

Circulate to:  Sales Manager  Accounting  Service Manager  Technician  Parts Manager

## Maintenance of Synthetic Elastic Materials

### Models Affected

Models Covered	Serial Number
Mercury/Mariner	All outboard products

### Scope

Worldwide

### Situation

It is generally understood that synthetic elastic materials used in outboard engines, such as fuel hoses, water hoses, drive belts, isolation mounts for engine components, and hydraulic hoses will degrade over time. These items are considered maintenance items and should be inspected on a regular basis for deterioration and should be replaced as necessary. This communication is to outline the processes associated with identifying the conditions when these components should be replaced.

### Inspection

#### Hoses

Fuel hoses, steering hoses, and all other hydraulic hoses should be visually inspected for surface abnormalities, leaks, kinking or undue stress, and other signs of degradation before each operation of the engine.

Once a year or every 100 hours all hoses should be physically inspected using the following criteria.

#### Cracking

Hoses that show signs of cracking or crazing on the outer surface should be replaced. Most often the first areas to show distress are the outer bend radii where the material is in tension. If the hose does not have a bend in its length, move the hose from side to side to see if a crack can be exposed. Formed hoses should be inspected in the same manner as a nonformed hose. Molded hoses should be flexed slightly to expose corners and radii where the hose may have crack in a "T" or "Y" molded into the hose.

#### Stiff Hoses

Hoses which are no longer pliable or cannot move freely when flexed or handled must be replaced. UV, ozone, or incorrect cleaning agents can affect the hose long term and can drive some of the elastomer from the hose.

#### Leaking Hoses

Leaking hoses must be replaced. Most often the fitting area is an area of high stress so this is the first area to look for a leak. If the hose has cracking along its length, this may also cause a leak.

#### Wear/Abrasion

Hoses that show wear to the point in which material has been removed from the surface of the hose must be replaced. Most times the wear is not on the obviously exposed surface, but is on the backside of the hose or where a hose is covered by another boat component or engine component. Inspect the hoses with lights and mirrors to see all areas of the hose. Move the hose if necessary to obtain exposure to all surfaces. Do not kink the hose during this process.

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## Kinking

A hose that is kinked or appears that it has been kinked must be replaced. Most often the kink will not cause the hose to fail, but will restrict the flow of fluid through the hose. This may cause a reduction in fuel flow or water flow that may cause engine performance and durability issues. With steering related hoses, the kink may cause excessive steering force in one or both directions.

## Hose Routing

Hoses must be routed to reduce the affects of excessive stress due to tight radii or wear points. A hose that may come into contact with any sharp surface, have tight radii, or does not have a straight section for 25.4 mm (1 in.) after the end of a ferrule or fitting (unless the hose is a molded or formed hose) must be rerouted. If the hose has been damaged due to routing then it must be replaced before rerouting the hose.

Follow the instructions for routing steering hoses supplied with the hoses and ABYC specifications.

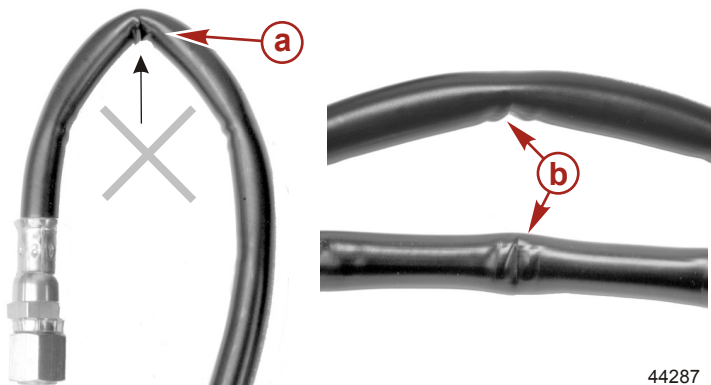
If the routing for steering related hoses does not meet the following instructions, the hoses must be rerouted. If the hose has been damaged due to routing, then it must be replaced before rerouting the hose.

