Datacard® SP55, SP55 Plus, and SP55k Card Printers

Service Manual

September 2007

Part No. 539358-001, Rev J

Liability Statement

This product has been built to the high standards of Datacard Group. Please do not attempt to operate or repair this equipment without adequate training. Any use, operation, or repair in contravention of this document is at your own risk. By acceptance of this system you hereby assume all liability consequent to your use or misuse of this equipment. Datacard assumes no liability for incidental, special, or consequential damage of any kind. Equipment specifications, applications, and options are subject to change at the sole discretion of Datacard without notice.

Proprietary Notice

Trademark Acknowledgments

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Revision Log

Datacard SP55, SP55 Plus, and SP55k Card Printers Service Manual

Revision	Date	Description of Changes
A	January 2004	First release of this document.
B	May 2004	Additional information for network options.
C	August 2004	Changed to release SP60 printers.
D	April 2005	Added volatile/flammable warning in Safe Environment.
E	October 2005	Updated product names.
F	December 2005	Updated front matter.
G	June 2006	Updated parts for RoHS compliance.
H	May 2007	Updated for release of Plus printers.
J	September 2007	Updated for release of SP55k printers.

Regulatory Compliance

Notice for USA (FCC Notice)

This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with this instruction manual, it may interfere with radio communications. This equipment has been tested and found to be within the limits for Class A computing devices, pursuant to Title 47 CFR Part 15 Subpart B of FCC rules, designed to provide reasonable protection against radio interference in a commercial environment. Operation of this equipment in a residential environment may possibly cause interference. In the event of interference, the user, at their own expense, will be required to take whatever measures are necessary to correct the problem.

Notice for Canada

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

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 radioélectrique édicté par le ministère des Communications du Canada.

Safety Issues

All Datacard products are built to strict safety and reliability specifications in accordance with UL60950-1 and CUL requirements; therefore, safety issues pertaining to operation and repair of Datacard equipment are primarily environmental and human interface.

The following basic safety tips are given to ensure safe installation, operation, and maintenance of Datacard equipment and are not to be considered as comprehensive on all matters of safety.

Safe Environment

- Connect equipment to a grounded facility power source. Do not defeat or bypass the ground lead.
- Place the equipment on a stable surface (table), and ensure floors in work area are dry and non-slip. Insulated rubber floor mats are preferred.
- Know the location of equipment branch circuit interrupters or circuit breakers and how to turn them on and off in case of emergency.
- Know the location of fire extinguishers and how to use them. Use only ABC type extinguishers on electrical fires.
- Know local procedures for first aid and emergency assistance at the customer facility.
- Use adequate lighting at the equipment.
- Maintain the recommended range of temperature and humidity in equipment area.
- Do not use this product in an environment containing volatile or flammable compounds.

Safe Human Interface

- Use proper lifting techniques when moving or installing the equipment.
- Use standard electrostatic discharge (ESD) precautions when working on or near electrical circuits.
- Do not defeat or disconnect safety interlocks.
- Observe standard safety precautions when servicing the system.

WARNING: To avoid a possible electric shock, always unplug the system before servicing.

Chapter 1: Introduction

1

This chapter provides an introduction to the Datacard® SP55, SP55 Plus, and SP55k card printers.

Intended Audience

This manual is intended for use by authorized representatives of Datacard who are responsible for the maintenance, service, and repair of the SP55, SP55 Plus , and SP55k card printers. The service representatives must complete an authorized Datacard service training course prior to servicing the printer.

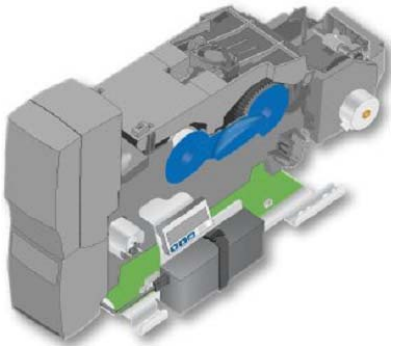
Introduction to SP55 Printers

The SP55 printers have the following features and options:

- Single or, optionally, two-sided (simplex or duplex) printing (duplex option always on SP55k)
- Monochrome or full color printing, edge-to-edge
- T-panel topcoats
- Lockable input tray and printer-to-desk security lock (not available on SP55k)
- Automatic card feed, continuous cleaning roller, and operator-replaceable printheads
- Clear card printing (only on SP55 Plus)
- Bar code printing
- Magnetic stripe encoding, tracks 1, 2, and 3, high and low coercivity (optional)
- Smart card personalization, optional contact and contactless kits
- Proximity cards
- USB connectivity
- Ethernet connection (optional)
- Liquid crystal display (LCD) with visual prompts (mounted on side of SP55k)

SP55

SP55 Plus



SP55k

Avoiding Electrostatic Discharge

While working around control boards and other sensitive components, use proper equipment and procedures to reduce the possibility of damaging the components. This section describes the procedure for protecting against damage due to electrostatic discharge.

CAUTION: Static electricity can destroy components on a circuit board. Use the following precautions when handling the board, its components, or tools in contact with the board or its components.

Tools Required:

Static-grounding kit (Part Number: TUL006-006) containing:

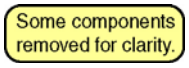
- Static-grounding mat
- Mat-grounding cable
- Static-grounding wrist strap
- Wrist strap grounding cable
- Grounding plug

Procedure:

1. Wear appropriate clothing. Avoid wool and synthetic fabrics.
2. Remove movable carpet and rugs.
3. Apply the grounding strap to a wrist. Ensure that there is no clothing between the strap and skin and that the strap is snug enough to maintain contact with the skin.
4. Connect one end of the grounding cable to the wrist strap.
5. Using the grounding plug, connect the other end of the grounding cable to the earth ground of a facility AC outlet.
6. Clear a work area, lay the static-grounding mat on the work area, and connect the movable end of the long grounding cable to the mat.
7. Always set unshielded static-sensitive materials on the grounded anti-static mat. Whenever possible, place components into static-shielded bags.
8. When bringing two objects into contact (tool to circuit board or board to mat), first simultaneously touch both objects with fingers.

Symbol Conventions

The appearance and purpose of the symbols used in this manual are presented below.

	This symbol is used to designate a procedure that involves electrostatic discharge sensitive components. ESD procedures should be used.
	CAUTION: This symbol indicates a strong cautionary message to avoid serious damage to the printer.
	WARNING: This symbol indicates a strong warning message to prevent personal injury to the technician.
	This symbol indicates a spring hazard. Safety glasses should be worn when completing the procedure.
	This symbol indicates a reminder message or other additional information for the technician.
	Graphic callouts with a colored background provide incidental information about the graphic itself.
	Graphic leaders with a colored background indicate a direction of movement or similar information.

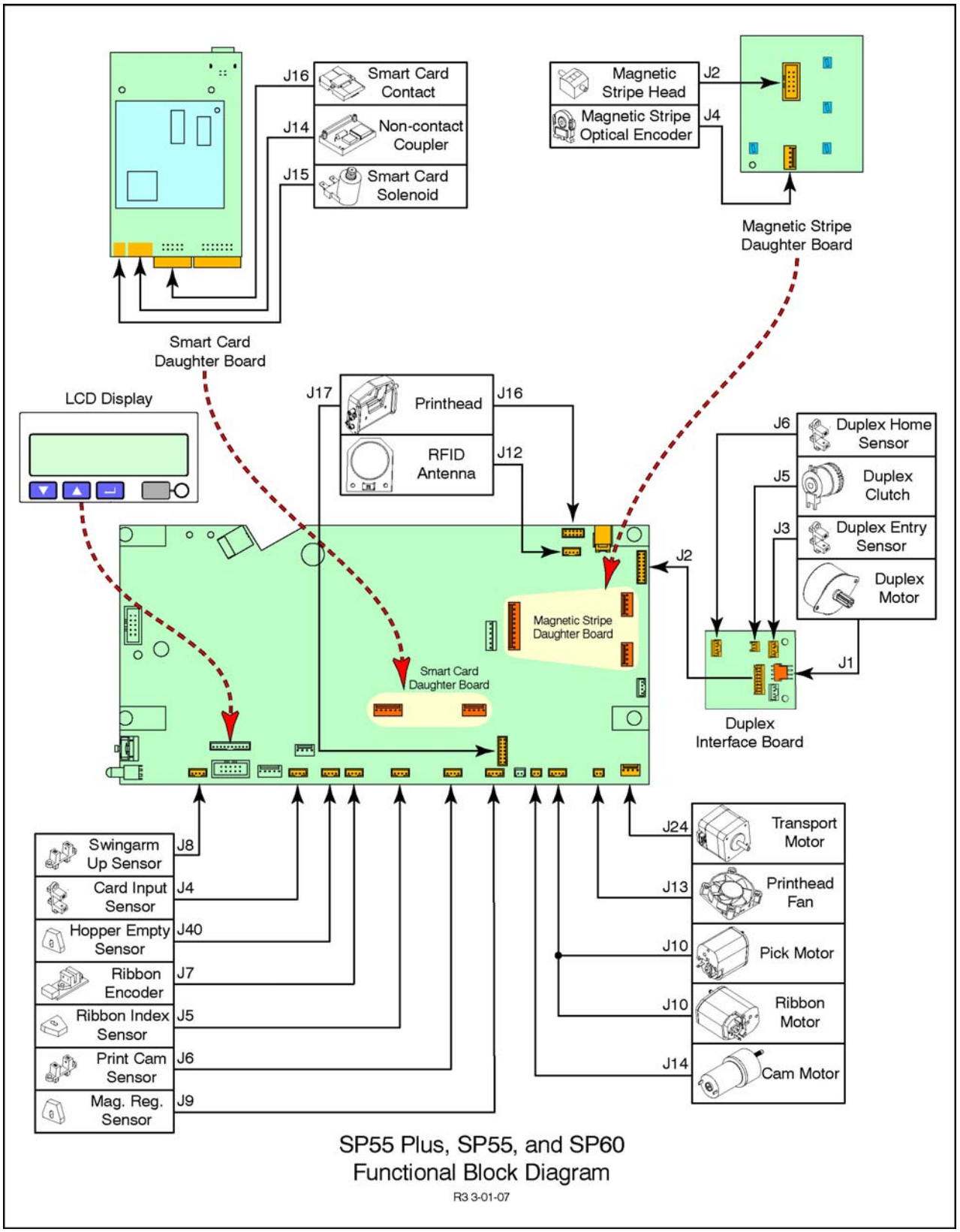
Chapter 2: Theory of Operation

2

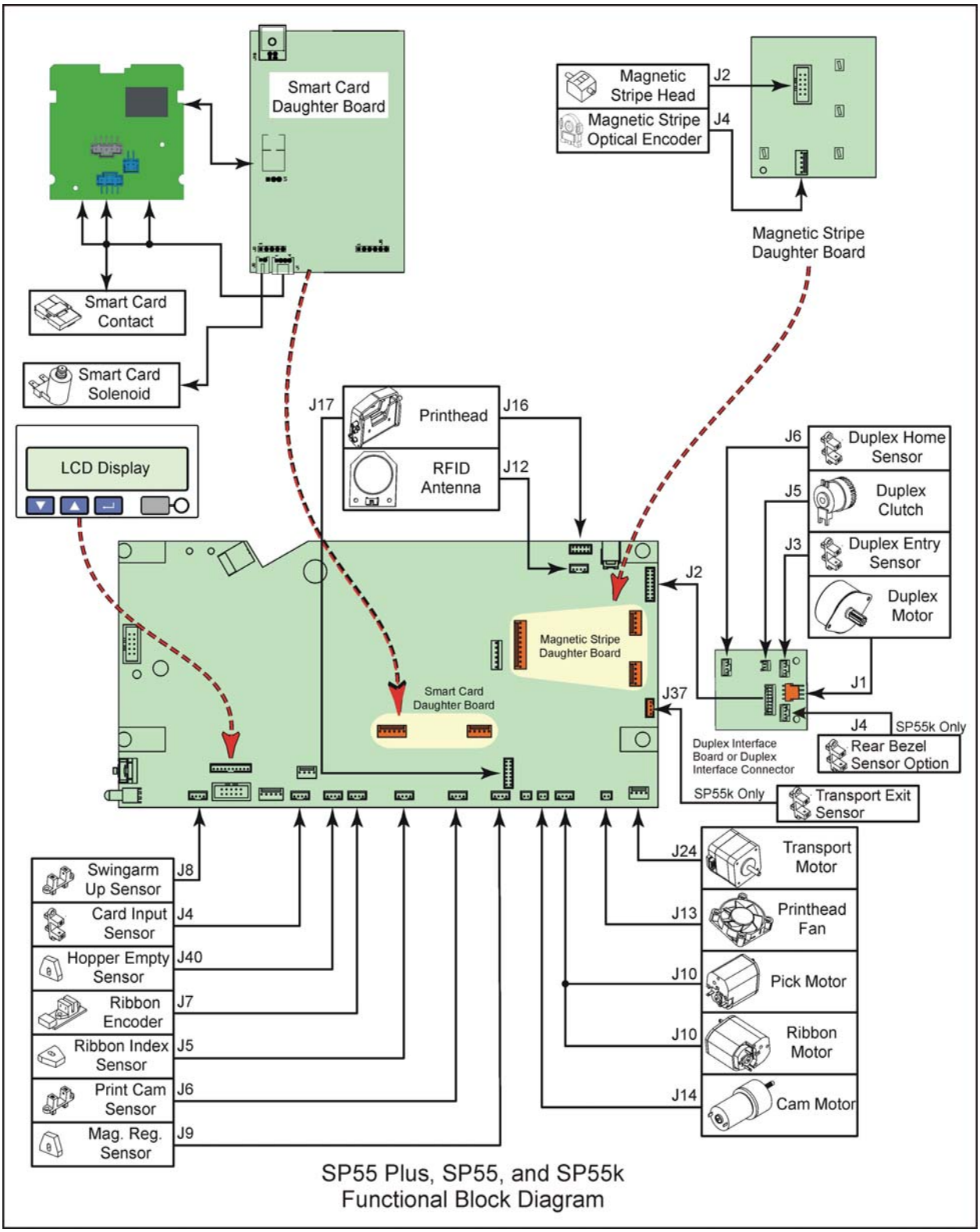
This chapter provides the theory of operation for the SP55, SP55 Plus, and SP55k card printers.

Printer Components

Functional Block Diagram (SN Under 70,000)



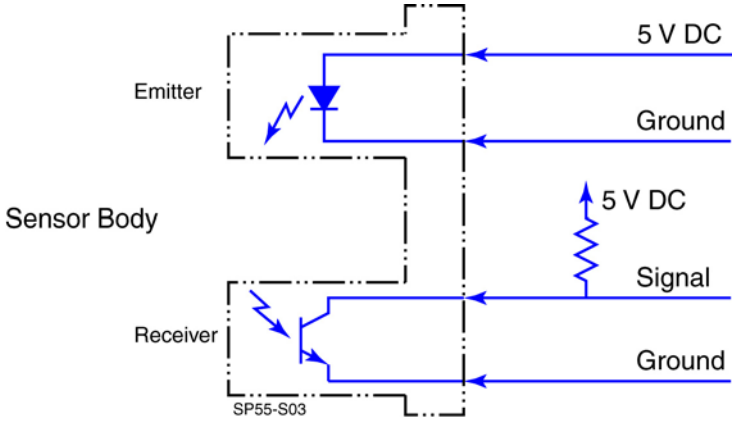
Functional Block Diagram (SN 70,000 and Up)



SP55 Plus, SP55, and SP55k
Functional Block Diagram

Sensors

All of the optical sensors in the SP55, SP55 Plus, and SP55k printers are of the open collector type, and are configured to be active-low with a pull-up resistor on the output. When the sensor is not active (or not connected at all) the control board sees a high voltage (5V) at the Signal input. When the sensor is active, it shorts Signal to Ground. The diagram below is a simplified representation of an interruption sensor.



Name	Function
Card Input	The card input sensor is an interruption sensor that detects the presence of a card at the entry of the printer and registers the trailing edge of the card for printing. For the clear card option, this sensor is replaced with a reflective sensor.
Printhead Cam	As the printhead cam rotates, a flag on the cam interrupts the beam of the cam sensor. This allows the printer to know the position of the printhead lifters. The printhead lifters lift the printhead away from the platen roller when not printing.
Swingarm Open (Cover arm)	The swingarm open sensor detects when the swingarm is open. The sensor itself detects when the swingarm is closed, but the signal is inverted elsewhere in the system. **Note:** The user information and Diagnostics refer to this as a cover arm sensor.
Ribbon Index	The ribbon index sensor is used to determine the position of the print ribbon panels. The sensor bounces a beam off the reflective sticker on the printhead. When the index mark or K-panel on the ribbon passes between the sensor and the reflector, the beam is broken (not reflected). The Y, M, C, & T panels do not interrupt the beam.
Ribbon Motion	The ribbon motion sensor is a two-channel optical interruption sensor that detects slots on the ribbon encoder wheel. The encoder wheel is located on the ribbon cartridge. Internally the sensor body contains a pair of standard interruption sensors.

Name	Function
Magnetic Stripe Registration	This reflective sensor locates the leading edge of the card for magnetic stripe encoding. When no card is present, the sensor beam reflects off a plate on the magnetic stripe rocker. When a card passes between the sensor and the reflector, the beam is broken (not reflected). The sensor itself is active when no card is present, but the signal is inverted elsewhere in the system. For the clear card option, this sensor is replaced with another reflective sensor.
Magnetic Stripe Optical Encoder	This encoder monitors the rotation of the idler roller in the magnetic stripe module. It provides positional feedback to the module to ensure proper magnetic encoding.
Duplex Entry	The duplex entry sensor is an optical interruption sensor that detects the presence of a card as it enters and leaves the duplex module. For the clear card option, this sensor is replaced with a reflective sensor.
Duplex Home	The duplex home sensor determines the rotational position of the duplex flipper. The flipper has three flags that pass through the sensor.
Input Hopper Empty (Optional)	This reflective sensor detects when the card hopper has no cards left. It functions only when special software is created to use it.
Transport Exit	This sensor on the SP55k detects which type of rear assembly is mounted: the duplex end or the hopper end.
Rear Bezel	This sensor on the rear bezel option of the SP55k detects when a card is ejected.

Motors

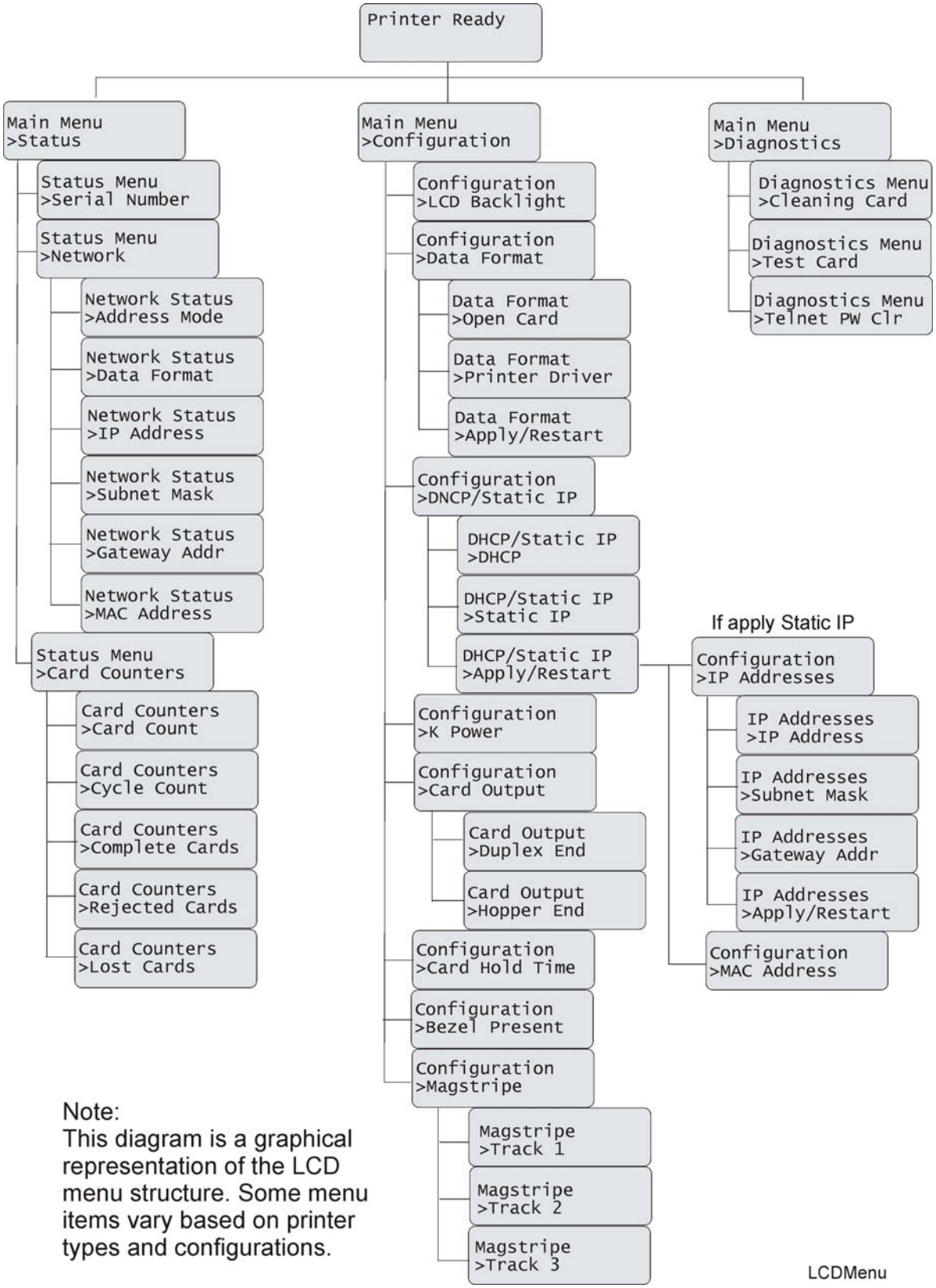
The SP55, SP55 Plus, and SP55k printers have up to five motors depending on the configuration. The three DC motors are all similar, with an integral reduction geartrain and 24-volt operation. The speed of the motors is controlled by pulse width modulation. While the motors are reversible, some are wired to operate in one direction only. The duplex step motor operates at 24 volts, but the transport step motor operates at 40 volts.

Name	Function
Pick Motor	The pick motor drives the pick roller to bring a card into the system. The motor is wired for unidirectional operation and cannot be reversed by the control board. One wire is tied to ground and the other wire is the control. This motor is driven by a single channel in the motor driver.
Transport Motor	The transport motor drives the platen roller through a gear, which also drives the main transport belt. This is a 2-phase (4-wire), 40-volt stepper motor.
Cam Motor	The cam motor rotates the printhead cam, which operates the printhead lifters. This raises and lowers the printhead into position for printing or permitting a card to pass beneath. This motor is wired bi-directional and uses two channels from the motor controller so that it can be reversed. (However at this time, the motor is not operated in reverse.)
Ribbon Motor	The ribbon motor drives the gear train of the ribbon cartridge to advance the ribbon during printing. The motor is wired for unidirectional operation and cannot be reversed by the control board. One wire is tied to ground and the other wire is the control. This motor is driven by a single channel in the motor driver.
Duplex Motor	The duplex motor drives a gear on the duplex clutch. The clutch permits a single motor to either operate the rollers, or rotate the entire flipper assembly (this is discussed in more detail on page 2-7). This is a 2-phase (4-wire), 24-volt stepper motor.

Miscellaneous

Name	Function
Smart Card Solenoid	The smart card solenoid retracts the smart card rocker downward so the contacts touch the card. When relaxed, a return spring lifts the rocker and contacts away from the card.
Duplex Clutch	The duplex clutch controls whether the duplex motor operates the drive rollers or rotates the whole flipper assembly. The clutch contains two concentric axes that are free to rotate independently when the clutch is relaxed. When the clutch is active, a magnetic field pulls the two axes together and friction forces the two to rotate in unison. Because the clutch is engaged magnetically, the rotation of either axis is independent from the body of the clutch. **Operation:** The duplex motor rotates the outer axis (large gear), which is coupled to the two duplex drive rollers. The flipper assembly is coupled to the inner axis. When the clutch is relaxed, the outer axis (gear) rotates independently from the flipper assembly, and this causes the drive rollers to rotate. When the clutch is engaged, the whole flipper assembly rotates in unison with the large gear, which keeps the drive rollers from rotating.
RFID Antenna	The RFID antenna circuit board is a simple loop antenna that communicates with the supplies ID chip in the ribbon supply spool. The bi-directional communication method is similar to Non-Contact Smart Cards (p. 2-33) using load-modulation, although the specific details may vary.
Duplex Interface Board	The duplex interface board contains a step motor driver for the duplex motor, and a 24-volt driver circuit for the clutch. The sensor signals are passed through directly from the main control board.
Magnetic Stripe Daughter Board	There are two types of magnetic stripe daughter boards: 3-track and single track. The circuit board controls the magnetic stripe head and provides an interface for the optical encoder. The optical encoder data is passed back to the main control board without modification.
Smart Card Daughter Board	The smart card daughter board provides a communication interface between the application computer and the smart card. Most of the communication aspects and the data transfer are controlled by an external software application, and are transparent to the printer. The daughter board also provides a connection to control the smart card solenoid.

LCD Menu Diagram



Sequence of Operation

Power-on Initialization

1. When the printer is plugged in, it begins its initialization routine. (There is no On/Off switch.)
2. As the main control board initializes itself, the status light on the front of the printer will be steady amber.
3. After the control board is initialized, the status indicator will cycle through Red, Amber, and Green.
4. While the control board examines and initializes external components, the indicator will flash green.
   A. It checks for smart card, magnetic stripe, and duplex modules.
   B. The duplex module is initialized, and the rollers are operated for sufficient time to ensure no cards are present in the module.
   C. The printhead cam motor is cycled and homed.
   D. The transport is initialized and then operated for sufficient time to ensure that the card track is clear.
   E. The ribbon type is identified. This may or may not result in the ribbon motor being energized for a short time to detect a ribbon encoder change.
5. When the printer has finished its initialization procedure and is ready to process cards, the status light will turn green.

Default Card Production Sequence

1. After the card data has been sent to the printer, it begins the card personalization process.
2. The card is picked and passes through the cleaning rollers.
3. After the leading edge of the card passes through the cleaning rollers, the input sensor detects the card. The trailing edge of the card is registered for positioning.
4. The card is first sent to the smart card area.
   A. When the card is approaching the location of the smart card contacts, the solenoid engages and pulls the contacts down.
   B. The leading edge of the card makes contact with the smart card sensor (mechanical switch in the contact block) and the transport stops.
   C. The card is programmed by an external application. The printer acts only as an interface to the card.
   D. The external application notifies the printer that smart card interaction is complete, and control is returned to the printer.

5. The card is then sent back toward the entry of the printer before being sent to the magnetic stripe module.
    A. The magnetic stripe sensor registers the leading edge of the card.
    B. The optical encoder measures the distance the card is traveling during the encoding process.
    C. All tracks of the card are written simultaneously.
    D. On the return pass, the card data is verified.
6. The card is then returned to the input sensor and registered for graphics printing.
    A. When the leading edge of the card reaches the platen roller, the printhead cam engages and lowers the head onto the card.
    B. The ribbon motor is engaged. The motor is over-driven, and the spindle clutch slips as needed to match the speed of the card.
    C. After printing a panel, the printhead is raised and the card is returned to the input sensor.
    D. The ribbon motor advances to the next panel by examining the ribbon encoder.
    E. The process is repeated for the remaining panels.
7. The card is passed to the duplex module.
    A. The duplex entry sensor detects the card and determines the position within the flipper.
    B. With the magnetic clutch relaxed, the drive rollers pull the card into the module.
    C. The clutch is engaged and the motor rotates the flipper to the return position.
    D. The clutch is released, and the motor drives the rollers to move the card back into the printer. (The rollers always move in the forward direction, but since the flipper assembly is inverted, the card is moved back into the printer.)
8. The card is re-registered by the input sensor and printing is completed on the back of the card in the same fashion as the front.
9. After printing, the card is moved to the front of the printer and placed into the output hopper.

Open Card Printer Differences

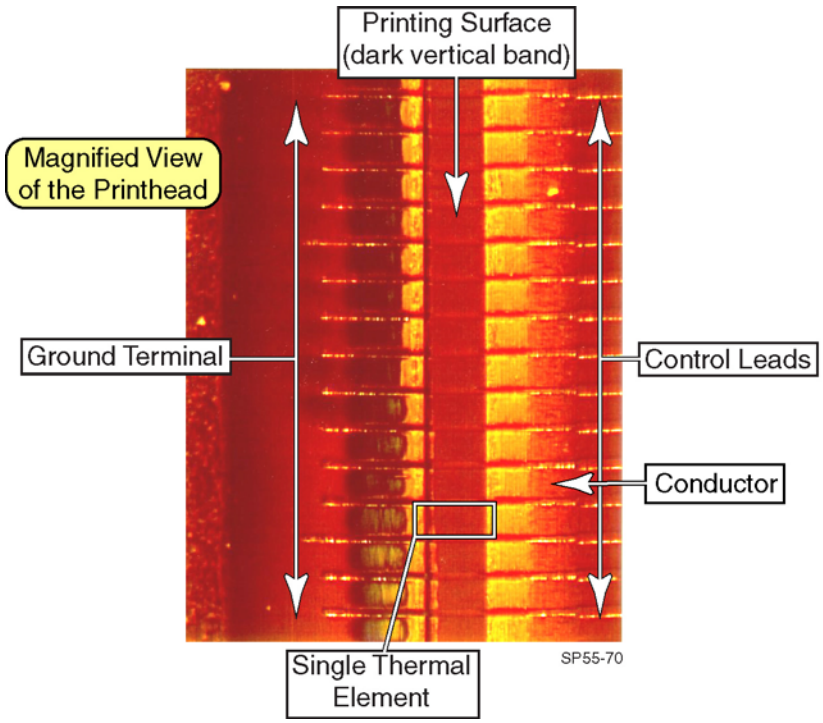
There are several Datacard printers that support the Open Card format, but not all printers support the same functions. The table below lists the differences by printer model.

	Printer Model				
Item	**SP55 SP55 Plus SP55k**	**SE48**	**220**	**280**	**310**
@S character spacing	✓		✓	✓	✓
@L line spacing	✓		✓	✓	✓
@T graphics template				✓	
@@ hex character control	✓		✓	✓	
Allow format characters in print field	✓	✓	✓	✓	✓
More than 11 dummy emboss lines	✓		✓	✓	✓
Special font spacing for fonts 1, 2, 3		✓	✓	✓	✓
Characters not on emboss wheel permitted	✓	✓	✓	✓	✓
Graphics data control	✓			✓	

Graphics Printing

The information presented in the following section is not required for servicing the printers but to augment the customer engineer's training and knowledge base.

The printhead is made up of 672 microscopic heating elements. Each of these thermal elements is made from a printed circuit conductor etched into the printhead substrate (metallic-like foil). The elements are spaced 0.0035 inch apart, and represent a single pixel at 300 DPI resolution.



To transfer pigment from the print ribbon to the card, the respective thermal element (pixel) heats up until the temperature reaches the transfer threshold. At this point, pigment from the print ribbon will adhere to the card. The longer the element remains on, the more material gets applied.

- At temperatures below the transfer threshold, no pigment is transferred to the card.
- If the temperature of an element is too high, the area surrounding the element may also get hot enough to transfer pigment. This will lead to reduced resolution, blotching, and ribbon breaks.
- The intensity of the printed pixel is controlled by the length of time that the pixel's thermal element is turned on. The longer the pixel is on, the darker (more intense) the color will be.

Printhead Settings

A printed card is made up of 1013 discrete vertical (short edge of the card) columns printed across the length of the card. As each column is printed, the printhead circuitry activates the necessary pixels to transfer pigment from the ribbon to the card.

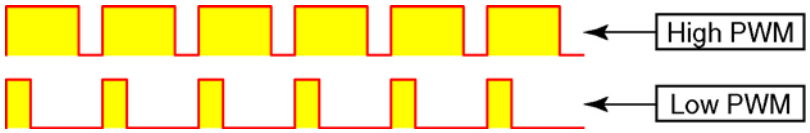
Controlling when and how these pixels heat up is determined by several parameters: power, base power, and strobe.

Power

In the past, printhead pixels were controlled by varying the voltage to the pixel element. On the newer generation of printheads, the power to the pixel is controlled by pulsing the voltage, commonly referred to as Pulse Width Modulation (PWM). This concept is also known as Duty-Cycle.

The heat of a thermal element on the printhead is controlled by how long it is turned on versus how long it is turned off. In a sense, the printhead control was analog but is now digital.

To increase the temperature, or heat, on a single element, it is turned On more than it is turned Off. The higher the duty-cycle, the hotter the element becomes. Because the printhead now receives full voltage from the power supply, swapping the power supply for another power supply will have an impact on printing intensity. The printer can easily be adjusted to compensate when a new power supply is required.



Base Power

The Base Power sets the upper limit to the power PWM. In simple terms, this sets the bandwidth (gamut) of the printing. Increasing the base power darkens the available colors in the printer, but does not impact the lighter colors. Note that there is an upper threshold after which increasing the base power has little or no effect on the final printing. At this point, the image is saturated and cannot be increased in gamut any further. However, note that this is not the same as darkening the image in the SmartDriver control panel. This will darken the whole image, including the lighter areas.

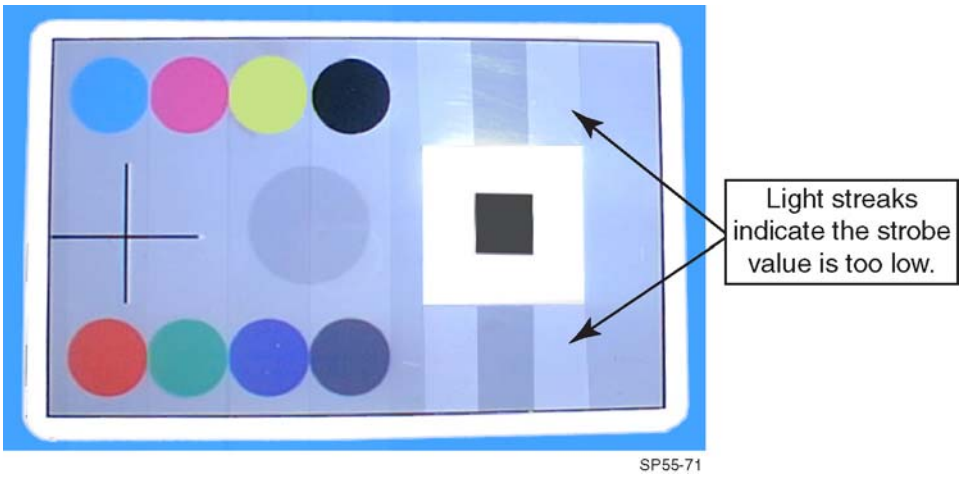
Strobe

If an entire column of thermal elements (pixels) needs to be activated, the overall power to the printhead will drop due to the current draw. The strobe setting compensates for this drop in voltage by increasing the time that the pixels are active.

For example, if all 672 pixels were turned on, it would take longer for each pixel to reach the threshold temperature than it would if only 300 pixels were turned on. This would result in a lighter image if more pixels are needed, and a darker image if only a few pixels are needed.

The Strobe setting is a time factor that compensates for this reduction in power by increasing the "on-time" for each pixel based on how many pixels are required for the printed column. The strobe setting value is a baseline number for a look-up table that the printer calculates for each printed column.

The gray test card is used to detect strobe misadjustment. This test card is available only to the Advanced User in Diagnostics.



Magnetic Cards

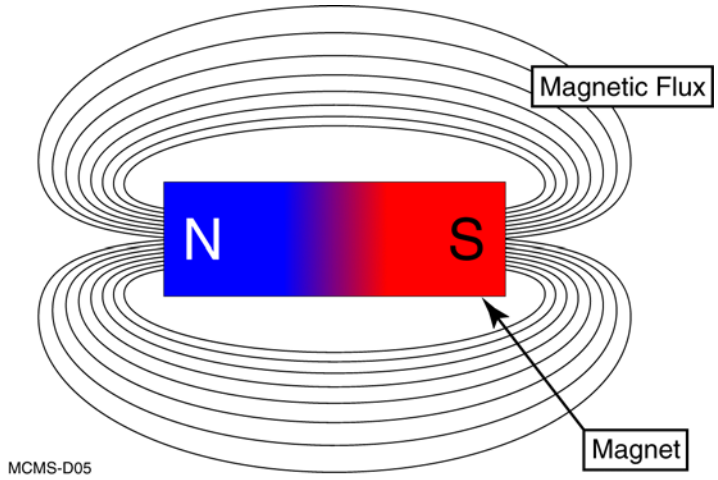
The information presented in the following section is not required for servicing the printers but to augment the customer engineer's training and knowledge base.

Magnetic Data Principles

This discussion is intended to be a primer for those who are not completely familiar with the principles of writing data to and reading data from a magnetic stripe. It covers some advanced theory, but is not intended to be a comprehensive discussion into the physics of *electromagnetism*. Those wishing to delve deeper into the physics of electromagnetism should be able to find additional information on the Internet or from their local library (Search Topics include: Electromagnetism, Gauss, Magnetic Stripe).

Magnetism

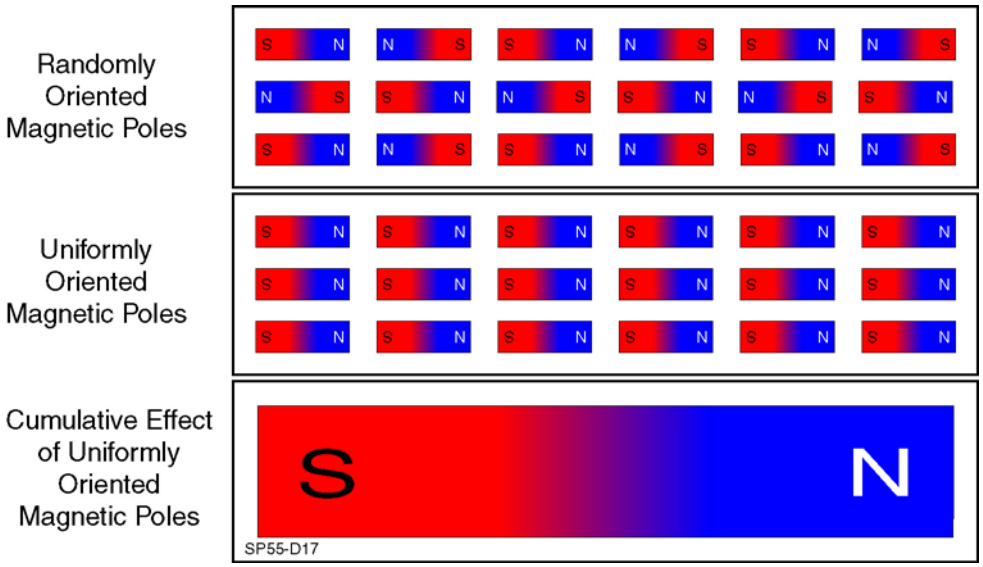
All magnets, including the Earth, have a North Pole and a South Pole. These poles always appear in North/South pairs, and there will never be one without the other. A magnetic field is comprised of *Magnetic Lines of Force*, or *Magnetic Flux,* which travel from North to South between the poles. Even though magnetic flux is invisible, the effects of these lines can be seen as they interact with particles of iron. If a piece of paper is placed over a common bar magnet, and iron filings are sprinkled across the paper, the iron particles will line up in a fashion similar to the drawing below[1]. The greater the density of these lines, the stronger the magnetism. From the drawing below, we can see that the magnetic field is strongest near the poles.



1 This is the same principle used with magnetic stripe developing fluid. The fluid contains magnetic particles in an evaporative fluid. When the fluid evaporates, the particles align on the strongest magnetic areas.

Magnetic Media

Magnetic media (stripe material) contains small magnetic particles. Before information is encoded on the stripe, the poles of the magnetic particles are randomly oriented (top image below). To encode information, the poles of the individual particles are oriented in the same direction (middle image below). The effect of having all of the small particles oriented in the same direction is the same as having one large magnet with a single North pole and single South pole (bottom image below).



Electrical Current and Magnetism

There is an interrelationship between magnetic fields and electrical current. When an electrical current moves through a wire, a magnetic field is generated around the wire[2]. Reciprocally, when a magnetic field moves past a wire, a current[3] will be generated (induced) in the wire.

Note that in the case of magnetic stripe cards, a static (non-changing) magnetic field is physically moving past the conductor. This would be analogous to flying over the mountains in an airplane. The hills and valleys make the distance between the airplane and the ground increase and decrease, but the landscape itself does not change.

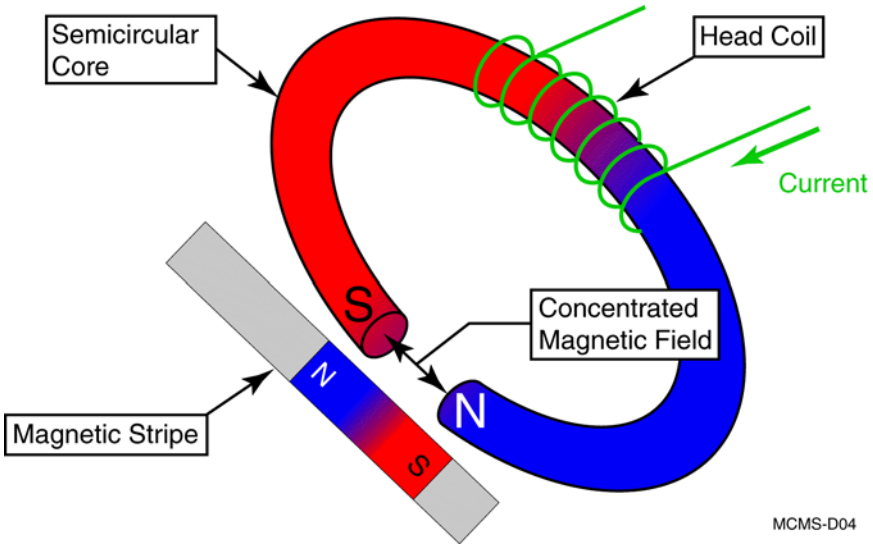
If the magnetic field (landscape) were changing, the result would be the same, and induction would occur. What is important is that the magnetic field is either changing or moving for induction to occur.

2 From *Ampere's Law*.

3 Mathematically, Faraday's Law of Induction states that a voltage is induced in the conductor. However, for reasons of symmetry with Ampere's Law, it is common practice in discussion to refer to the energy transfer as "induced current." This is appropriate as long as the conductor forms a closed circuit and Ohm's Law can be applied.

Writing Data

To write data to the magnetic material on a card, it is necessary to create a magnetic field near the stripe. This aligns all of the magnetic particles nearby in the same orientation (polarity). The Magnetic Write Head contains a small coil of wire wrapped around a semicircular iron core[4]. (The head coil and iron core are used to focus and concentrate the magnetic field.) When electrical current passes through the head coil, a small but concentrated magnetic field is generated across the open ends of the core. The magnetic stripe on the card is magnetized with the opposite magnetic polarity from the head. This is shown in the image below.



To change the polarity of the magnetic stripe under the magnetic head, the polarity of the current in the head coil is reversed. This reverses the magnetic polarity of the iron core, which in turn reverses the polarity of the magnetic stripe.

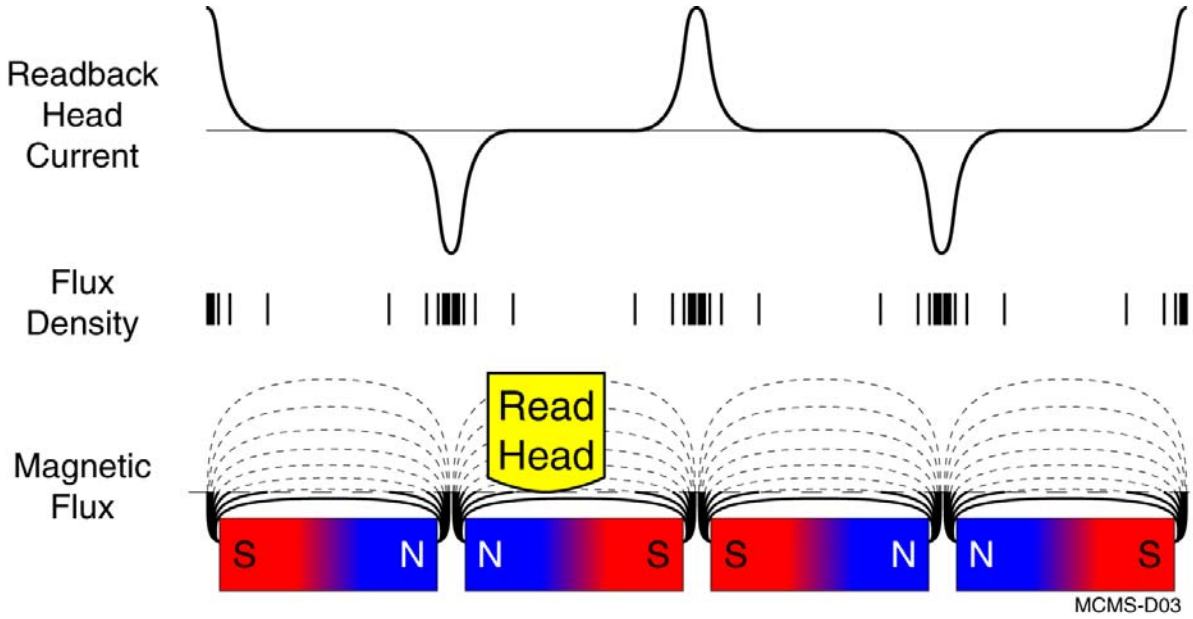
4 Other materials may also be used for magnetic cores.

Reading Data

To read the magnetic information from a card, the magnetic field on the card is used to generate a current in the magnetic head. This is possible because a moving magnetic field induces a current (or voltage) in a conductor.

The magnitude of the current is dependant on the rate of change of the magnetic field passing by the head. The greater the change, the larger the current. A simple way of understanding this is that current will be induced when the read head cuts through a line of flux. When the read head is traveling parallel to a flux line, no current will be induced.

Because the flux density is greatest at the poles of a magnet, the current will also be greatest as the magnetic pole passes below the head. This is illustrated in the drawing below. If the magnetic stripe were comprised of a single North-to-South magnet, no current would be induced in the magnetic head for the majority of the length of the card.



When two North Poles or two South Poles are adjacent to one another, the magnetic field is compressed and becomes even denser. The higher the density of the magnetic field, the larger the current that is induced in the magnetic head.

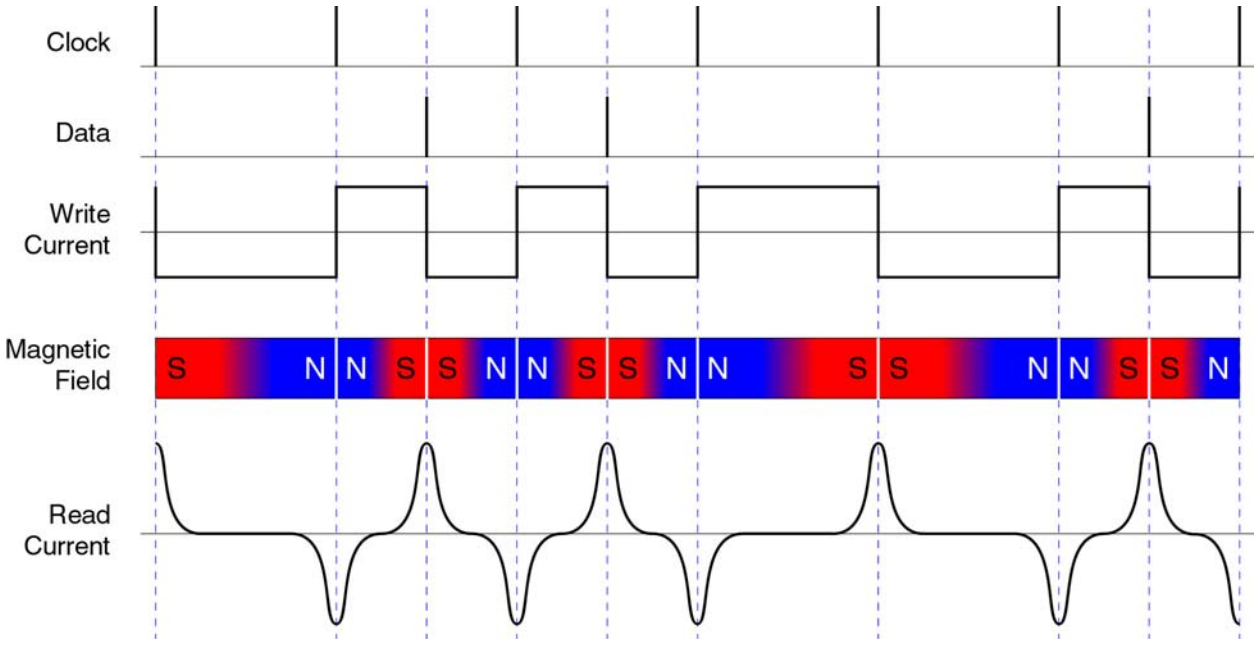
For this reason, magnetic data is comprised of *Transition Points* where the polarity of the magnetism reverses, which results in North-to-North or South-to-South polarity.

Magnetic Data

The method for recording information on a magnetic stripe is called *two-frequency, coherent phase encoding* (also known as F/2F). Although the name is complex, the concept is simple: two signals are merged together and written as a single signal. The significance of this format is that a timing signal is embedded in the data stream (called *self-clocking data*). This method allows the data to be read properly regardless how fast or slow a person swipes the card past a read head.

The clock signal is evenly spaced pulses that are recorded for the whole length of the stripe. The binary data is written between each of the clock pulses. These two signals are merged together into a serial data stream and sent to the magnetic head as an alternating current of varying frequency.

In the example below, the binary data to be written to the card is "011001." When this is merged with alternating clock pulses, the result is "1011111010111." To write this merged data string to the magnetic stripe, the polarity of the magnetic head is reversed when a "1" is in the data stream, and left unchanged when a "0" is in the data stream.



When this information is read back from the magnetic stripe, the current in the magnetic head appears as alternating pulses. This is shown as the bottom graph in the figure above.

Encoding Format

As described in the preceding section, the data on a magnetic stripe is nothing more than a series of binary 1's and 0's. However, for this data to be usable, it is necessary to know how to extract and interpret the information. By specifying how information is recorded to the stripe, it can be assured that the read device will extract and interpret the information correctly.

Bit Density

The lowest level encoding format is the recording density. This is typically specified as bits per millimeter, or bits per inch. A high bit density will allow more information to be stored on the magnetic track.

Word Length

Each piece of information written to the magnetic stripe is a binary coded character. These characters (numeric or alphanumeric) are represented by a binary number known as a binary word. Typically, these binary words are between 4 and 8 bits in length.

The number of bits per word is determined by how many possible characters there are in a character set. The common alphanumeric character set requires 6 bits for the binary character code, but a numeric character set requires only 4 bits for the character code. Once the number of bits per word has been specified, all characters in the same data string will have the same number of bits per word.

Record Length

The record length is the total number of binary words (characters) that can be stored on a magnetic track. Bit density, word length, and the physical length of the stripe determine the maximum record length.

Parity Check

A parity check is a method of determining if an error has occurred. This is accomplished by adding one extra bit to the end of a binary character code. The purpose of the parity bit is to make the sum of data bits in a binary word either even or odd. This way, all words throughout the data string will have the same parity. In the table below, note that the sum of all the bits in each row is an odd number. This is called *odd parity*. With *even parity*, the sum of the rows would be an even number.

Char	Parity Bit	Binary Char Code						Bit Sum
		2^5	2^4	2^3	2^2	2^1	2^0	
$	0	0	0	0	1	0	0	1
A	1	1	0	0	0	0	1	3
B	1	1	0	0	0	1	0	3
C	0	1	0	0	0	1	1	3
S	1	1	1	0	0	1	1	5
W	0	1	1	0	1	1	1	5
Z	1	1	1	1	0	1	0	5

Data String

Regardless what type of information is written on a magnetic stripe, there is a basic layout that is followed. This basic layout is shown below.

Leading Clock Pulses	Start Sentinel	Specific Data	End Sentinel	Longitudinal Redundancy Check	Trailing Clock Pulses

Leading/Trailing Clock Pulses

The actual information written to a magnetic stripe cannot extend fully to the edges of the stripe. The main reason for this is because the card reader needs to synchronize its timing to the speed at which the card is swiped through the reader. Leading and trailing clock pulses permit the reader to gauge the speed of the card without losing data. (The timing is continuously updated as the whole card is read, but the leading and trailing clock pulses provide a starting point without data loss.)

Specific Data

This is the actual data that personalizes the card. This data can represent a person's name, birth date, account number, etc. The actual content of this data is determined by the card issuer or one of the many international standards. (Refer to the Magnetic Stripe Primary Data Standards section for a description of some common standards.)

Start Sentinel/End Sentinel

The specific data on a card is bracketed by a Start Sentinel and an End Sentinel. These are used to identify where valid data begins and ends. These two sentinels are reserved characters and cannot be used for any other reason on the magnetic stripe. For this reason, the sentinel characters will not be standard letters or numeric characters. (Just like any other character written to the card, the sentinel's binary word also includes a parity bit.)

Longitudinal Redundancy Check (LRC)

This is a final parity check for the entire data string. Unlike the parity bit mentioned in the preceding section, the LRC is a complete binary word itself, with the same number of bits as the specific data characters.

Each bit in the LRC binary word (except its own parity bit) represents a single parity check for all of the preceding bits in the same position. This can best be explained by examining the binary data in the tabular form shown below. Each character's parity bit makes the horizontal sum of bits an odd number. The LRC makes the vertical sum of all the individual bits an even number. (The LRC's own parity bit sets the parity for the LRC word in the same manner as it would for any other character.)

Name	Parity Bit	Binary Char Code						Bit Sum	Char
		2^5	2^4	2^3	2^2	2^1	2^0		
Start Sentinel	1	0	0	0	1	0	1	3	%
Sample Data	1	0	1	0	1	1	1	5	7
Sample Data	0	1	0	0	0	1	1	3	C
Field Separator	0	1	1	1	1	1	0	5	^
Sample Data	1	1	1	0	0	1	1	5	S
Sample Data	1	1	1	1	0	1	0	5	Z
End Sentinel	0	0	1	1	1	1	1	5	?
Pre-LRC Sum		4	5	3	4	6	5		
LRC	0	0	1	1	0	0	1	3	
Post-LRC Sum		4	6	4	4	6	6		

Magnetic Stripe Primary Data Standards

The magnetic stripe on a card can store binary data in any form you wish; however, to maintain consistency, national and international standards are followed. A primary data standard is one that specifies how information is stored on a card. A secondary standard is one that specifies the content of the information stored on a card.

ISO/IEC 7811 (Parts 2 and 6)

This is the primary standard for recording that most other formats and standards are based on. This standard dictates how information is written to a card, but does not describe the content of the information. It covers 2-track and 3-track magnetic stripe cards, where 1, 2, or 3 tracks may be used.

In the past, this 3-track recording standard was referred to as IAT, which is an acronym for IATA, ABA, and TTS. This acronym should not be used to describe a 3-track card, because it describes the "content" not the "technique." It is more accurate to describe these tracks as ISO-1, 2, or 3.

Full Name	Abbreviated Name	Former Designation
ISO/IEC 7811 part 2 or 6 Track 1	ISO-1	IATA
ISO/IEC 7811 part 2 or 6 Track 2	ISO-2	ABA
ISO/IEC 7811 part 2 or 6 Track 3	ISO-3	TTS

Note that this standard permits the use of a single-track recording, but doing so does not make the recording a JIS Type-II card. That is a completely different standard, and is discussed below.

AAMVA DL/ID-2000

This is the standard used for U.S. driver's licenses. It follows the ISO standard except for some changes in data type and record length. Technically, this is not a primary standard, but since it modifies some aspects of the primary ISO/IEC standard, it is treated as though it were a primary standard.

Saflok and Ving

These are proprietary formats that the printer is capable of encoding; however the specifics of these formats cannot be published.

Multiple Record Format (SDS)

This is a special format that is used most often by the casino industry. The main purpose for the change in format is to introduce redundancy into the data to protect against misreads at the card readers. Because the cards are not intended to be universal from one provider to another, there is no specific standard format. Card issuers can have their own variations on the basic format. Some of the aspects that may be encountered within this format are shown in the table below.

Parameter	Comments
Number of Records	Each track is permitted to repeat the primary data record as many times as the issuer chooses. Each duplicate record contains its own start and end sentinels and error checking characters.
Number of Start Sentinels	Each data record is permitted to repeat the start and end sentinel any number of times. This is to ensure that the beginning and end of the record has been detected.
Number of Nulls	Between duplicate data records, there can exist empty, non-recorded space. This separates the records to ensure that two adjacent records are not misread as one record.

JIS X 6302 (Type I and Type II Cards)

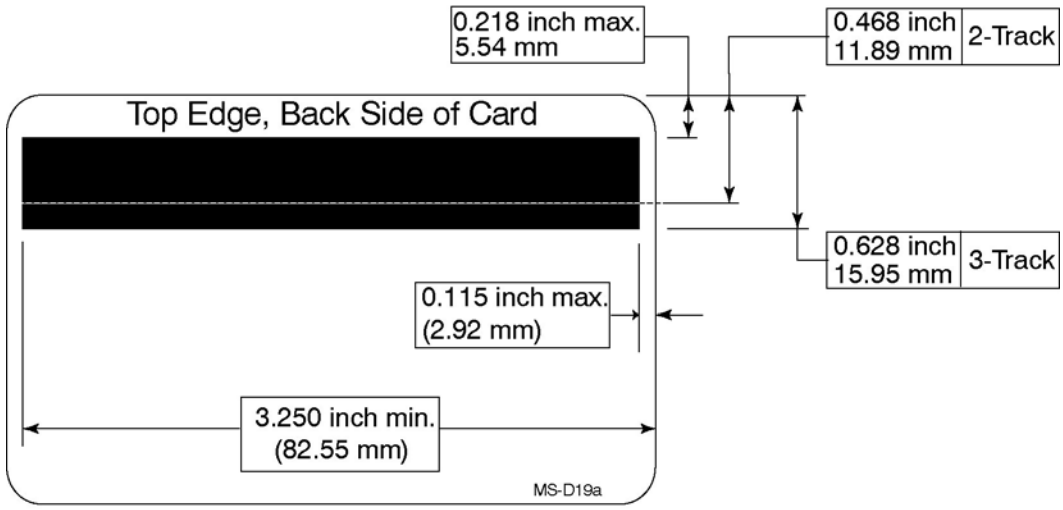
JIS X 6302 is the Japanese standard for magnetic striped cards and identifies two distinct card formats.

Type I: A JIS Type I card is a 3-track card. As of the 1998/1999 revision of this standard, the Type I card standard conforms to the ISO/IEC standard for 3-track cards. For this reason, Type I cards will not be discussed separately from ISO/IEC cards. However, note that some card issuers may still be producing cards under the 1979/1988 version of JIS X 6302. This manual does not cover that standard, but the system will nonetheless support the format.

