Matthews Marking Systems

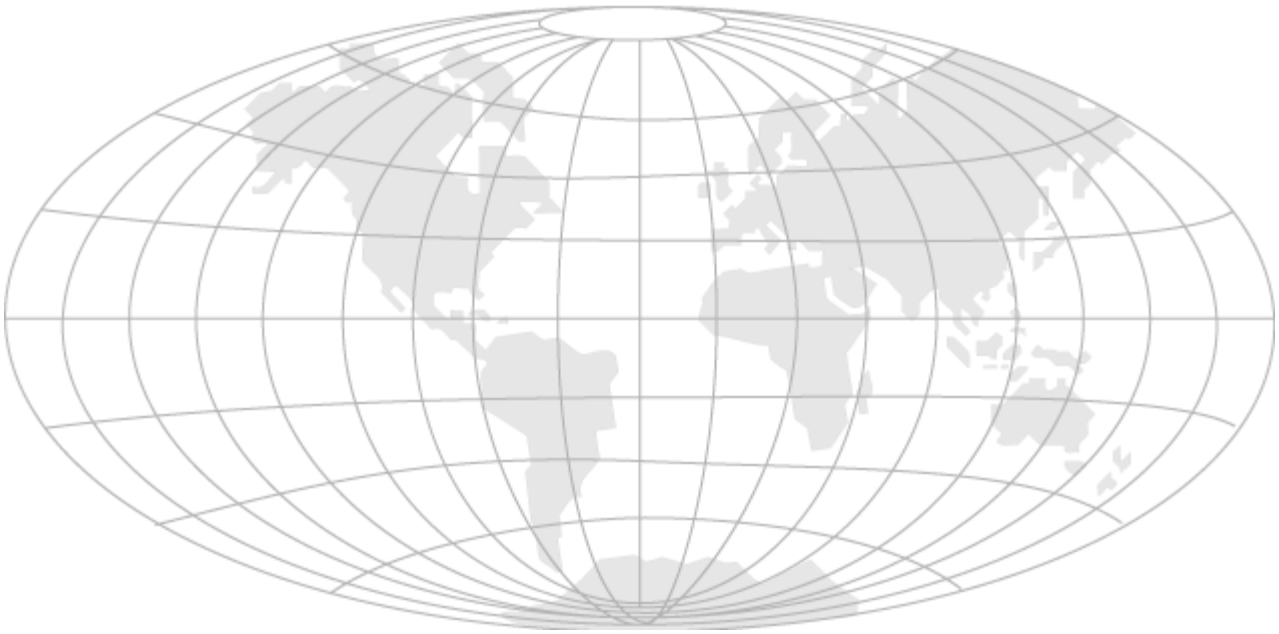
I·Mark™ OEM Controller V84i

I·Mark™ EZ Touch V84e

I•Mark™ V84i/e
Protocol/Technical Manual

Part Number: 41010433
Rev. 05

Matthews™ BRAND SOLUTIONS



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Safety

Cautions and Warnings

IMPORTANT:

Where appropriate in this manual additional safety statements will be displayed. These statements are designed to call attention to potential hazards and to assist in allowing the user to utilize the equipment safely and efficiently.

This symbol and text format is used throughout this manual to draw your attention to important information and tips.

CAUTION:

This symbol and text format is used throughout this manual to indicate that the user should proceed with caution, being sure to follow all instructions so that problems are avoided.

Always wear eye protection when servicing or operating printing equipment. Solvent resistant gloves should be used when contact with the ink or solvent liquids is possible.

Lifting

The controller has a shipping weight of 8 pounds (3.6 kg). To avoid injury to personnel or damage to equipment, always use proper lifting and/or carrying techniques with the unit.

Lethal Voltages

Warning: lethal voltages are present in this equipment when electrical power is applied. There is a danger of injury or death from electrical shock.

- The Matthews Marking Systems printing equipment utilizes electric power. There are no user serviceable parts for this system. Only trained service personnel should access the internal components.
- Before attempting to work on this system, disconnect all electrical power. Follow OSHA Lockout/Tag out procedures as necessary.
- CAUTION – Do NOT place the unit in any position where the power cord is not accessible. There must be access to the power cord to enable disconnecting power in the event of an emergency.
- Do not permanently hard wire to power unless a breaker is accessible to disconnect power.

Warning: This Equipment Must Be Earthed / Grounded.

Safety

General Considerations

- Ensure that the system components are properly mounted for stability to prevent personnel injury from falling equipment.
- The connecting cables and ink lines must be located out of travel zones and in areas free of potential damage.
- All installation and maintenance of the unit is to be performed by properly trained and qualified personnel only.
- Use only Matthews Marking Systems inks and cleaners. Use of other inks could cause damage to the unit, pose safety hazards and will void the warranty.
- The ink supply systems used with this printing equipment are pressurized. Use care to properly release this pressure when changing the source containers.
- In case of spill or leak from the Matthews Marking Systems Printing System, immediately shutdown the unit and isolate from sources of heat, spark or flame. Refer to ink MSDS for cautions, warnings, and appropriate clean up procedures.
- Good housekeeping practices and proper containment of ink, ink residuals, and incidental line leakage is critical. The customer is responsible for proper care and procedures to ensure that the Matthews Marking Systems Printing System and ancillary equipment is kept clean and well maintained.
- ALWAYS check to be sure that all covers are correctly fitted to the unit before operation. Contact a supervisor for guidance if you are not sure. In addition to providing electro-magnetic shielding to the components, the covers provide a safety barrier to protect the user.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Fire Safety

DO NOT smoke or have open flames near the printer. Many Inks and Cleaners are flammable.

- Many of the inks and solvents used by Matthews Marking Systems printing systems are flammable and the vapors are heavier than air. The customer is responsible for vapor management as well as preventing any sparks or flames in the area of the printing equipment. Refer to ink Material Safety Data Sheets (MSDS) for cautions, warnings, and proper handling procedures.
- In accordance with applicable federal and state environmental laws, the customer is responsible for properly disposing of the waste generated by the printing equipment.
- Store all inks and solvents in their original containers, in a properly grounded, Flammable Liquid Storage Cabinet and away from heat sources. Promptly clean up any spilled ink using the correct solvent.

During operation, surfaces of the equipment may be hot to the touch.

Welcome

www.matthewsmarking.com

Thank you for choosing an I•Mark™ V84i/e Ink Jet Printer.

We sincerely hope you find this manual to be informative and useful. Comments regarding our manuals are always welcome and appreciated.

Please email any suggestions to this address: ***tech@matw.com***

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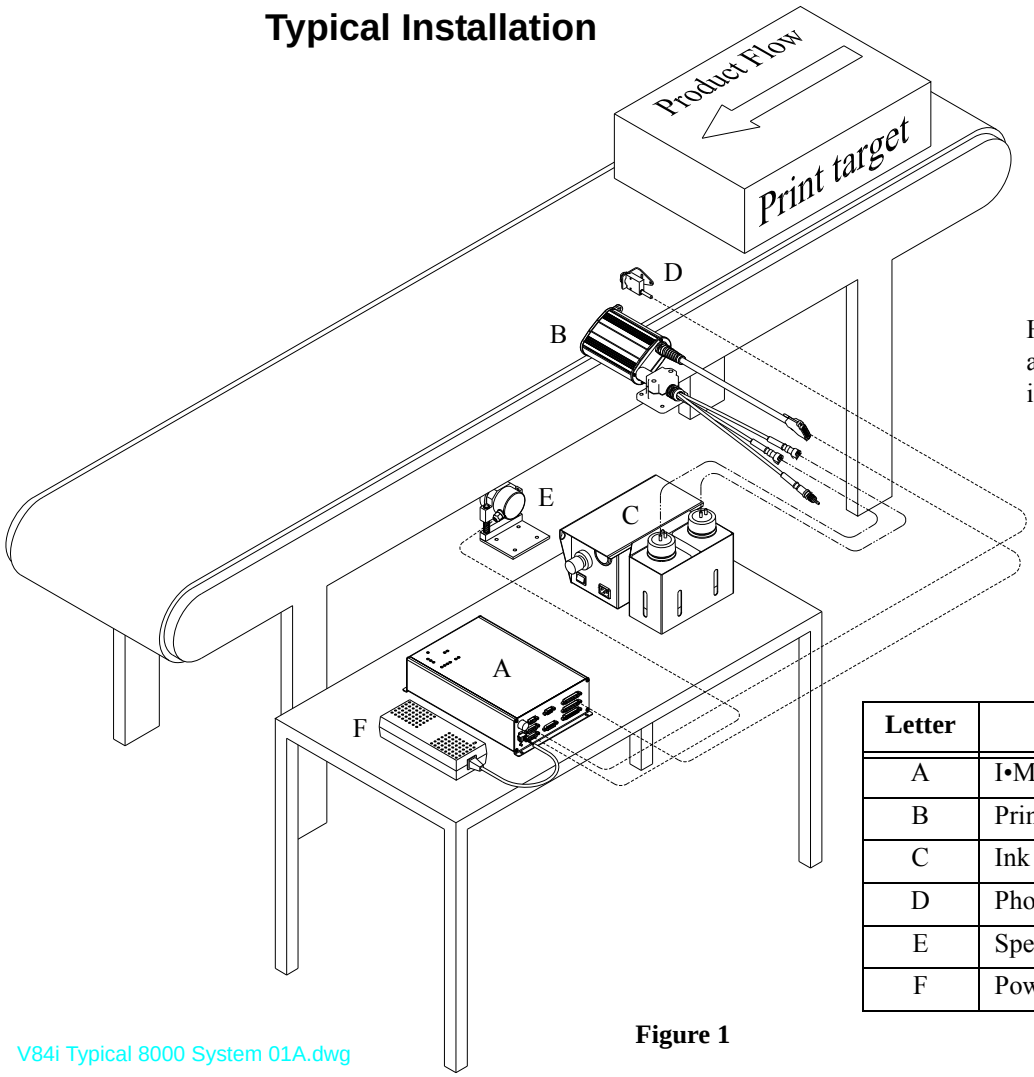
Welcome

System Description

A complete system normally consists of several components: the I•Mark™ V84i/e Controller, one to four print heads with cables, an ink delivery system, a trigger device and an (optional) encoder, see ***Figure 1***. All components work together to form a functioning printer system. While all of these components are mentioned in this manual, the primary component documented in this manual is the I•Mark™ V84i/e Controller itself. See the documentation provided with each component for important instructions for those components. In addition, the next couple of sections provide more details concerning the print heads and the speed encoder.

Typical Installation



Hardware mounting brackets are omitted from the illustration for clarity

Letter	Description
A	I•Mark™ V84i Controller
B	Print Head
C	Ink Delivery System
D	Photocell (trigger sensor)
E	Speed Encoder
F	Power Supply

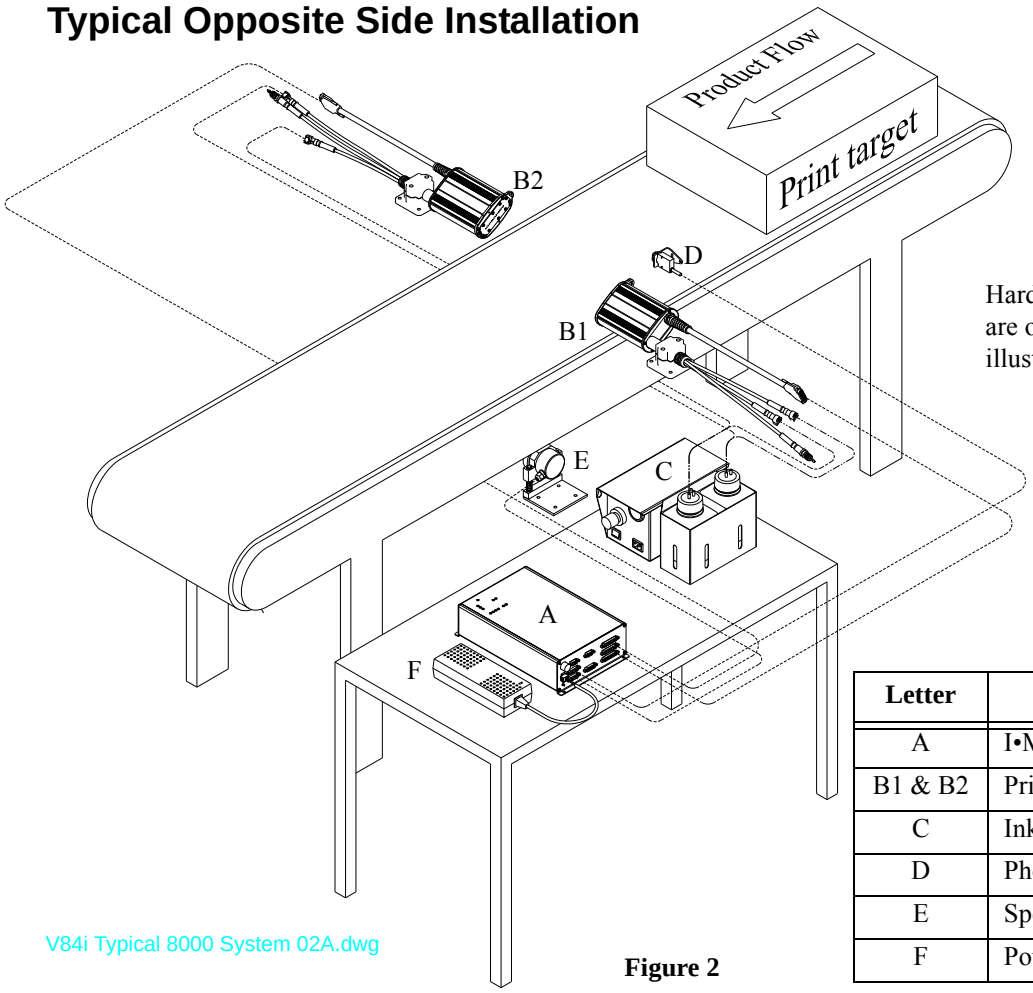
V84i Typical 8000 System 01A.dwg

Figure 1

Connected to the I•Mark™ V84i/e Controller are a power supply, the print head(s), the trigger device, and the speed encoder (if used). The print head(s) require an ink delivery system, several options are available [1] - consult your local distributor or Matthews Marking Systems for details.

1. A High Pressure Ink Supply Unit is illustrated.

The V84i also supports printing on both sides of a product, see ***Figure 2***.



Hardware mounting brackets are omitted from the illustration for clarity

Figure 2

Letter	Description
A	I•Mark™ V84i Controller
B1 & B2	Print Heads
C	Ink Delivery System
D	Photocell (trigger sensor)
E	Speed Encoder
F	Power Supply

IMPORTANT:

It is strongly recommended that when setting up for printing on both sides of a product that the print heads be offset from each other. That way, if there is an accidental trigger the heads will not spray ink on each other.

The print head(s) contains the valves that control the printing. The substrate (or print head) must be moving for printing to occur. Tilting of the print head relative to the product flow results in adjustable character height.

A print trigger tells the controller when to print. Typically, a photocell is used to detect the target as it passes the print station. The controller reacts to the trigger signal and initiates a print cycle. A trigger signal may also be provided by some other device such as a PLC.

If a conveyor belt does not move at a constant line speed, an encoder should be used to automatically compensate for any variations in line speed. The encoder wheel mounts in contact with the conveyor. It turns at a rate proportional to the conveyor speed. While the wheel turns, an electrical pulse train is sent to the controller. These pulses allow the controller to compensate for variations in the line speed and result in good print quality.

The ink is delivered to the print head(s) by an ink delivery system. Many systems use compressed air to pressurize a container of ink. Ink leaves the container through a pick up or dip tube and flows directly to the print head(s).

Delivery pressure varies by print head type, but is typically between 3 and 14.7 psi., see ***"Positioning Ink Supply" on page 24***.

Welcome

Specifications

Power Requirements

24VDC ± 5%, 240W (10 Amp) minimum

Interconnection wiring;

- Up to 10 feet use 14 gauge wire between the power supply and the I•Mark™ V84i/e controller.
- Over 10 feet use 12 gauge wire

Environmental Ratings

Temperature Rating:

- 41-113°F (5-45°C)

Humidity:

- 10-95% non-condensing

Altitude:

- Up to 7000 feet (2133.6 meters)

Enclosure classification:

- Designed to meet IP42 rating

Syntax Change

CAUTION:

If this V84i is to replace the earlier version V80i, there has been a change in the protocol. For example, SM[n] (SET MESSAGE) syntax: sets of parentheses and the equal sign have been added.

V80i SET MESSAGE syntax:

SM[0] T[1]@0:0, G[1]@120:0

V84i SET MESSAGE syntax:

SM[0]=((T[1]@0:0), (G[1]@120:0))

IMPORTANT:

FAILURE TO OBSERVE THIS CHANGE WILL RESULT IN A SYNTAX ERROR AND A NO PRINT SITUATION!

For more information see *"GET_MESSAGE, SET_MESSAGE" on page 86*
OR
call Matthews Marking Systems phone support at +1 412 665-2500.

Print Heads

The I•Mark™ V84i/e Controller supports 8000 series print heads and Standard Drop-On-Demand (DOD) print heads. The 32 and 16-valve sizes of the 8000 series print heads contain a 3-way valve for fluid selection. The ink line connects to the print head at the black-banded connector. Cleaner is supplied to the yellow-banded connector. The 7-valve 8000 series print heads and Standard DOD print heads do not contain a 3-way valve and only have one connector. Fluid selection changes on these print heads are made by physically switching the connected supply line.

8000 Series Print Heads - Side View

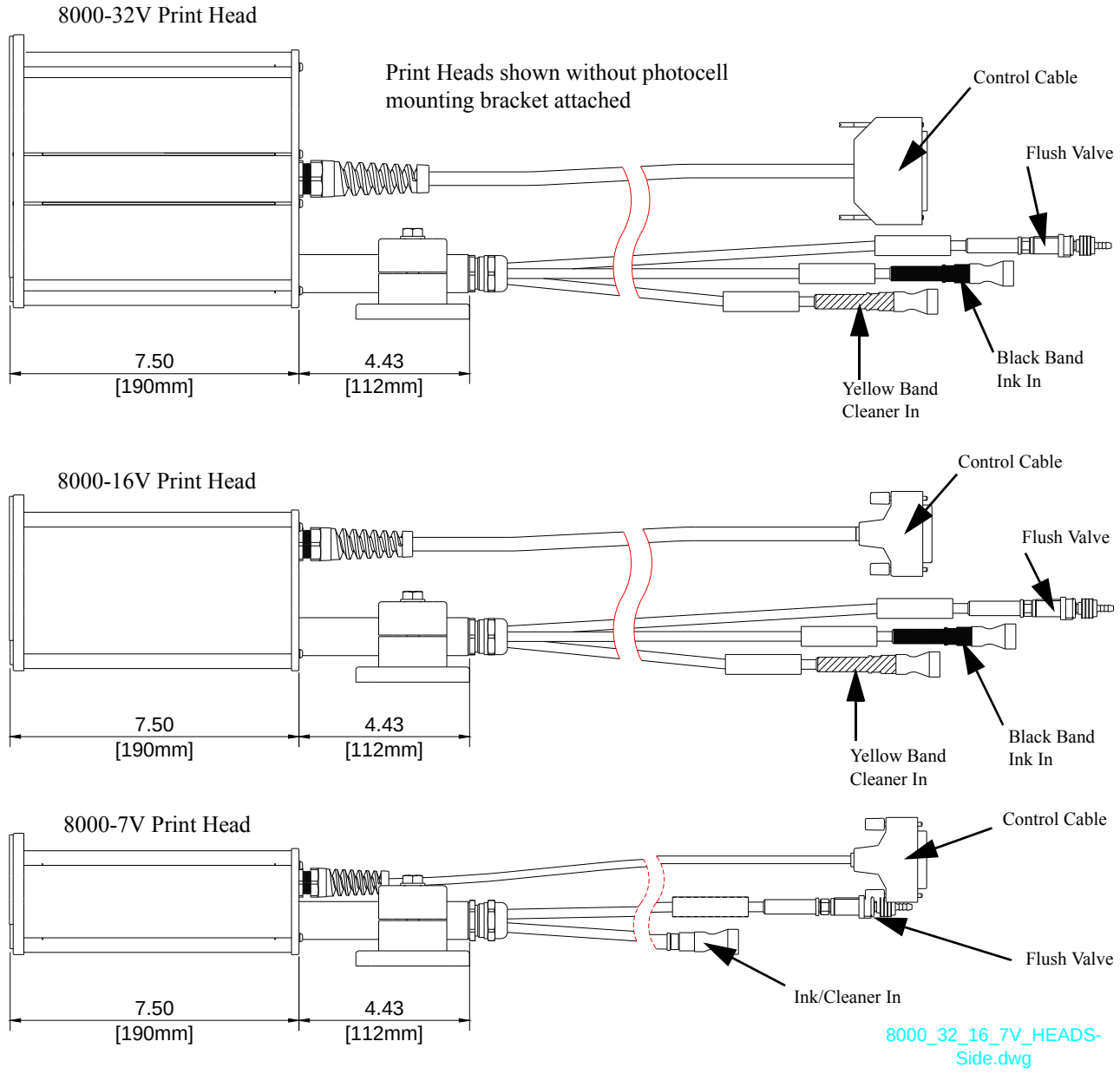


Figure 3

Figure 3 is a side view of the 8000 series print heads.

Print Heads

8000 Series Print Heads - Nozzle View

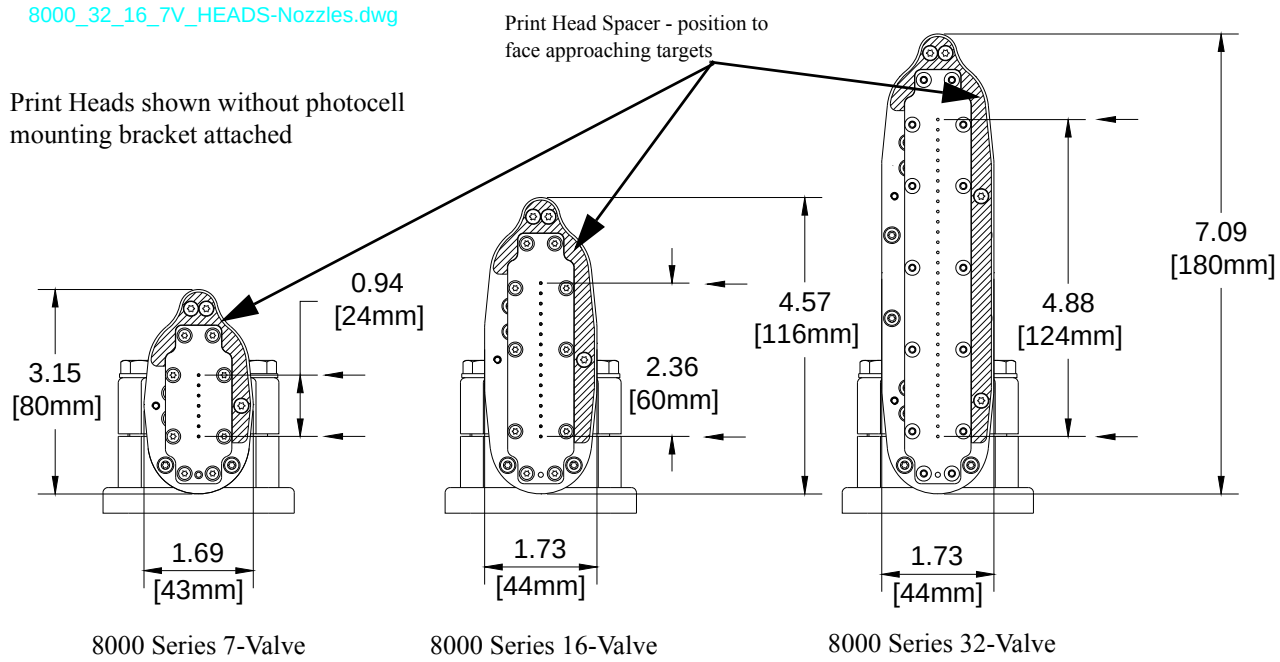


Figure 4

Figure 4 is the nozzle end view of the 8000 series print heads.

The distance between nozzles is 4mm (0.16 inches). The print head pivots around the bottom nozzle when tilted.

For MEK and Acetone based inks using the 8000 series print heads, the normal operating pressure is 10 psi (0.7 bar), while alcohol-based inks and pigmented inks are used at 14.7 psi (1.0 bar). In some instances, it may be necessary to work with lower pressure to compensate for ink flow on the substrate.

Each model of 8000 series print head is available with a choice of three nozzle sizes:

Nozzle Size Designations
Maxi
Midi
Mini

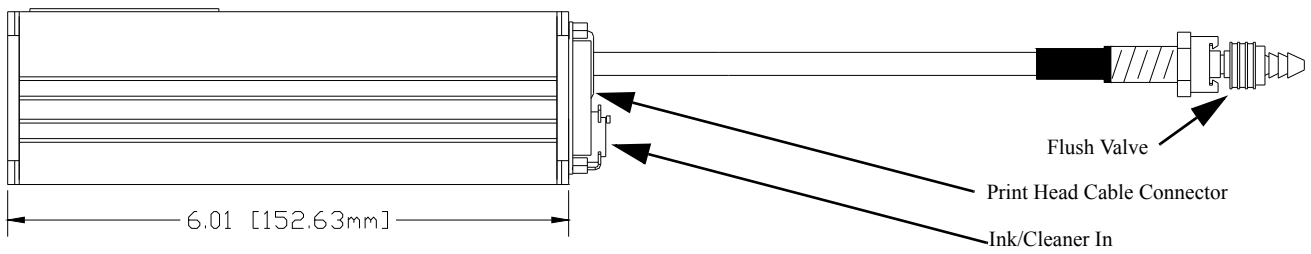
CAUTION:

Pigmented inks are **NEVER** used in a Mini print head.

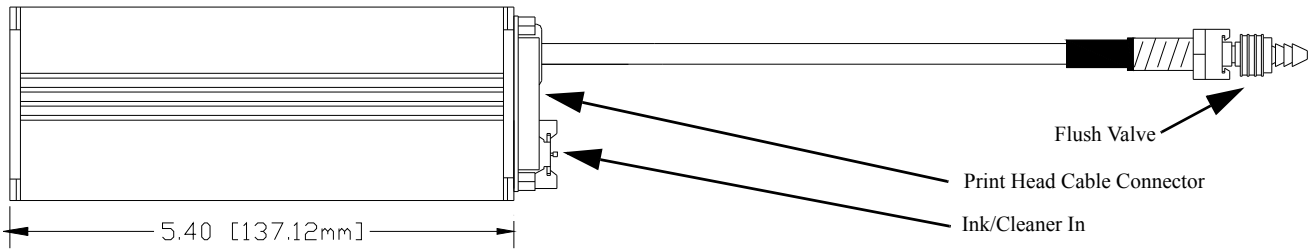
Standard DOD Print Heads - Side View

The Standard DOD print heads do not contain a 3-way valve and only have one connector as shown in ***Figure 5***. Fluid selection changes on these print heads are made by physically switching the connected supply line.

Standard 7-Valve Print Head (14 / 28mm)



Standard 16-Valve Print Head (32mm)



Standard 16-Valve Print Head (64mm)

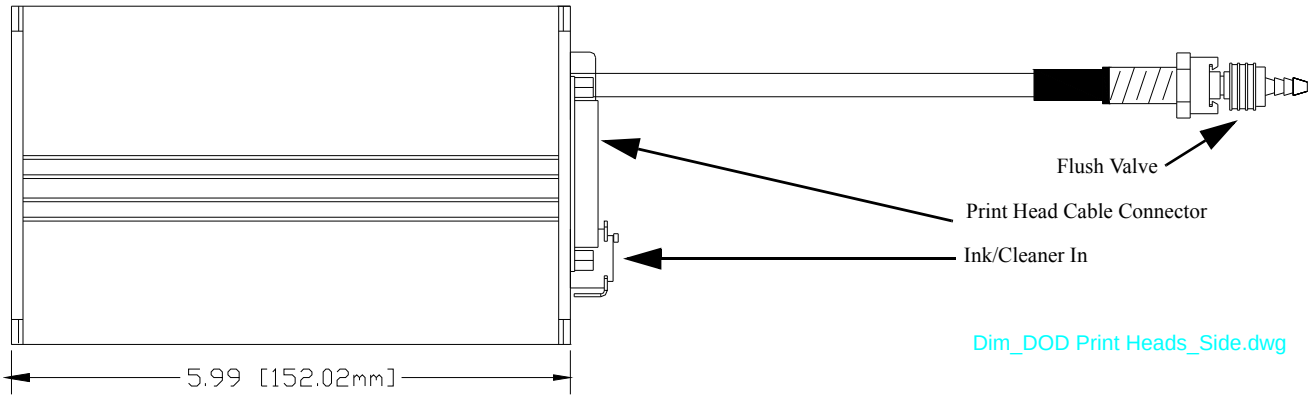


Figure 5

Print Heads

Standard DOD Print Heads - Nozzle View

Figure 6 is the nozzle end view of the various Standard DOD print heads along with their dimensions.

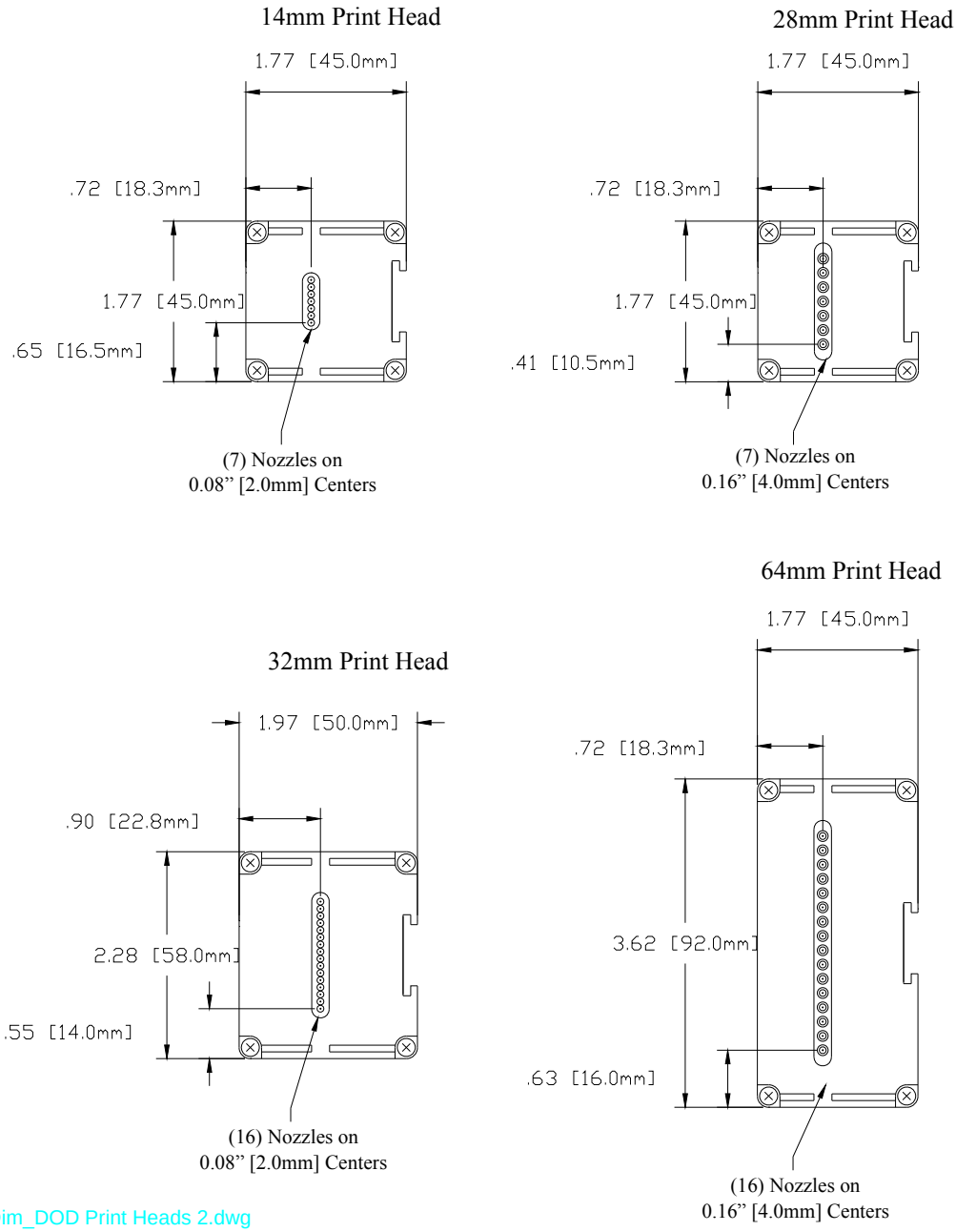


Figure 6

Compared to 8000 series print heads, Standard DOD print heads work at much lower pressures, normally in the 3 to 5 psi range. Please see documentation provided with the print heads for more details including recommended operating ink pressures.

IMPORTANT:

The 14 and 32mm print heads can only be used at the 100% height (PRINTHT[head]=100), see ***"Property 24 – PRINTHT[head]" on page 81***.

See ***"Standard DOD Series Print Heads" on page 25*** for specific guidelines for the various ink types used in this series.

CAUTION:

MEK base inks and pigmented inks are **NEVER** used in 14 and 32 mm print heads.

Print head types are automatically detected by the controller (but not the number of heads or valves – this must be set using the configuration command, see ***"Property 8 – CONFIG" on page 65***).

To prepare the system for printing, see ***"Prepare Print Head(s) for Printing" on page 35*** for instructions on filling either style of print head(s) with ink.

Speed Limitations

The various print heads have physical limits on how fast the valves can cycle, which limits the maximum speed of the print target.

The maximum possible print speed for each of the print head types is shown in the following table.

Head Type	Maximum Speed feet per minute	Maximum Speed meters per second
8000 Mini	393 f/m	2.0 m/s
8000 Midi	393 f/m	2.0 m/s
8000 Maxi	786 f/m	4.0 m/s
14/32mm	197 f/m	1.0 m/s
28/64mm	393 f/m	2.0 m/s

The speed table is based on ***"Property 30 – COLSKIP[head]" on page 82*** set to the default (0) where the print head prints every column. Maximum speed can also be limited by column spacing, see ***"Property 23 – COLSPAC[head]" on page 80*** (if the print head is used at 100% print height, see ***"Property 24 – PRINTHT[head]" on page 81***) or by the tilt aspect, see ***"Property 27 – TILTASP[head]" on page 81*** (if the print head is used at a print height less than 100%). Maximum speeds can also be limited by the dot size, see ***"Property 22 – DOTSIZE[head]" on page 80***.

Generally, the closer together the dot columns are printed and/or the larger the dot size, the slower the transport speed limit must be for good print quality.

This speed limit is also affected by the encoder/encoder wheel combination that is used. The following chart shows the correlation between the encoder/encoder wheel and print head type.

Encoder Pulses	5000 ppr		10000 ppr	
Wheel Circ. / Head Type	0.2 m	0.5 m	0.2 m	0.5 m
8000 Mini	2.0 m/s (393 f/m)	2.0 m/s (393 f/m)	1.6 m/s (315 f/m)	2.0 m/s (393 f/m)
8000 Midi	2.0 m/s (393 f/m)	2.0 m/s (393 f/m)	1.6 m/s (315 f/m)	2.0 m/s (393 f/m)
8000 Maxi	3.2 m/s (630 f/m)	4.0 m/s (786 f/m)	1.6 m/s (315 f/m)	4.0 m/s (786 f/m)
14/32mm	1.0 m/s (197 f/m)	1.0 m/s (197 f/m)	1.0 m/s (197 f/m)	1.0 m/s (197 f/m)
28/64mm	2.0 m/s (393 f/m)	2.0 m/s (393 f/m)	1.6 m/s (315 f/m)	2.0 m/s (393 f/m)

Print Heads

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Mechanical Installation

Controller

The I•Mark™ V84i/e Printer includes a bank of electrical connections. The printer is designed for mounting vertically, such as on a wall, or horizontally, such as on a table. Mount the printer onto a vertical surface using screws, or onto a horizontal surface with or without screws. See ***"Dimensions" on page 103*** for the location and spacing of the mounting screw holes.

Print Heads

Proper placement of the print heads is important for good print quality. Below are general recommendations for mounting print head(s):

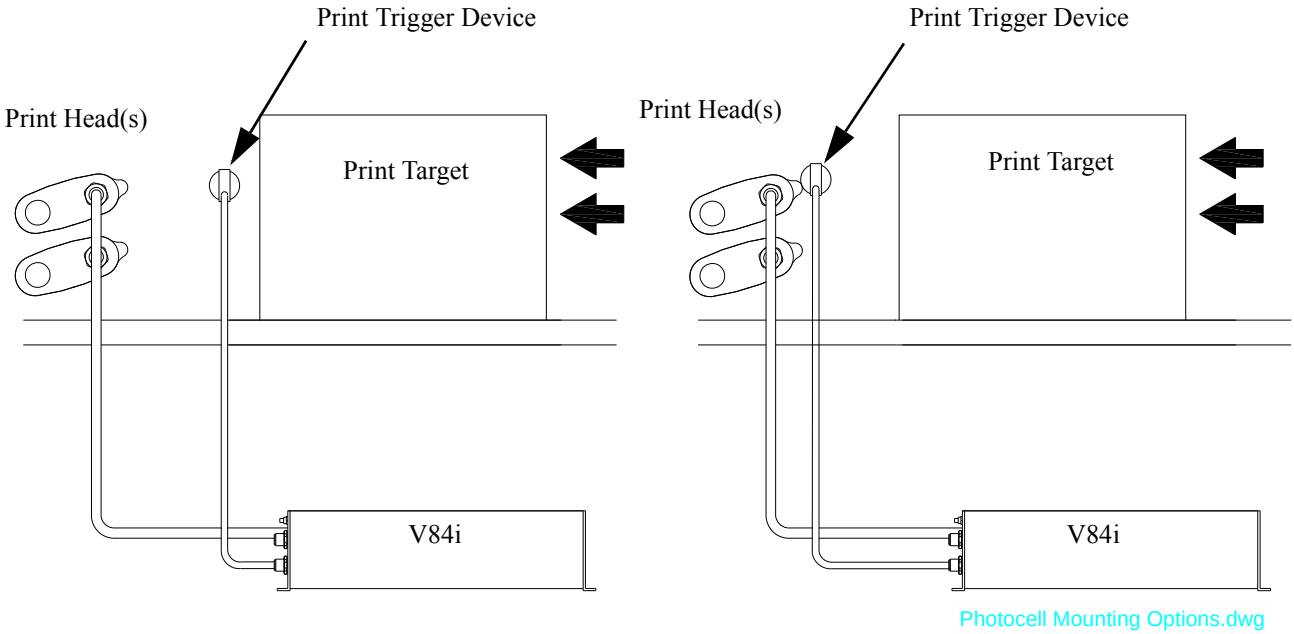


Figure 7

- Position the print trigger device so that it detects the Print Target before the target reaches the first valve of the print head(s), see ***Figure 7***.
- The print trigger device can be mounted onto the print head or positioned separately. See Trigger Mounting on Figure 35.
- Print heads are normally to be used only for printing from above or from the side, not for "under the line" printing. (There are some special model print heads for this purpose.)
- Recommended distance from print head to substrate: 0.04 - 0.25" (1 - 6.4mm).
- Recommended maximum print speed for 8000 Series Midi and Mini print heads and Standard DOD print heads is 400 f/m (2.0 m/s).
- Recommended maximum print speed for 8000 Series Maxi print heads is 780 f/m (3.96 m/s) - this limit is Width setting dependant, tighter column spacing will have a lower maximum speed.
- The I•Mark™ V84i/e Controller does not automatically sense the number of print heads connected. The user must configure this parameter. See ***"Object 3 – Print Head Configuration" on page 74***.

Mechanical Installation

Print Head Mount Assemblies

Matthews offers a range of print head mounting accessories that have been released for DOD technology.

This range of accessories includes the following assemblies that are sold as complete kits:

***"Horizontal Print Head Mount Assembly"* below**
"Vertical Print Head Mount Assembly" on page 15
"Free Standing Print Head Mount Assembly" on page 16
"Conveyor Print Head Mount Assembly" on page 16
"Free Standing Print Head/Controller Mount" on page 17

These assemblies support the most common mounting configurations. They have been designed to provide quick installations with maximum versatility. Individual components that comprise the assemblies can also be purchased separately allowing a wide range of parts to be used in combination. This flexibility satisfies a diverse scope of applications, customized solutions, or future modifications. These individual components include various poles, clamps, and brackets.

