BRAKES

1. DESCRIPTION

The hydraulically operated brakes are individually activated by floor mounted toe pedals located at both pilot stations. A parking brake mechanism holds induced hydraulic pressure on the disc brakes for parking.

The brake system consists of a master cylinder for each rudder pedal, a hydraulic fluid reservoir, a parking brake valve, control cable, and knob, a single disc brake assembly on each main landing gear wheel, and associated hydraulic plumbing.

The master cylinders are located forward of the pilot's rudder pedals. The hydraulic fluid reservoir is located in the engine compartment on the upper RH side of the firewall. The reservoir is serviced with Mil-H-5606 hydraulic fluid.

For disassembly/assembly of brake master cylinder refer to the manufacturer's approved Instructions For Continued Airworthiness and/or other service instructions.

The parking brake system consists of a parking brake valve, hydraulic plumbing, and a parking brake control cable. The parking brake valve is mounted adjacent to the firewall on the LH side of the outboard console rib. The parking brake control cable knob is mounted to the LH side of the mid console, adjacent to the alternate air controls.

2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Brake drag.	Piston cocked in cylinder, resulting in overheating brake and/or excessive lining wear.	Remove and repair cylinder or piston. Replace brake assembly. (Refer to 32-42)
	Foreign matter wedged in brakes.	Locate and remove foreign matter.
	Back pressure due to malfunction of master cylinder.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Repair or replace master cylinder. (Refer to 32-42)
	Back pressure due to malfunction of parking brake valve.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Replace parking brake valve. (Refer to 32-42)
	Water or ice in hydraulic system.	Thaw ice and flush system. Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Excessive bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder and follow manufacturer's recommended torque value.
	Piston does not retract.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42) Remove piston and inspect for damage. (Refer to 32-42)

Trouble	Probable Cause	Remedy
Brake drag.	Warped pressure plate.	Replace pressure plate or flatten to within 0.100 inch (0.254 mm). (Refer to 32-42)
	Corroded anchor bolts and/or torque plate bushings.	Clean and lubricate or replace.
	Cocked anchor bolts and/or torque plate bushings.	Replace anchor bolts and/or torque plate bushings. (Refer to 32-42)
	Bent or cracked torque plate.	Replace torque plate. (Refer to 32-42)
	Restriction in hydraulic line.	Isolate and remove restriction.
	Lining out of position or stuck.	Repair or replace lining. (Refer to 32-42)
	Warped brake disk.	Inspect brake disk by laying a straightedge across brake disk face. Replace brake disk. (Refer to 32-42)
	Lining not seated flush against pressure plate or back plate.	Deburr rivet hole on surface adjacent to lining.
	Parking brake control cable stop incorrectly adjusted.	Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)
Brakes inoperative.	Brake fluid level low.	Replenish brake fluid. (Refer to 12-10)
	Air in brake system.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Defective master cylinder.	Replace master cylinder. (Refer to 32-42)
	Defective caliper.	Replace caliper. (Refer to 32-42)
	Worn brake linings.	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace O-rings. (Refer to 32-42)
		Replace brake linings. (Refer to 32-42)
	Leaky brake line connections	Tighten or replace connectors.
Parking brake inoperative.	Parking brake valve defective.	Replace parking brake valve. (Refer to 32-42)

Trouble	Probable Cause	Remedy
Parking brake will not release.	Control cable stop incorrectly adjusted.	Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)
	Defective control cable.	Replace control cable. (Refer to 32-42)
Brake overheating.	Improper and/or aggressive braking practices.	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace O-rings. (Refer to 32-42)
		Replace brake linings. (Refer to 32-42)
Rapid disk and lining wear.	Improper adjustment of master cylinder rod length restricting the development of maximum stroke.	Adjust cylinder rod length. (Refer to 32-42)
	Improper conditioning of brake linings.	Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)
	Excessive rusting, scoring, or pitting of brake disk.	Clean or replace brake disk. Use factory chrome-plated disk where applicable.
	Excessive back plate deflection caused by bent bolts or over torquing bolts.	Replace bolts. Torque bolts to proper value.
Unable to obtain sufficient hydraulic brake pressure, excessive toe pedal travel, or spongy pedal.	Air in hydraulic system.	Perform Adjustment/Test - Bleeding the Brake System. (Refer to 32-42)
	Vent in master cylinder reservoir clogged.	Clean vent or overboard drain.
	Leak in hydraulic system.	Locate leak and repair.
	Defective master cylinder.	Replace or repair master cylinder. (Refer to 32-42)
	Back plate bolts loose or not properly torqued, causing excessive brake deflection.	Torque bolts to proper value.
	Excess bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder.
	Defective brake line (ballooning).	Replace brake line.

Trouble	Probable Cause	Remedy
Brakes won't hold.	Contaminated brake lining.	Replace brake lining. (Refer to 32-42)
	Improper conditioning of brake linings.	Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)
	Brake linings worn below minimum wear limits.	Perform Inspection/Check - Brake Linings. (Refer to 32-42)
	Brake disk worn below minimum wear limits.	Perform Inspection/Check - Brake Disk. (Refer to 32-42)
	Brake lining carbonized (overheated).	Perform Inspection/Check - Brake Temperature Indicator. (Refer to 32-42)
		Replace brake lining. (Refer to 32-42)
	Pressure plate contacting torque plate assembly.	Check for correct torque plate and wheel installation.
	New brake linings not seated in wear track of old brake disk, resulting in partial contact with brake disk.	Replace brake disk. (Refer to 32-42)
Brake fluid leaking.	O-rings damaged.	Replace O-rings. (Refer to 32-42)
	Connections or hoses leaking.	Locate leak and repair.
	Cylinder scored/deteriorated or obstructed by debris.	Clean cylinder.
		Replace cylinder.

3. MAINTENANCE PRACTICES

A. Brake System Replenishing (Refer to 12-10)

B. Brake Assembly (See Figure 32-421)

(1) Removal - Brake Assembly

WARNING: **Verify parking brake is in off position and wheels are blocked.**

(a) Remove main gear fairings. (Refer to 32-10)
(b) Remove and cap hydraulic line attached to brake. Cap brake inlet fitting.
(c) *Serials 0002 thru 1739 before SB 2X-32-13:* Remove bolts and washers securing back plate to cylinder assembly. Remove back plate.
(d) *Serials 1740 & subs, 0002 thru 1739 after SB 2X-32-13:* Remove bolts and washers securing back plate and shim to cylinder assembly. Remove back plate and shim.
(e) Carefully slide anchor bolts secured to cylinder assembly off torque plate.
(f) If torque plate removal is required:
1 Remove wheel/tire. (Refer to 32-41)
2 Remove bolts, nuts, and washers securing torque plate to axle flange. Remove torque plate.

(2) Disassembly - Brake Assembly

(a) Slide pressure plate over and off anchor bolts secured to cylinder assembly.
(b) Remove pistons by injecting air into ports (15-20 psi) [103 to 138 kPa] maximum pressure.

CAUTION: Care should be used in handling O-rings to prevent damage.

(c) Remove O-rings from pistons.
(d) *Serials 1740 & subs, 0002 thru 1739 after SB 2X-32-13:* Remove friction springs from pistons.
(e) Remove bleeder seat, screw, cap, and inlet fitting.
(f) Remove anchor bolts secured to cylinder assembly, if necessary.
(g) Remove brake lining, if necessary. (Refer to 32-42)
(h) *Serials 1728 & subs, 0002 thru 1727 after SB 2X-32-14:* Remove brake temperature indicator. (Refer to 32-42)

(3) Reassembly - Brake Assembly

Note: Thoroughly clean parts before assembling.

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Arbor Press	-	Any Source	Install anchor bolts.
O-Ring Lubricant	Dow Corning 55 O-Ring Lubricant	Dow Chemical Co. Midland, Michigan 48674 989-636-1000	Lubrication.
Silicon Spray	-	Any Source	Lubrication.
Mallet (plastic or wooden)	-	Any Source	Piston installation.

(b) If removed, install brake linings. (Refer to 32-42)

(c) If anchor bolts were removed, install anchor bolts using arbor press and a holding fixture. Install washers and nuts. Torque nuts to 90 in-lb (10 Nm).

(d) Install inlet fitting and torque to 40 - 50 in-lb (4.5 - 5.6 Nm).

Note: Cap fittings if brake is not being immediately installed on the airplane.

(e) Install bleeder seat, screw, and cap. Torque to 40 - 50 in-lb (4.5 - 5.6 Nm).

(f) *Serials 1740 & subs, 0002 thru 1739 after SB 2X-32-13:* Install friction springs on pistons.

(g) Install O-rings on pistons and lubricate.

(h) Place pistons in cylinder bores and verify pistons and O-rings are in proper alignment.

(i) Press pistons into cylinder bores by hand. If required, tap the pistons squarely with a wooden or plastic mallet while rotating pistons.

CAUTION: Care should be exercised to prevent over tightening the inlet fitting which could result in cracking of cylinder casting. Finger tighten the inlet fitting, rotate one to two turns to obtain proper installation orientation, and torque to specified value.

(j) Install pressure plate lining facing away from pistons by sliding over anchor bolts. Verify pressure plate slides freely over anchor bolts.

