## Overview

This instruction bulletin provides detailed procedures for successful, durable graphic applications on vehicles, including commercial vehicles, automobiles, vans, and buses. This includes instructions specific to challenging aspects of film application on commercial vehicles, including deep recesses and contours, and other difficult applications. Failure to follow these procedures may result in wrinkled graphics and/or lifting from contoured areas. For instructions specific to vehicle color change applications see 3M Instruction Bulletin Application: Vehicle Color Change.

## Table of Contents



## Permissible Applications

Numerous types of vehicle applications are covered by the 3M™ MCS™ Warranty and the 3M™ Performance Guarantee. Applications not warranted or recommended by 3M are to be performed strictly on a user test-and-approve basis.

### Avoid These Applications

- **Do NOT apply film in any way that restricts the safe operation of emergency window exits.** See "Window Application Restrictions" section on page 2 for details.
- Avoid applying graphics to unpainted plastic substrates. 3M does not warrant the application of film to textured plastic substrates under any circumstances. Using heat and a rivet brush to conform the film to the texture may be satisfactory for an unwarranted application, strictly on a user test-and-approve basis.
- Do NOT apply the films to rubber, silicone, or flexible plastics. The adhesive on the recommended films does not adhere to these materials.
- 3M does NOT support applying perforated window graphic film when a driver's view will be obstructed and/or where local laws prohibit its use.

**Penalties For Non-compliance**

Failure to trim film away from rubber gaskets surrounding emergency exit windows can render an emergency exit inoperable

Users are responsible for identifying and complying with their local, regional, or national regulations which may affect the product's usability in their jurisdiction.

## Window Application Restrictions

Do NOT apply perforated graphic film to the following surfaces:

- Never use a carbon steel blade as these will damage the glass. Careful use of stainless steel knife blade is recommended when cutting graphics on glass.
- Openings of any emergency window exit
- Windows with windshield wipers
- Windows that crank or roll down
- Rubber moldings or window gaskets
- Non-laminated or improperly laminated film on exterior windows that require an optically clear view.

**NOTE**

Applications that require an optically-clear view, such as vehicle window exteriors, must be laminated with 3M™ Scotchcal™ Optically Clear Overlaminate 8914. Some regions have laws or regulations requiring minimum light transmission that may limit or preclude the use of graphic products on regulated vehicle windows, which may include passenger vehicles and vans. The user is responsible for determining and complying with all applicable standards and acquiring relevant certifications.

### Safety Guidelines for Applying Vehicle Window Graphics

- Before applying film, open all emergency exit windows to determine exactly where graphics must be trimmed to ensure they do not interfere with the operation of these windows.
- If an emergency window is non-functioning, it is your responsibility to alert the bus maintenance personnel before proceeding.
- Always trim the film 1/8 in. to 1/4 in. (3 mm to 6 mm) away from all rubber gaskets. Do NOT apply film over rubber gaskets.
- Do NOT allow any graphic film, whether applied to windows or to the bus body, to overlap the opening of an emergency window exit.
- After graphic installation is completed, ensure that all emergency window exits are fully functional.

# Tools*

* Product availability varies by region. Contact a local sales representative or application engineer for details.

## Cleaning Products and Tools

### General Cleaning

- A mixture of 70% isopropyl alcohol and 30% water
- Lint free cloths

This list of cleaners is provided for your convenience; other acceptable cleaners may be available. 3M does not endorse any particular chemical manufacturer or supplier.

### Lower Solvent Content Cleaners

- 3M™ Prep Solvent-70 08983[1]
- Other suitable products may be available from your local building products store.

### Petroleum Distillate-based Cleaners

- 3M™ General Purpose Adhesive Cleaner
- 3M™ Citrus Base Industrial Cleaner[1]
- 3M™ Adhesive Cleaner and Wax Remover 8984[1]
- DuPont™ Prep-Sol™ Solvent Cleaner 3919S[2]
- Sherwin Williams R7K156 Sher-Will-Clean™[2]
- Sherwin Williams R7K158 Sher-Will-Clean™[2]

[1] Available from 3M Commercial Branding and Transportation.
[2] Available from automobile supply houses handling DuPont or Sherwin Williams products.

### Application Tools

- 3M™ Plastic Applicator (squeegee) PA-1[1]
- 3M™ Scotchmate™ Reclosable Hook and Loop Fastener - Loop portion SJ-352B[1]
  - Apply to applicator PA-1 as a way to reduce friction and minimize the possibility of surface scratching.
- 3M™ Rivet Brush RBA-1 or RBA-3[1]
- 3M™ Air Release Tool 391X[1]
- 3M™ Tape Primer 94[1]
- 3M™ Adhesion Promoter 111
- 3M™ VCAT-2
- 3M™ Roller L
- 3M™ Roller S
- 3M™ Knifeless™ Tape[1]
  - *3M recommends using this product with 3M's 2-mil cast films.*
- Stainless steel snap-off cutting knives or razor blades in safety holders
- Scotch™ Masking Tape - 1in. to 2 in. (2.5 cm to 5.1 cm) roll
- Industrial heat gun capable of attaining at least 500°F (260°C)
- Cotton gloves
- Wrap gloves

1 Available from 3M Commercial Branding and Transportation.

## Pre-installation Inspection Record

3M recommends that installers complete a properly executed and signed pre-installation inspection record before applying any 3M graphics. This record identifies any potential problem areas. Fill out a copy of the appropriate pre-installation inspection record for each vehicle. These forms are located at the end of this bulletin.

3M recommends graphics manufacturers clearly define mutual obligations between the vehicle graphics operating companies and themselves and strongly suggests that graphics manufacturers seek written limitations of claims or liabilities on individual vehicles for unsound paint.

