GLI STANDARD SERIES

GLI-12:

STANDARDS FOR PROGRESSIVE JACKPOTS

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About This Standard

Gaming Laboratories International, LLC (GLI) has developed this technical standard for the purpose of providing independent technical analysis and/or certifications to gaming industry stakeholders indicating the state of compliance for gaming operations and systems with the requirements set forth herein.

Operators and suppliers are expected to provide documentation, credentials, and associated access to a production equivalent test environment with a request to the independent testing laboratory that it be evaluated in accordance with this technical standard. Upon the successful completion of testing, the independent testing laboratory will provide a certificate of compliance evidencing the certification to this standard.

GLI-12 should be viewed as a living document that will be tailored periodically to align with this developing industry over time as gaming implementations and operations evolve.

Table of Contents

Chapter 1: Introduction to Progressive Jackpots 4
1.1 Introduction 4
1.2 Purpose of Technical Standards 4
1.3 Other Documents That May Apply 5
1.4 Interpretation of this Document 6
Chapter 2: Progressive Jackpot Requirements 7
2.1 Introduction 7
2.2 Jackpot Displays and Information 7
2.3 Jackpot Games 8
2.4 Jackpot Design and Operation 9
2.5 Jackpot Management 12
2.6 Jackpot Controllers 13
Chapter 3: External Jackpot Component Requirements 16
3.1 Introduction 16
3.2 Jackpot Hardware Requirements 16
3.3 Jackpot Software Requirements 17
3.4 Jackpot Interface Elements 17
3.5 External Jackpot Displays 18
3.6 External Jackpot Controllers 18
Chapter 4: Multi-Site Jackpot System Requirements 22
4.1 Introduction 22
4.2 Components of a Multi-Site Jackpot System 22
4.3 Multi-Site Communications 23
4.4 Reporting Requirements 25
Glossary of Key Terms 26

Chapter 1: Introduction to Progressive Jackpots

1.1 Introduction

1.1.1 General Statement

Gaming Laboratories International, LLC (GLI) has been testing gaming equipment since 1989. Over the years, GLI has developed numerous technical standards utilized by jurisdictions all over the world. This document, *GLI-12*, sets forth the technical standards for Progressives Jackpots.

1.1.2 Document History

This document is a compilation based upon many standards documents from around the world. Some were written by GLI; others were written by industry regulators with input from independent test laboratories and gaming operators, developers, and suppliers. GLI has taken each of the standards documents and merged the unique rules, eliminated some rules and updated others, to reflect both the change in technology and the purpose of maintaining an objective standard that achieves common regulatory objectives without unnecessarily impeding technological innovation. It is the policy of GLI to update this document as often as warranted to reflect changes in technology and/or testing methods. This document will be distributed without charge and may be obtained by downloading it from the GLI website at www.gaminglabs.com or by contacting GLI at:

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1.1.3 Acknowledgment of Other Standards Reviewed

GLI acknowledges and thanks the regulatory bodies and other industry participants who have assembled rules, regulations, technical standards, and other documents which have been influential in the development of this document.

1.2 Purpose of Technical Standards

1.2.1 General Statement

The purpose of this technical standard is as follows:

a) To eliminate subjective criteria in analyzing and certifying progressive jackpot technologies.
b) To test the criteria that impact the credibility and integrity of gaming from both revenue collection and player perspectives.
c) To create a standard that will ensure gaming is fair, secure, auditable, and able to be operated correctly.

d) To distinguish between local public policies and Independent Test Laboratory criteria, acknowledging that it is the prerogative of each regulatory body to set its own public policies with respect to gaming.
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 progressive jackpot.
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. On the contrary, GLI will periodically review this standard and update it to include minimum standards for any new and relevant technology.

1.2.3 Adoption and Observance

This technical standard can be adopted in whole or in part by any regulatory body that wishes to implement a comprehensive set of requirements for progressive jackpots.

1.3 Other Documents That May Apply

1.3.1 Other GLI Standards

This technical standard covers the requirements for progressive jackpots. Depending on the technology utilized by a system or device, additional GLI technical standards may also apply.

NOTE: The entire family of GLI Standards is available free of charge at www.gaminglabs.com.

1.3.2 Minimum Internal Control Standards (MICS)

Implementing progressive jackpots is a complex endeavor, necessitating the development of internal processes and procedures to ensure the gaming production environment is secure and controlled adequately. To that end, it is expected that a set of Minimum Internal Control Standards (MICS) will be established to define the internal processes for the management and handling of jackpot transactions as well as the requirements for internal control of any system or component software and hardware, and their associated accounts. The regulatory body's MICS may also include technical security controls and testing requirements for the gaming production environment.

