



International Technical Standards for Electronic Gaming Machines

Version 1.0

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Acknowledgements

These standards are brought together by the International Association of Gaming Regulators Technical Standards Sub-committee (TSC) to compile essential technical requirements for electronic gaming machines.

We wish to express our warmest appreciation to members in the TSC for their efforts, hard work and expertise in the realm of gaming technology:-

- ❖ Mr Lau Peet Meng, Casino Regulatory Authority of Singapore
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This document has been developed by studying technical standards listed below. We acknowledge the regulators who have put together these standards and thank them:-

- ❖ Australian/New Zealand Gaming Machine National Standard Revision 10.3
- ❖ New Jersey Casino Regulations, Chapter 69E Gaming Equipment
- ❖ Technical Standards for Gaming Devices and On-line Slot Systems (Nevada)
- ❖ Technical Standards for Electronic Gaming Machines (Singapore) Version 1.4

Further, gaming technology is constantly evolving and contents in this document cannot be static. There will be opportunities for improvements and updates. If you have suggestions on how to improve these technical standards, please write to the TSC with your suggestions.

Foreword

Numerous technical standards have been written for gaming equipment used in regulated casinos, each uniquely tailored based on regulatory policies in that jurisdiction. Though the specifics may differ across jurisdictions, there are also common expectations like gaming integrity, operation security and responsible gaming, just to name a few. If these common expectations can be consolidated, concurred and confirmed into one common standard, more efforts and resources can be put into tasks of greater regulatory value such as addressing the issue of problem gambling. Such an international standard would also give new regulators who are starting out in this area a very useful reference point, and enable sharing of best practices across jurisdictions. With this belief, IAGR formed the Technical Standards Sub-Committee (TSC) to create the first international standards drawn up by regulators.

Although this set of International Technical Standards for Electronic Gaming Machines (EGMs) is a result of studying technical standards used in the TSC members' jurisdictions, much thought have been put into making the requirements general and practical for use elsewhere. In ensuring the practicality and applicability of this document, TSC has consulted major EGM manufacturers, testing laboratories as well as gaming associations before finalising it.

The process of constructing these international standards took approximately one and a half years. This effort will not be possible without the commitment, hard work and perseverance of the TSC; the pro-activeness and contributions from EGM manufacturers (Aristocrat, Bally and IGT), testing laboratories (BMM and GLI) as well as gaming associations (GSA); and the strong support from the IAGR's Board of Trustees.

These standards for EGMs now form the foundation for a common understanding and expectations amongst IAGR members and the industry. The next step is to actualise them. I strongly encourage everyone to put these standards into practical usage - in research and development of gaming products by EGM manufacturers; in testing and assessment of gaming products by regulators and testing laboratories; and in ensuring the compliance of EGM operations by the casino operators.

This initiative is only the first step; it is a new beginning for more common international technical standards to be developed for the benefit of gamers, regulators, manufacturers, testing laboratories, gaming associations and casino operators. I encourage everyone to adopt the common principles set out in this document and participate in the TSC process so that we can jointly achieve our common objectives for safer and more robust standards in gambling regulation across the world.

Lau Peet Meng

IAGR President, Trustee & Chairman of TSC

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1. Overview of this document

1.1 Background

The International Association of Gaming Regulators (IAGR) Technical Standards Subcommittee (TSC), a multi-jurisdictional team, has identified and established a common set of aims and principles for the effective operation of electronic gaming machines (EGMs). This document draws on the experiences and expertise of various jurisdictions to develop requirements for EGMs based on these aims and principles agreed upon by the TSC.

The TSC recognises that there may be more than one way of achieving the requirements and hence, this set of technical standards does not specify any particular method to fulfil each requisite.

1.2 Scope of the Document

The scope of this document covers: -

- a. a set of technical standards for EGMs that are commonly used by IAGR's members. Such standards include security, reliability and integrity of the gaming software and hardware; accuracy in player displays, meters, PAR sheets and gaming information; and randomness of RNG.
- b. a set of testing criteria for use by gaming testing laboratories or facilities to carry out compliance testing against the technical standards.

It is important to note that this set of technical standards alone is not sufficient to cover all aspects of the regulation of EGMs; rather it focuses on the technical expectations of the EGMs.

1.3 Future Review of this Document

Recognising that Gaming Technology is a dynamic and fast moving field, this document does not intend to limit the use of new technology and shall be reviewed regularly. The TSC will consistently consider developments in the realm of EGMs and where appropriate, propose amendments to this document.

1.4 Objectives of the Document

The objectives of establishing a set of common technical standards for EGMs is to elaborate on the technical requirements for gaming equipment so as to ensure that common regulatory objectives of the IAGR's members are met. In essence, the common technical standards shall address the following common regulatory objectives: -

- a. ensuring gaming integrity, fairness and openness of gaming equipment are maintained at all times;
- b. providing gaming equipment manufacturers, testing laboratories and casino operators with a good indication of the regulator's technical requirements or expectations during the assessment and testing of gaming equipment;
- c. protecting minors and other vulnerable persons from the potential harm of gaming; and
- d. ensuring that the operation of gaming equipment is free from criminal exploitation.

