EVOLUTION TSC

INK JET PRINTERS
INSTALLATION AND OPERATION MANUAL

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This manual is for use in operating and maintaining the EVOLUTION ink Jet Printer, covering both the HP, LX, SC, DEP, DET and LD versions when used in conjunction with the Touch Screen Controller (TSC). This manual also includes various optional features, which may not be included in your basic model printer. For basic set-up instructions, please refer to PART 1 Installation Procedures.

Digital Design Inc. has a policy of continual product improvement. The Company therefore reserves the right to modify the information contained in this manual without prior notice.

ALL PRINT CARTRIDGES SUPPLIED BY DIGITAL DESIGN INC. ARE FACTORY TESTED AND PROFILED TO PRODUCE AN OPTIMUM AND CONSISTANT CODE. USING OTHER THAN AUTHORIZED CARTRIDGES WILL CAUSE UNDESIRABLE RESULTS.
EACH FLASH DATA CARD IS PROFILED EXPLICITELY FOR ITS' INTENDED PRINTER, AND IS SECURITY LOCKED PROHIBITING USE IN OTHER THAN THE ORIGINAL PRINTER FOR WHICH IT WAS PURCHASED. KEEP ALL UPGRADE CARDS IN A SECURE PLACE.
EVOLUTION I IS A NON-FEATURED MODEL WITH VARIABLE FIELD PROGRAMMING AVAILABLE THROUGH SOFTWARE UPGRADES.
EVOLUTION II & IV ARE FULLY FEATURED MODELS WITH VARIABLE FIELD PROGRAMMING AND BARCODE CAPABILITIES.

EVOLUTION TSC CONTROLLER

The photo at the left is the startup screen and designations for the HP style printer.

The upper left corner of the information area (blue) shows EV 2 and could change to EV 1 or EV 4 or any other printer series depending on the type of system currently attached to the TSC.

The photo at the left is the startup screen and designations for the LX style printer.

The upper left corner of the information area (blue) shows LX 2 and could change depending on the type of system currently attached to the TSC.

The photo at the left is the startup screen and designations for the SC style printer.

The upper left corner of the information area (blue) shows EVSC, which is the only designation for small character systems.

The photo at the left is the startup screen and designations for the DEP style printer.

The upper left corner of the information area (blue) shows DEP 2, which is the only designation for DEP systems.

NOTE:
THE EVOLUTION TSC (TOUCH SCREEN CONTROLLER)
GRAPHIC CONTROLLER WILL CONTROL THE

```
        EVOLUTION 1  (EV1)
        EVOLUTION 2  (EV2)
        EVOLUTION 4  (EV4)
        EVOLUTION DEP    (DEP)
        EVOLUTION DET    (DET)
        EVOLUTION LD (LD)
        EVOLUTION SC (EVSC)
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THE UPPER LEFT CORNER OF THE BLUE SHADED INFORMATION AREA INDICATES THE SPECIFIC PRINTER TYPE AND ADDRESS CONNECTED TO THE TSC CONTROLLER

PART 1: INSTALLATION PROCEDURES
INSTALLING THE EVOLUTION PRINTING SYSTEM

Caution should be taken while installing the EVOLUTION printing system on your equipment. Digital Design Inc. has taken every precaution to ensure a safe and accurate instruction set to guide the installer through the installation process. Follow the operational guidelines in the installation procedures.

VERIFY THAT YOUR EQUIPMENT IS IN PROPER OPERATING CONDITION.

LOCATE A CONVENIENT POSITION ON YOUR EQUIPMENT. EVOLUTION PRINTERS REQUIRES 4-1/2" OF SPACE ON THE PRODUCTION LINE.

FOLLOW THE INSTALLATION PROCEDURES.

READ CAREFULLY ALL INSTALLATION PROCEDURES BEFORE PROCEEDING.

INSTALL THE PRINTING SYSTEM ON YOUR EQUIPMENT. THERE IS NO EXTRA HARDWARE REQUIRED OTHER THEN THAT SUPPLIED IN THE INSTALLATION KIT.

MOUNTING ON PRODUCTION LINE

