

## INSTALLATION OF EATON VORAD COLLISION WARNING SYSTEM WITH SMARTCRUISE®

**Caution:** Installations performed outside of PrevoSt factory, as retrofit on existing vehicles, must strictly be done by qualified people in accordance with the present procedure and under the direct supervision of a PrevoSt employee.

### SPECIAL TOOLING REQUIRED

#### Digital level

SmartTool Model 92346

Manufacturer: Macklanburg-Duncan (MD)

4041 N. Santa Fe

Oklahoma City, OK 73118

1-800-654-8454

[www.mdteam.com](http://www.mdteam.com)

(≈ \$200 Can )

Or

DP45 Digital Protractor

Manufacturer: Lucas Control System

1000 Lucas Way

Hampton, Virginia , 23666

1 800 745-8004

(≈ \$750 CAN)

#### Tester

PRO-LINK PLUS® scan tool with MPC cartridge and 6 pin Deutsch adapter (PN: 108004 + 208040 + 404024 Or 608000 starter kit)

And

Dana/Eaton Roadranger application card PN: 801001

Supplier: Nexiq Technologies (formerly MPSI)

6405 Nineteen Mile Road

Sterling Heights , MI 48314

Tel: 1 800 639-6774 , Internet: [WWW.nexiq.com](http://WWW.nexiq.com)

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## Straight metal Flat Bar

Straight aluminum flat bar 7 - 8 feet long. (less than 25 mil curvature over the length of the bar)

## Cut-out Templates

Side antennas cut out template, Prevost PN: 381998 (Included in retrofit kit)

## Glue and Sealant

Sika 252 Black Prevost PN: 682462 (Included in retrofit kit)

## VEHICLE COMPATIBILITY REQUIREMENT

The engine must be equipped with a DDEC IV ECM using software version 27.50 or greater and it must be equipped with the Engine brake option (Jacob brake). DDEC equipped with versions older than 27.50 cannot be upgraded to the version 29.04. H3-45 Vehicles with serial numbers Y-3435 and above that were equipped with the engine brake option meet this requirement.

The DDEC IV must be loaded with the software version 29.04 and above. H3-45 Vehicles with serial numbers after 1-4147 have version 29.04. Vehicles with serial numbers between Y-3435 and 1-4147 can be equipped with the system but must have their DDEC software upgraded to version 29.04 or greater by a Detroit Diesel dealer.

## VEHICLE PREPARATION

The DDEC ECM must be enabled for SmartCruise (ACC). This is done by Detroit Dealers using the Detroit ECM programming tool. There are two things required :

- 1- Enable the SmartCruise parameter (ACC).
- 2- Change the configuration of two of the ECM pins in order to permit the Engine brake activation by the SmartCruise function even when the dash engine brake switch is inactive.
  - Switch the Pin J2 to “No function “
  - Switch the Pin H2 to “No function”

This step must be done right before installing the VORAD system or at any time during the installation but not several days before proceeding with the installation. Once the DDEC is enabled for SMARTCRUISE, it expects to be connected to the VORAD ECU. Until the VORAD ECU is installed, the “Check Engine” warning light will remain ON in the dash indicating that the VORAD is not present.

## MATERIAL

Kit #382012 includes the following parts :

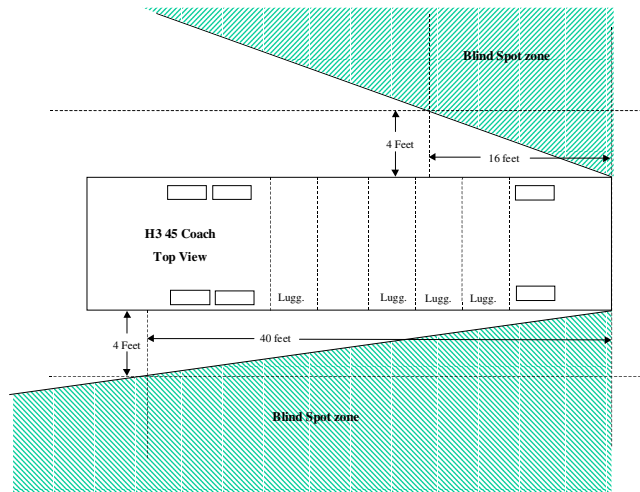
Part No.	Description	Reference on drawing	Qty
563192	CPU with SmartCruise	1	1
563188	Front Antenna	2	1
563189	Side Sensor Display	3	2
563191	Side Sensor Antenna	4	2
563190	Driver Display unit with driver card	5	1

065608	Main Harness	6	1
065609	Side Sensor Harness	8	2
563194	Bracket Sensor Display	9	2
065591	J1939 Engine ECM Cable	10	1
065592	J1939 Harness Front to Rear	11	1
561566	Connector J1587	12	1
561568	Terminal pins J1587 Connector	13	2
561565	Seal for connector J1587	14	2
561181	Crimp terminals for relay	15	2
561700	Crimp terminals for voltage supply	16	2
382008	Support bracket for Driver's Display	17	1
5001479	Screws for Driver's Display	18	8
381993	Front Antenna Support Box	200	1
504399	Base washer 10 Ga Plastic Black	201	4
506785	Adhesive tape	202	0.009
5001544	Washers Lock Ext T ss #10	203	4
5001543	Screws #10-32x½	204	4
504403	Black Cap	205	4
500952	Screw TPG #8x½ ss	206	2
504671	Grommet	207	1
682462	Sika 252 Black	208	1
381995	Side Antenna Support Bracket	300	2
502622	Screw Cap Hex M6x20 ss	301	12
500411	Washer FL M6 ss	302	8
502570	Washer Lock M6 ss	303	12
502565	Nut Hex M6	304	12
500589	Nut Well M4	305	8
502677	Screw Ma Rnd M4	306	8
381997	CPU Mounting Bracket	400	1
506338	Rubber Ext	401	0.66
680066	Locktite	402	1
500470	Lock #8	403	5
500641	Screw Tpg #8x¾	404	6
504637	Cable Tie	405	30
500649	Screw Tpg #6x¾	500	44
563213	SmartCruise warning sticker		1
563193	Driver Training Video Cassette		1
381998	Side Door Cut-out Template		1
IS-01171	Instruction Sheet		1