1.5 Use of the Document

The approach stipulated in this document is not intended to be a universally endorsed approach for regulating EGMs as each jurisdiction may have its unique requirements, national laws, regulations and international obligations. However, it serves to propose good practices in key areas of EGMs regulations which any jurisdiction can incorporate should they choose to do so.

The following terminology used in this document separates mandatory guidelines from those which are non-mandatory:-

- a. Use of the word "*must*" signifies that the guideline is mandatory; and
- b. Use of the word "should" signifies that the guideline is optional.

A jurisdiction may refer to the mandatory guidelines for the more crucial requirements for EGMs.

2. Definition of Technical Terms

Objectives

This section provides definition of technical terms used within this set of technical standards in order to achieve a common understanding among the IAGR's members.

2.1 Definitions

Term	Description
Alterable Media	Any form of storage device that allows the modification of the programs or data on the device during the normal operation of the EGM. This does not include devices typically considered to be alterable but through either software or hardware means been rendered unalterable.
Attract/Idle Mode	The period of time between a play finishing and the next play commencing, or another mode being entered.
Audit Mode	The mode where it is possible to view EGM meters, statistics, etc. and perform non-player related functions.
Authority	The regulatory body responsible for the enforcement of the gaming laws of that jurisdiction.
Autoplay	A feature whereby the player can nominate to play games without manually initiating each game play by a distinct and separate activation of the player interface. Any continuous play caused by the holding down or physical jamming of player interfaces is also considered autoplay.
Auto Gamble	A feature whereby a win will automatically trigger entry to a Gamble feature.
Base Game	The fundamental part of a game which provides the majority of game play and winnings. The Base Game should also offer access to other game features such as Gamble, free game features, etc.
Bonus Game	An additional function not part of the base game which allows extra credits to be won. They should take the form of free games and/or extended play screen features.

Cashless Wagering System	A Cashless Wagering System (CWS) is characterised as a host system whereby a player maintains an electronic wagering account on the CWS host database. Secured means of accessing the wagering account on EGM will be provided to the player. This is not limited to the issuing of a unique magnetic cards and a Personal Identification Number (PIN) in conjunction with the wagering account on the CWS database. Funds should be electronically transferred from the wagering account to an EGM or vice versa.
Coinciding Wins	Coinciding wins occur when two or more distinctly separate winning patterns are displayed.
Conventional ROM Device	Device incapable of being altered while installed in an EGM and should contain executable programs or data that are directly addressable by a processor.
Credit Meter	EGM 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 EGM.
Disruption	Any form of interruption to the normal operation of the equipment.
Electrostatic Interference (ESI)	Interference caused by Electrostatic Discharge (ESD). This can be caused by a discharge directly, indirectly or in close proximity to the EGM.
Electromagnetic Interference (EMI)	Interference caused by electromagnetic fields. EMI can be generated by EGMs and also affect the operation of EGMs exposed to these fields.
Erasable Programmable Read Only Memory (EPROM)	Non-volatile storage hardware that cannot be altered while installed within an EGM.
Game Cycle	The total number of possible outcomes of a game.
Inappropriate Coin-in	Legal coin or token of the correct denomination which has been accepted by an EGM after the EGM has already accepted its maximum number of coins or when the EGM is in a state which normally rejects additional coins.
Logic Area	The separately locked area within an EGM that houses the electronic components that would significantly influence the gaming outcome.
Meter	A non-volatile variable, storing EGM audit and other information.
Player Initialisation	An action on the part of the player to acknowledge the only option available during a game play.

Player Interface Module	Any unit or peripheral device in the EGM used for advertisements and usable by a player for electronic transactions. Examples include, but are not limited to, different types of peripheral devices such as card readers, key pads, displays and biometric input mechanisms.
Player Selection	An action on the part of the player to make a decision when presented with more than one selectable option during a game play.
Programmable Read Only Memory (PROM)	Non-volatile storage hardware that cannot be erased and reprogrammed once it has been programmed.
Random Access Memory (RAM)	Electronic component used for computer workspace and storage of volatile information in an EGM.
RAM Clear	Process that is used to reset the memory of an EGM which configures the EGM as a “new” state.
Random Number Generator (RNG)	Hardware, software or combination device for generating number values that exhibits characteristics of randomness.
Read Only Memory (ROM)	Electronic component used for storage of non-volatile information in an EGM. This includes Programmable ROM and Erasable Programmable ROM.
Residual Credit Removal Play	A function of residual credit removal (which allows the player to remove residual credits from the EGM), in which the player has a chance of rounding up the remaining residual credits to the token value.
Radio Frequency Interference (RFI)	Interference within the radio frequency band. This can be generated by an EGM or affect the operation of an EGM.
Ticket In Ticket Out (TITO)	TITO refers to a receipt/ticket/voucher produced by an EGM instead cashing out coins or bills.
Tilt Condition	Programmed error state for an EGM. A tilt condition has occurred when the EGM detects an internal error, malfunction, attempted cheating or any other events specified by the Authority (e.g., door open and power reset) and it disallows further play until the event is resolved.