```
MOUNTING BRACKET TEMPLATE
     PLACE ADHESIVE TEMPLATE
       ON PRODUCTION LINE


   ⊕      MARK CENTER SPOTS    ⊕


 DRILL AND TAP 5/16-18 (0.250 DRILL)
               OR
   CLEAR DRILL 11/32 (0.343 DRILL)
```
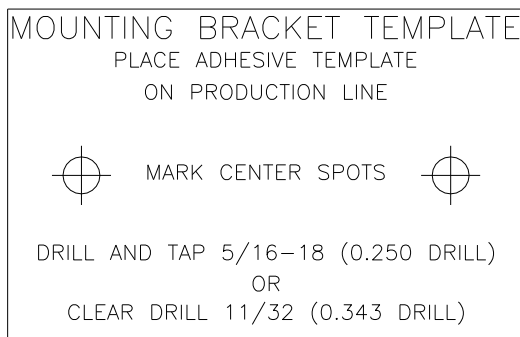
Locate the supplied mounting template and affix in a convenient location on the production line. Spot and drill both mounting holes for a 5/16" bolt. NOTE: the user may also thread the side of the conveyer using a 5/16" tap.

Fasten the mounting bracket to the conveyer using the supplied mounting hardware and ensuring that the supplied ground strap is located securely beneath either of the two mounting bolts, and that conductivity to earth ground is less than 1 ohm. This ensures a proper path for static discharge, should the need arise.

EVOLUTION MOUNTING OPTIONS

The EVOLUTION mounting bracket assembly C21010 has a number of possible mounting configurations, which allows adaptability to a variety of production equipment.

Refer to the first pictorial to identify the various components of the mounting bracket system C21005.

C21010-1
34313
C20744
C21010-2
C20741
0.2000
501KHS/9714K24
504JCS
503JHS
5993K41
C20742
3/8FWSS
8.475
(WITH ARM EXTENDED)
C20755
10.5000
13.175
(WITH C20742 BRACKET REVERSED)
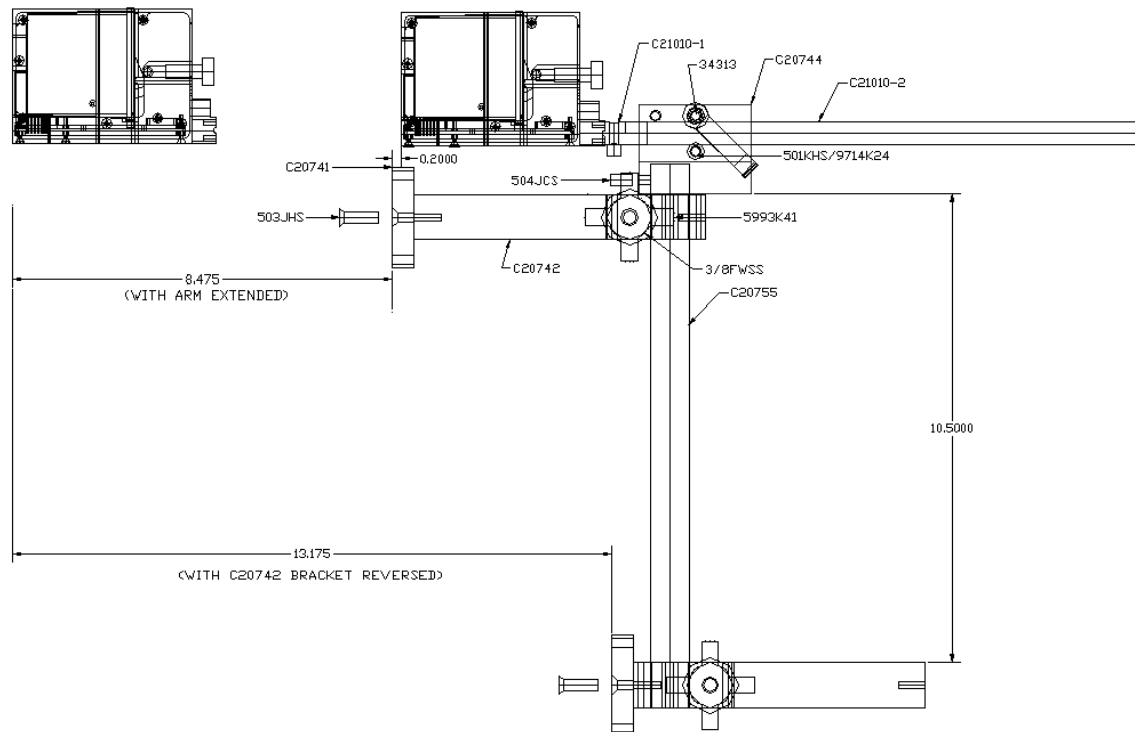
The horizontal rod guide bracket C20744 may be rotated 180 deg by loosening the included setscrew 504JCS and rotating the bracket. This allows the print head to be extended by 1.825".

Loosening the included hand knob 5993K41 and adjusting the printer up or down as required accomplish vertical height adjustment for the print head assembly.

Note that the hand knob may be mounted on either side of the vertical post holder bracket C20742 depending on the orientation of the bracket. It should also be noted when rotating the horizontal rod guide assembly C20744; the ratchet handle 34313 is on the opposite side of the cross slide assembly. Ensure that the 501KHS (1/4-20 socket screw) and 9714K24 (wave washer) are only loosely hand tight. Over-tightening will prevent the horizontal rod from moving freely while adjusting.

Rotating the vertical post holder bracket C20742 further increases extension into the production line. The mounting centers on both ends of the vertical post holder bracket C20742 are identical. Remove the two 502JHS flat head screws from the bracket mount C20741 rotate the bracket and replace screws.

The above procedure allows for an extended print head displacement of 4.900 inches.

1.6250

10.3
(WITH ARM EXTENDED)

10.5000

15.200
(WITH C20742 BRACKET REVERSED)
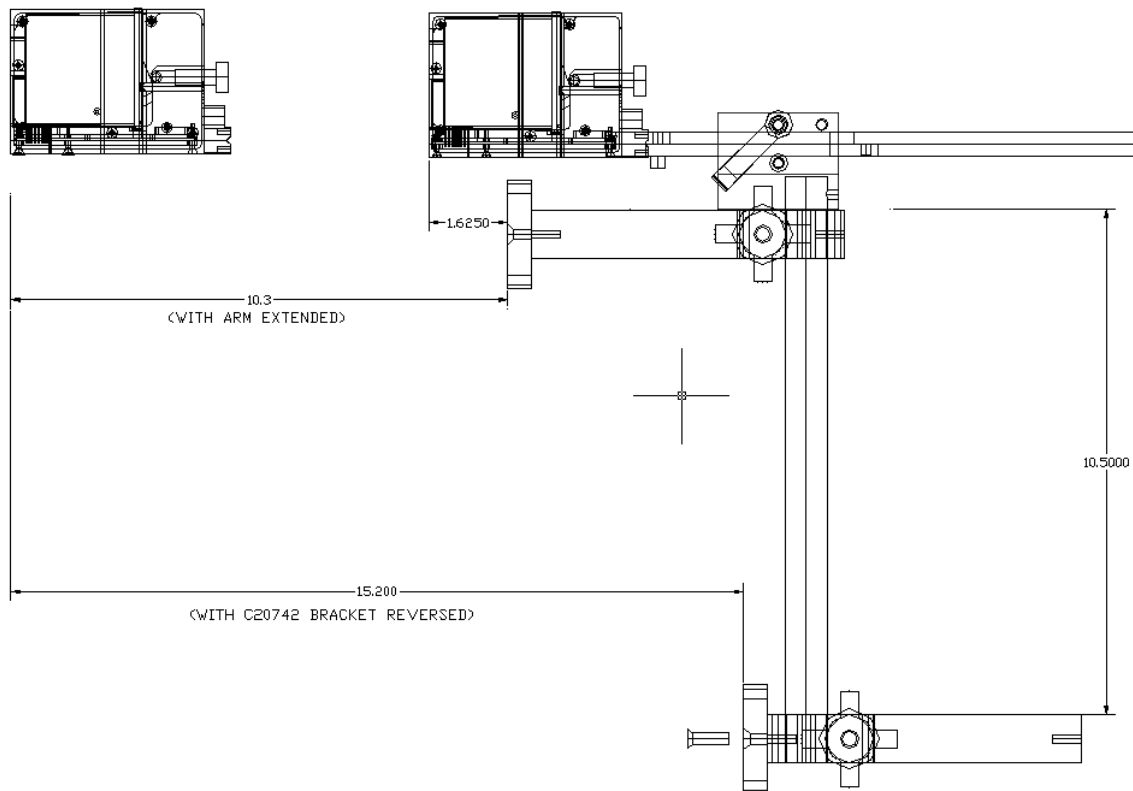
After the mounting bracket is configured loosen the locking collar 7A014S and re-locate it against the horizontal extension bracket and tighten. This allows the user to loosen the horizontal mounting bracket-locking knob and rotate the assembly without losing the height adjustment. Note that the locking collar 7A014S is not shown in the previous pictorials and would need to be removed if the vertical post holder C20742 is aligned in contact with the horizontal rod guide C20744 for maximum height adjustment.

MOUNTING THE TOUCH SCREEN CONTROLLER

The TSC is mounted to the horizontal rod guide bracket C20744 and held in place with the two ¼-20 thumb screws and two ¼" lock washers supplied with the controller.
Ensure that the two ¼" lock washers are placed between the plastic knurl knob and the TSC mounting bracket. These lock washers provide the proper tensioning against the plastic housing and the horizontal rod guide bracket C20744.

NOTE: INSERT THE COMMUNICATIONS CABLE PRIOR TO ASSEMBLY

INSTALL COMMUNICATIONS CABLE PRIOR TO MOUNTING

¼-20 KNURLED THUMB SCREW AND ¼" LOCK WASHER
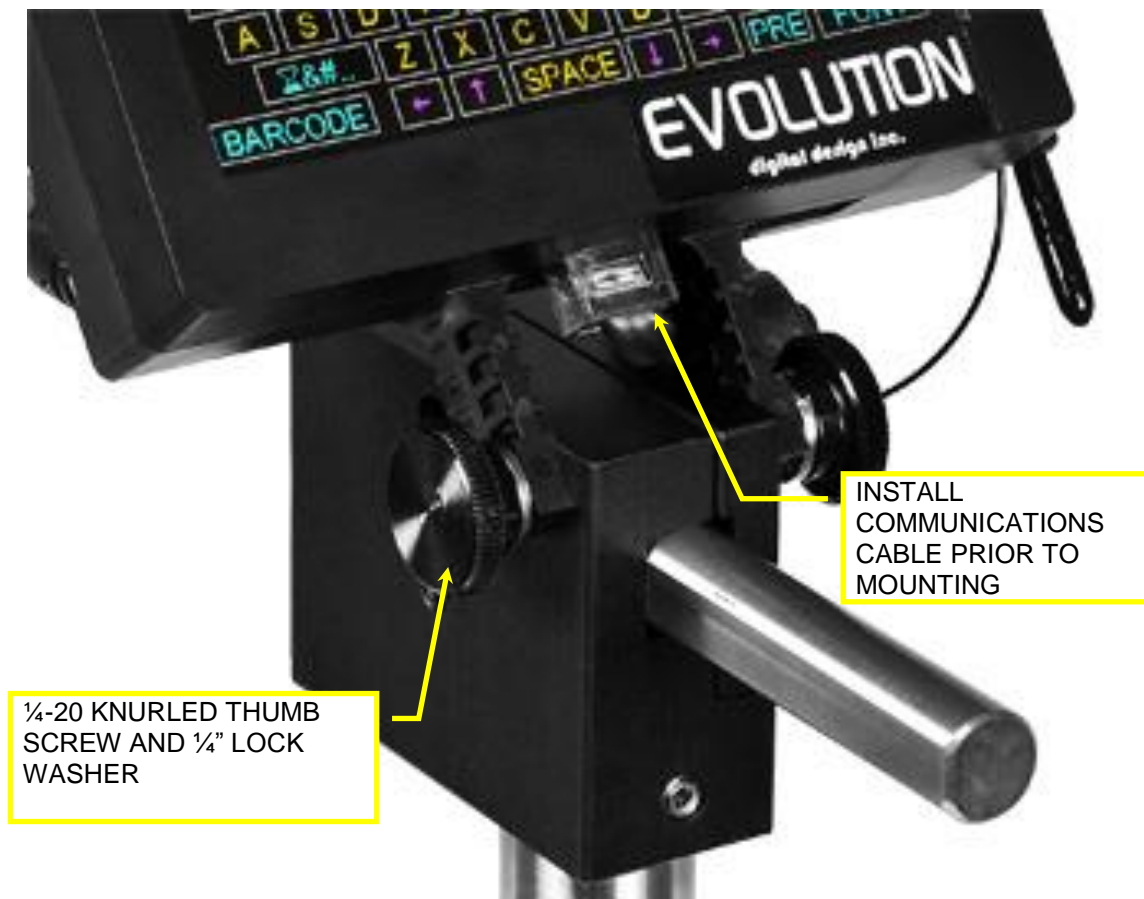
GROUNDING STRAP INSTALLATION

INSTALL STRAP UNDER 5/16" SCREW. ENSURE CONDUCTIVITY TO EARTH GROUND IS LESS THAN 1 OHM
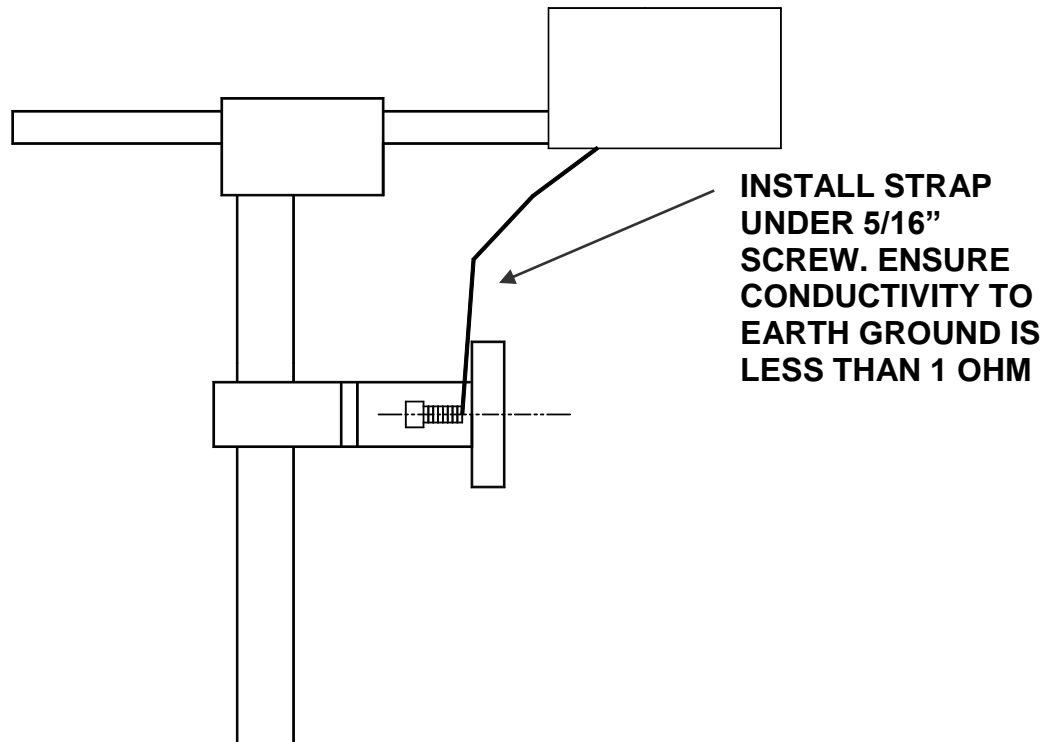
INPUT POWER CONNECTION AND MODIFICATION

Insert the power plug to the available power source. The supplied power supplyl is universal and will auto detect 100/240 VAC 50-60hZ.
No other adjustments are necessary.

INSTALLING THE PRINT CARTRIDGE

Remove the protective film from the face of the print head and discard the film. This protective film should not be re-applied to store partially used cartridges. If it is necessary to remove the print head and store for a long period of time, it is best to insert the cartridge in the appropriate sealing clip, as an alternate choice the cartridge may be placed in a closeable plastic bag. Rotate the Print Head Release mechanism to the rear of the print head, for the HP systems, or PULL BACK on the plunger for the LX systems, so that the cartridge can be inserted freely.

NOTE: EACH PRINT CARTRIDGE HAS BEEN PROFILED AT THE FACTORY. THIS PROCEDURE DETERMINES THE OPTIMAL OPERATING CHARACTERISTECS FOR EACH INDIVIDUAL CARTRIDGE. USING ANY OTHER PRINT CARTRIDGE WILL HAVE UNDESIRABLE RESULTS.

PULL PLUNGER BACK

RELEASE LOCKING LEVER
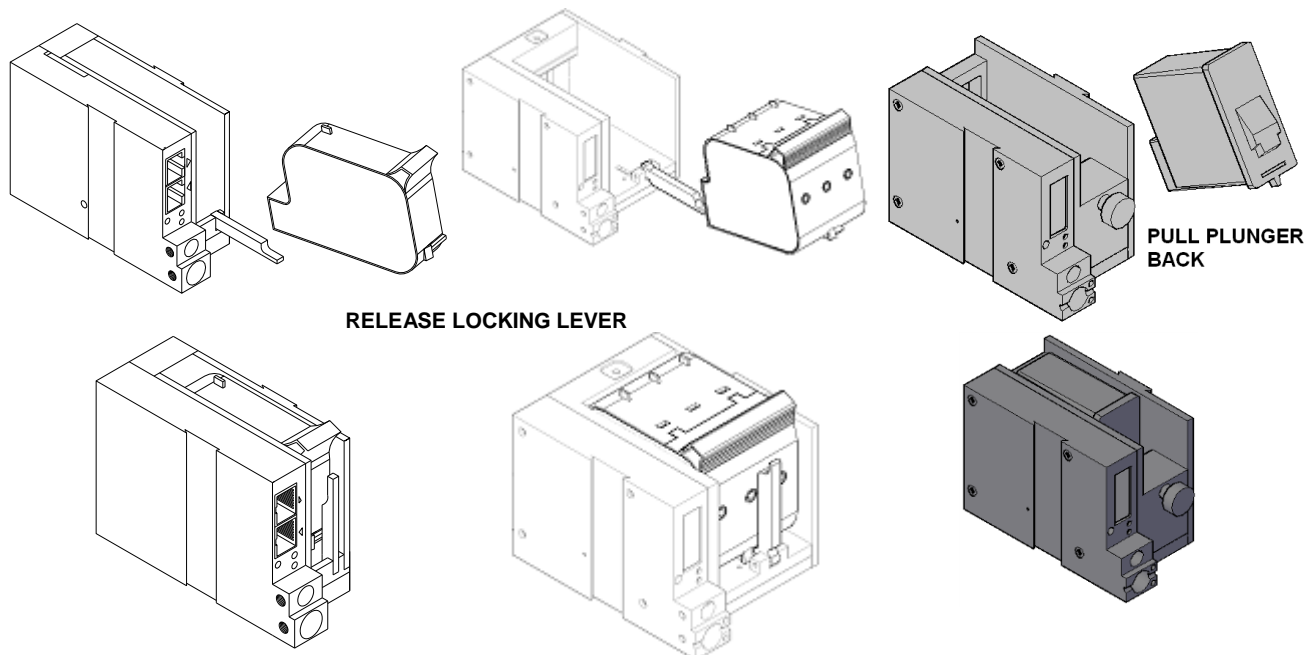
NOTE: WHEN A NEW CARTRIDGE IS INSTALLED, BOTH THE RED AND GREEN LIGHT WILL FLASH TWICE INDICATING A CORRECT INSTALLATION. THE USER MUST REMEMBER TO RESET THE INK LEVEL FOR HP STYLE SYSTEMS FOUND UNDER THE F4 FUNCTION KEY MENU. LX STYLE UNITS AUTOMATICALLY ADJUST THE PROPER INK LEVEL WHEN CARTRIDGES ARE INSERTED.

CONNECTING THE CONTROLLER TO THE PRINT HEAD

Connect the Controller to the print head using the supplied 3 FT (.9 mm) interconnect cable C21008-3-8 supplied with the Printing System. The cable is a standard RJ50 (10 conductor). Longer cables are available as required.
Connect either end of the cable to the Print Head Assembly and securely lock in place. **NOTE: THE CONNECTOR MUST BE PLUGGED INTO THE INPUT RJ50 CONNECTOR LOCATED ADJACENT TO THE LED'S AND MARKED WITH AN ARROW POINTING TO THE CONNECTOR**. A click will be heard when the connector is in the appropriate position. Connect the free end to the Controller Assembly and ensure connector is securely seated.

PRINT CARRIAGE RJ50 OUTPUT CONNECTOR

RESET SWITCH ACCESS HOLE

PRINT CARRIAGE RJ50 INPUT CONNECTOR

CONTROLLER RJ50 CONNECTOR

GREEN CYCLE LED

RED PRINT ENABLE LED

POWER INPUT +12VDC @1.5A

RESET SWITCH ACCESS HOLE

PRINTER RJ50 OUTPUT CONNECTOR

PRINTER RJ50 INPUT CONNECTOR

CONTROLLER RJ50 CONNECTOR

GREEN CYCLE LED

RED PRINT ENABLE LED

POWER INPUT +12VDC @1.5A
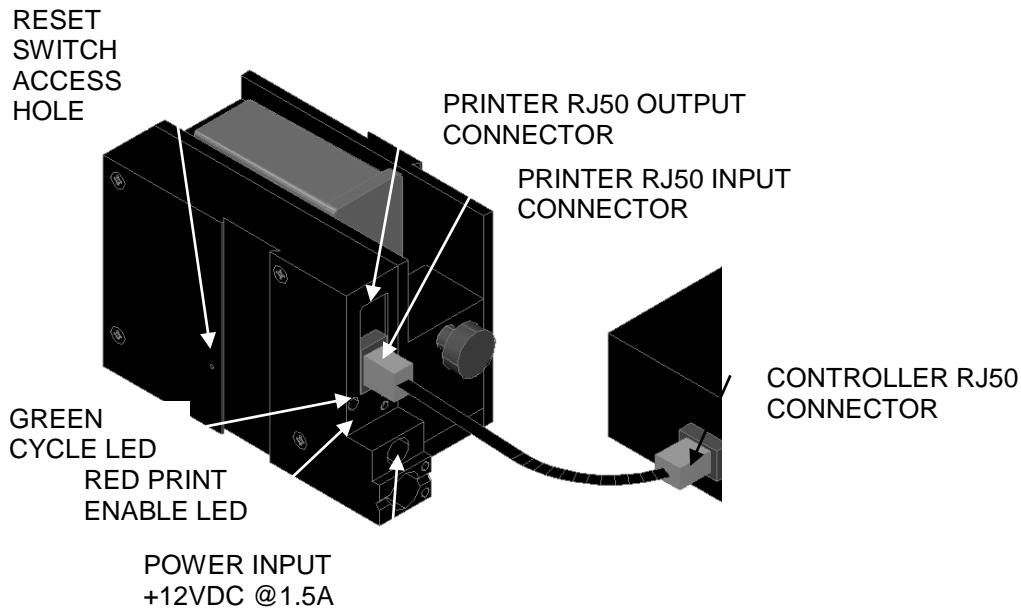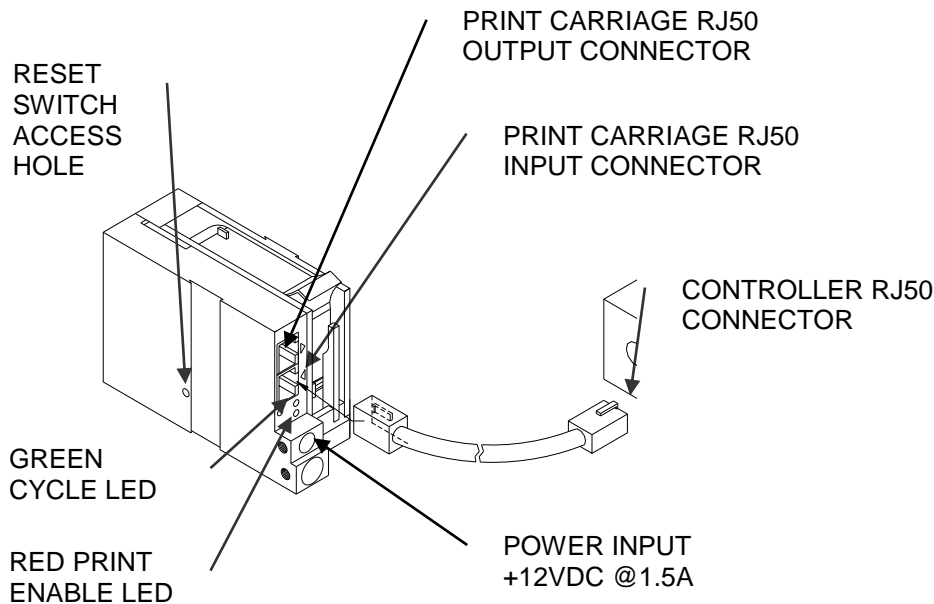
CAUTION:
NOTE THE CORRECT ORIENTATION WHEN INSERTING THE CONNECTORS. DO NOT FORCE CONNECTORS INTO POSITION SECURELY LATCH (CLICK) INTO POSITION.
CONTROLLER MUST PLUG INTO THE PRINT HEAD RJ50 INPUT CONNECTOR (BOTTOM CONNECTOR) FOR PROPER OPERATION. THE PRINT HEAD RJ50 OUTPUT CONNECTOR (TOP CONNECTOR) IS USED EITHER FOR CONNECTION TO THE NEXT PRINTER ON A NETWORK OR FOR EXTERNAL PRODUCT OR EXTERNAL ENCODER INPUT.
THE POWER INPUT CONNECTOR MUST BE SECURELY INSERTED INTO THE PRINT HEAD. UPON PROPER INSERTION BOTH THE RED AND GREEN LED'S WILL FLASH INDICATING PROPER CONNECTION.

CONFIGURING THE PRINTER

To verify the current operating software press the <mark>STOP PRINTING</mark> key if the system is in the <mark>PRINTING</mark> mode. The photo below and to the right should be seen.
Press the <mark>SYSTEM SETUP</mark> key to view the setup menu.
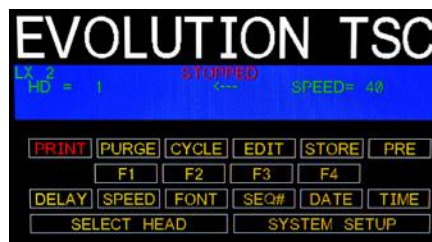
This is the SYSTEM SETUP menu. The first line (in the blue shaded area) indicates the version of the controller software. In this case the controller software is 2.01
The second line indicates the printer type that the controller is addressing and the version number of the firmware in the printer. The photo

at the left indicates the controller is currently addressing and connected to a LEXMARK print head with a firmware 3.17C. The '+' (s) following indicate options installed:

+	= Option pack 1 (EV1)
++	= Option pack 1.5 (EV1)
+++	= Option pack 2 (EV1)
++++	= Option pack 3 (EV1)
++++	= Fully Optioned (EV2 shows fully optioned)

The third line indicates the serial number of the printer

This screen also provides control of the LCD backlight. Select the <mark>DISPLAY</mark> key and use the ◀ ▶ keys to control the backlight intensity.
Select <mark>EXIT</mark> when done. This setting should be set to 25 for optimum power savings.

MULTIPLE PRINT HEADS

EVOLUTION systems have the ability to reside on a network. The network may contain from 1 to 32 print heads connected via RJ50 cables. These cables are available in varying lengths depending on the application.
Each mounting bracket can support up to 4 print heads (2 for the EV4) and would typically interconnect with a 7" RJ50 data cable.

NOTE: Please address each unit individually as per page 2-17 prior to daisy chaining the printers. Special care must be taken to connect the output of the first print head to the input of the next print head.

When connecting multiple print heads place no more than 2 stations on a side of the mounting bracket as shown. EV4 systems should only have 2 stations total.

PRINTER ADDRESS 1

PRINTER ADDRESS 4

PRINTER LOCKING SET SCREW

TO CONTROLLER OR COMPUTER DATA LINK

PRINTER
ADDRESS 1

PRINTER
ADDRESS 4

TO
CONTROLLER
OR COMPUTER
DATA LINK

PRINTER
LOCKING SET
SCREW
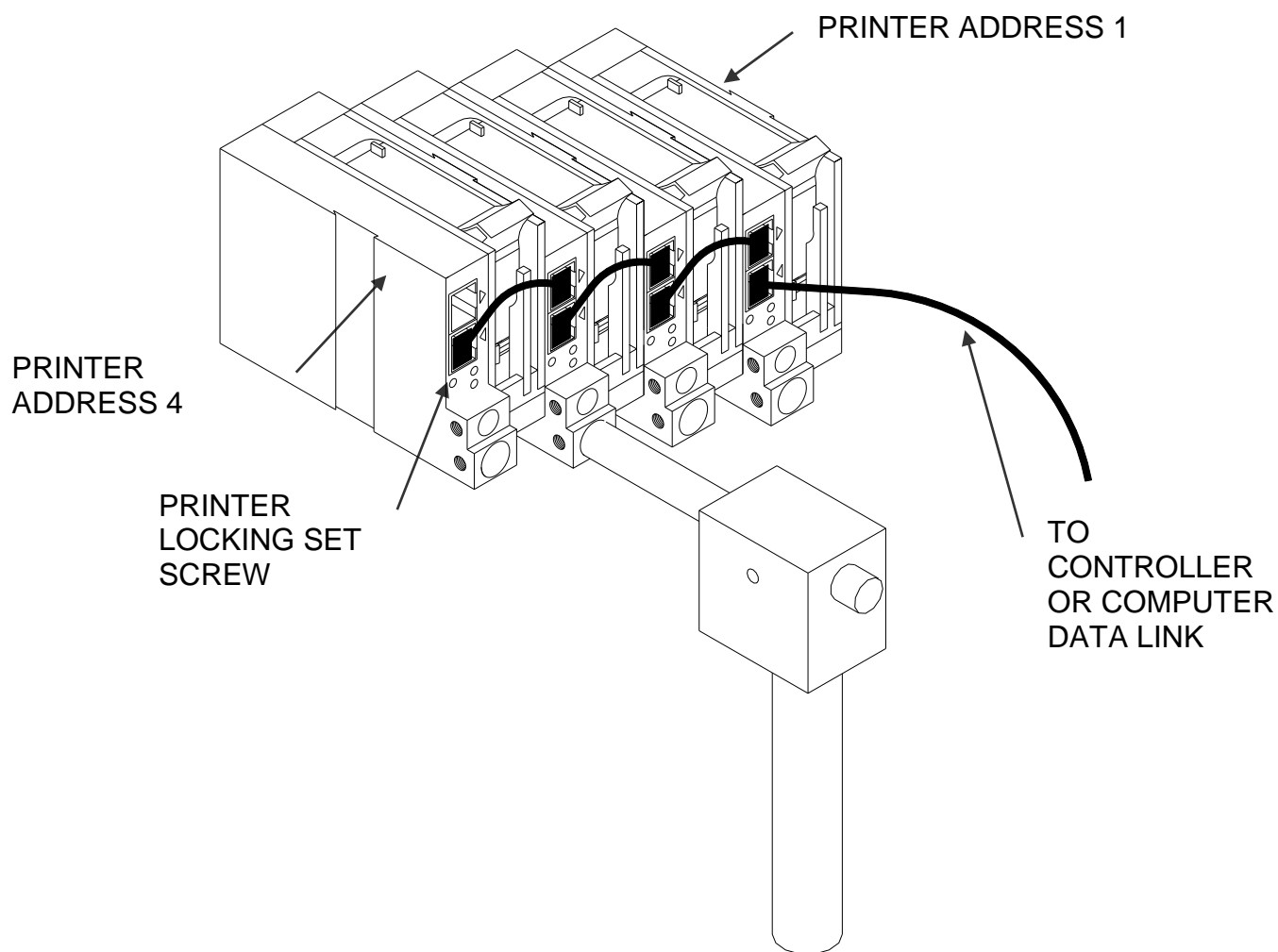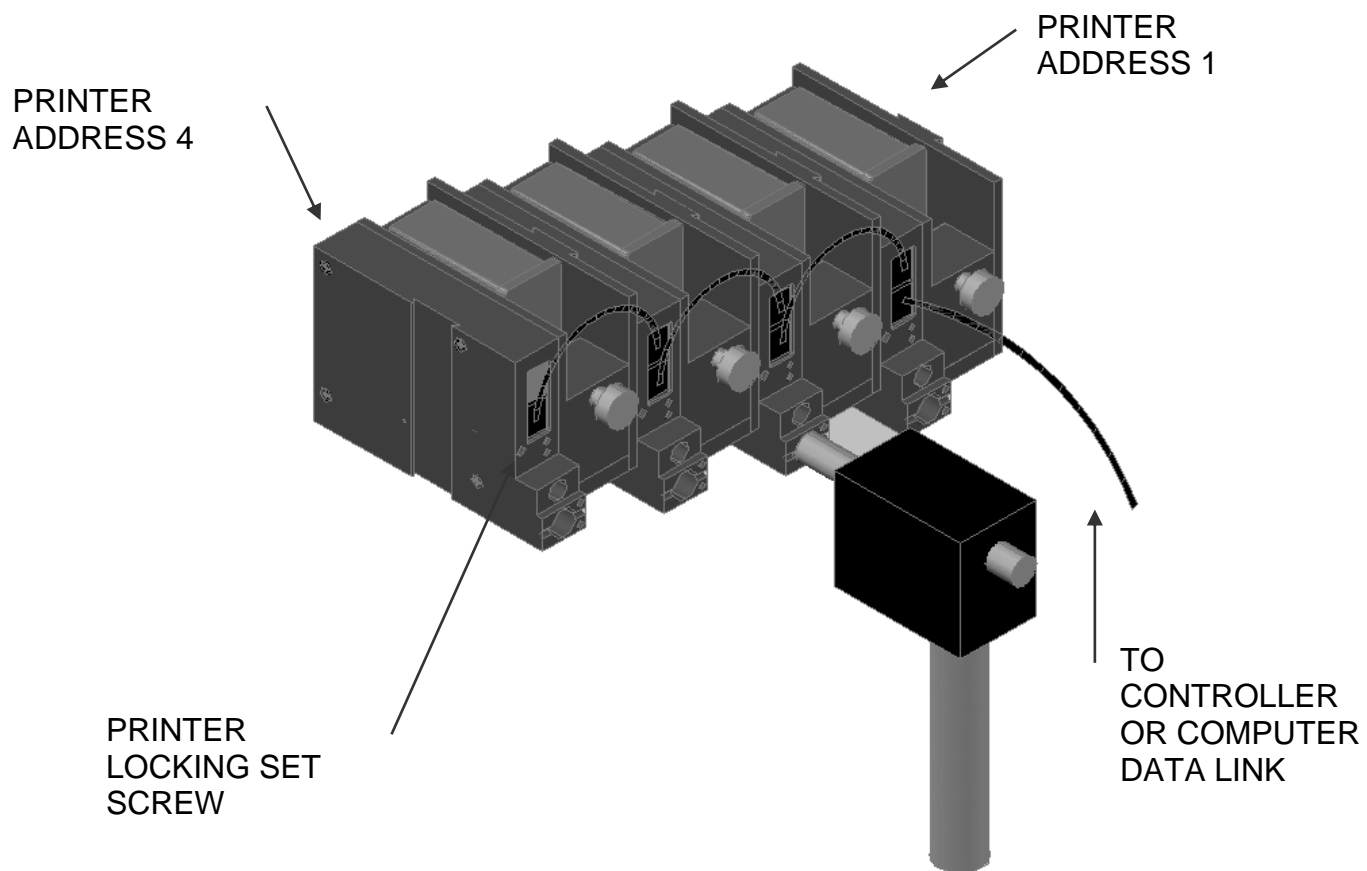
SYSTEM RESET

SOFT RESET
There are two types of resets available in the Evolution printing system. The first type of reset is a SOFT RESET.

The soft reset is the only method to reset the controller to the factory default condition. A soft reset may also be used to reset the print head to the factory defaults.

When power is applied to the TSC by removing and reinserting the controller cable touch the LCD when the blue information area first appears to invoke the system reset feature.

The photo at the left prompts the user if the TSC requires a reset. Selecting the YES key will then prompt the user desires to delete all stored messages.

CAUTION: A response of YES will delete all stored messages.

The photo at the left prompts the user if the print head requires a reset. Selecting the YES key will then prompt the user to reset the print head to factory defaults.

CAUTION: A response of YES will reset the print head.

CAUTION: ALL PRINT HEADS CONNECTED TO THE CONTROLLER WILL BE RESET TO FACTORY DEFAULT CONDITIONS. THIS INCLUDES RESETING EACH UNIT ADDRESS TO 1. TO PREVENT THIS REMOVE ALL INTERCONNECTED PRINT HEADS EXCEPT FOR THE UNIT TO BE RESET.
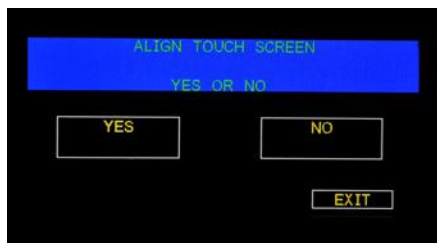
The last step in the reset sequence is the touch screen alignment verification screen. Selecting the YES key shows the alignment screen.
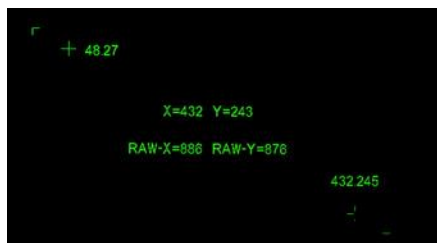
Use the stylus and depress the cross hairs in the upper left and lower right of the LCD display and verify that the number shown in the center of the screen is relatively close to those numbers adjacent to the crosshairs.

Power to the TSC must be cycled to exit the system-reset function.

HARD RESET

The second reset is a hard reset. Disconnect the power cable. Insert a standard paper clip into the hole on the female dovetail side of the printer chassis, and while holding the paper clip in place (a light click will be felt) re-apply the power connector.

This operation will reset the print head assembly to the factory default settings and clear any current message.

Although an LX head is shown below, all evolution printers have the reset located in the same orientation.

Insert paper clip here for hard reset
All Evolution systems have the reset switch located in the same location.
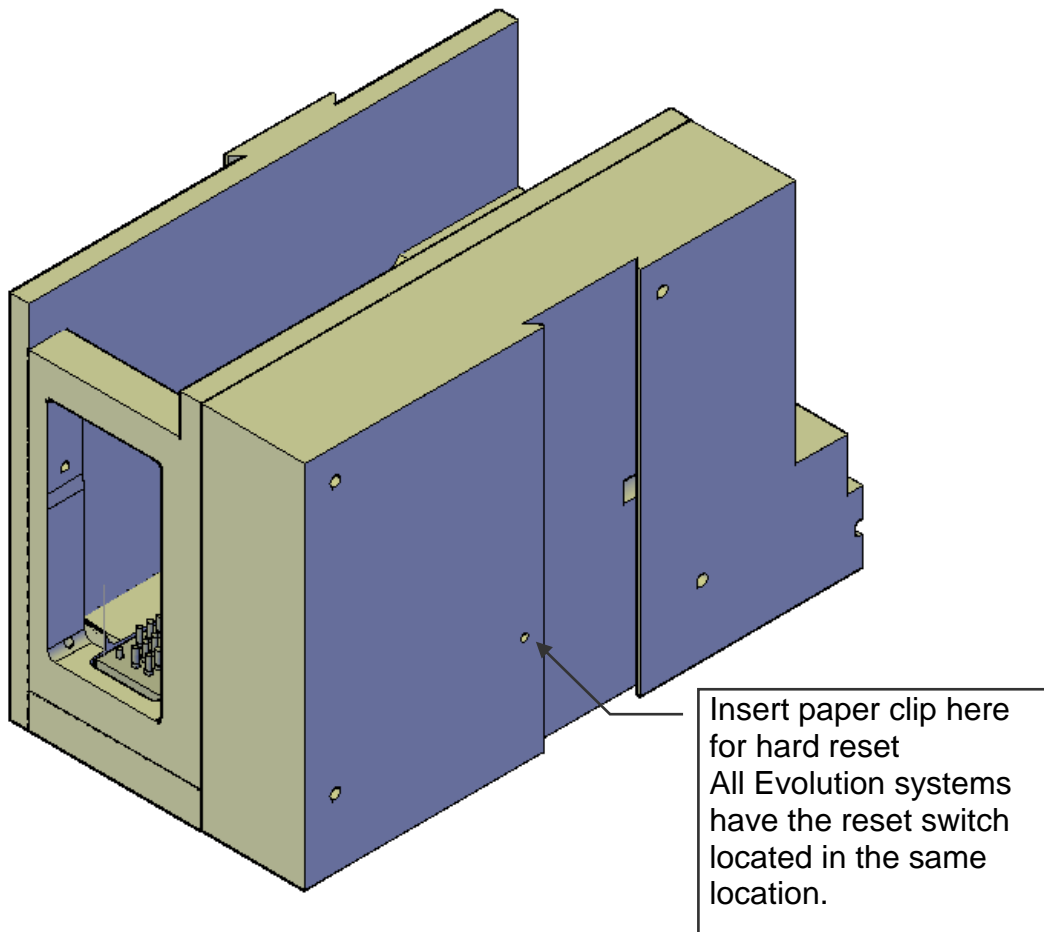
EVOLUTION QUICK START

TURNING ON THE PRINT STATION FOR THE FIRST TIME

To turn the print station on insert the power jack into the DC power connector.
There is no on/off switch.

The first time the print station is turned on, as received from the factory, the LCD will look like the photo on the left. Each section of the LCD gives important information regarding the system:

The Top section indicates the current message followed by an information section (blue area), which indicates operating mode of the unit, line speed, system type, the print head currently selected, and the direction of travel.

The lower half of the display shows a series of selectable keys, which allow the user access to various other controller functions.

NOTE: THE DISPLAY IS A WYSWIG GRAPHIC TYPE AND MAY ONLY DISPLAY A PORTION OF THE ACTUAL MESSAGE.

CHECKING SYSTEM INFORMATION

Verify system information by pressing the SYSTEM SETUP key on the LCD keyboard. The LCD screen will display the software, firmware, serial number and options enabled. The EVOLUTION printer is fully configured thus a ++++ will be displayed.

NOTE: depending on system type the system setup screen will vary showing those optional features applicable to the specific system currently addressed by the TSC.
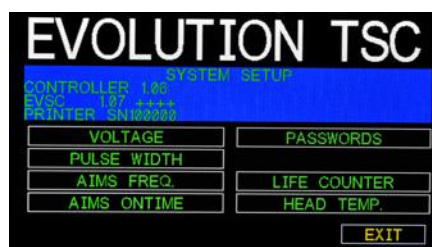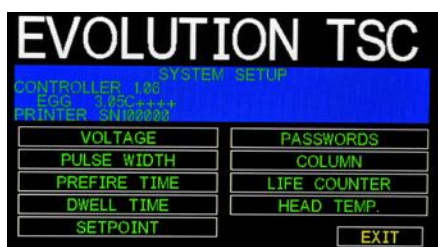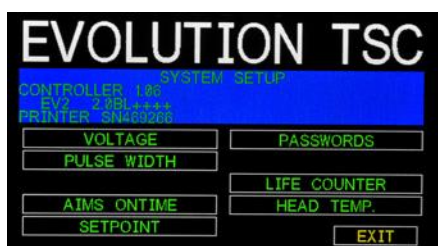
CHECKING LOADED FONTS

  Press the FONT key to check what fonts are currently loaded in the print head.

Remember for EV1 systems there are only two font sizes while all other systems contain 4 font styles.

  Connect the printer to the appropriate power source.
Connect the controller to the printer assembly. The controller derives power from the printer.

On startup the LCD will display as pictured.

CHANGING LANGUAGE PROMPTS

Press the F4 key and select LANGUAGE to change systems prompts and commands. Use the ◄ ► keys to select the desired language and press the EXIT to select the language.

ENABLING PRINT MODE

  Press the PRINT key to start printing.

HEAD SELECT MODE

The TSC can program up to 32 print heads on an RS485 data link. The factory default sets each print head to **ADDRESS 1.** Selection of another print head other than ADDRESS 1, press the **SELECT HEAD** key. This key is accessible either from the **STOPPED** menu as pictured above or in the **PRINTING** mode as in the photo to the right. Use the ◀ ▶ keys to select the alternate print head number and press the **EXIT** key. The print head whose address was selected will respond with the current message and appropriate parameters.
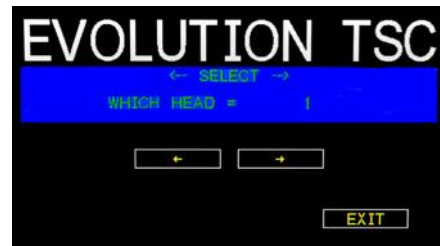
As an added convenience using the ◀▶ will auto scan to find the next available head connected to the environment
Accessing an address not associated with any print head will result in a no response message.

Note: If multiple print heads have the same "UNIT ADDRESS" indeterminate results will occur and also may return a "NO RESPONSE" message.
Note: Before connecting to a network programming each unit with a unique address must be accomplished.

CHANGING INK CARTRIDGES

An ink cartridge may be installed by simply replacing the cartridge. The current ink level may be viewed by selecting the F4 key from the STOPPED menu.

It should be noted that depending on the specific printer currently connected the Ink Level menu will differ. When a LEXMARK print head is the currently selected print head the photo at the right will be seen. In this case the syetem reports that REMAINING INK 100%. If either an HP or SC (Small Character) printer is attached then the user has the option to reset the current ink level with the CLEAR key. Press the EXIT key to return to the STOPPED menu.

Each time a LEXMARK style print cartridge is installed, the system automatically profiles the correct operating parameters for the new cartridge. These parameters set the required voltage and on time to produce consistent results without user intervention.

When using either the HP or SC print heads the correct parameter settings must be changed in the SYSTEM SETUP menu.

NOTE: USING OTHER THAN AUTHORIZED CARTRIDGES MAY CAUSE UNDESIRABLE RESULTS.

SETTING LINE SPEED AND PRINT DELAY

To set the line speed (character width), press the SPEED key in either the STOPPED or PRINTING menus.
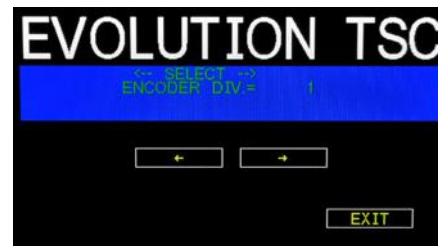
Change the print width by pressing the SPEED key. Adjust the desired print width relative to the actual line speed if known. Adjust the desired character width by using the ◄ ► keys. Press the EXIT key to return to the previous menu.
Note that when the external encoder mode is selected the LINE SPEED = 40 changes to ENCODER DIV = 1 to indicate that the system is in external encoder mode.

Change the print delay (that time from first sensing the product to actual start of print) by using pressing the DELAY key. Use the ◄ ► keys to set the print delay

NOTE: Each increment or decrement changes the delay by approximately 0.053". This assumes that the line speed setting matches the actual line speed of the production line.

You may continue to experiment with line speed and print delay until the desired code registration on the product is achieved.

CHANGING SYSTEM DATE AND DAY OF WEEK CODES

Selecting the DATE key allows the user to change the system date. If there are no changes press the NO key and EXIT to return to the previous mode.

Press the YES key to change the date.

The system will prompt the user first for the Month (enter 2 digits), then the Day (2 digits) and finally the year (2 digits).

After the date is entered the system requests the actual date day of week. This parameter is usually set to 1 for Sunday, 2 for Monday etc.

The day of the week can be entered into a message as either a number 1-7 or as a letter A-G. The day of the week is entered into a message by pressing the ⬓ key while in the MESSAGE ENTRY mode.

After the data is entered the system displays the currently entered date and pressing the NO key returns the user to the STOPPED mode, or press YES to the correct the date.

CHANGING SYSTEM TIME AND DATE ROLL OVER TIME

Selecting the TIME key allows the user to change the system time.
The user has the ability to SET TIME or change DATE ROLLOVER
Selecting the SET TIME prompts the user to eith accept the displayed time by selecting NO or change the current setting by selecting YES.

Enter the correct hours (2 digits) followed by the correct minutes (2 digits). The screen displays the corrected time. Press the YES key to make further changes or NO key to return to the previous menu.
Notice the time is in 24-hour format.
Selecting DATE ROLLOVER enables the Date Change option. This feature allows the date to roll over at a specified time other than 12:00AM (midnight). For example if the start of a new shift day occurs at 6:00AM the date will be changed each day at 6:00AM.
Selecting YES allows changing of the roll over time or NO to return to the previous menu. Setting this parameter to 00:00 disables the function.

Similar to entering the time enter first the hours then at the next prompt enter the minutes.

Remember the time is entered in military time.

Entering 06:00 sets the date change time at 6:00AM.

Enabling this function requires resetting the current correct time.

Enter both the current time in hours and minutes.
This resets the correct time and establishes a new Date Rollover Time.

PASSWORD PROTECTION

The printer contains a password function designed to limit access to the edit menu and prevent unauthorized changing of message lines. To activate this function, select the SYSTEM SETUP key on the main screen.
The display changes to the system setup menu.

Select the PASSWORDS key to change the default password.

The user must enter a password to continue. The default system password is 12345.

After successful password entry the user is prompted to enable the option that requires password entry prior to message editing. Selecting the YES key enables this feature.
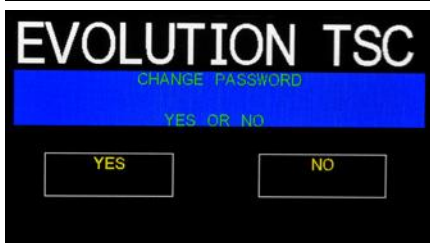
The user also has the option to change the current default password by selecting the YES key.

The user may enter any 5-digit combination as the new password.

NOTE: If the new password is misplaced or forgotten, reset the TSC with a soft reset.

CONFIGURING SEQUENTIAL NUMBERING

Sequence number format is programmable in the STOPPED mode. Select the SEQ# key on the main menu to enter the sequence number format screen.

   First determine if the count is to be a COUNT UP or COUNT DOWN.
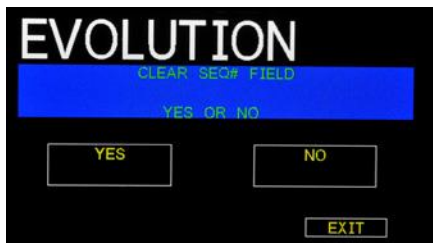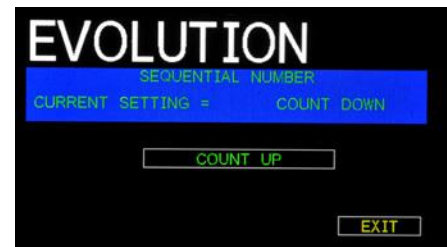
   The user may reset the current count by selecting the YES key. This will reset the sequence counter to the default starting count.
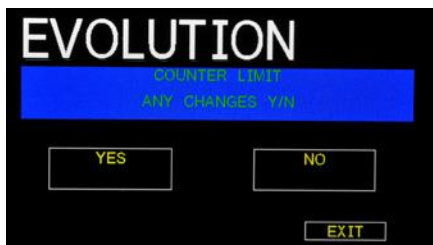
   The next prompt allows for changes in the sequence limit field.

