EFI™ R3225 3M™ Premium UV Inks
For EFI™ R3225 UV Roll-to-Roll Printer

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2. Product Description

EFI™ R3225 3M™ Premium UV Ink for EFI™ R3225 UV Roll-to-Roll Printer are designed for printing on inkjet-compatible 3M films and media for making warranted multicolor graphics. These UV-cured inks are durable, weather resistant and have excellent color retention. The flexibility and conformability of the inks makes them suitable for graphics used on corrugated and riveted surfaces as well as flat surfaces, depending on the base film used.

3. Disclaimer

With the exception of 3M branded products, 3M does not represent that any printer or printer accessory recommended in 3M literature will meet customer requirements, any federal, state or local regulations or any applicable safety standards. Such determination is the responsibility of the printer owner.

4. Product Line

Note: These inks are sold exclusively by EFI. Call 1-877-EFI-INKS (1-877-334-4657).

A. Ink

Color No.	Color
45111058	Cyan
45111059	Magenta
45111060	Yellow
45111061	Black

Container size: 3.25L, 4 bottles per case

B. Cleaning Solvent

Current cleaning solvent as recommended in the EFI printer literature.

5. Compatible Products

For details about graphic construction options, recommended uses and durability, refer to the Product Bulletin for the base media (film or substrate) you are using. See *3M Related Literature* at the end of this Bulletin.

A. 2-mil Film

- 3M™ Envision™ Print Wrap Film 480Cv3
- 3M™ Envision™ Translucent Graphic Film IJ3730-50
- 3M™ Envision™ Translucent Graphic Film IJ3730-60
- 3M™ Scotchcal™ Graphic Film with Comply™ Adhesive IJ170Cv3-10
- 3M™ Controltac™ Graphic Film IJ180-10
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ180C-10
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ180Cv3-10
- 3M™ Controltac™ Graphic Film IJ181
- 3M™ Controltac™ Graphic Film IJ380Cv3-10
- 3M™ Controltac™ Changeable Graphic Film with Comply™ Adhesive IJ3552C
- 3M™ Scotchcal™ Translucent Graphic Film IJ3630-20
- 3M™ Scotchcal™ Graphic Film IJ3650-114
- 3M™ Scotchcal™ Clear View Graphic Film IJ8150

B. 4-mil Film

- 3M™ Controltac™ Graphic Film IJ160-10
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ160C-10
- 3M™ Scotchcal™ Graphic Film IJ3470
- 3M™ Scotchcal™ Changeable Graphic Film IJ3555
- 3M™ Controltac™ Removable Graphic Film with Comply™ Adhesive 3545C

C. Reflective Film

- 3M™ Scotchlite™ Flexible Reflective Graphic Film IJ680-10
- 3M™ Scotchlite™ Flexible Reflective Graphic Film with Comply™ Adhesive IJ680CR-10
- 3M™ Scotchlite™ Reflective Graphic Film IJ5100R
- 3M™ Scotchlite™ Reflective Graphic Film IJ5100

Note: Printing on these films may affect retroreflectivity. See the film's Product Bulletin for details.

D. Flexible Substrate

- 3M™ Panagraphics™ III Wide-Width Flexible Substrate

E. Graphic Protection

- 3M™ Scotchcal™ Luster Overlaminate 3619
- 3M™ Scotchcal™ Matte Overlaminate 3620
- 3M™ Scotchcal™ Gloss Overlaminate 8518
- 3M™ Scotchcal™ Luster Overlaminate 8519
- 3M™ Scotchcal™ Matte Overlaminate 8520
- 3M™ Scotchcal™ Gloss Overlaminate 8528
- 3M™ Envision™ Gloss Wrap Overlaminate 8548G
- 3M™ Scotchcal™ Gloss Overlaminate 8580
- 3M™ Scotchcal™ Luster Overlaminate 8908
- 3M™ Scotchcal™ Matte Overlaminate 8909
- 3M™ Scotchcal™ Luster Overlaminate 3645
- 3M™ Screen Print UV Gloss Clear 9740i
- 3M™ Screen Print Gloss Clear 1920DR

F. 3M Intermediate Graphic Materials

This ink series may be used with 3M's intermediate product line for low cost graphics that do not need a graphics warranty. Visit our On-Line Catalog or Creative Solutions Guide at www.3Mgraphics.com to see the 3M Intermediate Product Portfolio.