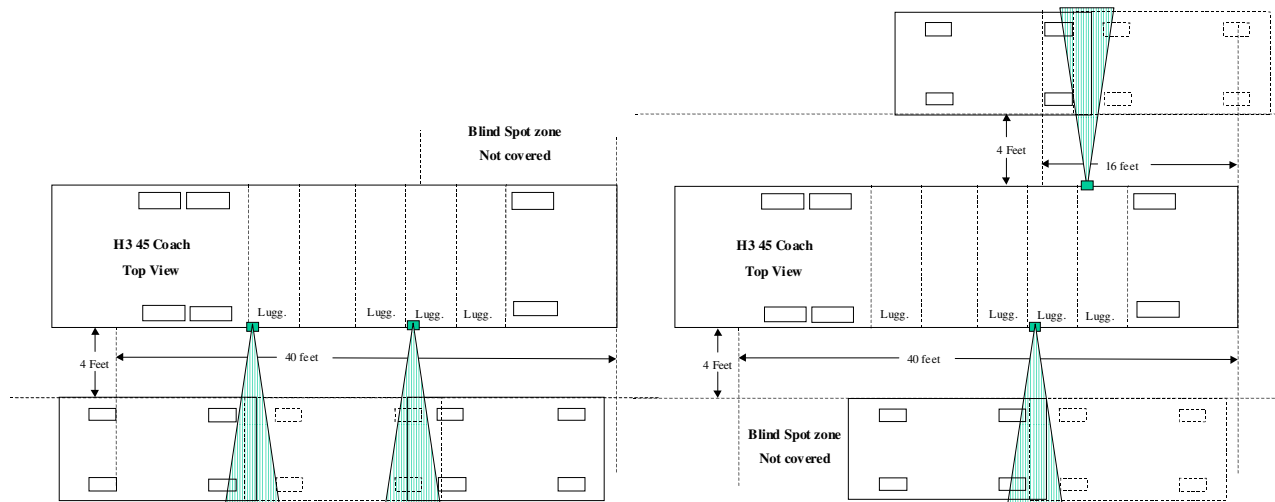
## SIDE SENSOR LOCATIONS

There is a choice on the mounting location of the side sensors.

As shown on the figure, the blind spot zone on the right hand side extends up to 40 feet behind the front of the coach for a vehicle that circulates at a 4 feet distance from the coach side. On the driver side, the blind spot zone goes from the front of the coach up to 16 feet behind.



The choice consist of installing both sensors on the right hand side of the coach leaving the driver's side non protected (Option 1 below) or installing one sensor on each side but then with the blind spot on the right hand side not fully covered (Option 2 below).



**Option 1**

**Option 2**

If choosing option 1, the side sensors are located on the rear end of the 2<sup>nd</sup> baggage compartment door and on the rear end of the last baggage compartment door on the right side of the vehicle.

If choosing option 2, the left side sensor is located on the rear end of the first baggage compartment door and the right sensor on the rear end of the 2<sup>nd</sup> baggage compartment door.

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## PROCEDURE

**Warning :** Park vehicle safely, apply parking brake, stop engine and set battery master switch(es) to the OFF position prior to working on the vehicle.

**Note:** For the front antenna alignment, the coach needs to be inside a garage on a level surface.

1. Route cable J1939 supplied in the kit (065592), between the engine compartment and the compartment located above the front wheel on the driver's side (Refer to D380210 P4). Connect J1939 to the DDEC ECM using the cable harness supplied in the kit (065591). (Refer to D380210 P4).

**Note:** It is important to route the cable in the specified wire channel. The electrical channel located on the vehicle opposite side was not used because it contains power cables that might disturb the J1939 signal.

2. Make a rectangular cut-out in the front skin of the vehicle to install the front antenna. First drill a hole in one corner and then use a jigsaw to cut a rectangular hole as per the dimensions indicated on D380210 Page 2.
3. Prepare the front antenna by removing the existing mounting supports. (See D380210 Page 2 ).
4. Prepare the Prevest supplied antenna support. Install tape (506785) around the back of the antenna support (381993) as shown on drawing D380210 Page 2 (Note: No tape in the bottom part). Apply Sikaflex (682462) on the back of the antenna support as shown.

**Note:** Sikaflex is applied on the back of the antenna support such that the joint is not apparent once the holder is in place. The only thing apparent is the black tape.

5. Place the antenna support into the vehicle front skin hole. While pushing the holder in place, make sure it is level with the vehicle horizontal line. Drill two 1/8" (3.5 mm) diameter holes in the vehicle front skin where the antenna support holes are located and secure the holder using the two screws supplied (500952). (Refer to D380210 Page 2).
6. Do the cut-outs for the side sensor installation using the side antenna cut-out template (381998). (See diagram D380210 page 3).
7. Mount the side sensor on its mounting plate (381995) using the screws supplied. Temporary position the side sensor into its cut-out hole in the baggage compartment door and drill four 3/8" (9.5 mm) diameter holes into the baggage compartment door to fix the side sensor bracket. Remove the sensor and apply SikaFlex onto the sensor as shown on drawing (D380210 Page 3). Mount the sensor into its hole and screw the four retaining screws into the baggage compartment door.

**Note:** Before applying Sikaflex, make sure the cutout is wide enough to allow the side sensor diamond shape to be fully pushed in, enlarge the cutout as necessary. This is important in order to ensure that the sensor face is not significantly vertically tilted.

