

# KENWORTH T680 - MIRRORS

## SERVICE MANUAL



## FOREWORD

Read this manual carefully before operating.

For the most recent version of this manual visit: [www.lang-mekra.com](http://www.lang-mekra.com).

If you have any questions, contact technical support at:

- Telephone: 1-888-MEKRA 4U / Fax: (803) 337 5265
- E-mail: [quality@lang-mekra.com](mailto:quality@lang-mekra.com)

**NOTE:** If you have trouble with any portion of this service manual, please call our service line at 803-337-5264 and ask for customer service. Our hours of operation are 9:00 am – 4:00 pm EST, Monday – Friday.

These Products may be the subject of Pending U.S. Patent Applications or may be covered by, but not limited to, one or more of the following U.S. Patents or patent applications:

**8544151 B2, US 20130043362 A1, US 20130092812 A1, 61/769,838**

### Kenworth T680 MIRRORS SERVICE MANUAL

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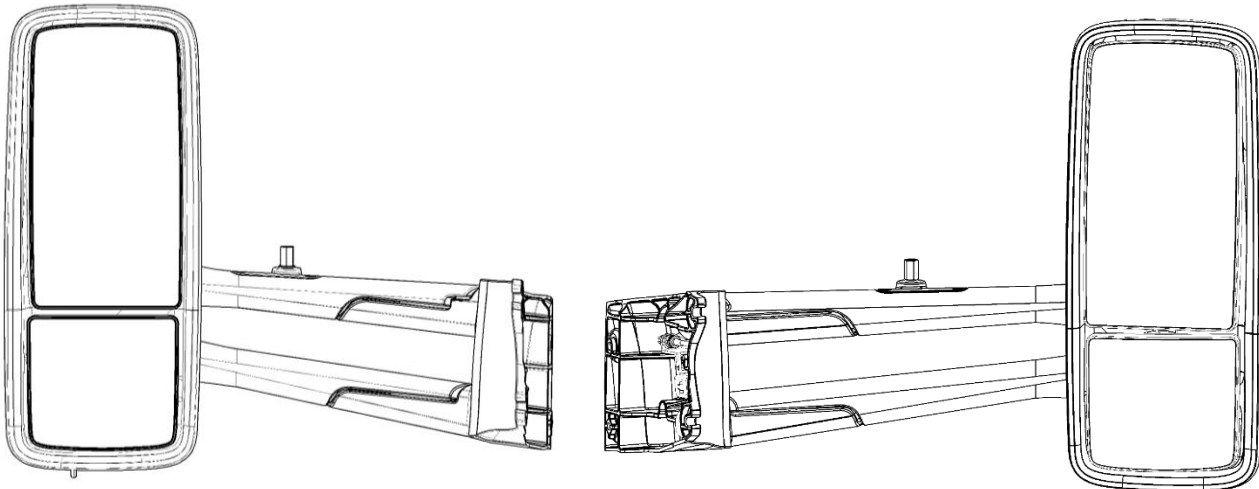
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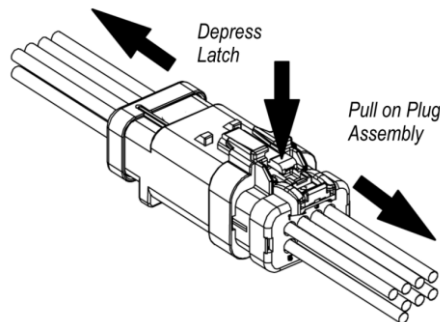
## 1. MIRROR SYSTEM

**Precautions:** When removing and installing the mirror system from/to the truck's door, make sure the mirror is properly supported to avoid damage to the mirror system, truck and personal injury.

### Removal:



1. With the mirror system in its nominal position, remove the four bolts that secure the mirror system to the truck.
2. Carefully disconnect the truck's connector from the old/damaged mirror system.



### Installation:

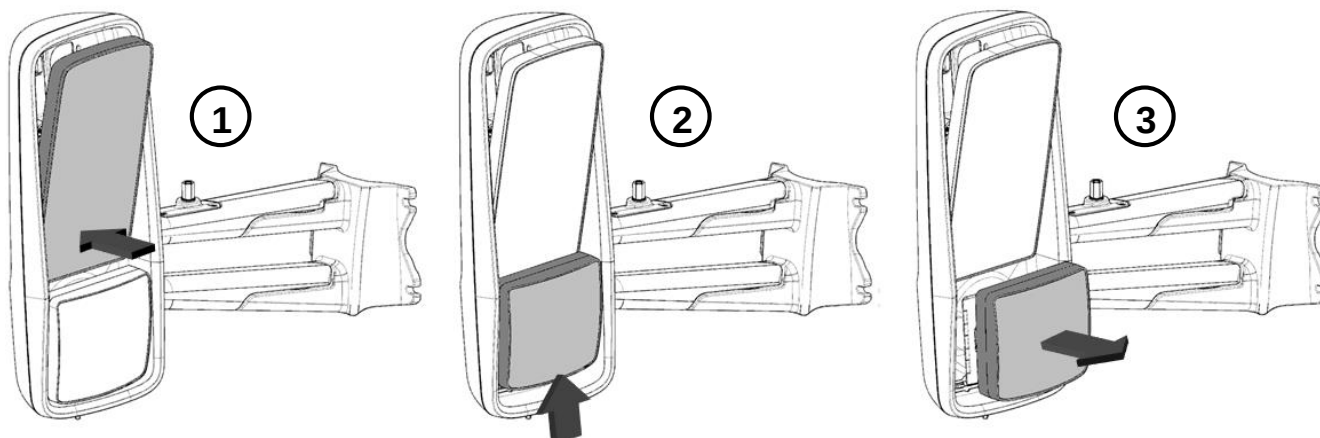
1. Before inserting the truck's connector into the replacement mirror connector, inspect the truck's connector for any damage (defects, corrosion, etc...). If truck connector appears to be okay, then insert the truck's connector into the mirror system's connector; if not then refer to the truck service manual for replacement.
2. Place the new mirror system against the truck's and secure it to the panel by fastening the four bolts to the specified torque value as specified in the truck service manual.

## 2. CARRIER GLASS ASSEMBLY



**Warning:** Wear protective gloves and safety glasses especially when replacing broken glass

### 2.1. CONVEX MIRROR GLASS



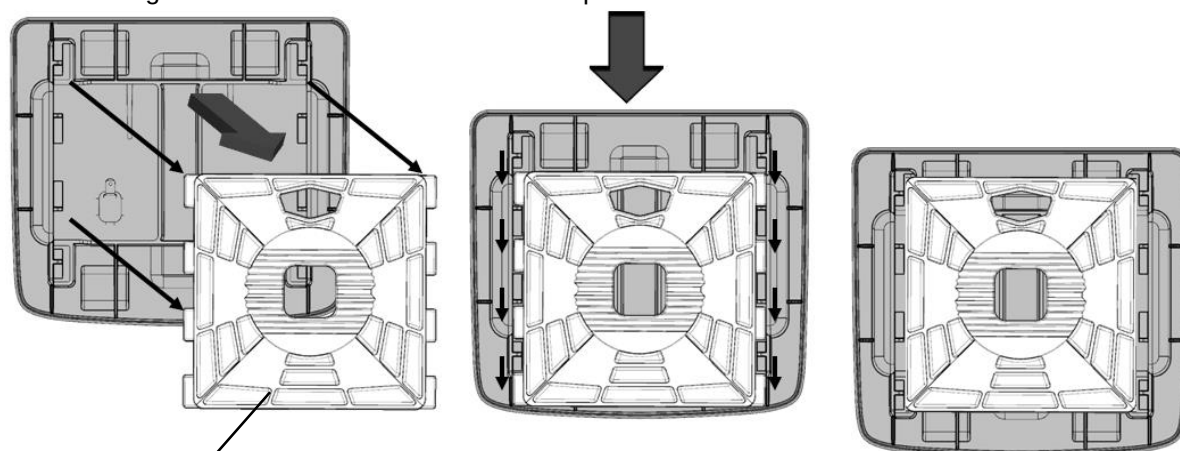
#### Removal:

1. Push the main mirror glass inward at the bottom. (The actuator clutch will allow this manual adjustment of a motorized mirror.) This will provide enough clearance in order to lift up on the convex mirror to disengage the tabs from the manual socket plate.
2. With the flat mirror pushed inward, push up on the convex mirror approximately  $\frac{1}{2}$ " to disengage the tabs on the convex carrier plate from the manual socket plate.
3. The convex mirror can now be removed from the mirror housing.
4. Disconnect the heating element wires from the heater foil terminals by pulling firmly on the wire connectors to completely free the convex mirror from the mirror assembly.

**Installation:** Install the replacement convex carrier assembly in the reverse operation of it being removed.

5. Inspect the condition of the heating element wires (corrosion, exposed wire, etc...) before inserting the connectors onto the heater foil terminals. If they are in good condition, then insert the connectors.

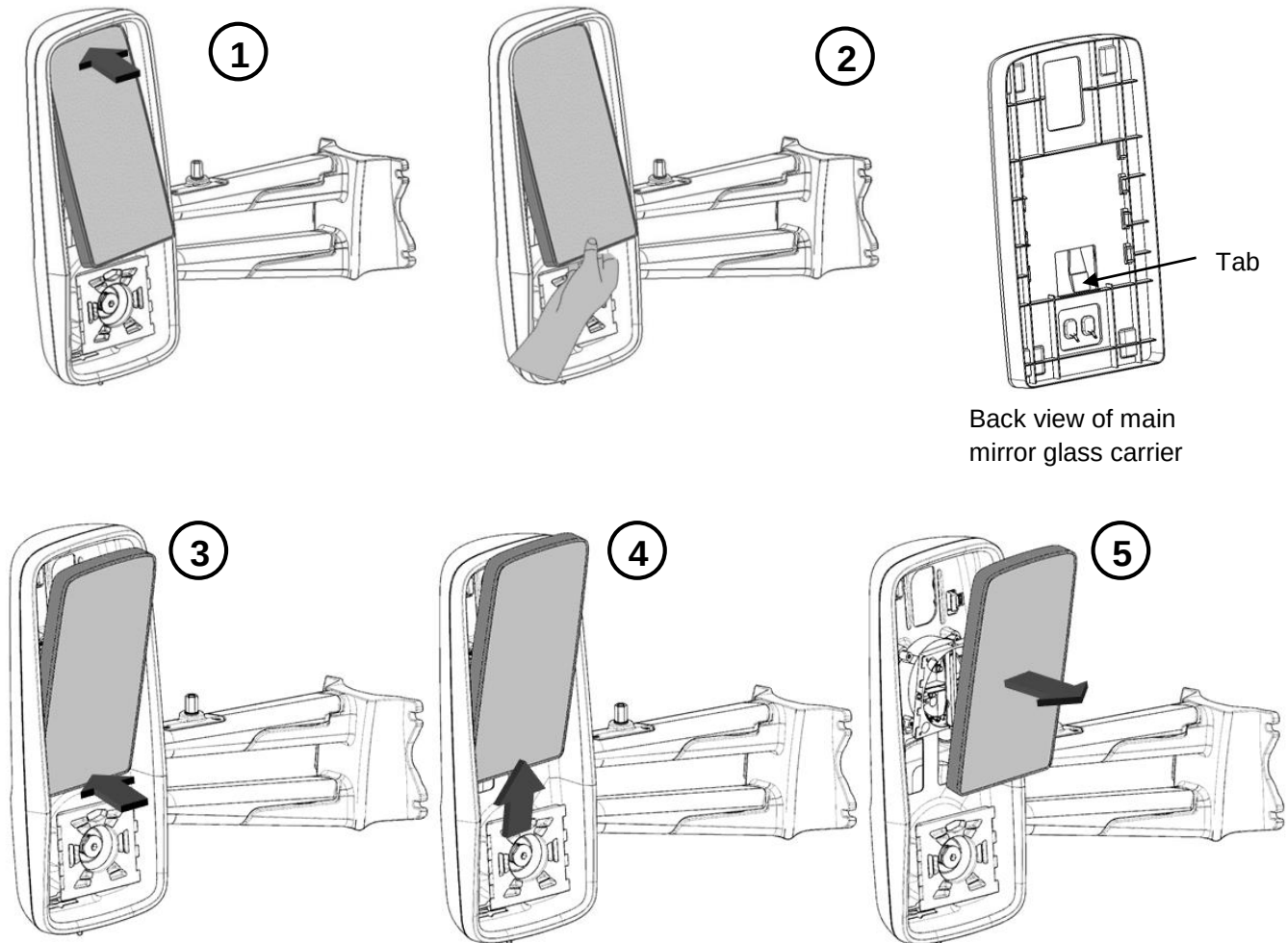
**Note:** The manual socket plate is fixed to the bezel. The illustrations shown below demonstrate how to carefully remove the glass carrier from the manual socket plate.