G. Other Graphics Materials

This ink series also may perform satisfactorily on many other non-3M graphics materials, but such applications are not warranted by 3M.

Always run a test print to be certain that the finished graphic quality meets your needs. Also check adhesion and scratch resistance of any graphic protection used. Contact the printer manufacturer and material manufacturer for guidance.

6. Warranty Information

A. Warranty Coverage Overview

Graphics made with this ink may be covered by the 3M™ MCS™ Warranty. For complete details on recommended applications, graphic construction options, durability and warranty, please refer to the base media's Product Bulletin (see *3M Related Literature* at the end of this document), or the Digital Warranty Matrices, which provide an overview of all films, graphic protection, printers and inks with warranty periods.

The following is made in lieu of all other express or implied warranties, including any implied warranty of merchantability or fitness for a particular purpose or implied warranty arising out of a course of dealing, custom or usage of trade.

B. 3M Basic Product Warranty

This product is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this Product Bulletin and as further set forth in the 3M Commercial Graphics Warranty Brochure.

C. Limited Remedy

3M will replace or refund the price of any 3M materials that do not meet this warranty within the specified time periods. These remedies are exclusive.

D. Limitation of Liability

Except where prohibited by law, 3M SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO PURCHASER OR USER FOR ANY DIRECT (EXCEPT FOR THE LIMITED REMEDY PROVIDED ABOVE), INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LABOR, NON-3M MATERIAL CHARGES, LOSS OF PROFITS, REVENUE, BUSINESS, OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO SELLER'S PRODUCTS, SERVICES OR THIS BULLETIN. This limitation of liability applies regardless of the legal or equitable theory under which such losses or damages are sought including breach of contract, breach of warranty, negligence, strict liability, or any other legal or equitable theory.

E. Additional Limitations

See the 3M Commercial Graphics Warranty Brochure at 3Mgraphics.com, which gives the terms, additional limitations of the warranty, if any, and limitations of liability.

7. Support Information

- Hardware, software, ink and profiling support: Contact EFI at 1-877-321-8330.
- 3M products: Contact 3M Commercial Graphics Technical Support at 1-800-328-3908.

8. Health and Safety

⚠ CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

To obtain MSDS sheets for this ink series go to the EFI website: www.efi.com .

When using any equipment, always follow the manufacturers' instructions for safe operation.

A. Ventilation

Provide local and/or general exhaust ventilation in the print production areas to prevent a build up of ink vapors and to maintain levels below the limit for worker exposure. An experienced industrial ventilation engineer and/or a certified industrial hygienist can help evaluate your ventilation requirements and design based on your site process conditions.

Please refer to the printer manufacturer's literature for additional details and requirements.

B. Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

C. More on Environmental Health and Safety

Additional environmental, health and safety information is available on our website at 3Mgraphics.com. Go to the page for 3M and the Environment.

9. Setting and Understanding Printing Requirements

- **Printer operator**

  The printer operator needs to understand the relationship between film characteristics, printer setup, total ink coverage and to produce graphics that achieve the performance expectations of the film and the customer.

- **Graphic designer**

  The graphic designer needs to know the parameters and printing recommendations for both the film and printer being used for each graphic.

10. Selecting, Preparing and Using 3M Graphic Materials

- Use the right film for the job. Each film has specific intended uses, construction options, processing conditions and durabilities. Always refer to the Product Bulletins for each product used and to the recommended 3M Instruction Bulletins for complete details. See *3M Related Literature* at the end of this Bulletin.
- Do not use damaged rolls of film, which can result in head strikes and printer damage.
- Condition the film, ink and graphic protection for 24 hours in the same environment as the printer before using.

11. Optimizing Image Quality

- Good color management practices are essential.

