

Money Controls

Specification and Adjustment Manual World Acceptor Cassette System

ARDAC Brand WACS Eagle

ARDAC-2 Protocol

Diagnostics Protocol

Money Controls Manual Part Number 44x497

Revision 2 July 8, 2002

BANKNOTE ACCEPTORS IN OVER 60 COUNTRIES AROUND THE WORLD

Specification and Adjustment Manual

World Acceptor Cassette System
WACS Eagle
ARDAC-2 and Diagnostics Protocols

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Initial Release: December, 2001
Rev. 1: June 14, 2002 To add smart cassette functions
Rev. 2: July 8, 2002 To add cleaning card mode function

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CONVENTIONS USED IN THIS MANUAL

In this manual, certain information will be set off from the main text for special consideration:

NOTE

A **NOTE** identifies additional information or instructions, which may help, clarify an operation or procedure.

CAUTION

A **CAUTION** identifies additional information or instructions, which should be followed to avoid damage to the equipment.

WARNING

A **WARNING** identifies safety-related information or instructions, which should be followed to avoid personal injury.

Table of Contents

TABLE OF CONTENTS.....	0-2
DESCRIPTION AND SPECIFICATIONS.....	1-1
SYSTEM DESCRIPTION – WORLD ACCEPTOR CASSETTE SYSTEM 4 (WACS-4).....	1-1
TERMINOLOGY.....	1-3
MAIN SUBASSEMBLY PART NUMBERS	1-4
CHASSIS MOUNTING RECOMMENDATIONS	1-5
FEATURES.....	1-5
SPECIFICATIONS.....	1-7
CONNECTOR DESCRIPTION	1-10
CONNECTOR SPECIFICATIONS	1-10
MAIN CHASSIS CONNECTOR TO SYSTEM.....	1-11
HOST INTERFACE CONNECTIONS	1-13
DIP SWITCH SETTINGS AND FUNCTIONS	1-15
SWITCH OFF.....	1-16
SWITCH ON	1-16
HOST MACHINE INSTALLATION	2-1
HOST INSTALLATION & SETUP	2-1
INSTALLATION OVERVIEW.....	2-1
POWER SUPPLY AND VOLTAGE REQUIREMENTS	2-2
CONNECTION OF THE WACS4 SYSTEM TO THE HOST	2-2
INSTALL NEW OR UP-GRADED EPROM / FLASH ON MICROPROCESSOR BOARD (OPTIONAL).....	2-2
PROGRAMMING NEW FIRMWARE INTO AN EPROM / FLASH.....	2-3
EPROM / FLASH REMOVAL AND REPLACEMENT	2-3
CHECK THE DIP SWITCH SETTINGS AND RE-SET AS REQUIRED	2-4
INSERT STACKER MODULE INTO THE CHASSIS.....	2-4
INSERT NOTE ACCEPTOR MODULE.....	2-4
SYSTEM POWER-UP.....	2-6
SYSTEM OPERATION	3-1
FUNCTIONAL DESCRIPTION OF SYSTEM MODULES.....	3-1
NOTE ACCEPTOR:	3-1
CASSETTE STACKER:	3-1
CHASSIS:.....	3-1
OPERATIONAL NOTES - ACCEPTOR	3-3
REMOVAL OF THE NOTE ACCEPTOR	3-4
OPERATIONAL NOTES - CASSETTE STACKER	3-4
REMOVAL OF THE CASSETTE STACKER	3-4
OPERATIONAL NOTES - CHASSIS.....	3-7
OPERATIONAL NOTES - SYSTEM POWER-UP SEQUENCE	3-7
SYSTEM DIAGNOSTICS.....	4-1
INTRODUCTION.....	4-1
EQUIPMENT AND SOFTWARE REQUIRED FOR ARDAC-2 HOST SIMULATOR.....	4-1
ARDAC-2 SIMULATOR CONNECTIONS	4-3
HOST SOFTWARE INSTALLATION	4-3
RUNNING THE HOST SOFTWARE	4-4

HOST SOFTWARE MAIN SCREEN DISPLAY	4-5
ARDAC-2 HOST SIMULATOR SET-UP	4-9
DIAGNOSTIC (BENCH) MODE	4-9
DIAGNOSTIC (BENCH) MODE OPERATIONS	4-10
DUAL DENSITY CALIBRATION	4-15
MAINTENANCE.....	5-1
INTRODUCTION	5-1
ADJUSTMENTS	5-1
CALIBRATION CARD.....	5-1
"QUICK CALIBRATION"	5-1
CLEANING	5-2
CLEANING INSTRUCTIONS	5-3
USING CLEANING CARD MODE.....	5-4
ARDAC-2 & DIAGNOSTIC INTERFACE.....	6-1
INTRODUCTION	6-1
DESCRIPTION	6-1
COMMUNICATIONS PARAMETERS	6-2
BENCH MODE USING DIAGNOSTIC CONNECTOR.....	6-3
BENCH MODE OPERATIONS USING DIAGNOSTIC CONNECTOR	6-3
RECOMMENDED SPARE PARTS AND DIAGRAMS	7-1
INTRODUCTION	7-1
SERVICE AND REPLACEMENT PARTS MANUAL	7-1
SPARE PARTS RECOMMENDATION	7-1
BOARD LOCATIONS.....	7-1
GATHERING NOTE DATA USING THE WACS4 SYSTEM.....	8-1
INTRODUCTION	8-1
SETTING UP THE SYSTEM	8-2
HOW TO GATHER DATA	8-3
CASSETTE DOCKING STATION SYSTEM.....	9-1
TABLE OF CONTENTS.....	9-1
INTRODUCTION	9-1
CASSETTE DOCKING STATION SYSTEM COMPONENTS	9-1
DOCKING STATION SOFTWARE	9-2
REPLACEMENT OF MICROPROCESSOR EPROM.....	9-3
INSTALLATION CONNECTIONS	9-4
INSTALLATION OF DOCKING STATION HOST SOFTWARE	9-4
INITIAL SET-UP: THE CHASSIS NUMBER TO GAME ID MAP	9-5
DOCKING STATION SYSTEM HOST COMPUTER- NORMAL OPERATION (HOST.EXE).....	9-7
DOCKING STATION(S) - NORMAL OPERATION	9-8
MICRO SOFT EXCEL MACRO.....	9-9

1

Description and Specifications

System Description – World Acceptor Cassette System 4 (WACS-4)

The Money Controls World Acceptor Cassette System 4 (ARDAC WACS-4) identifies, collects, and stacks paper currency or the equivalent into a secure, lockable, removable cassette stacker. The WACS-4 is a modular system consisting of a note acceptor, cassette stacker, and mounting chassis. These three modules and other system components are identified and illustrated in Figure 1-1.

The WACS-4 offers world capability and can be used for any country or currency set within the dimensional limits detailed in the Specifications in this chapter. Changing acceptance from one country or currency set to another is easily accomplished by updating the acceptor's EPROM / FLASH. The acceptor resident firmware determines system operating features and the bank notes accepted. Refer to Table 1-1 for firmware and bank note acceptance information.

Section 3, System Operation describes the functions and operations of the major System components.

This system can be ordered with a "Smart Cassette" option, which allows the cash box to record data about the quantity and denomination of notes accepted. This smart option also has an electronic serial number stored in the chassis that can be used to track where a cash box has been installed.

The smart system records the following information in the cassette:

1. Chassis Serial Number
2. Number of each denomination accepted
3. Reject Count for notes not recognized
4. Note Handling Reject Count
5. Tamper Count
6. Acceptor Jam Count
7. TIME since memory last cleared

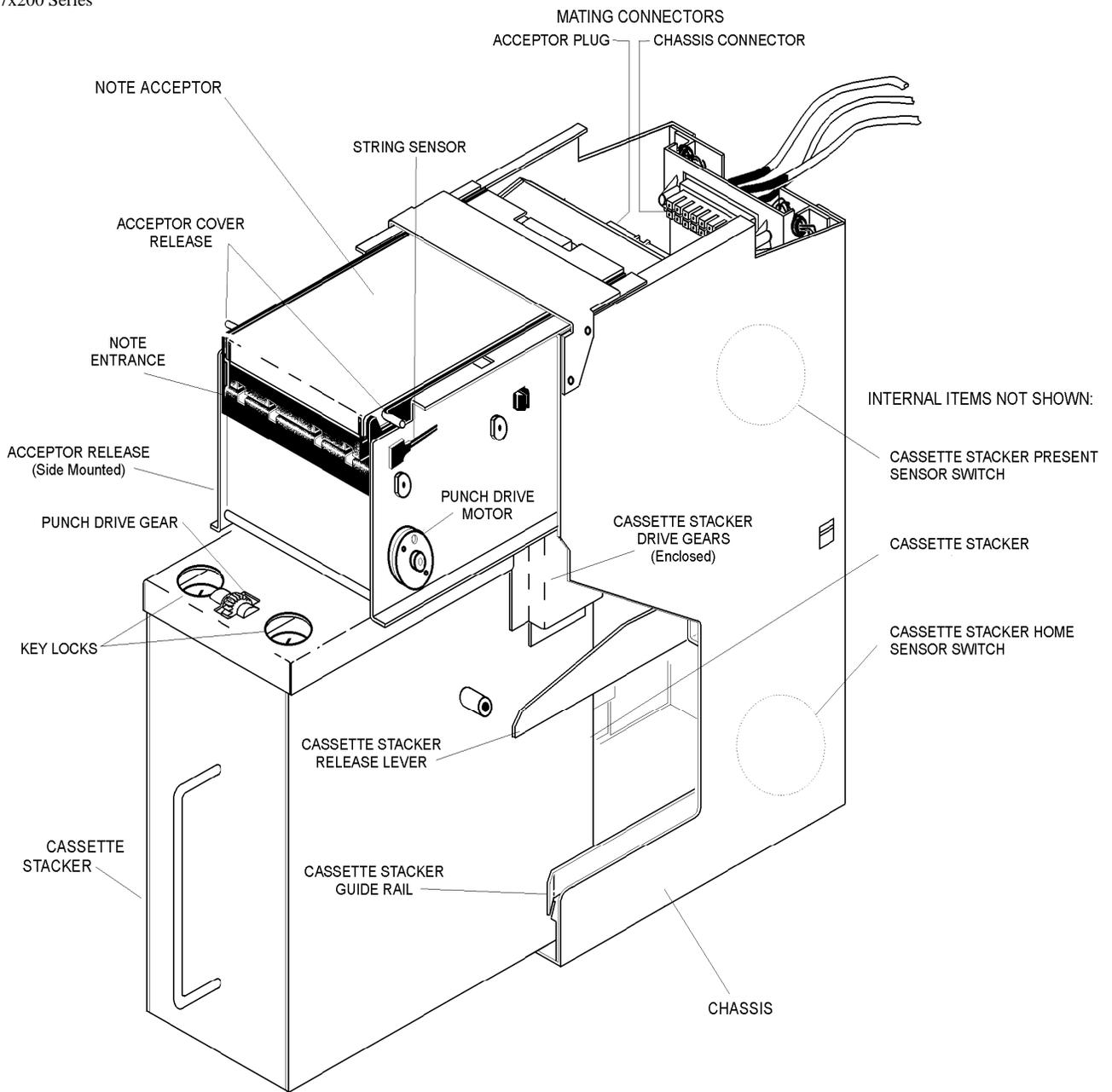


Figure 1-1
WACS Eagle System Components

Terminology

For convenience and clarity several terms are used interchangeably throughout this manual. These and other system terms and components are illustrated in Figure 1-1.

- The terms Money Controls World Acceptor Cassette System 4, ARDAC WACS-4 and System describe the complete system, which includes all three modules (note acceptor, cassette stacker, and chassis).
- The chassis is the rectangular frame mounted permanently in the host equipment. The chassis secures the acceptor and stacker in precise alignment in the host. Smart cassette models contain a read only memory to store and communicate its specific chassis ID number. The stacker home sensor and system wiring harness are chassis components.
- The terms imbedded note acceptor, note acceptor and acceptor describe only the portion of the System, which actively transports and identifies the notes.
- The terms cassette, cassette stacker, cassette, and stacker refer to the removable, lockable box located in the bottom section of the system chassis. It contains the memory device to store acceptor data.
- The terms note, bank note, and bill refer to paper currency or equivalent, which is inserted into the note acceptor and stored in the stacker.
- The terms “Smart Cassette System”, “Smart System” and “Smart Cash box” refer to an option that can be installed on new systems ordered that allow tracking of system data in a memory button located on the cash box.

Main Subassembly Part Numbers

The part numbers for the ARDAC WACS-4 main modules are listed below. Figure 1-1 illustrates these modules and various other subassemblies of the System. Refer to Section 8, Diagrams and Parts Listings for more details parts information.

ARDAC#	Description
77X200	'Standard' WACS-4 system supplied with Non-smart metal cash box
77X201	'Standard' WACS-4 system supplied with smart metal cash box
77X206	'85mm 13V' WACS-4 system with Non-smart metal cash box
77X207	'85mm 13V' WACS-4 system supplied with smart metal cash box
77X209	'85mm Standard' WACS-4 system with smart metal cash box
77X210	Standard WACS-4 system with non-smart plastic cash box
77X211	Standard WACS-4 system with smart plastic cash box
88X3333	'Standard WACS-4 acceptor head'
88X3344	'85mm Standard WACS-4 acceptor head'
88X3339	85mm 13Volt WACS-4 acceptor head
48x827	Non-smart Metal Cash Box
48x833	Smart Metal Cash Box
48x862	Non-smart Plastic Cash Box
48x863	Smart Plastic Cash Box
2x7096	Non-smart Standard Width Chassis
2x7134	Smart Standard Width Chassis
2x7144	Non-smart 85mm chassis
2x7179	Smart 85mm chassis

* = Version number, as determined by installed EPROM / FLASH

Chassis Mounting Recommendations

The chassis must be supported from underneath and be bolted to the host housing. The Dimension Drawing (Figure 1-3) shows the location of the chassis mounting hardware (notes 1 through 4).

As a minimum, secure the chassis to the host housing by doing the following:

- a. Bolt one side and the bottom of the chassis to the housing.
- b. Bolt one side and the back of the chassis to the housing. (Although the chassis must be supported from underneath, it is not necessary to bolt the bottom if the back is bolted to the host housing.)
- c. Bolt both sides of the chassis to the housing. (Bottom support is not required.)

Features

The Money Controls World Acceptor Cassette System 4 (WACS-4) has a number of features which minimize the need for maintenance, and simplify installation and operation:

- **MODULAR DESIGN:** The acceptor and cassette stacker are easily removed from the chassis. The acceptor provides all mechanical drive for itself and the cassette stacker. This simplified design makes the cassette stacker useful as an exchangeable, lockable cash box.
- **FIRMWARE-CONTROLLED OPERATING SYSTEM:** A microprocessor located in the acceptor controls: note identification, note handling, stacking, and communication with the host. Output signals indicate note denomination and acceptor status. Two drive motors in the acceptor drive the acceptor and the cassette stacker components.
- **BENCH TEST DIAGNOSTICS:** The WACS-4 firmware includes a Computer Analysis Program System (CAPS). When a CAPS Interface board connects the WACS-4 to a Personal Computer, the computer can access the CAPS software. The computer then monitors and operates some System components for diagnostic and bench test functions.
- **LOCKABLE CASSETTE STACKER:** The cassette stacker contains locations for two independent key locks for maximum security.
- **STABLE, RELIABLE OPERATION:** Note recognition devices are self-compensating and require no adjustments or maintenance. Systems are ready for immediate installation.
- **12-24VDC OPERATION:** The ARDAC WACS-4 System operates from a single, regulated DC source, which must be supplied by the host system.
- **EASY ACCESS TO THE NOTE PATH FOR MAINTENANCE:** The acceptor opens to fully expose the sensors and note transport mechanism. This facilitates inspection, cleaning, and servicing.
- **SOLID CONSTRUCTION:** Structural components of the acceptor, cassette stacker, and mounting chassis are of welded steel construction for durability, strength, and security.
- **STRING DETECTOR:** This security system provides maximum protection against all types of stringing and numerous other intrusive cheating devices.
- **Optional Smart Cassette data tracking system** allows user to download data detailing the amount of money and the quantity of notes directly from the cash box without the need to unlock and open it.

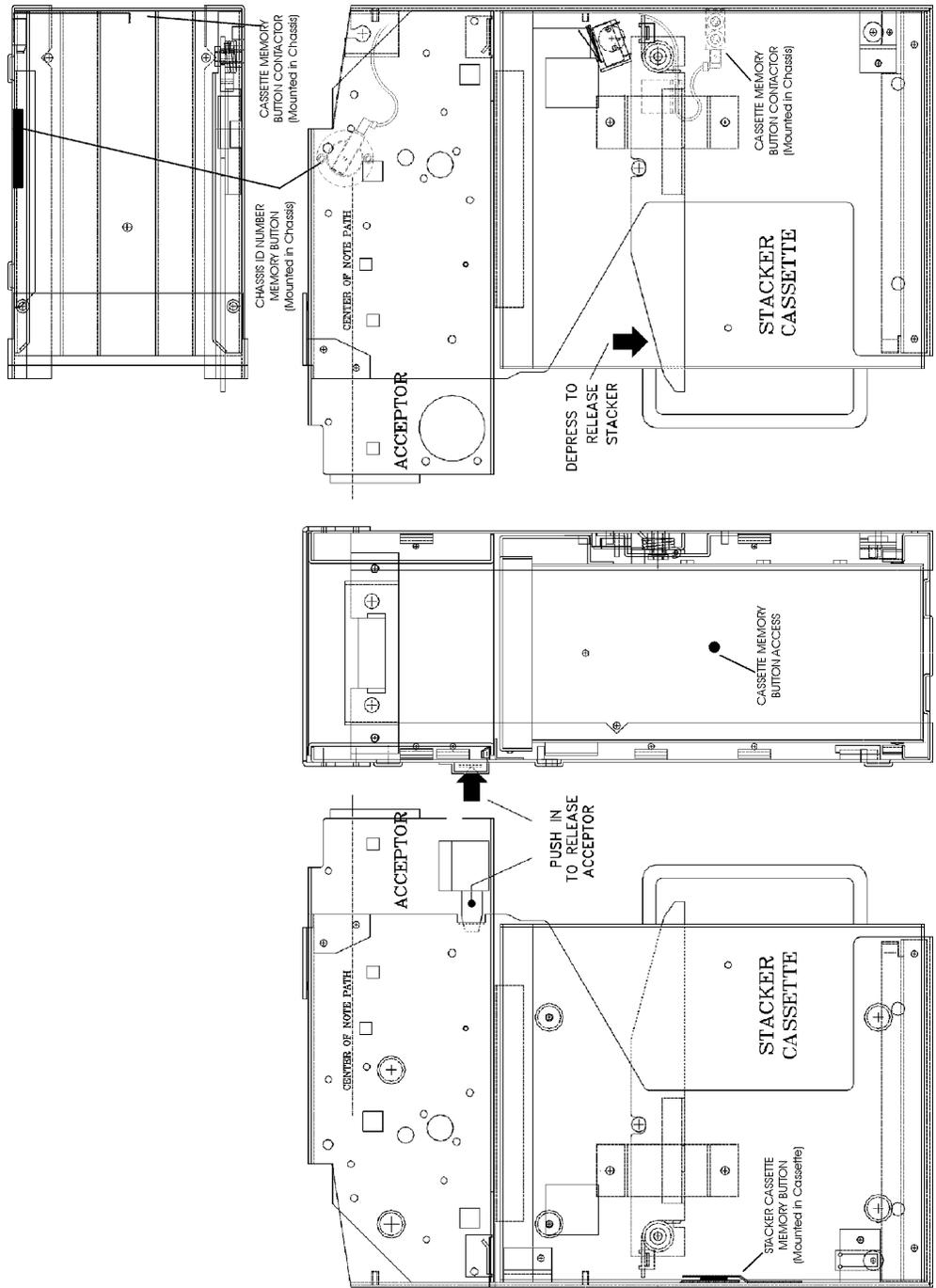


Figure 1-2
Phantom view: Top, Front, Sides

Specifications

NOTE SIZE RANGE:	62mm x 120mm to 83mm x 172mm
ACCEPTANCE RATE:	95% or better on first insertion with street-grade notes.
STACKER CAPACITY:	550 notes, minimum, in street-grade condition.
STACKER LOCKS:	Dual locks, 0.625" to 1.125" barrel length
CYCLE TIME, MAXIMUM:	1.5 seconds to note identification; 3.5 seconds total cycle time
POWER SUPPLY:	External to WACS-4
Mounting Requirements:	Separate from System chassis
Supply Voltage (Max):	12 Volts to 24 Volts DC
Max Current	(Refer to Chart 1-1)
POWER SUPPLY CONNECTOR:	2-pin Molex Connector 35x552-2 with crimp terminals 35x435. Mating connector: 35x436-2 with 35x434 crimp terminals
POWER CONSUMPTION:	6 VA Idle, 48 VA maximum (With 12V input)
STATUS MONITOR:	Status is monitored through ARDAC-2 serial protocol
DIAGNOSTIC CONNECTION:	The 5-pin connector connects to a 2x7136-interface cable to allow P.C. based diagnostics.
DIAGNOSTICS COMMUNICATION	RS-232 ASCII, 19200,O,8,1 (For Use with Windows Hyper terminal™ or equivalent)
HOST COMMUNICATION:	ARDAC-2 Serial Protocol (RS-232)
HOST INTERFACE CONNECTOR:	DB-25 Female (Can plug directly to P.C. serial port)
SYSTEM DIMENSIONS:	(Standard 83mm system)
Acceptor:	3.520"H x 4.210"W x 9.000"L
Stacker:	8.042"H x 3.476"W x 7.940"L
Overall:	12.442"H x 4.558"W x 7.100"L
Mounting Arrangements:	Refer to Figure 1-3.
OPERATING ENVIRONMENT:	0° To 45° C, 15% To 90% Relative Humidity.
FIRMWARE:	Version: Refer To Table 1-1.
Currency:	Refer To Table 1-1.
Direction:	Refer To Table 1-1.
Optional smart system:	Will record data for up to 4 separate chassis in separate records in cash box memory button. Cash box data can be read and cleared either by using an optional docking station or through a bench type computer connection.

