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DIRECÇÃO DE INSPECÇÃO E COORDENAÇÃO DE JOGOS
“DICJ”
(Macau)

ELECTRONIC GAMING MACHINE
TECHNICAL STANDARDS
VERSION 2.0

With effect from 01 September 2021

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EXECUTIVE SUMMARY

This document describes DICJ's minimum technical requirements for Electronic Gaming Machines for operation in Macau Casinos.

This standard covers requirements for Electronic Gaming Machines and does not cover technical requirements for Server Based/Supported Gaming Machines.

DICJ accepts no responsibility whatever for errors or omissions within this Standard. In particular, it accepts no responsibility for actual or consequential loss which may be claimed by any person to be attributable to compliance with the Standard, whether such loss is due to negligence on its part, or not. Electronic Gaming Machine manufacturers and approved testing laboratories may seek clarification of any matter contained within the Standard, but any such clarification shall be provided by DICJ in writing, and shall be subject to the same limitation of liability.

Software change which **materially alters** the operation, fairness, security, reliability or auditability of the affected machine or game, especially game changes must comply with the requirements specified in this Standard. While DICJ will consider any submission made by an authorized EGM manufacturer regarding the nature of a software change, it will make a binding determination as to whether the software change constitutes a material alteration.

To the extent any inconsistency exists between this Standard and a law, regulation, dispatch, executive order or binding Instruction concerning gaming machines ("other law"), which may be operative in Macau before, or after, the commencement date of this Standard (as prescribed in the accompanying DICJ Instruction), the relevant provisions of the other law will prevail.

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1 INTRODUCTION

1.1 Purpose

This document describes DICJ's minimum technical requirements for Electronic Gaming Machines. This standard should be read in conjunction with Macau legislative requirements.

1.2 Objectives

The intent of this document is to specify sufficient requirements and controls to ensure that gaming on Electronic Gaming Machines occurs in a manner that is:

1. Fair;
2. Secure;
3. Reliable;
4. Auditable.

It is not the intent of this document to unreasonably:

5. Mandate a single solution or method of realizing an objective;
6. Limit technology application to gaming equipment;
7. Limit creativity or variety of choice;
8. Limit marketability;
9. Advantage any supplier or manufacturer of equipment; or
10. Preclude research and development into new technology, equipment or innovative solutions.

Hence, this document specifies what the minimum technical requirements for Electronic Gaming Machines are instead of how the requirements should be met and is not intended to mandate a particular solution or method as the means to realize the requirement.

The DICJ is the regulatory authority that supervises and regulates the activities of casinos in Macau. Concessionaires are required to be licensed by law and their gaming machines deployed on the casino floor shall comply with the technical requirements stated in this document before they can be lawfully operated in the Macau jurisdiction.

1.3 Certification

Certification of gaming machines and devices submitted for approval by DICJ must be undertaken by approved testing laboratories which shall be required to determine compliance with the technical requirements provided in these technical standards. Scope of any non-compliance shall be reported in the certification report. A copy of all certification reports must be lodged with DICJ at the time of application for Approval.

1.4 Regularity of Interpretation

DICJ acknowledges that the technical standards may be subject to different interpretations by gaming machine manufacturers, gaming operators and, testing laboratories. Thus, any comment where different interpretations may be applied to these technical standards should be referred to DICJ for clarification.

2 HARDWARE

2.1 Objective

This section describes the physical features of a gaming machine, its components and its inner functions. The goal is to provide Macau specific standards for gaming manufacturers to ensure that all conforming electronic gaming platforms can be operated in a reliable, honest, secure and, auditable manner.

2.2 Cabinet Identification

An Electronic Gaming Machine shall have an identification badge that is permanently affixed to the exterior of the cabinet by the manufacturer and shall include the following information:

1. The name of the manufacturer;
2. A unique serial number;
3. The gaming machine model number/name; and
4. The date of manufacture.

The identification plates must be reasonably resistant to scratching, to prevent them being defaced or fraudulently altered.

2.3 Cabinet Security

2.3.1 Locked Areas

1. The entirety of an Electronic Gaming Machine which does not form part of the player's input interface (e.g. buttons) must be stored within one or more locked areas of the Electronic Gaming Machine.
2. All locked areas must be equipped with access detection devices / switches, to detect access to all locked areas.
3. It must not be possible to disable a door open sensor without first opening the door using the designed manner (e.g. key) or leaving physical evidence of forced entry.
4. It must not be possible to reset the door open state by software means, if the door open sensor indicates that the door is still open.

2.3.2 Program or Logic Area

The program or logic area is a locked compartment area (with its own independently locked door), within the cabinet, that houses electronic components that have the potential to significantly influence the operation of the Electronic Gaming Machine. There may be more than one (1) such logic area in an Electronic Gaming Machine.

Provision must be made for a physical seal on the logic area door which must be broken on entrance or removal of the logic area.

2.4 Electrical - Cabinet Wiring

1. The Electronic Gaming Machine shall be designed so that power and data cables into and out of the Electronic Gaming Machine can be routed so that they are not accessible to the general public.
2. Security related wires and cables that are routed into a logic area must not be able to be removed without unlocking the logic area door.

2.5 Tower Light (Candle)

Where practicable, the gaming machine shall have a light visibly located on top of its cabinet. The light shall automatically illuminate whenever

1. A player has won an amount, or is redeeming credits, that the machine cannot itself pay;
2. An error situation has occurred (including “door open”); or
3. A “call attendant” situation has been triggered by the player.

If it is impracticable, due to the design of a machine, to locate a light on top of its cabinet (e.g. “bar-top” style machine), the requirement may be satisfied either by an audible alarm, or by a machine (paging) communication system, which communicates real time machine event alerts directly to a floor attendant. This requirement is additional to that contained in section 2.14 below.

2.6 Interference

All electrical testing of Electronic Gaming Machines is to be conducted while the devices are fully operational and installed as they would be in the venue. This kind of electrical testing of an EGM may be conducted by appropriate test labs, such as UL or CE.

2.6.1 Electromagnetic Radiated Emissions

The Electronic Gaming Machine shall comply with the CISPR 32 Class A or equivalent specifications.

2.6.2 Electrostatic Discharge (ESD)

1. Gaming machines shall exhibit total immunity to human body model electrostatic discharges on all areas exposed to player contact. The tests shall be conducted according to IEC 61000-4-2 with a severity level of $\pm 7.5\text{kV}$ contact discharge.
2. Gaming machines may exhibit temporary disruption when subjected to a more significant electro-static discharge, but they shall recover and complete any interrupted play without loss or corruption of any control or data information associated with the gaming machine. The tests shall be conducted according to IEC 61000-4-2 with a severity level of $\pm 20\text{kV}$ air discharge.

2.6.3 Radio Frequency Interference (RFI)

Gaming machines shall not be affected in any way by the application of RFI at a frequency range from 27MHz to 1000 MHz with a field strength of 3 volts per meter.

2.6.4 Electrical Safety

The Electronic Gaming Machine shall comply with the IEC 60335-2-82 or equivalent specifications.

2.7 Environmental

Electronic Gaming Machine can be expected to operate in a variety of extreme environments. The manufacturer shall specify the environmental conditions under which the Electronic Gaming Machine will operate within full specification.

1. Performance of Electronic Gaming Machines shall not degrade while operating within manufacturer's specified range of environmental parameters.
2. In the event that the operating conditions exceed the environmental parameters specified by the manufacturer, and the Electronic Gaming Machine is incapable of continued operation, it shall perform an orderly shutdown without loss of current status, accounting and security event data.
3. Electronic Gaming Machine shall be robust enough to withstand destructive power by human being (a man without destructive tool).

2.8 Power Supplies

1. Electronic Gaming Machine must operate from electric mains power of nominally 220V 50Hz.
2. Electronic Gaming Machine shall comply with the requirements of IEC 61000-3-2 for harmonic currents when operated at nominal mains voltage.
3. Electronic Gaming Machine shall be unaffected by Electrical Fast Transients as defined by IEC 61000-4-4. Criteria shall be 2.5kV both polarities, each conductor, 5ns rise, 50ns duration, 5kHz, one minute.
4. Electronic Gaming Machine shall be unaffected by continuous operation when supplied with mains electric power that deviates from the nominal voltage by $\pm 10\%$.
5. Electronic Gaming Machine shall either be unaffected by or shall recover from:
 - a. A surge or dip of $\pm 20\%$ of the supply voltage that lasts for 600 seconds;
 - b. Voltage dips and interruptions as defined in IEC 61000-4-11, 30% dip 500ms;
 - c. Electrical surge as defined in IEC 61000-4-5 2kV line to line and 2kV line to earth;
 - d. Repeated switching on and off of the AC power supply; and
 - e. Jiggling the AC cord at the wall outlet.

In each case, it shall be acceptable for the equipment to reset provided no damage to the equipment or loss or corruption of data is experienced.

2.9 Liquid Spills

Liquid spills applied to the outside of an Electronic Gaming Machine must not affect the normal operation of the machine, or affect the integrity of the material or information stored inside the cabinet (or affect the safety of the patrons operating the equipment). It is recognized that as a result of a liquid spill some peripheral components such as touch screen, button, button panels and, bill acceptor may lose normal operation until the surface dries or the component replacement.

2.10 Circuit Boards

1. Each Printed Circuit Board (PCB) in an Electronic Gaming Machine shall be identifiable by a name (or number) and revision level that is permanently displayed on the board.
2. The circuit board assemblies, used in gaming machines, shall conform functionally to the documentation of the PCBs that were submitted to the recognized testing laboratory.
3. All patch wires and track cuts shall be documented in the relevant service manual and submitted to the recognized testing laboratory.
4. All switches and jumpers shall be fully documented for evaluation by an approved testing laboratory.
5. Switches or jumpers that have the potential to affect the security, integrity or the game result (e.g. percent return) of the gaming machine shall not be permitted.

2.11 Critical Memory

2.11.1 Maintenance of Critical Memory

1. All critical data must be stored using a fault tolerant methodology that enables errors to be identified and corrected in most circumstances;
2. Critical memory data storage shall be capable of reliably preserving its memory contents for at least thirty (30) days with the mains power switched off. A rechargeable or non-rechargeable backup power source may be used to meet this requirement;
3. A proven and reliable mechanism shall be implemented to check for any corruption of critical memory locations used for crucial gaming machine functions.

