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BULLETIN NO. 187

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Application: Installation of the Barber-Colman 1/4 Ft-Lb Linear Governor Actuator on the Hercules D4800T. The actuator operates the pump stop lever of the Roosamaster fuel pump. The throttle lever must be set to operate the engine 10% above normal speed and locked in this position. This prevents the mechanical governor in the fuel pump from drooping down and possibly limiting fuel under full load. **Note:** If the fuel pump does not have a stop lever, refer to Barber-Colman Bulletin No. 38 and order the correct parts.

Read all instructions before proceeding.

A. Procedure

- 1) The stop lever, Item 16, replaces the original lever. Refer to the layout. Position the stop lever so it points down and toward the rear of the engine.
- 2) Operate the engine and adjust the throttle lever (outboard lever on the pump) until the engine operates at 10% above normal desired speed. Lock the lever in this position.
- 3) Operate the engine; by hand slowly move the stop lever toward the rear of the engine until the engine stops. Mark the position of the stop lever. **Note:** This should be the position the stop lever is in when the linkage is connected. When the stop lever is moved approximately 25 degrees toward the front of the engine (increasing fuel) there is more than sufficient fuel for full load.

B. Installing the Actuator Bracket, Item 3 and the Actuator, Item 1

- 1) Refer to instruction note 4 of the layout drawing. Two engine block bosses must be drilled and tapped to install the bracket, Item 3. Caution: **DO NOT** drill the holes more than 5/8 inches deep. It may also be necessary to use a bottom tap to insure that the threads are deep enough for the Item 4 screws. After the holes are completed install the Item 3 bracket.
- 2) Install the actuator, Item 1, on the bracket as shown in the layout drawing using four each of screws, Item 6, and pinch nuts, Item 7.

C. Installing the Linkage

- 1) Rotate the fuel pump stop lever toward the rear of the engine (engine dead) and install one Item 12 round head screw in the lever hole from the fuel pump side of the lever. Install one Item 14 flat washer, a rod end bearing, Item 10, another flat washer, a lock washer, Item 13 and nut, Item 15.



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- 2) Next, install the only M6 nut, Item 8, on the actuator shaft. Install the clevis, Item 9, on the shaft and tighten the M6 nut against the back side of the clevis.
- 3) Install one Item 15 jam nut on each end of the threaded linkage rod, Item 11.
- 4) Install one end of the rod in the bearing at the fuel pump stop lever and lightly tighten the rod jam nut.
- 5) Install the last rod end bearing, Item 10, on the other end of the rod. Adjust the length of the rod so the pump stop lever is at the shut down position and the opposite end of the rod lines up with the hole in the clevis on the actuator shaft. If the threaded rod is too long, cut it to the correct length. Note: The stop lever on the fuel pump should be in the position established in paragraph A, step 3. At the clevis end of the rod turn the rod bearing one full turn onto the rod. Install the bearing in the clevis using Items 12, 13 and 15. Last, tighten the rod jam nut against the clevis rod end bearing while holding the clevis in the correct position, as shown in the layout drawing.

D. Installing the Magnetic Pick-Up

- 1) A pre-threaded hole (5/8 - 18 thread) should exist in the bell housing that will accept the Item 17 bushing. If not, proceed to step 2.
- 2) The pick-up must be installed in the engine bell housing. The pick-up thread is 3/8 - 24.
- 3) After the hole has been drilled over the ring gear teeth using a Q size bit, or 0.3320" dia. bit, tap the hole for 3/8 - 24 thread.
- 4) Rotate the flywheel so the tip of a tooth is in the middle of the hole.
- 5) Install the magnetic pick-up until the tip makes contact with the gear tooth. Turn the pick-up counterclockwise one half turn and tighten the jam nut.

E. Governor Wiring

- 1) The controller should be panel mounted.
- 2) D.C. power leads and actuator leads should be a minimum of 14 ga. twisted pairs.
- 3) It is good practice to run the D.C. supply leads to where the large battery cables come to the engine and wire the positive lead to a normally open contact of a 10 amp relay.

