NCR RealPOS 70 (7402)

Release 1.0

User's Guide

NCR

B005-0000-1463
Issue A

Preface

Audience

This book is written for hardware installer/service personnel, system integrators, and field engineers.

Notice: This document is NCR proprietary information and is not to be disclosed or reproduced without consent.

Safety Warnings

Servicing
This product does not contain user serviceable parts. Servicing should only be performed by a qualified service technician.

Fuse Replacement
Caution: For continued protection against risk of fire, replace only with the same type and ratings of fuse.

Attention: Pour prévenir et vous protéger contre un risque de feu, remplacer la fusible avec une autre fusible de même type, seulement.

Power Supply Cord Used as Disconnect Means
Caution: The power supply cord is used as the main disconnect device. Ensure that the socket outlet is located/installed near the equipment and is easily accessible.

Attention: Le cordon d'alimentation est utilisé comme interrupteur général. La prise de courant doit être située ou installée à proximité du matériel et être facile d'accés.

Lithium Battery Warning
Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Attention: Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type recommandé par le constructeur. Mettre au rébut les batteries usagées conformément aux instructions du fabricant.

Battery Disposal (Switzerland)
Refer to Annex 4.10 of SR814.013 for battery disposal.

IT Power System
This product is suitable for connection to an IT power system with a phase-to-phase voltage not exceeding 240 V.

Peripheral Usage
This terminal should only be used with peripheral devices that are certified by the appropriate safety agency for the country of installation (UL, CSA, TUV, VDE) or those which are recommended by NCR Corporation.

Caution: DO NOT connect or disconnect a printer, keyboard, or any other non-USB terminal-powered peripheral while the terminal is powered on. Doing so may result in peripheral or system damage.

Environmental Consciousness
NCR is demonstrating its concern for the environment by designing an intelligent power management system into this terminal that operates efficiently whether the system is in a stand-alone or network environment.

Grounding Instructions

In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This product is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances. Do not modify the plug provided – if it will not fit the outlet, have the proper outlet installed by a qualified electrician. Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal. Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the product is properly grounded.

Use only 3-wire extension cords that have 3-prong grounding plugs and 3-pole receptacles that accept the product's plug. **Repair or replace damaged or worn cords immediately.**

References

- *NCR RealPOS 70 Hardware Service Guide*
  (B005-0000-1465)

- *NCR RealPOS 70 Site Preparation Guide*
   (B005-0000-1464)

- *NCR RealPOS 70/EasyPoint 42 Parts Identification Manual*
  (B005-0000-1466)

- *NCR FitClient Software User's Guide* (B005-0000-1235)

- *NCR RealPOS 70/EasyPoint 42 Migration Guide* (B005-0000-1500)

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Revision Record

Issue	Date	Remarks
A	Nov 2003	First Issue

Radio Frequency Interference Statements
Federal Communications Commission (FCC)

Information to User

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

NCR is not responsible for any radio or television interference caused by unauthorized modification of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by NCR. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user. The user is cautioned that changes or modifications not expressly approved by NCR may void the user's authority to operate the equipment.

Canadian Department of Communications

This Class A digital apparatus complies with Canadian ICES-003.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectriques édicté par le ministrère des Communications du Canada.

Voluntary Control Council for Interference (VCCI)

　この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Declaration of Conformity

Manufacturer's Name	NCR Corporation
Manufacturer's Address	NCR Corporation Retail Solutions Division – Atlanta 2651 Satellite Boulevard Duluth, GA 30096-5810
Type of Equipment	Information Technology Equipment
Model Number	Class 7402
Electrical Ratings (Input)	100-240 V ac, 6.0 A, 50-60 Hz

NCR Corporation, 1700 South Patterson Boulevard, Dayton, OH 45459, USA, declares that the equipment specified above conforms to the referenced EU Directives and Harmonized Standards.

EU Directive	Harmonized Standard(s)
89/336/EEC (EMC)	EN 55022 EN 55024 EN 61000-3-2 EN 61000-3-3 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11
73/23/EEC (Low Voltage)	EN 60950

NCR Corporation
Retail Solutions Division — Atlanta
2651 Satellite Boulevard
Duluth, GA 30096-5810

Chapter 1: Product Overview

Introduction

NCR's RealPOS 70 (also referred to as NCR 7402) is a scalable, retail-hardened Point-of-Sale Solution with an intuitive touch screen interface designed for extended life cycles, stability, and superior availability. Engineered to thrive in the most demanding environments, the RealPOS 70 offers leading retailers in Hospitality, Convenience Stores and General Merchandise a POS platform that offers the greatest value for their POS investment.

Unlike other POS solutions, the RealPOS 70 sets a new standard by offering an unprecedented combination of standard features including new embedded technology, tool-free serviceability, and maximum configuration flexibility.

Magnetic Stripe Reader

Power Switch

20950
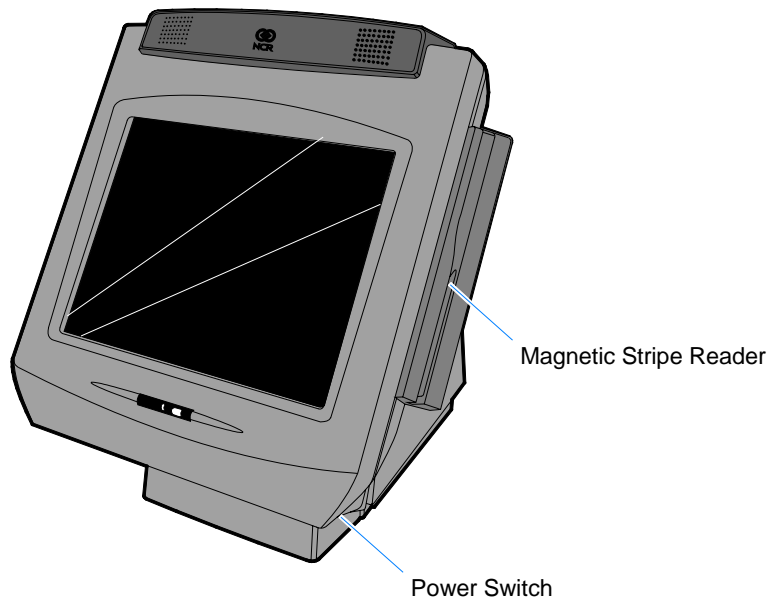
Hinged LCD

The RealPOS 70 utilizes a top-hinged LCD which allows extremely quick and easy motherboard access. The LCD can be completely removed if necessary for upgrades or repair. Functioning much like the hood of a car to gain access to the *engine*, the LCD has a security mechanism allowing it to be locked into place if desired.

20932
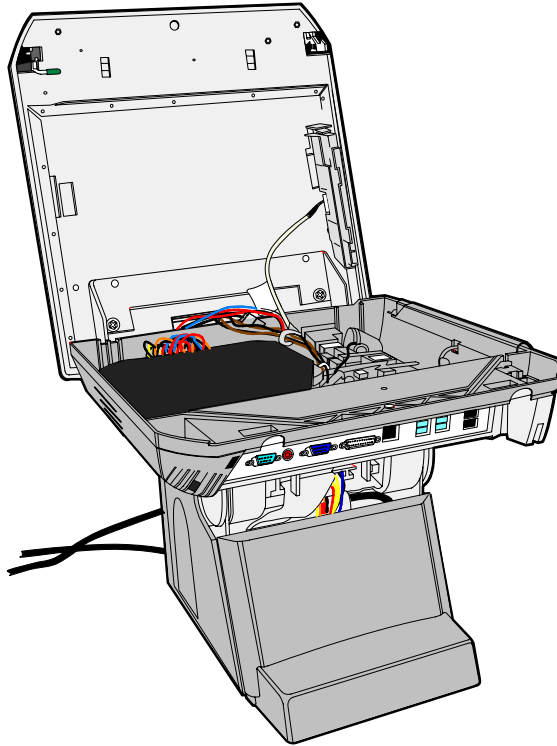
Hardware Options

- Integrated 3-Track ISO MSR
- Integrated Stereo Module
- Integrated Infrared Sensor
- PCMCIA (for wireless LAN)
- 128 MB, 256 MB, 512 MB non-ECC Memory DIMMs
- 256 MB Compact Flash
- Cash drawers
  - 2183 Mid-Size Cash Drawer (modular)
  - 2189 Full-Size Cash Drawer (modular)
  - Dual cash drawer cable
- MSR
  - ISO
  - JIS
- Keyboard
  - USB Alphanumeric Big Ticket Keyboard
  - PS/2 Alphanumeric Big Ticket Keyboard
- Customer Displays
  - Integrated 2 x 20 VFD
  - International APA (All Points Addressable)
- Printers
  - 7167 Thermal Receipt/Impact Printer
  - 7197 Thermal Receipt Printer
- Integrated PCMCIA Slot Adapter Board (Two Type 2 Slots): PCI I/F

- PCMCIA Wireless Adapter Supporting 802.11 Standard
- 12-Inch LVDS TFT Display – Dual Bulb Enhanced Brightness
- 3M Touch Systems Resistive or Capacitive Touch Sensor
- Low-Profile ATX Power Supply – 300 Watts

Operating Systems

- DOS 6.22 (7402-3xxx)
- Windows NT Workstation
- Windows 2000 Professional
- Windows XPe
- Windows XP (certified)
- Linux (certified)

Removable Motherboard Sled

Complementing the hinged LCD is a motherboard tray mounting mechanism which allows the component to be easily removed without the use of tools.

Removable Power Supply

The 7402 utilizes an intuitive removable rear cover allowing easy access to the power supply. The Power Supply is mounted on a sled which permits removal or tool free service.

Removable Hard Disk

Removal of the back cover permits easy removal of the front cover, which permits tool-free removal of the hard disk.

Label Locations

The serial number and model number are included on three labels, which can be viewed by tilting the display and removing the cable cover. If the terminal was shipped with an Operating System pre-installed then there is also a Certificate of Authenticity label.

Class:7402-1000

S/N:36309845   Date:21 November 2003

NCR Corp Class:7402-1000   Unit Serial:36309845

NCR Corporation   Atlanta, GA 30096   Made in Singapore 新加坡制迄

Class 7402 機型

Model No 型号   : 7402

Serial No 序号   : 36-309845

Date of Mfg 制造日期 21 NOV 2003

National NATIONAL

100-120 V~ac, 50-60 Hz 6A 300W

200-240 V~ac, 50-60 Hz 3A 300W

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada Patents Pending

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

NO. 437 NCR

ME:01 ACN 000 003 592

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Model Numbers

The following table identifies 7401 terminal models.

Major Model	CPU
7402-1000	Intel 2.0 GHz Celeron, Resistive Touch, 128MB Memory, 40GB Hard Disk, 3 RS-232, 3 Powered USB, 2 Standard USB, Audio/Mic. and US Power Cord, No MSR, No Customer Display, Integrated Stereo Speakers
7402-1010	Intel 2.0 GHz Celeron, Capacitive Touch, 256MB Memory, 40GB Hard Disk, 3 RS-232, 3 Powered USB, 2 Standard USB, Audio/Mic. and US Power Cord, MSR, No Customer Display, Integrated Stereo Speakers

Hardware Modules

Pentium 4 Embedded ATX Motherboard

- Celeron 2.0 GHz with 400 MHz Front Side bus
- Intel Montara-GML (852GM) North Bridge with integrated LVDS and multi-monitor capability
- Inverter & LCD power support
- LCD Adapter Board
- DVI or VGA Interfaces for Secondary Displays
- DDR-SDRAM; 266MHz in desktop DIMM, 2 sockets (1GB Max)
- Intel ICH4 Desktop South Bridge
- USB 2.0, supports 6 ports, including 2 USB+Power (12V), 2 internal USB
- ATA-100 Primary & Secondary IDE Ports
- Intel Integrated 10/100 Ethernet
- Three Serial Ports, all with 12V Power Option
- Support for Internal Wedge Peripherals (MSR)
- PCI Connector Supporting a Riser Card
- CPU and Power Supply Fan Speed Detection
- Integrated Audio with Amplified Speaker Output and Mic Input, Internal PC Speaker
- IRDA Interface
- Daughter Card GPIO Interface for Cash Drawer and Retail Function Support
- AMI BIOS with NCR Retail Customizations and ACPI support

Retail Daughter Card

- Cash Drawer Port (supports two drawers via a Y-cable)
- Touch Controller (3M EXII) for Resistive & Capacitive Touch Sensors
- NCR 2nd Generation Trigantor MSR Controller with Wedge I/F
- 24 V Powered USB Port
- Motion Sensor I/F

Other Hardware Features

- Integrated PCMCIA slot adapter board (Two type 2 slots): interfaces via PCI
- PCMCIA wireless adapter supporting 802.11 standard
- 12 inch LVDS TFT display – dual bulb enhanced brightness
- 3M Touch Systems resistive or capacitive touch sensor
- Internal Compact Flash adapter

Hardware Module Descriptions

Motherboard

Processor/Chip Set

The terminal uses an Intel architecture processor, which permits it to leverage existing software drivers and applications, as well as provide the greatest flexibility in choosing an operating system. This provides several other advantages:

- Capable of SW MPEG-1 or MPEG-2 playback at 30 frames per second with 22 kHz stereo audio (may be limited by OS constraints).

- SoundBlaster®-compatible audio

- Expansion capabilities for optional features and future requirements (PCI bus and USB)

The following identifies processors, system bus speed, and on-board memory available on the board:

- Intel 2.0 GHz Celeron Processor

- 128kB L2 Cache

- 400 MHz front side bus

Montara-GML GMCH (852GM Graphics & Memory Controller Hub)

- Supports CPU with 400 MHz FSB
- Supports Desktop Intel Celeron or Pentium 4 processor with Northwood Core
- Memory: DDR-DRAM 200 or 266MHz, up to 2 double sided DIMMs, No ECC Support, 1GB maximum
- Integrated graphics with VGA, LVDS LCD, and 1 digital video (DVO) port

- Dual independent display with Windows multi-monitor support
- Shared memory architecture – 8-32 MB video memory dynamically allocated from system memory
- Hub interface to ICH4 south bridge at 266 Mb/s
- IOQD (In order Queue Depth) = 12

South Bridge Features

The 7402 Motherboard uses the Intel ICH4 South Bridge, which provides the following functions:

- Integrated Intel Audio (requires external codec)
- Integrated 10/100 Ethernet controller (requires external 82562 PHY transceiver chip)
- IDE controller with Primary & Secondary channels, each supporting master & slave drives; ATA-100 support
- USB Host controller – Four USB host controllers, six physical USB ports, USB 2.0 supported
- PCI Bus Host Controller – up to 6 bus masters supported
- LPC Bus Bridge Controller – interface to SuperIO & Trusted Platform Module
- Hub Interface to North Bridge at 266Mb/sec
- SMBUS (I2C) Controller – Interface Hardware monitor
- Firmware Hub (BIOS ROM) Interface
- ACPI Power management support
- Base PC functionality: DMA controller, Interrupt controller, Real-Time-Clock, and event timer

Video Memory

Shared memory architecture uses 8-64 MB video memory, with Dynamic video memory allocation (DVMT).

BIOS Memory

The 7402 includes 512KB of Flash BIOS and 1MB size Flash parts. A DMI area in the BIOS ROM stores system information about the 7402, such as serial number and model number. Platform software detects board version via device ID of key components on the board. There is no board ID EEPROM.

Video

The 7402 uses integrated graphics in the Montara chip.

Graphics Controller Architecture
- Shared memory architecture uses 8-32MB video memory, with Dynamic video memory allocation (DVMT)
- Motion compensation for MPEG-2 support
- Software DVD playback at 30 frames/second full screen
- Video overlay support
- 2D Graphics engine includes 128 bit BLT engine and color space conversion
- 3D Graphics engine includes DirectX support, 16/24 bit Z-buffering, Enhanced texture functions, Double and triple render buffer support, 16 & 32 bit color, maximum 3D resolution of 1600x1200 @ 85Hz
- Dual independent display pipelines – appear as independent display devices to the OS

Graphics Output Devices
Video outputs: VGA CRT (15 pin DB-9 connector), DVI-I external monitor, and LVDS LCD (internal)

- VGA CRT support up to 1600x1200x24 bit @ 85Hz, 1920x1440x24 bit @ 60Hz

- Integrated LVDS transmitter: Supports up to 1400x1050@ 60Hz single or dual channel dual channel LVDS flat panel, with LVDS frequency up to 112MHz.

- Generates LCD power sequencing and backlight inverter control signals

- Bi-Linear panel fitting (stretching)

- Digital video (DVO) port used to drive DVI transmitter component

- DVI external monitor support up to 1600x1200 @ 60Hz, Compliant with DVI Specification 1.0

- Dual independent display support with Windows multi-monitor support (Concurrent & Simultaneous modes) VGA+DVI, VGA+LVDS, LVDS+DVI supported, any device can be selected as primary.

Analog Monitor

DVI-I is provided as a convenience for users with analog monitors having a DVI connector. DVI-I means an analog VGA signal is present on the DVI connector, along with the digital DVI signals. On the 7402, the analog DVI-I signal is the same as that sent to the VGA 15 pin connector. A VGA monitor may be connected to either the VGA 15 pin connector or the DVI-I connector, but not both at the same time.

LCD Support

Intel generated a specification for integrated LCD support in PC systems, called *Common Panel Interface Specification (CPIS)*. The Montara graphics controller uses the LCD interfaces.

LVDS signals are brought out to a 50 pin header on the motherboard. Although CPIS specifies an LCD connector the 7402 does not use it because it does not support 24-bit color LCD.

DVI Interface

The DVI supports NCR display peripherals such as the 5964 as well as standard PC digital monitors.

Power Management

The BIOS supports the ACPI 1.1 specification. This permits the terminal to go to a low power state during some level of inactivity. With ACPI, the operating system has some control over the power management by going into *suspend*, *standby*, or *hibernate* (depending on the Operating System). The **S0**, **S1**, and **S5** states are implemented. For the detail of the ACPI, refer to *ACPI Specification 2.0b*. Not all Entry and Exit points are available at all times. Availability is based on ACPI states.

Notes:

- Supported wakeup methods include:
    - Wake on Alarm can be used in standby (**S1**) or soft off (**S5**) states.
    - Wake on LAN is supported from **S1** only.
    - Wake on ring indicator is functional from **S1** and **S5**.
    - Motion Sensor allows wakeup from S1 standby based on activity near the system Keyboard, Mouse, or USB activity as supported by the Intel chipset
- USB devices must be enabled in Windows for *Wake from Standby* to function. This is set in at:
    Start → Control Panel → System → Hardware Tab → Device Manager → [USB device] → Properties.
    There is a check box to enable the function under the USB tab.

Cash Drawer Support

The 7402 Terminal can control a cash drawer through a cash drawer Kickout connector on the back of the terminal (daughter card), or through the cash drawer Kickout connector on the transaction printer. The terminal can be configured with 0, 1, or 2 cash drawers. The first drawer is attached to the terminal through a cable with an RJ-45 connector. A second drawer can be connected using a 'Y' cable.

Note: A single *Open*/*Close* status signal is shared with both drawers. Therefore, it is not possible to determine which cash drawer is open.

Power LED

The Processor Board provides support for an external green power LED through the onboard Front Panel. This LED reflects the state of the system power supply. The LED is turned on anytime the power supply is fully on, which occurs when the system is on or in standby. The power LED cannot be controlled by software. When the system is in standby or in a screen saver, the power LED notifies the user that the system is powered on and can quickly return to a normal working state.

MSR

The MSR interface supports a maximum of 3 tracks of magnetic stripe information for support of ISO format cards. Activate the MSR interface by enabling it in *BIOS Setup* under IO Configuration. The MSR interface controller is a memory-mapped device, which can reside at system memory addresses CA000, CC000, or D0000. If MSR capability is not desired, it may be disabled through *BIOS Setup*.

Graphics Subsystem

The GMCH IGD provides a highly integrated graphics accelerator delivering high performance 3D, 2D, and video capabilities. With its interfaces to UMA using a DVMT configuration, analog display, LVDS, and digital display (e.g. flat panel), the GMCH provides a complete graphics solution. The GMCH contains an extensive set of instructions for the following:

- The GMCH also provides 2D hardware acceleration for block transfers of data (BLTs). The BLT engine
- Provides the ability to copy a source block of data to a destination and perform raster operations (e.g.,
- ROP1, ROP2, and ROP3) on the data using a pattern, and/or another destination. Performing these
- common tasks in hardware reduces CPU load, and thus improves performance.
- High bandwidth access to data is provided through the System Memory ports. The GMCH uses Tiling architecture to increase System Memory efficiency and thus maximize effective rendering bandwidth.

Intel DVMT (Dynamic Video Memory Technology) permits the graphics driver to use only the exact amount of system memory required for the current graphics state. Excess memory is returned to the operating system. The driver allocates memory in the range of 8 - 64MB for video. Under DOS, the BIOS setting for video memory takes effect. Up to 48MB is permitted, but normally the default value of 8MB is acceptable.

Graphics Driver

- Single, unified driver that supports all Intel® 830, 845G, 852GM/GME, 855GM/GME, and 865G/GV integrated graphics chipsets

- CUI API for third party application control of Windows display attributes via the Monitor Control Command Set (MCCS) standard

- Backlight Image Adaptation support for Intel® 855GME chipset

- *OS Support:* Windows XP, XP Media Center Edition, XP Tablet PC Edition, 2000, ME, NT4, 98 SE, and Linux Xfree86 4.0.x Server, Kernel 2.4.x. (Note: NCR does not support all of these on the platform).

- IBM OS/2 Warp 3.0/4.0 support provided by SciTech

- API Support: Direct X 7.0, 8.0, 8.1, 9.0 OpenGL 1.3, GDI & GDI+

Resolutions Supported

Resolution	Max Vfreq
640x480 – 1024x1280	60 – 85 Hz

Colors Supported

256 Colors (8-Bit)	65,000 Colors (16-Bit)	16.7 M Colors (24-Bit)
512 k	1 MB	2 MB

NCR 12.1 inch LCD

Resolution	Colors
800x600	262,144

Note: In BIOS POST and DOS modes the LCD image is stretched to fill the display. Intel Graphics driver also permits stretching.

Dual Displays

The Summa II Motherboard (Release 2.5) is dual display (LCD and CRT) capable. In a dual display environment the 7401 terminal supports 16-bit color when both displays are connected to the motherboard. Both displays must have the same maximum resolution capability. Refer to the following information for details about the implementation of a dual display configuration.

- *Lynx Family Control Panel Specification 1.2* on the NCR 74xx Base System and Client Third party Drivers CD-ROM (Product ID: D370-0111-0100) or in the `video.exe` self-extracting Video Drivers file on the Retail Solutions Specific Third Party Products *Drivers and Patches* web site at:

  http://www.ncr..com/support/support_drivers_patches.asp?Class=retail_TPP.

