Scotchlite™ Reflective Graphic Film

Series 5100R
5100R-10
IJ5100R-10, RG5100R*

for Screen Printing and Thermal Mass Transfer
for Electrostatic Printing
for Inkjet Printing

1. Product Description

These 7-mil, removable, enclosed lens, retroreflective, engineer grade films offer flexibility and excellent angularity. Use these long-term durable films for decals, commercial and non-regulated signage, vehicle markings, emblems and striping on vertical, flat or curved surfaces with or without rivets. Use film series 5100R for screen printing and thermal mass transfer, film IJ5100R-10 for inkjet printing, and film 5100R-10 for electrostatic printing.

A. Advantages

- Up to 7 year expected performance life with a 4 year 3M™ MCS™ Warranty on most applications
- This film series is available in 15 colors, including black (which reflects white)
- Designed for excellent cutting and weeding with computer sign cutting equipment
- Similar daytime and nighttime appearance that retains most of its reflectivity when wet
- Excellent angularity
- Unprocessed film resists fuel vapors or occasional spills

2. Recommended Types of Graphics and End Uses

When constructed and used as described in this Bulletin, these types of graphics and end uses may be warranted by the 3M™ MCS™ Warranty or the 3M Performance Guarantee. Please read the entire Bulletin for details.

* Films with an RG prefix are offered without a 3M™ MCS™ Warranty since 3M no longer sells 3M™ Piezo Inkjet Ink Series 6800.

- Most commercial vehicle markings and graphics
- Cut letters and decals
- Non-regulated signage

A. Limitations of End Uses

This 3M product is not designed or recommended for the following uses. Please contact us to discuss other options.

(1) Unsuitable End Uses for This Film

- Do not apply this film on:
  - Walls
  - Corrugated or highly irregular surfaces
  - Substrates with compound curves
  - Substrates that do not have a clean, smooth surface or have poor paint-to-substrate adhesion
  - Stainless steel
  - FRP with a Tedlar® coating
  - Flexible substrates
- Paint that is not thoroughly cured or dried.
- Low surface eney substrates (some plastics, powder-coated paints, etc.)
- Also see limitations of graphic removal, page 7.

3. Compatible Products

This Bulletin provides details about the base film, **recommended construction options, warranted durability and warranty limitations for the constructions shown in the Warranted Durability Tables.** Additional specific information about compatible products can be found in the Product and Instruction Bulletins listed in **3M Related Literature** at the end of this bulletin.

See the Warranty matrix to determine which Compatible Products are approved for your graphic construction.

A. Solvent Inkjet Inks and Printers

Ink Series	Printer
• 3M™ Piezo Inkjet Ink Series 1500v2	EFI™ VUTEk® 150, 2360/3360, 3300/5300 & 3000/5000 Printers
• 3M™ Piezo Inkjet Ink Series 4400	HP XLJet Series 1200, 1500 Printers
• 3M™ Piezo Inkjet Ink Series 4800	HP Scitex TJ8300 Series Digital Press
• 3M™ Piezo Inkjet Ink Series 6200	Agfa :Jeti 3312, 3318, 3324, 5024 [Gandinnovations] Printers

B. Latex Inkjet Inks and Printers

• HP 3M LX600 Specialty Latex Ink	HP Designjet L65500, Scitex LX600 & LX800

C. UV Inkjet Inks and Printers

• 3M™ Piezo Inkjet UV Ink Series 2200UV	EFI™ VUTEk® PV200 Printer
• 3M™ Piezo Inkjet UV Ink Series 2600UVv2	3M™ Printer 2500UV
• 3M™ Piezo Inkjet UV Ink Series 2700UV	Durst Rho 160R & 351R Printers
• 3M™ Piezo Inkjet UV Ink Series 2800UV	EFI™ VUTEk® QS2000, QS3200, QS3220 and QS220 Printers
• 3M™ Piezo Inkjet Ink Series 5400UV	HP Designjet H35000/H45000
• EFI™ VUTEk™ GS500r Printer	GSr 3M™ Premium UV Inks
• Mimaki Ink Series LF-200 *Manufactured by 3M*	Mimaki UJV-160, JFX-1631 & 1615R Printer