1.3.3 Gaming Security Framework (GSF)

Adherence to the GLI Gaming Security Framework (GLI-GSF) is strongly recommended for External Jackpot Controllers. The GLI-GSF defines technical security controls, which will be assessed during evaluations of the gaming production environment. This includes, but is not limited to, operational process reviews critical to compliance, vulnerability and penetration testing of the external and internal infrastructure and applications handling sensitive information, and any other criteria set by the regulatory body.

NOTE: The GLI Gaming Security Framework is available free of charge at www.gaminglabs.com.

1.4 Interpretation of this Document

1.4.1 General Statement

This technical standard applies to monetary awards or "jackpot payoffs" which increase according to the credits wagered in the game, also known as progressive jackpots. The terms "progressive jackpot" and "jackpot" are used interchangeably throughout this document. Monetary awards or "jackpot payoffs" which increase through other methods will be reviewed on a case-by-case basis.

NOTE: This technical standard does not apply to awards of restrictive incentive credits, bonuses/features which offer awards which may increase over a single game cycle or, static awards whose odds of winning change as the game is played, 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 player experience and/or achievements.

1.4.2 Jackpot Implementations

There are three main types of progressive jackpot implementations:

a) A standalone jackpot is a jackpot offered by a single instance of Gaming Equipment whose gameplay contributes to its own jackpot payoff, and is not linked to any other instances of Gaming Equipment.
b) A linked jackpot is a jackpot offered by and linked to multiple instances of Gaming Equipment whose gameplay contributes to a common jackpot payoff.
c) A multi-site jackpot is a linked jackpot which is interconnected across multiple Gaming Venues through a Multi-Site Jackpot System.

NOTE: When referenced within this document, the term "Gaming Equipment" refers to any gaming device, electronic table game, live gaming table, or other gaming component that is intended to award or contribute to a jackpot.
NOTE: Where allowed by the regulatory body, a multi-site jackpot may also include cases where a jackpot is interconnected between one or more Gaming Venues and an Interactive Gaming System.

Chapter 2: Progressive Jackpot Requirements

2.1 Introduction

2.1.1 General Statement

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

2.2 Jackpot Displays and Information

2.2.1 Jackpot Displays

The Jackpot Display may be a mechanical, electrical, or electronic device, including the video display incorporated into the Gaming Equipment. For External Jackpot Displays the requirements for "External Jackpot Displays" shall also be met. Additional requirements for External Jackpot Displays can be found in the "External Jackpot Component Requirements" of the next chapter.

2.2.2 Alternating Displays

Where multiple items of information are displayed on a 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.

2.2.3 Jackpot Payoffs

The Jackpot Display shall be visible to all eligible players and be used to indicate the jackpot payoff for each jackpot in credits or the local currency format to all players who are playing a game which may potentially trigger the jackpot. If the progressive jackpot offers a "mystery jackpot payoff" where the actual jackpot payoff amount is not displayed to the player, the "Mystery Jackpot Payoff Features" shall apply.

a) As games are played, the current jackpot payoff for each jackpot shall be updated on the Jackpot Display at least every thirty seconds from the incrementing game event to reasonably reflect the actual size of the jackpot payoff. The use of odometer and other "paced" updating displays are allowed.
b) Where the Jackpot Display has a maximum display limitation (i.e., it could only display a certain number of digits):
    i. A maximum jackpot payoff limit or "ceiling" shall be required unless the maximum display amount acts as such; and
    ii. The requirements for "Maximum Jackpot Payoff Limits" shall be met.

NOTE: The jackpot payoff(s) shall be displayed as accurately as possible within the constraints of communication delays and latencies.

2.2.4 Maximum Jackpot Payoff Limits

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

a) All additional contributions after reaching the ceiling amount shall be credited to an overflow or diversion pool, unless otherwise specified by the regulatory body.
b) The ceiling amount, if disclosed to the player, shall be accurate.

NOTE: Where such disclosure is required by the regulatory body, if not displayed directly by the game or other display, it is the responsibility of the operator to conspicuously provide notice of the ceiling amount at or in the immediate vicinity of the game to which such limit applies. This disclosure should not be required where a ceiling is used to address the digital limitations of the Jackpot Display.

2.2.5 Jackpot Information

Descriptions of progressive jackpots, including any written, graphical, and auditory information, shall be accessible by a player without the need for funds deposited or commitment of a wager, including all qualifying wagers, possible winning outcomes, and combinations, as applicable.

NOTE: If not displayed directly by the game or other display, it is the responsibility of the operator to provide this information to players via stickers, decals, external signage, forms, or brochures available at the Gaming Venue as required by the regulatory body.

2.2.6 Mystery Jackpot Payoff Features

If the progressive jackpot offers a "mystery jackpot payoff", where the actual jackpot payoff amount is not displayed to the player, the following information shall be displayed for each mystery jackpot payoff:

a) The minimum mystery jackpot payoff amount, unless the minimum amount that could potentially be awarded is zero;
b) The maximum mystery jackpot payoff amount, where a maximum jackpot payoff limit or "ceiling" is supported by the jackpot; and
c) If the value of the mystery jackpot payoff depends on amounts wagered, or any other factors, the conditions in relation to this value.