## Hose Routing Requirements

### Do's and Don'ts

1. Never step on or bend the hose in a way that could allow it to kink. If the hose should ever get kinked, replace the hose. Do not use a hose that has been kinked, the hose could fail under pressure. If the outer hose cover shows any signs of wrinkles, the hose was kinked at that location and the hose must be replaced.

**IMPORTANT: If the hose should ever get kinked, the hose is damaged. The hose could fail under pressure and must be replaced.**



Example of a kinked hose

a - Kinked

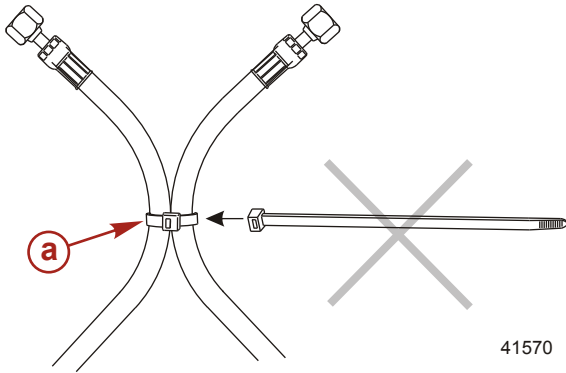
b - Signs of a kinked hose - wrinkles

2. The hose diameter must be free to flex and expand while under pressure. Do not fasten the hose with cable ties or any other tight-fitting clamp that could restrict hose flexing and expansion.

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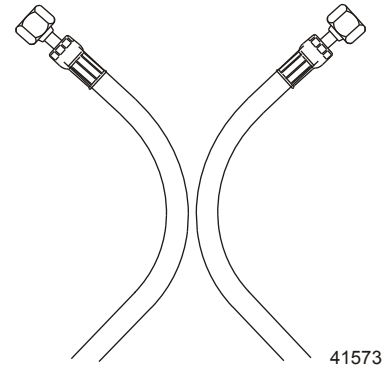
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**IMPORTANT:** Damage to the hose could result if hose expansion is restricted during operation. Do not use cable ties or any other tight-fitting clamp to fasten the hose during rigging.



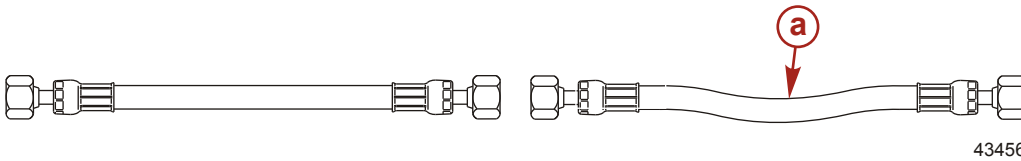
**Incorrect**

**a** - Cable tie - Do not use



**Correct**

3. Select the length of the hose that will be close to the proper size. Allow an additional small amount of hose length for motion and tolerances.

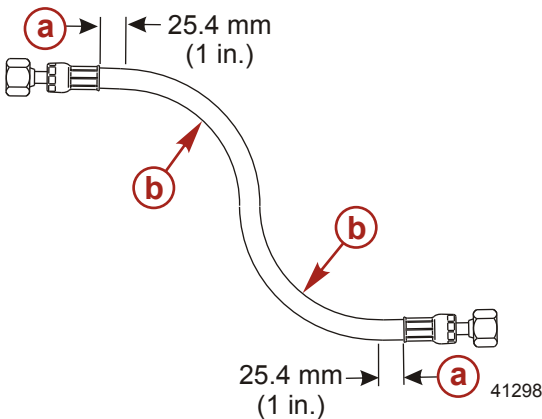


**Incorrect**

**a** - Hose length allowance for movement

**Correct**

4. Handle the hose with care during installation. Kinking the hose or bending less than the 50.8 mm (2 in.) minimum bend radius may reduce hose life. Maintain a 25.4 mm (1 in.) straight section of hose out from the coupler prior to the beginning of the bend radius.



