

INSTRUCTIONS NO. 2769H

Fairbanks-Morse

TYPES C and CWD

DIFFERENTIAL FUEL INJECTION NOZZLES



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DIFFERENTIAL FUEL INJECTION NOZZLES

These instructions cover the new Type C injection nozzle, which is not water cooled.

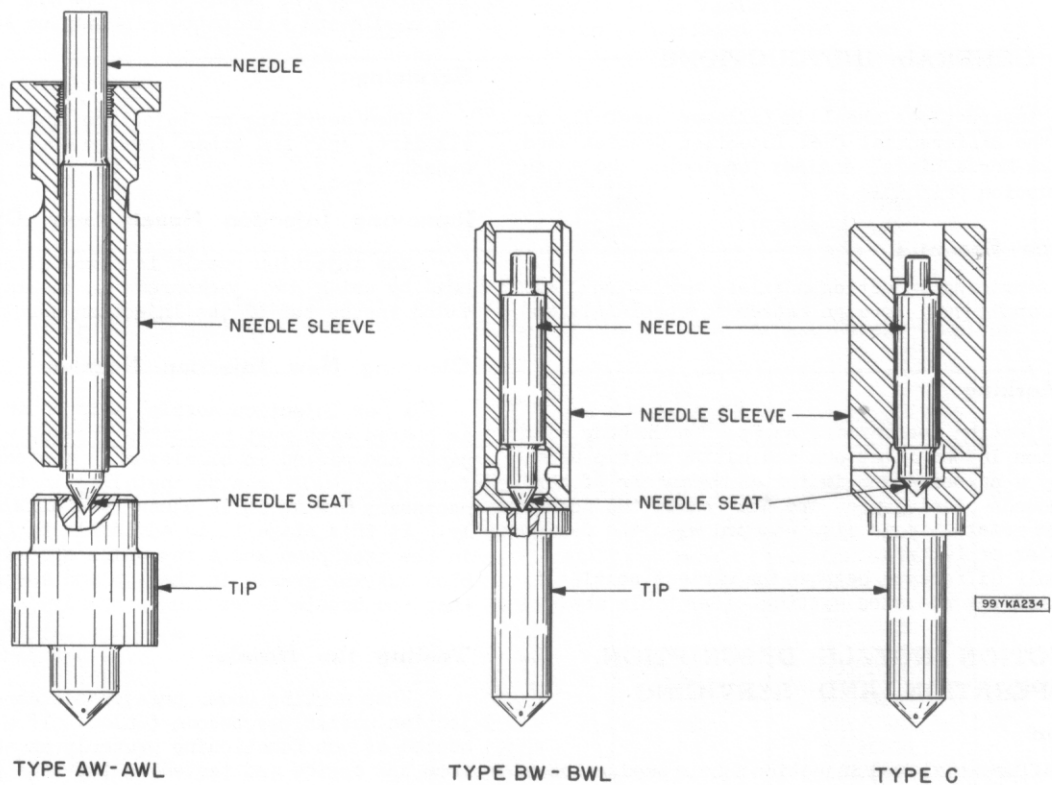
See Pages 17 and 18 for replacement information for engines not originally equipped with the type C nozzle.

The principle differences between the Type AW injection nozzle (needle seat in the tip) and the Type BW injection nozzle (needle seat in the sleeve) are:

1. The injection nozzle needle seat is contained in the nozzle sleeve, in the Type BW, rather than in the nozzle tip as in the Type AW.
 2. On the Type BW nozzle there is no adjustment of the lift of the injection nozzle needle.
- Both types of nozzles provide for water cooling connections in the nozzle body.

The type C nozzle does not provide for a water cooling system. The remainder of its features are the same as in the Type BW nozzle.

The type CWD (Dual Fuel) nozzle has water cooling connections in the nozzle body. This nozzle is equipped with a check valve and pilot fuel inlet. See page 8 and 12.



TYPE AW-AWL

TYPE BW-BWL

TYPE C

Service Equipment

Chart No. 1 - Type C and CWD Injection Nozzle Tools	Page 9
Chart No. 2 - Type C Injection Nozzle	Page 10
Chart No. 3 - Type CWD Injection Nozzle	Page 12
Chart No. 4 - Injection Nozzle Test Pump and Stand	Page 14

Reference Charts

Injection Nozzle Test Pump and Stand Complete	Chart No. 4
Injection Nozzle Tools	Chart No. 1

Pressure Setting

The opening pressure of these nozzles has been set at 200 lbs. per sq. inch higher than normal to allow for the initial drop in pressure.

MODEL NUMBER OF ENGINE USED ON	TIP USED	PRESSURE SETTING LBS. PER SQ. IN.
32E12	BD	2200
32E14	BC	2200
33F12	BB	2500
37F12	BB	2500
33E14	N	2500
37E14	N	2500
33F16	N	2500
37F16	N	2500
42G8-3/4	BI	2200

For Models not listed above, see page 13.

GENERAL INSTRUCTIONS

These instructions should be followed carefully in servicing the Differential Fuel Injection Nozzles used on Fairbanks-Morse Diesel engines employing the "Open Head" combustion principle.

Cleanliness Essential

When servicing injection nozzles, exclusion of all dirt, grit and other foreign matter is absolutely essential.

Nozzle Marking

All injection nozzles are stamped on the body with a designation letter or letters indicating the tip used, followed by a number which indicates the number of hundreds of pounds opening pressure for which the nozzle is set. The nozzle tip is also stamped with the designation letter or letters.

The only difference between the various nozzles is in the tip and the pressure setting. (See table above.)

INJECTION NOZZLE DESCRIPTION, OPERATION AND SERVICING

Description

The differential fuel injection nozzle used on these engines consists of a needle, needle sleeve, nozzle tip, filter, spring and nozzle body.

Operation

On the pressure stroke of the injection pump plunger, fuel at high pressure enters the injection nozzle through the injection tube and is forced through the nozzle filter. This filter removes any foreign matter which has passed through the main fuel filters and which might clog the small holes in the nozzle tip.

Two types of filtering units are used and differ according to the type of fuel injection pump that is installed on the engine at the factory. One filtering element is the conventional type, having thin layers of bronze element wire wrapped around the element body.

The other type has a one piece element with a close fit between the element and the filter body and with longitudinal grooves extending lengthwise and connected alternately with an annular groove at the end of the element. Very small clearance is provided for the passage of fuel from one groove to another. Thus, the fuel entering the end of the filter is forced through the clearance space between the filter and the filter housing into the longitudinal grooves extending to the opposite end of the filter.

The filtered fuel is forced down through grooves along the outside of the needle sleeve, and then enters the sleeve chamber through holes near the ends of the grooves. The fuel under pressure, acting against the face of the needle at the needle seat and at the shoulder lifts the needle from its seat. This action is counteracted by the spring through the push rod. As the fuel pump plunger moves toward the end of the stroke, the fuel pressure (at the seat of the nozzle needle) will exceed the spring pressure and lift the needle and fuel will pass through the small holes in the nozzle tip and be injected into the combustion space of the cylinder in a fine spray. The high pressure of the spring and fuel acting on the needle makes its action extremely fast and snappy. The needle is opened when the fuel pressure from the injection pump exceeds the spring load in the nozzle housing, and it is closed when the fuel pressure drops below that required to hold it open. The differential pressures insure quick opening and closing of the needle and eliminate dribbling or leaking.

Servicing

When servicing an injection nozzle, exclusion of all dirt, grit and other foreign matter is absolutely essential.

Removing Injection Nozzle from Cylinder Head

The injection nozzle is removed from the cylinder head by using two jackscrews in the tapped holes provided in the top of the injection nozzle body.

Cleaning New Injection Nozzles

A new injection nozzle, shipped from the factory, is coated with rust resisting grease, wrapped in oiled paper and packed in excelsior in a strong carton. Before the nozzle can be installed in the engine it is necessary to wash it in clean fuel oil and dry thoroughly. At this stage it is advisable to fasten the nozzle in the test pump and a few quick strokes will serve to blow out any grease in the tip and assure the operator that the nozzle is working properly.

