TECHNICAL STANDARDS

FOR

ELECTRONIC CARD SHUFFLERS

AND ELECTRONIC CARD SHOES

(SINGAPORE)

Version 2.0

With effect from 1 February 2013

Total number of pages: 13 (inclusive of cover page)

Whilst every effort has been made to ensure that the information contained in this document is accurate as at the date of issue, the Authority makes no warranty or representation whatsoever with regards to the information in this document. The Authority assumes no responsibility or liability for any consequences (financial or otherwise) suffered directly or indirectly by persons who have entered into commercial activities upon reliance on any information in this document.

The information in this document is subject to change from time to time to adapt to the continual development and evolution of the gaming industry in Singapore. The Authority reserves the right to change its policies and to amend, modify or supplement any information in this document.

This document does not in any way bind the Authority to grant any approval for or exemption from any matter for which approval is required under any written law in Singapore.

This document shall not affect any regulatory requirements of any other competent authority in Singapore.

Persons who may be in doubt about how the information in this document may affect them or their commercial activities are advised to seek independent legal advice or any other professional advice they may deem appropriate.

TABLE OF CONTENTS

Preface

The purpose of this document is to establish the technical standards for the design and operation of electronic card shufflers and electronic card shoes for the casino industry in Singapore and to provide guidance to certification testing bodies on such technical standards.

An electronic card shuffler is an electronic device that, at a minimum, has the capability to randomly rearrange a deck or decks of playing cards to completely eradicate any prior pattern(s) introduced to the playing cards.

An electronic card shoe is an electronic device used to hold playing cards for distribution by a dealer to each player of a card game.

In this document, the term "device" is used to refer to either an electronic card shuffler or an electronic card shoe. Unless otherwise stated, the requirements in this document apply to both an electronic card shuffler and an electronic card shoe.

The intent of this document is to ensure the electronic card shufflers and electronic card shoes operate in a manner that:-

a. Has integrity;
b. Is secure;
c. Is reliable; and
d. Is auditable.

It is not the intent of this document to:-

a. Mandate a single solution or method to realise an objective;
b. Limit technology application to gaming equipment;
c. Limit creativity and variety of choice;
d. Limit any supplier or manufacturer of equipment; and
e. Preclude research and development into new technologies or innovative ideas.

As far as possible, this document stipulates what the minimum technical standards for electronic card shufflers and electronic card shoes are instead of how these standards should be met, and does not mandate a particular solution or method as the means to realise these standards.

The electronic card shufflers and electronic card shoes used in casinos must comply with the technical standards provided in this document.

Where applicable, the provisions in the Casino Control Act (Cap. 33A) and its subsidiary legislation shall take precedence over these technical standards.

This document would be reviewed on an ongoing basis to take into account the evolution of technologies utilised in electronic card shufflers and electronic card shoes and the development of other casino related technologies that may require technical regulation.

Comments on this document can be forwarded to:

Casino Regulatory Authority of Singapore
Gaming Technology and ICT Systems Division
460 Alexandra Road, #12-01
Singapore 119963
Website: http://www.cra.gov.sg

1. INTRODUCTION

1.1 Purpose

1.1.1 The purpose of these technical standards is to:-

a. Create technical standards that would ensure that the operation of electronic card shufflers and electronic card shoes in casinos in Singapore is secure, reliable and auditable;

b. Establish the minimum integrity standards for electronic card shufflers and electronic card shoes;

c. Construct technical standards that are technology neutral wherever feasible; and

d. Construct technical standards that do not specify or approve any particular method or algorithm. The intent being to allow a wide range of methods to be used to conform to these standards as long as the methods are secure, reliable and consistent with the best practices of the day for the relevant technologies.

1.2 Scope

1.2.1 The scope of these technical standards covers the minimum standards required in the operation of any electronic card shuffler or electronic card shoe so that security, reliability and integrity of the device are achieved.

1.2.2 The scope of this technical standard does not cover requirements that are not related to gaming (such as health and safety).

1.3 Terminology

1.3.1 The following terminologies used in this document are to be interpreted as follow:-

a. Shall: The requirement is mandatory, and therefore must be complied with; and

b. Should: The requirement is recommended. Non-compliance shall be documented and approved by the Authority. Where appropriate, compensating controls shall be implemented.