A. Screen Printing

- 3M™ Screen Printing Ink Series 1900
- 3M™ Screen Printing UV Ink Series 9800
- 3M™ Scotchlite™ Screen Printing Ink Series 2900

B. Electrostatic Printing

- Scotchprint® Toner Series 8700/8800
- 3M™ Trident Transfer Paper

C. Graphic Protection

- 3M™ Screen Print Gloss Clear 1920DR
- 3M™ Screen Print UV Gloss Clear 9720i
- 3M™ Screen Print Gloss Clear 9720UV
- 3M™ Scotchcal™ Gloss Overlaminate 8518
- 3M™ Screen Printing Gloss Clear 9800CL
- 3M™ Scotchcal™ Luster Overlaminate 8519
- 3M™ Scotchcal™ Gloss Overlaminate 8528 *(coming soon)*
- 3M™ High Gloss Graffiti Resistant Overlaminate 8912 *not for use on rivets*
- 3M™ Scotchcal™ Optically Clear Overlaminate 8914
- 3M™ Screen Print Clear 8920 ES *not for use on corrugations*

D. Other Products

- 3M™ Prespacing Tape SCPS-2
- 3M™ Prespacing Tape SCPM-53X
- 3M™ Premasking Tape SCPM-3
- 3M™ Premasking Tape SCPM-44X
- 3M™ Edge Sealer 3950

4. Characteristics

These are typical values for unprocessed product; processing may change the values. Contact your 3M representative for a custom specification.

A. Physical Characteristics

Characteristic	Value
Material	Vinyl
Thickness	**With adhesive:** 7 to 8 mils (0.18 to 0.20 mm)
Film colors & typical retroreflection	At -4° entrance angle and 0.2° observation angle. **Film Number** / **Color Name** / **Typical Coefficient of Retroreflection** IJ5100R-10 / White / 100 5100R-10 / White / 100 5100R-14 / Orange / 20 5100R-64 / Gold / 70 5100R-65 / Rich Gold / 65 5100R-71 / Yellow / 65 5100R-72 / Red / 20 5100R-74 / Royal Purple / 5 5100R-75 / Blue / 10 5100R-76 / Light Blue / 10 5100R-77 / Green / 20 5100R-78 / Light Green / 20 5100R-79 / Brown / 5 5100R-81 / Lemon Yellow / 75 5100R-82 / Ruby Red / 15 5100R-85 / Black / 30
Retroreflection Definition	The typical coefficient of retroreflection defined is measured at a -4° entrance angle and a 0.2° observation angle. It is expressed in candlepower per foot-candle per square foot (candela/lux/square meter) per ASTME 810. The entrance angle is formed by a light beam striking the surface at a point and a line that is perpendicular to the surface at the same point. An observation angle is formed by the light beam striking the reflective surface and returning to the observer. From 800 feet (249 meters), a motorist normally views a graphic at a 0.2° angle.
Adhesive type	Pressure-sensitive
Adhesive color	White
Liner	Polyethylene-coated paper
Safety Standards	See Section 13. for ASTM, NFPA and AAR information.
Chemical resistance	• Resists mild alkalis, mild acids, and salt • Excellent resistance to rain *(not immersion)* • Resists occasional fuel spills
Flammability	Call 1-800-328-3908 for information

B. Application Characteristics

Characteristic	Value
Finished graphic application recommendation	**Surface type:** Flat, with/without rivets; moderate curves **Substrate type:** Aluminum, FRP, paint **Graphic orientation:** Vertical only **Application method:** Dry

Continued on the next page.

Application Characteristics, Continued

Characteristic	Value
Application temperature	**Application temperature:** *air and substrate* • 50° to 85°F (10° to 29°C) flat surfaces without rivets • 55° to 85°F (7° to 29°C) flat surfaces with rivets,curves
Adhesion *24 hours after application*	**Aluminum:** 4.8 lb/in (0.86 kg/cm) **FRP (Fiberglass Reinforced Plywood):** 3.7 lb/in (0.7 kg/cm) **Painted aluminum panels:** 2.6 pounds/inch (0.5 kg/cm)
In use temperature range	-30° to +200°F (-34° to +93°C)
Graphic removal	Easily removable with heat from most substrates within specified warranty period

5. Definitions

A. Exposure

U.S. Vertical Exposure

The face of the graphic is +/- 10° from vertical.

