

BERMUDA CASINO GAMING COMMISSION (BCGC)



BCGC-2 LINKED JACKPOT STANDARDS

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GLI®

BCGC-2 Linked Jackpot Standards

ABOUT THIS STANDARD

This equipment standard has been produced by **Gaming Laboratories International, LLC (GLI)** for the purpose of providing independent technical analysis and/or certifications to gaming industry stakeholders for Bermuda indicating the state of compliance for linked jackpot arrangements with the requirements set forth herein.

This document is intended to be used by casino operators and industry suppliers as a compliance guideline for technologies pertaining to linked jackpot arrangements for Bermuda. This standard is not intended to represent a set of prescriptive requirements that every linked jackpot arrangement shall comply with; however, it does establish a standard regarding the technologies used to facilitate these operations.

Suppliers are expected to submit equipment with a request that it be certified in accordance with this equipment standard. Upon completion of testing, the independent testing laboratory will provide a certificate of compliance evidencing the certification to this Standard.

Chapter 1: Introduction to Linked Jackpots

1.1 Introduction

1.1.1 General Statement

This equipment standard has been developed by reviewing and using portions of the GLI-12 Standards for Progressive Gaming machines with revisions specific to the legislation of the Territory of Bermuda and the regulations enacted by the Bermuda Casino Gaming Commission (hereafter the “Commission”).

1.2 Purpose of Equipment Standards

1.2.1 General Statement

The purpose of this equipment standard is as follows:

- a) To eliminate subjective criteria in analyzing and certifying the regulated operations of linked jackpot arrangements.
- b) To test the criteria that impact the credibility and integrity of a linked jackpot arrangement from both the revenue collection and security perspective.
- c) To create a standard that will ensure that linked jackpot arrangements are fair, secure, and able to be audited and operated correctly.
- d) To distinguish between Bermuda public policy and independent testing laboratory criteria. It is up to the Commission to set public policy with respect to linked jackpot arrangement.
- e) To recognize that non-gaming testing (such as electrical testing) should not be incorporated into this standard but left to appropriate test laboratories that specialize in that type of testing. Except where specifically identified in this standard, testing is not directed at health or safety matters. These matters are the responsibility of the manufacturer, purchaser, and operator of the linked jackpot arrangement.
- f) To construct a standard that can be easily revised to allow for new technology.
- g) To construct a standard that does not specify any particular design, method, or algorithm. The intent is to allow a wide range of methods to be used to conform to the standards, while at the same time encourage new methods to be developed.

1.2.2 No Limitation of Technology

One should be cautioned that this document shall not be read in such a way that limits the use of future technology. This document should not be interpreted to mean that if the technology is not mentioned, then it is not allowed. To the contrary, the Commission will review this standard and make changes to incorporate minimum standards for any new and related technology.

1.3 Other Documents That May Apply

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1.3.1 Other Equipment Standards

This equipment standard covers the requirements for linked jackpot arrangements. Depending on the technology utilized by a linked jackpot arrangement, additional equipment standards may also apply.

1.3.2 Legislated Acts or Regulations

This equipment standard must not contradict any provisions of the following legislation:

- a) Casino Gaming Act, 2014; and
- b) Casino Gaming Regulations, 2018.

1.4 Interpretation of this Document

1.4.1 General Statement

This equipment standard applies to linked jackpot arrangements involving monetary awards or “payoffs” which increase according to the credits wagered in the game, also known as progressive jackpots. Linked jackpot arrangements involving jackpots which increase through other methods will be reviewed on a case-by-case basis.

NOTE: This equipment standard does not apply to awards of restrictive incentive credits, fixed awards or bonus prizes, bonuses/features which offer awards which may increase over a single game cycle or, static awards whose probabilities of triggering change as the game is played. This section also does not apply to persistence game features which increase as the game is played (e.g., number of free games, multipliers, several achievements towards the activation of a bonus/feature or the issuance of an award, etc.) or “levels” of static awards available to be won based on patron experience and/or achievements.

1.4.2 Linked Jackpot Implementations

A linked jackpot is a jackpot which is linked to multiple instances of gaming equipment contributing to a common payoff schedule. Linked jackpots may either be linked

- a) Exclusively within an individual casino premises; or
- b) Between multiple casinos through an inter-casino linked system. Pursuant to section 97 of the Act, inter-casino linked jackpots are only permitted with written authorisation from the Commission

NOTE: When referenced within this document, the term "gaming equipment" refers to any gaming machine (including an electronic table game) or device used in connection with the operation of a table game that is intended to award or contribute to a jackpot.

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Chapter 2: Jackpot Requirements

2.1 Introduction

2.1.1 General Statement

The requirements of this chapter, unless otherwise indicated, apply to all forms of jackpots and their components, which may be internal or external to the gaming equipment.

2.2 Jackpot Display Requirements

2.2.1 Jackpot Display

The Jackpot Display is a mechanical, electrical, or electronic device, including the video display incorporated into the gaming equipment, if applicable, which is used to indicate the jackpot information in credits or the local currency format to all players who are playing a game which may potentially trigger the award. Where this information is not displayed directly by the gaming equipment, an External Jackpot Display shall be used for this purpose and shall also meet the requirements for "External Jackpot Displays".