2.3 Jackpot Games

2.3.1 Jackpots in Electronic Games

Electronic Games offering progressive jackpots shall comply with the applicable jurisdictional requirements set out for games in the "Game Requirements chapter of the *GLI-11 Standards for Gaming Devices* and/or other applicable technical requirements observed by the regulatory body.

2.3.2 Jackpots in Live Games

Live Games offering progressive jackpots shall use a Live Game Jackpot System to ensure the functionality of the jackpot complies with the applicable rules established for that live game. For the placement of wagers eligible to win the jackpot, the Live Game Jackpot System may include, where supported:

a) One or more Electronic Wager Stations or other methods for wager placement that acknowledges or accepts the placement of the wager; and
b) A Live Game Management Component to control or monitor the placement of wagers at the game, including a mechanism (e.g., a lock-out button) that once activated by authorized personnel, prevents the recognition of any further wagers that players attempt to place.

2.4 Jackpot Design and Operation

2.4.1 Jackpot Randomization

A random number generator (RNG) used by the progressive jackpot shall comply with the applicable jurisdictional requirements set out for RNGs in the "Random Number Generator (RNG) Requirements" chapter of the *GLI-11 Standards for Gaming Devices* and/or other applicable technical requirements observed by the regulatory body. Additionally, the use of an RNG shall comply with the following rules:

a) Where more than one RNG is used within the jackpot, each RNG shall be separately evaluated; and
b) Where each instance of an RNG is identical, but involves a different implementation within the jackpot, each implementation shall be separately evaluated.

2.4.2 Jackpot RTP Calculations

For progressive jackpots used in the return to player (RTP) calculations for a house-banked game, the minimum percentage requirement, as specified by the regulatory body, shall be met using the lowest available parameters for the jackpot during the expected lifetime of the game.

NOTE: In absence of any minimum percentage requirement observed by the regulatory body, the seventy-five percent (75%) minimum percentage requirement from the *GLI-11 Standards for Gaming Devices* shall be applied. Also, at the discretion of the regulatory body, the independent test laboratory can apply an alternative approach to RTP calculations.

2.4.3 Jackpot Odds

Each explicitly advertised progressive jackpot shall be available to be won by a player. The odds of winning any explicitly advertised progressive jackpot based solely or partially upon chance shall occur at least once in one hundred million (100,000,000) games, unless the game artwork prominently displays to the player the actual odds of winning that jackpot or, if the triggering

mechanism is external to the game, a message indicating that jackpot's odds exceed this value (e.g. "Odds of triggering XXXX exceeds 100 million to one").

a) This odds requirement applies to all wager categories that can win the explicitly advertised jackpot.
b) If an explicitly advertised jackpot can occur within a bonus/feature, odds calculations shall include the odds of obtaining the bonus/feature including the odds to achieve the award.
c) The odds calculations shall combine the odds for the same explicitly advertised jackpot when occurring, where applicable:
    i. With and without substitute or wild symbols; and
    ii. In different game elements (e.g., base game and bonuses/features).
d) If the likelihood of winning an explicitly advertised jackpot is affected by player choices, the odds calculations shall assume that the player is sufficiently informed to make decisions that maximize the expected frequency of occurrence of that jackpot.

2.4.4 Linked Jackpot Odds

For linked jackpots, unless otherwise clearly disclosed to the player, each game shall have equivalent odds of winning each explicitly advertised jackpot, adjusted for the denomination played. For instance, the odds shall remain equivalent for multi-denomination games based on the total value of the player's monetary wager. A tolerance of one percent (1%) is acceptable for determining equivalent odds.

NOTE: The tolerance is calculated by obtaining all associated expected values for each level for each total monetary wager, determining the median expected value, identifying the maximum difference between any expected value and the median expected value, and dividing the maximum difference by the median expected value.

2.4.5 Jackpot Diversion

A Jackpot Diversion Scheme may be used, where a portion of the progressive 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).

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.

2.4.6 Mystery-Triggered Jackpots

Mystery-triggered jackpots shall be awarded based on a random event (e.g., triggering randomly upon each play, triggering once the jackpot payoff reaches a randomly selected hidden trigger threshold, etc.). For mystery-triggered jackpots which use a hidden trigger threshold to determine the when the progressive jackpot is awarded, the hidden trigger threshold shall:

a) Be selected randomly upon initial startup and each jackpot reset. The selected hidden trigger threshold shall be the range of the startup value or reset value to the ceiling amount; and
b) Remain unknown at all times. It shall not be possible to gain access to or knowledge of the hidden trigger threshold at any time.

