



Secure MICR Printer User's Guide

ST9715 Secure MICR Printer

User's Guide

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Notice

This manual serves as a reference for a Source Technologies' secure MICR printer. This manual should be used as a reference for learning more about MICR technology and developing MICR printing applications. This guide was produced to assist IS technicians and engineers in the integration of Source Technologies' programmed printers with their custom MICR applications. The guide also contains information on MICR related error messages that post to the operator panel.

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1. MICR Overview

MICR stands for Magnetic Ink Character Recognition. All MICR documents have a MICR line with numbers and symbols printed in a unique MICR font with magnetically chargeable ink or toner. Each character of the MICR font has a unique waveform when sensed magnetically. Financial institutions and the Federal Reserve use the MICR line to identify and sort checks. The high-speed automated processing of checks and other financial documents depends on the accuracy and the integrity of the data printed in the MICR line. Your new Source Technologies Secure MICR Printer is specifically designed to produce high quality MICR documents.

The Check Clearing System

The Check Clearing for the 21st Century Act (Check 21) was signed into law October 28, 2003. Prior to Check 21, checks traveled through the bank's high speed reader/sorter equipment an average of near seven times in the Check Clearing process. Some checks could be read up to 30 times or more by these machines.

In today's environment high and low speed check readers can capture a picture or image of the check allowing for images to be exchanged between financial institutions, the Federal Reserve, and other clearing houses. This new law, Check 21, defines what is called a "Substitute Check", and removed barriers that existed in converting physical checks to check images for clearing. The original physical check can now be truncated by the first institution that converts the check to image. The original check can now be destroyed.

United States and International MICR Standards still require the printed MICR line information to be of the highest quality and durability, and be printed with magnetic ink or toner. Additionally, issues related to check fraud continue to place high importance on print quality. For these reasons, the quality and durability of information printed with Source Technologies' Secure MICR Printers remains a key new product development criterion.

MICR Printing Standards in the United States Today

Congress established the Federal Reserve System (FRS) in 1913. Today most commercial banks in the United States belong to the FRS. Many other depository institutions provide banking and checking account services to the public. These other institutions, such as some credit unions, savings and loan associations and non-member banks, are not formally part of the FRS. However, they have access to the payment services it provides and are subject to many of the FRS regulations.

In 1958, because of the explosive growth of check usage, the American Bankers Association selected the E-13B MICR font and the MICR system as the technology for high-speed check processing. MICR was the result of a joint development project headed by the Stanford Research Institute and the General Electric Computing Laboratory with participation from a few of the major banks and other computing technology companies, IBM, Control Data, Deluxe, Bank of America, and others. Today, check standards are determined by the Accredited Standards Committee X9AB Payments Subcommittee of which Source Technologies is a voting member. The latest versions of the standards and technical guidelines are available from:

Hardcopy:

Global Engineering Documents
Phone 800-854-7179 or 303-397-7956
Fax 303-397-2740
global@ihs.com
<http://global.ihs.com>

Softcopy:

X9 Electronic Bookstore
www.X9.org - click ESS
www.ansi.org - click ESS
or
<http://webstore.ansi.org>

The key standards that address check documents are as follows:

ANSI X9.100-160 Specifications for Placement and Location of MICR Printing
ANSI X9.100-10 Paper Specifications for Checks
ANSI X9.100-20 Print and Test Specifications for Magnetic Ink Character Recognition
ANSI X9.100-30 Optical Background Measurements for MICR Documents
ANSI X9.100-110 Document Imaging Capability

For those with an interest or need there are also US standards that address Deposit Tickets, Check Endorsements (the back of the check), image interchange file formats, and other MICR areas.

Users of our Secure MICR Printers are not required to have access to the above standards. Our Technical Support staff maintains current knowledge of the standards and changes that affect the check industry in the US and other countries with unique requirements.

2. MICR Check Design

General Features of Check Design

To be a legal and negotiable document, the necessary data elements required on a check are the date, amount, payee name, payer's bank name, and payer's signature.

Other elements included in a good check design are: the amount in words, account title, check serial number, fractional routing number and MICR line.

A good check design contains security features and is formatted to be easily read by both machines and the human eye. If the format is complicated, the depositor, bank employee or reader/sorter machine may make an error in reading the data.

Position and Dimension Gauge

A MICR position and dimension gauge, like the one available from Source Technologies (part number 205-1000MGE or 220-M1027-34, is an important tool for use in designing checks. During check design, check your output against this gauge to determine if the data elements (date, amount, payee name, payer's bank name, and payer's signature) are correctly positioned on your document.

Design Elements in Detail

Paper

The ideal paper for check production is 24 to 29 lb. laser bond. Source Technologies' MICR lab has tested paper stock from most major manufacturers and has compiled a list of products that produce superior results. Contact your sales representative for this information. For a fee, Source Technologies will test your paper for proper MICR adherence and check reader/sorter performance. There are also many security features available to aid in the overall security of your MICR documents. Please refer to Chapter 4, Security Issues, for more information on check stock specifications and security features.

Size

The size of check documents must be:

6.00 inches to 8.75 inches in length

2.75 inches to 3.66 inches in height

We recommend standard 8.5" X 11" letter size stock or 8.5" X 14" legal size stock for proper feeding through your ST Secure MICR Printer. The number of checks per page is determined by your application. Custom size stock other than letter or legal can be done with proper planning and application programming within the paper size specifications for the base printer.

