentials in multiple formats from a wide variety of external input devices. As stated above, card readers can be connected to the module via the data input interfaces. Software House offers several types of readers that are designed and vendor-tested for use with the module, including:

- RM Card Readers
- Multi-Format Proximity Readers
- Multi-Technology Readers

2.4 Roles, Services, and Authentication

The following sections described the authorized roles supported by the module, the services provided for those roles, and the authentication mechanisms employed.

2.4.1 Authorized Roles

There are two roles in the module that operators may assume: a Crypto Officer (CO) role and a User role.

- **Crypto Officer** – The Crypto Officer role is responsible for the initialization and management of the cryptographic functions provided by the module. This role is generally assumed by an operator accessing the module's management applications: the iSTAR Configuration Utility (ICU) and the C●CURE host server.
- **User** – The User role is assumed by a networked controller (i.e. a cluster member or Master Controller) in a single- or multi-controller environment. The User role is responsible for establishing the TLS session with the module and for the secure transmission of access control data to the module.

The module also supports a Maintenance role. Operators assuming this role are allowed physical access to the module in order to perform battery replacement tasks as required (see section 3.1.5 below for more information).

2.4.2 Services

The services that require operators to assume the Crypto Office or User role are listed in Table 5 and Table 6, respectively. Additional services that do not require the assumption of an authorized role are listed in Table 7. Please note that the Critical Security Parameters (CSPs) listed in the table use the following indicators to show the type of access required:

- **R (Read)**: The CSP is read
- **W (Write)**: The CSP is established, generated, modified, or zeroized
- **X (Execute)**: The CSP is used within an Approved or Allowed security function or authentication mechanism

For a complete listing of all services (both security-related and non-security-related), please review the appropriate iSTAR Administration Guide.

Table 5 – Mapping of Crypto Officer's Services to Inputs, Outputs, CSPs, and Type of Access

Service	Description	Input	Output	CSP and Type of Access
Configure the module	Configure the module using the required IP address and connection data	IP data via management application	None	None
Configure the module for Approved mode of operation	Configure the module for FIPS-Approved mode of operation	FIPS selection from the configuration screen	None	None

Service	Description	Input	Output	CSP and Type of Access
Create database of access card rights	Create database of access card rights	User names and applicable authorization data	None	None
Reboot the module	Command the module to reboot and restart	Reboot command	Module reboots	None
Generate an ECC key pair	Generate a new ECC key pair	Message from the C●CURE host server to generate a new ECC key pair	New ECC key pair is generated	HMAC_DRBG 'V' Value – RX HMAC_DRBG 'Key' Value – RX ECC Public Key – W ECC Private Key – W
Generate an ECC certificate	Generate a new ECC certificate	Message from the C●CURE host server to generate new ECC key pair	New ECC certificate is generated and signed	ECC Public Key – R ECDSA Private Key – W
Load new firmware	Load a new firmware image onto the module	Selection of the appropriate menu item on the C●CURE host server	New firmware image is loaded	Firmware Upgrade Key - RX
Show status	Display module status information	Selection of the appropriate menu item on the C●CURE host server	Status window is displayed on the C●CURE host server	None
Perform self-tests	Initiate and run all power-up self-tests	Reboot command	Module reboots and initiates power up self-tests	TLS Session Key – W PRNG seed – R

Table 6 – Mapping of User’s Services to Inputs, Outputs, CSPs, and Type of Access

Service	Description	Input	Output	CSP and Type of Access
Initiate a secure TLS session	Initiate a secure TLS session with a cluster member.	Digital certificate	Secure connection established	TLS Session Key – RX ECC Public Key – R ECC Private Key – R
Check access rights	Check access card rights database	Access rights information request	Access approval or denial	None
Terminate a secure TLS session	Terminate a secure TLS session with a cluster member.	None	Secure connection terminated	ECC Public Key – R ECC Private Key – R

Table 7 – Mapping of Additional Services to Inputs, Outputs, CSPs, and Type of Access

Service	Description	Input	Output	CSP and Type of Access
Initiate access request process	Request access to controlled area	Access rights information (via card swipe on card reader)	Opened door for approved access request	None

Service	Description	Input	Output	CSP and Type of Access
Zeroize	Zeroize keys and CSPs	Reboot or power-cycle	Module reboots; keys are cleared	ECC Private Key – W ECDSA Public Key – W ECDSA Private Key – W Entropy Input – W HMAC_DRBG ‘V’ Value – W HMAC_DRBG ‘Key’ Value – W

For further details regarding module services, please review the appropriate iSTAR Administration Guide.

2.4.3 Authentication Mechanisms

The module supports role-based authentication. Module operators must authenticate to the module before being allowed access to services which require the assumption of an authorized role. The module employs the authentication methods described in Table 8 to authenticate Crypto Officers and Users.

