



# Scotchlite™ Removable Graphic Film with Comply™ Performance Series 680CR

## For Screen Printing and Electrostatic Imaging Only

### Description

3M™ Scotchlite™ Removable Graphic Film with Comply™ Performance Film Series 680CR is a durable, flexible, removable enclosed lens reflective film. It features positionable, pressure activated adhesive and Comply™ Performance for easier, high quality installations.

### Advantages

- Similar daytime and nighttime appearance
- Excellent angularity
- Retains 90% of its retroreflectivity when totally wet
- Easy to temporarily position during application
- Ideal for both large graphics and graphics applied to corrugated surfaces
- Up to 8 years exterior durability
- Up to 8 years removability on vertical surfaces with heat
- Suitable for use for railroad
- Unprocessed film resists fuel vapors or occasional spills

### Applications and Uses

Film series 680CR is intended for making removable, durable graphics when used with the listed Compatible Products in the following applications. These applications are warranted by the 3M™ MCS™ Warranty.

- Commercial vehicle graphics, railroad graphics, commercial signs and striping

### Limitations of Uses

We do not normally warrant other applications, but please contact us to discuss your needs or let us suggest other 3M products.

Specifically, we do not warrant this film for the following:

- Application to FRP without a Tedlar™ coating
- Permanent, regulatory traffic signs
- Use on stainless steel; contact Technical Service
- Graphics made for automotive Original Equipment Manufacturers (OEM); contact 3M Automotive Division at 1-800-328-1684, Ext. 444, for alternatives.

### Compatible Products

#### Screen Print Applications

- 3M™ Screen Printing Ink Series 1900
- 3M™ Screen Printing Ink Series 9700UV
- 3M™ Scotchlite™ Transparent Screen Printing Ink Series 2900

#### Electrostatic Imaging Applications

- Scotchprint® Electronic Graphics System
- 3M™ Trident Transfer Paper
- Scotchprint® Toner Series 8700/8800 ES
- 3M™ Scotchcal™ Luster Overlaminate 8910 ES
- 3M™ Scotchcal™ High Gloss, Graffiti Resistant Overlaminate 8912 ES (not for use on rivets)
- 3M™ Screen Print Clear 8920 ES (not for use on corrugations)

#### All Applications

- 3M™ Scotchlite™ Edge Sealer 4433
- Selected 3M application tapes

### Characteristics

This information is subject to change. Be sure this is the most current Product Bulletin. See 3M Related Literature at the end of this bulletin.

Characteristic	Description																						
Thickness (film and adhesive)	7 to 8 mils (0.18 to 0.20 mm)																						
Colors	<table border="0"> <tr><td>680CR-10</td><td>White</td></tr> <tr><td>680CR-14</td><td>Orange</td></tr> <tr><td>680CR-64</td><td>Gold</td></tr> <tr><td>680CR-71</td><td>Yellow</td></tr> <tr><td>680CR-72</td><td>Red</td></tr> <tr><td>680CR-75</td><td>Blue</td></tr> <tr><td>680CR-76</td><td>Light Blue</td></tr> <tr><td>680CR-77</td><td>Green</td></tr> <tr><td>680CR-81</td><td>Lemon Yellow</td></tr> <tr><td>680CR-82</td><td>Ruby Red</td></tr> <tr><td>680CR-85</td><td>Black</td></tr> </table>	680CR-10	White	680CR-14	Orange	680CR-64	Gold	680CR-71	Yellow	680CR-72	Red	680CR-75	Blue	680CR-76	Light Blue	680CR-77	Green	680CR-81	Lemon Yellow	680CR-82	Ruby Red	680CR-85	Black
680CR-10	White																						
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680CR-82	Ruby Red																						
680CR-85	Black																						

Characteristics continued on the next page.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Characteristics, continued.