3. Hardware Requirements

Objectives

This section provides technical requirements pertaining to the physical aspects of an EGM, including its inner workings, to ensure that it will operate in a fair, honest, secure and auditable manner.

3.1 Cabinet

- 3.1.1 For EGMs, all doors that control access to critical areas must be equipped with switches or sensors which detect door open signals. Critical areas refer to those that should affect revenue, game outcome or the integrity of the EGM.
- 3.1.2 An EGM must have an identification badge that is permanently affixed to the exterior of the cabinet by the manufacturer and must include, at minimum, the following information:-
 - a. the name of the manufacturer;
 - b. a unique serial number;
 - c. the EGM model number; and
 - d. the date of manufacture.
- 3.1.3 Authorised access to the cabinet's critical areas such as the cash box door, currency compartment, and coin compartments must be segregated through the use of unique locking mechanisms in accordance with the Authority's rules.
- 3.1.4 The logic area must be designed as a separately locked area that houses electronic components which have potential to significantly influence the operation of the EGM.
- 3.1.5 Logic areas must be designed with:-
 - a. a provision for a physical tamper evident seal, which must be broken on entrance of or before performing any changes to the logic area;

- b. a provision of an auto-triggered alarm to its connected EGM management system intended for upon any openings of the logic area.

3.1.6 All RAM clear activities must not be allowed without accessing the logic area.

3.1.7 Electronic components / items that are required to be housed in one or more logic areas are:-

- a. CPU and other electronic components involved in the operation and calculation of game play (e.g., game controller electronics, and components housing the game or system firmware program storage media);
- b. electronics involved in the operation and calculation of game result determination;
- c. electronics involved in the calculation of game display, and components housing display program storage media (passive display equipment exempted);
- d. communication controller electronics, and components housing the communication program storage media;
- e. interfaces and drivers for metering systems; and
- f. all memory devices that affect the game play function of the EGM.

3.1.8 The EGM must be robust enough to resist forced illegal entry and must retain evidence or signs of illegal entry attempts until properly cleared and prior to allowing the initiation of a new play.

3.1.9 The EGM must be designed so that power and data cables into and out of the EGM can be routed so that they are not accessible to the general public.

3.2 Cash Input System

3.2.1 The banknote acceptor device must be an electronic device that is configured to ensure that the device only accepts valid legal tender bills and reject all others with high accuracy and provide a mechanism to enable the EGM software to interpret and act appropriately on a valid or invalid input.

3.2.2 The banknote acceptor device must be designed to protect against vandalism, abuse or other fraudulent activity.

- 3.2.3 All accepted banknotes must be deposited into a secure banknote storage area in the EGM. Rejected or invalid notes must be returned to the player.
- 3.2.4 The banknote acceptor device must have mechanisms to allow software to interpret and act upon the following conditions:-
- a. stacker full;
 - b. bill jams;
 - c. stacker removed; and
 - d. any other applicable malfunction not specified above.
- 3.2.5 An acceptance device must include a mechanism which prohibits the input of any banknotes, or alternatively, rejects all banknotes entered, during periods when the EGM is inoperable or deactivated for any reason.
- 3.2.6 Wires, cables and harness connecting the bill acceptor to an EGM must be housed inside the EGM's cabinet and must not be accessible from the outside of the EGM.
- 3.2.7 Bill acceptors must perform Power On Self Test (POST) upon every power up and must self-disable if POST fails. POST must also be performed after every recovery from an error state.
- 3.2.8 A coin acceptor must be able to:-
- a. accept only approved coins;
 - b. be protected against vandalism, abuse and fraudulent activities; and
 - c. deliver coins inserted to the correct area in the EGM.
- 3.2.9 The coin acceptor devices must be designed to meet the following requirements:-
- a. ability to accept or reject a coin on the basis of metal composition, mass, composite makeup or equivalent security;
 - b. ability to indicate accurately each valid coin inserted to the EGM controlling software and to return all inappropriate coin-ins back to the player; and
 - c. ability to guard against known cheating methods.
- 3.2.10 EGMs must allow a credit meter limit to be set such that in the event that the limit is reached, the EGM will refuse to accept any more coins, banknotes or cashless

in (e.g., tickets and vouchers) unless a wager is made or play initiated.