- *Retail Customer Information Display User's Guide* (BD20-1431-B) on the NCR Information Products web site at:
  http://www.info.ncr.com/eHome.cfm

Printer Options

NCR 7167 Printer

The NCR 7167 Printer is a fast, quiet, relatively small and very reliable multi-function printer. It prints receipts, validates and prints checks, and prints on a variety of single or multiple part forms. There is not journal as it is kept electronically by the host terminal. The printer can connect through a USB port or a serial port. It can receive power from a power supply or through a USB+ power cable.

Power Supply

AC Adapter Cable
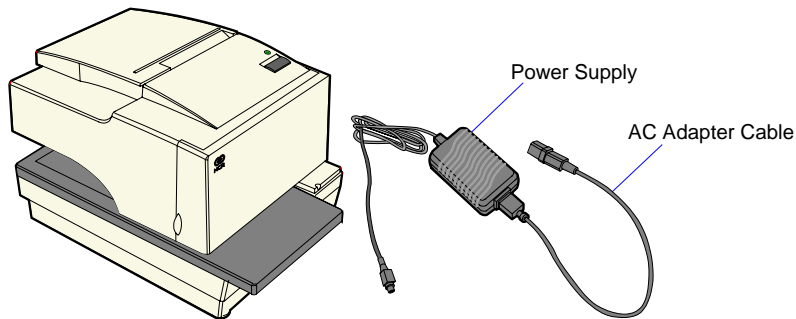
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NCR 7197 Printer

The NCR 7197 Printer is a fast, quiet, relatively small and very reliable multi-function printer. It prints receipts and two-color printing. The printer can connect through a USB port or a serial port. It can receive power from a power supply or through a USB+ power cable.

Power Supply

AC Adapter Cable
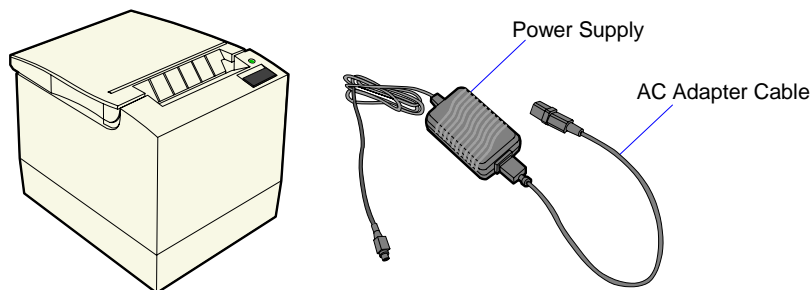
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Operator Displays

5964 12.1-Inch Touch Screen
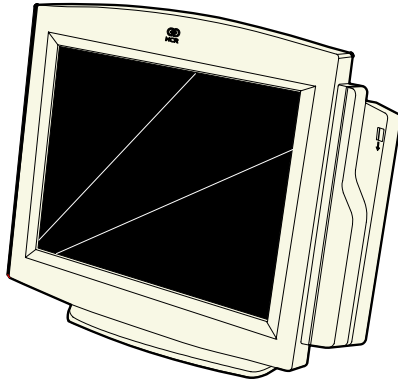
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The 5964 is designed for touch-based applications and features a high-brightness 12.1-Inch Active Matrix Color LCD with SVGA resolution. The 5964 features a 5-wire Resistive Touch Screen, integrated MSR, Digital Video Interface (DVI), table top mount with tilt and swivel (or can be integrated on the terminal), and convenient connections for an external keyboard and hand held scanner.

Note: If *Simultaneous Mode* is used (same display on both the integrated LCD and the 5964) then Extended desktop (concurrent mode) is recommended.

Features

Resistive Touch Screen	Touch overlay uses 5-wire resistive technology for ease of use and long reliability. Resistive technology allows users to operate the touch screen with a gloved hand, stylus, etc.
Retail Hardened	Touch screen surface contains an anti-glare, spill-proof and hardening coating
12.1-Inch Active Matrix LCD	Dual backlight color LCD display offers exceptional brightness (300 nits max.) and viewability.
Brightness Control	The LCD is factory set to run at full brightness. Users can select reduced brightness through a user adjustable hardware switch below the right front bezel (high/low brightness).
Wide Viewing Angle	Horizontal viewing angle of −60° to +60° (right to left), vertical −50° to +50° (bottom to top)
SVGA Resolution	High resolution (800 x 600) supports the latest graphical and multimedia applications
PS/2 Keyboard Connector	A convenient PS/2 connector supports a non-wedge PC-style keyboard for alpha entry and diagnostics
Scanner Connector	RJ-45 interface provides 5 V power and communication for the NCR RS-232 hand-held scanner
Tone Speaker	Sounds error tones & audible feedback during operator input - controlled by TAPS/OPOS commands
DVI Video Interface	Industry standard DVI (Digital Video Interface) for connection to DVI-I connector on 7402
RS-232 Touch Interface	7402 Powered RS-232 connector provides power

	and touch interface for NCR 5964 display
Wedge Controller	Passes data (MSR, scanner, keyboard) to host terminal through PS/2 data stream via Y-cable
Terminal Powered	No additional power cord or power supply is required simplifying cable management
MSR Option	Integrated 3-track ISO MSR
Tilt / Swivel	The remote table top pedestal mount supports tilt and swivel to adjust display to optimum angle

5942 12.1-INCH Color LCD
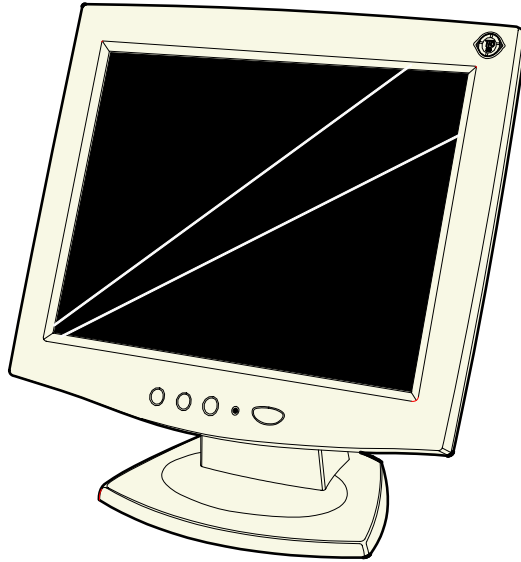
19809

The 5942 12.1-Inch LCD is designed for customers who desire a color display and prefer the small footprint and ergonomic packaging of LCD technology versus traditional CRT's. Depending on the customer's requirements, this LCD display can be used either as an operator display or a customer information display (CID). The 5942 Display features a 12.1-Inch Active Matrix Color LCD with support for SVGA and XGA resolution.

The 5942 can be integrated on the terminal or installed on a remote mount.

7452-K309/K404 9-Inch Monochrome CRT

The 9-Inch CRT can be integrated on the terminal or installed on a remote mount.
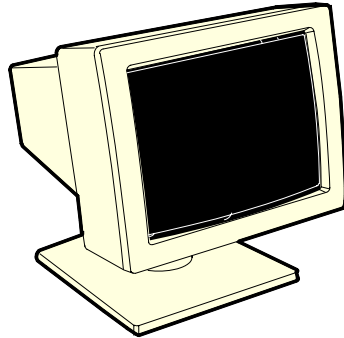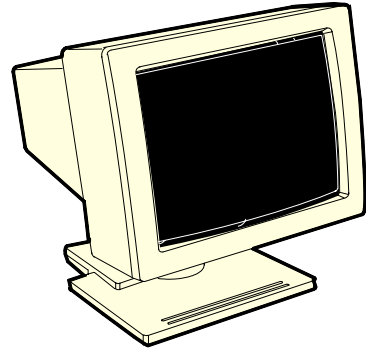
7452-K309   7452-K404   19742a

7452-K419 15-Inch Color CRT

The 15-Inch CRT can be integrated on the terminal or installed on a remote mount.

Note: The 15-Inch display is too large for the Swivel Arm. For integrated configurations it is placed on the Large Peripheral Extension Deck, which is included in the Integration Tray Accessories Kit (7402-K310/K315).
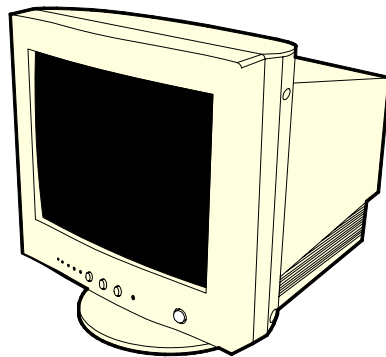
19743

NCR 5932 Keyboards

There are three models of the 5932 Keyboard:

- 109-Key USB Keyboard
- 115-Key Big Ticket Keyboard (PS/2 interface)
- 68-Key POS Keyboard (PS/2 interface)

109-Key USB Keyboard
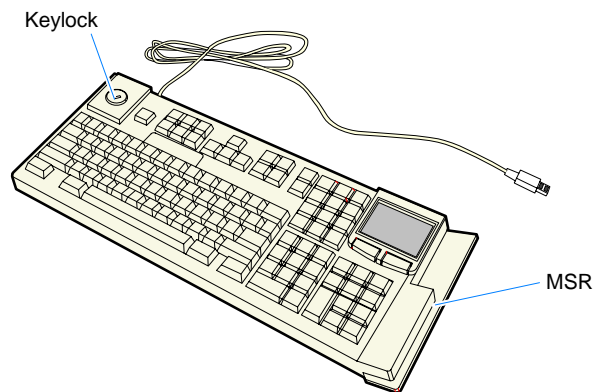
19586

The 109-key USB keyboard is a multifunction keyboard that is two keyboards built into one.

The keyboard consists of two major sections:

- 38-key POS keyboard
- Industry-standard alphanumeric PC keyboard

The keyboard contains the key matrix and other POS-specific functions such as Keylock, speaker, system status indicator, and magnetic stripe reader (MSR). This 5932 keyboard also has a USB port to connect a Scanner or other USB device.

Features

The NCR 5932 USB Keyboard supports the following features:

- Keylock
- Speaker
- Magnetic Stripe Reader (MSR)
- Keyboard Status LEDs

Keylock

The USB keyboard has a four-position Keylock. You can rotate the
Keylock between specific positions by use of three keys. The positions
are explained in the following table.

Abbreviation	Position	Description
Ex	Exception	Used by the customer or service representative to perform low level programming such as workstation diagnostics, configuring the workstation, or loading the workstation.
L	Locked	Used to lock keyboard input to prohibit use of normal functions.
R	Register	Used when performing normal retail mode functions.
S	Supervisor	Used by the supervisor to provide highest level of workstation control in cases such as refunds and running totals.

Speaker

The programmable speaker is capable of generating key clicks and
error tones.

MSR

The MSR is an optional feature that provides support for reading magnetically coded data cards. The keyboards support two different types of MSR:

- ISO Tracks 1, 2, and 3
- JIS-II and ISO Track 2

Keyboard Status LEDs

The keyboard has three status LEDs:

- Num Lock
- Caps Lock
- Scroll Lock

These features are used to provide the present state of the keyboard. The indicators are single color (Green) LED's. When the system is off, no LED's are illuminated.

115-Key PS/2 Big Ticket Keyboard

Keylock

Status
Indicator

MSR
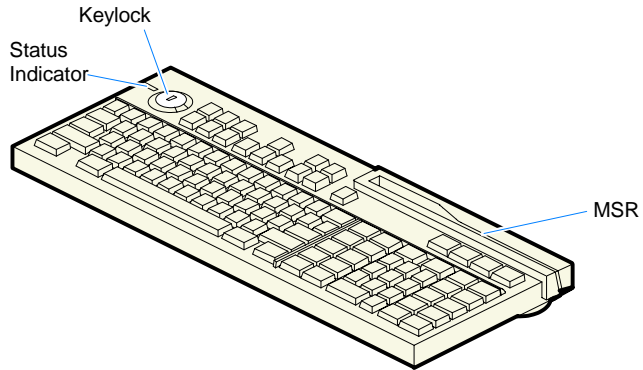
19745

68-Key PS/2 POS Keyboard

Keylock

Status
Indicator

MSR
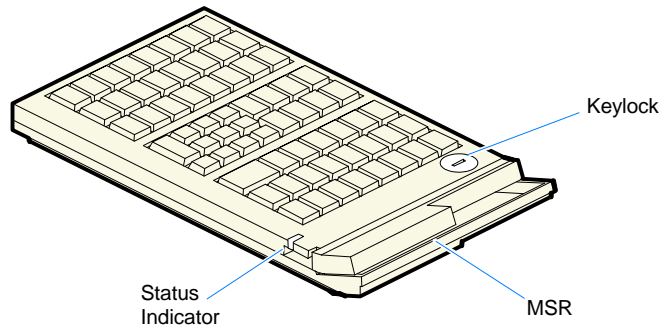
19746

Features

The 5932 PS/2 Keyboards include the following features:

- Keylock
- Speaker
- System Status Indicator LED
- Magnetic Stripe Reader (MSR)
- External Decoded Scanner Connector
- Special *PC Setup* mode on the 68-key keyboard

The operations of the user-programmable speaker, Magnetic Stripe Reader (MSR), keylock, and scanner connector are handled by the Wedge controller. Please refer to the *Wedge Software User's Guide* (BD20-1368-A) for detailed information about interfacing and configuring these devices.

Keylock

The Big Ticket and 68-key keyboards have a four-position keylock switch. The positions are explained in the following table.

Abréviation	Position	Description
Ex	Exception	Used by the customer or service representative to perform low-level programming such as terminal diagnostics, configuring the terminal, or loading the terminal.
L	Locked	Used to lock keyboard input to prohibit use of normal functions.
R	Register	Used when performing normal retail mode functions.
S	Supervisor	Used by supervisor to provide highest level of terminal control in cases such as refunds and running totals.

Speaker
A programmable speaker generates key clicks and error tones.

Buzzer
The buzzer is an internal on board Buzzer.

System Status Indicator LED
The system status indicator is a two-color LED. The green color indicates the keyboard is powered. Red indicates an error condition. When the system is off, the LED is extinguished.

When the 68-key keyboard is in the special "PC setup" mode, the LED flashes red/green.

The status and condition indicated by the LED are shown as follows:

Status	Condition
Green	Power on
Red	Wedge controller reporting an error condition
Flashing red/green	Keypad of 68-key keyboard in "PC Setup" mode (See special keypad mode on next page)
Off	System off

Note: For more information about the Wedge controller, refer to *Wedge Software User's Guide* (BST0-1368-B).

MSR (Magnetic Stripe Reader)

The MSR is an optional feature that provides support for reading magnetically coded data cards. The keyboards support two different types of MSR:

- ISO Tracks 1, 2, and 3
- JIS-II and ISO Track 2 (Big Ticket and full-featured 68-key keyboards only)

Note: MSR signals are routed to the Wedge controller and passed into the system keyboard data stream. For more information about the Wedge controller, refer to *Wedge Software User's Guide* (BD20-1368-A)

External Decoded Scanner Connector

A decoded RS-232 input device that only requires TXD, RXD, CTS and RTS, such as a bar-code scanner, can be connected to the keyboard. RS-232 signals are routed to the Wedge controller and passed into the system keyboard data stream. The connector provides +5V to power the scanner. For more information about the Wedge controller, refer to *Wedge Software User's Guide* (BD20-1368-A).

Special "PC Setup" Keypad Layout for 68-key Keyboard

On power-up, the operator can switch the 68-key keyboard into an alternate keypad layout that can be used with many PC BIOS setup and configuration routines. The alternate layout contains keys such as ESC, TAB, END, "+", "-" and arrow keys which are not available in the normal keypad layout. The alternate layout allows the operator to configure a PC with the 68-key keyboard.

NCR 5972 2x20 Remote Customer Display

Tall Post Models
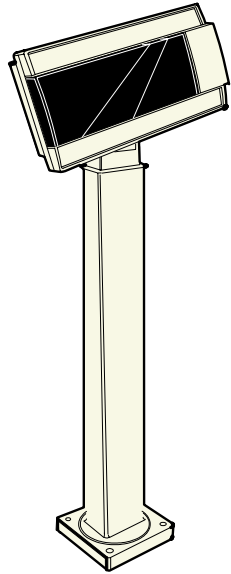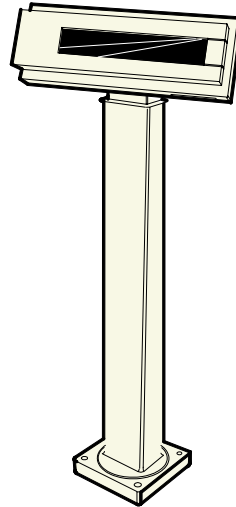
| 5972-1xxx (VFD) | 5972-2xxx (LCD) | 19750a |

Desktop Models
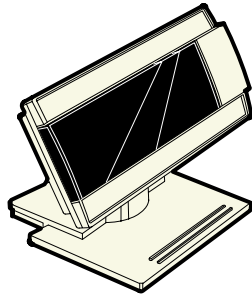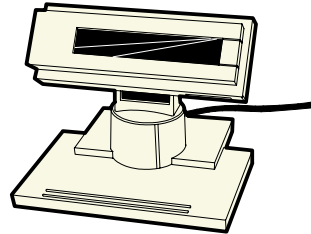
5972-1xxx (VFD)   5972-2xxx (LCD)

19749

Features

- RS-23 Interface
- Socket for 32K of PROM for additional character sets (5972-1000 VFD).
- 7 x 9 pixel characters (5972-1000 VFD); 5 x 8 pixel characters on 5972-2000 LCD
- Diagnostics
- Character sets:
  - Code Page 850 (International)
  - Katakana (except 5972-2000)
  - Code Page 866 (Cyrillic) (except 5972-2000)

NCR 5973 2x20 International VFD Customer Display
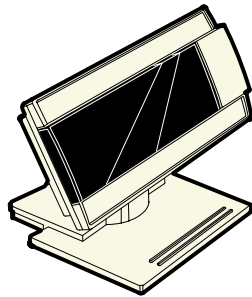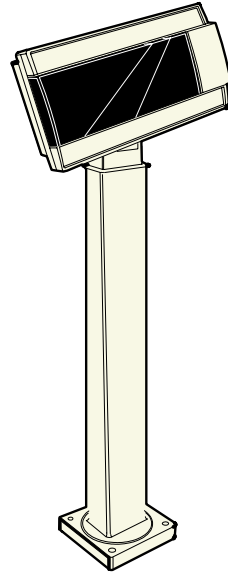
Desktop Model   16-Inch Post   20448

Features

- 256x64 dots graphic VFD
- Micro-controller
- Flash ROM
- Display driver circuitry
- Communication/power connector
- Power converter circuitry
- Communication drivers
- Bi-directional parallel interface support

System Configuration Diagram

CRT

5964
Touch Screen

5942

| RS-232 | DVI | RS-232 (Powered) | VGA |

USB
(24 V)

Line In
Speaker Out
Mic In

7167   7197

5932 USB

Retail Daughter Card

7402 Motherboard

2nd Drawer (Y-Cable)

Cash Drawer

Parallel

2189/2183

PS/2   5932 Big Ticket   Mouse

| PS/2 | RS-232 | USB (12 V) | USB | RS-232 (Powered) |

RS-232 Peripherals

RS-232 Peripherals (Powered)

5972-1xxx

7197

7162

5945

7882

5972-2xxx   7875   7167   5992   7892   7837

20929

Compatibility

LAN Communications

The software associated with the terminal systems conform to the following standards:

- Network Driver Interface Specification (NDIS 4)

- IEEE 802.3 & 802.3u CSMA/CD (10/100 MB/s Ethernet)

- IEEE 802.2 Link Level Control (LLC)

- TCP/IP

Application Programmability

The software associated with the terminal systems conform to the following standards:

- OLE for Retail POS 1.4

- JavaPOS for Retail 1.4

- HTML 4.0

- ECMA Script

- Java Development Kit 1.1.3

Operating System Information

The software associated with the terminal systems conform to the following standards:

- Microsoft Windows NT

- Microsoft Windows 2000

- Windows XPe

Chapter 2: Hardware Installation

Introduction

The 7402 is fully assembled at the factory. This chapter explains how to connect optional hardware components to these terminals.

Installation Summary

The terminal should be removed from the shipping packaging and visual checks made to verify the correct hardware configuration. The system is then configured and any communication cables are connected.

Only after inspection should the power cord be attached to the system and then connected to the AC power source. Power-up self-tests will run to verify basic functionality.

Power Cord
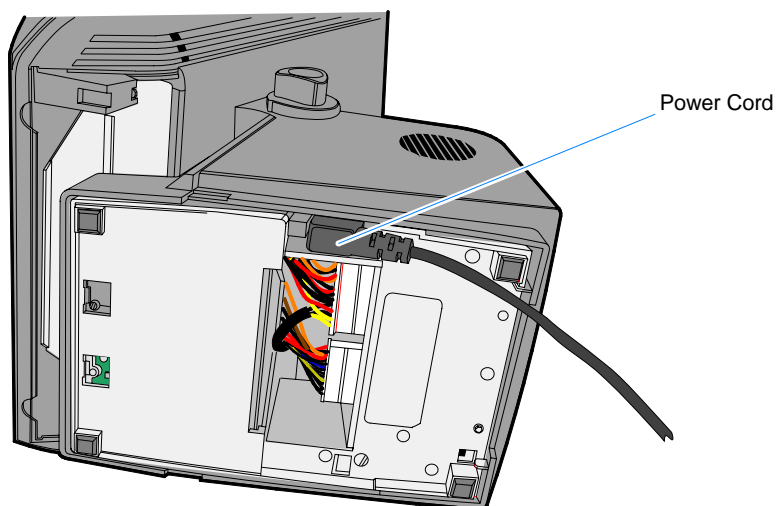
21047

ROM-based setup should be used to configure network options. Full configuration depends upon the system server and the management web site.

Installation Restrictions

- Before installing the terminal, read and follow the guidelines in the *NCR RealPOS 72 Site Preparation Guide* (B005-0000-1464) and the *NCR Workstation and Peripheral AC Wiring Guide* (BST0-2115-53).

- Install the terminal near an electrical outlet that is easily accessible. Use the power cord as a power-disconnect device.

- Do not permit any object to rest on the power cord. Do not locate the terminal where the power cord can be walked on.

- Use a grounding strap or touch a grounded metal object to discharge any static electricity from your body before servicing the terminal.

- If the power cord is replaced, it must be replaced with the same type of cord with the protective shroud.

- Do not route the power cord through openings with sharp edges.

Caution: This unit contains hazardous voltages and should only be serviced by qualified service personnel.

Caution: DO NOT connect or disconnect the transaction printer while the terminal is connected to AC power. This can result in system or printer damage.

Installing Peripherals

Peripheral Cable Routing

The peripheral cables are routed down through the base and out the rear of the unit. They are secured internally with a Cable Clamp.

