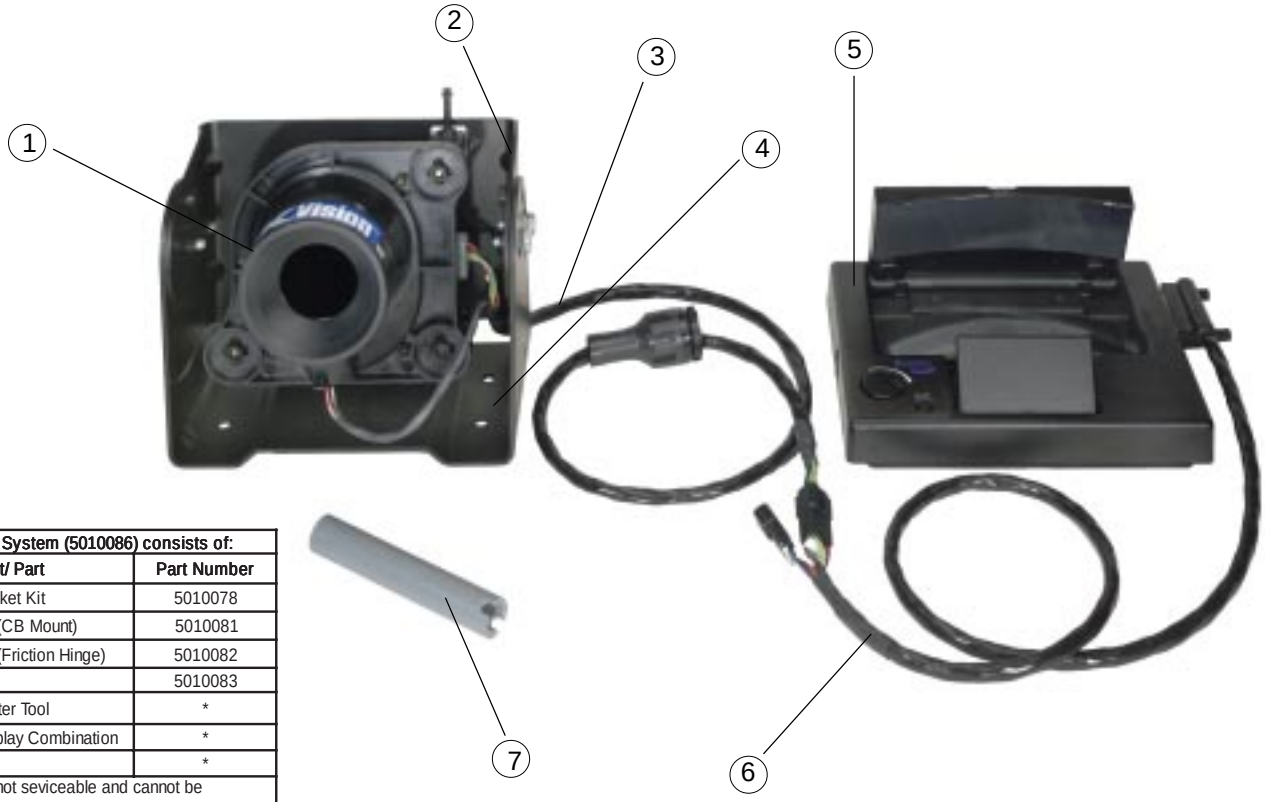
Installation Instructions

Night Vision Enhancement System for Commercial Vehicles Kit Piece No. 5010086



XVision System (5010086) consists of:	
Kit/ Part	**Part Number**
Camera Bracket Kit	5010078
Mounting Kit (CB Mount)	5010081
Mounting Kit (Friction Hinge)	5010082
Harness Kit	5010083
Aiming Adjuster Tool	*
Camera/ Display Combination	*
Video	*
* Kit/ Part is not seviceable and cannot be individually ordered through Bendix®.	

Item No.	Description	Qty.
1	IR Camera	1
2	Camera Bracket	1
3	Camera Harness	1
4	Mounting Bracket	1
5	Display	1
6	Display Harness**	2
7	Aiming Adjuster Tool	1

** The display harness shown is for the friction hinge mount (visor).

Figure 1 XVision™ System

The information in these instructions is correct and complete as of the time of printing. Options or updates to the XVision™ System that were developed after publication may not be included.

DESCRIPTION

This kit contains all of the components necessary to install the Bendix XVision™ infrared thermal imaging system on most heavy vehicles. The kit also includes harnesses and hardware that are not shown in Figure 1.

The XVision™ system consists of an infrared (IR) camera, a display for viewing images from the camera, brackets for installing the system components, and harnesses for connecting and powering the system.

IMPORTANT! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. **Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.**
2. **Stop the engine when working around the vehicle.**

3. **If the vehicle is equipped with air brakes, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle.**
4. **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in manner that removes all electrical power from the vehicle.**
5. **When working in the engine compartment the engine should be shut off. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.**
6. **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
7. **Never exceed recommended pressures and always wear safety glasses.**
8. **Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
9. **Use only genuine Bendix replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, etc. should be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.**
10. **Components with stripped threads or damaged parts should be replaced rather than repaired. Repairs requiring machining or welding should not be attempted unless specifically approved and stated by the vehicle or component manufacturer.**
11. **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**

PRELIMINARY CONSIDERATIONS

The XVision™ system installation will differ from cab to cab. To achieve the best installation, first consider where to install both the display and camera and also how to route the harnesses.

The display can be mounted in four ways:

Friction Hinge Mount (Visor) - the display pivots on a pair of friction hinges (similar to a vehicle sun visor). The friction hinge mount allows for the sun visor to be used during the day and the XVision™ System to be used during the night. See Figure 2.

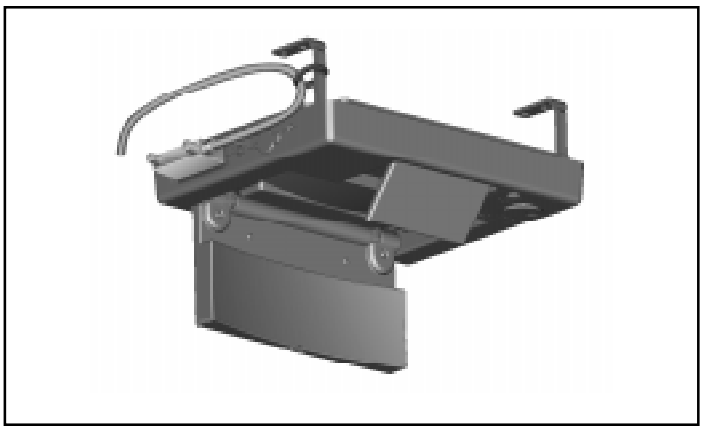


Figure 2 Friction Hinge Mount (Visor)

CB Mount (Overhead) - the display is mounted above the driver's head in the headliner area (head-up). See Figure 3.

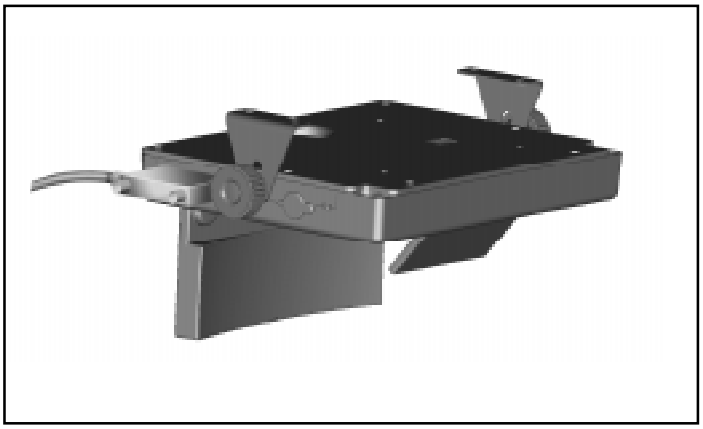


Figure 3 CB Mount (Overhead)

CB Mount (Dashboard) - the display is mounted on the vehicle dashboard (head-down). See Figure 4.

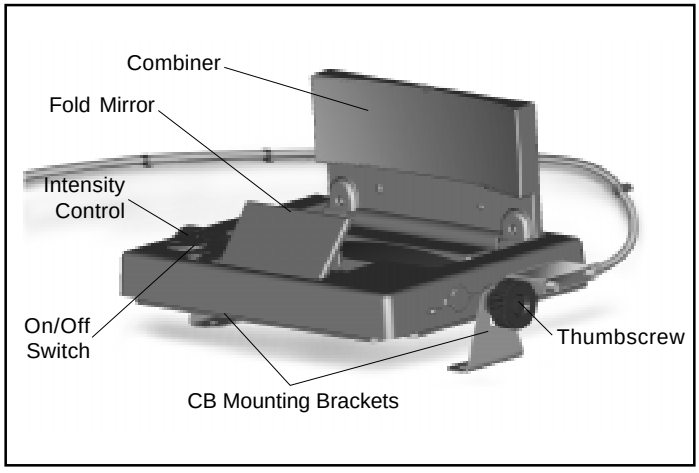


Figure 4 CB Mount (Dashboard)

Base #8-32 - the display is recessed, or custom-mounted. See Figure 5.

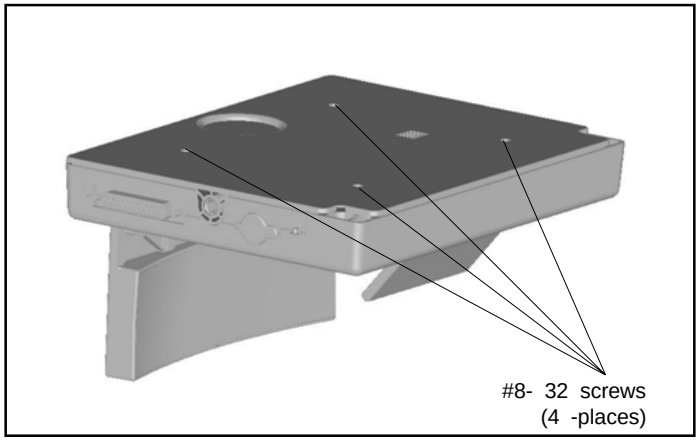


Figure 5 Base #8-32 Mount

OVERVIEW

Prior to installation, spend time exploring the cab of your truck and experimenting with different mounts for your display. Please use the following guidelines to optimize your installation.

Height of driver and preferred seat position

These variables will determine if an overhead mount can be used. The display should be mounted so that the combiner is approximately 20 in. from the driver's eye and in his/her peripheral vision to minimize head movement. Ideal overhead mounting conditions should result in a look-up angle of 6 to 24 degrees. See Figure 6.

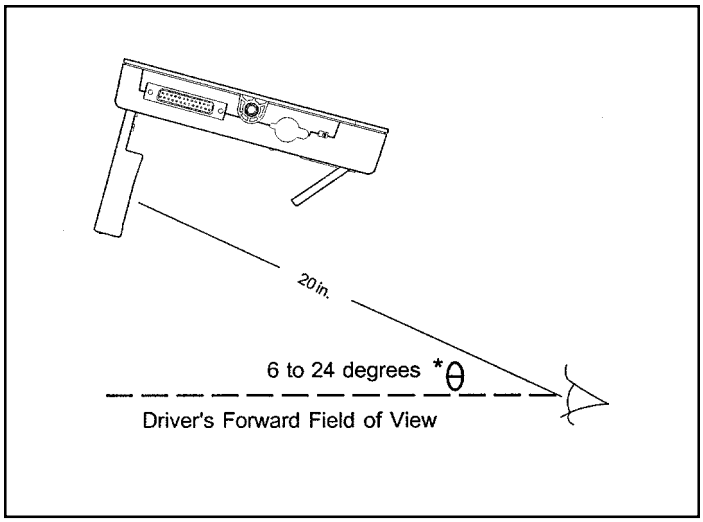


Figure 6 Optimal Overhead Mount Sight Distance
* The smaller the angle between the driver's forward field of view and line of sight to the combiner, the better the results.

Width of dashboard and steering wheel position

To use the CB mount (dashboard), there must be room on the dashboard to install the display so that the combiner does not contact the windshield or block the windshield defrosters. The display must also be positioned so that it does not interfere with the driver's ability to turn the steering wheel. When mounting, make sure the display is in line with and square to the driver. See Figure 7.