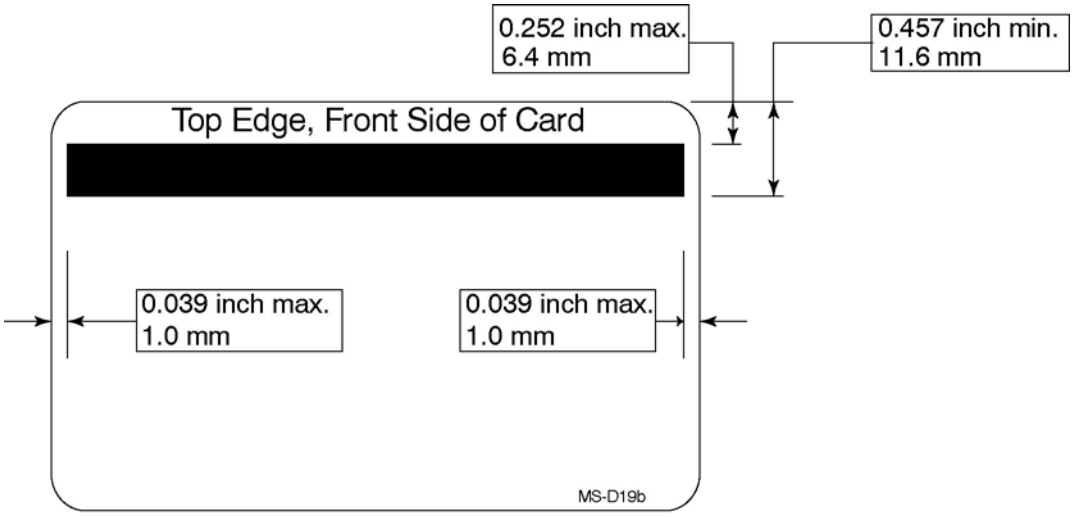
Type II: A JIS Type II card is a single-track card, and does not have an ISO/IEC equivalent. In the past, this type of card has frequently been referred to as J-Stripe, J-Track, NTT, or simply JIS Type II. (JIS Type II is now preferred.)

Magnetic Media Locations

The physical location and size of the magnetic stripe on a card follows the specifications outlined in the two drawings below. The first graphic is for a two or three track card (ISO/IEC and JIS Type I). (Note that under the ISO and JIS standards, even if only one of the three tracks is used, the minimum track size follows this specification.)



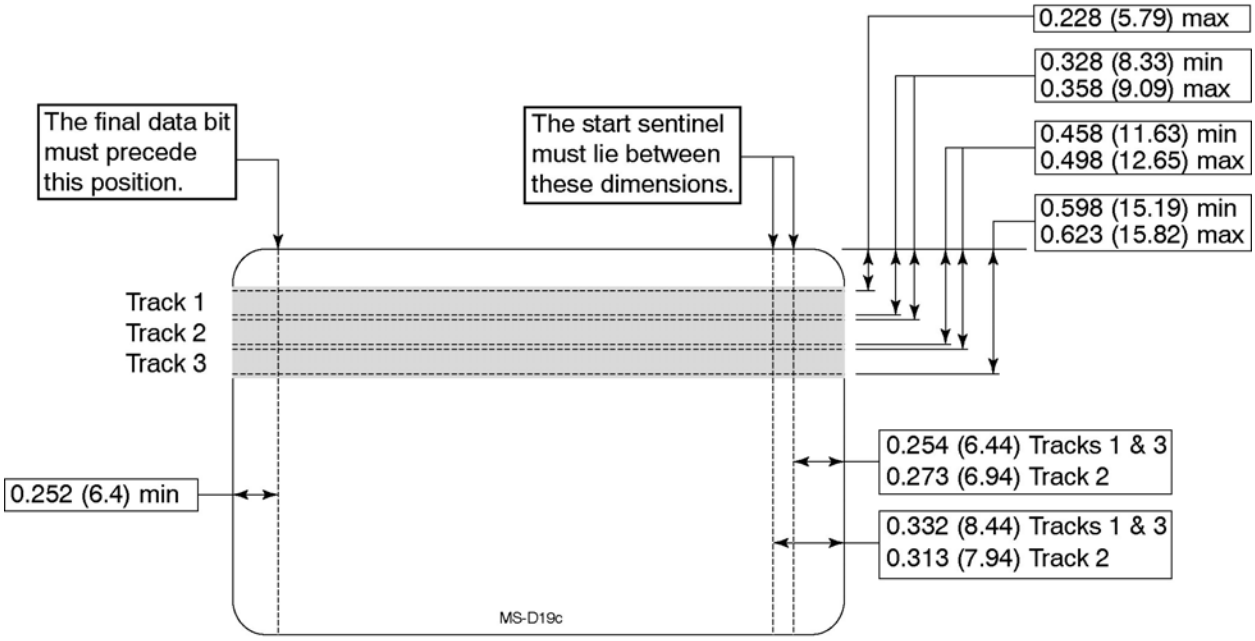
ISO/IEC 7811-2 and 7811-6
2- and 3-Track Magnetic Media Locations



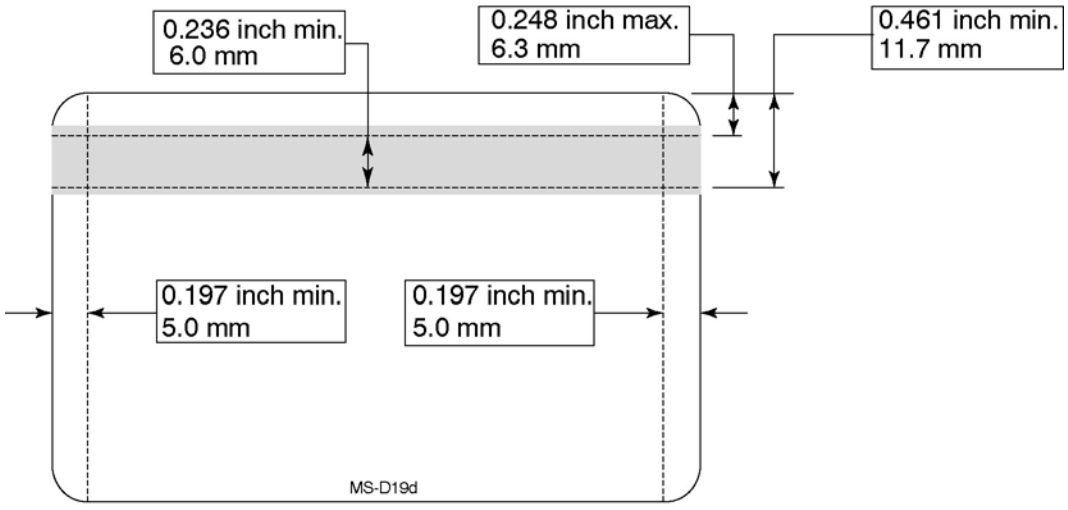
JIS X 6302 Type II Magnetic Media Locations (J1, J2)

Data Track Locations

The positions where data can be recorded on a 3-track stripe are described in the graphic below. This applies to all three of the aforementioned standards, but does not apply to a JIS Type II card.



ISO/IEC 7811-2 and 7811-6 Magnetic Data Locations



JIS X 6302 Type II Magnetic Data Locations (J1 and J2)

Summary of Specifications

The preceding sections described where magnetic data can reside on a card. This section describes the general format of that magnetic data. The following table summarizes the data specifications for the primary standards.

Parameter	ISO/IEC 7811 JIS Type I			JIS Type II
	Track 1	Track 2	Track 3	Single Track
Bit Density	210	75	210	210
Total Length	79	40	107	72
Record Length	76	37	104	69
Data Type	7-bit A/N	5-bit N	5-bit N	7-bit A/N
Start Sentinel	%	;	;	DEL
End Sentinel	?	?	?	DEL
Field Separator	^	=	=	
Word Parity	ODD			EVEN
LRC Parity	EVEN			EVEN

N = Numeric character set
A/N = Alphanumeric character set

Character Encoding

7-bit Alphanumeric Character Set as Defined by ISO/IEC 7811

Note	Char	Parity	Binary					
			2^5	2^4	2^3	2^2	2^1	2^0
	Space	1	0	0	0	0	0	0
H	!	0	0	0	0	0	0	1
H	"	0	0	0	0	0	1	0
R	#	1	0	0	0	0	1	1
	$	0	0	0	0	1	0	0
S	%	1	0	0	0	1	0	1
H	&	1	0	0	0	1	1	0
H	'	0	0	0	0	1	1	1
	(	0	0	0	1	0	0	0
	)	1	0	0	1	0	0	1
H	*	1	0	0	1	0	1	0
H	+	0	0	0	1	0	1	1
H	,	1	0	0	1	1	0	0
	-	0	0	0	1	1	0	1
	.	0	0	0	1	1	1	0
	/	1	0	0	1	1	1	1
	0	0	0	1	0	0	0	0
	1	1	0	1	0	0	0	1
	2	1	0	1	0	0	1	0
	3	0	0	1	0	0	1	1
	4	1	0	1	0	1	0	0
	5	0	0	1	0	1	0	1
	6	0	0	1	0	1	1	0
	7	1	0	1	0	1	1	1
	8	1	0	1	1	0	0	0
	9	0	0	1	1	0	0	1
H	:	0	0	1	1	0	1	0
H	;	1	0	1	1	0	1	1
H	<	0	0	1	1	1	0	0
H	=	1	0	1	1	1	0	1
H	>	1	0	1	1	1	1	0
E	?	0	0	1	1	1	1	1

Note	Char	Parity	Binary					
			2^5	2^4	2^3	2^2	2^1	2^0
H	@	0	1	0	0	0	0	0
	A	1	1	0	0	0	0	1
	B	1	1	0	0	0	1	0
	C	0	1	0	0	0	1	1
	D	1	1	0	0	1	0	0
	E	0	1	0	0	1	0	1
	F	0	1	0	0	1	1	0
	G	1	1	0	0	1	1	1
	H	1	1	0	1	0	0	0
	I	0	1	0	1	0	0	1
	J	0	1	0	1	0	1	0
	K	1	1	0	1	0	1	1
	L	0	1	0	1	1	0	0
	M	1	1	0	1	1	0	1
	N	1	1	0	1	1	1	0
	O	0	1	0	1	1	1	1
	P	1	1	1	0	0	0	0
	Q	0	1	1	0	0	0	1
	R	0	1	1	0	0	1	0
	S	1	1	1	0	0	1	1
	T	0	1	1	0	1	0	0
	U	1	1	1	0	1	0	1
	V	1	1	1	0	1	1	0
	W	0	1	1	0	1	1	1
	X	0	1	1	1	0	0	0
	Y	1	1	1	1	0	0	1
	Z	1	1	1	1	0	1	0
R	[	0	1	1	1	0	1	1
R	\	1	1	1	1	1	0	0
R	]	0	1	1	1	1	0	1
F	^	0	1	1	1	1	1	0
H	_	1	1	1	1	1	1	1

Code	Description
H	These 14 characters **! " & ' * + , : ; < = > @ _** are reserved for hardware control and cannot be part of the data content. (These may or may not be used by different device manufacturers.)
R	Additional reserved characters.
S,E,F	Reserved characters for Start Sentinel, End Sentinel, and Field Separator

5-bit Numeric Character Set as Defined by ISO/IEC 7811

Note	Char	Parity	Binary			
			2^3	2^2	2^1	2^0
	0	1	0	0	0	0
	1	0	0	0	0	1
	2	0	0	0	1	0
	3	1	0	0	1	1
	4	0	0	1	0	0
	5	1	0	1	0	1
	6	1	0	1	1	0
	7	0	0	1	1	1
	8	0	1	0	0	0
	9	1	1	0	0	1
H	:	1	1	0	1	0
S	;	0	1	0	1	1
H	<	1	1	1	0	0
F	=	0	1	1	0	1
H	>	0	1	1	1	0
E	?	1	1	1	1	1

Code	Description
H	These characters are used to control the hardware and cannot be part of the data content. (These may or may not be used by different device manufacturers.)
S,E,F	Reserved characters for Start Sentinel, End Sentinel, and Field Separator

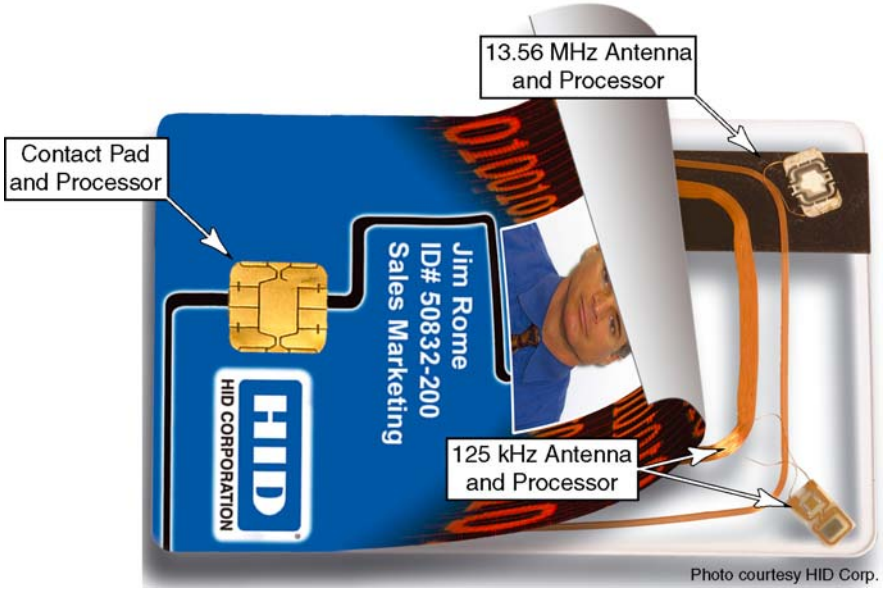
Smart Card Technology

The information presented in the following section is not required for servicing the printers but augments the customer engineer's training and knowledge base.

The underlying concept of smart cards is fairly simple: A chip is embedded inside a plastic card—the chip may be microprocessor based, or a simple memory device. The capabilities of a smart card, however, are a little more complex. They can be as simple as a means of identification, or as complex as a financial database.

Although it is not a mandated parameter (and some overlap may exist), all smart cards have a unique identifier that identifies the card type, the manufacturer, and the specific card. Most card manufacturers present this unique identifier as part of the "answer to reset" which is discussed below. Even if the card protocol permits it, this identifier should not be altered.

There are two basic types of smart cards: Contact Smart Cards and Non-Contact Smart Cards (or a combination of both types, as shown in the graphic below). Contact smart cards connect to the external interface via a set of eight electrical contact points. Non-contact smart cards interact with the external interface through a principle called inductive coupling. There are many variations on the basics of smart cards, including proprietary designs. The discussion below will be limited to discussing smart card architecture as defined under ISO/IEC 7816 (1-10) and ISO/IEC 14443 (1-4).



About this Graphic

The photograph above is an actual transparent card with magnetic stripe, a contact-type processor, a 125 kHz non-contact type processor, and a 13.56 MHz non-contact type processor. This graphic (without annotations) was provided by HID Corporation and is shown here for educational purposes. The printed image on the card is an artist's rendering.

Contact Smart Cards

A contact smart card needs to connect to an external interface to provide the processor with power and set up serial communication. The eight terminal contacts are described in the table below. (Note that two contacts are reserved for future use.)

There are two classes of contact smart cards: Type-A cards operate at 5 volts, and Type-B cards operate at 3 volts.

Smart Card Contacts					
No.	**Name**	**Purpose**	**No.**	**Name**	**Purpose**
C1	VCC	Supply voltage (3 or 5 V)	C5	GND	Ground
C2	RST	Resets the processor	C6	VPP	Variable voltage for programming
C3	CLK	Provides the timing (clock) signal	C7	I/O	Data line
C4	N/A	Reserved for future use	C8	N/A	Reserved for future use

Initiating Communication

When the card is inserted into a reader, it needs to be initialized and communication protocols defined. Note that steps 1 through 6 all occur while the card is forced to remain in a reset state (no activity).

1. The card reader senses that the card is in position under the contacts. In most cases, this is a mechanical switch that detects the presence of a card (any type of card).
2. The Reset line (C2) is held low. (The active-low reset forces the card to remain in the reset state until released.)
3. Power is applied to the Vcc and Gnd contacts.
   - A Type-A reader will apply 5 volts to the card. (Type-B cards must accept the overvoltage, but are not allowed to respond.)
   - A Type-B reader will apply 3 volts to the card.
   - A Type-A/B reader will first apply 3 volts to the card. If no response is received, it removes power, waits, and reapplies power at 5 volts.
4. The I/O line is held in the Receive mode (high impedance).
5. If the card is a Type-A card, the programming voltage (Vpp) is placed in the pause value, which is equal to Vcc.
6. The clock signal is activated.
7. The reader releases the Reset by bringing it to a high voltage.

8. The card then issues its Answer To Reset (ATR). The ATR is a hexadecimal string up to 32 characters and contains:
    - The format of the communication
    - Permissible baud rates
    - Parameters of the circuitry in the card
    - Required programming voltage on Vpp
    - The make and model of the card
    - Other information the manufacturer chooses
9. With communication parameters known, the interface can begin to communicate with the card.
10. Serial communication across the I/O line commences.
11. If necessary, the voltage on Vpp is altered, and information can be written to the card.

Non-Contact Smart Cards

Types of Cards

Whenever a new technology is developed by multiple manufactures, there tends to be multiple protocols for the device. For example, during the 1980's there were as many personal computer types as there were manufacturers. In time, the number of computer types dwindled as designs were standardized. The same is true with smart card technology, except there still exists many off-standard card types.

The primary information in this section is geared toward the ISO/IEC 14443 Type-A and Type-B cards. However, recognition should be given to a few other formats that are still widely used.

The photograph on page 2-30 shows a combicard with both a 125kHz antenna and the standardized 13.56 MHz antenna. This card is used to help facilitate the transfer from the 125 kHz system to the common 13.56 MHz system. The lower frequency format is not supported by any of the ISO/IEC standards. These low frequency cards are frequently referred to as Wiegand cards, and generally only provide a unique ID when energized.

The FeliCa card format was developed by the Sony Corp. and is similar to the standard Type-A card, except it uses 212 kb/s data rate instead of the standardized 106 kb/s data rate. There are also some variations on the modulation protocol.

The Mifare card is fairly common because it is based on an open standard used by many manufacturers. According to the Phillips Corporation this format is fully compliant with the ISO/IEC 14443-A standard.

Communication

Communication with non-contact smart cards is slightly more complicated because there is no physical connection between the interface and the card. The card reader sends out a radio frequency broadcast, which not only provides power to the card, but also establishes communication. This is called inductive coupling, and is similar to the function of a transformer.

Inductive coupling works the same way as a transformer does, except that the two coils are farther apart (called loosely coupled). The operating field of the card reader has a frequency of 13.56 MHz. This is called the carrier frequency.

Signal Modulation

The concept of signal modulation arises from the relationship between frequency and required antenna size. Namely, the antenna needs to be on the same order as the wavelength of the signal. The lower the frequency--the longer the wavelength--the larger the antenna required to transmit or receive the signal.

An audio signal for example, would require an antenna of approximately 300 Km in length. This wouldn't fit very well in the trunk of your car for listening to your favorite music, and a boom box would be totally out of the question.

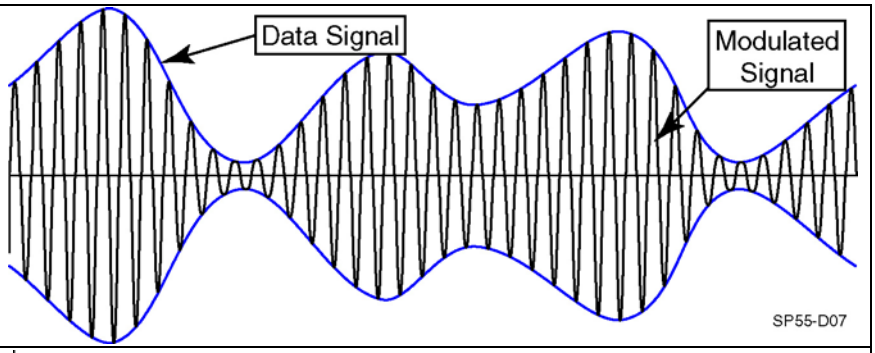
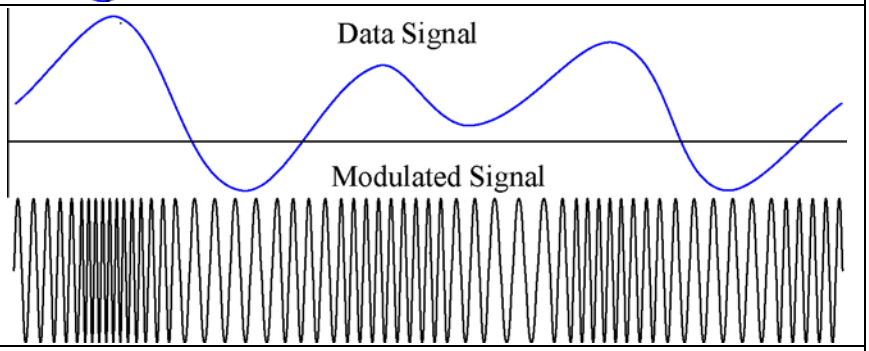
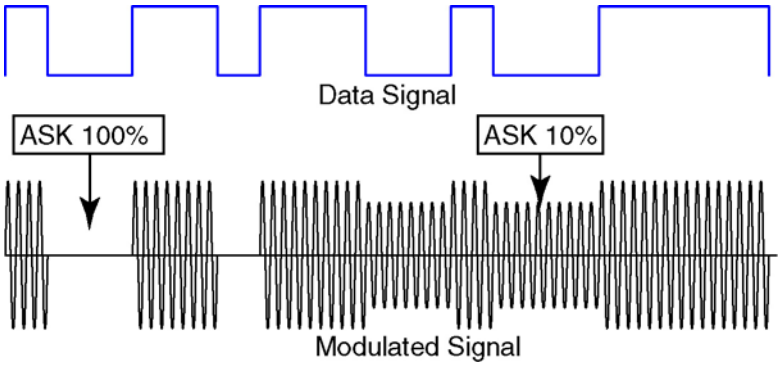
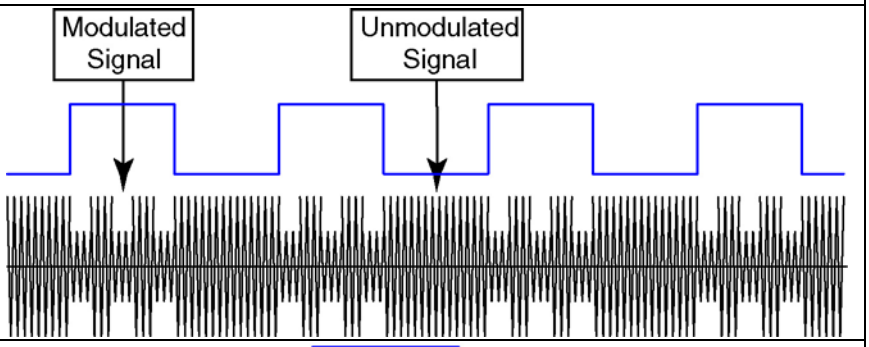
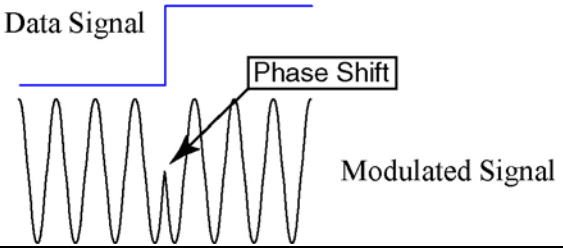
Instead, the lower frequency (the data signal) is combined with a higher frequency (the carrier). The higher frequency is more easily transmitted and received. Combining two signals together is called *modulation*.

There are many different types of signal modulation, but they all boil down to three basic parameters—altering the amplitude, frequency and/or phase of the carrier signal.

You are probably familiar with the terms *Amplitude Modulation* and *Frequency Modulation* because these are used by most consumer radios. We know them as AM and FM radios. Because of their nature, digital signals can utilize many variations on these basic modulation schemes.

The following diagrams show a couple of the basic modulation schemes as well as the variants used by digital signals. The AM and FM modulation diagrams are shown with analog data signals, but phase-shift modulation is easiest to show with a digital signal.

Signal Modulation Summary Diagram

Amplitude Modulation: The magnitude (height) of the carrier signal is varied according to the height of the data signal. This is what is used in AM radio. **Note:** The blue data signal is shown here for clarity. It is not actually present in the actual modulated signal.	
Frequency Modulation: The frequency of the carrier signal is varied according to the height of the data signal. This is what is used in FM radio. **Note:** The modulated frequency remains close to the carrier frequency, but the drawing is exaggerated for clarity.	
Amplitude Shift Keying: This is a digital variant on the AM modulation. It comes in two common forms: 100% and 10%. **Note:** 10% modulation (ASK10%) means the carrier is modulated by only 10%. 100% modulation means that the carrier signal is fully modulated. Both of these variants are shown to the right.	
Load Modulation: The card switches the resistance of its antenna, which alters the current in the transmitter. **Note:** This is a complex topic and will be discussed in greater detail later.	
Phase Modulation: A data transition is signified by a shift in the signal's phase. In this case, the phase is shifted 180 degrees by inverting the signal.	

Reader to Card Communication

The reader communicates with the card by sending an amplitude-modulated signal at 13.56 MHz. The modulation variant depends on the class of card. A Type-A card uses 100% Amplitude Shift Keying (ASK100%). A Type-B card uses ASK10% modulation. These two variants are shown in the graphics above.

The benefit of ASK100 is that it is more immune to noise and errors because there is a strong difference in amplitude at bit transitions. The drawback to this is that the card doesn't receive power during the low cycle of the modulation. The card doesn't turn off during these times, but the effect is that less overall (average) power is being transmitted to the card.

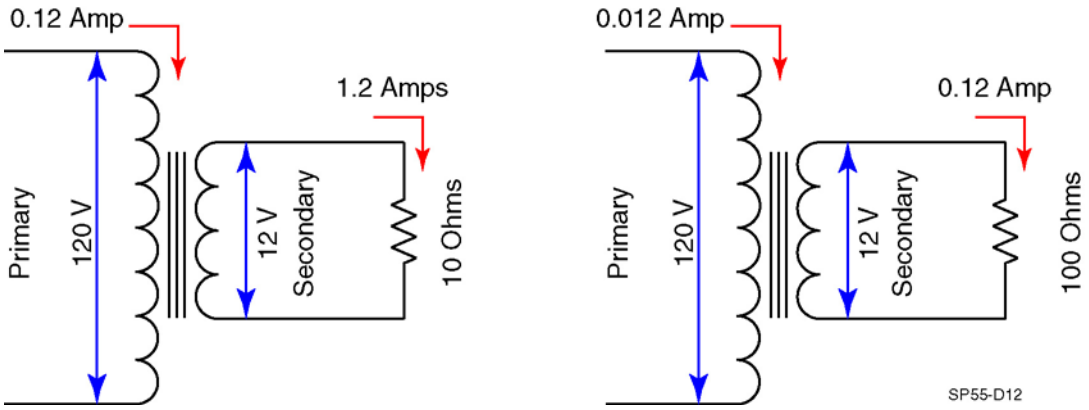
ASK10 provides more power to the card because the modulated signal remains within 10% of the maximum amplitude. The tradeoff is that the difference between high and low amplitudes is minimal. This can lead to slightly more data transmission errors.

Card to Reader Communication

The communication method back to the reader is elegantly simple, but a little more complicated to understand. It is a passive communication because the card doesn't really send a signal back to the reader—it modifies the signal emanating from the reader. This is called *Load Modulation*, and is based on a loosely coupled transformer (two coils separated by distance and without an iron core).

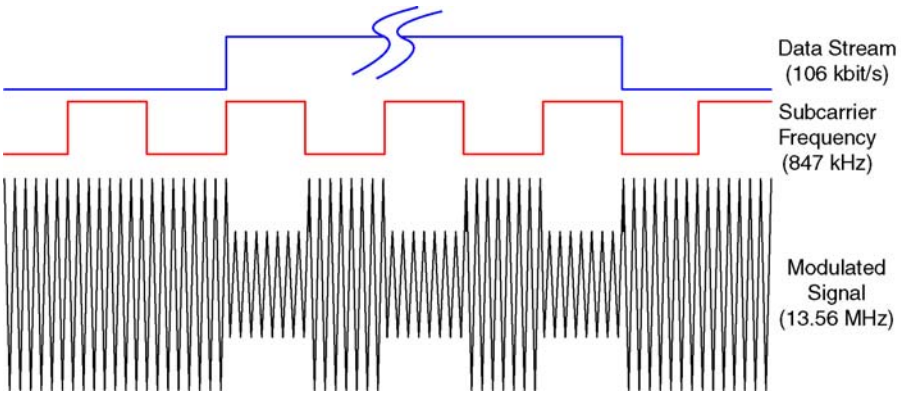
A normal transformer is frequently thought of as a method for changing one voltage to another, such as a computer power supply that takes 120 volts and reduces it to 12 volts. While the voltage decreases across the transformer shown below, the current increases proportionally. The value of the current in the secondary winding is dependant on the load being powered. Consequently, the current in the primary winding is inversely proportional to the load on the secondary winding. As a result, if the load is varying with time, the circuitry on the primary side of the transformer can detect the change in current draw.

When the card engages and disengages (switches) resistance in its own antenna, the reader detects this change by examining the current draw within its antenna.



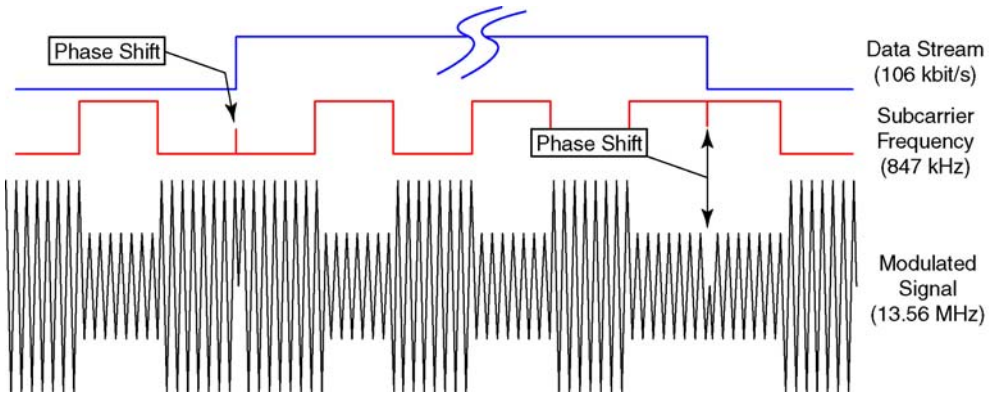
Type-A Card Modulation

The type of return modulation from the card to the reader differs with the two classes of cards (Type-A and Type-B). Type-A cards use a simple On-Off-Keying modulation (OOK). This is the binary equivalent of amplitude modulation. The card switches the resistance seen by the card reader at a frequency of 1/16th the frequency of the carrier signal. This means that during a modulation period, the carrier signal is attenuated every eight cycles. The data stream is even slower than this (1/128th of the carrier frequency) so each data bit will have several transitions from modulation to non-modulation of the carrier.



Type-B Card Modulation

A Type-B card uses a combination of amplitude modulation and phase modulation, called Binary Phase Shift Keying (BPSK). This method sends a constant subcarrier frequency of 847 kHz using amplitude modulation, but shifts the phase of the subcarrier by 180 degrees (inverted) at each data transition. In other words, the carrier is always modulated with the subcarrier, but during data transitions, the subcarrier signal is altered (inverted). The subcarrier is permitted to invert only at its own transition points (which is why the frequencies are even multiples of each other).



Chapter 3: Routine Maintenance

3

This chapter provides routine maintenance procedures for the SP55, SP55 Plus, and SP55k card printers.

Required Tools and Supplies

The following tools and supplies are needed for routine maintenance procedures.

Description	Part Number
Compressed air (canned)	TUL001-018
General purpose, non-abrasive cleaner	Any
Lint-free cloth	TUL001-020
Isopropanol cleaning pen	557492-001
Isopropanol cleaning card	552141-001
Cleaning sleeve	549288-002
Molykote DX grease	807421-001

Cleaners used on the printer's exterior should not contain any abrasives, oils, fragrances, antibacterial agents, solvents, or isopropanol. Do not use soft-scrubbing cleansers, products with petroleum, or products with mineral, pine, or lemon oil.

CAUTION: Use only canned compressed air on this printer. Do not use facility air as it will have trace amounts of oil and moisture that will accumulate on surfaces and possibly damage electronic components.

Routine Maintenance Procedure

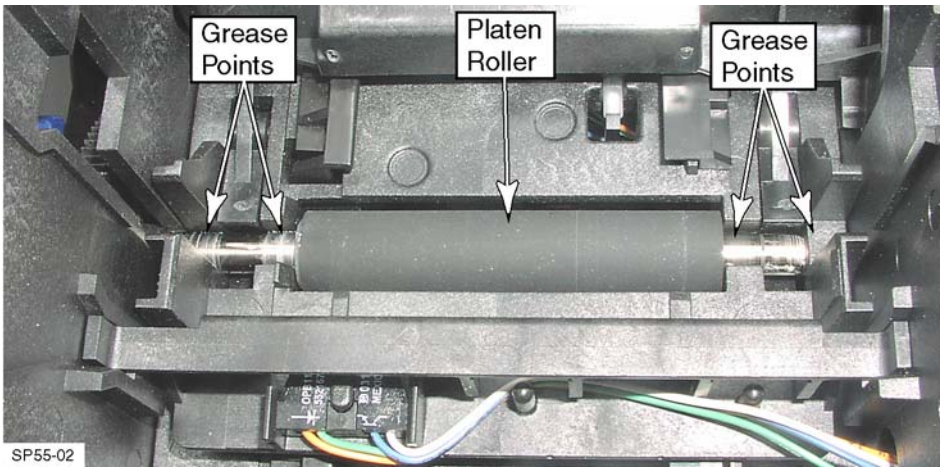
To extend the life of the printer, perform the entire routine maintenance procedure each time the printer is serviced.

Refer to chapter 6 of this manual for removal and replacement procedures.

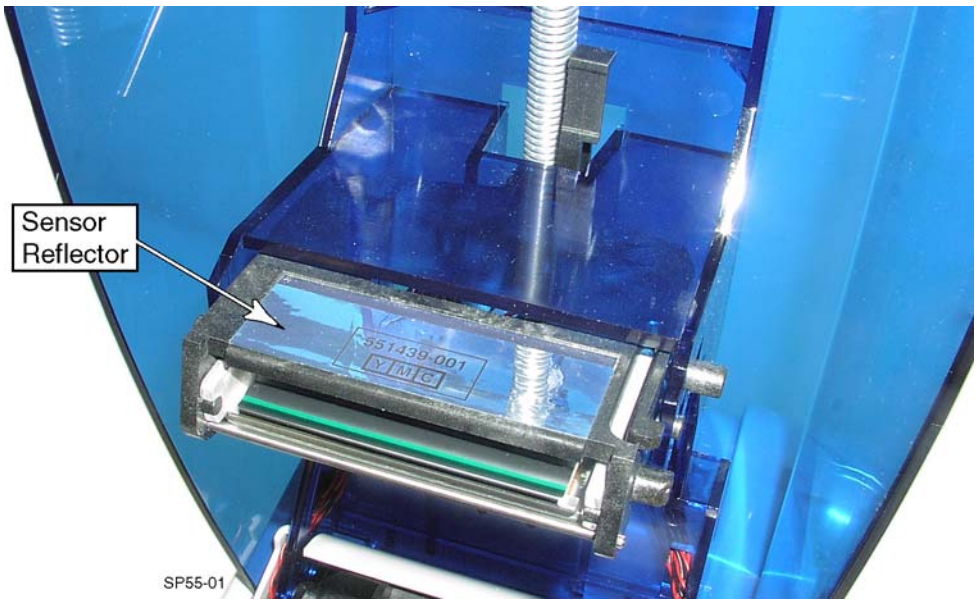
CAUTION: Do not spray or pour cleaner directly on or into any electrical device.

Clean the Interior of the Printer

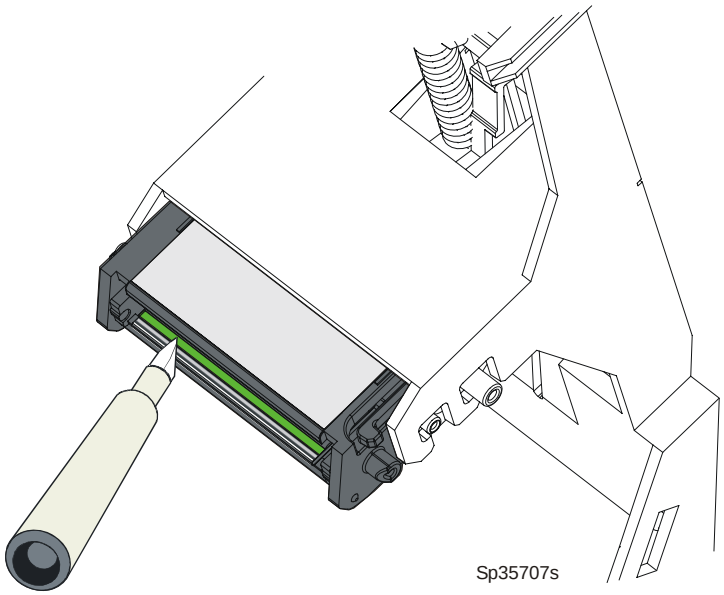
1. Unplug the printer.
2. Remove the printer enclosures (not applicable on SP55k).
3. Remove the chassis from the base.
4. Using canned compressed air:
   - Blow out any debris near the sensors
   - Blow out any dust from the control board and other surfaces of the base.
   - Blow out any dust and debris from the underside of the chassis. Make sure to include the cam sensor.
5. If the grease on the platen roller shaft has accumulated dirt and debris, wipe off the grease with a dry cloth, and re-grease the surfaces with Molykote DX grease.



6. Use a cloth dampened with water to clean the sensor reflector on the printhead cartridge.



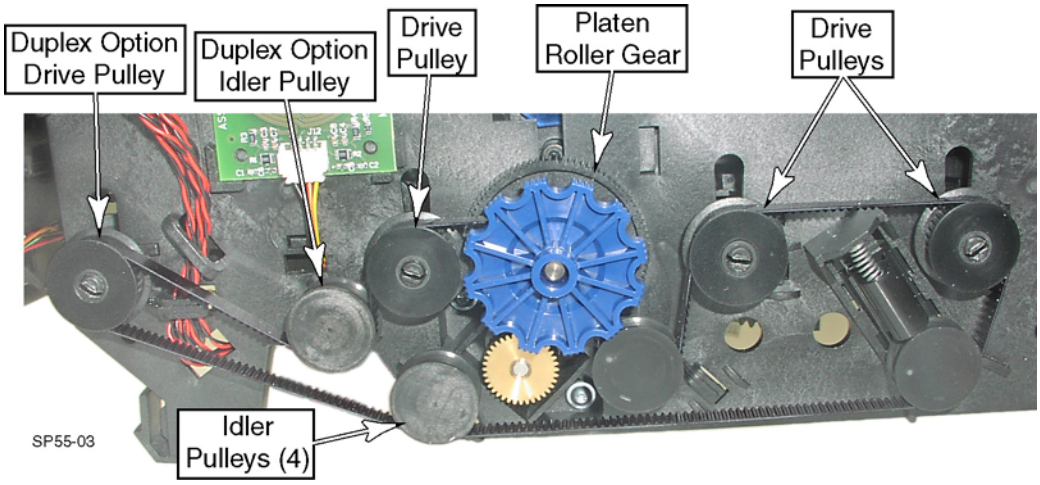
7. Using an isopropanol cleaning pen, clean the thermal printhead by rubbing the isopropanol tip over the printing portion of the printhead.



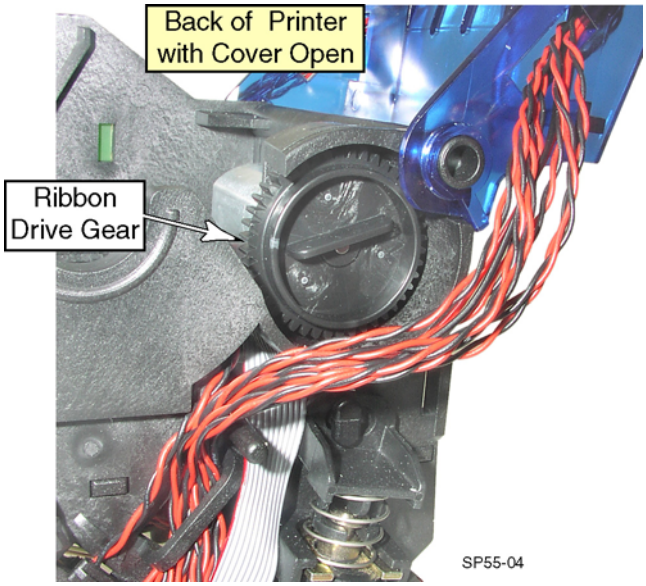
Mechanical Inspection

Inspect the following components and replace as needed.

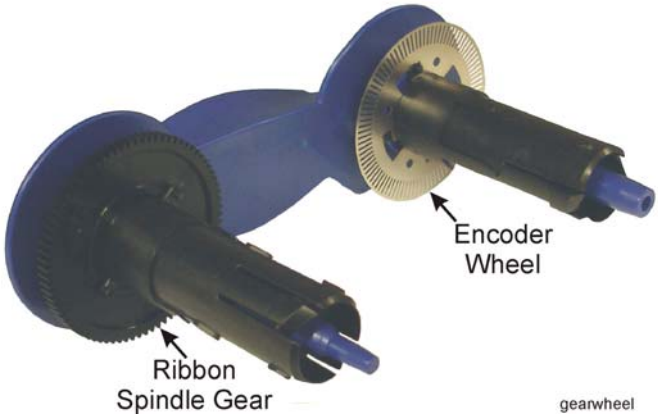
1. Check the fixed cleaning rollers to make sure they are not nicked or gouged. Replace them if they are dry.
2. Check all other rollers for wear or damage.
3. Check springs to verify they are in position and not damaged.
4. Inspect the transport system:
   - Inspect the timing belt for wear and missing teeth.
   - Inspect the three or four idler pulleys and make sure they are securely seated.
   - Inspect the drive pulleys for wear and broken teeth.
   - Inspect the platen roller gear and pulley for wear and broken teeth.



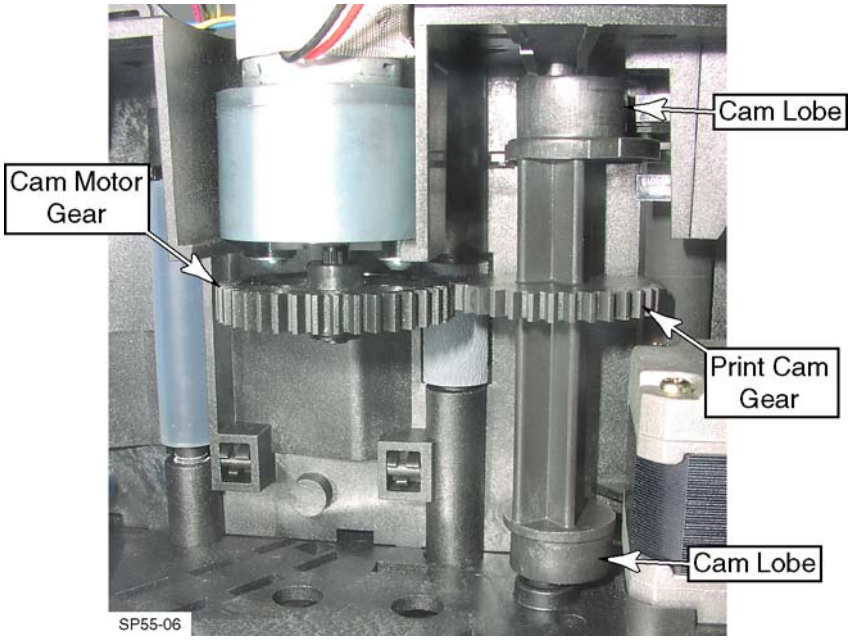
5. Inspect the ribbon drive gear for wear and broken teeth. Make sure it is securely seated on the motor shaft.



6. Inspect the ribbon cartridge.
   - Inspect the spindle gear for wear and missing teeth.
   - If the cassette has a plastic encoder wheel, inspect it for scratches and missing lines.
   - Check the spindles for proper movement, and that the clutches are providing a slight drag.



7. Inspect the print cam gear and motor gear on the underside of the printer for wear and broken teeth.
8. Inspect the cam lobes for wear or grooves.



9. Reassemble the printer.
10. Wipe the exterior of the printer with a cloth dampened with a non-abrasive, general purpose cleaning solution. Let the printer dry before connecting power.

Run the Cleaning Card

1. Connect the printer to the computer and turn on the power.
2. Remove the cleaning roller, print ribbon, and any cards from the input hopper.
3. Open the Printer Toolbox Dialog, and click on **Clean Printer**.
4. If additional cleaning is required, wipe the rollers with the isopropanol cleaning pen or 99% isopropanol.
   - The transport rollers can be rotated by turning the manual advance knob.
   - The pick roller can be rotated by reaching in through the output hopper.
   - Access the lower cleaning roller by removing the cleaner rocker assembly.
   - Access the front drive roller by removing the front roller rocker arm.
   - Access the magnetic stripe encoder roller by removing the magnetic encoder roller rocker assembly.
5. Put a new cleaning sleeve on the cleaning spindle, and replace the roller.

Visual Inspection for Card Quality

1. Print an internal test card by pressing and holding the Ready button on the printer and connecting power.
2. Continue holding the Ready button until a 3-tone signal is heard.
3. Release the Ready button. The printer begins printing the test card.
4. Inspect the test card for obvious flaws in quality. If you find problems, refer to chapter 4, Troubleshooting.

Chapter 4: Troubleshooting

4

This chapter provides information for troubleshooting problems with the SP55, SP55 Plus, and SP55k card printers.

General Notes

The SP Series *InfoCentral* help file contains a great deal of information for troubleshooting the system--such as print quality and software communication problems.

- To open *InfoCentral*, click on the icon installed to the desktop when the printer driver was installed on the computer.
- If *InfoCentral* was not installed, insert the Printer Driver CD, click on **User Information** and then **View InfoCentral** to view it. You can also select it from the Service CD Library menu.

General Troubleshooting Procedures

CAUTION: This section is intended only for a fully trained technician. Performing these procedures in an inappropriate manner will damage the printer. Even a trained technician should use care in applying these procedures to avoid permanent damage to the printer.

The following procedures are intended to be a rough guideline for isolating the cause of a failure. These scenarios do not cover every aspect of the devices, but should provide enough information to isolate the root cause of a failure.

Many of these procedures assume a familiarity with the printer's diagnostic software. For brevity, details about the diagnostic software are not discussed unless required. For further information about Diagnostics, refer to chapter 5 of this manual.

CAUTION: Unless instructed otherwise, always unplug the printer before connecting or disconnecting any electrical device from any circuit board.

Non-Clearing Repetitive Messages

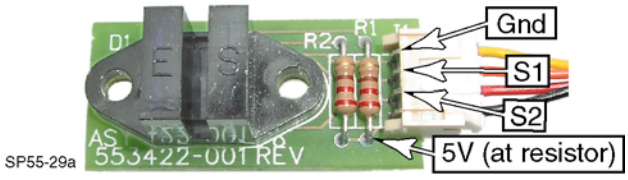
If the printer encounters an error that will not allow it to begin production, clearing the error message may result in the printer continuing to test for the same error condition. This will result in a repetitive error message which prevents the customer engineer from performing diagnostic routines to troubleshoot the error. Some examples of this type of situation may include a failed duplex motor, cam motor, card input sensor, duplex sensor, etc.

When the error message is displayed and the printer beeps, do not clear the error message from the computer's screen. Instead, hold the Ready Button in until the Ready Light turns red and the printer beeps once more (about 10 seconds). The printer will clear its errors, but will not reinitialize. The printer ignores the error until a task is performed to reveal the error again. During the course of your investigation, you may need to repeat this procedure.

Troubleshooting Sensors

This procedure is used to determine if a sensor has failed or if the main control board is not seeing the sensor properly. The first step in troubleshooting a sensor is to determine if the sensor is toggling from an active state to an inactive state as a physical condition changes.

1. Verify that the sensor is fully plugged in to the control board. In some cases, an unplugged sensor will be displayed as "active" in the Diagnostics window.
2. Using Diagnostics, observe the sensor status indicator as the sensor is blocked and unblocked.
   - To test the ribbon index sensor, remove the ribbon cartridge, and open and close the swingarm. (Also verify that the reflector is in position on the printhead).
   - To test the magnetic stripe registration sensor, slide a card between the sensor and the reflector on the rocker arm.
   - Because the ribbon motion sensor has two channels, the only way to verify that both channels are functioning is with a volt meter. Use the test points in the figure below to test the sensor.



3. Unplug the printer and swap the sensor with another sensor:

   You cannot swap the ribbon motion sensor with any other sensor. It is not compatible with any other sensor.

   - Because this is a test of the sensor, the original sensor does not need to be removed. Simply unplug the original sensor from the control board and plug in a replacement sensor.
   - If a spare sensor is not available, you can use an adjacent sensor from within the printer. (Except for the ribbon motion sensor, all sensors are electrically compatible.)
   - The sensor does not need to be the same type. For example, a transmissive sensor can be used in place of a reflective sensor. (The transmissive sensor is easier to block and unblock.)
4. If the replacement sensor functions, then the original sensor is defective. Verify this by reconnecting the original sensor.
5. If the replacement sensor is non-functional and other sensors in the printer are observed to be functional, then the main control board is defective. (If none of the sensors are functional, you may have a communication problem between the printer and Diagnostics.)

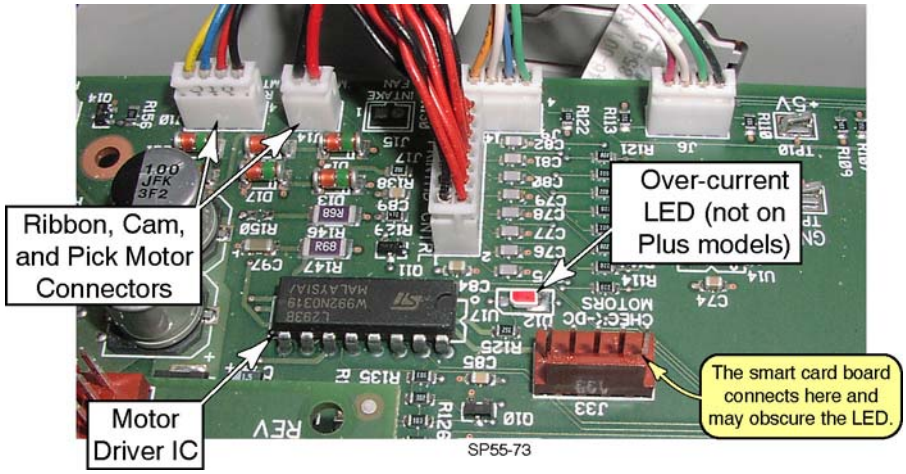
Troubleshooting Motors

The best way to determine if a motor has failed versus a main control board failure, is to swap the motor with a similar motor. If a motor has failed, then a replacement motor should function. Conversely, if the motor's driver has failed, then a replacement motor will not function either.

CAUTION: This is intended to be a limited test using Diagnostics to verify if a motor turns or not. Do not attempt to operate the printer with motors swapped out. Limit your test to short periods of time.

Testing General DC Motors

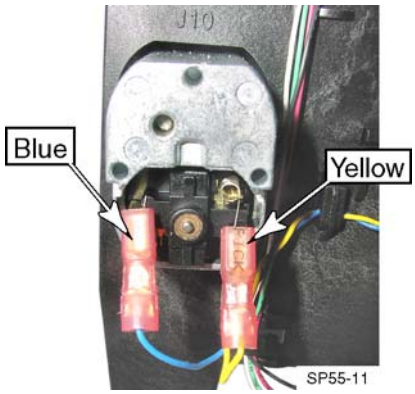
- The ribbon, pick, and cam motors are all driven from the same motor driver chip (integrated circuit). If all three motors have failed, the main control board is faulty and needs to be replaced.
- If a motor is drawing too much power from the motor driver IC, an LED will be illuminated to indicate an over-current condition.
  - Once the LED has been turned on, it can be reset only by unplugging the printer.
  - If operating a specific motor (but not the other two) results in this LED being turned on, the likely cause is that the motor has failed.
  - If the LED turns on regardless which motor is operating, then it is more likely that the main control board is faulty.

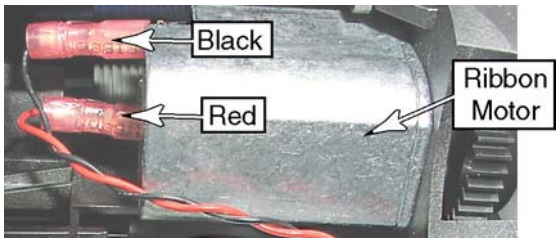


Testing the Ribbon and Pick Motors

Because the ribbon and pick motors are identical, swapping the two motors can isolate whether the motor is faulty or the control board is faulty.

1. Remove the wires from both motors.
2. Take the two wires from the operable motor and connect them to the motor to be tested. (The pick motor is shown below for reference.)
3. Using Diagnostics, operate the motor. (Note that the motor you select in Diagnostics is the opposite of the one you are actually testing. If in doubt, operate both motors from Diagnostics.)

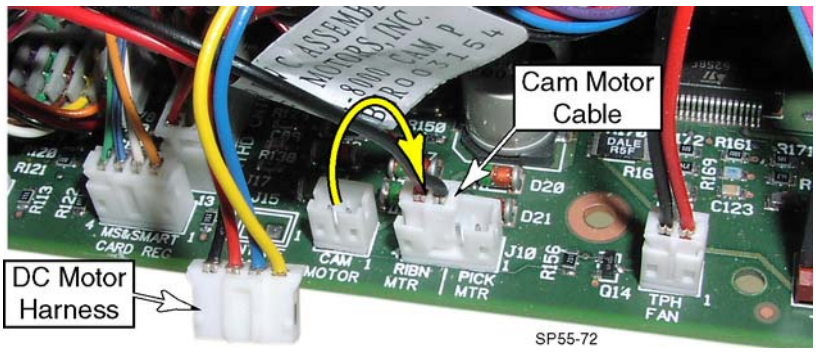




Testing the Cam Motor

Use care with this procedure. Even though the motors are different, their controlling circuitry is similar. The connectors are not compatible, but can be interchanged for testing purposes only.

1. Unplug the DC motor harness (ribbon and pick motors).
2. Connect the cam motor to one side of the DC motor connector as shown below. (Note that you will receive a repetitive error (see page 4-2) when the printer is powered up.)
   - Connect the cam motor to either pick or ribbon motor positions. Note that the motor connector does not fit properly in the socket, but it fits enough for testing purposes.
3. Using the motor tests diagnostics, operate the ribbon or pick motor and see if the cam motor rotates.



Testing the Printhead Fan

To test the printhead fan, it can be connected to the cam motor's connection. These two motors are not compatible, but the driver circuitry for the cam motor will operate the fan.

CAUTION: You cannot connect the cam motor into the fan's connector. The circuitry of the control board will be damaged.

Testing Transport and Duplex Motors

The two stepper motors cannot be tested using the methods presented above. The only reliable way of verifying if the motor is non-functional is to replace the motor with another identical motor.

Troubleshooting Other Devices

Testing the Smart Card Solenoid

The driving circuitry for the smart card solenoid is located on the smart card daughter board. A power transistor on the daughter board amplifies the signal going to the solenoid. If the solenoid is not receiving a signal, the daughter board is the likely cause. To verify that the solenoid itself is functioning, plug it into the cam motor's connector.

CAUTION: Do not attempt to connect the solenoid into the printhead fan's connector, as this may damage the fan's driving circuitry.

Testing the Duplex Clutch

CAUTION: Connecting or disconnecting the duplex interface cable from the main control board with the printer powered may result in immediate damage to the main control board. Never make modifications to the interface board with the printer powered.

The driving circuitry for the duplex clutch is located on the duplex interface board. If the duplex clutch is not receiving a signal, the most likely cause is the interface board or the cable leading to the main control board.

From an electrical standpoint, the duplex clutch is similar to a solenoid. When the clutch is energized, it will lock the center shaft of the duplex flipper with the main drive gear of the duplex transport. Testing the clutch will require some physical involvement with the printer (manually rotating the flipper).

1. Manually rotate the duplex flipper to determine which direction the flipper is supposed to operate.

   The flipper should rotate in only one direction. If it can be rotated in both directions, the spring is damaged and needs to be replaced.

2. With the printer powered off, remove the duplex clutch cable from the interface board and connect it to the cam motor connector. (Note that you will receive a repetitive error (see page 4-2) when the printer is powered up.)
3. In Diagnostics, set the motor test duration to 3 seconds, and activate the cam motor circuit.
   A. While the Diagnostics program energizes the cam motor circuit, manually rotate the duplex flipper in the same direction determined in the step above.
      - When the clutch is relaxed, the main duplex gear will not rotate.
      - When the clutch is energized, the main duplex gear will rotate as you rotate the flipper.

   B. After Diagnostics releases the cam motor circuit, you should notice that the main duplex gear rotates freely from the rotation of the flipper.
      - If you did not observe the main duplex gear rotating as you rotated the flipper, then it is likely that the clutch is faulty.
      - If the duplex gear did rotate, then the most likely cause is a faulty interface board. The secondary cause is a faulty duplex clutch.

Diagnosing the Duplex Interface Board

CAUTION: Connecting or disconnecting the duplex interface cable from the main control board with the printer powered may result in immediate damage to the main control board. Never make modifications to the interface board with the printer powered.

Whenever a problem arises that is related to the duplex module, the first thing to check is the cable between the duplex interface board and the main control board.

All of the duplex sensors pass directly through the duplex interface board without intervention, so if a sensor is non-functional, the most likely cause is the cable between the interface board and the main control board.

The interface board contains driver circuitry for the duplex clutch and the duplex motor. If either of these devices aren't working yet the device itself is not the cause, the interface board is likely at fault.

Diagnosing the Ribbon RFID Antenna

The circuit board for the RFID antenna is very simple and not prone to failure. If a failure exists in identifying a ribbon, the most likely cause is with the ribbon cartridge's ID tag. This is best tested by replacing the supply spool with a new spool.

If the printer cannot read any ID tag, first check the cable leading to the main control board. If the cable is connected properly, then the main control board is likely at fault.

Performance Problems

Printer Initialization Errors

Symptom	Comments

The printer initializes but reports a card stuck in the transport, and the transport runs more than expected.	• Check the operation of the card input sensor using the sensor screen in Printer Diagnostics. If the sensor is always blocked, it is either disconnected or not fully seated (obscured by part of the chassis).
	• Check the operation of the magnetic stripe registration sensor using the sensor screen in Printer Diagnostics. If the sensor is always active (non-reflecting):
	  • The sensor may be disconnected.
	  • The sensor may not be seated (doesn't reflect off of rocker).
	  • The rocker assembly may be stuck in an elevated position.
	  • The reflective pad on the rocker may be missing.
	  • The sensor has failed.

The printer initializes but reports a card stuck in the duplex.	• Check the operation of the duplex entry sensor using the sensor screen in Printer Diagnostics. If the sensor is always blocked, it is either disconnected or not fully seated (obscured by part of the chassis).
The printer initializes but reports a broken print ribbon.	• Verify that a cartridge is installed. • Check the encoder wheel for damage. • Make sure the ribbon motion sensor is connected and functioning.
The printer initializes and the ribbon is advanced, but the printer reports that the index mark could not be found.	Remove the ribbon and close the cover. Check the sensor setting in Diagnostics. If the sensor is not active: • Make sure the reflective tape is present on the printhead. • Make sure the sensor is plugged in. • Replace the sensor.
Frequent time-out errors occur at the beginning of printing.	If there are other USB devices on the same computer, they may interfere with timely communication with the printer. Specifically look for the following: • Is the card creation program saving its file or database to a USB device? • USB mass storage devices, where some program application is set to auto-save to the device. • A program application that is using or referencing a USB device on a regular basis.
The printer continually reports a card jam at the smart card module, but no card is present.	The smart card contact contains a small mechanical switch. The switch contacts may be stuck.