Input Volts VS Input Current

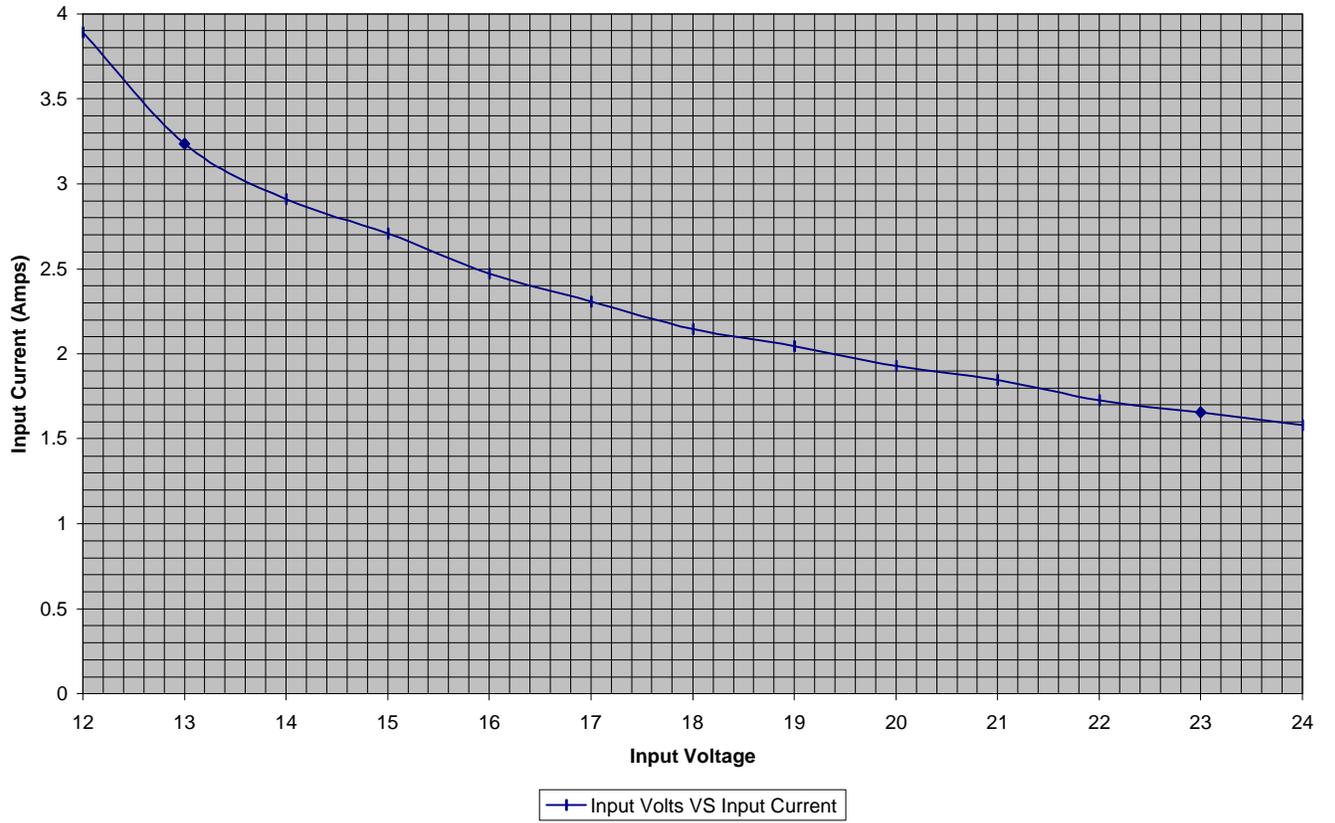


Chart 1-1

Connector Description

Refer to Figure 1-4. Power and I/O connections to the system electronics are made through the main system internal wiring harness (not shown) to a single connector located at the top rear of the chassis. The acceptor unit makes or breaks all connections when the acceptor is installed or removed from the chassis. The external wiring harness is permanently mounted to the chassis connector, and provides cabling and termination for the power supply, and Host I/O or Money Controls Host Simulator connections.

Connector Specifications

Figure 1-5 shows the pin-outs of the main chassis to note acceptor connections. These connectors appear as viewed from the rear of the acceptor and the rear of the Main Chassis Connector.

Figures 1-5 through 1-9 show the pin-outs of the external harness connectors:

- The 2-pin power supply connector connects the WACS-4 to the host or bench power supply.
- The DB-25-pin host I/O connector passes control signals between the Host and WACS-4.
- The 5-pin diagnostic connector allows access to the WACS-4 diagnostic system.

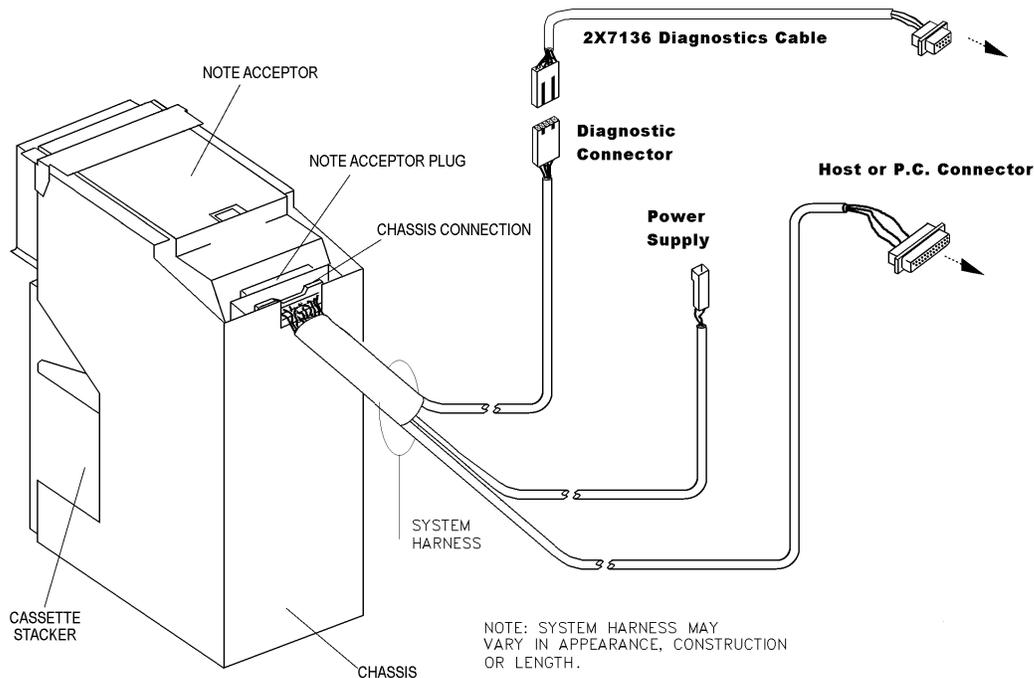


Figure 1-4
Diagnostic Bench Interface

MAIN CHASSIS CONNECTOR TO SYSTEM WIRING HARNESS

PIN #	FUNCTION	HARNESS COLOR
1		
2	Diagnostic RXD	White / Blue
3	Stacker Present	White / Red
4		
5		
6	RS-232 RX	Violet
7	Ground	Green
8	Memory Button (Smart Only)	Blue (Smart only)
8	Ground (Non-Smart only)	Green (Non-Smart only)
9	RS-232 TX	Yellow
10	Stacker Home	Orange
11	+12 to 24V	White / Orange
12	Ground	Green
13		
14	Diagnostics TXD	White / Yellow

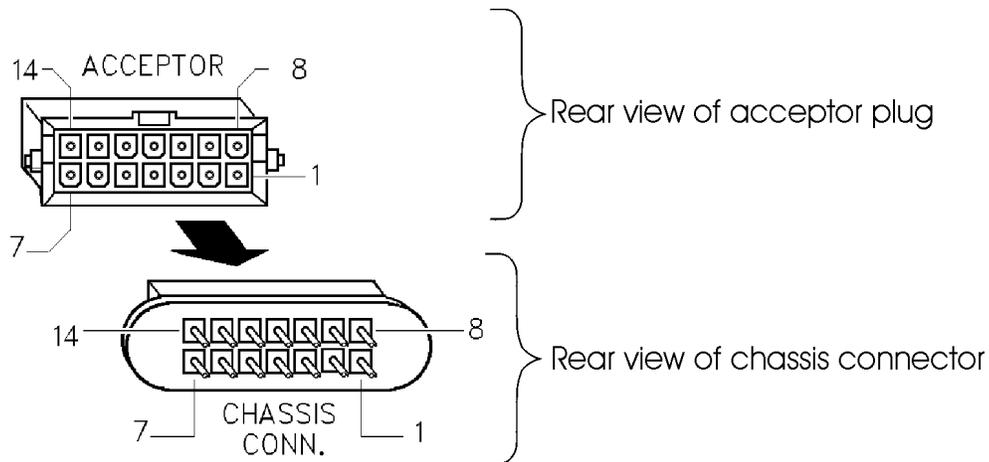


Figure 1-5
14 Pin Rear Connector

2-PIN POWER CONNECTOR (12-24VDC)

PIN #	FUNCTION	HARNESS COLOR
1	+13VDC	White / Orange
2	Ground	Green

Money Controls Part Numbers: 35x592 housing with 35x593 pins

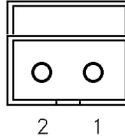


Figure 1-6
Two pin Power Connector

5-PIN DIAGNOSTIC CONNECTOR

PIN	FUNCTION	HARNESS COLOR
1	Diagnostic RXD	White / Violet
2	Ground	Green
3	Diagnostic TXD	White / Yellow
4		
5		

Money Controls Mate Part Numbers: 35x592-5 housing with 35x593 pins

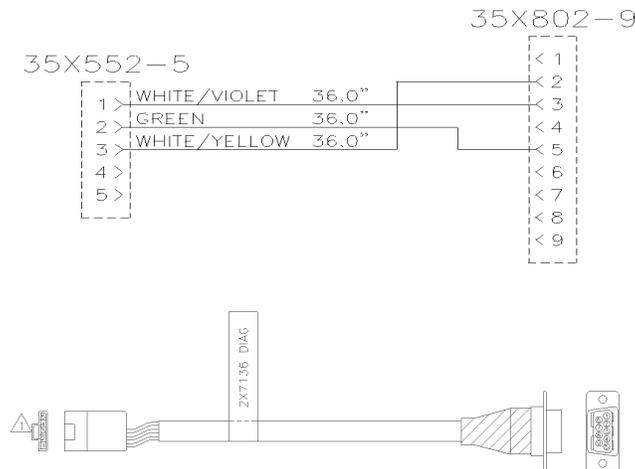


Figure 1-7
2x7136 Diagnostic Connector

Host Interface Connections

The DB-25 connector is used for communication with the host machine and can also be connected to a P.C. so that the acceptor can be run with a Host Simulator program. This also allows access to diagnostics.

DB-25 HOST CONNECTOR

PIN #	FUNCTION	HARNESS COLOR
1	-----	-----
2	WACS Receive Data	Violet
3	WACS Transmit Data	Yellow
4	-----	-----
5	-----	-----
6	-----	-----
7	Ground	Green
8-25	-----	-----

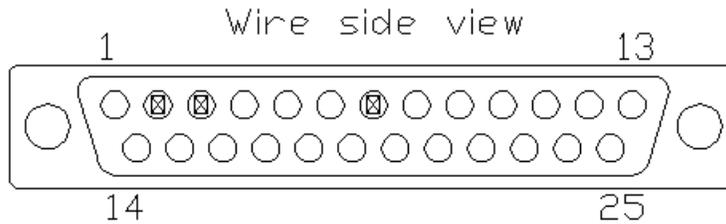


Figure 1-9
DB-25 Host Interface

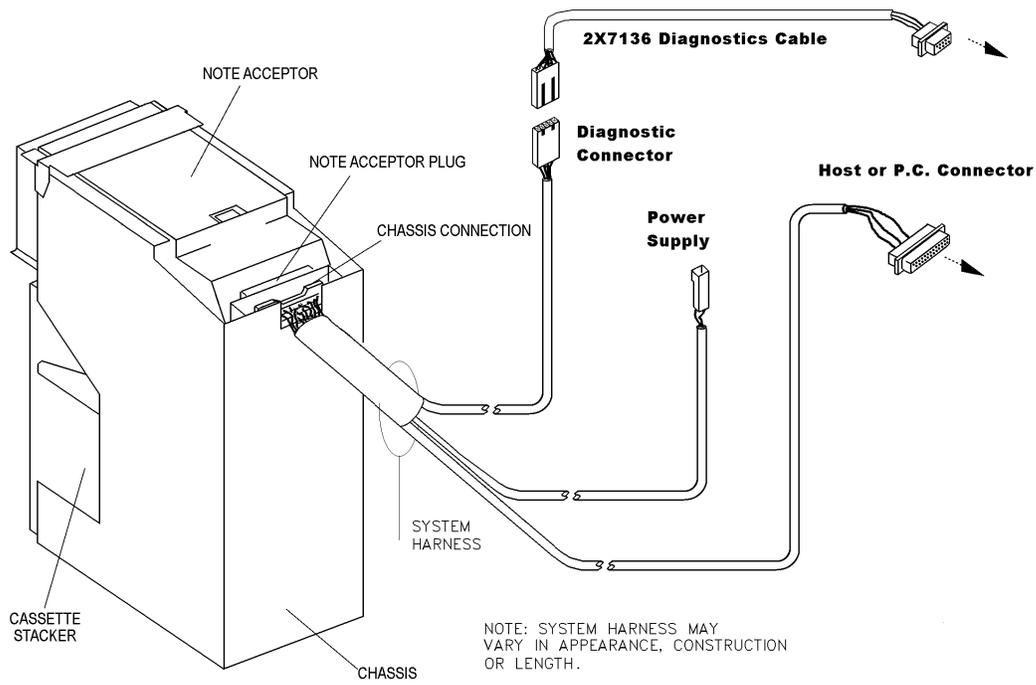
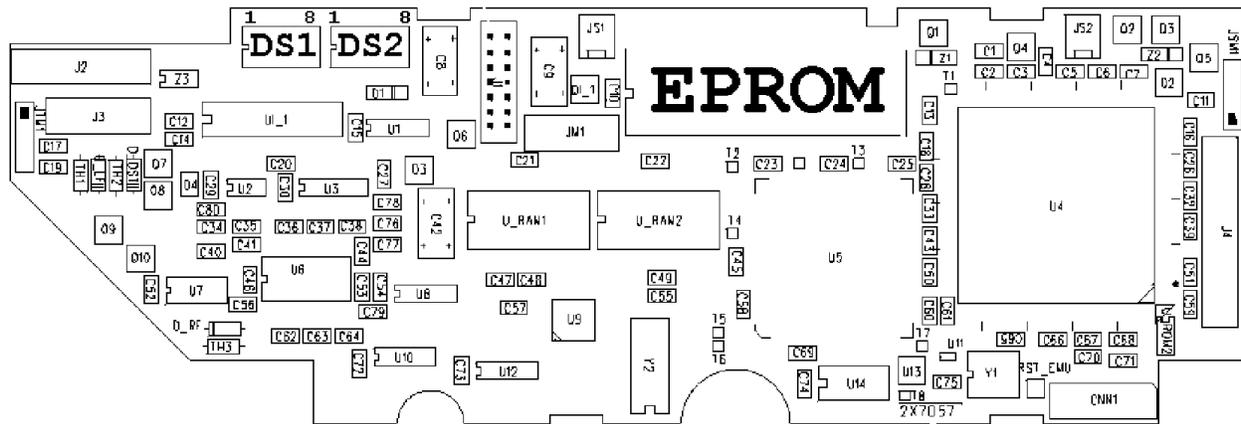


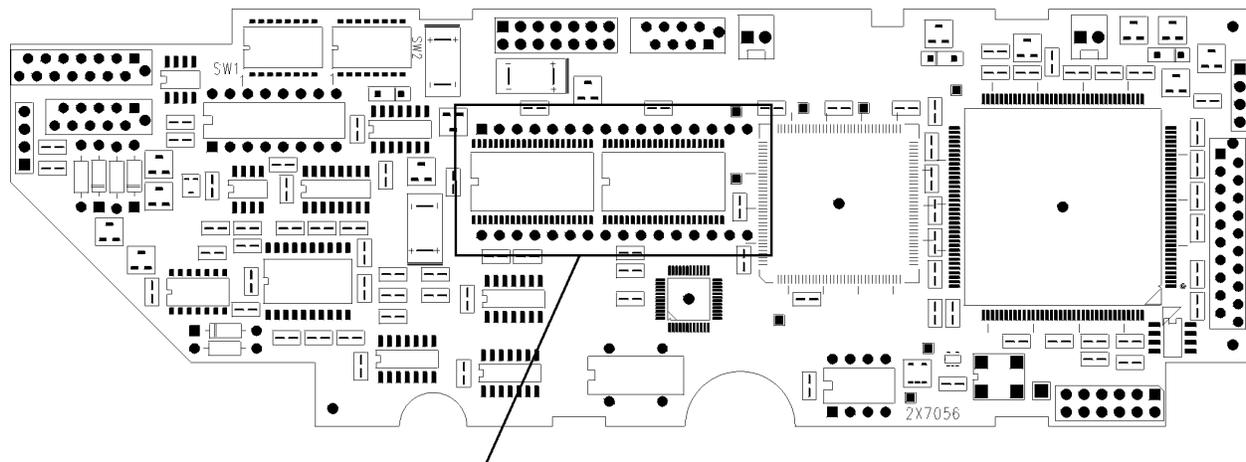
Figure 1-10
WACS Eagle
Diagnostic Interface

DIP Switch Settings and Functions

The microprocessor board used in the System note acceptor has 2 banks of eight DIPswitches. These switches set the System's operating mode and enable or inhibit acceptance of certain notes. For the location of these DIPswitches, refer to Figure 1-1. Table 1-1 describes the DIPswitch functions. DIPswitch settings may vary from table 1-1 depending on specific firmware version installed in machine.