Table 8 – Authentication Mechanisms Employed by the Module

Role	Type of Authentication	Authentication Strength
Crypto Officer, User	Certificate	<p>During TLS session negotiation, the module authenticates the CO or User using a 571-bit ECC public key. Using conservative estimates, the probability for a random attempt to succeed is</p> $= 1:2^{571}$ $= 1:(7.73 \times 10^{171})$ <p>which is less than a 1:1,000,000 probability as required by FIPS 140-2.</p> <p>The fastest network connection supported by the module is 1000 Mbps. Hence, at most 60,000,000,000 bits of data ($1000 \times 10^6 \times 60$ seconds, or 6×10^{10}) can be transmitted in one minute. Therefore, the probability that a random attempt will succeed or a false acceptance will occur in one minute is</p> $= 1: (2^{571} \text{ possible keys} / ((6 \times 10^{10} \text{ bits per minute}) / 571 \text{ bits per key}))$ $= 1: (2^{571} \text{ possible keys} / 105,078,809 \text{ keys per minute})$ $= 1: (7.36 \times 10^{163})$ <p>which is less than a 1:100,000 probability as required by FIPS 140-2.</p>

As a part of its primary function, the module receives access credential data from individuals swiping a card through an attached card reader. These credentials do not authenticate cardholders to the module; rather, the credentials are simply data that is processed by the module and used to determine the cardholders’ access rights to protected areas. Thus, for the purposes of this validation, those credentials are not considered authentication data, and are not discussed in the narrative above.

2.5 Physical Security

The iSTAR Edge is a multi-chip standalone cryptographic module. All firmware and hardware components of the module are entirely contained within a steel enclosure, which defines the module’s cryptographic boundary. The enclosure is opaque within the visible spectrum, and includes a door with a locking mechanism. The enclosure is further protected with serialized tamper-evident labels in order to provide evidence of tampering. The Crypto

Officer is responsible for applying the labels as well as for periodically inspecting the tamper-evident labels for signs of tampering. See Section 3.1.1.1 for instructions on how to affix the tamper-evident labels.

The iSTAR Edge Door Controllers have been tested and found conformant to the EMI/EMC requirements specified by 47 Code of Federal Regulations, Part 15, Subpart B, Unintentional Radiators, Digital Devices, Class A (i.e., for business use).

2.6 Operational Environment

The requirements associated with this section are not applicable, as the iSTAR Edge does not provide a general-purpose operating system (OS) to module operators. The module employs a 180 MHz Atmel 9260 ARM processor running Microsoft Windows CE 5.0. The operating system is stored on the module's flash and executes the code on the processor chip.

The module provides a method to update the firmware in the module with a new version, which involves downloading a digitally-signed firmware image from the C●CURE host server to the module.

2.7 Cryptographic Key Management

The module supports the critical security parameters (CSPs) listed in Table 9 below.

Table 9 – Cryptographic Keys, Cryptographic Key Components, and CSPs

Key	Key Type	Generation ²¹ / Input	Output	Storage	Zeroization	Use
ECC Public Key	571-bit	Internally generated by FIPS-Approved DRBG	Output in certificate form during TLS session negotiation	Plaintext in non-volatile memory	When a new ECC key pair is generated	Establishing a TLS session
		Input in certificate form during TLS session negotiation	Never output	Plaintext in volatile memory	Deleted after session is over	
ECC Private Key	571-bit	Internally generated by FIPS-Approved DRBG	Never output	Plaintext in volatile memory	When a new ECC key pair is generated; by removing power or reboot	Establishing a TLS session
ECDSA Public key	B-571 curve	Internally generated	Output in plaintext	Plaintext in volatile memory	When a new ECDSA key pair is generated; by removing power or reboot	Signature verification
ECDSA Private key	B-571 curve	Internally generated	Never output	Plaintext in volatile memory	When a new ECDSA key pair is generated; by removing power or reboot	Signature generation

²¹ The module complies with IG 7.8 Scenario 1 for symmetric key generation as well as the seed supplied to the algorithm for generating asymmetric keys.