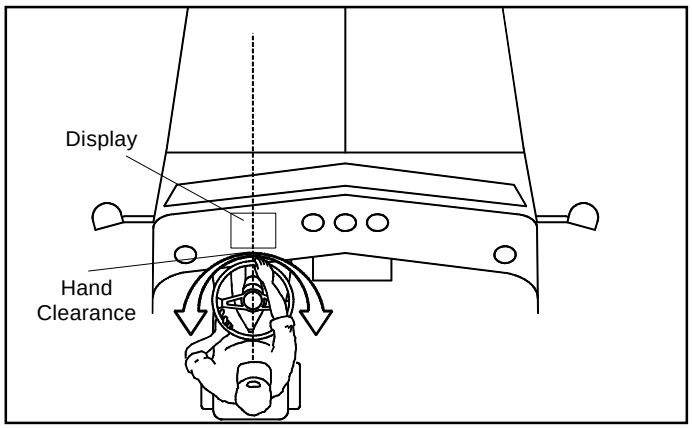


Figure 7 CB Mount (Dashboard) Considerations

Visor width and thickness

In order to use the friction hinge mount (visor), the display should not interfere with the visor or its storage, and should be mounted approximately 20 in. from the driver's eyes. See Figures 8 -9. Additionally, to use the friction hinge mount (visor), be sure that the display is square to the driver, not the headliner of the cab.

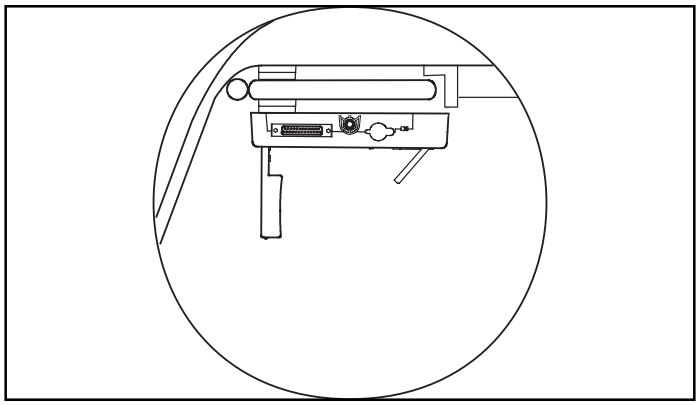


Figure 8 Friction Hinge Mount; Display is in use (night-time driving).

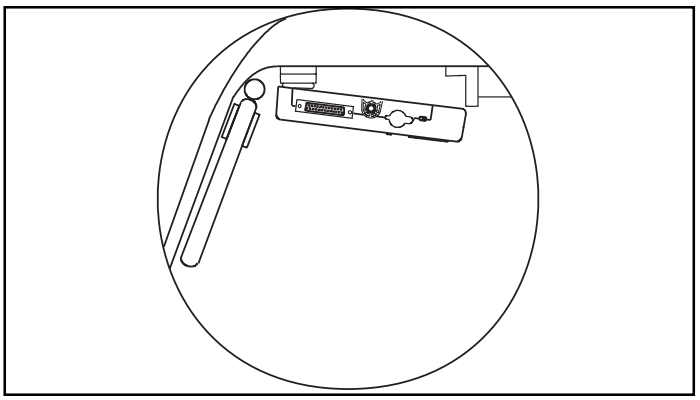


Figure 9 Friction Hinge Mount; Visor is in use (day-time driving).

Size of cab

To use the CB mount (overhead), the cab must be tall enough and wide enough to allow for the display to be suspended approximately 20 in. in front of the driver's eyes. The display must not interfere with other truck fixtures (curtain rod, light fixtures, etc.)

HARNESS ROUTING

The vehicle harness will need to reach the fuse panel as well as the camera harness and display harness.

CAMERA INSTALLATION

In all cases, the camera **MUST** be mounted externally on the vehicle. If possible, the camera should be centered directly above the driver's head. The camera mounting bracket can accommodate various mounting surface angles.

POWER INPUTS

The camera and display are compatible with 12V DC battery systems with a negative ground.

The camera is operational within the range of -40° C to 75° C. The display is operational within the range of -40° C to 60° C.

Table 1 Electrical Wiring Configuration

Vehicle Harness Connector 3 Contacts		Fused	Color
A	Vehicle ignition +12 Volts	3 A slow blow fuse (max.)	RED
B	Vehicle ground		BLACK
C	Headlamp active	1 A fast fuse (max.)	BLUE

IMPORTANT: When replacing a fuse, it is important to use only the specified fuse with the correct amperage and blow ratings, listed above. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to blow, it indicates a problem in the circuit that must be corrected.

EQUIPMENT FOR INSTALLATION

TOOLS

For efficient installation, you will need the following tools:

- Center punch
- 7/16 in. wrench
- 1/2 in. wrench
- Drill
- Drill bits (5/16 in., 9/64 in., and 11/64 in.)
- Crimping tool
- Screwdriver (or Torx®)
- One-inch step-drill (like Unibit®)
- Miniature butane torch or heat gun
- Wire stripper
- Torpedo level
- Multi-meter
- Small plumb bob
- Safety glasses
- Cable ties
- P-clips
- E8 External Torx®
- T15 Internal Torx®
- Spanner Wrench
- Clean soft cloth
- Cleaning solvent

TIME

Allow 3 to 4 hours to install the entire XVision™ system.

HARDWARE

The following screws and washer are referred to throughout these Installation Instructions. Please check to be sure that your kit contains all of the following parts. The drawings below are made to scale.

#10 Plastite® Pan Head Screw (1/2 in. long) QTY 4

#10 Plastite® Pan Head Screw (3/4 in. long) QTY 4

#10 Plastite® Pan Head Screw (1 in. long) QTY 4

The CB Mount requires using one of the Plastite Pan Head Screws listed above. The screw is used to mount the display to either the headliner or dash. Based on the thickness of the headliner or dash, choose the appropriate length screw.

#8-32 Flat Head Screw (1/2 in. long) QTY 1

#8-32 Flat Head Screw (3/4 in. long) QTY 1

#8-32 Flat Head Screw (1 in. long) QTY 1

The Friction Hinge Mount requires using one of the Flat Head Screws listed above. The screw is used to fasten the striker assembly to the visor. Based on the thickness of the visor, choose the appropriate length screw.

#4 Threadroll Pan Head Screw (3/8 in. long) QTY 2

Used to install the friction hinge supports onto the display for the friction hinge mount.

 # 8 Plastite® Flat Head Screw (1/2 in. long) QTY 1

Used to fasten the striker plate to headliner for the friction hinge mount.

#8-32 Hex®/Torx® (1/2 in. long) QTY 4

Used to fasten the aiming assemblies to the camera bracket. This is a factory-installed screw and should not be removed or adjusted.

#6 Plastite® Flat Head Screw (3/8 in. long) QTY 1

Used to fasten the magnet to the display for the friction hinge mount.

Plastite® Hex Flange Head Screw (3/4 in. long) QTY 1

Used to secure the standoff base (for the pivot assembly) to the camera bracket. This is a factory-installed screw and should not be removed or adjusted.

#10 Lock Washer QTY 1

Used to secure the standoff base (for the pivot assembly) to the camera bracket. This is a factory-installed washer and should not be removed or adjusted.

EQUIPMENT FOR INSTALLATION (CONT'D)

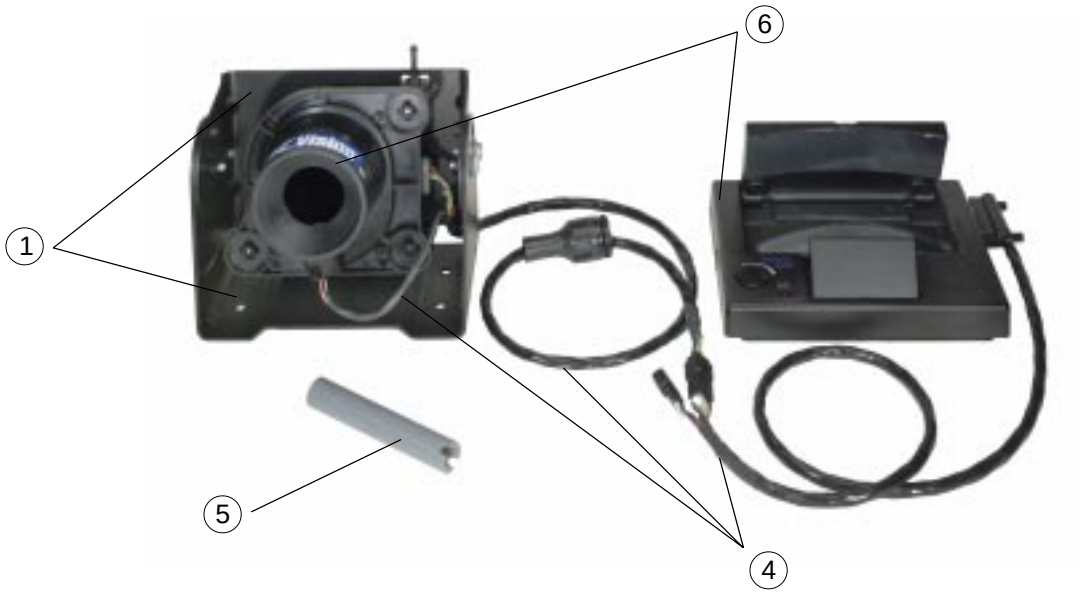


Figure 10 XVision™ System Components, Installed

INSTALLATION KITS

Each XVision™ system includes the following six components.

1. **Camera Bracket Kit** including:
    - mounting bracket kit
    - camera bracket with aiming adjusters
    - cable tie
    - hardware needed to assemble the camera, camera bracket and mounting bracket
2. **CB Mounting Kit** (not shown) including:
    - mounting brackets
    - knob kit
    - Plastite® screws
3. **Friction Hinge Mounting Kit** (not shown) including:
    - screw and shim kit
    - magnet kit
    - hinge supports
    - hardware needed to install the friction hinge (visor) mount
4. **Harness Kit** including:
    - IR camera harness
    - display harnesses (the display harness shown is for the friction hinge mount (visor))
    - vehicle harness (not shown)
    - jumper harness (not shown)
    - fuse holders (not shown)
    - butt splices (not shown)
    - fuses (1 A fast and 3 A slow blow not shown)
5. **Aiming Adjuster Tool**
6. **Camera/ Display Combination** including:
    - IR Camera
    - Video Display

INSTALLATION OF IR CAMERA BRACKETS

CAMERA MOUNTING BRACKET

1. Make sure the truck is parked on a level surface.
2. Remove the panel of the headliner above the driver's head to inspect for electrical wires, tubing, or support members.
3. Depending on the cab style, choose whether the bracket should be installed to the vehicle roof or faring area. Refer to Figure 11.

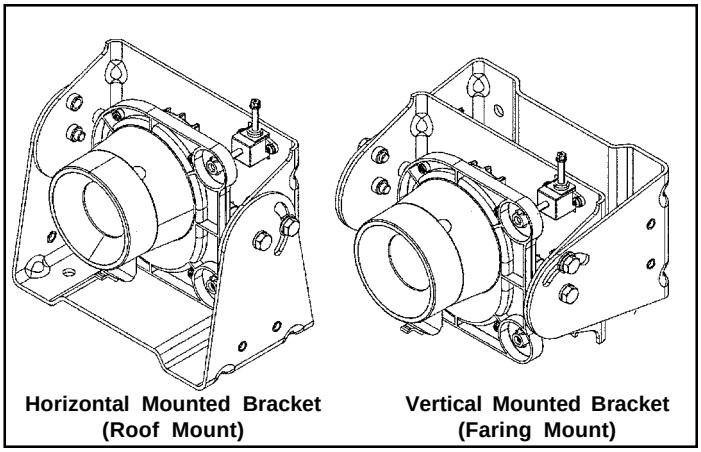


Figure 11 IR Camera Mounting Configurations

4. On the roof of the vehicle above the driver's head, find and mark the driver's centerline of sight.
5. Tape down the Camera Mounting Bracket Template. For best results, the bracket should be mounted anywhere along the driver's centerline of sight. See Figure 12.

   NOTE: For optimum performance, the centerlines of the template and driver should line up. Refer to Appendix A, Figure 1 for the appropriate template.
6. Verify that the template is parallel to the lateral axis of the vehicle. This ensures that the bracket, when mounted, will face squarely forward. See Figure 12.

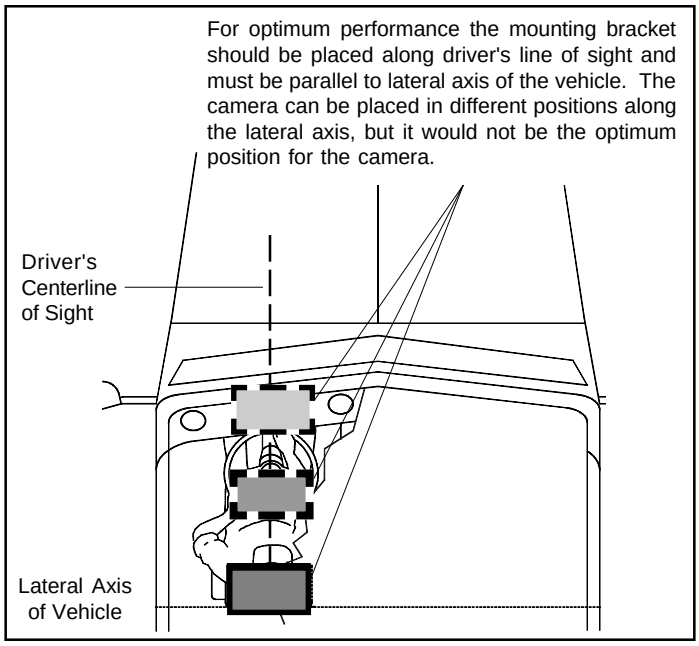


Figure 12 Mounting bracket location with respect to lateral axis of vehicle and driver's centerline of sight.