Card Jams at Card Input

Symptom	Comments
A card is not picked from the input hopper.	• Clean the printer. • Use graphic quality cards. • Fan cards properly. • Inspect the pick roller for buildup or debris. • Inspect the card gate to make sure it is securely fastened. • Inspect the card stock for burrs and excessive static buildup. • Inspect the pick roller and motor function.
The card is picked but stalls at the cleaning rollers.	• Clean the printer. • Inspect the cleaning rollers for excessive debris. • Transport not working. • Inspect the cleaning rocker assembly springs to make sure they are tensioning the rocker assembly. • Check for double card pick.
A card is picked and appears to be properly positioned, but the error is still reported.	• Clean the card input sensor. • Check the position of the card input sensor and make sure it is firmly seated. • Check the operation of the card input sensor using the sensor screen in Printer Diagnostics. • If the sensor is always blocked, it is either disconnected, or not fully seated (obscured by part of the chassis). • If the sensor never blocks, either the cable has a short circuit, or the sensor is not seated at all (outside of the card track).

Card Stalls at Output Stacker

Symptom	Comments
Completed cards frequently fail to drop into the card output stacker.	• Clean the printer. • This situation is more likely to occur with thinner cards or cards printed on one side only. • Reduce static in the area of the printer by increasing the relative humidity. • Use thicker cards. • Empty output tray often. • Make sure the static brushes are installed.

Card Jams in Printing Area

Symptom	Comments
Card stops prior to reaching the platen roller.	• Clean the printer. • Increase the card registration distance. • Check the front rocker assembly springs for damage. • Check the front card guide and spring for damage. • Check the position of the sensors and make sure they are firmly inserted into the printer.
Card stops under the printhead.	• Two cards were picked and one is in the back of the transport. • If using a monochrome ribbon, make sure an SP Series print ribbon is installed. Other ribbons are not designed for the increase in printhead heat. • Inspect the card for improper print ribbon panel placement. Printing with the wrong panel can cause the ribbon to adhere to the card. • Decrease the printing brightness setting. • Inspect the card guide and rocker assembly springs for placement and damage.
Card stops past the printhead.	• Inspect the rear rocker arm assembly and springs for placement and damage. • Inspect the magnetic stripe rocker arm and springs for placement and damage. • Make sure the magnetic stripe head is firmly seated. • Inspect the rear card guide and spring for damage.

Ribbon Break Errors

Symptom	Comments
Ribbon did not break, but the error is reported.	• Clean the printhead. It may be preventing the ribbon from advancing. • Check the ribbon encoder wheel. Verify that it is positioned in the sensor and is not damaged. • Check the ribbon motion sensor cable to make sure it is connected. • Check the sensor to make sure it is functional and correctly aligned. • Check the ribbon motor and make sure it is functional. • Check the ribbon motor gear and take-up spool gear for damage or broken teeth. • Check the ribbon cartridge clutch. • Check that the ribbon is attached to the take-up ribbon core. • Check to see that the ribbon is not sticking to the card.
The ribbon frequently breaks.	• Check the Card Registration Offset. • Adjust the image trimming farther from the edge of the card. • Make sure an SP Series ribbon is installed. • Make sure the printing intensity is not too dark. On an edge-to-edge image when the leading edge of the image uses 100% of a color (Y, M, or C), the ribbon may get burned if the card is not fully under the printhead to absorb the heat. • Check for burrs on the edges of the cards. • Make sure the cards being used are not already printed.

Error Codes

When an unexpected or undesired event occurs, the printer and/or software will generate an error code to be displayed on the monitor. Many times the error code is intended to be informational to instruct the operator to perform a required or routine task. Other times the error code is the result of a non-routine event that indicates a more serious problem with the system.

Error Code Prefixes

The error messages use the following prefixes to indicate the source of the problem:

Driver API	AP-008xx
Printer Driver Errors	DR-009xx
Input Errors	IS-012xx
Duplex Errors	DM-007xx
System Errors	SY-013xx
Magnetic Stripe Errors	MS-014xx
Print Errors	PR-017xx
Smart Card Errors	SC-018xx

General Notes

This section does not instruct the user on how to handle routine errors. The solutions presented are for repetitive errors. For example, a simple card jam can occur periodically without a specific cause. However, a repetitive card jam would indicate a problem with the printer.

In the tables below, the name of the error handling procedure call is included under the symptom of the error. This procedure name is never displayed, but it is included here to provide additional information about the specific error. For example, the procedure name called when a card is lost in the duplex is, (× ERR_FLP_CARD_LOST).

There is a significant difference between a card being lost versus stuck (or jammed). A lost card means it was not seen by a sensor. A jammed card means the sensor never cleared. These two distinctions can be helpful when determining the cause of an error. For example, if the printer is reporting a jammed card but the card is not located under the sensor, then the first place to begin troubleshooting is with the sensor (it is possibly unplugged).

Driver API (AP)

Error Code	Message text	Comments
AP 00800 AP 00801 AP 00802	Data includes too many characters for the selected track format (tracks 1,2,&3). Check the data entered or the format selected.	Verify the data is correct for the selected track, and resubmit the card for printing.
AP 00804 AP 00805 AP 00806	Data includes a character not allowed for the selected track format (tracks 1,2,&3). Check the data entered or the format selected.	Verify the data is correct for the selected track, and resubmit the card for printing.
AP 00808	The application used a Datacard printer function with a printer other than the Datacard printer.	Select the SP55, SP55 Plus, or SP55k printer.
AP 00809	Internal Datacard printer API error.	Contact the print application developer.
AP 00810	The application used a Datacard printer function out of the proper sequence.	Contact the print application developer.
AP 00811	The application sent a value that is not consistent with current settings.	Contact the print application developer.
AP 00812	The application sent a value that is not supported by the Datacard printer API.	Contact the print application developer.
AP 00813	A printer error occurred while picking a card.	Inspect the card pick system.
AP 00814	A timeout error occurred while picking a card.	Check the communication cables. Verify that another USB device is not interfering with communication.
AP 00815 through AP 00825	Custom magnetic stripe API messages	

Printer Driver Errors (DR)

Error Code	Message text	Comments
DR 00901	The printer is not responding. Check the printer and USB cable connections.	• Make sure the printer status light is showing steady green. • Check the cables. • Make sure the computer's USB port is functioning.
DR 00902	The printer is paused. Click **OK** to continue printing.	• Check for a broken ribbon. • Check the ready button; it may be defective.

Error Code	Message text	Comments
DR 00903	Error processing this card. Click **Help** for steps to follow.	The driver has failed to create or access the temporary files containing the data for the card. • Make sure the TEMP environment variable is set correctly. User should have sufficient rights to write to this folder. • Make sure there is enough free disk space to store the necessary card data.
DR 00904	PC to printer communication error. Check the *data* cable.	Check for possible PC configuration failures such as: • Defective port. • Defective main control board and its connections. • Wrong printer or communication parameters are set.
DR 00906	Printer driver error. Click **Help** for more information.	Perform hard drive maintenance.
DR 00907	The printer driver cannot access the required PC resources. Click **Help** for more information.	The print processor has an error opening or reading the temporary files. • Make sure the TEMP environment variable is set correctly. User should have sufficient rights to write to this folder. • Delete the job and resend it from the application. • If the spooler crashes, restart Windows.
DR 00908	The printer driver cannot get enough PC memory. Click **Help** for more information.	There is not enough memory to process and print a card. • Make sure that the computer resources are not being used extensively by other applications. • Clean up the PC hard drive.
DR 00909	Printer driver error. Click **Help** for more information.	Run the Update utility to update the printer firmware to make it compatible with the printer driver. The update process takes several minutes. • Clean up the PC hard drive.
DR 00910	The printer firmware needs to be updated. Click **OK** to update firmware now.	
DR 00912	The printer driver was not installed successfully. Click **Help** for steps to follow.	You may not have restarted Windows after you installed the driver. Restart Windows and try printing a card.

Error Code	Message text	Comments
DR 00914	The printer driver was not started successfully. Close all applications and restart the PC.	• Restart Windows, and then open the printing application. • Reinstall the driver: a. Uninstall the print driver from the PC. b. Restart Windows. c. Run the Cleanup Utility. d. Reinstall the driver. • Perform hard drive maintenance for Windows; the PC may not be able to load all the components of the printer driver.
DR 00917	The current card is part of a two-sided job. Click **Help** for steps to follow.	You have selected "Manual" for the Print on Both Sides or Duplex Method setting for this card.
DR 00918	Time out when processing this card. Click **Help** for steps to follow.	• The computer resources are being used by other applications. a. Close all applications you are not using. The card creation application and the printer driver are the only applications needed to print cards. b. Wait until the captured image is displayed on the PC before printing the card to prevent competition for PC resources. • Interactive mode jobs, including smart card jobs and read magnetic stripe jobs, are not supported for networked printers. Do not send interactive mode jobs to a network printer.
DR 00919	The current printer was disconnected or powered off. Card jobs might be lost or duplicate cards might be printed.	• The printer was disconnected from the PC after a card was sent. • The card might or might not print. The card status and completion information will not be available. The card might or might not be removed from the Print Manager list. • The printer was powered off after the card was printed but before the printer returned card completion or card status data to the driver. • Pause the printer before powering it off.
DR 00921	A printer has been identified. Please wait while the driver reads the printer.	
DR 00924	The driver does not support the connected printer. Connect a supported printer or install the driver for this printer.	

Input Errors (IS)

Error Code	Symptom	Comments
IS-01206	A card was not picked successfully. × ERR_IH_NO_CARD_PICKED	• Reload the card stock. • Inspect the card gate in the input hopper and verify that the spring is in place and working correctly. • Check the transport belt and pulleys for damage. • Check the belt tensioner to make sure it is putting tension on the transport timing belt. • Check the rocker arm springs and make sure they are placed correctly and not damaged. • Test the card input sensor to see if it toggles. • Test the pick motor functions. • Test the transport motor functions.

Duplex Module Errors (DM)

Error Code	Symptom	Comments
DM 00760	The duplex mechanism did not reach the correct position. × ERR_FLP_POSITION	One or more sensor transitions was not detected. • Check the flipper for obstructions. • Check if the clutch is functioning. • Check if the sensor is functioning. • Check the duplex motor.
DM 00762	The card is stuck in the duplex module. × ERR_FLP_CARD_JAM	The duplex entry sensor did not clear. • Check the sensor. • Check the duplex motor.
DM 00765	The duplex module is not installed or detected. × ERR_FLP_NOT_INSTALLED	The driver attempted to send a duplex job to a printer not equipped with a duplex module. Check the duplex interface cable and circuit board.
DM 00767	The card is lost in the duplex module. × ERR_FLP_CARD_LOST	The duplex entry sensor was not blocked when expected. • Check the sensor. • Check the duplex motor.

System Errors (SY)

Error Code	Symptom	Comments
SY-01305	The setting sent to the printer does not match printer features. × ERR_SYS_CONFIG_OPTIONS	Check settings and printer options.
SY-01306	The setting value you selected is not valid. × ERR_SYS_CONFIG_VALUE	Check configuration setup in printer to make sure it matches what is sent by the application.
SY-01310	EEPROM flash data error. Obtain a new update file. × ERR_SYS_FLASH_DATA	• Try to reinstall the printer firmware or download an updated firmware update utility. Make sure to use the correct firmware update utility for the specific printer. • Main control board problem.
SY-01312	EEPROM flash size error. × ERR_SYS_FLASH_SIZE	A logo loaded into flash memory is too large.
SY-01314	Warning! EEPROM flash write error. Do not power off the printer. RETRY the update file. × ERR_SYS_FLASH_WRITE	Main control board problem. NOTE: Do not power off the printer. Try to reinstall the printer firmware or download an updated firmware update utility.
SY-01317	Memory error × ERR_SYS_MEM	The printer could not save the data being sent.
SY-01325	The options or supplies installed do not match settings or card data. × ERR_SYS_SEQ_STR	A color card job was sent to the printer but the ribbon is monochrome. If the ribbon is not monochrome: • Check the RFID antenna • Check the supplies ID by swapping with another ribbon.
SY-01327	The request sent to the printer is not supported. × ERR_SYS_UNIMPLEMENTED	
SY 01331	Data transmission error. × ERR_SYS_COMM	Power cycle the printer.
SY -1332	General printer fault. × ERR_SYS_HW_FAILURE	Power cycle the printer.

Magnetic Stripe Errors (MS)

Error Code	Symptom	Comments
MS-01401 MS-01402 MS-01403	Data sent does not match requirements for track 1, 2, or 3. × MS_T1_DATA_ERR × MS_T2_DATA_ERR × MS_T3_DATA_ERR	• Check the data entered to see if application is sending data to match correct track format. • Check the application and the printer configuration to see that they match and are set correctly. If this occurs frequently: • Run a cleaning card. • Check the magnetic stripe head. • Check the magnetic stripe optical encoder. • Check the magnetic stripe daughter board.
MS-01404 MS-01405 MS-01406	Parity error reading data on track 1, 2, or 3. × MS_T1_PAR_ERR × MS_T2_PAR_ERR × MS_T3_PAR_ERR	If this occurs frequently: • Run a cleaning card. • Try different card stock. • Check the printer's coercivity setting to make sure it matches the cards being used. • Run the **Calibrate MS Head** in Diagnostics. • Check the magnetic stripe head. • Check the magnetic stripe optical encoder. • Check the magnetic stripe daughter board.
MS-01407 MS-01408 MS-01409	LRC error reading data on track 1, 2, or 3. × MS_T1_LRC_ERR × MS_T2_LRC_ERR × MS_T3_LRC_ERR	The longitudinal redundancy check failed. If this occurs frequently: • Run a cleaning card. • Try different card stock. • Check the printer's coercivity setting to make sure it matches the cards being used. • Run the **Calibrate MS Head** in Diagnostics. • Check the magnetic stripe head. • Check the magnetic stripe optical encoder. • Check the magnetic stripe daughter board.
MS-01410 MS-01411 MS-01412	Start Sentinel error reading data on track 1, 2, or 3. × MS_T1_SS_ERR × MS_T2_SS_ERR × MS_T3_SS_ERR	An error was encountered at the beginning of the data record. If this occurs frequently: • Run a cleaning card. • Try different card stock. • Check the printer's coercivity setting to make sure it matches the cards being used. • Run the **Calibrate MS Head** in Diagnostics. • Check the magnetic stripe head. • Check the magnetic stripe optical encoder. • Check the magnetic stripe daughter board.

Error Code	Symptom	Comments
MS-01413 MS-01414 MS-01415	End Sentinel error reading data on track 1, 2, or 3. × MS_T1_ES_ERR × MS_T2_ES_ERR × MS_T3_ES_ERR	An error was encountered at the end of the data record. If this occurs frequently: • Run a cleaning card. • Try different card stock. • Check the printer's coercivity setting to make sure it matches the cards being used. • Run the **Calibrate MS Head** in Diagnostics. • Verify that the data does not extend past the end of the card. • Check the magnetic stripe head. • Check the magnetic stripe optical encoder. • Check the magnetic stripe daughter board.
MS-01417	A card jam occurred when attempting to write magnetic stripe data on the card. × MS_MOVE1_ERR	The magnetic stripe sensor was never cleared. If the card is still over the sensor, check the following: • Make sure the magnetic stripe rocker is applying pressure to the card and the encoder roller is free to turn. • Inspect the card track for obstructions. • Check card stock for powder, dirt, or oil on cards, and then run a cleaning cycle. • Check the transport belt and pulleys for operation. If the card is not over the sensor, check the following: • Make sure the sensor reflector is in position on the magnetic stripe rocker. • Check the magnetic stripe sensor using the sensor Diagnostics.
MS-01418	The card was lost before writing magnetic stripe data. × MS_MOVE2_ERR	The card was never detected by the magnetic stripe sensor. If the card is located between the input sensor and the magnetic stripe sensor, check the following: • Inspect the card track for obstructions. • Inspect the transport belt and pulleys for operation. • Inspect all of the rocker assemblies to ensure they are applying pressure to the card and that the rollers rotate freely. If the card is at the sensor or past the sensor, check the sensor functions: • Block the magnetic stripe sensor and look for a sensor transition in Diagnostics. • To confirm if the main control board is faulty: a. Turn off the printer.

Error Code	Symptom	Comments
		b. Unplug the reflective sensor and connect a functional transmissive sensor in its place. c. Turn the power on and block the sensor. d. If no sensor transitions are observed in Diagnostics, the control board needs to be replaced.
MS-01419	A card was lost outside of the magnetic stripe area when attempting to read data encoded on the card. × MS_MOVE3_ERR	The card was not returned from the rear of the printer, or the card has been read, but did not reach the input sensor. (The read cycle is not complete until the card is passed off to the input sensor.) • Check the card input and magnetic stripe sensors for operation. • Check the transport system for obstructions and proper operation. • Check the smart card and front rockers for proper operation.
MS-01420	A card was stuck when attempting to read magnetic stripe data encoded on the card. × MS_MOVE4_ERR	The magnetic stripe sensor never cleared after the read operation. If the read-back direction is "forward," then it may also be possible that the card input sensor never cleared. • Check the operation of the card input and magnetic stripe sensors. • Check the front and magnetic stripe rockers for proper spring pressure and roller movement. • Check the transport for proper operation or obstructions.
MS-01421	A card was lost when attempting to read or write magnetic stripe data on card. × MS_MOVE5_ERR	The card was never detected by either the magnetic stripe or card input sensors. • Check the card input and magnetic stripe sensors for operation. • Check the transport system for obstructions and proper operation. • Inspect all of the rocker assemblies to ensure they are applying pressure to the card and that the rollers rotate freely.
MS-01424	Unable to read any data from the card. × MS_MINDATA_ERR	This error can occur during normal encoding, but it can also occur if the magnetic stripe head calibration process fails to complete. • Make sure cards are loaded correctly and that they are magnetic stripe cards. • Check data format. Printer and driver should match. • Verify that the coercivity setting matches the card stock. • Clean the magnetic stripe head.

Error Code	Symptom	Comments
		• Check the magnetic stripe mechanical assembly. Possible failed components are the magnetic stripe head, the cable assembly, the magnetic stripe encoder cable assembly, the magnetic stripe control board, and the main control board.
MS-01425	Unexpected magnetic stripe coercivity value. × MS_CURRENT_ERR	The coercivity value stored in the printer is out of range. This should not happen, and indicates a possible problem with the main control board EPROM. 1. Using Diagnostics, change the printer's coercivity setting. 2. Save the changes to power-on defaults. (If the EPROM is defective, this will generate an error.) 3. Retry the magnetic stripe operation.
MS-01426	Magnetic stripe module settings EEPROM read or write error. × MS_EEPROM_ERR	• Try the operation again. • Reboot the computer and printer. • If the error continues, replace the main control board.
MS-01427	Configuration information passed through by the printer driver was not accepted by the magnetic stripe module. × MS_CONFIG_ERR	• Check the magnetic stripe configuration settings using Diagnostics. • For a custom application, incorrect values may have been sent.
MS-01428	Status request passed through by the printer driver was not accepted by the magnetic stripe module. × MS_STATUS_ERR	• Illegal command. Try again. • Verify application is sending the correct data. • Verify printer driver is loaded and configured correctly. • Check data cable connection between PC and printer.
MS-01429	Data sent to a track does not match the requirements for that track. × MS_ILLICIT_DATA_ERR	• Occurs after multiple individual track errors such as MS 01401, MS 01402, and MS 01403 when "display all messages" is checked in Diagnostics. • Verify the magnetic stripe settings in the card production application are correct and resubmit the card for printing.
MS-01430	Control information passed through by the printer driver was not accepted by the magnetic stripe module. × MS_PASSTHROUGH_ERR	• Illegal command. Try again. • Verify application is sending the correct data. • Verify printer driver is loaded and configured correctly. • Check data cable connection between PC and printer.

Error Code	Symptom	Comments
MS-01431	Magnetic stripe module settings EEPROM read error. × MS_OPS_READ_ERR	• Try the operation again. • Reboot the computer and printer. • If the error continues, replace the main control board.
MS-01432	Magnetic stripe module settings EEPROM read error. × MS_FAC_READ_ERR	• Check the magnetic stripe configuration settings using Diagnostics. • Try the operation again. • Restart Windows and power cycle the printer. If the error continues, replace the main control board.
MS-01433	Magnetic stripe module settings EEPROM write error. × MS_OPS_WRITE_ERR	• Check the magnetic stripe configuration settings using Diagnostics. • Try the operation again. • Power cycle the printer. If the error continues, replace the main control board.
MS-01434	Magnetic stripe module settings EEPROM write error. × MS_FAC_WRITE_ERR	• Check the magnetic stripe configuration settings using Diagnostics. • Try the operation again. • Power cycle the printer. If the error continues, replace the main control board.
MS-01435	The magnetic stripe module is not installed or detected. Make sure the card creation application does not send magnetic stripe data if no module is installed. × ERR_MS_NOT_INSTALLED	• The main or magnetic stripe control board may be defective. • Power cycle the printer. If the error continues, replace the main or magnetic stripe control board.

Print Errors (PR)

Error Code	Symptom	Comments
PR-01703	The printhead cam is not in the correct position to print. × ERR_PRN_HEAD_POSITION	• Check the printhead cam sensor. • Inspect the cam gear for damage. • Test the cam motor.
PR-01705	The card is lost in the printer. × ERR_PRN_CARD_LOST	The card was not seen by a sensor when it was expected. • If the card is located under a sensor, begin troubleshooting the sensor. • Use Diagnostics to verify the function of the transport.
PR-01706	The card is stuck in the printer. × ERR_PRN_CARD_JAM	A sensor did not clear when expected. • If the card is located under a sensor, the problem is likely related to the transport system. • If the card is not located under a sensor, make sure the sensor is plugged in and operating.
PR-01710	Factory settings read problem. × ERR_PRN_FACT_EEREAD	Check the main control board assembly. Possible failed components are the printhead, the cable, and the main control board.
PR-01715	The cover was opened during printing. × ERR_PRN_HEAD_OPEN	If the cover was not opened, check the sensor for a loose connection.
PR-01716	The cover is open. × ERR_PRN_HEAD_OPEN_WARNING	This will be reported if the sensor is disconnected. Use Diagnostics to see if the sensor toggles when blocked.
PR-01717	Printing is suspended while the printhead returns to operating temperature. × ERR_PRN_HEAD_TEMP_WARN	• Check the printhead fan and its connections; it may be defective. • Check for blocked air flow. • Check the printhead assembly.
PR-01718	The printhead temperature is too high. × ERR_PRN_HEAD_TEMPERATURE	• Check the printhead fan and its connections; it may be defective. • Check for blocked air flow. • Check the printhead assembly.
PR-01719	The printhead is not installed or detected. × ERR_PRN_HEAD_TYPE	• Check cable connections. • Replace the printhead.
PR-01720	The print ribbon index mark was not found. × ERR_PRN_NO_RIBBON_INDEX	• Check the ribbon index sensor for proper operation.
PR-01721	Operational settings read error. × ERR_PRN_OP_EEREAD	• Check the main control board assembly. Possible failed components are the printhead, the cable, and the main control board.

Error Code	Symptom	Comments
PR-01722	Operational settings write error. × ERR_PRN_OP_EEWRITE	• Check the main control board assembly. Possible failed components are the printhead, the cable, and the main control board.
PR-01723	General printer fault. × ERR_PRN_PRINTER_FAULT	• Cycle the printer power and try printing again. • Check the main control board. • If this occurs while running a firmware update, run the firmware update again.

PR-01724	The print ribbon is broken.
	× ERR_PRN_RIBBON_BREAK
		If the ribbon is not broken:
		• Verify that the print ribbon is not misrouted and that the cartridge is properly inserted.
		• Check the operation of the ribbon motion sensor.
		• Check the ribbon motor using the motor Diagnostics.
		If the ribbon breaks frequently:
		• Check the following offsets using Diagnostics:
		  • Card registration
		  • Image clipping
		  • YMC, K, & T power
		• Check the swingarm assembly; it may not be secure or is defective.

PR-01726	Out of print ribbon. Replace the print ribbon with the same type and click **OK** when ready. × ERR_PRN_RIBBON_OUT	If the ribbon is not empty: • Check the ribbon index sensor for proper operation. • Verify that the ribbon ID tag was not swapped with another ribbon.
PR-01730	Unable to read the printhead temperature. Power off the printer and check the printhead cable. × ERR_PRN_TPH_TEMP	• Check the printhead assembly. Possible failed components are the printhead, the cartridge, the cable, and the main control board. • Connect cables to the TPH cartridge.
PR-01737	The print ribbon is running low. × ERR_PRN_RIB_LOW	• Make sure the supplies ID was not transferred from one ribbon spool to another.
PR 01738	The printer cannot identify the ribbon installed. Install another ribbon or click **OK** to print one-color (K) cards. × ERR_PRN_RIBBON_TYPE	• Check antenna board. • Check antenna cable. • If the ribbon is a new type, the printer's firmware may need to be updated to recognize it.

Smart Card Errors (SC)

Error Code	Message text	Comments
SC-01804	The smart card module is not installed or detected. Make sure the card creation application does not request smart card programming. × ERR_IC_NOT_INSTALLED	• Verify that the smart card option is enabled using Diagnostics. • Check the smart card assembly. Possible failed components are the sensor, the cable, and the smart card control board. • Power cycle the printer.

Chapter 5: Adjustments

5

This chapter provides instructions for adjusting the SP55, SP55 Plus, and SP55k card printers.

General Notes

This document is organized sequentially for the customer engineer who is encountering an SP55, SP55 Plus, or SP55k printer for the first time, and begins with installing the diagnostic software, navigating and using the software, and concludes with specific adjustment procedures for the printer.

- Temperature Terminology: To distinguish between an absolute temperature and a relative temperature (change in temperature), this manual will adhere to standard notation. Absolute temperatures are indicated by °C (degrees Celsius), and a change in temperature is indicated by C° (Celsius degrees). For example: The difference between 25 °C and 30 °C is 5 C°.

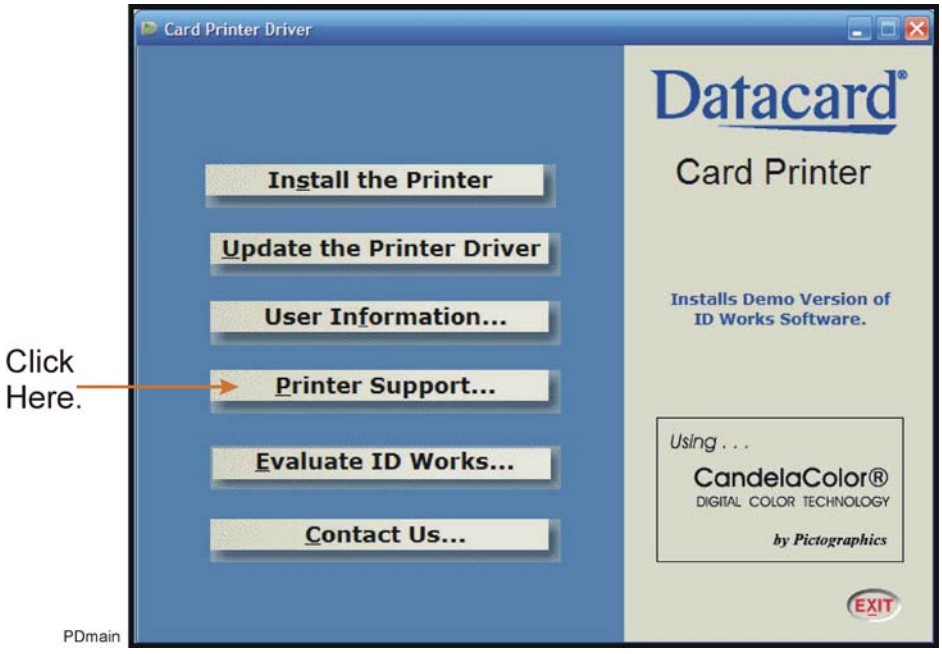
Helpful Hint: There may be times when you wish to perform a task while observing sensor changes in another diagnostic window. It is permissible to open multiple instances of Diagnostics to view separate dialog boxes not normally viewable with a single instance. To do this, double-click on the Diagnostics icon, and then double-click on the icon again. Two instances of the software will open.

Installing Printer Diagnostics

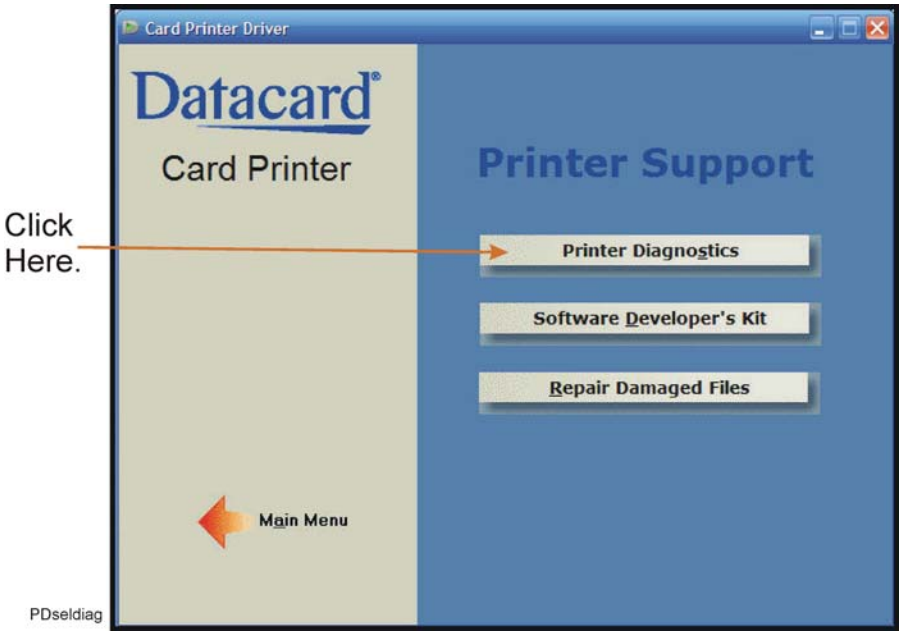
Before you begin, confirm that the printer driver has been installed on the computer. Diagnostics will not run without the print driver.

Procedure

1. Insert the printer driver CD into your CD drive. The CD should run automatically and display the following window. If the CD does not auto start, run the setup.exe file from the CD. When running, click the **Printer Support** button.



2. From the displayed window, click the **Printer Diagnostics** button.



3. From the displayed window, click **Next** to begin the installation.
4. You will see a prompt for changing the destination directory. It is recommended that you not change this setting. Click **Next**.
5. You will then be asked to which program group the icon should be added. Make no changes and click **Next**.
6. The program performs the installation and informs you when it is completed. Click on **Finish**.

Using Printer Diagnostics

1. The first time you use the Printer Diagnostics you may be required to select the printer model. Make sure the printer is connected and powered on, and then click on the appropriate printer.
2. Next, select **User Properties** from the **File** menu to change the logon level.
   A. Select **Advanced User** from the list and press **OK**.

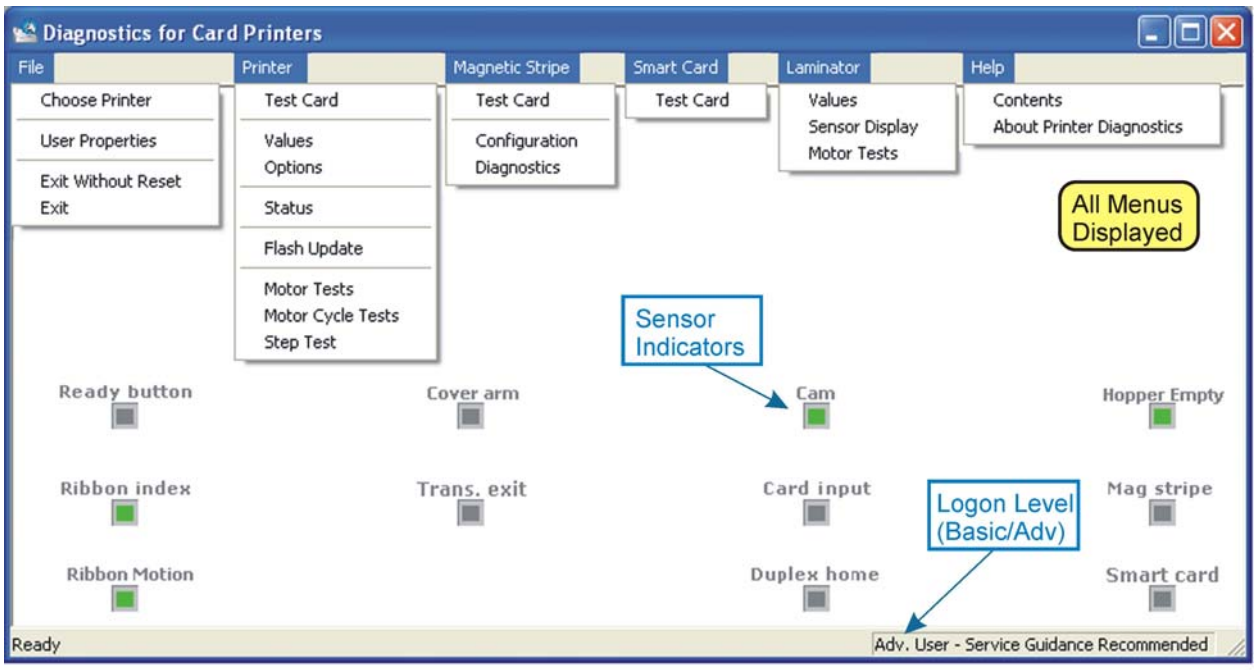
   Selecting **Basic User** will disable some of the settings within Diagnostics. No password will be required for this option.

   B. At the prompt, enter the service technician password (**926918**).

   Do not share this password with the end-user of the printer. It permits access to settings that should not be altered by untrained personnel.

Parts of the Diagnostics Window

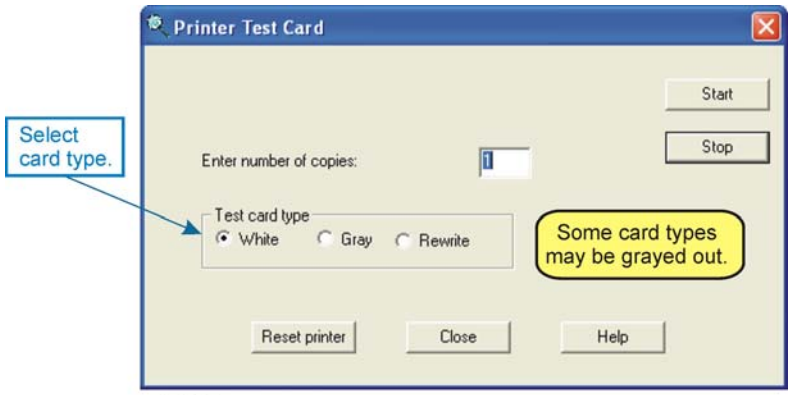
The main Diagnostic window shows the near-real-time status of the printer's sensors (there may be a communication delay). The lower right corner shows the current Logon Level (either Basic or Advanced). Menu options that are not appropriate for the printer are grayed out.



diag-K01

Menu Options

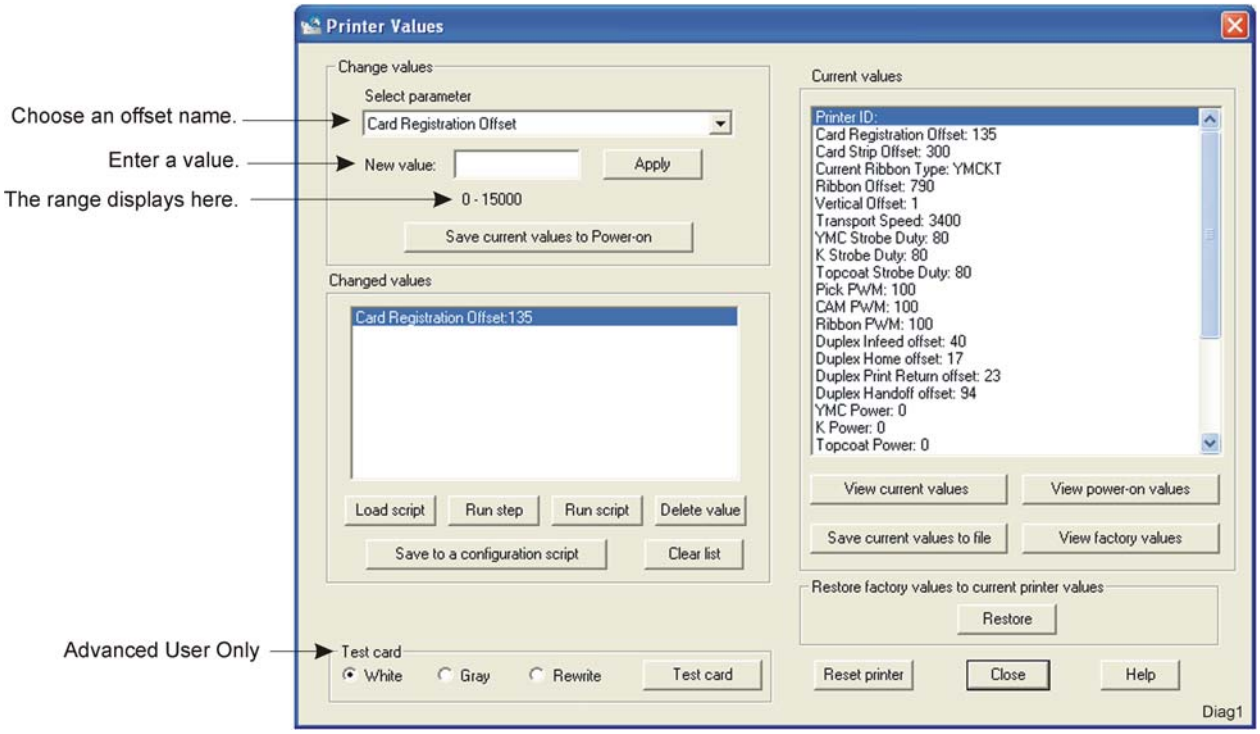
The options on the menus are for the purposes outlined in the table below.

Option	Purpose
File | Choose Printer	Use this option to select the printer for which you plan to use Diagnostics.
File | User Properties	Use this option to set the access level for Diagnostics. The *Basic User* setting has some critical settings disabled. The *Advanced User* setting requires a password (926918) to enable all settings. Do not share this password with the end-user of the printer! It provides access to parts of the system that should not be available to untrained personnel.
File | Exit File | Exit Without Reset	By default, exiting the program will **reset** the printer to ensure the printer is ready to produce cards. It is recommended that you reset the printer when exiting Diagnostics, but if you do not wish to, select **Exit without reset**.
Printer | Test Card	Use this option to print the default test card for the printer. The gray test card is available to the Advanced User only. The rewrite card is available only when the printer is configured for rewrite cards. In rewrite mode, the white and grey cards are not available.  diag-K02
Printer | Values	This option is for changing the operation parameters of the printer. See additional information in Changing Printer Values.
Printer | Options	This option is for setting printer options. See additional information in Setting Printer Options.
Printer | Status	This option is for checking the status of the printer (such as the error log or print ribbon information) as described in Viewing Printer Status.
Printer | Flash Update	This option provides a method for manually updating the printer's firmware. This feature is used only with *.fls files, and does not function with the flash update found in the driver software.

Option	Purpose
Printer | Motor Tests	This option allows you to operate each of the motors in the printer for a specified duration as described in Testing Motors.
Printer | Motor Cycle Tests	This option is for selecting a motor to test by having it complete a full cycle of operation as described in Testing Motor Functions.
Printer | Step Test	This option runs routines from the printer's firmware. Each routine can be run individually or as a series of successive routines as described in Setting Up Step Tests for the Printer.
Magnetic Stripe | Test Card	This option provides access to printing test cards for the magnetic stripe module. Only Advanced Users can read cards.
Magnetic Stripe | Configuration	This option for configuring the magnetic stripe module is available only to the Advanced User. It is for configuring Start Sentinels, etc. as described in Configuring the Magnetic Stripe.
Magnetic Stripe | Diagnostics	This option provides access to functions for troubleshooting the magnetic stripe module.
Smart Card | Test Card	The smart card test is a built-in routine to simulate smart card personalization. A card is picked from the hopper, personalized, and transported to the smart card module. See additional information in Testing the Smart Card Option.

Changing Printer Values

Use the Printer Values dialog box to change the operational parameters of the printer. For a description of each parameter and how to change it, refer to Setting Printer Value Parameters. For information on how to create a test script, refer to Working With Scripts. For information on whether to save your changes or discard them, refer to Viewing and Saving Values.

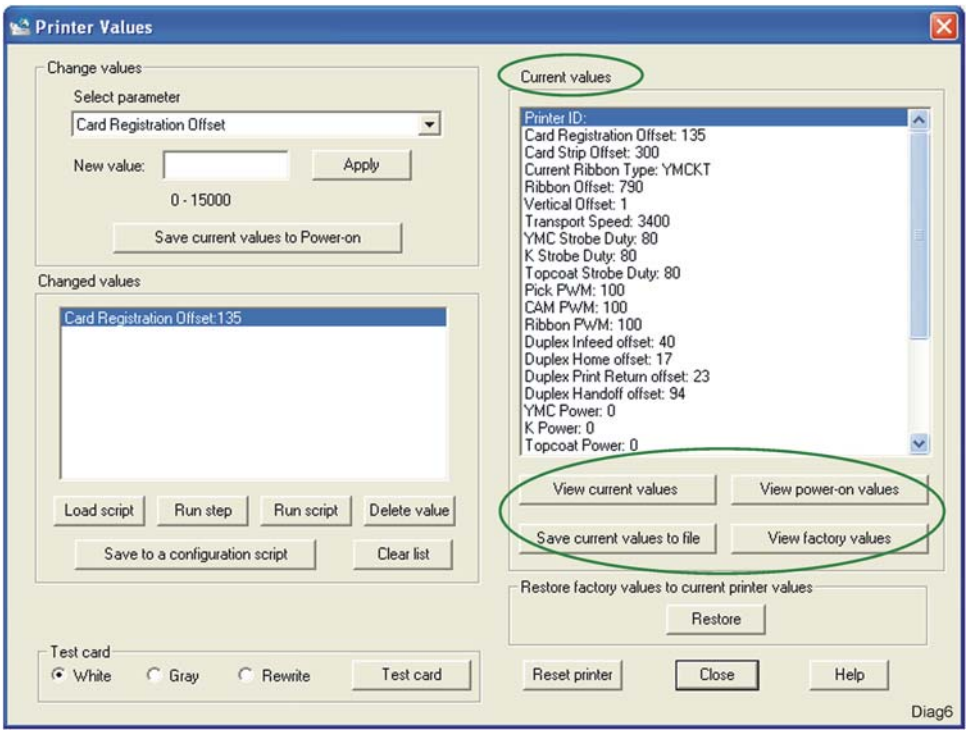


Procedure

1. If you need to access the advanced settings, log in as an Advanced User.
2. Select the parameter to change from the list in the Change Values box.
3. Type your change in the New Value data box and click on **Apply**. (The new value is temporarily stored in the printer's RAM memory, but it is not permanently stored in EPROM memory yet. If you turn off or reset the printer, the value is removed from RAM and the original power-on default value is loaded.)
4. Use the **Test card** option or a card creation program to print a test card to test your changes. The printer will use your new values for the test.
5. If the changes are not acceptable, either reset the printer or turn it off.
6. If the changes are acceptable, click on the **Save current values to Power-on** button to store the changes permanently. You will be prompted for a password. Enter **42360**.

Viewing and Saving Values

The buttons on the right of the Printer Values dialog box are used to choose what values are listed in the current values window.

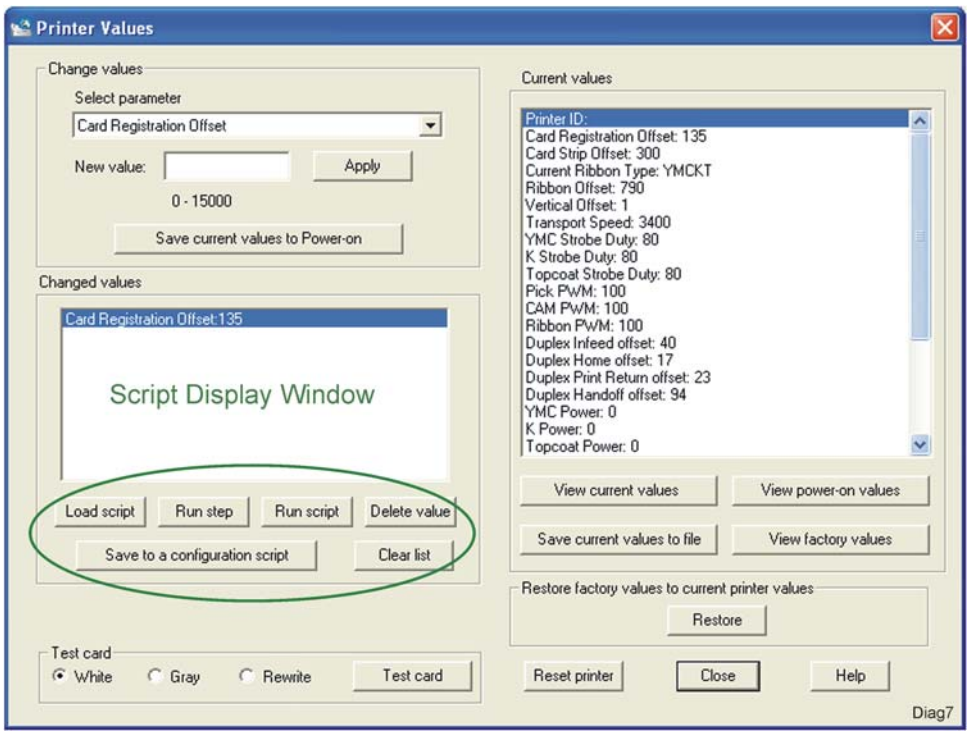


Current values	Displays the current parameter values.
View current values	Select to display the values that are currently loaded in the printer's non-permanent memory.
View power-on values	Select to display the values that are currently loaded in the printer's permanent, power-on memory.
Save current values to file	Writes all parameters and values currently saved in memory to a text file.
View factory values	Select to display the values that were permanently written into the printer at the factory.

Working With Scripts

The scripting area allows you to create, load, and run scripts for adjusting printers. A configuration script is a group of settings that are saved to a text file.

Make sure the configuration script does not contain a Printer ID listing or a Ribbon Type listing. If these parameters are present in the script file, use a text editor to delete them.



The script display window shows the contents of the current script, whether loaded from a file using **Load Script** or created by modifying printer values.

To perform a single step and run the selected line of the script, click on **Run Step**. The line will be run and the next line highlighted.

To test the entire script, click on **Run Script**.

To delete the highlighted line of a script, click on **Delete value**. (This option may not be available for loaded scripts.)

After making printer value changes, click **Save to a configuration script** to record the changes in a configuration script. The script can then be loaded into another printer for batch processing a series of printers.

Click on **Clear list** if you want to clear the scripting window.

Setting Printer Value Parameters

The following sections describe how to modify the printer parameters. Please note the following:

- Just because a parameter is listed and explained here does not mean it should be altered. Those parameters that should not be altered are so noted in the description. Do not modify these parameters without contacting technical support first.
- Some of these offsets have procedures for setting the values. If a procedure is associated with the parameter, it has a link to the procedure.

Printer ID

This value should not be modified unless the main control board is replaced. Altering this value will cause a new instance of the printer driver to be installed, and altering it incorrectly may cause significant problems for the printer and the customer's PC. This is available only to the advanced user.

If the main control board is replaced, follow the Saving and Restoring a Printer Configuration procedure on page 5-33.

Card Registration Offset

This parameter determines how far the card travels after being detected by the card input sensor for the leading edge of the card to arrive at the printhead. This setting can also be changed in the printer driver under the Advanced Settings button.

- Refer to the Card Registration Offset Adjustment procedure (p. 5-36).
- Make sure the image clipping settings are not interfering with this adjustment.

Range	0 to 15,000 (in thousandths of an inch)
Increase Value	The printed image moves away from the leading edge of the card.
Decrease Value	The printed image moves toward the leading edge of the card.
Symptom/Solution	Print ribbon breaks at the start of a printed panel • Increase the card registration offset because the printhead is heating up the ribbon but the card is not yet in position to absorb some of this heat.

Card Strip Offset

This parameter determines how far the card travels after printing a panel to allow the ribbon to be stripped away from the card. This offset begins when the last portion of the image has been printed. This parameter should not be altered.

Range	0 to 15,000 (in thousandths of an inch)
Increase Value	The card travels more distance after printing a panel. (This will slow down throughput slightly.)
Decrease Value	The card travels less distance after printing a panel.
Symptom/Solution	Print ribbon sticks to the trailing edge of the card. • Increase the card strip offset.

Ribbon Type

Ribbon type is a read-only parameter that cannot be changed. The display will show the type of ribbon that has been detected by the printer. However, it is more informative to query the printer using Viewing Printer Status**.** This will provide the ribbon type number as well as the Datacard part number.

Ribbon Offset

This parameter tells the printer how far to advance the print ribbon after the index mark is detected by the ribbon index sensor. This value is applied only to the first panel following an index mark.

This parameter should not be modified from the factory default setting. If it does become necessary to change it, refer to the Ribbon Offset Adjustment on page 5-37.

Range	0 to 10,000 (in thousandths of an inch)
Value Too Large	Printing will begin on the proper color panel, but will extend past the end of the panel and into the next color. This results in coloration errors at the trailing edge of the card.
Value Too Small	Printing will begin with the wrong (previous) color panel but will conclude with the correct color. This results in coloration errors at the leading edge of the card, and frequently results in the index mark being printed.

Vertical Offset

This parameter shifts the image within the printhead to keep it centered on the card. The variable is called *vertical* because many other printers process cards with a vertical orientation to the card path. The variable is the same across all of these printers, but the orientation of the card path is horizontal in this printer.

This value is best modified in the printer driver interface under the *Edge to Edge* tab.

Range	-15 to 15
Increase Value	The printed image moves toward the right on a portrait-oriented card.
Decrease Value	The printed image moves toward the left on a portrait-oriented card.

Transport Speed

This parameter controls the speed of the transport motor during card transport but not during printing.

Altering this parameter can cause resonance in the printer and/or increase audible noise of the printer. This parameter should not be changed without contacting technical support.

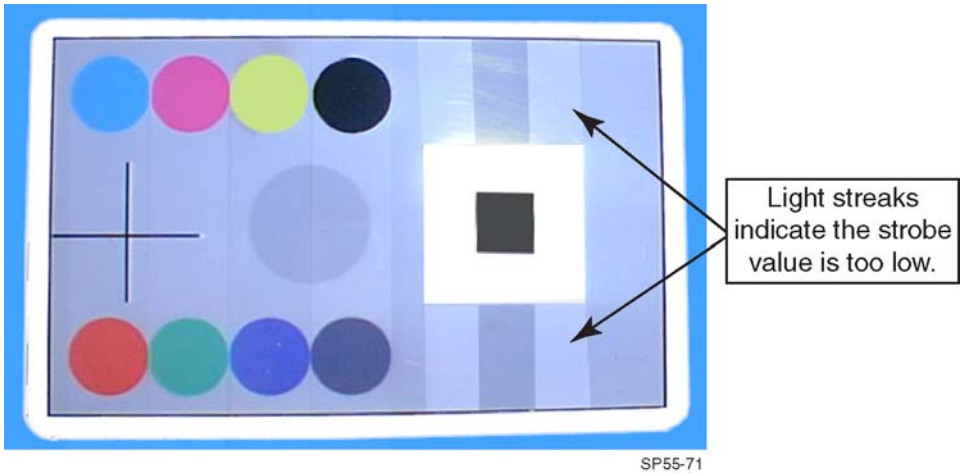
Range	150 to 3000

YMC, K, T, & F Strobe Duty

These parameters are used to maintain a consistent print intensity between full columns and partial columns (YMC=Yellow, Magenta, Cyan; K=Black; T=Topcoat; F=Fluorescent).

These parameters should not be changed. However, if one parameter is altered, all three should be altered accordingly.

Range	0 to 255
Increase Value	Columns with fewer pixels print darker.
Decrease Value	Columns with fewer pixels print lighter.
Symptom/Solution	The shaded area directly above and below the white square on the service test card prints light. • Increase the YMC strobe setting.
	The shaded area directly above and below the white square on the service test card prints dark. • Decrease the YMC strobe setting.
	K-panel horizontal lines drop out but vertical lines print properly. • Increase the K-strobe setting.



YMC, K, T, and F Power and Base Power

These settings control the print threshold of each of the print panels. K and T power settings can be made in the print driver, but YMC and F power can be modified only from Diagnostics.

Power and Base Power serve the same function. The Base power setting is used to compensate for variations in the printer, and the Power setting is used to tune the printing results to suit the needs of the user (YMC=Yellow, Magenta, Cyan; K=Black; T=Topcoat; F=Fluorescent).

Range	-100 to 100
Value Too Low	Colors will be dull and washed out. K-panel printing may have dropouts.
Value Too High	Frequent ribbon breaks and bar code growth.

Duplex Infeed Offset

This parameter controls how far a card will travel after it leaves the duplex entry sensor. If this value is incorrectly set, the card may bind as the duplex rotates.

Range	1 to 80
Increase Value	The card travels further into the duplex.
Decrease Value	The card travels less distance into the duplex.

Duplex Home Offset

This parameter controls where the duplex flipper stops when in the home position.

Refer to the **Duplex Rotational Adjustment** procedure (p. 5-39).

Range	1 to 40
Increase Value	The index pointer moves toward the lower letters (see the adjustment procedure).
Decrease Value	The index pointer moves toward the higher letters (see the adjustment procedure).

Duplex Print Return Offset

This parameter controls where the duplex flipper stops when in the print return (flipped) position.

Range	1 to 70
Value	Home Offset plus 6

Adjust the Duplex Home Offset, and then set this value to be 6 units larger.

Duplex Handoff Offset

This parameter controls where the duplex flipper stops when in the vertical handoff position.

Range	70 to 130
Value	Home Offset plus 77

Adjust the Duplex Home Offset, and then set this value to be 77 units larger.

Smart Card Registration Offset

This parameter controls the distance a contactless smart card travels to reach the programming station. Because of the nature of the contactless programming operation, this parameter need not be precise. This parameter should not be changed and is available only to the Advanced User.

Range	0 to 6000

The approximate position of the contactless smart card should be the same as a contact smart card. If this position cannot be determined, set the offset so the trailing edge of the card covers the location of the magnetic head but does not cover the location of the magnetic head's pivot pin.

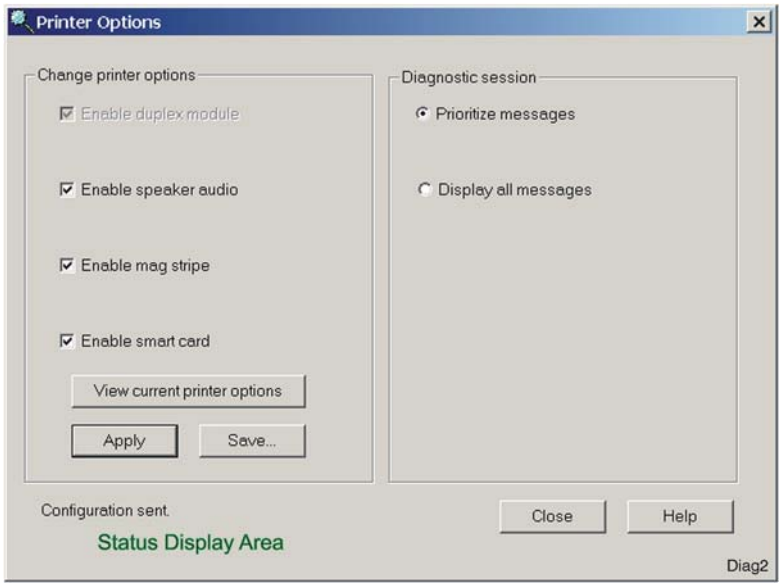
Image Clipping Leading and Trailing

These settings clip (truncate) the image so printing begins in the correct position.

Range	0 to 1000 (in thousandths of an inch)
Increase Value	Increases the amount of unprinted space on the leading or trailing edge of the card.
Decrease Value	Decreases the amount of unprinted space on the leading or trailing edge of the card.
Symptom/Solution	Undesirable white space on the leading edge of the card. • Reduce the leading edge image clipping. • Also check the Card Registration Offset Adjustment (p. 5-36) to make sure that is not the cause.
	Undesirable white space on the trailing edge of the card. • Reduce the trailing edge image clipping. • Verify that the card design is not too short to extend to the end of the card.
	Frequent ribbon breaks at the leading or trailing edge of a card. • Increase the image clipping to prevent the printhead from overheating the ribbon before printing should begin.

Setting Printer Options

The Printer Options window controls various aspects and features of the printer.

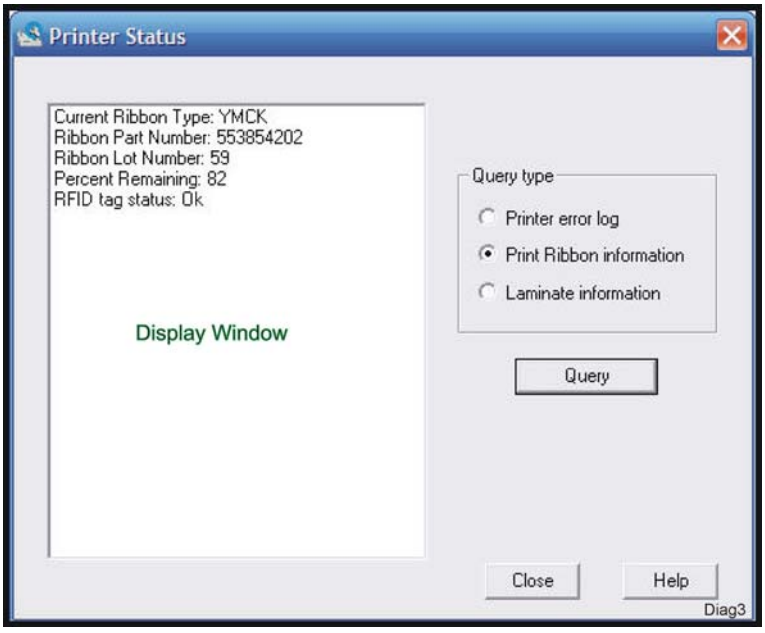


Option	Description
Enable duplex module	Enable or disable the duplex module option for printers so equipped.
Enable speaker audio	Enable or disable the speaker output of the printer.
Enable mag stripe	Enable or disable the magnetic stripe capabilities of the printer.
Enable smart card	Enables or disables the smart card option in the printer.
View current printer options	Click on this button to refresh the options currently saved in the printer.
Apply	Click this button to store the change in the printer's non-permanent (RAM) memory. The changes will be discarded when the printer is reset unless you click on **Save**.
Save	This saves the changes to the printer's EPROM memory. You will be prompted for a password. Enter **42360**.
Status Display Area	This area displays the status of the current operation.
Prioritize messages	During the diagnostic session, the highest priority message of each type is displayed.
Display all messages	During the diagnostic session, all messages are displayed. This option reverts back to *Prioritize messages* when Diagnostics is closed.

Make sure the magnetic stripe and/or smart card options are enabled before returning the printer to production.

