

REFERENCE:	Nova Bus Manuals
SECTION:	14: HVAC
RS N°:	MQR 7621-1154
EFFECTIVE IN PROD.:	N/A

APPLICATION DEADLINE: 2019AL03
CLAIM REFERENCE NUMBER: WB-4173

SUBJECT:	EGS flexible coolant hoses
JUSTIFICATION:	The EGS coolant hoses may leak in the baselight above the passenger area.

LEVEL	DESCRIPTION	DIRECT CHARGES		TIME
		LABOUR	MATERIAL	
1	Above the passenger area, install copper pipes in between PEX tubing and flexible hoses.	Nova Bus	Nova Bus	6 h
2	Adjust PEX tubing length if there is interference.	Nova Bus	Nova Bus	20 min

MATERIAL

QTY	PART N°	REV.	DESCRIPTION	REPLACES PART N°
LEVEL 1				
1	N90353	–	Heating pipe inboard FR assembly	–
1	N90354	–	Heating pipe outboard RR assembly	–
1	N90355	–	Heating pipe outboard FR assembly	–
1	N90356	–	Heating pipe inboard RR assembly	–
1	N92161-02	–	Cap and saddle bracket (middle section)	N70905-02
1	N92161-03	–	Cap and saddle bracket (bottom section)	N70905-03
4	N69299	–	Cable tie 250 lbs, Tyton T255	–
48	G5007994	–	Cable tie	–
4 x 6 ft	N20379	–	Tube insulation 1 3/8" ID	–
4	N45715	–	Ring for Pex 1-1/2"	–
16	N68156	–	Cable tie	–
LEVEL 2 (only if required*)				
3 ft	N45726	–	Tubing Pex 1-1/2"	–
3	N45715	–	Ring for Pex 1-1/2"	–
1	N91167	–	Brass fitting for Pex 1-1/2"	–

Materials will be available within 42 days once your order has been placed. To order, please contact Prevost Parts by phone at 1-800-771-6682, by fax at 1-888-668-2555 or by email at prevostparts.commandes@volvo.com. Specify document number, quantity of parts required and shipping address.

* The material identified in Level 2 is to be ordered only for vehicles that meet the criteria defined in Level 1.

SEE PAGE 2 FOR TOOLS AND ACCESSORIES.

TOOLS AND ACCESSORIES

QTY	MODEL N°	DESCRIPTION *	NOTE
1	N8907170	M12 battery ProPEX tubing cutter, Milwaukee	or the equivalent
1	N8907171	M18 battery ProPEX expansion tool, Milwaukee	or the equivalent
1	N8907172	1-1/2" M18 ProPEX Expansion Head, Milwaukee	or the equivalent
1	N8907632	1.75 oz ProPEX Expander Cone Grease, Milwaukee	or the equivalent

* Milwaukee tooling is recommended by Uponor, manufacturer of PEX pipes and fittings.



DISPOSAL OF PARTS

REMOVED PARTS ARE:	DISCARDED *	RETAINED	* Dispose of the unused parts and the defective parts in accordance with local environmental standards in effect.
	Yes	–	

REVISION HISTORY

REV.	DATE	CHANGE DESCRIPTION	WRITTEN BY
NR	2018JA30	Initial release	Danielle Lacroix

CLIENT	ORDER	ROAD NUMBER		VIN (2NVY/4RKY...)		QTY
		FROM	TO	FROM	TO	
SEPTA - Pennsylvania	L741	7355	7355	S92L4E4500504	S92L4E4500504	1
SEPTA - Pennsylvania	L742	7371	7414	S92L6E4500729	S92L7E4500772	44
SEPTA - Pennsylvania	L743	7356	7370	S92L1E4500489	S92L2E4500503	15
SEPTA - Pennsylvania	L745	7415	7415	S92L0F4500873	S92L0F4500873	1
SEPTA - Pennsylvania	L746	7416	7454	S92L7F4500952	S92L8F4501012	39
SEPTA - Pennsylvania	L749	7302	7354	S92Y7D4500409	S92L2E4500470	53
SEPTA - Pennsylvania	L861	7300	7484	S92L5G9775188	S92L8G9775220	32

**WARNING**

Follow your internal safety procedures.

PROCEDURE**WARNING**

The PEX working procedure contained in this service document should be done per the Uponor manufacturer instructions. Failure to comply with these requirements may cause coolant to leak.

The procedure for removing and installing Uponor PEX (extract from the Uponor Assistance Manual) is available in Appendix 1, or you could also refer to HePEX heating pipes heading in SECTION 99: GENERAL PRACTICES in the Nova Bus Maintenance Manual.