7. Center punch the four holes of the template.
8. Drill through the four punched holes with a 5/16 in. drill bit.
9. Remove the template.
10. Place the mounting bracket over the holes.
11. Using a torpedo level, make sure the mounting bracket is seated level on the surface of the roof. If it is not, use the shims included with the kit to make it level.
12. Install the stud plates on both sides of the mounting bracket.

    NOTE: Make sure the studs protrude into the cab so a nut can be fastened. See Figure 13.
13. Remove all parts and clean the surfaces you wish to seal.
14. Apply sealant between all contact areas (between the roof and the shims, between each shim, between the shim and the bracket, and between the bracket and stud plates). See Figure 13.

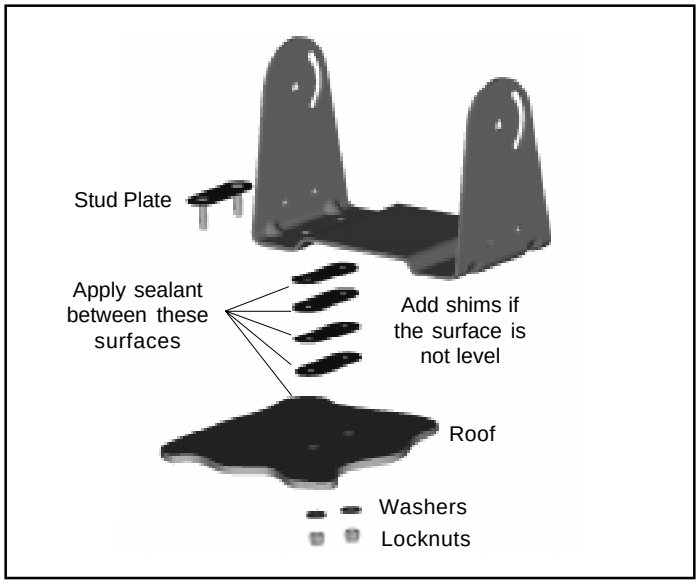


Figure 13 Sealant and Camera Mounting Bracket

15. From the inside of the cab, tighten all mounting hardware to a torque of 90-100 in-lbs.

INSTALLATION OF IR CAMERA BRACKETS (CONT'D)

CAMERA BRACKET

1. Choose the threaded insert on the camera bracket that is appropriate for the mounting (horizontal or vertical) that you have chosen. Refer to Figure 14.

   IMPORTANT:

   For a faring mount, use the uppermost inserts

   For a horizontal mount, use the rear-most inserts

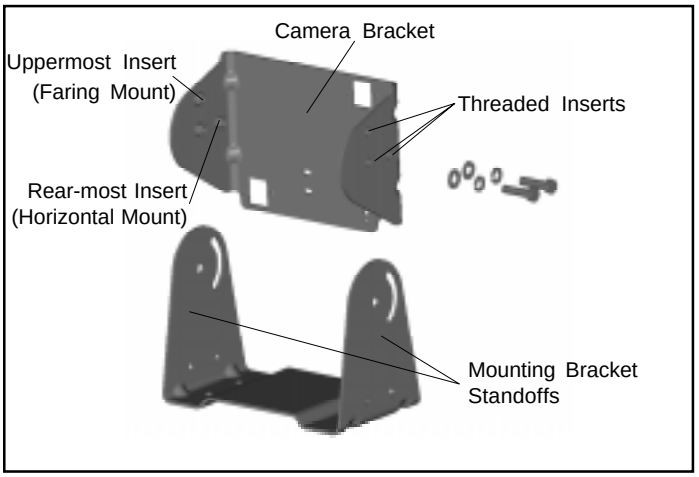


Figure 14 Camera Mounting Bracket Threaded Inserts

2. Position the camera bracket between the standoffs of the mounting bracket. Refer to Figures 14 and 15.

   NOTE: Line up the holes in the standoffs of the mounting bracket with the threaded inserts chosen in step 1.

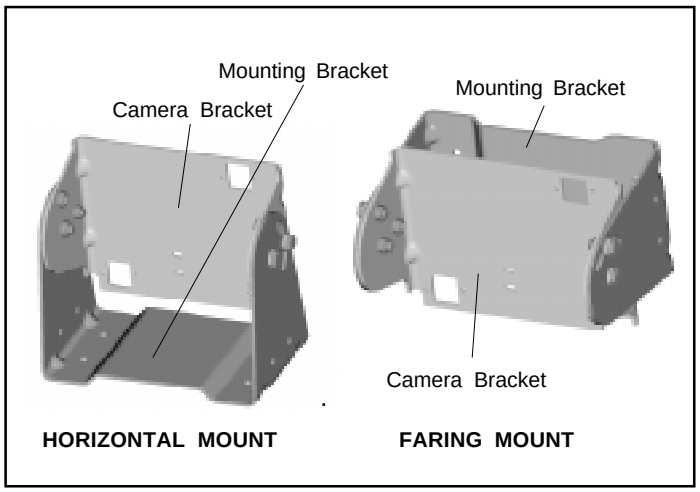


Figure 15 Mating Camera Bracket to Mounting Bracket

3. Make sure that the camera bracket is parallel to the ground using a torpedo level.
4. Insert 5/16 in. bolts through the chosen threaded inserts and through the mounting bracket holes.
5. Hand-tighten the nuts to keep the camera bracket in place.

   NOTE: Allow enough mobility for adjustments to be made later in the installation, during the aiming procedure.

ROUTE THE CAMERA HARNESS

1. Drill a 1 in. diameter hole through the roof of the truck cab using a step drill like the Unibit®. Drill the hole approximately 3 to 5 in. behind the installed mounting bracket. Refer to Figure 16.
2. Deburr the hole.
3. Remove the externally threaded nut from the heat shrinkable shroud assembly on the harness.

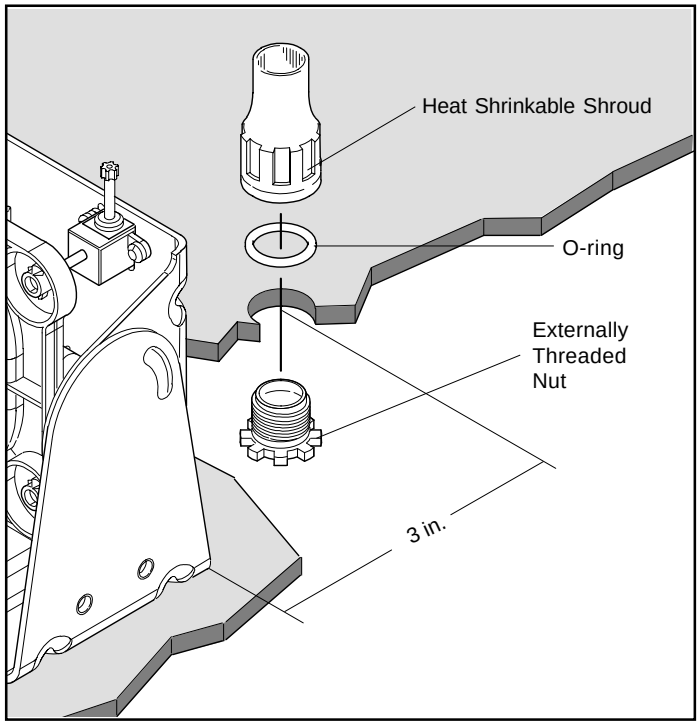


Figure 16 Heat Shrinkable Shroud Assembly (camera harness not shown)

4. From inside the cab, push the threaded nut through the hole in the roof.

   NOTE: The threaded section of the nut should protrude past the vehicle surface. Refer to Figure 16.
5. Place the O-ring over the externally threaded end.
6. Thread the harness through the externally threaded nut.
7. Fasten the heat shrinkable shroud onto the nut.
8. Hand-tighten the shroud from the outside of the roof.
9. Torque the heat-shrinkable shroud with a Spanner Wrench to approximately 15 to 20 in-lbs. or until the O-ring is slightly flattened.
10. Route the camera harness to the "A" pillar of the cab.

ATTACH THE CAMERA HARNESS

1. Pull the camera harness through the opening between the camera bracket and mounting bracket.
2. Plug the 2-pin connector of the camera harness into the window heater. Refer to Figure 17.
3. Plug the 6-pin connector of the camera harness into the camera connection. Refer to Figure 17.
4. Loosely install the harness tie-wrap around the harness.

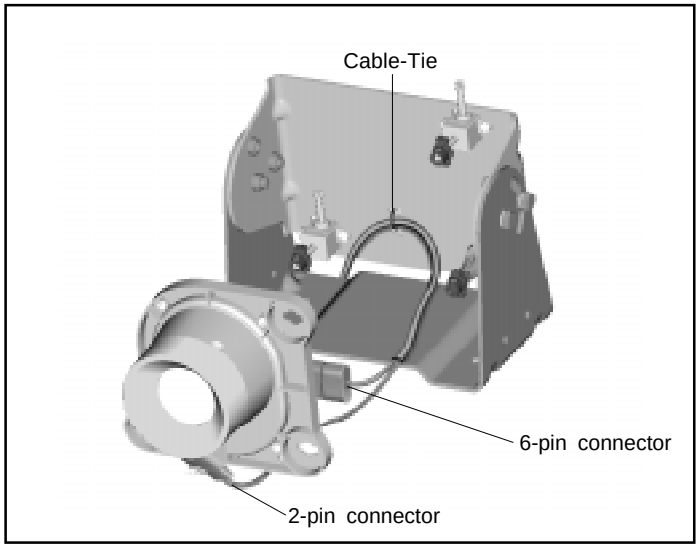


Figure 17 Connecting the Camera Harnesses

ATTACH THE IR CAMERA TO THE CAMERA BRACKET

1. Position the camera onto the factory-installed aiming assemblies. Refer to Figure 18.
2. Rotate the pivot locks on the ends of the aiming assemblies 1/4 turn clockwise using the included aiming adjuster tool. This will lock the camera in position.
3. Adjust the harness accordingly and securely tighten the harness cable tie.
4. After the camera harness is properly secured and routed, heat shrink the shroud assembly from the outside of the vehicle using a heat gun. Once the shroud assembly is heat shrunk the harness can not be moved or adjusted.

   WARNING: Do not touch the shroud assembly after it has been heat-shrunk. It will be hot and may cause burns.

   IMPORTANT: Be careful not to melt the wiring or O-Ring during the heat shrinking process.

6. Re-install the headliner.

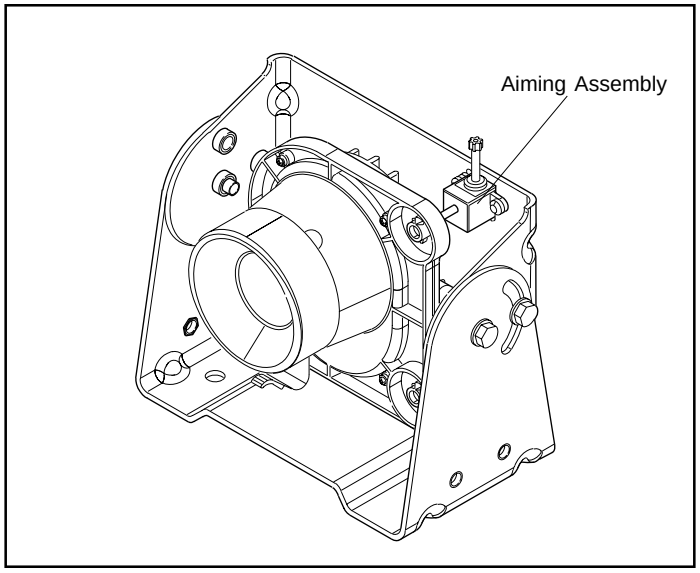


Figure 18 Fully Assembled Camera

PREPARE FOR INSTALLATION

CHOOSE THE DISPLAY LOCATION

Based on the factors described in **Preliminary Considerations** on pages 2-3 and the limitations of your cab, decide if you will mount your XVision™ system overhead or on your dashboard.

CONFIGURE THE DIP SWITCH

The orientation of the virtual image on the display will depend on the display location that you have chosen. There are four DIP switches which allow you to "flip" the virtual image so that it will be displayed correctly on your display. The notebook will arrive with the DIP switches configured for the overhead or visor display location, as illustrated in Table 2. Figure 19 references the position of the DIP switches would be in if the display is dash mounted.