Characteristic	Description
Adhesive color and type	Clear, positionable, pressure activated
Liner	94 pound, polyethylene-coated paper
Application surfaces	Flat, flat with rivets, moderately curved, or corrugated
Application substrates	Aluminum, FRP, paint



Characteristic	Description
Application temperature range for air and substrate	40° to 100°F (4° to 38°C) flat surfaces without rivets 45° to 100°F (7° to 38°C) flat, curved or corrugated surfaces with rivets
Service temperature range	-30° to +200°F (-34° to +93°C)
Removal	Easily removable with heat from most substrates up to 8 years

## Effective Performance Life

The effective performance life for films series 680CR is based on field experience and exposure tests conducted throughout the United States. When the graphics are processed and used according to 3M recommendations, they should have the following performance life. The actual performance depends on the:

- Correct combination of film, ink/toner and screen print clear/overlamine
- Ink formulation (screen print only)
- Drying methods (screen print only)
- Selection and preparation of the substrate
- Application methods
- Exposure conditions
- Cleaning methods

## Warranted Durability

Vehicle and Fleet Applications						
Ink Series or Toner	Film	Screen Print Clear or Overlamine	 <b>Vertical Exposure</b> <i>face of graphic is ± 10° from vertical</i>		 <b>Non-Vertical Exposure</b> <i>face of graphic is 10° - 45° from vertical</i>	
			U.S. <sup>1</sup> years	S.W. <sup>2</sup> years	U.S. <sup>1</sup> years	S.W. <sup>2</sup> years
None	Series 680CR	None	8	5	5	0
2900 line color	Series 680CR	2920DR 4430R 9720UV	7	5	5	0
2900 four color	Series 680CR	2920DR 4430R 9720UV	5	4	3	0
1900 line color	Series 680CR	1920DR 4430R	7	5	5	0
		9720UV	6	5	4	0
9700 line color	Series 680CR	9720UV	7	4	3	0
9700 four color	Series 680CR	9720UV	5	4	3	0
8700/8800	Film 680CR-10 only	8910 ES 8920 ES	5	4	0	0
		8912 ES	4	3	0	0

<sup>1</sup> For warranty periods outside the United States, contact the 3M sales organization for that country.

<sup>2</sup> The U.S. Desert Southwest includes Arizona, New Mexico, and the desert areas of California, Nevada, Utah and Texas. A detailed map is available by request. The warranty for this area is reduced because there is more solar energy. This warranty applies to graphics that are exposed more than 50% of the time in the U.S. Desert Southwest.

Note: For the full product names of the 3M products listed on this page, please see page 1.

Ink Series or Toner	Film	Screen Print Clear or Overlamine	Vertical Exposure <i>face of graphic is ± 10° from vertical</i>		Non-Vertical Exposure <i>face of graphic is 10° - 45° from vertical</i>	
			U.S. <sup>2</sup> years	S.W. <sup>3</sup> years	U.S. <sup>2</sup> years	S.W. <sup>3</sup> years

Railroad Applications <sup>1</sup>						
None	Series 680CR	None	5	4	3	0
2900 line color	Series 680CR	2920DR 4430R 9720UV	5	4	3	0
1900 line color	Series 680CR	1920DR 4430R 9720UV	5	4	3	0
9700UV line color	Series 680CR	9720UV	5	4	3	0

Commercial Signs and Non-Vehicle Applications						
None	Series 680CR	None	5	3	0	0
1900 line color	Series 680CR	1920DR 2920DR 4430R 9720UV	5	3	0	0
2900 line color and four color	Series 680CR	2920DR 4430R 9720UV	5	3	0	0
9700UV line color and four color	Series 680CR	9720UV	5	3	0	0
8700/8800	Film 680CR-10 only	8908 ES	1	0	0	0
		8910 ES 8912 ES	5	2	0	0
		8920 ES	4	2	0	0

<sup>1</sup> Removal not warranted for railroad applications.

<sup>2</sup> For warranty periods outside the United States, contact the 3M sales organization for that country.

<sup>3</sup> The U.S. Desert Southwest includes Arizona, New Mexico and the desert areas of California, Nevada, Utah and Texas. A detailed map is available by request. The warranty for this area is reduced because there is more solar energy. This warranty applies to graphics that are exposed more than 50% of the time in the U.S. Desert Southwest.

### Warranty Limitations

- 3M warrants film series 680CR for non-vertical applications in the U.S. (except not in the Desert Southwest) for graphics applied at 10° to 45° from vertical. Film that is exposed at these angles may have a shorter life. The customer must assume the responsibility for testing and approving other exposures.

- Long exposure to continuous high heat decreases the effective performance life 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.
- Overlamine 8912 ES is only recommended for flat surfaces without rivets.
- Clear 8920 cannot be used on graphics applied to corrugations.