2.4.7 Jackpot Wins

Progressive 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 jackpot payoff:
   i. By the end of the game in play; or
   ii. If awarded by an External Jackpot Controller, within thirty seconds of the jackpot trigger being recognized.
b) Contributions toward the jackpot shall not be lost. Jackpot payoffs when awarded shall not be rounded down or truncated unless carried over to the reset amount.
c) For Electronic Games, the jackpot payoff 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 payoff is incremented in whole credit amounts; or
   iii. The jackpot payoff 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.
d) Where the jackpot payoff is not automatically added to the player's credit meter in an Electronic Game (e.g., awards exceeding any jurisdictional limit, including a taxation limit) or paid out to the player directly, the game shall cease play, display an appropriate message, and require intervention by appropriate personnel to resolve player payment.
e) The jackpot payoff shall update to the reset value and continue normal operations.

NOTE: A jackpot may be disabled or decommissioned concurrent with the winning of the jackpot if the game was configured to automatically disable or establish in its place an award which does not increment.

2.4.8 Swapping Jackpot Levels

For games offering multiple progressive jackpot levels, when a single winning combination may be evaluated as more than one of the available paytable 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 jackpot payoff for "Jackpot B" if the player obtains an outcome of five aces on a payline).

2.5 Jackpot Management

2.5.1 Jackpot Parameters

The method by which parameter values for each progressive jackpot are entered, viewed, and modified shall be via a secure access method to ensure that only authorized personnel are allowed access. The following parameters for each jackpot offered shall be maintained and shall be displayed or able to be calculated on demand, as applicable:

a) Unique jackpot ID, or other unique identifier if the jackpot is only tied to a specific game theme/paytable or particular Gaming Equipment;
b) For multi-games, the ability to identify the participating game theme/paytable ID(s), unless all game theme/paytable ID(s) are participating;
c) For linked jackpots, the ability to identify the participating Gaming Equipment ID(s);
d) Current value of the jackpot (jackpot payoff);
e) Any other pools containing jackpot contributions:
    i. Current value of amount exceeding ceiling, where required by the regulatory body (overflow);
    ii. Current value of the Jackpot Diversion Scheme (diversion pool);
f) Reset value of the current jackpot if different from startup value (reset value);
g) Initial value of the jackpot (startup value);
h) Percentage increment rate (increment);
i) Jackpot limit value (ceiling);
j) Percentage increment rate after ceiling is reached (secondary increment);
k) Percentage increment rate for diversion pool (hidden increment);
l) Diversion pool limit value (diversion limit);
m) Any parameters indicating time periods the jackpot is available for triggering (time limit); and
n) Any additional information needed to properly reconcile any configurable jackpot.

2.5.2 Changes to Parameters

The following requirements apply to modifying progressive jackpot parameter values once the current jackpot payoff has already had player contributions to it and without requiring it to be decommissioned:

a) For jackpots with a configurable increment rate which affects the RTP of the game(s), changes to the increment rate may not take effect until the current jackpot is won, unless a reliable method exists to reconcile these changes;
b) For jackpots with a configurable ceiling which does not affect the RTP of the game(s), changes to the ceiling may only be greater than the current jackpot payoff. Alternatively, changes to the ceiling may not take effect until the current jackpot is won;
c) Changes to the parameters shall not decrease the odds of winning the current jackpot;

d) For mystery-triggered jackpots which use a hidden trigger threshold to determine when the jackpot is awarded:
   i. The hidden trigger threshold shall be reselected when modifying any parameters that could result in an immediate trigger due to the modification; and
   ii. The reselected hidden trigger threshold shall be in the range of the current jackpot payoff to the ceiling and shall not result in a trigger without any contribution after the modification.

2.5.3 Jackpot Transfers

There shall be a secure means for transferring or combining contributions from a decommissioned progressive jackpot (and any overflow or diversion pools specific to that jackpot), correcting errors with a jackpot, or any other reasons required by the regulatory body.

2.5.4 Jackpot Disable

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

a) An appropriate message shall be displayed to the affected players indicating that the jackpot is not available;
b) For house-banked games, if the minimum percentage requirement, as specified by the regulatory body is no longer met when the jackpot is not available, the affected games shall be disabled.
c) It shall not be possible for the jackpot payoff to be incremented or won while in this state; and
d) 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 jackpot payoff. The hidden trigger threshold, if used to determine jackpot win for a mystery-triggered jackpot, may only be reselected if the reselected threshold is in the range of the current jackpot payoff to the ceiling.

2.6 Jackpot Controllers

2.6.1 General Statement

The requirements of this section are intended to apply equally to Jackpot Controllers integrated within the Gaming Equipment (Internal Jackpot Controllers), external to the Gaming Equipment (External Jackpot Controllers) or a combination of the two. Additional requirements for External Jackpot Controllers can be found in the "External Jackpot Component Requirements" of the next chapter.