Cable Clamp

21025
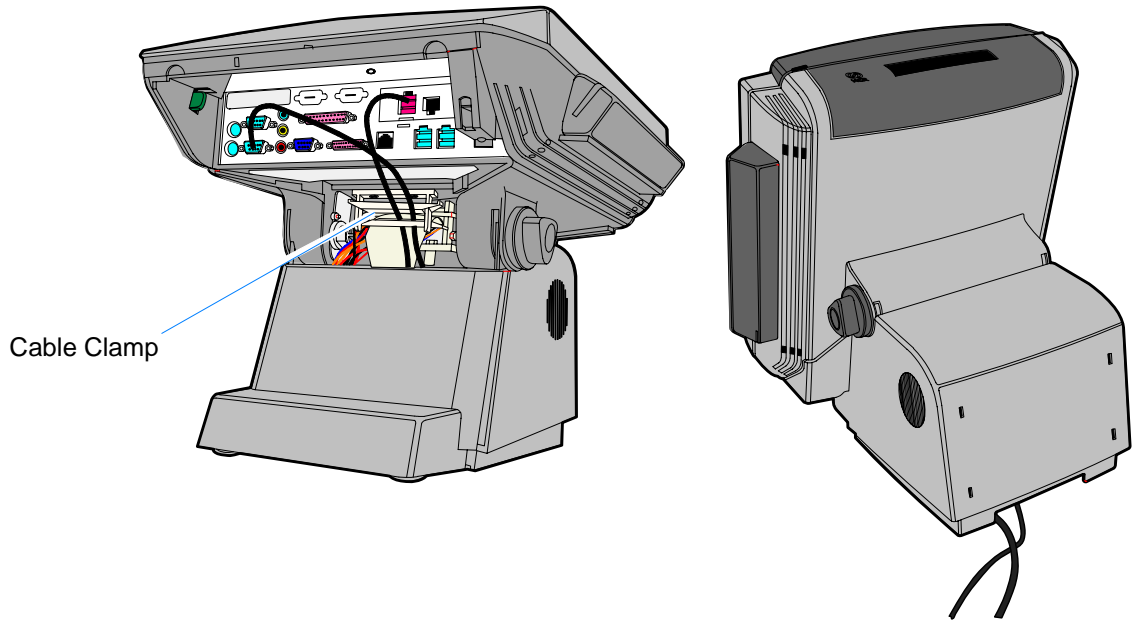
Accessing the Cable Connectors

This section describes how to install transaction printers and other peripherals supported by the 7402. The cable connectors are located behind the Cable Cover.

1. Tilt the Display Module.

2. Remove the Cable Cover.

   a. Remove the screw from the Cable Cover.

   b. Press down on the two plastic Cable Cover Release Tabs and slide the cover forward.

Front Cover Latches

Screw

20931
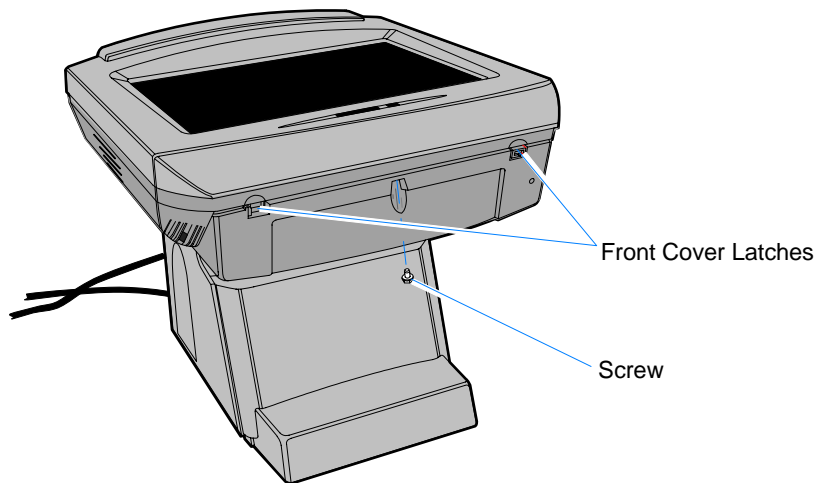
Cable Connector Identification

1. Connect the peripheral and LAN cables. The illustration identifies the peripheral connectors on the terminal. See the sections that follow for specific installation instructions for each of the peripherals.
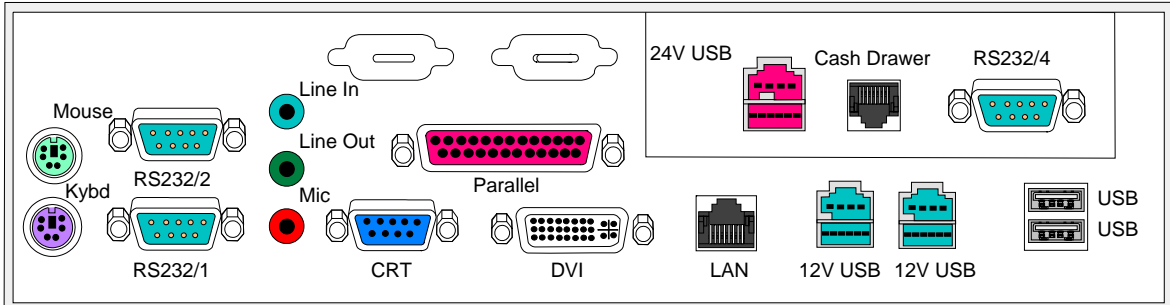
20917

Note: RS232/1, RS232/2, and RS232/4 can be powered ports. They are enabled via hardware straps on the Motherboard. RS232/3 is an internal port that is dedicated to the Touch feature.

2. After installing the peripheral and LAN cables replace the cable cover.

PS/2 Keyboard/Mouse Cable Connections

The 7402 has dedicated PS/2 connectors to support both a keyboard and mouse.
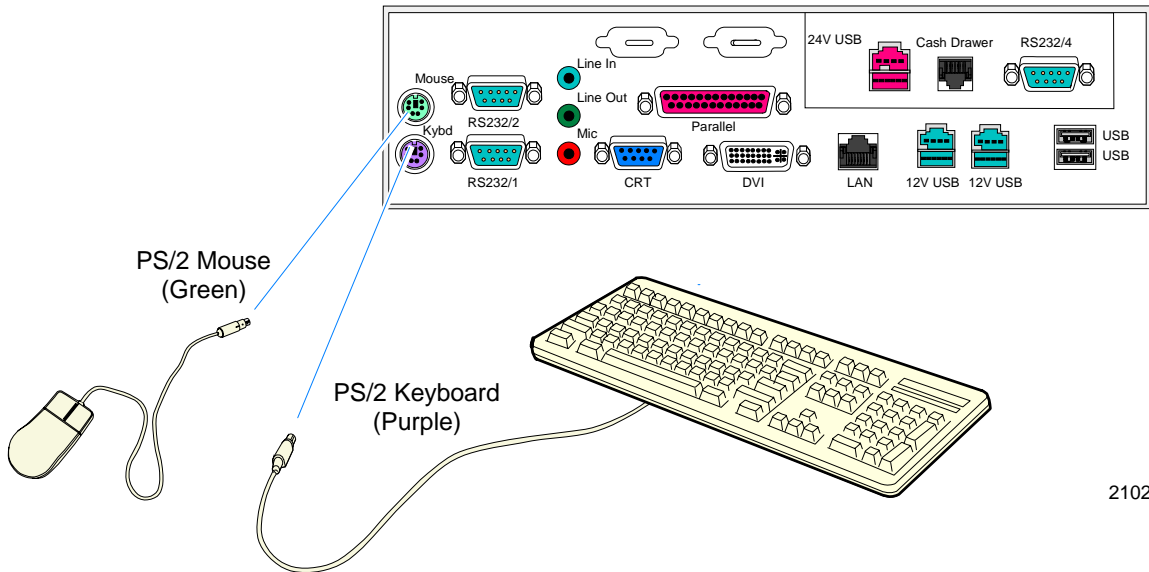
21028

Mouse Installation Restriction

If you are running Windows NT you must make the following Registry entry in order to enable the Mouse Class Driver.

```
[HKEY_CURRENT_CONFIG/System/CurrentControlSet/Enum/ROOT/
LEGACY_MOUSCLASS/0000]
"CSConfigFlags"=dword:00000000
```

Installing an NCR 5964 12.1-inch Touch LCD

The NCR 5964 can be connected as a remote device.
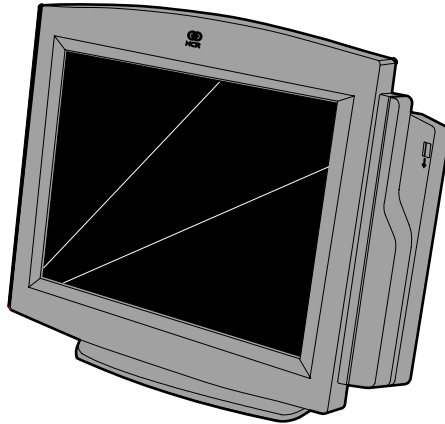
19429a

Note: A PC keyboard is required to configure a 5964 12.1-inch Touch LCD.

The following illustrations show the cable connections for the 5964 and the 7402. There are two cables required.

- DVI Cable – provides the video interface to the 5964
- RS-232 Y-Cable – provides a serial interface and power to the 5964. It also connects the 5964 PS/2 keyboard connector to the terminal, which provides an interface for the wedge controller (MSR, PS/2 Keyboard, Scanner, and Tone Speaker).

DVI Cable Connections

Connect the cable to the *DVI Connectors* on the 5964 display and 7402 terminal.

DVI

497-0422831 - 1.0 m
(1416-C723-0010)

497-0422832 - 4.0 m
(1416-C723-0040)

21029
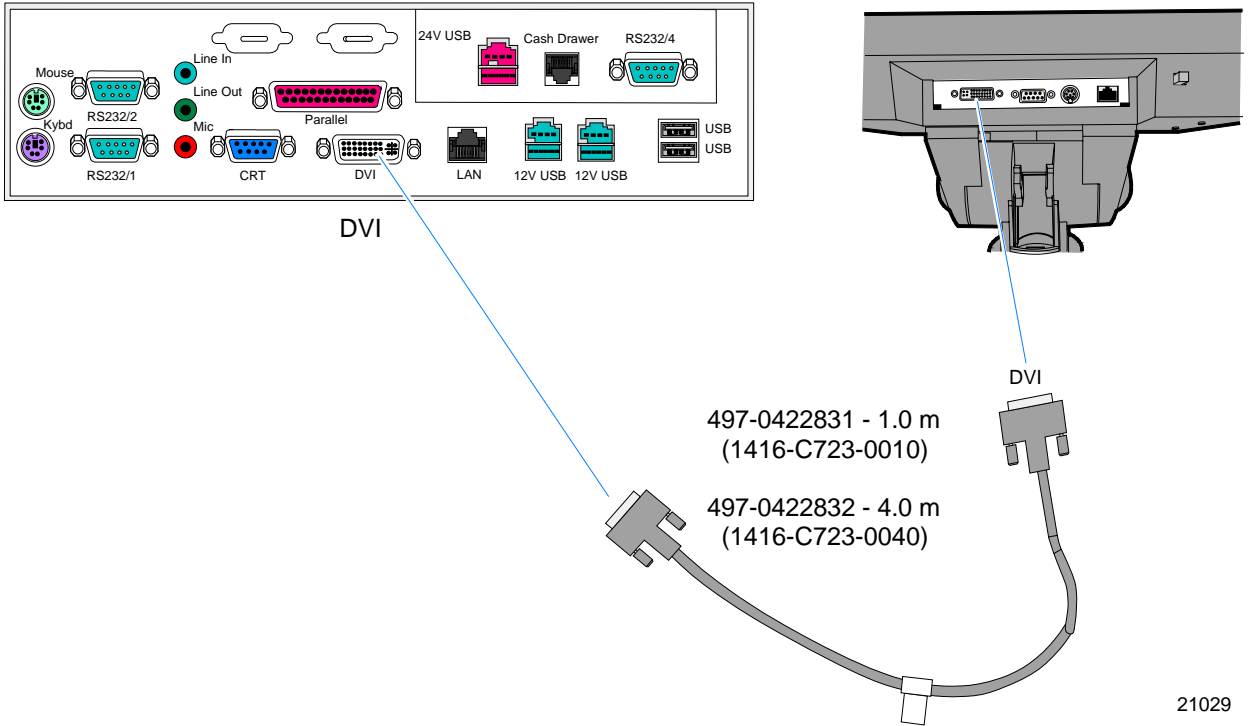
RS-232 Cable Connections

1. Connect the Y-cable to one of the *Powered RS-232* ports and to the *PS/2* connector on the 7458 terminal.

2. Connect the other end of the Y-Cable to the *RS-232* connector on the 5964 display.

Powered RS-232 Ports
(A, B, or D if available)

RS-232

PS/2

497-0422833 - 1m
(1416-C725-0010)

497-04228324 - 4m
(1416-C725-0040)
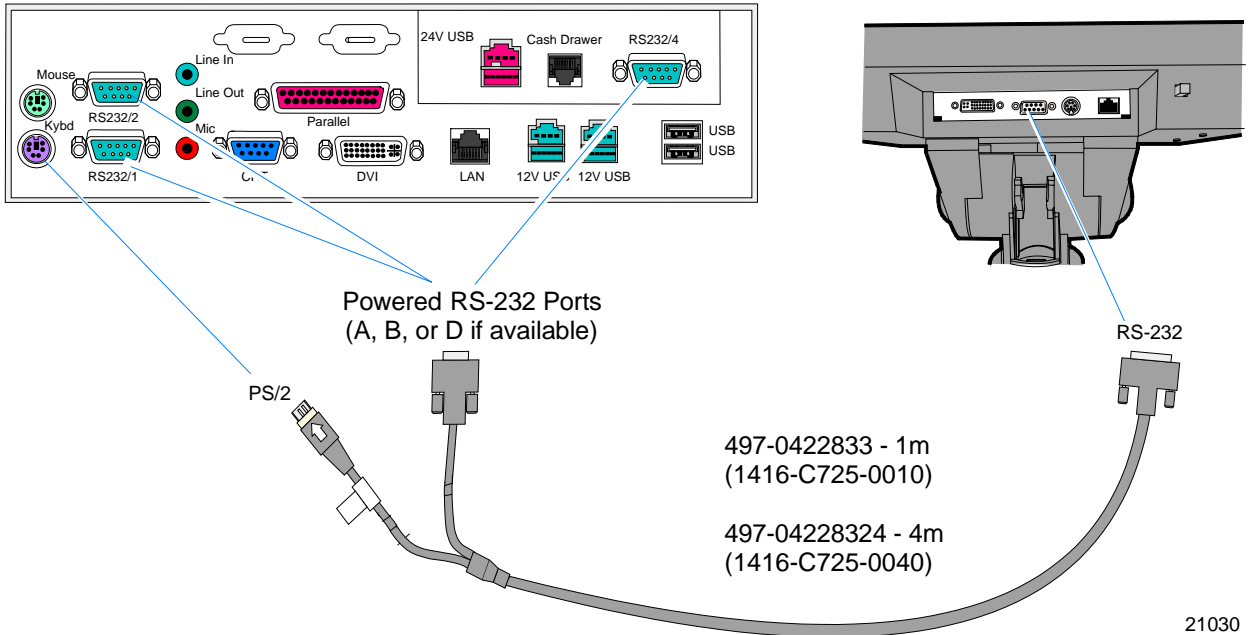
21030

For more information refer to the *NCR 5964 12.1-Inch Touch LCD User's Guide* (B005-0000-1324)

Installing a 5942 12.1-Inch LCD Monitor

The NCR 5942 can be connected as a remote device.

497-0426160 - 4 m Beige
(1416-C803-0040)

497-0428512 - 4 m Black
(1416-C851-0040)
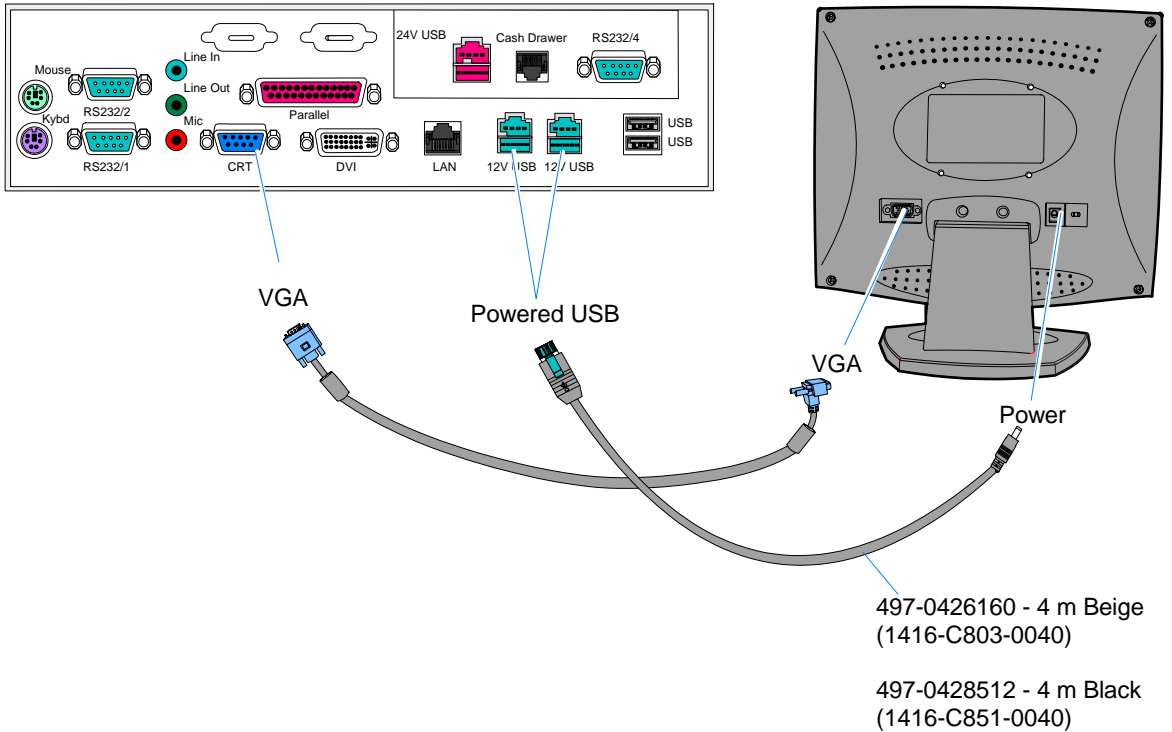
21031

1. Connect the LCD Cable to the *VGA* connectors on both the 5942 monitor and 7458 terminal.

2. Connect the Power Cable to the 5942 and to a *Powered USB* connector on the 7458 terminal.

For more information refer to the *NCR 5942 12.1-Inch LCD Monitor User's Guide* (B005-0000-1394)

Installing the Transaction Printer

The printers can connect through a USB connector or an RS-232 connector. It receives power through a Powered USB power cable.

USB Installation

Connect the Powered USB Printer Interface Cable to the *USB Connector* and *Power Connector* on the printer and to the *24 V Powered USB Connector* on the terminal.

21032
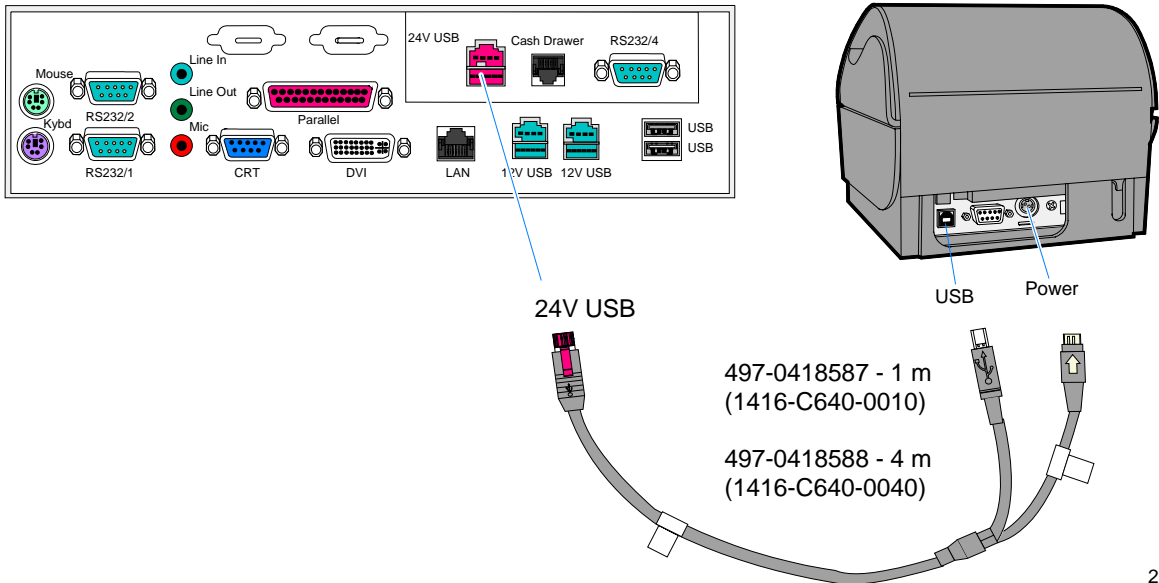
RS-232 Installation w/Power from Powered USB

1. Connect the RS-232 Printer Interface Cable to the *RS-232 Connector* on the printer and to an *RS-232 Connector* on the terminal.