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- 4) The coil of the relay should be wired to the engine fault circuit for automatic fault shut down. This method of wiring will allow shut down of the fuel system because the actuator internal spring returns the actuator to minimum stroke when electrically de-energized.
- 5) Refer to the attached typical wiring diagram attached.
Note: If a remote speed potentiometer is used, refer to the optional parts list, table 3.

F. Calibration

- 1) Refer to the attached calibration procedure.

Typical wiring diagram for DYN1 10752, 754, and 756 controllers.

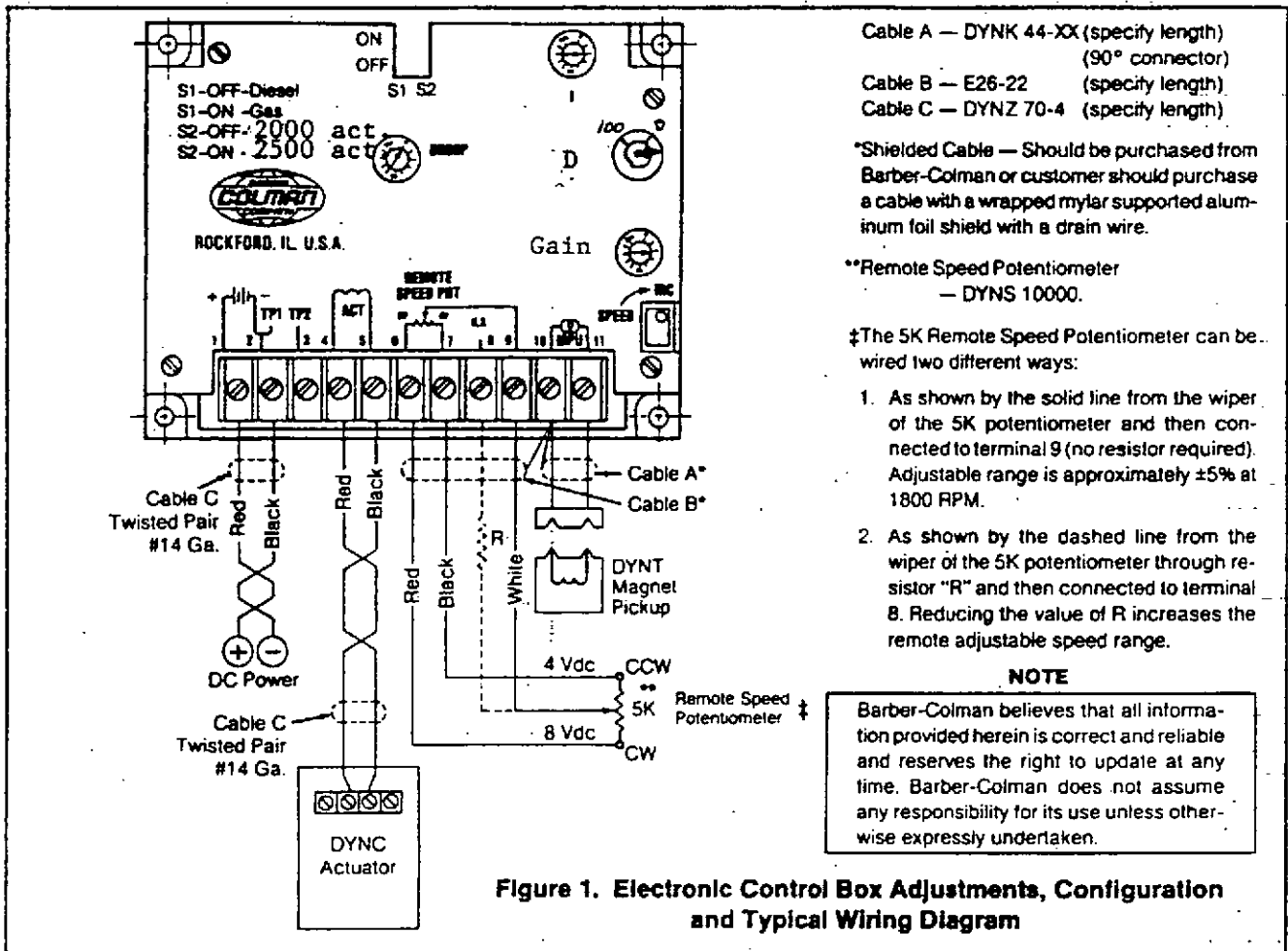


Figure 1. Electronic Control Box Adjustments, Configuration and Typical Wiring Diagram

Refer to... calibration procedure attached.