1.4 Definition of Terms

Authority	The Casino Regulatory Authority of Singapore
Authentication	Process of determining if the source of the program is legitimate and valid.
Card Checking	Process of checking the completeness of cards in the intended number of decks to be shuffled.
Critical Memory	Memory locations storing data that is considered vital to the continued proper operation of the device. The contents of critical memory may include, but not be limited to device configuration data and game configuration data.
Electronic Card Shuffler	An electronic device that, at a minimum, has the capability to randomly rearrange a deck or decks of playing cards to completely eradicate any prior pattern(s) introduced to the playing cards.
Electronic Card Shoe	An electronic device used to hold playing cards for distribution by a dealer to each player of a card game.
Electrostatic Interference (ESI)	Physical property of being able to create electronic interference to a device by either discharging static electricity onto the surface of the unit (such as from a user) or via a mains power or communication cable (from lightning for example).
Random Number Generator (RNG)	Hardware, software or combination device for generating number values that exhibits characteristics of randomness.
Second(s)	An additional card beyond the first.
Shuffle	The procedure of randomising a deck or decks of playing cards to completely eradicate any prior pattern(s) introduced to the playing cards.
Verification	Process of checking that the content of the program is not corrupted.

1.5 Testing

1.5.1 Testing of the electronic card shufflers and electronic card shoes by recognised testing laboratories shall be aimed at determining compliance with the technical standards provided in this document. Areas of non-compliance shall be reported in the test/certification report. Where, in the opinion of the testing or certification laboratory, the technical standards provided in this document are insufficient, inappropriate or not pertinent to the design and operation of the electronic card shufflers or electronic card shoes, the laboratory shall seek direction and further clarification from the Authority before testing the electronic card shufflers or electronic card shoes against the technical standards, or before issuing any certification for the electronic card shufflers or electronic card shoes.

1.6 Consistency of Interpretation

1.6.1 The Authority recognises that these technical standards may be subject to different interpretation by manufacturers, casino operators and testing/certification laboratories. As such, any questions or feedback on the interpretation of the technical standards provided in this document should be directed to the Authority for clarification when they arise.

2. SOFTWARE REQUIREMENTS

2.1 Critical Memory

2.1.1 Critical memory storage shall be maintained by a methodology that enables errors to be identified and corrected in most circumstances.

2.2 Program Requirements

2.2.1 Program, including the RNG algorithm, shall be stored in either:-

a. Non-alterable memory devices;

b. Memory devices with the implementation of write protection; or

c. Memory devices with sufficient proprietary controls and mechanisms set in place by manufacturer to restrict modification access.

2.2.2 Every device shall contain a proven and robust mechanism which has the capability to internally authenticate and verify that the program has not been corrupted or altered prior to use or loading. Such mechanism shall prevent further operation of the device if unexpected data or inconsistencies are found.

2.2.3 The device shall utilise an integrity check with a secured hashing method of at least 128 bits such as MD5.

2.3 Independent Program Verification

2.3.1 The device shall have the ability to allow for an independent integrity check of the device's program (firmware and/or software). This integrity check will provide a means for field verification to ascertain the consistency of the program.

2.3.2 Integrity checks shall utilize mechanism with at least one secured hashing method of at least 160 bits based on open hash standards such as SHA-1.

2.4 Communications Protocol

2.4.1 For devices that are required to communicate with another system for the results of the game, the devices must be accurately implemented in accordance to the protocol specifications.

2.5 Error Condition, Interruption and Resumption

2.5.1 In the event of an error condition, there shall be an appropriate indicator to signify that an error has occurred. If a display screen is present, a message describing the type of error shall be displayed.

2.5.2 If the device is interrupted due to an error condition, then upon a power reset, the specific error message shall still be displayed and the device shall remain locked-up if the error is still in existence.

(Section 2.6 applies to devices with shuffling functionality)

2.6 Random Number Generator (RNG)

2.6.1 The use of a RNG shall result in shuffling outcomes that are proven, via the application of recognised statistical tests, to be:-

a. Statistically independent;

b. Uniformly distributed over their range; and

c. Unpredictable.

Background RNG Activity Requirement

2.6.2 The RNG shall be cycled continuously between shuffles.

RNG Seeding

2.6.3 The method of seed generation shall ensure that:-

a. The same sequence of random numbers is never used in more than one device at the same time;

b. The shuffle is not predictable; and

c. The seeding and re-seeding shall be randomly determined and shall not be under operator control.