   Selecting YES allows the user to enter the desired maximum (minimum for down count) count. Digits are entered via the keyboard right justified. As an example to set a maximum count of 5000 enter 5000.

   .
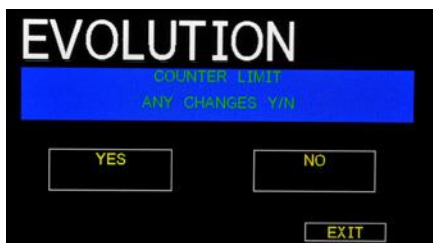
PART 2: OPERATION PROCEDURES
OVERVIEW CONTROLLER AND LCD

The Touch Screen Controller (TSC) is an entirely soft graphical unit interface (GUI). This feature displays and prompts the user as to only those functions pertinent in the current mode of operation. The LCD is divided into three segments. The top ¼ of the screen is dedicated to display the current message. Below the message area is the system information bar and depending on various menus and sub-menus different prompts or system information is displayed. The lower half of the display will show key selectable areas to perform various functions for example the F1 F2 F3 and F4 keys all invoke sub-menus.

The system operates is 3 basic modes. They are: PRINTING Mode, STOPPED Mode, and MESSAGE ENTRY Mode.

In the PRINTING Mode (photo above right) top line of the system status will display PRINTING.

The STOPPED Mode is used to change the functions of the printer. The MESSAGE ENTRY MODE is used to create or modify printable codes, when in this mode the top line of the information area will show MESSAGE ENTRY.

KEYPAD KEY DESCRIPTIONS

PRINT	This is the Print key. Use it to place the unit in the Print mode
PURGE	This is the Purge key. Use it to purge ink for maintenance purposes.
CYCLE	This is the manual cycle key. Pressing this key causes the printer to print one MESSAGE.
EDIT	This is the Message Entry key. Use this key to enter the Message Entry mode, to input a code or to edit a code
STORE	This key is the Message Storage key. Use it to store and to recall individual codes.
PRE	This key allows the operator to enter a prefix message which can be used in conjunction with normal messages. This feature is only available on LX systems
F1	Invokes the F1 sub-menu
F2	Invokes the F2 sub-menu
F3	Invokes the F3 sub-menu
F4	Invokes the F4 sub-menu
DELAY	This key invokes the print delay screen. To change where a message starts to print after a product detect has occurred.
SPEED	This key invokes the print speed screen. To change how the characters in a message are printed.
FONT	This key displays the active system fonts. EV1 systems will display two font sizes and EV2 systems will display 4 font sizes
SEQ	This is the Sequence Number key that allows the user to change the format of sequence numbers
DATE	This is the Date key. Use this key to enter the current calendar date.
TIME	This is the Time key. Use this key to enter the current time in military (24 hour) format
SELECT HEAD	This key allows the user to select which print head is to be addressed by the controller, or select functions for "ALTERNATE" to set parameters for Traverse systems, and label dispensers.
SYSTEM SETUP	This key selects the Print Delay in COMMAND mode and Offset Date in EDIT mode (OPTION PACK 3)

PROGRAMMING

DEFINITIONS

There are two parts to programming the EVOLUTION ink jet printer,
- Setting the operations parameters, (character width, delay, etc.) and
- Building the message.

MODES OF OPERATION
Remember in the PRINTING Mode, only those keys pertinent to operation are displayed.
When in the Print mode the screen will look like the screen on the right. When PRINTING is seen on the LCD, the unit will print as product passes in front of the print head assembly. To enter Print mode, press PRINT key.

The STOPPED Mode is used to change the functions of the printer. When in the Stopped Mode the display will show STOPPED on the top line and the screen looks like the illustration at the right. When STOPPED the printer will not print when product is moved past the print head assembly.

In STOPPED mode, access can be made to the menus and sub-menus available on the lower half of the LCD display.

The EDIT Mode is used to create or modify printable codes, when in this mode the top line of the display will show **MESSAGE ENTRY**.

SUB-MENU STRUCTURE

In the Command mode, access is allowed to the menu structure for basic parameters. The menus reside within the function keys, **F1** through **F4**. In order to select one of the parameters, press the number key that corresponds to the desired parameter.

The **F1** key, when pressed, brings up the menu as shown below.

The **F2** key, when pressed, brings up the menu as shown below.

The **F3** key, when pressed, brings up the menu as shown below.

The **F4** key, when pressed, brings up the menu as shown below.

F1 MENU

EVOLUTION TSC
FUNCTION KEY 1 MENU

CHARACTER SPACING
ENCODER
DATE OFFSET
BARCODES   EXIT

The screen shown to the left is displayed when the F1 key is selected.   Select the correct parameter to be modified. Those selections designated as NOT AVAILABLE will not respond to selection. They are reserved for future system expansion.

CHARACTER SPACING

EVOLUTION TSC
<-- SELECT -->
OF SPACES-   10

←   →
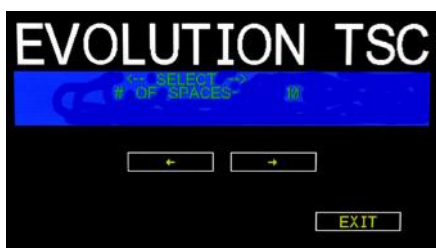
EXIT

This parameter controls the amount of space between characters in the code. Spacing can be varied from 1 to 25 columns. Use this control to make printed codes more legible when code is compressed. Press the ◀ ▶ keys to change the value.   Press EXIT once the desired value is displayed.

ENCODER

EVOLUTION TSC
ENCODER
CURRENT SETTING =   INTERNAL

EXTERNAL

EXIT

This parameter controls the source of the time base used for printing. Each vertical column printed requires a signal necessary to produce a character representative of the line speed of the production line. The printer can be set to produce a perfect aspect ratio character (300 dpi vertical and horizontal) or compressed by setting the print head line speed faster than the actual line speed, or expanded by changing the internal speed slower than the actual line speed.

In the event there is an acceleration or deceleration to the production line, or there is a requirement to guarantee accurate aspect ratio, such in the case of barcodes, an external encoder is necessary. Press EXTERNAL to select external encoder. While external encoder is selected the SPEED key will adjust the expansion and compression of the printed message. NOTE: WHEN PRODUCING BARCODES IT IS NECESSARY TO PRODUCE A PERFECT ASPECT RATIO CHARACTER.

Swath height is 0.500 (1/2") / 150 vertical dots = 0.0033" between vertical dots

Therefore to print a perfect aspect ratio character requires an encoder pulse every 0.0033". The encoder range adjustment is from 0 to 7 and assuming the mean is a count of 4 then by connecting an encoder that produces a pulse for each 0.000825" the correct character aspect ratio can be achieved. This allows either compression or expansion of the printed text.

DATE OFFSET

This option is only available in systems with option pack 3 (shown as ++++).
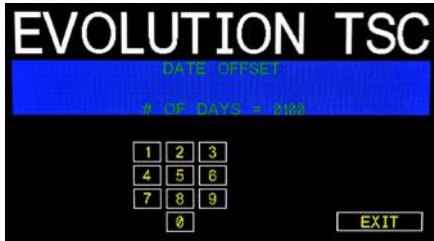
To enter a date offset (expiration date) change the value equal to the number of days until expiration. Legal entries are 0 to 999 days. The format of the date offset can be different than a normal date and may be set with the F3 option DATE FORMAT.

Both DATE OFFSET1 and DATE OFFSET2 function the same. There are two different offsets so one can be used as sell by while the other is a use by.

BARCODE TYPE

This option is not available in EV1 systems.
This parameter determines the barcode type to be entered into a message. As standard the EVOLUTION contains 8 barcode symbologies, which are: UPC-A, UPC-E, EAN-8, EAN-13, CODE 39, CODE 128B, CODE 128C AND INTERLEAVED 2 OF 5.
Press the ◀ ▶ keys to change the barcode type and press NEXT once the desired type is displayed.

The default system parameter establishes that the normal size of a narrow bar is equal to 5 vertical columns. This value, which is variable from 3 to 15, is selectable depending on the overall length of the barcode to be printed. This value sets both the light and dark bars nominal width.
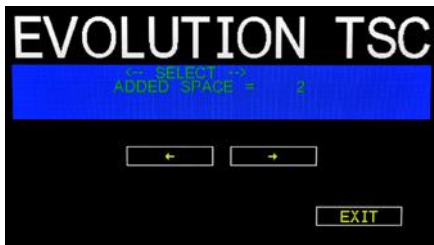
The added space parameter allows the user to insert extra columns to a normal light bar width to allow for the bleed factors associated with various substrates. Valid entries are from 0 to 3 extra spaces.

SPECIAL NOTE: FOR BROWN CORRUGATED THE USER SHOULD START WITH SETTINGS OF 7 FOR THE BAR WIDTH AND 2 FOR ADDED NO BAR SPACE TO ALLOW FOR BLEAD.

The quiet zone is the space before and after a barcode that must be kept blank. Each count is equal to one vertical column. In proper aspect ratio each column is 0.0033" thus a count of 75 would leave 0.247" before and after the barcode.

Check digits may be added to any of the imbedded symbologies by selecting option YES.

This parameter adds a man readable set of characters directly beneath the barcode being printed, and is valid for all barcode types.

If man readable characters are enabled the user has the option of enabling or disabling guard bars.

Barcode reliability is directly related to the substrate and linearity of the production line. Care should be taken to ensure that the production environment is conducive to printing barcodes. For example barcodes are susceptible to vibration (bounce) found on roller style conveyers where flat belt types are preferable. Acceleration and deceleration components will add a skew factor to the barcode as will slippage between the product and production line. Refer to Appendix A for further details on "Producing a Reliable Barcode".

F2 MENU

The screen shown to the left is produced when the F2 key is selected. Select the correct parameter to change.

LINE DIRECTION

The arrow shown on the LCD's third line screen should agree with the direction of product travel. Press ◄ to change the direction of print. Press EXIT for the unit to accept the change.

INVERT PRINT

This parameter allows the code to print right side up or upside down. Press INVERT PRINT for upside down codes. Save the choice by pressing EXIT. Look for the change of direction on the imprint.

PRODUCT DETECT

This menu selection allows the user to select the source of the product detect feature. The system default is INTERNAL. Press EXTERNAL to use an external product detect sensor. If it becomes necessary to sense a portion of the product not directly in front of the print head then an external product detect sensor must be used. This setting also allows the printer to be controlled from other sources, like a PLC. When external product detect is selected the user must also change the jumper option within the print head. Refer to the OPTION SELECT section for proper use.

AUTO REPEAT

This option is only available in the EV1 with option pack 1 or greater and all other systems. This option enables the unit to continuously print repeated codes at specified time intervals along the entire length of the product. A time of 0 disables the Auto Repeat option. Use the ◀▶ keys to change the repeat time. Each number in the time delay adds or subtracts a distance equivalent to the pre-defined setting. Save your choice by pressing EXIT. The maximum repeat spacing is 255 counts where each count is equal to 16 character columns or 0.053". This allows for a total displacement of 13.46". Setting a print delay that uses the same mathematical equation can increase this number. Thus a total displacement of 26.92" can be realized.
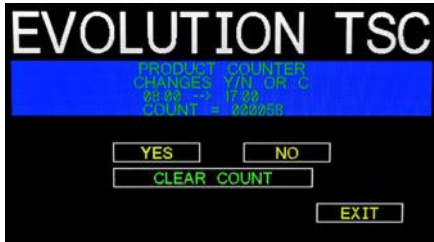
PRODUCT COUNT

This option is only available in the EV1 with option pack 3 and all other systems. The product counter is a non-printable entity, and must be read after the end of the set time period. The counter indicates each print cycle sensed by the external photo eye. Depressing the **CLEAR COUNT** **key will** clear the counter**.**

If there are no changes press the NO key.

To change the settings depress the YES key**.**
All times are in Military Time 00:00 to 23:59 hours.

Enter the start time HOURS.
At the next screen prompt enter the start time MINUTES

The system then prompts the user for the STOP TIME. Enter both the stop time HOURS and then the MINUTES.
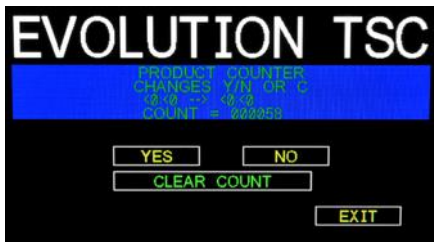
The newly entered data is re-displayed for verification or correction if necessary Press the YES key to change the data or the NO key to finish and return to the previous menu.
.

SHIFT CODE
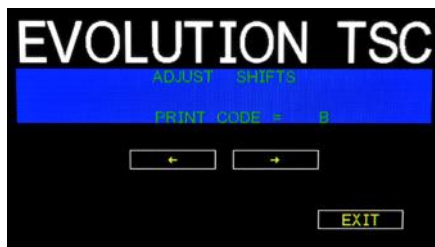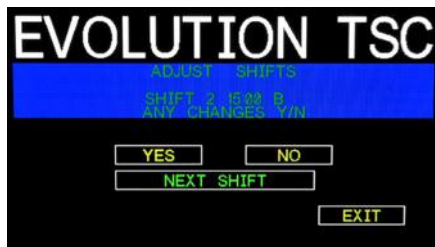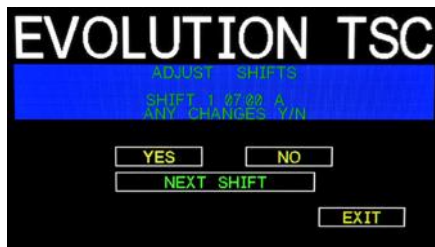
This option is only available in the EV1 with option pack 3 and all other systems. Shift codes may be encoded directly in the printable message. The printer can print 6 individual shift codes. Each shift code contains a unique start time and alpha/numeric code to be printed.

Press the YES key to change the desired shift or the NEXT SHIFT key to view other shifts.

The shift code option allows the user to enter 6 different shift times per day. Use the NEXT SHIFT key to select a shift and enter a Y to change a shifts start time.

All times are in Military Time 00:00 to 23:59 hours.

Enter the correct start time HOURS and minutes for the shift selected.

Finally, enter the desired code to be printed in the message. Legal characters are the letters A to Z and the numbers 0 to 9.

The printer re-displays the data for the selected shift for verification. Select EXIT to return to the previous menu.

NOTE: THIS PROCEDURE MAY BE REPEATED FOR ALL DESIRED SHIFTS

NOTE: TO DISABLE A SHIFT ENTER A SPACE CHARACTER IN THE PRINT CODE FIELD. THE SHIFT TIMES WILL BE DISPLAYED AS --:-- FOR ALL DISABLED SHIFT TIMES.

DATE FORMAT

This option is only available in the EV1 with option pack 2 or greater and all other systems.
Press CALENDAR DATE to change the date formatting. Each of the following screens prompts the user to enter the desired format for printing.

NOTE: THE USER MAY INDIVIDUALLY CHANGE THE FORMAT OF BOTH THE CALANDER FORMAT AND THE DATE OFFSET FORMAT
NOTE: THE FOLOWING PROCEDURE APPLYS TO BOTH CALANDER AND OFFSET DATE FORMATS.

Selecting the numeric format will prompt the user to enter the format of the date in standard number format.

By selecting the ALPHA key all month codes are represented by 3 digits (e.g. JAN FEB etc.)

The default as shipped from the factory is dm/dd/dy, and may be modified as required.
If the offset format was selected the word DATE is replaced with the word OFFSET.

To change the format press the delete key and the last line on the display will be erased. The entire format will be erased and must be re-entered.
Press either of the designator keys MONTH, DAY, ETC. and the display will display the correct code for the item selected. As an example enter the Julian date and year. Press the JULIAN key followed by the YEAR key. The code entered will print the Julian date followed by the 2-digit year. Notice no delimiters were selected, but may have been entered by selecting the appropriate key on the keyboard. Legal delimiters are the forward slash (/) SPACE or the period (.).

The software performs a special function allowing the user to set the current date to change only at a certain day of the week. This function is typically used in batch processing, where a batch may be prepared on Sunday and packaged from Monday through Friday of the following week.

Entering either the current date or offset date in a message will result in the initial date being printer for either function throughout the following week. Selecting option 2 returns the user to the STOPPED mode.

TIME FORMAT

This option is only available in the EV1 with option pack 2 or greater and all other systems.

NOTE: Delimiter characters like a :/ or SPACE character may be entered to separate fields

The factory default for time formatting is hh:mm and may be changed as required. Press the CLEAR key and the last line on the display is erased.

Enter the desired format by pressing the HOURS, MINUTES or SECONDS keys, and select delimiters as required. For example select HOURS if only hours are required.

Press the EXIT key to return to the STOPPED mode.

F4 MENU

After selecting the F4 key the screen shown at left is produced.

LANGUAGE
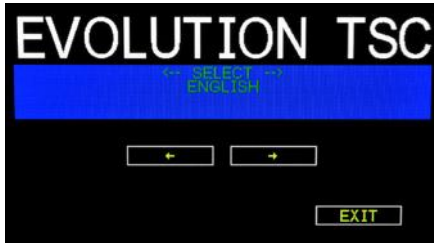
The default language is English. Scroll through the choices using either ◀ or ▶ keys. Once the desired language is shown on the screen, press EXIT. This will return the unit to the Command mode. Whenever language is chosen, all prompts and commands shown on the screen will be in that language.

INK SUPPLY

It should be noted that depending on the specific printer currently connected the Ink Level menu will differ. When a LEXMARK print head is the currently selected print head the photo at the left will be seen. In this case the syetem reports that REMAINING INK 100%. If either an HP or SC (Small Character) printer is attached then the user has the option to reset the current ink level with the CLEAR key. Press the EXIT key to return to the STOPPED menu.

Each time a LEXMARK style print cartridge is installed the system automatically profiles the correct operating parameters for the new cartridge. These parameters set the required voltage and on time to produce consistent results without user intervention.

Each cartridge is tested and profiled at the factory eliminating the burden of personalizing each cartridge by the user. There are a number of tasks associated with print cartridge profiling, as each print cartridge differs from another. The correct drive voltage, pulse width timing and pre-fire pulse warming must be calculated for optimum operation.

NOTE: USING NON-AUTHORIZED CARTRIDGES MAY PRODUCE UNDESIRABLE RESULTS

SET UNIT I.D.

Each print head can contain a unique address to distinguish multiple print heads when controlled by a single hand held controller or computer data link using an RS485 data link. The default for each new print head module is ADDRESS 1. Addresses can range from 1 to 32. It is advisable when adding multiple print heads to affix a label indicating the unique ADDRESS number of the individual print head.

Note: To program a print head it must be connected directly to the hand held controller, with no other print heads connected.

LOAD CARD
LOAD FONTS / LOAD LOGOS / LOAD OPTIONS

The user can replace the existing FONT, add up to six logos, or load optional software from a Data Flash card, which is plugged into the top of the print head. Select LOAD FONTS to load a different font to replace the current system font.

The screen to the left will appear and after a few seconds a result will be displayed to indicate NO FLASH CARD or the name of the newly loaded font, logos or software upgrades.

To load or replace the current LOGOS in the system press the LOAD LOGOS key. Similar to loading FONTS the screen at the left will appear indicating the

load results.
Note: LOGOS may be created with any graphics package that can produce a B&W 2-bit bitmap image. Large logos may be any size and small logos must be no larger than half the large logo in height. For example a large ½" logo can be up to 150 pixels vertical and a small logo may be no larger that 70 pixels vertical.

A successful load will display the current font names loaded into the print head or logos loaded. The screen at the right shows a successful logo load to logo 1.

When loading alternate fonts the AF will replace LINE for the alternate font or fonts loaded.

NOTE: when optional fonts or software is loaded into the system the Data Flash Card is encoded with the serial number of the unit and is valid only for the unit in which the fonts were loaded.

Verify system information by pressing the SYSTEM SETUP key. The LCD screen will display the software, firmware, serial number and options enabled. Enabled options are indicated on the second line as a series of + characters where the first + indicates option pack 1, the second + indicates option pack 1.5 the third is option pack 2 and the last + indicates option pack 3 or defines that a system is fully loaded.

ALTERNATE SYSTEM CONTROLS

<mark>TRAVERSE CONTROLS</mark>

The TSC is capable of structuring commands and sending those product specific commands to ancillary devices.
The first ancillary device to cover is the Traversing System. Although originally intended for the egg packing industry to print on eggs, the basic device is well structured to reside basically anywhere the print head is required to traverse (shuttle) across an intermittent motion conveying system.
