



MarkIDS-L

Ink Delivery System

Installation and User's Manual



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Revision History

Revision	Description of Change	Author	Date
A	As issued	BB	4/27/11
B	Added diagram for mounting specifications Updated diagrams, mounting instructions Added re-priming rate information	BL/CS	8/29/12

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MarkIDS-L Introduction

The MarkIDS-L provides a bulk ink supply with an automatic low ink indicator and connection to Quick Disconnect (QD) HP45 print cartridges through a regulator. Use of bulk ink supplies allows longer printing times before ink changes are required and enables lower cost per print.

This document describes how to assemble and use the MarkIDS-L system to print vertically downwards onto a horizontal surface or sideways onto a vertical surface. A printing system equipped with a MarkIDS-L consists of the following six major components. Typical layout of the system is shown in Figure 1.

1. Bulk Ink Container,
2. MarkIDS-L Ink Delivery System,
3. HP Backpressure regulator(s), one for each QD Cartridge,
4. Quick Disconnect HP45 print cartridges, each equipped with an ink feed tube (referred to here as the "QD Cartridge"),
5. QD cartridge pockets (not shown)
6. Priming Tool (not shown)

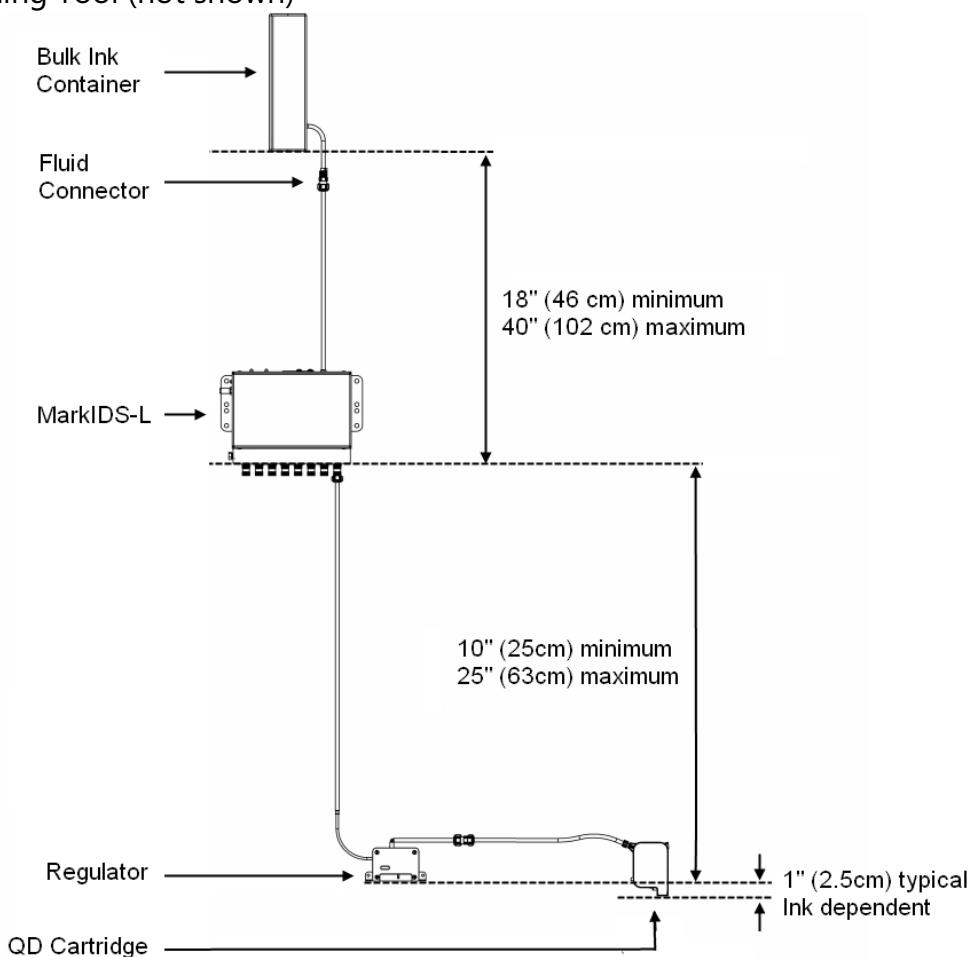


Figure 1: MarkIDS-L System Layout

MarkIDS-L Operation

A bulk ink container is connected to the input connector of the MarkIDS-L and supplies ink down through the regulator to the QD Cartridge. This system is demand driven and as ink is printed replacement ink is provided to the cartridge from the ink container. When the ink level in the ink container is full the green LED on the top of the unit will be lit. When the ink level in the tank gets low the green LED will turn off and the red LED will turn on. If the optional light tree is attached it will show similar light conditions. Once low ink has been indicated the ink container should be changed in a timely manner or the print cartridge could deprime. The time from when low ink is indicated until a cartridge deprime will occur varies by application and is primarily dependent on the rate at which ink is being used.