Note: For the full product names of the 3M products listed on this page, please see page 1.

## 3M™ MCS™ Warranty

3M warrants the performance of the Product from the date of installation for the number of years stated in the Warranted Durability charts. In the event that the Product does not perform as stated within the warranted time, and the graphics are fabricated as specified by the 3M MCS Warranty, then 3M shall at 3M's option either (a) refund the entire purchase price of the material, or (b) replace all 3M materials consumed in the manufacture of the graphics. In addition, *for fleet applications only*, 3M will reimburse 100% of the labor costs associated with the removal, remanufacture and reapplication of the graphic to the extent that 3M determines such amount is reasonable and necessary in the circumstances. This labor cost reimbursement will be determined by 3M on a case-by-case basis taking into account the expected amount of labor needed to make such repairs and other considerations.

## Screen Printing

### Durability

To obtain the durability given in the Effective Performance Life section, use only approved combinations of ink or toner and screen print clear or overlamine.

Formulations and processing conditions can affect the durability of the ink. Carefully follow the limitations of the specific inks and the instructions in the appropriate Product and Instruction Bulletins. Refer to the 3M Related Literature section.

### Ink Considerations

- All inks in ink series 1900 and most inks in ink series 9700UV are opaque. Be aware that opaque inks prevent the film from retroreflecting in the screen printed areas.
- Do not use inks containing metallic pigments.
- For printed graphics subjected to fuel spills, use screen printing ink 2900 and screen print clear 4430R. Contact Commercial Graphics Technical Service for other ink and clear combinations.
- Oven dry the last color and the screen print clear when using solvent-based inks on graphics needed for any corrugated application.

## Electrostatic Printing

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

Film 680CR-10 can be used as graphic film for the transfer of an image. The image is electrostatically printed onto the transfer media and then heat transferred onto film 680CR-10. A recommended overlamine or screen print clear must be applied to the graphic.

## Cutting



### Caution

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

### Recommended Cutting Methods

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

### Weeding Considerations

Electronically-cut graphics may be difficult to cut and weed. The customer must assume responsibility for testing and approving this cutting method.

Weed the film within 24 hours of cutting it. The adhesive may flow after cutting.

Perform weeding carefully. Cut graphics do not re-adhere to the Comply performance liner if they are pulled off of it. For this same reason, do not attempt to exchange the liner.

Refer to Instruction Bulletin 4.1 for more details.

### Design Factors

- 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).
- For uniform color and brightness when making a graphic with multiple pieces of film series 680CR together, be sure the pieces are properly color matched. See Instruction Bulletin 2.1 for details. Color-matched film is available by special order. Contact your 3M sales representative.
- Order "roll applicator splices" for roll striping. Butt splices may have a small gap.

Note: For the full product names of the 3M products listed on this page, please see page 1.

## Application Tapes

The type of application tape to use depends on the type of graphic produced and the ink/toner and screen print clear/overlamine used. Refer to Instruction Bulletin 4.3 for more details.

- Use a prespacing tape if the graphic has large amounts of exposed liner.
- Use a premasking tape if very little of the liner is exposed.

Premasking IS NOT recommended for:

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

Premasking IS recommended for:

- Graphics larger than 4 square feet (0.4 m<sup>2</sup>)
- Striping greater than 4 inches (10 cm) wide

Screen Print Clear or Overlamine	Premasking Tape	Prespacing Tape
Unprinted film	SCPM-3	SCPS-55
2920DR 1920DR	SCPM-2	SCPS-55
4430R	SCPM-3	SCPS-55
9720UV	SCPM-44X	SCPS-55
8910 ES 8912 ES	None required, but may use SCPM-3	SCPS-55
8920 ES	SCPM-44X	SCPS-55

### Handling Prespaced Graphics

For the best results when using prespacing tape SCPS-55, we recommend these practices.

- Store and ship prespaced film lying flat (do not roll it). This allows adhesion to build and minimizes the chance of the prespacing tape from popping off of the liner or film.
- Handle the prespaced graphic as little as possible and keep it flat during processing.
- Remove as much liner as possible.

## Application

The application details given below apply to film series 680CR. Use them in conjunction with complete application information found in our Instruction Bulletins. Refer to the 3M Related Literature section near the end of this bulletin.