The traversing mechanism is capable of traversing just over 20" per second and is capable of, with external system controls, bi-directional printing. The basic Traversing System provides these signals to the print head in addition to encoder pulses to track system motion.
The basic Traversing System can accommodate either the HP or LX style printers.

Auxiliary devices are accessed from the main STOPPED screen and selecting SELECT HEAD.

The SELECT HEAD screen allows the user to either select various print heads in a multi-head environment or an ALTERNATE (auxiliary) device.

Selecting ALTERNATE, in this case, invokes an alternate set of sub-menus directly dealing with the Traversing System. Again, the type of ancillary device may vary and is currently limited to the Traversing System or Label Dispenser.

The sub-menu contains 4 options and an EXIT selection.

NUMBER OF COLUMNS

Often times a traversing system is required to print a multiple number of times across a print area like egg cartons, blister packs, etc.
This first command selection allows the user to select the number of times the current message is printed during its transition.

COLUMN SPACING

Naturally, the ability to print N-ACROSS during a transition will require a displacement from printed column to printed column. The value is not displayed in actual units of measure but rather in a numerical count, where each count represents a specific unit of measure.
Where: Each count is equivalent to the horizontal dot pitch at 300dpi, which in this case is 0.0033. Attempting to adjust such a fine number would be difficult so that the system adds a multiplier of 8 to each count. Therefore the resolution is approximately 0.0264"

ALIGN PRINT

The next controllable quantity is the ability to adjust the print while traversing in the reverse direction. Normal print delay is used to set the proper location of the print in the forward direction

SETTLE TIME

The traversing system has the capability of automatically adding a dwell time prior to the start of a transition to allow product to settle, if necessary, prior to the start of a transition cycle.

LABEL DISPENSER CONTROLS

The TSC is capable of structuring commands and sending those product specific commands to ancillary devices.
The second ancillary device to cover is the Label Dispenser.
The Label Dispenser is capable of handling up to a 15" in diameter by 6" wide roll of labels.
The Label Dispenser provides encoder signals in the event that the user requires a printer to be attached to the dispenser.
The basic Label Dispenser can accommodate either the HP or LX style printers.

Auxiliary devices are accessed from the main STOPPED screen and selecting SELECT HEAD.

The SELECT HEAD screen allows the user to either select various print heads in a multi-head environment or an ALTERNATE (auxiliary) device.

Selecting ALTERNATE, in this case, invokes an alternate set of sub-menus directly dealing with the Traversing System. Again, the type of ancillary device may vary and is currently limited to the Traversing System or Label Dispenser.

The sub-menu contains 4 options and an EXIT selection.

SET LABEL LENGTH

The label dispenser is capable of dispensing a pre-defined length of tape. This mode may be used if there is no inter-label gap or for materials that the dispenser is not capable of sensing.

PEEL OFF LENGTH

The Peel Off Length setting allows the user to adjust where the presented label is to stop on the peel plate. Normally the unit is set such that the label, after the inter gap space is detected, stops with about ¼" of the dispensed label still attached to the peel plate.

RUN MULTIPLE LABELS

This option allows the user to dispense a defined number of labels and is enabled/disabled when entering the sub-menu.
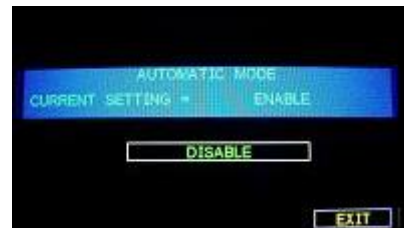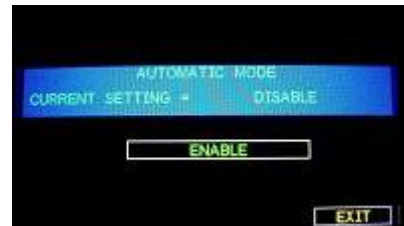
If enabled the user may select the number of labels required. This option is often used to pre-print x number of labels to be used elsewhere. In this mode the labels, after printing, are carries to where they are needed.

SPEED

If necessary the user may determine that the label dispenser is dispensing to rapidly and may reduce the speed. Normally it is set at 99%

NOTE: THE FIGURE BELOW SHOWS THE CORRECT ORIENTATION FOR INSERTING THE DATA FLASH CARD.

INSERT THE DATA FLASH CARD INTO THE SLOT PROVIDED AT THE TOP OF THE PRINT CARRIAGE AS SHOWN. NOTE THE ORIENTATION OF THE LABEL ON THE CARD. PRESS THE CARD COMPLETELY INTO THE SLOT. THE CARD SHOULD BE REMOVED AFTER USE AND STORED IN A SAFE PLACE. ONCE LOADED (FONTS & OPTIONS) THE CARD IS SECURITY LOCKED WITH THE SERIAL NUMBER OF THE PRINTER CARRIAGE AND WILL NOT OPERATE IN ANOTHER PRINT CARRIAGE. APLICABLE FOR BOTH THE HP AND LX MODELS
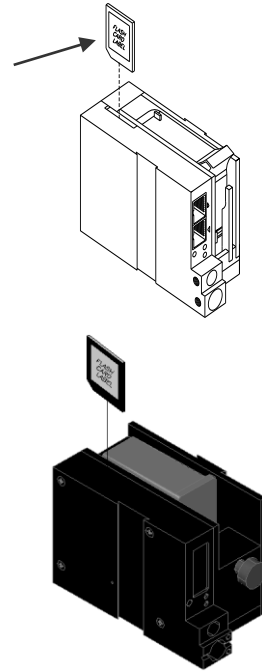
NOTE:

There are two fonts loaded in an EVI and has a 1/2" font and a 7/32" font as default from the factory. Four fonts loaded into the EVII printer at any one time. Loading a new font will overwrite the existing font or fonts. Print starts at the bottom nozzle of the print head (dot 150 for 1-line) and at the middle of the print head (dot 75 2-line). EVI printers are shipped with a 1/2" font, a 7/32" font, while EVII printers are shipped with a 1/2" font, a 7/32", 1/8" font and a 3/32" font. Alternate fonts that are loaded replace the existing fonts. For example the 1/2" font may be replaced with other than a 3/8" or 7/16" tall character.

EV4 systems have as default a 1", ½", 7/32" and 1/8".

Inserting a data flash card containing alternate fonts and cycling the power will temporarily use the alternate fonts on the data flash card until the card is removed and either the power is cycled or the print station is set to the STOPPED mode. This eliminates the need to load the alternate font using the LOAD FONT option.

INPUT/EDIT MESSAGES

When the unit is in the STOPPED mode the user may enter the EDIT message mode of operation by selecting the EDIT key.

.

The user has two options to edit or change a message. If a new message is to be entered press the CLEAR key to delete the entire existing message.

Notice to access other symbols or character sets requiring several keyboards select the SYMBOL key. In the photo at the left the SYMBOL key is shown as. Select the ALPHA to return to the primary character set screen.

In the above photo the system shows that the current message is a 1-line font style. For example purposes we will delete the message and replace it with a 2-line message using a variety of variable field information.

Select the CLEAR key to delete the current message and then the FONT key to select the appropriate font for a 2-line message.

This message contains 5 variable field objects. The top line contains two different expiration dates EXP1 and EXP2. Notice that the format of each is different as predetermined previously and each may have a different number of days offset. The second line contains a current date, current time and sequence number field. The second line was entered using the DATE, TIME and SEQ# keys.

EV2 and EV4 messages may contain up to 4 lines of text. Selecting multiple message lines is accomplished by pressing the font key until the appropriate line designation is displayed. NOTE: barcodes may only be used in the 1 or 2 line mode. Smaller barcodes are generally un-useable under 7/32".

Moving the cursor back over the various characters contained in the message may be used to validate the message. Note that the field designator will normally appear as - - - - indicating an alpha/numeric code. The same designator will be seen when the cursor is placed under any non-changeable field including the space character.

Moving the cursor under a variable programmable field will display the correct field designator in place of the - - - - alpha/numeric designator.

For example, moving the cursor under the S (shift code) in a message would display the field designator as < < < <

The various field designators displayed are:
- - - - Alpha/Numeric non-changeable data
Sequence number field
< < < < Shift code field
OM Offset date month field
OD Offset date day field
OY Offset date year field
DM Current date month field
DD Current date day field
DY Current date year field
TH Current time hour field
TM Current time minute field

NOTE: ONLY 15 OBJECTS ARE PERMITTED ON A PARTICULAR LINE. AS AN EXAMPLE A LINE OF DATA
                         MFG DM/DD/DY HH:MM
CONTAINS 10 OBJECT FIELDS. FOR PURPOSES OF CLARITY THE SPACE CHARACTER IS SHOWN AS THE UNDERLINE _ CHARACTER
WHERE:

MFG_ = ALPHA/NUMERIC FIELD
DM   = DATE MONTH FIELD
/   = ALPHA/NUMERIC FIELD
DD   = DATE DAY FIELD
/   = ALPHA/NUMERIC FIELD
DY   = DATE YEAR FIELD
_   = ALPHA/NUMERIC FIELD
HH   = TIME HOURS FIELD
:   = ALPHA/NUMERIC FIELD
MM   = TIME MINUTES FIELD

The above constitutes 10 object fields. Even though there are 48 characters permitted per line, data entry will be inhibited when the 15th object is entered, although the last field, if it is an alphanumeric object, may contain enough characters to meet the 48-character limit.

Barcodes are also an object field and must be considered when entering a message. Thus a barcode with an imbedded sequence number is counted as two objects.

Select the BARCODES key to enter Barcode data.

NOTE: ONLY AVAILABLE ON EV2 and EV4 MODELS

The barcode insignia and the code type are displayed in the information. When the barcode entry is completed press the BARCODES key to end the barcode field entry. The software checks that the data entered is valid according to the barcode type selected. If the barcode entered is valid the system re-displays the barcode with a series of lined overlaying the barcode field. Barcode fields may contain a sequence number if the specified code permits such a function. Codes therefore may contain Alpha and Numeric characters, code dependent.

The barcode types are selected from the STOPPED mode screen and press the F4 key, and select the BARCODES menu option.

Entering a sequence number within a barcode requires a specific sequence of operations that must be adhered to:

1. ENTER THE BARCODE FIELD BY PRESSING THE BARCODES KEY.
2. ENTER ANY CHARACTERS REQUIRED PRIOR TO SEQUENCE NUMBER
3. PRESS THE SEQ# KEY TO BEGIN THE SEQUENCE NUMBER FIELD
4. ENTER THE APPROPRIATE SEQUENCE NUMBER
5. PRESS THE SEQUENCE NUMBER KEY SEQ# TO END THE FIELD
6. ENTER ANY CHARACTERS REQUIRED FOLLOWING THE SEQUENCE NUMBER
7. EXIT THE BARCODE FIELD BY PRESSING THE BARCODES KEY.

The above sequence will allow the user to imbed a sequence number into the barcode type selected.

The system contains 8 barcode types:
CODE 39
INTERLEAVED 2of5
CODE 128B and CODE 128C
UPC A and UPC E
EAN 8 and EAN 13
Each barcode type may contain man readable characters, guard bars, and check characters. All barcode characteristics are programmable and are controlled in the F1 menu BARCODES option.

NOTE: REFER TO APPENDIX A – PRODUCING RELIABLE BARCODES

VARIABLE FIELD FORMAT PRINTING

Certain EVOLUTION printers contain options that provide the operator the capability of adding variable fields to a message. This includes TIME, DATE, SEQUENCE, DATE OFFSET and SHIFT CODE PRODUCT COUNT and BARCODES.

Enabling variable field programming requires the use of the special function keys.
EXP1 EXP2 SHIFT SEQ# DATE TIME LOGO BARCODE PRE FONT

Date offset codes are entered by using the EXP1 or EXP2 key.
The correct date offset format as defined in the F3 menu is entered into the message.

Shift codes are entered into a message by selecting the SHIFT key.
Shift codes are defined in the F3 menu and will automatically change at the appropriate shift times. The shift designator S is displayed to indicate the data entry.

Sequence numbers may be added to a message with the SEQ# key. Note when the key is depressed the four ---- are changed to #### indicating a sequence number field. After entering the correct sequence number press the SEQ# key to terminate the sequence field. The maximum number of digits allowable is 9 numeric characters. NOTE: the sequence number format is set from the main menu by selecting the SEQ# key.

To enter a date that automatically changes use the DATE key. The current date format as set in the F3 menu is entered into the message.

To enter a time that automatically changes use the TIME key. The current date format as set in the F3 menu is entered into the message.

Logos may be added to a message by selecting the LOGO key and selecting the appropriate logo from the display using the ◄► keys.

MESSAGE STORAGE

The TSC controller is capable of accepting input from a barcode scanner which may be connected to the TSC via the USB connection located at the bottom of the controller adjacent to the RJ50 input connector. The addition of the barcode scanner allows immediate selection of a pre-stored message with the same name as the detected barcode.

For example, a message stored with a filename 012345678901, will automatically be selected when any barcode read has those numbers as their content.

When naming a message, do not forget to include the check character whether visible or not.

As an added convenience, when a message is being saved, the barcode scanner may be used to correctly enter the actual barcode data by reading the particular barcode in question. Message storage filenames can be alpha/numeric as determined by the legal content of the barcode required.

When the system is placed in the PRINTING mode the operator may select a barcode from a worksheet, product or elsewhere to automatically select the appropriate message relating to that barcode. Subsequent products will be printed with that new message.

There is a limit of 14 characters allowable for stored message names, so therefore the largest barcode permissible is 14 characters in length.

LOADING/STORING A MESSAGE

The TSC controller is able to store up to 200 system wide programmed messages and their associated parameters. Follow these steps to enter MESSAGE STORAGE. After creating the message press STORE found on the MAIN SCREEN.

There are two methods to save or retrieve messages. The first method is similar to the current hand held controller where the user can scroll through the available messages to select the desired storage location by using the ◄ ► keys.

The second option is to enter the file name.

Selecting the FILENAME key allows the user to either enter the filename from the keyboard or to select the correct name displayed on the LCD screen. Use the ◄ ► keys to scroll through multiple pages of names.

The same procedure is used to either recall or save a message. The only difference is that the RECALL key name will be changed to STORE.

First determine is the operation is to load a new message or to store the current message.

The LCD display will indicate that the message is stored or recalled.

Press EXIT key to exit.

NOTE: Message storage should be used after the product has been coded satisfactorily. When a message is stored all operating parameters of the printed code are saved. Once recalled, codes will be printed the same as they had been before.

The controller is capable of storing up to 200 messages, and it should be noted that all stored messages are contained in the hand held controller.

Attempting to load a stored message into a printer type for which the message is incompatible will return an "INVALID MESSAGE".

PART 3: MAINTENANCE PROCEDURES
SHORT PERIODS OF SHUT DOWN

When the printer has been shut down overnight, the system might require a purge to clear out dust particles that have settled on the nozzle area during non-use. This is only necessary if there are missing dots in the printed code on product.

To purge be sure that the unit is in the STOPPED Mode.

Place a piece of lint free wipe (or absorbant non-lint paper) in front of the print head and press the PURGE key Allow the unit to purge for several seconds. There is an automatic shut down after 1,000 printed columns to ensure that the print head will not be damaged. If ink residue has solidified on the nozzle area a small drop of solvent or water may be applied to the lint free wipe prior to wiping the nozzle area.

CAUTION: Never use a solvent on a water-based ink.

When purging is complete the LCD will be returned to the STOPPED mode.

LONG PERIODS OF SHUT-DOWN

When the printer is to be shut down for extended periods, or the ink cartridge needs to be changed to insert a different color cartridge, the ink cartridge should be removed.

Clean the print head nozzle area with a soft, lint free wipes and insure there is no ink residue remaining on the nozzle area. Do not re-apply the sealing tape. The print cartridge may be stored in a sealed plastic bag or in an approved sealing clip.

CAUTION: DO NOT USE THE ORIGINAL SEALING TAPE SUPPLIED WITH THE EVOLUTION INK CARTRIDGE. DO NOT USE ANY OTHER MATERIAL OR ANY ADHESIVE BACKED PRODUCT, AS THIS WILL DAMAGE THE NOZZLE AREA.
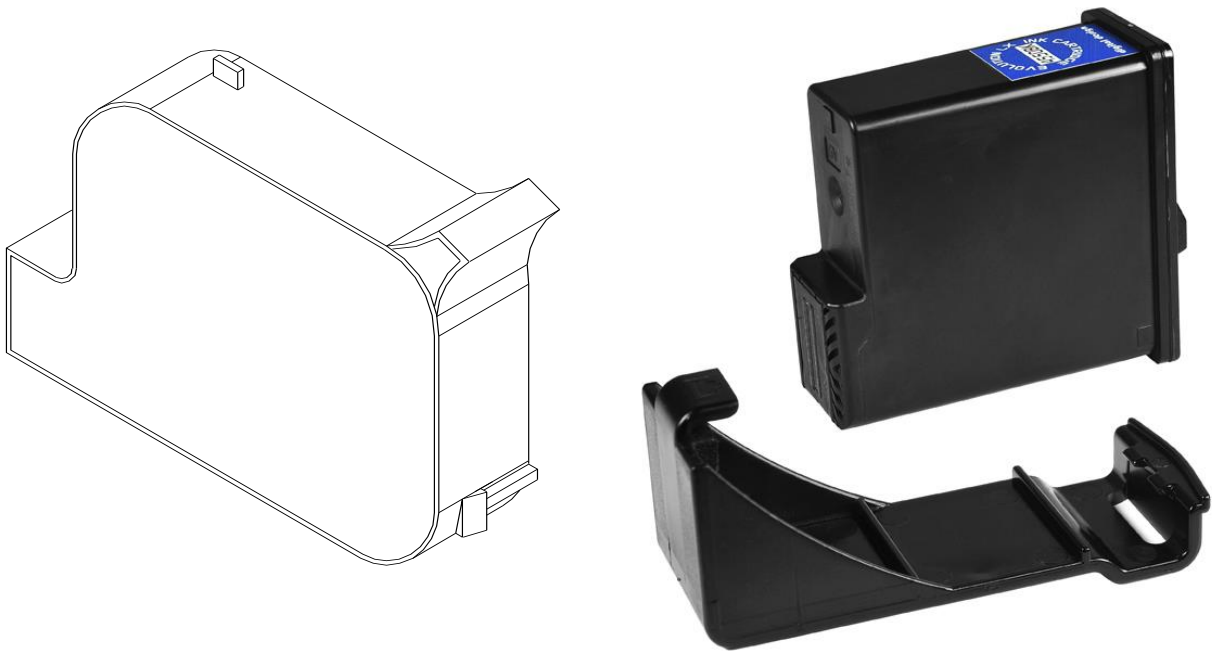
PRINT CARTRIDGE MAINTENANCE

It is necessary to maintain the print cartridge free from accumulated dust and debris. Periodically the cartridge should be removed and cleaned. This is totally dependent on the operating environment and the average printable life of the ink cartridge. In extremely dusty environments, this maintenance procedure may be required regularly.

To clean the cartridge, carefully clean the face of the cartridge with a soft, lint free wipe. Use caution in wiping the NOZZLE area so as not to scratch the face. Always wipe in the ARRAY PLATE vertically as indicated.
Clean the CONTACT area in a similar fashion.

NOZZLES

DIRECTION OF WIPING

CONTACT AREA

NOZZLES

CONTACT
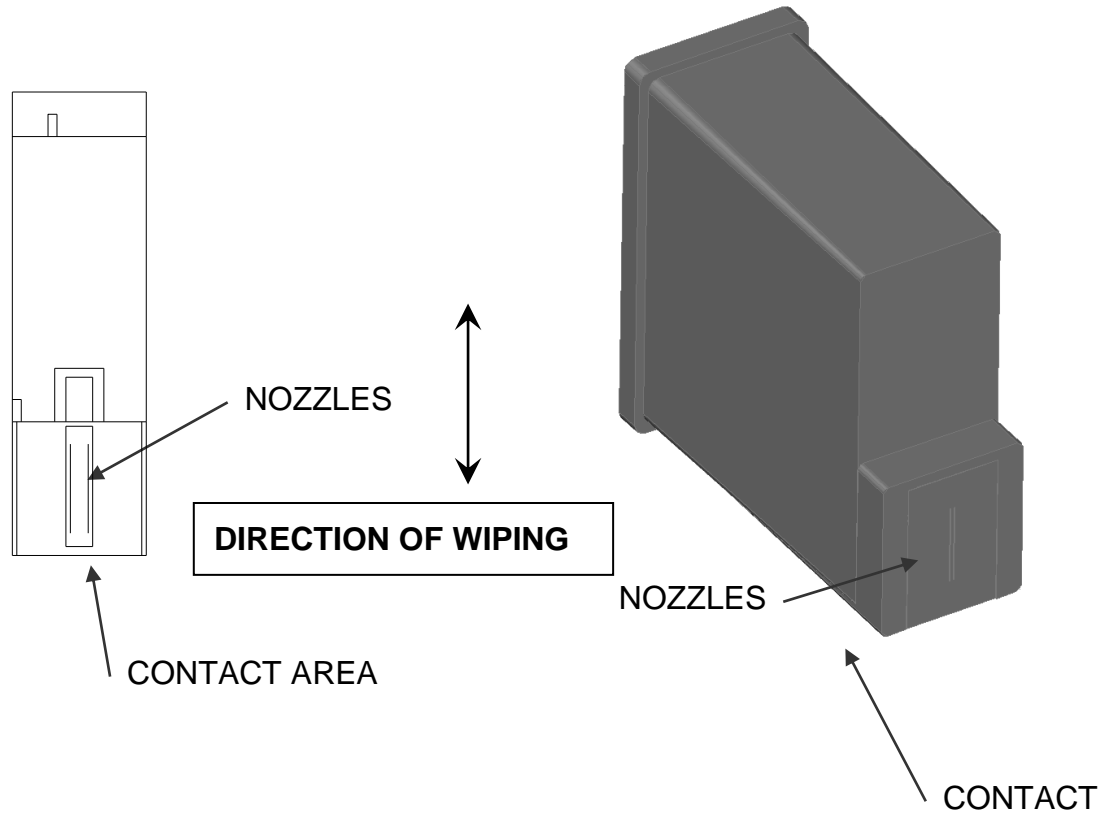
NOTE:

Ingested air or severe nozzle clogs may be eliminated with the use of the cleaning syringe/tray ordered optionally.

The photo below shows the correct procedure in using the syringe and cleaning tray. Insert the ink cartridge into the tray and securely snap into place. Place the tip of the syringe into the front of the tray. While holding the syringe securely in place gently draw back on the syringe plunger until ink flows into the syringe. Normally, it is not necessary to evacuate more than 0.1 cc of ink at a time as indicated below. Following ink withdrawal remove the syringe carefully. Remove the ink cartridge from the tray. Remove any remaining ink from the nozzle face with a lint free wipe. Place a piece of clean white paper directly in front of the print head and perform a purge function by pressing and releasing the <mark>PURGE</mark> key. The key is activated on the release of the key. Swipe the paper quickly past the print head to expand the purge pattern so the individual droplets may be viewed.

Perform a test print and verify that all nozzles are firing correctly.

0.1 cc of ink drawn at any one time

Apply downward pressure

Place Cartridge on tray

Apply pressure to plunger on syringe
Never draw back on plunger while cartridge is seated in tray

Cleaning/Priming Tray
4x50-CLEAN
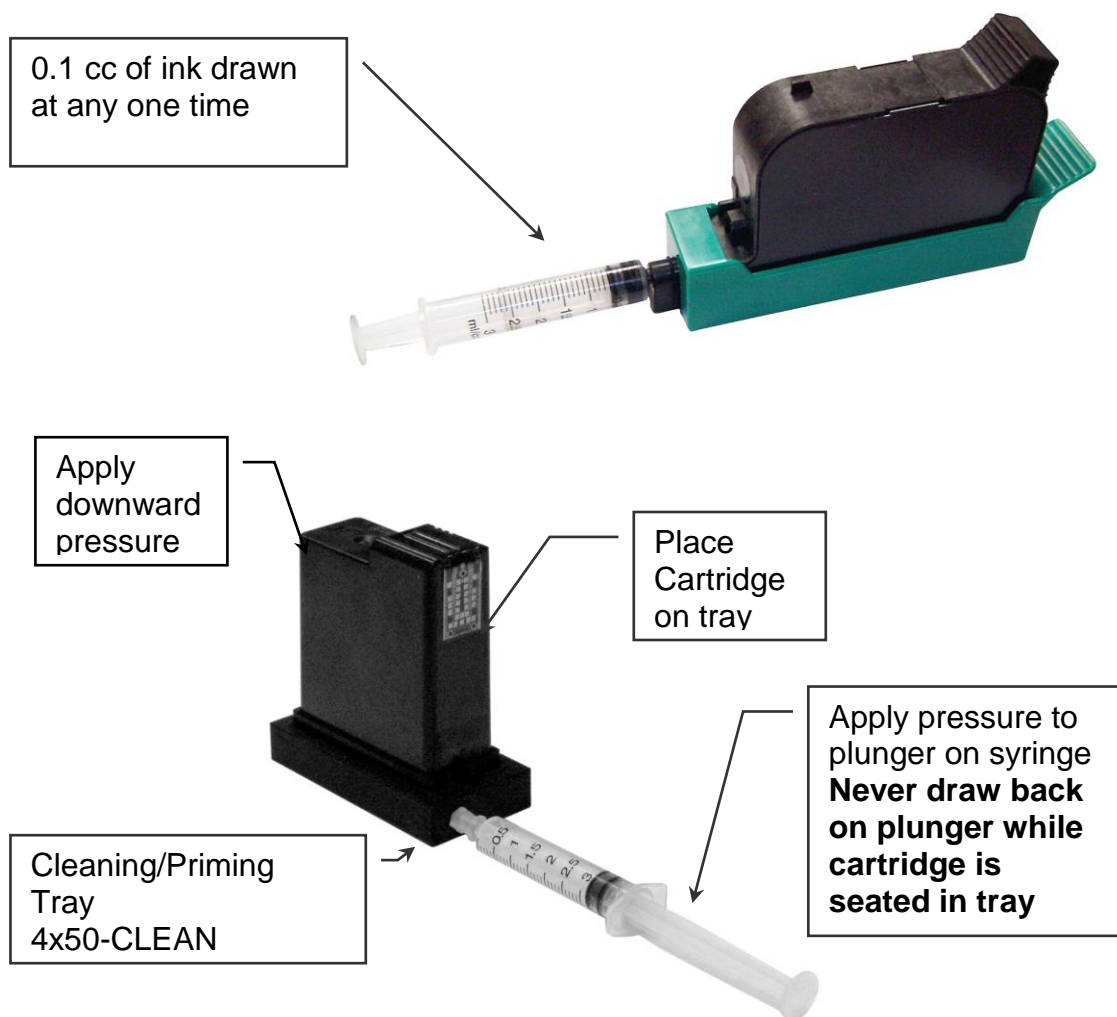
PRINT HEAD MAINTENANCE

It is necessary to maintain the print head assembly free from accumulated dust and debris. Periodically the print head assembly should be inspected and cleaned. This is totally dependent on the operating environment. In extremely dusty environments, this maintenance procedure may be required occasionally but on average every week should be sufficient.
Remove the print cartridge and carefully inspect the print head for dust and debris.
Re-insert the print cartridge and place the unit into the PRINTING mode by pressing PRINT key.

EXPLODED VIEW OF THE C21002 EV HP PRINT HEAD

C21002 HP PRINT HEAD PART CALLOUT

ITEM	PART NUMBER	DESCRIPTION	QTY
1	C21002-4	EV PH DRIVER COVER	1
2	C21002-5	EV HP PH DRIVER CHASSIS PLATE	1
3	C21002-6	EV PH MALE DOVETAIL PLATE	1
4	C21002-9	EV HP PH LOCKING LEVER	1
5	C21002-3	EV HP POGO BOARD COVER	1
6	C21002-7	EV HP DRIVER ASSY	1
7	C21002-8	EV HP POGO PCB ASSY	1
8	513CJS	2-56X.875 FH PHIL BK OX	4
9	513CES	2-56X.375 FH PHIL BK OX	4
10	513CCS	2-56X.250 FH PHIL BK OX	3
11	520GFS	.093X.750 DOWEL PIN	1
12	D24	.125X.250 MAGNETIC CYLINDER	1
13	504GGS	8-32X.625 SET SCREW/NYL TIP	1
14	PLP2-125	LIGHT PIPE .125 LENGTH	2

EXPLODED VIEW OF THE C22002 EV LX PRINT HEAD

C22001 EV LX PRINT HEAD PART CALLOUT

ITEM	PART NUMBER	DESCRIPTION	QTY
1	C21002-4	EV PH DRIVER COVER	1
2	C22001-1	EV LX PH DRIVER CHASSIS PLATE	1
3	C21002-6	EV PH MALE DOVETAIL PLATE	1
4	C22001-2	EV LX POGO BOARD COVER	1
5	C22001-7	EV LX DRIVER ASSY	1
6	C22001-8	EV LX POGO PCB ASSY	1
7	513CJS	2-56X.875 FH PHIL BK OX	4