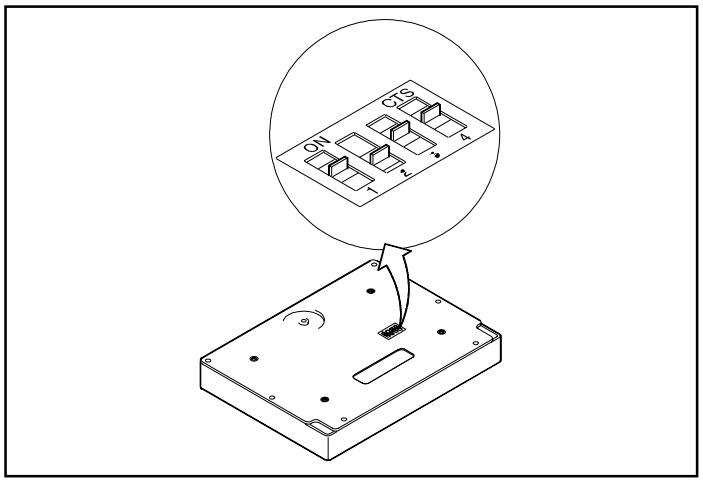


Figure 19 DIP Switches - Dash Mounted

The DIP switches are located on the mounting side of the display, under a switch cover. See Figure 19.

1. Slide the switch cover in the direction away from the 25-pin connector to expose the DIP switches.
2. Set the DIP switches according to the options in Table 2.

Table 2 DIP Switch Positions

Mounting Position	DIP Switch Positions			
	1	2	3	4
Dash Mounted (NTSC)	N/A	OFF	ON	ON
Overhead Mounted (NTSC)	N/A	OFF	OFF	OFF

CHOOSE THE MOUNT

Choose one of the following mounts and follow the installation instructions provided for that mount.

CB mount (Dashboard) Page 11
CB mount (Overhead) Page 13
Friction hinge mount (Visor) Page 14

After installing your particular mount, go to **Connecting the Harnesses** on page 16.

INSTALL THE CB MOUNT (DASHBOARD)

Some dashboard installations result in a 30 to 40 in. distance from the driver's eyes. At distances over 20 in., the driver may have to move his or her head to view complete virtual images on the combiner.

INSTALLATION TIP: The IR sensor (camera) and wiring should be routed away from any onboard communication system radio antenna and associated wiring. This includes CBs (Citizen Band Radios), Amateur Radio, or commercial two-way radios. To minimize possible interference from communication system transmission, locate the camera the furthest distance possible from any antenna. Likewise, route XVision™ camera wiring away from CD antenna wires to minimize cross talk.

NOTE: The CB Mount installation instructions include the use of a CB Mount template. However, the template is only designed to be used when mounting the bracket feet so they face each other. The bracket feet can also be installed pointing outward, away from one another. If you choose to mount the feet outward, do not use the CB Mount template. Follow all of the steps below, but disregard the references to the template.

POSITION THE DISPLAY

1. With the driver seated, determine a location on the dashboard where the display will not disturb the driver's sight or normal operation of the vehicle.
2. Place the display in the chosen location and draw a line on the dashboard indicating the front of the display.
3. Establish the driver's centerline of sight. See Figure 20.

   NOTE: Sometimes the center of the steering wheel is also the centerline of the driver.

   If the center of the steering wheel is not the "true" centerline of the driver, use the center of the driver's seat as the driver's centerline.
4. Transfer the driver's centerline to the dash, where the display will be mounted.

   NOTE: The centerlines of the driver and of the display should line up.

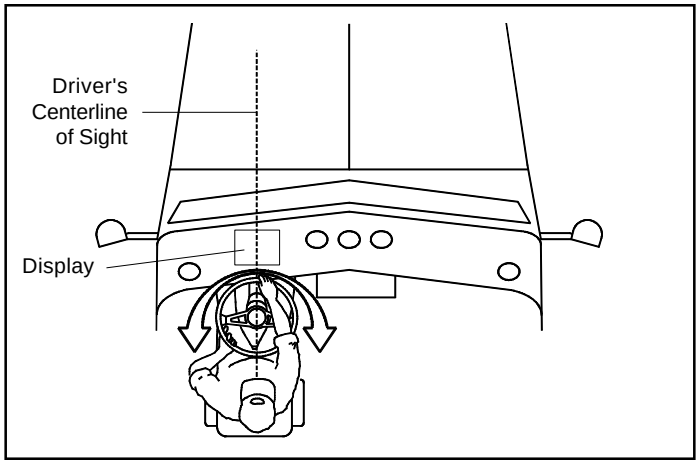


Figure 20 Driver's Centerline of Sight

5. Tape the CB mount template to the dashboard.

   NOTE: Align the CB Mount (dashboard) template with the lines that were drawn on the dash. Make sure the template is square to the driver, not the dashboard. Refer to Appendix A, Figure 3 for the appropriate template.

MOUNT THE DISPLAY

1. Center punch the four holes of the template.
2. Remove the CB mount template.
3. Inspect the area under the dashboard for electrical wires, tubing, or instruments.
4. Drill four 11/64 in. holes in the dashboard.
5. Place the mounting brackets over the holes.
6. Secure the CB brackets with the four #10 Plastite® screws provided in the kit. Refer to Page 5 for screw identification and Figure 21 for a representation of the installed mount.
7. Torque the screws to approximately 20 in-lbs.

   NOTE: The torque of the screws depends on the composition and thickness of your dashboard. If your truck does not have a plastic dashboard, substitute metal machine screws for the Plastite® screws. If the thickness of the dashboard is less than 1/8 in., you will need to use additional mounting material or another method of fastening.

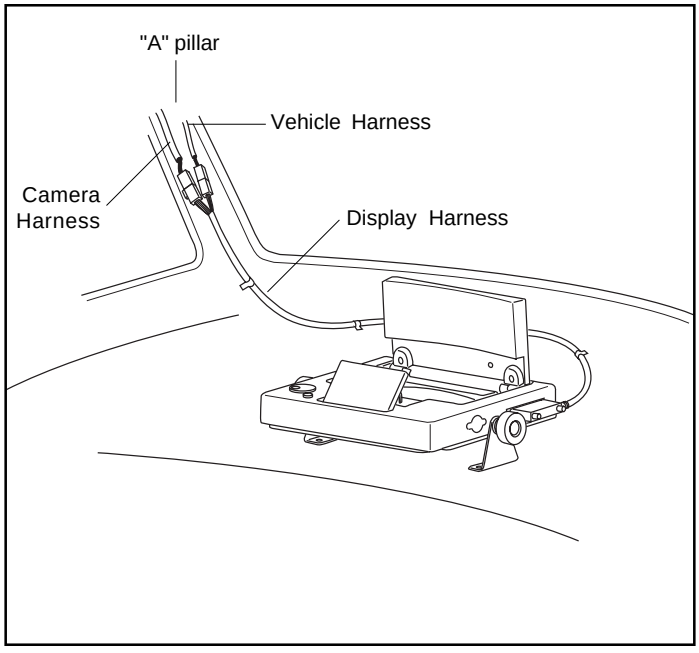


Figure 21 CB Mount (Dashboard) Installed

CB MOUNT (DASHBOARD) CON'TD

INSTALL THE KNOB AND WASHER ASSEMBLY

There are four stainless steel washers in the knob kit. These should be installed on the inner and outer sides of the standoff of each bracket.

1. Slide one of the washers onto one of the threaded knobs.
2. Hold one washer between the display and a bracket while threading the washer/knob assembly from the outside of the bracket. Refer to Figure 22.

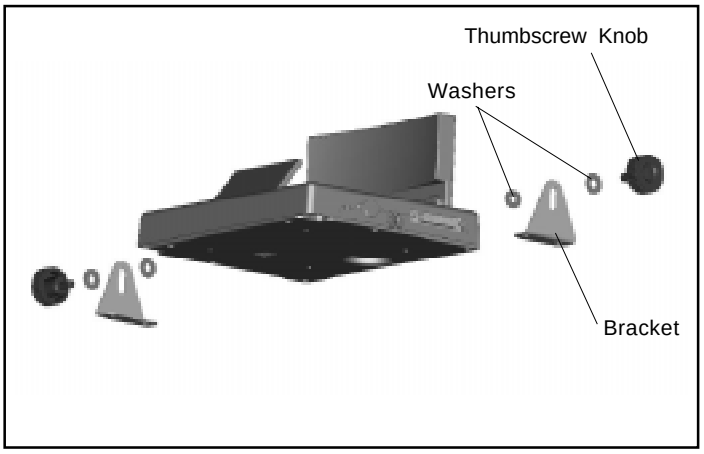


Figure 22 Knob and Washer Assembly

3. Repeat steps 1 and 2 for the other bracket.
4. Hand-tighten the knobs until they are snug.

ATTACH THE DISPLAY HARNESS

1. Plug the D-subminiature 25-pin connector into the display.

   NOTE: Use the display harness that routes the harness toward the windshield.

2. Hand-tighten the locking screws of the connector to keep it in place.
3. Route the harness along the back of the dashboard to the "A" pillar of the cab.
4. Secure the harness every 3 in. with a cable tie or P-clip to prevent pinching or chafing.

.

INSTALL THE CB MOUNT (OVERHEAD)

INSTALLATION TIP: The IR sensor (camera) and wiring should be routed away from any onboard communication system radio antenna and associated wiring. This includes CBs (Citizen Band Radios), Amateur Radio, or commercial two-way radios. To minimize possible interference from communication system transmission, locate the camera the furthest distance possible from any antenna. Likewise, route XVision™ camera wiring away from CD antenna wires to minimize cross talk.

NOTE: The CB mount installation instructions include the use of a CB mount template. However, the template is only designed to be used when mounting the bracket feet so they face each other. The bracket feet can also be installed pointing outward, away from one another. If you choose to mount the feet outward, do not use the CB mount template. Follow all of the steps below, but disregard the references to the template.

POSITION THE DISPLAY

1. Turn the truck ignition on and build the system air pressure. Be sure the seat is properly adjusted for the driver.
2. With the driver seated, determine the location on the headliner where the display will not disturb the driver's line of sight.
3. Determine the driver's centerline of sight. Refer to Figure 20 on Page 11.

   NOTE: Sometimes the center of the steering wheel is also the centerline of the driver. Use a plumb bob to transfer the center point from the steering wheel to the headliner.

   If the center of the steering wheel is not the "true" centerline of the driver, use the centerline of the driver's seat.
4. Transfer the driver's centerline to the headliner, where the display will be mounted.

   NOTE: The centerlines of the driver and the display should line up. Refer to figure 20.
5. Position the display on the headliner approximately 20 in. away (or as close as possible to 20 in. away) from the driver's eyes.
6. Draw a line indicating the front of the display.
7. Tape the CB mount template to the headliner.

   NOTE: Square the template with the line that was drawn for the mounting. Place the template so that its centerline lines up with the driver's line of sight. Refer to Appendix A, Figure 3 for the appropriate template.

MOUNT THE DISPLAY

1. Center punch the four holes of the CB mount template.
2. Remove the template.
3. Verify that drilling into the headliner will not interfere with electrical wires, tubing, or support members.
4. Drill four 11/64 in. holes in the headliner.
5. Place the mounting brackets over the holes.

   NOTE: Make sure the brackets are square to the driver.
6. Secure the CB Brackets with the four #10 Plastite® screws provided in the mounting kit. Refer to Page 5 for screw identification.

   NOTE: The bracket feet should be pointed toward each other.
7. Torque the screws to approximately 20 in-lbs.

   NOTE: The torque of the screws depends on the composition and thickness of your headliner. If your truck does not have a plastic headliner, substitute metal machine screws for the Plastite® screws. If the thickness of the headliner is less than 1/8 in., you will need to use additional mounting material or another method of fastening.

INSTALL THE KNOB AND WASHER ASSEMBLY

Follow the **"Install the Knob and Washer Assembly"** procedure on page 12.

ATTACH THE DISPLAY HARNESS

1. Plug the D-subminiature 25-pin connector into the display.

   NOTE: Use the display harness that routes the harness toward the windshield.
2. Hand-tighten the locking screws of the connector to keep it in place.
3. Route the harness along the headliner to the "A" pillar of the cab.
4. Secure the harness every 3 inches with a cable tie or P-clip.

INSTALL THE FRICTION HINGE MOUNT (VISOR)

INSTALLATION TIP: The IR sensor (camera) and wiring should be routed away from any onboard communication system radio antenna and associated wiring. This includes CBs (Citizen Band Radios), Amateur Radio, or commercial two-way radios. To minimize possible interference from communication system transmission, locate the camera the furthest distance possible from any antenna. Likewise, route XVision™ camera wiring away from CD antenna wires to minimize cross talk.

ASSEMBLE THE FRICTION HINGE MOUNTING HARDWARE

1. Assemble the magnet by positioning the smaller inside diameter of the conical spring toward the display and the larger diameter side toward the magnet.
2. Attach the magnet to the display with a #6 Plastite® Flat Head screw (3/8 in. long). Refer to Page 5 and Figure 23 for screw identification.