NOTE: It is expected that Internal Jackpot Controllers installed on Electronic Games (e.g., within the program storage devices of a gaming device) meet their requirements for program storage devices, critical control programs, and critical non-volatile (NV) memory.

2.6.2 Monitoring of Game Play

The Jackpot Controller shall ensure the processing of progressive jackpot contributions is accurate. If the detection of unreasonable contributions is supported by the Jackpot Controller, such contributions shall be ignored. In addition, an appropriate error message shall be displayed to the affected players, the affected jackpots shall be disabled, and the "Jackpot Disable" requirements shall be met. This error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported.

2.6.3 Jackpot Triggers for Multiple Players

The Jackpot Controller shall have a means to accurately identify and record the order of triggers when multiple players trigger winning a jackpot at nearly the same time, such that the full amount of the jackpot 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), the full amount of the jackpot payoff shall be awarded to each winning player unless information on how the jackpot payoff is distributed is disclosed to the player.

NOTE: If not displayed directly by the artwork or jackpot display, it is the responsibility of the operator to provide this information to players via stickers, decals, external signage, forms, or brochures available at the Gaming Venue where required by the regulatory body.

2.6.4 Jackpot Controller Meters

The Jackpot Controller shall incorporate the following meters for each progressive jackpot it offers, unless properly communicated to a separate external Gaming System, who will address these responsibilities. Meters shall be labeled so they can be clearly understood in accordance with their function:

a) Specific electronic accounting meters that accumulate the total value of jackpot payoffs paid for each jackpot. These accounting meters shall be at least ten digits in length. Eight digits shall be used for the integer currency (e.g., dollar) amount and two digits used for the sub-currency (e.g., cents) amount. The meters shall automatically roll over to zero once its maximum logical value has been reached.
b) Specific electronic occurrence meters that accumulate the number of times each jackpot is awarded. These occurrence meters shall be at least eight (8) digits in length, however, are not required to automatically roll over.

2.6.5 Internal Linked Jackpot Controllers

For linked jackpots, 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 affected progressive jackpots shall be disabled, and the "Jackpot Disable" requirements shall be met unless another instance of the Gaming Equipment has been established as

the Primary Jackpot Controller. This error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported.

2.6.6 Communication Loss or Malfunction

If communication is lost between the Gaming Equipment and any External Jackpot Controller, or a malfunction occurs with that Jackpot Controller, the affected progressive jackpots on that Gaming Equipment shall be disabled, and the "Jackpot Disable" requirements shall be met. This error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported.

Chapter 3: External Jackpot Component Requirements

3.1 Introduction

3.1.1 General Statement

This chapter sets forth additional technical requirements for progressive jackpot components external to the Gaming Equipment, such as External Jackpot Displays and External Jackpot Controllers, including, Multi-Site Jackpot Systems, and Live Game Jackpot Systems used with live table games as applicable.

3.2 Jackpot Hardware Requirements

3.2.1 General Statement

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

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

3.2.2 Player Safety and Environmental Effects on Integrity

The following requirements only apply to any jackpot hardware for external jackpot components accessible by a player (e.g., External Jackpot Displays):

a) Electrical and mechanical parts and design principles of the jackpot hardware shall not subject a player to any physical hazards.
b) The jackpot hardware shall be impervious to influences from Electro-Static Discharge (ESD). Protection against ESD requires that the jackpot hardware be earthed in such a way that static discharge energy shall not permanently damage or permanently impact the normal operation of the electronics or other components within the jackpot hardware. An external jackpot component may exhibit temporary disruption when subjected to a significant external ESD with a severity level of 8kV air discharge and 4kV contact discharge. The external jackpot component shall exhibit a capacity to recover and complete any interrupted function without loss or corruption of any locally stored control information or critical data following any temporary disruption.

3.2.3 Printed Circuit Board (PCB) Identification Requirements

Each PCB used in the jackpot hardware 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.

3.2.4 Switches and Jumpers

If the jackpot hardware contains switches and/or jumpers, they shall be fully documented for evaluation by the independent test laboratory.

3.2.5 Wired Communication Ports

Wired communication ports on the jackpot hardware shall be clearly labeled.

3.2.6 Touch Screen Displays

Touch screen displays, if in use by the jackpot hardware (e.g., for Live 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.

3.3 Jackpot Software Requirements

3.3.1 Software Identification

Jackpot software shall contain sufficient information to identify the software and its version.

3.3.2 Independent Software Verification

It shall be possible to perform an independent integrity check of all jackpot software that affects the integrity of jackpot operations from an outside source. This verification shall be accomplished by being authenticated by a third-party application run from the jackpot component, 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 test laboratory, prior to software approval, shall evaluate the integrity check method.

3.4 Jackpot Interface Elements

3.4.1 Interface Elements

Where Gaming Equipment uses interface elements to communicate with the External Jackpot Component, the interface elements shall meet the applicable "Interface Element Requirements" within the *GLI-13 Standards for Monitoring and Control Systems and Validation Systems* and other applicable jurisdictional requirements observed by the regulatory body.