2X7057 EPROM Inside



EPROM Located on Back of Board

2X7056 EPROM Outside

**Figure 1-11
EPROM / FLASH and Dip Switch Location
DSP (Micro) board**

SWITCH BANK 1		SWITCH OFF (Enable)	SWITCH ON (Inhibit)
SWITCH 1-1	NOTE 1 (Lowest Value)	ACCEPT NOTE 1	INHIBIT NOTE 1
SWITCH 1-2	NOTE 2	ACCEPT NOTE 2	INHIBIT NOTE 2
SWITCH 1-3	NOTE 3	ACCEPT NOTE 3	INHIBIT NOTE 3
SWITCH 1-4	NOTE 4	ACCEPT NOTE 4	INHIBIT NOTE 4
SWITCH 1-5	NOTE 5	ACCEPT NOTE 5	INHIBIT NOTE 5
SWITCH 1-6	NOTE 6	ACCEPT NOTE 6	INHIBIT NOTE 6
SWITCH 1-7	NOTE 7	ACCEPT NOTE 7	INHIBIT NOTE 7
SWITCH 1-8	NOTE 8	ACCEPT NOTE 8	INHIBIT NOTE 8

SWITCH BANK 2		SWITCH OFF	SWITCH ON
SWITCH 2-1	Firmware Specific		
SWITCH 2-2	Firmware Specific		
SWITCH 2-3	Firmware Specific		
SWITCH 2-4	STRING SENSOR	OFF = ENABLE	ON = DISABLE
SWITCH 2-5	SMART CASSETTE	OFF = DISABLE	ON = ENABLE
SWITCH 2-6	FIRMWARE DEVICE	OFF = EPROM	ON = FLASH

SWITCH BANK 2-7 AND 2-8	FUNCTION
SW2-7 = OFF, SW2-8 = OFF	NORMAL OPERATION
SW2-7 = OFF, SW2-8 = ON	CALIBRATION CARD MODE
SW2-7 = ON, SW2-8 = OFF	CLEANING CARD MODE
SW2-7 = ON, SW2-8 = ON	UNUSED

Table 1-1

2

Host Machine Installation

Host Installation & Setup

When the WACS4 is connected to the host, the 2-pin connector attaches to the host power supply and the DB-9 or DB-25 connector is used for communications.

Installation Overview

The WACS4 is to be installed only in equipment built in accordance with the application data and specifications provided in Section 1, Description and Specifications. The basic WACS4 installation consists of mounting the chassis in the host and securing the acceptor and stacker into the chassis. Because the WACS4 systems are modular, the modules of any WACS4 systems are interchangeable with the modules of any other WACS4 systems of the same type.

To install Money Controls World Acceptor Cassette System 4 (WACS4) unit into the host equipment:

- Fit the chassis into the host equipment and secure it in place by the mounting nuts captive in the chassis body. Refer to Chassis Mounting Requirements in Chapter 1.
- Connect the DB-25 or DB-5 pin, and two pin connectors on the chassis wiring harness to the matching connectors of the host equipment.
- If necessary install a new or up-graded EPROM / FLASH. Ordinarily this is done at the factory before shipment.
- Verify the proper DIP Switch settings and reset as required.
- Install the cassette stacker module into the chassis.
- Install the note acceptor module into the chassis.
- Apply power to the assembled System through the host equipment.

Power Supply and Voltage Requirements

The WACS4 operates from an external regulated 12 to 24 Volt DC power supply. Section 1, Description and specifications, has details on the recommended power requirements.

Connection of the WACS4 System to the Host

WACS4 units connect to the host equipment through the DB-25 or DB-9 connector on the chassis. The specifications for each of these connectors are provided in Section 1, Description and Specifications.

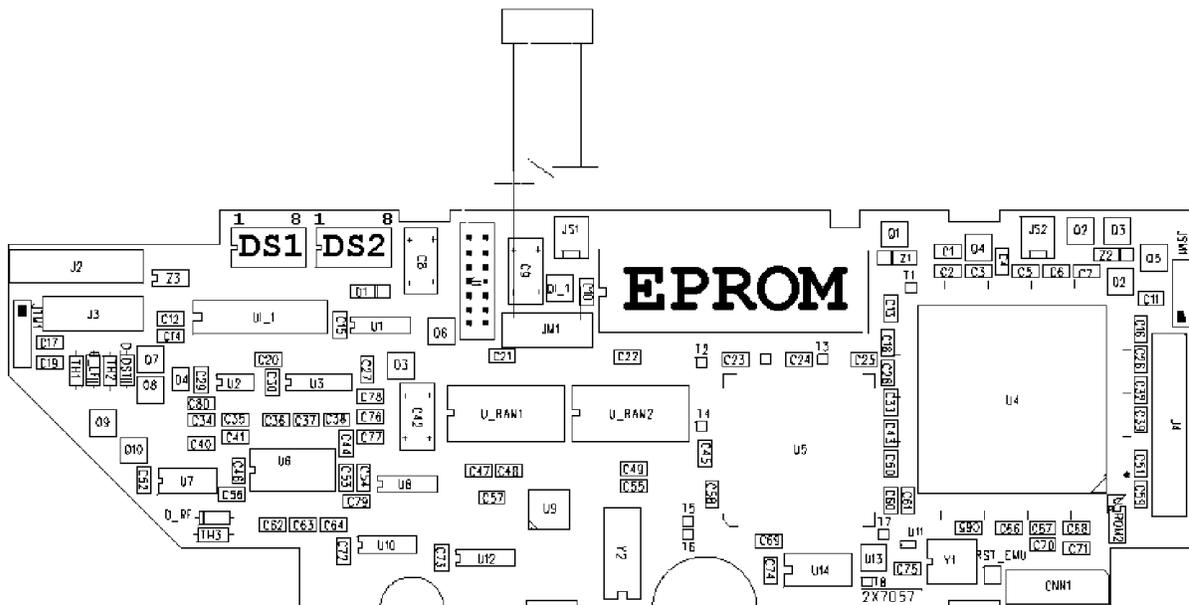
- RS-232 ARDAC-2 serial communications pass through the DB-25 I/O connector.
- The 2-pin power connector must be connected to a host (or bench test) power supply meeting the specifications of Section 1, Description and Specifications.
- The 5-pin black connector is not used when installed in host machine.

Install New or Up-Graded EPROM / FLASH on Microprocessor Board (Optional)

It may become necessary to install or change the EPROM / FLASH on an acceptor's Microprocessor board. The WACS-4 units are shipped from the factory with the latest version of the firmware for the specified country, currency and application.

An EPROM / FLASH change may be required to:

- Adapt the System to a new country, currency or application.
- Change or increase the type of notes or currency handled by the System.
- Up-grade an already installed acceptor with the latest firmware version.



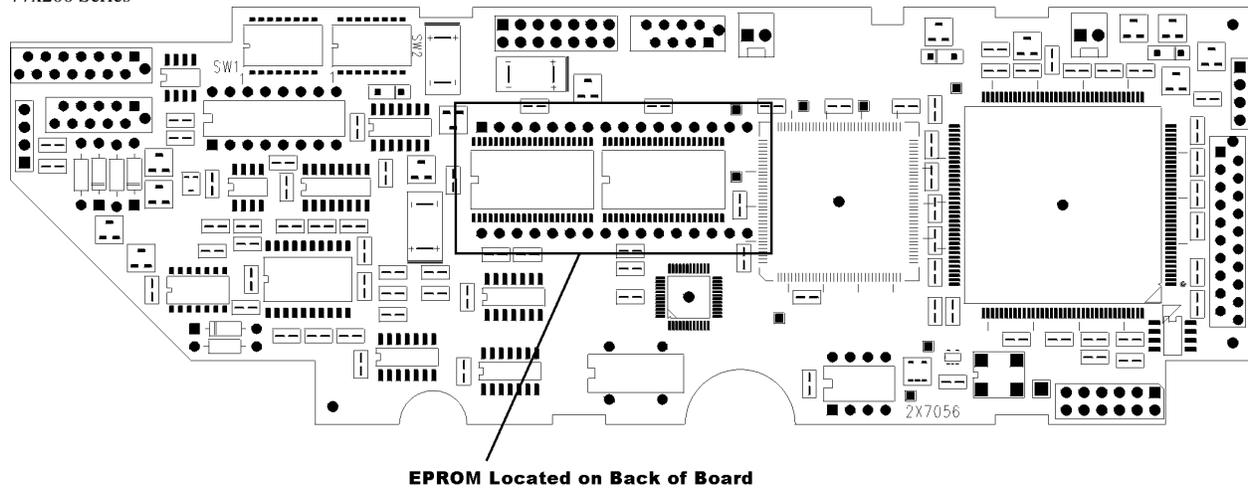


Figure 2-1 EPROM / FLASH Location

Programming New Firmware into an EPROM / FLASH

New firmware can be ordered already programmed into an EPROM / FLASH, or delivered by E-Mail. If new firmware is required, it must be programmed into a suitable 4 Meg EPROM or FLASH device. Money Controls recommends using the parts listed below.

<u>Source</u>	<u>MFG Part Number</u>	<u>Money Controls Part Number</u>
National Semiconductor	27c040 (EPROM)	56x764
AMD	29F040 (FLASH)	56x713

EPROM / FLASH Removal and Replacement

WARNING



The EPROM / FLASH on the acceptor's microprocessor board should be changed only by personnel experienced with proper ESD Static Protection procedures.

Refer to Figure 2-1 and replace the old EPROM / FLASH with the new one:

1. Make sure all power is disconnected from the bill acceptor.
2. Note the orientation of the EPROM / FLASH and pin-1 notch.
3. Using a small needle nose pliers, loosen one end of the EPROM / FLASH and then the other. Pull the EPROM / FLASH from its socket. **(Observe proper ESD protection procedures)**
4. Position the new EPROM / FLASH over the socket with the notch in the EPROM / FLASH at the pin 1 end of the socket. This is the end of the socket closest to the DIP Switches.
5. Make sure all of the pins are straight and aligned with their respective sockets.
6. Be careful to prevent bending the pins or damaging the EPROM / FLASH, press the EPROM / FLASH into its socket until it seats firmly.

Check the DIP Switch Settings And Re-set As Required

The microprocessor board used in the WACS4 note acceptor has two banks of eight DIP switches. These switches set the System's operating mode and enable or inhibit acceptance of certain notes. They are located on the Microprocessor Board as shown in Figure 2-1. Refer to Table 1-1 and verify that the DIP switches are set properly for the required mode of operation and currency combination. If changes are required, use a small non-conductive screwdriver or plastic switch setting wand to toggle the switches. Do not use a conductive probe of any kind.

Insert Stacker Module into the Chassis

To assure proper operation of the WACS4, the stacker cassette must be fully installed and locked into position before the System is powered up.

When inserting the stacker cassette into the chassis:

1. Position the back of the cassette between the guide rails at the bottom of the chassis. (Fig. 2-2)
2. Make sure the latch pin on the right side of the stacker is under the stacker retaining latch on the right side of the chassis.
3. If the note acceptor has already been inserted into the chassis, note the stacker punch gear at the top front corner of the cassette. Also note the punch drive gear at the bottom front corner of the note acceptor. Make sure these gears mesh properly and without damage as the stacker cassette slides into the chassis.
4. Carefully push the cassette into the chassis until it seats against the back of the chassis, and the stacker-retaining latch catches the latch pin.

Insert Note Acceptor Module

To assure proper operation of the WACS4, the note acceptor module must be properly positioned, locked in place, and the main harness connector of the acceptor must be fully inserted into its mating connector in the chassis. The acceptor unit makes or breaks all connections when the acceptor is installed or removed from the chassis.

When inserting the note acceptor into the chassis:

1. Position the back of the acceptor so the support rails at the top of the acceptor fit above the guide rails at the top of the chassis.
2. If the cassette stacker has already been inserted into the chassis, note the stacker punch gear at the top front corner of the cassette. Also note the punch drive gear at the bottom front corner of the note acceptor. Make sure these gears mesh properly and without damage as the acceptor slides into the chassis.

3. Carefully push the cassette into the chassis until the connector at the back of the acceptor seats properly into the connector at the back of the chassis, and the acceptor retaining latch on the left side of the acceptor catches the latch on the left side of the chassis.

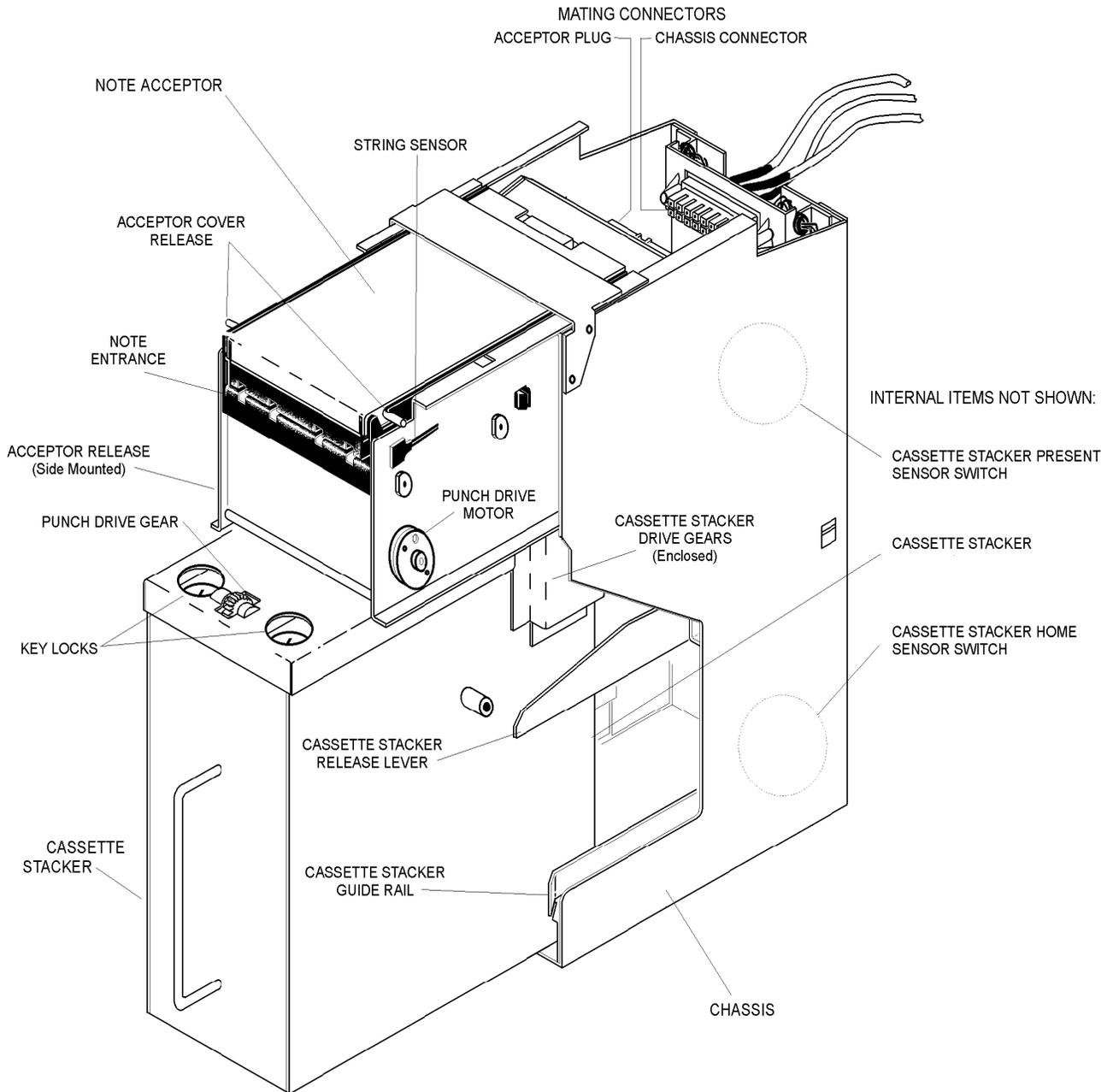


Figure 2-2
System Components

System Power-up

NOTE

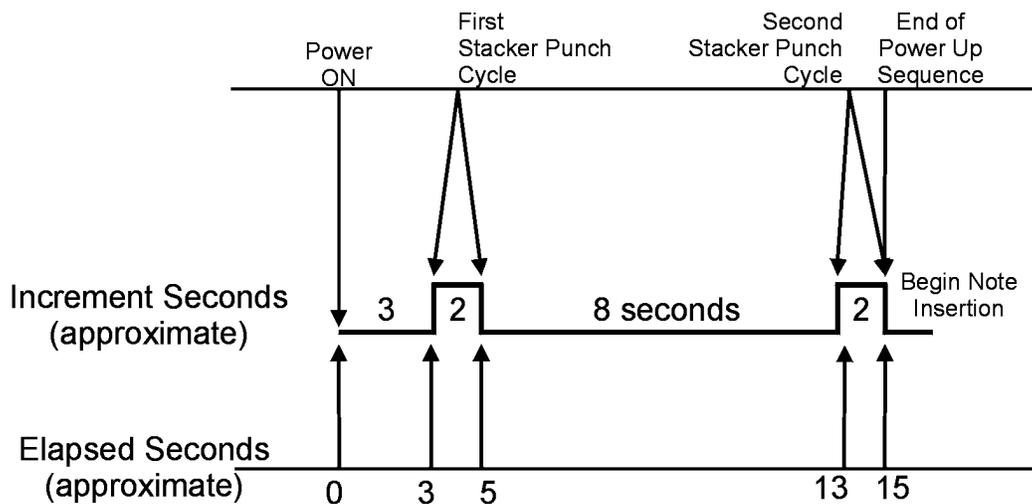
Before applying power to the system, check that there are no notes in the acceptor. Wait until the stacker cycles twice before inserting notes.

The stacker punch cycles once at the beginning and once at the end of the power-up self-calibration sequence. The second cycling of the stacker punch marks the end of the power-up sequence.

The power-up sequence takes approximately 10 to 15 seconds. Refer to Figure 2-3. The System should not be disturbed until the sequence is completed. During this sequence, the System firmware does the following:

- Checks for objects in the note path and if necessary clears the note path.
- Cycles the stacker punch once.
- Calibrates the front sensors.
- Calibrates the dual-density sensor.
- Calibrates the top and bottom TNT sensors.
- Calibrates the String Sensor.
- Checks the DIP switch settings.
- Checks for stacker present. If present, the stacker is cycled and checked for proper rest position.
- Reads chassis and cash box memory buttons (If optional smart system is installed)

Section 3, System Operation explains in detail the System Power-up Sequence, including calibration and storage of calibration values.



