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SMIB

FIRMWARE V5.0.5.X

HARDWARE REV. B

Technical Manual

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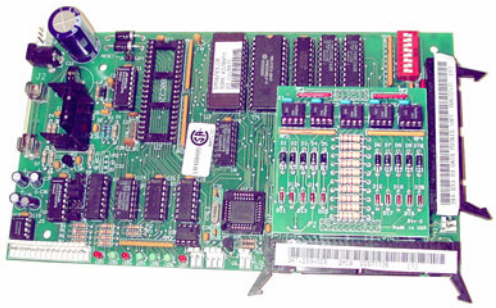
About This Manual

This manual contains detailed hardware and software information you will need to configure, install, and use the SMIB in the CasinoLink system. Versions documented in this manual are listed on the next page. If you are the responsible party who will install, configure, maintain, or troubleshoot the SMIB, this manual is intended for you.



Slot Machine Interface Board, SMIB

Contents

This manual references optional hardware and software components that may be prohibited in certain jurisdictions or that your system may not use. Examples of optional components: Player Tracking Modules and progressive applications.

The first chapter introduces the basic concepts of the SMIB and its interaction with machines and the CasinoLink system. Chapters 2 and 3 explain how to perform the basic hardware configurations and installation. The remaining chapters and appendices provide technical details, such as hardware component descriptions and pinouts, and system and hardware requirements for optional components.

- **Chapter 1**: Introduction to the SMIB hardware and software, including its interaction in the CasinoLink system.
- **Chapter 2**: Hardware configuration, such as DIP switch and jumper settings. Also includes an overview of system-side and optional feature configuration.
- **Chapter 3**: Installation and use. Includes troubleshooting.
- **Chapter 4**: Hardware details.
- **Chapter 5**: Configuration details for support of progressives (optional feature).
- **Chapter 6**: Configuration details for support of PTMs (optional feature). Includes message configuration details.
- **Chapter 7**: Overview and configuration of optional Firmware Download feature.
- **Chapter 8**: Overview and configuration of optional IVS Interface feature.
- **Appendix A**: MISC_FLAGS and UPLOAD settings.
- **Appendix B**: SMIB error (SERROR) codes.
- **Appendix C**: Machine error (MERROR) codes.
- **Appendix D**: ROM Signature (ROMSig) Verification process.

Hardware and Firmware Versions

The information in this manual is valid for SMIB hardware, P.N. 341-033-00 Rev. B, and firmware v5.0.5.4 SAS and v5.0.5.6 Non-SAS.

Conventions

This manual uses the following conventions:

- Blue text serves as a hyperlink for online readers to quickly jump to cross-references.
- Captions are used when necessary for cross-referencing and defining figures and tables. Self-explanatory figures and illustrations do not have captions.
- Notes and warnings are represented by the symbols shown at right. Notes provide helpful and important information, while warnings provide information to minimize or prevent undesirable outcomes.

Other Documents

The following table lists related Mikohn documentation. To order, contact Mikohn Customer Service and provide the document part number. Engineering Change Orders (ECO) and Software Change Orders (SCO) provide complete information about the products associated with the document. ECO and SCO information is generally for internal Mikohn use, but may also be valuable to regulatory agencies and customers.

Product Documented	Document P.N.	ECO	SCO
SMIB SFC Hardware	Bulletin 950-404-14	4212	N/A
CasinoLink Firmware Download 1.0.1.0	Manual 990-241-83	4211	5150
CasinoLink IVS Interface Module v1.0	Manual 990-403-59 Rev. A	4209	5149
CasinoLink 2.4.4.1	Bulletin 950-403-80	4209	5148

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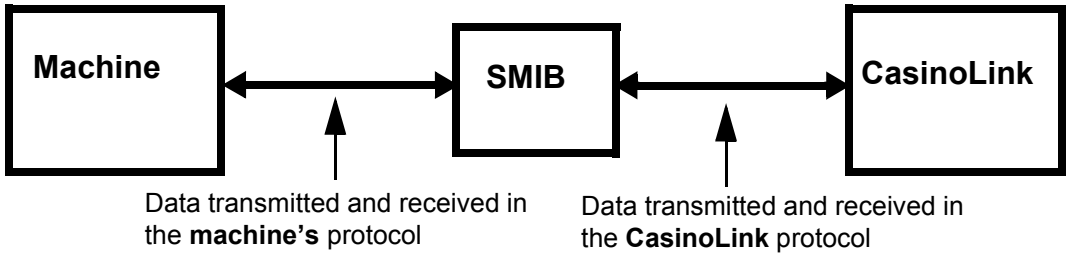
Chapter 1 - Introduction to SMIBs

This chapter is for those who are unfamiliar with the basic function of a SMIB, what it looks like, or how it is used in the CasinoLink system.

What is a SMIB?

The Mikohn SMIB is a logic board that allows the Mikohn CasinoLink system to communicate with different types of slot machines. See page 5 for information about SMIB interaction with CasinoLink.

Slot machines, produced by different manufacturers such as Aristocrat and IGT, often use proprietary methods of communication (or protocols). The CasinoLink system has its own proprietary protocol as well. One SMIB is installed in each machine that is linked to the CasinoLink system, with cables connecting the machine and the system to the SMIB. As the interface between the machine and the system, the SMIB receives data from both and translates the information from the sender's protocol to the recipient's protocol, before passing it on to the recipient.



Types of Information Transmitted

Examples of machine information the SMIB transmits to the CasinoLink system include machine component statuses (such as door switches and bill acceptors), player activity (if using the optional CasinoLink Player Tracking Module, or PTM), and game activity (such as coin-in, coin-out, and jackpot data).

The SMIB also transmits system information and instructions to the machine, such as configuration settings, enable/disable commands, progressive information (such as jackpot pay commands and progressive value updates), and requests for data.

Optional Features

In addition to supporting different machine protocols, the SMIB also allows you to take advantage of optional CasinoLink features (as regulatory approval allows), such as progressive jackpots and player tracking. Information about using the SMIB for these features is also included in this manual. See page 10 in Chapter 2 for an overview, and Chapters 5 through 8 for detailed information.

About SMIB Firmware

Firmware is simply another term for software. Firmware normally refers to programming that is stored on an IC[1] chip, on a logic board, to distinguish from programming stored in a personal computer drive (software).

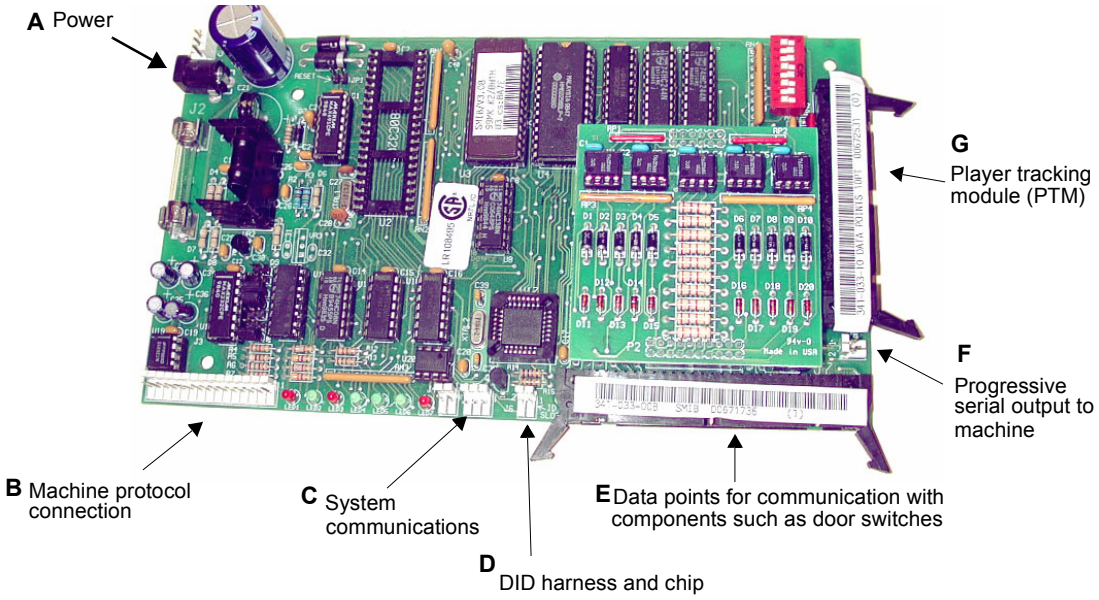
SMIB firmware contains all the code that the SMIB requires to communicate with CasinoLink, certain slot machines (see page 7), as well as peripheral devices such as the PTM. The SMIB firmware may be located in an EPROM[2] chip directly on the SMIB logic board, or it may be located in a flash memory chip installed in optional add-on hardware called a SMIB Flash Controller (see Chapter 7, page 38).

It is important to note that SMIB firmware versions 5.0.5.4, and later, are packaged in two separate files: one that supports the **SAS** protocol and another that supports **non-SAS** protocols such as Aristocrat, Bally, and Sycom protocols. Labels on SMIB EPROMs, and the firmware file names, clearly identify which file type is installed. Make sure you are using the correct firmware file for your machine types. Also note that several optional CasinoLink features can be supported only if using the SAS firmware.

1. Integrated Circuit
2. Erasable Programmable Read-Only Memory

SMIB Connections inside the Machine

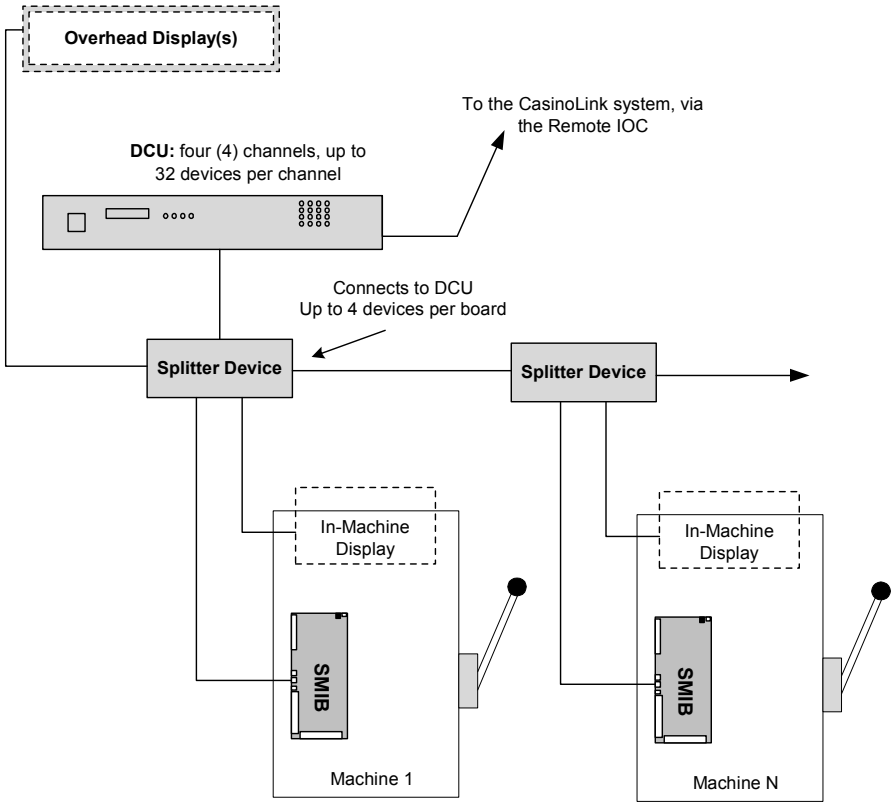
The purpose of this section is to familiarize you with the SMIB connections. Later chapters describe in detail how to configure and install the SMIB and any associated hardware. The figure below shows a photograph of the SMIB board, with the main connectors labeled. A SMIB is mounted to a bracket and installed inside the body of a slot machine. The location will depend on the free space available, as well as what will be connected to the SMIB, and harness lengths.



At minimum, a SMIB will be connected to a power source normally at **A**, to the CasinoLink system at **C**, to the DID chip at **D**, and to the machine's communication port at **B**. To monitor machine switches such as those for the main door, drop box, and bill validator, a data points harness connects the switches to the SMIB at **E**. If the CasinoLink system includes the optional player tracking, the PTM assembly will be connected to the SMIB at **G**. In progressive jackpot systems, progressive broadcasts are transmitted to the machine by a connection at **F**. Some types of progressive information can also be communicated through the machine protocol connection at **B**.

SMIB Connections to the CasinoLink System

The block diagram below shows an example of how SMIBs and displays, may connect to a CasinoLink system. The first CasinoLink computer in the network near the SMIB is the Remote Input/Output Controller, or IOC. All data transmitted between the SMIB and the Remote IOC travels in or out of one SMIB connector (item **C** in the photograph on the previous page). Between the SMIB and Remote IOC, there may be one or more splitter devices and a physical Data Controller Unit, or DCU. If the Remote IOC software performs the functions of a DCU, there may be only splitter devices. A splitter devices allows you to link banks of machines together, as well as any associated peripheral devices, on the same network communication line.



SMIB Communication with CasinoLink System Software

This section provides useful information about the CasinoLink system and some of its programs, which communicate with the SMIB.

What is CasinoLink?

CasinoLink is a real-time casino management system that can provide slot accounting, player and revenue tracking, and linked progressive jackpot capabilities across one or more gaming machines in one gaming site, as well as over a Wide Area Network (WAN). CasinoLink also provides comprehensive reporting on all aspects of a slot system, including player information.