  For good color output, the graphic designer must consider the printer and materials being used. Use the method you are accustomed to that provides the desired printing results, which should include ICC color profiles for proper color management. Each printer, ink and film combination has a unique color profile that helps ensure successful printing. Contact the printer manufacturer for assistance.

12. Prepare the Ink

Refer to the printer's User Guide for ink preparation details.

13. Film Processing Recommendations

Printer set-up is critical to achieve the image quality needs and to ensure proper film processing, including UV cure dose. The following printer settings are a good starting point for most materials. Make adjustments as necessary for your specific speed and quality requirements. Refer to the printer manufacturer's user manual for details.

A. Curing Table

Sq. Ft. /hour	Pass	Rex	Res Y	Level GS	Smoothing	Application
820	3	450	300	8	N	Billboard (Up to Speed)
610	4	600	600	4	N	Banner
420	6	450	600	8	N	High Quality Banner
350	8	600	600	4	S	Quality POP
150	18	900	900	4	S	High Quality POP

B. Processing Details

(1) Requirements for Warranted Graphics

- An optimized curing dose prevents both over curing and under curing the ink.
- Over curing occurs when the cure dose is too high. It reduces clear coat adhesion to the ink and the ink flexibility is reduced, leading to cracking.
- Under curing occurs when the cure dose is too low. It results in poor ink adhesion, so the ink can be scratched off easily, and poor ink abrasion resistance if no graphic protection is applied.
- Even if an ink appears sufficiently cured, the ink may be tacky after printing. To test for adequate ink cure, rub a clean white cloth, tissue or cotton swab lightly over the ink and check if any ink transfers to the cloth.
- The optimal cure dose depends on the final graphic construction and application.
- Always test the finished construction with graphic protection applied before starting a production run.

(2) Using a Clear Coat or Overlaminate

When using a clear coat or overlaminate, use the lowest cure setting on your UV printer that fully cures the ink. To find this setting:

1. Set the printer to its lowest cure setting.
2. Print a test sample and wipe the ink with a clean white cloth or tissue or cotton swab.
3. If any ink transfers to the cloth, increase the cure setting by one level and repeat Steps 2 and 3.
4. Use the lowest setting that does not transfer any ink to the cloth.

Keep in mind that the ink will receive an additional cure dose as the UV clear is processed. The printed ink will continue to cure at a slow rate after it has been removed from the printer. To achieve the highest clear coat adhesion, apply the clear within 3 days after printing. Check adhesion using the Tape Snap Test, page 7.

(3) Silvering Caused by UV Piezo Inkjet Printers

To reduce or eliminate silvering caused by the texture of UV piezo inkjet printers:

1. Set the laminator roll pressure to its highest setting—not exceeding a maximum of 100 psi (103 kg/cm^2).
2. Set the pressure roller temperature for the printed (base) film to 115°F (46°C).
3. Set the laminator speed to 2-4 feet per minute (61-122 cm/min).
4. Reduce the tension on the overlaminate supply roll to the lowest level possible without causing wrinkles.

(4) Graphics without Graphic Protection

For printed graphics without a clear coat or overlaminate, use a higher cure dose, which creates a harder ink surface for more abrasion resistance.

(5) Lamp Output Changes Over Time

Lamp output is highest with new lamps and will decrease over time. Regularly verify that curing is still adequate at the settings you are using.

14. Managing Amount of Ink on Film

A. Total Ink Coverage

Properly managing the total amount of ink laid down in any area on the graphic results in better image quality, less ink usage and greater throughput. It also helps ensure good film performance.

Total Ink Coverage: 280%

Total ink coverage is the total percentage of all inks (CMYK) used in the graphic. For example, CMYK values of 60%, 60%, 60% and 100% produces a total ink coverage of 280%. For inks, a maximum of 280% is recommended unless otherwise noted in the base film's Product Bulletin.

Note: Depending on the software or the color printing reference books you use, total ink coverage may be called: total area coverage, total dot area, maximum CMYK, maximum ink amount, total ink limit, total printing dot.

You can achieve very good density using lower total ink coverage with little or no loss of quality. The rest of this section discusses options for managing the total ink coverage.

B. Controlling Total Ink Coverage

Controlling total ink coverage can be managed by the color profile of the original artwork and during the printing process.

