

---

---

# HXM Screening module

Technical Note Hqn077

December 2010



# 1 Introduction

This document describes the HXM (Harlequin Cross-Modulated) screening plugin for the Harlequin RIP™. HXM screening is supplied as a plugin upgrade to the Harlequin RIP and requires a security password for it to be enabled.

In the current printing on paper marketplace the challenge between increasing costs, particularly paper, results in lower quality papers being used coupled with higher customer expectations. HXM screening is a solution that addresses both these issues. Higher screen rulings can be used without major re-tooling, producing visually higher quality printing. The range of screens offered within the HXM screen set can handle both matte and gloss stocks.

HXM screening is a combination of Traditional Amplitude Modulated (AM) screening and Pseudo-Randomized Frequency Modulated (FM) screening which allows higher screen rulings than is provided by AM screens alone.

The following information is available:

- [“System requirements” on page 2.](#)
- [“Installation notes” on page 3.](#)
- [“What is HXM hybrid screening?” on page 5.](#)
- [“Which HXM screens are available?” on page 6.](#)
- [“Screenings compared” on page 8.](#)
- [“Calibration” on page 8.](#)

## 2 System requirements

To operate correctly the HXM screening plugin requires:

- [A v7.1 or later Harlequin RIP.](#)
- [A security key \(password\).](#)

### 3 Installation notes

To install HXM screening use the following procedure:

1. Double-click the HXM installer **Install\_HXMscreening.exe**.
2. Click **< Previous** to display a previous screen or **Next >** to move onto the next screen.
3. In the “Choose Plugins” window select one or both of **HXM Traditional Screening X.Xrx** or **HXM Round Screening X.Xrx**. Where **X.Xrx** is the version number. Click **Next >**.
4. In the “Install Folder” window select the folder containing the Harlequin RIP to which you want to install the screens. Click **Choose** and select the folder. If an invalid folder is selected an error message will appear. Click **Next >**.
5. The “Select HXM Traditional screen set(s)” window allows you to choose which traditional screen sets you want to install. Make your choice and click **Next >**.
6. The “Select HXM Round screen set(s)” window allows you to choose which round screen sets you want to install. Make your choice and click **Next >**.
7. In the “Evaluation License Agreement” window you must accept the agreement and click **Next >** to continue.
8. The Pre-Installation Summary” window allows you to review your previous selections. Click **< Previous** to change your options. Click **Install** to continue.
9. Click **Next >** and **Done** when the installation is complete.

To enable HXM screening you must add a password to the Enable Feature dialog by selecting **Configure RIP > Extras**, choosing HXM- Cross Modulated Screening and clicking **Add**.

The HXM screening plugin needs two procsets normally present in v8.0 RIPs: **HqnHtm** and **HqnPluginConf**. **HqnHtm** (replacing `add_sdef`) adds the screen definitions to the RIP’s screen table. **HqnPluginConf** adds the definitions to the Screen Names list for use with the Harlequin RIP GUI. The plugin installer will install versions of both files when a v7.x RIP is detected.

The plugin is installed into a new directory called `\SW\Tiles`. This keeps the screen definitions away from the screen cache (in `\SW\Screens`).

A new Extra start file is provided which activates the HXM screen set on start-up.

When using the HXM screens you must ensure that the Resolution is correctly configured within the RIP.

**Note:** Do not use the HXM screening plugin with ink jet printers.

## 4 An overview of AM and FM screening

A common artifact of conventional fixed screening (AM) is moiré. This can be reduced by careful manipulation of screen angles, adjusting the input resolution and increasing the output lines per inch (LPI). Other screening types can eliminate moiré but have additional printing requirements so may not be suitable in some applications. Increasing the LPI can greatly reduce moiré but this requires that the printing system uses higher screen rulings, and printing at higher screen rulings places additional demands on the entire pre-press and press systems where dot gain or tone value increase (TVI) and registration become more critical, especially where color fidelity and print quality are to be maintained. The challenge with conventional AM screening is to be able to print the smallest dots possible to enhance detail, maintain highlight detail, and to provide smooth gradients when present.

HXM screens have been designed to solve the printing challenges that come from printing at higher screen rulings.