3.3 Cash Output System

- 3.3.1 EGMs must allow a cash-out limit to be set such that player-initiated cash-outs beyond the limit will not be paid out by the EGM, but instead require intervention by an attendant.
- 3.3.2 The coin hopper, if fitted in an EGM that is operated using coins, must be located within the EGM.
- 3.3.3 Hoppers must be designed to be resistant to manipulation by external source, power interruption, electrostatic discharge or any foreign object.
- 3.3.4 The EGM must be able to detect the following hopper conditions in all game states:-
 - a. hopper empty;
 - b. hopper jam;
 - c. hopper full;
 - d. extra coin paid / hopper runaway (i.e., one or more unintended coins exiting the hopper); and
 - e. hopper disconnected.
- 3.3.5 All coins paid from the hopper mechanism must be properly accounted for by the EGM including those paid out as extra coins during a hopper malfunction.
- 3.3.6 A valid ticket voucher must contain the following information, at minimum,-:
 - a. unique EGM identification number;
 - b. current date and time of issuance in the prescribed format;
 - c. value of ticket voucher in the prescribed format;
 - d. unique identifying number of the ticket voucher;
 - e. casino name;
 - f. number of days before voucher/coupon expires; and
 - g. validation (check) number. The validation number computation method must be approved.

3.4 Printers

3.4.1 Printers must be located inside the locked cabinet of the EGM.

3.4.2 Printers must have mechanism(s) to detect and act upon the following conditions:-

- a. out of paper;
- b. printer jam;
- c. printer disconnection;
- d. paper low;
- e. hardware error;
- f. software error; and
- g. communication error.

4. Effects of Interferences

Objectives

This section describes technical requirements for elimination and/or minimisation of any adverse effects of environmental interferences to the normal operation of EGMs which potentially affects its operational integrity.

4.1 Interferences

- 4.1.1 EGMs must not divert from normal operation by the application of electromagnetic interference from an outside source.
- 4.1.2 EGMs must exhibit total immunity to human body electrostatic discharges on all areas exposed to player contact.
- 4.1.3 EGMs should exhibit temporary disruption when subjected to a significant electrostatic discharge greater than human body discharge, but they must exhibit a capacity to recover and complete any interrupted play without loss or corruption of any control or data information associated with the EGM.
- 4.1.4 EGMs must not divert from normal operation by the application of radio frequency interference (e.g., radio frequency interference generated by Wi-Fi, Bluetooth, etc.).
- 4.1.5 Liquid spills applied to the outside of an EGM must not affect the normal operation of the EGM or the integrity of the material or information stored inside the cabinet.

5. Software Requirements

Objectives

This section provides the software requirements to ensure that the operation of an EGM is fair, honest, secure and auditable.

5.1 Control Program

- 5.1.1 EGM control program (i.e., software that operates the EGM's functions) must 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 methodology must detect 99.99 percent of all possible failures.
- 5.1.2 The initial program component of the authentication or initialisation mechanism must be stored on a non-modifiable physical storage device such as a conventional ROM device and must be capable of being verified. A chain of trust must exist from the initial program component to the running system.
- 5.1.3 The control programs must utilise an integrity check with a secured hashing method of at least 128 bits such as MD5 or SHA-1.
- 5.1.4 EGMs with control programs or other security programs residing in conventional ROM devices such as EPROMs must have the unused portions of the memory devices that contain the programs set to zero.
- 5.1.5 Control programs residing in one or more conventional ROM devices must employ a mechanism to verify the integrity of the control programs and data.
- 5.1.6 The EGM must allow for an independent integrity check of the machine's software from an outside source. This should be accomplished by the medium being able to be removed and authenticated by an external device, or having an interface port for an external device to authenticate the media. This integrity check mechanism must provide the means for field testing of the machine

software for identification and validation purposes.

5.1.7 Integrity checks must utilise mechanism with at least one secured hashing method of at least 128 bits based on open hash standards such as MD5 or SHA-1.

5.1.8 The EGM must also allow for self-authentication of the machine software with an EGM management system where applicable.

5.2 Payout and Odds

5.2.1 The theoretical payback percentages of an EGM must not be changed without making a hardware, software or RAM reset and configuration change in the EGM unless the RTP-change mechanism has been approved by the Authority.

5.2.2 A game must have at least one configuration setting that yields a minimum theoretical statistical expectation that the minimum return-to-player percentage (RTP) of the game will be greater than or equal to the value stipulated by the Authority during the expected lifetime of the game.

5.2.3 The minimum RTP requirement must be met at all times:-

- a. In particular, the minimum RTP requirement must be met when playing at the lowest end of a non-linear payable (i.e., if a game is continuously played at a minimum bet level for its entire game cycle).
- b. For EGMs that may be affected by player skill, strategy (to be provided by the manufacturer) should be assumed unless otherwise instructed by the Authority.

5.2.4 In a progressive game, whenever a progressive payout is offered as part of the EGM payout, the base amount (the lowest starting value possible) must be included in the theoretical payout percentage for purposes of satisfying the minimum percentage RTP requirements.

