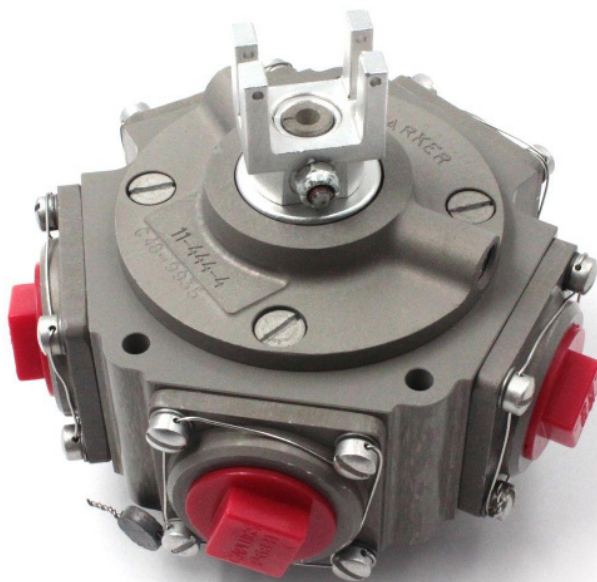


Repair Station - P-51 Fuel Selectors

Problem with Parkers

Manufacturer	North American Aviation / Parker Appliance Company
Aircraft	P-51 Mustang
NAA Part Number	122-48347
Fuel Selector Manufacturer P/N	11-444-4 (Parker)
Proper Description	122-48347 VALVE ASSEMBLY - FUEL SELECTOR
Location	One is located in left main landing gear wheel well
Nickname	Fuel Selector



OVERVIEW / EXECUTIVE SUMMARY

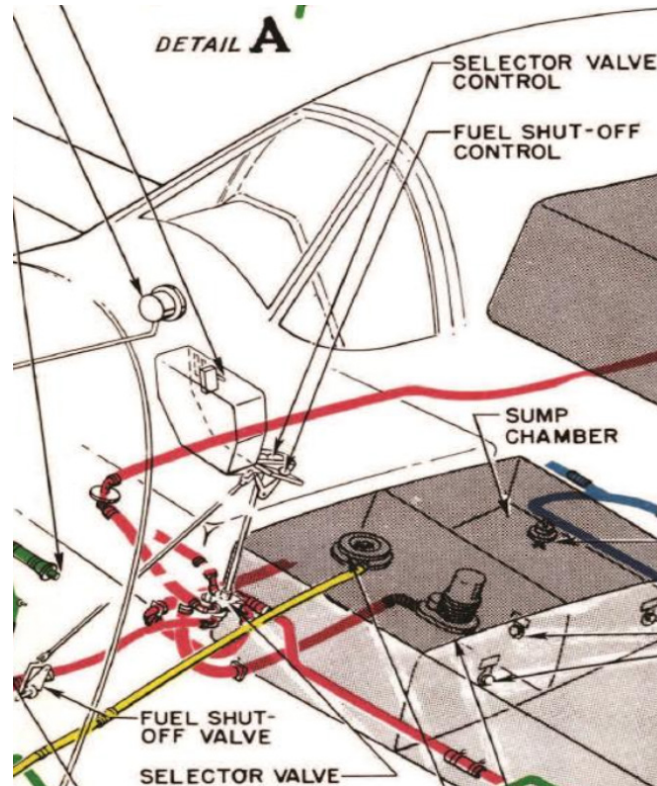
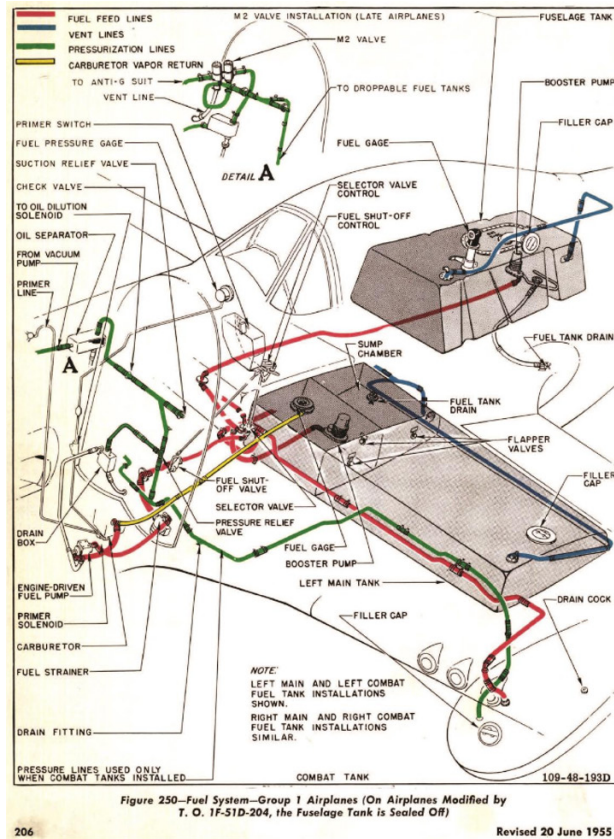
Nobody wants fuel management problems while maintaining or operating any aircraft. For obvious reasons the maintenance and operation of the P-51 Mustang fuel selector is critical. Fortunately there are measures and fixes that almost eliminate the likelihood of selector maintenance problems and failure modes. AirCorps Aviation in Bemidji MN has compiled a comprehensive explanation of the Parker Appliance Company fuel selector with the belief that it is something every pilot and mechanic involved with a Mustang should thoroughly understand.