- a) As games are played, the current jackpot award amount or "payoff" shall be updated at least every 30 seconds from the incrementing game event to reasonably reflect the actual size of the payoff. The use of odometer and other "paced" updating displays are allowed.
- b) If the jackpot offers a "mystery payoff" where the actual payoff is not displayed to the player, the Jackpot Display shall clearly indicate information describing the feature, including the following:
 - i. The minimum mystery payoff amount, if this amount is a non-zero value;
 - ii. The maximum mystery payoff amount, if this amount is a fixed value; and
 - iii. If the mystery payoff amount when awarded depends on credits wagered, or any other factors.

2.2.2 Display Digital Limitations

Where the Jackpot Display has a maximum display limitation (i.e. it could only display a certain number of digits), a maximum payoff limit or "ceiling" shall be required and shall meet the requirements for "Maximum Payoff Limits".

2.2.3 Alternating Displays

Where multiple items of information are displayed on the Jackpot Display, it is acceptable to have this information displayed in an alternating fashion provided that, the rate at which information alternates permits a player a reasonable opportunity to read each item.

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2.3 Design and Operation

2.3.1 Jackpot Games

In addition to the requirements specified in this section, games with jackpots shall comply with the “Game Requirements” of the BCGC-1 Gaming Machine Standards.

2.3.2 Jackpot RTP Calculations

For jackpots used in the return to player (RTP) calculations for the game, the minimum percentage requirement of eighty three percent (83%), shall be met using the lowest available parameters for the jackpot during the expected lifetime of the game.

NOTE: At the discretion of the Commission, the independent testing laboratory can apply an alternative approach to RTP calculations.

2.3.3 Jackpot Odds

Pursuant to Regulation 30(9), where several games are connected to the same payoff schedule:

- a) If the games are played using the same denomination, they shall have equivalent odds of winning the payoff schedule based, as applicable, on either or both of the combined influence of the attributes of chance and skill; and
- b) If the games are played using different denominations:
 - i. They shall equalize the expected value of winning the payoff schedule on the various denominations by setting the odds of winning the payoff schedule in proportion to the amount wagered based, as applicable:
 - 1) on either or both the combined influence of the attributes of chance and skill; or
 - 2) by requiring the same wager to win the payoff schedule regardless of the denomination; and
 - ii. the method of equalizing the expected value of winning the payoff schedule shall be conspicuously displayed on all gaming equipment connected to the payoff schedule.

NOTE: For the purposes of this requirement, a variance is acceptable of no greater than five percent (5%) for *expected value* and no greater than a one percent (1%) tolerance on the expected RTP *or payback*.

2.3.4 Maximum Payoff Limits

If a maximum payoff limit or “ceiling” is supported by the jackpot, once the payoff reaches its ceiling, it shall remain at that value until awarded to a player.

- a) Where required by the Commission, all additional contributions shall be credited to an overflow or diversion pool.

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- b) Where disclosed to the player in the artwork, the displayed ceiling amount shall be accurate.

NOTE: If not displayed directly by the artwork, it is the responsibility of the operator to provide the ceiling amount to players via stickers, decals, external signage, forms, or brochures available at the casino where required by the Commission.

2.3.5 Jackpot Time Limits

If a jackpot supports the ability to limit the time the jackpot is available, where disclosed to the player in the artwork, the displayed time limits shall be accurate.

NOTE: If not displayed directly by the artwork, it is the responsibility of the operator to provide information on time limits to players via stickers, decals, external signage, forms, or brochures available at the casino where required by the Commission.

2.3.6 Jackpot Diversion

A Jackpot Diversion Scheme, where a portion of the jackpot contributions are diverted to another pool or “diversion pool” to be used as needed by the design of the jackpot (e.g., the diversion pool may be added to the reset value of the next jackpot or be used to pay simultaneous wins of a jackpot), may be used where allowed by the Commission and if supported, shall meet the following requirements:

- a) A Jackpot Diversion Scheme shall be able to be implemented such that it does not have a mathematical expectation of infinity.
- b) Diversion pools shall not be truncated. Diverted contributions once that diversion pool has reached its upper limit shall be accounted for.
- c) Where a diversion pool is used to fund the reset value of a jackpot, the reset value shall assume an empty diversion pool for the purposes of RTP calculations.

2.3.7 Jackpot Wins

Jackpots may be awarded based on obtaining winning symbols, or by other criteria, such as mystery-triggered jackpots, bad-beat jackpots, etc. When a jackpot is triggered:

- a) A winning player shall be notified of a jackpot win and its value, by the end of the game in play if internal to the game, or within 30 seconds if the jackpot is external to the gaming equipment.
- b) Jackpot awards may be added to the player’s credit meter if either:
 - i. The credit meter is maintained in the local currency amount format;
 - ii. The jackpot amount is incremented in whole credit amounts; or
 - iii. The jackpot award in local currency amount format is converted properly to credits upon transfer to the credit meter in a manner that does not mislead the player.
- c) Where the jackpot awards are not automatically added to the player’s credit meter (e.g., awards exceeding any jurisdictional limit, including a taxation limit), the game

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shall cease play, display an appropriate message, and require intervention by appropriate personnel to resolve player payment.

- d) The Jackpot Display shall update to the reset value (unless the jackpot offers a "mystery payoff") and continue normal operations.

NOTE: A jackpot may be disabled concurrent with the winning of the jackpot if the game was configured to automatically establish a fixed reset amount with no increment.