Fixed to bezel

## 2.2. MAIN MIRROR GLASS

The flat mirror glass has the option of being removed with or without having the convex mirror removed. However, removal of the convex first will provide additional hand clearance to lift up on the flat glass during removal.



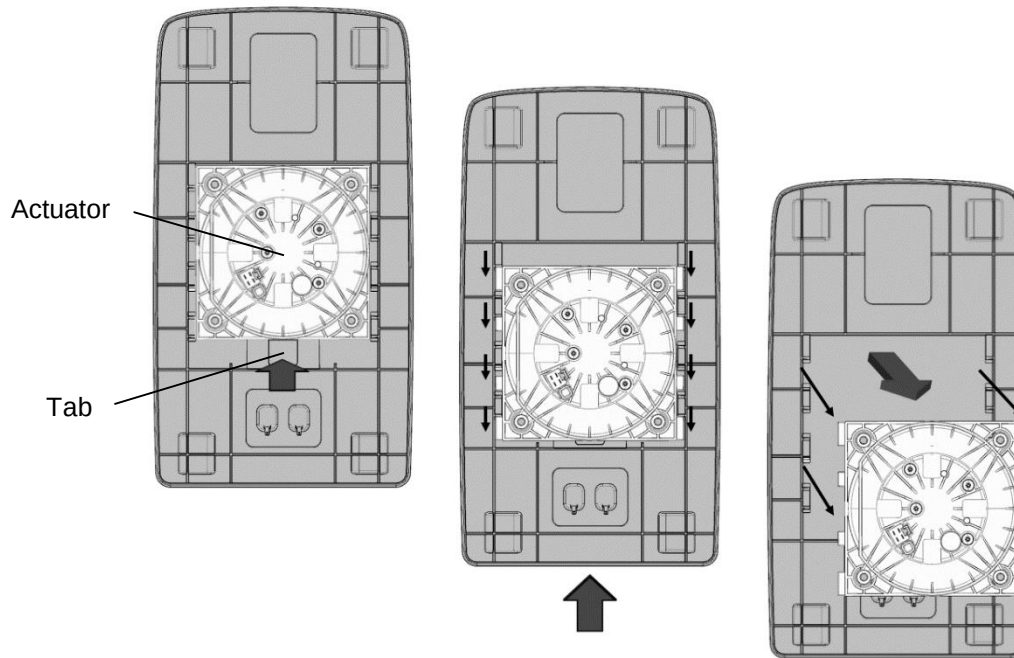
### Removal:

1. Push the main mirror glass inward at the top.
2. Insert hand from the bottom of glass and press tab down with fingers while pushing glass upwards to disengage tab.
3. Push the main mirror glass inward at the bottom.
4. Push the main mirror glass up approximately 1/2" to disengage the tabs on the carrier plate from the actuator. (See note below.)
5. The main mirror glass can now be removed from the actuator.
6. Disconnect the heating element wires from the heater foil terminals by pulling firmly on the wire connectors to completely free the main glass from the mirror assembly.

**Installation:**

1. Install the replacement main carrier assembly in the reverse operation of it being removed.
2. Inspect the condition of the heating element wires (corrosion, exposed wire, etc...) before inserting the connectors onto the heater foil terminals. If they are in good condition, then insert the connectors.

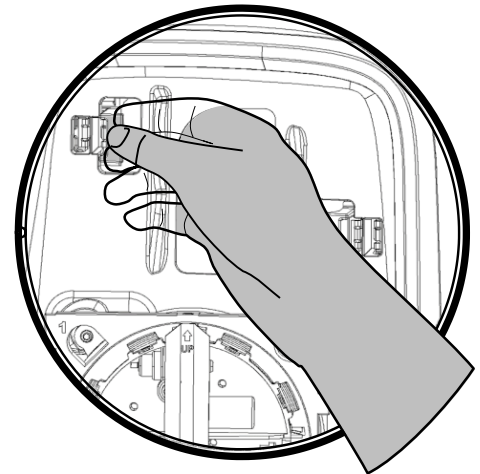
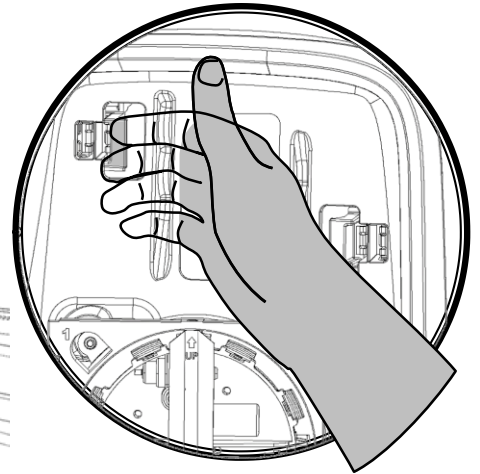
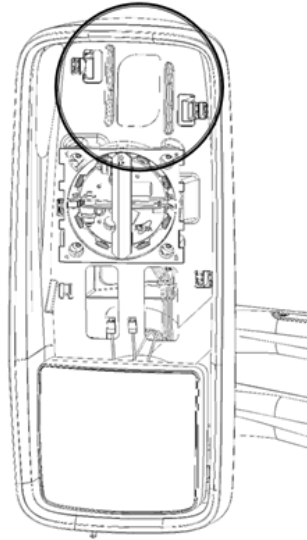
**Note:** The actuator is fixed to the bezel. The illustration below demonstrates how to carefully remove the glass carrier plate from the actuator.



### 3. HOUSING REMOVAL AND REPLACEMENT

#### Removal:

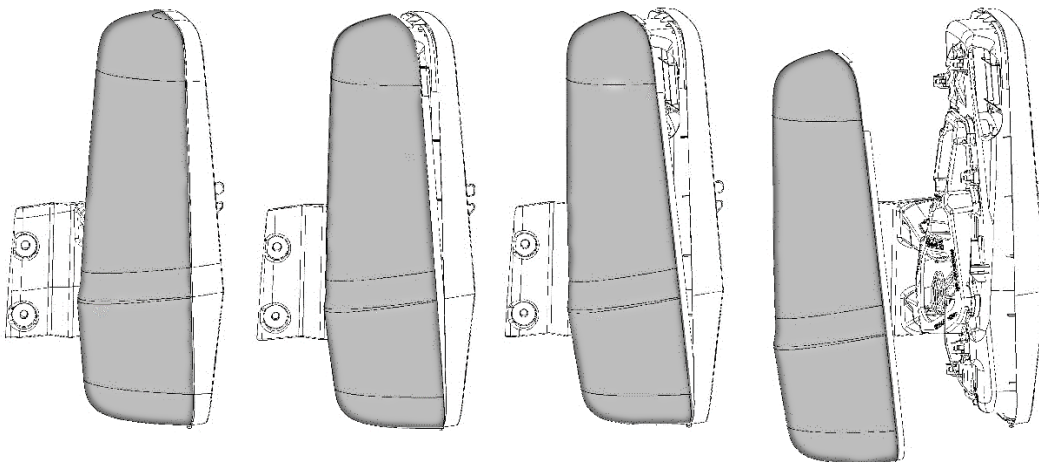
1. Remove the main mirror glass (see 2.2).
2. The bezel is equipped with an opening and two molded-in thumb tabs located at the top of the mirror housing as shown in the figure. The opening will give your hand the needed space to push on the thumb tabs which will disengage the housing clips from the bezel tabs.
3. Push on the top two tabs until the housing clips are completely disengaged from the bezel tabs.
4. Once the top two tabs are disengaged, the lower clips will disengage from the bezel tabs by pulling the housing away from the arm.



#### Installation:

1. Position the housing at the back of the mirror.
2. Engage the bottom of the housing, making sure that the side walls of the housing is inside the lip of the bezel. Also ensure the OAT sensor is positioned correctly on the Left Hand Mirror.

Apply force onto the back cover until all the clips have engaged and the housing is seated correctly. Make sure that the side walls of the housing are inside the lip of the bezel.



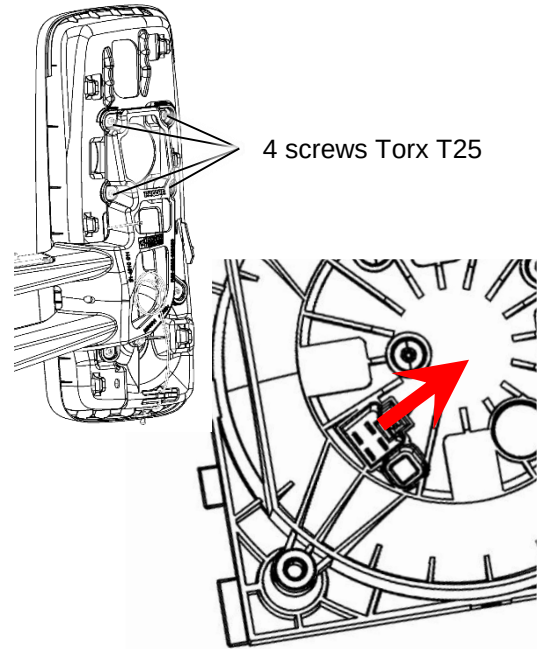


## 4. ACTUATOR

**Precautions:** If you don't have the proper tools for applying the torque shown below, then the actuator may become dysfunctional by applying the wrong torque. The actuators holes are a critical area and if a higher torque is applied, then the holes could fracture causing the actuator to become non-operational.