At minimum, a CasinoLink network consists of a central and remote IOC (input/output controller), a database server, and one or more workstations. The central IOC is the hub of CasinoLink communications with gaming machines. It controls system processes and routes communications to the remote IOC and workstation applications that communicate with machines. Remote IOCs act as communication routers between the central IOC and the DCU. The DCU manages data transmissions between the remote IOC and SMIBs, as well as other peripheral devices.

CasinoLink System Communication (SysComm) Service

The SysComm (system communication) service, installed on the remote IOC, communicates directly with all connected DCUs and is the software communication gateway between SMIBs and the CasinoLink system network. The primary function of SysComm is to poll DCUs, notify the system when SMIBs and DCUs transition between online and offline states, and transfer communications between the system and the SMIBs and DCUs.

CasinoLink Machine Configuration (MConfig) Process

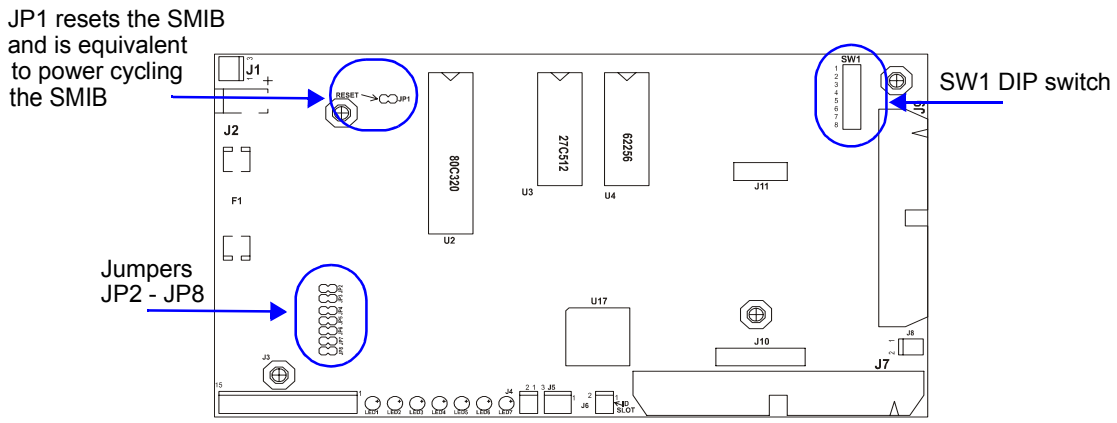
The MConfig (machine configuration) process, installed on the remote IOC, maintains address configuration and machine property information for the gaming machines communicating with an IOC. SMIBs and DCUs request and receive current configuration information from MConfig upon login to the system.

Chapter 2 - Configuration

Overview

This chapter describes the basic hardware configurations required for the SMIB to work properly with its gaming machine, and to communicate as the CasinoLink expects it to. It also introduces you to the software configurations that affect SMIB behavior, which are configured in the CasinoLink system, as well as a brief overview of configuration requirements that are specific to optional hardware or software components.[1] This chapter is arranged as follows:

DIP switch settings ..... page 7
Jumper settings ..... page 8
About system-configuration ..... page 9
About configuration for optional components ..... page 10



1. Examples of optional components: firmware download or PTM hardware or IVS interface software.

Hardware Configuration

The SMIB hardware configuration includes the DIP switches at SW1 and jumpers. DIP switches define the protocol in which the SMIB will communicate to the machine, and the SMIB address. Jumpers define how signals are handled in the SMIB.

DIP Switch Settings

To configure the SMIB for machine communications, you must know the protocol of the machine to which the SMIB will be connected. DIP switches 1 – 4 define the machine protocol. DIP switches 7 and 8 define whether and what type of serial communication will be used. Use the following tables to correctly set the DIP switch SW1.

DIP Switches 1 – 4

In the SMIB 5.x series of firmware, support for the following unused machine protocols has been removed: IGT Pulse, Sigma, and Universal.

DIP Switch				Description
1	2	3	4	
ON	ON	OFF	OFF	Bally 5500, 7000 (Bally S500 Communication Protocol 1992)
OFF	OFF	ON	OFF	Bally 5000 (Bally S500 Communication Protocol 1992)
OFF	ON	ON	OFF	IGT SAS with bill meters (SAS+ Protocol 5/24/94)
ON	OFF	OFF	ON	Aristocrat (Optimized U.S. Dacom Protocol Issue B.3)
OFF	OFF	ON	ON	Sycom IGT
ON	OFF	ON	ON	Sycom
ON	ON	ON	ON	For future use.

DIP Switches 7 and 8 (5 and 6 Not Used)

Switch	Setting	Function
7	ON	Use serial return
	OFF	Do NOT use serial return. Must be off if using SAS progressives.
8	ON	SINFO (Bally) protocol. Switch 7 must be set to ON.
	OFF	IGT Serial Return protocol. Switch 7 must be set to ON.

Signal Configuration Jumpers

Check that jumpers JP4, JP5, and JP8 **are set**. These jumpers control how data signals come in or go out particular connector pins. If for any reason, you find it necessary to change the jumper settings, it is **very important** to first carefully read all restrictions listed below. Mikohn strongly recommends that you also contact Mikohn Customer Service prior to changing these settings. The data inputs listed above the table all share the same receiver channel on the SMIB CPU; only one of these inputs should be used in an installation:

- J3 Pin 6 and Pin 7 (data could be current-loop or logic)
- J3 Pin 13 (RS-232)
- J3 Pin 9 and Pin 10 (RS-422)

Location	Jumper Functions
JP4	**Use:** This jumper connects the RS-232 receiver to the SMIB CPU. Set this jumper when using J3 Pin 13. **Restrictions:** • If this jumper is set, do not use either J3 Pin 6 or Pin 7. • If this jumper is set, do not set JP6, which is RS-422 and not used in current installations. • If using harness P.N. 311-117-01 on J3 (Pin 7 connected), do not set either this jumper or JP6.
JP5	**Use:** This jumper connects a 1.2Kohm pull-up resistor from J3 pin 2 to the 5V supply. Set this jumper **only** when using one of the following: • Output on J3 Pin 2. • RS-422 output on J3 Pin 11 and Pin 12. • RS-232 output on J3 Pin 14. **Restrictions:** • If the opto-coupler output at J3 Pin 4 drives an external load, which is connected between a positive supply voltage and this output pin, do not set this jumper. • If the RS-422 outputs on J3 Pin 11 and 12 is used, you must set this jumper and J3 Pin 2 must not be used. • If the RS-232 output on J3 Pin 14 is used, you must set this jumper and J3 Pin 2 must not be used.
JP8	**Use:** This jumper affects data input from J3 Pin 6 and Pin 7, RS-232 input from J3 Pin 13, and RS-422 input from J3 Pin 9 and Pin 10. Note that the RS-422 input is not used in current installations. Set this jumper to receive data into the SMIB in a non-inverted state. (JP7 inverts the data received into the SMIB). **Restrictions:** • If this jumper is set, JP7 must not be set. • If JP7 is set, this jumper must not be set.

About System-Side Configuration

The CasinoLink system administrator is responsible for the system-side configurations that affect SMIB behavior. Although a technician installing SMIB hardware is not typically concerned with system-side configuration, this manual does include this information for reference, here in this overview, in the chapters that describe configuration for specific optional CasinoLink features, and also in Appendix A. This information may help you in communications with the system administrator and during troubleshooting.

Slot machine and SMIB properties are configured in the Advanced Settings screen of the Casinolink System Administration program. Basic machine properties include settings such as game denomination, points per coin, and progressive level configurations. Basic SMIB properties define behaviors such as when and which errors should be generated, and when and whether to disable the machine. SMIB behaviors are divided into two groups of settings: MISC_FLAGS and UPLOAD.

The CasinoLink MConfig program, also called Machine Configuration, transmits these settings to each SMIB as it first logs into the system and anytime configurations change. If you are familiar with the CasinoLink protocol, or have seen messages in hexadecimal format in the Portal Spy program, note that the MISC_FLAGS and UPLOAD settings are sent in the 0x71 message, which is also called the TMACHPROP, or Transmit Machine Properties, message.

About Configurations for Optional Components

The SMIB supports several optional CasinoLink features, some of which require additional hardware or configuration.

IVS Interface support requires SMIB SAS firmware (see About SMIB Firmware, on page 2).

- **Progressives** (Chapter 5): The SMIB supports CasinoLink progressive jackpots. This requires some configuration on the SMIB board, as well as on the system-side, in CasinoLink System Administration (Advanced Settings\MISC_FLAGS and UPLOAD). Chapter 5 explains how to configure the system and the SMIB to support progressives.
- **Player tracking** (Chapter 6): The SMIB supports communication with PTMs (player tracking modules). These devices contain a magnetic card stripe reader and a small display. The SMIB requires harnessing to connect to the PTM, but no additional configuration. It is hard-coded with default messages that display in response to various events and conditions. These messages can be customized in the CasinoLink System Administration program (Advanced Settings\PTM messages). Chapter 6 explains in detail how to configure the messages, to use tokens (special symbols), and includes a full list of the default messages and settings.
- **Firmware Download** (Chapter 7): Firmware can be downloaded to SMIBs from the CasinoLink system. This requires add-on hardware called an SFC (SMIB Flash Controller), some hardware configuration, as well as system-side configuration. Chapter 7 describes the SFC and explains how to install and configure it on the SMIB.
- **Mikohn IVS Interface** (Chapter 8): CasinoLink, with the SMIB, can pass through data between ticket printing machines and the IGT IVS system. The SMIB requires minimal configuration and no additional hardware. Chapter 8 gives an overview of the IVS Interface function and the SMIB's part in IVS communication.

Chapter 3 - Installation and Use

This chapter contains installation guidelines and tips, start-up and monitoring information, as well as methods to troubleshoot SMIB operation.

Installation:

- Checklist ..... page 12
- Installation guidelines ..... page 12
- Replacement ..... page 14

Operation:

- SMIB login process ..... page 17
- LED and PTM status indicators ..... page 18
- Troubleshooting with LEDs ..... page 19
- General Troubleshooting ..... page 19
- RAM clear procedure ..... page 14

Installation

Where inside the machine you choose to install the SMIB will depend on practical issues, such as available free space, length of harnessing and locations of components to which the SMIB must connect.

SMIB Kits

A basic Mikohn SMIB kit will include the SMIB logic board with a mounting bracket, the data points board (installed at J10 and J11), and a power supply with cables. The system and machine communication harnesses will vary depending the type of system and machine component connections.

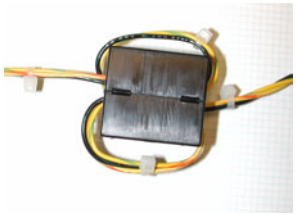
Checklist

DISCONNECT MACHINE POWER before accessing the inside of the machine cabinet.

- Check that jumpers and DIP switches are correctly set.
- Ensure that the EPROM or flash memory chip is correctly labeled with the appropriate firmware version.
- Ensure that you have all harnesses needed for power and communication. All communication harnesses have ferrite cores (also called chokes), as follows:
  - Machine protocol harness: two triple-wrapped cores placed close to J3.
  - System communication harness: three triple-wrapped cores placed close to J5.
  - Data points harness: one single-wrapped core placed close to the J7 connector.
  - Player tracking harness: One single-wrapped core placed closest to J9, followed by two triple-wrapped cores.

open ferrite core

open ferrite core, single wrap

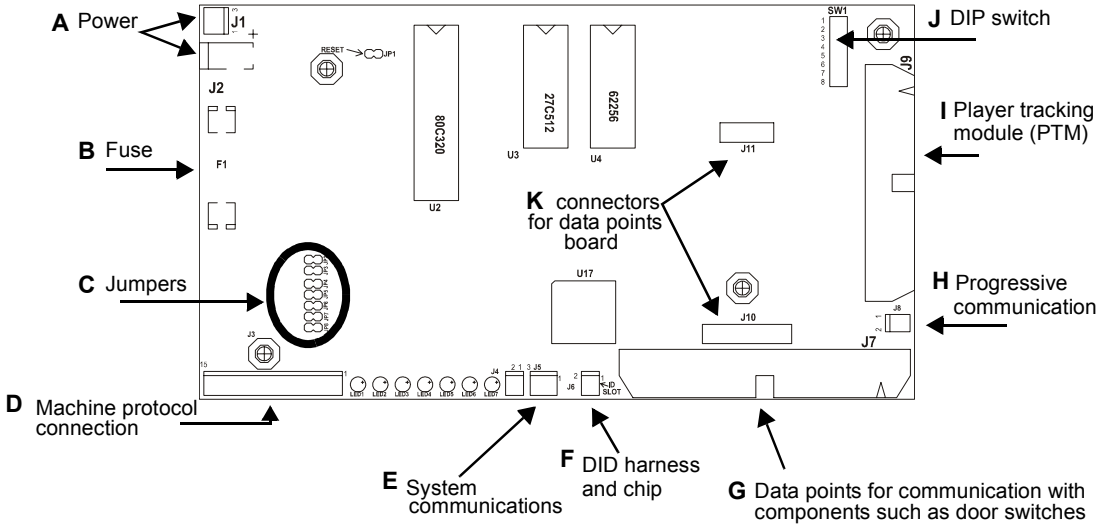


closed ferrite core, triple wrap

Do not remove the ferrite cores! In combination with proper cable routing practices, the cores are essential in protecting the SMIB from EFT, or electrical fast transients, and ESD, or electrostatic discharge. Refer to the guidelines on the next page as well as the drawing on page 14.