Testing the Nozzle

When working under unfavorable conditions, the injection nozzle may become fouled. If a nozzle is suspected of not functioning properly it should be removed from the engine and tested on the test pump, Chart No. 4. Bolt the nozzle onto the test pump. Connect the oil supply tube from the pump pressure gauge to the injection nozzle tube fitting. Prime the test pump by using very quick strokes until the fuel is ejected from the nozzle in a fine spray. Then pump with a very slow, even stroke; if the needle sleeve and needle are clean and properly seated a continuous, uniform popping will occur.

When the opening pressure has been reached the needle will lift from its seat in the sleeve and a quick pressure drop will be indicated on the gauge. The highest pressure reached before this drop, as indicated on the gauge, will be the opening pressure.

The correct opening pressure may be found in the table on this page. Pressure readjustment is made by adding or removing spring retainer shims. Shims of .004", .0149" and .0299" are furnished. These will

change the pressure approximately 100, 400 and 1000 lbs. per sq. inch respectively.

The correct opening pressure may be found in the table on page 4. Pressure readjustment is made by adding or removing spring retainer shims. Shims of .004", .0149" and .0299" are furnished. These will change the pressure approximately 100, 400 and 1000 lbs. per sq. inch respectively.

If the pressure indicated on the gauge is low, it is possible that:

1. The spring setting is not correctly adjusted. Adding a shim reduces the spring pressure - removing a shim increases the pressure.

2. The needle is stuck and is partially open. Remove the needle and sleeve. Clean both; if necessary lap needle to its seat or replace with a new needle and sleeve.

3. The spring is weak or broken. Replace with a new spring.

If the pressure indicated on the gauge is high, it is probable that:

1. The spring setting is high. Adding a shim reduces the spring setting.

2. The needle is stuck and closed. Remove the needle and sleeve. Clean both; if necessary lap needle to its seat or replace with a new needle and sleeve.

3. The holes in the tip are clogged. Clean the tip.

4. The filter is dirty. Clean the filter.

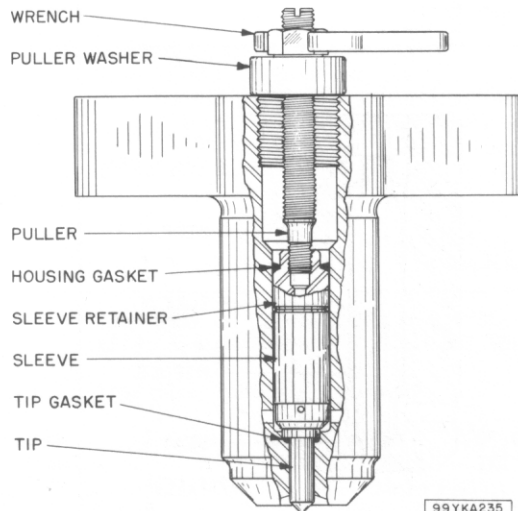
Testing for Leaky Needle Seat

Pump the pressure up to 500 pounds below the opening pressure, as listed in the table on page 4, and hold this pressure for a short time. If drops of fuel collect at the tip, the needle leaks and probably has dirt on the seat or needs lapping. It is advisable, however, to clean the needle and seat thoroughly and retest before lapping. Lapping should be avoided unless absolutely necessary, and is recommended only after everything else has been done to make the nozzle operate properly.

Disassembling the Nozzle

The Type C nozzle is disassembled by first removing the spring housing assembly complete (without removing the spring retainer). If any parts in this assembly need servicing, remove the spring retainer from the spring housing. Next pull out the needle sleeve retainer, using the tool shown in Illus. 1.

Remove the body vent plug and ball. Invert the nozzle, and the needle stop will drop out.

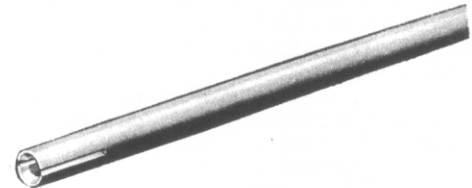


Illus. 1. Needle Sleeve Retainer Puller

Insert the needle lapping tool, Illus. 2, and tap it gently to wedge it to the top of the needle. Then withdraw the tool with the needle attached. If the needle is stuck and cannot be withdrawn by means of the needle lapping tool, strike the nozzle tip with a block of wood. This will loosen the needle sleeve, so that the sleeve and needle will fall out by inverting the nozzle. The needle can then be tapped loose from the sleeve.

The tip can be tapped out with the tip removing tool, as shown in Illus. 3.

Disassembly of the filter and filter housing does not require the use of any special tools.



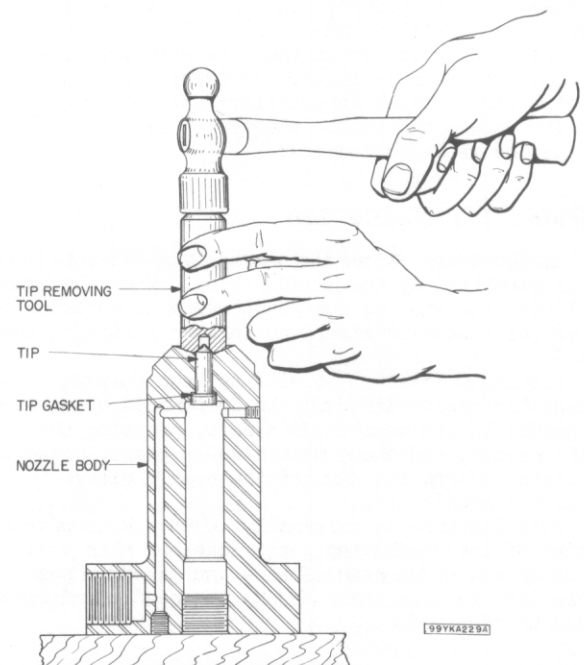
Illus. 2. Lapping Tool

Cleaning the Needle

Using the needle tool, remove and clean the needle in the following manner:

Dip the needle in kerosene and clean it with soft tissue paper free from fibres and glaze. Then dip in kerosene again and place in the sleeve to clean the needle seat. By means of the tool, rotate the needle back and forth, and at the same time up and down. Again remove and clean the needle with tissue paper. Repeat the process until the needle moves perfectly free in the needle sleeve, and will fall in place by its own weight.

Caution: Do not use sharp tools, emery cloth, powder, or other abrasives for cleaning. When assembling, be careful not to touch the needle with the bare hand, as this will leave a film on the polished surface, causing the needle to stick in the needle sleeve.



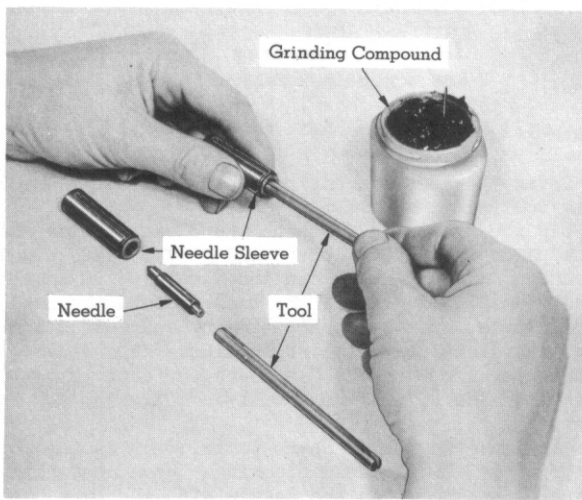
Illus. 3. Removing the Tip

Lapping the Needle Seat

If the nozzle leaks after cleaning it will be necessary to lap the needle to its seat.