U.S. Desert Southwest Exposure — Any outdoor graphic exposed to solar energy more than half of the daylight hours in Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas is subject to reduced warranties. A detailed map is available at 3Mgraphics.com under Warranties.

B. Graphic Types

Indoor Signs — Stationary graphics applied indoors and *not* exposed to the elements.

Outdoor Signs — Stationary graphics applied outdoors and exposed to the elements.

OEM — Labels and decorative graphics produced for and used by original equipment manufacturers.

Decals — A small graphic used indoors or outdoors for decoration, information or identity.

C. Vehicle Types

Fleet Vehicle — Straight trucks, semi-tractors and trailers used in commercial fleets. Excludes air shields.

Recreational Vehicle (RV) — Vehicles used for personal pleasure, such as campers, motor homes and trailers, that are not used in connection with any commercial or business enterprise. 3M specifically excludes watercraft from this definition.

Standard Vehicle — Buses, vans, automobiles, recreational vehicles unless otherwise noted.

D. Graphic Construction

The products used to make a graphic, which may include film and/or flexible substrate, graphic protection, ink, printer and application tape.

E. Graphic Protection

Overlaminate films or clear coats used to protect the graphic and/or change gloss.

F. Removable with Heat

Film is removable when heat is used within the specified time period and leaves no more than 10% adhesive residue on flat and simple curves without rivets, and no more than 30% adhesive residue on rivets.

6. Warranty Information

A. Limitations and Disclaimers Applicable to All Warranties & Warranty Coverage Overview

Both the warranty coverage and the durability for each graphic is based on the user(s) reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the Warranted Durability stated in the base film or substrate Product Bulletin that is current when the film was purchased. Warranted durabilities may be reduced and stipulations may apply for certain constructions and applications, as covered in this Bulletin.

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. 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. **In no case shall 3M be liable for any direct, indirect, or consequential damages, including any labor or non-3M materials charges.**

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

B. 3M Basic Product Warranty

All 3M products are 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 Graphics Market Center Warranty Brochure.

C. 3M™ MCS™ Warranty

Subject to Stipulations set forth in Section E., below

Finished graphics constructed with the materials specified and the exposure specified in the Warranted Durability Tables, Section C.(1), is eligible for the 3M™ MCS™ Warranty. For warranties for other exposures, see Section E.(1).

(1) Warranted Durability Table for Finished Graphics in a Standard U.S. Vertical Exposure

VEH = Fleet and Standard Vehicle Graphics
OUT = Outdoor Signs
IN = Indoor Signs

Note: Films with an RG prefix are offered without a 3M™ MCS™ Warranty since 3M no longer sells 3M™ Piezo Inkjet Ink Series 6800.

a. 3M Inkjet Printing For Film IJ5100R-10

Warranted Durability for Finished Graphics, in Years

	EFI™ VUTEk® 150, 2360/ 3360, 3300/5300, 3000/5000			HP XLJet Series 1200, 1500			HP Scitex TJ8300 and TJ8350 Digital Presses		
	SOLVENT Ink Series 1500v2			**SOLVENT Ink Series 4400**			**SOLVENT Ink Series 4800**		
Graphic Protection	VEH	OUT	IN	VEH	OUT	IN	VEH	OUT	IN
8518, 8519, 8528	4	3	4	4	3	4	4	3	4
1920DR	3	3	3	—	—	—	3	3	4
9720UV	—	—	—	—	—	—	3	3	4
9720i	4	3	4	4	3	4	4	3	4

	Agfa [Gandinnovations] :Jeti 3312, 3318, 3324, 5024			Designjet L65500; Scitex LX600 & LX800 Printers			EFI™ VUTEk™ GS500r Printer		
	SOLVENT Ink Series 6200			**HP 3M LX600 Specialty Latex Ink**			**GSr 3M™ Premium UV Inks**		
Graphic Protection	VEH	OUT	IN	VEH	OUT	IN	VEH	OUT	IN
8518, 8519, 8528	4	3	4	3	2	3	4	3	4
1920DR	4	3	4	2	2	2	2	2	2
9720UV	—	—	—	—	—	—	4	3	4
9720i	4	3	4	—	—	—	4	3	4