Key	Key Type	Generation ²¹ / Input	Output	Storage	Zeroization	Use
TLS Session Integrity Key	HMAC SHA-1 key	Internally generated	Never output	Plaintext in RAM for duration of the session	Deleted after session is over	Data integrity for TLS sessions
TLS Session Key	256-bit AES CBC key	Established from a shared Master Secret during TLS session negotiation	Never output	Plaintext in RAM for duration of the session	Deleted after session is over	Encrypting data exchanges during TLS sessions
Entropy Input	256-bit value	Internally generated	Never output	Plaintext in volatile memory	By removing power or reboot	Entropy material for DRBG
HMAC_DRBG 'V' Value	Internal DRBG state value	Internally generated	Never output	Plaintext in volatile memory	By removing power or reboot	Generating random numbers
HMAC_DRBG 'Key' Value	Internal DRBG state value	Internally generated	Never output	Plaintext in volatile memory	By removing power or reboot	Generating random numbers
Firmware Upgrade Key	ECDSA public key (B-571)	Externally generated and hard-coded into the module's firmware	Never output	Hard-coded into the module	Never	Firmware load test

2.8 Self-Tests

2.8.1 Power-Up Self-Tests

The iSTAR Edge Door Controllers perform the following self-tests at power-up:

- Firmware integrity check (using a 32-bit Cyclic Redundancy Check)
- Cryptographic Library File integrity check (using HMAC SHA-1)
- Cryptographic algorithm tests
 - AES Known Answer Test (KAT) for encrypt
 - AES KAT for decrypt
 - HMAC SHA-1 KAT
 - HMAC SHA-256 KAT
 - HMAC SHA-384 KAT
 - HMAC SHA-512 KAT
 - HMAC DRBG KAT
 - ECC CDH KAT (as outlined in Section 5.6.2.5 of NIST SP 800-56A)
 - ECDSA Pairwise Consistency Test (PCT)

Note that no independent SHA KATs are implemented. Rather, the full functionality of the SHA variants is tested by the KATs for HMAC SHA-1/256/384/512.

If one of the self-test fails, then the module will transition to a critical error state. An error message is logged in the System Log for the Crypto-Officer to review. This error state can only be cleared by rebooting or power-cycling the module.

2.8.2 Conditional Self-Tests

The iSTAR Edge performs the following conditional self-tests:

- Continuous RNG test for the Approved DRBG
- Continuous RNG test for non-deterministic RNG
- ECDSA PCT
- EC DH Public Key Assurance Test (as outlined in Section 5.6.2.5 of NIST SP 800-56A)
- Firmware Load Test (using ECDSA signature verification with NIST-recommended curve B-571)

If the Firmware Load Test fails, the module will abort the load process and continue executing with the current firmware. If one of other the self-test fails, then the module will transition to a critical error state. An error message is logged in the System Log for the Crypto-Officer to review. This error state can only be cleared by rebooting or power-cycling the module.

2.8.3 Critical Functions Tests

The module implements four critical functions tests that support the Approved DRBG (as specified in NIST SP 800-90A):

- DRBG Instantiate
- DRBG Generate
- DRBG Reseed
- DRBG Uninstantiate

If any one of these self-test fails, then the module will transition to a critical error state. This error state can only be cleared by rebooting or power-cycling the module.

Additionally, the module performs the following tests on the entropy it generates:

- Monobits Test
- Runs Test

If the entropy tests are passed, then the generated entropy will be used to seed the DRBG. If they are failed, then the entropy value will not be used. Any associated key generation process will abort, and the operator will be notified of the key generation failure via the status output interface.

2.9 Mitigation of Other Attacks

The module also provides mitigation for the following attack(s):

- Tampering – In addition to the tamper-evident labels that secure the module, each enclosure also includes a tamper switch attached to each door/removable cover. The switch is wired to the controller's Main Processing Board via the special purpose "tamper detect" input.

The tamper input activates when the controller enclosure is opened or removed from its mounting surface. Upon activation, notice of a controller tamper violation is reported to the C●CURE host server. Switch action can be configured to take additional actions. Please refer to the *C●CURE 9000 Hardware Configuration Guide* for more information.

- Denial-of-Service (DoS) – The module's firmware includes protection against DoS attacks. The module employs a proprietary algorithm that prevents it from processing access control requests during a DoS attack.

3 Secure Operation

The iSTAR Edge Door Controllers meet Level 2 requirements for FIPS 140-2. The sections below describe how to place and keep the module in FIPS-Approved mode of operation.

3.1 Crypto Officer Guidance

The Crypto Officer must ensure that the module is properly mounted, and that the power and Ethernet cables are properly connected. All installation activities not performed by the Crypto Officer (including the removal of punch-out hole fillers from the wall-mount models and the securing of punch-out holes after connections are made) must be performed by a certified professional under the direct supervision of the Crypto Officer.

Before the iSTAR Edge Door Controllers are installed, the following must be performed:

- Check equipment (hardware, software, power supply, and wiring). Verify that the contents of the shipped boxes match the packing lists. Contact Software House if any items are missing or damaged.
- Check power, wiring, equipment clearances, and code compliance at the site.
- Ensure proper tools for mounting and wiring the iSTAR Edge Door Controllers are available.