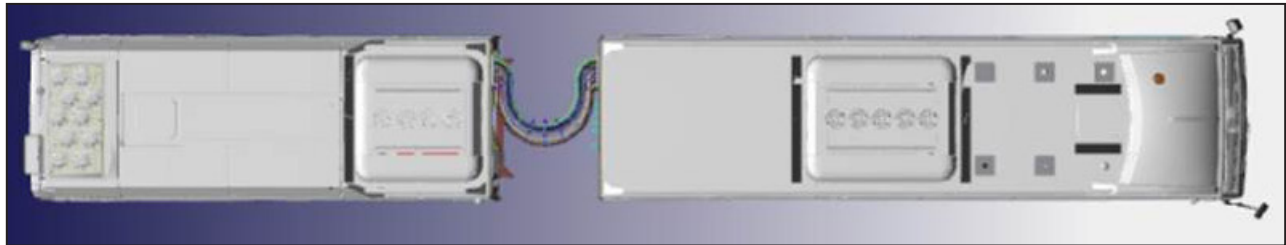
OVERVIEW OF THE MODIFICATION

Figure 1 - Top View of a 60-ft Bus

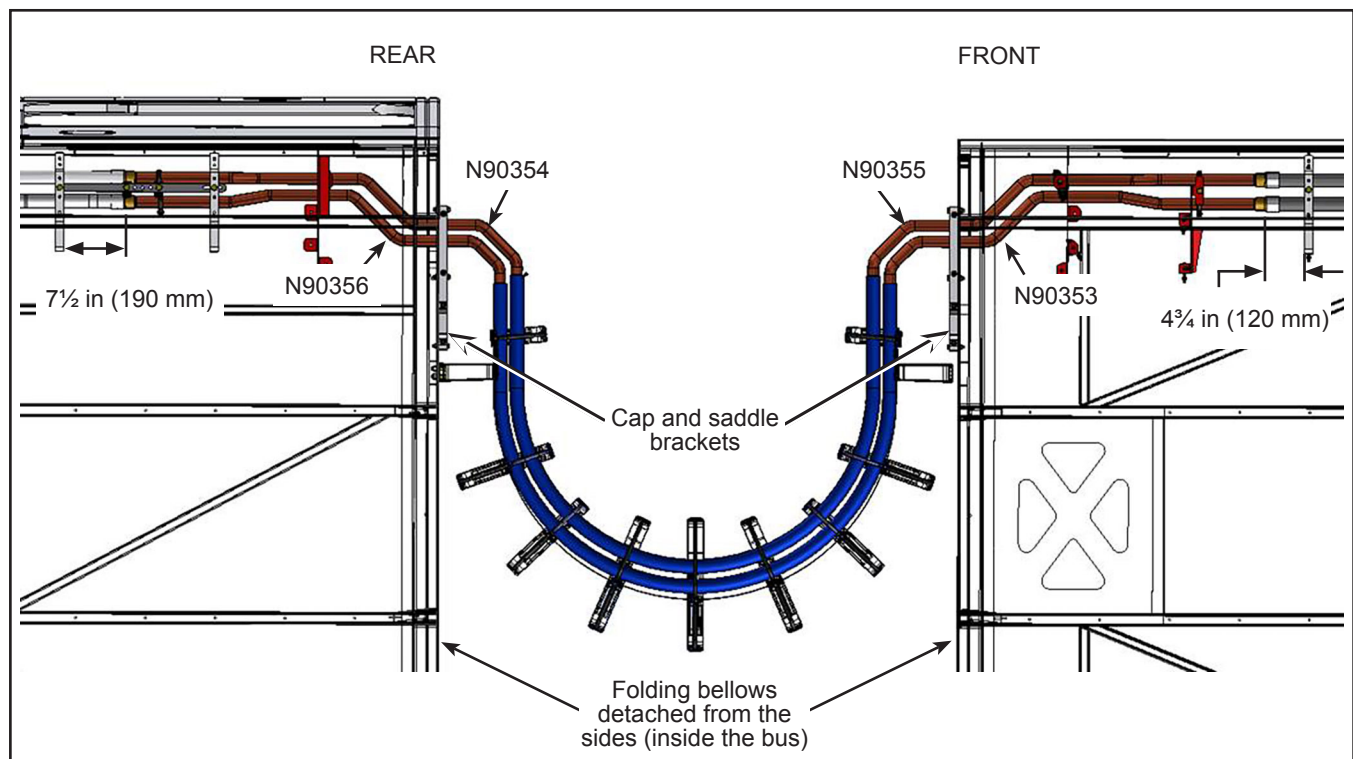


Figure 2 - Copper Pipes Replacing a Segment of the Flexible Hoses

**NOTE**

For a complement of technical information during this procedure, refer to the guidelines in SECTION 99-000.00 of the Nova Bus Maintenance Manual.

LEVEL 1: REPLACE A SEGMENT OF FLEXIBLE HOSES

- 1.1. Set the battery disconnect switch in the battery compartment to the **OFF** position.

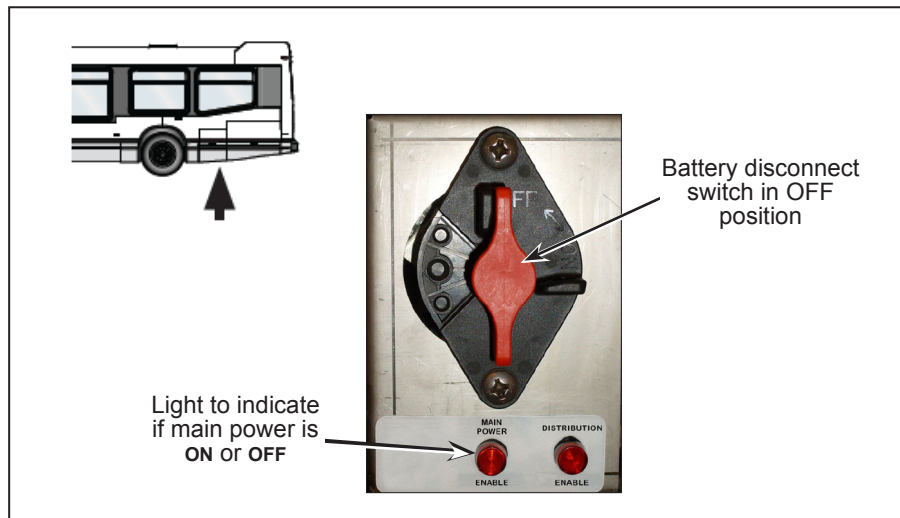


Figure 3 - Battery Disconnect Switch

- 1.2. Place a container under the coolant drain valve.
- 1.3. Drain the cooling system per the heading **DRAINING THE COOLING SYSTEM** in section **09-302: ENGINE COOLING** in the Nova Bus Maintenance Manual. Retain the coolant.

REAR SIDE

- 1.4. Remove the first baselight panel located closest to the articulation. Retain the baselight panel and hardware.
- 1.5. In the articulation, detach the folding bellows roof cover from the side (not from the middle) and push it toward the middle. Retain parts for reinstallation.

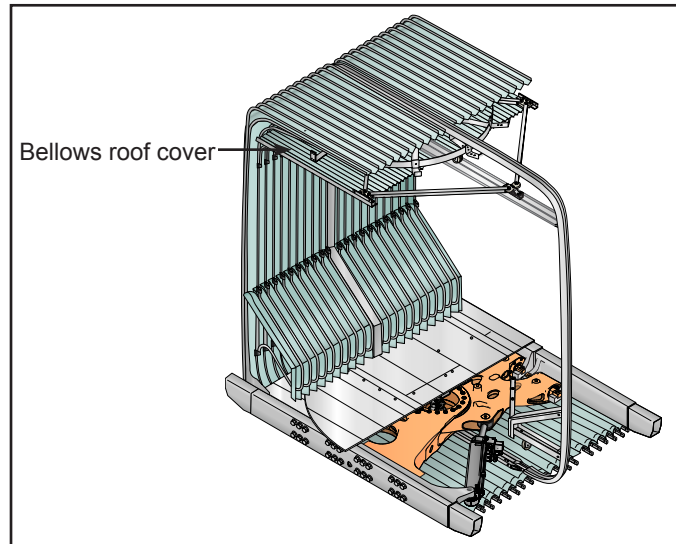


Figure 4 - Bellows Roof Cover to Detach From the Side

- 1.6. Loosen the 4 bolts under the cap and saddle bracket located before the EGS.