Warranted Durability for Finished Graphics, in Years

	EFI™ VUTEk® PV200			3M™ Printer 2500UV			Durst Rho 160R & 351R		
	Ink Series 2200UV			**Ink Series 2600UVv2**			**Ink Series 2700UV**		
Graphic Protection	VEH	OUT	IN	VEH	OUT	IN	VEH	OUT	IN
8518, 8519, 8528	4	3	4	4	3	4	4	3	4
1920DR	—	—	—	4	3	4	—	—	—
9720i, 9720UV	4	3	4	4	3	4	4	3	4

	EFI™ VUTEk® QS2000, QS3200, QS3220, QS220			HP Designjet H35000/45000			Mimaki UJV-160, JFX-1631 & 1615R		
	Ink Series 2800UV			**Ink Series 5400UV**			**Ink Series LF-200**		
Graphic Protection	VEH	OUT	IN	VEH	OUT	IN	VEH	OUT	IN
8518, 8519, 8528	4	3	4	4	3	4	4	3	4
1920DR	—	—	—	—	—	—	—	—	—
9720i, 9720UV	4	3	4	4	3	4	—	—	—

b. Screen Printing For Film Series 5100R

Warranted Durability for Finished Graphics, In Years

	SOLVENT Ink Series 2900			**SOLVENT Ink Series 1900**			**UV Ink Series 9800**		
Graphic Protection	VEH	OUT	IN	VEH	OUT	IN	VEH	OUT	IN
1920DR	4	3	4	4	3	4	—	—	—
9720UV	4	3	4	4	3	4	4	3	4
9720i	4	3	4	4	3	4	4	3	4
9800CL	—	—	—	—	—	—	4	3*	4

* Ink series 9800 with 9800CL is removable for up to 3 years for outdoor signs

c. Electrostatic Printing For Film 5100R-10

Warranted Durability for Finished Graphics, In Years

	Toner Series 8700		
Graphic Protection	VEH	OUT	IN
8519	4	3	4
8914	4	3	4
8912	4	3	4
8920	4	3	4

(2) Unprinted Film with No Graphic Protection, and a U.S. Vertical Exposure

For unprinted film, 3M offers a:

- Warranted Durability for finished graphics covered by the 3M™ MCS™ Warranty.
- Expected Performance Life is a good faith estimate of how long unprinted product may perform satisfactorily based on 3M testing. However, there is no warranty for performance or durability.

Years

	Ink and Graphic Protection	VEH	OUT
3M™ MCS™ Warranty Durability	None	4	4
Expected Performance Life, Unwarranted	None	7	7

(3) Removal Warranty with Heat or Chemicals

Within the stated warranted durability period of each graphic construction in this Bulletin, if this film cannot be removed with heat and/or chemicals, or if more than 30% of the adhesive residue remains on the substrate, 3M will reimburse a reasonable portion of extra removal costs.

a. Removal Warranty Exceptions

The following exceptions are not covered by the Removal Warranty.

- Substrate damage due to:
  - removing film from a pre-existing graphic
  - removing film that was applied to painted wallboard
  - removing film from paint that is not firmly bonded to the substrate
- No guarantee is made for:
  - ease or speed of removal of any graphic
  - removal from railroad cars or engines, or stainless steel or bare aluminum
  - removal from paint that is improperly cured
  - removal from aged paint or metals, surface oxidation or chalking; user must test, approve and accept liability for such applications

b. Removal Factors

The ease and rate of removal using heat depends on several factors. Also see Instruction Bulletin 6.5.