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A. Calibration procedure for linear governor controller, DYN1-10752, 754 or 756.

- 1) Observe that potentiometer settings are adjustable from zero to 100%. Each small division is 10%. The speed potentiometer is a 10K, 20 turn.
- 2) Set the small dip switch, S1, for the correct engine. Set switch S2 in the "OFF" position for actuator DYNC-10200 or in the "ON" position for DYNC-10500.
- 3) If a remote speed potentiometer is used, set it to mid range.

B. Initial potentiometer settings

- | | | |
|----|-------|------|
| 1) | Gain | 20% |
| | I | 30% |
| | D | 20% |
| | Droop | Zero |

C. Start Engine

- 1) Adjust the controller speed potentiometer for desired engine speed.
- 2) Adjust the "I" potentiometer to 100% or until the governor becomes unstable. Next, slowly turn the "I" adjustment counter-clockwise until the governor is stable.
- 3) Repeat step C2 for the gain setting.
- 4) Repeat step C2 for the "D" setting.
- 5) After the above calibration, it may be necessary to slightly re-adjust speed.
- 6) Following the above calibration conduct the following test. With the engine operating at rated speed, turn the engine off. When engine speed slows to approximately half of rated speed, turn the electric governor D.C. power back on and observe that there is no significant overshoot of engine speed above rated. Two to three Hertz overshoot may be acceptable. Overshoot can be farther reduced. Proceed to step 7.
- 7) With the engine operating at rated speed, reduce the "I" setting by 5% (1/2 div). Last, turn the gain setting clockwise until the governor is unstable. Reduce the gain slowly until governor operation is stable.
Note: If the "I" setting is less than 20% and the gain setting less than 10%, verify that the drain shields of shielded cable are properly connected.



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Table 1 Governor Assembly - Hercules D4800
Specify voltage when ordering Items 1 and 2.

ITEM	DESCRIPTION	BARBER-COLMAN PART NUMBER	QTY.
1	Governor Actuator	DYNC 10200	1
2	Control	DYN1 10754	1

Table 2 Installation Kit
Barber-Colman Part Number DYNK 10293

ITEM	DESCRIPTION	BARBER-COLMAN PART NUMBER	QTY.
3	Bracket - Mounts on engine block	DYNK 32-19	1
4	Bracket to Block Screws 5/16 - 18 x 7/8 Hex.	BYRF 1351	2
5	Lock Washers 5/16	CYRD 559	2
6	Actuator to Bracket Screws 1/4 - 28 x 1" Hex.	BYRF 1346	4
7	Nuts 1/4 - 28 (Pinch type)	DYRF 532	4
8	M6 Nut - Use on actuator shaft.	N1-17	1
9	Clevis - Use on actuator shaft.	DYNK 218-2	1
10	Rod End Bearings 10-32 Th.	AKKH 175	2
11	Threaded linkage rod 10 - 32 x 6.5" Cut to correct length	DYNK 31-7	1
12	Rod end bearing screws 10-32 x 3/4" Button head cap. Round head	BYRF 2611	2
13	Lock washers No. 10	CYRD 198	2
14	Flat washers 3/16	W1-181	2
15	Nuts 10-32	DYRF 29	4
16	Fuel pump stop lever *	DYNK 13	1

* Replaces existing stop lever. Has shorter radius.



