FREON AIR CONDITIONING - MAINTENANCE PRACTICES

1. General Precautions

A. Handling Freon.

NOTE: The effect of the Montreal Protocol and U. S. Environmental Protection Agency's Clean Air Act of 1990 is to ban the unnecessary release of CFC-12 refrigerant (also known as R-12) into the atmosphere. In compliance with the preceding, Cessna Aircraft recommends the refrigerant be captured and recycled. For additional information, refer to Federal Clean Air Act, EPA 40 CFR Part 82.

WARNING: Liquid R-12 at normal atmospheric pressure and temperature will freeze anything it contacts. The eyes are especially susceptible to damage. Safety glasses are the absolute minimum protection and shall be worn at all times when servicing the Freon system.

WARNING: Do not attempt to treat yourself, should any liquid refrigerant get into the eyes. Follow these instructions: Do not rub the eye. Splash large quantities of cool water into the eye to raise the temperature. Apply a few drops of mineral oil to the eye to wash it, followed by a weak solution of boric acid to flush out all of the oil. Seek the aid of a doctor immediately.

(1) Observe safety precautions when handling refrigerant or servicing and performing maintenance on air conditioning system.

(2) Use of protective clothing, gloves and goggles will protect the skin and eyes.

B. General system notes.

NOTE: Cleanliness is of the utmost importance to avoid system contamination and useless wear to the compressor and other equipment items. All plumbing and hoses shall be cleaned and capped after fabrication and shall remain capped during storage and installation until connected to their mating components. All ports shall also be capped with clean caps or plugs. During the time components are open, extreme care shall be exercised to assure that no contaminating matter enters the parts or system. The receiver/dryer is easily contaminated with moisture from the atmosphere. All care shall be exercised to prevent moisture from entering the receiver/dryer.

C. Removing hoses under pressure.

WARNING: Do not remove hoses under pressure. This procedure will result in the release of refrigerant into the atmosphere. Removing hoses under pressure may also result in personal injury if hose ends are not restrained.

D. Use of intense heat.

WARNING: To avoid explosion, never weld, use a blow torch, steam clean, bake aircraft finish or use excess amounts of heat on or in the immediate area of any part of the air conditioning system or refrigerant supply tank, while they are closed to atmosphere, charged or not. Although R-12 gas, under normal conditions, is nonpoisonous, the discharge of refrigerant gas near a flame can produce a very poisonous gas (phosgene). This gas will also attack all bright metal surfaces.

WARNING: Do not use a flame-type leak detector because of fire hazard on airplanes and production of minor amounts of phosgene gas.

WARNING: Do not smoke in the vicinity of refrigerant discharge. Inhaling refrigerant through burning tobacco will produce a poisonous gas like an open flame.

E. Use of nitrogen.

NOTE: All nitrogen pressure checks are to be made only with regulated nitrogen.

2. Compressor Removal/Installation

A. Remove Compressor (Refer to Figure 201).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Disconnect electrical connector from compressor.

(3) Unscrew discharge service valve from compressor.

(4) Cap discharge service valve and compressor fitting.

(5) Unscrew suction service valve from compressor.

(6) Cap suction service valve and compressor fitting.

(7) Release tension on compressor by loosening nut and bolt at bottom of support plate.

(8) Remove clips from turnbuckle and loosen turnbuckle.

(9) Remove turnbuckle from compressor.

(10) Remove nut, bolt and washer from bottom of support plate.

(11) Remove belt from compressor.

(12) Remove compressor from airplane.

NOTE: For compressor refurbishing procedures, refer to vendor's component maintenance manual.

(13) If compressor is being replaced, perform the following steps:

(a) Remove oil plug and drain compressor oil into measuring cup. Record amount of oil removed.

B. Install Compressor (Refer to Figure 201).

(1) If new compressor is being installed, perform the following steps:

(a) Drain oil from new compressor.

NOTE: Compressors are shipped from the factory with approximately 6.0 ounces of fluid. This fluid should be drained, discarded and replaced before compressor is attached to airplane.

CAUTION: Do not leave compressor oil containers uncapped. Open containers of refrigerant oil absorb moisture rapidly.

CAUTION: Do not operate system without refrigerant oil in compressor.

(b) Determine amount of oil removed from old compressor and add 1.0 ounce to this measurement. Add this amount of new, uncontaminated compressor oil to new compressor. Refer to Air Conditioning - General for a list of approved compressor oils.

(c) Reinstall drain plug.

(2) Attach compressor to support assembly using nut, bolt and washer. Do not tighten.

(3) Lift up on compressor far enough to position belt around compressor pulley.

(4) Connect turnbuckle to adjuster plate using nut, washer and bolt.

(5) Adjust compressor belt tension. Refer to Compressor Drive Belt Removal/Adjustment.

(6) Remove protective caps from discharge and suction service valves and reconnect lines to compressor.

(7) Connect electrical connector to compressor.

(8) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

3. Compressor Drive Unit Removal/Installation

A. Remove and Disassemble Compressor Drive Unit (Refer to Figure 202).

(1) Remove compressor. Refer to Compressor Removal/Installation.

(2) Remove drive belt. Refer to Compressor Drive Belt Removal/Adjustment.

(3) Loosen and disconnect drain hose from elbow at bottom of support assembly.

(4) Cut safety wire and remove bolts and washers securing support assembly to engine. Note position of shims for later reassembly.

(5) Carefully pull entire support assembly aft to disengage drive shaft from engine. Discard gasket.

(6) If disassembling drive unit, perform the following steps. (Refer to Figures 202 and 203.

(a) Remove retaining ring, closure disc and shim at end cap.

(b) Remove retaining rings which hold drive shaft to both ends of pulley.

(c) Remove drive shaft from support assembly.

NOTE: Drive shaft and retaining rings are removed to prevent damage when bearings are pulled.

(d) Carefully pull end cap off of bearing.

(e) Remove pulley, bearings, splined coupling and retaining ring from support housing.

(f) Separate bearings and splined coupling from pulley.

(g) Remove oil seal from support housing.

B. Assemble and Install Compressor Drive Unit (Refer to Figure 202).

(1) If drive unit was disassembled, reassemble in the following steps. (Refer to Figure 202 and Figure 203).

(a) Press new oil seal into support housing.

(b) Press bearing into support housing.

(c) Press bearings on pulley.

(d) Install retaining ring on splined coupling.

(e) Install splined coupling to pulley and secure with retaining ring.

(f) Install drive shaft into splined coupling and secure with retaining rings.

(g) Press assembly shown in Detail B into assembly shown in Detail A, Figure 203.

(h) Reinstall shim and closure disc to end cap using retaining ring.

NOTE: Remove laminates from shim as required to install closure disc. Shim is required to keep closure disc in position.

(i) Press end cap onto bearing.

NOTE: Do not insert spacer at this time. Spacer must be removed to install belt.

(2) Apply Plastilube (MIL W-G-632) lubricant to the forward splines of the Compressor Unit compressor drive shaft.

NOTE: Plastilube (MIL W-G-632) is not to be used on phenolic splines.

(3) Using new gasket, align drive shaft on support assembly with accessory pad coupling.

(4) Secure support assembly on accessory pad using bolts, washers and shims as required.

(5) Safety wire bolts at accessory pad. Refer to Chapter 20, Safetying - Maintenance Practices.

(6) Connect drain hose to support assembly elbow.

(7) Install compressor. Refer to Compressor Removal/Installation.

(8) Install drive belt. Refer to Compressor Drive Belt Removal/Adjustment.

4. Compressor Drive Belt Removal/Installation.

A. Remove Drive Belt (Refer to Figures 201, 202 and 204).

(1) Loosen bolt at bottom of compressor.

(2) Remove and discard turnbuckle clip from turnbuckle.

(3) Loosen turnbuckle enough to pass belt over compressor pulley.

(4) Remove bolts securing spacer between end cap and support assembly.