**Figure 2-3
Eagle Power-Up Timing**

3

System Operation

Functional Description of System Modules

Section 1, Description and Specifications provides a general System description and a list of major system subassemblies including part numbers. This section of the manual describes operation of the three system modules and subassemblies. The Money Controls World Acceptor Cassette System 4 (WACS4) consists of the following three modules, which are mounted and interconnected as shown Figure 3-1 and in Section 1, Description and Specifications:

NOTE ACCEPTOR:

- Processes an incoming note and passes or rejects the note based on sensor data.
- Acts as the System controller.
- Provides protection against all types of stringing and numerous other intrusive fraud devices.
- Monitors the presence and status of the cassette stacker via sensors in the chassis.
- Provides all mechanical drive for itself and the cassette stacker.
- Communicates with the host.

CASSETTE STACKER:

- Receives notes exiting the note acceptor through a drive-down mechanism, which is propelled by the note acceptor.
- Stacks notes through action of a punch mechanism, which is driven by the note acceptor.
- Acts as an interchangeable, locking note cassette (2 locks).
- Contains memory device to store acceptor data. (On system with Smart option.)

CHASSIS:

- Provides proper alignment of the note acceptor and cassette stacker.
- Provides fastener points for mounting the WACS4 to the host.
- Contains the main System power and communication connector.
- Contains a mechanical switch sensor, which enables the acceptor to detect the presence of the cassette.
- Contains an optical sensor, which enables the acceptor to detect when the stacker punch is in the home (rest) position.
- Contains the chassis ID number memory (read only) for the cassette tracking system. (Smart systems only)

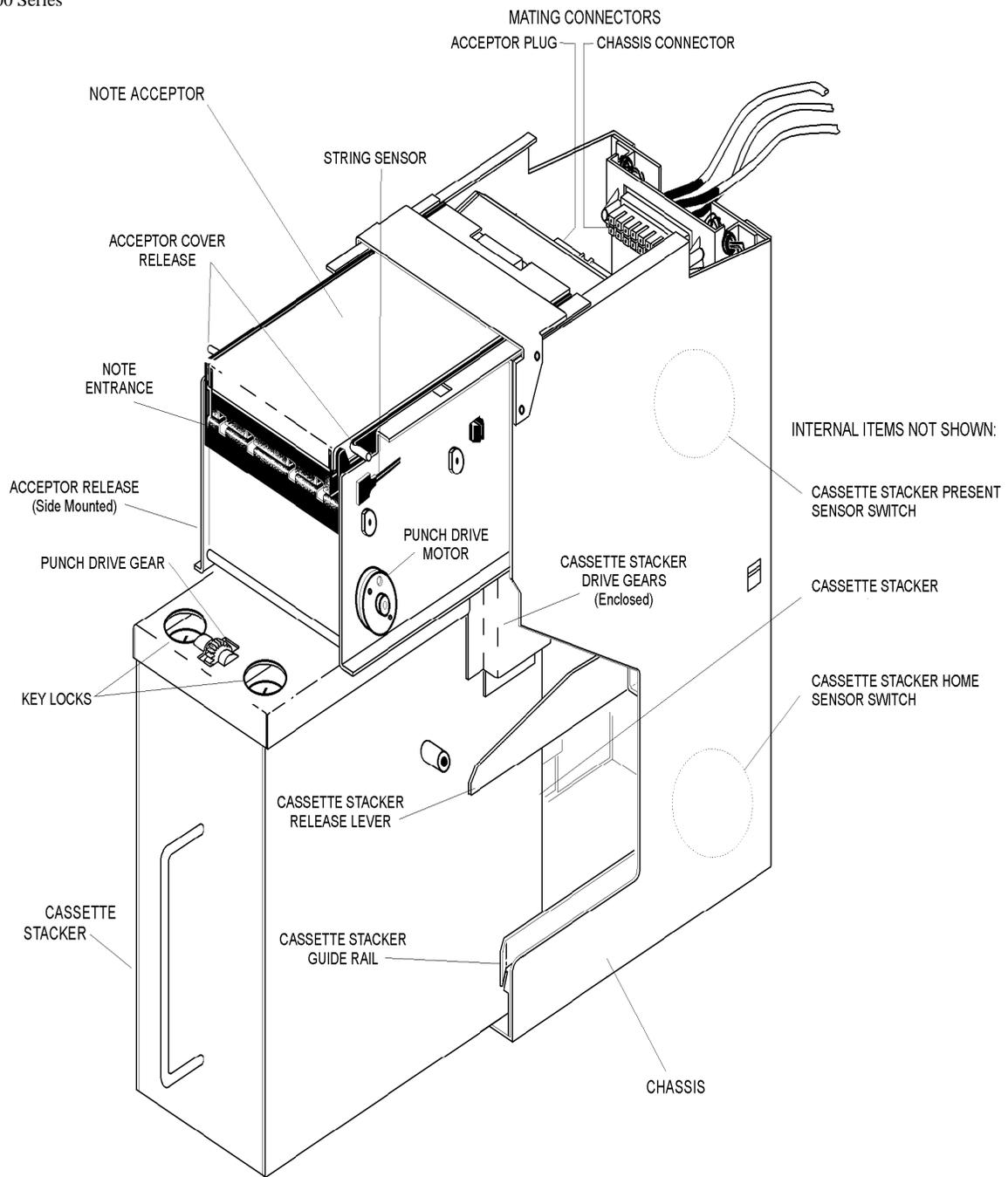


Figure 3-1

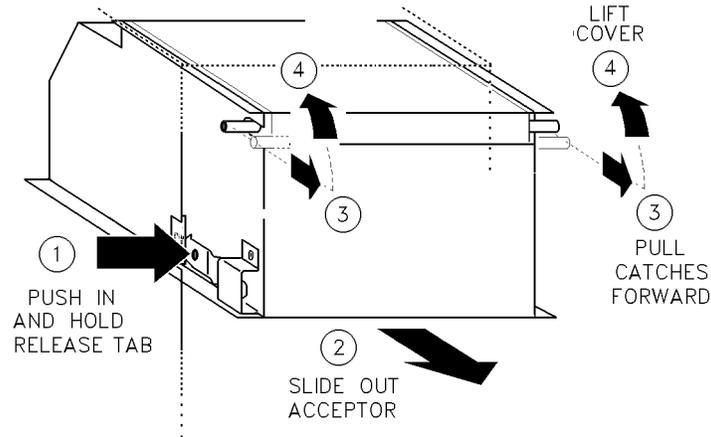


Figure 3-2

Operational Notes - Acceptor

The note acceptor used in the WACS4 System is a belt-driven, horizontal note acceptor. The acceptor identifies notes through the use of a DSP-based, self-calibrating sensing system. Sensors located above and below the note path scan both sides of the note. A sensor at the opening of the note path monitors for a variety of stringing and other intrusive fraud devices.

- When the acceptor verifies that the note is a valid, applicable currency and the cassette stacker can receive it, the acceptor drives the note out of a slot at the bottom rear of the acceptor, into the stacker.
- The note is returned to the customer through the note entrance when the acceptor detects that:
 1. The note is not a valid, applicable currency
 2. An intrusive fraud device is being used
 3. The stacker is jammed or full
 4. The host instructs the acceptor to return the note.

The note acceptor contains two drive motors. One motor, located toward the rear of the acceptor, operates the drive belts inside the acceptor. These belts transport the note past the acceptor's sensor systems. This motor also operates gears, which propel a drive-down mechanism in the cassette stacker. This mechanism actively drives an accepted note into the stacker as the note leaves the acceptor, thus assisting in the initial stages of note stacking.

The second drive motor operates the punch mechanism in the cassette stacker. This bi-directional motor is located toward the front of the acceptor, and can be seen on the right side plate of the acceptor. After a note has been driven fully into the stacker, the punch mechanism pushes the note toward the front of the stacker, into the existing note stack. After the note is stacked, the motor reverses to return the punch to the home position. Optical sensors located in the lower rear corners of the chassis detect this home position.

Removal of the Note Acceptor

The note acceptor positively locks into the System chassis. A spring-loaded release on the left side of the acceptor engages a tab on the chassis to lock the acceptor in place. All connections between the note acceptor and the rest of the System are made or broken automatically through a 14-pin connector on the back of the note acceptor and its mate on the chassis.

To remove the acceptor:

1. Locate the spring release tab on the left side of the acceptor (Figure 3-2 Item 1).
2. Press the tab inward, toward the side of the acceptor and hold.
3. While maintaining pressure on the tab, pull the acceptor from the chassis.

To open the acceptor (after acceptor is removed from the chassis): Refer to Figure 3-2

1. Grasp and pull forward both acceptor cover release pins at the front corners of the acceptor cover, and hold.
2. While maintaining pressure on the release pins, lift the acceptor cover.

Before replacing the acceptor, open the acceptor and check that no notes or other materials remain in the note path. When inserting the acceptor into the chassis refer to the instructions: Insert Acceptor Module into the chassis in Section 2, Installation.

Operational Notes - Cassette Stacker

The cassette stacker is a single-compartment unit, which can hold up to approximately 550 notes in average, circulated condition. The cassette stacker does not contain any electronics or active drive components. The acceptor provides drive to the stacker through gears located at the front and rear of the stacker. See the previous sections, which describe these drive systems.

The internal drive mechanisms in the cassette stacker consist of a pinch roller set in the rear top of the stacker, on either side of the note inlet, and a belt/screw mechanism located inside the front of the stacker and along the bottom left of the stacker. Both mechanisms are driven through gears by motors in the acceptor. The pinch rollers act as a drive-down for incoming notes. The belt/screw system operates the stacker punch. See Figure 3-3.

The cassette stacker contains two positions for key locks. Keys can be removed only if both locks are in the locked position. Both keys must be removed before the stacker can be seated in the chassis. The locks must both be unlocked before the stacker top cover can be opened for emptying of notes. There is a screw inside the cassette stacker that must be removed to disassemble the stacker. If this screw is not removed, it is not possible to dismantle or open the cash box without serious damage.

Removal of the Cassette Stacker

The cassette stacker positively locks into the system chassis through the action of a spring-loaded release lever located on the right side of the chassis (Figure 3-1). To remove the stacker, depress the lever, and then pull the stacker out of the chassis.

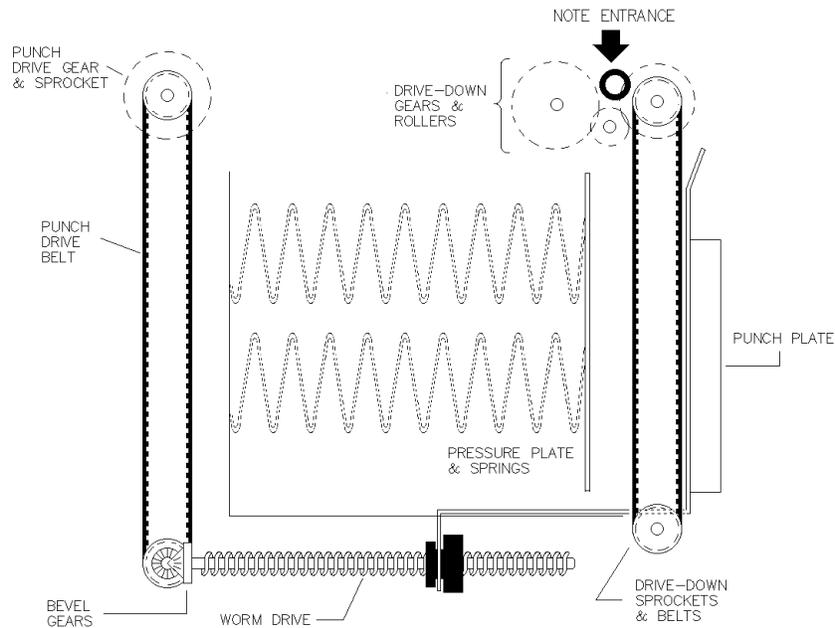


Figure 3-3
Cassette Drive-Down and Punch Mechanisms

Opening The Cassette Stacker

CAUTION

DO NOT FORCE THE STACKER COVER WIDE OPEN.

Refer to Figure 3-4. Open the stacker cover by lifting the front edge only until the cover is perpendicular to the top of the stacker. Mishandling of the stacker cover can cause permanent damage to the cover and hinge. When opening the cassette stacker:

- **DO NOT** force the cover back into the areas of dark shading in Figure 3-4.
- **DO NOT** hold or suspend the stacker by the front edge or by the key lock holes in the cover.
- **DO NOT** flip the cover open by holding the cassette handle and snapping the cassette down and forward.

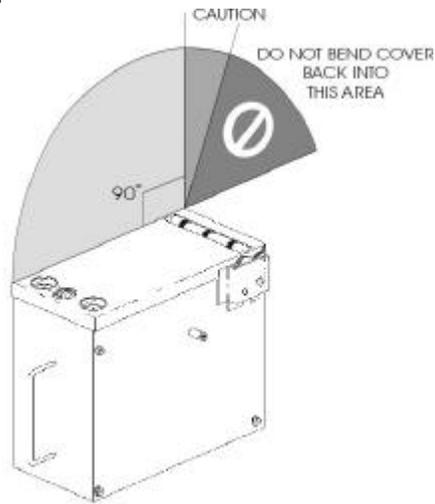


Figure 3-4

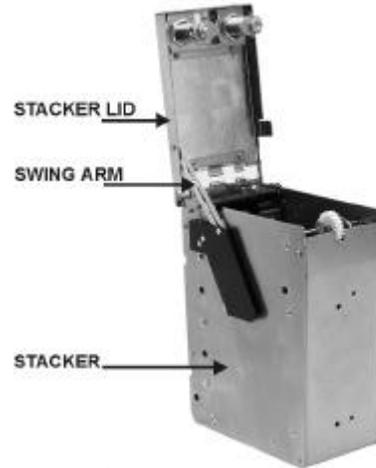


Figure 3-5

Closing and Locking The Cassette Stacker

While firmly supporting the cassette stacker, use only fingers to move the front edge of the cover from its open position above the stacker, to its closed position at the top front edge of the stacker. Mishandling of the stacker cover can cause permanent damage to the cover and hinge. When closing the cassette stacker:

- **DO NOT** close the cover by hitting it against another object such as a table top or chair back.
- **DO NOT** flip the cover closed by holding the cassette handle and snapping the cassette up and inward.
- **DO NOT** close the cover by pushing the open stacker cassette into the System Chassis. The stacker cassette must be closed completely before insertion into the chassis.

If locks are installed, the keys can be removed only if both locks are in the locked position. Both keys must be removed before the stacker can be seated in the chassis.

- * NOTE: Even though the swing arm of the stacker (Figure 3-5) prevents lid over travel; observe the precautions outlined above for proper handling of stackers.

Replacement of the Cassette Stacker

To assure proper operation of the WACS4, the stacker cassette must be fully installed and locked into position before the System is powered up. When inserting the stacker cassette into the chassis refer to the instructions: Insert Stacker Module into the chassis in Section 2, Installation.

Operational Notes - Chassis

Like the cassette stacker, the chassis is an electronically passive device. Its main function is to provide alignment and a mounting shell for the acceptor and cassette inside the host. The acceptor and cassette should smoothly slide into the chassis, and easily lock into position. If the acceptor or cassette require excessive force to engage the latches, the acceptor, cassette, or chassis may be bent or damaged.

Sensors in the chassis detect the presence of the cassette stacker, and also when the stacker punch is the home position. The “Stacker Present” sensor is a normally closed mechanical switch. When the stacker is fully seated, this switch is set to the open position.

The “Stacker Home” sensor is an LED-photo sensor pair. One element of this pair is mounted on either side of the chassis, in the lower inside rear corners of the chassis. When the stacker punch moves out of the home position, the photo sensor sees the LED through access holes in the sides of the stacker cassette. When the stacker punch is in the home position, the punch plate mechanism breaks the light beam between the LED and photo sensor.

If the optional Smart function is installed, there is a read-only memory device installed in the chassis that stores a unique electronic serial number for that chassis.

Operational Notes - System Power-up Sequence

The power-up sequence takes approximately 10 to 15 seconds. The System should not be disturbed until the sequence is completed. During this sequence, the System firmware checks the note path, calibrates the sensors, checks for stacker present, and checks the DIP switch settings. The stacker punch cycles once at the beginning and once at the end of the power-up sequence.

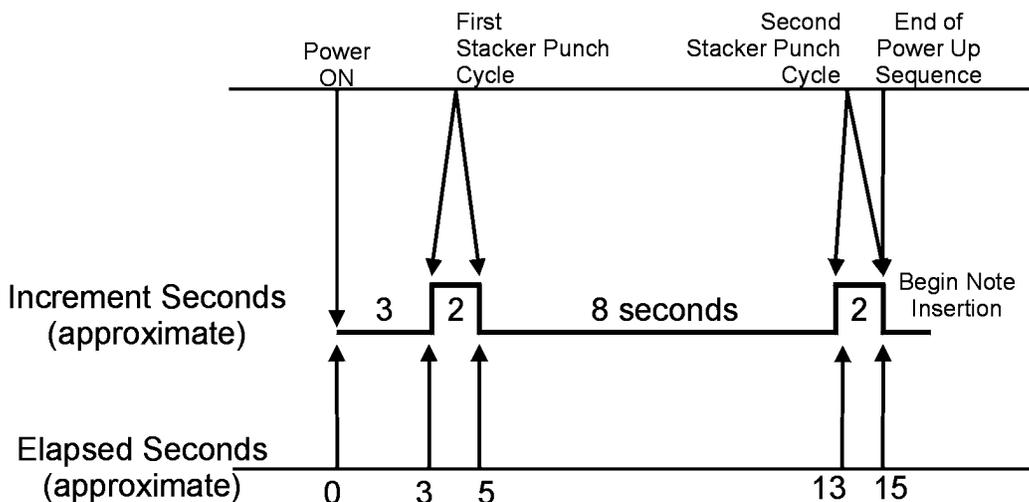
Before Applying Power To The System

1. If possible, check that there are no notes in the acceptor’s note path. In some cases this may not be possible. For example: When power is momentarily lost to the host equipment, and then restored. To address these cases, the acceptor firmware includes routines to automatically clear the note path and reset the stacker. These are explained below.
2. For proper completion of the Power-up Sequence, the stacker cassette must be fully installed and locked into position before the System is powered up.

Power-up Sequence

During the power-up sequence, the following occur:

1. Unit checks RAM and ROM for accuracy..
2. The acceptor checks the note path for covered sensors. If a note was stopped in the note path when the system was powered-down, it will cover some of the sensors. Depending on the position of the stopped note and the condition of the stacker, the acceptor will either:
 - Drive the note into the stacker cassette.
 - Return the note to the customer.
3. The acceptor cycles the stacker punch once. This completes the stacking of any note that was partially stacked when power was removed from the system.
4. The front sensors are calibrated.
5. The mid-density sensors are calibrated.
6. The TNT sensors are calibrated.
7. The String Sensor is calibrated. This occurs only if the string sensor DIP switch is set to enable the sensor. For details, refer to Section 1, Description and Specifications, Figure 1-10 and Table 1-2.
8. The presence of the stacker cassette is checked. If present, the stacker is cycled and checked for proper rest position.
9. The DIP switch settings are checked for note inhibits.