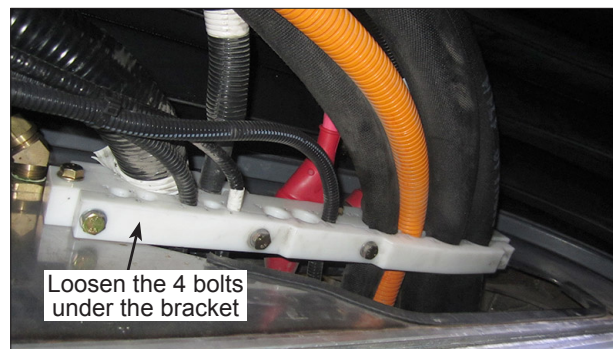


Figure 5 - Cap and Saddle Bracket in the Articulation (Rear Side)

- 1.7. Disconnect the two flexible hoses from the Pex tubing; start by cutting some cable ties on each side of the clamps, then remove the clamps (retain them for later). Have a container handy in case there is coolant still in hoses.

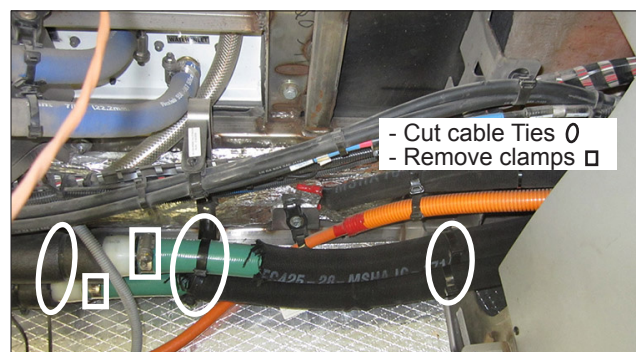


Figure 6 - Flexible Hoses on the Rear Side

1.8. From the articulation side, pull the hoses to completely bring them to the articulation side.

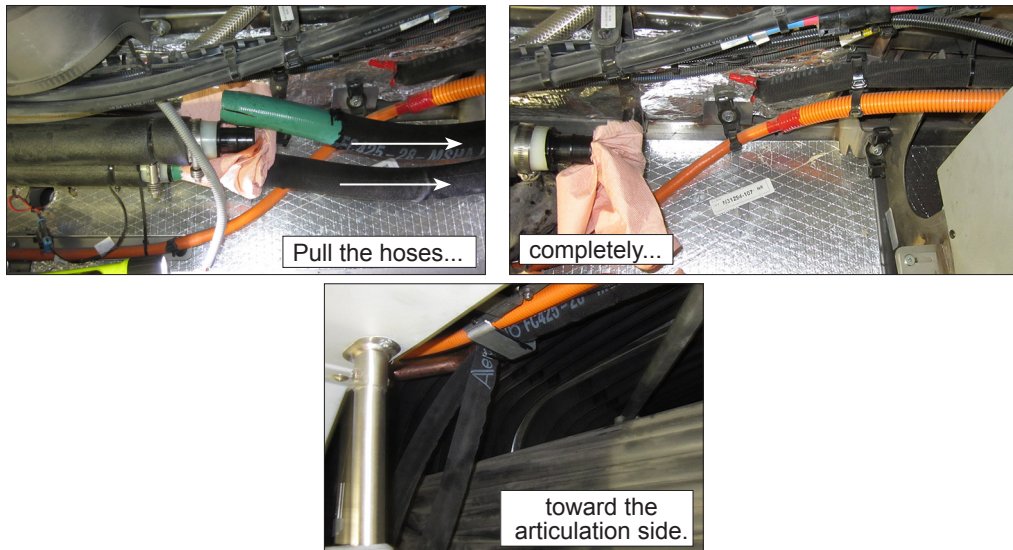


Figure 7 - Flexible Hoses Brought to the Articulation Side

1.9. Remove the insulation covering the Pex tubes.

1.10. Measure **PRECISELY** (see the warning below) the length to cut starting at the front edge of the bracket. Mark the location on each tube. Then cut the tubes.



WARNING

The measure must be very precise otherwise it could create an interference at the other end of the assembly with the hoses, pipes and cables coming out of the EGS, therefore, requiring the Level 2 procedure.

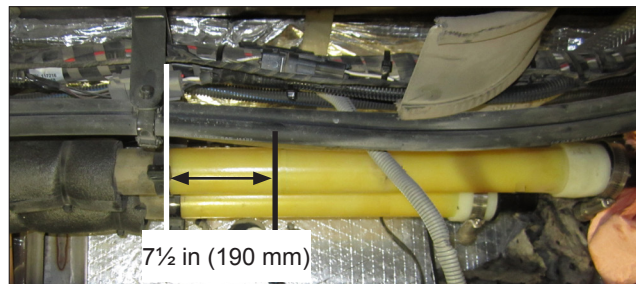


Figure 8 - Length to Precisely Cut on the Rear Side

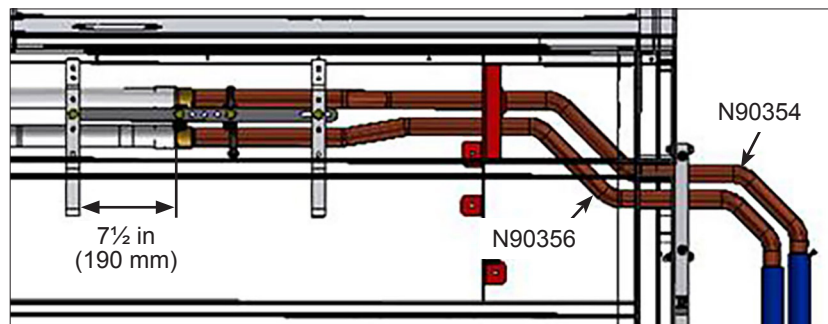


Figure 9 - Schematic of the Change (Rear Side)

- 1.11. Remove the caps at the end of the copper pipes.
- 1.12. Insert the copper pipe N90354 (outer side). Insert the copper pipe N90356 (inner side) in front of the outer pipe.

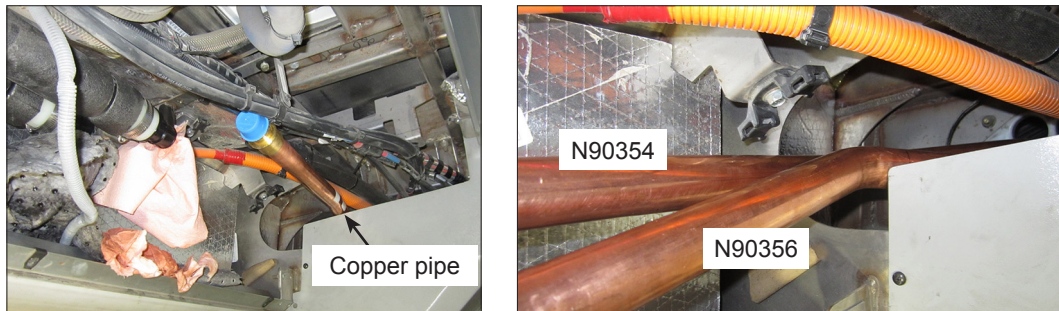


Figure 10 - Copper Pipes Coming From the Articulation Side (Temporary Position)

- 1.13. Slide the PEX ring N45715 over the end of the **OUTER** PEX tube, beveled side first, until it reaches the stop edge.
- 1.14. Expand the tube and the ring (using an expansion tool), then quickly insert and align properly the copper pipe N90354. The pipe must be **horizontally aligned** for its connection with the hose.