### Temperature

- 40° to 100°F (4° to 38°C)  
flat surfaces without rivets
- 45° to 100°F (7° to 38°C)  
flat, curved or corrugated surfaces with rivets

### Positioning

This film has a positionable adhesive. This 3M technology is a mechanical feature, not an adhesive property. Application pressure bonds the adhesive to the substrate and destroys the positionability feature.

This film loses its positionability feature at application temperatures above 100°F (38°C).

### Application Method

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

Film series 680CR has the Comply performance feature. This 3M technology is also a mechanical feature rather than an adhesive property. This feature allows air to travel through the adhesive, resulting in fewer air bubbles. Refer to Instruction Bulletin 5.31 for complete information on the application of films with Comply performance.

### Substrate

- Some substrates such as under-cured polyurethane paint, fiberglass and some paint systems may continue to outgas for some time. Two-part polyurethane paints and clear coats may stop curing when the air and surface temperatures are lower than 75°F (24°C). Film series 680CR shows an ability to minimize bubbles due to outgassing.

Note: For the full product names of the 3M products listed on this page, please see page 1.

## Finishing Overview

- If needed, use edge sealer 4433.
- Most graphics made with film series 680CR 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 (see Note, below)
  - graphics applied to chrome substrates
  - graphics applied to locomotives and rolling railroad stock
  - graphics applied to truck rollup doors

Note: 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.

## Maintenance and Cleaning

Use a cleaner such as the kind used 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.)

## Removal

### Caution

Solvents may ignite near heat or open flame. Do not use heat sources near solvents. Failure to avoid the use of heat sources near solvents can cause flash fire.

You can use heat to remove film series 680CR from flat and riveted surfaces within the stated warranty period. Also refer to Instruction Bulletin 6.5 for details on how to remove graphics.

### Warranted Removal on Vertical Applications

Film series 680CR is warranted to be removable from vertical surfaces using only heat. Removing film series 680CR from an underlying graphic will damage the underlying graphic.

Removability is defined as leaving no more than 10% of the adhesive on the surface. If the applied graphic cannot be removed within the warranted period, 3M will reimburse the end user for the documented excess costs incurred beyond the anticipated normal removal costs. The reimbursed amount shall not exceed the current low net selling price for the film.

### Requirements for Warranted Removal on Vertical Applications

The ease and rate of removal depends on a number of factors. See Instruction Bulletin 6.5 for details.

- The 3M recommended removal method, including pull off angle, is used.
- Removal is performed when the air and surface temperature is above 60°F (15°C).
- The type and condition of the substrate.
- The amount and type of ink or toner used.
- The graphic age and weathering conditions.

### Removal Warranty

The removal warranty for standard vertical vehicle and sign substrates is:

- **Vertical in most of the U.S.:** 8 years or the **Warranted Durability**, whichever comes first.
- **Vertical in the Desert Southwest:** 5 years or the **Warranted Durability**, whichever comes first.

### Removability Exceptions

These applications are not warranted for removal. A significant amount of adhesive may remain on these non-warranted surfaces. Contact Technical Service for further details or assistance.

- Exterior, horizontal applications.
- Skip or tight corrugations
- Railroad applications.
- Stainless steel substrates.
- Bare aluminum substrates.
- Corrugated substrates.
- Rivet heads.
- Aged paint and metals must be tested to ensure removability. Surface oxidation or chalking may result in adhesive residue upon removal.
- Paint that is not firmly bonded to the substrate may be damaged when removing the film.
- Paint that is not properly cured may prevent the film from being removed.

Note: For the full product names of the 3M products listed on this page, please see page 1.

## Shelf Life and Storage

- The shelf life of film series 680CR whether or not it has been processed is one year from the date of receipt from 3M.
- Leave the rolls of film in the original shipping carton or suspend the rolls horizontally.
- Store cut sheets lying flat.
- Store the film and the processed graphics in a clean, dry area and away from direct sunlight.
- If the graphic has screen print clear 4430R on it and it is premasked, store it at a temperature less than 85°F (30°C). Other graphics should be stored at a temperature lower than 100°F (38°C).
- Ship the finished graphics lying flat or in a roll. To roll the graphic, wrap it film-side-out on a minimum 6 inch (15 cm) diameter core. These methods help prevent the film and premasking from wrinkling or popping off the liner.