8. Seal the side sensors in place from the outdoor side of the baggage compartment doors using sikaflex.
9. Install the CPU in the compartment located above the front wheel on the driver's side using the mounting bracket supplied (381997). First mount the CPU on the bracket using the screws supplied then fix the assembly on the top of the compartment. Drill holes of 3.5 mm diameter (1/8") in the vehicle structure channels. Secure the ground strap to the chassis using one of the assembly retaining screws (see drawing). (Refer to D380210 Page 4).

**Note:** Make sure the ground strap is tighten onto the CPU case.

**Note:** The CPU must be oriented such that the cartridge slot is accessible when opening the first baggage compartment door.

10. Referring to drawings D380210 Page 5 (Pictures), mark with a piece of masking tape the position where the driver's display unit and side sensor display units are to be mounted in the coach cockpit.
11. Remove the dash top in order to get access to the dash wiring.

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12. Install the main harness (065608) in the compartment located above the front wheel on the driver's side near by the CPU. Connect the two side sensor wiring cables (065609) to the main harness. (See drawing page 4)
  13. Route the front antenna cable through the front service compartment and below the dash towards front antenna holder. Pass the cable and connector through the antenna support hole. Install the grommet (504671). Leave 10 inches of cable . Seal the grommet and cable with SikaFlex .(Refer to D380210 page 2) .
  14. Route the Driver's Display cable and the left side sensor display cable up to the dash. Pass the cable beside the left window structure tube. It may be necessary to make a clearance hole into the dash top where the cables are coming through. In the case where both side sensors are installed on the right hand side, then, the left side display cable is not required . Leave it in the CPU compartment and tape the connector end to protect it.
  15. Make the connections described on drawing D380210 page 1 in the front electrical junction box. Connect connector J1587 to the 900-901 circuit using existing free connector C472. Referring to Detail A on drawing, extract wire 21H and 23H from the R21 and R23 relay Position 86, cut the existing terminal and crimp left turn signal with 21H on a new terminal then Right turn signal with 23H on a new terminal. Re-insert the terminals into position 86 of R21 and R23. Crimp a terminal end on the VORAD ignition wire and connect to 12 V ignition junction block in front service compartment. There is a fuse within the VORAD wiring harness . Do the same for mounting the ground wire and secure it to chassis ground.

**Note:** *The brown wire identified LTURN may need to be extended to reach the front service compartment. The orange wire labeled BRAKE is not used and does not need to be routed up to the front service compartment.*

16. Route the two side sensor antenna cables from the CPU location up to the side sensors locations. See D380210 page 4. Install Tie wrap to hold on existing vehicle harnesses.
17. Route the right sensor display cable from the CPU location up to the right side display location inside the coach near and in-line-of-sight with the right mirror. The cable is routed behind the plastic finishing piece that covers the right vertical stud. Drill a hole in the finishing plastic below the display on the side to get the cable out and connect to the display.
18. Connect the front antenna cable and mount the front antenna into its holder.
19. With the coach sitting on a level surface, proceed to the alignment portion of the front antenna. An assistant is needed for the azimuth adjustment. Slightly loosen the 4 screws that retain the antenna to its holder. Using the digital level, adjust the antenna elevation angle to 89 degrees (Antenna looking downward by 1 degree). A tolerance of +/- 0.5 is allowed for that adjustment (That means angle reading of 88.5 to 89.5 acceptable). Position the center of the aluminum flat bar against the center of the antenna surface and measure the distance between the flat bar and one of the screw that retains the front headlight located at about 38 inches from the middle of the antenna. Measure the distance from the bar and the opposite screw located on the other side of the antenna. Subtracting the two, the difference between the left and right side measurement shall be less then ¼ inch (6 mm) in order to get the proper Azimuth angle adjustment of less than 0.4 degree. Tighten the screws and check the elevation angle to make sure it is still within the acceptable tolerance range.
20. Re-install the Dash top and mount the driver's display unit on the dash top using the mounting fixture supplied.
21. Install the side sensor displays. Drill holes of 3 mm diameters (1/8") in the vertical stud to mount the display mounting bracket to the stud.
22. Install the SmartCruise Warning sticker on the left side console above the Cruise control rocker switches. (See drawing D380210 Page 5).

**Note:** *There could be two stickers in the kit. Be sure to install the one that has a warning orange line in it. The other one does not need to be installed.*

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## SYSTEM SETUP

Connect the Pro-link tester to the Diagnostic port on the left wall below the dash near the driver's seat area. Install the Eaton PCMCIA application card into the Pro-link . Turn on the ignition (or start the coach) and perform the following configuration set-up steps:

Go to the set-up menu:

- Select Eaton VORAD from the list of application
- Wait until the system responds and press enter when Diagnostics is present
- Select Set-up

Set the Date and Time.

**Note:** *The Vehicle ID could be set if desired. This is useful only in the case where the owner has multiple vehicles equipped with Eaton VORAD and when he is using the optional VORAD EVIMS software to track the driving habits of its driver.*

Go to the Hardware config Menu :

- Set both parameters, R SS (Right Side sensor) and L SS (Left side sensor) to YES.

**Note:** *The L SS must be set to YES even when both sensors are installed on the right side.*

- Set the parameter 2SS, 1SSD to YES if both side sensors are installed on the same side using one side sensor display.
- Set R TURN SIG to YES
- Set L TURN SIG to YES if a side sensor is installed on the left side. Otherwise leave it at NO.
- Leave the Brake BIST (Built In Self Test) and Turn SIG BIST to N/A

Go to the S/W Config menu and within this menu:

- Set Brake Mode to J1939
- Set Hi brake Logic to N/A
- Set Speed mode to J1939
- Set Speedo BIST to NO
- Set Proximity alert to YES
- Set 2 second alarm Audio to YES

Go to the Performance Options menu ( submenu of S/W config.)