Frequency Modulated Screening (FM) places dots of varying size in a pseudo-random way to produce the required tints. Some of the advantages include increased apparent sharpness and the removal of cross screen and object moiré. This is accomplished because the dots are dispersed instead of clustered as they are in a traditional periodic screen.

Some of the limitations of FM screens, because of the variable dots, include ink tack needing adjustment from conventional screens, printing blanket hardness, TVI, dots not being printable for long runs and substrate quality which can cause piling. Also some FM screens can show graininess in the highlights for some colors. FM does provide the possibility for making ink

savings and, if process control is tightly maintained, has been shown to be able to print purer colors. Second order FM screens have attempted to control the press issues but research and testing is still required to optimize an FM screen to a given printing press.

## **5 What is HXM hybrid screening?**

Hybrid screening is designed to improve print quality by increasing the output LPI for any given resolution. For example, if a printer is currently imaging plates at 2400 DPI with output at 150 LPI and is able to hold a 1% dot when printing on the required substrate, using HXM screens it would be possible to print at 200–250 LPI without any special pre-press or on press requirements. The TVI difference between the current printing setup and the HXM screens would need to be adjusted to optimize the printing.

The areas that suffer most when trying to increase the LPI for a given printing condition, typically the substrate being the largest factor, is the loss of dots in the highlights and merging of dots in the shadows (loss of shadow detail). Using current computer-to-plate imaging systems at 2400 DPI it has been shown that a 0.5% dot can be produced on some plating material. However, only a very controlled printing system, on the finest sheet fed presses with premium gloss paper stock can this 0.5% dot actually print over the course of a reasonable press run. This is where HXM comes in. HXM recognizes the issue and is, therefore, designed to carefully control the dot size and placement in the 0–8% and 92–100% range within the tone scale.

In essence, a Traditional AM dot shape is used (something similar to Euclidean) for the 9–91% tonal region and a Frequency Modulated or FM dot for the two end regions. Two distinct features make this type of screen a true Hybrid. First is the use of two screening types to form a combined screen, and second the fact that the dot size is fixed at a known printable size, which ensures print quality at the extreme ends of the tonal scale. The number and placement of the dots in the FM regions use a combination of blue noise masks and a randomization generator but are aligned with the traditional screens to ensure a smooth transition from the FM to AM or AM to FM.

## 6 Which HXM screens are available?

The first step in optimizing for HXM screens is to determine how the current printing method is holding highlight dots. If, for example, you are currently printing at 175 LPI and can print a 2% dot reliably, this is an indication of where to begin in the selection of an HXM screen set. At 2400 DPI and 175 LPI, a 2% dot would equal a 21 micron spot. By referencing [Table 1, on page 6](#) you can see that HXM Fine would be the correct match and therefore a good starting point from which to run tests. You would then choose what LPI is required and begin testing.

Screen name	Highlight	Micron size	Shadow
HXM X-Fine	1 x 1	10.58 (11)	2 x 2
HXM Fine	2 x 2	21.16 (21)	3 x 3
HXM Medium	3 x 3	31.75 (32)	4 x 4
HXM Coarse	4 x 4	42.23 (42)	6 x 6

**Table 1** Image resolution 2400 DPI

[Table 2, on page 6](#) and [Table 3, on page 7](#) show some of the DPI and LPI options possible with the HXM screening technology for a traditional and round dot shape. The screen tile sizes are fixed and the LPI options are therefore calculated from these tiles. Some rounding has occurred but you can see the relationship of say 1200 DPI at 120 LPI and 2400 DPI at 240 LPI which has doubled.

**Note:** Alternative options to suit your specific printing requirements can be calculated and created and would be handled by special request.

1200 DPI	1270 DPI	2400 DPI	2540 DPI
<b>105 LPI</b>	<b>110 LPI</b>	<b>133 LPI</b>	<b>180 LPI</b>
<b>120 LPI</b>	<b>127 LPI</b>	<b>150 LPI</b>	<b>200 LPI</b>
		<b>210 LPI</b>	<b>220 LPI</b>
		<b>240 LPI</b>	

**Table 2** Traditional dot shape DPI/LPI

1200 DPI	2400 DPI
<b>75 LPI</b>	<b>133 LPI</b>
<b>85 LPI</b>	<b>150 LPI</b>
<b>95 LPI</b>	
<b>105 LPI</b>	
<b>120 LPI</b>	