Installation Guidelines

This section assumes that the DCU is installed and the communication cables are routed to the machines. Because machine-side connections vary widely based on machine manufacturer, model, and components, SMIB-side connections can also vary. This section does not refer to specific harness part numbers and provides only general installation guidelines. Before installation, be sure to read the Checklist section on the previous page.

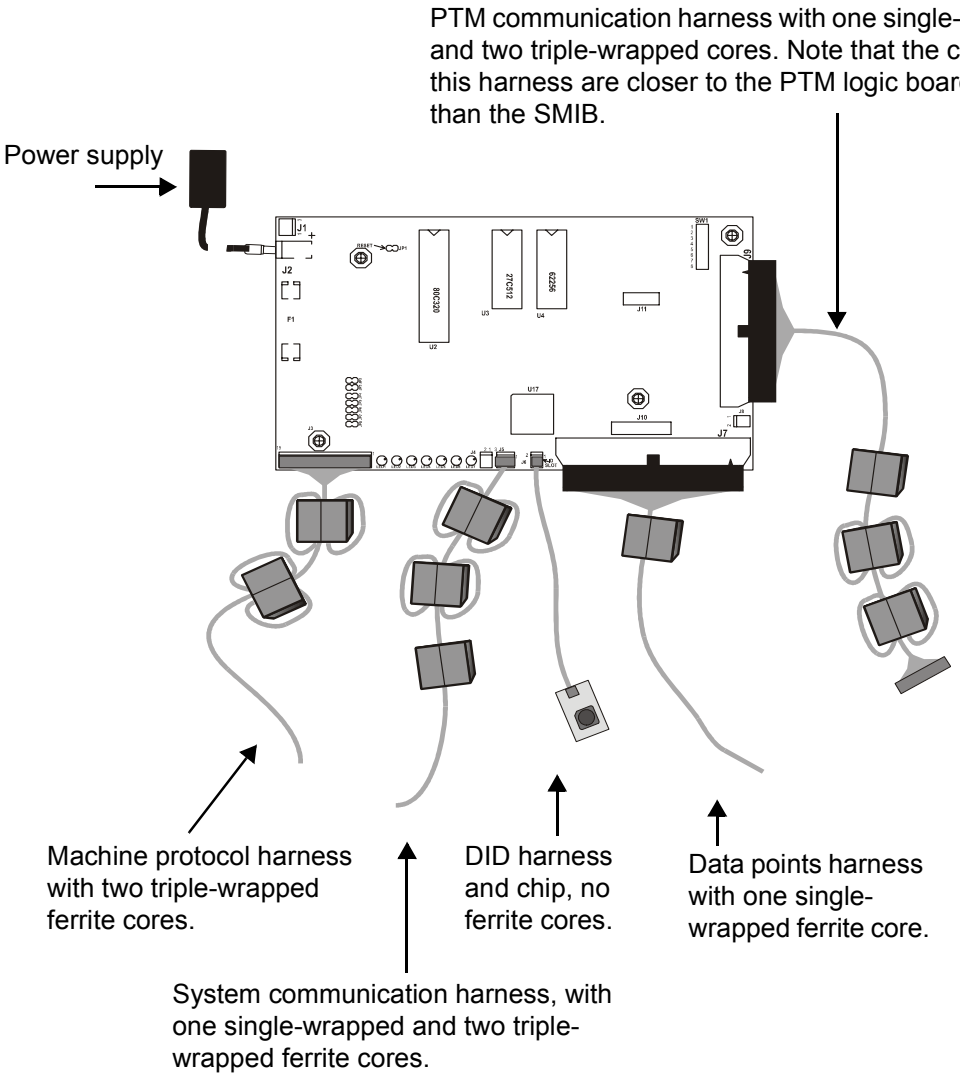


1. Install and secure the SMIB in a clear area of the machine. The top box is a common location. Keep in mind that all communication harnesses have bulky ferrite cores that require additional room. Also, **no hardware**, such as other PCB boards, or cabling may cross over SMIB or PTM electronics.
2. Route the power supply and system communication cables to the SMIB. Refer to the figure above, and install all appropriate harnessing on the SMIB.
3. Ensure that the ferrite cores are correctly positioned (as described on the previous page and shown on the next page. Use tie wraps and adhesive mounted tie wraps to secure harnessing and hardware, as referred to in step 1.
4. Double-check the DIP switch and jumper configuration, ferrite choke positioning and security.
5. Check that all SMIB harnesses have solid connections on both sides, to include the power supply, PTM (if applicable) and the system communication line.
6. Power up the machine.

See page 15 for procedures to replace SMIB, while keeping the same DID. The sections that start on page 16 contains helpful information about monitoring the SMIB operation after the initial installation. Troubleshooting information begins on page 19.

Ferrite Core and Harness Positioning for EFT and ESD Immunity

Remember: Allowing other hardware or harnessing to contact the DID cable or the data points harness can cause a coupling effect. Route cabling to avoid contact with the SMIB, or with the PTM if used. Take care not to tangle harnessing during installation. Then, use tie wraps and adhesive mounts to separate harnesses and lift them up off of the SMIB and PTM.



Replacement

To replace a SMIB while keeping the DID from the old SMIB, perform the following steps:

1. Disconnect the power and remove the old SMIB.
1. Check all DIP switch and jumper settings on the new SMIB.
1. Check that the correct chips and hardware are installed on the new SMIB.
2. Remove the DID from the old SMIB and install on the new SMIB.
3. Remove the harnessing from the old SMIB and install on the new SMIB.
4. Install the new SMIB and re-connect the power.

If you must replace the SMIB and the DID, perform the following steps:

1. In CasinoLink, update the machine configuration with the new DID. See Appendix A.
2. On the machine, disconnect the power, replace the SMIB, and re-connect the power.

Operation

After the SMIB is configured and connected to the machine and the CasinoLink system, it must first log on to the system, and then it begins communicating with the system and the machine. There are two main methods to monitor its operation and communication statuses, while at the machine location:

- LED status indicators: requires the machine door to be open. The SMIB has several LEDs which indicate basic power and communication statuses.
- PTM messages: If the SMIB is connected to a Mikohn PTM, it will display a variety of SMIB status information, including system communication and login status, as well other status information, such as whether the SMIB has reset or detected a bad DID.

  In addition, if an employee card is inserted in the PTM, you can view more information, such as current meter and switch statuses, the SMIB's current firmware version and game type configuration. See Chapter 6 for more details.

SMIB information and status can also be accessed from the CasinoLink system, in programs such as Machine Enable/Disable, Alarms, and Slot Maintenance programs.

You should first understand how the SMIB logs into the system, as described on the next page, before attempting to decipher the meaning of LED indicators or symbols and messages displayed on a PTM. A summary of the SMIB login process is described on the next page. Following that, on page 18 are descriptions of the LED indicators and descriptions of status information displayed on the PTM.

How the SMIB Logs in to the CasinoLink System

After the SMIB is powered on, it must log in to the CasinoLink system, normally through a physical DCU. CasinoLink does not allow the SMIB to send or receive information until the SMIB has logged in. This login process is described below.

1. The SMIB chooses a random address between 64 – 95.
2. When the DCU polls that offline address, the SMIB requests machine property configurations. This request includes the SMIB's DID.[1] With default PTM settings, the DID is displayed on the PTM until communications are established.
3. The DCU passes the request to the system.
4. The system checks the CasinoLink database for the machine configurations associated with the SMIB's DID. If found, the system sends the requested configurations to the DCU. If not, an alarm is displayed in the CasinoLink Alarms program.
5. The DCU passes the configuration data to the SMIB and assigns it an address between 0 and 31,[2] and then also forwards the address to the system to be stored in the database and associated with the SMIB's DID.

After logging in, the SMIB starts communicating with the machine and the system.

About the DCU Polling Process

Both physical and virtual DCUs conduct the Polling sequence as follows:

1. Poll all online interface boards (addresses 0-31)
2. Poll one offline address (addresses 64-95)
3. Transmit any pending messages, normally limited to one message per SMIB.
4. Transmit any pending broadcast messages.

1. If a PTM is used, by default the Dallas ID value is displayed on the PTM screen until communications is established.
2. If a PTM is used, after communication is established, the idle message displays.

LED Status Indication

The SMIB has red and green LEDs located between the J3 and J4 connectors. These LEDs indicate whether the SMIB is powered on and whether it is in communication with the system (DCU) and the machine. The LED functions are described in the following table.

LED	Color	Function	States
1	red	Power indicator	Steady on when SMIB has power
2	green	**J3** TX (game/diagnostic port)	On while **transmitting** to machine
3	red	Ready to Send indicator:	Blinks .25 second on/.25 second off. Heartbeat blinks while SMIB firmware is running (firmware controlled)
4	green	**J3** TX (game/diagnostic port)	On while **receiving** from machine
5	green	**J5** DCU transmit enable (inverted)	Off while **transmitting** to DCU
6	green	**J5** DCU serial port TX	On while **transmitting** to DCU
7	red	**J5** DCU serial port RX	On while **receiving** from DCU

Using a PTM to Determine the SMIB's Communication Status

If a PTM (Player Tracking Module) is installed in the gaming machine, in default configurations the SMIB displays its communication status with the DCU on the PTM screen, as follows:

- An asterisk (*****) after the text indicates the SMIB is not receiving from the DCU.
- A period (**.**) after the text indicates the SMIB has not yet been assigned an address.
- The Idle message displayed, followed by the SMIB's DID[1] and address, indicates the SMIB is logged on and in communication with the DCU. This changes every time a poll is received on this address or once a minute if no poll is received.

1. To not display DID, set the time to display value of the Linking message, File 2, to 255.

Troubleshooting

The following sections contain helpful information you can use for troubleshooting problems with the SMIB. Basic communication issues may be determined by messages and/or symbols displayed on the PTM, as described on the previous page (see Chapter 6 for detailed information). Some communication problems can be determined by looking at the SMIB's LED indicators, as described in the following section. Still other issues may require a bit of detective work and deductive reasoning, checking condition of certain board components and harnessing, until you narrow the possibilities to one final solvable problem. Use the table on the following page to help you work through possible SMIB problems and causes.

Troubleshooting with LEDs

LED Pattern	Possible Causes
2 flashing 4 **not** flashing	• Faulty J3 connector or dirt on J3 pins. • SMIB and machine communications down.
1 off	• Faulty power supply adaptor. • Faulty SMIB.
3 not flashing	• Faulty EPROM or not installed correctly. • Faulty SMIB.
5 not flashing 6 not flashing	• J5 connector not installed correctly. • Faulty J5 connector or dirt on J5 pins. • Faulty DID or DID number recorded in the system database is incorrect. • Faulty SMIB.

Common Problems and Possible Causes

The table on the next page lists common problems that may occur with the SMIB. The probable causes are listed in the right column of the table. Check the hardware or software associated with the probable cause. Where multiple causes are listed, they are listed in order of likelihood.

Also see helpful tips below the table.

SMIB Issue	Probable Cause(s)
No heartbeat	• SMIB firmware is not running: check for faulty installation of EPROM or FLASH. • 82510 UART chip: faulty installation.
SMIB does not establish communication with DCU.	• Bad DCU cabling or connections • DCU not operational
SMIB is not assigned an address	DCU not receiving machine properties from system: • SMIB's DID is not in the system database • IOC is down
All SMIBs on a certain channel are experiencing communication errors	• Incorrect cabling or faulty connections • One or more faulty SMIB boards on the channel. • A SMIB may be resetting frequently. • DCU hardware problem
SMIB not getting data from game	• Game type DIP switches set incorrectly. • Faulty data points board harness installation. • Faulty data points board installation.
SMIB generates too many game messages	• Faulty data points board installation.
PTM not communicating with SMIB – Error code C1 displays on PTM screen	• PTM faulty (possibly overheated). • PTM harness faulty or loose. • SMIB not functioning (check the heartbeat).
System reports invalid DID	• DID number in the system does not match the DID chip. • Dirt on J6 pins. • Faulty J6 connector.

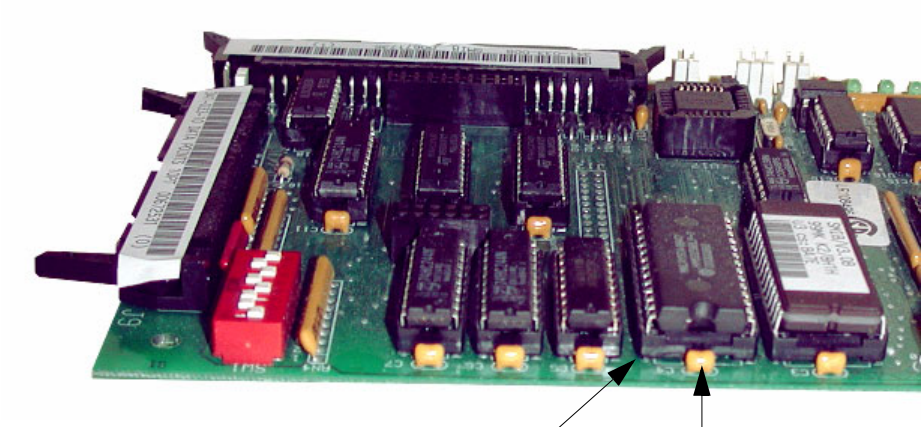
- **Faulty chip installations** (such as EPROM, FLASH, or DID): If the chip appears to be installed correctly, but is not functioning, replace the chip.
- **Faulty harness installations**: Check for 1) secure connections, 2) good connector condition, 3) good contact of pins in connectors, and 4) good wiring and insulation. If no damage is visible and other avenues are exhausted, try replacing the harness. There may be breaks in the wiring or bad contacts that are not easily seen.
- **DIP switch settings**: see page 7
- If all hardware, harnessing, and configuration seems to be in order, try resetting (power cycling) the SMIB, by putting a shunt on the JP1 jumper.
- **RAM clear** procedure: If all troubleshooting has failed, use this procedure, described on the next page, as your last resort.