   IMPORTANT: Tighten the screw until the magnet is seated, then loosen the screw 1/8 to 1/4 turn. The magnet should still be able to pivot and tilt when attached to the striker assembly.
3. Attach the two friction hinge supports to the bottom of the display with the #4 Threadroll Pan Head screws. Refer to Page 5 and Figure 23 for screw identification.

   IMPORTANT: Do not exceed 15 in-lbs when fastening. If 15 in-lbs. are exceeded the screw head will shear off or the standoffs will strip. Taptite screws will form the threads on the standoffs as they are tightened. If it feels as though the screw is binding, back the screw out slightly and continue to tighten to prevent breakage.

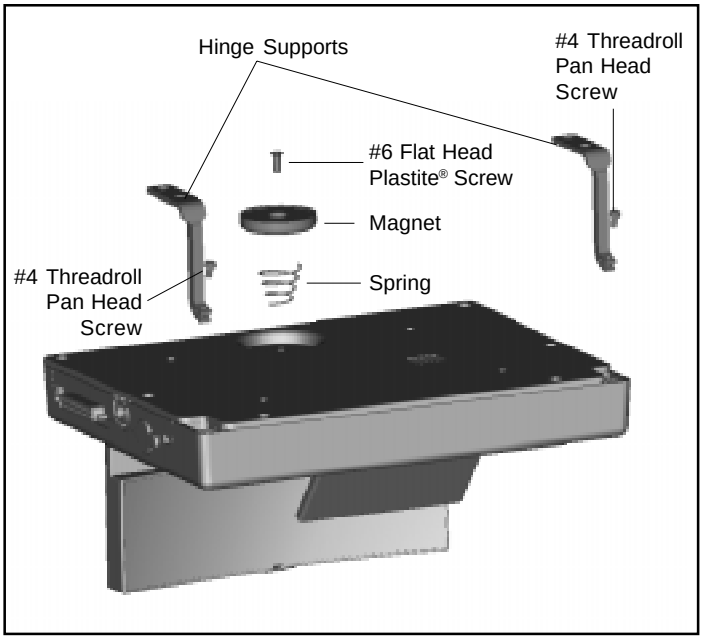


Figure 23 Friction Hinge Mounting Hardware

POSITION THE DISPLAY

1. Fold the sun visor down (toward the windshield).
2. With the driver seated, determine a location in the visor area of the headliner where the mount will not disturb the driver's line of sight or interfere with operation of the sun visor.
3. Determine the driver's centerline of sight. Refer to Figure 20 on Page 11.

   NOTE: Sometimes the center of the steering wheel is also the centerline of the driver. Use a plumb bob to transfer the center point from the steering wheel to the headliner/visor area.

   If the center of the steering wheel is not the "true" centerline of the driver, use the centerline of the driver's seat.
4. Transfer the driver's centerline to the headliner, where the display will be mounted.

   NOTE: The centerlines of the driver and the display should line up.
5. Position the display on the headliner approximately 20 in. away (or as close as possible to 20 in. away) from the driver's eyes. Draw a line indicating the front of the display.
6. Tape the Friction Hinge mount template to the headliner.

   NOTE: Refer to Appendix A, Figure 2 for the appropriate template.

   NOTE: Square the template with the line that was drawn along the front edge of the display. Place the template so that its centerline lines up with the driver's line of sight.

MOUNT THE DISPLAY

1. Center punch the front four holes and the back hole of the template.
2. Remove the template.
3. Verify that drilling into the headliner will not interfere with electrical wires, tubing, or support members.
4. Drill the front four holes with an 11/64 in. drill bit and the single back hole with a 9/64 in. drill bit.
5. Place the mounting brackets over the four front holes. Make sure the brackets are square to the driver and level to the driver's vision.
6. Use a torpedo level to determine if the mount is level. If it is not level, attach the provided shims under the brackets until the mount is level with the driver's line of vision. Refer to Page 5 and Figure 23 for screw identification.
7. Secure the Friction Hinge supports to the headliner with the four #10 Plastite® screws provided in the kit.

FRICTION HINGE MOUNT (VISOR) CONT'D

8. Torque the screws to approximately 20 in-lbs.

   NOTE: The torque of the screws depends on the composition and thickness of your headliner. If your truck does not have a plastic headliner, substitute metal machine screws for the Plastite® screws. If the thickness of the headliner is less than 1/8 in. you will need to use additional mounting material, or use another method of fastening.

9. Secure the striker plate to the headliner with a #8 plastite flat head screw. Refer to Page 5 for screw identification.
10. Torque the screw to approximately 15 in-lbs.

INSTALL THE STRIKER PLATES ON THE VISOR

After the friction hinge supports have been mounted:

1. Cut the Friction Hinge mount template along the dotted line, as indicated on the template. (The holes along the front of the template will fit around the installed friction hinge supports). With the template in the correct location, mark the location of the striker plate.
2. Drill a hole through the center of the marked striker plate location with an 11/64 in. drill bit.
3. Insert the nutsert half of the striker plate assembly through the visor, from the bottom up.

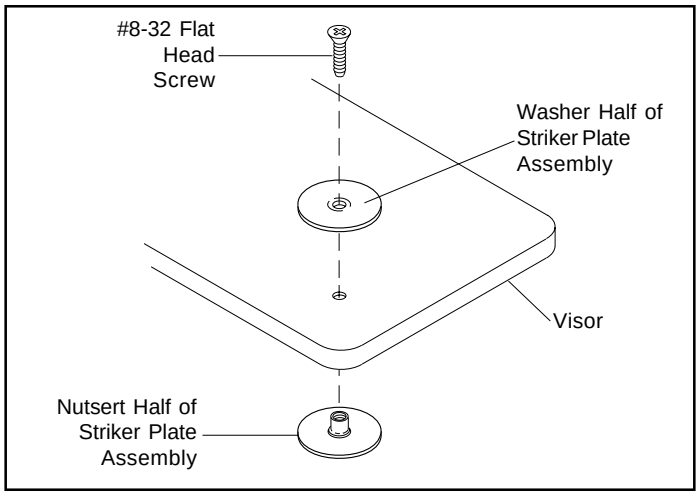


Figure 24 Striker Plate Assembly and Visor

4. Thread the #8-32 flat head screw and washer of the assembly into the nutsert from the top of the visor pointing downward.
5. Tighten the screw until snug on the visor.

   NOTE: Do not overtighten the screw and nutsert assembly. The magnet should still be able to pivot and tilt when attached to the striker assembly.

6. Fold the visor up against the roof of the cab (in its stowed position).
7. Fold the display up so that the magnet contacts the visor.

ATTACH THE DISPLAY HARNESS

1. Plug the D-subminiature 25-pin connector into the display and fasten the thumb screws.

   NOTE: Use the display harness that routes the harness toward the driver.

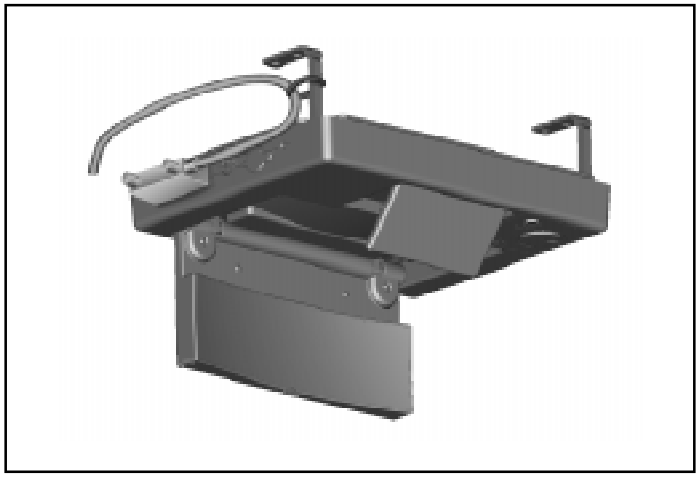


Figure 25 Friction Hinge Mount (Visor) Installed

2. Fasten the harness to the display support with a cable tie.
3. Route the harness back along the headliner to the A pillar of the cab.

   NOTE: Make sure to leave enough harness length so that it does not kink or pinch when it pivots.

4. Secure the harness every few inches with a cable tie or P-clip.

INSTALL THE BASE PLATE 8-32 MOUNT

Four # 8-32 inserts are provided in the display base. Refer to Appendix A, Figure 4 for a template that will facilitate the layout and drilling of holes. Use an 11/64 in. bit to drill the four clearance holes. Typically, this installation is used when the display is being recessed, or for custom mounts.

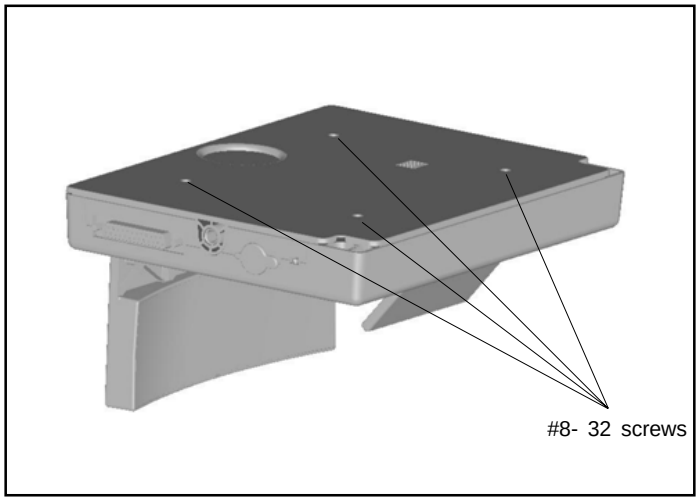


Figure 26 Base #8-32 Mount

CONNECTING THE HARNESSES

WARNING: Improper installation of the vehicle harness can cause damage to your vehicle's wiring and/or the XVision™ system. It is the responsibility of the installer to review wiring and service information for the vehicle and to identify proper locations for connecting the vehicle harness to the power. Many modern vehicles have additional fused accessory power breakouts built into their systems and these breakouts should be used if at all possible.

After installation of the camera and display is complete, all harnesses should be routed to the "A" pillar. At the "A" pillar, both the display harness and camera harness will connect to the vehicle harness. The following steps explain how the harnesses should be installed.

1. Connect the 8-pin connector of the camera harness to the 8-pin connector of the display harness.

   NOTE: If the display harness does not reach the camera harness (i.e. they are greater than 6 feet apart), the jumper harness can be used as an "extension" between the two.

   To install the jumper harness, connect the 8-pin connectors to both the display harness and camera harness.

2. Plug the 3-pin connector of the vehicle harness to the 3-pin connector of the display harness.
3. Route the vehicle harness to the fuse panel.
4. Cut the vehicle harness to an appropriate length.
5. Strip the ends of the three wires of the vehicle harness.
6. According to Table 3, connect the three wires of the vehicle harness to the electrical hook-ups on the vehicle.

   WARNING: Vehicle power and headlight circuits **WILL** be fused. Permanent damage to display and/or camera could occur. Eliminating fuses from circuit will void all warranties.

   IMPORTANT: When replacing a fuse, it is important to use only the specified fuse with the correct amperage and opening time, listed below. The use of a fuse with a rating other than indicated may result in a dangerous electrical system overload. If a properly rated fuse continues to open, it indicates a problem in the circuit that must be corrected.

Table 3 Vehicle Harness Wiring

Vehicle Harness Connector 3 Contacts		Fused	Color
A	Vehicle ignition +12 Volts	3 A slow open fuse (max.)	RED
B	Vehicle ground		BLACK
C	Headlamp active	1 A fast open fuse(max.)	BLUE

7. Fuse the Red wire (A-contact) of the vehicle harness to the ignition bus with a 3 A slow open fuse. See Figure 24.

   WARNING: Use a slow blow fuse with a 3 A maximum.

8. The Blue wire (C-contact) of the vehicle harness must be fused with a 1 A fast open fuse to the headlamp circuit. When the headlamps are on, the Blue wire should have 12 V applied to it. See Figure 24.
9. Connect the Black wire to the vehicle ground bus. See Figure 24.

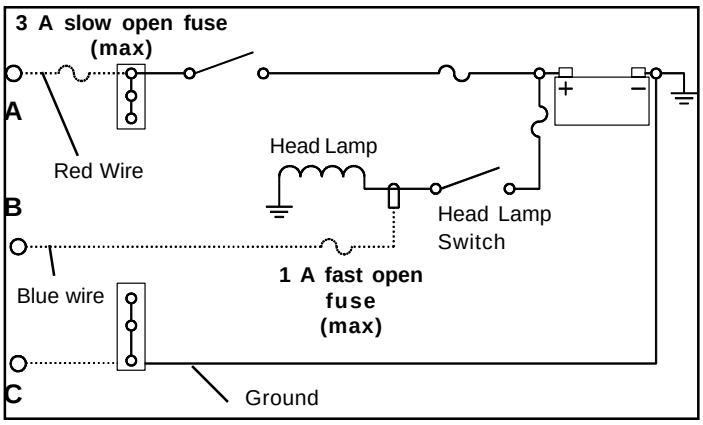


Figure 27 Power Supply Schematic

OPERATING THE XVISION™ SYSTEM

Under optimal conditions, the XVision™ system will be fully operational within 45 to 60 seconds following power up.