8	513CES	2-56X.375 FH PHIL BK OX	4
9	513CCS	2-56X.250 FH PHIL BK OX	3
10	504GGS	8-32X.625 SET SCREW/NYL TIP	1
11	STPR-SPXA5	EV LX RING PLUNGER ASSY	1
12	9528K15	.250 CHROME GRADE BALL	1
13	PLP2-125	LIGHT PIPE .125 LENGTH	2

EXPLODED VIEW OF THE C22180 EV4 PRINT HEAD
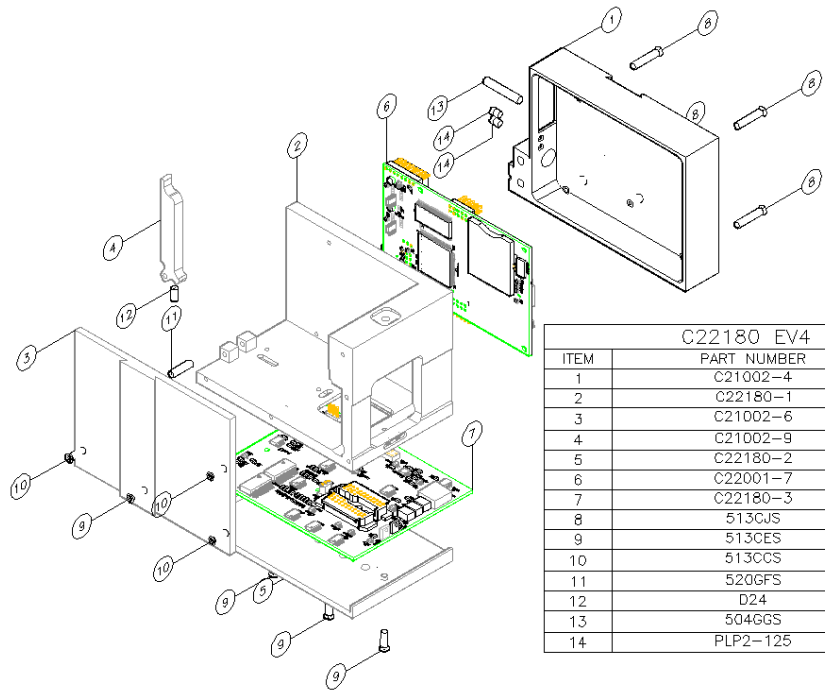
ITEM	PART NUMBER	DESCRIPTION	QTY
	C22180 EV4 PRINT HEAD PART CALLOUT		
1	C21002−4	EV PH DRIVER COVER	1
2	C22180−1	EV4 PH DRIVER CHASSIS	1
3	C21002−6	EV PH MALE DOVETAIL PLATE	1
4	C21002−9	EV HP PH LOCKING LEVER	1
5	C22180−2	EV4 POGO BOARD COVER	1
6	C22001−7	EV LX HP DRIVER ASSY	1
7	C22180−3	EV4 POGO PCB ASSY	1
8	513CJS	2−56X.875 FH PHIL BK OX	4
9	513CES	2−56X.375 FH PHIL BK OX	4
10	513CCS	2−56X.250 FH PHIL BK OX	3
11	520GFS	.093X.750 DOWEL PIN	1
12	D24	.125X.250 MAGNETIC CYLINDER	1
13	504GGS	8−32X.625 SET SCREW/NYL TIP	1
14	PLP2−125	LIGHT PIPE .125 LENGTH	2

EXPLODED VIEW OF THE C22070 EV LD LABEL DISPENSER
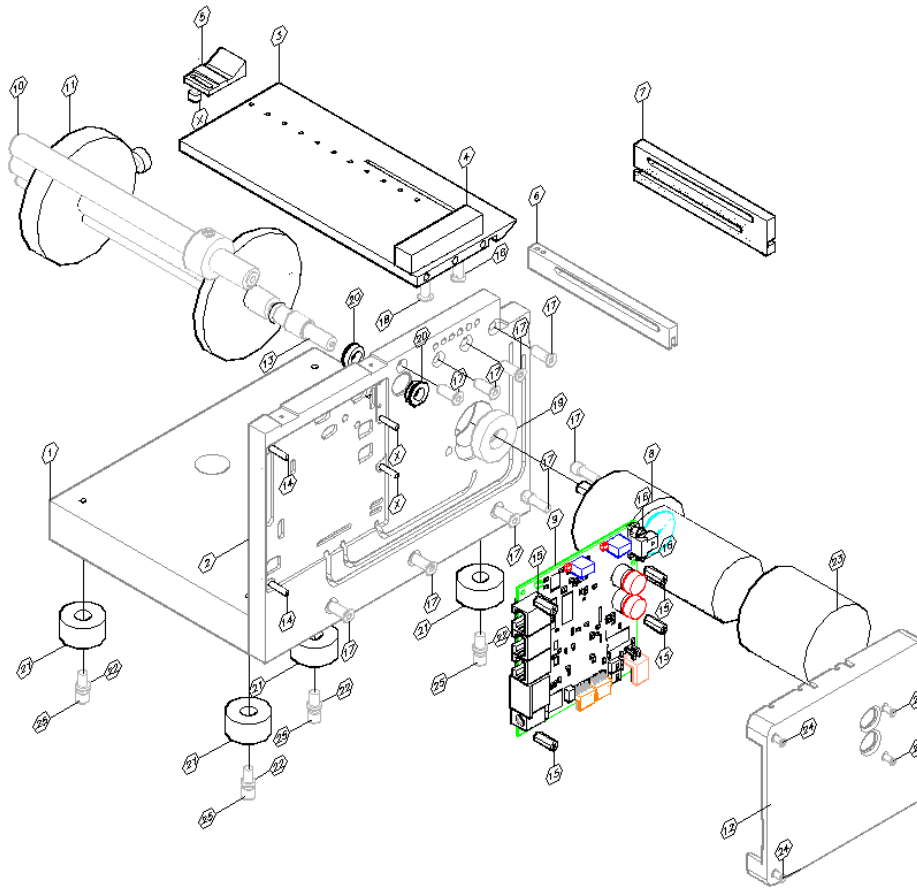
ITEM	PART NUMBER	DESCRIPTION	QTY
	C22070 LABEL DISPENSER PART CALLOUT		
1	C22070-1	BASE PLATE	1
2	C22070-2	REAR PLATE	1
3	C22070-3	PEEL PLATE	1
4	C22070-20	REAR LABEL GUIDE	1
5	C22070-19	LABEL GUIDE	1
6	C22072	PEEL SENSOR ASSY	1
7	C22071	SLOT SENSOR ASSY	1
8	RS44AXLE	MOTOR 12VDC 86OZ/IN	1
9	C22070-15	CPU PCB ASSY	1
10	C2207	LABEL IDLER ASSY	1
11	C22076	TAKEUP ASSY	1
12	C22070-12	CPU COVER	1
13	C22073	ENCODER ASSY	1
14	504DFA	4-40 X .500 SET SCREW	4
15	1893	4-40 X .500 HEX SPACER	4
16	510DBS	4-40 X .187 FILLISTER HEAD	2
17	503JHS	10-32 X .750 FLAT HEAD SS	9
18	503JFA	10-32 X .500 FLAT HEAD	2
19	60355K505	BEARINT .500 X 1.125 X .25	1
20	57155K325	FLANGED BEARING .312	2
21	1" RUBBER FEET	1" RUBBER FEET	4
22	#10 FW	#10 FLAT WASHER	4
23	VC-1593-32	PLASTIC PROTECTIVE CAP	1
24	509DES	4-4- X .375 FLAT HEAD SS	4
25	501JGS	10-32 X .625 SOCKET CAP SS	4
26			
27			
28			
29			
30			
CAREFULLY INSERT BEARINGS (19 & 20) INTO REAR PANEL AND ENSURE THEY ARE SQUARE AND FLUSH WITH THE SURFACE			
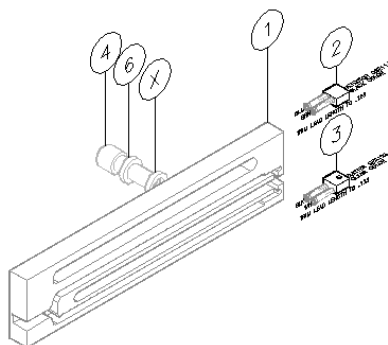
C22071 SLOT SENSOR ASSY PART CALLOUT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-10	SLOT SENSOR	1
2	QSE114	LED IR SENSOR	1
3	QEE124	LED IR EMITTER	1
4	501GFS	8-32 X .500 SOCKET CAP	1
5	#8FW	#8 FLAT WASHER	1
6	#8LW	#8 LOCK WASHER	1
INSERT FERRUL ON LED LEADS AND CRIMP WITH BLUE LONG NOSE PLIERS. ENSURE CRIMP IS PARALLEL TO THE 2 LEAD AXIS. USE BE4CABLE AND STRIP JACKET BACK 1" AND STRIP EACH WIRE TO .125". APPLY A .3" PIECE OF .062 HEAT SHRINK AND INSERT EACH WIRE TO THE APPROPRIATE PIN. CRIMP AND SEAL HEATSHRINK.			
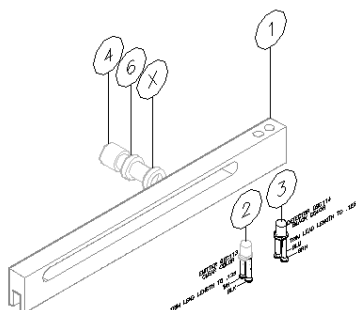
C22072 PEEL SENSOR ASSY PART CALLOUT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-11	PEEL SENSOR	1
2	QEC113	LED IR EMITTER	1
3	QSC114	LED IR DETECTOR	1
4	507CBC	8-32 X .500 SOCKET CAP	1
5	#8FW	#8 FLAT WASHEER	1
6	#8LW	#8 LOCK WASHER	1
INSERT FERRUL ON LED LEADS AND CRIMP WITH BLUE LONG NOSE PLIERS. ENSURE CRIMP IS PARALLEL TO THE 2 LEAD AXIS. USE BE4CABLE AND STRIP JACKET BACK 1" AND STRIP EACH WIRE TO .125". APPLY A .3" PIECE OF .062 HEAT SHRINK AND INSERT EACH WIRE TO THE APPROPRIATE PIN. CRIMP AND SEAL HEATSHRINK.			
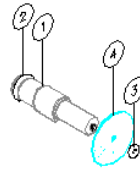
C22073 ENCODER ASSY PART CALLOUT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-12	ENCODER ROD	1
2	9452K337	.125 X .171 X .499 O-RING	1
3	9452K12	.062 X .078 X .203 O-RING	1
4	C30185	401 CPR ENCODER DISC	1
THE ENCODER DISC (4) AND RETAINING O-RING (3) ARE TO BE INSTALLED AFTER THE PCB IS ATTACHED TO THE REAR PANEL			
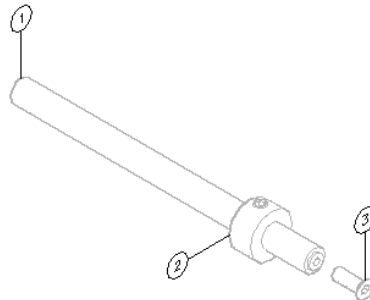
C22076 GUIDE ROD ASSY PART CALLOUT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-9	IDLER ROD	1
2	6432K16	SHAFT COLLAR .500	1
3	503JHS	10-32 X .75 HEX FLAT HEAD	1
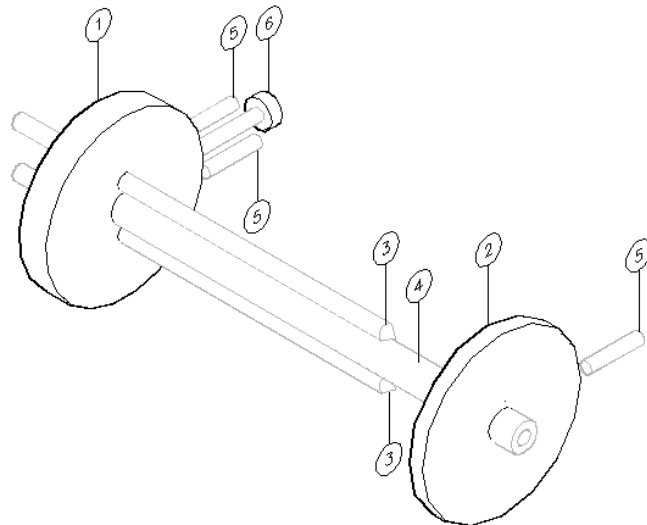
C22074 TAKEUP ASSY PART CALLOUT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-17	FRONT TAKEUP PLATE	1
2	C22070-16	REAR TAKEUP PLATE	1
3	C22070-18	TAKEUP GUIDE ROD	2
4	C22070-8	TAKEUP ROD	1
5	504GKS	SET SCREW 1" CUP POINT	3
6	C22075	#8 LOCKING CAP SCREW	1
NOTE: MAKE SURE THAT THE REAR TAKEUP PLATE ALIGNS WITH THE DETENT HOLE AT THE REAR OF THE TAKEUP ROD			

WHEN THE UNIT IS RECEIVED IT IS PATRIALLY DIS-ASSEMBLED FOR SHIPPING PURPOSES.

The following pictorial shows the correct procedure for assembly:

1. Mount the REAR REEL SUPPORT (3) to the REEL HOLDER BRACKET (6) with 2 of the 503JHS flat head screws. The location on the REEL ROD may vary depending on the nominal size of a full reel.
2. Mount the REEL ROD (1) in the center of the REAR REEL SUPPORT with 1 of the 503JHS flat head screws.
3. Place the FRONT REEL SUPPORT (4) and REEL LOCKING SCREW (5) on the REEL ROD.

C22077 REEL HOLDER ASSY PART CALLOUT

ITEM	PART NUMBER	DESCRIPTION	QTY
1	C22070-5	LABEL DISPENSER REEL ROD	1
2	503JHS	10-32 X .75 HEX FLAT HEAD	4
3	C22070-24	REAR REEL SUPPORT	1
4	C22070-23	FRONT REEL SUPPORT	1
5	C22075	#8 LOCKING CAP SCREW	1
6	C22070-4	REEL HOLDER BRACKET	1

MOUNT REEL ROD (1) AND REAR REEL SUPPORT (3) WITH 10-32 X .75 SCREWS. MAKE SURE THAT THE REEL HOLDER BRACKET IS LOCATED WITH THE COUNTERSINK FROM THE REAR AS SHOWN. THE FRONT COUNTERSINK LOCATIONS WILL BE USED TO MOUNT THE REEL HOLDER ASSY TO THE MAIN FRAME. THE REMAINING 2 10-32 X .75 SCREWS ARE USED TO MOUNT THE REEL HOLDER ASSY TO THE MAIN FRAME C22070-2.

4. Mount the assembly to the main rear panel as shown at the right with the remaining 503JHS flat head screws
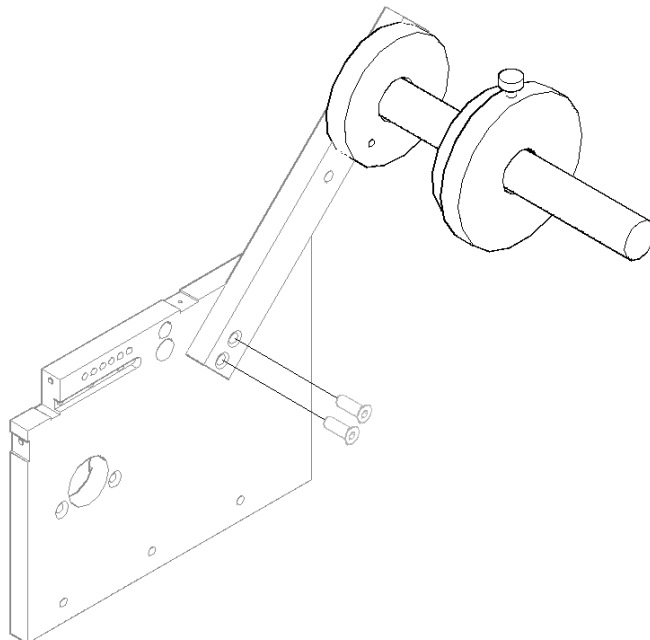
The Label Dispenser may be purchased with an optional print head of any variety. The pictorial below shows an HP style print head, but the same procedure is to be used for the LX style.

1. Mount HEAD MOUNT ADAPTER (2) to print head using 2 502GES button head screws.
2. Mount HEAD MOUNT ROD (3) into assembly and secure in place 501KES socket cap screw. Align the front of rod to edge of adapter block as shown.
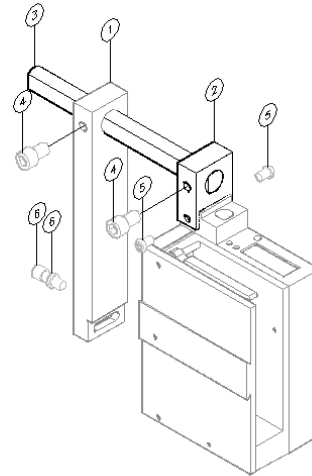
ITEM	PART NUMBER	DESCRIPTION	QTY
C22078 PRINTER MOUNTING ASSY PART CALLOUT
1	C22070-7	HEAD MOUNT NRACKET	1
2	C22070-20	HEAD MOUNT ADAPTER	1
3	C22070-6	HEAD MOUNT ROD	1
4	501KES	1/4-20 X .375 SOCKET CAP SS	2
5	501JGS	10-32 X .625 SOCKET CAP SS	1
6	#10FW	#10 FLAT WASHER	1

WHEN MOUNTING PRINT HEAD ASSEMBLY ADJUST LOCATION TO ACHIEVE THE PROPER PRINT POSITION ON LABEL.

3. Mount HEAD MOUNT BRACKET (1) to rear of main rear panel in the center of the 5 holes located just behind the slot sensor using the 10-32 x .625 socket cap screw and #10 flat washer. This bracket may be adjusted +/- .250" from this position to allow positioning of the print head in the desired location. Alternate hole patterns (5) allow for further adjustability.
4. Finally, mount the print head assembly to the HEAD MOUNT BRACKET (1) using the 501KES socket cap screw and adjust the in/out stroke to place the print head in the desired location.
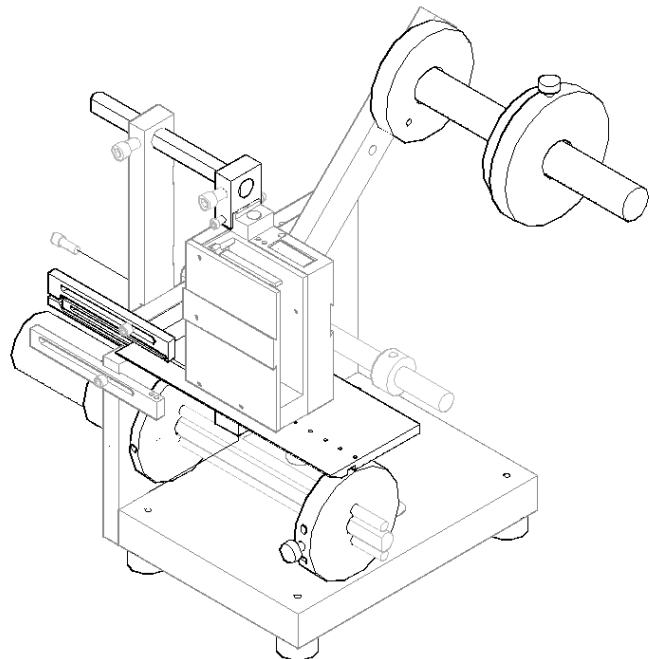
Threading the Label Dispenser

Ensure that the Guide Clamp is positioned correctly. Normally the gap should be less than 0.050". This prevents label skew

Set the under peel plate label guide to the correct position. Normally the gap should be less than 0.050" to prevent label skew.

Adjust the moveable take up mount to leave no more than 0.050 gap between the label and the bracket. The two 8-32 set screws will affix the bracket onto the two alignment guide rods

PART 4: TROUBLESHOOTING AND REPAIRS

This chart was created to assist the user in troubleshooting the unit. Find the problem in the first column; apply the remedy(s) suggested in the third column.

Condition	Probable Cause	Remedy
LCD remains blank.	No power.	Ensure the controller is securely connected to the correct port on the print head assembly
Unit does not print, although LCD shows information.	No message in unit	Input your message (see pages 2-18).
	Unit in "COMMAND" mode.	Press STOP PRINTING.
	No ink.	Replace ink cartridge; reset ink volume parameter (press F4 and follow the sequence.
Low ink indicator on with full ink cartridge.	Did not reset ink volume parameter.	Press F4 . Continue key entry following menu prompts.
Unit does not purge.	Out of ink.	Replace with full ink cartridge. Reset ink volume parameter (press F4).
	Unit in "PRINTING" mode	Press STOP PRINTING.
	Ink cartridge clogged	Clean Ink Cartridge Nozzle area with lint free wipe
Missing one or more dots from code.	No ink.	Clean or Replace cartridge and purge system (press PURGE).
	Long downtime.	Follow daily start-up procedure if your line experienced a long down time.
Unit loses data while printing	Static electricity	Eliminate source of static. Attach ground strap between print head and low impedance earth ground.
	High levels of radio frequency.	Move unit to an alternate location or attach ground strap as above.
	Spikes in electrical line.	Use AC line filter

PART 5: PARTS LIST AND OPTIONS

Part No.   Description

SPARE PARTS

C21030-1   EVOLUTION TSC Controller Cabinet

C22030-4   EVOLUTION TSC Controller LCD Assembly

C21030-3   EVOLUTION TSC Controller PCB Assembly

C21002   EVOLUTION HP 1Print Head Assembly

C21031   EVOLUTION HP 2 Print Head Assembly

C21002-7   EVOLUTION HP 1 Print Head CPU Assembly

C21031-7   EVOLUTION HP 2 Print Head CPU Assembly

C21002-8   EVOLUTION HP Print Head POGO Assembly

C21005   EVOLUTION Mounting Bracket Assembly

C21000-2   EVOLUTION Power supply

C22001   EVOLUTION LX 1 Print Head Assembly

C22007   EVOLUTION LX 2 Print Head Assembly

C22001-7   EVOLUTION LX 1 Print Head CPU Assembly

C22007-7   EVOLUTION LX 2 Print Head CPU Assembly

C22001-8   EVOLUTION LX Print Head POGO Assembly

OPTIONS

96280-01   Floor stand

C21003   Top Coding Mounting Bracket

C21006   External Product Detect

C21007   External Encoder

C21012   Optional Junction Box

EV1-FONT   Alternate Font (Specify when ordering)

EV1-LOGO   Logo Option (Specify when ordering)

CABLES

C21008-1-10   EVOLUTION RJ50 Cable 7 INCH

C21008-3-10   EVOLUTION RJ50 Cable 3 Feet

C21008-10-10   EVOLUTION RJ50 Cable 10 Feet

C21008-25-10   EVOLUTION RJ50 Cable 25 Feet

C21008-50-10   EVOLUTION RJ50 Cable 50 Feet

C21008-100-10   EVOLUTION RJ50 Cable 100 Feet

INKS for HP Systems

4500BK6	6 Pack of Black Ink Cartridges
4500RD6	6 Pack of Red Ink Cartridges
4500GR6	6 Pack of Green Ink Cartridges
4500BL6	6 Pack of Blue Ink Cartridges
4500YW6	6 Pack of Yellow Ink Cartridges
4500CY6	6 Pack of Cyan Ink Cartridges
4500UV6	6 Pack of Ultra Violet Ink Cartridges
4600BK	Black Ink Cartridges (SEMI-POROUS)
4600BL	Blue Ink Cartridges (SEMI-POROUS)
4600RD	Red Ink Cartridges (SEMI-POROUS)
4700BK	Black Ink Cartridges (NON-POROUS)

INKS for LX Systems

4550BK6	6 Pack of Black Ink Cartridges
4550RD6	6 Pack of Red Ink Cartridges
4550GR6	6 Pack of Green Ink Cartridges
4550BL6	6 Pack of Blue Ink Cartridges
4550YW6	6 Pack of Yellow Ink Cartridges
4550CY6	6 Pack of Cyan Ink Cartridges
4550UV6	6 Pack of Ultra Violet Ink Cartridges
4650BK	Black Ink Cartridges (SEMI-POROUS)
4650BL	Blue Ink Cartridges (SEMI-POROUS)
4650RD	Red Ink Cartridges (SEMI-POROUS)
4555RD	USDA APPROVED Red Ink Cartridge
4555BL	USDA APPROVED Blue Ink Cartridge
4750BK	Black Ink Cartridges (NON-POROUS)

PART 6: COMMUNICATIONS PROTOCOL

Introduction – Using The EVOLUTION Printer Control Language

To ensure that all features of EVOLUTION printers are used to their fullest, this section has been written as an aid in creating applications.
This section has been written with both the professional and advanced programmer in mind. It is assumed the reader understands concepts such as: ASCII codes, typical printer control languages, command structures, objects and various parametric programming. It is also assumed the reader can use a programming language like C, C/C++, Basic, or any other programming language capable of sending and receiving commands to and from the EVOLUTION printer via a serial communications port.

This communication protocol covers all EVOLUTION products. Some commands are not applicable to certain units, and care must be taken in determining what valid commands are for each specific printer. Commands that reference specific units are so noted.

Communications between a printer and the hand held controller, a host computer, or PLC are identical. The hand held controller limits the available features of the printer to simplify operation and minimize user data entry mistakes.

The communications protocol is via an RS485 data link operating in a master/slave environment where the printers are the slaves. There can only be one master such that both the hand held controller and a host device cannot coexist.
RS485 communications can be used effectively over long distances (up to 4000 feet) and in electrically noise environments as result of electromagnetic interference from motors and welding equipment. Also, multiple receivers (EVOLUTION Printers) -up to 32- may be connected to such a network in a linear multi-drop configuration in a master-slave topology.

When writing a customized Windows software application to drive the EVOLUTION LX printer from a personal computer either an RS232 serial port or USB virtual port may be used. In either case an RS232 to RS485 or USB to RS485 converter is necessary.

RS232 serial ports are becoming less standard especially on laptop computers; therefore USB converters are the preferred communications interface. Software drivers create a **"virtual serial port"** which is an emulation of the standard serial port has to be installed. This port is created by software, which enables extra serial ports in an operating system without additional hardware installation.

When installing a USB device the operating system normally decides on installation what device address is assigned to the newly installed device.

The converter its driver and the virtual serial port along with the cables are available as an option from Digital Design.

Also, in writing Windows Applications is necessary to considerer the following:

When using a virtual serial port USB device the printer network may be connected as a multi-drop environment. Therefore it is necessary to ensure that when writing software all command structures are preceded by a specific device address.

If using MS Visual Basic as a development tool for building applications the user should ensure to use the MSComm serial communications module.

If using MS Visual C++ or MS Visual C#, the Serial Port class included in Microsoft's .NET Framework is the best tool to be used.

ASCII CHARACTER CHART

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2	SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	`	|	`	~	DEL

DESCRIPTION
This communication protocol is based on Version 1.4, which was initially released NOV 2005 and is used with all EV0LUTI0N products. The communications option converses with a host computer via an RS485 data link.

NOTE: EACH REQUEST OR COMMAND SENT TO A PRINT STATION RECEIVES A RESPONSE FROM THAT PRINT STATION. COMMUNICATIONS SOFTWARE MUST WAIT FOR A RESPONSE TO DETERMINE IF THE PRINT STATION WAS READY TO ACCEPT THE COMMAND, AND THE DATA WAS VALID AND PROCESSED. NO RESPONSE COULD INDICATE THE DATA WAS LOST. IF AN ERROR WAS DETECTED IN PROCESSING A NAK WITH AN ERROR CODE IS RETURNED.

DATA WORD DEFINITION
Full Duplex
7 Data Bits
1 Even Parity Bit
1 Start Bit
1 Stop Bit

BAUD RATE
115,200 Bits per second

DEFINITIONS
Q=QUERY TO HEAD
R=RESPONSE FROM HEAD
D=DATA UPDATE TO HEAD
X=ACK FROM HEAD
'!'=ASCII CHARACTER OR CHARACTERS
0x21 HEX DATA EQUIVELENT
ADDRESS= TWO ASCII REPRESENTATIONS OF HEX CHARACTERS
`x`|`y` TWO ASCII CHARACTERS REPRESENTING THE UPPER AND LOWER
       NIBBLE OF A HEXADECIMAL BYTE WHERE X IS THE UPPER NIBBLE AND
       Y IS THE LOWER NIBBLE
FOR EXAMPLE:
       TO SEND A SPEED OF 105 FEET PER MINUTE SEND
          ASCII : (0x3a) AND ASCII 5 (0x35)
       TO SEND A DELAY OF 30 SEND
          ASCII 3 (0x33) AND ASCII 0 (0x30)

NOTE: THE ` CHARACTER AND | CHARACTER ARE NOT PART OF THE DATA STREAM AND ARE THERE FOR SEPARATION OF FIELDS ONLY.

CABLING FOR EVLINK ENVIRONMENT
C40020-1   EV to RS232 Convertor
C40020-2   EV to USB Convertor (for custom network cable length)
C40020-3   EV to USB Convertor (6 feet)
C21009   RS485 Termination Plug

HARDWARE INTERFACE
When connecting multiple printers via an RS485 link, input and output connectors are provided on the print station, which allows the cabling to be daisy chained. NOTE: It is important to remember to set each of the print stations to a unique address.

PHYSICAL CONNECTIONS RS485 PRINTER

Pin # 4	= Receive +
Pin # 5	= Receive -
Pin # 6	= Transmit +
Pin # 7	= Transmit -
Pin # 9	= Ground

Note: At the end of the data link a termination plug should be installed to balance the RS485 data link-connecting pin 4 to pin 5 and pin 6 to pin 7 with 120-ohm resistor.

PROTOCOL FORMAT:
  Host request for information;
      ESC|Command|SOH|EOT   (Single End Host to 1 printer)
     Or
     ESC|STX|Address|Command|SOH|EOT (Multiple printers)

  Host sending new information;
      ESC|Command|Data|EOT   (Single End Host to 1 printer)
     Or
     ESC|STX|Address|Command|Data|EOT (Multiple printers)

EVOLUTION PRINTABLE CHARACTER SET

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9

Special Symbols:

ASCII Character	Hexadecimal	Prints As
Space	(0x20)	Space
!	(0x21)	Hour Glass
#	(0x23)	#
$	(0x24)	$
&	(0x26)	&
(	(0x28)	(
)	(0x29)	)
*	(0x2a)	*
+	(0x2b)	+
-	(0x2d)	-
.	(0x2e)	Period
=	(0x3d)	=
:	(0x3a)	:
/	(0x2f)	/
"	(0x22)	Cents
%	(0x25)	Solid block
;	(0x3b)	Ň
?	(0x3f)	Ě
@	(0x40)	Ó

Special Function Characters

`	(0x7b`	Large Logo 1
|	(0x7c)	Large Logo 2
`	(0x7d`	Large Logo 3
`	(0x7b`	Small Logo 1
|	(0x7c)	Small Logo 2
`	(0x7d`	Small Logo 3

NOTE: The same characters are used for a 2-line logo as is used for a 1-line logo. When the message is a 1-**line it accesses the logo from the** font table **memory map for a single line font, which is, where the large logos are stored. Conversely when the message is a 2-line then the logo is accessed from the memory map imbedded within the 2-line font table.**

SOFTWARE PROTOCOL

In the following pages, all references to characters or digits pertain to the standard ASCII character set. The bar (|) character is used as a field separator and it is not part of the transferred data. When data is shown in hexadecimal, it will consist of the hex number preceded by a 0x, for example (0x1B). Generally, all packets to and from a print station begin with an ESC (0x1B) and terminate with an EOT (0x04).

There are two types of commands:

Downloading information to the print station

Requesting information from the print station.

To distinguish the two types of commands, a SOH (0x01) is placed after the command byte in a request command string. The following illustrates this concept:

   To download data to print station
   ESC/GROUP ADDRESS/UNITADDRESS/COMMAND/DATA/EOT
   To request data from the Print Station
   ESC/GROUP ADDRESS/UNITADDRESS/COMMAND/SOH/EOT

NOTE: EACH REQUEST OR COMMAND SENT TO A PRINT STATION RECEIVES A RESPONSE FROM THAT PRINT STATION. COMMUNICATIONS SOFTWARE MUST WAIT FOR A RESPONSE TO DETERMINE IF THE PRINT STATION WAS READY TO ACCEPT THE COMMAND, AND THE DATA WAS VALID AND PROCESSED. NO RESPONSE COULD INDICATE THE DATA WAS LOST OR THE PRINTER WAS OCCUPIED PERFORMING A NON-INTERRUPTABLE TASK. IF AN ERROR WAS DETECTED DURING COMMUNICATIONS A NAK WITH AN ERROR CODE IS RETURNED. IN THE EVENT OF A NAK RESPONSE IT IS THE RESPONSIBILITY OF THE PROGRAMMER TO DETERMINE THE NATURE OF THE ERROR, CORRECT THE PROBLEM IF NECESSARY, AND RESEND THE COMMAND TO THE APPROPRIATE PRINTER. IT SHOULD NEVER BE ASSUMED THAT THE PRINTER RECEIVED THE DATA. VERIFICATION FROM THE PRINTER SHOULD ALWAYS BE TAKEN INT CONSIDERATION.

There is often confusion concerning how data is represented when transmitted within strings of text. As a general rule each character imbedded within a string is an ASCII character. Take for example the command for setting the printer address, which is the ASCII character B. The imbedded data requires two bytes of data they are 'X' and 'Y'. When received by the printer these two bytes are concocted into an 8-bit byte. Therefore to set a printers address to 15 it is necessary to send two ASCII characters a HEX 31 (the number 1) and a HEX 35 (the number 5)

   i.e. x = 0x31 & y = 0x35 yields unit address 15

ERROR CODES

Commands to a print station, if completed successfully, return a single byte response of an ASCII ACK (0x06). If the command was not successful, a two-byte response of an ASCII NAK (0x15) is returned, followed by an error code. Below is a list of the returned error codes.