RAM Clear Procedure

The SMIB RAM chip, located at U4, is a battery-backed non-volatile temporary data storage chip, where configurations from the system and message queues are stored. If the SMIB is not functioning properly, and you have checked the hardware and performed other troubleshooting procedures (see previous pages), it is possible that the SMIB is simply "stuck" in a particular process, such as waiting for the system to respond to a message, which for whatever reason the system has ignored.

For this type of problem, where the SMIB appears to have locked up and is not communicating, as a *last resort*, you can clear the RAM. **However**, keep in mind that in doing so, you may loose data that is stored in the message queues, such as meter and progressive data, or machine events.

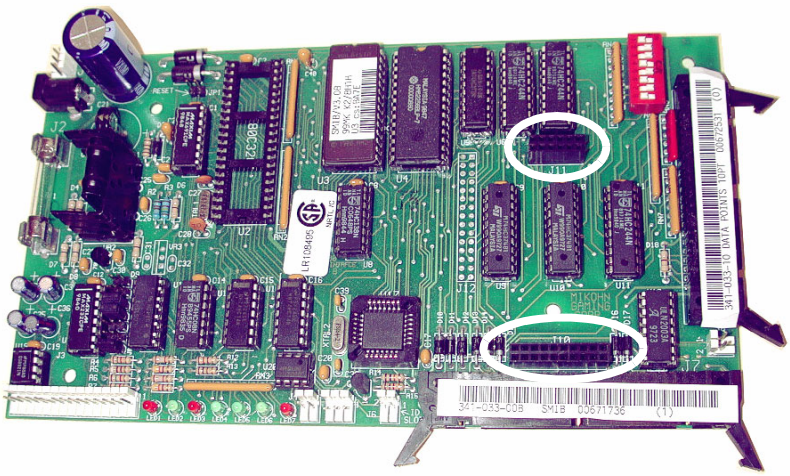
The figure below shows the location of the RAM chip and its capacitor.



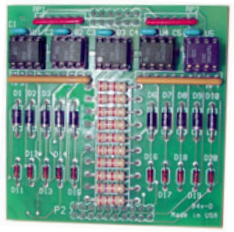
To clear the RAM, short out the C4 capacitor pins (or legs), with a screwdriver or other metal object. You must have bare metal contact with both pins. If it is difficult to get solid contact with the pins on the component side of the board, you can perform the same procedure on the capacitor's solder pads, on the bottom side of the board.

Chapter 4 - SMIB Hardware Details

SMIB connector descriptions and pinouts are listed on the next page. On page 24 and page 25, you will find information about the data points board (shown above right), including the process with which the SMIB can use to detect the board, as well as the system configuration and hardware required to enable the detection functionality. Refer to Chapter 2 for LED, jumper, and DIP switch configuration.



SMIB board, with data points board removed and shown at right.



Data points board: mounts on J10 and J11, shown at left circled in white.

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Fuses and Chip Descriptions

Location	Description	Location	Description
F1	Main power fuse, 2A 250V	U2	Microprocessor
U3	EPROM	U17	UART
U4	RAM	SW1	DIP switch (see Chapter 2)

Connector Descriptions and Pinouts

Location	Description	Harness Pinouts
J1	(**J2** currently used for power.) AC/DC Power, 3-pin connector, 12V AC absolute maximum.	1 = +8V to +16V DC 8V to 12V AC 2 = GND 3 = +8V to +16V DC 8V to 12V AC
J2	DC Power, barrel connector	N/A
J3	Auxiliary port, 15-pin connector. RS-422/RS-232 capable. Often used for progressive communication with the machine, in the machine protocol. It can also be used to connect to in-machine displays.	Connections may vary. 2 = TX 3 = TX Opto Emitter 7 = RX
J5	DCU RS-485 communication port, 3-pin connector	1 = RS-485 TX/RX+ 2 = RS-485 TX/RX- 3 = GND
J6	DID connector, 2-pin connector	1 = ID 2 = GND
J7	Data points board harness connector for machine communication, 50-pin connector	Pins used depends on machine manufacturer.
J8	2-pin **progressive serial output** connector. Transmits progressive broadcast data. **Note**: The voltage output of Pin 1 is the same as the SMIB's supply voltage, DC or rectified AC. This output has a series rectifier which drops the voltage by 0.5V to 1V depending on the load. The maximum load current from this pin should be limited to 500mA.	1 = VUNREG+ 2 = TX
J9	40-pin connector for PTM communications (optional). Can also be used for progressive communication between the machine and SMIB. **Note**: 1) Pin 25 (not listed) is also VUNREG+ output. For both Pin 24 and Pin 25, the voltage is the same as the SMIB's supply voltage (DC or rectified AC). This output has a series rectifier which drops the voltage by 0.5V to 1V depending on the load. Combined load current from Pin 24 and Pin 25 should be limited to 500mA maximum. 2) Limit the combined current into Pin 26 and Pin 27 to 1A maximum.	Connections vary depending on use. Following pins always wired. 3 = PCOININ 20 = P1.1 (not used) 21 = TXD1 22 = RXD1 24 = VUNREG+ 26 = GND 37 = External GND
J10 and J11	Connectors for data points board installation See the next page, for more information about this board.	N/A

About the Data Points Board

The data points board mounts on the J10 and J11 connectors on the SMIB, and optically isolates the J7 connector to the SMIB logic board. This board must be installed on the SMIB to connect machine components, such as door switches, to J7.

The SMIB can be configured to periodically check for the presence of the data points board, and if the board is not detected, to send errors to the system. However, if the SMIB is not configured to perform the check and if the data points board is not correctly installed, many machine-related errors can be sent to the system without it being clear that the missing or incorrectly installed data points board is causing the errors.

To support the detection functionality requires the following:

- Set UPLOAD Bit 9 in CasinoLink System Administration. See Appendix A for a description of this bit.
- Harness kit, P.N. 790-007-55 Rev. B, which is described on page 25. See page 25 for helpful installation notes and examples.

Note that when the detection function is enabled, the pin normally used for coin-in drop is used for the detection function. If that pin is being used, coin-in must be gathered through a different line.

Detection Process

The detection process is as follows:

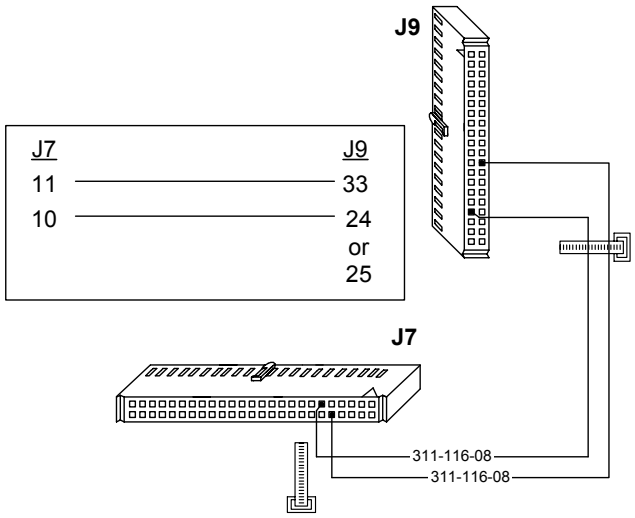
1. On power up, the SMIB reads the data point values on the data points board.
2. Approximately every 30 seconds, the SMIB sends alternately a high and then a low signal through the harness connecting J9 Pin 33 to J7 Pin 11. This alternating signal is delivered to the data points board and changes the setting of the data point at 0x0C000 Bit 3, on the data points board, each time it is sent.
3. Approximately 15 seconds after the SMIB toggles the value of 0x0C000 Bit 3, it re-checks the values of all data points. Any change in the values indicates that the board is present.

   The data point values are also changed when the SMIB receives signals, such as door open messages, from the machine through J7. the SMIB manually changes the value of one of the data points every 30 seconds, simply to ensure there is always a change that it can detect the next time it reads the data point values.
4. If the data points board is not detected, the SMIB generates the 0x42 SERROR, Error Code 0xA8 to indicate the board is missing.
5. If the board is reinstalled, the SMIB then generates the 0x42 SERROR, Error Code 0xA9 to indicate the board is returned.

About Kit P.N. 790-007-55 Rev. B

This kit contains two single-wire harnesses, P.N. 311-116-08, and two tie-wraps. Each harness connects two pins between the harnesses installed at J7 and J9, as shown at right. For readability, only the connectors of the harnesses that are installed at J7 and J9 are shown, and not the wiring.

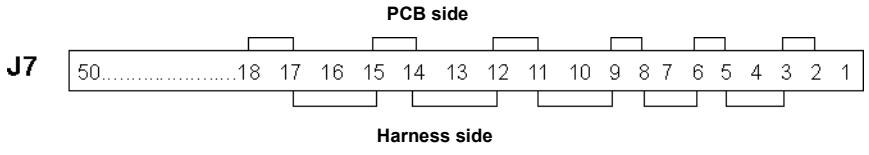
In some cases there may be wiring conflicts with the existing harnesses Carefully study the Installation Notes and the examples included, on the next page, to ensure that you correctly install the two harnesses.



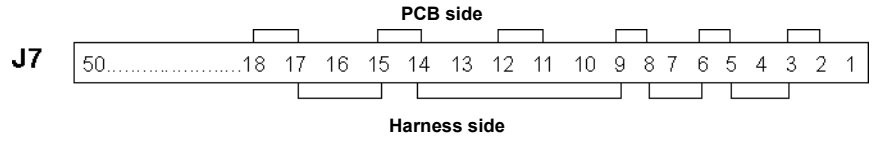
Installation Notes for Kit

1. If the existing machine harness on J7 has a wire installed on Pin 10, you must remove the wire. Note that the wire function will be lost. The data points detection functionality will not work if coin in and drop signals are sent through Pin 10.
2. J7 Pins 11 and 12 are normally on a ground circuit with jumpers on the harness and traces on the PCB. The jumpers and traces interconnect alternately to form the ground circuit. The harness side has the following pins jumpered: 17 - 15, 14 - 12, 11 - 9, 8 - 6, and 5 - 3. If a harness wire is connected to Pin 11, you must remove the wire, but note that the ground connection needs to be reestablished. A connection not including Pin 11 would jumper on the harness side from Pins 14 to 9 to complete the ground circuit. See the following example:

   In the following example, wires are connected to Pin 11 and Pin 12 on the harness side.



   To install harness P.N. 311-116-08 on Pin 11, you must disconnect the wires from Pin 11 and Pin 12 and tie them together, so that the ground connection remains continuous.



Chapter 5 - Supporting Progressives

On the SMIB, to handle CasinoLink progressive data, you need only to set the DIP switches, as shown in the following table. However, considerable configuration is required on the system side, including settings in the caslnk.ini and registry, as well as in System Administration, and other CasinoLink programs. See User Manual P.N. 990-242-21, for details. The Progressive Connections section provides additional information about how progressive information can be received/transmitted through the machine connections.

DIP Switch Settings

Configuration	Settings	Additional information
Serial return protocol	Turn serial protocol on: DIP switch 7 = ON Select the serial return protocol, **unless** using Sycom: IGT: DIP switch 8 = OFF Bally SINFO: DIP switch 8 = ON	Note that if using Sycom, DIP switches 7 and 8 have no effect. Serial Return is sent to the machine every 333 milliseconds with the last progressive value received from PROGLINK, unless PROGLINK has not sent a progressive value in over 8 seconds.

Progressive Connections

Progressive connections to the machine vary depending on the manufacturer, model, and components installed. This section explains only how information can be received and transmitted on machine-side connections.

The machine **progressive port** on the SMIB at J8, transmits progressive broadcast information to the machine serial return. Progressive coin-in and jackpot hit information is transmitted from the machine to the SMIB through the machine **protocol port** at J3, and the PTM port at J9.

Chapter 6 - PTM Support

CasinoLink Player Tracking Modules (PTMs) are optional devices that can be used to track player activity and create incentive to play in CasinoLink systems. PTMs can also be used in service or diagnostic functions. PTMs have a magnetic stripe reader for reading player and employee cards, and a 16-character display.

This chapter describes the different types of information that can be displayed for employees and players, as well as how to configure that information in the CasinoLink system. The table at the end of this chapter lists the hard-coded default text files and settings in the SMIB.

When connected to a PTM and instructed by the CasinoLink system or in response to a particular event, the SMIB sends specific text files to the PTM screen. Examples of events are a player or employee card being inserted or communication with the DCU is interrupted.

The text file settings, either the default settings or downloaded customized settings, are stored in the SMIB ROM and reset when the SMIB is RAM-cleared. You can customize the display files in the CasinoLink System Administration module. Customized settings are stored in the caslnk.ptm_messages database table.

This chapter is organized as follows:

Time and effect configuration ..... page 28
Special value tokens ..... page 28
Using an employee card type 98 ..... page 29
Using an employee card type 99 ..... page 31
Default text files and configuration ..... page 32

Configuration Codes and Tokens

Codes to Configure Time and Effects

The following table lists the code descriptions of the display file effect and time settings. These codes control how a message appears on the PTM screen. For example, you can configure a message to scroll or flash (Effect Code), and control the length of time (Time Code) the message remains on the screen.