2.11.2 Contents of Critical Memory

Critical memory shall maintain all data that is considered vital to the continued operation of an Electronic Gaming Machine. This includes, but is not limited to:

1. All soft meters required in section 3.5 including last Bill In data, last Ticket In and Ticket Out data;
2. Information pertaining to the play and final outcome of the most recent game & the last 9 base games prior to the most recent game;
3. Last drawn random number generator outcome should be stored in critical memory. It may not be relevant for Cryptographic RNGs;
4. Credits available for play; and
5. The last software state of the Electronic Gaming Machine before interruption.

2.11.3 Detection of Corrupted Memory

1. Comprehensive checks of the relevant contents of the Electronic Gaming Machine's critical memory shall be undertaken at least after:
 - a. Every restart of the device; and
 - b. When the main or logic door is closed;
2. After an Electronic Gaming Machine restarts (e.g. power off and on), the device must complete its validity check of the entire critical memory storage area and then perform a comparison check of all good logical copies of critical memory.
3. Any failure of a validity check is to be considered either:

- a. A recoverable memory corruption if at least one copy of critical memory is established to be good, or
- b. An unrecoverable memory corruption.

2.11.4 Program Storage Device (PSD)

1. All removable and internal PSDs, including but not limited to ROM, EPROM, FLASH ROM, USB thumb drive, Hard Disc, CD-ROM, SSD and, DVD shall be clearly marked with sufficient information to identify the software and revision level of the information stored in the devices.
2. All removable and internal PSDs shall maintain an internal hash / signature of the contents of the media, using a secured hashing method such as SHA1. This value shall be stored on the storage media. Verification of the contents of the entire program storage device is to be performed after every restart and, if the verification fails, the equipment must enter a "fatal error" state.
3. All EPROMs (and Programmable Logic Devices (PLDs) that have erasure windows) shall be fitted with covers over their erasure windows.
4. Employs a mechanism which tests unused or unallocated areas of the alterable media for unintended programs or data and tests the structure of the media for integrity. The mechanism must prevent further play of the gaming device if unexpected data or structural inconsistencies are found.
5. A CD, DVD or Blu-ray devices shall not be used as a re-writeable disc.
6. When the CD-ROM, DVD-ROM or Blu-ray device is created, the write cycle must be "finished" such that it is not possible to write any further data to the PSD.
7. Writeable program storage, such as hard disc or flash disc may be used provided that it:
 - a. Employs a mechanism which verifies that all control program components, including data and graphic information, are authentic copies of the approved components. The verification mechanism must have an error rate of less than 1 in 10 to the 38th power and must prevent the execution of any control program component if any component is determined to be invalid. Any program component of the verification or initialization mechanism must originate from a secure location that must be capable of being authenticated using commercially available tools.
 - b. Employs an integrity check method to verify that there are no additional or missing program(s) or fixed data records/files on the storage device. The mechanism must prevent further play of the gaming device if unexpected data or structural inconsistencies are found.

2.11.5 Writeable Disc

Writeable disc may be used for storage of critical memory provided that the following requirements are met.

1. Critical memory stored on a disc must be recoverable after any form of restart of the Electronic Gaming Machine.
2. The critical memory files are to be protected against accidental or malicious access / damage by threads / programs outside the critical memory maintenance software.
3. Suitable hash values or other such means must be used to enable corrupted disc files to be identified.

2.11.6 USB Thumb Drive

Universal Serial Bus (USB) drives are primarily used in gaming machine applications for software upgrades.

1. General Requirements:
 - a. The USB used shall be reliable.
 - b. It shall be possible to read the contents of the USB externally using appropriate tools. This is necessary to verify the contents of the USB for the field inspection.
 - c. USB shall incorporate suitable error detection and correction methods.
2. The following requirements apply when USB is used for storage of PSD executables:
 - a. There shall be no possibility to alter the contents of the USB while it is installed in the EGM.
 - b. The EGM shall enter into a non-playable error state with a suitable message when an attempt is made to alter the contents of the USB or an unexpected USB drive is detected and generate an exception code.
 - c. When a USB thumb drive is used for software upgrade, the software in the EGM should have the capability to authenticate the contents in the USB drive before any software download from the USB drive to the EGM is commenced.
 - d. The USB drive/s shall be installed within the secure logic area.

2.11.7 RAM Reset (RAM Clear)

1. Following the initiation of a RAM Reset procedure utilizing a recognized RAM Clear method, the game program shall execute a routine, which initializes each and every bit in critical memory to the default state. For games that allow for partial RAM clears, the methodology in doing so must be accurate and the game must validate the un-cleared portions of critical memory.
2. Clearing non-volatile memory shall only be able to be undertaken by accessing the logic area in which it is housed.

2.11.8 Solid-State Drive (SSD)

Solid states Drive (SSD) can be used for storing of PSD executables or for storing critical memory contents.

1. General Requirements:
 - a. The SSD used shall be reliable.
 - b. It shall be possible to read the contents of the SSD externally using appropriate tools. This is necessary to verify the contents of the SSD for the field inspection.
 - c. SSD shall incorporate suitable error detection and correction methods.
 - d. The SSD drive/s shall be installed within the secure logic area.
2. The following requirements apply when SSD is used for storage of PSD executables:
 - a. It shall only be possible to alter the contents of SSD using a secure approved method.
 - b. The EGM shall enter into a non-playable error state with a suitable message when an attempt is made to alter the contents of the SSD and generate an exception code.
3. The following requirements apply when SSD is used for storage of critical memory:
 - a. When SSD is used to store critical memory contents, it shall use a suitable method to achieve redundancy, recovery, and reliability of critical memory contents. A suitable method for example is to use a RAID architecture to implement a single reliable drive to

store critical memory contents.

- b. The critical memory implementation of the SSD shall also comply with all the applicable requirements given in section 2.11 of this Standard.

2.12 Information Displays

1. The default reel position after a RAM Reset shall not be the top award on any selectable line.
2. Electromechanically controlled display devices such as spinning reels shall have a sufficiently closed loop of control so as to enable the software to detect a malfunction, or an attempt to interfere with the correct operation of that device. This requirement is to ensure that if a reel is not in the position it is supposed to be in, an error condition shall be generated and the device shall become inoperable.
3. Reel assemblies must have a clearly identifiable reference point at which the start of the strip symbol artwork is located.

2.13 Monitors

If a machine is equipped with a monitor, the following requirements apply:

1. The monitor along with its surrounding bezel shall fit precisely into the machine in a manner that avoids gaps, defends against the entry of external objects, and which does not physically obscure any required game display information;
2. The monitor shall be constructed of toughened material to resist patron abuse;
3. The resolution of the configured monitor shall be compatible with the resolution supported by the gaming device software in a manner that ensures the intended function of the display;
4. The resolution of the configured monitor shall not fail to display any information critical to game play;
5. Where adjustment mechanisms for a monitor unit are provided for use by gaming attendants (i.e. not service technicians), they shall:
 - a. be clearly labelled; and
 - b. be accompanied by detailed instructions in the Operator's Manual.

2.14 Audible Alarm

1. A suitable audible alarm in the Electronic Gaming Machine shall be provided for effectively signaling any of the error or security features required by this standard.
2. There may be a method whereby legal access can be made into the internal area of the Electronic Gaming Machine (by authorized personnel via an audit mode or other accountable method) where the audible alarm is not activated.
3. A technique may be provided to enable authorized personnel to adjust the volume level (without the need to enter the logic area). However the adjustment of the volume shall not allow the alarm output to be below a threshold level whereby the alarm cannot be heard with the door shut in a typical gaming environment.
4. The duration of the alarm when activated shall be at least 3 seconds.

2.15 Printers

1. If an Electronic Gaming Machine is equipped with a printer, it must be located inside locked cabinet of the Electronic Gaming Machine.
2. A printer must have mechanisms to allow software to interpret and act upon the following conditions:
 - a. Out of paper / Paper low;
 - b. Printer jam/failure; and
 - c. Disconnected.

2.16 Bill Acceptor Devices

2.16.1 General

1. The bill input system must be constructed in a manner that protects against vandalism, abuse or fraudulent activity.
2. The acceptance device(s) must be electronically based and be configured to ensure that it only accepts valid bills of MOP/HKD plus valid coupons, tickets, or other approved casino script and rejects all others.
3. All accepted valid bills of legal tender plus valid coupons, tickets, or other approved casino script are to be deposited into the secure bill storage area (stacker).
4. All invalid or unauthorized bills are to be rejected and returned to the player.
5. Interconnecting cables from the bill acceptor device to the Electronic Gaming Machine must not be exposed external to the Electronic Gaming Machine or readily accessible to unauthorized staff.

2.16.2 Functional

1. Acceptance of bills for crediting to the credit meter shall only be possible when the Electronic Gaming Machine is enabled for play. Other states such as door open states, fault conditions and audit mode must cause the disabling of the bill acceptor system (other than in bill acceptor self test mode, if supported).
2. Under no circumstances shall credits be lost if bills are accepted by the Electronic Gaming Machines. The machines shall give proper credits or return the note, notwithstanding that there may be a small window of time where power may fail and credit may not be given. In this case, the window shall be less than one (1) second.
3. The Electronic Gaming Machine shall register credits only when the bill/ticket is stacked.
4. Bill acceptors shall accept only one single currency (i.e. MOP or HKD).

2.16.3 Bill Stacker

1. The bill acceptor device shall have a 'stacker full' sensor.
2. The stacker shall be locked independently of the main cabinet and logic area.
3. The stacker must be fitted with sensors that indicate stacker door open/close or stacker removed.
4. A separate lock shall be required to remove the bills from the stacker.
5. There must be a sensor which detects and reports to the software whenever there is access to the bill door or the stacker has been removed.

2.17 Coin Input / Output Systems

Coin acceptance and coin hoppers are prohibited to use in Macau gaming floors.

2.18 Communication with Bill Acceptors

The bill acceptor device must employ a reliable, bi-directional protocol with error detection for communicating with the Electronic Gaming Machine. A message with error must either be corrected or rejected.

2.18.1 Bill Acceptor Self Test

The bill acceptor device must perform a self test at each power up. In the event of a self test failure, the bill acceptor must automatically disable itself until the error state has been cleared.