The modules do not include wall-mounting hardware for installation. Mounting hardware depends upon the site and must be approved by a Structural Engineer or other certified professional. Software House recommends anchoring systems to a structure capable of sustaining a 75 lb. (34.1 kg) load. The module will need to be mounted and the power and Ethernet connections made before the tamper-evident labels are applied.

All installation activities not performed directly by the Crypto Officer (including the removal of punch-out hole fillers from the wall-mount models) must be performed under the Crypto Officer's direct supervision. Additionally, the Crypto Officer shall ensure that only those fillers covering punch-out holes that are necessary to fully cable the module shall be removed; all other fillers shall be left in place and intact.

3.1.1 Initialization

The Crypto Officer is responsible for initialization and security-relevant configuration and management activities for the module through the management interfaces. Initialization and configuration instructions for the module can also be found in the appropriate Installation and Configuration Guide.

The Crypto Officer must follow these steps to ensure that the module is operating in its Approved mode:

1. Secure the enclosure door/cover
2. Enable Approved mode of operation
3. Verify Approved mode of operation

All of these steps are required by this policy, and the module is considered to be in its Approved mode of operation only after these steps are successfully completed. Any operation of the module without performing these steps is outside the scope of this policy.

3.1.1.1 Securing the Enclosure Door/Cover

The Crypto Officer must first ensure that the module's physical security mechanisms are in place before operation. This includes the locking of the enclosure door and the application of tamper-evident labels. All physical security mechanisms shall be installed for the module to operate in its FIPS-Approved mode of operation.

To mitigate visual access of internal components, the module enclosure provides the necessary level of opacity without any additional baffles or operator-applied mechanisms. Once the module is fully installed, the cabling will provide additional opacity. Note that during installation of the wall-mount enclosure, only those fillers covering punch-out holes that are necessary to fully cable the module shall be removed.

The module ships with fourteen (14) serialized tamper-evident labels. The steps below provide instructions for applying the tamper-evident labels to the module's enclosure. When applying labels, the Crypto Officer shall do the following:

- Ensure the system is unplugged and the enclosure door is locked (or cover is closed).
- Clean the label placement locations with 99% isopropyl alcohol solution and dry with a clean cloth.
- Allow a minimum of 24 hours for the labels to cure.

The module's enclosure is a hard metal enclosure that includes a door with a locking mechanism and a tamper-response switch. The Crypto Officer shall apply two (2) tamper-evident labels to the module door such that each label is affixed to both the door and the enclosure along the top and bottom of the door (see Figure 2). The Crypto Officer must ensure that the tamper-evident labels are affixed to the bare metal, and do not adhere to any other labels, stickers, or seals on the enclosure.



Figure 2 – Tamper-Evident Label Placement

Log the serial numbers of the applied labels. Once properly sealed, any attempts to tamper with the module will leave visible evidence in the form of label residue or physical damage to the enclosure. After the physical security mechanisms are placed as instructed above, the module can be powered up, and the Crypto Officer may proceed with initial configuration.

3.1.1.2 Enabling Approved Mode of Operation

To enable the Approved mode, the CO must accomplish three tasks: enable the custom key management mode, set the certificate strength, and enable the Approved mode of operation. The required setup procedures can be performed from either the C•CURE or the ICU management tool.

1. Enable the custom key management mode.
 - a. On the C•CURE server, navigate to the “iSTAR Controller” tab. This will display a list of all managed controllers.
 - b. Select the desired controller, and then click “Hardware”. This will display the iSTAR Cluster Hardware Tree.
 - c. Select the desired controller from the list.
 - d. Click “Options & Tools”, and then select “Encryption Options” from the Options & Tools list. This will display the **Encryption Options** window.
 - e. Under the “General” tab, select either **Controller-Based Encryption Mode** or **Host-Based Encryption Mode** as the key management option (see Figure 3 below).
2. Set the encryption method's certificate strength to a FIPS-Approved method.

- a. Under the “Certificate Strength” tab, select **ECC** as the encryption method (see Figure 4 below). This will regenerate all certificates in the cluster using the selected method.
 - b. Click “Save and Close” on the **Encryption Options** screen. This will close the screen and again display the list of controllers in the cluster.
3. Enable the Approved mode of operation for the controller (this is done at the cluster level).
 - a. Select and enable the desired cluster (see Figure 5 below).
 - b. Under the “Encryption” tab, select **FIPS 140-2 Validate mode**. All on-line controllers in the selected cluster will reboot in the Approved mode and reconnect back to the host server.