Both responses will be preceded with the printers address for further verification.

ACK command
   ESC/GROUP ADDRESS/UNITADDRESS/ACK/EOT

NAK command
   ESC/GROUP ADDRESS/UNITADDRESS/NAK/'ERROR CODE'/EOT
   Where error code is a single byte ASCII 31 to 39

NAK 1	= PHYSICAL DATA ERROR
NAK 2	= ILLEGAL COMMAND BYTE
NAK 3	= MANUAL PRINT ATTEMPTED WHILE IN PRINTING MODE
NAK 4	= TRYING TO READ A WRITE ONLY FIELD
NAK 5	= TRYING TO WRITE A READ ONLY REGISTER
NAK 6	= PRINT STATION INPUT BUFFER FULL MUST PRINT BEFORE NEXT DOWNLOAD TO CLEAR INPUT BUFFER.
NAK 7	= SYSTEM BUSY – USER HAS SYSTEM THRU KEYBOARD
NAK 8	= SYSTEM BUSY – PRINTING FUNCTION
NAK 9	= BARCODE DOES NOT VERIFY

NOTE THE FOLLOWING COMMAND SET IS APPLICABLE TO ALL EVOLUTION MODELS EXCEPT WHERE NOTED. WHERE EV 1 OR EV 2 IS STATED IT REFERS TO BOTH EV 1 OR EV 2 AND LX 1 OR LX 2.

COMMANDS:

'!'   0x21   Software Version (read only)
(EV 1, EV 2, EV SC)

   Q. ESC|STX|Address|`!`|SOH|EOT

  R. ESC|STX|Address|`PRINTER fffffssss`|CR|EOT

      Where:

      PRINTER= ASCII string   PRINTER for EVOLUTION I LX

                                EV2   for EVOLUTION I LX

                                  EVSC   for EVOLUTION SC

            fffff = Software and Firmware versions

            (e.g. 2.02H indicates version 2.02 with Firmware version H)

            ssss = Optional Software loaded

                  Where: (for EV 1 only)

                        The first y indicates option pack 1 – OP1

                        The second y indicates option pack 2 – OP2

                        The third y indicates option pack 1.5 – OP1.5

                        The last y is reserved for option pack 3- OP 3

                  Where: (for EV 2 and EV SC)

                  Both units are standard with all options thus a ++++ will be returned

'#'   0x23 Printer Configuration (Read only)
(EV 1, EV 2, EV SC)

   Q. ESC|STX|Address|`#`|SOH|EOT

   R. ESC|STX|Address|`#`|`x`|`y`|EOT

     Where Byte x Bits 3,2,1,0

             Bit 3 = if 1 Cartridge Not Valid

             Bit 2 = Not Used

             Bits 1,0 = System Type

                  11 = EVOLUTION I LX

                  10 = Evolution 2

                  01 = Evolution 3

                  00 = Evolution Small Character

     Where Byte y Bits 3,2,1,0

                  0000 = no options available

                  0001 = option1 enabled

                  0010 = option2 enabled

                  0100 = option1.5 enabled

                  1000 = option3 enabled

'\'   0x5c Unit Serial Number (Read only 6 digits)
(EV 1, EV 2, EV SC)

   Q. ESC|STX|Address|`\`|SOH|EOT

   R. ESC|STX|Address|`\`|`serial number`|CR|EOT

'l'   0x6c Special Field Flags
(EV 2, EV SC AND EV 1 WITH OP1 AND ABOVE)

Q. ESC|STX|Address|`l`|SOH|EOT
R. ESC|STX|Address|`l`|`x`|`y`|EOT
         Where: x defines bits 7,6,5,4
              Bit 7 = don't care
              Bit 6 = dont care
              Bit 5 = 1 = No guard bars
              Bit 4 = 1 = Man read added to barcode
       Where: y defines bits 3,2,1,0
              Bit 3 = 1 = Bar checksum added to barcode
              Bit 2 = 0 = Calendar will only change on 1st day of week
              Bit 1 = 1 = Day of the week is alpha
              Bit 0 = 1 = counting down

D. ESC|STX|Address|`l`|`x`|`y`|EOT
X. ESC|STX|Address|`l`|ACK|EOT

'8'   0x38 Control Flags
(EV 1, EV 2, EV SC)

Q. ESC|STX|Address|`8`|SOH|EOT
R. ESC|STX|Address|`8`|`x`|`y`|EOT
         Where: x defines bits 7,6,5,4
              Bit 7   1 = Head busy printing message
              Bit 6   1 = Print image inverted
              Bit 5   1 = Head busy manual cycle
              Bit 4   1 = Head busy purging
       Where: y defines bits 3,2,1,0
              Bit 3   1 = External Encoder
              Bit 2   1 = External Product Detect
              Bit 1   1 = Direction forward
              Bit 0   1 = Enable PRINTING Mode

D. ESC|STX|Address|`8`|`x`|`y`|EOT
X. ESC|STX|Address|`8`|ACK|EOT
         Where: x defines bits 7,6,5,4
              Bit 7   Don't Care
              Bit 6   1 = Print image inverted
              Bit 5   Don't Care
              Bit 4   Don't Care
       Where: y defines bits 3,2,1,0
              Bit 3   1 = External Encoder
              Bit 2   1 = External Product Detect
              Bit 1   1 = Direction forward
              Bit 0   1 = Enable PRINTING Mode

'G'   0x47 Errors (note: error codes must be reset)
(EV 1, EV 2, EV SC)

Q. ESC|STX|Address|`G`|SOH||EOT
R. ESC|STX|Address|`G`|`x`|`y`|EOT

      Where: x defines bits 7,6,5,4

           Bit 7 = UART Overrun Error
           Bit 6 = Communication Overrun Error
           Bit 5 = UART Framing Error
           Bit 4 = UART Parity Error

      Where: y defines bits 3,2,1,0

           Bit 3 = Font checksum error loading from card to chip
           Bit 2 = Font 1 checksum error in Ram
           Bit 1 = Font 0 checksum error in Ram
           Bit 0 = Real Time Clock Memory error

TO RESET ERROR CODES

D. ESC|STX|Address|`G`|`x`|`y`|EOT

        same bit positions as above
        use only as a mask to clear error bits.
        i.e. x = 0001 and y = 0001 clears real time clock memory
           error and UART parity error.

X. ESC|STX|Address|`G`|ACK|EOT

'R'   0x52   Head Status (read only)
(EV 1, EV 2, EV SC)

Q. ESC|STX|Address|`R`|SOH|EOT
R. ESC|STX|Address|`R`|`x`|`y`|EOT

      Where: x defines bits 7,6,5,4

           Bit 7 = Not Used
           Bit 6 = Latched eye active
           Bit 5 = Unfiltered eye active
           Bit 4 = Product being printed

      Where y defines bits 3,2,1,0

           Bit 3 = auto repeat print gap active
           Bit 2 = Not Used
           Bit 1 = Input buffer Line 2 full
           Bit 0 = Input buffer Line 1 full

'U'   0x55   General purpose flags (read only)
(EV 1, EV 2, EV SC)
     Q. ESC|STX|Address|`U`|SOH|EOT
     R. ESC|STX|Address|`U`|`y`|EOT
          Where y defines bits 3,2,1,0
               Bit 3 = Not Used
               Bit 2 = Not Used
               Bit 1 = Ink Cartridge Empty
               Bit 0 = Mixed Raster Enabled

'B'   0x42 Set Unit Address (Write Only)
(EV 1, EV 2, EV SC)
    D. ESC|STX|Address|`B`|`x`|`y`|EOT
    X. ESC|STX|Address|`B`|ACK|EOT
       Where x y = 8 bit unit address
          i.e. x = 0x31 & y = 0x35 yields unit address 15

'1'   0x31 Auto Repeat Inter-print delay (Range 0 - 255)
(EV 2, EV SC AND EV 1 with any option pack)
    Q. ESC|STX|Address|`1`|SOH|EOT
    R. ESC|STX|Address|`1`|`x`|`y`|EOT

    D. ESC|STX|Address|`1`|`x`|`y`|EOT
    X. ESC|STX|Address|`1`|ACK|EOT
       0 = Auto Repeat Disabled
       Each count provides a delay equal to 16 columns for EV 1 and EV 2.
       Each count provides a delay equal to 2 columns for EV SC.

'&'   0x26 Line Speed (RANGE 10-200)
(EV 1, EV 2, EV SC)
    Q. ESC|STX|Address|`&`|SOH|EOT
    R. ESC|STX|Address|`&`|`x`|`y`|EOT

    D. ESC|STX|Address|`&`|`x`|`y`|EOT
    X. ESC|STX|Address|`&`|ACK|EOT

'd'   0x64 Encoder Divider (Range 0-7)
(EV 1, EV 2, EV SC)
    Q. ESC|STX|Address|`d`|SOH|EOT
    R. ESC|STX|Address|`d`|`x`|`y`|EOT

    D. ESC|STX|Address|`d`|`x`|`y`|EOT
    X. ESC|STX|Address|`d`|ACK|EOT

'''   0x27 Product Delay (RANGE 1-255)
(EV 1, EV 2, EV SC)
    Q. ESC|STX|Address|`0x27`|SOH|EOT
    R. ESC|STX|Address|`0x27`|`x`|`y`|EOT

    D. ESC|STX|Address|`0x27`|`x`|`y'|EOT
    X. ESC|STX|Address|`0x27`|ACK|EOT

')'   0x29 Inter-Character spaces (RANGE 1-25)
(EV 1, EV 2, EV SC)
    Q. ESC|STX|Address|`)`|SOH|EOT
    R. ESC|STX|Address|`)`|`x`|`y`|EOT

    D. ESC|STX|Address|`)`|`x`|`y'|EOT
    X. ESC|STX|Address|`)`|ACK|EOT

'>'   0x3E Head Align (Range 0 - 16)   'O' on keyboard
(EV 2 only)
Q. ESC|STX|Address|`>`|SOH|EOT
R. ESC|STX|Address|`>`|`x`|`y'|EOT

D. ESC|STX|Address|`>`|`x`|`y`|EOT
X.   ESC|STX|Address|`>`|ACK|EOT

'4'   0x34 Sequence Number Rollover Value
(EV 2, EV SC AND EV 1 with version 2.09 and OP2 or 3)
Q. ESC|STX|Address|`4`|SOH|EOT
R. ESC|STX|Address|`4`|`#########`|CR|EOT
            where ######### = rollover value in ascii (max 9 digits)

D. ESC|STX|Address|`4`|`#########`|CR|EOT
X. ESC|STX|Address|`4`|ACK|EOT

'^'   0x5E Lot Counter Limit Count
(EV 2, EV SC AND EV 1 with version 2.09 and OP2 or 3)
Q. ESC|STX|Address|`^`|SOH|EOT
R. ESC|STX|Address|`^`|`###`|CR|EOT
            where ### = rollover value in ascii (max 4 digits)

D. ESC|STX|Address|`^`|`####`|CR|EOT
X. ESC|STX|Address|`^`|ACK|EOT

'_'   0x5F Lot Counter Value (read only)
(EV 2, EV SC AND EV 1 with version 2.09 and OP2 or 3)
Q. ESC|STX|Address|`_`|SOH|EOT
R. ESC|STX|Address|`_`|`###`|CR|EOT
            where ### = current count value in ascii (max 4 digits)

D. ESC|STX|Address|`_`|`####`|CR|EOT
X. ESC|STX|Address|`_`|ACK|EOT

'['   0x5b DATE_ROLLOVER
(EV 2, EV SC AND EV 1 with version 2.09 and OP2 or 3)
Q. ESC|STX|Address|`[`|SOH|EOT
R. ESC|STX|Address|`[`|`x`|`y`|`x1`|`y1`|EOT
            Where:
                     |`x`|`y`| = Time of Day Hours
                     |`x1`|`y1`| = Time of Day Minutes

D. ESC|STX|Address|`[`|`x`|`y`|`x1`|`y1`|EOT
X. ESC|STX|Address|`[`|ACK|EOT

'3'   0X31 Expiration Days 1 (max 999)
       or
'@'   0X31 Expiration Days 2 (max 999)

       (EV 2, EV SC AND EV 1 WITH OP3)
       Q. ESC|STX|Address|`3`|SOH|EOT
       R. ESC|STX|Address|`3`|`aaaa`|EOT
              Where: each set of 2 ASCII characters represent the upper and
                     lower nibble of a packed BCD byte

       D. ESC|STX|Address|`3`|aaaa`|EOT
              Where: each set of 2 ASCII characters represent the upper and
                     lower nibble of a packed BCD byte
       X. ESC|STX|Address|`3`|ACK|EOT

'r'   0x72   Remaining Ink (0 to 99%)
       (EV 1, EV 2, EV SC)
   Q. ESC|STX|Address|`r` |SOH|EOT
   R. ESC|STX|Address|`r`|`x`|`y`|EOT

'0'   0x30 Shift Code (max 6 shift codes)
       (EV 2, EV SC AND EV 1 WITH OP3)
       Q. ESC|STX|Address|`0`|SOH||EOT
       R. ESC|STX|Address|`0`|`hh mm`|`zz`|……|CR|EOT
              Where: each set of 2 ASCII characters represent the upper and
                     lower nibble of a packed BCD byte
                     ……   = pattern repeat for each shift code programmed
                     hh   = shift start hours
                     mm   = shift start minutes
                     zz   = shift code to print

       D. ESC|STX|Address|`0`|`hhmm`|`z`|CR|EOT
              Where: each set of 2 ASCII characters represent the upper and
                     lower nibble of a packed BCD byte
                     hh = shift start hours
                     mm = shift start minutes
                     zz = shift code to print
       X. ESC|STX|Address|`0`|ACK|EOT

'/' 0x2f Product Counter (6 Digits Max)
(EV 2, EV SC AND EV 1 WITH OP3)
Q. ESC|STX|Address|`/`|SOH|EOT
R. ESC|STX|Address|`/`|`HH MM hh mm`|`cccccc`|CR|EOT

> Where: each set of 2 ASCII characters represent the upper and
> lower nibble of a packed BCD byte
> HH = Product counter start hours
> MM = Product counter start minutes
> hh = Product counter stop hours
> mm = Product counter stop minutes
> cccccc = counter (6 Digits Max)

D. ESC|STX|Address|`/`|`ww xx yy zz`|`cccccc`|CR|EOT

> Where: each set of 2 ASCII characters represent the upper and
> lower nibble of a packed BCD byte
> HH = Product counter start hours
> MM = Product counter start minutes
> hh = Product counter stop hours
> mm = Product counter stop minutes
> cccccc = counter

X. ESC|STX|Address|`/`|ACK|EOT

'6'   0x36   Cycle Head (Write Only)
(EV 1, EV 2, EV SC)
D. ESC|STX|Address|`6` |SOH|EOT
R. ESC|STX|Address|`6`|ACK|EOT

'`'   0x60 Print Column Configuration
(All Lexmark Models)
Q. ESC|STX|Address|```|SOH|EOT
R. ESC|STX|Address|```|`x`|`y`|EOT

> Where: y defines
> 1 = Column 1
> 2 = Column 2
> 3 = Column 3
> 4 = Column 4
> 5 = Columns 1&2 (600 DPI)
> 6 = Columns 3&4 (600 DPI)
> 7 = Columns 1,2 ,3 ,4 sequencing each print cycle
> 8 = Column 1&2, 3&4 sequencing each print cycle (600 DPI

D. ESC|STX|Address|```|`x`|`y`|EOT
X. ESC|STX|Address|```|ACK|EOT

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SPECIAL FIELD OBJECTS

Message Objects define special characteristics about the messages contained in line 1 or line 2. These may define for example font size, sequence number, date code, etc. There may be up to 15 Objects (special fields) for each line in a message with the limitation that there can only be 1 sequence number imbedded in a message.

'P'   0x50   Message Objects
(EV 1, EV 2, EV SC)

Q. ESC|STX|Address|`P`|SOH|aabb|EOT

R. ESC|STX|Address|`P`|`aa bb cc dd ee ff gggg hhhh`|EOT

        Where: each set of 2 ASCII characters represent the upper and lower nibble of a byte

        aa = objects for which line 0 or 1

        bb = number of objects transmitted. (Max 15)

        Each object as defined by bb: (repeat the for each object)

            cc   = Position within message string

            dd   = Number of characters in object

            ee   = Attribute of the object

            Where:

                ee= 00 Normal Alpha/Numeric character

                ee= 01 Time Hours

                ee= 02 Time Minutes

                ee= 03 Time Seconds

                ee= 04 Date Month

                ee= 05 Date Day

                ee= 06 Date Year

                ee= 07 Date Julian

                ee= 08 Sequence Number (1 per message)

                ee= 09 Barcode

                ee= 0A Shift Code

                ee= 0B Expiration Date Month

                ee= 0C Alpha Date Code

conflict shows lot code ee= 0D Expiration Date Year

                ee= 0E Expiration Date Julian

                ee= 0F Expiration Date Day

                ee= 10 Day of Week (1-7)

                ee= 12 Expiration 2 Date Month in Alpha

                ee= 13 Expiration 2 Date Year

                ee= 14 Expiration 2 Date Month

                ee= 15 Expiration 2 Date Julian

                ee= 16 Expiration 2 Date Day

                ee= 40 Valid Bar Code (EV 2 only) OR'd with other Attributes

                ee= 80 Bar Code Attribute (EV 2 only) OR'd with other Attributes

'P' 0x50   Message Objects (continued)

ff   = font of object
Where: for EV 1 AND EV 2
        ff= 00 for 2 Line Font
        ff= 01 for 1 Line Font
        ff= 02 for 3 Line Font (EV 2 only)
        ff= 03 for 4 Line Font (EV 2 only)
Where: for EVSC ONLY
        ff= 00 for S5 Font
        ff= 01 for S7 Font
        ff= 02 for B7 Font
        ff= 03 for S12 Font
        ff= 04 for B12 Font

gggg   = starting column of object in printed image (reserved)
hhhh   = starting row of object in printed image (reserved)

D. ESC|STX|Address|`P`|`aa bb cc dd ee ff gggg hhhh`|EOT
X. ESC|STX|Address|`P`|ACK|EOT

Even though there up to 24 characters (48 characters for LX1 with OP 1.5 and above or LX 2) permitted per line data entry will be inhibited when the 15th object is entered, although the last field, if it is an alpha/numeric object, may contain enough characters to meet the max character limit.
Barcodes are also an object field and must be considered when entering a message. Thus a barcode with imbedded variable field data would be counted as two or mode objects.

NOTE: PRINTER MAX CHARACTERS PER LINE
(EV 1 max 24 characters – 48 characters OP1.5, 2 or 3)
(EV 2 max 48 characters)
(EV SC max 96 characters)

'$'   0x24 Line 1 Message
Q. ESC|STX|Address|`$`|SOH|EOT
R. ESC|STX|Address|`$`|`message`|CR|EOT

D. ESC|STX|Address|`$`|`message`|CR|EOT
X. ESC|STX|Address|`$`|ACK|EOT

'%'   0x25 Line 2 Message
Q. ESC|STX|Address|`%`|SOH|EOT
R. ESC|STX|Address|`%`|`message`|CR|EOT

D. ESC|STX|Address|`%`|`message`|CR|EOT
X. ESC|STX|Address|`%`|ACK|EOT

'w'   0x77 Line 3 Message (EV 2 only max 48 characters)
Q. ESC|STX|Address|`$`|SOH|EOT
R. ESC|STX|Address|`$`|`message`|CR|EOT

D. ESC|STX|Address|`$`|`message`|CR|EOT
X. ESC|STX|Address|`$`|ACK|EOT

'z'   0x7a Line 4 Message (EV 2 only max 48 characters)
Q. ESC|STX|Address|`$`|SOH|EOT
R. ESC|STX|Address|`$`|`message`|CR|EOT

D. ESC|STX|Address|`$`|`message`|CR|EOT
X. ESC|STX|Address|`$`|ACK|EOT

'E'   0x45 Line 5 Message (Prefix line)
Q. ESC|STX|Address|`$`|SOH|EOT
R. ESC|STX|Address|`$`|`message`|CR|EOT

D. ESC|STX|Address|`$`|`message`|CR|EOT
X. ESC|STX|Address|`$`|ACK|EOT

NOTE: TO ENTER A LOGO CALLOUT INTO A MESSAGE USE THE ACSII CHARACTERS 0x7B FOR LOGO1 0x7C FOR LOGO 2 AND 0x7D FOR LOGO 3

':' 0x3A Logo1 Name (read only - max 9 characters) (EV 1, EV 2)
  Q. ESC|STX|Address|`:`|SOH|`x`|`y`|EOT
  R. ESC|STX|Address|`:`|`logo name`|CR|EOT
          Where: x = don't care
                  y = Bit 0 =   0 = Logo Name in Font 0
                                 1 = Logo Name in Font 1
                     Bit 1 =   0 = Get Name from on board data flash chip
                                 1 = Get Name fro Data Flash card

';' 0x3B Logo2 Name (read only - max 9 characters) (EV 1, EV 2)
  Q. ESC|STX|Address|`;`|SOH|`x`|`y`|EOT
  R. ESC|STX|Address|`;`|`logo name`|CR|EOT
          Where: x = don't care
                  y = Bit 0 =   0 = Logo Name in Font 0
                                 1 = Logo Name in Font 1
                     Bit 1 =   0 = Get Name from on board data flash chip
                                 1 = Get Name fro Data Flash card

'<' 0x3C Logo3 Name (read only - max 9 characters) (EV 1, EV 2)
  Q. ESC|STX|Address|`<`|SOH|`x`|`y`|EOT
  R. ESC|STX|Address|`<`|`logo name`|CR|EOT
          Where: x = don't care
                  y = Bit 0 =   0 = Logo Name in Font 0
                                 1 = Logo Name in Font 1
                     Bit 1 =   0 = Get Name from on board data flash chip
                                 1 = Get Name fro Data Flash card

'Q' 0x51 Starting Sequence Number (max. length 9 digits) (EV 2, EV SC AND EV1 with version 2.09 and after)
  Q. ESC|STX|Address|`Q`|SOH|EOT
  R. ESC|STX|Address|`Q`|`zzzzzzzzz`|CR|EOT
          Where:
                  zzzzzzzzz = ASCII string which is the starting sequence number to print.

  D. ESC|STX|Address|`Q`|`zzzzzzzzz`|CR|EOT
  X. ESC|STX|Address|`Q`|ACK|EOT

'2' 0x32 Date and Time Setting / Reading
(EV 1, EV 2, EV SC)
Q. ESC|STX|Address|`2`|SOH|EOT

R. ESC|STX|Address|`2`|`aa bb cc dd ee ff gg`|EOT

Where: each set of 2 ASCII characters represent the upper and
lower nibble of a packed BCD byte
aa= Time of Day Seconds (not used)
bb= Time of Day Minutes
cc= Time of Day Hours
dd= Day of Week
ee= Date Day
ff = Date Month
gg= Date Year

D. ESC|STX|Address|`2`|`aa bb cc dd ee ff gg`|CR|EOT

X. ESC|STX|Address|`2`|ACK|EOT

'u' 0x75 Store message in non-volatile memory (Write only)
(EV 1, EV 2, and EV SC)
D. ESC|STX|Address|`u`| EOT

X. ESC|STX|Address|`u`|ACK|EOT

NOTE: THE FOLLOWING CODES ARE SPECIFIC TO EV 2

' " '   0x22 Minimum Bar Width (Range 3-15 Data matrix 2-15)
                                                                Default 5

    Q. ESC|STX|Address|`"`|SOH|EOT
    R. ESC|STX|Address|`"`|`x`|`y`|EOT

    D. ESC|STX|Address|`"`|`x`|`y`|EOT
    X. ESC|STX|Address|`"`|ACK|EOT

' . '   0x2e Bleed Compensation (Range 0 - 3) Default 0
    Q. ESC|STX|Address|`.`|SOH|EOT
    R. ESC|STX|Address|`.`|`x`|`y`|EOT

    D. ESC|STX|Address|`.`|`x`|`y`|EOT
    X. ESC|STX|Address|`.`|ACK|EOT

' * '   0x28 Quiet Zone (Range 0 - 150) Default 75
    Q. ESC|STX|Address|`*`|SOH|EOT
    R. ESC|STX|Address|`*`|`x`|`y`|EOT

    D. ESC|STX|Address|`*`|`x`|`y`|EOT
    X. ESC|STX|Address|`*`|ACK|EOT

'n'   0x6e Type of Barcode (read only)
    Q. ESC|STX|Address|`n`|SOH|EOT
    R. ESC|STX|Address|`n`|`x`|`y`|EOT
        where
            x = number of available barcodes
            y = type of barcode
                0= CODE39
                1= TWO OF FIVE
                2= CODE 128B
                3= CODE 128C
                4= UPCA
                5= UPCE
                6= EAN8
                7= EAN13
                8= DATAMATRIX

'?'   0x3F Barcode Name(read only)
Q. ESC|STX|Address|`?`|SOH|`x`|`y`|`x1`|`y1`|EOT
          Where:
               `x``y` = Barcode type as in 'n' command
               `x1`|`y1` = don't care
R. ESC|STX|Address|`?`|`BARCODENAME`|CR|EOT
    where BARCODENAME = Ascii name of type of barcode

'='   0x3d Barcode Verify
D. ESC|STX|Address|`=`|`x`|`y`|`BARCODESTRING`|CR|EOT
        x = don't care
        y = type of barcode (same as 'n' command)
        BARCODESTRING = Barcode Ascii data
X. ESC|STX|Address|`=`|`xy`|EOT
    where
         if barcode verifies
        ESC|STX|Address|`=`|ACK|EOT
         if barcode doesn't verify
        ESC|STX|Address|`=`|NAK|`9`|EOT

EXAMPLE WRITTEN IN C
to query a print station to determine the line speed.
INITIALIZE AND OPEN A SERIAL CHANNEL
EXECUTE THE FOLLOWING CODE