- Set Sys Off enable to YES or NO according to owner preference
- Set ½ second alert to YES
- Set Min Volume to 0

**Note:** *You will be asked for a password, enter DEAD using the arrow keys on the Prolink tool.*

- Set Range enable to YES

Get into the product options menu ( submenu of S/W config.)

- Verify that Set Trip REC, AR Data Enable and SMARTCRUISE are set to YES
- Leave SATCOM ENABLE and BLACK OUT enable to NO and DISPLAY TYPE to DDU

Go to the Trip Params menu (submenu of SETUP MENU)

- Set the CARD ALARM to NONE (Unless the owner specifies that he wants to track his driver's performance with the optional EVIMS software from VORAD and force his drivers to identify themselves.

## SYSTEM CHECK OUT

Item tested	Action	Expected Results
Lamps of driver's display and side sensor display(s)	Rotate the volume knob on the Driver's Display Unit fully clockwise. Turn on the vehicle's ignition switch but do not start.	All LEDs on the Driver's Display Unit and Side Sensor Display(s) will illuminate for approximately 15 seconds and a medium pitched tone will sound after the ignition switch is turned ON. Ensure that all LEDs are coming On.  <b>Note:</b> Both of these displays are equipped with one ambient light sensor each, which will not illuminate.
Driver's Display Unit	Wait until the "Lamp Test" is complete	The green "ON" LED will illuminate. Ensure that the red "Fail" lamp is not illuminated (after the "Lamp Test") and no low pitched fail tone has sounded during power up.
Side Sensor Display(s)	Wait until the "Lamp Test" is complete	Ensure that the yellow LED only (if no objects are moving near the sensor) is illuminated after the "Lamp Test".
Antenna Assembly Test (front antenna)	Observe the Driver's Display Unit. Have an assistant stand directly in front of the Antenna Assembly and walk to and from it (approx. 10 to 15 feet away and walk towards the vehicle and back).	The yellow LED that is located between the volume and range knobs should illuminate when the Antenna Assembly detects the assistant.
R.H. Side Sensor Assembly	Turn on (activate) the right turn signal. Observe the Side Sensor Display. Have an assistant move a sheet of metal to and from the sensor at a distance of 3 to 4 feet away from the sensor. When too close to the sensor, (less than 2 feet) the sensor does not detect the object.	A one-time double tone Side Sensor alert should sound and the LED on the right Side Sensor Display should toggle from yellow to red when the Side Sensor detects the assistant's hand.
L.H. Side Sensor Assembly	Turn on (activate) the left turn signal. Observe the Side Sensor Display. Have an assistant move a sheet of metal to and from the sensor at a distance of 3 to 4 feet away from the sensor. When too close to the sensor, (less than 2 feet) the sensor does not detect the object.	A one-time double tone Side Sensor alert should sound and the LED on the left Side Sensor Display should toggle from yellow to red when the Side Sensor detects the assistant's hand.



## ROAD TEST

**Caution:** You must be familiar with the system prior to performing the road test. Information is available in the Eaton VORAD Driver Reference Manual (part number VODR-0030, February 2001 edition) and the VORAD VHS driver training videocassette.

Item tested	Action	Expected Results
Front Antenna detection range	Approach a slower vehicle ahead	<p>At 350 feet to the vehicle ahead, the Yellow indicator light comes ON.</p> <p>At 3 seconds to the vehicle ahead, the orange indicator also lights</p> <p>At 2 seconds, a single beep will sound (if brakes have not been applied)</p> <p>At 1 second, the red indicator also lights, accompanied by a double beep (if brakes have not been applied)</p> <p>At 0.5 seconds to the vehicle ahead, the double beeps will be continuous.</p>
Target Tracking	Approach a slower vehicle ahead to get within the 3 seconds range (Yellow and orange light ON)	<p>The lights remain ON (Target not lost) even when the vehicle ahead is getting off of the lane center, (not more than 3 feet off of center to either side)</p> <p>The lights remain ON (target not lost) when getting into high speed curved road segments (If 3 seconds distance can be maintained)</p>
SmartCruise	While driving in an area and conditions where normal cruise control can be used, approach a slower vehicle and set the cruise control while driving at a higher speed than the vehicle ahead.	<p>The SmartCruise green light shall come ON (upper right corner of Driver Display Unit)</p> <p>The system shall maintain the distance to the vehicle ahead to a comfortable safety zone.</p> <p>When the vehicle ahead decreases its speed, the system shall automatically cut the fuel to slow down the coach and maintain the following distance desired.</p> <p>The system shall apply the engine brake in cases where cutting the fuel is not enough to decelerate to the desired target vehicle following distance.</p> <p>When the vehicle ahead increase its speed and the coach is below the initial cruise set point, the system shall re-apply the fuel until the initial cruise set point is reached.</p>
DDEC Engine Brake settings	While doing the SmartCruise check above, set the Engine brake Rocker switch to OFF.	Ensure the system still applies the engine brake when necessary even if the dash engine brake switch is set to OFF.
Proximity alert	When stopped in the traffic, approach the vehicle ahead to within 15 feet and going less than 2 mph.	The proximity alert tone shall come ON.

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## CLIENT DELIVERY

**Warning:** *You must brief the person taking delivery of the vehicle equipped with an Adaptive Cruise Control system like the VORAD SmartCruise prior to getting behind the wheel.*

The briefing shall cover the following points:

- SmartCruise is activated automatically when Cruise Control is Set.
- SmartCruise is de-activated as soon as the brake pedal is touched (Like the normal Cruise).
- SmartCruise will slow down the coach, 1- by de-fueling , 2- by applying the engine brakes , to keep a safe distance from the vehicle ahead.
- SmartCruise is not capable of applying the brakes. The driver must stay alert and be ready to apply the brakes for cases where de-fueling and Engine brake are not providing enough following distance gap or braking.
- As it was the case for a normal Cruise Control before installing the SmartCruise, do not use the Cruise Control (And SmartCruise) in slippery conditions, fog conditions, stop and go traffic and winding roads.