To do this, take the needle out of the needle sleeve and see that both needle and seat are absolutely dry. Hold the needle sleeve in your hand, as shown in Illus. 4. Place a very small amount of lapping compound on the polished surface at the tip of the needle. Use carborundum grinding compound "H40 Fine", made by the Carborundum Co., Niagara Falls, N.Y., or its equivalent. Do not allow the lapping compound to come in contact with the lapped fit between the needle and the needle sleeve. Lap the needle to its seat by rotating the lapping tool back and forth very rapidly. Usually a few revolutions are sufficient to properly seat the needle in the sleeve.

After lapping, clean the needle and its seat thoroughly. Then test for leakage in test pump.



Illus. 4. Lapping the Needle Seat

If lapping by hand does not prove satisfactory, the sleeve may be inserted in a piece of wood that has a 13/16" dia. drilled hole about 1/2" deep. Rip this piece of wood; place it in the vise with the sleeve in the hole, as shown in Illus. 5. Twirl the needle tool with the finger tips; do not exert any pressure on it.

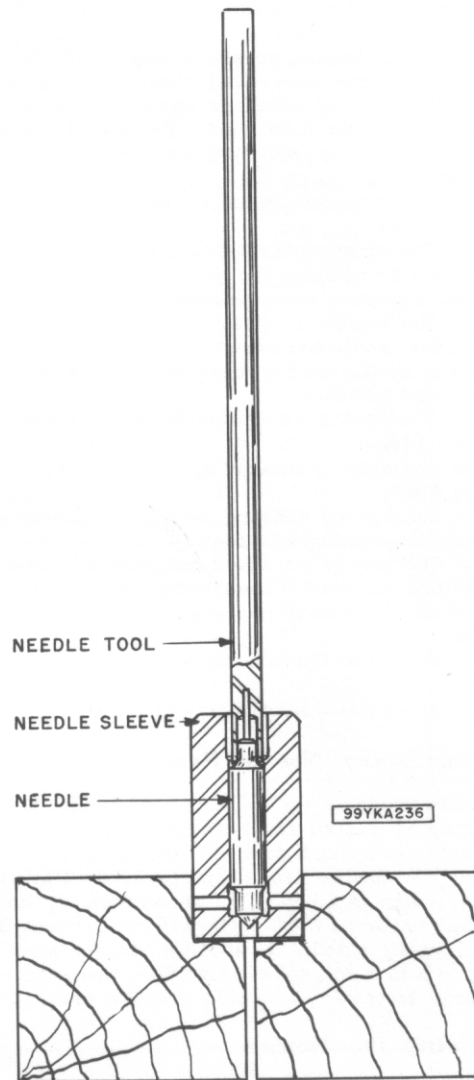
The needle and needle sleeve are lapped together, and must be replaced together.

Checking the Needle Lift

Oil pressure raises the needle from its seat to the extent permitted by the needle stop. When the needle has lifted the stop to the point where it contacts the end of the sleeve retainer, no further lifting is possible.

Looking at Illus. 6, it will be seen that the amount of possible needle lift can be determined by pressing the needle to its seat in the sleeve, pressing the stop to the needle, and then, with a depth gauge, measuring the distance from the top of the needle sleeve to the top of the needle stop.

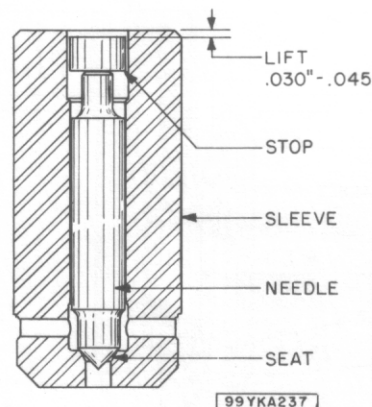
This distance is originally .030". When wear and lapping of the needle and seat, together with wear on the upper end of the needle, have increased the possible needle lift to more than .045", the needle and sleeve should be replaced.



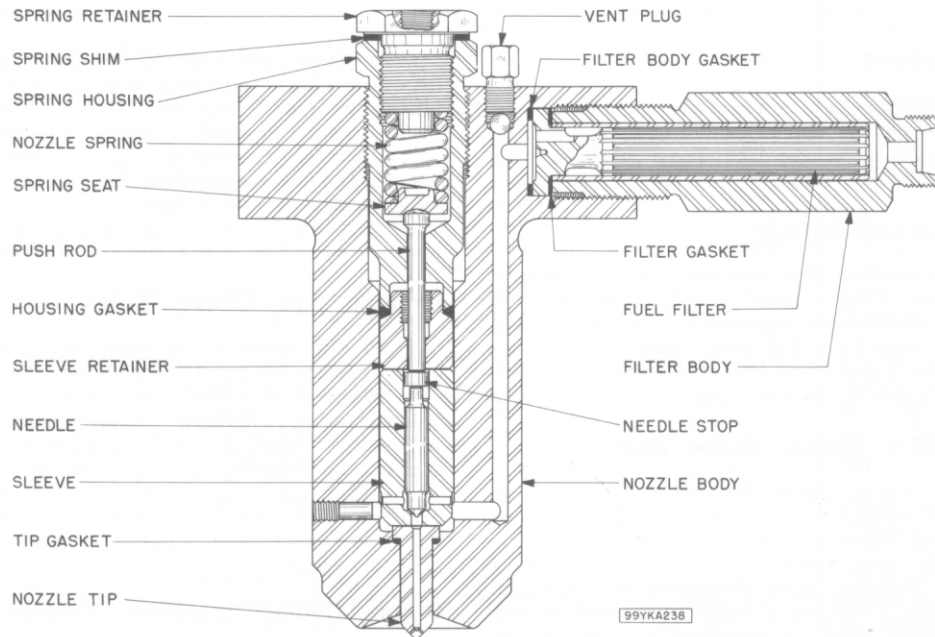
Illus. 5. Lapping the Needle Seat

Inspecting and Cleaning the Nozzle Tip

With a magnifying glass, examine the spray holes in the nozzle tip. Compare them with those in a new tip. If the edges appear ragged or distorted, replace with a new tip.



Illus. 6. Checking the Needle Lift



Illus. 7. Injection Nozzle

Do not use a cleaning wire on a plugged nozzle hole until after the nozzle has been soaked for several hours or longer in a solvent. This loosens the carbon, and generally the hole can then be cleared by using an air hose at the nozzle hole.

If the holes persist in remaining clogged, they may be cleared with the Cleaning Drill. Refer to the List of Tools for the correct cleaning drill. The wire should be clamped in the Tip Drill Vise, as shown in Chart No. 1, so that it does not extend for more than 1/8". Before using a freshly cut wire, remove the sharp edges by drawing the wire, with a rotating motion, over a cutting stone. Push the wire straight through; use a reaming action. Care must be exercised not to break the drill off in the nozzle hole.

Assembling an Injection Nozzle

The following description covers the assembling of an injection nozzle which has been completely disassembled. Selected portions of this description will serve as a guide to reassembling nozzles which have been only partially disassembled in connection with one or more of the servicing operations previously described.

The needle and the needle sleeve are lapped together, and must be replaced only in lapped sets as supplied by the manufacturer.

If the push rod, needle, needle stop or spring retainer have to be replaced; the needle and needle stop, the push rod and spring seat or the push rod and needle stop must be lightly lapped together.

Extreme caution must be observed to have every part clean before assembly.

Place a NEW nozzle tip gasket on the tip. Invert the nozzle body, then replace the tip and gasket and push them into the body with a square ended rod.

Next, assemble the needle and then the needle stop into the needle sleeve. Insert this sub-assembly into the nozzle body on the top of the nozzle tip.

Install the needle sleeve retainer with the tapped end up. Insert a new spring housing gasket.

To assemble the spring housing, first insert the push rod in the housing with the large rounded end at the top. Place the remainder of the parts into the

housing in the following order: the spring seat, the spring, the shims and spring retainer. Then screw the spring housing firmly into the nozzle body. Do not use undue force in screwing down the spring housing or the spring retainer, or parts may be distorted and cause the needle to bind in the sleeve.

Replace the body vent ball and vent plug in the nozzle body.