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ITEM	DESCRIPTION	BARBER-COLMAN PART NUMBER	QTY.
17	Magnetic Pick-Up Bushing	DYNC 600-3	1
18	Magnetic Pick-Up	DYNT 17200	1
19	Wire Lugs - Mate with lugs on Item 1	E24-866-1	2

Table 3: Optional Parts

ITEM	DESCRIPTION	BARBER-COLMAN PART NUMBER	QTY.
20	Controller *	DYN1-10704	1
21	Remote speed potentiometer, 5K	DYNS 10000	1
22	3 Wire foil shielded cable	E26-22	**
23	D.C. power switch, 15A, toggle type	CYZP 11-1	1



DYNA Governor Interface with Roosa Master Pumps and Mechanical Governors

This application bulletin describes the method of interfacing the DYNA governor with the Roosa Master fuel pump and mechanical governor for precision speed control. Precision governing and the flexibility of electronic control can be achieved by using the DYNA governor and operating through the Roosa Master mechanical governor. The mechanical governor throttle shaft lever is set to the desired maximum speed which then provides overspeed protection while the DYNA governor controls through the shut-off shaft lever. This can be accomplished with the Model DB, DC and DM pumps, and their mechanical governors.

The interface for the DB, DC and DM pumps is the same since the mechanical governors are essentially the same. Only a simple modification of the mechanical governor shaft is necessary. The extent of the modification depends on whether the mechanical governor has a shut-off shaft assembly. These two modification methods are described as follows:

- Modification of mechanical governor without a shut-off shaft assembly. Refer to Figure 1 for an illustration of this modification.
- Modification of mechanical governor with a shut-off shaft assembly. Refer to Figure 2 for an illustration of this modification.

These parts are available from any Roosa Master distributor or from Barber-Colman Company as a kit as defined in Tables 1 and 2.

A pump with the LR designation in the accessory code of its part number is designed for external governing and the modification described in this application bulletin is not necessary. For pumps with the LR designation, set the throttle for overspeed protection and operate the DYNA governor through the shut-off lever as described in this application bulletin.

General Installation Instructions

1. Remove the governor top cover and modify the Roosa Master mechanical governor by installing the parts as described in Figures 1 or 2 and Tables 1 or 2 of this bulletin.
2. With the above cover removed, set the maximum fuel set screw on the shut-off lever shaft. Rotate the throttle lever to compress the governor control spring so that the governor spring hook assembly is under spring pressure. Then rotate the shut-off shaft lever CCW until the cam assembly, Item 7 in Figure 1 and Table 1, just makes physical contact with the governor spring hook assembly. Set and lock the shut-off shaft set screw to stop CCW rotation at this point. Replace the mechanical governor top cover.
3. Install the DYNA governor actuator, controller, magnetic speed sensor, and remote speed pot in accordance with the installation instructions furnished with the DYNA governor. Do not connect the actuator linkage to the shut-off lever at this time.
4. Set the mechanical governor maximum speed adjustment sufficiently high that the full load droop speed is above rated speed. This mechanical governor adjustment also provides a method of overspeed protection. Based on 10 per cent mechanical governor droop, the high speed limit should be set at 2050 RPM for 1800 RPM-rated speed engines. To make this adjustment, operate the engine with no load. With the shut-off lever fully CCW, rotate the throttle lever to operate the engine at the desired maximum speed limit. Lock the throttle lever shaft at the maximum speed position with the two set screws.
5. Set the shut-off lever minimum fuel position by rotating the lever CW to a position where the engine stops. At this position, set and lock the shut-off lever shaft assembly set screw to stop CW rotation at this point.
6. Install the linkage between the shut-off shaft lever and the DYNA actuator following the installation instructions furnished with the governor. Installation kits with detailed instructions are available for some engines. Consult your nearest Barber-Colman Power Control Distributor for this information.

Engine Shutdown

As a safety measure, Barber-Colman Company recommends that all engines be equipped with an independent overspeed shutdown device.

When using the DYNA governor to control through the shut-off shaft lever, engine shutdown can still be accomplished in two ways:

1. Remove electric power from the DYNA governor system and the DYNA actuator will return to minimum fuel or shutdown. This can be accomplished through an electric speed switch and relay.
2. Incorporate the Roosa Master electric shut-off relay. This device mounts inside the mechanical governor and shuts off the metering valve. It is independent of the mechanical overspeed governor or DYNA governor and overrides these governors. It can be used as a safety shutdown for high water temperature or low oil pressure. Consult your Roosa Master distributor for this modification.