Assembly kits contain all necessary components for the most common print head mounting positions. They are constructed of 40mm diameter aluminum tubing. Each offers three quick-release handles for easy vertical and horizontal adjustments, along with a print head bracket[2] for versatility in positioning the print head accurately.

Horizontal Print Head Mount Assembly

This mounting accessory, see ***Figure 8***, is ideal for applications where the DOD print head mounting stand is mounted onto a horizontal surface.

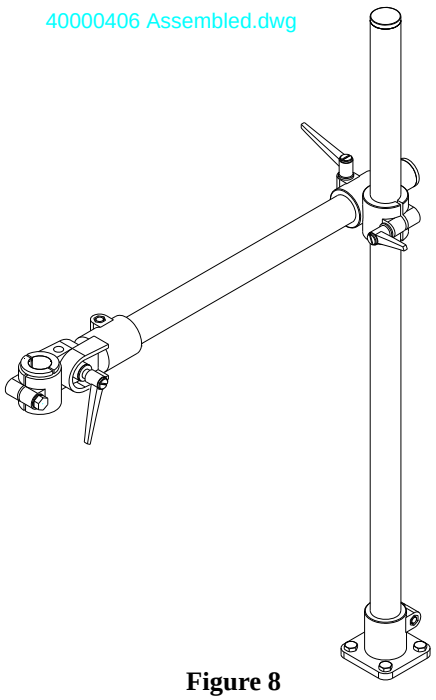


Figure 8

2. An 8000 series print head can be clamped directly in the bracket, a standard DOD print head requires installing a pipe or rod (25mm – one inch diameter) in the bracket and then using a clamp, see ***"Standard DOD Print Head Mounting Clamps" on page 18***.

Vertical Print Head Mount Assembly

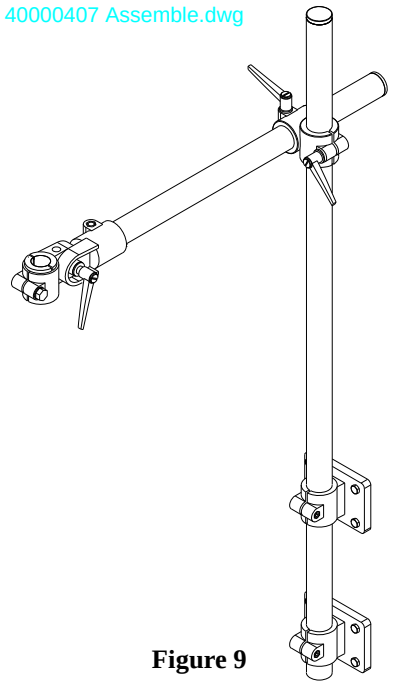


Figure 9

The Vertical Print Head Mount Assembly is ideal for applications where the DOD print head mounting stand is mounted onto a vertical surface such as the printer cabinet assembly, see ***Figure 9*** and ***Figure 10***.

Vertical Print Head Mount Assembly shown installed on the side of the available printer cabinet assembly.

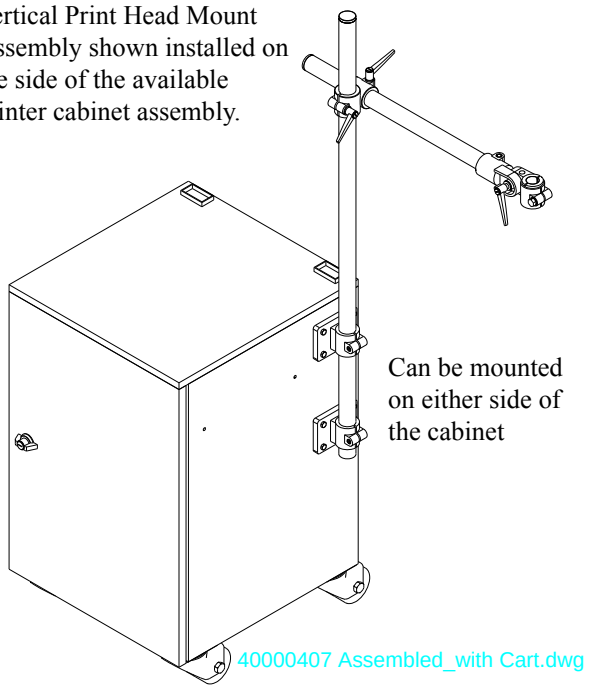


Figure 10

Mechanical Installation

Free Standing Print Head Mount Assembly

The Free Standing Print Head Mount Assembly is for applications where the DOD print head mounting stand is freestanding on the floor, see ***Figure 11***.

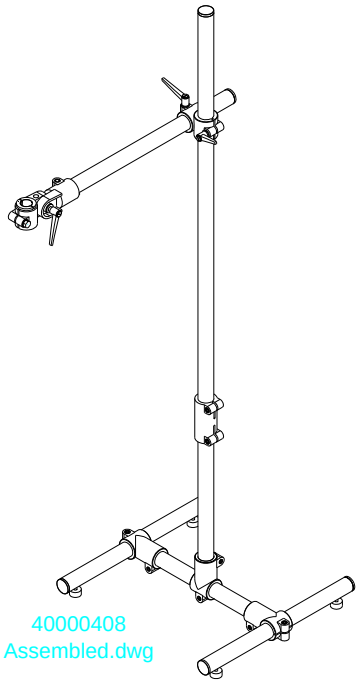


Figure 11

Conveyor Print Head Mount Assembly

The Conveyor Print Head Mount Assembly is ideal for applications where the DOD print head[3] is printing in the horizontal position and the stand is mounted to the side of a conveyor, see ***Figure 12***.

Note: ink tubes and electrical lines not shown for clarity.

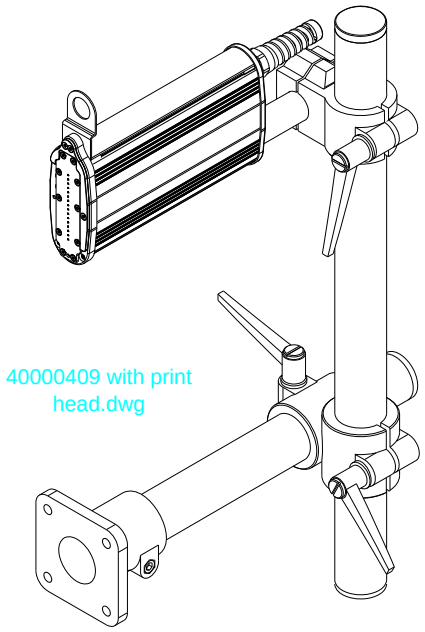


Figure 12

3. Shown with a 16-valve 8000 series print head at 100% print height installed in clamp.

Free Standing Print Head/Controller Mount

The Free Standing Print Head/Controller Mount Assembly is ideal for applications where space is limited. The Controller, Print Head and Ink Supply System are all mounted on the one stand, see ***Figure 13***.

The ink supply unit bracket flange clamp may need to be installed above the sleeve clamp to stay within the guideline for ***"Positioning Ink Supply" on page 24***.

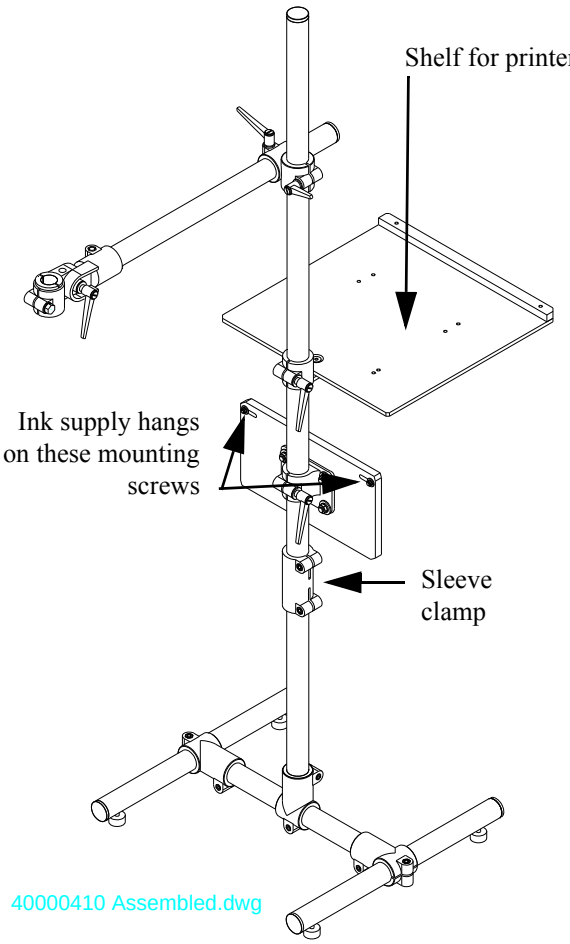


Figure 13

8000 Print Head Mounting Clamp

This style mounting clamp, see ***Figure 14***, can be used with any 8000 series print head.

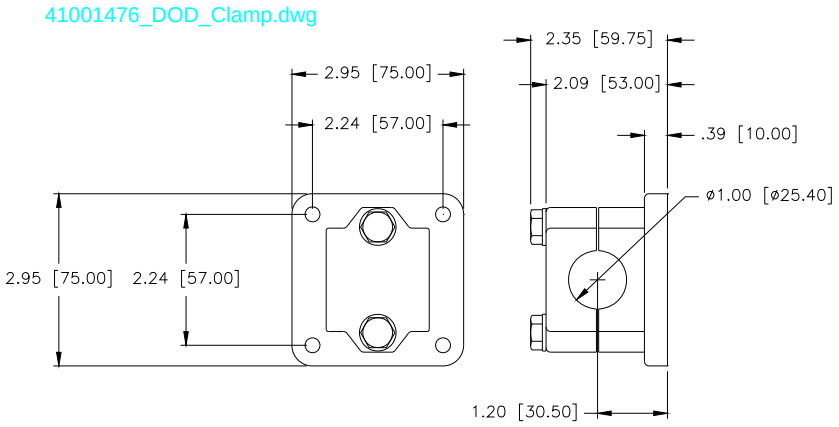


Figure 14

Mechanical Installation

Standard DOD Print Head Mounting Clamps

There are two different mounts available for Standard DOD print heads.

The adjustable mounting clamp, see ***Figure 15***, is used when tilting the print head is required. This clamp is designed to mount on a rod (25mm – 1 inch) and is secured in the print head mounting slot.

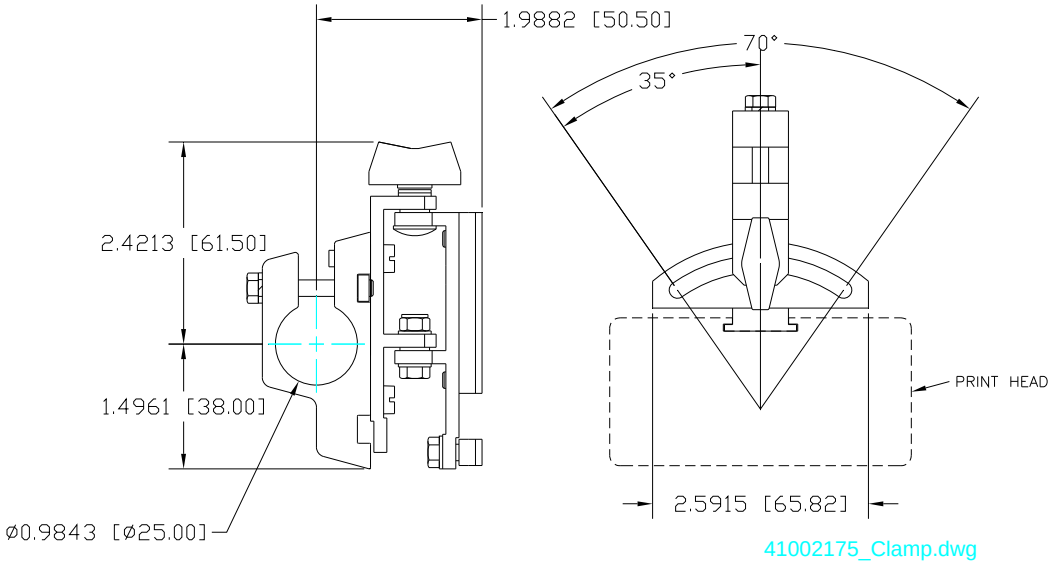


Figure 15

The fixed mounting clamp, see ***Figure 16***, is used when the print head is not tilted. This clamp is also designed to mount on a rod (25mm – 1 inch) and is secured in the print head mounting slot.

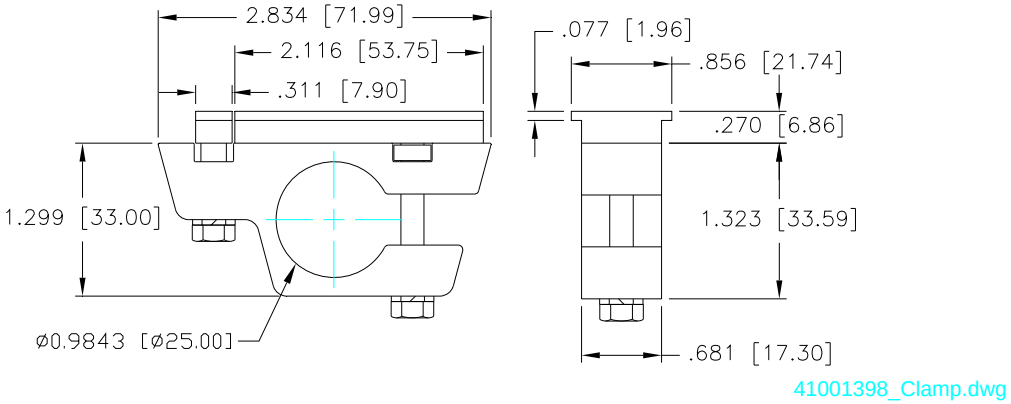


Figure 16

Adapting a Print Head to Print Direction

8000 Series Print Head

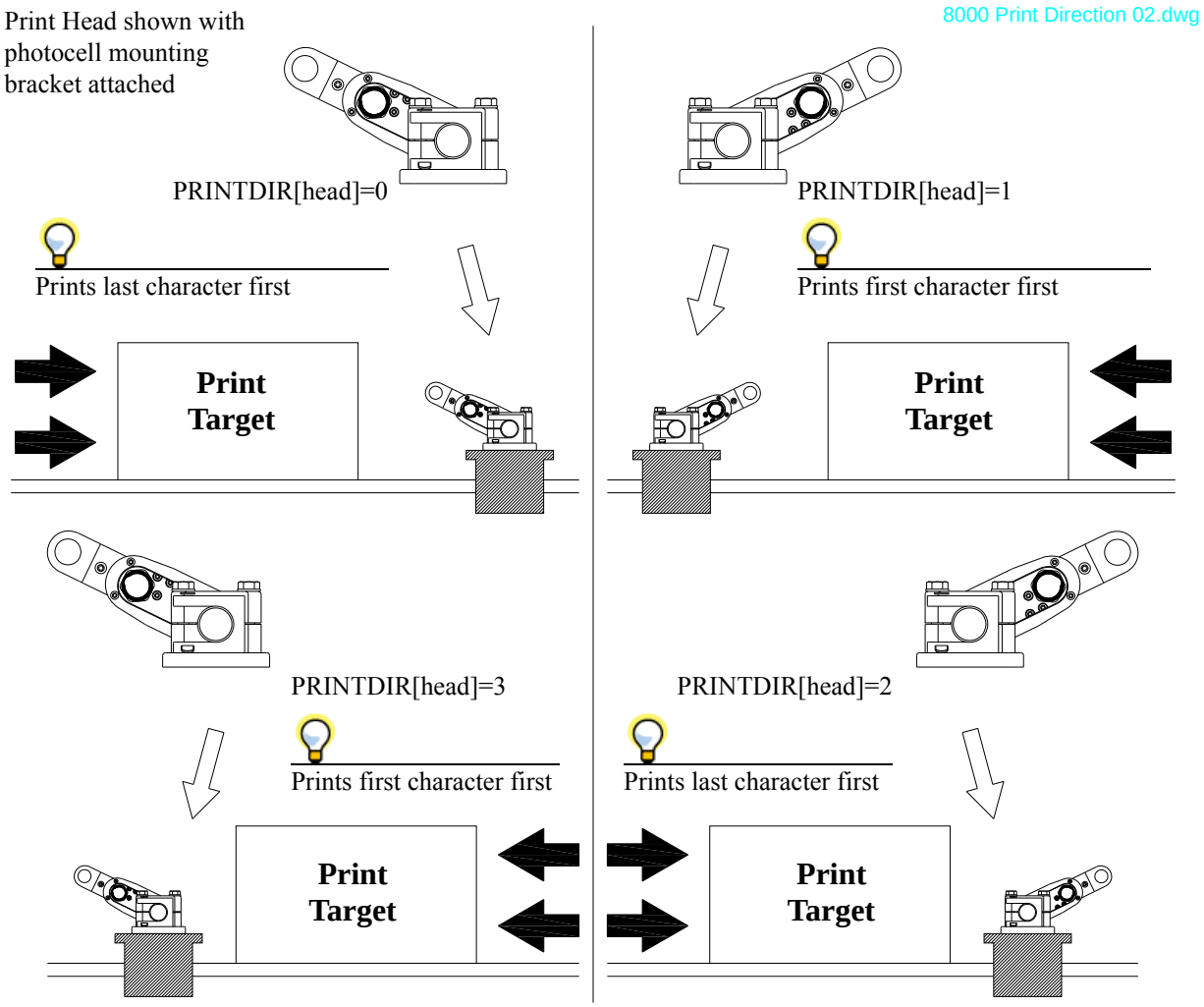


Figure 17

The print direction setting in the I•Mark™ V84i/e Controller is controlled by ***"Property 10 – PRINTDIR[head]" on page 76***.

CAUTION:

It is important to note that for PRINTDIR[head]=2 and PRINTDIR[head]=3, as illustrated in ***Figure 17***, the Print Target is well past the valves before the photocell would be triggered. Make sure that there is enough length on the Print Target to allow this configuration.

If the print head is mounted on an traversing arm and it is desired to print on both strokes, it may be necessary to change the margin, see ***"Property 11 – MARGIN[head]" on page 76***, on the stroke that utilizes PRINTDIR[head]=2 or PRINTDIR[head]=3.

Another option would be to provide a trigger from a source other than a photocell to control the placement of the mark on the Print Target.

Mechanical Installation

It is important to avoid hitting the print head with the print target. The 8000 series print heads have a print target spacer to protect the nozzle plate from possible damage by the print target, see ***Figure 17***.

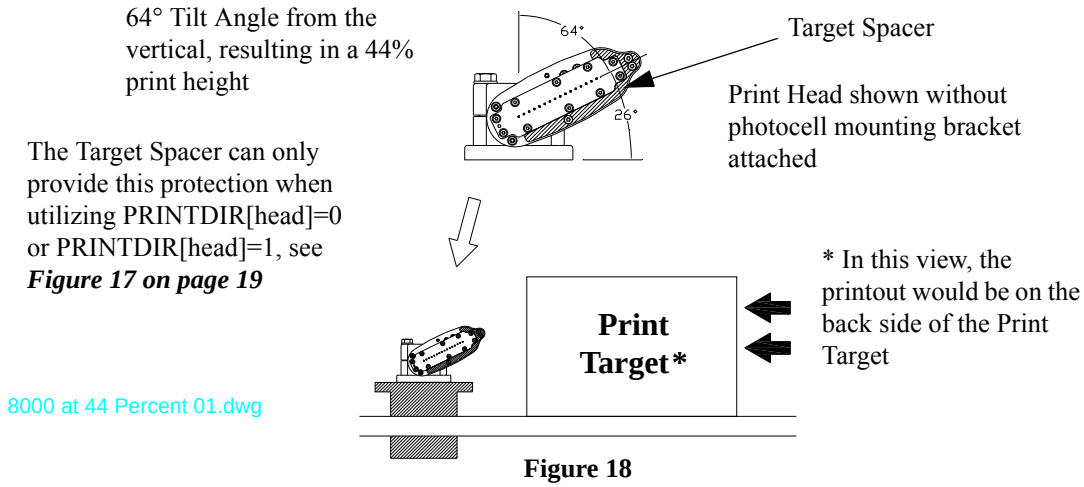


Figure 18

Position the print target spacer so that the print head nozzle plate will not be hit by the print target and the printout is not smudged, see ***Figure 18***.

Standard DOD Series Print Head

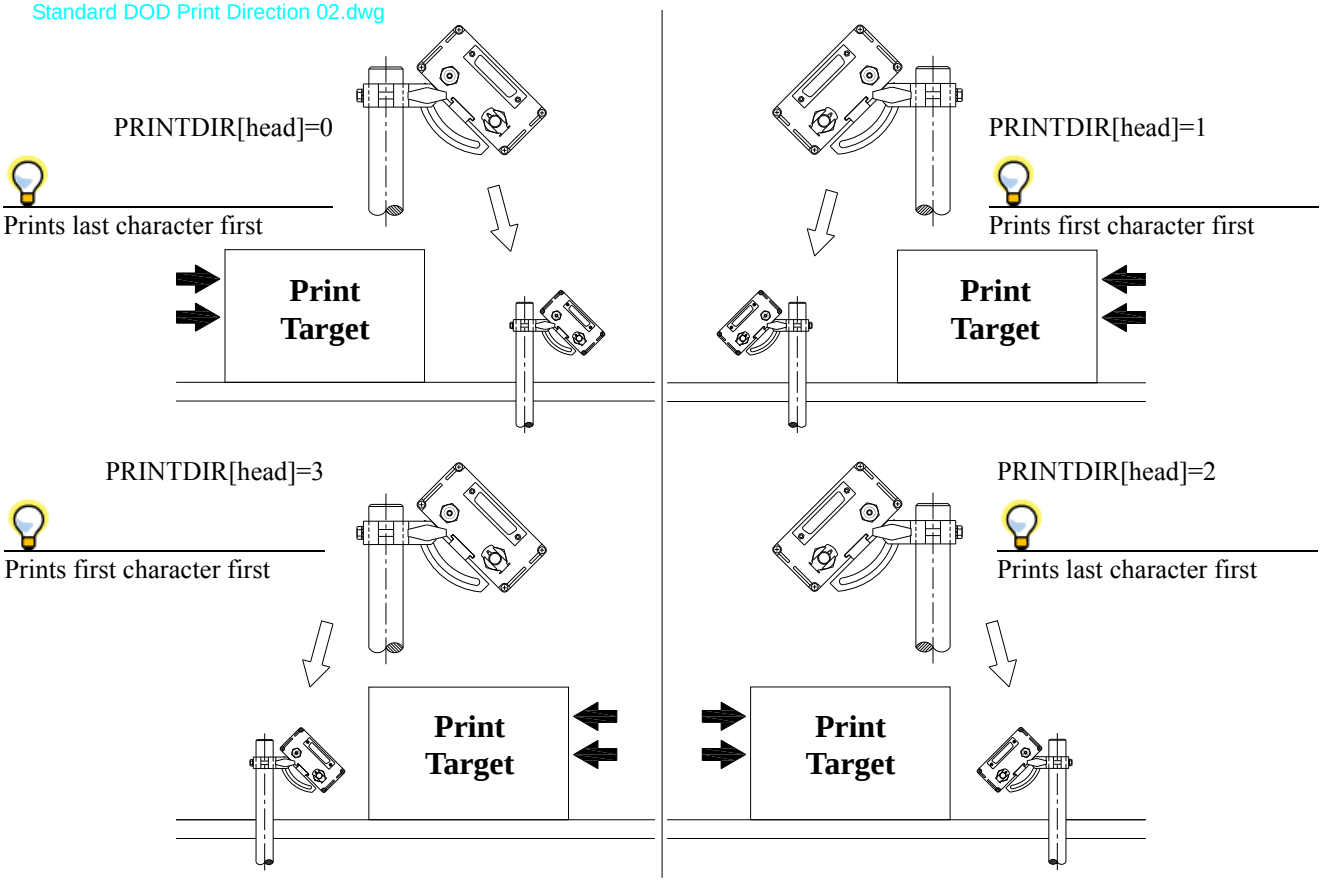
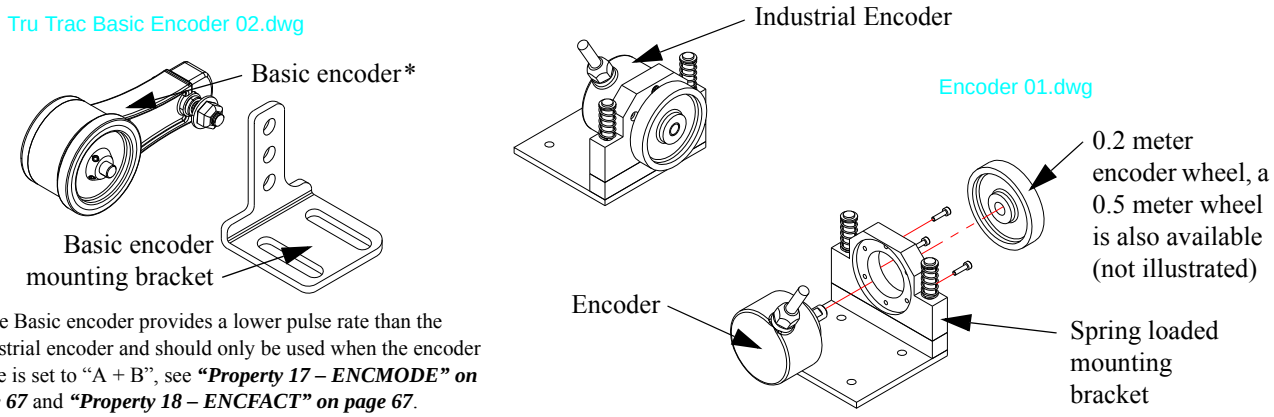


Figure 19

It is important to avoid hitting the print head with the print target. The Standard DOD series print heads have nozzles that can be damaged by contact with the print target. Position the print head as shown in ***Figure 19***, so that the print head will not be hit by the print target and the printout is not smudged.

Encoder

For details on encoder mounting see the instructions that are provided with the encoder. Below are a few points to keep in mind when selecting, installing and using an Encoder, see ***Figure 20***, with the I•Mark™ V84i/e Printer:



* The Basic encoder provides a lower pulse rate than the Industrial encoder and should only be used when the encoder mode is set to "A + B", see ***"Property 17 – ENCMODE" on page 67*** and ***"Property 18 – ENCFACT" on page 67***.

Figure 20

- Only use Matthews approved speed encoders.
- Speed encoders are delicate, precision instruments and should be mounted accordingly.
- It is recommended that placement of an encoder be within 1 foot of the print station.
- Place the speed encoder so that it is well protected from knocks and vibration.
- Make sure that there is no play between the speed encoder shaft and the drive wheel, as this will adversely affect the printout.

The V84i controller can have only one encoder connected.

Sample Encoder Factor Calculation

Below is a sample calculation of Encoder Factor (pulses per meter) for the industrial encoder shown in ***Figure 20 on page 21***:

Encoder = 5000 pulses per revolution
Wheel Circumference = 0.2 meter = 200mm
Revolutions per meter = 1000mm ÷ 200mm = 5 rev/m
Encoder Pulses per meter = 5 rev/m x 5000 pulses/revolution = 25000 pulses/m

The firmware uses pulses per meter for the Encoder Factor, see ***"Property 18 – ENCFACT" on page 67***. The value to enter into the V84i is 25000 (for pulses/m or 7620 for pulses/ft.).

Encoder Installation Recommendations

It is frequently easier to get everything working properly when using an encoder by starting at the 100% print height, see ***"Property 24 – PRINTHT[head]" on page 81***. This allows getting the encoder pulses correct before attempting to get the print head tilted to the correct angle. This will also help with configuring print direction, see ***"Property 10 – PRINTDIR[head]" on page 76*** (if the print direction is incorrect and the print head is also tilted, it may be difficult to look at the "garbled" printout and determine what is at fault).

Mechanical Installation

Trigger (Photocell)

The trigger tells the V84i controller when a print target is available. Mount the trigger device so that it is activated by the print target before the print target reaches the first print head nozzle, see ***Figure 21***.

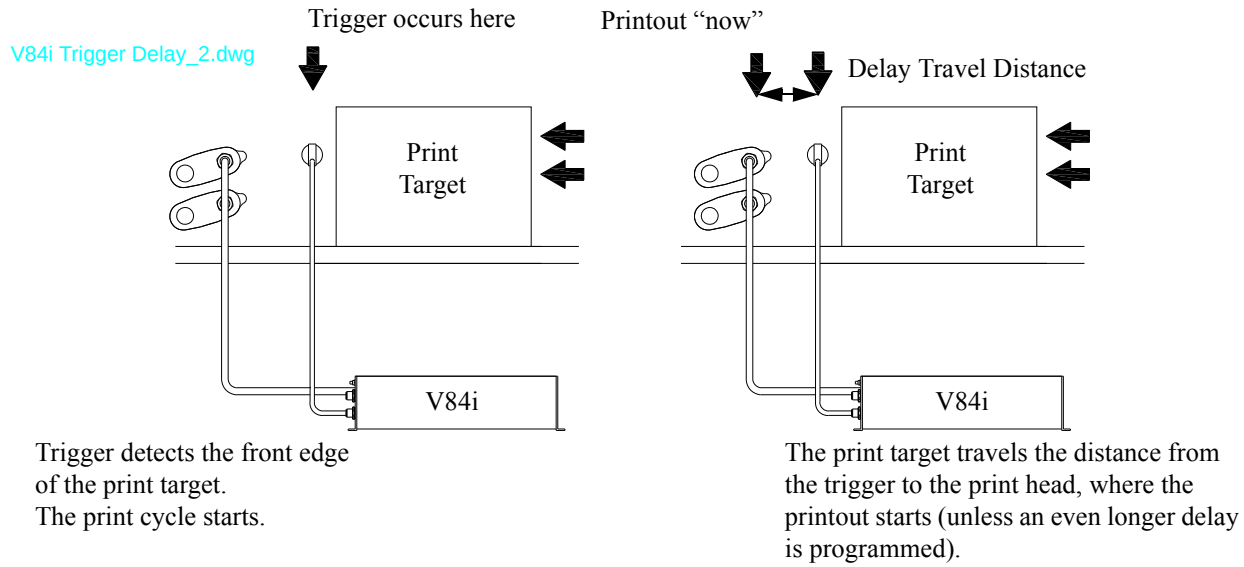


Figure 21

Each trigger signal initiates a print cycle in the controller. If too many signals are received in quick succession, problems may occur. To avoid this problem, position the trigger device so that it transmits only one signal per printout.

The trigger device also signals when the end of the print target passes. This information is used by the Terminate function when the I•Mark™ V84i/e Controller is configured for the Continuous Print mode, see ***"Property 19 – TRIGEND[head]" on page 79***. It is possible to use other triggers besides a photocell. For instance a PLC may be used to initiate print cycles at given time intervals.

Each attached print head can be configured to print from a separate trigger source.

Each available print head can have a different trigger source assigned. Naturally it is also possible to use the same trigger source for more than one print head. There are five possible trigger sources, see ***"Property 18 – TRIGMODE[head]" on page 79***.

If there is only one trigger input, the connection is made to one of the two ENC/TRIGGER ports (the two ports are wired in parallel, so it doesn't matter which one is used). Two trigger inputs require the use of the (optional) trigger input fan-out adapter. Three or four trigger inputs require the use of the (optional) trigger input box.

Two Trigger Fan-Out Cable - 1 Foot Long
Three/Four Trigger Box

The trigger inputs may be from any combination of sensors, PLCs, etc.

IMPORTANT:

If using only one source, the trigger input must be set to Trigger 0 for all print heads.

Ink Supply

Several types of ink supplies are used with the DOD print heads and a V84i printer. The most common is the high pressure ink supply module. This manual will go into detail for the high pressure ink supply system. If one of the other ink supply modules, such as the standard ink module, the large capacity ink supply or the flow jet is being used, please see documentation provided with those units.

Figure 22 shows the controls of the High Pressure Ink Supply unit.

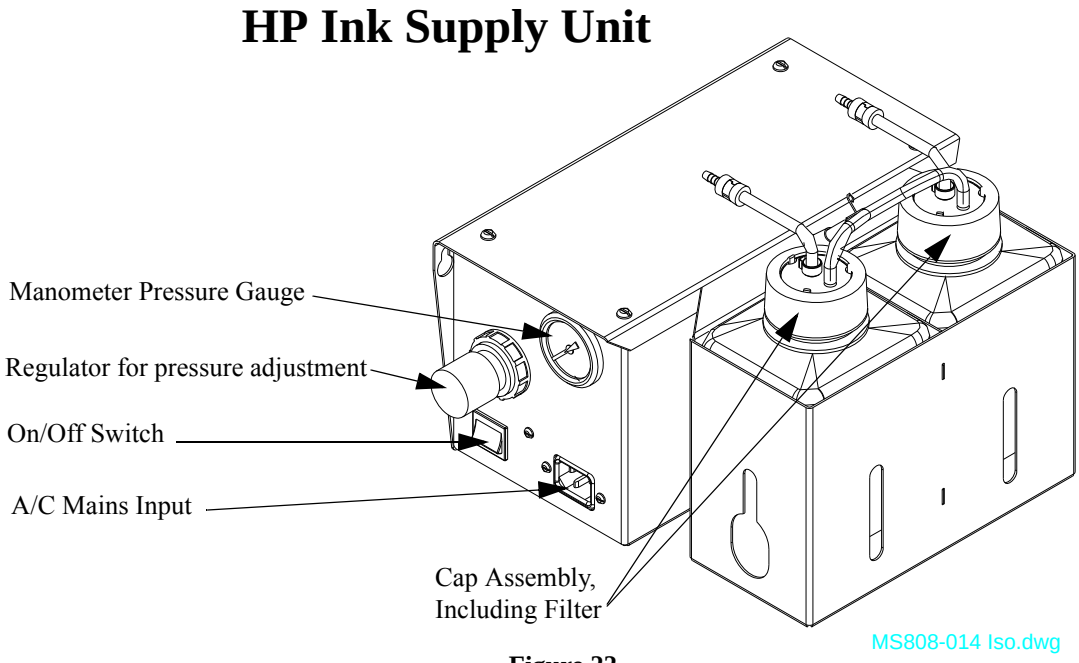


Figure 22

Figure 23 shows the dimensions of the High Pressure Ink Supply unit.

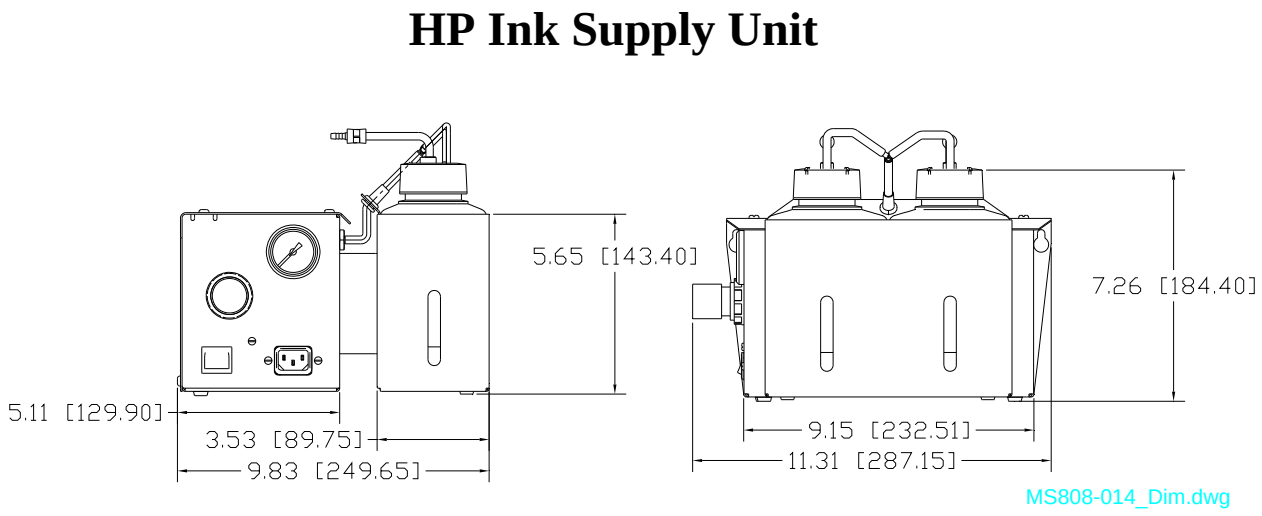


Figure 23

Dimensions are shown in inches, with millimeters in brackets.

Mechanical Installation

Positioning Ink Supply

8000 Series Print Heads

When using the I•Mark™ V84i/e Controller with the 8000 series print heads, position the ink supply and set the pressure according to the following illustrations:

SCP 600/800 Series Inks

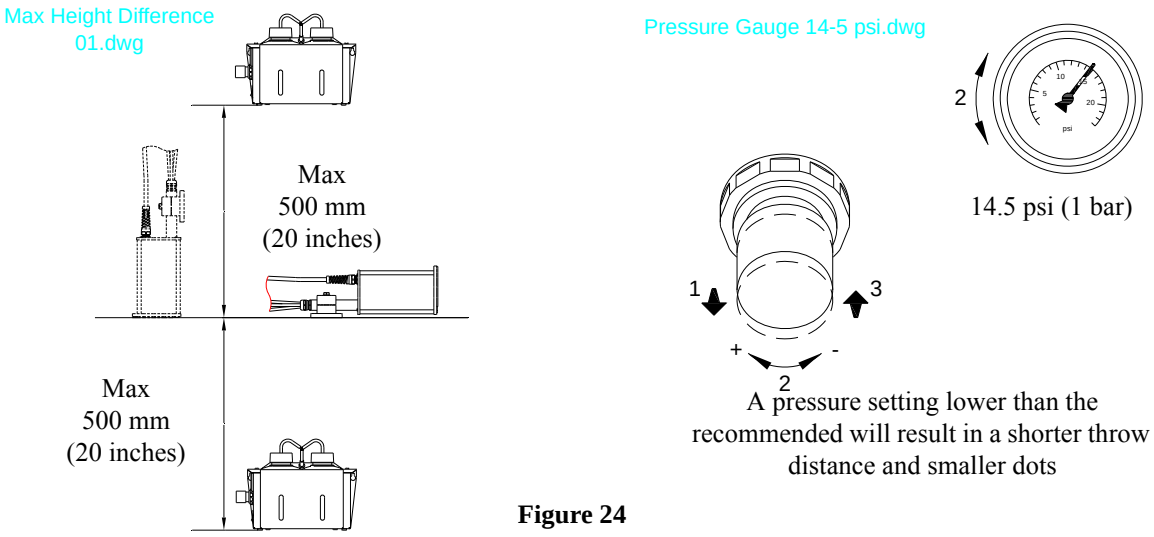


Figure 24

SCP 400/700/900 Series Inks

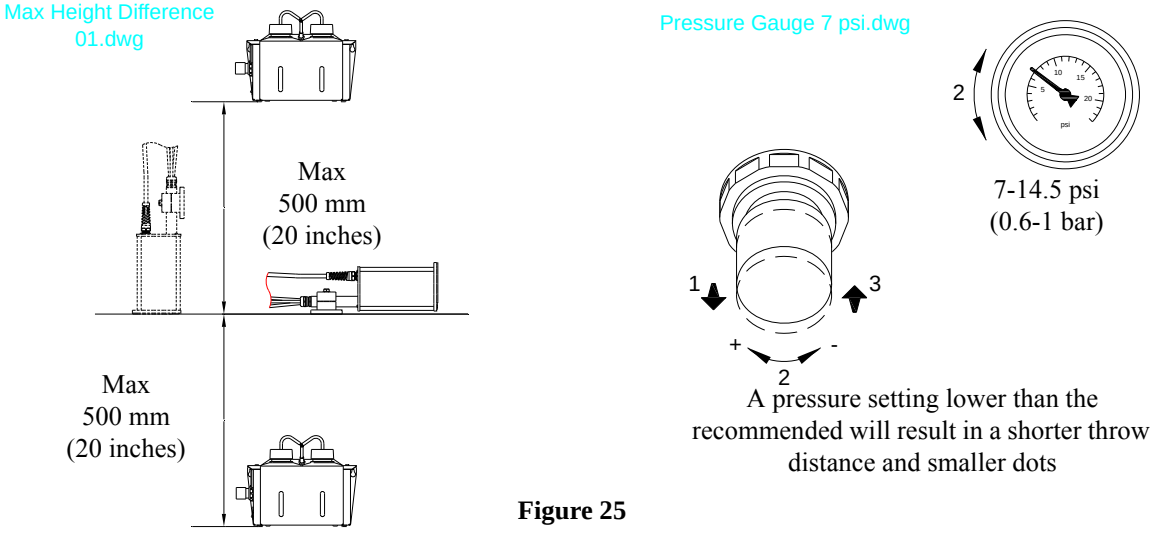


Figure 25

To adjust the pressure of a High Pressure Ink Module, use the following procedure:

1. Pull the knob outward to unlock.
2. Rotate the knob counterclockwise to lower the pressure, clockwise to increase the pressure. When lowering the pressure, it is necessary to release the pressure completely, then re-pressurize to get an accurate reading).
3. To prevent accidental changes in the pressure, push the knob inward to lock in position.