Insert a new filter body gasket before installing the fuel filter (on nozzles equipped with ermeto fittings, a new fuel filter gasket is inserted over the fuel filter). Then screw the fuel filter body into the nozzle body.

Test the assembled nozzle in the test pump as previously instructed. Add or remove shims as necessary to bring the opening pressure to the required lbs. per sq. inch.

Installing an Injection Nozzle

Place a NEW nozzle body gasket into the cylinder head.

Push the completely assembled nozzle into the cylinder head. Replace the nuts on the two studs. Tighten the two nuts evenly, using the same tension on both. This must be done to properly seat the body cap gasket and to avoid any distortion which might cause nozzle failure, such as the needle sticking in the sleeve.

Care of Injection Nozzle Test Pump

The injection nozzle test pump will rarely require attention other than periodic checking of the pressure gauge. A new nozzle, or one repaired at the factory, placed in the test pump could be used to check the gauge. If the test pump is working properly, the pressure registered on the gauge will be the same as that listed in the table on page 4.

The sleeve wrench provided with the tools is used for removing and replacing the pump sleeve.

For testing injection nozzles, the test pump should be filled with fuel oil to the level indicated. Care should be taken to use only clean, filtered oil of the same specifications as for the engine.

TYPE CWD INJECTION NOZZLE

General Instructions

The Dual Fuel Nozzle description, operation and servicing is the same as the standard nozzle with the addition of a Fuel Check Valve, Pilot Fuel Inlet Fitting and Water Cooling Passages.

Dual Fuel Pressure Setting

The opening pressure when checked through the main fuel oil inlet (Fuel Filter Body) should be set at 2700 pounds, and 2500 pounds when checked through the pilot fuel oil inlet. There is a 200 pound pressure difference between the two inlets and it is necessary to check the nozzle through the Pilot Fuel Inlet.

Testing for Leaky Check Valve Seat

If the check valve leaks, fuel oil will back up through the main fuel oil inlet. This leak will indicate that the check valve is stuck and partially open. It is advisable to clean the seat and valve thoroughly and retest before lapping, also check the spring which maybe weak or broken. Lapping should be avoided unless absolutely necessary, and is recommended only after everything else has been done to make the check valve operate properly. If the check valve leaks, the injection nozzle will fail to supply the proper amount of pilot fuel when operating on gas; this may result in a dangerous accumulation of unburned gas.

Cleaning the Check Valve

Dip the valve in kerosene and clean it with soft

tissue paper free from fibres and glaze. Then dip in kerosene again and place the valve in the seat to clean the valve seat. Hold the valve in the seat with a wood dowel, pencil or index finger, then rotate the seat back and forth on the valve. Again remove and clean the valve with tissue paper. Repeat the process until the valve and seat are clean.

Caution: Do not use sharp tools, emery cloth, powder, or other abrasives for cleaning.

Lapping the Check Valve Seat

If the check valve leaks after cleaning, it will be necessary to lap the valve to its seat.

Place a very small amount of lapping compound on the valve tip. Rotate the seat back and forth on the valve very rapidly. Usually a few revolutions are sufficient to properly seat the valve in the seat.

After lapping, clean the valve and the seat thoroughly. Then test for leakage in the test pump. The valve and seat are lapped together, and must be replaced together.

Water Cooled Injection Nozzles

On water cooled injection nozzles, an adequate supply of cold soft water should be circulated through the nozzle. Decreased flow of cooling water discharging from the nozzle may indicate formation of scale or collection of sediment in the passages, or insufficient pressure on the water being circulated. Forcing water through under high pressure will not clear the passages. The scale can be removed from the passages with an acid solution.

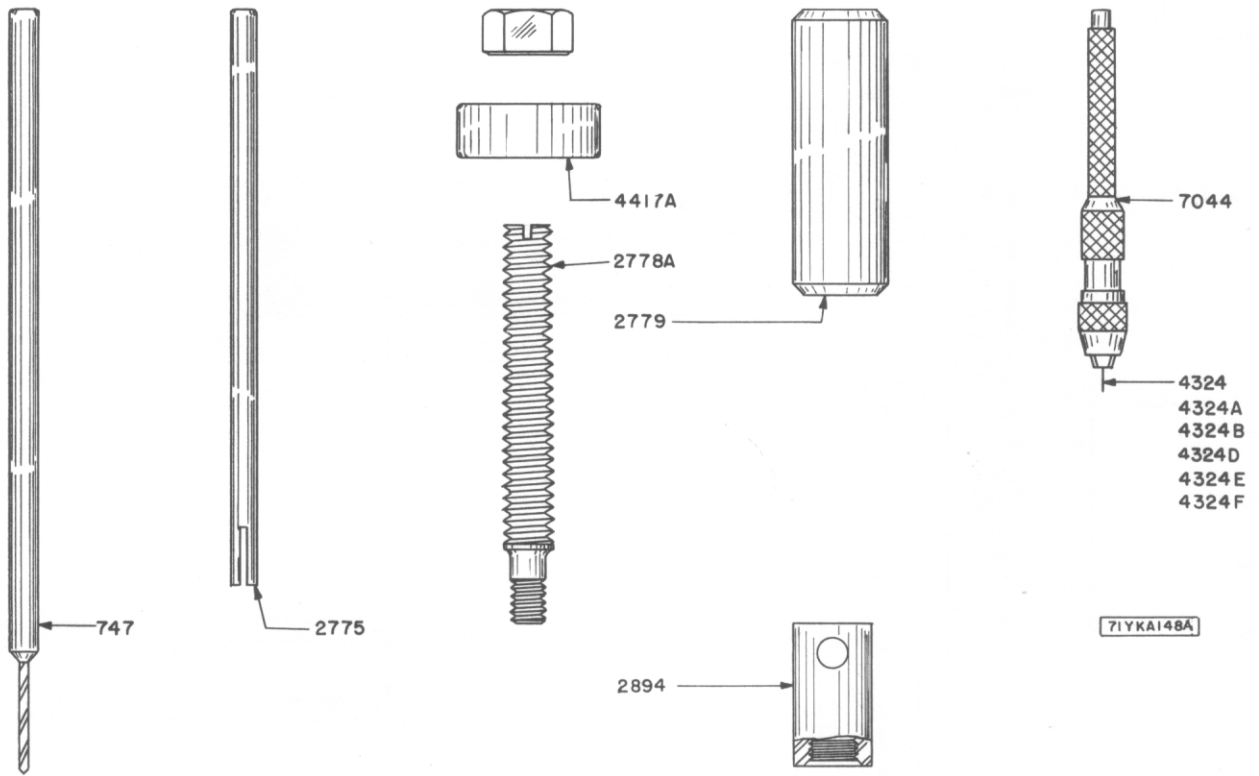


Chart 1. Tools

Repair Number	Name of Part	Symbol or Size	No. Used Per Nozzle
747	Tip Cleaning Tool (With Twist Drill #42)	YKA747A	1
2775	Needle Tool	TD2775A1	1
2778A 4417A ø	Needle Sleeve Retainer Puller - Always with	TD2778B1	1
	" " " " Washer	TD2866A	1
	" " " " Nut	11FM29A 1/2"	1
2779	Tip Removing Tool	TD2779A	1
2894 ø	Injection Nozzle Check Valve Seat Puller	TD2894A	1
	" " " " " " Handle	#565(5/16x5) 11FM41A	1
4324	Cleaning Drill (For use on Tips BE, BD and BH)	YKA4324A	12
4324A	Cleaning Drill (For use on Tip BC)	YKA4324B	12
4324B	Cleaning Drill (For use on Tip BB)	YKA4324C	12
4324D	Cleaning Drill (For use on Tip N)	YKA4324E	12
4324E	Cleaning Drill (For use on Tip BA)	YKA4324F	12
4324F	Cleaning Drill (For use on Tip BI)	YKA4324G	12
7044 ø	Tip Cleaning Drill Vise	(Starrett) #162A	1
	Spring Housing Wrench	16FM19C #8A(1-5/16")	1