2. Connect the Printer Power Cable to the *Power Connector* on the printer and to the *24 V Powered USB Connector* on the terminal.
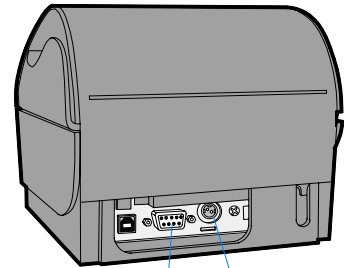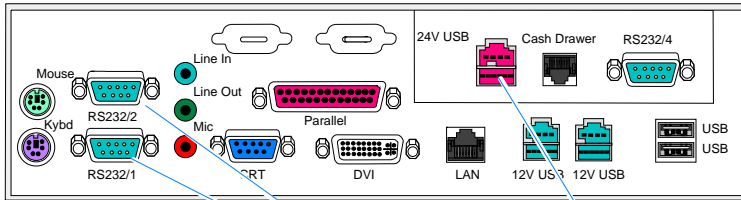
9-Pin to 9-Pin
497-0408349 - 0.7 m
(1416-C266-0007)

497-0407943 - 4 m
(1416-C266-0040)

497-0409379 - 15 m
(1416-C266-0150)

9-Pin to 25-Pin (7162)
497-0407427 - 1.0 m
(1416-C337-0010)

497-0407429 - 4 m
(1416-C337-0040)

497-0407430 - 15.2 m
(1416-C337-0152)

497-0422292 - 4 m
(1416-C712-0040)

RS-232

Power

RS-232

21033

Installing an NCR 5972 Remote Customer Display

There are two models of the NCR 5972 Remote Customer Display:

- 5972-1xxx Vacuum Fluorescent Display (VFD)
- 5972-2xxx Liquid Crystal Display (LCD)

Tall Post Models
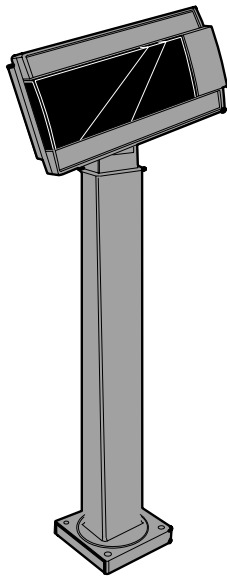
5972-1xxx (VFD)   5972-2xxx (LCD)   19750b
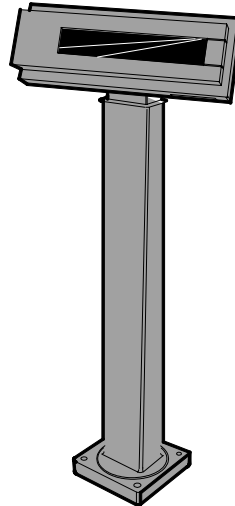
Desktop Models
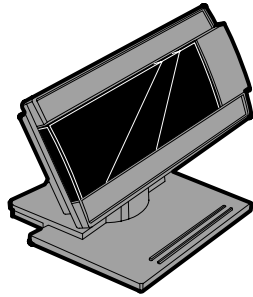
5972-1000/5973-1000 (VFD)   5972-2000 (LCD)
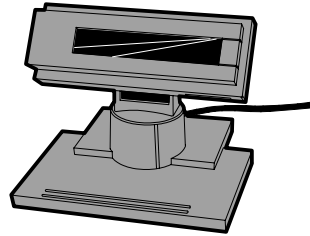
19749b

1. Locate the Display Mount within 4 meters (13 ft.) of the host
    terminal.

2. Determine if the cable should be routed down through the
    mounting surface or if it should be run on top of the surface. Drill a
    hole if necessary.

3. **High-Post Mount:** If you are installing High-Post model secure the
    Mounting Plate with screws (4) that are provided.

Mounting Plate

4.06 mm (0.160 in.) Diameter

7.6 cm
(3.0 in.)
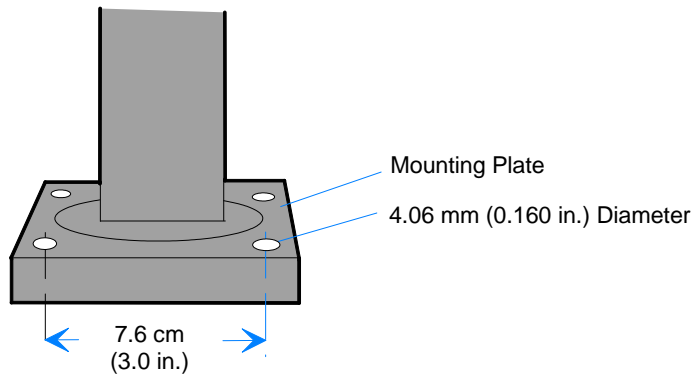
14622a

Cable Connections

1. Connect the Display Cable to a powered RS-232 connector on the terminal.
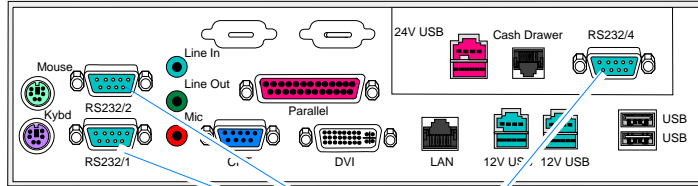
Powered RS-232 Ports
(A, B, or D if available)

21034

Installing a Cash Drawer

The Cash Drawer can be connected to the Cash Drawer connector or to the transaction printer.

Cash Drawer Connector

Cash Drawer Connector

21035
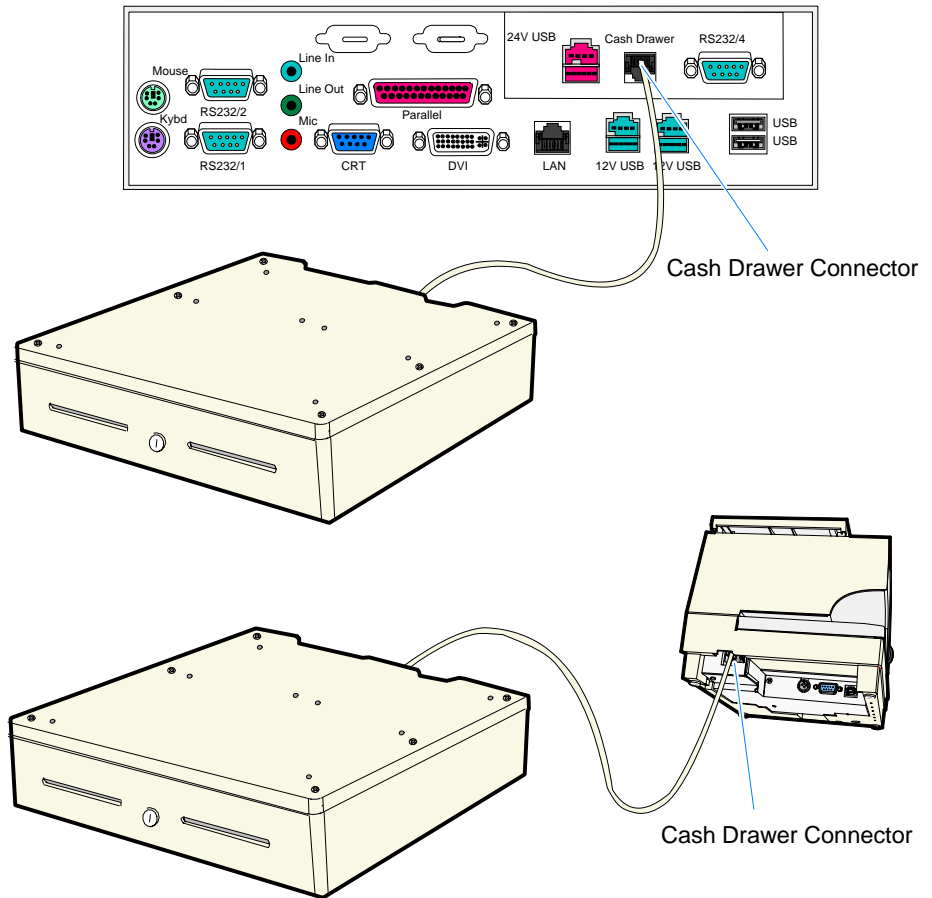
Installing a Second Cash Drawer

The terminal supports a 2-drawer configuration with a Y-cable (1416-C372-0006).

1. Place the cash drawer in the desired location, within cable's length of the printer.

2. Connect the Y-cable to the transaction printer cash drawer connector.

Calibrating the Touch Screen

Be sure to observe for the following Touch Screen calibration guidelines:

- Calibrate the touch screen as part of the installation process.

- Recalibrate the touch screen when the system is installed at its final location.

- Recalibrate whenever the terminal is moved to a new location.

- Recalibrate the touch screen anytime the system has been disassembled for servicing.

- The Touch Screen can be calibrated using MicroTouch (Windows) or Microcal (DOS), or it can be calibrated from the BIOS.

- If the Touch Screen or the Retail Daughter Card is replaced, the 25-point calibration procedure is necessary.

- If the calibration is consistently off, even after performing the 2-point calibration, then do the 25-point. This should always be done before resorting to touch screen glass replacement.

Calibration Using MicroTouch (Windows)

1. From the Windows Start button, select **Settings→Control Panel→MicroTouch Touchscreen**.

2. From the *MicroTouch Touchscreen Properties* screen, select **Calibrate** to begin calibration.
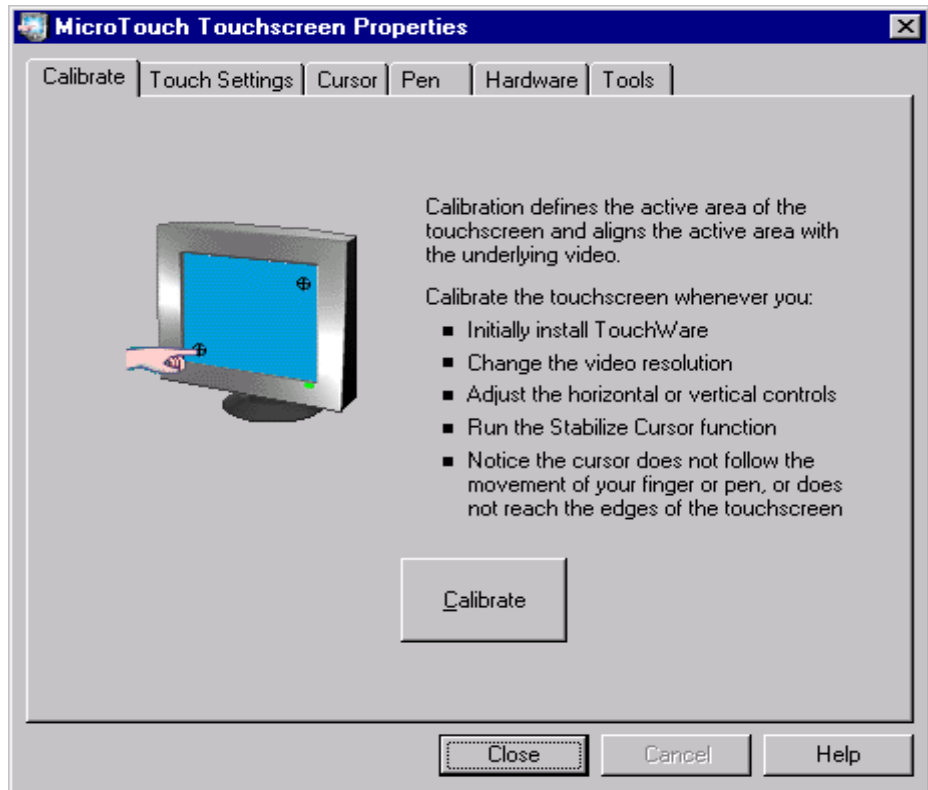
3. The following screen is displayed with two targets. Place your finger on the target that has a finger icon pointing towards it and hold it until the statement *Touch Enable* is displayed over the finger icon.

    Note: For best results, press the screen near the circle and then slide your finger onto the circle without raising your finger from the screen.

4. Using the same method as above, touch the circle near the upper-right corner of the screen.

5. The *MicroTouch Calibration* dialog box then appears. Do not touch the screen until this dialog box is no longer displayed.
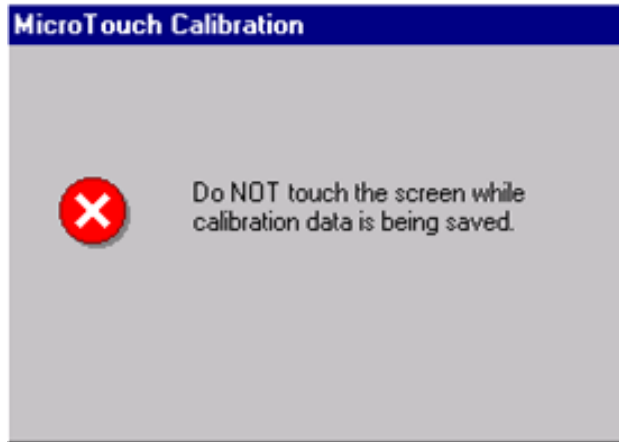
6. From the *Calibration Complete* screen, select **Done**.

7. Select **Close** to exit the MicroTouch program.

8. From the Control Panel, select **File→Close** to exit the Control Panel.

Calibration Using Microcal (DOS)

The calibration program looks at where your finger is when you lift it off the screen, not where you touch it. Therefore, calibrate the screen as follows:

1. Touch the screen near the calibration target.

2. Keep your finger on the screen and slide it to the center of the target.

3. Hold your finger firmly on the target for two seconds, then lift it off quickly.

4. Verify that the calibration was set accurately before making a service call. Perform the calibration again if necessary.

If cursor is not stable, or false touches are suspected, run the Noise Check Utility from the Microcal program. Choose the recommended frequency (the one with the lowest noise level). This should also be done if the Touch Screen is still not calibrated after one attempt to recalibrate it.

1. Set the video resolution by going to the **Tools** menu, Video and selecting **800 x 600 256 colors**.

2. Go to the **Tools** menu, select **Noise Check**.

3. Follow the instruction prompts. Choose the frequency with the lowest noise level.

Application software can possibly generate a dialog box from the Touch Driver, with the message that the touch screen needs to be recalibrated. If the screen appears to be working normally, then this message can be ignored. There will be a check box labeled `Do not show this message again`. Make sure this box is checked.

Summary

If there is a Touch Screen calibration issue during or after installation, take the following actions in the order listed:

1. Recalibrate.

2. If recalibration is unsuccessful after two attempts, then run the Noise check to change the frequency.

3. If you are still unable to calibrate, change the touch screen glass.

4. The final step is to replace the Processor Board. If this corrects the problem, then the old glass is probably OK to reuse.

Out-of-Box Failures

The RSD-Atlanta Customer Satisfaction Hotline will replace <u>out-of-box</u> failed hard disks with identical, preloaded drives. Once a system is successfully installed, all disk contents are the responsibility of the customer. The customer is responsible for restoring operating system software and/or customer-specific data onto replacement disks sent to repair a failed or damaged disk in the field. NCR provides recovery tools for the operating system and platform software.

Chapter 3: Setup

Entering Setup

1. Connect an alphanumeric PS/2 keyboard to the terminal.

   Note: If a USB keyboard is used then *Legacy USB Support* in the BIOS Setup must be enabled.

2. Apply power to the terminal.

3. When you see the *American Megatrends* logo displayed press **[Del]**.

Keyboard Shortcuts

Function	Keystroke	Notes
Enter SETUP	DEL	1
Load AMIBIOS "failsafe" CMOS SETUP values	END	
Display extra AMIBIOS information at boot	INS	8
Switch between AMIBIOS "Silent Boot" graphical logo and standard text boot screen	TAB	2, 6
Boot from Network Device	F12	1, 2
Enter SETUP after system error	F1	1
Load CMOS SETUP defaults after system error	F2	1
Initiate BIOS RECOVERY & clear CMOS	CTRL-HOME	7, 8
Initiate BIOS RECOVERY, clear CMOS & NVRAM	CTRL-PGUP	7, 8
Initiate BIOS RECOVERY, preserve CMOS & NVRAM	CTRL-PGDN	7
PopUp Boot Menu	F8 or F11*	1, 2, 3

Function	Keystroke	Notes
Enter SETUP (for serial console redirection)	F4	1, 2, 3, 4
PopUp Boot Menu (for serial console redirection)	F3	1, 2, 3, 4
Activate AMIKey Recovery Boot Services	F9	1, 2, 5

Notes:

1. This keystroke can be configured to be a different value, based on the system manufacturer's specification. The keystroke listed here is the "default" setting in AMIBIOS8.

2. This feature is not enabled in all AMIBIOS products.

3. The assigned keystroke & a short description of its function is typically displayed by the BIOS on system startup.

4. These keystrokes are only available when using the AMIBIOS "serial console redirection", which allows access to the BIOS boot screen via a VT-100/ANSI terminal connected to a serial port.

5. This feature is only available if AMIKey Recovery Boot Services are installed on the system drive and the BIOS is configured to use these services.

6. AMIBIOS will automatically switch from the "Silent Boot" logo to the standard BIOS text screen if an error occurs that requires user attention. Some error messages are displayed over the "Silent Boot" logo, depending on system configuration.

7. These BIOS functions are only available during the very early stages of system initialization, also known as "boot block code". To initiate these functions, please hold down the keys immediately after powering on the system.

8. After AMIBIOS recognizes this keystroke, the BIOS will wait and display the following message: *Press <F1> to Run SETUP, Press <F2> to load default values and continue*.

How to Select Menu Options

The following keyboard controls are used to select the various menu options and to make changes to their values.

- Use the arrow keys to select (highlight) options and menu screens.
- Use the **[Enter]** key to select a submenu.
- Use the **[+]** and **[-]** keys to change field values.
- To view General Help at any time, press **[F1]**.
- To save the changes, move the cursor to the *Exit Menu*, select either *Save Changes & Exits*, and press **[Enter]**.

BIOS Default Values

The following tables show default settings. On such settings as IDE drives, where there are no defaults, typical settings are shown

Main Menu

System Time	(variable)
System Date	(variable)

Advanced Menu

CPU Configuration	
IDE Configuration	
OnBoard PCI IDE Controller	[Both]
Primary IDE Master	[Hard Disk]
Type	[Auto]
LBA/Large Mode	[Auto]
Block (Multi-Sector Transfer)	[Auto]
PIO Mode	[Auto]
DMA Mode	[Auto]
S.M.A.R.T.	[Auto]
32Bit Data Transfer	[Disabled]

Primary IDE Slave	[ATAPI CDROM]
Type	[Auto]
PIO Mode	[Auto]
DMA Mode	[Auto]
Secondary IDE Master	[Not Detected]
Secondary IDE Slave	[Not Detected]
Hard Disk Write Protect	[Disabled]
IDE Detect Time Out (Sec)	[35]
ATA (PI) 80Pin Cable Detection	[Device]
SuperIO Configuration	
OnBoard Floppy Controller	[Enabled]
Serial Port A Address	[3F8/IRQ4]
Serial Port B Address	[2F8/IRQ3]
Serial Port 2 Mode	[Normal]
Serial Port C Address	[3E8/IRQ10]
Serial Port D Address	[2E8/IRQ11]
Parallel Port Address	[378]
Parallel Port Mode	[ECP]
ECP Mode DMA Channel	[DMA3]
Parallel Port IRQ	[IRQ7]

Hardware Health Configuration	
H/W Health Function	[Enabled]

ACPI Configuration

Advanced ACPI Configuration

ACPI 2.0 Support	[No]
BIOS→AML ACPI table	[Enabled]
Headless mode	[Disabled]

DMI Event Logging

Remote Access Configuration

Remote Access	[Disabled]

USB Configuration

Legacy USB Support	[Enabled]
USB 2.0 Controller Mode	[HiSpeed]

Multiple Option ROM Configuration

On-board Intel LAN	[Enabled]
On-board Intel PXE	[Enabled]
Parallel CD-ROM Boot	[Disabled]
User ROM 3	[Disabled]
User ROM 4	[Disabled]
User ROM 5	[Disabled]
User ROM 6	[Disabled]
User ROM 7	[Disabled]

PCI/PnP Menu

Plug & Play O/S	[No]
PCI Latency Timer	[64]
Allocate IRQ to PCI VGA	[Yes]
Palette Snooping	[Disabled]
PCI IDE BusMaster	[Disabled]
OffBoard PCI IDE Card	[Auto]
DMA Channel 0	[Available]
DMA Channel 1	[Available]
DMA Channel 3	[Available]
DMA Channel 5	[Available]
DMA Channel 6	[Available]
DMA Channel 7	[Available]
Reserved Memory Size	[Disabled]

Boot Menu

Boot Settings Configuration	
Quick Boot	[Disabled]
Quiet Boot	[Enabled]
Boot Type	[Cold Boot]
AddOn ROM Display Mode	[Force BIOS]
Bootup Num-Lock	[On]
PS/2 Mouse Support	[Enabled]
Typematic Rate	[Fast]
System Keyboard	[Present]
Parity Check	[Disabled]
Boot To OS/2	[No]
Wait For 'F1' If Error	[Enabled]
Hit 'DEL' Message Display	[Enabled]
Interrupt 19 Capture	[Disabled]
Continuous POST	[Disabled]
After Power Failure	[Last State]
Boot Device Priority	
1st Boot Device	[IBA FE Slot 0441 v]
2nd Boot Device	[1st Floppy Drive]
3rd Boot Device	[IPS-SR244W]
4th Boot Device	[PM-ST320410A]

Hard Disk Drives	
1st Drive	[PM-ST320410A]
2nd Drive	[SM-ST320012A]
Removable Drives	
1st Drive	[1st Floppy Drive]
ATAPI CDROM Drives	
1st Drive	[PS-SR244W]
Initiate Pre-boot Services	[Hot Key]

Security Menu

Supervisor Password:	:Not Installed
User Password:	:Not Installed
Change Supervisor Password	[Enter]
Change User Password	[Enter]
Clear User Password	[Enter]
Boot Sector Virus Protection	[Disabled]

Chipset Menu

Intel Montara-GML NorthBridge Configuration	
Primary Video Device	[Auto]
Graphics Mode Select	[Enabled, 8MB1]
IGD – Device 2,Function 1:	[Enabled]
Boot Type	[CRT+LFP]
Flat Panel Type:	[800x600 LVDS]
TV Standard:	[Automatic]
NTSC Minor Standards:	[NTSC M]
PAL Minor Standards:	[PAL B]
SECAM Minor Standards:	[SECAM L]
Flat Panel Scaling:	[Auto]
Intel ICH4 SouthBridge Configuration	
ICH4 Dev31 Func1, IDE	[Enabled]
ICH4 Dev31 Func3, SMBUS	[Enabled]
ICH4 Dev31 Func5, AC'97	[Enabled]

ICH4 Dev29 Func8, USB#1	[Enabled]
ICH4 Dev29 Func1, USB#2	[Enabled]
ICH4 Dev29 Func2, USB#3	[Enabled]
ICH4 Dev29 Func7, EHCI	[Enabled]
MIDI Decode	[Disabled]
Adlib Range 388h-38Bh	[Enabled]
LPC 4Eh-4Fh Decode	[Enabled]
LPC 2Eh-2Fh Decode	[Enabled]
Onboard LAN	[Enabled]
IDAPIC	[Disabled]
Extended IDAPIC	[Disabled]
CPU B.I.S.T.	[Disabled]
ICH4 DMA Collection	[Disabled]
DMA-0 Type	[LPC DMA]
DMA-1 Type	[LPC DMA]
DMA-2 Type	[LPC DMA]
DMA-3 Type	[LPC DMA]
DMA-4 Type	[LPC DMA]
DMA-5 Type	[LPC DMA]
DMA-6 Type	[LPC DMA]
DMA-7 Type	[LPC DMA]

Chapter 4: Operating System Recovery

Introduction

This chapter discusses procedures how to recover the Operating System using the integrated or an external USB CD-ROM drive.

Note: It is also possible to perform a BIOS update using a network connection. Refer to the *NCR FitClient Software User's Guide* (B005-0000-1235) for information about that procedure.

Prerequisites

The following are required in order to perform an OS recovery from a CD.

