Barber-Colman Integrated Actuator for Stanadyne "D" Series Injection Pump — Model DYNA 70025

Installation Procedure

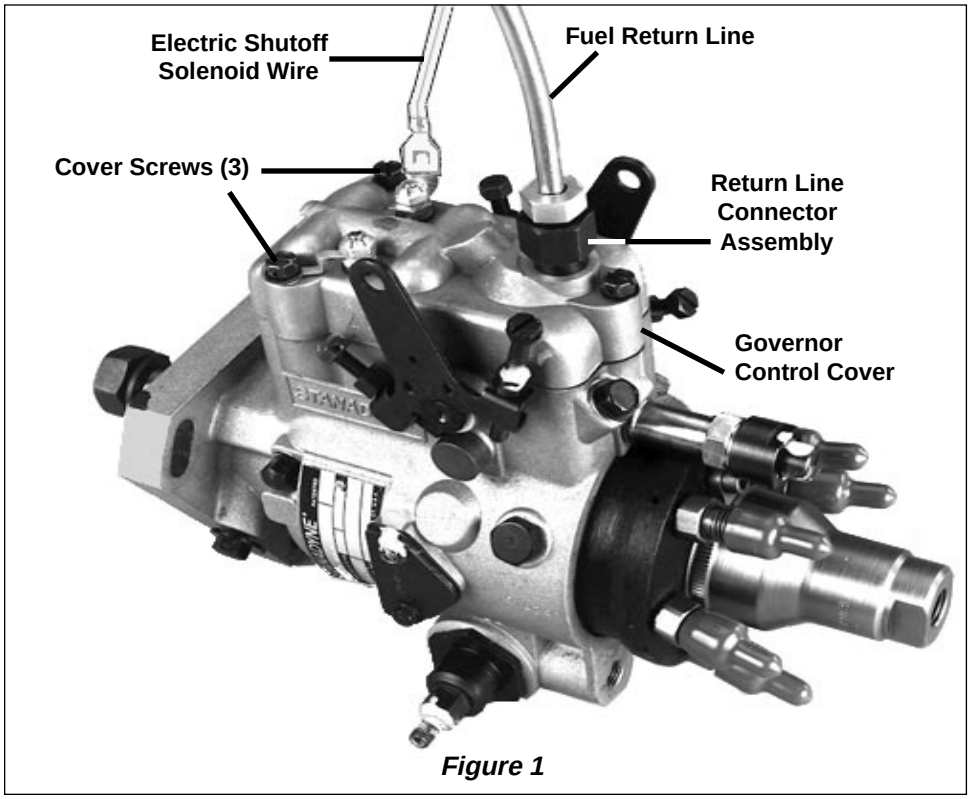

Figure 1

STEP I

REMOVAL OF EXISTING GOVERNOR CONTROL COVER

— NOTE —

Clean outside of pump with solvent and dry with compressed air prior to removing the GOVERNOR CONTROL COVER. A suitable container should be placed underneath the fuel injection pump to catch any fuel that may spill when removing the GOVERNOR CONTROL COVER.

1.0 Remove the FUEL RETURN LINE from the pump's RETURN LINE CONNECTOR ASSEMBLY. Use two wrenches to loosen. *See Figure 1.*

1.1 Remove the RETURN LINE CONNECTOR ASSEMBLY from the GOVERNOR CONTROL COVER using care not to allow dirt to enter the injection pump. Remove and discard the RETURN LINE CONNECTOR O-RING. Set aside the RETURN LINE CONNECTOR for later installation on the new INTEGRATED ACTUATOR COVER ASSEMBLY.

1.2 Remove the ELECTRIC SHUTOFF (ESO) SOLENOID WIRE from the GOVERNOR CONTROL COVER. Trace the solenoid wire back to its source. Remove and discard the wire.

CAUTION

Do not use this wire to power the new INTEGRATED ACTUATOR.

1.3 Loosen the three COVER SCREWS and remove the GOVERNOR CONTROL COVER ASSEMBLY from the pump. Save all three screws for later installation of the INTEGRATED ACTUATOR COVER ASSEMBLY.