**Table 3** Round dot shape DPI/LPI

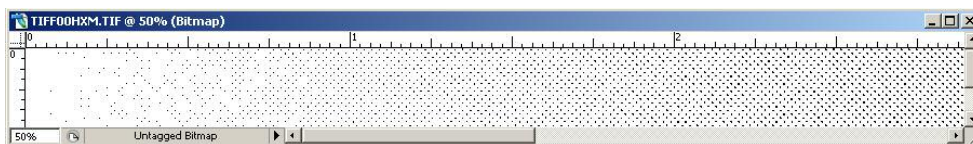
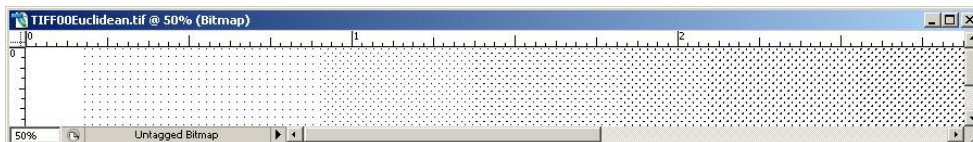
To continue the example of using the HXM Fine screens, the highlight printing would maintain the 21 micron spot size throughout but alter their number and placement to obtain the correct tone scale value. The same process is done in the darkest area of the tone scale. This ensures that at the higher screen rulings for our example (190 LPI, 210 LPI, or 240 LPI from the table above), provided the same process control is maintained, the highlight and shadow regions will hold the dots at 21 microns (which was shown to be printable) and thus higher quality printing can be achieved.

As shown in the tables above a limited number of HXM Generic screen sets have been created and made available for evaluation. Three industry segments were defined as follows: Newspaper printing, Commercial printing, and Flexo Printing. From the [Table 2, on page 6](#) the Traditional Dot shape screens at 1200 DPI at 105 LPI and 120 LPI along with the 2400 DPI at 133 LPI and 150 LPI should be considered as the recommended screens for Newspaper printing. The 2400 DPI at 210 LPI and 240 LPI should be considered the recommended screens for Commercial printing. Lastly, the entire round dot offerings including 1200 DPI at 75 LPI, 85 LPI, 95 LPI, 105 LPI and 120 LPI along with the 2400 DPI at 133 LPI and 150 LPI should be considered the working set for Flexo printing. The HXM Generic screen sets are not a complete set of all possible combinations but a reference set. Specific OEM requests for alternative screen sets within the fixed tile size limitations can be discussed through account managers.

**Note:** The generic round screens use the same angles as the traditional screens.

## 7 Screenings compared

Shown below are sample images of traditional screening using a Euclidean Dot and the HXM Screens using the FM to Traditional Dot. Notice how the dots differ in placement and size in this example as seen in the highlight end of the tone scale.



**Note:** These samples are simulations created so that they can be printed on standard laser printers at 600 x 600 DPI. In some instances they may not be reproduced accurately.

## 8 Calibration

If reasonable results are achieved after printing the test files using the HXM screens, a set of transfer curves should be calculated for each colorant. Ideally, this would mean printing a multi-step tone scale for the 175 LPI work as normal and the HXM screen at, for example, 210 LPI using the current printing process control. A 30 step target is recommended but lesser steps could also work well. Also, because the screening can be slightly different for each colorant combined with likely different TVI, it is recommended that each colorant has a transfer curve calculated. Ideally, the test form should contain both sets of step tone scales and it has been observed that in some cases running the plate twice through the imager can accomplish this. Other options are available, for example changing the plates on press and returning to the same solid ink densities (SIDs). These adjustments can then be added to the Harlequin

RIP as press curves or tone curves depending on the workflow. Once completed, work intended for everyday 175 LPI work could be changed to the higher LPI should it be required.

**Note:** Calibration can also be included/embedded into the screens but this would require custom work on Global Graphics part and would also mean that the printing parameters and process control must be locked down. Thus a paper change or press change, for example, would not be possible. In some applications this solution may be preferable.

