ARISTOCRAT

TECHNICAL SERVICES

U.S.A. 540MVP

VIDEO GAMING MACHINE

SERVICE MANUAL

AM-1911502-02

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Aristocrat Leisure Industries Pty Limited reserves the right to change, without notice, the design or specifications of the gaming machine covered by this document. Additional information is available from time to time in the form of technical bulletins. New editions of this document may change its contents. This document is not for use in countries where gaming machines are prohibited by law.

CAUTION

All functions of the machine are controlled by complex electronics. Unqualified personnel must not interfere with any mechanisms or controls as this may permanently damage the machine and lead to expensive repairs or component replacement, and will render the warranty void.

Important Safety Information

This document contains important information about the use of the equipment and hazards involved in owning and operating the equipment to which it relates. The equipment can be very hazardous if used other than in accordance with this document.

Inform yourself and your staff

You must read this document before using the equipment or opening any part of the equipment. Ensure your staff do too.
The equipment itself is marked with important warning labels detailing dangers.

- Check for warning labels whenever opening any part of the equipment.
- Read and comply with all warning labels you see when operating or opening the equipment.
- Under no circumstances remove or alter any warning label.

Be careful

If you don't follow the directions in this manual and on warning labels you increase the risk of the following things occurring:

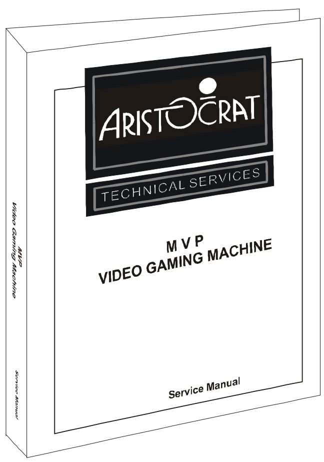
- **serious personal injury**, including electrocution and amputation. Unless you are a trained technician, tampering with the machine can kill you;
- serious damage to the equipment;
- serious damage to other equipment;
- serious damage to the premises housing the equipment.

Aristocrat MVP Manuals

Operator Manual

Primarily intended for operators of Aristocrat MVP Video Gaming Machines. The Operator Manual:

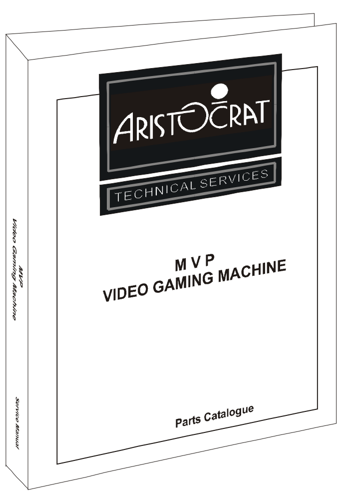
- gives a general overview of the hardware and software
- provides procedures for daily operations and simple maintenance.



Service Manual

Primarily intended for service technicians. The Service Manual:

- gives a general overview of the hardware and software
- provides instructions for installation and fault finding
- describes in detail each of the major components of the machine.



Parts Catalogue

Primarily intended for operators and service technicians. It enables operators and service technicians to order machine parts. The Parts Catalogue:

- shows an illustration of each of the components of the machine
- links each illustration with a part number.

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Record of Amendments

Amendment Number	Amendment Date	Insertion Date	Your Initials

Amendment Number	Amendment Date	Insertion Date	Your Initials

Foreword

How To Use This Manual

Purpose of the Manual

This manual provides procedures for the servicing and maintenance of the video gaming machine. It covers areas of machine operation that must be carried out by licensed technicians.

User of the Manual

The manual is aimed at technicians who need to understand detailed and technically complex aspects of the machine to service and maintain it.

Warnings, Cautions and Notes

WARNING
A warning immediately precedes an operating procedure or maintenance practice which, if not correctly followed, could result in personal injury or loss of life.

CAUTION
A caution immediately precedes an operating procedure or maintenance practice which, if not strictly observed, could result in damage to or destruction of the equipment, or corruption of the data.

Note
A note immediately precedes or follows an operating procedure, maintenance practice or condition which requires highlighting.

Units of Measure

The manual uses the international system of units. The following conversion is provided for the convenience of readers.

1 W = 3.41241 Btu/hour	1 Btu/hour = 0.2930711 W
1 kJ = 0.948 Btu	1 Btu = 1.06 kJ.

About Aristocrat Leisure Industries

Aristocrat Leisure Industries (ALI) commenced operations in 1953 and is one of the largest and most successful gaming machine manufacturers. ALI has supplied machines to every country and region in the world where gaming machines are legal, including Austria, France, Germany, Holland, Malaysia, China, the Philippines, Africa, Singapore, Russia, South America, and the USA.

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Chapter 1

General Description

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1.1 Physical Description

The Aristocrat MVP Video Gaming Machine is the latest model of a range of advanced gaming machines that incorporates the following features:

- Advanced, high-performance electronics based on ARM RISC technology,
- Advanced software enabling a wider variety of games and simpler machine operations,
- Complete range of machine attachments enabling note and coin currency, communication links, progressive systems, and custom options,
- Comprehensive security options,
- Modular design and construction,
- A multi-voltage power supply assembly,
- Easier servicing and maintenance,
- High resolution video displays, advanced animation and graphics, and improved sounds and tunes,
- Variety of aesthetic cabinet types, colours, and game and score displays.

The machine is assembled from various sub-assemblies and major components (modules) which are described in detail in other chapters of this manual.

Figure 1-1 shows a typical external view of the machine with a bill acceptor fitted and Figure 1-2 shows an internal view.

The following table briefly identifies the various modules of the gaming machine.

Table 1-1 Video Gaming Machine Modules

Machine Module	Description
Cabinet, Door and Top Box.	The physical outer enclosure which provides for the location and mounting of other modules.
Belly Panel Door	This door is located on the main door, below the mid trim, and provides access to the note stacker (where fitted) and main door fluorescent tube. This door is fitted with a lock and a battery-backed security switch.
Video Monitor	High resolution 640 x 400 pixels for improved-quality graphics. The monitor is the main medium for displaying game operation and status to the player.
Main Board	The Main printed circuit board (PCB) provides primary control of the gaming machine. The Main Board is interfaced (via the Backplane) to all the major components of the machine. The board receives signals from, and sends control signals to machine components. The Main Board houses the central processor and other logic components for game generation, video and stepper drivers, security items, power control, memory storage, and communications.
Backplane (may also be called the Interface Board).	The Backplane houses an array of connectors which are used to electrically connect (via direct mechanical coupling or through looms and ribbon cables) the various electrical components of the machine to the Main Board.
I/O Driver Board	The I/O Driver Board drives the lamps, receives inputs from the pushbuttons, interfaces with the coin handling system, and provides a battery-backed circuit for security monitoring.
Communication Configuration Board	The Communication Configuration Board (CCB) 'piggy-backs' to the Main Board. The board is used to set up the communications channels of the Main Board (up to three) for external networks, bill acceptor, printer, and touchscreen.
Logic Cage	The logic cage consists of a secure, steel cabinet which houses the Main, Communications Configuration, and I\O Driver PCBAs. The section of the Interface Board that interfaces with the Main Board and the I/O Driver Board is also located within the logic cage.
Power Supply Assembly	The power supply assembly converts the AC mains input voltage into low voltage DC power for the various machine modules and circuits. Power is directed via the Interface Board to the machine components. The video monitor and the fluorescent lighting system receive AC power directly from the power supply assembly.
Coin Handling System	The function of the coin handling system is to check the validity of coins inserted, establish a count and pass signals to the Main Board. The coin handling system directs coins to either the hopper, cash box, or coin tray. The MkV Series II is compatible with several different coin handling systems.

Hopper (if used)	The hopper acts as a holding unit for coins. When instructed by the main board, the hopper returns coins to the player. For each coin ejected, the hopper sends a signal to the Main Board. When the required number of coins have been dispensed, the Main Board signals the hopper motor to stop.
Bill Acceptor and Soft Drop Analyser (if used)	The function of the bill acceptor is to accept valid note currency and register the appropriate number of credits for gameplay. A note stacker is used to store the notes and to record monetary and statistical information. The information stored in the stacker may be read by a PC-based system away from the gaming floor without opening the stacker.
Player Communication (if used)	The function of player communication is to allow a player, using an identification card, to 'log on' to a network system when playing a machine. The network system maintains a record of player transactions, and allows messages to be sent to individual players. The player communication module can be attached to the side of the gaming machine or fitted in the top box.
Mechanical Meter Board (if used)	Electromechanical meters are used to record accounting data in a physical format. The signals for the meters are received from the Main Board, via the Backplane.
Ticket Printer (if used)	The ticket printer is an electronic device mounted within the cabinet, it is used for providing the player with a printed ticket for redeemable credits. The printer may also keep a second copy of all tickets printed for additional audit information.
Communications Interface (if used)	The function of the communications interface is to enable the machine to be linked to a network and/or subsidiary equipment. The communications interface may be linked to various machine modules, including security, and transmits signals from these inputs as each one changes status.
Light Tower (if used)	Multi-level light towers may be used to provide an additional level of customer service and security.

Figure 1-1 Typical MVP Video Gaming Machine with Bill Acceptor - External View

Figure 1-2 Typical MVP Video Gaming Machine with Bill Acceptor - Internal View

Machine Keys

The gaming machine requires keys for the following locks and switches to establish effective security and correct operation. A key may only be removed from its lock or key switch after it has been returned to the locked position. Refer to Figure 1-1 for lock and keyswitch positions.

Table 1-2 Machine Keys

Name	Function
Cabinet Door Lock	Allows the operator to open the cabinet door. Insert the cabinet door key and turn it 180° clockwise, then lift the latch to release the door.
Audit Key Switch	Enables entry to the Operator Mode Menu (see Machine Modes). Insert the Audit Key and turn it 180° clockwise.
Jackpot Reset Keyswitch - also called the Cancel Credit Key Switch	Allows the operator to reset the machine after a machine fault has been corrected (see Machine Modes). Insert the Cancel Credit key, turn it 90° clockwise then back again.
Belly Panel Door	Allows the operator access to the bill acceptor note stacker and door fluorescent tube.
Logic Cage Lock (if fitted)	Allows the operator access to the PCB logic cage. Insert the logic cage key and turn it 180° clockwise.
Bill Acceptor Cage Door Lock(s) (optional)	Allows operator access to the bill acceptor stacker lock(s) and to remove the stacker. Turn keys 180° clockwise to open.
Bill Acceptor Stacker Lock	Allows the operator to remove the notes from the stacker. Insert the key and turn it 90° clockwise, open the door and remove the notes.

1.2 Basic Operation

The gaming machine functions are controlled by an advanced software and hardware platform that gives operators greater control over machine functions, easier maintenance, and simplified machine setup. New games developed with the software provide higher quality graphics, new sounds, and a wider variety of features.

The machine has two major modes of operation: ***Play*** mode and ***Operator*** mode.

The machine is in Play Mode when the cabinet door is closed and locked, the Audit key switch is in the OFF position and there are no fault or lock-up conditions.

The machine is in Operator Mode when the Audit key switch is in the ON position. The operator mode provides a range of operational procedures, data displays, and specific machine functions, all of which are fully controlled by the Operator Mode Menu system and the on-screen guidance. The functions of the operator mode are explained in detail in the chapter Machine Modes.

When the machine is in operator mode, normal game operation is not possible. However, demonstration mode and combination test mode enable gameplay without using currency.

1.2.1 Play Mode

When in Play Mode, the machine:

- operates security and audit features,
- runs self-checking and testing continuously,
- permits gameplay,
- monitors and records gameplay activities continuously,
- displays comments and guidance for players, operators and technicians.

Basic machine operation in Play Mode is shown in Figure 1.3 Depending on the machine configuration, credits may be registered by inserting coins, tokens, or bank notes, or by using a cashless system. With a cashless system, credits are transferred to and from the machine through either a computer link or a smart card. The machine has security features for screening the currency tendered to ensure that only valid currency is accepted.

If the currency is accepted by the machine, the playbuttons on the mid trim become active and flash. The player may then insert more currency, play a game by pressing one of the flashing playbuttons, or have the machine return the current credit total by pressing the CASHOUT pushbutton. The player determines how many credits to wager by pressing one of the BET playbuttons, and the BET meter on the display screen shows the credits wagered.

Once the player starts a game by pressing one of the active playbuttons, the machine runs the game sequence and displays the outcome on the screen. If the result is a winning combination, the player may gamble the win (if the gamble feature is available); otherwise, the machine increments the credits won. If the result is not a winning combination, the player may continue gameplay provided there are credits remaining.

The machine is equipped with electronic audit meters which continuously monitor and record credit movement and game activity. Electromechanical meters may also be fitted. The electronic meters are accessed through the Operator Mode. The information in these meters is used for audit calculations and security purposes.

If the machine encounters an abnormal condition, it alerts the operator by automatically entering Machine Lockup. In lockup, gameplay is disabled to prevent any further player interaction and guidance information is displayed in the game message area. The lockup condition can be identified by examining the Current Lockup screen, which is accessed from the Operator Mode Menu.

1.2.2 Operator Mode

Within Operator Mode (Audit Key ON), the following options are available:

- machine identification
- metering information
- diagnostic information
- operator setup/selection
- miscellaneous
- current lockup mode.

In Operator Mode, the electronic audit meters and the electromechanical meters (if fitted) do not function. Menu selections may be used to review the machine details, select new configurations, and carry out machine tests. Refer to the chapter Machine Modes for detailed information.

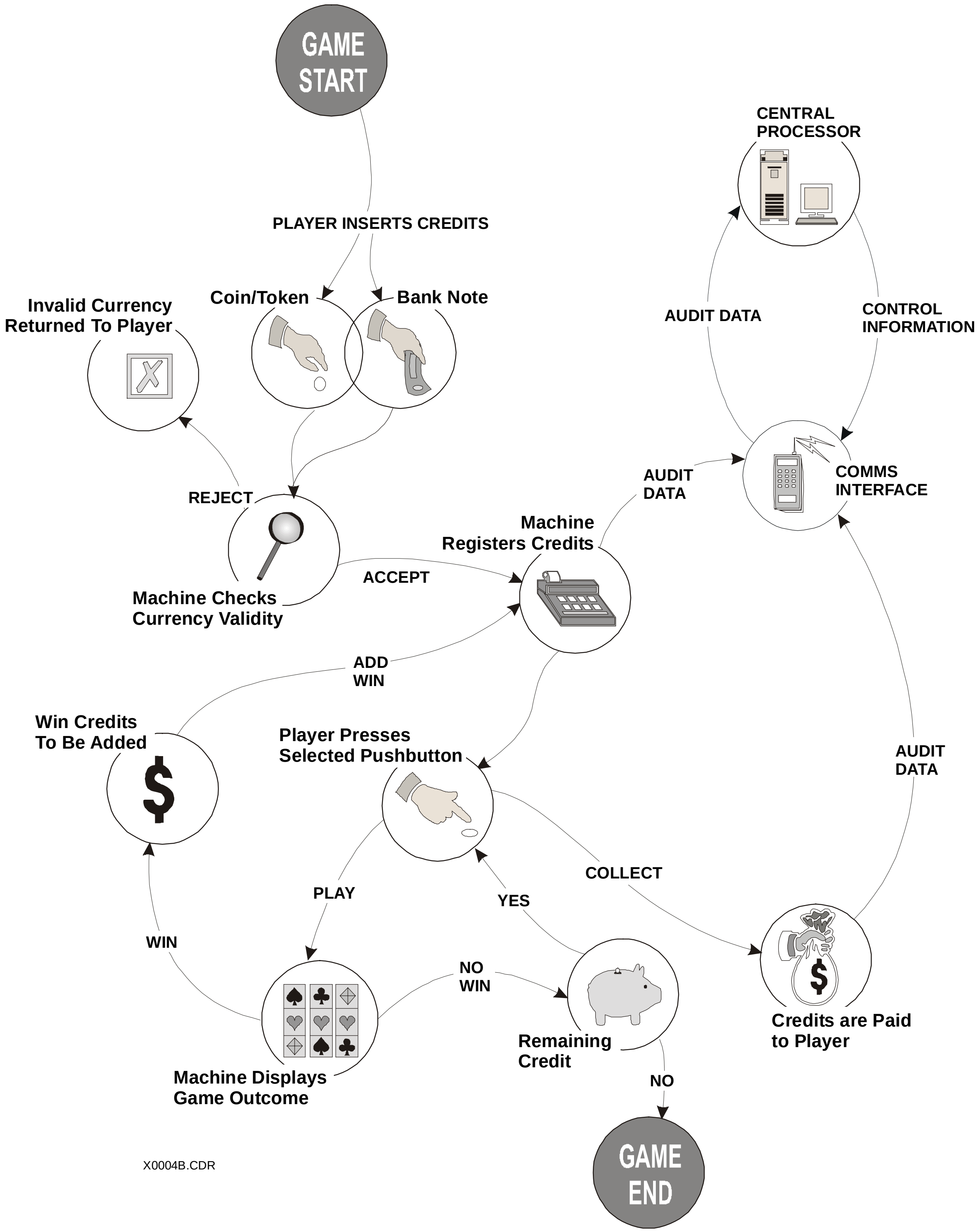


Figure 1-3 Basic Game Operation in Play Mode

1.3 Specifications

Table 1-3 Physical Characteristics

Dimensions (Typical)	
Height of cabinet with high boy top box	1468 mm
Height of cabinet with casino top box	1278 mm
Height of low boy cabinet	897 mm
Width	540 mm
Depth	611 mm
Recommended minimum clearance between machines	180 mm
Weight (Typical)	
With casino top box and bill acceptor	approx. 102 kg

Table 1-4 Power Requirements

The voltage selector switch on the power supply assembly may be set for a mains voltage of either 110/120 V or 220/230/240 V.

Nominal Mains Input Voltage	120 V	240 V
Minimum	99 V AC	198 V AC
Maximum	132 V AC	264 V AC
Frequency	60 Hz	50 Hz
Mains Input Current		
Gaming Machine Idle	0.7 A	0.4 A
Gaming Machine Maximum	6 A	1.8 A
Gaming Machine Maximum plus Convenience Load Maximum	9 A	4.8 A
Power Consumption at Nominal Voltage		
Gaming Machine Idle	84 W	96 W
Gaming Machine Maximum	720 W	432 W
Gaming Machine Maximum plus Convenience Load Maximum	1180 W	1152 W
Gaming Machine Typical Power Consumption	310 W	380 W

Table 1-5 Environment

	Operating	Storage
Minimum Temperature	0° C	-20° C
Maximum Temperature	50° C	80° C
Relative Humidity	0 - 80% non-condensing	0 - 95% non-condensing

Table 1-6 Compliances

Compliances	Explanation
UL22 (Pending)	Standard for Safety Amusement and Gaming Conditions
FCC-CFR47-Pt15	Radiated EMI for ITE standard
AS1099 (Pending)	Environmental testing for electro-technology over a specified temperature and humidity range

Chapter 2

Installation

List of Figures:

2.1 Pre-Installation Requirements

The following items are required to install a machine (see Figure 2-1, Figure 2-2, and Figure 2-3):

- verification of jurisdictional approval.
- a floor plan (only required for new installations).
- a suitable base on which to mount the machine.
- adequate clearance between the sides of adjacent machines to allow the doors to be opened (a clearance of 180 mm is recommended).
- access to mains power outlets and connection cables of peripheral devices.
- machine keys (if locks are fitted).

Important Note
All mains power wiring must be installed by a qualified electrician and comply with Australian standard AS3000-1991, or equivalent national/jurisdictional standards for mains wiring.

WARNING
The gaming machine must be transported and handled with care. Ensure the machine is not dropped or severely bumped.

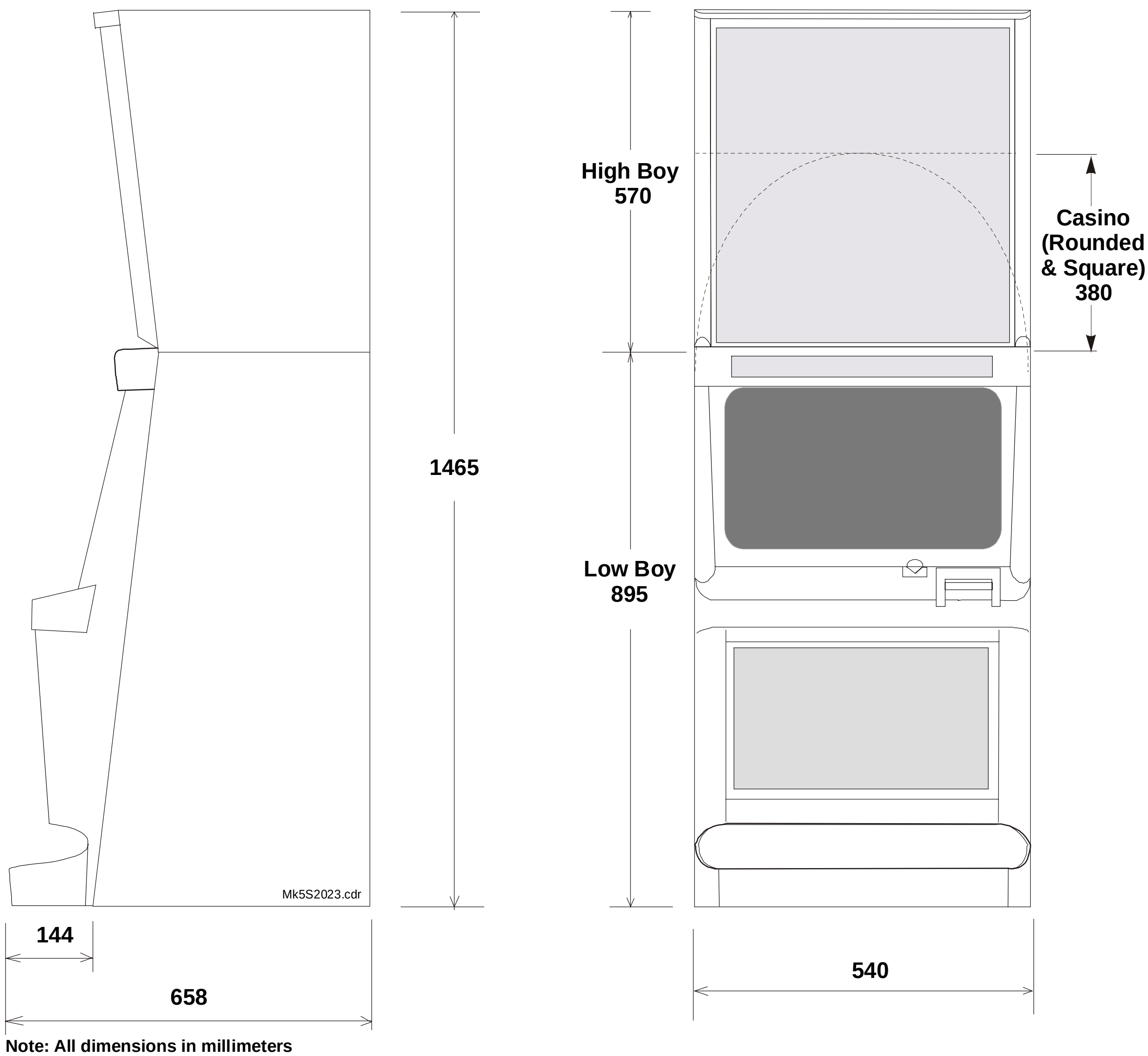


Figure 2-1 Machine Dimensions

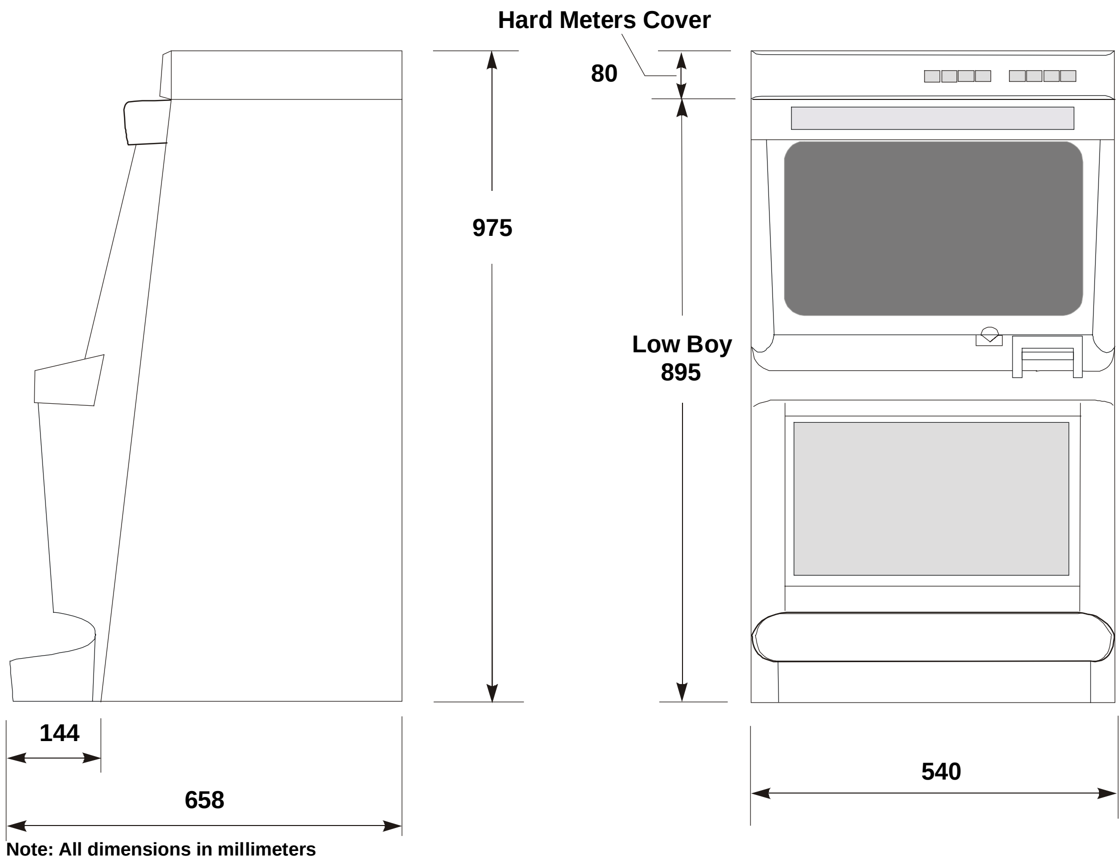
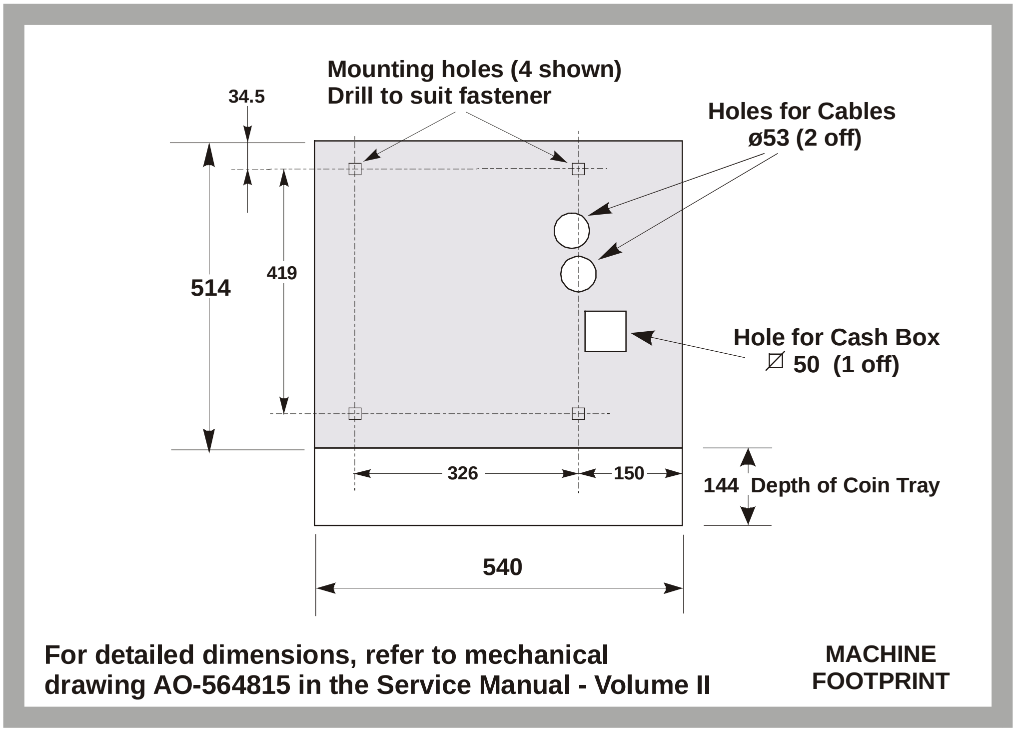
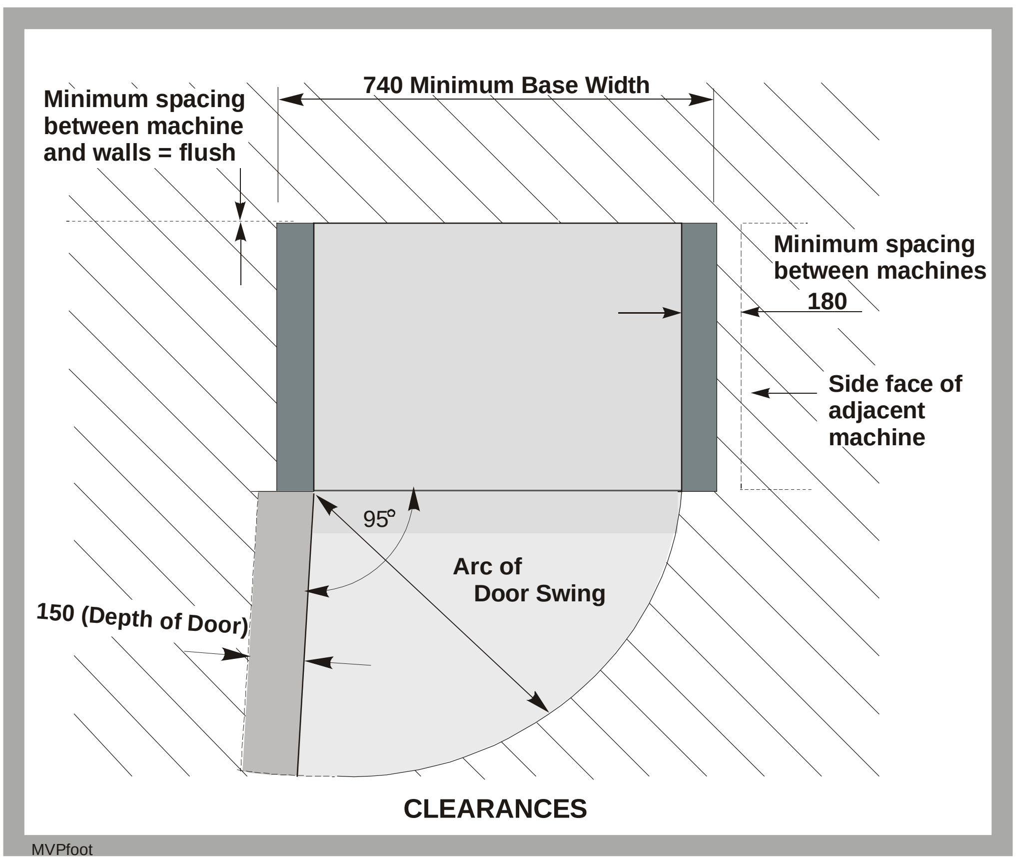


Figure 2-2 Machine Dimensions - Low Boy with Hard Meters





Note: All dimensions in millimeters

Figure 2-3 Machine Footprint and Clearances

2.2 Inspection on Delivery

Inspect all exterior panels of the cabinet for damage that may have occurred during transportation. Report any damage to your supervisor.

2.3 Installation Procedure

Installation and commissioning of machines must be carried out by an appropriately licensed technician and must comply with the regulations of the jurisdictional authority.

The following procedures are for mounting, connecting, and commissioning the gaming machine into service.

2.3.1 Mounting

WARNING
The gaming machine is a heavy item. Follow the national standard and code of practice for manual handling.

Mount the machine to the cabinet base as follows:

1. Position the machine on the cabinet base, aligning it with the cash box and cable holes (refer to Figure 2-3). Drill holes in the cabinet base to match four rectangular mounting holes. The machine **must** be fixed in four positions, two at the front and two at the back, to meet stability requirements.
2. Secure the machine to the base using either bolts and nuts or the special-purpose fasteners provided.

2.3.2 Pre-start Connections, Checks and Power Up

Perform the following machine connections and checks:

1. Check that the printed circuit board assemblies (PCBAs) in the logic cage are firmly seated. The PCBAs are:
   - ♦ Main Board
   - ♦ Backplane Board
   - ♦ Extended USA I/O Driver Board
   - ♦ Communications Configuration Board
   - ♦ Pulse Mechanical Meter Board

Note
For accessing PCBAs, refer to the relevant chapter in the Service Manual.

2. The machine power supply and monitor isolation transformer (Ceronix only) are set at the factory for a mains input voltage of 240 V (or 110 V in North America), unless clearly labeled otherwise. Should there be a need to change the mains input voltage setting:

WARNING
Make sure the machine is disconnected from mains power before adjusting voltage settings.

WARNING
Selecting the wrong power supply and/or monitor isolation transformer voltage will cause considerable damage to the power supply and/or monitor transformer.

   a. Set the voltage selector switch on the power supply for the correct mains input voltage. The switch is mounted on the metal housing of the power supply assembly, which is located at the back of the cabinet, in the bottom right-hand corner.

   b. Where a Ceronix monitor with a manually-switched isolation mains input transformer is used, set the mains input switch on the transformer to match the mains input voltage.

3. Make sure that the mains power switch is OFF. Connect the mains power cable to the machine. The power cable may enter the cabinet either via a hole in the base of the cabinet or via a hole in the rear wall of the cabinet. A hole is provided in the base of the cabinet, near the cable entrance, to allow a clamp to be fitted to the mains cable. The purpose of this clamp is to prevent the mains

power cable from being accidentally disconnected. This clamp should be fitted if there is a reasonable risk that the mains power cable may be accidentally disconnected.

WARNING
Visually check that the insulation of the mains power cable is sound. Check that all machine earth wires (green/yellow stripe or braid) and screws that were moved during installation are correctly attached.

4. If the machine is fitted with a coin comparator (as opposed to a coin validator), then a sample coin (or token) must be placed in the coin comparator sensor assembly (refer to Figure 2-4) which is mounted to the reflector panel on the inside of the main door. To install a sample coin:
   a. Slide (without lifting) the scanner unit to the right.
   b. Insert the sample coin into place and carefully release the scanner unit. The coin should automatically seat itself.
   c. Check that the sample coin is seated firmly between the scanner unit and the ribs of the rail insert.

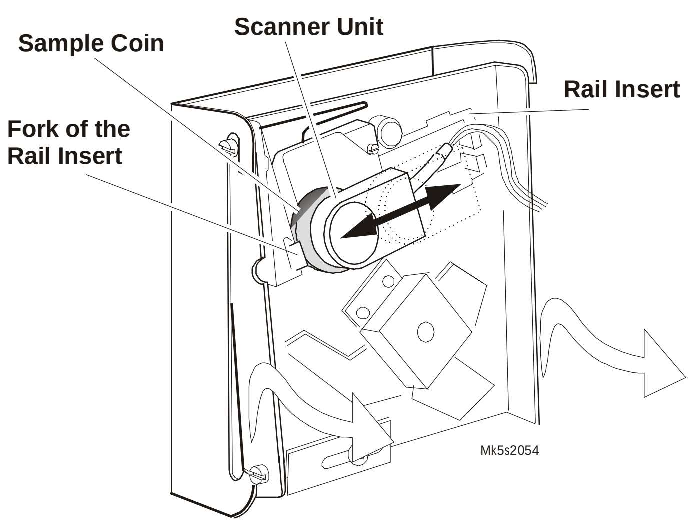


Figure 2-4 Coin Comparator (CC-62 shown)

5. Switch ON the machine and close the main door within 5 seconds (see item 6 below). The monitor and fluorescent lighting system will then be powered up. The machine will perform self-testing procedures for a few moments and any faults detected will be highlighted by a message on the video screen. To fix detected faults, refer to Fault Mode in the chapter Machine Modes.

6. If the monitor exhibits colour aberrations, this may be the result of magnetic interference. Degaussing the monitor and cabinet, as described below, can remove the colour aberrations.
   a. Power down the machine and wait for a 30-minute period to elapse. This time delay enables the monitor circuit varistors to cool sufficiently and create enough energy to degauss both the monitor's ferrous content and that of the cabinet.
   b. Power up the machine and close the door within 5 seconds. Automatic degaussing will now occur.
   c. Should colour aberrations persist, use a degaussing wand to degauss the monitor and cabinet.

2.3.3 Commissioning the Machine

Carry out the following procedures to commission the machine:

1. Check that the machine program type and variation match the customer order. Use the Operator Mode menu and the options described in the chapter Machine Modes.
2. If the machine is fitted with a hopper, fill the hopper as described below.

Important Note
The procedure for filling the hopper is dependant on house rules.

   a. Obtain the correct number of coins required to fill the hopper.
   b. Open the cabinet door. If the jurisdiction requires that the hopper be weighed, turn OFF the machine before removing the hopper.
   c. Place the coins in the hopper, and close and lock the cabinet door.
   d. In some markets, the hopper refill amount must be recorded in the machine memory. To do this, insert and turn the Audit Key to enter Operator Mode, select Record Refill (may be under Miscellaneous Operations) and press the appropriate buttons to record the refill amount. Turn the Audit key back to return to Play Mode.
   e. Record the number of coins placed in the hopper in the refill register.
3. Where the Operator permits, monitor gameplay operations for any faults:
   a. For machines that accept bank notes, insert a valid bank note (in good condition) and confirm that it is accepted and credited correctly. If the bank note is not accepted on the second attempt, repeat the test on another note. If the second bank note is also rejected, refer to the Fault Finding section in the Bank Note Acceptor chapter of the Service Manual.
   b. For machines that accept coins, check that coins are accepted, credited, and paid out correctly.

Retrieve bank notes and coins inserted during testing.

4. Machines operating on a network system may now be connected and installed onto the network. For installation procedure refer to the manual for the particular communications network used.
5. For machines fitted with a ticket printer, carry out the general maintenance procedures as detailed in the Printer chapter of the Service Manual or the Care and General Maintenance chapter of the Operator Manual.
6. Request an Operator to record the values of the hard audit meters (if fitted) and the soft audit meters (as required by the applicable jurisdictional authority).
7. Log installation data as specified by the appropriate jurisdictional requirements.

The machine may now commence operation.

Notes

Chapter 3

Machine Modes

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3.1 Modes of Operation

The gaming machine is operated in two main modes, Play Mode and Operator Mode. Play Mode permits gameplay while the machine is fully operational and the cabinet door is closed. Operator Mode allows the operator to configure the machine, view audit information, carry out machine tests, and reset machine faults. Turning the Audit Key ON switches the machine from Play Mode to Operator Mode.

The gaming machine may be configured to play one of several types of games, the most common being spinning reel games and poker games. Although spinning reel games are featured in this chapter, the explanations and information given can be easily adapted to other game types. The options and procedures outlined are similar for all game types.

3.2 Play Mode

The machine is in Play Mode when the cabinet door is closed and locked, and there are no active lockup conditions. In Play Mode the machine:

- shows game displays in readiness for player operation,
- carries out gameplay,
- continuously monitors and records play activities,
- continuously runs the self-test processes,
- displays comments and guidance for players, operators, and technicians.

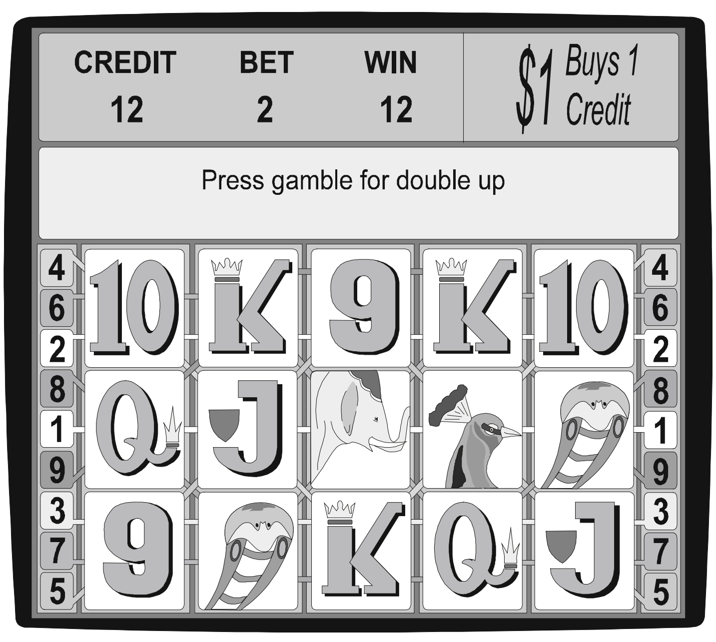


Figure 3-1 Typical Format of Game Display

Figure 3-1 shows the format of a game display. The symbols on the screen will vary depending on the particular game software being used. The CREDIT, BET, and WIN game meters show the number of credits applicable at the current stage of the game. Comments appear in two message lines to guide players and operators as the game progresses. Machine conditions, including security alerts, are also displayed in the message area.

Examples of comments are:

- Game Over
- Main Door Open
- Coin Diverter Fault
- COMBINATION TEST

Lockup fault messages are listed in Section 3.3.8, Fault Mode - Current Lock Menu.

In Play Mode the machine operates with full security features. For example, the machine monitors operations and alerts operators should malfunction or tampering occur. Electronic meters and electromechanical meters (if fitted) record details of gameplay and machine operations in Play Mode.

Options

Besides being able to alter machine controls to suit house preferences, the machine provides menu controls for setting important game and player preferences, including:

- Game percentage,
- Links to house and stand-alone progressives in various levels,
- Hopper coin-collect limit,
- acceptable bill ($ note) denominations
- Volume settings for sounds and tunes.

See Section 3.3.5, Operator Setup/Selection Mode.

The base credit value (a game credit), machine token amount for coin entry, and game gamble option are set using the DIP switches on the I/O Driver Board.

Note
Jurisdictional requirements must be followed when configuring machines.

3.2.1 Player Operation

When the machine is switched on and the cabinet door is closed and locked, the fluorescent tubes light up and the machine automatically initiates a self-test. If no faults are detected, gameplay may begin.

Spinning Reel Games

When a player inserts a coin or note, the machine either accepts or rejects the currency. If the machine accepts the currency, it increments the CREDIT meter on the game video display by the number of credits. The mid trim pushbuttons become active and flash. The player may now either insert more currency or press one of the pushbuttons to play the game. The player selects the number of credits to bet and this number is shown on the BET meter on the video display. A beep sound is heard when any of the BET playbuttons are pressed.

The reels then start to spin and after a short interval come to rest. When the spinning reels stop, the line combinations are evaluated. If the result is a winning combination, a selected win tune is played. The video display shows the number of credits won in the WIN meter.

Some games incorporate a win gamble feature that provides players with the chance to double their WIN amount. This feature is initiated by pressing the GAMBLE pushbutton. The GAMBLE feature may be selected a maximum of five times in succession. If players do not wish to gamble their WIN, they may press the TAKE WIN button to add the WIN to the CREDIT meter.

Due to the limit on the number of coins that can be held in the hopper, as well as other payout considerations, there is a limit to the number of coins that the machine can pay out. This is called the Hopper Limit and is set via the Operator Mode Menu ⇒ Operator Setup/Selections screen.

A player can collect coins up to the Hopper Limit amount by pressing the CASHOUT pushbutton. When the CASHOUT button is pressed, the machine prevents functions such as gameplay and entry of currency until the hopper has dispensed the coins into the coin tray. The hopper photo-optic detector counts the coins being dispensed. The CREDIT meter decrements to zero.

When a player presses the CASHOUT pushbutton and the value of the game credits is greater than the Hopper Limit:

- the message **Call attendant - Cancel Credit $99.99** is displayed ($99.99 is the value of credits to be paid out).
- the attendant hand pays the value of the credits and then resets the machine by turning the Jackpot Key ON then OFF.
- the message **Credits paid out $99.99** is displayed on the screen.
- the CANCEL CREDIT electronic meters and electromechanical meters record the number of credits paid out.
- the game CREDIT on the screen and the CREDIT electronic meters are reset to zero.

Types of Games

Machines generally have one of three game types: multiplier, multiline, and multiline-multiplier:

Multiplier- A multiplier game allows a player to gamble more than one credit per game on a single winning line. Each additional credit gambled generally multiplies the value of the prize by the value of the credits staked.

Multiline- A multiline game allows a player to specify multiple lines on which to bet for a winning combination. The win total is calculated by adding each of the win lines.

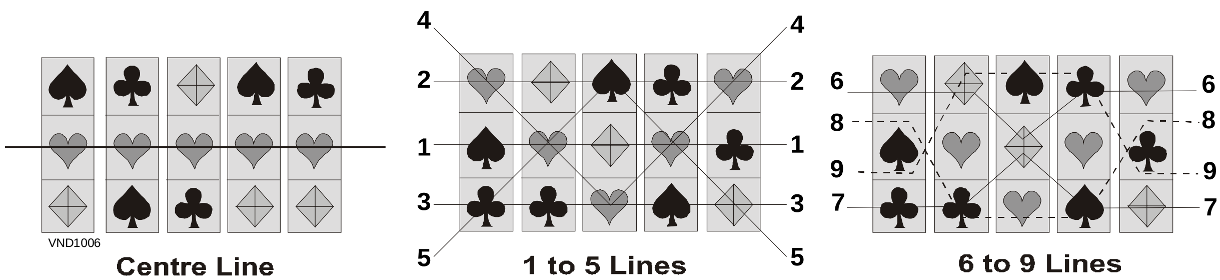


Figure 3-2 Centre Line and Multi Line Combinations

3.2.2 Video Display

The video display unit provides high-resolution graphics based on 256 colors. The unit is able to display attractive game illustrations and animations, as well as player messages, operator menus and information displays.

The simulated spinning reels take up most of the screen area. The area at the top of the screen displays CREDIT, BET, and WIN information, as well as the coin denomination accepted. Between these two areas is the message display area.

3.2.3 Sounds and Tunes

Sounds and tunes are used, in combination with the graphics and animation, to increase game appeal.

Different sounds are played to signify various machine conditions, such as alarm, reel spin/stop, win, lose, double-up win, jackpot bell, coins entering machine, and coins falling to coin tray. Each game has its own specific sounds and tunes.

The volume of the sound system can be adjusted in the Sound System Setup menu.

3.2.4 Light Tower

Multi-level light towers are fitted to provide an additional level of customer service, security and house control. The tower is color coded to identify the machine's denomination.

Typical light tower functions are as follows:

CONDITION	DOOR CLOSED		DOOR OPEN	
	Top Light	Bottom Light	Top Light	Bottom Light
Idle	OFF	OFF	OFF	FAST FLASH
Service	ON	OFF	ON	FAST FLASH
Tilt	SLOW FLASH	OFF	SLOW FLASH	FAST FLASH
Hand Pays	SLOW FLASH	SLOW FLASH	SLOW FLASH	FAST FLASH

The Light Tower indicates one of four possible machine states:

The **IDLE** state: the default state when no other state exists.

The **SERVICE** state: when the 'Service' button has been being pressed and it is lit.

The **TILT** state: the machine will be considered to be in this state when one of the following conditions exists:

- a lockup fault condition (excluding Main Door Open and the Handpays state), such as Logic Door Accesses or Bill Acceptor Error.
- a non-lockup fault condition, such as Bill Stacker Full or Printer Paper Low.

The **HANDPAYS** state exists when one of the following conditions occur:

- a Jackpot lockup,
- a Cancelled Credit lockup, or
- a Progressive Link Jackpot lockup.

Note
After the Main Door has been closed, the bottom tier light should remain lit (unless it is otherwise flashing) until the start of the next game.

3.2.5 Pushbuttons

A typical layout of the pushbuttons is shown below. The pushbuttons are labelled and have the following functions: CASHOUT, SERVICE, PLAY 1/5/10/15/20 LINES, BET 1/2/3/5/10 CREDITS, TAKE WIN, GAMBLE, and RED and BLACK, which refer to features of the gamble option.

Each pushbutton has a lamp behind it that may either be lit, unlit, flashing, or flashing at double speed, depending on the circumstances and the machine mode.

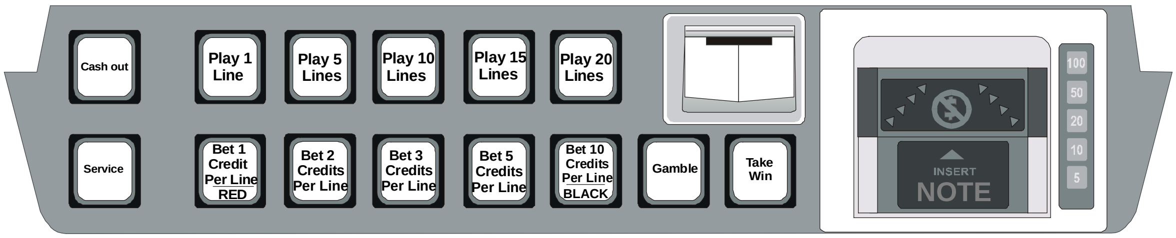


Figure 3-3 Typical Pushbutton Layout

Cash Out Button

The enabled Cash Out button is used to initiate a player credit payout from the machine in the form of a hopper pay, a printer cash ticket, or a cancel credit handpay procedure.

The Cash Out button will be disabled if there is no credit on the credit meter, a hopper payout is in progress, or the machine is in the process of playing a game. Otherwise, this button will be lit to indicate it is enabled.

Service Button

This button is used by the player to request service. Pressing this button will toggle the button lamp on and off, and will toggle the Service tier of the light tower on and off.

The Service tier of the light tower is also used to signal non-lockup errors. The on-screen error message is cleared by pressing the Service button again. The error is cleared when the fault has been corrected. The following faults are non-lockup faults:

- Bill acceptor disconnected fault
- Bill stacker fault
- Bill stacker full
- 5 Bills rejected
- Printer paper low.

3.2.6 Machine Self-Monitoring

Self-test

When the machine is switched on, it automatically initiates a self-test that continues in the background as long as the machine is in play mode. During the self-test, the machine checks the electronic meter data held in computer memory and also carries out an audit calculation using essential meter counts.

This self-audit calculation is defined by the formula:

CASH IN + HOPPER REFILLS + TOTAL CREDITS WON + JACKPOT HANDPAYS
=
TOTAL CREDITS BET + CANCEL CREDIT + COIN OUT

The memory holds up to three copies of the electronic meter data, METER SET 1, METER SET 2 and METER SET 3. If the data in one meter set does not match that in the other two sets, the data of the two identical sets overwrites the single set.

Security

When the machine is in Play Mode, it continuously operates the following security features:

Coin Comparator. The coin comparator scans inserted coins and compares them with a sample coin held in the comparator. Invalid coins are diverted to the coin tray. Accepted coins are directed past the comparator's internal photo-optic detector and on to the coin accept chute.

The machine software monitors the speed and direction of travel of the accepted coins. For coins travelling too slowly or travelling in the wrong direction, an error signal is generated and the machine locks up, with the appropriate error message being displayed on the screen.

If the inserted coin is valid and no error conditions are encountered, the appropriate credits are registered in the game CREDIT display and gameplay may take place. The Jurisdictional Meters CASH IN and CREDIT and the electromechanical meter CASH IN (if fitted) are incremented accordingly.

Hopper. If the hopper is empty and the player is in credit and presses the CASHOUT pushbutton, the machine locks up and displays a HOPPER EMPTY message and the electronic meter HOPPER EMPTY increments. The hopper is refilled in these circumstances according to house rules, after which gameplay may resume.

During a payout, the hopper disc rotates and passes coins onto the coin runner where they are counted by the hopper photo-optic detector. After passing the detector, they are deposited in the coin tray for the player to collect. Also:

- the CREDITS COLLECTED electromechanical meter and the TRUE OUT electronic meter are incremented by the amount paid out.
- the game CREDIT on the screen and the CREDIT electronic meter are decremented by the amount paid out.
- a payout message is displayed on the screen showing the value paid out.

The machine monitors the hopper operation and the coin’s passage from the hopper to the coin tray. Unusual conditions and faults are registered by increments in the Diagnostic Meters, video messages and machine lockups. These fault conditions are ILLEGAL COIN OUT, HOPPER EMPTY, HOPPER JAMMED, and HOPPER DISCONNECTED.

Bill (Bank Note) Acceptor. The Bill Acceptor consists of an optical scanning unit and a bill stacker contained in a high-security housing. The scanning unit achieves a high percentage of acceptances, and a second-level scanning option can be initiated for high-denomination bills.

During operation, the acceptor registers acceptances and rejections. Bills accepted increment the BILLS INSERTED electronic meter and electromechanical meter (where fitted). Detailed information is recorded in the Bill Acceptor meters, which may be accessed from Operator Mode / Accounting Information Menu. These meters record the value and quantity of each note accepted. A record is also kept of the last five notes accepted.

The machine monitors the bill acceptor operation and unusual conditions and faults are registered by increments in the Diagnostic Meters, and by display messages and machine lockups. The lockups and video messages are BILL ACCEPTOR ERROR and BILL ACCEPTOR OUT OF SERVICE. Should the bill stacker door be opened, the alarm sounds and the message BILL STACKER REMOVED is displayed.

A lockup occurs should the bill acceptor stacker become full. The lockup description and video message is BILL ACCEPTOR FULL.

The belly panel door which provides access to the bill stacker is monitored by a mechanical security switch (see below for further details).

Door Access

The main door, cash box door, belly panel door, and logic cage door are monitored by battery-backed mechanical security switches. If a door fitted with a security switch is opened, the following actions occur:

- One of the following messages is displayed on the screen: DOOR OPEN MAIN, DOOR OPEN CASH BOX, DOOR OPEN BILL ACCEPTOR, or SECURITY CAGE OPEN MAIN BOARD.
- The alarm sound is heard.
- One of the following lockups occurs: MAIN DOOR OPEN, CASH BOX DOOR OPEN, BILL ACCEPTOR DOOR OPEN, or LOGIC DOOR OPEN.
- gameplay is suspended.
- One of the following electronic Diagnostic Meters is incremented: MAIN DOOR ACCESSES, CASH BOX ACCESSES, BILL ACCEPTOR ACCESSES, or LOGIC ACCESSES.

The condition is reset by closing the appropriate door.

3.2.7 Electronic Meters

The electronic meters (soft meters) record a variety of details relating to machine operation, gameplay and player interaction, as well as a variety of statistical counts, security events and past games. Players have the assurance that there is a record kept of recent win or pay situations.

When the machine is switched on, it automatically initiates a self-test that continues in the background as long as the machine is in play mode. During the self-test, the machine checks the electronic meter data held in memory.

Some jurisdictions require electronic metering data to be stored in triplicate in three separate battery-backed RAM chips. In the case of a meter malfunction, where none of the meters sets match, the machine displays the error message 3-WAY MEMORY ERROR and the machine locks up. This message indicates a serious machine malfunction.

Failure in the self audit calculation also causes a machine lockup with the message SELF AUDIT ERROR being displayed.

Resetting Metering and Self Audit Errors

To clear a metering or self audit error, it is necessary to rectify the memory fault and re-establish correct operations with all corrupted meters set to zero. The lockup is removed by turning the Audit Key ON, following the on-screen guidance, and then turning the Audit Key OFF to return to gameplay. After recovering from a memory error, all electronic meters will be reset to zero. The information held in the electronic meters includes Accounting Information Menu items, Diagnostic Information Menu items, and Operator Setup / Selections Menu items as detailed in the Operator Mode.

3.3 Operator Mode

Operator Mode addresses the jurisdictional and accounting / management information requirements, allows the machine configuration to be changed, and facilitates machine testing and fault finding. Entry to Operator Mode is achieved by turning the Audit (Operator) key ON. The various options can be selected by following the on-screen guidance and pressing the appropriate pushbutton.

Note

The screen displays and options covered in this chapter are typical; however, slight variations may occur between markets.

The Operator Mode structure is shown in Figure 3-5 and the Operator Mode Menu screen is shown below.

Table 3-1 Typical Operator Mode Menu

OPERATOR MODE MENU
Machine Identification Accounting Information Diagnostic Information Operator Setup/Selections Miscellaneous Current Lockup
Play 1 Line - Press to select next item Play 5 Lines - Press to select previous item Play 10 Lines - Press to choose selected item Service - Press to return to previous menu Operator Key - Turn off to exit

Note

"Operator Key - Turn off to exit" message will not be displayed if a Lockup is present.

Instructions are given on each screen to guide the operator through the various menus and options available. Any active lockups are indicated by a flashing message at the bottom of the screen.

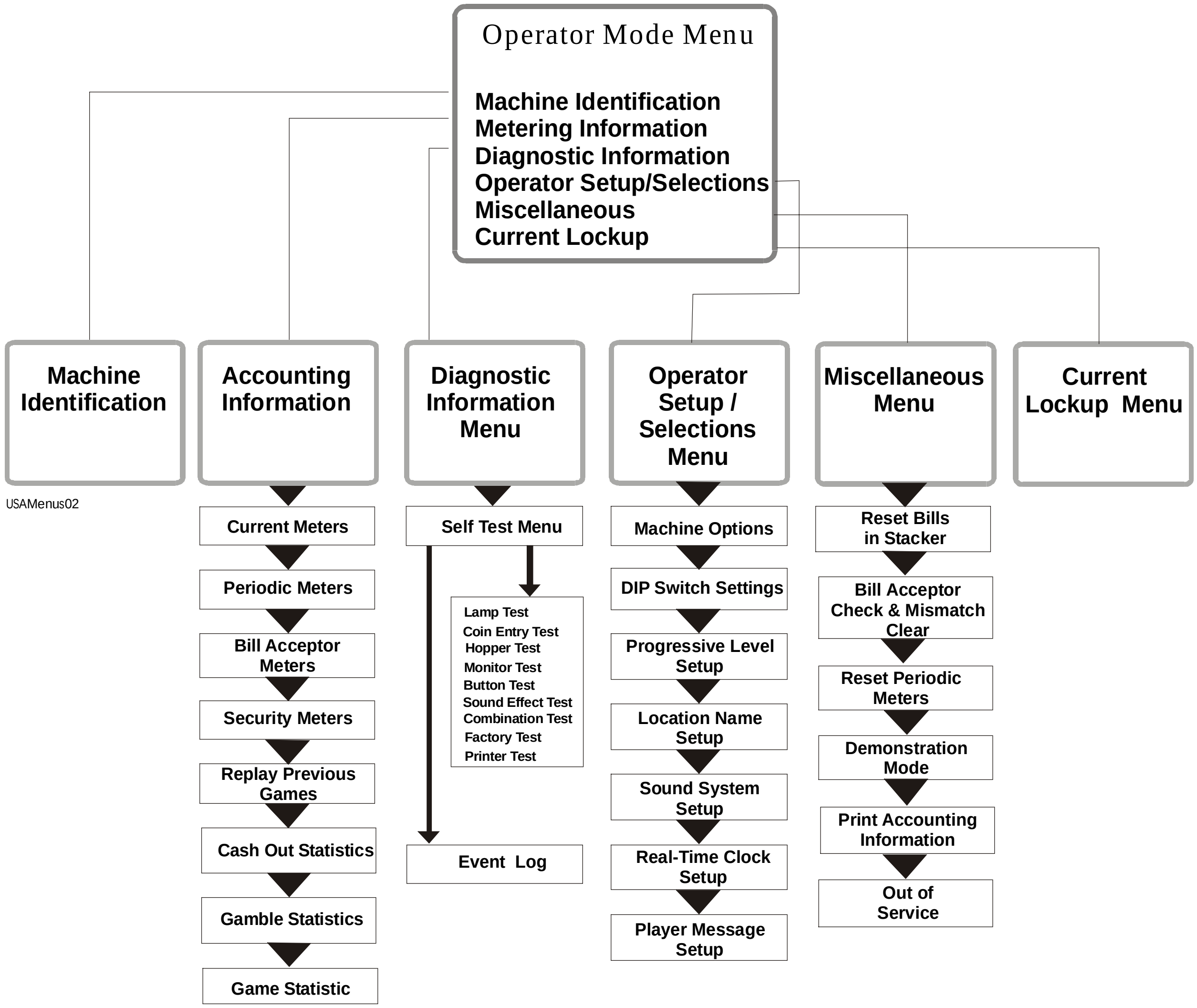


Figure 3-4 Operator Mode Menu Displays - Typical Structure

3.3.1 Machine Identification

The Machine Identification screen provides essential machine information, such as Game Eprom Id, Credit Value, Percentage Return, and Jackpot Limit.

Table 3-2 Machine Identification Display

MACHINE IDENTIFICATION AND CONFIGURATION

Game Eprom Id (UCI):	0100090V (17264)
Value of 1 Credit:	$1.00
Variation (% and no):	87.890% 99
Actual Operating Percentage:	123.00%
Venue Name:	Casino Name
Machine Number (GMID):	0
Mikohn Address:	1
Progressive Links Supported:	3
Comms Protocol Supported:	Broadcast Dacom
Hopper or Printer Installed:	Hopper selected
Hopper Payout Limit:	9999999 Coins
Jackpot Win Limit:	9999999 ($99999)
Maximum Credit Limit:	$1199.99

Service - Press to return to previous menu
Operator Key - Turn off to exit

3.3.2 Metering Information

The Metering Information displays provide information for government authorities, as well as additional financial and statistical details, including periodic performance details, game replay, and game and gamble statistics. Most of the information can not be altered; although some details may be changed through Operator Setup / Selections ⇒ Machine Options.

The various screen displays may be accessed by following the on-screen guidance and pressing the appropriate pushbuttons.

Table 3-3 Metering Information Menu

ACCOUNTING INFORMATION
Current Meters
Periodic Meters
Bill Acceptor Meters
Security Meters
Replay of Previous Game
CASH OUT Statistics
Gamble Statistics
Game Statistic
Play 1 Line - Press to select next item
Play 5 Lines - Press to select previous item
Play 10 Lines - Press to choose selected item
Service - Press to return to previous menu
Operator Key - Turn off to exit

Current Meters

The Current Meters provide the financial counts of machine activity. Items include turnover, total wins, and amounts inserted in the coin entry and the bill acceptor devices. In depth statistical information is also provided by the Game and Gamble displays.

Table 3-4 Current Meters Display - Screen 1

CURRENT METERS - MAIN			
	METER SET 1	METER SET 2	METER SET 3
Current Credits:	nn	nn	nn
Total Games Played:	nn	nn	nn
Total Credits Bet:	nn	nn	nn
Total Credits Won:	nn	nn	nn
True In (Coins Inserted):	nn	nn	nn
Bills Inserted:	nn	nn	nn
Coin Drop (Cashbox):	nn	nn	nn
Gross Drop (Gross In):	nn	nn	nn
True Out:	nn	nn	nn
Cashout Handpays:	nn	nn	nn
Jackpot Wins:	nn	nn	nn
Total Handpays:	nn	nn	nn
Play 1 Line - Press to display next meter screen			
Service - Press to return to previous menu			
Operator Key - Turn off to exit			

Table 3-5 Current Meters Display - Screen 2

CURRENT METERS - OTHER			
	METER SET 1	METER SET 2	METER SET 3
Power Up (count):	n	n	n
Games Since Power Up:	n	n	n
Games Since Door Open:	n	n	n

Play 1 Line - Press to display next meter screen
Play 5 Lines - Press to display previous meter screen
Service - Press to return to previous menu
Operator Key - Turn off to exit

Table 3-6 Current Meters Display - Screen 3

CURRENT METERS - LINK PROGRESSIVES			
	METER SET 1	METER SET 2	METER SET 3
Occurrences of			
Jackpot 0:	n	n	n
Jackpot 1:	n	n	n
Jackpot 2:	n	n	n
Jackpot 3:	n	n	n
Jackpot 4:	n	n	n
Jackpot 5:	n	n	n
Mystery Pay	n	n	n
Accumulative Value of			
Jackpot 0:	$n.nn	$n.nn	$n.nn
Jackpot 1:	$n.nn	$n.nn	$n.nn
Jackpot 2:	$n.nn	$n.nn	$n.nn
Jackpot 3:	$n.nn	$n.nn	$n.nn
Jackpot 4:	$n.nn	$n.nn	$n.nn
Jackpot 5:	$n.nn	$n.nn	$n.nn
Mystery Pay	$n.nn	$n.nn	$n.nn

Play 1 Line - Press to display next meter screen
Play 5 Lines - Press to display previous meter screen
Service - Press to return to previous menu
Operator Key - Turn off to exit

The items recorded in the Current Meters screens are explained below.

Current Credits	Credits currently available to be bet or collected.
Total Games Played	Total number of games played.
Total Credits Bet	Accumulated value of all credits bet.
Total Credits Won	Accumulated value of credits won that is paid out : - to the credit meter, - as a hopper payout, or - a winning cash ticket.

True In	The total number of all coins inserted (and accepted) into machine.
Bills Inserted	The total credits of all bills inserted (and accepted) into the machine.
Coin Drop	Total number of all coins that are diverted to the cashbox.
Gross Drop	The total credit value of all money (coins and bills) accepted by the machine.
True Out	The total credits of all cashouts paid out by the machine, either by: - hopper payout, or - printer ticket (CASH OUT Tickets and CASH WIN Ticket).
Cashout Handpays	The total of all credits paid out as handpays as a result of cashouts exceeding the Hopper Payout Limit (or the Printer Payout Limit).
Jackpot Wins	The total of all credits paid out as handpays as a result of wins exceeding the Jackpot Win Limit
Total Handpays	The total credits of all combined handpays including : - Cashout Handpays, - Jackpot Handpays, - Win Handpays, and - Progressive Handpays (Links and Mysterys).
Power Up	The number of times the power has gone down.
Games Since Power Up	The number of games played since the power was last restored.
Games Since Door Open	The number of games played since the main door was last opened.
Occurrences of Link Progressives	The number of times each level of link progressive has been won.
Accumulative Value of Link Progressives	The total value won (when returned by the progressive equipment) for each link progressive level.
Occurrences of Mystery Progressives	The number of times each level of mystery progressive has been won.

Accumulative Value of Mystery Progressives	The total value won (when returned by the progressive equipment) for each mystery progressive level.

Periodic Meters

The Periodic Meters screens contain the same information items as the Jurisdictional Meters, but the values held usually relate only to a specified period determined by the club management. The periodic meters can be reset via the Miscellaneous option from the Operator Mode Menu.

Bill Acceptor Meters

This screen provides a record of the number of notes of each denomination received, the last five notes accepted, the total value of notes received, the total value of bills in the note stacker, the number of bills accepted / rejected, and the amount of change money obtained.

To maintain the accuracy of this information, the Bill Acceptor Meters must be reset when the stacker is emptied. To reset the meters, select Miscellaneous ⇒ Reset Bills in Stacker.

Table 3-7 Bill Acceptor Information Display

BILL ACCEPTOR INFORMATION

NUMBER OF NOTES RECEIVED		LAST FIVE NOTES RECEIVED	
$1 Notes Received:	n	Last:	Nothing
$2 Notes Received:	n	Second Last:	Nothing
$5 Notes Received:	n	Third Last:	Nothing
$10 Notes Received:	n	Fourth Last:	Nothing
$20 Notes Received:	n	Fifth Last:	Nothing
$50 Notes Received:	n		
$100 Notes Received:	n		
Total Value of Notes Received:		$n.nn = n credits	
Bills In Stacker:		n	
Bills Validated:		n	
Bills Rejected:		n	
Change Credits Obtained:		nn	

Service - Press to return to previous menu
Operator Key - Turn off to exit

Security Meters

The Security Meters record the number of occurrences of specific security accesses and machine faults.

Table 3-8 Security Meters Display (Page 1)

SECURITY METERS	
Main Door Accesses:	n
Cash Box Accesses:	n
Logic Door Accesses:	n
Bill Acceptor Door Accesses:	n
Mechanical Meters Disconnected:	n
Printer Faults:	n
Printer Disconnected:	n
Paper Depleted Faults:	n
Play 1 Line - Press to display next meter screen	
Service - Press to return to previous menu	
Operator Key - Turn off to exit	

Table 3-9 Security Meters Display (Page 2) - Example

SECURITY METERS	
Coin Optic Faults:	n
Coin Acceptor Faults:	n
Coin Diverter Faults:	n
Reverse Coin Attempts:	n
Illegal Coin Out:	n
Hopper Empty:	n
Hopper Jammed:	n
Hopper Disconnected:	n
Bill Acceptor Faults:	n
Bill Acceptor Disconnected:	n
Bill Stacker Removals:	n
Bill Stacker Full:	n
5 Consecutive Bills Rejected:	n
Play 5 Lines- Press to display previous meter screen	
Service - Press to return to previous menu	
Operator Key - Turn off to exit	

The following events are recorded in the Security Meters:

Main Door Accesses	Incremented when the main door is opened.
Cash Box Accesses	Incremented when the cash box door is opened.
Logic Door Accesses	Incremented when the logic security cage is opened.

Bill Acceptor Door Accesses	Incremented when the belly panel door is opened.
Mechanical Meters Disconnected	Incremented if the meter board is disconnected.
Printer Faults	Incremented when the printer indicates that an internal fault occurred.
Printer Disconnected	Incremented when the printer is detected as being disconnected.
Paper Depleted Faults	Incremented when the printer indicates that the paper roll has been completely depleted.
Coin Optic Faults	Incremented if the coin comparator detects a coin jam.
Coin Acceptor Faults	Incremented if the coin acceptor pulse exceeds 50 ms.
Coin Diverter Faults	Incremented when the software detects that the coin diverter isn’t operating correctly.
Reverse Coin Attempts, (may also be referred to as Yo-Yo attempts)	Incremented when the coin comparitor device detects a coin passed through the coin optics in the reverse direction.
Illegal Coin Out	Incremented when the machine is not in hopper collect, but a coin passes the hopper optic.
Hopper Empty	Incremented when in hopper collect two consecutive 4 second attempts to pay out a coin fail.
Hopper Jammed	Incremented when the hopper optic is blocked for more than 200 ms.
Hopper Disconnected	Incremented when hopper is disconnected (checked once every second).
Bill Acceptor Faults	Incremented when a bill acceptor fault is detected.
Bill Acceptor Disconnected	Incremented when a bill acceptor has being disconnected.
Bill Stacker Removals	Incremented when a bill stacker is removed.
Bill Stacker Full	Incremented when a bill stacker is full.
5 Consecutive Bills Rejected	Incremented when 5 consecutive bills are rejected

Replay Previous Games

This Replay Previous Games screen allows the operator to replay the most recent games played on the machine. The most recent game is game number 1, and approximately twenty of the most recent games are normally available to be replayed. Because these game histories are stored dynamically in memory, the number of games available to be recalled will vary depending on the available memory.

Table 3-10 Previous Game Display

GAME REPLAY	
No. Of Games Available To Replay:	nn
Replay Game Number:	nn
During replay, press any key to pause the game	
Play 1 Line - Press to select next game	
Play 5 Lines - Press to select previous game	
Play 10 Lines - Press to see replay selected game	
Service - Press to return to previous menu	
Operator Key - Turn off to exit	

CASHOUT Statistics

The CASHOUT Statistics screen displays, for each range of CASHOUT credits, the number of times players CASHOUT the total credits.

Table 3-11 CASHOUT Statistics Display

COLLECT STATISTICS

COLLECT Amount (Credits)			Times COLLECTED
1	-	10	n
11	-	20	n
21	-	30	n
31	-	40	n
41	-	50	n
51	-	75	n
76	-	100	n
101	-	200	n
201	-	300	n
301	-	500	n
501	+		n

Service - Press to return to previous menu
Operator Key - Turn off to exit

The following text provides an explanation for the information in the CASHOUT Statistics:

CASHOUT Amount (Credits)	Specifies the range of CASHED OUT amount in credits, eg., 1 - 10, 11 - 20, 21 - 30, 31 - 40, 41 - 50, 51 - 75, 76 - 100, 101 - 200, 201 - 300, 301 - 500, 501+

Times CASHED OUT	The number of times that a player CASHED OUT credits in that range.

Gamble Statistics

The Gamble Statistics screen displays the gamble statistic of the machine. For each winning amount within a winning range, the selected gambled or Take win is recorded.

Table 3-12 Gamble Statistics

GAMBLE STATISTICS

Win Amount		Gambled	Take Win	Chosen	Won
1	-4	n	n	Red	Red
5	-9	n	n	0	0
10	-19	n	n		
20	-29	n	n|	Black	Black
30	-49	n	n	0	0
50	-99	n	n		
100	-199	n	n		
200	-499	n	n		
500	-999	n	n		
1000	-1999	n	n		
2000	-4999	n	n		
5000	+	n	n		

Service - Press to return to previous menu

The following text provides an explanation for the information in the Gamble Statistics:

Win Amount	Specifies the range of winning amount in credits.
Full Gambled (if applicable)	The number of times that a player chooses to Double after a winning play.
Half Gambled (if applicable)	The number of times that a player chooses to halve the win and double the remainder
Take Win	The number of times that a player chooses to take the win after a winning play.
Won	Total number of times that card beat the dealer card.

Game Statistics

Details of game play are recorded and displayed through the Game Statistics option. The types of bets and lines chosen are analysed, and the number of games played and the money won is displayed for each sub-division.

Table 3-13 Game Statistics Display

GAME STATISTICS

Bet	Lines	Games Played	Money Won	Bet	Lines	Games Played	Money Won
1	1	4	$30.00	5	1	0	$0
1	5	0	$0	5	5	0	$0
1	10	0	$0	5	10	0	$0
1	15	0	$0	5	15	0	$0
1	20	0	$0	5	20	0	$0
2	1	0	$0	10	1	0	$0
2	5	0	$0	10	5	0	$0
2	10	0	$0	10	10	0	$0
2	15	0	$0	10	15	0	$0
2	20	0	$0	10	20	0	$0
3	1	0	$0				
3	5	0	$0				
3	10	0	$0				
3	15	0	$0				
3	20	0	$0				

Service - Press to return to previous menu
Operator Key - Turn off to exit

3.3.3 Diagnostic Information Menu

The Diagnostic Information Menu provides access to the Self Test Mode and the Error Log display.

Table 3-14 Diagnostic Information Menu

DIAGNOSTIC INFORMATION MENU

Self Test Mode
Event Log

Play 1 Line - Press to select next item
Play 5 Lines - Press to select previous item
Play 10 Lines - Press to choose selected item
Service - Press to return to previous menu
Operator Key - Turn off to exit

Self Test Mode

Self Test Mode addresses the repair and maintenance tasks for the machine. The items on the Self Test Mode Menu are designed to test various machine components and features. The Self Test screen is displayed below.