**Figure 3-6
Eagle Power-Up Timing**

Storage of Calibration Values

Except for dual density values, all calibration values are stored in volatile RAM on the Microprocessor Board. Each time power is removed from the System the old values are discarded. New values are established through re-calibration when the System is power-up again.

Dual Density Values

Dual density calibration values are stored in the EEPROM of the Microprocessor. It is not necessary to recalibrate the optical density values unless:

- The Microprocessor Board or microprocessor has been replaced.
- Major service or repair replacement has been performed on the dual density sensor or emitter.
- Testing on the bench in diagnostics mode indicates a high rate of "C0" errors related to the "Density Sum". The "C0" error will have a message indicating "Dual Density Sum Over Limit". If the "C0" error is not associated with a "Density Sum Over Limit" error, Density Calibration will not correct the problem.

Re-calibration of the optical density values is explained in Section 4, System Diagnostics, under the heading Dual Density Calibration.

System Stalls and Incomplete Power-up

For the calibration process to work properly, the System must be powered up without any notes or obstructions in the note path.

- If any object is present in the note path during calibration, the process will not complete properly, resulting in such problems as erratic performance or poor acceptance.
- If an obstruction is present in the note path during subsequent power-ups, the acceptor will try to clear the note path and complete the power-up sequence. If the acceptor cannot clear the note path, the power-up sequence will be halted, and the stacker punch will not cycle.
- If the System has been improperly powered up and stalls, power down the System, and check the note path. Correct the problem as necessary and re-energize the System.

Dip Switch Note Inhibits And String Sensor

The DIPswitches on the microprocessor board are read during power-up to check the communications mode, whether any notes have been inhibited and whether the string sensor is enabled or disabled. The EPROM / FLASH on the acceptor Microprocessor Board must support the protocol selected or the System will not operate properly. The DIPswitches are located on the Microprocessor Board as shown in Figure 1-10 of Section 1, Description and Specifications. Table 1-1 of the same section lists the switch functions.

4

System Diagnostics

Introduction

The WACS4 System can be removed from the host machine and connected to an IBM-compatible personal computer (PC) in two different ways for maintenance and diagnostic testing.

Figure 4-1 shows the WACS4 connected to the PC through its host interface cable. This interface allows the unit to be operated from a P.C. running a "Host Simulator". When connected in this manner, the PC simulates a host machine and allows the user to insert notes and monitor acceptance.

Figure 4-2 shows the WACS-4 connected to the PC through the flat 5-pin diagnostics connector and a 2x7136 Diagnostic interface cable. This type of connection allows the user to access more detailed diagnostic information, monitor acceptance, gather data and calibrate the unit. This diagnostics mode can be used by itself or at the same time as the ARDAC-2 communications to monitor the system. Using both modes at the same time will require the use of two serial ports or 2 computers.

Equipment and Software Required for ARDAC-2 Host Simulator

To operate the WACS4 in diagnostic (bench) mode, you will need the following items:

1. IBM-compatible personal computer (PC), 80286, or better, running at 16MHz (minimum).
2. This PC must have one available serial (COM) port capable of running at 19,200 baud.
3. Money Controls ARDAC-2 Host Simulator Software.
4. An extension or adapter cable may be required to connect the 25-pin connector on the chassis to the PC serial port (9-pin or 25-pin).

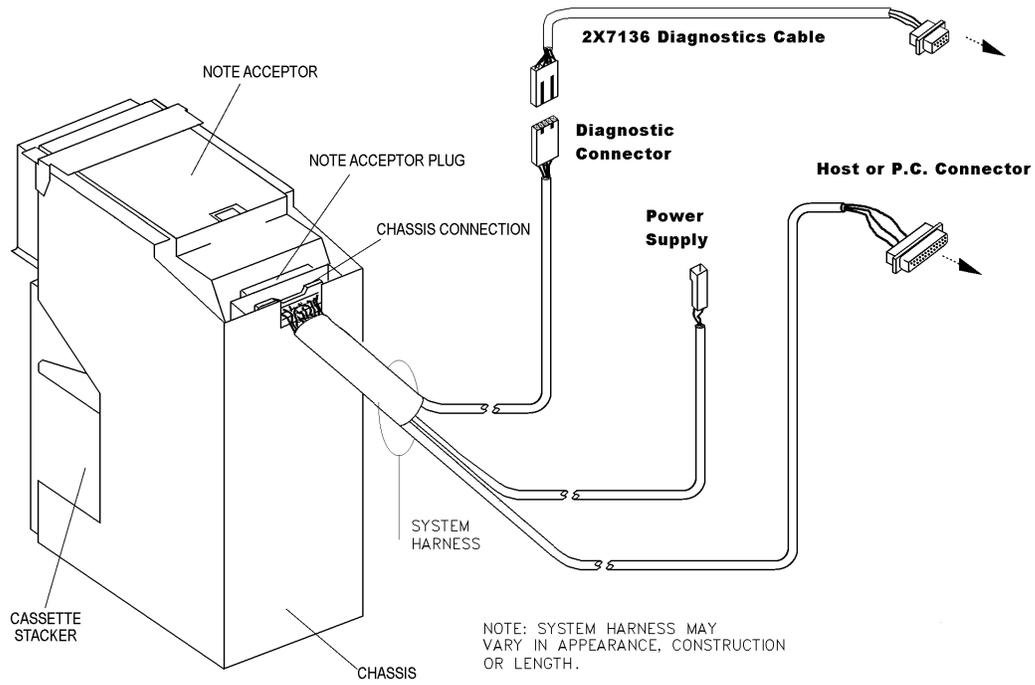


Fig. 4-1
ARDAC-2 Simulator Connection
CAPS Connection for diagnostics

ARDAC-2 Simulator Connections

To connect the WACS to a PC for simulator operation, refer to Figure 4-1.

1. Turn off the WACS4 System.
2. Connect the WACS4 DB-25 connector to the computer serial port.

Host Software Installation

Money Controls will provide a copy of the Money Controls ARDAC-2 Host Simulator software 59x105-3 on 3.5" floppy diskette, CD-ROM or through E-Mail to individuals or organizations authorized by Money Controls. Before installation or operation of the Host Simulator, set aside a master copy of the package.

- If you receive the software on floppy diskette, copy the diskette and store the original (master) in a safe place.
- If you receive the package by way of E-Mail, copy the files to a floppy diskette and store this master in a safe place.

Fixed Disk Or Floppy Diskette

For maximum convenience and speed, run HOST.EXE from a fixed disk. Although it is not recommended, it is possible to run HOST.EXE from a floppy diskette.

- If you intend to run the host simulator from a floppy diskette:
 1. Never run HOST.exe from the master diskette. Use only a copy of the master diskette.
 2. If the copy is damaged or fails, make another copy of the original (master) program diskette and use this copy to run the Host Simulator program.
- If you intend to run the host simulator from a fixed disk, install the host simulator software in a directory of its own.
 1. Create a directory for the program files on the fixed disk (ARDAC-2 is suggested).
 2. Copy all the files from the distribution diskette to this new directory. Refer to Host Setup files below and make sure these files are in the new directory.

Host Setup Files

The files **COMM.HST**, and **DEFAULT.HST** should be in the same directory as the executable **HOST.EXE**. If present, they change the initial set up of the program.

The **COMM.HST** file contains the communications set-up parameters. The only parameter that should be modified is the default communication port number. This is the very first character in the file. Care must be taken to keep all the strings in the same order and of the same general format (punctuation, etc.) as the originals.

Running the Host Software

Communication Port Settings

While the computer's serial port may support a variety of parameters, the Money Controls ARDAC-2 Host software supports only those parameters detailed as the Diagnostic Communications Parameters in the Specifications table of Section 1, Description and Specifications.

To change the COM port settings, Hit <F3> when the host is running then select the communications option on the list. It is also possible to edit the file **COMM.HST** and manually change the port by entering the correct port number in the first position in the file.

Simulator Start-up Command

To run the Host Simulator software, move to the directory containing the software and type **HOST** at the DOS command line. For example:

```
C:\cd\ardac-2  
C:\HOST
```

This program can also be executed by creating a shortcut placed on the Windows™ desktop.

Commands - F2 for more			
A - Inhibit 1	E - Inhibit 5	I - Accept 1	M - Accept 5
B - Inhibit 2	F - Inhibit 6	J - Accept 2	N - Accept 6
C - Inhibit 3	G - Inhibit 7	K - Accept 3	O - Accept 7
D - Inhibit 4	H - Inhibit 8	L - Accept 4	P - Accept 8
U - Debug On	V - Debug Off	[- Inquire Input	\ - Reset Accptr
W - Escrow On	X - Escrow Off	Y - Credit Taken	Z - Reject Note

Commands - F2 for more			
@ - Sleep			
1 - Motor On	2 - Motor Off	3 - Motor Forward	4 - Motor Reverse
5 - TNT Lamps On	6 - TNT Lamps Off	< - Calibrate	: - Setup Voltages
7 - Stacker For	8 - Stacker Rev	9 - Stacker Off	0 - Stacker Cycle
F1 - Help	F3 - Options	F4 - Show Message Window	

Commands - F2 for more			
1 - Motor On	2 - Motor Off	3 - Motor Forward	4 - Motor Reverse
5 - TNT Lamps On	6 - TNT Lamps Off	< - Calibrate	: - Setup Voltages
7 - Stacker For	8 - Stacker Rev	9 - Stacker Off	0 - Stacker Cycle
F1 - Help	F3 - Options	F4 - Show Message Window	
F5 - Quit	F6 - Reset Host	F7 - Transparent/Host Sim Mode	

Figure 4-4
“F2 for more” Screens

```

Message Window - F4 to return to normal

World Acceptor/Cassette System: (Copyright (c) 2000 Ardac Inc.)
odel: 88x3333
Firmware PN: 57x2000.07-045.08.04
Country: England/Scotland

checksum = C8E1

Bench mode: ENABLED
CAPS mode: DISABLED
AutoCalibration: DISABLED
Data dump( 44 ): DISABLED

Memory Compare OK

Ardac OS>>>

CON          A/R          ACC:12345678  9600O81COM2:  4/ 0  state=15
    
```

Figure 4-5
“Message Window” screen

STATUS ELEMENT	MEANING
STK	The stacker is under control of the acceptor.
ESC	The acceptor is in escrow mode.
DEB	The acceptor is in debug mode.
CON	The host will automatically reconfigure the acceptor on receipt of a request for reconfigure.
POL *	The host will periodically poll the acceptor.
INQ *	The host will automatically perform an inquire input at a certain time.
A/R	The host, when in escrow mode, will automatically accept or reject a note in for a credit signal was received.
SIM	The host is in host simulation mode (as opposed to transparent mode).
ACC:12345678	This shows which notes are acceptable.
9600O81COM1:	(9600/O/8/1/COM1) The baud rate, parity, bits per byte, stop bits, and com port for the serial communications.
2/3	The present value of the system clock (in 1/18 sec) and the time at which it will time-out waiting for some event.
state = 1	The state of the host simulation.

* The POL and INQ flags in HOST.EXE Version 1.0 have no function and are included for future releases.

Table 4-1
Description of Host Messages

ARDAC-2 Host Simulator Set-up

After the connections have been made, ensure that the note acceptor and cassette are installed and fully seated in the chassis. Then proceed with the following steps:

1. Apply power to the computer. Allow the computer to boot and load operating system.
2. Start the Host Simulator by running the HOST.EXE file from the DOS prompt or by creating and using a shortcut on your Windows™ desktop. Configure the software for the serial port where the note acceptor is connected.
3. The software will start in Auto-Polling Mode unless this mode was disabled during a previous operating session. The “From Host”, “From Computer”, and “Communications” windows will show the polling activity.
 - If Auto-Polling is ON, proceed to step 4.
 - If Auto-Polling is OFF, press the F3 function key to access the Options Menu. Select Auto-Polling from the menu options and press the Enter key. When Auto-Polling starts, proceed to step 4.
4. Apply power to the WACS4, and wait for the stacker punch twice indicating completion of the power-up sequence.

Diagnostic (Bench) Mode

1. The diagnostics or “Bench” mode on a WACS-4 can be accessed by using the ARDAC-2 Host simulator and placing the acceptor into setup mode or by using the diagnostic cable and interfacing to a computer using Windows Hyper Terminal™

A serial communications program such as Windows Hyper Terminal™ set to 19,200 baud, odd parity, 8 data bits and one stop bit can be used to access the diagnostics mode if using the 5 pin diagnostics port. After the WACS4 completes power-up, start Diagnostic (Bench) mode by hitting <ESC> <ESC> <ESC> <ENTER>

2. Hitting the <ENTER> key by itself while in diagnostics will display a block of information containing the following information:

Model	88x3333	
FIRMWARE NO:	xVVV-RR	(VVV = Version, RR = Revision)
CHECKSUM:	CCCC	(CCCC = hex checksum)
Country		

Bench mode: ENABLED
CAPS mode: DISABLED
Auto calibration: DISABLED
Data dump(44): DISABLED

Diagnostic (Bench) Mode Operations

With Diagnostics mode enabled, the technician can operate the System directly from the P.C. keyboard. The Host software will monitor and control:

- Monitoring Note Acceptance
- Calling Up Calibration Voltages
- Controlling the Note Transport Motor
- Controlling the Stacker Drive Motor
- Data gathering
- Auto Calibrate Mode
- Read and clear data from Smart Cassette system (If installed)

The CAPS and data dump modes are for factory use.

The available commands are shown below:

```
Ardac OS>>>?
```

```
Valid Commands:
```

```
ACAL = autocalibration mode  
C = caps dump  
D = data dump  
M = Mag calibration  
P = previous note caps dump  
R = register dump  
Q = quick note caps dump  
S = number of points pernote  
V = auto_zero voltage dump  
Y = Retrieve data from Smart Cassette (If installed)  
1 = toggle transport forward  
2 = toggle transport reverse  
3 = toggle stacker forward  
4 = toggle stacker reverse  
5 = toggle stacker cycle  
6 = toggle TNT act/deact  
? = this display
```

```
Ardac OS>>>
```

Table 4-2. Diagnostic Control Keys

To Monitor Note Acceptance:

Each time a note is inserted in the note acceptor, the computer display will return one of two message strings.

- If the note is accepted, the display responds in the following format (actual messages or numbers may differ):

Denomination: cccc dddd
(Position Error Information)
VENDED

Time to ESCROW: tttt sec.
Time to credit: tttt sec.
Time to irretrievable: tttt sec.
Time to IDLE: tttt sec.

Where cccc = the currency, dddd = the denomination, and ttt = time in seconds.

- If a note is inserted and then rejected, the display shows:

Status Exception XXXX

The number following "Status Exception" will be most useful in determining the cause of the error condition or reason for note rejection. Table 4-3 shows a collection of error codes and their meaning.

To Control The Transport Motors:

To toggle the acceptor motors forward or reverse, and ON or OFF, press the numeral keys 1 or 2 as shown below. The cassette must be left in place to enable these operations. If the cassette is removed, the actuator lever on the top of the Stacker Present switch must be taped down to simulate the presence of the cassette. No specific printout information will appear on the computer display.

- 1 (Toggle transport motor forward ON/OFF)
- 2 (Toggle transport motor reverse ON/OFF)

To Cycle The Cassette Stacker:

To run the stacker motor through one cycle, press the numeral key 5. No specific printout information will appear on the PC display.

- 5 (Cycle stacker motor)

To Control The TNT Lamps:

To toggle the TNT lamps ON or OFF, press the letter key T. To avoid unnecessary heating of the sensors, keep lamp ON-time to a minimum during such checks (a few seconds).

- 6 (Toggle TNT lamps ON/OFF)

<u>ERROR</u>	<u>MEANING</u>
02	Note Handling Error (improper transportation of note)
03	Stalled motor
04	2nd note in transport
05	Transport jammed
06	Note position error
07	Long note
08	Short note
10	Host disabled
11	Host has disabled acceptor
20	Stacker cassette full or missing
30	Message sent to host, but no response received.
40, 41, 42, 44, 48	Failure to calibrate sensor LED's (min PWM error)
50, 51, 52, 54, 58	Failure to calibrate sensor LED's (max PWM error)
60, 61, 62, 64, 68	Failure to calibrate sensor LED's (low rail error)
70, 71, 72, 74, 78	Failure to calibrate sensor LED's (hi rail error)
A0, A1, A2, A3	Failure to calibrate TNT sensor
7D	DAC at High Rail
7E	DAC at Low Rail
7F	Calibration unstable
80	EPROM / FLASH checksum error
81	Microprocessor internal RAM problem
82	Microprocessor board (external) RAM problem
82	Microprocessor board non-volatile RAM problem
B0	String detector calibration error
C0	Inability to identify note based on stored note data
C1	Calibration failed to complete within 10 sec time-out
C2	TNT calibration failed to complete within 10 sec time-out
C3	String sensor covered or detected an obstruction

Table 4-3. Error Codes

To Show Calibration Voltages:

After communications are established and the acceptor has been enabled, press the V key. A display similar to the one below will appear on the computer display.

Ardac OS>>> V

```
Top Vis      Voltage = 1.99 Volts (102) ee pot: 21/31
Top IR       Voltage = 1.95 Volts (100) ee pot: 19/31
Bottom Vis   Voltage = 2.08 Volts (107) ee pot: 19/31
Bottom IR    Voltage = 2.07 Volts (106) ee pot: 22/31
Left Front   Voltage = 4.70 Volts (target=4.72 V) DAC Setup = 100/255
Right Front  Voltage = 4.72 Volts (target=4.72 V) DAC Setup = 113/255
IR Density   Voltage = 4.76 Volts (target=4.72 V) DAC Setup = 224/255
Red Density  Voltage = 4.72 Volts (target=4.72 V) DAC Setup = 119/255
String Detect Voltage = 2.34 Volts (target=2.34 V) DAC Setup = 128/255
IR Density Calibration: Slope=050, Diffusion Offset=+0.17, Cal Open V=4.88
Red Density Calibration: Slope=097, Diffusion Offset=-0.31, Cal Open V=4.72
```

***** CALIBRATION PASSED *****

PRESS <ENTER> TO CONTINUE...