(5) Remove belt through opening where spacer was removed.

B. Install Drive Belt (Refer to Figures 201, 202 and 204).

(1) Insert belt through opening between end cap and support housing.

(2) Reinstall spacer. Secure spacer between end cap and support assembly using bolts and washers.

(3) Lift upward on compressor far enough to allow belt to slip over compressor pulley.

(4) Connect clevis end of turnbuckle to compressor.

(5) Adjust compressor drive belt. Refer to Adjust Drive Belt.

C. Adjust Drive Belt (Refer to Figure 204).

(1) Tension can be checked by using either of the two following methods:

(a) A spring scale hooked under the belt at a point midway between compressor drive unit pulley and compressor clutch pulley, pulling perpendicular to the belt.

(b) Using a Gates 150 tensiometer.

(2) Correct belt tension is a 0.12-inch deflection when a load force of 3.6 to 4.4 pounds is applied to the belt.

(3) If belt tension is not correct, adjust as follows:

(a) Loosen bolt at bottom of compressor to allow compressor to pivot.

(b) Remove and discard clips on turnbuckle.

(c) Adjust turnbuckle in or out to obtain correct belt tension.

NOTE: A maximum of three threads must be exposed on adjustment arm clevis. Replace MS21252-5RS clevis with MS21252-5RL. Refer to the following table for turnbuckle adjustment ranges.

ADJUSTMENT RANGE	NORMAL	MAX (REF)
MS21252-5LL & MS21252-5RS	4.55 to 5.55 inch	5.70 inch
MS21252-5LL & MS21252-5RL	5.40 to 6.40 inch	6.60 inch

(d) Install new clip on turnbuckle.

(e) Tighten bolt at bottom of compressor.

5. Condenser Removal/Installation

A. Remove Condenser (Refer to Figure 205).

(1) Remove lower left engine cowl. Refer to Chapter 71, Engine Cowling and Nose-cap - Maintenance Practices.

(2) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(3) Loosen clamps and remove hoses leading into condenser. Cap all hoses and fittings.

(4) Remove bolt securing aft end of condenser to condenser support bracket.

(5) Remove bolts, clamps and spacers securing compressor to engine mount.

(6) Remove inlet duct and condenser from airplane.

(7) Remove bolts and washers securing inlet duct to condenser. Separate inlet duct from condenser.

(8) If required, remove seal assemblies from condenser.

B. Install Condenser (Refer to Figure 205).

(1) If required, install seal assemblies to condenser.

(2) Attach condenser to inlet duct using bolts and washers.

(3) Attach condenser to engine mount using clamps, spacers and hardware as required. Do not tighten at this time.

(4) Align holes in right aft corner of condenser with holes in condenser support bracket. Attach using washers and bolts.

(5) Tighten clamps, spacers and hardware on engine mount.

(6) Reinstall hoses to condenser. Tighten with clamps.

(7) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(8) Install lower left engine cowl. Refer to Chapter 71, Engine Cowling and Nose-cap - Maintenance Practices.

6. Receiver/Dryer Removal/Installation

A. Remove Receiver/Dryer (Refer to Figure 206).

NOTE: Anytime the air conditioning system has been exposed to atmosphere for any length of time, or when any major components of the system have been replaced, the receiver/dryer should also be replaced.

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Disconnect fitting at manifold pressure switch housing.

(3) Remove sta-straps and disconnect electrical connector.

(4) Remove pressure switch from manifold pressure switch housing. Discard packing and cap open lines.

(5) Disconnect fitting from OUT end of receiver/dryer.

(6) Loosen clamps and remove receiver/dryer from engine mount.

(7) Remove unions from both ends of receiver/dryer. Discard packing and receiver/dryer.

B. Install Receiver/Dryer (Refer to Figure 206).

(1) Install union fittings (with new packing) to both ends of new receiver/dryer.

(2) Attach receiver/dryer to engine mount and secure clamps.

(3) Attach fittings to both ends of receiver/dryer unions.

(4) Attach pressure switch with new packing to manifold pressure switch housing.

(5) Connect housing cap to housing plug and secure wire using sta-straps.

(6) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

7. Pressure Switch Removal/Installation

A. Remove Pressure Switch (Refer to Figure 206).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Remove sta-straps from electrical wiring.

(3) Disconnect housing plug from housing cap.

(4) Remove pressure switch and packing from manifold pressure switch housing. Discard packing.

(5) Cap manifold pressure switch housing to preclude entry of moisture and/or contaminants into system.

(6) Check pressure switch for proper operation. Refer to Pressure Switch Functional Test.

B. Install Pressure Switch (Refer to Figure 206).

(1) Install pressure switch to manifold pressure switch housing using new packing.

(2) Connect housing plug to housing cap.

(3) Secure electrical wiring using sta-straps.

(4) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

8. Air Conditioning Plumbing Removal/Installation

A. Remove Air Conditioning Plumbing (Refer to Figure 207).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

NOTE: Refrigerant lines in the engine compartment, under the floorboards and in the fuselage sidewalls interconnect the compressor, condenser, receiver/dryer and evaporators.

(2) Remove interior equipment and access panels as required to gain access to refrigerant lines.

(3) Disconnect plumbing and remove as necessary.

(4) Cap all lines and fittings to preclude entry of moisture and/or foreign particles into system.

B. Install Air Conditioning Plumbing (Refer to Figure 207).

CAUTION: The use of other thread lubricants is positively prohibited, including "Lock-Tite" or other commercial refrigerant lubricants such as "Leak-Lock."

(1) Remove previously installed caps from lines and install plumbing.

NOTE: It is recommended that all straight thread fittings and O-rings be lubricated with clean refrigerant oil and all taper (pipe) threads be serviced with Teflon tape. Use care to ensure Teflon tape does not get closer than one to one-half threads from end of fitting. Should a piece of tape get into system, it can cause blockage of small orifices.

(2) Torque lines to valves listed in table below.

NOTE: All plumbing fittings must be torqued to prevent Freon leakage and shall be rechecked after performing an air conditioning leak test.

TUBE DIAMETER	TORQUE VALUE
0.250 inch	55 to 65 inch-pounds
0.375 inch	100 to 125 inch-pounds
0.500 inch	200 to 250 inch-pounds
0.750 inch	400 to 500 inch-pounds

(3) Perform leak test of system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(4) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(5) Perform an operational test of the system. Refer to System Operational Test.

(6) Reinstall removed floor boards, panels and interior equipment.

9. Wing Mounted Evaporator Removal/Installation

NOTE: Evaporator removal and installation are typical for both left and right wing evaporator.

A. Remove Wing-Mounted Evaporators (Refer to Figure 208).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Remove wing root access panel 511AB/611AB. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

(3) Disconnect electrical housing cap from housing plug.

(4) Disconnect evaporator drain hose from drain tube.

(5) Disconnect elbow fitting from bottom of evaporator and cap line

(6) Disconnect expansion valve from evaporator and cap line.

(7) Disconnect duct at blower assembly.

(8) Remove four bolts securing evaporator assembly to duct.

(9) Pull evaporator assembly far enough aft to allow studs to clear duct. Remove evaporator assembly from airplane.

B. Install Wing-Mounted Evaporators (Refer to Figure 208).

(1) Position evaporator assembly in wing root area with forward studs through holes in duct. Secure evaporator assembly to duct using nuts and bolts.

(2) Reconnect and tighten duct at blower assembly.

(3) Connect expansion valve to evaporator.

(4) Connect elbow fitting to bottom of evaporator.

(5) Connect evaporator drain hose to drain tube.

(6) Connect electrical housing cap to housing plug.

(7) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(8) Install wing root access panel 511AB/611AB. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

10. Wing Mounted Return Air Check Valve Removal/Installation

A. Remove and Disassemble Wing-Mounted Return Air Check Valve (Refer to Figure 208).

(1) Remove wing root access panel 511AB/611AB. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

(2) Remove clamp and flexible duct from outboard duct assembly.