An ink container is replaced by disconnecting at the input fluid connector and connecting a full container. After use the old container should be disposed of properly.

One to four cartridges can be supplied with ink from a MarkIDS-L 4-Ink-Outs unit and one to eight cartridges from a MarkIDS-L 8-Ink-Outs unit. A regulator is required between the MarkIDS-L and each printhead that it supplies.

MarkIDS-L Installation

This section contains instructions on how to position the components of the system relative to one another and how to connect them together, to print either vertically downward or sideways.

It is important to note that all the specifications listed in this document refer to dimensions along the vertical direction. The installers have some flexibility to position the ink delivery system components in a horizontal direction, as long as the vertical distance guidelines are followed. For example, it is not an absolute necessity to have vertical alignment between the MarkIDS-L unit and the ink container, but the vertical distance between them must be between 18" and 40". This flexibility allows the installer to tailor the tube routing as required, however sharp bends in the tubing should be avoided.

The system tubing should run in a continuous downward slope from the bulk ink container to the MarkIDS unit, to the regulator, then to the cartridge, except where impossible to do so. Loops and "U"-shaped bends in the tubing layout tend to act as air traps and must be avoided. This helps avoid air blockage of the ink feed tubing, which can cause the QD Cartridge(s) downstream to starve for ink while printing.

Step 1: Position the cartridge pocket

Position the cartridge pocket so the nozzle plate to substrate spacing is 0.5-2 mm. Note that during use, this nozzle-to-substrate spacing will be subject to adjustment for best print quality.

Step 2: Adjust the regulator position

a) For vertical Downward Printing

Each regulator should be positioned so its bottom surface is above the cartridge nozzle plate by a vertical distance of approximately 1.0" (2.5 cm). This distance may vary some depending on the ink used. (See Figure 2)

b) For sideways printing

Each regulator should be positioned so its bottom surface is above the flex interconnect surface of the cartridge by a vertical distance of approximately 1.25" (3.2 cm). This distance may vary some depending on the ink used. (See Figure 3)

The optimal distance varies with each regulator and the ink being used. During use, fine adjustment of the height of each individual regulator relative to the QD Cartridge connected to it may be necessary. For this reason, it is recommended to install a regulator mount for each regulator that allows vertical adjustment between the bottom of the regulator and the cartridge nozzle plate over a range of 0 to + 2 inches (0 to 5 cm) in 0.25 inch (0.5 cm) maximum increments.