- Bootable CD-ROM drive (internal or external)
- Keyboard

Connecting an External CD-ROM Drive

If your terminal contains an integrated CD-ROM, skip to *OS Recovery Procedures*.

1. Connect the external CD-ROM (2336-K208) drive to the *USB* connector on the terminal.
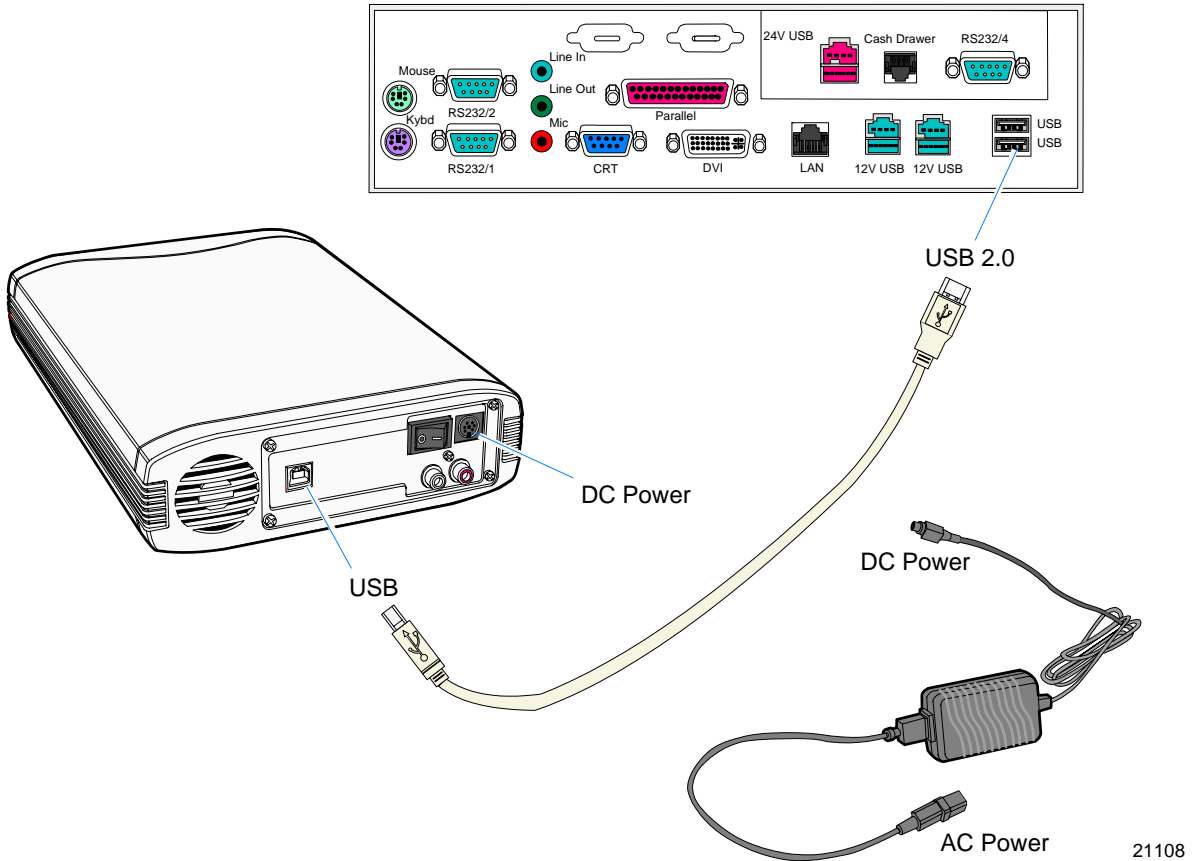
2. Connect the Power Supply to the CD-ROM and to an AC outlet.

3. Apply power to the CD-ROM drive (switch on the back).

OS Recovery Procedures

1. Apply power to the terminal.

2. Press **[DEL]** during boot to enter Setup.

3. At the Setup Utility menu, select **Advanced BIOS Features**.

4. Set the **First Boot Device** to **USB-CDROM**.

5. The **CDROM** selection is used when you want to boot from an internal CD-ROM drive.

6. Press **[Esc]** to return to the Setup Utility menu.

7. Select **Save and Exit Setup**.

8. As the system reboots, insert the *NCR Partition Image Application* CD (D370-0605-0100). You should see a message during boot, indicating that the CD-ROM has been recognized.

9. At the menu, enter **1** to select the image restore function.

    ```
    ###############################
       NCR Boot CD for Partimage
    ###############################

    Select an option
            1 – Restore an Image
            2 – Exit to a shell
    ```

10. At the prompt, insert the CD which contains the operating system image. Press **[Enter]**.

Windows 2000	D370-0586-0100
Windows NT	D370-0587-0100
Windows XPe	D370-0588-0100

11. At the prompt, press **1** (Yes) to *Continue*.

12. Press **[Enter]** to mount the CDROM, or **[*]** to cancel.

```
+------+ Automatic mount +------+
|                              |
| Please press "ok" to mount   |
| [/dev/cdrom] on [mnt/cdrom]  |
|                              |
|                              |
|          +----+              |
|          | Ok |              |
|          +----+              |
|                              |
+------------------------------+
```

Some Operating Systems occupy more than one CD. The restore program behaves differently between CDs, depending on which OS you are restoring:

Win2000: The program will pause when it is time to insert the next CD, displaying the *Automatic Mount* message. Insert the next CD and press **[Enter]** to continue.

WinNT: The program will pause when it is time to insert the next CD, without displaying any message. Press **[Ctrl-Q]** to continue. Insert the next CD and press **[Enter]** to continue.

13. Remove the CD from the drive.

Completing the OS Installation

Windows 2000

The system automatically reboots when the image recovery is complete and starts the software installation. This installation also installs most of the additional software and drivers included in the disk image. Complete the installation as follows.

1. Accept the license agreement.
2. Enter the *User Name* and *Organization*.
3. Enter the *Computer Name* for the client.
4. Enter the *Administrator's Account Password* (optional)
5. Login when prompted after the reboot.
6. Run the touch calibration (if using a touch screen).

Windows NT 4.0

The system automatically reboots when the image recovery is complete and starts the software installation. This installation also installs most of the additional software and drivers included in the disk image.

Note: The mouse port is disabled. You must use the keyboard to complete the installation. The mouse can be enabled later.

Complete the installation as follows.

1. Accept the license agreement.
2. Enter the *User Name* and *Organization*.
3. Enter the *Computer Name* for the client.
4. Enter the *Administrator's Account Password* (optional)
5. Login when prompted.
6. Run the touch calibration (if using a touch screen).

Windows XPe

The system automatically reboots when the image recovery is complete and opens at the Welcome screen.

Gold Disk Contents

This section describes the contents of each of the Gold Disk Images, including all the additions and changes that were made on top of the generic operating system.

For each operating system, NCR **strongly** recommends that the drivers placed in the c:\install directory be left there for the purposes of servicing and maintaining the system. If you are using the information in this section to build your own operating system image and not using NCR's provided OS Recovery image as a base image, then we recommend that all installed drivers be placed in a similar c:\install directory for support.

Microsoft Operating System License Agreements

When purchasing a workstation or kiosk preloaded with a Microsoft operating system, the application provider must follow certain license agreement guidelines. Listed below are some of the major points of Microsoft's "Embedded Software" agreement, which currently covers DOS, Win 3.11, Windows 95, Windows 98, Windows NT, Windows 2000, and Windows XPe.

- The end user application should not permit the user (typically a cashier) to exit the application so that they may be able to browse the operating system desktop, explorer, or other Microsoft operating system user interface elements. This does not apply to servicing, upgrading, or diagnosing problems for the workstation by services or field engineers. This restriction is meant to ensure that the end user is only permitted to navigate within the confines of the end user's application under normal operating conditions.

- The NCR OS Recovery image can only be used to recover or update systems with licenses procured from NCR.

Operating System Restrictions

Standby and Hibernate Mode Restriction

When using a 7402 terminal without a keyboard or mouse, the Windows 2000, Windows XP PRO, and Windows XP Embedded OS *Standby Mode* should be avoided. This mode places the hardware in a *low power state* that requires an interrupt to restart the processor.

The Windows 2000 and Windows XP Embedded Gold Disk Images disable *Standby Mode* on the 7402 terminal. ***This mode should not be used without a keyboard or mouse.***

Note: Hibernate Mode is not supported.

NCR 7402 Win2000OS Recovery Software
(LPIN: D370-0586-0100)

The *NCR 7402 Windows 2000 Operating System Recovery Software* provides the means of restoring the operating system to the terminal hard disk to the preinstalled state as shipped from the factory.

Installed Software:

- Microsoft Windows 2000 Professional w/ SP3
- Security Rollup Package (SRP) 1
- Microsoft Internet Explorer 6.0 with SP1 (6.0.2800.1106)
- Intel 85x Video driver (6.14.10.3606)
- Intel Control Panel
- RealTek Audio driver (5.10.0.4050)
- Intel Ethernet LAN driver (7.0.26.0)
- Intel ProSet diagnostic control panel application for LAN
- Windows Installer 2.0
- Intel Application Accelerator installed (2.11.15.)
- Intel Chipset Software Installation Utility installed (5.0.1.1015)

- Microsoft SNMP service installed but not activated
- Edgeport EPIC I/O Networks USB drivers available (2.30)
- 3M TouchWare driver available (5.64 SR 2)
- Hampshire USB Touch available (6.07)
- Promise Raid Card available

Software Drivers

The following drivers are not installed automatically, but can be installed from their respective locations (Readme files exist in these locations, as well):

- Edgeport USB   `C:\Install\Drivers\Edgeport USB`
- Hampshire USB Touch `C:\Install|Drivers\Hampshire USB Touch`
- Promise Raid Card   `C:\Install\Drivers\Promise Raid Card`

Special Settings

Furthermore, the following settings/revisions are configured:

- Sysprep.inf answer file and sysprep.bat batch file created to: Accept EULA, Preinstall the Product ID Number (PID)
- Gold Drive Identification in Registry
- Terminal Check utility to validate that the OS Recovery is only being installed on NCR workstations
- Dynamic resolution configuration utility
- Dynamic RS232 touch detection utility

Note: This product should only be used on NCR 7402 terminals with a Microsoft Windows 2000 license.

Recommendation

For each operating system, NCR strongly recommends that any drivers placed in the `C:\Install directory` be left intact for the purposes of servicing and maintaining the system. If you are using this information in order to build your own operating system image and not using NCR's provided OS Recovery image as a base image, we recommend that all drivers that are installed be placed in a similar `C:\Install` directory for support.

NCR RealPOS 7402 WinNT OS Recovery Software
(LPIN: D370-0587-0100)

The NCR 7402 Windows NT 4.0 Operating System Recovery Software provides the means of restoring the operating system to the terminal hard disk to the preinstalled state as shipped from the factory.

Installed Software:

- Microsoft Windows NT Workstation 4.0 w/ SP6a
- Microsoft Internet Explorer 6.0 SP1 (6.0.2800.1106 SP1)
- Intel Extreme Graphics Driver 2 13.2 Video (4.03.1381.3606)
- RealTek AC'97 Audio (ALC201A) (A3.35)
- Intel 82562 LAN driver(4.0.100.1124)
- Windows Installer (2.0)
- Backpack CD-Rom available (2.04)
- 3M TouchWare (5.64 SR2)
- Edgeport USB available (2.20)
- C&T Video available

Software Drivers

The following drivers are not installed automatically, but can be installed from their respective locations (Readme files exist in these locations, as well):

- Backpack CD-ROM   `C:\Install\Drivers\CDRom`
- Edgeport USB   `C:\Install\Drivers\USB`
- C&T Video   `C:\Install|Drivers\Video`
- Promise Card   `C:\Install\Drivers\Promiseraid`
- SIIG Card   `C:\Install\Drivers\SIIG`

Special Settings

Furthermore, the following settings/revisions are configured:

- Preinstalled NT to include the Product ID Number (PID)
- Placed the Gold Drive Part Number, Date Created, LPIN, and Release in Registry under:

  `HKey-Local_Machine\Software\NCR\Gold Drive`
- Ran Sysprep (so that the mini installation will run on initial boot) with the following parameters:

  - Automatically include PID
- Host.cmd set in RunOnce to update the registry
- Established a 2gb FAT16 primary system partition
- Established a secondary NTFS partition that fills the remainder of the drive
- Included necessary OS cab files in C:\Install
- Made SP6a folder available in C:\Install (installed)
- Made I386 folder available in C:\Install
- Installed MS SNMP, set to Manual
- Replaced the standard EULA with the NCR-specific EULA.
- TerminalCheck.exe in Run registry to determine correct hardware platform (otherwise it will shut down)
- Hide MS splash screen by adding `/noguiboot` parameter to boot.ini
- SerMouse device disabled
- Added `/noserialmice` to boot.ini
- Set resolution to 800x600
- Set colors to 65536
- Disabled MousClass service
- Updated C:\Install\drivers\touch folder to Microtouch 5.64 SR1
- 20.Manually added Com5

Note: This product should only be used on NCR 7402 terminals with a Microsoft Windows NT 4.0 license.

Recommendation

For each operating system, NCR strongly recommends that any drivers placed in the `C:\Install directory` be left in tack for the purposes of servicing and maintaining the system. If you are using this information in order to build your own operating system image and not using NCR's provided OS Recovery image as a base image, we recommend that all drivers that are installed be placed in a similar `C:\Install` directory for support.

NCR 7402 Windows XPe Operating System Recovery Software
(LPIN: D370-0588-0100)

The NCR 7402 Windows XPe Operating System Recovery Software provides the means of restoring the operating system to the terminal hard disk to the preinstalled state as shipped from the factory.

Installed Software:

- Microsoft Windows XPe w/ SP1
- Intel Extreme Video (6.14.10.3606)
- Intel Pro/100 LAN (7.0.26.0)
- Intel Chip Set Utility (5.01.1015)
- RealTek Audio Driver (5.10.0.4050)
- MicroTouch drivers available (5.64 SR1)
- Hampshire TSHARC USB Touch Drivers available (6.07)
- Edgeport USB drivers (2.30)
- Globetek drivers available (2.55.4.0)
- Promise FastTrak Raid Driver available (2.00.0.34)

Software Drivers

The following drivers are not installed automatically, but can be installed from their respective locations (Readme files exist in these locations, as well):

- 3M TouchWare   `C:\Install\Drivers\Touch`
- Globetek   `C:\Install\Drivers\Camera`
- Hampshire USB Touch `C:\Install|Drivers\Hampshire_ USB_Touch`
- Promise Raid Card   `C:\Install\Drivers\Promise Raid`

Special Settings

Furthermore, the following settings/revisions are configured:

- Preinstalled XPe to include the Product ID Number (PID)
- Placed the Gold Drive Part Number, Date Created, LPIN, and Release in Registry under:
  HKey-Local_Machine\Software\NCR\Gold Drive
- Established a NTFS primary system partition that fills the entire drive
- Installed RealTek Audio Driver
- Installed Intel Chipset Utility
- Installed Intel LAN Driver
- Set virtual memory to 384
- Added NCR-specific EULA

Note: This product should only be used on NCR RealPOS 80/80c terminals with a Microsoft Windows XPe license.

Recommendation

For each operating system, NCR strongly recommends that any drivers placed in the C:\Install directory be left intact for the purposes of servicing and maintaining the system. If you are using this information in order to build your own operating system image and not using NCR's provided OS Recovery image as a base image, we recommend that all drivers that are installed be placed in a similar C:\Install directory for support.

Chapter 5: BIOS Updating Procedures

Introduction

This chapter discusses procedures how to update the terminal BIOS by using the parallel CD-ROM drive. The software is distributed on bootable CD-ROM media. The drivers that are necessary to run the CD-ROM are temporarily installed during boot.

It is also possible to perform a BIOS update using a network connection. Refer to the *NCR FitClient Software User's Guide* (B005-0000-1235) for information about that procedure.

Crisis Recovery

In the event the BIOS becomes corrupt, such as the result of a power failure during the BIOS Update procedure, you can use the method discussed later in this chapter in the **BIOS Crisis Recovery** section to recover the BIOS.

Prerequisites

The following are required on the 7402 in order to perform a BIOS update using a CD.

- Bootable CD-ROM drive (2336-K024)
- Keyboard

  NCR 7402 BIOS and BIOS Update Software
  (LPIN: A370-0056-0100)

Connecting an External CD-ROM Drive

If your terminal contains an integrated CD-ROM, skip to *Updating Procedures*.

4. Connect the external CD-ROM (2336-K208) drive to the *USB* connector on the terminal.
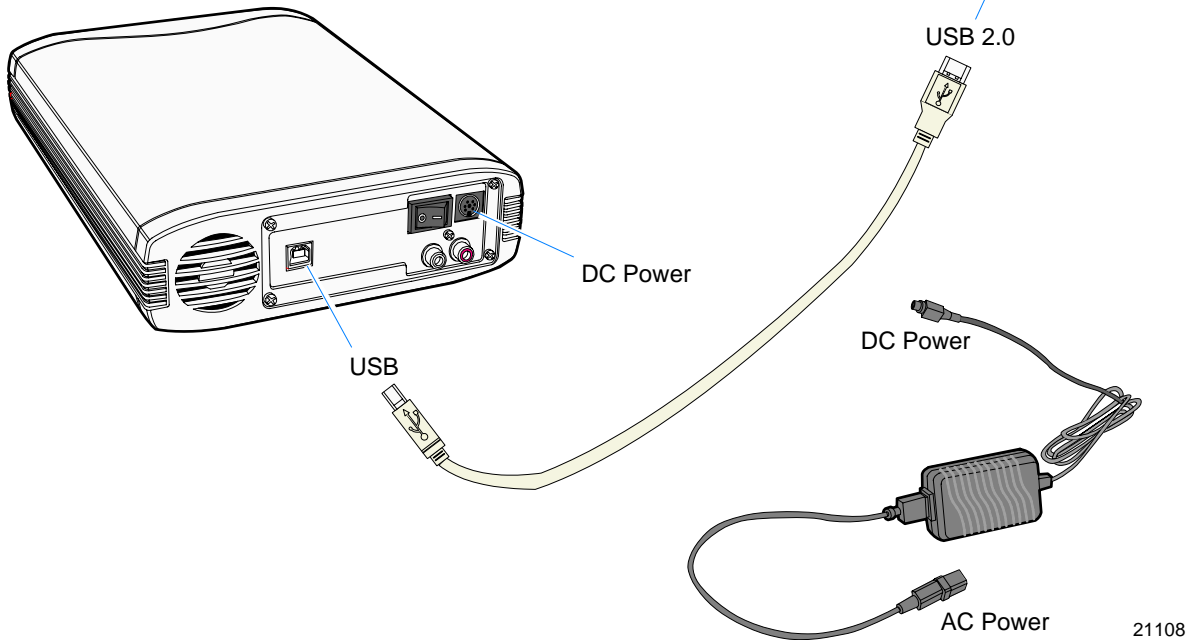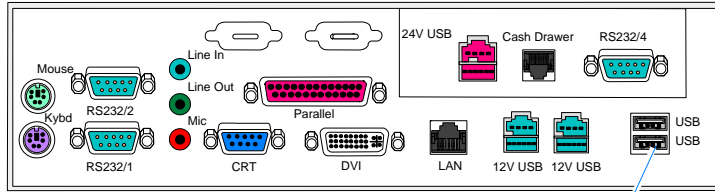
5. Connect the *Power Supply* to the CD-ROM and to an AC outlet.

Updating Procedures

1. Apply power to the terminal.

2. Press **[DEL]** during boot to enter Setup.

3. In the *Advanced* menu, select **I/O Device Configuration**.

4. Verify that the **LPT 1 Mode** is set to **ECP**.

5. Go back to the *Advanced* menu, select **Multiple ROM Menu**.

6. Set the **Parallel CD-ROM Boot** to **Enabled**.

7. In the **Exit** menu, select **Save Changes** and reboot.

8. Insert the media containing the BIOS update onto the spindle.

   NCR 7402 BIOS and BIOS Update Software
   (LPIN: A370-0056-0100)

9. Follow the screen prompts on the client to update the BIOS. You can select two methods to run the update program.

   • Automatic BIOS Update – update process runs unattended

     Note: You will see a prompt for terminal model and serial number information if the program detects invalid information in the current BIOS, or if you are replacing the processor board, in which case there is not model/serial number information in the BIOS.

     Important: Model/Serial Number is mandatory.

   • Interactive BIOS Update – permits you to input/replace the model/serial number information that is stored in the BIOS.

     Note: Model/Serial number data that is currently stored in the BIOS is displayed during power up.

10. You should see a green window, indicating a successful update.

11. Remove the CD.

12. Press any key to reboot.

13. When the system reboots, press **[F2]** (7402-3xxx) or **[DEL]** (7402-4xxx) during boot to enter Setup.

14. In the **Exit** menu, select **Load Setup Defaults**.

15. Go to the **Advanced** menu and set **Reset Configuration Data** to [**Yes**].

16. Exit Setup and Save Changes.

BIOS Crisis Recovery

The procedures below provide a way to restore the BIOS resulting from a non-recoverable condition.

Note: Use this BIOS crisis recovery procedure only for a **NON-RECOVERABLE** BIOS failure. A non-recoverable BIOS state typically results from power loss during a flash BIOS update process. This is a rare occurrence and should not be confused with other hardware errors that cause a *no video* state. **This procedure is not intended to be used for changing or upgrading an operational BIOS**.

Required Hardware

Part Number	Part Name	Use
	PC with an RS-232 port	Download BIOS
497-0408349	Cable, 9-Pin Female to 9-Pin Female RS232	PC to terminal connection
497-0413418	Parallel Dongle	Forces BIOS recovery

Required Software

Acquire the following software from NCR.