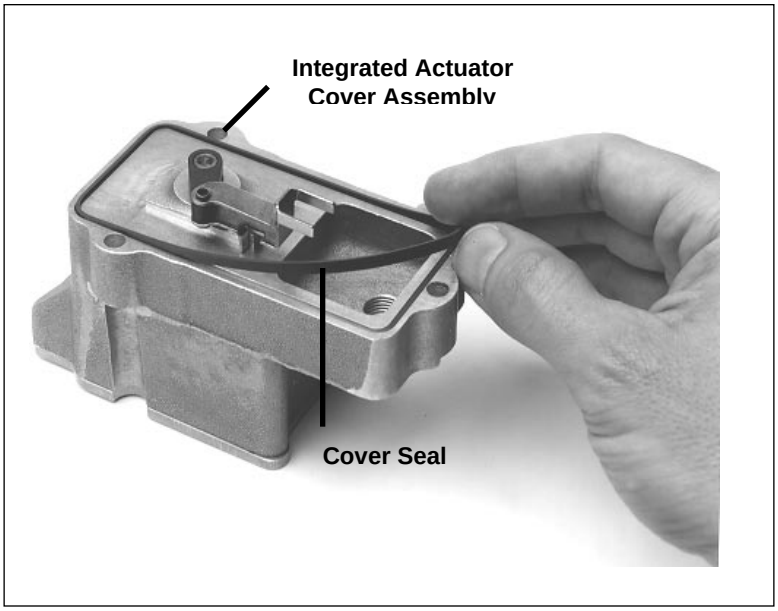

Figure 2

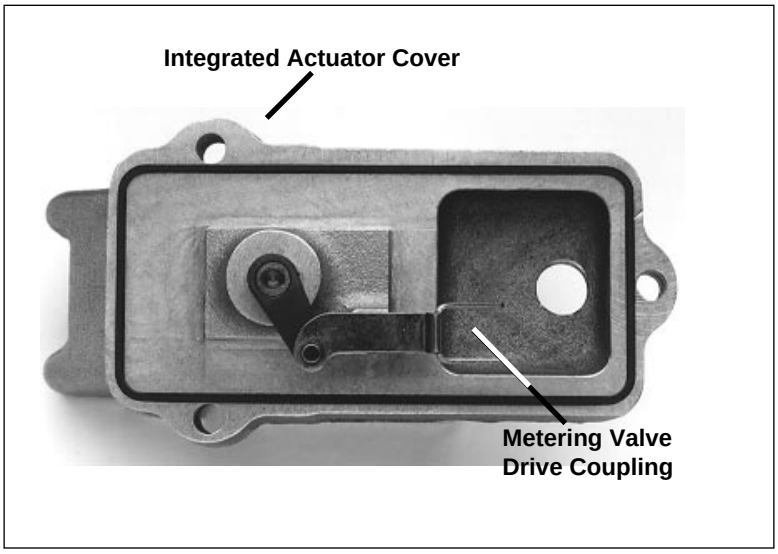

Figure 3

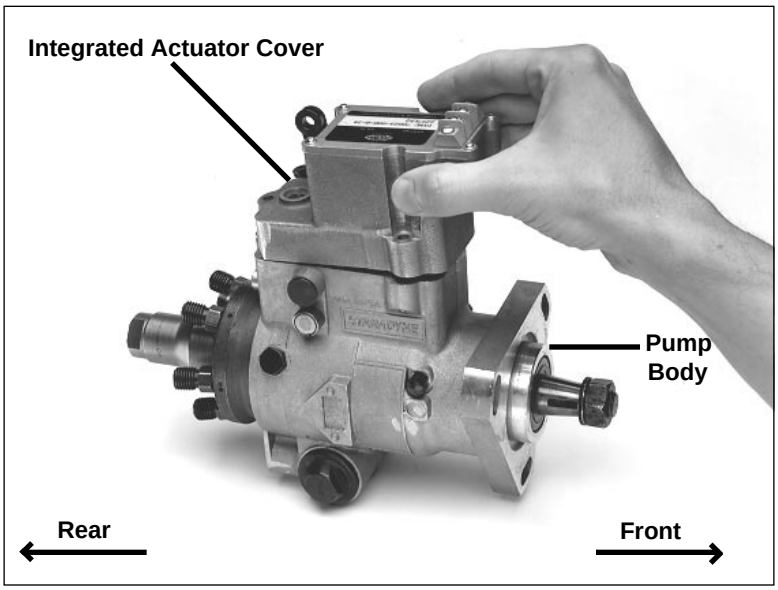

Figure 4

STEP 2

INSTALLING THE NEW INTEGRATED ACTUATOR COVER ASSEMBLY

2.0 Install new COVER SEAL — Item 2 from the parts list, into the groove of the INTEGRATED ACTUATOR COVER ASSEMBLY as shown in *Figure 2*.

2.1 Align and hold the METERING VALVE DRIVE COUPLING parallel to the side of the INTEGRATED ACTUATOR COVER as shown in *Figure 3.*

2.2 Position the INTEGRATED ACTUATOR COVER ASSEMBLY into the top of the pump while holding the METERING VALVE DRIVE COUPLING parallel to the PUMP BODY. Slightly lift the front portion of the INTEGRATED ACTUATOR COVER as shown in *Figure 4.*

2.3 Carefully slide the INTEGRATED ACTUATOR COVER toward the rear of the pump until the horseshoe portion of the METERING VALVE DRIVE COUPLING contacts the pump's GOVERNOR LINKAGE HOOK as shown in *Figure 5*. Once contact has been made, continue moving the INTEGRATED ACTUATOR COVER in the same direction until the mounting holes between the INTEGRATED ACTUATOR COVER and the PUMP BODY are aligned.

CAUTION

Failure to properly install the METERING VALVE DRIVE COUPLING to the pump's GOVERNOR LINKAGE can result in serious damage.

2.4 Obtain three COVER SCREWS retained from the original GOVERNOR CONTROL COVER. Assemble the INTEGRATED ACTUATOR COVER to the PUMP BODY with these screws. Tighten screws to 35 - 45 lbs/in.

2.5 Install a new O-RING — Item 3 from the parts list, on the RETURN LINE CONNECTOR ASSEMBLY retained from the original GOVERNOR CONTROL COVER. Apply a light coating of all purpose grease to the O-RING and install connector into the 7/16-20 UNF-2A threaded hole located in the INTEGRATED ACTUATOR COVER. Tighten to 43 - 53 lbs/in.

See **CAUTION** following on page 3.

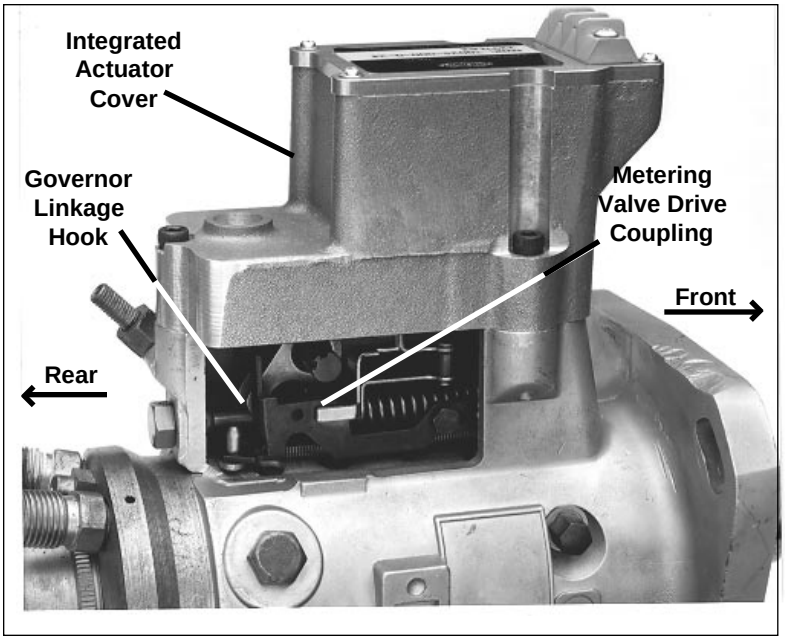

Figure 5

CAUTION

If the RETURN LINE CONNECTOR is a 7/16-20 UNF-2A, paragraph 2.5 can be completed. If the RETURN LINE CONNECTOR is not 7/16-20 UNF-2A, there are two possible solutions:

OPTION 1
A Stanadyne 21251 RETURN LINE CONNECTOR may be used to replace the RETURN LINE CONNECTOR ASSEMBLY on the return fuel line.

OPTION 2
A Stanadyne 24509 CONNECTOR BODY can be used to mate the 1/8-27 NPT RETURN LINE CONNECTOR ASSEMBLY to the 7/16-20 UNF-2A threaded hole located in the INTEGRATED ACTUATOR COVER.

2.6 Install the FUEL RETURN LINE to the RETURN LINE CONNECTOR. Hold RETURN LINE CONNECTOR in place and tighten FUEL RETURN LINE to engine manufacturer's specification.

STEP 3
PRELIMINARY SET-UP PROCEDURE

— NOTE —

The following method will be used to properly set up the mechanical governor for operation with the ELECTRONIC INTEGRATED ACTUATOR. Proper calibration of both the mechanical and electronic governor must be performed in order for the system to operate properly. Failure to perform this procedure properly may result in inability to provide maximum power or cause poor steady state speed control.

CAUTION

Steps 3.0 thru 3.3 are performed PRIOR to starting the engine.

3.0 Position the SHUT-OFF SHAFT ASSEMBLY (if equipped with one) in the "Fuel On" position by rotating it in the direction shown in *Figure 6* until it reaches its limit of travel. Secure the SHUT-OFF SHAFT ASSEMBLY in place with existing mechanical linkage. A spring may be used to hold it in place when there is no linkage.

CAUTION

Do not attach springs to the engine's high pressure lines.

3.1 THROTTLE SHAFT ASSEMBLIES are often locked in the "High Idle" position on pumps equipped with speed droop governors. When this is the case, the LOW IDLE SCREW may be backed out a **maximum** of three (3) turns. This should only be done if the HIGH IDLE speed is known to be greater than 12% above the rated speed. Excessive backing out of the LOW IDLE SCREW may result in the disengagement of the pump's internal components.

— WARNING —

This procedure must be followed carefully in order to not overspeed the engine and cause damage to the generator or other load.

3.2 Adjust the droop by turning the DROOP ADJUSTING SCREW in a counterclockwise (CCW) direction until it stops. *See Figure 6.* Some pumps may not be equipped with a speed droop adjustment.

Turn the DROOP ADJUSTING SCREW clockwise (CW) two full turns. The mechanical governor is now set in a position that will permit starting the engine to calibrate the ELECTRONIC INTEGRATED ACTUATOR GOVERNOR. Do not operate the engine without the electronic governor connected and the system calibrated properly as described in Step 6.

Once this droop adjustment has been made, do not readjust.