ALWAYS GIVE ENGINE SERIAL NUMBER

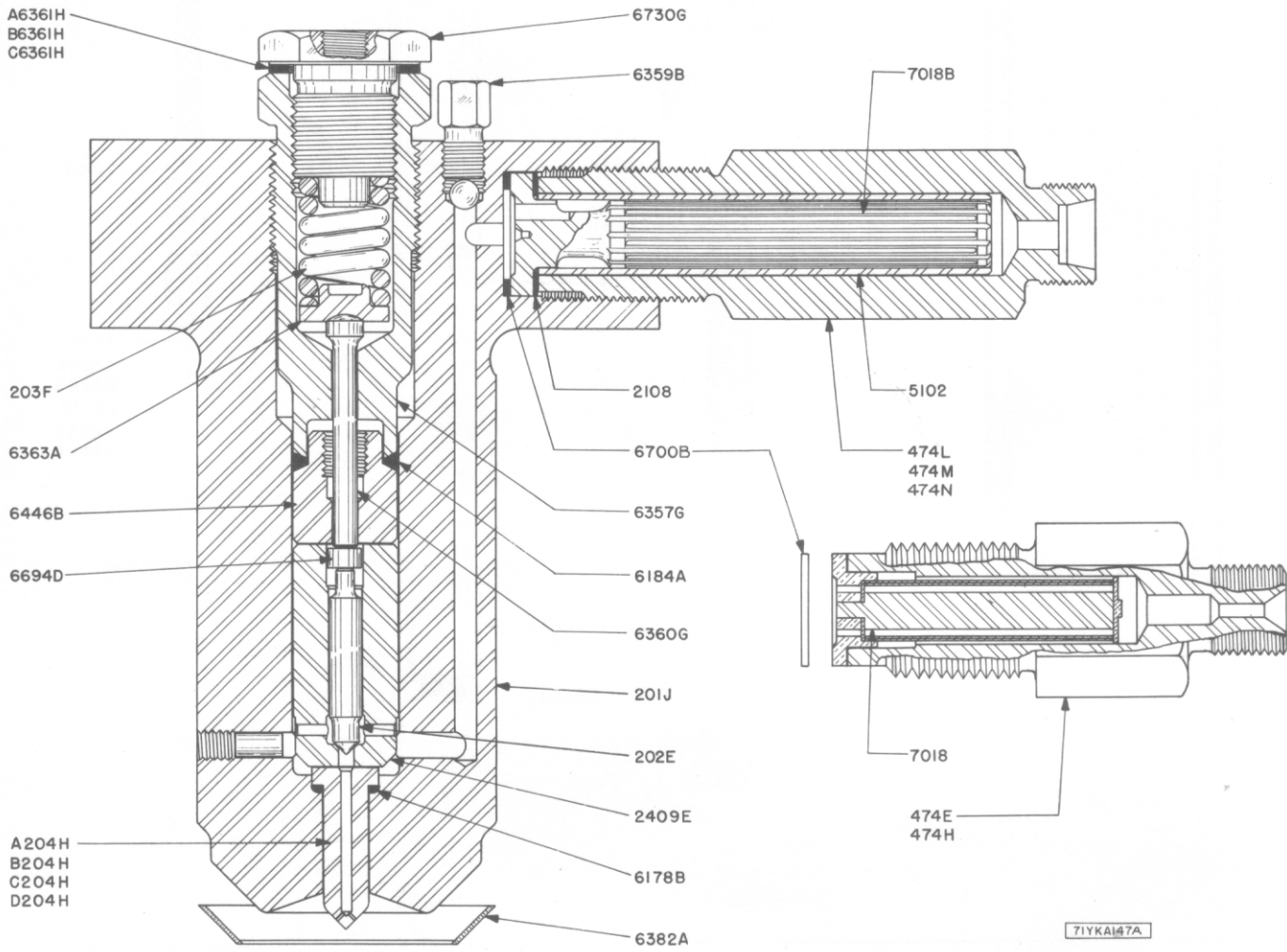


Chart 2. Type C Injection Nozzle

Service Instructions Fairbanks-Morse Differential Injection Nozzles

Repair Number	Name of Part	Symbol or Size	No. Used Per Nozzle
201M-C	Injection Nozzle (Complete)	1
201J	Injection Nozzle Body - Always with	YLA201G	1
	" " " Plug (Not furn. sep.)	YKA534A1	1
202E 2409E	Injection Nozzle Needle - Always with	C-AFB202A9	1
	" " Sleeve (Not furn. sep.)	DLA2409A	1
203E	Injection Nozzle Spring	C-ADD203A1	1
*A204H	Injection Nozzle Tip (Used on Models 33F12, 37F12) (Stamped "BB")	CKC204B1	1
*B204H	Injection Nozzle Tip (Used on Model 32E12) (Stamped "BD")	YJA204D1	1
*C204H	Injection Nozzle Tip (Used on Model 32E14) (Stamped "BC")	YKA204L1	1
*D204H	Injection Nozzle Tip (Used on Model 33E14 & 37E14) (Stamped "N")	YLA204N1	1
*D204H	Injection Nozzle Tip (Used on Models 33F16 & 37F16) (Stamped "N")	YLA204N1	1
*F204H	Injection Nozzle Tip (Used on Model 42G8-3/4) (Stamped "BI")	CFG204A	1
6178B	Injection Nozzle Tip Gasket	YLA6178D	1
6184A	Injection Nozzle Spring Housing Gasket	YLA6184B	1
6357G	" " " Housing	YLA6357C	1
6359B	" " Body Vent Plug	YLA6359A	1
e	" " " " Ball	1/4" 16FMI8B	1
6360G 6363A	Injection Nozzle Spring Push Rod - Always with	YLA6360D1	1
	" " " Seat - Not furn. sep.	YLA6363B3	1
A6361H	Injection Nozzle Spring Shim (.0299")	C-ADD6361B3	As Req'd
B6361H	" " " Shim (.0149")	C-ADD6361C3	" "
C6361H	" " " Shim (.004")	C-ADD6361D3	" "
6446B	Injection Nozzle Needle Sleeve Retainer	YLA6446B	1
6694D	" " " Stop	C-ADD6694B	1
6730G	" " Spring Retainer	YLA6730A	1
	Used on Models 32E12, 32E14, 42G8-3/4.		
* 474E	Injection Nozzle Fuel Filter Body - 45° Seat, Brazed Tubing	YKA474C2	1
	Used on Models 33F12 and 37F12.		
* 474N	Injection Nozzle Fuel Filter Body - Ermeto Fittings	CKC474A2	1
	Used on Models 33E14 and 37E14.		
* 474L	Injection Nozzle Fuel Filter Body - Ermeto Fittings	CKC474B	1
	Used on Models 33F16 and 37F16.		
* 474M	Injection Nozzle Fuel Filter Body - Ermeto Fittings	YLA474D	1
2108	Injection Nozzle Fuel Filter Gasket	YLA2108G1	1
5102	" " " Sleeve	YLA5102A	1
6382A	" " Body Gasket	YJA6382A1	1
6700B	" " Fuel Filter Body Gasket	YLA2108J5	1
7018	" " " Element (Purolator #7)	16FMI15D14	1
7018B	" " " Filter (For "V-B" Type Pump)	YLA351C	1

* See pages 17 and 18 for Tips and Fuel Filter Bodys on Models not listed on this page.