2.3.8 Mystery-Triggered Jackpots

For mystery-triggered jackpots which use a hidden trigger amount to determine the jackpot:

- a) The hidden trigger amount shall be set randomly upon each reset and shall have an equal probability of triggering at any value between the reset value and the ceiling.
- b) The hidden trigger amount shall remain unknown at all times and it shall not be possible to gain access to or knowledge of the hidden trigger amount at any time.

2.3.9 Swapping Jackpot Levels

For jackpots offering multiple levels of awards, when a single winning combination may be evaluated as more than one of the available payable combinations, unless otherwise explicitly defined in the game rules, the player shall always be paid the highest possible value based on all combinations to which the outcome may correlate (e.g., if "Jackpot A" is awarded for five aces on a payline and "Jackpot B" is awarded for four aces on a payline, and "Jackpot B" has a larger award than "Jackpot A", the player shall be awarded the payoff for "Jackpot B" if the player obtains an outcome of five aces on a payline).

2.3.10 Jackpot Awards Paid Over Time

For jackpots awards which are paid over time (instead of one lump sum), such rules, if displayed in the artwork, shall accurately specify that the displayed payoff will be paid over time as well as the period covering the payments.

NOTE: If not displayed directly by the artwork, it is the responsibility of the operator to provide payment period information to players via stickers, decals, external signage, forms, or brochures available at the casino where required by the Commission.

2.3.11 Jackpot Disable

For cases where a jackpot is disabled (e.g., attendant intervention, error condition, time limit has expired, etc.), the following requirements shall apply:

- a) An indication shall be displayed when the jackpot is not available.
- b) It shall not be possible for the jackpot to be incremented or won while in this state.

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- c) Upon resumption of the jackpot from the disabled state, it shall be possible to return the jackpot with the identical parameters as before the disable, including the payoff.
- e) For mystery-triggered jackpots which use a hidden trigger amount to determine the jackpot win, the hidden trigger amount may be reselected upon resumption of the jackpot from the disabled state if the reselected amount is in the range of the payoff to the ceiling.

NOTE: It is recommended that if the minimum percentage requirement as specified within the "[Jackpot RTP Calculations](#)" section is no longer met when the jackpot is not available, the participating game shall also be disabled.

2.4 Jackpot Controller Requirements

2.4.1 General Statement

The requirements of this section are intended to apply equally to Jackpot Controllers integrated within the gaming equipment (e.g., within the critical control program of a gaming machine), within linked jackpot equipment (External Jackpot Controllers) or a combination of the two.

2.4.2 Monitoring of Game Play

The Jackpot Controller shall ensure the processing of contributions is accurate. If the detection of unreasonable contributions is supported by the Jackpot Controller, such contribution(s) shall be ignored and the affected game(s) shall be disabled.

2.4.3 Jackpot Parameters

The method by which parameter values for each jackpot are entered, viewed, and modified shall be via secure method accessible only to authorized personnel. The following parameters for each jackpot offered shall be maintained in critical non-volatile (NV) memory of the Jackpot Controller, and shall be displayed on demand:

- a) Where multiple game themes reside on the gaming equipment, identification of the participating game theme(s) unless all game themes are participating;
- b) The participating gaming equipment ID(s);
- c) Current value of the jackpot (payoff);
- d) Any other pools containing jackpot contributions, as applicable:
 - i. Current value of amount exceeding ceiling, where required by the Commission (overflow);
 - ii. Current value of the Jackpot Diversion Scheme (diversion pool);
- e) Reset value of the current jackpot if different from startup value (reset value);
- f) Where such parameters are configurable after initial setup, as applicable:
 - i. Initial value of the jackpot (startup value);
 - ii. Percentage increment rate (increment);
 - iii. Jackpot limit value (ceiling);

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- iv. Percentage increment rate after ceiling is reached (secondary increment);
- v. Percentage increment rate for diversion pool (hidden increment);
- vi. Diversion pool limit value (diversion limit);
- vii. The odds of triggering the jackpot (odds); and
- viii. Any parameters which indicate time periods the jackpot is available for triggering (time limit).

NOTE: It is expected that for non-configurable parameters not displayed by the Jackpot Controller, there will be documentation available to the operator indicating such static values. For Inter-Casino Linked Systems, the configurable and non-configurable parameters of this section must be maintained as specified in the "[Information to be Maintained](#)" section in this document.

2.4.4 Progressive Jackpot Transfers

The Jackpot Controller shall contain a secure means for transferring or combining payoffs from a disabled progressive jackpot, correcting errors, or any other reasons required by the Commission.

2.5 Jackpots with Configurable Parameters

2.5.1 General Statement

In addition to the other requirements within this chapter, the requirements of this section only apply to jackpots with parameters which are configurable after initial setup.

2.5.2 Changes to Parameters

The following requirements apply to modifying parameter values once the jackpot has already had player contributions to it:

- a) For jackpots with a configurable increment rate, changes to the increment rate may not take effect until the current jackpot is won.
- b) For jackpots with a configurable ceiling, changes to the ceiling may only be to a value greater than the current payoff. Alternatively, changes to the ceiling may not take effect until the current jackpot is won.
- c) Changes to the parameters shall not affect the probabilities of triggering the current jackpot.
- d) For mystery-triggered jackpots which use a hidden trigger amount to determine the jackpot win:
 - i. The hidden trigger amount shall be reselected when modifying any parameters that could result in an immediate trigger due to the modification.
 - ii. The reselected amount shall be in the range of the payoff to the ceiling and shall not result in a trigger without any contribution after the modification.