Viewing Printer Status

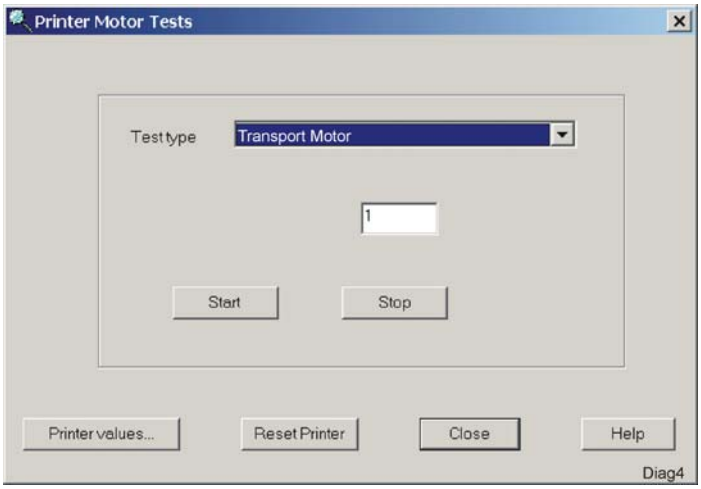
This dialog box provides information about the printer. To use this, click on the appropriate parameter and then click on the **Query** button. The information is displayed in the window at the left.



Name	Description
Printer error log	Select this option and click **Query** to display the error history for the printer in the display window.
Print Ribbon information	Select this option and click **Query** to display the type of ribbon detected by the printer in the display window
Laminate information	This option is not available for the SP55, SP55 Plus, or SP55k printers.

Testing Motors

This dialog box allows you to operate each of the motors in the printer for a specified duration.



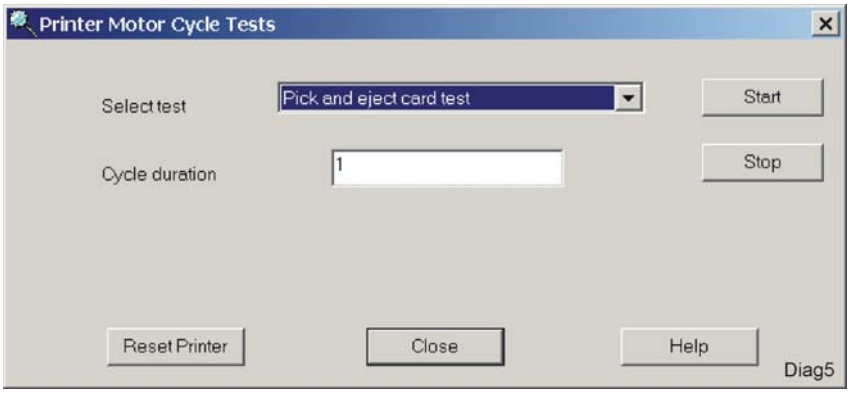
Procedure

1. Select from this list of available motor tests:
   - Transport Motor (fast, slow, forward, or reverse)
   - Ribbon Motor
   - Printhead Cam Motor
   - Card Pick Motor (remove cards from the hopper first)
   - Printhead Fan Motor (the fan cycles on and off)
2. Enter a duration in seconds (or number of cycles for the fan) in the box below the test type selection.
3. Click **Start** to begin the test (**Stop** ends the test before it times out).
4. Click **Reset Printer** as it is a good practice to reset the printer before returning to card production.

Use the **Printer values** button if you want to check the settings.

Testing Motor Functions

The Printer Motor Cycle Tests dialog box allows you to perform various operations with the printer to check functionality.

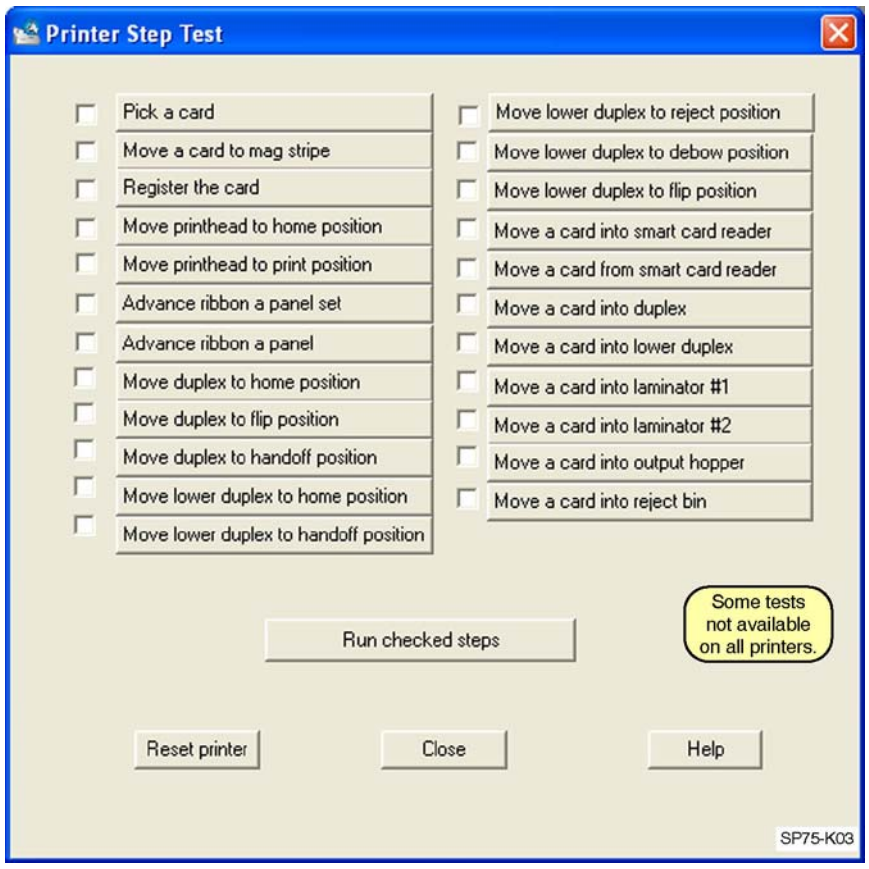


Procedure

1. Select from this list of available tests:
   - **Pick and Eject Card Test**: This test picks a card, moves it just past the printhead location, and sends it back out of the printer.
   - **Magnetic Stripe Module Test**: This test picks a card and continuously cycles it back and forth between the magnetic stripe sensor and the input sensor.
   - **Printhead Cam Test**: The printhead cam continually cycles between elevated and retracted until you click **Stop**.
2. Enter the number of cycles to perform in the *Cycle duration* box.
3. Click **Start** to begin the test (**Stop** ends the test before it completes all the cycles).
4. Click **Reset Printer** as it is a good practice to reset the printer before returning to card production.

Setting Up Step Tests for the Printer

The Printer Step Test dialog box offers a series of routines from the printer's firmware. Each routine can be run individually or as a procedure of successive routines.



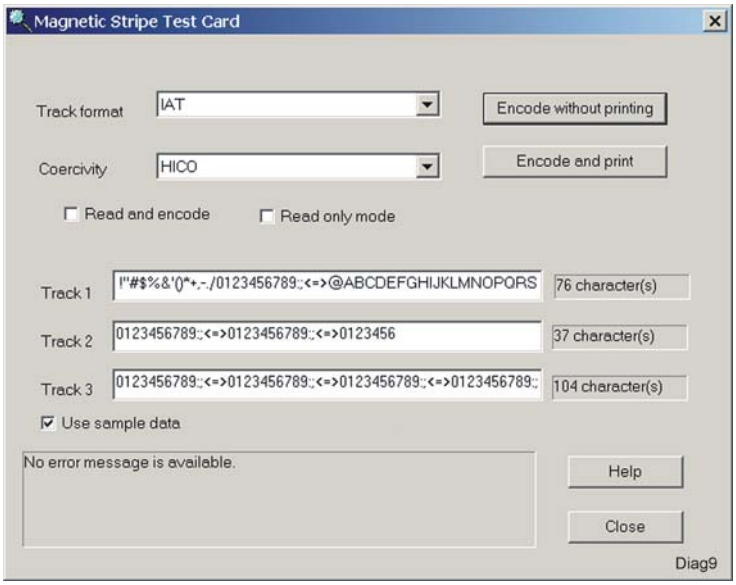
Buttons that are appropriate for the printer model are selectable; the others are grayed out.

- To run a single routine, click on its name button.
- To create a procedure, check the appropriate boxes of routines to indicate the steps and then click on **Run checked steps**.

It is very important that you use the **Reset printer** button every time you have completed a test.

Running a Magnetic Stripe Test Card

The Magnetic Stripe Test Card dialog box provides access to printing test cards for the magnetic stripe module. Only Advanced Users can read cards.

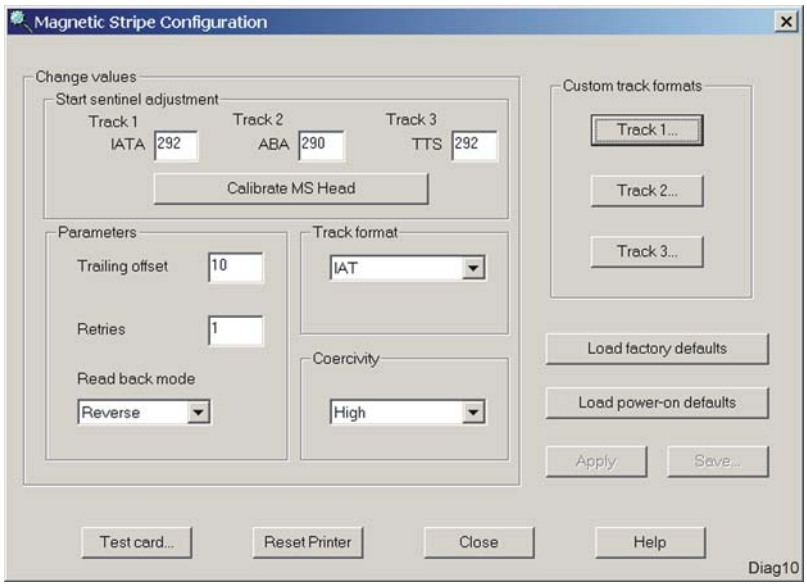


Set the parameters for the test card using this dialog box.

Track format	Select the track format type (standard) from the list.
Coercivity	Select the coercivity setting of the card stock (HICO or LOCO).
Read and encode	Select **Read and encode** to read data from the card and encode data to the card. This is available only with the Advanced User login.
Read only mode	Select **Read only mode** to read back data from a previously encoded card. This is available only with the Advanced User login.
Track 1, Track 2, and Track 3	Enter encoding data into the three track data boxes. These boxes will also contain read-back information.
Use sample data	Select **Use sample data** to fill in the track data boxes automatically (some formats do not have sample data). Checking this box will overwrite any data already entered in the track data boxes.
Encode without printing	Click on this button to encode the card without printing graphics on the card.
Encode and print	Click on this button to encode the card and print test graphics on the card. The printing on the card duplicates the character data encoded on the card.

Configuring the Magnetic Stripe Module

This option is available only with the Advanced User login.

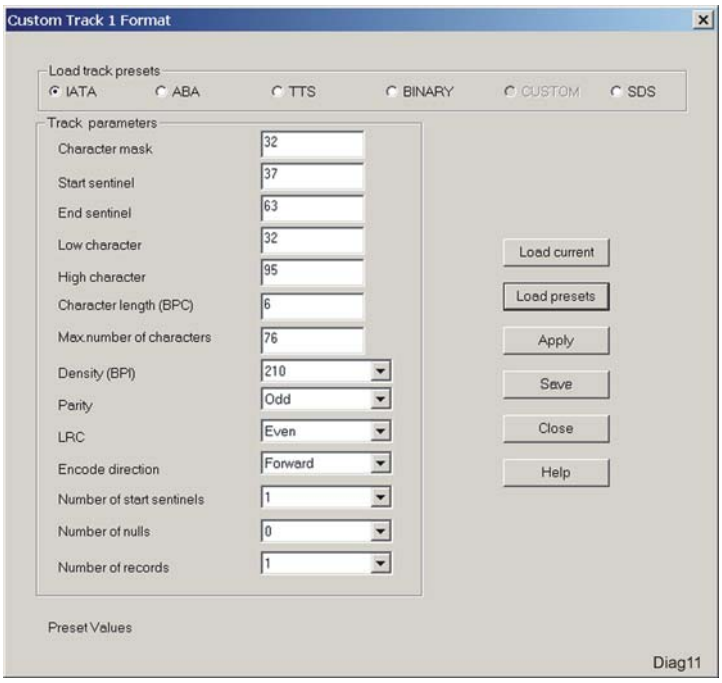


Start sentinel adjustment	The Track # boxes show the current start sentinel values and the format defined for the track. This allows for adjusting the start sentinel position to a custom location. Refer to the Start Sentinel Position adjustment procedure on page 5-35 for further information.
Calibrate MS head	This option automatically calibrates the printer for variations in mechanical components. Refer to the Start Sentinel Position adjustment procedure on page 5-35 for further information.
Trailing offset	This setting determines how far the card travels to ensure that trailing clock pulses are encoded for the entire length of the card.
Retries	This setting indicates how many times the card is re-read in the event of a read-back error. Note that during a retry, the card is read in both the forward and reverse direction regardless of the mode set in read back mode.
Read back mode	This setting determines the direction the card is read during the initial verification (not including retries). **Forward**: This setting provides more reliable data read-back but decreases throughput because the card needs to return to the front of the printer before being read. This setting should be used only if there are frequent read back errors. **Reverse**: (default setting) In reverse mode, the card is read on its return from the back of the printer. This mode is faster, but it may result in more frequent read-back errors.

Track format	Select the printer's default track format.
Coercivity	Encoding a LOCO card with a HICO setting will saturate the magnetic media and result in periodic errors. Encoding a HICO card with a LOCO setting may result in non-encoded cards, which will result in more frequent read back errors.
Custom track formats	The options on the right side of the screen open a separate dialog box for customizing the magnetic stripe formatting. Refer to Configuring Custom Track Formats on page 5-25.

Configuring Custom Track Formats

The purpose of the Custom Track Format dialog box is to permit the customer engineer the ability to set up a custom format to meet the specific needs of the end user. This dialog box is available only with the Advanced User login. Further information about magnetic data formats is located in the Theory of Operation chapter of this manual.

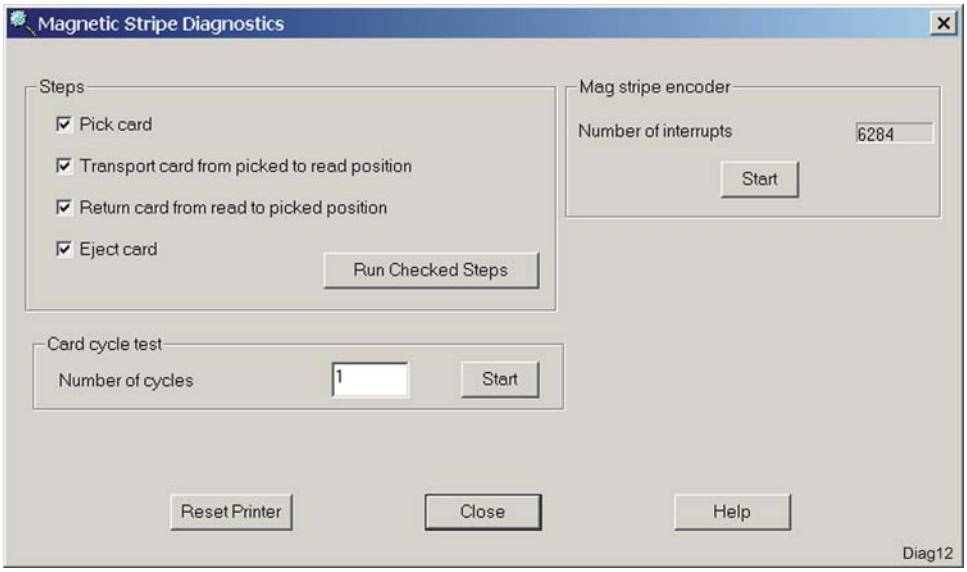


Procedure

1. Start with an existing data standard by selecting IATA, ABA, TTS, etc. at the top of the dialog box and clicking **Load presets**, or by clicking on **Load current** to start with the settings now used in the printer.
2. Modify the settings as required using the boxes at the left.
3. Click on **Apply** to send the changes to the printer.
4. Click on **Save** to save the changes and use them when the printer is next powered on.

Running Magnetic Stripe Diagnostics

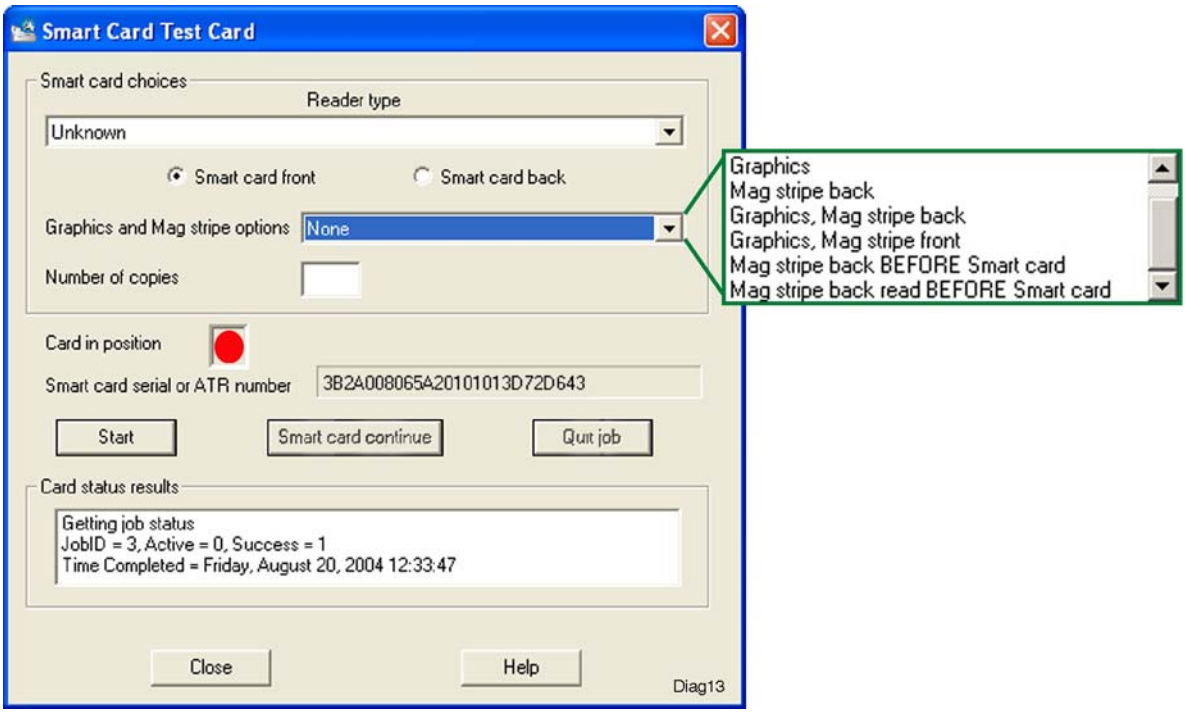
The Magnetic Stripe Diagnostics dialog box provides access to functions for troubleshooting the magnetic stripe module.



- Select a series of steps to perform, and click on the **Run Checked Steps** button.
- If you want to use a test that picks a card and passes it through the magnetic stripe area multiple times, enter the number of times in the Number of cycles box and click **Start**.
- Click on **Start** in the Mag stripe encoder test to cause the transport motor to turn for about half a second and report the number of encoder interrupts in the display box.

Testing the Smart Card Option

The smart card test is a built-in routine to simulate smart card personalization. A card is picked from the hopper, personalized, and transported to the smart card module. The module issues the Reset command to the card, and the card responds by sending its ATR (Answer To Reset) signal.



Reader Type	The list contains names of every smart card reader connected to the computer, whether they are part of the printer or not. Select the reader for the printer.
Smart card front **Smart card back**	By default the contact position is set to front. When back is selected, the card needs to be loaded with the contacts facing down, and the duplex module (only on selected model printers) flips the card over.
Graphics and Mag stripe options	Select the personalization options that should be used when making a smart card test card. Text will be printed on the card for all options except *None* and *Mag stripe back*.
Number of copies	Set the number of times you want to perform the test.
ATR Number	The ATR number is issued by the card and displayed any time there is a reset command. This number identifies the manufacturer and the card type.
Card in position	The sensor that detects a card is located on the smart card connector. The icon turns red when a card is in place and fully inserted under the contacts.

Card status results	The status window displays the status of the test. "Success = 1" indicates the test was successful. All aspects of the test (including graphics printing and magnetic stripe encoding) must be completed for the test to be successful.
Start	Click the **Start** button to begin the test. A card will be picked from the input hopper and personalized. Then the smart card chip is issued a reset command.
Smart card continue	Click this button to pause the card in the smart card area and allow for an external software routine to test the card. When the routine is complete, click this button to finish the test.
Quit job	Click this button to stop the test before it is completed.

Test Procedure

1. Connect the printer's smart card interface to the computer. (If the interface uses a USB port, connect it to a USB port on the computer.)
2. Insert a smart card into the printer's exception slot with the contacts on the top side and toward the rear of the printer.
3. From the **Smart Card** menu, select **Test Card**. When the test card window first opens, the Diagnostics software will poll the computer to identify all smart card readers. This will take a few seconds.
4. From the Reader type list, select the card reader that Diagnostics should use.
5. Select **Smart card front** from the smart card choices. (If you select **Smart card back**, the card must be loaded with the contacts on the bottom side of the card and toward the front.)
6. Select in the Graphics and Mag stripe options box what personalization should be done to the card during the test. (Text will be printed on the card for all selections except **None** and **Mag stripe back**.)
7. Click on the **Start** button.
   - The card is personalized and sent to the smart card module.
   - When the card is detected in the smart card module, the *Card in Position* indicator turns red.
   - Shortly afterward, the ATR (answer to reset) is displayed.
   - The card pauses in this position so that an external software application can interact with the card.
8. If necessary, perform additional testing on the card using the customer software application.
9. Click on the **Smart card continue** button to eject the card and display the results in the status window.

Network Option Adjustments

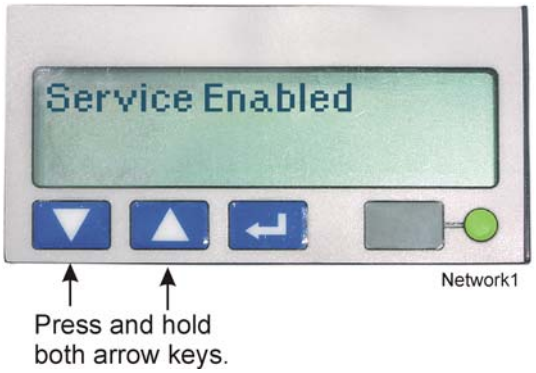
The SP55 and SP55 Plus printers each have an LCD display mounted below the input hopper. The SP55k printer has the LCD display mounted above the power supply on the side. In service mode, the display is used to set network protocols for the printer.

Except for the MAC (Media Access Control) Address, the network settings are specific to the network to which the printer is connected. Before changing these settings, contact the local network administrator for the proper settings.

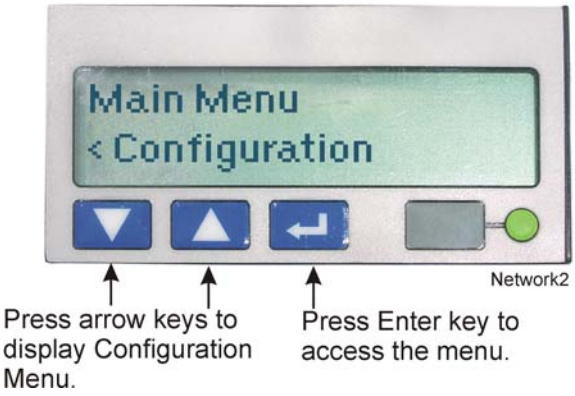
The MAC Address is a unique identifier for the physical printer. The first 6 digits of the MAC address are assigned to Datacard and cannot be changed. The remaining 6 digits are assigned to each individual printer. The MAC Address shown on the LCD display should match the address printed on the chassis.

Adjustment Procedure

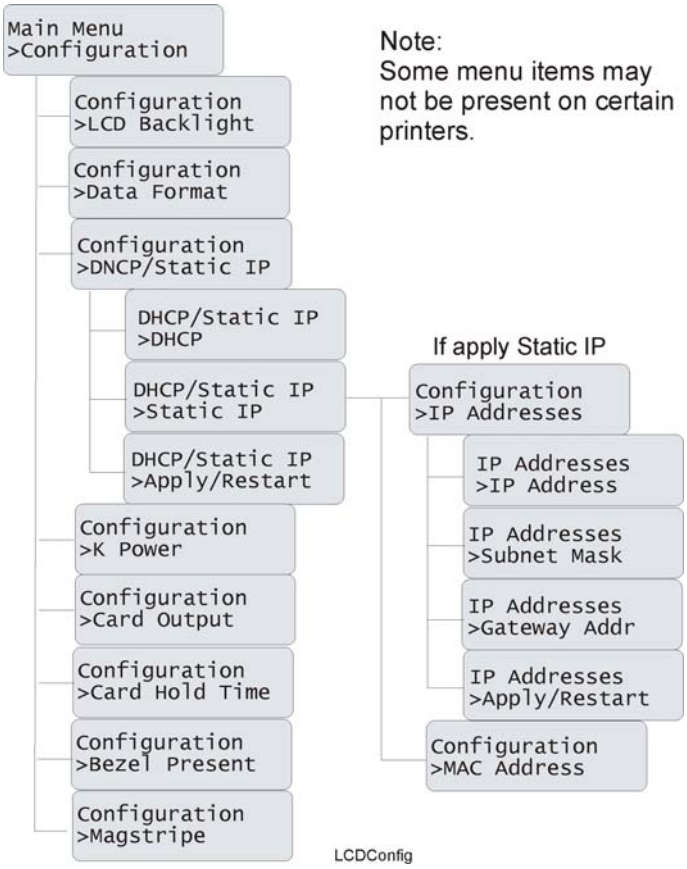
1. Simultaneously press the Up and Down arrows on the LCD display until the display shows "Service Enabled."



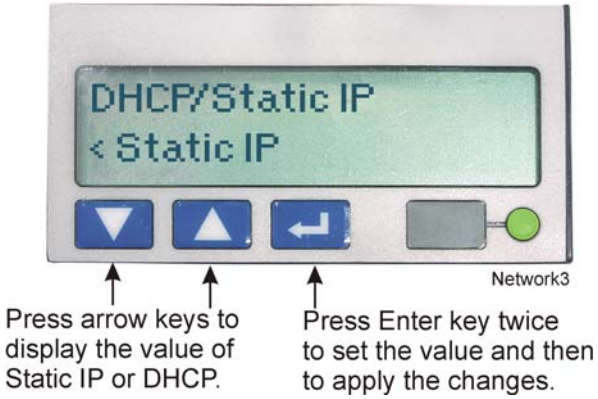
2. Press the Up or Down arrow until the Configuration menu is displayed. Then press the **Enter** key to access the menu.



3. Press the **Up** or **Down** arrow to scroll to the parameter to change and press the **Enter** key. The image below shows the submenu options under the configuration menu.



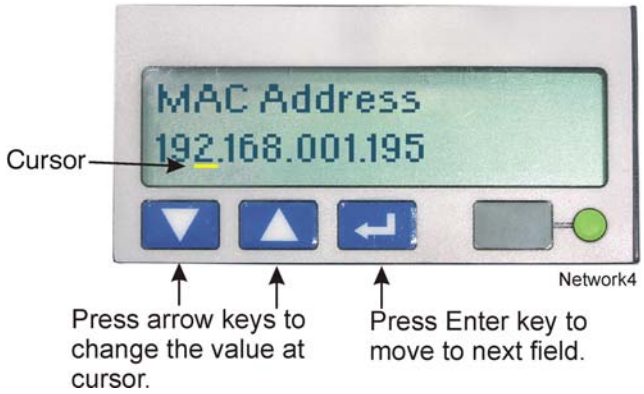
4. To switch between a DHCP assigned IP Address and a Static IP Address, use the **Up** or **Down** arrow to select the protocol and press the **Enter** Key. To apply the changes, press the **Enter** key again.
   - If DHCP is selected, the printer will reboot when **Apply/Restart** is selected.
   - If DHCP is selected, the IP Addresses submenu will not be available.
   - If Static IP is selected, the IP Addresses submenu is displayed.



5. To change any of the IP Addresses, enter the IP Addresses submenu. The image below shows the options under the IP Addresses menu.

   A. Use the **Up** or **Down** arrow to select the address to change and press the **Enter** key. The selections are at the right in the diagram on the previous page.

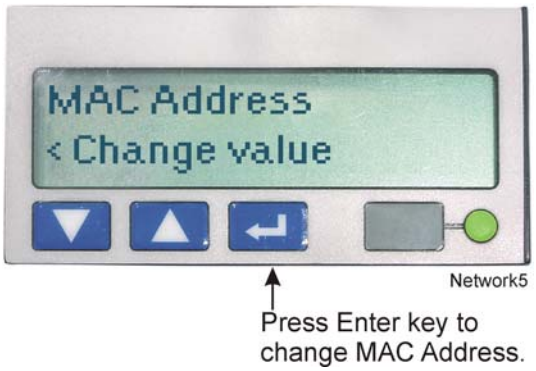
   B. Use the **Up** or **Down** arrow to change the value in each field, and press the **Enter** key to move the cursor to the next field.



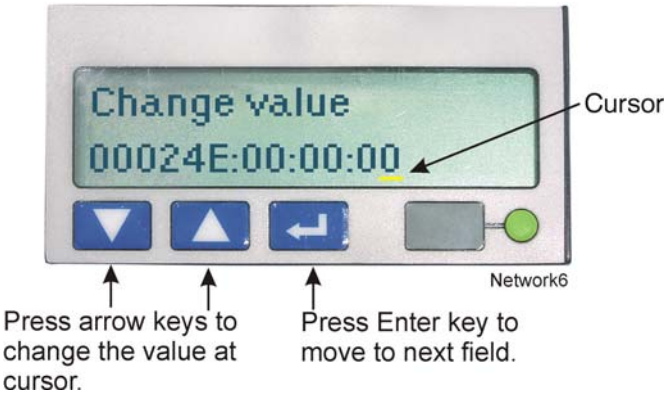
6. To change the MAC Address:

The MAC Address should match the sticker on the printer chassis.

   A. Use the **Up** or **Down** arrows to scroll to the MAC Address Menu and press the **Enter** key. When the Change Value option appears, press the **Enter** key again.



B. To change the value, use the **Up** or **Down** arrows to change the hexadecimal value in each field, and press the **Enter** key to move to the next field.



C. After the value has been changed, press the **Enter** key to apply the settings and reboot the printer.

Software Adjustment Procedures

Saving and Restoring a Printer Configuration

Procedure Notes

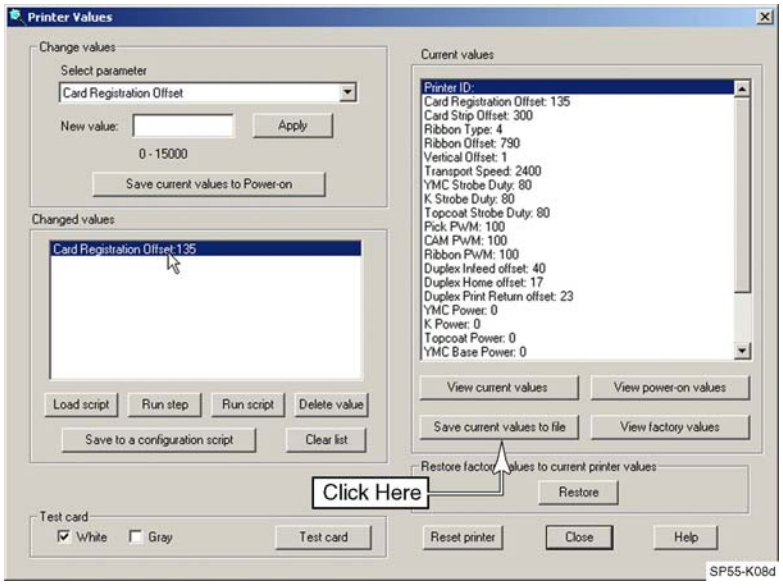
If the control board is not being replaced with a new board, it is important to keep the existing serial number as described in step 1.B on page 5-34.

If this procedure is being completed because the main control board was replaced, note the following items:

- When the new control board is first connected, it will not have a serial number. In this situation, do not delete the serial number entry as described in step 1.B on page 5-34. Instead, verify that the serial number listed in the script file corresponds to the serial number printed on the side of the printer's transport.
- Use your own laptop or PC to complete this procedure. Do not perform this procedure on the customer's PC. When the printer is first connected without a serial number, it will create a duplicate instance of the driver with a Null serial number. Even if the Null instance is deleted, some entries will remain. This can cause future problems for the customer.

Backing Up the Printer Settings

1. With the printer powered and connected to a computer, start Diagnostics.
2. From the **Printer** menu, select **Values**.
3. Click on the **Save current values to file** button. Name the text file with a unique name using the printer serial number and current date (for example, *S0004-09-30-06.txt*).



1. Using a text editor (Notepad), open the original configuration script you saved in step 3 above and make the following changes:
   A. Delete the header from the file ("*Printer Values Datacard Card Printer Printer Offsets*").
   B. Locate the entry *Printer ID: xxxxx*.
      - If the control board is not being replaced, delete the entire line. Deleting this line prevents inadvertently overwriting the existing serial number within the circuit board, especially if the same script file is used with multiple printers.
      - If the control board is being replaced, enter the printer's serial number read from the side of the transport.
   C. Locate the entry *Ribbon Type:xx*, and delete the whole line. If this line is not deleted, the script will halt-on-error and you will have to step through the remaining lines of the script manually.
2. Resave the file.
3. Connect the printer to the computer and start Diagnostics.
4. From the **Printer** menu select **Values**.
5. Click on the **Load Script** button and select the configuration file.

   Before running the script, verify that the appropriate edits have been made to the file.

   A. Click on the **Run Script** button.
   B. To verify that all of the settings have been accepted by the printer, click on the **View current values** button and compare the results with the script file.
6. Click on the **Save current values to Power-on** button. When prompted, enter **42360** for the password.

If this procedure resulted in a duplicate instance (Null serial number) of the driver, the only way to fully remove this instance is to uninstall **ALL Datacard printers** from the PC, at which time the Clean-up Utility removes leftover files.

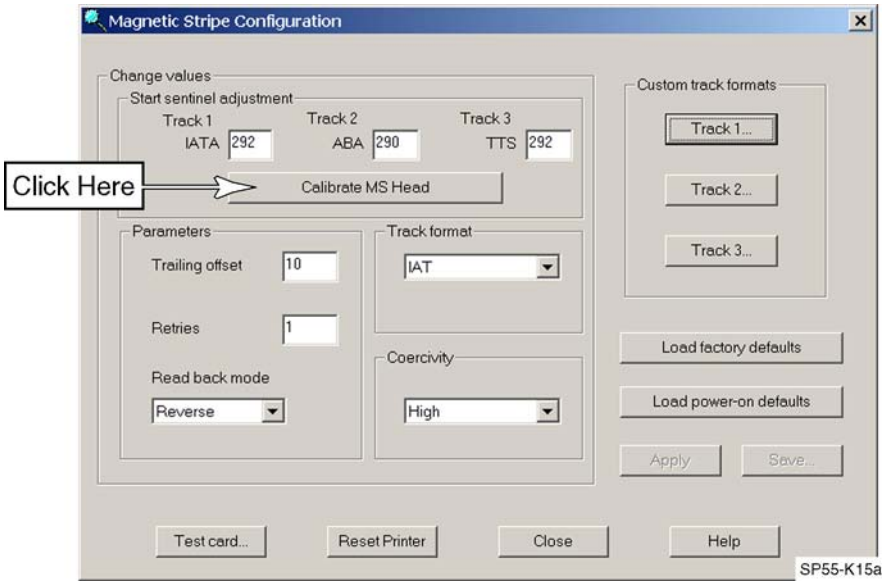
Start Sentinel Position

Perform this procedure any time you replace any component that can impact magnetic stripe registration. This includes all magnetic stripe components and any transport drive component related to moving the card past the magnetic stripe area.

Mandatory Procedure: Even if you are manually setting the start sentinel positions, you must complete the Auto Calibration procedure first.

Adjustment Procedure

1. Put a magnetic stripe card in the input hopper.
2. In Printer Diagnostics, click on the **Magnetic Stripe** menu and select **Configuration**.
3. Click **Calibrate MS Head**. The system will pick the card, pass the card through the magnetic stripe 10 times, and then eject the card.
   - Note that this card will be blank (all zeros) and will not display data if read in a card reader. However, it can be developed with magnetic developing solution.
   - The values (292, 290, and 292) will always be displayed after the calibration has been completed, regardless what changes were made during the auto calibration. In a sense, the system was calibrated to make these values correct.
4. If the customer requires a custom start sentinel position, alter the numeric entries for each track in the entry boxes. Since this is custom, you will have to refer to the customer's procedure for this setting.



Card Registration Offset Adjustment

Use the Card Registration Offset adjustment to set the distance a card travels after being detected by the Card Input sensor.

Procedure

1. In Printer Diagnostics, click on the **Printer** menu and select **Values**.
2. Record the current customer settings for image clipping, and then set both values to zero.
3. Click on the **Test Card** button and print a white test card.
   A. Using an accurate ruler or caliper, measure the distance from the leading edge of the card to the black outline printed on the card.
   B. If the distance is greater than 0.100 inch, decrease the offset.
   C. If the distance is less than 0.100 inch, increase the offset.

   Note that the trailing edge of the test card may have a smaller distance than the leading edge. This is unrelated to this adjustment (that is, do not attempt to center the image).
4. If no changes were made to the registration setting, restore the customer's clipping offsets.
5. If changes were made to the registration setting, the clipping offsets may need to be altered according to the customer's specific needs.
6. After completing the adjustment, click on **Save to Power-on Defaults** and enter **42360** for the password.

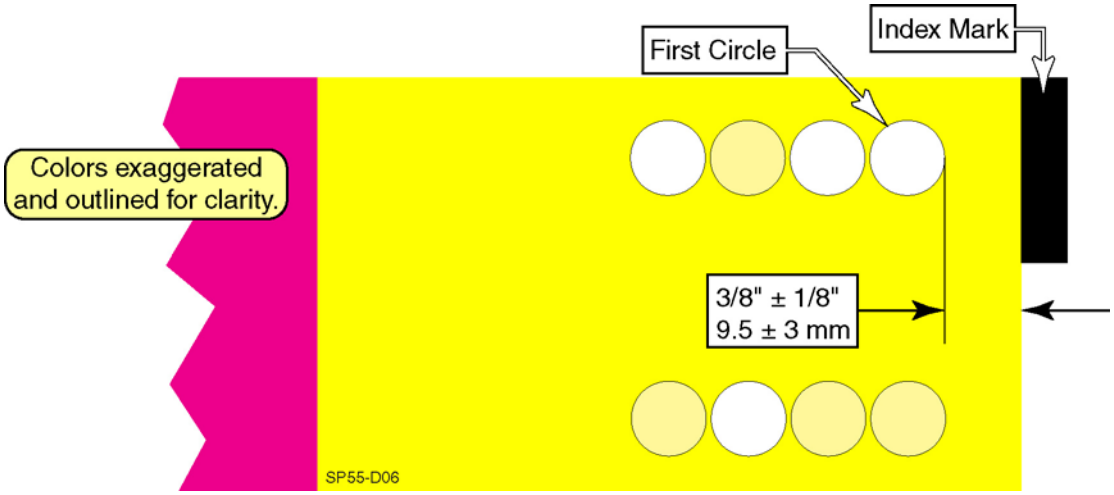
Ribbon Offset Adjustment

Manufacturing strongly recommends that this setting not be altered from the factory default setting. Doing so presents potential problems to the system.

Use the Ribbon Offset to position the print ribbon's yellow panel so that the printing begins at the correct location. If the value is too low, printing may begin on top of the registration mark. If printing begins too late, the trailing edge of the image will print on the magenta panel. There is enough extra length in the ribbon panel that this adjustment is not critical.

Procedure

1. Print a test card (either white or gray—the gray card is shown below).
2. After printing, remove the print ribbon and examine the yellow panel (some ribbon types will not have an index mark as shown in the graphic below).
   A. Locate the first printed circle in the panel. The image will be faint, but should be visible if the ribbon is held up to the light. (This circle is where the red circle is printed on the card.)
   B. If the circle is less than approximately ¼ inch away from the beginning of the panel, increase the offset.
   C. If the circle is greater than ½ inch away from the beginning of the panel, decrease the offset.



3. Verify the settings with a new ribbon and also with a near-empty ribbon, as the spool diameters may impact the results.
4. Click **Save to Power-on defaults** to store the new value permanently.
5. Enter **42360** in response to the password prompt.

Updating the Printer Firmware

There are two methods for updating the firmware in the printer. The preferred method is to automatically update the firmware (if required) when a new version of the printer driver is installed. Each of the methods is described below.

Updating the firmware with the printer driver is preferred as it is fully automated. Just follow the prompts on screen. Do not use this method if any of the following are true:

- If Datacard has provided you with a flash update file that is specifically engineered for a customer.
- If Datacard has provided you with a flash update file that is newer than the firmware utility in the printer driver.

Update the firmware using Diagnostics if an *.fls file is used. After selecting the *.fls file, the rest of the procedure is automated.

Using Diagnostics Procedure

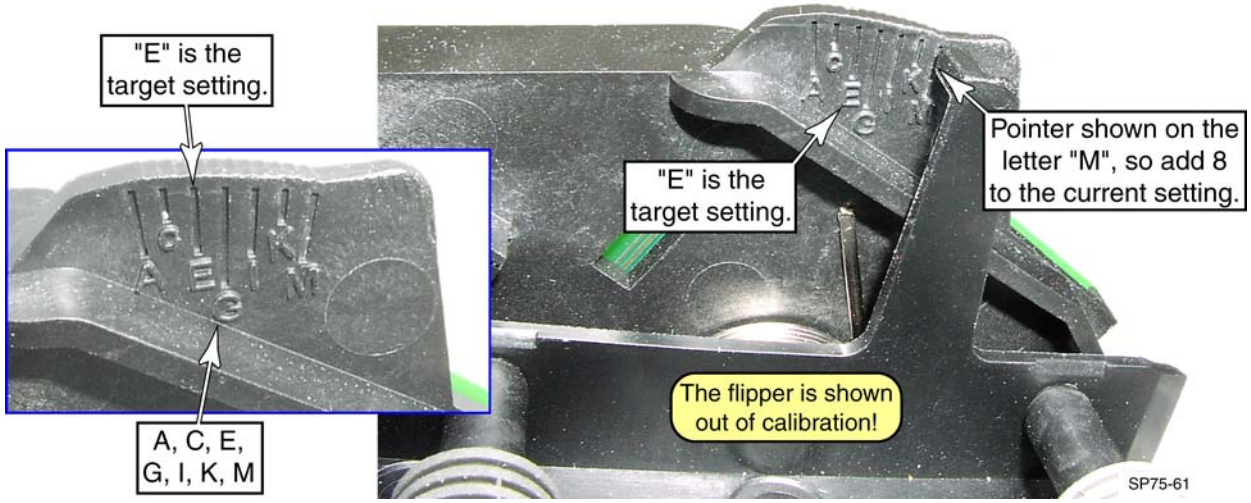
1. Start Printer Diagnostics and select the printer to be updated.
2. From the **Printer** menu select **Flash Update**.
3. Click on **Select Flash Update File** and select the file from the Open dialog box.
4. Click on **Update**, and follow the screen prompts.

Duplex Rotational Adjustment

This adjustment sets both the Duplex Home and Duplex Print Return offsets. These parameters control the rotational position of the flipper as the card enters or leaves the duplex module. This adjustment is best made with two instances of the Diagnostics software (start Diagnostics and then start another copy).

Adjustment Procedure

1. From Diagnostics, select **Printer** and then **Step Test**.
2. Click on the **Move duplex to home position** button. The flipper will rotate and re-register at the home position.
3. Open a second instance of Diagnostics and go to the **Printer Values** window.
4. Examine the physical position of the duplex calibration pointer. The proper location of the pointer is at the letter "E" on the duplex chassis.
   - If the pointer is right of the "E", add the number of units to the current setting (each letter represents 2 units because every other letter is shown).
   - If the pointer is left of the "E", subtract the number of units from the current setting.
5. Verify the setting by re-homing the duplex in Diagnostics.



6. Set the other parameters based on the new Home offset. The table below shows what should be added or subtracted from the Home offset's value. For example, the Handoff offset should be 77 units larger than the Home offset.

Parameter	Change	Sample
Duplex Home Offset	Baseline	17
Duplex Print Return Offset	Add 6	23
Duplex Handoff Offset	Add 77	94

7. Save the values to Power-on defaults.

Chapter 6: Removal and Replacement

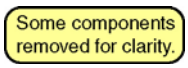
This chapter provides instructions for removal and replacement of assemblies and parts in the SP55, SP55 Plus, and SP55k card printers.

General Notes

- After completing replacement procedures, always perform the routine maintenance procedures in chapter 3 of this manual.
- Verify that the printer functions correctly after replacing parts by performing and/or observing a limited customer production run.
- For consistency, all photographs in this document show the blue colored covers of an SP55 printer, but are still applicable for an SP60 printer.

Symbols

Chapter 1 of this manual provides a complete listing of symbol conventions. The following symbols are used frequently in this chapter, and are repeated here for convenience.

	This symbol is used to designate a procedure that involves electrostatic discharge sensitive components. ESD procedures should be used.
	This symbol indicates a spring hazard. Safety glasses should be worn when completing the procedure.
	Graphic callouts with a colored background provide incidental information about the graphic itself.
	Graphic leaders with a colored background indicate a direction of movement or similar information.

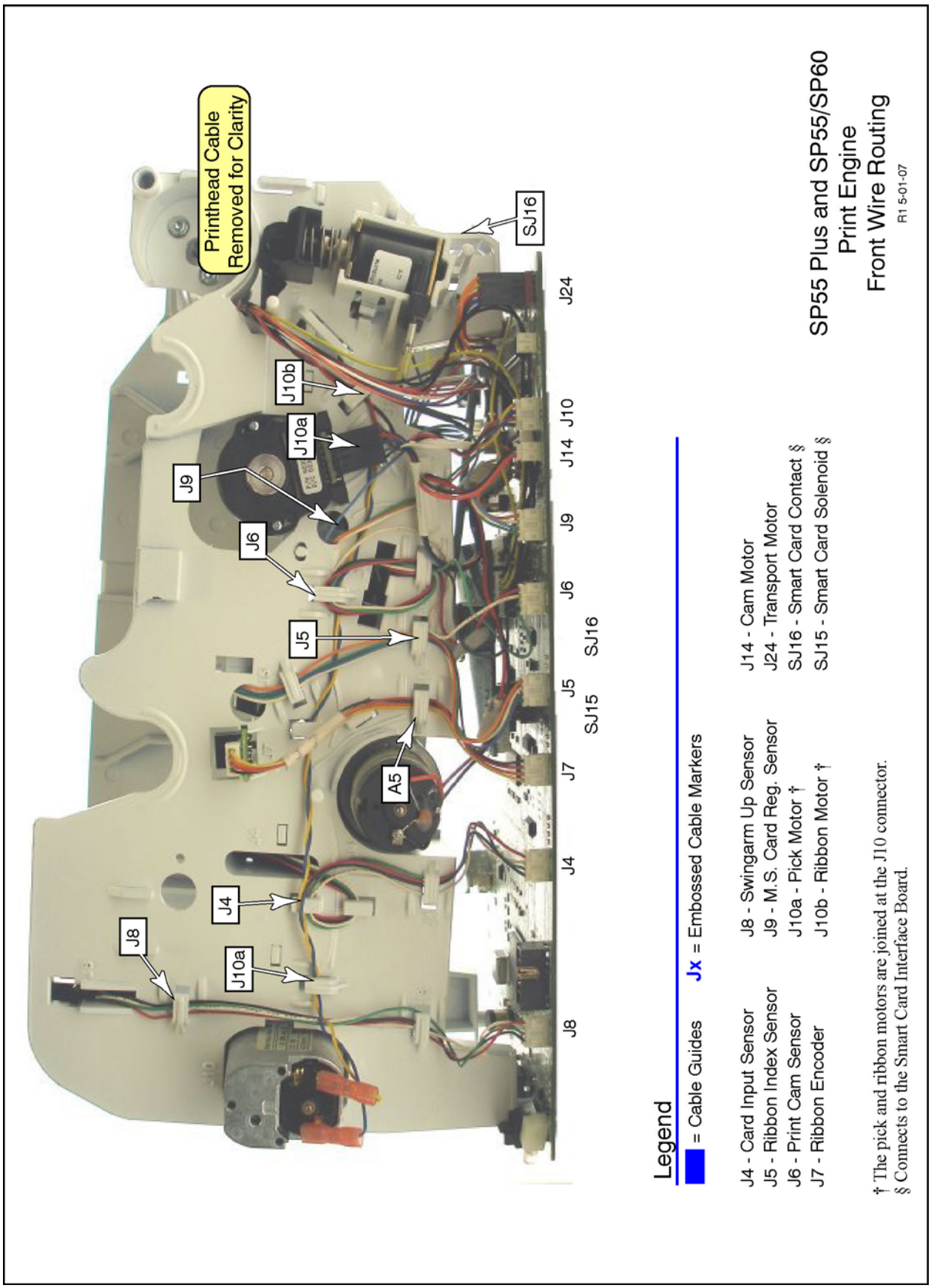
Required Tools

- T10 Torx driver
- Slotted screwdriver (standard and small)
- Needle nose pliers
- ESD grounding kit (Part # TUL006-006)
- Protective eye wear

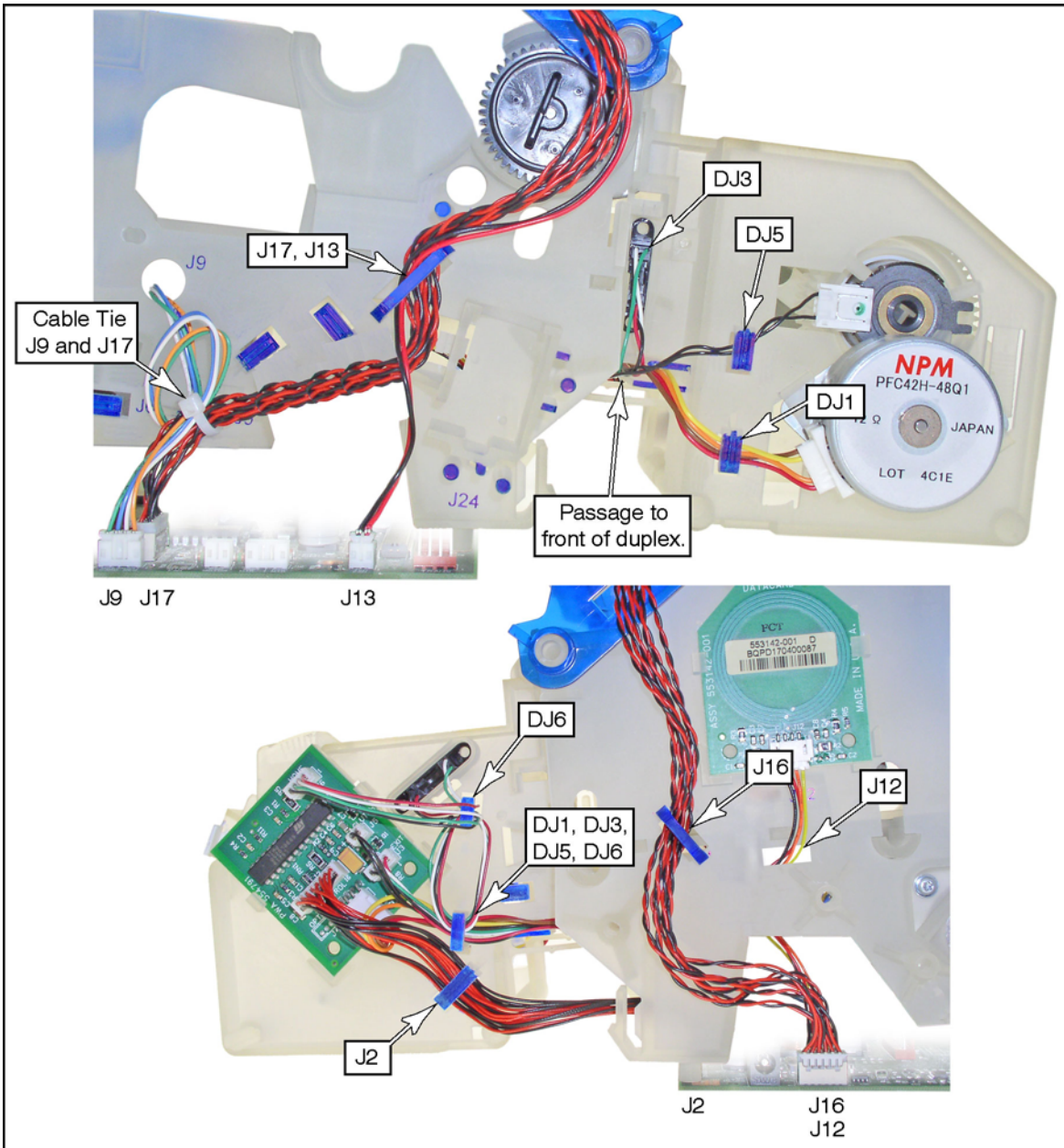
Screw Torque Specifications

Screw Location	Torque (in-lbs)
Pick motor	8±0.8
Transport motor	8±0.8
Cam motor	8±0.8
Ribbon take-up motor	8±0.8
680 coupler cable screws	0.9±0.1
Magnetic stripe encoder set screw	1.2±0.1
Magnetic stripe encoder mounting screws	0.9±0.1

Front Wire Routing



Duplex and Printhead Wire Routing



Legend

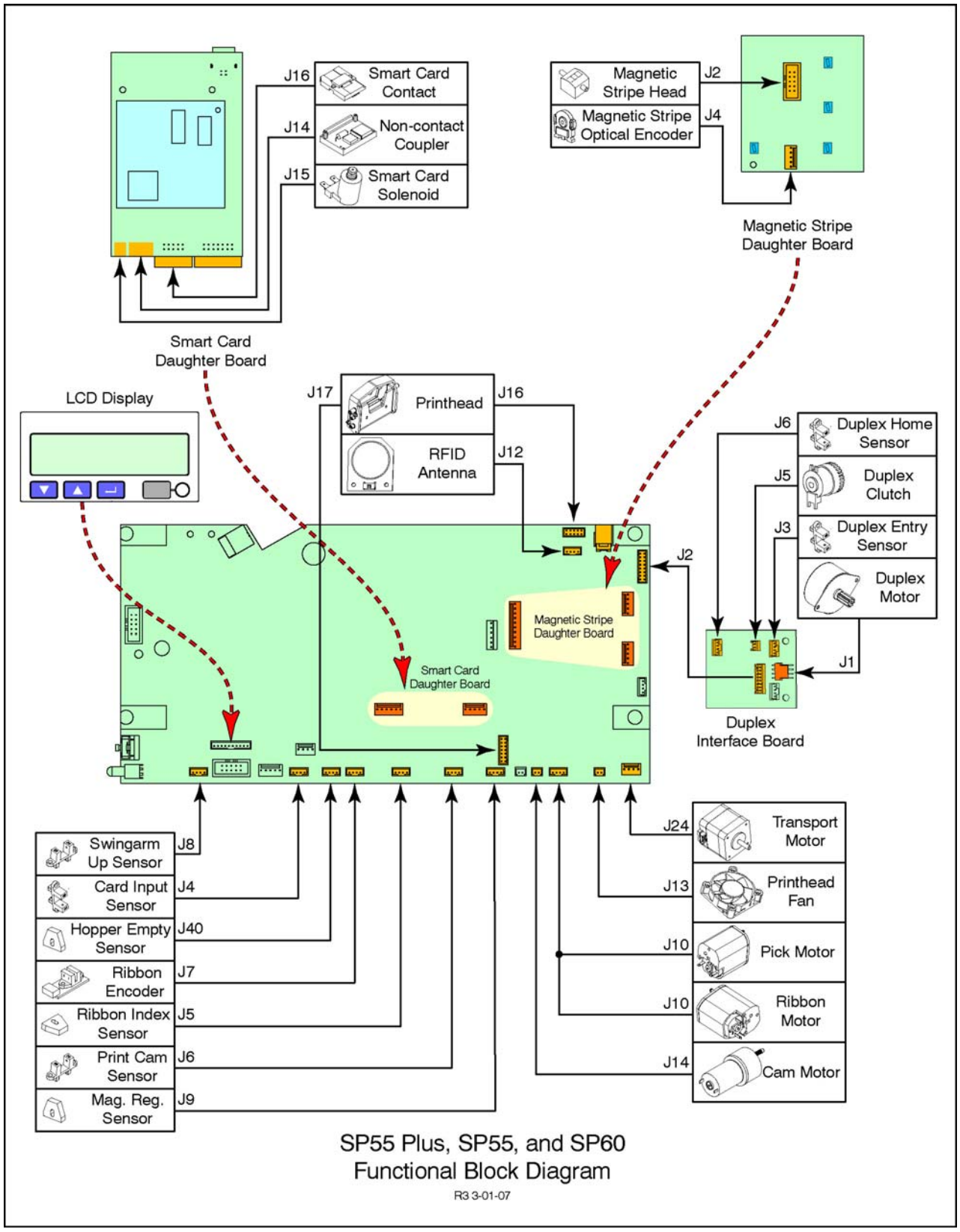
= Cable Guides Jx = Embossed Cable Markers

J2 - Duplex Interface
J9 - M.S. Card Reg. Sensor
J12 - RFID
J13 - Printhead Fan
J16 - Printhead Power
J17 - Printhead Data
DJ1 - Duplex Motor ‡
DJ3 - Duplex Entry Sensor ‡
DJ5 - Duplex Clutch ‡
DJ6 - Duplex Clutch ‡

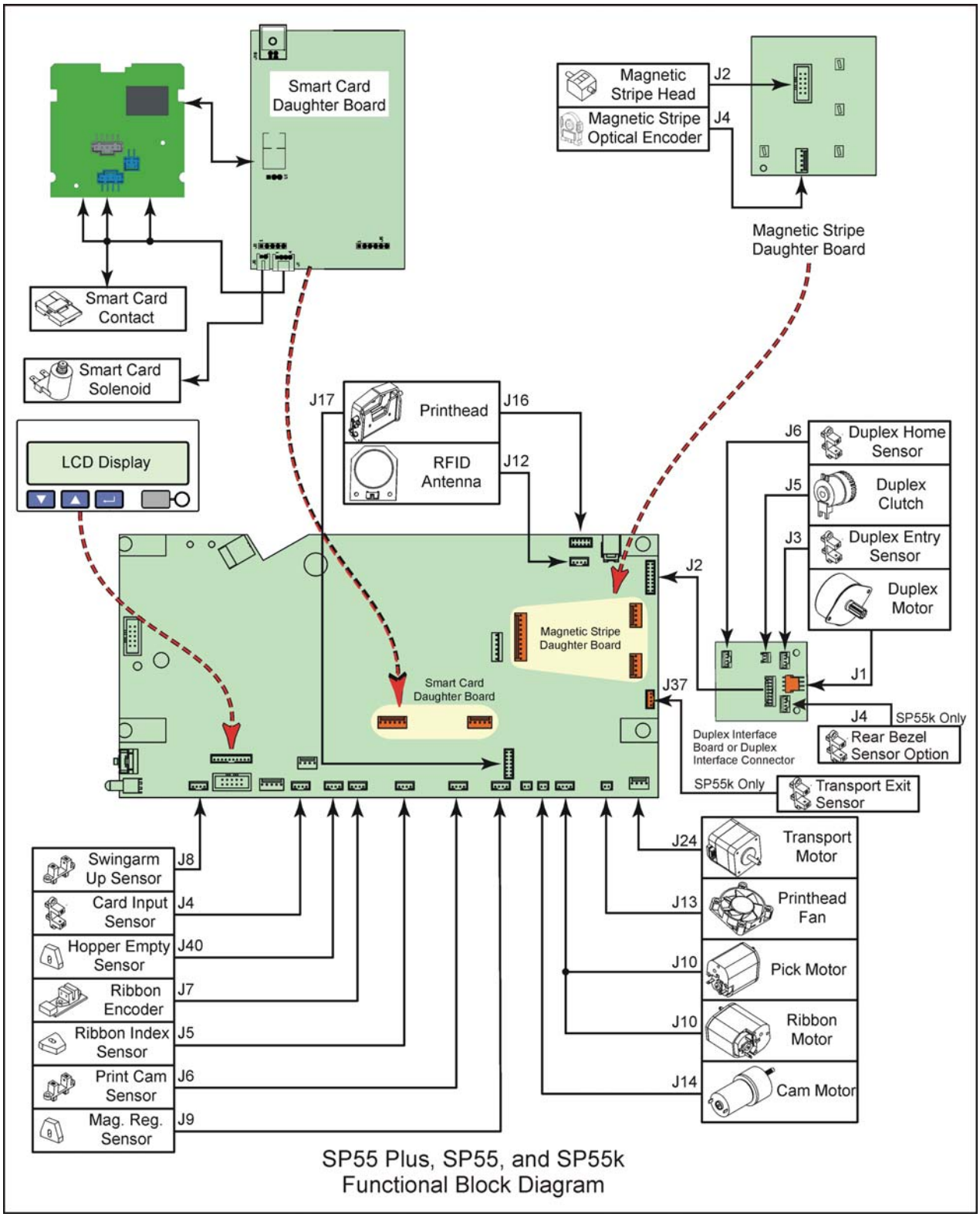
‡ Connects to the Duplex Interface Board.