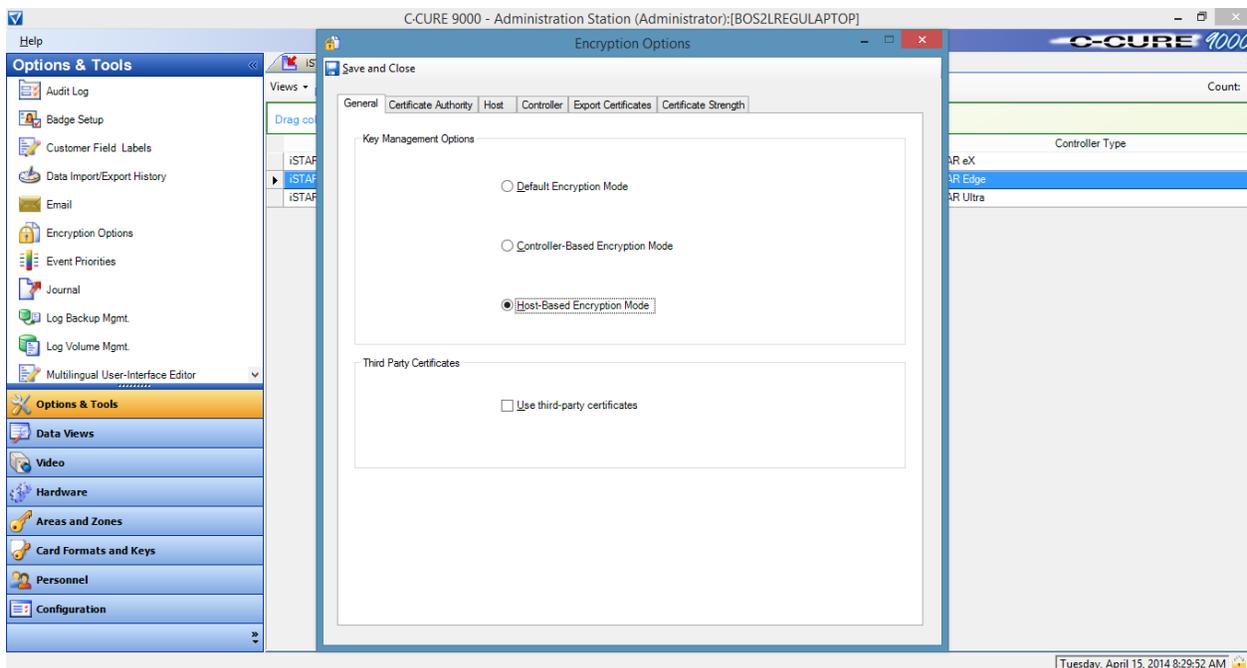


Figure 3 – “Encryption Options => General” Tab

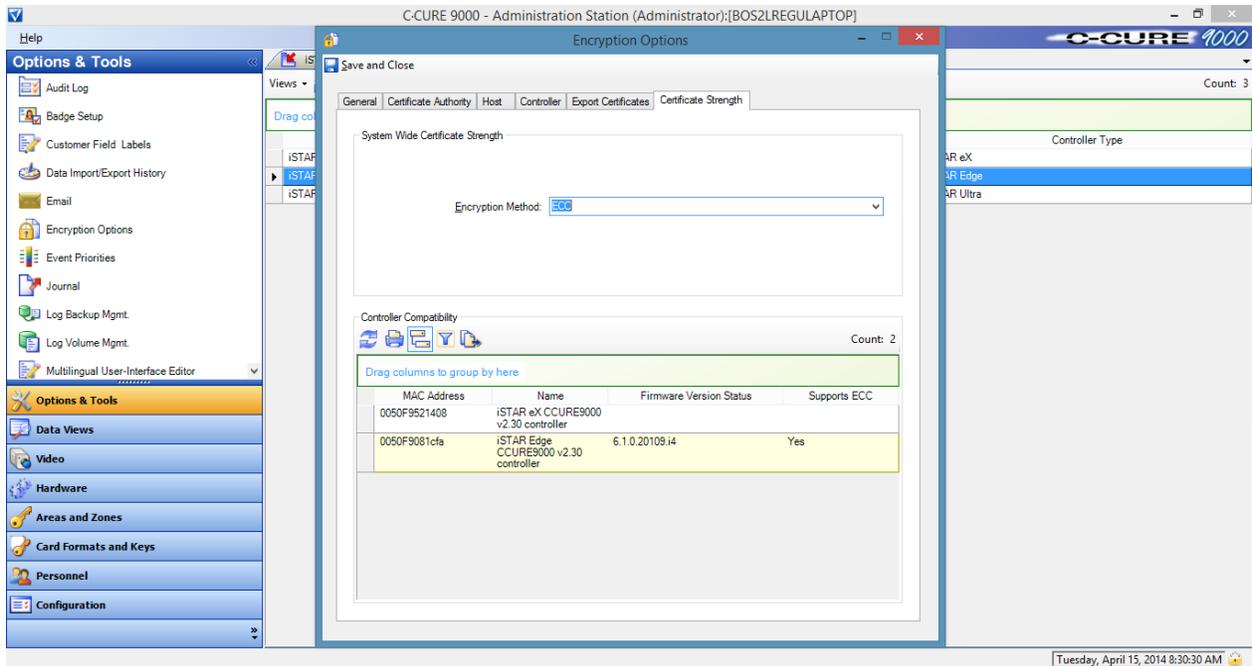


Figure 4 – “Encryption Options => Certificate Strength” Tab

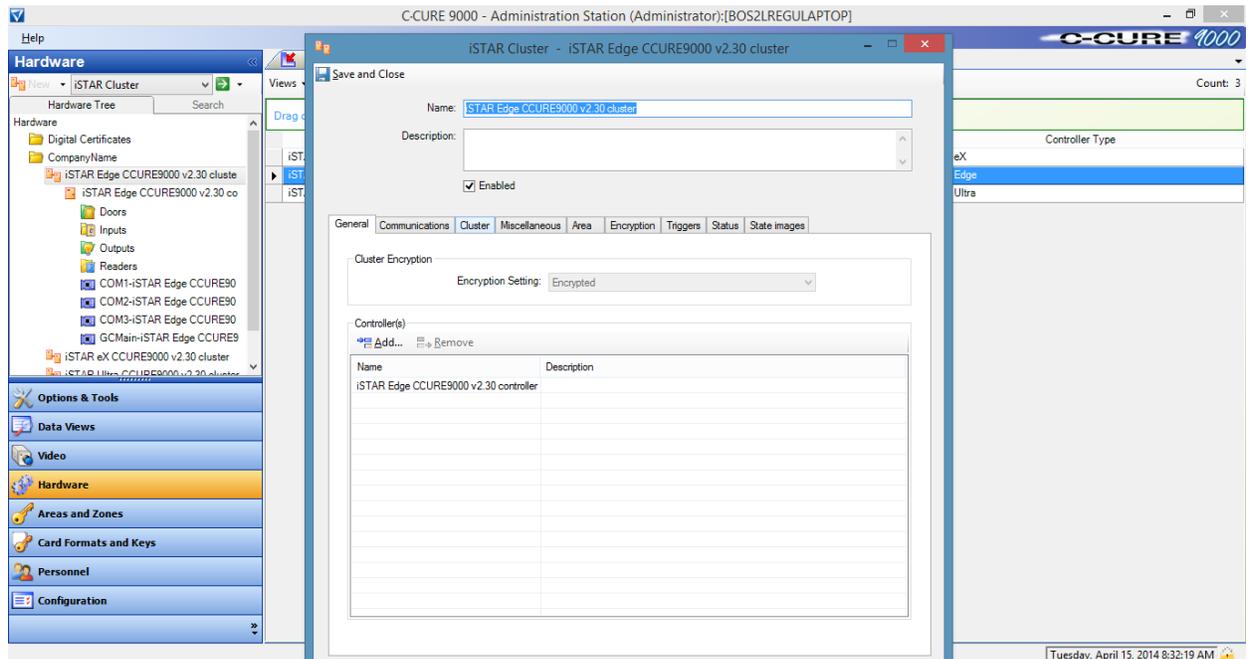


Figure 5 – “iSTAR Cluster” Screen

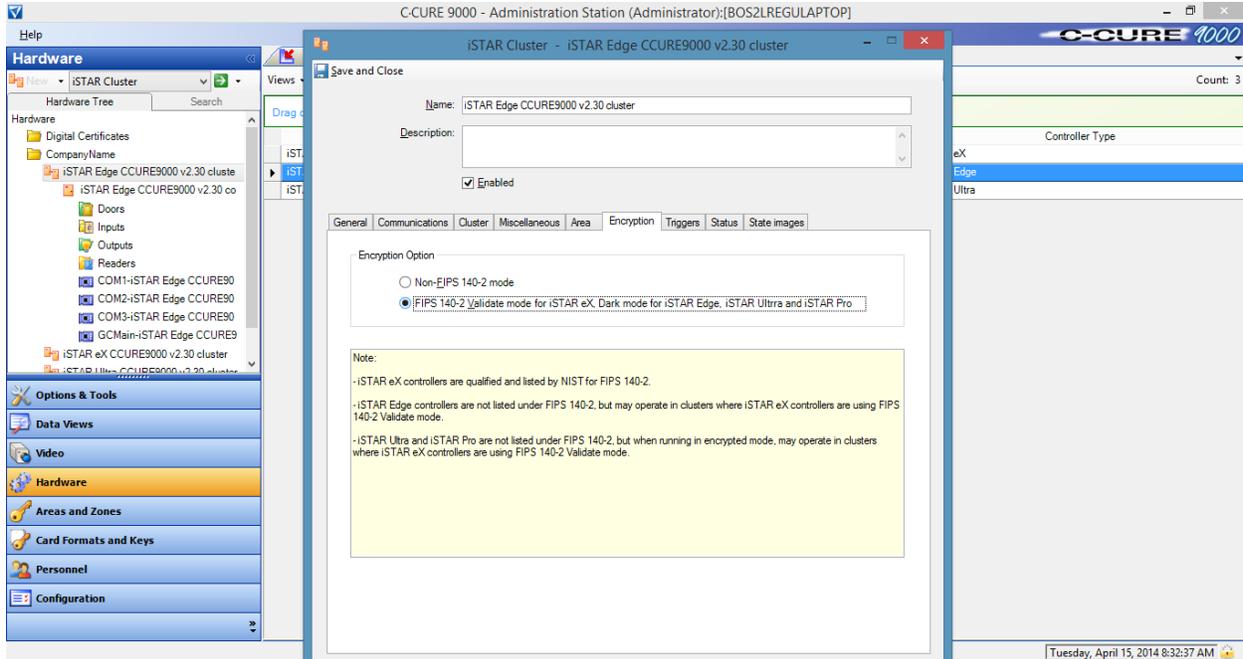


Figure 6 – “iSTAR Cluster => Encryption” Tab

Refer to the appropriate Installation and Configuration Guide for details on creating the required certificates.

3.1.1.3 Verifying Approved Mode of Operation

To determine if the module is operating in its Approved mode, navigate to **Report => Hardware => iSTAR Cluster** in the C•CURE host server, and a Cluster Encryption Report will be generated (see Figure 7 below).



ClusterEncryptionReport

iSTAR Cluster

Name	Encryption Setting	Fips Mode
Robert Cluster	Non Encrypted	None Mode
!@a00444dCluster	Non Encrypted	None Mode