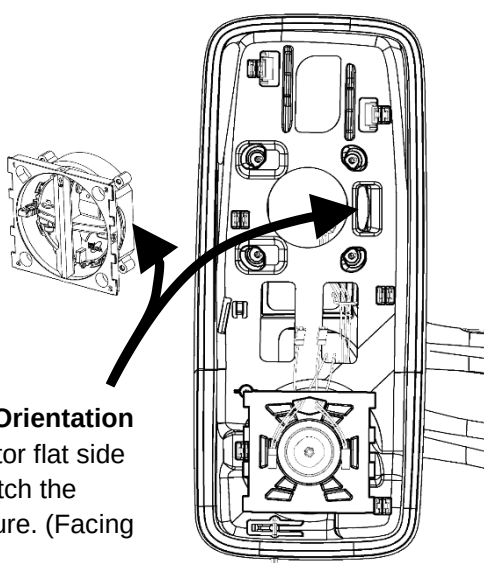
### Removal:

0. Optional: Remove the mirror system from the truck (see 1).
1. Remove the main glass (convex optional) (see 2).
2. Remove the Housing (see 3).
3. To remove the actuator connector from the actuator, push the lever on the actuator, as shown, and pull the wire harness.
4. Remove the 4 Screws – Torx T25 from the back of the mirror.

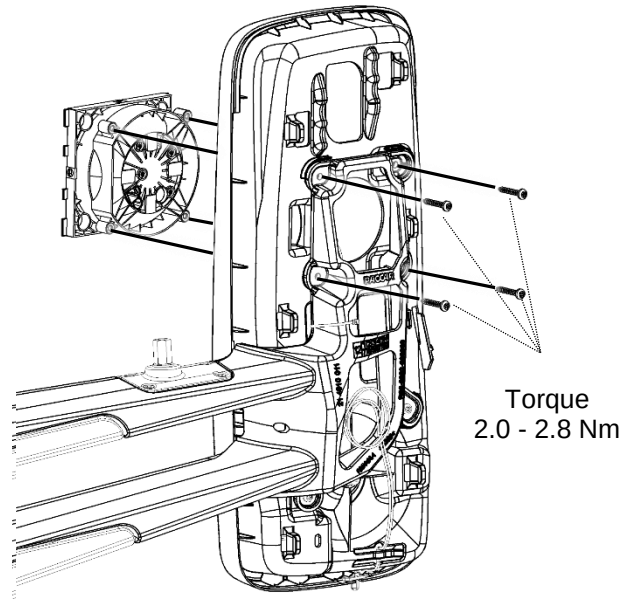


### Installation:

1. Position the actuator correctly. See figures below.
2. Install the 4 screws Torx T25 (torque 2.0 - 2.8 Nm).
3. Plug the actuator connector. Make sure it is secured with the lever.
4. Re-install the glass, housing and the mirror system on the truck (see 3, 2.1).

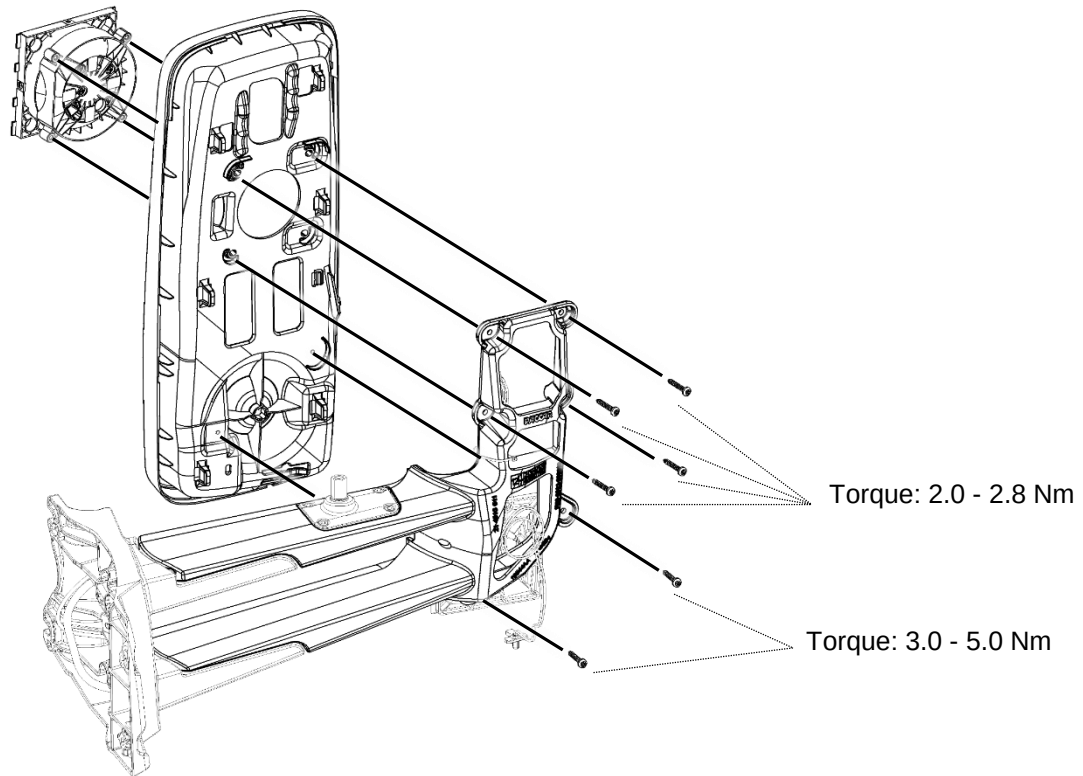


**Actuator Orientation**  
The Actuator flat side should match the Bezel feature. (Facing the truck)



## 5. BEZEL

**Precautions:** If you don't have the proper tools for applying the torque shown below, then the actuator may become dysfunctional by applying the wrong torque. The actuators holes are a critical area and if a higher torque is applied, then the holes could fracture causing the actuator to become nonoperational.



### Removal

0. Optional: Remove the mirror system from the truck (see 1).
1. Remove the glass and the housing (see 2, 3).
2. Unplug the actuator (see 4) and the OAT sensor (see 6.3.1) from the bezel.
3. Remove the 6 Screws – Torx T25 from the back of the mirror and remove the bezel, ensure that the wires are not entangled in the bezel when removing the bezel.

### Installation

1. Position the bezel on the arm so that the holes are aligned and install the 2 lowest screws first.
2. Position the actuator and install the 4 screws.
3. Torque screws to values as shown in the figure above.
4. Plug the actuator connector. Make sure it is secured with the lever.
5. Rout the heater wires and OAT sensor (see 6.3.1 ).
6. Re-install the glass and housing (see 3, 2)

## 6. ELECTRICAL COMPONENT REPLACEMENT

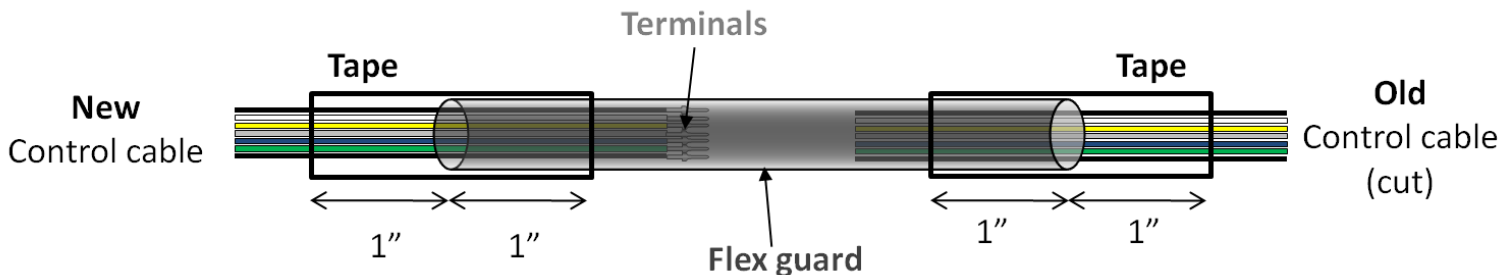
### 6.1. CONTROL CABLE REPLACEMENT

If your mirror system's electrical components and/or heating elements fail, then follow the troubleshooting section to determine the problem. If the problem can be determined then take the necessary steps to resolve the issue.

**NOTE:** Do **NOT** remove the existing control cable at the beginning. This cable will be used to guide the new control cable through the mirror's arm into the correct position.

#### Procedure:

1. Remove the mirror system from the truck (see 1) and disconnect the connectors carefully.
2. Remove carrier glass assemblies (see 2) and the housing (see 3).
3. Disconnect all connectors (i.e. actuator, heater foils) and remove the OAT (left hand only) from its location.
4. Cut the faulty cable wire just before the first heater foil connectors.
5. Insert this wire into the flex guard (supplied with the replacement kit) and tape them tight with electrical tape.
6. Insert the terminals of the new wire control cable at the other side of the flex guard and tape them tight.



7. Pull the old control cable through the arm until all wires of the new cable are outside of the mirror arm. Remove the flex guard (and tape) from the new control cable.
8. Insert the terminals ends of the cable into the correct holes on the connector (see 6.4.1) and ensure that the holes without wires are plugged with the yellow seal plug.
9. Attach the electrical connector back onto the connector housing while pushing the extra cable into the arm (see 6.4.3).
10. Rout the wire to the different components: Actuator, Heater foil, OAT sensor (left hand only) and reconnect the connectors into position (see 6.3).
11. Re-install the housing and carrier glass assemblies (see 3 & 2).
12. Plug the mirror and truck connectors together, fit the mirror onto the truck and secure it with the four bolts as specified.

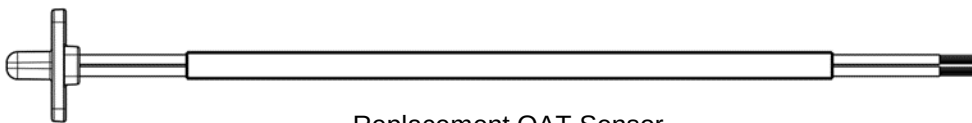
## 6.2. OAT SENSOR REPLACEMENT

The OAT sensor is located on the Left Hand Mirror (driver side).

Before replacing the sensor, check if it is faulty. Remove the mirror and test the resistance with an ohmmeter between terminals 5 & 6 on the connector.