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2.5.3 Meters and Reconciliation

Sufficient meters to properly reconcile each configurable jackpot offered shall be maintained in critical NV memory of the Jackpot Controller and shall be displayed on demand. Each configurable progressive jackpot shall be reconcilable using the following meters:

- a) The number of times the progressive jackpot has been awarded; and
- b) The total value of progressive jackpots won, including, as applicable and as required by the Commission, a separation of amounts paid directly by the gaming equipment and attendant paid amounts.

2.6 Linked Jackpots

2.6.1 General Statement

In addition to the other requirements within this chapter, the requirements of this section only apply to linked jackpots.

2.6.2 Jackpot Triggers for Multiple Players

The linked jackpot shall be designed to accurately identify and record the order of triggers when multiple players trigger at nearly the same time, such that the full amount of the displayed payoff can be awarded to winning player who triggered first. When this is not possible or if it's possible that multiple players trigger at the exact same time (e.g. in a multi-player game), one of the following shall occur:

- a) The full amount of the displayed payoff shall be awarded to each winning player; or
- b) Accurate information on how the payoff is distributed shall be disclosed to the player.

NOTE: If not displayed directly by the artwork, it is the responsibility of the operator to provide how the payoff is distributed to players via stickers, decals, external signage, forms, or brochures available at the casino where required by the Commission.

2.6.3 Internal Linked Jackpot Controllers

Where the Jackpot Controller is internal to the gaming equipment, only one instance of gaming equipment on the link at a time shall function as the primary Jackpot Controller. If the instance of gaming equipment configured as the primary Jackpot Controller becomes inoperative the linked jackpot(s) shall be disabled and the requirements specified in the "[Jackpot Disable](#)" section of this document shall be met unless another instance of gaming equipment has been immediately established as the primary Jackpot Controller.

Chapter 3: Linked Jackpot Equipment Requirements

3.1 Introduction

3.1.1 General Statement

This chapter sets forth additional technical requirements for linked jackpot equipment, such as External Jackpot Displays and External Jackpot Controllers, including, Inter-Casino Linked Systems, and Table Game Jackpot Systems used with live table games as applicable.

3.2 Jackpot Software Requirements

3.2.1 Software Identification

Linked jackpot equipment software shall contain sufficient information to identify the software and its version.

3.2.2 Independent Software Verification

It shall be possible to perform an independent integrity check of all jackpot software that affects the integrity of the linked jackpot arrangement from an outside source. This verification shall be accomplished by being authenticated by a third-party application run from the linked jackpot equipment, by allowing a third-party device to authenticate the media, or by allowing for removal of the media such that it can be verified externally. The independent testing laboratory, prior to software approval, shall evaluate the integrity check method.

3.2.3 Random Number Generator (RNG) Requirements

Random Number Generators (RNGs) used by the linked jackpot equipment software shall comply with the "Random Number Generator (RNG) Requirements" of the *BCGC-1 Gaming Machine Standards*.

3.3 Jackpot Hardware Requirements

3.3.1 General Statement

All proprietary hardware of the linked jackpot equipment shall meet the applicable requirements within this section. Unless otherwise directed by the Commission, these requirements do not apply to linked jackpot equipment that solely utilizes unaltered commercial off-the-shelf (COTS) components, such as a PC or a display/monitor. For linked jackpot equipment that utilizes modified off-the-shelf (MOTS) components, these requirements will apply only to the modifications made to the components.

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NOTE: It is expected that the linked jackpot equipment hardware is installed in a secure location allowing only authorized access.

3.3.2 Player Safety

For linked jackpot equipment hardware which is accessible by a player (e.g. External Jackpot Displays), the electrical and mechanical parts and design principles of the jackpot hardware shall not subject a player to any physical hazards.

3.3.3 Custom and Modified Hardware

This section only applies to custom and modified linked jackpot equipment hardware which has the potential to influence the linked jackpot arrangement.

- a) Each PCB shall be clearly identifiable by an alphanumeric identification and, when applicable, a revision number. If track cuts, patch wires, or other circuit alterations are introduced to the PCB, then a new revision number shall be assigned.
- b) Any switches and/or jumpers shall be fully documented for evaluation by the independent testing laboratory.
- c) Wired communication ports shall be clearly labeled.

3.3.4 Touch Screen Displays

Touch screen displays, if in use by the linked jackpot equipment hardware (e.g. for Table Game Jackpot Systems), shall be accurate, and if required by their design, shall support a calibration method to maintain that accuracy; alternatively, the display hardware may support automatic self-calibration.

3.4 External Jackpot Displays

3.4.1 General Statement

In addition to the “[Jackpot Display Requirements](#)” of the last chapter, as well as the hardware and software requirements within this chapter, the requirements of this section apply to External Jackpot Displays.

3.4.2 Display Resolution

If an External Jackpot Display is equipped with a configurable display/monitor, the resolution of the configured External Jackpot Display shall:

- a) Be compatible with one or more of the resolutions supported by the software in a manner that ensures the intended function of the display; and
- b) Not clip or fail to display any required jackpot information.

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3.4.3 Display Error

If a malfunction or a communication loss with the External Jackpot Display has been identified, an error shall be indicated to all affected players and/or the appropriate personnel. If a payoff, which may be incorrect, is still displayed, the malfunction or communication loss shall clearly be indicated on the External Jackpot Display.