Standard DOD Series Print Heads

When using the I•Mark™ V84i/e Controller with print heads from the Standard DOD series, position the ink supply and set the pressure according to the following illustrations:

Standard Valve Inks - Dye Based

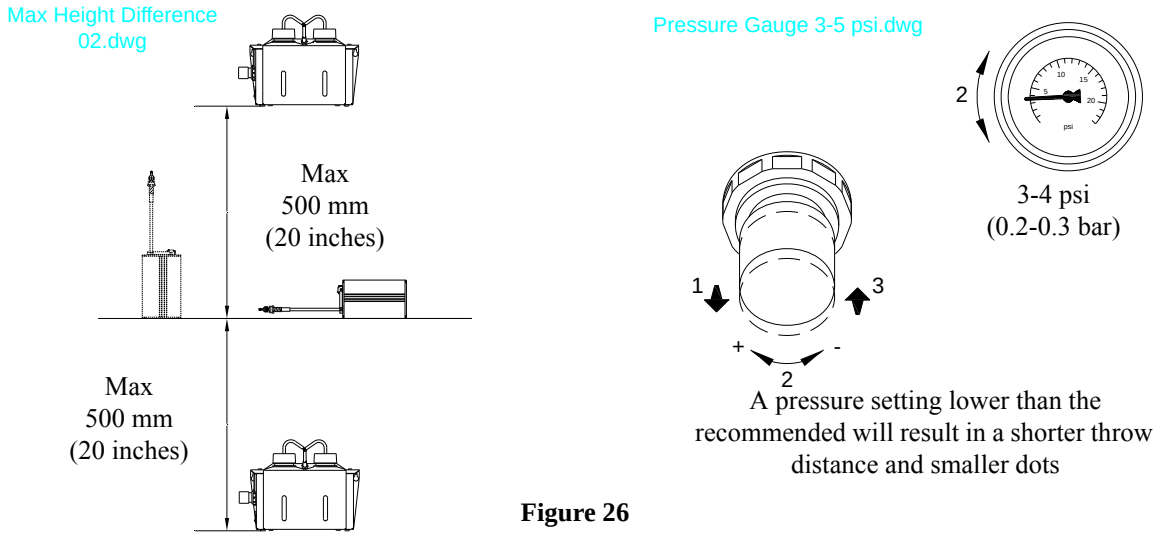


Figure 26

Standard Valve Inks - Pigmented

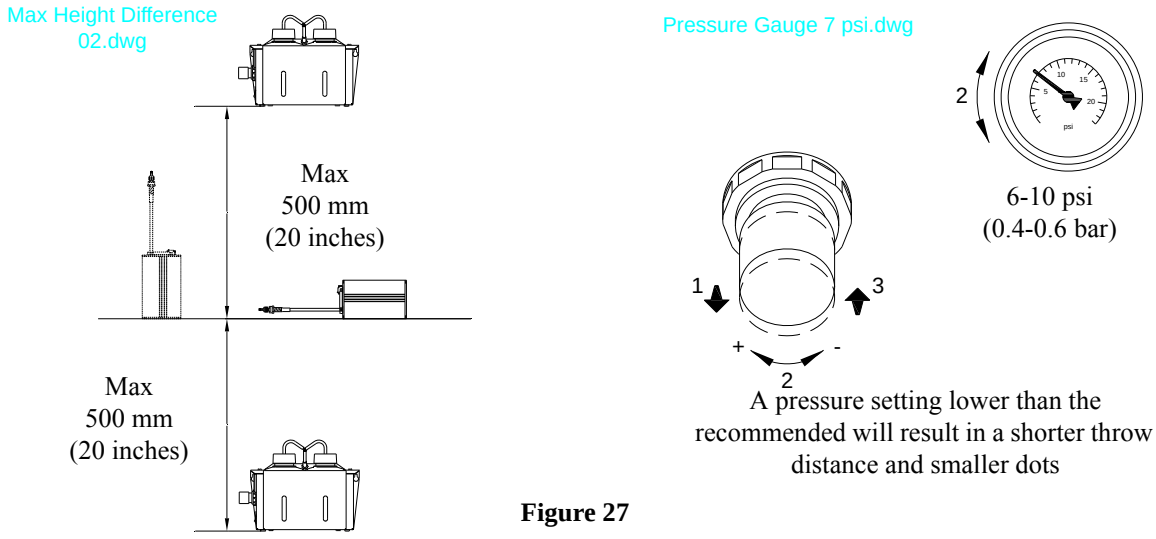


Figure 27

To adjust the pressure of a High Pressure Ink Module, use the following procedure:

1. Pull the knob outward to unlock.
2. Rotate the knob counterclockwise to lower the pressure, clockwise to increase the pressure. When lowering the pressure, it is necessary to release the pressure completely, then re-pressurize to get an accurate reading).
3. To prevent accidental changes in the pressure, push the knob inward to lock in position.

If another type of ink is being used in the printer, please see the documentation provided with the ink for the appropriate supply pressure or contact a Matthews representative.

Mechanical Installation

Ink Pressure Recommendations

System	Ink Type	Recommended Delivery Pressure
8000	SCP600 and SCP800	15 psi (1 bar), see ***Figure 24 on page 24***
8000	SCP400, SCP700 and SCP900	7 to 15 psi (0.6 to 1.0 bar), see ***Figure 25 on page 24***
Standard DOD	Dye Based	3 to 4 psi (0.2 to 0.3 bar), see ***Figure 26 on page 25***
Standard DOD	Pigmented	6 to 10 psi (0.4 to 0.6 bar), see ***Figure 27 on page 25***

If using a different ink delivery system consult the instructions for that unit for pressure and height differential recommendations.

The tubing connecting the ink supply to the print heads must also be installed. For most 8000 series print heads, there are separate connections for the ink and cleaner lines.

The ink line connector has a black band attached. The cleaner line connector has a yellow band. Connect both lines to the print heads.

For a standard DOD head, the same input is used for ink and cleaner. When preparing for printing, connect the ink line to the input fitting.

The fluid connections for all print heads have easy-to-use quick-connect fittings.

CAUTION:

To prime ink through the valves the print head cables must be connected to the ports on the controller. **All connections must be made with the power off.**

Follow the instructions in the Maintenance section under ***"Prepare Print Head(s) for Printing" on page 35*** to complete the priming process.

Electrical Connections

Once the appropriate hardware has been mounted, the interconnecting cables should be installed. The V84i controller has one electrical interface panel for port connections on the front side of the system enclosure. The various pieces of hardware are connected to this panel.

Connector Interface Panel - Connection Ports

For a new installation, there are connections that must be made on the Enclosure. These include the print head(s), a trigger device (photocell, external trigger or sensor) and possibly an encoder. ***Figure 28*** shows the location diagram of the connections on an I•Mark™ V84i/e Controller. The actual connections used will vary by application and equipment purchased.

IMPORTANT:

All connections should be made with the external power cord unplugged.

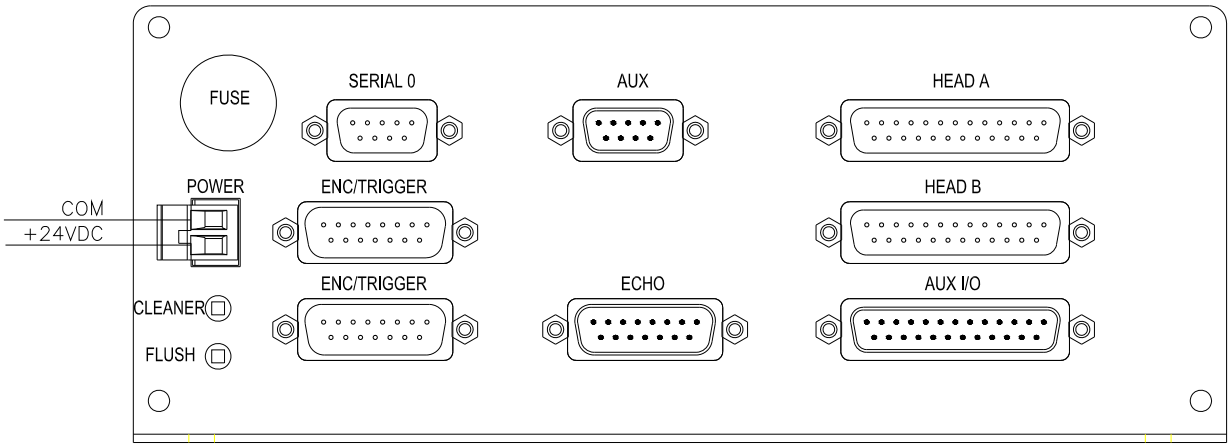


Figure 28

The labels on the drawing are for illustration purposes only, they are not actually on the end panel, but are referenced on the top overlay, see ***Figure 29 on page 28***.

Electrical Connections

Top Overlay

The overlay is placed on the top surface of the I•Mark™ V84i/e. In addition to providing the labels for all the components on the end panel and identifies the LED indicators that are used for troubleshooting, see ***Figure 29*** and ***"LED Board" on page 120***.

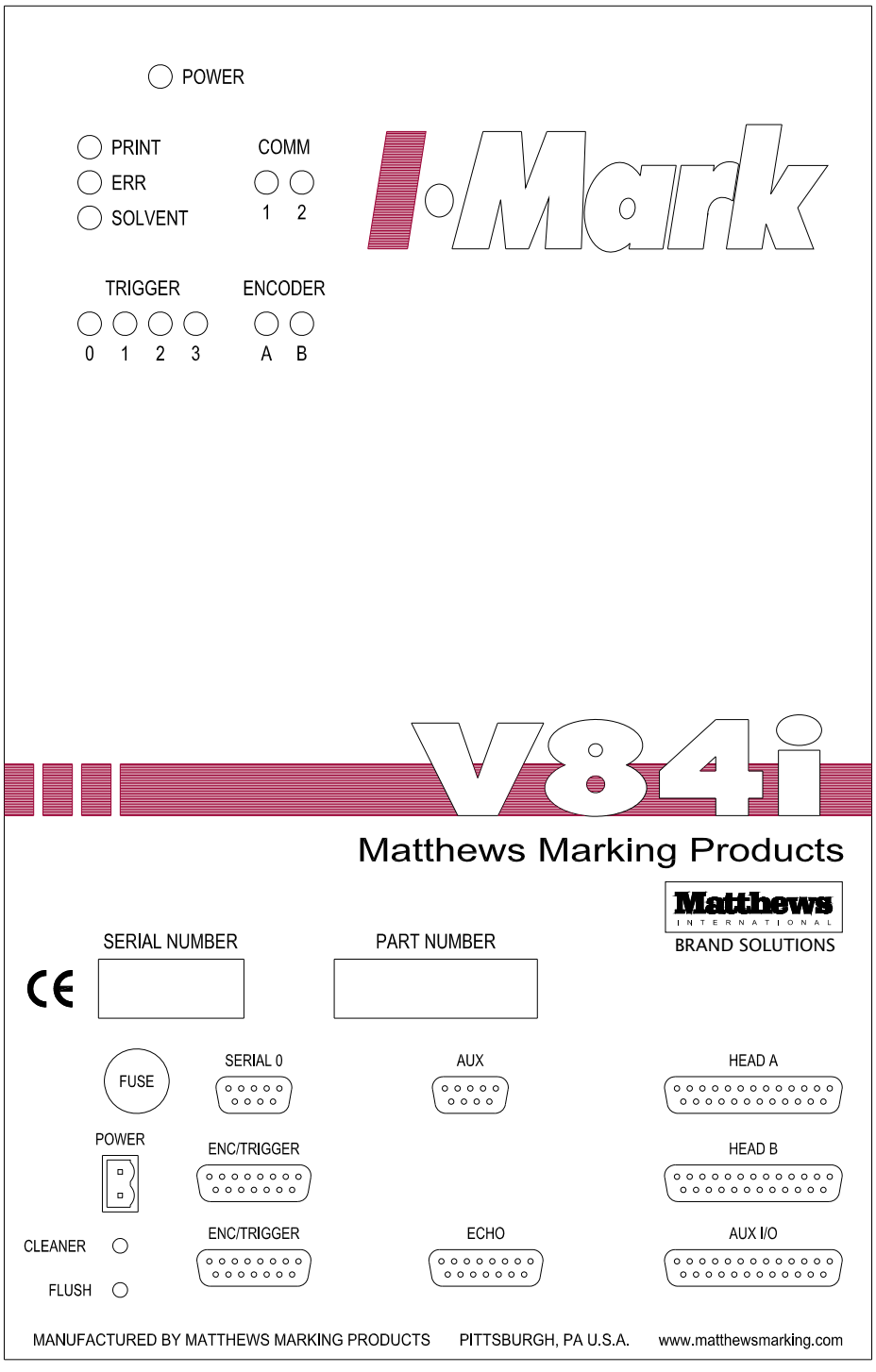


Figure 29

Print Heads

There are two DB-25 female connectors, see ***Figure 30***, used to connect the print head(s) to the controller. If the application has one print head, it should be connected to the port labeled “Head A”. With two 16-valve print heads, one print head should be connected to “Head A” and the other connected to “Head B”. A 32-valve print head cable has two connectors labeled “A” and “B”, connect each to the port with the same letter. Connecting any 7-valve print head(s) will require the use of optional Fan-out Cable(s).

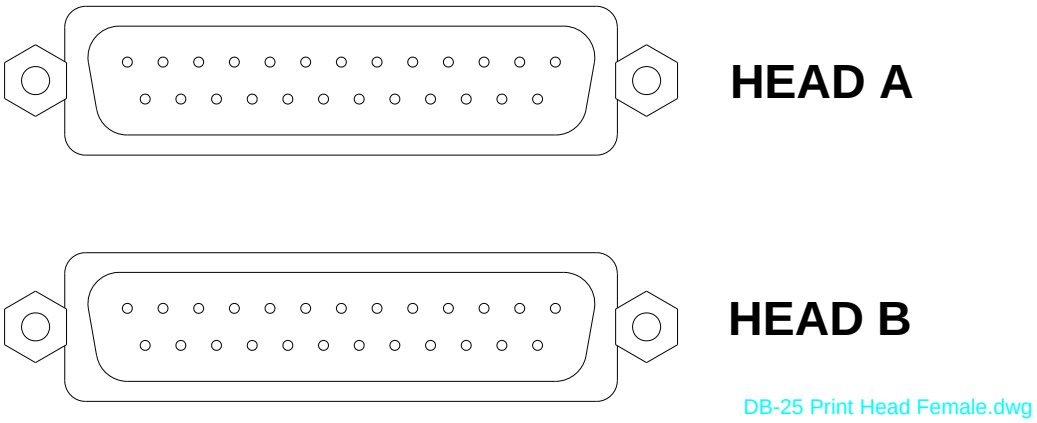


Figure 30

The following tables list the print head cables currently available for use on the I•Mark™ V84i/e Controller. Listed are the cables to use for the standard configurations on the I•Mark™ V84i/e Controller. Other configurations are possible; see your local distributor or Matthews Marking Systems representative for more information.

Electrical Connections

Print Head Cables

8000 Series Print Head Cables

V84i 8000 Series Print Head Cables		
Configuration	**Cable Needed[a]**	**Port**
32	8 foot (2.5 meters) print head cable	A and B
16	10 foot (3 meters) print head cable	A
16, 16	10 foot (3 meters) print head cable 10 foot (3 meters) print head cable	A B
16, 7, 7	10 foot (3 meters) print head cable Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables	A B
7, 7[b]	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables	A
7, 7, 16	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables 10 foot (3 meters) print head cable	A B
7, 7, 7, 7	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables	A B

a. For other available lengths, contact your local distributor or Matthews Marking Systems.
b. **For installations of only one 7-Valve print head, use the 2 x 7 configuration setting, but only use y-position 0…7 for message construction.** A fan-out cable is still required.

Standard DOD Print Head Cables

V84i Standard DOD Print Head Cables		
Configuration	**Cable Needed[a]**	**Port**
32	N/A	N/A
16	10 foot (3 meters) print head cable	A
16, 16	10 foot (3 meters) print head cable 10 foot (3 meters) print head cable	A B
16, 7, 7	10 foot (3 meters) print head cable Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables	A B
7, 7[b]	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cable	A
7, 7, 16	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables 10 foot (3 meters) print head cable	A B
7, 7, 7, 7	Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables Fan-out cable plus quantity 2 of the 10 foot (3 meters) print head cables	A B

a. For other available lengths, contact your local distributor or Matthews Marking Systems.
b. **For installations of only one 7-Valve print head, use the 2 x 7 configuration setting, but only use y-position 0…7 for message construction.** A fan-out cable is still required.

CAUTION:

Any time a 7-Valve print head is installed a fan-out cable **MUST** be used, even it there is only one print head.

Encoder and Trigger Connections

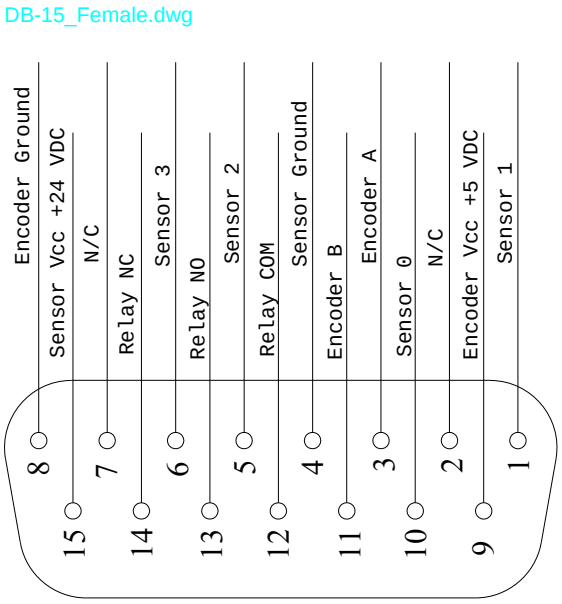


Figure 31

Two DB-15 female connectors, labeled “ENC/TRIGGER”, are used to connect the trigger signal (normally a photocell) and the (optional) encoder signal, see ***Figure 28 on page 27***. The two ports are wired in parallel and also include the Relay output. The pin out of the “ENC/TRIGGER” connectors is shown in ***Figure 31***.

For installations where both an encoder and trigger source(s) are used that also need to have the relay output available require the use of a fan-out cable. The cable will accept either an encoder or trigger source(s) on the cable labeled “SENSORS” while the relay output pins are available on the cable labeled “RELAY OUT”. The cable can be used on either of the two “ENC TRIGGER” ports on the I•Mark™ V84i/e controller since the ports are wired in parallel.

Echo

There is one DB-15 male connector (labeled ECHO) that outputs the Sensor and Encoder signals. This allows sharing of these signals with additional I•Mark™ V84i/e controllers. Sharing these signals requires the use of an ECHO cable[4].

The pin out of the ECHO connector is shown in ***Figure 32***.

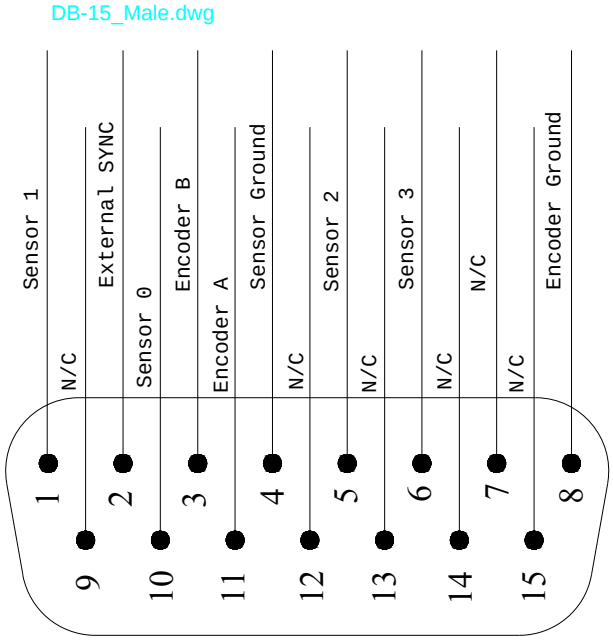


Figure 32

4. Available in different lengths, contact your local distributor or Matthews Marking Systems.

Electrical Connections

Serial 0

SERIAL 0 is a DB-9 female connector that supports the ASCII protocol commands. The pin outs of the SERIAL 0 port is shown in ***Figure 33***.

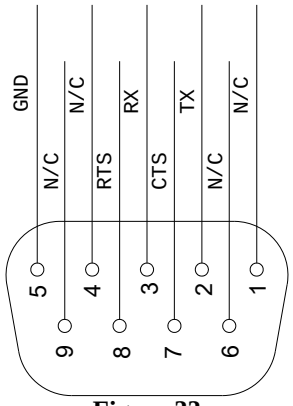


Figure 33

IMPORTANT:

For Hardware Handshaking, DSR/DTR is not supported. If using any custom third party software to communicate with the I•Mark™ V84i/e that requires DSR/DTR, either disable the feature or use our custom cable which has an internal jumper across pins 4 and 6. Contact your local distributor or Matthews Marking Systems for availability.

AUX

By default, the port is configured for RS-232 communication. Aux If RS-485 is desired, see***"RS-485" on page 134***.

AUX is a DB-9 male connector that can be used to receive data from an external source. The pin outs of the AUX port is shown in ***Figure 34***.

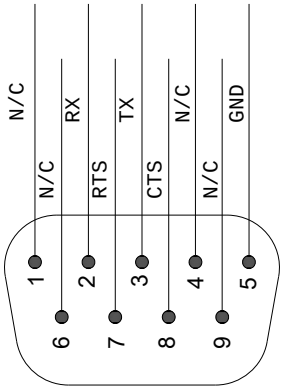


Figure 34

This port can be used to select the message for printout when SP MSGSEL[head]=1, see ***"Property 9 – MSGSEL[head]" on page 75***.

Aux I/O

The AUX I/O is a DB-25 male connector that allows for external control of the controller. This port can be used in special applications where it is required to connect to other devices. Input 0 through Input 5 are used for binary message selection, see ***"Property 9 – MSGSEL[head]" on page 75***. The left two bits are used for the push buttons in the I•Mark™ V84i/e controller, see ***"Push Buttons" on page 34*** and ***"Property 26 – AUXIN" on page 70***. The pin outs of the AUX I/O port is shown if ***Figure 35*** and are defined in ***"I/O Port Pin Assignments" on page 139***.

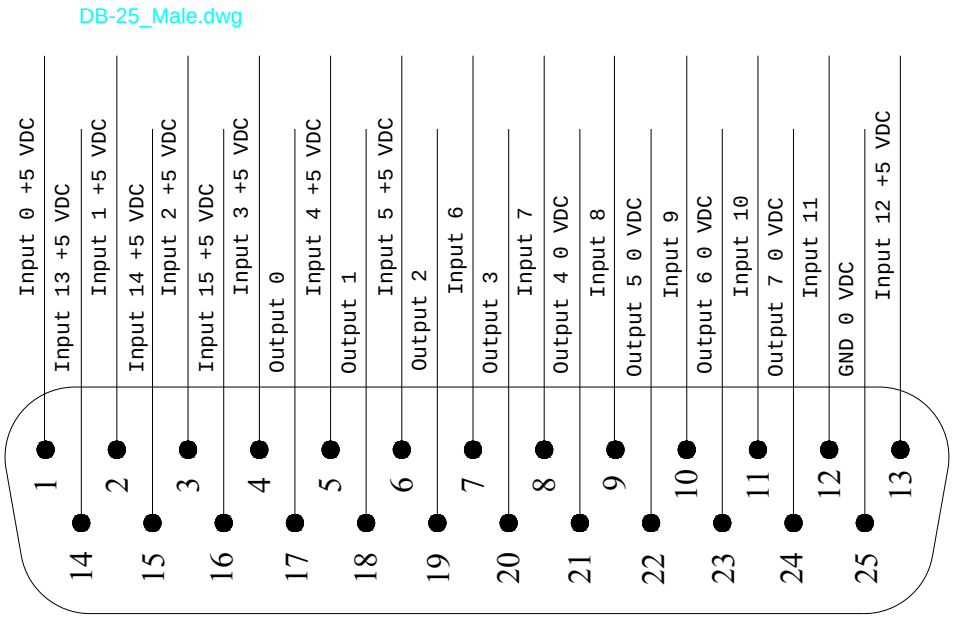


Figure 35

Power Connector

On the left side of the panel on the controller is the DC input, see ***Figure 28 on page 27***. Matthews Marking Systems offers two Power Supplies for use with the I•Mark™ V84i/e. If the equipment is not in an enclosure use our Desktop Power Supply, see ***Figure 42 on page 104*** for dimensions. If the equipment is mounted inside an enclosure use our OEM Power Supply, see ***Figure 43 on page 105*** for dimensions.

Fuse Holder

Above the power connector is a fuse holder that contains the protection fuse.

After all components are connected to the I•Mark™ V84i/e Controller, plug in the external power supply. Once power is applied you will need to configure the communication settings, see ***"Object 0 – Serial Port Configuration" on page 44***. Once communication has been established, the hardware will need configured, see ***"Object 2 – Printer Configuration" on page 64***.

Electrical Connections

Push Buttons

On the lower left corner of the connector panel are two push buttons, see ***Figure 28 on page 27***.

- The top button activates **ALL** the three-way valve(s) – if present – in the print head(s).
- The bottom button initiates a programmed flush sequence. When activated **ALL** valves on every connected print heads are cycled for three seconds (using whichever fluid has been selected). Be sure to have something in front of every nozzle plate to capture the discharged fluid.

If MARKEND[head]=0 (continuous print mode) and the Trigger is enabled, the Flush will not occur until the Trigger is disabled.

The Cleaner button can be used in conjunction with the Flush command, see ***"Method 8 – FLUSH[head]" on page 83***, to change the fluid expelled through the print head nozzles.

This can be used when cleaning the print head(s) or to make sure the valves are clear prior to printing.

It is also possible to switch the three-way valve(s) position with a software command, see ***"Method 8 – INK/CLEANER" on page 72***.

CAUTION:

When a Flush cycle is initiated, **ALL** connected print heads will activate. Be sure to have something in front of every nozzle plate to collect the discharged fluid.

IMPORTANT:

Be sure to switch the three-way valve back to the ink setting before resuming printing.

Maintenance

It is recommended to perform maintenance on start up and shut down of the print head(s) to maximize printer performance. Cleaning procedures are described in the following pages.

Prepare Print Head(s) for Printing

To prepare a print head for printing, it is necessary to fill all of the lines with fluid. Connect the ink and cleaner lines from the ink module (or other fluid delivery system) to the connectors on the print head. Please note that an ink module with pressurized ink and cleaner fluid must be used and connected for these procedures. The Ink line is coupled to the connector with the black heat shrink tubing. The Cleaner line is coupled to the connector with the yellow heat shrink tubing. If the print head only has one connector (Standard DOD or 7-valve 8000 series head), see steps 'A' and 'B' below. If the print head has separate connectors for ink and cleaner, see steps 1 and 2 below.

1. If the print head has an internal three-way valve, touch the "Cleaner" button on the end panel of the unit, see ***"Push Buttons" on page 34***. The Cleaner LED on the top surface will turn on when the valve is in the cleaner position. (If the print head is a Standard DOD or 7-valve 8000 series print head, it does not have a 3-way valve. Go to step 'A'.)

Hold the flush valve in one hand and aim the outlet into a container. This container should be labeled "Waste" and the contents disposed of according to local government regulations. Squeeze the flush valve open and hold until clear fluid is discharged. Release the valve to stop the fluid flow, see ***Figure 36***.

A. For a Standard DOD or 7-valve 8000 series print heads, connect the cleaner line to the "Ink/Cleaner In" connector. Hold the flush valve in one hand and aim the outlet into a container. This container should be labeled "Waste" and the contents disposed of according to local government regulations. Squeeze the flush valve open and hold until clear fluid is discharged. Release the valve to stop the fluid flow, see ***Figure 36***.

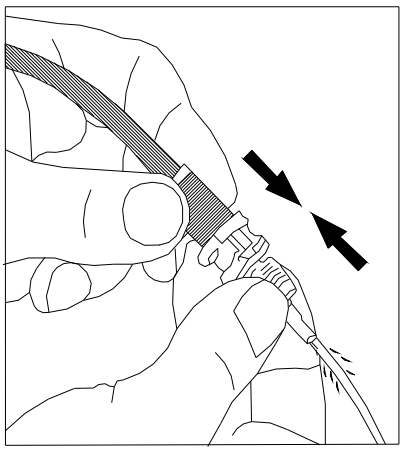


Figure 36

2. Next, for print heads with internal 3-way valves, touch the "Cleaner" button on the end panel of the unit, see ***"Push Buttons" on page 34***. This will switch the fluid selection back to the Ink position.

Again, squeeze the flush valve (with the fluid being discharged into the waste container) until you see ink in the discharge. Release the valve to stop the fluid flow, see ***Figure 37***.

Flush Valve - Ink.dwg

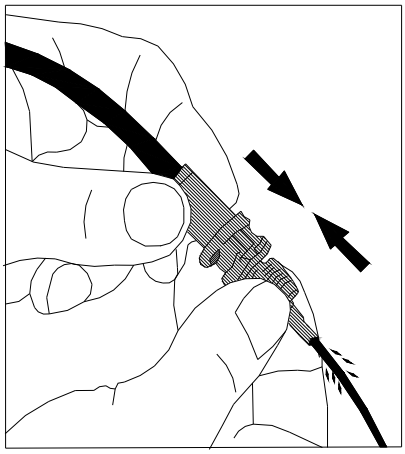


Figure 37

   B. For Standard DOD or 7-valve 8000 series print heads, connect the ink line to the "Ink/Cleaner In" connector. Hold the flush valve in one hand and aim the outlet into a container. This container should be labeled "Waste" and the contents disposed of properly. Squeeze the flush valve open and hold until you see ink in the discharge. Release the valve to stop the fluid flow, see ***Figure 37***.

3. The lines are now filled with the proper fluid and the manifold is filled with ink. All that remains is to get ink into the valve area.
4. Push the Flush button on the end panel of the unit, see ***"Push Buttons" on page 34***. This will cycle fluid through the valves of all connected print heads.

IMPORTANT:

When a Flush cycle is initiated be sure to have something in front of the print head nozzle plate(s) to capture the discharged fluid.

Cleaning the Printer Enclosure

When necessary, gently wipe the printer down with a cloth that has been moistened with water.

CAUTION:

Never use excessive amounts of water or cleaner fluid. The printer is **NOT** designed for wash down.

Ink can be removed using a cloth that has been moistened with the Cleaner that is specified for the Ink used. The overlay is resistant to the fluids used in the I•Mark™ V84i/e printer system.

Suspend Printing

End of Shift / End of Day

If the shutdown in printing is for a relatively short period of time, no special procedures need to be done for dye based inks. For pigmented inks, follow the procedure for ***"Extended Shutdown" on page 37*** for any non-printing interval of over four hours in length.

After the shutdown interval it is recommended that the Flush function be followed to re-wet the print head(s) nozzles, see step four in ***"Prepare Print Head(s) for Printing" beginning on page 35***. Re-wetting the nozzles prior to printing insures that the print quality will be good.

Extended Shutdown

If the shutdown in printing is for an extended period of time (over 48 hours for MEK based inks, over 4 hours for pigmented inks), it is recommended to flush cleaner through the print head(s). See steps '1' and 'A' in ***"Prepare Print Head(s) for Printing" on page 35***. Per these steps, the lines should be flushed with cleaner. Next, implement the Flush function, see ***"Method 8 – FLUSH[head]" on page 83***. Repeat the Flush function until the discharged fluid is clear. This is the same procedure in step '3' of the above except that the cleaner is flushed through the valve area instead of ink. (Steps '2' and 'B' are skipped in a shutdown). The print head should remain with cleaner in the manifold until printing resumes.

When it is time to resume printing, follow either step 2 or 'B' in ***"Prepare Print Head(s) for Printing" beginning on page 35*** (depending on the print head type) to reintroduce ink to the print head(s) manifolds.

Push the Flush button on the end panel of the unit, see ***"Push Buttons" on page 34***. This will cycle fluid through the valves of all connected print heads.

CAUTION:

When a Flush cycle is initiated be sure to have something in front of the print head nozzle plate(s) to collect the discharged fluid.

IMPORTANT:

Please note that if printing with a pigmented ink, the print head should be completely flushed out for any shutdown period greater than 4 hours.

Daily Maintenance

IMPORTANT:

Always keep the print head(s) clean. Periodically clean the nozzles with a brush dipped in cleaner fluid, see ***Figure 38***.

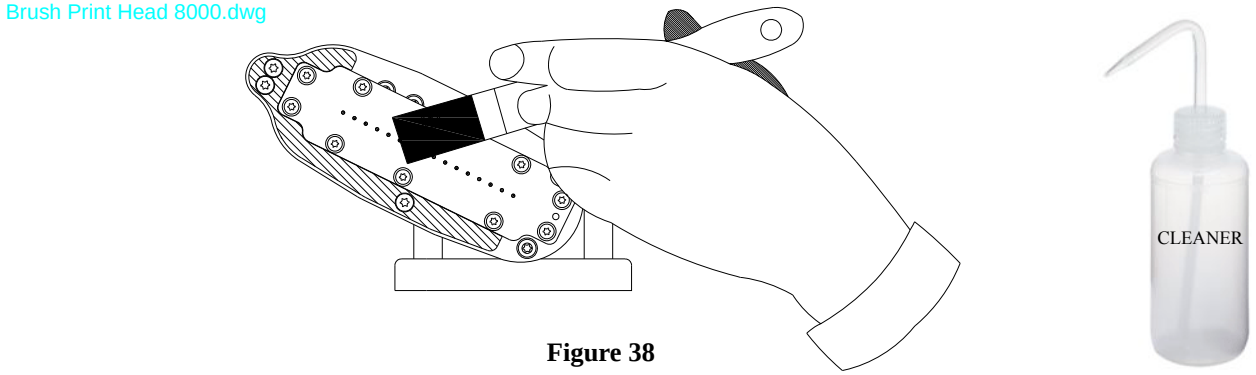


Figure 38

A wash bottle, properly labeled and filled with Cleaner, may also be used. Over a waste collection container, gently squeeze the bottle and direct the stream of Cleaner over the components of the print head(s) that have any ink on the surface.

IMPORTANT:

In accordance with applicable federal and state environmental laws, the customer is responsible for properly disposing of the waste generated by the printing equipment.

CAUTION:

Do not use a cloth to wipe across the print head or use compressed air on the face plate. Foreign matter could be forced into the nozzles and effect print quality.

Maintenance

Pigmented Ink Systems

Pigmented inks have special installation requirements as described below:

- The ink and cleaner lines must be as short as possible depending on the application. A distance of no longer than 3 feet is recommended.
- A drop size of at least 350 for a 8000 series print head and 700 for Standard DOD print head must be used for this ink type. Any smaller size will cause problems with the proper functionality of the print head.
- The ink module should be mounted above the print head, whenever possible.
- Recommended pressure setting is 1 bar (14 psi) for 8000 series print heads and ½ bar (7 psi) for Standard DOD print heads.
- Shake new ink bottle vigorously for at least 3 minutes before initially installing it into the system.
- After any extended shutdown, the ink bottle should be depressurized so that it can be removed from the ink supply unit. After the pressure is released, remove the bottle, make sure the cap is tight, and shake the ink bottle (do not invert the bottle – this would allow ink to flow into the air supply line). Place the bottle back in the ink supply unit before re-pressurizing the bottle to resume printing.

Pigmented Ink Routine Maintenance

Every 4 Hours:

- Visually inspect mark and face plate of print head.
- If any dots are missing or if there is a coating on the face of the print head:

    - Brush face with soft bristle brush and appropriate solvent.
    - Select and flush Cleaner through the print head as described in step ‘1’ or ‘a’ of ***“Prepare Print Head(s) for Printing” on page 35***.
    - Press the Flush button, see ***“Push Buttons” on page 34***, to flush cleaner through the valves as in step ‘3’ of ***“Prepare Print Head(s) for Printing” on page 35***.
    - Select or connect the ink and flush ink through the print head and nozzles until ink is leaving the nozzles. See steps ‘2’, ‘b’, and ‘3’ of ***“Prepare Print Head(s) for Printing” on page 35***.
    - Gently wipe off any excess fluids with a clean cloth.
    - Shake the ink bottle once every 4 hours to make sure pigments are dispersed throughout the ink.
    - Clean the nozzle plate and flush solvent/cleaner through the print head and valves once every 4 hours to make sure nozzles are staying clear.
    - With pigmented inks flush print head and valves with cleaner (See steps ‘1’, ‘a’, ‘3’ and ‘4’ of ***“Prepare Print Head(s) for Printing” on page 35***) before any shutdown.

Ink Filter

The ink filter assembly screws into the 1-liter bottles of ink. This assembly consists of a cap, nipple plate assembly, gasket, ink filter and pick-up tube as shown in ***Figure 39***. The ink filter assembly should be changed once for every 30-40 liters of ink for dye-based inks. For pigmented inks, it should be changed every 15-20 liters.

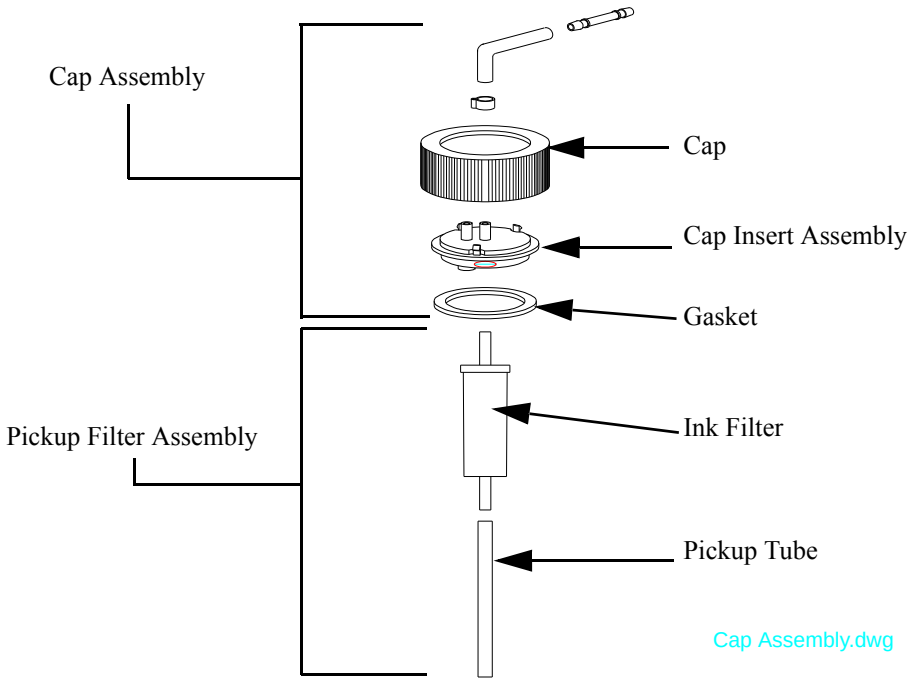


Figure 39

Changing Ink / Solvent Bottle:

- Shake the new ink bottle vigorously (for pigmented inks do this at least 3 minutes).
- Turn the power switch on the Ink Supply Unit to the “OFF” position.
- Slowly open the cap on the ink (or solvent) bottle to relieve the system pressure.
- Remove the cap assembly from the empty bottle.
- Use a knife or other sharp instrument to cut a slit in the foil seal
- Insert the cap assembly into the new bottle, see ***Figure 40 on page 40***.