- Substrate type and condition
- Graphic age and weathering conditions
- Removal is performed when the air and surface temperature is above 60°F (15°C)
- Angle of removal, which should be less than 90 degrees

D. 3M Performance Guarantee

Subject to Stipulations set forth in Section E., below

Graphics constructed with the 3M materials specified and in the exposure specified in the Warranted Durability Table, Section D.(1), are eligible for the 3M Performance Guarantee. This warranty only covers the performance of the recommended 3M products used in the graphic construction when imaged with the printers and OEM inks listed in the most current version of Performance Guarantee Printer and Ink Matrix at 3Mgraphics.com. The Matrix may also list certain restrictions for using the film covered in this Bulletin. For warranties for other exposures, see Section E.(1).

(1) Warranted Durability Table for 3M Product Performance Only in a Standard U.S. Vertical Exposure

Warranted Durability for 3M Product Performance Only, in Years

Film	Graphic Protection	Vehicles, Indoor, Outdoor	Inks and Printers
IJ5100R-10	8518 8519 1920DR 9720i 9720UV	2	See the *3M Performance Guarantee Printer and Ink Matrix* at 3Mgraphics.com, under Warranties

E. General Warranty Stipulations for 3M™ MCS™ Warranty and 3M Performance Guarantee

These stipulations apply to both the 3M™ MCS™ Warranty and 3M Performance Guarantee unless otherwise noted. Specific provisions of these stipulations are covered in the *3M Graphics Market Center Warranty Brochure* at 3Mgraphics.com.

(1) Reduced Warranted Durability for Selected Graphic Exposures

For each exposure shown below, multiply the warranted durability years for your graphic construction as shown in the applicable Warranted Durability Tables, Section C.(1) or Section D.1, by the percentage shown for the intended graphic exposure. This is the reduced warranty.

If the Outdoor Graphic Exposure is:	Use this Percentage of U.S. Vertical Exposure, Warranted Durability	Examples
Desert Southwest Vertical	70% (0.7)	0.7 x 5 years = 3.5 years 0.7 x 2 years = 1.4 years
Non-vertical	0	0

(2) Reduced Warranty for Graphics Exposed to Heat

Long exposure to continuous high heat decreases the durability of this film by 2 years. High heat is a temperature above 150°F (65°C). It may occur in areas such as railroad locomotives, vehicle engine compartments, non-insulated tankers exposed to frequent internal steam cleaning, or compartments that carry hot cargo.

(3) Abrasion and Loss of Gloss

Abrasion damage and loss of gloss are not covered by any 3M warranty. This is considered normal wear and tear.

(4) Application to Glass

3M accepts no liability for glass breakage when using this film for window graphics. See Instruction Bulletin 5.1 for details.

(5) Application Outside the U.S.

Contact the 3M organization for that country.

(6) Graphics Made with Components Not Sold or Recommended by 3M

The 3M™ MCS™ Warranty does not cover finished graphics made with inks, film, graphic protection and/or application tapes that are not sold or recommended by 3M. The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any other products.

The 3M Performance Guarantee covers selected 3M branded graphics products when used with qualified printers and inks. See the *3M Performance Guarantee Printer and Ink Matrix* at www.3Mgraphics.com.

(7) Graphic Protection

Any graphic exposed to abrasive conditions (including vehicles), harsh cleaners or chemicals must include graphic protection in order to be warranted. Abrasion damage and gloss loss are not covered.

(8) Rivets

This film may tent when applied over rivets. If the rivets are closely spaced, the film will likely bridge between rivets. Tented or bridged film may fail prematurely, which is not covered by any 3M warranty.

7. Factors that Affect Graphic Performance Life

The actual performance life of a graphic is affected by all of the following.

- The combination of graphics materials used
- Adequate ink drying or curing
- Selection, condition and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance methods

8. Graphics Manufacturing

⚠ CAUTION

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

A. Inkjet Printing

Always read and follow the ink manufacturer's written instructions on usage.

(1) Total Ink Coverage

250% is the maximum recommended total ink coverage for this film for all solvent, latex and UV inks.

Too high a total physical ink amount on the film results in media characteristic changes, inadequate drying, overlaminate lifting, and/or poor graphic performance. Make sure that the ink lay down is within the limits of what the dryer can handle to prevent ink smearing. The Product & Instruction Bulletin for each 3M ink series includes additional details about total ink coverage.

Note: Be sure to check the consistency of color on reflective film as it may appear different in daytime and nighttime lighting.