Self Test Mode can only be entered when the following conditions are met, otherwise a warning screen will be displayed:

- Credit is zero,
- Main door is open,
- No other lockups active, and
- No game is currently in progress.

Table 3-15 Self Test Mode Menu

SELF TEST MODE MENU	
Lamp Test	Sound Effect Test
Coin Entry Test	Combination Test
Hopper Test	Factory Test
Monitor Test	Printer Test
Button Test	
Play 1 Line - Press to select next item Play 5 Lines - Press to select previous item Play 10 Lines - Press to choose selected item Service - Press to return to previous menu Operator Key - Turn off to exit	

Lamp Test

This screen allows the operator to test the pushbutton lamps, animation lamps and light tower lamps. The state of individual lamps can be set to either on, off, flashing slow, or flashing fast. The operator can then observe the lamps to verify correct operation.

Table 3-16 Lamp Test

TEST MODE - LAMP TEST

Light Tower Lamp #	Animation Lamp #	Player Key Lamp #		
1	1	1	6	ALL
2	2	2	7	
3	3	3	8	
4		4	9	
		5		

Current Function: ON OFF FLASH SLOW FLASH FAST

Press 1 Line - Press to select next lamp
Press 5 Lines - Press to select previous lamp
Press 10 Lines - Press to select function (on/off/flash)

Service - Press to return to previous menu
Operator Key - Turn off to exit

Coin Entry Test

This screen allows the operator to test the coin entry devices. The operator can change the reject state of the coin comparator, change the diverter state, and turn the optic emitter on and off. A message is displayed if a fault occurs.

Table 3-17 Coin Entry Test Screen

TEST MODE - COIN ENTRY TEST SCREEN

COIN ENTRY

Reject state:	Chip Tray
Validator:	Inactive
Optic A:	Unblocked
Optic B:	Not Used

CASHBOX

Diverter state:	Chip Tray
Optic A:	Not Used
Optic B:	Not Used

MESSAGE

Press 1 Line - Press to change reject state
Press 5 Lines - Press to change diverter state

Service - Press to return to previous menu
Operator Key - Turn off to exit

Hopper Test

Open the main door and select Hopper Test from the menu, the hopper will then pay out 10 coins. Place the coins back into the hopper and close the main door. If a fault, such as Hopper empty, jammed, etc, occurs, a message is displayed on the screen.

Table 3-18 Hopper Test Screen

TEST MODE - HOPPER TEST	
Hopper Test Payout	n
Coin Reinserted:	n
Last Hopper Event	none
Cashout - Press to activate payout	
Service - Press to return to previous menu	
Operator Key - Turn off to exit	

Monitor Test

This screen display allows a range of tests to be conducted on the video monitor. The operator inspects the display to display whether the tests have been passed or failed. The available monitor tests are described below.

Table 3-19 Video Monitor Test Screen

TEST MODE - VIDEO MONITOR TEST MENU	
Screen Frame Test	Vertical Regularity Test
Tilt Test	Horizontal Regularity Test
Horizontal Curvature Test	Red Colour Purity Test
Vertical Curvature Test	Green Colour Purity Test
Geometrical Linearity Test	Blue Colour Purity Test
Barrel Distortion Test	Basic Colours Test
Screen Regulation Test	Mode Colours Test
Press 1 Line	- Press to select next test
Press 5 Lines	- Press to select previous test
Press 10 Lines	- Press to choose selected test
Service - Press to return to previous menu	
Press Any Button to exit chosen test	

Screen Frame	Displays a white rectangle on the extremities of the screen.
Tilt	Displays the screen frame with a vertical line and a horizontal line halfway across the screen.
Horizontal Curvature	Displays a series of vertical lines that will highlight any horizontal distortion.
Vertical Curvature	Displays a series of horizontal lines that will highlight any vertical distortion.
Geometrical Linearity	Displays the series of horizontal and vertical lines on the same screen.
Barrel Distortion	Tests for distortion at the edges of the monitor.
Screen Regulation	Tests the effects of high current on screen size.
Vertical Regularity	Compares the size of red, green and blue pixels.
Horizontal Regularity	Compares the size of red, green and blue pixels.
Red Color Purity	Activates all red pixels.
Green Color Purity	Activates all green pixels.
Blue Color Purity	Activates all blue pixels.
Basic Colors	Displays a four colored rectangles, one of red, green, blue and white.
Mode Colors	Displays all of the 256 colors available on the monitor.

Button Test

The Button Test allows the operator to test the function and operation of each playbutton.

Table 3-20 Button Test Screen

BUTTON TEST

PLAYER KEY 1	Cashout
PLAYER KEY 2	Service
PLAYER KEY 3	Hold 1
PLAYER KEY 4	Hold 2
PLAYER KEY 5	Hold 3
PLAYER KEY 6	Hold 4
PLAYER KEY 7	Hold 5
PLAYER KEY 8	Bet 1-5
PLAYER KEY 9	Deal/Draw

Service - Press to return to previous menu
Operator Key - Turn off to exit

Sound Effects Test

This screen allows the operator to change the volume setting of the machine and to listen to all the sound effects used by the machine.

Table 3-21 Sound System Test Screen

TEST MODE - SOUND SYSTEM TESTS

Hold 1 - Press to increase column
Hold 2 - Press to decrease volume
Hold 3 - Press to play machine tunes
Service - Press to return to previous menu
Operator Key - Turn off to exit

Combination Test

The combination test allows the operator to select a combination of cards to be dealt. This test is used to check the graphics and sound output associated with any winning combination.

Table 3-22 Self Test Mode.- Combination Test Display

SELF TEST MODE - COMBINATION TEST

KEY

Play 1 Line	Play 5 Lines	Play 10 Lines	Play 15 Lines	Reserve
Next Reel	Step Forward	Step Backward	Go	Exit
0	20	10	19	11

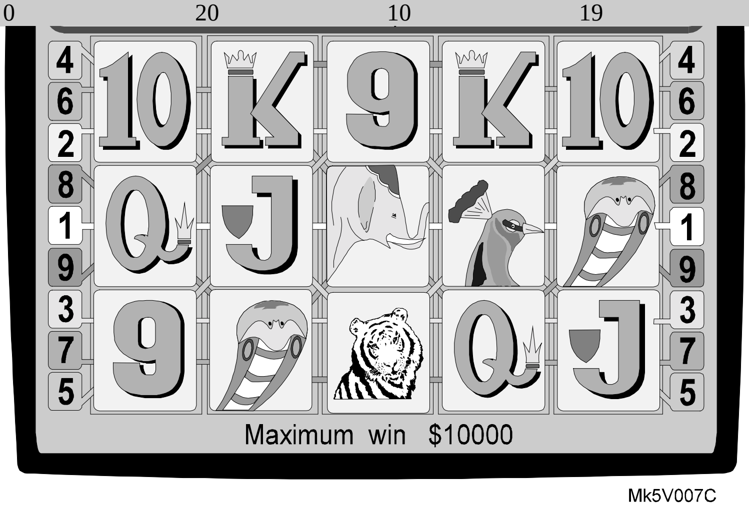
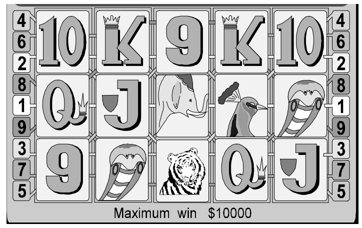


Table 3-23 Self Test Mode - Combination Test Result Display



Factory Test

The Factory Test option automatically conducts several tests simultaneously. Tests conducted include coin validator, coin diverter, door switch, video monitor tests, and sound system tests. Failed tests are displayed on the screen. The Factory Test continues until stopped by the operator or until an error occurs, in which case the type of failure is displayed on the screen.

Table 3-24 Factory Test Screen

TEST MODE - FACTORY TEST

Cycle Count:	1
Test Description:	Coin Entry Validator Test
Time:	n
Error Type:	ccccc

Hold 1 - Press to start factory test

Service - Press to return to previous menu
Operator Key - Turn off to exit

Printer Test

This test allows the operator to test various aspects of the printer. If a printer is not fitted or enabled then the message “Printer not enabled or available” will be displayed

Table 3-25 Self Test Mode - Printer Test Display

```
PRINTER TEST

*****************************TEST PRINT*****************************
------------------------------------------------------------------------

Abcdefghijklmnopqrstuvwxyz1234567890
ABCDEFGHIJKLMNOPQRSTUVWXYZ!@#$%^&*()

------------------------------------------------------------------------
```

Error Log Display

This screen displays the date, time, and type of the most recent error messages recorded in SRAM. The log holds information on the last eighty errors.

Table 3-26 Error Log Display

ERROR LOG (1)

Event #	Date	Time	Error Type
0	dd-mm-yy	hh:mm	Main Door Open
1	dd-mm-yy	hh:mm	Operator Mode Entered
2	dd-mm-yy	hh:mm	Cash Credit Hand Pay $ 15.60
3	dd-mm-yy	hh:mm	...
4	dd-mm-yy	hh:mm	...
5	dd-mm-yy	hh:mm	...
6	dd-mm-yy	hh:mm	...
7	dd-mm-yy	hh:mm	...
8	dd-mm-yy	hh:mm	...
9	dd-mm-yy	hh:mm	...
80..			

Play 1 Line - Press to scroll forward by one line
Play 5 Lines - Press to scroll backward by one line
Play 10 Lines - Press to scroll forward by one page
Play 15 Lines - Press to scroll backward by one page
Cash Out - Press to display extra information (if available)
Service - Press to return to previous menu
Operator Key - Turn off to exit

3.3.4 Operator Setup/Selections

The Operator Setup/Selections menu gives the operator access to configurable options of the gaming machine.

Table 3-27 Operator Setup/Selection Menu

OPERATOR SETUP/SELECTIONS MENU
Machine Options DIP Switch Settings Progressive Level Setup Location Name Setup Sound System Setup Real Time Clock Setup Player Message Setup Play 1 Line - Press to select next item Play 5 Lines - Press to select previous item Play 10 Lines - Press to choose selected item Service - Press to return to previous menu Operator Key - Turn off to exit

Machine Options

The Machine Options Setup screen allows the operator to control and change some aspects of machine operation. Options are selected and changed by following the on-screen guidance and pressing the appropriate pushbuttons. The machine options are stored in the first EEPROM on the Main Board.

Note
Approval from the jurisdictional authority is required before the items in the Machine Options screen can be changed.

The logic door must be open to save changes to machine options.

Table 3-28 Operator Setup Mode - Machine Options Display

MACHINE OPTIONS

(The Logic Door must be opened to complete the change)

MACHINE ID	000123	ACCEPT $1	NOTES	NO
MIKOHN GAME ADDRESS	0	ACCEPT $2	NOTES	YES
		ACCEPT $5	NOTES	YES
BLACK BUTTON:	Black and Maxbet	ACCEPT $10	NOTES	YES
MAX BET LIMIT	9999999	ACCEPT $20	NOTES	NO
HAND PAY LIMIT	$200.00	ACCEPT $50	NOTES	NO
MAX CREDIT LIMIT	$1200.00	ACCEPT $100	NOTES	NO
MAX BACC LIMIT	$100.00			
BET BUTTON	Continuous	ENABLE BILL JACKPOT		
JACKPOT WIN LIMIT (CREDIT)	100000	HOPPER/PRINTER :Hopper select		
JACKPOT BELL LIMIT (CREDIT)	100000			
JACKPOT BELL TRIGGER:	TRIGGER AT LIMIT			

Play 10 Lines - Press to increment a digit
Play 15 Lines - Press to select another digit

Play 1 Line - Press to select next option
Play 5 Lines - Press to select previous option
Play Bet 1 Credit - Press to save new setting
Service - Press to return to previous menu
Operator Key - Turn off to exit

Explanation of Terms

MACHINE ID: a number between 0 and 999999.

MIKOHN GAME ADDRESS: a number between 1 and 32 or DISABLED.

GAMBLE: enables/disables gamble option (if available and applicable).

MAX BET LIMIT: limit for maximum bet.

HAND PAY LIMIT: limit for hand pay.

JACKPOT WIN LIMIT: the Jackpot Win Limit is the maximum win for one game that does not need to be verified by an attendant (in the form of a Jackpot Handpay).

JACKPOT BELL LIMIT: the Jackpot Bell Limit is the minimum win for one game that will cause the jackpot bell to be activated.

MAX CREDIT LIMIT: the Max Credit Limit is the maximum value of credits that can be stored on the credit meter by the player.

ACCEPT NOTES: the bill acceptor can be programmed to accept only specified denominations. The DIP switches on the bill acceptor should be configured to match these settings.

ENABLE BILL ACCEPTOR: enables/disables the Bill Acceptor.

To save the changes made to the machine options, press the save button. Changes to all the machine options will be saved in this way. The Logic Door must be open at the time otherwise the changes will not be saved.

To exit from the machine options screen without saving any of the changes made, press the return to previous menu button.

Machine DIP Switch Settings

This screen displays the functions of the two 8-bit DIP switch banks on the I/O Driver Board.

The first DIP switch bank allows the coin/token value and the base credit value of the machine to be set. These values can only be reset during initial setup or during a 3-way metering error.

The second DIP switch bank allows the Gamble, Max Bet Coin Reject, and Rounding Gamble features to be enabled/disabled. Changes to these settings only take effect during power-up.

Refer to the I/O Driver Board chapter of the Service Manual for details of the DIP switch settings and the procedure for changing the switch settings.

Table 3-29 Dip Switch Settings

	MACHINE DIP SWITCH SETTINGS		
BANK 1 - DENOMINATION VALUES			
	1 - 4 Coin Value - $1.00		
	5 - 8 Credit Value - $0.25		
	Conversion Factor : 1 Coin Buys 4 Credits		
BANK 2			
	1	: Gamble -	Gamble Allowed
	2	: Max Bet Coin Reject -	Max Bet Coin Reject Allowed
	3	: Not Used	
	4	: Bill Acceptor	VFM4 - No CRC Check
	5	: BACC Denomination	Dollar ($)
	6 - 8	: Not Used	
Service	- Press to return to previous menu		
Operator Key - Turn off to exit			

Progressive Level Setup

This screen allows the operator to set each winning hand to correspond to a link progressive jackpot. The operator selects the desired Winning Hand to be modified. Then the level may be changed by pressing the appropriate button to increase or decrease the level. A non-existent level (blank) implies that there is no link progressive level associated with that hand, and hence the normal credit win value will be won. Otherwise a number between 0 and 5 will appear and this indicates the level of the link that will be won.

Table 3-30 Progressive Level Setup

PROGRESSIVE LEVEL SETUP

Mikohn Address	Disabled
Protocols Selected	Type #25 Serial
Link Id	1
Winning Combinations	Levels
Mystery Pay	JP5

Play 10 Lines - Press to increment a digit
Play 15 Lines - Press to select another digit
Play 1 Line - Press to select next option
Play 5 Lines - Press to select previous option
Play Bet 1 Credit - Press to save new setting
Service - Press to return to previous menu
Operator Key - Turn off to exit

Location Name Setup

This screen allows the operator to enter the name of the venue. This name is displayed in the Machine Identification Screen and is printed on cash tickets and metering tickets.

Table 3-31 Venue Name Setup

VENUE NAME SETUP

Venue Name : Casino Name

Play 1 Line	- Press to select next character
Play 5 Lines	- Press to select previous character
Play 10 Lines	- Press to increment the selected character
Play 15 Lines	- Press to decrement the selected character
Bet 1 Credit	- Press to save the current venue name
Service	- Press to return to previous menu

Sound System Setup

This screen allows the operator to change the volume setting of the machine and to hear all the sound effects used by the machine.

Table 3-32 Sound System Setup

SOUND SYSTEM TESTS

Play 1 Line	Press to increase column
Play 5 Lines	Press to decrease volume
Play 10 Lines	Press to play machine tunes

Service - Press to return to previous menu
Operator Key - Turn off to exit

Real Time Clock Setup

This screen allows the real time clock to be set.

Table 3-33 Real Time Clock Setup

REAL TIME CLOCK SETUP

SECOND	:	50
MINUTE	:	28
HOUR	:	15
MONTH	:	JANUARY
DAY	:	16
YEAR	:	1995

Press 1 Line	- Press to choose next item
Press 5 Lines	- Press to choose previous item
Press 10 Lines	- Press to increase item value
Press 15 Lines	- Press to decrease item value

Service - Press to return to previous menu
Operator Key - Turn off to exit

Player Message Setup

The contents of the Player Message screen display is shown on the Game Screen during game play.

Table 3-34 Player Message Information

PLAYE R MESSAGE SETUP
PLAYER MESSAGE: ENGLISH
Play 10 Lines - Press to select item Service - Press to return to previous menu Operator Key - Turn off to exit

3.3.5 Miscellaneous Menu

The Miscellaneous Menu provides a range of operational features relating to the Bank Note Acceptor, Periodic Meters, demonstrations, accounting print outs, and removing the gaming machine from service.

Table 3-35 Miscellaneous Menu

MISCELLANEOUS MENU
Reset Bills In Stacker Bill Acceptor CRC Check & Mismatch Clear Reset Periodic Meters Demonstration Mode Print Accounting Information Out of Service
Play 1 Line - Press to select next item Play 5 Lines - Press to select previous item Play 10 Lines - Press to choose selected item Service - Press to return to previous menu Operator Key - Turn off to exit

Reset Bills In Stacker

This screen allows the operator to reset the Bills In Stacker meter. This meter should be reset each time the Note Stacker is emptied.

Table 3-36 Reset Bills in Stacker

RESET BILLS IN STACKER
Play 1 Line - Press to RESET BILLS IN STACKER meter
Service - Press to return to previous menu Operator Key - Turn off to exit

Bill Acceptor CRC Check and Mismatch Clear

This security procedure enables a CRC check to be carried out by an authorised attendant at a suitable time.

Table 3-37 Bill Acceptor CRC Check and Mismatch Clear

BILL ACCEPTOR CRC INFORMATION	
Current Saved CRC Value	00000000
Current Saved CRC Seed Value	00000000
BACC Program ID: XXXXXXXXXXX	
Play 1 Line: Press to upload and run CRC BACC Program	
Service - Press to return to previous menu Operator Key - Turn off to exit	

Reset Periodic Meters

This screen allows the operator to reset all periodic meters.

Table 3-38 Reset Periodic Meters Screen

RESET PERIODIC METERS
Play 1 Line - Press to RESET PERIODIC METERS
Service - Press to return to previous menu Operator Key - Turn off to exit

Demonstration Mode

Demonstration Mode enables gameplay without any money being inserted or any payouts being made.

This option is only available when player credits are zero, the main door is open, and no other lockups are active. To enter Demonstration Mode, the operator must close the main door and turn the Audit key OFF.

To exit from Demonstration Mode and return to the Operator Mode Menu, turn the Audit key ON.

If certain conditions are not met when selecting Demonstration Mode item then a warning screen will be displayed:

Table 3-39 Demonstration Mode Screen

```
DEMONSTRATION MODE

Entry to this mode is not permitted unless
            a)  Credit is zero
            b)  Main Door is open
            c)  No other lockups active
            d)  Game is not currently in progress


Service    - Press to return to pervious menu
Operator Key - Turn off to exit
```

If the previous conditions are met, and the machine is NOT currently in Demonstration Mode then the following information is displayed:

Table 3-40 Demonstration Mode Screen (Error Mode)

Operator Key - Turn off to start DEMONSTRATION MODE after first closing main door Service - Press to return to pervious menu without entering Demonstration Mode To exit from demonstration mode, return to operation mode menu and choose Miscellaneous Menu / Demonstration Mode Operator Key - Turn off to exit

When the machine is in Demonstration Mode then the following information is displayed:

Table 3-41 Demonstration Mode Screen (Normal Mode)

DEMONSTRATION MODE complete - Normal Mode entered Service - Press to return to previous menu Operator Key - Turn off to exit

Print Accounting Information

A range of functions is provided when a Ticket Printer is installed. Selection of each of the Print Accounting Information items results in a printed ticket with a variety of details. See selected formats following the menu display below.

Table 3-42 Print Accounting Information Menu

PRINT ACCOUNTING INFORMATION Current Accounting Data Last Day End Accounting Data Win Category Data Previous Games Cash Out History Play 1 Line - Press to select next items Play 5 Lines - Press to select previous item Play 10 Lines - press to choose selected item Service - Press to return to previous menu Operator Key - Turn off to exit

Venue: Not Configured Permit No: Not Cfg.
Address: Not Configured
Terminal No: 0418000f Date: 12/12/94
Firmware No: 04100041V Time: 12:00 S

CURRENT METERS

MAIN METERS
12/12/94 12:00

MASTER 12/12/94 12:00			PERIOD 12/12/94 12:00	
$	0.00	Cash Box In	$	0.00
$	0.00	Hopper In	$	0.00
$	0.00	Hopper Refills	$	0.00
$	0.00	Hopper Out	$	0.00
$	0.00	Cash Tickets Out	$	0.00
$	0.00	Net Revenue	$	0.00
$	0.00	Money Played	$	0.00
$	0.00	Money Won	$	0.00
$	0.00	Net Hopper		

Current Credit: $ 0.00

GAME METERS

Game ID: Not Configured
Game Name: Not Configured

Games Played: 0 Money Played: $ 0.00
Games Won: 0 Money Won: $ 0.00

MISCELLANEOUS METERS

Door Accesses		Faults		Comms Errors	
Main:	1	Coin In:	0	CRC:	0
Logic:	0	RAM:	0	Validation:	0
Cashbox:	0	System:	0	Timestamp:	0
Topbox:	1				
Meters:	0				

Machine Status: GAME DISABLED
Game Eprom CRC: 13c3

Ticket Number: 9

TEST PRINT

abcdefghijklmnopqrstuvwxyz 1234567890
ABCDEFGHIJKLMNOPQRSTUVWXYZ !@#$%^&*()

Venue: Not Configured Permit No: Not Cfg.
Address: Not Configured
Terminal No: 0418000f Date: 12/12/94
Firmware No: 04100041V Time: 12:00 S

CASH TICKET

Cash Ticket Amount:
$2.50

Amount in Words:
TWO dollars and FIFTY cents

Voucher Number: 1
Universal Time : 12:00:00 12/12/94

Certificate Number: 1199 0455 4521
Authorisation Number: 0000 1235 748

TATT201

Figure 3-5 Examples of Typical Printer Tickets

Out of Service Option

This operational option enables a floor attendant to place an EGM into, or remove a machine from, the Out of Service mode as required.

Table 3-43 Out of Service Screen

OUT OF SERVICE	
Operator Key	Turn off to start Out of Service Mode
Service Key	Press to return to previous menu without entering Out of Service Mode
Operator Key	Turn again to EXIT Out of Service Mode Turn Reset Key to reset lockups detected in Out of Service Mode

3.3.6 Current Lockup Menu Items

The gaming machine has an extensive system of self-monitoring and should any abnormal conditions be detected, the machine will automatically enter a lockup condition. In lockup, the game is disabled to prevent any further player interaction and the game message area displays guidance information.

Lockup conditions are handled by the Operator Mode Menu item Current Lockup. The menu is displayed and the conditions requiring attention are highlighted by the characters ***. Each lockup condition has an associated help screen outlining the procedure for fixing the fault.

The Current Active Lockup Menu is shown below, followed by a summary of the associated help screens.

Table 3-44 Current Lockup Screen Display

CURRENT ACTIVE LOCKUPS

	Attendant Handpay		**Coin Faults**		**Bill Acceptor**
***	Cash Out Handpay		Coin Acceptor Fault		Bill Acceptor Error
	Jackpot Win		Coin Jam/optic Fault		Signature Error
	Win Handpay		Yoyo		Bill Acceptor Failed
	Mystery Handpay		Coin Diverter Fault	***	Stacker Full
					Stacker Removed
	Memory Errors		**Hopper Faults**		Bill Acc OOS
	3 Way Memory Error	***	Hopper Empty		
	GameEPROMs Changed		Hopper Jammed		**Printer Faults**
	Self Audit Error		Illegal Coin Out		Printer Disconnected
	Machine Options		Hopper Disconnected		Printer Fault
	DIP Switch Settings				Paper Depleted
	Mikohn Faults				**Miscellaneous**
	Mikohn Disconnected				Battery Low
	Mikohn Comm Error				Meters Disconnected
					Out of Service
	Door Faults				
	Main Door Open				
	Logic Door Open				
	Cashbox Door Open				
	Bill Acceptor Door Open				

The characters *** are next to active lockups
Play 1 Line - Press to select next lockups
Play 5 Lines - Press to select previous lockups
Cashout - Press to see selected lockup help
Service- Press to return to previous menu
Operator Key - Turn off to exit

Table 3-45 Lockup Help Displays

CURRENT ACTIVE LOCKUP HELP SCREENS	
Lockup	HELP Screen Explanation and Advice
Cash Out Handpay	To reset: Complete any relevant book work, and turn Reset Key on then off.
Jackpot Win	To reset: Complete any relevant book work, and turn Reset Key on then off.
Win Handpay	To reset: Complete any relevant book work, and turn Reset Key on then off.
Mystery Handpay	To reset: Complete any relevant book work. Turn the Reset Key on then off. Wait for the Mikohn equipment to reset.
Three Way Memory Error	To reset this fault - Follow the instructions at the main menu.
Game Eproms Changed	To reset this fault - Follow the instructions at the main menu.
Self Audit Error	To reset this fault - Follow the instructions at the main menu.
Machine Options Setup	To reset this fault, enter the Machine Options setup menu. Set options as required, then save options.
Mikohn Disconnected	Open the main door, check loom and reconnect the Mikohn, or close the main door, or disable the "Mikohn Game Address" from the Machine Option Menu.
Mikohn Comm Error	Caused due to 5 transmission failures, open the main door, close the main door
Main Door Open	To reset this fault, close the Main Door.
Logic Door Open	To reset this fault, close the Logic Cage Door.
Cashbox Door Open	To reset this fault, close the Cashbox Door.
Bill Acceptor Door Open	To reset this fault, close the Bill Acceptor Door. (Note: Requires the Bill Acceptor Door and the Belly Panel Door to be closed)
Coin Acceptor	To reset this fault, open main door, correct problem, then close main door.
Coin Optic Fault	To reset this fault, open main door, correct problem, then close main door.
Yoyo	To reset this fault, open main door, correct problem, then close main door.
Coin Diverter Fault	To reset this fault, open main door, correct problem, then close main door.
Dip Switch Settings	To reset this fault, power the machine off. Set the legal coin and credit values. Power the machine on. Return to Operator Mode Menu and reset the static RAM
Hopper Empty	Check if the hopper is empty - if so refill the hopper. Open main door, correct problem, then close main door.
Hopper Jammed	Open main door, clear the reason for the hopper jam - check the hopper coin out sensor, close the main door.
Illegal Coin Out	To reset this fault, open main door, correct problem then close main door.
Hopper Disconnected	Open main door, reconnect the hopper, then close the main door.
Bill Acceptor Error	To reset this fault, disconnect and then reconnect power to bill acceptor.
Signature Error	BACC Signature Mismatch. To reset this fault, go to the Miscellaneous Menu, select Bill Acceptor CRC Check and follow instructions.
Bill Acceptor Failure	To reset this fault, empty the stacker, reset meter values, disconnect and then reconnect power to bill acceptor.
Stacker Full	To reset this fault, empty the stacker, reset meter values, disconnect and then reconnect power to bill acceptor.
Stacker Removed	Replace the stacker.
Bill Acceptor Out Of Service	To reset this fault, reconnect the Bill Acceptor, then close the main door. Alternatively, disable the Bill Acceptor via the Machine Options Setup screen
Printer Disconnected	Open the main door, reconnect the Printer, close the main door.
Printer Fault	Open the main door, repair or replace the Printer, then close the main door.
Paper Depleted	Open the main door, insert new paper roll and close the main door.
Battery Low	To reset this fault, replace the battery (Note: this will result in a metering error).
Meters Disconnected	To reset this fault, open the main door and the logic door, reconnect the mechanical meters then close the logic door and the main door.
Out of Service	To exit, turn the Operator Mode Key on. After exiting from Out of Service mode, the Out of Service lockup can be cleared by turning the Reset Key on and off.

Notes

Chapter 4

Cabinet, Door and Top Box

List of Figures

4.1 General Description

The gaming machine cabinet, top box, and cabinet door are of welded pressed sheet metal construction. The cabinet provides security to the inside of the machine and a rigid structure for mounting the various machine components. The cabinet door is secured to the cabinet with three high-strength hinges and latches to the cabinet with a security three-point latch. A steel reflector panel, fitted inside the cabinet door, provides mounting for the coin handling system and the door fluorescent tube and ballast.

The major components of the machine are located either within the cabinet, on the cabinet door, or in the top box. The following components are detailed in this chapter (see Figures 4-1 and 4-2):

In the cabinet:

- key switches,
- cabinet door security
- main door latch assembly,
- cash box chute,
- logic cage,
- game display shelf.

On the cabinet door:

- cabinet door fluorescent lighting,
- mid-trim, coin entry and playbuttons,
- cabinet door security,
- cabinet door artwork,
- reflector panel,
- belly panel door,
- monitor mask,
- coin tray.

In the top box:

- top box shell,
- top box door,
- fluorescent lighting and reflector,
- top box door artwork,
- light tower (optional).

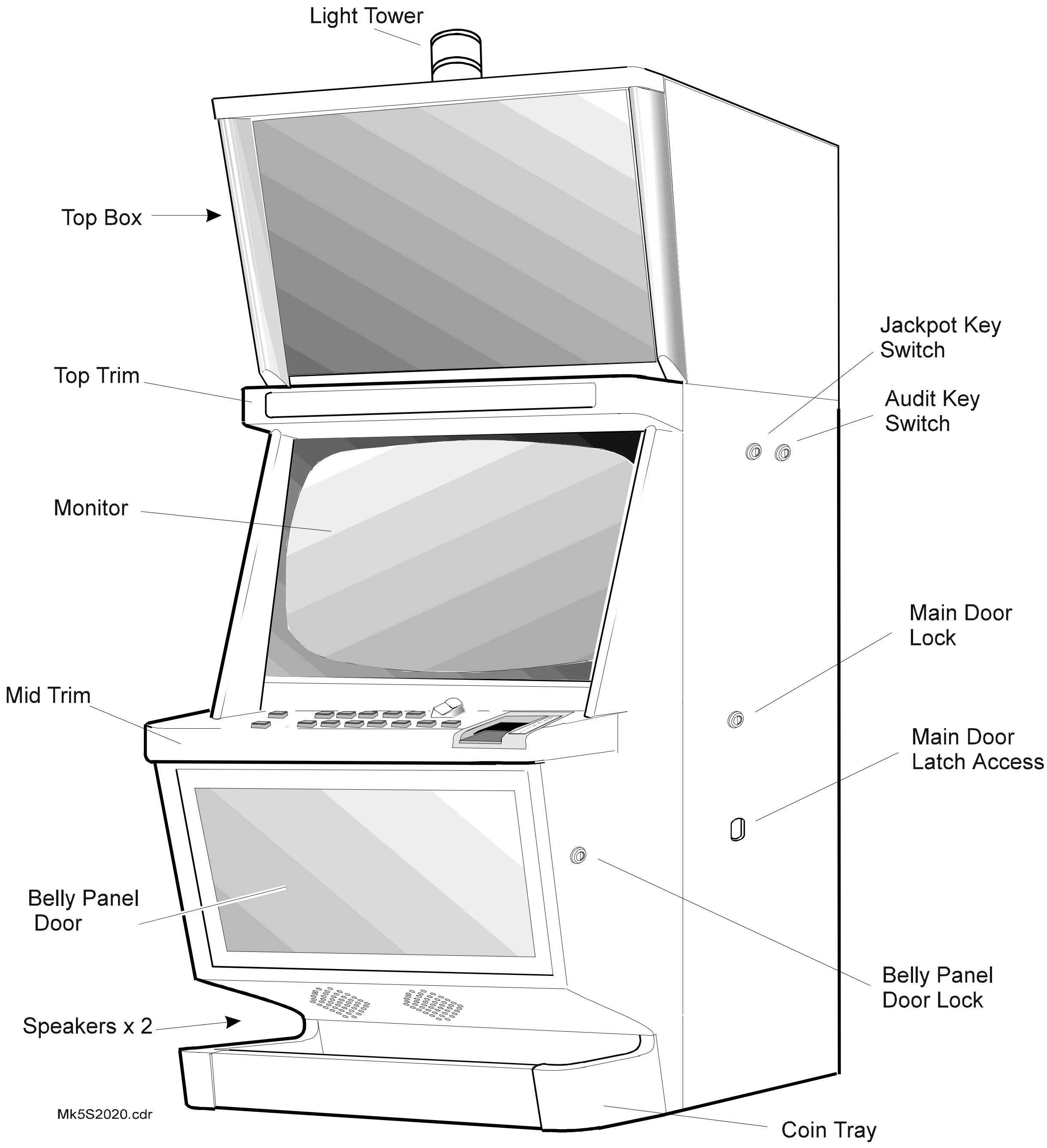


Figure 4-1 MVP Gaming Machine with Highboy Top Box and Bill Acceptor - External View

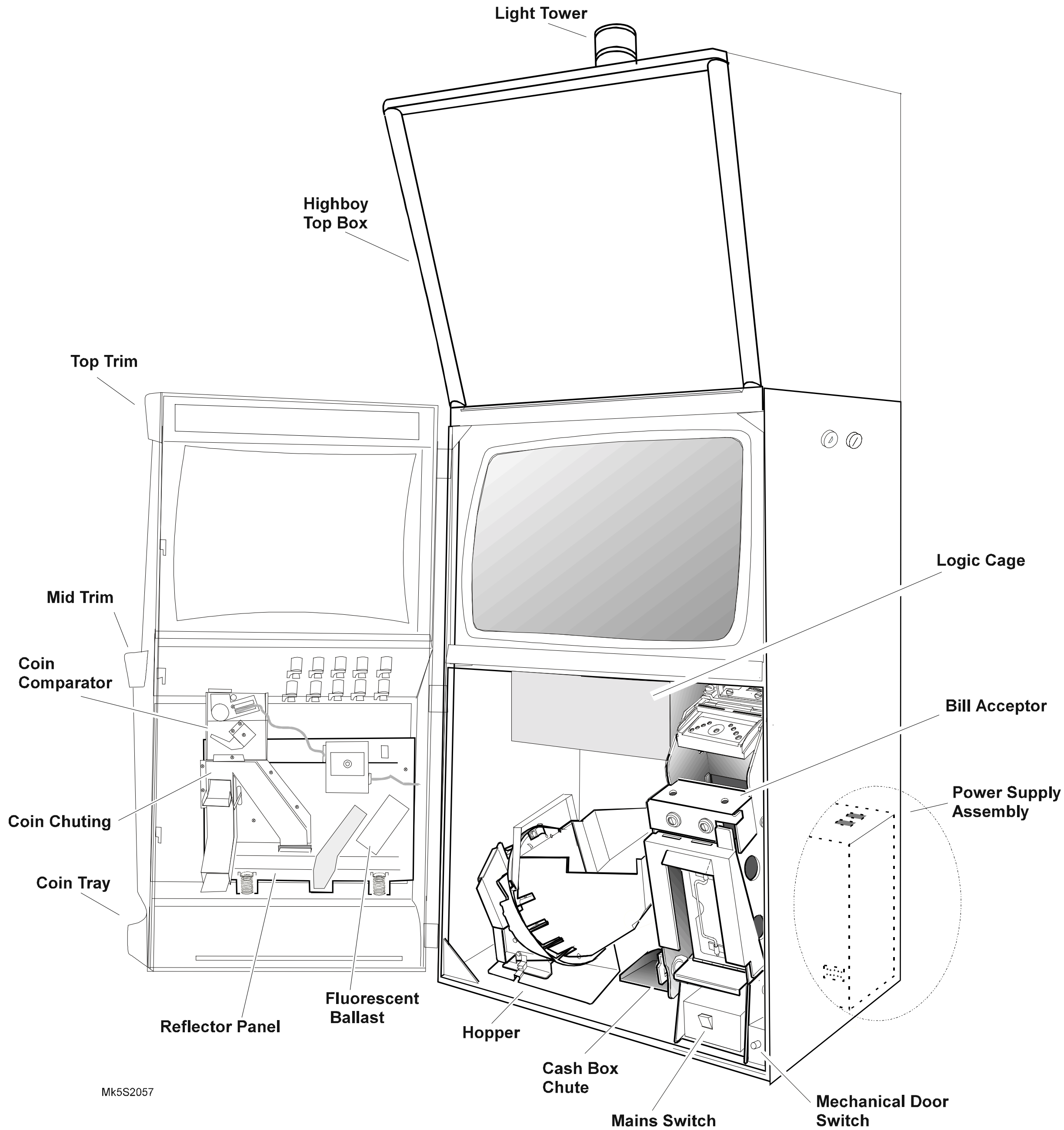


Figure 4-2 MVP Gaming Machine with Highboy Top Box and Bill Acceptor - Internal View

4.2 Technical Description

The following sections describe the function of each component and outline procedures for adjusting, removing and replacing, and assembling and disassembling components.

4.2.1 Cabinet and Door

The cabinet is comprised of a one piece shell (back and two sides) with separate top and base sections. The parts are interlocked and welded together with strengthening gussets and rails for rigidity. The cabinet door is mounted on three high-strength hinges. Various brackets and plates are welded to the assembly to provide mounting for other machine components.

Cabinet (Main) Door

The cabinet (or main) door is fabricated from sheet steel. The structure is welded and bolted together, using three cross braces for rigidity. Mountings are provided in the door for the coin handling system, artwork, lighting, coin tray, speakers, and other devices. The belly panel of the main door opens to allow access to the bill stacker.

The door is mounted to the cabinet on three high-strength hinges on the left-hand side of the machine. The door is located on the right-hand side with a three-point latch mechanism.

Adjustment Procedures:

The hinges are bolted to the cabinet and can be moved vertically by up to 4 mm, allowing the position of the door to be adjusted to fit neatly to the cabinet.

Removal and Replacement Procedures:

To remove the door, door hinges and hinge pins:

1. Open the cabinet door, and switch OFF the machine.
2. Disconnect all looms between the door and the rest of the machine.
3. Remove the nut and bolt securing the door stay.
4. Lift the door off the three hinge pins and remove.

CAUTION
The door is a heavy item; follow the national standard and code of practice for manual handling.

5. The hinges and hinge pins can be removed from the door and cabinet, respectfully, by removing the bolts securing them.

Replacement is a reversal of the removal procedure.

Door Latch Bar

The latch bar assembly and cabinet door lock are mounted to the inside of the cabinet wall. The latch bar may be adjusted up or down to ensure that the cabinet door closes and locks correctly.

Adjusting the Door Latch:

1. Open the cabinet door, and switch OFF the machine.
2. Disengage the bill acceptor dual cage housing and pivot it forward to provide easier access to the door latch.
3. Loosen the two mounting nuts, move the latch bar up or down as required, then tighten the nuts.
4. Check that the cabinet door closes and locks correctly.

Removing the Keyed Lock from the Cabinet:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the cam nut, cam washer and cam from the end of the lock.
3. Remove the rotation limiting washer from the lock. Note the position of the stops on the rotation limiting washer - it will make replacement easier.
4. Remove the lock nut and lock washer from the lock barrel.
5. Withdraw the lock barrel from the outside of the housing.

Replacement is a reversal of the removal procedure.

The procedure for lock removal is the same for all keyed locks.

Cabinet Security

The cabinet door and belly panel door are both fitted with battery-backed security switches. When either door is properly closed, the switch is activated and sends a signal to the Main Board indicating that the door is closed. If either switch does not provide the correct signal to the Main Board, an alarm will sound, gameplay will be disabled, and the appropriate machine lockup message will be displayed on the monitor screen.

The main door mechanical security switch is located in the bottom corner of the cabinet, beside the mains switch box. The belly panel door security switch is mounted to the cabinet door.

Removal and Replacement

To remove either door security switch:

1. Open the cabinet door, and switch OFF the machine.
2. Using a flat-blade screwdriver, prise the security switch from the cabinet.
3. Unplug the switch connectors.

The switch is replaced by firmly pushing it back into position.

Key Switches

The Jackpot Reset and Audit key switches are used to access and reset the machine's software. The key switch functions are covered in detail in the chapter Machine Modes.

The key switches are fixed to a common plate mounted to the inside wall of the cabinet. The switches are connected by a loom to the Backplane which transfers the switch signals to the Main Board for processing.

Removal and Replacement Procedures:

Removal of the key switches is as follows (refer to Figure 4-3):

1. Open the cabinet door, and switch OFF the machine.
2. Unplug the key-switch loom from the Backplane.
3. Remove the two nuts fastening the assembly to the cabinet wall.
4. Remove the key-switch assembly from the cabinet.
5. The individual key switches may be removed from the assembly:
   a. Unplug or de-solder the loom from the key switch.
   b. Remove the lock nut and washer from the switch body.
   c. Pull the switch from the mounting plate.

Replacement is a reversal of the removal procedure.

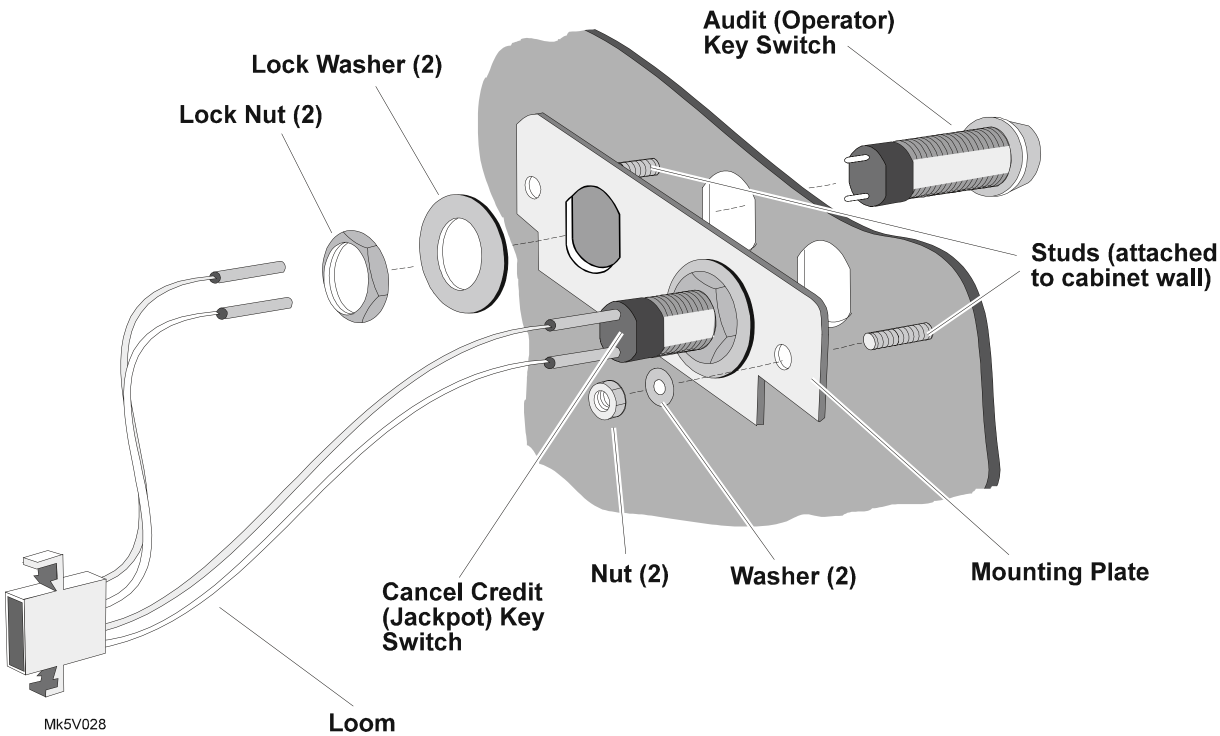


Figure 4-3 Key Switches: Removal and Replacement

Cash Box and Chute

Once the hopper is full, further coins entered into the gaming machine are collected in the cash box, which is located inside the cabinet base. A door in the cabinet base provides access to the cash box for the clearance of coins. This door is locked and monitored by a battery-backed security switch.

Coins enter the cash box via the cash box chute, which is located at the bottom of the cabinet. The chute is moulded from plastic.

Removal and Replacement Procedures:

To remove the cash box chute (refer to Figure 4-4):

1. Open the cabinet door, and switch OFF the machine.
2. Remove the hopper from the machine (refer to the chapter Hopper).
3. Remove the self-tapping screw securing the chute to the base of the cabinet.
4. Pull the chute from the cash box hole in the cabinet base.

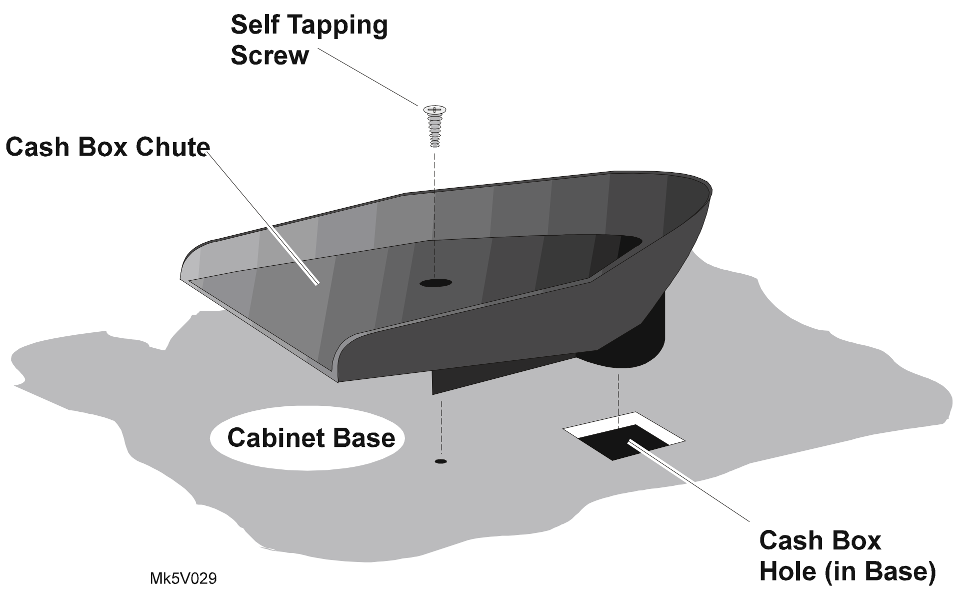


Figure 4-4 Cash Box Chute: Removal and Replacement

Logic Cage

The logic cage is a steel enclosure with a hinged door in the front. The cage houses the machine logic PCBAs and the Backplane Board. The door of the cage has a sliding latch that allows a security seal to be fitted. The door is fitted with a battery-backed microswitch used for signalling the machine software that the logic cage door has been opened. In addition, one or two security key locks may also be fitted to the logic cage door. A small electric fan for cooling the PCBAs may be mounted on the outside of the cage.

The logic cage sits below the game display shelf. It slots into the shelf at the back and is fastened to it by two screws at the front.

Within the logic cage are brackets and plastic guides for locating the PCBAs. The Backplane is mounted at the back of the logic cage. When a PCBA is fitted into the logic cage, it travels along the guides and is aligned with the corresponding multi-way connector on the Backplane.

Removal and Replacement Procedures:

To remove the logic cage and Backplane (refer to Figure 4-5):

1. Open the cabinet door, and switch OFF the machine.
2. Remove the hopper from the machine (refer to the chapter Hopper).
3. Open the logic cage door; the door flips down and is spring loaded to stay completely open.
4. Carefully lever the PCBAs out using the extractors. Standard Electrostatic Discharge (ESD) prevention procedures should be followed when removing PCBAs.
5. The PCBAs should be immediately placed into anti-static bags.
6. Disconnect all of the looms from the Backplane. Label the connectors as they are removed to ensure that they can be replaced easily.
7. Remove the two screws attaching the logic cage to the game display shelf.
8. Gently pull the logic cage from the machine; the tabs at the back of the cage will disengage from the shelf. Remove the logic cage and Backplane from the machine.

Replacement is a reversal of the removal procedure.

Disassembly and Assembly Procedures:

To disassemble the logic cage:

1. Remove the logic cage as previously described.
2. The Backplane is removed by removing the screws securing it.
3. The door catch, microswitch, and fan unit (if fitted) are removed by removing the screws securing them.
4. The PCB guides are removed by pulling them from their location holes.

Assembly is a reversal of the disassembly procedure.

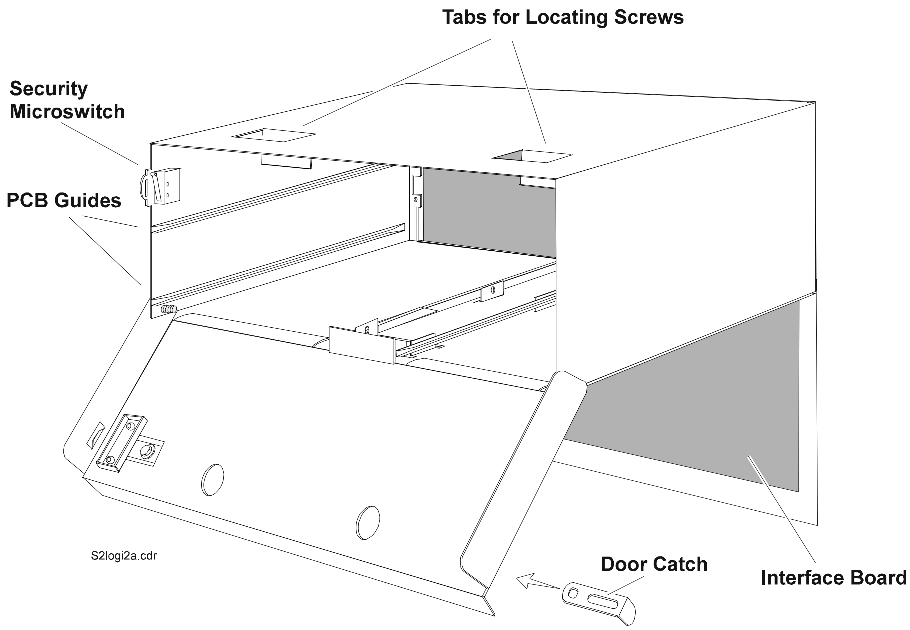


Figure 4-5 Logic Cage

Game Display Shelf

The game display shelf is a pressed sheet metal assembly that is bolted to the inside of the cabinet. The shelf provides both a strengthening cross brace to the cabinet structure and an area on which to mount the video monitor.

Removal and Replacement Procedures:

To remove the game display shelf from the machine:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the hopper from the machine (see chapter - Hopper).
3. Remove the bill acceptor dual cage assembly (see chapter - Bill Acceptor).
4. Remove the video monitor assembly (see chapter - Video Monitor).
5. Remove the logic cage as previously described.
6. Remove the two shoulder bolts fastening the monitor socket to the shelf. Note the orientation of the socket for re-assembly.
7. Remove the four nuts fastening the shelf to the back and sides of the cabinet.
8. Lift the front of the shelf off its mounting brackets, and then pull it from the cabinet.

Replacement is a reversal of the removal procedure.

Door Fluorescent Lighting and Artwork

The cabinet door is equipped with a fluorescent lighting system for illuminating the belly panel artwork and coin tray.

The artwork panel is located in the belly panel door and held in place by rubber spacers that are pressed into the channel behind the panel.

The lighting system consists of an 8 W fluorescent tube, a 6 W fluorescent tube, and two electronic ballasts. The tubes and ballasts are mounted to a reflector panel on the inside of the main door. The electronic ballast that drives the 8 W fluorescent tube receives 24 V DC directly from the power supply assembly. The 24 V power rail is daisy chained from the first ballast to the second ballast to power the 6 W tube.

Note
Fluorescent tubes are 8 W and 6 W to AS1201 (IEC 81) standard.

Removal and Replacement Procedures:

To remove a fluorescent ballast from the cabinet:

1. Open the cabinet door, and switch OFF the machine.
2. The ballast is mounted to the reflector panel on the inside the main door.
3. Unplug the fluoro loom and power loom from the ballast box.
4. Squeeze the sides of the ballast housing to disengage the plastic clips, and remove the ballast.

Replacement is the reverse of the removal procedure.

To replace a cabinet door fluorescent tube (refer to Figure 4-6):

1. Open the cabinet door, and switch OFF the machine.

Warning
When the lighting system is working, the fluorescent tube becomes very hot.

2. Open the belly panel door.
3. Rotate the tube and carefully remove from its sockets. Insert the new fluorescent tube.
4. Close and lock the belly panel door.
5. Switch ON the machine, check the lighting system, and close and lock the main door.

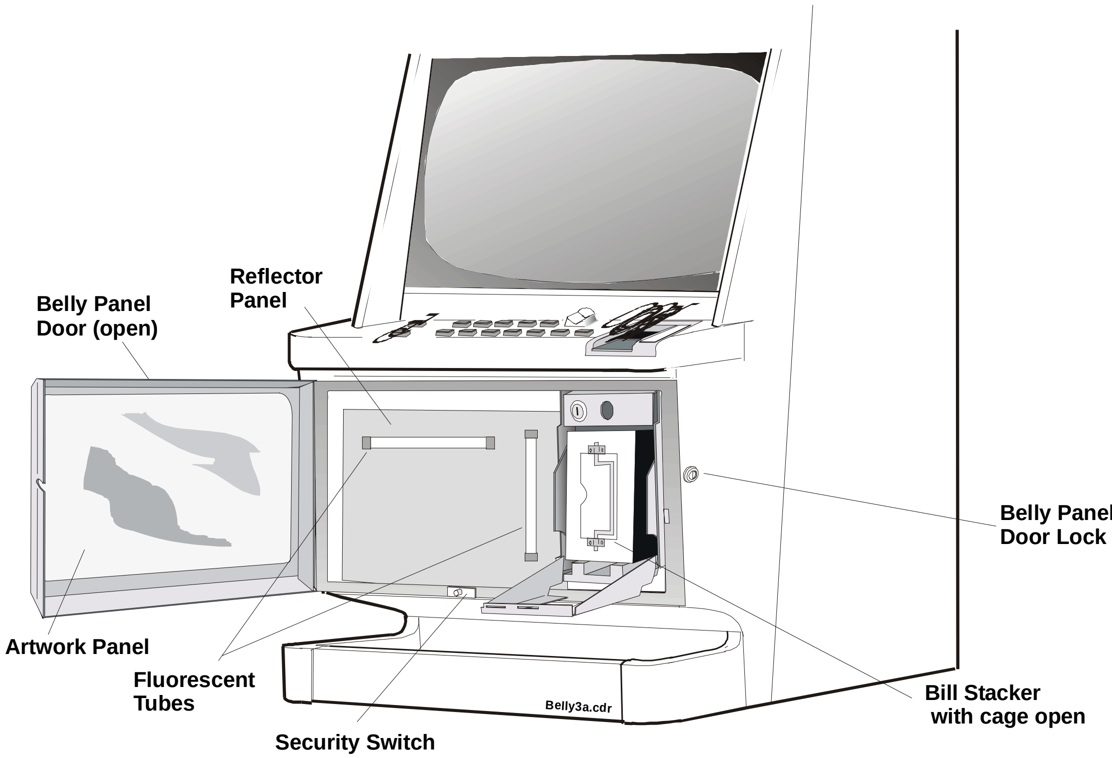


Figure 4-6 Cabinet Door Fluorescent Lighting System and Artwork

To remove the artwork panel from the belly panel door:

1. Open the belly panel door.
2. Remove the rubber spacers from behind the artwork panel.
3. Carefully remove the panel from the door.

Replacement is a reversal of the removal procedure.

Mid-Trim Panel

The mid-trim panel is fabricated from sheet steel. The function of the trim is to act as a strengthening brace for the door assembly and to provide an area for the playbuttons and coin entry to be mounted.

The mid-trim panel is attached to the door assembly by studs and screws. It can be removed from the door for repair or replacement. Some game conversions on machines require the mid-trim panel to be replaced to accommodate different playbutton configurations.

Removal and Replacement Procedures:

To remove the mid-trim panel from the door of the machine:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the reflector panel from inside the door:
   - Remove the screw that secures the panel to the bracket on the right-hand side, nearest the door hinge.
   - Disconnect the looms to the coin comparator and the fluorescent ballast.
   - Press down on the panel to disengage from under the coin entry slot on the door mid trim
   - Carefully remove the reflector panel from its locating slots.
3. Unplug all of the playbutton microswitches from the playbutton bodies (see Playbuttons in this chapter). Mark each switch for easy identification.
4. Remove the nuts on either side of the mid-trim panel that attach it to the door.
5. Pull the mid-trim panel from the door.

Replacement is a reversal of the removal procedure.

Playbuttons

The playbuttons function as the interface between the player and the machine. Various games have different configurations of playbuttons, and the playbuttons themselves may be either square, double square, rectangular, or double rectangular. The playbuttons are mounted onto the mid-trim panel.

Removal and Replacement Procedures:

To replace a playbutton lamp (refer to Figure 4-7):

1. Open the cabinet door, and switch OFF the machine.
2. Grasp the microswitch and lamp holder unit and pull it down, out of the body of the playbutton.
3. Pull out the faulty lamp, and push in the replacement lamp.
4. Replace the microswitch and lamp holder unit by inserting it into the body of the playbutton, then push the microswitch and lamp holder up into the playbutton body until it snaps into place.
5. Switch ON the machine, close and lock the cabinet door and check the button lamp.

To remove a playbutton from the mid-trim panel (refer to Figure 4-7):

1. Open the cabinet door, and switch OFF the machine.
2. From the underside of the of the body, squeeze together the two legs of the playbutton, then from the top of the button (with the legs of the playbutton still together) withdraw the lens/pushbutton assembly. The spring is loose in the playbutton and drops away when the lens/pushbutton assembly is removed.
3. Unscrew the lock nut securing the playbutton body.
4. Lift the playbutton body from the mid-trim panel.

To replace a playbutton into the mid-trim panel (refer to Figure 4-7):

1. Open the cabinet door, and switch OFF the machine.
2. Place the body of the button into the correct hole in the mid-trim panel.
3. Screw on the lock nut to secure the playbutton body in the mid-trim panel.
4. Place the spring into the lower section of the pushbutton (between the legs) and hold it there.
5. Squeeze the two legs together, then place the pushbutton into the body of the playbutton.
6. Push the pushbutton down into the body until the legs pop out under the body and hold the spring and pushbutton in place.
7. Place the lamp holder and microswitch into the body and push upwards until the unit clips into place.
8. Confirm that all playbuttons light up correctly (refer to the chapter Machine Modes).

If a playbutton does not light up when it should, check the connections and the bulb.

Disassembly and Assembly Procedures:

To disassemble the playbutton (refer to Figure 4-10):

1. Remove the pushbutton assembly from the playbutton (as previously described).
2. Place a small screwdriver between the lens cover and the pushbutton and prise the lens cover off.
3. Turn the pushbutton upside-down, the lens and label should drop out.

To assemble the playbutton (refer to Figure 4-7):

1. Place the correct label between the lens cover and the lens.
2. Place the lens cover, complete with label and lens, onto the pushbutton and clip into place.
3. Replace the lens/pushbutton assembly into the playbutton, as previously described.

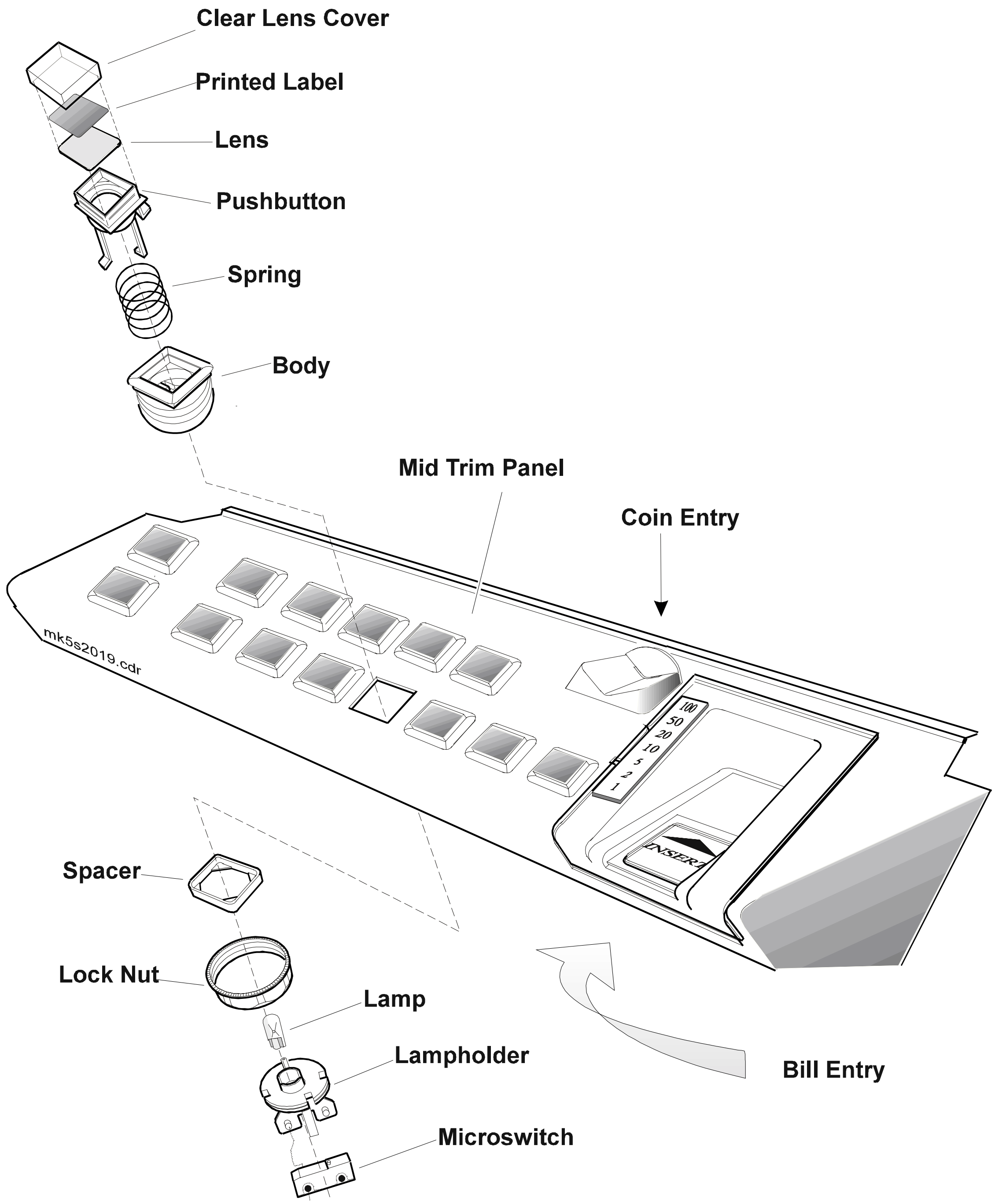


Figure 4-7 Playbutton: Exploded View

Top Trim Panel

The top trim is fabricated from sheet steel. If a player communications unit is fitted, it is located in the top trim. A cut-out in the trim panel provides an area for players to insert identification cards into the card reader and for viewing the LCD display. Where a player communication unit is not fitted, the top trim is used to hold an artwork panel.

Removal and Replacement Procedures:

To remove the top trim panel and artwork from the door.

1. Open the cabinet door, and switch OFF the machine.
2. Remove the bolts securing the top trim to the door.
3. Pull the top trim panel and artwork off the door.

Replacement is a reversal of the removal procedure.

Monitor Mask

The monitor mask is moulded from high-strength plastic. The mask and a foam tape gasket match the contour of the monitor to provide a protective seal against moisture and intrusion.

The mask is held in position by screws at the top and by the mid trim panel at the bottom. If the mask does not fit neatly against the monitor, adjust the monitor as described in the chapter Video Monitor.

Removal and Replacement Procedures:

To remove the monitor mask:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the screws from the top of the mask.
3. Gently ease the monitor mask up and out of the door.

Replacement is a reversal of the removal procedure.

Coin Tray

The coin tray provides a receptacle for coins or tokens that are dispensed by the machine hopper, and also for coins or tokens that are rejected by the coin handling system. The tray mounts onto the lower section of the door and is held in position with four screws, which are inserted from the inside of the door. It consists of three components that are held together by locating tabs. The four mounting screws must be removed before the coin tray can be disassembled.

Removal, Disassembly, and Replacement Procedures:

To remove the coin tray from the machine (refer to Figure 4-8):

1. Open the cabinet door, and switch OFF the machine.
2. Remove the four screws that secure the coin tray to the door.

3. Gently pull the coin tray assembly from the door.
4. The end caps can be removed from the chip tray by pressing the front panel of the chip tray in until the locating tabs disengage.

Replacement is a reversal of the removal procedure. When replacing the coin tray, the location tabs should be aligned with the corresponding slots on the bottom of the cabinet door.

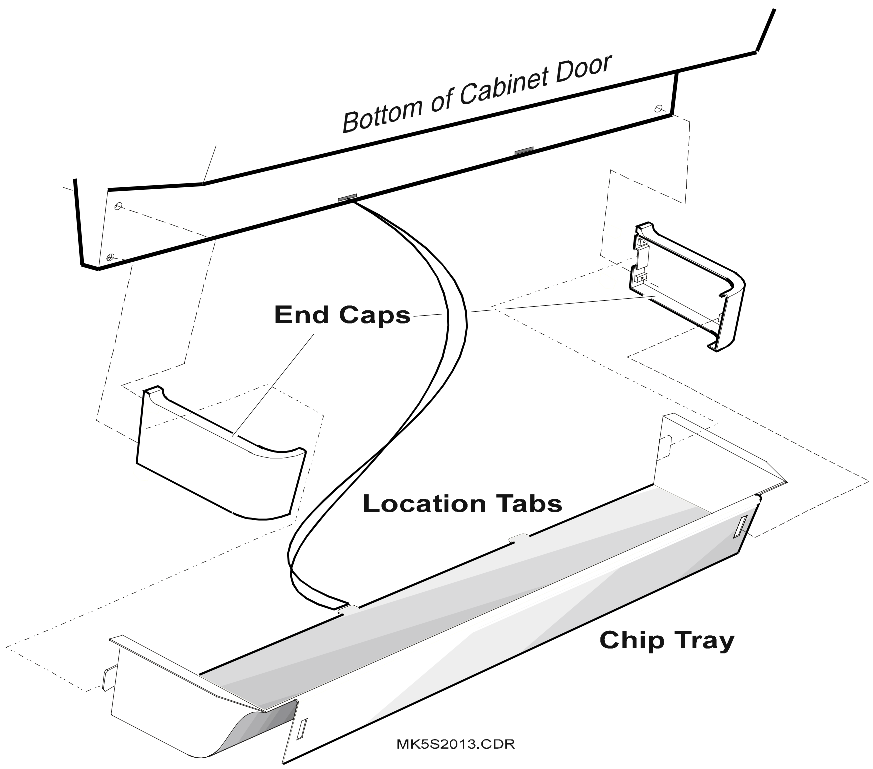


Figure 4-8 Coin Tray

4.2.3 Top Box

Machines may be fitted with one of several variations of top box. The top box consists of a welded steel shell with a door at the front, and it is bolted to the roof of the cabinet. If a player communications unit is fitted, it is housed in the bottom of the top box.

The door of the top box is fabricated from steel; except for the rounded variation in door shape which is moulded from plastic. The door is mounted to the top box by four locating tabs that fit into slots provided on either side of the top box shell. The bottom of the top box door is angled to fit underneath the top of the cabinet door when closed. This design ensures that the top box door cannot be removed unless the main door is open.

The top box provides an area for displaying the game pay table and also increases the visual impact of the machine. The game pay table is displayed by a polycarbonate artwork panel contained within the top box door. This panel is backlit by a fluorescent lamp located within the top box.

Mechanical meters, stand-alone progressive systems, and communication interfaces may also be housed in the top box.

Top Box Door

Removal and Replacement Procedures:

To remove the door from the top box (refer to Figure 4-9):

1. Open the cabinet door, and switch OFF the machine.
2. Holding the door by its sides, push it upwards to disengage the location tabs, then pull the door from the top box shell.

To replace the door, locate the tabs on the top box door in the slots provided in the top box shell, then pull the door downwards into position.

Artwork

The artwork panel located in the top-box door displays the game pay table and acts as an attraction to players. It is backlit by the top box fluorescent lighting system.

Removal and Replacement Procedures:

To remove the artwork panel from the top box door (refer to Figure 4-9):

1. Open the cabinet door, switch OFF the machine, and remove the top box door.
2. Remove the two screws securing the lower trim of the door. Pull the trim from the door.
3. Gently slide the polycarbonate artwork panel out of the door.

Replacement is a reversal of the removal procedure.

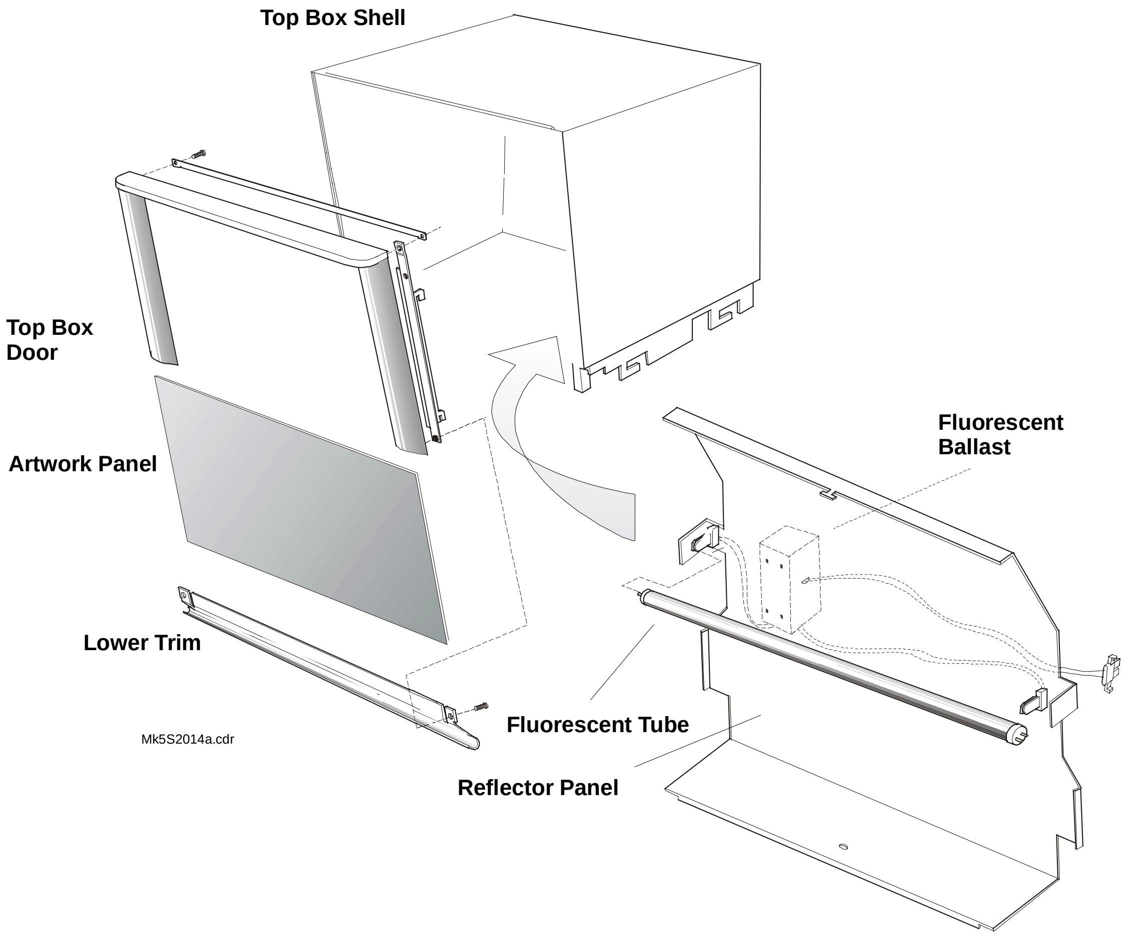


Figure 4-9 Top Box

Fluorescent Lighting

The top box is equipped with fluorescent lighting for illuminating the top box artwork panel and the top trim artwork. The fluorescent tube is mounted on the front of a reflector panel inside the top box. The tube is driven by an electronic fluorescent ballast, which is mounted to the back of the reflector panel. The fluorescent ballast receives 24 V DC from the power control assembly via a loom. The fluorescent tube is 15 W to AS1201 (IEC 81) standard.

Removal and Replacement Procedures:

WARNING
High voltages are present when the machine is switched ON. These voltages may be lethal.

To replace the top box fluorescent tube (refer to Figure 4-9):

1. Open the cabinet door, switch OFF the machine, and remove the top box door.
2. To remove the fluorescent tube, rotate it 90° and pull it clear of its socket.
3. Insert the replacement fluorescent tube.
4. Replace the top box door, switch ON the machine, and close and lock the main door. Check that the lighting system is operating properly.

To remove the top box reflector panel (refer to Figure 4-9):

1. Open the cabinet door, switch OFF the machine, and remove the top box door.
2. Remove the screw securing the reflector panel, then pull it forward/out of the top box.
3. Unplug the looms from the fluorescent ballast and electromechanical meters (if fitted).
4. Remove the reflector from the top box.

Replacement is a reversal of the removal procedure.

To replace the top box fluorescent lamp ballast (refer to Figure 4-9):

1. Open the cabinet door, switch OFF the machine, and remove the top box door.
2. Remove the reflector panel to gain access to the ballast.
3. Disconnect the looms from the ballast.
4. Squeeze the sides of the ballast housing to disengage the plastic clips, and remove ballast.

Replacement is a reversal of the removal procedure.

Light Tower

A light tower may be fitted to machines to provide an additional level of security, customer service and house control. The light tower is screwed to the roof of the top box (or the roof of the cabinet where a top box is not used) so that it may be seen from a distance. Light towers are available with either two or four tiers. The tiers of the light tower illuminate in response to player requests (change, reserve, etc) through the playbuttons and/or machine conditions (door open, jackpot, etc). The colour of the light tower tiers and the corresponding messages and functions may vary from machine to machine. Refer to Chapter 3 - Machine Modes for a description of the light tower messages.

The light tower consists of coloured plastic bushes surrounding either two or four lamps. The assembly is held together by a metal shaft around which the circular bushes are seated.

Note
The light tower may be disassembled in place or removed from the top box as a single unit.

Disassembly, Replacement, and Removal Procedures:

To disassemble the light tower and replace components (refer to Figure 4-10):

1. Open the cabinet door and switch OFF the machine.
2. Note the position, colour and display of each tier.
3. Remove the screw fastening the light tower cap and remove the cap.
4. The individual bushes and lamps can now be removed and replaced as required.
5. Replace the light tower cap and screw and fasten the assembly together.
6. Switch ON the machine, close and lock the cabinet door, and check that the light tower is functioning correctly.