To activate the XVision™ system, five conditions must be met:

1. The vehicle must have accessory power on.
2. The vehicle must have its headlights on.
3. The display power must be on.
4. The notebook must be opened.
5. The intensity knob must be turned to a visible intensity.

   NOTE: During warm-up, the Bendix® logo will be displayed on the combiner for approximately 45 seconds.

After the system has warmed up, the combiner will display the image in the driver's forward field of view.

NOTE: This is the appropriate time to set the intensity control. Adjust the intensity level to suit the driver's preference.

ADJUSTING THE CAMERA

The aiming adjusters on the camera bracket allow the forward field of view (FOV) of the camera to be adjusted horizontally and vertically. The adjustment screw head(s) will accommodate an E8 external Torx® or a T15 internal Torx®.

When the camera is mounted, adjust the horizontal and vertical aiming adjusters enough to align the camera FOV with the display. The position of the virtual image presented to the driver and how the virtual image correlates to objects in the road depends directly on camera aiming.

NOTE: Use two people to aim and adjust the camera. One technician should view the virtual image on the display while the other technician aims the camera.

NOTE: Verify that the vehicle is level and that the tires are properly inflated before beginning the camera aiming procedure.

HORIZONTAL AIMING AND ADJUSTING

Align the display image horizontally with the objects in the road to give the driver a sense of object location.

1. Refer to Figures 29-31 to understand how to properly adjust for the horizontal view, adjust the angle of the camera as needed.

   NOTE: Two and one-quarter turns of the horizontal adjuster is equal to one degree of camera movement.

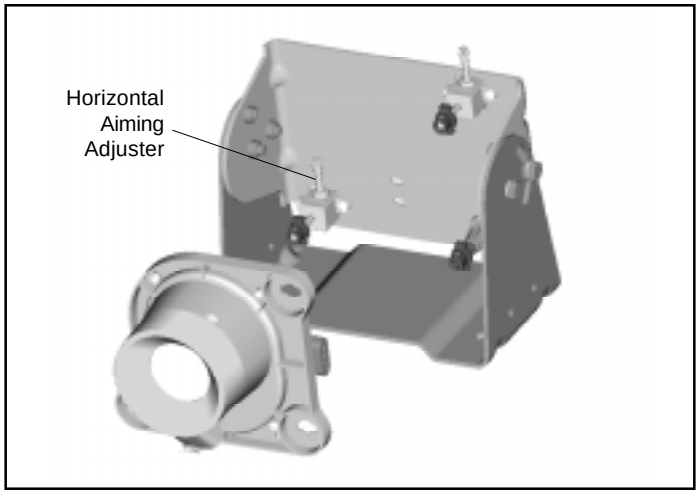


Figure 28 Horizontal Aiming Adjuster

NOTE: Do not tamper with or adjust any factory-installed screws while aiming the camera. Only turn the horizontal aiming adjuster.

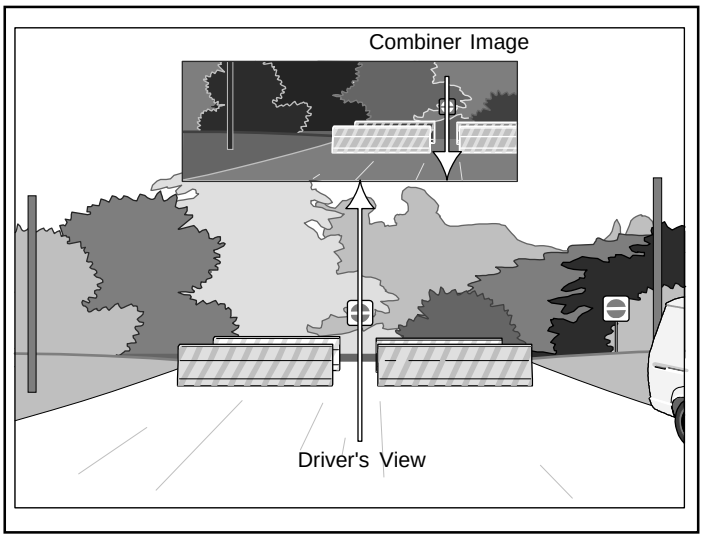


Figure 29 IR camera aimed too far left

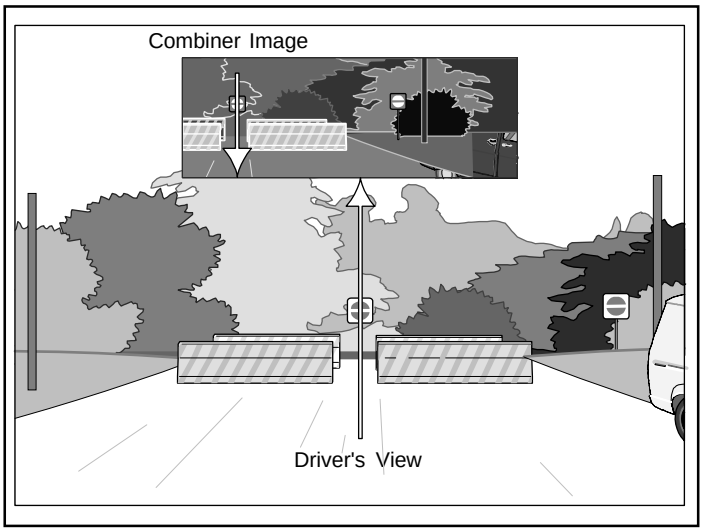


Figure 30 IR camera aimed too far right

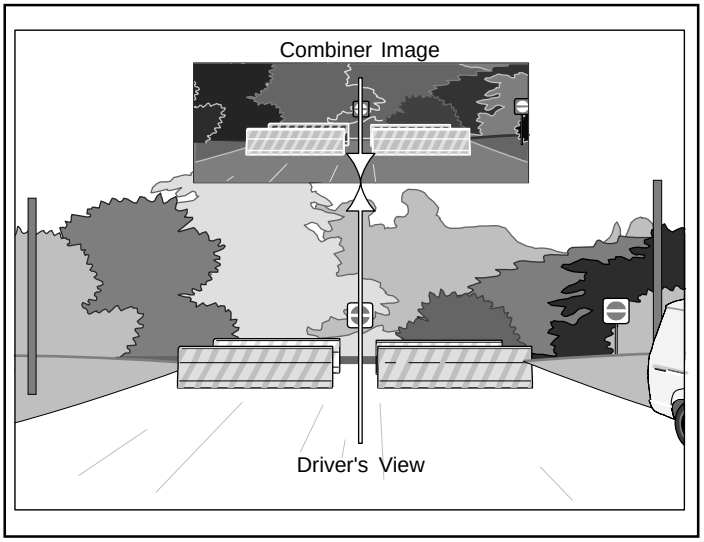


Figure 31 IR camera aimed correctly

VERTICAL AIMING AND ADJUSTING

The virtual image should be aligned vertically so that the horizon appears in the lower one-half to one-third of the combiner. Keeping the image at this adjustment should provide a view of the road when the vehicle is driven up and down hills.

1. Refer to Figures 33-35 to understand how to properly adjust for the horizontal view, adjust the angle of the camera as needed.

   NOTE: Two turns of the vertical adjuster is equal to one degree of camera movement.

   NOTE: It is recommended that the camera adjusters be aimed to view approximately 200 ft (61m) in front of the vehicle. Any thermal objects closer than 200 feet will already be illuminated by the headlamps.

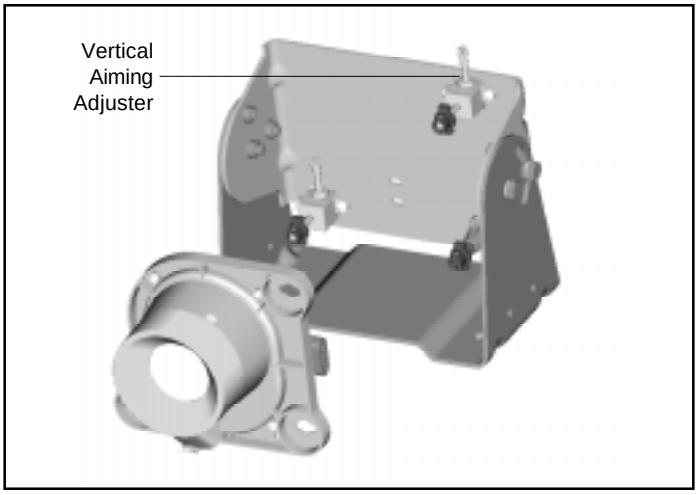


Figure 32 Vertical Aiming Adjuster

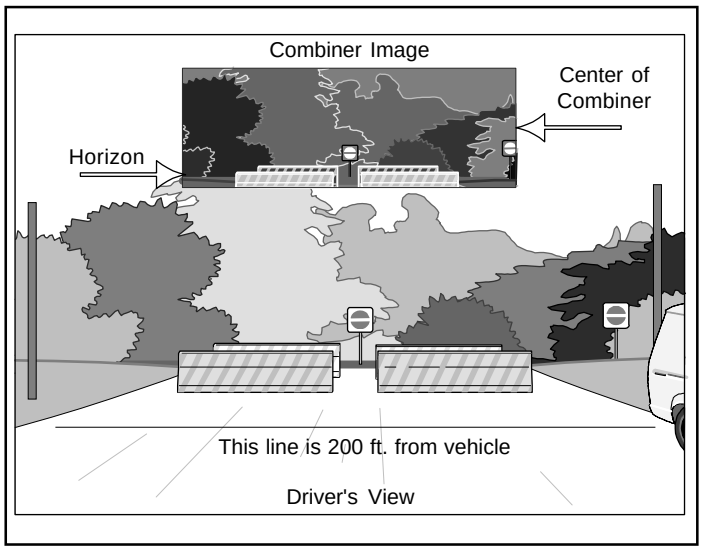


Figure 33 IR camera aimed too high

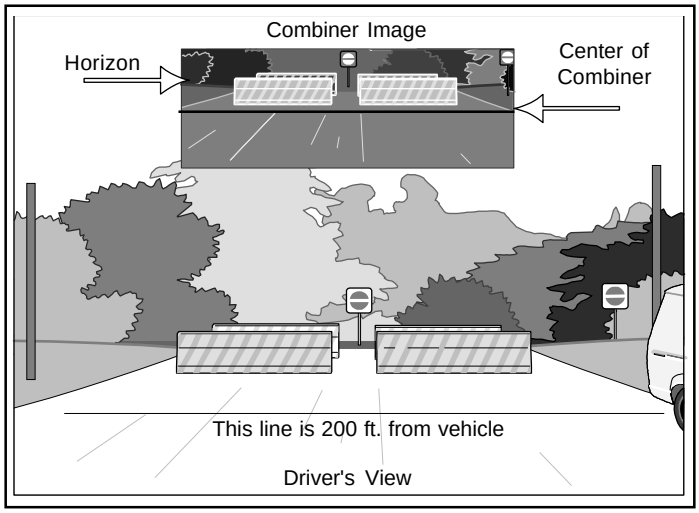


Figure 34 IR camera aimed too low

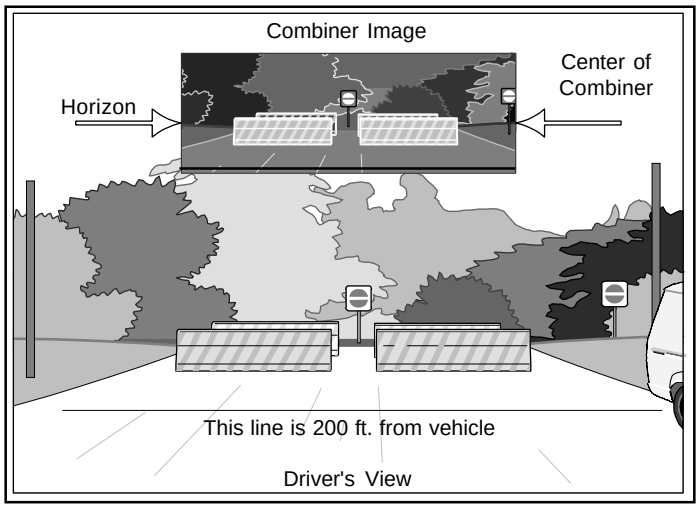


Figure 35 IR camera aimed correctly

MAINTAINING AND CLEANING THE XVISION™ SYSTEM COMPONENTS

IMPORTANT: Use a soft, damp cloth moistened with window cleaning solution to clean the camera window. Shop rags and paper towels will scratch optical surfaces.