## 9 Document history

Change history		
v1.4	12.11.2010	Added installer information
v1.3	13.10.2010	Updated Table 2 and Table 3
v1.2	12.03.2009	Small correction
v1.1	08.01.2009	Update HXM descriptions
v1.0	13.08.2008	New document



Copyright and Trademarks

HXM screening module

Version 1.4: December 2010

Part number: Hqn077

Document issue: 108

Copyright © 2010 Global Graphics Software Ltd. All rights reserved.

Certificate of Computer Registration of Computer Software. Registration No. 2006SR05517

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Global Graphics Software Ltd.

The information in this publication is provided for information only and is subject to change without notice. Global Graphics Software Ltd and its affiliates assume no responsibility or liability for any loss or damage that may arise from the use of any information in this publication. The software described in this book is furnished under license and may only be used or copied in accordance with the terms of that license.

Harlequin is a registered trademark of Global Graphics Software Ltd.

The Global Graphics Software logo, the Harlequin at Heart Logo, Cortex, Harlequin RIP, Harlequin ColorPro, EasyTrap, FireWorks, FlatOut, Harlequin Color Management System (HCMS), Harlequin Color Production Solutions (HCPS), Harlequin Color Proofing (HCP), Harlequin Error Diffusion Screening Plugin 1-bit (HEDS1), Harlequin Error Diffusion Screening Plugin 2-bit (HEDS2), Harlequin Full Color System (HFCS), Harlequin ICC Profile Processor (HIPPP), Harlequin Standard Color System (HSCS), Harlequin Chain Screening (HCS), Harlequin Display List Technology (HDLT), Harlequin Dispersed Screening (HDS), Harlequin Micro Screening (HMS), Harlequin Precision Screening (HPS), HQcrypt, Harlequin Screening Library (HSL), ProofReady, Scalable Open Architecture (SOAR), SetGold, SetGoldPro, TrapMaster, TrapWorks, TrapPro, TrapProLite, Harlequin RIP Eclipse Release and Harlequin RIP Genesis Release are all trademarks of Global Graphics Software Ltd.

Protected by U.S. Patents 5,579,457; 5,808,622; 5,784,049; 5,862,253; 6,343,145; 6,330,072; 6,483,524; 6,380,951; 6,755,498; 6,624,908; 6,809,839.

Other U.S. Patents Pending

Protected by European Patents 0 803 160; 0 772 934; 0 896 771; 672 29 760.8-08.

Portions licensed under U.S. Patent No. 5,212,546; 4,941,038.

TrueType is a registered trademark of Apple Computer, Inc.

The ECI and FOGRA ICC color profiles supplied with this Harlequin RIP are distributed with the kind permission of the ECI (European Color Initiative) and FOGRA respectively, and of Heidelberg Druckmaschinen AG (HEIDELBERG).

The IFRA ICC profiles supplied with this Global Graphics Software are distributed with the kind permission of IFRA and of GretagMacbeth.

International Cooperation for Integration of Processes in Prepress, Press and Postpress, CIP4, Job Definition Format, JDF and the CIP4 logo are trademarks of CIP4.

Adobe, Adobe Photoshop, Adobe Type Manager, Acrobat, Display PostScript, Adobe Illustrator, PostScript, Distiller and PostScript 3 are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries which may be registered in certain jurisdictions.

Global Graphics Software Ltd is a licensee of Pantone, Inc. PANTONE® Colors generated by ScriptWorks are four-color process simulations and may not match PANTONE-identified solid color standards. Consult current PANTONE Color Publications for accurate color. PANTONE®, Hexachrome®, and PANTONE CALIBRATED™ are trademarks of Pantone, Inc. © Pantone, Inc., 1991.

Other brand or product names are the registered trademarks or trademarks of their respective holders.



#### US Government Use

Harlequin RIP software is a computer software program developed at private expense and is subject to the following Restricted Rights Legend: "Use, duplication, or disclosure by the United States Government is subject to restrictions as set forth in (i) FAR 52.227-14 Alt III or (ii) FAR 52.227-19, as applicable. Use by agencies of the Department of Defense (DOD) is subject to Global Graphics Software's customary commercial license as contained in the accompanying license agreement, in accordance with DFAR 227.7202-1(a). For purposes of the FAR, the Software shall be deemed to be 'unpublished' and licensed with disclosure prohibitions, rights reserved under the copyright laws of the United States." Global Graphics Software Incorporated, 31 Nagog Park, Suite 315, Acton MA 01720.