Current Mag Gain Value = 23

```
DIP Switch1:  1  2  3  4  5  6  7  8
              off off off off off off off off
```

```
DIP Switch2:  1  2  3  4  5  6  7  8
              off off off on  off on  off off
```

```
Note present front :UNcovered
Rear clear         :UNcovered
Note present back  :UNcovered
```

```
Stacker Home
Stacker Installed
```

Table 4-4. Diagnostic (Bench) Mode Voltage Printout

To Show Smart Cassette Data:

After communications are established and the acceptor has been enabled, press the “Y” key. A display similar to the one below will appear on the computer display.

```
Y
Chassis SN = 01 3e 1b 52 07 00 00 6a

Record 1 -- Chassis SN in Cassette = 01 8f be 87 02 00 00 0e
VEND[1-16] = 0 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0
Correlation Reject Count = 0   Note Handling Reject Count = 0
Tamper Count = 0   Acceptor Jam Count = 0
TIME since record 1 started = 8 days, 1 hours, 21 minutes, 11 seconds
Cassette RAM CRC = 57 78

Record 2 -- Chassis SN in Cassette = 01 3e 1b 52 07 00 00 6a
VEND[1-16] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Correlation Reject Count = 0   Note Handling Reject Count = 0
Tamper Count = 0   Acceptor Jam Count = 0
TIME since record 2 started = 0 days, 2 hours, 30 minutes, 15 seconds
Cassette RAM CRC = d7 3a
```

There can be as many as 4 records stored in the cassette memory. The data displayed above can be broken down as follows:

1. The first line showing the chassis SN is the electronic serial number stored in the chassis memory button.
2. The VEND [1-16] will show how many of each denomination has been stacked in the cash box since the last time the memory was cleared. The first character is the lowest denomination; the second character is the second lowest denomination. This is repeated up to the highest denomination. 16 locations are allocated but generally, not all locations are required since most countries do not have 16 denominations.
3. The Correlation reject count shows how many notes were rejected because they could not be recognized.
4. The note handling reject count shows how many notes were rejected due to poor insertion or handling.
5. The tamper count shows how many times the acceptor saw a condition that appeared to be attempted tampering with the note acceptor.
6. The Acceptor jam count shows how many times the acceptor detected a note jam.
7. The Time since record started shows how long it has been since that cassette was either:
 - A. Cleared by docking station or computer
 - B. Installed into a chassis with a different serial number

Dual Density Calibration

Dual Density Calibration Card (Money Controls part number 49x307) is required to perform this calibration procedure. If this card is not available, obtain one from Money Controls before starting this procedure. Please note that the unit is calibrated at the factory and should not need routine re-calibration by the end user. The probability that poor acceptor operation is caused by improper calibration is very low. Calibration should only need to be performed after a unit has had a circuit board changed or an optical part was changed in the density circuit. **THE CALIBRATION CARD ONLY AFFECTS THE DENSITY CIRCUIT AND WILL NOT CORRECT ANY OTHER PROBLEMS.**

CAUTION

Calibrating the acceptor with anything other than the calibration card specified will cause poor or no note acceptance.

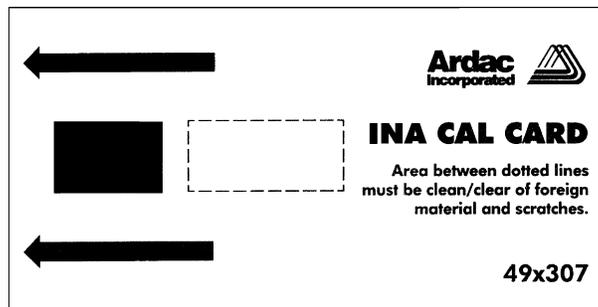
Calibration Procedure

1. Follow the instructions in the Diagnostics section of this manual to:
 - Install and set-up the equipment for bench mode operations.
 - Set up the Windows Hyper Terminal™ software for bench mode operations.
 - Start bench mode as described in the Diagnostics section above.
2. Once bench mode is active, access the Message Window. The screen display includes an auto calibration status line that reads:

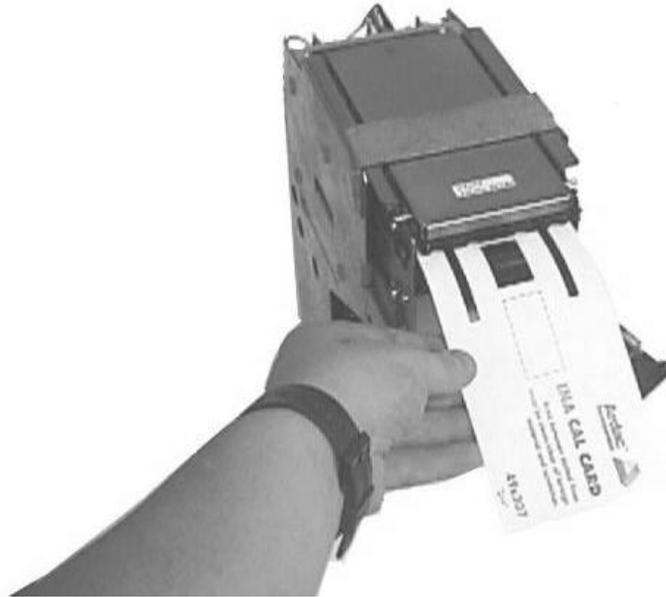
Autocalibrate: DISABLED

3. With the Message Screen displayed, start the Auto Calibration sequence by typing ACAL. The CAPS software responds with the message:

Insert the calibration card



4. Using only a Money Controls 49x307 Calibration Card, insert the card into the acceptor. As shown below:



5. The card is drawn into the acceptor and returned after a second.
6. The message “Calibration Passed” and the new calibration values display on the monitor. The unit is calibrated.
7. At the end of its calibration sequence, the acceptor automatically leaves Auto Calibrate Mode. When the Message Screen displays again, the Auto Calibration status line will read:

Autocalibrate: DISABLED

5

Maintenance

Introduction

The Money Controls World Acceptor Cassette System 4 (WACS4) provides maximum performance with a minimum of service and maintenance. Typical maintenance consists of periodic inspection and cleaning of:

- Sensor Surfaces
- Drive Components
- Note Path Components

Adjustments

The WACS4 sensors are self-adjusting and do not require routine electronic calibration.

Calibration Card

If the performance of the machine indicates that calibration is required, the user can enter a "Quick Calibrate" mode through the use of a dip switch. This procedure is listed below. Use of the calibration card will only correct calibration errors in the dual density (Center round) sensor. The original calibration is done at the factory. The unit should not need to be calibrated again unless the microprocessor, top sensor board or bottom sensor board have been changed. Also, if a part in the dual density has been changed, calibration is suggested.

"Quick Calibration"

Dip Switch 8 on switch bank #2 will be used to enable and disable "Quick Calibration". Setting the switch to ON will enable the calibration. Setting the switch to OFF will disable the calibration.

1. Beginning Calibration
 - a. Place Switch 2-8 to the ON position.
 - b. Supply power to the unit.
 - c. Wait until the stacker cycles twice before inserting the calibration card.
(The unit needs to complete its power up calibration before the Calibration Card is inserted. The presence of anything on the front sensors before power up calibration is finished will cause a delay in the power up calibration.)
 - d. The cycling of the stacker is the signal that power up calibration is complete.

2. Ending Calibration (Within Limits)
 - a. If the unit passes the calibration test, the Calibration Card will be returned, the stacker will cycle once, and the unit will be disabled.
 - b. It will not take any more note insertions until Switch 2-8 is set to OFF and the power is cycled.
3. Ending Calibration (Outside of Limits)
 - a. If the unit fails the calibration test, the Calibration Card will be returned, but the unit will not be disabled.
 - b. The Calibration Card can be reinserted until the calibration passes.
3. Power up Hardware Tests
 - a. To minimize the time needed to perform the "Quick Calibration", none of the power up hardware tests will be executed.
 - b. The Power Up Calibration still needs to be performed. (Stacker cycles twice at power up)
4. Operation without a stacker
 - a. The "Quick Calibration" can be performed without a stacker.
 - b. All of the steps to perform the calibration are the same, with or without a stacker.
 - c. The stacker motor will still run to signal the user if a stacker is not installed.

Cleaning

Banknote handling devices normally build up a film of oil and dirt from the banknotes themselves. The WACS-4 has been designed to operate for extended periods of time between cleanings. If excessive dirt builds up on the transport drive mechanism or sensors, poor acceptance may result. The note path should be cleaned at least once a year. More frequent cleaning may be required depending on the location, frequency of usage, and condition of the banknotes taken in.

Cleaning Materials

CAUTION

OIL-BASED SOLVENTS WILL ATTACK RUBBER PARTS, CAUSING PREMATURE FAILURE. AGGRESSIVE AROMATIC SOLVENTS WILL ATTACK OR MELT PLASTIC COMPONENTS AND PAINT

When cleaning the WACS4, use the following materials:

- Clean, soft lint-free clothes
- 99% Isopropyl Alcohol

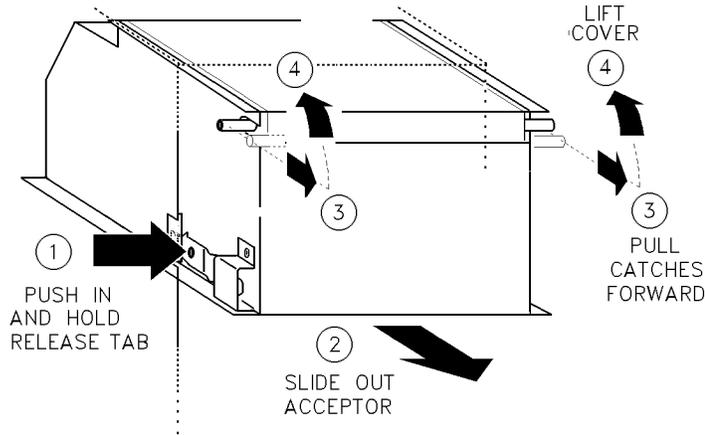


Figure 5-1 Removing and Opening Acceptor

Cleaning Instructions

Clean the acceptor and note path as follows:

1. Turn off power to the System.
2. Locate the release tab on the left side the acceptor. Press the tab inward, and while maintaining pressure on the tab, slide the note acceptor out of the chassis (Figure 5-1).
3. Open the acceptor by simultaneously pulling the acceptor cover releases on either side of the acceptor top toward the front of the acceptor. While maintaining pressure on the release pins, swing the top cover open to expose the note path and sensors.
4. Inspect the condition of the belts, gears and sensor surfaces in the bottom sensor plate. The belts should not be frayed, glazed, nicked, or worn. Also inspect the rollers in the top sensor plate. Rollers should be smooth and not show signs of wear, abrasion, or other damage.
5. Check the condition of the sensor windows and grays scales in the top and bottom sensor plates. These surfaces should not be worn, scratched, or discolored.
6. Dampen a lint-free cloth with 99% isopropyl alcohol. Make sure the cloth is not soaked so much that alcohol will drip from it into the acceptor. Wipe the inside of the note path. Make sure to clean pressure wheels on top, belts, windows and gray-scale plastic. After exposed portion of belts are cleaned, rotate large black gear on rear of acceptor to expose the portion of the belts that have not been cleaned and repeat cleaning until all of belts are clean.
7. Locate the other note sensor sets in the top and bottom sensor plates. Use a cotton swab moistened with alcohol the sensors if required.
8. Routine lubrication of this product is not required.

NOTE:

Do not clean small round sensors unless a film or dirt is visible on the lens

Using Cleaning Card Mode

A cleaning card can be used for a quick cleaning where only the belts and pressure wheels need to be cleaned. There is a special mode set using dipswitches and a 49x315 pre-soaked cleaning card. It is recommended that the acceptor be inspected for dirty or damaged components in the note path. Use of a cleaning card should not replace routine inspection of the note path by opening acceptor and inspecting the belts, wheels, windows and levers for proper operation.

1. Setting switches on the micro board enters the cleaning card mode. (See switch setting table in section 1)
2. Set unit into cleaning card mode according to switch settings in section 1.
3. Install unit into host machine and apply power.
4. Wait for stacker to cycle out and back two times.
5. Insert Money Controls 49X315 cleaning card while holding end of cleaning card firmly.
6. The motors should run for approximately 6 seconds.
7. Do not allow the entire card to be pulled inside machine.
(The belts should be moving while card is held stationary)
8. If the cleaning card does accidentally slip into the machine, it will be returned to you.
9. The card should be inserted in all four directions to assure adequate cleaning of belts.
(It is normal to see black marks on the cleaning card from the dirt on the acceptor belts.)
10. After running the cleaning card, open the unit and wipe the note path with a cloth to clear any remaining debris from the note path. (Dampen cloth with alcohol if required to remove foreign material)
11. After cleaning, turn cleaning card mode off with the DIPswitches.

6

ARDAC-2 & Diagnostic Interface

Introduction

The DB-25 interface connector provides interface to the WACS system communication lines. This interface is used by the host machine and can also be used to run the acceptor on a test bench with a computer running a host simulator program.

Description

The WACS system should be connected as illustrated below for bench operation:

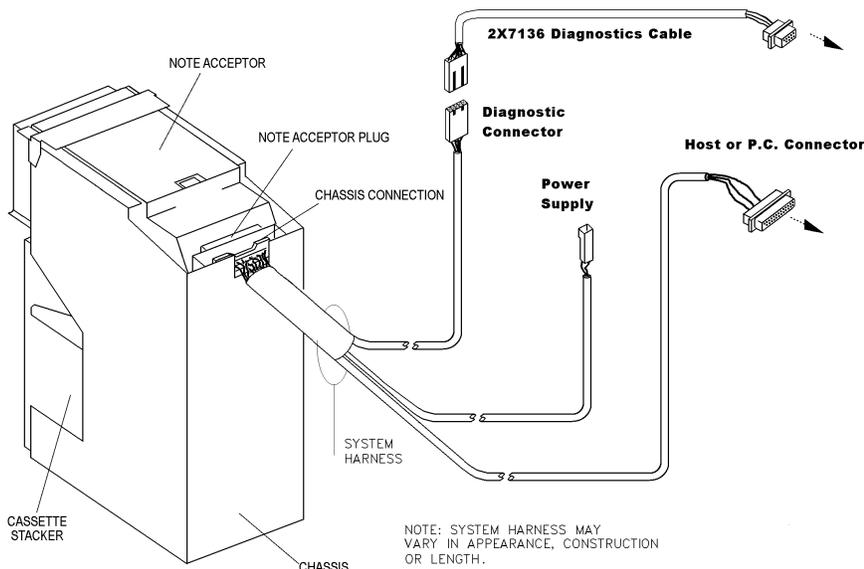


Figure 6-1
ARDAC-2 Host Simulator Connections

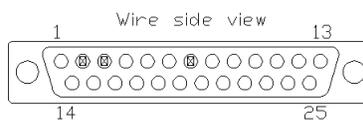


Figure 6-2
DB-25F Communications connector pin-out

Communications Parameters

While the computer's serial port may support a variety of parameters, the Money Controls ARDAC-2 CAPS interface board supports only those parameters detailed as the Diagnostic Communications Parameters in the Specifications table of Section 1, Description and Specifications. Make sure the simulator software sets the computer's serial port for the specified parameters.

The 5 pin diagnostic connector connects the WACS4 and the computer using a special 2x7136 diagnostics cable as illustrated below:

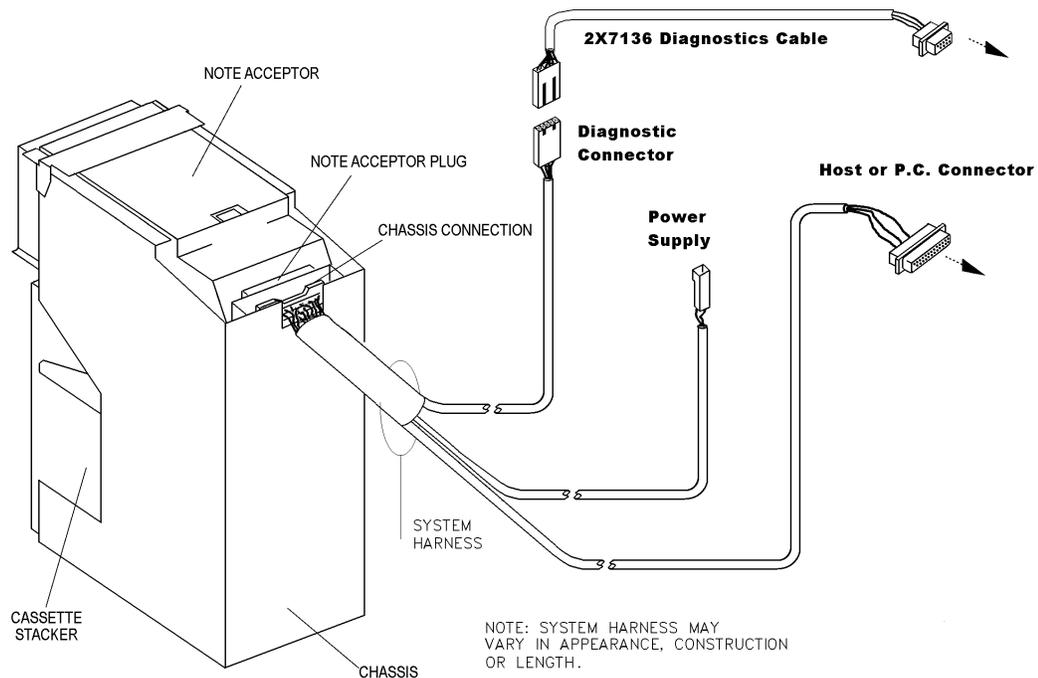


Figure 6-3
Diagnostics Interface

Bench Mode using Diagnostic Connector

1. The diagnostics or “Bench” mode on a WACS-4 can only be accessed by connecting a 2X7136 interface cable to the black 5 pin connector on the chassis as shown in Fig. 4-2.
2. A serial communications program such as Windows Hyper Terminal™ set to 19,200 baud, odd parity, 8 data bits and one stop bit should be used to access the diagnostics mode. After the WACS4 completes power-up, start Diagnostic (Bench) mode by hitting <ESC> <ESC> <ESC> <ENTER>
A screen similar to the following should appear:

```
World Acceptor/Cassette System: (Copyright (c) 2000 Ardac Inc.)
Model: 88x3333
Firmware PN: 57x2000.07-045.08.04
Country: England/Scotland

checksum = C8E1

Bench mode: ENABLED
CAPS mode: DISABLED
AutoCalibration: DISABLED
Data dump( 44 ): DISABLED

Memory Compare OK

Ardac OS>>>
```

Bench Mode Operations using Diagnostic Connector

With Diagnostics mode enabled, the technician can operate the System directly from the P.C. keyboard. The Host software will monitor and control:

- Monitoring Note Acceptance
- Calling Up Calibration Voltages
- Controlling the note transport motor
- Controlling the stacker drive motor
- Data gathering
- Auto Calibrate Mode
- Read and clear Smart Cassette data (If smart option is installed.)

The CAPS and data dump modes are for factory use.

77x200 Series

<ESC> <ESC> <ESC> <ENTER> = Enter Diagnostics Mode

ACAL = Density auto calibration mode

C = caps dump

D = data dump

M = Mag calibration

P = previous note caps dump

R = register dump

Q = quick note caps dump

S = number of points per note

V = auto zero voltage dump

Y = Read Smart Cassette data (If smart option is installed.)

1 = toggle transport forward

2 = toggle transport reverse

3 = toggle stacker forward

4 = toggle stacker reverse

5 = toggle stacker cycle

6 = toggle TNT act/deactivate

? = this display

Ardac OS>>>

Table 4-2
Diagnostic Control Keys

To Show Calibration Voltages:

After communications are established and the acceptor has been enabled, press the V key. A display similar to the one below will appear on the computer display.

Ardac OS>>> V

```
Top Vis      Voltage = 1.99 Volts (102) ee pot: 21/31
Top IR       Voltage = 1.95 Volts (100) ee pot: 19/31
Bottom Vis   Voltage = 2.08 Volts (107) ee pot: 19/31
Bottom IR    Voltage = 2.07 Volts (106) ee pot: 22/31
Left Front   Voltage = 4.70 Volts (target=4.72 V) DAC Setup = 100/255
Right Front  Voltage = 4.72 Volts (target=4.72 V) DAC Setup = 113/255
IR Density   Voltage = 4.76 Volts (target=4.72 V) DAC Setup = 224/255
Red Density  Voltage = 4.72 Volts (target=4.72 V) DAC Setup = 119/255
String Detect Voltage = 2.34 Volts (target=2.34 V) DAC Setup = 128/255
IR Density Calibration: Slope=050, Diffusion Offset=+0.17, Cal Open V=4.88
Red Density Calibration: Slope=097, Diffusion Offset=-0.31, Cal Open V=4.72
```

***** CALIBRATION PASSED *****

PRESS <ENTER> TO CONTINUE...