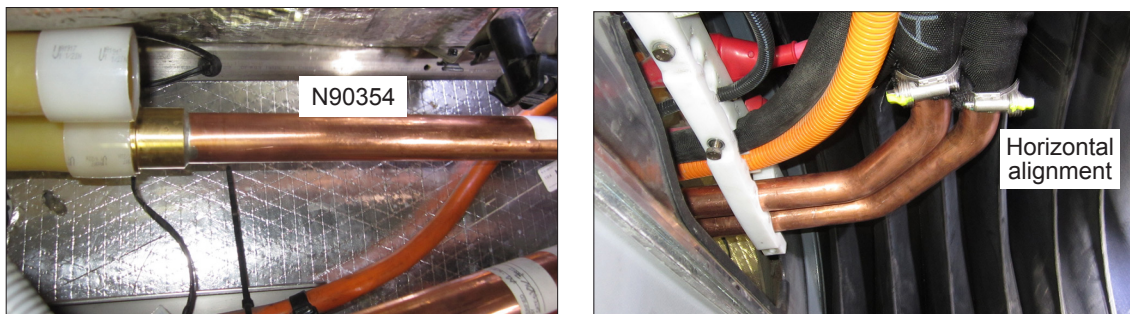


Figure 11 - Copper Pipe Installation Horizontally Aligned

- 1.15. Repeat steps 1.13 and 1.14 to install the **INNER** copper pipe N90356. See Figure 2 for the schematic view.
- 1.16. On the articulation side, assess where to cut the hose by placing the flexible hoses and copper pipes side by side. The hose must reach the shoulder on the copper pipe. **Validate if the new pipes interfere with the hoses, pipes, and cables coming out of the EGS. If the copper pipes do not align properly with the flexible hoses, or if there is a risk of rubbing between parts (including the clamps), the length of the PEX tube has to be adjusted according to the level 2 procedure.**
- 1.17. Mark the location and cut the hoses.

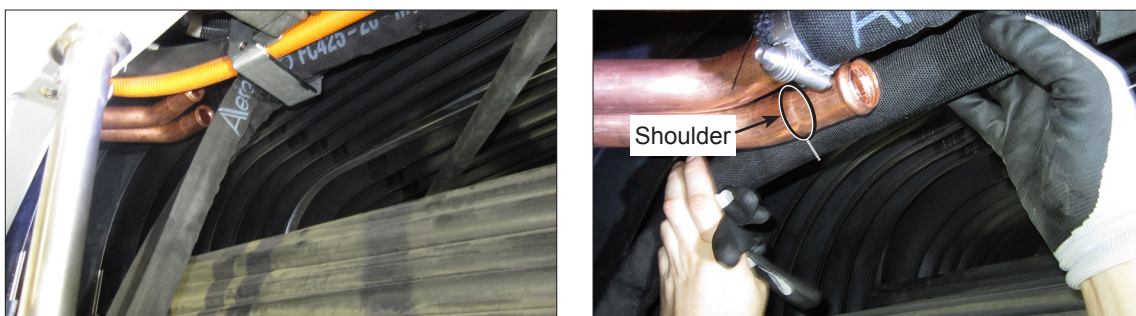


Figure 12 - Measure and Cut the Flexible Hoses

- 1.18. Slide the clamps (retained earlier) onto the hoses, and slide up the hose's fabric sheath.
- 1.19. Insert the copper pipes into the hoses. **Do not use** lubricant or the expansion tool to ease insertion – **only coolant** should be used to ease the insertion.
- 1.20. **Validate again if the position of the assembly interferes with the other hoses, pipes, and cables coming out of the EGS. If there is interference, proceed to level 2.**
- 1.21. Lower the fabric sheath onto the hoses. Place and tighten the clamps. See the torque in the figure below.

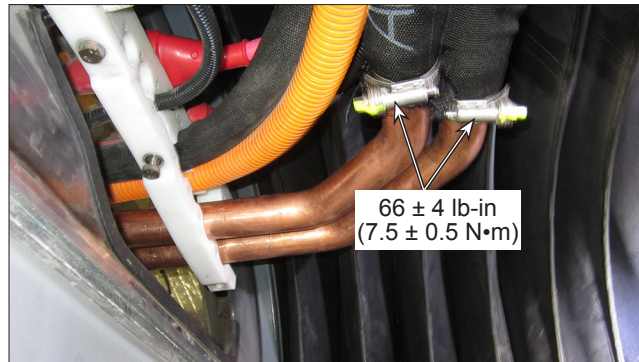


Figure 13 - Clamps on the Flexible Hoses

- 1.22. Remove the Cap and saddle bracket. Reinstall the top section with the new middle section (N92161-02) and bottom section (N92161-03) using the same hardware. Tighten the bolts. See the figure below for the right parts positioning and torque.

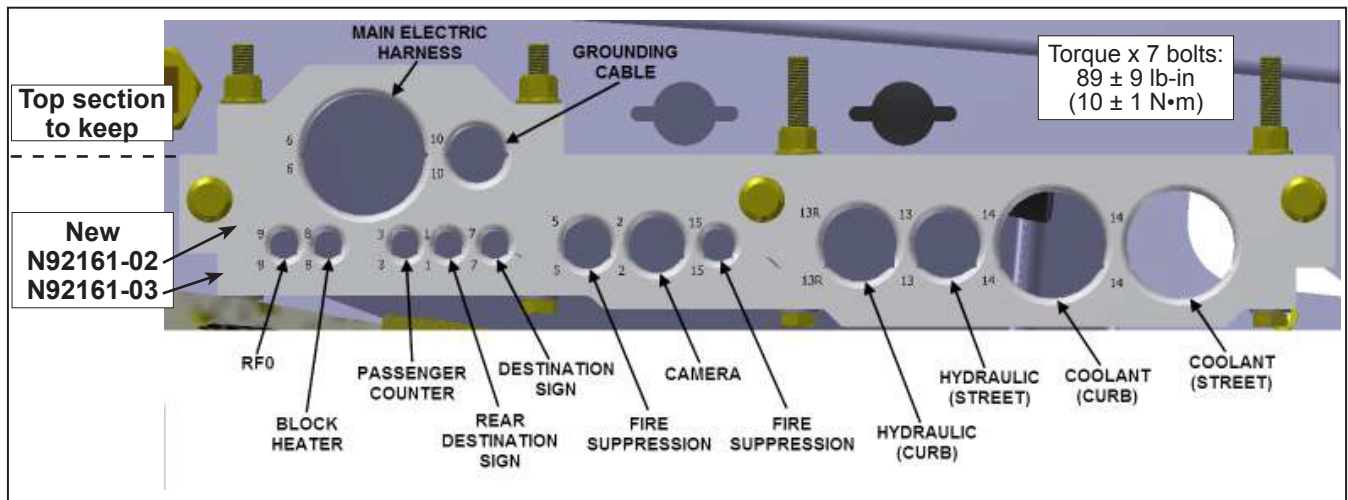


Figure 14 - Parts Positioning in the Cap and Saddle Bracket - REAR View. (Some options may not apply)