Effect Codes		Time Codes	
Code	**Description**	**Code**	**Description**
0	Steady	0	Display message forever or until next message
1	Scroll	1 – 254	Length of time in seconds to display message
2	Flash	255	Do not display message
3	Flash and scroll		

Using Tokens to Insert Values in Messages

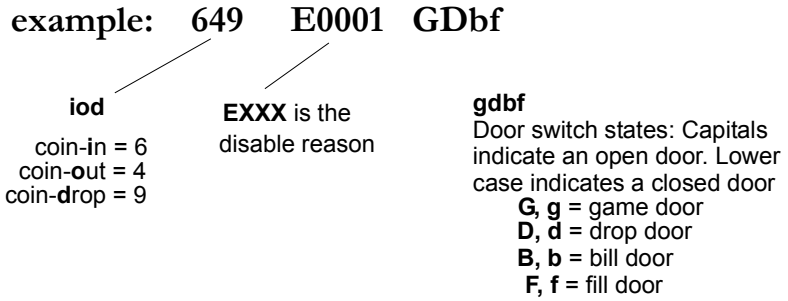
A token is a string of characters that indicates to the SMIB the type of value to be displayed. The following table lists the tokens you can insert into text files to display values, such as earned comp points. For example, the text "You have %c points" includes the token %c and when displayed on the PTM the token is replaced by the number of comp points the player has. These tokens can be used in any message; however, not all usages makes sense. For example, the point multiplier and comp point values are only valid during the player session.

The letters following the % (percent symbol) must be lowercase.

Token	Description	Token	Description
%a	Display the SMIB address	%m	Display the current comp point multiplier
%c	Display the current session comp points	%n	Display the name of the current player
%d	Display the number of coins the player needs to earn the next comp point	%t	Display the total earned comp points
%i	Display the SMIB DID		

Employee Card Type 98

When a 98 card type is inserted in the PTM, the SMIB displays coin meter movement, the disable reason and the current game, drop, bill, and fill door states. The test string is only displayed when the test mode is first entered or a change in state has occurred. Test data is displayed in the format **iod EXXX gdbf**, as explained in the following example:



In the example above:

- **649** represent the last digit in coin-**i**n, coin-**o**ut, and coin-**d**rop meters respectively. As the meters increment, the appropriate digit increments, wrapping to zero after nine. Note that this is only valid for games types that monitor meter pulses, rather than getting the meters serially.
- **E0001** is the disable reason code. E stands for error. The four digit hexadecimal value represents the bits set in the disable reason bitmask. For example, 0001 indicates that only bit 0 is set; and 0007 indicates that bits 1 – 3 were set. The current disable reasons and corresponding bits are shown on the next page. If you **remove the card**, the text descriptions for each disable reason scrolls on the PTM display.
- **GDbf** indicates the door states. A capital indicates open, a lower case indicates closed: Door switch states: Capitals indicate an open door and lower case indicates a closed door:

Closed doors	Opened doors
g = game door	**G** = game door
d = drop door	**D** = drop door
b = bill door	**B** = bill door
f = fill door	**F** = fill door

For example, **Gdbf** would indicate that the game door is open, and all others are closed.

DISABLE Reason Codes

Remember, if you remove the card, the text descriptions for each disable reason scrolls on the PTM display. It is easier to read the text descriptions than to calculate the hexadecimal value of the bit settings from the test data displayed.

Bit That is Set	Disable Reason
BIT_0	Disabled by system with 0x49 LOCKOUT message
BIT_1	Disabled by site with 0x49 LOCKOUT message
BIT_5	Disabled by the remote with 0x49 LOCKOUT message
BIT_8	No machine configurations received in 0x71 TMACHPROPS message
BIT_9	No progressive configurations received in 0x2B TPROGRESSIVEPROPS message
BIT_11	Unauthorized door open event
BIT_12	Machine failed a ROMSig
BIT_13	No progressive updates received in 0x29 PBROAD message within 30 seconds
BIT_15	No Mystery configurations were received in the 0x2F TMYSTPROPS message
BIT_16	No PTM configurations were received in 0x71 TMACHPROPS message
BIT_17	No time received in 0x46 STIME message
BIT_18	Failure in the data points board on the SMIB message
BIT_19	No deltas message received in 0x7B TMETERDELTAS message
BIT_22	Denomination mismatch
BIT_23	Mystery hit occurred and the SMIB is set to disable on Mystery hits

Employee Card Type 99

When a card type 99 is inserted in the PTM, the SMIB cycles through several pieces of information, such as progressive and game configurations. The data displayed is as follows:

- Test mode data shown when a card type 98 is inserted.
- Progressive configuration. For example "0…4…. M1" indicates that levels 0 and 4 are configured, and one level is a mystery progressive. Dots indicate levels that are not configured.
- Each progressive value (example 0P0003 = 24,000). The first number is an internal SMIB identifier for the progressive. The letter indicates whether it is a normal or mystery progressive. The last four digits are the PGID of the progressive.
- DID (hexadecimal) followed by a space and the SMIB address assigned by the DCU
- Game type setting (defined by the DIP switch)
- Serial return configuration (SRET)
- The coin-in value (CIN)
- The coin-out value (COUT)
- The coin-drop value (CID)
- Games played
- The SMIB version string
- The ROM checksum
- The PTM version string
- MISC_FLAG configuration
- UPLOAD configuration
- Meter values ($1,$2,$5,$10,$20,$50,$100). There are a total of 20 meters.

Use the PTM buttons (**B**, **C**, **F**, and **CE**) to control how the data is displayed.

To stop the information from scrolling, press **C**. Press it again to resume scrolling.

To move to the previous item, press **B**,

To move to the next item, press **F**

To return to the first item displayed, press **CE**.

Hard Coded Support for PTM Messaging

The following table lists the default text and settings of PTM files that are hard-coded in the SMIB. File numbers that are not shown are not used. Remember, you can change the default settings in CasinoLink System Administration.

Notes: A) Message strings are limited to 75 characters, player names are limited to 21 characters. **B**) Files 11 – 14, 23, 25, and 26 display only if the CasinoLink program player_t.exe is used. **C**) Files 27 – 29 will not display independently and are appended to a currently displaying message.

File #	Shown on PTM Screen	Effect	Time	PTM Message Details
0	WELCOME TO THE MIKOHN CASINOLINK!	scroll	1	**Idle message**: No game activity and no cards inserted in PTM. Time should be set to 1.
1	CHECK ID	steady	0	**Bad DID chip**: After the SMIB resets, it attempts to read the unique 6-byte value on its DID chip. If the read fails, this message is displayed. Time should be set to 0.
2	LINKING	steady	0	**Connecting to DCU**: The SMIB is in the process of being assigned an address. The SMIB DID and current random address are displayed, such as "4DD38B000000 46", in hexadecimal format. To not display the DID, set Time to 255. Time value should be set either to 0 or 255.
3	* (asterisk)	steady	0	**No DCU communication**: The SMIB is not receiving communication from the DCU. The * is placed at the end of the currently displayed message. This allows a discreet method of showing the current state of the SMIB communication with the DCU, such as, "WELCOME TO THE MIKOHN CASINOLINK!*". You can also configure the current displayed message to flash when DCU communication is down by setting the Effect for this file to flash. To disable this file, set time to 255 or put spaces in this string.
4	SMIB	steady	2	**SMIB has reset**: After the SMIB resets, this the first message displayed.
5	REFRESHMENTS PLEASE!	scroll	0	Not supported. Displayed when the corresponding PTM button is pressed.
6	CHANGE PLEASE!	scroll	0	Not supported. Displayed when the corresponding PTM button is pressed.

File #	Shown on PTM Screen	Effect	Time	PTM Message Details
7	REQUEST CANCELED!	scroll	0	Not supported. Displayed when the corresponding PTM button is pressed.
8	REQUEST CANCELED!	scroll	0	Not supported. Displayed when the corresponding PTM button is pressed.
9	CARD ACCEPTED	steady	0	**Card accepted**: A valid player card (not displayed for 98 or 99 type cards) is inserted and successfully read by the PTM. This message displays until the card is determined to be valid or invalid, and the appropriate message is displayed (#11 or #14), or another event occurs, such as the system does not respond or the card is removed.
10	THANK YOU FOR PLAYING	scroll	10	**Departure message**: After a player has been validated by the system (the greeting message was received) and removes the card, this is the last message displayed before the Idle message is restored.
11	GOOD LUCK, PLAYER!	scroll	10	**Greeting message**: The system instructs the SMIB to display this message in response to a valid card-in message from the SMIB. It usually contains a personalized greeting that includes the player's name. With the appropriate tokens, it can also contain the player's current total comp points. For example, "Good luck %n, you have %t comp points" expands to "Good luck [player name], you have [x number of] comp points. This process is done at the system level, so the SMIB receives the literal string "Good luck John, you have 25 comp points." The Time value of this file effects how the session comp points are displayed during play. If Time = 0, the greeting is displayed the entire time the player's card is inserted (disabling the real-time comp point display feature). If Time = 1 – 254, the greeting is displayed for the specified number of seconds and then the Comp Points message 1 (#12) appears and displays for the duration the player's card is inserted.

File #	Shown on PTM Screen	Effect	Time	PTM Message Details
12	Play %d more coin(s) for your next point.	scroll	10	**Comp points message 1**: Displays the number of coins the player needs to play to earn the next point. This message appears after the Greeting message has timed out. If the comp points per coin value is greater than 1, the coins-left value is set to 1. When the next point is earned, Comp points message 2 (#13) is displayed. When Comp points message 2 times out, Comp points message 1 displays again. The token used in this display message to specify coins left is **%d** (for example, "%d coins to go!"). If Time is not set to 0, only the current session comp points earned. The session comp points are calculated and displayed each time this message times out. The calculation truncates any fractional comp point. The comp points token is **%c** (see #13). The comp points are calculated by the SMIB based on coin-in (or coin-out) and a coins-per-comp-point constant received from the system. This is done to lessen the burden on the system. Note that the system calculates the comp points independently when the player removes his card (although both values should equate). Time should be set to 1 – 254.
13	You have %c points	scroll	10	**Comp points message 2**: Displays when the player earns a comp point(s). Time should be set to 1 – 254. When this message times out, Comp points message 1 displays.
14	INVALID	steady	0	**System invalidates a player card**: The system has received a card-in message and determined the card is not a valid player card. The system instructs the SMIB to display this message in place of the Greeting message. Time should be set to 0.
15	SYSTEM TIMEOUT	steady	0	**System not responding**: If the Card Accepted message times out before the Greeting message is displayed, this message is displayed. This message is never displayed unless the Card accepted message (#9) has a time-out value. Time should be set to 0.
16	CARD INSERTED INCORRECTLY	scroll	20	**Bad card read**: Displays if the PTM reports a card has been inserted that it cannot read. After this message times out, the Idle message displays.
23	AUTHORIZED	steady	2	**Valid employee card**: The system has received a card-in message and determined the card is a valid employee card.
24	AUTHORIZING	steady	0	**Employee card accepted**: The system has read the card successfully but has not yet instructed SMIB to display file #14, #23, or #25 is displayed. Time should be set to 0.

File #	Shown on PTM Screen	Effect	Time	PTM Message Details
25	NOT AUTHORIZED!	flash	0	**Invalid employee card**: The system has received a card-in message and determined the card is not a valid employee card. Time should be set to 0.
26	UNAUTHORIZED ENTRY!	flash and scroll	0	**Unauthorized door open**: The system has received a door open message that did not include a valid employee card. Time should be set to 0.
27	. (period)	flash and scroll	0	**Address not assigned**: The DCU has not assigned the SMIB an online address (0 – 31).
28	~ (tilda)	flash and scroll	0	**Address assigned but not receiving polls**: The SMIB has been assigned an address but has been instructed by the virtual DCU to not send any messages.
29	$	flash and scroll	0	**Game communication lost**: The SMIB is not receiving communication from the game.
31	[disable reasons]	N/A	N/A	**Disable reasons:** If the machine is disabled and an employee card is inserted, shows the reason the machine is disabled.
32	[meter values]	N/A	N/A	**Meters**: Displays meter values.
33	%i %a	steady	1	**Offline**: The SMIB DID and current address is displayed until communication with the system is re-established, at which time the Idle message displays.

Chapter 7 - Optional Firmware Download Support

Overview

With special hardware along with certain system configurations, you can download firmware from a CasinoLink workstation to SMIBs at remote sites, rather than physically replacing the EPROM on-site to change or upgrade firmware. To take advantage of this functionality, you will need to configure and install certain hardware on the SMIB, as well as configure the CasinoLink system.

This chapter explains how to configure and install the hardware on the SMIB, and includes the following information:

Software and hardware requirements ..... page 37
SMIB Flash Controller (SFC) hardware ..... page 38
About system configuration ..... page 37
Installation procedures ..... page 40
Firmware Download messages ..... page 42

Requirements

The system and hardware requirements are as follows:

- CasinoLink v2.4.4.1 and Firmware Download Module v1.0.1.0, or later
- SFC Module hardware (see page 38)
- SMIB firmware v5.0.5.4, or later. It installs on the SFC flash and checks whether the SFC Module is present; if so the SMIB uses the UART and 18 MHz clock rate on the SFC Module.
- SMIB Download firmware version DL1.04, or later. The DL EPROM is installed at U3 on the SMIB and the SFC hardware replaces the microprocessor originally located at U2. The DL firmware contains the boot loader program that runs when the SMIB is first powered on. The DL firmware checks for the SFC board and for valid firmware in the SFC flash memory. It will determine whether to start running valid firmware or to enter download mode. During a download the DL firmware displays the flash memory bank location (either D0 or D1) and number of downloaded packets (in hexadecimal format) on the PTM screen.