3.5 External Jackpot Controllers

3.5.1 General Statement

In addition to the "[Jackpot Controller Requirements](#)" of the last chapter, as well as the hardware and software requirements within this chapter, the requirements of this section apply to External Jackpot Controllers.

3.5.2 Linked Jackpot Arrangement

The External Jackpot Controller shall hand the functions of the Linked Jackpot Arrangement, which shall:

- a) record, from time to time, an amount which, in the event of a jackpot or other result being obtained on one of those games, may be payable, or part of which may be payable, as winnings;
- b) for the purpose of recording the amount referred to in paragraph (a), receive data from each game on gaming equipment to which the linked jackpot equipment is linked; and
- c) not be capable of affecting the outcome of a game on gaming equipment to which the linked jackpot equipment is linked.

3.5.3 Software Validation

The External Jackpot Controller shall verify that all critical components contained in the External Jackpot Controller are valid each time the software is loaded for use and upon recovery from a program interruption. Critical components may include, but are not limited to, jackpot functionality, elements that control the communications between the External Jackpot Controller and the gaming equipment, or other components that are needed to ensure proper operation of jackpots.

- a) The authentication shall employ a hash algorithm which produces a message digest of at least 128 bits. Other test methodologies shall be reviewed on a case-by-case basis.
- b) In the event of a failed authentication (i.e., program mismatch or authentication failure), the External Jackpot Controller shall cease operation and the requirements specified in the "[Controller Error Conditions](#)" section of this chapter shall be met.

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NOTE: Program verification mechanisms will be evaluated on a case-by-case basis and approved by the Commission and the independent testing laboratory based on industry-standard security practices.

3.5.4 Integrity of Protocol Communications

The External Jackpot Controller shall utilize a robust bidirectional communication protocol which ensures that erroneous data or signals do not adversely affect the integrity or operation of the jackpot. In addition, the following rules shall be met:

- a) The External Jackpot Controller shall accurately function as indicated by the communications protocol that has been implemented.
- b) The External Jackpot Controller shall be designed or programmed such that it:
 - i. Ensures proper communications of jackpot information with the participating gaming equipment; and
 - ii. Constantly updates the Jackpot Display(s) as game play is continued.
- c) If the communication is lost between the gaming equipment and the External Jackpot Controller is lost, the gaming equipment shall identify the loss in communication and the affected game(s) shall be disabled. It is permissible for the gaming equipment to detect this error when it tries to communicate with the External Jackpot Controller.

3.5.5 Controller Error Conditions

When an External Jackpot Controller error occurs, an appropriate error message shall be made visible to all affected players and/or the appropriate personnel shall be made aware of the error. In addition, the jackpot(s) shall be disabled and the requirements specified in the "[Jackpot Disable](#)" section of this document shall be met:

- a) Program verification or critical NV memory error;
- b) Communication failure (when communication with all participating gaming equipment is lost);
- c) Jackpot configuration lost or not set;
- d) Unreasonable contribution detected (where such detection is supported); and
- e) Controller meters do not reconcile against gaming equipment meters (where reconciliation between the meter sets is supported).

3.5.6 Interruption and Recovery

After a program interruption, the External Jackpot Controller shall be able to recover to the state it was in immediately prior to the interruption occurring once communications with all components necessary for jackpot operation have been established and similarly authenticated. These communications shall not begin until the program resumption routine, including any self-test, is completed successfully.

3.5.7 Information to be Maintained

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The information to be maintained by the External Jackpot Controller for each jackpot offered shall include:

- a) Unique jackpot ID;
- b) The date and time the jackpot was made available;
- c) The "[Jackpot Parameters](#)" specified in this document;
- d) For each jackpot awarded:
 - i. The date and time of jackpot trigger;
 - ii. Jackpot hit and payoff amount;
 - iii. Winning gaming equipment ID;
 - iv. Where multiple game themes reside on the gaming equipment, identification of the winning game theme;
 - v. Location of gaming equipment (if known);
 - vi. Identification of user(s) who processed and/or confirmed the win (as applicable);
- e) The jackpot's current status (active, disabled, etc.); and
- f) The date and time for any change to the jackpot's parameters or status, including values before and after the change, and who performed the change (user identification).

Chapter 4: Inter-Casino Linked System Requirements

4.1 Introduction

4.1.1 General Statement

In addition to other requirements in this document for External Jackpot Controllers, the requirements of this chapter apply to Inter-Casino Linked Systems. Pursuant to section 97 of the Act, inter-casino linked jackpots are only permitted with written authorisation from the Commission

- a) The independent testing laboratory will test and certify the components of the Inter-Casino Linked System in accordance with the chapters of this technical standard within a controlled test environment, as applicable. Any of these requirements which necessitate additional operational procedures in place to meet the intent of the requirement shall be documented within the evaluation report and used to supplement the scope of the operational audit.
- b) The integrity and accuracy of the operation of a Inter-Casino Linked System is highly dependent upon operational procedures, configurations, and the production environment's network infrastructure. In addition to the testing and certification of Inter-Casino Linked System components, the Commission may elect to require a periodic operational audit be conducted, using the recommended scope outlined within the appendix for "[Operational Audit for Inter-Casino Linked Jackpots](#)".