(3) Remove screws securing outboard duct assembly (with check valve and seal) to inboard duct assembly.

(4) Remove outboard duct assembly from airplane.

(5) Disassemble check valve in the following steps:

(a) Remove nut at bottom of hinge pin and withdraw hinge pin from outboard duct assembly. This will allow check valve halves and spring to be removed from outboard duct assembly.

(b) Remove nut at bottom of pin and withdraw pin from outboard duct assembly.

B. Assemble and Install Wing-Mounted Return Air Check Valve (Refer to Figure 208).

(1) Reassemble check valve in the following steps:

(a) Assemble check valve halves and spring in outboard duct assembly. Insert hinge pin through duct, valve halves and spring. Secure hinge pin using nut.

(b) Insert pin through outboard duct assembly and secure using nut.

(c) Ensure check valve operates smoothly and seats fully.

(2) Install outboard duct assembly (with check valve and seal) to inboard duct assembly using screws.

(3) Attach flexible duct to outboard duct assembly using clamp.

(4) Reinstall wing root access panel 511AB/611AB. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

11. Forward Evaporator Return Air Grill

A. Remove Return Air Grill (Refer to Figure 208).

(1) From cabin area, remove screws securing grill to inboard duct assembly.

B. Install Return Air Grill (Refer to Figure 208).

(1) Align holes in grill with holes in headliner and inboard duct assembly.

(2) Install screws to secure grill to inboard duct assembly.

12. Tailcone Mounted Evaporator Removal/Installation

A. Remove Aft Evaporator (Refer to Figure 209).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Remove aft cabin partition to gain access to evaporator unit. Refer to Chapter 25, Rear Cargo Compartment Wall - Maintenance Practices.

(3) Disconnect electrical housing plug from housing cap.

(4) Disconnect evaporator drain hose from bottom of evaporator.

(5) Remove recirculated air ducts from duct assembly.

(6) Remove fitting from expansion valve. Cap open line.

(7) Remove fitting from union on suction line leading into evaporator. Cap open line.

(8) Remove screws securing evaporator to brackets.

(9) Remove flexible distribution duct from blower motor and remove evaporator assembly from airplane.

B. Install Aft Evaporator (Refer to Figure 209).

(1) Install evaporator to aft cabin area using screws and washers as required.

(2) Attach flexible distribution duct to blower motor.

(3) Install Freon lines to evaporator.

(4) Connect drain line to evaporator.

(5) Attach recirculated air ducts to duct assembly.

(6) Connect electrical connector housing plug to housing cap.

(7) Recharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(8) Install aft cabin partition. Refer to Chapter 25, Rear Cargo Compartment Wall - Maintenance Practices.

13. Aft Evaporator Distribution and Return Air System Removal/Installation

A. Remove Aft Evaporator Distribution and Return Air Ducts (Refer to Figure 209).

(1) Remove aft cabin partition to gain access to evaporator unit. Refer to Chapter 25, Rear Cargo Compartment Wall - Maintenance Practices.

(2) Loosen clamps securing recirculated air ducts to elbow assemblies.

(3) Remove recirculated air ducts from airplane.

(4) Loosen clamp securing flexible distribution duct to wye duct.

(5) Remove flexible distribution duct from wye duct.

(6) Remove screws securing wye duct to distribution duct and remove wye duct from airplane.

(7) Remove screws securing distribution duct to airplane and remove duct from airplane.

B. Install Aft Evaporator Distribution and Return Air System (Refer to Figure 209).

(1) Install distribution duct to airplane using screws.

(2) Attach wye duct to distribution duct.

(3) Attach flexible distribution duct to wye duct using clamp.

(4) Attach recirculating air ducts to elbow assemblies using clamps.

(5) Install aft cabin partition. Refer to Chapter 25, Rear Cargo Compartment Wall - Maintenance Practices.

14. System Operational Test

A. Air Conditioning System Operational Test.

NOTE: Perform system check at ambient temperatures of 55°F or higher.

(1) Start airplane engine and run at a minimum 54% N_g. Under extremely hot outside air temperature it may be necessary to run engine at 60 to 65% N_g.

(2) Engage the following circuit breakers:

(a) LEFT VENT BLWR

(b) RIGHT BENT BLWR

(c) AFT VENT BLWR

(d) AIR COND CONT

(3) Move fan switches from HIGH to LOW and note a change in evaporator fan speed.

(4) Place the air conditioner switch to COOL and activate compressor.

(5) Temperature differential across evaporators should be at least 20°F. Measure temperatures at evaporators with dial-type thermometers. If evaporators do not cool, refer to Freon Air Conditioning - Troubleshooting.

15. Pressure Switch Functional Test

A. Testing Pressure Switch (Refer to Figure 206).

(1) Discharge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

(2) Remove pressure switch and packing from manifold pressure switch housing.

(3) Check for electrical continuity through the switch. Switch (continuity) should be closed.

(4) Apply 355.0 PSIG dry nitrogen pressure to pressure switch. At 355.0 PSIG, +5 or -5 PSIG, switch should open (no continuity).

(5) Decrease pressure on switch. At approximately 330.0 PSIG switch should close (continuity).

(6) Replace the switch if it is not within these parameters.

(7) Install the pressure switch, with new packing, to the manifold pressure switch housing

(8) Charge system. Refer to Chapter 12, Freon Air Conditioning - Servicing.