IMPORTANT: Do not use ammonia to clean the mirrors of the display components, as it will remove scratch-resistant and anti-glare coatings from their surface.

IMPORTANT: Do not store or use the display in any location that is extremely dusty, damp, or wet.

IR CAMERA

The camera is an optical element and should be cleaned when it becomes dirty or filled with debris. Dirt and debris can affect camera performance.

To clean the camera, use a clean soft cloth and an ammonia-free window cleaning solvent.

If the camera lens has been contaminated due to a damaged seal or window, carefully remove the debris and replace the damaged part according to instructions in your "Service Data" manual.

If a window cleaning solvent is used to clean the lens, make sure all of the moisture is removed from the sealed cavity between the window and lens prior to reassembly. If moisture remains in the sealed area after reassembly, it will affect the performance of the camera.

IMPORTANT: When cleaning the window, do not use scrapers or other sharp instruments that may scratch or break it.

NOTE: When cleaning ice or snow from the IR Sensor, use a commercially-available spray deicer.

DISPLAY

Both the combiner and fold mirror are delicate optical elements. To prevent them from being scratched or damaged, both should be treated the same as a camera lens.

Clean the combiner and fold mirror with an ammonia-free window solvent and a soft cloth. Heavy dirt or grit should be carefully removed before applying the window cleaner or wiping with a soft cloth.

IMPORTANT: The display is not waterproof and should not be exposed to rain, snow, or moisture. Under extreme conditions, water may enter the circuitry through the panel buttons. In general, treat the display as you would a pocket calculator or other small electronic instrument.

IMPORTANT: The XVision™ display technology is designed to meet severe weather operational extremes. However, when installing the display for head down operation or for use in extremely warm climates, take necessary precautions to shield the unit from direct sunlight. Prolonged exposure to direct sunlight in enclosed truck cabs can damage the system.

TROUBLESHOOTING

Table 6 Troubleshooting

Troubleshooting Your XVision™ System	
Situation	**Possible Solutions**
Combiner is not displaying an image	Check that the combiner is open to an angle that allows you to see the image.
	Make sure the vehicle accessory power, headlights, and the XVision™ system are all on.
	Make sure that a thermal entity is in the view of the camera.
	Wait two minutes for the combiner to warm up.
	Check that the combiner intensity is set at an appropriate level to view the infrared image.
	Verify that the video in/out switch is set to "out."
	Check that the 25-pin connector of the display harness is completely plugged into the display.
	Verify that both the 2-pin window heater connector and the 6-pin video connector of the camera harness are connected to the camera.
	Remove the "A " pillar cover and verify that : (a) the camera harness is connected to the display harness, and (b) the display harness is connected to the vehicle harness.
	Check that the 3 A slow blow fuse connecting the red wire of the vehicle harness to the 12 V battery is intact. Also check that there is a 12 V current at this location, using a mulitmeter.
	Check that the 1 A fast fuse connecting the blue wire of the vehicle harness to the head lamp circuit is intact. Also check that there is a 12 V current at this location, using a multimeter.
	Check that the DIP switch is set correctly .

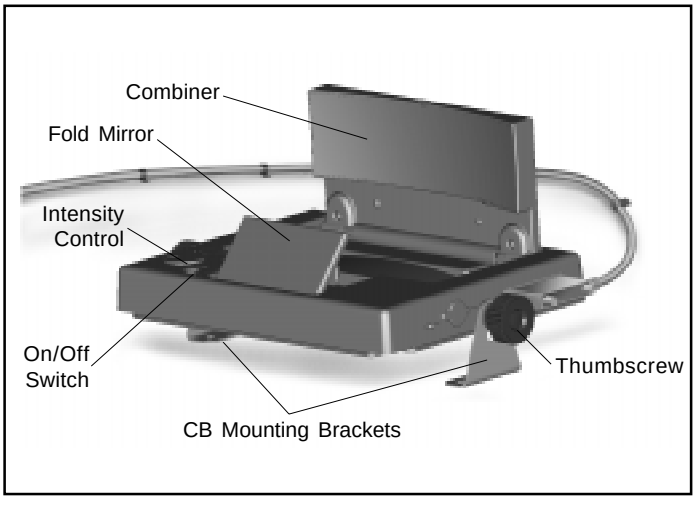


Figure 36 CB Mount (Dashboard) Assembled

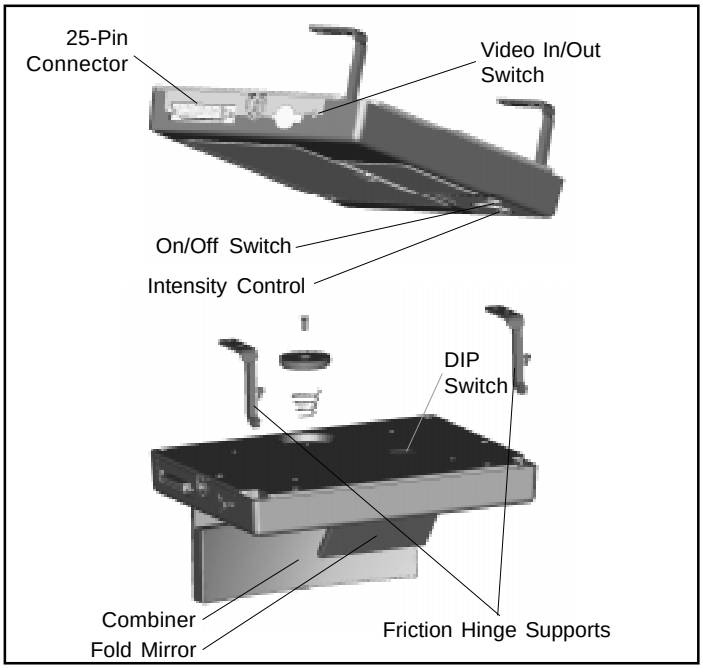
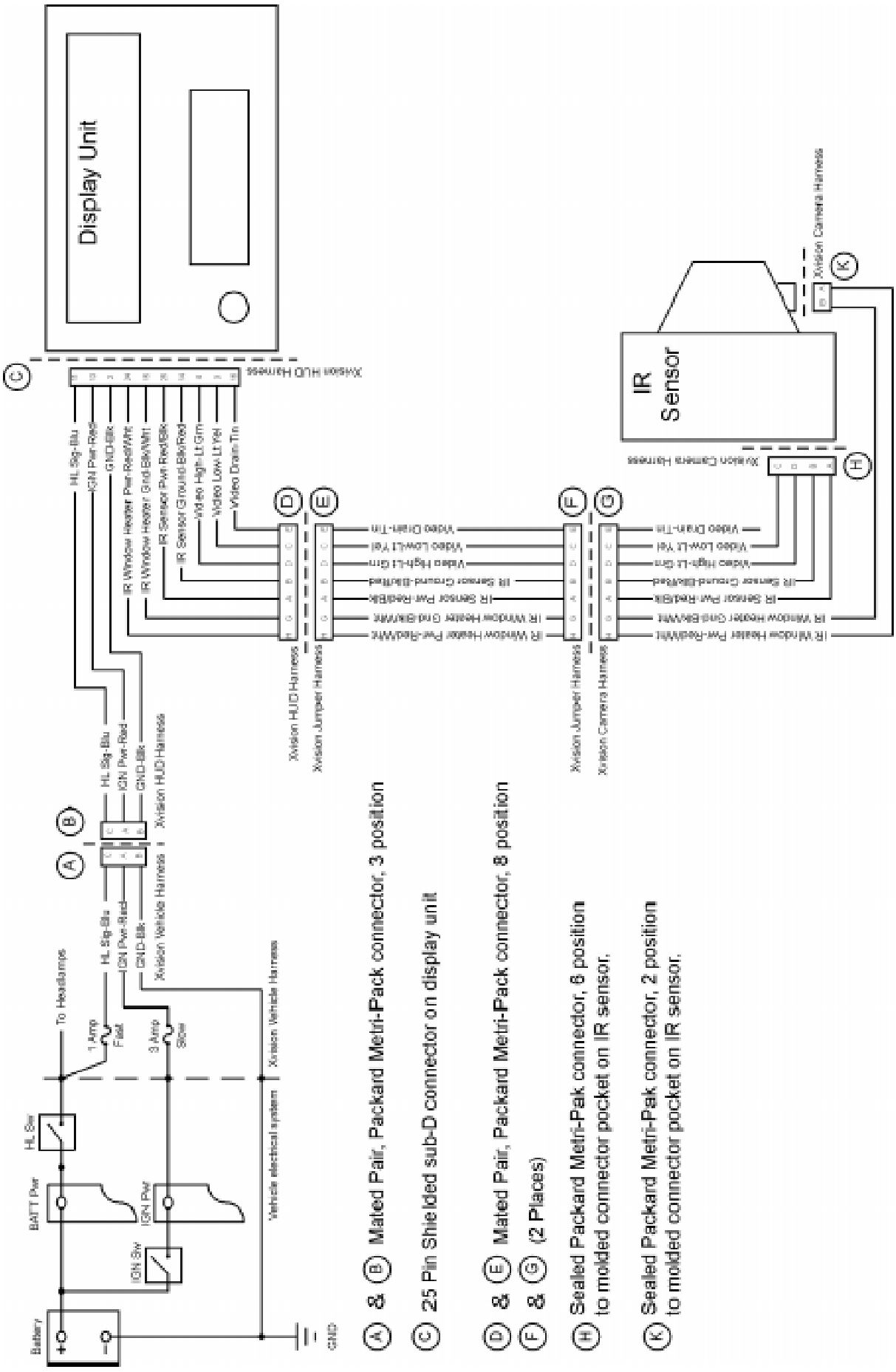


Figure 37 Friction Hinge Mount (Visor) Assembled



Appendix A

Installation Templates

During printing or photocoying, take care not to reduce or enlarge the images in this Appendix. The following templates are drawn to scale. Measure the reference scale on each template with a ruler to be certain that no templates have been resized. If a template has been resized at all, it can not be used.