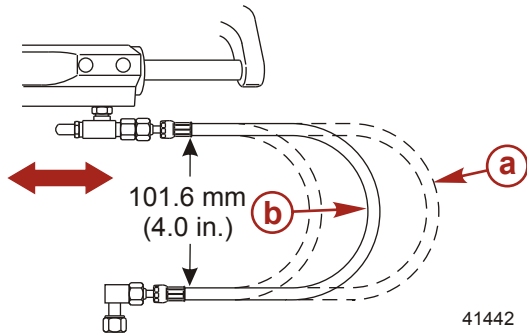
**a** - Straight hose section of 25.4 mm (1 in.) prior to the beginning of the hose bend

**b** - Minimum hose bend radius of 50.8 mm (2 in.)

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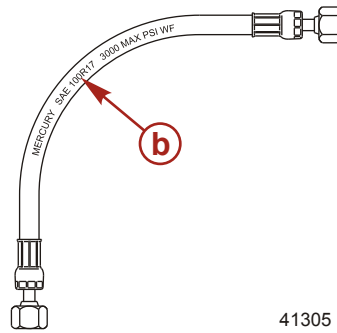
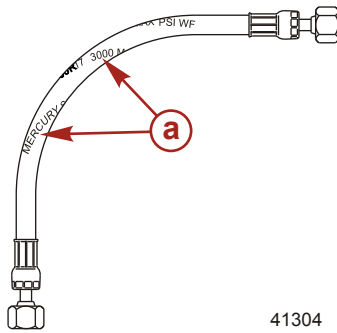
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5. Provide adequate hose length to allow for motion during steering or trimming of outboards.



- a - Provide adequate hose length due to motion
- b - Minimum hose bend radius of 50.8 mm (2 in.)

6. Pressure applied to a twisted hose may shorten the life of the hose, or loosen the connections. To avoid twisting, use the writing on the hose as a reference.

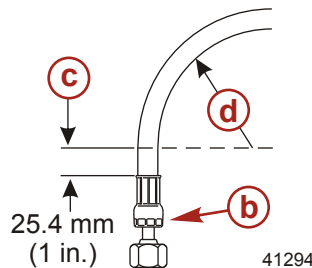
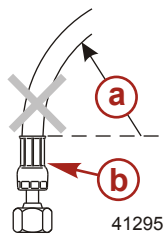


**Incorrect**

- a - Writing on hose is twisted
- b - Writing on hose is straight

**Correct**

7. Maintain a 25.4 mm (1 in.) straight section of hose out of the coupler prior to the beginning of the hose bend radius.



**Incorrect**

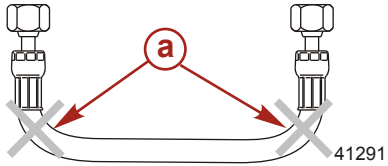
- a - Sharp bend out of coupler
- b - Coupler
- c - Straight hose section of 25.4 mm (1 in.) prior to the beginning of the hose bend radius
- d - Minimum hose bend radius of 50.8 mm (2 in.)

**Correct**

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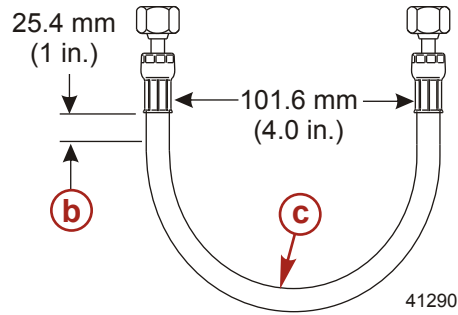
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8. Provide adequate hose length to prevent any sharp bends in the hose. Maintain a 25.4 mm (1 in.) straight section of hose out of the coupler prior to the beginning of the hose bend radius.



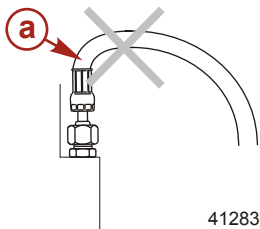
**Incorrect**

- a - No sharp bends
- b - Straight hose section of 25.4 mm (1 in.) prior to the beginning of the hose bend radius
- c - Minimum hose bend radius of 50.8 mm (2 in.)



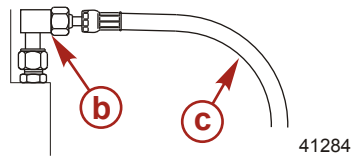
**Correct**

9. Example showing the use of a 90° fitting to prevent a sharp hose bend out of the coupler.



**Incorrect**

- a - No sharp bend
- b - 90° fitting (22-892528)
- c - Minimum hose bend radius of 50.8 mm (2 in.)