4.2 Components of an Inter-Casino Linked System

4.2.1 Inter-Casino Linked System Controllers

The Inter-Casino Linked System typically contains the following controllers. The Inter-Casino Linked System as a whole and all communication between its controllers shall conform to the applicable technical requirements within this document:

- a) The Central Controller receives the contributions from the Local Controllers, increment the current jackpot payoff, and communicates the payoff to the Local Controllers and, where directly connected to the Central Controller, the Jackpot Display(s), at each casino.
- b) The Local Controllers for each casino receives the contributions from the connected gaming equipment and communicates them to the Central Controller. Once the current payoff has been received from the Central Controller, the Local Controllers updates the Jackpot Display(s), unless they are directly connected to the Central Controller.

NOTE: Cases where gaming equipment directly connects to the Central Controller are also acceptable.

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4.2.2 Time Synchronization

There shall be a means of synchronizing the time and dates of the Local Controllers with the Central Controller.

4.3 Communications Between Controllers

4.3.1 Inter-Casino Linked System Communication

Inter-Casino Linked Systems shall ensure that the following jackpot data is communicated at least once every 60 seconds between the Central Controller, Local Controllers, and gaming equipment:

- a) Contributions to the jackpot;
- b) Jackpot triggers (where the trigger occurs at the Central Controller);
- c) Changes to "[Jackpot Parameters](#)"; and
- d) Changes to the jackpot's status (active, disabled, etc.).

4.3.2 Inter-Casino Linked Jackpot Triggers

In addition to the "[Jackpot Wins](#)" section in this document, the following requirements apply when the inter-casino linked jackpot is triggered:

- a) If the trigger occurs external to the Central Controller, the Central Controller shall be made aware of the trigger as soon as possible. Once the trigger is acknowledged by the Central Controller:
 - i. A message shall be sent to the winning Local Controller containing the win, its value, and the reset value; and
 - ii. A message shall be sent to the other Local Controllers containing the reset value.
- b) If the trigger is recognized in the middle of a system-wide polling cycle, the Jackpot Display may contain a value less than the aggregated payoff amount calculated by the Central Controller. The credit values from the remaining portion of the polling cycle will be received by the Central Controller but not the Local Controller, in which case the jackpot amount paid will always be the higher of the two reporting amounts.

NOTE: Credits contributed to the system after the trigger occurs in real-time, but during the same polling cycle, shall be deemed to have been contributed to the payoff amount prior to the trigger. Credits contributed to the system after the trigger message being received, as well as credits contributed to the system before the trigger message is received by the system but registered after the trigger message is received at the system, will be deemed to have been contributed to the payoff amount of the next jackpot, if applicable.

4.3.3 Inter-Casino Meter Readings

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When requested to do so, the Central Controller shall receive readings of any meters used in the calculation of the jackpot's rate of progression from all Local Controllers attached to the system in real-time in an automated fashion. The Central Controller's meter readings shall be identical to the gaming equipment connected to the Local Controller's meters.

NOTE: The purpose of this meter reading is to verify and compare the jackpot amount(s) in conjunction with the rate of progression. Manual reading of meter values shall not be substituted for these requirements.

4.3.4 Inter-Casino Communication Failure

The following requirements will apply when there is an unexpected loss in communication:

- a) If the communication is lost between the gaming equipment and the Local Controller, the gaming equipment shall identify the loss in communication and the affected game(s) shall be disabled. It is permissible for the gaming equipment to detect this error when it tries to communicate with the Local Controller.
- b) If the communication is lost between the Local Controller and the Central Controller, game play may continue provided that:
 - i. The jackpot data from all affected games connected to the Local Controller is buffered;
 - ii. Once the Local Controller's buffer is full, the affected game(s) shall be disabled; and
 - iii. Once communication with the Central Controller is reestablished, the Local Controller shall accurately relay all buffered jackpot data to the Central Controller and the system-wide totals shall be updated.

4.4 Information and Reporting

4.4.1 Inter-Casino Linked Jackpot Reports

The Inter-Casino Linked System shall be able to provide the information needed to compile the following reports:

- a) Error Conditions Report. A report indicating the "[Controller Error Conditions](#)" as defined in this document for each component of the system, including date, time, and description of error (including component);
- b) Summary Report. A report indicating, for each jackpot offered, the amount of, and basis for, the current progressive jackpot amount (the amount currently in play);
- c) Aggregate Report. A report indicating the balancing of the system with regard to system-wide totals; and
- d) Payoff Report. A report indicating the method of arriving at the payoff amount previously paid for each jackpot offered.

Appendix A: Operational Audit for inter-casino linked jackpots

A.1 Introduction

A.1.1 General Statement

This appendix sets forth recommended technical security controls, procedures and practices for inter-casino linked jackpots which, if required by the Commission, will be reviewed in an periodic operational audit, including, but not limited to, managing inter-casino linked jackpots, review of the operational processes that are critical to compliance, storing and/or processing jackpot data, and any other objectives established by the Commission.

NOTE: It is also recognized that additional security controls, procedures and practices which are not specifically included within this standard may be relevant and required for an operational audit as determined by the casino operator and/or Commission within their rules, regulations, and Minimum Internal Control Standards (MICS).