!@a084135cluster	Encrypted	Non Fips Mode
!@a009e28cluster	Non Encrypted	None Mode
!@a51a372exCluster	Encrypted	Non Fips Mode
DummyTest2	Non Encrypted	None Mode
zz@AAAA	Non Encrypted	None Mode
DownUnder	Non Encrypted	None Mode
Ultra323brasilgia	Non Encrypted	None Mode
Ultra342Hawaii	Non Encrypted	None Mode
Ultra361brasilgia	Non Encrypted	None Mode
Ultra325pacific	Non Encrypted	None Mode
Ultra376EDT	Non Encrypted	None Mode
Ultra378EDT	Non Encrypted	None Mode
Ultra379EDT	Non Encrypted	None Mode
Ultra324Encrypted	Encrypted	Non Fips Mode
!@a100028cluster	Non Encrypted	None Mode
!@a52037eCluster	Encrypted	Non Fips Mode
Ultra324NonEncrypted	Non Encrypted	None Mode
Edge Cluster	Encrypted	Fips Mode
Edge Cluster 507	Encrypted	Non Fips Mode
Edge Cluster 509	Encrypted	Non Fips Mode
Edge Cluster 115	Encrypted	Non Fips Mode
Edge Cluster 834EF	Encrypted	Non Fips Mode
Edge Cluster 80E31	Encrypted	Non Fips Mode
Edge Cluster 80E2F	Encrypted	Non Fips Mode
Edge Cluster 834FC	Encrypted	Non Fips Mode
Edge Cluster 834DD	Encrypted	Non Fips Mode
Edge Cluster 83502	Encrypted	Non Fips Mode
Edge Cluster 81333	Encrypted	Non Fips Mode
Edge Cluster 834F5	Encrypted	Non Fips Mode
Edge Cluster 834E2	Encrypted	Non Fips Mode
Edge Cluster 834E4	Encrypted	Non Fips Mode
Edge Cluster 80423	Encrypted	Non Fips Mode
Edge Cluster 80406	Encrypted	Non Fips Mode

Figure 7 – FIPS Mode Report

There is a **Fips Mode** column in the generated report which will indicate in what mode the cluster is running (note that every controller in the cluster will be in that mode). The following mode indicators are used:

- **“Fips Mode”** – each controller in the cluster is using Approved encryption.
- **“Non-Fips Mode”** – each controller in the cluster is using non-Approved encryption.
- **“None Mode”** – each controller in the cluster is not using any encryption.