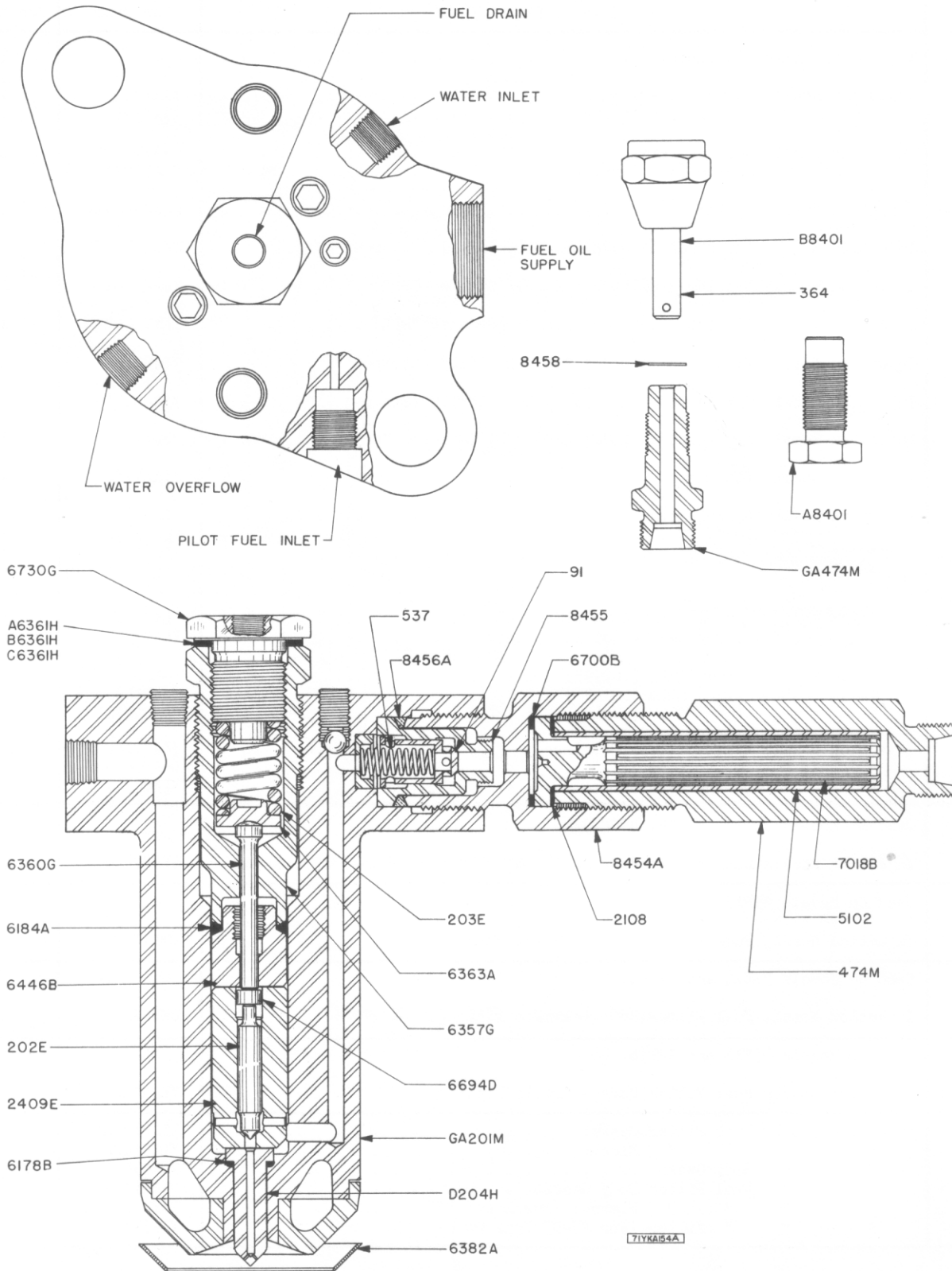


Chart 3. Type CWD Injection Nozzle

Service Instructions Fairbanks-Morse Differential Injection Nozzles

Repair Number	Name of Part	Symbol or Size	No. Used Per Nozzle
GA201M-C	Injection Nozzle - Dual Fuel (Complete)		1
GA201N	Injection Nozzle Body - Always with	YLA201GA7	1
	" " " Plug	YKA534A1	1
	" " " Cap	YLA738GA2	1
	" " Check Valve Stop	YKA534A	1
	" " Body Plug	1/8" 20FM7T	2
	" " Vent Ball	1/4" 16FM18B	1
" " " " Screw	5/16x1/2 11FM22C	1	
(202E 2409E	Injection Nozzle Needle - Always with	C-AFB202A9	1
	" " Sleeve - Not furn. sep.	DLA2409A	1
203E	Injection Nozzle Spring	C-ADD203A1	1
D204H	" " Tip (Used on Model 33F16)(Stamped "N")	YLA204N4	1
6178B	" " Gasket	YLA6178D	1
6184A	" " Spring Housing Gasket	YLA6184B1	1
6357G	" " " Housing	YLA6357C2	1
(6360G 6363A	Injection Nozzle Spring Push Rod - Always with	YLA6360D3	1
	" " " Seat - Not furn. sep.	YLA6363B3	1
A6361H	Injection Nozzle Spring Shim (.0299")	C-ADD6361B3	As Req'd.
B6361H	" " " Shim (.0149")	C-ADD6361C3	" "
C6361H	" " " Shim (.004")	C-ADD6361D3	" "
6446B	" " Needle Sleeve Retainer	YLA6446B2	1
6694D	" " " Stop	C-ADD6694B1	1
6730G	" " Spring Retainer	YLA6730A3	1
(474M 5102	Injection Nozzle Fuel Filter Body - Always with (Used on Model 33F16)	YLA474D	1
	" " " " Sleeve	YLA5102A	1
GA474M	Injection Nozzle Pilot Fuel Inlet Fitting	YLA474GA	1
537	" " Fuel Check Valve Spring	C-AFB537C	1
2108	" " Fuel Filter Gasket	YLA2108G1	1
6382A	Injection Nozzle Body Gasket	YJA6382A1	1
6700B	" " Fuel Filter Body Gasket	YLA2108J5	1
7018B	" " " Filter	YLA351C1	1
(8455A 91 8454A	Injection Nozzle Fuel Check Valve Seat - Always with	DLA8455A	1
	" " " " Valve - Not furn. sep.	C-AFB91A3	1
	" " " " Valve Cage - Not furn. sep.	DLA8454A1	1
8456A	Injection Nozzle Fuel Check Valve Cage Gasket	DLA8456A1	1
8458	" " Pilot Fuel Inlet Fitting Gasket	YLA8458GA	1
	For testing nozzle with removal of pilot fuel inlet fitting, when testing through fuel oil supply inlet.		
A8401	Pilot Fuel Inlet Plug	DLA8401B	1
	For testing nozzle without removal of pilot fuel inlet fitting, when testing through fuel oil supply inlet.		
(B8401 ø ø 364 ø	Pilot Fuel Inlet Plug Assembly - Always with	426TD	1
	" " " " Nut	5/16T 20FM42A	1
	" " " " Sleeve	5/16T 20FM42C	1
	" " " Plug	ND364B	1
	" " " Cotter Pin	3/32x5/8 .11FM2A	1