## Pre-Application Instructions

This instruction bulletin provides detailed procedures and tips for a successful, durable graphic application. Failure to follow these procedures may result in wrinkled graphics and/or lifting from contoured areas.

- Ensure the application environment is clean and well lit.
- Sweep the work area clean to remove any loose dirt or particles.
- Use a clean table top to handle graphics. Do NOT place graphics on the floor.
- Do NOT select the “spot-free rinse” option when washing vehicles in an automatic car wash.
- Ensure the vehicle surface is completely dry prior to starting the application.

## Application Temperature and Environment

Generally speaking it is best practice to apply vehicle graphics when the air and vehicle surface are both at 60°F to 90°F (16°C to 32°C).

### Cool Application Conditions

If the temperature is too cool, move the vehicle indoors to bring its surface temperature up to at least the minimum application temperature. Below the recommended minimum application temperature:

- Films cool too quickly and are unable to maintain the elevated temperatures required for stretching.
- The initial adhesive bond may be insufficient to ensure the film stays adhered.
- Moisture may condense on the vehicle surface if the vehicle’s surface temperature is below the dew point.
- In very humid conditions, it may be difficult to keep the substrate dry.

### Very Warm Application Conditions

If the temperature is too warm, move the vehicle indoors or into the shade and ensure the vehicle's surface cools to below 90°F (32°C) before starting the installation.

Above the recommended maximum application temperature:

- Graphics may pre-adhere and trap air.
- The adhesive will be more aggressive.
- Controltac™ films may lose their positionability feature.
- The film may stretch.

## Surface Preparation

All substrates must be considered contaminated. Clean the substrate immediately before applying the film. Dust and other contaminants can collect quickly on the substrate and prevent the film from adhering properly.

1. Use a solution of 1 ounce (30 ml) of liquid dish washing detergent per gallon (3.8 l) of lukewarm water to thoroughly clean the vehicle. Rinse with water.

   Avoid soaps or preparations that contain waxes, oils or lotions; some window cleaners contain waxes! Be aware that the chemicals used in some automated vehicle washing equipment may prevent good film adhesion.

   Pay particular attention to cleaning the front and rear of the vehicle and areas where the film will be wrapped around, like doors and body seams.
2. Dry the surface thoroughly with clean, lint-free paper towels. A heat gun may be used to apply moderate heat and accelerate the drying.

   Moisture prevents the adhesive from adhering correctly, can cause bubbles, and can freeze in cold environments. Any moisture trapped beneath the graphic will cause the graphic to fail prematurely.

   Condensation can occur at low installation temperatures (below 60°F or 15°C), so having a dry surface is critically important.
3. Wipe the surface again with a solvent-based cleaner. Refer to the list of cleaners on page 2. Be sure that the cleaner does not damage the vehicle's paint.

   **NOTE**

   Car wax can greatly reduce graphic adhesion. Solvent-based cleaners must be used to thoroughly remove any wax residue. Saturate a clean paper towel with the cleaner.

   With the saturated towel, wipe the surface where the graphic will be installed 12 in. (30 cm) beyond this area.

   Before the cleaner evaporates from the substrate, wipe the surface with a dry, lint-free paper towel. As the paper towel becomes dirty, discard it. A dirty towel will simply move the dirt around, rather than remove it.
4. In order to further improve the adhesive performance, 3M recommends to repeat Step 3 using a mixture of 70% isopropyl alcohol (IPA) and 30% water as the cleaner.

   **NOTE**

   IPA evaporates very quickly. Always wipe the surface before it evaporates. The evaporation rate increases in warm and/or windy environments.
5. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

# General Application Techniques

Identify all areas on the vehicle where graphics may tend to lift such as in concave channels, inside wheel wells and other underside areas of the vehicle.

## Use 3M™ Tape Primer 94

3M recommends, but does not require, the use of 3M™ Tape Primer 94 to promote better film adhesion where the film will be stretched, as it reduces the chances of film lifting, and can be especially helpful in deep recesses.

- In concave channels, apply a thin layer of primer over most of the concave area. Allow the primer to dry.
- When going around convex areas, apply a thin layer of primer at the outer edges of the curve to prevent film edge lifting. Allow the primer to dry for five minutes.
- For the most effective bond, and to avoid contamination, install the graphic within one hour of applying the primer.

## Apply to Flat Areas First

Apply the film to the vehicle's flat areas vehicle first.

Avoid areas on the underside of the vehicle. These areas are usually too difficult to clean sufficiently to ensure proper film adhesion.

## How to Use Heat to Soften Film

Use heat to soften the film when stretching it around and into complex curves. Please refer to the table for typical film heating temperatures.

1. Gently stretch the film immediately after the heat source is removed, as the film cools within seconds. Wear a wrap glove, since the film should be too hot to touch with unprotected hands.

**Table A.** Temperatures for Conforming Graphic Films

| Base Film | Film Temperature Range for Conforming During Installation |
|---|---|
| **3M™ Print Wrap Film IJ280 (w/3M™ Gloss Wrap Overlaminate 8428G)** | 120°F to 130°F (50°C to 55°C) |
| **3M™ Print Wrap Film IJ180mC<br>3M™ Controltac™ Graphic Film with Comply™ v3 IJ180Cv3<br>3M™ Print Wrap Film IJ175Cv3** | 130°F to 140°F (55°C to 60°C) |
| **3M™ Envision™ Print Wrap Film LX480mC/3M™ Envision™ Print Wrap Film SV480mC (w/ Envision overlaminates)** | 140°F to 150°F (60°C to 65°C) |

2. To apply film into concave channels, use a wrap glove, or a squeegee with a low friction sleeve or Scotchmate™ loop material applied to the edge. First press the heated and softened film into the middle of the channel so the film is stretched evenly across the channel. See Figure 1.