To remove the light tower assembly (refer to Figure 4-10):

1. Open the cabinet door, switch OFF the machine, and remove the top box door.
2. Unplug the loom from the connector at the bottom of the light tower.
3. Remove the screws securing the light tower to the top box.
4. Withdraw the light tower from the roof of the top box.

Replacement is a reversal of the removal procedure.

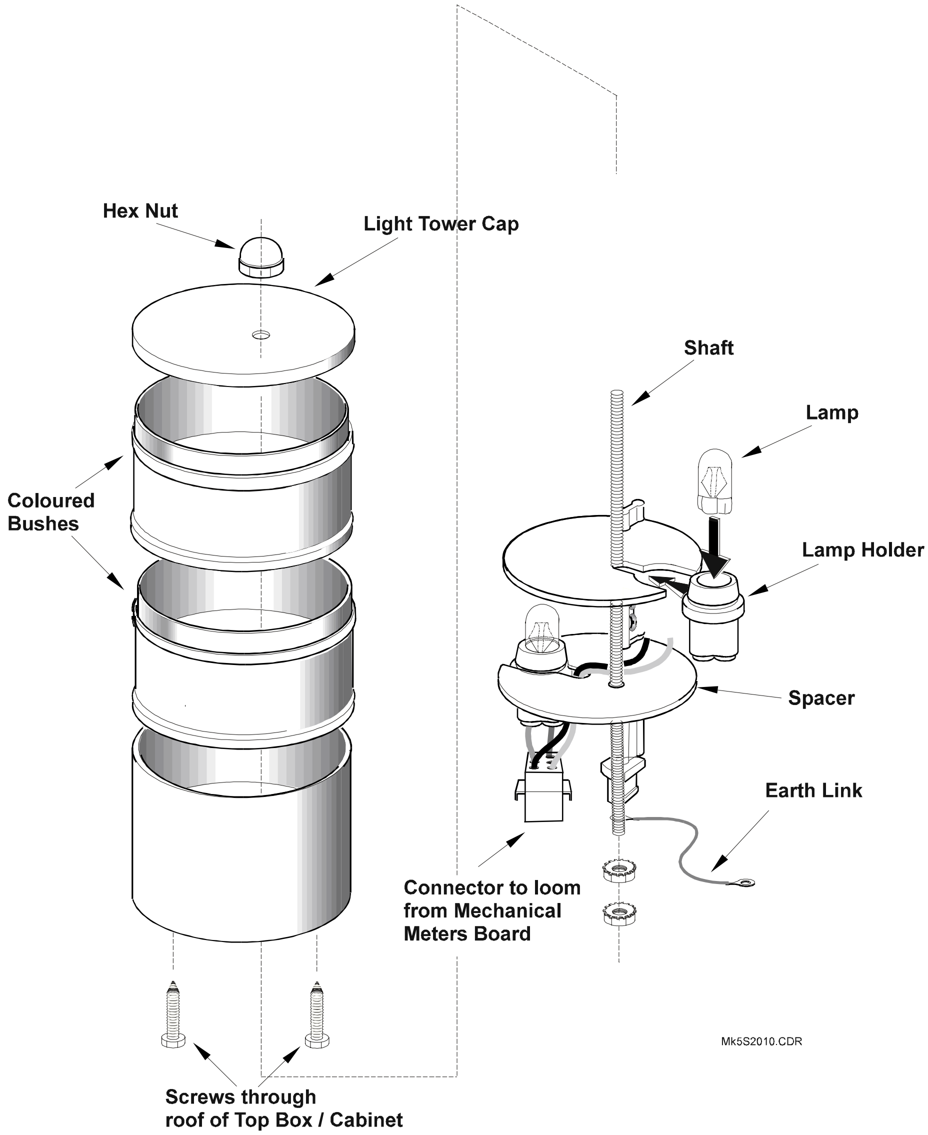


Figure 4-10 Two-tier Light Tower - exploded view.

4.3 General Maintenance

For the general maintenance of the cabinet, cabinet door and top box, the following procedures should be carried out as part of regular machine servicing:

- Clean the exterior of the machine using a non-abrasive household cleaning solution.
- Check that the belly panel door, cabinet door, and top box door are not damaged.
- Check that all cabinet earth leads are in good condition and securely connected.
- Check the condition of the artwork panels. Replace if necessary.
- Check that the machine security features (eg: cabinet door security switch) are functioning correctly and are not damaged.
- Check the condition of the monitor mask and its sealing gasket. Replace if necessary.
- Check the fluorescent lighting system works correctly. Replace any faulty components if necessary.
- Check that all playbuttons function correctly. Replace if necessary.
- Check that there are no foreign objects in any of the security locks.
- Check that all doors and latches close and lock correctly. Adjust if necessary.

Chapter 5

Power Supply Assembly

List of Figures:

5.1 Physical Description

The power supply assembly provides power to the electronic and electrical devices within the machine. It also performs electromagnetic interference (EMI) filtering and protects the system from adverse input disturbances such as lightning and voltage fluctuation.

The power supply metal enclosure is divided into two separate areas by an internal metal bracket. The area on one side of the bracket accommodates the mains filter, switches, fuses, surge protection, the solid-state relay, and wiring between the components mounted to the metal enclosure. The area on the other side of the bracket accommodates the off-line power supply, which consists of a switched mode power converter PCBA.

To provide easy access to the mains switch, it is located in a separate switch box that is positioned towards the front of the cabinet. The switch box is linked to the power supply box using mains cable. The mains ON/OFF switch controls the power to all equipment in the cabinet, apart from any equipment that may be powered from the GPO outlet.

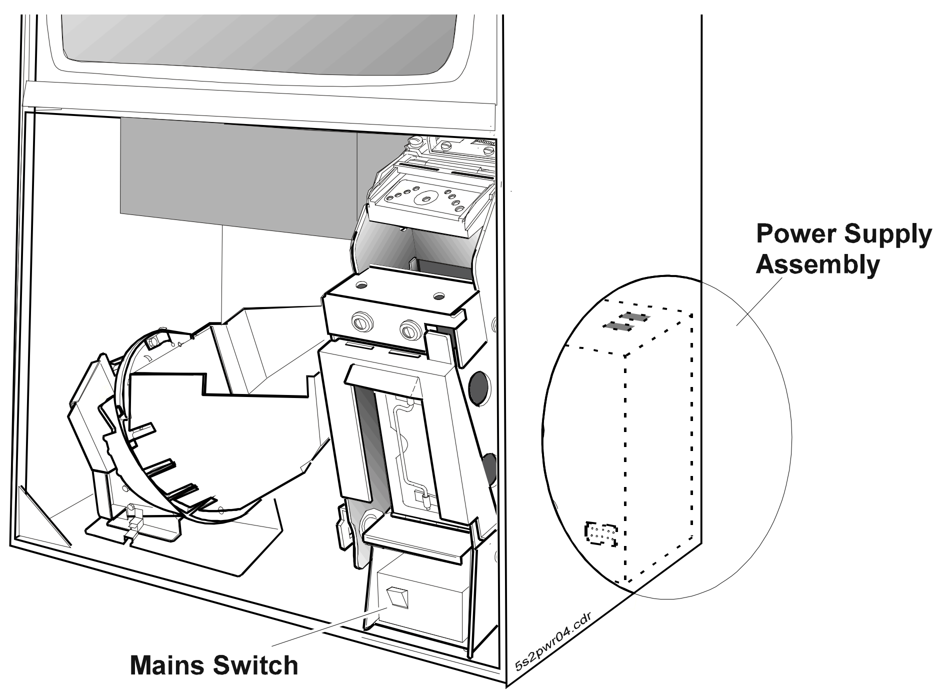


Figure 5-1 Power Supply Assembly Location

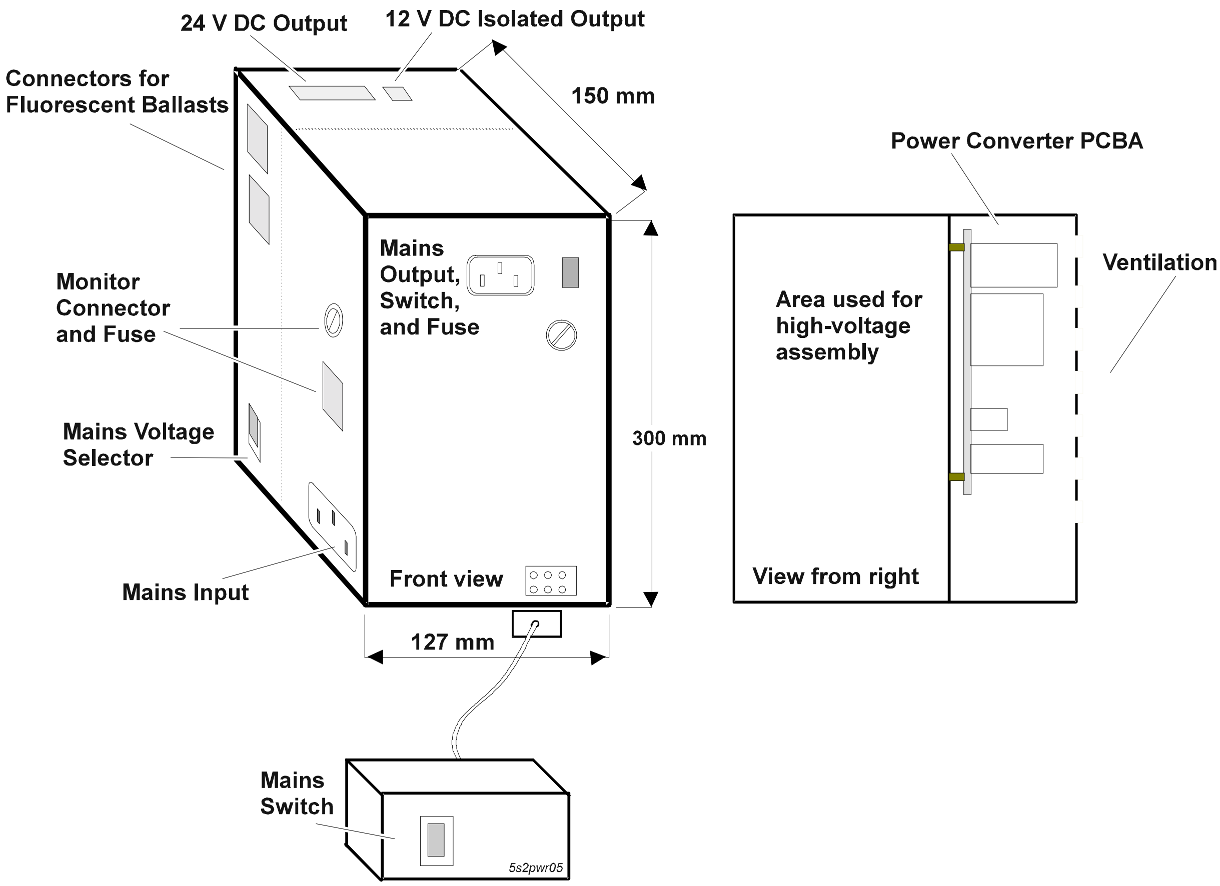


Figure 5-2 Power Supply Assembly

The power supply assembly consists of the following components:

- Mains switch (located in the switch box).
- Mains input socket.
- EMI filter and surge protection device.
- Switched mode power converter PCBA, internally fused.
- Mains selector switch. This switch is used to select the correct mains input voltage of either 120 V AC or 220/230/240 V AC.
- Generic 24 V DC output socket (connects to the Backplane to provide power for the low voltage components of the machine).
- 12 V DC output socket. This outlet provides power for subsidiary equipment.
- 24 V DC switchable output for the electronically driven fluorescent lighting system.
- Separately fused, switched mains output for the monitor
- Solid-state relay for switching monitor and fluorescent lamps to low-power mode.
- General Purpose Outlet (GPO)**.** This outlet is separately fused and switched and used to provide mains power for any accessories or test equipment that may need to be connected during maintenance.

5.2 Basic Operation

The power supply assembly receives 120/220-240 V AC mains input via a standard IEC socket.

The mains input is switched, filtered, and surge protected before connection to the monitor and the off-line power supply.

The off-line power supply unit consists of a switched mode converter on a PCB. It provides power outputs of 12 V DC and 24 V DC and the control signal Power Fail. The low-power mode feature, whereby power is switched off to the monitor and fluorescent tubes, is not used in the U.S. machine configuration.

The 24 V output is used to power the Main Board, the electronic ballasts for the fluorescent tubes, and all other machine components requiring low-voltage power. The 12 V output is used to power LAB subsidiary equipment or other machine peripherals.

A separately switched and fused mains GPO outlet is provided via an IEC female connector.

The power supply operation and distribution are shown in the following diagrams:

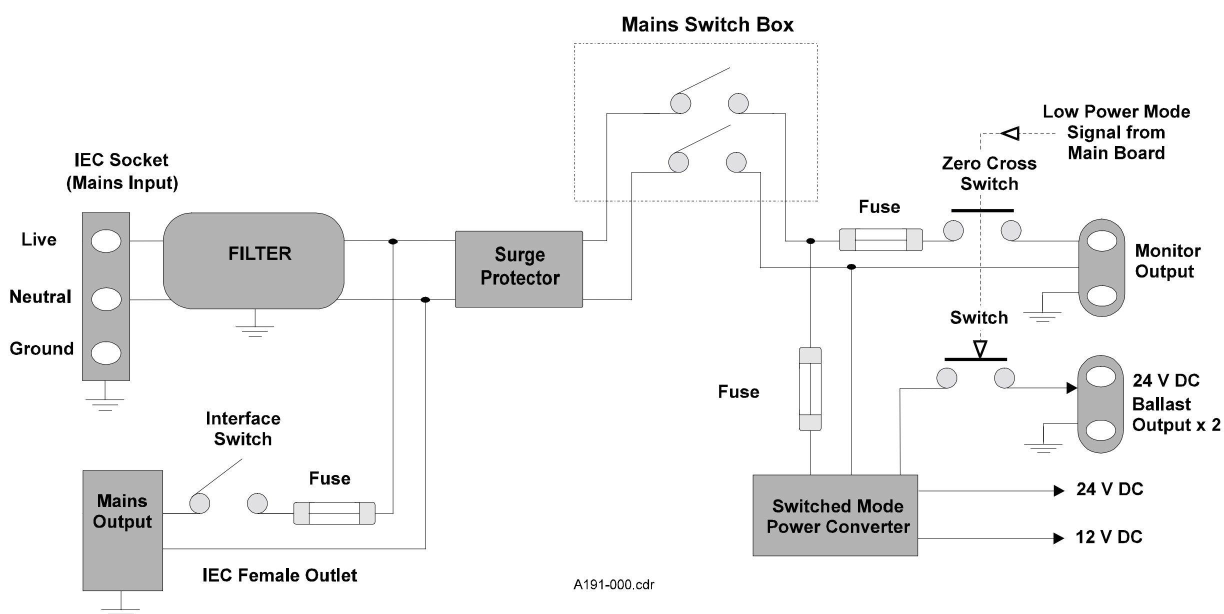


Figure 5-3 Power Supply Assembly Wiring Diagram

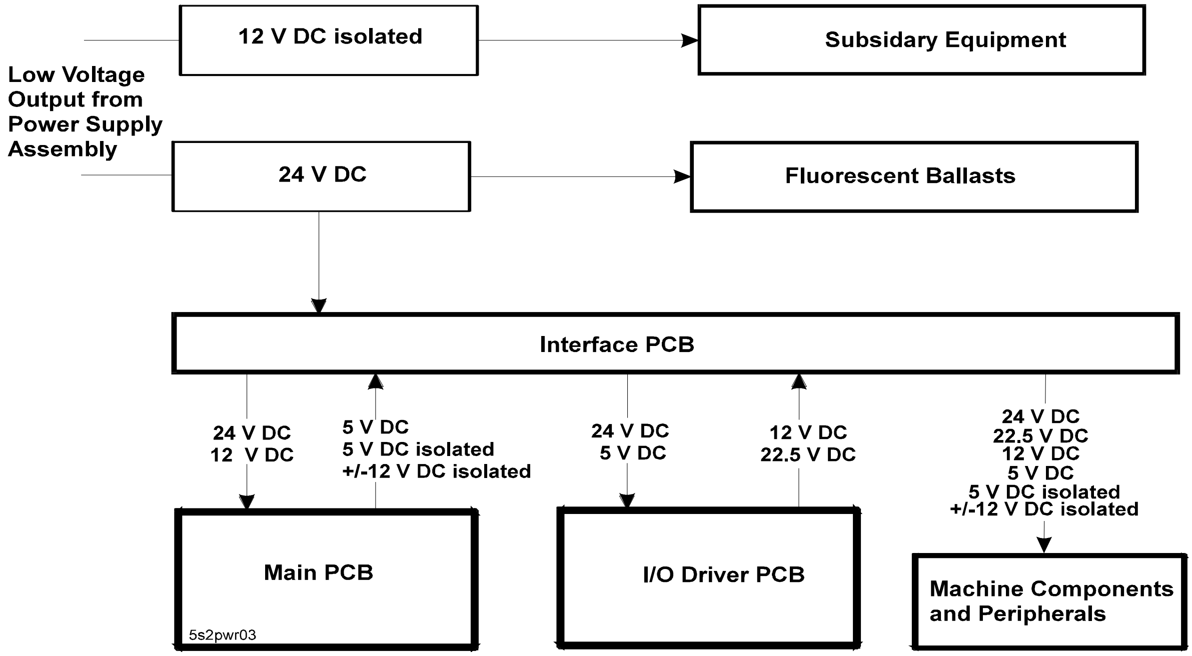


Figure 5-4 Low Voltage Power Distribution

5.3 Functional Specification

WARNING
The mains voltage selector switch must be set for the correct voltage range before power is connected to the machine. Selecting the wrong voltage will cause irrevocable damage to the machine.

5.3.1 Input Requirements

The power supply assembly is designed to accept a nominal mains input voltage of either 110/120 V AC or 220/230/240 V AC. The mains input voltage defines the monitor outlet voltage and the GPO outlet voltage. The mains selector switch must be set to the correct mains input voltage before power is connected. This switch is mounted on the metal housing of the power control assembly. The input voltage ranges and current requirements are as follows:

220 V AC - 10% to 240 V AC + 10%, 50 Hz at 6 A maximum (198-264 V AC)

or

110 V AC - 10% to 120 V AC + 10%, 60 Hz at 10 A maximum (99-132 V AC)

Physical Connection
Mains input is via a standard IEC socket mounted on the metal housing.

5.3.2 Output Requirements

Mains GPO

Voltage and Current

+0%, -2% of the input mains voltage at 0 A to 1 A.

Physical Connection

Mains output is via a standard female IEC socket. This output is separately switched and fused. This fuse is externally accessible.

Monitor Output

Voltage and Current

+0%, -2% of the input mains voltage at 0 A to 1.2 A.

Physical Connection

The monitor output is provided via a Molex Minifit Junior 6-pin connector plug mounted on the metal housing. This output is separately fused, and the fuse is externally accessible.

Generic Output 24 V DC

Provides power to the Blackplane for distribution to the Main Board, the I/O Driver Board, and other low-voltage machine components and peripherals. Maximum current is specified considering present requirements and allowing for future flexibility.

Vout = +24 V DC +/-5%

Iout = 0.5 to 15.0 A continuous

Ripple = 200 mVp-p, measured at 0-20 MHz

Fluoro Output 24 V DC

Provides power for the fluorescent lighting system.

Vout = +24 V DC +/-5%

Iout = 0.0 to 2.0 A continuous

Ripple = 200 mVp-p, measured at 0-20 MHz

Output 12 V DC

Provides power for subsidiary equipment. Isolation of 3 kV is required between this output, other secondaries and primary.

Vout = +12 V DC +/-5%

Iout = 0.0 to 3.0 A continuous

Ripple = 200 mVp-p, measured at 0-20 MHz

Overcurrent Protection

Generic Output 24 V - The output is limited to constant output current in the range 17.1 A to 22 A. The response time for the overcurrent circuit is between 20 and 150 ms. Shorter response times can cause malfunction due to short circuit glitches.

The power will recover if the overcurrent duration is shorter than the recovery time. If the overcurrent duration is longer than the recovery time, the power supply shuts down and has to be switched off/on for 1-3 seconds to recover. During shutdown state, the output 24 voltage is less than 1 V DC.

Current limits are stated for no load condition in the fluoro 24 V output. Generic output protection includes a 2 A current margin dedicated to the fluoro lamps. Therefore, the current limits can be reduced by up to 2 A depending on the fluoro load.

Fluoro Output 24 V - The output is limited to constant output current above 2 A. The response time for the overcurrent circuit is specified in seconds. Shorter times can cause malfunction of the electronic ballast and result in the fluoro tube not starting. The output will recover when the overcurrent is removed.

Output 12 V - The output is limited to constant output current in the range 3.1-7 A. The power will recover when the overcurrent is removed. The response time for the overcurrent circuit is set to allow the fluoro drives to function correctly. During current limit status, the output voltage is less than 1 V and current is limited to 2 A maximum.

Overvoltage Protection

All peripherals connected to the 24 V output rail are protected against an accidental increase of the output voltage. When the voltage rises above 28±1 V, the entire power supply will shut down.

Inrush Current

Some peripherals exhibit significant inrush current when first powered. The power supply has to cope with these temporary transients and remain stable. Maximum steady-state current drawn from the 24 V output is 14.45 A. If a Westrex printer is fitted, it causes an additional current spike that increases the maximum current to 17 A. The steady-state current limitation for the output is 17.1 A. Therefore, the off-line converter is capable of handling the current demands of normal machine operation.

5.3.3 Control Signals

Low-Power Mode Signal

This signal is generated by the Main Board and is used to switch the machine to low-power mode. This feature is not used in this machine.

Power Fail Signal

The power fail signal provides a warning to the system of imminent mains failure. The power supply is designed such that one full missing period of mains (50 Hz or 60 Hz) cannot have any effect on the correct operation of the power supply assembly. The PFAIL signal is generated by the power converter PCBA when the input mains rectified voltage drops below a threshold. This feature maintains the +24 V DC output within regulation for a minimum of 25 ms following a power fail signal. This allows enough time for mechanical meters to finish counting and for the CPU to back up the audit data held in the machine RAM before the power shuts down.

After mains voltage recovery, PFAIL can be inactivated when the level of the 24 V output reaches at least 22.5 V.

5.3.4 Physical Connections

External Mains Switch Outputs

The mains switch is connected to the power supply box via a 4-pin AMP, Mate-N-Lock compatible, universal connector. This connector is used for its high current capability per pin.

The pin functions of this connector are shown below.

Pin	Signal	Comments
1	N ret	Mains neutral line switched
2	A ret	Mains active line switched
3	A	Mains active line to the mains switch
4	N	Mains neutral line to the mains switch

Off-Line Converter Output

Two secondary output connectors are provided: one for the 24 V DC output and the control signals, the other for the 12 V DC output.

The secondary output 24 V and the control signals are connected to the power supply assembly via a Molex Minifit Junior 14-pin connector soldered directly to the PCBA. The socket fits into an opening in the metal housing.

The pin functions of the connector are as described in the following table.

Pin	Function	Destination	Comments
1	LowPower	J1-13	low power mode (input)
2	OUTFAIL		Output 24 V correct (output)
3	output 24 V	P17-10	power for machine, +24 V
4	output 24 V	P17-11	power for machine, +24 V
5	output 24 V	P17-12	power for machine, +24 V
6	output 24 V		power for machine, +24 V
7	output 24 V		power for machine, +24 V
8			
9	PFAIL	P17-14	mains voltage missing (output)
10	output GND24	P17-3	ground, +24 V
11	output GND24	P17-4	ground, +24 V
12	output GND24	P17-5	ground, +24 V
13	output GND24	P17-7	ground, +24 V
14	output GND24		ground, +24 V

The secondary output 12 V is connected via a 4-pin Molex Minifit Junior compatible header soldered directly onto the power supply PCBA. The socket fits into an opening in the metal housing.

The pin functions of the connector are as described in the following table.

Pin	Function	Destination	Comments
1	output 12 V	P17-1	isolated power, +12 V
2	output GND12	P17-8	ground, +12 V
3	—		—
4	—		—

These two secondary outputs connect to the 14-way Minifit Junior connector P17 on the Backplane. The pin assignment of the connector P17 is given in the following table.

Pin	Pin Name	Function
1	ISOLPIN	12V Isolated Power (before filter)
2	NC	-
3	GND	Gnd
4	GND	Gnd
5	GND	Gnd
6	NC	-
7	GND	Gnd
8	ISOLPGIN	12V Isolated Ground (before filter)
9	Keyway	Plastic Keyway
10	24V	24V
11	24V	24V
12	24V	24V
13	NC	-
14	NPFAIL	Power Fail

Fluorescent Lamp Outputs

Voltage and Current

24 V DC ±5% at 0 A to 2.0 A for all outputs.

Physical Connections

Two 24 V outputs are provided to power the top box fluorescent lamp and the cabinet door fluorescent lamps. The electronic ballasts used provide the possibility of daisy chaining the 24 V power rail for future adaptability. Outputs are via 4-pin Molex Minifit Junior compatible connectors, which are mounted on the metal housing. The pin functions are shown in the table below.

Pin	Signal	Function
1	—	—
2	GND 24 V	ground, 24 V
3	—	—
4	+24 V	power for fluorescent lamps, +24 V

5.4 Removal and Replacement Procedures

WARNING

High voltages are present when the machine is switched ON. These voltages may be lethal.

Note

Run a complete machine test after replacing the power supply box or any power supply component.

Fuses

The switched mode power supply fuse is an internal non-serviceable component. If this fuse is blown, the power supply box must be shipped to the manufacturer for service (contact the nearest Aristocrat office).

The monitor fuse and the GPO fuse are externally accessible and may be replaced as described below (see Figure 5-2):

1. Open the cabinet door, and switch OFF the mains switch and the GPO switch.
2. Remove the fuse cap from the fuse holder by unscrewing it in an anticlockwise direction.
3. Remove the blown fuse and insert the new fuse into the cap. Insert the fuse cap into the holder, screwing it in an clockwise direction. Do not overtighten.
4. Switch ON the mains switch and the mains outlet switch. Check that the monitor has power and the mains outlet has power. Close and lock the cabinet door.

Power Supply Assembly

To remove the power supply assembly from the machine (see Figure 5-2):

1. Open the cabinet door, and switch OFF the mains switch and the GPO switch.
2. Remove the hopper to gain access to the power supply assembly (refer to the chapter Hopper).
3. Unplug all looms and connectors from the power supply box.
4. Remove the screw securing the earth lead from the power supply assembly to the cabinet.
5. Unscrew the two screws that secure the power supply assembly to the cabinet base. One of these screws is positioned below the mains input plug and cannot be removed while the plug is connected.
6. Pull the power supply assembly forward and remove from the cabinet.

Replacement is a reversal of the removal procedure. Ensure that the earth lead is correctly replaced.

5.5 General Maintenance

The following procedures should be carried out as part of regular machine maintenance:

- Check that all connections to the power supply box are secure.
- Remove any dust or dirt accumulating on the power supply assembly.

Chapter 6

Coin Handling Assembly

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6.1 Overview

The coin handling system consists of a coin comparator/validator for determining the validity of inserted coins, a coin diverter and coin chuting for directing the coins to the correct destination, and a photo-optic module for monitoring the position of the coin diverter. The handling system is fitted and adjusted at the factory to suit a specific coin denomination.

The coin entry, located on the cabinet door trim, is designed to accept a specific coin denomination for a particular machine. It will not accept oversized or bent coins. The coin entry ensures that the coin is directed into the comparator/validator correctly.

The coin comparator/validator, coin chuting and diverter solenoid are mounted to a panel on the inside of the cabinet door (see Figure 6-1). Coins inserted into the machine pass through the comparator/validator. The comparator/validator sends signals to the Main Board, via the Interface Board and Driver Board, that allow the machine software to determine the validity of the coins. Accepted coins are directed to the accept chute, and rejected coins are directed to the chip tray via the reject chute.

The coin diverter solenoid is powered from the 24 V DC supply. The Coin Comparator/Validator receives 12 V DC derived from the 24 V DC supply using a switch mode regulator on the Driver Board.

One of several comparators/validators may be fitted as part of the coin handling assembly. A coin comparator compares the properties of inserted coins with the properties of a sample coin installed in the comparator. A coin validator, on the other hand, compares the properties of inserted coins with preset limits stored in the validator software.

The machine is compatible with the following coin comparators/validators:

1. Coin Mechanisms Inc. CC-62 or CC-46 Coin Comparator.
2. Condor CN133A Validator.
3. S7 Coin Validator in single coin mode.

The CC-62 comparator and Condor validator are described in this chapter.

6.2 CC-62 Coin Comparator

6.2.1 Basic Operation

The operation of the coin chute assembly is shown in Figure 6-1.

Once in the sensor assembly, the coin passes a sensor coil that detects its diameter, thickness, and mass.

The sensor assembly is connected to the comparator PCBA via a wiring loom. The comparator PCBA compares the inserted coin with the sample coin held within the sensor assembly.

Rejected Coins

If the comparator rejects the inserted coin, it is sent to the chip tray via the reject chute.

Alarm

If the comparator accepts the inserted coin, it is directed to the coin accept chute. As the coin exits the sensor assembly, it passes the comparator photo-optic sensor. If the comparator detects a slow moving coin, or a coin travelling in the wrong direction:

- the machine is shut down
- an alarm is sounded
- the machine displays a fault message

Accepted Coins

If the coin passes normally, a credit signal is sent to the Main Board via the Coin Handling Interface section of the I/O Driver Board and the electronic and electromechanical credit meters are incremented. The coin diverter solenoid directs the accepted coins to the hopper. If the hopper is full, the coin diverter solenoid redirects the accepted coins to the cash box via the cash box feed chute. A photo-optic sensor is used to monitor the position of the coin diverter.

Components

The CC-62 Coin Comparator consists of two modules: the sensor assembly and the comparator PCBA, which are connected via a wiring loom. The CC-62 contains the following major components (see Figure 6-2):

- sensor coil
- dampener arm
- coin accept solenoid
- photo-optic emitter and detector
- comparator PCBA
- wiring loom.

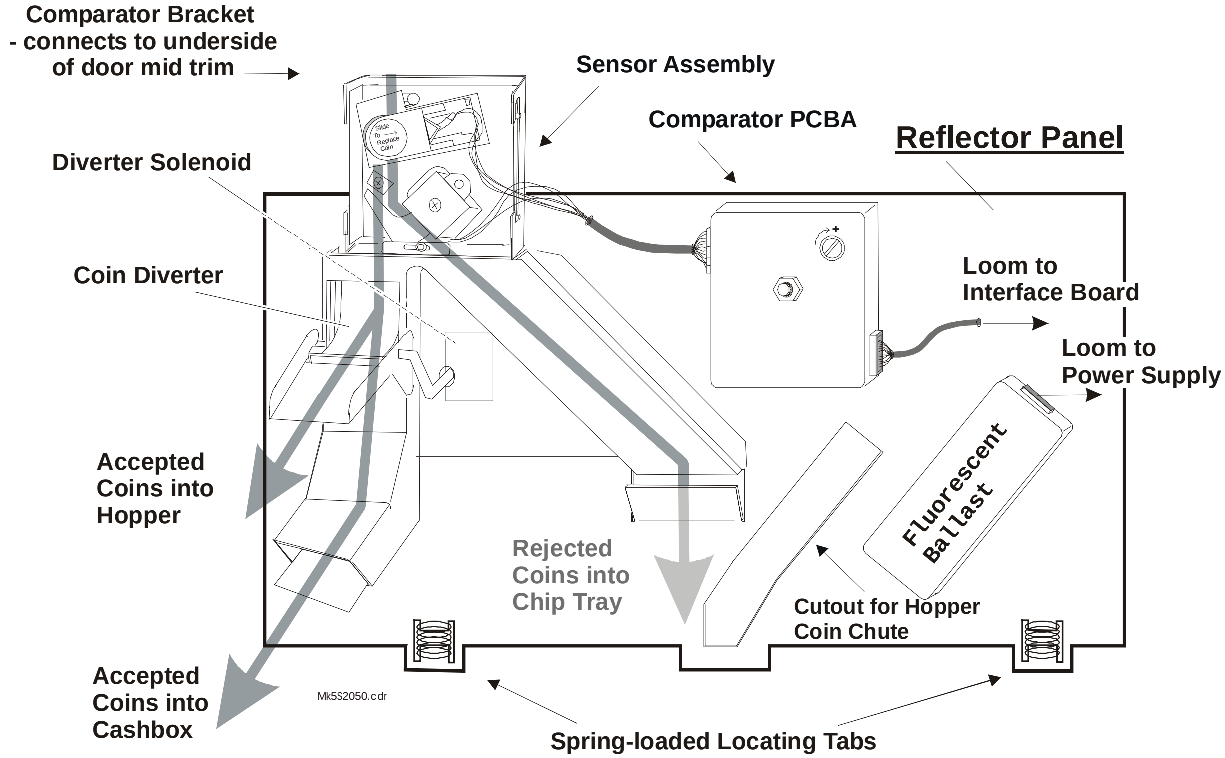

Figure 6-1 CC-62 Coin Chute Assembly - Location

6.2.2 Functional Description

The comparator PCBA performs the following functions:

- drives the sensor coils
- monitors the pick-up coil for valid coins
- activates the coin accept solenoid when a valid coin is detected
- monitors the coin travel using photo-optic sensors
- provides signals to the Main Board indicating when a valid coin has been detected, when a coin has left the sensor assembly, and when incorrect coin travel has been detected.

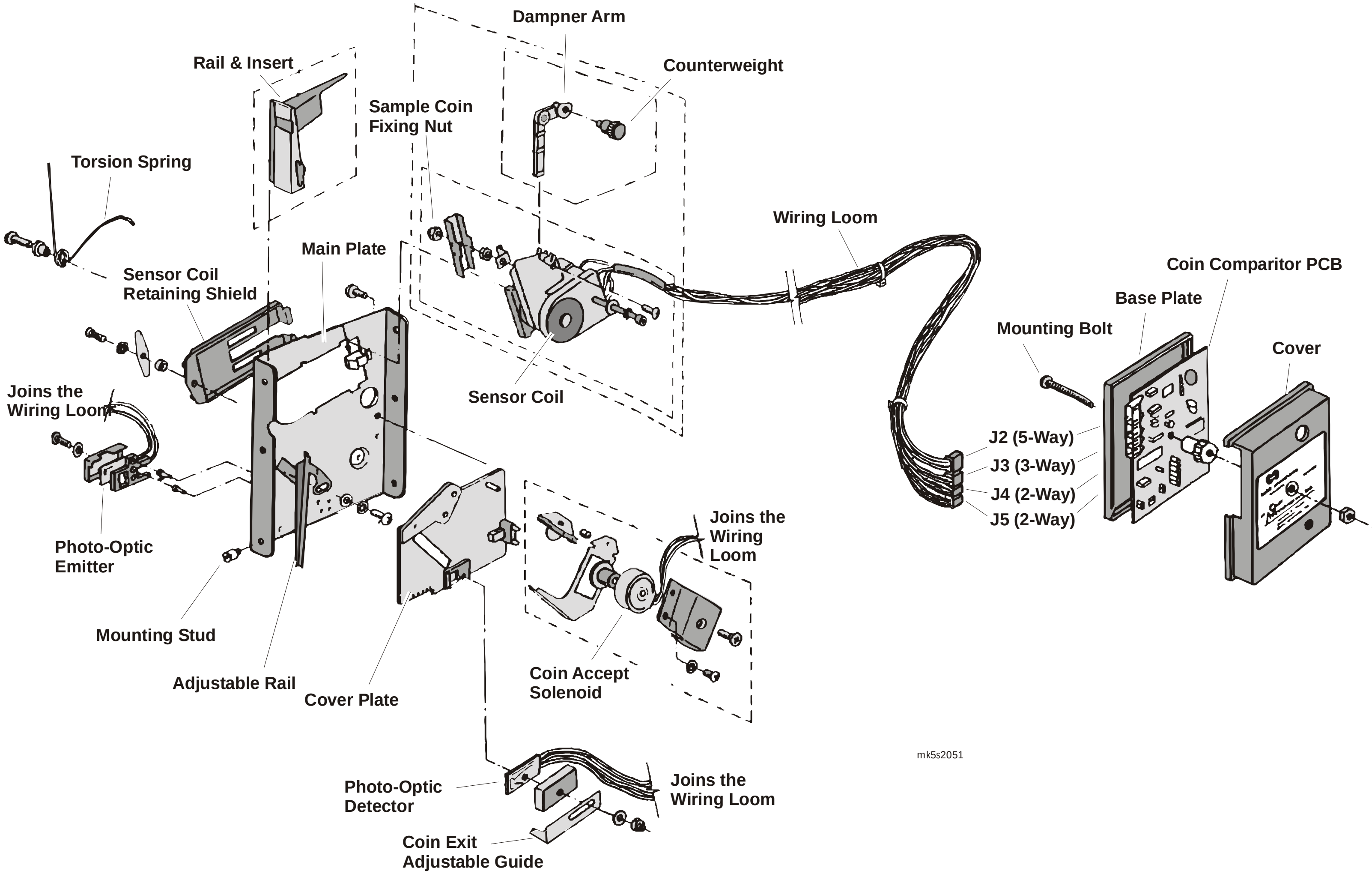

Figure 6-2 CC-62 Coin Comparator - Exploded View

When a coin enters the sensor assembly, it hits a weighted lever which slows down the passage of the coin. Weights on the lever can be changed to suit the coin denomination.

The coin then passes the scanner unit (see Figure 6-3), which contains three sensor coils, L1, L2 and L3. L1 and L3 are driven by the comparator PCBA to create a magnetic field. The central coil, L2, is a pick-up coil used to monitor the magnetic field. The sample coin sits between L1 and L2 and disturbs the magnetic field. When a coin that is identical to the sample coin passes between L2 and L3, it disturbs the magnetic field in exactly the same way as the sample coin. The result is a momentary null field in the middle. This null is detected by the comparator and registered as a valid coin.

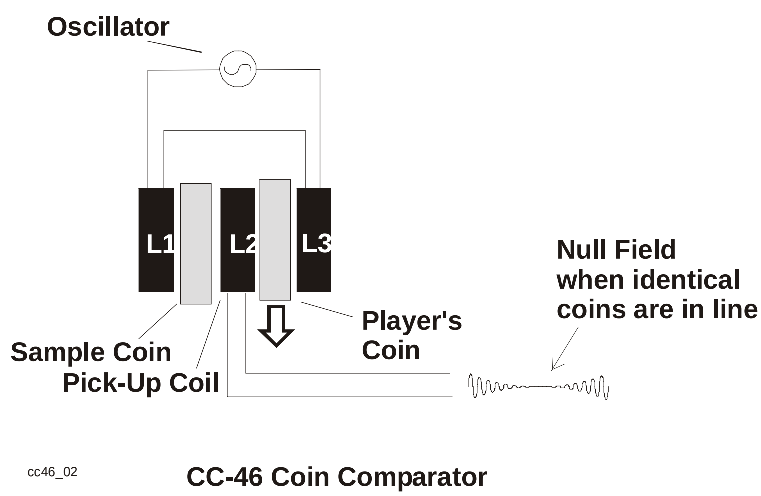

Figure 6-3 CC-62 Sensor Coil Arrangement

When the comparator registers a valid coin, it sends a CSENSE signal to the Driver Board and activates the coin accept solenoid. This solenoid is attached to a gate that opens when the solenoid is activated, allowing the valid coin to fall directly into the accept chute.

As the coin exits the sensor assembly, it passes through the internal photo-optic sensor. This sensor consists of two emitter/detector pairs that allow the CC-62 comparator to detect the speed and direction of the passing coin.

If the coin is travelling in the wrong direction or is travelling too slow, then a CERROR signal is sent to the Driver Board and the machine locks up. The CERROR pulse indicates a Yoyo or Coin Blockage condition depending on the length of the pulse. The lockup condition will be either Yoyo, Coin Acceptor Fault, or Coin Optic Fault.

If the coin passes normally then a CCREDIT signal is sent to the Driver Board.

When the machine is paying out, the Main Board sends the signal NECOINBLK to disable the coin comparator. If any coins are inserted in the coin entry during this time, the comparator directs them to the reject chute.

6.2.3 Replacing the Sample Coin

To replace the sample coin (refer Figure 6-4):

1. Open the cabinet door, and switch OFF the machine.
2. Slide the scanner unit (on the sensor assembly) to the right on the rail insert until the sample coin can be removed.

Note
In some markets the sample coin is sealed into position. Permission may be required to remove the sample coin.

3. Insert a newly minted sample coin in the scanner unit.
4. Carefully release the scanner unit.
5. Check that the sample coin is seated firmly between the scanner unit and the fork of the rail insert.
6. Switch ON the machine, and close and lock the cabinet door.

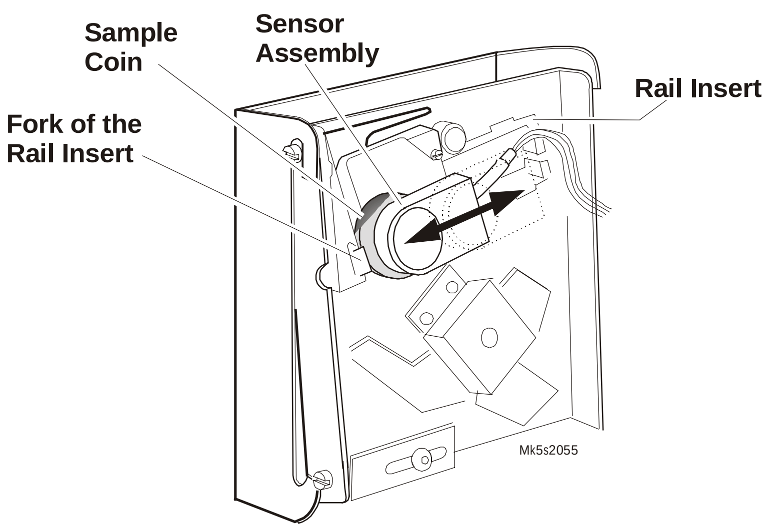

Figure 6-4 CC-62 Sensor Assembly

6.2.4 Adjustment Procedures

Two types of adjustments may be made to the coin comparator - accept/reject adjustment, and null field adjustment.

Note
These are field adjustments only. More accurate adjustments require workshop equipment.

Accept/Reject Adjustment

The *accept/reject adjustment* is performed by turning the accept/reject potentiometer at the front of the comparator PCBA (see Figure 6-5). This adjustment is normally required when:

- the comparator has just been installed,
- the accept/reject ratio becomes unacceptable,
- slugs or coins are being accepted incorrectly,
- the denomination of the sample coin has been changed.

To adjust the accept/reject ratio of the coin comparator:

1. Check that the coin comparator has the correct sample coin installed.
2. Turn the accept/reject potentiometer completely clockwise (see Figure 6-5). The comparator should reject all coins.
3. Repeatedly insert coins as you slowly turn the potentiometer anti-clockwise in small steps, until the coins are continuously accepted.
4. Repeatedly insert a slug and check that it is rejected. If the slug is accepted, repeat steps 2 and 3 then insert the slug again.

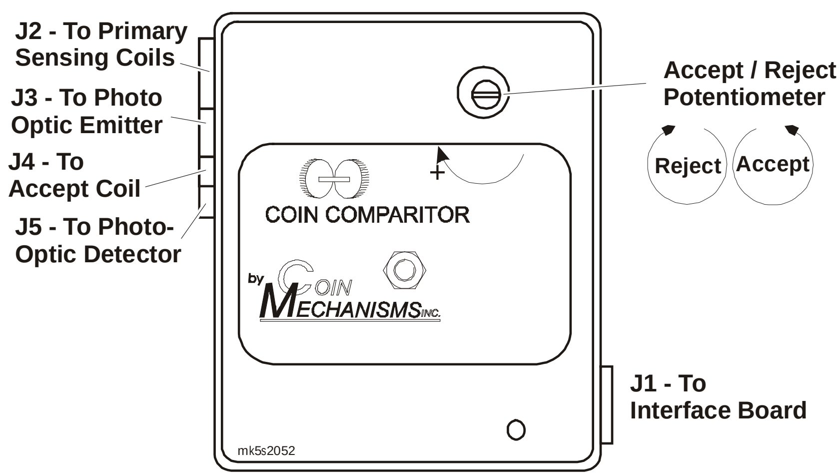

Figure 6-5 CC-62 Comparator - accept/reject adjustment

Null Field Adjustment

The *null field adjustment* is normally a factory adjustment and should not be required unless the comparator has been dropped or handled roughly. The null field adjustment aligns the two sensor coils to ensure the comparator is operating at its best.

To adjust the null field of the coin comparator:

1. Remove the sensor assembly from its installed position without disconnecting the wiring loom. You need to have access to both sides of the coin comparator.
2. Remove the sample coin from the coin comparator.
3. Set a high quality digital multimeter to measure in the range of 0 to 200 mV AC.
4. Connect the multimeter probes to the test pin (pin 4 of the 5-way connector J2 on the comparator) and to the machine ground.

CAUTION
The allen head screws are screwed into plastic. Take extreme caution to prevent stripping of the thread.

5. Rotate the allen screws on the back of the comparator (see Figure 6-6) until the voltage on the test pin is a minimum. Normally this should be below 20 mV AC.
6. Remove the probes and re-install the sample coin.

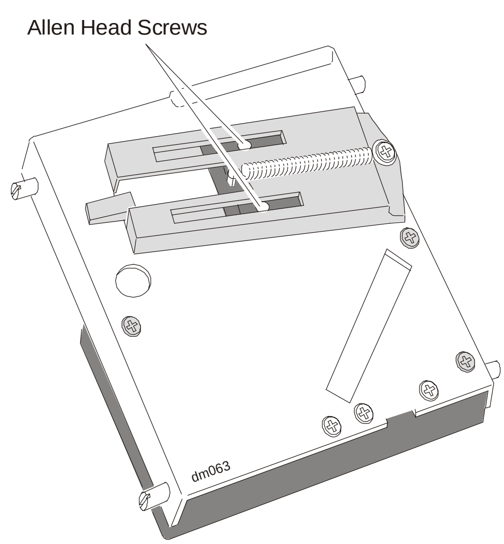

Figure 6-6 CC-62 Null Field Adjustment

6.2.5 Removal and Replacement

To remove the comparator sensor assembly (see Figure 6-4):

1. Open the cabinet door, and switch OFF the machine.
2. Carefully unplug the connectors from the sensor assembly. Do not pull on the wires.
3. Push the assembly upwards, to the full extent of the top locating groove. This action causes the sensor unit to come free of the bottom locating groove.
4. Swing the bottom of the unit outwards.
5. Pull the sensor assembly downwards and clear of the coin chute assembly.

To replace the sensor assembly, reverse the above procedure.

To remove the coin comparator PCBA:

1. Open the cabinet door, and switch OFF the machine.
2. Carefully unplug the connectors from the comparator PCBA. Do not pull on the wires.
3. The unit is mounted to the panel by a single bolt through the center. To remove, simply remove the nut at the front of the unit and then carefully pull the assembly clear of the mounting bolt.

To replace the comparator, reverse the above procedure

6.2.6 CC-62 Comparator Connector Pinouts

The connectors J2, J3, J4, and J5 on the left of the comparator PCBA are connected via a loom to the sensor assembly. The connector J1 on the right of the comparator PCBA connects to P12 on the Interface Board.

The coin interface section of the I/O Driver Board receives the signals from the coin comparator and solenoid optics and converts them into the form required by the Main Board. For a description of the coin handling interface refer to the I/O Driver Board chapter.

The signals to and from the coin comparator are shown in the following tables.

Table 6-1 J1 - Connects to the Interface Board

Pin	Function
1	Inhibit (YL)
2	+12 V DC (RD)
3	Not Connected
4	Credit Output (BL)
5	Error Output (OR)
6	Sense Output (GN)
7	GND Common (BK)

Table 6-2 J2 - Connects to the Photo-Optic Emitters

Pin	Function
1	Anode 0 V DC (BK)
2	Cathode + 1.2 V DC(RD)

Table 6-3 J3 - Connects to the Accept Solenoid Coil

Pin	Function
1	Coil Return 0 V DC (GN)
2	Coil Supply +12 V DC (GN)

Table 6-4 J4 - Connects to the Photo-Optic Detectors

Pin	Function
1	Return 0 V DC (BK)
2	LED 2 Collector (VL)
3	LED 1 Collector (OR)

Table 6-5 J5 - Connects to the Sensor Coils

Pin	Function
1	L1 (YL)
2	L3 (RD)
3	L2 (WH)
4	Test Pin (for null field adjustment)
5	L2 (BK)

6.2.7 Fault Finding

Table 6-6 Fault Finding

Fault	Probable Cause	Corrective Action
Coins continually rejected.	A. Sample coin not in the correct location in the comparator.	Check that the sample coin is correctly located.
	B. Comparator not working.	Check that the comparator has power. If it has, replace the comparator.
Coins jamming in the cash box feed chute.	The cash box chute is blocked or misaligned.	Unblock / realign the chute and tighten the fixing screws.
All coins are going to the cash box and the hopper is empty.	The diverter solenoid is not working.	1. Check that the solenoid has power. 2. Check that the coin diverter has not jammed. 3. Check that the hopper probe is not permanently grounded.
Rejected coins not falling into the coin tray.	Coins jammed in the reject chute.	Carefully clear the reject chute.
Coins accepted by the comparator but not registered as credits. The machine locks up.	The photo-optic module in the comparator is faulty.	Check that the module and its connectors are secure. Replace if necessary.

6.3 Condor Coin Validator

6.3.1 Basic Operation

The operation of the coin chute assembly is shown in Figures 6-7 and 6-8.

The Condor Coin Validator CN133A is pre-programmed to accept a specific coin type and cannot be reprogrammed in the field. The validator is clearly labelled with the pre-programmed coin type.

Once in the validator, the coin passes a sensor coil that detects its diameter, thickness, and magnetic properties.

The validator uses two sets of sensors for coin discrimination: opto and inductive. This combination gives a high degree of security.

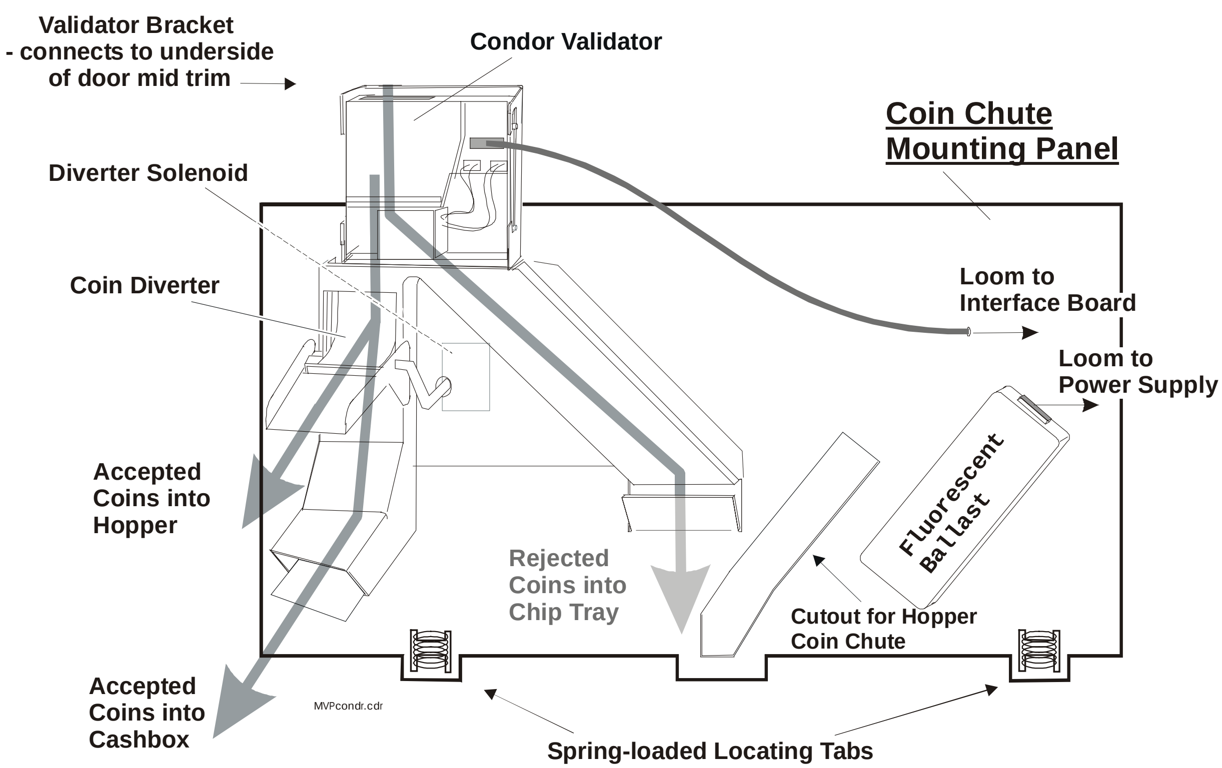

Figure 6-7 Condor Coin Handling Assembly

The inductive sensor pair has been designed to achieve a linear field independent of coin position. In a typical validator, the coin position relative to sensors is critical for accurate discrimination.

Two inductive sensors are positioned on opposite sides of the coin path and are switched between in-phase and anti-phase as the coin passes. The network impedance is affected by the coin thickness and conductivity. The resulting amplitude change is measured by a microcontroller and forms the basis of the inductive discrimination. The readings are compared against preset limits stored in the validator.

The opto system measures coin diameter. There are three longitudinal IR beams across the coin path. A 16-bit timer uses a 3-point measurement system to obtain a precise measurement of diameter. The resulting calculation of diameter is compared against preset limits. Like the inductive sensors, the opto sensors are part of a closed loop system that maintains very fast triggering for accurate timing. It also ensures that slight variations which occur from mechanism to mechanism (such as component tolerance) are irrelevant.

Rejected Coins

If both sets of sensor readings are not within the required limits, the validator rejects the inserted coin and sends it to the coin reject tray.

Accepted Coins

If both sets of sensor readings are within the required limits, the coin is deemed true, the Valid Advance Coin Signal (VACS) output pulse is generated, and the coin accept solenoid is activated. This solenoid is attached to a gate that opens when the solenoid is activated, allowing the valid coin to fall directly into the accept chute.

As the coin exits the validator, it passes a photo-optic sensor and a CREDIT output pulse is generated.

Accepted coins are directed to either the hopper or the cash box, depending on the position of the coin diverter, which depends on whether or not the hopper is full.

Alarm

If the validator detects a coin travelling in the wrong direction (yo-yo) or a failed or blocked credit or reject optic, an Alarm output pulse is generated.

On receiving this Alarm signal:

- the gaming machine shuts down
- an alarm is sounded
- a fault message is displayed on the screen

Inhibit All

For greater functionality and overall security, the host machine can send the INHIBIT ALL signal to prevent the validator from accepting any coins or tokens.

Self Calibration

The validator automatically recalibrates itself in relation to its environment approximately every 210 seconds.

Diagnostics

At power up, the validator automatically runs a self diagnostic test on the following critical areas:

- Inductive Coils
- Reflective Sensors
- Diameter Opto Sensors
- Credit Opto Sensors

If there is a failure in any one of these areas, the LED will flash red continuously and the validator will not accept any coins until power is removed and the fault condition corrected.

Debris Flap

The CN133A Validator incorporates a debris flap that allows direct access to the coin path for inspection and the clearance of coin jams.

6.3.2 Removal and Replacement

To remove the validator:

1. Open the cabinet door, and switch OFF the machine.
2. Carefully unplug the loom from the validator to the Interface Board. Do not pull on the wires.
3. Push the assembly upwards, to the full extent of the top locating groove. This action causes the validator to come free of the bottom locating groove.
4. Swing the bottom of the unit outwards.
5. Pull the validator downwards and clear of the coin chute assembly.

To replace the sensor assembly, reverse the above procedure.

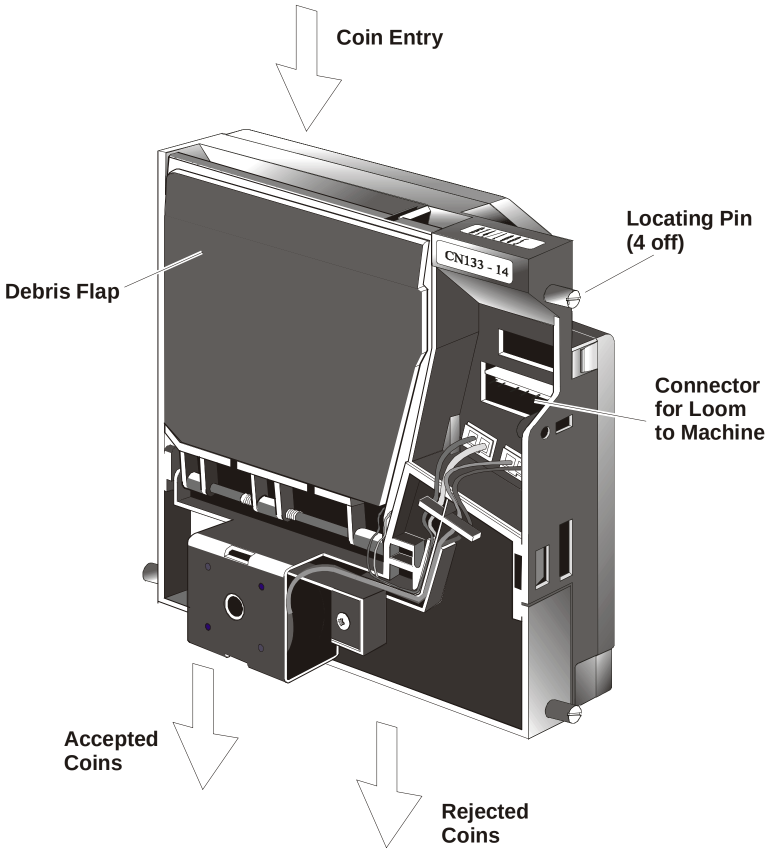

Figure 6-8 Condor Coin Validator

6.3.3 Cleaning Procedure

Equipment needed.

- Short bristle paintbrush or toothbrush.
- Clean lint free cloth.
- Pozidrive torque screwdriver and flat-blade screwdriver.
- Cotton buds.
- Water based mild detergent i.e. washing-up liquid and water.
- **Do not use any solvents as the detergent.**

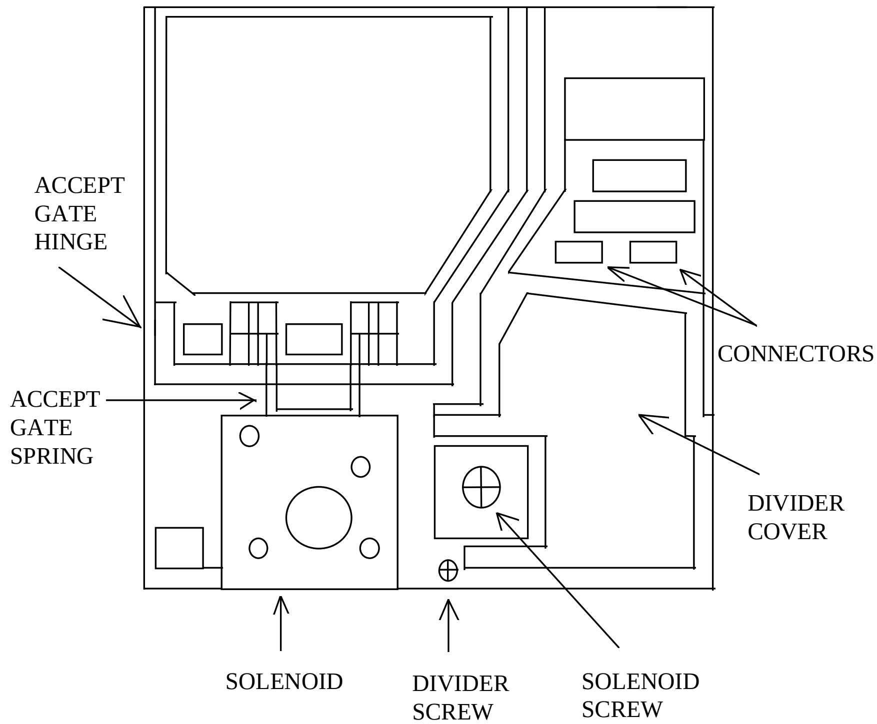

Figure 6-9 Condor Validator – components

Removal of the Accept Gate and the Divider Piece

- Remove the two connectors from their sockets, using long nosed pliers, (**do not** pull them out by the wires).
- Remove the divider screw, (in large coin builds, a metal ring is fitted in the body under the screw, taking care not to lose the ring, if fitted). Refer to Figure 6-9.
- Insert a thin edged screwdriver level with the hinge, far most left of the hinge, between the body and the divider section, and prise up the divider section and remove. Refer to Figure 6-10.
- In small coin builds there is a coin deflector inserted on the bottom left-hand side of the body, take care not to lose this piece. Refer to Figure 6-11.

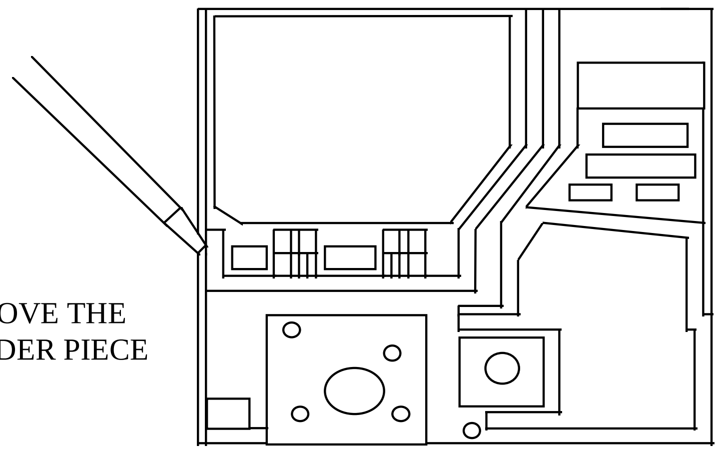

Figure 6-10 Removing the Divider Piece

Cleaning the Photo-Optics

- To clean the left and right hand opto's in the coin path, moisten the paintbrush with the cleaning fluid, and remove all residue. Refer to Figure 6-11.
- To clean the deflector opto light guide, moisten the cotton bud and rub gently until the residue is removed.
- To clean the credit opto's, moisten a cotton bud with the cleaning fluid, and remove the residue present.

Cleaning the Coin Path and Gate Piece

- To clean the coin path and gate piece, moisten the lint free cloth with the cleaning fluid and rub off all the residue present. Refer to Figure 6-12.

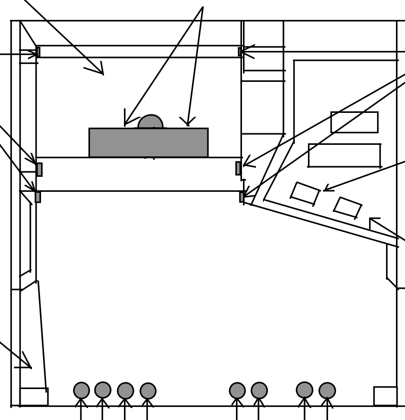

Figure 6-11 Condor Photo-Optics

Cleaning the solenoid

- Check the solenoid for any fluid residue and freedom of movement, and that the pole piece does not stick inside the solenoid. Refer to Figure 6-12.
- If residue is present, remove the solenoid screw. Refer to Figure 6-9.
- Gently lift the solenoid clear of the body.
- On standard solenoids the pole piece can be easily lifted out of the solenoid and cleaned.
- On reverse action solenoids, the circlip must be removed from the pole piece before removing the pole piece.
- Moisten a cotton bud with the cleaning fluid, and remove all the residue. Check that the solenoid has freedom of movement.
- Re-insert the pole piece and spring back into the solenoid and replace the circlip if one was removed, lifting the accept gate spring out of the way, re-insert the solenoid into the divider piece, and re-insert the screw, and tighten with a torque screwdriver to 33 cNm.

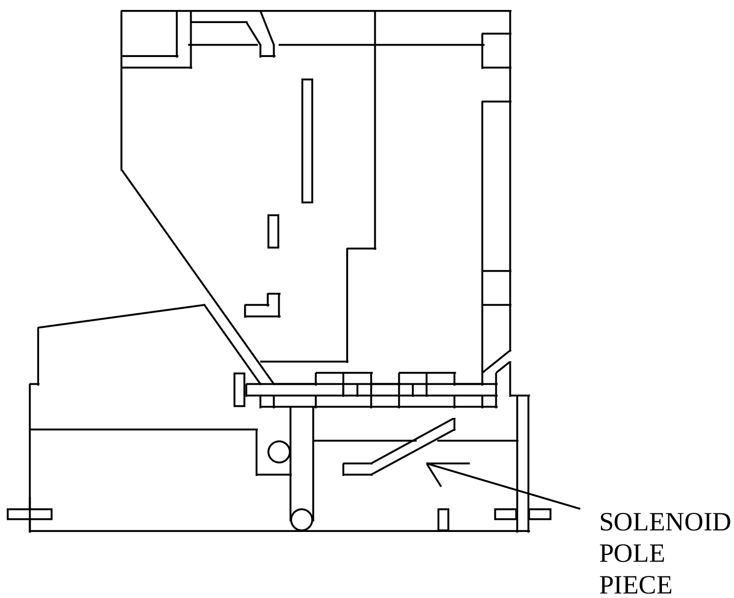

Figure 6-12 Solenoid Pole Piece

Replacing the Divider Piece and the Gate Piece

- Ensuring the coin deflector piece is in place, if one was fitted, hold the gate piece and the divider piece flush with each other.
- Position them at a 45° angle from the left-hand side (refer to Figure 6-13), align the plastic stud on the left-hand side of the divider piece with the hole on the left-hand side of the body.
- Twist the divider piece and the gate piece together to the left, ensuring the plastic stud goes into the hole in the body.
- Press down on the divider cover until the divider piece clicks into place, within the body.
- Re-insert the metal ring into the body, if one was fitted, now insert the screw and tighten with a torque screwdriver to 33 cNm.
- Now re-insert the connectors into their relevant polarised positions.

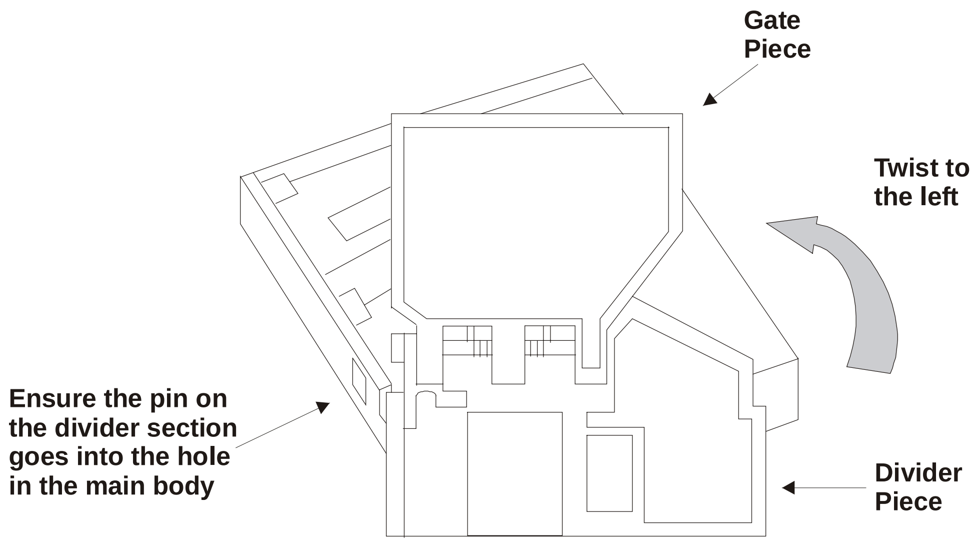

Figure 6-13 Replacing the Gate Piece and the Divider Piece

6.3.4 CN133A Coin Validator Connector Pinouts

The connector J1 on the right of the validator connects to P12 on the Interface Board.

The coin interface section of the I/O Driver Board receives the signals from the coin validator and solenoid optics and converts them into the form required by the Main Board. For a description of the coin handling interface refer to the I/O Driver Board chapter. The signals to and from the coin validator are shown in the following table.

Table 6-7 Condor Validator Interface Signals

Pin	Signal	Description
1	0V	Ground
2	VACS	Generated when valid coin is sensed
3	Alarm	Yo-yo or optic blocked
4	Credit	Generated when valid coin exits validator
5	Keyed Pin	
6	+12V	Power from I/O Driver Board
7	Inhibit	Inhibit signal from host machine

6.3.5 Fault Finding

Table 6-8 Fault Finding

Fault	Probable Cause	Corrective Action
Coins continually rejected.	Validator fault	1. Check that the validator has power. 2. Remove any blockage or debris from the validator. 3. Otherwise, replace the validator.
All coins are going to the cash box and the hopper is empty.	The diverter solenoid is not working.	1. Check that the solenoid has power. 2. Check that the coin diverter has not jammed. 3. Check that the hopper probe is not permanently grounded.
Rejected coins not falling into the reject tray.	Coins jammed in the reject chute.	Carefully clear the reject chute.

6.4 Diverter Solenoid and Photo-Optic Sensor

6.4.1 Physical Description

Figure 6-14 shows the diverter solenoid and the photo-optic sensor, mounted on the door reflector panel.

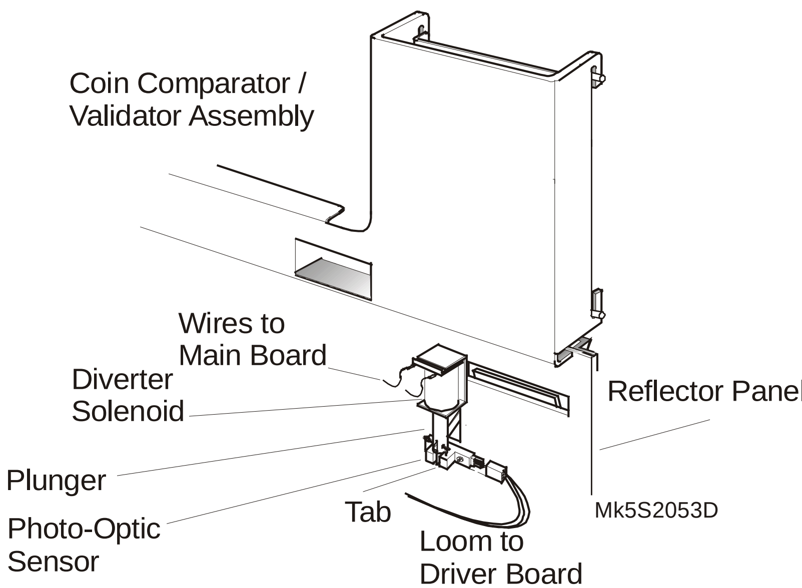

Figure 6-14 Diverter Solenoid and Photo-Optic Sensor

6.4.2 Basic Operation

The solenoid plunger is mechanically linked to the coin diverter in the coin chute assembly. When no power is applied to the solenoid, the plunger is extended and valid coins fall into the hopper. When 24 V DC is applied to the solenoid, the plunger retracts, causing the diverter to redirect valid coins to the cash box. A tab at the lower end of the plunger interrupts the beam in the photo-optic sensor when the plunger is fully extended. When this beam is interrupted, the signal CDIVPOS to the Driver Board is set to high.

In this way, the machine software can indirectly monitor the destination of accepted coins by monitoring the position of the diverter. If the machine software detects that five consecutive coins intended for the hopper are diverted to the cash box, or vice versa, the machine locks up with the fault message COIN DIVERTER FAULT.

6.5 General Maintenance

For general maintenance of the coin handling system:

- **Coin Comparator**
  - Clean the rail inserts and surrounding areas using a clean dry cloth or a soft, long-bristle paint brush.
  - Remove the sample coin and clean the sensor coils, housing and surrounds. Replace the sample coin.

Note
In some markets the sample coin is sealed into position. Permission may be required to remove the sample coin.

- **Coin Validator**
  - Open the debris flap and clean the coin path using a clean dry cloth or a soft, long-bristle paint brush.

- **Coin Chute Assembly**
  - Check that all assembly bolts and nuts are tight.
  - Clean the coin chuting with a clean dry cloth or a soft, long bristle paint brush.

- **Photo-optic Sensor**
  - Remove the photo-optic sensor and clean the photo-optic detector and LED faces with a clean dry cloth or a soft, long-bristle paint brush.
  - Check that the photo-optic sensor is seated correctly.
  - Check that the loom sockets are secure.

Chapter 7

Hopper

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7.1 Physical Description

The Aristocrat Disc Hopper (ADH) is mounted onto a base plate that slides into a guide plate on the base of the cabinet (see Figure 7-1). It is locked in position by a spring-loaded release pin.

When the hopper is pushed into position, a socket at the back of the hopper automatically connects to a plug on the cabinet base. This socket provides power and control signals to the Hopper PCB, which controls the hopper.

The Hopper PCB drives a 24 V DC motor, which rotates the disc within the hopper through the gearbox. The motor and gearbox are one assembly and are replaced as one unit.