A.2 Procedures and Practices

A.2.1 Internal Control Procedures

The casino operator shall establish, maintain, implement and comply with internal control procedures for inter-casino linked jackpots, including the following:

- a) Central Controller location, specifications, and operational procedures;
- b) Method of secured communication within the inter-casino linked jackpot environment between participating gaming equipment, casinos, and systems;
- c) Details of inter-casino linked jackpot seeding arrangements, ceiling values, increment rates, reconciliation, and monitoring arrangements;
- d) Contribution rates, including information sufficient to ensure the accurate accounting of contributions to the inter-casino linked jackpot;
- e) Method and process for monitoring meter readings and error events;
- f) The independent reconciliation of meters and inter-casino linked jackpot awards;
- g) Inter-casino linked jackpot adjustments and transfers;
- h) inter-casino linked jackpot verification and payment procedures, including disbursement options for payoffs and information for periodic payments;
- i) Payment of inter-casino linked jackpots when multiple jackpot triggers occur and there is no definitive way of knowing which trigger occurred first (unless it's handled automatically by the Inter-Casino Linked System);
- j) Inter-casino linked jackpot discontinuation procedures, including procedures for distribution of contributions to another inter-casino linked jackpot or return of pro rata shares to participating casinos;
- k) The collection drop of gaming equipment funds;
- l) Inter-Casino Linked System maintenance, accuracy, security, and failures including:

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- i. The Central Controller and Local Controllers;
- ii. Failures in communications; and
- iii. Backup and recovery.

A.2.2 Inter-Casino Linked Jackpot Accounting

Where inter-casino linked jackpot contributions are part of the return to player (RTP) calculations, the contributions shall not be assimilated into revenue. The Casino operator shall have procedures in place to perform adequate reconciliation to ensure that all inter-casino linked jackpot increments deducted:

- a) Have been paid to players as inter-casino linked jackpot payoffs;
- b) Are displayed as part of inter-casino linked jackpot payoffs; or
- c) Are held in separate accounts, which can be demonstrated to be paid to players as part of future inter-casino linked jackpot payoffs.

A.3 Technical Security Controls

A.3.1 Physical Location of Controllers

The Inter-Casino Linked System components shall be housed in a secure environment which shall:

- a) Have sufficient protection against alteration, tampering or unauthorized access; and
- b) Be equipped with a surveillance system that shall meet the procedures put in place by the Commission.

A.3.2 Logical Access Control

The inter-casino linked jackpot arrangement shall be logically secured against unauthorized access by authentication credentials allowed by the Commission, such as passwords, multi-factor authentication, digital certificates, PINs, biometrics, and other access methods (e.g., magnetic swipe, proximity cards, embedded chip cards).

A.3.3 Communications

The inter-casino linked jackpot arrangement shall use communication techniques that have proper error detection and recovery mechanisms, which are designed to prevent intrusion, interference, eavesdropping and tampering. Any alternative implementations will be reviewed on a case-by-case basis.

A.3.4 Inter-Casino Encryption Method

The inter-casino linked jackpot arrangement shall utilize an encryption method which includes the use of different encryption keys so that encryption algorithms can be

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changed or replaced as soon as practical. Other methodologies shall be reviewed on a case-by-case basis.

A.3.5 Storage Medium Backup

Audit logs, system databases, and any other pertinent jackpot data specified in the under the section entitled "[Information to be Maintained](#)" shall be stored using reasonable protection methods for a period of five years or as otherwise specified by the Commission. The inter-casino linked jackpot arrangement shall be designed to protect the integrity of this data in the event of a failure. Redundant copies of this data shall be kept on the Inter-Casino Linked System with open support for backups and restoration, so that no single failure of any portion of the system would cause the loss or corruption of data.

A.3.6 Uninterruptible Power Supply (UPS) Support

All components in the inter-casino linked jackpot arrangement shall be provided with adequate primary power. Where the Inter-Casino Linked System is a stand-alone application, it shall have an Uninterruptible Power Supply (UPS) connected and shall have sufficient capacity to permit a graceful shut-down and that retains all inter-casino linked jackpot data during a power loss. It is acceptable that the system may be a component of a network that is supported by a network-wide UPS provided that the system is included as a component protected by the UPS. There shall be a surge protection system in use if not incorporated into the UPS itself.

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Glossary of Key Terms

Algorithm – A finite set of unambiguous instructions performed in a prescribed sequence to achieve a goal, especially a mathematical rule or procedure used to compute a desired result. Algorithms are the basis for most computer programming.

Artwork – The graphics, thematic art, helpscreens, and other textual information that is shown to a player by way of a game's payglass and/or video display(s).

Authentication – Verifying the identity of a user, process, software package, or device, often as a prerequisite to allowing access to resources in a system.

Biometrics – A biological identification input, such as fingerprints or retina patterns.

Casino Operator – A person who is the holder of a casino licence.

Central Controller – A component of the Inter-Casino Linked System which receives the contributions from the Local Controllers and increments the current jackpot payoff, then communicates it to the Local Controllers at each casino.

Commission – The Bermuda Casino Gaming Commission

Contributions – The financial method by which jackpot pools are funded.

Credit Meter – A meter which maintains the credits or cash available to the player for the commitment of a wager.

Critical Component – Any sub-system for which failure or compromise can lead to loss of player entitlements, government revenue or unauthorized access to data used for generating reports for the Commission.

Critical Non-Volatile (NV) Memory – Memory used to store all data that is considered vital to the continued operation of the Linked Jackpot Arrangement.

Diversion Pool – The monies collected pursuant to a contribution schedule that are intended to be used for the funding of future jackpots or for other purposes.

Encryption – The conversion of data into a form, called a ciphertext, which cannot be easily understood by unauthorized people.

Encryption Key – A cryptographic key that has been encrypted in order to disguise the value of the underlying plaintext.