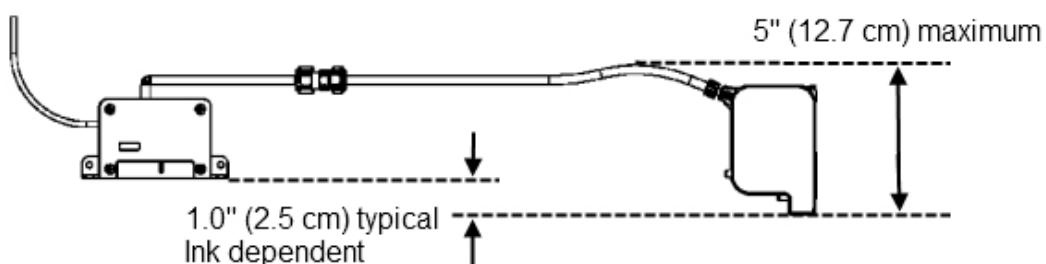


Figure 2: Downward Printing

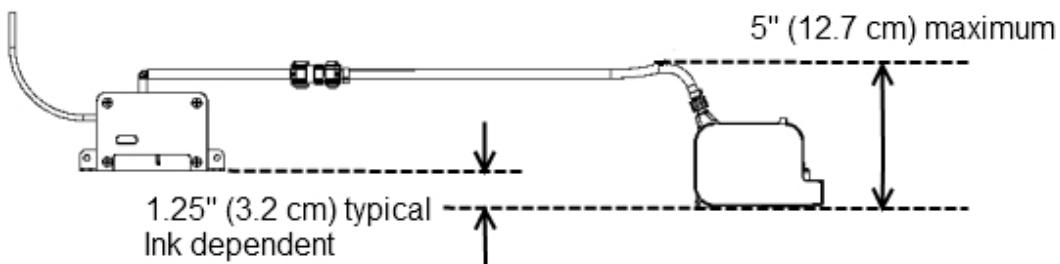


Figure 3: Sideways Printing

When connecting each regulator outlet port with its QD Cartridge, the highest point in the tubing run must be no more than maximum height shown in figures 2 and 3. Care should be taken to minimizing overall tube length and avoiding sharp bends (see Figure 2 and 3). In addition, do not allow any vertical sag or "back bow" in the tubing run between the regulator and the QD Cartridge: **no part of the ink feed tube or tubing connector should ever drop below the point where the fitment on the QD Cartridge attaches to the ink feed tube.** If necessary, furnish support to the tube(s) as needed to prevent sag.

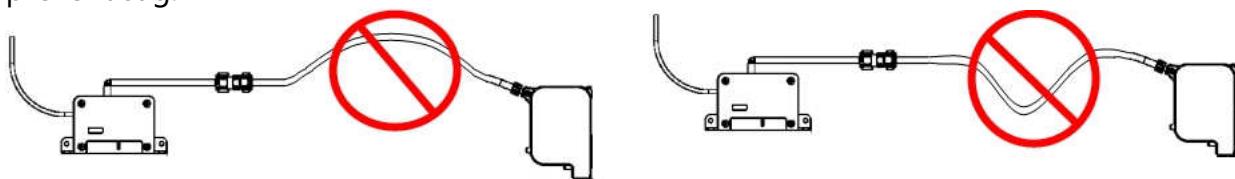


Figure 5: Tube Layouts to Avoid

Loops and "U"-shaped bends in the tubing layout tend to act as air traps and must be avoided wherever possible. Horizontal tubing runs from the regulator should be sloped downward towards the QD Cartridge end of the installation. This helps avoid air blockage of the ink feed tubing, which can cause the QD Cartridge(s) downstream to starve for ink while printing

See TECHNICAL NOTE #1 in the appendix for adjustments of the regulator position.

Step 3: Position Mark IDS-L system

The MarkIDS-L unit is positioned above the regulator so that the vertical distance between the bottom surface of the MarkIDS-L housing and the bottom surface of the regulator housing falls within the minimum and maximum indicated in Figure 1.

Step 4: Position Bulk Ink Container

For maximum ink recovery from the Bulk Ink Container and most consistent INK LOW warning from the MarkIDS-L unit, the ink container should be oriented with its long axis vertical and its ink outlet tube nearest the bottom of the box. Position the ink container so the bottom surface of the ink container box is at least 18 inches and no more than 40 inches above the bottom surface of the MarkIDS-L housing. Restrain the ink container so it will not tip over or fall as it empties.

Positioning the ink container at a vertical distance less than the recommended 18" will trigger the LOW ink signal early, leaving extra unused ink in the ink container.

Step 5: Connect the Bulk Ink Container to the MarkIDS-L

Once the components are positioned per the layout dimensions, they should be connected together and primed for use as follows. See TECHNICAL NOTES #2 and #3 in the appendix for additional information on the tubing connectors used in the MarkIDS-L system.

Extract the ink-feed tube from the cutout on the side of the ink container box and connect it to the tube leading to the inlet port on the top of the MarkIDS-L housing.

Step 6: Connect the regulator to the MarkIDS-L

Connect the inlet line of the regulator (tube on the regulator housing) to one of the outlet ports on the bottom of the MarkIDS-L housing.

Step 7: Prime the system

Make sure to start with a full Bulk Ink Container.

Connect the priming tool to the outlet port on the top of the regulator housing and gently withdraw the plunger from the syringe tube, until all the air in the tubing between the ink container and the regulator outlet has been suctioned into the syringe. Do not withdraw the plunger at a rate greater than 1mL per second. Priming faster than this rate can damage the regulator and cause to it malfunction. Expect to use 10-25 mL ink per regulator when priming. This is a one time process.

It is recommended that nitrile rubber gloves be worn when working with fluid connectors.

If more than one QD Cartridge is to be connected to the Mark IDS-L unit, repeat steps 6 and 7 for each QD cartridge/regulator pair. Repeat this priming process until all the regulator lines you wish to use have been primed.