Read on to learn why...

LOCATION

The VALVE ASSEMBLY - FUEL SELECTOR ([P/N - 122-48347](#)), is mounted in the left wheel well recess.¹ The valve has five sources or inlets to which fuel lines are attached.

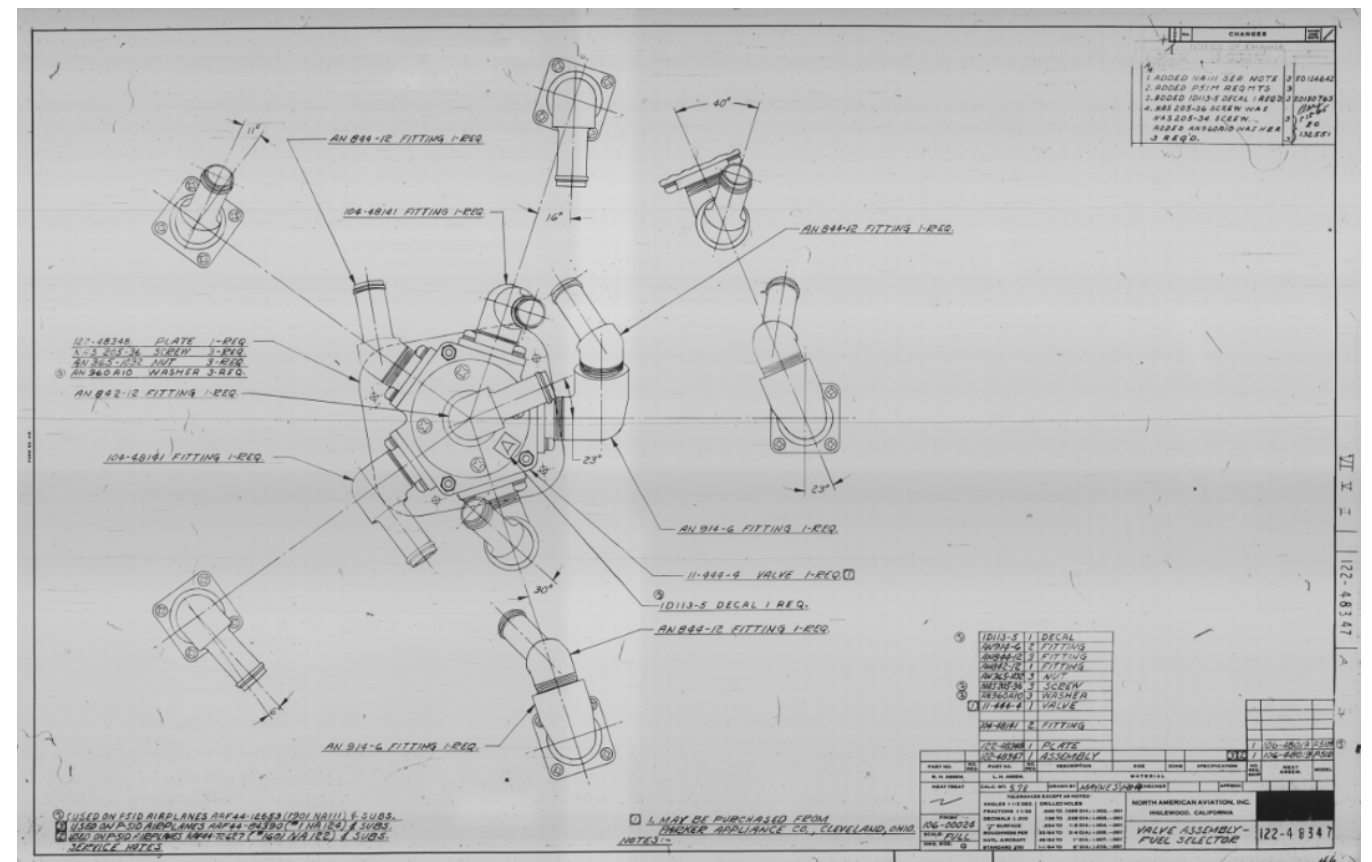
¹ For purposes of length, we will refer to this assembly as installed on a P-51D per Valve Installation – Fuel Selector Shut Off ([P/N 106-48019](#)).



The [122-48347](#) Valve Assembly - Fuel Selector consists of a mounting plate 122-48348 and eight fittings in specific angled orientations.

MAKEUP

The 11-444-4 fuel selector valve allows the operator to select fuel supply and direct flow. Parker fuel selector valves have a cylindrical rotor, movable by means of a yoke, which fits into a cylindrical hole in the valve body, where it is enclosed by bottom and top caps. The body consists of five ports and an outlet port in the bottom adapter. The rotor is drilled to conform to the desired flow with relation to the body ports. Pressure balanced sealing discs aid in obtaining a leakproof seal. Threaded ports are not machined in the valve body, but connections are made to port adapters which are secured to the valve body side ports by means of machine screws.



FUNCTION

The complete [122-48347](#) Valve Assembly - Fuel Selector and the attaching [106-481047](#) Control Assembly - Fuel Selector & Shutoff Valves can be described as providing two major functions.

- Selection of fuel source
- Mechanical connection to the 11-444-4 fuel selector in the left wheel well.
- Switch in the selector handle assembly is connected in series with the booster pump switch and starts the booster pump in the tank selected, provided that the fuel booster pump switch is ON.
- Booster pumps in fuel tanks not selected for use are automatically shut off.

Connecting Fuel Selector Switch to Fuel Selector Valve (In Red)

[106-481047](#) Control Assembly - Fuel Selector & Shutoff Valves (In Fuselage)

ATTACHES

[106-48208](#) Shaft Assembly - Fuel Selector Valve Control

TO

[122-48347](#) - Valve Assembly - Fuel Selector (In Left Landing Gear Recess)

Fuel Shutoff Lever to Fuel Shutoff Valve (In Blue)