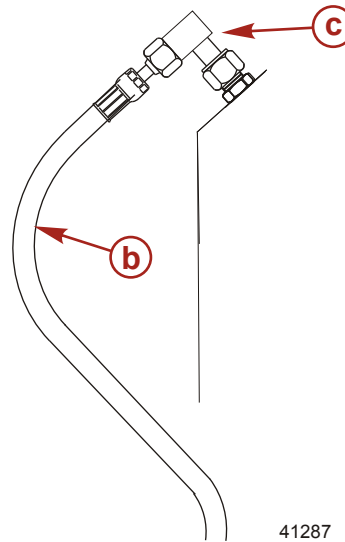
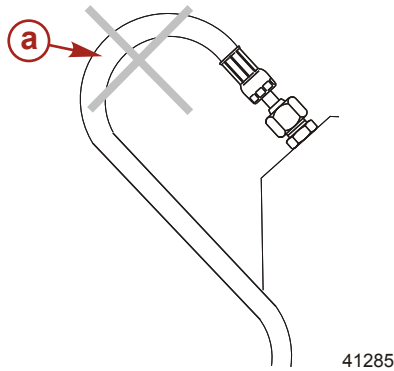


**Correct**

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10. Example showing the use of a 90° fitting to prevent a sharp bend in the hose.

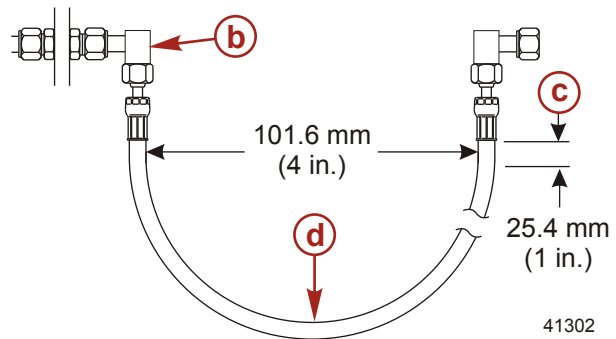
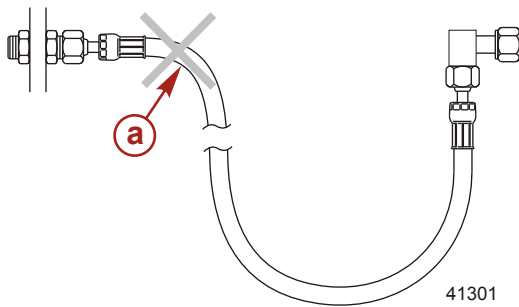


**Incorrect**

- a - No sharp bend
- b - Minimum hose bend radius of 50.8 mm (2 in.)
- c - 90° fitting (22-892528)

**Correct**

11. Example showing the use of a 90° fitting to relieve hose strain.



**Incorrect**

- a - No sharp bend
- b - 90° fitting (22-892528)
- c - Straight hose section of 25.4 mm (1 in.) prior to the beginning of the hose bend radius
- d - Minimum hose bend radius of 50.8 mm (2 in.)

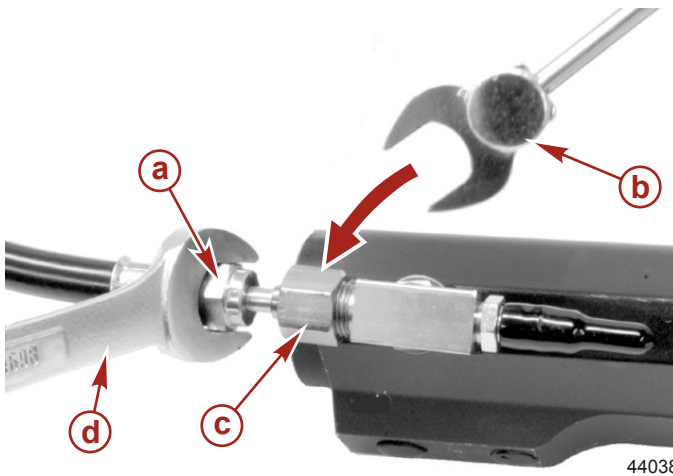
**Correct**

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## Tightening the Hose Fittings

Place a wrench onto the flats on the hose fitting and hold the hose from turning while tightening the hose fitting. Tighten the hose fitting to the specified torque.