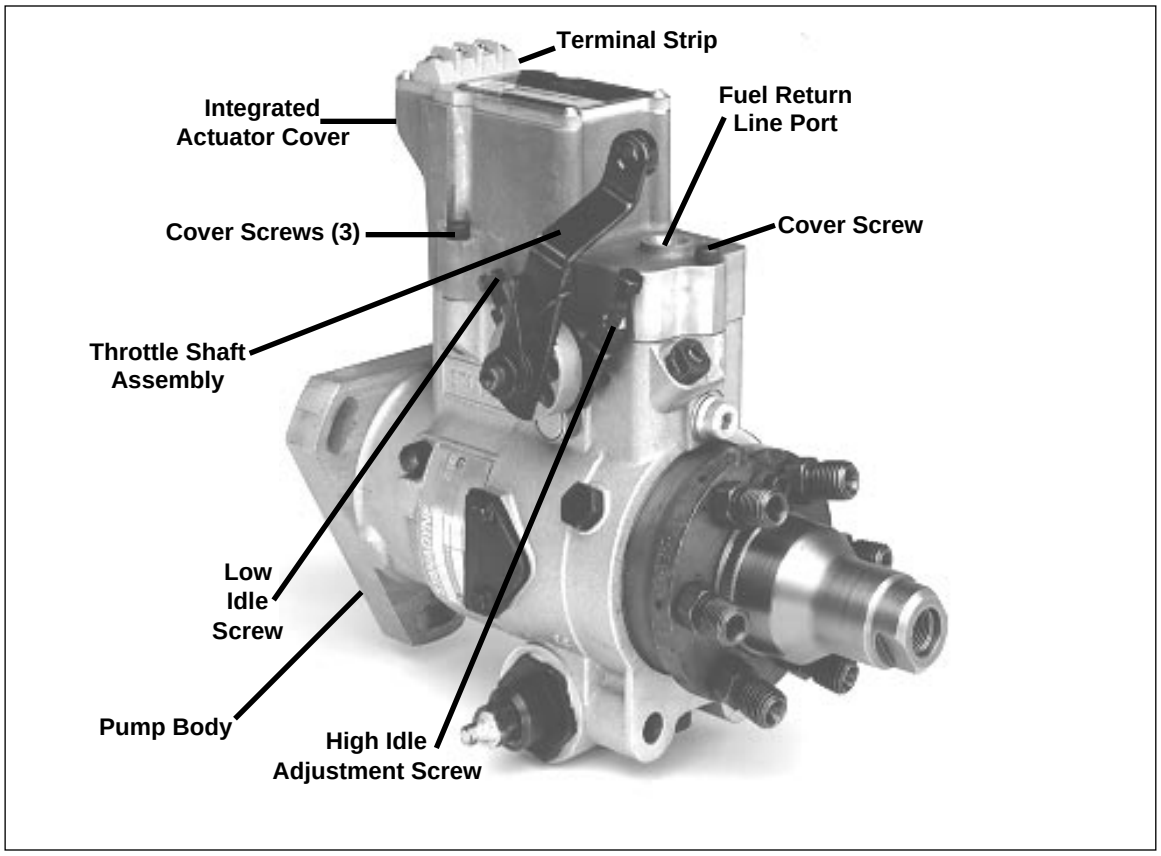

Figure 6

STEP 4
MAGNETIC PICKUP INSTALLATION

4.0 Refer to Bulletin Number 2, F-16457-1.

STEP 5
GOVERNOR CONTROL BOX INSTALLATION

CAUTION

Make certain that proper voltage (12 or 24 Vdc) GOVERNOR CONTROL BOX and INTEGRATED ACTUATOR ASSEMBLY are used.

5.0 Wire and pre-set the adjustments of the INTEGRATED GOVERNOR system as described in the wiring and calibration information for the controller's specific part number. Make certain to use the shielded wire and twisted cables as shown in the installation information.

Connect ACTUATOR WIRES to the two center terminals on the terminal strip. Do not connect any other wires to the actuator than the ones from the governor control box.

5.1 The mechanical governor is to be set 12% higher than the desired running speed. Calculate the maximum speed setting for the mechanical governor as follows:

EXAMPLE: If desired speed is 1800 RPM for electronic governing, then 1800 x 0.12 = 216 RPM; 1800 + 216 = 2016 RPM.

STEP 6
CALIBRATION PROCEDURE

6.0 Make certain the electronic governor adjustments are set as stated in the proper governor literature.

The SPEED adjustment is a 20 turn potentiometer on the DYN1-10784 and DYN1-10794 control boxes. Turn it counterclockwise (CCW) 20 turns and then clockwise (CW) 5 turns.

6.1 Rotate and hold the THROTTLE SHAFT LEVER to maximum position as permitted by present high idle screw adjustment. Do not attempt at this time to adjust the high idle screw beyond its present setting.

6.2 Turn on the DC power to the system.

— NOTE —

Be sure Step 6.0 has been performed.

6.3 Start the engine. The engine should be operating on the INTEGRATED ACTUATOR COVER GOVERNOR. The speed should be below 1800 RPM or the desired speed.

— NOTE —

Check for fuel leaks.

6.4 Slowly using the GOVERNOR CONTROL BOX speed adjustment, increase the engine speed. (If the engine does not increase in speed, follow the troubleshooting procedure in the governor manual)

6.5 Keep increasing the speed until it is approximately 20 RPM higher than the speed calculated in Step 5.1. If this speed cannot be obtained, loosen the jam nut on the HIGH IDLE SPEED ADJUSTMENT SCREW of the THROTTLE LEVER and turn the HIGH IDLE ADJUSTMENT SCREW counterclockwise (CCW) until the calculated speed can be obtained. *See Figure 6.*

6.6 Set the speed with the electronic governor to the value calculated in Step 5.1. Then slowly turn the HIGH IDLE ADJUSTMENT SCREW on the THROTTLE LEVER clockwise (CW) until the speed just starts to decrease. Turn the HIGH IDLE ADJUSTMENT SCREW counterclockwise (CCW) until the speed just controls at the proper calculated speed. Tighten the HIGH IDLE adjusting screw locknut to 35-45 lbs/in.

6.7 Turn the LOW IDLE SCREW clockwise (CW) to lock the THROTTLE LEVER at this maximum position. Tighten the LOW IDLE adjustment screw locknut to 35-45 lbs/in.

— NOTE —

On some pump bodies, the LOW IDLE adjustment screw may not be able to position the throttle lever to the proper position. If it cannot hold the throttle to the proper position, use a spring to hold the throttle to the maximum position or maximum speed and power will not be obtainable.

CAUTION

Do not attach springs to the engine's high pressure lines.

6.8 Decrease the speed on the ELECTRONIC GOVERNOR CONTROL BOX until the desired run speed is obtained.

6.9 Properly calibrate the adjustments of the electronic governor.

Check the system for good response and stability at all possible loads and speeds.

STEP 7

SHUT OFF ENGINE

Parts List

Table 1: Governor Assembly
Specify voltage when ordering Items 1 and 4

Item	Description	Barber-Colman Part Number	Qty.
1	Integrated Actuator	DYNC-70025	1
2	Cover Seal	L5-162	1
3	O-Ring for Fuel Return	L5-163	1
4	Controller — See options below (Items 5 & 6)		

Table 2: Optional Control Components

Item	Description	Barber-Colman Part Number	Qty.
5	Controller — Analog without Remote Speed	DYN1-1078**X**	1
6	Controller — Analog with Remote Speed	DYN1-1079**X**	1
7	Magnetic Pickup — 3/8 In. Dia.	DYNT-17200	1
8	Remote Speed Potentiometer	DYNS-10000	1

"X" Specify operating frequency

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CAUTION

As a safety measure, the engine should be equipped with an independent overspeed shutdown device in the event of failure which may render the governor inoperative.

NOTE

Barber-Colman believes that all information provided herein is correct and reliable and reserves the right to update at any time. Barber-Colman does not assume any responsibility for its use unless otherwise expressly undertaken.