Maintenance

To minimize contamination by airborne dust and other debris, follow the procedure listed below, see ***Figure 40***:

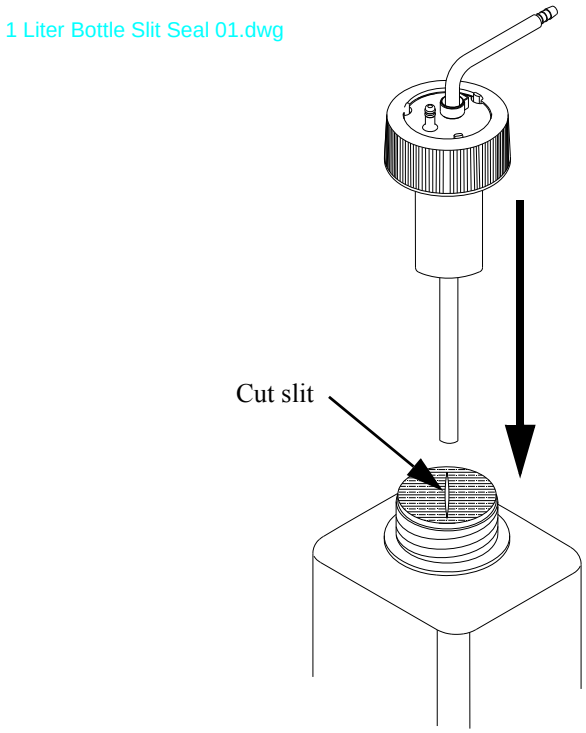


Figure 40

If replacing a bottle of pigmented ink, invert the bottle and shake vigorously for at least three (3) minutes before proceeding.

Turn the bottle right side up and remove the cap from the replacement ink or cleaner bottle, but **DO NOT REMOVE THE FOIL SEAL COVERING THE TOP OF THE BOTTLE**.

- Use a knife and cut a slit across the foil seal.
- Position end of filter pick up tube assembly above the foil seal.
- Slowly push the filter tube assembly downward, piercing the slit in the foil.
- Continue to push the filter tube assembly through the foil seal and into the bottle.
- Tighten the cap assembly.
- Insert the bottle into the ink supply unit cradle.
- Turn the power switch on the Ink Supply Unit to the "ON" position.
- Check the gauge to verify that the correct pressure is re-established.
- Flush ~50 ml of the appropriate fluid through the flush valve into a waste container (enough to purge any air from the ink line).

Push the Flush button on the end panel of the unit, see ***"Push Buttons" on page 34***. This will cycle fluid through the valves of all connected print heads.

CAUTION:

When a Flush cycle is initiated be sure to have something in front of the print head nozzle plate(s) to collect the discharged fluid.

Protocol

The object model for the I•Mark™ V84i/e product is based on Holjeron's (a Matthews International Company) I/O Server Object Modeling. The properties, methods and events within the object model are all accessible through the I/O Server Protocol. Many parameters are also available through the I•Mark ASCII Protocol. This document describes the object model, and defines whether a parameter is available through ASCII. The format for the ASCII protocol is also described.

IMPORTANT:

The Protocol commands MUST be used with the I•Mark™ V84i. It is also used with the I•Mark™ V84e (when configured for Remote Controlled operation – using either the Serial or Ethernet port).

Object List

Object	Instances	Name	Description
0	4	SERIAL	Configuration and control of the serial ports (see ***"Object 0 – Serial Port Configuration" on page 44***).
1	1	PRODUCT	Product information and general configuration (see ***"Object 1 – Product" on page 55***).
2	1	PRINTER	Global printer configuration and control (see ***"Object 2 – Printer Configuration" on page 64***).
3	4	PRINTHEAD	Configuration of each print head (see ***"Object 3 – Print Head Configuration" on page 74***).
4	1	MESSAGING	Database interface for message elements and message structure (see ***"Object 4 – Messaging" on page 84***).

Parameters

There are two types of parameters within a given object:

- Properties
- Methods

Properties are used to configure the functionality of an I•Mark™ V84i/e controller, or to gather information about the printer and/or its status. Examples include the current time, number of print heads attached, and configuration of an encoder.

Methods are instructions to the printer to execute a specific function. Examples include resetting the printer to its factory defaults or clearing all errors in the fault registers.

Terminology

In this document the terms "object", "field", "segment" and "element" may be used to describe any of the parts that makeup a message.

Protocol

I•Mark ASCII Protocol

The following describes the ASCII protocol as implemented in the serial port of the I•Mark™ V84i/e Controller, see ***"Serial 0" on page 32*** for the port location. To set up the communication parameters see ***"Object 0 – Serial Port Configuration" on page 44***. The protocol is designed to be used with host computers or PLC's with ASCII capability.

All ASCII commands must be sent using Serial Port 0.

The protocol maps simple commands into the I/O Server model developed for the I•Mark™ V84i/e controller.

Command Format

All commands must be strictly ASCII characters, terminated by a carriage return <cr> (ASCII Decimal 13) – the "Enter" key on a computer keyboard.

There exist three basic command types:

1. Commands that are used to read and write properties within objects. Each property is defined by a KEYWORD, which are described in this document.
2. Commands to load message elements, and to construct printed message formats. These operate on the I/O server tables defined for the I•Mark™ V84i/e Controller.
3. Commands to perform a specific function, such as reset or clear. These are associated with methods within the object model.

 **IMPORTANT:**

Note that object data must be enclosed within quotation marks.

The general format for all messaging is COMMAND KEYWORD = value.

Node Addressing

Nodes can be given an address using the ADDR property KEYWORD. If the ADDR property is set to 0, then the unit will not respond to a given address. If the ADDR property is set to some value other than 0 (1…31), then the command format is modified to communicate directly with a unit on the RS-485 network.

[ADDR]COMMAND KEYWORD = value

Address * is reserved to communicate to all nodes on a network. For example, to synchronize all the real time clocks in the controllers on a network the TIME property could be set in all units with a single command, as follows:

[*]SP TIME = "HHMMSS"<cr>

If the [ADDR] prefix is not included in the command when a unit has been assigned an address, then the unit will not respond to the command. If the [ADDR] prefix is not included in the command, then an address of 0 is assumed.

 **IMPORTANT:**

Use caution when attempting to set global printer properties if all nodes are not configured identically.

Reading and Writing Properties

GP	Get Property	Used to read the value of a property of the I•Mark™ V84i/e Controller.
SP	Set Property	Used to write the value of a property of the I•Mark™ V84i/e Controller. Note that not all properties can be SET (some are read only).

Reading a property is accomplished by using the GET_PROPERTY (GP) command, followed by a KEYWORD. The value of the property will be returned by the I•Mark™ V84i/e controller in the form of KEYWORD = data.

Example Command: GP STATUS<cr>

Response: status=0000000000000010<cr><lf>

Throughout this document <cr> is used to designate a Carriage Return (ASCII decimal 13) and <lf> is used to designate a Line Feed (ASCII decimal 10).

Writing a property is done by the SET_PROPERTY (SP) command, followed by KEYWORD = data and a Carriage Return. The I•Mark™ V84i/e controller will return the characters “ok” if the command is accepted.

Example Command: SP MARGIN[0]=1000<cr>

Response: ok<cr><lf>

If a command causes an error, then the I•Mark™ V84i/e will return an error message.

Example Command: SP PRINTDELAY[0] = 1000<cr>

Response: invalid property<cr><lf>

Example Command: SP MARGIN[0]=1p98<cr>

Response: invalid property value<cr><lf>

Commands are **NOT** case sensitive, using either upper or lower case characters works and returns the same result:

Example Command: SP MARGIN[0]=1000<cr>

Response: ok<cr><lf>

Example Command: sp margin[0]=1000<cr>

Response: ok<cr><lf>

There are three basic property types:

Product Information
Printer Configuration
Print Head Configuration

Each of the properties within these types are described within this document.

Object 0 – Serial Port Configuration

Object 0, Instances 0-3 are for the serial ports on the V84 platform. The ports are assigned as follows:

Instance	Description	Port	Notes
0	ASCII	0	ASCII command language port
1	Auxiliary Port	1	Device integration port
2	User Interface	2	5v logic level to ARM7 or RS232 to GUI using binary protocol (this port is used by the GUI when this circuit board is installed in a V84e)
3	Daughter Card	3	A serial interface is reserved for interfacing to an optional card. One type of card is an Ethernet to Serial adapter. For future use, this serial port could communicate with print heads equipped with an electronic nameplate.

Serial Port Property Keywords

The following properties are used to configure the serial ports on the controller.

Keyword	Property	ASCII
ENBL[port]	7, see ***"Property 7 - ENBL[port]" on page 45***	✓ Ports 0 & 3
ADDR[port]	8, see ***"Property 8 – ADDR[port]" on page 46***	✓ Ports 0 & 3
BAUDRATE[port]	9, see ***"Property 9 – BAUDRATE[port]" on page 47***	✓ Ports 1, 2, & 3
PARITY[port]	10, see ***"Property 10 – PARITY[port]" on page 48***	✓ Ports 1, 2, & 3
FLOW[port]	11, see ***"Property 11 – FLOW[port]" on page 49***	✓ Ports 1, 2, & 3
MULTI[port]	12, see ***"Property 12 – MULTI[port]" on page 49***	✓ Ports 0 & 3
SERINHDR[port]	16, see ***"Property 16 – SERINHDR[port]" on page 50***	✓ Auxiliary port [1] only
SERINFTR[port]	17, see ***"Property 17 – SERINFTR[port]" on page 50***	✓ Auxiliary port [1] only
SEROUTHDR[port]	18, see ***"Property 18 – SEROUTHDR[port]" on page 51***	✓ Auxiliary port [1] only
SEROUTFTR[port]	19, see ***"Property 19 – SEROUTFTR[port]" on page 51***	✓ Auxiliary port [1] only
SERINMODE[port]	21, see ***"Property 21 – SERINMODE[port]" on page 52***	✓ Auxiliary port [1] only
SERINLEN[port]	22, see ***"Property 22 – SERINLEN[port]" on page 52***	✓ Auxiliary port [1] only
SERINTXT[port]	23, see ***"Property 23 – SERINTXT[port]" on page 53***	✓ Auxiliary port [1] only

NOTE: A check mark (✓) is used to indicate that ASCII commands are supported.

IMPORTANT:

Any changes to Serial port properties will NOT take affect until after the power is cycled to the I•Mark™ V84i/e Controller.

Property 7 - ENBL[port]

Ports:	0 (ASCII)	✓
	1 (Auxiliary)	
	2 (User Interface)	
	3 (Daughter Card)	✓
Get/Set:	GET/SET	
Data Type:	Boolean	
Range:	0, 1	
Defaults:	1 for port 0, 0 for port 3	
Description:	Controls which ASCII serial ports are enabled.	

IMPORTANT:

There is only one ASCII protocol processing loop in the printer, so BOTH port[0] {the RS232/RS485 port} and port[3] {the daughter card port} use the same services. This means that once a command is started on one, it must be completed (with a <cr>) before commands can process on the other port. The recommendation when using the daughter card port is to enable port 3, then disable port 3.

Example Command: SP ENBL[3]=1<cr>
Response: ok<cr><lf>

Example Command: SP ENBL[0]=0<cr>
Response: ok<cr><lf>

Example Command: GP ENBL[3]<cr>
Response: enbl[3]=1<cr><lf>

Example Command: GP ENBL[0]<cr>
Response: enbl[0]=0<cr><lf>

Recommended Settings for Ethernet

Example Command: SP ENBL[3]=1<cr>
Response: ok<cr><lf>

Example Command: SP ENBL[0]=0<cr>
Response: ok<cr><lf>

Example Command: SP BAUDRATE[3]=7<cr>
Response: baudrate[3]=7<cr><lf>

Example Command: SP PARITY[3]=0<cr>
Response: parity[3]=0<cr><lf>

Example Command: SP FLOW[3]=1<cr>
Response: flow[3]=1<cr><lf>

IMPORTANT:

Note: since the connection is via Ethernet packets, it is possible to use other speeds or flow control types, as it's all virtual at the PC end. (The number of data bits, start, stop, and parity bits must to be the same.) The speed and flow control settings must always match the printer settings for port[3].

Property 8 – ADDR[port]

Ports:	0 (ASCII)	✓	Reminder, a check mark indicates ASCII Commands are supported.
	1 (Auxiliary)		
	2 (User Interface)		
	3 (Daughter Card)	✓	
Get/Set:	GET/SET		
Data Type:	Unsigned Byte		
Range:	0…31		
Default:	0		
Description:	Sets the address for the port by which the controller is referenced when it is part of a network.		

Example Command: SP ADDR[0]=4<cr>
Response: ok<cr><lf>

Example Command: GP ADDR[0]<cr>
Response: addr[0]=4<cr><lf>

IMPORTANT:

Reminder: if the [ADDR] prefix is not included in the command when a unit has been assigned an address, then the unit will not respond to the command.

Example Command: [4]SP CONFIG=2<cr>
Response: ok<cr><lf>

Example Command: SP CONFIG=2<cr>
Response: There is no response

Property 9 – BAUDRATE[port]

Ports:	0 (ASCII)	✓
	1 (Auxiliary)	✓
	2 (User Interface)	✓
	3 (Daughter Card)	✓
Get/Set:	GET/SET	
Data Type:	Unsigned Byte	
Range:	1…7	
Default:	2 for ports 0 &1, 6 for port 2, 7 for port 3	
Description:	Sets the baud rate of the serial port.	

Value	Baud Rate
1	9600
2	19200
3[a]	28800
4	38400
5	57600
6	115200
7	230400

a. DO NOT set BAUDRATE to 3 when using HyperTerminal to communicate with the printer. HyperTerminal does not support this baud rate and you will be unable to change it back.

Example Command: SP BAUDRATE[0]=2<cr>

Response: ok<cr><lf>

Example Command: GP BAUDRATE[0]<cr>

Response: baudrate[0]=2<cr><lf>

Any changes to Serial port properties will NOT take affect until after the power is cycled to the I•Mark™ V84i Controller.

Property 10 – PARITY[port]

Ports:	0 (ASCII)	✓
	1 (Auxiliary)	✓
	2 (User Interface)	✓
	3 (Daughter Card)	✓
Get/Set:	GET/SET	
Data Type:	Unsigned Byte	
Range:	0…4	
Default:	0	
Description:	Sets the parity used in the serial communications. If parity is none (set to 0), then the number of data bits is 8. All other parity settings results in 7 data bits. Stop bits is always 1.	

Value	Parity
0	None
1	Odd
2	Even
3	Mark
4	Zero

Example Command: SP PARITY[0]=0<cr>
Response: ok<cr><lf>

Example Command: GP PARITY[0]<cr>
Response: parity[0]=0<cr><lf>

Any changes to Serial port properties will NOT take affect until after the power is cycled to the I•Mark™ V84i Controller.

Property 11 – FLOW[port]

Ports:	0 (ASCII)	✓
	1 (Auxiliary)	✓
	2 (User Interface)	✓
	3 (Daughter Card)	✓
Get/Set:	GET/SET	
Data Type:	Unsigned Byte	
Range:	0…2	
Default:	0 for ports 0 & 1, 2 for ports 2 & 3	
Description:	Sets the method for flow control used in the serial communications.	

Value	Flow Control[a]
0	None
1	XON/XOFF
2	Hardware - DTR/DSR not supported by Port 0 (see ***"Serial 0" on page 32***), only RTS/CTS (which is not active in RS-485)

a. For the highest communication reliability it is strongly recommended to use the setting FLOW[0]=2.

Example Command: SP FLOW[0]=2<cr>
Response: ok<cr><lf>

Example Command: GP FLOW[0]<cr>
Response: flow[0]=2<cr><lf>

Property 12 – MULTI[port]

Ports:	0 (ASCII)	✓
	1 (Auxiliary)	
	2 (User Interface)	
	3 (Daughter Card)	
Get/Set:	GET/SET	
Data Type:	Boolean	
Range:	0, 1	
Default:	0	
Description:	Enables RS-232/RS-485 Multidrop. Setting MULTI[port] to a value of one (1) - (ASCII port 0 only) - configures the UART to release (let float) the transmit line when it is not actually transmitting. This gives the other printers in the network a chance to transmit if they want to.	

Example Command: SP MULTI[0]=1<cr>
Response: ok<cr><lf>

Example Command: GP MULTI[0]<cr>
Response: multi[0]=1<cr><lf>

Property 16 – SERINHDR[port]

Ports: 0 (ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte[2]
Range: 0...65535
Default: 0
Description: Used to enter the decimal value of the ASCII characters that constitute the beginning of incoming serial message. Lower byte = First character, Upper byte = Second character. In the ASCII protocol, the value is expressed as ASCII digits.

Example Command: SP SERINHDR[1]=0<cr>
Response: ok<cr><lf>

Example Command: GP SERINHDR[1]<cr>
Response: serinhdr[1]=0<cr><lf>

Property 17 – SERINFTR[port]

Ports: 0 (User Interface)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte[2]
Range: 0...65535
Default: 13 (ASCII <cr>)
Description: Used to enter the decimal value of the ASCII characters that constitute the end of incoming serial message. Lower byte = First character, Upper byte = Second character. In the ASCII protocol, the value is expressed as ASCII digits.

Example Command: SP SERINFTR[1]=13<cr>
Response: ok<cr><lf>

Example Command: GP SERINFTR[1]<cr>
Response: serinftr[1]=13<cr><lf>

Property 18 – SEROUTHDR[port]

Ports: 0 (ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte[2]
Range: 0...65535
Default: 0
Description: Used to enter the decimal value of the ASCII characters that constitute the beginning of outgoing serial message. Lower byte = First character, Upper byte = Second character. In the ASCII protocol, the value is expressed as ASCII digits.

Example Command: SP SEROUTHDR[1]=0<cr>
Response: ok<cr><lf>

Example Command: GP SEROUTHDR[1]<cr>
Response: serouthdr[1]=0<cr><lf>

Property 19 – SEROUTFTR[port]

Ports: 0 (User ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte[2]
Range: 0...65535
Default: 13 (ASCII <cr>)
Description: Used to enter the decimal value of the ASCII characters that constitute the end of outgoing serial message. Lower byte = First character, Upper byte = Second character. In the ASCII protocol, the value is expressed as ASCII digits.

Example Command: SP SEROUTFTR[1]=13<cr>
Response: ok<cr><lf>

Example Command: GP SEROUTFTR[1]<cr>
Response: seroutftr[1]=13<cr><lf>

Property 21 – SERINMODE[port]

Ports: 0 (ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…2
Default: 0
Description: Used to set how incoming serial data is handled. SERINFTR[port] and SERINHDR[port] have been removed from the incoming message.

Value	Serial Input Mode
0	Store in input buffer until read by SERIN[port] command.
1	Match code lookup. Uses the data in the string received for the NAME of a message construct as a method for selecting a different message to print. Valid for MSGSEL[head]=1
2	Incoming text object. The data in the string received gets placed into a text message object as defined in SERINTXT[port], see ***"Property 23 – SERINTXT[port]" on page 53***.

Example Command: SP SERINMODE[1]=0<cr>
Response: ok<cr><lf>

Example Command: GP SERINMODE[1]<cr>
Response: serinmode[1]=0<cr><lf>

Property 22 – SERINLEN[port]

Ports: 0 (ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)
Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…255
Default: 0
Description: Sets what constitutes an end of a serial input message. A value of 0 means the characters defined in SERINFTR[port] define the end of a serial input, while a non-zero value is the number of characters that make up a serial input message.

Example Command: SP SERINLEN[1]=0<cr>
Response: ok<cr><lf>

Example Command: GP SERINLEN[1]<cr>
Response: serinlen[1]=0<cr><lf>

Property 23 – SERINTXT[port]

Ports: 0 (ASCII)
1 (Auxiliary) ✓
2 (User Interface)
3 (Daughter Card)

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0…250

Default: 0

Description: When SERINMODE[port], see ***"Property 21 – SERINMODE[port]" on page 52***, is set to a value of 2, then the incoming text message will be placed into the text message object whose value is entered in SERINTXT[port].

Example Command: SP SERINTXT[1]=0<cr>
Response: ok<cr><lf>

Example Command: GP SERINTXT[1]<cr>
Response: serintxt[1]=0<cr><lf>

Object 0 – Methods

Method	Command	Description
16	SERIN[port]	When SERINMODE[1]=0, this method receives data from the auxiliary serial port input buffer. SERINHDR[port] and SERINFTR[port] have been removed.
17	SEROUT[port]	This Method transmits data to the auxiliary serial port output buffer. SEROUTHDR[port] and SEROUTFTR[port] are concatenated.

Method 16 – SERIN[port]

Transmit Data: none

Receive Data: "text string" 250 Chars Max

Description: Returns "text string" through the auxiliary (AUX) serial port.

Example Command: SERIN[1]<cr>

Response: "text string"<cr><lf> Note: Receives "text string" through the auxiliary (AUX) serial port.

Method 17 – SEROUT[port]

Transmit Data: "text string" 250 Chars Max

Receive Data: none

Description: Transmits "text string" through the auxiliary (AUX) serial port.

Example Command: SEROUT[1]="TEST"<cr>

Response: ok<cr><lf> Note: Transmits – TEST – through the auxiliary (AUX) serial port.

Object 1 – Product

Property Keywords

The following property keywords are used with the GP and/or SP commands to get information about the product as contained in Object 1- Product.

Keyword	Property	ASCII
STATUS	8, see ***"Property 8 – STATUS" on page 56***	✓
WARN	9, see ***"Property 9 – WARN" on page 57***	✓
FAULT	10, see ***"Property 10 – FAULT" on page 58***	✓
SERNUM	12, see ***"Property 12 – SERNUM" on page 59***	✓
VENDOR	13, see ***"Property 13 – VENDOR" on page 59***	✓
CATLIST	14, see ***"Property 14 – CATLIST" on page 59***	✓
PRODUCT	15, see ***"Property 15 – PRODUCT" on page 59***	✓
HWVERS	16, see ***"Property 16 – HWVERS" on page 60***	✓
HWDATE	17, see ***"Property 17 – HWDATE" on page 60***	✓
SWVERS	18, see ***"Property 18 – SWVERS" on page 60***	✓
SWDATE	19, see ***"Property 19 – SWDATE" on page 60***	✓
COUNTRY	20, see ***"Property 20 – COUNTRY" on page 61***	✓
LANGUAGE	21, see ***"Property 21 - LANGUAGE" on page 61***	✓
DATE	24, see ***"Property 24 – DATE" on page 62***	✓
TIME	25, see ***"Property 25 – TIME" on page 62***	✓
ZERO	26, see ***"Property 26 – ZERO" on page 62***	✓

Property 8 – STATUS

Get/Set: GET only

Data Type: Boolean[16] - transmitted as a string of binary characters

Range: 0000h - FFFFh

Description: Returns the status of the controller per the table below.

Bit	Hex Value	Description
0	0001h	Valve set to Cleaner
1	0002h	Printer Enabled
2	0004h	
3	0008h	
4	0010h	SW Trigger Status (see ***"Method 10 – TRIGON/TRIGOFF" on page 73***)
5	0020h	
6	0040h	Printer Warning Present (see ***"Property 9 – WARN" on page 57***)
7	0080h	Printer Fault Present (see ***"Property 10 – FAULT" on page 58***)
8	0100h	
9	0200h	
10	0400h	RS-485 mode
11	0800h	Forced default serial settings (port 0)
12	1000h	HW Trigger 0 Status
13	2000h	HW Trigger 1 Status
14	4000h	HW Trigger 2 Status
15	8000h	HW Trigger 3 Status

Example Command: GP STATUS<cr>

Response: status=0000000000000010<cr><lf>

Property 9 – WARN

Get/Set: GET only

Data Type: Boolean[32] - transmitted as a string of binary characters.

Range: 00000000h - FFFFFFFFh

Description: Returns print error information from the table below. All of the errors listed are classified as WARNINGS for the purpose of indication.

Card	Bit	Description
Control	0	Low Clock Battery
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	

Example Command: GP WARN<cr>

Response: warn=00000000000000000000000000000000<cr><lf>

Property 10 – FAULT

Get/Set: GET only

Data Type: Boolean[32] - transmitted as binary character string.

Range: 00000000h - FFFFFFFFh

Description: Returns print error information from the table below. All of the errors listed are classified as FAULTS for the purpose of indication.

Card	Bit	Description
Control	0	
	1	
	2	
	3	
	4	Isolated Power Missing
	5	PCB Overtemp
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	

Example Command: GP FAULT<cr>

Response: fault=00000000000000000000000000000000<cr><lf>

Property 12 – SERNUM

Get/Set: GET only
Data Type: Unsigned Long
Range: $(0\ldots2^{32})$-1
Description: Unique serial number assigned by Holjeron during manufacture.

Example Command: GP SERNUM<cr>
Response: sernum="678123"<cr><lf>

Property 13 – VENDOR

Get/Set: GET only
Data Type: String
Range:
Default: Matthews
Description: Returns the name of the manufacturer.

Example Command: GP VENDOR<cr>
Response: vendor="Matthews"<cr><lf>

Property 14 – CATLIST

Get/Set: GET only
Data Type: String
Range:
Default:
Description: Returns the catalog listing of the controller.

Example Command: GP CATLIST<cr>
Response: catlist="P0225-498-00"<cr><lf>

Property 15 – PRODUCT

Get/Set: GET only
Data Type: String
Range:
Default: I-Mark V84 Controller
Description: Returns the name of the product

Example Command: GP PRODUCT<cr>
Response: product="I-Mark V84 Controller"<cr><lf>

Property 16 – HWVERS

Get/Set: GET only
Data Type: String
Range: aaa.bbbbb.cc
Description: Returns the hardware version of the controller, where aaa is the assembly type and bbbbb is the unique assembly number and cc is the revision.

Example Command: GP HWVERS<cr>
Response: hwvers="175-02388-01"<cr><lf>

Property 17 – HWDATE

Get/Set: GET only
Data Type: String
Range: MMYY
Description: Returns the date of manufacture in the format MMYY.

Example Command: GP HWDATE<cr>
Response: hwdate="0209"<cr><lf>

Property 18 – SWVERS

Get/Set: GET only
Data Type: String
Range: aaa.b.c
Description: Returns the software version of the controller, where aaa is the assembly type and b is the unique assembly number and c is the revision.

Example Command: GP SWVERS<cr>
Response: swvers="105.8.0"<cr><lf>

Property 19 – SWDATE

Get/Set: GET only
Data Type: String
Range: MMYY
Description: Returns the date of compile of the software in the format MMYY.

Example Command: GP SWDATE<cr>
Response: swdate="0710"<cr><lf>

Property 20 – COUNTRY

Get/Set: GET/SET
Data Type: Boolean
Range: 0, 1
Default: 1
Description: Sets the unit of measure: 0 = US, 1 = metric

Example Command: SP COUNTRY=0<cr>
Response: ok<cr><lf>

Example Command: GP COUNTRY<cr>
Response: country=0<cr><lf>

Property 21 - LANGUAGE

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…24
Default: 0
Description: Used **ONLY** by the V84e GUI, no function in the V84i

Value	Language	Value	Language
0	Undefined	13	Greek
1	English	14	Romanian
2	Swedish	15	Persian
3	German	16	Arabic
4	French	17	Hebrew
5	Spanish	18	Danish
6	Italian	19	Reserved
7	Dutch	20	Reserved
8	Čzech	21	Reserved
9	Polish	22	Reserved
10	Turkish	23	Reserved
11	Russian	24	Reserved
12	Japanese		

Example Command: SP LANGUAGE=1<cr>
Response: ok<cr><lf>

Example Command: GP LANGUAGE<cr>
Response: language=1<cr><lf>

Property 24 – DATE

Get/Set: GET/SET

Data Type: Unsigned Byte(4)

Range: DDMMYYYY

Description: Sets the current date in the format DDMMYYYY (where DD is the two digit day of the month, MM is the two digit month of the year and YYYY is the four digit year).

Example Command: SP DATE="13022013"<cr>[a]

Response: ok<cr><lf>

a. This is the data string to set the date for February 13, 2013.

Example Command: GP DATE<cr>

Response: date="13022013"<cr><lf>

Property 25 – TIME

Get/Set: GET/SET

Data Type: Unsigned Byte (3)

Range: HHMMSS

Description: The current time in the format HHMMSS (where HH is the two digit hour – in 24 hour mode, MM is the two digit minute and SS is the two digit seconds that represents the current time).

Example Command: SP TIME="153000"<cr>[a]

Response: ok<cr><lf>

a. This is the data string to set the time for 3:30:00 PM.

Example Command: GP TIME<cr>

Response: time="153642"<cr><lf>

Property 26 – ZERO

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0, 1

Default: 0

Description: Selects the glyph for the zero character, either with or without a slash.

Value	Glyph Style
0	No Slash
1	Slash

Example Command: SP ZERO=1<cr>

Response: ok<cr><lf>

Example Command: GP ZERO<cr>

Response: zero=1<cr><lf>

Object 1 – Methods

Methods Keywords

Command	Method	ASCII
RESET	7, see ***"Method 7 – RESET"*** below	✓
CE	8, see ***"Method 8 – CE"*** below	✓
WARMBOOT	13, see ***"Method 13 – WARMBOOT" on page 63***	✓

Method 7 – RESET

Transmit Data: None

Receive Data: None

Description: Resets all properties to their factory defaults and **erases ALL objects and Messages!**

Example Command: RESET<cr>

Response: ok<cr><lf> **NOTE**: the "ok" response occurs when the action is completed.

IMPORTANT:

After a RESET it is necessary to cycle power to the I•Mark™ V84i/e controller to clear the print buffer.

Method 8 – CE

Transmit Data: None

Receive Data: None

Description: Clears all fault and warning registers.

Example Command: CE<cr>

Response: ok<cr><lf> **NOTE**: the "ok" response occurs when the action is completed.

Method 13 – WARMBOOT

Transmit Data: None

Receive Data: None

Description: Re-starts the printer without having to turn it off

Example Command: WARMBOOT<cr>

Response: ok<cr><lf> **NOTE**: the "ok" response occurs when the action is completed.

This command allows re-starting the printer without having to turn it off, which is useful for changing the port configurations and/or RESET to factory defaults remotely.

Object 2 – Printer Configuration

Printer Configuration is conducted by changing properties in the Printer Object (Object 2). Each property is defined as to its KEYWORD and associated property ID.

Printer Configuration Property Keywords

The following properties are used to configure the print controller for the system being implemented.

Keyword	Property	ASCII
MASTER	7, see ***"Property 7 – MASTER"*** below	✓
CONFIG	8, see ***"Property 8 – CONFIG" on page 65***	✓
UPDMODE	14 see ***"Property 14 – UPDMODE" on page 66***	✓
TARGSPD	16, see ***"Property 16 – TARGSPD" on page 66***	✓
ENCMODE	17, see ***"Property 17 – ENCMODE" on page 67***	✓
ENCFACT	18, see ***"Property 18 – ENCFACT" on page 67***	✓
RELAYMODE	23, see ***"Property 23 – RELAYMODE" on page 68***	✓
RELAY	24, see ***"Property 24 – RELAY" on page 68***	✓
INKTYPE	25, see ***"Property 25 – INKTYPE" on page 69***	✓
AUXIN	26, see ***"Property 26 – AUXIN" on page 70***	✓
AUXOUT	27, see ***"Property 27 – AUXOUT" on page 70***	✓
AUXMODE	28, see ***"Property 28 – AUXMODE" on page 71***	✓

Property 7 – MASTER

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0, 1
Default: 0
Description: Sets the printer for master or slave mode per the table below:

Value	Description
0	Slave
1	Master

Example Command: SP MASTER=0<cr>
Response: ok<cr><lf>

Example Command: GP MASTER<cr>
Response: master=0<cr><lf>

When a unit is in Master Mode, the name of the selected message is transmitted out the serial port when it is selected for printing, i.e. **[*]SP MSGNAME[head]="text string"**. When a unit is in Slave Mode, the message is selected using the message name received on the serial port (as long as a message with the exact same name exists on the slave controller and SP MSGSEL[head]=1, see ***"Property 9 – MSGSEL[head]" on page 75***).

Property 8 – CONFIG

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0…6

Default: 0

Description: Sets the configuration of print heads based on the table below:

Port Connection	Y Position	Value						
		0	**1**	**2**	**3**[a]	**4**[b]	**5**[c]	**6**[d]
Head A	0…7	32 valve head[0]	16 valve head[0]	16 valve head[0]	16 valve head[0]	7 valve head[0]	7 valve head[0]	7 valve head[0]
	8…15					7 valve head[1]	7 valve head[1]	7 valve head[1]
Head B	16…23			16 valve head[2]	7 valve head[2]		16 valve head[2]	7 valve head[2]
	24…31				7 valve head[3]			7 valve head[3]

a. For a 16-valve print head and a single 7-valve print head, use Config Value 3 and limit all message constructs to the 0…15 Y position range for the 16-valve print head and the 0…7 Y position range for the 7-valve print head. **A fan-out cable is still needed for the 7-valve print head.**

b. For single 7-valve print head applications, use Config Value 4 and limit all message constructs to the 0…7 Y position range. **A fan-out cable is still required.**

c. For a single 7-valve print head and a 16-valve print head, use Config Value 5 and limit all message constructs to the 0…7 Y position range for the 7-valve print head and the 0…15 Y position range for the 16-valve print head. **A fan-out cable is still needed for the 7-valve print head.**

d. For three 7-valve print head applications, use Config Value 6 and limit all message constructs to the 0…7 Y position range. **A fan-out cable is still required for the third print head.**

Example Command: SP CONFIG=0<cr>

Response: ok<cr><lf>

Example Command: GP CONFIG<cr>

Response: config=0<cr><lf>

IMPORTANT:

For each cell in the Configure table above there is a number enclosed in brackets that designates the number assigned to a specific head for addressing with protocol commands.

Property 14 – UPDMODE

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…2
Default: 1
Description: Sets the event that causes messages to be rebuilt, per the table below.

Value	Description
0	Message is built once on the first trigger, then remains the same.
1	End of Trigger. The message is rebuilt when the trigger signal transitions to OFF.
2	End of Mark. The message is rebuilt after every mark. Useful when printing multiple marks on a target, or printing continuous.

Example Command: SP UPDMODE=2<cr>
Response: ok<cr><lf>

Example Command: GP UPDMODE<cr>
Response: updmode=2<cr><lf>

Property 16 – TARGSPD

Get/Set: GET/SET
Data Type: Unsigned Word
Range: 20…6100 [mm/sec]
Default: 200
Description: Sets the rate at which the target is moving.

TARGSPD is only valid when ENCMODE is set to 0 (disabled), see ***"Property 17 – ENCMODE" on page 67***.

Example Command: SP TARGSPD=450<cr>
Response: ok<cr><lf>

Example Command: GP TARGSPD<cr>
Response: targspd=450<cr><lf>

Property 17 – ENCMODE

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…5
Default: 0
Description: Sets the functionality of the encoder input based on the following entries:

Value	Description
0	Disabled (time is used, see ***"Property 16 – TARGSPD" on page 66***).
1	Single ended – A Input
2	Single ended – B Input
3	Double Count (A + B)
4	Forward Quadrature
5	Reverse Quadrature

Example Command: SP ENCMODE=1<cr>
Response: ok<cr><lf>

Example Command: GP ENCMODE<cr>
Response: encmode=1<cr><lf>

Property 18 – ENCFACT

Get/Set: GET/SET
Data Type: Unsigned Word
Range: 1…50,000 [pulses/meter]
Default: 10,000
Description: Sets the number of pulses generated by the encoder per meter of travel[a] (when ***"Property 17 – ENCMODE"*** above is > 0).

a. For an example of how to calculate the correct value see ***"Sample Encoder Factor Calculation" on page 21***.

Example Command: SP ENCFACT=25000<cr>
Response: ok<cr><lf>

Example Command: GP ENCFACT<cr>
Response: encfact=25000<cr><lf>

Property 23 – RELAYMODE

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…4
Default: 1
Description: Sets the functionality of the relay output. See ***"Encoder and Trigger Connections" on page 31*** for the RELAY pinouts.

Value	Description
0	Disabled/Software control (see ***"Property 24 – RELAY" on page 68***).
1	Fail/Warn
2	Fail Only
3	Reserved
4	Print status

Example Command: SP RELAYMODE=4<cr>
Response: ok<cr><lf>

Example Command: GP RELAYMODE<cr>
Response: relaymode=4<cr><lf>

When configured with RELAYMODE=4 the internal relay, see ***"Encoder and Trigger Connections" on page 31***, can be used to monitor print status. You can supply to the common on the relay either +24 VDC or GND for a NPN or PNP output. In other words, when the printer is busy printing, the relay activates so you can use that output to know the print status. It's a NO/NC relay so use one side to determine ready and the other side to determine busy or just use the one signal.

Property 24 – RELAY

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0, 1
Default: 0
Description: Sets the state of the relay output (0 = RELAY disabled; 1 = RELAY enabled).

Example Command: SP RELAY=1<cr>
Response: ok<cr><lf>

Example Command: GP RELAY<cr>
Response: relay=1<cr><lf>

Property 25 – INKTYPE

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0...9

Default: 0

Description: Sets the HOT [a] (Head Open Time) compensation.

a. During periods of non-printing it is possible for the ink in the nozzles to start to dry. This dried ink can effect the quality of the first printout after this inactive period. HOT compensation provides a method to eliminate this issue. This is accomplished by holding each valve open proportionally longer for the first dot column printed. This allows the ink in the nozzle to be re-wetted and form proper drops. The higher the number, the longer each valve is held open for the first column printed. Choose a value that provides the proper correction for your normal non-printing interval.

Ink Type	Description
0	Default, no HOT (Head Open Time) compensation
1	Minimum HOT (Head Open Time) compensation
2	Increasing HOT (Head Open Time) compensation
3	Increasing HOT (Head Open Time) compensation
4	Increasing HOT (Head Open Time) compensation
5	Increasing HOT (Head Open Time) compensation
6	Increasing HOT (Head Open Time) compensation
7	Increasing HOT (Head Open Time) compensation
8	Increasing HOT (Head Open Time) compensation
9	Maximum HOT (Head Open Time) compensation

Example Command: SP INKTYPE=2<cr>

Response: ok<cr><lf>

Example Command: GP INKTYPE<cr>

Response: inktype=2<cr><lf>

Property 26 – AUXIN

Get/Set: GET
Data Type: Unsigned word
Range: 0000h - FFFFh
Default: n/a
Description: Reads the state of the auxiliary inputs. Dedicated operations are defined as follows:

Bit	Function
0-5	Select message if MSGSEL[head]=2, see ***"Property 9 – MSGSEL[head]" on page 75***
12	Update counter if UPDMODE=4, see ***"Property 14 – UPDMODE" on page 66***
13	Reset counter if RSTMODE=4, see ***"RSTMODE" on page 90***
14	Flush button
15	Ink/cleaner button

Example Command: GP AUXIN<cr>
Response: auxin=0000000000000000<cr><lf>

The left two bits (14 & 15) are used for the push buttons in the I•Mark™ V84i/e, see ***"Push Buttons" on page 34***.

Property 27 – AUXOUT

Get/Set: GET/SET
Data Type: Unsigned byte
Range: 00h - FFh
Default: 00h
Description: Reads/writes the state of the auxiliary outputs.

Bit	Function*
0	Reserved
1	Reserved
2	Reserved
3	Reserved
4	Rebuild in progress
5	Printer enabled
6	Warning present
7	Fault present

* These functions (dedicated outputs) drive the auxiliary outputs when the associated bit in the AUXMODE register is set to one. For the pinout of the AUX I/O Port see ***"I/O Port Pin Assignments" on page 139***.

Example Command: SP AUXOUT=00000000<cr>
Response: ok<cr><lf>

Example Command: GP AUXOUT<cr>
Response: auxout=00000000<cr><lf>

Property 28 – AUXMODE

Get/Set: GET/SET

Data Type: Unsigned byte

Range: 00h - FFh

Default: 00h

Description: Controls operation of auxiliary outputs, see ***"Property 27 – AUXOUT"*** above. For each of the 8 outputs, a 0 indicates dedicated operation, and 1 enables user defined output.