Figure 201 : Sheet 1 : Compressor Installation

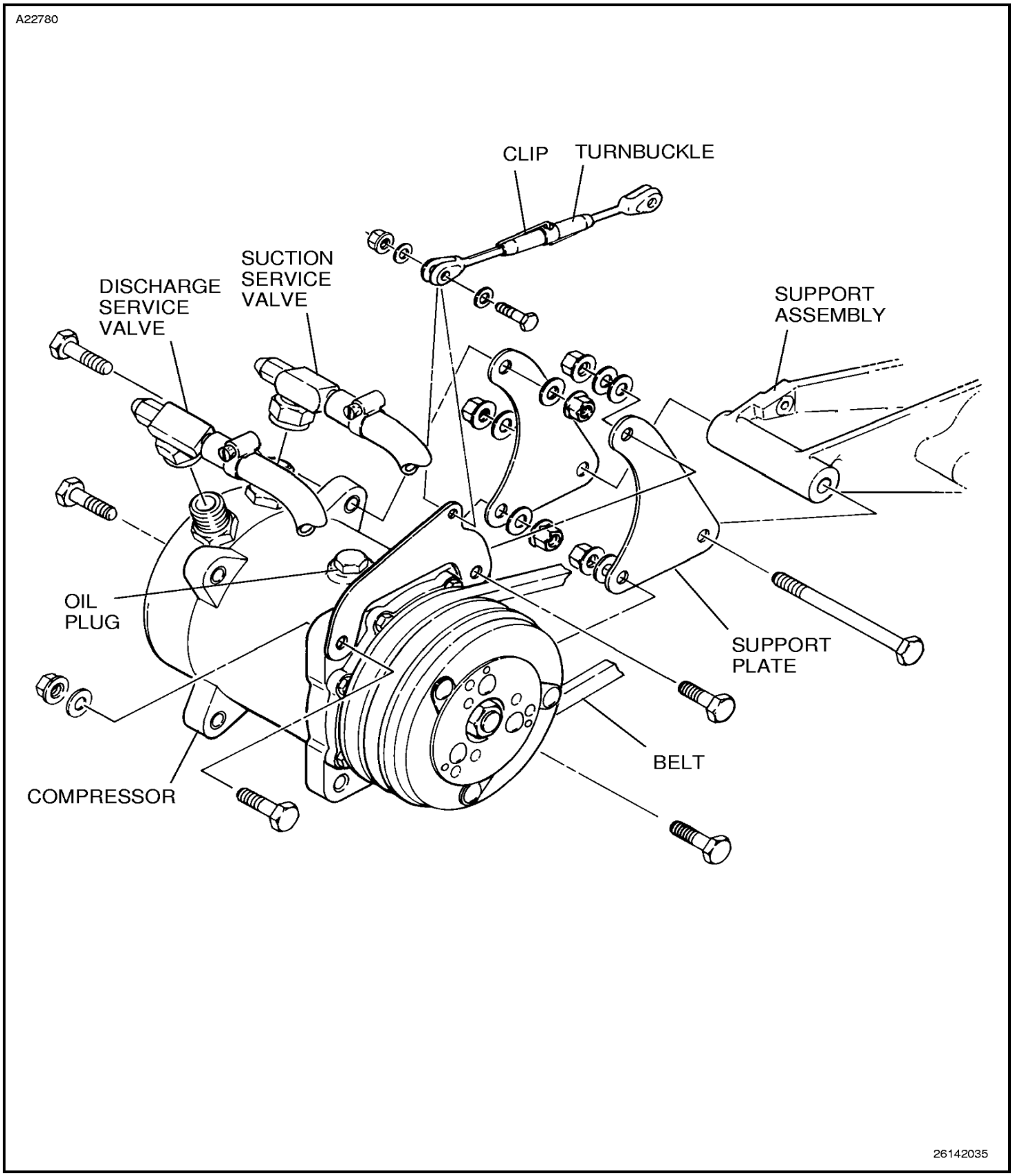

Figure 202 : Sheet 1 : Compressor Drive Unit Installation

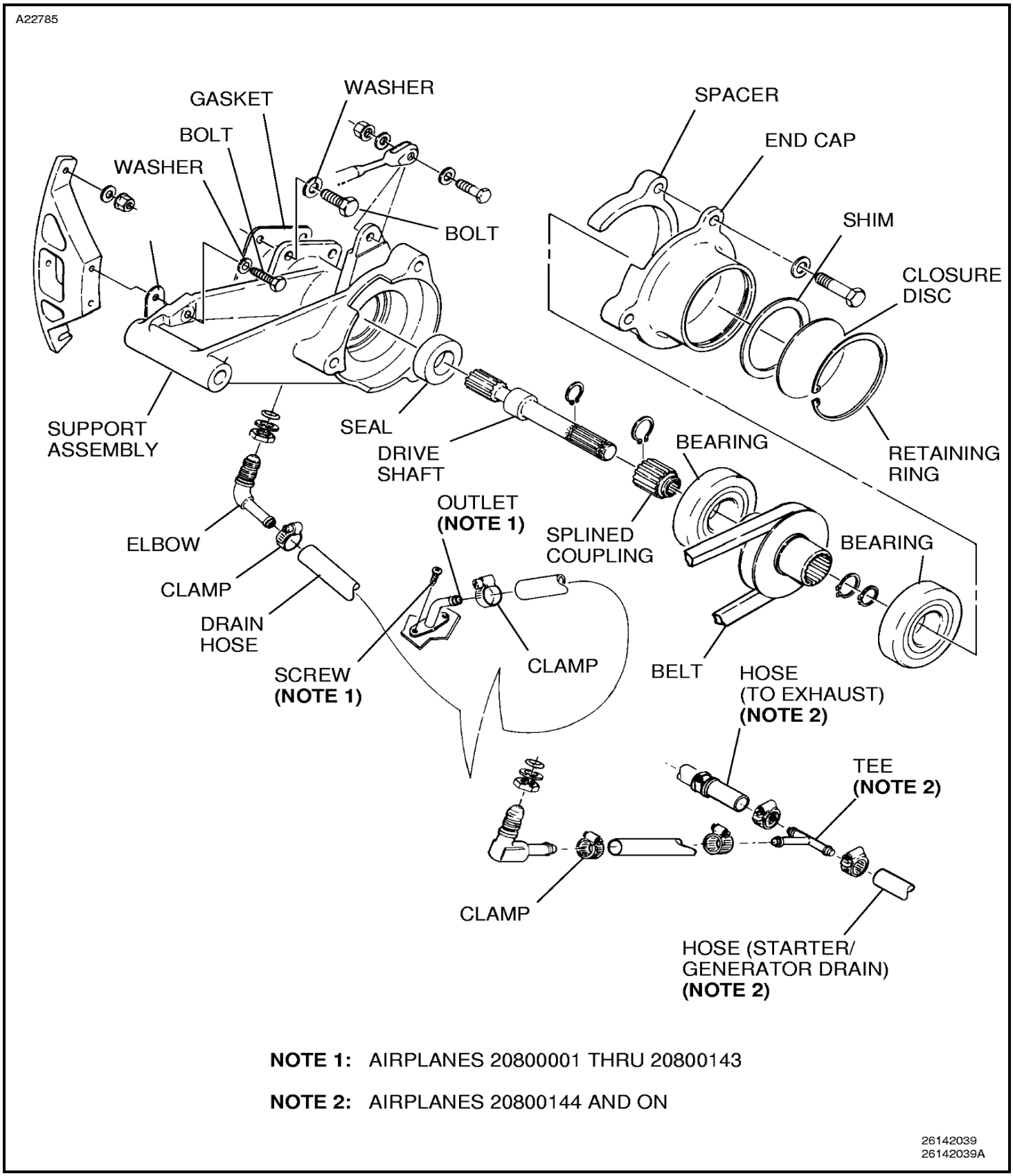

Figure 203 : Sheet 1 : Compressor Drive Unit Cutaway View