(k) *Serials 1728 & subs, 0002 thru 1727 after SB 2X-32-14:* Install brake temperature indicator. (Refer to 32-42)

(4) Installation - Brake Assembly

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Silicon Spray	-	Any Source	Lubrication.

(b) If torque plate installation is required:

1 Orient and install torque plate on axle flange with bolts, nuts, and washers. Torque to 160-190 in-lb (17.6 - 20.9 Nm).

2 Install wheel assembly. (Refer to 32-41)

Note: Dry film lubricants such as silicone spray should be applied to anchor bolts and torque plate bushings to assist sliding motion. Exercise care to verify that linings do not become contaminated with fluid or lubricant. For best service life, cylinders must slide freely in torque plate.

(c) Carefully slide anchor bolts secured to cylinder assembly into torque plate bushings.

(d) Position back plates between brake disk and wheel.

(e) *Serials 0002 thru 1739 before SB 2X-32-13:* Install bolts and washers securing back plates to cylinder assembly. Torque to 75 - 80 in-lb (8.5 - 9.1 Nm).

(f) *Serials 1740 & subs, 0002 thru 1739 after SB 2X-32-13:* Install bolts and washers securing back plates and shim to cylinder assembly. Torque to 90 in-lb (10.2 Nm).

(g) Uncap and attach hydraulic line to cylinder inlet fitting.

(h) Bleed the system. (Refer to 32-42)

(i) Install main gear fairings. (Refer to 32-10)

(j) Perform Adjustment/Test - Conditioning Procedure for Brake Linings. (Refer to 32-42)

(5) Inspection/Check - Brake Assembly

(a) Disassemble brake assembly. (Refer to 32-42)

(b) Check brake lining for deterioration and maximum permissible wear. Replace lining when worn to 0.100 inch (2.54 mm).

(c) Inspect brake cylinder bores for evidence of scoring and deterioration. If scored, replace brake caliper assembly.

(d) Using new O-rings, reassemble brake assembly. (Refer to 32-42)

C. Brake Linings (See Figure 32-421)

(1) Removal - Brake Linings

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Arbor Press	-	Any Source	Rivet removal.

(b) Remove brake assembly. (Refer to 32-42)

(c) Slide pressure plate over and off anchor pins secured to cylinder assembly.

(d) Using arbor press, remove rivets attaching lining to pressure plate.

(e) Using arbor press, remove rivets attaching lining to back plate.

(f) Separate lining from pressure plate and back plate.

(g) Clean pressure plate and back plate surfaces of dirt and grease.

(2) Installation - Brake Linings

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Silicon Spray	-	Any Source	Lubrication.

(b) Inspect pressure plate and back plates for excessive corrosion, visible damage, or excessive warping.

Note: Pressure plates should not be used if warped in excess of 0.010 inch (0.254 mm) flatness. Excessive warping can result in brake drag especially when new disk and linings are installed.

(c) Align new lining segments on pressure plate and back plates, and install rivets. Verify linings are tight and movement free with no distortion of parts.

(d) Clean dirt, grease, etc. from cylinder, pressure plate, and portions of pistons extending beyond cylinder face. Push pistons back into cylinder.

Note: Dry film lubricants such as silicone spray should be applied to anchor bolts and torque plate bushings to assist sliding motion. Exercise care to verify that linings do not become contaminated with fluid or lubricant. For best service life, cylinders must slide freely in torque plate.

(e) Install pressure plate with new linings facing away from pistons by sliding over anchor bolts. Verify pressure plate slides freely over anchor bolts.

(f) Install brake assembly. (Refer to 32-42)

(3) Adjustment/Test - Conditioning Procedure for Brake Linings

This conditioning procedure will generate sufficient heat to create a thin layer of glazed material at the lining friction surface. Normal brake usage should generate enough heat to maintain the glaze throughout the life of the lining. Light brake usage can cause the glaze to wear off, resulting in reduced brake performance. In such cases, the lining may be conditioned again following the instructions below.

(a) *Serials 0002 thru 1739 before SB 2X-32-13:* For organic brake linings:

1 Taxi airplane for 1500 feet with engine at 1700 RPM applying brake pedal force as needed to develop a 5-10 MPH taxi speed.

(b) *Serials 1740 & subs, 0002 thru 1739 after SB 2X-32-13:* For semi-metallic brake linings:

CAUTION: Do not allow the brake discs to cool substantially between the stops.

1 Perform two (2) consecutive full stop braking applications from 30 to 35 knots.

(c) Allow brakes to cool for 10-15 minutes.

(d) Apply brakes and check to see if a high throttle static run up may be held with normal pedal force. If so, conditioning is completed.

(e) If static run up cannot be held, repeat previous steps as needed to successfully complete test.

(4) Inspection/Check - Brake Linings

(a) Remove Main Gear Fairing. (Refer to 32-10)

(b) Check brake lining for deterioration and maximum permissible wear. Replace lining when worn to 0.100 inch (2.54 mm).

(c) Install Main Gear Fairing. (Refer to 32-10)

D. Brake Temperature Indicator - *Serials 1728 & subs, 0002 thru 1727 after SB 2X-32-14* **(See Figure 32-421)**

(1) Removal - Brake Temperature Indicator

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Scraper	-	Any Source	Remove indicator.
Isopropyl Alcohol	TT-I-735 Grade A or B	Any Source	Clean.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Using plastic scraper, remove temperature indicator from brake caliper assembly and discard.

(d) Using isopropyl alcohol, remove any remaining adhesive residue from brake caliper piston housing. (Refer to 20-30)

(2) Installation - Brake Temperature Indicator

(a) Clean dirt and oil from brake caliper piston housing.

(b) Using isopropyl alcohol, solvent clean installation location on brake caliper piston housing and surrounding area. (Refer to 20-30)

(c) Remove paper backing from temperature indicator, then press indicator firmly to installation location on brake caliper assembly.

(d) Install main gear fairing. (Refer to 32-10)

(3) Inspection/Check - Brake Temperature Indicator

(a) Wipe off any debris from temperature indicator that may obstruct inspection.

(b) At access hole on inboard main landing gear wheel fairing, locate temperature indicator installed on piston housing of brake caliper assembly.

(c) If temperature indicator is white, the brake assembly has not overheated. Temperature indicator replacement is not necessary.

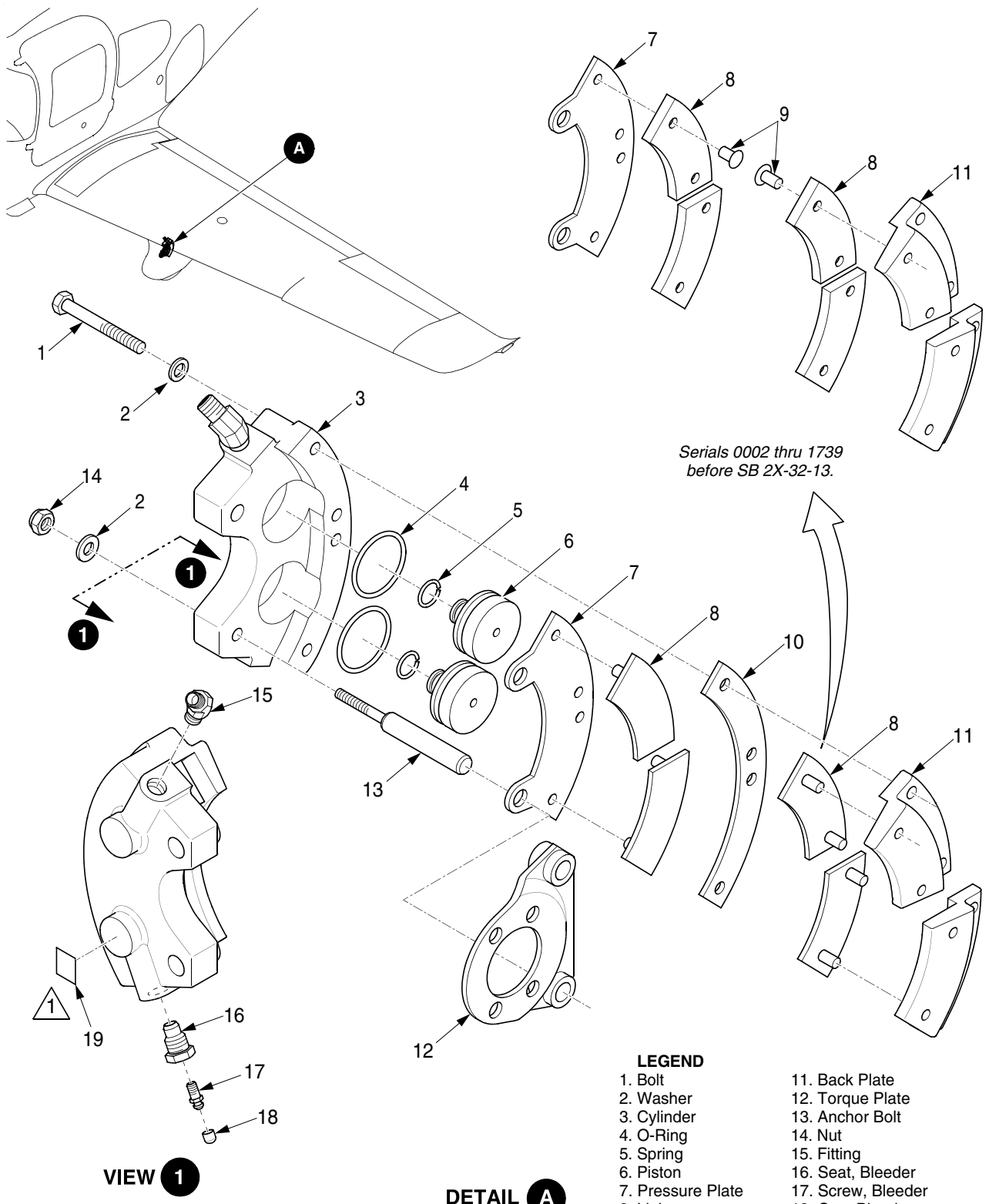
1 Verify temperature indicator is firmly adhered to piston housing.