2.18.2 Bill Acceptor Error Conditions

Each gaming device and/or bill acceptor shall have the capability of detecting and displaying the following bill acceptor error conditions:

1. Bill-in Jam;
2. Bill Acceptor Door Open;
3. Stacker Door Open or Stacker Removed.

2.19 Credit Acceptance Conditions

Acceptance of any Valid Ticket/Coupon, Bills or other medias for crediting to the credit meter shall only be possible when the gaming device is enabled for play. Other states, such as error conditions, including door opens, audit mode and game play, shall cause the disabling of the credit acceptance system.

2.20 Touch Screens

2.20.1 Accuracy

Touch screens must be accurate so that a user's actions can be interpreted correctly.

2.20.2 Button Icons

Touch screen button icons must be sufficiently separated to reduce chances of the wrong icon being selected due to miscalibration or parallax errors.

2.20.3 Calibration Facility

1. A touch screen must have a software re-calibrating facility unless the touch screen is designed never to require re-calibrating;

2. Once calibrated, the touch screen must maintain that accuracy for at least the manufacturers recommended maintenance period; and
3. A touch screen should be able to be re-calibrated by venue staff without access to the machine cabinet other than opening the main door unless it does not require calibration.

2.20.4 Construction

Touch screens must be resistant to scratching from conditions likely to occur during normal use.

2.21 Hardware Detection

1. Software which provides games designed to operate on gaming machines fitted with required hardware (e.g. touch screen, top box LCD, additional RAM), must detect that the required hardware is present;
2. The detection of required hardware is to occur during configuration;
3. If the required hardware is not detected as present during configuration, the game must not operate and an appropriate message is to be displayed; and
4. There must be no facility to disable the function of detecting required hardware.

2.22 Charging Mechanisms

A gaming device may support a capability for an externally accessible charging mechanism, such as a Universal Serial Bus (USB) charging port, or some other technology (e.g., cables, inductive chargers, etc.). The mechanism may be employed to provide external power or charging access for an electronic device such as a tablet, smartphone, etc. If so equipped, the charging mechanism shall:

1. Be appropriately fused and/or electrically-protected; and
2. No influence on the integrity, proper operation, or outcome of the gaming device; and
3. Shall not have any connection to the gaming machine's logic unit.

3 SOFTWARE

3.1 Objective

This section describes the gaming software requirements so that the gaming software performs as anticipated and is reliable and fair to the player. It creates the minimum standards of function so that all conforming electronic gaming platforms would be reliable, honest, secure, auditable and, operate in conformance with their specifications.

3.2 Source Code Compilation

1. All source code submitted must be correct, complete and able to be compiled.
2. The resultant compiled object code must be identical to that in the storage media submitted to test laboratory for evaluation, and be verifiable with the media to be operational in sites.

3.3 Control Program Requirement

1. Gaming machine control programs (software that runs the gaming machine's functions) shall be authenticated against possible corruption caused by the failure of the program storage medium and all critical game functions during each power-up cycle. The method shall detect not less than 99.9% of all possible failures.
2. Any program component of the authentication or initialization mechanism must originate from a secure location that must be capable of being authenticated using commercially available tools.

3.4 PSD Identification

All discrete PSD (e.g. Flash, CD-ROM, USB thumb drive, Hard disc, SSD) must be uniquely identified, displaying:

1. Game name (and/shell name, if applicable);
2. Manufacturer;
3. Version number;
4. Type and size of media (where applicable); and
5. Location in Electronic Gaming Machine (if critical, e.g. socket position U3 on PCB).

3.5 Soft Meters

3.5.1 Master Meters

1. All electronic gaming machines shall be equipped with soft meters (electronic digital storage meters) of at least 10 digits capable of recording and displaying the required information listed in this section where applicable to the gaming machines.
2. All soft meters shall be updated upon the occurrence of a particular event except the credit meter. The update operation shall include a fetch operation of the current value of the

updating meter from the memory, an arithmetic addition operation and a storing operation of the updated value to the memory.

3. These meters, listed in section 3.5.2, shall display the following information in dollars and cents.
4. The Electronic Gaming Machines need to provide only the necessary meters for the authorized functions the devices support.

3.5.2 Meter Definitions

1. **Coin In:** The machine must have a meter specifically labeled “Coin In” that accumulates the total value of all wagers, whether the wagered amount results from the insertion of valid tickets/coupons, currency, deduction from a credit meter or any other means. This meter shall:
 - a. Not include subsequent wagers of intermediate winnings accumulated during game play sequence such as those acquired from “double up” games;
 - b. For multi-game and multi-denomination/multi-game gaming devices, provide the information necessary, on a per payable basis, to calculate a weighted average theoretical payback percentage; and
 - c. For gaming devices which are considered Electronic Gaming Machines and which contain identifiably different games (such as an ante-bet game), maintain and display coin in meters and the associated theoretical payback percentage, for each wager category with a different theoretical payback percentage, and calculate a weighted average theoretical payback percentage for that payable.
2. **Coin Out:** The machine must have a meter specifically labeled “Coin Out” that accumulates the total value of all amounts directly paid by the machine as a result of winning wagers, whether the payout is made from the ticket printer, to a credit meter or by any other means. This meter will not record amounts awarded as the result of an external bonusing system or a progressive payout;
3. **Attendant Paid Jackpots:** The machine must have a meter specifically labeled “Attendant Paid Jackpots” that accumulates the total value of credits paid by an attendant resulting from a single winning alignment or combination, the amount of which is not capable of being paid by the machine itself. This does not include progressive amounts or amounts awarded as a result of an external bonusing system. This meter is only to include awards resulting from a specifically identified amount listed in the manufacturer’s Probability and Accounting Report (par) sheet;
4. **Attendant Paid Cancelled Credits:** The machine must have a meter specifically labeled “Attendant Paid Cancelled Credits” that accumulates the total value paid by an attendant resulting from a player initiated cash-out that exceeds the physical or configured capability of the machine to make the proper payout amount;
5. **Bill In:** The machine must have a meter specifically labeled “Bill In” that accumulates the total value of currency accepted. Additionally, the machine must have a specific meter for each denomination of currency accepted that records the number of bills accepted of each denomination;
6. **Ticket In (Voucher In):** The machine must have a meter specifically labeled “Ticket In” that accumulates the total value of all Electronic Gaming Machine wagering tickets accepted by the machine;
7. **Ticket Out (Voucher Out):** The machine must have a meter specifically labeled “Ticket Out” that accumulates the total value of all Electronic Gaming Machine wagering tickets and payout receipts issued by the machine;
8. **Electronic Funds Transfer In (EFT In):** The machine must have a meter specifically labeled “EFT In” that accumulates the total value of cashable credits electronically transferred to the machine through a cashless wagering system;

9. **Wagering Account Transfer In (WAT In):** The machine must have a meter specifically labeled “WAT In” that accumulates the total value of cashable credits electronically transferred to the machine from a wagering account by means of an external connection between the machine and a cashless wagering system;
10. **Wagering Account Transfer Out (WAT Out):** The machine must have a meter specifically labeled “WAT Out” that accumulates the total value of cashable credits electronically transferred from the machine to a wagering account by means of an external connection between the machine and a cashless wagering system;
11. **Non-Cashable Electronic Promotion In:** The machine must have a meter specifically labeled “Non-Cashable Electronic Promotion In” that accumulates the total value of non-cashable credits electronically transferred to the machine from a promotional account by means of an external connection between the machine and a cashless wagering system;
12. **Cashable Electronic Promotion In:** The machine must have a meter specifically labeled “Cashable Electronic Promotion In” that accumulates the total value of cashable credits electronically transferred to the machine from a promotional account by means of an external connection between the machine and a cashless wagering system;
13. **Non-Cashable Electronic Promotion Out:** The machine must have a meter specifically labeled “Non-Cashable Electronic Promotion Out” that accumulates the total value of non-cashable credits electronically transferred from the machine to a promotional account by means of an external connection between the machine and a cashless wagering system;
14. **Cashable Electronic Promotion Out:** The machine must have a meter specifically labeled “Cashable Electronic Promotion Out” that accumulates the total value of cashable credits electronically transferred from the machine to a promotional account by means of an external connection between the machine and a cashless wagering system;
15. **Coupon Promotion In:** The machine must have a meter specifically labeled “Coupon Promotion In” that accumulates the total value of all Electronic Gaming Machine coupons accepted by the machine;
16. **Coupon Promotion Out:** The machine must have a meter specifically labeled “Coupon Promotion Out” that accumulates the total value of all Electronic Gaming Machine coupons issued by the machine;
17. **Machine Paid External Bonus Payout:** The machine must have a meter specifically labeled “Machine Paid External Bonus Payout” that accumulates the total value of additional amounts awarded as a result of an external bonusing system and paid by the Electronic Gaming Machine;
18. **Attendant Paid External Bonus Payout:** The machine must have a meter specifically labeled “Attendant Paid External Bonus Payout” that accumulates the total value of amounts awarded as a result of an external bonusing system paid by an attendant;
19. **Attendant Paid Progressive Payout:** The machine must have a meter specifically labeled “Attendant Paid Progressive Payout” that accumulates the total value of credits paid by an attendant as a result of progressive awards that are not capable of being paid by the machine itself;
20. **Machine Paid Progressive Payout:** The machine must have a meter specifically labeled “Machine Paid Progressive Payout” that accumulates the total value of credits paid as a result of progressive awards paid directly by the machine. This meter does not include awards paid as a result of an external bonusing system.

3.5.3 Games Completed Meter

Electronic Gaming Machine shall have soft meters that record the number of games completed:

1. Since power reset;

2. Since main door close; and
3. Since game initialization (RAM clear).

3.5.4 Bill In Count Meters

An Electronic Gaming Machine which contains a bill acceptor device shall maintain sufficient metering to be able to report the following:

1. Total monetary value of all items accepted;
2. Total number of all items accepted;
3. Total monetary value of all bills accepted;
4. Total number of bills accepted;
5. Total count of rejected bills;
6. The number of bills accepted for each bill denomination;
7. The value of the last ten bills accepted with time stamps; and
8. For all other notes (tickets and coupons) the Electronic Gaming Machine shall have a separate meter that reports the number of items accepted, excluding bills.

3.5.5 Credit Meter Limit

Gaming machines shall refuse to accept any addition to the credit meter (e.g. insertion of bill, ticket, coupon, or Wagering Account Transfer In), where such addition will cause the credit meter balance to exceed the credit meter limit. However, the Gaming machines may continue to accept all jackpot transfers even when this limit is reached.