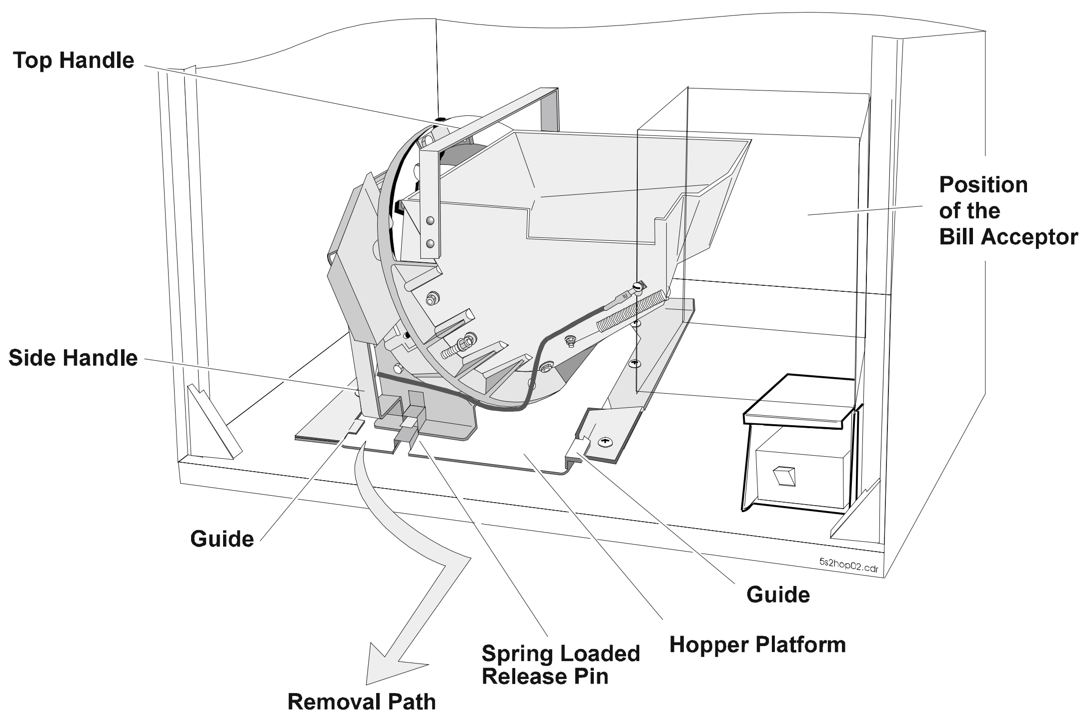

Figure 7-1 Hopper Location

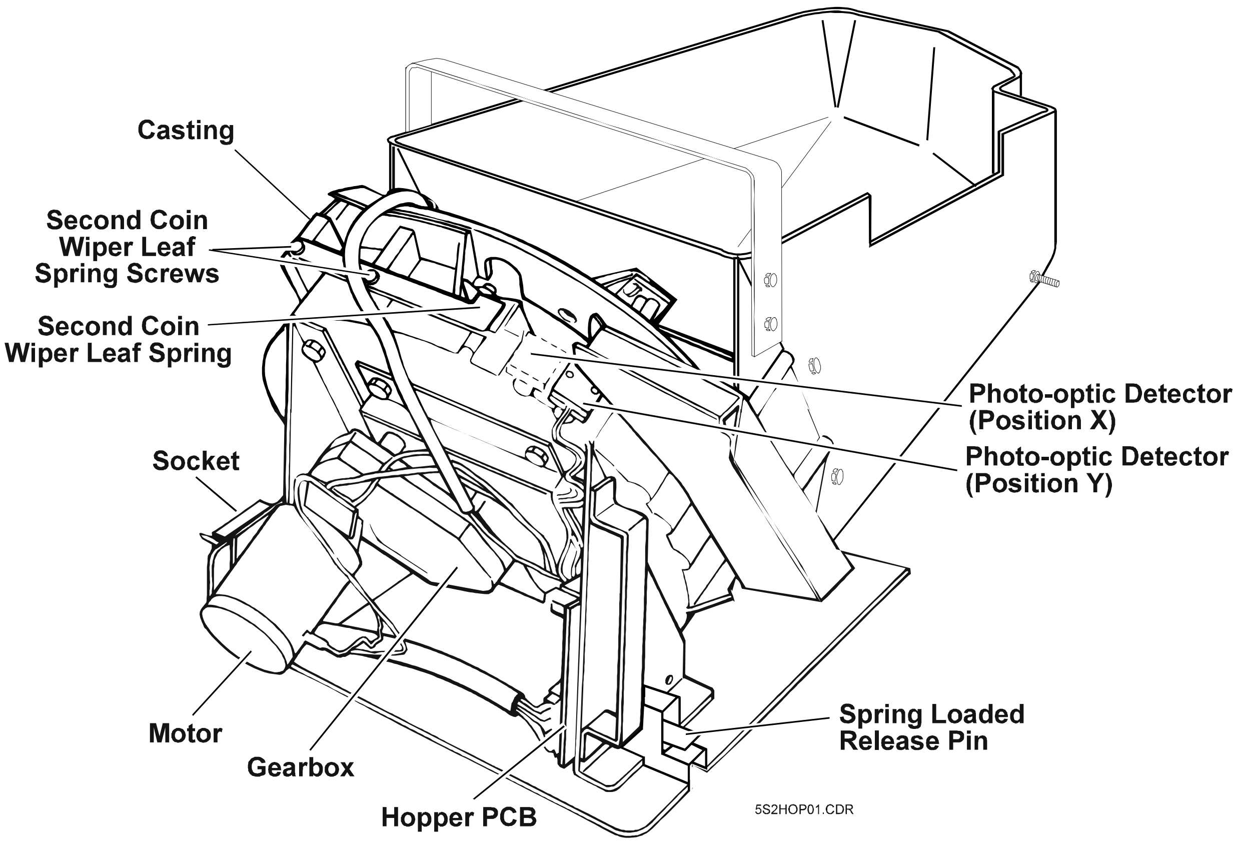

Figure 7-2 Hopper- rear view

Hopper Parts

The stationary parts of the hopper are (see Figure 7-3):

- the casting — with gearbox, side handle, and motor attached
- the casting plate — which is bolted to the casting with one fixed and three spring-loaded bolts
- the bowl — with internal baffles, coin slider, and probe which is secured to the casting plate.

The parts of the hopper that are rotated by the motor are (see Figure 7-3):

- the disc
- the spigot
- the coin stirrer.

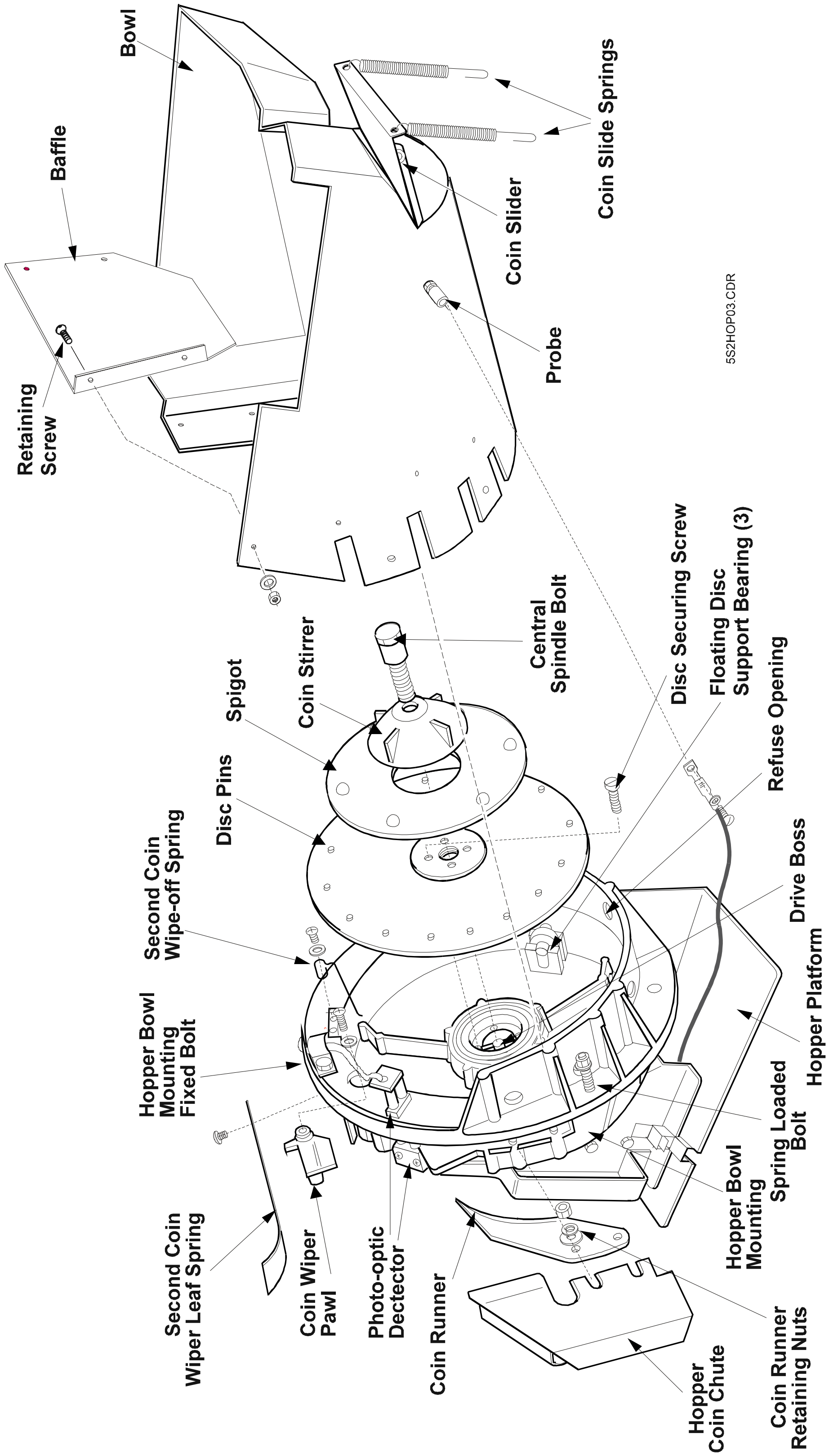

Figure 7-3 Hopper Exploded View

The Hopper PCB transmits two outputs from detectors:

- Output to the machine from a probe, which detects when the hopper is full.
- Output to the machine from a photo-optic detector, which detects coins as they are dispensed from the hopper.

The photo-optic detector is mounted in one of two positions: Position X or Position Y in Figure 7-2.

7.2 Basic Operation

The hopper holds and dispenses coins. Coins entering the machine are fed into the hopper bowl or the cash box chute through the coin handling system. Coins are fed into the cash box when the hopper is full.

The hopper dispenses coins into the coin tray when the player has sufficient credits and presses the CASHOUT pushbutton. Coins are dispensed via the hopper coin chute which juts out through the slot in the door reflector panel. The hopper can pay out any number of coins above the token value and below the collect limit. The token value is the coin value accepted by the machine, and the collect limit is the maximum value of coins that can be paid from the hopper.

If the player presses the CASHOUT pushbutton when the number of coins in credit is greater than the collect limit, the machine locks up. The credits are paid as a book pay by the cashier, and the machine must be reset using the Jackpot Reset (Cancel Credit) key.

If the player presses the CASHOUT pushbutton when the number of coins in credit is less than the cancel credit amount but greater than the number of coins in the hopper, all coins in the hopper are dispensed. The machine then locks up. The attendant must refill the hopper and reset the machine before the balance of coins is dispensed.

If the machine pays out too many coins, or not enough, the machine locks up and cannot be played until the problem has been fixed.

7.3 Functional Description

Coin Dispensing

On receiving a drive signal from the Main Board, the Hopper PCB starts the hopper motor. The motor rotates the disc in an anticlockwise direction.

As the disc turns, the coins are caught between the disk pins and the edge of the spigot. If there is more than one coin between two pins on the disc, the excess coins are cleared by the second coin wiper.

The second coin wiper pawl ejects the pay-out coins from the rotating disc into the hopper coin chute. For each coin entering the hopper coin chute, the photo-optic detector sends a signal to the Main Board. The coin runner guides the coins into the hopper coin chute.

The individual coins exciting the hopper interrupt the photo-optic detector, which sends a signal to the Main Board, via the Hopper PCB and the Backplane. The Main Board counts the optic interrupts, and when the correct payout number is reached, it terminates the hopper drive signal to the Hopper PCB. The Hopper PCB stops the motor, which is then held by an electronic brake. The second coin wiper pawl prevents the next coin from falling from the disc.

Hopper Full Detection

A probe is fitted onto the hopper bowl to detect a full hopper (see Figure 7-3). When the coins reach the probe, they create an electrical circuit through the coins to ground. The probe is monitored by the Main Board. If the probe indicates that the hopper is full, the software operates the diverter solenoid (situated on the front of the inner door) which diverts the coins to the cash box. The position of the probe in the hopper can be adjusted to alter the maximum coin level.

Coin Jamming Prevention

A spigot and coin stirrer, friction fitted to the disc, keep the coins moving in the hopper bowl (see Figure 7-3). A spring-loaded coin slider prevents the hopper from jamming due to coin stacking.

Two baffles, secured with spring-loaded bolts, control the coin level in the bowl.

The casting plate is connected to the casting by four bolts. The top bolt is fixed, but the other three are spring loaded. This is to prevent serious damage to the casting if there is a large coin jam in the bowl.

An opening on the hopper casting allows dirt and foreign objects to escape.

In the event of a coin jam, the motor will automatically stop and then restart after about eight seconds. If this does not remove the jam:

- the motor automatically stops.
- the machine locks up.
- the software displays a fault message on the video monitor.

Hopper Interface Signals

The Aristocrat Disc Hopper interfaces with the Main Board via the 20-way Minifit connector P7 on the Backplane. This connector may alternatively be used to communicate with a ticket printer, where that option is fitted. The signals used for the printer are shaded in the table below.

Table 7-1 Hopper / Printer interface with Backplane

Pin	Pin Name	Connects to ...	Function
1	HOPCOIN	J1-B30	Coin Output from Hopper
2	Keyway		Plastic Keyway
3	Keyway		Plastic Keyway
4	HOPON	JP22-C1	Hopper motor drive
5	HOPHIGH	J1-A31	Hopper high probe, Detects hopper full.
6	VCC	VCC	5V for Hopper Electronics
7	GND	GND	Gnd Hopper
8	RTS3	JP20-C12	RTS for printer
9	CTS3	JP20-A10	CTS for printer
10	GNDIsol	GNDIsol	Gnd, Isolated, for Printer Comms
11	24V	24V	24V Motor Drive for Hopper
12	HOPTEST	JP22-A1	Hopper Sensor Test output
13	HOPDIR	JP22-A29	Hopper motor direction
14	GND	GND	Gnd
15	DSR3	JP20-C11	Handshake Input 1, serial channel 3
16	DTR3	JP20-B12	DTR for Printer
17	24V	24V	24V for Printer
18	SIN3	JP20-A9	Rxd from Printer
19	SOUT3	JP20-C10	Txd to Printer
20	GND	GND	Gnd

7.4 Fault Finding

Table 7-2 Fault Finding

Fault	Probable Cause	Action
Too many coins being dispensed and the machine locks out.	The leaf spring holding the second coin wiper pawl is bent or loose.	Tighten the leaf spring fixing screws or replace the spring.
Hopper not working.	A. No power is supplied.	1. Check that power is reaching the hopper.
	B. Faulty connector.	2. Check that the connector is not damaged and is correctly seated.
	C. Hopper is not in the correct location.	3. Check the hopper mounting spring-loaded bolt is in the correct position.
	D. Motor is faulty.	4. Replace the motor and gearbox assembly.
Coins jamming at the top of the coin chute	Coin runner is loose or not in the correct position.	Place the coin runner point as close as possible to the disk and tighten the securing nuts. Also check if the shims are damaged.
Coins stacking at the bottom of the bowl.	Bottom coin slide springs are not secure.	Check if the springs are hooked into the hopper spring fixing holes.

7.5 Removal and Replacement Procedures

CAUTION
Always use the handles to lift the hopper. Never lift the hopper by the motor and the end of the bowl, as this action may bend the motor spindle.

CAUTION
Avoid handling the second coin wiper leaf spring. If this spring is damaged, it may cause an incorrect coin payout and the machine to lock out.

To remove the hopper from the cabinet (see Figure 7-1):

1. Open the cabinet door, and switch OFF the machine.
2. Lift the spring-loaded release pin.
3. Rotate the hopper 90° by sliding the left-hand side outwards. This action is necessary because part of the hopper bowl actually sits behind the bill acceptor (where fitted).
4. Slide the hopper straight out of the machine.
5. Lift the hopper by grabbing the handle with one hand and placing the other hand under the base of the bowl.

Note
You must place a Fault Tag on any faulty equipment.

To replace the hopper in the cabinet:

1. Lift the hopper by its handles.
2. Slide the hopper into the guides on the base of the cabinet until the hook on the right hand side is in place.
3. Push on the hopper handle to pivot the hopper 90° until the spring-loaded pin is engaged in the retaining hole.
4. Switch ON the machine, and close and lock the cabinet door.

Note
Run a complete machine test after replacing the hopper.

7.6 Disassembly and Assembly Procedures

Disassembly Procedure

To disassemble the hopper (see Figure 7-3):

1. Remove the bowl assembly:
   a. Remove the four spring-loaded bolts that attach the casting plate to the base of the hopper.
   b. Disconnect the hopper probe at the side of the bowl.
   c. Remove the photo-optic detector and the fixed bolt that restrains the wire to the detector.
   d. Pull away the bowl (still attached to the casting plate) from the base of the hopper.
2. Remove the two coin-runner retaining nuts.
3. Remove the hopper coin chute.

CAUTION
If shims are fitted under the coin runner, ensure they are not damaged when removing the coin runner or coin chute. Do not discard the shims.

4. Remove the coin runner.
5. Remove the second coin wiper pawl and the second coin wipe-off spring.

CAUTION
Ensure that the spring-loaded bearings do not fall out from their mountings in the casting when removing the disc.

6. Remove the disc:
   a. Remove the centre bolt that holds the disc assembly in place.
   b. Remove the coin stirrer and spigot.
   c. Remove the four securing screws from the centre of the disc and withdraw the disc from the drive boss.
7. To remove the motor/gearbox unit (refer to Figure 7-3):
   a. Disconnect the motor PCB and loom from the hopper PCB.
   b. Remove the nuts securing the motor/gearbox mounting bracket to the disc and spindle housing.
   c. Tap out the drive pin, and remove the bolts securing the motor/gearbox unit to the bracket.

Assembly Procedure

To assemble the hopper:

1. Replace the disc:
   a. Slide the drive shaft end of the disc into the driving boss, ensuring the slot on the shaft engages with the drive pin in the gearbox.
   b. Insert the four disc securing screws in the centre of the disc and tighten.
   c. Place the second coin wiper pawl in position, insert the screws and tighten.
   d. Place the second coin wiper spring in position, insert the two securing set screws and tighten.
   e. Place the spigot and coin stirrer in position.
   f. Insert the centre bolt through the centre hole of the spigot and coin stirrer and tighten onto the driving boss.
   g. Place the coin runner on the two studs. Screw on the two nuts and washers, but do not tighten. Locate the point of the coin runner as close as possible to the spigot without rubbing, and ensure free running of the disc underneath the coin runner. Use shims if required.
   h. Slide the hopper coin chute under the two bolts holding the coin runner and tighten the nuts.

2. Replace the bowl assembly:
   a. Place the bowl assembly (still attached to the casting plate) in position on the base of the hopper.
   b. Insert the four spring-loaded bolts into the casting plate and tighten.
   c. Place the photo-optic detector in position, insert the screw and tighten.
   d. Place the fixed bolt in position so that it restrains the wire for the photo-opto detector, and tighten.

7.7 Test Procedure

To test the hopper after servicing, follow the hopper test procedure outlined in the chapter Machine Modes.

7.8 General Maintenance

For the general maintenance of the hopper:

1. Remove any dust from the photo-optic detector with a soft paint brush or by blowing through a drinking straw. Dirt accumulating on the detector can result in faulty coin counting.

2. Check that the second coin wiper leaf spring has not been bent away from the second coin wiper pawl. Replace if necessary.

Chapter 8

Serial Ticket Printer

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8.1 Technical Description

Note
The information provided in this chapter is a general overview of the Westrex serial printer. Full servicing details can be obtained from the Westrex Service Manual.

8.1.1 Physical Description

The printer module is located at the bottom of the cabinet, in place of the hopper. It is positioned by a guide plate on the floor of the cabinet and is secured by two screws. The printer interfaces with the machine logic via a 20-way loom that connects to P7 on the Backplane. This connector is alternatively used for the hopper signals. Machines may be fitted with either a hopper or a printer, not both. Figure 8-1 shows the location of the printer module.

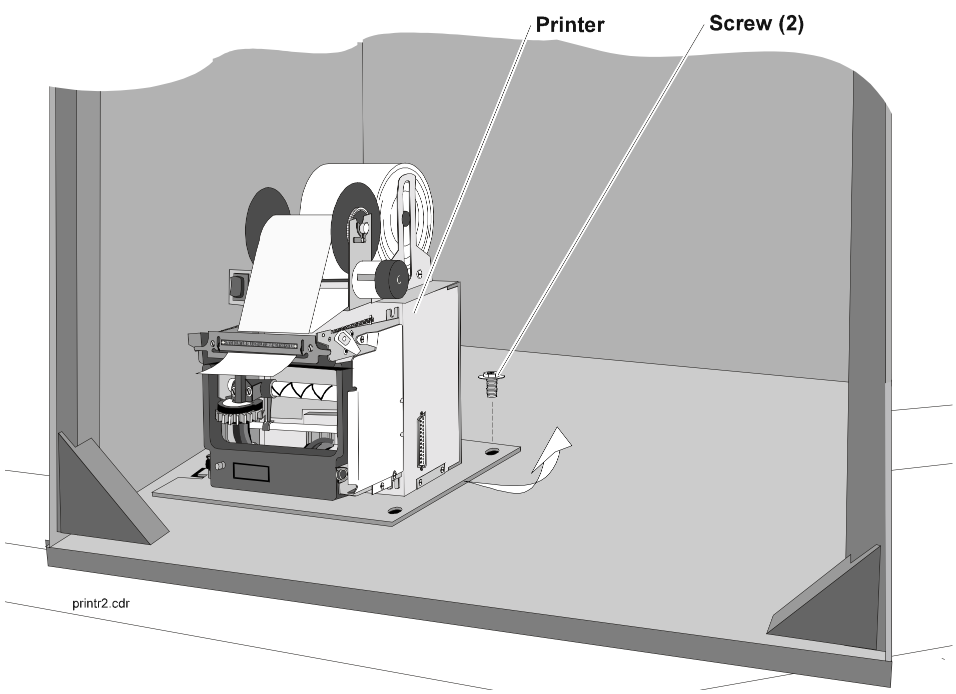

Figure 8-1 Location of Printer

The major components of the printer module are as follows (refer to Fig 8-2):

- Chassis assembly,
- Electronic controller PCB,
- Take-up unit,
- Westrex 4800 serial printer with:
  - Electric motor, gear train and encoder gear,
  - Print head and drive shaft,
  - Paper and ribbon feed mechanisms,
  - Bail.

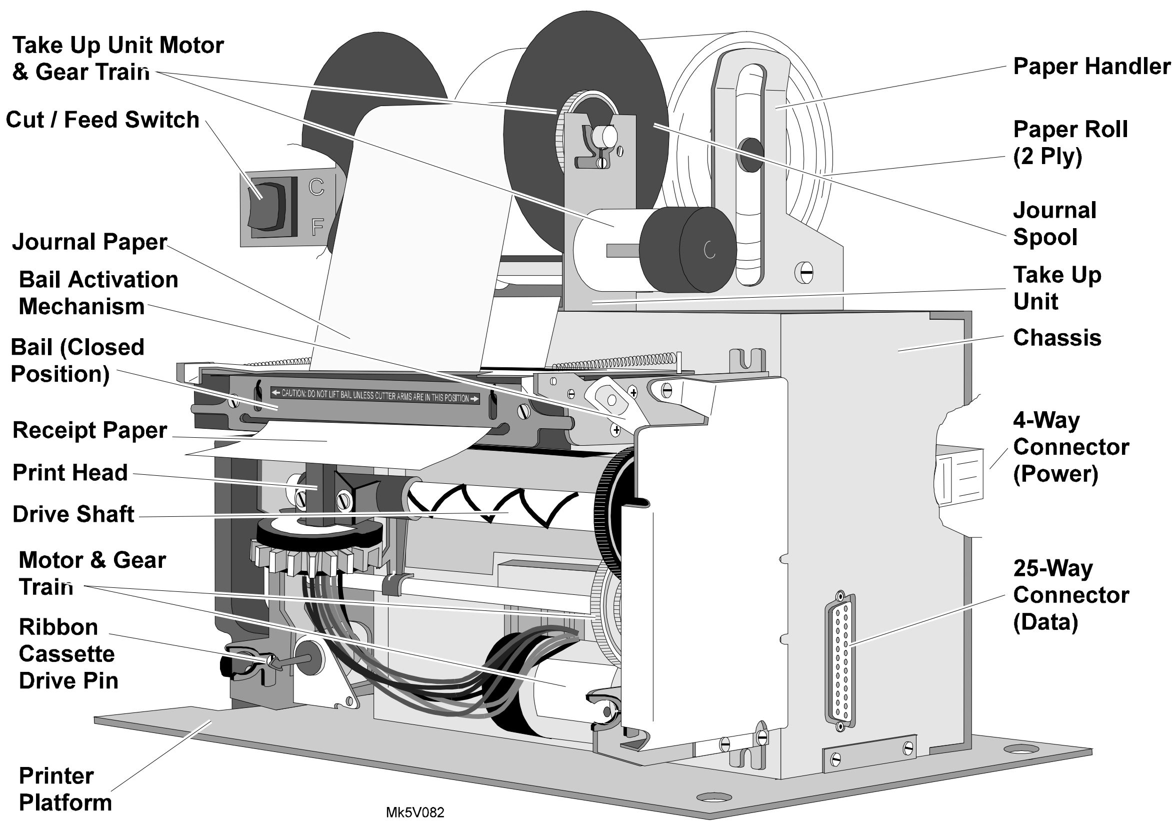

Figure 8-2 Printer - Physical Description

Table 8-1 Printer Specifications

Parameter	Value
Print method	Impact, 9-pin dot matrix.
Print speed	Up to 185 characters per second (CPS).
Paper feed	Friction rollers.
Paper	Width: 83mm (3.25"); Diameter: 100mm (4"), 2-ply, Aristocrat Part No. 6213-563356
Inking	Replaceable ribbon cassette.
Ribbon cassette	Aristocrat Part No.. 6213-563357 (Black)..
Power requirements	24V DC ± 5%, 1.5 A (3.0 A peak).
Input interface	RS232C serial interface, variable baud rate, default is 2400 baud.

Printer:

The dot matrix print head is used with the following print formats:

Table 8-2 Print Formats

Parameter	Value
Font matrix	4 x 9 or 5 x 9 normal; 8 x 9 or 10 x 9 elongated.
Columns	60 (19.5 characters per inch) or 66 (21.5 characters per inch).
Printer area width	78mm (3.07") on the 83mm (3.25") wide paper.

CAUTION

The printer is controlled from the machine software. The variable printer formats can be changed via the printer EEPROM parameters. However, attempting to change any of the standard parameters may cause a malfunction.

Electronic Controller PCB:

The electronic controller PCB is mounted within the printer chassis. It communicates with the Main Board logic of the machine via the RS-232 interface configured on COM3. This communications channel has six input/output signals including data I/O. Refer to the chapter Communications Configuration Board for further details.

Paper Roll:

The paper is two-ply self carbonating, the inner ply goes to the journal spool (copy - yellow colour). The outer ply is cut and deposited to the coin tray after printing (original - white colour).

When the paper is running low, the machine will display a **Printer Paper Low** message until the paper is renewed.

Figure 8-3 shows the paper path through the feed rollers. The two plies of paper must follow their correct paths to ensure correct operation and that the journal copy is not cut off with the original and deposited into the coin tray.

Ribbon Cassette:
The average life expectancy of a ribbon cassette is 1.5 million characters. The ribbon cassette should be replaced when the printouts become unclear. The printer will not function if a ribbon cassette is not installed.

CAUTION
Never add ink to a used cassette, always replace it with a new one.

Take-up Unit:
The take-up unit is mounted on top of the chassis. It provides a motor driven shaft for the journal paper to spool onto, as well as a shaft for mounting the two-ply paper roll.

8.1.2 Functional Description

Depending on the machine software configuration, the printer can provide the following:

- A ticket showing the customer's winnings (which would usually be redeemable from the cashier).
- A printout of audit information.
- A printout of machine security events such as:
  - Main door opening,
  - Logic cage door opening,
  - Cash box door opening,
  - Mechanical meter accesses
  - Resetting of the electronic meters - both before and after the reset.

The printer module receives data, control signals, and 24 V DC power from the machine via the 20-way Minifit Junior connector P7 on the Backplane.

Movement of the print head (left to right and right to left) is provided by a mechanical drive shaft on which the print head is mounted. The drive shaft is driven by the electric motor and gear train. The drive motor mechanism includes an encoder gear and sensor which derives timing pulses from the motor. The electronic controller PCB uses the timing pulses to determine the exact position of the print head along the drive shaft.

The printing process is achieved by the print head needles striking the inked ribbon and leaving a corresponding dot on the paper. Printed characters are formed by combinations of print head needles, the activation of the needles is controlled by the printer electronics.

Each complete movement (left to right or right to left) of the print head constitutes a print cycle (a printed line). To complete a print cycle the drive shaft rotates four times and the encoder gear rotates 24 times (geared 6:1 reduction ratio between motor and drive shaft). Thus, each print cycle contains a fixed number of encoder pulses, a print head needle can be energised on every other encoder pulse. A print cycle includes the actual printing time and the time needed to change the direction of the print head movement.

Paper is friction fed from one printed line to the next by the feed roller. The feed roller is controlled by a pawl and solenoid mechanism which activates the feed roller once for each revolution of the drive shaft by a cam on the drive shaft.

Ribbon advancement is controlled by the ribbon feed assembly which is driven off the same cam as the line feed mechanism.

The bail cuts off the receipt from the paper roll. It is activated by reversing the motor drive direction and energising a solenoid (cutter lockout solenoid). A lever arrangement driven by a drive shaft cam operates the blade mechanism to cut the paper. When the motor drive direction is reversed again, the blade mechanism is retracted and normal printing operations can resume.

Note
The paper cutting mechanism is designed to cut single ply paper only.

The take up unit consists of a separate chassis which is secured to the printer chassis. The take up unit has a paper handler for mounting the journal ply of the paper roll and provides an electric motor, shaft, gear train and clutch assembly for the journal paper, the Cut/Feed switch is also mounted to the take up unit. The motor runs faster than actually required to spool the journal, the clutch providing slippage to keep the tension of the journal spool constant regardless of the diameter of the spool. The motor is driven by the electronic controller PCB.

The following diagram provides examples of cash, audit meter and test printouts. The information printed on the tickets may vary somewhat between machines due to customer and gaming authority requirements.

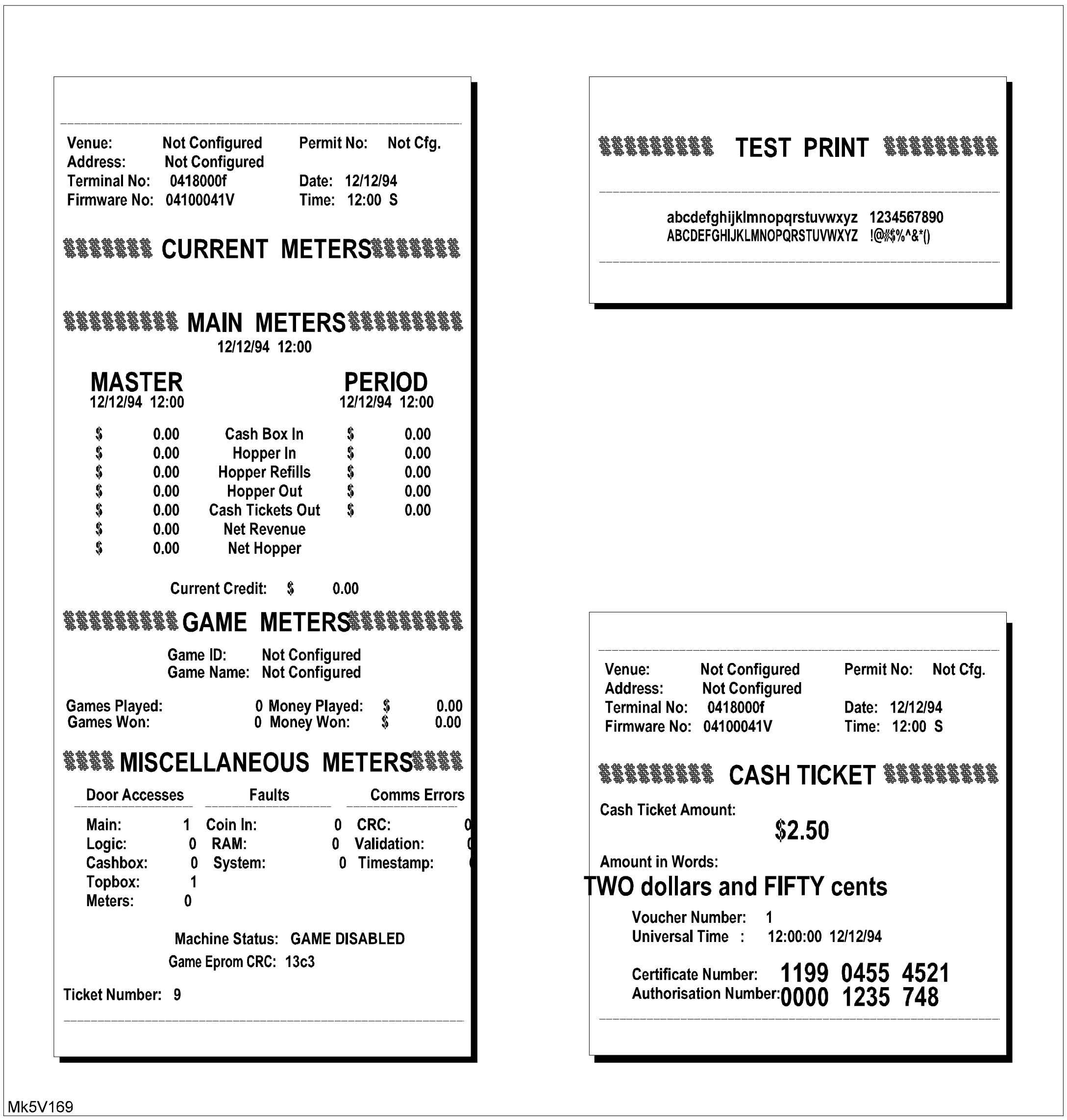

Figure 8-3 Printed Ticket Examples

8.2 Removal and Replacement Procedures

To remove the printer from the machine (refer to Fig 8-1):

1. Open the cabinet door, and switch OFF the machine.
2. Disconnect the loom connector from the printer.
3. Remove the two screws securing the printer module to the cabinet base.
4. Slide the printer to the right until the location tabs are disengaged from the machine base and lift the printer from the machine.

Replacement is a reversal of the removal procedure.

Note
It is advisable to run a printer test or a complete machine test after replacement.

8.2.1 Paper Roll Replacement

It is not necessary to remove the printer from the machine to replace the paper roll.

To remove the paper roll (refer to Fig 8-4):

1. Open the cabinet door, and switch OFF the machine.
2. Tear through both plies of paper at the tear point.
3. Remove the journal spool by lifting it off the take-up unit. Remove the paper from the journal spool and replace the spool into the take up unit, it should *snap* into place.
4. Remove the old paper roll, retaining the roller pin for the new paper roll.

CAUTION
Take care not damage the Paper Low micro-switch when handling the paper roll.

To replace the paper roll:

1. Insert the roller pin through the centre of the new paper roll.
2. Place the paper roll into the paper handler. Make sure the paper can unroll.
3. Direct the 2-ply paper down into the guide slot until the paper stops against the feed mechanism. It may be easier to remove the journal spool while guiding the paper into the guide slot.
4. The paper can now be advanced automatically through the printer.
5. Turn the machine power ON. After a few seconds, press the Feed switch (shown in Fig 8-2) until about 150 mm (6") of paper is extended beyond the bail. You may need to help feed the paper into the feed mechanism (through the guide slot) until it is picked up by the feed mechanism.

6. Lift the bail and pull both plies out of the bail slot.
7. Separate the two plies and guide the journal paper back through the bail slot, then up and through the journal slot.
8. Split the journal spool, wrap the paper over the spool ①**,** then clip the other end of the journal spool over the paper and spool to secure it ②. Advance the journal spool by hand until the journal paper is taut.
9. Guide the receipt paper back through the bail slot and close the bail. Press the Cut switch (shown in Fig 8-2) to verify.
10. The paper is now loaded.

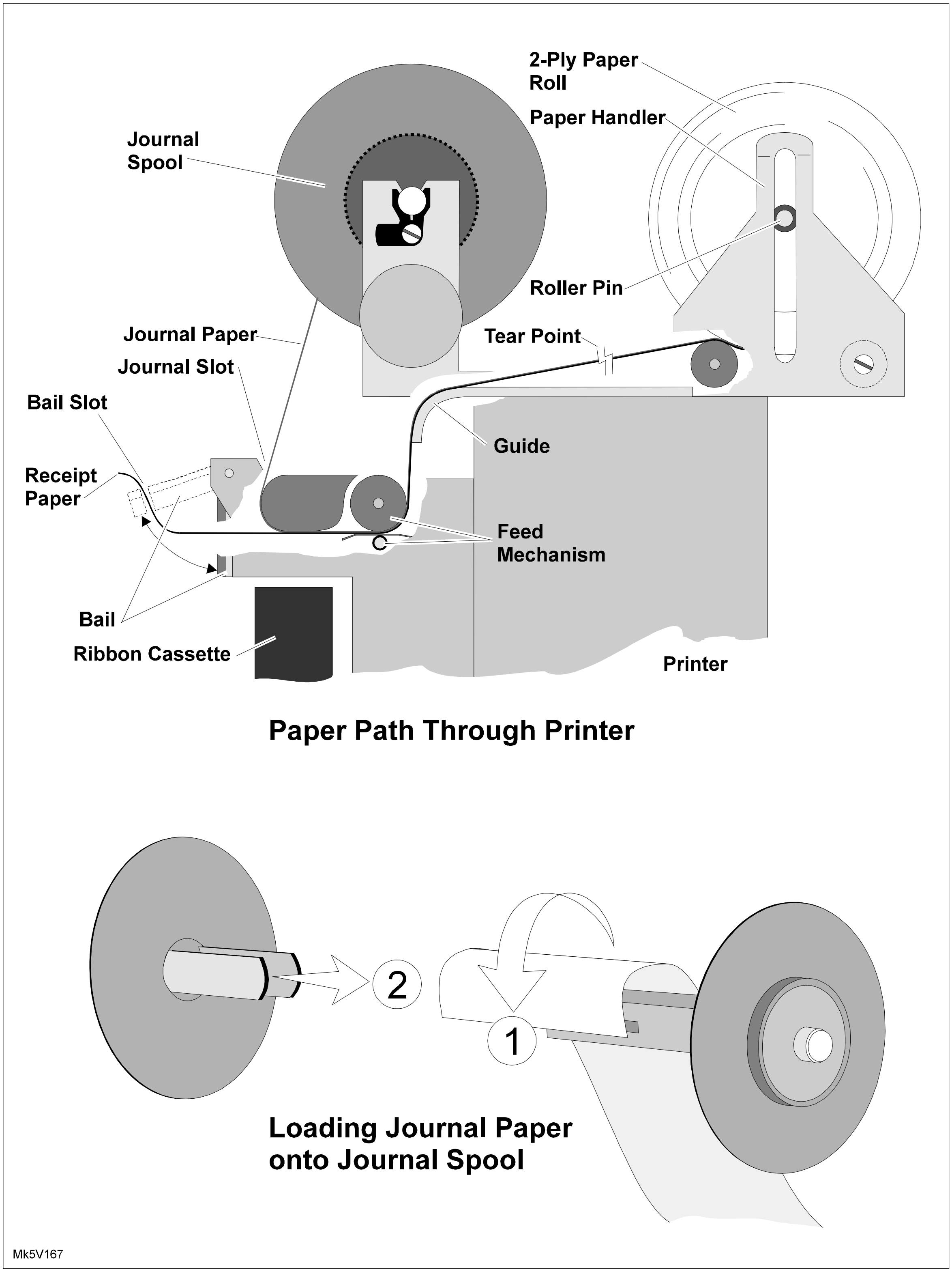

Figure 8-4 Replacing the Paper Roll

8.2.2 Ribbon Cassette Replacement

Note
Use only the specified ribbon cassettes to ensure print quality and ribbon life.

To replace the ribbon cassette (refer to Fig 8-5):

1. Open the cabinet door, and switch OFF the machine.
2. Lift the bail, and remove the used cassette by pulling it from the chassis and off the drive pin.
3. Before inserting the new cassette, turn the knob anti-clockwise until the ribbon is taut.
4. Open the bail, mount the cassette onto the drive pin whilst keeping the ribbon between the platen and the print head. When the cassette is properly mounted it will *snap* onto the chassis.
5. Make sure the ribbon is threaded through the guide slot and is taut.
6. Lower the bail. The ribbon cassette is now loaded.

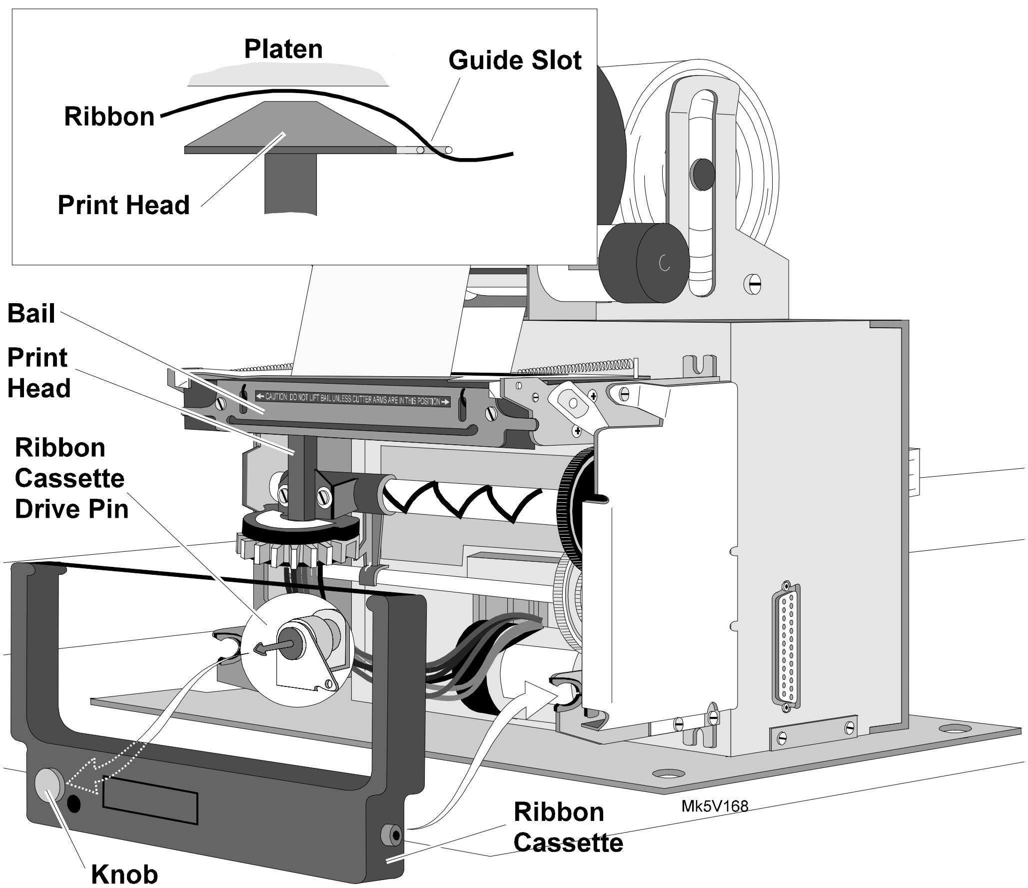

Figure 8-5 Replacing the Ribbon Cassette

8.3 Connector Pin Assignments

The 20-way Minifit connector P7 on the Backplane is used to interface with either a printer or hopper. The hopper signals are shaded in the table below.

Table 8-3 Printer / Hopper Connection to Backplane P7

Pin	Pin Name	Connects to ...	Function
1	HOPCOIN	J1-B30	Coin Output from Hopper
2	Keyway		Plastic Keyway
3	Keyway		Plastic Keyway
4	HOPON	JP22-C1	Hopper motor drive
5	HOPHIGH	J1-A31	Hopper high probe, Detects hopper full.
6	VCC	VCC	5V for Hopper Electronics
7	GND	GND	Gnd Hopper
8	RTS3	JP20-C12	RTS for printer
9	CTS3	JP20-A10	CTS for printer
10	GNDIsol	GNDIsol	Gnd, Isolated, for Printer Comms
11	24V	24V	24V Motor Drive for Hopper
12	HOPTEST	JP22-A1	Hopper Sensor Test output
13	HOPDIR	JP22-A29	Hopper motor direction
14	GND	GND	Gnd
15	DSR3	JP20-C11	Handshake Input 1, serial channel 3
16	DTR3	JP20-B12	DTR for Printer
17	24V	24V	24V for Printer
18	SIN3	JP20-A9	Rxd from Printer
19	SOUT3	JP20-C10	Txd to Printer
20	GND	GND	Gnd

8.4 General Maintenance

General maintenance for the Westrex Serial Printer consists of the following activities:

- Perform a printer self-test:
  1. Open the cabinet door, and switch OFF the machine.
  2. While depressing the Feed switch (shown in Fig 8-2), switch the machine power ON.
  3. After a few seconds, the self-test will start printing. Once printing, the feed switch can be released.
  4. Check the print quality of the self-test. If the printout is not clear, replace the ribbon cassette.
- Check that all connectors are secure.
- Make sure that receipts are falling correctly into the coin tray.
- Check that the journal is being rolled properly onto the journal spool.

Notes

Chapter 9

Bill (Bank Note) Acceptor

List of Figures

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9.1 Technical Description

9.1.1 Overview

The Bank Note (or Bill) Acceptor and ancillary items provide advanced solutions for the entry, security, analysis, and accounting of note currency. It communicates with the Main Board via generic serial channel 1 (which is configured through connector P18 on the Interface Board).

The full system provides a range of features, including:

- A Bank Note Acceptor for entry, sensing and acceptance of note currency. The unit is equipped with a microcontroller, RAM memory, and an operating system.
- A stacker unit holds accepted notes in a highly secure environment. It is electronically linked to the Bank Note Acceptor. A memory module within the stacker stores identification, diagnostic, and accounting information.
- The Aristocrat Dual Cage Assembly houses the Bank Note Acceptor and stacker while allowing note entry to be conveniently placed on the mid trim. The assembly is located at the front of the cabinet. The stacker may be accessed by opening the main door.
- An EGM number (house number) is provided by utilising a serialised, integrated circuit embedded within the main cable connected to the host machine. The number allows the tracking of units for maintenance, accounting and operational control.
- The illuminated Intelligent Bezel facilitates player recognition of the note insertion area and displays acceptable note denominations. The bezel also provides maintenance error messages for abnormal events occurring in the acceptor and the stacker.
- Diagnostics information on machine operations and historical details are available through the RS-232 port.

9.1.2 Physical Description

The embedded Bank Note Acceptor consists of an optical scanning unit linked to a bill stacker for the entry and storage of a range of note denominations. The Bank Note Acceptor dual-cage assembly, which houses the Bank Note Acceptor and stacker, is located in the cabinet, below the monitor shelf.

The note entry channel is situated on the mid trim, together with the pushbuttons, coin entry assembly, and note-denomination display panel. The Bank Note Acceptor stacker can be accessed for removal and emptying by opening the cabinet door and then opening the Bank Note Acceptor security cage door.

Two options are available for processing Bank Note Acceptor stacker information. The units may be withdrawn from the dual cage assembly, emptied, notes counted, and details for control and operations obtained from the Aristocrat Operator Mode Menu functions. Alternatively, the stacker may be connected to the Soft Drop Analyzer system which automatically processes the information stored within the stacker memory module. This system is under development.

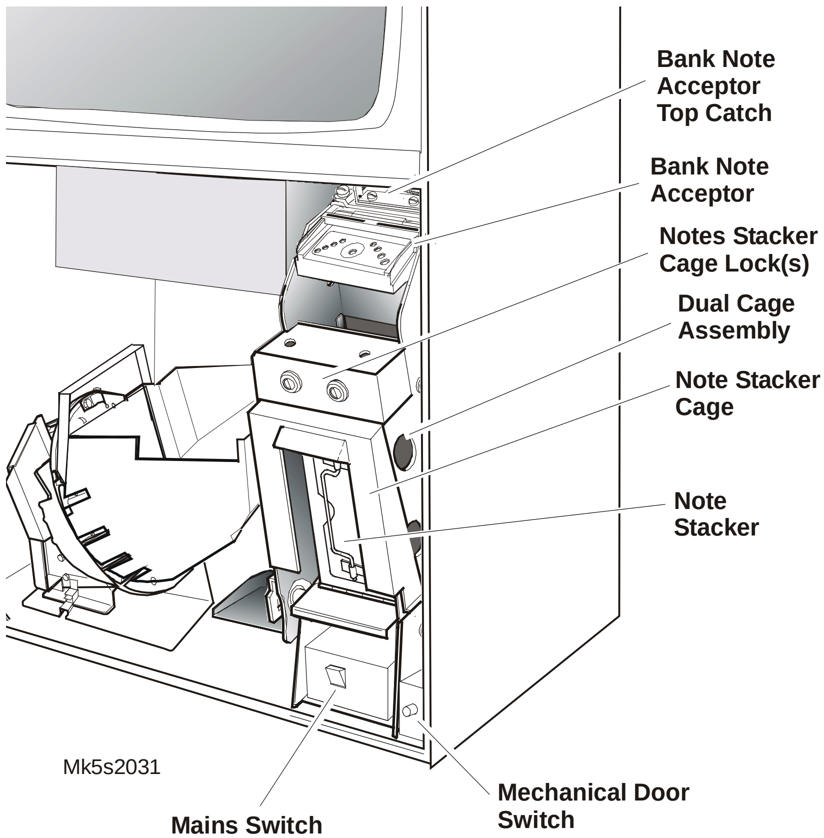

Figure 9-1 Bank Note Acceptor Location

Security

The note stacker is fitted with a lock, and two additional locks may be fitted to the stacker cage door. A communications link between the note stacker and the Bank Note Acceptor is monitored by the machine software. When the stacker cage door is lowered to gain access to the stacker, this link is broken and the machine will lock up with the error message BILL STACKER REMOVED being displayed on the screen. For USA gaming machines, when the belly panel door is opened, the message BILL ACCEPTOR DOOR OPEN displays on the screen, the alarm sound is heard, the BILL ACCEPTOR DOOR OPEN lock up occurs, game play is suspended, and the electronic meter BILL ACCEPTOR ACCESSES is incremented.

Mechanics and Transport

The Bank Note Acceptor employs four mounting posts which interface to the dual cage assembly. The dual cage housing holds the stacker and allows it to travel in multi axes for installation, in-position maintenance, and removal.

The main Bank Note Acceptor housing supports and aligns the drive rollers and drive stepper motor while providing mounts for the other subassemblies of the unit. The drive rollers provide motive power to the drive belts which transport the notes or coupons past the circuitry and out of the unit.

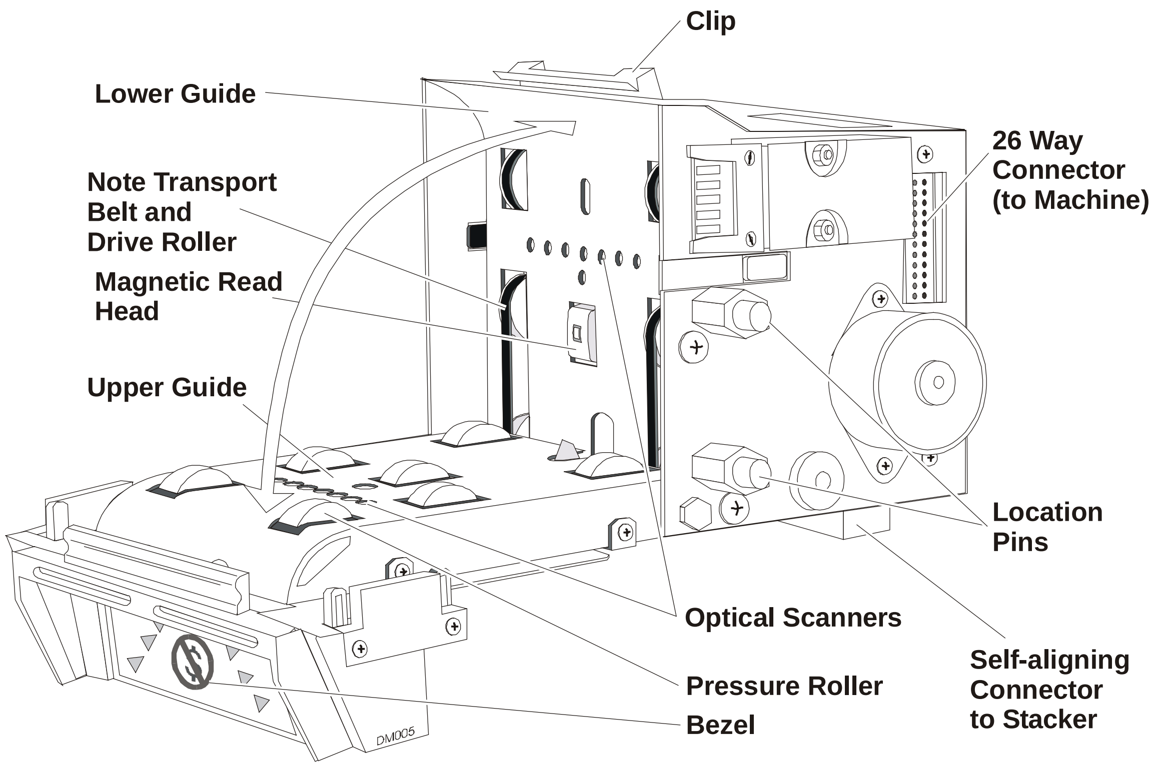

Figure 9-2 Bank Note Acceptor with open Upper Guide

The two drive belts are individually tensioned to assure a reliable and straight feed. The belt path is interrupted to provide an area suitable for the detection of stringing devices or tails by the side looking sensor detection system.

Upper and Lower Guide Assemblies

The upper guide assembly supports and locates the pressure rollers that force the note to the drive belts for traction. It also supports and locates part of the validation circuitry which examines the note as it passes through the unit. The upper guide clips into position on the main unit and is pivoted at its lower end. This allows the note channel to be opened so that maintenance and cleaning operations can be carried out and any jammed notes can be removed.

The lower guide assembly provides the lower half of the note channel which steers the note onto the drive belts and pressure rollers. The lower guide also supports and locates additional validation circuitry and the magnetic read head. The guide assembly is integrated into the housing assembly, and the unit is factory aligned to the upper guide for accurate sensing operations.

Aristocrat Dual Cage Assembly

The Bank Note Acceptor dual-cage housing is pivot-hinged at the base and held in position by the top catch.

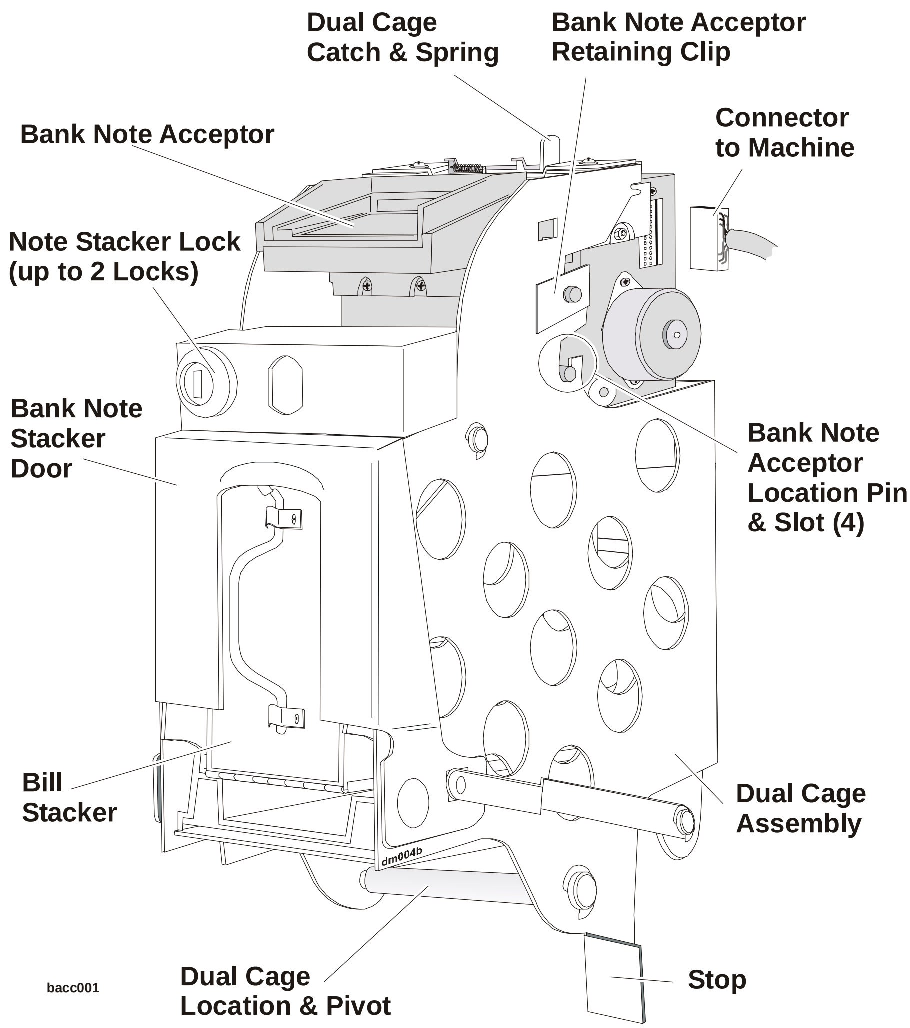

Figure 9-3 Bank Note Acceptor Dual Cage Assembly

The dual cage design ensures the stacker is protected when gameplay is occurring and when the main door is opened for maintenance and day-to-day routine operations.

The design enables the cage assembly to be pivoted to improve the various access operations. The outer cage assembly remains firmly affixed by the base retaining pin during pivotal movements.

Note Entry

Operation commences when a note of a suitable denomination, as indicated on the note entry display, is inserted in the Bank Note Acceptor. The note may be inserted either end first and either face up. The unit grips the inserted note and moves it over the magnetic head and optical system.

The note is evaluated and either accepted or rejected. If the note is accepted, credits are issued only after the note has exited the Bank Note Acceptor and reached the security stacker. If the note is rejected, it is returned to the player.

A note should only be given three read attempts before it is classed as unreadable.

Electronics Assembly

The electronics assembly provides the intelligence that controls all functional, validation, communications, diagnostic, and display functions. The Bank Note Acceptor electronics consists of a microprocessor board mounted on the main board. The assembly is mounted on the electronics tray, which can be removed for repair and replacement. The electronics tray also serves as a mount for a self-aligning connector that electronically connects the Bank Note Acceptor to the stacker.

The main electronics board contains the input connector (see Figure 9-4) which connects to the host machine, the top-accessed DIP switch for Bank Note Acceptor functional setup, and the status LED display.

Figure 9-5 displays a block diagram of the Bank Note Acceptor electronics.

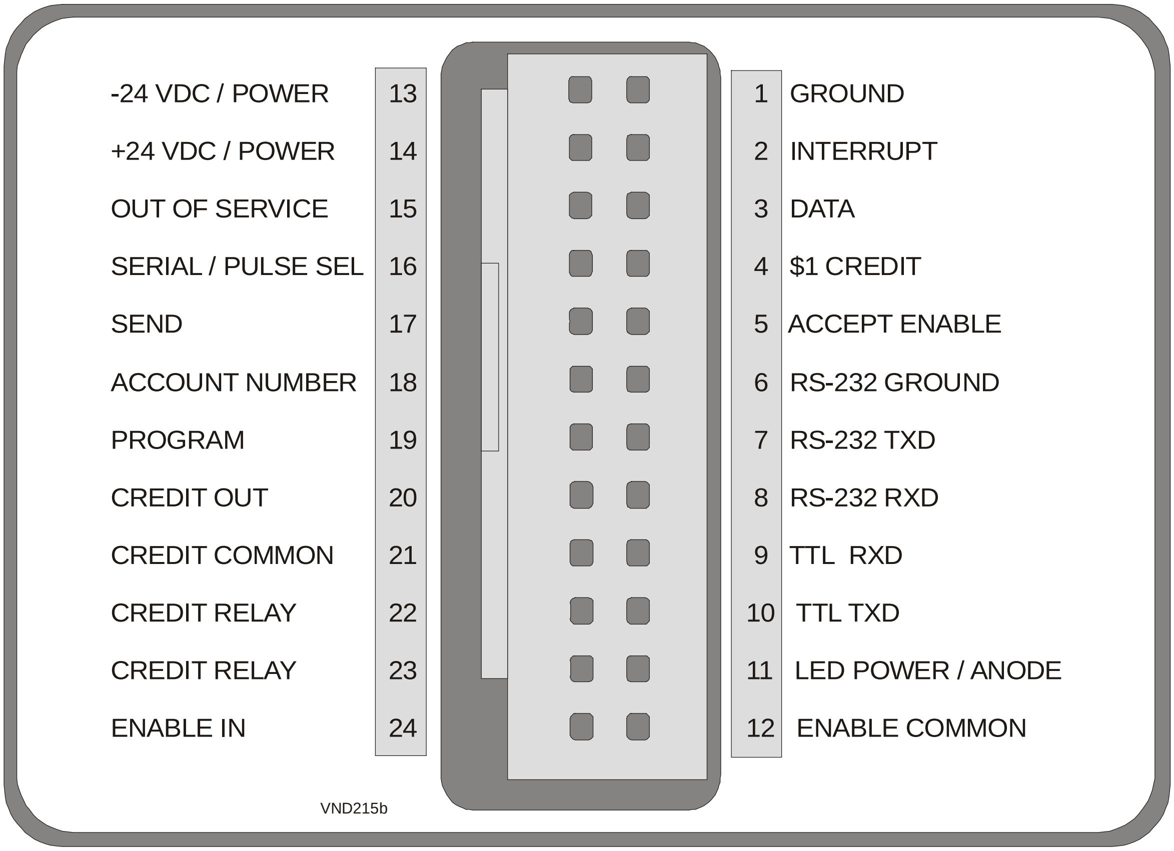

Figure 9-4 Input/Output Connector

Microcontroller

The microcontroller is a Dallas Semiconductor 5000 configured as an integrated assembly mounted on a SIMM printed circuit board with a 10-year battery-backed 32 kbytes RAM, and a real time clock. The microcontroller runs at 16 MHz enabling a range of advanced functions to be implemented.

Operating System and Software Distribution

Within the first 4 kbytes of memory space of the microcontroller is the unit's Operating System (OS) which controls all machine functions. Within the OS is the encoded security number, Factory Security Number (FSN), which must be input if a software upgrading takes place.

The OS also has a module that records machine identification, summary information on performance, and amounts of note denominations accepted. This information is transferred to the stacker memory.

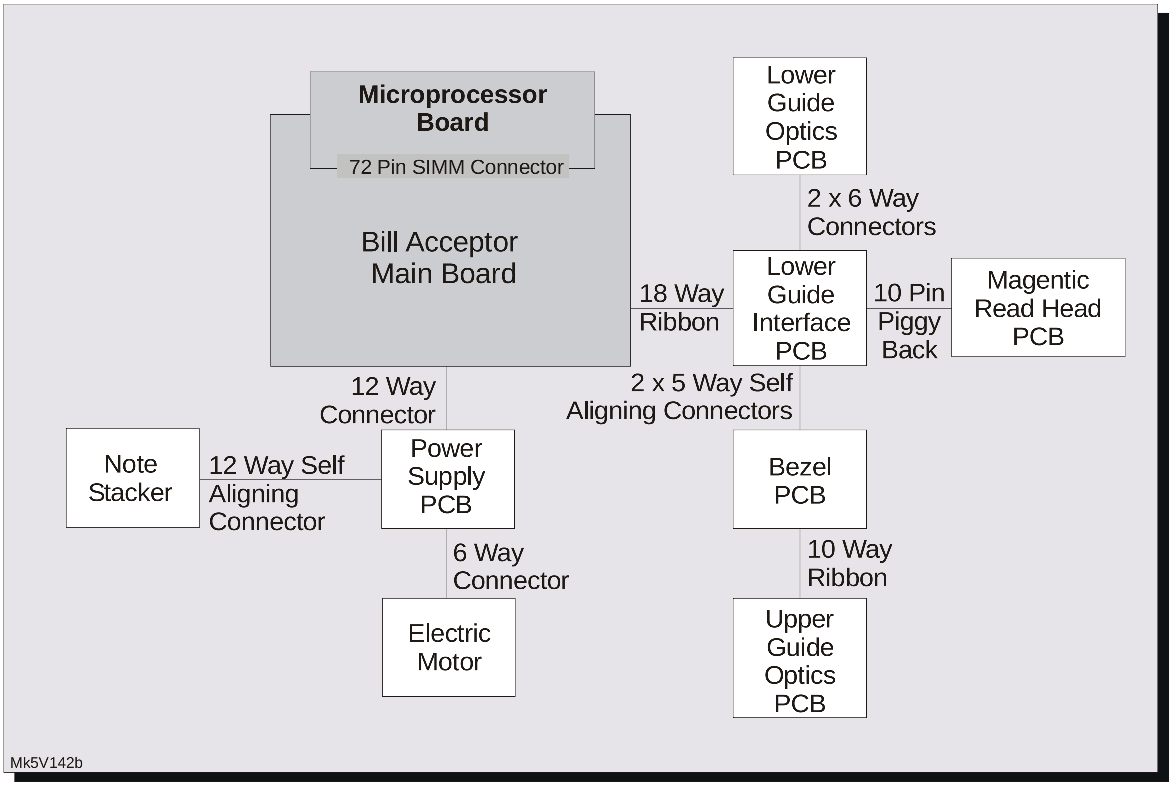

Figure 9-5 Interconnection Diagram

Scanning System

The scanning transport mechanics consist of a continuous timing belt and a pressure roller configuration. The timing belts are organised to provide an area of optical inspection within the currency channel so that vertical and horizontal inspections are possible. The horizontal analysis is performed by the Side Looking Sensors (SLS) and is used exclusively for the detection of tails and/or strings attached to bank notes or coupons. Any unusual activity detected by the SLS system is cause for automatic rejection and reporting.

Stacker

The stacker is designed for the storage and control of bank notes.

Housed within the stacker is a special memory device that has a serial communications interface and is supported by a 10-year lithium battery for non-volatile memory storage. The unit records the following groups of information:

- **System identification**: this item is copied from the unique Software Serial Number embedded in the cable attaching the host machine to the unit. The number equates to a property asset number and identifies the machine and the stacker for accounting and maintenance purposes. The number is recorded in the stacker during the Power On Reset procedure if the unit is empty (physically and electronically). The number is checked if the stacker is removed and replaced, as might occur during maintenance activities.

- **Note transaction information**: Each note transaction and note denomination is recorded.
- **Diagnostics**: fault information is analysed and stored in the stacker module. After processing, maintenance personnel may be targeted to specific machines to perform maintenance.

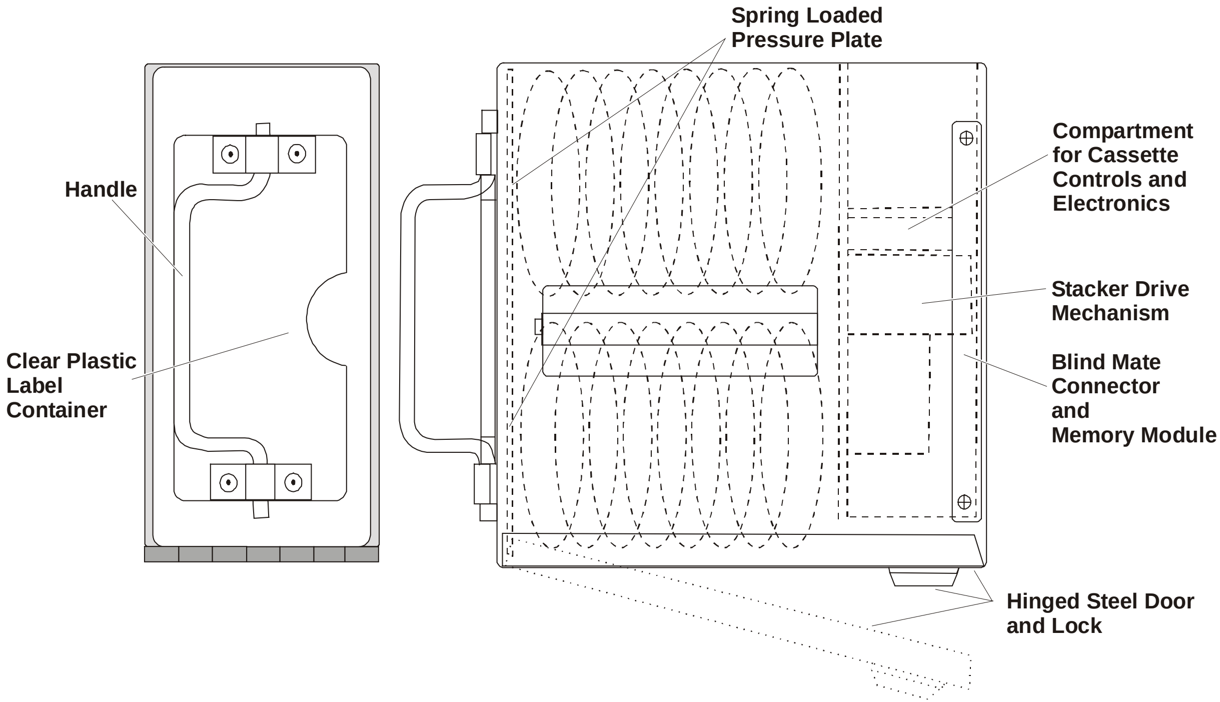

Figure 9-6 Stacker

Stacker Physical Description

The stacker features a self-aligning connector that provides electrical connection and aligns the stacker to the Bank Note Acceptor. Access to the stored notes is only possible by unlocking the hinged steel door at the rear of the module with a tubular security key.

The stacker assembly is a sturdy, locked steel box capable of storing 500 stacked currency notes.

The interior of the stacker contains a spring loaded pressure plate which supports the note stack and a pair of note support rails on which presented notes lie prior to the stacking operation. The front surface of the stacker incorporates a handle and a clear plastic label retainer.

An upper cavity is created in the box which contains the stacker drive mechanism sealed from the note compartment. The compartment contains a blind mate connector to the Bank Note Acceptor, and the memory module for electronically storing stacker identification, diagnostic and content information.

A motor/pusher plate assembly within the stacker accomplishes note stacking. The unit consists of a motor driven, slider-crank mechanism. On receipt of the appropriate signal from the Bank Note Acceptor, the motor turns through one revolution which cycles the pusher plate through one complete linear extension-retraction cycle. On extension, the pusher plate moves the note past the note support rail against the pressure plate. On retraction, the note is trapped below the support rail and held there by the pressure plate.

Intelligent Bezel

The bezel display, mounted to the uppermost portion of the upper guide assembly, highlights the note insertion area and indicates Bank Note Acceptor faults.

When the machine is in idle mode, eight green LEDs flash in a "runway" type effect. A ninth, red LED flashes if the Bank Note Acceptor operation is inhibited for any reason. Selected green LEDs flash to indicate machine conditions requiring attention - see 9.2.2 Machine Condition Indicators.

9.1.3 GL5 Non-isolated Serial Interface

The serial communication protocol used to interface with the Bank Note Acceptor conforms to the Mars GL5 standard. This interface provides one-way communications with the control system; where messages are sent, via the DATA line, from the Bank Note Acceptor to the control system in response to the control lines. Three control lines are used, ACCEPT, SEND (from the control system to the Bank Note Acceptor), and INTERRUPT from the Bank Note Acceptor to control system.

In normal operation, the control system activates the ACCEPT line by pulling it low, and the Bank Note Acceptor is ready to accept money. After the validation process, a DENOMINATION message for successful evaluation or a REJECT message for unsuccessful processing is ready to be sent to the control system.

The Bank Note Acceptor pulls the INTERRUPT line low and informs the control system of its intention to send a message. The control system responds (T1) by dropping the SEND line low which grants permission to the Bank Note Acceptor to send data. After the SEND line becomes low (T2), data comes out via the DATA line in a serial fashion with 1 start bit, 8 data bits and 1 stop bit, at 600 baud rate. After the control system receives the last bit (T4) it raises the SEND LINE high. The Bank Note Acceptor responds (T3) by raising the INTERRUPT line high which completes the transmission of the first message.

If the validation is not successful, the Bank Note Acceptor sends the REJECT message to the control system and then waits for another note to be input. The REJECT message also tells the controller of the end of the communication session.

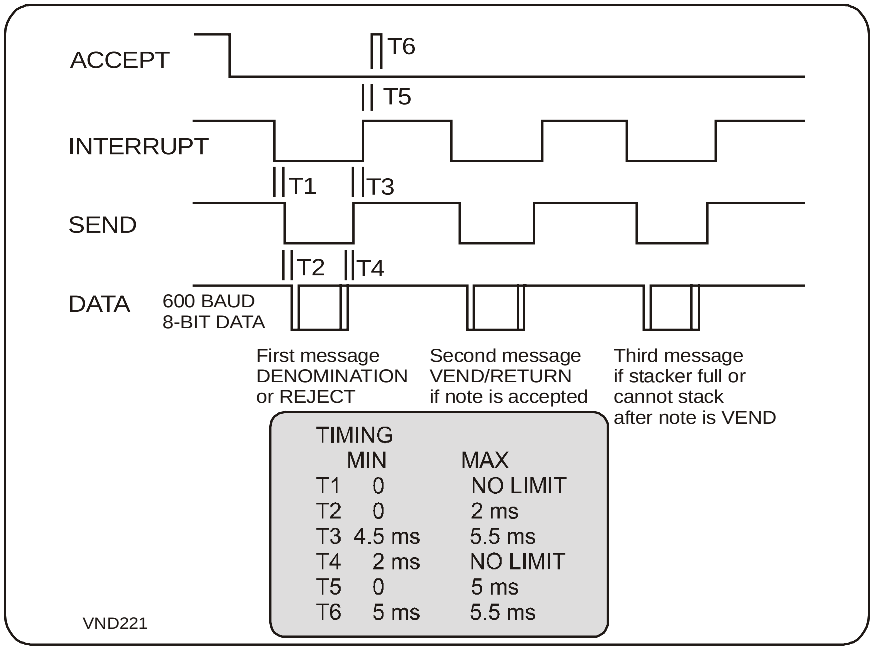

Figure 9-7 GL5 Protocol - Accept and Return Messages

Should the validation be successful, a DENOMINATION message is sent to the control system which then has to determine whether to accept or return the note. If the note is going to be returned, the control system raises the ACCEPT line (T5) after the INTERRUPT line goes high, and keeps the ACCEPT line high for a time duration (T6). This state tells the Bank Note Acceptor to return the note. The rejection occurs when the Bank Note Acceptor reverses the transport and returns the note with the RETURNED message.