FRONT SIDE

1.23. On the FRONT SIDE repeat steps 1.4 to 1.22.

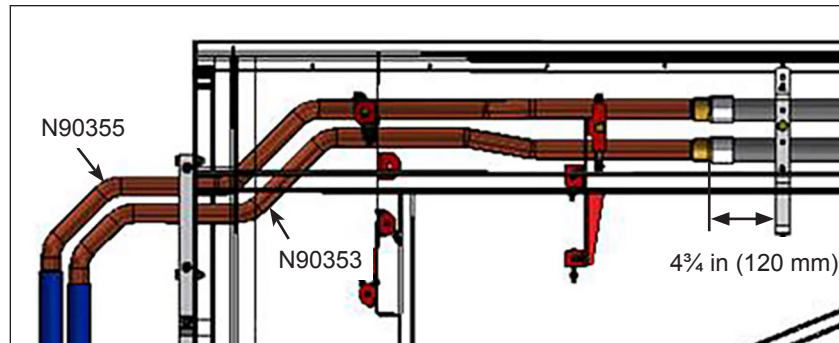


Figure 15 - Distance of the Cut on the Front Side

AIR TESTING

1.24. Connect an air hose equipped with a pressure regulator to the quick-connect fitting, and set the pressure to 10 psi. Visually validate if there is a leak on the newly installed piping. Repair as needed.

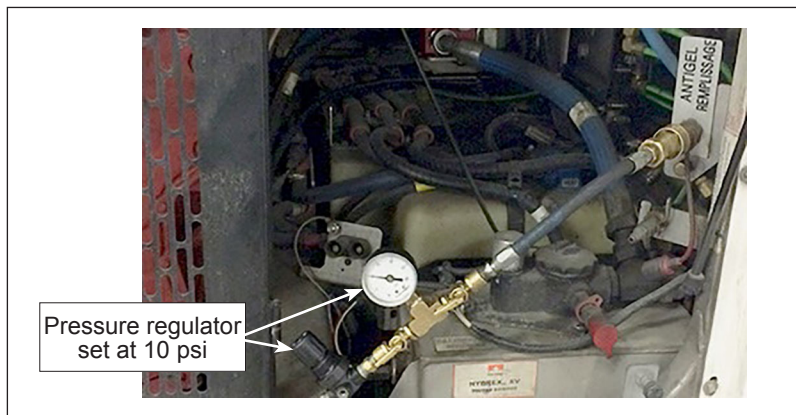


Figure 16 - Hose Equipped with a Pressure Regulator

FINAL STEPS BOTH SIDES

- 1.25. Replace the 4 Tyton cable ties previously cut with the new ones (N69299) and affix the PEX tubes to these anchor points.
- 1.26. Put the insulation on the copper pipes. Do not put it over the fitting or the Tyton cable ties.



Figure 17 - Insulation on the Copper Pipes

- 1.27. Fill the cooling circuit with the retained coolant according to the procedure indicated in section **09-302: ENGINE COOLING** of the Nova Bus Maintenance Manual.
- 1.28. Install the retained baselight panels.
- 1.29. Install the ceiling curtains and the parts removed for access.
- 1.30. Set the battery disconnect switch in the battery compartment to the **ON** position.

LEVEL 2: ADJUSTING A PEX TUBE LENGTH

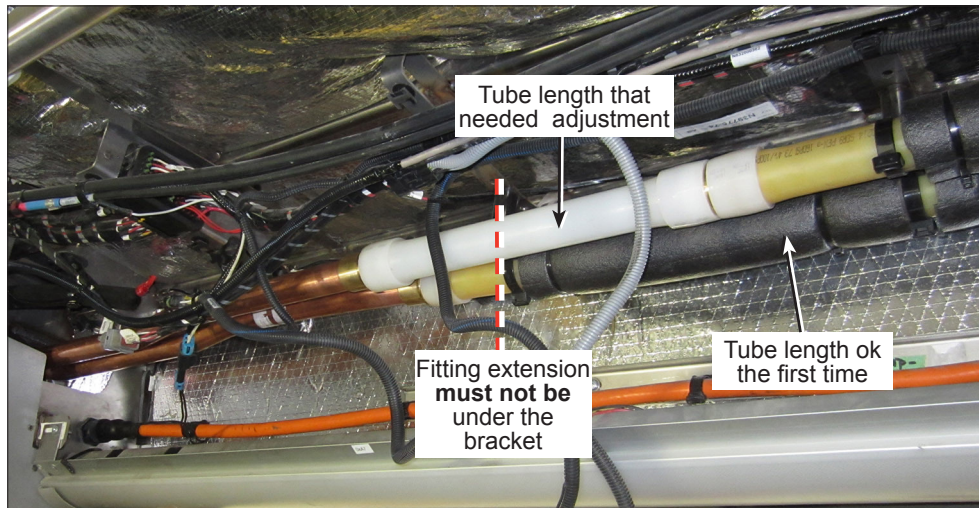


Figure 18 - General View of a length Adjustment (FRONT side)

- 2.1. From the articulation side, estimate how long the PEX tube should be. Calculate the length of the PEX tubes that need to be cut (2 tubes in the vehicle, and the piece of PEX N45726 to be added) to obtain a PEX-RING-FITTING-RING-PEX assembly of the required final length. **Be aware that the position of the fitting must not be under the bracket – where the cable tie will attach it later.**

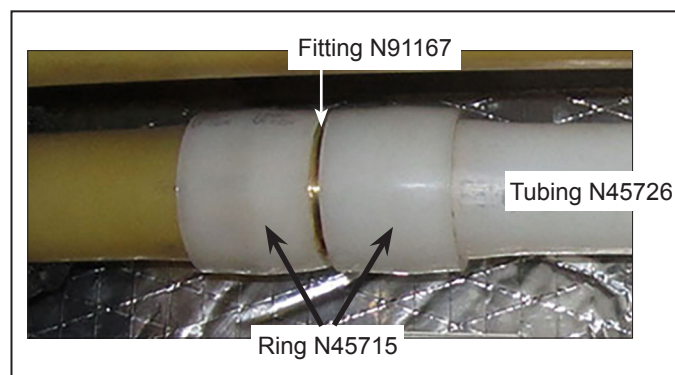


Figure 19 - Parts Needed for the Extension

- 2.2. Measure and mark the PEX tubes.