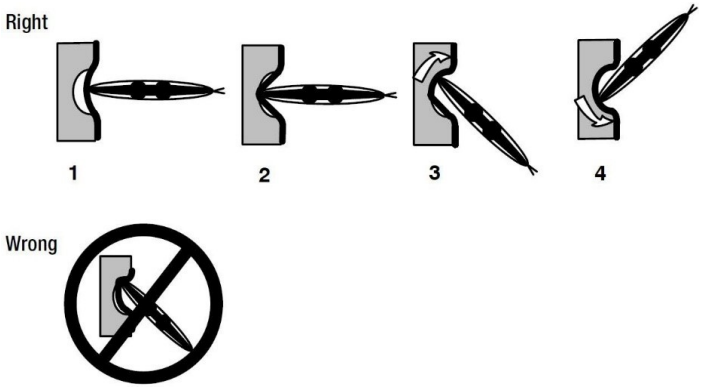


**Figure 1.** Technique for Stretching Heated Film Into Channels

## Graphics printed with UV cured inkjet inks and UV cured clears are heat sensitive!

UV cured inkjet inks and UV cured clears may crack if too much heat is used during graphic application to complex curves and deep contours as well as around rivets. When using heat during application, ensure the film surface temperature does not exceed 212°F (100°C). For best results, always do a test application of a printed graphic to determine how much heat can be used without damaging the image.

3M recommends using additional heat in the post-application process for vehicle wraps. During this process, 3M recommends using only a heat gun to ensure the film surface temperature does not exceed 212°F (100°C).

## Use Heat in Post-Application

1. Strive for a bubble-free applications. Although puncturing air bubbles improves the appearance of the graphic, it can contribute to premature graphic failure if the film is torn or cut rather than neatly punctured.

   When removing bubbles is necessary:

   a. Reheat film (especially in any recessed areas and deep channels) with a heat gun. This can help detect overlooked air bubbles.

   b. Puncture any remaining air bubbles with the 3M™ Air Release Tool 391X.

   c. Firmly push any trapped air out the puncture hole with a squeegee

2. After the film has been applied, apply heat to the graphic to reduce the internal stress in the vinyl film.

   a. Adjust the heat source so the film temperature reaches 200°F to 225°F (93°C to 107°C). Installers should measure the temperature of the film with an infrared thermometer as they heat the film. Hold the heat gun in the lead hand and the heat gun in the trailing hand to best measure the film's temperature. Have the infrared thermometer trail the heat gun slightly to ensure the temperature of the film is measured, rather than the temperature of the air.

   b. Move the heat source slowly across the stretched film surface.

   c. For the best performance, press stretched film with a 3M™ Roller S while the vinyl is still hot. This helps fully wet-out the adhesive onto the substrate and reduces the risk of lifting.
   See Figure 2.


**Figure 2.** Heating the Film and Measuring the Temperature

3. Use firm, even, overlapping squeegee strokes to avoid missing any areas. This pressure is key to bonding the adhesive to the substrate. Missed areas leave wrinkles and bubbles in the applied film. These are areas where premature film failures may occur.
4. Carefully cut the film at all seams in vehicle body panels, being careful to avoid scratching the paint. Seams on vehicles flex as the vehicle moves. If they are not cut, graphics will pull away from the seams, resulting in premature failure.
5. Resqueegee all edges and overlaps to ensure good adhesion before releasing the vehicle for use.

## Post-Application Conditions

1. After applying the graphic, keep the vehicle temperature above 60°F (16°C) for at least 12 hours before exposing the vehicle to either a cold or wet climate. This strengthens the graphic's bond to the contoured areas.
2. Do NOT wash the vehicle for at least 24 hours after completing the graphic installation.
3. After 24 hours, the vehicle may be washed by hand or in a touchless automated car wash using normal vehicle washing solutions. Do NOT use high pressure sprays directed at the film edges, as this can cause edge lifting and damage the film.
4. Dry the graphics to prevent hard water stains.

## Edge Sealing

Edge sealing is required for all perforated window graphics in order to be warranted. Edge sealing improves graphics' resistance to environmental damage and enhances their durability. Installers can use one of these two options:

### Edge Sealing with an Edge Sealer

Order 3M™ Edge Sealer 8914, which is 1/2 in. (12.7 mm) wide rolls of 3M™ Overlaminate 8914. Use part number 75-3469-0233-3 and specify 1/2 in. by 50 yard (12.7 mm by 45.7 m) rolls.

### Edge Sealing with Strips of Overlaminate.

This method can be used whether a graphic has Overlaminate 8914 or a screen printed clear coat applied.

Apply 1/2 in. (12.7 mm) wide strips of Overlaminate 8914 so each strip evenly straddles the perforated film and substrate. Overlap the corners. See Figure 3 and Figure 4.

**NOTE**

Never allow film or overlaminate or edge sealer to touch the rubber window molding.

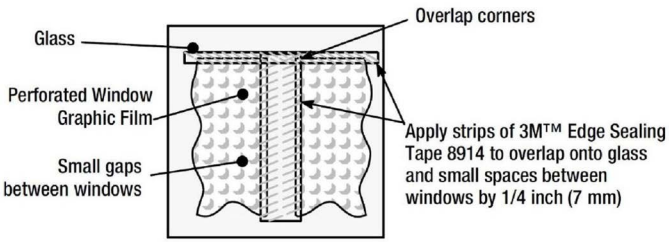


**Figure 3.** Applying 3M™ Edge Sealing Tape 8914

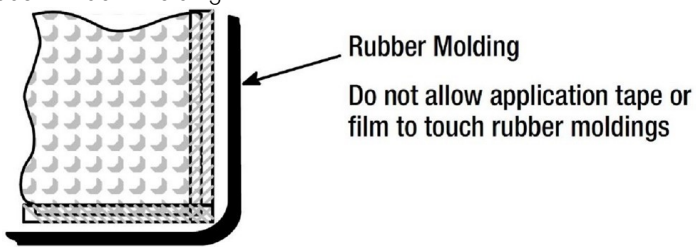


**Figure 4.** Avoid Rubber Molding

# Application to Recesses

## Selecting the Appropriate Print Film

Different type of recesses and application technique are causing different stress to the graphic. The table below lists typical kind of challenging recesses and recommended 3M products to use.