MICR Clear Band

The MICR clear band is an area at the bottom of the check where the MICR line prints. No other magnetic printing should appear in this area on both the front and back of the document. The clear band is an area 0.625 (5/8) inches high from the bottom of the check running the entire length of the check. Exact MICR line placement in this area is very important. Please refer to Figure 3.1 for more information on MICR line placement.

Data Elements

Date

The date is a required data element for a check. It represents the day upon which or after which the transfer of the check amount may take place. The date is usually placed in the upper right portion of the check so it does not interfere with the convenience amount field. The common format is Month, Day and Year, however, the military format of Day, Month and Year is also acceptable.

Amount

The amount of the check is a required data element for negotiation. The amount usually appears at least twice on the check. The amount printed in numbers is called the convenience amount. The amount printed in words is sometimes referred to as the legal amount; this is the amount that applies if there is a difference between the two amount fields. The amount may also be printed a third time on the check in a secure font, intended to make alteration of the amount field difficult. Please refer to Chapter 6 and Appendix B for information on Source Technologies' Secure Numeric Font.

Convenience Amount

The convenience amount location is specified in ANSI X9.100-110. Since this amount can be machine scanned, its location and design should be kept within the specifications. The amount beginning with the dollar sign should be left justified within the scan area with numbers spaced normally to the right. The dollars and cents should be separated by a decimal point with the cents printed in the same size font as the rest of the field. Embedded commas should not be used. The convenience amount background should have good reflectance so it does not interfere with optical scanning.

The convenience amount should be printed in a simple, fixed pitch font. We recommend our ICR Secure Numeric Font (see Appendix C). It was designed to be easily read by image capture equipment and is also a fraud deterrent. A fixed pitch courier font, or if available, OCR-B, are also acceptable fonts to print the convenience amount.

Note: *The Source Technologies' Secure Numeric Font (see Appendix B) should not be used in the convenience amount since it is not a machine-readable font.*

Amount in Words

The amount in words (sometimes called the legal amount) is normally located either above or below and to the left of the convenience amount. The area for the amount in words should be entirely filled to make alterations difficult. The amount should start at the far left of the line with the words placed immediately adjacent to each other. The cents need not be written out. They may be expressed as a fraction (60/100), and should be placed immediately to the right of the dollar amount and followed by a line or other space filler to inhibit alteration.

Example: One hundred forty-four and 62/100-----DOLLARS

Given the available area on the document, you may need to use a smaller font when printing larger value amounts.

Payee Area

The payee is a necessary data element for a negotiable document. The payee area is generally to the left side of the document either above or below the amount in words. It is often preceded by the words "Pay to the Order Of." The payee data should not enter the MICR clear band, which extends 5/8 of an inch above the bottom of the check. Some financial institutions have established specific print requirements for the Payee Name and optional address. Consult your bank for details on their print requirements.

Signature Area

A signature is a required data element for a negotiable document. The signature or signatures authorize the bank to honor the check; therefore, it must match the bank's records. The signature area should be beneath the convenience amount area but the signatures should not enter the convenience amount area or the MICR clear band. This is especially true if you print the signature with MICR toner.

Drawee Institution Name

The name of the institution where the maker's account is located is referred to as the drawee institution. The bank's name, city, and state are required.

Account Title

The account title is normally printed in the upper left corner of the check. It includes the name of the account holder and other information such as addresses, telephone numbers, and logos. The data in the title should be legible and sufficiently complete so that if the MICR data account number is destroyed, the drawee institution can refer to the account title in order to trace the account number.

Memo Line

This line is located in the lower left quadrant of the check, and is not required. Data printed here does not contain any legal significance. Printing in this area with magnetic toner should not extend downward into the MICR clear band which is 5/8 of an inch above the bottom of the check.

Check Serial Number

The check serial number is generally printed in the upper right quadrant of the check. Although the check number is not required for the check to be negotiable, the account holder and financial institution use these numbers to reconcile statements and execute stop payments. The check serial number should also appear a second time in the MICR line, and these numbers should match. The number of digits in the check serial number is controlled by the financial institution and the MICR line format. Consult your banking institution for their requirements.


Fractional Routing Number

The fractional routing number should be printed in a fractional format in the upper right quadrant of the check. This number is assigned to identify the Federal Reserve District and drawee institution. Consult with your bank for the proper routing number and format for each of your accounts.

MICR Line

Accurate high-speed processing of your checks by financial institutions is enabled by the accuracy and integrity of the data in the MICR line. Refer to figure 3.1 for the location of the following MICR line fields. The MICR line is read from **right-to-left** with position one being the right most position proceeding to position sixty-five on the left. The MICR line must be printed at exactly eight characters per inch.


Auxiliary On-Us Field—Positions 65 to 45

This field usually contains the check serial number for commercial size checks and possibly account control information. It is bounded by On-Us symbols . It is not included on personal, small size checks.


External Processing Code (EPC) Field—Position 44

This one digit field is position 44 of the MICR line. This field is usually left blank. The use of this field is reserved and is controlled by the ASC X9AB Standards Committee.

Routing Field—Positions 43 to 33

The routing field is bounded by Transit symbols  in positions 43 and 33. It contains fixed format information about the drawee institution. Consult with your bank for the specific data field to be placed here for each of your accounts.


On-Us Field—Positions 32 to 14

The On-Us field contains the makers' account number. The structure and content of this field is left to the drawee bank. On personal checks this field also contains the check serial numbers. The On-Us field may not consist of more than 19 characters. An On-Us symbol  must appear immediately to the right of the account number.