SP55/SP55 Plus and SP60
Print Engine
Duplex and Printhead Wire Routing
R1 5-01-07

Functional Block Diagram (SN Under 70,000)



Functional Block Diagram (SN 70,000 and Greater)



SP55 Plus, SP55, and SP55k
Functional Block Diagram

Exterior Components

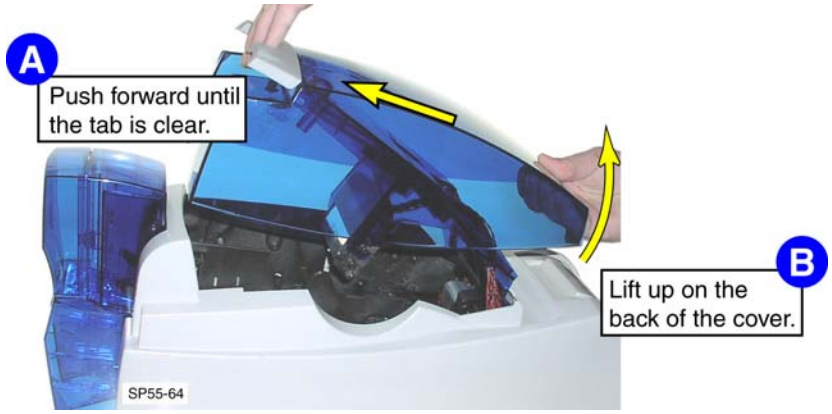
The SP55k does not have the swingarm cover or enclosure as it was designed for placement in a kiosk. In this section, only the special LCD and Card Hopper procedures for the SP55k are relevant to servicing that printer.

Swingarm Cover

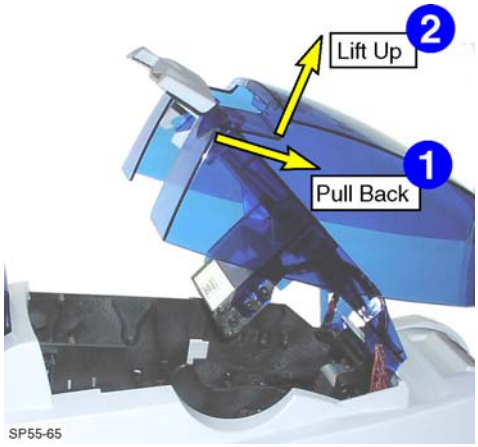
Removal Procedure

1. Place your fingertips under the back of the cover and pull back to release the retaining tab.

2. Push the cover toward the swingarm latch, and then rotate it upward to release the forward retaining tab.



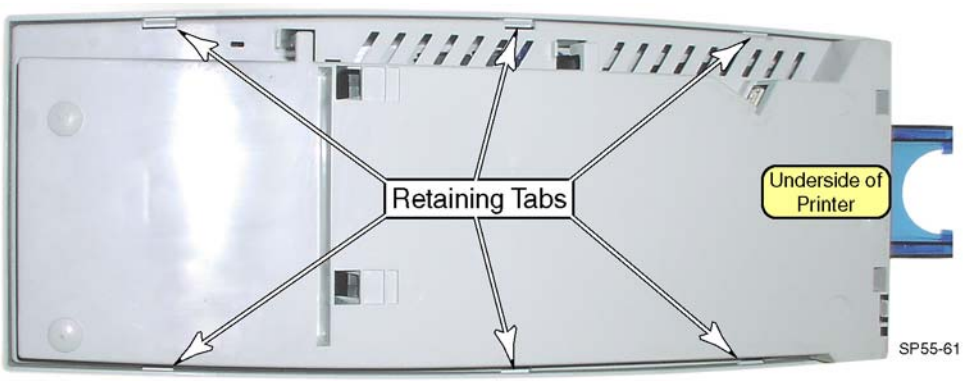
3. Pull the cover back and lift it off the swingarm.



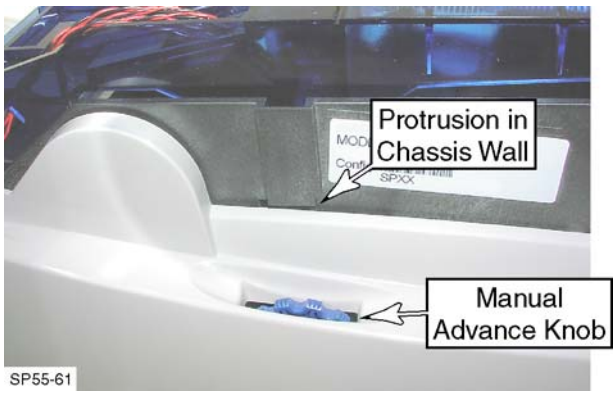
Removal Procedure

1. Unplug the printer.
2. Remove the Swingarm Cover (p. 6-8).
3. Remove the ribbon cartridge and cleaning roller as described in *InfoCentral*.
4. Close the swingarm, but do not latch it.
5. There are three retaining tabs on each side of the enclosure. Using your fingertips, pry the enclosure away from the locking tabs and begin to lift the enclosure. Work back and forth as necessary until all six locking tabs are free.

   Note that there are alignment tabs inside the enclosure. Do not pull out too far or these will break.

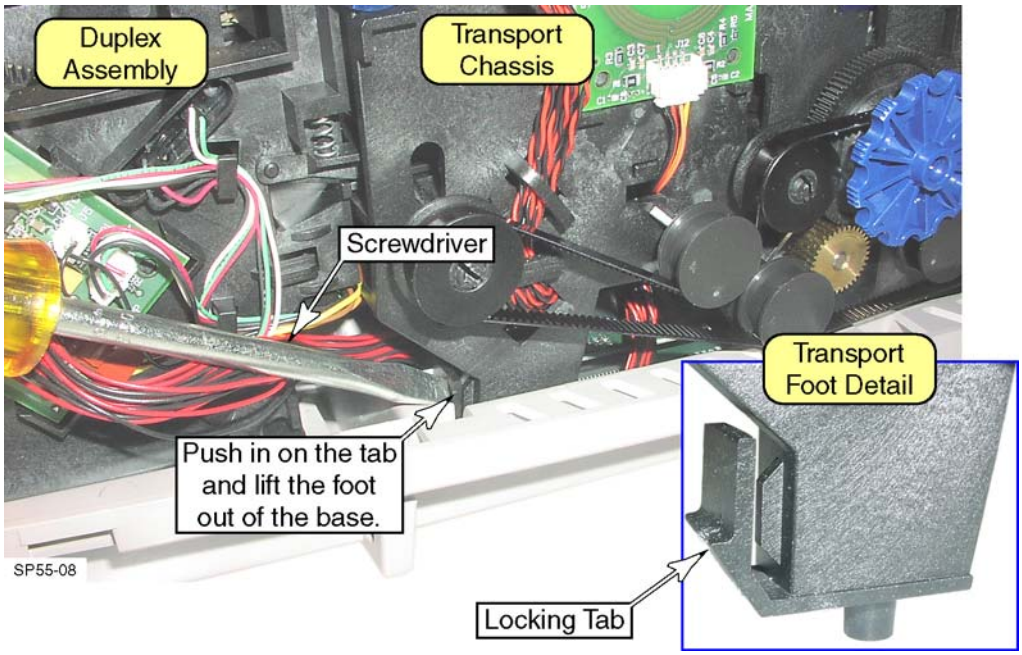


6. With the swing arm closed but not latched, lift the enclosure off the base.
   - If the swingarm is open, the rear of the enclosure will not clear the swingarm. Once this is clear, you can open the swingarm.
   - There is a small projection near the manual advance knob. The enclosure may hang up on this.
   - When the enclosure is clear of the base, turn it slightly to clear the swingarm latch handle.

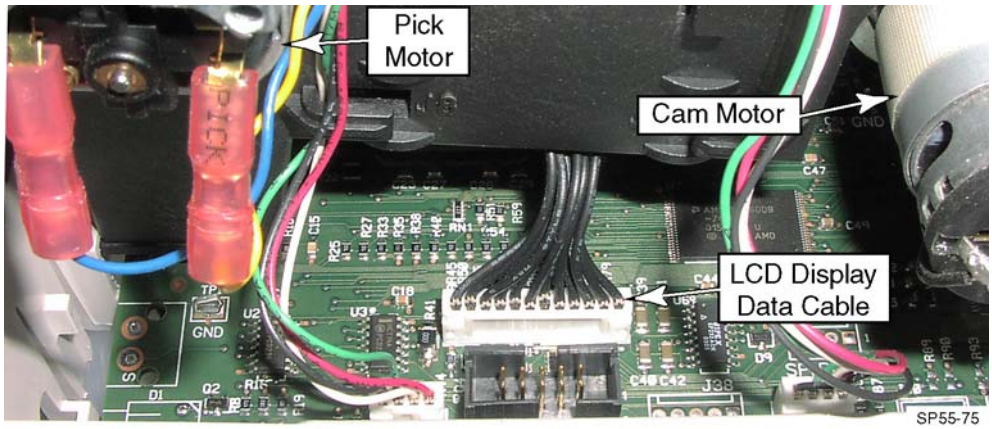


Removal Procedure

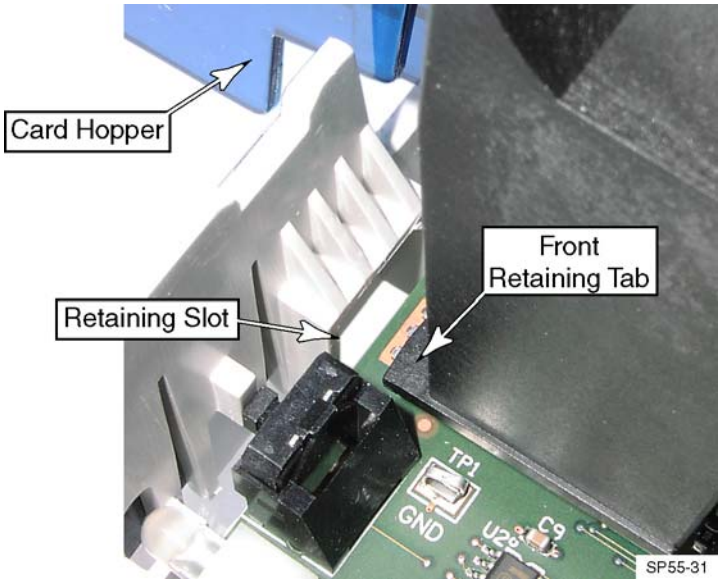
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Use a screwdriver to press in on the transport chassis locking tabs near the duplex assembly, and lift up on the back of the transport assembly.



4. If the printer is equipped with an LCD display in the hopper, disconnect the cable from the main control board.



5. Simultaneously pull back on the transport chassis and forward on the card hopper. Remove the hopper from the chassis.



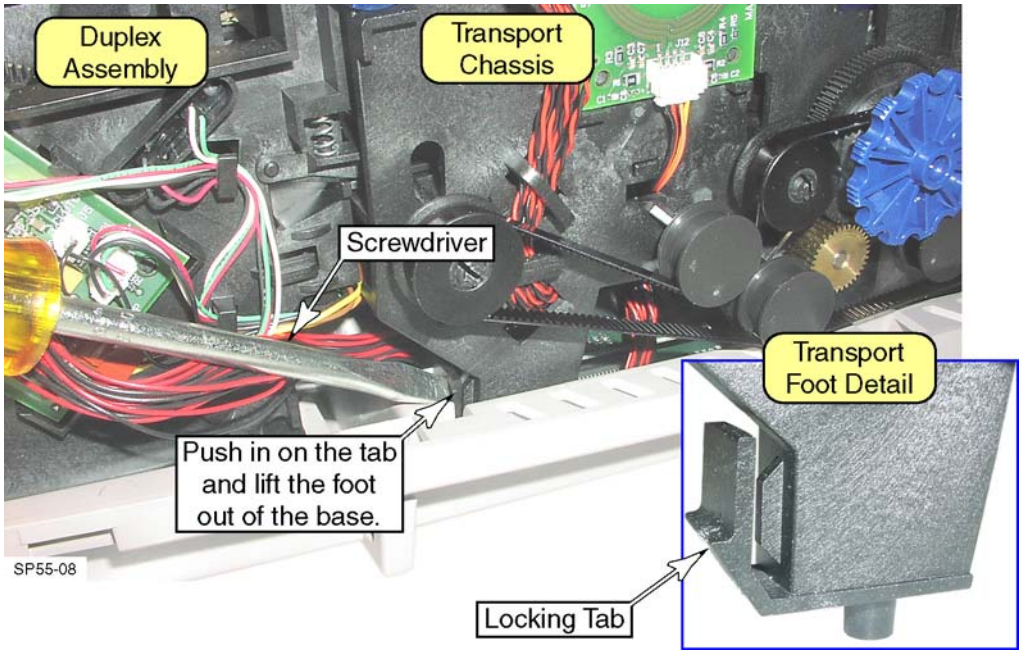
LCD Display (SP55 and SP55 Plus)

SP55 and SP55 Plus printers with a Network option will have an LCD display in the lower card hopper.

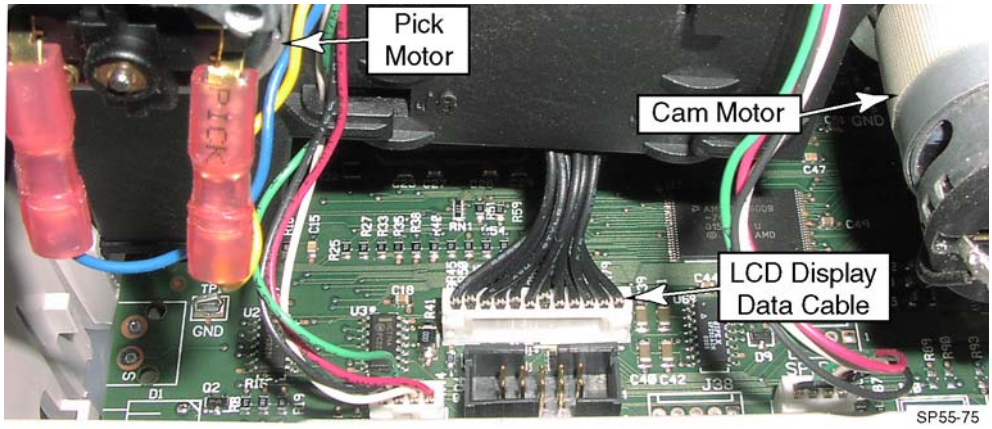
Removal Procedure

ESD Sensitive!

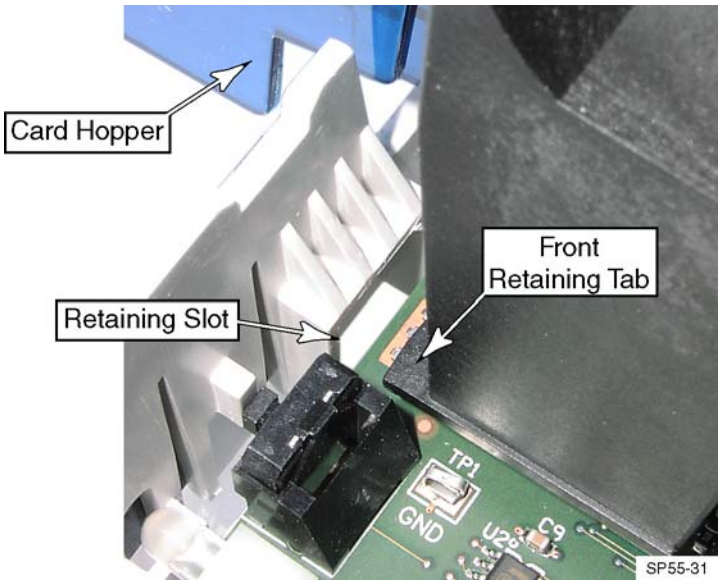
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9. (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Main Enclosure (p. 6-9).
4. Press in on the transport chassis locking tabs, and lift up on the back of the transport assembly.



5. Disconnect the LCD cable connector from the main control board.



6. Remove the card hopper by simultaneously pulling back on the transport chassis and forward on the card hopper.



7. Remove the LCD from the hopper:

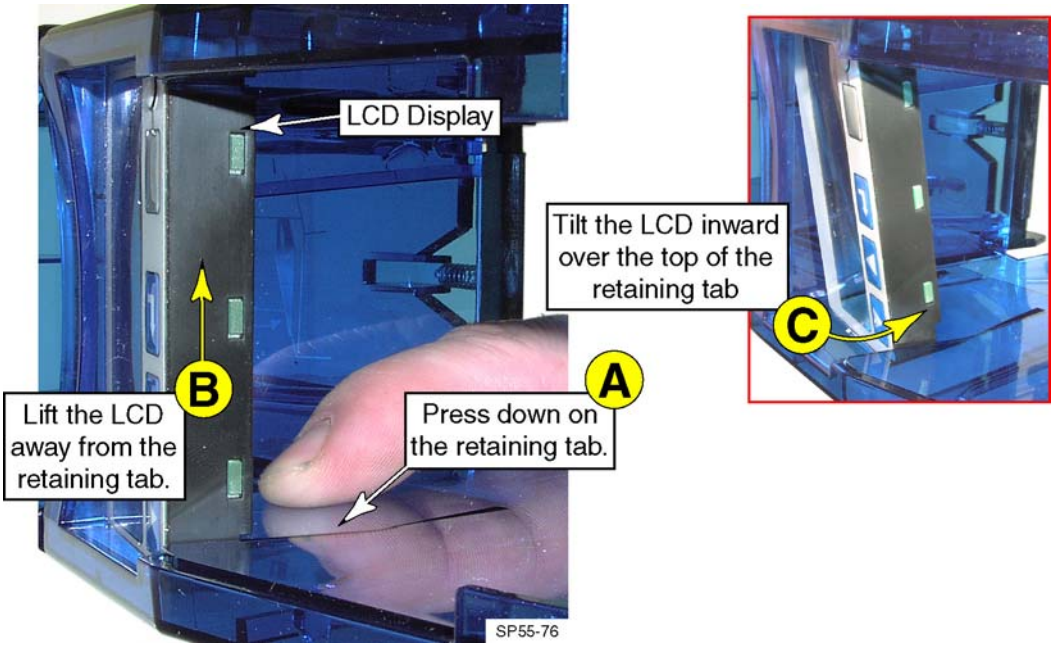
   A. Reach in from the back of the hopper and press down on the retaining tab.

   B. Lift the LCD away from the retaining tab.

   C. Tilt the LCD inward over the top of the retaining tab.

   Note: When pressing against the front of the LCD display, try to avoid pushing directly on the face of the liquid crystal.

8. Remove the cable from between the hopper walls.



LCD Display (SP55k)

The LCD display on the SP55k printer is mounted on the side of the printer, to a bracket above the power supply.

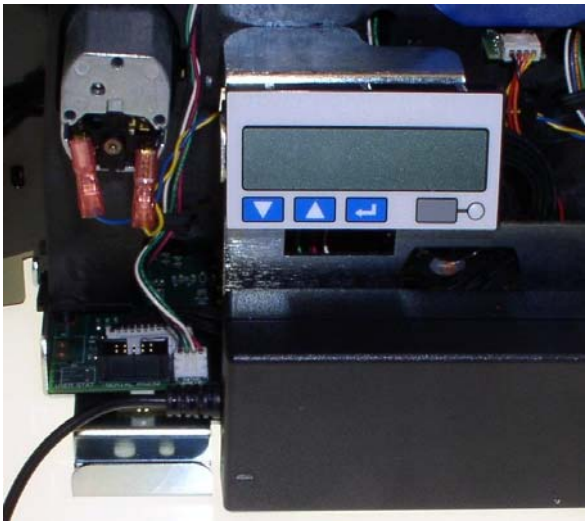
Do not remove the LCD display unless you have a replacement. It can easily be damaged during removal.

Removal Procedure

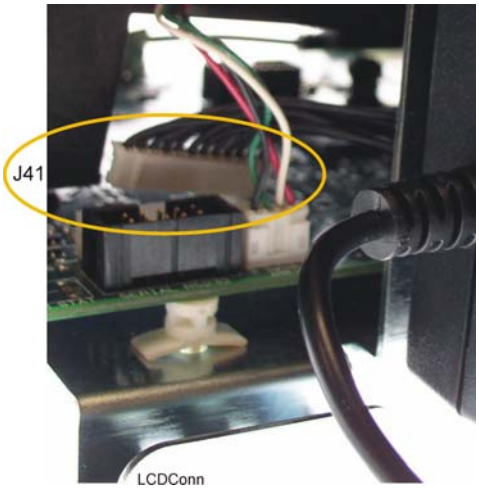
ESD Sensitive!

1. Unplug the printer.
2. Disconnect the LCD cable connector from J41 on the main control board.

LCD on Bracket



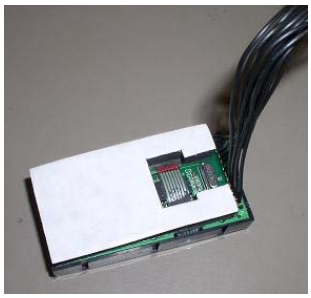
Connector Detail



3. Grip the edges of the LCD panel and pull firmly until the mounting pad pulls loose from the bracket.
4. Use isopropanol to clean any residue off the bracket.

Replacement Procedure

1. Peel one side of the paper backing off the mounting pad and place it on the back of the new LCD.



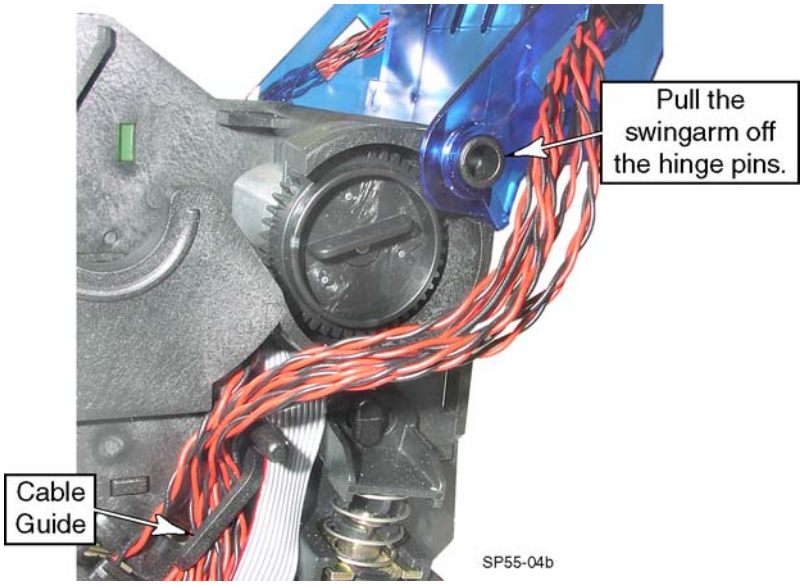
2. Peel the other side off and press it firmly on the bracket until it is attached.
3. Attach the LCD connector to the main control board.

Swingarm Assembly

The user manual refers to this assembly as a cover arm.

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Optional: If the swingarm needs to be fully removed from the printer, it will be necessary to remove the printhead cable.
   A. Remove the Transport Assembly from the base (p. 6-31).
   B. Disconnect the printhead power and data cable connectors from the main control board.
   C. Disconnect the printhead fan connector from the main control board.
   D. Pull the cables back through the cable guides in the transport chassis.
4. Unhinge the swingarm by pulling each side off the hinge pins.



Printhead Fan

There are two different sizes of fans in the SP55 and SP60 printers. The thicker fan is removed from the top of the swingarm, and the thinner fan slides out from the bottom of the swingarm. The SP55 Plus and SP55k use only the thicker fan.

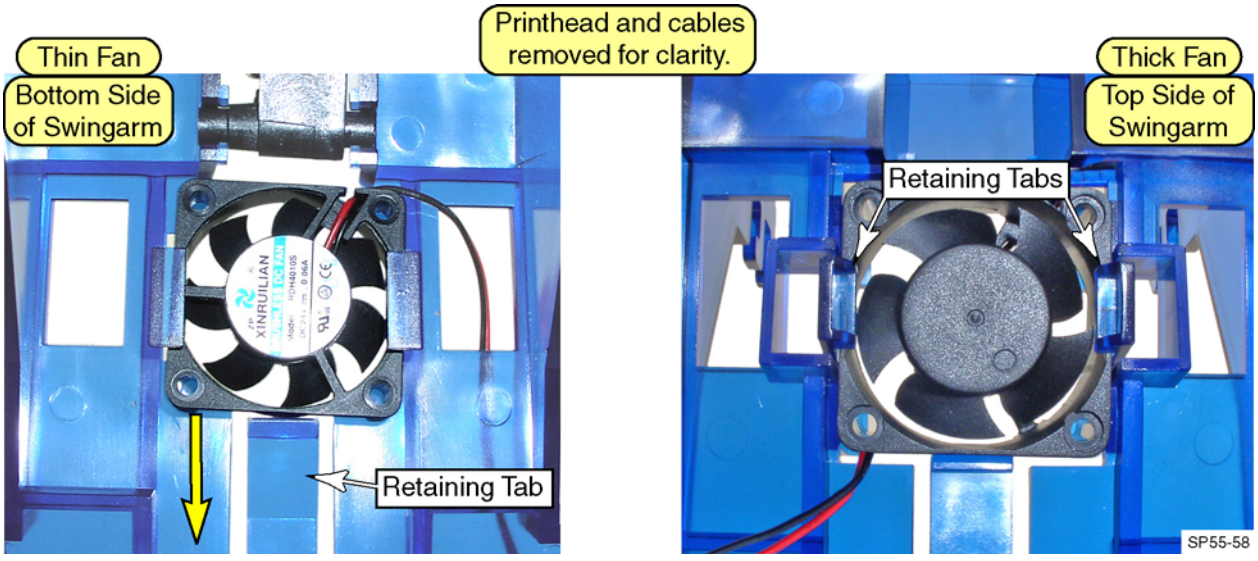
To identify the fan size, look for the retaining tabs on the top side of the swingarm as shown in the right-hand picture below. If the tabs are present, the fan is the thicker fan.

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Unplug the fan from the main control board.
4. To remove the thick fan, press in on the two retaining tabs and lift the fan out from the top of the swingarm (right-hand image below).

   Do not attempt to remove the thick fan using the thin fan procedure. The retaining tab will break.

5. To remove the thin fan, press in on the single retaining tab and slide the fan down to remove it (left-hand image below).

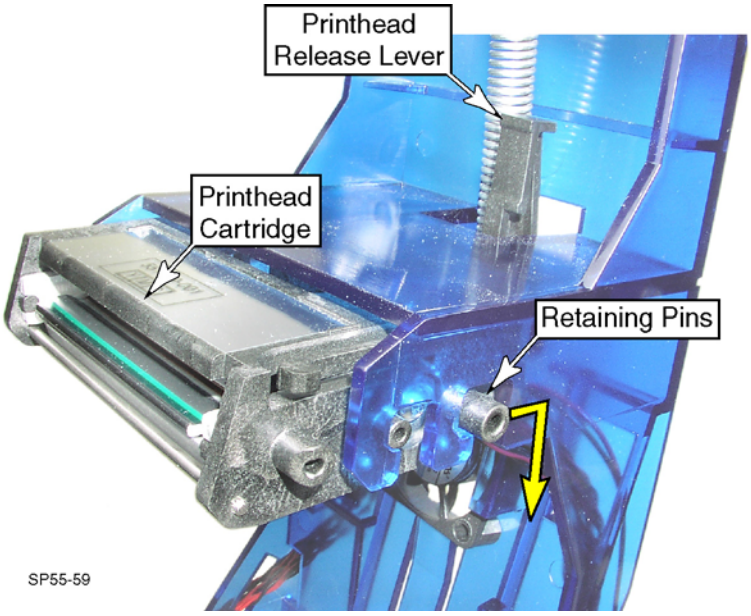


Note that with either fan, the label on the fan is facing toward the inside of the printer.

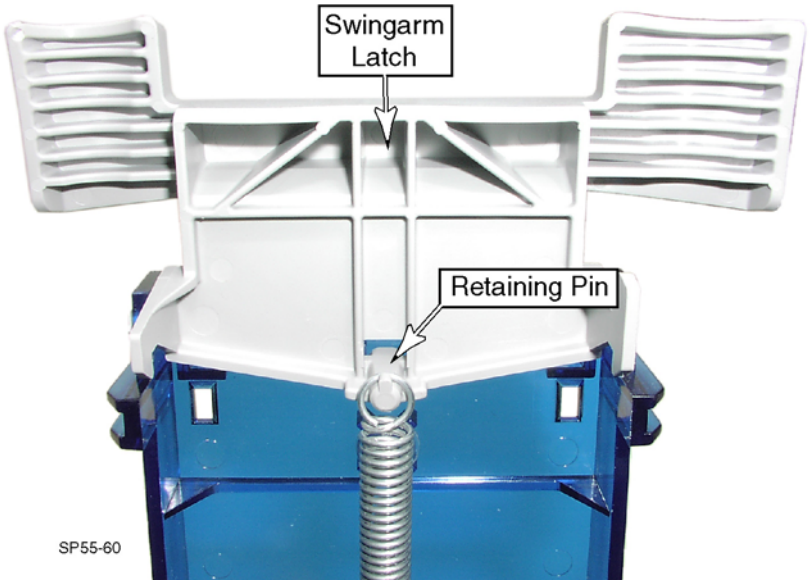
Printhead Spring

Removal Procedure

1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Press in on the printhead release lever and remove the printhead.



4. Pull up firmly on the printhead spring to unhook it from the retaining pin on the swingarm latch.
5. Remove the other end of the spring from the printhead release lever.



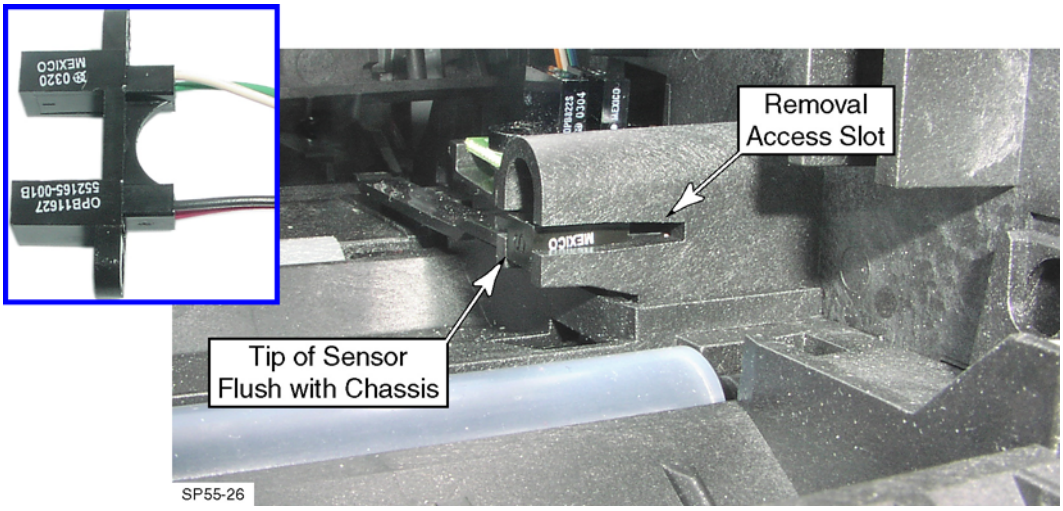
Sensors

Card Input Sensor (Without Clear Card)

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Gently press the side of a screwdriver against the tip of the sensor (removal access slot shown below) and push it out of the chassis.
4. Only when the sensor cannot be pushed out any further is it okay to pull the sensor out with the wires.
5. Unplug the connector from the main control board.



Replacement Notes

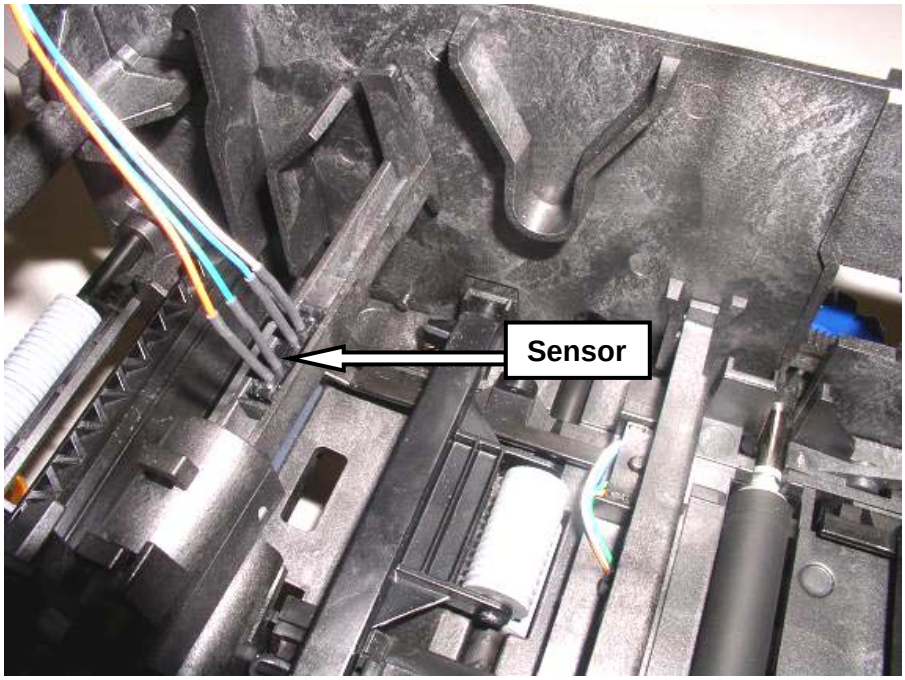
- When pushing the sensor back into position, use a blunt tool and push only on the top tab, bottom tab, or the center of the body. Do not push against the wire entry points or crush the wires.
- Make sure the sensor is fully seated. The tip of the sensor should be flush with the edge of the chassis.
- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Use Diagnostics to pick cards to verify that the sensor is functional.

Card Input Sensor (With Clear Card)

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Gently lift the sensor up from the bracket.
4. Unplug the connector from the main control board.



Replacement Notes

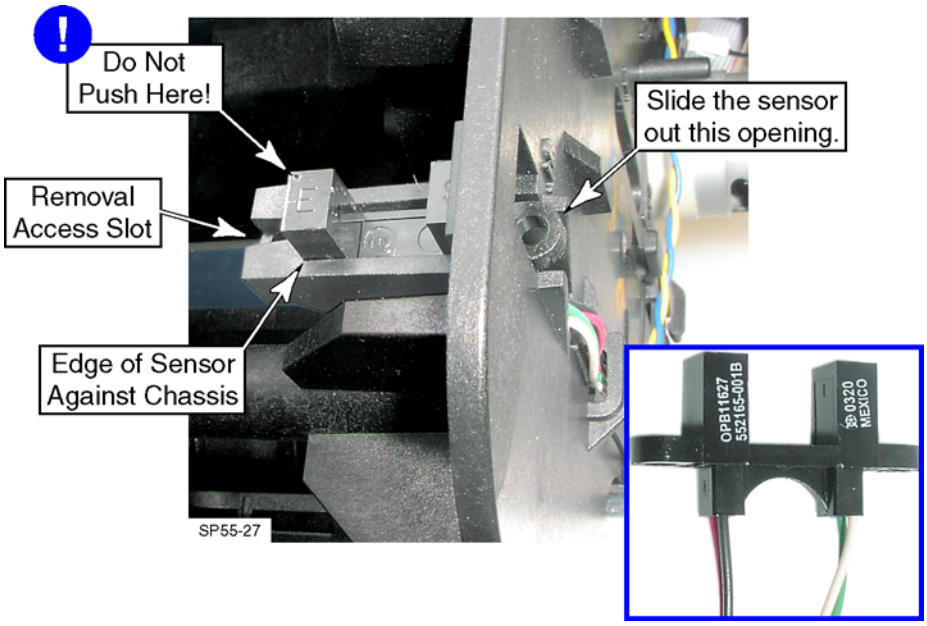
- When pushing the sensor back into position, use a blunt tool and push only on the center of the body. Do not push against the wire entry points or crush the wires.
- Make sure the sensor is fully seated. The tip of the sensor should be flush with the edge of the chassis.
- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Use Diagnostics to pick cards and verify that the sensor is functional.

Swingarm Sensor

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Gently press the side of a screwdriver against the mounting tab of the sensor (removal access slot shown below) and push it out of the chassis.
   - Do not push against the tip of the sensor arm. It may break.
   - Only when the sensor cannot be pushed out any further is it okay to pull the sensor out with the wires.
4. Unplug the connector from the main control board.



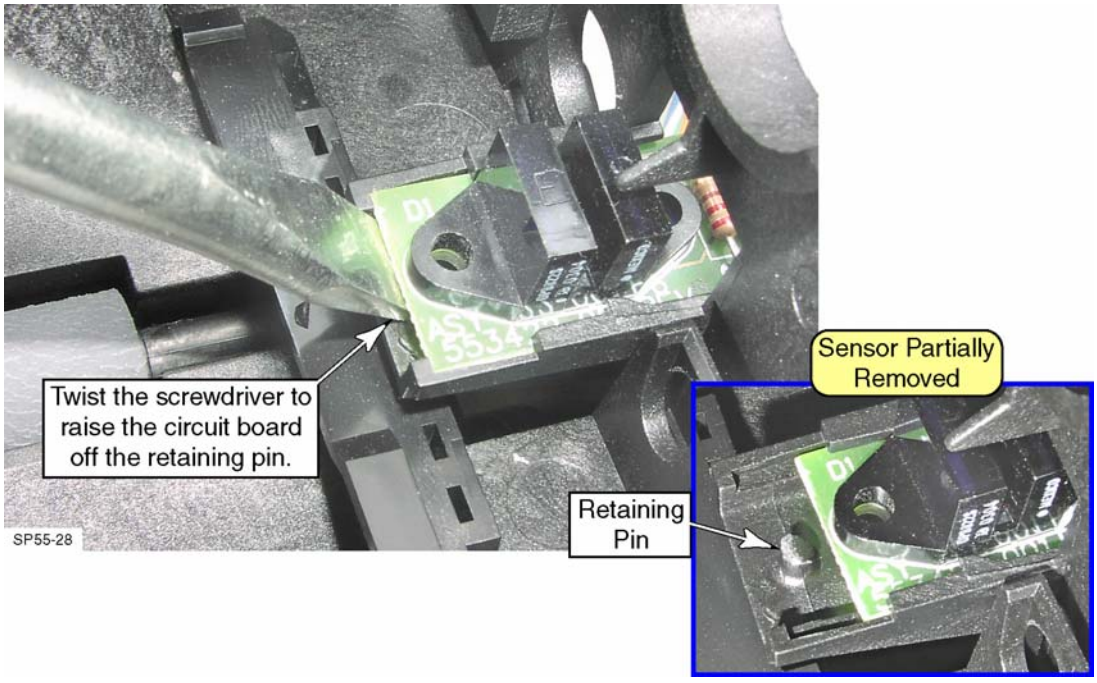
Replacement Notes

- Make sure the sensor is fully seated. The edge of the sensor arm should be against the edge of the chassis.
- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Use the sensor display in Diagnostics to verify that the sensor is functional.

Ribbon Motion Sensor

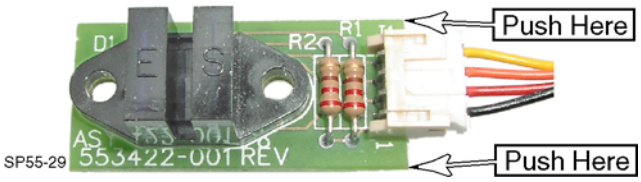
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the sensor:
   A. Insert a screwdriver under the sensor's circuit board and gently twist to free the sensor from the retaining pin.
   B. Continue to pull the sensor out of the chassis by grasping the sides of the circuit board.
4. Disconnect the sensor cable connector from the sensor's circuit board.



Replacement Notes

- When replacing the sensor, do not push against the cable connector—the solder leads will bend. Push against the corners of the circuit board.



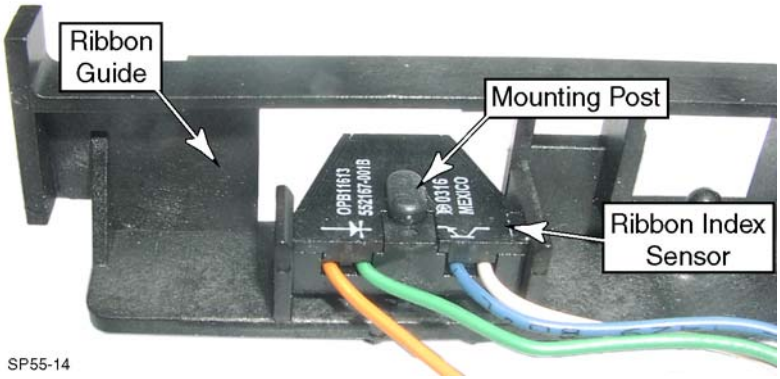
- Use the sensor display in Diagnostics to verify that the sensor changes state as the ribbon supply spindle is rotated.

Ribbon Index Sensor

Removal Procedure

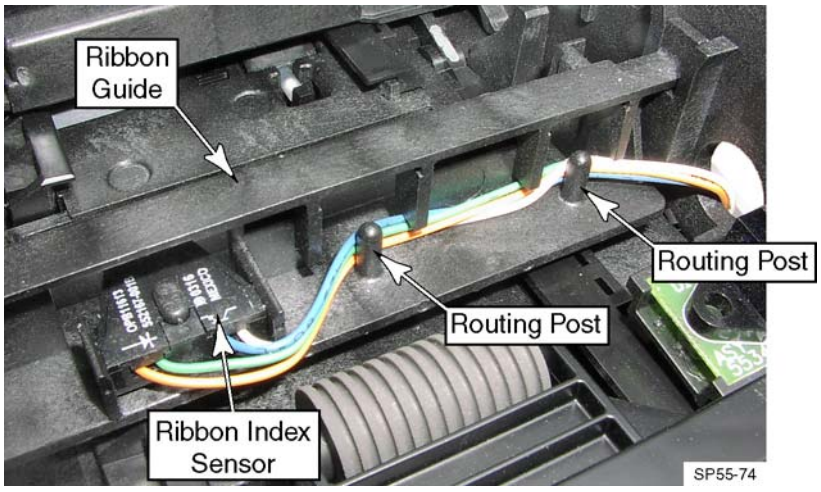
ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Optional: For easier access, you may choose to remove the Ribbon Guide (p. 6-46).
4. Unplug the sensor from the main control board.
5. Pull the sensor off the mounting post on the ribbon guide. Pry underneath with a screwdriver if necessary.



Replacement Notes

- Route the cable through the ribbon guide as shown below.



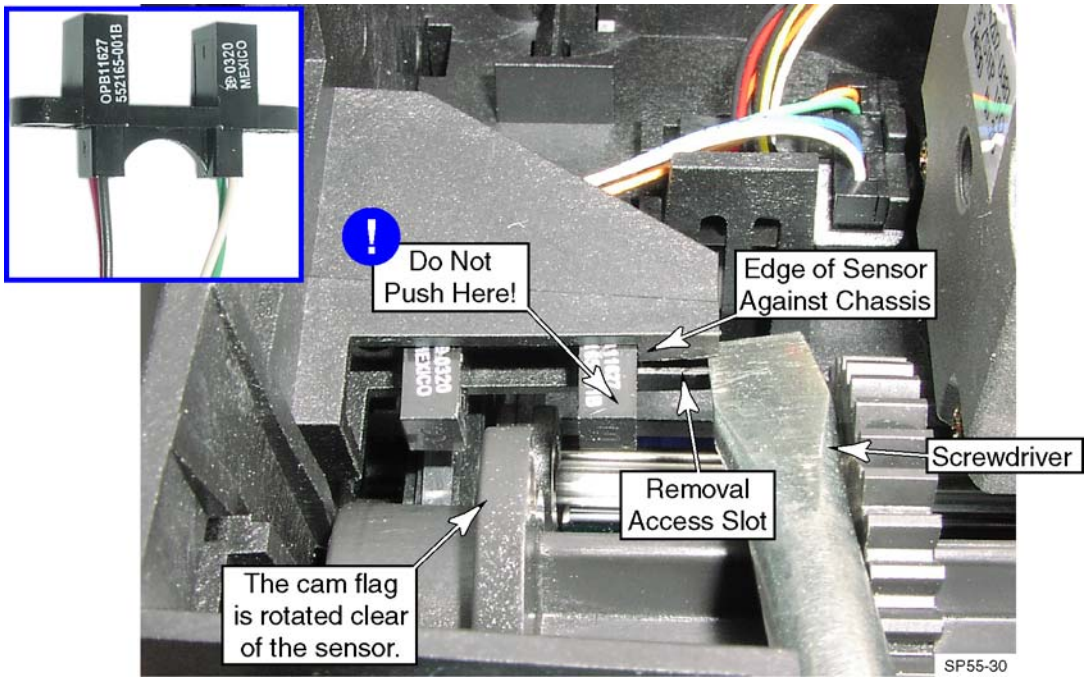
- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Use the sensor display in Diagnostics to verify the sensor changes state as the ribbon is advanced.

Cam Sensor

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Close and lock the swingarm, and turn the printer upside down.
5. Rotate the printhead cam until the cam flag is clear of the sensor.
6. Remove the sensor:
   A. Place a screwdriver into the removal access slot, and push the sensor out.
   B. Only when the sensor is partially removed (loose) is it acceptable to push against the sensor arm or pull with the wires.
   C. Disconnect the sensor cable connector from the main control board.



Replacement Notes

- Make sure the sensor is fully seated. The edge of the sensor arm should be against the edge of the chassis.
- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Run the *Printhead Cam Test* in Diagnostics to verify the sensor is functional.

Card Hopper Empty Sensor

The Input Hopper Empty Option has a bracket that clips onto the Card Tray. The sensor fits into the bracket and plugs into the J40 connector labeled **Spare**.

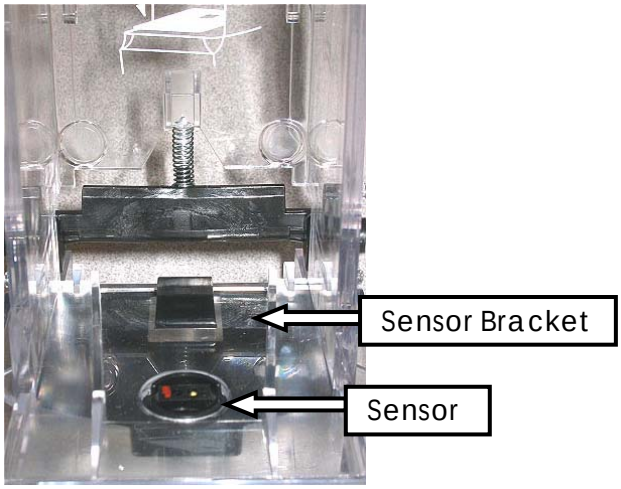
Even though this sensor displays on the Diagnostics Sensor screen, it is used only by the printer driver API and is not reported to the driver; it will have no effect on the printer or error messages from the driver. The sensor can be utilized only after custom development is done to incorporate it.

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer).
3. Unplug the Hopper Empty sensor from the J40 connector labeled **Spare**. The plug is located below the CAM Motor.

4. Pull the wire free from the printer.
5. Unclip the sensor bracket from the Card Input Hopper.



Replacement Notes

Use Diagnostics to verify that the sensor is working properly.

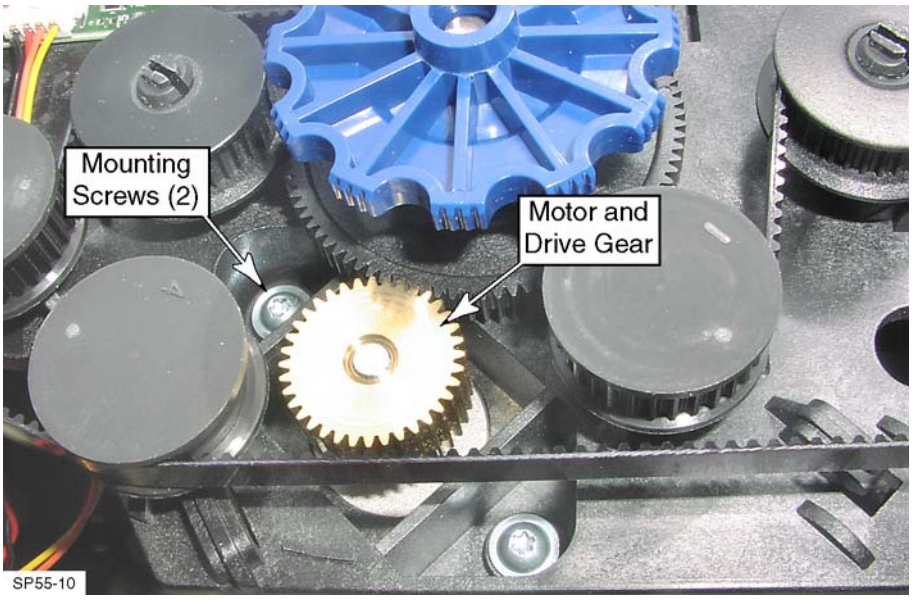
Motors

Transport Motor

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. If the transport motor is not already disconnected from the main control board, unplug it.
5. Using the T10 Torx driver, remove the two screws that hold the transport motor. During replacement, tighten the screws to 8 in-lbs.

Caution. Do not force the motor against the platen roller. Doing so causes print artifacts.



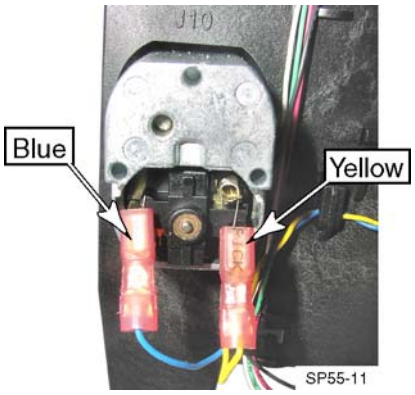
Follow-up Procedure

- Refer to the Functional Block Diagram for replacement details.
- Use the motor tests in Diagnostics to verify the motor is functioning properly.
- Print several test cards.

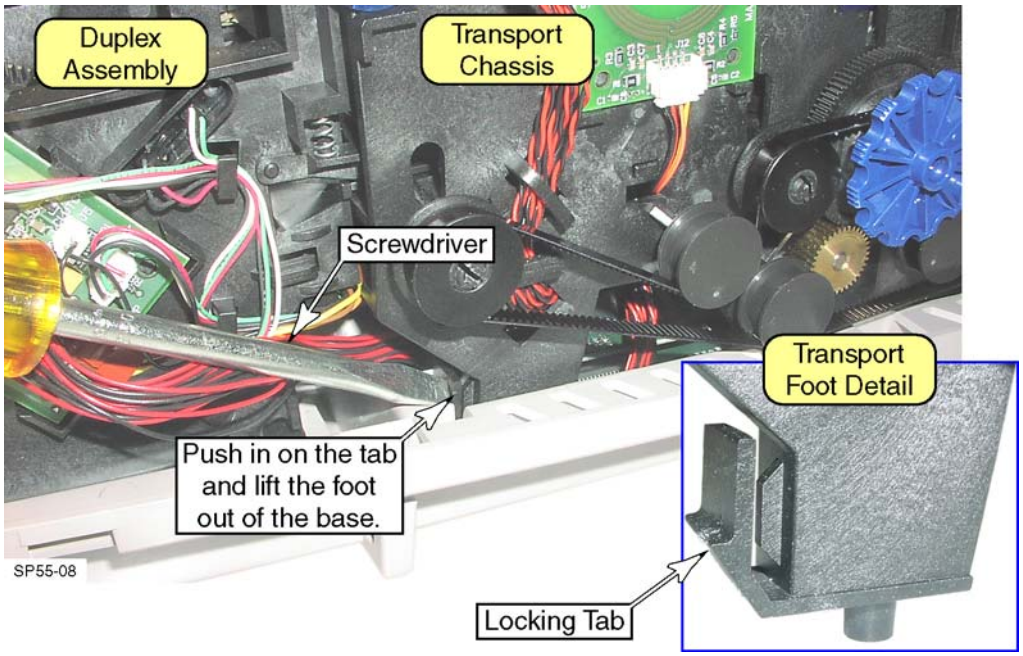
Pick Motor

Removal Procedure

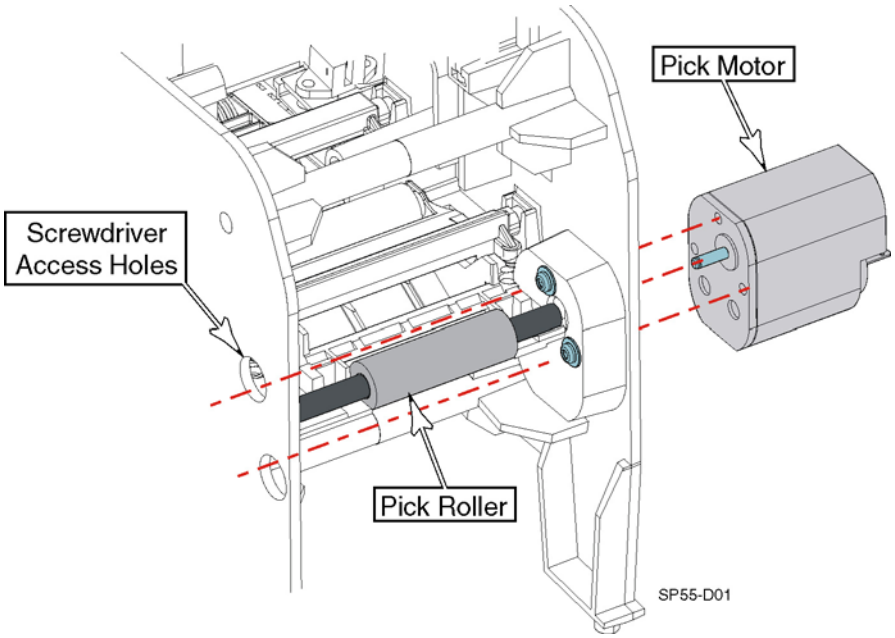
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Unplug the wires from the motor.



4. To access the motor mounting screws, it is necessary to remove the Card Hopper (p. 6-10).
   A. Unsnap the rear transport feet from the base.
   B. Slide the transport chassis back, and simultaneously pull forward on the card hopper. Remove the card hopper.

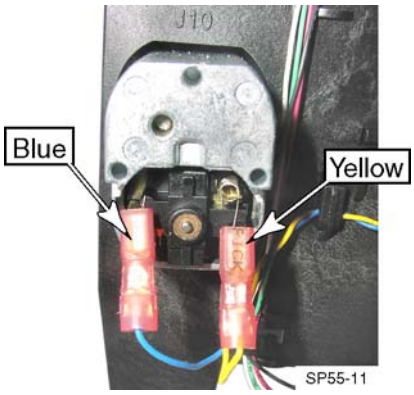


5. Remove the two screws that secure the pick motor to the transport chassis, and remove the motor.



Replacement Procedure

1. Place the pick roller in the transport chassis.
2. While positioning the pick motor, rotate the pick roller until the shaft-flat lines up with the flat on the roller.
3. Tighten the mounting screws to 8 in-lbs.
4. Reconnect the wires to the motor. (The motor will turn backward if the wires are reversed.)



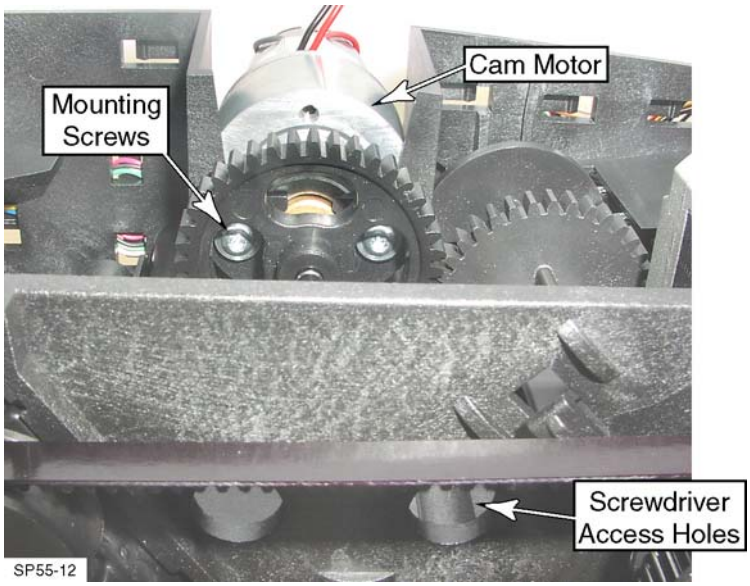
5. Continue reassembling the printer.
6. Run the *Pick and Eject Card Test* in Diagnostics to verify that the motor is functioning properly.

Cam Motor

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Rotate the motor gear until the mounting screws are accessible through the slots.
5. Loosen the two mounting screws, and lift the motor out of the chassis. (Unless necessary, don't remove the screws as they can be difficult to replace.)