(d) If temperature indicator is black, the brake assembly has overheated and temperature indicator must be replaced.

1 Disassemble brake assembly. Remove and discard O-rings and temperature indicator. (Refer to 32-42)

2 Perform Inspection/Check - Brake Linings. (Refer to 32-42)

3 Reassemble brake assembly with new O-rings and temperature indicator. (Refer to 32-42)



NOTE

1. If temperature indicator is black and/or shows signs of adhesion loss, replace the temperature indicator.

Figure 32-421
Brake Assembly

EFFECTIVITY:
All

E. Strut Assembly Brake Line - *Serials 0002 thru 2437* (See Figure 32-422)

(1) Removal - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Dead Blow Hammer	60515A4	McMaster Carr	Strut removal.
Plastic Wedge	5868A91	McMaster Carr	Strut removal.
Heat Gun	-	Any Source	Epoxy removal.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Cut and remove tie down securing brake line to lower strut.

(e) Loosen breeze clamp securing braided grounding strap to brake line.

(f) Disconnect and cap flexible brake line at upper end of strut.

(g) Disconnect brake line fitting from support bracket at upper end of strut.

(h) Disconnect flexible brake line at lower end of strut.

(i) Remove nuts and washers securing strut clamp to canted rib.

(j) Using the dead blow hammer, squarely strike upper side of strut near clamp fitting to move strut down and away from clamp fitting.

(k) Insert and drive plastic wedge into gap between clamp and fitting to free strut from clamp.

(l) Slide grommet down strut to brake assembly.

WARNING: **Verify no fuel leaks or fuel residue are present before applying heat to strut.**

CAUTION: The adhesive securing the brake line to the strut does not require a high degree of heat to disbond. Heat the adhesive to the point where it is slightly hot to the touch.

CAUTION: To protect the composite wing skin from heat damage, place a barrier on the wing skin such as a welding blanket, high temperature mat, or damp cloth before applying heat to the upper section of the strut near the wing skin.

(m) Apply heat to epoxy bonding brake line to strut channel. As epoxy heats and softens, pull brake line free from strut channel. Discard brake line.

(2) Installation - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Epoxy removal.
Sandpaper	80 Grit	Any Source	Remove epoxy.
5 Minute® Epoxy	-	Any Source	Secure brake line.

CAUTION: Do not use power tools to remove epoxy.

Do not cut or gouge strut laminate when removing epoxy.

(b) Using a putty knife and sandpaper, remove epoxy from strut channel.

(c) Mark the position where the lower fitting on the newly installed brake line should be positioned:

1 At bottom, aft edge of strut, measure 8.9 inches (22.6 cm) up and make a perpendicular reference line across strut face with pencil.

(d) Test fit new brake line:

1 Place new brake line into upper support bracket and position to strut assembly.

2 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.

3 Verify flare on lower section of brake line aligns with reference mark on strut.

(e) Solvent clean strut channel with isopropyl alcohol.

(f) Solvent clean brake line with isopropyl alcohol.

(g) Mix approximately 12.5 grams of epoxy.

CAUTION: Place a drop cloth over wheel assembly to protect assembly from dripping epoxy.

(h) Using wooden applicator, fill strut channel with epoxy until epoxy is flush with top of strut channel.

(i) Install new brake line:

1 Position brake line into upper support bracket, insert brake line into strut channel, and position brake line so flare on lower section of brake line aligns with reference mark on strut.

2 Firmly press brake line into strut channel.

3 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), seat brake line completely into strut channel so that top radius of brake line is flush with top of strut channel. Use a wooden applicator to spread epoxy over brake line

4 Where brake line enters and exits strut channel, use a wooden applicator to spread epoxy over and around brake line.

5 Wet a clean, lint free cotton cloth in isopropyl alcohol and clean up epoxy. Leave a thin coat of epoxy over top of brake line.

6 Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line. (See Figure 01, Note 3)

7 Allow epoxy to cure for 2 hours.

(j) Slide grommet up strut to canted rib strut fitting.

(k) Move strut assembly up and towards strut fitting.

(l) Position clamp fitting over grommet and install washers and nuts securing clamp fitting to canted rib fitting. Torque to 150.0 in-lb (16.9 Nm).

(m) Connect flexible brake line at lower end of strut.

(n) Connect brake line fitting to support bracket at upper end of strut.

(o) Connect flexible brake line at upper end of strut.

(p) Position breeze clamp around braided grounding strap and fasten to brake line.

(q) Install tie down securing brake line to lower strut.

(r) Remove jacks and lower airplane. (Refer to 07-10)

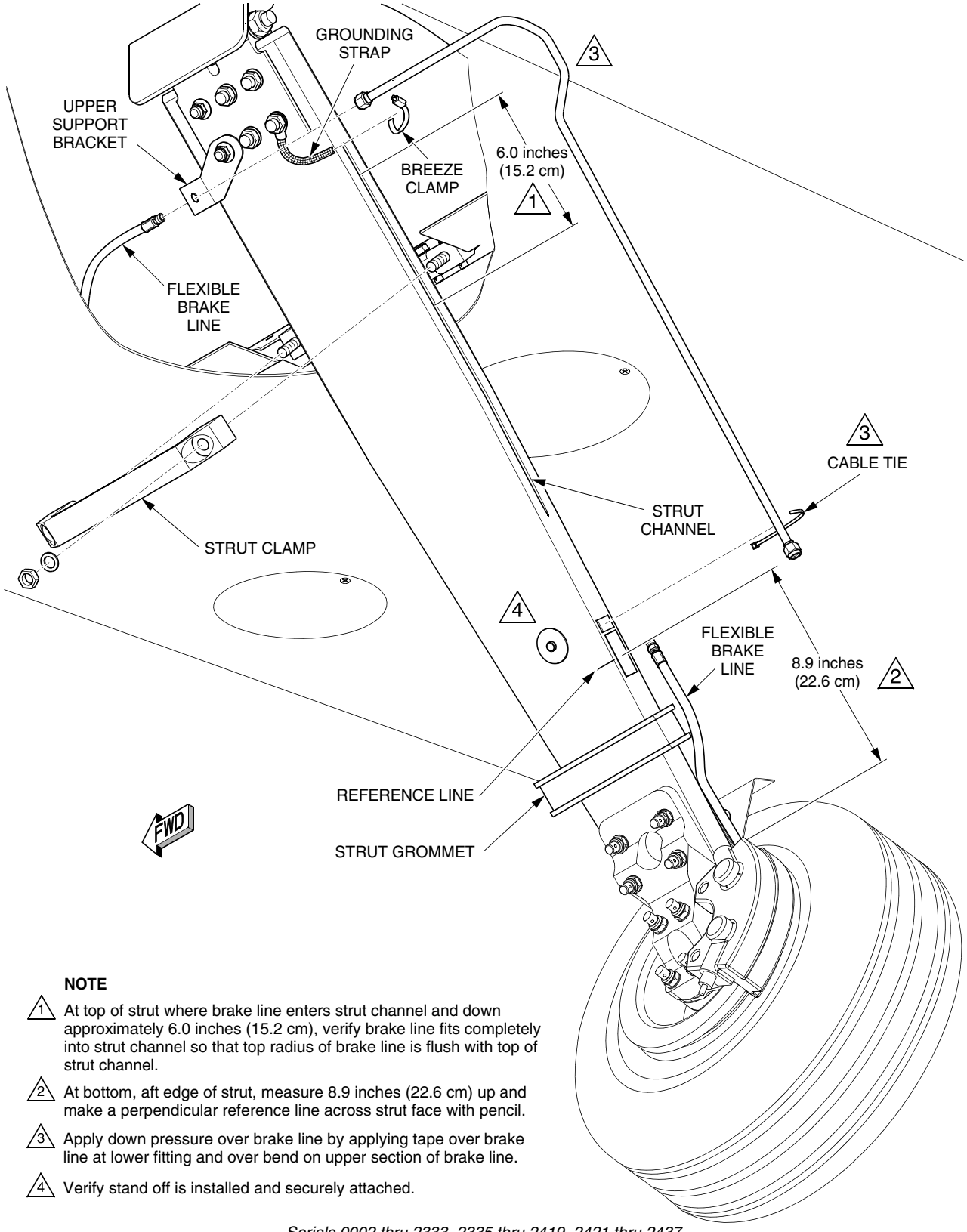
(s) Final torque bolts securing strut(s) to canted rib(s) to 160.0-190.0 in-lb (18.1- 21.5 Nm)

(t) Fill brake system. (Refer to 12-10)

(u) Bleed brake system. (Refer to 32-42)

(v) Verify strut stand-off used to secure lower strut fairing to strut is installed and securely attached.