- a - Flats for wrench
- b - Torque wrench
- c - Hose fitting
- d - Wrench

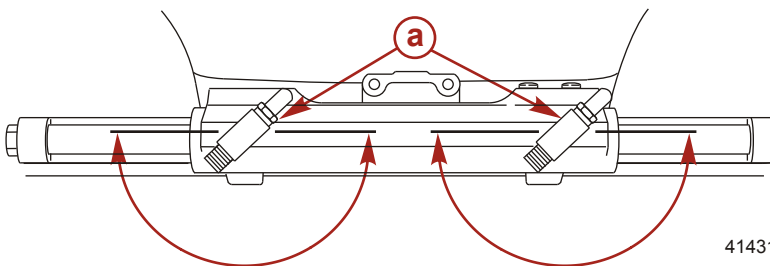
Description	Nm	lb-in.	lb-ft
Hoses marked (R-STAR and L-PORT) - wrench size 18 mm (11/16 in.)	24		17.5
Hoses marked (P and T) - wrench size 21 mm (13/16 in.)	54		40

## Recommended Hose Routing to the Steering Cylinder - All Models except Verado Six Cylinder Models

Tighten the hose hex fittings to the specified torque.

Description	Nm	lb-in.	lb-ft
Hoses marked (R-STAR and L-PORT) - wrench size 18 mm (11/16 in.)	24		17.5
Hoses marked (P and T) - wrench size 21 mm (13/16 in.)	54		40

1. Position the 90° hose fittings to the desired direction. Loosen the fastening nuts in order to rotate. Tighten after the correct hose routing location is verified.

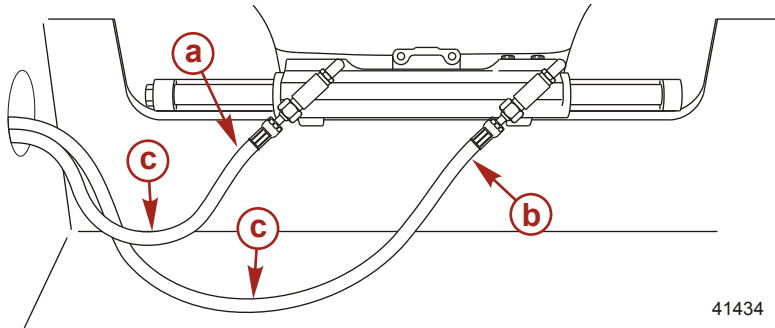


- a - Hose fitting - position to desired direction

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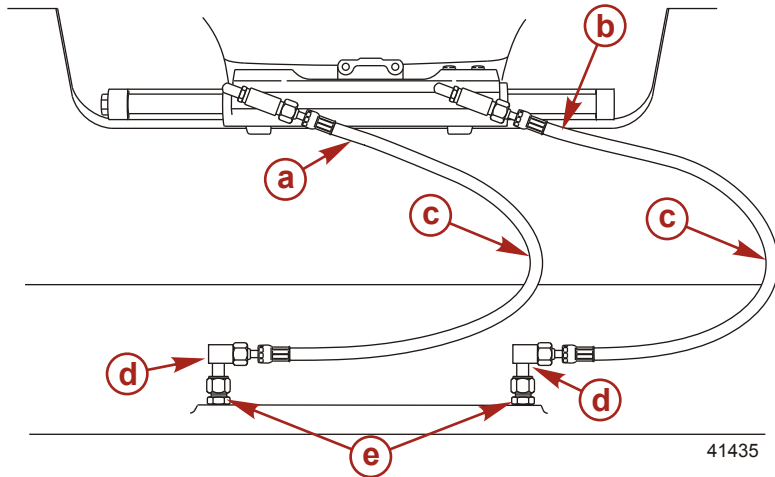
2. Boats with engine well opening - route the hydraulic hoses to the steering cylinder, as shown. Provide adequate hose length to allow for changes in length due to motion on the steering cylinder and tilting of the outboard.