Example Command: SP AUXMODE=00000000<cr>

Response: ok<cr><lf>

Example Command: GP AUXMODE<cr>

Response: auxmode=00000000<cr><lf>

Object 2 – Methods

Command	Method	ASCII
INK/CLEANER	8	✓
ENABLE/DISABLE	9	✓
TRIGON/TRIGOFF	10	✓

Method 8 – INK/CLEANER

Transmit Data: Fluid Type Boolean
Receive Data: None
Default: INK
Description: Sets the fluid source status. The Status parameter can have the following values:
INK Three-way valve switched to the ink feed side.
CLEANER Three-way valve switched to the cleaner feed side.

Example Command: CLEANER<cr> {Cleaner Side Feed}
Response: ok<cr><lf>

Example Command: INK<cr> {Ink Side Feed}
Response: ok<cr><lf>

Method 9 – ENABLE/DISABLE

Transmit Data: Status Boolean
Receive Data: None
Default: ENABLE
Description: Sets Printer Status. The Status parameter can have the following values:
ENABLE Allows printing when print trigger present
DISABLE Prevents printing even when print trigger present

Example Command: DISABLE<cr> {Disable Printing}
Response: ok<cr><lf>

Example Command: ENABLE<cr> {Enable Printing}
Response: ok<cr><lf>

Method 10 – TRIGON/TRIGOFF

Transmit Data: Trigger Boolean

Receive Data: None

Default: TRIGOFF

Description: Sets Software Trigger state. The Status parameter can have the following values:

TRIGON Enable SW Trigger

TRIGOFF Disable SW Trigger

Example Command: TRIGON<cr> {Trigger On}

Response: ok<cr><lf>

Example Command: TRIGOFF<cr> {Trigger Off}

Response: ok<cr><lf>

Object 3 – Print Head Configuration

Print Head Configuration is conducted by changing properties in the Print Head Configuration Object (Object 3, Instances 1-4). Each property is defined as to its KEYWORD and associated property ID within Object 3.

Print Head Property Keywords

The following property numbers and keywords are used to configure the printing of individual print heads.

KEYWORD	Property	ASCII
MSGNUM[head]	8, see ***"Property 8 – MSGNUM[head]" on page 75***	✓
MSGSEL[head]	9, see ***"Property 9 – MSGSEL[head]" on page 75***	✓
PRINTDIR[head]	10, see ***"Property 10 – PRINTDIR[head]" on page 76***	✓
MARGIN[head]	11, see ***"Property 11 – MARGIN[head]" on page 76***	✓
MARKEND[head]	12, see ***"Property 12 – MARKEND[head]" on page 77***	✓
MARKGAP[head]	13, see ***"Property 13 – MARKGAP[head]" on page 77***	✓
MARKLEN[head]	14, see ***"Property 14 – MARKLEN[head]" on page 78***	✓
HEADTYPE[head]	16, see ***"Property 16 – HEADTYPE[head]" on page 78***	✓
TRIGMODE[head]	18, see ***"Property 18 – TRIGMODE[head]" on page 79***	✓
TRIGEND[head]	19, see ***"Property 19 – TRIGEND[head]" on page 79***	✓
TRIGSKIP[head]	20, see ***"Property 20 – TRIGSKIP[head]" on page 80***	✓
DOTSIZE[head]	22, see ***"Property 22 – DOTSIZE[head]" on page 80***	✓
COLSPAC[head]	23, see ***"Property 23 – COLSPAC[head]" on page 80***	✓
PRINTHT[head]	24, see ***"Property 24 – PRINTHT[head]" on page 81***	✓
PRINTNEG[head]	25, see ***"Property 25 – PRINTNEG[head]" on page 81***	✓
TILTASP[head]	27, see ***"Property 27 – TILTASP[head]" on page 81***	✓
COLSKIP[head]	30, see ***"Property 30 – COLSKIP[head]" on page 82***	✓
PRINTCNT[head]	31, see ***"Property 31 – PRINTCNT[head]" on page 82***	✓

The following properties are used to configure individual print heads. The I•Mark™ V84i/e Controller supports up to four (4) heads, which are labeled 0, 1, 2 or 3 (see ***"Property 8 – CONFIG" on page 65***).

Property 8 – MSGNUM[head]

Get/Set: GET/SET
Data Type: Unsigned Byte[16]
Range: 0…99
Default: 0
Description: Sets the message number to be printed for each print head. The format of the message is defined in the SM (SET_MESSAGE) command, see ***"GET_MESSAGE, SET_MESSAGE" on page 86***.

Example Command: SP MSGNUM[0]=0<cr>
Response: ok<cr><lf>

Example Command: GP MSGNUM[0]<cr>
Response: msgnum[0]=0<cr><lf>

Property 9 – MSGSEL[head]

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…2
Default: 0
Description: Sets the method that message number to be printed is selected based on the table below.

Value	Message Selection
0	Message selected by MSGNUM[head].
1	Message selected by auxiliary serial port
2	Message selected by Auxiliary Inputs 0…5 (messages 0-63)[a]

a. Utilizing Binary message selection, see ***"Binary Table" on page 137***

Example Command: SP MSGSEL[0]=0<cr>
Response: ok<cr><lf>

Example Command: GP MSGSEL[0]<cr>
Response: msgsel[0]=0<cr><lf>

Property 10 – PRINTDIR[head]

Get/Set: GET/SET
Data Type: Boolean
Range: 0…3
Default: 0
Description: Sets the print direction for each print head based on the table below:

Value	Print Direction
0	Prints right-to-left with CCW tilt[a], if applicable.
1	Prints left-to-right with CW tilt[a], if applicable.
2	Prints right-to-left with CW tilt[a], if applicable.
3	Prints left-to-right with CCW tilt[a], if applicable.

a. Viewed from the end opposite the nozzles.

For an illustration of these configurations, see ***Figure 17 on page 19*** for 8000 series print heads or ***Figure 19 on page 20*** for Standard DOD print heads

Example Command: SP PRINTDIR[0]=0<cr>
Response: ok<cr><lf>

Example Command: GP PRINTDIR[0]<cr>
Response: printdir[0]=0<cr><lf>

Property 11 – MARGIN[head]

Get/Set: GET/SET
Data Type: Unsigned Word
Range: 0…4000 (mm)
Default: 0
Description: Sets the size of the margin to be implemented after a trigger is received and before the message begins printing. This allows for adjusting the position of the printout on the target.

Example Command: SP MARGIN[0]=50<cr>
Response: ok<cr><lf>

Example Command: GP MARGIN[0]<cr>
Response: margin[0]=50<cr><lf>

Property 12 – MARKEND[head]

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0…100

Default: 1

Description: Sets the number of marks to be repeated after a trigger has been received. The printing will discontinue when the trigger is removed, even if the number of marks has not been completed.
SP MARKEND[head]=0 initiates continuous print (as soon as a trigger is received the unit will begin printing and continue even if the trigger is removed.
It is strongly recommended that when SP MARKEND[head]=0 that TRIGEND[head]=1 also be set, see ***"Property 19 – TRIGEND[head]" on page 79***. When this is done, printing will halt when the trigger is removed. If this is not done the only way to halt printing is to turn off power to the unit and then make sure the trigger is removed before re-applying power.

Example Command: SP MARKEND[0]=2<cr>

Response: ok<cr><lf>

Example Command: GP MARKEND[0]<cr>

Response: markend[0]=2<cr><lf>

In the above example, the message would print twice with each print trigger (as long as the trigger remained present during the printing).

Property 13 – MARKGAP[head]

Get/Set: GET/SET

Data Type: Unsigned Word

Range: 0…4000 (mm)

Default: 0

Description: Sets the distance between marks when multiple marks are being printed during a single print cycle (see ***"Property 12 – MARKEND[head]"*** above).

Example Command: SP MARKGAP[0]=1000<cr>

Response: ok<cr><lf>

Example Command: GP MARKGAP[0]<cr>

Response: markgap[0]=1000<cr><lf>

IMPORTANT:

MARKGAP[head] is enabled **ONLY** when MARKLEN[head]=0 **AND** MARKEND[head]=0.

Property 14 – MARKLEN[head]

Get/Set: GET/SET

Data Type: Unsigned Word

Range: 0 (Autolength), 1…16000 (mm)

Default: 1000

Description The MARKLEN[head] is the maximum length of printout allowed. If the message data exceeds the value set for the MARKLEN[head], the message will be truncated in the printout. If the message is less than the value set in MARKLEN, the next message cannot be printed until the MARKLEN[head] distance has been reached. In the case that the substrate is a continuous roll or web instead of individual units, the MARKLEN[head] is the interval between the starting points of the printouts.

0 = autolength (message length is automatically calculated by the print engine firmware)

Example Command: SP MARKLEN[0]=0<cr>

Response: ok<cr><lf>

Example Command: GP MARKLEN[0]<cr>

Response: marklen[0]=0<cr><lf>

IMPORTANT:

MARKLEN[head] can NOT be set to zero (0) [automatic mode] when stitching print head printouts in continuous print mode (when SP MARKEND[head]=0). The V84i will operate when MARKLEN[head]=0, but the stitching will not stay in alignment.

Property 16 – HEADTYPE[head]

Get/Set: GET only

Data Type: Unsigned Byte

Range: 0…2

Default: 2

Description: Gets the print head type.

Note: this configuration is automatically detected by the print head cable used. The detection is done by sensing jumpers in the print head cable. The 8000 series print head cable does not have any jumpers. If the get property command is issued when there are no print heads attached to the I•Mark™ V84i/e Controller, the system response will indicate an 8000 series print head is connected.

Value	Head Type
0	Standard DOD
1	3000 Series
2	8000 Series

Example Command: GP HEADTYPE[0]<cr>

Response: headtype[0]=2<cr><lf>

Property 18 – TRIGMODE[head]

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0…4

Default: 1

Description: Sets the functionality of the trigger input, based on the table below[a]:

a. If only one external trigger is connected ALL print heads should be configured to use Hardware Trigger 0.

Value	Description
0	Software only (TRIGON/TRIGOFF)
1	Hardware Trigger 0
2	Hardware Trigger 1
3	Hardware Trigger 2
4	Hardware Trigger 3

Example Command: SP TRIGMODE[0]=1<cr>

Response: ok<cr><lf>

Example Command: GP TRIGMODE[0]<cr>

Response: trigmode[0]=1<cr><lf>

Property 19 – TRIGEND[head]

Get/Set: GET/SET

Data Type: Boolean

Range: 0, 1

Default: 0

Description: Sets the action when the trigger is removed. A value of 0 means continue printing until the message is complete, a value 1 means terminate printing when the trigger is removed.

Example Command: SP TRIGEND[0]=1<cr>

Response: ok<cr><lf>

Example Command: GP TRIGEND[0]<cr>

Response: trigend[0]=1<cr><lf>

Property 20 – TRIGSKIP[head]

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 0…100
Default: 0
Description: Sets how many trigger inputs must occur before the printer begins printing. Allows for skipping objects on a line.

Example Command: SP TRIGSKIP[0]=1<cr>
Response: ok<cr><lf>

Example Command: GP TRIGSKIP[0]<cr>
Response: trigskip[0]=1<cr><lf>

Property 22 – DOTSIZE[head]

Get/Set: GET/SET
Data Type: Unsigned Word
Range: 5…500
Default: 50
Description: Sets the size of a dot by setting the time that a valve is turned on. The value is in increments of 10 microseconds (1 = 10 microseconds)[a].

a. For a range of recommended values for each head type see ***"Dot Size Recommendations" on page 138***.

Example Command: SP DOTSIZE[0]=40<cr>
Response: ok<cr><lf>

Example Command: GP DOTSIZE[0]<cr>
Response: dotsize[0]=40<cr><lf>

Property 23 – COLSPAC[head]

Get/Set: GET/SET
Data Type: UNS WORD
Range: 1…12000 [mm/1000]
Default: 4000
Description: Sets the distance between columns when PRINTHT[head] = 100, see ***"Property 24 – PRINTHT[head]" on page 81***.

Example Command: SP COLSPAC[0]=1800<cr>
Response: ok<cr><lf>

Example Command: GP COLSPAC[0]<cr>
Response: colspac[0]=1800<cr><lf>

Property 24 – PRINTHT[head]

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 10…100(%)
Default: 100
Description: Sets the print height. Less than 100% requires tilting the head, see ***"Tilt Chart" on page 129***.

Example Command: SP PRINTHT[0]=44<cr>
Response: ok<cr><lf>

Example Command: GP PRINTHT[0]<cr>
Response: printht[0]=44<cr><lf>

Property 25 – PRINTNEG[head]

Get/Set: GET/SET
Data Type: Boolean
Range: 0, 1
Default: 0
Description: Sets entire message to print negative for the designated print head, see ***"Negative Print" on page 143***.

Example Command: SP PRINTNEG[0]=1<cr>
Response: ok<cr><lf>

Example Command: GP PRINTNEG[0]<cr>
Response: printneg[0]=1<cr><lf>

Property 27 – TILTASP[head]

Get/Set: GET/SET
Data Type: Unsigned Byte
Range: 1…10
Default: 1
Description: Sets the aspect ratio of a tilted print (PRINTHT[head] < 100). The number acts as a divisor to the column spacing (the higher the number, the closer the columns will be to each other and the narrower the character will appear). See ***"How to Calculate Spacing" on page 130*** for more information.

Example Command: SP TILTASP[0]=4<cr>
Response: ok<cr><lf>

Example Command: GP TILTASP[0]<cr>
Response: tiltasp[0]=4<cr><lf>

Property 30 – COLSKIP[head]

Get/Set: GET/SET

Data Type: Unsigned Byte

Range: 0…2

Default: 0

Description: Determines which dot columns of a message to print. Can be used as a means of achieving higher printing speeds. The print heads must be precisely mounted so that the resulting prints can be stitched together. Both print heads must have the same message selected and use the same parameters. One print head should be set to print the odd columns and the other to print the even columns (naturally both print heads must be set to print the same message). Because the column spacing is now twice as wide (for each head), higher transport speeds and larger dot sizes can be used.
See ***"High Speed Applications" on page 125*** for additional information.

Value	Description
0	Print all columns
1	Print odd columns
2	Print even columns

Example Command: SP COLSKIP[0]=0<cr>

Response: ok<cr><lf>

Example Command: GP COLSKIP[0]<cr>

Response: colskip[0]=0<cr><lf>

Property 31 – PRINTCNT[head]

Get/Set: GET

Data Type: Unsigned Long

Range: 0…(2^{32})-1

Default:

Description: Records the total number of print cycles of the designated print head.

If a RESET command is issued (see ***"Method 7 – RESET" on page 63***), the print count (for **all** print heads) will be reset to zero[a].

a. THIS ALSO ERASES ALL OBJECTS AND MESSAGES!

Example Command: GP PRINTCNT[0]<cr>

Response: printcnt[0]=n<cr><lf>
(where "n" is the total number of print cycles done by the controller for the requested print head)

The maximum print count would be 4,294,967,295. When that value is reached the count will roll over and start over at a value of zero (0).

Object 3 – Methods

Method	Command	Description
8	FLUSH[head]	Cycles valves to flush fluid through the print head nozzles.
9	STRIPE[head]	Set and clear striping mode for the head

Method 8 – FLUSH[head]

Transmit Data: Duration Uns Word
Range: 0…65535
Receive Data: None
Description: Flush head. The fluid is not changed. The Duration of the flush is specified in milliseconds. The dot size is 100 (1000µs) and the column time is 10ms. To change the fluid, see ***"Method 8 – INK/ CLEANER" on page 72***.

Example Command: FLUSH[0]=5000<cr>
Response: ok<cr><lf>

Method 9 - STRIPE[head]

Transmit Data: Pattern
Data Type: Boolean[32] - transmitted as a string of binary digits.
Range: 00000000h - FFFFFFFFh
Receive Data: None
Description: Set striping pattern for a head. If the striping pattern is all zeroes, the striping mode is cleared.

Example Command: STRIPE[0]=00010001000100010001000100010001<cr>
Response: ok<cr><lf>

The STRIPE[head] command is used to print continuous line(s) of ink on the substrate. If an attempt is made to print stripes without using this command, such as continuously printing a graphic, damage to the print head(s) is possible.

When the STRIPE[head] command is given, the specified head is placed in striping mode, and the numeric value that follows determines which valves in the head are to be opened (striping pattern) when striping is active. Consequently, if multiple heads are connected to the V84i, some might be striping while others are printing normally. The V84i supports up to four triggers, see ***"Property 18 – TRIGMODE[head]" on page 79***, so each head can also have its own trigger.

IMPORTANT:

A one in the numeric value means open the valve when striping, while a zero means keep the valve closed. Striping will start when the trigger assigned to that head is activated and **MUST** stop when that trigger is deactivated. This means that ***"Property 19 – TRIGEND[head]" on page 79*** should be set to 1 for that print head (TRIGEND[head]=1) to terminate striping. **The STRIPE[head] command can ONLY be implemented if** ***"Property 17 – ENCMODE" on page 67*** **is set to a value >0 – an encoder MUST be used.**

To protect the print head valve coil packs while in the STRIPE mode each valve is opened with a "peak" voltage which then drops to a "hold" value. This lower voltage is high enough to keep the valve open, but low enough that there isn't a heat buildup that would damage the coil pack.

Object 4 – Messaging

The I•Mark controller stores message elements in a set of tables. Each table has its own Get/Set commands, plus includes a numerical index to describe a specific message element. The message index must be contained within square brackets, with no space following the Get or Set command.

Table	Name	Command	Number of Entries	Entry Size	Description
0	MESSAGE CONSTRUCT	GM[n] SM[n]	100	24 objects	Used to define a complete message using the elements in the other tables, see ***page 85***.
1	TEXT	GT[n] ST[n]	250	250 characters	Reads and writes text object elements, including their configuration, see ***page 87***.
2	GRAPHICS	GG[n] SG[n]	32	2000 bytes	Reads and writes a graphic object using the Matthew's format for pixel definition, see ***page 89***.
3	COUNTER	GC[n] SC[n]	32	10 characters	Reads and writes a counter object, including configuration of the counter, see ***page 90***.
4	REAL-TIME CLOCK	GR[n] SR[n]	32	16 characters	Reads and writes a time or date object, see ***page 94***.
5	BARCODES	GB[n] SB[n]	32	32 characters	Reads and writes information to be printed in a barcode format object, see ***page 96***.
6	SHIFT CODES	GS[n] SS[n]	8	24 codes 8 UTF16 each	Reads and writes a shift (as in a working shift in a factory) code object, see ***page 98***.

Field Encoding

Fixed size fields are encoded using the same format as is used by the I/O Server Protocol, i.e. little endian direct encoding. Fixed array types are written as Type[n] in the specification, where "n" is the number of items in the array.

Variable size fields are encoded with a word indicating the number of items, followed by the items without any padding. Variable array types are written as Type[≤n] in the specification, where "n" is the maximum number of items in the array.

UCS-4 is encoded as a Long Word (32 bits). UTF-16 arrays are encoded as Words (16 bit). UTF-16[n] means "n" Words, which is equal to "n" or fewer Unicodes. There are no BOM markers.

The ASCII command format for message elements allows for all the KEYWORDS for a single message element to be described in a single command, with each KEYWORD delimited by a comma. For example, a text message can have a different font size, be bold, or can be printed inverted.

Example Command: ST[0] = "Matthews", SIZE=16, BOLD=2, INV=1<cr>[a]

Response: ok<cr><lf>

a. When any object is created the SIZE should be specified to avoid having a "hidden" message object.

In a SET_MESSAGE command, only those KEYWORDS the user wishes to change need to be included. KEYWORDS not included in the command will assume their default values.

If an invalid value for a KEYWORD is included, or an incorrect KEYWORD is used, the response will contain an error message (such as: Invalid field or Invalid field value).

Message Configuration Commands

GM[n]	Get Message	Read what objects define a printed message.
SM[n]	Set Message	Write what objects define a printed message.
GT[n]	Get Text	Read the configuration of a text message object.
ST[n]	Set Text	Write the configuration of a text message object.
GC[n]	Get Counter	Read the configuration of a counter message object.
SC[n]	Set Counter	Write the configuration of a counter message object.
GG[n]	Get Graphic	Read the configuration of a graphic message object.
SG[n]	Set Graphic	Write the configuration of a graphic message object.
GB[n[	Get Bar code	Read the configuration of a bar code message object.
SB[n]	Set Bar code	Write the configuration of a bar code message object.
GR[n]	Get Real-Time Clock	Read the configuration of a time or date message object.
SR[n]	Set Real Time Clock	Write the configuration of a time or date message object.
GS[n]	Get Shift Code	Read the configuration of a shift code message object.
SS[n]	Set Shift Code	Write the configuration of a shift code message object.

Table 0 – Message Constructs

Field	Name	Data Type	Description
0	Message Name	UTF-16[16]	A string that is used to identify the message.
1	Message Construct	ObjectType[24]	Format defined below

A message construct is an array of Message Objects. The number of objects in a message construct is variable, depending on the application, with a maximum of twenty-four (24) objects. The Message Construct can also not exceed the height of the connected print head(s), nor the length based on the controller option.

Object Type definition

Table	Unsigned Byte	The table in the object model that contains the message object.	
Record	Unsigned Word	The record within the table of a specific message object.	
X Location	Unsigned Word	The beginning X location (horizontal pixel) for the object.	
Y Location	Unsigned Word	The beginning Y location (vertical pixel) for the object.	
Font	Unsigned Byte	Which font type to use. (255 for attributes defined in object, binary protocol only)	
Size[a]	Unsigned Byte	The font size to use (0, 5, 7, 9, 14, 16, 21, or 32 – print head/y-position dependent).	
Bold	Unsigned Byte	The number of times to repeat a print column (0-9).	
XSP	Unsigned Byte	The number of additional spaces to add between characters (0-7).	
Modifiers[b]	Boolean[4]	Bit 0	Print Direction (REV) with 0 – Normal, 1 – Reversed.
		Bit 1	Print Inverted (INV) with 0 – Normal, 1 – Inverted.
		Bit 2	Print Rotate (ROT) with 0 – Normal, 1– Rotate 90° Counter-clockwise.
		Bit 3	Print Negative (NEG) with 0 – Normal, 1 – Negative.

a. When any object is created the SIZE should be specified to avoid having a "hidden" message object.
b. For examples of each Modifier applied to an object, see ***"Print Samples" on page 143***.

GET_MESSAGE, SET_MESSAGE

The GET_MESSAGE (GM) and SET_MESSAGE (SM) commands are used to view the contents of a message (the GET function) or to assemble different message elements into a single printable message (the SET function). There can be up to 24 elements in each printable message.

Format: SM[n]=((a[n]@x:y), (b[n]@x:y,…)),name=”name”<cr>

Where a[n], b[n], etc. is one of the message elements:

T	Text
G	Graphic
B	Barcode
C	Counter
R	Realtime Clock
S	Shift Code

x:y is the beginning location of the message element in terms of x and y pixel.

It is possible to override the attributes of a particular object by adding the changes to the message construct:

Format: SM[n]=((a[n]@x:y, font=0, size=s, bold=b, xsp=x, mode=m), (b[n]@x:y, …)),name=”name”<cr>

If any object is overridden, then the “FONT=0” statement **MUST** be included with that object because none of the other modifiers will take effect unless it is included.

IMPORTANT:

Care should be taken with all position statements to avoid having objects overlap. If overlap occurs, the last object in the message construct that occupies the same space (reacts as if it is placed “on top” the other object) is the one that will actually print. If there is only a partial overlap, then a part of a character may not be printed.

IMPORTANT:

The maximum allowable length (the “x” value) for a message is 4000 dot columns.

Font = font type	Identification number for various fonts. Currently, only font 0 is supported.
Size = object size	The font size in number of dots high: 0, 5, 7, 9, 14, 16, 21 and 32 heights are supported.[a]
Bold = repeated columns	The number of times a printed column is repeated
xsp = extra spaces	The number of additional columns to space between characters.

a. When any object is created the SIZE should be specified to avoid having a “hidden” message object.

Mode = object mode ≤ 15

Value	Description	
Bit 0	reverse	0 normal, 1 reverse
Bit 1	invert	0 normal, 1 invert
Bit 2	rotate	0 normal, 1 rotate
Bit 3	negate	0 normal, 1 negate

Name = message name A 16 character UTF-16 string that is used to identify the message.

Commands can be written either using spaces as separators or without spaces. For example, both of these command structures are valid:

SM[n]=((a[n]@x:y),(b[n]@x:y),(…))<cr>
SM[n] = ((a[n]@x:y), (b[n]@x:y), (…))<cr>

There are optional modifiers for each object that can be specified to override the default parameters of the object. The keywords are FONT, BOLD, XSP and MODE. The modifiers are entered using the format:

SM[n]=((a[n]@x:y,FONT=0,MODE=1),(b[n]@x:y,FONT=0,MODE=8).(…))<cr>

If any object is overridden, then the "FONT=0" statement **MUST** be included with that object because none of the other modifiers will take effect unless it is included.

SM[n] also has the option to have a text name, up to 16 characters in length. This name is entered using the format:

SM[n] = ((a[n]@x:y), (b[n]@x:y), (…)), NAME = "EXAMPLE"<cr>

To view a message construct use the following command:

Example Command: GM[0]<cr>
Response: m[0]=((a[n]@x:y),(b[n]@x:y),(…)),name="EXAMPLE"<cr><lf>

To clear a message location, use the following command:

Example Command: SM[n]=()<cr>
Response: ok<cr><lf>

Table 1 – Text objects

Field		KEYWORD	Data Type	Range	Description
0		NAME	UTF-16[16]		A string that is used to identify the text object.
1		text string	UTF-16[250]		The string value.
2		FONT	Unsigned Byte	0	Identification number for various fonts. Currently, only font 0 is supported.
3		SIZE	Unsigned Byte	0, 5, 7, 9, 14, 16, 21, 32	The font size in number of vertical dots. A value of 0 implies hidden.
4		BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
5		XSP	Unsigned Byte	0…7	Number of additional dot columns to space between characters.
6	bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
	bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
	bit 2	ROT	Boolean	0, 1	The characters will be rotated 90º counter-clockwise.
	bit 3	NEG	Boolean	0, 1	The object will be printed using a negative format[a].

a. The Negative format prints the background and leaves the characters blank.

GET_TEXT, SET_TEXT

Format: ST[n] =“text string”, KEYWORD=value…<cr>

text string: UTF-16 string that is no more than 250 characters in length.

Example Command: ST[0]=“Product XYZ”,NAME=“Msg 01”,SIZE=16,REV=1<cr>[a]

Response: ok<cr><lf>

a. When any object is created the SIZE should be specified to avoid having a “hidden” message object.

Example Command: GT[0]<cr>

Response: t[0]=“Product XYZ”,name=“Msg 01”,font=0,size=16,bold=0,xsp=0,rev=1,inv=0,rot=0, neg=0<cr><lf>

For any of the ASCII format commands to create message objects, the order of the Field elements in the command doesn’t matter.

IMPORTANT:

Special instructions for printing the Inch symbol. Since quotation marks are used to delimit fields, to incorporate one in a text field requires a special string format. To have one inch mark inside a text string you need to use a double set of quotation marks.

Example Command: ST[0]=“SPACE EVERY 16”” ON CENTER”,SIZE=16<cr>

Response: ok<cr><lf>

This would print:

SPACE EVERY 16" ON CENTER

A message can contain up to 24 objects, a text object can contain a maximum of 250 characters. This means that a single message can contain up to 6,000 characters. With the capability of supporting four (4) print heads, each of which can print a different message, the absolute maximum for a single print operation is 24,000 characters.

Table 2 – Graphic Objects

Field		KEYWORD	Data Type	Range	Description
0		NAME	UTF-16[16]		A string that is used to identify the graphic object.
1		SIZE	Unsigned Byte	1…32	The graphic height in number of dots.[a]
2		bitmap data	Byte[2000]	0…F	Bitmap data in Matthews pixel format.
3		BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
4	bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
	bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
	bit 2	NEG	Boolean	0, 1	The object will be printed using a negative format[b].

a. When any object is created the SIZE should be specified to avoid having a "hidden" message object.
b. The Negative format prints the background and leaves the graphic blank.

bitmap data: string in Matthews HEX conversion format that represents the graphic object. For conversion procedure instructions, see ***"Graphic Conversion Template" on page 107*** and ***"Graphic Conversion Software" on page 111***.

The 2000 Byte limit equates to a Maximum Graphic Size of 32 pixels high x 500 long **OR** 16 pixels high x 1000 long.

GET_GRAPHIC, SET_GRAPHIC

Format: SG[n] = "bitmap data", KEYWORD=value …<cr>

Example Command: SG[0]="FFFFFFFFC003C203C603CFFBDFFBCFFBC603C203C003C003C203C603CFFBDFFBCFFBC603C203C003FFFFFFFF",NAME="Up",SIZE=16<cr>

Response: ok<cr><lf>

Example Command: GG[0]<cr>

Response: g[0]="FFFFFFFFC003C203C603CFFBDFFBCFFBC603C203C003C003C203C603CFFBDFFBCFFBC603C203C003FFFFFFFF",name="Up",size=16,bold=0,rev=0,inv=0,neg=0<cr><lf>

The data string in this example is the HEX code conversion for this bitmap: 

There are 24 graphics that are pre-installed in the I•Mark™ V84i/e Controller. For a complete list and preview of these graphics, see ***"Pre-installed Graphics" on page 141***. Care should be taken when assigning a memory location for any new graphics.

IMPORTANT:

Using a memory location that already had a graphic stored there will result in the original file being overwritten. There is no warning that an overwrite will take place.

CAUTION:

If a RESET command is issued, see ***"Method 7 – RESET" on page 63***, any custom loaded graphic files will be erased and the hard coded graphics will be restored to their default locations.

In addition ALL objects and messages will be erased!

Table 3 – Counter Objects

Field	KEYWORD	Data Type	Range	Description
0	NAME	UTF-16[16]		A string that is used to identify the counter object.
1	count	ASCII[10]		Current value
2	FMT	ASCII[10]		Each character of the format string represents how the corresponding digit in the counter value is formatted:
				9 Numeric (0-9)
				f Hex lower case (0-9, a-f)
				F Hex upper case (0-9, A-F)
				z Lower case alpha (a-z)
				Z Upper case alpha (A-Z)
3	FIRST	ASCII[10]		The beginning count value.
4	LAST	ASCII[10]		The ending count value. When reached, the count will roll over to the Start Value. If the End Value is smaller than the Start Value, the counter will decrement instead of increment.
5	REP	Unsigned Byte	0…255	Number of times to repeat the count before incrementing.
6	SKIP	Unsigned Byte	0…255	Number of prints to skip before incrementing the counter.
7	UPDMODE	Unsigned Byte	0…4	Update mode:
				0 Use global update mode (default)
				1 Update at end-of-trigger
				2 Update at end-of-mark
				3 Update on counter cascade
				4 Update on auxiliary input 12
8	CASC	Unsigned Byte	0…31 ‡	If UPDMODE=3, counter that will increment this counter when it rolls over.
9	OPT	Boolean[3]	0…7 ♦	Bit 0 Skip I for Z formats
				Bit 1 Skip O for Z formats
				Bit 2 Use spaces for left most padding
10	RSTMODE	Boolean	0...4	Reset mode:
				0 Reset on rollover only
				1 Reset on rollover or end of trigger
				2 Reserved
				3 Reserved
				4 Reset on rollover or auxiliary input 13
11	FONT	Unsigned Byte	0	Identification number for various fonts. Currently, only font 0 is supported.
12	SIZE	Unsigned Byte	0, 5, 7, 9, 14, 16, 21, 32	The font size in number of vertical dots. A value of 0 implies hidden.[a]
13	BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
14	XSP	Unsigned Byte	0…7	Number of additional dot columns to space between characters.

Field		KEYWORD	Data Type	Range	Description
15	bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
	bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
	bit 2	ROT	Boolean	0, 1	The characters will be rotated 90º counter-clockwise.
	bit 3	NEG	Boolean	0, 1	The object will be printed using a negative format[b].

a. When any object is created the SIZE should be specified to avoid having a "hidden" message object.
b. The Negative format prints the background and leaves the characters blank.

IMPORTANT:

‡ In any given message there can only be one cascade counter.

♦ OPT — decimal equivalents of the three binary bits:

Binary	Decimal	Description
000	0	No special formats
001	1	Skip I for Z formats
010	2	Skip O for Z formats
011	3	Skip I for Z formats, Skip O for Z formats
100	4	Use spaces for left most padding
101	5	Skip I for Z formats, Use spaces for left most padding
110	6	Skip O for Z formats, Use spaces for left most padding
111	7	Skip I for Z formats, Skip O for Z formats, Use spaces for left most padding

Examples:

Format	Value [Printed]	Next Value [Printed]	Second next value [Printed]
999	998 [998]	999 [999]	000 [000]
FF	FE [FE]	FF [FF]	00 [00]
Z99	Z98 [Z98]	Z99 [Z99]	A00 [A00]
999 (space padding on)	008 [_ _8] (where _ means space)	009 [_ _9]	010 [_10]

GET_COUNTER, SET_COUNTER

Format: SC[n]= "*count"*, KEYWORD=value …<cr>

count: an up to 10-character ASCII string that is the current value of the counter.

Example Command: SC[0]="09",NAME= "S",FMT= "99",FIRST= "00",LAST= "99",SIZE=7<cr>
Response: ok<cr><lf>

Example Command: GC[0]<cr>
Response: c[0]="09",name="S",fmt="99",first="00",last="99",rep=0,skip=0,casc=0,opt=0,font=0, size=0,bold=0,xsp=0,rev=0,inv=0,rot=0,neg=0<cr><lf>

A hidden counter can be used to track production (number of products marked). Build the counter with the desired range and set the size to zero.

Example Command: SC[0]="0001",NAME= "S",FMT= "9999",FIRST= "0001",LAST= "9999", SIZE=0<cr>
Response: ok<cr><lf>

Prior to the production run use the GET command to determine the counter's starting value.

Example Command: GC[0]<cr>
Response: c[0]="0125",name="S",fmt="9999",first="0001",last="9999",rep=0,skip=0,casc=0,opt=0, font=0,size=0,bold=0,xsp=0,rev=0,inv=0,rot=0,neg=0<cr><lf>

At the completion of the production run again use the GET command to determine the counter's ending value.

Example Command: GC[0]<cr>
Response: c[0]="0565",name="S",fmt="9999",first="0001",last="9999",rep=0,skip=0,casc=0,opt=0, font=0,size=0,bold=0,xsp=0,rev=0,inv=0,rot=0,neg=0<cr><lf>

Subtract the starting value from the ending value to arrive at the total count for the number of times the message was printed.

0565	ending count
-0125	starting count
0440	count total

Cascade Counters

A Cascade Counter can function as a Batch Counter.

Take a simple example where you want to print cartons with a sequential number and track the pallet where the cartons are stacked. For this example say that 144 cartons will fit on a pallet. Build the following counters:

Example Command: SC[0]=“001”,NAME= “COUNT”,FMT= “999”,FIRST= “001”,LAST= “144”,SIZE=7<cr>
Response: ok<cr><lf>

Example Command: SC[1]=“001”,NAME= “BATCH”,FMT= “999”,FIRST= “001”,LAST= “999”, UPDMODE=3,CASC=0,SIZE=7<cr>
Response: ok<cr><lf>

(Where the number in CASC=0 actually refers to the counter number you would like to link to for the rollover, in this case counter [0].)

Next, build a message that incorporates these counters (naturally there can be other object elements in the message):

Example Command: SM[0]=((C[0]@0:0),(C[1]@24:0))<cr>
Response: ok<cr><lf>

With each print trigger the message will print both counters:

COUNT	BATCH
001	001
002	001
003	001
004	001
etc.	etc.
142	001
143	001
144	001
001	002
002	002
003	002
004	002
005	002
etc.	etc.

Table 4 – Real-Time Clock Objects

Field	KEYWORD	Data Type	Range	Description
0	NAME	UTF-16[16]		A string that is used to identify the RTC object.
	time	ASCII[2048]		The current formatted RTC string.
1	FMT	ASCII[16]		Each character in the format string represents the format for the real-time clock value, based on the following format characters (case is important):
				y Year without century (2-digits)
				Y Year with century (4-digits)
				e Year Name (4-characters)
				m Month (01-12)
				d Day of Month (01-31)
				c Week of Year name (2 characters)
				b Month Name (e.g. FEB)
				a Day Name (e.g. TUE)
				j Day of Year (001-366)[a]
				J Day of Year (001-366) European[a]
				w Week of Year Name (4-characters)
				H Hour using a 24-hour clock
				I Hour using a 12-hour clock
				M Minutes
				S Seconds
				p AM or PM placeholder
				- Date Separator (see DSEP)
				: Time Separator (see TSEP)
2	DSEP	UCS-4		Sets the separator used between elements of a date object.
3	TSEP	UCS-4		Sets the separator used between elements of a time object.
4	DFWD	Unsigned Word	0…7305	The number of days forward from the current date. Used for expiration dates.
5	MFWD	Unsigned Word	0...1440	The number of minutes forward from the current time/ date.
6	FONT	Unsigned Byte	0	Identification number for various fonts. Currently, only font 0 is supported.
7	SIZE	Unsigned Byte	0, 5, 7, 9, 14, 16, 21, 32	The font size in number of vertical dots. A value of 0 implies hidden.[b]
8	BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
9	XSP	Unsigned Byte	0…7	Number of additional dot columns to space between characters.
10 bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
10 bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
10 bit 2	ROT	Boolean	0, 1	The characters will be rotated 90º counter-clockwise.
10 bit 3	NEG	Boolean	0, 1	The object will be printed using a negative format[c].

a. For an explanation of the difference see ***"Julian Dates" on page 136***.
b. When any object is created the SIZE should be specified to avoid having a "hidden" message object.
c. The Negative format prints the background and leaves the characters blank.

GET_REALTIMECLOCK, SET_REALTIMECLOCK

Format: SR[n] KEYWORD= value, KEYWORD=value, …<cr>

Example Command: SR[0] NAME="AM-PM",FMT="I:Mp",TSEP=":",SIZE=7<cr>

Response: ok<cr><lf>

Example Command: GR[0]<cr>

Response: r[0]="03:21PM",name="AM-PM",fmt="I:Mp",dsep="",tsep=":",dfwd=0,mfwd=0,font=0, size=7,bold=0,xsp=0,rev=0,inv=0,rot=0,neg=0<cr><lf>[a]

a. The response contains the "current value" – in this case the current time – of the object when the command was issued.

Rollover Clock

The Rollover Clock is designed to allow users with shifts starting before midnight to have the same date print for the entire shift period.

For instance, if a shift starts at 11:00 PM, you would build the date clock using MFWD=60, for example:

Example Command: SR[1] NAME="ROLL",FMT="mdy",DSEP="-",MFWD=60,SIZE=7<cr>

Response: ok<cr><lf>

This clock will then switch to the next day's date at 11:00 PM, instead of waiting until midnight, when the switch would normally occur. For additional information see ***"Rollover Clock Table" on page 136***.