Blank Field—Position 13

Position 13 is always left blank.

Amount Field—Positions 1 to 12

The amount field is the right most field in the MICR line. It remains blank until it is printed by the bank of first deposit. When the check enters the banking system, the bank of first deposit encodes this field from data in the convenience amount field. It will be bounded by Amount symbols .

3. Quality Issues

A high quality MICR document can be read by bank reader/sorter equipment many times with no readability issues and does not result in damage to bank equipment. This quality is the result of a well-designed printer, an originally manufactured MICR toner and high-quality check stock.

MICR Printing Supplies

The ST9715 Secure MICR Printer has two user replaceable MICR components relative to printing MICR documents. Both components must be MICR capable units and be installed in the printer as a paired set.

MICR Cartridge

There are two size versions of the ST MICR cartridge. A new printer ships with a 1.5K or 1,500 page yield cartridge. The 5K version can be ordered for replacement. The cartridge yield is based on printing pages at an average print coverage of 5% in continuous printing mode. The yield claim has been certified by the procedures governed by the international standard ISO 19752.

Print applications that are more transactional and averaging near 5% coverage but nearer to a 1 to 3 page average print job, will see yield nearer to 85 to 95% of the stated yield. When the printer alerts the user that 0 pages remain and a new cartridge is needed, the cartridge is empty. It must be replaced to continue.

MICR Imaging Unit or IU

The imaging unit contains a majority of the components needed to transfer an image to paper. The unit also contains a Refuse Bin for storing any waste toner cleaned from the photoconductor or OPC. In terms of component wear and waste capacity, the IU useful life should be near 40K or 40,000 pages or sides assuming some duplex printing. The 40K is based on an average print coverage of 5% and an average print job size of three pages or page sides. Lower actual average print coverage and/or a larger average page count per job will increase the useful life of the IU. Higher actual average print coverage above 5% and/or a smaller average page count below three will shorten the useful life. Internally, the printer automatically adjusts unit alarms or replacement alerts based on the actual printing factors. If the actual print averages extend the useful life beyond the 40K page forecast, the printer will not exceed 60K pages or sides due to wear OPC factors. The printer will stop printing and request a new unit.

Printer Features

Your secure MICR printer is equipped with some features to ensure high-quality MICR documents.

Paper Type

When the printer senses the presence of a Source Technologies' MICR toner cartridge, internal operating points that affect the print engine and fuse grade are optimized for MICR documents and the MICR toner. For the optimum MICR quality we recommend that the printer paper trays with check paper have the Paper / Texture / Weight settings set to Bond / Rough / Heavy. See the base printer's User's Guide regarding paper tray settings.

Print Density

For optimum MICR quality and maintaining compliance to the check printing standards, the Print Density should be set to density 8, the default value, when printing MICR documents.

MICR Toner and Imaging Unit (IU) nearing end-of-life

Internal alarms are set to alert the end user that the print cartridge or IU is approaching the end of useful life and will require replacement soon. The initial alarms are set to 10% life remaining for the cartridge and 5% remaining for the IU. See the base printer's User's Guide for custom alarm alternatives. See Section 8 of this manual for information on the relative messages displayed.

MICR Toner and Imaging Unit (IU) end-of-life

When the toner cartridge or the IU is determined to be at end-of-life, (0 Pages Remaining) the printer will stop printing. To continue printing, a new cartridge or IU will need to be installed. See Section 8 for information on the relative messages displayed.

MICR Toner

Use only Source Technologies' MICR toner when printing MICR documents. It is specifically engineered to print quality MICR documents with your printer. The printer's MICR toner sensor is designed to work with the Source Technologies' MICR toner cartridge to prevent printing checks with regular toner components installed.

Source Technologies does not recommend the use of refilled or remanufactured MICR toner cartridges. Refilled cartridges may result in expensive printer repairs and bank check reject fees due to an inferior MICR toner formulation.

MICR Check Stock

Check stock has a significant impact on the resulting quality and security of your MICR document. Here are a few features that should be considered when selecting a check stock. Please see Chapter 4: *Security Issues* for more information on check stock security features.

Quality

Quality MICR check printing with your Source Technologies' secure MICR printer requires check stock that matches the printer's requirements. Source Technologies can supply paper specifically made for our printers. If you wish to order check stock from other suppliers, please show the following requirements to your sales representative. We will test other suppliers' paper for a nominal fee.

Layout

Layout your check design before any paper is purchased or layout your design to existing check stock. Keep perforations, orientation, special logos and any color elements in mind. The printer can print just about anything as long as it is black.

Weight

We recommend 24 lb. - 29 lb. paper.

Stiffness

We recommend Taber M.D. 2.5 and C.D. 1.1 minimum.

Smoothness

For best toner fusing, we recommend rougher surfaces within the base printers' specifications, and the Paper Specifications for Checks, X9.100.10. We recommend a smoothness range of 150 to 200, Sheffield.

Paper Grain Direction

When using 24 lb. - 29 lb. bond paper we generally support either long or short paper grain. Overall performance in the bank's reader/sorters is best when the resultant grain direction is left to right when viewing the check.

Perforations

All perforations in the stock should be Laser-Cut or Micro-Perfs (20 or more cuts per inch). Larger perforations can produce excessive paper chaff and result in damage to the toner cartridge. Perforations should be ironed by the paper supplier to reduce nesting and potential double feeding of paper sheets.