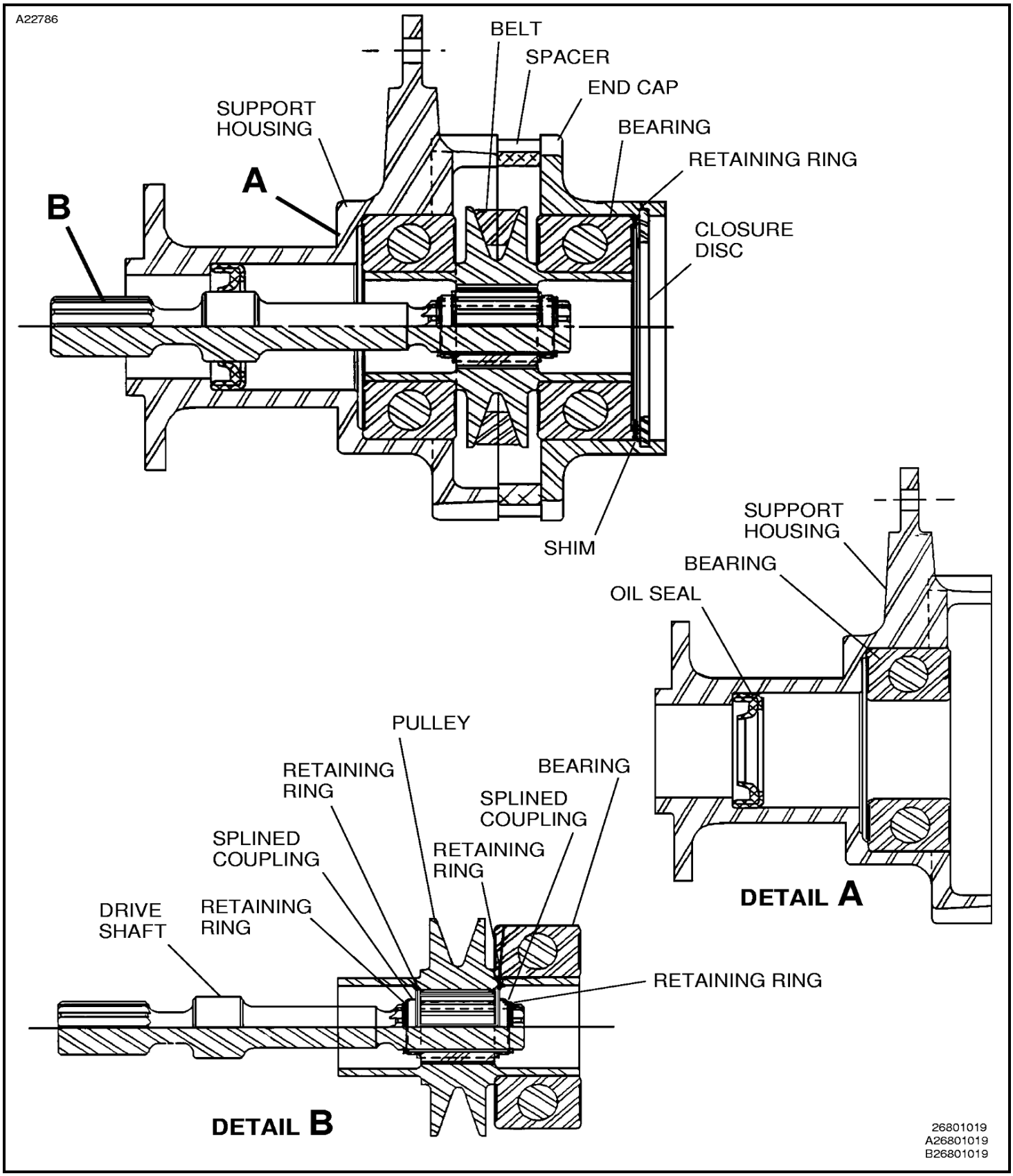

Figure 204 : Sheet 1 : Compressor Drive Belt Adjustment

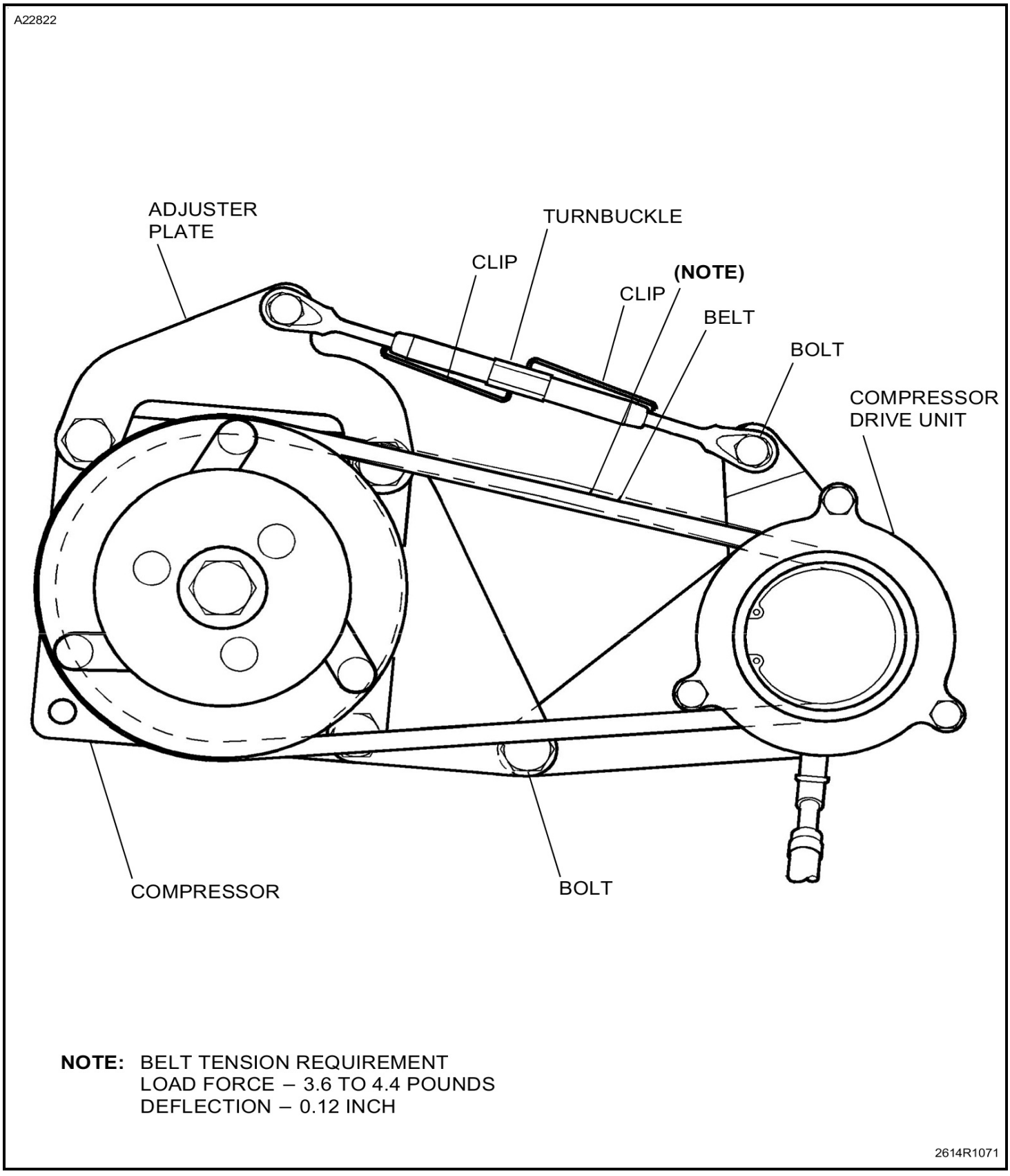

Figure 205 : Sheet 1 : Condenser Installation

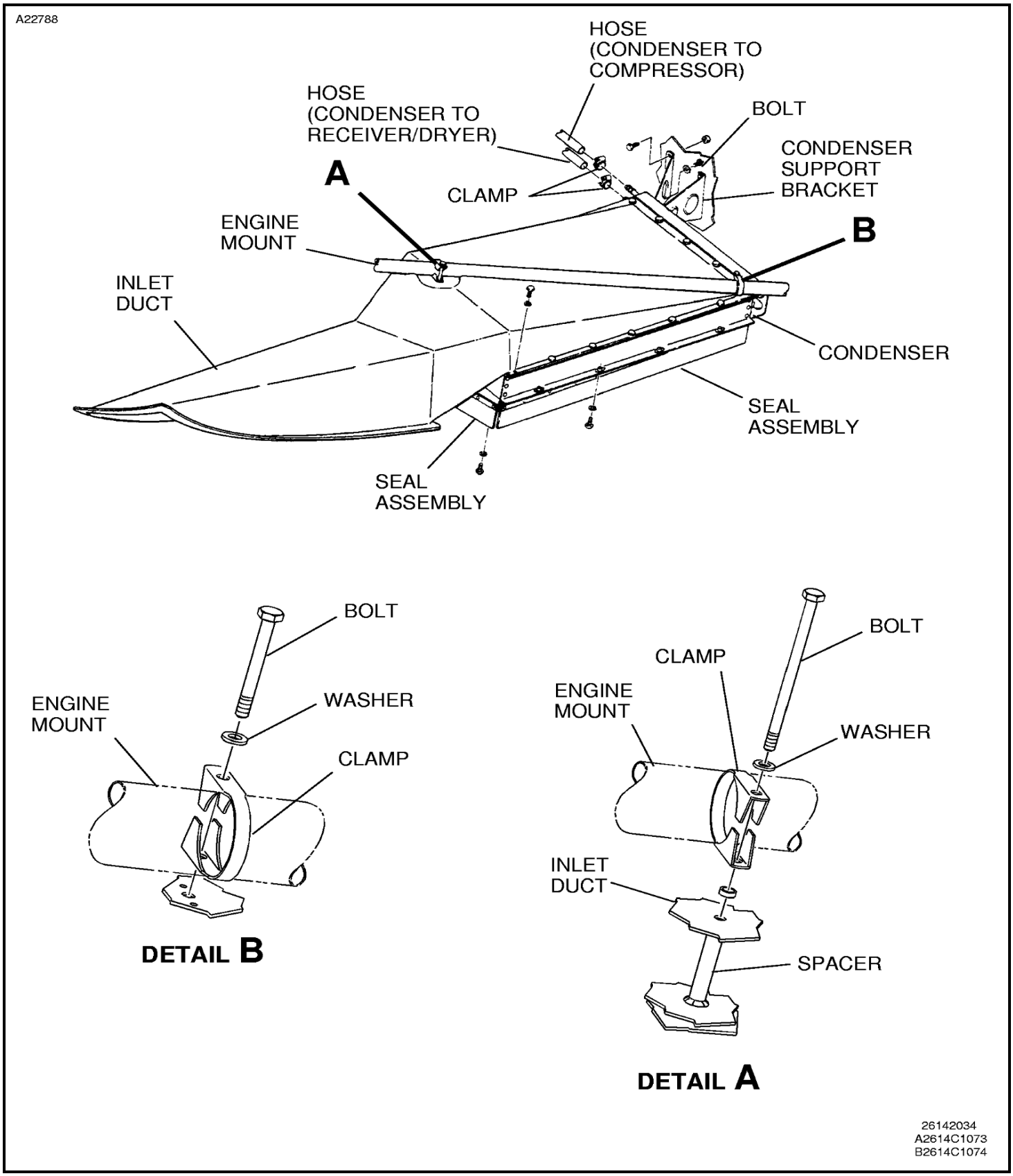

Figure 206 : Sheet 1 : Receiver/Dryer Installation