The tables below assume the application without making relief cuts or using adhesion promoters. Making relief cuts enable the non-stretched, stress free graphic to adhere in the recess.

The usage of adhesion promoters can aid to increase the performance of film in recesses and reduce the risk of film lifting. Please consider the impact of reduced removability when using adhesion promoters.

## Stretching Capabilities of Wrap Film Graphic Constructions

**Table B.** Application Methods

| | |
|---|---|
| A | Follow Contour of the substrate - no heating |
| B | Heat stretch - minimum of 8 in. (20 cm) away from recess |
| C | Bridge the area, heat, and stretch |

**Table C.** Inks and Graphic Protection

| | |
|---|---|
| **Best** | 3M™ Gloss Wrap Overlaminate 8428G, 3M™ Envision™ Gloss Wrap Overlaminate 8548G, 3M™ Envision™ Luster Wrap Overlaminate 8549L, 3M™ Envision™ Matte Wrap Overlaminate 8550M, most solvent inkjet inks, Latex Inks, GSLXr SuperFlex Ink |
| **Good** | 3M™ Scotchcal™ Gloss Overlaminate 8518, 3M™ Scotchcal™ Luster Overlaminate 8519, 3M™ Scotchcal™ Matte Overlaminate 8520, 3M™ Scotchcal™ Gloss Overlaminate 8528, 3M™ Scotchcal™ Ultra-Matte Overlaminate 8915, 3M™ Screen Print Dirt Resistant Gloss Clear 1920DR, 3M™ Screen Print UV Gloss Clear 9740i, 3M™ Screen Print UV Gloss Clear 9760LX, most UV inkjet inks |

**NOTE**

To achieve stretching capability with 9740i or 9760LX, you have to follow optimal processing conditions. For detailed information, please refer to the respective product bulletin.

Follow preparation, application and post-heating techniques.

Film inlays and adhesive promoter – not required, but add extra level of insurance against lifting and may be needed for very deep recesses.

**Table D.** Application Method Selection

| Surface Description | Example | Application Method | IJ280 | IJ180mC/ IJ180Cv3/ IJ175Cv3 | LX480mC/ SV480mC | Inks and Graphic Protection |
|---|---|---|---|---|---|---|
| **Single Recess Channel** |  | **B** | ✔ | ✔ | ✔ | **Good**<br>**Best** |
| **Wide Corrugations (i.e. Van Roof)** |  | **C** | ✔ | ✔ | ✔ | **Good**<br>**Best** |
| **Multi Dimensional Concave (i.e. Door Handle)** |  | **C** | ✔ | ✔ | ✔ | **Good**<br>**Best** |
| **Small V-Shape Channel** |  | **A** | ✔ | ✔ | ✔ | **Good**<br>**Best** |
| **U-Shape Recess** |  | **C** | ✔ | - | ✔ | **Best** |

| Surface Description | Example | Application Method | IJ280 | IJ180mC/ IJ180Cv3/ IJ175Cv3 | LX480mC/ SV480mC | Inks and Graphic Protection |
|---|---|---|---|---|---|---|
| **Single Recess With Additional Adjacent** |  | **B** | ✔ | - | ✔ | **Best** |
| **Combined Recesses (i.e. Front Wheel Well)** |  | **B** | ✔ | - | ✔ | **Best** |
| **Micro-V Channel** |  | Relief Cutting | ✔ | ✔ | ✔ | **Good**<br>**Best** |
| **License Plate Holder** |  | Relief Cutting | ✔ | ✔ | ✔ | **Good**<br>**Best** |

Contact 3M if your type of recess is not listed in the above table.

## Premasking and Prespacing Tapes

The use of application tape is not required on laminated graphics. However, depending on environmental conditions (high temperature) it may be an advantage for a trouble free application. The use of application tape is recommended for clear coated samples.

For large format graphics 3M™ Premasking Tape SCPM-19 and 3M™ Premasking Tape SCPM-44X can be used. 3M™ Prespacing Tape SCPS-100 or 3M™ Prespacing Tape SCPS-55 is suitable for pre-spaced graphics or logos.

## Adhesion Promoters

The usage of adhesion promoters within the recess area will increase the adhesion of the graphic. It is considered an extra level of insurance to avoid film lifting.

Repositionability and removability will be lost in areas where adhesion promoters are used.

3M offers two options to promote good adhesion to the vehicle body: 3M™ Tape Primer 94 and 3M™ Adhesion Promoter 111.

### 3M™ Tape Primer 94

If you choose to use 3M™ Tape Primer 94 (“Primer 94”) or other adhesion promoters, apply it to:

- The deepest part of any channel
- Both sides of any silicone bead

Apply film within 5 minutes to 60 minutes after Primer 94 application.

1. Break the glass inside the Primer 94 ampules to activate.
2. Apply Primer 94 to the deepest part of the channel.

**Figure 5.** Application of 3M™ Primer 94

### 3M™ Adhesion Promoter 111

Using 3M™ Adhesion Promoter 111 is another option for promoting adhesion to vehicle substrate. Apply film within 5 minutes to 60 minutes after 3M™ Adhesion Promoter 111 application.

**NOTE**

3M™ Adhesion Promoter 111 should only be applied to recessed areas, edges, and areas of high stress, due to its ability to promote adhesion. Promoter 111 may leave adhesive behind during removal.