3.5 External Jackpot Displays

3.5.1 General Statement

In addition to the requirements for "Jackpot Displays" 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.

3.5.2 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 jackpot software in a manner that ensures the intended function of the display; and
b) Not clip or fail to display the jackpot payoff or any other required jackpot information.

3.5.3 Display Error

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

3.6 External Jackpot Controllers

3.6.1 General Statement

In addition to the requirements for "Jackpot Controllers" 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.

NOTE: Upon request, or as required by the regulatory body, the independent test laboratory will conduct on-site testing where the External Jackpot Controller, Gaming Equipment, and communications are set-up prior to and/or during implementation.

3.6.2 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, progressive 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. This error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported

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

3.6.3 Gaming Equipment Identification

The External Jackpot Controller shall uniquely identify each instance of Gaming Equipment connected to the controller. This unique identification number will be used by External Jackpot Controller to track all mandatory information related to the associated Gaming Equipment with regards to the progressive jackpot. Additionally, the External Jackpot Controller shall not allow for duplicate entries of this identification number.

3.6.4 Controller 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 progressive jackpot.

3.6.5 Integrity of Protocol Communications

The External Jackpot Controller shall accurately function as indicated by the communications protocol that is implemented, and as required by the regulatory body. In addition, the External Jackpot Controller shall be designed or programmed such that it:

a) May only communicate with authorized Gaming Equipment and External Jackpot Components through secure communications;
b) Sends the jackpot payoff to the game for metering purposes when a progressive jackpot is triggered; and
c) Constantly updates the Jackpot Display(s) as game play is continued.

3.6.6 Controller Error Conditions

When one of the following External Jackpot Controller errors occur, an appropriate error message shall be displayed to the affected players, the affected progressive jackpots shall be disabled, and the "Jackpot Disable" requirements shall be met. The error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported:

a) Loss of communications with all participating Gaming Equipment;
b) Program error or signature mismatch;

c) Critical non-volatile (NV) memory error, which shall also cause any external communication to cease;
d) Jackpot configuration lost or not set;
e) Unreasonable contribution detected, where such detection is supported; and
f) Controller meters do not reconcile against Gaming Equipment meters, where reconciliation between the meter sets is supported.

3.6.7 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 progressive 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.

3.6.8 Information to be Maintained

The External Jackpot Controller shall be capable of maintaining the following information for each progressive jackpot it offers, unless properly communicated to a separate external Gaming System, who will address these responsibilities, as applicable. There shall be a mechanism to export this information for the purposes of analysis and auditing/verification (e.g., CSV, XLS, PDF, etc.):

a) Unique jackpot ID, or other unique identifier if the jackpot is only tied to a specific game theme/paytable or particular Gaming Equipment;
b) The date and time the jackpot was made available;
c) The "Jackpot Parameters" specified in this document;
d) For multi-site jackpots, the participating Gaming Venue Name/Site Identifiers;
e) For each jackpot awarded:
    i. Winning Gaming Equipment ID;
    ii. For multi-games, winning game theme/paytable ID;
    iii. For multi-site jackpots, Gaming Venue Name/Site Identifier of jackpot trigger;
    iv. The date and time of jackpot trigger;
    v. Jackpot hit and jackpot payoff amount;
    vi. Identification of user(s) who processed and/or confirmed the jackpot win if not done so automatically;
f) The current status of the jackpot (active, disabled, decommissioned, etc.);
g) Any change to the jackpot's status or parameters, including:
    i. The date and time of the change;
    ii. Identification of user(s) who performed and/or authorized the change;
    iii. Reason/description of the change, including status or parameter changed;
    iv. Status or parameter value before change;
    v. Status or parameter value after change; and
h) The date and time the jackpot was or is scheduled to be decommissioned (blank until known).

NOTE: Internal controls may be in place to ensure this information is recorded where it is not maintained directly by the system.

3.6.9 Jackpot Balancing Reports

The External Jackpot Controller shall be capable of generating the information needed to compile jackpot balancing reports for each progressive jackpot it offers, unless properly communicated to a separate Gaming System, who will address these responsibilities. At a minimum, that report shall provide balancing of the changes of the jackpot amounts, including jackpot payoffs won, for all participating games versus current jackpot amount(s), plus jackpot payoffs. In addition, the report shall account for, and not be made inaccurate by, unusual events such as those related to the "Jackpot Management" or "Controller Error Conditions".