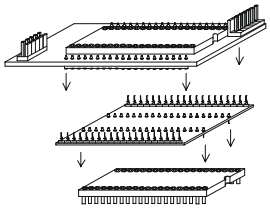
System Configuration

There are system-side configurations required to support firmware download functionality, including several registry and caslnk.ini file settings. Refer to User Manual P.N. 990-241-83 for configuration details.

SFC Hardware

The following subsections describe the logic boards and associated hardware required for firmware download functionality. See page 40 for installation procedures. Firmware download hardware consists of:

- SMIB Flash Controller (SFC) Module, P.N. 370-043-00. The SFC is installed on the SMIB. It is a 4Mb flash device that holds the SMIB firmware. The SFC components are shown below:

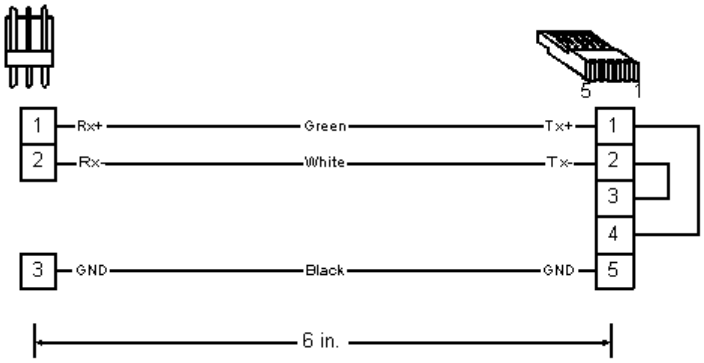


SFC logic board, P.N. 341-043-00. See the next page for a closer look.

SFC adapter, P.N. 341-0440-00

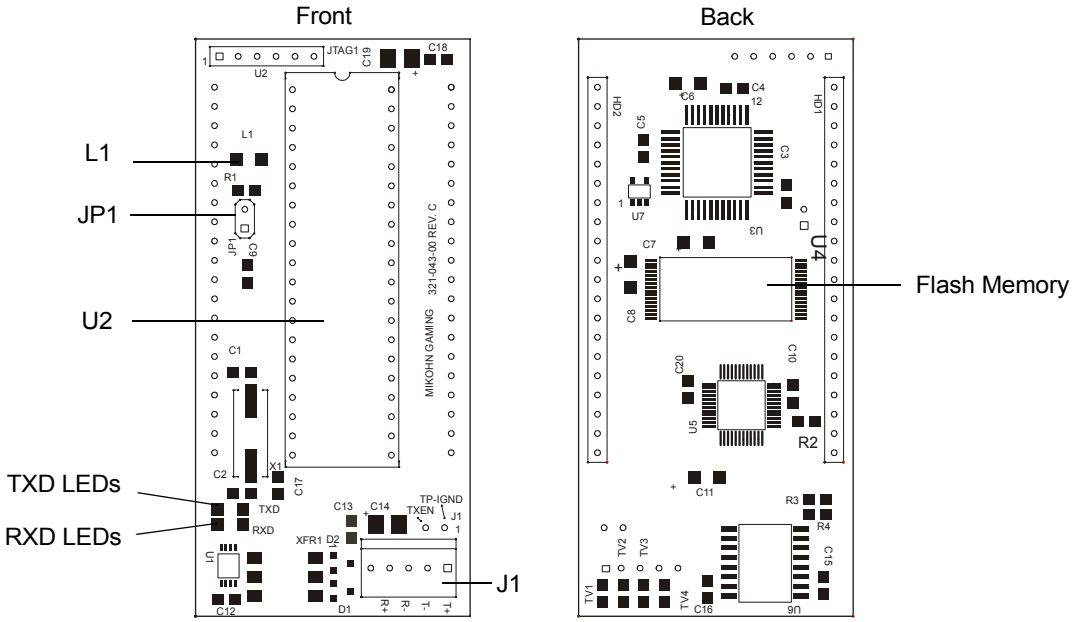
40-pin socket (mounts at U2 on SMIB), P.N. 162-012-10

- Adapter harness, P.N. 311-116-12, shown below, allows DCU communications to be routed directly to the SFC. It is installed between the communication line from the system (previously installed at J5 on the SMIB) and J1 on the SFC logic board.



- Download Firmware EPROM (refer to previous page)

A drawing of the SFC logic board, P.N. 341-043-00 Rev. C, is shown below.

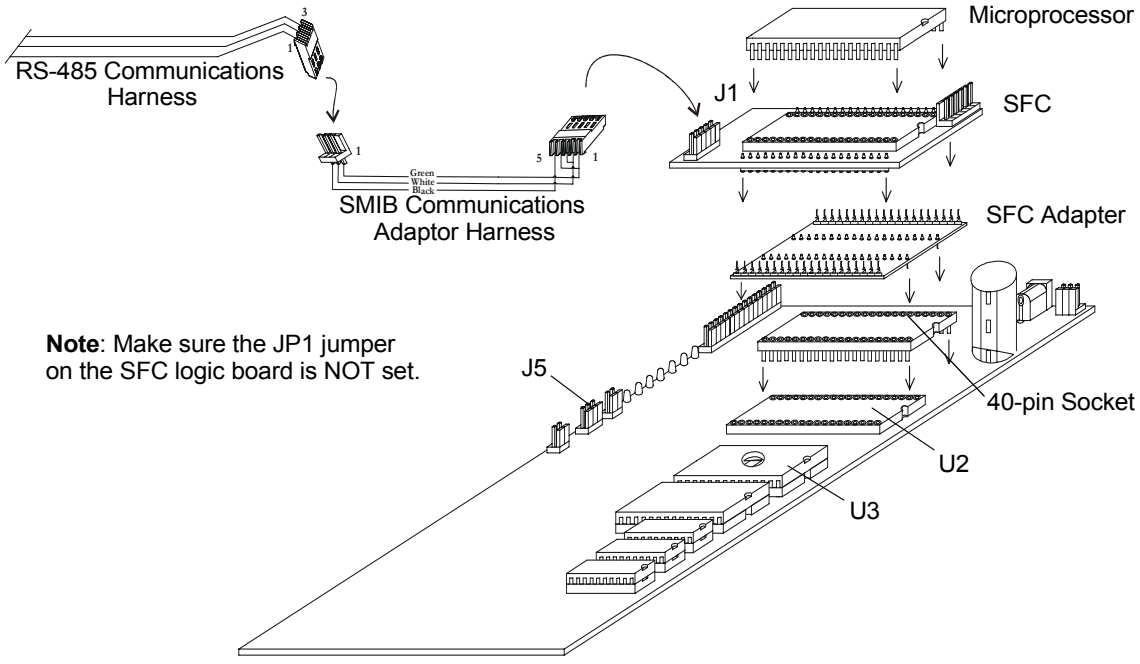


Location	Description
B0 and B1	Flash memory banks. Each holds 64Kb of data. When the SFC is first installed, the banks are empty, however after the initial firmware download, one of the two banks will always have firmware installed. When a user downloads firmware to the flash device, it saves the download to one of the two memory banks, whichever is available. When the download is complete, the device deletes the firmware from the other memory bank.
J1	DCU communications.
JP1	**NOT SET**: Not set for normal operations. DL firmware checks for valid SMIB firmware on the SFC flash memory. If the firmware is **not valid**, the SMIB goes immediately to download mode—that is, to log on to the DCU and wait for a firmware download from the CasinoLink system. If the firmware **is valid**, DL EPROM resets (stops running), and the SMIB firmware begins running from the SFC flash memory and logs on to the DCU. **SET**: SMIB goes immediately to download mode, logging on to the DCU and waiting for a firmware download from the CasinoLink system. See also page 42.
LED L1	Flashing = receiving download, ON = JP1 installed, OFF = SFC not working or is running firmware from flash memory.
LED TXD	Transmitting to system.
LED RXD	Receiving from system.
U2	Microprocessor chip from U2 on SMIB is installed here.

Installation Procedures

To install the SFC Module onto the SMIB, refer to the figure below and perform the following steps:

1. Power down the SMIB.
2. Make sure that the JP1 jumper on the SFC logic board is **not** set.
3. Move the microprocessor from U2 on the SMIB to U2 on the SFC logic board. Make sure that the notches on the chip and the SFC match.
4. Plug the socket into U2 on the SMIB. Make sure the notches on the chip and SMIB match.
5. Plug the adapter into the socket so pin 1 lines up with pin 1 on the socket.
6. Plug the SFC logic board into the adapter so pin 1 lines up with pin 1 on the adapter.
7. Replace the original EPROM at U3, on the SMIB, with the DL firmware EPROM. Ensure pin 1 lines up with pin 1 in U3. Discard the old EPROM.
8. Plug the 5-pin connector of harness 311-116-12 into J1 on the SFC.
9. Unplug the 3-pin RS-485 communication connector from J5 on the SMIB and plug it into the 3-pin connector of harness 311-116-12.
10. Power up the SMIB. Refer to User Manual 990-241-83 for download procedures.



Force SMIB to Read Firmware Download EPROM

If the downloaded firmware is not working correctly, use the JP1 jumper to force the SMIB to access the code on the Firmware Download EPROM. This allows you to then download new firmware to the flash memory. To force the SMIB to read the Firmware Download EPROM, perform the following steps:

1. Disconnect power from the SMIB.
2. Put a shunt on JP1 on the SFC.
3. Download firmware to the SFC. Refer to User Manual, P.N. 990-241-83.
4. Remove the shunt from JP1 when finished downloading firmware. If you do not remove the shunt, the SMIB cannot run the firmware installed in flash memory.
5. Power up the SMIB. The PTM will display the normal SMIB initialization messages.

Messaging

The following subsections contain summary descriptions of each firmware download message that the SMIB and CasinoLink system use. This information is duplicated in the Firmware Download manual listed above.

0XB0 Initiate Download

The IOC sends this message to the interface board indicating a forthcoming download. It also establishes a session number for use with the 0xB1 Download Program Data message.

If the data is valid and the interface board is able to start the download, it sends the IOC a 0xB3 Program Status message with Bit 1 turned on, to indicate a download is in progress, and the download begins. If the data is not valid, the interface board ignores the download request.

0XB1 Download Program Data

The DCU sends these messages to download a new program to the interface board. Each 0xB1 message contains up to 220 bytes of program data and instructs the interface board where to store it in the flash memory. Intervals between these messages are configured in the registry and must be sufficient to give the interface board time to process them, particularly between the first and second messages, as the interface board may need to reset.

0XB2 Request Program Status

The IOC sends this message to the interface board to get information such as the firmware version currently loaded on the interface board, the current status of a download, the offset the current download on, the Boot Loader version running, and the session number of the current download.

Continues on the next page.

0XB3 Program Status

During download mode, the interface board sends these messages to the IOC, which include bits shown in the following table, as either 1 (On) or 0 (Off) to indicate the status. For example, if the interface board misses data packets during a download, it send this message to the IOC with both Bit 1 (download in progress) and Bit 15 (missed packet) turned on.

Bit	Program Status Bit Description	Bit	Program Status Bit Description
0	Download complete	8	Incompatible shared RAM segment
1	Download in progress	9	Download would overwrite all programs or the boot loader
2	Flash device failure	10	Wrong program type for this device
3	All blocks received, program CRC failure	11	Bad download size (zero or non-multiple of 64Kb)
4	Bad Header size	12	Program would cross FLASH device boundary
5	Program already loaded	13	Bad load address (needs to be on a 64Kb boundary)
6	Program version mismatch	14	Session aborted due to timeout
7	Program size mismatch	15	Missed packet

0xB4 Delete Firmware Version

The DCU sends this message to the interface board to delete a firmware version when the user presses the Delete Version button, which only appears on the Firmware Download screen if the ShowDeleteVersionButton string value is in the firmware download registry settings. Note that the interface board will not delete a version if it removes the last application programmed.

Chapter 8 - Optional IVS Interface Support (SAS-Only)

IVS Interface is a CasinoLink module that interacts with International Game Technology's (IGT) Integrated Voucher System (IVS) and related hardware, such as wireless cashier terminals and handheld ticket validation devices. The SMIB routes the ticket information between the slot machines and the CasinoLink system. CasinoLink routes the data between the SMIB and the IVS.

Requirements

- **SMIB** firmware version 5.0.5.6 SAS, or later. Firmware must support SAS protocol.
- **CasinoLink** system: Mikohn IVS Interface module must be installed. All configuration to support the IVS system must be done through CasinoLink, as detailed in User Manual P.N. 990-403-59 Rev. A.

The following sections are provided for your convenience, and includes descriptions of the messaging supported by the SMIB that is specific to the IVS system, as well as associated meters used.

IVS Interface Messages

The following table lists IVS Interface messages the SMIB supports.