Moisture

The paper moisture content should be between 4.7 and 5.5%. Storage conditions have much to do with the final moisture content of most papers. Store your check stock in a cool, dry, environmentally stable and secure area. Protective wrappings should be removed just prior to use.

4. Security Issues

Printing negotiable documents from blank paper on desktop MICR laser printers makes security a top priority for any company embarking on a desktop check-printing project.

Combating fraud is a moving target. As soon as a new weapon is developed, malicious forces are at work to devise workarounds to it. Good security programs integrate hardware, software, your employees, processes, and your financial institution into a secure check production system. The ultimate liability for fraudulent documents rests with the banks and their customers, and there can be many vulnerable points throughout the overall system. Customers must have systems designed and documented to show “Ordinary Care and Good Faith Effort” is in place to avoid liability. In the past, financial institutions generally credited corporations when fraud was discovered. Today, regulations attempt to define who may have been negligent in the transaction and put the liability on that party or parties. If a fraudulent occurrence can be traced to a corporation’s lack of security procedures or the design of their negotiable documents, the regulations will protect the banks, or at best case the loss will be shared.

The following internal and external security measures will help minimize your risk of check fraud.

1. Stay abreast of current check fraud methods and the latest in fraud detection. Many financial institutions offer seminars to educate corporate clients.
2. Financial institutions should train tellers to look at the check, not the person presenting the check. The check, not the person, is the item that must be verified.
3. Incorporate security features into your base check stock and utilize printed security features that address both alteration and counterfeiting of original items. We have found the following check stock security features to be of merit:

Artificial Watermarks - White on white printing generally on the back reveals words or patterns when held at an angle. You should state on the front of the check that this feature is present. True watermarks are valuable but more costly.

Laid Lines - Background lines that make cut and paste alteration difficult. These are normally on the back of the check.

Fuse Enhancing Additive - Coatings or additives to the paper that improve the bonding of toner to the paper. This helps prevent altering of critical data such as the amount, or payee name.

Chemical Additives - If an ink eradicator (bleach, acetone, etc.) is applied to the document, the eradicator creates a permanent stain.

Numbered Check Stock - Sequential numbering printed in dye that penetrates to the reverse side of the check can be used to verify authenticity.

This also provides for inventory control of blank check stock. This number should not be linked or be equal to the check serial number due to the potential of occasional double feeding of paper in laser printers.

Note: These features serve as a general guide for check security. You should not consider these features as an all-inclusive list. We recommend consulting with your paper supplier or bank for any additional comments or suggestions.

4. Firms accepting checks should be aware of damaged MICR lines. Intentionally damaging the MICR line can increase the time necessary to process an item, giving the forger enough time to leave town. Discoloration could be an indication of alteration as well.
5. Safeguard check stock paper, and limit access only to necessary employees.
6. When generating final negotiable items:
 - The document always includes the amount value in words
 - The document should not include information that limits the value range, i.e. "Not valid over \$500." This only guides the fraudulent attempt. Use your application software to detect out of range items
 - All levels of hardware and software password protection should be utilized
7. Understand and approve the security procedures of your check stock suppliers to safeguard stock in their custody.
8. Consider "Positive Pay" check services from your financial institution. You should provide the check number, check date, dollar amounts, and sometimes the payee name to your bank when checks are issued. The bank will match these values and alert you to mismatches before clearing the check to your account. Financial institutions should encourage full participation of corporate clients.
9. Move methods of fraud detection to the item's point of entry into the clearing system. For example, low cost readers can detect low magnetic strength in the MICR line, which is a possible indication of attempts to copy an original.
10. Review and document your internal negotiable document printing procedures. Investigate employee backgrounds before assigning security authority. Split the responsibilities. For example, an accounts payable production/security officer should not also balance the account.

5. MICR Features

Source Technologies' secure MICR printers are designed to allow both general office document printing and secure MICR document printing. You may print a variety of conventional jobs with regular Lexmark toner using all of the printer features available such as network printer utilities. Source Technologies' printers support multiple printer languages (for example - HP's PCL5 & PCL6, PostScript Level 2 emulations). The MICR features require the PCL5e print data stream. Source Technologies has designed features to enhance these printers with MICR mode specific operation that allows you to securely print high-quality negotiable documents.

Secure MICR

Source Technologies' secure MICR printers have resident fonts for printing MICR documents, password secured in Flash memory. Specific PJI commands are required to unlock and relock these font resources. While unlocked, they can be accessed with standard PCL5e commands. Please refer to Chapter 6 for more information. In addition to the secured font resources, the printer has been internally modified to ensure high quality printing with MICR toner. Specific print densities, transfer voltages and fusing temperatures are factory pre-set. Source Technologies' Secure MICR printers only support Source Technologies MICR toner cartridges.

MICR Fonts

The E-13B and CMC7 MICR fonts reside in the printer. Examples of these fonts are in the Appendix of this manual.

Secure Fonts

Source Technologies has designed two fonts: Secure Numeric Font and ICR Secure Numeric Font. These reside in the printer as well. Examples of these fonts are in the Appendix of this manual.

- The ICR Secure Numeric Font is designed for the Convenience Amount Scan Area of your check. It can be read optically by the image capture equipment used by the financial institutions.
- The Secure Numeric Font should not be used in this area since the reverse image aspect of this font prevents it from being read optically by this equipment.

We recommend using both of these fonts on your checks as they are designed to deter check fraud.