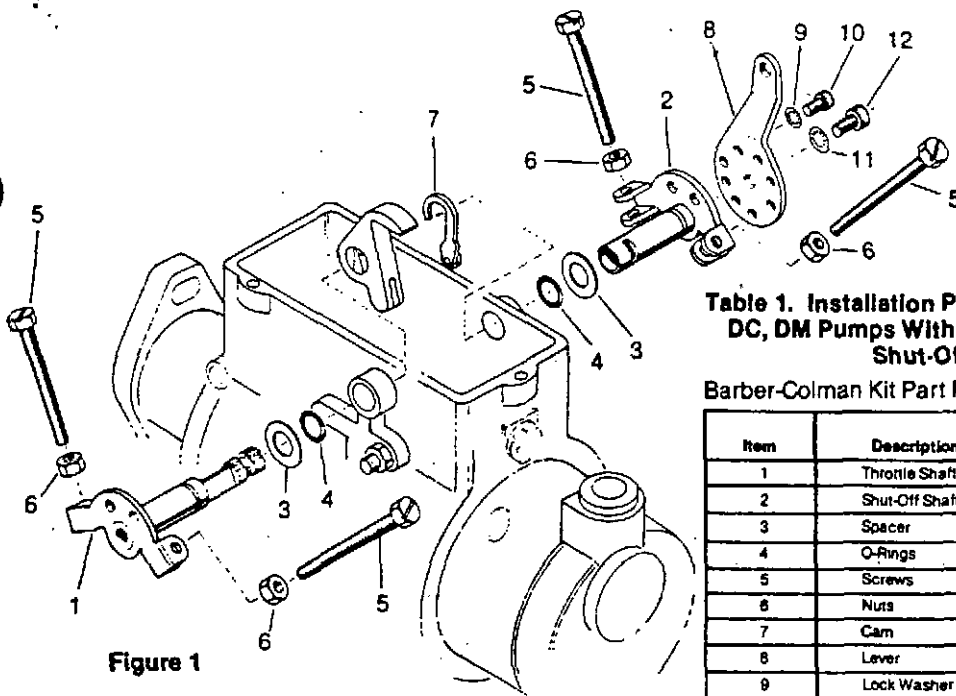


Figure 1

Exploded View of Parts Required for DYNA Governor Interface with Roosa Master Model DB, DC, DM Pumps With Mechanical Governor Without Shut-Off Shaft Assembly.

Table 1. Installation Parts for Roosa Master Model DB, DC, DM Pumps With Mechanical Governor Without Shut-Off Shaft Assembly

Barber-Colman Kit Part No. DYNK-10030.

Item	Description	Roosa Master Part Number	Qty.
1	Throttle Shaft	12019	1
2	Shut-Off Shaft	16247	1
3	Spacer	14408	2
4	O-Rings	12040	2
5	Screws	12169	4
6	Nuts	12173	4
7	Cam	14966	1
8	Lever	12992	1
9	Lock Washer	11582	1
10	Screw	12998	1
11	Lock Washer	12049	1
12	Screw	12051	1