(2) Adequately Dry Graphics

Important Note!

Inadequate drying can result in graphic failure including curling, increased shrinkage and adhesion failure, which are not covered under warranty.

Always build enough time into your process to ensure adequate drying of the graphic. Poorly dried film may become soft and stretchy, and the adhesive may become too aggressive. This can cause difficulty when applying an overlaminate, rolling or applying the graphic. See the ink's Instruction Bulletin for more details.

A. Screen Printing

Ink formulations and processing conditions can affect ink durability. Refer to the Product and Instruction Bulletins for your ink for limitations and proper usage.

- Ink series 1900 and some colors in ink series 9800 are opaque. Be aware that opaque ink can prevent the film from retroreflecting in the screen printed areas. Ink series 2900 and the transparent colors from ink series 9800 are good choices when retroreflection is important in the screen printed areas.
- For graphics subjected to fuel vapors or occasional spills, use screen printing ink series 2900 and clear 1920DR.
- Oven dry the last color and the clear when using solvent-based inks on graphics needed for any corrugated application.

B. Electrostatic Printing

Refer to the 3M Related Literature section for Instruction Bulletins that discuss digital printing methods.

An image is printed on electrostatic paper and transferred with heat and pressure to the film. Graphic protection is required.

C. Cutting

(1) Methods

The following are common cutting methods for this film. See Instruction Bulletin 4.1 for details.

- Cold and hot steel-ruled die cutting
- Hot kiss cutting
- Drum-type electronic cutting
- Flat-bed electronic cutting
- Guillotine
- Hand cut

(2) Design Considerations

- Use a minimum letter height of 1 inch (2.5 cm).
- Use a minimum stroke width of 3/8 inch (1.0 cm).
- Use a minimum radius for a point of 1/16 inch (1.6 mm).
- Order “roll applicator splices" for roll striping. Butt splices may have a small gap.

(3) Weeding Considerations

- For the best results, weed the film within 24 hours of cutting it.
- Refer to Instruction Bulletin 4.1 for more details.

D. Application Tapes

(1) When to Use Premasking Tape

- As an application aid to increase stiffness, and prevent stretching and damage during application.
- Graphics larger than 4 square feet (0.4 m^2).
- Striping greater than 4 inches (10 cm) wide.

(2) When NOT to Use Premasking Tape

- Continuous rolls or striping wider than 12 inches (31 cm).
- Rolls wider than 12 inches (31 cm) that will be slit.

(3) When to Use Prespacing Tape

- Hold cut and weeded letters or graphics in registration after removing the film liner.
- Protect cut graphic parts from scratching or damage during application.
- Use when large amounts of liner are exposed.

(4) How to Select an Application Tape

Determine whether you want to premask the graphic or prespace cut graphics. Then select the application tape that corresponds to the graphic protection used. See Instruction Bulletin 4.3 for complete details.

Graphic Protection Refer to the Warranty table to determine what graphic protection is approved for your graphic construction.

a. Inkjet Printing

Application Tape	Inkjet Inks	1920DR	9720i 9720UV	8518 8519 8528
Premasking SCPM-3	Any	■		■
Prespacing SCPS-2		■		■
Premasking SCPM-44X			■	
Prespacing SCPS-53X			■	

Graphic Protection Refer to the Warranty table to determine what graphic protection is approved for your graphic construction.

b. Screen Printing

Application Tape	Screen Print Inks	1920DR	9720i 9720UV 9800CL
Premasking SCPM-3	1900 2900	■	
Prespacing SCPS-2		■	
Premasking SCPM-44X	9800		■
Prespacing SCPS-53X			■

c. Electrostatic Printing

Application Tape	Electrostatic Toners	1920DR	8920	8519, 8912
Premasking SCPM-3	8700	■		■
Prespacing SCPS-2		■		■
Premasking SCPM-44X			■	
Prespacing SCPS-53X			■	

d. No Printing or Graphic Protection

- Premasking Tape SCPM-3
- Prespacing Tape SCPS-2

9. Application and Installation

Install the film using the dry application method.

Refer to the 3M Related Literature section, located at the end of this bulletin, for a list of the Instruction Bulletins that may be needed to apply or install this film.