```
// Query Print Station Address 7 for Line Speed
        putchar(0x1b);              // Send out ESC
        putchar(0x02);              // Send out STX
        putchar(0x30);              // Send out upper nibble of address 07
        putchar(0x37);              // Send out lower nibble of address 07
        putchar(0x26);              // Send out a '&' command
        putchar(0x01);              // Send out SOH
        putchar(0x04);              // Send out EOT

        // Get results from print station
        `
        unsigned char dummy,speed;

                dummy = getchar();                      // Get ESC
                dummy = getchar();                      // Get STX
                dummy = getchar() << 4;                 // Get upper nibble of address
                dummy |= getchar() & 0x0f;              // Get lower nibble of address
                if(dummy == our_address)
                `
                        dummy = getchar();              // Get command
                        speed = getchar() << 4;         // Get upper nibble of speed
                        speed |= getchar() & 0x0f;      // Get lower nibble of speed
                        dummy = getchar();              // Get EOT
                ` else `
                        // error handler (not our address)
                `
        `
```

Example written in C to send a line speed to a print station
INITIALIZE AND OPEN A SERIAL CHANNEL
EXECUTE THE FOLLOWING CODE
// Send Print Head Address 2 Line Speed of 100 feet per minute.

```
        putchar(0x1b);          // Send out ESC
        putchar(0x02);          // Send out STX
        putchar(0x30);          // Send out upper nibble of address
        putchar(0x32);          // Send out lower nibble of address
        putchar(0x26);          // Send out '&' command
        putchar(0x36);          // Send out upper nibble for Line Speed 100
        putchar(0x34);          // Send out lower nibble for Line Speed 100
        putchar(0x04);          // Send out EOT


        // Get results from print station
        `
        unsigned char dummy;

                dummy = getchar();                  // Get ESC
                dummy = getchar();                  // Get STX
                dummy = getchar() << 4;             // Get upper nibble of address
                dummy |= getchar() & 0x0f;          // Get lower nibble of address
                if(dummy == our_address)
                `
                        dummy = getchar();          // Get command
                        dummy = getchar();          // Get ACK for print station
                        if(!dummy == ACK)
                        `
                                // error handler (didn't get acknowledgement from printer)
                        ` else `
                                dummy = getchar();      // Get EOT
                        `
                ` else `
                        // error handler (not our address)
                `
        `
```

EXAMPLE WRITTEN IN VB
to send a new message to a print station.
INITIALIZE AND OPEN A SERIAL CHANNEL
EXECUTE THE FOLLOWING CODE

```
Public Sub DoMessage()
DATA$ = "800": GETINFODATA: Rem DISABLE PRINTING MODE
DATA$ = "&32": GETINFODATA: Rem SET LINE SPEED TO 50
DATA$ = "P01010010000100000000" & Chr$(&HD): GETINFODATA: Rem SET OBJECTs
DATA$ = "%ABCDEFGHIJ" & Chr$(&HD): GETINFODATA: Rem SEND MESSAGE
End Sub


Public Sub GETINFODATA() : :  Rem SENDS A COMMAND AND GETS A RESPONSE
RESPONSE$ = "": COMM.InBufferCount = 0
COMM.Output = ESC & STX & "01" & DATA$ & EOT
Timer.Enabled = True: TIMERFLAG = False
GETINFO:
   Do
     DoEvents
     If TIMERFLAG = True Then GoTo TCOMMERROR
   Loop Until COMM.InBufferCount >= 1
     RESPONSE$ = RESPONSE$ & COMM.Input
     If InStr(RESPONSE$, Chr$(&H15)) > 0 Then GoTo GETDATAERROR:
Rem A NAK WAS RECEIVED
     If InStr(RESPONSE$, Chr$(&H4)) = 0 Then GoTo GETINFO
Rem AN EOT WAS RECEIVED
     RESPONSE$ = Mid$(RESPONSE$, 6, Len(RESPONSE$))
Rem DELETE ADDRESS HEADER
     Timer.Enabled = False
Rem WE NOW HAVE A VALID RESPONSE
     Exit Sub
GETDATAERROR:
   Timer.Enabled = False: TIMERFLAG = False
   GoTo PROCESSERROR
   Exit Sub
TCOMMERROR:
   Timer.Enabled = False: TIMERFLAG = False
PROCESSERROR:
If RESPONSE$ = "" Then RESPONSE$ = "0" Else RESPONSE$ = Right$(RESPONSE$, 1):
Rem GET THE ERROR CODE
Select Case (RESPONSE$)
   Case 0
     MSG$ = "NO RESPONSE FROM UNIT"
   Case 1
     MSG$ = "TRANSMISSION ERROR"
   Case 2
     MSG$ = "ILLEGAL COMMAND"
   Case 3
     MSG$ = "TRYING TO PRINT WHILE IN COMMAND MODE"
   Case 4
     MSG$ = "TRYING TO READ A WRITE ONLY REGISTER"
   Case 5
     MSG$ = "TRYING TO WRITE A READ ONLY REGISTER"
   Case 6
     MSG$ = "UNIT INPUT BUFFER FULL"
```

```
        Case 7
          MSG$ = "UNIT IN EDIT MODE"
        Case 8
          MSG$ = "PRINT STATION BUSY TRY AGAIN"
        End Select
        MsgBox MSG$
        COMM.InBufferCount = 0: Rem FLUSHES THE INPUT BUFFER
End Sub
```

THE ABOVE VB ROUTINES DEMONSTRATE THE ENTIRE SEQUENCE OF:
      PREPARING DATA TO SEND TO THE HEAD
      SENDING THE DATA TO THE HEAD
      WAIT FOR A RESPONSE
      DETERMINE IF THE DATA WAS ACCEPTED OR REJECTED

EXAMPLE USING HYPER TERMINAL

Preliminary test of the device data link can be performed using the standard HYPER TERMINAL supplied with windows.

NOTE: it is assumed that the user has already installed a RS485 adapter and has verified the device address (COMM PORT) that device is attached to.

Select the appropriate COM port
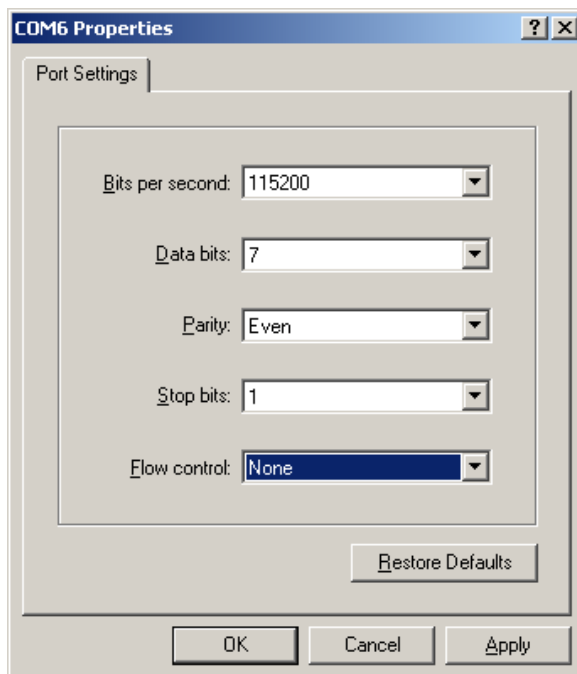
Set the baud rate, data bits, parity, Stop bits and flow control.

Select properties and enter the following settings.

PROPERTIES
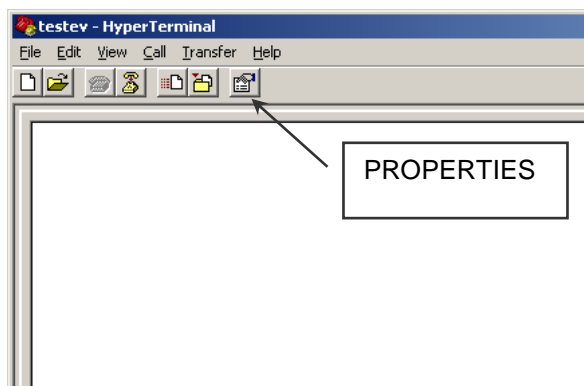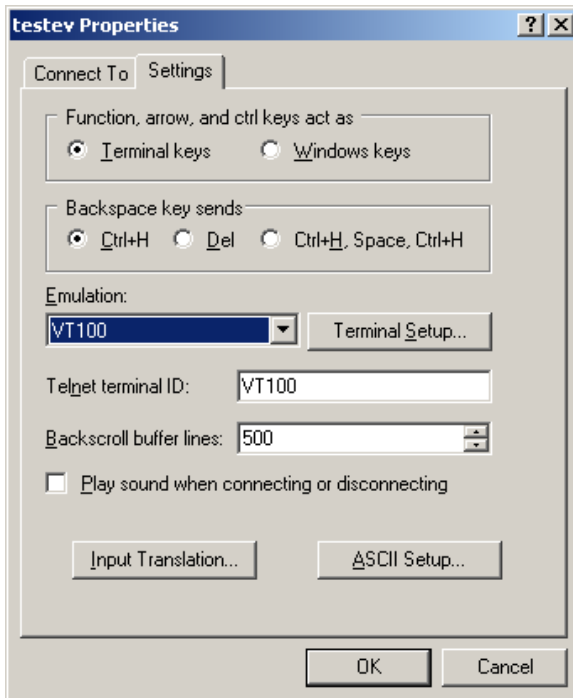
Set terminal keys checked. Select VT100 for the emulation mode as pictured on the left.

You can save your setup for future usage.
There are several keys that are required as control characters. They are as follows:
(The ^ character represents the control key in conjunction with the key shown)
^A THE SOH CHARACTER
^B THE STX CHARACTER
^D THE EOT CHARACTER
ESC the actual key on the keyboard
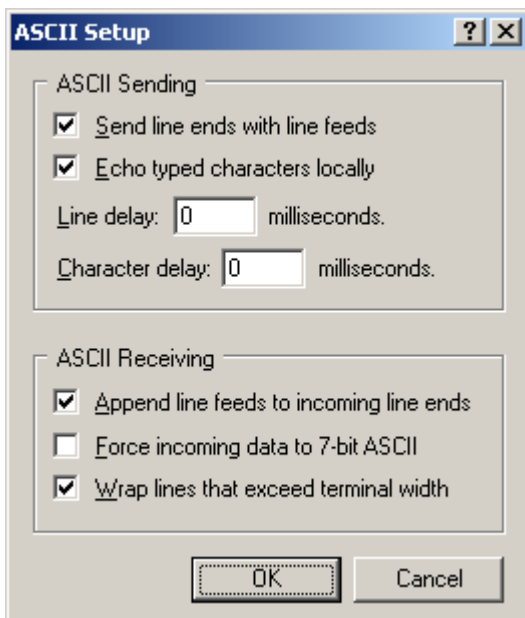
Select ASCII setup and set the appropriate check boxes.

Test the link by typing: spaces are shown for clarification and are not included.
ESC ^B 01 ! ^A ^D
The printer will respond with the printer's software/firmware information.
NOTE: NOT ALL CHARACTERS ARE DISPLAYED ON THE SCREEN.

EXAMPLE USING EVCOMMTEST

Hyper Terminal has a drawback in that it does not normally display the ASCII control character set, specifically those characters between a hex 01 through a hex 1F. The following describes a simple program written in visual basic (VB5) that provides the programmer with a clearer definition of the ASCII control character sequence. The program is included on this CD manual and may be found in the sub-directory "EVCOMMTEST".

The user should find the correct location and install the program by invoking "SETUP.EXE".

NOTE: it is assumed that the user has already installed a RS485 adapter and has verified the device address (COMM PORT) that device is attached to.

Program initiation displays the COMM PORT selection screen. The user should enter the correct COMM PORT and select "OK".

After a comm. Port is selected the above screen is displayed. This program allows for simple command entry and provides the programmer a detailed view of both the characters sent and the data received from the printer.

Commands to be sent to the printer are typed in first text box labeled "COMMAND TO BE SENT TO PRINTER". Since windows does not display ASCII control characters, and often interprets these control characters to have special meaning data entry for the special characters are in the form of icons on the screen. The second line of the display shows 6 gray-scaled boxes. The first 4 boxes represent the ESC, STX, ETX and EOT ASCII control characters. The "CLEAR SEND COMMAND' is intended to clear the first line text box. Of course any other windows erasing method will work. Finally the last box "SEND COMMAND" actually sends the command typed into the first line to the printer.

To enter a command string the user must follow the correct sequence. All command structures sent to a printer must start with the ESC character so select the ESC gray scaled box. Next select the STX box and then place the cursor in the command text box following the second character, which was the STX.
After the cursor is placed in the command text box it is necessary to enter the unit ID (device address) of the printer. For initial test purposes use the factory default setting. This default address is 01 and should be typed in the command box following the STX. The required command follows the address. Selecting the ETX box followed by the EOT box ends the command string. Select the "SEND COMMAND" button to send the command to the printer.
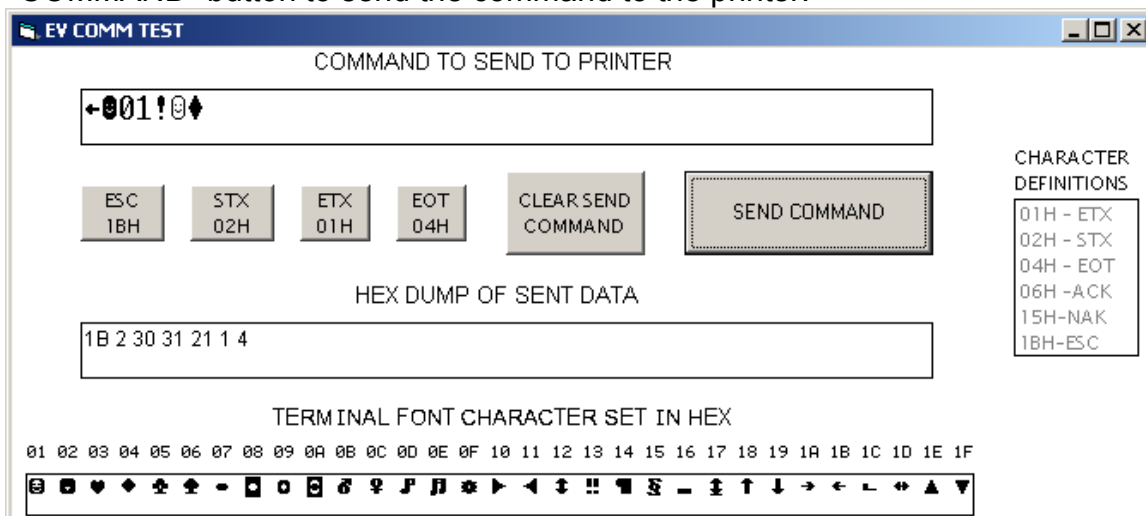
When the "SEND COMMAND" button is selected the second text line displays the hex values of the message sent to the printer. In this case the ASCII character ! (Exclamation Point) was sent to the printer. This command requests the printer to respond with the software version of the system.
For convenience the third text line displays all the ASCII control codes with the hex values above them.

DATA RECEIVED FROM PRINTER

```
←001!LEXMARK3.13B++++♪♦
```

HEX DUMP OF RECEIVED DATA

```
1B 2 30 31 21 4C 45 58 4D 41 52 4B 33 2E 31 33 42 2B 2B 2B 2B D 4
```

The bottom half of the display shows the ASCII data received from the printer and the hex values for the received data displayed in the last text box.
The above response shows the printer is a LEXMARK with software version 3.13, a "B" firmware rev, and all options installed.

The programmer should try several commands to become familiar with the typical responses received from the printer. It should also be noted that the actual returned data might be in packed BCD format, or a hex value that needs to be translated.

PART 7: OPTION JUMPERS AND CABLING

OPTION JUMPER DESCRIPTIONS

Factory default for all jumper settings is in the ON position. To remove a jumper in the OFF position place the jumper on a single pin for future use
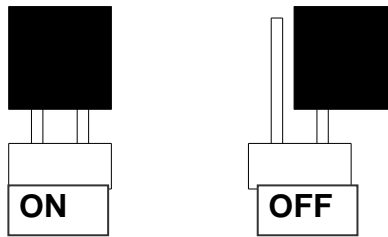
VSEL J7

This jumper when in the ON position supplies a +12vdc source on the RJ50 input connector. The hand held controller uses this source for power. Removing this jumper prevents the +12vdc source from exiting on pin 2 and possibly damaging other external control devices.

ENSEL J9

When this jumper is in the ON position the external encoder signal connected to the RJ50 output connector is passed through the print head to the RJ50 input connector. This allows the same encoder signal to drive several print heads. If this is not desired remove the jumper

PRSEL J10

When this jumper is in the ON position the external product detect signal connected to the RJ50 output connector is passed through the print head to the RJ50 input connector. This allows the same product detect signal to drive several print heads. If this is not desired remove the jumper
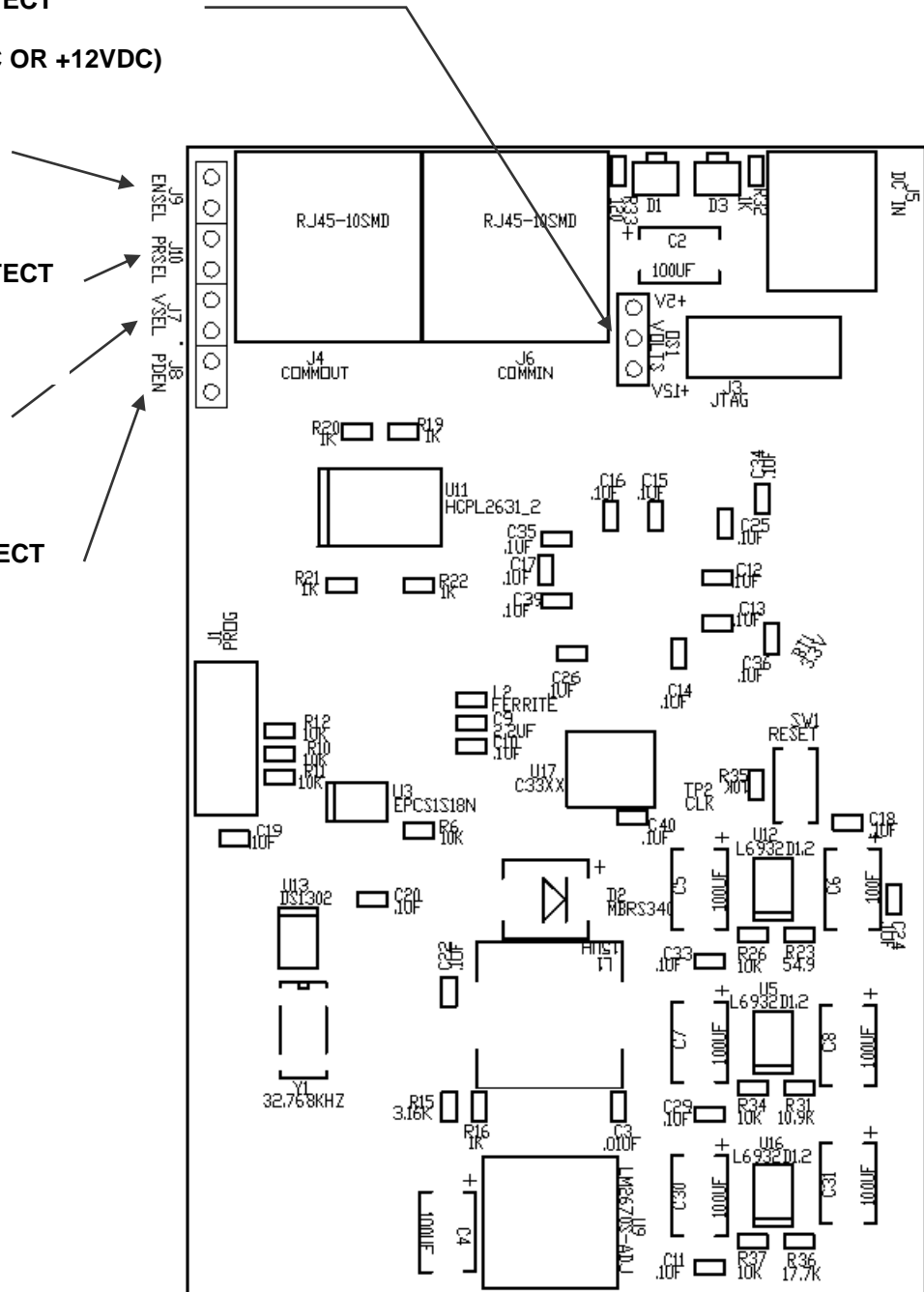
JUMPER LOCATION

EXTERNAL PRODUCT DETECT
EXTERNAL ENCODER
VOLTAGE SELECT (+5VDC OR +12VDC)

EXTERNAL ENCODER
ENSEL J9
ON= PASS THRU
OFF= FLOAT OUTPUT

EXTERNAL PRODUCT DETECT
VSEL J10
ON= PASS THRU
OFF= FLOAT OUTPUT

VOLTAGE SELECT
VSEL J7
ON= +12 OUTPUT
OFF= FLOAT OUTPUT

INTERNAL PRODUCT DETECT
PDEN J8
ON=ENABLE
OFF=DISABLE

OPTION CABLING DESCRIPTIONS
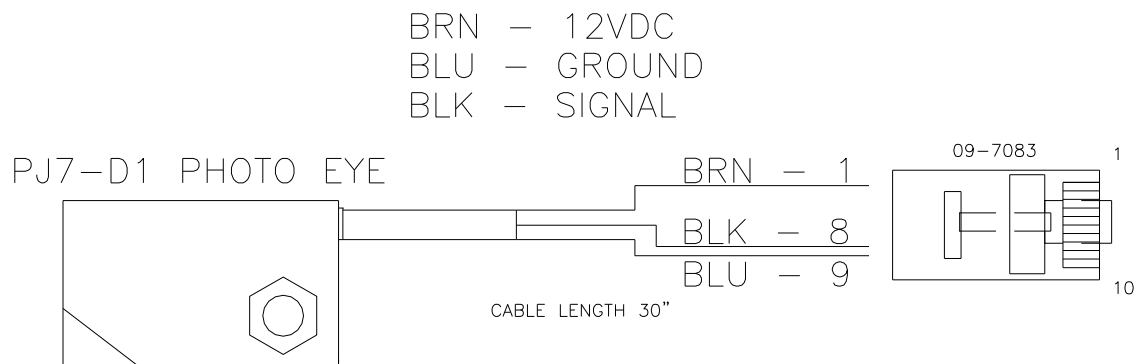
Evolution printers can accept inputs from external sources to control product detection and timing circuits to track product speed (Encoders). These device inputs are internally connected to pull-up resistors and drive optically.
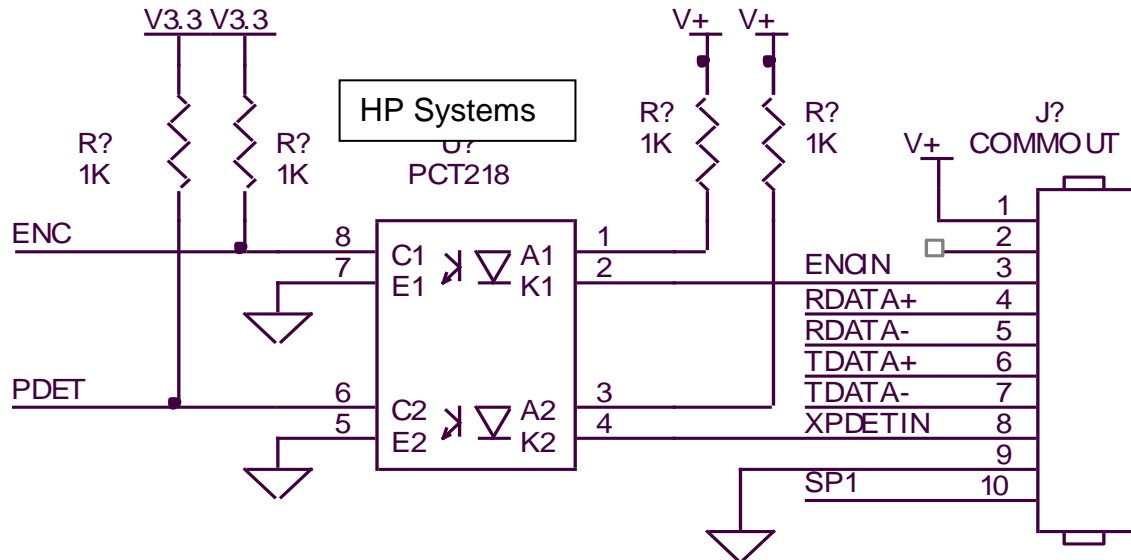
Each input requires the capability of sinking 12ma to ground as depicted in the above circuit. Connection to the optional control port requires an RJ50 connector.
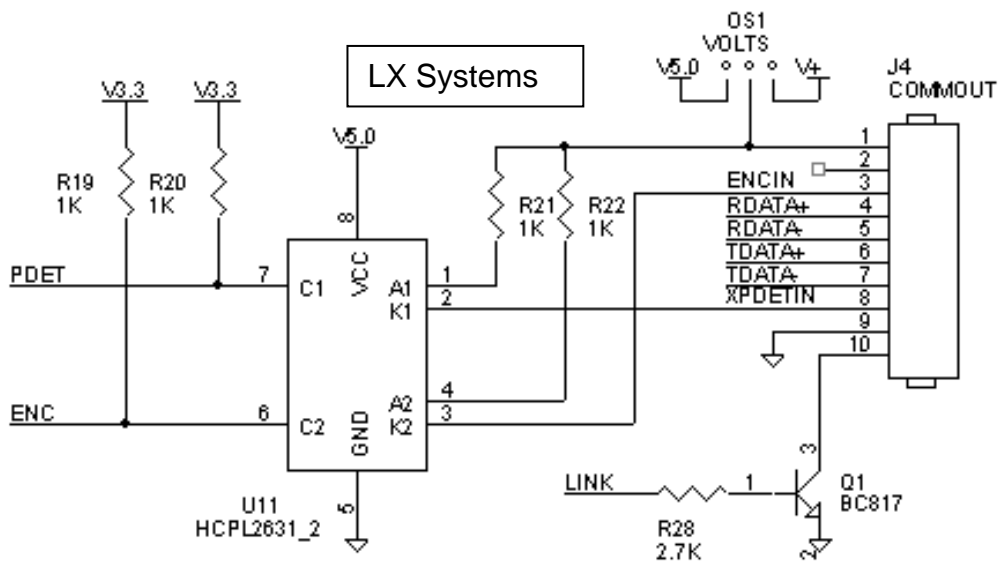
Below is an example of the external product detect eye supplied by DIGITAL DESIGN INC part number C21006.