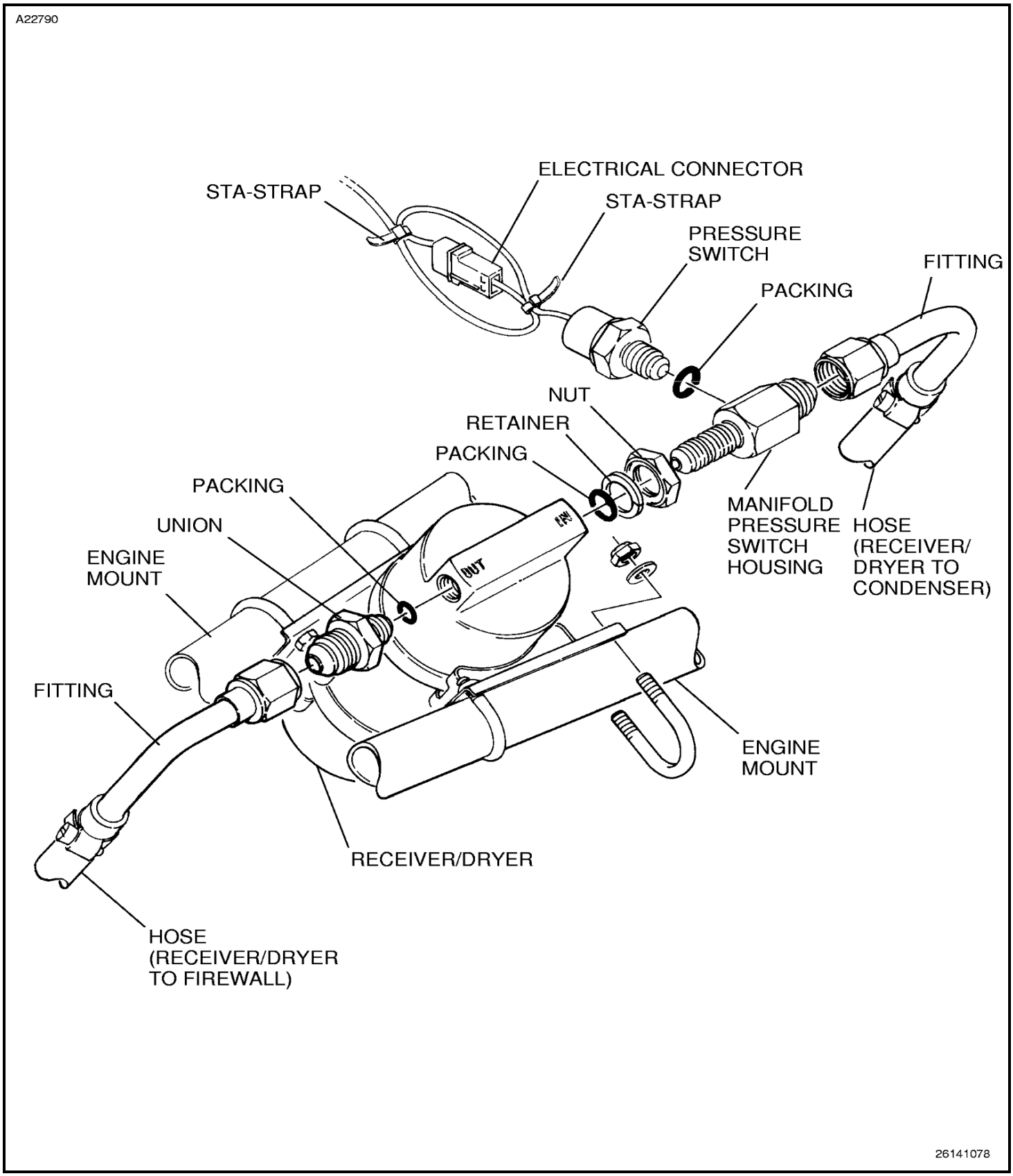

Figure 207 : Sheet 1 : Air Conditioning Plumbing Installation

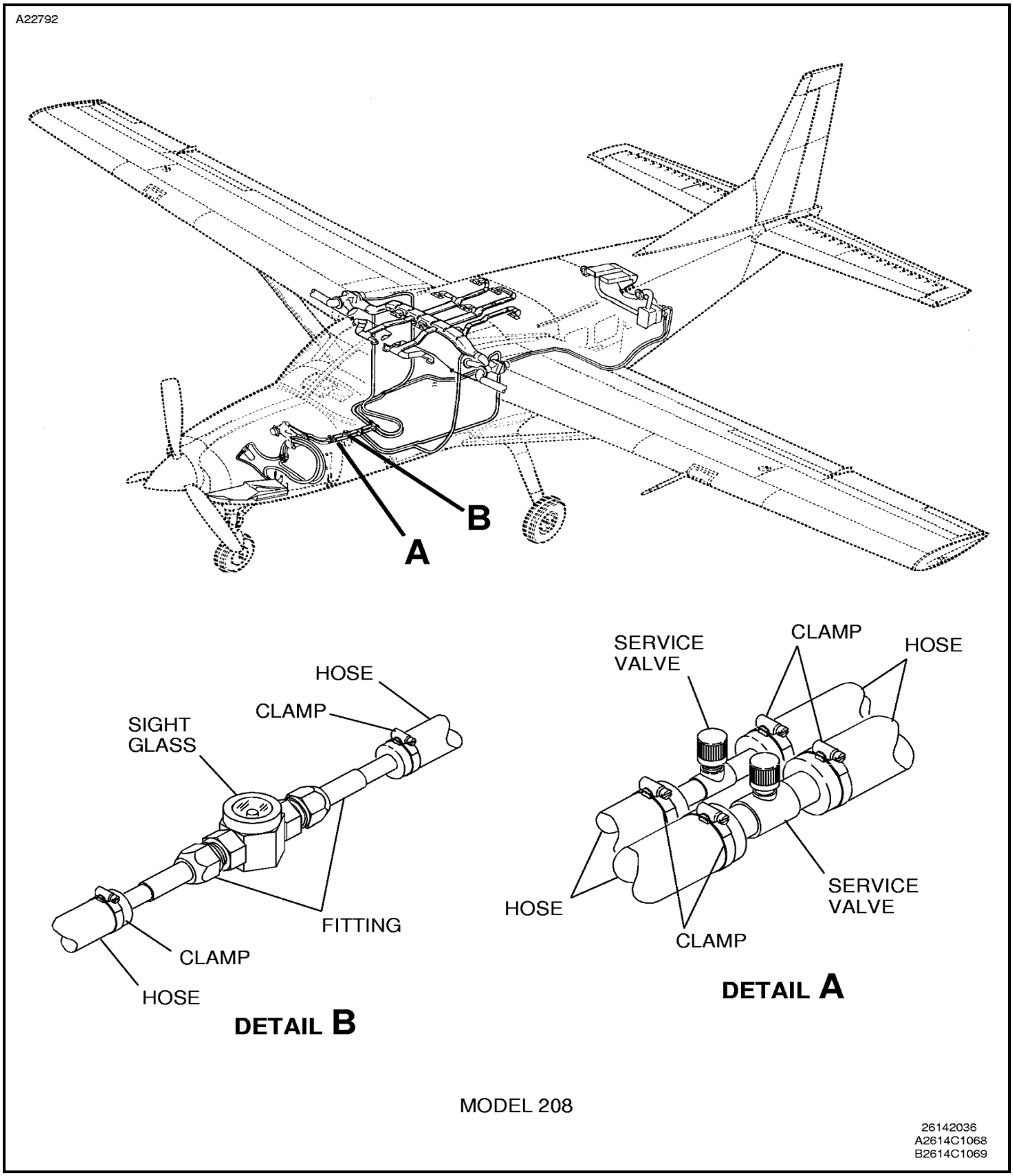

Figure 207 : Sheet 2 : Air Conditioning Plumbing Installation

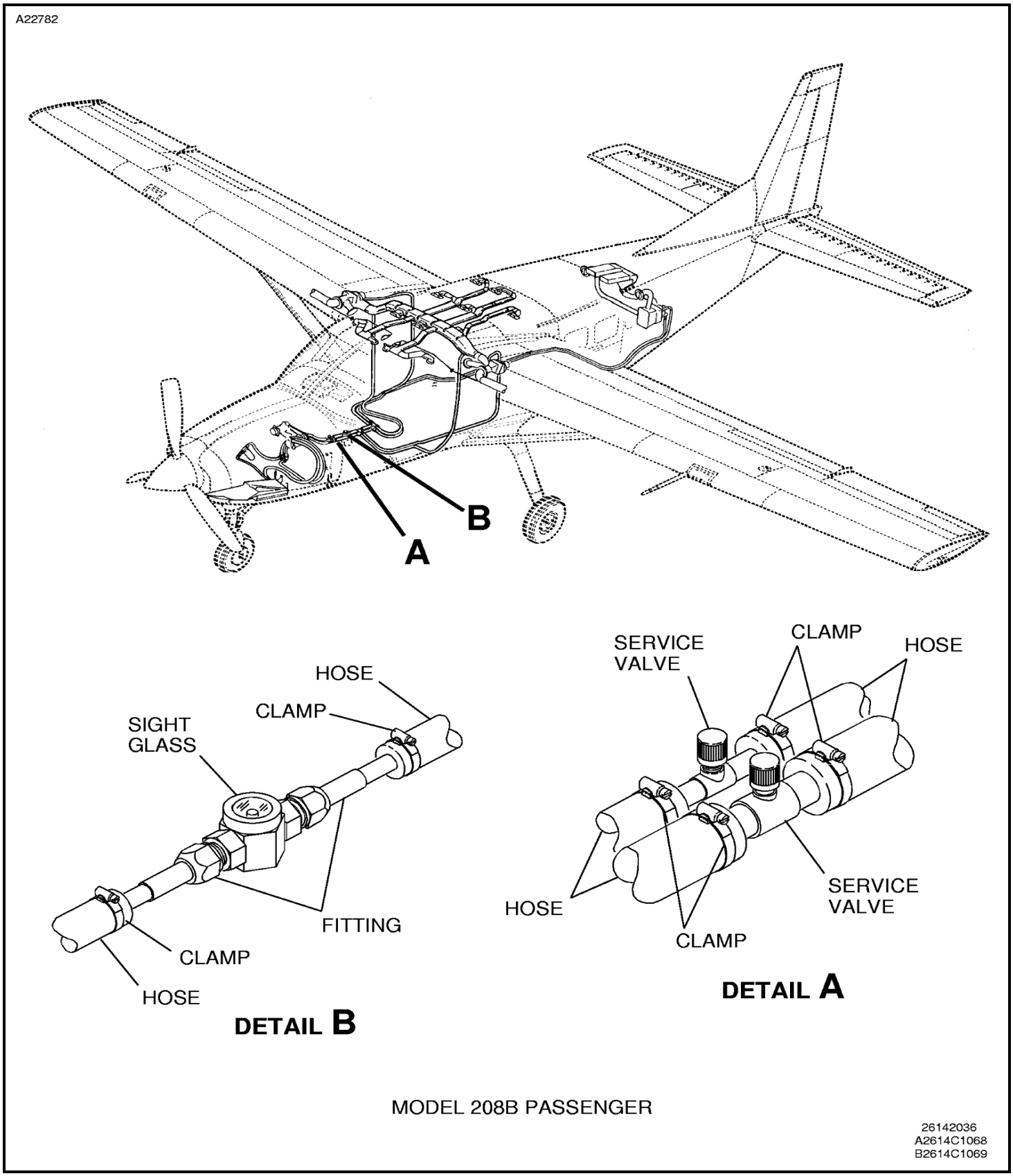