Step 8: Connecting QD cartridges to already primed system

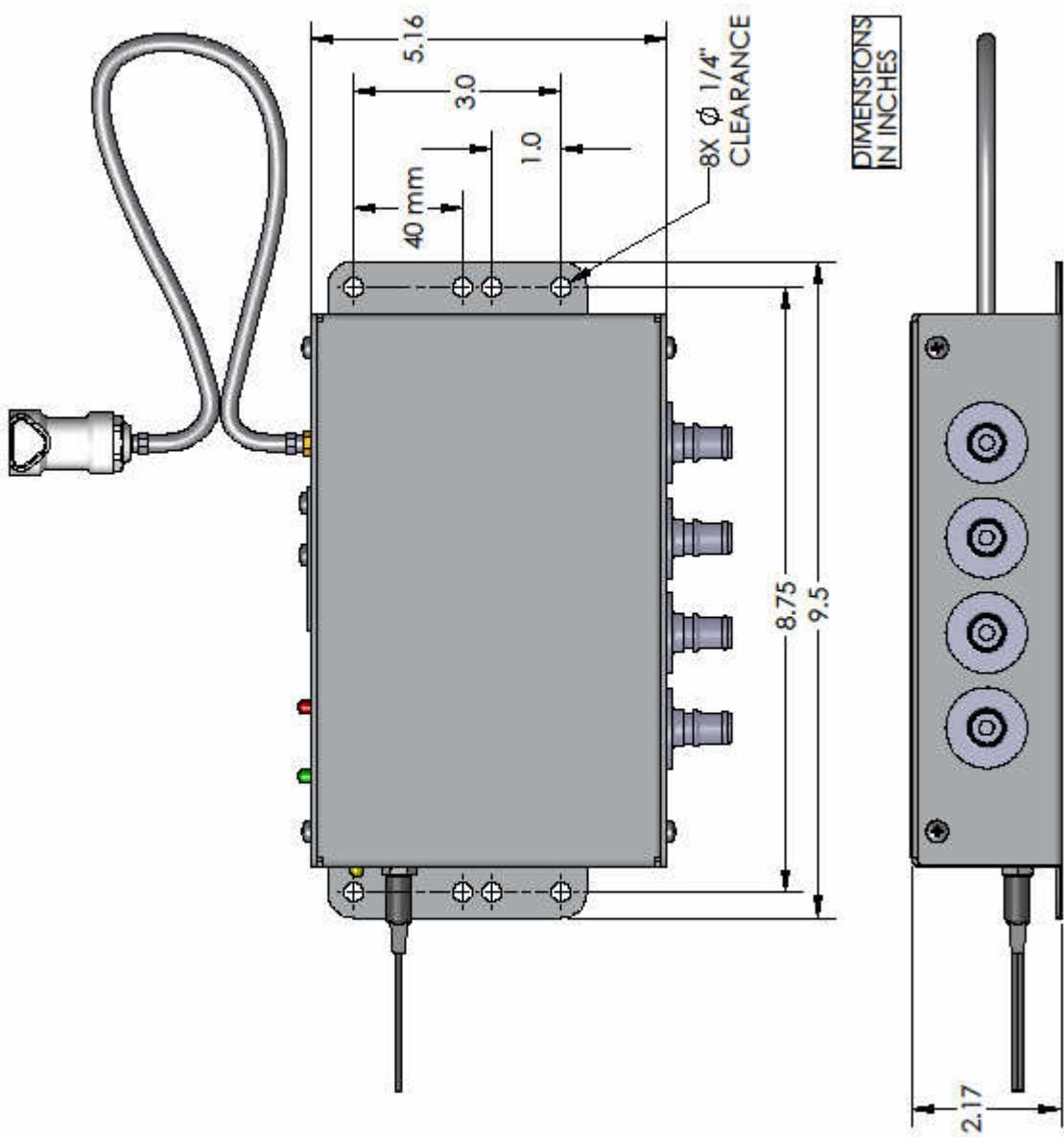
Slip the QD Cartridge into an unoccupied pocket and make sure the cartridge is electrically in contact with the pocket. If the pocket has a protective lid, it should be closed after installing the QD Cartridges. In some equipment the lid is interlocked with the drive electronics and the cartridges will not fire unless the lid is closed.

Connect each QD Cartridge to its regulator. See **Step 2** for details on best and worst tubing run layouts.

Step 9: Power the MarkIDS-L unit—and you are ready to print

Plug the power supply for the MarkIDS-L into an AC outlet and observe that the yellow power light and the green INK OK light are lit.