Sample Format Strings

Desired Format	Format String	Desired Format	Format String
MM~DD~YY (01~21~09)	m-d-y	YY~DD~MM	y-d-m
MM~DD~YYYY (01~21~2009)	m-d-Y	YYYY~DD~MM	Y-d-m
mmm~DD~YYYY (JAN~21~2009)	b-d-Y	hh☼mm (16☼45, 24 hour)	H:M
DD~MM~YY (21~01~09)	d-m-y	hh☼mmXM (04☼45PM)	I:Mp
DD~mmm~YY (21 JAN 09)	d-b-y	hh☼mm☼ssXM (04☼45☼32PM)	I:M:Sp
YYYY~MM~DD (2009~01~21)	Y-m-d	Character Key	
YY~MM~DD	y-m-d	~: Place holder for date separator	
JJJ~YY (124~09, Julian with year)	j-y	☼: Place holder for time separator	
ddd~mmm~DD (MON~JAN~21)	a-b-d	X: A or P (in AM and PM)	

Table 5 – Bar Code Objects

Field		KEYWORD	Data Type	Range	Description
0		NAME	UTF-16[16]		A string that is used to identify the bar code object.
1		data	Unsigned Byte[32]		Data to be printed in the bar code. Unicode characters (characters with an ASCII value greater than 127) are UCS8
2		Objects	ObjectType[8]		Data objects to be included in code
3		CODE	Unsigned Byte	0…9, 100	Which bar code format to use for the message format. Valid entries and the associated bar code format are: 0 Codabar 1 Interleaved 2 of 5 (dynamic objects) 2 Code 39 (dynamic objects) 3 EAN 8 (static digits) 4 EAN 13 (static digits) 5 UPC-A (static digits) 6 Code 128 B (dynamic objects) 7 Code 128 C (dynamic objects) 8 ITF14 (dynamic objects) 9 SCC14 (dynamic objects) 100 ECC200 Data Matrix (dynamic objects)
4		SIZE	Unsigned Byte	0…32	For codes 0-9, the bar height in number of vertical dots.[a] For code 100, the Data Matrix size per the list below: 0 - Reserved 8 - Reserved 1 - 12x12 9 - 32x32 2 - Reserved 10 - 8x18 3 - 16x16 11 - 8x32 4 - Reserved 12 - 12x26 5 - 20x20 13 - 12x36 6 - Reserved 14 - 16x36 7 - 24x24 15 - 16x48
5	bit 0	OPT	Boolean	0, 1	When enabled, includes the human readable when printing the bar code. **Font size cannot be specified.** Not available on Data Matrix.
	bit 1	OPT	Boolean	0, 1	When enabled, include bearer bars on ITF bar codes.
	bit 2	OPT	Boolean	0, 1	When enabled, use 2x2 pixels in data matrices with 16 rows or less
6		BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
7	bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
	bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
	bit 2				Reserved
	bit 3	NEG	Boolean	0, 1	The object will be printed using a negative format[b].

a. When any object is created the SIZE should be specified to avoid having a “hidden” message object.
b. The Negative format prints the background and leaves the characters blank.

ObjectType definition:

Table	Unsigned Byte	The table in the object model that contains the message object.
Record	Unsigned Word	The record within the table of a specific message object.

GET_BARCODE, SET_BARCODE

Format: SB[n]="*data*"&(object),(object),…,KEYWORD=value,KEYWORD=value,…<cr>

Data: The value to be printed as a bar code, up to a 32 character string.

Object: An array of up to eight (8) message objects t[n], c[n], r[n], s[n] (table and entry) used to create the data for the barcode. This array is referred to as concatenated data[a].

a. Computer instructions to join two or more strings together and treat as a unit

Example Command: SB[0]="12345678"&(),NAME="Barcode-01",CODE=2, SIZE=16<cr>

Response: ok<cr><lf>

Example Command: SB[1]="MATTHEWS"&(t[n],c[n]),NAME="Barcode-02",CODE=2, OPT=1, SIZE=24<cr>

Response: ok<cr><lf>

Example Command: SB[2]="MATTHEWS"&(t[n],c[n]),NAME="Data matrix-01",CODE=100, SIZE=9<cr>

Response: ok<cr><lf>

Example Command: GB[0]<cr>

Response: b[0]="12345678"&(),name="Barcode-01",code=2,size=16,opt=0,bold=0,rev=0,inv=0, neg=0<cr><lf>

To calculate the length of a bar code object, see ***"Bar Code Object Length" on page 131***.

IMPORTANT:

Some barcode types require a check digit. This number is calculated automatically by the print engine. When constructing the data string to be encoded, enter one digit less than the barcode's capacity.

GS1 Barcodes

GS1 Barcodes are supported as a special version of the ITF14 or SCC14 barcode. For the first item in the construct enter a Fixed Text object that includes the currency sign (¤) followed by the desired AI (Application Identifier), see ***"UCC Application Identifiers" on page 135***. The barcode data can either be a continuation of that Fixed Text object or other object types that are appended to the construct.

Example Command: ST[0]="11223344556677"<cr>

Response: ok<cr><lf>

Example Command: SB[3]="Â¤01"&(t[0]),NAME="Barcode-03",CODE=9,SIZE=24,OPT=1<cr>

Response: ok<cr><lf>

This will generate a GS1 barcode with the AI of (01) and the information 11223344556677.

The currency sign (¤) is entered using two entries: Alt + 0194 [U+00C2], then Alt + 0164 [U+00A4] (the currency sign has an ASCII value greater than 127 and therefore must be represented by two bytes of data in the UCS8 format).

With this format it is easy to construct additional GS1 barcodes with the same Application Identifier by simply changing the text object link in the command string.

Data Matrix Capacity

Matrix Size (Height x Width)	Capacity Numeric	Capacity ASCII	Matrix Size (Height x Width)	Capacity Numeric	Capacity ASCII
12 x 12	10	5	8 x 32	20	10
16 x 16	24	12	12 x 26	32	16
20 x 20	44	22	12 x 36	44	22
24 x 24	72	36	16 x 36	64	32
32 x 32	124	62	16 x 48	98	49
8 x 18	10	5			

IMPORTANT:

There is NO error message if you exceed the capacity of the matrix size.

Table 6 – Shift Code Objects

Field		KEYWORD	Data Type	Range	Description
0		NAME	UTF-16[16]		A string that is used to identify the Shift Code object.
1		SHIFT	ShiftObject[24]		Shift construct in the following format: Start Uns Word Time past midnight (24-hour format) Code UTF-16[8] Text to print for shift.
2		FONT	Unsigned Byte	0	Identification number for various fonts. Currently, only font 0 is supported.
3		SIZE	Unsigned Byte	0, 5, 7, 9, 14, 16, 21, 32	The font size in number of vertical dots. A value of 0 implies hidden.[a]
4		BOLD	Unsigned Byte	0…9	Number of times to repeat a dot column.
5		XSP	Unsigned Byte	0…7	Number of additional dot columns to space between characters.
6	bit 0	REV	Boolean	0, 1	Reverses the print direction (mirror image).
	bit 1	INV	Boolean	0, 1	The object will be printed inverted (upside down).
	bit 2	ROT	Boolean	0, 1	The characters will be rotated 90º counter-clockwise.
	bit 3	NEG	Boolean	0, 1	The object will be printed using a negative format[b].

a. When any object is created the SIZE should be specified to avoid having a "hidden" message object.
b. The Negative format prints the background and leaves the characters blank.

GET_SHIFTCODE, SET_SHIFTCODE

Format: SS[n]=("value"@mmmm,"value"@mmmm), KEYWORD=value …<cr>

value: the code to be printed for each shift designated by the minutes past midnight segment.

Example Command: SS[0]=("AM"@0000,"PM"@1200),NAME="AP",SIZE=7<cr>

Response: ok<cr><lf>

Example Command: GS[0]<cr>

Response: s[0]=("AM"@0000,"PM"@1200),name="AP",font=0,size=7,bold=0,xsp=0,rev=0,inv=0, rot=0,neg=0<cr><lf>

Object 4 – Methods

Command	Method	ASCII
CDB (Clear Database), see ***"Method 8 – CDB"*** below	8	✓
SMN[12] (Set Month Names), see ***"Method 22 – SMN[12]"*** below	22	✓
GMN[12] (Get Month Names), see ***"Method 23 – GMN[12]" on page 100***	23	✓
SDN[7] (Set Day Names), see ***"Method 24 – SDN[7]" on page 100***	24	✓
GDN[7] (Get Day Names), see ***"Method 25 – GDN[7]" on page 100***	25	✓
SYN[10] (Set Year Name), see ***"Method 26 – SYN[10]" on page 101***	26	✓
GYN[10] (Get Year Name), see ***"Method 27 – GYN[10]" on page 101***	27	✓
SWN[53] (Set Week of Year Names), see ***"Method 28 – SWN[53]" on page 102***	28	✓
GWN[53] (Get Week of Year Names), see ***"Method 29 – GWN[53]" on page 102***	29	✓

Method Keywords

Method 8 – CDB

Transmit Data: None
Receive Data: None
Description: Clears all records in the database

Example Command: CDB<cr>
Response: ok<cr><lf>

CAUTION:

Use with extreme caution, the CDB command erases ALL the message objects in the messaging data base (but does not affect any of the properties).

Method 22 – SMN[12]

(Set Month Names)

Transmit Data: Names UCS-8[16]
Receive Data: None
Description: Allows the user to define the names of months as used by the real-time clock object.

Format: SMN[m]="mname"<cr> (where **m** is a month number from 0-11 and **mname** is up to a 16-character UCS8 string)

Example Command: SMN[0]="JAN"<cr>
Response: ok<cr><lf>

IMPORTANT:

All Month names **MUST** be the same length.

Method 23 – GMN[12]

(Get Month Names)

Transmit Data: None

Receive Data: Names UCS-8[16]

Description: Allows the user to read the names of months as used by the real-time clock object.

Format: GMN[m]<cr> (where **m** is a month number from 0-11)

Example Command: GMN[0]<cr>

Response: mn[0]="JAN"<cr><lf>

Method 24 – SDN[7]

(Set Day Names)

Transmit Data: Names UCS-8[16]

Receive Data: None

Description: Allows the user to define the names of days as used by the real-time clock object.

Format: SDN[d]="dname"<cr> (where **d** is a day number from 0-6 and **dname** is a 16-character UCS8 string)

Example Command: SDN[2]="WED"<cr>

Response: ok<cr><lf>

Monday is day zero (0).

IMPORTANT:

All Day names **MUST** be the same length.

Method 25 – GDN[7]

(Get Day Names)

Transmit Data: None

Receive Data: Names UCS-8[16]

Description: Allows the user to read the names of months as used by the real-time clock object.

Format: GDN[d]<cr> (where **d** is a day number from 0-6)

Example Command: GDN[2]<cr>

Response: dn[2]="WED"<cr><lf>

Monday is day zero (0).

Method 26 – SYN[10]

(Set Year Names)

Transmit Data: Names UCS-8[4]

Receive Data: None

Description: Allows the user to define the names of years as used by the real-time clock object. The entries define the 10 year names. The current year, mod 10[a], will be used as an index into the table to determine the year name used for printing.

a. Mod 10 is defined as the remainder after you divide by 10. In 2009 the ten-year window is 2000-2009. Next year the window will roll over to 2010-2019.

Format: SYN[y]="yname"<cr> (where **y** is a year number from 0-9 and **yname** is a 4-character UCS8 string)

Example Command: SYN[9]="FROG"<cr>

Response: ok<cr><lf>

IMPORTANT:

All Year names **MUST** be the same length.

Method 27 – GYN[10]

(Get Year Names)

Transmit Data: None

Receive Data: Names UCS-8[4]

Description: Allows the user to read the names of years as used by the real-time clock object. The entries define the 10 year names. The current year, mod 10[a], will be used as an index into the table to determine the year name used for printing.

a. Mod 10 is defined as the remainder after you divide by 10. In 2009 the ten-year window is 2000-2009. Next year the window will roll over to 2010-2019.

Format: GYN[y]<cr> (where **y** is a year number from 0-9)

Example Command: GYN[9]<cr>

Response: yn[9]="FROG"<cr><lf>

If no names have been assigned, the system will return four hyphens.

Example Command: GYN[0]<cr>

Response: yn[0]="----"<cr><lf>

Method 28 – SWN[53]

(Set Week of Year Names)

Transmit Data: Names UCS-8[2]

Receive Data: None

Description: Allows the user to define the names of the week of the year used by the real-time clock object.

Format: SWN[w]="wname"<cr> (where **w** is a week number from 0-52 and **wname** is a 2-character UCS8 string)

Example Command: SWN[0]="AA"<cr>

Response: ok<cr><lf>

IMPORTANT:

All Week names **MUST** be the same length.

Method 29 – GWN[53]

(Get Week of Year Names)

Transmit Data: None

Receive Data: Names UCS-8[2]

Description: Allows the user to read the names the week of the year used by the real-time clock object.

Format: GWN[w]<cr> (where **w** is a week number from 0-52)

Example Command: GWN[0]<cr>

Response: wn[0]="AA"<cr><lf>

Dimensions

The overall dimensions of the I•Mark™ V84i/e Controller are shown in ***Figure 41***. Units of measurement are inches with millimeters in brackets.

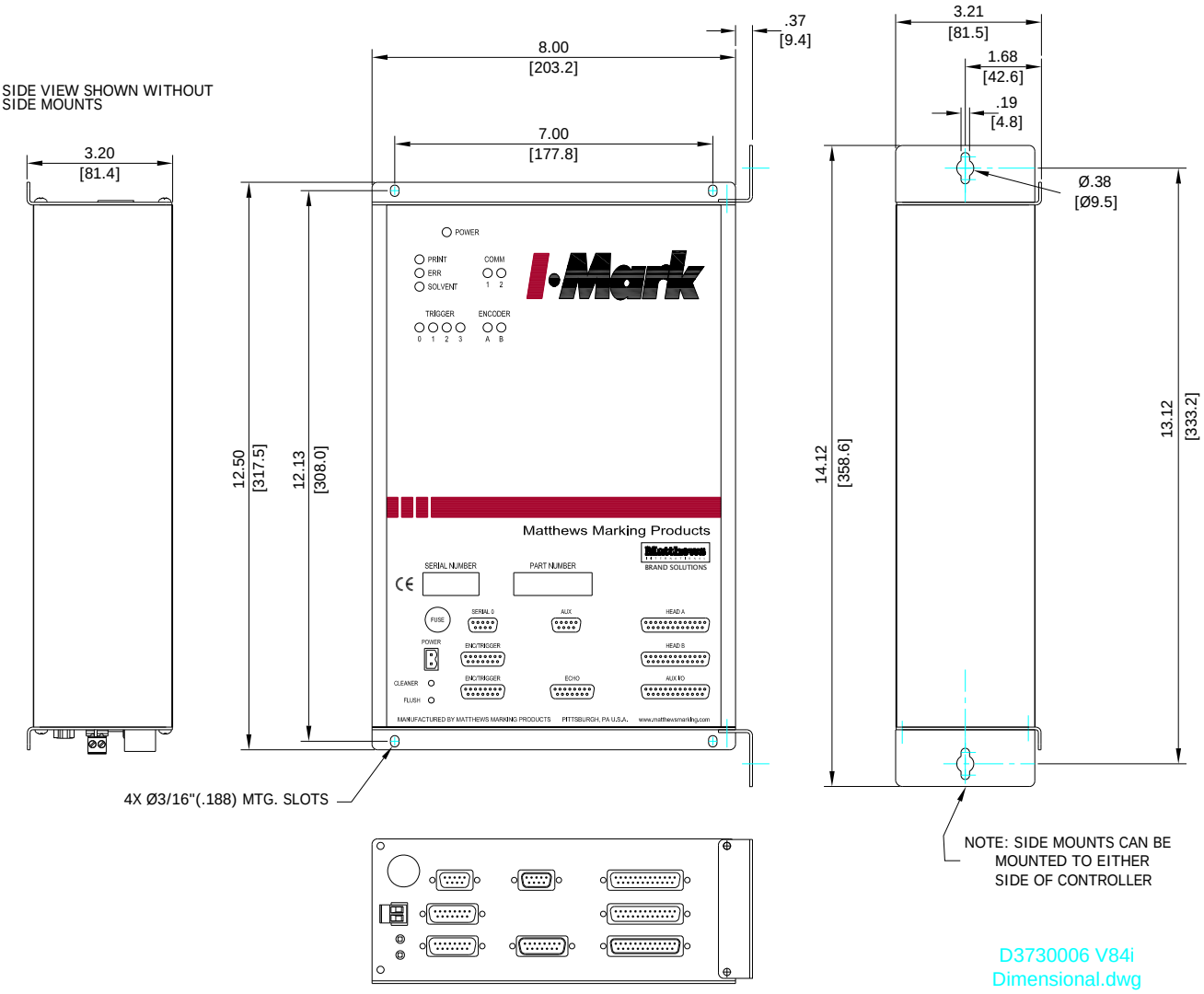


Figure 41

Side Mounting Brackets

Side mounting brackets are included with the I•Mark™ V84i/e Controller. They are used when it is desired to mount the controller perpendicular to the surface. The brackets can be used on either side of the controller. To install, remove two screws on the same side of each end of the controller enclosure, position a mounting bracket over the existing holes on one end and secure in place using the screws previously removed. Repeat with the remaining bracket on the other end of the controller enclosure.

Dimensions

Desktop Power Supply

For equipment not installed in an enclosure Matthews Marking Systems offers a Desktop Power Supply. The overall dimensions of the Desktop Power Supply are shown in ***Figure 42***. Units of measurement are inches with millimeters in brackets.

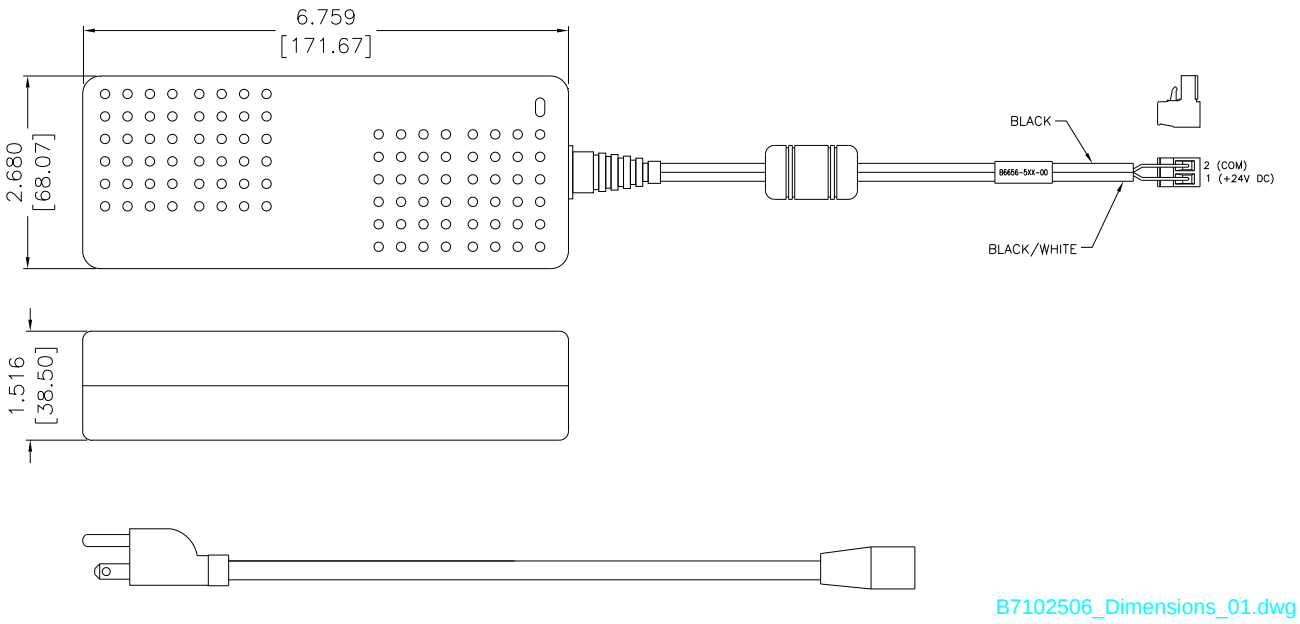


Figure 42

OEM Power Supply

For equipment installed in an enclosure Matthews Marking Systems offers an OEM Power Supply. The overall dimensions of the OEM Power Supply are shown in ***Figure 43***. Units of measurement are inches with millimeters in brackets.

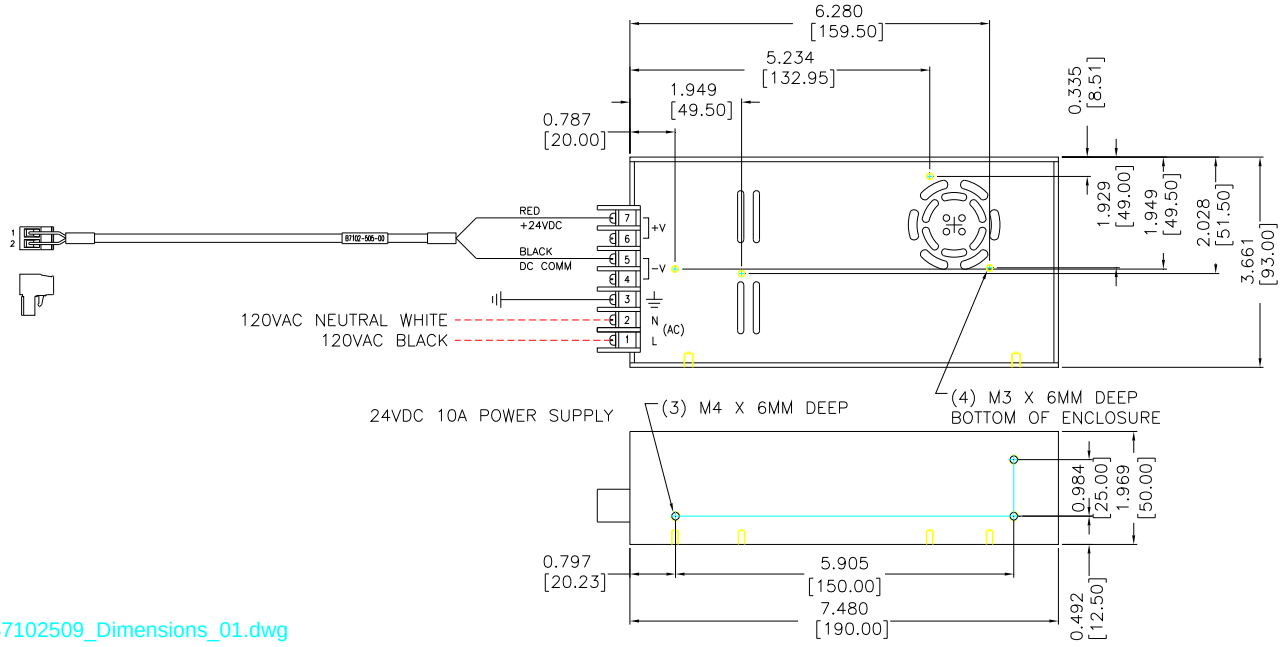


Figure 43

Dimensions

Exploded View

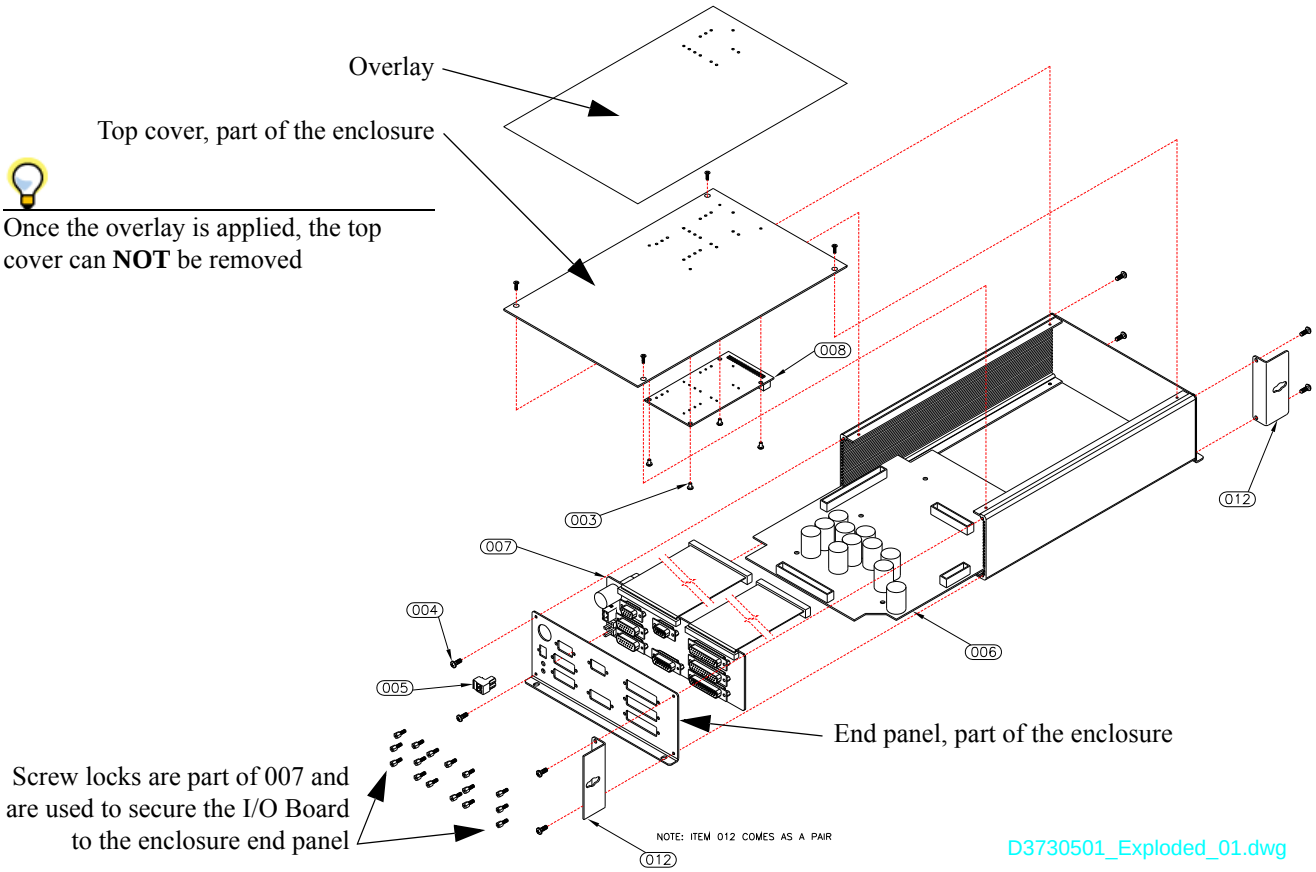


Figure 44

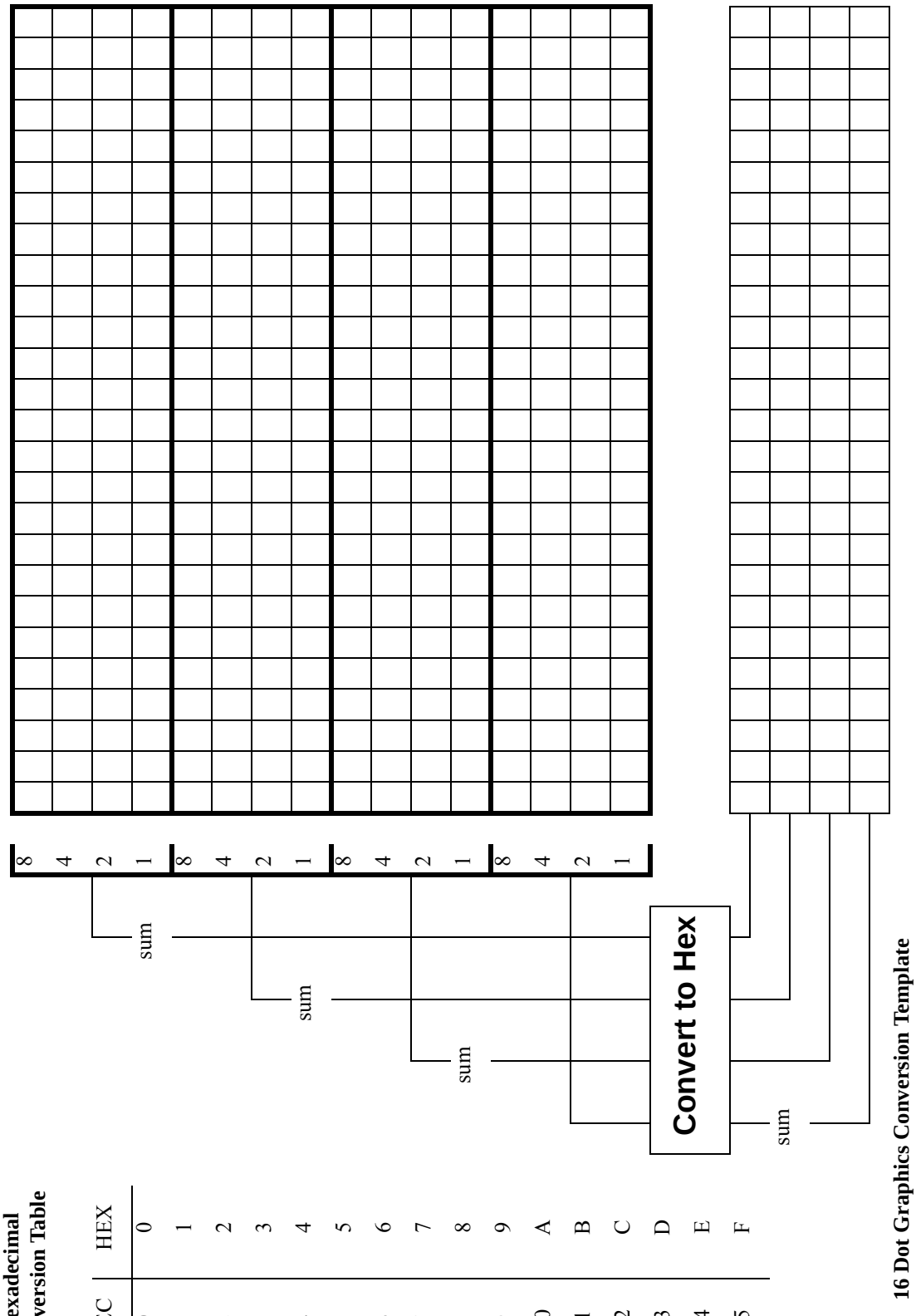
Figure 44 is an exploded view that illustrated the user replaceable parts. Only user replaceable parts are identified with a balloon.

Parts List

Balloon	Description
003	PHPMS[a] W/WASHER 4-40 X 3/16" Long
004	PHPMS[a] 6-32 X 3/8" Long
005	Connector Terminal Block Plug, 2 Position (also included with CST-MAT376 V84i I/O Board)
006	CST-MAT375 V84i Controller Board
007	CST-MAT376 V84i I/O Board
008	CST-MAT377 V84i LED Board
012	Bracket, V84i Side Mount (pair)
Not illustrated	Fuse, 32V Slow-Blow, 3AG, 10A (also included with CST-MAT376 V84i I/O Board)
Not illustrated	Cap, Connector, Shielded, DB9F and Cap, Connector, Shielded, DB9M
Not illustrated	Cap, Connector, Shielded, DB15F and Cap, Connector, Shielded, DB15M
Not illustrated	Cap, Connector, Shielded, DB25F and Cap, Connector, Shielded, DB25M

a. PHPMS - Pan Head Phillips Machine Screw

Graphic Conversion Template



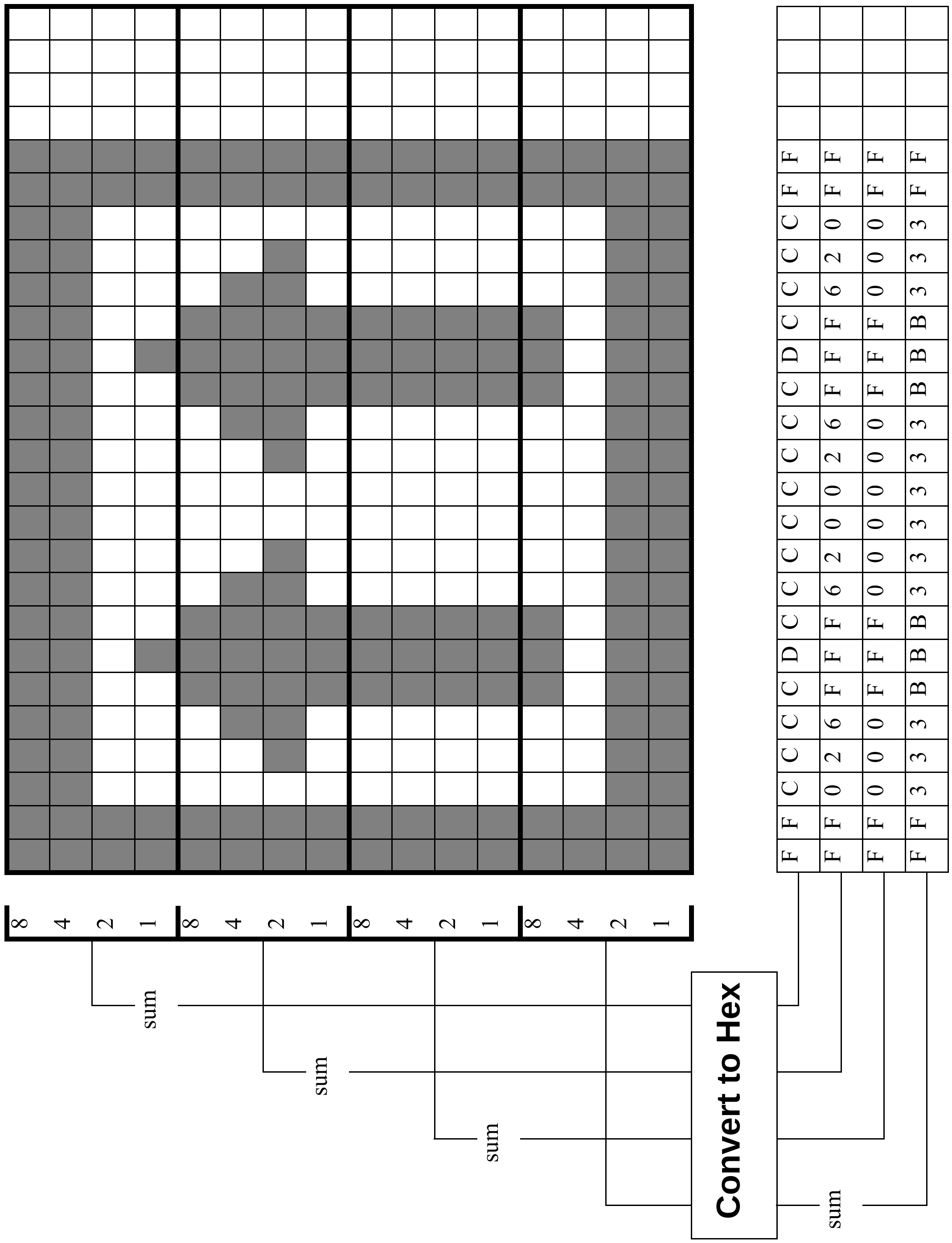
16 Dot Graphics Conversion Template

Decimal to Hexadecimal Conversion Table

DEC	HEX
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

Graphic Conversion Template

Sample Graphic



16 Dot Graphics Conversion Template

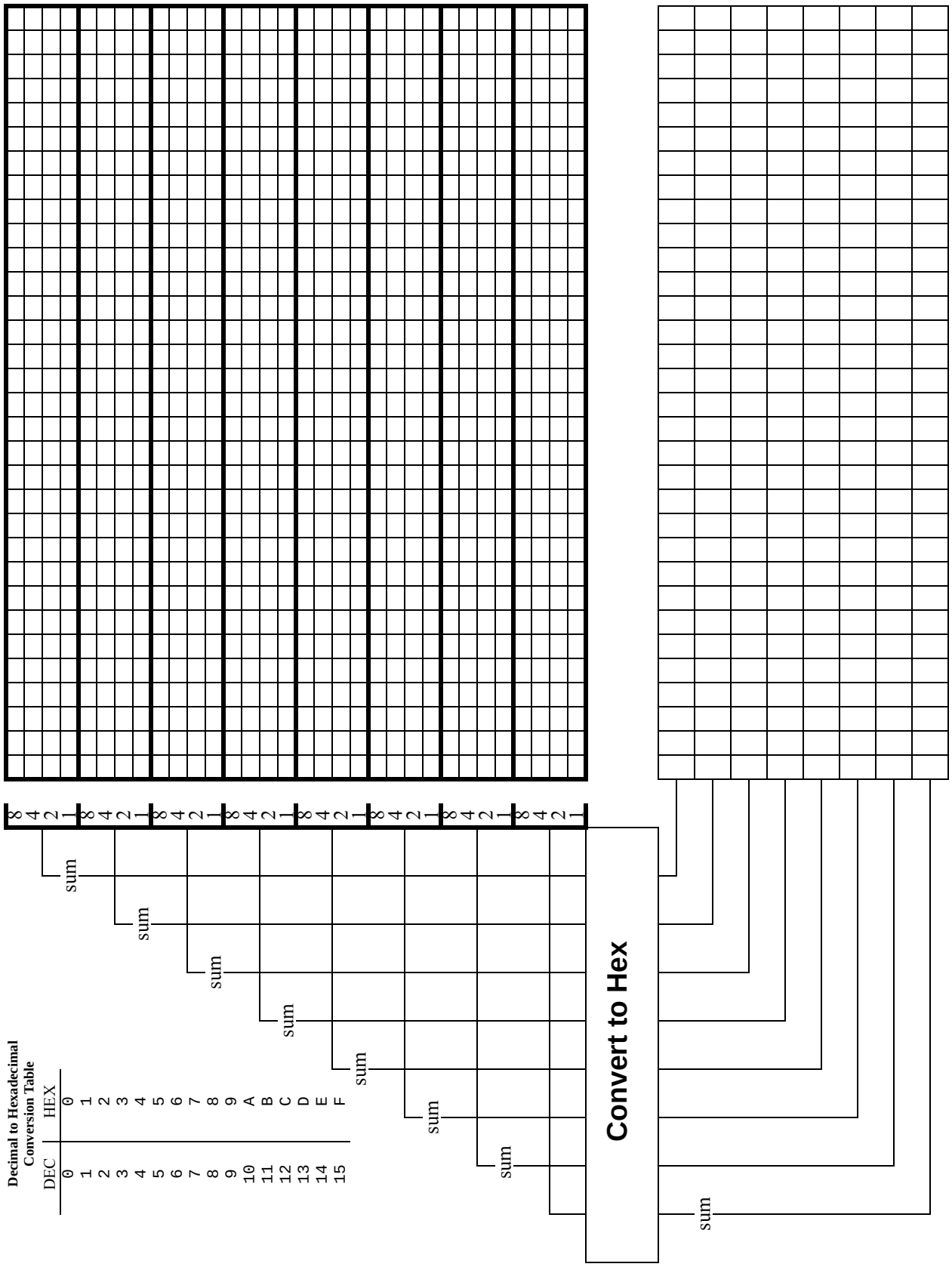
Starting with the first column, use the characters from top to bottom to create the protocol format (see ***"GET_GRAPHIC, SET_GRAPHIC" on page 89***):

FFFFFFFFC003C203C603CFFBDFFBCFFBC603C203C003C203C603CFFBDFFBCFFBC603C203C003FFFFFFFF

Decimal to Hexadecimal Conversion Table

DEC	HEX
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

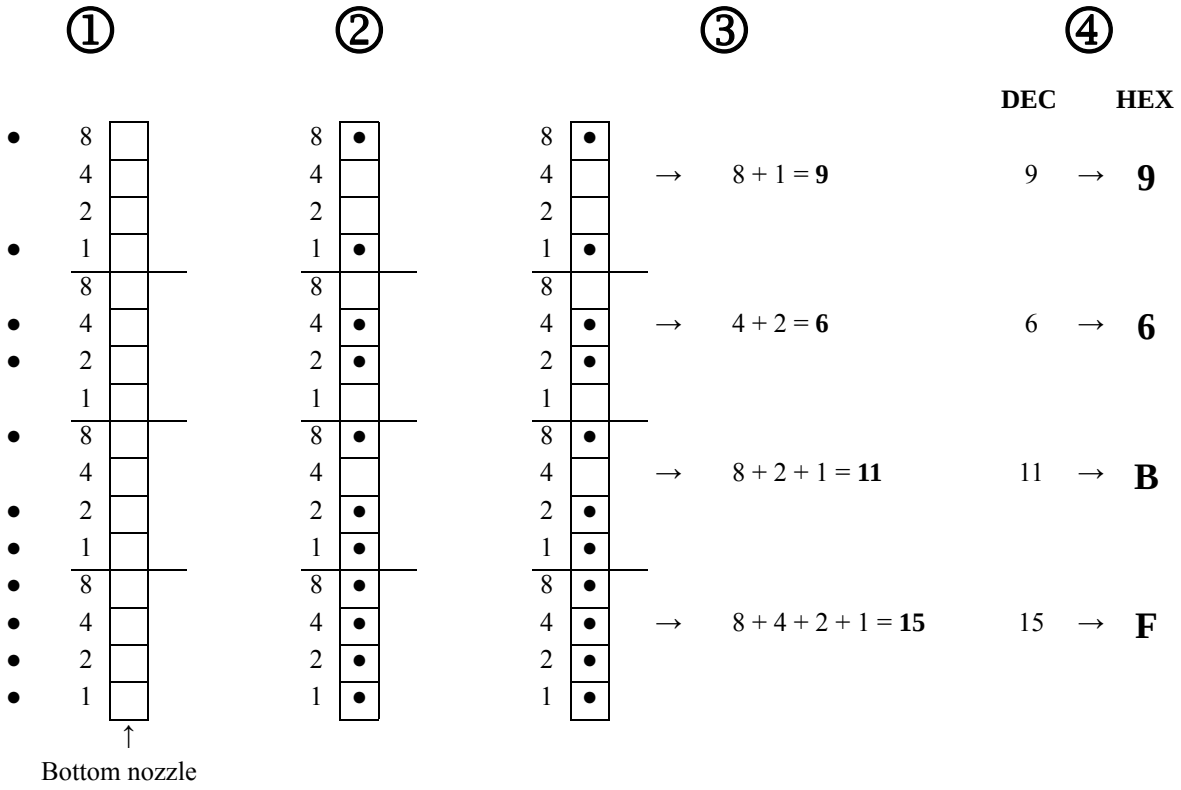
32 Dot Graphic Conversion Template



Graphic Conversion Template

Conversion Template Instructions

Choose the template to work with based on the size of graphic to be converted. Mark each of the squares that represent where a printed dot is needed. Graphic data is handled in vertical columns in groups of four nozzles until the whole graphic has been encoded. Below is an example of how one column is handled.