3.1.2 Management

Management of the iSTAR Edge Door Controllers is handled through the C●CURE host server and the ICU. The ICU is a diagnostic tool for setting parameters on the iSTAR Edge, including the device IP address and host IP address. The ICU, however, is disabled when the module is running in its Approved mode of operation, so all management must be accomplished via the C●CURE host server while in the Approved mode.

The C●CURE host server is the access control system. The C●CURE host server is used to set up the rules governing access and actions. Those rules are then downloaded as a database file to the iSTAR Edge so it can make its own decisions.

The CO shall ensure that the module is installed, initialized, and configured to operate in its tested and Approved manner. Once properly setup, the Crypto Officer shall ensure that the module remains in its tested and Approved configuration. Operation of the module using any other configuration is outside of the scope of this Security Policy. If any irregular activity is noticed or the module is consistently reporting errors, then Software House Customer Service should be contacted.

3.1.3 Physical Inspection

The Crypto Officer shall check the module on a monthly basis for evidence of tampering (including unusual dents, scrapes, removal of additional punch-out hole fillers, or damage to the tamper-evident labels or enclosure) and to verify that the tamper-evident labels still have the proper serial numbers.

Per FIPS 140-2 Implementation Guidance (IG) 14.4, the CO shall also be responsible for the following tasks:

- Securing and having control at all times of any unused labels
- Direct control and observation of any changes to the module where the tamper-evident labels are removed or installed to ensure that the security of the module is maintained during such changes and that the module is returned to its Approved state

The CO shall perform the periodic inspections at intervals specified per end-user policy. If evidence of tampering is found during periodic inspection, the Crypto Officer shall zeroize the keys and re-initialize the module before bringing it back into operation.

To request additional labels, the Crypto Officer must contact the local authorized Software House integrator. The Crypto Officer must be sure to include contact information and the shipping address, as well as the appliance serial number, shipping address, and label part number (STAR-FIPS-LBLS).

3.1.4 Zeroization

To zeroize keys, a module operator must reboot or power-cycle the module. Keys are also automatically be zeroized in the event of power loss or battery failure.

Additionally, the TLS Session Key is a temporary key and is automatically zeroized after the TLS session is terminated. The module's ECC Public and Private Keys are overwritten when a new key pair is generated.

3.1.5 Battery Replacement

Backup power is provided to the module via four on-board non-rechargeable alkaline AA batteries. To replace the batteries:

- Zeroize all keys by power down the module.
- Remove tamper-evident labels, being sure to clean any residue left as a result of removal.
- Open the enclosure door.
- Remove the old batteries and replace with fresh batteries.
- Re-accomplish all initialization steps as described in section 3.1.1.

3.2 User Guidance

The User is a cluster member that shares access data with other instances of the module over a secure connection. This role has no ability to affect the configuration or security parameters of the module.

3.3 Non-Approved Mode of Operation

When installed, initialized, and configured according to the Crypto-Officer guidance in this Security Policy, the module does not support a non-Approved mode of operation.

4 Acronyms

Table 10 provides definitions for the acronyms used in this document.

Table 10 – Acronyms

Acronym	Description
AC	Alternating Current
ACM	Access Control Module
AES	Advanced Encryption Standard
ANSI	American National Standards Institute
CBC	Cipher Block Chaining
CMVP	Cryptographic Module Validation Program
CO	Crypto Officer
CPU	Central Processing Unit
CSEC	Communications Security Establishment
CSP	Critical Security Parameter
CVL	Component Validation Listing
DRAM	Dynamic Random Access Memory
DRBG	Deterministic Random Bit Generator
DSA	Digital Signature Algorithm
ECC	Elliptic Curve Cryptography
ECC CDH	Elliptic Curve Cryptography Cofactor Diffie-Hellman
ECDSA	Elliptic Curve Digital Signature Algorithm
EDC	Error Detection Code
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FAI	Fire Alarm Interface
FCC	Federal Communications Commission
FIPS	Federal Information Processing Standard
GCM	General Control Module
HMAC	Keyed-Hash Message Authentication Code
I/O	Input / Output
ICU	iSTAR Configuration Utility
IP	Internet Protocol
KAT	Known Answer Test
KDF	Key Derivation Function
LAN	Local Area Network
LCD	Liquid Crystal Display

Acronym	Description
LED	Light-Emitting Diode
MB	Megabyte
NC	Normally Closed
NIST	National Institute of Standards and Technology
NO	Normally Open
NVLAP	National Voluntary Laboratory Accreditation Program
OS	Operating System
PCT	Pairwise Consistency Test
PoE	Power Over Ethernet
RAM	Random Access Memory
RM	Reader Module
RNG	Random Number Generator
SD	Secure Digital
SHA	Secure Hash Algorithm
SP	Special Publication
TCP	Transmission Control Protocol
TLS	Transport Layer Security
USB	Universal Serial Bus