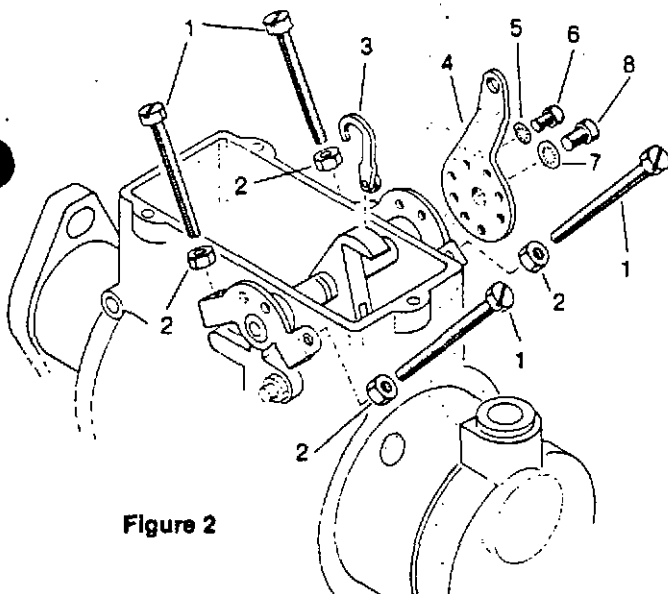


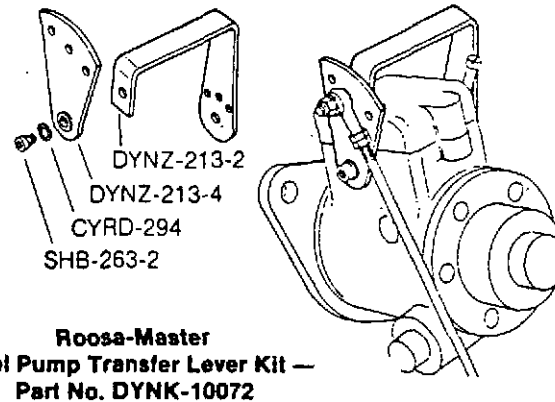
Figure 2

Exploded View of Parts Required for DYNA Governor Interface with Roosa Master Model DB, DC, DM Pumps With Mechanical Governors With Shut-Off Shaft Assembly.

Table 2. Installation Parts for Roosa Master Model DB, DC, DM Pumps With Mechanical Governor With Shut-Off Shaft Assembly.

Barber-Colman Kit Part No. DYNK-10031.

Item	Description	Roosa Master Part Number	Qty.
1	Screws	12169	4
2	Nuts	12173	4
3	Cam	14966	1
4	Lever	12992	1
5	Lock Washer	11582	1
6	Screw	12998	1
7	Lock Washer	12049	1
8	Screw	12051	1



Roosa-Master Fuel Pump Transfer Lever Kit — Part No. DYNK-10072

The transfer lever is used to transfer the stop lever function of the Roosa Master fuel pump from the left side to the right side of the fuel pump. Use care in assembling the transfer lever to be sure it operates freely with no resistance or binding.

For best control of engine speed, use full actuator output shaft travel for only the effective stroke of the fuel pump stop lever.

Also use a non-linear linkage arrangement between the actuator and fuel pump. Non-linear linkage means at light loads the fuel pump lever moves only slightly compared to the actuator lever, while at full load the fuel pump lever moves about the same amount as the actuator lever.

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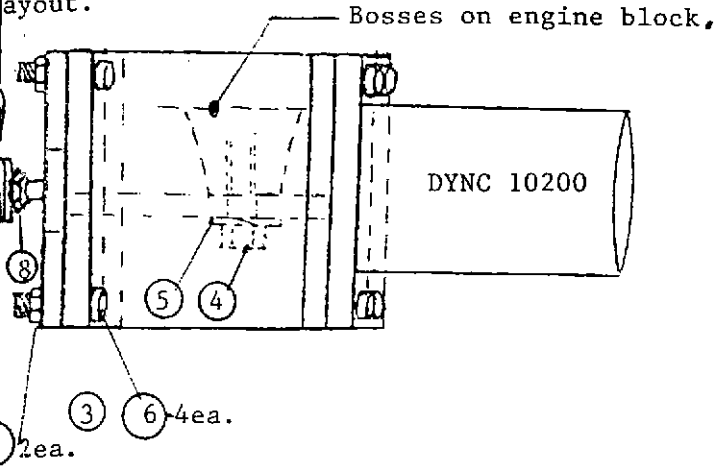
1354 Clifford Avenue
P.O. Box 2940
Loves Park, IL U.S.A. 61132-2940

Phone: (815) 877-0241
Telex: 4330365

In Europe contact: Colman Nederland B.V.,
Maalderij 30, 1185 ZC Amstelveen, The Netherlands.
Phone: (020) 45-51-57, Telex: 15419 COL NE NL.