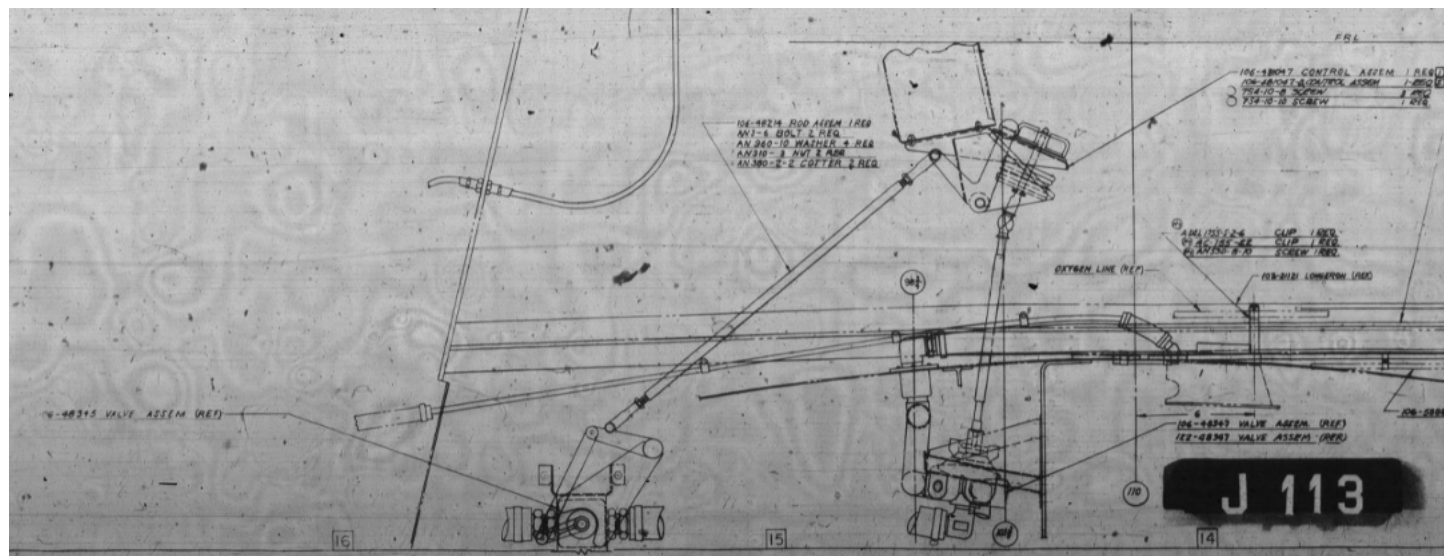
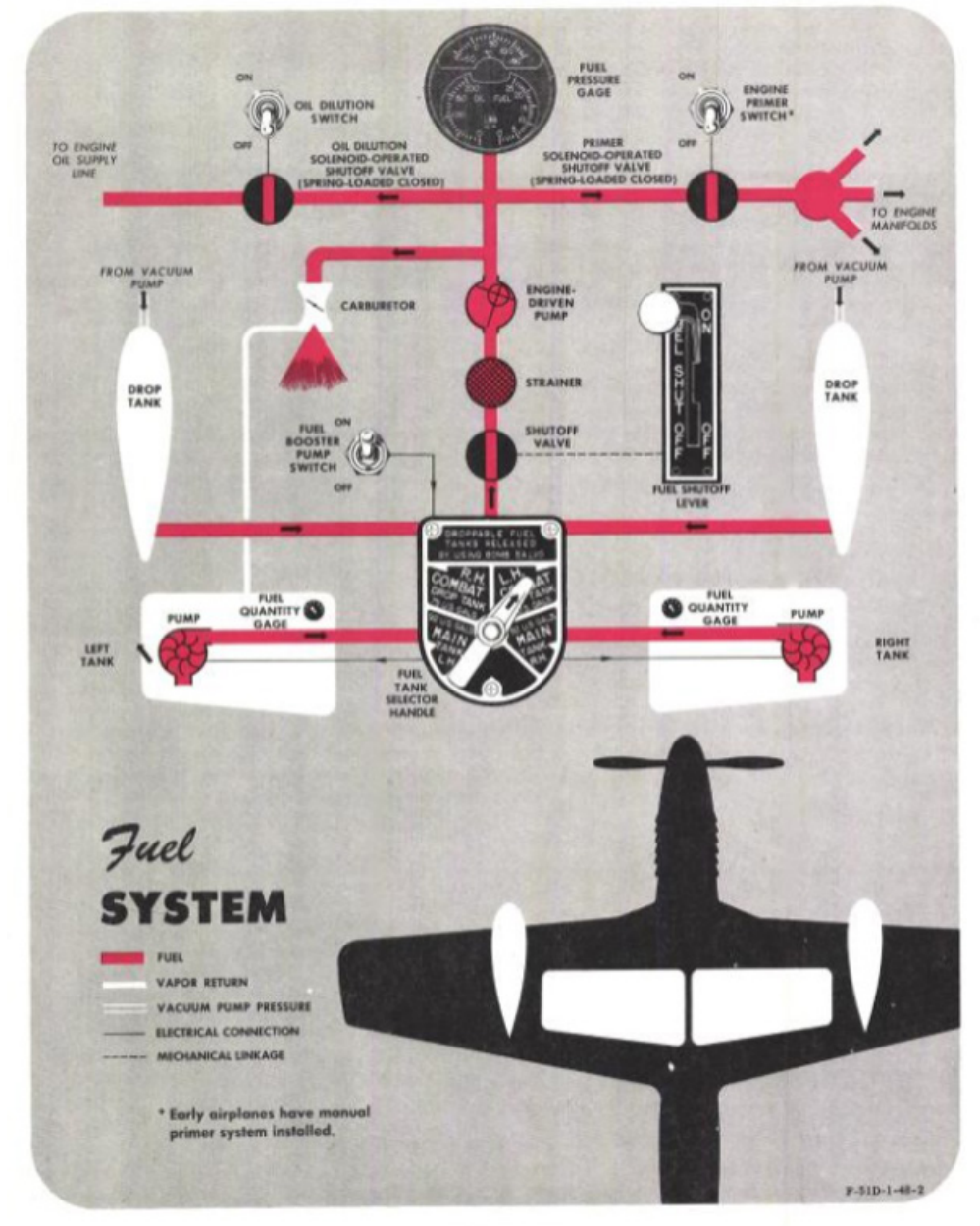
[106-481047](#) Control Assembly - Fuel Selector & Shutoff Valves (In Fuselage)