A. Adhesive

This film has a pressure-sensitive adhesive. It bonds to the surface even with light pressure and cannot be repositioned.

Do not use detergent and water or a commercial application liquid to position the graphic.

This film is not recommended for use on low surface energy substrates such as some plastics, powder-coated paint, etc. The user must assume responsibility for testing and approving these substrates.

This film can be applied over other recommended 3M graphic systems. Graphics printed with clear 1920DR must be weathered for at least one year before applying this film over it. See Instruction Bulletin 5.1 for details.

B. Graphics Printed with UV Inkjet Inks are Heat Sensitive!

UV inkjet inks may crack if too much heat is used during graphic application to complex curves and deep contours as well as around rivets. When using a heat gun or other heat source during application, make sure the film surface temperature does not exceed 212°F (100°C).

Using additional heat in the post-application process may cause UV inkjet ink to crack.

For the best results ***always do a test application*** of a UV inkjet printed graphic to determine how much heat can be used without damaging the image.

C. Finishing

- If needed or recommended, use edge sealer 3950.
- Most graphics made with these films do not require an edge sealer, although certain applications may benefit from its use.
- All processed and unprocessed graphics subjected to fuel vapors or occasional fuel spills do require edge sealer.
- Edge sealing in the following applications is not required, but it may help keep the edges adhered when subjected to external sources such as abrasion and/or high pressure washing.
  - graphics exposed to severe abrasion or high pressure washing
  - graphics applied to chrome substrates
  - graphics applied to locomotives and rolling railroad stock
  - graphics applied to truck rollup doors

10. Maintenance and Cleaning

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

Refer to Instruction Bulletin 6.5 for details on pressure cleaning. Exceeding 3M's recommendations will void the warranty whether or not an edge sealer was properly used.

11. Removal

These films are removable with heat from most substrates within the warranted durability period specified for your construction. See Instruction Bulletin 6.5 for details on how to remove graphics.

12. Shelf Life, Storage and Shipping

A. Shelf Life

Total shelf life: 3 years from the date of manufacture on the original box. Up to 3 years unprocessed, ***OR*** process within 2 years ***and*** then apply within 1 year of processing.

B. Storage Conditions

for Unprocessed Film or Unapplied Finished Graphics

- 40° to 100°F (4° to 38°C)
- Out of sunlight
- Clean dry area
- Store unprocessed film in original container
- Cut sheets must lie flat
- Bring the film to print room temperature before using

C. Shipping Finished Graphics

Flat, or rolled printed side out on 6 inch (15 cm) or larger core. This helps prevent the application tape, if used, from popping off.

See Instruction Bulletin 6.5 for details.

13. 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.

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

A. Standards

This information is important for applications that are regulated by ASTM or NFPA standards, for example, traffic control signs, emergency vehicles and certain railroad graphics. The user is solely responsible for determining and complying with all current and applicable local, state and federal regulations regarding the use and application of graphics materials.

B. ASTM D-4956-07: Standard Specification for Retroreflective Sheeting for Traffic Control

ASTM D-4956-07 covers flexible, non-exposed glass bead lens and microprismatic retroreflective sheeting designed for use on traffic control signs, delineators, barricades and other devices. For Type I sheeting it specially covers these colors: white, yellow, orange, green, red, blue and brown. As defined in ASTM D-4956-07, film series 5100R and film IJ5100R-10 are classified as Type I sheeting (section 4.2.1) with a Class 1 adhesive (section 4.3.1). For corresponding colors covered by ASTM D-4956-07, the aforementioned films (except orange) meet the requirements specified in section 6.1.1 (minimum performance requirements for Type I sheeting).

Note: Film 5100R-78 (Light Green) and 5100R-79 (Brown) are new products that are currently being tested for compliance with ASTM D 4956-07.

C. NFPA® 1901: Standard for Automotive Fire Apparatus (2009 Edition)

According to NFPA® 1901, section 15.9.3.3 specifies that all retroreflective materials required by section 15.9.3.1 and 15.9.3.2 shall conform to the requirements of ASTM D 4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Section 6.1.1 for Type I sheeting. Section 15.9.3.3.1 specifies that colors not listed in ASTM D-4956 can be used on the front and sides of the fire apparatus as long as the sheeting has a minimum coefficient of retroreflection of 10 when measured with an observation angle of 0.2° and an entrance angle of -4°.