1. Draw and mark a column of squares to represent all the print head nozzles. In this case a 16 nozzle head.
2. Draw the pattern of dots in the squares.
3. Add together the values for each square containing a dot in the top group and then do the same for each of the rest of the groups.
4. Convert each decimal sum to hexadecimal (refer to the Decimal to Hexadecimal Conversion Table on the template pages).

Entering 96BF as the graphic data, in the SG command, will produce this dot pattern.

There is a 2000 Byte limit which equates to a Maximum Graphic Size of 32 pixels high x 500 long **OR** 16 pixels high x 1000 long.

The current version of conversion software, see ***"Graphic Conversion Software" on page 111***, has a length limit of 250 pixels in either height, so it can't be used to create the longer graphics. At this time the only method to create longer sizes would be to create them manually using the hex code conversion described previously.

Graphic Conversion Software

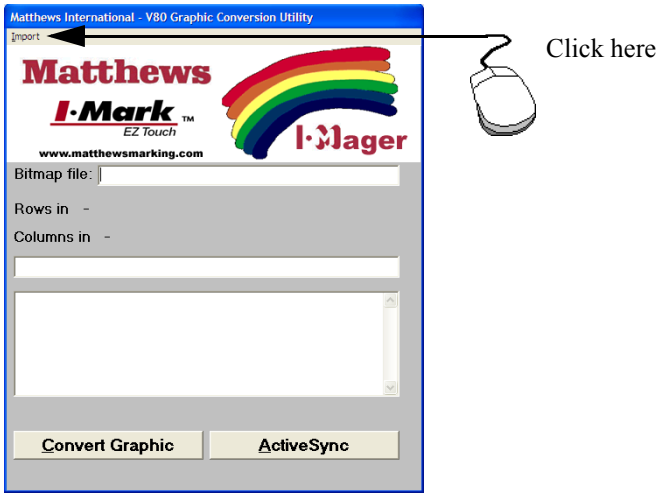
Graphic Creation Procedure:

1. Create a monochrome bitmap image of the graphic needed. The conversion software only allows a maximum length of 250 pixels and either 16 or 32 pixels high - **longer images will have to be done in segments**. It is recommended to use Microsoft Paint for creating the graphic files - some software programs when saving files in the bitmap format manipulate the files in a manner that causes errors in the conversion software. Saving using Microsoft Paint eliminates that potential source of a problem.

2. The bitmap can be manually converted to hexadecimal code using the Graphics Conversion Template (see ***"Graphic Conversion Template" on page 107***). If using this method of conversion, skip to ***Step 13.***

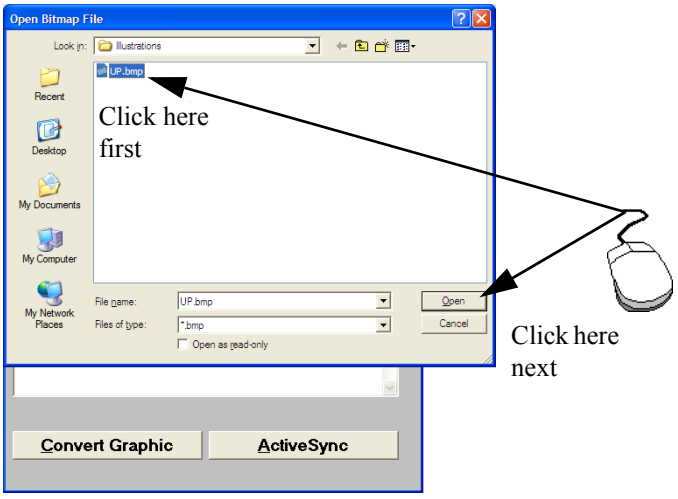
3. Organize the graphics to be loaded into a file folder on a PC that has the Matthews I-Mager program (see your Matthews representative) installed.

4. On the Title Bar, left click "Import" with the computer's mouse. From the drop down list, select "Import Bitmap".

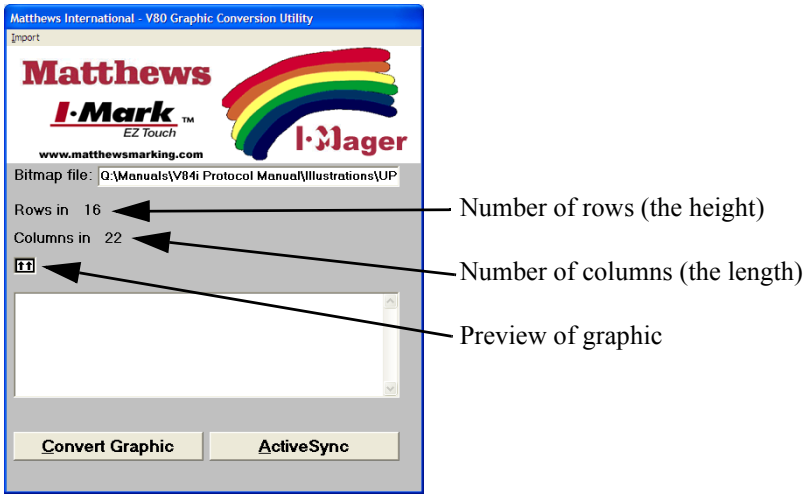


5. Navigate to the folder where the logos are stored and select the logo to be converted.

6. Select the bitmap that needs to be converted. Click on the "Open" button.



7. The bitmap will be previewed on the screen and the number of rows (height) and columns (width) will be displayed.

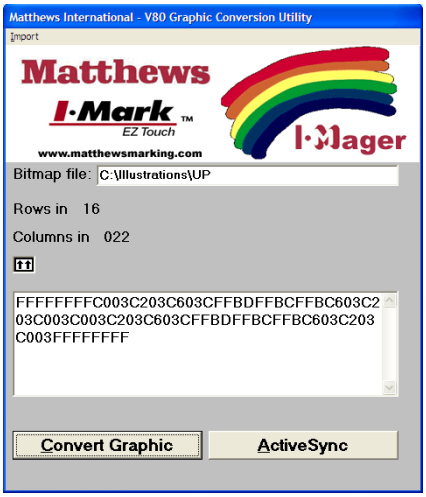


8. The maximum size for a bitmap in the I•Mark™ V84i/e Controller is 2000 bytes. This correlates to 16 x 1000 or 32 x 500 pixels. If the graphic desired is larger than these maximums then it must be split into pieces and then reassembled in a message in the controller.

The I-Mager software has a limit of 250 pixels for the length, so splitting into segments will have to be done for any graphics that exceed that length.

9. To make the actual conversion, left click the Convert Graphic button using the computer's mouse.

10. As shown in the screen capture at the right, the bitmap is converted to Hex values that can be used by the controller.



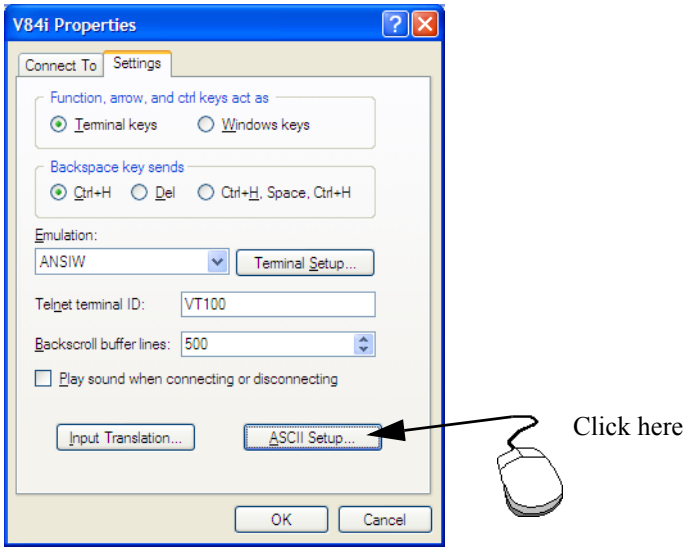
11. The hex file is automatically saved in the same folder as the bitmap. The same file name is used, but with a ".txt" extension.

12. When the text file is opened, it will look something like below:

    "16,022,FFFFFFFFC003C203C603CFFBDFFBCFFBC603C203C003C003C203C603CFFBDFFBCFFBC603C203C003FFFFFFFF"

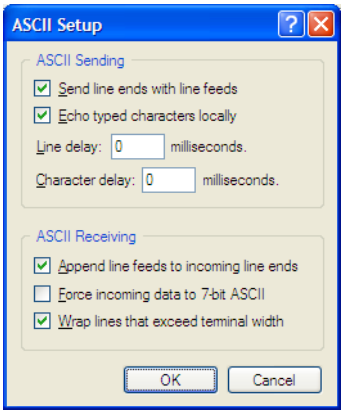
13. Connect to the I•Mark™ V84i/e Controller using HyperTerminal[5] (the factory default settings are 19200, 8, n, 1). Go to File on the top title bar then Properties. A HyperTerminal Properties window will open.

14. Go to the Settings tab, then hit the ASCII Setup button.



15. Click inside the appropriate boxes to enable:

    Send line ends with line feeds
    Echo typed character locally
    Set the Line Delay to 10 milliseconds
    Append line feeds to incoming line ends
    Wrap lines that exceed terminal width



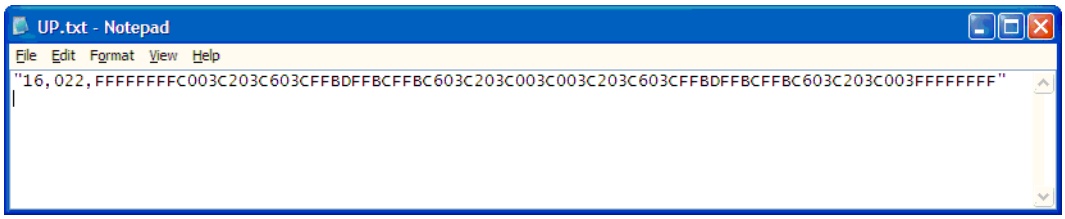
5. Other terminal programs such as PuTTY may also be used.

16. When connected to the V84i Controller using HyperTerminal, the information in the text file can be used to create a graphic for print. Do this using the SET_GRAPHIC (SG) command as shown below:

    SG[n]=“

    The number [n] is a memory location in the V84i Controller. There are 32 available memory locations (0 to 31) reserved for graphics.

17. Open the hexadecimal code text file using Notepad.

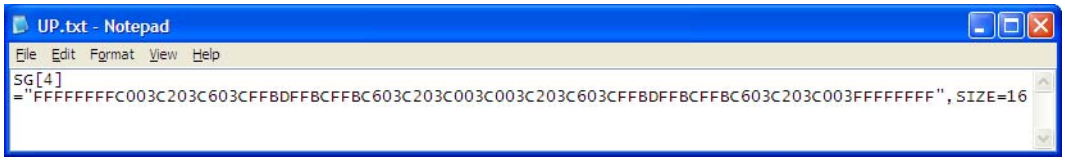


18. The first two numbers (the height and width of the graphic) are not needed, so delete them and the commas (**but remember the height**, it will be used in a moment as SIZE). Place the cursor before the first quotation mark and type the SET_GRAPHIC command and a memory location as shown in ***Step 16.*** Next place the cursor after the last quotation mark, type a comma and then the SIZE command with the graphic height value (from the remembered height). See the example below:

    SG[4]=“FFFFFFFFC003C203C603CFFBDFFBCFFBC603C203C003C003C203C603CFFBDFFBCFFBC603C203C003FFFFFFFF”, SIZE=16<cr>

A carriage return is needed at the end of every command.

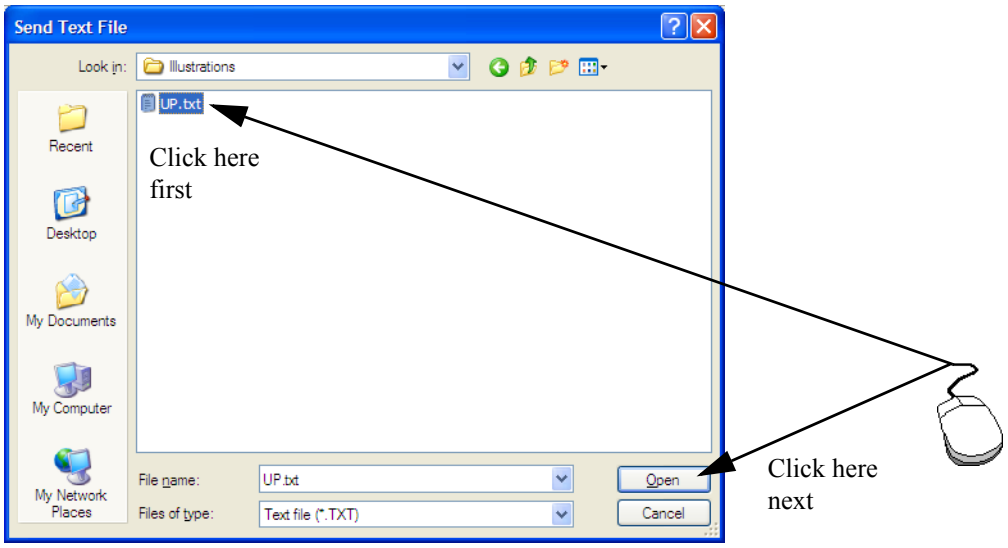
    Save the resulting file (it is OK to keep the same file name).



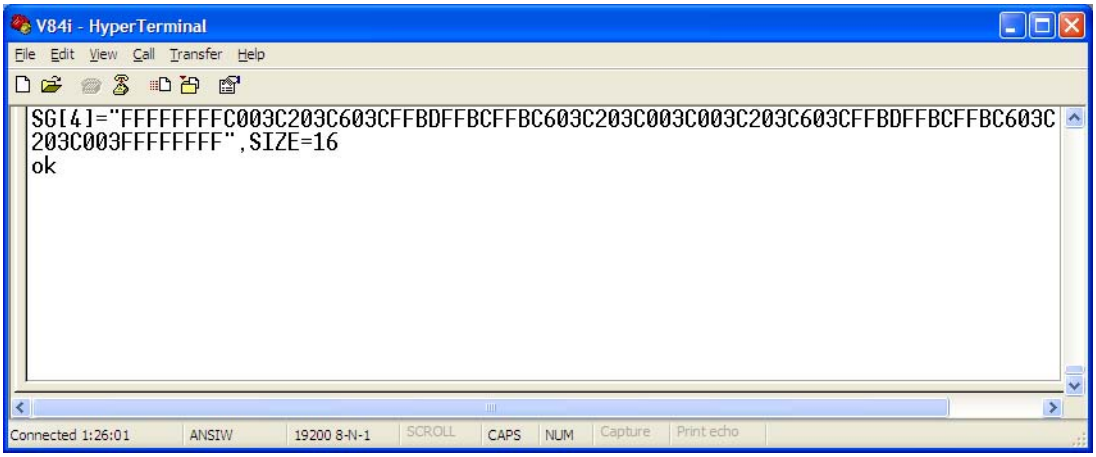
    If the bitmap was manually converted to hexadecimal, the hexadecimal code should be typed in after the first quotation mark. A closing quotation mark should follow the last hexadecimal character, then the size of the graphic (16 or 32) as shown in the example above.

19. In the title bar of HyperTerminal, select “Transfer” and then “Send Text File…”

20. A window will open to select the desired file. Navigate to the folder where the graphic conversion file is located and select the file. Once the file name is highlighted, click on the Open button.



21. Immediately after the Open button is clicked, the file will be downloaded to the controller. If everything was done correctly, the system will respond with an “ok”.



22. This graphic can now be used in a message as shown in the example commands below:

    This command creates a message with the above graphic placed at coordinates 0:0 in the message:

    SM[1] = (G[4]@0:0)<cr>

    This command sets the message number 1 to be printed on print head [0]:

    SP MSGNUM[0]=1<cr>

Graphic Conversion Software

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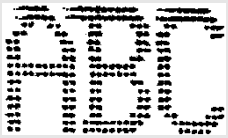
Troubleshooting

Problem	Possible Cause	Remedy
No Printout	No message selected	Select a message
	Selected message is blank	Check message contents
	Printout is not being triggered	Check print trigger (i.e. Photocell, etc.), position and activation
	No ink/pressure	Check the ink supply unit
	Print delay setting is too long or too short causing the print to miss the print target	Adjust print delay setting
	Dot size is too small	Increase dot size
Poor Printout Quality	Distance between print head and print target is too great	Move print head closer to target, see ***"Print Heads" on page 13***
	ink bottle filter clogged	Change filter
	Incorrect print attribute settings such as dot size or print width	Adjust print attribute settings
	Low ink pressure	Adjust pressure at ink supply unit
Leading dots in printout too weak or too strong.	Incorrect Ink Type setting.	Change the Ink Type setting, see ***"Property 25 – INKTYPE" on page 69***
Partial Printout (truncated) 	Mark length is not set correctly	Increase mark length or select auto-length, see ***"Property 14 – MARKLEN[head]" on page 78***
	Terminate "On" and trigger turns off	Turn Terminate "Off", see ***"Property 19 – TRIGEND[head]" on page 79***, or reposition sensor to allow print cycle to complete
Printout contains missing dots 	One or more print head nozzles are blocked	Flush head with cleaner, clean head's nozzle area, see ***"Daily Maintenance" on page 37***
Printout is smeared 	Print head is touching print target	Adjust print head position, see ***"Print Heads" on page 13***
Printout is slanted 	Print head height does not correspond with the print height% setting	Adjust print head angle or print height setting, see ***"Property 24 – PRINTHT[head]" on page 81***

Troubleshooting

LEDs On Main Board

The LED lights on the boards help in troubleshooting problems.

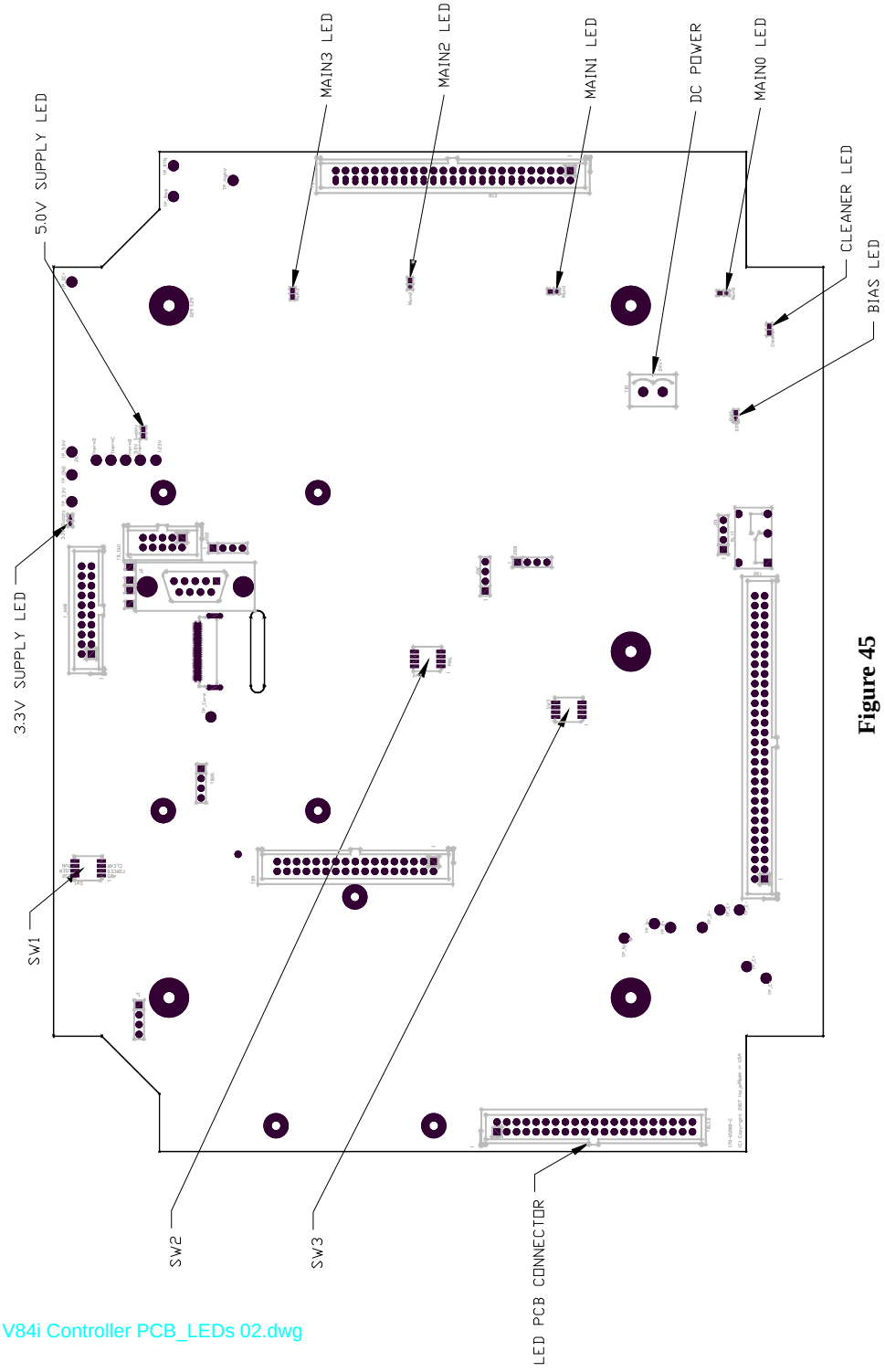


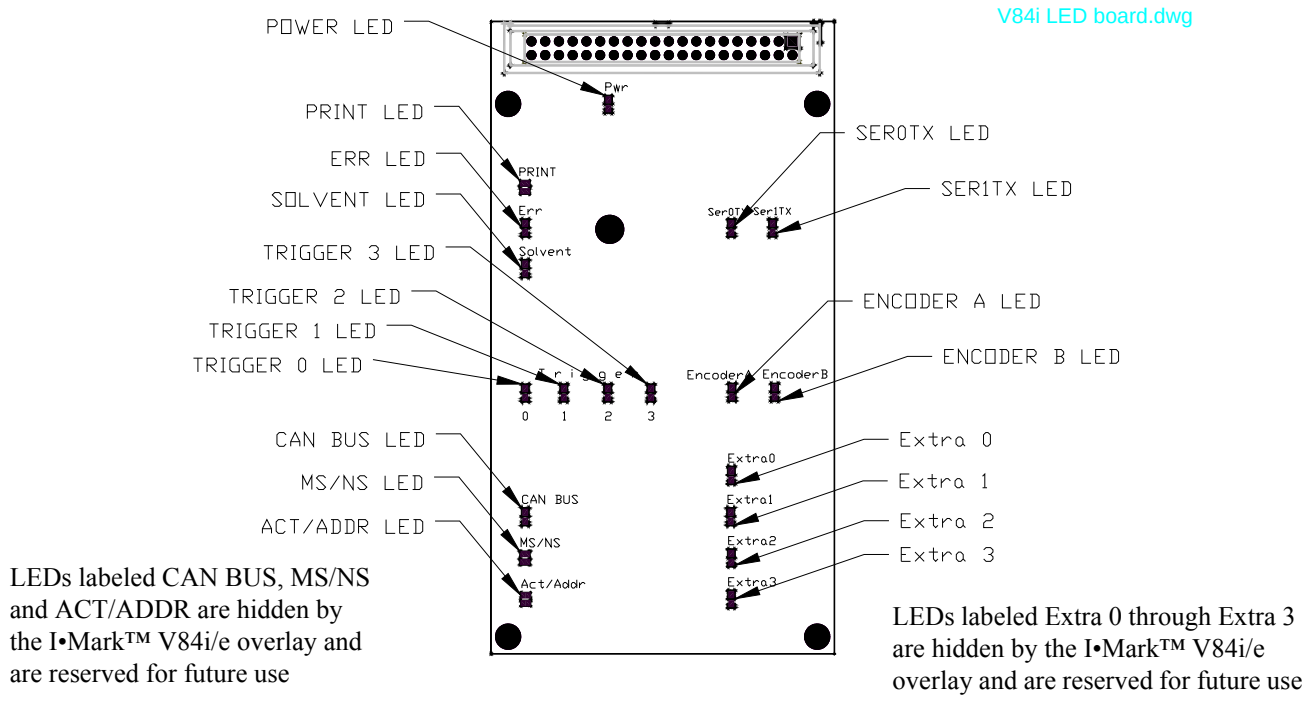
Figure 45

These LEDs can be used for troubleshooting the system. The following table identifies the different LEDs and what they designate, see ***Figure 45*** for LED locations.

Main Board LED Matrix

LED Label	Function
3.3V Supply	Glows with 3.3V Supply (Green)
5.0V Supply	Glows with 5.0V Supply (Green)
KBDUAL	SX Style UI, Print Status (Green/Red)
KBDUAL1	SX Style UI, Print Status (Green/Red)
MAIN3	Glows when drive for valve group 25-32 active (Amber)
MAIN2	Glows when drive for valve group 17-24 active (Amber)
MAIN1	Glows when drive for valve group 9-16 active (Amber)
MAIN0	Glows when drive for valve group 1-8 active (Amber)
BIAS	Glows with BIAS Supply (Green)
Iso485	Glows with ASCII Serial (TP_C+/TP_C-) Supply (Green)
IsoCAN	Glows with CAN (TP_N+/TP_N-) Supply (Green)
IsoAux	Glows with Aux I/O (TP_2+/TP_2-) Supply (Green)
IsoEnc	Glows with Encoder/AuxSerial (TP_C+/TP_C-) Supply (Green)

LED Board



LEDs labeled CAN BUS, MS/NS and ACT/ADDR are hidden by the I•Mark™ V84i/e overlay and are reserved for future use

LEDs labeled Extra 0 through Extra 3 are hidden by the I•Mark™ V84i/e overlay and are reserved for future use

Figure 46

The following table identifies the different LEDs and what they designate, see ***Figure 46*** for LED locations.

LED Board Matrix

LED Label	Function	Notes
Pwr	Glows solid while running / Flashes with RESET (Green)	
PRINT	Print Status (Green/Red)	See ***"Method 9 – ENABLE/DISABLE" on page 72***
Err	Flashes if Error (selected Warning &/or Faults) (Red)	
Solvent	Glows with activation logic for 3-way valve(s) (Amber)	See ***"Method 8 – INK/CLEANER" on page 72***
Trigger0	Glows with Sensor0 active (Green)	
Trigger1	Glows with Sensor1 active (Green)	
Trigger2	Glows with Sensor2 active (Green)	
Trigger3	Glows with Sensor3 active (Green)	
SerTX0	Glows while transmitting on ASCII serial port (Green)	Port 0
SerTX1	Glows while transmitting on AUX serial port (Green)	Port 1
EncoderA	Glows with Encoder channel A active (Green)	
EncoderB	Glows with Encoder channel B active (Green)	
CAN BUS[a]	Glows with external CAN bus Supply (Green)	Hidden by overlay
MS/NS	CAN status (DeviceNET style) (Green/Red)	Hidden by overlay
Act/Addr	CAN activity (DeviceNET style) (Green/Red)	Hidden by overlay

a. The CAN BUS is not implemented at this time.

Interconnect Diagram

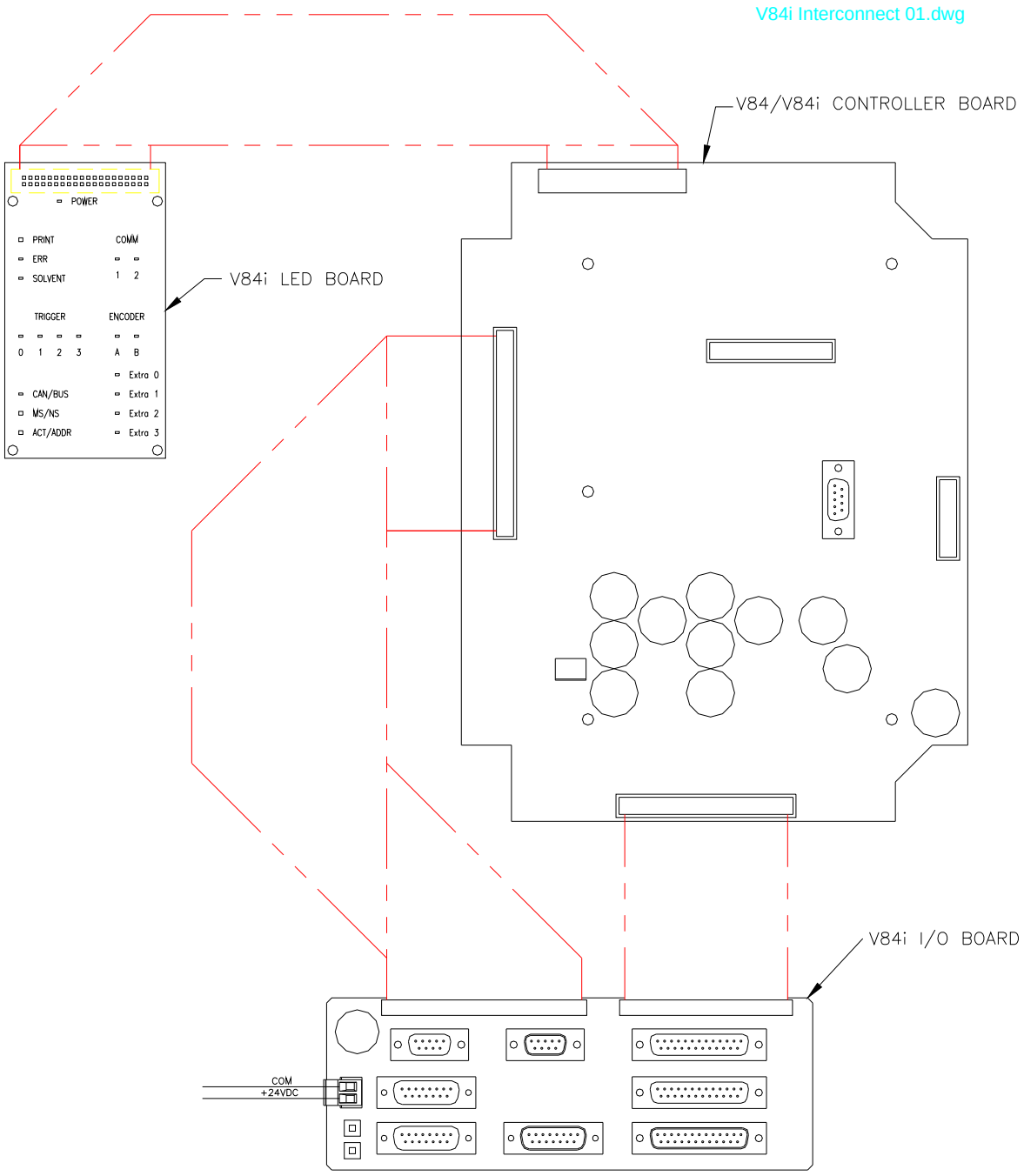


Figure 47

Figure 47 illustrates how the different parts of the I•Mark™ V84i/e are connected together.

Test Points On Board

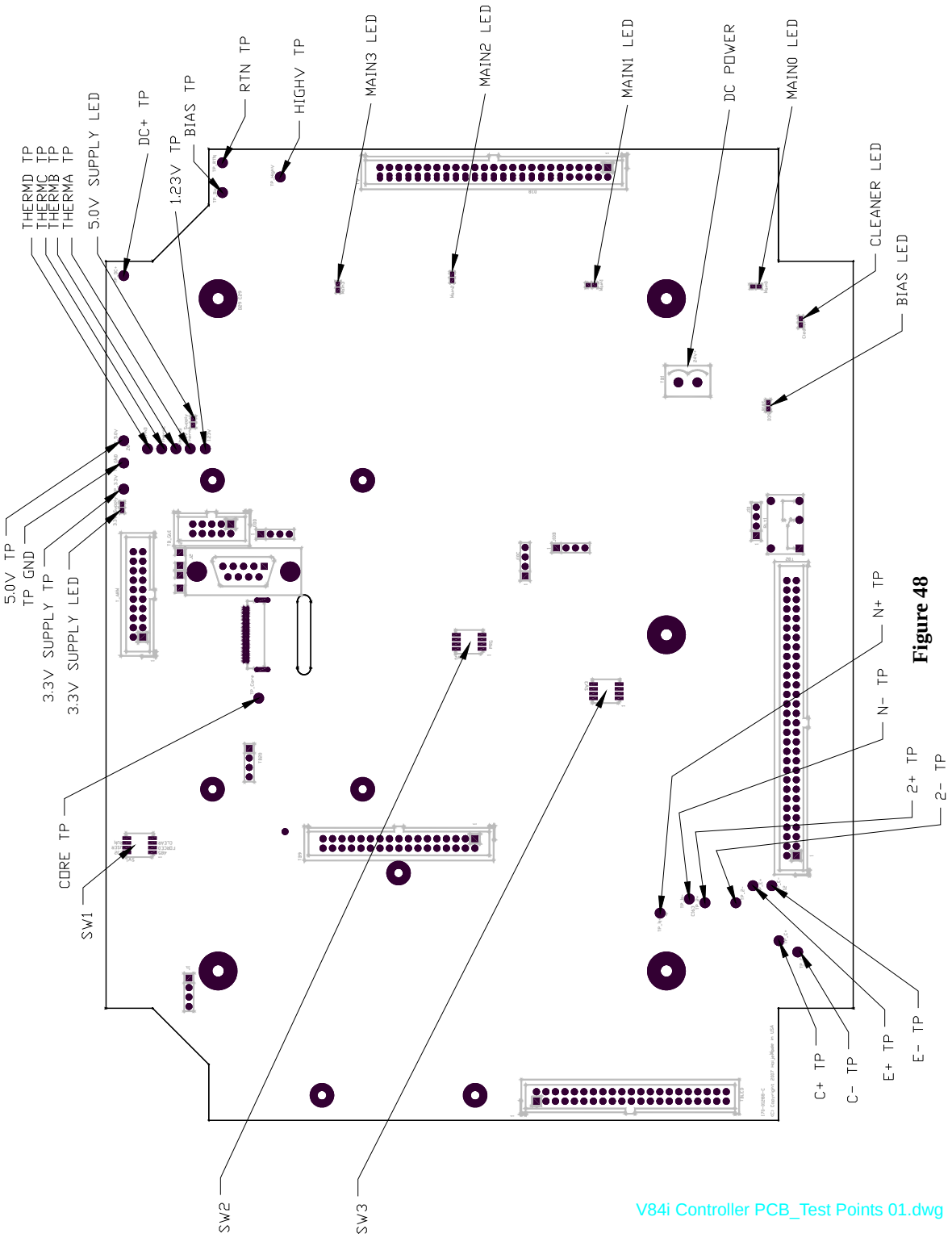


Figure 48

These Test Points can be used for troubleshooting the system. The following table identifies the different Test Points and what they designate, see ***Figure 48*** for Test Point locations.

Test Point	Function
+ (Positive Battery terminal)	(3.0 to 3.3 VDC above TP_GND)
TP_Core	SX Style UI , ARM core supply (1.80 to 1.95 VDC above TP_GND)
TP_3.3V	3.3V Logic Supply (3.2 to 3.4 VDC above TP_GND)
TP_GND	Digital Logic Ground Return (filtered from TP_RTN)
TP_5.0V	5.0V Logic Supply (4.8 to 5.2 VDC above TP_GND)
ThermD	Valve group 25-32 Temp Signal (2.5 to 2.8 VDC above TP_GND @ 25° C)
ThermC	Valve group 17-24 Temp Signal (2.5 to 2.8 VDC above TP_GND @ 25° C)
ThermB	Valve group 9-16 Temp Signal (2.5 to 2.8 VDC above TP_GND @ 25° C)
ThermA	Valve group 1-8* Temp Signal (2.5 to 2.8 VDC above TP_GND @ 25° C) *Also monitors 3-way valve drive temperature.
1.23V	Over Temperature Reference (1.22 to 1.24 VDC above TP_GND)
TP_Bias	Valve drive BIAS supply (10 to 14 VDC above TP_RTN)
TP_RTN	External 24VDC Power Supply Ground Return
TP_HighV	24VDC Supply after input polarity protection (about 24VDC above TP_RTN)
TP_N+	Isolated Supply for CAN interface (4.8 to 5.4 VDC above TP_N-)
TP_N-	Isolated Supply for CAN interface (4.8 to 5.4 VDC below TP_N+)
TP_2+	Isolated Supply for Aux I/O (4.8 to 5.4 VDC above TP_2-)
TP_2-	Isolated Supply for Aux I/O (4.8 to 5.4 VDC below TP_2+)
TP_E+	Isolated Supply for Encoder & AUX (4.8 to 5.4 VDC above TP_2-)
TP_E-	Isolated Supply for Encoder & AUX (4.8 to 5.4 VDC below TP_2+)
TP_C+	Isolated Supply for ASCII Port (4.8 to 5.4 VDC above TP_C-)
TP_C-	Isolated Supply for ASCII Port (4.8 to 5.4 VDC below TP_C+)

DIP Switches

SW1 (4 pos DIP)	(All ON in default condition)
#1	ASCII Serial Port (Port 0) Mode (OFF=RS-485, ON=RS-232)
#2	Serial Port Rates (OFF = Forced to default, ON = User configurable)
#3	Configuration RAM Battery Power (OFF = Clear, ON = Keep)
#4	Future Use
SW2 (4 pos DIP)	(All ON in normal operation)
#1	OFF to program Scenix (Parallax) processors @ U30
#2	OFF to program Scenix (Parallax) processors @ U30B
#3	OFF to program Scenix (Parallax) processors @ U30C
#4	OFF to program Scenix (Parallax) processors @ U30D
SW3 (4 pos DIP)	(All ON in normal operation) - Future Use

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High Speed Applications

The I•Mark™ V84i/e Controller offers a special function that enables higher possible printing speeds when compared to normal operation. Two print heads are required to use this function with one print head printing the odd columns of the message while the other print head prints the even columns.

The special function is controlled by ***"Property 30 – COLSKIP[head]" on page 82***. To utilize this property the print heads must be perfectly aligned. The easiest method to accomplish this alignment is to utilize a logo plate. Consult your local distributor or Matthews Marking Systems for availability.

A logo plate aligns both print heads at the same tilt angle with the nozzles on the same horizontal plane. The print heads are also separated by a horizontal distance that allows the odd/even column printing of one print head to stitch between the columns printed by the other print head. A sample alignment is shown in ***Figure 49***.