5.2.5 The Double-up or Gamble options must have a theoretical return to the player of one hundred percent (100%).

(Note: Residual credit removal play is exempted from this requirement to prevent

such play from becoming the primary gameplay due to the higher RTP.)

- 5.2.6 The probability for hitting any advertised jackpot must not be less than 1/100,000,000 (at a rate of at least 1 in 100 million plays).

5.3 **Random Number Generator**

- 5.3.1 All possible permutation or combination of game elements that produces winning or losing game outcomes must be available for random selection at the initiation of each play.
- 5.3.2 The game software must not determine the outcome of a play (critical to the game result) or gamble until after all player options pertaining to the play or gamble have been made.
- 5.3.3 The use of a RNG must result in a selection of game symbols or game outcomes that are proven, via the application of recognised statistical tests, to be:-
- a. statistically independent;
 - b. uniformly distributed over their range; and
 - c. unpredictable.
- 5.3.4 The RNG must be cycled continuously between plays.
- 5.3.5 The method of seed generation must ensure that:-
- a. the same sequence of random numbers is never used in more than one EGM at the same time;
 - b. the “next” game outcome is not predictable;
 - c. the seeding and re-seeding must be randomly determined and must not be under operator control; and
 - d. the initial seeding must be from one (1) or more sources of random entropy.
- 5.3.6 The range of values produced by the RNG must be adequate to provide sufficient precision and flexibility when setting event outcome probabilities.
- 5.3.7 If a random number with a range shorter than that provided by the RNG is required for some purpose within the EGM, the method of re-scaling, (i.e.,

converting the number to the lower range), must be designed such that all numbers within the lower range are equally probable.

5.3.8 If a particular random number selected is outside the range of equal distribution of rescaling values, it is permissible to discard that random number and select the next in sequence for the purpose of re-scaling.

5.4 **Program Interruption and Resumption**

5.4.1 After a program interruption (e.g., power down), the software must be able to recover to the state it was in immediately prior to the interruption occurring.

5.4.2 On program interruption, the following procedures must be implemented at the minimum:-

- a. The hopper must be turned off;
- b. The integrity of critical variables must not be compromised by the interruption procedures; and
- c. The power-down routine, if any, must be fully completed.

5.4.3 If an EGM is powered down while in an error condition, then upon restoring power, the error message must be displayed and the EGM must remain 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 EGM checks for the error condition and detects that the error is no longer in existence.

5.4.4 On program resumption, the following procedures must be performed at the minimum:-

- a. Any communications to an external device must not begin until the program resumption routine, including self-tests, is completed successfully;
- b. EGM control programs must test themselves for possible corruption due to failure of the program storage media using a robust and proven mechanism;
- c. The integrity of all critical memory must be checked;
- d. The power down process, if any, must be tested for correct completion, and an appropriate message must be displayed if incorrect completion is detected; and

- e. The software must be able to detect any unauthorised change in the EGM program from when the EGM was last powered down or interrupted. If an unauthorised change is detected, the EGM must lock-up, display an appropriate error message until the EGM is reset by an authorised person.

5.5 **Game History Recall**

- 5.5.1 For the game history information held by the EGM, it must be possible to show to the player the results of the recalled game(s) (including residual credit removal play) as the player originally saw it. The manner in which the information is provided must enable observers to clearly identify all game sequences and result(s) that occurred.
- 5.5.2 The following information must be derivable from the game history displayed:-
 - a. the total number of credits at the start of recalled game (less credits bet);
 - b. the total number of credits at the end of recalled game;
 - c. the total number of credits bet;
 - d. X ways/lines for Y credits or vice versa (X and Y to be based on bet without multiplier, e.g., 1 line per credit);
 - e. selected lines/ways and their total number;
 - f. selected denomination;
 - g. selected multiplier;
 - h. the total number of credits won associated with the recalled game or the value in dollars and cents for progressive prizes; and
 - i. results of Gambles, Double-ups and bonus features if applicable.
- 5.5.3 Game history recall must be able to replay a minimum of the last fifty (50) games of the bonus sequence with the triggering base game as part of the sequence.
- 5.5.4 Game history recall information on at least the last ten (10) base games (with the related bonus games) must be retrievable on the operation of a suitable external key-switch, entry of an authorised access card or other secure method.

5.6 **Bonus and Extended Play Features**

- 5.6.1 A bonus game or extended play feature offered by an EGM, which requires player selection within a reasonable finite period of time, must provide a

distinguishable visual message with real-time display of the “count-down” of time remaining (in seconds) on the game presentation.

5.6.2 A bonus game or extended play feature offered by an EGM, which requires player initialisation within a reasonable finite period of time, must provide a distinguishable visual warning message for at least five seconds, before the EGM initiates any games or play features automatically.