(w) Install main gear fairings. (Refer to 32-10)



NOTE

1. At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.
2. At bottom, aft edge of strut, measure 8.9 inches (22.6 cm) up and make a perpendicular reference line across strut face with pencil.
3. Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line.
4. Verify stand off is installed and securely attached.

Serials 0002 thru 2333, 2335 thru 2419, 2421 thru 2437.

SR22_MM32_1863B

Figure 32-422
Strut Assembly Brake Line - Serials 0002 thru 2437

F. Strut Assembly Brake Line - *Serials 2438 & subs* (See Figure 32-423)

(1) Removal - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Plastic Dead Blow Hammer	60515A4	McMaster Carr	Strut removal.
Plastic Wedge	5868A91	McMaster Carr	Strut removal.
Heat Gun	-	Any Source	Epoxy removal.

(b) Remove main gear fairing. (Refer to 32-10)

(c) Raise airplane on jacks. (Refer to 07-10)

(d) Remove tie down securing brake line to lower strut.

(e) Remove tie down securing braided grounding strap to brake line.

(f) Remove bolt, washers, and nut securing lightning protection wire to lateral wing rib.

(g) Disconnect and cap brake line at strut upper end.

(h) At strut upper end, remove bolt, washer, and clamp securing brake line to bracket.

(i) Disconnect and cap brake line at strut lower end.

(j) Remove nuts, washers, bolts, and clamp securing strut assembly to lower attach fitting.

CAUTION: When removing strut from lower attach bracket, use caution to prevent damaging upper strut fitting and upper attach bracket.

(k) If necessary, gently tap upper side of strut with a dead blow hammer to move strut away from lower attach fitting.

(l) Slide grommet down strut to brake assembly.

WARNING: **Verify no fuel leaks or fuel residue are present before applying heat to strut.**

CAUTION: The adhesive securing the brake line to the strut does not require a high degree of heat to disbond. Heat the adhesive to the point where it is slightly hot to the touch.

CAUTION: To protect the composite wing skin from heat damage, place a barrier on the wing skin such as a welding blanket, high temperature mat, or damp cloth before applying heat to the upper section of the strut near the wing skin.

(m) Apply heat to epoxy bonding brake line to strut channel. As epoxy heats and softens, pull brake line free from strut channel. Discard brake line.

(2) Installation - Strut Assembly Brake Line

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Putty Knife	-	Any Source	Epoxy removal.
Sandpaper	80 Grit	Any Source	Remove epoxy.
5 Minute® Epoxy	-	Any Source	Secure brake line.

CAUTION: Do not use power tools to remove epoxy.

Do not cut or gouge strut laminate when removing epoxy.

(b) Using a putty knife and sandpaper, remove epoxy from strut channel.

(c) Mark position where lower fitting on newly installed brake line should be positioned.

1 At bottom, aft edge of strut, measure 8.6 inches (21.8 cm) up and make a perpendicular reference line across strut face with pencil.

(d) Test fit new brake line.

1 Align flare on lower section of brake line with reference mark on strut.

2 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.

(e) Solvent clean strut channel with isopropyl alcohol.

(f) Solvent clean brake line with isopropyl alcohol.

(g) Mix approximately 12.5 grams of epoxy.

CAUTION: Place a drop cloth over wheel assembly to protect assembly from dripping epoxy.

(h) Using wooden applicator, fill strut channel with epoxy until epoxy is flush with top of strut channel.

(i) Install new brake line.

1 Insert brake line into strut channel, and position brake line so flare on lower section of brake line aligns with reference mark on strut.

2 Firmly press brake line into strut channel.

3 At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), seat brake line completely into strut channel so that top radius of brake line is flush with top of strut channel. Use a wooden applicator to spread epoxy over brake line.

4 Where brake line enters and exits strut channel, use a wooden applicator to spread epoxy over and around brake line.

5 Wet a clean, lint free cotton cloth in isopropyl alcohol and clean up epoxy. Leave a thin coat of epoxy over top of brake line.

6 Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line. (See Figure 01, Note 3)

7 Allow epoxy to cure for 2 hours.

(j) Slide grommet up strut to lower attach fitting.

(k) Move strut assembly up and towards lower attach fitting.

(l) Position clamp to lower attach fitting and secure with bolts, washers, and nuts.

(m) Connect brake line at strut lower end.

(n) At strut upper end, position brake line to bracket and secure with bolt, washer, and clamp.

(o) Connect brake line at strut upper end.

(p) Position lightning protection wire to lateral wing rib and secure with bolt, washers, and nut.

(q) Position braided grounding strap to brake line and secure with cable tie.

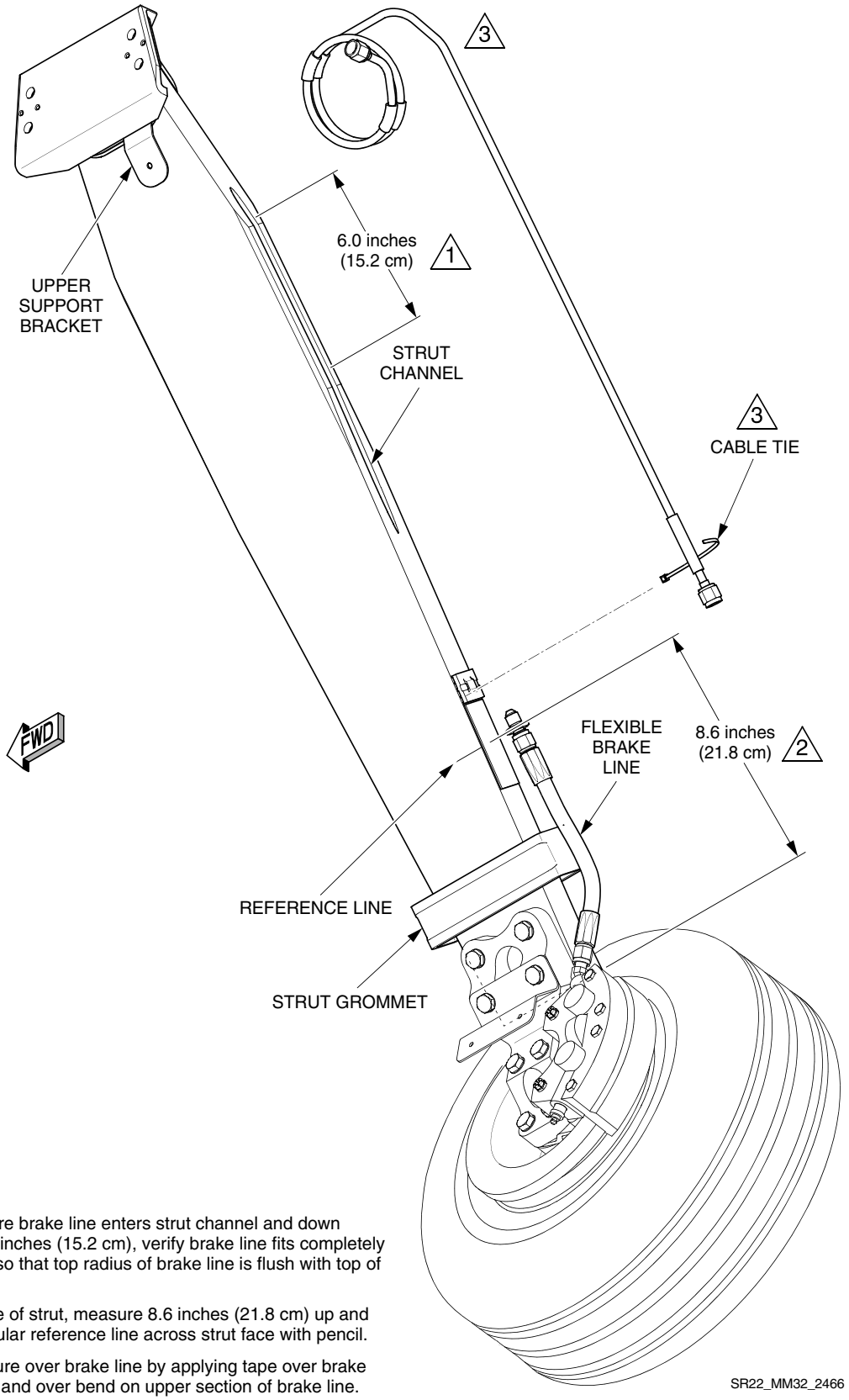
(r) Install cable tie securing brake line to lower strut.