Current Mag Gain Value = 23

```
DIP Switch1:  1  2  3  4  5  6  7  8
              off off off off off off off off
DIP Switch2:  1  2  3  4  5  6  7  8
              off off off on  off on  off off
```

```
Note present front :UNcovered
Rear clear          :UNcovered
Note present back  :UNcovered
```

```
Stacker Home
Stacker Installed
```

**Table 4-3
Acceptor Voltage display**

To Show Smart Cassette Data:

After communications are established and the acceptor has been enabled, press the “Y” key. A display similar to the one below will appear on the computer display.

```
Y
Chassis SN = 01 3e 1b 52 07 00 00 6a

Record 1 -- Chassis SN in Cassette = 01 8f be 87 02 00 00 0e
VEND[1-16] = 0 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0
Correlation Reject Count = 0   Note Handling Reject Count = 0
Tamper Count = 0   Acceptor Jam Count = 0
TIME since record 1 started = 8 days, 1 hours, 21 minutes, 11 seconds
Cassette RAM CRC = 57 78

Record 2 -- Chassis SN in Cassette = 01 3e 1b 52 07 00 00 6a
VEND[1-16] = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Correlation Reject Count = 0   Note Handling Reject Count = 0
Tamper Count = 0   Acceptor Jam Count = 0
TIME since record 2 started = 0 days, 2 hours, 30 minutes, 15 seconds
Cassette RAM CRC = d7 3a
```

There can be as many as 4 records stored in the cassette memory. The data displayed above can be broken down as follows:

1. The first line showing the chassis SN is the electronic serial number stored in the chassis memory button.
2. The VEND [1-16] will show how many of each denomination has been stacked in the cash box since the last time the memory was cleared. The first character is the lowest denomination, the second character is the second lowest denomination. This is repeated up to the highest denomination. 16 locations are allocated but generally, not all locations are required since most countries do not have 16 denominations.
3. The Correlation reject count shows how many notes were rejected because they could not be recognized.
4. The note handling reject count shows how many notes were rejected due to poor insertion or handling.
5. The tamper count shows how many times the acceptor saw a condition that appeared to be attempted tampering with the note acceptor.
6. The Acceptor jam count shows how many times the acceptor detected a note jam.
7. The Time since record started shows how long it has been since that cassette was either:
 - A. Cleared by docking station or computer
 - B. Installed into a chassis with a different serial number

7

Recommended Spare Parts And Diagrams

Introduction

This section provides service, repair, and recommended spare parts information. The parts diagrams listed in Table 7-1 may be ordered from the Money Controls Service Department. The Money Controls address, phone, and fax numbers are provided in the front of this manual.

Service and Replacement Parts Manual

The comprehensive Service And Replacement Parts Manual covers all models of WACS and WA/CS systems. The manual is a supplement to this Service and Adjustment Manual. Refer to it when ordering service and replacement parts. The diagrams and parts lists of the manual cover:

- WACS Acceptor Parts
- WACS Stacker Parts
- WACS Chassis Parts

To order this manual, contact the Money Controls Service Department.

Spare Parts Recommendation

A list of recommended spare parts is provided in Table 7-1. This list includes only the spares for the System listed. To obtain quantity recommendations and current pricing, contact the Money Controls Service Department.

Board Locations

The printed circuit boards, which control the system, are located in the acceptor. The board locations are illustrated in Figure 7-1.

Bottom Sensor Board

The bottom sensor board is located in the inside of the note acceptor, immediately beneath and parallel to the note path.

Top Sensor Board

The top sensor board is located within the lid of the acceptor. The top cover must be removed to gain access to this board.

Motor Driver Board

The motor driver board is located inside the note acceptor, on the right side of the acceptor (the side containing the motors and drive gears).

Microprocessor Board

The microprocessor board is located inside the note acceptor, on the left side of the acceptor.

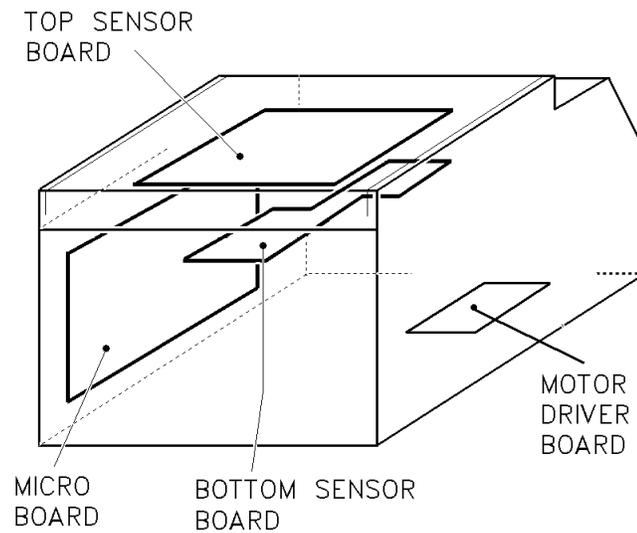


Figure 7-1 Circuit board Locations

Part Description	Part/Drawing Number
System (International)	77x200
Non-Smart Chassis	2x7096
Non-Smart Chassis Harness	2x7095
Stacker (Metal)	48x828
Stacker (Plastic)	48x862
Acceptor (International)	88x3333
Acceptor Internal Harness	2x7094
Micro PCB (EPROM / FLASH Inside)	2x7057-1
Micro PCB (EPROM / FLASH Outside)	2x7056-1
Top Sensor PCB (International)	2x6552
Top TNT (International)	2x2587-30
Top TNT (United States)	2x2587-32
Bottom Sensor PCB (International)	2x6553
Bottom TNT (International)	2x2587-31
Bottom TNT (United States)	2x2587-33
Motor Driver PCB Assembly	2x6794
Stacker Punch Coupler Gear	18x116
Stacker Home Sensor (PS5042)	56x544
Stacker Home L.E.D. P.C. BD.	2x6232
Stacker Drive Assembly	2x6793
Stacker Assembly Motor Encoder	2x6582
Stacker Motor	2x6375
Transport Drive Assembly	2x6792
Transport Assembly Motor Encoder	2x6791
Transport Motor	2x6776
LED	56x146
LED - Red - Super Bright	68x5
Belt	29x172

Table 7-1 Spare Parts List

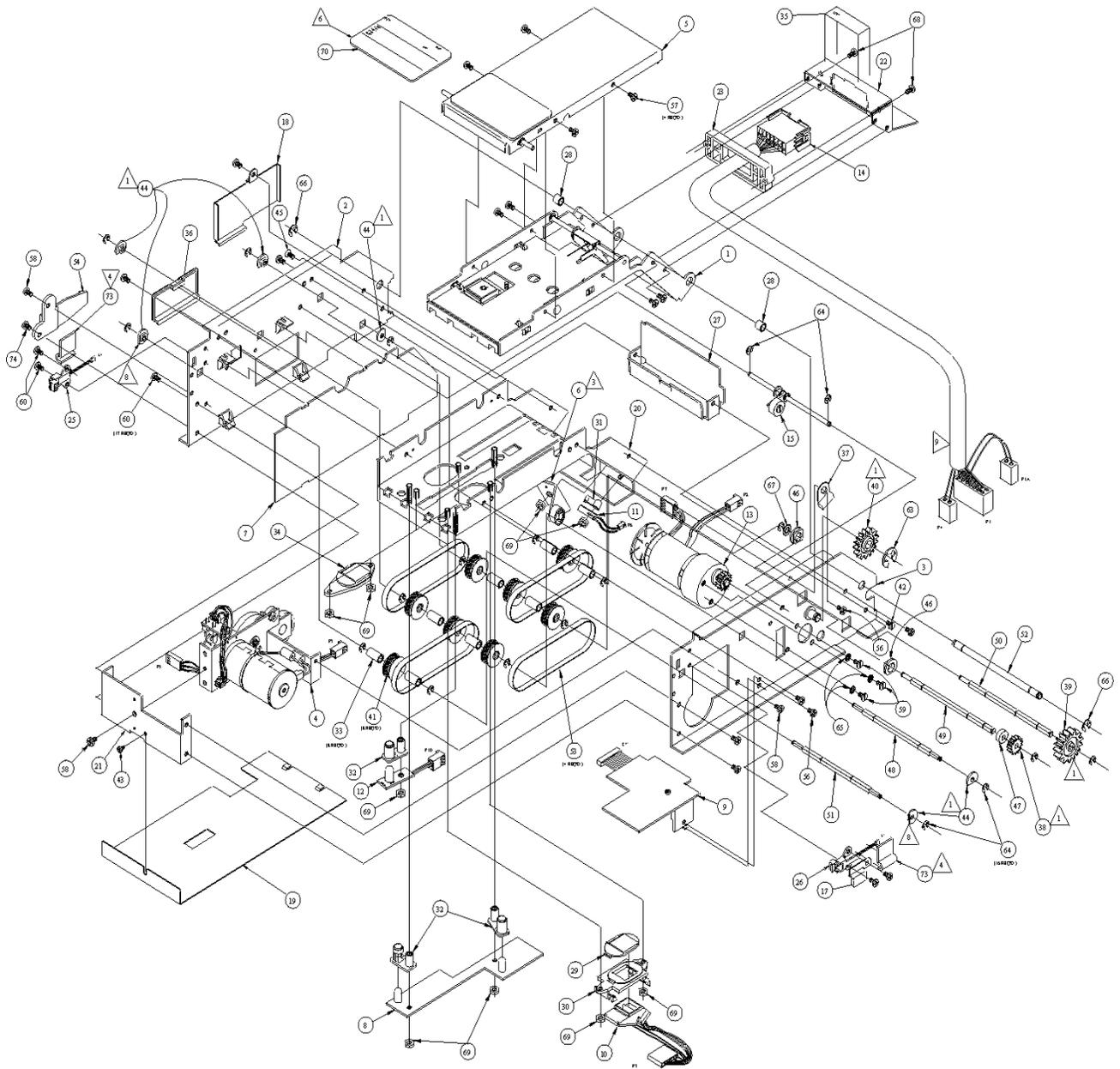


Figure 7-2
Exploded view

MONEY CONTROLS INCORPORATED
88X3333, 34, 39, 44 SERIES PARTS LIST

<u>ITEM</u>	<u>PART#</u>	<u>DESCRIPTION</u>
# 1	02X6807	TOP SENSOR PLATE
	02X2587-0030	TOP TNT HEAD (NON U.S. UNITS)
	02X2587-0032	TOP TNT HEAD (U.S. UNITS)
	02X6282	NOTE PRESENT DETECTOR
	02X6385	IDLER WHEEL
	02X6552-0002	TOP SENSOR P.C. BOARD
	02X6554	FRONT IDLER WHEEL
	11X2144	REAR CLEAR
	20X0808	REAR CLEAR ACTUATOR SHAFT
	33X0260	REAR CLEAR SPRING
	56X0546	PHOTOTRANSISTOR
68X0002	PHOTODIODE	
# 2	02X7040	SIDE PLATE L.H.
# 3	02X6587	SIDE PLATE R.H.
# 4	02X6793	STACKER DRIVE BRACKET
	02X6381	PUNCH GEAR LEVER
	02X6582	CHOPPER SENSOR
	02X6953	STACKER MOTOR
	11X2235	STACKER DRIVE BRACKET
	16X0045	O-RING
	17X0684-0001	CHOPPER DISC
	18X0113	COMBINATION GEAR
	18X0116	PUNCH COUPLER GEAR
20X0804	GEAR PIVOT STUD	
# 5	02X6382	TOP COVER
	11X2131	COVER
	20X0805	FRONT LATCH ROD
	33X0259	LATCH SPRING
# 6	02X6392	BELT TENSION ANGLE
	11X2130	WHEEL MOUNTING BRACKET
	17X0990	ROLLER BACK-UP
	20X0796	WHEEL STUD
# 7	02X7056-1	MICRO BOARD
# 8	02X6553	BOTTOM SENSOR P.C. BOARD
# 9	02X6637	MOTOR DRIVER P.C. BOARD
# 10	02X2587-0031	TNT HEAD BOTTOM (NON U.S. UNITS)

# 11	02X2587-0033 02X6514 02X6513 56X0146	NT HEAD BOTTOM (U.S. UNITS) REAR NOTE PRESENT LED HARNESS LED
# 12	02X6592 02X6423 68X0005	FRONT LED BOARD HARNESS RED LED
# 13	02X6792 02X6776 02X6791 11X2225 17X1566 18X0114	DRIVE MOTOR & TACH TRANSPORT MOTOR TACH CHOPPER MOUNTING BRACKET CHOPPER DISC 7 INTERRUPT MOTOR OUTPUT GEAR
# 14	02X7094	INTERNAL HARNESS
# 15	02X6478 09X1216 17X1388	MAG PRESSURE LEVER & WHEEL PRESSURE LEVER L.H. MAG PRESSURE WHEEL
# 17	12X991	STING SENSOR COVER
# 18	17X1415	RIBBON CABLE COVER
# 19	11X2318	BOTTOM COVER
# 20	02X6811	BOTTOM SENSOR PLATE W/SIDE CUTOUTS
# 21	11X2134	FRONT BRACET
# 22	11X2126	REAR COVER
# 23	17X1611	CONNECTOR BRACKET
# 25	02X6585	STRINGING SENSOR MOUNT L.H.
# 26	02X6586	STRINGING SENSOR MOUNT R.H.
# 26	02X7067	RIGHT STRING SENSOR ASSEMBLY
# 27	2X6539	REAR TOP SENSOR PLATE
# 28	17X1359	SPACER
# 29	17X1349	WINDOW
# 30	17X1351	TNT SNAP MOUNT

# 31	17X0874	EMITTER/SENSOR PCB MOUNT
# 32	17X1340	LED COVER
# 33	17X1346	PULLEY SPACER
# 34	17X1350	GRAY SCALE
# 35	80X1135	LABEL 12 TO 24VDC
# 36	17X1792	EPROM COVER
# 37	17X1858	CABLE CLAMP
# 38	18X0111	DRIVE GEAR
# 39	18X0115	DRIVE GEAR
# 40	18X0112	INTERMEDIATE IDLER GEAR
# 41	18X0117	PULLEY
# 42	30X244-3	#4-40X.19 W.W.H.S.T.S
# 43	30X341	#4-40 .197 P.H.ES-FORM PHILLIPS
# 44	19X005	BEARING
# 45	30X52	#4-4- X.19 F.H.M.S.
# 46	19X6	BEARING
# 47	20X0811	DRIVE SHAFT BUSHING
# 48	20X0802	DRIVE SHAFT
# 49	20X0800	DRIVE SHAFT
#50	20X779	REAR DRIVE SHAFT
#51	20X801	FRONT DRIVE SHAFT
# 52	20X0807	PIVOT ROD
# 53	29X0172	BELT
# 54	17X1411	ACCEPTOR LATCH
#56	30X382	#4-40 X .25 P.H.M.S PHILLIPS W EXT SEMS
#57	30X95	#4-40 X .120 P.H.M.S

#58	30X276	#6-32 X .19 P.H.M.S INT SEMS PHILLIPS
#59	30X363	M3 6MM LG. P.H.MS. PHILLIPS
#60	30X370	#4-40 X .19 P.H.M.S. W/SEMS PHILLIPS
#61	37X28	FISH PAPER INSULATOR, RIBBON CABLE
#62	85X8	LUBRIPLATE
#63	31X9	WALDES RING (.25 SHAFT)
#64	31X18	WALDES RING (.125 SHAFT)
#65	31X52	BELLVILLE SPRING WASHER
#66	31X36	WALDES RING (.187 SHAFT)
#67	31X96	TEFLON WASHER .187 I.D.
#68	30X195	#6-32 X .44 P.H.S.T. PHILLIPS H.L.
#69	#4-40	SMALL PATTERN HEX NUT
#70	80X36-11	PART AND SERIAL NUMBER LABEL
#73	17X1311-2	WIRE CLIP
#74	30X366	#4-40 X .25 P.H.M.S. PHILLIPS
#75	17X167	CABLE TIE

8

GATHERING NOTE DATA USING THE WACS4 SYSTEM

NOTE

This procedure, and the data extracted using this procedure, is confidential.

Introduction

When gathering note data, the instructions in this addendum supersede those in Chapter 4, System Diagnostics, and Chapter 7, CAPS Interface.

Equipment and Software Required For Data Grabber Operations.

This procedure describes how to gather note data and requires the following items:

1. IBM-compatible personal computer (PC), 80386 or better, running at least 16MHz.
2. This PC must have one available serial (COM) port capable of running at 19,200 baud.
3. Serial communications software, which can log incoming serial data directly to a file. The commercial software Windows Hyper Terminal™ provided with Windows is recommended, but any communications or terminal software, which can log data to disk, may be used.
4. A Money Controls WACS4 Note Acceptor with standard chassis, as illustrated in Figure A-1. The WACS4 includes the note acceptor, stacker and chassis with harness.
5. Currency from the country to be programmed..
6. Optional: To connect the 25-pin, male D-shell connector of the chassis to the PC serial port a combination of the following may be required:
 - RS232 extension cable
 - Female-to-female adapter plug or cable (gender changer)
 - 25-to-9-pin adapter plug or cable

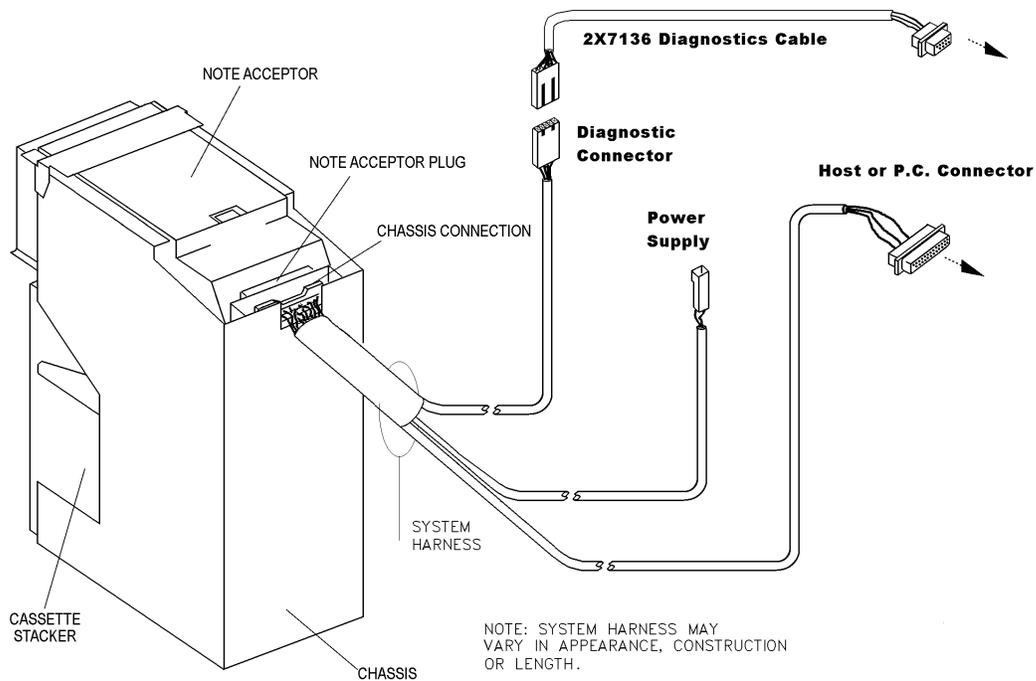


Figure 8-1

Setting Up the System

1. Turn off power to the WACS4 System.
2. Refer to Figure 8-1, and connect the 5-pin connector of the WACS4 harness to the 2x7136 diagnostic connector and the other end of the 2x7136 cable to the computer serial port.