ATTACHES

[106-481344](#) - HANDLE ASSEM - FUEL SHUT OFF VALVE CONTROL

TO

[106-48345](#) - VALVE ASSEMBLY - FUEL SHUTOFF (In Left Landing Gear Recess)



P-51 FUEL SYSTEM

The fuel system consists of wing fuel tanks located in the inboard end of each wing panel. To supplement these tanks Mustangs coming off the factory floor included a fuselage fuel tank and provisions for the installation of auxiliary fuel tanks on each wing bomb rack. The two main fuel tanks on all airplanes are equipped with a gravity-fed, submerged booster pump that receives power from the electrical system of the airplane. These pumps supplement the engine-driven fuel pump and supply the fuel needs of the engine at all altitudes if the engine driven fuel pump fails. Only one booster pump will be in operation at any one time, since the electrical circuit is connected by a switch to the fuel selector valve control handle, and the pumps are turned on or off by rotation of the selector valve control handle to the tank desired. A fuel shut-off valve is located in the left wheel recess, and its control handle is mounted just to the left of the fuel selector valve control handle. Fuel is drawn from the wing auxiliary tanks by the engine driven fuel pump. Normal fuel feed to the engine is maintained during steep climbs and dives through the incorporation of a sump chamber surrounding the booster pump in each main fuel tank. The sump chamber is formed by bulkheads fitted at the inboard end of each tank. Flapper valves in the bulkheads ensure one-way fuel flow through the sump chamber. The fuel injection-type carburetor is equipped with a vapor separation line ending at the left main tank fuel gage and utilizes an "IDLE CUT OFF" position for stopping an engine. All units of the fuel system are suitable for use with aromatic fuels.