## Product Data

These are typical values for film series 680CR and are not intended for use in specifications. Your local 3M sales representative can help you get a custom specification.

### Retroreflection

At a -4° entrance angle and a 0.2° observation angle, unprinted film series 680CR has the following typical coefficient of retroreflection. It is expressed in candlepower per foot-candle per square foot (candela/lux/square meter) per ASTM E 810.

The entrance angle is formed by a light beam striking the surface at a point and at 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.

Film and Color	Typical Coefficient of Retroreflection
680CR-10 White	100
680CR-14 Orange	25
680CR-64 Gold	65
680CR-71 Yellow	60
680CR-72 Red	20
680CR-75 Blue	10
680CR-76 Light blue	10
680CR-77 Green	15
680CR-81 Lemon yellow	40
680CR-82 Ruby red	20
680CR-85 Black	30

## Chemical Resistance

- Resists mild acids, mild alkalis and salts
- Excellent water resistance
- Resists occasional fuel spills

## 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:

- By fax, call 1-800-364-0768 in the US and Canada or 1-650-556-8417 for all other locations.
- Electronically, visit us at <http://www.3m.com/msds>.
- 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.

## Warranty and Limited Remedy

*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: 3M™ Scotchlite™ Removable Graphic Film with Comply™ Performance Film Series 680CR 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. 3M will replace or refund the price of any 3M materials that do not meet this warranty within the specified time periods. See the worldwide 3M™ MCS™ Warranty bulletin, which gives the terms and limitations of the warranty.*

**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.**

**Attention:**

**Scotchprint® Graphics Authorized Manufacturers**

Visit our password-protected website (www.scotchprint.com, then *Login*) for exclusive product information, services and product promotions for 3M's Scotchprint® Graphics Authorized Manufacturers.

Ask your Commercial Graphics Division sales representative to sign you up today!

**3M Related Literature**

**Before starting any job, be sure you have the most recent product and instruction bulletins.**

Listed below is related 3M technical literature that may be of interest. You may view and print these Bulletins from our Web site at www.scotchprint.com, or order them via our Fax-on-Demand (FOD) system. Call one of these phone numbers to order the desired bulletins, and specify the FOD document number provided in the chart.

United States or Canada: 1-800-364-0768  
International: 1-651-732-6506

Subject	Bulletin No.	FOD No.
<b>Product Bulletins</b>		
3M™ Screen Printing Ink Series 1900 and Overprint Clear VI0402	1900	2501
3M™ Screen Printing Ink Series 9700UV	9700	2507
3M™ Scotchlite™ Screen Printing Ink Series 2900	2900	2512
3M™ Trident Transfer Paper	Trident	3567
Scotchprint® Toner Series 8700/8800	8700	3514
3M™ Scotchcal™ Luster Overlamine 8910 ES	8910	3519

Subject	Bulletin No.	FOD No.
3M™ Scotchcal™ High Gloss Graffiti Resistant Overlamine 8912 ES	8912	3521
3M™ Screen Print High Luster Protective Clear 8920 ES	8920	2510
<b>Instruction Bulletins</b>		
Design of graphics	2.1	5501
Screen printing with ink series 1900	3.12	6012
Screen printing with ink series 2900 - line color - 4-color	3.18 3.19	6018 6019
Screen printing with ink 9700UV - line color - 4-color	3.4 3.13	6004 6013
Transferring and laminating electrostatically printed images	4.7	6507
Screen printing with clear 8920 ES	3.15	6015
Using toner series 8700/8800	4.12	6512
Scoring and cutting	4.1	6501
Using 3M application tapes; premasking and prespacing for films	4.3	6503
Application, substrate selection, preparation and substrate-specific application techniques	5.1	7001
Application, special applications and vehicles	5.4	7004
Application, general procedures for interior and exterior dry applications	5.5	7005
Applying 3M graphic films with Comply™ Performance	5.31	7031
Storage, handling, maintenance, removal	6.5	8505

3M, Comply, MCS, Scotchcal and Scotchlite are trademarks of 3M Company. Scotchprint is a registered trademark of 3M in the US and other countries.

**Bulletin Change Summary**

Modified the Description on page 1 to remove statement about use on stainless steel. Remove the statement about stainless steel from note 1 following the warranted durability table. Bulletin shows Release E and F changes.



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