Chapter 4: Multi-Site Jackpot 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 Multi-Site Jackpot Systems. The purpose of a Multi-Site Jackpot System is to offer a common jackpot payoff (system jackpot) at all participating Gaming Venues.

a) The independent test laboratory will test and certify the components of the Multi-Site Jackpot System in accordance with the chapters of this technical standard within a controlled test environment, as applicable.
b) The integrity and accuracy of the operation of a Multi-Site Jackpot System is highly dependent upon operational procedures, configurations, and the gaming production environment's network infrastructure. In addition to the testing and certification of Multi-Site Jackpot System components, a regulatory body may elect to require the following operational audits and assessments be conducted on a periodic basis:
    i. An internal controls audit, against the applicable controls identified in the regulatory body's Minimum Internal Control Standards (MICS); and/or
    ii. A technical security assessment, against the applicable controls and tests identified in the GLI Gaming Security Framework (GLI-GSF), and/or any other controls and tests identified by the regulatory body.

4.2 Components of a Multi-Site Jackpot System

4.2.1 Multi-Site Jackpot System Controllers

The Multi-Site Jackpot System typically contains the following Jackpot Controllers. The Multi-Site Jackpot System as a whole and all communication between its Jackpot 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 jackpot payoff to the Local Controllers and, where directly connected to the Central Controller, the Jackpot Display(s), at each Gaming Venue.
b) The Local Controllers for each Gaming Venue receive the contributions from the connected Gaming Equipment and communicate them to the Central Controller. Once the current jackpot 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, as a Local Controller, directly connects to the Central Controller are also acceptable.

4.2.2 Local Controller Identification

The Multi-Site Jackpot System shall uniquely identify each Local Controller connected to the Central Controller. This unique identification number will be used by the Multi-Site Jackpot System to track all mandatory information related to the associated Local Controller. Additionally, the Multi-Site Jackpot System shall not allow for duplicate entries of this identification number.

4.2.3 Time Synchronization

The Multi-Site Jackpot System shall implement a means to ensure that Local Controllers and the Central Controller operate on a common time reference sufficient to maintain the validity of time-based communications.

4.3 Multi-Site Communications

4.3.1 Communications

The communication techniques used by the Multi-Site Jackpot System shall 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) All jackpot data transmitted between the Central Controller, Local Controllers, and Gaming Equipment shall employ a reasonable level of cryptography for the information being transmitted.
b) The communication process used by the Multi-Site Jackpot System shall be:
    i. Robust and stable enough to secure each communication such that failure event(s) can be identified and logged for subsequent audit and reconciliation; and
    ii. Protected against the capture of authentication data transmitted during the authentication and against manipulation by unauthorized parties.

4.3.2 Periodic Communication

Multi-Site Jackpot Systems shall ensure that the following multi-site jackpot data is communicated at least once every sixty seconds between the Central Controller, Local Controllers, and Gaming Equipment, as applicable:

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.).

4.3.3 Multi-Site Jackpot Triggers

In addition to the "Jackpot Wins" section in this document, the following requirements apply when the multi-site 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 jackpot 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 jackpot payoff amount calculated by the Central Controller. The 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 payoff paid will always be the higher of the two reporting amounts.

NOTE: Contributions to the system after the trigger occurs in real-time, but during the same polling cycle, shall be deemed to have contributed to the jackpot payoff amount prior to the trigger. Contributions to the system after the trigger message being received, as well as contributions 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 jackpot payoff amount of the next multi-site jackpot, if applicable.

4.3.4 Multi-Site Meter Readings

When requested to do so, the Central Controller shall receive readings of any meters used in the calculation of the multi-site 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.

4.3.5 Multi-Site Communication Failure

If communication is lost between the Local Controller and the Central Controller, game play may continue under the following conditions:

a) The multi-site jackpot data from the affected games connected to the Local Controller shall be buffered.
b) Once the Local Controller's buffer is full, an appropriate error message shall be displayed to the affected players and the affected games shall be disabled. This error condition shall be communicated to a Gaming System when such a compatible system and protocol are supported.
c) 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 Reporting Requirements

4.4.1 General Reporting Requirements

The Multi-Site Jackpot System shall be capable of generating the information needed to compile multi-site jackpot reports as required by the regulatory body, unless properly communicated to a separate Gaming System, who will address these responsibilities.

a) The system shall be able to provide the reporting information on demand, on a daily basis, and for other intervals required by the regulatory body (e.g., month-to-date (MTD), year-to-date (YTD), life-to-date (LTD), etc.).
b) Each required report shall contain:
   i. The multi-site jackpot provider's name (or other identifier), the title of report, the selected interval and the date/time the report was generated;
   ii. An indication of "No Activity" or similar message if no information appears for the period specified; and
   iii. Labeled fields which can be clearly understood in accordance with their function.