MicroPrint

Your secure MICR printer also contains the MicroPrint font. MicroPrint is text less than .010" tall. It can easily be read with a magnifying glass but appears to be a solid line to an unaided eye. This font provides protection against reproduction by some scanners and copiers.

Most check printers use a MicroPrint font in the signature area of their preprinted checks. We recommend using this font to help deter check fraud. The text in this font can either be fixed, such as the name of your organization, or it can be variable, such as the check amount, payee name, etc. The use of variable text provides an additional method of protection against check counterfeiters.

Use of the “MP” designate symbol, to identify the line as MicroPrint, is optional. The ST MicroPrint font only contains alphanumeric characters. Punctuation marks, special symbols and spaces are ignored by the font’s design and do not print.

Resource Storage

The Flash memory in the printer contains five Source Technologies’ secured fonts but can be loaded with additional resources for check or non-check printing. The Flash can be loaded with signature fonts, overlay Macros, or other custom resources limited only by the available space. Flash memory in the ST9712 is read/write password protected. To load additional resources to Flash requires the proper PJI commands to unlock the Flash memory device. This will be detailed in Chapter 6.

Storing resources (fonts, Macros, etc.) in RAM is also an option. Resources in RAM are deleted when the printer is powered off and cannot be password protected in the printer.

MICR Toner Cartridge

When a MICR toner cartridge and MICR imaging unit are installed the following occurs:

Control of image density or print density and fusing temperatures are set to optimum levels for MICR printing.

When the PJI “MICRJOB” command is sent, the following occurs:

1. The printer forces internal copies to 1. Downloaded copy commands are ignored.
2. Automatic reprint of jammed documents is disabled, forcing the application to reprint any jammed documents. This provides an audit trail to the application of the jam event.
3. The printer checks for the presence of MICR toner cartridge and Imaging Unit and will issue a message “Install MICR Cartridge” to the operator panel if not presently installed.

6. MICR Commands

The following are the key PJP and PCL commands required to access MICR resources in the printer. For more information on PJP and PCL languages, contact Source Technologies Technical Support for the most current version of 's Printer Languages and Interfaces Technical Reference documentation.

PJP MICRJOB

The MICRJOB command (@PJP MICRJOB) forces Copy count=1 and Jam Recovery=OFF. In addition, if your MICR printer has been custom configured to support both standard and MICR cartridges, the MICRJOB command will request a MICR cartridge and Image Unit to be installed. The function of the MICRJOB PJP command supports both SET and DEFAULT PJP options. An older version of the @PJP MICRJOB without a SET or DEFAULT is still supported and functions similar to the SET command.

SET and DEFAULT formats for the MICRJOB command

There are two formats of the SET MICRJOB command

```
@PJP SET MICRJOB=ON  
@PJP SET MICRJOB=OFF
```

The ON value must be included with the MICR printing application data stream. The OFF value can allow a particular job to be processed as a non-MICR job if the DEFAULT MICRJOB=ON was the current status of the printer.

There are two formats of the DEFAULT MICRJOB Command

```
@PJP DEFAULT MICRJOB=ON  
@PJP DEFAULT MICRJOB=OFF (factory default)
```

The ON value forces all jobs to be treated as MICR jobs. This command format allows users who cannot embed MICRJOB into their MICR printing application data stream to send MICRJOB separately. For example, the user could send the command in a flat file totally separate from the printing application. Once set, the printer is now ready for MICR printing. The OFF format returns the printer to the factory default value.

Because DEFAULT commands alter information stored in non-volatile memory, the frequency of switching between DEFAULT ON & OFF should be limited to around 5 times daily thereby protecting the memory from early failure.

Fonts and Secured Resources

Source Technologies' secure MICR printers hold five password protected fonts in Flash memory. The printer requires PJP commands with the correct password value to unlock the font resources, followed by PCL commands to print the fonts. They are then re-locked by PJP commands or by a printer power cycle.

The PJP commands to unlock the fonts must precede all PCL commands. The re-lock PJP commands must follow the PCL commands and final form feed command. The PCL commands can print an unlimited number of pages between the unlock and re-lock

sequences. The following examples will use <ESC> to indicate the Escape character, ASCII 27 (1B). Values shown in parentheses () are hexadecimal.

PJL Unlock Sequence

```
<ESC>%-12345X@PJL LDECLARE LRESOURCE:"flash:" LRWLOCK="PASSWORD"
(0D) (0A)@PJL ENTER LANGUAGE=PCL (0D) (0A)
```

The sequence contains a UEL (Universal Exit Language) command followed by the PJL unlock and enter language commands. These commands are case sensitive. PASSWORD is the initial default password value. The command delimiter is a Line Feed (hex 0A) with Carriage Return (hex 0D) being optional. Spaces are required as shown. The ENTER LANGUAGE command is optional but recommended. The command should also end with a LF (hex 0A). At this time all secured resources including any resources that are customer unique in Flash are unlocked and available to PCL commands.

The password value is limited to no more than 8 alphanumeric, case-sensitive characters.

PJL Re-Lock Sequence

```
<ESC>%-12345X@PJL LDELETEPASSWORD LRESOURCE:"flash:" (0D) (0A)
<ESC>%-12345X
```

This sequence re-locks the resources with no change in the password value. The PJL syntax of LDELETEPASSWORD is **not** the password. The command sequence terminates with the UEL command (Universal Exit Language). This is optional but recommended.