```
                        BRN  —  12VDC
                        BLU  —  GROUND
                        BLK  —  SIGNAL

PJ7—D1  PHOTO  EYE                BRN  —  1        09—7083          1

                                 BLK  —  8

                                 BLU  —  9                         10
                  CABLE LENGTH 30"
```
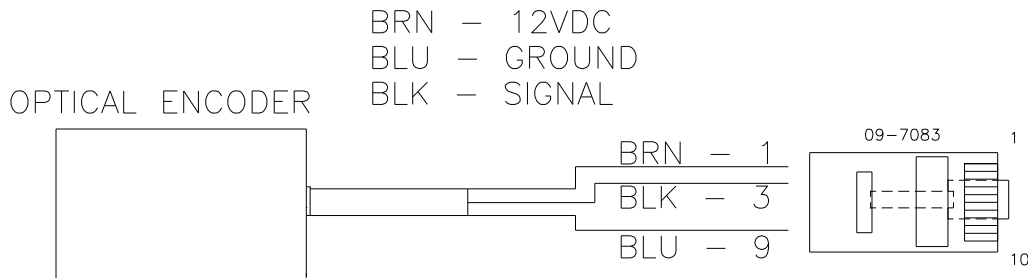
For those applications requiring accurate line speed detection an external encoder is needed.

The external encoder will provide accurate signals eliminating problems in those applications where moving product has an acceleration or deceleration component in its motion, and is often mandatory when trying to produce a reliable printed barcode. Selecting the external encoder should take into consideration a supply source that will yield the correct aspect ration of printed height to width.

A vertical printed column contains 150 dots and spans 1/2". This equates to 0.00333 between each vertical dot placement, thusly each horizontal dot placement should be the same to maintain a perfect 300DPI ratio.

Selecting the external encoder, the line speed calculation is replaced by a scalable encoder setting ranging from 0-7 allowing a printed message to be compressed or expanded. Ideally, the external encoder should be provided to use this feature to its maximum advantage.

If the external encoder were selected to provide a resolution of 0.00333 then the external encoder set to 0 would produce the correct aspect ratio and the message can only be expanded in multiples of 0.00333 thousands of an inch. This may provide all that is required. Selecting an external encoder source that provided 0.00111 thousands of an inch would be a better choice.

```
                        BRN — 12VDC
                        BLU — GROUND
OPTICAL ENCODER         BLK — SIGNAL

                              BRN — 1        09-7083     1
                              BLK — 3
                              BLU — 9                   10
```

The above pictorial is an example of the connections for an external encoder.

If it becomes necessary to supply both external product detect, and external encoder, both signals can be wired into the same connector, or DIGITAL DESIGN INC can supply an optional adaptor to allow connection of both cables (part number C21012)
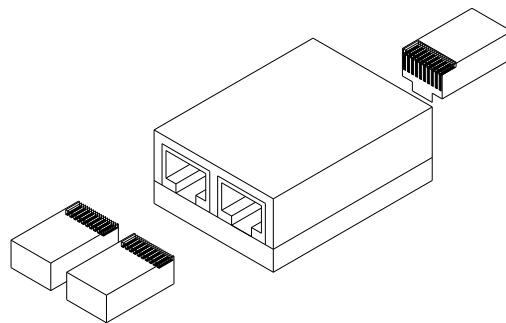
PART 8: SPECIFICATIONS

PRINT CHARACTERISTICS

Character Set:	Full alphanumeric and 20 special symbols
Standard Font:	Arial style
Logos:	up to 6 resident (3 for 1 line a d 3 for 2 line)
Line Speeds:	From 10 to 200 fpm
Encoder Ratio:	0 to 7
Print Delay:	From 1 to 255 (approx .060 in to 15.0 in)
Character Heights:	Standard font sizes are:
	1/2" single line of print (LX1 and LX2)
	7/32" two lines of print (LX1 and LX2)
	1/8" three lines of print (LX2 only)
	3/32" four lines of print (LX2 only)
Length:	Up to 48 characters per line
Message Storage	Up to 200 Messages
Print Head to Product Distance:	Up to 3/8" (9.525 mm)

CONTROLLER

Standard Finish:	Hi Impact ABS Black
Dimensions:	8.75"H x 4.25"W x 2.7"D (222 mm x 108 mm x 69 mm)
Weight:	1 lbs. (4.5 kg)
Control Panel:	WSYWIG TOUCH SCREEN WITH STYLUS

PRINTER

Standard Finish:	Aluminum Black Anodized
Dimensions:	HP 3.0" x 1.8 x 4.0" (76 mm x 46 mm x 102 mm)
	LX 3.0" x 2.5" x 4.0" (76 mm x 63.5 mm x 102 mm)
Weight:	1 lb. (4.5 kg)

ENVIRONMENTAL CONDITIONS

Temperature Range:	40°F - 104°F (5°C - 40°C)
Humidity:	up to 90% relative, non-condensing
Electrical Supply:	100-250 VAC; 50-60 Hz; 0.25Amp

GENERAL

Product Detector:	IR LED convergent
Communications link	RS485 (115KBAUD 7-BITS EVEN PARITY 1 STOP BIT)

DEFAULT SETTINGS

FUNCTION	DEFAULT SETTING	RANGE
DIRECTION	<	< >
FONTS	ARIAL STYLE	USER DEFINED
INTER-CHARACTER SPACING	10	1 - 25
LANGUAGE	ENGLISH	ENGLISH / SPANISH FRENCH / GERMAN
LINE SPEED	100	10 - 200
LOGOS	0	1 - 6
PRINT INVERSE	NORMAL	NORMAL / INVERSE
PRODUCT DETECT	INTERNAL	INTERNAL / EXTERNAL
EXTERNAL ENCODER	INTERNAL	INTERNAL / EXTERNAL
PRINT DELAY	1	1 - 255
ENCODER RATIO	1	0 - 7
MESSAGE STORAGE (OPTION PACK 1, 1.5, 2, 3)	1	1 - 100
PASSWORD (OPTION PACK 1, 1.5, 2, 3)	12345	5 CHARACTERS USER DEFINED
AUTO REPEAT (OPTION PACK 1, 2)	0	0 - 255
DATE (OPTION PACK 2, 3)	dm/dd/dy	User defined
TIME (OPTION PACK 2, 3)	hh:mm	User defined
SEQUENCE NUMBER	0	9 CHAR MAX
LOT COUNTER	0	4 CHAR MAX
SHIFT CODE (OPTION PACK 3)	TIMES AND CODES SET TO ZERO	User defined
DATE OFFSET (OPTION PACK 3) 2 COUNTERS	OFFSET DAYS SET TO ZERO	MAX 9999 DAYS
PRODUCT COUNTER (OPTION PACK 3)	TIMES AND CODES SET TO ZERO	User defined
BAR CODE BAR WIDTH	5	3 - 15
BAR CODE SPACE	0	0 - 3
BAR CODE QUIET ZONE	75	0 - 150
BAR CODE CHECK CHAR	NO	Y / N
BAR CODE MAN READABLE	NO	Y / N
BAR CODE GUARD BARS	NO	Y / N
FIRING COLUMNS	1	1 - 8

APPENDIX A – PRODUCING RELIABLE BAR CODES

Printing reliable barcodes requires that several key issues be observed.
1. Barcode integrity
2. Contrast ratio
3. Bar separation
4. Quiet zone

BARCODE INTEGRITY -
Barcode integrity is the validity of the data contained in the barcode. This includes valid characters and the correct ratio of dark to light bars.

CONTRACT RATIO -
The contrast ratio is the optical density of the print against the background substrate. For example a black ink barcode against a white coated cardboard versus a black ink barcode on a brown cardboard.

BAR SEPARATION -
Bar separation is the ratio of a dark bar to a light bar. This is one of the most critical parameters to be observed. Assuming that the aspect ratio of the printed barcode is correct, bleed factors can greatly diminish the readability of a barcode. Bleed factors vary greatly depending on substrates. For example printing on virgin versus recycled corrugated cases.

EVOLUTION II printers have the capability to adjust various parameters of the printed barcode to circumvent the inherent problems in producing a reliable printed barcode. These include:

Dark Bar width
White bar width

Even though the ratio of a dark bar to a light bar should not be changed it might be necessary to alter the printed barcode by adjusting the light bar size relative to a dark bar size allowing for bleed factors found on different substrates

QUIET ZONE -
These are areas at the beginning and end of a barcode symbol that allow optical equipment to differentiate the barcode from other printed material.

The inks developed for the EVOLUTION printers will produce, at 300 dpi and 200ft/min, a class "A" barcode on brown corrugated, but care must be exercised in programming the various parameters that control how the printed image is produced. As with any fine resolution image the distance from the print head to the product is of utmost importance. Trial and error is often required to produce the desired results.

PROGRAMMING BAR CODES:

BARCODE TYPE: This is the type of barcode to be used and only one type is valid per message.

> Valid types are:
> CODE 39
> CODE128B
> CODE 128C
> INTERLEAVED 2of5
> EAN13
> EAN 8
> UPC-A
> UPC-E
> DATA MATRIX (optional)

MINIMUM BAR WIDTH: This parameter controls the number of columns in a narrow bar. The legal limits are 3 to 15 printed columns for 1-D linear codes and 2 to 15 for 2-D codes.

ADDED SPACE: This controls the amount of added columns for 1-D codes only and is intended to overcome the nature of the bleed factor of the ink on different substrates. The legal values are 0, 1, 2 or 3 additional printed columns.

QUIET ZONE: These are areas at the beginning and end of a barcode symbol that allow optical equipment to differentiate the barcode from other printed material. The user may program a value from 0 to 150 printable columns where, with a correct aspect ratio, each column is 0.0033".

ADD CHECK CHARACTER: If selected the software will calculate the check character automatically.

ADD MAN READABLE TEXT: If selected the software will add man readable characters to the barcode.

GUARD BARS: If selected indicates that guard bars will be higher than other bars to allow for man readable characters located at the bottom of the code. Man readable characters must be enabled for guard bars to take effect.

BARCODE TECHNIQUES:

The following are actual scanned images of a UPC-A barcode (without man-readable or guard bars for clarity). These tests were produced on white coated corrugated. These are pictured here to help the user understand some of the important parameters in producing a reliable barcode. The faint background noise is a result of the scanning process and is not indicative of a typical printed sample.

Notice the diminished size ratio of the narrow light bar versus the narrow dark bar

Barcode with:
Bar width = 5
Added space = 0
Decodability = 39%
Average bar = 16X
Code class = C

The narrow light bar is still slightly less than the dark bar

Barcode with:
Bar width = 5
Added space = 1
Decodability = 50%
Average bar = .11X
Code class = B

Adding 2 spaces makes the narrow light bar equal to the narrow dark bar

Barcode with:
Bar width = 5
Added space = 2
Decodability = 62%
Average bar = .03X
Code class = A

Notice the diminished size ratio of the narrow light bar versus the narrow dark bar

Barcode with:
Bar width = 6
Added space = 0
Decodability = 47%
Average bar = .17 X
Code class = C

The narrow light bar is still slightly less than the dark bar

Barcode with:
Bar width = 6
Added space = 1
Decodability = 51%
Average bar = .10 X
Code class = B

Adding 2 spaces makes the narrow light bar equal to the narrow dark bar

Barcode with:
Bar width = 6
Added space = 2
Decodability = 64%
Average bar = .00 X
Code class = A

Barcode reader/verifier test equipment QUICK CHECK 800
All barcodes were readable and acceptable, some better than others
Decodability is the percentage as compared to the verifiers standard
Average bar is the size difference of a light bar to a dark bar
Code class is the overall acceptance of the code A B C D F

The picture at the right is an exploded view of the previous scanned image. Again notice the ink bleed and how it affects the ratio of the dark to the light bar widths. Using the ADD SPACE parameter gives the user the ability to minimize this effect.

Trial and error is necessary to find the correct settings to be used. The substrate material is the governing factor in deciding what the correct settings are.

The second concept that the pictures show is the overall consistency in bar width across the image. All scanners have the capability of accepting a certain amount of bar growth but must be kept to a minimum. Bar growth will be seen in non-linear production lines. Normally with a consistent running production line, there is no need for an external encoder. Where there is an acceleration or deceleration component in the production line, it is absolutely necessary to use an encoder. Even with an encoder a code can deviate from the proper aspect ratio. This deviation is caused by slippage of the product against the production line.

Bar growth will also lead to a less dense dark bar due to the fact the printed vertical columns will print further apart then previous dark bars. This may also be seen when not using an encoder and the line speed of the printer is set slower than the actual line speed of the production line.

The image below is a scanned image of two sample prints. The upper section of code is produced at 60ft/min matching the line speed, while with the second sample, the line speed was increased to 100 ft/min. It should be immediately apparent at the difference in the optical density between both prints. This variation will be more apparent on brown corrugated than on a white substrate.

NORMAL OPTICAL DENSITY

Displacing adjacent vertical columns farther than the correct aspect ratio caused this lack of optical density.

DIMINISHED OPTICAL DENSITY

NORMAL ASPECT RATIO

The pictorial at the right is an expanded section of the above code and clearly defines the correct versus incorrect aspect ratio and should be avoided.

It should also be noted that the MINIMUM BAR WIDTH parameter was set to 6.

BAD ASPECT RATIO

Below is a scanned image of a typical application where there was an acceleration and deceleration component in the line movement. Notice how the bars grew from left to right then began to compress towards the normal at the right. Also apparent is the change in the optical density of the pattern. This was a totally unreadable code.

BAR WIDTHS BEGIN TO STRETCH

BAR WIDTHS BEGIN TO COMPRESS
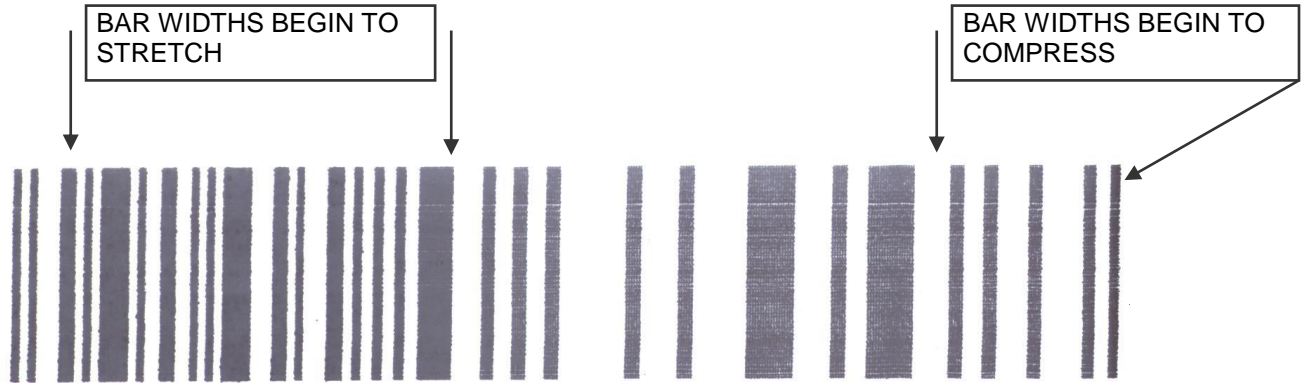
Finally, the image as it should look. This code was produced on white corrugated at 100ft/min and produced a verifiable class "A" with a decodability of 70%. The average bar growth from the reference standard was 0.03%.

BARCODE TYPES

The following is a short description of the supported barcode types:
Each barcode type contains either 2 or 4 widths. This defines how many sizes or a light or dark bar exists in the code.

CODE39: Code 39 is an alphanumeric bar code that can encode (2 widths)
    Numbers
    Upper case alphabet
    Special symbols   _ . * $ / % +
    If the Check Character flag is set the software will calculate the optional check character (modulus 43).

CODE128: Code 128 is a 128-character ASCII code (4 widths)
    If the Check Character flag is set the software will calculate the optional check character (modulus 103).

EAN-13: EAN-13 encodes 13 characters (4 widths)
    Numbers only
    It includes a 2 or 3 digit country code
    9 or 10 data digits (depending on the length of the country code)
    Checksum digit
    If the Check Character flag is set the software will calculate the optional check character (modulus 10).

EAN-8: EAN-8 is a shortened version of the EAN-13 code (4 widths)
    Numbers only
    It includes a 2 or 3 digit country code
    4 or 5 data digits (depending on the length of the country code)
    Checksum digit.
    If the Check Character flag is set the software will calculate the optional check character (modulus 10).

INTERLEAVED 2of5: Interleaved 2 of 5 is a numeric only bar code (2 widths)
    Numbers only
    If the Check Character flag is set the software will calculate the optional check character (modulus 10).
    This code requires an even number of digits. If an odd number of digits are entered the software automatically inserts a leading 0. If a code contains an even number of digits and a check digit then the software adds a leading 0.

UPC-A: UPC-A encodes 12 characters (4 widths)
  Numbers only
  It includes a 1-digit system code (normally 0)
  10 digits are the data characters
  Checksum digit
  If the Check Character flag is set the software will calculate the optional check character (modulus 10).

UPC-E: The UPC-E code is a compressed barcode (4 widths)
  Numbers only (must include 0's)
  Compression works by squeezing extra zeroes out of the barcode and then automatically re-inserting them at the scanner. Only barcodes containing zeroes are candidates for the UPC-E symbol.

DATAMATRIX: Is a 2-D full 256-character ASCII code
 The code is made up of square modules (elements) arranged within a perimeter-clocking pattern.
  The symbol consists of data regions, which contain square modules set out in a regular array.
  Most of the symbols are square ranging from 10x10 to144x144 elements.
  The correct array is automatic, dependent on the data entered.

The following are ideal data matrix codes.
The pictorial below is a 10x10 array encoding the numbers 1, 2, 3, 4 and 5 scaled for reference purposes.

CLOCKING PATTERNS
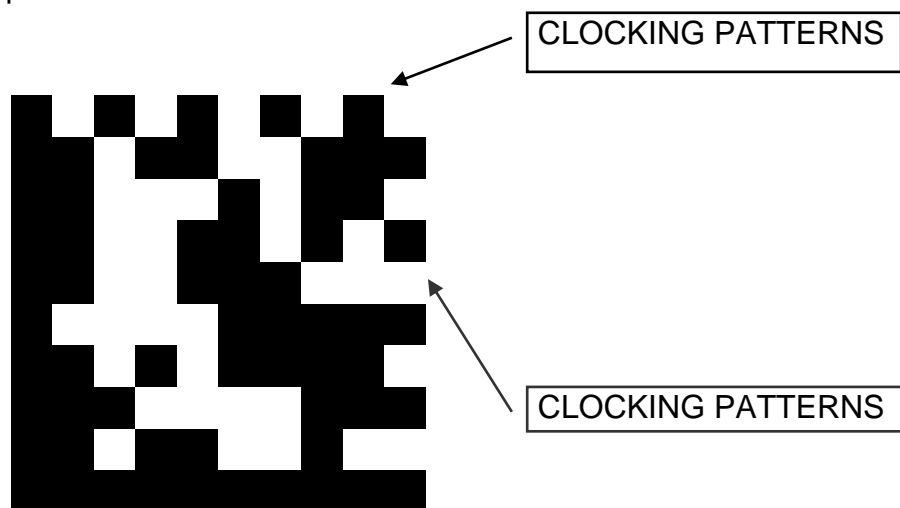
CLOCKING PATTERNS

Data matrix codes are more tolerable to stretch and skew by the nature of their imbedded clocking patterns defining both columns and rows.

Below is an 18x18 array encoding DIGITAL DESIGN INC. The pattern is repeated 7 times with various resolutions ranging from a 7x7 element to a 1x1 element. Even though it is conceivable to produce a 1x1 element, the nature of

ink bleed makes it unrealistic. The EVOLUTION II with the optional DATAMATRIX symbologies installed limits the element size to a 2x2 array.

As a comparison the following is a scanned image of the actual printed sample.

| 7x7 | 6x6 | 5x5 | 4x4 | 3x3 | 2x2 | 1x1 |

| 3x3 | | 2x2 | | 1x1 |

IDEAL 1X1 ELEMENT WITHOUT BLEED
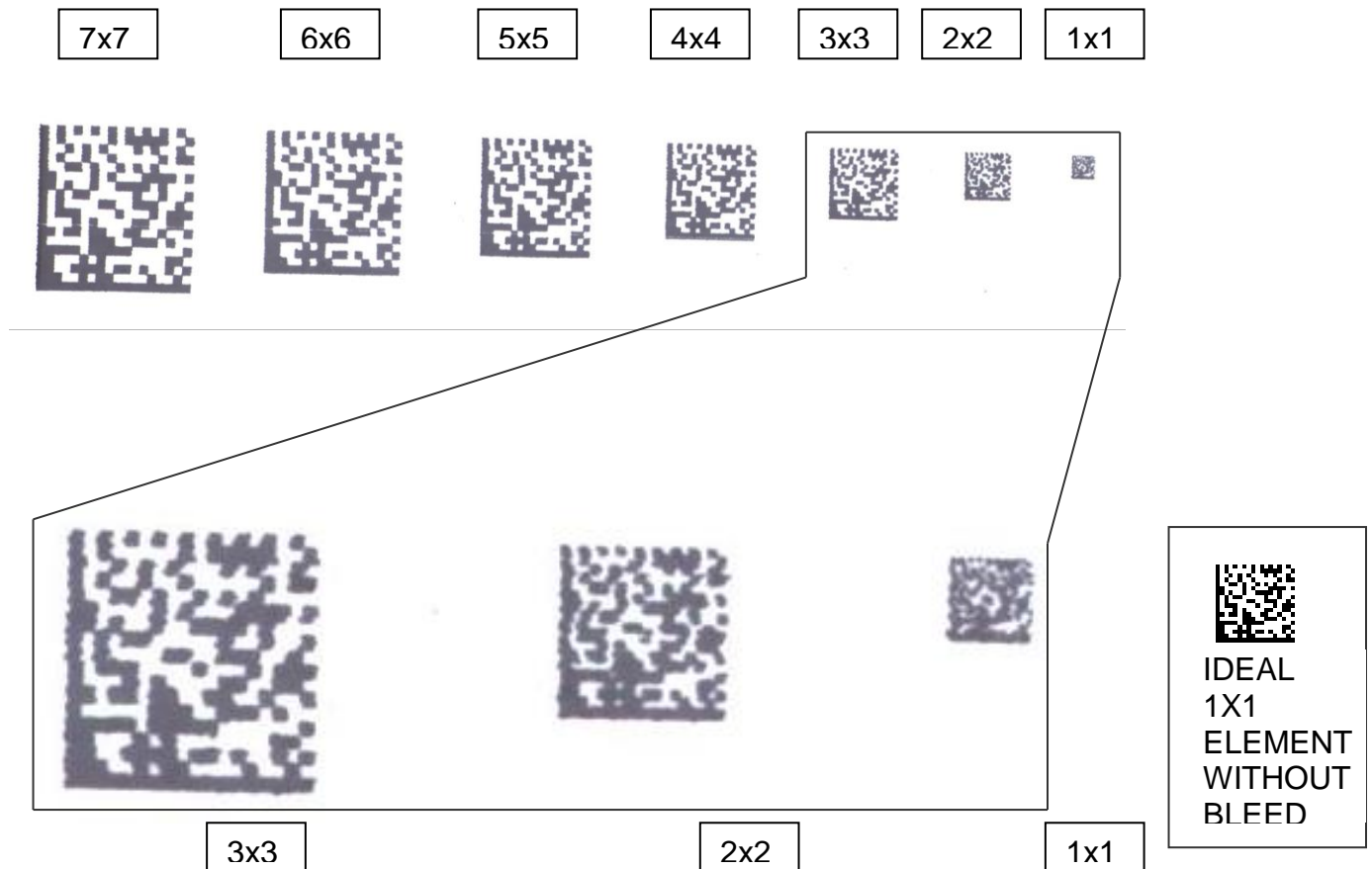
The above is an enlarged pictorial of the last 3 element resolutions. As may be seen the 2x2 element is extremely discernable, where the 1x1 array loses definition due to bleed patterns.

As with linear barcodes the use of an encoder is not necessary for 2-D barcodes for any environment that does not contain an acceleration or deceleration component. Product handling should always be considered and care should be exercised in presenting the product relative to the print head in a consistent manner.

USING CHECK CHARACTER:

If you are supplying the code with the check digit already calculated, you must deselect the ADD CHECK CHARACTER.
If you want the software to calculate the checksum for you, you must select ADD CHECK CHARACTER.

For example:
EAN and UPC have fixed length and therefore only have the following possibilities exist.

EAN13: you supply a 13-digit code including the CHECK CHARACTER or you supply a 12-digit code and select the ADD CHECK CHARACTER.

EAN8: you supply an 8-digit code including the CHECK CHARACTER or you supply a 7-digit code and select ADD CHECK CHARACTER.

UPCA you supply a 12-digit code including the CHECK CHARACTER or you supply 11-digit code and select ADD CHECK CHARACTER.

UPCE: you supply an 8-digit code including the CHECK CHARACTER or you supply a 7-digit code and select ADD CHECK CHARACTER.