- a - Hose marked L-PORT
- b - Hose marked R-STAR
- c - Generous radius - 50.8 mm (2 in.) radius minimum

41434

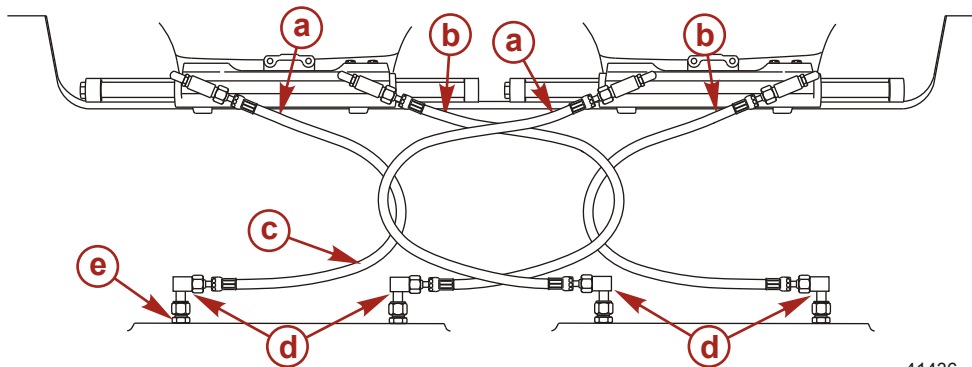
3. Boats using bulkhead fittings - single outboard models - install 90° fittings onto the bulkhead fittings. Route the hydraulic hoses to the steering cylinder as shown. Provide adequate hose length to allow for changes in length due to motion on the steering cylinder and tilting of the outboard.



- a - Hose marked L-PORT
- b - Hose marked R-STAR
- c - Generous radius - 50.8 mm (2 in.) radius minimum
- d - 90° fitting (22-892528)
- e - Bulkhead fitting

41435

4. Boats using bulkhead fittings - dual outboard models - install 90° fittings onto the bulkhead fittings. Route the hydraulic hoses to the steering cylinders as shown. Provide adequate hose length to allow for changes in length due to motion on the steering cylinders and tilting of the outboards.



- a - Hose marked L-PORT
- b - Hose marked R-STAR
- c - Generous radius - 50.8 mm (2 in.) radius minimum
- d - 90° fitting (22-892528)
- e - Bulkhead fittings (4)

41436

## Recommended Hose Routing to the Steering Cylinder - Verado Six Cylinder Models

Tighten the hose hex fittings to the recommended torque.

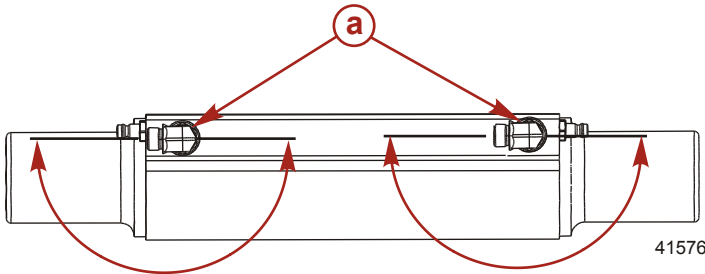
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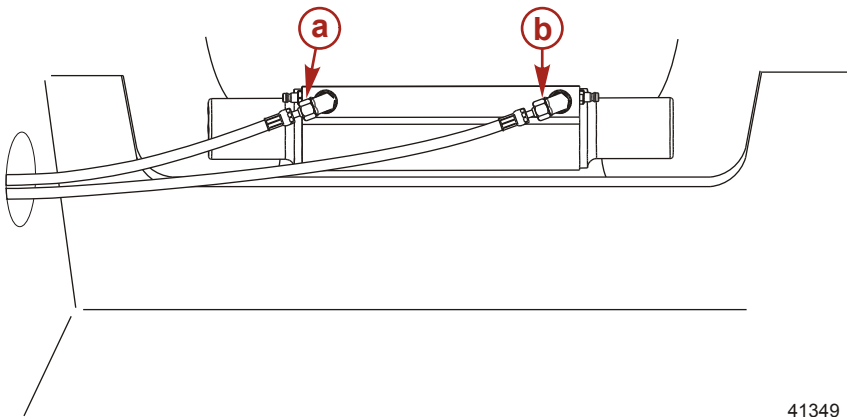
Description	Nm	lb-in.	lb-ft
Hoses marked (R STAR and L PORT) - wrench size 18 mm (11/16 in.)	24		17.5
Hoses marked (P and T) - wrench size 21 mm (13/16 in.)	54		40