PJL Re-Lock Sequence With A New Password Value

```
<ESC>%-12345X@PJL DEFAULT LRESOURCE:"flash:" LRWLOCK="xxxxxxx"
(0D) (0A)<ESC>%-12345X
```

This command requires the resources to be previously unlocked. The new password is represented by the value xxxxxxxx. The UEL is again optional but recommended.

After consulting Lexmark Technical Reference materials you may wish to expand the PJL sequences to include more than the examples above. To chain multiple PJL commands, follow the following format:

```
(UEL) (PJL COMMAND) (0A) (PJL COMMAND) (0A) (PJL COMMAND) (0A) (UEL or
ENTER LANGUAGE)
```

The normal printer action to any format problems or missing or extra symbols is to ignore the PJL command. This may make it difficult to troubleshoot format errors.

PCL Font Call Commands

After PJL has unlocked the MICR Flash resources, the ST9715 uses standard PCL5e commands to print. The five resident Source Technologies MICR font resources are all bitmapped fonts and therefore cannot be scaled larger or smaller than the bitmapped images. These fonts can be called by either a PCL Font Selection String or by their ID. The commands are:

E13B MICR FONT	<ESC>(100<ESC>(s0p8h8v0s7b360T	The Selection String
	<ESC>(30802X	The ID Call
SECURE NUMERIC	<ESC>(16C<ESC>(s0p5h36v0s112T	The Selection String
	<ESC>(30043X	The ID Call
ICR SECURE	<ESC>(10<ESC>(s1p12v0s0b110T	The Selection String
	<ESC>(30066X	The ID Call
CMC7 MICR FONT	<ESC>14Y<ESC>(s0p8h8v0s0b361T	The Selection String
	<ESC>(30803X	The ID Call
MicroPrint	<ESC>(2Q<ESC>(s1p1v0s0b112T	The Selection String
	<ESC>(30055X	The ID Call

MICR FONT NOTE – The E-13B and CMC7 Fonts are 8 characters per inch. To position correctly at an exact 8 characters per inch, the printer must be set to an internal Unit of Measure of 600 DPI or greater or must have a horizontal motion index command at 8 CPI be issued after the font call. This is true even if the base printer is set at 600 DPI. The default character positioning is at 300 DPI, and 300 divided by 8 equals 37.5 pixels. The printer will either round down to 37 or up to 38 pixels causing characters to creep. There are multiple ways to resolve this:

1. If you are using a printer driver set to 600 DPI, the printer data stream should include a Unit of Measure PCL command set to 600. The command is
<ESC>&u600D
2. If the application controls the printer data stream, add the Unit of Measure command early in the data stream. The command also affects X & Y positioning commands. Add <ESC>&u600D
3. After calling the E-13B MICR font, issue an HMI (Horizontal Motion Index) command set to 8 characters per inch.
<ESC>&k15H

The command must be included with every E-13B MICR font call using either the Selection String or ID call. The command string is:

<ESC>(100<ESC>(s0p8h8v0s7b360T<ESC>&k15H font data—The Selection String

<ESC>(30802X<ESC>&k15H font data—The ID Call

Refer to the Font Mapping Appendix pages for specific character set data for each font.

Toner Cartridge and Imaging Units

The ST9715 MICR Print Cartridge is comprised of two components: the toner cartridge and the imaging unit.

Toner cartridges are available in two models depending on the yield: a 1.5K page and a 3K page. The 1.5K model ships with new printers. The 3K model is the normal replacement model. The projected life in terms of page count is based on a typical 5% print coverage and continuous print mode. These projected values of 1,500 and 3,000 were certified using the ISO 19752 Yield Testing Methodology. The standard requires continuous print mode. The projected life is reduced somewhat dependent on the actual average print-job page count.

The imaging unit contains a majority of the components needed to transfer an image to paper. The unit also contains a Refuse Bin for storing any waste toner cleaned from the photoconductor or OPC. In terms of component wear and waste capacity, the IU useful life should be near 40K or 40,000 pages or sides assuming some duplex printing. The 40K is based on an average print coverage of 5% and an average print job size of three pages or page sides. Lower actual average print coverage and/or a larger average page count per job may increase the useful life of the IU. Higher actual average print coverage above 5% and/or a smaller average page count below three will shorten the useful life. Internally, the printer automatically adjusts unit alarms or replacement alerts based on the actual printing factors. If the actual print averages extend the useful life beyond the 40K page forecast, the printer will not exceed 60K due to wear OPC factors. The printer will stop printing and request a new unit.

The ST9715 MICR printer keeps record of the actual printing modes in terms of average print job size and the actual average print coverage percentage. The printer internally adjusts when either the toner cartridge or photoconductor unit needs to be replaced. The following error messages pertain to the toner and imaging unit.

Error Messages

Your secure MICR printer has a set of front panel error messages unique to MICR applications. These messages appear if there is a MICR related problem. The printer may also print an error message on the page near where the error occurred. In many cases you can receive more information about a displayed error by pressing Continue. See the base printer's User Guide for posted errors on the operator's panel not listed below.