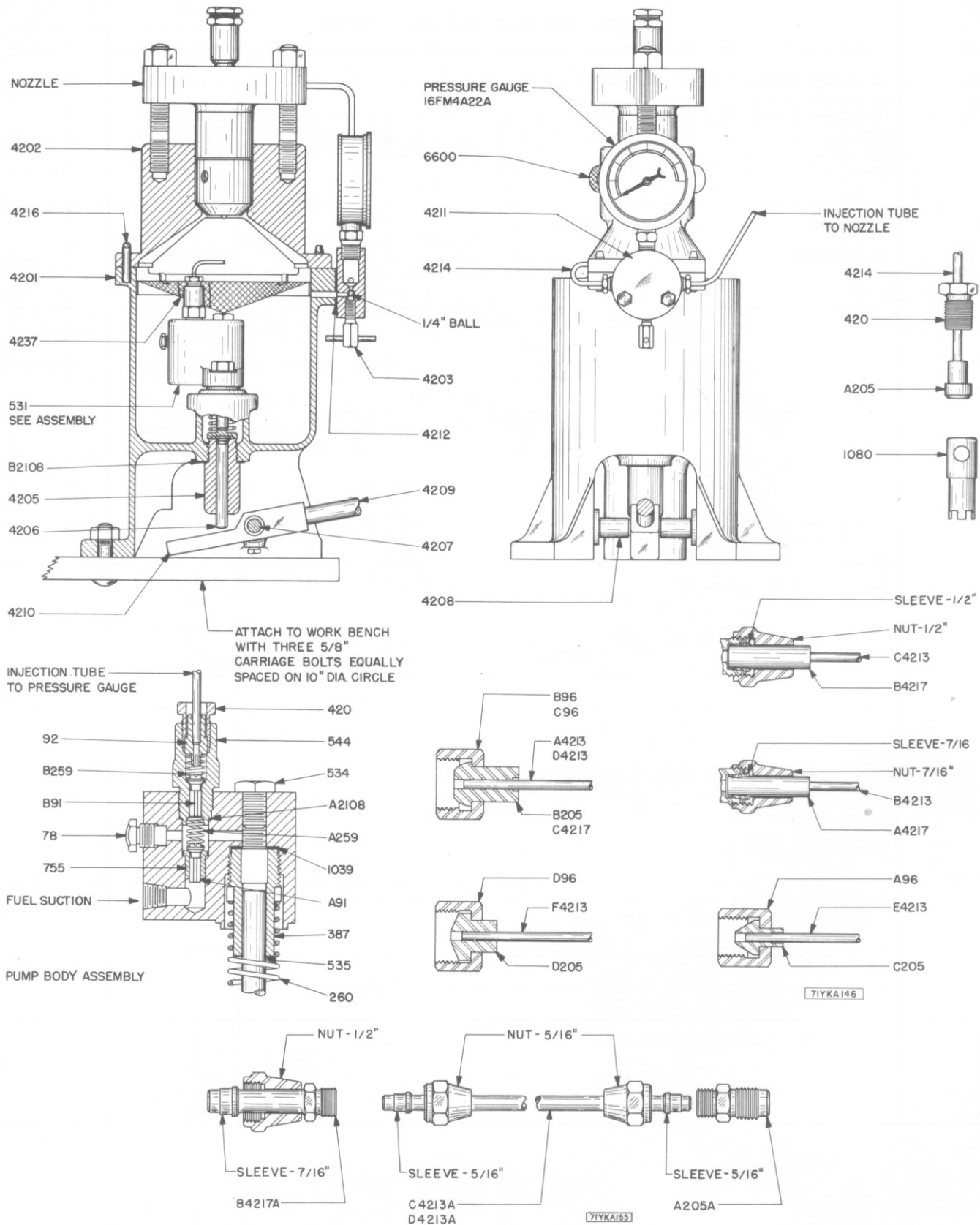


Chart 4. Injection Nozzle Test Pump and Stand

Service Instructions

Fairbanks-Morse Differential Injection Nozzles

Identification Number	Name of Part Order parts by symbol or size as listed in 3rd column.	Symbol or Size	Number Used
78	Pump Body Plug	YDB78A	1
92	Pressure Gauge Tube Gland - Pump End	CEA92A1	1
A96	Injection Tube Nut - Nozzle End	CFE96A	1
B96	" " Nut - Nozzle End	YKA96B1	1
A205	Pressure Gauge Tube Gland - Gauge End	CEA205A	1
B205	Injection Tube Gland - Nozzle End	YKA205D3	1
C205	" " Gland - Nozzle End	YKA205E	1
A259	Pump Suction Valve Spring	CEA259A	1
B259	" Discharge Valve Spring	CEA259A	1
260	" Spring	CEB260C	1
387	" Sleeve - Always with	CEB387C1	1
535	" Plunger - Not furn. sep.	CEB535C1	1
420	Injection Tube Gland Nut - Gauge End	CEA420A	1
420	Pressure Gauge Tube Gland Nut	CEA420A	2
531	Pump Body - Always with	YDA531B	1
755	" Suction Valve Seat - Always with	CEA755A1	1
A91	" " Valve	CEA91A2	1
534	Pump Filler Plug	YDA534A	1
544	Pump Discharge Valve Cage - Always with	CEA544A	1
B91	" " Valve	CEA91A2	1
1039	Pump Gasket	CEB1039B	1
1080	" Plunger Sleeve Wrench	CEB1080B	1
A2108	" Discharge Valve Gasket	CEA2108A	1
B2108	" Stand Push Rod Guide Gasket	YLA2108A	1
4201	Pump Stand - Always with	YKA4201A5	1
4216	" " Pipe Plug 20FM7D	1/4"	1
4216	" " Pin	YKA4216A	4
4202	Pump Stand Top	YKA4202A1	1
4203	Pressure Gauge Vent Screw - Always with	YKA4203B1	1
4203	" " " " Pin (1/2x2)	#429	1
4205	Pump Stand Push Rod Guide - Always with	YKA4205A3	1
4206	" " Plunger Push Rod - Not furn. sep.	YKA4206A2	1
4207	Pump Stand Lever Rod	YKA4207A	1
4208	" " " " Setscrew 11FM15A	3/8" x 5/8"	1
4208	" " " " Spacer	YKA4208A	2
4209	" " " Rocker Handle	YKA4209A1	1
4210	" " " Rocker	YKA4210B1	1
4211	Pressure Gauge Vent Body - Always with	YKA4211C	1
4211	" " " " Plug 20FM7K	1/2"	1
4211	" " " " Capscrew 11FM7A	3/8x1-3/4"	2
4211	" " " " Ball 16FM18C	1/4"	1
4212	" " " " Gasket	YKA4212A2	1
Used on all Engines except: Models 33DL4 and 37DL4 Previous to Engine 5 Cyl. - 867346; 6 Cyl. - 859953; 7 Cyl. - 859046. Models 33E16 and 37E16 Previous to Engine 842670.			
A4213	Injection Tube - Always with	YKA4213A	1
B205	" " Gland	YKA205D5	1
B96	" " Nut	YKA96B1	1
A205	" " Gland - Gauge End	CEA205A	1
420	" " " Nut - Gauge End	CEA420A	1
Used only on Models 33E14 and 37E14 with V.B. Pumps. Effective on Engine 5 Cyl. - 867346; 6 Cyl. - 859953; 7 Cyl. - 859046.			
B4213	Injection Tube - Always with	CKC4213A	1
A4217	" " Gland	CKC4217A	1
4217	" " Nut (Ermeto - 7/16" O.D. Tube)	20FM42A	1
4217	" " Sleeve (Ermeto - 7/16" O.D. Tube)	20FM42C	1
A205	" " Gland - Gauge End	CEA205A	1
420	" " " Nut - Gauge End	CEA420A	1