- Position the 90° hose fittings to the desired direction. Loosen fastening nuts in order to rotate. Tighten after the correct hose routing location is verified.



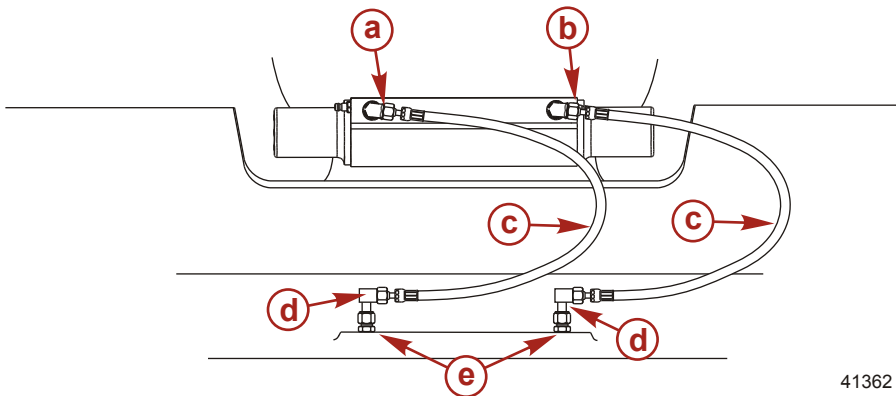
**a** - Hose fitting - position to desired direction

- Boats with engine well opening - route the hydraulic hoses to the steering cylinder, as shown.



**a** - Starboard side fitting  
**b** - Port side fitting

- Boats using bulkhead fittings - single outboard models - install 90° fittings onto the bulkhead fittings. Route the hydraulic hoses to the steering cylinder, as shown.

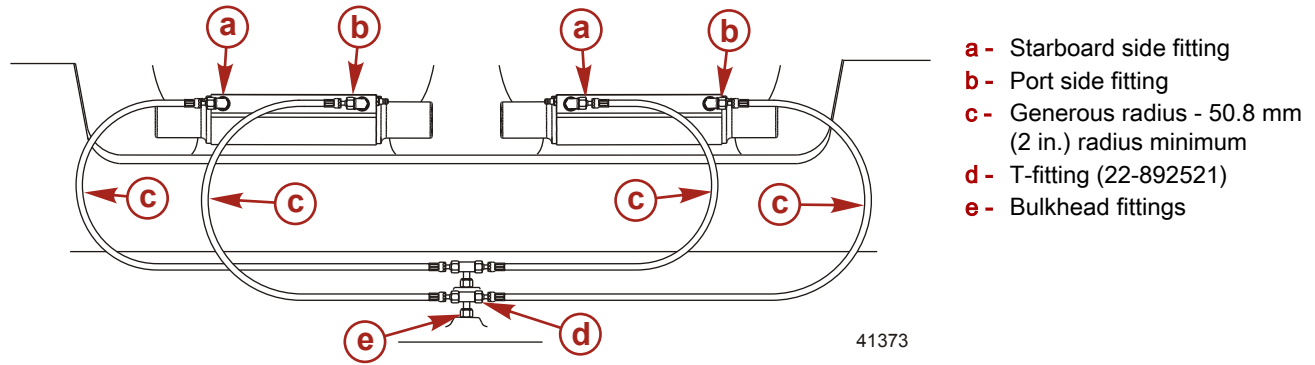


**a** - Starboard side fitting  
**b** - Port side fitting  
**c** - Generous radius - 50.8 mm (2 in.) radius minimum  
**d** - 90° fitting (22-892528)  
**e** - Bulkhead fittings

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- Boats using bulkhead fittings - dual outboard models with dual steering cylinders - install T-fittings onto the bulkhead fittings. Route the hydraulic hoses to the steering cylinders, as shown.