Barber-Colman Integrated Actuator For Stanadyne "D" Series Injection Pump Model DYNA 70025

— Factory Approved by Stanadyne —

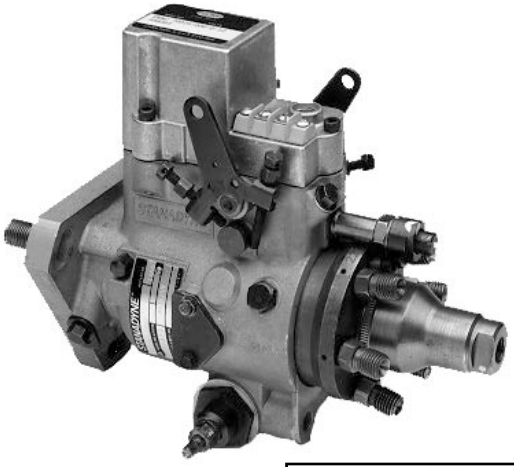
General

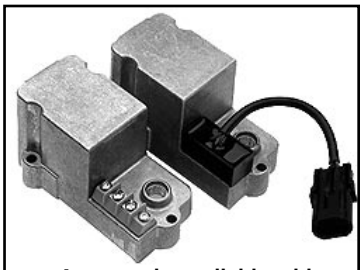
The Barber-Colman Integral Governor System for Stanadyne "D" Series* injection pumps has been designed in close cooperation with Stanadyne. Through this cooperation a uniquely simple integrated governor is now available.

Barber-Colman has taken a proven rotary actuator and built it into a new cover design for Stanadyne "D" Series injection pumps. This new integrated approach eliminates all brackets and external linkage. No internal parts to the injection pump need to be added or replaced.

The actuator design utilizes the principle of variable reluctance. This simple design of a proportional electric solenoid has a rotating armature whose magnetic force is proportional to input coil current.

The integrated actuator and injection pump housing is very easy to install. Simply remove the existing cover and install the new cover. Along with the standard model (DYNC-70025-000-0-12/24), a completely sealed model (DYNC-70025-001-0-12/24) is also available. Pollutants from contaminated fuel can cause the actuator to bind and hinder the engine governing. For those contaminated fuel applications, the completely sealed model prevents pollutants from entering the actuator and causing erratic governing.





Actuator is available with flying lead connector, which mates with Packard weatherpak 2 way connector with female sleeves, part number 1201 5792.

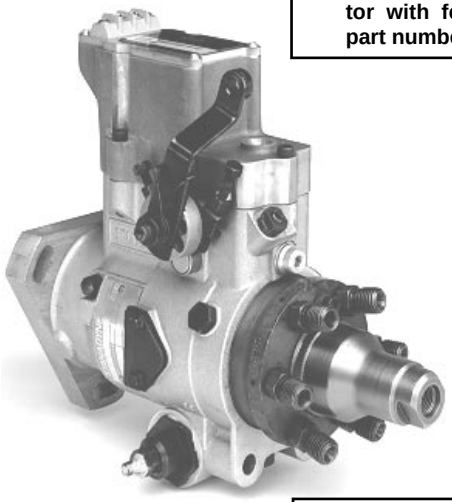
Standard Models

DYNC-70025-000-0-12/24
DYNC-70025-200-0-12/24

Standard Features

- All Electric
- Fast Response
- Compact
- Precise Repeatability
- No External Linkage
- No Mounting Bracket
- Spring Return to Shut Off

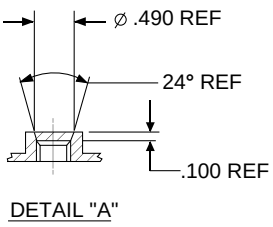
*Manufactured by Stanadyne Automotive Corp.



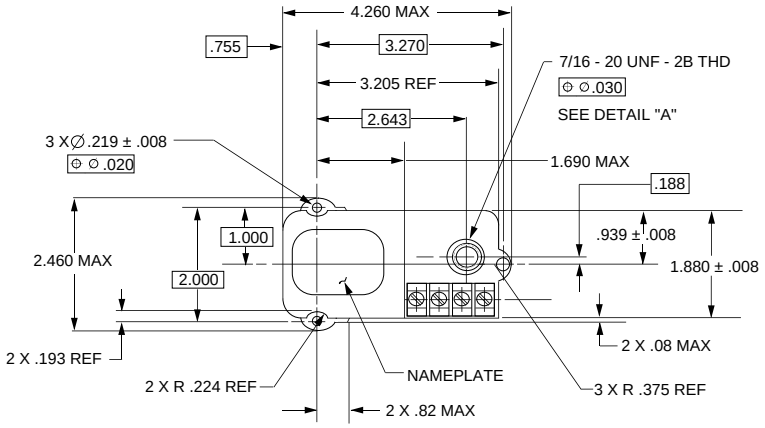
Sealed Model

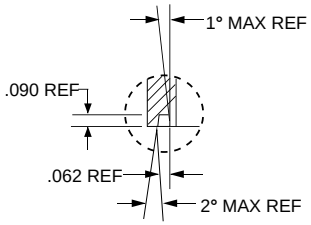
DYNC-70025-001-0-12/24

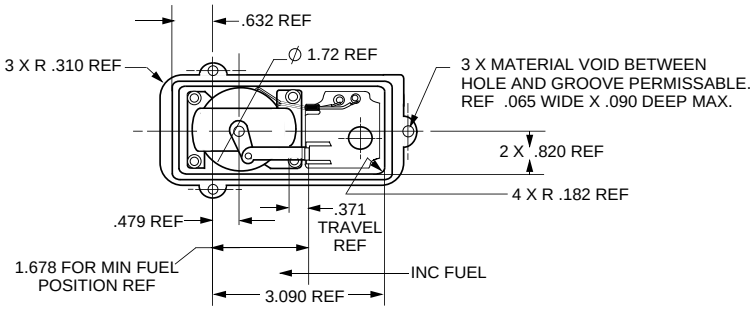
Installation Dimensions — DYNC-70025-000-0-12/24 & DYNC-70025-200-0-12/24