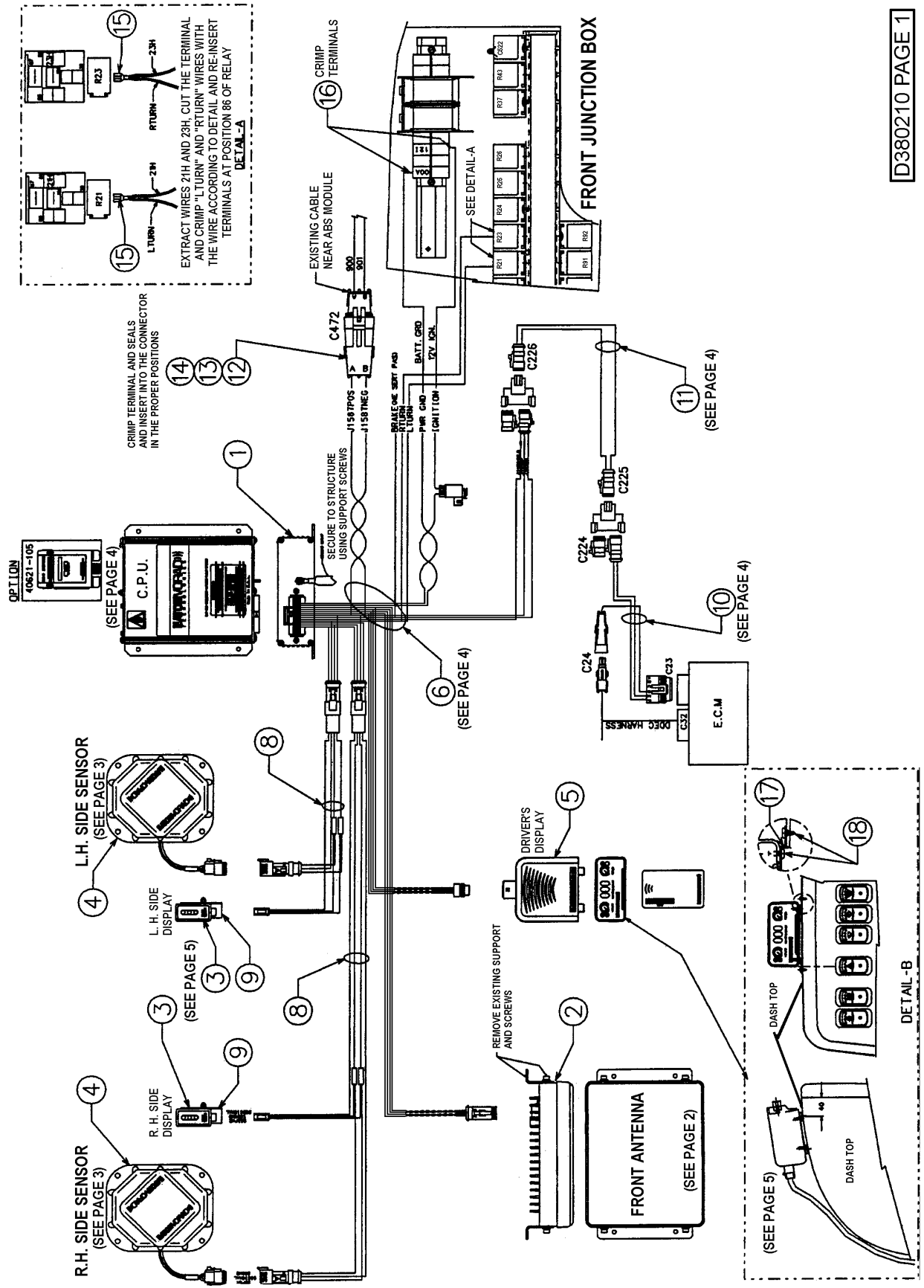
**Note:** *If the engine is stopped and the ignition key turned back ON within less than 7 seconds, a "Check Engine" light will appear on the telltale panel. This is not a real problem and the error will resume by itself when re-starting the engine.*