**Figure 6.** 3M™ Adhesion Promoter 111

**NOTE**

Be sure to clean beyond areas where the film will be wrapped, such as the backside of the doors, all painted surfaces and behind rubber moldings.

1. Wet 3M™ Adhesion Promoter 111 on a lint free cloth and wipe the cloth in the recessed areas and edges.

## Application Method A

Use the "General Application Techniques" described above.

## Application Method B

**Figure 7.** Single Recess Vehicle Surface

1. Position the film and apply it from the top and fix the edges of the contours.

**Figure 8.** Positioning and Tacking the Film to a Single Recess

2. In case of applying the graphic within the recess area, do not apply closer than 8 in. (20 cm) to the recess. To minimize the risk of lifting, it is essential, to have sufficient amount of material left.

3. Use firm, even application pressure. The use of 3M™ PA-1 Gold Squeegee with thin and soft sleeve (e.g. microfiber) is recommended. Wetting of sleeves with a solution of 70% IPA and 30% water can help prevent scratches on film surface during application.

**Figure 9.** Aligning Contour Edges

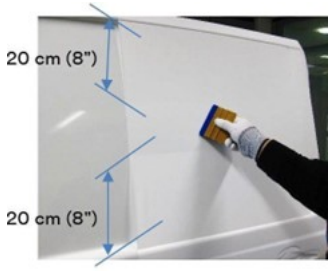


**Figure 10.** Do NOT squeegee the top or bottom 8 in. (20 cm) of the single recess.

4. Heat the film around the recess area with a professional heat gun to the following temperature based on the base film (see Table A on page 5).
5. Applying heat to areas of film 8 in. (20 cm) beyond the recess area will reduce the tension of the film when being applied in the recess area.

**Figure 11.** Applying Heated Film to the Recess

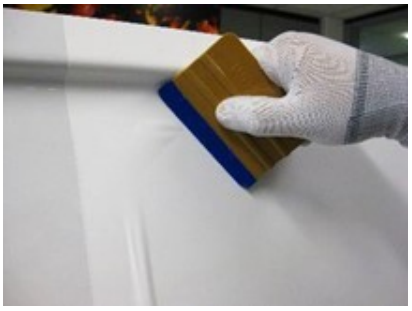

**Figure 12.** Squeegee the top and bottom 8 in. (20 cm) of film.

6. Apply the film into the recess either with a gloved finger or with the hand roller (3M™ Roller L or S).
7. After the film is completely applied into the recess, apply the film on the remaining area within the recess.
8. Due to the 3M™ Comply™ technology, trapped air can easily be removed without causing air bubbles.

## Application Method C

When planning the film application in the recess area, make sure you leave a path for the air to escape.

1. Position the film panel onto the substrate and fix the film panel with magnets or masking tape on the top.
2. Roll the film panel up to the top. Remove the liner carefully from the film.
3. Start the application on the flat part of the substrate and bridge the film over the recess (deep channel).

**Figure 13.** Aligning and Attaching the Panel with Masking Tape

**Figure 14.** Roll the film up to the top.

**Figure 15.** Unrolling the Liner While Applying Film

**NOTE**

Films require high squeegee pressure to avoid air entrapment between film and substrate. Therefore the use of 3M™ PA-1 Gold Squeegee with thin and soft sleeve (e.g. microfiber) is recommended. Wetting of sleeves helps to avoid scratches on film surface during application.

4. Apply the film into the recess either with your thumb, your finger or with the hand roller (3M™ Roller L or S).
5. When applying manually, wear textile gloves to lower the friction between finger and film. Heat the film around the recess area with a professional heat-gun. See Table A on page 5.
6. Start film application in the recess in the deepest point first (1). Then continue at the opposite point of the recess (2). Last apply the film in the middle part of the recess (3).

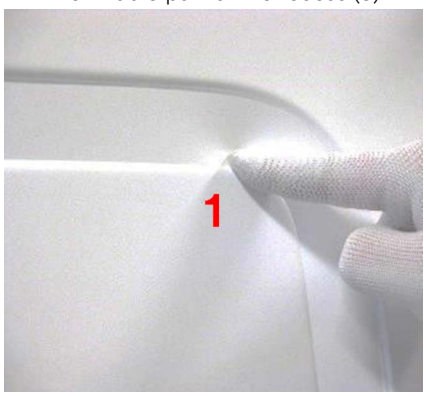


**Figure 16.** Apply the deepest first.

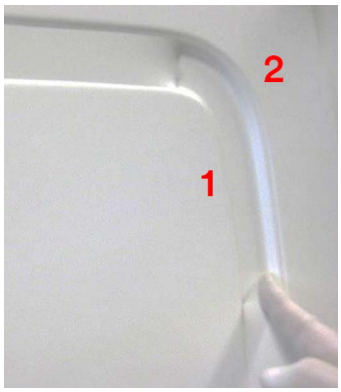


**Figure 17.** Apply the opposite side second.


**Figure 18.** Finally, apply the center of the recess.

## Post-Heating of Film Applied to Single Recesses and U-Shape Recesses

For application on recesses, post-heating is required.

1. Reheat film in the recessed areas and deep channels with a heat gun. This can help detect overlooked air bubbles.
2. Puncture any remaining air bubbles with the air release tool.
3. Firmly push any trapped air out the puncture hole with a squeegee.
4. Heat the film to 200°F to 225°F (93°C to 107°C). Installers should measure the temperature of the film with an infrared thermometer as they heat the film. Hold the heat gun in the lead hand and the heat gun in the trailing hand to best measure the film's temperature.
5. Immediately re-roll the film with the small hand-roller in all recessed areas and deep channels, using uniform continuous pressure. This softens the adhesive, closes remaining air channels, and helps provide good final adhesion.