VARIANTS OF MERLIN ENGINE FUEL SELECTORS

The Merlin engine fuel selector in the P-51 was originally designed and engineered by North American on September 22, 1943. This design utilized a Thompson TCB-14800 selector for installation on both the P-51B, and P-51C under the [104-48140](#) part number.

In October of 1943, the revised design, P/N [106-48347](#), was drafted for production on the P-51D. This new selector still utilized the Thompson Products Co P/N TCB-14800 fuel selector valve. Improvements on this fuel selector included the addition of the [106-48348](#) Adapter Plate and some changes to the orientation of the fittings.

In November of 1944, the latest revision design, P/N [122-48347](#), was drafted for production on all subsequent P-51D Mustangs. This new selector was produced by Parker Appliance Co. P/N 11-444-4 fuel selector valve. Improvements on this fuel selector include the following:

- The Parker 11-444-4 was a more easily managed and overhauled design that changed from the cast style / tapered cone style Thompson Products valve.
- Addition of [122-48348](#) Adapter Plate
- Minor orientation adjustments of fittings

INTERCHANGEABILITY WITH THOMPSON STYLE 106-48347 SELECTOR VALVE

North American Aviation also employed a Thompson Products Co [P/N TCB-14800](#) selector valve installed in a serial block range of NA-122, NA-111, and NA-109 variants under P/N 106-48347. For purposes of this blog we have focused solely on the Parker Appliance company valve. The Thompson valve is single aluminum alloy casting with standard taper pipe threaded bosses. This valve is a tapered cone, synthetic rubber seal type that performs similar functions to that of the Parker valve. A breakdown of this Thompson Products fuel selector is outlined in Tech Order - [Handbook with Parts Catalog for Fuel Line Selector Cock, AN 03-10-1, 20-Oct-1943](#)

REMOVAL OF 122-48347 VALVE ASSEMBLY - FUEL SELECTOR

Disconnect all lines from the valve and tape open ends. Disconnect control rod, remove attaching nuts and bolts and remove valve from wheel recess. Instructions for removal and installation of selector are outlined in Tech Order - [Maintenance Instructions for F-51D, F-51M, ZF-51K, and TF-51D, T.O. No. 1F-51D-2 \(AN 01-60JE-2\), 30-Nov-1956](#)

INSPECTION

This heavily worked and integral component on the P-51 Mustang requires frequent inspection and attention to prevent failure, particularly if operating 70+ year old selectors.

Some key questions in determining if your 122-48347 Valve Assembly - Fuel Selector needs to be inspected / tested / replaced / repaired:

- Which type of fuel selector do you have? (Identification photos above)
- Has the fuel selector recently been inspected?

AirCorps recommends these additional inspections / actions.

- Fuel selector should be visually checked during pre-flight to verify there are no visible leaks and attachment of hoses to fittings is in good working order.
- Know your aircraft so any change will draw your attention.
- Conditions that would cause binding or excessive backlash, general condition of universal joints, yokes, yoke pins, dial and handle assemblies, taper pins. Check for interference with other parts.
- If leaking is present it is necessary to remove the valve from the aircraft. These valves cannot be serviced or repaired while installed.
- [The Technical Order Fuel System - Operation and Inspection of Fuel Selector Valve and Controls, T.O. No. 03-10-13, 7-May-1944](#) is both concise and well written for inspection periods and areas of focus.
- The following chart is available in Document Part Number: [AN 03-10-41 Operation, Service, and Overhaul Instructions with Parts Catalog for Balanced Fuel Selector Valves, AN 03-10-41, 25-July-1949](#)