IVS Messages	Description
0x14 TTICKETLOCATION	MConfig.exe sends this message to the machines, specifying the data the machines should print on every ticket. This message includes information such as the casino name and address, and the ticket expiration period.
0x15 RVALIDATIONINFO	When a machine comes online, the SMIB sends this message to the MSvc_IvsInterface.exe requesting the machine's validation information. This message includes information such as the date, transaction number, and current Validation ID and Sequence Number.
0x16 TVALIDATIONINFO	The MSvc_IvsInterface.exe gets the machine validation information from the IVS and sends the information to the SMIB in this message. It includes a unique Validation ID and a Validation Sequence Number, which the machine will use to calculate a validation number printed on the next cashout ticket it generates.
0x17 TCOLLECTREQUEST	When a player presses the cashout button, the SMIB sends this message to the MSvc_IvsInterface.exe. It includes ticket information such as a transaction number, a validation number, the ticket amount, and the machine date and time.
0x18 TCOLLECTRESPONSE	The MSvc_IvsInterface.exe sends this message to the SMIB in response to the TCOLLECTREQUEST message, and includes information such as Validation ID, and Sequence Number. This message includes a transaction number, that must match the transaction number sent in the 0x17 TCOLLECTREQUEST,
0x19 TREDEEMREQUEST	When a player inserts a ticket into a machine's bill validator, the SMIB sends this message to the MSvc_IvsInterface.exe. This message includes the ticket status, amount, and validation number.
0x1A TREDEEMRESPONSE	The MSvc_IvsInterface.exe sends this message to the SMIB in response to the TREDEEMREQUEST message. This message includes information such as a transfer code, ticket amount, and ticket validation number. A transfer code indicates whether the ticket is valid.
0x1B TREDEEMCOMPLETION	The SMIB sends this message to the MSvc_IvsInterface.exe when the machine has indicated that it has redeemed the ticket and credited the credit meter. This message includes the machine status, and the transfer amount and validation number.
0x1C TTICKETDOOROPEN	When a user opens the machine's door, the SMIB sends this message to the MSvc_IVSInterface.exe indicating the date and time, and the door that was opened.

IVS Interface Meters

The following table lists the new IVS Interface meters the SMIB supports.

Meter Number	Transaction Code	Description	Validation Type
48	1052	Cashable Ticket from Cashout or win	00
49	1055	Handpay from cashout (ticket printed)	10
50	1053	Handpay from single win (ticket printed)	20
51	1056	Handpay from cashout (no ticket)	40
52	1054	Handpay from single win (no ticket)	60
53	1051	Cashable Voucher Redeemed	80
54	not available	Total number of this Validation Type	00
55	not available	Total number of this Validation Type	10
56	not available	Total number of this Validation Type	20
57	not available	Total number of this Validation Type	40
58	not available	Total number of this Validation Type	60
59	not available	Total number of this Validation Type	80

Appendix A - MISC_FLAGS and UPLOAD Settings

Introduction

Slot machine and SMIB properties are configured in the Advanced Settings screen of the Casinolink System Administration program. Basic machine properties include settings such as game denomination, points per coin, and progressive level configurations. Basic SMIB properties define behaviors such as when and which errors should be generated, and when and whether to disable the machine. SMIB behaviors are divided into two groups of settings: MISC_FLAGS and UPLOAD.

The CasinoLink MConfig program (Machine Configuration), transmits these settings to each SMIB as it first logs into the system and anytime configurations change. If you are familiar with the CasinoLink protocol, or have seen messages in hexadecimal format in the Portal Spy program, note that the MISC_FLAGS and UPLOAD settings are sent in the 0x71 message, which is also called the TMACHPROP (Transmit Machine Properties) message.

The UPLOAD and MISC_FLAGS settings, as well as the procedures to manually send the TMACHPROP message are described in the following sections:

UPLOAD settings ..... this page
MISC_FLAG settings ..... page 48
Procedures to update the settings in MConfig ..... page 49

UPLOAD Settings

UPLOAD settings in the TMACHPROP message correspond to the caslnk.other_args table. You can change the UPLOAD value in Casinolink System Administration (Advanced Settings\UPLOAD): See page 49 for instructions to manually update SMIBs with new UPLOAD or MISC_FLAG settings.

Currently only the BIT 9 setting is checked, as follows:

UPLOAD Bit	SMIB Behavior if Bit is Set to 1
BIT_9	Data points board detection. To use this function, you must have the data points board and harness P.N. 311-116-08. **1** = Check for the presence of the data points board. **Note**: The functionality of the coin-in drop signal is lost. **0** = 0x0C000 Bit 3 will operate normally (for coin in and drop signals).

MISC_FLAG Settings

MISC_FLAGS settings in the TMACHPROP message correspond to the caslnk.other_args table. As with the UPLOAD settings, you can change the MISC_FLAGS settings in Casinolink System Administration (Advanced Settings\MISC_FLAGS).

The MISC_FLAGS settings control which errors the SMIB will communicate and under which conditions the SMIB will disable the machine. The following table lists the MISC_FLAGS bits used by the SMIB (unused bits are not listed).

See page 49 for instructions to manually update SMIBs with new UPLOAD or MISC_FLAG settings.

MISC_FLAGS Bit	SMIB Behavior if Bit is Set to 1
BIT_0	This setting is for diagnostic use only and should **always** be set to 0 unless otherwise instructed by Mikohn. 1 = Generate the following errors: DCU CRC Failures, with more than 10 instances of DCU CRC failures DCU No Acknowledgment, with more than 10 instances of no DCU acknowledgement for messages that require DCU acknowledgement
BIT_1	1 = SMIB generates a **PTM Checksum Failures** error when there are more than 20 instances of PTM Checksum failures.
BIT_5	1 = Do NOT disable the machine if there is a ROM Signature mismatch.
BIT_6	1 = Disable if a denomination mismatch is detected.
BIT_9	1 = Reset the SMIB if DCU communication is lost. Recommended setting: **1**
BIT_10	Only for SAS, Sycom, or Sycom/IGT protocols. 1 = Do NOT disable the game for any reason. **Important**: Realize that when this bit is set to 1, the SMIB will continue normal operation even when it detects serious error conditions.
BIT_12	1 = resend DOOR_OPEN messages, at **X** second intervals, while the machine door is open. The interval is configured in the DOOR_OPEN_FIELD of the 0x71 TMACHPROPS message.
BIT_13	1 = Perform a ROM Signature check when a jackpot is hit, **and** if bits 5 and 10 are set to 0, disable the machine until the ROM Signature check passes.
BIT_14	1 = Disable the machine if the door opens without authorization.

Sending Updated Machine Properties

After a SMIB first logs into the system, it requests and receives the machine properties from MConfig. MConfig also checks the database at regular intervals and if it detects changes, sends an updated TMACHPROP message to the SMIB(s) affected.

Most machine and SMIB configurations can be set using the CasinoLink System Administration module. If you change these settings and want them sent immediately in the TMACHPROPS message, perform the following steps:

1. In the MConfig screen, type the command **q** to exit the process.
2. Open a command prompt screen, type **mconfig**, and press ENTER to restart the process. MConfig retrieves the new configurations from the database.
3. Type the command **t** to manually prompt MConfig to send an updated TMACHPROP message to the SMIBs.

Appendix B - SERROR Error Codes

The SMIB generates a variety of errors in response to certain events or conditions detected in the SMIB and in the gaming machine. Some errors are identified as SMIB errors, or SERRORs; and others are identified as machine errors, or MERRORs. Typically, but not always, a SMIB is the originator of SERRORs and a machine is the originator of MERRORs, though they pass through and are interpreted by the SMIB.

SMIB and machine errors are sent to CasinoLink in two different CasinoLink protocol messages: the 0x41 MERROR, which contain specific machine error codes and information; and the 0x42 SERROR, which contain specific SMIB error codes and information.

These errors can be viewed in the Alarms and Portal Spy programs. In the Alarms screen, you will see the error code in decimal format, followed by the error text. In the Portal Spy screen, you will see the entire message contents of an error message in hexadecimal format.

The following table lists individual error codes sent in the SERROR message. The error codes must be defined in the alarms.ini and alarm_code.bcp files in CasinoLink, to be displayed in the Alarms.exe program. Note that the far left column, both the hexadecimal and decimal values of the error code are included. Appendix C lists the error codes sent the MERROR message.

Code	0x42-Interface Board Event Description	Extended Data and Notes
0x10	Interface Board Power Fail	**Note**: Time stamp field can be undefined.
0x11	Interface Board RAM Birth	**Extended data:** [*4 byte* reason_code][*varies* Text message] **Description**: SMIB initialized its battery-backed RAM. Occurs first time firmware runs and if SMIB detects RAM corruption upon reset. Soft meters and other values that SMIB stores are all initialized to default states. **Notes**: In the reason_code - All bits set to 0 **or** 1st bit set to 1: Text message reads "Complete Memory Birth." If the 2nd bit is set to 1: Text message reads "Progressive Queues Birthed." Any other bits set to 1: Text message reads "Unknown Queues Birthed, Flag: XX."
0x12	Interface Board Serial Number Changed	**Description**: Upon reset, SMIB detects a unique ID different from expected ID stored in RAM.
0x15	Interface Board RAM Check Error	
0x16	Interface Board Meters Lost	

Code	0x42-Interface Board Event Description	Extended Data and Notes
0x17	Interface Board Meters Fixed	
0x18	Interface Board DCU Transmit Queue Purged	**Description**: DCU transmit buffer was corrupt. All messages in queue are lost.
0x19	Interface Board DCU Transmit Queue Full	
0x1A	Interface Board ROM Checksum Changed	**Description**: When SMIB resets, ROM checksum is calculated. If it does not match value stored in battery-backed RAM, this error is issued. Usually occurs because a new ROM version was installed in SMIB, but could also possibly be caused if ROM checksum value stored in RAM was corrupted.
0x1B	Interface Board Player Data Corrupt	
0x1C	Interface Board DCU Transmit Queue Corrupt	**Description**: Checksum failed for a message pending transmit. Indicates RAM corruption.
0x1D	Interface Board Bill Meters Lost	
0x1E	Interface Board No Game Type Set (Only where set by DIP switches)	**Description**: DIP switch settings do not match machine protocol.
0x30	Interface Board PTM Not Responding	**Description**: SMIB-PTM communications interrupted due either to a bad connection or a hot PTM.
0x31	Interface Board PTM Responding Again	**Description**: PTM communication resumed.
0x32	Interface Board PTM Receive Overflow	
0x33	Interface Board PTM Checksum Failure	**Description**: SMIB received 10 PTM messages with failed checksums (only if MISC_FLAGS Bit 1 is set). May be due to either a bad connection or a hot PTM.
0x34	Interface Board PTM Version Changed	

Code	0x42-Interface Board Event Description	Extended Data and Notes
0x35	Interface Board PTM Card Abandoned	**Description**: A card has been in the machine for **X** number of seconds without any coin activity. This value is set in the CARD_ABANDONED_TIME field in the caslnk.other_args database table.
0x40	Interface Board DCU Not Responding	
0x41	Interface Board DCU CRC Failures	**Description**: SMIB received 10 DCU messages with bad CRCs (reported only if MISC_FLAGS Bit 0 is set). May be due to either a bad connection or a different SMIB malfunctioning on the same line.
0x42	Interface Board DCU Rx Overflow	**Description**: DCU sent message that was too long. May indicate memory corruption, memory interrupt, or power fail.
0x43	Interface Board DCU No Acks	**Description**: DCU failed to acknowledge messages from SMIB 10 times (only if MISC_FLAGS Bit 0 is set). DCU does not acknowledge messages with invalid CRCs or if not received in time allotted after a poll.
0x44	Interface Board DCU Too Many Comm Errors	**Description**: If SMIB receives 20 consecutive communication errors from the DCU, it assumes a runaway condition, resets itself, and reports this error.
0x45	Interface Board Game Too Active	**Description**: Machine has sent SMIB more than N messages per second. N defaults to 10 and is configured in GAME_MSG_RATE in caslnk.other_args database table.
0x46	Interface Board Bill Meters Lost	
0x47	Interface Board Bill Meters Fixed	
0x48	Interface Board Interface Board Reset	**Description**: SMIB reset. Non-volatile RAM is intact.
0x49	Interface Board Online	
0x5A	Interface Board Lost DCU Communication	
0x5B	Interface Board Machine Properties Corrupt	**Description**: Machine properties corrupt and set to defaults.
0x5C	Interface Board Watchdog Reset	**Description**: SMIB reset by watchdog circuitry. **Note**: Time stamp field can be undefined.

Code	0x42-Interface Board Event Description	Extended Data and Notes
0x5D	Interface Board Progressive Values Corrupted	**Description**: Progressive values found corrupt in SMIB.
0x5E	Interface Board Invalid Machine Program Signature	[*8 byte* Seed] (Hex, LSB) [*8 byte* Signature] (Hex, LSB) **Description**: Machine failed to pass ROM signature verification. IGTSAS protocol only.
0x5F	Interface Board ROM Signature Lost	**Description**: SMIB has a ROM seed of 0 for machine. Occurs on SMIB RAM clear. IGTSAS protocol only.
0x60	Interface Board ROM Signature Disagreement	**Description**: System informed SMIB that machine failed its ROM signature verification.
0x61	Interface Board Denomination Mismatch	**Description**: Machine reported different denomination than SMIB expected. IGTSAS protocol only.
0x62	Interface Board Standard Data Block Corrupt	**Description**: SMIB determined that its internal data block is corrupt.
0x71	Interface Board Machine Disabled By System	**Description**: SMIB disabled machine due either to an error condition detected by SMIB or because system received a disable message.
0x72	Interface Board Machine Enabled By System	**Description**: SMIB enabled the machine because system received an enable message.
0xA8	Data Points board not detected	
0xA9	Data Points board connected	
0xB0	Interface Board Stopped Responding	**Description**: SMIB-machine communications interrupted. Only Aristocrat/IGTSAS/Williams.
0xB1	Interface Board Resumed Responding	**Description**: SMIB-machine communications resumed. Only Aristocrat/IGTSAS/Williams.
0xB2	Mystery Progressive Hit	[word PGID] byte LEVEL] [long AMOUNT_WON] [long AMOUNT_TO_PAY] **Notes**: Extended data is from the JACKPAY message.