3.5.6 Gamble Meters

If gamble is implemented, the following meters must be recorded and displayable in audit mode (If Gamble meters are not supported, the feature of Gamble should be disabled):

1. The number of games where gamble was invoked;
2. The number of games where gamble was won;
3. Amount played in the gamble feature; and
4. Amount won in the gamble feature.

3.6 Doors to be Monitored

The Electronic Gaming Machine shall be able to detect access to the following doors or secure areas:

1. Main door(s);
2. Logic area door(s);
3. Drop box door(s);
4. Bill acceptor doors (including stacker door);
5. Belly door(s);
6. Any other area housing a critical processor; and
7. Communication boards if accessible without opening any of the above.

When any doors are closed, a message stating that the door(s) has/have closed must be displayed. This message must be displayed until the next game play.

3.7 Credit Redemption Conditions

Available credits may be collected from the Electronic Gaming Machine by the patron pressing the "COLLECT / CASHOUT" button at any time other than:

1. During a play;
2. While in audit mode;
3. While any door open condition exists;
4. While in test mode;
5. While the player's credit meter or total wins meter is incrementing;
6. While disabled by a Casino Monitoring System (CMS) or other external system;
7. While any fault condition exists, excluding:
 - a. Progressive controller failure (except when the progressive controller is required to validate the payment); and
 - b. Bill acceptor full.

3.8 Transfers that are not Multiples of Credit Value

If the Electronic Gaming Machine is to accept credit transfer from external systems, such as Ticket Control or Bonusing systems, it must be properly able to handle the circumstance where the amount to be transferred is not an exact multiple of the credit value of the device. The Electronic Gaming Machine may handle this circumstance by:

1. Rejecting the cashless transfer;
2. Providing an appropriate means of redemption and displaying the odd cents; or
3. Automatically generate a credit out transaction for the odd cents (i.e. for example by printing a ticket for the odd cents or doing a cashless transfer back to the cashless system of the odd cents.).

3.9 Test/Diagnostic Mode

3.9.1 General

If in a test mode, any test that incorporates credit entering or leaving the gaming machine (e.g. a bill test) shall be completed prior to resumption of normal operation. In addition, there shall not be any test mode that increments any of the electronic meters. Any credits on the gaming machine that were built up during the mode shall be cleared before the test mode is exited. Test meters are acceptable provided the meter indicates as such.

3.9.2 Enter to Test/Diagnostic Mode

The sensor of the main cabinet door of the gaming machine may automatically set the machine in a service or test-mode. Test/diagnostic mode may also be entered, via a proper instruction, from an attendant during an audit mode access.

3.9.3 Exit from Test/Diagnostic Mode

When exited from test mode, the game shall return to the original state it was in when the test mode was entered.

3.9.4 Test Games

If the gaming machine is in a test mode, the machine shall clearly specify that it is in a test mode and is not available for normal play.

3.10 Data Partitioning

Electronic Gaming Machine software must be designed so that machine specific information (e.g. machine address or other configurable parameters) are not stored within the same PSD as game and system software. This partitioning will provide for common game and system software devices among same type of machines when performing signature calculations.

3.11 Electronic Gaming Machine Events (Tilt Situation)

A description of tilt shall be displayed in a self-explanatory way.

3.11.1 Self Clearing Events

Gaming machines shall detect and display the following conditions and may be automatically cleared when the fault is cleared by the gaming machine upon commencement of a new play sequence and also communicated to an on-line monitoring and control system if applicable:

1. Power reset;
2. Any door open (including bill acceptor & stacker);
3. Any door just closed;
4. Inappropriate bill in or ticket in if it is returned to the player; and
5. Stacker removed/inserted.

3.11.2 Events Cleared by Attendant Intervention

Gaming machines shall be capable of detecting and displaying the following error conditions that shall disable the game play and shall only be cleared by an attendant and also communicated to an on-line monitoring and control system if applicable:

1. Bill in jam;
2. Low RAM battery for batteries external to the RAM itself or low power source;
3. Uncorrectable RAM error (defective or corruptive RAM);
4. Print failure, if the gaming machine has no other means to make a payout, a replacement ticket may be printed once the failure condition has been cleared;
5. Printer mechanism paper jam. A paper jam condition shall be monitored at all times during the print process;
6. Printer mechanism paper out;
7. Presentation error;
8. Program error (Defective program storage media);

9. Reels spin error of any type including a mis-index condition for mechanical reels. The specific reel number shall be identified as part of the error condition; microprocessor controlled reels as well, if applicable, shall be monitored to detect malfunctions such as a reel which is jammed, or is not spinning freely, or any attempt to manipulate their final resting position;
10. Removal of control program storage media; and
11. Player-initiated attempt to cash-out after insertion of an operator-specified threshold amount of bills and/or cashless in without initiating any play.

Gaming machines shall be capable of storing and displaying a minimum of the last 100 events.

3.12 Audit Mode

3.12.1 Audit Mode Requirements

Audit mode is to include as a minimum the following items:

1. Display of all electronic meter information as per the section 3.5.2 'Meter Definitions';
2. Last play recall;
3. Display of terminal identification;
4. Display of software/game identification;
5. On-screen hashing algorithm signature verification;
6. Perform combination/paytable test.
7. Last Bill In, Ticket In and Ticket Out Data;
8. Machine configuration information;
9. Display of minimum and maximum number of line(s)/way(s) for the game;
10. Display of minimum and overall maximum bet values for the game in credits and in dollars and cents for one spin;
11. Display of maximum win value of a single payline in a bought game excluding jackpots, scatter pays and, bonus prizes in credits and in dollars and cents for one spin;
12. Display of the current set denomination of all games configured for play;
13. Display of minimum RTP breakdown (not a range) of all games configured for play. If the game has different component games (such as Ante-bet games, jackpot) it must show the additional RTP(s) in separated line items (should not show it (them) as a range);
14. For games supporting Standalone jackpots, it should show the startup and increment percentage & minimum and maximum (if applicable) value for each level in dollars and cents with total RTP for each level and total RTP of the whole jackpot, rounding techniques can be used on the individual values so that they match the total returns, and
15. Display of any other game statistics (e.g. wins by category), if maintained by the Electronic Gaming Machine and not transferred to and maintained by CMS.

3.12.2 Audit Mode Access

1. Access to Audit mode is limited to the operation of a key-switch or other secure methods.
2. Auditing of metering information must be accessible by an authorized person at any time, except during collect in progress or during play (except where play is interrupted by a fault condition).
3. The gaming machine must not be playable while in Audit mode.

3.12.3 Signature Verification

The gaming machine shall provide capability to verify the signature of all PSDs used in the Electronic Gaming Machine in the audit mode. This function shall support the following:

1. The gaming machine shall provide capability to verify the signature of all physical or logical PSDs using a secure hashing method such as HMAC-SHA1 or other better well-known security algorithms which are recognized by the gaming industry.
2. The gaming equipment must allow the manual entry of a signature key for the hashing algorithm. Signature key entry must be via an interface provided by the gaming equipment and there must be an on-screen legend displayed. The default signature key is hexadecimal 00 / 0000.
3. Signature key entry is to be :
 - a. In hexadecimal characters;
 - b. Entered least significant bytes (LSB) first;
 - c. Suitably formatted for displaying for easy reading; and
 - d. For gaming equipment with multiple physical or logical PSDs, the gaming machine shall display individual signature results of each physical/logical PSD in the gaming equipment.

3.12.4 Combination and Paycheck Mode

The gaming machine shall provide a Combination and Paycheck Mode. This function shall support the following:

1. Every base game combination result may be selected, allowing testing of any combination;
2. The number of credits staked can be varied;
3. The number of lines/patterns/ways can be varied;
4. The value of the prize attained for the combination with respect to the number of credits staked is displayed; and
5. Triggering the prize resulting from the feature is displayed.

It will clearly display on the screen of the gaming machine while performing this test mode.

3.13 Software Verification

1. The gaming machine shall allow for an independent integrity test of the machine's software from an external source. This may be performed by the medium being able to be removed and authenticated by an external device, or employing an interface port for an external device to authenticate the media. This integrity test procedure shall provide the means for field testing of machine software for verification purposes.
2. The gaming machine shall also be enabled for self-authentication of the machine software with its electronic gaming management system as specified in the protocol used for communication between the electronic gaming management system and the gaming machine.

4 GAMES

4.1 Objective

This section describes the game requirements so that the game performance is as anticipated and is reliable and fair to the player. It creates the minimum standards of function so that all conforming electronics gaming platforms would be reliable, honest, secure, auditable and operate in conformance with their specifications.

4.2 Game Content

4.2.1 Games Not To Be Approved

DICJ will not approve any game which:

1. Is derived from or based on a product that is currently and primarily intended or marketed for use by persons under the prescribed age at which it is legal to enter casinos in Macau;
2. Is offensive to public morality or order.
3. Contain themes specifically targeted at children.
4. Violate the intellectual property rights of third parties.

4.2.2 Intellectual Property

Manufacturers must complete and lodge with any application for DICJ Approval of a game, a certification and indemnity, in the form of Attachment 1 to this document.

4.3 Game Play

The player shall start game play by pressing a play or bet button, or similar player interface (e.g. touch screen and so on). Each play shall be started by a different and separate activation of the player interface.

4.4 Game Play Information

An Electronic Gaming Machine must display the following information to the player at all times when the machine is available for player input:

1. The current credit balance;
2. The current bet amount;
3. All possible winning outcomes, or be available as a menu item or help menu;
4. Win amounts for each possible winning outcome or be available as payglass, menu or help screen item;
5. The amount won for the last completed game (until the next game starts or the betting options are changed);
6. The player options selected (e.g. bet amount, number of lines/patterns/ways played) for the last completed game (until the next game starts or the betting options are changed);
7. The denomination of the game being played;

8. A disclaimer regarding malfunction voids all pays;
9. The results for the last complete game, including the winning playlines/patterns/ways shall be clearly indicated to the player (until the next game starts or the betting options are changed); and
10. For multi-line/multi-way games, the display shall provide a mechanism for clearly indicating to the player each possible line that can be played.