5.6.3 The game must not adjust the likelihood of a bonus occurring, based on the history of prizes obtained in previous games (i.e. games must not adapt their theoretical return to player based on past payouts).

6. Memory Requirements

Objectives

This section provides the requisite for memory used for the storage of data that is critical to the operation of an EGM.

6.1 Memory

- 6.1.1 Critical memory data storage must 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 should be used to meet this requirement.
- 6.1.2 A proven and reliable mechanism must be implemented to check for any corruption of critical memory locations used for crucial EGM functions. This must include information pertaining to the play and final outcome of the most recent game, the nine (9) games prior to the most recent game, random number generator outcome, credits available for play, and any other error states. Detection of any corruption that cannot be corrected must be deemed to be a game malfunction.
- 6.1.3 Clearing memory must only be undertaken by accessing the logic area in which it is housed.
- 6.1.4 In a RAM clear, the game program must execute a routine, which sets each and every bit in RAM to the default state. For games that allow for partial RAM clears, the methodology must be highly accurate and must validate the un-cleared portions of RAM.
- 6.1.5 All Conventional Read Only Memory (ROM) devices and other programmable logic elements must be clearly marked with sufficient information to identify the software and revision level of the information stored in the devices.

- 6.1.6 All Conventional ROM devices (and PLDs) that have erasure windows must be fitted with covers over their erasure windows.
- 6.1.7 A program storage device (e.g., CD-ROM, flash memory devices or alternate storage medium) must only contain the program files that operate the game and must be authenticated upon power up and at the first time the program files are loaded for use.
- 6.1.8 A proven and robust mechanism must be implemented to internally authenticate that the program files and/or support files had not been corrupted or altered prior to use/loading. The mechanism must prevent further play of the EGM if unexpected data or inconsistencies are found.
- 6.1.9 Write protection must be employed on the program storage device where applicable.
- 6.1.10 If the EGM is not intended to be used in a client-server system, the program storage device must not be re-written or re-programmed, unless the process of re-writing and re-programming entails accessing and unsealing (if sealed) of the logic area.
- 6.1.11 EGMs must be capable of sustaining prolonged period of game plays without memory leaks.
(Note: Prolonged is defined as the period of time in between consecutive preventive maintenance as recommended by the EGM manufacturer.)

7. Meter Requirements

Objectives

This section states the meters that an EGM must have at minimum and provides requirements that the metering should satisfy.

7.1 Metering Requirements

- 7.1.1 All EGMs must be equipped with soft meters (i.e., electronic digital storage meters) of at least ten (10) digits capable of recording and displaying the required information listed in this section.
- 7.1.2 All soft meters must be updated upon the occurrence of the particular event the meter is monitoring. All meters must be added to except for coin handling meters (i.e., Coin In and Coin Out meters) which should be added to or incremented if preferred. The term “added to” provides for a fetch of the current value from memory, conduct of arithmetic add operation and storage back in memory. In addition, it must be verified that the update has been successfully performed and that each logical copy has been correctly updated.
- 7.1.3 All EGMs must have soft meters of at least ten (10) digits that record the number of games played since:-
 - a. power reset;
 - b. door close; and
 - c. game initialization (RAM clear).
- 7.1.4 All EGMs must provide the means for on-demand display of the stored soft meter information to authorised persons.
- 7.1.5 All other soft meters, if any, must be suitably labelled or explained if necessary.
- 7.1.6 EGMs that are unable to display the specific meter labels required must use a legend to indicate what information a specific meter accumulates.

- 7.1.7 The meters, listed in this section, must accumulate the required information in the local currency. EGMs configured for multi-denomination play must display the required information in the local currency.
- 7.1.8 Progressives should be added to the credit meter if either:-
- a. the credit meter is maintained in the local currency amount;
 - b. the progressive meter is incremented to whole credit amounts; or
 - c. the prize in the local currency amount is converted to credits on transfer to the player's credit meter in a manner that does not mislead the player (i.e., make unqualified statement "wins meter amount" and then rounds down on conversion) or cause accounting imbalances.
- 7.1.9 The EGMs must also have meters in units equal to the denomination of the current game selection that continuously displays to a player the following information as it pertains to the current play or monetary transaction, unless there is a malfunction or tilt condition:-
- a. the coins or credits wagered;
 - b. the coins or credits won, if applicable;
 - c. the coins paid by the hopper for a credit cash-out or a direct pay from a winning outcome; and
 - d. the credits available for wagering, if applicable.
- 7.1.10 Credits staked (e.g., commencement of play, additional wagers during a play) must be immediately subtracted from the player's credit meter.
- 7.1.11 The end of a play is defined to be when all appropriate meters for a game have been updated. Update of the credit meter before the completion of play should be made provided that:-
- a. critical memory is updated when the credit meter is updated; and
 - b. only credits held on a win meter should be wagered on a gamble feature, i.e., it is not possible to wager any credits transferred to the credit meter on gamble.
- 7.1.12 All EGMs must be equipped with a device, mechanism or method that retains the value of all the required meters in the event of power loss to the EGM.