See the table below to compare the reading against actual temperatures.

| Temp<br>deg C (deg F) | Min Resistance (kOhms) | Nom Resistance (kOhms) | Max Resistance (kOhms) |
|-----------------------|------------------------|------------------------|------------------------|
| -10 (13.8)            | 52.8                   | 55.3                   | 58.0                   |
| -5 (22.9)             | 40.5                   | 42.3                   | 44.2                   |
| 0 (32.0)              | 31.3                   | 32.7                   | 34.0                   |
| 5 (41.1)              | 24.4                   | 25.4                   | 26.4                   |
| 10 (50.2)             | 19.2                   | 19.9                   | 20.6                   |
| 15 (59.3)             | 15.2                   | 15.7                   | 16.3                   |
| 20 (68.4)             | 12.1                   | 12.5                   | 12.9                   |
| 25 (77.5)             | 9.7                    | 10.0                   | 10.3                   |
| 30 (86.5)             | 7.8                    | 8.1                    | 8.3                    |



Replacement OAT Sensor



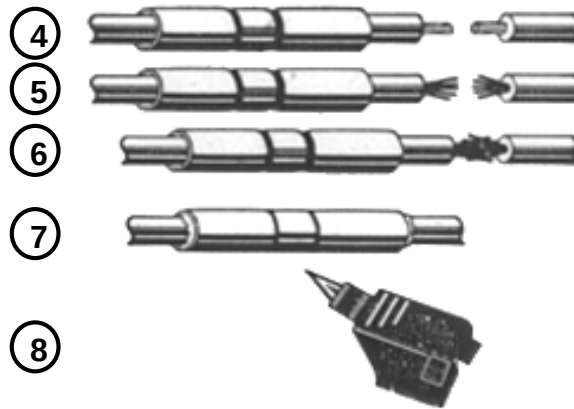
Butt Splice

### Procedure:

1. Remove the mirror system from the truck (see 1), carrier glass assemblies (see 2) and the housing (see 3) from the mirror.
2. Remove the faulty OAT sensor by cutting the green and blue wires approximately 1/4" before the sensor and appropriately dispose the faulty OAT sensor.
3. Strip the ends of the wires on the remaining cable approximately 3/8" from the cut.
4. Use butt splice supplied and slide over one of the wires.
5. Separate the wire strands in a way that the wires fray as shown in the figure below.
6. Push the two wires (new OAT sensor & remaining cable) together to intertwine the two wire strands.
7. Slide the butt splice over the combined wires and center it.



8. Apply heat evenly around the length of the tubing from the center and out to the ends until the tubing recovers and the adhesive flows. Continue distributing the heat over the butt splice until the solder flows into the wire strands. Remove the heat and allow it to cool for a perfect connection.
9. Repeat step 4 - 8 above for the other wire.
10. Install OAT sensor as shown in 6.3.1



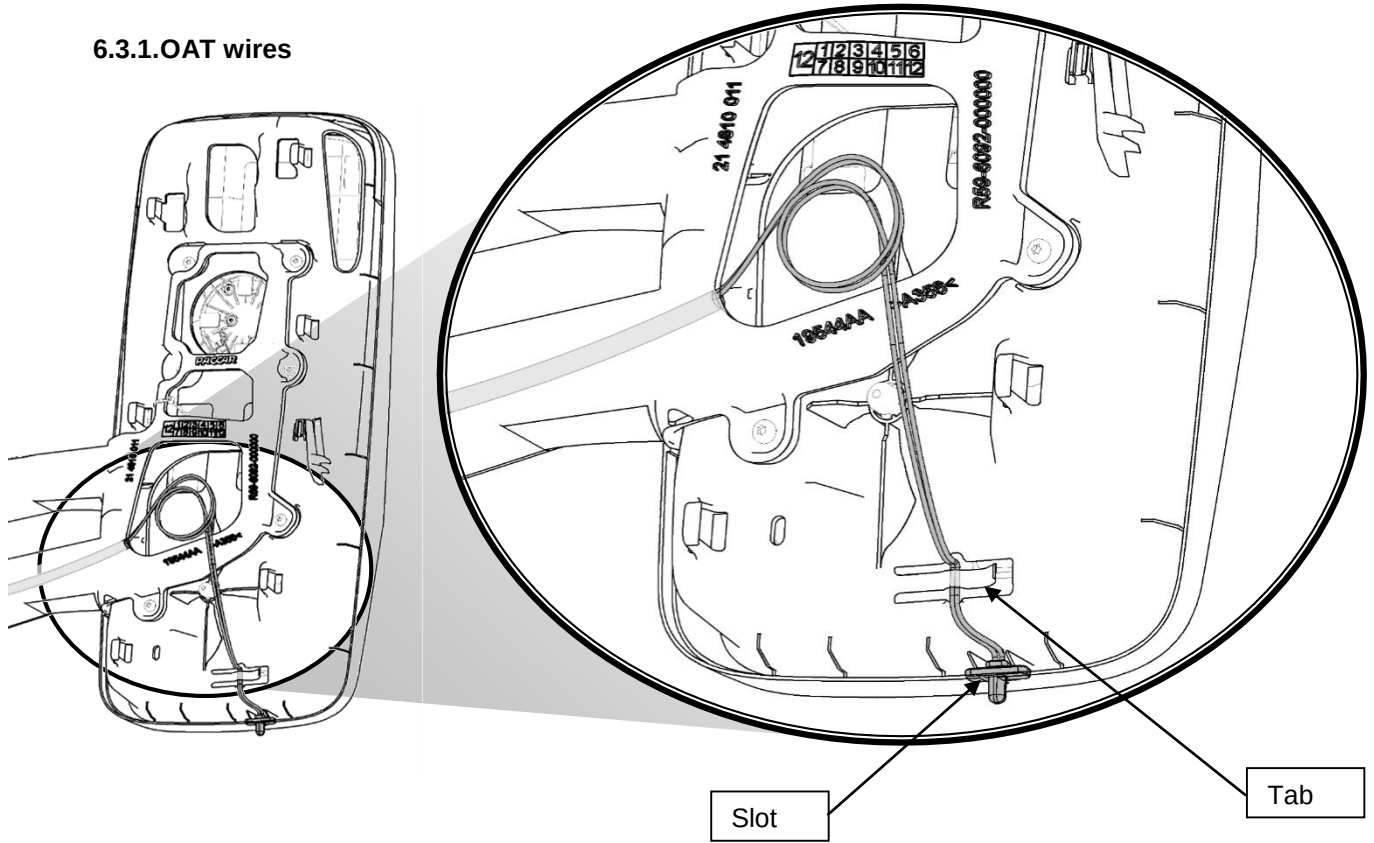
**For Best Results:** Use a heat device capable of producing a temperature of 500 °F. When using an open flame, do not isolate the flame on one area of the tubing. Make sure to distribute the heat evenly. Failure to heat the connector until the solder is melted will result in an inferior connection. Overheating the connector may cause damage to the tubing. The use of a liquid flux is recommended, especially with used wire.

For more information see the following website (video available):

[http://www.calcentron.com/Pages/elektralink/elektralink\\_sealed\\_solder\\_connectors.html](http://www.calcentron.com/Pages/elektralink/elektralink_sealed_solder_connectors.html)

## 6.3. WIRES ROUTING

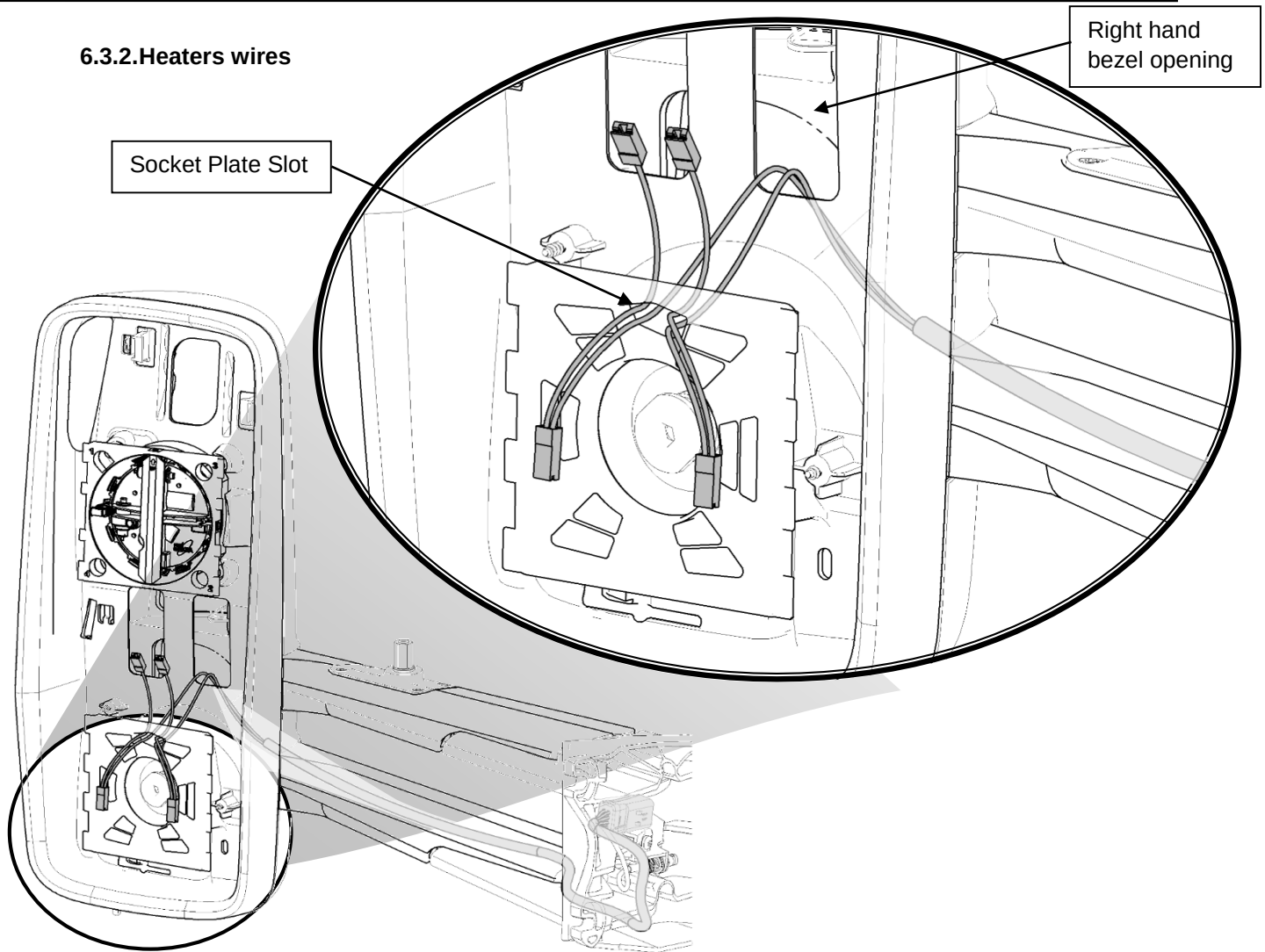
### 6.3.1. OAT wires



#### Routing:

1. Route the OAT wires between the bezel and arm.
2. Insert the OAT sensor into the slot located at the bottom of the bezel as shown above.
3. Place the blue and green wire in between the tab and bezel (shown above). This will help keep the OAT sensor in place during operation.