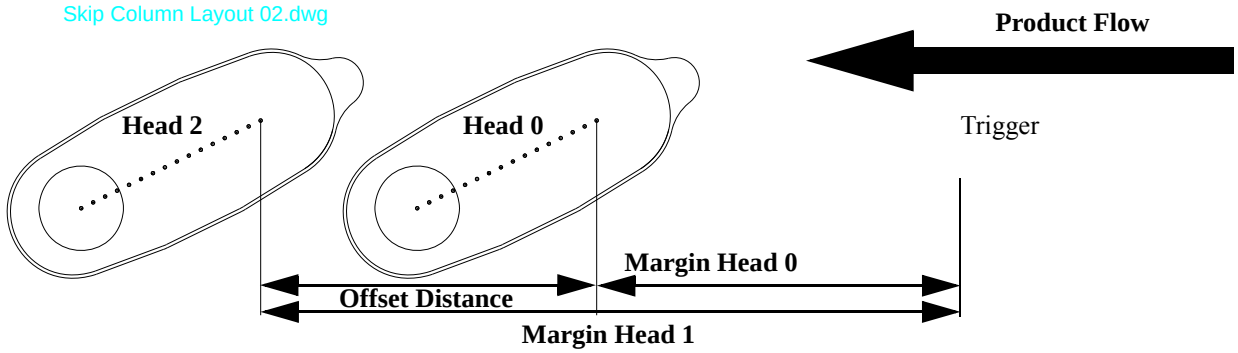

Figure 49

Start-up Suggestions

If there is any problem with the start-up, select one of the print heads and configure for 100% height. Do test prints until all settings such as print direction, encoder factor, etc. are resolved, then continue with the actual installation.

Installation Commands

First, set the configuration to SP CONFIG=2<cr>, see ***"Property 8 – CONFIG" on page 65***. Then each print head needs to be configured to the correct print height, see ***"Property 24 – PRINTHT[head]" on page 81*** and desired aspect ratio, see ***"Property 27 – TILTASP[head]" on page 81*** (these values will depend on the logo plate – print requirements). In addition, the print heads must be given these individual commands:

SP COLSKIP[0]=1<cr>	(Command for Head 0)	{prints the odd columns of the message}
SP COLSKIP[2]=2<cr>	(Command for Head 2)	{prints the even columns of the message}

The print head that approaches the print target **FIRST** should be set to print the odd columns.

In addition, the margin for both print heads must be set, see ***"Property 11 – MARGIN[head]" on page 76***, with the offset distance added to the value for Head 2: i.e. Margin[0] + Offset = Margin[2], see ***Figure 49*** above.

When installing the print heads, perform a separate test print with each print head to confirm the system is set up as designed (if there are any setup issues it is easier to determine where the problem exists when only one print head is printing).

High Speed Applications

Logo Plate Alignment

The logo plate MUST be square to the product flow for the print to be correctly aligned. To assist in getting the alignment correct it is suggested that a test graphic be used. ***Figure 50*** is a typical graphic that could be used.

Figure 50

When the logo plate is correctly aligned, the horizontal lines will be straight. If there is any misalignment, the horizontal lines will have a sawtooth/wavy appearance.

If you would like to utilize this graphic, enter the following command (where "n" is the graphic storage location you select):

SG[n]="FFFF8001FFFFFFFF8001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001800180018001FFFFFFFF8001FFFF",NAME= "BOX",SIZE=16<cr>

Import the graphic into a message and select this message to print with **BOTH** print heads.

CAUTION:

It is critical that all parameters for both heads be identical.

Perform test prints and adjust the alignment of the logo plate until the pattern prints correctly. Be sure to secure the logo plate so that it does not slip out of position.

Message Length

A "side effect" of using the COLSKIP[head] property is that it "doubles" the message length when SP MARKLEN[head]=0 – the "autolength" setting – see ***"Property 14 – MARKLEN[head]" on page 78***.

IMPORTANT:

For this reason, MARKLEN[head] can NOT be set to zero (0) when using the ***"Property 30 – COLSKIP[head]"*** to stitch print head printouts. The V84i will operate when MARKLEN[head]=0, but the stitching will not stay in alignment.

It will be necessary to calculate and set a mark length that reflects the actual length of the print out.

Remember to set the same values for **BOTH** print heads!

Appendix A

Conversion Chart

Conversion Chart		
To Convert	Into	Multiply by
Inches	Millimeters	25.4
Feet	Meters	0.3048

Inches to Millimeter Conversion Chart

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
0.001	0.0254	0.1	2.54	10	254.0	28	711.2	46	1168.4	64	1625.6
0.002	0.0508	0.2	5.08	11	279.4	29	736.6	47	1193.8	65	1651.0
0.003	0.0762	0.3	7.62	12	304.8	30	762.0	48	1219.2	66	1676.4
0.004	0.1016	0.4	10.16	13	330.2	31	787.4	49	1244.6	67	1701.8
0.005	0.1270	0.5	12.70	14	355.6	32	812.8	50	1270.0	68	1727.2
0.006	0.1524	0.6	15.24	15	381.0	33	838.2	51	1295.4	69	1752.6
0.007	0.1778	0.7	17.78	16	406.4	34	863.6	52	1320.8	70	1778.0
0.008	0.2032	0.8	20.32	17	431.8	35	889.0	53	1346.2	71	1803.4
0.009	0.2286	0.9	22.86	18	457.2	36	914.4	54	1371.6	72	1828.8
0.01	0.254	1	25.4	19	482.6	37	939.8	55	1397.0	73	1854.2
0.02	0.508	2	50.8	20	508.0	38	965.2	56	1422.4	74	1879.6
0.03	0.762	3	76.2	21	533.4	39	990.6	57	1447.8	75	1905.0
0.04	1.016	4	101.6	22	558.8	40	1016.0	58	1473.2	76	1930.4
0.05	1.270	5	127.0	23	584.2	41	1041.4	59	1498.6	77	1955.8
0.06	1.524	6	152.4	24	609.6	42	1066.8	60	1524.0	78	1981.2
0.07	1.778	7	177.8	25	635.0	43	1092.2	61	1549.4	79	2006.6
0.08	2.032	8	203.2	26	660.4	44	1117.6	62	1574.8	80	2032.0
0.09	2.286	9	228.6	27	685.8	45	1143.0	63	1600.2	81	2057.4

Appendix A

Conversion Factors

Common Conversion Factors			
	From →	To	Multiply by:
Multiply by:	To	← From	
0.03936996	inch	millimeter	25.4
0.001550003	inch²	millimeter²	645.16
0.06102374	inch³	millimeter³	16.38706
0.2641721	gallon (U.S.)	liter	3.785412
0.0352736	ounce (avoirdupois) (oz.)	gram (g)	28.34952
2.20462	pound (avoirdupois) (lb.)	kilogram (kg)	0.4535924
62.43	lbs./ft.²	g/cm³	0.0160
(°C x 1.8) + 32	°F	°C	(°F - 32)/1.8
0.1450377	psi	kPa	6.894757
14.22334	psi	kg/cm²	0.07030696

Print Height Chart

Print Head Size:		32–Valve Print Head		16–Valve Print Head		7–Valve Print Head	
% Reduction	Tilt angle to product travel	Print Height mm	Print Height inches	Print Height mm	Print Height inches	Print Height mm	Print Height inches
Largest Dot		128	5.04	64	2.52	28	1.1
100	90.0	124	4.88	60	2.36	24	0.94
90	64.0	112	4.41	54	2.16	22	0.87
80	53.0	102	4.02	49	1.93	20	0.79
70	44.5	90	3.54	43	1.69	17	0.67
60	37.0	76	2.99	36	1.42	14	0.55
50	30.0	66	2.60	31	1.22	12	0.47
40	24.0	56	2.20	26	1.02	10	0.39
30	17.6	48	1.89	22	0.94	9	0.35
20	12.0	38	1.50	17	0.67	7	0.28
10	6.0	34	1.34	15	0.59	6	0.24

Appendix A

Tilt Chart

The following table shows selected % Tilt values and the corresponding ° Tilt Angle with the effective nozzle spacing (see ***Figure 51 on page 130*** for an illustration of the “h”, “W” and “H” spacing measurements):

% Tilt	“h” mm	Max “W”	Max Text Height 16–Valve (“H”)	Max Text Height 32–Valve (“H”)	° Tilt Angle	% Tilt	“h” mm	Max “W”	Max Text Height 16–Valve (“H”)	Max Text Height 32–Valve (“H”)	° Tilt Angle
10	0.40	3.98	6.50	13.0	84	69	2.78	2.90	44.40	88.8	46
14	0.56	3.96	9.05	18.1	82	70	2.82	2.86	45.05	90.1	45
20	0.80	3.92	12.75	25.5	79	71	2.86	2.82	45.70	91.4	44
24	0.97	3.88	15.55	31.1	76	72	2.90	2.78	46.30	92.6	44
28	1.12	3.84	17.90	35.8	74	73	2.93	2.73	46.95	93.9	43
31	1.25	3.80	20.00	40.0	72	74	2.97	2.69	47.50	95.0	42
34	1.37	3.76	21.85	43.7	70	75	3.01	2.65	48.10	96.2	41
37	1.47	3.72	23.55	47.1	68	76	3.04	2.60	48.65	97.3	41
39	1.57	3.68	25.10	50.2	67	77	3.07	2.55	49.20	98.4	40
41	1.66	3.65	26.55	53.1	66	78	3.11	2.50	49.70	99.4	39
44	1.74	3.59	27.90	55.8	64	79	3.17	2.45	50.70	101.4	38
46	1.82	3.55	29.20	58.4	63	80	3.20	2.40	51.20	102.4	37
48	1.90	3.51	30.40	60.8	62	81	3.23	2.35	51.65	103.3	36
49	1.97	3.49	31.55	63.1	60	82	3.29	2.29	52.60	105.2	35
51	2.04	3.44	32.65	65.3	59	83	3.31	2.23	53.00	106.0	34
53	2.11	3.39	33.70	67.4	58	84	3.37	2.17	53.85	107.7	33
54	2.17	3.37	34.75	69.5	57	85	3.39	2.11	54.25	108.5	32
56	2.23	3.31	35.70	71.4	56	86	3.44	2.04	55.05	110.1	31
57	2.29	3.29	36.65	73.3	55	87	3.49	1.97	55.80	111.6	29
59	2.35	3.23	37.55	75.1	54	88	3.51	1.90	56.15	112.3	29
60	2.40	3.20	38.40	76.8	53	89	3.55	1.82	56.85	113.7	27
61	2.45	3.17	39.25	78.5	52	90	3.59	1.74	57.45	114.9	26
63	2.50	3.11	40.05	80.1	51	91	3.65	1.66	58.35	116.7	24
64	2.55	3.07	40.85	81.7	50	92	3.68	1.57	58.95	117.9	23
65	2.60	3.04	41.60	83.2	49	93	3.72	1.47	59.45	118.9	22
66	2.65	3.01	42.35	84.7	49	94	3.76	1.36	60.20	120.4	20
67	2.69	2.97	43.05	86.1	48	95	3.8	1.25	60.85	121.7	18
68	2.73	2.93	43.75	87.5	47						

All height measurements in table are in millimeters.

Appendix A

How to Calculate Spacing

The column spacing for a tilted print head is determined by an Aspect Ratio. The "effective" spacing between nozzles varies according to the tilt angle. Three letters are used to designate these values:

Letter	Description
h	The effective vertical spacing of the nozzles, see ***"Tilt Chart" on page 129***
H	The maximum possible print height (varies depending on print head – number of valves)
W	The effective horizontal spacing of the nozzles

These spacing values are illustrated in ***Figure 51***.

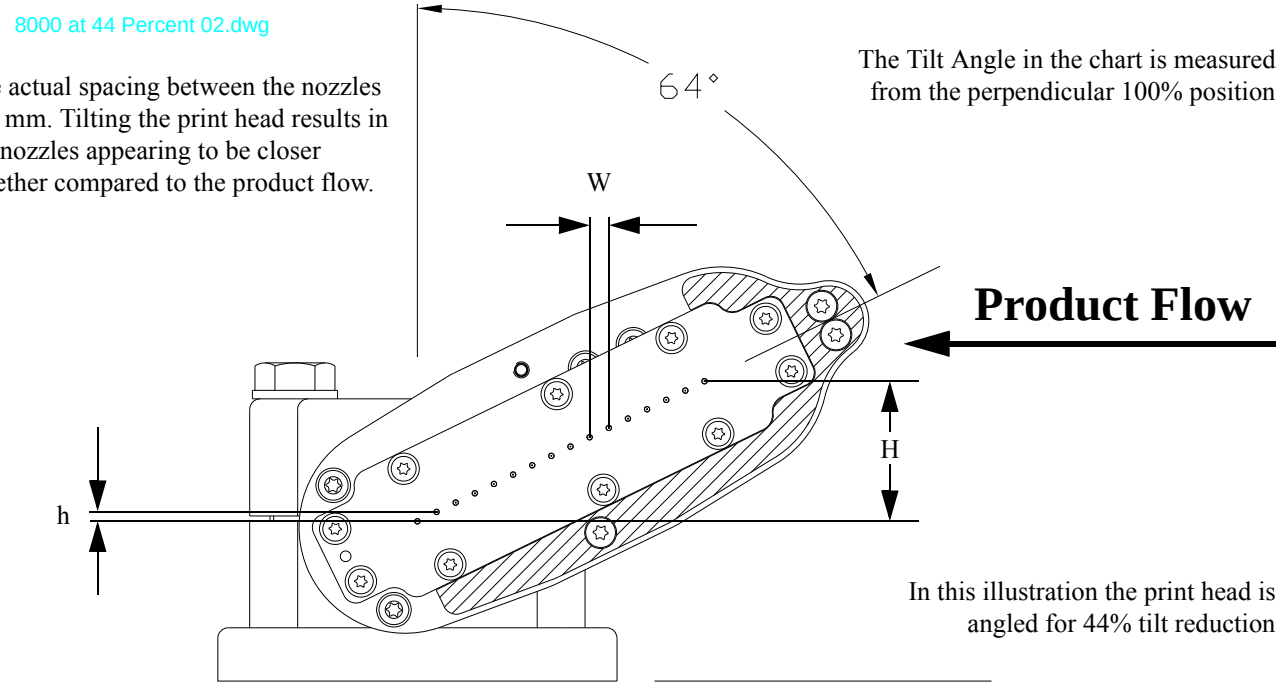

Figure 51

Referring to ***"Property 27 – TILTASP[head]" on page 81***, the horizontal column spacing can be calculated using the ***"Tilt Chart" on page 129***. For example, using the data for the print head illustration in ***Figure 51***, "h" is 1.74mm and "W" is 3.59 mm. The Aspect Ratio is a divisor, so the column spacing choices for this tilt angle are:

Aspect Ratio	Column Spacing
1	3.59 ÷ 1 = 3.59mm
2	3.59 ÷ 2 = 1.80mm
3	3.59 ÷ 3 = 1.20mm
4	3.59 ÷ 4 = 0.90mm
5	3.59 ÷ 5 = 0.72mm
6	3.59 ÷ 6 = 0.60mm
7	3.59 ÷ 7 = 0.51mm
8	3.59 ÷ 8 = 0.45mm
9	3.59 ÷ 9 = 0.40mm
10	3.59 ÷ 10 = 0.36mm

The maximum "W" from the table (for the selected %Tilt – 44%) divided by the Aspect Ratio will determine the Column Spacing. If you take the "h" value into account (in this case 1.74mm), using the Aspect Ratio of 2 would result in a vertical dot spacing of 1.74mm and a horizontal column spacing of 1.80mm. This is effectively a "perfect" aspect ratio where the height and width spacing are the same (or extremely close) value which will result in a printout that looks the way the font was designed to look.

Appendix A

Fonts

The fonts available in the I•Mark™ V84i/e are mono type fonts. All characters in mono type fonts have equal widths. This gives the advantage of the same number of characters always taking up the same amount of space in the message.

Font Spacing Table

The table below is for reference about character size (height is number of dots, width is number of dot columns):

FONT	Character HEIGHT	Character WIDTH	Columns of Separation	Total Width
5-High	5	5	1	6
7-High	7	5	1	6
9-High	9	7	1	8
14-High	14	10	2	12
16-High	16	10	2	12
21-High	21	15	3	18
32-High	32	20	4	24

Bar Code Object Length

Some bar code objects are a fixed length while others are variable. The following table gives the dot column length of the fixed length objects and the formulas for calculating the length of a variable length bar code. In the formulas, “N” is equal to the number of characters in the code. All lengths include the necessary quiet zone that all bar codes require.

CODE	Description	Length in Dot Columns
0	Codabar	10 * N + 41
1	Interleaved 2 of 5	9 * N + 30
2	Code 39	16 * N + 51
3	EAN 8 (fixed length, N = 7)	85
4	EAN 13 (fixed length, N = 12)	113
5	UPC A (fixed length, N = 11)	113
6	Code 128 B	11 * N + 55
7	Code 128 C	11 * (N / 2) + 55

Interleaved 2 of 5 and Code 128 C both require an even number of characters. If an odd number is entered for the data, the print engine will automatically add a leading zero to the string.

EAN 8, EAN 13 and UPC–A are all fixed length bar codes. Again, if the data string is not the correct length the print engine will add zeros to fill to the proper string length. If too many characters are entered the system will return: “Invalid field value”.

 **IMPORTANT:**

Both of these automatic corrections are only in the actual print. A GP (GET_PROPERTY) command will return the entered string value.

Appendix A

Tilt Values Table

Print Height Setting in%	Tilt Value	Print Height Setting in%	Tilt Value	Print Height Setting in%	Tilt Value
10	3.980	41	3.648	71	2.817
11	3.976	42	3.630	72	2.776
12	3.971	43	3.611	73	2.734
13	3.966	44	3.592	74	2.690
14	3.961	45	3.572	75	2.646
15	3.955	46	3.552	76	2.600
16	3.948	47	3.531	77	2.552
17	3.942	48	3.509	78	2.503
18	3.935	49	3.487	79	2.452
19	3.927	50	3.464	80	2.400
20	3.919	51	3.441	81	2.346
21	3.911	52	3.417	82	2.289
22	3.902	53	3.392	83	2.231
23	3.893	54	3.367	84	2.170
24	3.883	55	3.341	85	2.107
25	3.873	41	3.648	86	2.041
26	3.862	56	3.314	87	1.972
27	3.851	57	3.287	88	1.900
28	3.840	58	3.258	89	1.824
29	3.828	59	3.230	90	1.744
30	3.816	60	3.200	91	1.658
31	3.803	61	3.170	92	1.568
32	3.790	62	3.138	93	1.470
33	3.776	63	3.106	94	1.365
34	3.762	64	3.073	95	1.249
35	3.747	65	3.040	96	1.120
36	3.732	66	3.005	97	0.972
37	3.716	67	2.969	98	0.796
38	3.700	68	2.933	99	0.564
39	3.683	69	2.895	100	0.500
40	3.666	70	2.857		

How To Calculate Mark Length

Below are the formulas used to calculate Mark Length. For the number of character dot columns, see ***"Fonts" on page 131***. In these formulas, use the Total Width values from the Font Spacing Table to calculate Mark Length. For the Tilt Table Value, see ***"Tilt Values Table" on page 132***. The Tilt Aspect, see ***"Property 27 – TILTASP[head]" on page 81*** and Column Spacing, see ***"Property 23 – COLSPAC[head]" on page 80*** are values set in configuration.

If print height is under 100%, use the following TILTASP calculation to determine Mark Length:

(Number of characters * number of character dot columns * TILT Table Value) / TILTASP value

For example, if you have eight characters, **MMP V84i**, (including spaces) in a 16–High font at a 25% Print Height Setting and use a TILTASP value of 4 you would get:

(8 * 12 * 3.873) / 4 = 92.952 (rounded to 93mm)

If print height is 100%, use the following COLSPAC calculation to determine Mark length:

(Number of characters * font size width * COLSPAC Value) / 1000

Using the same example of eight characters, **MMP V84i**, (including spaces) in a 16–High font at 100% Print Height Setting and use a COLSPAC value of 1000 you would get:

(8 * 12 * 4000) / 1000 = 384mm

Remote Field Connections

For the I•Mark™ V84i/e Controller to receive data it will be necessary to connect an external source to the interface.

Remote field data is inputted to the AUX Port (see ***"AUX" on page 32***).

The AUX port on the I•Mark™ V84i/e Controller has the following pin assignments:

Pin 1	N/C
Pin 2	Received Data — RX
Pin 3	Transmitted Data — TX
Pin 4	N/C
Pin 5	Signal Ground — GND
Pin 6	N/C
Pin 7	Request to Send — RTS
Pin 8	Clear to Send — CTS
Pin 9	N/C

The data is sent as raw ASCII characters followed by a Carriage Return (ASCII decimal value 13 designated with <cr>).

Appendix A

RS-485

If RS-485 is desired, an internal DIP switch needs to be changed. The location of the DIP switch, SW1, is shown in the circuit board for ***"Test Points On Board" on page 122***. The specific switch position is documented in ***"DIP Switches" on page 123***.

For RS-485 a maximum of 32 addresses are allowed. The units normally operate in a Master/Slave environment 4-wire* configuration:

- The Master transmit pair is connected to all the slave(s) receive pair(s).
- The Slave(s) transmit pair(s) is connected to the Master receive pair.

*5 physical wires are required as a common ground wire is also needed.

When establishing a RS-485 network be sure to set the address for each unit, see ***"Property 8 – ADDR[port]" on page 46***.

Typical RS-485 Network

Figure 52 illustrates a typical RS-485 network.

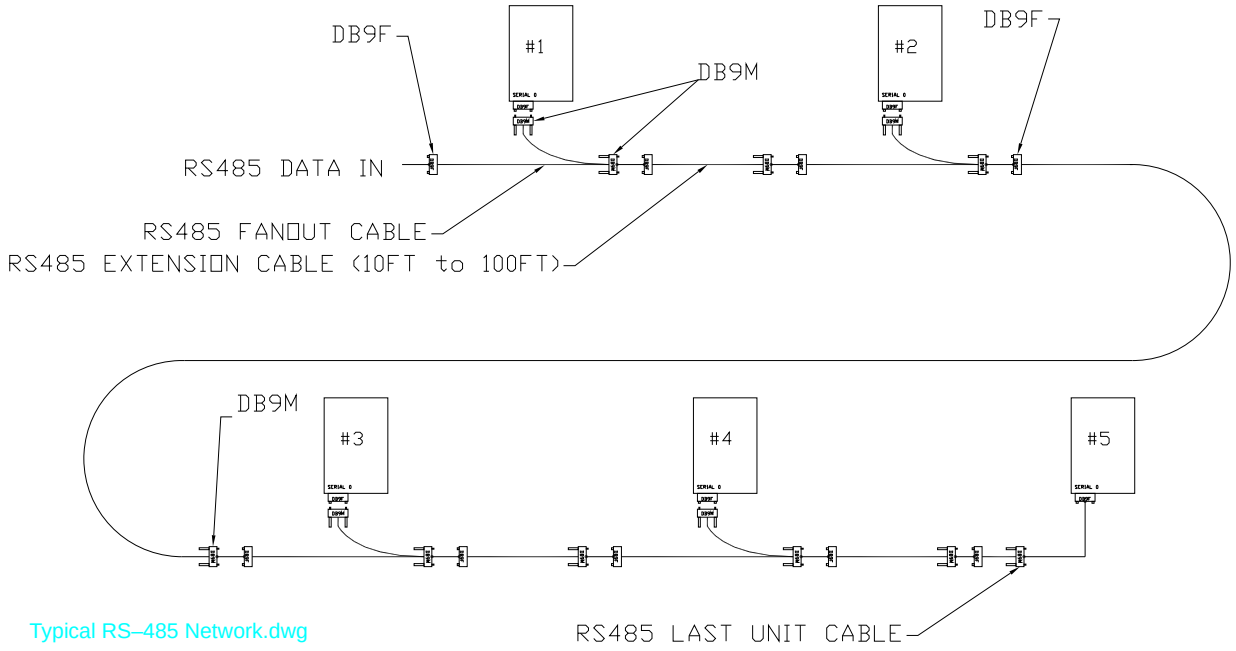

Figure 52

There are three different cables used in a RS-485 network:

Description
V84e/V84i RS-485 Fan Out Cable
V84e/V84i RS-485 Extension Cable, 10 foot (3 meters)[a]
V84e/V84i RS-485 Last Unit Cable

a. For other available lengths, contact your local distributor or Matthews Marking Systems.

Appendix A

UCC Application Identifiers

The following table is a listing of the Application Identifiers (AI) that may be used with the GS1 barcodes.

Data Content	AI	Plus The Following Data Structure
Serial Shipping Container Code	00	exactly 18 digits
Shipping Container Code	01	exactly 14 digits
Batch Numbers	10	up to 20 alphanumerics
Production Date (YYMMDD)	11	exactly 6 digits
Packaging Date (YYMMDD)	13	exactly 6 digits
Sell By Date (YYMMDD)	15	exactly 6 digits
Expiration Date (YYMMDD)	17	exactly 6 digits
Product Variant	20	exactly 2 digits
Serial Number	21	up to 20 alphanumerics
HIBCC Quantity, Date, Batch and Link	22	up to 29 alphanumerics
Lot Number	23*	up to 19 alphanumerics
Quantity Each	30	
Net Weight (Kilograms)	310**	exactly 6 digits
Length, Meters	311**	exactly 6 digits
Width or Diameter (Meters)	312**	exactly 6 digits
Depths (Meters)	313**	exactly 6 digits
Area (Sq. Meters)	314**	exactly 6 digits
Volume (Liters)	315**	exactly 6 digits
Volume (Cubic Meters)	316**	exactly 6 digits
Net Weight (Pounds)	320**	exactly 6 digits
Customer PO Number	400	up to 29 alphanumerics
Ship To (Deliver To) Location Code using EAN 13 or DUNS Number with leading zeros	410	exactly 13 digits
Bill To (Invoice To) Location Code using EAN 13 or DUNS Number with leading zeros	411	exactly 13 digits
Purchase from	412	exactly 13 digits
Ship To (Deliver To) Postal Code within single postal authority	420	up to 9 alphanumerics
Ship To (Deliver To) Postal Code with 3–digit ISO Country Code Prefix	421	3 digits plus up to 9 alphanumerics
Roll Products – width, length, core diameter, direction and splices	8001	exactly 14 digits
Electronic Serial number for cellular mobile phone	8002	up to 20 alphanumerics

For date fields that only need to indicate a year and month, the day field is set to “00”.

* Plus one digit for length indication.

** Plus one digit for decimal point indication.

Appendix A

Rollover Clock Table

Use the following table to clarify the hours figure to enter for the desired offset.

Actual Time	Actual Time	Hours to Move Forward	
Military	**Civilian**	**Rollover Time**	**Examples**
2300	11:00 PM	1	
2200	10:00 PM	2	Date Rollover at 11:00PM
2100	9:00 PM	3	
2000	8:00 PM	4	
1900	7:00 PM	5	Date Rollover at 7:00PM
1800	6:00 PM	6	
1700	5:00 PM	7	
1600	4:00 PM	8	
1500	3:00 PM	9	Date Rollover at 3:00PM
1400	2:00 PM	10	
1300	1:00 PM	11	
1200	12:00 PM	12	
1100	11:00 AM	13	
1000	10:00 AM	14	
0900	9:00 AM	15	Date Rollover at 9:00AM
0800	8:00 AM	16	
0700	7:00 AM	17	
0600	6:00 AM	18	
0500	5:00 AM	19	
0400	4:00 AM	20	
0300	3:00 AM	21	
0200	2:00 AM	22	Date Rollover at 2:00AM
0100	1:00 AM	23	

Julian Dates

A Julian Date is the numbered day of the year (expressed as a three digit number with leading zeros – if needed), starting with 001 representing January 1st. The method for counting the days differs between the U.S. and the European Union. For all years, up to February 28th, the number is the same.

If it is a leap year, on the February 29th the U.S. day number will be 060 and the European Union will be 366. Continuing on the same leap year, March 1st will be day number 061 for U.S. but 060 for the European Union. December 31st will be day number 366 for U.S., but 365 for the European Union.

On a non leap year, all day numbers will match.

Appendix A

Binary Table

The following table illustrates the pins that must have +5VDC applied to in the I/O Port, see the I•Mark™ V84i/e Technical Manual for pinouts, to enable selection of a specific message, see ***"Property 9 – MSGSEL[head]" on page 75***.

	Binary Value	1	2	4	8	16	32		Binary Value	1	2	4	8	16	32
	Pin Number	1	2	3	4	5	6		Pin Number	1	2	3	4	5	6
Message #								Message #							
0		–	–	–	–	–	–	32		–	–	–	–	–	X
1		X	–	–	–	–	–	33		X	–	–	–	–	X
2		–	X	–	–	–	–	34		–	X	–	–	–	X
3		X	X	–	–	–	–	35		X	X	–	–	–	X
4		–	–	X	–	–	–	36		–	–	X	–	–	X
5		X	–	X	–	–	–	37		X	–	X	–	–	X
6		–	X	X	–	–	–	38		–	X	X	–	–	X
7		X	X	X	–	–	–	39		X	X	X	–	–	X
8		–	–	–	X	–	–	40		–	–	–	X	–	X
9		X	–	–	X	–	–	41		X	–	–	X	–	X
10		–	X	–	X	–	–	42		–	X	–	X	–	X
11		X	X	–	X	–	–	43		X	X	–	X	–	X
12		–	–	X	X	–	–	44		–	–	X	X	–	X
13		X	–	X	X	–	–	45		X	–	X	X	–	X
14		–	X	X	X	–	–	46		–	X	X	X	–	X
15		X	X	X	X	–	–	47		X	X	X	X	–	X
16		–	–	–	–	X	–	48		–	–	–	–	X	X
17		X	–	–	–	X	–	49		X	–	–	–	X	X
18		–	X	–	–	X	–	50		–	X	–	–	X	X
19		X	X	–	–	X	–	51		X	X	–	–	X	X
20		–	–	X	–	X	–	52		–	–	X	–	X	X
21		X	–	X	–	X	–	53		X	–	X	–	X	X
22		–	X	X	–	X	–	54		–	X	X	–	X	X
23		X	X	X	–	X	–	55		X	X	X	–	X	X
24		–	–	–	X	X	–	56		–	–	–	X	X	X
25		X	–	–	X	X	–	57		X	–	–	X	X	X
26		–	X	–	X	X	–	58		–	X	–	X	X	X
27		X	X	–	X	X	–	59		X	X	–	X	X	X
28		–	–	X	X	X	–	60		–	–	X	X	X	X
29		X	–	X	X	X	–	61		X	–	X	X	X	X
30		–	X	X	X	X	–	62		–	X	X	X	X	X
31		X	X	X	X	X	–	63		X	X	X	X	X	X

Appendix A

Dot Size Recommendations

Each print head type used with the I•Mark™ V84i/e Printer has a usable range for the dot size used when printing. The controller allows any setting between 50 and 5000, but there are more "normal" values used for typical applications. These are defined in the following table:

Head Type	Normal Range	Recommended Starting Value[a]
14mm	800 to 2000	1000
28mm	800 to 2000	1000 for dye based ink, 1500 for pigmented ink
32mm	800 to 2000	1000
64mm	800 to 2000	1000 for dye based ink, 1500 for pigmented ink
8000 Mini	210 to 500	210
8000 Midi	230 to 600	250
8000 Maxi	300 to 1200	400

a. The setting represents the time in microseconds

IMPORTANT:

A Dot Size that is too small can cause a "no print" condition to occur (the valves are not open long enough for ink to exit the nozzles).

The theoretical maximum possible Dot Size is dependant on the Column Spacing vs. the product line speed. There is a 75% duty cycle limitation (the valves must have time to mechanically close before needing to open again for the next dot column). For a rough estimate of the maximum dot size possible use the following formula:

PS x 0.75 = Maximum Dot Size

Where PS = (Column Spacing in mm ÷ speed in meters per second) x 1000.

If using Imperial measurements, convert the values to metric and insert in the formula. To provide a cushion, you can multiply by 0.70 vs. 0.75.

This result is the total microseconds[6] available for a dot column to be printed.

IMPORTANT:

A Dot Size value that is too large for the Print Speed will result in missing dots in the printout (the valve is still open when the signal to open for the next dot is received – this is ignored which results in missing dots).

If this occurs a smaller Dot Size or larger Column Spacing (or lower Aspect Ratio) value must be used to achieve an acceptable printout.

6. Reminder, the maximum Dot Size setting is this value divided by 10.

I/O Port Pin Assignments

The following table defines the pin assignments for the I/O Port:

Pin #	Bit #	Label	Description	Voltage
1	Bit 0	Input 0	Print Select Binary Coded Bit 0[a]	+5 VDC
2	Bit 1	Input 1	Print Select Binary Coded Bit 1[a]	+5 VDC
3	Bit 2	Input 2	Print Select Binary Coded Bit 2[a]	+5 VDC
4	Bit 3	Input 3	Print Select Binary Coded Bit 3[a]	+5 VDC
5	Bit 4	Input 4	Print Select Binary Coded Bit 4[a]	+5 VDC
6	Bit 5	Input 5	Print Select Binary Coded Bit 5[a]	+5 VDC
7	Bit 6	Input 6	Reserved	
8	Bit 7	Input 7	Reserved	
9	Bit 8	Input 8	Reserved	
10	Bit 9	Input 9	Reserved	
11	Bit 10	Input 10	Reserved	
12	Bit 11	Input 11	Reserved	
13	Bit 12	Input 12	Update counters configured for auxiliary update, see ***"UPDMODE" on page 90***	+5 VDC
14	Bit 13	Input 13	Reset counters configured for auxiliary reset, see ***"RSTMODE" on page 90***	+5 VDC
15	Bit 14	Input 14	Request flush (button), see ***"Push Buttons" on page 34***	+5 VDC
16	Bit 15	Input 15	Toggle between ink and cleaner (button), see ***"Push Buttons" on page 34***	+5 VDC
17	Bit 0	Output 0	Reserved	
18	Bit 1	Output 1	Reserved	
19	Bit 2	Output 2	Reserved	
20	Bit 3	Output 3	Reserved	
21	Bit 4	Output 4	Message rebuild in progress (Rendering begins when the previous message has been fully loaded into the FIFO releasing the message buffer.)	0 VDC
22	Bit 5	Output 5	Printer enabled	0 VDC
23	Bit 6	Output 6	Warnings present, see ***"Property 9 – WARN" on page 57***	0 VDC
24	Bit 7	Output 7	Faults present, see ***"Property 10 – FAULT" on page 58***	0 VDC
25	GND	Ground	Isolated ground	0 VDC

a. Use Bits 0 to 5 to select messages to print if MSGSEL[head]=2, see ***"Property 9 – MSGSEL[head]" on page 75*** and ***"Binary Table" on page 137***.

IMPORTANT:

Note: Inputs are active low with +5V sinking, Outputs are active low sourcing.

Appendix A

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Appendix B

Pre-installed Graphics

There are twenty-four (24) graphics pre-loaded in the I•Mark™ V84i/e Controller.

Table Entry	Name	Dimensions in dots (width x height)	Appearance
0	Up	22 x 16	
1	Fragile	7 x 16	
2	Wet	17 x 16	
3	Knife	16 x 16	
4	Cold	16 x 15	
5	Recyc1	24 x 16	
6	Recyc2	16 x 16	
7	CE	21 x 16	
8	Poison	22 x 16	
9	Heat	12 x 16	
10	Crown	23 x 16	
11	PE-LD	32 x 32	
12	Sun	32 x 32	
13	CST32	72 x 32	
14	EUR32	56 x 32	
15	NF32	51 x 32	
16	CSA16	15 X 16	
17	NSF16	29 X 16	

Appendix B

Table Entry	Name	Dimensions in dots (width x height)	Appearance
18	NSF6116	51 X 16	
19	NSFDWF16	58 X 16	
20	NFSPW16	52 X 16	
21	ULA16	16 X 16	
22	ULR16	27 X 16	
23	UPCR16	27 X 16	

Care should be taken when assigning a memory location for any new graphics.

IMPORTANT:

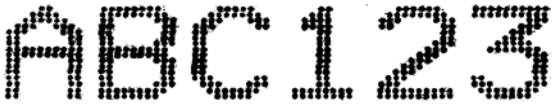
Using a memory location that already had a graphic stored there will result in the original file being overwritten. There is no warning that an overwrite will take place.

Appendix C

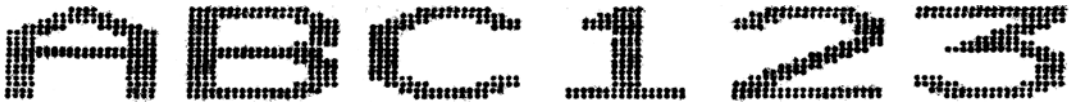
Print Samples

The following print samples were done using a 16-valve print head. The print height and aspect ratio were selected to allow the viewer to distinguish the individual drops to better visualize how the different settings effect the print.

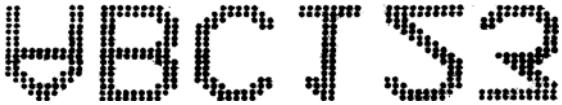
Normal Print



Bold 1 Print

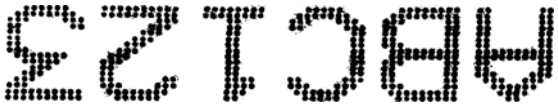


Inverse Print



Reverse Print

Invert and Reverse



Negative Print

Negative Print with Leading Space

Rotate Print

Appendix C

Actual settings used for these print samples:

Property	Value
CONFIG	1
T[1]	“ABC123”,SIZE=16
M[1]	((T[1]@0:0))
MSGNUM[0]	1
ENCMODE	1
ENCFACT	50000
MARGIN[0]	0
MARKLEN[0]	0
DOTSIZE[0]	50
PRINTHT[0]	35
TILTASP[0]	2
PRINTDIR[0]	0

Revision History

Manual Number, Revision Number	Manual issue date (month/year)	Major updates in manual
MV84i-001-00, Version 1.0	04/08	Note 1
MV84i-001-00, Version 1.1	05/08	Note 2
41010433, Rev. 01	09/10	Note 3
41010433, Rev. 02	05/11	Note 4
41010433, Rev. 03	12/11	Note 5
41010433, Rev. 04	02/12	Note 6
41010433, Rev. 05	03/13	Note 7

Note 1:	Initial release
Note 2:	Added support for Flush Button starting with Firmware 201.6.C, corrected default value for MARKLEN[head], updated range of some properties. Added information for RS-485 support. Added Tilt Value Table and formulas to Appendix.
Note 3:	Update to TARGSPD and TILTASP[head], changed index formatting, removed Object 4 Methods 26, 27, 28, and 29 (not implemented through ASCII protocol), corrected Standard DOD print head installation drawing, updated part numbers to SAP system & moved to separate manual, added contact information for Kenuohua Matthews, update to MSGSEL[head], update to Command Index, removed support for 3000 series print heads from installation and maintenance sections. Starting with Firmware 105.8.0 (firmware number is now synchronized with the V84e), added Object 4 Methods, Data Matrix (2D barcodes), ITF14 and SCC14 as well as concatenation feature that goes with them and GS1 bar code support, Master/Slave capabilities, updated terminology in Object 2 Methods, changed the default for RELAYMODE from 0 to 1, changed PRINTCNT from a global to a per head count (PRINTCNT[head]), added values to the PRINTDIR[head] property to enable bidirectional printing. Added information on How to Calculate Spacing, Dot Size Recommendations, I/O Port Pin Assignments to Appendix, added information on how to utilize the higher speed capabilities when using the COLSKIP[head] property and two print heads, updated address for Matthews Swedot, minor formatting changes
Note 4:	Updated print head mounting stand illustrations, corrected some example commands that didn't include the <cr> as part of the string, updated temperature rating range, updated exploded view and dimensional drawings to include new side mounting brackets, added dimensional drawings for power supplies, updated positioning ink supply illustrations, corrected 7-valve configuration cable requirements, corrected Binary Message selection table application statement, added file names to AutoCAD illustrations
Note 5:	Reformatted Binary Message selection table, updated I/O Port Pin Assignment table, added Vcc voltage values to the Encoder and Trigger Port illustration, updated High Speed Applications illustration
Note 6:	Added support for Ethernet Daughter card - firmware 105.8.4 or newer and GUI 1.4.0 or newer (when board is installed in a V84e), reverse quadrature encoder mode, WARMBOOT method, Seconds added to clock object, added measured voltages to I/O port, have optional ITF bearer bars, have optional 2x2 pixels in data matrix codes 16 rows or less, added STRIPE[head] method to Object 3, added statement & changed cover to reflect that the Protocol commands can be used on a V84e when configured for Remote Controlled operation
Note 7:	Clarified Shift Code start time description, clarified that MARKLEN[head] can NOT be set to zero (0) when stitching print head printouts in continuous print mode (when SP MARKEND[head]=0), corrected example for using Modifiers, clarified instructions on using the STRIPE[head] method, added index entries, updated to new logos and division name, minor formatting changes

Notes

Notes

For miscellaneous notes:

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