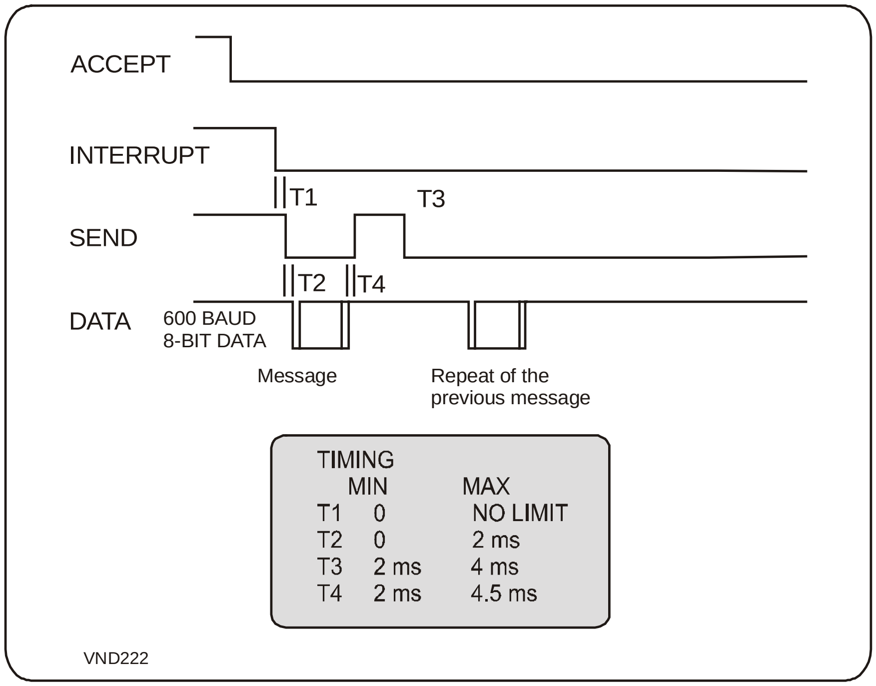

Figure 9-8 GL5 Protocol - Request for Re-transmission Message

If the control system decides to accept the note, the absence of the RETURNED pulse on the ACCEPT line is interpreted by the Bank Note Acceptor as an acceptance. The note then passed through the transport system to the stacker with the message VEND.

In both cases, a second message, RETURN or VEND, is ready to be sent to the control system by the Bank Note Acceptor, and the same timing sequence is repeated for the control lines. The communication session then ends.

A possible third message, STACKER FULL or FAILURE (the Bank Note Acceptor and stacker cannot stack a note) can be sent to the control system, and the timing sequence is repeated for the message. The communication session then ends.

The control system can request re-transmission of the previous message from the Bank Note Acceptor. Retransmission timing (T4), after a message is received, occurs when the control system raises the SEND line and keeps it high for a time (T3).

GL5 HEX CODE MESSAGES

$1 CREDIT	81H
$2 CREDIT	82H
$ 5 CREDIT	83H
$ 10 CREDIT	84H
$ 20 CREDIT	85H
$ 50 CREDIT	86H
$ 100 CREDIT	87H
VEND	89H
RETURNED	8AH
REJECT	8BH
FAILURE	8CH
STACKER FULL	8DH
JAM-STACKERLESS	8DH
SRC STACKER REMOVED	8EH
SRC STACKER ATTACHED	8FH

VND223

Figure 9-9 GL5 Protocol - Hex Code Messages

The replica of the previous message is sent by the Bank Note Acceptor and this process will be repeated as often as requested by the control system.

9.2 Installation and Machine Conditions

9.2.1 Configuration Setup

Bank Note Acceptor configuration options are established by the use of DIP switches and the Operator Mode Menu settings. To enable note denominations, it is necessary to set the required note values in both the Bank Note Acceptor DIP switches and the Operator Mode menu options.

The DIP switches are conveniently located at the top of the Bank Note Acceptor housing and are accessible when the main door is opened and the Bank Note Acceptor is pivoted froward.

The function of each DIP switch will depend on the specific software loaded in the Bank Note Acceptor. A typical allocation of the DIP switches is shown below.

Table 9-1 Bank Note Acceptor DIP Switch Functions

Switch	Position	Function
1	ON OFF	Enable $1 and $2 notes. Disable $1 and $2 notes.
2	ON OFF	Enable $5 note. Disable $5 note.
3	ON OFF	Enable $10 note. Disable $10 note.
4	ON OFF	Enable $20 note. Disable $20 note.
5	ON OFF	Enable $50 note. Disable $50 note.
6	ON OFF	Enable $100 note. Disable $100 note.
7	ON OFF	Display last 5 notes. Standard mode.
8	ON OFF	Use GL5 mode (Stacker Messages). Use VFM4 mode.
9	ON OFF	Standard mode. P/U starts video adjustment procedure.
10	ON OFF	Enable VFM protocol. Standard mode (High level protocol).

The settings for accepted note denominations are found in the Operator Mode Menu ⇒ Operator Setup / Selections Menu ⇒ Machine Options (refer to the chapter Machine Modes for more information).

A decal panel to the right of the note entry area identifies the accepted note denominations.

9.2.2 Machine Condition Indicators

The Bank Note Acceptor's operational details are indicated by the intelligent bezel displays and by several Operator Mode menu displays. The alarm sounds for error conditions.

Intelligent Bezel Indicators

The intelligent bezel displays eight green LEDs (2 rows of four, with a wide to narrow shape) which flash in a runway type effect when the machine is in idle mode of operation. A ninth, red LED (behind a circle, slash character, and $ sign) will flash if the Bank Note Acceptor operation is inhibited for any reason.

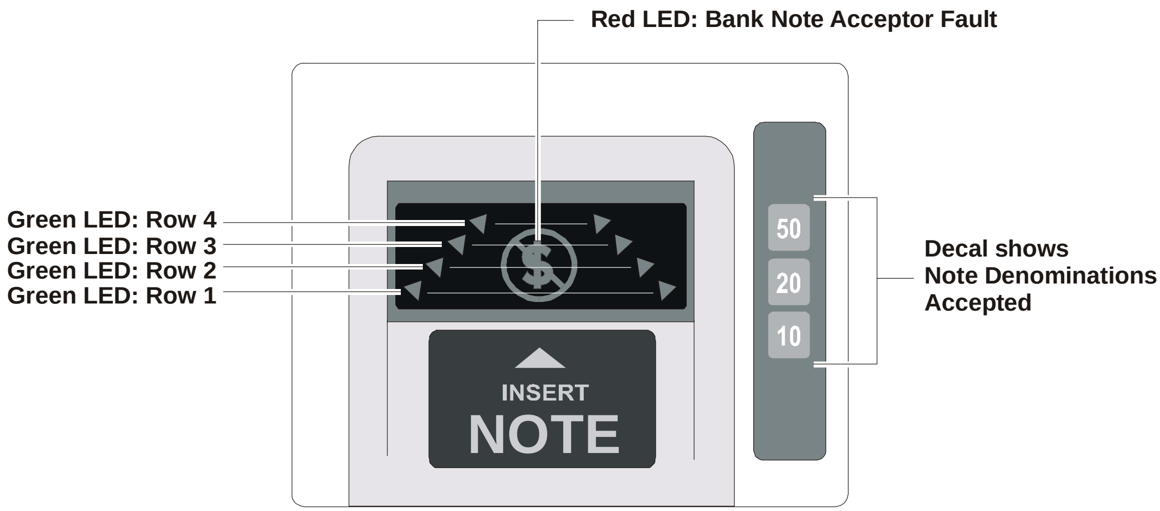

Figure 9-10 Bezel Assembly Indicators - LED Displays

Malfunctions flash different rows of the green LEDs. The pair of LEDs nearest the player is row number 1. The pair nearest the note entry channel is row number 4. The bezel error messages are:

Row Number 1: Hardware fault.

Row Number 2: Stacker full.

Row Number 3: Jam in stacker.

Row Number 4: Jam in currency channel.

To the right of the note entry area, a decal shows the range of accepted note denominations. The range of notes accepted can be selected by setting the DIP switches on the Bank Note Acceptor and selecting the appropriate options in Operator Mode ⇒ Operator Setup / Selections Menu ⇒ Machine Options.

Operator Mode Displays

Several Operator Mode displays provide Bank Note Acceptor information that addresses note entry history, machine status, accounting/audit/statistics data, and error and lockup information (refer to the chapter Machine Modes for further information).

9.3 Removal and Replacement Procedures

The dual cage assembly supports the retaining pins located on each side of the Bank Note Acceptor assembly (see Figure 9-3). Electrical connection is through a single connector which supplies both power and communications. The connector is easily accessed from the side of the unit when the main door is open.

Connection to the Bank Note stacker is automatically made through a blind mate connector located at the bottom of the Bank Note Acceptor unit. The bill stacker automatically disconnects from the Bank Note Acceptor when the dual cage door is lowered.

9.3.1 Clearance of Embedded Bank Note Acceptor Stacker

The procedure for the clearance of notes from the Bank Note Acceptor stacker will be strictly controlled by the house.

The stacker unit and the Bank Note Acceptor unit can be accessed and removed independently. The stacker is accessed by opening the cabinet door and the stacker cage door. The cabinet door is fitted with a mechanical security switch and dual locks may be fitted to the stacker cage door.

9.3.2 Removing Bank Note Acceptor Stacker

To remove the stacker:

1. Open the cabinet door. The machine lockup Bank Note Acceptor Door Open occurs.
2. Unlock and open the stacker cage.
3. Hold the stacker handle and withdraw the stacker from the machine.
4. After the stacker is withdrawn, the stacker door must be unlocked before the notes can be withdrawn. Each stacker may be numbered to assist accounting and control operations.

Replacement is a reversal of the removal procedure.

9.3.3 Bank Note Acceptor Jams

If a jam occurs, the unit is usually able to clear itself within a short period as an automatic process comes into effect. The unit runs the motor forward and then reverses in an attempt to clear the jam. This routine continues for five attempts. Should the jam persist, a fault message is initiated and a machine lockup occurs.

CAUTION
The Bank Note Acceptor is controlled by complex electronics. Unqualified personnel must not interfere with the unit.

The scanning and transport channel of the Bank Note Acceptor passes currency in a direct process to the stacker. Should a note become lodged within the scanning channel, the following steps will enable the jam to be cleared:

CAUTION
Ensure the power is turned off before any maintenance procedures are carried out on the Bank Note Acceptor, stacker and dual cage doors.

1. Open the cabinet door, and switch OFF machine power.
2. Disconnect the Bank Note Acceptor loom.
3. Release the Bank Note Acceptor outer cage top catch, and pivot the assembly forward.
4. Unclip the upper guide of the Bank Note Acceptor to gain access to the scanning channel. If this does not enable the jam to be removed, the Bank Note Acceptor can be removed from the housing to enable complete access to the unit.
5. Pull back the retaining clip(s) (see Figure 9-3) to release the Bank Note Acceptor locating pin(s). Lift the Bank Note Acceptor up and out from the back of the housing.
6. Open the upper guide and remove any obstruction.

9.4 Care and Maintenance

9.4.1 Troubleshooting

The following guide provides possible solutions to faults that may be encountered during normal use. Also refer to Removal and Replacement in this chapter.

Table 9-2 Bank Note Acceptor Fault Finding

Fault	Remedy
Note jammed in unit	Open the scanning channel and remove the note.
Note repeatedly skews and jams	Pressure rollers have incorrect tension. Belts are not adjusted properly. Make adjustments to the roller tension and transport belts.
Display electronics are non functional	Check that the Bank Note Acceptor loom is correctly connected and the machine power is on.
Note is not transported into the unit	Check that the Bank Note Acceptor loom is correctly connected and the machine power is on. Remove any jammed notes from the scanning channel. The Bank Note Acceptor may be inhibited from further operation by the game and machine software. Remove any current machine locks. See Machine Modes.
Low acceptance rate	Perform a Video Level Calibration

9.4.2 Periodic Maintenance

The Bank Note Acceptor and stacker require only a minimal amount of maintenance which can be provided while the units are in operating positions.

Occasional wiping of the plastic bezel surface is all that is required to remove surface deposits and smudges. A soft lint-free cloth dampened with a 90% solution of isopropyl alcohol is recommended for cleaning.

CAUTION
Caution must be exercised not to flood the bezel area with liquids due to the electronics in the bezel unit and because liquids must not seep down into the Bank Note Acceptor units below the bezel area. Do not use a solvent other than isopropyl alcohol as permanent damage to the bezel assembly and other items may result.

Over a period of time, dirt from the surface of the notes will accumulate on the pressure rollers, drive belt surfaces and Bank Note Acceptor optics. These areas should be cleaned to ensure reliable operation.

The procedure to clean rollers, belt surfaces, and validation optics is as follows (see Removal and Replacement Procedures in this chapter):

1. Power down the Bank Note Acceptor and disconnect the electrical cable from the side of the Bank Note Acceptor assembly.
2. Remove the Bank Note Acceptor from the dual cage housing.
3. Swing open the upper guide assembly to give complete access to the note channel.
4. Using a soft lint-free cloth dampened with 90% isopropyl alcohol, wipe the note channel surfaces on both the upper and lower guides to remove any surface dirt.

Pay particular attention to the optics area and the magnetic head when removing deposits from the surfaces.

5. On the upper guide assembly, clean the surface of the pressure rollers. The belt surface may be cleaned by using a thumb to rotate one of the drive rollers while holding the cleaning cloth against the surface of the belt. Again, caution should be used to prevent excess liquid from reaching the Bank Note Acceptor internals.

9.4.3 Video Level Calibration

Should the Bank Note Acceptor exhibit an unusually low level of acceptance, a video level calibration can be performed as described below.

Video Level reference paper (Part No. CBV-1000) is required for this procedure. **Do not** use any other paper to perform this procedure.

Video Adjustment Procedure

1. Remove power to the Bank Note Acceptor **or** alternatively open the currency channel while power is applied.
2. Locate the DIP switches at the top of the Bank Note Acceptor. Turn DIP switch 9 ON (away from the front bezel).

NOTE
Step 4 must be executed within 5 seconds of Step 3.

3. Apply power to the Bank Note Acceptor **or** alternatively close the currency channel.
4. Insert the video level calibration paper into the note entry area.
5. The Bank Note Acceptor will step the paper out as it performs the video calibration. The procedure is complete when the paper is fully ejected.
6. Turn DIP switch 9 OFF.
7. Remove then reconnect power to the Bank Note Acceptor or, alternatively, open and close the currency channel.
8. Re-install the Bank Note Acceptor, and test its operation.

The video level adjustment procedure is now complete.

Chapter 10

Video Monitor

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10.1 Overview

The video monitor consists of a metal chassis manufactured by Aristocrat, a cathode ray tube from RCA Thompson or Philips, and electronics supplied by either Tatung, Ceronix, or Kristel. This chapter provides a description of the three monitor types. For full servicing details refer to the manufacturer's manual.

10.2 General Description

The video monitor is a 20" (51 cm) VGA type capable of up to 640 x 480 pixel resolution (the resolution used is 640 x 400 pixels). The major components of the video monitor assembly are: the cathode ray tube (CRT), the video monitor printed circuit boards (PCBs) and the video monitor chassis. The Ceronix monitor assembly also includes an isolation transformer because it can not run directly from the mains supply.

The CRT and video PCBs are all mounted onto a common metal chassis that slides along the game display shelf into the cabinet (refer to Figure 10-3). The video monitor assembly is secured in place by a single screw, inserted from the underside of the game display shelf.

The slide-in chassis system enables the video monitor assembly to be removed and replaced easily, and also to connect to the rest of the machine via a single, self-aligning, multi-pin connector on the back of the chassis. This connector transmits the monitor power and the video drive signals from the video controller, which is built into the ARM250 microprocessor.

The PCBs associated with the monitor assembly are (refer to Figure 10-2):

- Picture Control PCB
- Main Monitor Chassis PCB
- CRT Neckboard PCB.

The Picture Control PCB provides for picture adjustment and is located at the front of the monitor assembly for easy access.

10.3 Tatung Monitor

10.3.1 Physical Description

The Picture Control PCB is located at the front of the monitor assembly for easy access. It provides the following controls and adjustments for the monitor picture:

R871 - Brightness.	R671 - Horizontal Position.
R670 - Horizontal Hold.	R770 - Vertical Hold.
R772 - Vertical Size.	R773 - Vertical Position.
VR2 - Horizontal Size.	R958 - Contrast.

The following controls and adjustments are available on the Main Monitor PCB:

R111 - Power Supply Voltage.	R651 - ZD602 Anode Voltage.
R650 - Horizontal Frequency.	R652 - Horizontal Position.
R714 - Vertical Linearity.	VR1 - Pincushion.
VR3 - Pincushion.	

The following controls and adjustments are available on the CRT PCB:

R950 - Red Gain.	R952 - Green Gain.
R953 - Blue Gain.	R938 - Red Background.
R937 - Green Background.	R936 - Blue Background.

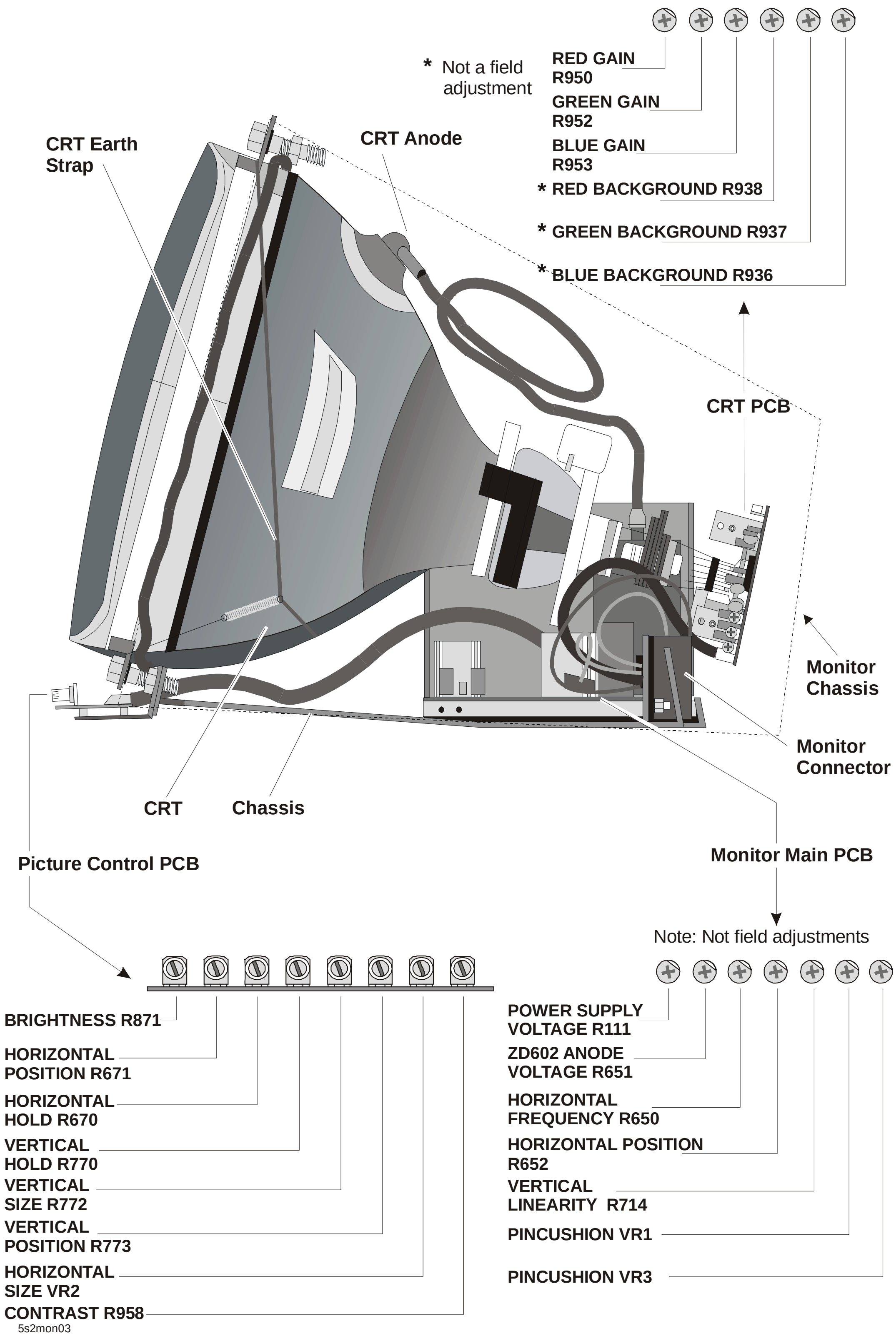

Figure 10-1 Tatung Video Monitor Assembly

10.3.2 Technical Description

The video monitor electronics consist of the following circuits:

- Sync Interface circuit.
- Vertical circuit.
- Horizontal circuit.
- Power supply.

The sync interface circuit synchronises the operation of the vertical and horizontal circuits for video display on the CRT. The video circuit interfaces video inputs to the monitor, sets the gain (*gain* is the proportion of multiplication between the input signal and output signal of the amplifier) of the video, generates beam current for the CRT anode and controls CRT blanking (*blanking* is the turning off of the scan lines as they traverse back from the end of the screen back to the beginning again).

The vertical circuit controls the size and position of the vertical raster (*raster* is the scan lines which are visible on the screen) on the CRT. The vertical circuit also initiates vertical blanking via the video circuit.

The horizontal circuit controls the size and position of the horizontal raster on the CRT and also initiates horizontal blanking via the video circuit.

The power supply circuit supplies the required voltage from an isolated supply.

Sync Interface Circuit

The sync interface circuit consists of two comparators which receive the vertical and horizontal sync signals from the Main Board (via the Interface Board). The electronics takes the signals from the Main Board and synchronises their operation so that the vertical and horizontal circuits operate in unison.

Vertical Circuit

The vertical circuit consists of:

- Vertical control circuit.
- Vertical output circuit.
- Vertical auto bias circuit.

The vertical control circuit receives the vertical sync pulse from the sync circuit and initiates the vertical oscillator. The output from the vertical oscillator is converted to a linear vertical ramp current by a ramp generator.

The output from the vertical control circuit drives the vertical output circuit. The vertical output circuit consists of a power driver which drives the vertical deflection yoke of the CRT. The vertical output circuit produces evenly spaced horizontal lines on the CRT.

The vertical auto bias circuit monitors the power driver output and sends a feedback signal to the vertical control circuit to maintain the output at the required level.

Horizontal Circuit

The horizontal circuit consists of:

- Horizontal control circuit.
- Horizontal driver circuit.
- Horizontal output circuit.

The horizontal control circuit incorporates a variable sync delay and a phased loop to generate the horizontal timing. The horizontal position (H.POSI) adjustment on the picture control PCB sets the sync delay time to control the horizontal raster position on the CRT.

The horizontal sync pulse is used to trigger a saw tooth generator in the horizontal control circuit. The output from saw tooth generator is gated with the delayed sync pulse to control the horizontal oscillator. The output of the horizontal oscillator is applied to the horizontal driver.

The horizontal driver converts the output from the horizontal control circuit to the high base current necessary to drive the horizontal output circuit.

The horizontal output circuit consists of a transistor, this transistor produces a linear ramp current in the CRT horizontal yoke which provides the horizontal raster. The output from the transistor is also applied to the flyback transformer.

The flyback transformer (FBT):

- Generates a 25 kV potential for the anode of the CRT.
- Provides the focus voltage and the filament power for the CRT.
- Provides beam current to the horizontal size control circuit.
- Provides the flyback pulse to the video circuit for blanking.

The anode voltage multiplied by the beam current is the power that lights up the phosphor on the CRT.

The horizontal size control circuit has the following inputs:

- H.SIZE adjustment from the picture control PCB.
- Beam current from the flyback transformer.
- Vertical deflection voltages from the vertical output circuit.

These inputs are combined to produce the diode modulator control voltage. This voltage controls the current flow in a diode placed in series with the horizontal yoke. Maximum current flow in the diode determines maximum horizontal size on the CRT.

Power Supply

The monitor incorporates a switching regulated power supply circuit, which receives mains voltage directly from the machine power supply assembly. This circuit generates all required operating voltages for the monitor.

10.3.3 Adjustment Procedures

Adjusting the Monitor Picture

The monitor picture can be modified in various ways, most of the adjustments are available on the picture control PCB for easy access. Other adjustments are available on the CRT and Main Monitor PCBs. Refer to Figure 10-1.

The tables below describe the controls and functions available on the Picture Control, CRT, and Main Monitor PCBs.

Table 10-1 Adjustments and Functions - Picture Control PCB

Adjustment	Function
Brightness **(BRIGHT)**	The brightness adjustment controls the bias of the amplifier. Changing the brightness moves the colour outputs further up toward *colour saturation* or down toward *black.*
Horizontal Position **(H.POSI)**	The horizontal position adjustor controls the position of the picture area from left to right.
Horizontal Hold **(H.HOLD)**	The horizontal hold adjustor controls the horizontal oscillator frequency. Changing the H.Hold
Vertical Hold **(V.HOLD)**	The verticals hold adjustor controls the vertical oscillator frequency. Changing the V.Hold
Vertical Size **(V.SIZE)**	The vertical size adjustor controls the size of the picture area from top to bottom.
Vertical Position **(V.POSI)**	The vertical position adjustor controls the position of the picture area from top to bottom.
Horizontal Size **(H.SIZE)**	The horizontal size adjustor controls the size of the picture area from left to right.
Contrast **(CONTRAST)**	The contrast adjustor controls the gain of the amplifier. The contrast control changes the range of colour outputs making it either narrower or wider. The wider the range the more difference (contrast) between dark and light colours.

Table 10-2 Adjustment and Functions - CRT PCB

Adjustment	Function
Red Gain **(R GAIN)**	The red gain adjustor controls the proportion of amplification for the red signal. Increasing the red gain will enhance the red section of the colour spectrum
Green Gain **(G GAIN)**	The green gain adjustor controls the proportion of amplification for the green signal. Increasing the green gain will enhance the green section of the colour spectrum.
Blue Gain **(B GAIN)**	The blue gain adjustor controls the proportion of amplification for the blue signal. Increasing the blue gain will enhance the blue section of the colour spectrum
Red Background **(R K)**	The red background adjustor controls the proportion of red in the background.
Green Background **(G K)**	The green background adjustor controls the proportion of green in the background.
Blue Background **(B K)**	The blue background adjustor controls the proportion of blue in the background.

Table 10-3 Adjustment and Functions - Main Monitor PCB

Adjustment	Function
R111 - Power Supply Voltage	power supply voltage adjustment.
R651 - ZD602 Anode Voltage	X-Ray protection.
R650 - Horizontal Hold Frequency	Frequency of horizontal oscillator
R652 - Horizontal Position Centring	Synchronisation delay, positions picture on the screen.
R714 - Vertical Linear	Linearity of vertical output.
VR1 - Pincushion	Corrects *pincushion* distortion.
VR3 - Pincushion	Phase adjustment.

Basic Monitor Settings

The basic monitor setup settings are described below. Complying with these procedures will provide an initial reference point for fine tuning the monitor picture. The following procedures require the monitor to be removed from the machine and connected to it via a monitor extension lead to allow access to the PCBAs whilst the monitor is powered.

WARNING
High voltages are present at the rear of the monitor when the monitor is powered.

Adjustment of the video monitor should be carried out in conjunction with the monitor tests available in the Operator Mode Menu ⇒ Self Test Mode ⇒ Monitor Test. Refer to the chapter Machine Modes.

1. Select the Basic Colours Test from the Monitor Test menu. In this procedure only the white section of the screen is used.
2. With the basic colours displayed (Red, Green, Blue and White) set the contrast (R958) and brightness (R871) controls on the picture control PCB to minimum.
3. Remove the monitor as previously described and set R Gain (R950), G Gain (R952), B Gain (R953), R K (R938), G K (R937), and B K (R936) on the CRT PCB to approx. 65% max.
4. Adjust the Screen control on the flyback transformer until an image appears on the screen.
5. Adjust the R K, G K and B K until the image appears closest to 'white'.
6. On the picture control PCB set the contrast to approx. 65% max. and the brightness control to maximum.
7. Readjust the R K, G K and B K controls to give a clean white image.
8. Adjust Red Gain, Green Gain and Blue Gain for an image closest to white.

10.4 Ceronix or Kristel

10.4.1 Technical Description

Refer to separate Ceronix or Kristel service manuals.

Power Supply

Kristel

The monitor incorporates a power supply regulator circuit, which receives mains voltage directly from the machine power supply assembly. This circuit generates all required operating voltages for the monitor.

Ceronix

The Ceronix monitor requires isolated mains input, which is supplied by an isolated transformer box mounted on the inside of the monitor chassis. A power supply regulator circuit converts the isolated mains input to the voltages required by the monitor.

Warning
Where a manual switched isolation mains input transformer is used, the mains input switch on the transformer must be set to match to mains input voltage supplied to the machine. The mains input switch on the transformer must not be switched between 115 V AC and 230 V AC when power is on. Failure to adhere to the above procedures may result in the destruction of the transformer.

10.4.2 Adjustment Procedures

The Picture Control PCB is located at the front of the monitor assembly for easy access. It provides the following controls and adjustments for the monitor picture:

- Horizontal Raster size
- Vertical Raster size
- Vertical Picture position
- Horizontal Picture position
- Video Gain (Contrast)

These controls can be adjusted only to a limited amount. The brightness will be maintained throughout the life of the unit by the auto-brightness circuit.

All colours are automatically adjusted by the auto bias circuit and will remain constant throughout the life of the unit.

Pincushion distortion is automatically adjusted using the auto bias circuit.

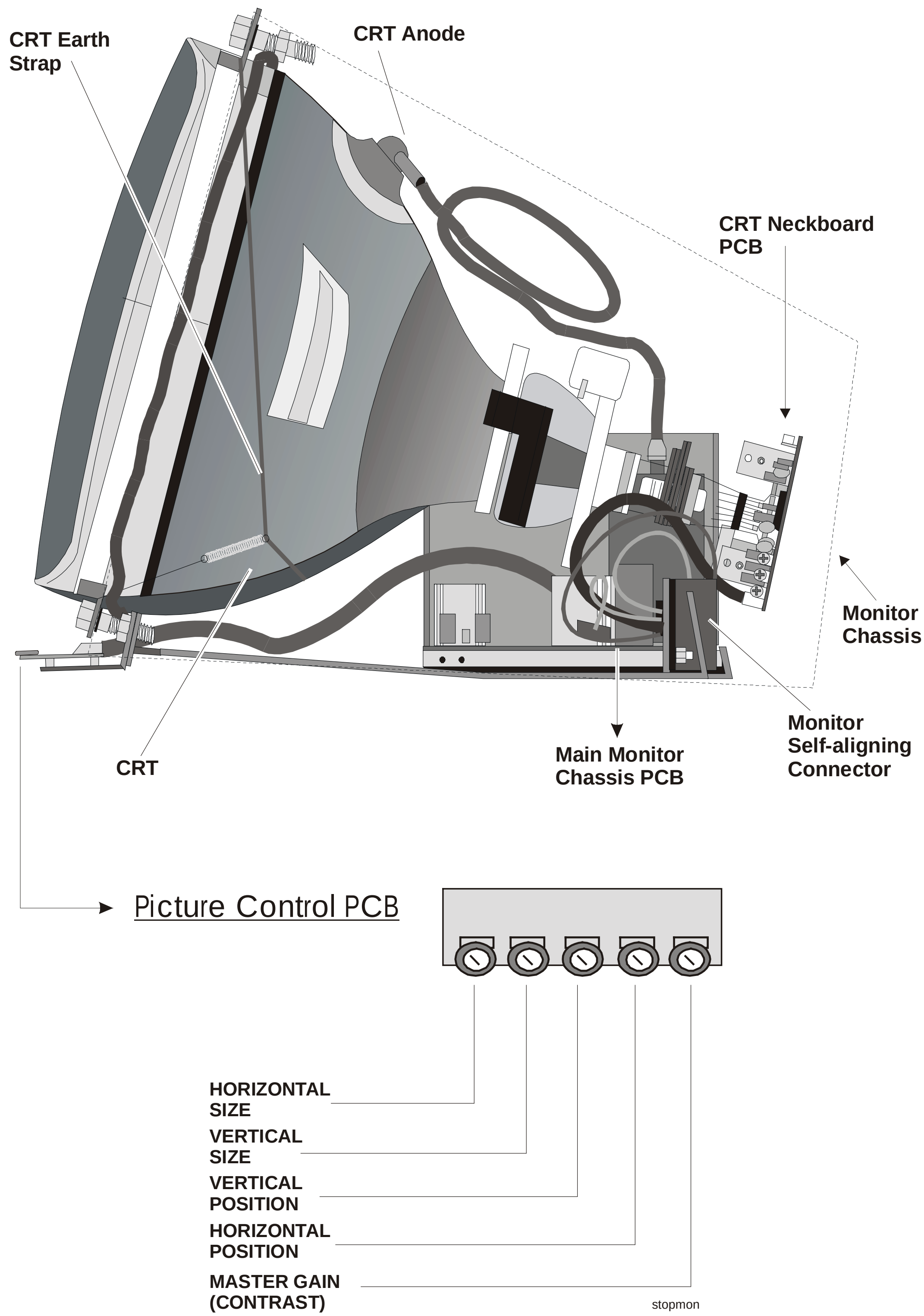

Figure 10-2 Monitor Assembly – Kristel and Ceronix

10.5 Removal and Replacement Procedures

To remove the monitor assembly from the machine:

WARNING
High voltages are present at the rear of the monitor when the machine is ON. Switch OFF the machine before removing the monitor.

CAUTION
The monitor assembly is a heavy item (approximately 20 kg). Care should be taken when removing the monitor assembly to prevent personal injury or damage to the monitor.

To remove the monitor:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the locating screw from the underside of the game display shelf.
3. Gently pull the monitor assembly from the machine. The steel frame of the monitor assembly has openings at either side to facilitate handling.

Replacement is a reversal of the removal procedure.

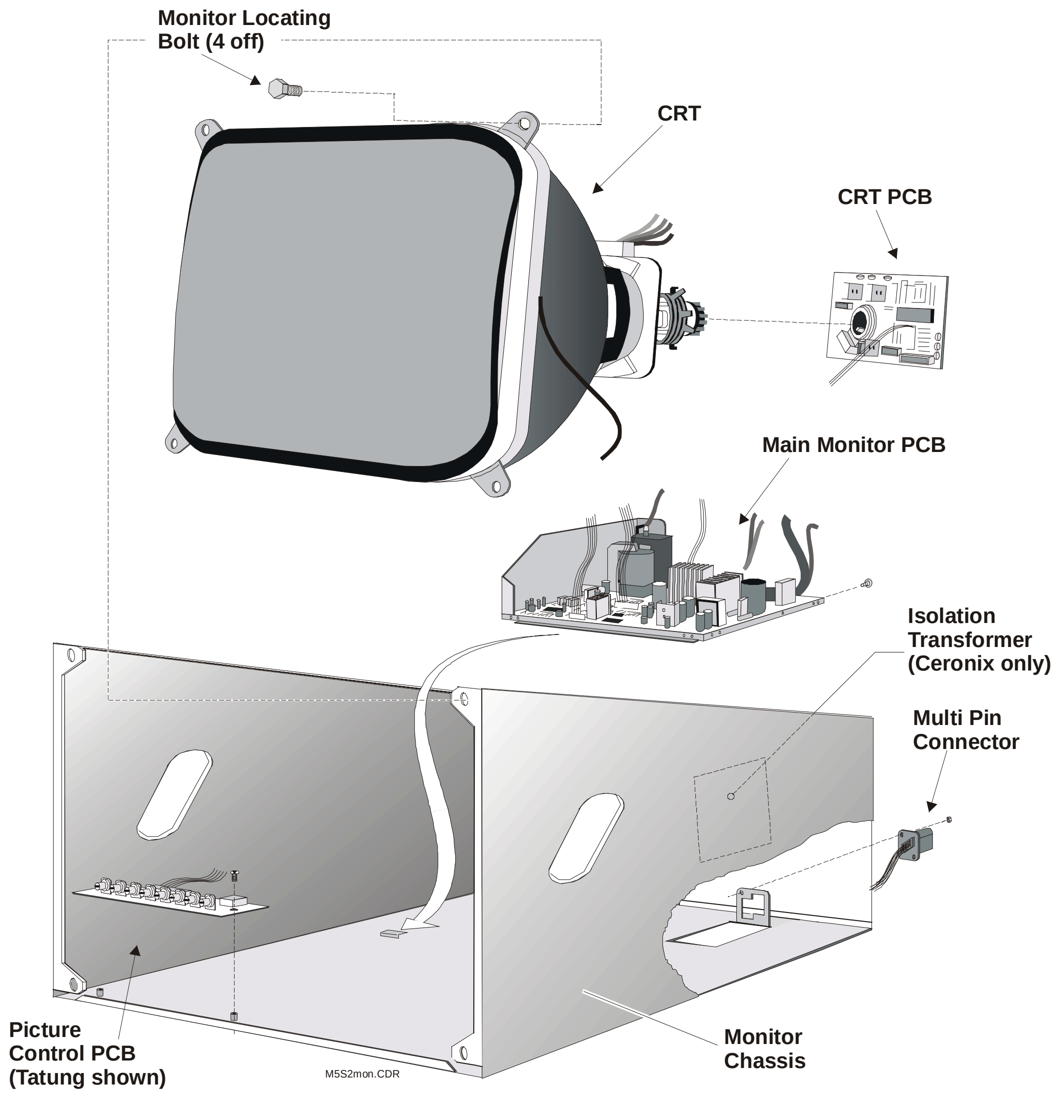

Figure 10-3 Video Monitor Assembly

10.6 Degaussing

Magnetic interference can cause colour aberrations on the monitor screen. To restore the colour purity of the monitor picture, the monitor and cabinet need to be degaussed. The monitor assembly is fitted with a degaussing coil and circuitry that emits a degaussing pulse on power-up. The machine needs to be without power for at least 30 minutes for the monitor’s degaussing circuit varistors to cool sufficiently to enable a degaussing pulse with enough energy to degauss both the monitor’s ferrous content and that of the cabinet.

To degauss the monitor and cabinet:

1. Open the cabinet door and switch OFF the machine.
2. Leave the machine unpowered for at least 30 minutes.
3. Turn the machine power ON and immediately close the cabinet door. The door must be closed within 5 seconds of the power being switched on to ensure that the cabinet’s magnetic circuit is complete when the degaussing pulse is sent. Degaussing of the cabinet is ineffective unless the door is closed.
4. If colour aberrations persist, use a degaussing wand to degauss the monitor and cabinet.

10.7 General Maintenance

For general maintenance of the video monitor:

- Remove any dust or dirt from external surfaces.
- Clean the monitor screen with a soft cloth and suitable cleaning agents.
- Check that all connectors are secure.
- Check that all monitor assembly PCBs are secure and properly connected.
- Check that the monitor and monitor mask fit correctly when the cabinet door is closed.

Notes

Chapter 11

Main Board -- 410289 or 410461

List of Figures

11.1 Introduction

The MkV Depopulated Main Board provides central control of the USA 540 MVP Video Gaming Machine. The board is fitted with an ARM RISC microprocessor which interfaces with other equipment in the machine via the Backplane. The Main Board can be configured differently for different machine variations. The major features of the Main Board are as follows:

- ARM RISC microprocessor operating at 12 MHz (combines CPU, memory management, I/O Interface, audio and video on a single chip)
- on-board power supply regulator
- audio amplifier for speaker
- game EPROMS
- security monitoring of machine door activities
- serial channels
- temperature sensing
- watchdog timer and reset
- surface mounted technology
- flexible design allows for future changes to the machine configuration.

11.2 Physical Description

The MkV Depopulated Main Board is based on the MkV Main Board, although certain changes have been incorporated that replace the Serial Peripheral Interface system with parallel I/O, leading to a depopulated Main Board. The Depopulated Main Board still provides some I/O, with the Extended I/O Driver Board being responsible for the remainder of I/O.

The Main Board contains an ARM RISC processor that interfaces with a number of subsystems via the Backplane. Figure 11-3 provides a block diagram illustrating the electronics system architecture. The system is available in various configurations to meet specific machine requirements.

The Main Board, along with the other major PCBAs, is located within the security logic cage (see Figure 11-1). The logic cage is a lockable, steel box located beneath the monitor shelf. It provides security and protection for the PCBAs.

The Main Board slides on guides within the cage and connects with the Backplane via three 96 way DIN 41612 connectors. Connectors are provided on the Main Board for the Communications Configuration Board and an optional memory expansion PCBA.

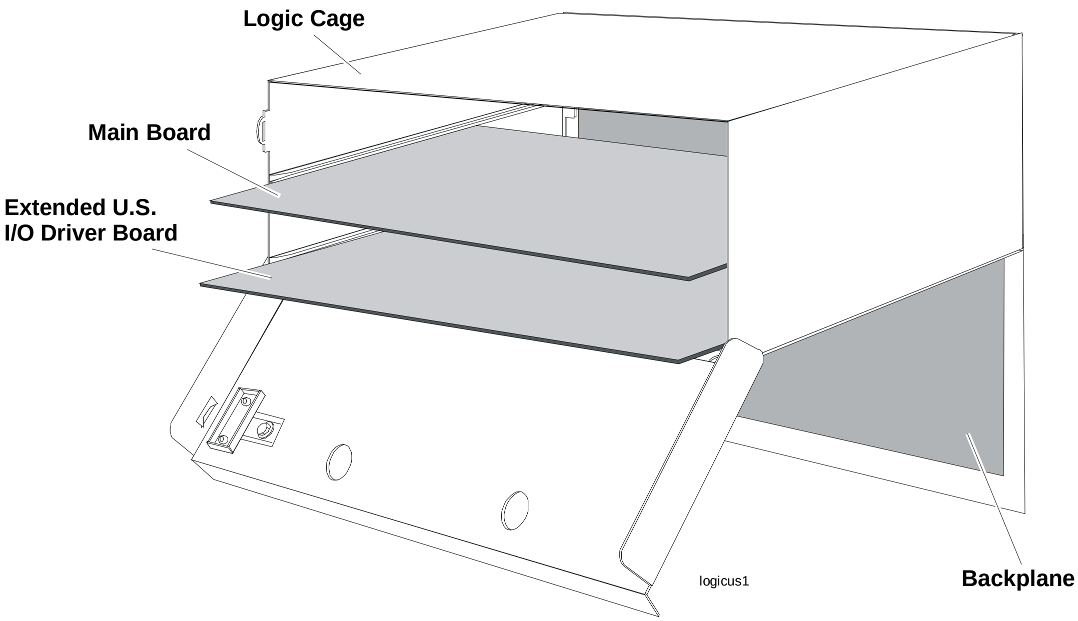

Figure 11-1 Location of the Main Board in the Logic Cage

11.2.1 Circuit Diagrams and Component Locations.

For further information and for reference, the following additional information on the Main Board is provided in Volume II:

- **Circuit diagrams.** Structured circuit diagrams.
- **Board Layout.** A drawing of the Main Board showing the location of the components.
- **I/O to Components and ICs.** A list of the I/O paths to each component and integrated circuit (IC) pin position**.**

11.3 Functional Description

The Main Board interfaces with the following peripheral devices (depending on machine features) via the Backplane:

- Extended MkV I/O Driver Board P/No 410355
- Video Monitor / Touchscreen
- Pushbuttons and Pushbutton lamps
- Mechanical Meter Board
- Top Box Distribution PCB
- Power Supply
- Animation Lamps
- Mechanical Security Switches
- Optical Security Switches
- Coin Handling Mechanism
- Solenoid Optics and Solenoid Diverter
- Bill Acceptor
- Speakers
- Key Switches
- Bill Acceptor
- Hopper or Printer
- Cooling Fan
- IGT SAS+ / Bally SDS / RS232 / ASP 1000 Head System
- Broadcast DACOM
- VLC Head System
- Spare Power Connector
- Network Interface
- Two Spare Serial Ports (via one connector)
- Debug Port

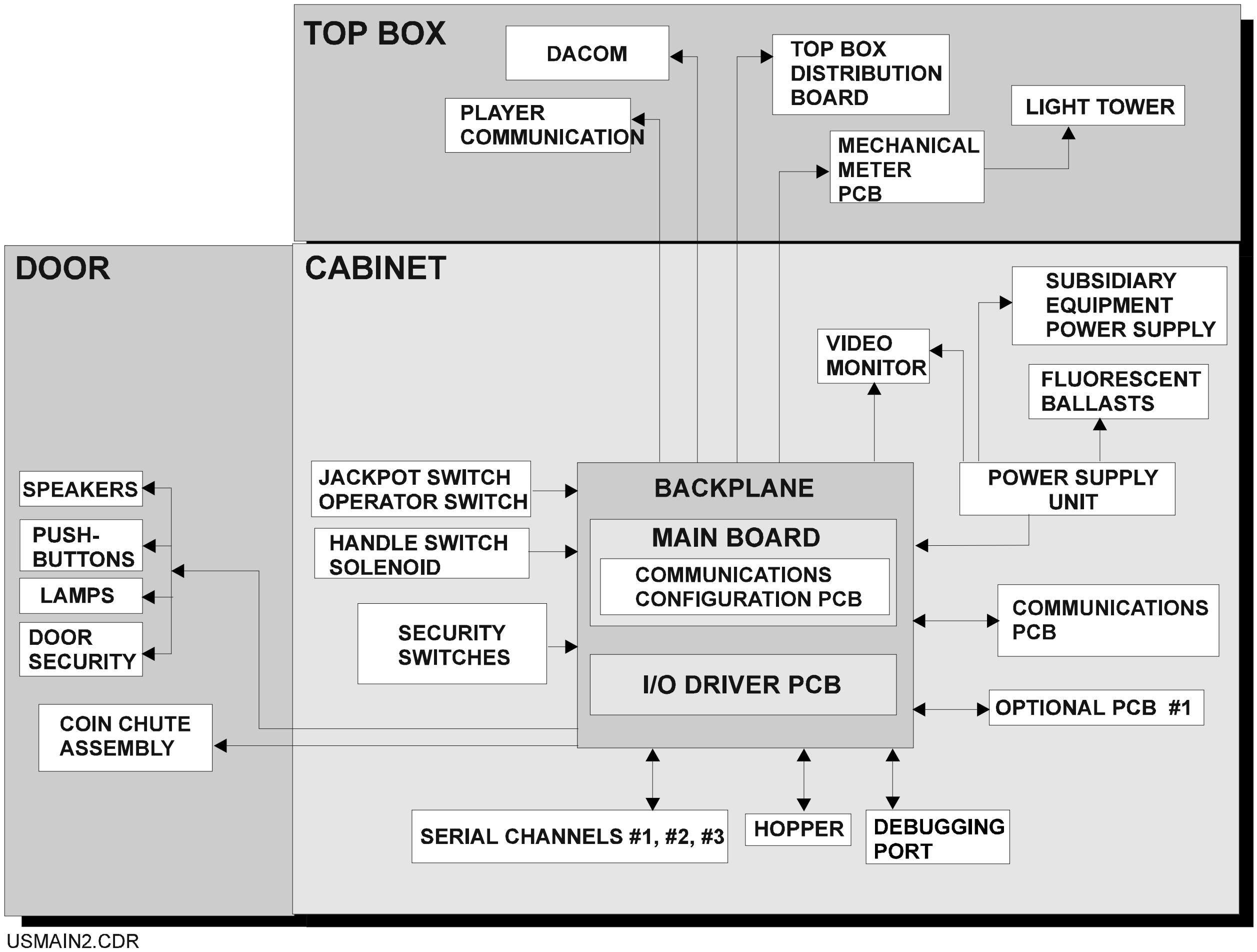

Figure 11-2 System Architecture

11.3.1 Main Board Functions

The Main Board provides the following functions:

- ♦ Core microprocessor and memory
  - CPU (ARM250 32 bits RISC ASIC operating at 12 MHz)
  - On Board EPROM's
  - DRAM (a minimum of 1 Mbyte or 2 Mbyte as a build option).
  - Audio amplifier and sound volume control circuitry.
- ♦ Non-volatile storage
  - EEPROMs (2).
  - SRAM for Electronic Meters.
  - Battery Back-up and test circuitry
- ♦ 8 bit I/O Expansion via the Backplane
- ♦ Interrupt System
  - Interrupt glue logic.

- Timers and Operating System Tick logic.
- Coin Handling
  - Coin Chute Interface.
  - Hopper Interface.
- Internal Read/Write Control Registers
- Security
  - Security switches (up to 8 optical and 8 mechanical switches)
- Communications.
  - Four serial channels (two DUART's). One channel is allocated to a FIP display (stepper only) and RS232, and the other three channels are configurable for Current Loop, Bill Acceptor, RS232, or DACOM5000.
- Power Control and Reset System.
  - Onboard DC-DC converter (+24 V to + 5.1 V and +/-12 V isolated).
  - Power supply supervisor and reset circuitry..
  - Status monitoring.
- Watch Dog timer.
- Status monitoring.
- Diagnostics.
  - Circuitry for test, diagnostics and debugging (in conjunction with the External Memory board).
- Real Time Clock (RTC).
- Mechanical Switch Inputs.
  - Five mechanical switch inputs for Cancel Credit/Reset, Audit, Handle etc.
- Temperature Sensor.
- Interface to the stepper motor controller PCBs (stepper only).
- Interface to the Aristocrat FIP/Alphanumeric display (stepper only).
- Video System.
- Sound System.

11.4 Circuit Description

This section begins with two diagrams, a block diagram to introduce the various functional subsystems of the Main Board and component layout diagram to indicate the locations of these subsystems on the Main Board.

These diagrams are followed by a description of the following components and functions of the Main Board:

- ARM250 RISC Microprocessor
- Video
- Sound
- Keyboard Port
- Reset
- Internal I/O
- External I/O Expansion
- Memory
- Battery Backup
- Real Time Clock
- Temperature Measurement
- Key Switches
- Mechanical Security
- Machine Peripherals
- Power Supply Regulator
- Serial Ports
- Communication Configuration Board.

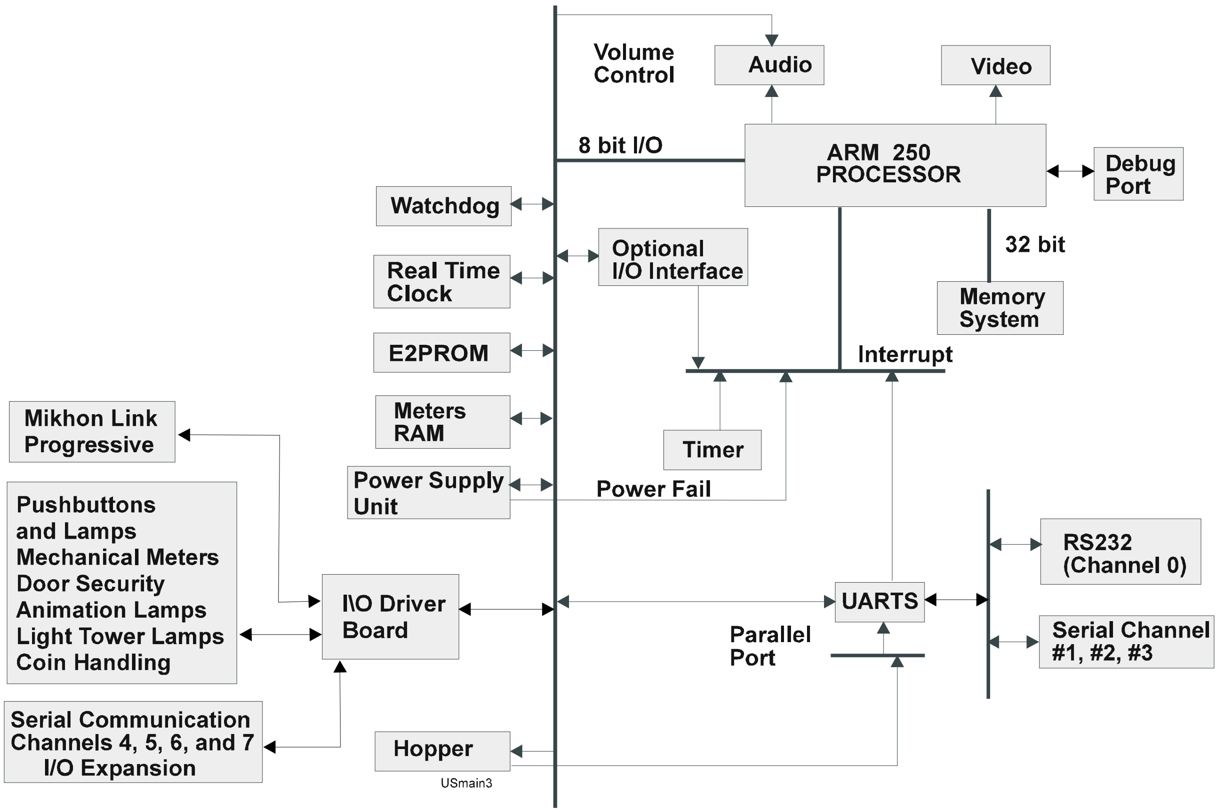

Figure 11-3 Main Board - Block Diagram

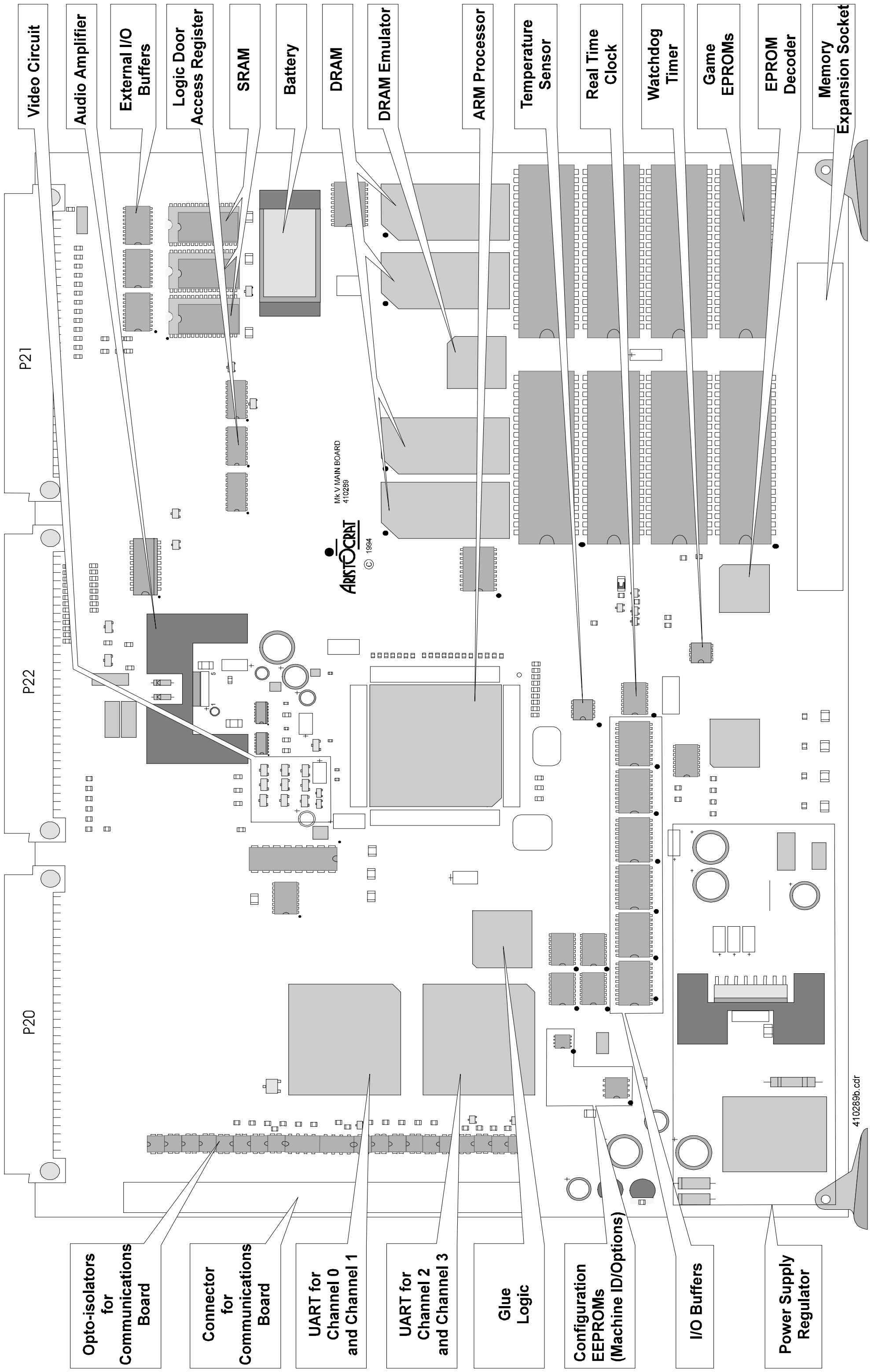

Figure 11-4 Main Board - Function Map

11.4.1 ARM250 RISC Microprocessor

The ARM250 microprocessor communicates with on board peripherals via a high speed 32 bit memory bus and an 8 bit I/O bus. The ARM250 contains the following 5 major blocks within a single chip:

- the ARM250 CPU
- I/O controller (IOC)
- video controller (VIDC)
- memory controller (MEMC)
- I/O expansion block (IOEB).

The ARM250 is a complete computer system on a chip comprising a 32-bit RISC microprocessor, a memory controller with DRAM interface, a bit-mapped video controller and an I/O controller. It is suitable for wide range of cost-sensitive embedded control, portable and consumer game applications - particularly those which require a video display.

The device is designed to drive up to 4 Mbytes of DRAM directly at 12 MHz, and at this speed it can sustain approximately 10 MIPS.

ARM250 I/O Data Bus

The ARM250 is designed to be easily interfaced to standard 8 bit peripheral chips. The majority of I/O is handled by the internal IOC block, with some extra functionality provided by the I/O Extension Block (IOEB). All I/O addresses in the ARM250 are memory mapped.

The peripheral address bus is simply the latched address lines. These are buffered to reduce loading and to avoid slowing down EPROM access.

ARM250 Diagnostic LEDs

The ARM250 has 4 open collector I/O bits. These are connected to 4 diagnostic LEDs to indicate diagnostic software status. The configuration of the circuit ensures that when the CPU is in reset, or if the software does not run, all the LEDs will be turned on. Therefore, faulty LEDs will be easily detected and not interpreted as incorrect diagnostic code.

ARM 250 Interrupt System

The interrupt system of the ARM250 functions with two main interrupts, FIQ and IRQ. Several external inputs are multiplexed internally to generate either a FIQ or IRQ interrupt.

FIQ is defined as the "fast interrupt" and is used for real time processing. IRQ is defined as the "slow interrupt" and is used for slower interrupts.

Specific registers are provided to enable the programmer to read the source of the interrupt without reading all the devices.

FIQ is of higher priority than IRQ and can interrupt an IRQ service routine. IRQ cannot interrupt FIQ. The priority of different interrupts is determined in software after reading the status registers.

I/O Expansion Port Interrupts

The I/O expansion port has 4 interrupts, `IL0`, `IF`, `FL`, and `FH0` (schematic IO_IN). Pull-up/down resistors pull unused interrupts to their inactive state. EMC filtering is provided by 1 kΩ resistors and 100 pF capacitors to prevent spurious interrupts.

ARM250 Timers

The ARM250 has 4 built-in timers. These run off a 2 MHz clock and can time intervals from 500 ns to 32.768 ms. Four primary clocks exist within the board, 72 MHz, 48 MHz, 25.175 MHz, and 32.768 kHz. All other clocks are derived from these:

- **Primary Clock.** The ARM250 uses a primary clock of 72 MHz which is internally divided to provide 36 MHz for the memory controller, 36 MHz or 24 MHz for the video, 12 MHz for the CPU, 8 MHz and 2 MHz for the I/O controller. The 72 MHz clock has a tight duty cycle specification of 45/55%.
- **System Clock.** The CPU core (ARM2aS) and memory controller (MEMC) of the ARM250 have an optional clock input to allow higher speed operation. A 48 MHz clock on the `SYSCLK` input of the ARM250 is divided by 3 giving 16 MHz CPU and memory operation.
- **Video Clock.** The video clock may be either 36 MHz, 24 MHz or an optional external crystal input. The external crystal is 25.175 MHz for VGA. The clock selected for the video clock is output on the `VIDCLK` pin and input on the `CLKVID` pin, which are normally connected together.
- **Time Clock.** The real time clock chip uses a 32.768 kHz crystal to keep time.

The 8 MHz `IOCLK` output from the ARM250 is divided by 2 to 4 MHz for the DES encryption chip (not used in the US Video Gaming Machine) and by 4096 to 1953.125 Hz for the operating system timer interrupt. The 12 MHz ARM250 keyboard clock output `CLKKB` and the 2 MHz `CLK2` IOC are not used.

11.4.2 Video

The ARM250 has a built in video controller which directly drives a monitor. The video system conforms to the IBM VGA standard (mode 2) and gives a resolution of 640 x 400 pixels with 8 bits per pixel.

Each video output signal from the ARM250 is a current sink with respect to the filtered video 5 V DC supply. The RGB signals (Red, Green and Blue) generate a voltage across a sense resistor and a common super diode, formed by a PNP transistor. The voltage across the sense circuit is converted to an output current per colour by a PNP transistor emitter follower. The RGB monitor output components are protected from transients by a three diode circuit for each colour signal. A 220 Ω load resistor limits the maximum unterminated voltage at each transistor collector; this ensures the transistor does not saturate and disturb the sense resistor signal. In normal use the RGB outputs generate an analogue 0.7 V peak signal into an external 75 Ω load. The sync signals have TTL levels.

11.4.3 Sound

The ARM250 has a built in stereo audio interface, requiring only filtering and amplification to drive a speaker. Sound data is accessed directly from DRAM and output to the audio D/A converters. The board implements a single channel of sound, because stereo is not required.

The Main Board provides monophonic audio with the following characteristics:

- Bandwidth : 200 Hz to 5.5 kHz ±10%.
- Power output: 4 W RMS.
- Frequency response shape: fourth order pole at 5.5 kHz ±10%.
- The volume is controllable via software with a resolution of 4 bits.

The power amplifier features are:

- Overload protected
- Short circuit protected
- Connected to the +24 V DC power supply.

A separate ground for the audio system has to be provided. It is connected to the digital ground (+5 V ground) and the power ground (+ 24 V ground) at one point only.

Volume Control

The volume control circuit uses a 4 bit control to give 16 levels. The lowest level turns the sound off. The 74HC4066 switch is powered from +5 V DC, and requires that the inputs are below +5 V DC at all times. The output of the previous filter stage is decoupled with a 0.1 μF capacitor and biased around 2.5 V DC.

Audio Power Amplifier

The TDA2006 audio power amplifier has overload/short circuit protection and is powered from +24 VDC. The speaker output is filtered using a surface mount ferrite bead and a 100 pF ceramic capacitor.

11.4.4 Keyboard Port

The ARM250 has a built-in serial communications port, the KART (Keyboard Asynchronous Receiver Transmitter). The KART is used only for debugging.

The data format is fixed at 8 data bits, 1 start bit, 2 stop bits and no parity. Unlike a normal UART, the KART has no data buffering.

11.4.5 Reset

The Main Board has 2 reset signals, RESETL and RESET. When reset is asserted it has a nominal period of 200 ms (guaranteed 140-280 ms).

- RESETL is the MAX705 reset output, valid for all supply voltages from 0-5 V DC. It is used in the battery backed circuits to prevent glitches during power up/down, while RESET is used every where else.
- RESET is the normal active low reset, generated by buffering RESETL. It is not valid between 0-2 V DC, as it is driven from HCMOS logic, which does not operate under 2.0 V DC.

Watchdog Timer

The MAX705 incorporates a watchdog timer to reset the Main Board if the CPU does not strobe the watchdog input with an I/O access to RDCS1. The watchdog timeout period is nominally 1.6 seconds, and is guaranteed to be 1.0 to 2.25 seconds. The manual reset input (from the BTEST gal) is asserted if the watchdog output trips (WDO) or if the external reset input is asserted.

The MAX705 voltage comparator also checks the battery voltage.

All devices that can be reset are reset to give the board a well defined power up state.

- The 74HC273 direct write registers are reset to 0x00.
- The ARM250 has 2 reset pins, RST and POR, and is reset through POR. RST is a bidirectional pin driven from POR. When POR is asserted the CPU is reset and RST is also asserted. RST is connected to the optional memory expansion board, which is reset by the Main Board reset, but can also reset the CPU by asserting RST.
- Peripheral I/O devices are reset
- I/O Expansion interface is reset
- Battery test GAL outputs are disabled.

11.4.6 Internal I/O

When an I/O access to an address between 0x3010000-0x3011FFF takes place the ARM250 I/O select pin AEN is asserted. AEN is further decoded (sheet "IODECODE") to select individual peripherals and read/write registers. The memory expansion board (P1) also uses NAEN and is responsible for selecting decode addresses that do not conflict with those on the Main Board.

I/O accesses to the static RAMs and external I/O boards use S2 and DACK respectively.

An I/O access in the range 0x3010000 to 302FFFF is a PC I/O access.

11.4.7 External I/O Expansion

Two expansion interfaces are provided:

- I/O expansion through the interface board allows two general purpose 8-bit I/O boards and one security subsystem board to be added, using 96 way DIN41612 connectors.
- The 32 bit memory expansion interface on the Main Board has a I/O port; however, this interface is primarily designed to add extra EPROM to the system.

I/O Boards

Twelve address lines are provided to access 4 kbytes of I/O space on the I/O boards. The 8 bit I/O data bus is buffered onto the I/O boards. I/O is accessed using chip select `DACK`.

Peripheral devices receive +5 V DC power from the Main Board. They may also be powered from +24 V DC.

Memory Expansion Board

The memory expansion interface has an I/O port. The I/O select line `AEN` provides for 8-bit I/O expansion, which can be used to implement bank selection page register, or any other interface.

11.4.8 Memory

The Main Board has six types of memory:

- **EPROM** contains the game software.
- **DRAM** provides memory for graphics, sound and other software requirements.
- **SRAM** provides memory for metering.
- **EEPROM** contains high reliability configuration data.
- **DRAM Emulator** (not used in the US Gaming Machine).

The Real Time Clock also contains a number of bytes of SRAM.

DRAM

The Main Board has 2 Mbyte of dynamic RAM as standard. The ARM250 can address a **maximum** of 4 Mbytes of DRAM, using its built in DRAM controller. The ARM250 directly drives the multiplexed address lines (`RA[9:0]`), row and column (`RAS`, `CAS[3:0]`) strobes, output (`OE[1:0]`), and write enable (`WE[1:0]`) signals.

The Main Board must have at least 1 Mbyte of dynamic RAM fitted, with the other 1 Mbyte being optional. Using 4 Mbit DRAMs the maximum possible (in 4 devices) is 2 Mbytes. The first bank of DRAMs is dual pitched to allow the use of 16 Mbit DRAMs allowing 4 Mbytes to be fitted in only 2 chips. As this is the maximum addressable, the second bank would not be fitted.

DRAM Emulator

This feature is not used in the US Gaming Machine. The DRAM emulator logic detects an access to the interrupt vector table and substitutes either ROM or a fixed branch instruction (to EPROM) in place of the DRAM.

EPROMs

The data bus for EPROMs is 32 bit wide. The Main Board contains sockets for 8 EPROMs, which can be configured to 1, 2, or 4 Mbit chips and each is 16 bit wide. This allows a maximum of 4 Mbytes of EPROMs, which is also the ARM250 addressing limit.

To expand the memory beyond 4 Mbytes, the on-board EPROMs can be replaced by an external memory PCB which sits onto the main board

Meters SRAM

The Main Board provides 32 kbytes of Static Random Access Memory (SRAM) with battery back-up for the electronic meters.

The SRAM contains machine metering information, recording money in/out and game history etc. It is critical that this data is preserved reliably, and various jurisdictions require multiple backups of the data.

Three standard low power SRAMs are fitted to the board. The data is usually replicated three times, so that each chip contains identical data. Each memory is checked against the other to verify that the stored data is correct.

Each chip is mapped to the same address, and the chip selected depends on the bank select register. Access is mutually exclusive, increasing security with only one chip visible in the CPU address space at a time. If the CPU crashes and overwrites memory only one of the three devices can be corrupted. On reset the bank select register selects bank 0, which does not exist. The SRAMs are at banks 1,2,3.

Each of the SRAM chips may be powered from a separate battery, further reducing the possibility of losing data. For the US Gaming Machine, a single battery provides power for all three SRAMs. This battery also powers the Real Time Clock.

EEPROMS

The Main Board has three serial EEPROMs. The minimum requirements are 128 bytes per EEPROM. The type selected is to be compatible with types providing 256 byte and 512 byte depth. Write protection is implemented with a jumper link.

Table 11-1 Serial EEPROMs Characteristics

No.	Socketed	Write protected	Comment
1	No	Yes	To replace DIP switch: surface mount version
2	Yes	No	For game options, DIP package
3	Yes	No	For network address, DIP package

Memory Expansion Port

The memory expansion port is primarily designed to add extra EPROM to the Main Board. The memory expansion PCB allows for up to 4 Mbytes of EPROM to be directly addressed together with signals to accommodate paged memory, external DRAM emulation and debug facilities. When the signal REPLACE is asserted from the expansion board it disables the on board EPROM, via address decode GAL U22.

The external memory PCB interfaces with the Main Board via a 96-way DIN41612 connector.

11.4.9 Battery Backup

The Main Board has one lithium battery for the meter SRAM and the Real Time Clock. The battery is mounted in a socket.

A resistor and diode combination in series prevents reverse charging of the battery. A lithium battery can potentially explode if reverse charged.

The Main Board includes circuitry to test the battery under microprocessor control. The test places a resistor load on the battery and checks the voltage after a short delay (about 50 ms). The load is enabled from a monostable so that a fault in the software cannot discharge the battery. The battery end life is at 2.0 V DC, below which the memory and logic is no longer guaranteed to work. The test will indicate a battery fail at 2.5 V DC.

Replacing the Battery

When the battery is changed, power will be maintained for a limited time by the decoupling capacitors. A connector is provided to allow for external battery backup during battery replacement.

A suitable replacement battery is RS part number 594-268.

CAUTION
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type. Dispose of used batteries according to the manufacturer's instructions.

CAUTION
Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

11.4.10 Real Time Clock

The Main Board uses the Dallas DS1202 Real Time Clock (RTC). It uses a standard Dallas 3 wire interface, which is shared with the Dallas temperature measuring chip (DS1620). The Real Time Clock is powered from the battery.

11.4.11 Temperature Measurement

The temperature of the Main Board is measured with a Dallas DS1620 temperature sensor. This device reads the temperature and gives a digital output accurate to ½°C. It shares the same 3 wire interface as the Dallas DS1202 RTC, using only a separate reset line. It has an operating temperature range of -55°C to +125°C.

11.4.12 Key Switches

The Main Board can monitor the status of five mechanical switch inputs: Audit Switch, Jackpot Reset Switch, Mechanical Main Door Switch, Bill Acceptor Switch, and Cashbox Switch.

11.4.12 Security

The system caters for two types of security inputs, optical and mechanical, with 8 of each. The sensor circuit is designed such that an external optional add-in security module (on the Backplane) is able to share the sensors.

This external security module has the capability of monitoring both the optical and mechanical inputs during normal operation and while the power is off. The system allows for the time stamping and logging of security events.

Optical Security

The Main Board provides the necessary circuitry to interface eight IR LED emitter/photo-transistor detector pairs. No optical security switches are used on the US Gaming Machine.

Mechanical Security

The system provides the necessary circuitry to interface eight mechanical security switches. Four of these mechanical security inputs allow for security breach detection while the power is off. When the power is on, a random number is written to a register that has battery backup. A breach of security (opening of the switch) while the power is off causes the register to reset. When the power is restored the absence of the original number indicates a security breach. The four battery-backed security inputs are typically allocated to the Main Door, Logic Cage Door, Belly Panel Door, and the Cash Box Door, and the circuitry is located on the I/O Driver Board.

Sensor sharing between the Main Board and the optional security system is accomplished by the use of diodes.

The mechanical security sensor interface has the following specification:

- Switch type: Single pole, changeover
- Secure state: normally closed
- Driving Source: +5 VDC

11.4.13 Hopper Interface

The Main Board interfaces with the Aristocrat Disc Hopper (ADH) via the Backplane. Machines may be fitted with either a hopper or a printer.

The hopper receives 24 V to power the motor and an isolated 5 V to run the logic. The isolated 5 V (VCC) is derived from the 24 V supply using a linear regulator on the I/O Driver Board. This voltage is also supplied, via the Backplane, to other peripheral boards requiring isolated 5 V.

The Main Board provides the following outputs to the ADH hopper via an optical coupler:

- HOPON - Hopper motor drive signal (+24 V DC driver output)
- HOPTEST - Hopper sensor test (driver output)
- HOPDIR - Hopper motor direction

The following outputs from the ADH hopper are received by the I/O Driver Board:

- HOPCOIN - Coin output from hopper photo-optic detector
- HOPHIGH - Hopper high (full) probe

Hopper Outputs

The hopper outputs HOPON and HOPTEST share a common interface. The driver enables these outputs to sink up to 700 mA, and is fully protected.

The HOPDIR output is driven from a 74HC273 through an opto, but has no power driver output. It does not need consideration, as there is no load or connection.

Hopper Inputs

The hopper inputs HOPCOIN and HOPHIGH also share a common interface. A capacitor filters the input, protecting it against high energy noise.

11.4.14 Coin Handling System

The Main Board interfaces with the coin chute assembly via the Backplane. The I/O Driver Board provides a regulated 12 V DC ±5% power supply for the coin comparator. The following coin handling signals are processed by the Main Board:

- CC-62 Sense (CVP0)
- CC-62 Credit (CVP1)
- CC-62 Error (CVP2)
- CC-62 Inhibit (CVP3)

All inputs have EMC R/C filtering, with a cut off frequency of 3.4 kHz.

Coin Diverter Solenoid

The coin diverter solenoid receives 24 V DC power and the signal SOLDIV from the Main Board. The solenoid optic sends the signal SOLOPT to the Main Board. The diverter solenoid output circuit has the following specifications:

- Switches 200 mA at 24 V
- Open collector NPN (low side drive) output
- Short circuit protected (up to +24 V)
- Diode protected against back EMF

For details relating to the coin comparator and coin diverter solenoid, refer to the chapter Coin Handling System.

11.4.15 Interface with the Power Control System

Power Lines

The Main Board receives +24 V DC from the power control assembly and 5 V DC (VCC) from the I/O Driver Board, via the Backplane. These inputs are EMC filtered using ferrite beads and ceramic capacitors.

The +24 V is supplied to the:

- Audio power amplifier
- Coin handling modules
- Bill acceptor
- Printer (if fitted)
- Mechanical meters (if fitted)
- Handle (if fitted)

The 5 V DC is used to power the Main Board logic. This voltage is also supplied to peripheral boards requiring 5 V.

The Main Board uses a Switched Mode Power Supply (SMPS) to generate an isolated +/-12 V DC supply from the 24 V. This +/-12 V DC is supplied to the communications channels.