4.4.2 Multi-Site Jackpot Reports

The Multi-Site Jackpot System shall be able to provide the information needed to compile the following reports for each multi-site jackpot offered, unless properly communicated to a separate Gaming System, who will address these responsibilities:

a) Summary Reports. These reports are to include the amount of, and basis for, the current jackpot payoff (the amount currently in play);
b) Aggregate Reports. These reports are to include the balancing of the system with regard to system-wide totals;
c) Payoff Reports. These reports are to include the method of arriving at the jackpot payoff amount previously paid, including the amounts contributed beginning at the polling cycle, immediately following the previous jackpot and will include all amounts contributed up to and including the polling cycle which includes the jackpot signal; and
d) Liability Reports. These reports are to include the total jackpot payoffs owed but unpaid on winning jackpots, the current jackpot payoff amount, any other pools containing jackpot contributions, and the reset value.

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.

Central Controller – A component of the Multi-Site Jackpot System which receives the contributions from the Local Controllers and increments the current jackpot payoff, then communicates it to the Local Controllers at each Gaming Venue.

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

Credit Meter – A meter which maintains the player funds 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 regulatory body.

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

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.

Electronic Game – A Gaming Device, Electronic Table Game, or other form of Gaming Equipment which uses electronic components to conduct game play.

Electronic Table Game – The combination of hardware and software components that function collectively to electronically simulate a live table game or a live card game. An electronic table game may be fully-automated or dealer-controlled (semi-automated).

Electronic Wager Station – A player interface unit that permits player transactions and/or wagering to be conducted at a live game.

Expected Value – The mathematically calculated average return to player associated with a specific jackpot level for a given total monetary wager.

Gaming Device (aka "machine", "terminal") – An electronic or electro-mechanical device that at a minimum will utilize an element of chance, skill, or strategy, or some combination of these elements in the determination of prizes, contain some form of activation to initiate the selection process, and makes use of a suitable methodology for delivery of the determined outcome.

Gaming Equipment – A gaming device, electronic table game, electronic wager station, live game management component, or any other critical electronic gaming component and its interface element intended for use with a jackpot.

Hash Algorithm – A function that converts a data string into an alpha-numeric string output of fixed length.

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

Interactive Gaming System – The hardware, software, firmware, communications technology, other equipment, as well as operator procedures implemented in order to allow player participation in gaming, and, if supported, the corresponding equipment related to the display of the game outcomes, and other similar information necessary to facilitate player participation. The system provides the player with the means to play games. The system provides the operator with the means to review player accounts, disable games, generate various gaming/financial transaction and account reports, input outcomes for live games, and set any configurable parameters.

Interface Element (aka "SMIB, *Slot Machine Interface Board")* – A circuit board that interfaces the Gaming Equipment with the External Jackpot Component, supporting protocol conversion between the equipment and the system.

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 payoff and any other relevant 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., the diversion pool may be added to the reset value of the next jackpot or be used to pay simultaneous wins of a jackpot)

Linked Jackpot – A jackpot which is offered by and linked to multiple instances of Gaming Equipment whose gameplay contributes to a common jackpot payoff.

Live Game – A game conducted by a gaming attendant (e.g., dealer, croupier, etc.). Live games include, but are not limited to, live drawings, live card games, live table games, live keno games, live bingo games, and live play of other games as allowed by the regulatory body.

Live Game Jackpot System – The hardware, software, firmware, communications technology, other equipment, as well as operator procedures implemented in order to offer one or more jackpots to participating live games. The Multi-Site Jackpot System contains an External Jackpot Controller, Live Game Management Component, and Electronic Wager Stations or other methods for the placement and acceptance of qualifying wagers.

Live Game Management Component – A workstation for gaming attendants (e.g., dealer, croupier, etc.) to manage live game activity, such as a live table game or a live card game.

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

Multi-Game – An electronic game which can simultaneously be configured for use with multiple themes and/or multiple paytables.

Multi-Site Jackpot Provider – A person or entity that operates a Multi-Site Jackpot System, using both the technological capabilities of the Multi-Site Jackpot System as well as their own internal procedures.

Multi-Site Jackpot (aka "Wide-Area Progressive") – A linked jackpot which is interconnected between multiple Gaming Venues through a Multi-Site Jackpot System.

Multi-Site Jackpot System – The hardware, software, firmware, communications technology, other equipment, as well as operator procedures implemented in order to offers one or more common jackpots (system jackpot) to all participating Gaming Venues. The Multi-Site Jackpot System contains a Central Controller and Local Controllers for each Gaming Venue.

Overflow – Pool containing the contributions which exceed the maximum jackpot payoff limit or "ceiling".

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 theme/paytable or device ID, etc.) and incorporates a feature that enables progress towards the award of game play enhancements and/or bonuses through the achievement of some designated game outcome.

Pool – An accumulated reservoir of jackpot monetary contributions.

Progressive Jackpot (aka "jackpot") – A monetary award or "jackpot payoff" that increases generally based on a function of credits or some other metrics.

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 an enabled game).

Standalone Jackpot – A jackpot offered by a single instance of Gaming Equipment whose gameplay contributes to its own jackpot payoff, and is not linked to any other instances of Gaming Equipment.

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

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