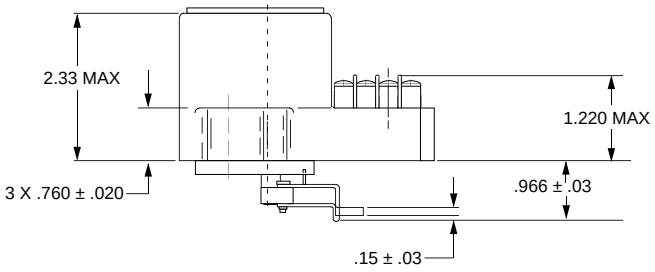


DETAIL "A"

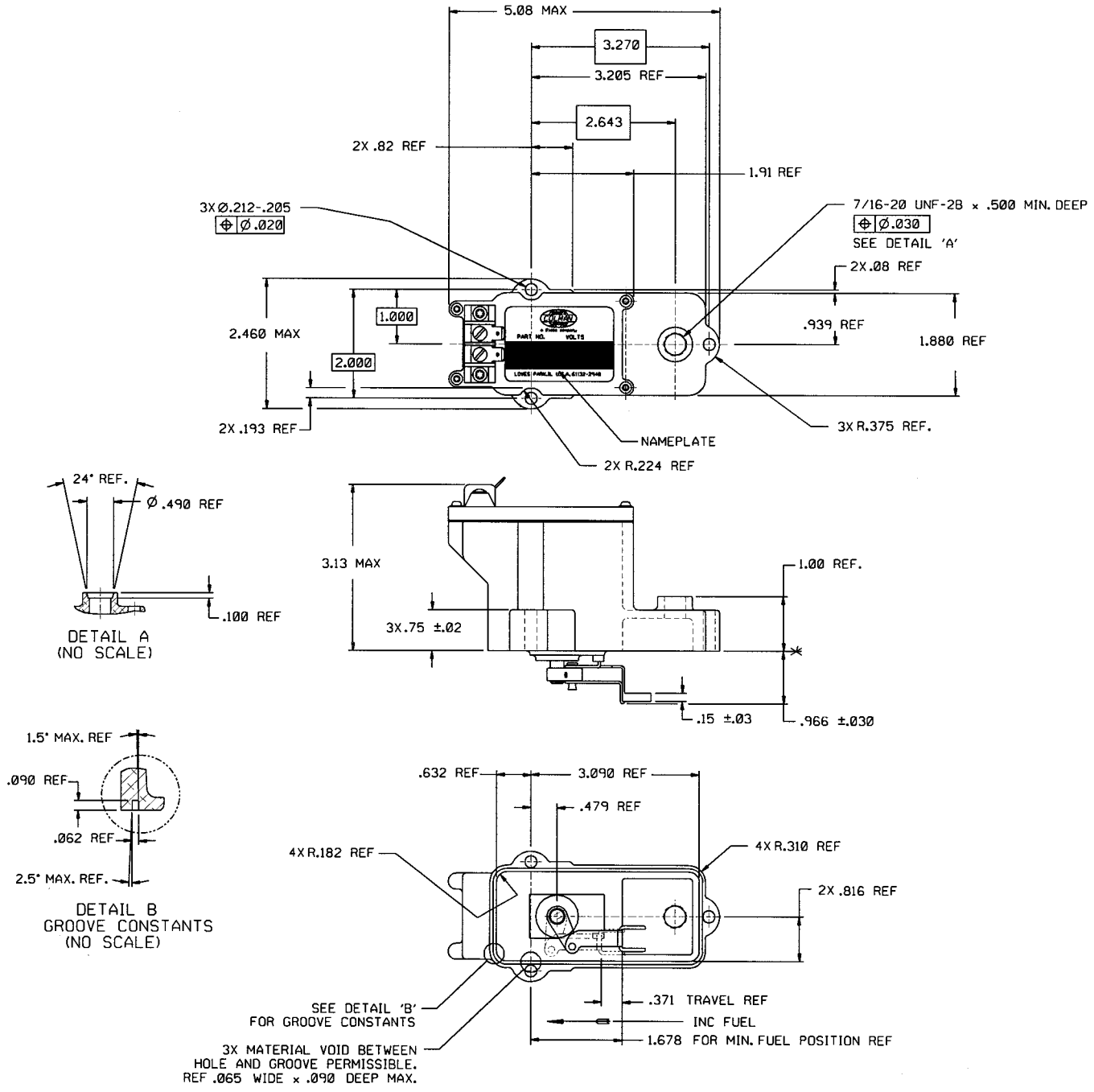








Installation Dimensions — DYNC-70025-001-0-12/24



Specifications

Operating Characteristics		
Nominal Voltage	12 Volts DC	24 Volts DC
Current Amps Nominal	2.5 Amps	1.94 Amps
Current Max Stall	6 Amps	2.2 Amps
Stroke	As Shown	
Duty Cycle	Continuous	
Temperature Range	-55°C to 124°C -65°F to 250°F	
Direction Of Travel	Increasing current causes travel in the direction shown (INC FUEL)	
Finished Weight	1 lb. 12 oz. max	
Finished Mass	.79 kg max	

Typical Applications

- Generator Sets
- Forklift Trucks
- Ground Power Carts
- Agriculture Vehicles
- Off-Road Vehicles
- Pump Sets
- Pleasure Boats
- Wood Chippers

Available Controllers	Input Signal Frequency
DYN1-10784-000-0-12/24	2500 - 5000 Hz
DYN1-10786-000-0-12/24	5000 - 9500 Hz
DYN1-10794-000-0-12/24	2500 - 5000 Hz
DYN1-10784-001-0-12/24 CE	2500 - 5000 Hz
DYN1-10786-001-0-12/24 CE	5000 - 9500 Hz
DYN1-10794-002-0-12/24 CE	2500 - 5000 Hz

Stanadyne Pump Models

- DB
- JDB
- DC
- DB2
- DB4
- DM2
- DM4

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NOTE

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CAUTION

As a safety measure, the engine should be equipped with an independent overspeed shutdown device in the event of failure which may render the governor inoperative.