THIS LINE SHOULD MEASURE 8.00 IN. IF IT DOES NOT, YOUR TEMPLATE HAS BEEN RESIZED AND CANNOT BE USED

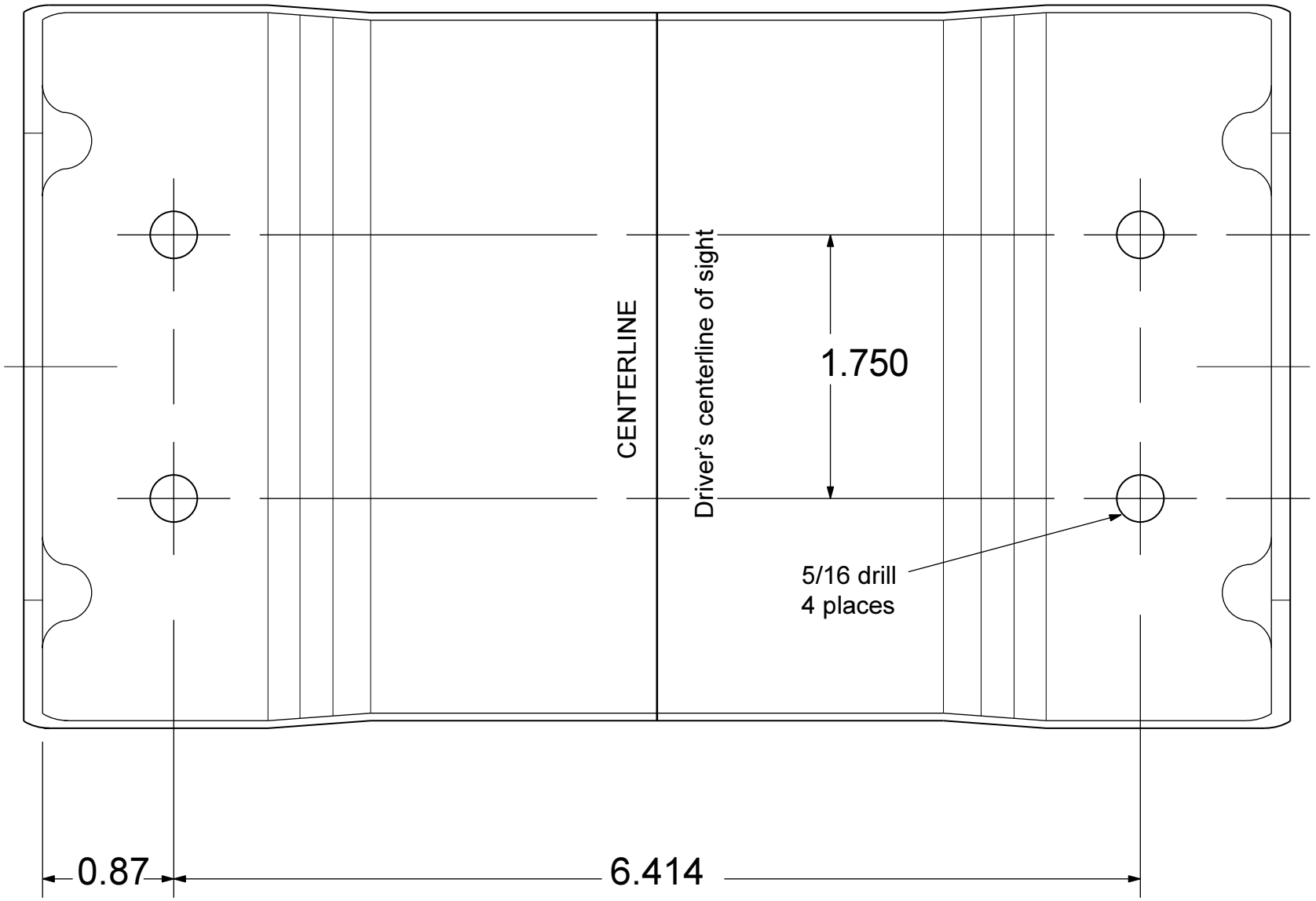


Figure 1 IR Camera Bracket Template

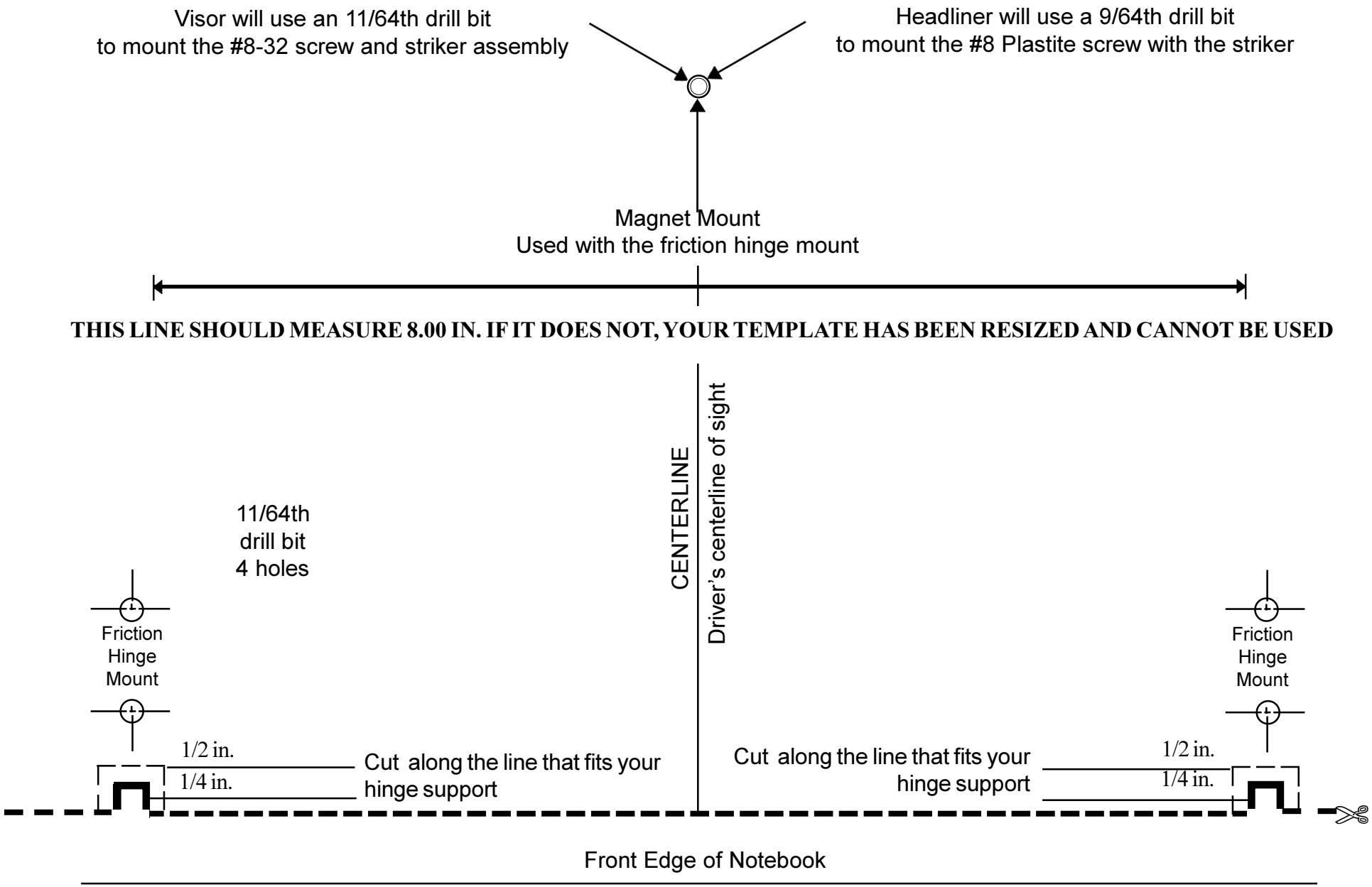


Figure 2 Friction Hinge Mount Template

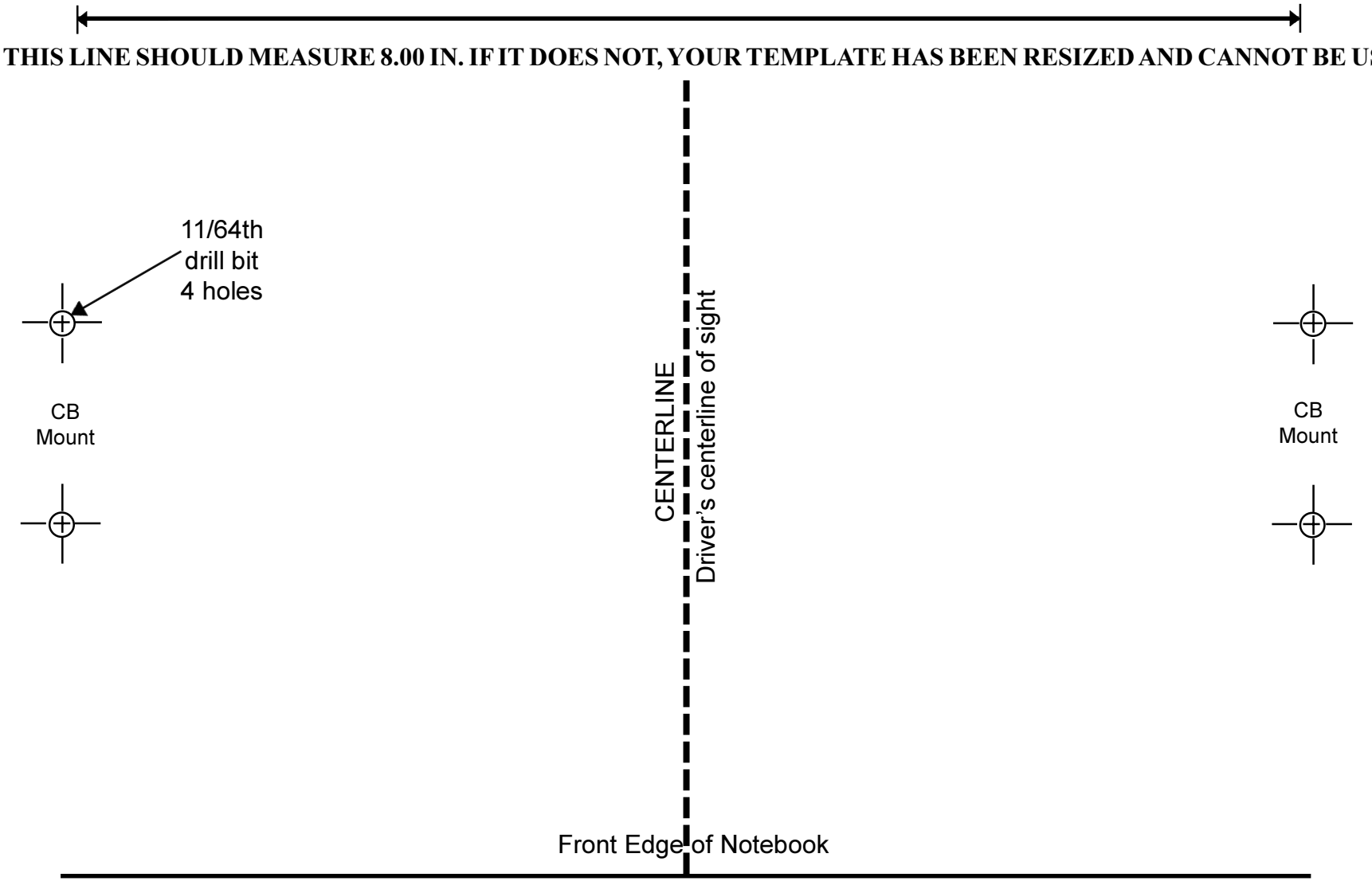


Figure 3 CB Mount Template

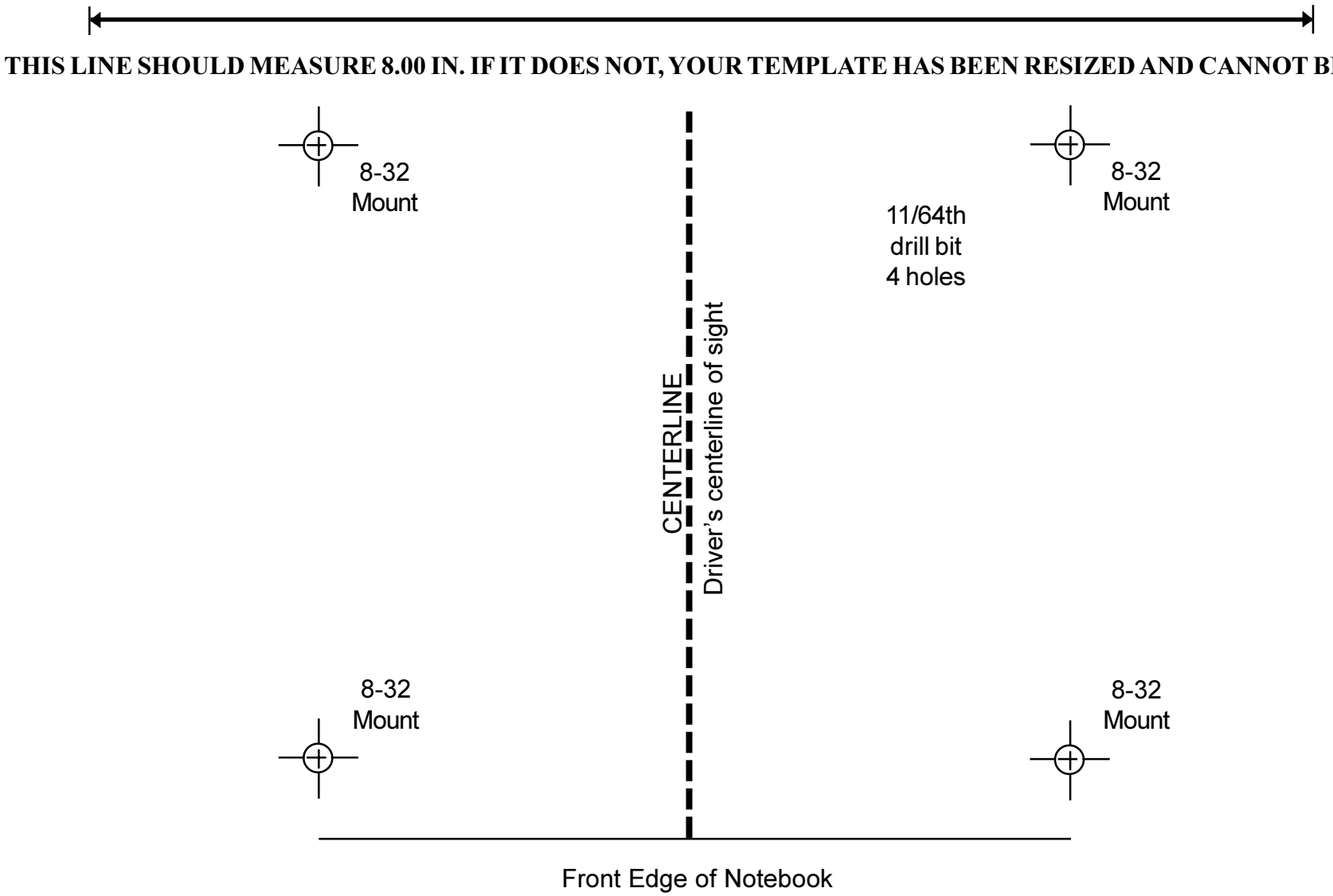


Figure 4 8-32 Mount Template

During printing or photocoying, take care not to reduce or enlarge the images in this Appendix. The following templates are drawn to scale. Measure the reference scale on each template with a ruler to be certain that no templates have been resized. If a template has been resized at all, it can not be used.