NCR 7458-4xxx BIOS and BIOS Update Software
(LPIN: A370-0056-0100)

Recovery Procedures

1. Connect the Parallel Dongle to the parallel connector on the
    terminal.

2. Connect the two machines with an RS-232 cable. Use COM1 on
    both machines.
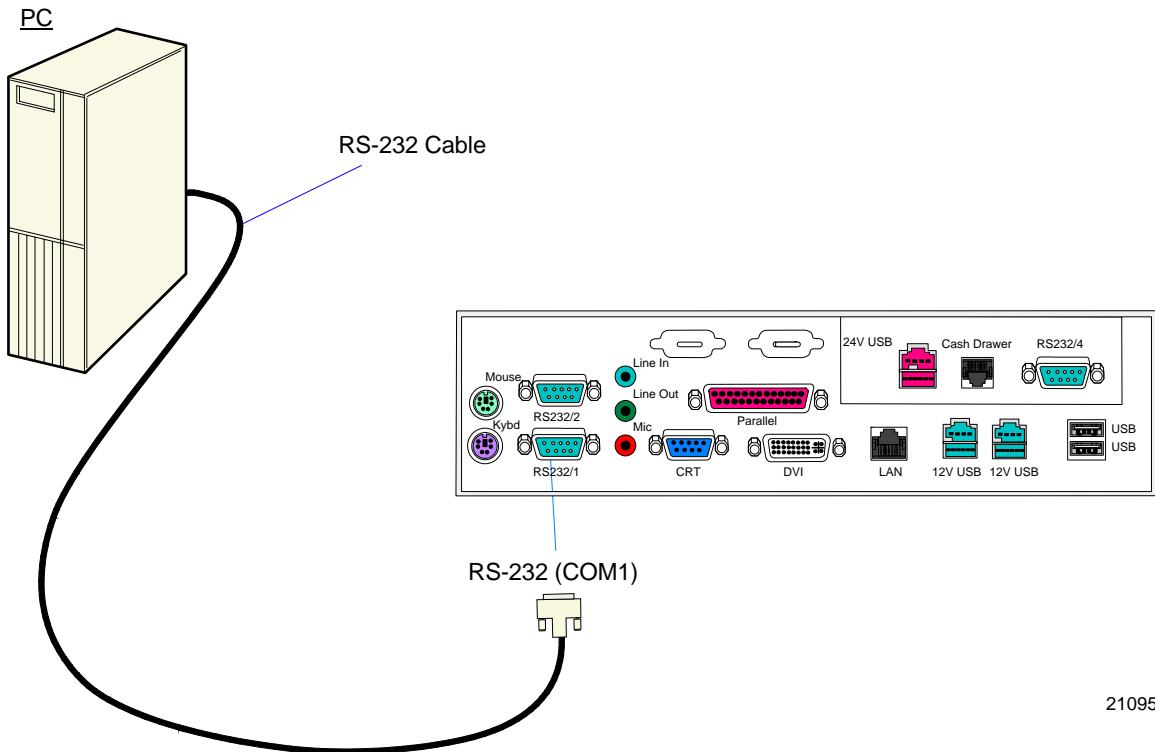
3. Boot the PC in the DOS mode. (If you are using CD-ROM media
    boot with CD-ROM support drivers.)

    Note: The PC must be running in the DOS mode (not in a
    Windows DOS box) for the software to operate correctly.

4. Insert the BIOS update CD into the PC.

5. Apply power to the terminal.

6. On the PC, change directory to the CD-ROM drive.

```
E: [Enter]
```

7. Enter the update command:

```
EMBflash [Enter]
```

8. Select the number for the 7402 terminal from the menu list:

```
1) 7454
2) 7401
3) 7452
4) 7453
5) 7455
6) 7460
7) 7451
8) 7456
9) 7458

9 [Enter]
```

A blue screen displays as the program runs, showing the program progress, followed by a green screen, indicating a successful load.


```
        ┌──────── PhoenixPhlash Status ────────┐
        │                                       │
        │                                       │
        │  Flash memory has been successfully programmed │
        │                                       │
        │                                       │
        │         PRESS ANY KEY TO EXIT         │
        │                                       │
        └───────────────────────────────────────┘
```
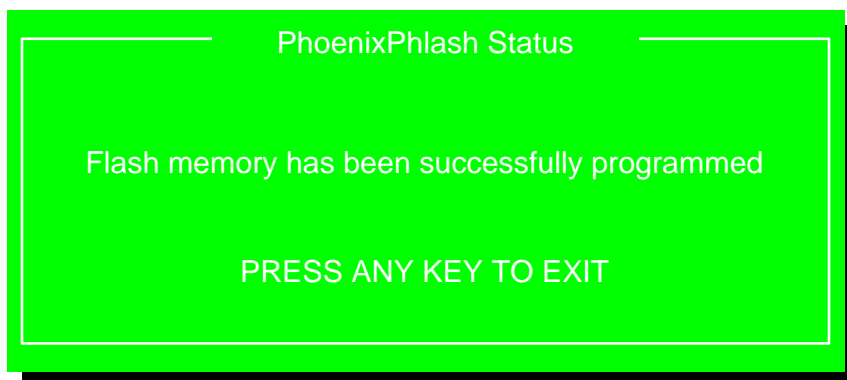
19502

The Class/Model/Serial # information is deleted using the Crisis Recovery procedure.

Use the normal BIOS update procedures as discussed earlier in this chapter to restore the information.

Cable/Connector Pin-Out Information

Parallel Dongle

25-Pin D-shell Receptacle
(Viewed from wiring side)

| 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

| 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |

19513

RS-232 Cable

P1   P2

9-Pin
D-shell
Receptacle

9-Pin
D-shell
Receptacle

1		1
2		2
3		3
4		4
5		5
6		6
7		7
8		8

P1   P2
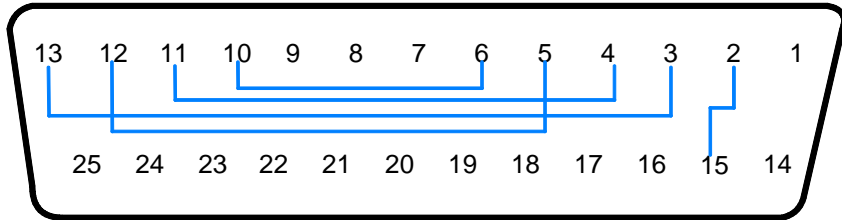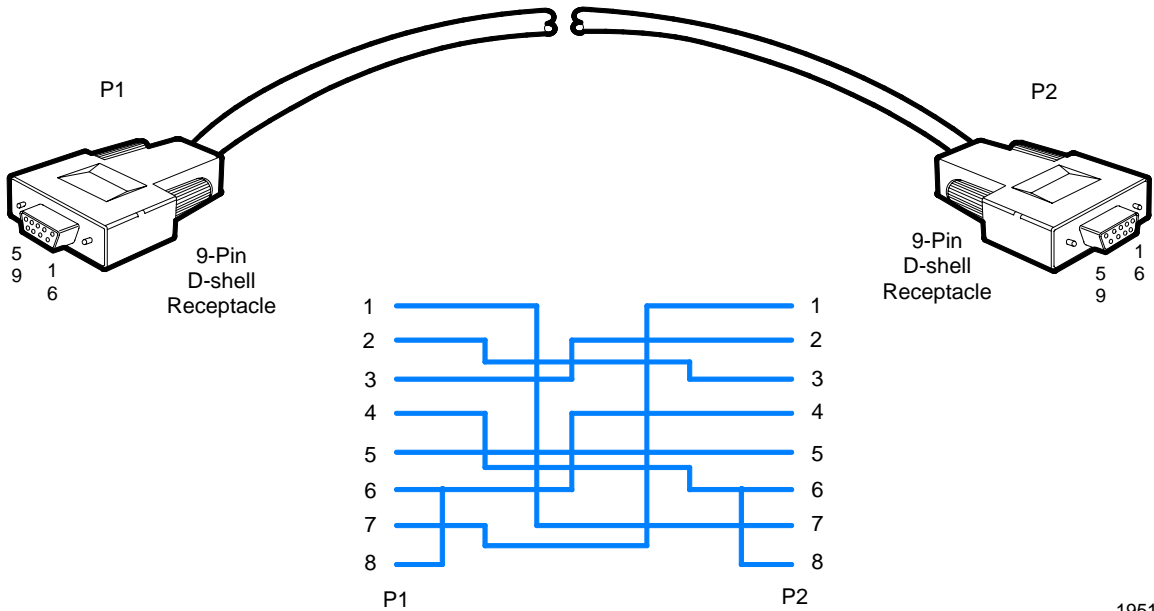
19512

Chapter 6: 2x20 Customer Display

Introduction

The 2x20 Customer Display consists of a Vacuum Florescent Display (VFD) with two rows of twenty 5x8 dot matrix characters, an RS-232 serial interface, driver circuitry, DC to DC/AC converter, and a character generator.

General Specifications

Item	Value
Number of characters	2 Rows x 20 Characters
Character Configuration	5x8
Character Height	8.86 mm
Character Width	3.90 mm
Character Pitch	5.15 mm
Line Pitch	9.64 mm
Peak Wavelength of Illumination	505 mm
Luminance	350 Cd/m2 (102 fL) (Minimum), 700 Cd/m2 (204 fL) (Typical)

Serial Communication Interface

The display receives commands and data from the host using an RS-232 serial interface, framed at 9600 baud, 8 data bits, no parity, and one stop bit.

Command Codes

User Defined Character Definition (08h, CODE, Byte1…Byte5)

This command defines a user defined character (UDC). The UDC character code is set by the CODE byte and must be 00H to 07H. All other values for CODE will this command. The five bytes following a valid CODE byte define the character. D1 through D40 represent the character dots. A (1) indicates the dot is on and (0) indicates the dot is off in the following format:

D1	D2	D3	D4	D5
D6	D7	D8	D9	D10
D11	D12	D13	D14	D15
D16	D17	D18	D19	D20
D21	D22	D23	D24	D25
D26	D27	D28	D29	D30
D31	D32	D33	D34	D35
D36	D37	D38	D39	D40

5 x 8 Dot Matrix Character

BYTE#	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	D1	D2	D3	D4	D5	D6	D7	D8
2	D9	D10	D11	D12	D13	D14	D15	D16
3	D17	D18	D19	D20	D21	D22	D23	D24
4	D25	D26	D27	D28	D29	D30	D31	D32
5	D33	D34	D35	D36	D37	D38	D39	D40

Character Table Select (09h, TABLE CODE)

This command selects which character table to display. The TABLE CODE byte determines the character set as defined in the table below. If bits 0 to 3 are all zero then this command is ignored. When a new character table is selected all characters on the display will be updated to display the character of the new table. After a reset the character table is set to Table 1.

Table Code	Character Table
01h	Table 1
02h	Table 2
03h	Table 3
04h	Table 4

Clear Display (12h)

This command sets all 40 characters to 20h (space) and moves the cursor to the first position of the top line.

Luminance Control (11h, LUMINANCE)

This command selects the display luminance. The LUMINANCE byte sets the display luminance level as defined in the table below. This command is ignored if the LUMINANCE byte is 00h.

LUMINANCE	Display Luminance
01h	25%
02h	50%
03h	75%
04h	100%

Cursor Position (10h, POSITION)

This command sets the cursor position. The POSITION byte moves the cursor position according to the table below. The next character byte writes to the new position and the cursor auto-increments to the next position. This command is ignored if the POSITION byte value is greater than 27h.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	00h	01h	02h	03h	04h	05h	06h	07h	08h	09h	0Ah	0Bh	0Ch	0Dh	0Eh	0Fh	10h	11h	12h	13h
2	14h	15h	16h	17h	18h	19h	1Ah	1Bh	1Ch	1Dh	1Eh	1Fh	20h	21h	22h	23h	24h	25h	26h	27h

Reset (13h)

This command resets the module to the following conditions:

- 100% luminance
- All 5x8 dot matrix characters set to 20h (space)
- Cursor position set to 00h
- Character table set to Table 1
- All user defined characters cleared

Character Tables and Codes

Data is written to the display one byte at a time. If the byte received is greater than 1Fh it is considered as 5x8 dot matrix character data. This character is written to the current cursor position and the cursor position is then incremented by one. When data is written to the last character position of the top line the cursor position moves to the first position of the bottom line. When data is written to the last character position of the bottom line the cursor position moves to the first position of the top line.

CP437

CP858

UPPER MIDDLE / LOWER MIDDLE	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	UDC CHAR (0)															
xxxx0001	UDC CHAR (1)															
xxxx0010	UDC CHAR (2)															
xxxx0011	UDC CHAR (3)															
xxxx0100	UDC CHAR (4)															
xxxx0101	UDC CHAR (5)															
xxxx0110	UDC CHAR (6)															
xxxx0111	UDC CHAR (7)															
xxxx1000																
xxxx1001																
xxxx1010																
xxxx1011																
xxxx1100																
xxxx1101																
xxxx1110																
xxxx1111																

CP866

CP932

Chapter 7: Cash Drawer Interface

Introduction

This document is intended to be a guide for writing software to use the 7402 cash drawer interface. It is intended to assist software engineers to design and code software to control the cash drawer port. This is not a specification on the cash drawer interface. The sample code included has not been compiled or tested but can be helpful in coding the cash drawer interface.

The 7402 cash drawer interface has unique signals to:

- control the cash drawer solenoid(s) for up to 2 cash drawers.
- enable the arming of an external driving circuit.
- for reporting the status of the drawer, either open or close (input signal).

Logic Description

long Initialize( );
Initialize () creates the mutex handles and opens the NCR port driver if the OS requires it.

void Terminate();
Terminate() closes the handles to the mutexes and the NCR port driver if opened.

long OpenPort();
OpenPort () initializes the port by calling *QueryConf()* and sets the solenoid control bits and the arming bit to inputs.

long OpenDrawer();

> *OpenDrawer ()*, sets the control bits to output, enables the arming circuitry using the arm bit, energizes the solenoid of the selected drawer, waits a constant time, then releases the cash drawer solenoid(s) bit(s) and disables the arming circuit. These output bits are then configured as inputs again. This method uses *SetState*() for controlling the drawer. See the section on Hardware/Firmware Interfaces for more detail.

void ClosePort();

> *ClosePort()* resets the port opened status flag to false.

DWORD GetDrawerStatus();

> *GetDrawerStatus ()*, reads from the port that monitors the cash drawer status bit and masks unused bits to determine the drawer state. This method uses *ReadIOPort* () for monitoring the status bit. See the section on Hardware/Firmware Interfaces for more detail.

BOOL SetState(DWORD dwState);

> *SetState ()*, uses the constant masks to create the data to write to the port that control the cash drawer solenoid(s) bit(s). This method uses *WriteIOPort* () for controlling the solenoid(s). See the section on Hardware/Firmware Interfaces for more detail.

BOOL QueryConf();

> In *QueryConf()*, we must initiate a configuration cycle with the PCI registers that control the cash drawer solenoid(s) and monitor the status bit. Interaction with GP*IO_BASE (General Purpose I/O Base Address Register)* takes place in order to determine the port address used for controlling the solenoid(s) and for monitoring the status bit. See the section on Hardware/Firmware Interfaces for more detail.

BOOL WriteIOPort(DWORD databytes, WORD ioport);

> *WriteIOPort ()*, writes data to the port that control the cash drawer solenoid(s) bit(s). This method uses the port address obtained in *QueryConf*() for controlling the solenoid(s). See the section on Hardware/Firmware Interfaces for more detail.

BOOL ReadIOPort(DWORD *databytes, WORD ioport);

> *ReadIOPort ()*, reads from the port that monitors the cash drawer status bit. This method uses the port address obtained in *QueryConf*() for monitoring the status bit. See the section on Hardware/Firmware Interfaces for more detail.

Component Architecture

The developer should provide a description, either textually or diagrammatically (i.e., block diagram), of how the components of the module subsystem interact in this sub-section.

The member function *Initialize()* is subsequently called to open the NCR Windows NT port driver (if applicable) and perform other initialization tasks. Then, the device's *OpenPort()* member function is called to make the device available, at which time *QueryConf()* is called.

Once the device has been configured, the member functions *OpenDrawer(), GetDrawerStatus() and SetState()* can be called to interact with the cashdrawer. These methods themselves invoke the member functions *WriteIOPort()* and *ReadIOPort()* to actually send and receive data to the cashdrawer via the port addresses obtained in *QueryConf()*.

Code Changes

Following is an enumeration of the code changes needed to support the 7402:

The interface of the new device supports two separate fields for GPIO select port address (read/write) and solenoid and status bit port address (read/write). The chip GPIO bits must be selected for use as GPIO and as either input or output.

It is desired that the driving circuit be disabled at power on and when not actively driving the solenoid. Two output control implementations will be used:

1. Use the *m_nIOPort_Select* address register to set the solenoid bit to an output function before driving the bit high using *m_nIOPort*, set the solenoid bit low after the charging time and then setting the bit function to input using *m_nIOPort_Select*.

2. Use the arming bit at address *m_nIOPort* to enable an external driving circuit, set the solenoid bit high, set the solenoid low after the charge time and finally disable the arming bit.

QueryConf():

> *QueryConf()* uses the PCI configuration cycle protocol at Bus 0, Device 31 and Function 0 and offset 0x58 to obtain the contents of *GPIOBase* register. When *GPIOBase* is referenced in the following paragraphs it is referring to the contents of register *GPIOBase [15:6]*. The primary differences are:
>
> a. One port address needs to be configured for reading the status bit and reading/writing to control the cash drawer solenoids, and if necessary the ARM bit using register GPIO Level for Input or Output 2 Register (GP_LVL2) offset *GPIOBase* + 0x38.
>
> b. GPIO must be selected for use as GPIO through register GPIO Use Select 2 Register (GPIO_USE_SEL2) offset GPIOBase + 0x30.
>
> c. GPIO bits used by the cash drawer must be selected as either input or output through GPIO Input/Output Select 2 Register(GP_IO_SEL2) GPIOBase + offset 0x34.
>
> d. An ARM bit may need to be setup as output and controlled with the solenoid and status port address. This bit enables the driving circuit for the solenoid outputs.

Hardware/Firmware Interfaces

In some previously supported models, no preliminary interaction with the hardware was required to determine the port address(s) used for communication with the cash drawer; these data were instead obtained from the registry. For the 7402, the port address is set dynamically by the BIOS and hence the hardware must be queried to obtain this information. This dictates the need for the generation of a configuration cycle as described previously.

Configuration mechanism one utilizes two 32bit I/O ports located at addresses 0x0CF8 and 0x0CFC. These two ports are:

- 32-bit configuration address port - occupying I/O addresses 0x0CF8 through 0x0CFB.
- 32-bit configuration data port - occupying I/O addresses 0x0CFC through 0x0CFF.

Accessing a PCI function's configuration port is a two step process:

- Write the target bus number, physical device number, function number and doubleword number to the configuration address port
- Perform an I/O read from or a write to the configuration data port.

The ICH4 Configuration Address Register should be defined as follows:

- Configuration Space Mapping enabled
- Bus number 0
- Device number 31
- Function number 0
- GPIO base register offset address 0x58

Within the ICH4, the General Purpose I/O ports are addressed using an offset read from the GPIO Base Address Register, [GPIOBASE] (offset 0x58). The base address included in Bits [15:6] is assigned by the BIOS. The GPIO Control Register [GPIO_CNTL] (offset 0x5C) has a R/W bit [4] that enables(1)/disables(0) the decode of the I/O range pointed to by the GPIO Base register and enables/disables the GPIO function. The GPIO Control Register is set by the BIOS to enable GPIO.

Intel® 82801DB ICH4 Datasheet

GPIO_USE_SEL2—GPIO Use Select 2 Register

Offset Address: GPIOBASE +30h Attribute: R/W
Default Value: 00000FFFh Size: 32-bit
Lockable: No Power Well: Core
Bit Description
31:0

GPIO_USE_SEL2[43:32] — R/W. Each bit in this register enables the corresponding GPIO (if it exists) to be used as a GPIO, rather than for the native function.

   0 = Signal used as native function.

   1 = Signal used as a GPIO.

For 7402, cash drawer bits GPIO_USE_SEL2 [35:32] will be set =1 for use as a GPIO, write value = read value ANDed with 0xF.

After a full reset (RSMRST#) all multiplexed signals in the resume and core wells are configured as their native function rather than as a GPIO. After just a PCIRST#, the GPIO in the core well are configured as their native function.

LPC Interface Bridge Registers (D31:F0)

GP_IO_SEL2—GPIO Input/Output Select 2 Register

Offset Address: GPIOBASE +34h Attribute: R/W
Default Value: 00000000h Size: 32-bit
Lockable: No Power Well: Core

GP_LVL2—GPIO Level for Input or Output 2 Register

Offset Address: GPIOBASE +38h Attribute: R/W
Default Value: 00000FFFh Size: 32-bit
Lockable: No Power Well: See below
Bit Description
31:12 Always 0. No corresponding GPIO.
11:0

GP_IO_SEL2[43:32] — R/W. When set to a 1, the corresponding GPIO
signal (if enabled in the GPIO_USE_SEL2 register) is programmed as
an input. When set to 0, the GPIO signal is programmed as an output.
Bit Description
31:12 Reserved. Read-only 0
11:0

GP_LVL2[43:32] — R/W. If GPIO[n] is programmed to be an output
(via the corresponding bit in the GP_IO_SEL2 register), then the
corresponding GP_LVL2[n] bit can be updated by software to drive a
high or low value on the output pin. 1 = high, 0 = low. If GPIO[n] is
programmed as an input, then the corresponding GP_LVL2 bit reflects
the state of the input signal (1 = high, 0 = low). Writes will have no
effect.

Since these bits correspond to GPIO that are in the core well, these bits
will be reset by PCIRST#.

Three GPO bits and one GPI bit of South Bridge ICH4 are used to
control the cash drawer(s). They are defined below:

GPIO 32 CD_SW_AB
   Input 1, high Drawer(s) closed. Input 0, low Drawer(s) open.

GPIO 33 CD_SOL_A
   Output 0, low turn off solenoid A. Output 1, high Activates
   Solenoid A.

GPIO 34 CD_SOL_B
   Output 0, low turn off solenoid B. Output 1, high Activates
   Solenoid B.

GPIO 35 CD_ARM

> Output 0, low Drawer(s) solenoid signals enabled. Output 1, high disabled.

There is only one cash drawer status signal CD_SW_AB. It is the status of either cash drawer or both cash drawers.

Dependencies/Assumptions/Constraints

Hardware Dependencies

Constraint: For systems in which two cashdrawers are in use on the Darlington, the drawers must share a status bit using a 'Y' cable.

Software Dependencies

NCR Windows NT Port Driver (NCRKMPDR.sys).