### 6.3.2.Heaters wires

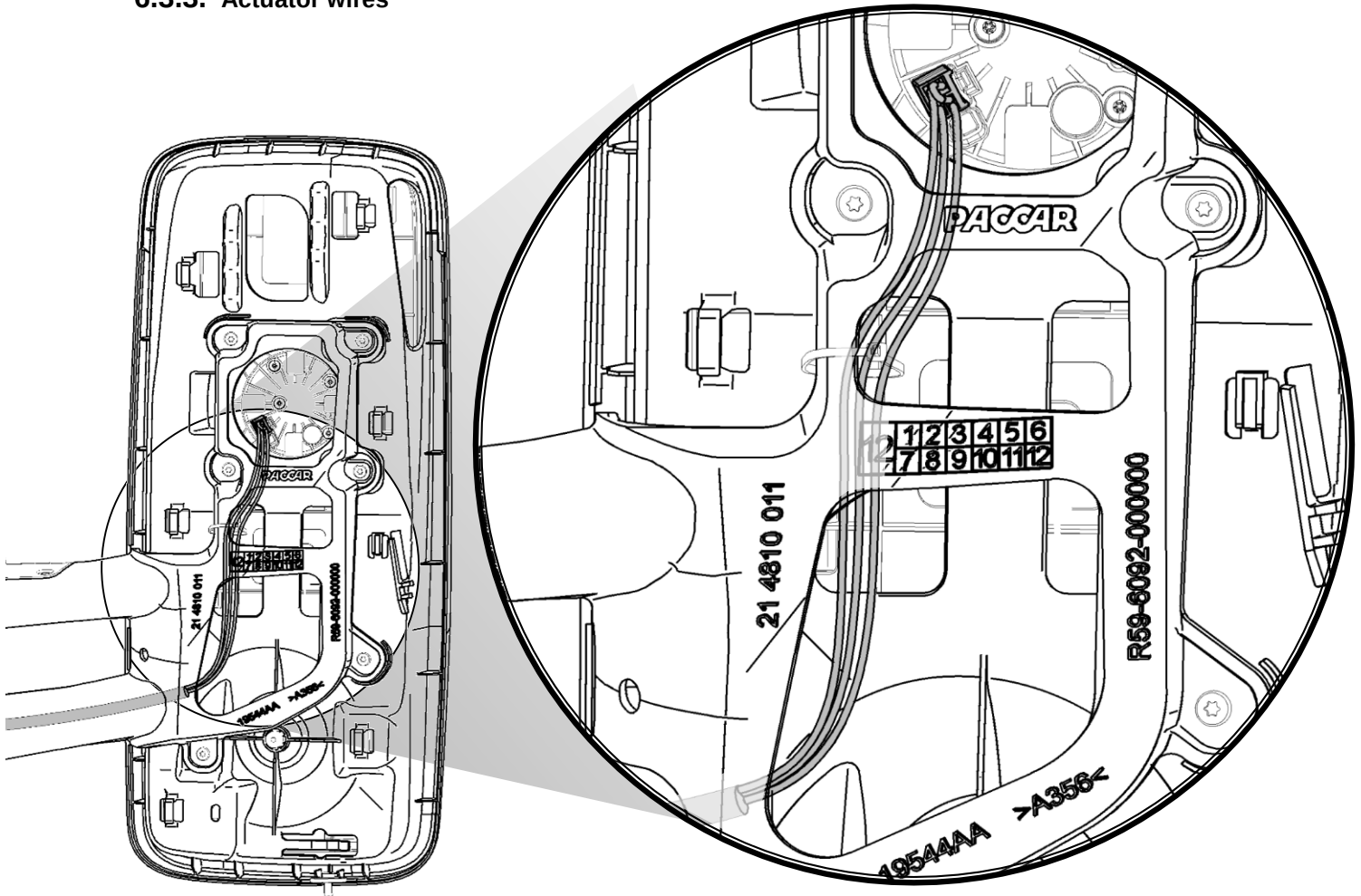


#### Routing:

1. Guide both sets of heater wires through the opening located on the right side of the bezel (shown above).
2. Guide the convex heater wires through the slot located on the adjustable socket plate. Insert all four connectors onto the heater foil terminals.

**Note:** The convex heater wires contain two sets of wires leading into the connector. The main heater wires branch off of the convex heater wires.

### 6.3.3. Actuator wires



#### Routing:

1. Route the actuator wires between the bezel and the arm.
2. Guide the wires along the right side of the arm and insert the connector into the actuator (shown above).
3. Insert a tie wrap in the location shown above, to avoid loose connection during operation.



## 6.4. ELECTRICAL CONNECTOR

### 6.4.1. Wire pin layout

The wire pin layout does not change for Left Hand, Right Hand, Manual nor Remote Mirrors. Pin layout is the same for all mirrors.

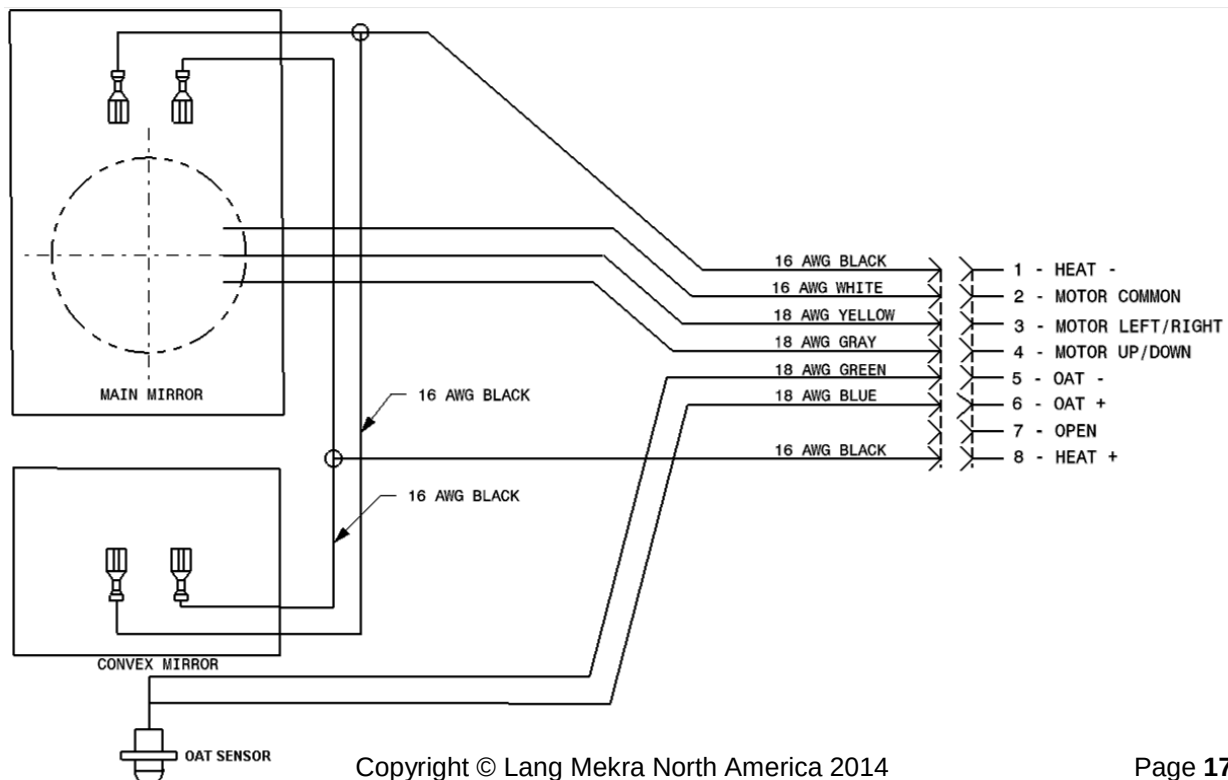
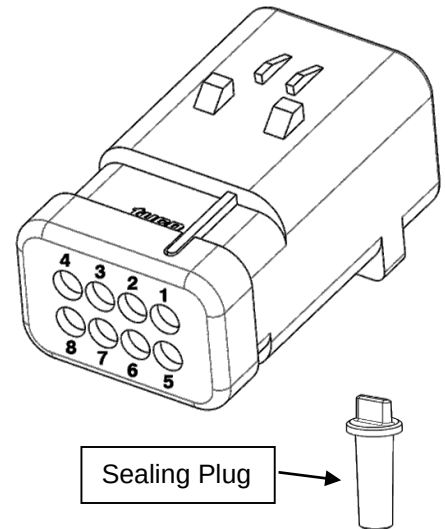
See the table below for the wire pin layout.

| # | Color (Function) | Left Hand |        | Right Hand |        |
|---|------------------|-----------|--------|------------|--------|
|   |                  | Remote    | Manual | Remote     | Manual |
| 1 | Black (Heater-)  | X         | X      | X          | X      |
| 2 | White (Act Grd)  | X         | -      | X          | -      |
| 3 | Yellow(Act L/R)  | X         | -      | X          | -      |
| 4 | Grey(Act U/D)    | X         | -      | X          | -      |
| 5 | Green (OAT-)     | X         | X      | -          | -      |
| 6 | Blue (OAT+)      | X         | X      | -          | -      |
| 7 | - [Sealing Plug] | -         | -      | -          | -      |
| 8 | Black (Heater+)  | X         | X      | X          | X      |

- Add plug

#### Note:

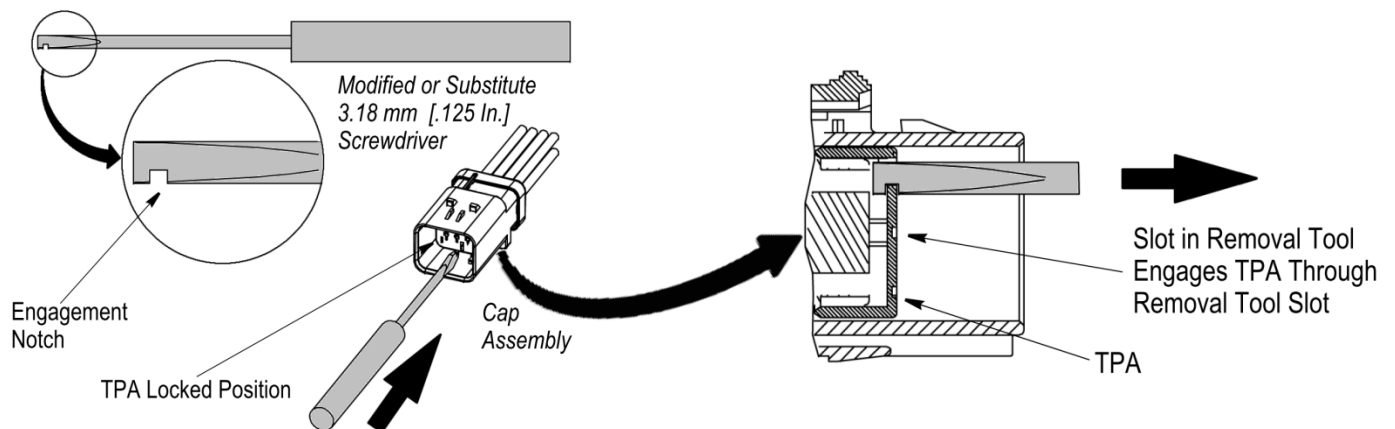
- The 2 black heater wires have no polarity and can be inserted vice versa at either #1 or #8.
- Plug all unused cavities with a sealing plug.
- The electrical wire diagram of the left-hand mirror system is shown below. Except for the OAT sensor (green and blue wires) the diagram is the same for the right hand mirror.