Appendix C - MERROR Codes

The SMIB generates a variety of errors in response to certain events or conditions detected in the SMIB and in the gaming machine. Some errors originate from the SMIB; others originate from the machine. When an error originates from the SMIB, it still passes through and is interpreted by the SMIB, who then notifies CasinoLink of the condition or event.

These errors are sent to the CasinoLink system in two different CasinoLink protocol messages: the 0x41 MERROR, which will contain one or more specific machine error codes and information; and the 0x42 SERROR, which will contain one or more specific SMIB error codes and information.

You can view these errors in the Alarms and Portal Spy programs. In the Alarms screen, for each error generated, you will see a time and date stamp, the error code in decimal format, and finally the error text. In the Portal Spy screen, you will see the entire message contents of an error message in hexadecimal format.

The following table lists individual error codes sent in the MERROR message. The error codes must be defined in the alarms.ini and alarm_code.bcp files in CasinoLink, to be displayed in the Alarms program. Note that the far left column, both the hexadecimal and decimal values of the error code are included.

MERROR Code	Description	IGT SAS	Bally Serial	Aristocrat
0x01	Coin In Jam	X	X	X
0x02	Coin Out Jam	X		
0x04	Hopper Empty	X	X	X
0x05	Bill Jam	X	X	
0x06	Stepper Reel Fault	X		X
0x10	Power Failure	X		
0x22	Machine Power Up During Reset	<----------any---------->		
0x23	Machine Reset During Payout		X	
0x24	Machine Power Up	X		
0x25	Machine Validator Reset	<----------any---------->		
0x26	Hopper Runaway/Overpay		X	
0x27	Handpay Jackpot	X	X	X
0x28	Inappropriate Coin In (excessive coin rejects)		X	X
0x29	Coin In Reverse		X	X

MERROR Code	Description	IGT SAS	Bally Serial	Aristocrat
0x2A	Hopper Jammed		X	X
0x2B	Machine Door Open During Reel Spin		X	
0x2C	Machine Message Center Failure		X	
0x2D	Machine Service Request		X	
0x50	Machine Reel 1 Malfunction	X	X	
0x51	Machine Reel 2 Malfunction	X	X	
0x52	Machine Reel 3 Malfunction	X	X	
0x53	Machine Reel 4 Malfunction	X	X	
0x54	Machine Reel 5 Malfunction	X	X	
0x55	Machine Illegal Reel 1 Movement		X	
0x56	Machine Illegal Reel 2 Movement		X	
0x57	Machine Illegal Reel 3 Movement		X	
0x58	Machine Illegal Reel 4 Movement		X	
0x59	Machine Illegal Reel 5 Movement		X	
0x5A	Cash Box Removed	X	X	X
0x5B	Cash Box Returned	X	X	X
0x5C	Cash Box Stacker Full	X	X	
0x5D	Machine Validator Out Of Service		X	
0x5E	Machine Validator In Service		X	
0x60	Main Machine Door Opened	X	X	X
0x61	Main Machine Door Closed	X	X	X
0x62	Drop Box Door Opened	X		X
0x63	Drop Box Door Closed	X		X
0x64	Processor Door Opened	X		
0x65	Processor Door Closed	X		
0x66	Belly Panel Door Open	X		

MERROR Code	Description	IGT SAS	Bally Serial	Aristocrat
0x67	Belly Panel Door Closed	X		
0x68	Note Acceptor Door Opened	X		
0x69	Note Acceptor Door Closed	X		
0x70	Note Acceptor Fault	X		X
0x73	Machine Mechanical Meter Failure			X
0x74	Machine Jackpot Reset	X		
0x75	Machine General Tilt (Unknown To Game)	X		
0x76	Machine Extra Coin Paid	X		X
0x77	Cash Box Optic/Diverter Malfunction	X		
0x78	Machine Options Mismatch	X		
0x79	Machine Meter Mismatch			X
0x7A	Machine Door Switch Fault			X
0x7B	Printer Fault			X
0x99	Unknown Event Code (a machine exception for which Mikohn does not have a code)	<----------any---------->		
0xA0	Machine RAM Error	X	X	X
0xA1	Machine EPROM Error	X		
0xA2	EEPROM Error/Fault	X		
0xB6	Low NVRAM battery	X		
0xBC	Machine CMOS RAM Error			
0xC3	Cancel Credit	<----------any---------->		
0xC4	All Faults Cleared	<----------any---------->		
0xD1	Invalid Game Configuration	<----------any---------->		
0xD9	Top Box Door Open			
0xDA	Invalid Game			
0xDB	Key Activated			

Appendix D - ROMSig Process (SAS-Only)

Most operators require the ability to verify the integrity of a gaming machine's EPROM. This is done by requiring the machine to calculate a cyclic redundancy code[1] (CRC) using a seed value provided by the system. The resulting value is then compared to the EPROM's known CRC value, or signature, which is stored in the CasinoLink database. This process is also known as a ROM signature, or ROMSig, verification. This section explains the SMIB requirements and the message flow of both manual and automated ROMSig verification.

Bit 5 in MISC_FLAGS must be set to OFF (0) for the SMIB to disable the machine if there is a ROM signature mismatch.

Firmware Requirements for ROM Signature Verification

To support ROMSig verification, you must use a SMIB firmware version that supports the SAS protocol.

ROMSig Trigger Events

A ROMSig verification is triggered by any of the following events:

- SMIB regains game communications after 30 seconds of no game communication, with the following exception: A ROMSig is not triggered if the SMIB detects a seed of 0 due to a RAM Clear. Instead of requesting a ROMSig, the SMIB sends the system a TROMSIG message.
- Jackpot hit is detected (with Bit 13 of MISC_FLAGS set to ON).
- Operator initiates ROMSig in the ROM Signature Verification screen.

SMIB Function and Requirements for Startup and RAM Birth

1. The SMIB comes online.
2. The SMIB obtains machine properties.
3. The SMIB must be manually verified one time in order to operate properly (see next page). This ensures that the seed has a non-zero value, as explained in step 2 of the automated process on page 59.

1. CRC is also sometimes interpreted as cyclic redundancy *check*.

Manual ROM Signature Process

This section describes a ROMSig verification process that is manually initiated.

1. The operator manually initiates a ROMSig verification on the SMIB via the ROM Signature Verification screen on a CasinoLink workstation. This step is procedural, not automated.
2. RomSig.exe sends a 0x90 RROMSIG message to the SMIB. This message contains the seed and expected CRC value (see page 59) for the slot machine.
3. The SMIB stores the seed and CRC received in the RROMSIG message and initiates a signature calculation in the slot machine.
4. The slot machine begins to calculate the CRC based on the seed given by the SMIB. It may take several minutes for the slot machine to calculate the CRC after receiving the request to do so. The SMIB continues the normal polling cycle during this time.
5. The slot machine sends the CRC back to the SMIB, which then compares the CRC from the slot machine to the CRC received in the RROMSIG message. The SMIB performs the appropriate step below:
   - If the CRC does **not** match, disables the slot machine.
   - If the CRC **does** match, enables the slot machine if it was previously disabled due to a ROMSig failure.
6. The SMIB sends a 0x91 TROMSIG message to RomSig.exe containing the CRC calculated by the slot machine and the seed used to calculate the CRC.
7. RomSig.exe compares the CRC and seed from the RROMSIG message (step 2) to those in the TROMSIG message. If the values do not match, a RROMSIG message is sent to the SMIB with a zero seed and CRC, which ensures the machine is disabled.

Automated ROM Signature after the Jackpot Hit

This section describes the automated ROMSig verification process that initiates when the SMIB detects a jackpot hit.

1. The SMIB detects a jackpot hit.
2. The SMIB initiates an automated ROMSig verification on the slot machine using the last seed received from the ROMSIG program. (Note: It is important that the SMIB ROMSig is manually verified once after each RAM birth.) The SMIB also immediately disables the machine.
3. The slot machine begins to calculate the CRC. It may take several minutes for the slot machine to calculate the CRC after receiving the request to do so. The SMIB continues the normal polling cycle during this time.
4. The slot machine sends the CRC back to the SMIB, which then compares the CRC to the last received CRC from the system. The SMIB enables the slot machine if the CRC matches. Otherwise, the machine remains disabled.
5. The SMIB sends a TROMSIG (0x91) message to RomSig.exe.
6. RomSig.exe compares the CRC with the given seed to the expected CRC of the slot machine. If the values do not match, a RROMSIG message is sent to the SMIB with a zero seed and CRC, which ensures the machine is disabled.

System CRC Calculation

CRC (Cyclic Redundancy Check) is a method for checking the integrity of data received over communication lines. The system calculates CRC values from a binary (BIN) image file of the game EPROM set provided by the game manufacturer.

Glossary

Battery backup	Battery that supplies power to a device to maintain memory in case of a power failure.
Baud	Rate data is transmitted over communication lines.
Bi-directional communications	Communication paths that transmit and receive data.
Birth	A reset function that restores the settings stored in RAM (except the RAM drive) to its default values and the program counters back to zero.
Broadcast	The act of a particular network device issuing a message to all devices on the network. All devices may receive the broadcast, however, all devices need not respond.
Channel	See Communication Channel.
Coin in	The value of coins wagered in a gaming machine. Also known as turnover, (coin) credits played, and (coin) credits wagered.
Coin out	The value of coins paid to a player by a gaming machine, including coins or credits won and paid, or won and wagered. Also known as (coin) credits won.
Communication Port	A connection on a device, such as a machine or computer, in which a harness is installed for data exchange with other system devices.
CRC	Cyclic Redundancy Code. A method for checking the integrity of data received over communication lines.
DB9	9-pin RS-232 serial communications connector used for communication ports/harnesses.
DB25	25-pin RS-232 serial communications connector used for communication ports/harnesses.
DCU	Data Collection Unit. A Mikohn-proprietary store and forward communications device that connects up to 128 peripheral devices, such as interface boards and visual displays. DCUs can be used for a variety of purposes, such as standalone controllers for devices; or, as a part of a larger system, such as CasinoLink, the DCU can route communications between devices and the system.
Denomination	Unit of monetary value that a machine accepts for play.
DID	Dallas® ID. A chip that contains a unique 12-digit hexadecimal number used for device identification purposes in communication.

DIP Switch	Dual-Inline Package switch. The package, or bank, contains a number of switches and fits into a standard chip position.
Display	See Visual Display.
Drop	Also Clearance. Money put into a gaming machine. This can be coin (hard drop) or paper currency (soft drop). The hard drop falls into a drop box, while the soft drop is inserted into the bill validator. The process in which authorized employees gather coin and currency from specific gaming machines.
EPROM	Erasable Programmable Read Only Memory chip that stores information such as programs or data.
EEPROM	Electronically Erasable Programmable Read Only Memory
Full-duplex	Bi-directional and simultaneous data transmission over communication lines.
Half-duplex	Non-simultaneous bi-directional data transmission over communication lines. See also Full-duplex.
IOC	Input/Output Controller. The software component of CasinoLink or the hardware that runs it. Game network configuration management and communications functions reside on the IOC, as do real-time functions such as those that process jackpots, hopper fills, alarms and player tracking points.
Jackpot	A prize awarded to a player upon receiving a winning combination in a game. If the jackpot is won on a machine, the machine normally locks up and flashes the Jackpot Candle sequence. The prize can be dispensed automatically by the machine or with a handpay for large jackpots.
LED	Light-Emitting Diode. A small light-emitting device commonly used in visual displays, and also as a status indicator in hardware devices.
Meter	Hardware or software counting devices. Commonly used to track money passing in and out of a machine. Mechanical meters collect lifetime totals and cannot be reset. Software meters are displayed in the statistical data mode and can be reset. An overhead visual display showing the incrementing numbers of a Progressive Jackpot.
Polling	The process of a network device, such as an IOC or a DCU, requesting specific data from other network devices such as computers or interface boards.
Port	See Communication Port.

Progressive (Jackpot)	A gaming machine or network of machines that each contribute a fixed percentage of wagers to a continuously incrementing jackpot. Linked machines can be located in a single establishment, known as a Linked Progressive, or across many establishments for a Wide Area Progressive (WAP). A player wins the progressive jackpot by playing a progressive game with qualifying wagers. An overhead visual display usually installed above the bank of machines linked to the progressive shows the current amount of the jackpot.
PTM	Player Tracking Module. A Mikohn hardware unit installed in a gaming machine, which includes a magnetic card reader, keypad, and a display. The PTM registers player activity and records employee and technician access to the machine. Its display shows meter and internal machine information for auditing and troubleshooting.
RAM	Random Access Memory. Used for temporary data storage.
Remote	A computer or site at a location other than Central, in the CasinoLink system.
ROM	Read Only Memory. Used for permanent data storage.
RS-232	Recommended Standard 232. EIA communication standard that supports one transmitter and one receiver locally (up to 50 feet) and is used to communicate serially.
RS-422	Recommended Standard 422. EIA communication standard that supports one driver that can transmit to multiple receivers. RS-422 can be used for higher baud rates and greater distances (up to 4000 feet) than RS-232.
RS-485	Recommended Standard 485. EIA communication standard that supports 32 drivers and 32 receivers (more with added components). Its serial communication protocol is used typically to connect one device with other devices that share a common cable. Baud rate and distance supported are the same as RS-422.
Serial	One by one; transmitting data one bit at a time.
Visual Display	Electronic sign using LED technology to communicate a wide range of information, such as jackpot values and win celebrations, promotions, and advertising. Visual displays connect to the system network and receive data files from machines and the IOC that determine jackpot values, wins, and other information.