(1) Getting a Color Profile

A color profile typically contains the ink limits for a specific ink set, printer and media. These are two common ways to get a profile.

1. You can use an existing color profile that is known to produce good color output with the required amount of ink limiting. Profiles may be available from the printer manufacturer, RIP software or material supplier.
2. The color profile conversion can be done in the front end software such as Adobe® Photoshop® or Adobe® Illustrator® software or during the RIP process. The profile automatically adjusts the color values in the image file to stay below the ink limit settings.

   Some RIP software has ink limit settings that may be adjusted without changing the color profile setup. Check the literature for the RIP software being used.

(2) Achieving Proper Ink Coverage During Printing

Achieving proper ink coverage during printing is a three step process: clip the upper ink limits, calibrate or linearize the output and use a good color profile during the RIP process.

1. Determine the maximum ink necessary to produce the greatest color saturation. For example, if you print and review a series of color patches in 1% increments from 90% to 100%, there may be no difference between the and the between the lowest patch and the highest percentage patch. So, any ink used above the lowest patch will not create a more saturated color but will unnecessarily add additional ink that does not contribute to or improve the image quality.
2. Properly calibrate or linearize your film, ink and printer. This will adjust the amount of ink printed to balance the levels of highlight, mid-tones and shadows.
3. Use the proper combination of source and destination color profiles to print your graphic. Preferably, the graphic designer should supply the source color profile used to create the digital artwork. Applying the proper destination or printer color profile for your particular film, ink and printer will ensure the total ink limit is not exceeded.
4. Additional ink limit settings including total maximum ink can be adjusted during the profile creation process.

Note: For complete details on ink control, refer to the User's Guide for the RIP you are using.

C. Ink Usage Factors

Ink usage may be affected by several factors, including but not limited to the following, depending on your printer:

- Color levels in images
- Ink limiting and color profiles
- Printer linearization
- Resolution (DPI)
- Cleaning or purging cycles
- Printer parameters

15. Completely and Properly Cure Printed Film

Tacky film indicates that the ink is not properly cured. To resolve this problem, consider increasing the printer's lamp intensity.

A. Prepare Print Tests

1. Print a test on each type of film you use. The default settings in the printer for speed and UV curing and the pre-selected settings in the software for total ink coverage and linearization, may not be the optimum for the film that you are printing.
2. Print the images at different settings: printer, total ink coverage and lamps. Refer to *Film Processing Recommendations,* page 4.
3. Check to see that the image does not emboss or block if the film is wound on a spindle or core during printing.

B. Check Ink Adhesion Using the Tape Snap Test

1. Use the point of a sharp razor blade, a knife, or other suitable instrument to scratch a crosshatch pattern through the ink. Do not cut into the film.
2. Use 3M™ Applicator PA-1 Gold to firmly apply a 1 inch wide strip of Scotch™ Premium Cellophane Tape #610 over the crosshatched areas.

Note: Applicator PA-1 is available from your 3M materials supplier. Tape 610 is available through most film or tape distributors.

3. Remove the tape by pulling it back upon itself using a rapid, firm pull. Less than 20% of the ink should be transferred to the tape when performing the tape snap test.
4. If more than 20% of the ink transfers to the tape, increase the lamp cure setting (for example, from medium to high) or reduce the print speed, reprint and retest the ink adhesion.

⚠ CAUTION

Before handling any chemical products, always read the container label and the MSDS.

16. Operation and Maintenance Procedures

Follow all operation and maintenance procedures recommended in the printer's user manual.

Printer cleanliness is very important in the production of high quality, full color graphics. Refer to the printer manufacturer's recommendations for compatible cleaning solutions for this ink and your printer.

17. Graphic Installation

Please refer to the 3M Product and Instruction Bulletins for the film and graphic protection you are using for detailed usage and graphic installation procedures.

The graphic installer needs to be aware of any special handling or application techniques for the construction. Any combination of high total ink coverages, hot ambient application temperatures and irregular application surfaces may make the application more difficult.

Some application difficulties cannot be controlled by the film processing. See the applicable Product Bulletin for application details on each product used.