(s) Remove jacks and lower airplane. (Refer to 07-10)

(t) Fill brake system. (Refer to 12-10)

(u) Bleed brake system. (Refer to 32-42)

(v) Install main gear fairings. (Refer to 32-10)



NOTE

1. At top of strut where brake line enters strut channel and down approximately 6.0 inches (15.2 cm), verify brake line fits completely into strut channel so that top radius of brake line is flush with top of strut channel.
2. At bottom, aft edge of strut, measure 8.6 inches (21.8 cm) up and make a perpendicular reference line across strut face with pencil.
3. Apply down pressure over brake line by applying tape over brake line at lower fitting and over bend on upper section of brake line.

Figure 32-423
Strut Assembly Brake Line - Serials 2438 & subs

G. Brake Master Cylinder (See Figure 32-424)

(1) Removal - Brake Master Cylinder

(a) Drain hydraulic fluid from brake system.

(b) Remove cotter pins and washers from rudder pedal pivot tubes.

(c) Slide rudder pedal pivot tube from bearing.

(d) Detach rudder pedals from torque tube weldment.

(e) Disconnect hoses from master cylinders. Cap or plug ports and hoses.

(f) Remove cotter pins, washers, and clevis pins from upper connection at rudder pedals of each master cylinder.

(g) Pull rudder pedal aft and remove cotter pins, washers, spacers, and clevis pins at floorboard mounting points and remove master cylinder.

(2) Installation - Brake Master Cylinder

(a) Place master cylinders on floorboard mounting points, install clevis pins, and secure with washers, spacers, and cotter pins.

(b) Connect brake hoses to master cylinders. Upper port is inlet, lower port is outlet.

(c) Connect piston rod clevis to upper connection at rudder pedals and install washers, clevis pins, and cotter pins.

(d) Place rudder pedals in proper alignment with torque tube weldment and install rudder pedal pivot tubes, washers, and cotter pins.

H. Parking Brake Valve (See Figure 32-424)

(1) Removal - Parking Brake Valve

(a) With parking brake knob in OFF position, drain hydraulic fluid from brake system.

(b) Remove LH crew seat. (Refer to 25-10)

(c) Remove LH kick plate. (Refer to 25-10)

(d) Disconnect brake lines and hoses from parking brake valve. Cap or plug ports, lines, and hoses.

(e) Remove cotter pin, washers, and clevis pin securing control cable to parking brake valve actuation arm.

(f) Remove bolts, washers, and nuts securing parking brake valve to outboard console rib. Remove parking brake valve from airplane.

(2) Installation - Parking Brake Valve

(a) Position parking brake valve to outboard console rib with actuation arm adjacent to firewall and brake line fittings oriented towards fuselage floor. Secure with bolts, washers, and nuts.

(b) Remove caps from ports, lines, and hoses.

(c) Connect LH brake line to forward inlet on parking brake valve.

(d) Connect RH brake line to aft inlet on parking brake valve.

CAUTION: Do not cross LH and RH brake hoses.

(e) Connect brake hose from LH master cylinders to forward outlet on parking brake valve.

(f) Connect brake hose from RH master cylinders to aft outlet on parking brake valve.

(g) Install clevis pin, washers, and cotter pin securing control cable to parking brake valve actuation arm.

(h) Perform Inspection/Check - Parking Brake Control Cable. (Refer to 32-42)

(i) Bleed brake system. (Refer to 32-42)

(j) Install LH kick plate. (Refer to 25-10)

(k) Install LH crew seat. (Refer to 25-10)

I. Parking Brake Control Cable (See Figure 32-424)

(1) Removal - Parking Brake Control Cable

(a) Remove LH crew seat. (Refer to 25-10)

(b) Remove LH kick plate. (Refer to 25-10)

(c) Remove cotter pin, washers, and clevis pin securing control cable to parking brake actuation arm.

(d) Remove bolt, washer, and clamp securing control cable to firewall.

(e) Cut cable tie(s) securing control cable to firewall.

(f) *Serials 0002 thru 0794, 0796 thru 0819:* Remove screw, clamp, washer, and nut securing control cable to support bracket on inboard console rib.

(g) *Serials 0795, 0820 & subs:* Remove screw, clamp, washer, and nut securing control cable to inboard console rib.

(h) Remove nut and washer securing control cable knob to mid console mounting bracket.

CAUTION: Remove control cable carefully, ensuring cable does not interfere with any flight controls, brake hoses, or wiring.

Note: Note routing of control cable prior to removal to facilitate reinstallation.

(i) Pull control cable through installation hole in mid console mounting bracket. Remove control cable from airplane.

(2) Installation - Parking Brake Control Cable

(a) Acquire necessary tools, equipment, and supplies.

Description	P/N or Spec.	Supplier	Purpose
Loctite®	222	Any Source	Cable stop installation.

(b) Route control cable through installation hole in mid-console mounting bracket and secure with washer and nut.

CAUTION: Verify control cable does not interfere with or rub against any flight controls, brake hoses, or wiring.

(c) Route control cable through inboard console rib, across firewall, over outboard console rib, and down to parking brake valve.

(d) Install clevis pin and washers through parking brake valve actuation arm.

(e) Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

(f) Install cotter pin securing control cable to parking brake valve actuation arm.

(g) Install cable stop.

1 Place parking brake valve actuation arm in OFF position.

2 Apply Loctite to threads of cable stop installation screw.

3 Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop and 0.2 inch (0.5 cm) of cable wire is visible between bottom of cable stop and top of actuation arm. (See Figure 32-424)

4 Install screw securing cable stop to control cable wire.

(h) Install bolt, washer, and clamp securing control cable to firewall. Do not tighten bolt.

(i) With parking brake control knob in OFF position, push cable sheath down so that parking brake valve is in OFF position. Tighten bolt securing control cable and clamp to firewall.

(j) *Serials 0002 thru 0794, 0796 thru 0819:* Install screw, clamp, washer, and nut securing control cable to support bracket on inboard console rib.

(k) *Serials 0795, 0820 & subs:* Install screw, clamp, washer, and nut securing control cable to inboard console rib.

(l) Install cable tie(s) securing control cable to firewall.

(m) Install LH kick plate. (Refer to 25-10)

(n) Install LH crew seat. (Refer to 25-10)

(3) Adjustment/Test - Parking Brake Control Cable

(a) Remove bolt, washer, and clamp securing control cable to firewall.

(b) Remove cotter pin, washers, and clevis pin securing control cable to parking brake actuation arm.

(c) Cut coils securing control cable to clevis pin.

(d) Install clevis pin and washers through parking brake valve actuation arm.

(e) Position cable stop on control cable.

(f) Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

(g) Install cotter pin securing control cable to parking brake valve actuation arm.

(h) Adjust and secure cable stop.

1 Place parking brake valve actuation arm in OFF position.

2 Apply Loctite to threads of cable stop installation screw.

3 Position cable stop so 1.8 inch (4.6 cm) of cable wire is visible between end of cable sheath and top of cable stop and 0.2 inch (0.5 cm) of cable wire is visible between bottom of cable stop and top of actuation arm. (See Figure 32-424)

4 Install screw securing cable stop to control cable wire.

(i) Install bolt, washer, and clamp securing control cable to firewall. Do not tighten bolt.

(j) With parking brake control knob in OFF position, push cable sheath down so that parking brake valve is in OFF position. Tighten bolt securing control cable and clamp to firewall.

(4) Inspection/Check - Parking Brake Control Cable

(a) Remove LH crew seat. (Refer to 25-10)