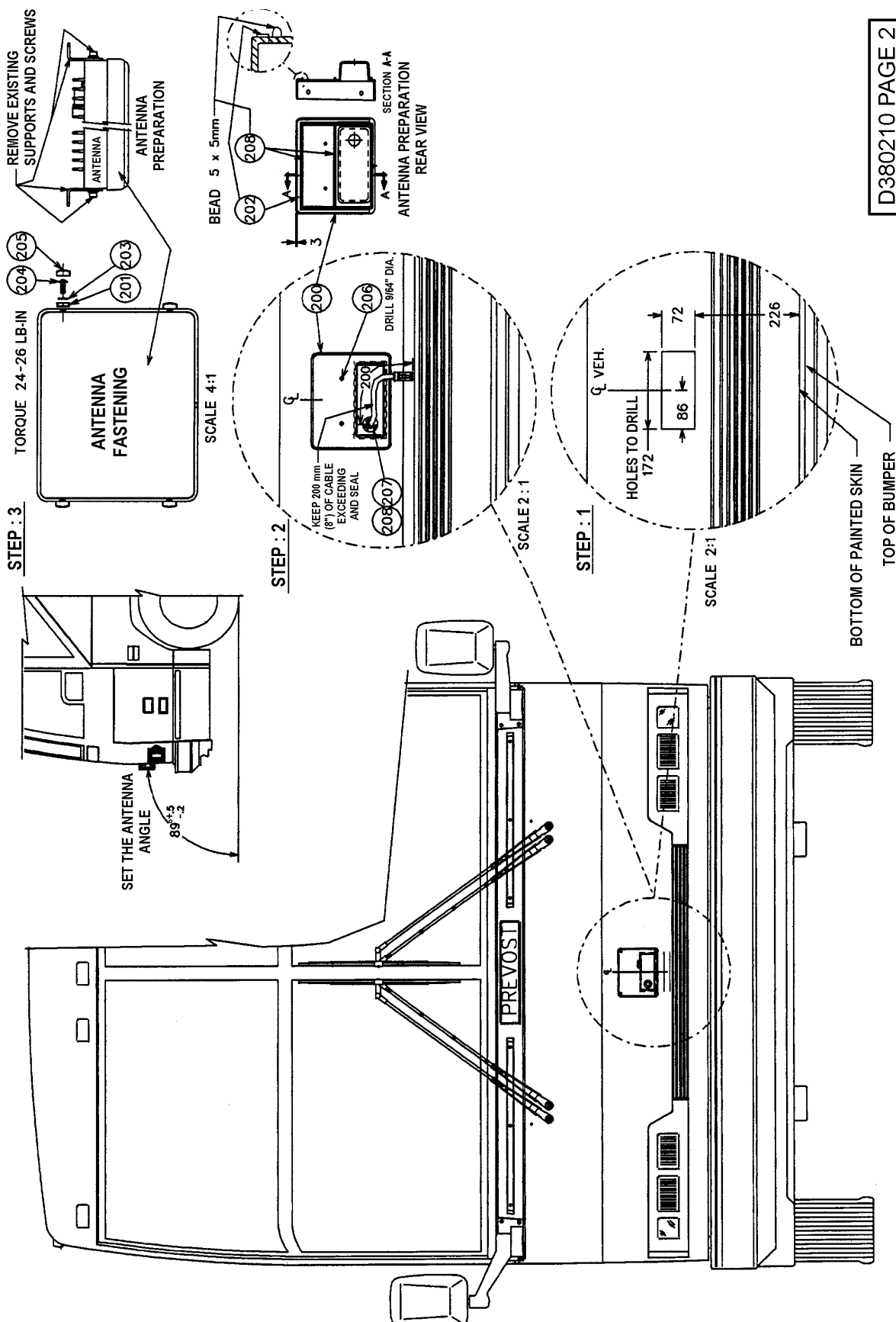
In the Eaton VORAD Driver Reference Manual:

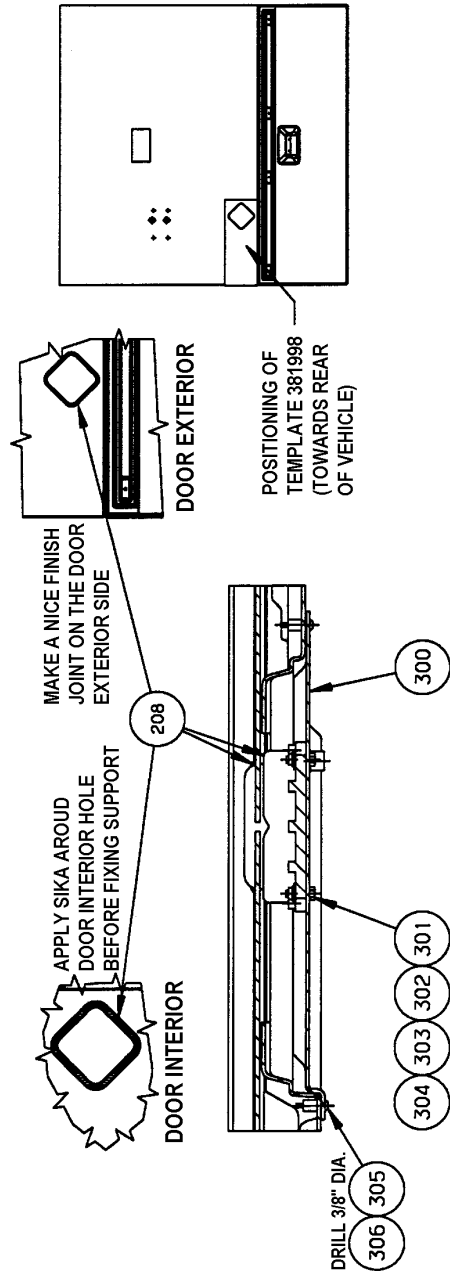
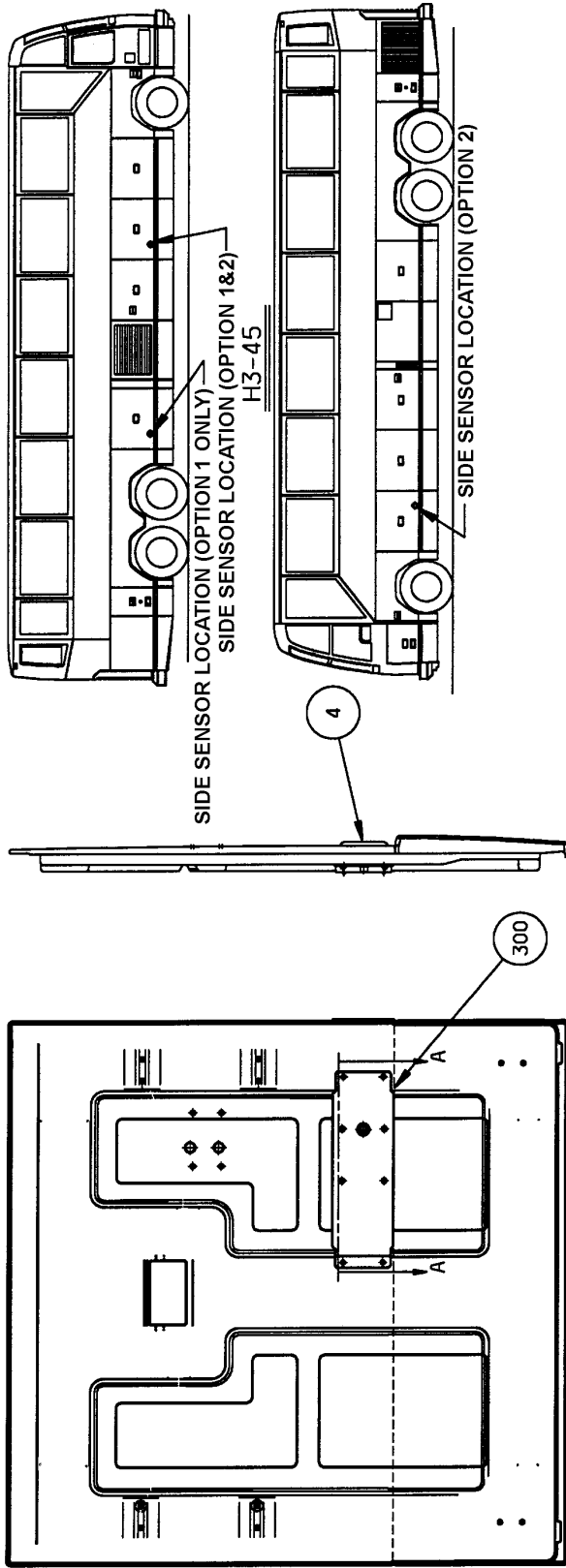
- Review and explain the display indicator lights behavior when approaching a slower vehicle (Page 15)
- Explain the Driver display controls (Page 12 and 13)
- Explain the side sensor indicators (Page 17)
- Go through the special road situations (Pages 21 to 24)