ALWAYS GIVE ENGINE SERIAL NUMBER

Identification Number	Name of Part Order parts by symbol or size as listed in 3rd column.	Symbol or Size	Number Used
	Used only on Models 33F16 and 37F16 with V.B. Pumps. Effective on Engine 5 Cyl. - 867347; 7 Cyl. - 868164.		
C4213 B4217 Ø Ø A205 420	Injection Tube - Always with " " Gland " " Nut (Ermeto - 1/2" O.D. tube) " " Sleeve (Ermeto - 1/2" O.D. tube) " " Gland - Gauge End " " " Nut - Gauge End	YLA4213B YLA4217B 2OFM42A 2OFM42C CEA205A CEA420A	1 1 1 1 1 1
	Used on Models 33F16 Dual Fuel with Uni-valve Pumps.		
C4213A B4217A Ø Ø A205A Ø Ø	Injection Tube - Always with " " Gland " " Nut - Nozzle End (Ermeto - 1/2" O.D. Tube) " " Sleeve - Nozzle End (Ermeto - 1/2" O.D. Tube) " " Gland - Gauge End " " Nut - Gauge End (Ermeto - 5/16" O.D. Tube) " " Sleeve - Gauge End (Ermeto - 5/16" O.D. Tube)	YLA4213D YLA4217C 2OFM42A 2OFM42C YLA4224A 2OFM42A 2OFM42C	1 1 1 1 1 2 2
	Used on Models 33F16 and 37F16 Standard Engines with Uni-valve Pumps.		
D4213A B4217A Ø Ø A205A Ø Ø	Injection Tube - Always with " " Gland - Nozzle End " " Nut - Nozzle End (Ermeto - 1/2" O.D. Tube) " " Sleeve - Nozzle End (Ermeto - 1/2" O.D. Tube) " " Gland - Gauge End " " Nut - Gauge End (Ermeto - 5/16" O.D. Tube) " " Sleeve - Gauge End (Ermeto - 5/16" O.D. Tube)	YLA4213C YLA4217C 2OFM42A 2OFM42C YLA4224A 2OFM42A 2OFM42C	1 1 1 1 1 2 2
	For Service on Nozzles Previously Furnished. Used only on Models 33E16 and 37E16 with Gland YLA205A. Effective on Engine 842670. Used on Engines Previous to 5 Cyl. - 867347; 7 Cyl. - 868164.		
D4213 C4217 C96 A205 420	Injection Tube - Always with " " Gland " " " Nut " " Gland - Gauge End " " " Nut - Gauge End	YLA4213A YLA4217A YLA96B1 CEA205A CEA420A	1 1 1 1 1
	For Service on Nozzles Previously Furnished. Used only on Models Equipped with Swedged Tubing.		
E4213 C205 A96 A205 420	Injection Tube - Always with " " Gland " " Nut " " Gland - Gauge End " " " Nut - Gauge End	YKA4213B YKA205E CFE96A CEA205A CEA420A	1 1 1 1 1
	For Service on Nozzles Previously Furnished. Used only on Models Equipped with Gland CKA491A or CKA491B.		
F4213 D205 D96 A205 420	Injection Tube - Always with " " Gland " " Nut " " Gland - Gauge End " " " Nut - Gauge End	YKA4213C YKA205F YKA96A1 CEA205A CEA420A	1 1 1 1 1
4214 A205 92 420	Pressure Gauge Tube - Always with " " " Gland " " " Gland " " " " Nut	YKA4214A CEA205A CEA92A1 CEA420A	1 1 1 2
4237 Ø Ø Ø 6600 Ø Ø	Test Pump Screen - Always with Test Pump Screen Ring } " " " Hook } Not furn. sep. " " " Shield } Pressure Gauge 5000 lbs., 3-1/2" Phillips Pump Stand Top Nozzle Stud 11FM6A " " " " Nut 11FM25A " " " Screw " " Capscrew 11FM7A " " Lockwasher 11FM1A	YKA4237A YKA4238A YKA4239A CHB4240A C-ND2013A 3/4x5-1/4" 3/4" YKA6600B 1/2x1-1/2" 1/2"	1 1 1 2 1 2 2 2 2 2

REPLACEMENT PARTS FOR AN AW OR AWL NOZZLE.
AN INJECTION NOZZLE WITH NEEDLE SEAT IN THE TIP.

When a Complete Nozzle or the Nozzle Body is to be replaced with the Type "C" Nozzle, the following parts are to be included in the order.

Repair Number	Name of Part	Symbol or Size	No. Used
201M-C	Injection Nozzle (Complete) Type C	1
2775	" Nozzle Needle Tool	TD2775A	1
2778A	" " Sleeve Retainer Puller - Always with	TD2778B1	1
4417A	" " " " Washer	TD2866A	1
e	" " " " " Nut 11FM29A	1/2"	1
2779	" " Tip Removing Tool	TD2779A	1

REPLACEMENT PARTS FOR A BW OR BWL NOZZLE.
AN INJECTION NOZZLE WITH NEEDLE SEAT IN THE SLEEVE,
WITH LEVER OR WITHOUT LEVER AND WATER COOLED.

When a Complete Nozzle or the Nozzle Body is to be replaced with the Type "C" Nozzle, the following parts are to be included in the order.

Repair Number	Name of Part	Symbol or Size	No. Used
201M-C	Injection Nozzle (Complete) Type C	1
2778A	" " Needle Sleeve Retainer Puller - Always with	TD2778B1	1
4417A	" " " " " Washer	TD2866A	1
e	" " " " " Nut 11FM29A	1/2"	1

These Tips are for Models not listed on page 9.
They are to be included in 201M-C to replace any AW, AWL, BW, or BWL Nozzle Complete.

Model	Repair Number	Tip Letter	Symbol	Pressure Setting
32C12, 32D12	B204H	BD	YJA204D1	2200
32C14, 32D14	C204H	BC	YKA204L1	2200
33C10-1/2, 33D10-1/2	B204H	BD	YJA204D1	2200
33C12, 33D12, 33E12	A204H	BB	CKC204B1	2500
33C14, 33D14	D204H	N	YLA204N1	2500
33C16, 33D16, 33E16	E204H	BA	YLA204P1	2500
35D8-3/4, 35E8-3/4, 35F8-3/4	D204H	BH	CFE204C1	2200
35FD8-3/4, 35FE8-3/4	D204H	BH	CFE204C1	2200
35HF8-3/4	D204H	BH	CFE204C1	2200
35C10, 35E10, 35F10	B204H	BE	CHB204E1	2200
35HE10, 35HF10	B204H	BE	CHB204E1	2200
35C14, 35D14, 35E14, 35F14	C204H	BC	YKA204L1	2200
37C10-1/2, 37D10-1/2	B204H	BD	YJA204D1	2200
37D12, 37E12	A204H	BB	CKC204B1	2500
37C14, 37D14	D204H	N	YLA204N1	2500
37C16, 37D16, 37E16	E204H	BA	YLA204P1	2500
41D8-3/4	D204H	BH	CFE204C1	2200
42E8-3/4, 42F8-3/4, 42G8-3/4	F204H	BI	CFG204A	2200
44D8-3/4, 44E8-3/4	D204H	BH	CFE204C1	2200
44HD8-3/4	D204H	BH	CFE204C1	2200
44HC10, 44HE10	B204H	BE	CHB204E1	2200

Complete Nozzle Groups 201D-C, 201E-C, 201F-C, and 201G-C included the Fuel Filter Body, Gasket, and Element; if the order for any AW or AWL Nozzle Complete includes these parts, they must be added to the "C" Nozzle Complete when furnished for replacements. To furnish a Fuel Filter Body for these models, it will be necessary to refer to engine serial numbers.

Repair Number	Name of Part	Symbol	No. Used
	Used on Models 33C12 and 37D12 with 45° Seat.		
474E	Fuel Filter Body (45° Seat)	CJB474A1	1
	Used on All Models with 45° Seat except 33C12 and 37D12.		
474E	Fuel Filter Body (45° Seat)	YKA474C1	1
	Used on Models 32D12, 33D16, and 37D16 with 26° Seat.		
474E	Fuel Filter Body (26° Seat)	YKA474E	1
	Used on Models 33D10½, 33D14, 37D14, 33D16, and 37D16 with 60° Seat.		
474G	Fuel Filter Body (60° Seat)	YKA474D	1
	Used on Models 33E16 and 37E16 with 45° Seat, equipped with Jerk Type Fuel Injection.		
474H	Fuel Filter Body (45° Seat)	YLA474A	1
	Used on Models 33E14 and 37E14 with ermeto fittings and water cooled nozzles.		
474J	Fuel Filter Body (For Ermeto Fitting)	CKC474A2	1
	Used on Models 33F16 and 37F16 with ermeto fittings and water cooled nozzles.		
474K	Fuel Filter Body (For Ermeto Fitting)	YLA474B1	1
	Used with Filter Body 474E, 474G, and 474H.		
6700A 7018	Fuel Filter Body Gasket Fuel Filter Body Element (Purolator #7)	YKA2108G 16FML15D14	1 1
	Used with Filter Body 474J and 474K.		
2108 6700A 7018A	Fuel Filter Gasket Fuel Filter Body Gasket Fuel Filter	YLA2108G1 YKA2108G YLA351A2	1 1 1

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