How To Gather Data

1. If not already done, perform setup procedures described above.
2. Apply power to the PC. Use a terminal emulation program such as Windows Hyper Terminal™ set to the communications parameters of:

19,200 baud
Odd parity
8 Data bits
1 stop bit
3. Apply power to the WACS4 System. Wait for the system to completely cycle the stacker. It should cycle within 5 to 12 seconds of power up.
4. Type <ESC><ESC> <ESC> <ENTER> to enter diagnostics mode.
5. Type <D> until DATA DUMP(XX): AFTER MATH displays on the PC monitor.
6. Type <S> until DATA DUMP(44): AFTER MATH displays on the PC monitor.
7. Using the terminal emulation program on the PC, open a log file.
8. The log file can have no more than 8 characters, with no more than 3 characters in the extension. The 8 characters should contain information on the denomination, direction, and any other pertinent information regarding the note such as an alternate printing or justification of the data grab. The 3 characters can contain information regarding the acceptor used, such as unit number one of three used, or the last three digits of the unit serial number.
9. Run notes through the acceptor. As each note passes through the acceptor, note data is collected in the log file on the PC.
 - Notes must be run with their proper note guide for the note width. Run notes center, left, and right justified within that note guide track.
 - Notes should be run in all 4 directions of insertion with a separate log file for each direction and for each denomination.

For example: A set of 100 sample \$5 notes will create four data files, one for each direction. Running an additional set of 100 sample \$10 notes will generate four additional files. These two runs will generate a total of eight data files.

Notes inserted in the Face-Up direction with the top of the note to the right will be called "Up-Right". If the note inserted is a \$5 bill, justified to the left of the note guide, face-up, top-right, the file should be named 5UR.LFT where 5 is the denomination, UR is for UP-RIGHT and .LFT is for left justified.

10. For further information or assistance in gathering note data, contact:

Money Controls at (001) 440-946-3000.

9

Cassette Docking Station System

TABLE OF CONTENTS

Introduction	9-1
Cassette Docking Station System Components	9-1
Docking Station Software	9-2
Installation Software	9-2
Operating Software	9-2
Replacement of Microprocessor EPROM	9-3
Installation Connections	9-4
RS485 Interface Cable and Connections	9-4
Chain of Stations and Chain Terminator	9-4
Station Address DIP Switch Settings	9-4
Installation of Docking Station Host Software	9-4
Initial Set-Up: The Chassis Number to Game ID Map	9-5
Chassis Number to Game ID Mapping Procedure	9-6
Revising The Chassis to Game ID Map	9-7
Docking Station System Host Computer- Normal Operation	9-7
Docking Station(s) - Normal Operation	9-8
Micro Soft Excel Macro	9-9

Introduction

The Cassette Docking Station System is part of the overall Money Controls IBA4 Smart Cassette System. The Docking Stations download data from the Smart Cassette memories and transfer that data into the Docking Station System's Host Computer. Software in this computer puts the data into a database format that can be used by data analysis programs.

Cassette Docking Station System Components

The following components are illustrated in Figure B-1.

- Smart Cassette Stacker with Built-In Memory
- Cassette Docking Station
- Docking Station Power Supply Transformer
- RS485 Compatible Host Interface Cable with Integral Current Loop Interface Board (2x6844)
- RS485 Multi-Drop Compatible Connecting Cables (between docking stations)

- *MSDOS Compatible Personal Computer as the Docking Station Host Computer.

The Docking Station Host Computer, its maintenance, security and backup are the responsibility of the end user. For proper operation of the docking stations, the host computer must have the following minimum parameters:

- 486 or Higher Processor
- 8Mg or More Ram
- Serial Port Compatible with 9600 bps or greater
- VGA or Higher Monitor and Graphics Board
- One 3.5 (1.44Mb) floppy drive
- Windows 95 or Higher Operating System
- Microsoft Excel, Version 5.0 or Higher

Docking Station Software

Money Controls provides two software packages for running the Cassette Docking Station System: Installation Software and Operating Software.

Installation Software

This software is used only when the system is first installed.

Cassette Mapping Host Software

59x108 (C:\Ardac\MAP\MAP.EXE)
This is an installation program that operates the system during initial set-up and mapping.

Microsoft Excel Mapping Macro 59x109 (C:\Ardac\MAP\MAP.XLS)
This is an Excel macro created by Money Controls to automatically map the Money Controls assigned Chassis Numbers to the customer assigned game numbers (or names).

Operating Software

Cassette Docking Host Software 59x106 (C:\Ardac\HOST.EXE)
This is a proprietary software program created by Money Controls to operate the Docking Stations and build the Docking Station Database.

Microsoft Excel Report Macro. 59x107 (C:\ARDAC\ARDAC.XLS)
This is an Excel Macro created by Money Controls to automatically manipulate and monitor data in the Docking Station Database.

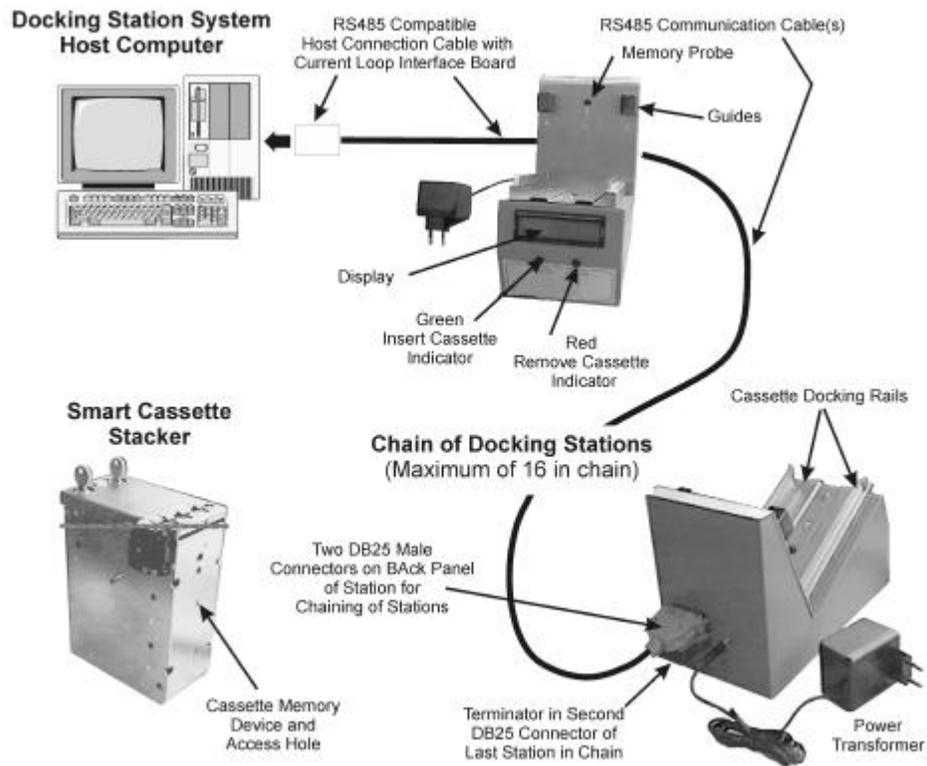


Figure B-1 Docking Station Connections

Replacement of Microprocessor EPROM

The Money Controls EPROM (57x752) installed in the Docking Station's Microprocessor board before shipment from the factory, has the latest version of the system firmware installed. If Money Controls upgrades the firmware, it may be necessary to replace the EPROM. When replacing the EPROM, observe the following precautions:

- Make sure all power is disconnected from the Docking Station..
- Access the Microprocessor Board by removing the Guide Rails.
 1. Refer to Figure B-2. DO NOT remove the slotted screw.
 2. Remove the three hex head screws that attach the guide rails to the station base.
 3. Carefully lift the Guide Rails from the station base. Do not damage the ground wire attached to the Guide Rails.
- Use appropriate tools for removal and replacement of the EPROM.
- Position the new EPROM in the socket as shown in Figure B-3. Make sure the notch matches the silk screen on the board.
- Being careful to prevent bending of- and damage to- the EPROM pins, press the EPROM into its socket until it seats firmly.
- Re-install the Guide Rails onto the station base.

Docking Station Address Settings

	0	1	2	3 *	4	5	6	7	8	9	10	11	12	13	15	15
Sw1	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
Sw2	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
Sw3	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
Sw4	ON	ON	ON	ON	ON	ON	ON	ON	OFF							

For a single station system, set docking station address to 3

Installation Connections

Hardware installation includes connecting all of the Docking Stations together with RS485 cables and connecting the System Host Computer to the chain of Docking Stations. Also plugging the computer power cable and each of the Docking Station transformers into a power source.

RS485 Interface Cables and Connections

Figure B-1 illustrates the RS485 cables connecting the Cassette Docking Stations and the Host computer. The Host Interface Cable (2x6844) which connects the Host Computer to the first Docking Station, includes an RS485 Current Loop Interface Board. This board has been completely prepared at the factory and needs no additional setup or adjustment. As illustrated, each station has two DB25 connectors to facilitate linking a chain of up to 16 Docking Stations to the Host.

Chain of Stations and Chain Terminator

All docking stations are identical. The external features of each are illustrated in Figure B-1. Note that each station has two DB25 connectors. These enable connection of the docking station to the computer, and enable chaining of up to 16 stations on one computer. Dipswitch settings on the station's microprocessor board establish a unique address for each station. The last station in the chain must have a terminator installed in one of the DBA25 connectors.

The simplest Docking Station System consists of the Host Computer connected to one Docking Station. The Host Interface Cable connects the computer to the station input terminal and a terminator connects to the other station terminal.

Station Address DIP Switch Settings

Each docking station has a unique address assigned and set at the factory during manufacture. If it is necessary to reset or verify an address, refer to Figure B-3 and Table A-1. The Figure B-3 shows the location of the DIP Switch Bank on the Microprocessor Board and indicates the ON and OFF switch positions. Table 1 shows the DIP Switch combinations to set each of the sixteen addresses.

Installation of Docking Station Host Software

Prior to operation of the Docking Station System, the Microsoft Excel program and the Money Controls Docking Station System Software must be installed on the System Host Computer.

The Money Controls Docking Station Host Software Distribution Diskette contains the following files:

MAP.EXE
MAP.XLS
HOST.EXE
ARDAC.XLS

Copy all files from the distribution diskette to the Docking Station Host Computer's sub directory:
C:\ardac.

Initial Set-Up: The Chassis Number to Game ID Map (C:\ardac\MAP\SMCAS.MAP)

The Mapping Procedure is performed only during initial installation of the Docking Station System. It creates a Chassis Number to Game ID Map in directory/file path C:\ardac\MAP\SMCAS.MAP. This map file is used by the HOST.EXE program to place both the Chassis Number and the associated Game ID into the database when downloading data from Smart Cassettes. Refer to Figure B-4:

- A. When the Money Controls chassis is manufactured, it is given a unique Smart Chassis ID Number. The chassis is then installed permanently in a specific game. When the cassette and acceptor modules are installed in the smart chassis, the acceptor reads the chassis number and downloads it to the cassette memory.
- B. The cassette memory contains the chassis number and the game activity data.
- C. When the cassette is placed in the Docking Station, the station uploads the chassis number and game data to the host computer. The host software program accesses the map file (SMCAS.MAP) and attaches the game ID to the data. In addition this game ID is sent to the Docking Station display for operator information.
- D. The host program can then place both the game ID and chassis number into the data base along with the game activity data.

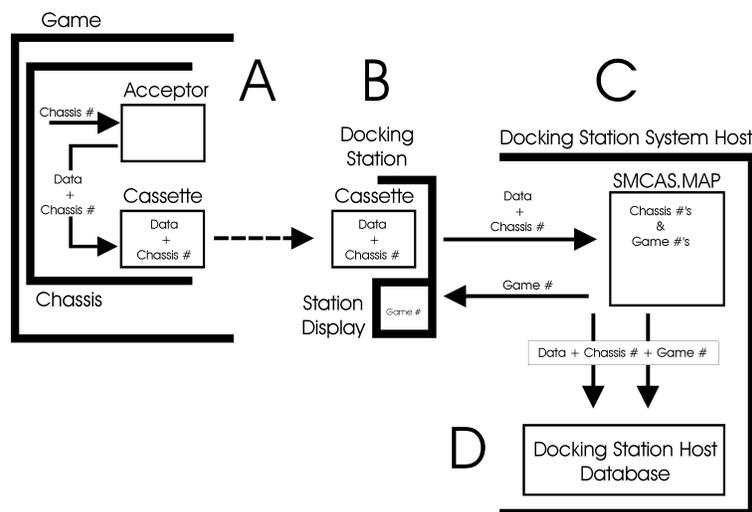


Figure B-2 Docking Station Connection Scheme

Chassis Number to Game ID Mapping Procedure

The following procedure covers the simplest Docking Station System: one Host Computer connected to one Docking Station. The mapping procedure can also be performed with a multiple docking station system.

NOTE

For the Docking Station System to create a useful database, this procedure **MUST** be performed before operating the games.

1. Prepare the Smart Cassette Stackers for the mapping procedure.
 - a. Prepare the Game ID labels to be attached to all Smart Chassis equipped games.

NOTE

The acceptors must be installed in the chassis. When energized, the acceptor reads the chassis number and downloads it to the cassette memory.

- b. Power-up each game and install a Smart Cassette Stacker in each of the Smart Chassis. The acceptors read the Smart Chassis Serial Number and download it to each Smart Cassette Stacker memory.
 - c. Place the appropriate game number label on each smart cassette.
 - d. Remove all cassette stackers and take them to the Docking Station room.
2. Start the mapping program MAP.EXE on the Docking Station System Host Computer.
 3. While the host system is running the MAP.EXE program, insert a cassette into the docking station.
 4. When the system requests a Game ID, enter the Game ID as written on the label attached to the Cassette.
 - Do not enter blank spaces. If necessary, use the dash or underline character to indicate blank spaces.
 - After entering the Game ID, press the Enter key. The monitor displays a message specifying the cassette and game numbers entered into the map file.
 - Check that the numbers entered into the map file are correctly matched and typed. If a mistake or typo has been entered into the file, it can be corrected later.
 - Make a note of the correction(s) and make all changes to the map file (SMCAS.MAP) after completing Mapping Procedure.
 5. After entering the game number wait for the red indicator to light. Check the station display window and verify that the game number in the window matches that on the label and in the monitor message.
 6. Remove the cassette stacker from the docking station and remove the label from the cassette.
 7. Repeat this procedure for each Cassette Stacker brought to the Docking Station room.
 8. When all the Chassis Numbers have been mapped to their associated Game ID in the SMCAS.BLD file (directory C:\ardac\MAP\), exit the MAP.EXE program.
 9. Run the Excel macro MAP.XLS to create the SMCAS.MAP file in directory C:\Ardac\MAP\.
 10. After creating this file back it up on a floppy or other secure medium.

Revising The Chassis to Game ID Map (SMCAS.MAP)

Corrections and revisions to the Chassis To Game Number Map can be made without repeating the Setup Procedure. The map file, SMCAS.MAP, is an ASCII text file that can be revised with any ASCII text editor. The directory path to the file is:

C:\ardac\MAP\SMCAS.MAP

After making all changes and corrections to this file, back it up on a floppy or other secure medium.

Docking Station System Host Computer- Normal Operation (HOST.EXE)

If the Docking Station System has been shutdown, apply power to all of the Docking station and the Host Computer. Start the Host Computer and start the Host.exe program. Most of the functions performed by the Money Controls Docking Station System Host Software are transparent to the user during Normal Operation.

1. At the beginning of each year, the program creates a directory for that year.
For Example: C:\Ardac\1997
2. At the beginning of each day, the program creates a sub directory for that day under the current year directory.

For Example, the year/date created on September 25, 1997 is: C:\Ardac\1997\0925

3. The Docking System Host computer continuously polls the attached docking stations for data. When the station operator inserts a cassette into a docking station, the system begins an upload cycle.
4. Each time a docking station uploads smart cassette information to the host computer, the host software creates a new data file under the current year/date directory.

For Example, the fifth cassette upload creates: C:\Ardac\1997\0925\5

5. Once this file is created, the host program places the uploaded game and cassette information into the file, adding it to the database.

The operator of Docking System Host Computer monitors system operations through various messages sent to the computer display during normal operation.

The Docking Station operator sees none of this activity during normal operation. The operator sees and responds only to the indicators and displays of the individual docking stations. Refer to Docking Station(s) - Normal Operation

Docking Station(s) - Normal Operation

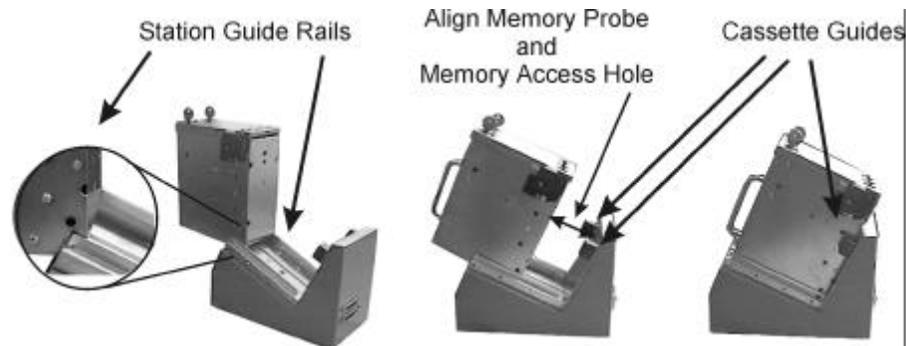


Figure B-3 Docking the Cassette

Operation of the Docking Station is fully automatic except for insertion and removal of Stacker Cassettes. The Red and Green lights on the Station Control Panels prompt the station operators to insert (green) and remove (red) the cassettes as the system software requires.

1. When the Green Indicator lights, place the Cassette on the guide rails as shown in Figure B-3. Slide it into the upload position shown. For proper upload to start, the cassette must:
 - Fit firmly between the guide rails.
 - Fit firmly between the guides.
 - Rest firmly against the station seat so the memory disk inside the cassette contacts the memory probe of the docking station.
2. When the Cassette is in the docking station, the Host computer automatically uploads the game information from cassette storage into the host computer data files.
3. The Red Indicator lights when the data transfer is complete. The Game ID is shown on the Station panel display.
4. Read and record the displayed Game ID. Then remove the Cassette from the station, count the money and/or perform any other locally required procedures.

Micro Soft Excel Macro

Once the Money Controls Docking Station System Host Software has placed data into the Docking System database, it can be accessed and analyzed by many means. Money Controls has created a Microsoft Excel spreadsheet macro to access and analyze the stored data.

Selecting the C:\Ardac\Ardac.XLS file from the Windows95 Start Menu activates the Excel program and the Ardac macro.

1. When the macro starts, the operator is prompted for the year and date to be analyzed. To analyze the data collected on September 23, 1997, for example, the operator responds to the prompts:

Input Directory Year: 1997
Input Directory Day: 0923

2. The macro reads all of the files in the C:\Ardac\1997\0923 directory into the Excel spreadsheet. Then it generates three reports for the day specified. These reports are displayed on the monitor and automatically saved to C:\Ardac\REPORTS\0923.XLS
 - a. The Report Worksheet provides analysis of the Drop for the day
 - b. The Diagnostic Worksheet provides analysis of diagnostic data (number of rejects, jams, etc.)
 - c. The Raw Data Worksheet provides the complete set of raw data in hex format (used for software analysis)