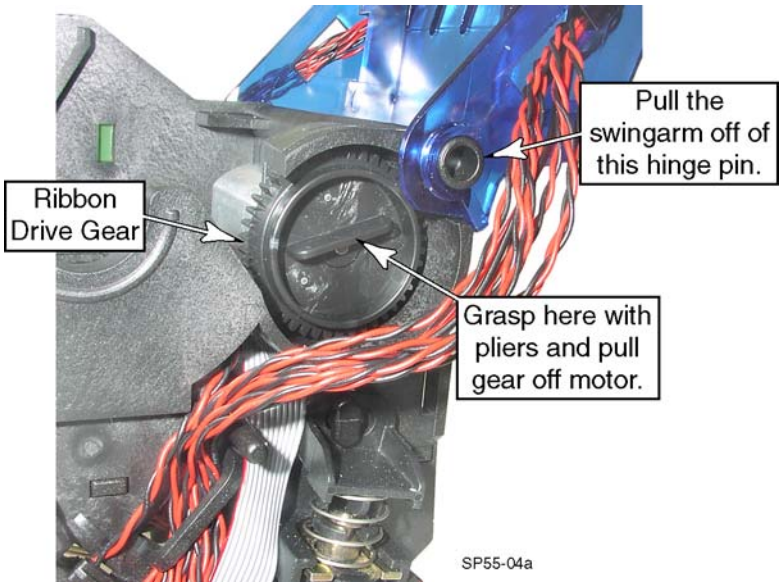


Follow-up Procedure

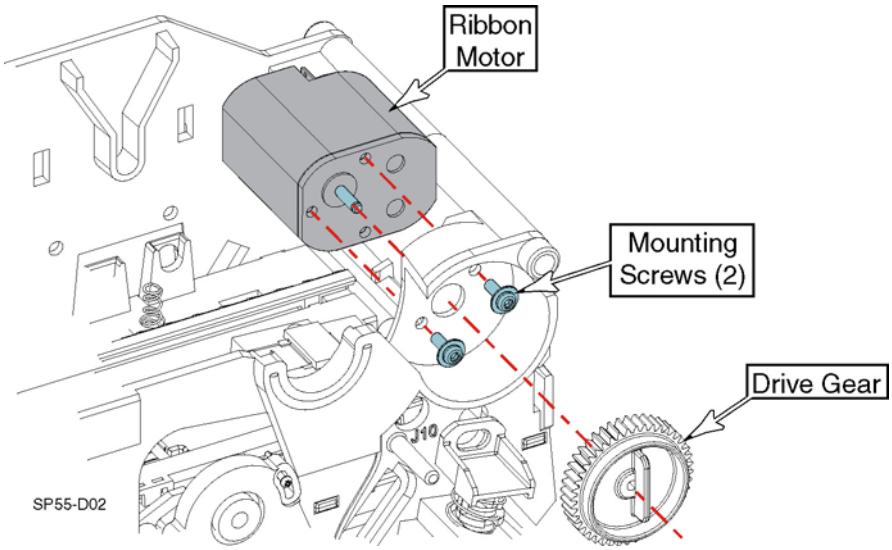
- Tighten the mounting screws to 8 in-lbs.
- Refer to the Functional Block Diagram for replacement details.
- Run the *Printhead Cam Test* in Diagnostics to verify that the motor is functional.

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Unhinge the swingarm by pulling back on the hinge tab.
4. Using pliers, pull the gear off the motor shaft. (During replacement, make sure to line up the shaft flats.)

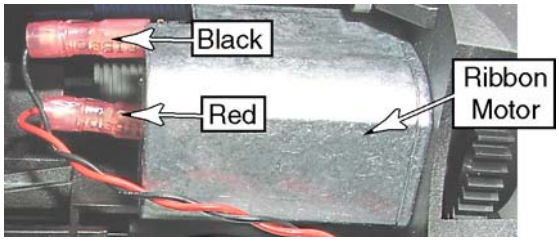


5. Remove the two screws that secure the motor to the transport chassis, and remove the motor.



Follow-up Procedure

- Tighten the mounting screws to 8 in-lbs.
- Connect the wires as shown below.
- Make sure the wires are not routed under the motor.



- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Run the ribbon motor test in Diagnostics to verify the motor is functioning.
- Print several test cards to verify the motor operates under a load.

Transport Assembly

This general procedure for removing the transport assembly from the printer is a prerequisite to many other procedures. The hopper and duplex units cannot be removed without at least loosening the transport assembly. The SP55k printer procedure is slightly different from that for the SP55 and SP55 Plus because its main control board is not attached directly to the transport assembly.

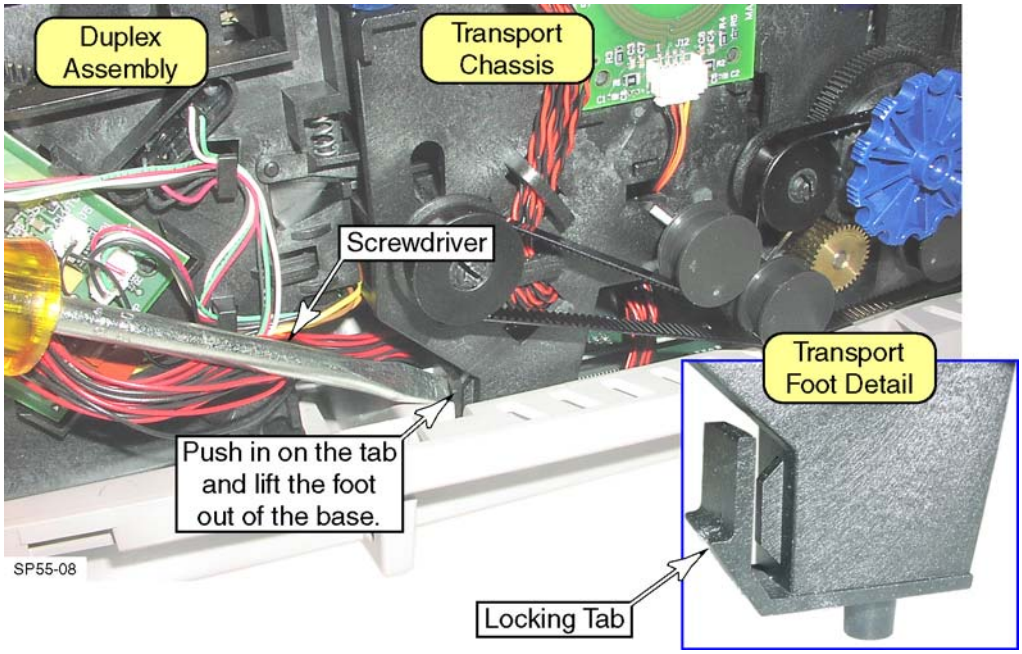
Transport Assembly (SP55 and SP55 Plus)

If you are performing this procedure to access a component, you may want to consider disconnecting only those cables necessary to turn the transport on its side. This reduces the number of connectors that need to be reconnected on the control board.

Removal Procedure

ESD Sensitive!

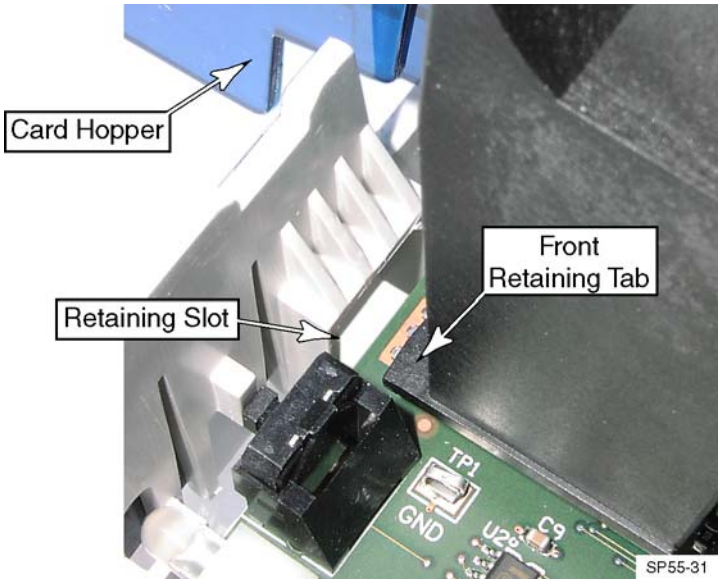
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9. (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Press in on the transport chassis locking tabs, and lift up on the back of the transport assembly.



4. Remove the front of the chassis from the base:

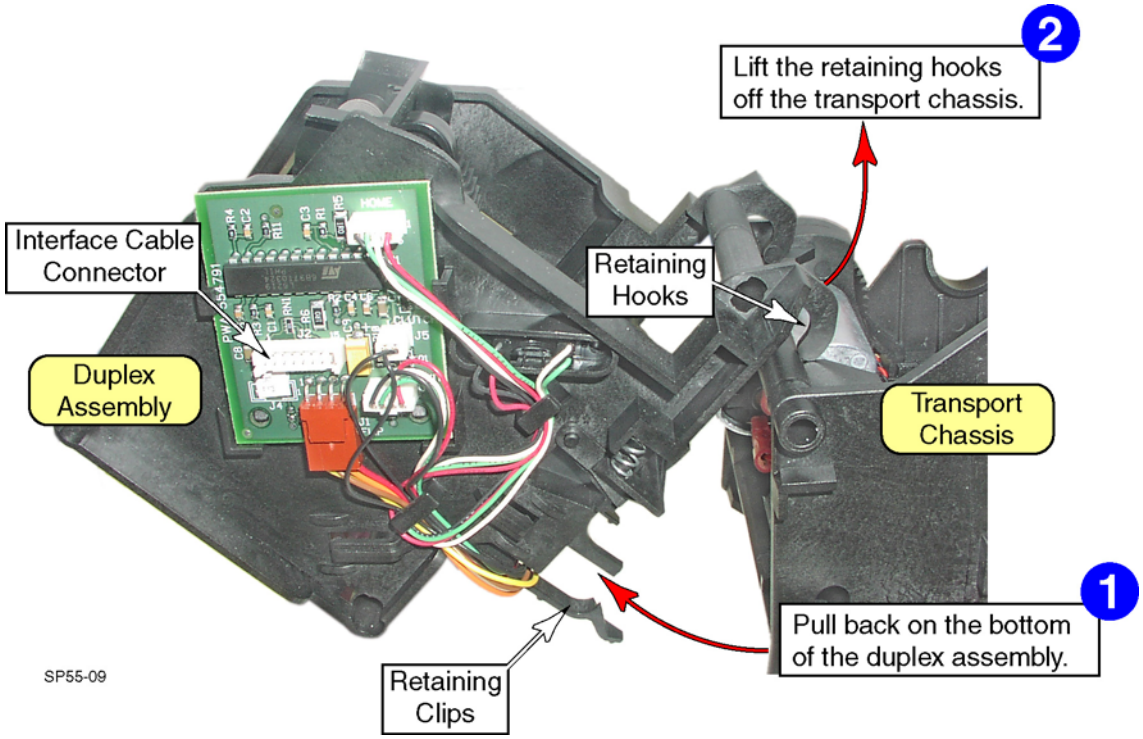
   A. Simultaneously pull back on the transport chassis and forward on the card hopper. The hopper can be left attached or removed.

   B. When the tabs on the chassis are clear of the openings, lift the chassis (and control board) out of the base.



5. If present, pull back on the duplex assembly and lift it off the transport chassis.

6. Disconnect cable connectors from the main control board as necessary.



Cable Replacement Procedure

Some of the cables described below are optional and may not be present on all printers.

1. If the main control board for an SP55k printer was removed without disconnecting cables from the transport assembly, place it in position first as described on page 6-36.
2. With the printer laying on its side and the control board placed next to it, begin connecting the cables that will reach.
   - Magnetic stripe registration sensor
   - Magnetic stripe optical encoder cable (disconnect the other end from the encoder)
   - Duplex interface cable (disconnect the other end from the duplex module)
   - Printhead power
   - RFID antenna
   - Magnetic stripe head
3. Tilt the printer up at an angle and continue to make connections.
   - Smart card contact (ribbon) cable
   - Smart card solenoid
   - Printhead data
   - Printhead cam sensor
4. Set the printer on top of the control board and make the last connections.
   - Transport motor
   - Printhead fan
   - Pick/Ribbon motors
   - Cam motor
   - Ribbon index sensor
   - Ribbon motion
   - Card input sensor
   - Swingarm up sensor
   - LCD display
   - Transport exit sensor (SP55k)
5. With the card tray and duplex (or rear reject) assemblies attached, install the transport onto the base of the printer. First insert the front into the tabs and then snap the back down into the base.
   - Verify that all cable connectors are properly seated, even if they were not disconnected.
   - Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
   - Print several test cards to verify that the printer is functioning properly.

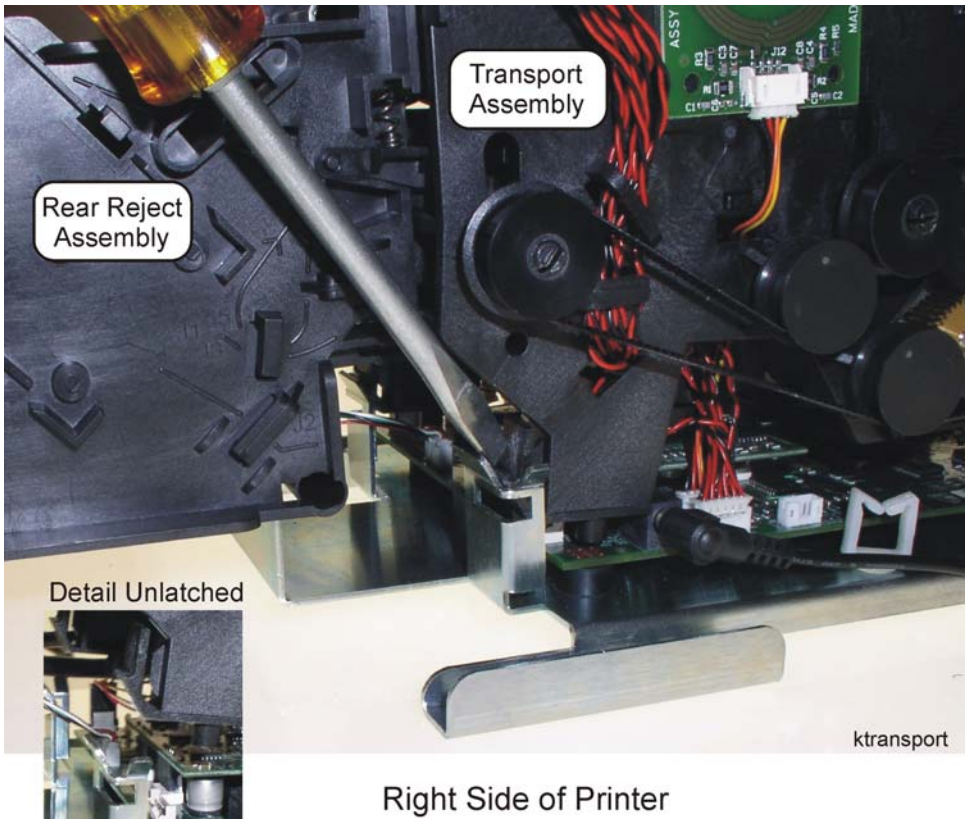
Transport Assembly (SP55k)

The main control board for the SP55k printer is not attached directly to the transport assembly. For this reason, you may need to disconnect all connectors on the board. To reduce the number of connectors that need to be reconnected, you may remove the control board from the base as part of the procedure. If you do so, be extremely careful in handling the transport assembly and main control board. You may need assistance is reassembling the printer.

Removal Procedure

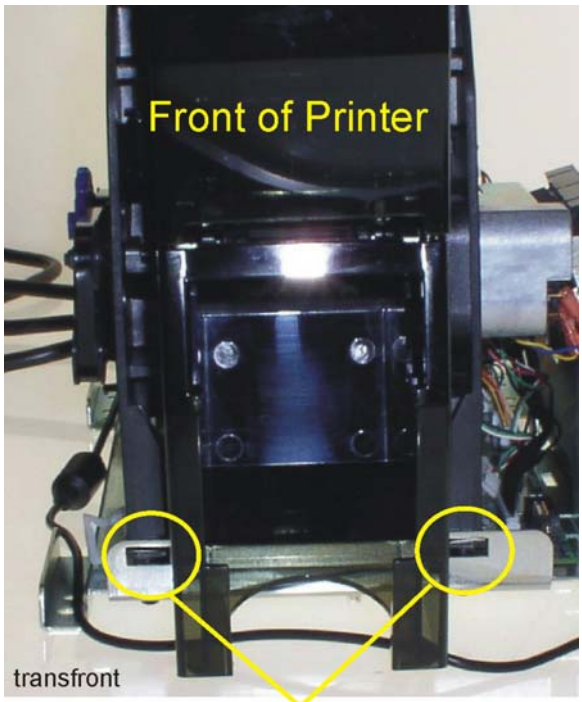
ESD Sensitive!

1. Unplug the printer.
2. Lift the swingarm cover and remove the ribbon cartridge and cleaning roller.
3. Disconnect from the main control board, at minimum, the LCD connector.
4. Twist a screwdriver as you push it down between the transport chassis and the locking tabs. Do the same to the other side, as you lift the back of the transport assembly.



Right Side of Printer

5. Pull the transport back from the chassis to release the tabs at the front of the printer. Leave it loose on the chassis to avoid disconnecting all the connectors (or pinch the two tabs in the base to remove the main control board with the transport assembly). If necessary, disconnect all connectors from the main control board.



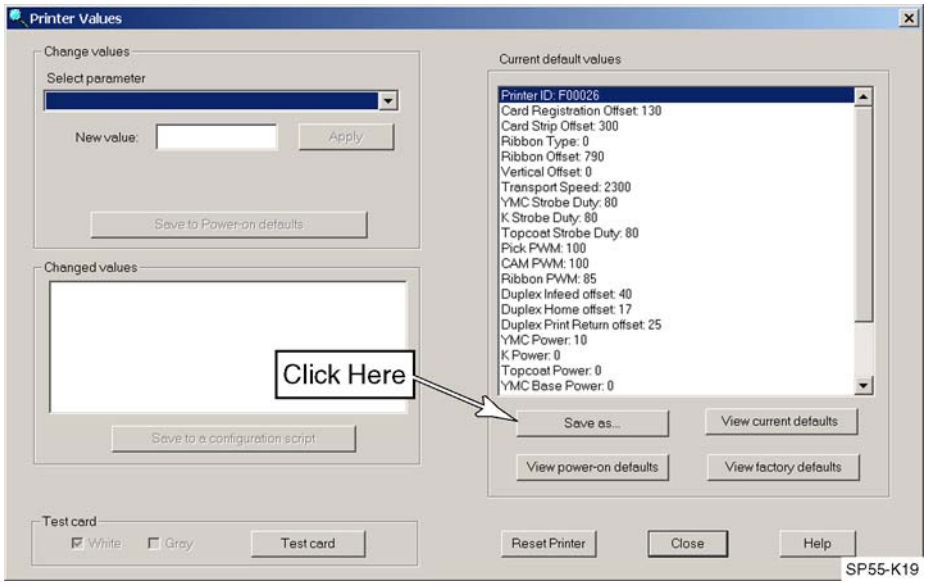
Pull transport to back of printer until tabs pull out of chassis.

6. The hopper at the front, the rear reject assembly, or the duplex assembly can now be removed from the transport. See details in the appropriate sections: Card Hopper, Rear Reject Assembly (SP55k Only) or Duplex Module.
7. Refer to the cable replacement procedure on page 6-33 during reassembly.

Refer to chapter 5 of this manual for additional details on using the Diagnostics software.

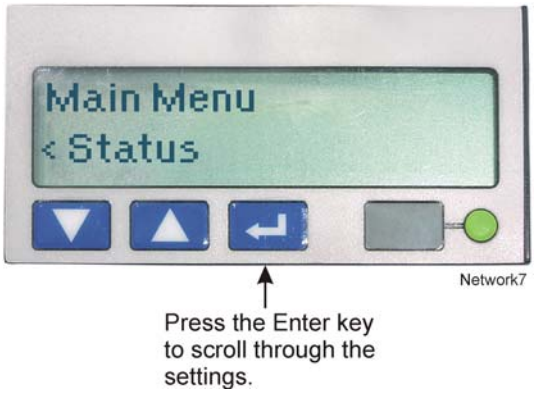
Back Up the Printer Values

1. With the printer powered and connected to a computer, start Diagnostics and log in as an Advanced User.
2. From the **Printer** menu, select **Values**.
3. Click on the *Save as* button. Name the file with a unique name using the printer serial number and current date (for example, *F50123-01-31-04.txt*).
4. Exit from Diagnostics but leave the printer running.



Record the Printer Network Settings

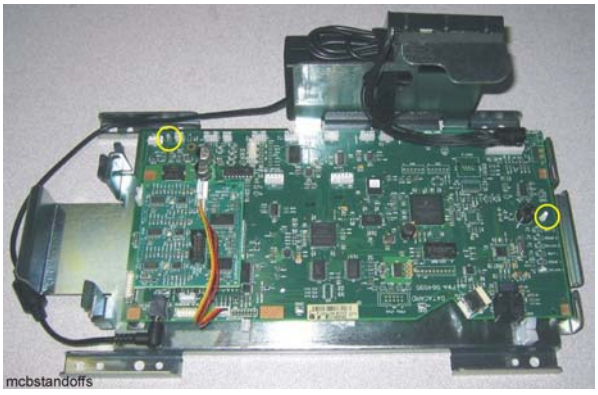
1. Press the Enter key on the LCD display to enter the status menu.
2. Repeatedly press the Enter key to scroll through the network settings and record each one as it is displayed.
   - Address Mode
   - Data Format
   - IP Address
   - Subnet Mask
   - Gateway Address
   - MAC Address



Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Disconnect all cables from the control board.
5. SP55k Printers: Use needle-nose pliers to squeeze the two white standoffs indicated in the following figure as you lift up the board to release it from the base. Then lift the board out of the base.



6. If the printer is equipped with the magnetic stripe option, remove the Magnetic Stripe Circuit Board (p. 6-87) from the main control board.
7. If the printer is equipped with a smart card option, remove the Smart Card Interface Board (p. 6-93) and the two standoffs from the main control board.

Replacement Procedure

1. If the printer is equipped with smart card, transfer the circuit board standoffs from the old board to the new board, and replace the smart card interface board.
2. If the printer is equipped with magnetic stripe, replace the magnetic stripe board.
3. Reconnect all cables to the board. Refer to the Cable Replacement Procedure on page 6-33 for details.
4. SP55k printers: Place the board in position and push down gently to thread it onto the two white standoffs. Be careful to keep the cable standoffs on the right side of the printer out of the way so that the board is not bent.
5. Reassemble the printer.

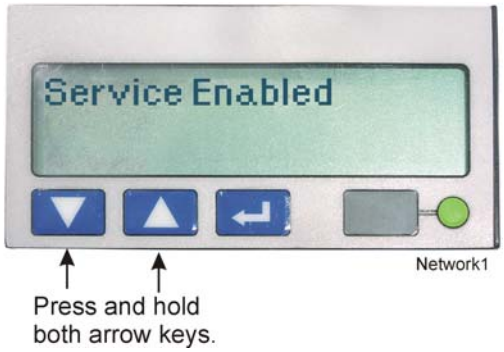
Restore the Printer Values

1. Using Notepad, open the original configuration script you saved in step 3 on page 6-36.
2. Locate the entry *Ribbon Type:xx*, and delete the whole line.
3. Resave the file.
4. Plug the printer in, turn it on, and open the Diagnostic software.
5. From the Printer menu select Configuration Script.
6. Click on the **Load Configuration Script** button and select the configuration file.

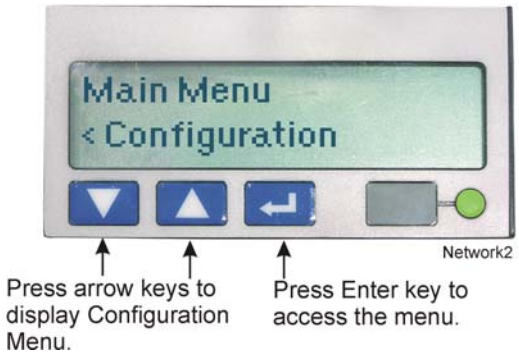
   Before running the script, verify that the Printer ID in the script file matches the serial number on the printer.
7. Click on the **Run All** button.
8. Click on the **Save to Power-on Defaults** button.

Restore the Network Settings

1. Simultaneously press the **Up** and **Down** arrows on the LCD display until the display shows "Service Enabled."



2. Press the **Up** or **Down** arrow until the Configuration menu is displayed, and press the **Enter** key to access the menu.

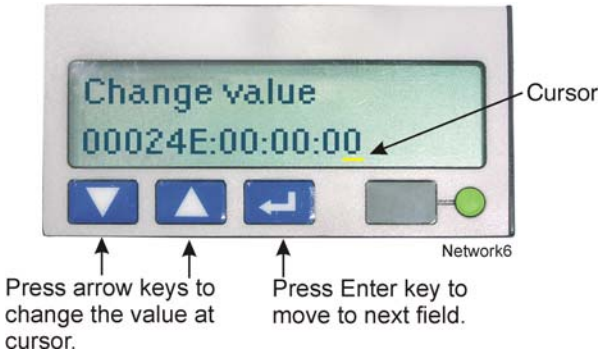


3. Update the settings. (The image below shows the MAC Address screen as an example.)

   A. Press the **Up** or **Down** arrow to locate each setting, and press the **Enter** key one or more times to access the Change Value screen.

   B. To change the value, press the **Up** or **Down** arrow to increment or decrement the existing value in each field.

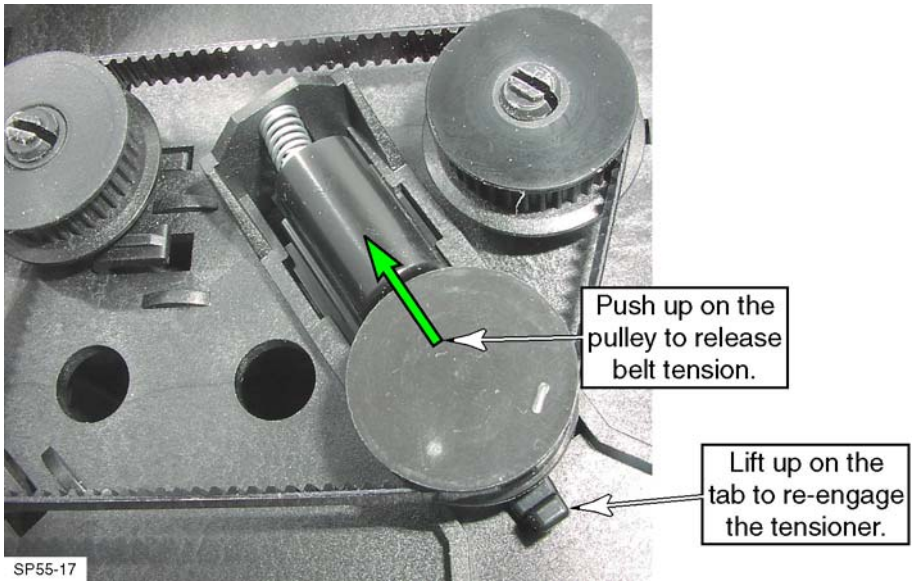
   C. Press the **Enter** key to move the cursor to the next field in the value and repeat the process.



Transport Timing Belt

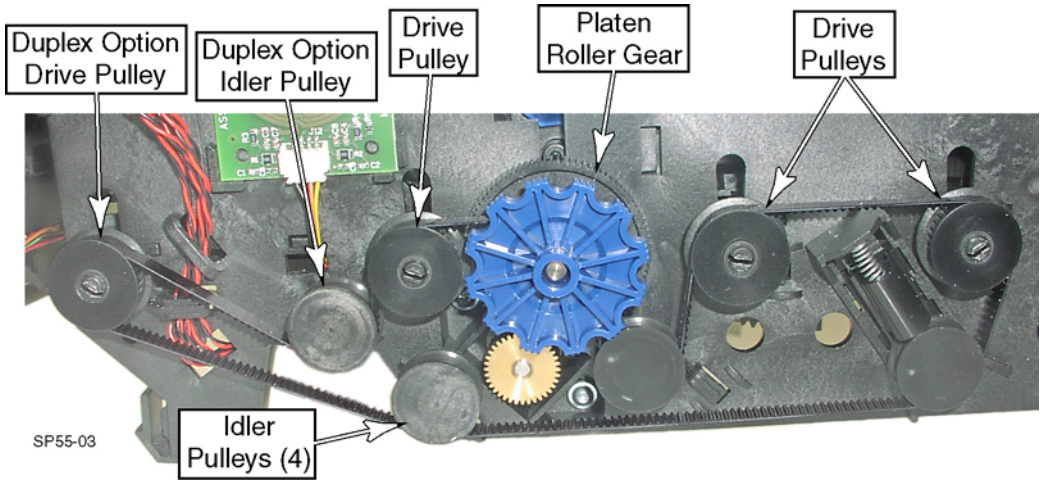
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Release the belt tension, and remove the transport belt.



Replacement Notes

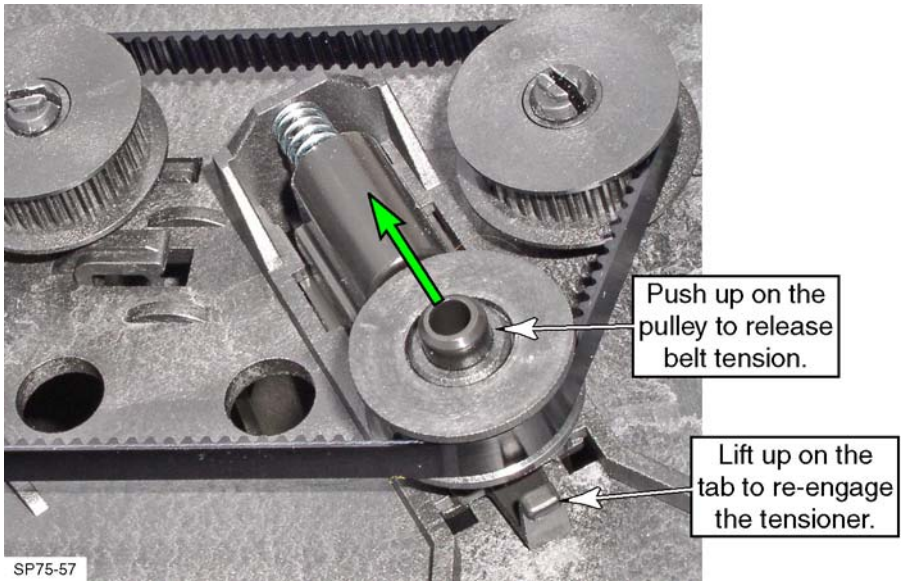
- Follow the belt routing shown below. If the printer is not equipped with the duplex option, the drive pulley and idler pulley (shown at the left) will not be present.
- Print a couple of test cards to verify that the printer is functioning properly.



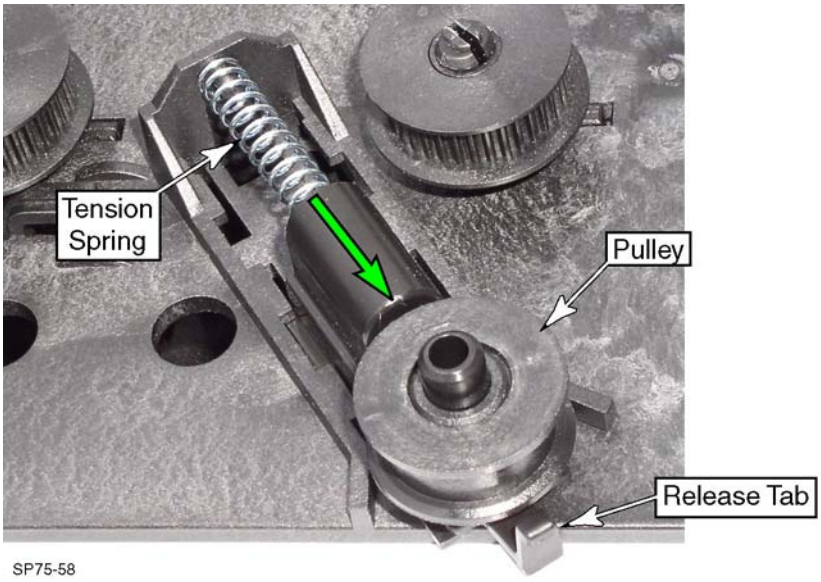
Belt Tensioner Pulley and Tension Spring

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Release the belt tension, and remove the transport belt.



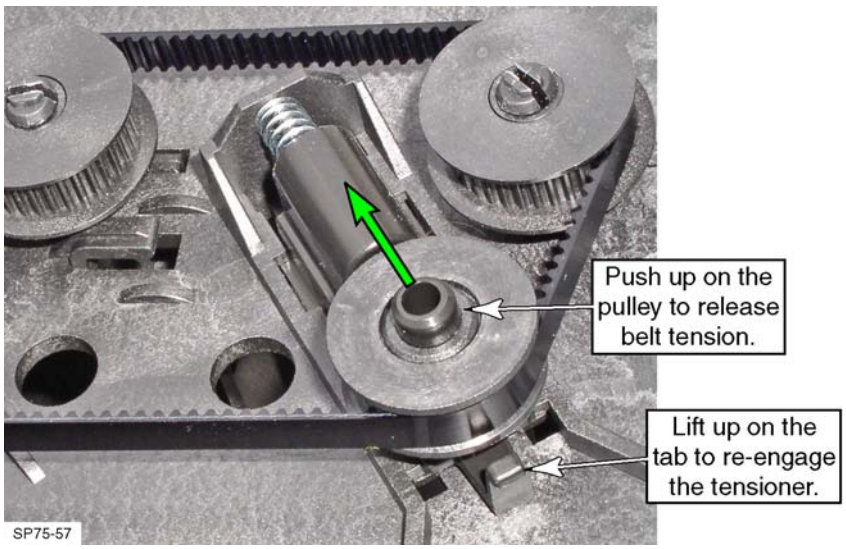
4. Lift the release tab and slide the tensioner down as far as it will go, and remove the spring.
5. Pull the idler pulley off the tensioner.



Drive and Idler Pulleys

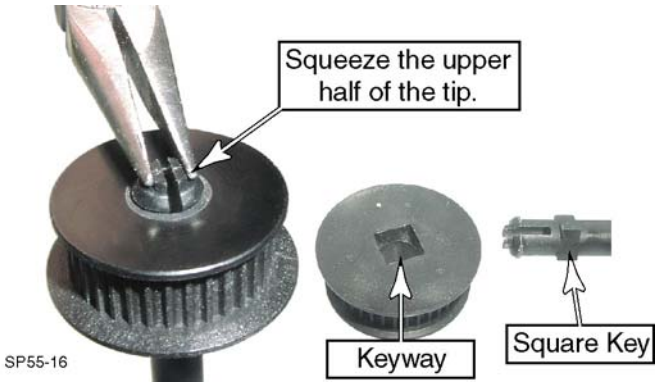
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Release the belt tension, and remove the transport belt.



4. Remove the idler pulleys by pulling them off their studs.
5. Remove the drive pulleys from their shafts by squeezing the end of the shaft, and slipping the pulley off.

The pulley's flange is permanently adhered to the pulley. Do not try to remove the flange.



Replacement Notes

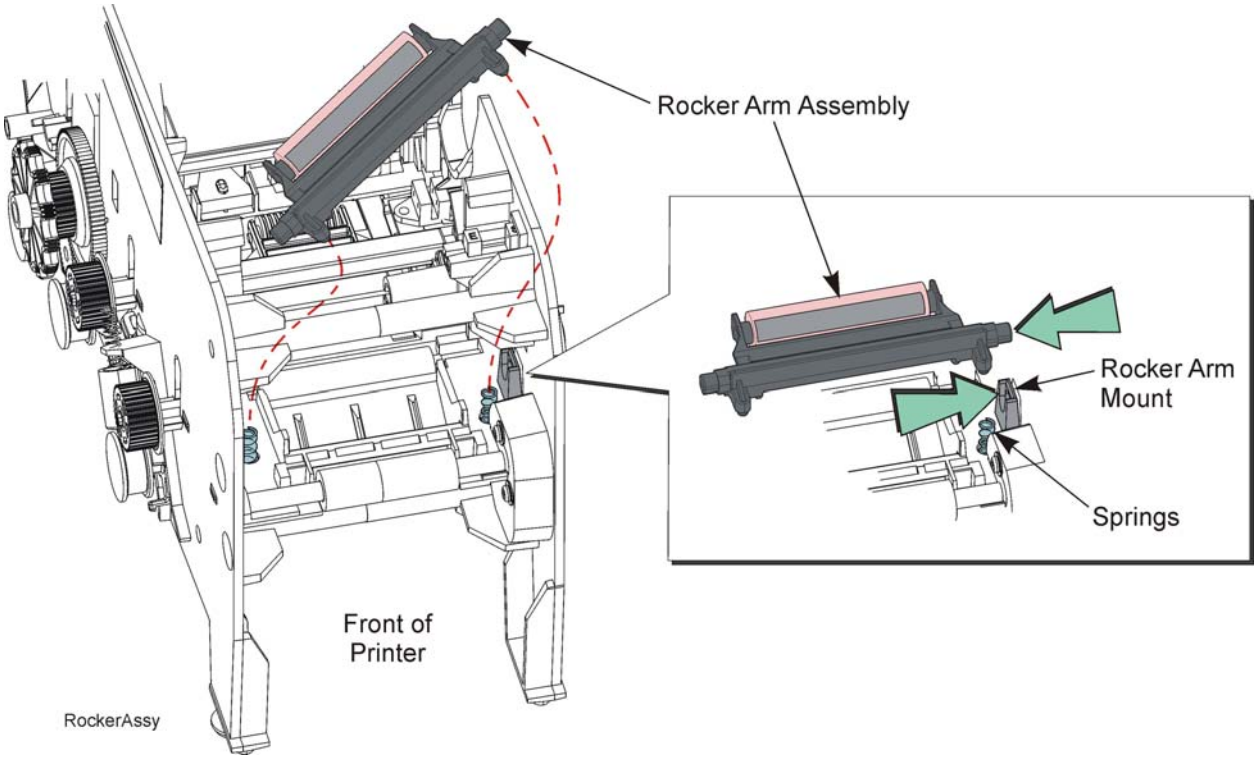
- After slipping the pulley onto the shaft, rotate it until the square key slips into the square keyway.
- Print several test cards to ensure there are no transport problems.

Cleaning Rocker Assembly

When replacing the rocker assembly, it is a good idea to replace the springs as well.

Removal Procedure

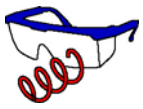
1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Push the rocker mount one direction and the rocker arm the other direction and pull up and out. Be careful not to lose the springs.



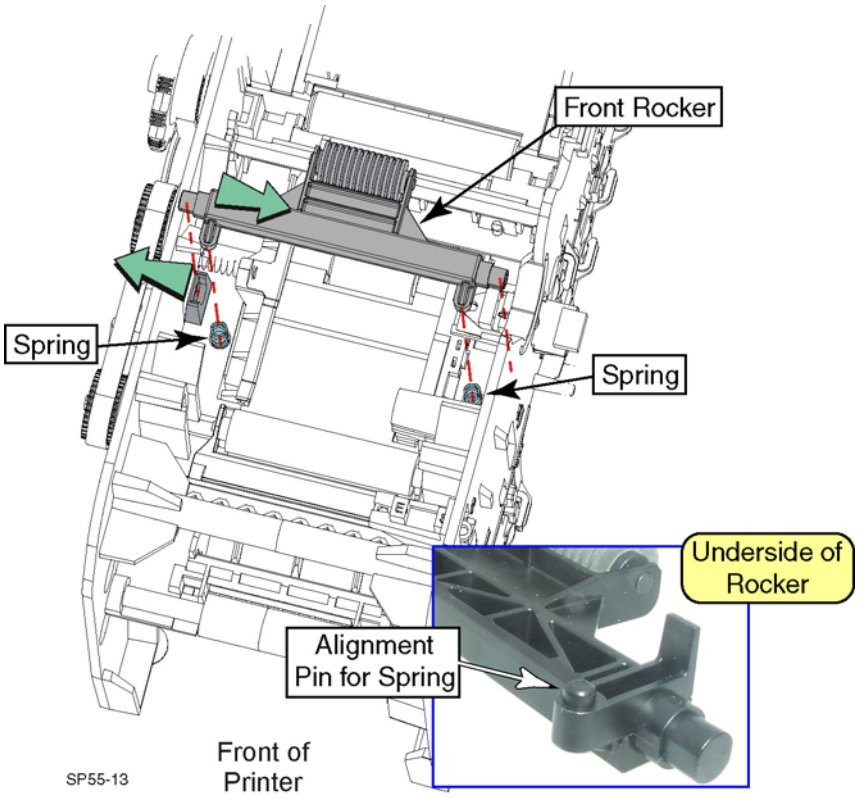
Front Rocker Assembly

When replacing the rocker assembly, it is a good idea to replace the springs as well.

Removal Procedure



1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Push the rocker assembly one direction and the rocker mounting tab in the opposite direction, and pull up on the rocker. Be careful not to lose the springs.



Replacement Note

Make sure the springs are seated in the pockets of the transport chassis, and on the alignment pins of the rocker assembly.

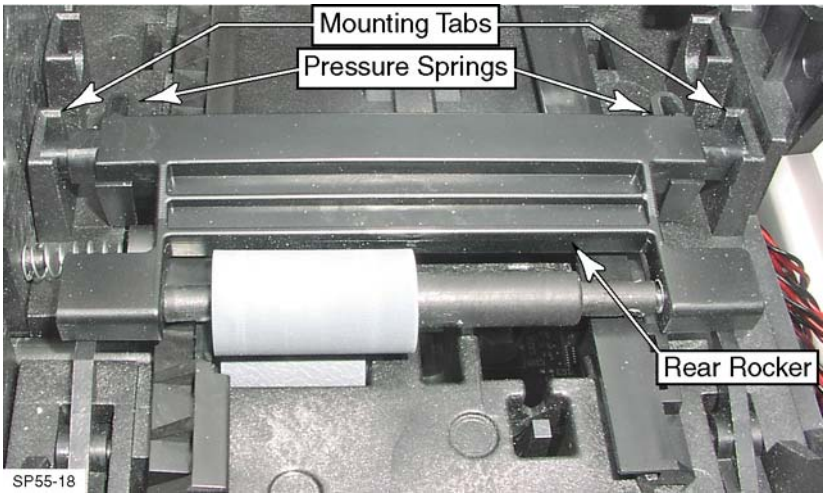
Rear Rocker Assembly

This procedure is for printers without the magnetic stripe option. For the Magnetic Stripe Rocker Assembly, refer to page 6-92.

When replacing the rocker assembly, it is a good idea to replace the springs as well.

Removal Procedure

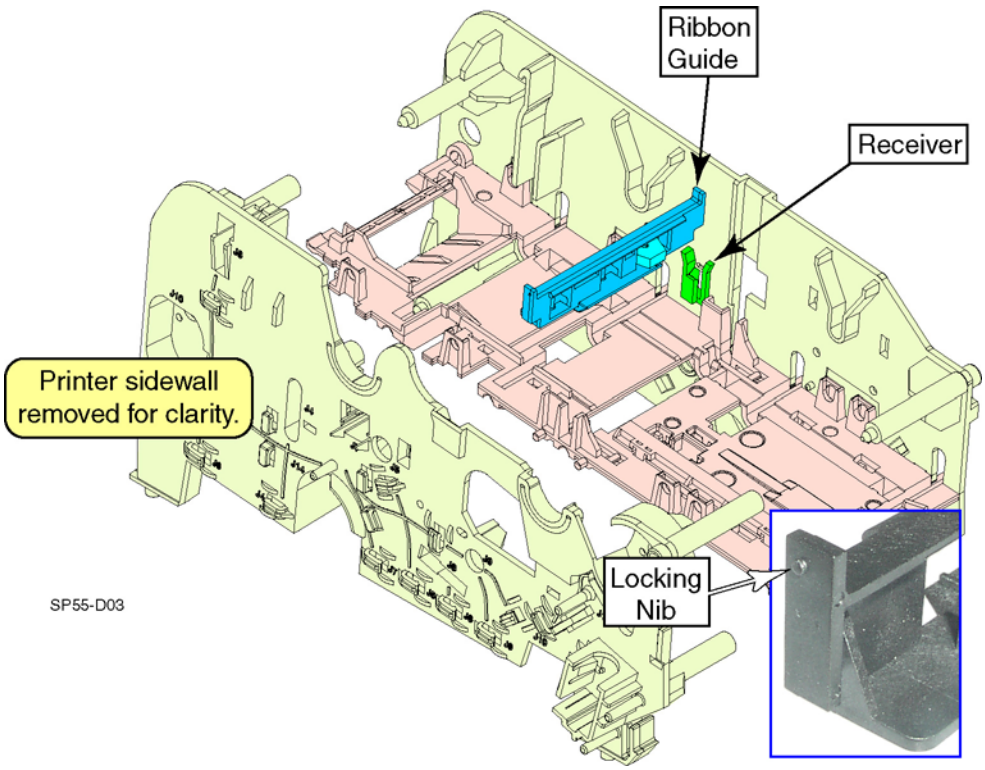
1. Unplug the printer.
2. Remove the ribbon cartridge.
3. Push the rocker assembly one direction and the rocker mounting tab in the opposite direction, and pull up on the rocker. Be careful not to lose the springs.



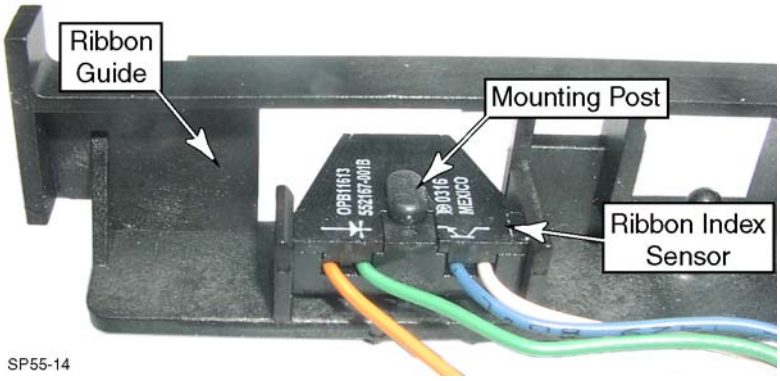
Ribbon Guide

Removal Procedure

1. Unplug the printer and remove the ribbon cartridge and cleaning roller.
2. Lift the ribbon guide out of the receivers in the transport chassis sidewalls:
   A. Simultaneously grasp the left and right sides of the ribbon guide with both hands.
   B. Flex the transport chassis sidewalls outward with the sides of your fists. This releases the small locking nibs on the ends of the ribbon guide (see inset photo below).
   C. Slowly lift the ribbon guide straight up.

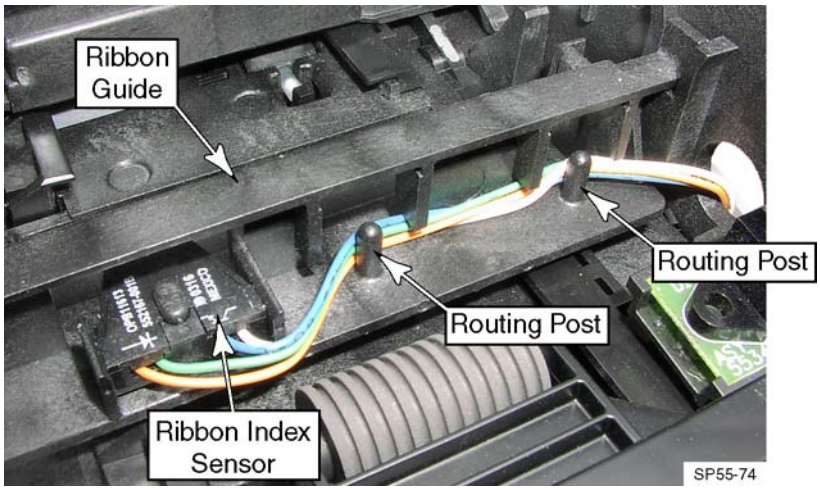


3. If necessary, remove the index sensor from the ribbon guide by lifting it off the mounting post.



Replacement Notes

- Route the cable through the ribbon guide as shown below.

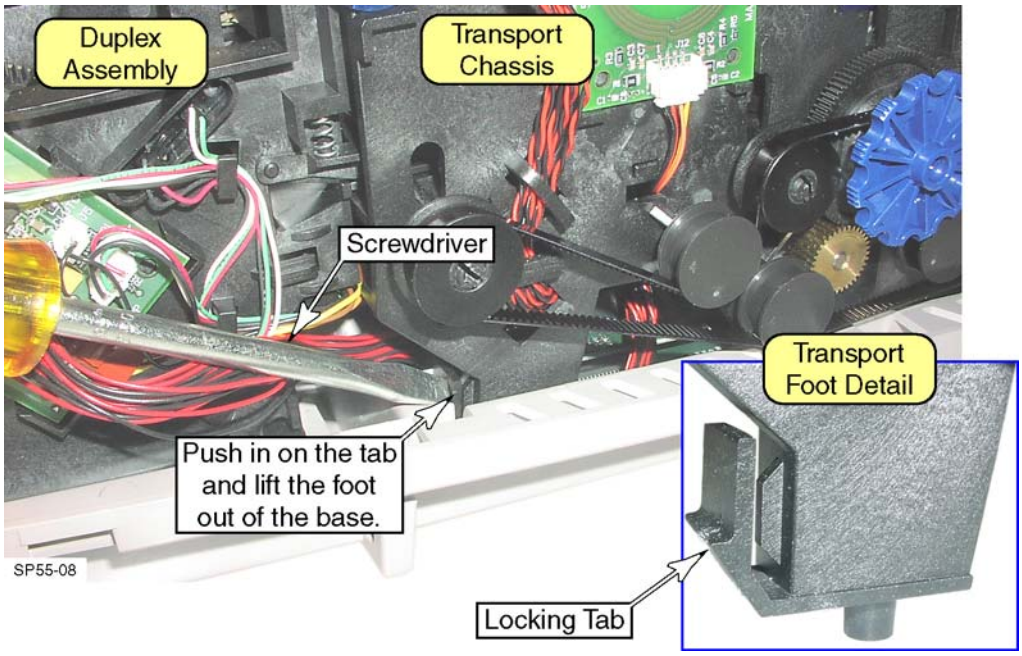


- Refer to the Front Wire Routing and Functional Block Diagram for replacement details.
- Use the sensor display in Diagnostics to verify the sensor changes state as the ribbon is advanced.

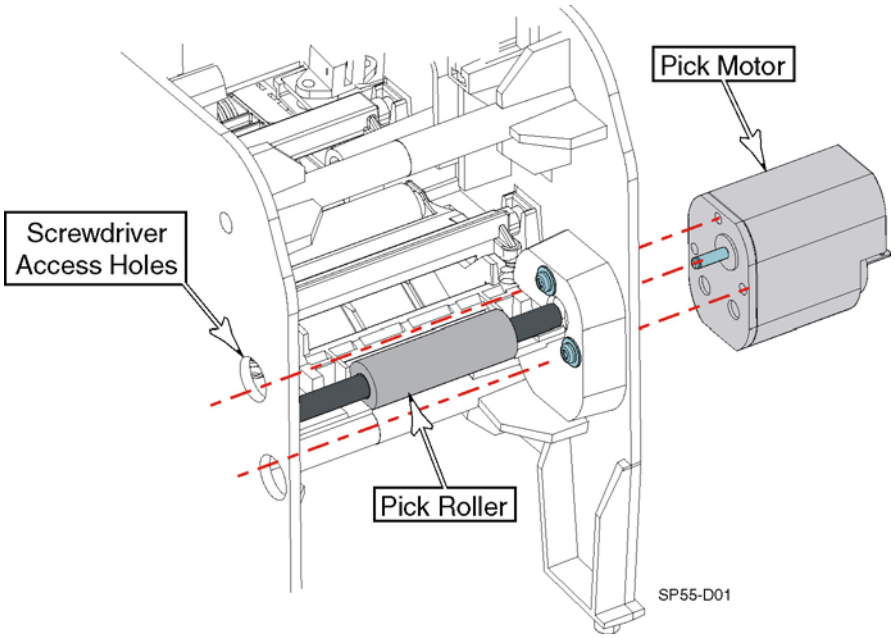
Pick Roller

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. To access the pick motor mounting screws, remove the card hopper.
   A. Press in on the transport chassis locking tabs, and lift up on the back of the transport assembly.
   B. Slide the transport chassis back, and simultaneously pull forward on the card hopper. Remove the card hopper.



4. Remove the two screws that secure the pick motor to the transport chassis, and remove the motor and roller.



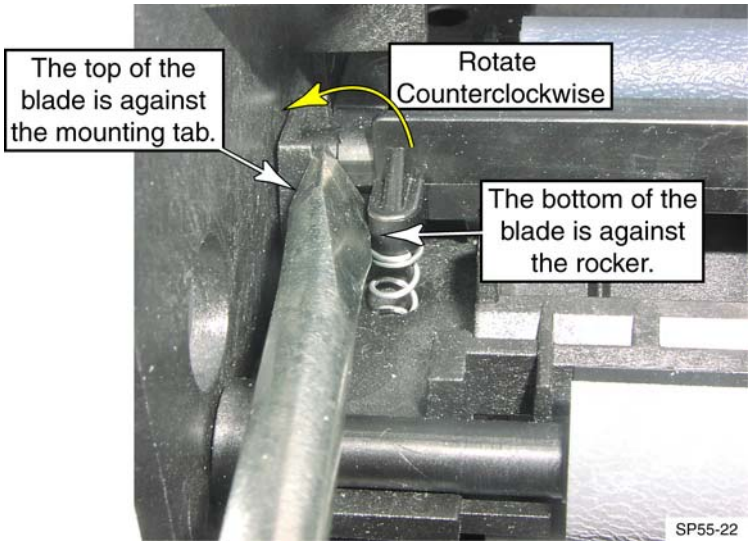
Replacement Procedure

1. Place the pick roller in the transport chassis.
2. While positioning the pick motor, rotate the pick roller until the shaft-flat lines up with the flat on the roller.
3. Tighten the mounting screws to 8 in-lbs.
4. Continue reassembling the printer.
5. Run the *Pick and Eject Card Test* in Diagnostics to verify that the motor is functioning properly.

Cleaning Drive Roller

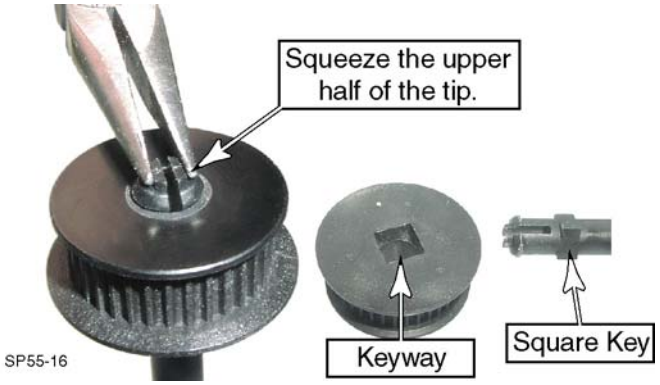
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Card Hopper as described on 6-10.
4. Remove the Transport Timing Belt (p. 6-40).
5. Remove the cleaning rocker assembly.

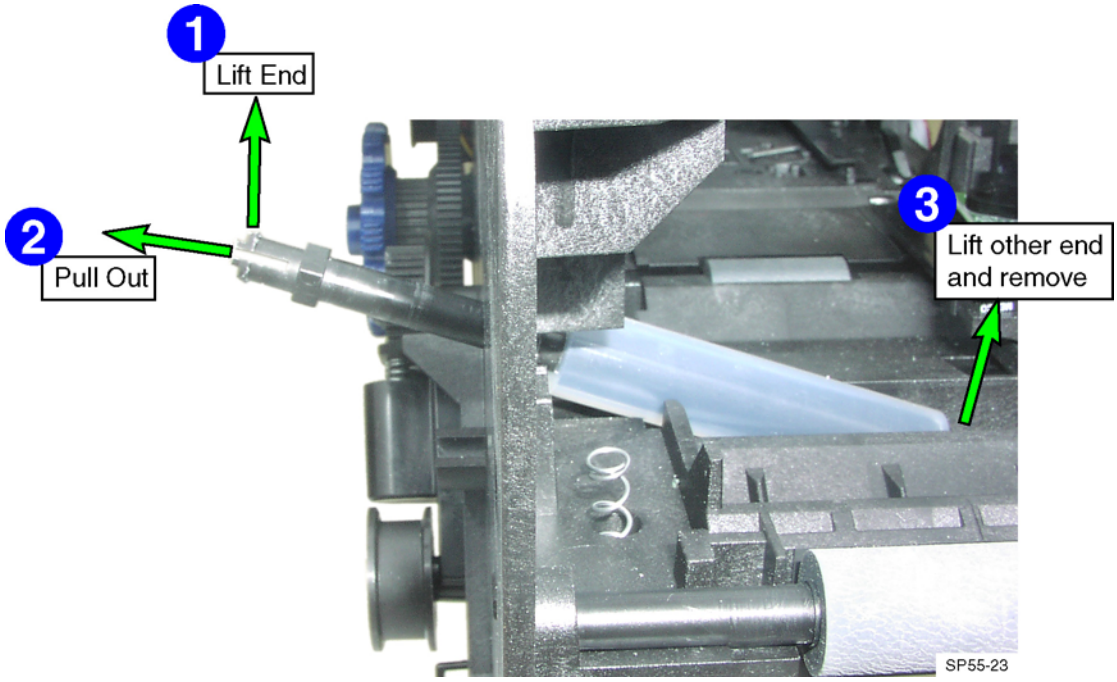


6. Remove the pulley from the shaft by squeezing the end of the shaft, and slipping the pulley off.

The pulley's flange is permanently adhered to the pulley. Do not try to remove the flange.



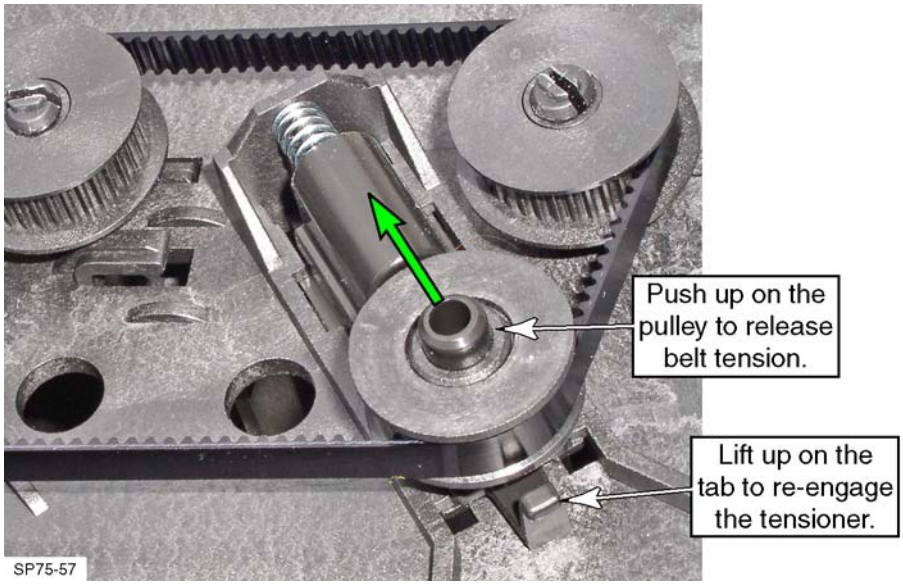
7. Remove the drive roller:
   A. Lift the pulley-end of the shaft up.
   B. Slide the shaft out the side.
   C. Lift the opposite end of the shaft and remove the roller.