7.2 List of Meters

Meter Name	Definition
Coin In	<p>The EGM must have a meter specifically labelled “Coin In” that accumulates the total value of all wagers, whether the wagered amount results from the insertion of coins, tokens, currency, vouchers, coupon, and deduction from a credit meter or any other means. This meter must:-</p> <ul style="list-style-type: none"> 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 EGMs, provide the information necessary, on a per pay table basis, to calculate a weighted average theoretical payback percentage; and c. For EGMs which contain paytables with a difference in theoretical payback percentage which exceeds 4 percent between wager categories, 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.
Coin Out	<p>The EGM must have a meter specifically labelled “Coin Out” that accumulates the total value of all amounts directly paid by the EGM as a result of winning wagers, whether the payout is made from the hopper, to a credit meter or by any other means. This meter must not record amounts awarded as the result of an external bonusing system or a progressive payout.</p>
Coin Drop	<p>The EGM must have a meter specifically labelled “Coin Drop” that accumulates the total value of coins or tokens diverted to the drop.</p>

Attendant Paid Jackpots	The EGM must have a meter specifically labelled "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 EGM 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 par sheet.
Attendant Paid Cancelled Credits	The EGM must have a meter specifically labelled "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 EGM to make the proper payout amount.
Physical Coin In	The EGM must have a meter specifically labelled "Physical Coin In" that accumulates the total value of coins or tokens inserted into the EGM.
Physical Coin Out	The EGM must have a meter specifically labelled "Physical Coin Out" that accumulates the value of all coins or tokens physically paid by the EGM.
Bill In	The EGM must have a meter specifically labelled "Bill In" that accumulates the total value of currency accepted. Additionally, the EGM must have a specific meter for each denomination of currency accepted that records the number of bills accepted of each denomination.
Voucher In	The EGM must have a meter specifically labelled "Voucher In" that accumulates the total value of all EGM TITO vouchers accepted by the EGM.

Voucher Out	The EGM must have a meter specifically labelled "Voucher Out" that accumulates the total value of all EGM TITO vouchers issued by the EGM.
Electronic Funds Transfer In (EFT In)	The EGM must have a meter specifically labelled "EFT In" that accumulates the total value of cashable credits electronically transferred from a financial institution to the EGM through a cashless wagering system.
Wagering Account Transfer In (WAT In)	The EGM must have a meter specifically labelled "WAT In" that accumulates the total value of cashable credits electronically transferred to the EGM from a wagering account by means of an external connection between the EGM and a cashless wagering system.
Wagering Account Transfer Out (WAT Out)	The EGM must have a meter specifically labelled "WAT Out" that accumulates the total value of cashable credits electronically transferred from the EGM to a wagering account by means of an external connection between the EGM and a cashless wagering system.
Non-Cashable Electronic Promotion In	The EGM must have a meter specifically labelled "Non-Cashable Electronic Promotion In" that accumulates the total value of non-cashable credits electronically transferred to the EGM from a promotional account by means of an external connection between the EGM and a cashless wagering system.
Cashable Electronic Promotion In	The EGM must have a meter specifically labelled "Cashable Electronic Promotion In" that accumulates the total value of cashable credits electronically transferred to the EGM from a promotional account by means of an external connection between the EGM and a cashless wagering system.

Non-Cashable Electronic Promotion Out	The EGM must have a meter specifically labelled “Non-Cashable Electronic Promotion Out” that accumulates the total value of non-cashable credits electronically transferred from the EGM to a promotional account by means of an external connection between the EGM and a cashless wagering system.
Cashable Electronic Promotion Out	The EGM must have a meter specifically labelled “Cashable Electronic Promotion Out” that accumulates the total value of cashable credits electronically transferred from the EGM to a promotional account by means of an external connection between the EGM and a cashless wagering system.
Coupon Promotion In	The EGM must have a meter specifically labelled “Coupon Promotion In” that accumulates the total value of all EGM promotional coupons accepted by the EGM.
Coupon Promotion Out	The EGM must have a meter specifically labelled “Coupon Promotion Out” that accumulates the total value of all EGM promotional coupons issued by the EGM.
Machine Paid External Bonus Payout	The EGM must have a meter specifically labelled “EGM 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 EGM.
Attendant Paid External Bonus Payout	The EGM must have a meter specifically labelled “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.

Attendant Paid Progressive Payout	The EGM must have a meter specifically labelled “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 EGM itself.
Machine Paid Progressive Payout	The EGM must have a meter specifically labelled “EGM Paid Progressive Payout” that accumulates the total value of credits paid as a result of progressive awards paid directly by the EGM. This meter does not include awards paid as a result of an external bonusing system.
Any Other Meters	Such other meters as may be required by the Authority.