The Main Board receives the signal PFAIL from the power supply assembly. This signal provides a warning to the system of imminent mains failure, allowing enough time for mechanical meters to finish counting and for the CPU to back up the audit data held in the machine RAM before the power shuts down.

The power supply has overcurrent protection for current > 6.5 A for +5.1 V. The power supply is 'folded back' when overloaded. Power is resumed once the overload is removed.

All outputs are protected from short circuit. The power is resumed after removal of the short circuit. The power supply also shuts down if the junction temperature of the regulator reaches 150°C.

11.4.16 DES Encryption

The Main Board may be fitted with an encryption IC. This feature is not used in the USA Gaming Machine.

11.4.17 Serial Ports

The Main Board provides four serial channels, referred to as COM 0 to COM 3, which may be used to communicate with peripheral equipment and external network interfaces. The serial channels are implemented via two PC compatible DUARTs. The serial debug channel is implemented on the ARM250 and is described elsewhere.

COM 0 has a non-isolated interface and is currently not used. It is reserved for future RS232 communications with a touchscreen. COM 1 to COM 3 is fully isolated and is configurable via the Communications Configuration Board (CCB).

The serial ports are implemented using two industry standard 16C452 UARTs. Each of the three generic serial channels (COM 1 to COM 3) has 1 receive data, 1 transmit data, 3 input and 3 output handshake lines.

The maximum baud rate supported is 9600 baud, except on channel 2 which uses fast optocouplers.

The Extended I/O Driver Board provides four additional serial channels, referred to as COM 4 to COM 7.

11.4.18 Communication Configuration Board

A complete description of the Communications Configuration Board is provided in a separate chapter.

COM 1 to COM 3 are interfaced through the Communications Configuration Board (CCB) plugged into the 72 pin SIMM socket on the Main Board. The CCB converts the opto-coupled UART I/O to any of the following signal levels:

- Bally-SDS and RS-232
- Bill acceptor interface
- Serial Printer
- TTL compatible level
- DACOM 5000
- Other

11.5 Removal and Replacement Procedures

CAUTION
When handling electrostatic sensitive devices (ESDs) such as PCBAs, take care to avoid physical contact with components. Do not place ESDs on metal surfaces. PCBAs should be handled by their edges. Care must be taken to avoid flexing the PCBA, as this may lead to physical damage.

Removal

To remove the Main Board:

1. Open the cabinet door, and switch OFF the machine.
2. Open the logic cage door.
3. Standard Electrostatic Discharge (ESD) prevention procedures should be followed when handling PCBAs.
4. Lever the Main Board out of the runners using the board extractors, and withdraw the board from the logic cage.
5. The Main Board should be placed in an antistatic bag immediately.

Note
A fault tag must be placed on any faulty boards.

Replacement

Replacement is a reversal of the removal procedure. Both sides of the replacement PCBA should be inspected for any signs of physical damage.

11.6 Main Board Input/Output Connectors

11.6.1 Communications Configuration Board

The Communications Configuration Board connects to the 72-pin SIMM socket P23 on the Main Board.

Pin	Pin Name	IC-Pin No.	Description
1	CFG2	U28-3	DTR0 output signal through opto emitter
2	GNDI		Ground
3	CFG4	U147-3	RTS1 output signal through opto emitter
4	CFG1	U28-4	DTR0 output signal through opto collector
5	SIN1	P20-A1	Input from channel 1 connector
6	CFG3	U147-4	RTS1 output signal through opto collector
7	SOUT1	P20-A12	Output to channel 1 connector
8	CFG6	U145-3	DTR1 output signal through opto emitter
9	CTS1	P20-A2	Input from channel 1 connector
10	CFG5	U145-4	DTR1 output signal through opto collector
11	DSR1	P20-C3	Input from channel 1 connector
12	CFG8	U146-3	SOUT1 output signal through opto emitter
13	CFG7	U146-4	SOUT1 output signal through opto collector
14	CFG10	U142-2	CTS1 input signal through opto cathode
15	I1	P20-A3	Input from channel 1 connector
16	CFG11	U144-1	DSR1 input signal through opto anode
17	CFG9	U142-1	CTS1 input signal through opto anode
18	CFG12	U144-2	DSR1 input signal through opto cathode
19	RTS1	P20-C4	Output to channel 1 connector
20	CFG13	U143-1K	SIN1 input signal through opto anode
21	DTR1	P20-B4	Output to channel 1 connector
22	CFG14	U143-2	SIN1 input signal through opto cathode
23	O1	P20-4	Output to channel 1 connector
24	P12VI		+12v power
25	CFG20	U131-3	RTS2 output signal through opto emitter
26	N12VI		-12v power
27	CFG19	U131-4	RTS2 output signal through opto collector
28	GNDI		Ground
29	CFG18	U75-5	SOUT2 output signal through opto emitter
30	CFG17	U75-6	SOUT2 output signal through opto collector
31	CFG16	U75-7	SOUT2 output signal through opto base
32	CFG15	U75-8	Opto Vcc
33	SIN2	P20-A5	Input from channel 2 connector
34	CFG22	U132-3	DTR2 output signal through opto emitter
35	SOUT2	P20-C6	Output to channel 2 connector
36	CFG29	U74-2	SIN2 input signal through opto anode
37	CTS2	P20-A6	Input from channel 2 connector
38	CFG30	U74-3	SIN2 input signal through opto cathode
39	DSR2	P20-C7	Input from channel 2 connector
40	CFG21	U132-4	DTR2 output signal through opto collector
41	I2	P20-A7	Input from channel 2 connector
42	CFG31	U136-1	CTS2 input signal through opto anode
43	RTS2	P20-C8	Output to channel 2 connector
44	CFG32	U136-2	CTS2 input signal through opto cathode
45	DTR2	P20-B8	Output to channel 2 connector
46	CFG33	U137-1	DSR2 input signal through opto anode
47	O2	P20-A8	Output to channel 2 connector
48	P12VI		+12v power

Pin	Pin Name	IC-Pin No.	Description
49	CFG34	U139-2	DSR2 input signal through opto cathode
50	GNDI		Ground
51	CFG24	U133-3	RTS3 output signal through opto emitter
52	N12VI		-12v power
53	SIN3	P20-A9	Input from channel 3 connector
54	CFG23	U133-4	RTS3 output signal through opto collector
55	SOUT3	P20-C10	Output to channel 3 connector
56	CFG26	U134-3	DTR3 output signal through opto emitter
57	CFG25	U134-4	DTR3 output signal through opto collector
58	CFG28	U135-3	SOUT3 output signal through opto emitter
59	CTS3	P20-A10	Input from channel 3 connector
60	CFG27	U135-4	SOUT3 output signal through opto collector
61	CFG35	U138-1	CTS3 input signal through opto anode
62	CFG36	U138-2	CTS3 input signal through opto cathode
63	DSR3	P20-C11	Input from channel 3 connector
64	CFG37	U140-1	DSR3 input signal through opto anode
65	I3	P20-A11	Input from channel 3 connector
66	CFG38	U140-2	DSR3 input signal through opto cathode
67	RTS3	P20-C12	Output to channel 3 connector
68	CFG39	U139-1	SIN3 input signal through opto anode
69	DTR3	P20-B12	Output to channel 3 connector
70	CFG40	U139-2	SIN3 input signal through opto cathode
71	O3	P20-A12	Output to channel 3 connector
72	GNDI		Ground

11.6.2 MkV Main Board / Backplane Connectors

The MkV Main Board interfaces with the other peripheral devices via the Backplane Board through three 96 pin DIN41612 connectors.

Mainboard/Backplane DIN, JP20/P20

JP20 on the Backplane board connects to P20 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	SIN1	P13-3	SIN1	Receive data, serial channel 1 (BACC DATA)
B1	N12VI	N12VI	N12VI	-12V from mainboard, isolated
C1	-	-	NC	-
A2	CTS1	P13-15	CTS1	Handshake Input 0, serial channel 1 (BACC SERVICE)
B2	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C2	SOUT1	P13-1	SOUT1	Transmit Data, serial channel 1 (Used for loopback testing to DTR1)
A3	I1	P13-17	I1	Handshake Input 2, serial channel 1 (LED ANODE)
B3	P12VI	P12VI	P12VI	+12V from mainboard, isolated
C3	DSR1	P13-16	DSR1	Handshake Input 1, serial channel 1 (INTERRUPT)
A4	-	-	Not Used	Handshake Output 2, serial channel 1
B4	DTR1	P13-20	DTR1	Handshake Output 1, serial channel 1 (SEND)
C4	RTS1	P13-19	RTS1	Handshake Output 0, serial channel 1 (ACCEPT ENABLE)
A5	SIN2	P23-11 P18-3 P19-2	SIN2	Receive data, serial channel 2 (232 TX - uP RX)
B5	N12VI	N12VI	N12VI	-12V from mainboard, isolated
C5	-	-	NC	-
A6	CTS2	P23-22	CTS2	Handshake Input 0, serial channel 2 (232 CTS)
B6	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C6	SOUT2	P23-10 P18-2 P19-3	SOUT2	Transmit data, serial channel 2 (232 RX - uP TX)
A7	I2	P23-23 P18-4	I2	Handshake Input 2, serial channel 2 (BALLY TX - uP RX)
B7	P12VI	P12VI	P12VI	+12V from mainboard, isolated
C7	-	-	Not Used	Handshake Input 1, serial channel 2
A8	O2	P23-9 P18-1	O2	Handshake Output 2, serial channel 2 (BALLY RX - uP TX)
B8	-	-	Not Used	Handshake Output 1, serial channel 2
C8	RTS2	P23-21	RTS2	Handshake Output 0, serial channel 2 (232 RTS)
A9	SIN3	P7-18	SIN3	Receive data, serial channel 3 (PRINTER TX - uP RX)
B9	N12VI	N12VI	N12VI	-12V from mainboard, isolated
C9	-	-	NC	-
A10	CTS3	P7-9	CTS3	Handshake Input 0, serial channel 3
B10	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C10	SOUT3	P7-19	SOUT3	Transmit data, serial channel 3 (PRINTER RX - uP TX)
A11	-	-	Not Used	Handshake Input 2, serial channel 3
B11	P12VI	P12VI	P12VI	+12V from mainboard, isolated
C11	DSR3	P7-15	DSR3	Handshake Input 1, serial channel 3

A12	-	-	Not Used	Handshake Output 2, serial channel 3
B12	DTR3	P7-16	DTR3	Handshake Output 1, serial channel 3
C12	RTS3	P7-8	RTS3	Handshake Output 0, serial channel 3
A13	COMS_RESET	J3-C13	COMS_RESET	Communications ports reset
B13	-	-	NC	-
C13	-	-	NC	-
A14	-	-	NC	-
B14	-	-	NC	-
C14	-	-	NC	-
A15	-	-	NC	-
B15	-	-	NC	-
C15	-	-	NC	-
A16	-	-	NC	-
B16	-	-	NC	-
C16	-	-	NC	-
A17	-	-	Not Used	Data from meter board
B17	-	-	Not Used	Gnd
C17	-	-	Not Used	Data from top box
A18	-	-	Not Used	Serial data input to main logic from serial input driver. Open collector output.
B18	-	-	Not Used	Gnd
C18	-	-	Not Used	Serial data input to main logic from serial output driver. Open collector output.
A19	-	-	Not Used	SPI reset signal
B19	-	-	Not Used	Gnd
C19	-	-	Not Used	Data output to meter board
A20	-	-	Not Used	Serial clock
B20	-	-	Not Used	Gnd
C20	-	-	Not Used	Reset signal to meter board
A21	-	-	Not Used	Strobe signal to meter board
B21	-	-	Not Used	Gnd
C21	-	-	Not Used	Serial output enable to top box
A22	-	-	Not Used	Serial output enable #5 which selects SPI output driver.
B22	-	-	Not Used	Gnd
C22	-	-	Not Used	Serial output enable #4 which selects SPI input driver.
A23	-	-	Not Used	Overcurrent sensor output, hopper
B23	-	-	Not Used	Gnd
C23	-	-	NC	-
A24	-	-	Not Used	Hopper high probe, Detects hopper full, hopper
B24	-	-	Not Used	Gnd
C24	-	-	Not Used	Coin output detector, hopper
A25	-	-	Not Used	Hopper motor direction, hopper
B25	-	-	Not Used	Gnd
C25	-	-	Not Used	Detects hopper low, hopper
A26	-	-	Not Used	Hopper Sensor Test output, hopper
B26	-	-	Not Used	Gnd
C26	-	-	Not Used	Hopper motor drive, hopper
A27	-	-	NC	-
B27	-	-	Not Used	Gnd
C27	-	-	Not Used	P5V
A28	-	-	Not Used	EPSU2SND
B28	-	-	Not Used	Gnd
C28	-	-	Not Used	/EPSU2OVR
A29	-	-	Not Used	ESPARE01
B29	-	-	Not Used	Gnd
C29	-	-	Not Used	/EHANDLE

A30	-	-	Not Used	PS2 section, +22V
B30	-	-	Not Used	Gnd
C30	-	-	Not Used	PS2 section, +22V
A31	-	-	Not Used	EMIKOHNP
B31	-	-	Not Used	PS2 section, +9V
C31	-	-	Not Used	PS2 section, +9V
A32	-	-	NC	-
B32	-	-	Not Used	Gnd
C32	-	-	Not Used	EMIKOHNN

Mainboard/Backplane DIN, JP22/P22

JP22 on the Backplane Board connects to P22 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	HOPTEST	P7-12	HOPTEST	Hopper Sensor Test output, hopper
B1	GNDI	GND	GND	Gnd
C1	HOPON	P7-4	HOPON	Hopper motor drive, hopper
A2	AUSW	P13-5	AUSW	mech. switch, AUDIT RESET
B2	SOLDIV	P14-9	SOLDIV	Coin Divert Drive (NPN trans. to GND)
C2	JPBELL	P13-4	JPBELL	Jackpot Bell
A3	MECHSW	P13-7	MECHSW	Mechanical Door Switch
B3	GNDI	GND	GND	Gnd
C3	CBOXSW	P13-6	CBOXSW	Mechanical Security Switch - cash box door
A4	CCSEN	P14-10	CCSEN	CC62 Coin output
B4	JPSW	P13-8	JPSW	mech. switch, JACKPOT RESET
C4	BASW	P14-20	BASW	Mechanical Security Switch - BACC door
A5	CCERROR	P14-19	CCERROR	Coin Error
B5	GNDI	GND	GND	Gnd
C5	CC_CRED	P14-7	CC_CRED	Valid Coin Input
A6	-	-	Not Used	solid state relay for ballast and monitor On/Off
B6	-	-	Not Used	S7 Coin output
C6	SOLOPT	P14-15	SOLOPT	Solenoid Optic
A7	232TxD0	P4-14	RS232TX	serial 0, nonisolated transmitter
B7	GNDI	GND	GND	PS1 section, ground 24V
C7	-	-	Not Used	Serial Transmit Data out
A8	232RxD0	P4-7	RS232RX	serial 0, nonisolated receiver
B8	-	-	Not Used	nonisolated handshake Output 0, serial channel 0
C8	-	-	Not Used	nonisolated handshake Input 0, serial channel 0
A9	GNDI	GND	GND	Gnd
B9	VGA_red	P4-4	RED	Red, video
C9	DACVSS_RED	P4-3	GND_RED	red colour signal ground
A10	VGA_blue	P4-6	BLUE	Blue, video
B10	DACVSS_GREEN	P4-11	GND_GREEN	Green colour signal ground
C10	VGA_green	P4-12	GREEN	Green, video
A11	DACVSS_BLUE	P4-5	GND_BLUE	Blue colour signal ground
B11	VSYNC	P4-9	VSYNC	Vsync, video
C11	DACVSS_SYNC	P4-8	GND_SYNC	synchro signal ground
A12	MLSPKR	P5-1, P12-21	SPEAKER	Audio output

B12	GNDI	GND	GND	Gnd
C12	HSYNC	P4-1	HSYNC	Hsync, video
A13	RSPKR	P5-3	SPEAKER2	Audio output to speaker 2
B13	SGND	P5-2, P12-22	SPKRGND	speaker signal ground, connected with PS1 ground on MkV only
C13	P24VSND	24V	P24VSND	PS1 24V, single track on PCB
A14	LGND	LGND	GND	Gnd
B14	L5VDC	L5VDC	VCC	5V
C14	LGND	LGND	GND	Gnd
A15	L5VDC	L5VDC	VCC	5V
B15	LGND	LGND	GND	Gnd
C15	P5VI	VCC	VCC	+5V from driver, converted from 24V
A16	LGND	LGND	GND	Gnd
B16	P5VI	VCC	VCC	+5V from driver, converted from 24V
C16	LGND	LGND	GND	Gnd
A17	P5VI	VCC	VCC	+5V from driver, converted from 24V
B17	LGND	LGND	GND	Gnd
C17	P5VI	VCC	VCC	+5V from driver, converted from 24V
A18	DIGCSYNC	P6-3	NC	Sync for low res. composite video
B18	TxD0	P1-2	KOUT	Serial data OUTPUT from ARM250 - keyboard debug
C18	RxD0	P1-1	KIN	Serial data INPUT from ARM250 - keyboard debug
A19	DIGGREEN	P6-1	NC	-
B19	GNDI	GND	GND	Gnd
C19	DIGRED	P6-7	NC	-
A20	-	-	NC	-
B20	-	-	NC	-
C20	DIGBLUE	P6-8	NC	-
A21	-	-	NC	-
B21	GNDI	GND	GND	Gnd
C21	-	-	NC	-
A22	-	-	NC	-
B22	-	-	NC	-
C22	-	-	NC	-
A23	-	-	NC	-
B23	GNDI	GND	GND	Gnd
C23	-	-	NC	-
A24	L12VDC	L12VDC	NC	12V (sx only)
B24	-	-	NC	-
C24	-	-	NC	-
A25	-	-	NC	-
B25	GNDI	GND	GND	Gnd
C25	-	-	NC	-
A26	-	-	not used	External battery backup
B26	-	-	not used	external reset
C26	NPFAIL	P17-14	NPFAIL	power fail signal, active low
A27	-	-	not used	emitter of link progressive for DACOM3000
B27	GNDI	GND	GND	Gnd
C27	-	-	NC	-
A28	CCINH	P14-6	CCINH	CC62 Inhibit
B28	-	-	not used	Current control for winding 2
C28	-	-	NC	-

A29	HOPDIR	P7-13	HOPDIR	Hopper motor direction, hopper
B29	GNDI	GND	GND	Gnd
C29	-	-	not used	Current control for winding 2
A30	-	-	not used	Phase winding 1 + lamp 1 test
B30	-	-	not used	Phase winding 2 + lamp 2 test
C30	-	-	not used	Current control for winding 1 + lamp3
A31	-	-	not used	For reel selection
B31	GNDI	GND	GND	Gnd
C31	-	-	not used	For reel selection
A32	-	-	not used	Strobe for latching the lamps
B32	-	-	not used	For reel selection
C32	-	-	not used	Strobe for latching the motor

Mainboard/Backplane DIN, JP21/P21

JP21 on the Backplane Board connects to P21 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	-	-	not used	mech. switch, JACKPOT RESET
B1	GNDI	GND	GND	Gnd
C1	-	-	not used	mech. switch, AUDIT RESET
A2	-	-	not used	mech. switch, spare
B2	-	-	not used	mech. switch, spare
C2	-	-	not used	mech. switch, spare
A3	-	-	NC	-
B3	GNDI	GND	GND	Gnd
C3	-	-	NC	-
A4	-	-	not used	Logic Door Security Switch 7 contact - NC
B4	-	-	not used	Door security detector output, no driver/buffer exists.
C4	DOPTOUT	P14-5	DOPTOUT	Door Optic Output
A5	-	-	not used	Emitter 1 drive signal, Security 1
B5	GNDI	GND	GND	Gnd
C5	-	-	not used	Logic Door Security Switch 7 contact - NO
A6	-	-	not used	Mechanical Security Switch 1 contact - NO
B6	-	-	not used	Mechanical Security Switch 1 contact - NC
C6	-	-	not used	Receiver 1 Sense signal, security 1
A7	-	-	not used	Receiver 2 Sense signal, security 2
B7	GNDI	GND	GND	Gnd
C7	-	-	not used	Emitter 2 Drive signal, security 2
A8	-	-	not used	Emitter 3 Drive signal, security 3
B8	-	-	not used	Mechanical Security Switch 2 contact - NO
C8	-	-	not used	Mechanical Security Switch 2 contact - NC
A9	-	-	not used	Mechanical Security Switch 3 contact - NC
B9	GNDI	GND	GND	Gnd
C9	-	-	not used	Receiver 3 Sense signal, security 3

A10	-	-	not used	Receiver 4 Sense signal, security 4
B10	-	-	not used	Emitter 4 Drive signal, security 4
C10	-	-	not used	Mechanical Security Switch 3 contact - NO
A11	-	-	not used	Emitter 5 Drive signal, security 5
B11	GNDI	GND	GND	Gnd
C11	-	-	not used	Mechanical Security Switch 4 contact - NC
A12	-	-	not used	Emitter 6 Drive signal, security 6
B12	-	-	not used	Mechanical Security Switch 5 contact - NC
C12	-	-	not used	Receiver 5 Sense signal, security 5
A13	-	-	not used	Mechanical Security Switch 6 contact - NC
B13	GNDI	GND	GND	Gnd
C13	-	-	not used	Receiver 6 Sense signal, security 6
A14	-	-	not used	Mechanical Security Switch 7 contact - NC
B14	-	-	not used	Receiver 7 Sense signal, security 7
C14	-	-	not used	Emitter 7 Drive signal, security 7
A15	-	J2-A6	IRQDMON	Demon Interrupt Line
B15	GNDI	GND	GND	Gnd
C15	NC	-	NC	-
A16	VBAT	J2-B4	VBAT	Battery Backup Voltage
B16	-	-	NC	-
C16	-	-	not used	Spare IO
A17	-	-	not used	CPU, read not write signal
B17	GNDI	GND	GND	Gnd
C17	-	-	NC	-
A18	IRQ12	J3-C23	NEIF	CPU, IF interrupt
B18	IRQ11	J3-C21	NEFHO	CPU, FH0 interrupt
C18	-	J2-B5	NDACK	CPU, data acknowledge
A19	IRQ5	J3-C22	NEFL	CPU, FL interrupt
B19	GNDI	GND	GND	Gnd
C19	IRQ14	J2-A5	NEIL0	CPU, IL0 interrupt
A20	CPURST	J2-B7	NERESET	CPU, external reset output
B20	-XIOW	J2-A7	NEIOW	CPU, IO write signal
C20	-XIOR	J2-B6	NEIOR	CPU, IO read signal
A21	-	-	not used	CPU, address bus 13
B21	GNDI	GND	GND	Gnd
C21	SERCLK	J2-A8	ECLK8M	CPU, clock signal
A22	-CHIPDEC1	J2-B11	EA10	CPU, address bus
B22	-CHIPDEC2	J2-A11	EA11	CPU, address bus 11
C22	-CHIPDEC3	J2-B10	EA12	CPU, address bus 12
A23	SA6	J2-B12	EA8	CPU, address bus
B23	GNDI	GND	GND	Gnd
C23	-ARESET	J2-A12	EA9	CPU, address bus
A24	SA3	J2-A14	EA5	CPU, address bus
B24	SA4	J2-B13	EA6	CPU, address bus
C24	SA5	J2-A13	EA7	CPU, address bus
A25	SA1	J2-A15	EA3	CPU, address bus
B25	GNDI	GND	GND	Gnd
C25	SA2	J2-B14	EA4	CPU, address bus
A26	-	-	NC	-
B26	-	-	NC	-
C26	SA0	J2-B15	EA2	CPU, address bus
A27	-	-	NC	-
B27	GNDI	GND	GND	Gnd

C27	-	-	NC	-
A28	SD5	J2-A19	ED5	CPU, data bus
B28	SD6	J2-B18	ED6	CPU, data bus
C28	SD7	J2-A18	ED7	CPU, data bus
A29	SD3	J2-A20	ED3	CPU, data bus
B29	GNDI	GND	GND	Gnd
C29	SD4	J2-B19	ED4	CPU, data bus
A30	SD0	J2-B21	ED0	CPU, data bus
B30	SD1	J2-A21	ED1	CPU, data bus
C30	SD2	J2-B20	ED2	CPU, data bus
A31	GNDI	GND	GND	Gnd
B31	P24VI	24V	24V	+24V
C31	GNDI	GND	GND	Gnd
A32	P24VI	24V	24V	+24V
B32	GNDI	GND	GND	Gnd
C32	P24VI	24V	24V	+24V

Chapter 12

MkV/SX US Backplane -- 410351

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12.1 Physical Description

The Backplane distributes signals between the Main Board, I/O Driver Board, and all peripheral sub-systems.

The Backplane in the USA 540 MVP gaming machine is designed for use with either the US Poker Depopulated MkV Main Board and Extended US Poker MkV I/O Driver Board or, alternatively, with the SX Main Board and SX I/O Driver Board.

The possible machine configurations are shown in Table 12-1 below.

Table 12-1 Backplane Configuration

Name	PCB	PCB Assembly
MkV/SX US Backplane Board	0801-410350	2501-410351
US Poker MkV Main Board	0801-410091	2501-410289
Extended US Poker MkV I/O Driver Board	0801-410354	2501-410355
	o r	
Name	**PCB**	**PCB Assembly**
MkV/SX US Backplane Board	0801-410350	2501-410351
SX Main Board	0801-410340	2501-410341
SX I/O Driver Board	0801-410342	2501-410343

The Mk V/SX Backplane is a printed circuit board assembly (PCBA) mounted vertically at the rear of the cabinet, partly behind the logic cage (see Figure 12-1). The Backplane mounts onto standoffs which are studded onto the back wall of the logic cage.

The Backplane is fitted with two types of connectors: Minifit Junior and DIN. The Main Board and I/O Driver Board are inserted directly onto the Backplane. Peripheral subsystems are connected to the Backplane via ribbon cables or wire looms. The layout of the connectors on the Backplane is shown in Figure 12-2.

12.1.1 Diagrams and Component Locations

For further information and for reference, the following additional information on the Backplane Board is provided in Volume II:

- **Circuit diagrams.** Structured circuit diagrams.
- **I/O to Components and ICs.** A list of the I/O paths to each component and integrated circuit (IC) pin position.

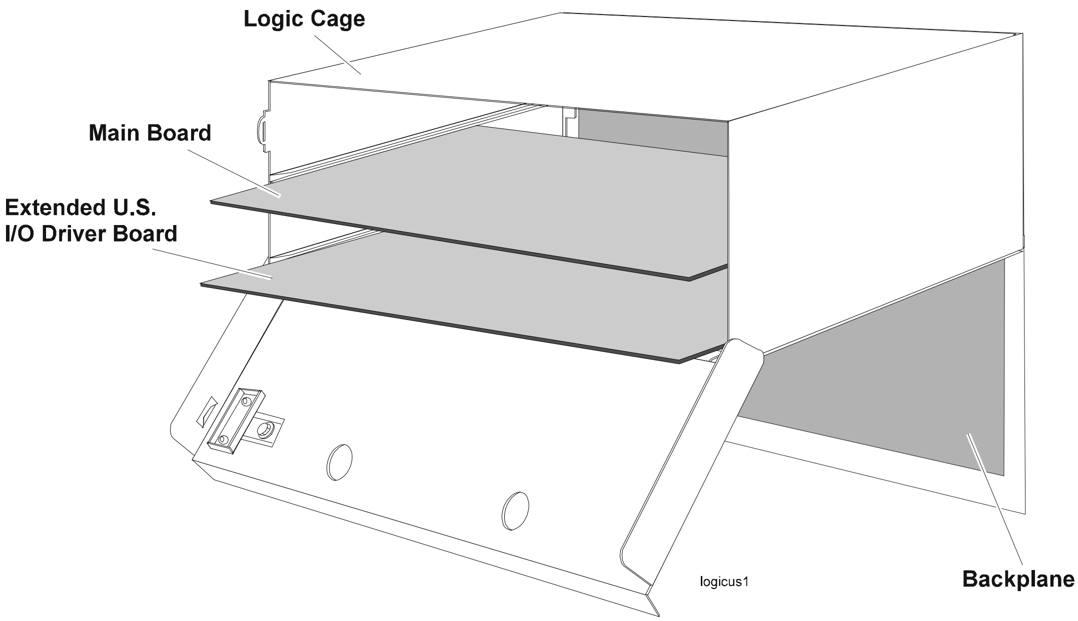

Figure 12-1 Backplane Location

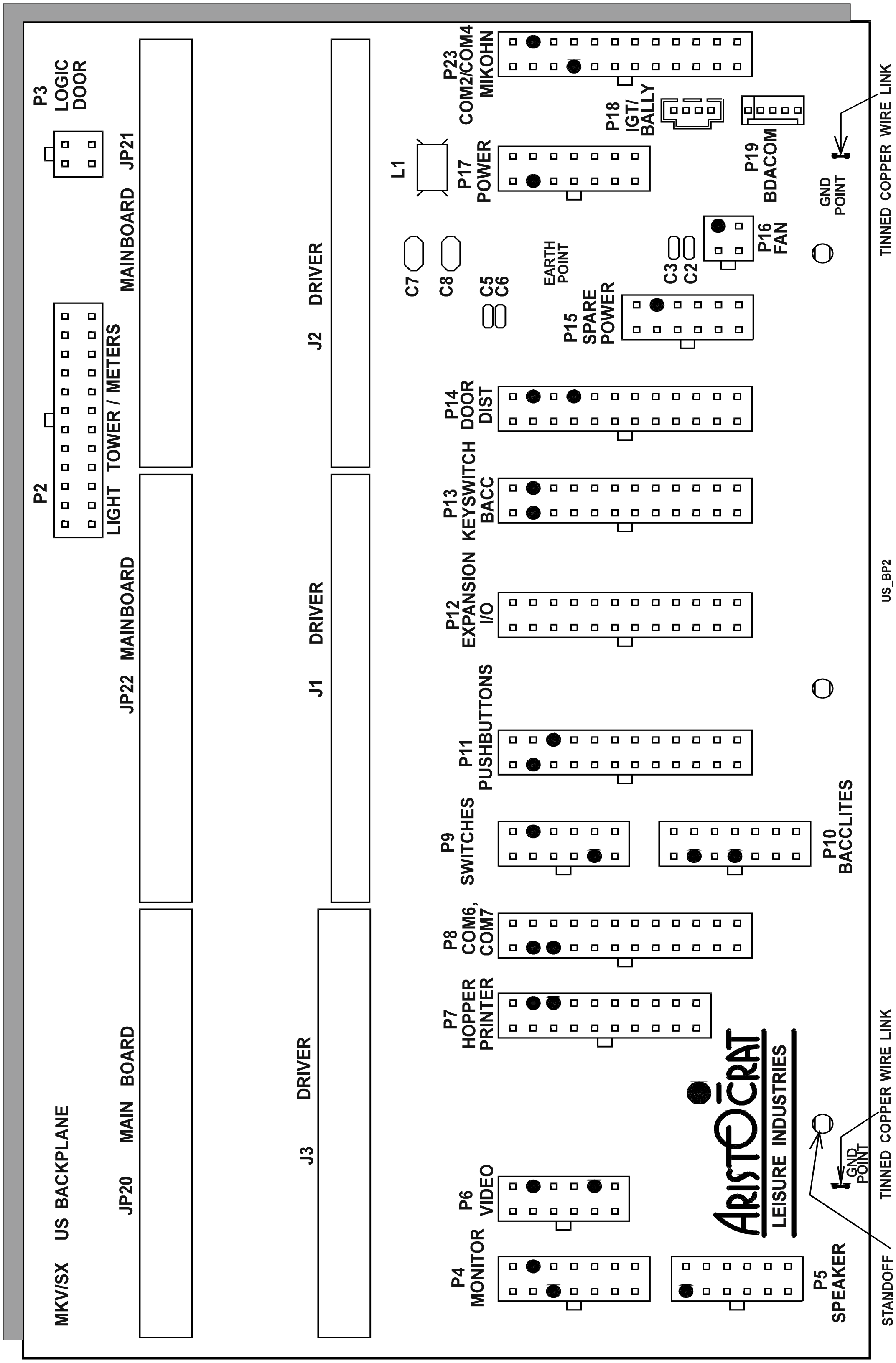

Figure 12-2 Backplane Component Location

12.2 System Overview

The Backplane Board is used to electrically connect the following boards and I/O peripheral devices (depending on machine configuration) used in the Mk 5 Series II machine:

- Depopulated MkV Main Board or SX Main Board
- Extended MkV I/O Driver Board or SX I/O Driver Board
- Video Monitor / Touchscreen
- Pushbuttons and Pushbutton lamps
- Mechanical Meters
- Light Tower
- Power Supply
- Animation Lamps
- Coin Handling System
- Bill Acceptor (GL5/232)
- Speakers
- Jackpot / Audit Keyswitches
- Mechanical and Optical Switches
- Hopper or Printer
- Cooling Fan
- Mikohn Progressives (RS-422)
- IGT SAS+ / Bally SDS / RS232 / ASP 1000 Head System
- Broadcast DACOM
- VLC Head System
- Spare Power Connector
- Two Spare Serial Ports (via one connector)
- Debug Port

The Backplane Board has the following physical connectors:

- three 96 way DIN41612 connectors used to electrically connect the (MkV or SX) Main Board to the Backplane Board.
- two 64 way DIN41612 connectors and one 96 way DIN41612 connector used to electrically connect the (Extended MkV or SX) I/O Driver Board to the Backplane Board.
- A 4 way Molex connector is used for IGT SAS+ (PT95A) and Bally SDS compatibility.
- A 5 way Mascon connector is used for Broadcast DACOM compatibility.
- Minifit Junior connectors are used for the rest of the connectors. The main reason for using Minifit Junior type connectors is because of their current-handling capacity and to simplify looming.

The accessible Minifit Junior connectors on the Backplane will be keyed to reduce the possibility of incorrect connection during machine configuration.

12.2.1 Electrical Connections

The Backplane electrically and mechanically connects the boards and connectors listed in the table below. Circuit diagrams of the Backplane are provided in Appendix B.

Table 12-2 Backplane Connections

Designator	Function	Connector Type
P1 *	Keyboard In/Out	4 Way Minifit
P2	Light Tower Mechanical Meters	24 Way Minifit
P3	Logic Door	4 Way Minifit
P4	Monitor Touchscreen	14 Way Minifit
P5	Speakers (stereo and shielded cable)	12 Way Minifit
P6	Low Res. Video	12 Way Minifit
P7	Hopper Printer	20 Way Minifit
P8	Com6 and Com7 serial I/O ports	24 way Minifit
P9	Power-down detection	12 way Minifit
P10	Bill Acceptor Lights	14 Way Minifit
P11	Pushbuttons & Pushbutton Lamps	24 Way Minifit
P12	Expansion I/O	24 Way Minifit
P13	Jackpot Key Audit Key Main Door Switch Door Detector Cashbox Bill Acceptor	24 Way Minifit
P14	Animation Lamps Coin Comparator Solenoid Optic Diverter Solenoid Bill Acceptor Switch Speaker 1 Door Emitter	24 Way Minifit
P15	Spare / Auxiliary Power	12 Way Minifit
P16 *	Fan	4 Way Minifit
P17	Power Supply	14 Way Minifit
P18	IGT SAS+ (PT95A) or Bally SDS Head System	Molex 70543-0003
P19	Broadcast DACOM Head System	5 way Mascon
P23	Com2 Com4 = Mikohn	24 Way Minifit
JP20,JP21, JP22	MkV Main Board & SX Main Board	DIN41612 96 pin vertical female
J1,J2	MkV I/O Driver Board & SX I/O Driver Board	DIN41612 64 pin vertical female
J3	SX I/O Driver Board	DIN41612 96 pin vertical female

* Optional Connectors

12.3 Description of Connectors

12.3.1 MkV Depopulated Main Board

The MkV Depopulated Main Board interfaces with the other peripheral devices via the Backplane through three 96 pin DIN41612 connectors.

Main Board/Backplane DIN, JP20/P20

JP20 on the Backplane board connects to P20 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	SIN1	P13-3	SIN1	Receive data, serial channel 1 (BACC DATA)
B1	N12VI	N12VI	N12VI	-12V from Main Board, isolated
C1	-	-	NC	-
A2	CTS1	P13-15	CTS1	Handshake Input 0, serial channel 1 (BACC SERVICE)
B2	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C2	SOUT1	P13-1	SOUT1	Transmit Data, serial channel 1 (Used for loopback testing to DTR1)
A3	I1	P13-17	I1	Handshake Input 2, serial channel 1 (LED ANODE)
B3	P12VI	P12VI	P12VI	+12V from Main Board, isolated
C3	DSR1	P13-16	DSR1	Handshake Input 1, serial channel 1 (INTERRUPT)
A4	-	-	Not Used	Handshake Output 2, serial channel 1
B4	DTR1	P13-20	DTR1	Handshake Output 1, serial channel 1 (SEND)
C4	RTS1	P13-19	RTS1	Handshake Output 0, serial channel 1 (ACCEPT ENABLE)
A5	SIN2	P23-11 P18-3 P19-2	SIN2	Receive data, serial channel 2 (232 TX - uP RX)
B5	N12VI	N12VI	N12VI	-12V from Main Board, isolated
C5	-	-	NC	-
A6	CTS2	P23-22	CTS2	Handshake Input 0, serial channel 2 (232 CTS)
B6	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C6	SOUT2	P23-10 P18-2 P19-3	SOUT2	Transmit data, serial channel 2 (232 RX - uP TX)
A7	I2	P23-23 P18-4	I2	Handshake Input 2, serial channel 2 (BALLY TX - uP RX)
B7	P12VI	P12VI	P12VI	+12V from Main Board, isolated
C7	-	-	Not Used	Handshake Input 1, serial channel 2
A8	O2	P23-9 P18-1	O2	Handshake Output 2, serial channel 2 (BALLY RX - uP TX)
B8	-	-	Not Used	Handshake Output 1, serial channel 2
C8	RTS2	P23-21	RTS2	Handshake Output 0, serial channel 2 (232 RTS)
A9	SIN3	P7-18	SIN3	Receive data, serial channel 3 (PRINTER TX - uP RX)
B9	N12VI	N12VI	N12VI	-12V from Main Board, isolated
C9	-	-	NC	-
A10	CTS3	P7-9	CTS3	Handshake Input 0, serial channel 3
B10	GNDISOL	GNDISOL	GNDISOL	ground of ±12 voltage, isolated
C10	SOUT3	P7-19	SOUT3	Transmit data, serial channel 3 (PRINTER RX - uP TX)

A11	-	-	Not Used	Handshake Input 2, serial channel 3
B11	P12VI	P12VI	P12VI	+12V from Main Board, isolated
C11	DSR3	P7-15	DSR3	Handshake Input 1, serial channel 3
A12	-	-	Not Used	Handshake Output 2, serial channel 3
B12	DTR3	P7-16	DTR3	Handshake Output 1, serial channel 3
C12	RTS3	P7-8	RTS3	Handshake Output 0, serial channel 3
A13	COMS_RESET	J3-C13	COMS_RESET	Communications ports reset
B13	-	-	NC	-
C13	-	-	NC	-
A14	-	-	NC	-
B14	-	-	NC	-
C14	-	-	NC	-
A15	-	-	NC	-
B15	-	-	NC	-
C15	-	-	NC	-
A16	-	-	NC	-
B16	-	-	NC	-
C16	-	-	NC	-
A17	-	-	Not Used	Data from meter board
B17	-	-	Not Used	Gnd
C17	-	-	Not Used	Data from top box
A18	-	-	Not Used	Serial data input to main logic from serial input driver. Open collector output.
B18	-	-	Not Used	Gnd
C18	-	-	Not Used	Serial data input to main logic from serial output driver. Open collector output.
A19	-	-	Not Used	SPI reset signal
B19	-	-	Not Used	Gnd
C19	-	-	Not Used	Data output to meter board
A20	-	-	Not Used	Serial clock
B20	-	-	Not Used	Gnd
C20	-	-	Not Used	Reset signal to meter board
A21	-	-	Not Used	Strobe signal to meter board
B21	-	-	Not Used	Gnd
C21	-	-	Not Used	Serial output enable to top box
A22	-	-	Not Used	Serial output enable #5 which selects SPI output driver.
B22	-	-	Not Used	Gnd
C22	-	-	Not Used	Serial output enable #4 which selects SPI input driver.
A23	-	-	Not Used	Overcurrent sensor output, hopper
B23	-	-	Not Used	Gnd
C23	-	-	NC	-
A24	-	-	Not Used	Hopper high probe, Detects hopper full, hopper
B24	-	-	Not Used	Gnd
C24	-	-	Not Used	Coin output detector, hopper
A25	-	-	Not Used	Hopper motor direction, hopper
B25	-	-	Not Used	Gnd
C25	-	-	Not Used	Detects hopper low, hopper
A26	-	-	Not Used	Hopper Sensor Test output, hopper
B26	-	-	Not Used	Gnd
C26	-	-	Not Used	Hopper motor drive, hopper
A27	-	-	NC	-
B27	-	-	Not Used	Gnd
C27	-	-	Not Used	P5V
A28	-	-	Not Used	EPSU2SND
B28	-	-	Not Used	Gnd
C28	-	-	Not Used	/EPSU2OVR

A29	-	-	Not Used	ESPARE01
B29	-	-	Not Used	Gnd
C29	-	-	Not Used	/EHANDLE
A30	-	-	Not Used	PS2 section, +22V
B30	-	-	Not Used	Gnd
C30	-	-	Not Used	PS2 section, +22V
A31	-	-	Not Used	EMIKOHNP
B31	-	-	Not Used	PS2 section, +9V
C31	-	-	Not Used	PS2 section, +9V
A32	-	-	NC	-
B32	-	-	Not Used	Gnd
C32	-	-	Not Used	EMIKOHNN

Main Board/Backplane DIN, JP22/P22

JP22 on the Backplane Board connects to P22 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	HOPTEST	P7-12	HOPTEST	Hopper Sensor Test output, hopper
B1	GNDI	GND	GND	Gnd
C1	HOPON	P7-4	HOPON	Hopper motor drive, hopper
A2	AUSW	P13-5	AUSW	mech. switch, AUDIT RESET
B2	SOLDIV	P14-9	SOLDIV	Coin Divert Drive (NPN trans. to GND)
C2	JPBELL	P13-4	JPBELL	Jackpot Bell
A3	MECHSW	P13-7	MECHSW	Mechanical Door Switch
B3	GNDI	GND	GND	Gnd
C3	CBOXSW	P13-6	CBOXSW	Mechanical Security Switch - cash box door
A4	CCSEN	P14-10	CCSEN	CC46 Coin output
B4	JPSW	P13-8	JPSW	mech. switch, JACKPOT RESET
C4	BASW	P14-20	BASW	Mechanical Security Switch - BACC door
A5	CCERROR	P14-19	CCERROR	Coin Error
B5	GNDI	GND	GND	Gnd
C5	CC_CRED	P14-7	CC_CRED	Valid Coin Input
A6	-	-	Not Used	solid state relay for ballast and monitor On/Off
B6	-	-	Not Used	S7 Coin output
C6	SOLOPT	P14-15	SOLOPT	Solenoid Optic
A7	232TxD0	P4-14	RS232TX	serial 0, nonisolated transmitter
B7	GNDI	GND	GND	PS1 section, ground 24V
C7	-	-	Not Used	Serial Transmit Data out
A8	232RxD0	P4-7	RS232RX	serial 0, nonisolated receiver
B8	-	-	Not Used	nonisolated handshake Output 0, serial channel 0
C8	-	-	Not Used	nonisolated handshake Input 0, serial channel 0
A9	GNDI	GND	GND	Gnd
B9	VGA_red	P4-4	RED	Red, video
C9	DACVSS_RED	P4-3	GND_RED	red colour signal ground
A10	VGA_blue	P4-6	BLUE	Blue, video
B10	DACVSS_GREEN	P4-11	GND_GREEN	Green colour signal ground
C10	VGA_green	P4-12	GREEN	Green, video
A11	DACVSS_BLUE	P4-5	GND_BLUE	Blue colour signal ground

B11	VSYNC	P4-9	VSYNC	Vsync, video
C11	DACVSS_SYNC	P4-8	GND_SYNC	synchro signal ground
A12	MLSPKR	P5-1, P12-21	SPEAKER	Audio output
B12	GNDI	GND	GND	Gnd
C12	HSYNC	P4-1	HSYNC	Hsync, video
A13	RSPKR	P5-3	SPEAKER2	Audio output to speaker 2
B13	SGND	P5-2, P12-22	SPKRGND	speaker signal ground, connected with PS1 ground on MkV only
C13	P24VSND	24V	P24VSND	PS1 24V, single track on PCB
A14	LGND	LGND	GND	Gnd
B14	L5VDC	L5VDC	VCC	5V
C14	LGND	LGND	GND	Gnd
A15	L5VDC	L5VDC	VCC	5V
B15	LGND	LGND	GND	Gnd
C15	P5VI	VCC	VCC	+5V from driver, converted from 24V
A16	LGND	LGND	GND	Gnd
B16	P5VI	VCC	VCC	+5V from driver, converted from 24V
C16	LGND	LGND	GND	Gnd
A17	P5VI	VCC	VCC	+5V from driver, converted from 24V
B17	LGND	LGND	GND	Gnd
C17	P5VI	VCC	VCC	+5V from driver, converted from 24V
A18	DIGCSYNC	P6-3	NC	Sync for low res. composite video
B18	TxD0	P1-2	KOUT	Serial data OUTPUT from ARM250 - keyboard debug
C18	RxD0	P1-1	KIN	Serial data INPUT from ARM250 - keyboard debug
A19	DIGGREEN	P6-1	NC	-
B19	GNDI	GND	GND	Gnd
C19	DIGRED	P6-7	NC	-
A20	-	-	NC	-
B20	-	-	NC	-
C20	DIGBLUE	P6-8	NC	-
A21	-	-	NC	-
B21	GNDI	GND	GND	Gnd
C21	-	-	NC	-
A22	-	-	NC	-
B22	-	-	NC	-
C22	-	-	NC	-
A23	-	-	NC	-
B23	GNDI	GND	GND	Gnd
C23	-	-	NC	-
A24	L12VDC	L12VDC	NC	12V (SX only)
B24	-	-	NC	-
C24	-	-	NC	-
A25	-	-	NC	-
B25	GNDI	GND	GND	Gnd
C25	-	-	NC	-
A26	-	-	not used	External battery backup
B26	-	-	not used	external reset
C26	NPFAIL	P17-14	NPFAIL	power fail signal, active low
A27	-	-	not used	emitter of link progressive for DACOM3000
B27	GNDI	GND	GND	Gnd
C27	-	-	NC	-
A28	CCINH	P14-6	CCINH	CC46 Inhibit
B28	-	-	not used	Current control for winding 2
C28	-	-	NC	-
A29	HOPDIR	P7-13	HOPDIR	Hopper motor direction, hopper

B29	GNDI	GND	GND	Gnd
C29	-	-	not used	Current control for winding 2
A30	-	-	not used	Phase winding 1 + lamp 1 test
B30	-	-	not used	Phase winding 2 + lamp 2 test
C30	-	-	not used	Current control for winding 1 + lamp3
A31	-	-	not used	For reel selection
B31	GNDI	GND	GND	Gnd
C31	-	-	not used	For reel selection
A32	-	-	not used	Strobe for latching the lamps
B32	-	-	not used	For reel selection
C32	-	-	not used	Strobe for latching the motor

Main Board/Backplane DIN, JP21/P21

JP21 on the Backplane Board connects to P21 on the Main Board.

PIN	Pin Name, SX Main Board	Connects to ...	Pin Name, MkV Main Board	Comment
A1	-	-	not used	mech. switch, JACKPOT RESET
B1	GNDI	GND	GND	Gnd
C1	-	-	not used	mech. switch, AUDIT RESET
A2	-	-	not used	mech. switch, spare
B2	-	-	not used	mech. switch, spare
C2	-	-	not used	mech. switch, spare
A3	-	-	NC	-
B3	GNDI	GND	GND	Gnd
C3	-	-	NC	-
A4	-	-	not used	Logic Door Security Switch 7 contact - NC
B4	-	-	not used	Door security detector output, no driver/buffer exists.
C4	DOPTOUT	P14-5	DOPTOUT	Door Optic Output
A5	-	-	not used	Emitter 1 drive signal, Security 1
B5	GNDI	GND	GND	Gnd
C5	-	-	not used	Logic Door Security Switch 7 contact - NO
A6	-	-	not used	Mechanical Security Switch 1 contact - NO
B6	-	-	not used	Mechanical Security Switch 1 contact - NC
C6	-	-	not used	Receiver 1 Sense signal, security 1
A7	-	-	not used	Receiver 2 Sense signal, security 2
B7	GNDI	GND	GND	Gnd
C7	-	-	not used	Emitter 2 Drive signal, security 2
A8	-	-	not used	Emitter 3 Drive signal, security 3
B8	-	-	not used	Mechanical Security Switch 2 contact - NO
C8	-	-	not used	Mechanical Security Switch 2 contact - NC
A9	-	-	not used	Mechanical Security Switch 3 contact - NC
B9	GNDI	GND	GND	Gnd
C9	-	-	not used	Receiver 3 Sense signal, security 3
A10	-	-	not used	Receiver 4 Sense signal, security 4
B10	-	-	not used	Emitter 4 Drive signal, security 4
C10	-	-	not used	Mechanical Security Switch 3 contact - NO
A11	-	-	not used	Emitter 5 Drive signal, security 5
B11	GNDI	GND	GND	Gnd

C11	-	-	not used	Mechanical Security Switch 4 contact - NC
A12	-	-	not used	Emitter 6 Drive signal, security 6
B12	-	-	not used	Mechanical Security Switch 5 contact - NC
C12	-	-	not used	Receiver 5 Sense signal, security 5
A13	-	-	not used	Mechanical Security Switch 6 contact - NC
B13	GNDI	GND	GND	Gnd
C13	-	-	not used	Receiver 6 Sense signal, security 6
A14	-	-	not used	Mechanical Security Switch 7 contact - NC
B14	-	-	not used	Receiver 7 Sense signal, security 7
C14	-	-	not used	Emitter 7 Drive signal, security 7
A15	-	J2-A6	IRQDMON	Demon Interrupt Line
B15	GNDI	GND	GND	Gnd
C15	NC	-	NC	-
A16	VBAT	J2-B4	VBAT	Battery Backup Voltage
B16	-	-	NC	-
C16	-	-	not used	Spare IO
A17	-	-	not used	CPU, read not write signal
B17	GNDI	GND	GND	Gnd
C17	-	-	NC	-
A18	IRQ12	J3-C23	NEIF	CPU, IF interrupt
B18	IRQ11	J3-C21	NEFHO	CPU, FH0 interrupt
C18	-	J2-B5	NDACK	CPU, data acknowledge
A19	IRQ5	J3-C22	NEFL	CPU, FL interrupt
B19	GNDI	GND	GND	Gnd
C19	IRQ14	J2-A5	NEIL0	CPU, IL0 interrupt
A20	CPURST	J2-B7	NERESET	CPU, external reset output
B20	-XIOW	J2-A7	NEIOW	CPU, IO write signal
C20	-XIOR	J2-B6	NEIOR	CPU, IO read signal
A21	-	-	not used	CPU, address bus 13
B21	GNDI	GND	GND	Gnd
C21	SERCLK	J2-A8	ECLK8M	CPU, clock signal
A22	-CHIPDEC1	J2-B11	EA10	CPU, address bus
B22	-CHIPDEC2	J2-A11	EA11	CPU, address bus 11
C22	-CHIPDEC3	J2-B10	EA12	CPU, address bus 12
A23	SA6	J2-B12	EA8	CPU, address bus
B23	GNDI	GND	GND	Gnd
C23	-ARESET	J2-A12	EA9	CPU, address bus
A24	SA3	J2-A14	EA5	CPU, address bus
B24	SA4	J2-B13	EA6	CPU, address bus
C24	SA5	J2-A13	EA7	CPU, address bus
A25	SA1	J2-A15	EA3	CPU, address bus
B25	GNDI	GND	GND	Gnd
C25	SA2	J2-B14	EA4	CPU, address bus
A26	-	-	NC	-
B26	-	-	NC	-
C26	SA0	J2-B15	EA2	CPU, address bus
A27	-	-	NC	-
B27	GNDI	GND	GND	Gnd
C27	-	-	NC	-
A28	SD5	J2-A19	ED5	CPU, data bus
B28	SD6	J2-B18	ED6	CPU, data bus
C28	SD7	J2-A18	ED7	CPU, data bus
A29	SD3	J2-A20	ED3	CPU, data bus
B29	GNDI	GND	GND	Gnd

C29	SD4	J2-B19	ED4	CPU, data bus
A30	SD0	J2-B21	ED0	CPU, data bus
B30	SD1	J2-A21	ED1	CPU, data bus
C30	SD2	J2-B20	ED2	CPU, data bus
A31	GNDI	GND	GND	Gnd
B31	P24VI	24V	24V	+24V
C31	GNDI	GND	GND	Gnd
A32	P24VI	24V	24V	+24V
B32	GNDI	GND	GND	Gnd
C32	P24VI	24V	24V	+24V

12.3.2 Extended I/O Driver Board

The Extended I/O Driver Board interfaces with the other peripheral devices via the Backplane through two 64 pin DIN41612 connectors and a 96 way DIN41612 connector.

I/O Driver Board 64 way DIN41612 connector, J1

J1 on the Backplane connects to J1 on the I/O Driver Board.

PIN	Pin Name, SX I/O Driver Board	Connects to ...	Pin Name, MkV I/O Driver Board	Comment
A1	GNDI	GND	GND	Ground
B1	GNDI	GND	GND	Ground
A2	PBS1	P11-24	PBS1	Pushbutton Switch 1
B2	PBS2	P11-23	PBS2	Pushbutton Switch 2
A3	PBS3	P11-22	PBS3	Pushbutton Switch 3
B3	PBS4	P11-21	PBS4	Pushbutton Switch 4
A4	PBS5	P11-20	PBS5	Pushbutton Switch 5
B4	PBS6	P11-19	PBS6	Pushbutton Switch 6
A5	PBS7	P11-18	PBS7	Pushbutton Switch 7
B5	PBS8	P11-17	PBS8	Pushbutton Switch 8
A6	PBS9	P11-16	PBS9	Pushbutton Switch 9
B6	PBS10	P11-15	PBS10	Pushbutton Switch 10
A7	PBS11	P12-22	PBS11	Pushbutton Switch 11
B7	PBS12	P12-21	PBS12	Pushbutton Switch 12
A8	PBS13	P12-20	PBS13	Pushbutton Switch 13
B8	PBS14	P12-19	PBS14	Pushbutton Switch 14
A9	SPARESW1	P12-18	SPARESW1	Spare 24V Input 1
B9	SPARESW2	P12-17	SPARESW2	Spare 24V Input 2
A10	PBL1	P11-2	PBL1	Pushbutton Lamp 1
B10	PBL2	P11-4	PBL2	Pushbutton Lamp 2
A11	PBL3	P11-5	PBL3	Pushbutton Lamp 3
B11	PBL4	P11-6	PBL4	Pushbutton Lamp 4
A12	PBL5	P11-7	PBL5	Pushbutton Lamp 5
B12	PBL6	P11-8	PBL6	Pushbutton Lamp 6
A13	PBL7	P11-9	PBL7	Pushbutton Lamp 7
B13	PBL8	P11-10	PBL8	Pushbutton Lamp 8
A14	PBL9	P11-11	PBL9	Pushbutton Lamp 9
B14	PBL10	P11-12	PBL10	Pushbutton Lamp 10
A15	PBL11	P12-15	PBL11	Pushbutton Lamp 11
B15	PBL12	P12-16	PBL12	Pushbutton Lamp 12
A16	PBL13	P12-1	PBL13	Pushbutton Lamp 13
B16	PBL14	P12-14	PBL14	Pushbutton Lamp 14
A17	DRVSP1	P12-3	DRVSP1	Spare 24V output 1
B17	-	P12-2	DRVSP2	Spare 24V output 2
A18	-	P12-5	SPAREIO0	Spare TTL I/O
B18	-	P12-4	SPAREIO1	Spare TTL I/O
A19	-	P12-7	SPAREIO2	Spare TTL I/O
B19	-	P12-6	SPAREIO3	Spare TTL I/O
A20	-	P12-9	SPAREIO4	Spare TTL I/O
B20	-	P12-8	SPAREIO5	Spare TTL I/O
A21	232RTS5	P12-11	SPRTS	Spare serial
B21	232CTS5	P12-23	SPCTS	Spare serial
A22	232RxD5	P12-24	SPRXD	Spare serial
B22	232TxD5	P12-12	SPTXD	Spare serial
A23	GNDI	GND	GND	Ground

B23	GNDI	GND	GND	Ground
A24	HM1	P2-5	HM1	Hard Meter 1
B24	HM2	P2-6	HM2	Hard Meter 2
A25	HM3	P2-7	HM3	Hard Meter 3
B25	HM4	P2-8	HM4	Hard Meter 4
A26	HM5	P2-9	HM5	Hard Meter 5
B26	HM6	P2-10	HM6	Hard Meter 6
A27	LTL1	P2-20	LTL1	Light Tower Lamp 1
B27	LTL2	P2-21	LTL2	Light Tower Lamp 2
A28	LTL3	P2-22	LTL3	Light Tower Lamp 3
B28	LTL4	P2-23	LTL4	Light Tower Lamp 4
A29	AL1	P14-18	AL1	Animation Lamp 1
B29	AL2	P14-17	AL2	Animation Lamp 2
A30	AL3	P14-16	AL3	Animation Lamp 3
B30	HOPCOIN	P7-1	HOPCOIN	Hopper Coin Output
A31	HOPHIGH	P7-5	HOPHIGH	Hopper Hi Probe (Hopper Full)
B31	DOPTIN	P13-9	DOPTIN	Door Optic In
A32	P24VI	24V	24V	24V
B32	P24VI	24V	24V	24V

I/O Driver Board 64 way DIN41612 Connector, J2

J2 on the Backplane connects to J2 on the I/O Driver Board.

PIN	Pin Name, SX I/O Driver Board	Connects to ...	Pin Name, MkV I/O Driver Board	Comment
A1	P12VDC	P12VDC	P12VDC	12V from Driver for CC46
B1	GNDI	GND	GND	Gnd
A2	P5VI	VCC	VCC	5V
B2	P5VI	VCC	VCC	5V
A3	LDOR_NC	P3-2	LDOR_NC	Logic Door Security Normally Closed Contact
B3	LDOR_COM	P3-3	LDOR_COM	Logic Door Security Sense
A4	LDOR_NO	P3-1	LDOR_NO	Logic Door Security - Hi-Z Battery Output
B4	VBAT	JP21-A16	VBAT	Battery Backed Power
A5	IRQ14	JP21-C19	NEIL0	CPU, IL0 interrupt
B5	-	JP21-C18	NDACK	CPU, data acknowledge
A6	-	JP21-A15	IRQDMON	Demon Interrupt Line
B6	-XIOR	JP21-C20	NEIOR	CPU, IO read signal
A7	-XIOW	JP21-B20	NEIOW	CPU, IO write signal
B7	CPURESET	JP21-A20	NERESET	CPU, external reset output
A8	SERCLK	JP21-C21	ECLK8M	CPU, clock signal
B8	-	GND	GND	Gnd
A9	P24VI	24V	24V	24V
B9	P24VI	24V	24V	24V
A10	-	-	not used	CPU, address bus
B10	-CHIPDEC3	JP21-C22	EA12	CPU, address bus
A11	-CHIPDEC2	JP21-B22	EA11	CPU, address bus
B11	-CHIPDEC1	JP21-A22	EA10	CPU, address bus
A12	-ARESET	JP21-C23	EA9	CPU, address bus
B12	SA6	JP21-A23	EA8	CPU, address bus
A13	SA5	JP21-C24	EA7	CPU, address bus
B13	SA4	JP21-B24	EA6	CPU, address bus
A14	SA3	JP21-A24	EA5	CPU, address bus

B14	SA2	JP21-C25	EA4	CPU, address bus
A15	SA1	JP21-A25	EA3	CPU, address bus
B15	SA0	JP21-C26	EA2	CPU, address bus
A16	P24VI	24V	24V	24V
B16	P24VI	24V	24V	24V
A17	GNDI	GND	GND	Gnd
B17	GNDI	GND	GND	Gnd
A18	SD7	JP21-C28	ED7	CPU, data bus
B18	SD6	JP21-B28	ED6	CPU, data bus
A19	SD5	JP21-A28	ED5	CPU, data bus
B19	SD4	JP21-C29	ED4	CPU, data bus
A20	SD3	JP21-A29	ED3	CPU, data bus
B20	SD2	JP21-C30	ED2	CPU, data bus
A21	SD1	JP21-B30	ED1	CPU, data bus
B21	SD0	JP21-A30	ED0	CPU, data bus
A22	P5VI	VCC	VCC	5V
B22	P5VI	VCC	VCC	5V
A23	GNDI	GND	GND	Gnd
B23	GNDI	GND	GND	Gnd
A24	-	-	NC	not used
B24	-	-	NC	not used
A25	-	-	NC	not used
B25	-	-	NC	not used
A26	-	P23-19	EMIKP2	Data A2
B26	-	P23-7	EMIKN2	Machine ID2
A27	-	-	NC	not used
B27	-	-	NC	not used
A28	-	-	NC	not used
B28	-	-	NC	not used
A29	ISOLPGND	ISOLPGND	ISOLPGND	Ground 12v/5v Power Supply filtered/isolated
B29	ISOLPWR	ISOLPWR	ISOLPWR	12v/5v Power Supply filtered/isolated
A30	-	P23-17	EMIKP1	Data A1
B30	-	P23-5	EMIKN1	Machine ID1
A31	422/485_TxD+	P23-14	TXDA+	Mikohn 422 Serial Comms
B31	422/485_TxD-	P23-3	TXDA-	Mikohn 422 Serial Comms
A32	422/485_RxD+	P23-13	RXDA+	Mikohn 422 Serial Comms
B32	422/485_RxD-	P23-1	RXDA-	Mikohn 422 Serial Comms

I/O Driver Board 96 way DIN41612 Connector, J3

J3 on the Backplane connects to J3 on the SX or Extended Mk V I/O Driver Board.

PIN	Pin Name, SX I/O Driver Board	Connects to ...	Pin Name, MkV I/O Driver Board	Comment
A1	-	-	NC	-
B1	232DTR7	P8-16	232DTR7	RS232 Serial Port Com7 Data Terminal Ready
C1	P5VI	VCC	VCC	5 Volts
A2	232DSR7	P8-17	232DSR7	RS232 Serial Port Com7 Data Set Ready
B2	-	-	NC	-
C2	GNDI	GND	GND	0 Volts referenced to SX Main Board Logic
A3	-	-	NC	-
B3	P12VI	P12VI	P12VI	+12V for communications
C3	-	-	NC	-
A4	-	-	NC	-
B4	232DTR6	P8-22	232DTR6	RS232 Serial Port Com6 Data Terminal Ready
C4	-	-	NC	-
A5	232DSR6	P8-23	232DSR6	RS232 Serial Port Com6 Data Set Ready
B5	-	-	NC	-
C5	-	-	NC	-
A6	-	-	NC	-
B6	P12VI	P12VI	P12VI	+12V for communications
C6	P5VI	VCC	VCC	5 Volts
A7	GNDISOL	GNDISOL	GNDISOL	Isolated GND for communications
B7	232TxD6	P8-12	232TXD6	RS232 Serial Port Com6 Transmitted Data
C7	GNDI	GND	GND	0 Volts
A8	232RxD6	P8-11	232RXD6	RS232 Serial Port Com6 Received Data
B8	232RTS6	P8-10	232RTS6	RS232 Serial Port Com6 Request To Send
C8	GNDI	GND	GND	0 Volts
A9	232CTS6	P8-9	232CTS6	RS232 Serial Port Com6 Clear To Send
B9	232DCD6	P8-8	232DCD6	RS232 Serial Port Com6 Data Carrier Detect
C9	-	-	NC	-
A10	GNDISOL	GNDISOL	GNDISOL	Isolated GND for communications
B10	232TxD7	P8-6	232TXD7	RS232 Serial Port Com7 Transmitted Data
C10	-	-	NC	-
A11	232RxD7	P8-5	232RXD7	RS232 Serial Port Com7 Received Data
B11	232RTS7	P8-4	232RTS7	RS232 Serial Port Com7 Request To Send
C11	-	-	NC	-
A12	232CTS7	P8-3	232CTS7	RS232 Serial Port Com7 Clear To Send
B12	232DCD7	P8-2	232DCD7	RS232 Serial Port Com7 Data Carrier Detect
C12	P12VI	P12VI	P12VI	12 Volts
A13	-	-	NC	-
B13	-	-	NC	-

C13	COMMS_RESET	JP20-A13	COMMS_RESET	Communications ports reset
A14	-	-	NC	-
B14	-	-	NC	-
C14	-	-	NC	-
A15	-	-	NC	-
B15	-	-	NC	-
C15	P5VI	VCC	VCC	5 Volts
A16	-	-	NC	-
B16	BACCLITE8	P10-8	BACCLITE8	Bill Acceptor Light #8
C16	GNDI	GND	GND	
A17	BACCLITE1	P10-1	BACCLITE1	Bill Acceptor Light #1
B17	BACCLITE2	P10-2	BACCLITE2	Bill Acceptor Light #2
C17	P12VI	P12VI	P12VI	+12V for communications
A18	BACCLITE3	P10-3	BACCLITE3	Bill Acceptor Light #3
B18	BACCLITE4	P10-4	BACCLITE4	Bill Acceptor Light #4
C18	N12VI	N12VI	N12VI	-12V for communications
A19	BACCLITE5	P10-5	BACCLITE5	Bill Acceptor Light #5
B19	BACCLITE6	P10-6	BACCLITE6	Bill Acceptor Light #6
C19	-	-	NC	-
A20	BACCLITE7	P10-7	BACCLITE7	Bill Acceptor Light #7
B20	-	-	NC	-
C20	-	-	NC	-
A21	AL4	P14-21	AL4	?
B21	-	-	NC	-
C21	IRQ11	JP21-B18	-	Interrupt to SX Main Board
A22	AL5	P14-22	AL5	?
B22	-	-	NC	-
C22	IRQ5	JP21-A19	-	Interrupt to SX Main Board
A23	-	-	NC	-
B23	-	-	NC	-
C23	IRQ12	JP21-A18	-	Interrupt to SX Main Board
A24	DDOR_NC	P9-12	DDOR_NC	Battery backed Cashbox switch Normally Closed
B24	DDOR_NO	P9-10	DDOR_NO	Battery backed Cashbox switch Normally Open
C24	-	-	-	-
A25	DDOR_COM	P9-9	DDOR_COM	Battery backed Cashbox switch Common contact
B25	-	-	NC	-
C25	-	-	NC	-
A26	GDOR_NC	P9-8	GDOR_NC	Battery backed main door switch Normally Closed
B26	GDOR_NO	P9-7	GDOR_NO	Battery backed main door switch Normally Open
C26	L12VDC	L12VDC	NC	12V
A27	GDOR_COM	P9-1	GDOR_COM	Battery backed main door switch Common contact
B27	-	-	NC	-
C27	L5VDC	L5VDC	NC	5V
A28	SEC_NC	P2-17	SEC_NC	Battery-backed belly panel door switch. Normally Closed
B28	SEC_NC	P2-18	SEC_NO	Battery-backed belly panel door switch. Normally Open
C28	L5VDC	L5VDC	NC	5V
A29	SEC_COM	P2-19	SEC_COM	Battery-backed belly panel door switch. Common contact
B29	-	-	NC	-
C29	LGND	LGND	NC	Gnd

A30	-	-	-	-
B30	-	-	NC	-
C30	LGND	LGND	NC	Gnd
A31	-	-	-	-
B31	-	-	NC	-
C31	LGND	LGND	NC	Gnd
A32	-	-	-	-
B32	-	-	NC	-
C32	LGND	LGND	NC	Gnd

12.3.3 MkV / SX Backplane Board Peripheral Connectors

The MkV / SX Backplane routes the various peripheral connectors to the Main Board and the I/O Driver Board. The peripheral connectors are outlined below.

Debug, P1

Pin	Pin Name	Connects to ...	Function
1	KIN	JP22-C18	Keyboard In
2	KOUT	JP22-B18	Keyboard Out
3	GND	GND	Ground
4	VCC	VCC	5V

This port is not usually loaded on the Backplane.

Light Tower / Meters / BACC Security, P2

Pin	Pin Name	Connects to ...	Function
1	24V	24V	24V for Meters
2	24V	24V	24V for Meters
3	24V	24V	24V for Meters
4	24V	24V	24V for Meters
5	HM1	J1-A24	Meter 1
6	HM2	J1-B24	Meter 2
7	HM3	J1-A25	Meter 3
8	HM4	J1-B25	Meter 4
9	HM5	J1-A26	Meter 5
10	HM6	J1-B26	Meter 6
11	5V	VCC	5V power for meters
12	GND	GND	Gnd for Meters
13	24V	24V	24V for Meters
14	24V	24V	24V for Meters
15	24V	24V	24V Light Tower Lamps
16	24V	24V	24V Light Tower Lamps
17	SEC_NC	J3-A28	Battery-backed Belly Panel Door Security Switch, Normally Closed Contact
18	SEC_NO	J3-B28	Battery-backed Belly Panel Door Security Switch, Normally Open Contact
19	SEC_COM	J3-A29	Battery-backed Belly Panel Door Security Switch, Common Contact
20	LTL1	J1-A27	Light Tower Lamp 1
21	LTL2	J1-B27	Light Tower Lamp 2
22	LTL3	J1-A28	Light Tower Lamp 3
23	LTL4	J1-B28	Light Tower Lamp 4
24	GND	GND	Gnd for Meters

Logic Door, P3

Pin	Pin Name	Connects to ...	Function
1	LDOR_NO	J2-A4	Logic Door Security - Normally Open contacts
2	LDOR_NC	J2-A3	Logic Door Security - Normally Closed contacts
3	LDOR_COM	J2-B3	Logic Door Security - Common
4	GND	GND	Ground

Monitor, P4

The video connector connects to an IBM VGA standard monitor. It also has facility for a touchscreen monitor.