Figure 208 : Sheet 1 : Wing Mounted Return Air Check Valve Assembly

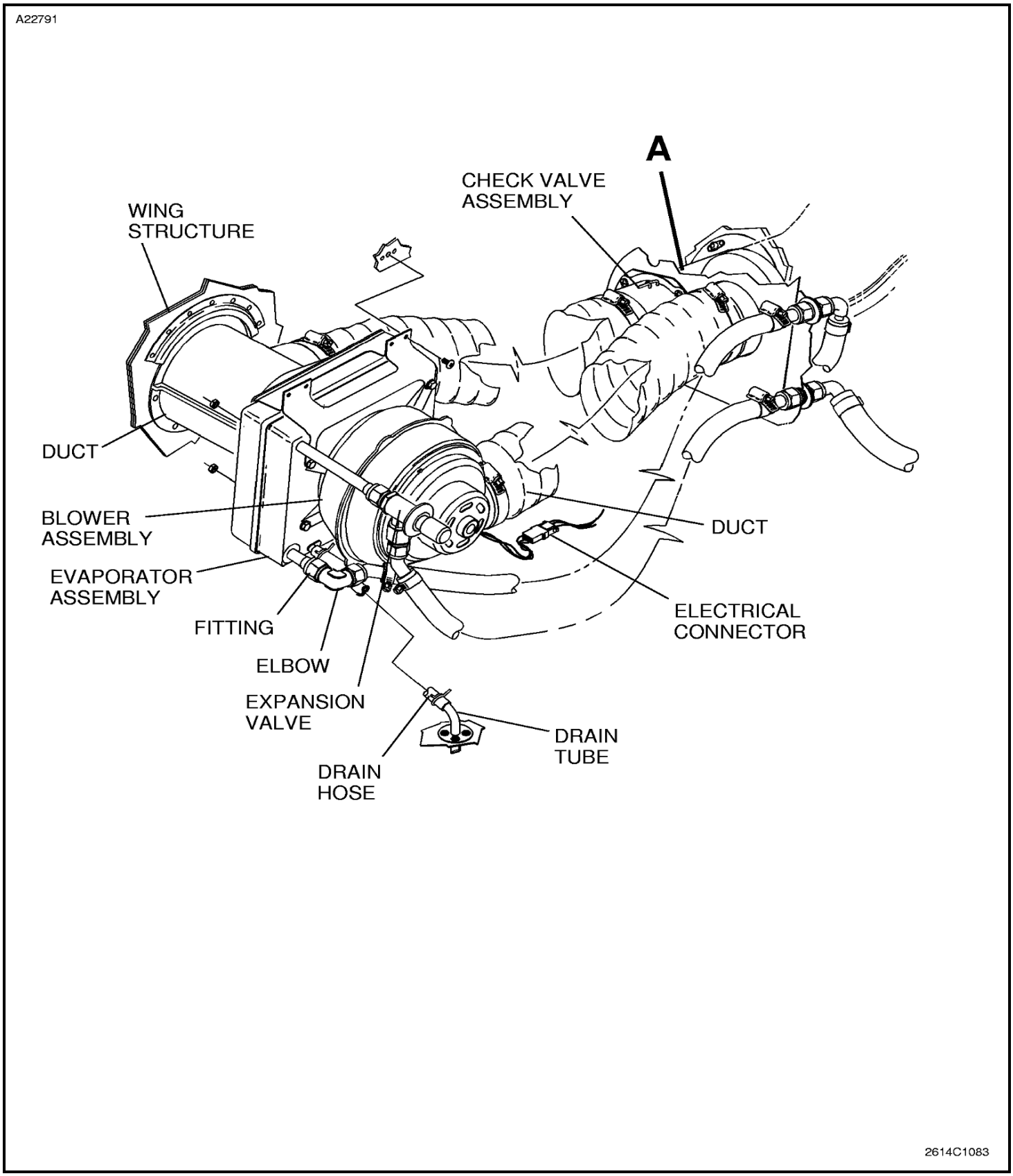

Figure 208 : Sheet 2 : Wing Mounted Return Air Check Valve Assembly

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