4.5 Player Interface

The player interface is defined as the interface in which the player interacts with the game, including the button panel(s), the touch screen(s), or other forms of player interaction devices. The player interface shall meet the following requirements:

1. All player-selectable touch points or buttons represented on the player interface that affect game play and/or the integrity or outcome of the game shall be clearly labeled according to their function and shall operate in accordance with applicable game rules;
2. Any resizing or overlay of the player interface screen shall be mapped accurately to reflect the revised display and touch points; and
3. There shall be no hidden or undocumented touch points or buttons anywhere on the player interface that affect game play and/or that impact the integrity or outcome of the game, except as provided for by the game rules.

4.6 Simultaneous Inputs

The Electronic Gaming Machine shall not be adversely affected by the simultaneous or sequential activation of the various inputs, such as 'play buttons', which might, whether intentionally or not, cause malfunctions or invalid results.

4.7 Display Requirements with Non-zero Credit Meter

While the Electronic Gaming Machine is in idle mode, if there are credits on the credit meter, the following must remain on view until the next play is initiated or the betting options are changed:

1. The total number of credits wagered for the last play;
2. The final results for the last game played;
3. The total number of credits won and other prizes associated with the combination resulting from the last play; and
4. When the player has made one or more initial play selection decisions for the next game, the display must clearly indicate that the information displayed is appropriate to the potential next game to be played.

4.8 Wagers

4.8.1 Credits Bet

Credits bet must only come from the credit meter, which is to be decremented at the start of play or when additional wagers are made during the game as per the game rules. Additional wagers from the credit meter must not be available to gamble games.

4.8.2 Mandatory Credit Return (Forced Bet)

The EGM must reject and return the credits wagered by the player if the credits bet are less than the minimum bet value for the selected bet option. A message of "Insufficient Credit" shall be displayed to the player.

4.8.3 Default Bet Value

Bet values should not default to the maximum bet values except in cases where there is only a single wagering option available.

4.9 Games with Components of Skill

Games involving player physical dexterity (e.g. hand/eye coordination) must return at least the minimum return to player [MINRTP] without adaptive strategies.

4.10 Return to Player

1. A game must have a theoretical/estimated statistical expectation that the minimum player return (RTP) of the game will be greater than or equal to [MINRTP]. The minimum percentage requirement must be met when playing at the lowest percentage available. If no minimum RTP is prescribed by regulation for the time being, it shall be taken to be 80%.
2. A game must have a theoretical/estimated statistical expectation that the maximum player return (RTP) of the game will be less than or equal to [MAXRTP]. If no maximum RTP is prescribed by regulation for the time being, it shall be taken to be 98%.
3. Any EGM plays a game that is recognizable to be a simulation of a live casino game approved for play in Macau pursuant to current gaming law must have an identical RTP.
4. Within a single game configuration, a change to the betting options selected must not cause a difference of more than 4% between the maximum theoretical RTP and the minimum theoretical RTP. Where one version of game software contains identifiably different games (such as ante-bet games) the requirement of the RTP difference will apply to each game separately.

4.11 Win Probability

1. Any advertised prize shall occur at least once in every 100 million games.
2. This does not apply to multiple awards won together on the same game play where the aggregate prize is not advertised.
3. This probability rule shall not apply to games which make it possible for a player to win the advertised prize or event multiple times through the use of free games.
4. This rule does apply to each wager that wins the advertised prizes and events.
5. If the advertised award or event can occur within a bonus or free game feature, the odds calculation shall include the odds of obtaining the bonus round including the odds to achieve the advertised prize or event.

4.12 Individual Game Cycle

A game is considered completed when the final transfer to the player's credit meter takes place (in case of a win), or when all credits wagered or won that have not been transferred to the credit meter, are lost. The following are all considered to be part of a single game:

1. Games that trigger a free game feature and any subsequent free games;
2. "Second screen" bonus feature(s);
3. Games with player choice (e.g. Draw Poker or Blackjack);
4. Games where the rules permit wagering of additional credits (e.g. Blackjack insurance or the second part of a two-part Keno game);
5. Double-up/Gamble features; and
6. Games that trigger progressive jackpots.

4.13 Minimum Individual Game Cycle Time

The minimum spin rate or interval between consecutive base game play on the gaming machine must not be less than 3 seconds.

4.14 Continuous Play

The player must initiate game play by pressing a play or bet button, or similar input device.

Each play must be initiated by a distinct and separate activation of the player interface (e.g. play button or touch screen etc.) and the gaming machine must not allow a player to circumvent this requirement by external interference (e.g. holding down or jamming play buttons).

4.15 Autoplay

Automated play is prohibited for any base game.

4.16 Game Fairness Objectives

1. All games are to be fair to players in that the game must not be designed to give the player a false expectation of better odds by falsely representing any occurrence or event.
2. The display of the result of a game outcome must not be misleading or deceptive to the player (e.g. must not improperly indicate a near-miss).
3. The mapping of numbers directly from the RNG output or through a scaling algorithm shall not influence a symbol to occur with a probability not equal to its statistical expectation.

4.17 Win Truncation

The win awarded in any individual game element or sequence of game elements must not be truncated.

4.18 Display of Lines/Patterns/Ways Selected

The EGM shall employ a mechanism to clearly indicate each individual possible line/pattern/way sequentially or concurrently which is activated as a lit selected line (by betting additional credits), so that the player is in no doubt as to which line/pattern/way a wager was placed.

4.19 Display of Lines Won

The winning playline(s)/winning pattern(s)/winning way(s) must be clearly highlighted to the player.

4.20 Bonus Games

1. All gaming machines that offer bonus game or extended play feature, which requires player selection or interaction, are prohibited from automatically making selections or initiating games or features unless:
 - a. The patron is presented with a choice and specifically acknowledges his/her intent to have the gaming machine auto-initiate the bonus or extended play feature by means of a button press or other physical/machine interaction;
 - b. The bonus or extended feature provides only one choice to the patron (i.e. press button to spin wheel). In this case, the machine may auto initiate the bonus or extended feature after a time out period of at least 2 minutes; or
 - c. In cases where player input is required within a finite period of time (e.g. selection of bonus prize symbols), an appropriate time period of not less than 2 minutes shall be provided. When input time elapses, the EGM is suggested to make a random input for the player. Additionally, this random input operation will be displayed in the payable.
2. The game's player return including all bonuses over the cycle shall conform to the theoretical minimum RTP percentage stated in the above sections.
3. The game shall not adjust the likelihood of a bonus occurring, based on the history of prizes obtained in previous games (i.e. games shall not adapt their theoretical return to player based on past payouts).

4.21 Game Recall

4.21.1 General

1. For the Game Recall information held by the Electronic Gaming Machine, it must be possible to show to the player the results of the play(s) as the player originally saw it. The manner in which the information is provided must enable observers to clearly identify the game sequences and result(s) that occurred.
2. Information on at least the last ten (10) games is to be always retrievable on the operation of a suitable key-switch, or another secure method that is not available to the player.

4.21.2 Game Recall Information Required

1. Reels in final resting position, card values, balls drawn or other form of game result;
2. Total number of credits at the start of play (less credits bet);
3. Total number of credits at the end of play;

4. The total number of credits bet including number of lines played and credits per line;
5. The total number of credits won associated with the prize resulting from the last play or the value in dollars & cents for progressive prizes;
6. The total number of credits added (separated into bills and cashless) since the end of the previous play and through to the end of the last play;
7. The total number of credits collected (separated into tickets and cashless) since the end of the previous play and through to the end of the last play;
8. The total value of cancelled credits (in dollars & cents) since the end of the previous play and through to the end of the last play (credits added or collected after the last play will be recorded on the completion of the next play);
9. Any player choices involved in play outcome including lines/patterns/ways selected, units wagered, cards held, balls selected, etc.;
10. Results of gambles; and
11. The value of all Standard Meters (as defined in Section 3.5.2) as at the end of the last play. Specific meters that are not applicable, may be omitted.

Note: The above requirements are the default for Last Play Information in that events after the completion of the last play (such as inserting money to add credits, or collecting credits) do not form a part of the Last play Requirements. However, it is permissible for manufacturers to display this information provided it is clear what happened after the completion of the last play.

4.21.3 Game Sequences

1. If the feature is retriggerable within the feature (i.e. the number of games in a feature sequence can theoretically be infinite), the Last Play Recall function must be able to replay a minimum of last 50 feature games irrespective of number of played.
2. In all cases for a feature or free game sequence, the initial trigger game and final game must be available for display.
3. The replay of alternate display game sequences (free games, feature games etc) must allow each game in the sequence to be examined. Progression to the replay of the next game in the game sequence must require external input, e.g. button press, touch screen input etc. Alternatively, the replay function may provide a 'Pause' input to allow the replay to be suspended between games of a game sequence.

4.22 Gamble Feature

1. The gamble option must have a theoretical return to player of at least 100%.
2. If gamble is offered on the result of bonus/feature games, only moneys not transferred from the win meter to the credit meter may be wagered on the gamble feature.
3. Amounts bet on gamble are not to be added to the Coin In meter.

4.23 Configuration Settings

1. It shall not be possible to change a configuration setting that causes an obstruction to the electronic accounting meters without a RAM clear.
2. Change of critical parameter (i.e. denomination, RTP etc.) must be done by a secure means, which includes access to the locked logic area.

4.24 Configuration of Multi-Game Electronic Gaming Machine

If it is possible to select between multiple games that are resident in an Electronic Gaming Machine's memory:

1. The set of games offered to the patron for selection or to the payable, can be changed only by a secure method approved by DICJ.
2. No changes to the set of games offered to the patron for selection (or to the payable) are permitted while there are credits on the player's credit meter or while a game is in progress.

4.25 Random Number Generator

The purpose of this section is to establish requirements for random selection processes with the use of random number generators (RNGs). In most implementations of an Electronic Gaming Machine, there will be the need for a Random Number Generator (RNG).

4.25.1 RNG Design

1. A manufacturer may employ one or more mechanical RNG, hardware RNG, Cryptographic RNG, PRNG or combinations of them.
2. The choice of algorithms and devices is left to the manufacturer. Each component or combination of components used to provide random numbers must satisfy the requirements of this document.
3. A Cryptographic RNG shall be used for the determination of game outcomes in an Electronic Gaming Machine.

4.25.2 RNG Properties

1. Crypto-analytic attack of an RNG must not be practically possible. All RNGs must produce output having the following cryptographic properties:
 - a. **Statistical Randomness:** RNG outputs must pass statistical tests for randomness in the way they are to be used by the gaming application and the rules of the games;
 - b. **Unpredictability:** it must not be feasible to predict future outputs of an RNG even if the algorithm and the past sequence of outputs is known;
 - c. **Uniform Distribution:** all possible RNG selections shall be equally likely to be chosen. The final game outcomes shall conform to the intended distribution.