Troubleshooting Information for Stanadyne "D" Series Injection Pumps Equipped with Barber-Colman Integrated Actuator Assemblies

— Note —
See Section I for using test stand and Section II for testing cover only.

I. Checking out and Calibrating a New or Rebuilt Stanadyne Injection Pump, using an Injection Pump Test Stand.

In this situation, the Barber-Colman Integrated Actuator will be used like an energize-to-run solenoid for the Stanadyne injection pump and mechanical governor. The last two digits in the part number on the nameplate for the Barber-Colman Integrated actuator indicate the proper voltage to be used.

The voltage polarity to the two terminals on the cover does not matter. It is recommended that one of the two following methods be used to apply and remove the voltage to the actuator terminals.

The actuator is a coil with inductance. When applied voltage is suddenly removed, there is a large transient voltage at the actuator. When used in the complete Barber-Colman governing system, arc suppression is supplied in the electronic governor control box. This permits polarity free wiring from the governor control box to the actuator. For production test fixtures it would be wise to put a freewheeling diode on the terminal strip used to wire the power supply to the actuator between the switch and actuator connected with polarity as shown. Repeated transients could damage the dielectric characteristics of the actuator causing early failures. *See Figure 1.*

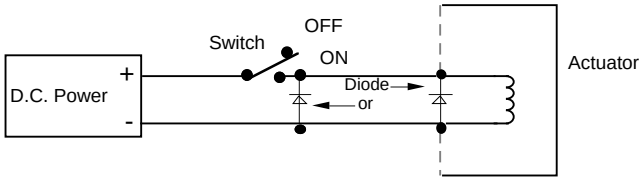

Figure 1

The diode, a Motorola MUR 810 or equivalent, could be used. It could be at the actuator terminal strip or at the switch.

Another method would be to slowly turn the DC voltage up and down.

As with the solenoid normally used, when the DC power is not applied to the actuator, the fuel is cut off from the engine. Use of the throttle lever and shut off lever have no effect.

When proper power is applied to the actuator, fuel is supplied to the engine as determined by the setting of the fuel shutoff lever and the combination of the throttle lever and input speed to the pump shaft. In this mode the throttle high and low speeds can be set as per the usual practice.

Checks to be made of the Integrated Actuator should be as follows:

1. Check the DC voltage shown on the integrated actuator cover for the specified DC voltage.

2. With all wires removed from the actuator terminals, use an ohmmeter to check for the proper resistance of the actuator coil. Measure between terminals of the terminal strip.

DC Voltage	Resistance in OHMS at normal room temp.
12 VDC	2.05 ± 0.25 OHMS
24 VDC	7.20 ± 0.50 OHMS

If easier, check the resistance of the coil by measuring current. The values would be as follows:

DC Voltage Of Unit	DC Voltage Applied	Current In Amps
12 VDC	12 ± 0.5 VDC	5.8 ± 0.5 Amps
24 VDC	24 ± 0.5 VDC	3.3 ± 0.4 Amps

3. With all wires removed, check the resistance between each of the two actuator terminals and case (ground). It must be 3 megohms or greater.

4. With the test stand operating on the mechanical governor, turn down the DC voltage to “0” and check that there is “0” fuel flow to the engine.

5. If the test stand was not operating, energize and de-energize the actuator and listen for a “click”.

It should be noted that if the Integrated Actuator had considerable use and was worn or had been damaged to cause stickiness, the above testing probably would not detect the defect. This could only be done by operating the actuator on a computerized checkout system or an X-Y plotter using position or flow checkout with a feedback loop control.

II. Doing Basic Checkout of the Barber-Colman Integrated Actuator Cover when it has been removed from the Stanadyne Injection Pump

The Integrated Actuator Cover cannot be completely checked out unless performance checks are made. To do this requires a dedicated test fixture with a feedback control loop. This would check for stickiness and/or looseness detrimental for good governing performance.

Visual Checks *(See Figure 2)*

1. Check or replace the Cover Seal.

2. Check the terminal strip for breakage. If broken, unit must be returned to factory for repair.

3. Check the internal wiring visually for frayed strands of wires at the terminal strip.

4. Check that the actuator arm is tight to the actuator shaft, with no play.

5. Check the pivot point of the actuator arm and metering valve drive coupling to see that it has free movement.

Electrical Checks

1. Check the DC voltage shown on the integrated actuator cover for the specified DC voltage.

2. Use an ohmmeter to check for the proper resistance of the actuator coil. Measure between terminals of the terminal strip.

DC Voltage	Resistance in OHMS at normal room temp.
12 VDC	2.05 ± 0.25 OHMS
24 VDC	7.20 ± 0.50 OHMS

If easier, check the resistance of the coil by measuring current. The values would be as follows:

DC Voltage Of Unit	DC Voltage Applied	Current In Amps
12 VDC	12 ± 0.5 VDC	5.8 ± 0.5 Amps
24 VDC	24 ± 0.5 VDC	3.3 ± 0.4 Amps

3. Check the resistance between each of the two actuator terminals and case (ground). It must be three (3) megohms or greater.

4. Take care that the actuator arm is free to travel and the metering valve drive coupling will not bind. Energize the actuator with the proper voltage and note that the lever arm moves to maximum mechanical position. Slowly de-energize the actuator (or use a diode as per Par. I, Figure 1) and determine that the lever arm returns to minimum position.