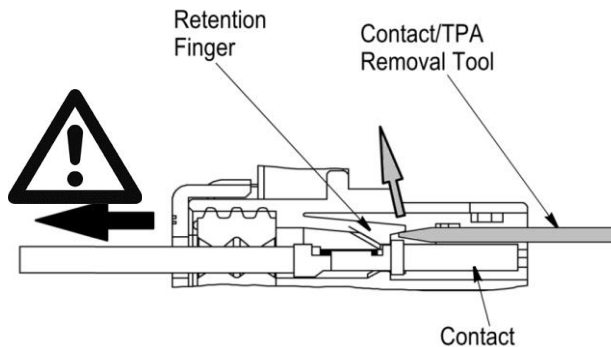
#### 6.4.2. Removal of wire terminals

**Note:** A special tool is required to remove wires from the connector: Ref. Contact/TPA Removal Tool 776441-1. It can be substituted with a modified screwdriver or other.

1. Insert the removal tool into the extraction slot in the cap assembly - Terminal Position Assurance (TPA).
2. Hook the removal tool firmly against the edge of the slot and pull on the TPA until it is completely removed from the housing assembly. Retain the red cap for use with the connector assembly after the contacts are replaced.



3. Insert the tip of the contact/TPA removal tool into the contact cavity and deflect the contact retention finger. Gently pull the wire until the contact is free from the housing. Repeat this procedure for the remaining contacts to be removed.



Rotating the contacts to remove them from the housing without using the extraction tool may damage the housing resulting in reduced contact retention upon subsequent use of the housing.

More information on the Connector instruction datasheet: to download **Ctrl + Click** on the button

With courtesy of TE



### 6.4.3.Connector installation

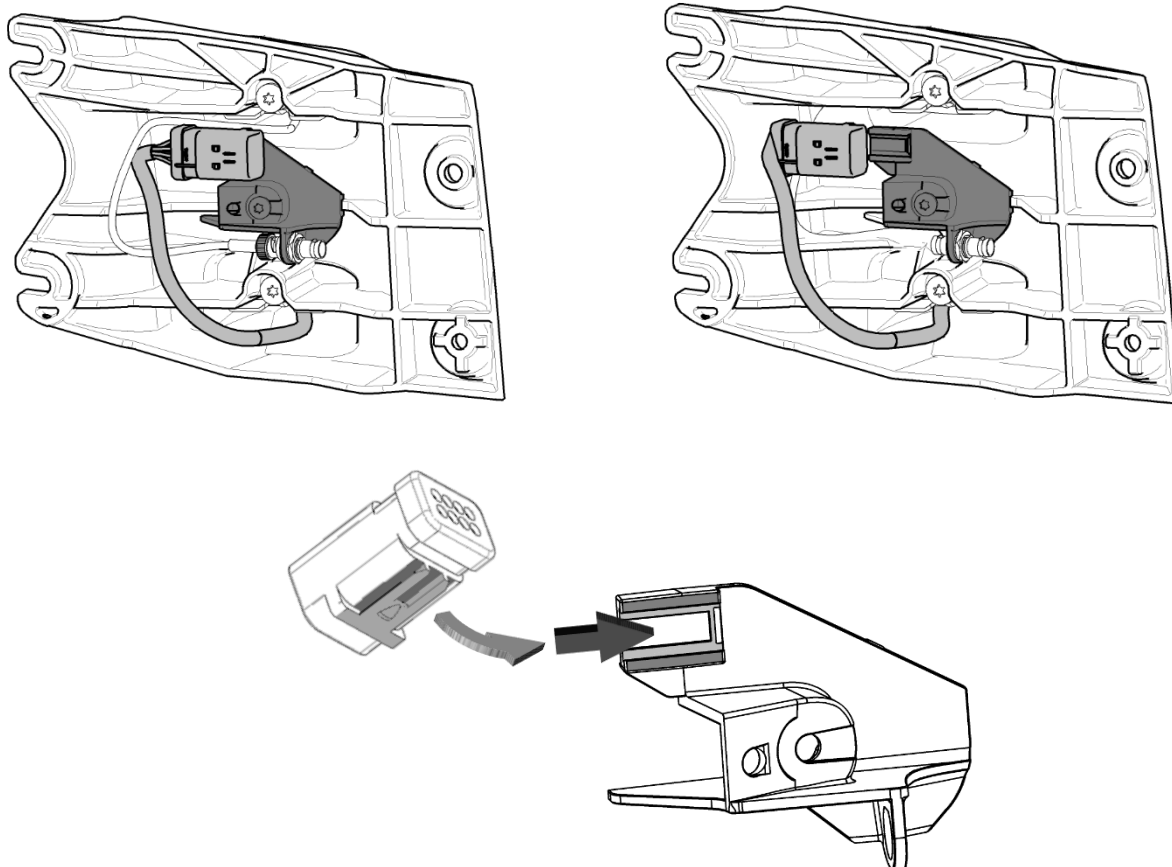
#### Removal:

1. To remove the connector, pull down on the connector to slide it out of the slot. See below.
2. The connector sits quite tight and one needs to pull and wiggle the connector in a downward direction until it slides out of the slot.

**Warning:** Using a lever between the holder and the top of the connector to slide it down can damage the wires, connector and connector housing.

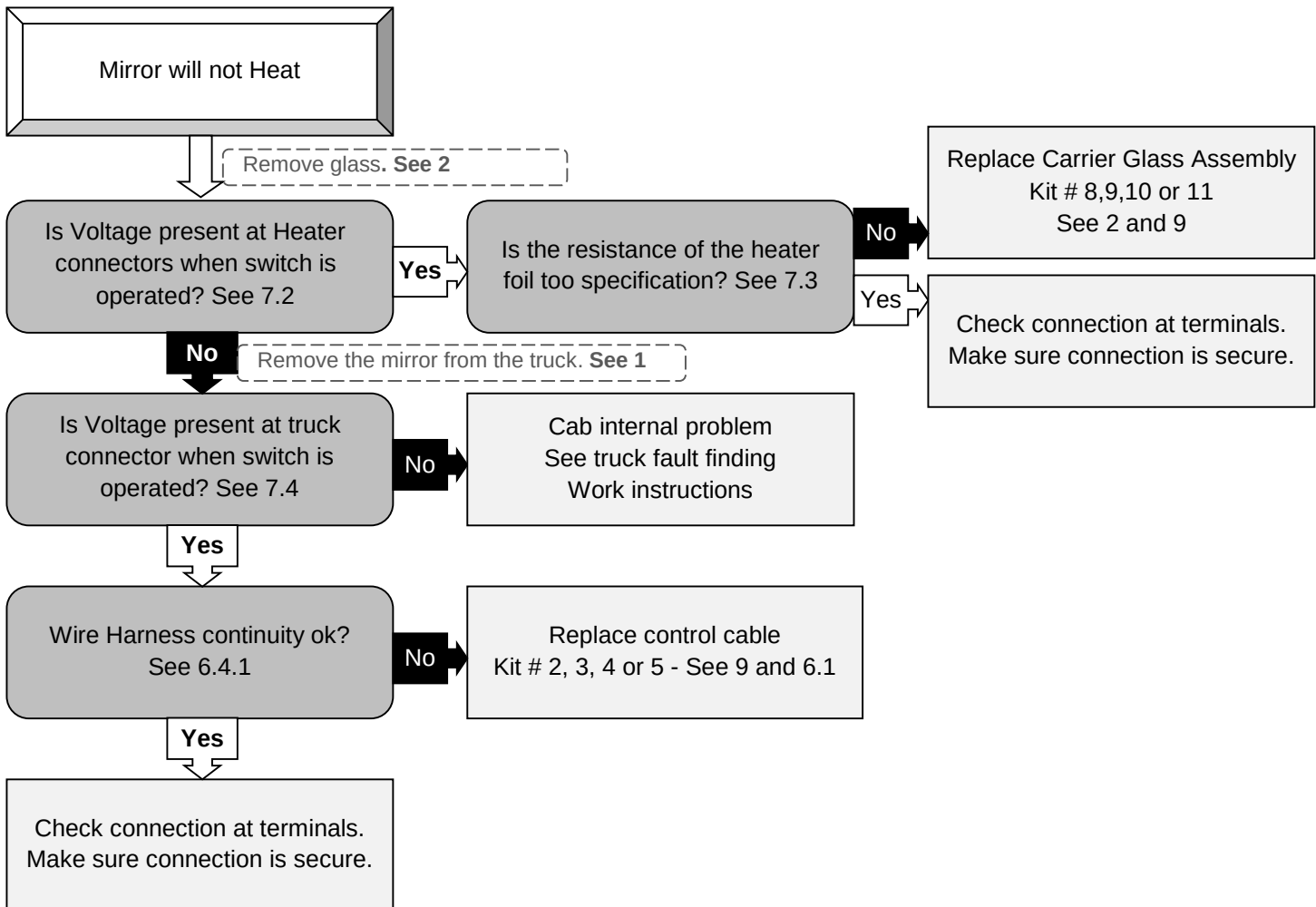
#### Installation:

1. Attach the electrical connector onto the connector housing.
2. Slide the connector into the slot provided on the connector housing while pushing the extra cable into the arm.
3. Slide the connector until it is locked into place.