Range Requirement

2.6.4 The range of values produced by the RNG shall be adequate to provide sufficient precision and flexibility required by the mechanical implementation of the device.

Scaling

2.6.5 Numbers generated from the RNG must be scaled down to usable values required by the mechanical implementation of the device, while maintaining the randomness of the number sequence over the new range.

3. DEVICE REQUIREMENTS

3.1 Equipment Identification

3.1.1 The device shall be identifiable, at minimum, with the following information:-

a. The name of manufacturer;

b. A unique serial number;

c. The model number; and

d. The date of manufacture.

3.1.2 If a display screen is present, the device shall be able to display the version of the software on the display screen.

3.2 Electrostatic Interference

3.2.1 The device shall exhibit total immunity to human body electrostatic discharges on all areas exposed to player contact.

3.2.2 The device may exhibit temporary disruption when subjected to a significant electro-static discharge greater than human body discharge, but it shall exhibit a capacity to recover and complete any interrupted play without loss or corruption of any control or data information associated with the device.

3.3 Equipment Physical Construction

3.3.1 The body of the device shall be constructed using solid material that is opaque, with all loose panels secured in a way to ensure that they have not been tampered with or conceal any hidden compartment.

3.3.2 The lip of the electronic card shoe shall be designed with bristles.

3.3.3 The roller of an electronic card shoe shall be constructed using solid material, with no loose panel that may conceal any hidden compartment. Any wheel on the roller shall be able to move freely.

3.3.4 The roller of an electronic card shoe shall:-

a. Be designed so that when positioned at the top of the ramp, it will roll to the bottom of its own accord; and

b. Be constructed and fitted to prevent ‘seconds’ from inadvertently being dealt.

3.4 Equipment Integrity

3.4.1 The device shall be designed to facilitate the dealing of cards without revealing their face values.

3.4.2 The device shall be secured to preclude the possibility of viewing of cards loaded into the device.

3.4.3 The device shall not provide any real time information, for the current game being played, that can be used to aid in the:-

a. Projection of the outcome of the game;

b. Tracking of the cards played and cards remaining to be played;

c. Analysis of the probability of the occurrence of an event relating to a game; or

d. Analysis of the strategy for playing or betting to be used in the game, unless the game rules approved by the Authority specifically mention and allow for ancillary devices that assist the player in making a decision.

3.4.4 Ancillary devices mentioned in 3.4.3d have to be separately approved by the Authority.

3.4.5 There shall be mechanisms and controls in place to prevent the access to any critical portion of the device, including the program storage media and the cards loaded into the device, which may affect the integrity and the security of the device.

3.4.6 If the device is capable of recognising rank and suit, it shall:-

a. Ensure 100% accuracy in its card recognition technology. This accuracy requirement will, however, not take into consideration errors induced by the print quality and condition of cards used, mishandling of device, wear and tear of device and operational/environmental conditions not recommended by the manufacturer;

b. Not provide any information that may be used to compromise the cards contained in the device;

c. Not interfere with or modify the device's behavior beyond the documented functionality of the device software; and

d. Have Role Based Access Control to restrict access to the history of game(s) played.

3.4.7 Any change in the password access shall be made by authorised personnel.

(Section 3.5 applies to devices with shuffling functionality)

3.5 Shuffling Functionality

3.5.1 The device shall be designed to completely eradicate any pattern(s) introduced to the playing cards.

3.5.2 During normal shuffling operation, the device shall not leave any markings or cause any damage to the cards that may assist, help or otherwise aid the player to identify any of the cards.

3.6 Card Checking Functionality

3.6.1 If the device is capable of card checking, it shall ensure 100% accuracy in the checking mechanism. This accuracy requirement will, however, not take into consideration errors induced by the print quality and condition of cards used, error on the usage of device, wear and tear of device and operational/environmental conditions not recommended by the manufacturer.

3.7 Hand Formation Functionality

3.7.1 If the device is capable of hand formation, it shall ensure the correct number of playing cards per hand.

3.7.2 If the device is capable of hand formation, all dealt hands shall meet the requirements of Section 2.6, Random Number Generator, of this document.

3.8 Game History and Errors

3.8.1 If the device is capable of displaying the history of game results and errors, it shall do so with 100% accuracy.

3.9 Multiple Game Functionality

3.9.1 If the device is capable of shuffling or dealing more than one type of game, the device shall indicate the current game being shuffled or dealt.