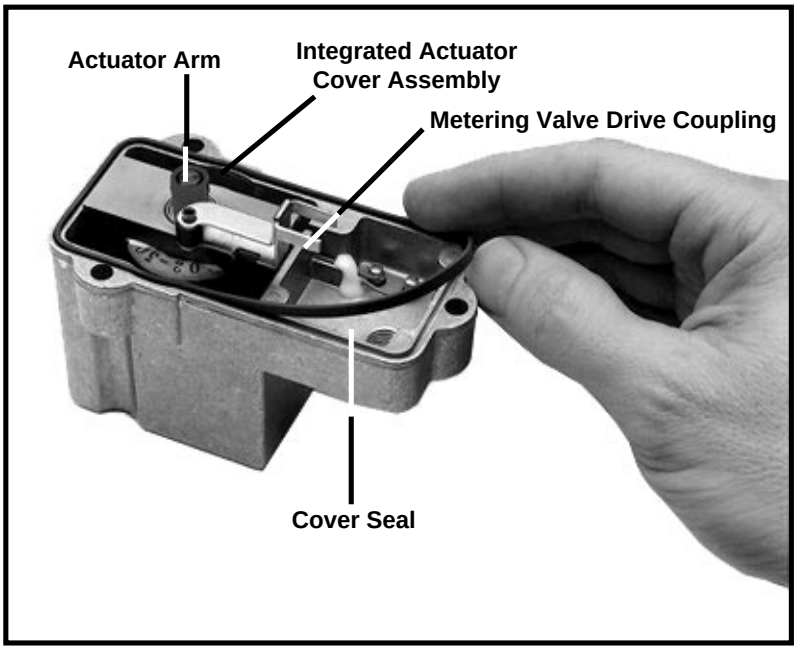

Figure 2

CAUTION

As a safety measure, the engine should be equipped with an independent overspeed shutdown device in the event of failure which may render the governor inoperative.

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III. Troubleshooting an Engine Fueled by a Stanadyne Injection Pump Equipped with a Barber-Colman Integrated Actuator

1. PROBLEM: Engine does not crank over when start switch operated.

	Means of Detection	Corrective Action
1.1	Check proper battery connections and voltage.	Repair, change or replace as required.
1.2	Check wiring to start switch and solenoid.	Repair or replace as required.
1.3	Check starter in accordance with engine manual.	Repair or replace as required.
1.4	Check tripped overspeed switch.	Re-set speed switch.

2. PROBLEM: Engine cranks but does not fire or start.

	Means of Detection	Corrective Action
2.1	Check for fuel in tank.	Fill tank.
2.2	Carefully loosen nut at injector and crank engine, checking for fuel.	If fuel, check engine manual. If no fuel, proceed to Step 3.

3. PROBLEM: No fuel to injectors.

	Means of Detection	Corrective Action
3.1	Loosen Return Fuel Line Connector and check for fuel while cranking.	If no fuel, check line to fuel pump and pressure supply, if any. If fuel, proceed to Step 4.

4. PROBLEM: No fuel to injectors, but fuel to pump.

	Means of Detection	Corrective Action
4.1	While cranking engine, check for voltage at actuator terminals on fuel pump cover. Should be approximately 75% or greater of cranking voltage.	If have voltage, proceed to Step 5. If do not have voltage, proceed to Step 6.

5. PROBLEM: No fuel to injectors, have fuel to pump and ***have*** voltage to actuator terminals.

	Means of Detection	Corrective Action
5.1	Place a low impedance 0-10 amp ammeter in one line to actuator. May need to check polarity first with voltmeter if polarized ammeter. Crank engine and check for 4.3 ± 1.5 amps for 12 VDC and 2.5 ± 1.3 amps for 24 VDC system.	If no current, internal wiring or coil open in cover assembly. Remove and replace. If shows proper current, check cover per Section II, or replace fuel pump assembly.

6. PROBLEM: No fuel to injectors, have fuel to pump and ***no*** voltage to actuator terminals.

	Means of Detection	Corrective Action
6.1	Check for DC voltage at actuator output terminals of governor control box while cranking. Should be approximately 75% or greater of cranking voltage.	If have voltage, repair or replace wire from control box to actuator. If no voltage at actuator terminals while cranking, proceed to Step 7.

7. PROBLEM: No voltage at actuator terminal while cranking.

Means of Detection	Corrective Action
7.1 Check for proper DC supply voltage to governor control box while cranking.	If no voltage, check and repair wiring.
7.2 Check for 2.5 VAC minimum at magnetic pickup input terminal to governor control box while cranking.	If no voltage or low voltage, check or replace magnetic pickup and/or wiring. If voltage above 2.5 VAC, proceed to Step 8.

8. PROBLEM: DC voltage & magnetic pickup voltage are ok, but no voltage out actuator terminals when cranking.

Means of Detection	Corrective Action
8.1 Remove all wires but DC input power and magnetic pickup. While cranking engine slowly turn SPEED potentiometer on box clockwise (CW) at least ten (10) turns, checking for DC voltage at actuator terminals of control box with actuator leads disconnected. **— WARNING —** Turn SPEED potentiometer counterclockwise (CCW) ten (10) turns before connecting other wires and starting engine.	If no voltage, replace governor control box. If voltage present, check and correct wiring of disconnected wires.

9. PROBLEM: Engine runs but will not produce maximum power.

Means of Detection	Corrective Action
9.1 Check to determine that throttle shaft lever and/or shutoff lever are at proper position.	Shutoff lever must be at maximum position and throttle shaft lever 12% above maximum operating speed.
9.2 Check that DROOP is properly set.	Turn DROOP adjustment screw counterclockwise (CCW) until it stops. Turn the screw two full turns clockwise (CW).
9.3 Check that "L" pot is properly set on controller.	Note position of "L" pot. Turn slowly clockwise (CW) to increase current to actuator. If engine still does not produce full power, return "L" pot to original position.

10. PROBLEM: Engine speed erratic at high loads.

Means of Detection	Corrective Action
10.1 Make certain throttle shaft lever and DROOP are properly set.	Set per Step 9 above.

11. PROBLEM: Engine speed surges, jitters or operates erratically at all or some speeds and loads.

Means of Detection	Corrective Action
11.1 Refer to calibration and troubleshooting for the appropriate controller.	Follow procedure.

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