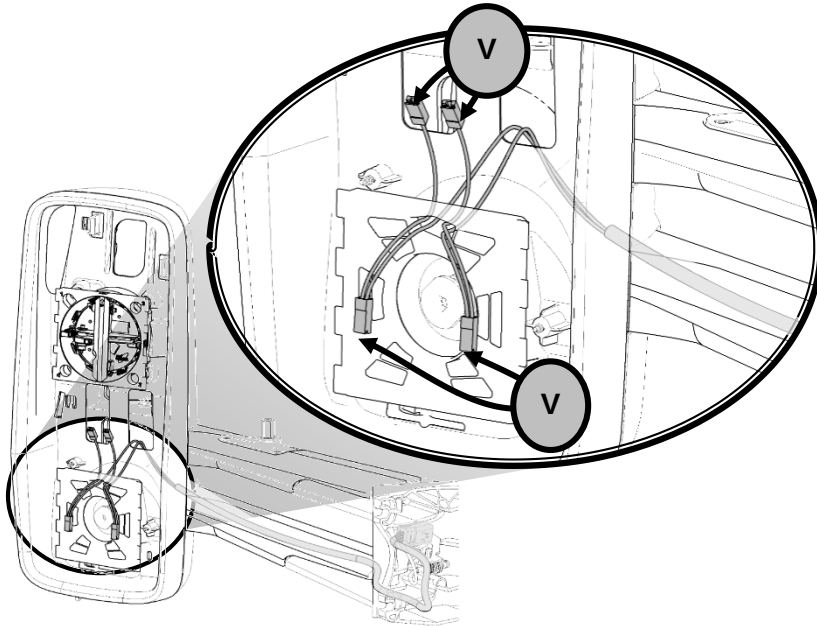
## 7. HEATERS TROUBLESHOOTING

### 7.1. ANALYSIS



## 7.2. VOLTAGE AT HEATER TERMINALS

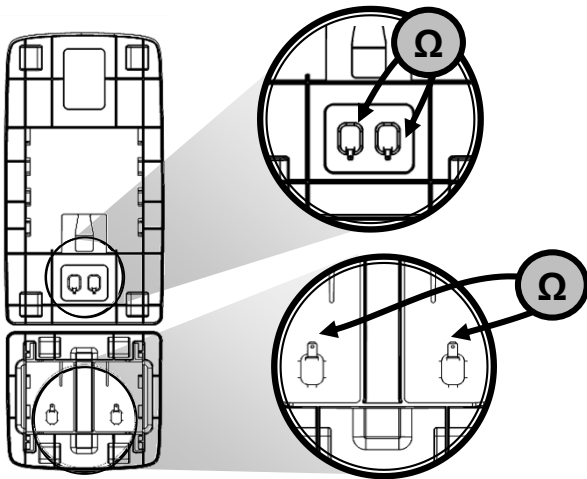
Check for voltage between the connectors on both sets of connectors when the heater is switched on.



## 7.3. HEATER FOIL CHECKING

Measure the resistance of the heater foil in question.  
Compare your measurements with the table below.

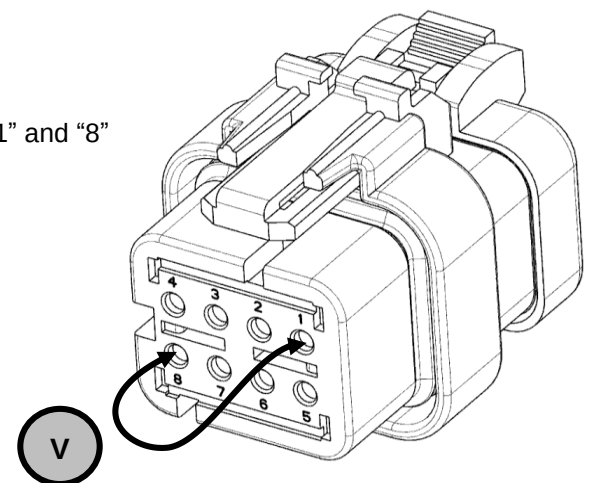
| Type   | Min          | Nom          | Max          |
|--------|--------------|--------------|--------------|
| Main   | 3.8 $\Omega$ | 4.4 $\Omega$ | 5.0 $\Omega$ |
| Convex | 6.2 $\Omega$ | 7.1 $\Omega$ | 8 $\Omega$   |



## 7.4. TRUCK CONNECTOR CHECKING

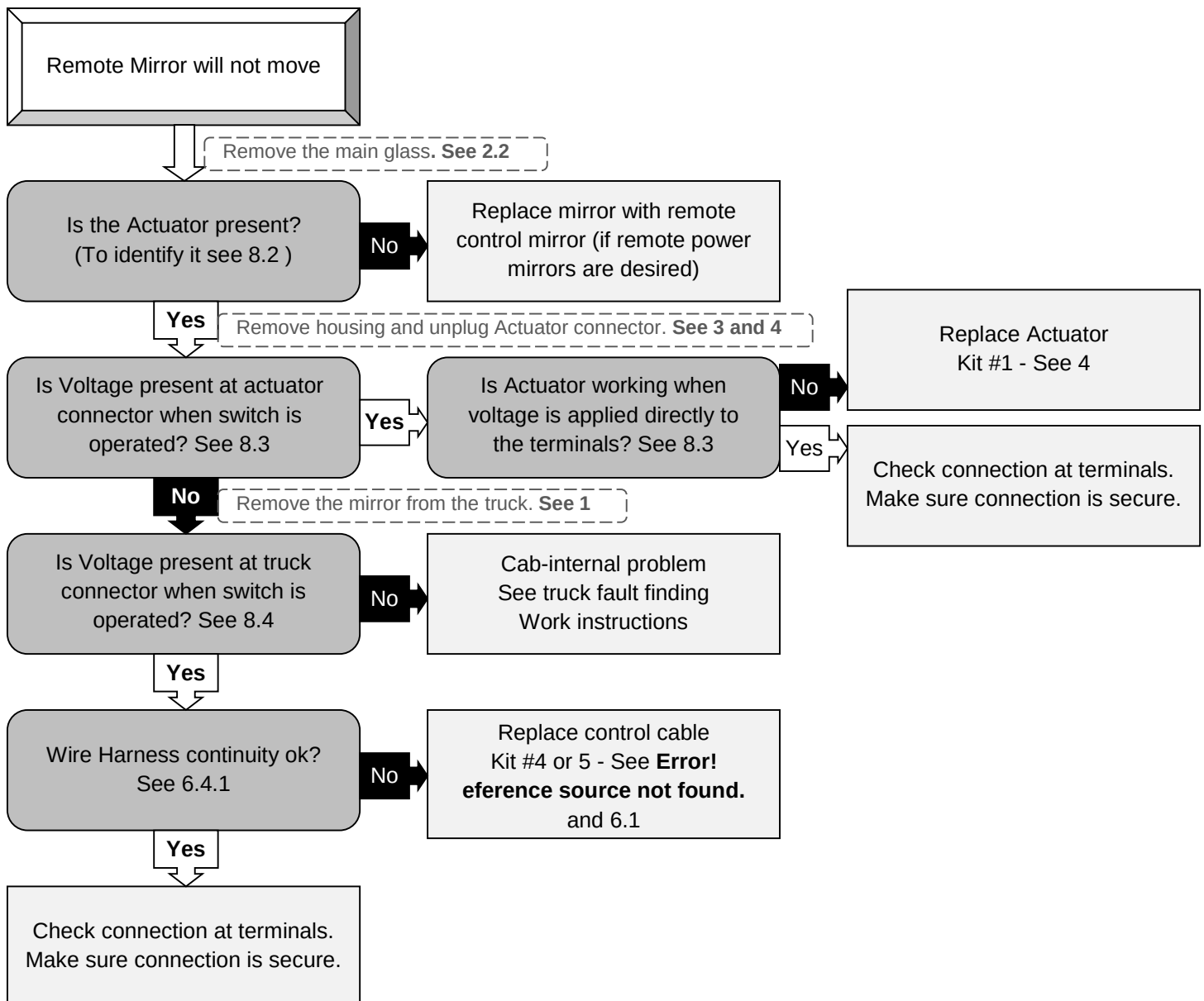
When the heater is switched on → measure voltage between cavities "1" and "8"

If no voltage is recorded then problem is inside the cab.



## 8. REMOTE TROUBLESHOOTING

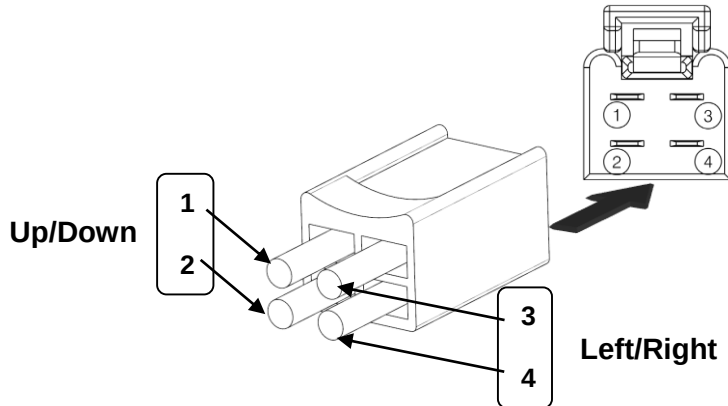
### 8.1. ANALYSIS



## 8.2. ACTUATOR VOLTAGE CHECKING

With a voltmeter check if there is 12V when operating the mirror from the truck cab.

- When operating up and down, check between ① and ②
- When operating Left and Right check between ③ and ④

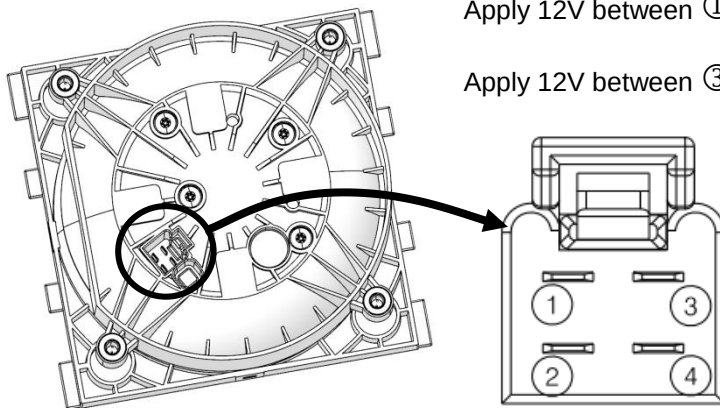


|   | Left Hand | Right Hand |
|---|-----------|------------|
| 1 | White     | Grey       |
| 2 | Grey      | White      |
| 3 | White     | Yellow     |
| 4 | Yellow    | White      |

## 8.3. ACTUATOR CHECKING

Apply 12V between ① and ②: the actuator should work up or down

Apply 12V between ③ and ④: the actuator should work left or right



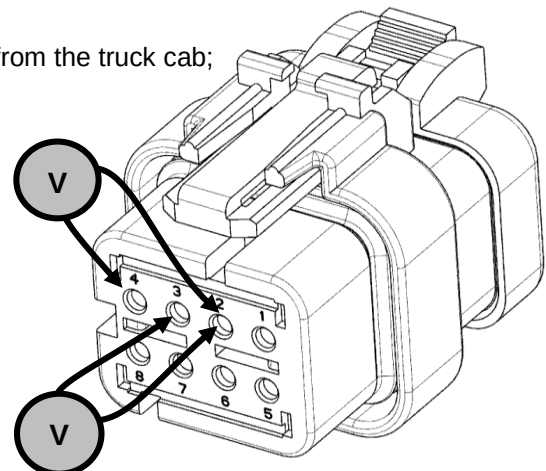
| Direction | Motor |   |   |   |
|-----------|-------|---|---|---|
|           | 1     | 2 | 3 | 4 |
| ↑ Up      | -     | + |   |   |
| ↓ Down    | +     | - |   |   |
| ← Left    |       |   | - | + |
| → Right   |       |   | + | - |

## 8.4. TRUCK CONNECTOR CHECKING

With a voltmeter check if there is 12V while operating the mirror from the truck cab;

- Up and down - check between cavity "2" and "4"
- Left and Right - check between cavity "2" and "3"

If no voltage is recorded then problem is inside the cab.