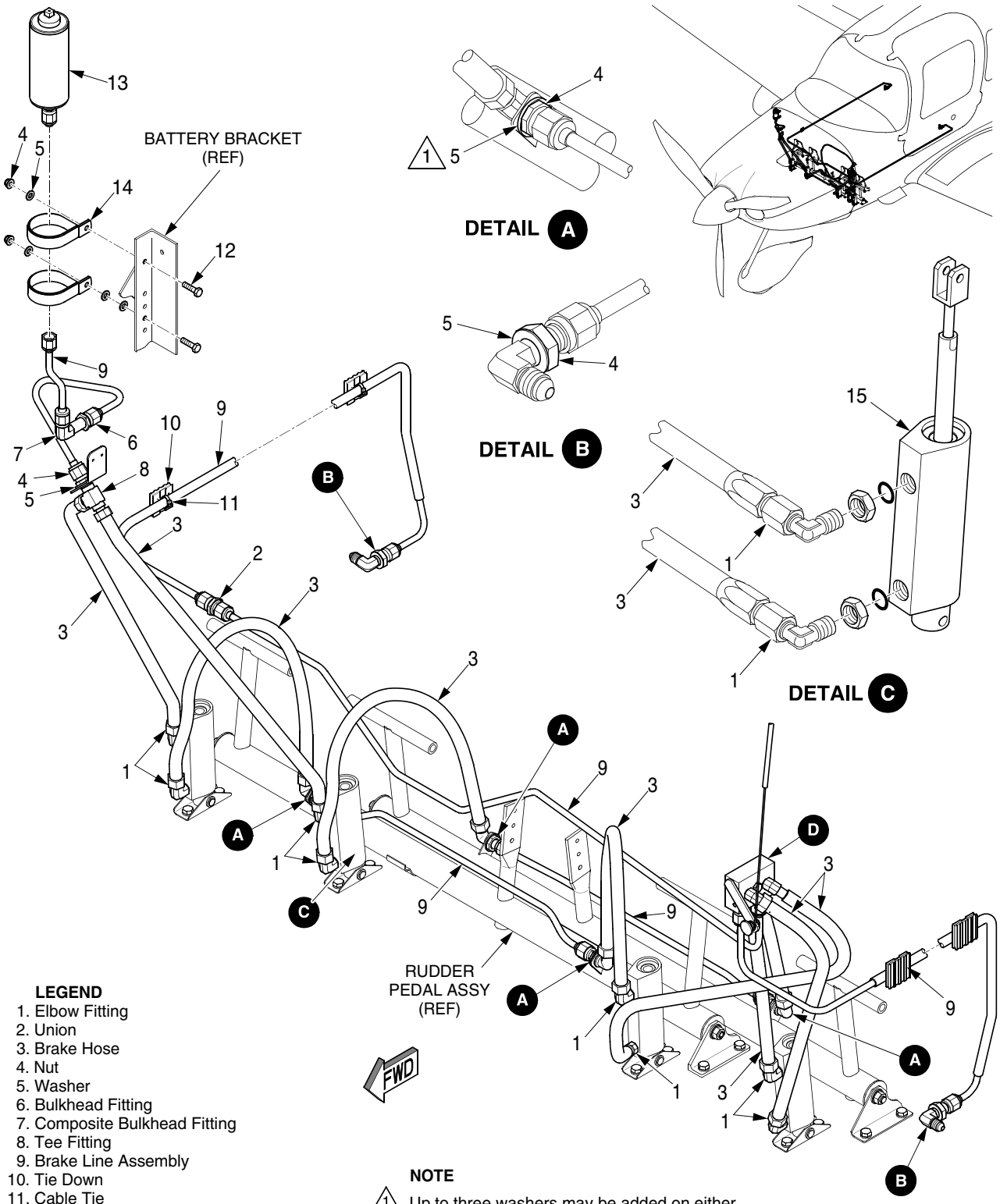
(b) Remove LH kick plate. (Refer to 25-10)

(c) Verify length of control cable wire between parking brake valve actuation arm and cable stop is equal to 0.5 inch (1.3 cm) or less. If control cable wire meets tolerance, the control cable is adjusted correctly.

(d) If length of control cable wire between actuation arm and cable stop exceeds 0.5 inch (1.3 cm), perform Adjustment/Test - Parking Brake Control Cable. (Refer to 32-42)

(e) Install LH kick plate. (Refer to 25-10)

(f) Install LH crew seat. (Refer to 25-10)



LEGEND

1. Elbow Fitting
2. Union
3. Brake Hose
4. Nut
5. Washer
6. Bulkhead Fitting
7. Composite Bulkhead Fitting
8. Tee Fitting
9. Brake Line Assembly
10. Tie Down
11. Cable Tie
12. Bolt
13. Brake Fluid Reservoir
14. Clamp
15. Brake Master Cylinder

NOTE

1. Up to three washers may be added on either side of tab to adjust fit of brake line connection.

Serials 0002 thru 2333, 2335 thru 2419, 2421 thru 2437.

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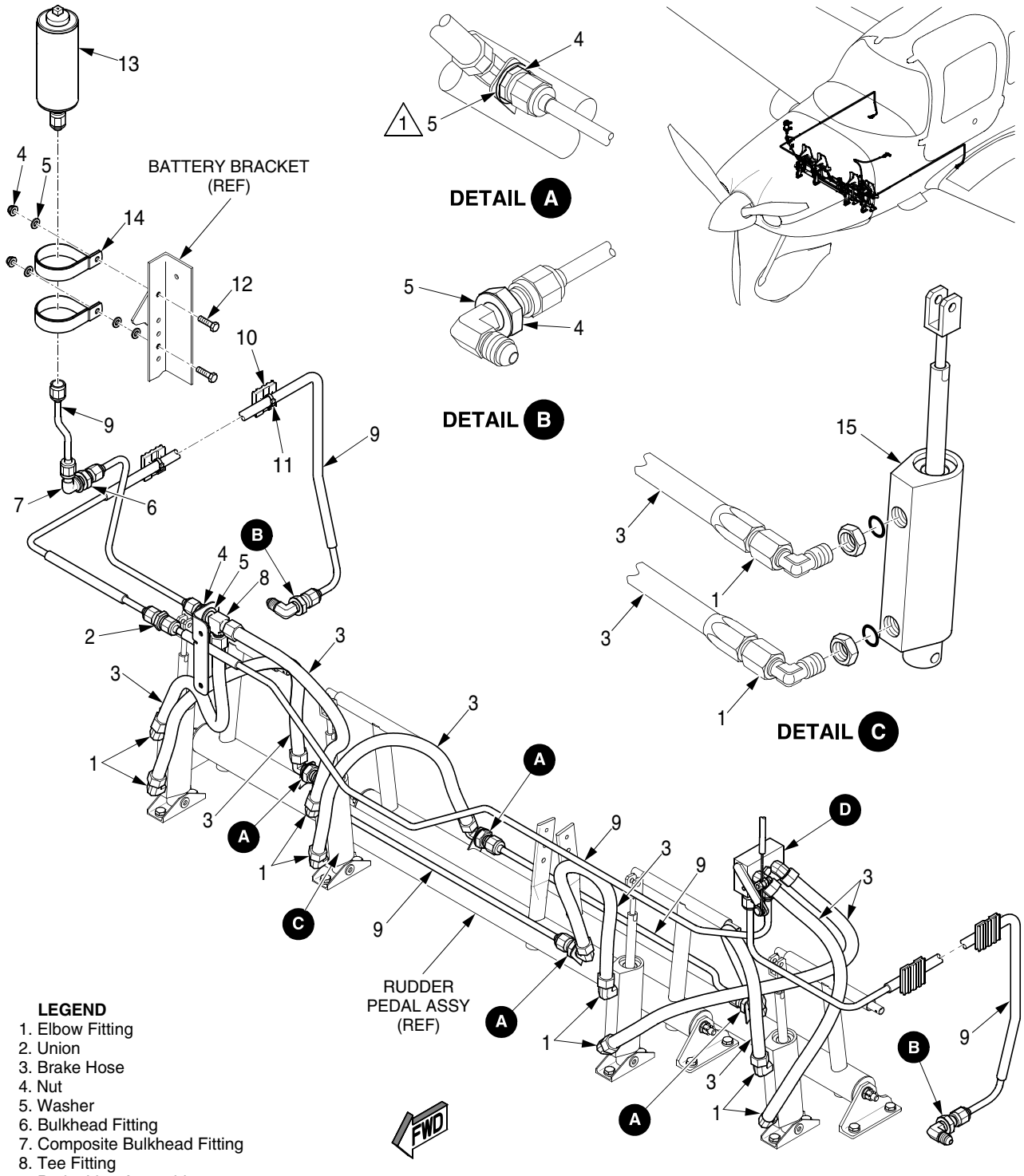
Figure 32-424
Cabin Brake System - *Serials 0002 thru 2437* (Sheet 1 of 3)

EFFECTIVITY:
Serials 0002 thru 2437



LEGEND

1. Elbow Fitting
2. Union
3. Brake Hose
4. Nut
5. Washer
6. Bulkhead Fitting
7. Composite Bulkhead Fitting
8. Tee Fitting
9. Brake Line Assembly
10. Tie Down
11. Cable Tie
12. Bolt
13. Brake Fluid Reservoir
14. Clamp
15. Brake Master Cylinder