A. Using Heat During Installation

Important Note!

Using too much heat during application can result in the ink cracking. When using a heat gun or other heat source during application, make sure the film surface temperature does not exceed 212°F (100°C). The use of a blow torch is not recommended.

Refer to Instruction Bulletin 5.4 and Instruction Bulletin 5.36 for details.

18. Waste Disposal

Refer to the EFI printer User's Manual for additional details.

19. Shelf Life, Storage and Shipping

Refer to the EFI ink container label or contact EFI for details.

20. 3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
3M™ Controltac™ Graphic Film IJ160, IJ160C	PB	PIJ160
3M™ Scotchcal™ Graphic Film with Comply™ Adhesive IJ170Cv3-10	PB	PIJ170Cv3
3M™ Controltac™ Graphic Film IJ180, IJ180C, IJ180Cv3	PB	PIJ180/180C

Subject	Type	Bulletin No.
3M™ Controltac™ Graphic Film IJ181	PB	PIJ181
3M™ Controltac™ Graphic Film IJ380Cv3	PB	PIJ380Cv3
3M™ Envision™ Print Wrap Film 480Cv3	PB	480Cv3
3M™ Scotchlite™ Flexible Reflective Graphic Film IJ680	PB	PIJ680
3M™ Scotchlite™ Flexible Reflective Graphic Film with Comply™ Adhesive IJ680CR	PB	PIJ680CR
3M™ Scotchcal™ Graphic Film IJ3470	PB	PIJ3470
3M™ Controltac™ Removable Graphic Film with Comply™ Adhesive 3545C	PB	3545C
3M™ Scotchcal™ Changeable Graphic Film IJ3555	PB	PIJ3555
3M™ Controltac™ Changeable Graphic Film with Comply™ Adhesive IJ3552C	PB	PIJ3552C
3M™ Scotchcal™ Translucent Graphic Film IJ3630 and IJ3670	PB	IJ3630/3670
3M™ Scotchcal™ Graphic Film IJ3470	PB	PIJ3470
3M™ Scotchcal™ Graphic Film Series IJ3650	PB	PIJ3650
3M™ Scotchlite™ Reflective Graphic Film IJ5000	PB	5000
3M™ Scotchlite™ Reflective Graphic Film IJ5100R	PB	5100R
3M™ Scotchlite™ Reflective Graphic Film IJ5100	PB	5100
3M™ Scotchcal™ Clear View Graphic Film IJ8150	PB	PIJ8150
3M™ Panagraphics™ III Wide-Width Flexible Substrate	PB	P3
3M™ Screen Print UV Clear 9740i, 9730UV	PB-IB	UV Clears
3M Graphic Protection Products *graphic protection products overview and specific information on most overlaminates*	PB	GP-1
3M™ Screen Print Gloss Clear 1920DR - Applying screen printing clear 1920DR	PB IB	1900 3.12
Using 3M application tapes; premasking and prespacing for films	IB	4.3
Hot and cold roll lamination	IB	4.22
Application, substrate selection, preparation and substrate-specific application techniques	IB	5.1
Application, special applications and vehicles	IB	5.4
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Application: special considerations for automobiles, vans and buses and inspection forms	IB	5.36
Storage, handling, maintenance, removal	IB	6.5
3M Commercial Graphics Warranty Brochure	Go to www.3Mgraphics.com/Warranties	

Commercial Graphics
3M Center, Building 220-12E-04
St. Paul, MN 55144 USA
General & Technical 1-800-328-3908
Fax 1-651-736-4233

3M Canada
PO Box 5757
London, Ontario
Canada N6A 4T1
General 1-800-265-1840
Fax 519-452-6245

3M México S.A. de C.V.
Av. Santa Fe No. 55
Col. Santa Fe, Del. Alvaro Obregón
México D.F. 01210
General 5255-5270-0400
Fax 5255-5270-2277

3M Puerto Rico, Inc.
350 Chardon Avenue
Suite 1100
San Juan, PR 00918
General 787-620-3000
Fax 787-620-3018

www.3Mgraphics.com