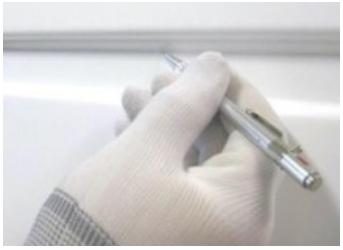

**Figure 19.** Puncturing Air Bubbles

**Figure 20.** Re-rolling Recessed Film

## Relief Cutting Method

Relief cuts are an alternative to Methods A, B, and C described above, installers may wish to utilize relief cuts instead.

1. Apply 3M™ Knifeless™ Tape on the outside edge of the channel. See Figure 22. This location will prevent shrinkage after the graphic has been relief cut.
2. Dry fit the panels onto the substrate to ensure the panels will line up per the specifications from the graphic manufacturer.
3. Squeegee the film to the top edge of the channel.
4. Use the squeegee to gently tuck the film into the channel.
5. Squeegee the film to the bottom edge of the channel.
6. Finish applying the film to the top part of the side panel.

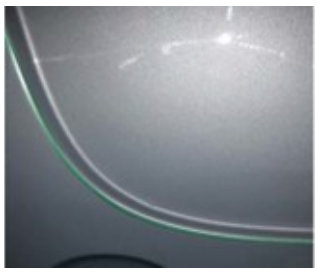

**Figure 21.** Applied 3M™ Knifeless™ Tape

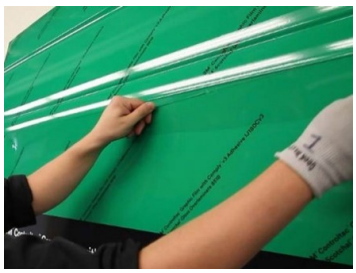

**Figure 22.** Cutting With 3M™ Knifeless™ Tape

**NOTE**

Do NOT bridge the channel and then force the film into it, even when using heat. Forcing the film into the channel will likely result in film lifting.

7. Cut the film using the installed 3M™ Knifeless™ Tape. (See 3M Instruction Bulletin Application: 3M™ Knifeless™ Tape for details.)

**NOTE**

The film can be cut either with application tape in place or removed, except at complex curves or when tucking film into channels. The application tape must be removed at such locations. Always remove application tape at an 180 degree angle.

8. Use the squeegee to tuck and adhere the cut film into the channel. (See Figure 24.)
9. Use the 3M Roller L or Roller S to help ensure good adhesion of the film to the channel.

**Figure 23.** Tucking Film

**Figure 24.** Finished Relief Cut

**Figure 25.** Applying Edge Tape

10. Lightly warm the film in the channel with a heat gun to soften it. Then gently work out any wrinkles in the film using the edge of a squeegee, 3M™ Roller L, or 3M™ Roller S.
11. Cover the exposed vehicle body with edge tape or install a filler strip. (See Figure 26.)

## Vehicle Window Graphics

### Sizing the Window

Measure the window opening and the graphic to ensure it fits on the window. Apply the graphic and then cut away a margin of 1/8 in. to 1/4 in. (3 mm to 6 mm) all around the graphic. See Figure 7.

Do NOT apply the film to any rubber gaskets or parts on the buses. This minimizes the chance of the graphic lifting, or absorbing water that may collect in the window edge.

Do NOT allow any film to overlap the openings for any emergency window exits, as this can prevent the window from operating properly in an emergency.

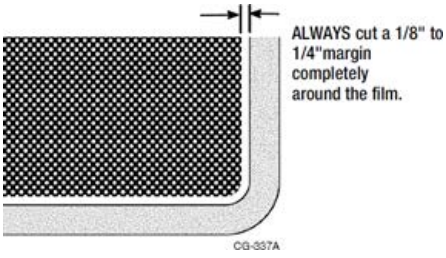


**Figure 26.** Leave Space All Around the Window

### Painted Metal Surfaces Between Windows

If window graphic film is applied to narrow painted metal surfaces between windows, the image may not appear consistent. To maintain a consistent image, an opaque 3M vinyl film may be applied to the surfaces between windows before the perforated film is applied.

### Seaming Side-by-Side Panels

If two panels are designed to meet side by side on a window, carefully trim the images so that the panels meet and form a butt seam. Do NOT overlap the panels. Always trim before starting the application. Do NOT cut the film while it is on the window as this may permanently scratch some window surfaces.

## Finishing the Installation

1. Resqueegee the entire film surface.
2. Using light heat, warm the edges of the film and resqueegee all of them. This is critical to prevent edge lifting.
3. Post heat any stretched areas of film between 200°F to 225°F (93°C to 107°C).
4. Keep the vehicle at an ambient temperature above 60°F (16°C) for at least 12 hours, before exposing it to either a cold or wet climate. This allows the film to build adhesive strength.
5. Do NOT wash the vehicle for at least 24 hours after completing the graphic installation.
6. After 24 hours, the vehicle may be washed by hand or in a touchless automated car wash using normal vehicle washing solutions. Do NOT use high pressure sprays directed at the film edges, as this can cause edge lifting and damage the film.
7. Dry the graphics to prevent hard water stains.

## 3M Related Literature

Read the most current 3M product and instruction bulletins before starting any job.

The information in 3M product and instruction bulletins is subject to change. Current bulletins are available at 3M.com/graphics. The techniques described in these bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional bulletins may be needed as indicated in the 3M Related Literature sections of the product bulletins of all 3M components used.

- 3M Instruction Bulletin Production: Graphic Design, Handling, and Storage
- 3M Instruction Bulletin Application: General Installation Techniques
- 3M Instruction Bulletin Application: Graphic Product Selection and Substrate Preparation
- 3M Instruction Bulletin Application: 3M™ Knifeless™ Tape
- 3M Instruction Bulletin Maintenance
- 3M Instruction Bulletin Removal

## Health and Safety

### Tools and Equipment Usage

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

### Chemicals

When handling any chemical products, read the manufacturers' container labels and the Safety Data Sheets (SDS) for important health, safety, and environmental information.