- 2.3. Disconnect the copper pipes.

**CAUTION**

To disconnect the pipes, follow the guidelines in the extract from the Uponor PEX Assistance manual in Appendix 1 or HePEX heating pipes heading in Section 99: GENERAL PRACTICES in the Nova Bus Maintenance Manual.

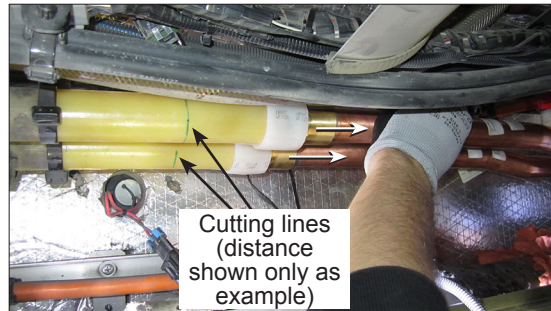


Figure 20 - Disconnecting the Pipes

- 2.4. Cut the PEX tubes.
- 2.5. Install the PEX extension as shown in the figure below.

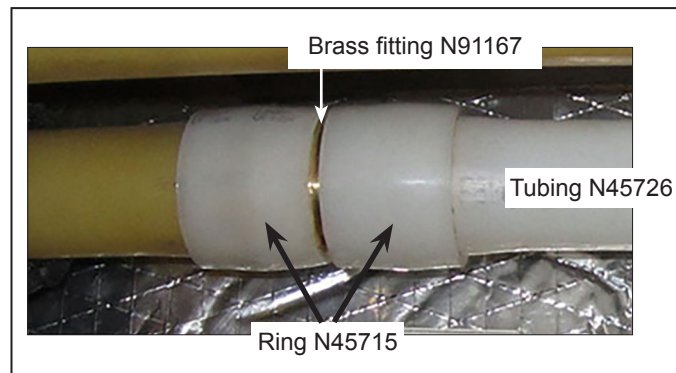


Figure 21 - Extension of the Tubing

- 2.6. Repeat steps 1.13 and 1.14 to reinstall the copper pipes.
- 2.7. Validate if the position of the assembly doesn't interfere with the other hoses, pipes, and cables coming out of the EGS.
- 2.8. When the position of the assembly is satisfactory, resume the process from step 1.21.



APPENDIX 1: UPONOR ASSISTANCE MANUAL, CHAPTER 2

Chapter 2: Making ProPEX Connections

Uponor ProPEX ASTM F1960 and CAN/CSA B137.5 cold-expansion fittings make solid, permanent, manufactured connections without the need for torches, glues, solder, flux or gauges. The unique shape memory of Uponor PEX piping forms a tight seal around the fitting, creating a strong, reliable connection.

This document shows how to make proper ProPEX connections using one of the following tools.

- Milwaukee® M12™ or M18™ ProPEX Expansion Tools
- Milwaukee M18 FORCELOGIC™ ProPEX Expansion Tool
- ProPEX 201 Corded Expander Tool
- ProPEX Hand Expander Tool

Distance Between Fittings

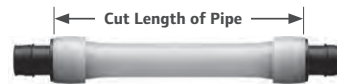
Uponor requires a minimum distance between ProPEX fittings to ensure the fittings are not damaged during the expansion process by the expander head. Refer to **Table 2-2** for the minimum distance between fittings, which is expressed as cut length of pipe.

General ProPEX Connection Tips

- If the fitting does not slide into the piping all the way to the stop, immediately remove it from the piping and expand the piping one final time.
 - Note:** To avoid over-expanding the piping, do not hold the piping in the expanded position.
- **Table 2-1** shows the recommended number of expansions. Experience, technique and weather conditions influence the actual number of expansions. Fewer expansions may be necessary under certain conditions. The correct number of expansions is the amount necessary for the piping and the shoulder of the fitting to fit snugly together.
- Ensure the ProPEX Ring rests snugly against the fitting shoulder. If there is more than 1/16" (1mm) between the ring and the shoulder of the fitting, the connection must be replaced. Square cut the piping 2" away from the fitting for 1/2" to 1" pipe, 3" away for 1 1/4" to 2" pipe and 5" away for 2 1/2" and 3" pipe prior to making the new connection.
- Brass ProPEX fittings can be disconnected and reused. EP fittings must be discarded. Be sure to follow the recommended minimum distance between ProPEX fittings shown in **Table 2-2**.

Nominal Fitting Size	Cut Length of Pipe
1/2"	2"
3/4"	3"
1"	3 1/2"
1 1/4"	4 1/2"
1 1/2"	4 1/2"
2"	6"
2 1/2"	7 1/2"
3"	9"

Table 2-2: Minimum Distance Between ProPEX Fittings



Piping Size	Milwaukee ProPEX Tool			Uponor ProPEX Tool		
	M12	M18	FORCELOGIC	Manual	100/150	201
3/8"	8	9	—	5	7	—
1/2"	5	6	—	4	4	—
3/4"	9	8	—	9	9H	—
1"	12	5	—	14	7H	—
1 1/4"	—	7	—	—	7H	—
1 1/2"	—	6	—	—	8H	—
2"	—	—	4	—	—	5H
2 1/2"	—	—	5	—	—	—
3"	—	—	7	—	—	—

Table 2-1: Recommended Number of Expansions for 3/8" to 3" Piping at 73.4°F (23°C)

Note: "H" in the table refers to Uponor H-series expander heads.



Making ProPEX Connections with Milwaukee ProPEX Expansion Tools

Note: All standard Uponor Expander Heads are compatible with the M12 and M18 tools. Uponor expander heads will not auto-rotate on the Milwaukee tools (only Milwaukee expansion heads will auto-rotate on the M12 and M18). H-heads are not compatible with Milwaukee tools and Milwaukee heads are not compatible with Uponor tools. Milwaukee heads are easily distinguished by color coding and the Milwaukee logo.

Important! Making expansions are slightly different when using a tool that features auto rotation. When making a ProPEX connection, be sure to follow the guidelines for the tool you are using in your application.

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Slide the ProPEX Ring over the end of the piping until it reaches the stop edge. If using a ProPEX Ring without a stop edge, extend the ring over the end of the piping no more than 1/8" (1mm).



3/8" and 1/2" Milwaukee Expansion Head



3/4" to 3" Milwaukee Expansion Heads

Important! If making a 3/8" ProPEX Connection, you must first expand each side of the ring before placing it on the piping. Refer to the "Making 3/8" ProPEX Connections" instructions on page 16 for further information.