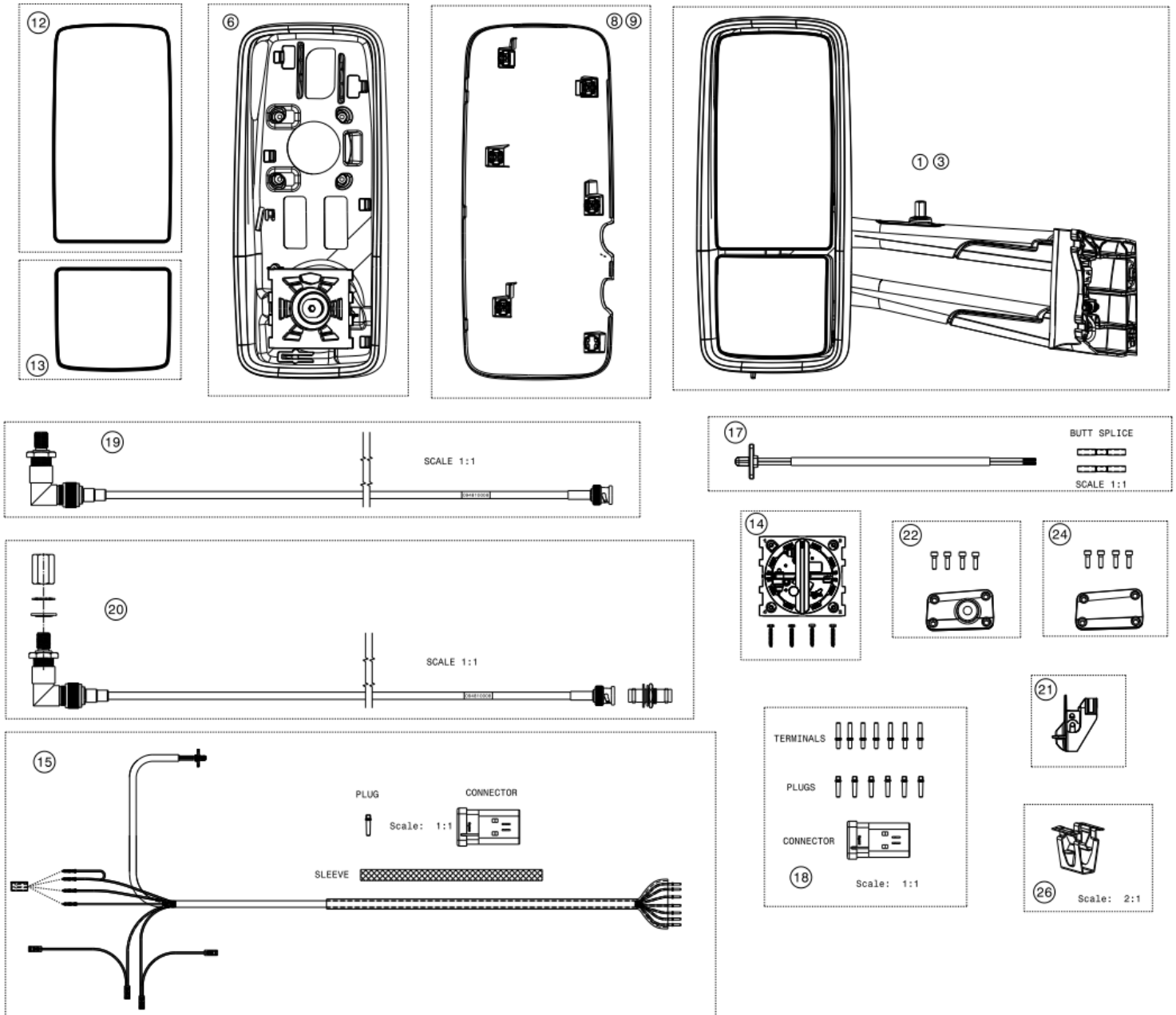


## 9. PDC LIST

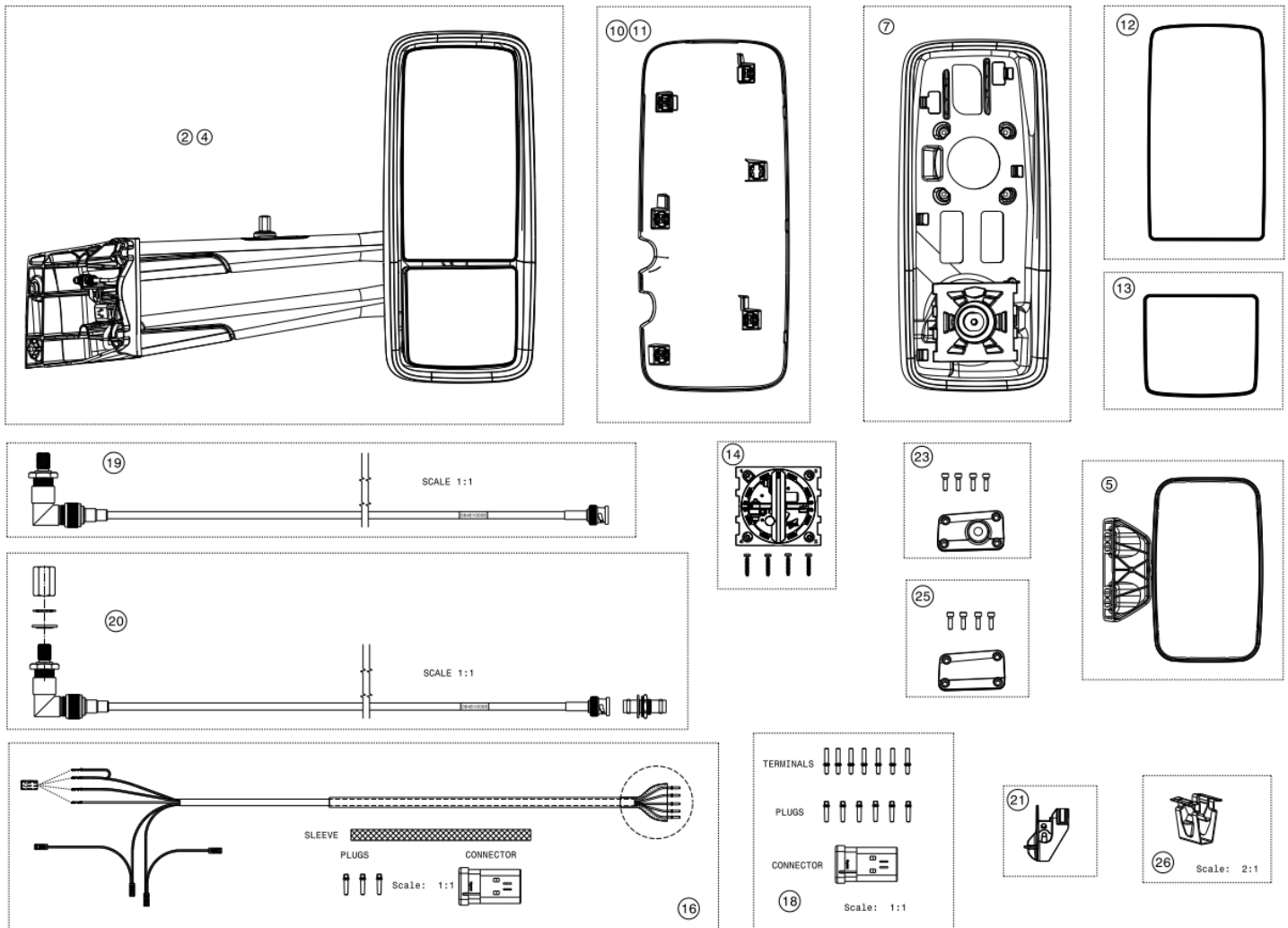
| ITEM | KENWORTH P#     | LMNA P#       | DESCRIPTION                        |
|------|-----------------|---------------|------------------------------------|
| 1    | R59-6092-220000 | 594810001-PDC | MIRROR SYS,LH,RMT,HTD              |
| 2    | R59-6093-220000 | 594810002-PDC | MIRROR SYS,RH,RMT,HTD              |
| 3    | R59-6092-221000 | 594810003-PDC | MIRROR SYS,LH,RMT,HTD,CB           |
| 4    | R59-6093-221000 | 594810004-PDC | MIRROR SYS,RH,RMT,HTD,CB           |
| 5    | R59-6089-102    | 594120002-PDC | LOOKDOWN MIRROR ASSEMBLY           |
| 6    | 614810003       | 614810003-PDC | KIT - BEZEL LH                     |
| 7    | 614810004       | 614810004-PDC | KIT - BEZEL RH                     |
| 8    | R22-6123-100    | 134810003-PDC | HOUSING,LH,PRIMED WITH CLIPS       |
| 9    |                 |               |                                    |
| 10   | R22-6124-100    | 134810004-PDC | HOUSING,RH,PRIMED WITH CLIPS       |
| 11   |                 |               |                                    |
| 12   | 154810011       | 154810011-PDC | CARRIER ASSY,MAIN,NH,HTD           |
| 13   | 154810012       | 154810012-PDC | CARRIER ASSY,CONVEX,NH,HTD         |
| 14   | 084803997       | 084803997-PDC | KIT - ACTUATOR                     |
| 15   | 094800013       | 094800013-PDC | KIT - CONTROL CABLE,LH,RMT,HTD,OAT |
| 16   | 094800014       | 094800014-PDC | KIT - CONTROL CABLE,RH,RMT,HTD     |
| 17   | 614800003       | 614800003-PDC | KIT - OAT REPLACEMENT              |
| 18   | 614800004       | 614800004-PDC | KIT - CONNECTOR                    |
| 19   | 614810008       | 614810008-PDC | CB CABLE                           |
| 20   | 614810005       | 614810005-PDC | KIT – CB CABLE WITH ACCESSORIES    |
| 21   | 204810008       | 204810008-PDC | ELECTRICAL CONNECTOR BRACKET       |
| 22   | 204810015       | 204810015-PDC | KIT – CB PLATE LH                  |
| 23   | 204810016       | 204810016-PDC | KIT – CB PLATE RH                  |
| 24   | 204810023       | 204810023-PDC | KIT - BLANK PLATE LH               |
| 25   | 204810024       | 204810024-PDC | KIT - BLANK PLATE RH               |
| 26   | 114810002       | 114810002-PDC | KIT – CLIPS                        |



## 9.1. LEFT HAND PDC



## 9.2. RIGHT HAND PDC



## 10. WARRANTY COVERAGE

Lang-Mekra provides a warranty for all production and service parts per Paccar Supplier Warranty Agreement.

Warranty claims must be submitted through Paccar.

### **The warranty will cover:**

- Functional quality of components
- Lang-Mekra workmanship
- Confirmed field failures
- Labor costs for replacement
- Approved administrative costs

### **The warranty will not cover:**

- Glass breakage and other impact which have been abused or mistreated
- Minor reassembly
- Unnecessary service
- Unauthorized product alterations and/or additions
- Unreasonable costs

**Please do not submit warranty claims for items that have suffered impact!**