4.25.3 Scaling

1. A RNG which provides output scaled to given ranges must use an unbiased algorithm.
2. RNGs that provide numbers scaled to the ranges required by game rules shall retain the cryptographic properties described above, and in particular:
 - a. Scaled numbers must be unpredictable, independent and uniform over the range; and
 - b. Scaled numbers must pass statistical tests relevant to the application which may include one or more of the following:
 - i. chi-square test;
 - ii. equi-distribution (frequency) test;
 - iii. gap test;

- iv. overlap test;
- v. poker test;
- vi. coupon/ticket collector's test;
- vii. permutation test;
- viii. run test (Patterns of occurrences must not be recurrent);
- ix. spectral test;
- x. serial correlation test potency and degree of serial correlation (outcomes must be independent from the previous game);
- xi. test on subsequences; and
- xii. die-hard tests.

4.25.4 Seeding

Some RNGs require seeding before use. These requirements apply to RNGs that require seeding.

1. The seeding process must be a random process in itself, subject to all requirements in this document concerning randomness.
2. The entropy gathered before seeding must be at least as random as results required during normal operation.
3. The seeding process must not be visible externally.
4. The method of seed generation must ensure that when a duplicate of the RNG is used in multiple devices, it is highly improbable that the same initial sequence of random numbers is used in more than one device.
5. When a PRNG is reseeded it must only be done with a seeding methodology that ensures all PRNG outcomes remain equally probable.
6. The RNG initial state must be seeded from an entirely unpredictable source of entropy.

4.25.5 Distribution

Each possible RNG selection shall be equally likely to be chosen. Where the game design specifies a non-uniform distribution, the final outcome shall conform to the intended distribution.

1. All scaling, mapping, and shuffling algorithms used shall be entirely free of bias, as verified by source code review. The discard of RNG values is permissible in this context and may be necessary to eliminate bias; and
2. The final outcome output shall be tested against intended distribution using appropriate statistical tests (e.g., Total Distribution test, and tests shown in Section 4.25.3).

4.25.6 Independence

Knowledge of the numbers chosen in one draw shall not provide information on the numbers that may be chosen in a future draw. If the RNG selects multiple values within the context of a single draw, knowing one or more values shall not provide information on the other values within the draw, unless provided for by the game design.

1. As verified by source code review, the RNG shall not discard or modify selections based on previous selections, except where intended by game design (e.g., without-replacement functionality); and

2. The final outcome output shall be tested for independence between draws and, as applicable, independence within a draw, using appropriate statistical tests (e.g., Serial or Interplay Correlation tests, and Runs test, and tests shown in Section 4.25.3).

4.25.7 Available Outcomes

As verified by source code review, the set of possible outcomes produced by the RNG solution (i.e., the RNG period), taken as a whole, shall be sufficiently large to ensure that all outcomes shall be available on every draw with the appropriate likelihood, independent of previously produced outcomes, except where specified by the game design.

4.25.8 Mechanical RNG (Physical Randomness Device)

Mechanical RNGs or “physical randomness devices” generate game outcomes mechanically, employing the laws of physics (e.g., wheels, tumblers, blowers). The requirements defined within this section apply to mechanical RNGs / physical randomness devices.

1. To provide best assurance of random behavior, the independent test laboratory shall collect game outcome data for at least 10,000 game outcomes.
2. The data collection shall be accomplished in a fashion reasonably similar to the intended use of the device in the field. In particular, the recommended setup and calibration shall be executed initially, and the device and components (cards, balls, etc.) shall be replaced or serviced during the collection period as recommended by the manufacturer.
3. All mechanical pieces shall be constructed of materials to prevent degradation of any component over its intended lifespan.
4. The player / game operator shall not have the ability to manipulate or influence the mechanical RNG in a physical manner with respect to the production of game outcomes, except as intended by game design.
5. The concessioner or the manufacturer of the mechanical RNG such as roulette wheels shall submit annual audit reports of all the mechanical RNG devices to DICJ which must include the randomness test results to ensure its randomness is not compromised.

4.25.9 Hardware RNG

Hardware-based RNGs derive their randomness from small-scale physical events such as electric circuit feedback, thermal noise, radioactive decay, photon spin, etc. The following requirements apply to hardware-based RNGs. Due to their physical nature, the performance of hardware-based RNGs may deteriorate over time or otherwise malfunction, independent of the gaming device. The failure of a hardware-based RNG could have serious consequences for the intended usage of the RNG. For this reason, if a hardware-based RNG is used, there shall be dynamic monitoring of the output by statistical testing. This monitoring process shall disable game play when malfunction or degradation is detected.

Hardware RNGs must be monitored. Such monitoring must only be implemented in accordance with the RNG manufacturer specifications and be appropriate to the context of their operation within a device. Monitoring should aim to confirm that an RNG continues to perform acceptably and has not deteriorated over time. Monitoring is a broad term, and in the simplest sense any RNG monitoring that is implemented should only be done so to add safeguards to the ongoing operation

of the RNG. Care should be taken to ensure monitoring does not introduce risk of compromising the core RNG operation or its randomness.

4.25.10 Cryptographic RNG

A cryptographic RNG is one that cannot be feasibly compromised by a skilled attacker with knowledge of the source code. “Cryptographically strong” means that the RNG is resistant to attack or compromise by an intelligent attacker with modern computational resources, and who may have knowledge of the source code of the RNG. The following RNG requirements apply to a cryptographic RNG and are being introduced to this technical standard. At its discretion, a regulatory body may elect to require that RNGs used in the determination of game outcomes be cryptographically strong. At a minimum, cryptographic RNGs shall be resistant to the following types of attack, all of which serve to replace the general RNG requirements for ‘unpredictability’:

1. Direct Cryptanalytic Attack: Given a sequence of past values produced by the RNG, it shall be computationally infeasible to predict or estimate future RNG values. This must be ensured through the appropriate use of a recognized cryptographic algorithm (RNG algorithm, hash, cipher, etc.);
2. It shall be infeasible to computationally determine or reasonably estimate the state of the RNG after initial seeding. In particular, the RNG must not be seeded from a time value alone. The manufacturer must ensure that games will not have the same initial seed, even when powered-on or booted simultaneously. Seeding methods shall not compromise the cryptographic strength of the RNG; and
3. The RNG shall periodically modify its state, through the use of external entropy, limiting the effective duration of any potential exploit by a successful attacker.

4.25.11 Pseudo-random number generator (PRNG)

A type of RNG implemented in software or firmware that generates a predictable sequence of numbers with the intended property of statistical randomness.

PRNGs use a ‘deterministic algorithm’, in that future outcomes are directly dependent on previous outcomes.

The state of the RNG must be modified between every game to ensure unpredictability. Possible modifications of RNG state that may satisfy this requirement include, but are not limited to:

1. The discard of an unpredictable number of RNG values (i.e., background cycling). If the number of discarded values is determined by an RNG, it may not be determined by the primary RNG itself, but must instead be determined by a secondary RNG, independent and asynchronous to the primary RNG; and
2. The overwriting (re-seeding) or mixing (entropy injection) of all or a portion of the RNG state by an external event or entropy source. The re-seeding or mixing shall be done in such a way that does not compromise the intended distribution, independence, or availability of prizes. The external event or entropy source shall not be able to be predicted or estimated by a player.

4.26 Game Interruption and Resumption

4.26.1 Game Interruption

After a game interruption (e.g. power down), the software shall be able to recover to the state it was in prior to the interruption taking place.

4.26.2 Game Interruption Procedures

On game interruption, the following procedures shall be executed at the least:

1. The ticket/coupon printer shall be turned off;
2. The power-down routine, if any, shall be fully completed; and
3. The integrity of critical variables shall not be compromised by the interruption procedures.

4.26.3 Restoration from Error Situation

If a gaming machine is powered down while in an error situation, then upon restoring power, the error message shall be displayed and the gaming machine shall stay locked-up. This is unless power down is used as part of the error reset procedure, or if on power up or door closure, the gaming machine checks for the error situation and detects that the error is no longer in existence.

4.26.4 Game Resumption

On game resumption, the following procedures shall be executed at the least:

- 1 Any communication to an external device shall not begin until the game resumption procedure, including self-tests, is successfully completed;
- 2 Gaming machine control programs shall test themselves for possible corruption due to failure of the game storage media using a robust and proven means;
- 3 The integrity of all critical memory shall be checked;
- 4 The power down process, if any, shall be tested for correct completion, and a proper message shall be displayed if incorrect completion is detected; and
- 5 The software shall be able to detect any change in the gaming machine program from when the gaming machine was last powered down or interrupted. If a change is detected, the gaming machine shall lock-up, display a proper error message until the gaming machine is reset by an authorized person.

4.27 Artwork

1. There must be sufficient game instructions to allow a player to determine the correctness of prizes awarded.
2. All statements on the artwork must be true.
3. The payable applicable to the device must be clearly visible, or the means of displaying such information must be readily available to the player prior to committing to a bet and when the EGM is waiting for player input.
4. The pay scale on the artwork must correspond to the pay scale used in the par sheet.
5. The message "Malfunction Voids All Pays and Play" or its equivalent must be displayed on each Electronic Gaming Machine.
6. The game instructions must be clearly visible, or the means of displaying such instructions

must be readily available to the player prior to committing to a bet and when the EGM is waiting for player input.

7. All game instructions on the artwork must be easily interpreted, not ambiguous, and sufficient to explain all game rules.
8. The name of the game being played must be clearly visible to the player.
9. The display of the result of a game outcome must not be misleading or deceptive to the player (e.g. must not improperly indicate a near-miss or a future win).
10. Written messages shall be in English and Chinese (Traditional / Simplified) and there must be an option for the player to view all written messages in the artwork, game rules and messages displayed to the player either in English or in Chinese (Traditional / Simplified). All messages displayed shall be both grammatically and syntactically sound, in the languages.
11. The functions of all buttons (physical or touch screen) in normal game mode must be clearly indicated preferably on the buttons.
12. Any game instructions that appear on the video screen should be accessible and visible without the need for credits to be inserted or wagered. This requirement does not apply to messages that will be displayed which are specific instructions that may be required to proceed to the next stage of the game.
13. Help screen shall provide adequate information in detail for the player to understand the game and all information provided must be correct.
14. All disclaimers shall be displayed either on machine cabinet or in game software, both in English & Chinese at all time; This can be implemented either by displaying the disclaimers in English & Chinese statically at all times or by scrolling the disclaimers in English & Chinese messages alternatively such that it is clearly visible to the player at all times while the gaming machine is available for game play.
15. Display of minimum and maximum lines/ways for the game be displayed to the player at all times the gaming machine is available for player input;
16. Display of minimum and maximum bet values for the game in credits and in dollars and cents for one spin be displayed to the player at all times the gaming machine is available for player input;
17. The denomination of all games configured for play must be displayed to the player at all times the gaming machine is available for player input.