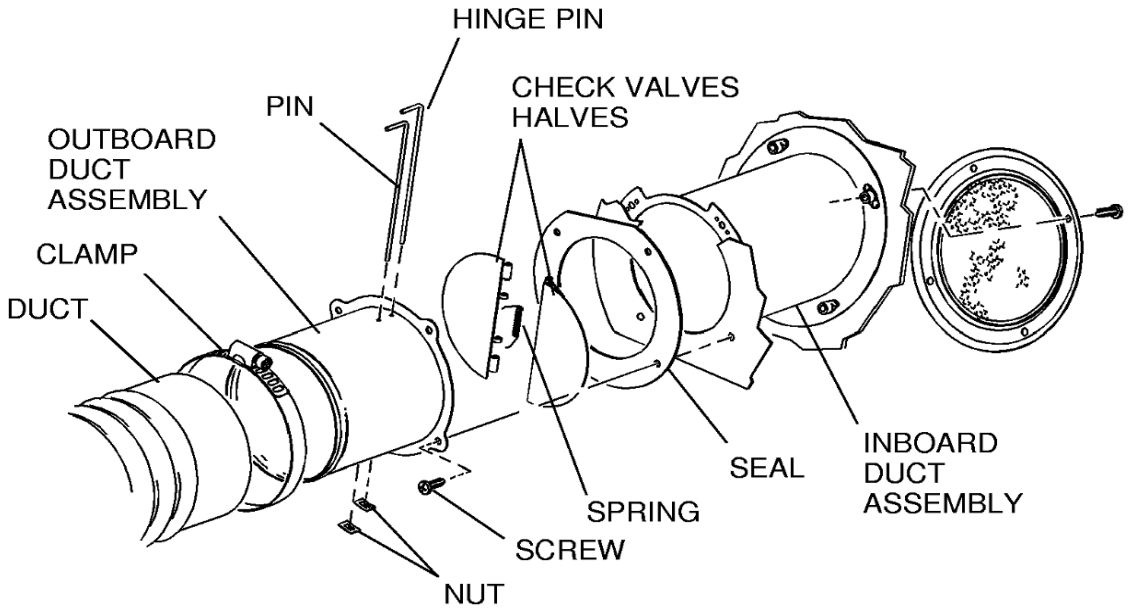

DETAIL A

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Figure 209 : Sheet 1 : Tailcone Mounted Evaporator Installation

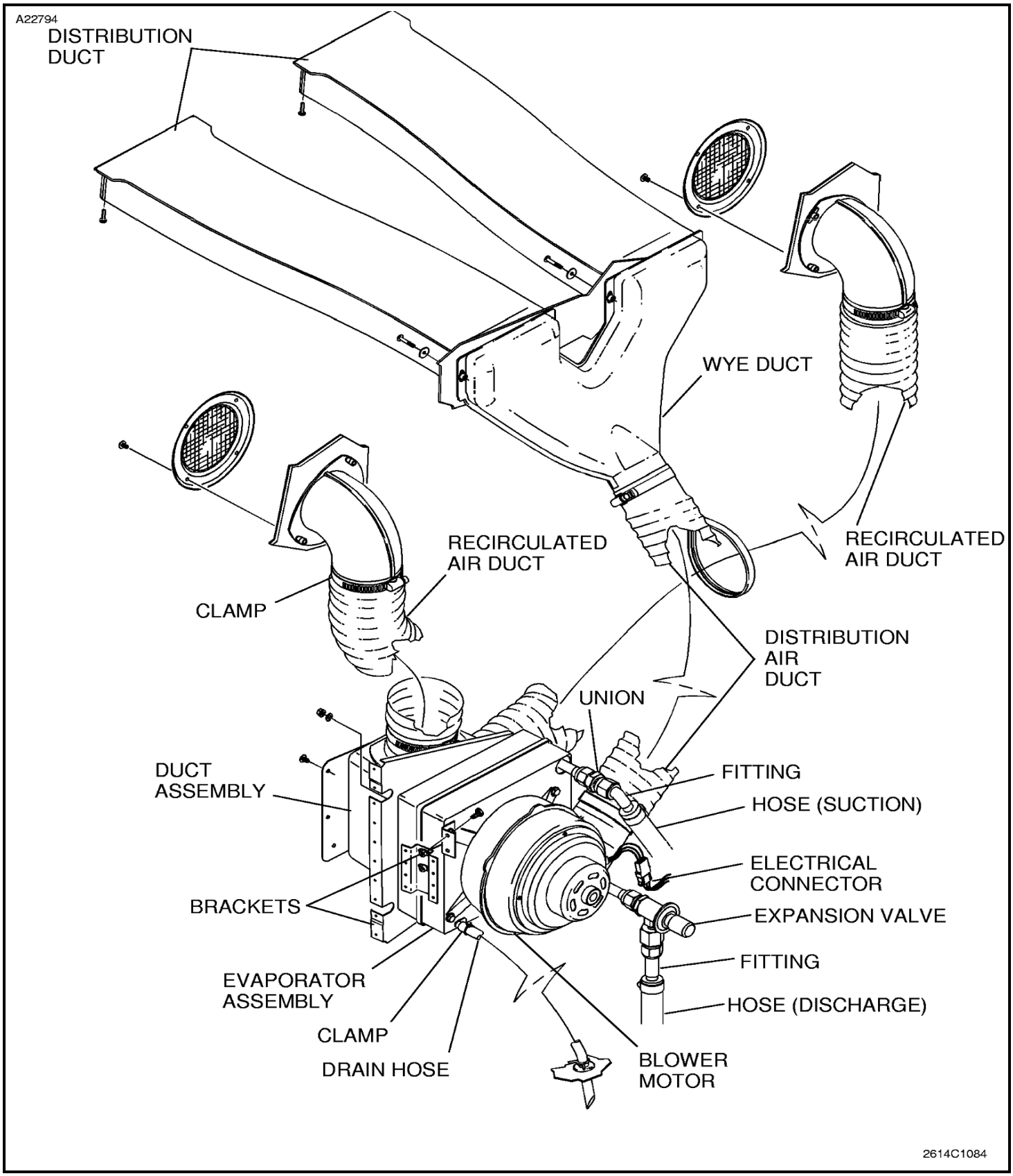

Figure 7 : Sheet 1 : Left Lower Wing Panels