Follow this link to obtain SDS sheets for 3M products.

Follow this link to obtain information about substances of very high concern (SVHC) for EU products.

### Air Quality Regulations

Country, state, or regional volatile organic compound (VOC) regulations may prohibit the use of certain chemicals with VOCs in graphic arts coatings and printing operations. Check with local environmental authorities to determine whether use of this product may be restricted or prohibited.

# Warranty Information

## Technical Information

Technical information, guidance, and other statements provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license to any intellectual property rights is granted or implied with respect to this technical information.

## Product Selection and Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment, reviewing all applicable regulations and standards, and reviewing the product label and use instructions. Failure to properly evaluate, select, and use a 3M product in accordance with instructions or to meet all applicable safety regulations may result in injury, sickness, death, and/or harm to property.

## Warranty, Limited Remedy, and Disclaimer

Unless a different warranty is specifically stated on the applicable 3M product packaging or product literature (in which case such warranty governs), 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. If a 3M product does not conform to this warranty, the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

## Limitation of Liability

Except for the limited remedy stated above, and except to the extent prohibited by law, 3M will not be liable for any loss or damage arising from or related to the 3M product, whether direct, indirect, special, incidental, or consequential (including, but not limited to, lost profits or business opportunity), regardless of the legal or equitable theory asserted, including, but not limited to, warranty, contract, negligence, or strict liability.

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# 3M Auto and Van Graphics Pre-installation Inspection Record

**NOTE**

Complete both pages of this pre-installation inspection record before each new graphic installation and between subsequent graphic installations on the same vehicle. Use a separate record for each vehicle and installation.

## Installer Requirements

1. Carefully and thoroughly examine each vehicle and record all potential problem areas prior to installing the graphics. 3M recommends washing the vehicle so that potential problem areas are easily seen.
2. Ensure the paint is sound so the graphics will adhere well to the paint. For the purpose of this inspection, “sound paint" is defined as paint that is free of defects (see the “Defects" bullet below).

   Circle all areas on the following diagram where your inspection shows the paint may be unsound, the graphic may adhere poorly, or graphic removal may damage the vehicle paint. This includes:

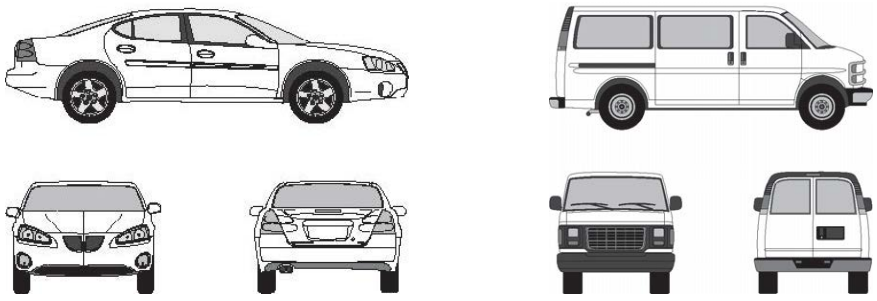
   - Defects: paint that is not well bonded over the entire application surface, including multiple layers of paint being well bonded to one another, loose paint, dents, surface damage, rough surface, fillers used for damage, rust, or blistered paint.
   - Areas where water can collect, which are more likely to rust, resulting in paint adhesion problems.

   **NOTE**

   Primer, which does not outgas, may be applied to bad paint spots on the vehicle to prepare it for film application. However, the use of primer on bad paint spots does not guarantee success or provide a warranty, must still be considered a problem area, and must be documented on the pre-installation inspection record.
3. Photograph all areas circled on the diagram as exhibiting unsound paint.
4. Explain proper graphic maintenance to the vehicle owner/operator. See 3M Instruction Bulletin Maintenance for details.
5. Complete the pre-installation inspection record.
6. Make and distribute copies to all signing parties.
7. Maintain a file with the signed form and photographs.

## Warranty Claims and Exceptions

1. 3M recommends using the pre-installation inspection record on the next page to document any existing damage prior to starting the graphic installation.
2. 3M makes no warranty (expressed or implied) for paint or existing graphic damage occurring during the removal of a graphic or staining that may be visible after removing a graphic. See the 3M Graphics Warranties Bulletin for complete details.



**Circle all areas where the paint may be unsound. Mark only one vehicle type.**

(Diagrams courtesy of Digital Auto Library, 1-888-843-1325 or www.digitalauto.on.ca)

# 3M Auto and Van Graphics Pre-installation Inspection Record

## COMPLETE THIS FORM, PROVIDE A COPY FOR EACH SIGNER

## AND RETAIN WITH PHOTOGRAPHS IN CASE OF A CLAIM

Please print except in signature boxes.

| **Automobile Owner/Operator** |
|---|
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zip |
| Area Code/Phone Number |
| **Graphics Printer** |
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zipc |
| Area Code/Phone Number |
| **Graphics Installer** |
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zip |
| Area Code/Phone Number |

| **Automobile Information** | |
|---|---|
| License Number | State |
| Automobile Year, Make, and Model | |
| VIN | |
| Automobile Owner/Operator | |
| Pre-Inspection: (see the previous page of this bulletin for inspection requirements)<br>❑ PASSED (DATE: _____ BY: _____)<br>❑ FAILED (Owner waives all product warranties if graphics are applied) | |
| Photographs of Potential Problem Areas<br>❑ YES (DATE: _____ BY: _____)<br>❑ NO | |
| **Graphic Construction and Installation Information** | |
| Installation Date | |
| Graphic Coverage<br>❑ Full ❑ Rear Only ❑ Trunk Only<br>❑ Driver Side Only ❑ Passenger Side Only | |
| Substrate Cleaned and Prepared According to 3M Recommendations:<br>❑ YES (DATE: _____ BY: _____) | |
| Film and Graphic Protection Used | |
| **Signatures of All Parties** | |
| Installer | Date |
| Agency Representative | Date |
| Automobile Owner/Operator | Date |

# 3M Bus and Mini-Bus Graphics Pre-installation Inspection Record

## Installer Requirements

**NOTE**

Complete both pages of this pre-installation inspection record before each new graphic installation and between subsequent graphic installations on the same vehicle. Use a separate record for each vehicle and installation.