NOTE

1. Up to three washers may be added on either side of tab to adjust fit of brake line connection.

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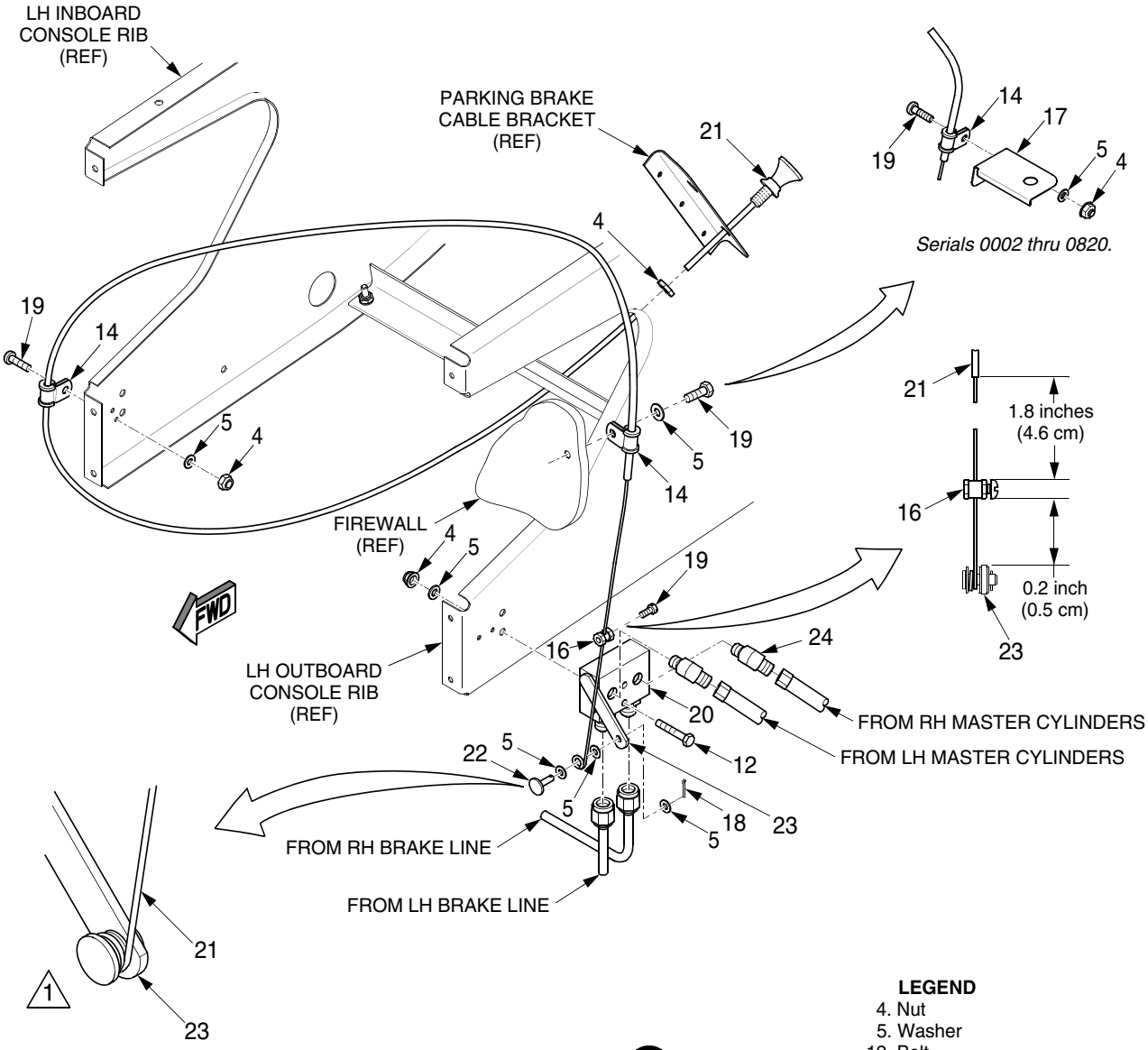
Figure 32-424
Cabin Brake System - *Serials 2438 & subs* (Sheet 2 of 3)



DETAIL D

LEGEND

4. Nut
5. Washer
12. Bolt
14. Clamp
16. Cable Stop
17. Bracket
18. Cotter Pin
19. Screw
20. Parking Brake Valve
21. Parking Brake Cable Assy
22. Clevis Pin
23. Actuation Arm
24. 45 Deg. Elbow Fitting

NOTE

1 Secure control cable to parking brake valve actuation arm by wrapping control cable 1-2 turns around clevis pin.

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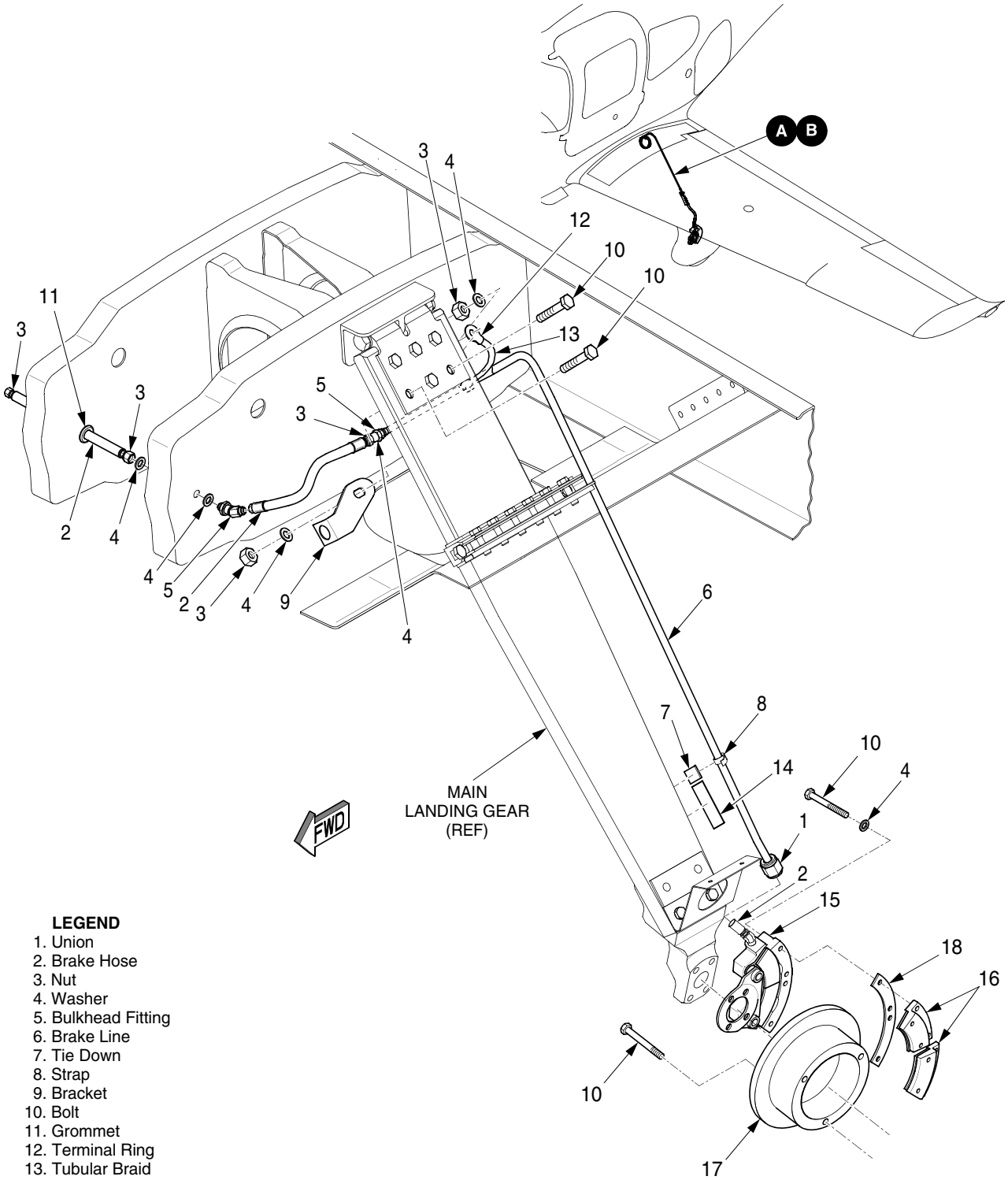
Figure 32-424
Cabin Brake System (Sheet 3 of 3)



LEGEND

1. Union
2. Brake Hose
3. Nut
4. Washer
5. Bulkhead Fitting
6. Brake Line
7. Tie Down
8. Strap
9. Bracket
10. Bolt
11. Grommet
12. Terminal Ring
13. Tubular Braid
14. Rubber Sheet
15. Brake Assembly
16. Back Plate Assembly
17. Brake Disc
18. Shim

Serials 0002 thru 2333, 2335 thru 2419, 2421 thru 2437.

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Figure 32-425
Landing Gear Brake System - *Serials 0002 thru 2437* (Sheet 1 of 2)