Pin	Pin Name	Connects to ...	Function
1	HSYNC	P22-C12	Horizontal Synchronisation Signal
2	Keyway		Plastic key way
3	GND_RED	P22-C9	Return path for Red video signal
4	RED	P22-B9	Red video signal
5	GND_BLUE	P22-A11	Return path for Blue video signal
6	BLUE	P22-A10	Blue video signal
7	RS232Rx	P22-A8	Received Data from Touchscreen
8	GND_SYNC	P22-C11	Video reference signal
9	VSYNC	P22-B11	Vertical Synchronisation Signal
10	Keyway		Plastic key way
11	GND_GREEN	P22-B10	Return path for Green video signal
12	GREEN	P22-C10	Green video signal
13	GND	GND	Return path for Touchscreen signals
14	RS232Tx	P22-A7	Touchscreen Transmitted Data

Speakers, P5

Pin	Pin Name	Connects to ...	Function
1	SPEAKER	JP22-A12	Sound Signal (stereo 1st (Left) speaker)
2	SPKRGND	JP22-B13	Speaker Gnd
3	SPEAKER2	JP22-A13	Sound Signal 2 (stereo 2nd (Right) speaker)
4	SPKRGND	JP22-B13	Speaker Gnd
5	-	-	-
6	-	-	-
7	Keyway		Plastic Keyway
8	GND	GND	Ground Lug or braid
9	GND	GND	Ground Lug or braid
10	-	-	-
11	-	-	-
12	-	-	-

Low Resolution Video, P6

Pin	Pin Name	Goes to ...	Function
1	DigGreen	JP22-A19	Green, Low resolution Video Signal
2	Keyway		Plastic Keyway
3	DigcSync	JP22-A18	Sync, Low resolution composite Video Signal
4	-	-	-
5	Keyway		Plastic Keyway
6	GND	GND	Ground Lug or braid
7	DigRed	JP22-C19	Red, Low resolution Video Signal
8	DigBlue	JP22-C20	Blue, Low resolution Video Signal
9	GND	GND	Ground Lug or braid
10	-	-	-
11	-	-	-
12	-	-	-

Hopper / Printer, P7

Pin	Pin Name	Connects to ...	Function
1	HOPCOIN	J1-B30	Coin Output from Hopper
2	Keyway		Plastic Keyway
3	Keyway		Plastic Keyway
4	HOPON	JP22-C1	Hopper motor drive
5	HOPHIGH	J1-A31	Hopper high probe, Detects hopper full.
6	VCC	VCC	5V for Hopper Electronics
7	GND	GND	Gnd Hopper
8	RTS3	JP20-C12	RTS for printer
9	CTS3	JP20-A10	CTS for printer
10	GNDIsol	GNDIsol	Gnd, Isolated, for Printer Comms
11	24V	24V	24V Motor Drive for Hopper
12	HOPTEST	JP22-A1	Hopper Sensor Test output
13	HOPDIR	JP22-A29	Hopper motor direction
14	GND	GND	Gnd
15	DSR3	JP20-C11	Handshake Input 1, serial channel 3
16	DTR3	JP20-B12	DTR for Printer
17	24V	24V	24V for Printer
18	SIN3	JP20-A9	Rxd from Printer
19	SOUT3	JP20-C10	Txd to Printer
20	GND	GND	Gnd

Com6 and Com7 Spare Serial Outputs, P8

Pin	Pin Name	Connects to ...	Function
1	GNDISOL	GNDISOL	Return from 12V DC, Isolated
2	232DCD7	J3-B12	Com 7 Data Carrier Detect
3	232CTS7	J3-A12	Com 7 Clear To Send
4	232RTS7	J3-B11	Com 7 Request To Send
5	232RxD7	J3-A11	Com 7 Received Data
6	232TxD7	J3-B10	Com 7 Transmitted Data
7	GndIsol	GndIsol	Return from 12V DC
8	232DCD6	J3-B9	Com 6 Data Carrier Detect
9	232CTS6	J3-A9	Com 6 Clear To Send
10	232RTS6	J3-B8	Com 6 Request To Send
11	232RxD6	J3-A8	Com 6 Received Data
12	232TxD6	J3-B7	Com 6 Transmitted Data
13	P12VI	P12VI	12V DC, Isolated
14	Keyway		Plastic Keyway
15	Keyway		Plastic Keyway
16	232DTR7	J3-B1	Com 7 Data Terminal Ready
17	232DSR7	J3-A2	Com 7 Data Set Ready
18	NC	-	-
19	P12VI	P12VI	12V DC, Isolated
20	NC	-	-
21	NC	-	-
22	232DTR6	J3-B4	Com 6 Data Terminal Ready
23	232DSR6	J3-A5	Com 6 Data Set Ready
24	NC	-	-

Battery Backed Security Switches, P9

Pin	Pin Name	Connects to ...	Function
1	GDOR_COM	J3-A27	Battery Backed Main Door Switch, Common Contact
2	Keyway		Plastic Keyway
3	NC	-	-
4	NC	-	-
5	NC	-	-
6	NC	-	-
7	GDOR_NO	J3-B26	Battery Backed Main Door Switch, Normally Open Contact
8	GDOR_NC	J3-A26	Battery Backed Main Door Switch, Normally Closed Contact
9	DDOR_COM	J3-A25	Battery Backed Cashbox Switch, Common Contact
10	DDOR_NO	J3-B24	Battery Backed Cashbox Switch, Normally Open Contact
11	Keyway		Plastic Keyway
12	DDOR_NC	J3-A24	Battery Backed Cashbox Switch, Normally Closed Contact

Bill Acceptor (BACC) Lights, P10

Pin	Pin Name	Connects to ...	Function
1	BACClite1	J3-A17	BACC Light #1
2	BACClite2	J3-B17	BACC Light #2
3	BACClite3	J3-A18	BACC Light #3
4	BACClite4	J3-B18	BACC Light #4
5	BACClite5	J3-A19	BACC Light #5
6	BACClite6	J3-B19	BACC Light #6
7	BACClite7	J3-A20	BACC Light #7
8	BACClite8	J3-B16	BACC Light #8
9	Keyway		Plastic Keyway
10	24V	24V	24V
11	Keyway		Plastic Keyway
12	NC	-	-
13	NC	-	-
14	GND	GND	Gnd

Pushbuttons & Pushbutton Lamps, P11

Pin	Pin Name	Connects to ...	Comments
1	24V	24V	24V Lamps
2	PBL1	J1-A10	Pushbutton Lamp 1
3	keyway		Plastic Keyway
4	PBL2	J1-B10	Pushbutton Lamp 2
5	PBL3	J1-A11	Pushbutton Lamp 3
6	PBL4	J1-B11	Pushbutton Lamp 4
7	PBL5	J1-A12	Pushbutton Lamp 5
8	PBL6	J1-B12	Pushbutton Lamp 6
9	PBL7	J1-A13	Pushbutton Lamb 7
10	PBL8	J1-B13	Pushbutton Lamp 8
11	PBL9	J1-A14	Pushbutton Lamp 9
12	PBL10	J1-B14	Pushbutton Lamp 10
13	24V	24V	24V Pushbuttons
14	keyway		Plastic Keyway
15	PBS10	J1-B6	Pushbutton 10
16	PBS9	J1-A6	Pushbutton 9
17	PBS8	J1-B5	Pushbutton 8
18	PBS7	J1-A5	Pushbutton 7
19	PBS6	J1-B4	Pushbutton 6
20	PBS5	J1-A4	Pushbutton 5
21	PBS4	J1-B3	Pushbutton 4
22	PBS3	J1-A3	Pushbutton 3
23	PBS2	J1-B2	Pushbutton 2
24	PBS1	J1-A2	Pushbutton 1

Spare I/O, P12

Pin	Pin Name	Connects to ...	Function
1	PBL13	J1-A16	OUT 3 SPARE PUSHBUTTON LAMP 13
2	DRVSP2	J1-B17	Spare 24V Output
3	DRVSP1	J1-A17	Spare 24V Output
4	SPAREIO1	J1-B18	Spare TTL I/O
5	SPAREIO0	J1-A18	Spare TTL I/O
6	SPAREIO3	J1-B19	Spare TTL I/O
7	SPAREIO2	J1-A19	Spare TTL I/O
8	SPAREIO5	J1-B20	Spare TTL I/O
9	SPAREIO4	J1-A20	Spare TTL I/O
10	GND	GND	Gnd
11	SPRTS	J1-A21	Spare Serial Com5
12	SPTXD	J1-B22	Spare Serial Com5
13	24V	24V	
14	PBL14	J1-B16	OUT 4 SPARE PUSHBUTTON LAMP 14
15	PBL11	J1-A15	OUT 1 SPARE PUSHBUTTON LAMP 11
16	PBL12	J1-B15	OUT 2 SPARE PUSHBUTTON LAMP 12
17	SPARESW2	J1-B9	Spare 24V Input
18	SPARESW1	J1-A9	Spare 24V Input
19	PBS14	J1-B8	IN 4 SPARE PUSHBUTTON 14
20	PBS13	J1-A8	IN 3 SPARE PUSHBUTTON 13
21	PBS12	J1-B7	IN 2 SPARE PUSHBUTTON 12
22	PBS11	J1-A7	IN 2 SPARE PUSHBUTTON 11
23	SPCTS	J1-B21	Spare Serial Com5
24	SPRXD	J1-A22	Spare Serial Com5

Keyswitches & BACC, P13

Pin	Pin Name	Goes to ...	Function
1	SOUT1	P20-C2	Loopback testing for DTR1
2	Keyway		Plastic Keyway
3	SIN1	P20-A1	Data (BACC)
4	JPBELL	P22-C2	Jackpot Bell
5	AUSW	P22-A2	Audit Keyswitch
6	CBOXSW	P22-C3	Cashbox Switch
7	MECHSW	P22-A3	Main Door Switch
8	JPSW	P22-B4	Jackpot Key
9	DOPTIN	-	Door Optic Detector
10	GND	GND	Cashbox Gnd
11	GND	GND	Audit Switch Gnd
12	NC	-	-
13	24V	24V	BACC 24V
14	Keyway		Plastic Keyway
15	CTS1	P20-A2	Service
16	DSR1	P20-C3	Int (BACC)
17	I1	P20-A3	LED Anode (BACC)
18	GndIsol	GndIsol	Isolated Ground for BACC Pin 1
19	RTS1	P20-C4	Acc. En (BACC)
20	DTR1	P20-B4	Send
21	GND	GND	Gnd
22	GND	GND	Jackpot Key Gnd
23	GND	GND	Main Door Switch Gnd (& BACC)
24	NC	-	-

Door Distribution, P14

Pin	Pin Name	Goes to ...	Comments
1	24V	24V	Animation Lamp 24V Power
2	Keyway		Plastic Keyway
3	24V	24V	24V Power Diverter Solenoid
4	Keyway		Plastic Keyway
5	DOPTOUT	-	Door Optic Emitter (on body)
6	CCINH	JP22-A28	Inhibit
7	CC_CRED	JP22-C5	Valid Coin Input
8	P12VDC	P12VDC	Coin Comparator 12V Power from driver
9	SOLDIV	JP22-B2	Control Signal for Diverter Solenoid
10	CCSEN	JP22-A4	Coin Sense
11	GND	GND	Coin Comparator gnd
12	GND	GND	BACC Security Switch Gnd
13	24V	24V	24V Power for Jackpot Bell
14	VCC	VCC	5V for Solenoid Optic
15	SOLOPT	JP22-C6	Ctl Solenoid Optic
16	AL3	J1-A30	Animation Lamp 3
17	AL2	J1-B29	Animation Lamp 2
18	AL1	J1-A29	Animation Lamp 1
19	CCERROR	JP22-A5	reverse coin
20	BASW	JP22-C4	BACC Security Switch
21	AL4	J3-A21	Animation Lamp 4
22	AL5	J3-A22	Animation Lamp 5
23	GND	GND	Gnd for Solenoid Optic
24	GND	GND	Gnd for BACC

Spare Power, P15

Pin	Pin Name	Connects to ...	Function
1	ISOLPGND	ISOLPGND	Gnd Isolated, 5V or 12V
2	keyway		Plastic keyway
3	GND	GND	Ground
4	GND	GND	Ground
5	24V	24V	24V
6	24V	24V	24V
7	ISOLPWR	ISOLPWR	5V or 12V, Isolated
8	NC	-	-
9	GND	GND	Ground
10	GND	GND	Ground
11	24V	24V	24V
12	24V	24V	24V

Fan, P16

Pin	Pin Name	Connects to ...	Function
1	Keyway		Plastic Keyway
2	24V	24V	24V
3	GND	GND	Gnd fan
4	-	-	-

Power Supply, P17

Pin	Pin Name	Connects to ...	Function
1	ISOLPIN	ISOLPIN	5V or 12V Isolated Power (before filter)
2	NC	-	-
3	GND	GND	Gnd
4	GND	GND	Gnd
5	GND	GND	Gnd
6	NC	-	-
7	NC	-	-
8	ISOLPGIN	ISOLPGIN	5V or 12V Isolated Ground (before filter)
9	Keyway		Plastic Keyway
10	24V	24V	24V
11	24V	24V	24V
12	24V	24V	24V
13	NC	-	-
14	NPFAIL	P22-C26	Power Fail

IGT SAS+ (PT95A) or Bally SDS Port, P18

Pin	Pin Name	Connects to ...	Function
1	O2	JP20-A8	Depends on configuration
2	SOUT2	JP20-C6	Depends on configuration
3	SIN2	JP20-A5	Depends on configuration
4	I2	JP20-A7	Depends on configuration

Although SAS+ (PT95A) and Bally SDS both use the same type of connector, the pinouts are different; therefore, the port pins are labelled in a generic fashion. The actual pinouts are determined by the Communications Configuration Board.

Broadcast DACOM Port, P19

Pin	Pin Name	Connects to ...	Function
1	GND	GND	Signal reference
2	SIN2	JP20-A5	Received data from network
3	SOUT2	JP20-C6	Transmitted data from EGM
4	-	-	-
5	VCC	VCC	+5 volts

Com2 / Com4 Mikohn, P23

Pin	Pin Name	Connects to ...	Function
1	RXDA-	J2-B32	Mikohn isolated 422 serial
2	Keyway		Plastic Keyway
3	TXDA-	J2-B31	Mikohn isolated 422 serial
4	NC	-	-
5	EMIKN1	J2-B30	Machine ID1
6	NC	-	-
7	EMIKN2	J2-B26	Machine ID2
8	NC	-	-
9	O2	JP20-A8	BALLY RX - uP TX
10	SOUT2	JP20-C6	232 RX - uP TX
11	SIN2	JP20-A5	232 TX - uP RX
12	P12VI	P12VI	12V for BALLY BLACKOUT
13	RXDA+	J2-A32	Mikohn isolated 422 serial
14	TXDA+	J2-A31	Mikohn isolated 422 serial
15	ISOLPGND	ISOLPGND	Mikohn isolated 422 serial Ground
16	Keyway		Plastic Keyway
17	EMIKP1	J2-A30	Data A1
18	NC	-	-
19	EMIKP2	J2-A26	Data A2
20	NC	-	-
21	RTS2	JP20-C8	232 RTS
22	CTS2	JP20-A6	232 CTS
23	I2	JP20-A7	BALLY TX - uP RX
24	GndIsol	GndIsol	Isolated Ground for COM2

Com2 is used for Bally-232 and RS-232 ports. Com4 is used for Mikohn.

12.4 Removal and Replacement Procedures

CAUTION
When handling electrostatic sensitive devices (ESDs) such as PCBAs, take care to avoid physical contact with components. PCBAs should be handled by their edges. ESDs should not be placed on metal surfaces. When handling PCBAs, take care to avoid flexing the PCBA, as this may lead to permanent damage.

Removal

The procedures for removing and replacing the Backplane Board are detailed in the chapter Cabinet, Door and Top Box, under the section describing how to remove and disassemble the logic cage.

Note
A fault tag must be placed on any faulty equipment.

Run a complete machine test after replacing the Backplane.

Chapter 13

Extended I/O Driver Board -- 410355

List of Figures

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13.1 Physical Description

The Extended I/O Driver Board is located inside the logic cage and connects directly to the Mk V/SX US Backplane (PCBA No. 410351) via two 64-way DIN connectors and one 96-way DIN connector. It is designed to be used in conjunction with the Mk V Depopulated US Main Board (PCBA No. 410289). Two extractors are positioned on the front edge of both the Driver Board and the Main Board to facilitate the removal of the boards from the mounting rails.

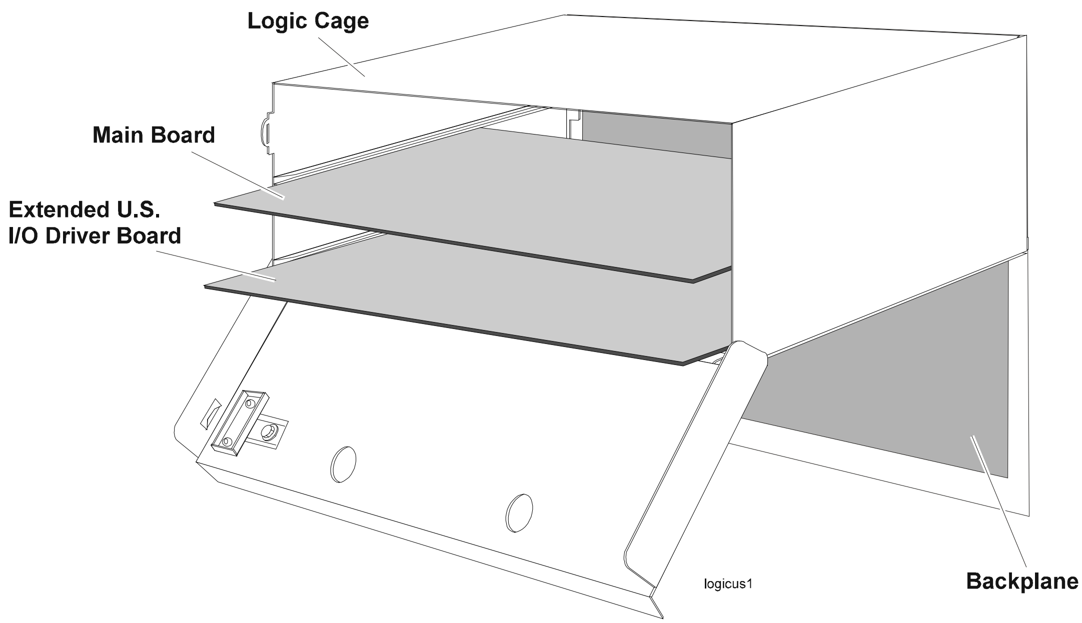

Figure 13-1 I/O Driver Board - Location

13.1.1 Circuit Diagrams and Component Locations

The component layout of the I/O Driver Board is shown in Figure 13-2. For further information and for reference, the following additional information on the extended I/O Driver Board is provided in Volume II:

Circuit diagrams. Structured circuit diagrams.

I/O to Components and ICs. A list of the I/O paths to each component and integrated circuit (IC) pin position.

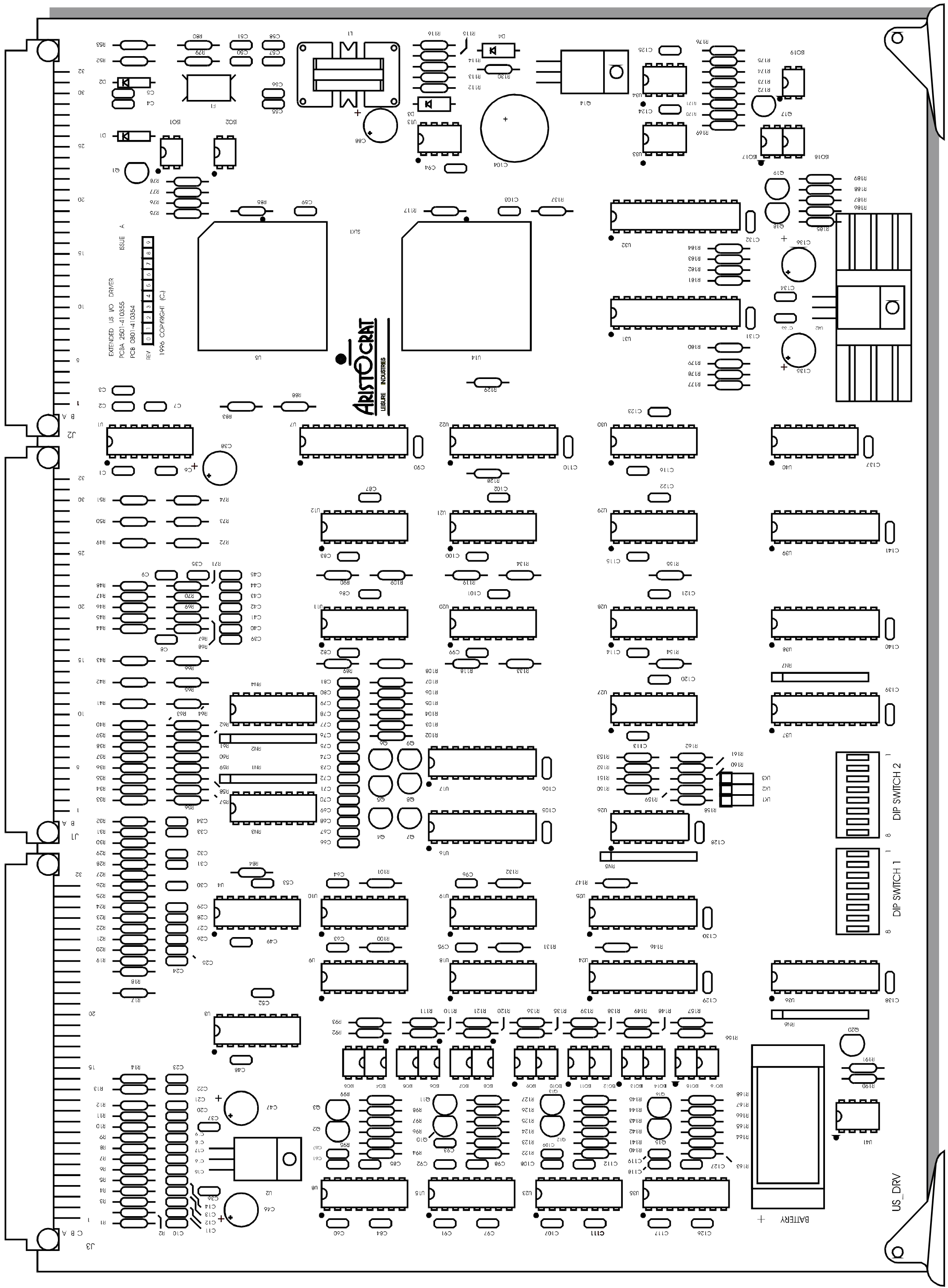

Figure 13-2 Extended I/O Driver Board Layout

13.2 Functional Description

The I/O Driver Board provides an interface between some of the machine equipment and the Main Board via the Backplane. The extended I/O Bus on the Main Board is connected to the I/O Driver Board, allowing the Main Board to address all I/O attached to the I/O Driver Board.

The I/O Driver Board consists of seven main functional blocks:

- Address Decoding
- Mikohn Interface
- Pushbuttons
- Hard Meters and Lamps
- Spare I/O
- Power and Door Security
- Communications Interface

Each of these sections is discussed in this chapter.

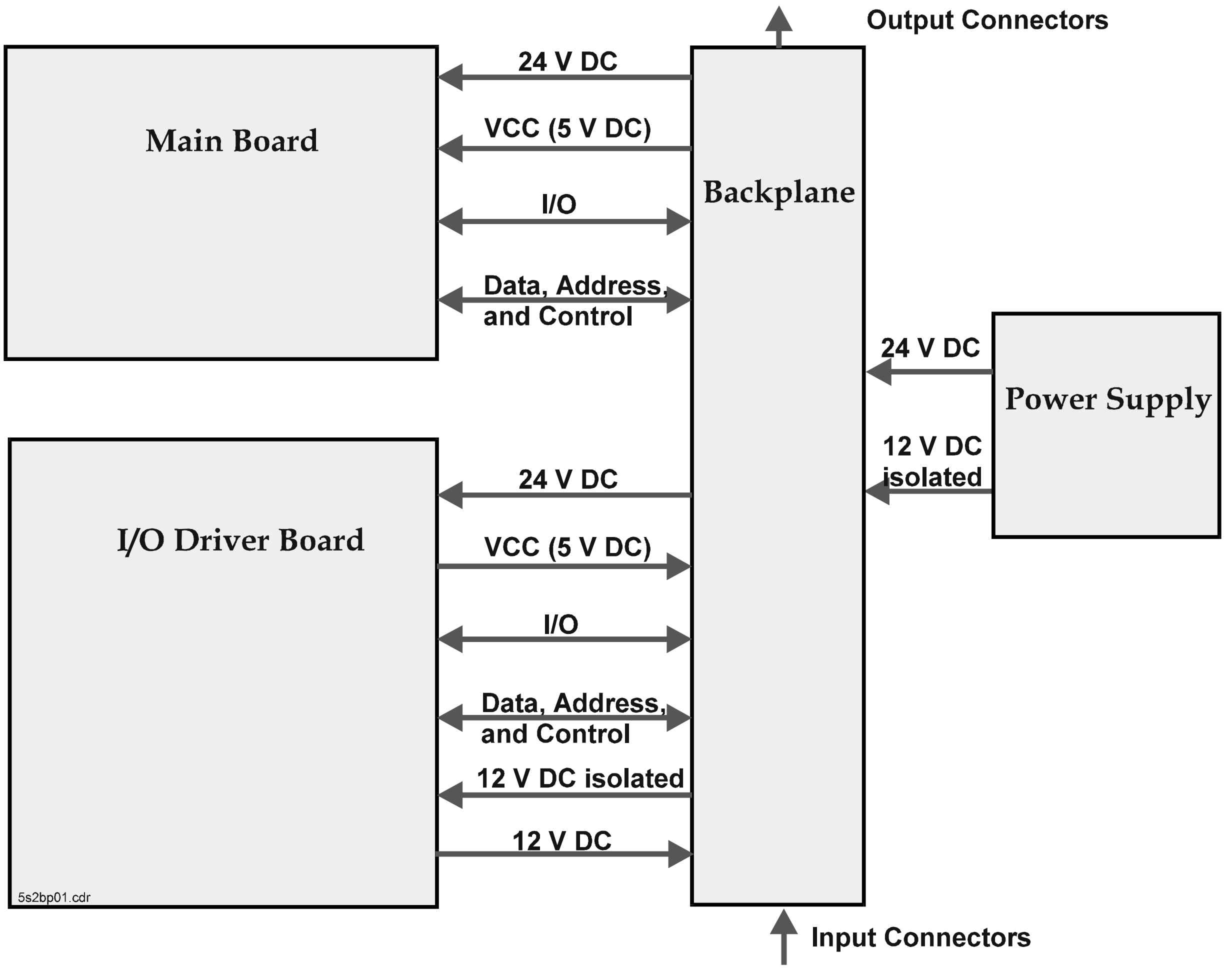

Figure 13-3 System Architecture

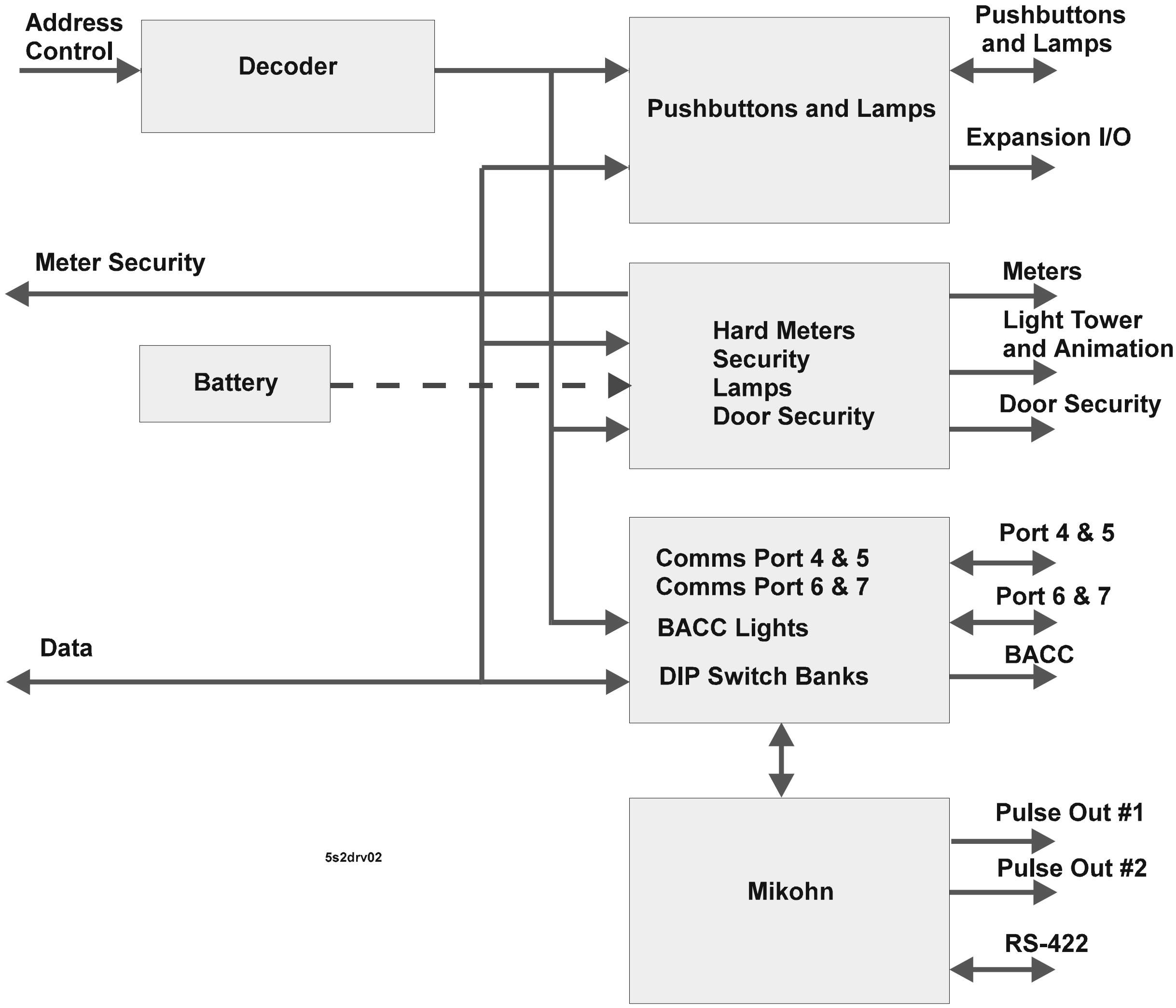

Figure 13-4 Extended US I/O Driver Board Block Diagram

The Extended I/O Driver Board facilitates the 'writing' of data to various outputs such as mechanical meters or the light tower lamps, and it 'reads' data from inputs such as the pushbutton switches or audit key switch. Table 13-1 lists those I/Os which are included on either the Extended I/O Driver Board or the Depopulated MkV Main Board.

In addition to the signals listed in Table 13-1, there are other input signals required by the I/O Driver Board. These are mainly control signals, and include the following: CLK8, NDACK, READ, WRITE, BATTERY, and various Power lines as well as address lines and the data bus. These signals are generated on the MkV Main Board and connect to the Extended I/O Driver Board via the MkV/SX Backplane Board.

Table 13-1 I/O Signals for I/O Driver Board and Main Board

Description	I/O	Qty	Name	Type	Where
Hard Meters	O	6	HM1-6	OC24	I/O DRIVER
Pushbutton switches	I	14	PBS1-14	24->TTL	I/O DRIVER
Pushbutton lamps	O	14	PBL1-14	OC24	I/O DRIVER
Battery Backed Logic Door Switch	I O	1 1	BBLI BBLO	TTL	I/O DRIVER
Animation Lamps	O	3	AL1..3	OC24	I/O DRIVER
Logic Door Security	O I	1 1	LDSECO LDSECIN	TTL	I/O DRIVER
Light Tower Lamps	O	4	LTL1-4	OC24	I/O DRIVER
Hopper	I O	2 3	HOPHIGH HOPCOIN HOPTEST HOPON HOPDIR	TTL OC24	I/O DRIVER MAIN
Mikohn	O O I	2 2 1	MIKPULS MIKTX MIKTX_EN MIKRX	OPTO RS422 TTL RS422	I/O DRIVER
Expansion Serial	O I	2 2	Driver Spare	TTL	I/O DRIVER
Expansion Parallel	I/O	6	Spare I/O	TTL	I/O DRIVER
Mechanical Door Switch	I	1	MECHSW	TTL	MAIN
Cashbox Door Switch	I	1	CBOXSW	TTL	MAIN
Belly Panel Door Switch	I	1	SECSW	TTL	MAIN
Jackpot Keyswitch	I	1	JPSW	TTL	MAIN
Audit Keyswitch	I	1	AUSW	TTL	MAIN
Coin Comparator	I O	3 1	CCSEN CCERROR CC_CRED CCINH	TTL	MAIN
Jackpot Bell	O	1	JPBELL	OC24	MAIN
Solenoid Diverter	O	1	SOLDIV	OC24	MAIN
Solenoid Optic	I	1	SOLOPT	TTL	MAIN
DUART Port 6	O I	3 3	TxD, DTR, RTS RxD,DCR,CTS	TTL TTL	I/O DRIVER EXPANDED
DUART Port 7		3 3 +2	TxD, DTR, RTS RxD,DCR,CTS	TTL TTL	I/O DRIVER EXPANDED
DUART Parallel	O		BACCLIT[1..8]	TTL	EXPANDED I/O
DIP SWITCH 1	I	8	DIPSW1	OC24	EXPANDED I/O
DIP SWITCH 2	I	8	DIPSW2	TTL	EXPANDED I/O
Battery Backed Door Security	I/O	6	DDOR_NC,GDOR_NC SEC_NC DDOR_NO, GDOR_NO SEC_NO	TTL/Battery	EXPANDED I/O

13.2.1 Address Decoding

The I/O Driver Board includes address decoding which defines the address of each I/O on the board. The I/O Driver does not manage all the I/O for the Main Board. Refer to the chapter Main Board for a description of the I/O connected directly to the Main Board. The following table lists the addresses of all I/Os on the I/O Driver Board and the Main Board. The various signal names for MkV Main Board I/O have been included as they are existing signals already used with previous MkV Main Board designs.

Table 13-2 I/O Address Map

	ADDRESS	READ / WRITE	BIT/S	NAME	SPARES
MAIN BD.		WRITE			
NWRCS0	0x3010400		D7	DOPTOUT	
NWRCS1	0x3010410		D0	CCINH	
			D2	HOPDIR	
NWRCS5	0x3010450		D0	SOLDIV	
			D1	JPBELL	
			D2	HOPON	
NWRCS4	0x3010440		D2	HOPTEST	
I/O DRIVER	0x3012000	WRITE	D0..D7	PBL1..8	
	0x3012010		D0..D7	PBL9..14	4 + 2
	0x3012020		D0..D5	HM1..6	2x NC
	0x3012030		D0..3	LTL1..4	
			D4..6	AL1..3	1x NC
	0x3012070		D0	LDSECO	
			D1	GDSHRIN	
			D2	BDSHRIN	
			D3	DDSHRIN	
	0x3012380 base address		PARALLEL Port DUART Channel 6,7	BACCLIT[1..8]	
MAIN BD.		READ			
NIOCS3	0x3010580 is base address		ERROR	CCERROR	
			SELECT	CCSEN	
			PE	CCRED	
			BUSY	SOLOPT	
			P3	AUSW	
			P4	JPSW	
			P5	BASW	
			P6	MECHSW	
			P7	CBOXSW	
I/O DRIVER	0x3012000	READ	D0..7	PBS1..8	
	0x3012010		D0..7	PBS9..14	4 + 2 EXP
	0x3012020		D0	GDSHRO	
			D1	BDSHRO	
			D2	DDSHRO	
			D4	HOPCOIN	
			D5	HOPHIGH	
			D6	DOPTIN	
			D7	LDSECIN	
	0x3012200		D0..D8	DIPSW1[1..8]	
	0x3012210		D0..D8	DIPSW2[1..8]	

	0x3012220		D4..D7	IRQ_CS DUART	Channel 4..7
I/O DRIVER		RD/WR	COMM Ports 4 & 5		
	0x3012100		CHANNEL A	MIKOHN	
	0x3012140		CHANNEL B	EXP SER	Rx Tx RTS CTS
	0x3012180		PARALLEL	EXP I/O	6x TTL I/O
			COMM Ports 6 & 7		
	0x3012300 base address		CHANNEL A	VLC	Rx Tx RTS CTS DTR, DCD
	0x3012340 base address		CHANNEL B		Rx Tx RTS CTS DTR, DCD

13.2.2 Mikohn Interface

The I/O Driver Board will provide the interface to be used with Mikohn Progressive Super Controllers (CON2). This interface is to be electrically isolated from the remainder of the board and requires an isolated 5 V DC supply, which is provided by the extended I/O Driver Board.

The MVP power supply provides 12 V DC isolated to the I/O Driver Board. The isolated 5 V DC supply required by the Mikohn interface is generated from this 12 V supply using a 12 V to 5 V step-down DC/DC regulator on the Extended I/O Driver Board.

The Mikohn signals must also be physically separated from other signals.

The Mikohn interface provides two Mikohn pulse outputs for two separate Mikohn Super Controller (CON2) systems as well as a bi-directional RS422 interface to allow for:

1. Information to be returned to the machine on current jackpot values - to be used in conjunction with the pulse system,
2. A true bi-directional serial interface to a controller as soon as the supporting software is available.

Mikohn uses channel A of the DUART (serial COM Port 4). The serial port supports transmit and receive lines only. No hardware handshaking is used.

Each pulse output must be able to provide at least 20 mA of current to the Mikohn circuitry.

Each of the two signal pairs (2 Mikohn pulse lines with return line) must be at least 5 mm from each other and from all other signals. The same is true of the RS422 signals.

13.2.3 Pushbuttons

This includes all pushbutton lamps and pushbutton switches. The lamps used are rated at 28 V DC and require OC current sinking drivers. The 24 V DC pushbutton switch signals must be converted to TTL levels before being input.

Sixteen pushbutton lamp outputs are provided. All lamp outputs, including light tower lamps and animation lamps, include warm-up resistors to extend the lamp life.

Similarly, sixteen pushbutton switch inputs are provided. All pushbutton switch inputs are initially at 24 V DC; hence voltage dividers can be used to convert these voltage levels into TTL levels. These inputs are filtered to reduce noise on the signals.

13.2.4 Communication

The extended I/O driver board design provides 4 serial ports, labelled COM4 to COM7. Serial Ports COM0 to COM3 are provided on the Main Board.

COM4 is allocated to the Mikohn Interface.

COM5 is a RS-232 compatible port, with RTS and CTS to be used as hardware handshake or as general input or output pins.

COM6 and COM7 are modem-compatible ports with full handshaking. COM6 supports the VLC interface/protocol.

13.2.5 BACC Denomination Lamps

The Extended I/O Driver Board has 8 lamp or LED outputs which are used to indicate the BACC denomination.

Lamp	Data Bit	Label	Function
1 to 7	D0.. D6	BACCLIT1..7	Available Bill Values - Denomination Lamps
			BACCLIT1 = Highest denomination LED
			BACCLIT7 = Lowest denomination LED
8	D7	BACCLIT8	“Insert Bill” Lamp

13.2.6 DIP Switch Banks

Two 8 bit DIP switch banks are provided. The switches are placed close to the bottom edge of the Driver Board for easy access. The settings and functions of these switches are software dependent and may be viewed via the Operator Mode Menu ⋗ Operator Setup/Selections ⋗ DIP Switch Settings.

Bank 1

The first DIP switch bank allows the coin/token value and the base credit value of the machine to be set. These settings can only be changed during a 3-way metering error. To cause a 3-way metering error:

- remove the battery temporarily

  or
- replace the game EPROMs.

To recover from a metering error, follow the on-screen instructions. All electronic meters will be reset after recovery.

Bank 2

The second DIP switch bank allows certain game options to be enabled/disabled. Changes to these settings only take effect during machine power-up.

13.2.7 Interrupt Request

The table below shows the interrupt request Bit map for DUART COM Ports 4, 5, 6, and 7.

The read-only address “0x3012220” provides a quick way to determine which channel has generated the interrupt.

Bit	Label	Function
D4	INTA	DUART COM Port 4 - Address 0x3012100
D5	INTB	DUART COM Port 5 - Address 0x3012140
D6	INT2A	DUART COM Port 6 - Address 0x3012300
D7	INT2B	DUART COM Port 7 - Address 0x3012340

13.2.8 Hard Meters and Lamps

The Extended I/O Driver Board can verify if the correct number of hard meters are actually connected. This provides meter security which is a requirement of some markets. A minimum of three and a maximum of six hard meters are used, depending on the specific market. Unused hard meter inputs have to be linked on the Driver Board to prevent misleading signals.

The hard meters are the 24 V DC type and use the same type driver that is used for the pushbutton lamps . Animation lamps and light tower lamps are driven in the same manner. There is provision for up to three animation lamps and four light tower lamps.

13.2.9 Expansion I/O

As well as providing for the I/O in Table 1, the system includes additional I/O for possible future use. Of the 16 pushbutton lamp driver outputs (as discussed in section 13.2.3 Pushbuttons), two 24 V DC driver outputs are specified as expansion outputs. Similarly, two pushbutton switch type inputs are specified as expansion inputs.

At least six expansion TTL I/Os are included. The TTL I/O lines are filtered to prevent external noise entering the board via these lines.

13.2.10 Door Security

The I/O Driver Board incorporates a battery-backed circuit for monitoring door security even while the machine is not powered. This circuit indicates to the system software that the door has been opened. Logic for 4 battery-backed door security switches is provided, and a typical allocation is shown in the table below:

Door	Signal Label
Main Door	GDOR
Logic Cage Door	LDOR
Belly Panel Door	SEC
Cash Box Door	DDOR.

13.2.11 Power

The I/O Driver Board receives 24 V DC and 12 V DC isolated from the Power Supply Assembly.

The 24 V DC supply is stepped down using an on-board DC/DC converter to provide a regulated 12 V DC ±5% supply to the coin comparator and a 5 V DC (VCC) supply to power the Main Board logic. VCC is also supplied to any peripheral logic circuits requiring 5 V DC.

A separate step-down DC/DC regulator on the I/O Driver Board is used to convert the isolated 12 V DC supply to the 5 V DC isolated required for the Mikohn interface.

13.3 Removal and Replacement Procedures

CAUTION
When handling electrostatic sensitive devices (ESDs) such as PCBAs, take care to avoid physical contact with components. PCBAs should be handled by their edges. ESDs should not be placed on metal surfaces.

CAUTION
When handling PCBAs, take care to avoid flexing the PCBA. Flexing may cause physical damage.

Removal

To remove the I/O Driver Board

1. Open the cabinet door, and switch OFF the machine.
2. Open the logic cage door.
3. Standard Electrostatic Discharge (ESD) prevention procedures should be followed when removing PCBAs.
4. Release the I/O Driver Board from its connected position using the extractor handles. Withdraw the board from the logic cage.
5. Place the I/O Driver Board in an antistatic bag immediately.

Note
A Fault Tag must be placed on any faulty boards.

Replacement

The replacement procedure is the reverse of the removal procedure.

13.4 Connector Pin Assignments

The I/O Driver Board connects to the Backplane via two 64 way DIN connectors, labelled J1 and J2, and a 96 way DIN connector, labelled J3.

Connector J1 includes most of the main I/O lines such as pushbutton lamps and switches, light tower lamp outputs, animation lamp outputs, hard-meter outputs, and all spare I/O lines whether they be driver outputs, simple TTL I/O, or serial communication lines.

Table 13-3 J1 Connector Pinout

PIN	Pin Name	Comment
A1	GND	Ground
B1	GND	Ground
A2	PBS1	Pushbutton Switch 1
B2	PBS2	Pushbutton Switch 2
A3	PBS3	Pushbutton Switch 3
B3	PBS4	Pushbutton Switch 4
A4	PBS5	Pushbutton Switch 5
B4	PBS6	Pushbutton Switch 6
A5	PBS7	Pushbutton Switch 7
B5	PBS8	Pushbutton Switch 8
A6	PBS9	Pushbutton Switch 9
B6	PBS10	Pushbutton Switch 10
A7	PBS11	Pushbutton Switch 11
B7	PBS12	Pushbutton Switch 12
A8	PBS13	Pushbutton Switch 13
B8	PBS14	Pushbutton Switch 14
A9	SPARESW1	Spare 24V Input 1
B9	SPARESW2	Spare 24V Input 2
A10	PBL1	Pushbutton Lamp 1
B10	PBL2	Pushbutton Lamp 2
A11	PBL3	Pushbutton Lamp 3
B11	PBL4	Pushbutton Lamp 4
A12	PBL5	Pushbutton Lamp 5
B12	PBL6	Pushbutton Lamp 6
A13	PBL7	Pushbutton Lamp 7
B13	PBL8	Pushbutton Lamp 8
A14	PBL9	Pushbutton Lamp 9
B14	PBL10	Pushbutton Lamp 10
A15	PBL11	Pushbutton Lamp 11
B15	PBL12	Pushbutton Lamp 12
A16	PBL13	Pushbutton Lamp 13
B16	PBL14	Pushbutton Lamp 14
A17	DRVSP1	Spare 24V output 1
B17	DRVSP2	Spare 24V output 2
A18	SPAREIO0	Spare TTL I/O
B18	SPAREIO1	Spare TTL I/O
A19	SPAREIO2	Spare TTL I/O
B19	SPAREIO3	Spare TTL I/O
A20	SPAREIO4	Spare TTL I/O
B20	SPAREIO5	Spare TTL I/O
A21	SPRTS	Spare serial
B21	SPCTS	Spare serial

A22	SPRXD	Spare serial
B22	SPTXD	Spare serial
A23	GND	Ground
B23	GND	Ground
A24	HM1	Hard Meter 1
B24	HM2	Hard Meter 2
A25	HM3	Hard Meter 3
B25	HM4	Hard Meter 4
A26	HM5	Hard Meter 5
B26	HM6	Hard Meter 6
A27	LTL1	Light Tower Lamp 1
B27	LTL2	Light Tower Lamp 2
A28	LTL3	Light Tower Lamp 3
B28	LTL4	Light Tower Lamp 4
A29	AL1	Animation Lamp 1
B29	AL2	Animation Lamp 2
A30	AL3	Animation Lamp 3
B30	HOPCOIN	Hopper Coin Output
A31	HOPHIGH	Hopper Hi Probe
B31	DOPTIN	Door Optic In
A32	24V	+24 V DC
B32	24V	+24 V DC

The J2 connector has all the power and ground pins for 24 V DC, 5 V DC (or VCC), and the isolated 5 V supply to be used with the Mikohn interface section. Most of the Mikohn lines are on this connector, although one Mikohn pulse output is on connector J1. The I/O Driver Board generates 12 V DC to supply the coin comparator. This 12 V DC line is also on connector J2. All control lines, data bus lines, and address bus lines are connected to J2.

Table 13-4 J2 Connector Pinouts

PIN	Pin Name	Comment
A1	P12VDC	12 V from Driver for Coin Comparator
B1	GND	Gnd
A2	VCC	5V from Main Board
B2	VCC	5V from Main Board
A3	LDOR_NC	Logic door switch - Normally Closed
B3	LDOR_COM	Logic door switch - Normally Common
A4	LDOR_NO	Logic door switch - Normally Open- Grounded
B4	NC	
A5	NEILO	CPU, IL0 interrupt
B5	NDACK	CPU, data acknowledge
A6	IRQDMON	“DEMON” - Debug interrupt
B6	NEIOR	CPU, IO read signal
A7	NEIOW	CPU, IO write signal
B7	NERESET	CPU, external reset output
A8	ECLK8M	CPU, clock signal
B8	GND	Ground
A9	24V	+24V
B9	24V	+24V
A10	NC	
B10	NC	EA12
A11	NC	CPU, address bus - bit EA11
B11	EA10	CPU, address bus

A12	EA9	CPU, address bus
B12	EA8	CPU, address bus
A13	EA7	CPU, address bus
B13	EA6	CPU, address bus
A14	EA5	CPU, address bus
B14	EA4	CPU, address bus
A15	EA3	CPU, address bus
B15	EA2	CPU, address bus
A16	24V	+24 VDC
B16	24V	+24 VDC
A17	GND	Ground
B17	GND	Ground
A18	ED7	CPU, data bus
B18	ED6	CPU, data bus
A19	ED5	CPU, data bus
B19	ED4	CPU, data bus
A20	ED3	CPU, data bus
B20	ED2	CPU, data bus
A21	ED1	CPU, data bus
B21	ED0	CPU, data bus
A22	VCC	+5VDC
B22	VCC	+5VDC
A23	GND	Ground
B23	GND	Ground
A24	NC	
B24	NC	
A25	NC	
B25	NC	
A26	EMIKP2	Data A2
B26	EMIKN2	Machine ID2
A27	NC	
B27	NC	
A28	NC	
B28	NC	
A29	ISOLPGND	Isolated Power Supply rail - Ground
B29	ISOLPWR	Isolated Power Supply rail - +5 V DC or +12 V DC
A30	EMIKP1	Data A1
B30	EMIKN1	Machine ID1
A31	TXDA+	Mikohn 422 Serial Comms
B31	TXDA-	Mikohn 422 Serial Comms
A32	RXDA+	Mikohn 422 Serial Comms
B32	RXDA-	Mikohn 422 Serial Comms

The functions provided by J3 include communication ports 6 and 7, door security, bill acceptor animation lamps, and power supply signals P12VI, N12VI, L12VDC, VCC, L5VDC, GNDISOL, and GND.

Table 13-5 J3 Connector Pinouts

PIN	Pin Name	Comment
A1	NC	
B1	232DTR7	COM port 7
C1	VCC	
A2	232DSR7	COM Port 7
B2	NC	
C2	GND	
A3	NC	
B3	P12VI	12 VDC isolated
C3	NC	
A4	NC	
B4	232DTR6	COM Port 6
C4	NC	
A5	232DSR6	COM Port 6
B5	NC	
C5	NC	
A6	NC	
B6	P12VI	12VDC isolated
C6	VCC	
A7	GNDISOL	Ground Isolated
B7	232TXD6	COM Port 6
C7	GND	Ground
A8	232RXD6	COM Port 6
B8	232RTS6	COM Port 6
C8	GND	Ground
A9	232CTS6	COM Port 6
B9	232DCD6	COM Port 6
C9	NC	
A10	GNDISOL	Ground Isolated
B10	232TXD7	COM Port 7
C10	NC	
A11	232RXD7	COM Port 7
B11	232RTS7	COM Port 7
C11	NC	
A12	232CTS7	COM Port 7
B12	232DCD7	COM Port 7
C12	P12VI	12 VDC isolated
A13	NC	
B13	NC	
C13	COMS_RST	Communication Channels RESET - SX system
A14	NC	
B14	NC	
C14	NC	
A15	NC	
B15	NC	
C15	VCC	5 VDC
A16	NC	
B16	BACCLIT8	BACC Denomination Lamp 8
C16	GND	Ground
A17	BACCLIT1	BACC Denomination Lamp 1

B17	BACCLIT2	BACC Denomination Lamp 2
C17	P12VI	
A18	BACCLIT3	BACC Denomination Lamp 3
B18	BACCLIT4	BACC Denomination Lamp 4
C18	N12VI	
A19	BACCLIT5	BACC Denomination Lamp 5
B19	BACCLIT6	BACC Denomination Lamp 6
C19	NC	
A20	BACCLIT7	BACC Denomination Lamp 7
B20	NC	
C20	NC	
A21	AL4	Animation Lamp 4
B21	NC	
C21	IRQ11	Interrupt request 11 - SX system
A22	AL5	Animation Lamp 5
B22	NC	
C22	IRQ5	Interrupt request 5 - SX system
A23	NC	
B23	NC	
C23	IRQ12	Interrupt request 12 - SX system
A24	DDOR_NO	Drop box door switch - Normally open
B24	DDOR_NC	Drop box door switch - Normally closed
C24	NC	
A25	DDOR_COM	Drop box door switch - Common
B25	NC	
C25	NC	
A26	GDOR_NO	Game door switch - Normally Open
B26	GDOR_NC	Game door switch - Normally Closed
C26	L12VDC	Logic 12 VDC
A27	GDOR_COM	Game door switch - Common
B27		
C27	L5VDC	Logic 5 VDC-
A28	SEC_NO	SEC Door switch - Normally Open
B28	SEC_NC	SEC Door switch - Normally Closed
C28	L5VDC	Logic 5 VDC
A29	SEC_COM	SEC Door switch - Common
B29	NC	
C29	LGND	Logic ground
A30	NC	
B30	NC	
C30	LGND	logic ground
A31	NC	
B31	NC	
C31	LGND	logic ground
A32	NC	
B32	NC	
C32	LGND	logic ground

Notes

_______Chapter 14_______

Communications Configuration Board

Type Bil/Bal/232

PCBA No. 2501-410291

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14.1 Physical Description

The Communications Configuration Board (CCB) is located within the logic cage where it is connected to the Main Board via a 72 pin SIMM socket (refer to Figure 14-1). The CCB is used to configure the internal serial communication ports COM 1, COM 2, and COM 3 for the bill acceptor, Bally-SDS, and RS-232 (serial printer).

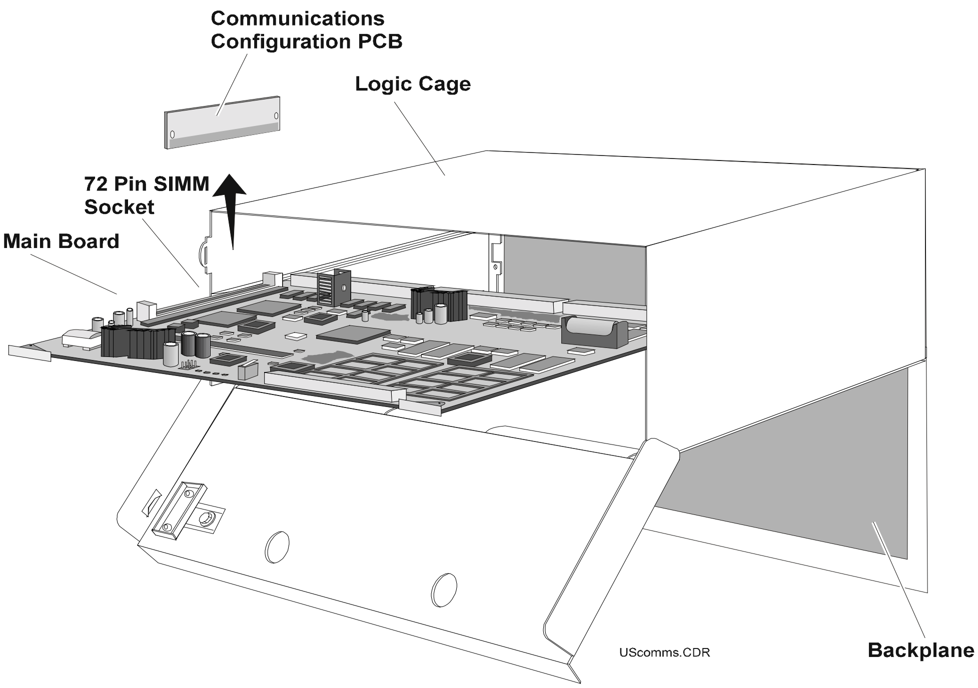


Figure 14-1 Communications Configuration Board - Position in the Logic Cage

14.1.2 Circuit Diagrams and Component Locations

A component layout of the Communications Configuration Board is shown in Figure 14-2 below. For further information and for reference, the following additional information on the Communications Configuration Board is provided in Volume II:

- **Circuit diagrams.** Structured circuit diagrams.
- **I/O to Components and ICs.** A list of the I/O paths to each component and integrated circuit (IC) pin position.

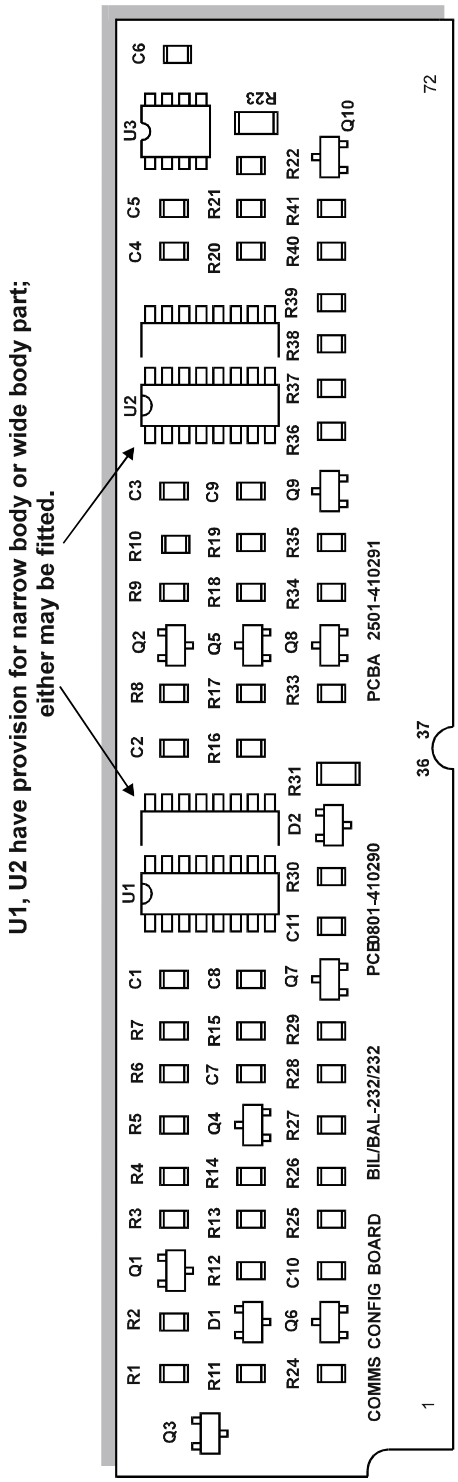


Figure 14-2 Communications Configuration Board - Component Layout

14.2 Functional Description

The Main Board has 4 serial channels referred to as COM 0, 1, 2, and 3. The Communications Configuration Board configures these 4 serial channels for operation in the USA Video Gaming Machine.

COM 0 is currently not used. It is reserved for future RS-232 communications with a touchscreen. COM 1, COM 2, and COM 3 are fully isolated and are configurable via the Communications Configuration Board (CCB).

The CCB is supplied with isolated ±12V at 100 mA (converted from the 24 V DC supply by the Main Board) for the communications channels and 5 V DC (VCC) (converted from the 24 V DC supply by the I/O Driver Board) to power the logic.

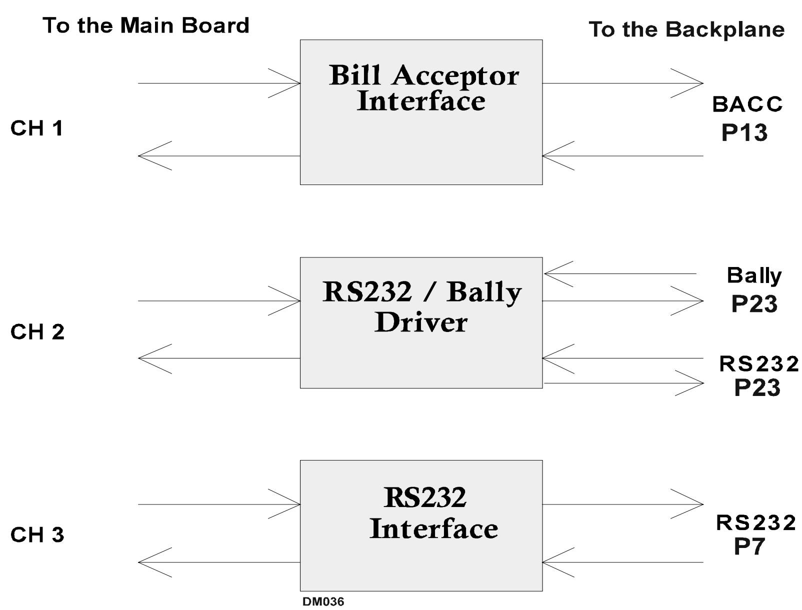


Figure 14-3 Communications Configuration Board - Block Diagram

This CCB is used with the following boards:

- MkV Depopulated Main Board (P/No 410289)
- MkV/SX Backplane Board (P/No 410351)
- Extended US I/O Driver Board (P/No 410355).

The Communications Configuration Board plugs into the Main Board via a standard 72 pin SIMM socket and converts the opto-coupled UART serial and I/O signals into the following signal levels:

- COM 1 - Bill Acceptor Interface
- COM 2 - Bally Serial Interface or RS-232
- COM 3 - RS-232 Interface.

14.2.1 COM 1 - Bill Acceptor Interface

COM 1 interfaces to the Bill Acceptor using the Mars VFM4/5 interface. This interface provides TTL/CMOS level one way communication - serial input only from the bill acceptor, with handshaking. The baud rate is 600 baud fixed, 8 bit data, 1 start bit, 1 stop bit and no parity. This port uses the 24 way Minifit connector P13 on the Backplane. This connector is also used for the keyswitch signals.

The bill acceptor used within the US Video Gaming Machine is manufactured by Coin Bill Validator of New York. The unit communicates to the Main Board via a serial protocol which conforms to the Mars GL5 standard.

The serial protocol is “one way” in that the bill acceptor sends to the host an ASCII code, depending upon the type of bill inserted or the status of the bill acceptor. The Main Board enables, disables or accepts the bill via two control lines, ACCEPT ENABLE and SEND.

Table 14-1 COM 1 Pinout

Pin	Pin Name	I/O	Bill Acceptor	Description
1	SOUT1	O		Serial data output, (loopback test for DTR1)
3	SIN1	I	Data	Serial data input in the NRZ format LSB first
13	24 V	I		Power for Bill Acceptor
15	CTS1	I	Out of Service	Active low input for bill acceptor not available
16	DSR1	O	Interrupt	Active low input that indicates the activity has occurred in the bill acceptor and a status message is ready to be transmitted.
17	I1	I	LED Anode	LED Anode indicates that BACC is connected.
18	GndIsol	-	-	Isolated Ground for Bill Acceptor
19	RTS1		Accept Enable	Active low output to enable the bill acceptor
20	DTR1	O	Send	Active low as a response of the interrupt signal that allows the bill acceptor to transmit the message

14.2.2 COM 2 - Bally / RS-232 Serial Interface

The Bally Interface and the RS-232 Interface are connected to the same port. They share the same transmit and receive lines from COM Port 2; therefore, only one interface can be connected at a time. This port uses the 24 way Minifit connector P23 on the Backplane. This connector is also used for COM 4 serial channel.

The Bally serial interface is a current loop interface defined by Bally Gaming. Normally it runs at 9600 baud rate with 1 start bit, 8 data bits, 1 stop bit, and no parity bit. Only a Bally Tx line, an Rx line, and a Blackout line (12VI) are required for the Bally Interface.

The RS-232 Interface has six input/output signals including data I/Os. The opto LED drivers on the Main Board are configured to the off state when the line is inactive or not connected to minimise the power consumption.

A pull-up resistor is required at the input of Rx1 (SIN2) so that the output DO1 goes low when there is no input at Rx1. The low signal at DO1 turns transistor Q1 ON which is required when the Bally SDS Head System is connected.

Table 14-2 COM 2 Pinout

Pin	Pin Name	Function	I/O	Description
9	O2	Bally RX - uP TX	O	Serial data output for BALLY
10	SOUT2	RS232	O	Serial data output
11	SIN2	RS232	I	Serial data input, high current LED driver to ensure the high speed switching of the opto.
12	P12VI	Bally Blackout	O	+12 V isolated for Blackout and RS232
21	RTS2	RS232	O	Active low handshake output
22	CTS2	RS232	I	Active low handshake input
23	I2	Bally TX - uP RX +	I	Serial data input for BALLY
24	GNDI	GNDI	-	Isolated Ground for COM 2

14.2.3 COM 3 - RS-232 Interface

COM 3 has six input/output signals including data I/Os. The opto LED drivers on the Main Board are configured to the off state when the line is inactive or not connected to minimise the power consumption. This port can be run at 9600 baud rate minimum. This port is initially intended to be used for the serial printer RS-232 interface. The 20-way Minifit connector P7 on the Backplane is used for this port. This connector is also used for the hopper signals.

Table 14-3 COM 3 Pinout

Pin	Pin Name	Function	I/O	Description
8	RTS3	RS232	O	Active low handshake output
9	CTS3	RS232	I	Active low handshake input
10	GNDI	GNDI	-	Isolated Ground for Printer Comms
15	DSR3	RS232	I	Active low handshake input
16	DTR3	RS232	I	Active low handshake output
17	24 V	24 V	I	24 V DC Power for Printer
18	SIN3	PRN Tx	I	Serial data input, high current LED driver to ensure the high speed switching of the opto.
19	SOUT3	PRN Rx	O	Serial data output

14.3 Removal and Replacement Procedures

CAUTION

When handling electrostatic sensitive devices (ESDs) such as PCBAs, take care to avoid physical contact with components. PCBAs should be handled by their edges. ESDs should not be placed on metal surfaces. When handling PCBAs, take care to avoid flexing the PCBA, as this may lead to permanent damage.

CAUTION

Turn the machine power OFF before removing any PCBs from the logic cage.

To remove the Communications Configuration Board (refer to Figure 14-1):

1. Open the cabinet door, and switch OFF the machine.
2. Open the logic cage door.
3. Standard Electrostatic Discharge (ESD) prevention procedures should be followed when removing PCBAs.

4. Release the Main Board using the extractor pins, and withdraw it from the logic cage.
5. Locate the Communications Configuration Board sitting perpendicular to the Main Board in the top left.
6. Remove the board by lifting it upwards while holding the Main Board steady.

Note
A fault tag must be placed on any faulty PCBAs.

To replace the Communications Configuration Board:

1. Standard Electrostatic Discharge (ESD) prevention procedures should be followed when replacing PCBAs.
2. Remove the replacement board from the antistatic bag.
3. Inspect both sides of the board for any signs of physical damage.
4. Press the Communications Configuration Board into position on the Main Board.
5. Slide the Main Board into the correct logic cage grooves and gently move the board into position on the Backplane. Close the logic cage door.
6. Switch the machine ON, and close the cabinet door.

Note
Relevant machine tests should be run after replacing the Communications Configuration Board.

14.4 Connector Pinout

The following table lists the pinout of the 72 pin SIMM connector between the CCB and the Main Board. Signals to and from the Main Board side are opto-isolated by opto-couplers on the Main Board.

Table 14-4 72 Pin Connector to Main Board - Pinout

Pin	Pin Name	IC-Pin No.	Description	CCB Function
1	CFG2		DTRA0 output signal through opto emitter	Not used
2	GNDI		Ground	Ground
3	CFG4	U1-13, U1-1	RTSA1 output signal through opto emitter	COM 1 B/A accept enable from Main Board
4	CFG1		PDA0 output signal through opto collector	Not used
5	SIN1	R7-2	Input from COM 1 connector	COM 1 B/A data in
6	CFG3	U1-14, U2-1	RTSA1 output signal through opto collector	+12 volt

Pin	Pin Name	IC-Pin No.	Description	CCB Function
7	SOUT1	R9-2	Output to COM 1 connector	COM 1 data out loopback tst for DTR1
8	CFG6	U1-3, U1-5	DTRA1 output signal through opto emitter	COM 1 B/A send from Main Board
9	CTS1	R31-2	Input from COM 1 connector	COM 1 B/A service to Main Board
10	CFG5		DTRA1 output signal through opto collector	+12 volt
11	DSR1	R8-2	Input from COM 1 connector	COM 1 B/A interrupt
12	CFG8	R11-1	SOUTA1 output signal through opto emitter	COM 1 data out loopback tst for DTR1
13	CFG7	R4-2	SOUTA1 output signal through opto collector	+12V
14	CFG10		CTSA1 input signal through opto cathode	Service/LED Anode
15	I1	R6-2	Input from COM 1 connector	B/A +5 volt LED Anode
16	CFG11	R2-1	DSRA1 input signal through opto anode	COM 1 B/A interrupt to Main Board +12V
17	CFG9	R3-11	CTSA1 input signal through opto anode	COM 1 B/A service to Main Board +12V
18	CFG12		DSRA1 input signal through opto cathode	Interrupt
19	RTS1	R28-2	Output to COM 1 connector	COM 1 B/A accept enable
20	CFG13	R32-1	SINA1 input signal through opto anode	COM 1 B/A data to Main Board +12V
21	DTR1	R29-2	Output to COM 1 connector	COM 1 B/A send
22	CFG14		SINA1 input signal through opto cathode	Data
23	O1		Output to COM 1 connector (Not Connected)	Not used
24	P12VI		+12v power	+12V power
25	CFG20	R24-1	DTRBO output signal through opto emitter	Ground
26	N12VI		-12v power	-12V power
27	CFG19		DTRBO output signal throuth opto collector	COM 2 RTS from Main Board
28	GNDI		Ground	Ground
29	CFG18	R22-1	SOUTBO output signal through opto emitter	O2 Tx for Bally
30	CFG17	R21-1	SOUTBO output signal through opto collector	Blackout for Bally +12V
31	CFG16	R20-1	SOUTBO output signal through opto base	Pull down through 150K res.
32	CFG15		Opto Vcc	+5volt
33	SIN2	R19-2	Input from COM 2 connector	COM 2 data in
34	CFG22	R13-1	RTSBO output signal through opto emitter	Ground
35	SOUT2	R22-2	Output to COM 2 connector	COM 2 data out
36	CFG29	R34-1	SINBO input signal through opto anode	COM 2 data in to Main Board (232 & Bally)
37	CTS2	R17-2	Input from COM 2 connector	COM 2 CTS
38	CFG30		SINBO input signal through opto cathode	Ground
39	DSR2	R18-2	Input from COM 2 connector	COM 2 DSR
40	CFG21		RTSBO output signal through opto collector	COM 2 DTR to Main Board
41	I2		Input from COM 2 connector	Rx from Bally
42	CFG31	R17-1	CTSBO input signal through opto anode	+5 volt
43	RTS2	R24-2	Output to COM 2 connector	COM 2 RTS
44	CFG32		CTSBO input signal through opto cathode	COM 2 CTS to Main Board
45	DTR2	R13-2	Output to COM 2 connector	COM 2 DTR
46	CFG33	R18-1	DSRBO input signal through opto anode	+5volt
47	O2	R23-2	Output to COM 2 connector	Tx to Bally
48	P12VI		+12v power	+12v power

Pin	Pin Name	IC-Pin No.	Description	CCB Function
49	CFG34		DSRBO input signal through opto cathode	COM 2 DSR to Main Board
50	GNDI		Ground	Ground
51	CFG24		RTSB1 output signal through opto emitter	ground
52	N12VI		-12v power	-12v power
53	SIN3	R16-2	Input from COM 3 connector	COM 3 data in
54	CFG23	R25-1	RTSB1 output signal through opto collector	COM 3 RTS from Main Board
55	SOUT3	R27-3	Output to COM 3 connector	COM 3 data out
56	CFG26		DTRB1 output signal through opto emitter	Ground
57	CFG25	R26-1	DTR3 output signal through opto collector	COM 3 DTR to Main Board
58	CFG28		SOUTB1 output signal through opto emitter	Ground
59	CTS3	R14-2	Input from COM 3 connector	COM 3 CTS
60	CFG27	R27-1	SOUTB1output signal through opto collector	COM 3 SOUT3 from Main Board
61	CFG35		CTSB1 input signal through opto anode	+5V
62	CFG36	R14-1	CTSB1 input signal through opto cathode	COM 3 CTS from Main Board
63	DSR3	R15-2	Input from COM 3 connector	COM 3 DSR
64	CFG37	U2-1	DSRB1 input signal through opto anode	+5V
65	I3		Input from COM 3 connector (Not Connected)	not used
66	CFG38	R15-1	DSRB1 input signal through opto cathode	COM 3 DSR from Main Board
67	RTS3	R25-2	Output to COM 3 connector	COM 3 RTS
68	CFG39	R33-2	SINB1 input signal through opto anode	COM 3 data in to Main Board
69	DTR3	R26-2	Output to COM 3 connector	COM 3 DTR
70	CFG40	U2-2,3,6,7	SINB1 input signal through opto cathode	Ground
71	O3		Output to COM 3 connector (Not Connected)	not used
72	GNDI		Ground	Ground

Notes

Chapter 15

Electromechanical Meters Board
Part No. 410361

List of Figures:

15.1 Physical Description

Pulse Mechanical Meters Board

The Pulse Mechanical Meters Board is located in the top box (refer to Figure 15-1). It is a conventional double sided PCB that interfaces with the Extended I/O Driver Board via a 24-way Minifit Junior connector on the Backplane. Up to six mechanical meters may be mounted to the board.

Mechanical Meters

The mechanical meters are used to record audit information such as games played, credits won, etc. The specifications of the meters are as follows:

Number of digits	7
Rated voltage:	24 V DC
Power consumption:	46 mA 1.1W
Operating volume range	90 to 110% of rated voltage
Count speed:	20 CPS (standard)
Allowable ripple ratio	<10%
Ambient temperature.	-25°C to +60°C (operating)
Dielectric strength	1500 V AC, 50/60 Hz for 1 minute

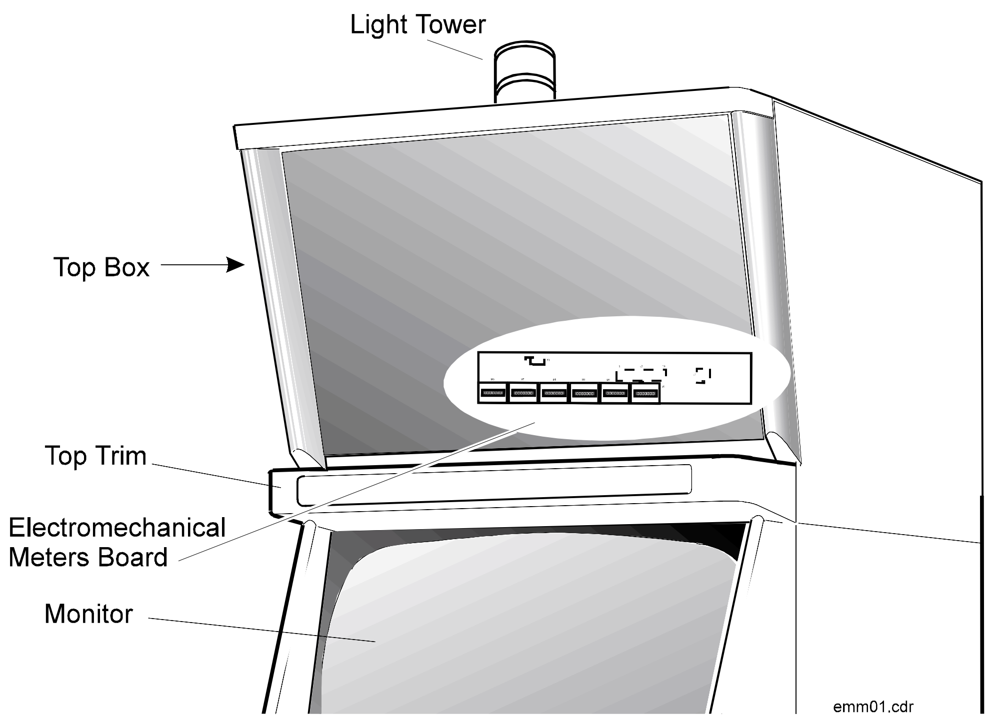


Figure 15-1 Electromechanical Meter Board - Location

15.1.2 Circuit Diagrams and Component Locations

A component layout of the Pulse Mechanical Meters Board is shown in Figure 15-2 below. For further information and for reference, the following additional information on the Pulse Mechanical Meters Board is provided in Volume II:

- **Circuit Diagrams.** Structured circuit diagrams.
- **I/O to Components and ICs.** A list of the I/O paths to each component.

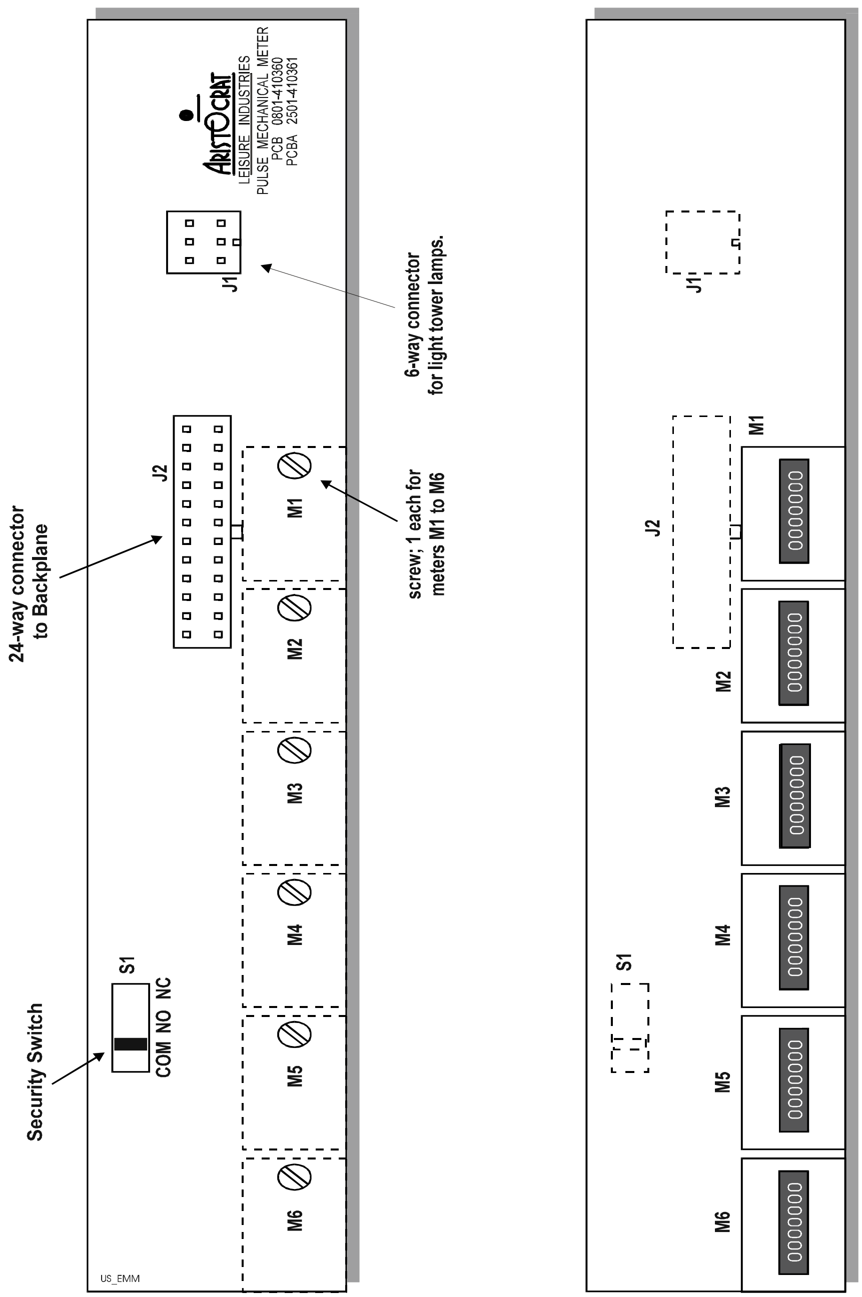


Figure 15-2 Electromechanical Meter Board - Component Layout

15.2 Functional Description

The Pulse Mechanical Meter Board's function is to (refer to Figure 15-2):

- provide physical location for up to six electromechanical meters
- provide an interface to the light tower lamps

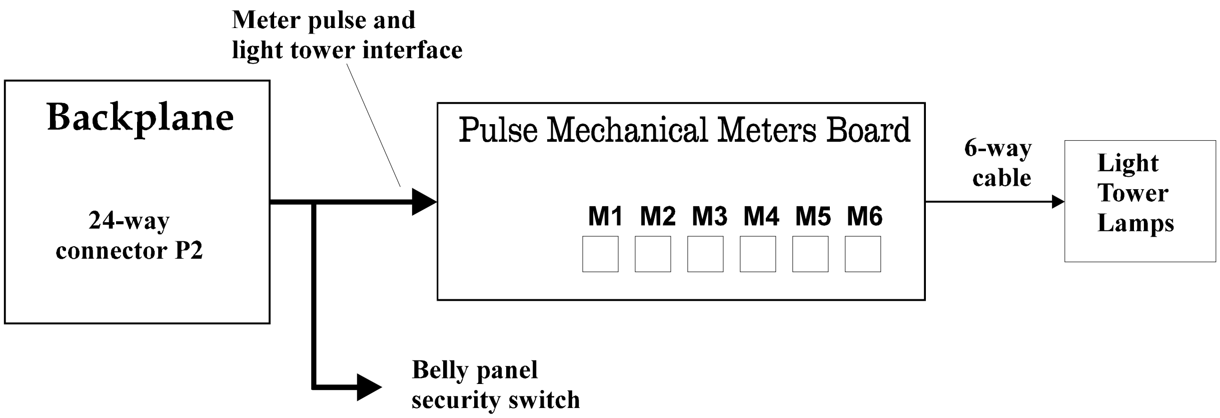


Figure 15-3 Electromechanical Meter Board - Block Diagram

Meters Interface:

The I/O Driver Board sends drive signals, via the Backplane, to the Pulse Mechanical Meters Board to increment the appropriate meter.