Front Drive Roller

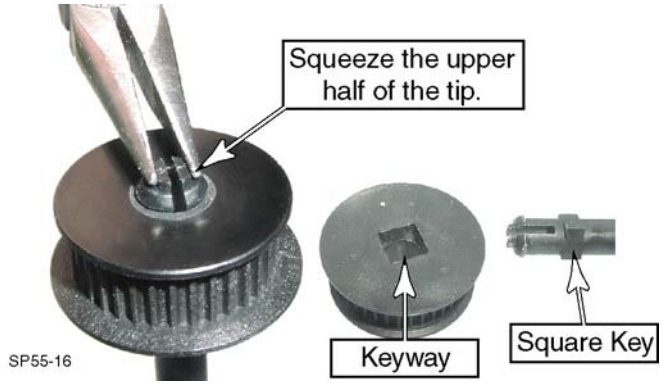
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Lift the Ribbon Guide (p. 6-46) out and set it aside.
4. Remove the Front Rocker Assembly (p. 6-44).
5. Remove the Front Card Guide (p. 6-60).
6. Release the belt tension, and remove the transport belt.

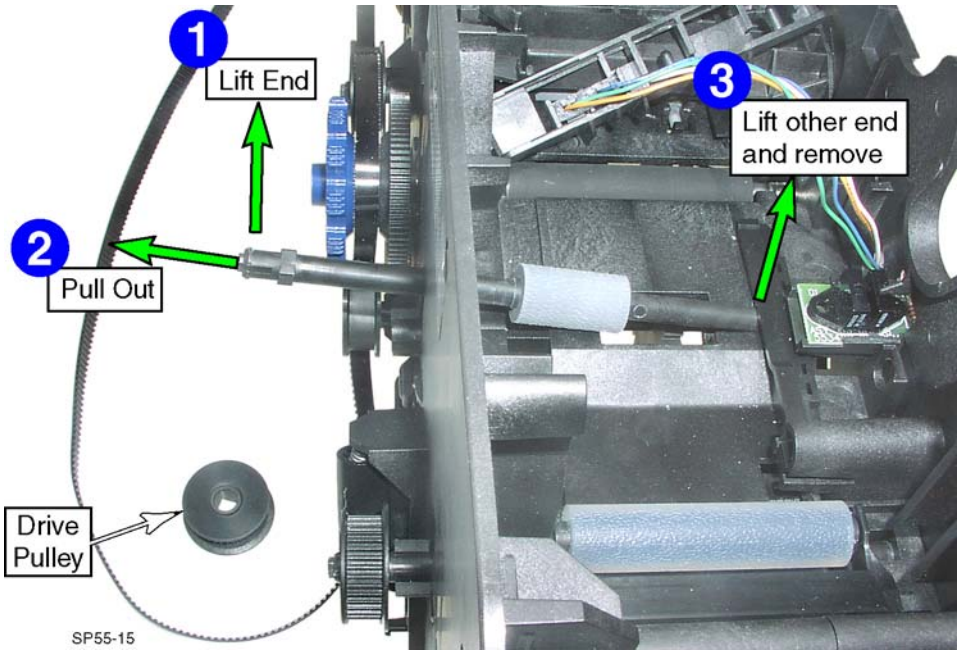


7. Remove the pulley from the shaft by squeezing the end of the shaft, and slipping the pulley off.

The pulley's flange is permanently adhered to the pulley. Do not try to remove the flange.



8. Lift the pulley-end of the shaft, slide it out until the roller touches the sidewall, and lift the other end out of the chassis.



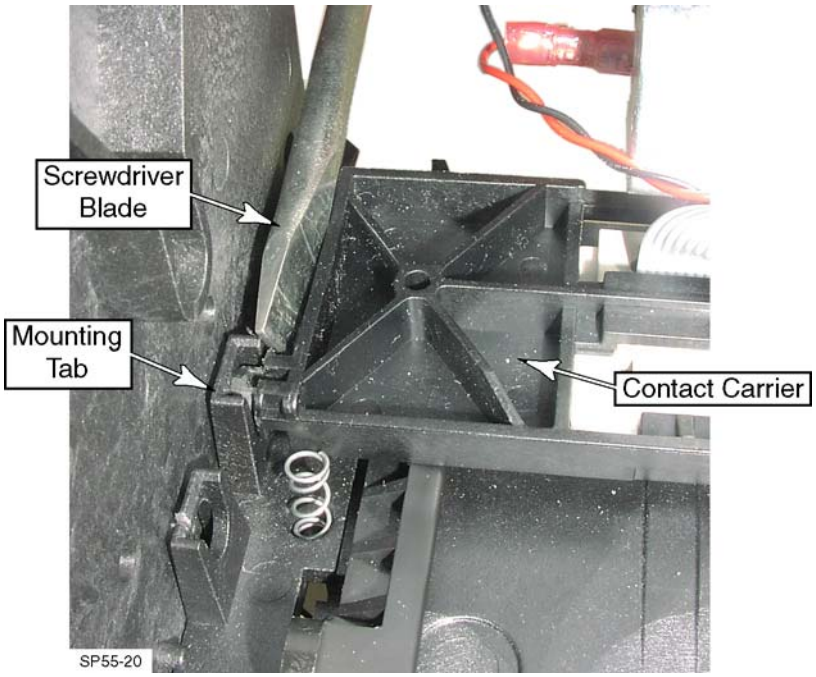
Follow-up Procedure

Print several test cards to ensure there are no transport problems.

Rear Drive Roller

Removal Procedure

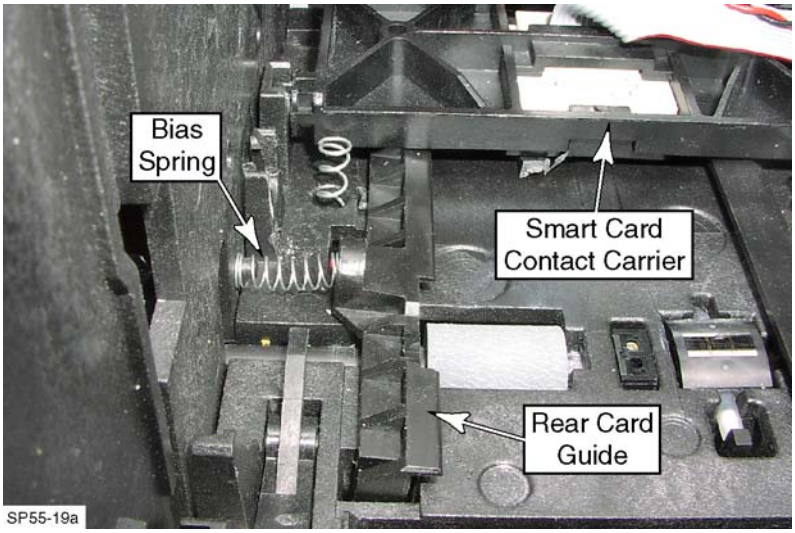
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge.)
3. Depending on the configuration of the printer, remove either the Rear Rocker Assembly (p. 6-45) or the Magnetic Stripe Rocker Assembly (p. 6-92).
4. If present, partially remove the smart card contact carrier:
   A. Insert a screwdriver between the carrier and the left mounting tab.
   B. Twist the blade to pry the carrier out of the mounting tab.
   C. It is not necessary to fully remove the carrier.



5. Remove the rear card guide:

   A. Remove the bias spring from the card guide. This will reduce the chance of the spring flying loose when the guide is removed.

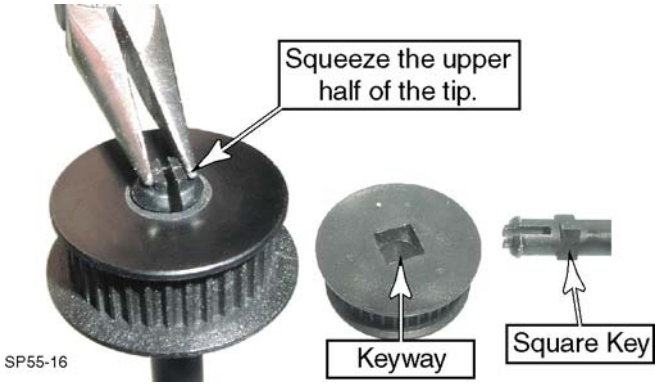
   B. Pull up on the card guide.



6. Remove the Transport Timing Belt (p. 6-40).

7. Remove the pulley from the shaft by squeezing the end of the shaft and slipping the pulley off.

The pulley's flange is permanently adhered to the pulley. Do not try to remove the flange.

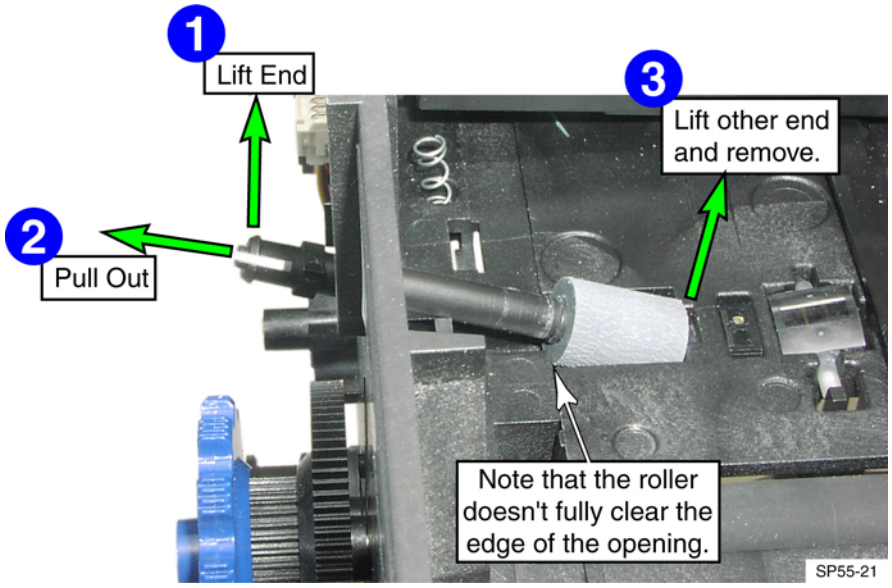


8. Remove the drive roller:

   A. Lift the pulley-end of the shaft up.

   B. Slide the shaft out the side. (It is necessary to deform the roller slightly as it will not fully clear the opening in the bottom of the transport chassis.)

   C. Lift the opposite end of the shaft and remove the roller.



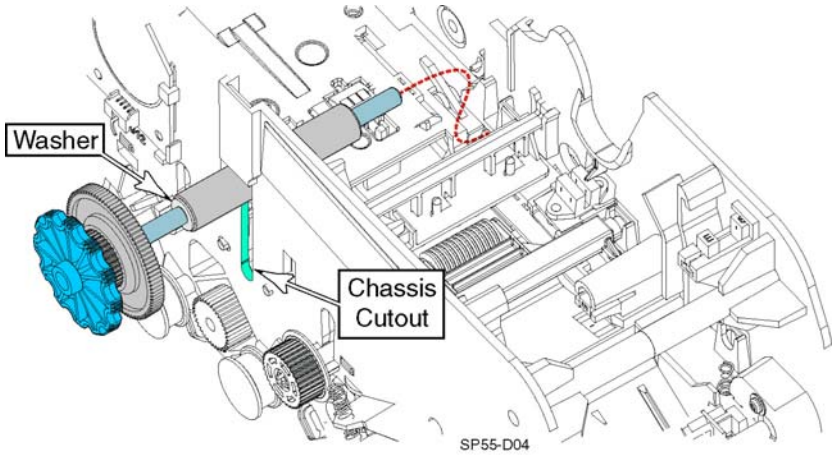
Follow-up Procedure

Print several test cards to ensure there are no transport problems.

Platen Roller

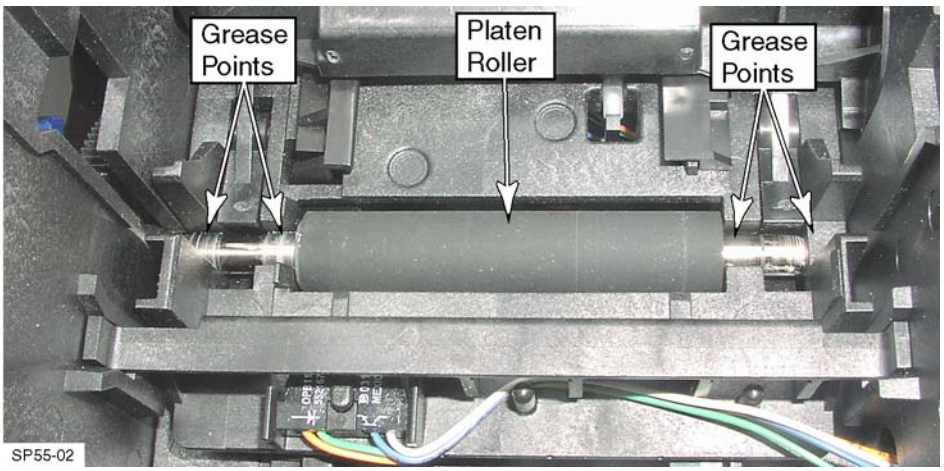
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Timing Belt (p. 6-40).
4. Grasp the manual advance knob on the platen roller and lift the roller up and out through the side wall of the transport chassis.



Replacement Notes

- If reusing the roller, clean the rubber with isopropanol and wipe off the original grease from the shaft.
- Make sure the washer is between the platen roller and the transport chassis.
- Put a thin film of Molykote® DX grease (Part No. 807421-001) on the shaft at the locations shown.
- Print several test cards to check print quality.

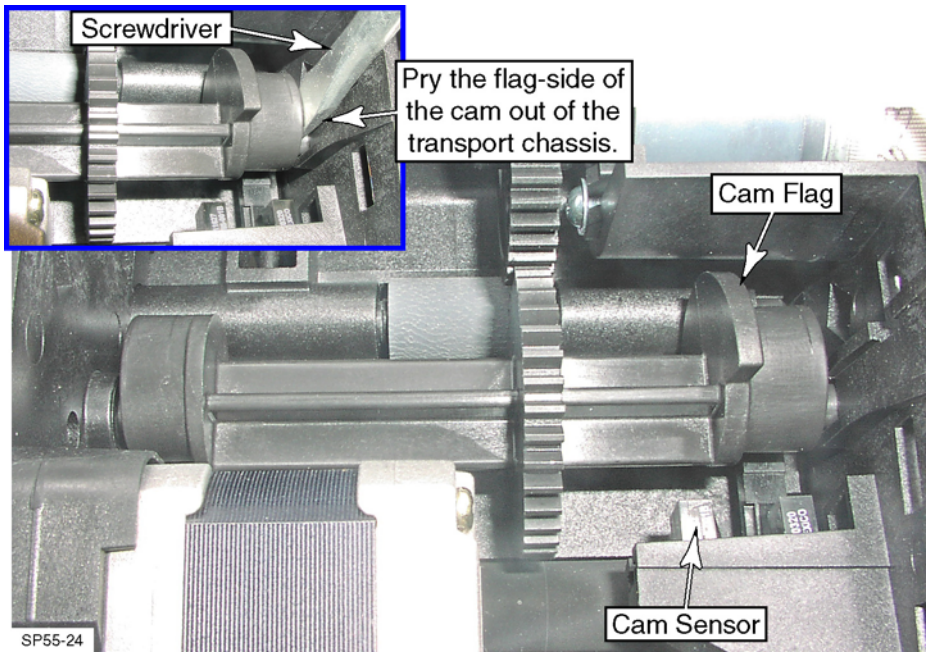


Printhead Cam

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Rotate the cam until the cam flag is clear of the sensor.
5. Using a screwdriver, pry the flag-side of the cam out of the transport chassis.
6. Gently lift the cam out of the chassis, taking care not to bind the gears.



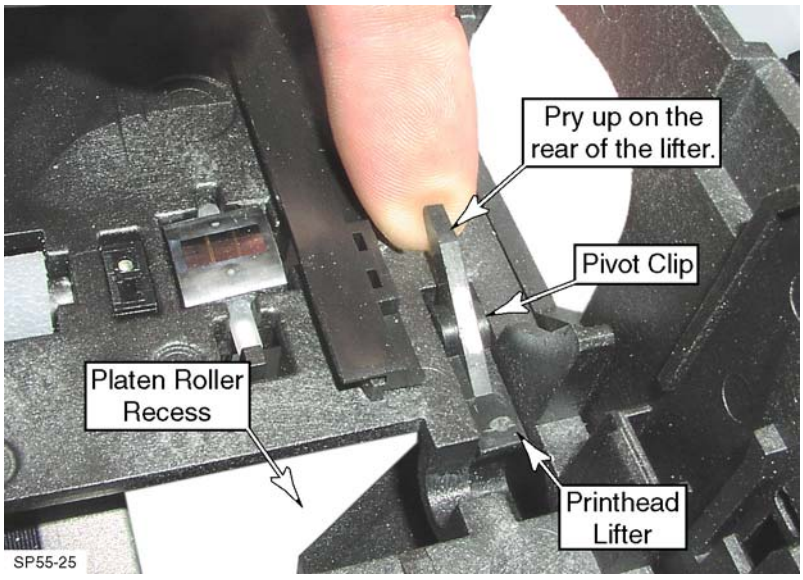
Follow-up Procedure

Run the *Printhead Cam Test* in Diagnostics to verify that the motor is functional.

Printhead Lifter

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Depending on the configuration of the printer, remove either the Rear Rocker Assembly (p. 6-45) or the Magnetic Stripe Rocker Assembly (p. 6-92).
4. Remove the Platen Roller (p. 6-57).
5. Grasp the rear lever of the lifter and pull up and out of the chassis.



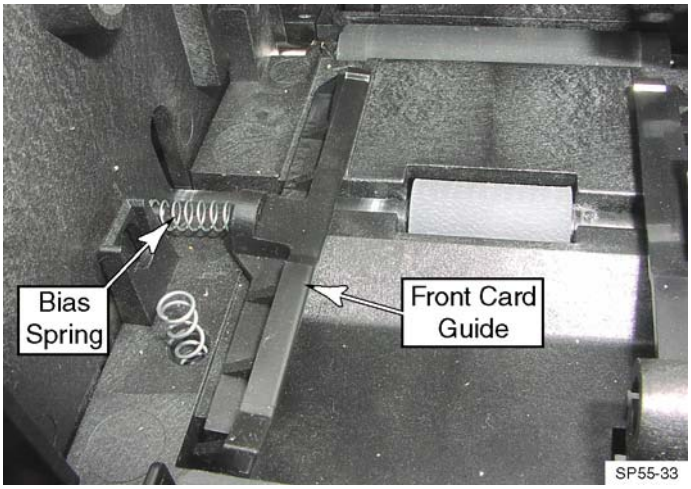
Follow-up Procedure

- Run the *Printhead Cam Test* in Diagnostics to verify that the lifters are operating properly.

Front Card Guide

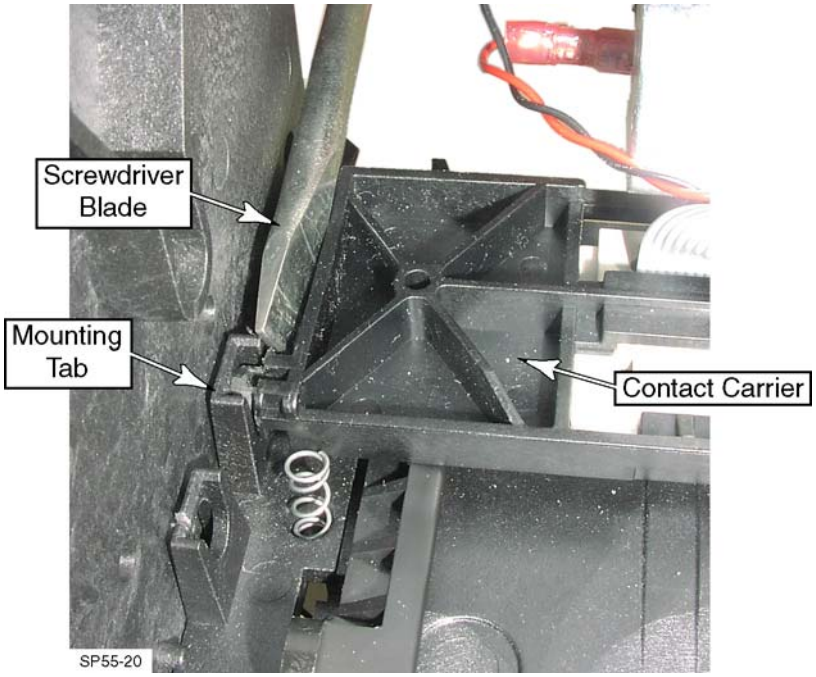
Removal Procedure

1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Remove the Ribbon Guide (p. 6-46).
4. Remove the Front Rocker Assembly (p. 6-44).
5. Remove the front card guide:
   A. Remove the bias spring from the card guide. This will reduce the chance for the spring flying loose when the guide is removed.
   B. Pull up on the card guide.



Removal Procedure

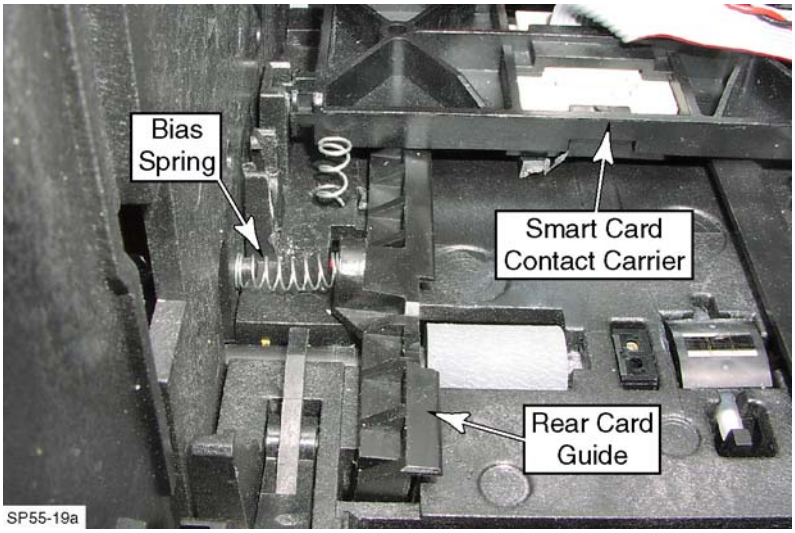
1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Depending on the configuration of the printer, remove either the Rear Rocker Assembly (p. 6-45) or the Magnetic Stripe Rocker Assembly (p. 6-92).
4. If present, partially remove the smart card contact carrier:
   A. Insert a screwdriver between the carrier and the left mounting tab.
   B. Twist the blade to pry the carrier out of the mounting tab.
   C. It is not necessary to fully remove the carrier.



5. Remove the rear card guide:

   A. Remove the bias spring from the card guide. This will reduce the chance of the spring flying loose when the guide is removed.

   B. Pull up on the card guide.

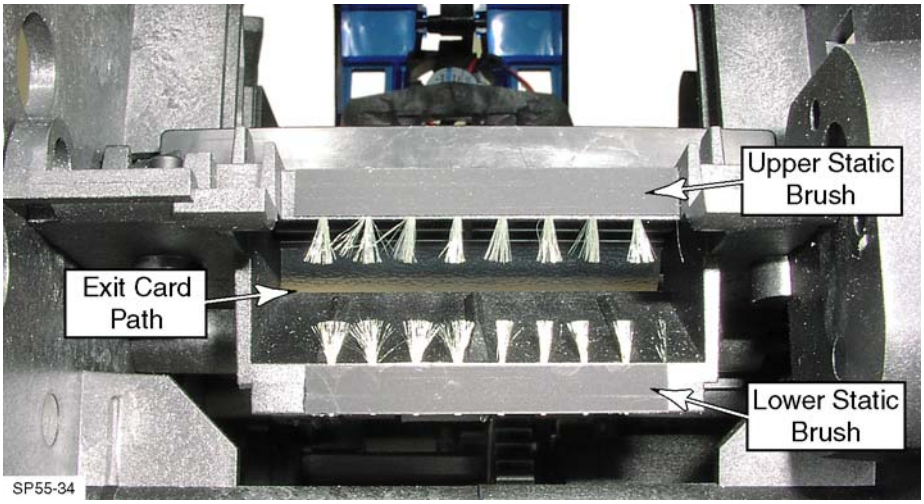


Static Brushes on Transport Assembly

There are two static brushes on the transport assembly and one in the SP55k rear reject assembly. See Static Brush on Rear Reject Assembly on page 6-84 for special instructions for SP55k printers.

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Card Hopper (p. 6-10).
4. Remove the Pick Roller (p. 6-48).
5. Peel the static brushes off the chassis surface.



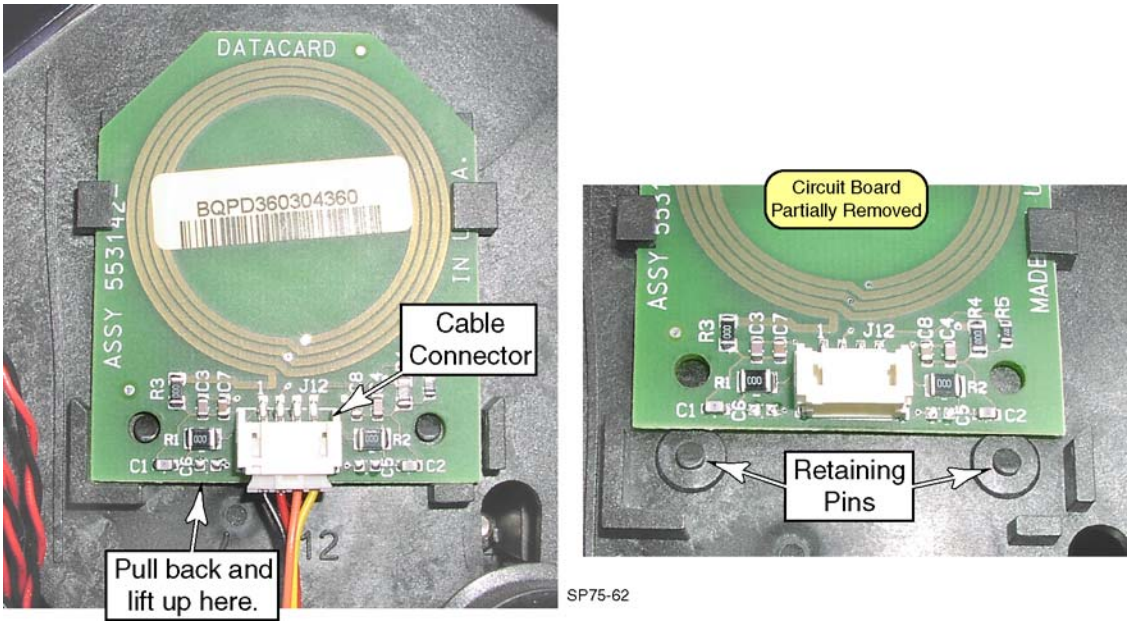
Replacement Notes

- Before putting new static brushes on the transport, use isopropanol to clean off the old adhesive residue from the chassis.
- Run the *Pick and Eject Card Test* in Diagnostics to verify that the pick motor is functioning properly.

RFID Antenna

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the cable connector from the bottom of the antenna board.
4. With the tip of your finger or a screwdriver, pull back slightly on the bottom of the circuit board, and lift the board out of the slots.



Follow-up Procedure

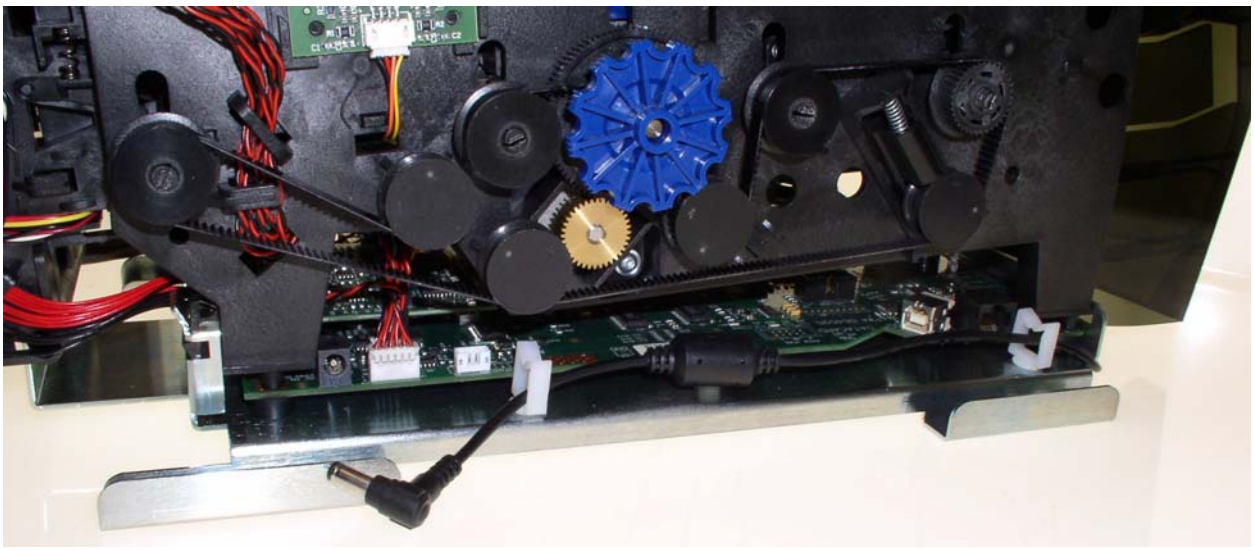
- Make sure the cable is routed through the opening in the chassis side wall.
- Place a ribbon cartridge in the printer and verify that the printer is able to identify the type of ribbon.

Power Supply (SP55k Only)

The power supply for the SP55k printers is mounted to the side of the base with hook-and-loop straps.

Replacement Procedure

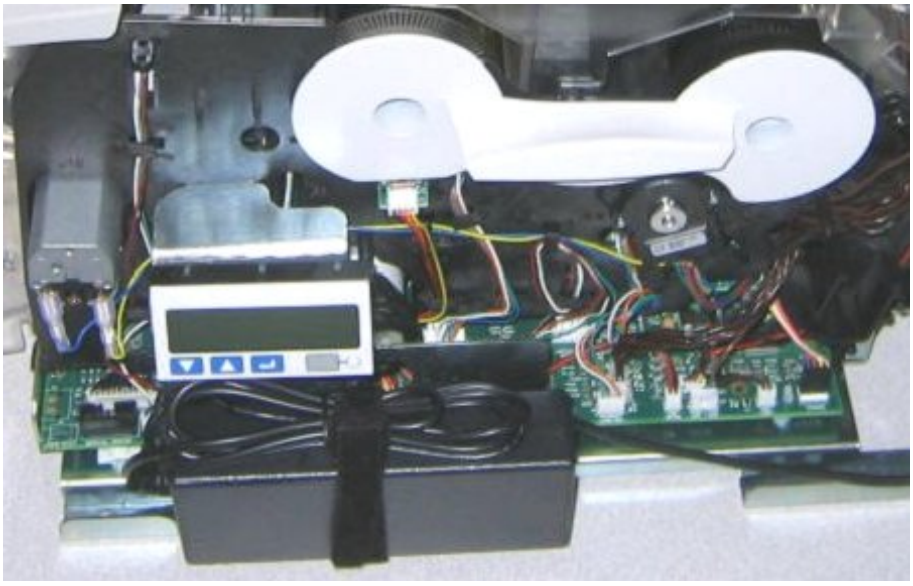
1. Unplug the printer.
2. Disconnect the power supply cord from the right side of the printer.



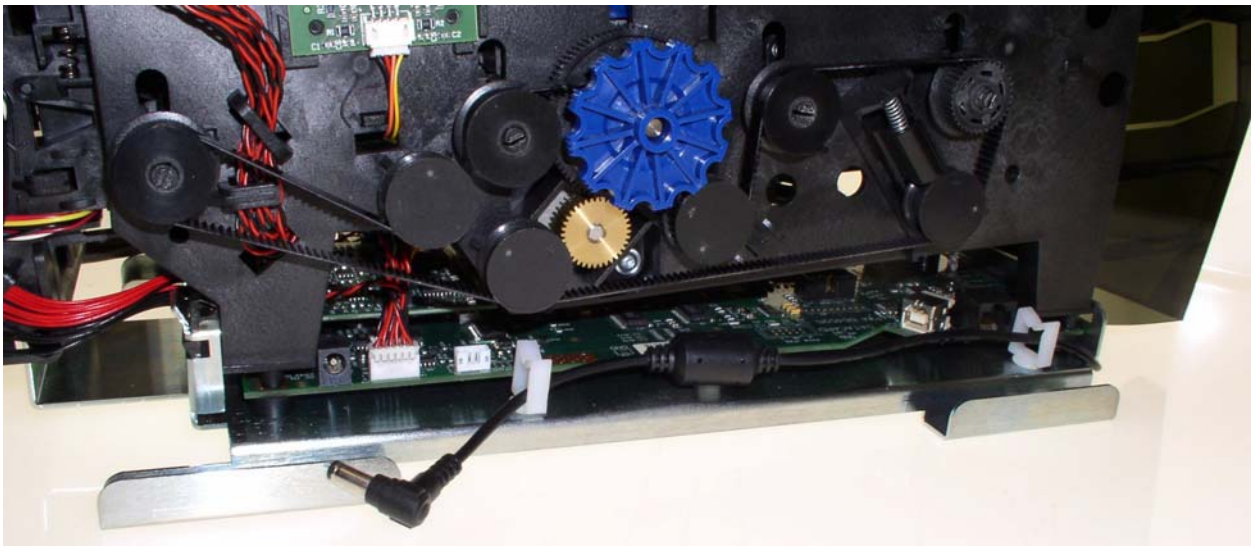
3. Free the cable from the clamps.
4. On the left side of the printer, disconnect the strap that surrounds the power supply and pull the power supply free from the hook-and-loop strip.

Replacement Procedure

1. Place the new power supply in position, wrap the extra cord above it, and secure with the strap.



2. Route the cable around the printer and through the clamps.
3. Plug the cable into the connector on the right side.

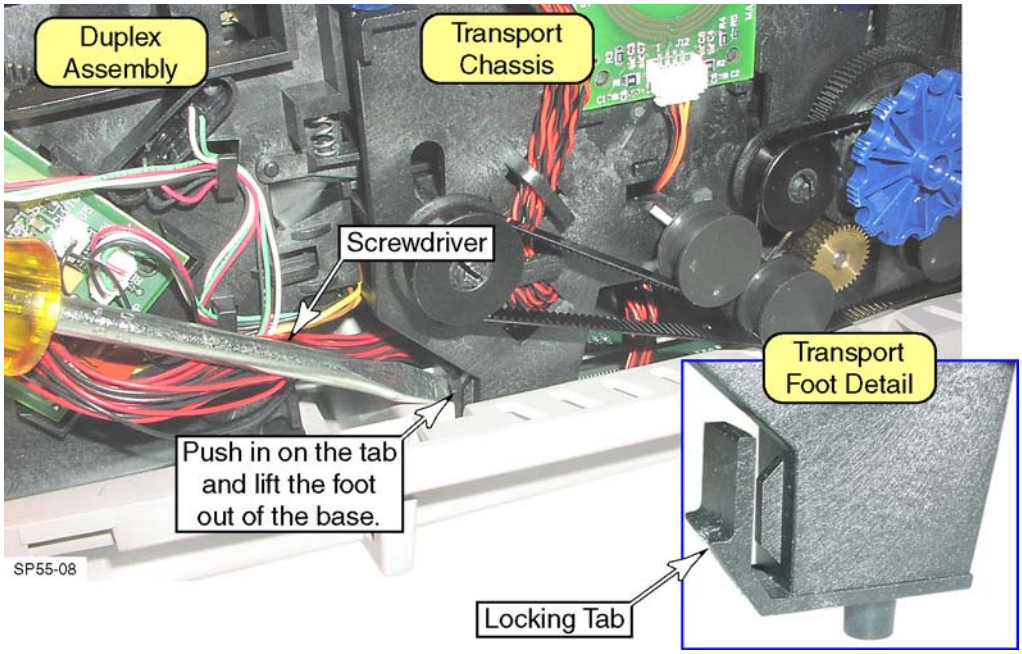


Duplex Module

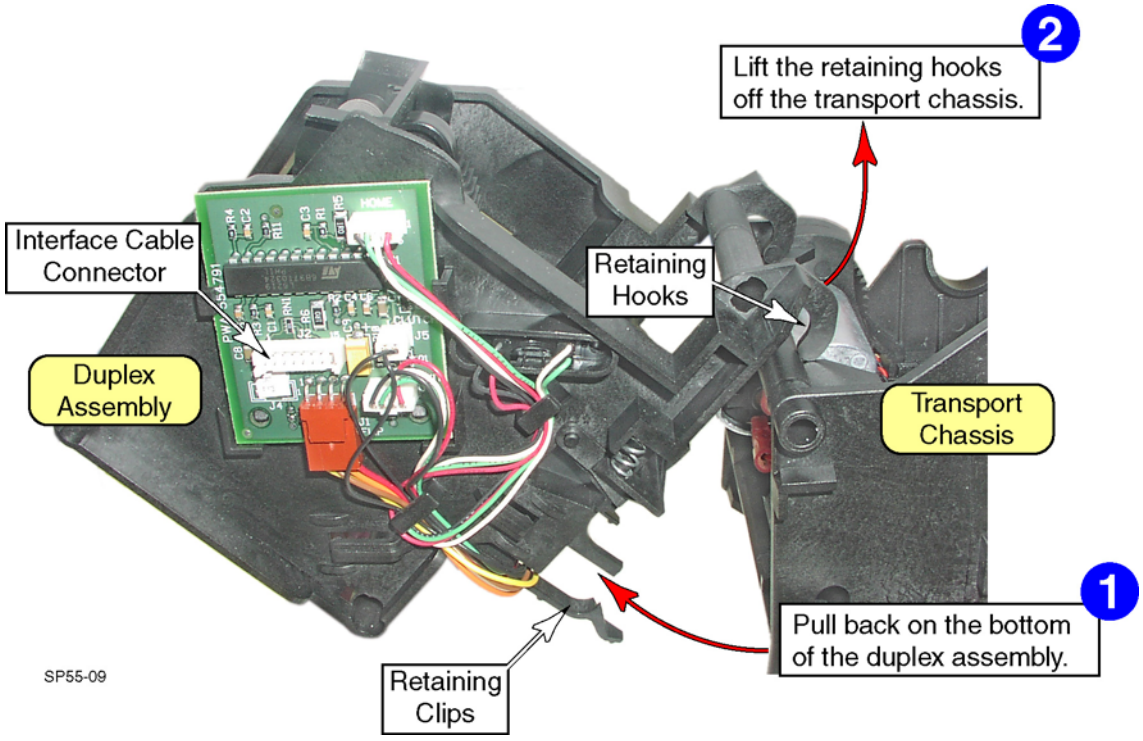
This procedure is a prerequisite for many others.

Removal Procedure

1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Remove the Main Enclosure as described on page 6-9 (not applicable to SP55 printer).
4. Press in on the transport chassis locking tabs, and lift up on the back of the transport assembly.



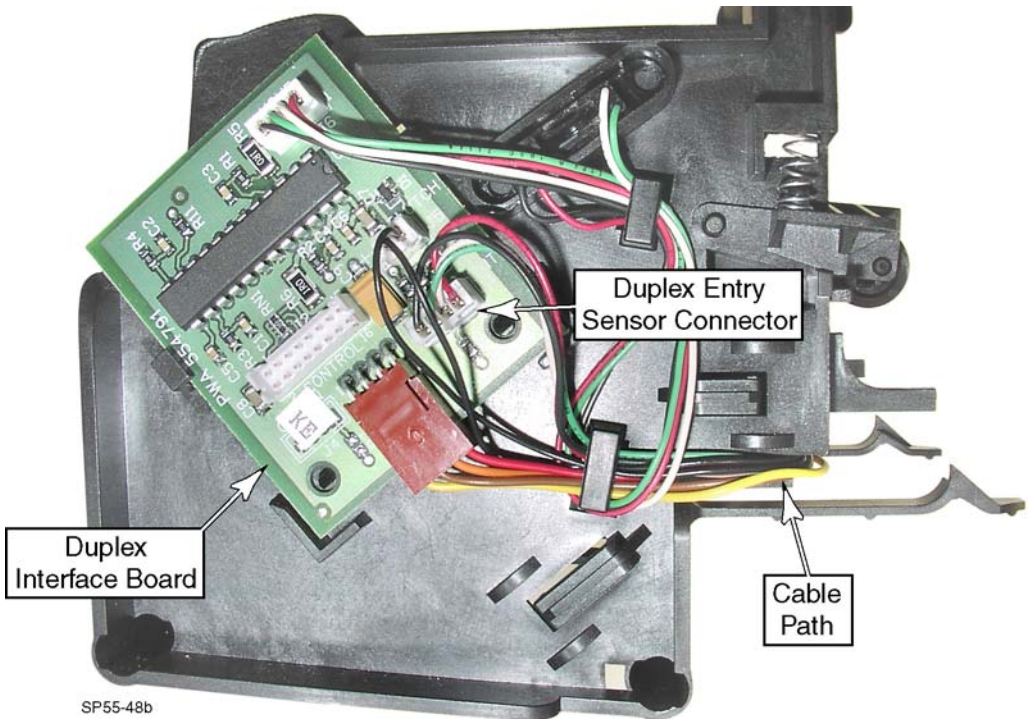
5. Disconnect the interface cable from the duplex interface board.
6. Pull back on the duplex assembly and lift it off the transport chassis.



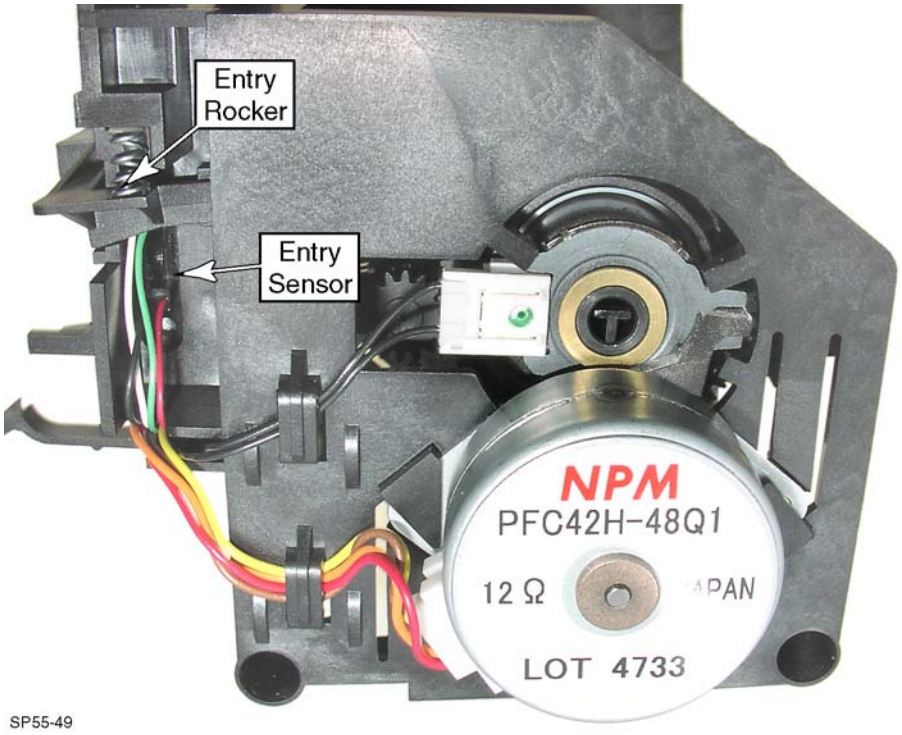
Duplex Entry Sensor

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the duplex interface cable from the interface board.
4. Remove the Duplex Module (p. 6-67) from the printer.
5. Disconnect the entry sensor connector from the interface board.



6. Remove the Duplex Entry Rocker from the module (p. 6-74).
7. Push the sensor out of the duplex chassis.



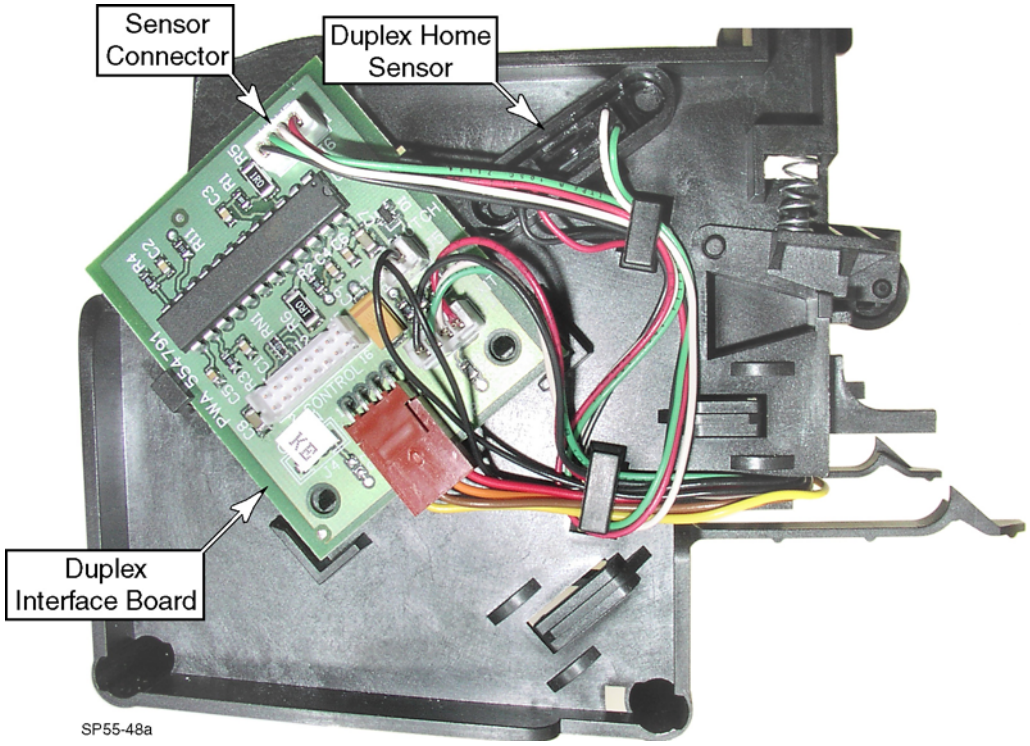
Replacement Notes

- When pushing the sensor into the duplex chassis, do not push against the wires or crush them.
- Print a test card to verify that the duplex is functioning properly.

Duplex Home Sensor (Without Clear Card)

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the sensor connector from the duplex interface board.
4. Carefully push the sensor out of the duplex chassis.



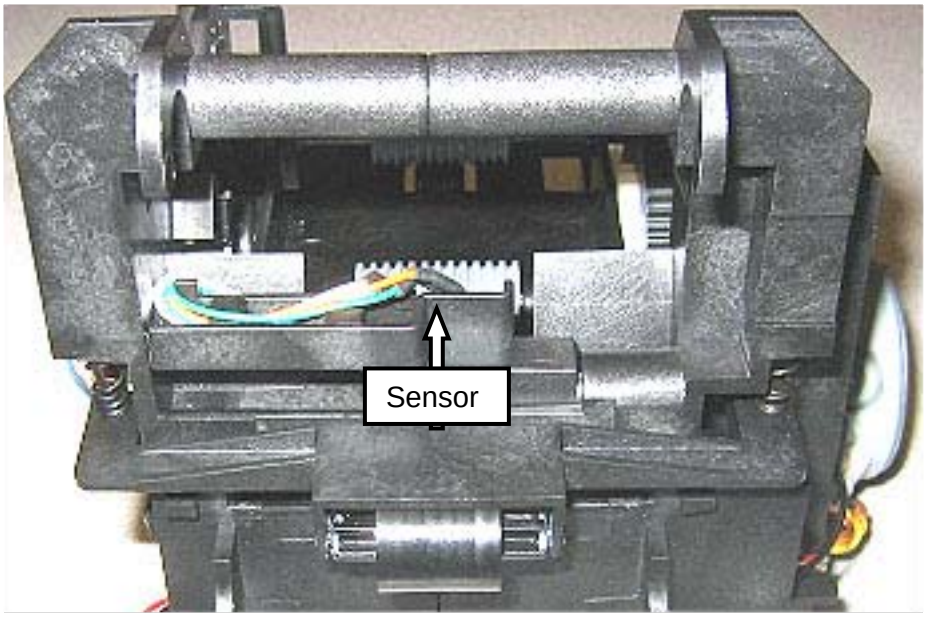
Replacement Notes

- When pushing the sensor into the duplex chassis, do not push against the wires or crush them.
- Print a test card to verify that the duplex is functioning properly.

Duplex Home Sensor (With Clear Card)

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the sensor connector from the duplex interface board.
4. Carefully push the sensor out of the sensor bracket in the duplex chassis.



Replacement Notes

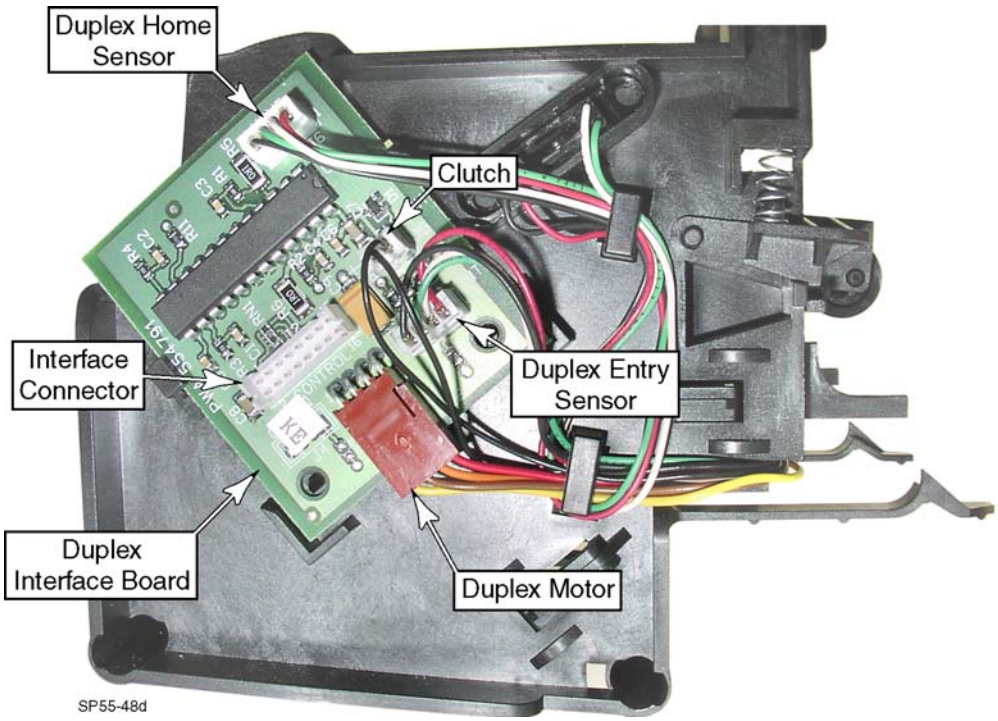
- When pushing the sensor into the duplex chassis, do not push against the wires or crush them.
- Use Diagnostics to verify that the sensor is working properly.
- Print a test card to verify that the duplex is functioning properly.

Duplex Interface Board

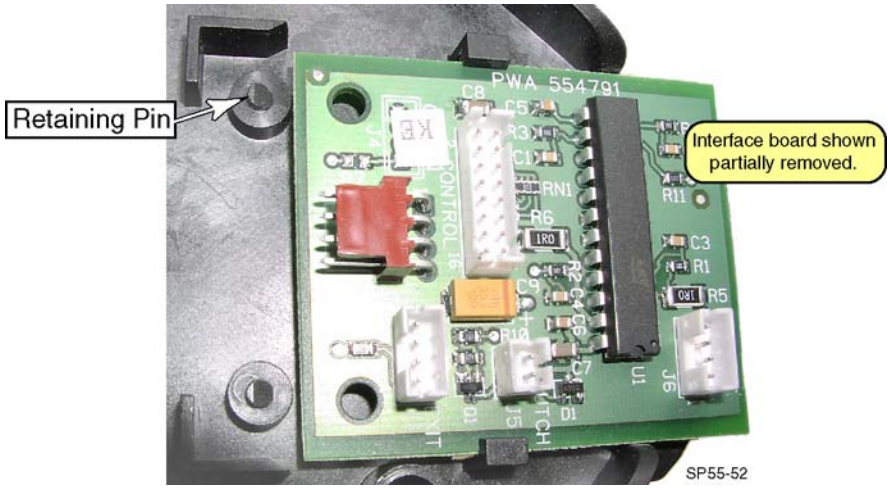
Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect all connectors from the duplex interface board.



4. Lift the edge of the board slightly, and slide it off the retaining pins.



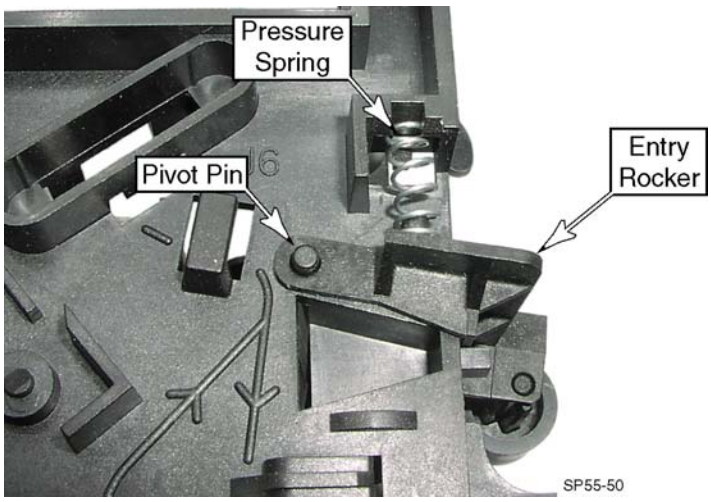
Follow-up Procedure

Print several test cards to ensure the duplex is operating properly.

Duplex Entry Rocker

Removal Procedure

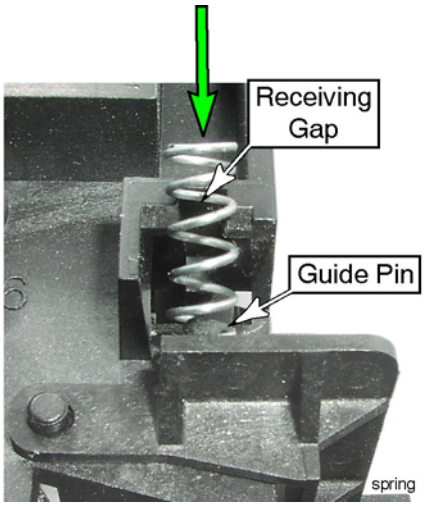
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the duplex interface cable from the interface board, and remove the Duplex Module (p. 6-65) from the printer.
4. Lift one side of the entry rocker off its pivot pin. As soon as possible, grasp the pressure spring and remove it before it gets loose.
5. Repeat the step for the other side, and remove the rocker.



Replacement Note

It is easiest to replace the rocker first and add the springs afterward.

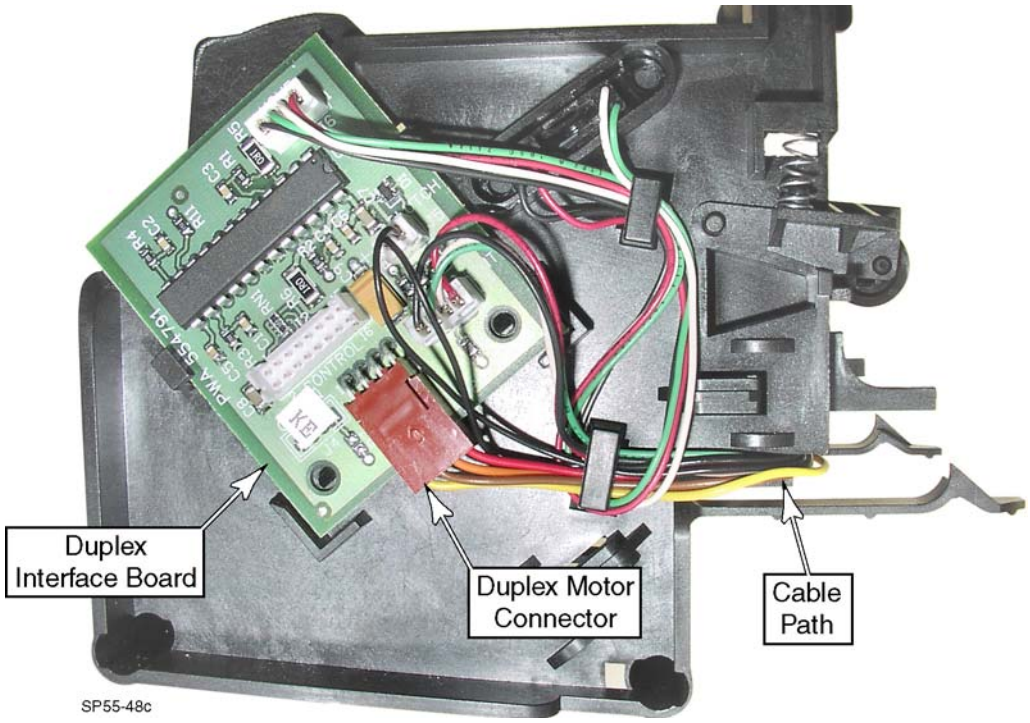
6. Insert the spring over the guide pin.
7. Compress the spring and slide it into the receiving gap.



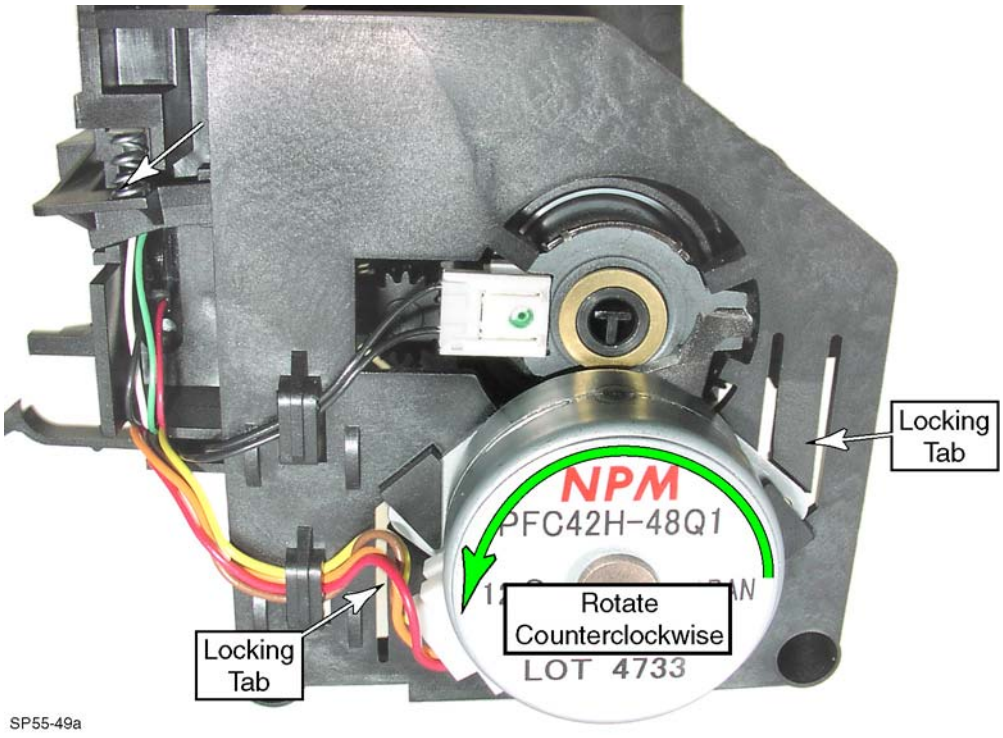
Duplex Motor

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the duplex interface cable from the interface board.
4. Remove the Duplex Module (p. 6-65) from the printer.
5. Disconnect the motor connector from the interface board.
6. Free up the cable from the retaining tabs.