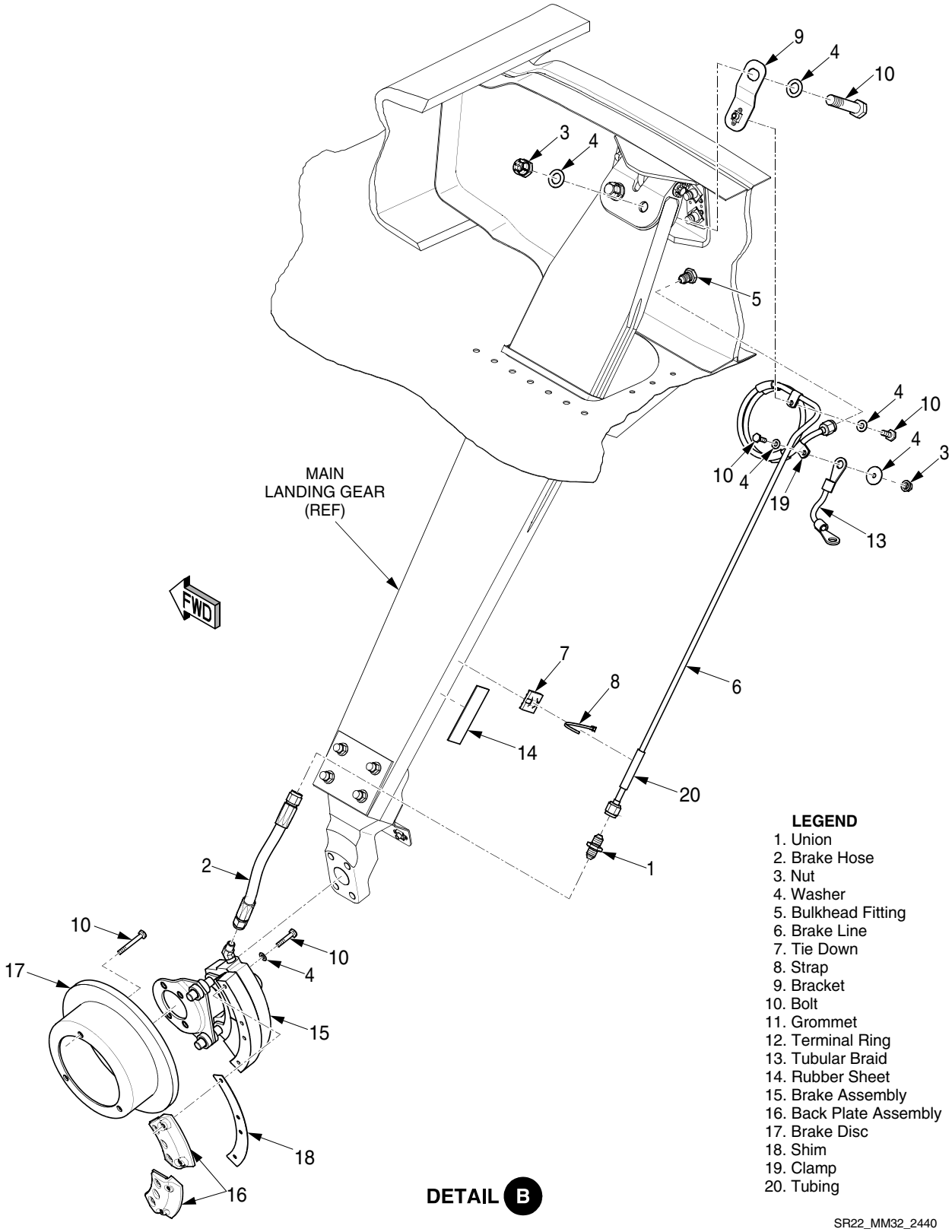


Figure 32-425
Landing Gear Brake System - *Serials 2438 & subs* (Sheet 2 of 2)

EFFECTIVITY:
Serials 2438 & subs

J. Bleeding the Brake System (See Figure 32-426)

If a brake line has been disconnected or the brake pedal has a “spongy” feel, there is a strong likelihood that air has entered the brake system. To ensure proper braking, all trapped air must be removed from the brake system.

(1) Adjustment/Test - Bleeding the Brake System

(a) Acquire necessary tools and equipment.

Description	P/N or Spec.	Supplier	Purpose
Hydraulic Fluid	MIL-H-5606	Any Source	Replenish brake system.
Pressurized Brake Bleeder	7300 (or equivalent)	Ammco Tools La Vergne, TN 37086 615-641-7533	Pressurize brake system.
Tubing	-	Any Source	Drain brake fluid.
Fitting	AN816-4D	Any Source	Connect overflow tubing to brake fluid reservoir.
Hose Clamps	-	Any Source	Secure tubing to fittings.

(b) Remove main gear fairings. (Refer to 32-10)

(c) Place wheel chocks into position.

(d) Disengage parking brake.

(e) Fill brake bleeder with approved hydraulic fluid.

(f) Remove plug from top of brake fluid reservoir.

(g) Install attach fitting to top of brake fluid reservoir, connect overflow tubing, and position end of tubing into empty one gallon container.

(h) Remove cap from brake caliper bleeder valve.

(i) Loosen brake caliper bleeder valve.

(j) Connect tubing from brake bleeder to fittings on bottom of brake caliper. Secure tubing with hose clamps.

(k) Connect air source to brake bleeder and slowly pressurize tank until pressure reaches approximately 15 psi.

(l) Open feed valve on brake bleeder to check brake system and tubing for leaks.

(m) Raise pressure to approximately 30 psi.

(n) Using a rubber mallet, lightly tap on caliper to release air from inside caliper.

Note: Pumping the brake pedals is not necessary when bleeding brakes with pressurized system.

(o) Slightly “jiggle” rudder pedals to release air from inside the master cylinders.

(p) Continue to “jiggle” rudder pedals and tap on caliper until brake system is free of air and no bubbles are present in overflow tubing.

(q) Close feed valve on brake bleeder, and depressurize tank by removing air source.

(r) Remove hose clamps securing tubing from brake bleeder to fittings on caliper. Cap off tubing to prevent contamination.

(s) Torque brake bleeder valve to 40 - 50 in-lb (4.5 - 5.6 Nm). Install cap over bleeder valve.

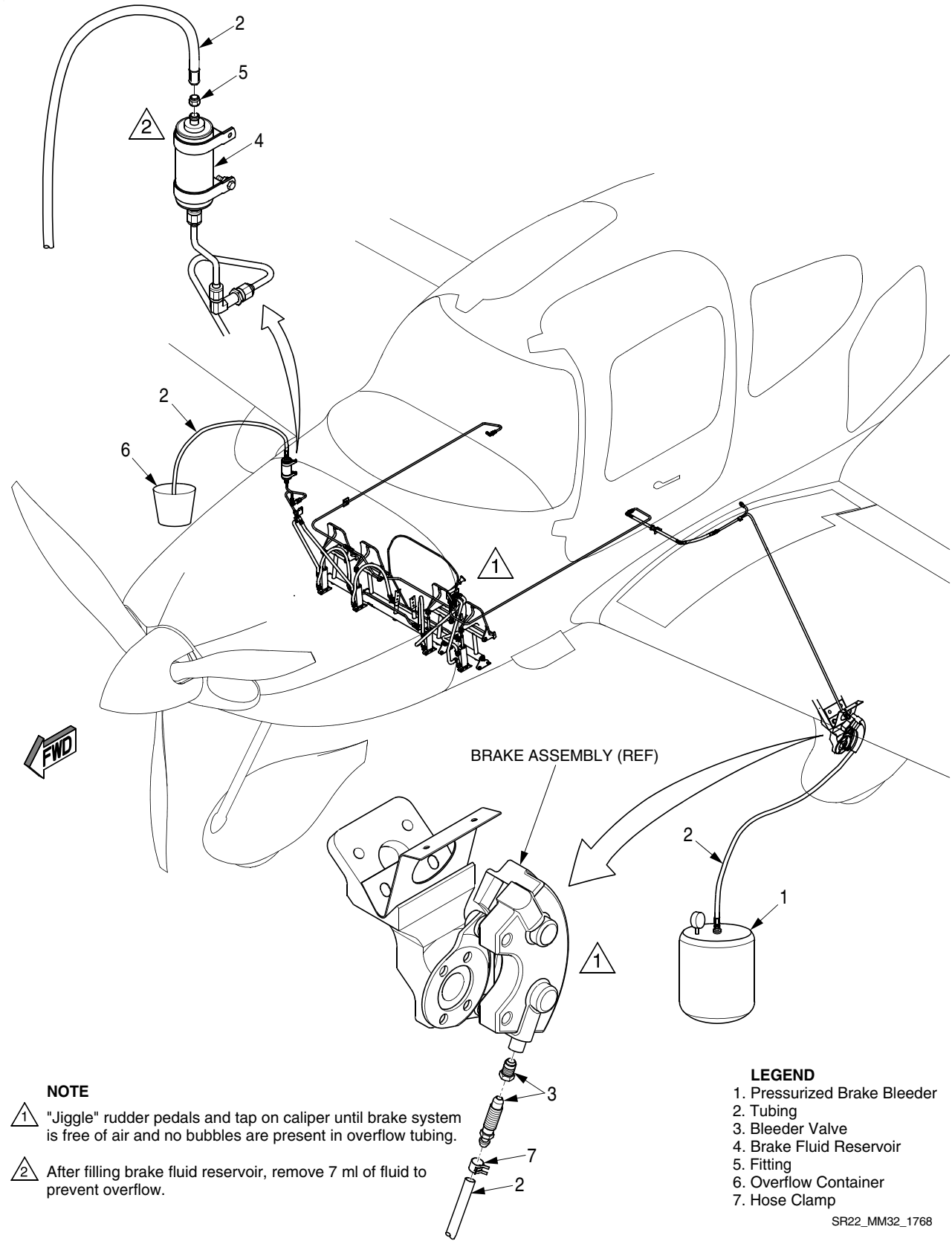
(t) Repeat procedure for opposite side.

(u) Remove overflow tubing from brake fluid reservoir. Cap off tubing to prevent contamination.

(v) After filling brake fluid reservoir, use a syringe to remove 7 ml of fluid to prevent overflow.

(w) Install plug into top of brake fluid reservoir.

(x) Install main gear fairings. (Refer to 32-10)



NOTE

1. "Jiggle" rudder pedals and tap on caliper until brake system is free of air and no bubbles are present in overflow tubing.
2. After filling brake fluid reservoir, remove 7 ml of fluid to prevent overflow.

LEGEND

1. Pressurized Brake Bleeder
2. Tubing
3. Bleeder Valve
4. Brake Fluid Reservoir
5. Fitting
6. Overflow Container
7. Hose Clamp

SR22_MM32_1768

Figure 32-426
Bleeding the Brake System

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