4.28 Display of Time

1. The current local time of day shall be always displayed on the game screen when the gaming machine is available for gaming.
2. The time is to be displayed in 12-hour format (i.e. hh:mm am/pm) at the bottom right corner of the gaming machine's main display or the third party add-on device attached to the gaming machine.
3. It must be clearly visible to the player at all times and the size is to be a minimum of 7mm high when measured directly off the display.
4. The time of day displayed must not obscure any other information relevant to gaming on the gaming machines.
5. The time of day displayed shall be synchronized with the Central Monitoring System within 1 minute accuracy.
6. The display of the time must flash 5 times per term so that it is clearly visible to the players. The clock should flash at the beginning of session and then at least every 10 minutes. The duration of a player's session of play is the continuous time that has elapsed from the start of

the first game played and includes all additional games played by a player until:

(a) A player does not play a game and a period of 60 seconds has elapsed since the end of the last completed game;

(b) No further play is possible without additional credits being purchased by the player and a subsequent period of 30 seconds has elapsed since the last completed game; or

(c) A player has exited the game by pressing the collect button.

7. If the play has been temporarily suspended, the display of time need not flash.

5 EXTERNAL COMMUNICATIONS

5.1 Objective

The intent of this section is to ensure that communications with gaming machines are secure so as to avoid unauthorized access or modification of communicated data as well as to ensure that all related translations are precise and free from error.

5.2 Communication Requirement

1. All external data communication shall be protocol based and/or integrate an error detection and correction scheme to ensure an accuracy of not less than 99% of messages received.
2. The communication protocol shall ensure that incorrect data or signals would not harmfully affect the operation of the gaming machines.
3. Certificates, keys or seeds that are used for encryption purposes shall not be hard coded, and shall be changed from time to time.
4. The communication protocol shall also ensure that erroneous data or signals would not adversely affect the operation of the gaming machine through the use of proven error checking mechanism on the transmission. The error checking mechanism used shall be at least Cyclic Redundancy Check (CRC) of 16 bits.
5. External data communication protocols shall as far as possible be open standards based to allow for interoperability between gaming machines and the electronic gaming management systems.
6. The gaming machine shall be able to synchronize its local date and time with the electronic gaming management systems intended for, less than sixty (60) seconds so as to ensure that time stamping of all events and data is correct.

5.3 Central Monitoring System (CMS)

A electronic monitor system is an electronic monitoring system or device, which is computerized or with communication intended to be used or adapted to send or receive data about gaming machines, namely with respect to its safety, integrity, accounting control, auditing.

1. The gaming machines must be permanently connected to a central monitoring system.
2. The gaming machines disconnected from electronic monitoring systems must be suspended automatically whenever the connection cannot be immediately established.
3. The current game (including base game, Bonus game and, feature game etc.) should be completely finished and shown the player accurate result. The gaming machine should allow the player to cash out his/her remaining credits by ticket or handpay slip.
4. The gaming machines disconnected from electronic monitoring systems are removed from the gaming location, except when they are subject to emergency maintenance.
5. The exploitation of gaming machines in the situation described in item 2 can only be resumed after the connection to the electronic monitoring system.

6 TICKET IN/TICKET OUT (VOUCHER IN/VOUCHER OUT)

6.1 Objective

This section describes the requirements of Ticket In/Ticket Out system for gaming machines so that the gaming software performance is as anticipated and is reliable and fair to the player. It creates the minimum standards of function so that all conforming electronics gaming platforms would be reliable, honest, secure, auditable and, operate in conformance with their specifications.

6.2 General

1. Ticket In/Ticket Out is allowed only when the Electronic Gaming Machine is connected to a Central Monitoring System (CMS) and the validation information is generated from the CMS.
2. Electronic Gaming Machine shall have the capability to display a complete transaction history for the most recent thirty-five (35) ticket in and ticket out transactions.

6.3 Ticket In

1. The acceptance device must be able to detect the entry of a valid ticket by reading its barcode or other unique identifier via the bill acceptor or other barcode reading device.
2. If the ticket is valid, it will be stacked and the appropriate credits will be transferred to the players account. The acceptance of the ticket is similar to the acceptance of Bills.
3. If the ticket is invalid, the ticket system will notify the Electronic Gaming Machine that the ticket is invalid.
4. If the ticket control system is offline, the Electronic Gaming Machine must always reject the ticket and return it to the player.

6.4 Ticket Out

6.4.1 Ticket Information Required

The ticket shall include the following information:

1. Licensee (casino) name, city;
2. Gaming device number or printer station number, as applicable;
3. Date and time of issuance;
4. Alpha and numeric dollar amount;
5. Sequence number;
6. Validation number;
7. Transaction type or other acceptable method of differentiating ticket types;
8. Expiration period or date when ticket or coupon will expire, if applicable; and
9. A statement of "This ticket shall not constitute any evidence whatsoever of any gaming result." in both English and Chinese. The statement can be pre-printed on the ticket.

6.4.2 Ticket Barcodes

Barcodes or other form of machine readable markings on a ticket must have enough redundancy and error checking to ensure that not less than 99.9% of all misreads are flagged as an error.

6.4.3 Ticket Validation Numbers

1. Ticket validation numbers must be unique – i.e. the ticket support system must ensure that a repeated validation number cannot happen even if there is a total replacement of an Electronic Gaming Machine.
2. Ticket validation numbers must use methodology to prevent prediction of subsequent validation numbers without detailed knowledge of the algorithm and parameters.

7 DISPLAY AUDIT DEVICE (DAD)

7.1 Objective

Display Audit Device (DAD) is a device that has the capability to capture and/or store the EGM (or ETG or DETG player terminal) game screen(s) video and either communicate them to the casino surveillance system or store them on the device itself. This stored information on the casino surveillance system or stored on the DAD itself can be replayed at a later time to verify the game play history on the connected EGM or ETG or DETG primarily for resolving player disputes. The device should be installed and operated in an EGM (or ETG or DETG player terminal) whenever the EGM (or ETG or DETG player terminal) that supports a progressive jackpot operating in Macau gaming floors. The DAD can be either a build-in or a separate device.

7.2 Hardware

7.2.1 Cabinet Identification

A Display Audit Device has an identification badge(s) that is affixed to the exterior of the DAD by the manufacturer & the gaming operator. It shall include the following information:

1. The name of the manufacturer;
2. A unique serial number;
3. The Display Audit Device model number / name;
4. The date of manufacture;
5. Device software / firmware identification;
6. Network details, if available (e.g. IP or Mac address); and
7. EGM identification number / EGM serial number where the device is installed.

The identification plates must be reasonably resistant to scratching, to prevent them being defaced or fraudulently altered.

7.2.2 Cabinet Security

1. The DAD shall be installed within a secure area of the EGM, ETG or DETG which is not easily accessible and/or tampered with by unauthorized personnel.
2. The electronic components of the DAD shall be located within the device enclosed area and not to be easily accessible or removed. The DAD must also be equipped with access detection devices / switches to enable it to detect and report directly to the CMS, the surveillance system or, the DAD system for any access.
3. The program storage component(s) shall be located within the device enclosed area and not to be easily accessible or removed.

4. The video storage device(s), if used, shall be located within the device enclosed area and not to be easily accessible or removed.
5. Interconnecting cables from the device to the EGM or to the surveillance system must not be exposed or readily accessible to unauthorized personnel.

7.3 Software

7.3.1 Device Program Integrity

1. The device's software / firmware must be reproducible via source code compilation process.
2. The device must test its software / firmware upon power-up for possible corruption and/or any change in software / firmware from when the device was last powered down. If unexpected data or inconsistencies are found; or a change has been detected, the device must cease operations and display an appropriate status. If a display screen is present within the DAD, a message describing the error must be displayed or shown in the CMS, the surveillance system or, the DAD system.
3. The device shall use HMAC-SHA1 method or other better well-known security algorithms which are recognized by the gaming industry for self-authentication. The test laboratory, in consultation with DICJ, shall approve any other methodologies implemented.
4. The device shall have the ability to allow for an independent integrity check of the device's software / firmware from an outside source. This may be accomplished by having an interface allowing the authentication of the software / firmware using third party device or by allowing the extraction of the software / firmware such that it can be verified externally. This integrity check provides a means for field verification of the approved software / firmware. The test laboratory shall approve the integrity check method.

7.4 Operational Requirements

7.4.1 Device Status Display

1. The DAD shall have at least the following status indicators visible from the exterior of the enclosed area:
 - a. Power good indication. Labeled "Power"
 - b. Fault / error indicator. Labeled "Fault"
 - c. Software / firmware heartbeat indicator. Labeled "heartbeat"
 - d. Network link indicator. Labeled "Comms". (Applicable only for device that streams "real time video" of the game play activity to the venue/casino surveillance system)
 - e. Alternately, the CMS, the surveillance system or, the DAD system has a capability to show a list of all status.

7.4.2 Device Power Supply

1. The device must be powered independently from the EGM (i.e. powering off the EGM shall have no effect on the device or vice-versa).

2. The device must automatically restart after a loss of power without manual intervention.

7.4.3 Device Set-up and Configuration

1. The methodology used to configure or setup the device must be secure and accessible to authorized personnel only (for example the usage of both the user login name and password).

7.4.4 Real Time Clock

1. The device shall maintain an internal clock that accurately (within ± 5 seconds) reflects the local current date and time.
1. The device shall be capable of synchronizing its clock directly with the Electronic Gaming Machine since the Electronic Gaming Machine's time will be synchronised with the CMS. In situations where more than one DAD is required in one EGM, there shall be a facility to synchronize time of all DSDs with one connection from the EGM. An example for such a capability will be to daisy chain the time synchronization between the DADs. Alternately, the device shall be capable of synchronizing its clock directly with the casino's surveillance system or CMS.
2. The current date and time shall be used for time-stamping the video storage files.