	SERVICE TROUBLES AND REMEDIES	
TROUBLE	PROBABLE CAUSE	REMEDY
External Leakage - cap or adapter	Worn or damaged sealing rings.	Remove valve from line. Install new sealing rings.
	Loose connection to body.	Tighten screws.
External Leakage - stem	Worn or damaged "O" packing rings	Remove valve from line. Install new backing rings.
Internal Leakage	Broken or damaged sealing disk assembly	Remove valve from line. Install new disk.
Weak rotor indexing	Broken or damaged index spring.	Remove index stop screw and spring. Install new spring. Check indexing.
	Loose index stop screw.	Tighten. Check indexing.
Insufficient flow through valve	Electric unit fails to operate, or operates at too slow speed.	Replace actuator
	Motor operates but mechanism fails to function properly.	Replace actuator
	Inaccurate stopping of rotor at ports	Replace actuator

As a reference, the [Aircraft Inspection & Maintenance Guide - P-51, 00-20A-2-P-51, 7-Nov-1947](#) outlines a detailed inspection of the aircraft fuel system that should happen during pre-flight, after flight, daily, and at 25, 50, 100 hour inspections.

					FUEL SYSTEM (COLUMN 23)
		Hrs	Hrs	Hrs	
				➡	After Flight. Tanks serviced to normal supply. (Filler caps secured.)
P	D	25	50	100	Carburetor air filters for contamination and proper lubrication. Daily under extremely dusty conditions. (T.O. No. 01-1-23)
			50	100	Dropable fuel tank air pressure selector valve for general condition, security. (See that dropable tank connections correspond to dial markings.)
				100	Fuel transfer line to fuel level control valve for general condition, security.
				100	Fuel gage transmitter rods (inside tanks) for damage, deterioration.
P	D	25	50	100	Drain fuel strainer and resafety
P	D	25	50	100	Vent lines for freedom from obstructions
				➡	After Flight. Fuel System for leakage.
	D	25	50	100	Fuel strainers and drain cocks drained and resafetied
	D	25	50	100	Fuel lines for leaks, dents, cracks, wear due to chaffing or vibration, security.
			50	100	Hoses for deterioration. (T.O. 04-1-17)
			50	100	Hose connections for cracks in bands, excessive rust, security of welding or riveting.
			50	100	Hose clamps for tightness, general condition. (T.O. 04-1-19) & (T.O. 04-1-19 Supplement)
		25	50	100	Drain lines for bends, traps, and internal restrictions
		25	50	100	Fuel strainer line cleaned
		25	50	100	Carburetor fuel insert bushing for seepage
				➡	600 hours - Booster pumps removed; screens for clogging, corrosion, breaks. (Clean, repair as necessary)
		25	50	100	Primer for leakage when pressure applied.
		25	50	100	Engine driven pump for security of mounting, proper safety.
			50	100	Vent plug on engine driven fuel pump relief valve housing cleaned.
			50	100	Relief valve for presence of foreign matter.
			50	100	Bypass valve for freedom from obstructions
		25	50	100	Lines for leaks and cracks (Especially at sharp bends)
			50	100	Fuel selector valve for general condition, security, excessive backlash, or drag
				100	Fuel gage transmitter rods and gears for general condition.
P	D	25	50	100	Fuel selector valve for binding and leakage under boost pump pressure.
		25	50	100	Fuel booster pumps for proper operation.
	D	25	50	100	Fuel booster pumps for evidence of leakage at the pump mounting bolts and outlet fitting attaching bolts.
				100	100 hours or when leakage is evident. Tank mounted booster pump mounting bolts tightened to 20-30 inch pounds torque and outlet fittings to 100-140 inch pounds torque and resafety with brass wire, Grade A, .032 Diameter, Spec QQ-W-321.
				➡	PRIOR TO ENGINE OPERATION ON AIRCRAFT BEING REMOVED FROM STORAGE. Check fuel pump body to relief valve housing assembly bolts for tightness. All 3/16 inch diameter bolts torqued to 20-30 inch pounds and 1/4inch diameter bolts torqued to 50-70 inch pounds and safetied.
					*P= Preflight / D= Daily