Electronic Table Game – A gaming machine used for the purpose of playing a game traditionally played at tables, and includes any electronic device through which bets may be placed on a game played at a table.

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Firmware – Programs stored permanently in read-only memory (ROM).

Gaming Equipment – means an electronic, electrical, or mechanical contrivance or machine or any device or thing (including chips) used, or capable of being used, for or in connection with gaming and betting and includes any of the following— a gaming machine; linked jackpot equipment or system; cashless wagering system; an electronic monitoring system; and a part of, or a replacement part for, any such machine, equipment or system; devices used in connection with the operation of table games, including but not limited to playing cards, chips and dice; a computerised betting system;

Gaming Machine (aka, machine, terminal) – means any device, whether wholly or partly mechanically or electronically operated, that is so designed that— it may be used for the purpose of playing a game of chance or a game of mixed chance and skill; and as a result of making a wager on the device, winnings may become payable;

Increment Rate – The configurable or hardcoded value used to increment the jackpot.

Independent Testing Laboratory – means a laboratory contracted by the Commission for the purposes of determining the suitability of gaming equipment.

Inter-Casino Linked Jackpot – A linked jackpot which is interconnected between multiple casinos through an Inter-Casino Linked System.

Inter-Casino Linked System – The hardware, software, communications technology and other associated equipment used to link and monitor games or machines located at different licensed casinos. The Inter-Casino Linked System contains the Central Controller and Local Controllers for each casino.

Jackpot – The combination of letters, numbers, symbols or representations required to be displayed on the reels or video screen of a gaming machine so that the winnings in accordance with the prize payout scale displayed on the machine are payable from money which accumulates as contributions are made to a special prize pool

Jackpot Controller – Software that takes contributions from one or more games and applies it to an incrementing award. When the proper condition or trigger occurs, the award is paid to a player. A Jackpot Controller may be integrated within the gaming equipment, external to the gaming equipment (External Jackpot Controllers) or both.

Jackpot Display – A mechanical, electrical, or electronic device, including the video display incorporated into the gaming equipment, if applicable, which is used to indicate the jackpot information.

Jackpot Diversion Scheme – A portion of the jackpot contributions are diverted to another pool or “diversion pool” to be used as needed by the design of the jackpot (e.g.,

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the diversion pool may be added to the reset value of the next jackpot or be used to pay simultaneous wins of a jackpot)

Key – A value used to control cryptographic operations, such as decryption, encryption, signature generation or signature verification.

Linked Jackpot – A jackpot which is linked to multiple instances of gaming equipment contributing to a common payoff schedule.

Linked Jackpot Arrangement – An arrangement or inter-casino linked system whereby two or more games are linked to linked jackpot equipment that —

- a) records, from time to time, an amount which, in the event of a jackpot or other result being obtained on one of those games, may be payable, or part of which may be payable, as winnings;
- b) for the purpose of recording the amount referred to in paragraph (a), receives data from each game on gaming equipment to which the linked jackpot equipment is linked; and
- c) is not capable of affecting the outcome of a game on gaming equipment to which the linked jackpot equipment is linked.

Linked Jackpot Equipment – Any jackpot meter, payout display, linking equipment, computer equipment, programming or other machine (other than a gaming machine) forming, or capable of forming, part of a linked jackpot arrangement.

Local Controller – A component of the Inter-Casino Linked System which receives the contributions from the connected games, communicates them to the Central Controller. Once the current payoff has been received from the Central Controller, the Local Controller then updates the Jackpot Display(s).

Multi-Factor Authentication – A type of authentication which uses two or more of the following to verify a user's identity: Information known only to the user (e.g., a password, pattern or answers to challenge questions); An item possessed by a user (e.g., an electronic token, physical token or an identification card); A user's biometric data (e.g., fingerprints, facial or voice recognition).

Overflow – Pool containing the contributions which exceed the jackpot ceiling.

Password – A string of characters (letters, numbers, and other symbols) used to authenticate an identity or to verify access authorization.

Paytable (aka, "variation") – 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.

Persistence Game – A game that is associated with a unique attribute (e.g., player ID, game or device ID, etc.) and incorporates a feature that enables progress towards the

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award of game play enhancements and/or bonuses through the achievement of some designated game outcome.

PIN, *Personal Identification Number* – A numerical code associated with an individual and which allows secure access to a domain, account, network, system, etc.

Pool – An accumulated reservoir of jackpot monetary contributions.

Progressive Jackpot – A monetary award or “payoff” that increases according to the credits wagered in the game.

Protocol – A set of rules and conventions that specifies information exchange between devices, through a network or other media.

Reset Value – The amount of a jackpot payoff initially offered before it increases.

RNG, *Random Number Generator* – A computational or physical device, algorithm, or system designed to produce numbers in a manner indistinguishable from random selection.

RTP, *Return to Player* – A ratio of the ‘total amount won’ to the ‘total amount wagered’ by a player. Such a return may be “theoretical” (based on mathematical calculations or simulations) or “actual” (based on the metering supported by a fielded game).

Startup Value – The initial jackpot value (does not include values from overflow or diversion pools).

Table Game Jackpot System – An External Jackpot Controller which offers a jackpot to all participating Gaming Tables.

Unauthorized Access – A person gains logical or physical access without permission to a network, system, application, data, or other resource.

Wager – Any commitment of credits or money by the player which has an impact on game outcome.

Wager Category – A term used to describe different bet options/levels available to the player in regards to the commitment of credits or money which could have an impact on game outcome.