With Auto Rotation (Standard Milwaukee Heads)

3. Milwaukee ProPEX Expansion Tools come with built-in auto rotation. If using a Milwaukee expansion head, simply hold the piping and tool in place while holding the trigger to expand the piping. The head will automatically rotate to ensure the piping is evenly expanded. Continue expanding until the piping and ring are snug against the shoulder on the expander head. See Table 2-1 for the recommended number of expansions for each piping size.

Note: Do not force the pipe onto the expander head. Ensure the expander head is rotating during each expansion.

Without Auto Rotation (Standard Uponor Heads)

4. Press the trigger to expand the piping.
5. Release the trigger, remove the head from the piping, rotate it 1/8 turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expander head. See Table 2-1 for the recommended number of expansions.

Important! Rotating the tool between expansions will provide smooth, even expansion of the piping. Failure to rotate the tool will cause deep grooves in the piping which can result in potential leak paths.



Expansion with Milwaukee M12 ProPEX Expansion Tool



6a Insert ProPEX Fitting into 1/2" Uponor PEX Piping.



ProPEX Coupling



6d Insert ProPEX Fitting into 1" Uponor PEX Piping.



ProPEX Tee

6. After the final expansion, immediately remove the tool and insert the fitting. Ensure the piping and ring seat against the shoulder of the fitting.

Important! Only perform the necessary number of expansions. DO NOT over expand the pipe. You should feel some resistance as the fitting goes into the piping.

If you do not feel any resistance, the piping may be over expanded and will require additional time to shrink over the fitting.



Expansion with Milwaukee M18 ProPEX Expansion Tool



Making ProPEX Connections with the Milwaukee M18 FORCELOGIC ProPEX Expansion Tool



FORCELOGIC Expansion Head Installation

The Milwaukee FORCELOGIC ProPEX Expansion Tool for 2", 2½" and 3" Uponor PEX pipe features an auto-rotating head with specially designed alignment cogs. This requires slightly different head installation than the M12 and M18 ProPEX expansion tools for ¾" to 1½" pipe sizes.

1. Remove the battery pack and place the FORCELOGIC Tool in the upright position (cone up).
2. Verify the expansion cone is fully retracted.
3. Screw the head onto the tool (clockwise). Hand-tighten securely. Do not over tighten. Ensure the expansion head fits flush against the tool.
4. Check the installation.
 - a. Ensure the head segments do not "flower" (see **image 4a**).
 - b. If the head flowers, correct the installation by loosening the head slightly and rotating the segments until they engage in the cogs. Re-tighten the head.
 - c. Rotate the six expansion segments in the clockwise direction. They will rotate freely. They should not rotate counter clockwise.
 - d. The expansion head collar will fit flush against the tool.



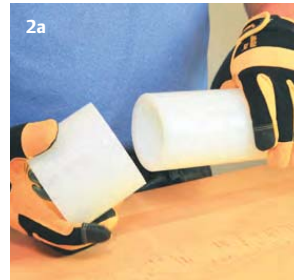
Incorrect Expansion Head "Flowering"



Correct Expansion Head Alignment

Making a ProPEX Connection

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Slide the ProPEX Ring over the end of the piping until it reaches the stop edge.
3. The Milwaukee tool comes with built-in auto rotation, meaning the head will automatically rotate to ensure the piping is evenly expanded.



Note: To cancel the expansion process quickly, pull and release the trigger.

4. Press the trigger to initiate the rotation of the head. A green light will turn on and the work light will blink. Insert the pipe and ring and release the trigger. When the expansion head has reached its maximum diameter, it will retract.

Important! Do not force the pipe and ring on the head during any expansion.

5. After the tool has retracted, the green indicator light blinks three times. Press the trigger and repeat the expansion process.

6. Repeat the process until the pipe and ring are snug against the shoulder of the expansion head. Repeat the expansion one or two more times depending on the ambient temperature.

Note: Fewer expansions are required in colder temperatures.

7. After final expansion, immediately remove the tool and insert the fitting.



Making ProPEX Connections with the ProPEX 201 Corded Expander Tool

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Slide the ProPEX Ring over the end of the piping until it reaches the stop edge. If using a ProPEX Ring without a stop edge, extend the ring over the end of the piping no more than $\frac{1}{16}$ " (1mm).
3. Slide the expander head into the piping until it stops. Full expansions are necessary to make a proper connection.
4. Press the trigger to expand the piping.



5. Release the trigger, remove the head from the piping, rotate it $\frac{1}{8}$ turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expander head. See **Table 2-1** for the recommended number of expansions.

Important! Rotating the tool between expansions will provide smooth, even expansion of the piping. Failure to rotate the tool will cause deep grooves in the piping which can result in potential leak paths.

6. After the final expansion, immediately remove the tool and insert the fitting. Ensure the piping and ring seat against the shoulder of the fitting.



Insert ProPEX Fitting into 2" Uponor PEX Piping.



ProPEX EP Tee Inserted into Uponor PEX Piping



ProPEX Brass Coupling Inserted into Uponor PEX Piping



Making ProPEX Connections with the ProPEX Hand Expander Tool

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Slide the ProPEX Ring over the end of the piping until it reaches the stop edge. If using a ProPEX Ring without a stop edge, extend the ring over the end of the piping no more than $\frac{1}{16}$ " (1mm).
3. Brace the free handle of the tool against your hip, or place one hand on each handle. Fully separate the handles and slide the expander head into the piping until it stops. Full expansions are necessary to make a proper connection. Bring the handles together to expand. Separate the handles, remove the head from the piping, rotate it $\frac{1}{8}$ turn and slide the head back into the piping. Continue expanding and rotating until

the piping and ring are snug against the shoulder on the expander head. See **Table 2-1** for the recommended number of expansions for each piping size.

Important! Rotating the tool between expansions will provide smooth, even expansion of the piping. Failure to rotate the tool will cause deep grooves in the piping which can result in potential leak paths.

Important! If making a $\frac{3}{8}$ " ProPEX Connection, you must first expand each side of the ring before placing it on the piping. Refer to the "Making $\frac{3}{8}$ " ProPEX Connections" instructions on **page 16** for further information.



ProPEX Hand Expander Tool

4. After the final expansion, immediately remove the tool and insert the fitting. Ensure the piping and ring seat against the shoulder of the fitting.

Important! You should feel some resistance as the fitting goes into the piping. If you do not feel any resistance, the piping may be over expanded and will require additional time to shrink over the fitting.



ProPEX Hand Expander Tool



Insert ProPEX Fitting into Uponor PEX Piping.

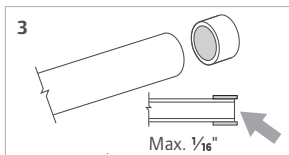
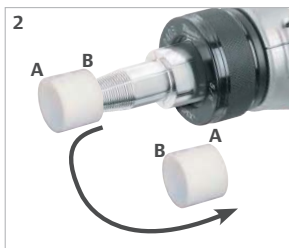
Making $\frac{3}{8}$ " ProPEX Connections

The $\frac{3}{8}$ " ProPEX Ring must be expanded once on each side to properly fit over the piping. Refer to the following instructions to make a $\frac{3}{8}$ " ProPEX connection.