Cartridge Related Errors

Error Message on Display	Printed Message	Description	Action
41.xx Cartridge, imaging unit mismatch	N/A	The printer may have the wrong cartridge or wrong IU installed. These supplies must both be either MICR or standard (non-MICR)	Check labels and install matched components
84.xx – Imaging unit low	N/A	The IU will soon need to be replaced. 5% life remains.	Press CONTINUE to continue printing.
88.xx – Cartridge is low	N/A	The amount of toner in the cartridge is getting low. 10% life remains.	Press CONTINUE to continue printing.
Install MICR Cartridge	N/A	Before printing a MICR document, the printer checks for MICR toner supplies. If regular cartridge and IU are installed, the printer will stop all printing and display this message.	Replace the standard toner cartridge and standard IU with a MICR toner cartridge and IU. If MICR toner is not available, you must power-off your printer and restart the print job at a later time when MICR toner is available.
84.xx - 0 pages remain, replace imaging unit	N/A	The imaging unit is at End-Of-Life. It needs to be replaced.	Replace only the imaging unit. The toner cartridge need not be replaced.
88.xx – 0 pages remain, replace the cartridge	N/A	The toner cartridge is empty and needs to be replaced	Replace only the toner cartridge. The IU need not be replaced.

7. MICR Command Example

Figure 7.1, is an illustration of an Accounts Payable check and remittance information. The page used a PCL macro for the static data and background design. This manual does not address macro design and programming but the variable text information including all the PCL and PCL commands used to print the example are located later in this chapter. For illustrative purposes there are some extra spaces in the text preceding the printable data. The following paragraphs describe the command functions. The commands are a minimal set chosen to produce the example. Please consult Lexmark Technical publications for the complete descriptions of PCL and PCL printer commands

PJL Unlock Sequence

The first two lines of the variable text example are PJL commands that unlock the MICR font resources and enter PCL language processing. The password, PASSWORD, is the default. These commands and all of the following commands are all case sensitive.

<ESC> is used to illustrate the ASCII Escape Character, ASCII 27, hex 1B. An actual data stream requires the Escape Character, not <ESC>.

PCL Initial Set-Up

The next two commands set up some printer PCL variables. These commands are normally early in the data stream. <ESC>&l2a1h6d1e64F sets the paper size to LETTER, the input tray to TRAY 1, the lines per inch to 6, the top margin to 1, and the lines per page to 64. The next command, <ESC>&u600D, is the Unit of Measure command set to 600 dots per inch as mentioned in chapter 7. This affects proper MICR line spacing and X and Y cursor positioning.

PCL MACRO Call

The next command calls macro 100 that was previously loaded in RAM memory. When called, the graphic background, logos, and static data are written to the internal print buffer.

PCL Font Calls, Positioning Commands and Variable Print Data

The next eleven lines of data in the example call printer resident fonts, position the cursor, and print the variable information. This is using the minimal data required, particularly the font selection strings, <ESC>(s4099t0b10H being a very short version to call Courier, Normal Weight, 10 Pitch.

<ESC>*p300x600Y is a PCL positioning command. In this case its values are 600 pixels down and 300 pixels to the right of the upper left corner of the page. The Unit of Measure command determines the exact distance.

The next 4 lines call the secured MICR font resources using the ID for the font call. The Form Feed prints the page.

PJL Re-Lock Sequence

The last two lines re-lock the secured fonts. The password is not changed in this example.

FIGURE 7.1 SAMPLE ACCOUNTS PAYABLE CHECK

CHECK NO: 123456


Source Technologies, Inc. 2910 Whitehall Park Drive Charlotte, NC 28273

REFERENCE NUMBER	INVOICE DATE	GROSS AMOUNT	DISCOUNT TAKEN	NET AMOUNT
XXXXXXXXXX	xx/xx/xxxx	\$x,xxx.xx	3%	\$x,xxx.xx
TOTALS				

CHECK NO: 123456

Source Technologies, Inc. 2910 Whitehall Park Drive Charlotte, NC 28273

REFERENCE NUMBER	INVOICE DATE	GROSS AMOUNT	DISCOUNT TAKEN	NET AMOUNT
XXXXXXXXXX	xx/xx/xxxx	\$x,xxx.xx	3%	\$x,xxx.xx
TOTALS				



Source Technologies, LLC
2910 Whitehall Park Drive
Charlotte, NC 28273
800.922.8501

Check No. 123456

NON-NEGOTIABLE Date xx/xx/xxxx

\$1,234.56**

DOLLAR 9-9-9-9-9-9 ONE CORRA TWO THREE FOUR FIVE SIX

PAY xxxxx Thousand xxxxx Hundred xxxxx Dollars and xx/100

TO THE ORDER OF Your Company
123 Main Street
Yourcity, ST 12345-6789

\$1,234.56**

NON-NEGOTIABLE

⑈0 1 234 56⑈ ⑆ 1 234 56 780⑆ 0 1 234 1 234 ⑈ 56 70⑈

PJL and PCL commands used to print the sample check:

<ESC>%-12345X@PJL LDECLARE LRESOURCE:"flash:" LRWLOCK="PASSWORD"

```

@PJL MICRJOB

@PJL ENTER LANGUAGE = PCL

<ESC>&l2a1h6d1e64F

<ESC>&u600D

<ESC>&f100y3X

<ESC>(s4099t0b10H

<ESC>*p300x600Y xxxxxxxx xx/xx/xxxx $x,xxx.xx 3% $x,xxx.xx

<ESC>*p300x2775Y xxxxxxxx xx/xx/xxxx $x,xxx.xx 3% $x,xxx.xx

<ESC>*p3250x75Y<ESC>(s4099t3b8H 123456

<ESC>*p3250x2200Y 123456

<ESC>*p4250x4450Y 123456

<ESC>*p3650x4775Y xx/xx/xxxx
<ESC>*p400x5225Y<ESC>(s4099t0b15H xxxxx Thousand xxxxx Hundred xxxxx
Dollars and xx/100 Cents

<ESC>*p600x5600Y<ESC>(s10H ABC TOOL & DIE

<ESC>*p600x5700Y 123 Main Street

<ESC>*p600x5800Y Yourcity, ST 12345-6789

<ESC>*p900x6325Y<ESC>(30802X<ESC>&k15H O123456O T123456780T
12345D67890O

<ESC>*p1500x5100Y<ESC>(30043X ($**1,234.56)

<ESC>*p3650x5400Y<ESC>(30066X $**1,234.56















<0C> Form Feed

<ESC>%-12345X@PJL LDELETEPASSWORD LRESOURCE:"flash:"

<ESC>%-12345X

```

Appendix A: E13B MICR Font Mapping














MICR Font Character	Description	Alpha/Numeric Values ¹	Hex Values
	Amount Symbol	A a /	41 61 2F
	Transit Symbol	T t B b :	54 74 42 62 3A
	On-Us Symbol	O o C c ;	4F 6F 43 63 3B
	Dash Symbol	V v D d - =	56 76 44 64 2D 3D
	Zero	0	30
	One	1	31
	Two	2	32
	Three	3	33
	Four	4	34
	Five	5	35
	Six	6	36
	Seven	7	37
	Eight	8	38
	Nine	9	39

Example:







⑆ 1 2 3 4 5 6 7 8 9 ⑆ 1 2 3 4 5 6 7 8 9 0 ⑆

¹Select only one alphanumeric character to call the font.

Appendix B: Secure Numeric Font Mapping

Description Character	Alpha/Numeric Character	Hex Value Character	Secure Font
Dollar Sign	\$	23	 The dollar sign is rendered in a stylized font with horizontal lines. Below the symbol, the word "DOLLAR" is printed in a small, sans-serif font.
Left Bracket	(28	 The left bracket is rendered in a stylized font with horizontal lines. Below the symbol, the word "LEFT" is printed in a small, sans-serif font.
Right Bracket)	29	 The right bracket is rendered in a stylized font with horizontal lines. Below the symbol, the word "RIGHT" is printed in a small, sans-serif font.
Asterisk	*	2A	 The asterisk is rendered in a stylized font with horizontal lines. Below the symbol, the word "ASTERISK" is printed in a small, sans-serif font.
Comma	,	2C	 The comma is rendered in a stylized font with horizontal lines. Below the symbol, the word "COMMA" is printed in a small, sans-serif font.
Dash	-	2D	 The dash is rendered in a stylized font with horizontal lines. Below the symbol, the word "DASH" is printed in a small, sans-serif font.
Period	.	2E	 The period is rendered in a stylized font with horizontal lines. Below the symbol, the word "PERIOD" is printed in a small, sans-serif font.
Slash	/	2F	 The slash is rendered in a stylized font with horizontal lines. Below the symbol, the word "SLASH" is printed in a small, sans-serif font.
Zero	0	30	 The zero is rendered in a stylized font with horizontal lines. Below the symbol, the word "ZERO" is printed in a small, sans-serif font.
One	1	31	 The one is rendered in a stylized font with horizontal lines. Below the symbol, the word "ONE" is printed in a small, sans-serif font.
Two	2	32	 The two is rendered in a stylized font with horizontal lines. Below the symbol, the word "TWO" is printed in a small, sans-serif font.
Three	3	33	 The three is rendered in a stylized font with horizontal lines. Below the symbol, the word "THREE" is printed in a small, sans-serif font.
Four	4	34	 The four is rendered in a stylized font with horizontal lines. Below the symbol, the word "FOUR" is printed in a small, sans-serif font.

Appendix B continued: Secure Numeric Font Mapping















Description	Alpha/Numeric Character	Hex Value	Secure Font Character
Five	5	35	
Six	6	36	
Seven	7	37	
Eight	8	38	
Nine	9	39	
Arrow	>	3E	

Example: Select font as send(\$>>123,456.00)


















Note: The secure fonts in the example are magnified for purposes of clarity.

Appendix C: ICR Secure Numeric Font Mapping

Description	Alpha/Numeric Character	Hex Value	Character
Zero	0	30	
One	1	31	
Two	2	32	
Three	3	33	
Four	4	34	
Five	5	35	
Six	6	36	
Seven	7	37	
Eight	8	38	
Nine	9	39	
Asterisk	*	2A	
Comma	,	2C	
Period	.	2E	
Dollar Sign	\$	23	

Note: The secure fonts in the example are magnified for purposes of clarity.

Appendix D: CMC7 MICR Font Mapping

Description	Alpha/Numeric Characters	Hex Values	CMC7 Font	Values ¹
Zero	0	30		
One	1	31		
Two	2	32		
Three	3	33		
Four	4	34		
Five	5	35		
Six	6	36		
Seven	7	37		
Eight	8	38		
Nine	9	39		
Colon	:	3A		
Semi-Colon	;	3B		
Less Than	<	3C		
Equal	=	3D		
Greater Than	>	3E		

Note: The CMC7 Font in the example above is magnified for purposes of clarity.

Appendix E: Contact

For more information, contact:

Source Technologies.
4505B Westinghouse Commons Drive
Charlotte, NC 28273

www.sourcetek.com

techsupport@sourcetek.com

800.922.8501