Sample Code

CPP Source File: DarlingtonCDSample.cpp

```
long Initialize( )
{

    // Init -- I/O Port -- Standard Configuration Register Address for PCI
Devices
   m_nIOConf = 0x0CF8;

    // Read -- I/O Port -- If these defaults are left unchanged, errors will be
reported
   m_nIOPort  = 0;  // R/W port for solenoid bits and status
   m_nIOPort_select = 0;  //R/W port for selecting GPIO Input/Output config

    m_nDrawerNumber = 1;  //Default


      m_bPortDrvr = FALSE;

      // determine if OS is WIN95 or WINNT
      if (GetVersion() < 0x80000000)
      {
      m_nOSVersion = OS_WINDOWS_NT;
      // Lock Mutex when accessing shared memory TAR 95236
      WaitForSingleObject( g_hSharedMemoryMutex, INFINITE );

      if ( g_hPortDrvr == NULL )
```

```
     {
          // -rtf- Create a security attribute allowing global access
          GetGlobalSA( _T("CreateFile"), _T("NCRKPDev"), &m_Attributes, &m_SD
);

          g_hPortDrvr = CreateFile(
                  "\\\\.\\NCRKPDev",                // Open the Device "file"
                  GENERIC_WRITE | GENERIC_READ,
                  FILE_SHARE_READ | FILE_SHARE_WRITE,
                  (LPSECURITY_ATTRIBUTES) &m_Attributes,  // no security
                  OPEN_EXISTING,
                  0,                               // flags
                  NULL);

          if (g_hPortDrvr == INVALID_HANDLE_VALUE)  // Was the device opened?
          {
              DWORD hr = GetLastError();

              m_bPortDrvr = FALSE;

              InitError = TRUE;
          }

          else
          {
           m_bPortDrvr = TRUE;
          }

     }   // end if (g_hPortDrvr==0)


     ReleaseMutex( g_hSharedMemoryMutex );

    }// WINNT OS

     else
     {
       m_nOSVersion = OS_WINDOWS_95;
     }


    } // end if (!InitError)


    // if the (OS is WINNT AND the port driver was opened )
    if ( !InitError )
    {

        // Create a security attribute allowing global access
        GetGlobalSA( _T("mutex"), sData, &m_Attributes, &m_SD );
```

```
    // Lock Mutex when accessing shared memory
    WaitForSingleObject( g_hSharedMemoryMutex, INFINITE );

    g_hHWPortMutex = CreateMutex( &m_Attributes, FALSE, (LPCTSTR) sData );

        if ( g_hHWPortMutex != NULL )
        {

         m_pDC->DCPrintf(
                       DCM_APIHIGH,
                       _T(" ..create m_hPowerMutex") );
       // Create a security attribute allowing global access
       GetGlobalSA( _T("mutex"), _T("NCRPowerSharingMutex"), &m_Attributes,
&m_SD );

           // create named mutex that prevents the cash drawer from firing
           // when the printer is printing
           // "NCRPowerSharingMutex"
           m_hPowerMutex = CreateMutex( &m_Attributes, FALSE,
_T("NCRPowerSharingMutex") );

        }  // HWPortMutex created

     }

     ReleaseMutex( g_hSharedMemoryMutex );    // TAR 95236

      }  // OS is WIN95 or WINNT and NCRKPDev driver present


    return RetStatus;
}
```

```
/////////////////////////////////////////////////////////////
void Terminate()
{

  if ( m_bInitialized )
  {
    // Lock Mutex when accessing shared memory
    WaitForSingleObject( g_hSharedMemoryMutex, INFINITE );

    CloseHandle( m_hPowerMutex );
    CloseHandle( g_hHWPortMutex );      // TAR 95236

    // if the NT port driver was opened...
        if (m_bPortDrvr )
      {
            // close the file handle
            m_bPortDrvr = FALSE;
            g_nPortDrvr=0;   // Dec to zero using and close handle
            CloseHandle(g_hPortDrvr);
            g_hPortDrvr = NULL;

      }
    m_bInitialized = FALSE;

  ReleaseMutex( g_hSharedMemoryMutex );
  }
}

/////////////////////////////////////////////////////////////
long OpenPort()
{
  CString sData;
  long RetStatus;
  CString Result;
  static TCHAR szIOPort[] = _T("Port");

  // Get the IO H/W Configuration to set IOPORT addresses

  // If other of same type exists then use same IOPort addresses
      QueryConf(); // Sets IOPORT addresses based on H/W configuration

    // initialize state
      DWORD sBytes=0;
      DWORD bMask = ~(CD7402DRWR1SOLENOID | CD7402DRWR2SOLENOID); // Set
Solenoid bits LOW
      bMask = bMask | CD7402ARM_OFF; // set solenoid bits low and arm bit high

      // **program solenoid bits as inputs to start
      if ( !ReadIOPort(&sBytes, m_nIOPort_select) )
    {
      // Error logged in ReadIOPort
```

```
      RetStatus = CDD_E_IOFAILURE;
      Result = _T("I/O read operation failed");
     }
     else if ( !WriteIOPort( sBytes | CD7402SELECT_GPI,
                             m_nIOPort_select))  // Darlington 1 = select input
     {
      // Error logged in WriteIOPort
      RetStatus = CDD_E_IOFAILURE;
      Result = _T("I/O write operation failed");
     }

     //** set solenoid bits de-activated, even though they are supposed to be
 inputs now
     if ( !ReadIOPort(&sBytes, m_nIOPort) )
     {
      // Error logged in ReadIOPort
      RetStatus = CDD_E_IOFAILURE;
      Result = _T("I/O read operation failed");
     }
      // Darlington 0 = solenoid de-activated, 1 = ARM de-activated
     else if ( !WriteIOPort( sBytes & bMask,
                             m_nIOPort))
     {
      // Error logged in WriteIOPort
      RetStatus = CDD_E_IOFAILURE;
      Result = _T("I/O write operation failed");
     }
     else
     {
      RetStatus = CDD_SUCCESS;
      Result = _T("Success");

      m_bIFOpened = TRUE;      //InterFace is OPENed

      // initialize Position variable in aCDData array element
      GetDrawerStatusLIO();

     }

   return RetStatus;

 }
```

```
/////////////////////////////////////////////////////////////////////
void ClosePort()
{

  if ( m_bIFOpened )
  {
    m_bIFOpened = FALSE;
  }

}


/////////////////////////////////////////////////////////////////////////////
// CDevice7402::OpenDrawer [called from polling thread]

long OpenDrawer()
{
  long RetStatus;
  CString RetString;

  WaitForSingleObject( g_hHWPortMutex, INFINITE );   // TAR 95236

  if ( m_bIFOpened )
  {
    WaitForSingleObject( m_hPowerMutex, INFINITE );

    // Set Device in RELEASE State
    if ( SetState( STATE_RELEASE ) )
    {
      // Give time for Drawer to see the RELEASE state change, then
      // check the drawer position.
      Sleep( CD7402_OPEN_WAIT );

      // Set Device in IDLE State
      if ( SetState( STATE_IDLE ) )
      {
        if (( GetDrawerStatusLIO() == DRAWER_OPENED ) ||
         ( m_pCashDrawer->m_bCapStatus == FALSE))   // no drawer status
available return success
        {
          RetStatus = OPOS_SUCCESS;
        }
        else
        {
          RetStatus = OPOS_E_TIMEOUT;
        }
      }//SetState( STATE_IDLE )
      else
      {
        RetStatus = OPOS_E_NOEXIST;
```

```
      }
    }//SetState( STATE_RELEASE )
    else
    {
      RetStatus = OPOS_E_NOEXIST;
    }

    ReleaseMutex( m_hPowerMutex );
  }

  ReleaseMutex( g_hHWPortMutex );

  return RetStatus;
}


/////////////////////////////////////////////////////////////////////////////
// CDevice7402::GetDrawerStatus [called from polling thread]
//
// Return Value:    DrawerStatus
//          DRAWER_OPENED
//          DRAWER_CLOSED
//
DWORD GetDrawerStatus()
{
  int Result;
  CString ResString;
  DWORD bMask;

  Result = DRAWER_INVALID;
  ResString = _T("INVALID");

  if ( m_bIFOpened && ( m_pCashDrawer->m_bCapStatus) )  // Opened and Drawer
status is available
  {
    switch( m_nDrawerNumber )
    {
      case 1:
        bMask = CD7402DRWR1CLOSED;
        break;

      case 2:
        bMask = CD7402DRWR2CLOSED;
        break;
    }

    DWORD sBytes;

    // if the status clear was successful, we will read a closed drawer
    BOOL sResult = ReadIOPort(&sBytes, m_nIOPort);
```

```
      if ( sResult )
      {
        if ( sBytes & bMask )  // bit = 1 means drawer CLOSED for DARLINGTON
        {
          ResString = _T("CLOSED");
          Result = DRAWER_CLOSED;
        }
        else
        {
          ResString = _T("OPENED");
          Result = DRAWER_OPENED;
        }
      }//sResult
   }

   return Result;

}

/////////////////////////////////////////////////////////////////////////////
// CDevice7402::SetState

BOOL SetState( DWORD dwState )
{
     // Fire cashdrawer mechanism by setting drawer to the RELEASE State.

     // Can't open both cash drawers at the same time. Must set H/W mutex
     // in OpenDrawerLIO() around SetState(RELEASE) and SetState(IDLE) to
     // insure this.

   // To engage solenoid, we must set the solenoid bit HIGH and the ARM bit
   // LOW.  The ARM bit controls the external arming circuit to drive the
   // solenoid.

     CString sState;

     DWORD bMask;
     DWORD sBytes = 0;
     DWORD oBytes = 0;
     BOOL  result = TRUE;
   // Read select register
   // Solenoid GPIO bits and ARM bit have been set to input when not using.
   if ( ReadIOPort(&sBytes, m_nIOPort_select) )
   {

       // solenoid bits  and ARM bit as outputs, Low enables output
       sBytes = sBytes & CD7402SELECT_GPO;
       result = WriteIOPort( sBytes, m_nIOPort_select );
   }

   else      // Error logged in ReadIOPort
```

```
        result = FALSE;
    if(result)
    {
        switch( m_nDrawerNumber )
        {
          case 1:
              // set solenoid bit high, arm bit low
            bMask = CD7402DRWR1SOLENOID;
            break;

          case 2:
            bMask = CD7402DRWR2SOLENOID;
            break;
        }
        // Read solenoid bit
        if ( ReadIOPort(&oBytes, m_nIOPort) )
        {
            switch (dwState)
            {
              case ( STATE_RELEASE ):
                // activate solenoid (open cash drawer)
                // bit = 1 activates solenoid, = 0 de-activates
                // Set the solenoid bit ON to energize, leave other bits alone
                oBytes = oBytes | bMask;
                    // driving circuit arming bit,LOW for arming
                oBytes = oBytes & CD7402ARM_ON;

                result = WriteIOPort( oBytes, m_nIOPort );
                sState = _T("STATE_RELEASE");
                break;

              case ( STATE_IDLE ):
                // deactivate solenoid
                oBytes = oBytes & (~bMask);   // Set the solenoid bit OFF to de-
  energize, leave other bits alone
                oBytes = oBytes | CD7402ARM_OFF;
                sState = _T("STATE_IDLE");
                // write new solenoid bit
                result = WriteIOPort( oBytes, m_nIOPort );
                sBytes = sBytes | CD7402SELECT_GPI;  // set solenoid bits and status
  bit as inputs
                // write new select with solenoid bits enabled as Inputs.
                WriteIOPort( sBytes, m_nIOPort_select );
                break;

              default:
                // Set the INVALID state configuration.
                return FALSE;
            }

        }
```

```
    else       // Error logged in ReadIOPort
        result = FALSE;

  }  //result


    return result;
}


//////////////////////////////////////////////////////////////////////////////
// CDeviceDarlington::QueryConf -

/*Configuration mechanism one utilizes two 32bit I/O ports located at addresses
0x0CF8 and 0x0CFC.
These two ports are:
· 32-bit configuration address port, occupying I/O addresses 0x0CF8 through
0x0CFB.
· 32-bit configuration data port, occupying I/O addresses 0x0CFC through
0x0CFF.
Accessing a PCI function's configuration port is a two step process:
· Write the target bus number, physical device number, function number
and doubleword number to the configuration address port
· Perform and I/O read from or a write to the configuration data port.

The ICH4 Configuration Address Register(CONFIG_ADDRESS) should be defined as
follows:
· Configuration Space Mapping enabled
· Bus number 0x0
· Device number 0x31
· Function number 0x00
· GPIO BASE Port offset address 0x58
The configuration address register at 0x0CF8 value for DWORD access:
  - for GPI/O GPIO_BASE register 80007858
  - for GPI/O GPIO_CNTL register 8000785C

Within the ICH4, the General Purpose I/O ports are addressed using an offset
from
the base address assigned by the BIOS.  The offset to GP I/O ports is as
follows:
· GPIO_USE_SEL2: DWORD offset GPIO_BASE contents + 0x30
· GPIO_IO_SEL2: DWORD offset GPIO_BASE contents + 0x34
· GPIO_LVL2: DWORD offset GPIO_BASE contents + 0x38

Two GPO ports one GPI port of South Bridge VT686B are used to control cash
drawer. They are defined as below:

· GPIO 33 CD_SOL_A     output 0, low turn off solenoid A.  Output 1, high
Activates Solenoid A.
```

```
· GPIO 34 CD_SOL_B    output 0, low turn off solenoid B.  Output 1, high
Activates Solenoid B.
· GPIO  32 CD_SW_AB      input 1, high Drawer(s) open.     Input 0, low
Drawer(s) closed.
· GPIO  35 CD_ARM      output 0, low Drawer(s) solenoid signals enabled. Output
1, high disabled.
There is only one cash drawer status signal CD_SW_AB. It is the status of
either cash drawer or
both cash drawers.

*/

//In the PCI device configuration space, query the
// GPIO Base Address Register (GPIOBASE) to determine the address for reading
// the GPI port assigned to the select register (m_nIOPort_select) and the
address
// we can read/write the solenoid bits and read the status bit (m_nIOPort).
// The BIOS assigns these addresses dynamically. We obtain the addresses as
// follows:
//
// A. Write to m_nIOConf, then read GPIOBASE from m_nIOConf+4 and add the
respective
//    offset to the result to obtain m_nIOPort and m_nIOPort_select.
// B. We can now control the solenoid bits and read the status bit via
m_nIOPort
//    and Input/Output select via m_nIOPort_select.
//   (see ReadInPort() and WriteOutPort() for details)
//
// REFERENCES: Shanley/Anderson, "PCI System Architecture" 3rd. ed. (Chapter
15-17)
//              "INTEL ICH4 I/O Controller Hub" Datasheet

BOOL QueryConf()
{
  BOOL  result = TRUE;
  DWORD FileOffset=0x40;
  DWORD DataRead=0;
  // Configuration Address Register at 0x0CF8
  // bit 31 = 1; Enable Configuration Space Mapping
  // bits 30 - 24 = 0 ; Reserved
  // bits 23 - 16 = 0 ; Bus number
  // bits 15 - 11 = 31   ; Device
  // bits 10 - 8  = 0 ; Function
  // bits 7 - 0 = 58; Register bits 1 - 0 Always zero (See NOTE 1)
  // NOTE 1:  GPIO base Address is read from General Purpose I/O Register Base
Address at a fixed Offset = 0x58
  // The GPIO Register Base Address value provides a base address in bits 15:6.
Therefore mask is 0x0FFC0.
  DWORD n_configGPIOReqData = 0x8000F858;  // Dev. 31, Func. 0, Reg. 0x58

  DWORD gpioport=0;
```

```
  UCHAR uc_gp_offset = 0x38; //DWORD IOoffset for the GPIO solenoid and status
bits
  // GPI[34:32] are bits 2:0
  UCHAR uc_gpsel_offset  = 0x34;   //DWORD IOoffset for the GPIO select
register
  // GPO[34:32] are bits 2:0
  UCHAR uc_gpuse_offset = 0x30; // IOoffset for GPIO Use select reg, 1 = GPIO
  int CD7402USE_GPIO   = 0x0000000F;
  WORD nUsePort =0;

  UCHAR status_mask = 0x01;  // GPI[32]
  UCHAR solenoidA_mask = 0x02;  // GPO[33]
  UCHAR solenoidB_mask = 0x04;  // GPO[34]

  DWORD DataWritten=0;
  WaitForSingleObject( g_hHWPortMutex, INFINITE );

  if ((m_nOSVersion == OS_WINDOWS_95) || (m_nOSVersion == OS_WINDOWS_CE))

  { // WIN 95 I/O config
    //*******************************PART A
************************************
    _outpd(m_nIOConf, n_configGPIOReqData);      // request communication
with GPIO_BASE
    gpioport = (LOWORD(_inpd(m_nIOConf+4)))
                               & 0x0FFC0;        // get GPIO base address
(only 10 bits)
    m_nIOPort_select = (WORD)gpioport+uc_gpsel_offset;    // GP Sel Base
address from GPIO Base Register
    m_nIOPort = (WORD)gpioport+uc_gp_offset;    // GPO Base address from GPIO
Base Register
    nUsePort = (WORD)gpioport+uc_gpuse_offset;

  } //Win95

  else // WIN NT I/O Config
  {
    if (m_bPortDrvr == TRUE) // if Wedge NT driver opened successfully
    {
     //*******************************PART A
************************************

      SetFilePointer( g_hPortDrvr, m_nIOConf, (PLONG)&FileOffset, FILE_BEGIN);

      // request communication with GPIOBASE
      if ( WriteFile(
            g_hPortDrvr,            // Handle to device
            (LPSTR) &n_configGPIOReqData,
            (DWORD) 4,              // Length of buffer in bytes
            &DataWritten,           // bytes written
```

```
                    NULL ) == FALSE )          // NULL means wait till I/O completes.
        {
          DWORD hr = GetLastError();
          result = FALSE;
         return result;
         }

         else
         {
           SetFilePointer( g_hPortDrvr, (m_nIOConf+4), (PLONG)&FileOffset,
 FILE_BEGIN);//TIGER +4

           // get GPIO base address
           if ( result &&
            ( ReadFile(
                   g_hPortDrvr,              // Handle to device
                   (LPSTR) &gpioport,
                   (DWORD) 4,                // Length of buffer in bytes
                   &DataRead,                // bytes read
                   NULL ) == FALSE ) )       // NULL means wait till I/O completes.
           {
            gpioport = 0;         //Read failed
            DWORD hr = GetLastError();
            result = FALSE;
          return result;
          }
        }  // end if WriteFile(...)

       gpioport &= 0x0FFC0;  // strip resource indicator
      m_nIOPort_select = (WORD)gpioport+uc_gpsel_offset;    // GP Sel Base
 address from GPIO Base Register
      m_nIOPort = (WORD)gpioport+uc_gp_offset;    // GPO Base address from GPIO
 Base Register
      nUsePort = (WORD)gpioport+uc_gpuse_offset;

    } // m_bPortDrvr
    }   //NT

    // End Read Configuration Register

    if ( result )
    {
      if ( (m_nIOPort == 0) || (m_nIOPort_select == 0) )
      {
       result = FALSE;
      }
      else
      {

         DWORD sBytes =0;
        // Read USE select register
```

```
      if ( ReadIOPort(&sBytes, nUsePort) )
      {

          sBytes = sBytes | CD7402USE_GPIO; //35:32 bits as GPIO
          // write new USE
          result = WriteIOPort( sBytes, nUsePort );
      }
      else
          result = FALSE;

        // Read select register
      if (( ReadIOPort(&sBytes, m_nIOPort_select) ) && result)
      {

          sBytes = sBytes | CD7402SELECT_GPI;  //solenoid bits as inputs
          // write new select with solenoid bits enabled as Outputs.
          result = WriteIOPort( sBytes, m_nIOPort_select );
      }
      else
          result = FALSE;
    }
  }

  ReleaseMutex( g_hHWPortMutex );
  return result;
}


//////////////////////////////////////////////////////////////////////////////
// CDevice7402::WriteIOPort
//We use the port address obtained from QueryConf().

BOOL WriteIOPort( DWORD databytes, WORD ioport )
{
  BOOL  result = TRUE;
  DWORD FileOffset=0x40;
  DWORD DataWritten;

  WaitForSingleObject( g_hHWPortMutex, INFINITE );  // TAR 95236

  if ((m_nOSVersion == OS_WINDOWS_95) || (m_nOSVersion == OS_WINDOWS_CE))

  { // WIN 95 I/O write
      _outpd( ioport, databytes );
  } //Win95

  else
  { // WIN NT I/O write
    if (m_bPortDrvr == TRUE)     // if Wedge NT driver opened successfully
    {
```

```
           //*********TIGER Write Register address dword to IOPort***************
            SetFilePointer( g_hPortDrvr, ioport, (PLONG)&FileOffset, FILE_BEGIN);

           m_pDC->DCPrintf( DCM_APILOW,
           _T("*CDeviceNCR7402:WriteIO: databytes= %X; IOPort= %X"), databytes,
                                                                  ioport );

           if ( WriteFile(
                   g_hPortDrvr,              // Handle to device
                   (LPSTR) &databytes,
                   (DWORD) 4,                // Length of buffer in bytes
                   &DataWritten,             // bytes written
                   NULL ) == FALSE )         // NULL means wait till I/O completes.
           {
              DWORD hr = GetLastError();
              result = FALSE;
           }
      } //m_bPortDrvr
   } //NT
   ReleaseMutex( g_hHWPortMutex );   // TAR 95236

   return result;
}

///////////////////////////////////////////////////////////////////////////////
// CDevice7402::ReadIOPort
// We use the port addresses obtained from QueryConf().

BOOL ReadIOPort( DWORD *databytes, WORD ioport )
{
   BOOL  result = TRUE;
   DWORD FileOffset=0x40;
   DWORD DataRead;

   WaitForSingleObject( g_hHWPortMutex, INFINITE );

   if ((m_nOSVersion == OS_WINDOWS_95) || (m_nOSVersion == OS_WINDOWS_CE))

   { // WIN 95 I/O write
        *databytes = _inpd( ioport );   //Read 32-bits from ioport
   } //Win95

   else

   {    // WIN NT I/O read
     if (m_bPortDrvr == TRUE) // if Wedge NT driver opened successfully
     {
           SetFilePointer( g_hPortDrvr, ioport, (PLONG)&FileOffset, FILE_BEGIN);

           if ( ReadFile(
                g_hPortDrvr,              // Handle to device
```

```
               (LPSTR) databytes,        // address of data buffer
               (DWORD) 4,                // Length of buffer in bytes
               &DataRead,                // bytes read
               NULL ) == FALSE )         // NULL means wait till I/O completes.
        {

          DWORD hr = GetLastError();
          result = FALSE;
         }
     } // m_bPortDrvr
   }  // NT

   ReleaseMutex( g_hHWPortMutex );

   return result;
}

// 7402 Modifications End Here!
/////////////////////////////////////////////////////////////////////////
////////

//..end..
```