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Expand each side of the $\frac{3}{8}$ " ProPEX Ring once.
3. Slide the expanded ring over the end of the piping. Extend the end of the ring over the end of the piping no more than $\frac{1}{16}$ " (1mm).
4. After the ring is on the piping, continue with the regular steps for making a proper connection with your specific tool.



E6081128 Pipe Cutter (plastic)



Proper Expander Tool and Head Maintenance

- Use a lint-free cloth to apply a light coat of lubricant to the cone prior to making any ProPEX connections.
- If used regularly, apply the lubricant daily to the cone of the ProPEX Expander Tool (manual, air or battery) as well as the ProPEX Auto Rotation Adapter. Failure to keep these tools lubricated may result in improper connections.
- The handles of the ProPEX Hand Expander Tool will open and close smoothly if properly lubricated.



Caution: Excessive lubrication may result in improper connections. Only use a small amount of lubrication to keep the tool working properly.

- Keep all other parts of the tool free from lubricant.
- Once a month, soak the heads in degreasing agent to remove any grease from between the segments. Clean the cone using a clean, dry cloth.

Important Tips for a Proper $\frac{3}{8}$ " ProPEX Connection

- The thicker $\frac{3}{8}$ " ProPEX Ring shrinks over the fitting faster than larger-sized rings.
- When the temperature is below 40°F (4.4°C), fewer expansions are required.

Disconnecting a ProPEX Brass Fitting

ProPEX brass and EP fittings are manufactured connections that can be concealed in walls, ceilings and floors. When necessary, ProPEX brass fittings can be disconnected.

Important! EP fittings cannot be reclaimed.

Refer to the following guidelines for disconnecting a ProPEX brass fitting.

1. Ensure the system is not pressurized.
2. Use a utility knife to carefully cut through the ProPEX Ring.

Important! Do not heat the ring prior to cutting it. Take care to cut only the ring and not the piping or fitting. Gouges in the fitting may result in leaks. If you accidentally damage the fitting, you must discard it.

3. Remove the ProPEX Ring from the piping.

4. After removing the ring, apply heat directly around the fitting and piping connection. **Do not use open flame.** Gently work the piping back and forth while pulling slightly away from the fitting until the piping separates from the fitting.

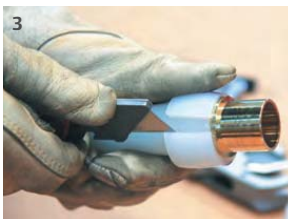
5. After removing the fitting, measure:

- 2" (50.8 mm) minimum for 3/8" to 1" pipe
- 3" (76.2 mm) minimum for 1 1/4" to 2" pipe
- 5" (127 mm) minimum for 2 1/2" and 3" pipe

6. Square cut the piping at the proper marking.

7. Allow the fitting to cool before making the new connection.

8. Use a new ProPEX Ring and follow the steps to make a new connection.



Troubleshooting ProPEX Connections

Trouble-free ProPEX installations begin with a tool that is maintained in proper working condition. If the tool or segment fingers are damaged, it is very difficult to make a proper connection. Refer to the following guidelines to assist with challenges in the field.

Fittings Won't Seal

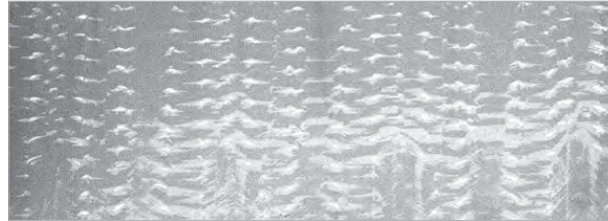
- Make sure the expander head is securely tightened onto the tool.
- Ensure the segment fingers are not bent. If the head does not completely close when the drive unit is fully retracted or the handles of the manual tool are open, replace the head.
- Examine the tool for excess grease on the segment fingers. Remove excess grease prior to making connections.
- Check the fitting for damage. Nicks and gouges will cause the fitting to leak.
- Make sure the internal driver cone is not damaged or bent.
- Make sure the last expansion is not held in the expanded position before the fitting is inserted. You should feel some resistance as the fitting goes into the piping. If you do not feel any resistance, the piping may be over expanded and will require additional time to shrink over the fitting.
- Be sure to rotate the tool $\frac{1}{8}$ turn after each expansion to avoid deep grooves in the piping which can result in potential leak paths.

Expansion is Difficult

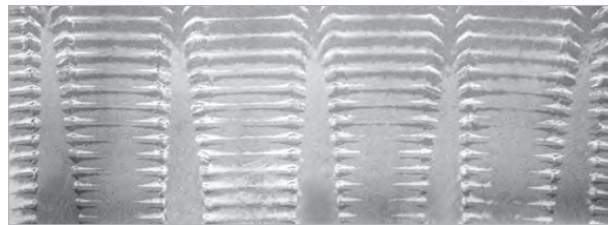
- Make sure the internal cone is properly greased.

Expansion Head Slips Out of Piping When Making Expansions

- Ensure the piping and ProPEX Ring are dry.



Expansion with Proper Rotation



Expansion without Proper Rotation

- Make sure that grease is not getting into the piping.
- Examine the segment fingers to ensure they are not damaged or bent.

ProPEX Ring Slides Down Piping During Expansion

- Ensure your hands are clean while handling the piping. Any sweat or oils on your hands can act as a lubricant. Due to the smoothness of PEX, any form of lubricant can cause the ProPEX Ring to slide down the piping during expansion.
- If you anticipate the ProPEX Ring may possibly slide down, position the ring slightly farther over the end of the piping and make the first couple of expansions slowly. Once the ring and the piping begin to expand together, continue with the normal number and type of expansions.
- Place your thumb against the ProPEX Ring to help support it and feel for any movement. If caught early, you can slide the ring up the piping and expand as described in the previous bullet point.

More Than the Recommended Number of Expansions are Needed to Make a Connection

- Ensure the head is hand-tightened to the expander tool.
- Examine the segment fingers for damage.
- Be sure to completely cycle the tool on each expansion (i.e., close the manual tool handle or release the trigger).

Cold-weather Expansions

- Temperatures affect the time required for the piping and ring to shrink onto the fitting. The colder the temperature, the slower the contraction time.
- Warming ProPEX fittings and ProPEX Rings reduces contraction time. Put fittings and rings in your pockets prior to installation to keep them warm.
- Fewer expansions are necessary in temperatures below 40°F (4.4°C).

Note: Do not use a heat gun on EP fittings to speed up the contraction time as this could result in damage to the fitting.