	Red	Ruby Red	Yellow	Lemon Yellow	White	Blue	Light Blue	Green	Gold	Black
Color Number	72	82	71	81	10	75	76	77	64	85
Section 15.9.3.1 (Front & Sides)	●	●	●	●	●	●	●	●	●	●
Section 15.9.3.2 (Chevrons)	●	●	●	●						

14. 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™ Piezo Inkjet Ink Series 1500v2	PB-IB	1500
3M™ Piezo Inkjet Ink Series 4400	PB-IB	4400
3M™ Piezo Inkjet Ink Series 4800	PB-IB	4800
3M™ Piezo Inkjet Ink Series 6200	PB-IB	6200
3M™ Piezo Inkjet UV Ink Series 2200UV	PB-IB	2200UV
3M™ Piezo Inkjet UV Ink Series 2600UVv2	PB-IB	2600UVv2
3M™ Piezo Inkjet UV Ink Series 2700UV	PB-IB	2700UV
3M™ Piezo Inkjet UV Ink Series 2800UV	PB-IB	2800UV
3M™ Piezo Inkjet Ink Series 5400UV	PB-IB	5400UV
Mimaki Ink Series LF-200 *Manufactured by 3M*	PB-IB	LF200

Subject	Type	Bulletin No.
3M Graphic Protection Products	PB	GP-1
3M™ Screen Print UV Clears 9720i, 9720UV, 9730UV	PB-IB	Clears 9720
3M™ Screen Printing Ink Series 1900 and Clear 1920DR - Screen printing with ink series 1900- line color	PB IB	1900 3.12
3M™ Scotchlite™ Screen Printing UV Ink Series 2900 - Screen printing with Ink Series 2900 - line color - 4-color	PB IB IB	2900 3.18 3.19
3M™ Screen Printing UV Ink Series 9800 - Screen printing with UV ink series 9800 - line color - 4-color	PB IB IB	9800 3.20 3.21
Cold roll lamination	IB	4.22
Design of graphics	IB	2.1
Transferring and laminating electrostatically printed images	IB	4.7
3M™ Trident Transfer Paper	PB	Trident
3M™ Screen Print Clear 8920	PB-IB	8920
Edge Sealer 3950 and 4150S, Edge Sealer Tape 8914	PB-IB	Edge Sealers
Scoring and cutting	IB	4.1
Using 3M application tapes; premasking and prespacing for films	IB	4.3
Application, substrate selection, preparation,substrate-specific techniques	IB	5.1
Application, special applications and vehicles	IB	5.4
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Applicator's quick reference guide for vehicle film	IB	5.35
Storage, handling, maintenance, removal	IB	6.5
3M Graphics Market Center Warranty Brochure	go to www.3Mgraphics.com, Warranties	

15. Bulletin Change Summary

Section 3, Compatible Products and Section 6, Warranty Tables: ADDED: VUTEk® QS3220 and QS220 Printers for UV Ink Series 2800; EFI™ VUTEk™ GS500r Printer for GSr 3M™ Premium UV Inks; Mimaki JFX-1631 & 1615R for Mimaki Ink Series LF-200; Agfa :Jeti 3312, 3318, 3324, 5024 [Gandinnovations] Printers for 3M™ Piezo Inkjet Ink Series 6200; HP Designjet L65500 and Scitex LX600, LX 800 Printer for HP 3M LX600 Specialty Latex Inks; 3M™ Scotchcal™ Gloss Overlaminate 8528. DISCONTINUED: Ink series 4600, 6000, 6800. Films with an RG prefix are still available. However, since 3M no longer sells 3M™ Piezo Inkjet Ink Series 6800, there is no warranted durability offered for graphics made with this film.

Section 2.A.1 and 9.B. New limitations for non-recommended uses: Paint that is not thoroughly cured or dried. Low surface energy substrates (some plastics, powder-coated paints, etc.).

Expanded definition of Removable with Heat in Section 5.F.

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