1. Carefully and thoroughly examine each vehicle and record all potential problem areas prior to installing the graphics. 3M recommends washing the vehicle so that potential problem areas are easily seen.
2. Ensure the paint is sound so the graphics will adhere well to the paint. For the purpose of this inspection, “sound paint" is defined as paint that is free of defects (see the “Defects" bullet below).

   Circle all areas on the following diagram where your inspection shows the paint may be unsound, the graphic may adhere poorly, or graphic removal may damage the vehicle paint. This includes:

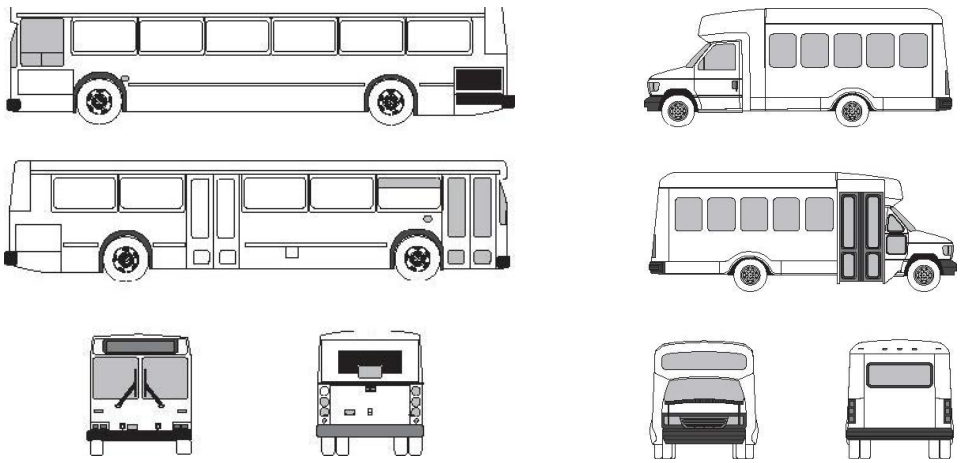
   - Defects: paint that is not well bonded over the entire application surface, including multiple layers of paint being well bonded to one another, loose paint, dents, surface damage, rough surface, fillers used for damage, rust, or blistered paint.
   - Areas where water can collect, which are more likely to rust, resulting in paint adhesion problems.

   **NOTE**

   Primer, which does not outgas, may be applied to bad paint spots on the vehicle to prepare it for film application. However, the use of primer on bad paint spots does not guarantee success or provide a warranty, must still be considered a problem area, and must be documented on the pre-installation inspection record.
3. Photograph all areas circled on the diagram as exhibiting unsound paint.
4. Explain proper graphic maintenance to the vehicle owner/operator. See 3M Instruction Bulletin Maintenance for details.
5. Complete the pre-installation inspection record.
6. Make and distribute copies to all signing parties.
7. Maintain a file with the signed form and photographs.

## Warranty Claims and Exceptions

1. 3M recommends using the pre-installation inspection record on the next page to document any existing damage prior to starting the graphic installation.
2. 3M makes no warranty (expressed or implied) for paint or existing graphic damage occurring during the removal of a graphic or staining that may be visible after removing a graphic. See the 3M Graphics Warranties Bulletin for complete details.



**Circle all areas where the paint may be unsound. Mark only one vehicle type.**

(Diagrams courtesy of Digital Auto Library, 1-888-843-1325 or www.digitalauto.on.ca)

# 3M Bus & Mini-Bus Graphics Pre-installation Inspection Record

**COMPLETE THIS FORM, PROVIDE A COPY FOR EACH SIGNER**

**AND RETAIN WITH PHOTOGRAPHS IN CASE OF A CLAIM**

Please print except in signature boxes.

| **Bus Owner/Operator** |
|---|
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zip |
| Area Code/Phone Number |
| **Graphics Printer** |
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zip |
| Area Code/Phone Number |
| **Graphics Installer** |
| Company Name |
| Contact Name |
| Street Address |
| City/State/Zip |
| Area Code/Phone Number |

| **Bus Information** | |
|---|---|
| License Number | State |
| Bus Year, Make, and Model | |
| VIN | |
| Bus Owner/Operator | |
| Pre-Inspection: (see the previous page of this bulletin for inspection requirements)<br>❑ PASSED (DATE: _____ BY: _____)<br>❑ FAILED (Owner waives all product warranties if graphics are applied) | |
| Photographs of Potential Problem Areas<br>❑ YES (DATE: _____ BY: _____)<br>❑ NO | |
| **Graphic Construction and Installation Information** | |
| Installation Date | |
| Graphic Coverage<br>❑ Full ❑ Body Only ❑ Windows Only<br>❑ Queen Panels Only ❑ King Panels Only | |
| Substrate Cleaned and Prepared According to 3M Recommendations:<br>❑ YES (DATE: _____ BY: _____) | |
| Films and Graphic Protection | |
| **Signatures of All Parties** | |
| Installer | Date |
| Agency Representative | Date |
| Bus Owner/Operator | Date |