Header file: **DarlingtonCDSample.h**

```
/////////////////////////////////////////////////////////////////////
// NCR7402 (Darlington Motherboard) Modifications start here ////////////
// - 7402 cash drawer port definitions
/*INTEL ICH4 South Bridge used to control cash drawer.
They are defined as below:

· GPI 32    CD_SW_AB      input 1, high Drawer(s) CLOSED.              Input
0, low Drawer(s) OPEN.
· GPO 33    CD_SOL_A      output 0, low turn off solenoid A.     Output 1,
high Activates Solenoid A.
· GPO 34    CD_SOL_B       output 0, low turn off solenoid B.       Output 1,
high  Activates Solenoid B.
. GPO 35  CD_ARM    output 0, low activates driving circuit.      Output 1,
high  De-activates driving circuit.
*/
const int CD7402DRWR1SOLENOID      = 0x000002;   //Darlington: GPIO bit 33
high actuates solenoid
const int CD7402DRWR2SOLENOID      = 0x000004;   //Darlington: GPIO bit 34
high actuates solenoid

const int CD7402SELECT_GPO      = 0xFFFFF1;  //Darlington: GPIO bit 32 high
selects bit as INPUT, low GPIO[35:33] output
const int CD7402SELECT_GPI      = 0x00000F;   //Darlington: GPIO bit [35:32]
high selects bit as INPUT,


const int CD7402DRWR1CLOSED          = 0x00000001;  //Darlington: GPIO bit
32 high means drawer closed
const int CD7402DRWR2CLOSED          = 0x00000001;  // This definition
assumes shared status bit

const int CD7402ARM_OFF            = 0x00000008;  // Disable Active low
ARM driving circuit, high is off.
const int CD7402ARM_ON             = 0xFFFFFFF7;  // Enable Active low ARM
driving circuit, high is off.

/////////////////////////////////////////////////////////////////////
// NCR7402 Modifications End here ////////////
HANDLE     g_hSharedMemoryMutex;   // mutex used to protect shared memory
area
HANDLE   g_hHWPortMutex;            // protects access to h/w I/O port

long Initialize( );
void Terminate();
long OpenPort();
void ClosePort();
long OpenDrawer();
```

```
DWORD GetDrawerStatus();
BOOL SetState( DWORD dwState );
BOOL QueryConf();
BOOL WriteIOPort( DWORD databytes, WORD ioport );
BOOL ReadIOPort( DWORD *databytes, WORD ioport );


//..end..
```
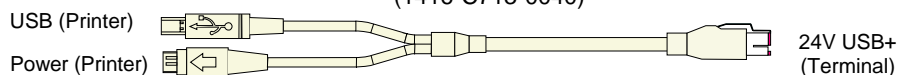
Appendix A: Cables

Printer Cables

USB+Power

497-0424888 - 1 m
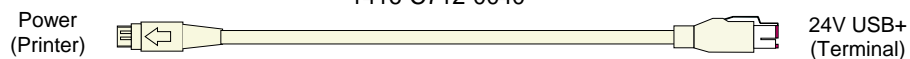(1416-C713-0010)

497-0424501 - 4 m
(1416-C713-0040)

USB (Printer)

Power (Printer)

24V USB+
(Terminal)

19307a

USB+Power (Power Only)

497-0424887 - 1m
1416-C712-0010

497-0422292 - 4m
1416-C712-0040

Power
(Printer)

24V USB+
(Terminal)

19721a

RS-232 (9-Pin to 9-Pin)

497-0408349 - 0.7 m
(1416-C359-0007)

497-0407943 - 4 m
(1416-C266-0040)

9-pin
D-shell
Receptacle

9-pin
D-shell
Receptacle

RS-232
(Printer)
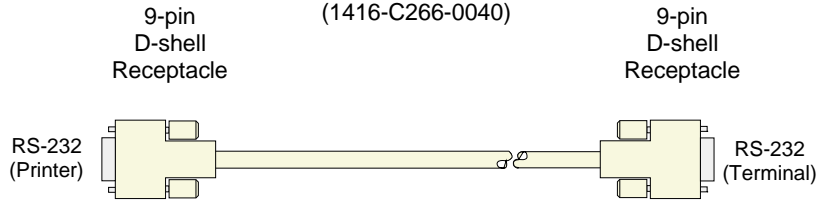
RS-232
(Terminal)

19722a

RS-232 (9-Pin to 25-Pin)

497-0407427 - 1.0 m
(1416-C337-0010)

497-0407429 - 4 m
(1416-C337-0040)

9-pin
D-shell
Receptacle

25-pin
D-shell
Plug

RS-232
(Terminal)
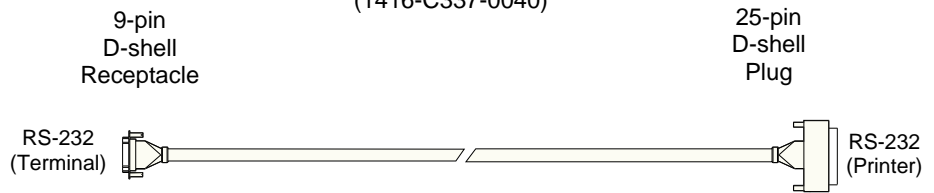
RS-232
(Printer)

20127b

Scanner Cables

7872 or 7875 Scanner/Scale (RS-232)

D-Shell
9-Pin
Receptacle

497-0300422 - 4 m
(1416-C019-0040)

Modular
10-Pin
Plug

RS-232
(Terminal)
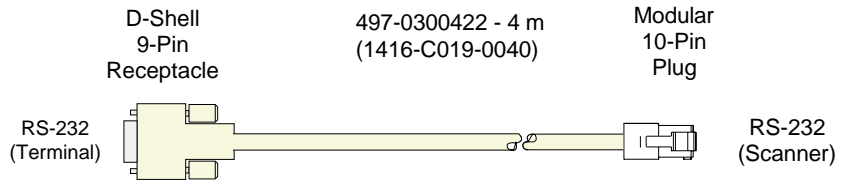
RS-232
(Scanner)

15479a

7892 Scanner (Powered RS-232)

497-0425593 - 3.0 m
(1416-C643-0030)

D-Shell
9-Pin
Receptacle

Modular
10-Pin
Plug

RS-232
(Terminal)
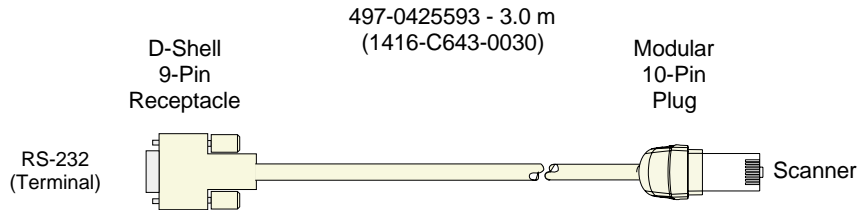
Scanner

20450a

7882 Scanner (Powered RS-232)

497-0419723 - 4.0 m
(1416-C653-0040)

D-Shell
9-Pin
Receptacle

Modular
10-Pin
Plug

RS-232
(Terminal)
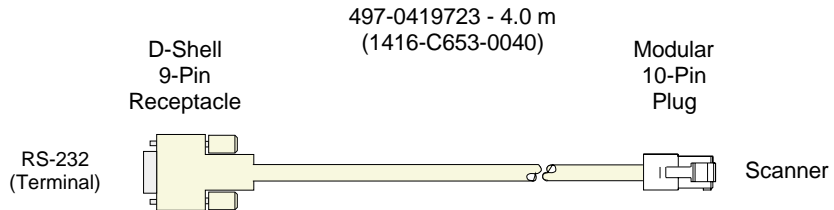
Scanner

19728a

7837 Scanner (Powered RS-232)

497-0412952 - 2.5 m
(1416-C430-0025)

D-Shell
9-Pin
Receptacle

Modular
10-Pin
Plug

RS-232
(Terminal)

Scanner
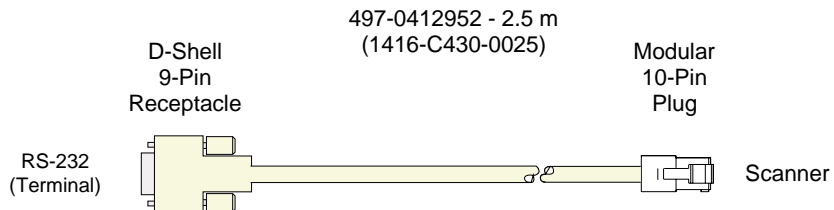
19724a

Display Cables

VGA Display, Mono

Sub Miniature D-Shell
15-Pin
Plug

497-0008164 - 4 m
1416-C042-0040

Sub Miniature D-Shell
15-Pin
Receptacle

VGA
(Terminal)

VGA
(CRT Display)
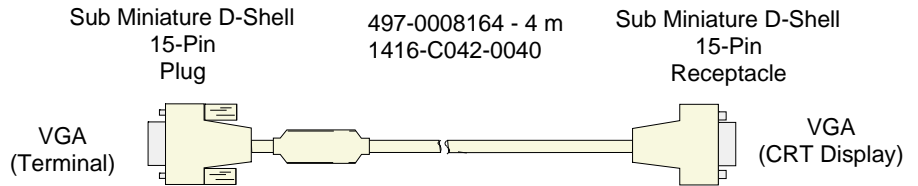
14607a

VGA Display, Color

1.0 m	Black	497-0428080	1416-C840-0010
1.5 m	Black	497-0428068	1416-C839-0015
1.0 m	White	497-0424530	1416-C753-0015
1.5 m	White	497-0424531	1416-C754-0010

Sub Miniature D-Shell
15-Pin Plug

Sub Miniature D-Shell
15-Pin Receptacle

VGA
(Terminal)

VGA
(Display)
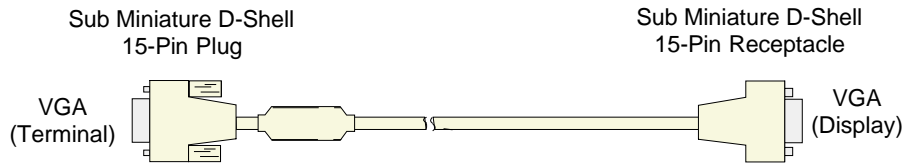
16318a

CRT AC Power Extension

497-0406237 - 4m
(1416-C508-0040)
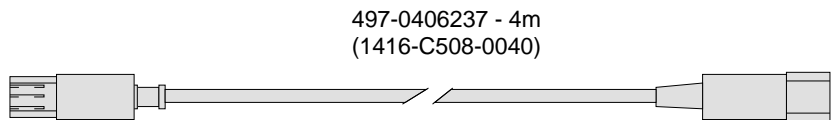
19741a

5972 VFD Customer Display (Powered RS-232)

497-0420926 - 1 m
1416-C683-0010

9-pin
D-Shell
Receptacle

497-0420927 - 4 m
1416-C683-0040

24-Position
Microfit
Receptacle

Terminal
RS-232 Port

Customer
Display

20279

DVI to DVI

497-0422831 - 1.0 m
(1416-C723-0010)

497-0422832 - 4.0 m
(1416-C723-0040)

DVI
(Display)

DVI
(Terminal)

19725a

PS/2 - RS-232 & Power

497-0422833 - 1m
(1416-C725-0010)

497-04222834 - 4m
(1416-C725-0040)

RS-232
(Terminal)

PS/2
(Terminal)

12 V COM
(5964)
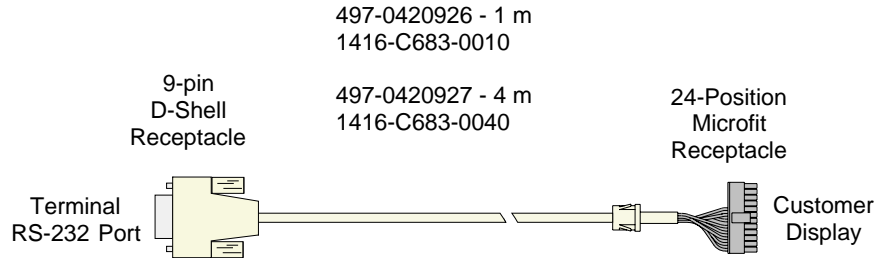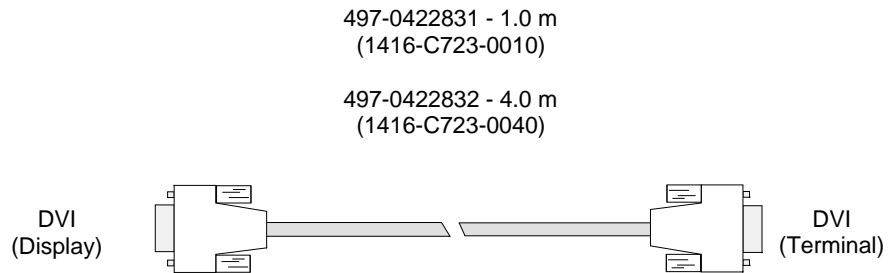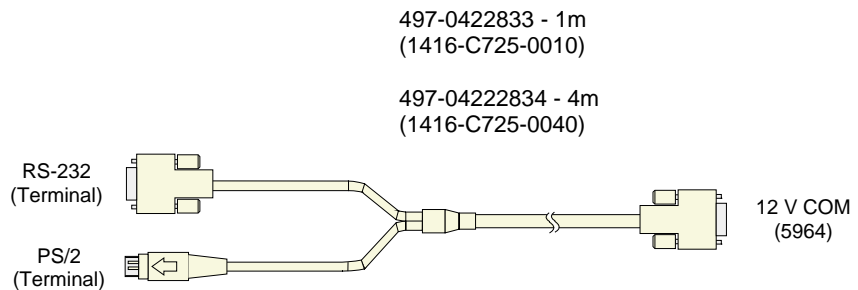
19734a

LCD Power Cable
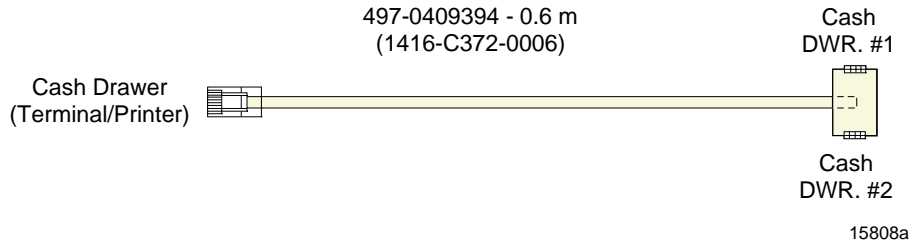
497-0426160 - 4 m (White)
1416-C803-0040

497-0428512 - 4 m (Black)
1416-C851-0040   USB

Power
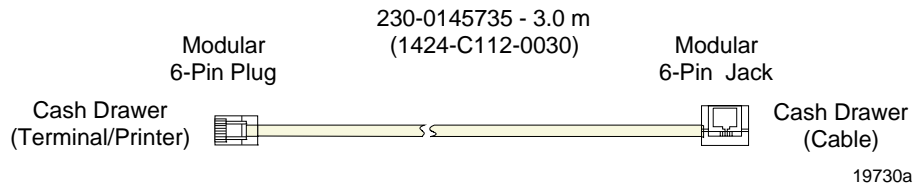(Display)   Powered USB
                                                                   (Terminal)

20444

Cash Drawer Cables

Dual Cash Drawer, Y-Cable

497-0409394 - 0.6 m
(1416-C372-0006)

Cash
DWR. #1

Cash Drawer
(Terminal/Printer)

Cash
DWR. #2

15808a

Cash Drawer, Extension Cable

Modular
6-Pin Plug

230-0145735 - 3.0 m
(1424-C112-0030)

Modular
6-Pin Jack

Cash Drawer
(Terminal/Printer)

Cash Drawer
(Cable)

19730a

Communications Cable

Ethernet, 10/100BaseT

Modular
8-Pin
Plug

497-0420456 - 3.0 m
(1416-C672-0030)

Modular
8-Pin
Plug

21094
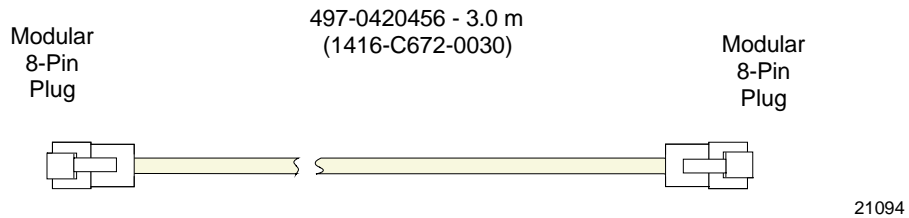
Keyboard Cables

PS/2 Keyboard Extension

6-pin
Mini-DIN
Plug

497-0406056 - 1.8 m
(1416-C281-0018)

6-pin
Mini-DIN
Receptacle

PS/2
(Terminal)

PS/2
(Keyboard)
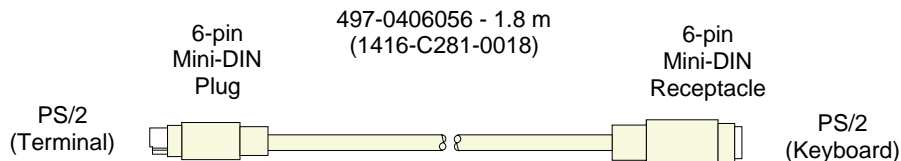
15403a

Signature Capture/Electronic Payment Terminal Cable

5945/5992 EPT (RS-232 w/Power)

9-pin
Mini-DIN
Plug

497-0418406 - 4.0 m
(1416-C634-0040)
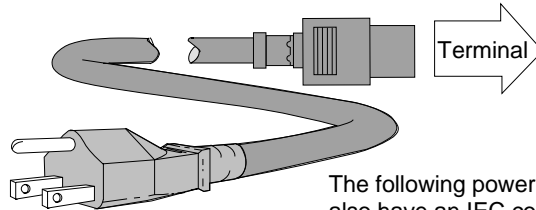
9-pin
D-shell
Receptacle

RS-232
(EFT Unit)

RS-232
(Terminal)
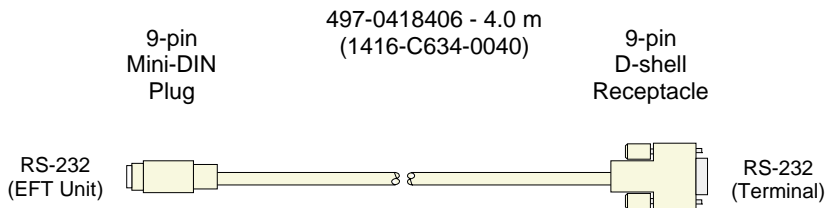
19723a

Power Cables (AC)

1416-C325-0030   006-1009037 - U.S.

Terminal

The following power cables (not shown)
also have an IEC connection of 45 mm:
  1416-C320-0030   006-8601011 - SEV
  1416-C321-0030   006-8601012 - U.K.
  1416-C322-0030   006-8601019 - Australia
  1416-C323-0030   006-8601010 - International
  1416-C391-0030   006-8605488 - China
  1416-C393-0030   006-8601001 - Japan Twist-Lock
                                          15405a

Appendix B: Feature Kits

Below is a comprehensive list of the optional hardware Feature Kits that can be installed in the customer environment. Kit installation instructions (for those requiring instruction) are available on the Information Products web sites.

- *NCR Intranet:* http://inforetail.atlantaga.ncr.com

- *Internet:* http://www.info.ncr.com

To locate the installation guides on these sites:

1. Select **General Search**.

2. Select the **Kit Instructions** icon.

3. In the **Kit Title** field, enter the *Kit Title*.

   Example: *MSR*

   or

   In the **Kit Number** field, enter the *Kit Number*.

   Example: *7402-K452*

4. Select Search

   The file can be viewed online by left-mouse clicking on the pub title, or if you prefer to download the entire file you can right-mouse click on the title then select the *Save Target as...* option.

If you aren't sure of the title of number you can display all kits associated with a terminal product class by:

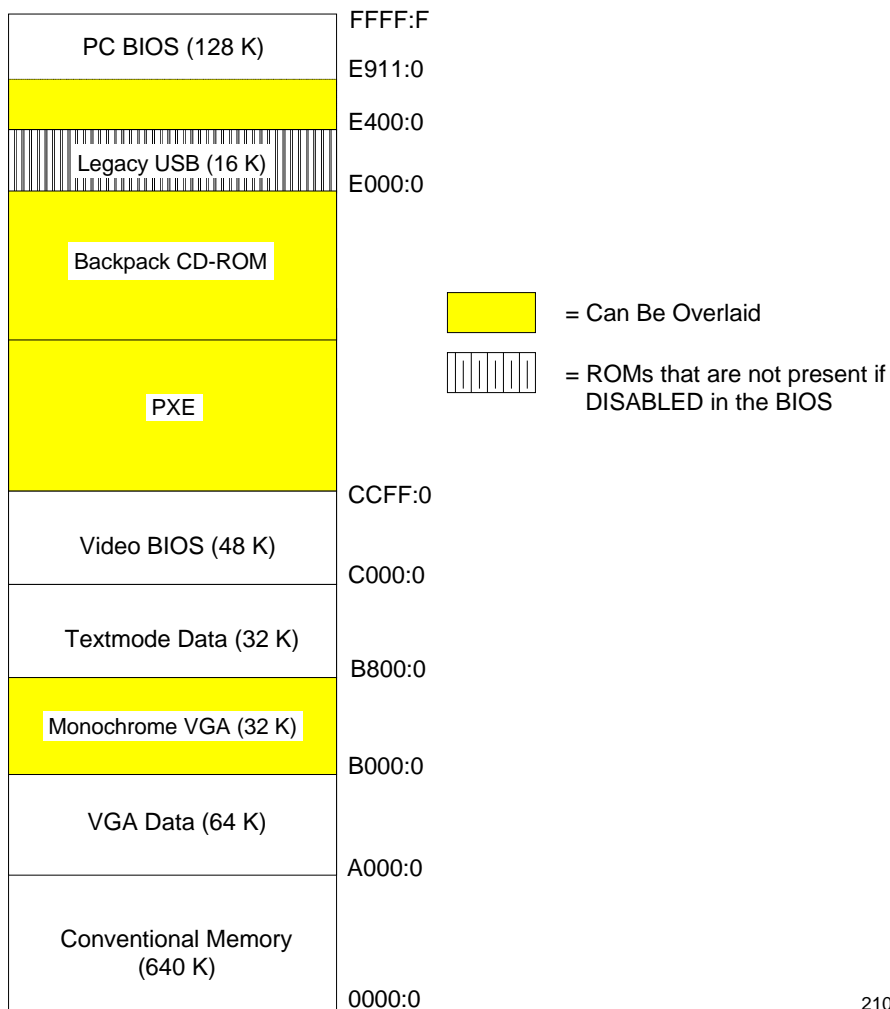1. In the **Class** drop-down list, select the *Class* of the terminal.

   Example: *7402*

2. Select **Search.**

Kit Number	Description
7402-K233	256 MB DIMM Memory Upgrade
7402-K234	512 MB DIMM Memory Upgrade
7402-K221	3-Track ISO MSR
7402-K451	Integrated U.S. 2 x 20 VFD Customer Display
7402-K452	Integrated International APA (All Points Addressable) Customer Display
7402-K305	RealPOS 70 Integration Tray

Appendix C: Memory Map

ACPI BIOS 1.0.0.9

PC BIOS (128 K)	FFFF:F
	E911:0
	E400:0
Legacy USB (16 K)	E000:0
Backpack CD-ROM	
PXE	
	CCFF:0
Video BIOS (48 K)	C000:0
Textmode Data (32 K)	B800:0
Monochrome VGA (32 K)	B000:0
VGA Data (64 K)	A000:0
Conventional Memory (640 K)	0000:0

= Can Be Overlaid

= ROMs that are not present if DISABLED in the BIOS

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DOS Considerations

EMM386 must be configured with the correct parameters, based on the BIOS Memory Map.