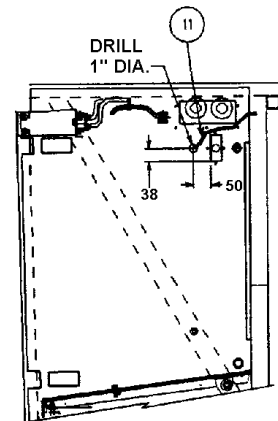
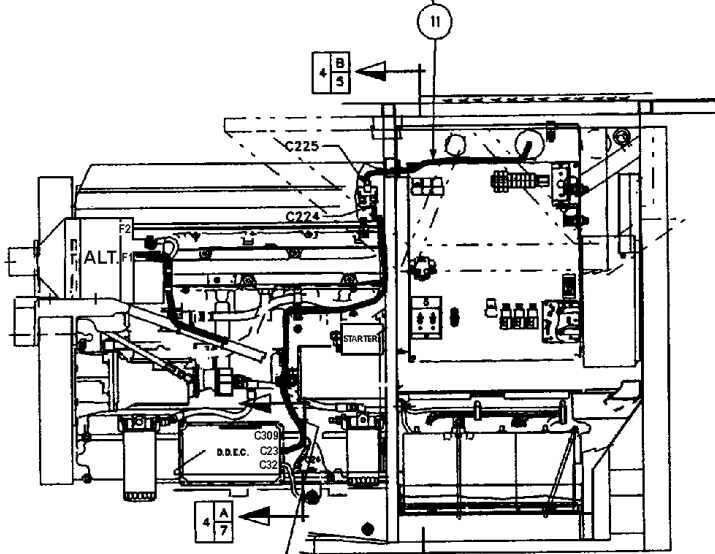
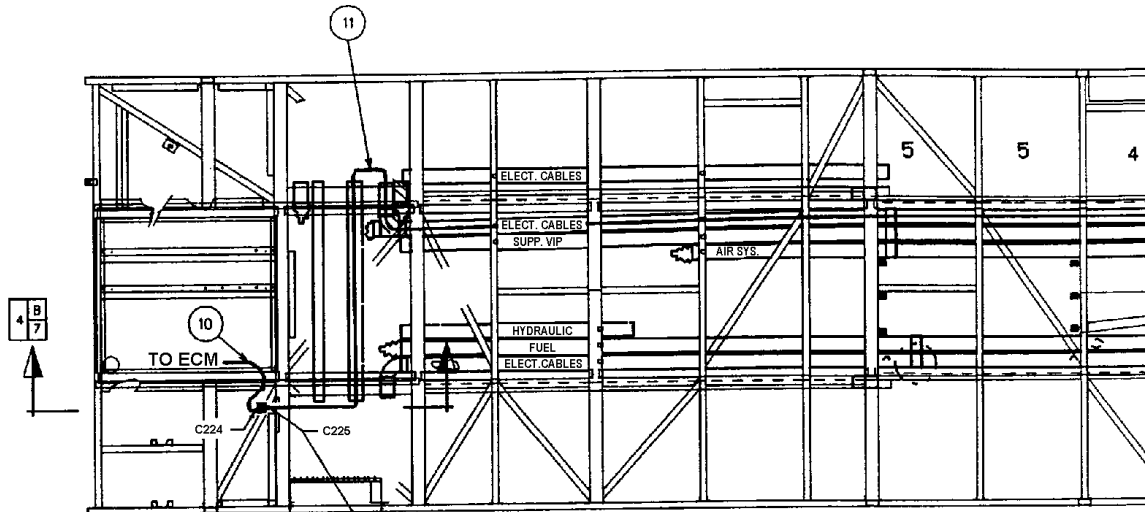
A 24 minutes, Driver Training video cassette is included in the documentation kit. Prevost recommends that all drivers using the SmartCruise system for the first time preview that training prior to driving.

A French version of the Video cassette is available on demand. (VORAD part #: VOMV-0202FR).