7.4.5 Device Not Affecting Game Operation

1. Both the video quality and resolution of the original EGM game screen(s) shall be preserved as per the EGM game screen itself without the device.
2. The device must not affect the game play screen(s) display in any way including the case of when the DAD is powered off.
3. The device must be functionally interoperable with player user interface (PUI) loyalty gaming device(s) installed in the EGM and must not affect the display and the quality of the loyalty screen section(s).

7.4.6 Video Streaming, Recording and Format

1. The DAD must be capable of streaming and/or recording the entire game play activity as displayed on the EGM game and jackpot screens.
2. If the DAD streams "real time video" of the game play activity to the venue/casino surveillance system and the network connection is interrupted (i.e. lost or unstable), it is recommended that the device is to record and store the game play activity in a video storage device within the DAD at least for last 48 hours. Once the network connection is resumed, video recordings can be retrieved back to the surveillance system by either DAD itself or the DAD system while the device continues to capture and record the game play activity. Alternately, the comprehensive camera coverage of the Electronic Gaming Machine (e.g. Overview and

Layout shot) can be supporting when video recordings are not able to be retrieved until the network connection is resumed.

3. If the DAD stores “real time video” of the game play activity within the device itself, the device must be capable of recording and storing the video files for the last fourteen (14) days minimum of game play activity. The video files are to be date and time stamped. The video files storage media shall have the capability to be retrieved and then browsed or played using an external viewer program.

The quality of the video streaming or the replay of the video capture of the game play activity from the device shall be 720P or above and it is able to show all details of the game as the original game screen itself without the device. Note: If the quality of the video capturing and/or streaming cannot be preserved due to the advancement of EGM games and/or screen display technology (e.g. multi-layer game screen displays, 3-D screens, etc.) alternative methods must be provided *to DICJ for consideration on a case-by-case basis*.

4. The video compression and formats used for storage and replay shall be of industry acceptable methodologies (such as MPEG-4, H.264, CIF etc.).
5. The video formats used for streaming the game play activity to the venue/casino surveillance system shall be of casino surveillance industry acceptable formats (such as RTSP, etc.).
6. The DAD shall have the capability to capture a wide range of EGM's video display formats employing the DisplayPorts of VGA, SVGA, DVI, and HDMI with different connector configurations such as normal, mini, micro etc. The DAD input and output format must be the same as the approved format of the connected EGM.
7. There shall be reliable copies of each video file with open support for backups and restoration.

7.4.7 Communication with Surveillance System

1. If the device that streams “real time video” of the game play activity to the venue/casino surveillance system:
 - a. There shall be a secure surveillance industry acceptable communication protocol between the device and the surveillance system.
 - b. The data transmission shall be through surveillance industry acceptable secure authentication methods.

8 GLOSSARY OF TERMS AND ABBREVIATIONS

Term or Abbreviation	Description
Approval	The legal act of approving gaming equipment.
Audit Mode	The mode where it is possible to view gaming machine meters, statistics, etc. and perform non-player related functions.
Bill Acceptor	The device using photo-optic, electromagnetic or magnetic sensors (internal or external to the gaming machine) and any additional devices used to validate a bill and/or printed ticket.
Bonus/Feature Game	An additional function not part of the base game which allows extra credits to be won. They may take the form of free games and/or second screen features.
Cancel Credit	Credits which are paid by manual cancellation at the gaming machine or by ticket payment to the player.
CMS	Central Monitoring System / Casino Management System
Cyclic Redundancy Check (CRC)	A software algorithm used to verify the accuracy of data during its transmission, storage, or retrieval. The algorithm is used to validate or check the data for possible corruption or unauthorized changes.
Credit Meter	Gaming machine indicator that displays the number of denominational credits or monetary value available to a patron for wagering.
Critical Memory	Memory locations storing information that is considered vital for the continued proper operation of the gaming machine.
DETG	Dealer Operated Electronic Table Game.
Display Audit Device (DAD)	It is a device that has the capability to capture and/or store the EGM (or ETG or DETG player terminal) game screen(s) video and either communicate them to the casino surveillance system or store them on the device itself.
Electrostatic Interference (ESD)	The 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).
Electromagnetic Interference	The physical characteristic of an electronic device to emit electronic noise either into free air, onto the mains power lines, or communication cables.
EPROM	Electrically Programmable Read Only Memory – a storage area which may be filled with data and information, which once written is not modifiable, and which is retained even if there is no power applied to the machine. Modification (erasure) is only possible by the application of an Ultra Violet (UV) light source.
ETG	Electronic Table Game.
Feature	Any additional free game, free spin of certain reels, metamorphosis of the basic game rules or secondary choice necessary to complete a game (except gamble) is considered a feature.

Term or Abbreviation	Description
Gamble	A game option, such as Double-Up, that may be selected following a win. This refers to player options where some or all of the winnings may be wagered at a minimum of 100% player return – includes multipliers other than evens, e.g. “pick a suit” where four outcomes are offered at 0.25 probability.
Game	A game is a set of rules that a gaming machine follows. Major constituents of a game are rules, artwork (virtual or static and inclusive of game symbols and payable), winning combinations and game symbol distribution.
Hashing Algorithm	Generally, a function which accepts a variable length data message and produces a fixed length message digest (i.e. hashing algorithm signature). In this Standard, the term ‘hashing algorithm’ referred is the HMAC-SHA1 algorithm.
HMAC-SHA1	‘Keyed-Hash Message Authentication Code’. Calculated using a cryptographic Hash Algorithm in combination with an input key. (refer: FIPS PUB 198).
H.264	A block oriented compression used for recording audio & video information
Last Play	The Last play is the most recently completed play.
Logic Area	The separately locked area within a gaming machine that houses the electronic components that would significantly influence the gaming outcome.
Master Meter	A meter whose value is reset only when a memory reset is performed. This meter represents the total of all updates since the last memory reset.
Meter	A non-volatile variable, storing gaming machine audit and other information.
MPEG-4	A method for compression and recording of audio & video information.
PAR	Probability and Accounting Report
Par Sheet	A document describing a set of rules, descriptions or graphical instructions relating to the prize(s) payable for all winning combinations.
PCB	Printed Circuit Board – the piece of board used to connect together electronic components in a certain manner using tracks and holes to route the signals.
Paytable	A term used to describe the mathematical behavior of a game based upon the data from the manufacturer’s PAR sheet, inclusive of the return percentage, and reflective of all possible payouts/awards.
Play	A sequence of actions and states in the gaming machine initiated by a player through a wagering of credits and terminated when all credits wagered have been lost or all winnings have been transferred to the gaming machine’s total wins meter and the player’s credit meter.
Player User Interface (PUI)	A designated section on the screen typically used for player communication & interface such as the ‘service window’.

Term or Abbreviation	Description
PLD	A programmable logic device or PLD is an electronic component used to build reconfigurable digital circuits. Unlike a logic gate, which has a fixed function, a PLD has an undefined function at the time of manufacture. Before the PLD can be used in a circuit it must be programmed, that is, reconfigured.
RAID	Redundant Array of Independent Disks
PSD	Programmable Storage Device, an integrated circuit including SSD, Flash-ROM, RAM, USB thumb drive, Hard Disk and logic functions on a single chip.
Random Access Memory (RAM)	Electronic component used for computer workspace and storage of volatile information in a gaming machine.
RAM Reset (RAM Clear)	Process that is used to reset the memory of a gaming machine which configures the gaming machine into a “as new” state.
Re-trigger	To trigger a feature during a feature of the same type.
Return to Player (RTP)	The ratio of total wins (including progressives and other features) to the total turnover in a game cycle (note gamble bets do not affect turnover and total wins is only affected by the final gamble outcome).
RFI	A Radio Frequency Interference which affects the operation of an electronic device.
RNG	Random Number Generator
Read Only Memory (ROM)	Electronic component used for storage of non-volatile information in a gaming machine. This includes programmable ROM and Erasable Programmable ROM.
RTSP	The Real Time Streaming Protocol (RTSP) is a network control protocol designed to control streaming between media servers.
Signature	The result from a mathematical algorithm, including the keyed HMACSHA1 algorithm, applied to the entire contents of a Program Storage Device or software file.
Signature Key	An input parameter used in conjunction with a signature algorithm.
Solid-State Drive (SSD)	It is a kind of flash memory to store data even after power is turned off. SSDs are designed to access data in the same way as traditional hard disk drives (HDDs).
Tilt	An error in gaming device operation that halts or suspends play and/or that generates some intelligent fault message.
Ticket (Voucher)	A printed or virtual ticket issued by a gaming device which can be redeemed for cash or used to subsequently establish credits on a device.
Ticket In	A method for inserting a valid printed ticket to get the corresponding credits.
Ticket Out	A method for redeeming the current available credits by means of printing a ticket.
Touch Screen	A video display device that also acts as a player input device by using electrical touch point locations on the display screen.

Term or Abbreviation	Description
USB, Universal Serial Bus	An industry standard interface that defines the cables, connectors and communications protocols used for connection, communication, and power supply between computers and electronic devices. Often used to reference the type of port or a flash type storage device using this interface technology.
Video Display Formats	A method used to send information to a display screen.
Win	The amount of credits (or money if applicable) that is awarded for a winning pattern, according to the game rules.

9 ATTACHMENT 1: CERTIFICATION AND INDEMNITY

CERTIFICATION AND INDEMNITY FORM

I(full name)

Being.....(position held)

For and on behalf of.....(supplier)

Hereby certify that:

1. The statements contained in the attached submission for approval by DICJ, together with attached documents, are, to the best of my knowledge and belief true and correct in every detail, and constitute a complete disclosure of the information required to be lodged with DICJ
2. The Director, DICJ, and all other officers and officially appointed agents of DICJ, shall be indemnified and held harmless from and against any and all claims , suits, demands, and costs, expense, losses and/or actions of any kind in consequence of any official action taken in respect to this application, and any intellectual property, such as a patent, trademark, copyright or registered design, relating thereto, and
3. The items submitted are complete and operational.

Name/Description of Equipment.....

Signed at

The.....day of.....20.....

..... (Signature)

In the presence of

..... (Witness)

Name and address of witness

.....