- a - Starboard side fitting
- b - Port side fitting
- c - Generous radius - 50.8 mm (2 in.) radius minimum
- d - T-fitting (22-892521)
- e - Bulkhead fittings

## Hose Routing Check List

- Place the outboard into each of the trim positions.
- Steer the outboard through the full steering range, as listed.
- Check each hydraulic hose so that it meets the listed requirements. If necessary, change the hose routing so that it meets all requirements.

Hose Routing Check List				
Trim position	Steer outboard to:	Hose bends are 101.6 cm (4.0 in.) diameter or larger	Hose extends straight out of each fitting at least 25.4 cm (1 in.) before bending	Hoses are not rubbing against each other during steering or trimming of outboards
Full down trim position	Full port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Full starboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Straight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full up trim position	Full port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Full starboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Straight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full tilt trailer position	Full port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Full starboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Straight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Belts

Once a year or every 100 hours or 300 hours where appropriate, belts should be physically inspected by the following criteria. Inspect the accessory drive belt and if any of the following conditions are found the belt must be replaced.

- Cracks in the back of the belt or in the base of the "V" grooves
- Excessive wear at the roots of the grooves
- The rubber portion is swollen by oil or other liquids
- The belt surface is roughened
- Signs of wear or fraying anywhere on the belt

Drive belts should be replaced after 3 years or 300 hours of service regardless of condition.

## Isolation Mounts

Once a year or every 300 hours all isolation mounts should be physically inspected by the following criteria.

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## Under cowl component isolation

Mercury Marine uses isolation mounts to control vibration transfer to many electrical components.

- Replace the mounts if they are cracked or have become hard, brittle, excessively soft or tacky due to exposure to ozone or chemicals.

## Engine mounts

Mercury Marine uses isolation mounts to control vibration transfer from the engine to the boat transom using elastomeric engine mounts. These mounts can wear or deteriorate over time. Worn engine mounts can affect boat handling and will also transfer unwanted vibration to the boat and ultimately to the customer.

For engines with power trim or gas assist (non-L6 Verado):

- With the engine straight, vertical, out of the water and the prop removed, move the engine from side to side using the anti-cavitation plate. If a constant increasing resistance is not felt, but the unit feels loose, the lower mounts must be replaced.
- With the engine straight, trimmed 45 degrees from vertical, out of the water and the prop removed, try to lift the engine using the skeg. If a constant increasing resistance is not felt, but the unit feels loose, either the upper or lower mounts or both must be replaced.

For Verado engines with advanced mid-section.

- There are no lower mounts on the AMS, but the procedure for checking the mount system is the same as above. The Verado mounts may feel more compliant than the same horsepower engine with the standard mounting system, but the mounts should never feel loose. As pressure is increased on the system, resistance should increase evenly.

Failure of the component being isolated or the mounting system can occur if not serviced when the above conditions exist.

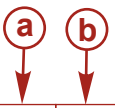
## Warranty

### Normal Warranty

If a failure due to product defect in material or workmanship occurs within the normal warranty period and before the first required scheduled maintenance, submit a warranty claim.

### Power Steering Hose Routing Issues

For all boats with hull identification numbers (HIN) prior to C1 in the 9th and 10th positions and 11 in the 11th and 12th positions that have Verado or OptiMax power steering routing related issues as illustrated in the attached installation instructions, replace the hose with correct routing and submit a warranty claim by the outboard serial number. List the correct hose kit part number, flat rate labor code SB10, and provide the boat HIN.



US ABC45678**A405** H2467 37412

- a** - Month and year of certification or manufacture
- b** - Model year

A-January	G-July
B-February	H-August
C-March	I-September
D-April	J-October
E-May	K-November
F-June	L-December

International - Hold parts for inspection/disposal by a Marine Power International technical representative.

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