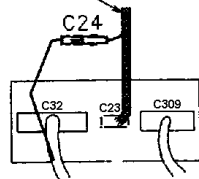




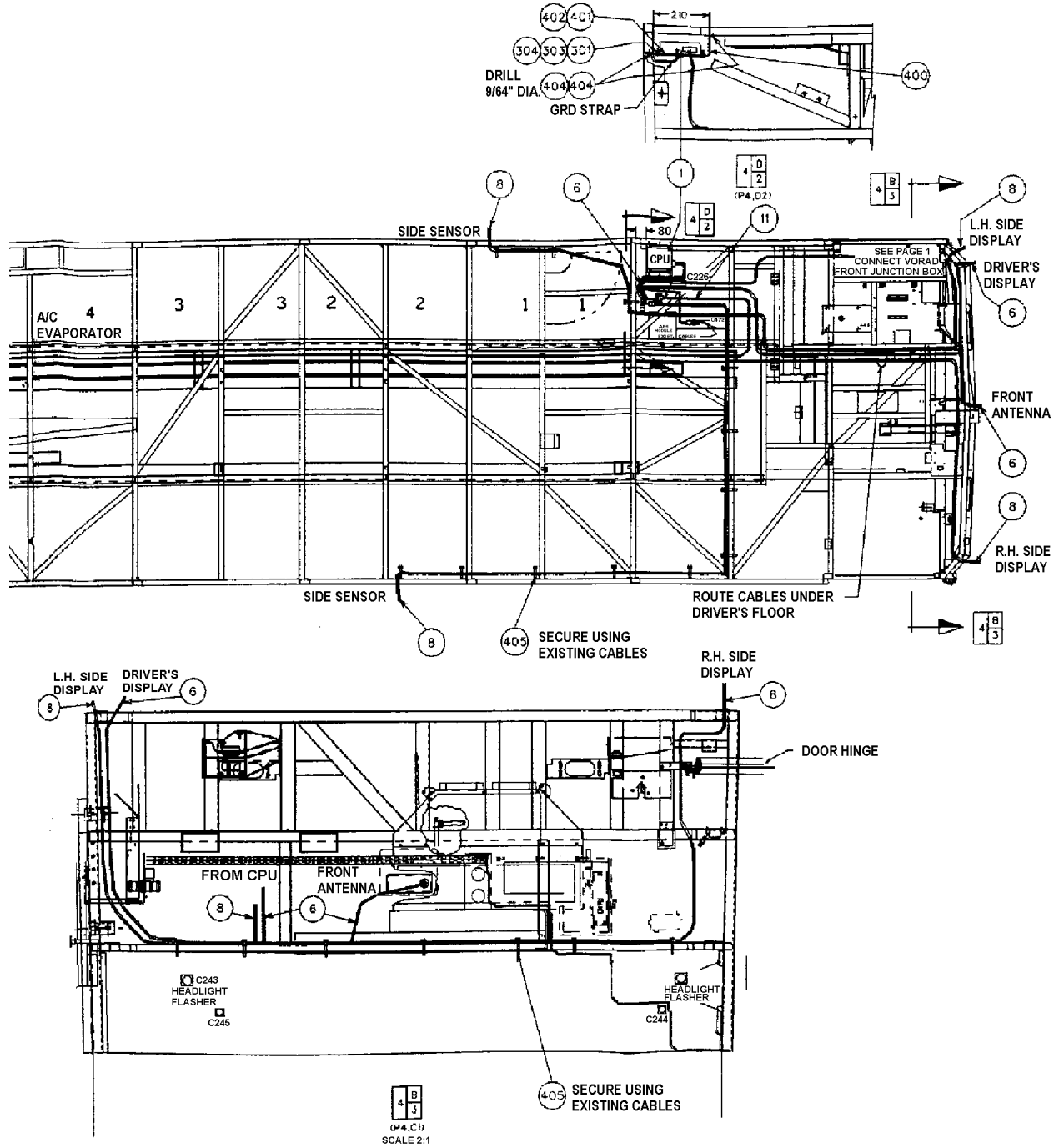


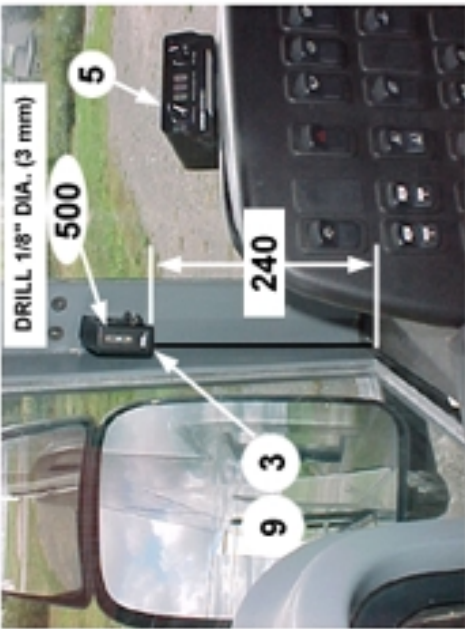
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SCALE 2:1

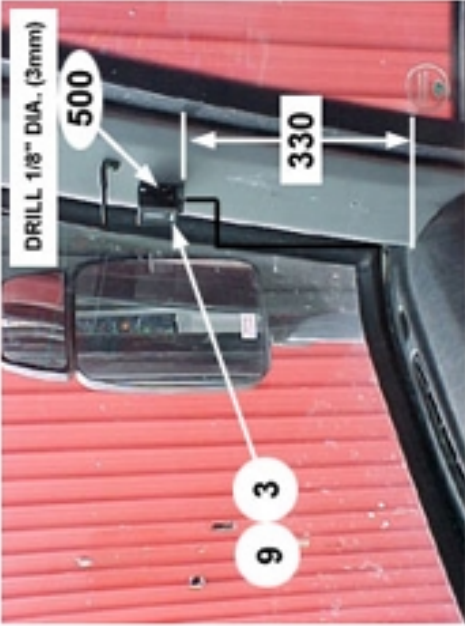


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(P4,B7)





L.H. SIDE



R.H. SIDE



L.H. CONSOLE