FUEL SELECTOR FAILURE MODES

PITTING / SCORING FUEL SELECTOR BODY

How to recognize: external leakage

How to inspect: remove selector, disassemble, and visually inspect

Tolerance of damage or wear: Zero

Solutions offered: Replacement Fuel Selector body or Replacement of entire selector

FAILURE LOCATION #1

The most common failure occurs in the 4-1847-4 - Body - Fuel Selector Valve with pitting occurring in the cylindrical hole in the body.



FAILURE LOCATION #2

Another common failure that occurs in the 4-1847-4 - Body - Fuel Selector Valve is scoring occurring in the cylindrical hole in the body.



Note that the above assemblies had been refurbished from the factory or in the field. This was an original parker valve that was repaired but leaked due to scoring.

BROKEN / SEALING DISCS

The fuel selector requires 5 square graphite disks that have a convex or outward curve on the face, which conforms to the radius or shape of the rotor and body bore. A hole through the disk permits gasoline at line pressure to enter the rubber cup, thus building up pressure back of the disk to air in sealing.

How to inspect: remove selector, disassemble, and visually inspect

Tolerance of damage or wear: Zero

Solutions offered: Replacement of 10-643-14 Seal Assem - Parker Fuel Selector Valve

FAILURE LOCATION #1

Cracking or broken sealing disks can be removed and replaced. Embrittlement of the rubber cup can also occur.

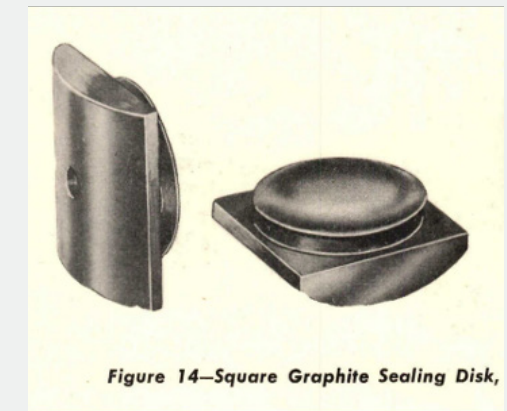


Figure 14—Square Graphite Sealing Disk,



WHEN PURCHASING



If you're replacing 122-48347 VALVE ASSEMBLY - FUEL SELECTOR, ensure airworthiness prior to purchasing by failure modes. If swapping out TCB-14800 Thompson valves for the 11-444-4 Parker Valves, maintainers should inspect the attaching parts. AirCorps is available to perform inspections, answer questions, complete services related to overhaul of landing gear, system components, along with services related to installation.

11-444-4 - PARKER FUEL SELECTOR - [AirCorps Depot](#).

122-48347 VALVE ASSEMBLY - FUEL SELECTOR

Additional Relevant Fuel Selector and P-51 Tech Orders & Information:

[AirCorps Library - P-51 Mustang Resources](#)

[Aircraft Inspection & Maintenance Guide - P-51, 00-20A-2-P-51, 7-Nov-1947](#)

[Handbook with Parts Catalog for Fuel Line Selector Cock, AN 03-10-1, 20-Oct-1943](#)

[T.O. 01-60JE-2, Maintenance Instructions for F-51D, F-51M, ZF-51K, and TF-51D, T.O. No. 1F-51D-2 \(AN 01-60JE-2\), 30-Nov-1956\)](#)

[Maintenance Instructions - Cavalier Mustang - F-51D, T.O. 1F-51D-2, 27-Sept-1968](#)

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