7. Simultaneously press in on the locking tabs, and rotate the motor to remove it.



Replacement Notes

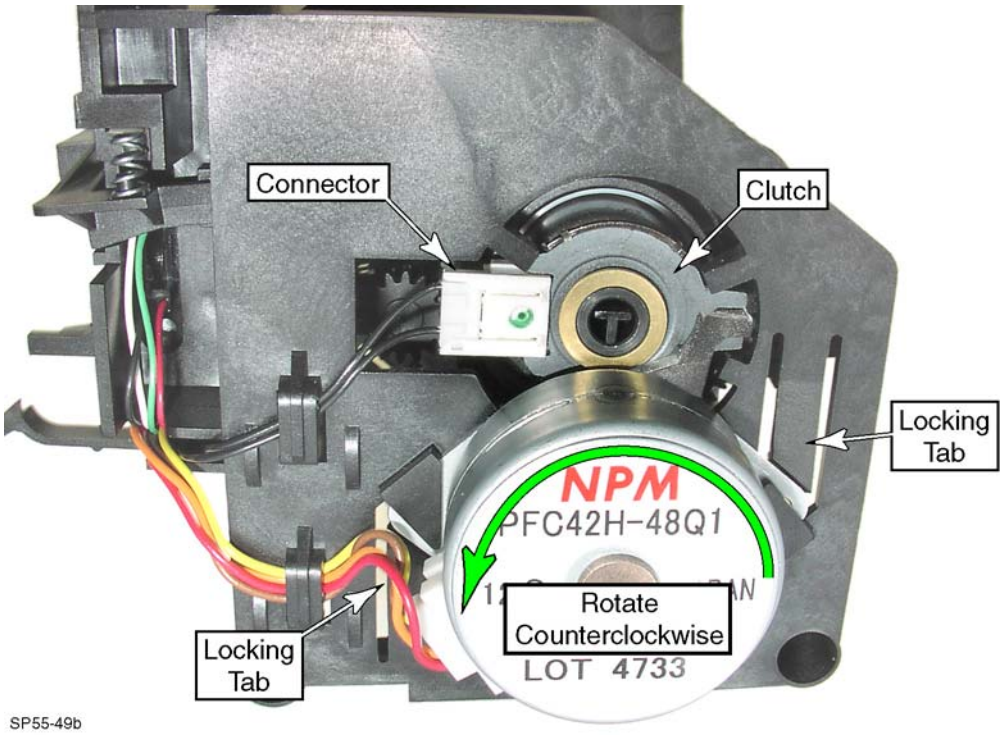
- When inserting the motor into the duplex chassis, make sure the gears mesh properly.
- Print several test cards to verify that the duplex is functioning properly.

Magnetic Clutch/Spring Clutch/Duplex Rollers

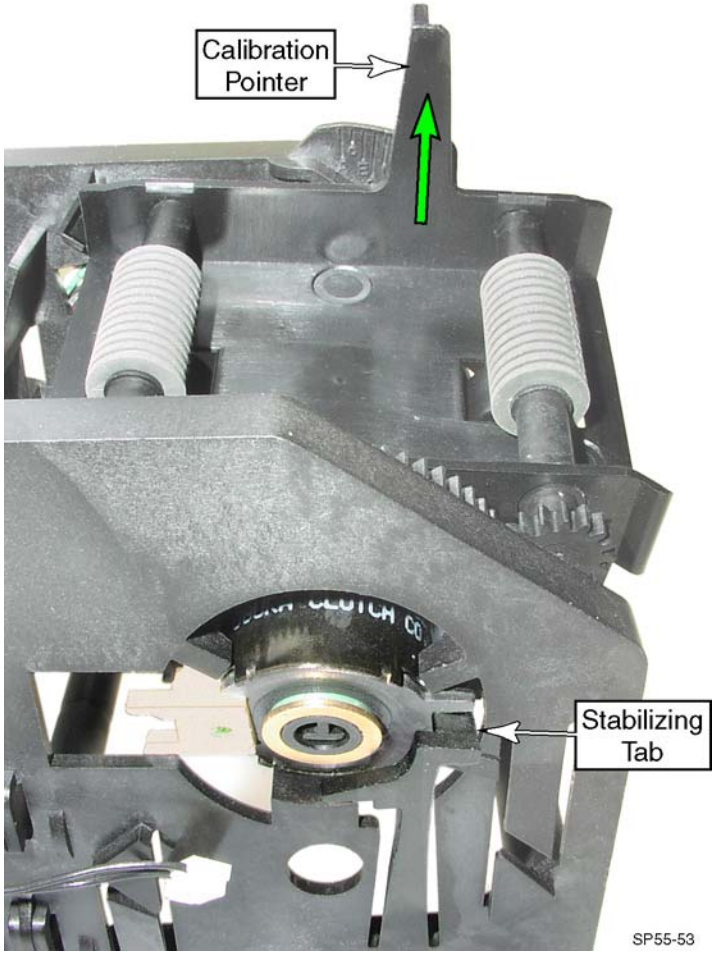
These three procedures require the same preliminary steps and are grouped together for convenience.

Removal Procedure

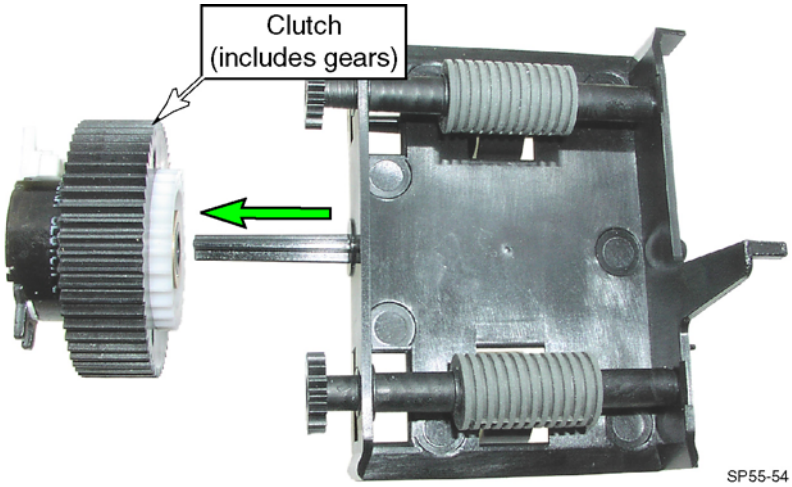
1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Disconnect the duplex interface cable from the interface board.
4. Remove the Duplex Module (p. 6-65) from the printer.
5. Remove the duplex motor by simultaneously pressing in on the locking tabs, and rotating the motor.
6. Disconnect the clutch connector from the clutch.



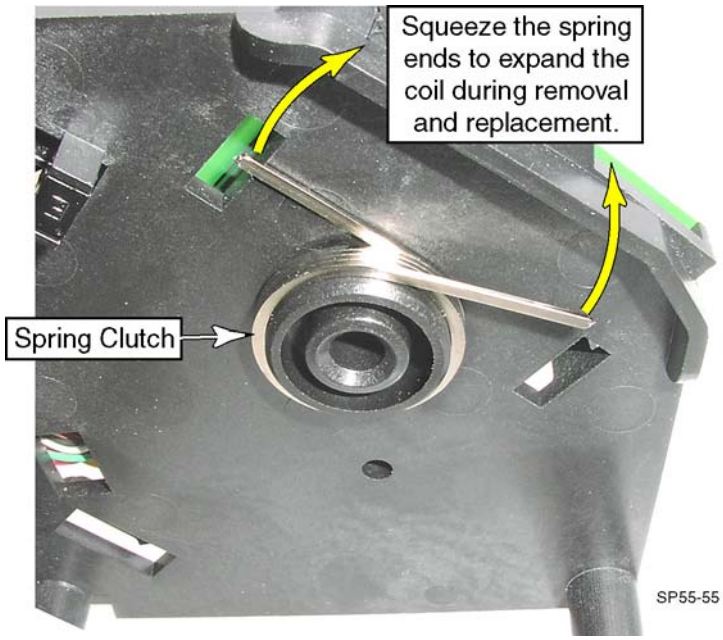
7. Rotate the flipper until the calibration pointer is pointing up.
8. Pull the flipper assembly toward the clutch end until the pivot pin is free from the chassis. (The stabilizing tab, which was previously constrained by the motor, will bend as necessary.)
9. Tilt the flipper assembly up and remove the whole assembly. Take care not to break the stabilizing tab. Pull it away from the clutch as needed.



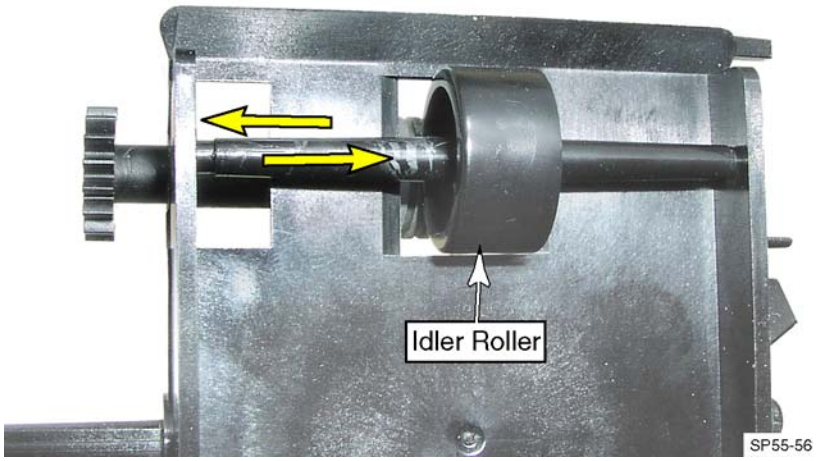
10. Slide the magnetic clutch off the center pin of the flipper.



11. Squeeze the ends of the spring clutch and pull it off the boss.



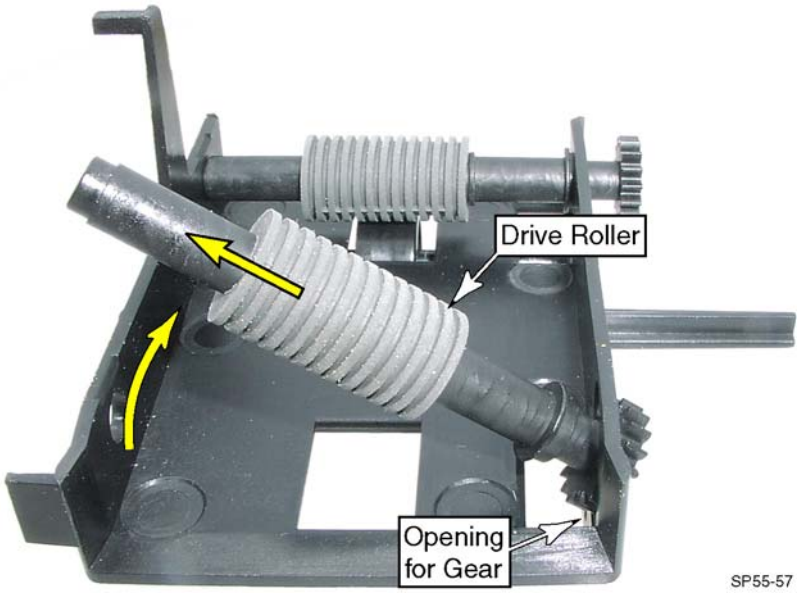
12. To remove the idler rollers, spread the sidewalls of the flipper, and pull the roller out one side at a time.



13. To remove the drive rollers:

    A. Spread the non-gear sidewall of the flipper and pull back on the roller.

    B. Tilt the roller shaft up and withdraw the gear through the opening in the sidewall.



Replacement Notes

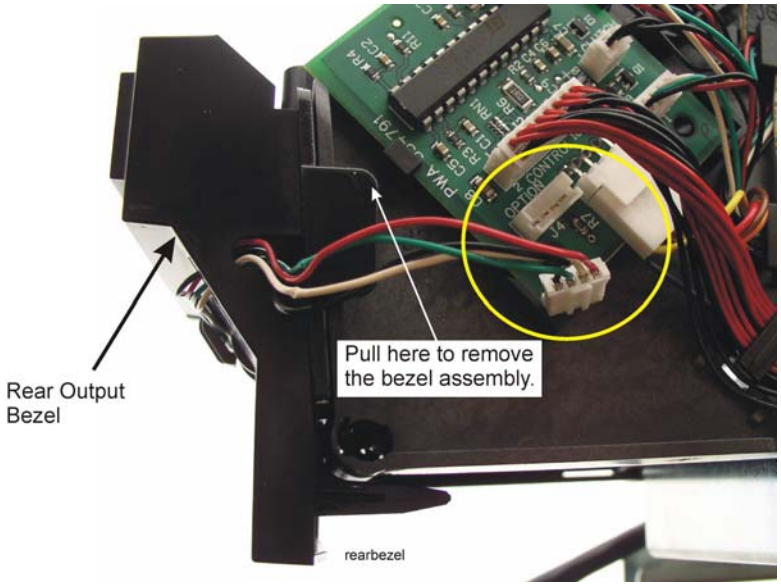
- The magnetic clutch will not fit into the opening if it is rotated incorrectly.
- After replacing the flipper assembly in the duplex module, rotate the flipper until the spring clutch engages the stop tabs (clockwise as viewed from the motor).
    - If you rotate the flipper counterclockwise, you can feel the drag of the spring clutch, but it will not engage the stop tabs.
    - When the flipper is rotated clockwise, the spring clutch will snap over the stop tabs and will no longer turn in that direction.
    - Verify that the clutch is properly engaged. When properly engaged, the flipper will rotate in only one direction.
- If necessary, adjust the duplex home offset.
- Print several test cards to verify that the duplex assembly is functioning properly.

Rear Output Bezel Assembly

The rear output bezel assembly is an option on the SP55k printer. It has a sensor that detects cards as they are ejected into the kiosk. It mounts on the rear reject assembly.

Removal Procedure

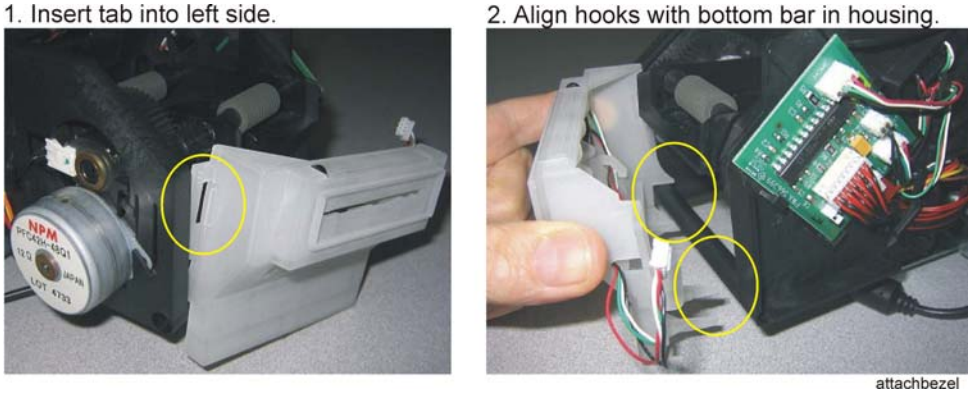
1. Unplug the printer.
2. Disconnect the rear bezel sensor connector from J4 on the duplex interface board.



3. Carefully pull back on the tab at the right side of the bezel and loosen that side.
4. Lift out the left side of the bezel.

Replacement Note

1. To reinstall the bezel assembly, hook the left side onto the housing.
2. Align the forked hooks with the bar at the bottom of the duplex housing and push in the bezel assembly.



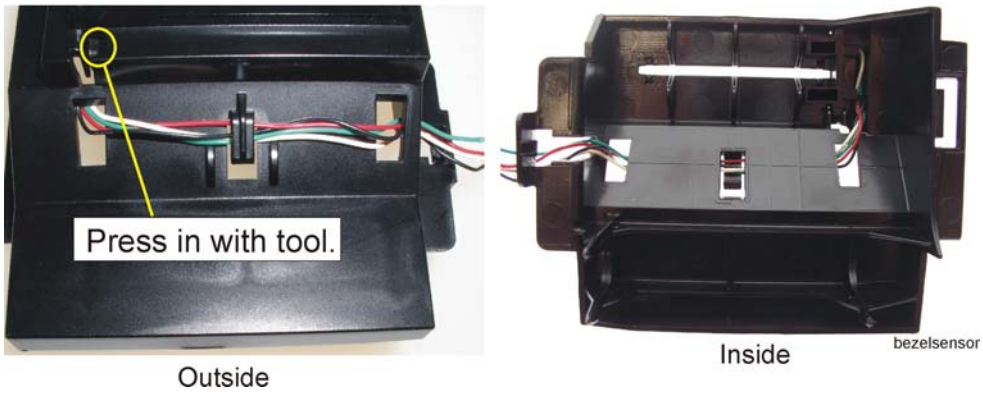
3. Connect the rear bezel sensor.

Rear Bezel Sensor

The rear bezel sensor is in the rear output bezel assembly option on the SP55k printer.

Removal Procedure

1. Unplug the printer.
2. Remove the Rear Output Bezel Assembly as described on page 6-81.
3. On the outside of the assembly, use a tool to push on the sensor to loosen it.
4. Thread the cable connector out of the assembly to remove the sensor.

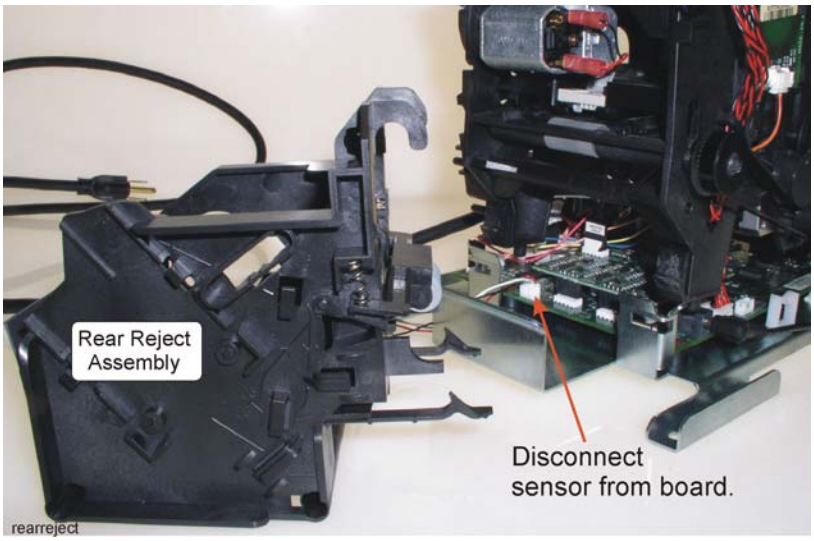


Rear Reject Assembly (SP55k Only)

The rear reject assembly is a hopper for collecting cards. The system can be configured so that it collects good or rejected cards. An insert can be removed from the assembly to allow cards to fall directly into the kiosk.

Removal Procedure

1. Unplug the printer.
2. Lift the swingarm assembly, and remove the ribbon cartridge and cleaning tape. Leave the swingarm unattached.
3. Press in on the transport chassis locking tabs, and lift up on the back of the transport assembly as described in Transport Assembly (SP55k) on page 6-34. Leave the back of the transport assembly loose.



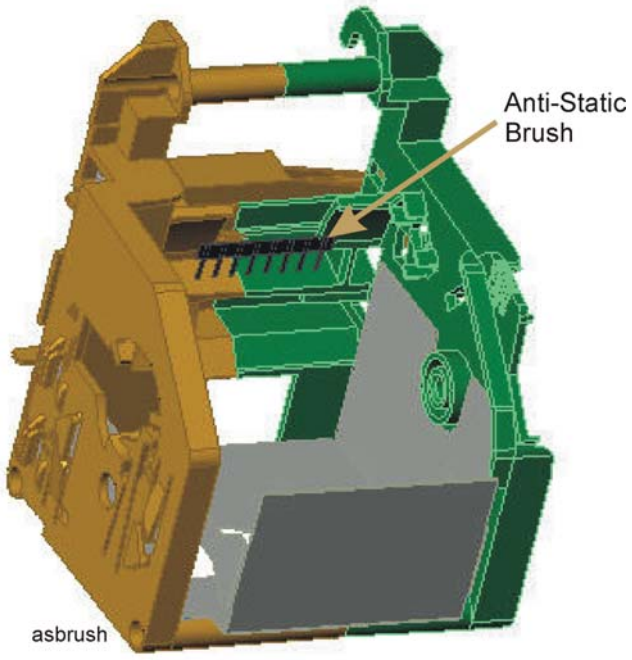
4. Grasp the bottom of the rear reject assembly and lift it up and off the transport assembly.
5. Disconnect the transport exit sensor from J37 on the main control board.

Static Brush on Rear Reject Assembly

One static brush is attached to the rear reject assembly. It is the same part number as the static brushes on the transport assembly.

Removal and Replacement Procedure

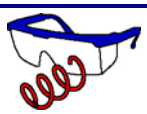
1. Unplug the printer.
2. Remove any cards from the rear reject assembly.
3. Peel the static brush from the rear reject assembly surface.
4. Use isopropanol to clean off any adhesive residue.
5. Attach the new static brush. Make sure the brush is centered on the gap, and that the bottom of the brush sits flush to the plastic edge.



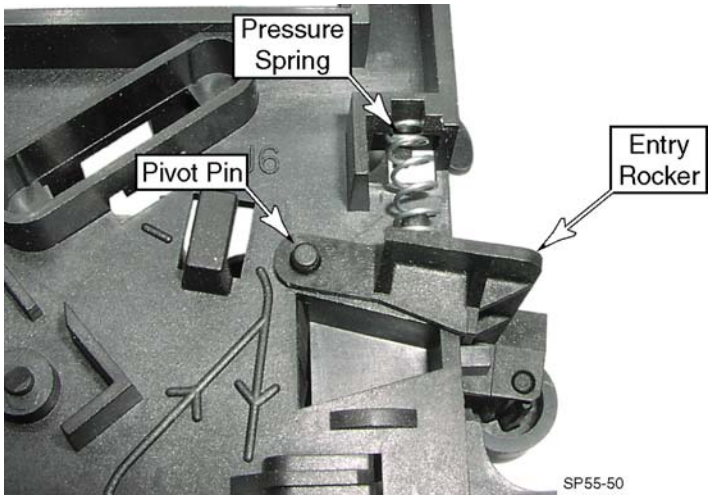
Transport Exit Sensor

The transport exit sensor is on the rear reject assembly option for the SP55k printer.

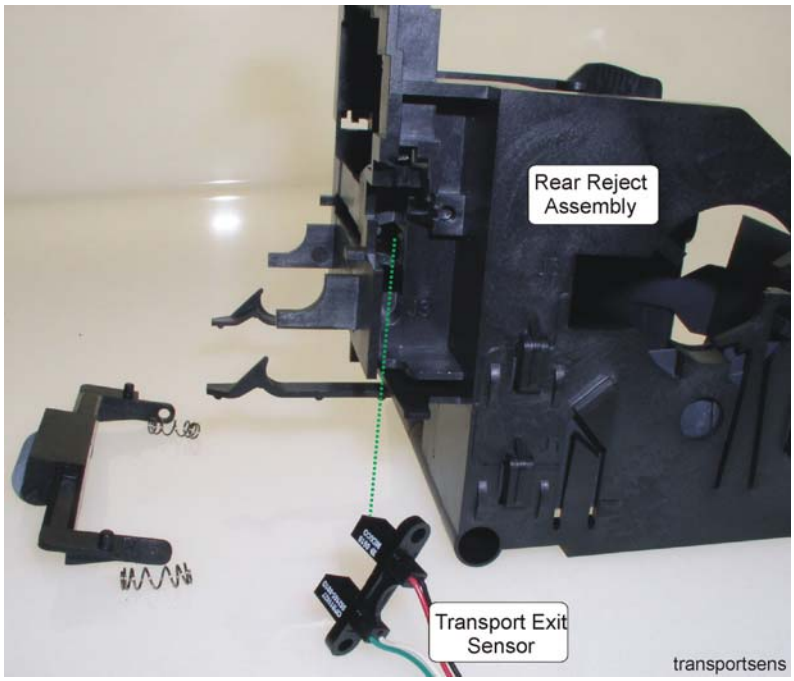
Removal Procedure



1. Unplug the printer.
2. Lift the swingarm assembly, and remove the ribbon cartridge and cleaning tape. Leave the swingarm unattached.
3. Loosen the back of the transport assembly as described in Transport Assembly (SP55k) on page 6-34. Leave the back of the transport assembly loose.
4. Remove the rear reject assembly and disconnect the sensor as described in Rear Reject Assembly (SP55k Only) on page 6-83.
5. Lift one side of the entry rocker off its pivot pin. As soon as possible, grasp the pressure spring and remove it before it gets loose.
6. Repeat the step for the other side, and remove the rocker.

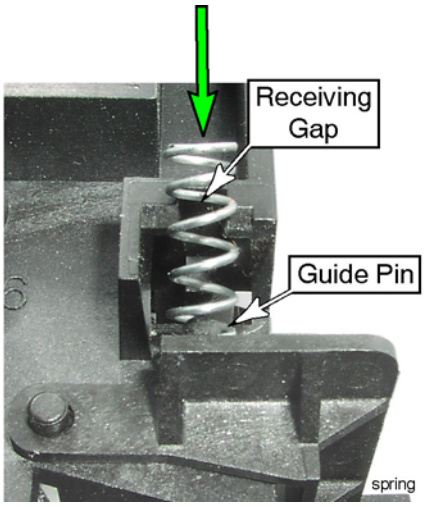


7. Use a small driver from the inside of the assembly to push the sensor out of the rear reject assembly.



Replacement Notes

1. When pushing the transport exit sensor into the rear reject assembly, do not push against the wires or crush them.
2. It is easiest to replace the rocker first and add the springs afterward.
   A. Insert the spring over the guide pin.
   B. Compress the spring and slide it into the receiving gap.



3. Print a test card to verify that the printer is functioning properly.

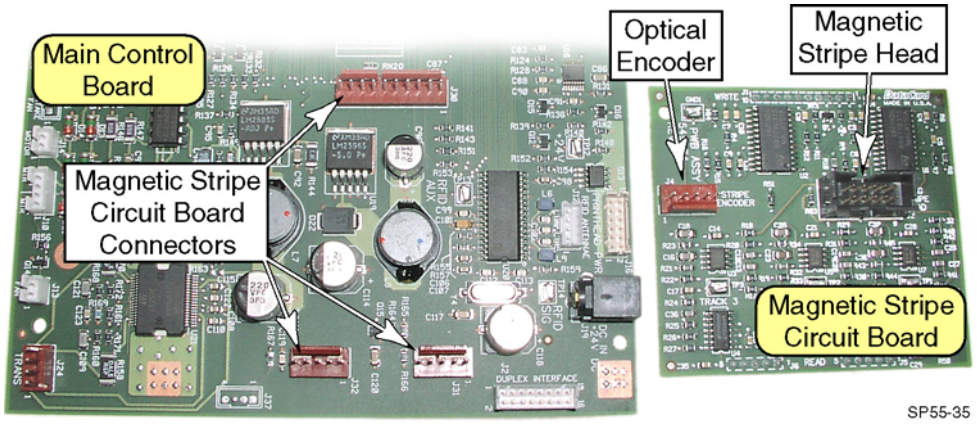
Magnetic Stripe Option

Magnetic Stripe Circuit Board

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Unplug the magnetic stripe head and encoder cables from the magnetic stripe board.
5. Remove the magnetic stripe circuit board from the main control board by lifting the board off all three connectors simultaneously.



Replacement Notes

- There is no built-in alignment mechanism between the main control board and the daughter board.

  Make sure the connectors between the two boards are aligned properly. If not, both boards could be damaged.

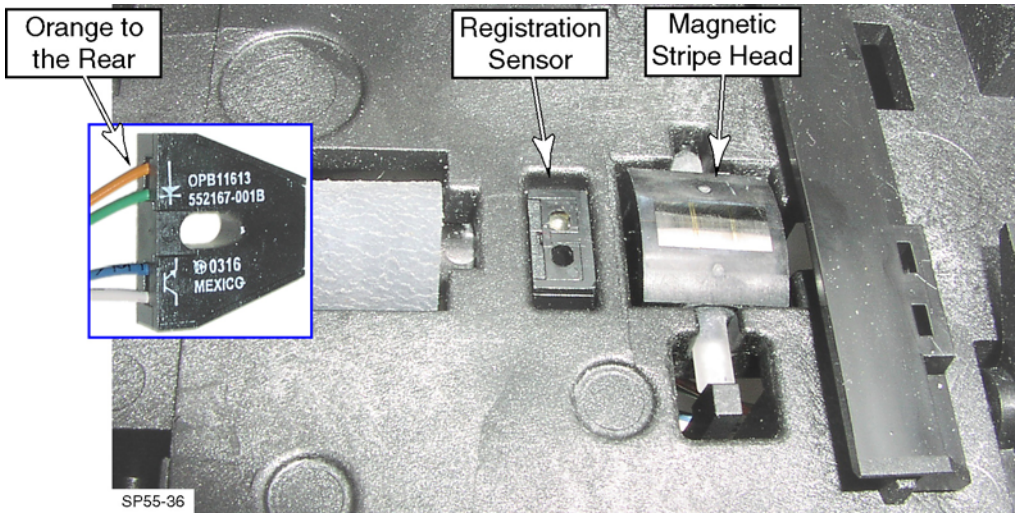
- Using the Diagnostics in chapter 5, calibrate the magnetic stripe head as described in *Start Sentinel Position*.

Magnetic Stripe Registration Sensor (Without Clear Card)

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Remove the Magnetic Stripe Rocker Assembly (p. 6-92).
5. Push the sensor's cable connector through the opening in the chassis (from outside to inside).
6. Carefully push down on the sensor from above and remove it through the bottom of the chassis. Do not use sharp tools.

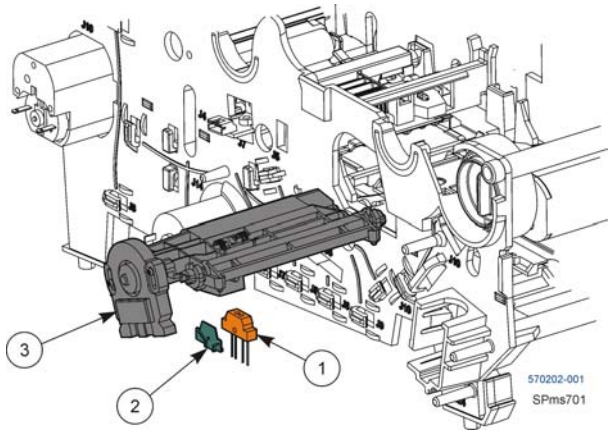


Replacement Notes

- Make sure the sensor is oriented with the orange wire (emitter) toward the rear of the printer.
- Be careful not to damage the wires when pushing the sensor into position.
- Make sure the sensor is fully seated.
- Using the Diagnostics in chapter 5, calibrate the magnetic stripe head as described in *Start Sentinel Position*.

Magnetic Stripe Registration Sensor (With Clear Card)

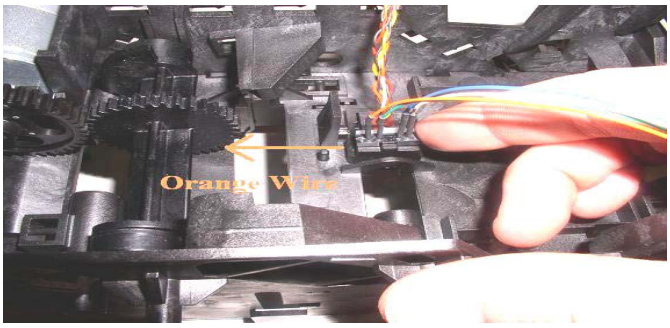
The Magnetic Stripe registration sensor on the Clear Card option is located in the same position in the chassis as the standard Magnetic Stripe option. The sensor is thinner than the standard sensor. It uses a spacer (2 in the following figure) to hold the sensor securely in place and positions the sensor to limit reflection off the rocker shaft.



Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the ribbon cartridge and cleaning roller.
3. Remove the Main Enclosure as described on page 6-9 (not applicable to SP55k printer).
4. Remove the Transport Assembly from the base (p. 6-31).
5. Remove the Magnetic Stripe Rocker Assembly (p. 6-92).
6. Push the sensor's cable connector through the opening in the chassis (from outside to inside).
7. Carefully push down on the sensor from above and remove it through the bottom of the chassis, being careful not to lose the spacer.



Replacement Notes

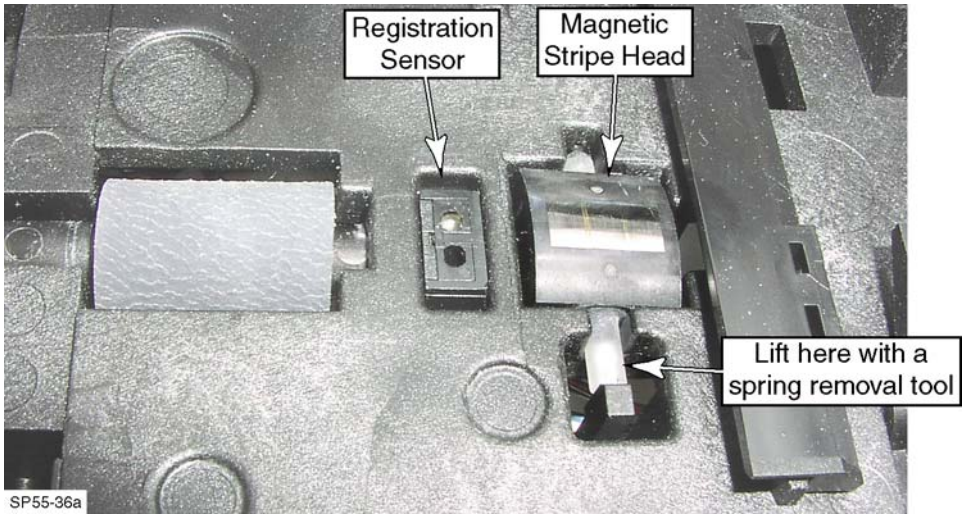
- Reuse the spacer with the new sensor.
- Use Diagnostics to verify that the sensor is working properly.

Magnetic Stripe Head

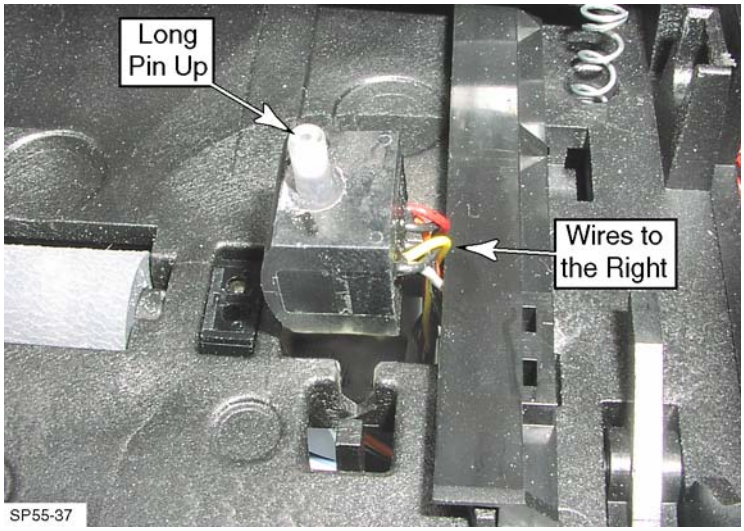
Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Unplug the magnetic head from the magnetic stripe board.
5. Remove the Magnetic Stripe Rocker Assembly (p. 6-92).
6. Using a spring removal tool (small hook), pull up on the long pivot arm of the magnetic head.



7. Rotate the head so the wires are facing toward the card guide, and lower the head through the chassis.



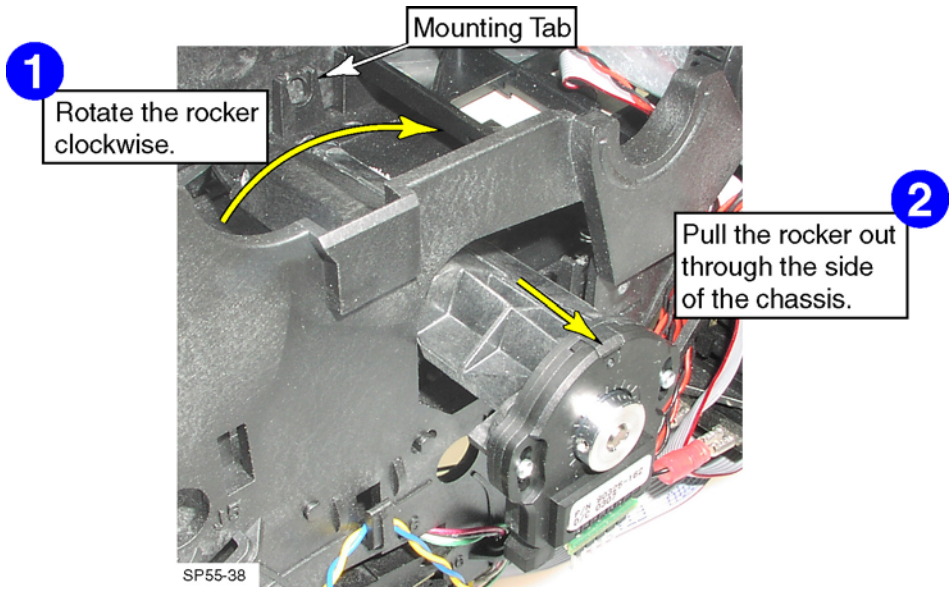
Replacement Notes

- The long pin on the head points toward the front of the printer (fits only one direction).
- Using the Diagnostics in chapter 5, calibrate the magnetic stripe head as described in *Start Sentinel Position*.

Magnetic Stripe Rocker Assembly

Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Using a screwdriver, pry the rocker's pivot pin out of the mounting tab on the chassis.
4. Rotate the rocker clockwise, and remove it through the side of the chassis (note that the encoder is pointing straight down during removal).



Replacement Notes

- Note that the violet colored wire on the encoder cable is toward the rear of the printer.
- Using the Diagnostics in chapter 5, calibrate the magnetic stripe head as described in *Start Sentinel Position*.

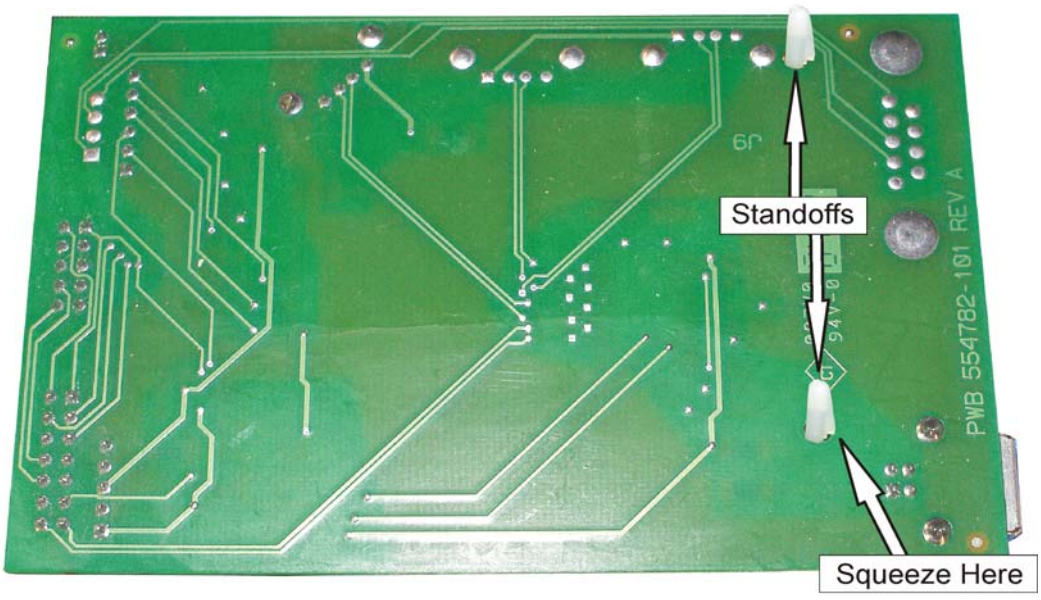
Smart Card Option

Smart Card Interface Board

Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Disconnect the interface and solenoid cables from the smart card interface board. Refer to the Functional Block Diagram (p. 6-6) for location and details.
5. Remove the interface board from the main control board. The board needs to be removed straight up to prevent damage to the connector.
   A. Squeeze the locking tab on one standoff and lift the board up slightly.
   B. Repeat for the other standoff.
   C. Gently pry the board off the connector.



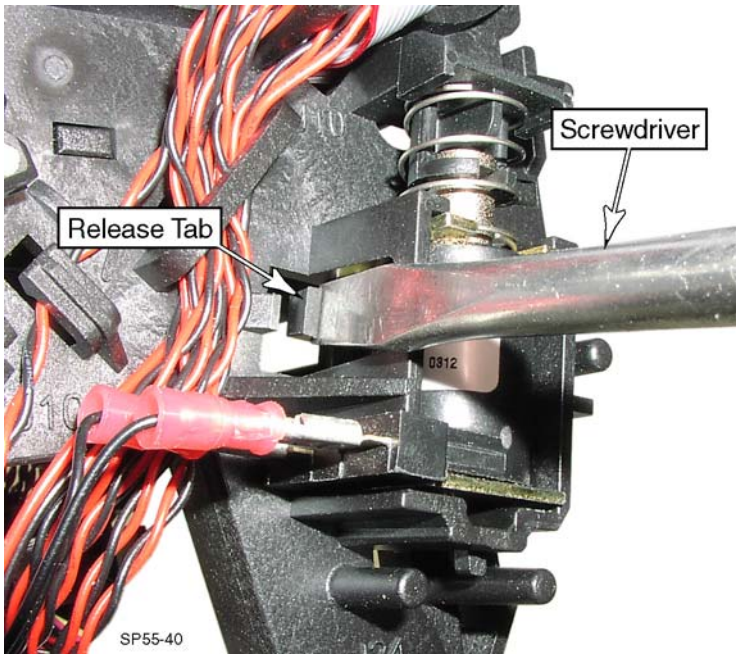
Follow-up Procedure

Using Diagnostics, perform the *Smart Card Test Card* procedure as described in chapter 5 of this manual.

Solenoid Assembly/Solenoid Link

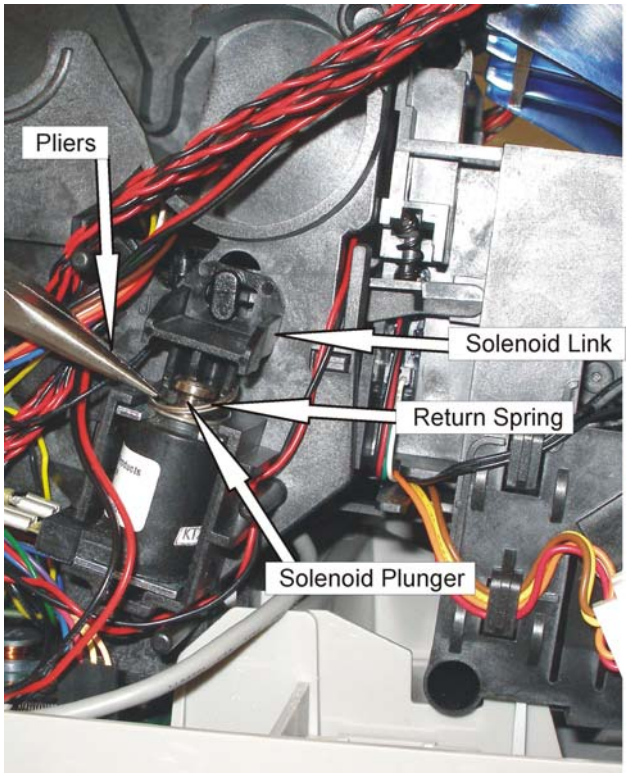
Removal Procedure

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Using a screwdriver carefully pry out the solenoid release tab, and pull the solenoid out just slightly from the mounting pocket.
   - Do not pry on the release tab any more than is necessary—it will break.
   - Do not pull the solenoid out too far as this will damage the return spring.

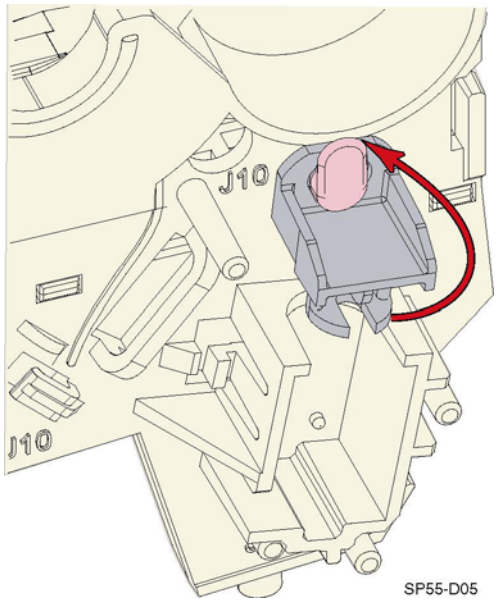


4. Unplug the connectors from the solenoid.
   - Tip: Use a screwdriver to pry the connectors loose, and then remove them the rest of the way by hand.
   - If the wires need replacement, remove the Transport Assembly (p. 6-31) from the base.
   - There is no polarity for the wires; they may be connected to either terminal.

5. Retract the return spring onto the solenoid link and hold it in place with pliers. Take care not to crush the spring.
6. Pull the solenoid out of the mounting pocket.



7. To remove the solenoid link, rotate it 90 degrees and pull it off the rocker.



Follow-up Procedure

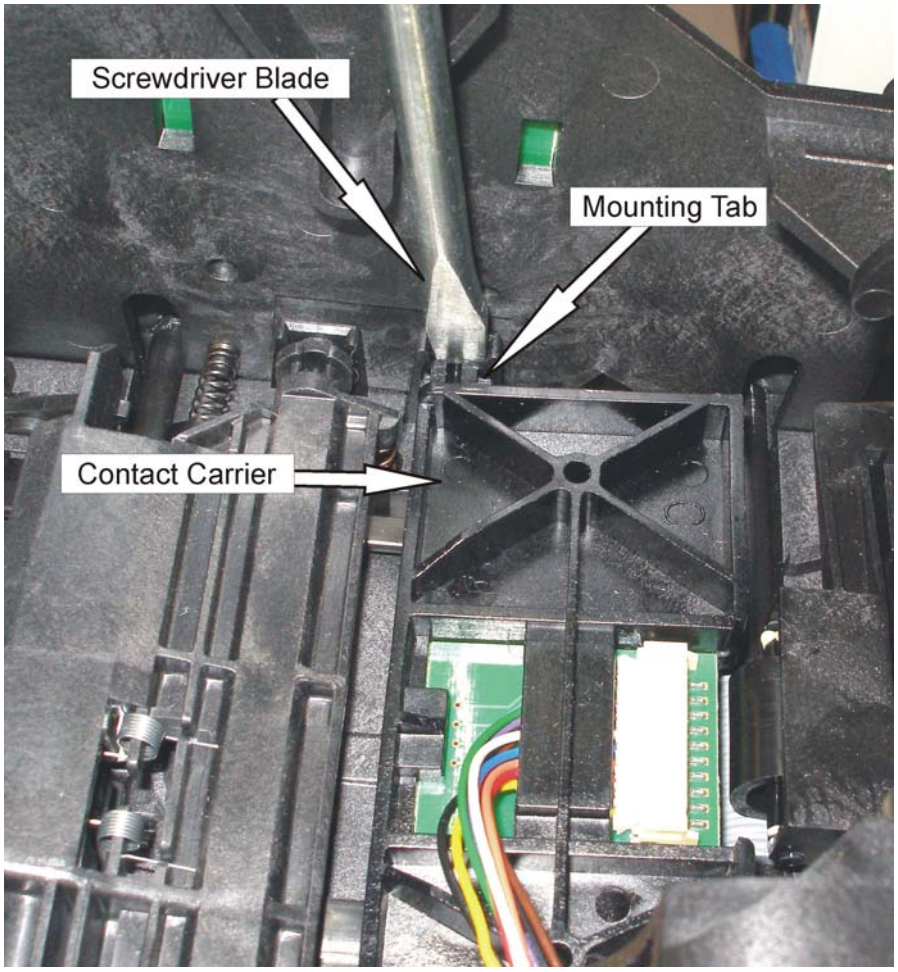
Using Diagnostics, perform the *Smart Card Test Card* procedure as described in chapter 5 of this manual.

Smart Card Contact

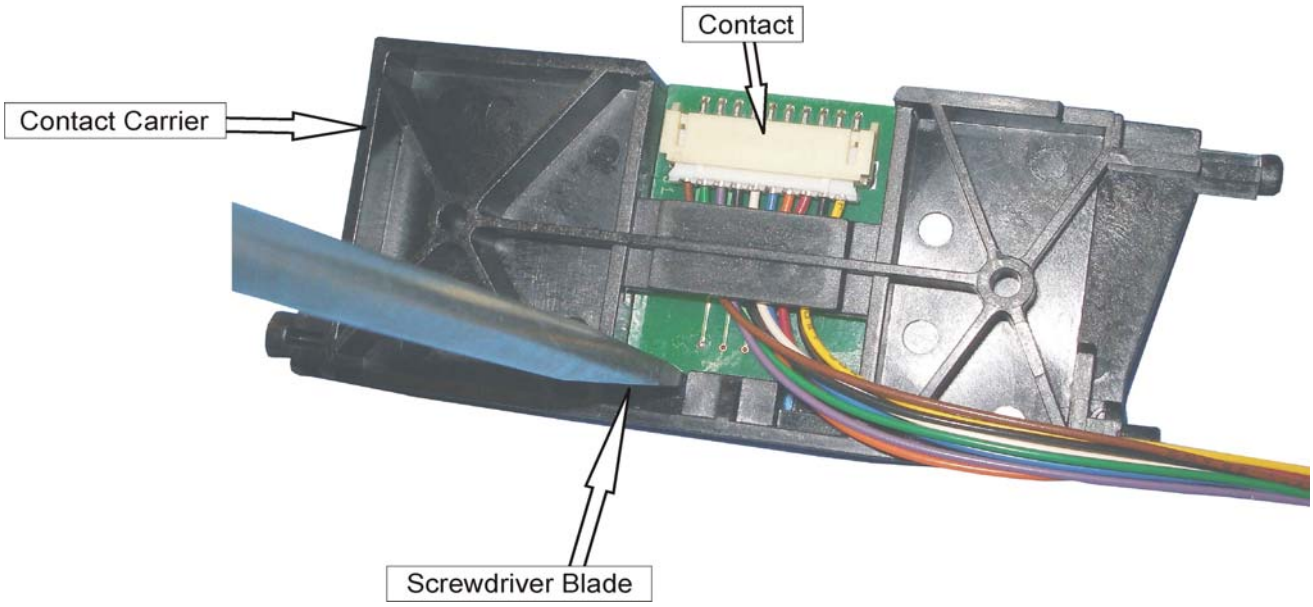
Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Disconnect the interface cable from the smart card interface board. Refer to the Functional Block Diagram (p. 6-6) for location and details.
5. Remove the Ribbon Motor (p. 6-29).
6. Remove the Solenoid Link from the rocker (p. 6-94).
7. Remove the smart card contact carrier:
   A. Insert a screwdriver between the carrier and the left mounting tab.
   B. Twist the blade to pry the carrier out of the mounting tab.

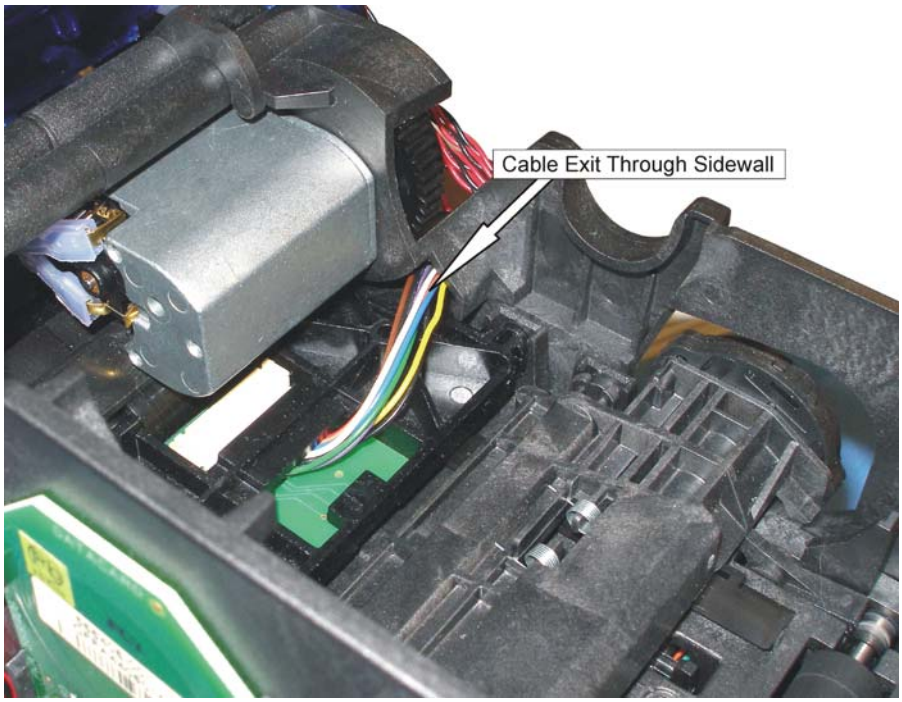


8. Use a small screwdriver to pry the contact out from along the edge and then a larger screwdriver to pry it out of the carrier.

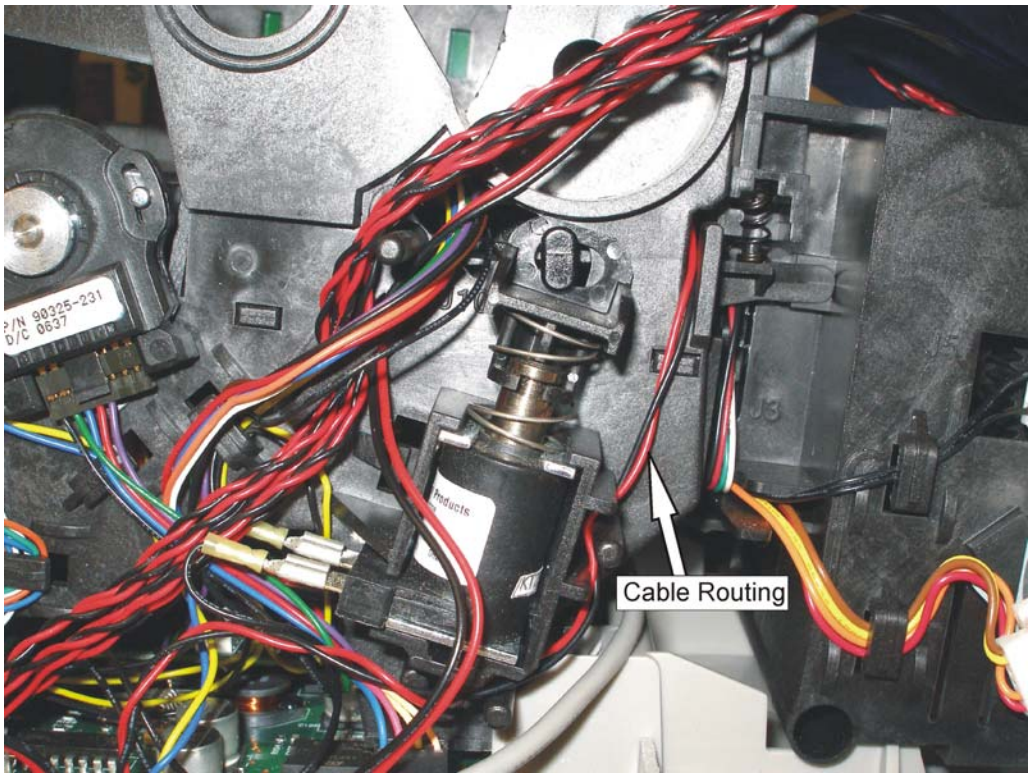


Replacement Notes

- Make sure the contact is fully seated in the carrier.
- Make sure the wires are not routed under the motor.
- Route wire out through the side of the chassis.



- Route the ribbon around the solenoid and connect it to the smart card interface board.



- Using Diagnostics, perform the *Smart Card Test Card* procedure as described in chapter 5 of this manual.

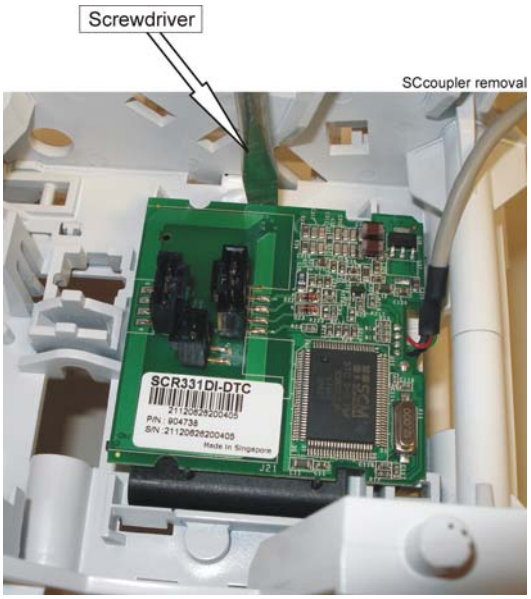
Contactless Smart Card Coupler

The components shown in this procedure may vary depending on the type of coupler used, but the general procedure remains the same.

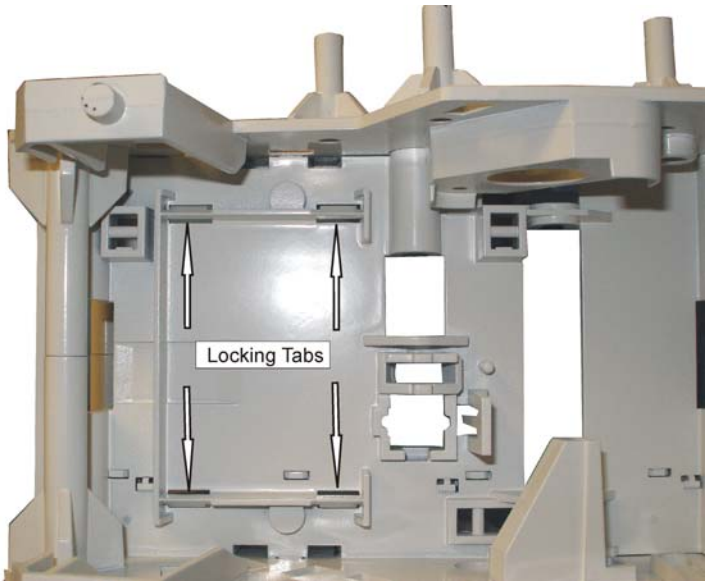
Removal Procedure

ESD Sensitive!

1. Unplug the printer.
2. Remove the Main Enclosure as described on page 6-9 (not applicable for SP55k printer). (This procedure includes lifting the swingarm cover and removing the ribbon cartridge and cleaning roller.)
3. Remove the Transport Assembly from the base (p. 6-31).
4. Use a screwdriver to press the plastic locking tabs out of the chassis.



5. Remove the coupler bracket or plastic cover.



Replacement Notes

1. Snap the coupler back into the chassis using the four mounting bracket locking tabs.

   Orientation is important for reading the smart card.

2. Connect the three connectors.

Follow-Up Procedure

Using Diagnostics, perform the *Smart Card Test Card* procedure as described in chapter 5 of this manual.