8. Communication Requirements

Objectives

This section provides requirements to ensure that all communications involving an EGM are secured and error conditions are detected and properly handled.

8.1 Communications

- 8.1.1 Communication ports must be clearly labelled and located within the EGM to prevent unauthorised access to the ports or cable connectors.
- 8.1.2 The communication protocol must also ensure that erroneous data or signals would not adversely affect the operation of the EGM.
- 8.1.3 All external data communication must be protocol based and/or incorporate an error detection and correction scheme to ensure its robustness and suitability for use.
- 8.1.4 The external data communication protocol must also ensure that erroneous data or signals would not adversely affect the operation of the EGM through the use of proven error checking mechanism on the transmission. The error checking mechanism used must be at least Cyclic Redundancy Check (CRC) of 16 bits.
- 8.1.5 Certificates, keys or seeds that are used for encryption purposes must not be hard coded, and must be changed periodically.
- 8.1.6 External data communication protocols must as far as possible be open standards based to allow for interoperability between EGMs and the EGM management systems.
- 8.1.7 The EGM must be able to synchronise its local date and time with a designated time source, within an accuracy of sixty (60) seconds so as to ensure that time stamping of all events and data is correct.

- 8.1.8 If there is communication failure between the game and the progressive controller that results in deviation from the stipulated game rules, the affected EGM must lock-up entirely and an error must be displayed on that EGM.

8.2 Error or Tilt Conditions

- 8.2.1 EGMs must detect and display the following conditions during idle states or game play. The following conditions should be automatically cleared by the EGM upon completion of a new play sequence and also communicated to an EGM management system if applicable:-

- a. Power reset;
- b. Door open (including bill acceptor);
- c. Door just closed; and
- d. Inappropriate coin-in if the inappropriate coin(s) in are not returned to the player.

- 8.2.2 EGMs must be capable of detecting and displaying the following conditions that must disable the game play and must only be cleared by an attendant and also communicated to an EGM management system if applicable:-

- a. Coin-in error (e.g. coin jam, reverse coin-in, etc.);
- b. Coin-out error (e.g. coin jam, extra coin paid out, etc.);
- c. Hopper empty or timed-out (hopper failed to make payment);
- d. Hopper runaway;
- e. Banknote-in jam;
- f. Low RAM battery for batteries external to the RAM itself or low power source;
- g. Uncorrectable RAM error (RAM defective or corrupted);
- h. Print failure, if the EGM has no other means to make a payout, a replacement voucher should be printed once the failure condition has been cleared;
- i. Printer mechanism paper jam. A paper jam condition must be monitored at all times during the print process;
- j. Printer mechanism paper out;
- k. Presentation error;
- l. Program error (Defective program storage media);
- m. Reel spin error of any type including a mis-index condition for mechanical reels. The specific reel number must be identified as part of the error condition and microprocessor controlled reels, if applicable, must 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 positions; and
- n. Removal of control program storage media;
 - o. Hopper jam;
 - p. Hopper failure;
 - q. External peripheral controller faults or disconnection;
 - r. Mechanical disconnection; and
 - s. Door open.

8.2.3 A description of tilt codes and their meanings must be affixed inside the EGM unless the displayed codes are self-explanatory.

9. Artwork Requirements

Objectives

This section provides requirements for artwork and displays associated with EGMs.

9.1 Artwork

- 9.1.1 All game instructions on the artwork must be accurate to how the actual game is being played, and must be easily interpreted, unambiguous, and sufficient to explain all game rules.
- 9.1.2 There must be sufficient game instructions to allow a player to determine the correctness of prizes awarded.
- 9.1.3 The pay table applicable to the game must contain sufficient information to allow a player to determine the prizes and must be clearly visible, or the means of displaying such information must be readily available to the player at any time a game is available to be played.
- 9.1.4 If any game instructions are on the video screen only, they must be accessible and visible without the need for credits to be inserted or bet. This requirement does not apply during game play except where specific instructions should be required to proceed to the next stage of the game.
- 9.1.5 Game instructions that are presented aurally must also be provided by visual instructions.
- 9.1.6 Game instructions must be printed in a colour that contrasts with the background colour to ensure that all instructions are clearly readable.
- 9.1.7 The message “Malfunction Voids All Pays and Plays” must be clearly and permanently displayed on each EGM at all times, except during audit and test modes.

9.1.8 The coin input denomination and tokenisation of the game must be stated using the message “\$Y = Z Credits” or “Y¢ = Z Credits” (where Y is the token value and Z is the number of credits for each token) regardless of whether or not the game is tokenised.

For example, a 5¢, \$1 tokenised game must have the message “\$1 = 20 Credits” displayed and a 20¢ non-tokenised game must have the message “20¢ = 1 Credit”.

(Note: The correct unit of currency should be used in this clause if the local currency is not in dollars and cents.)

10. Specific Requirements

Objectives

This section is meant to address any jurisdictional-specific requirements.