The Mechanical Meters Board is connected via a 24 way Minifit junior cable header connector to P2 on the Backplane.

Overcurrent Protection:

An 'intelligent' power driver is used for switching power on and off through the meter drive outputs. The power switch used incorporates built-in overcurrent sensing and protection.

Light Tower Interface:

When a light tower is used, it is interfaced with the machine via a connector on the Mechanical Meters Board. Lamp driver outputs from the I/O Driver Board are directed by the Meter Board to the appropriate light tower lamp.

Connection is via a 6 way Minifit junior cable header connector.

Meter Detection:

The interface allows the I/O Driver Board logic to detect if the correct number of mechanical meters are actually connected.

15.3 Connector Pin Assignments

15.3.1 Connection from Backplane Board

The Pulse Mechanical Meters Board connects to the 24-way Minifit Junior connector P2 on the Backplane.

Note: The shaded signals (SEC_NC, SEC_NO, and SEC_COM) provide for the belly panel door battery-backed security switch.

Pin	Signal	Function	Comment
1,2,3,4,13,14	MET24V	+24 V DC (input to meters board)	24 V DC supply for meters
5	HM1	Signal to control hard meter no.1 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
6	HM2	Signal to control hard meter no.2 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
7	HM3	Signal to control hard meter no.3 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
8	HM4	Signal to control hard meter no.4 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
9	HM5	Signal to control hard meter no.5 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
10	HM6	Signal to control hard meter no.6 (input to meters board)	Pulse signal for direct connection to the meter (pull-down)
11	VCC	+5 V DC (input to meters board)	not used on pulse meters board
12,24	GND	Ground	Ground reference
15,16	LTL24V	+24 V DC (input to meters board)	24 V DC supply for light tower
17	SEC_NC	Security switch - normally closed contact	Belly panel door battery-backed security
18	SEC_NO	Security switch - normally open contact	Belly panel door battery-backed security
19	SEC_COM	Security switch - common contact	Belly panel door battery-backed security
20	LTL1	Signal to control light tower lamp no.1 (input to meters board)	Signal for direct connection to the light tower (pull-down)
21	LTL2	Signal to control light tower lamp no.2 (input to meters board)	Signal for direct connection to the light tower (pull-down)
22	LTL3	Signal to control light tower lamp no.3 (input to meters board)	Signal for direct connection to the light tower (pull-down)
23	LTL4	Signal to control light tower lamp no.4 (input to meters board)	Signal for direct connection to the light tower (pull-down)

15.3.2 Connection to Light Tower Lamps

A 6-way cable header connector provides the interface to the light tower lamps. The connector is a Minifit Junior type.

Pin	Signal	Function	Comment
1,6	LTL24V	+24Vdc (output to tower lamps)	24V dc supply for tower lamps
2	LTL1	Signal to control light tower lamp no.1 (output from meters board)	Signal for direct connection to the top lamp (pull-down)
3	LTL2	Signal to control light tower lamp no.2 (output from meters board)	Signal for direct connection to the 2nd lamp (pull-down)
4	LTL3	Signal to control light tower lamp no.3 (output from meters board)	Signal for direct connection to the 3rd lamp (pull-down)
5	LTL4	Signal to control light tower lamp no.4 (output from meters board)	Signal for direct connection to the 4th lamp (pull-down)

15.4 Removal and Replacement Procedures

CAUTION

When handling electrostatic sensitive devices (ESDs) such as PCBAs, take care to avoid physical contact with components. PCBAs should be handled by their edges. ESDs should not be placed on metal surfaces. When handling PCBAs, take care to avoid flexing the PCBA, as this may lead to permanent damage.

To remove the Mechanical Meters Board:

1. Open the cabinet door, and switch OFF the machine.
2. Remove the top box door, and carefully remove the top box reflector panel.
3. The meter board is mounted to the back of the reflector panel.
4. Disconnect the looms from the meter board, and remove the board.

Replacement is a reversal of the removal procedure.

15.5 General Maintenance

For general maintenance of the Pulse Mechanical Meters Board:

- Remove any dust or dirt from external surfaces.
- Check that all connectors are in good condition and are secure.

Notes

Chapter 16

Communications Systems

List of Figures

List of Tables

16.1 Overview

Machines may be connected to a network communications system to monitor security, record accounting information, provide performance analysis, and enable player communications. To connect to a network, each machine must be fitted with a communications interface.

There are several different communications systems that may fitted, depending on the jurisdiction and market requirements. A number of companies, including Aristocrat Leisure Industries, manufacture and install communications interfaces and network systems for gaming machines.

The different types of communications systems are described in this chapter, with Aristocrat products being described in greater detail. For more information on any of the systems described, refer to the vendor documentation for the particular system installed.

16.2 VLC Communication PCB

The VLC Communication PCB and housing is mounted inside the gaming machine cabinet. The PCB has five connectors, two on the upper side for connection to the host machine and three on the reverse side for connection to the communications network and also the cash box security switch.

Functional Description

The purpose of the VLC Communication Inlet PCB is to provide connections to VLC communication protocol and 3 kV isolation for these connections in a single bi-directional channel. The VLC communication bus is a multi-drop system, the signals comply with EIA RS422 specification but with EIA RS485 driver/receiver capabilities, capable of supporting 9600 baud. The PCB also provides connections and signal filtering for the cash box switch.

The PCB converts input RS232 signals from the machine Main Board via P15 (serial channel 2) on the Interface Board, to TTL levels before crossing the signals over the 3 kV isolation via optical isolators.

The signals are then converted into RS422 for network transmission using an RS485 driver/receiver chip. This conversion process is reversed when the machine is receiving signals from the network. The machine software controls the transmission signals for the PCB via serial channel 2 from the machine Main Board - it can enable or disable TXD and RTS from the VLC network.

The PCB receives isolated 12 V DC power at connector P1. This power line is filtered then rectified and regulated down to 5 V DC before being utilised by the isolated side of the opto isolators and the driver/receiver. The PCB also receives 12

V DC non-isolated power at connector P0. This power line is regulated down to 5 V DC to power the non-isolated section of the PCB.

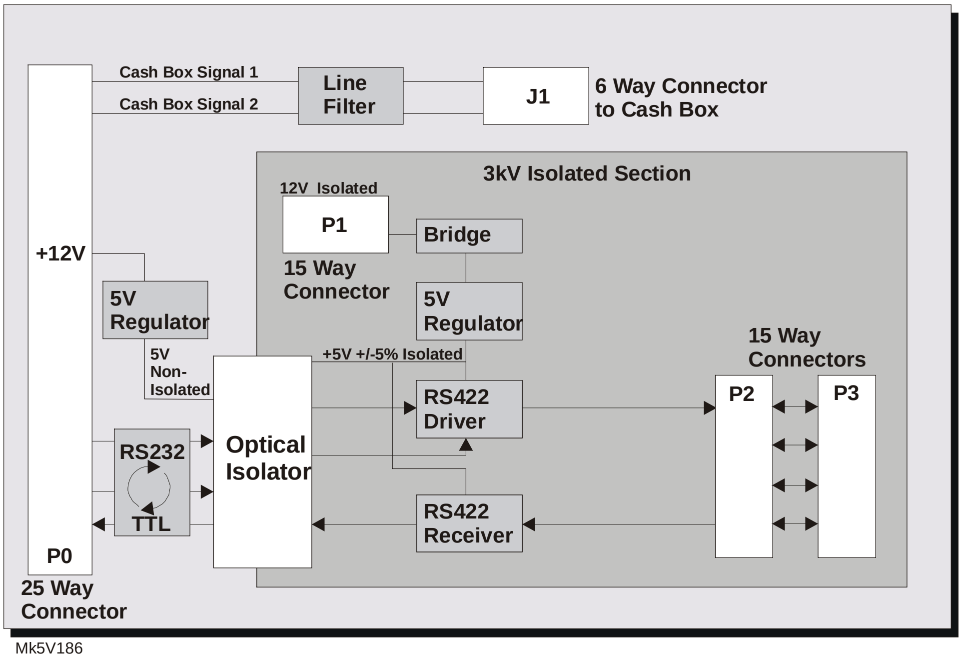


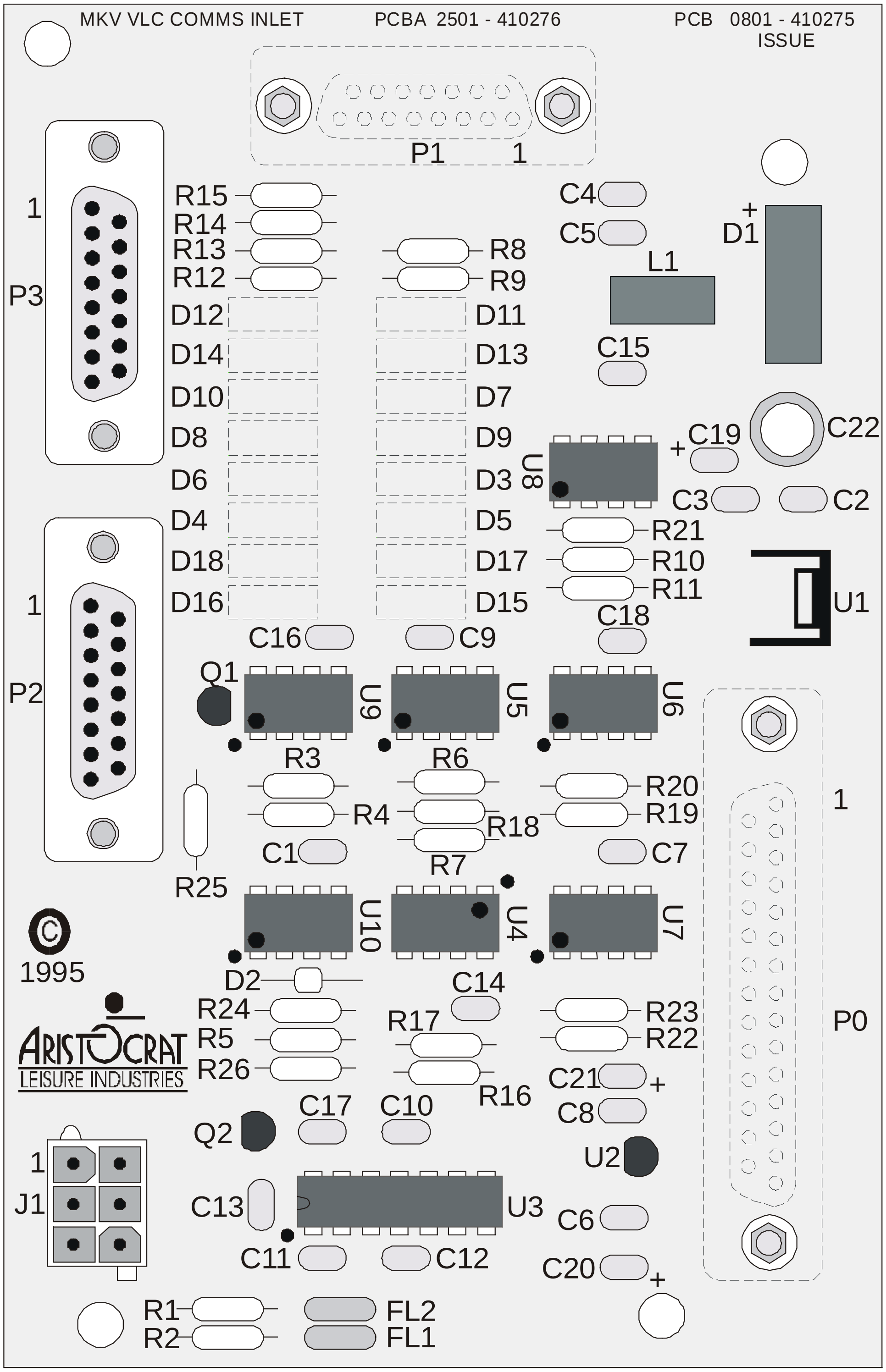
Figure 16-1 VLC Comms Inlet PCB Block Diagram

Ports P2 and P3 are connected in parallel in accordance with VLC communication bus standards.

Connectors

The connectors to the host machine and the VLC communication bus are as follows:

P0	Connects to P15 (serial channel 2) and P22 (cash box) on machine Interface Board.
P1	Connects to P23 on machine Interface Board for isolated 12 V DC power.
P2/P3	Connects directly to VLC communication bus.
J1	Connects to cash box security switch.



Mk5V185

Figure 16-2 VLC Communication Inlet PCB - Component Layout

Connector Pin Assignments

Table 16-1 Connector P0

Pin	Signal Name	Comment
1	GND	Ground.
2	GND	Ground.
3	GND	Ground.
4	/RTS	Handshake signal from machine, active 'low'.
5	/DTR	Handshake signal from machine, active 'low'.
6	GND	Ground.
7	GND	Ground.
8		Reserved.
9	GND	Ground.
10	GND	Ground.
11	+12V	+ 12 V DC non-isolated power.
12		Reserved.
13	CASH2	Cash box signal 2.
14	TX Data	Data signal from the machine.
15	RX Data	Data signal to the machine.
16	GND	Ground.
17	/CTS	Handshake signal to machine, active 'low'.
18		Reserved.
19		Reserved.
20		Reserved.
21		Reserved.
22		Reserved.
23		Reserved.
24		---
25	CASH1	Cash box signal 1.

Table 16-2 Connector P1

Pin	Signal Name	Comment
1	12VDC1	12 V DC isolated power from machine.
2		---
3	12VDC2	12 V DC isolated power from machine.
4		---
5		---
6		---
7		---
8		---
9		---
10		---
11		---
12		---
13		---
14		---
15		---

Table 16-3 Connectors P2 and P3

Pin	Signal Name	Signal Name	Comment
1	Shield	Shield	Chassis ground.
2	TXDa	TXDa	Transmitted data (to VLC bus).
3	RTSa	RTSa	Request to send (to VLC bus).
4	RXDa	RXDa	Received data (from VLC bus).
5	CTSa	DCDa	Clear to send (from VLC bus).
6			---
7	GND_REF	GND_REF	Ground reference.
8			---
9	TXDb	TXDb	Transmitted data (to VLC bus).
10	RTSb	DTRb	Request to send (to VLC bus).
11	RXDb	RXDB	Received data (from VLC bus).
12	CTSb	DCDb	Clear to send (from VLC bus).
13			---
14			---
15			---

Table 16-4 Connector J1

Pin	Signal Name	Comment
1	EXT2	To cash box security.
2	EXT1	To cash box security.
3		---
4		---
5		---
6	EXT2	To cash box security.

16.3 TCP/IP Communications

TCP/IP communications requires two separate boards be installed within the machine: the TCP/IP Communications (Comms) Board and the TCP/IP Comms Inlet Board.

16.3.1 TCP/IP Communications (Comms) Board

The TCP/IP Communications (Comms) Board is located inside the logic cage and is perpendicularly mounted to the Interface Board via the 96-way right-angled DIN41612 connector P5. The board links to the EGM and the TCP/IP Communications Inlet Board providing the interface between the machine and the IEEE802.3 TabCorp network data stream.

The MC68302 Integrated MultiProtocol Processor (IMP) acts as the main processor on the board and is attached to a variety of inputs and outputs which serve to inform the processor of the current machine status.

Functional Blocks

The MC68302 IMP operates at 16 MHz and contains 3 serial communications controllers, 4 programmable chip-select lines, two 16-bit timer/counters, interrupt encoding and a number of programmable input/output pins.

Memory devices attached to the bus consist of 2 x 128KB EPROMs and 4 x 128 KB static RAMs. The RAM is battery backed to provide a non-volatile, read-write, data storage area.

Network Interfaces

Network Address PROM

A 32-byte PROM carries the Ethernet hardware address of the module along with other site-dependent data and is read directly by the MC68302 IMP in the same manner as the other memory devices.

MACE™

The Am79C940 Media Access Controller for Ethernet (MACE™) interfaces the network transceiver to the MC68302 using the MC68302 external DMA channel. MACE performs the transmit, receive and collision arbitration and housekeeping.

The MACE contains a 136 byte transmit FIFO and a 128 byte receive FIFO which are read from or written to under DMA control, as configured by the processor and required for the network interface. The transmit, receive and collision sense pairs are transformer-isolated to 3 kV DC on the TCP/IP Communications Inlet Board.

Other System Elements

Additional functional blocks include:

- Three serial communication ports provided on the MC68302.
- A Bus Port used to communicate to the machine via a 16C452 UART and a 16V8.
- Two diagnostic ports buffered to RS232 signal levels and connected to 10-way headers.
- One optically-coupled digital input and one optically-coupled digital output port (10-way headers) provided on the two spare RS232 ports. These digital I/O points may be read or written to via the MC68230 Dongle parallel interface IC.
- An 8-pin socket which enables an EEPROM to be plugged in to the TCP/IP Communications Board and carry security-encoded site-specific data.
- General purpose I/O pins to monitor a variety of machine status points and functions, including:
  - (a) Battery-backed real-time, clock chip for real-time stamping of events, if required.
  - (b) Serially-driven octal driver device to provide a protected drive to the electromechanical meter module.
  - (c) Three inputs and three outputs used to interface to various optic door sensors within the cashbox.
  - (d) Special battery-backed 16-bit counter to provide a logic door seal for the machine.

Battery-Backed Logic Door Seal

The logic door security switch loom is disconnected from the Interface Board and connected to J2 on the TCP/IP Communications Board.

The logic door seal is provided by a sixteen-bit, buffered binary counter loaded with a value (up to 65535) which is reset to zero on breaking the logic seal. This value is read directly by the MC68302 to determine if the logic seal has been broken. The logic seal is battery backed so as to maintain monitoring of the seal during power-down or power-fail conditions.

Cashbox Optics

Three cashbox, optical-sensor signals are generated and monitored by the I/O on the MC68302 and filtered by the TCP/IP Communications Inlet Board. (TabCorp supplies the loom to the cashbox optics).

Electromechanical Meter Driver

The meter-driver circuitry is provided by the MC33298. This device is accessed serially by the MC68302 and provides a 1 A short-circuit, high-voltage protected output. Each output can be checked for open-circuit or short-circuit conditions simply by reading back a status byte.

To maintain compatibility with the ANET10 firmware design, the TCP/IP Communications Board uses pull-up resistors to convince the firmware that the meters are connected to it. However, the machine controls and monitors the meters via the Mechanical Meter Board to minimise changes to the machine.

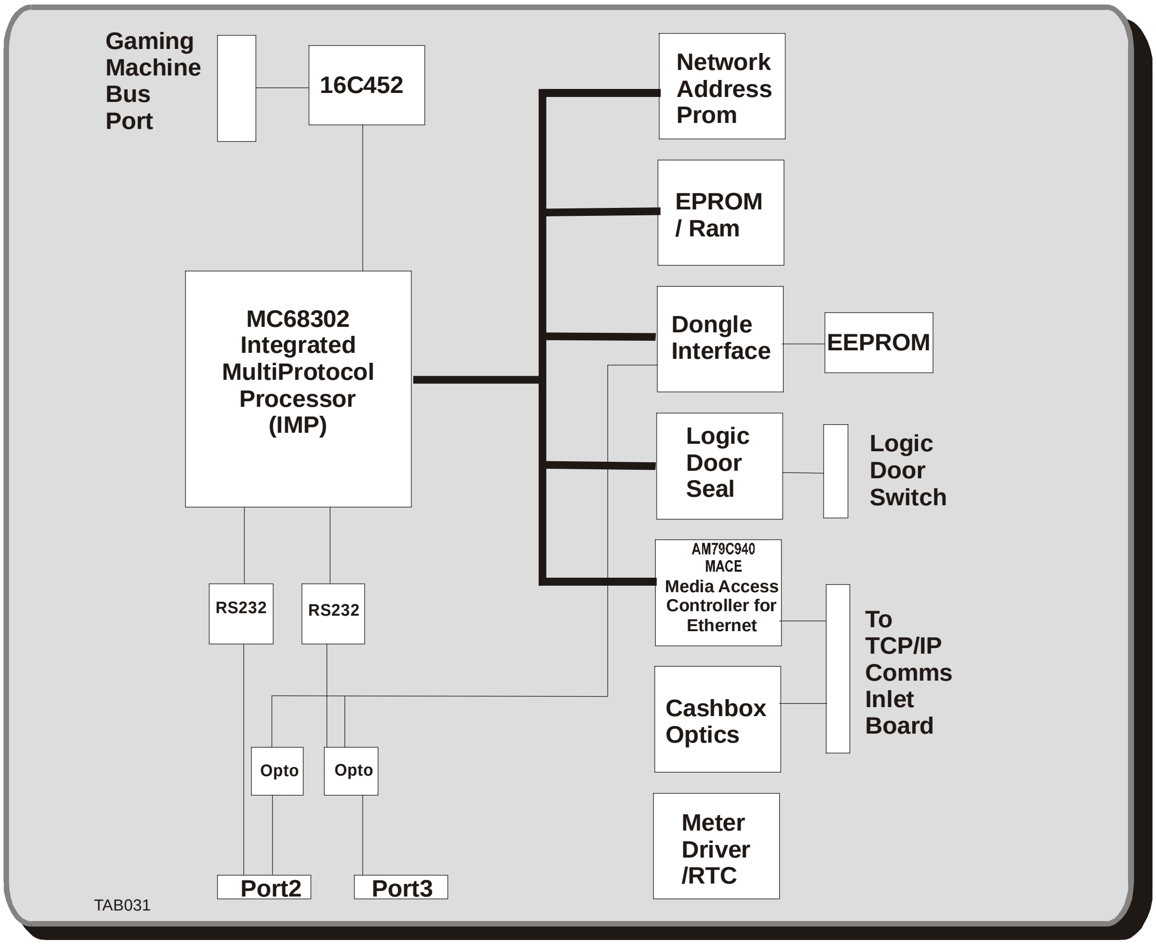


Figure 16-3 TCP/IP Communications Board - Block Diagram

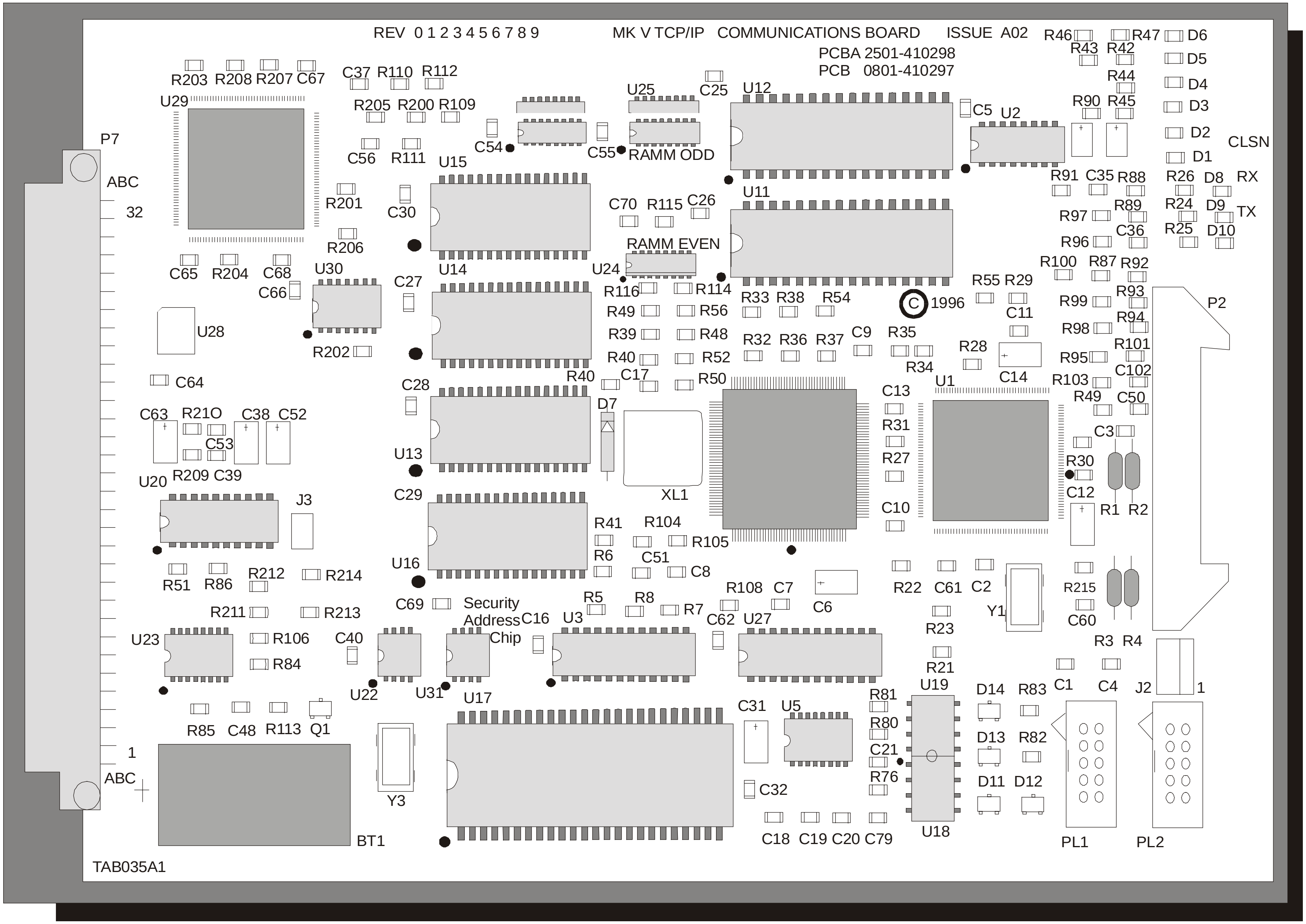

REV 0 1 2 3 4 5 6 7 8 9
MK V TCP/IP COMMUNICATIONS BOARD
ISSUE A02
PCBA 2501-410298
PCB 0801-410297
RAMM ODD
RAMM EVEN
Security Address Chip
1996
P7
ABC
32
1
ABC
P2
CLSN
RX
TX
PL1
PL2
J2
J3
BT1
Y1
Y3
XL1
U1
U2
U3
U5
U11
U12
U13
U14
U15
U16
U17
U18
U19
U20
U22
U23
U24
U25
U27
U28
U29
U30
U31
TAB035A1

Figure 16-4 Component Location

Machine Interface Connector - P7

The 96-way DIN 41612 connector P7 on the TCP/IP Communications Board interfaces with P5 on the Interface Board. The interface supplies 5 V and 24 V to the communications board.

Table 16-5 Interface Connector - P7

Pin No.	Pin Name	Destination / IC-Pin No.	Comment
A1			---
B1	GND		PS1 section, ground 24V
C1			---
A2			---
B2			---
C2			---
A3			---
B3	GND		PS1 section, ground 24V
C3			---
A4	MSS0		Logic Door Security Switch 7 contact - NC
B4			---
C4			---
A5			---
B5	GND		PS1 section, ground 24V
C5	MSSO0		Logic Door Security Switch 7 contact - NO
A6			---
B6			---
C6			---
A7			---
B7	GND		PS1 section, ground 24V
C7			---
A8			---
B8			---
C8			---
A9			---
B9	GND		PS1 section, ground 24V
C9			---
A10			---
B10			---
C10			---
A11			---
B11	GND		PS1 section, ground 24V
C11			---
A12			---
B12			---
C12			---
A13			---
B13	GND		PS1 section, ground 24V
C13			---
A14			---
B14			---
C14			---
A15	ID0		configuration pin, specify card number

B15	GND		PS1 section, ground 24V
C15	ID1	U28-18	configuration pin, specify card number
A16	P5V		+5V from mainboard, converted from PS1 24V
B16	P5V		+5V from mainboard, converted from PS1 24V
C16	P5V		+5V from mainboard, converted from PS1 24V
A17	RNW		CPU, read not write signal
B17	GND		PS1 section, ground 24V
C17			---
A18	/EIF		CPU, IF interrupt
B18	EHF		CPU, FH0 interrupt
C18	/DACK	U28-13	CPU, data acknowledge
A19	/EFL		CPU, FL interrupt
B19	GND		PS1 section, ground 24V
C19	/EIL0	U28-12	CPU, IL0 interrupt
A20	/ERESET	U30-11	CPU, external reset output
B20	/EIOW	U29-36	CPU, IO write signal
C20	/EIOR	U29-37	CPU, IO read signal
A21	EA13	U28-15	CPU, address bus
B21	GND		PS1 section, ground 24V
C21	ECLK8M	U29-4	CPU, clock signal
A22	EA10	U28-7	CPU, address bus
B22	EA11	U28-8	CPU, address bus
C22	EA12	UF28-9	CPU, address bus
A23	EA8	U28-5	CPU, address bus
B23	GND		PS1 section, ground 24V
C23	EA9	U28-6	CPU, address bus
A24	EA5	U28-2	CPU, address bus
B24	EA6	U28-3	CPU, address bus
C24	EA7	U28-3	CPU, address bus
A25	EA3	U28-4U29-34	CPU, address bus
B25	GND		PS1 section, ground 24V
C25	EA4	U29-33	CPU, address bus
A26	VBATE		external battery backup
B26	/PFAIL		power fail signal of PS1 section, ground 24V
C26	EA2	U29-35	CPU, address bus
A27			---
B27	GND		PS1 section, ground 24V
C27			---
A28	ED5	U29-19	CPU, data bus
B28	ED6	U29-20	CPU, data bus
C28	ED7	U29-21	CPU, data bus
A29	ED3	U29-17	CPU, data bus
B29	GND		PS1 section, ground 24V
C29	ED4	U29-18	CPU, data bus
A30	ED0	U29-14	CPU, data bus
B30	ED1	U29-15	CPU, data bus
C30	ED2	U29-16	CPU, data bus
A31	GND		PS1 section, ground 24V
B31			---
C31	GND		PS1 section, ground 24V
A32			
B32	GND		PS1 section, ground 24V
C32	P24V		PS1 section, +24V

AUI and Cashbox Optic Interface Connector - P2

The P2 interface is a 26-way header that connects the signals from the AM79C940 MACE and Cashbox optics to the TCP/IP Communications Inlet Board.

Table 16-6 AUI and Cash Box Connector P2

Pin	Pin Name	IC-Pin No.	Description
1	M_BD_EMIT +	R89-2	Cash Box Bottom Door Emitter +
2	M_CB_EMIT +	R88-2	Cash Box Emitter +
3	M_BD_EMIT -	R96-2	Cash Box Bottom Door Emitter -
4	M_CB_EMIT -	R97-2	Cash Box Emitter -
5	M_TD_EMIT +	R87-2	Cash Box Top Door Emitter +
6	M_CB_DET +	R92-2, R100-2, C36-1	Cash Box Detector +
7	M_TD_EMIT -	R95-2	Cash Box Top Door Emitter -
8	M_CB_DET -	R101-1	Cash Box Detector -
9	M_BD_DET +	R93-2, R99-2, C49-1	Cash Box Bottom Door Detector +
10	M_BD_DET -	R102-1	Cash Box Bottom Door Detector -
11	M_TD_DET +	R94-2, R98-2, C50-1	Cash Box Top Door Detector +
12	M_TD_DET -	R103-1	Cash Box Top Door Detector -
13	N C		
14	N C		
15	N C		
16	N C		
17	N C		
18	N C		
19	N C		
20	M_CI -	U81-1, R1-1	Collision -
21	M_CI +	U1-82, R2-1	Collision +
22	M_DO -	U1-76	AUI Data Out -
23	M_DO +	U1-77	AUI Data Out +
24	M_DI -	U1-79, R3-1	AUI Data In -
25	M_DI +	U1-80, R4-1	AUI Data In +
26	N C		

Logic Seal Interface - J2

The connector J2 is a 3-way Molex type connecting to the logic cage door security switch.

Table 16-7 Logic Seal Interface

Pin	Pin Name	IC-Pin No.	Description
1	NO	U5-13	Normally Open Contact
2	C		Common
3	NC	U5-14	Normally Close Contact

16.3.2 TCP/IP Comms Inlet Board

Functional Description

The TCP/IP Communications (Comms) Inlet Board is housed in a metal container (Communications Inlet Tower) which is located at the base of the machine. The board provides an interface between the TCP/IP Communications Board and the IEEE802.3 TabCorp network data stream.

The TCP/IP Communications Inlet Board provides a 3 kV isolation and ESD protection between the AUI Interface (TCP/IP Network) and Cash Box Signals on the network side, and the TCP/IP Communications Board on the machine side. The board also provides power (12 V DC) for the AUI Interface (TCP/IP Network).

The Cash Box Signals are protected by EMI/RFI filters and metal oxide varistors. The Data Signals from the TCP/IP Network are protected by transient voltage suppressors and 3 kV isolation transformers.

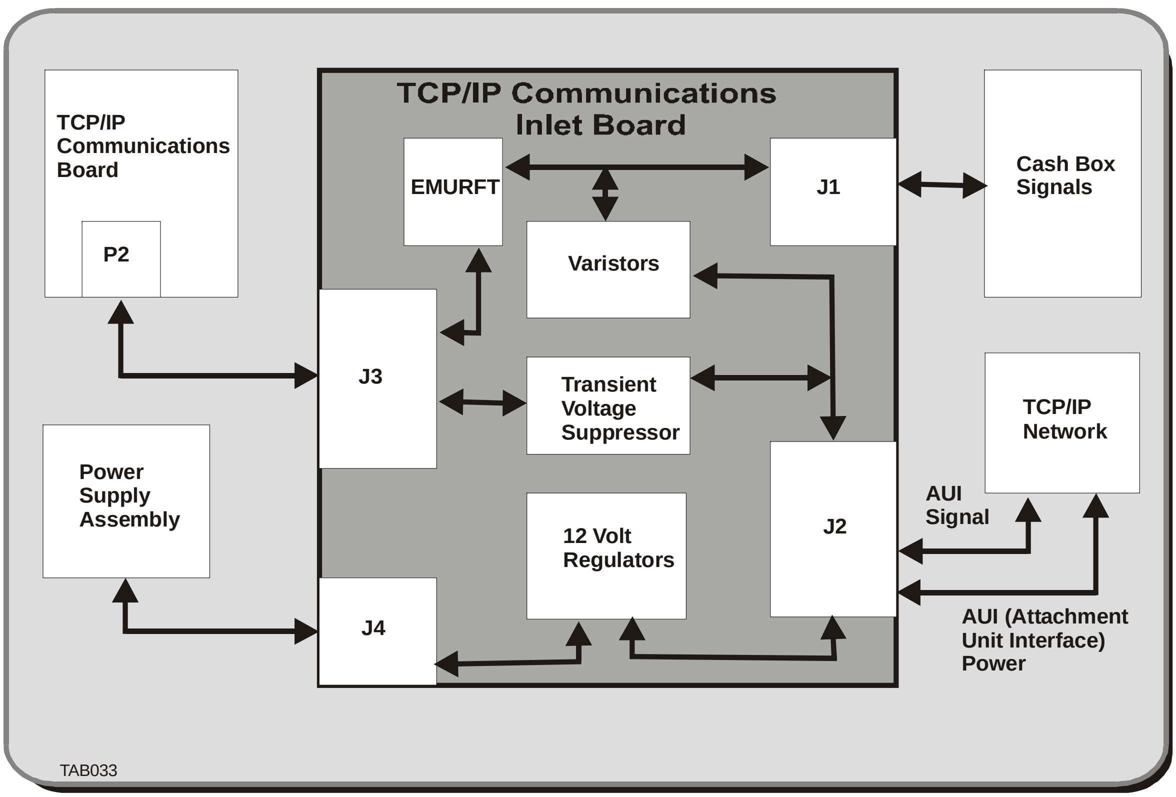


Figure 16-5 TCP/IP Comms Inlet Board - Block Diagram

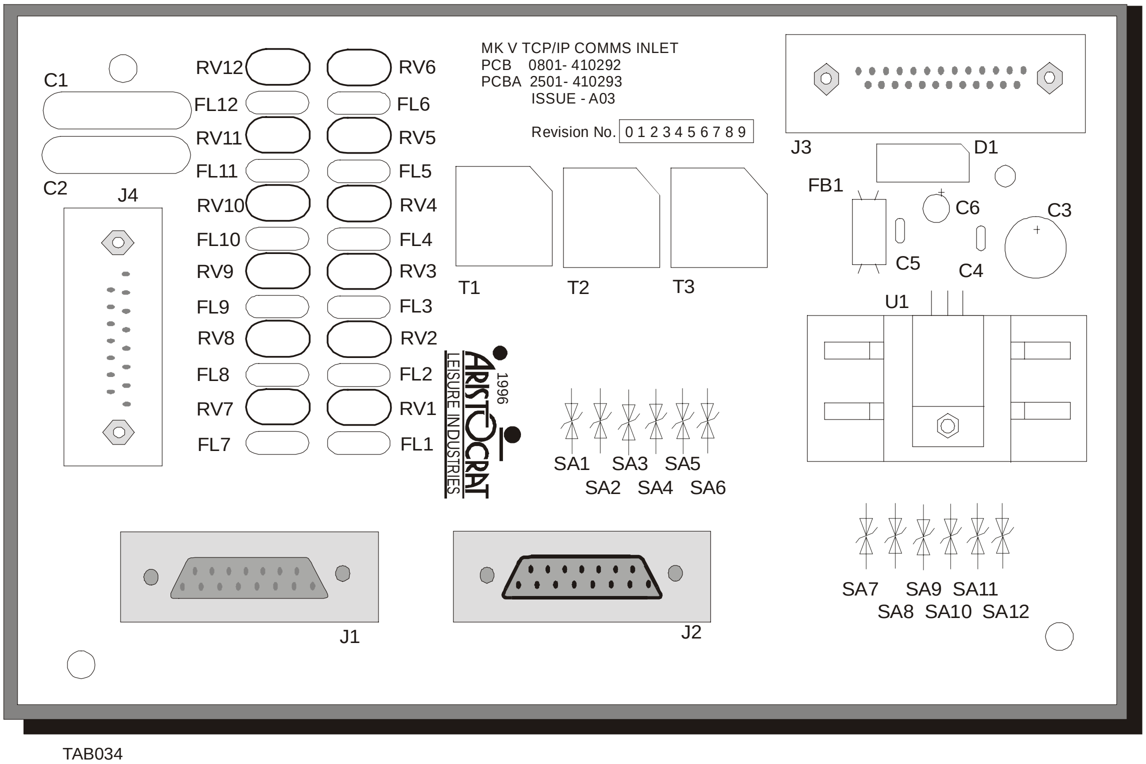


Figure 16-6 TCP/IP Comms Inlet Board - Component Location

Communications Board Connector J3 (Machine Side)

The connector between J3 on the Inlet Board and P2 of the Communications Board is a 25-way male D-type with ferrite.

The following pinout lists each pin on each connector on the board, the first destination and pin number, and the signal name.

Table 16-8 Comms Board Connector J3

Pin	Pin Name	Destination / IC-Pin No.	Function
1	M_BD_EMIT+	FL12-1	Cash Box Bottom Door Emitter +
2	M_BD_EMIT-	FL10-1	Cash Box Bottom Door Emitter -
3	M_TD_EMIT +	FL8-1	Cash Box Top Door Emitter +
4	M_TD_EMIT -	FLK6-1	Cash Box Top Door Emitter -
5	M_BD_DET +	FL4-1	Cash Box Bottom Door Detector +
6	M_TD_DET +	FL2-1	Cash Box Top Door Detector +
7	Not Used		Not Applicable
8	Not Used		Not Applicable
9	Not Used		Not Applicable
10	Not Used		Not Applicable
11	M_CI +	T3-IN1	Collision
12	M_DO +	T2-IN1	AUI Data Out +
13	M_DI +	T1-IN1	AUI Data In +
14	M_CB_EMIT +	FL11-1	Cash Box Emitter +
15	M_CB_EMIT -	FL9-1	Cash Box Emitter -
16	M_CB_DET +	FL7-1	Cash Box Detector +
17	M_CB_DET -	FL5-2	Cash Box Detector -
18	M_BD_DET -	FL3-1	Cash Box Bottom Door Detector -
19	M_TD_DET -	FL1-1	Cash Box Top Door Detector -
20	Not Used		Not Applicable
21	Not Used		Not Applicable
22	Not Used		Not Applicable
23	M_CI -	T3-IN2	Collision
24	M_DO -	T2-IN2	AUI Data Out -
25	M_DI -	T1-IN2	AUI Data In -

Interface Board Connector J4 (Machine Side)

The isolated power input is provided by a connector between the power supply assembly and J4 on the Inlet Board. The connector is a 15-way male D-type.

Table 16-9 Isolated Power Input Connector J4

Pin	Pin Name	Destination / IC-Pin No.	Function
1	12VDC1	C2-1, FB1-1	12 Volts DC Power
2	Not Used		Not Applicable
3	12VDC2	C1-1, FB1-3	12 Volts DC Power
4	Not Used		Not Applicable
5	Not Used		Not Applicable
6	Not Used		Not Applicable
7	Not Used		Not Applicable
8	Not Used		Not Applicable
9	Not Used		Not Applicable
10	Not Used		Not Applicable
11	Not Used		Not Applicable
12	Not Used		Not Applicable
13	Not Used		Not Applicable
14	Not Used		Not Applicable
15	Not Used		Not Applicable

AUI Interface (TCP/IP Network) Connector J2

The connector between the AUI (Attachment Unit Interface) (TCP/IP Network) and J2 is a 15-way male D-type with ferrite.

Table 16-10 AUI / Network Interface Connector J2

Pin	Pin Name	Destination / IC-Pin No.	Function
1	Not Used		Not Applicable
2	CI +	SA5-2, T3-OUT1	Collision +
3	DO +	SA3-2,T2-OUT1	Data Out +
4	Not Used		Not Applicable
5	DI +	SA1-2, T1-OUT1	Data In +
6	AUI Power -	U1-2, C3-2, D1-DC, C4-2, C5-2, C6-2	AUI Power -
7	Not Used		Not Applicable
8	Not Used		Not Applicable
9	CI -	SA6-2, T3-OUT2	Collision -
10	DO -	SA4-2, T2-OUT2	Data Out -
11	Not Used		Not Applicable
12	DI -	SA2.2, T1-OUT2	Data In -
13	AUI Power +	U 1-3, C5-1, C6-1	AUI Power +
14	Not Used		Not Applicable
15	Not Used		Not Applicable

Cash Box Connector J1 (External Side)

The cash box connector J1 is a 15-way female D-type with ferrite.

Table 16-11 Cash Box Connector J1

Pin	Pin Name	Destination / IC-Pin No.	Function
1	BD_EMIT +	FL12-3, RV12-2	Cash Box Bottom Door Emitter +
2	BD_EMIT -	FL10-3, RV6-2	Cash Box Bottom Door Emitter -
3	TD_EMIT +	FL8-3	Cash Box Top Door Emitter +
4	TD_EMIT -	FL6-3, RV6-2	Cash Box Top Door Emitter -
5	BD_DET +	FL4-3, RV4-2	Cash Box Bottom Door Detector +
6	BD_DET -	FL3-3, RV3-2	Cash Box Bottom Door Detector -
7	TD_DET +	FL2-3, RV2-2	Cash Box Top Door Detector +
8	TD_DET -	FL1-3, RV2-2	Cash Box Top Door Detector -
9	CB_EMIT +	FL11-3, RV11-2	Cash Box Emitter +
10	CB_EMIT -	FL9-3, RV9-2	Cash Box Emitter -
11	CB_DET +	FL7-3, RV7-2	Cash Box Detector +
12	CB_DET -	FL5-3, RV5-2	Cash Box Detector -
13	Not Used		Not Applicable
14	Not Used		Not Applicable
15	Not Used		Not Applicable

16.4 Machine Communications Interface (MCI)

MCI Connections

Figure 16-1 shows the connections between the MCI Box, the gaming machine and the Player Communications Module.

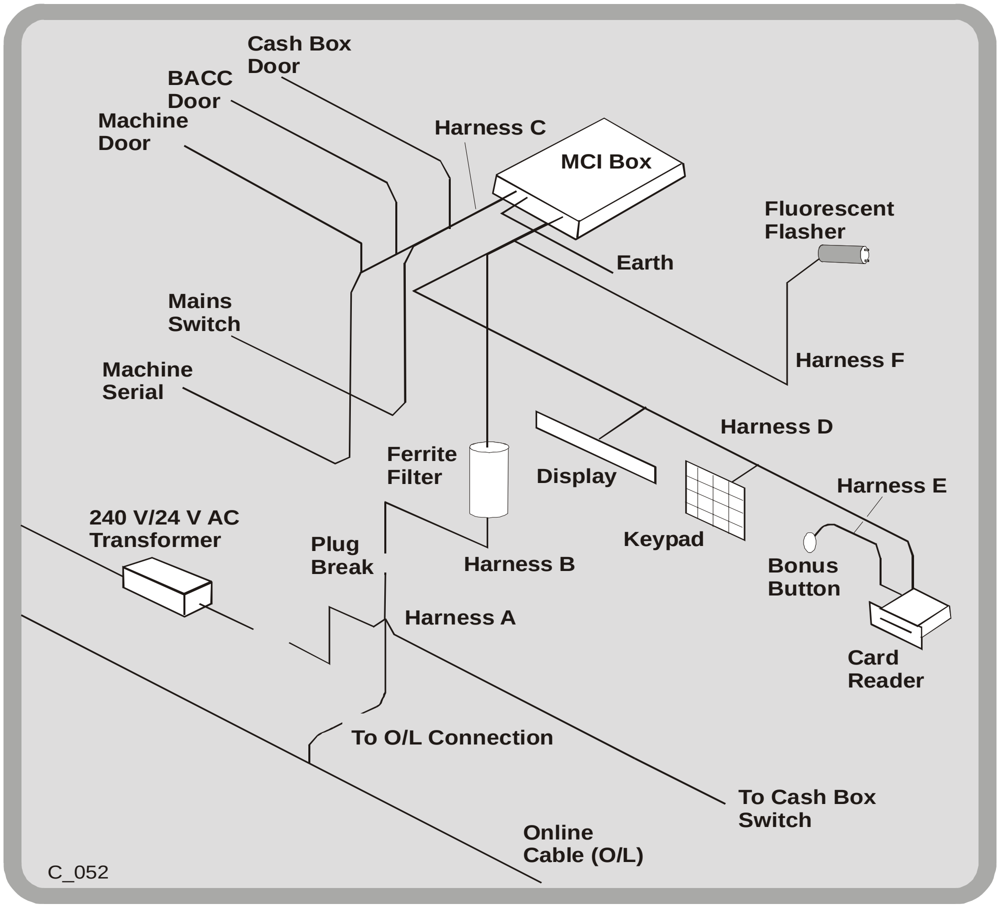


Figure 16-7 MCI - Typical Connections

The following table details the functions of the various harnesses.

Table 16-12 MCI Harnesses and Functions

Harness ID. Code	Connection	Function
A	Cash Box	The harness connects the cash box switch, on-line cable and the 24 V AC power to a 14-pin connector which then connects to a mating connector on harness B. Harness B links to the MCI box.
B	MCI to Plug Break	Harness connects from the plug break on the harness A to inside the MCI box. It also branches out at the MCI end to provide the cash box door switch signal that is brought up from the cash box and fed through the MCI.
C	EGM Machine	Harness connects the MCI to the machine to detect the BACC door switch signal, EGM machine door switch signal, EGM machine power signal, and most importantly, the serial communication to the EGM logical board.
D	VFD Display Harness	Harness connects the MCI to the fluorescent display, keypad, and card reader.
E	Bonus Button	Harness connects the bonus button from the card reader board.
F	Fluorescent Flasher	Harness connects the MCI to the fluorescent flasher.
G	240V/24VAC Transformer Pack	Item is a 240 V AC to 24 V AC power transformer. At the 24 V AC end, it plugs to the connector on harness A. At the 240 V AC end, a standard 3-wire AC cord is used to bring the 240 V AC power to the transformer.

Note: An optical reflective sensor is built into the MCI board to detect the opening of the lid of the box.

16.5 IGT Interface

The function of the IGT interface PCB is to provide a communications link between the Main Board and a Location COMmunicator (LCOM) system. The IGT interface assembly is supplied and installed into the machine by the Queensland Office of Gaming Regulation. The assembly consists of a base plate, the interface PCB, and a plastic cover. An earth stud is provided on the base plate for mandatory mains earth connection.

A separate switch and fuse are provided on the power supply assembly for the interface power.

Technical Description

The IGT interface PCB communicates with the Main Board using RS232 and with the LCOM system using a fibre-optic link. The RS232 port is configured on generic serial channel 2 (P15 on the Interface Board). The channel has six I/O signals, including data I/O.

High speed optoisolators used on channel 2 allow this port to support baud rates greater than 9600.

The following table lists the function of each pin on the 12-pin connector that links P15 to the IGT interface PCB.

Table 16-13 P15 - RS232 Port to IGT Interface Board

Pin	Name	I/O	Description
1	SIN2	Input	Serial data input, high current LED driver to ensure the high speed switching of the opto.
2	SOUT22	Output	Serial data output.
3	CTS2	Input	Active 'low' handshake input.
4	DSR2	Input	Active 'low' handshake input.
5	I2	Input	Not used.
6	RTS2	Output	Active 'low' handshake output.
7	DTR2	Output	Active 'low' handshake output.
8	O2	Output	Not used.
9	P12V		+ 12V isolated; from Main Board.
10			---
11	N12V		- 12V isolated; from Main Board.
12	GND		Ground.

The IGT interface PCB receives independently switched and fused mains power from the transformer box. This enables the LCOM system to be powered even when the machine is turned off. Power is connected via a standard IEC female socket located on the side of the transformer box. This socket is clearly labelled "INTERFACE", and the interface power switch is clearly labelled "ON", "OFF".

Overview of LCOM

The Location COMmunicator (LCOM) is connected via fibre-optic links to a cluster of gaming machines. Up to 255 machines can be controlled by a single LCOM. The LCOM monitors all machines on a frequent basis and redundantly stores all security and accounting information.

All communication between the LCOM and machine is accomplished over the fibre-optic link. Data is transferred asynchronously at 9600 baud with one start bit, eight data bits, one "wake-up" bit, and one stop bit. The first byte of all messages from the LCOM contains the address of the machine for which it is intended. This byte will have the wake-up bit set, allowing significantly reduced software overhead in the machines capable of interrupting when the wake-up bit is seen. An error detection and message retransmission protocol assures accurate communication.

The LCOM polls the machines continuously to detect any change in status and to collect current meter information. All valid machine responses will be acknowledged by the LCOM. The machines monitor the regular polling cycle of the LCOM. If a malfunction occurs that causes a machine to stop receiving polls to its address, or message acknowledgments from the LCOM, the machine will automatically disable gameplay.

Games can be disabled under the following conditions:

- Disabled by receiving a global disable broadcasting poll from LCOM
- Disabled by receiving an initialisation poll from LCOM
- No polls are received for a period of 10 seconds
- Three consecutive messages are not acknowledged
- Event log full

The LCOM only polls the machines defined in the initialisation data sent by the Central System. This feature prohibits any machine from being played on the system until the regulatory authority and Central System have been notified.

16.6 ActivData II+

All gaming machines connected to the ActivData II+ Casino Monitoring System must be fitted with an ORION Unit assembly supplied by M&B Electronics. The ORION Unit consists of a communications interface board, a card reader, a 2-line LCD display, and three call buttons. Power is supplied through a “Plug Pack” power unit, which connects to the GPO on the machine power supply unit.

The ORION Unit directly monitors the gaming machine top cover security switch and the cash box security switch. The ORION Unit controls the operation of the light tower (if fitted).

Staff Card

All staff required to work on the gaming machines are issued with Magnetic Cards, encoded according to their access rights.

Player Card

A Player Card is used for the purposes of player tracking and rating.

Cashless Card

The cashless card is another form of player card. This card provides player tracking and rating, as well as the ability to transfer cash from a centrally controlled account.

ActivData II+ Communications

Table 16-14 Gaming Machine to ORION Unit Communications

ORION Connector Molex 4-pin KK	Input/Output to ORION	Description
1	-	RX Data Return
2	Input	RX DATA+
3	-	TX Data Return
4	Output	TX DATA+

Table 16-15 ORION Unit to ActivData II+ communications cable

ORION Connector Molex 12-pin KK	Input/Output to ORION	Description	External Connector DB 15 Male
1	---------	0 Volts	7
2	Output	TX Data+	6
3	Output	TX Data-	8
4	Input	RX Data+	9
5	Input	RX Data-	11
6	Input	Address Input 0	12
7	Input	Address Input 1	13
8	Input	Address Input 2	14
9	Input	Address Input 3	15
10	Input	Address Input 4	2
11	Input	Address Input 5	3
12	Output	Address Common	10
-	---------	Cable Shield	1

16.7 Olympic Head Unit

The Olympic Head Unit is fitted inside the cabinet and provides the interface between the gaming machine and the Olympic communications network. The connections between the gaming machine and the Olympic Head Unit are shown in the diagram below.

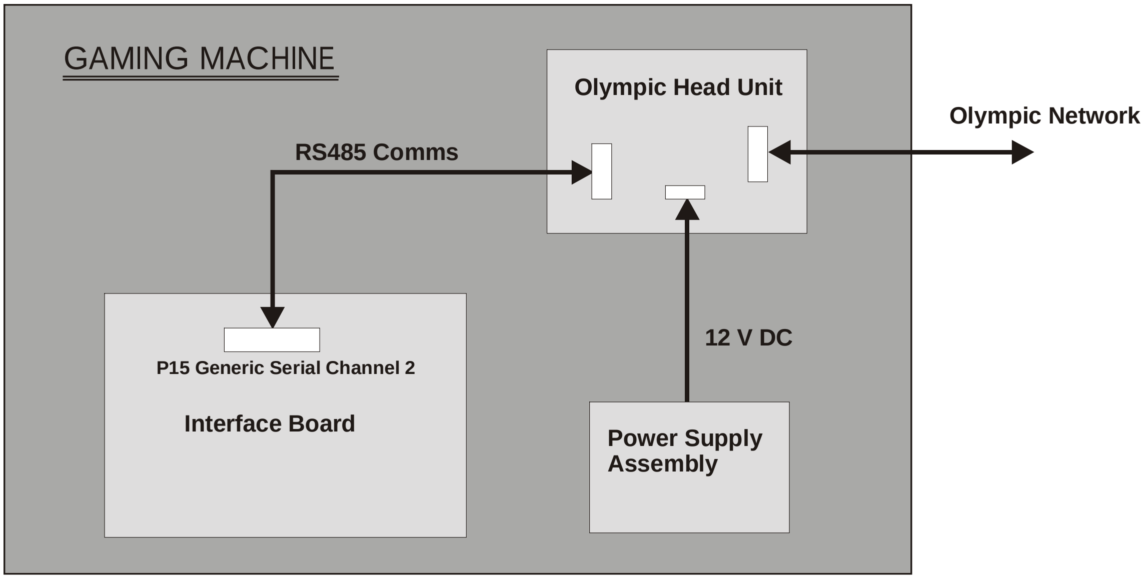


Figure 16-8 Olympic Head Unit - Connections

Chapter 17

Machine Fault Finding

Table 17-1 Fault Finding

Fault	Probable Cause	Action
Equipment connected to auxiliary power socket & has no power.	Auxiliary power socket fuse is blown.	Replace auxiliary power socket fuse.
Machine has no power.	A. Mains socket supplying the machine is not live.	1. Check that the mains socket is live. 2. If the mains socket is dead, check that the circuit breaker at the distribution board is on.
	B. Main board not showing 4 lit red LEDs (ie, sequential display).	3. Turn off mains power for 5 seconds, then turn power on. 4. Check main board seating and links. If condition continues, replace the Main Board.
No power-up cycle.	A. Coin jam in the Coin Chute Assembly.	1. Clear coin jam from the Coin Chute Assembly.
	B. Faulty hopper photo-optic detector.	2. Check that the hopper photo-optic detector is not damaged or disconnected. If the detector is damaged, replace the detector.
	C. Cable fault.	3. Check that the looms are correctly seated and have continuity.
	E. Faulty Backplane.	4. If the looms are OK, replace the Backplane.
	F. Faulty Main Board.	5. If there is still no power, replace the Main Board.

Table 17-1 Fault Finding (continued)

Fault	Probable Cause	Action
Fluorescent lamps, animation lamp, and pushbutton lamps not lit.	A. Faulty lamp or fluorescent driver.	1. If only one lamp is faulty, replace the fluorescent tube or driver, the animation lamp, or the pushbutton lamp or microswitch.
	B. Faulty power supply assembly.	2. Check that the power supply assembly is operating correctly. If not, replace the power supply assembly.
	C. Faulty loom between: • the fluorescent lamps and the power supply assembly.	3. Check cables and looms and ensure lamps are correctly seated.
	D. Faulty connection or loom between: • the animation lamps / pushbutton lamps and Backplane. • the power supply assembly and the Backplane. • the Backplane and the Main Board. • the Backplane and the Driver Board.	4. Check cables, looms, boards and lamps are correctly seated and have continuity.
	E. Faulty Main Board.	5. If there are still no lamps lit, replace the Main Board.
Video monitor blank.	A. Faulty power supply assembly.	1. Check that mains power is available at the power supply. See Power Supply Assembly.
	B. Faulty video monitor.	2. Check that the mains power supply is available at the monitor. If available, replace the monitor.
	C. Faulty loom between the monitor and the power supply or between the Main Board and the monitor.	3. Check that the looms are correctly seated and have continuity.
	D. Faulty Main Board.	4. If the condition persists, replace the Main Board.

Table 17-1 Fault Finding (continued)

Fault	Probable Cause	Action
Video monitor colour or picture incorrect.	A. Monitor settings incorrect.	1. Carry out Basic Colours Test from the Video Monitor Test Menu in Operator Mode. Work through the procedure for adjusting and testing the video monitor as detailed in the chapter Video Monitor.
	B. Faulty monitor.	2. If the condition persists, replace the monitor.
YO-YO-YO-YO message while machine not being played.	A. Coin jammed in the coin comparator sensor assembly.	1. Remove jammed coin.
	B. Faulty coin comparator.	2. Replace the coin comparator.
	C. Fault in the loom between the coin comparator and the Backplane.	3. Check that the loom is correctly seated and has continuity.
Sound too loud or too soft.	A. Volume control requires adjustment.	1. Adjust the volume using Sound System Setup in the Operator Setup / Selections Menu. 2. If the condition persists, replace the Backplane. 3. If the condition still persists, replace the Main Board.

Table 17-1 Fault Finding (continued)

Fault	Probable Cause	Action
No sound.	A. Volume control requires adjustment.	1. Adjust the volume using Sound System Setup in the Operator Setup / Selections Menu.
	B. Speaker open circuit.	2. Remove the connectors from the speaker terminals and check that there is 6 to 8 Ω across the speaker terminals. If not, replace the speaker. Reconnect the speaker terminals.
	C. Faulty loom between the Backplane and the speaker.	3. If there is no power at the speaker, check that the looms are correctly seated and are physically sound.
	D. Faulty Backplane	4. If the looms are OK, replace the Backplane.
	E. Faulty Main Board.	5. If the condition persists, replace the Main Board.
Hopper does not rotate.	A. Faulty loom between hopper and Backplane.	1. Check that the loom is correctly seated and has continuity.
	B. Faulty hopper motor.	2. If motor is not operating, replace the hopper.
Hopper motor running slowly.	A. Hopper disc is binding.	1. Remove hopper, dismantle it and remove foreign matter.
	B. Motor spindle bent.	2. Replace the hopper.
	C. Faulty hopper motor controller.	3. Replace the hopper motor controller.
COIN ACCEPTOR FAULT, COIN OPTIC FAULT message.	A. Faulty loom between: • the coin comparator and Backplane • the comparator PCBA and the sensor assembly.	1. Check that the looms are correctly seated and have continuity.
	B. Sample coin not correct or not in correct position in sensor assembly.	2. Check that the sample coin is correct and is located in the correct position.
	C. Coins jammed in coin comparator sensor assembly.	3. Remove coin jam.

Table 17-1 Fault Finding (continued)

Fault	Probable Cause	Action
Coins jamming in the diverter window.	Coin diverter jamming.	Adjust the position of the diverter.
Coins continually rejected.	A. Sample coin not in the correct location in the sensor assembly.	1. Check that the sample coin is located firmly between the scanner unit and the fork of the rail insert.
	B. Faulty comparator.	2. Replace the comparator.
ILLEGAL COIN OUT message on power-up.	A. Dirty hopper photo-optic detector/emitter.	1. Clean the hopper photo-optic detector/emitter.
	B. Faulty hopper.	2. Run a hopper test (see Machine Modes) to check that the hopper motor stops when the correct number of coins have been ejected.
All coins are going to the cash box and the hopper is empty.	A. Hopper probe shorted to ground.	1. Clear the short.
	B. Faulty coin diverter solenoid on the coin chute assembly.	2. Run a coin chuting test (see Machine Modes) to check that the solenoid has power.
	C. Coin diverter jamming.	3. Adjust the position of the coin diverter.
Reject coins not falling into the coin tray.	Coins jammed in the reject chute.	Carefully clear the reject chute.
Coins accepted by the comparator but not registered on the coin counter and the machine locks out.	A. Faulty loom between the coin comparator and the Backplane.	1. Check that the loom is correctly seated and has continuity.
	B. Faulty coin comparator.	2. Replace the comparator.
3 WAY METERING ERROR message.	Corrupt data. Inconsistent data across all three electronic audit meter sets.	Perform a memory reset (see Machine Modes).

Notes

Glossary

ADH	Aristocrat Disc Hopper.
Animation Lamps	Lamps located in the top box for animation purposes.
Any pays	Symbols are read anywhere on the payline, and not necessarily left to right or right to left.
ARM250	Advanced RISC Machine - a type of integrated microcontroller
ASIC	Application Specific Integrated Circuit
Audit key switch	To display the electronic audit meters on the monitor, insert the audit key and turn it 90° clockwise.
Audit meters	See electronic and electro-mechanical meters.
Base	A specially designed box unit on which the cabinet stands. The cash box is usually located securely within the base.
Book pay	After the player presses the COLLECT button, the credits are manually paid out to a player and recorded in the payout book.
Button panel	The series of buttons across the front of the cabinet which the player uses to control game play.
Cabinet	The major cabinet or casing in which the workings of the machine are housed.
Cancel credit	When a player attempts to COLLECT a credit amount greater than the amount that the Hopper can pay out, the machine locks up. When this occurs, the Cancel Credit procedure allows for the player to be paid manually and the credit on the machine cancelled to zero.
Cash box	The high security compartment used to hold any coins not held in the hopper.
Clearance	The value of coins removed from the cash box, usually daily.
CMOS	Channel metal oxide semi-conductor.
Coin comparator	Device that compares a coin inserted by a player with a sample coin of the correct denomination to determine if the inserted coin is valid and acceptable for play.
Coin detectors	See photo-optic detectors.

Coin jam	When coins jam in the coin chute assembly chute.
Coin selector	See coin comparator.
Coin tray	The tray at the bottom of the cabinet into which payout or reject coins are deposited for collection.
Coin validator	See coin comparator.
Collect cash	To convert the amount shown on the CREDIT meter to cash, the player presses the COLLECT button which activates the hopper to pay the coins into the coin tray.
Console	See base.
CPU	Central processing unit.
Credit	Coins inserted into the machine register as credits. One coin may equal more than one credit. Prizes are shown as credits until such time as the player chooses to collect them.
D/A	Digital to analog.
DES	Data Encryption System
Electromechanical meters	The electromechanical meters or counters. These meters are non-resettable and are cumulative for the life of the machine.
Electronic meters	The electronic audit meters that provide audit information.
EPROM	Erasable programmable read only memory.
ESD	Electrostatic discharge.
FPLA	Field programmable logic array.
GL5	Communications protocol for the bill acceptor
Hard meters	See electromechanical meters.
HCMOS	High speed CMOS logic.
Hopper	The electronically controlled unit which stores the coins that are played and which pays out the exact number of coins in a credit collect situation.
House	The club, casino or organisation running the games.
IC	Integrated circuit
Illegal coin	A coin which is incorrectly paid out by the hopper.
Intelligent bezel	Sites the accept/reject slot for note placement on the bill acceptor fascia panel.

Installation A club, casino or other place which has a number of gaming machines.

I/O Input/output.

Jackpot key switch To reset the machine after a cashier payout or after a machine fault has been corrected, insert the J key, turn it 180° clockwise and back again.

LAB New South Wales Liquor Administration Board.

LED Light emitting diode.

Left to right pay Symbols are read from left to right for prize determination.

Links A series of machines are *linked* together by an external progressive controller. Each machine contributes to a common progressively incremented jackpot and is displayed separately for the player to see.

Lockup A lockup renders the machine unplayable and is triggered either by a malfunction, when a jackpot has been won (if the program permits), or when the player has pressed the CASH OUT pushbutton when there is more than the cancel credit amount in credit.

Manual pay A book payment made for any amount in excess of the cancel credit limit of the machine.

Max bet A button which automatically bets the maximum amount possible on a game.

Meters Electronic (soft) meters and electro-mechanical meters located within the machine that record and display important audit information for the operator.

Microprocessor The computer component which controls and processes game play instructions.

Multiline A game in which a player bets on additional lines to multiply the chance of a prize.

Multiplier A game in which a player bets additional coins on any one game to multiply the value of the prize.

Payline(s) The line or lines which indicate where the symbols must line up for a player to win.

Payout book Book used to record hopper refill amount, jackpot amount and cancel credit amount.

PCBA Printed circuit board assembly.

Play button	One of the illuminated buttons on the button panel, used in game play.
PLD	Programmable logic device.
Progressive jackpot	This is an additional jackpot to the game's normal jackpot. This jackpot increments by a fixed percentage of the machine's turnover and is displayed separately for the player to see.
PROM	Programmable Read Only Memory.
Refill	Money you add to a hopper by opening the door and inserting coins, usually when the machine has run out of coins.
Reserve	A button on the machine which allows a player to indicate to others that the machine is reserved. This reserve message remains lit for 3 minutes.
RISC	Reduced Instruction Set Computer.
Scattered pays	Symbols can be above, below or on the payline to qualify for a prize.
SEF	Subsidiary equipment function.
SESI	Subsidiary equipment serial interface.
Short time out	The machine locks up when a coin jams across the hopper photo-optic detector for more than 0.5 seconds.
Soft meters	See electronic meters.
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory.
Symbols	The various designs on the reel strips. Common symbols include Jacks, Kings, Aces, Cherries, and Gold Bars.
Top box	The box unit on top of the cabinet which carries the game graphics, rules and score card.
Yo-Yo	A coin travelling in reverse to its normal direction. For example: a coin is dangled through and withdrawn from the coin entry slot of the machine in an attempt to cheat the machine of a coin during game play.

Appendix A

Games

List of Figures:

MVP Games

Three families of games are available in Aristocrat MVP video gaming machines:

- Spinning reel games (video simulation),
- Blackjack,
- Keno/Bingo.

Spinning Reel games

The screen displays a simulation of the reels spinning, which, after a short time 'come to rest'. The resultant positions of the various symbols (refer to Fig A-1) is assessed for a winning combination.

If the resultant combination is a winner (the winning combination(s) can be checked, if the machine has a top box, with the pay table provided on the top box artwork, if the machine has no top box, with the pay table provided on the belly panel artwork. Figure A-2 shows an example of a pay table), the machine responds by flashing the corresponding symbols and by emitting 'win' sounds. The game software displays the amount of credits won on the screen, prompts the player to gamble the win (if available), then adds them to the player's credit total. This action may vary slightly depending on the software, customer and legal requirements.

The gamble features can vary considerably between games, however, the concept is the same. The player is given the opportunity to gamble the credits won for a chance to double the total. This 'doubling up' may continue for up to five times (or possibly more) consecutively.

If the combination is not a winner, the machine will end the game if no credits are remaining or prompt the player to continue.

SCV018

Figure A-1 MVP Video Game Screen Example

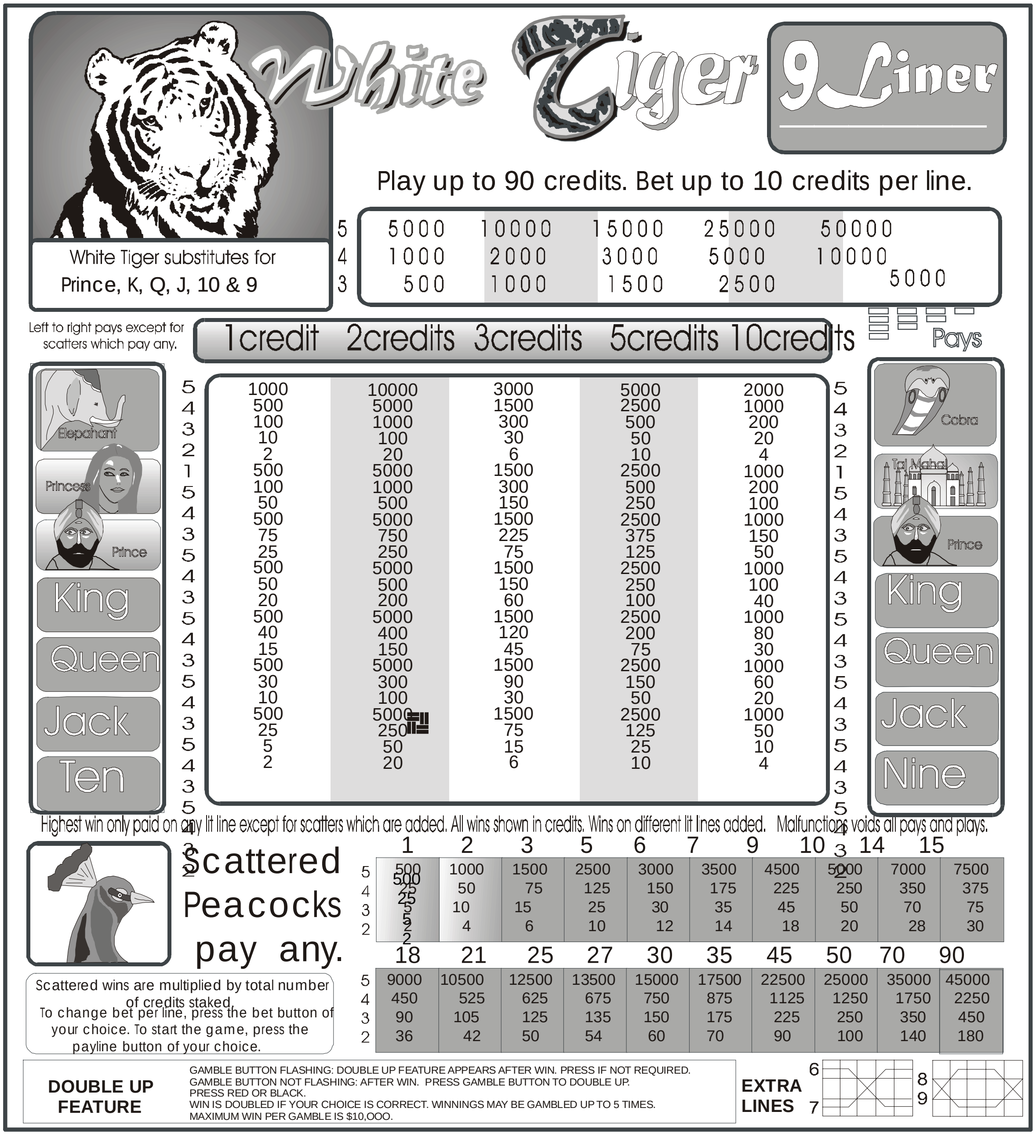


Figure A-2 MVP Table Example

Card Games

The blackjack type games are derived from the game '21' or 'Pontoon'. The player and dealer (machine) are dealt two cards from the pack.

The player decides whether to try and increase the sum of cards in his/her hand to more than the dealers', but not exceeding 21.

If the player is successful in beating the dealers' hand, the machine will respond by showing the credits won, 'win' graphics on screen and emitting the 'win' sounds. The player may also have the opportunity to gamble the win as well.

If the combination is not a winner, the machine will end the game if no credits are remaining or prompt the player to continue.

Keno/Bingo Games

The keno/bingo type games are based on the standard bingo game. The object of the game is for the player to select a set of numbers (eg: 10 numbers) from those available (eg: 80 numbers) and place a bet on these choices being also selected by the gaming machine.

The screen will dispay a simulation of bingo cards with the player's selections shown. As the game begins, the machine will display the random selections made and will mark off any of the player's selections that correspond.

If the player is successful in matching his/her numbers with the gaming machine, the machine will again respond with credits won, 'win' graphics and emitting the 'win' sounds.

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