MarkIDS-L Mounting Dimensions



APPENDIX

Technical Note #1: Regulator position adjustment

When furnished with external ink flow from the regulator, the ink accumulator inside the QD Cartridge will equilibrate with use at a gross weight (QD Cartridge plus ink) of between 95 and 120 grams. This weight is called the static steady state weight. Weights approaching 130 grams present a risk of ink drool from the nozzles and are remedied by reducing the vertical offset between the nozzles and the regulator bottom surface by about 0.25 inch. Weights below 90 grams indicate a risk of ink starvation and are remedied by increasing the vertical offset between the nozzles and the regulator bottom surface by about 0.25 inch. A safe static weight may be between 95 and 120 grams depending on the regulator condition.

While setting the regulators based on static equilibrium weight is generally safe, the best approach is to set the vertical height based on the weight reached by the cartridge during continuous printing. This weight is called Dynamic steady state weight. It is best determined by removing the QD Cartridge for a weight measurement during a normal printing operational regime to accurately determine its "active" weight while it is drawing ink from the regulator. If the "active" weight is below 95 grams, adjust the height of the regulator up in 0.25 inch increments and take a measurement after each adjustment.

Technical Note #2: How to make and break leak free fluid couplings

As shown in Figure 1, leak free fluid connectors are used between the ink container and the MarkIDS-L, between the MarkIDS-L and the regulator, and finally between the regulator and the QD Cartridge.

These couplings are joined together inserting the male connector into the female connector at an offset of 90 degrees, and twisting with gentle force in the clockwise direction $\frac{1}{4}$ turn until the two halves click together.

When necessary, the connectors are decoupled by turning in the counter-clockwise direction $\frac{1}{4}$ turn, and pulling them apart. While un-twisting you will hear the spring-loaded valve mechanism inside the connector make a quiet "click" sound, indicating the valves have sealed shut.

Technical Note #3: Leak free fluid couplings and contamination

The mating surfaces and internal valve mechanisms inside a fluid connector pair are sensitive to contamination by dirt and dust. Contamination will interfere with the functioning of the seals and valves inside the couplings and may allow ink to leak out of, and/or air and dirt to leak into the ink plumbing. This leads to ink spills, clogged nozzles, or deprime.

If a fluid connector pair must be disconnected and left in a dirty environment, both coupling halves should be protected from dust and debris by placing each inside a small Zip-Loc™ bag. The male fitting should be hand wiped clean and free of debris with a dry lint free material such as TechniCloth #TX609 just prior to reconnection. Be very careful not to press on the valve core, as this will open the valve and allow fluid to escape and air to enter the ink plumbing.

If the female half of the fluid connector needs cleaning, gently use a lint-free polyester swab. Be very careful not to press on the valve core, as this will open the valve and allow fluid to escape and air to enter the ink plumbing.

Technical Note #4: System re-priming

During connection and disconnection of the fluid couplings in a MarkIDS-L installation, a small amount of air may be introduced into the ink lines. It is not necessary to remove that air before starting the printing job. However, if air has accumulated anywhere in the tubing run from the outlet of the ink container to the inlet of the regulator to the point where it occupies several inches of tubing length and/or is visibly interfering with the ink flow, it is advisable to remove the air with an authorized Priming Tool. It is recommended that nitrile rubber gloves be worn when working with fluid connectors.

Priming process:

- 1) Make sure that regulators are attached to the MarkIDS-L as described above in Step 6.
- 2) Connect the Priming Tool to the outlet port on the top of any of the Regulators in the installation. This is the end that connects to the print cartridge.
- 2) Slowly and gently withdraw the plunger from the syringe tube, until all the air in the tubing between the Bulk Ink Container and the Regulator outlet has been suctioned into the syringe. Do not withdraw the plunger at a rate greater than 1mL per second. Priming faster than this rate can damage the regulator and cause it malfunction.
- 3) Detach the Priming Tool from the primed Regulator and repeat this process for each Regulator in the installation. **NOTE THAT A MULTIPLE-REGULATOR INSTALLATION WILL REQUIRE MULTIPLE PRIME CHARGES OF INK AS DESCRIBED ABOVE. MONITOR INK QUANTITY IN THE BULK INK CONTAINER DURING THIS PROCESS AND REPLACE IF NECESSARY.**

To empty the syringe any time, push in the plunger handle. This will dispel ink from the syringe into the bottle. The check valve in the line going to the connector will prevent ink from going to the regulator.

IF YOU ARE NOT USING AN AUTHORIZED PRIMING TOOL, DO NOT ATTEMPT TO FORCE INK BACK INTO THE TUBING THROUGH THE REGULATOR. This will permanently damage the regulator and cause it to malfunction.