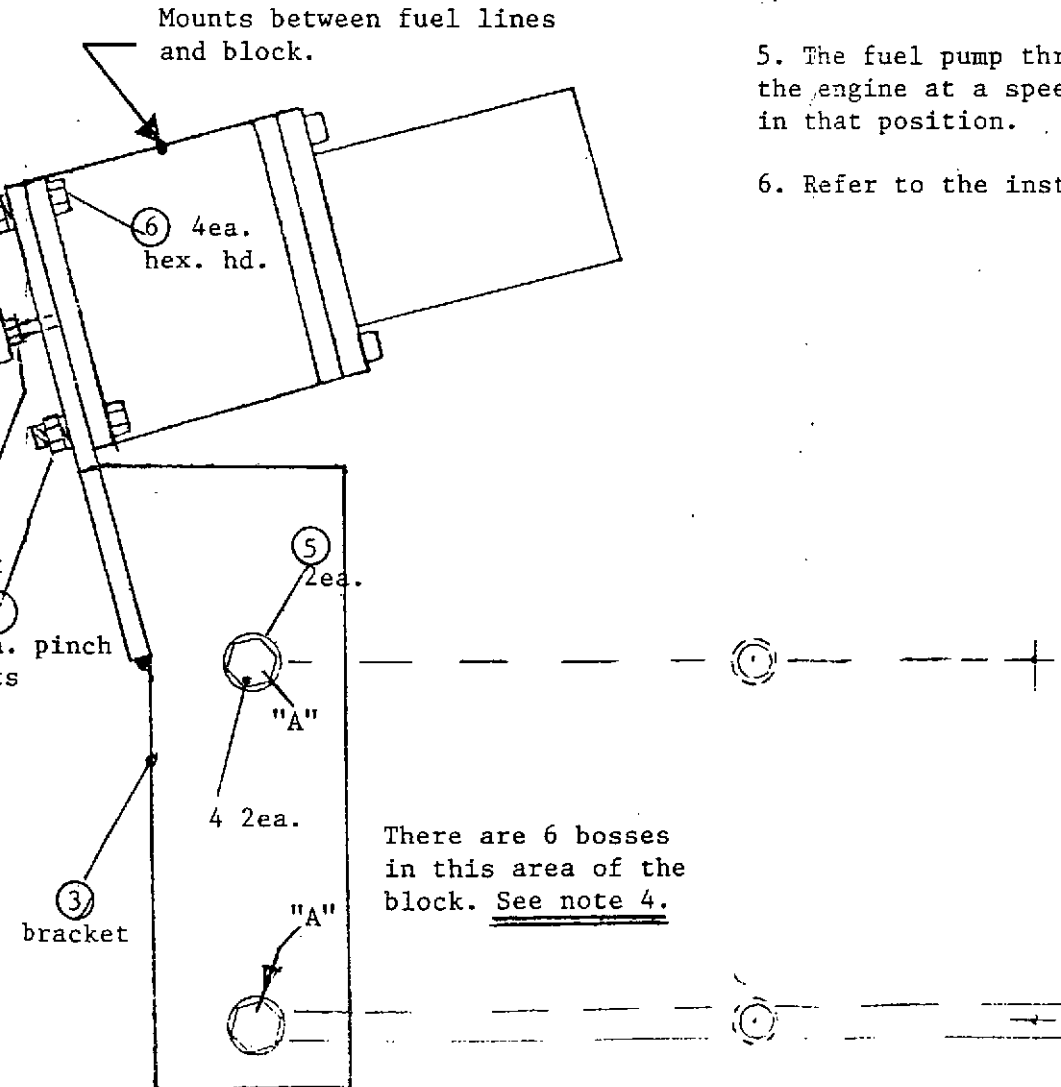


in the Hercules D4800T diesel. The engine flywheel has 138 teeth. The stop lever. The controller is to be panel mounted. D.C. power leads for the positive power lead connected to where the large battery negative terminal is located in the layout.

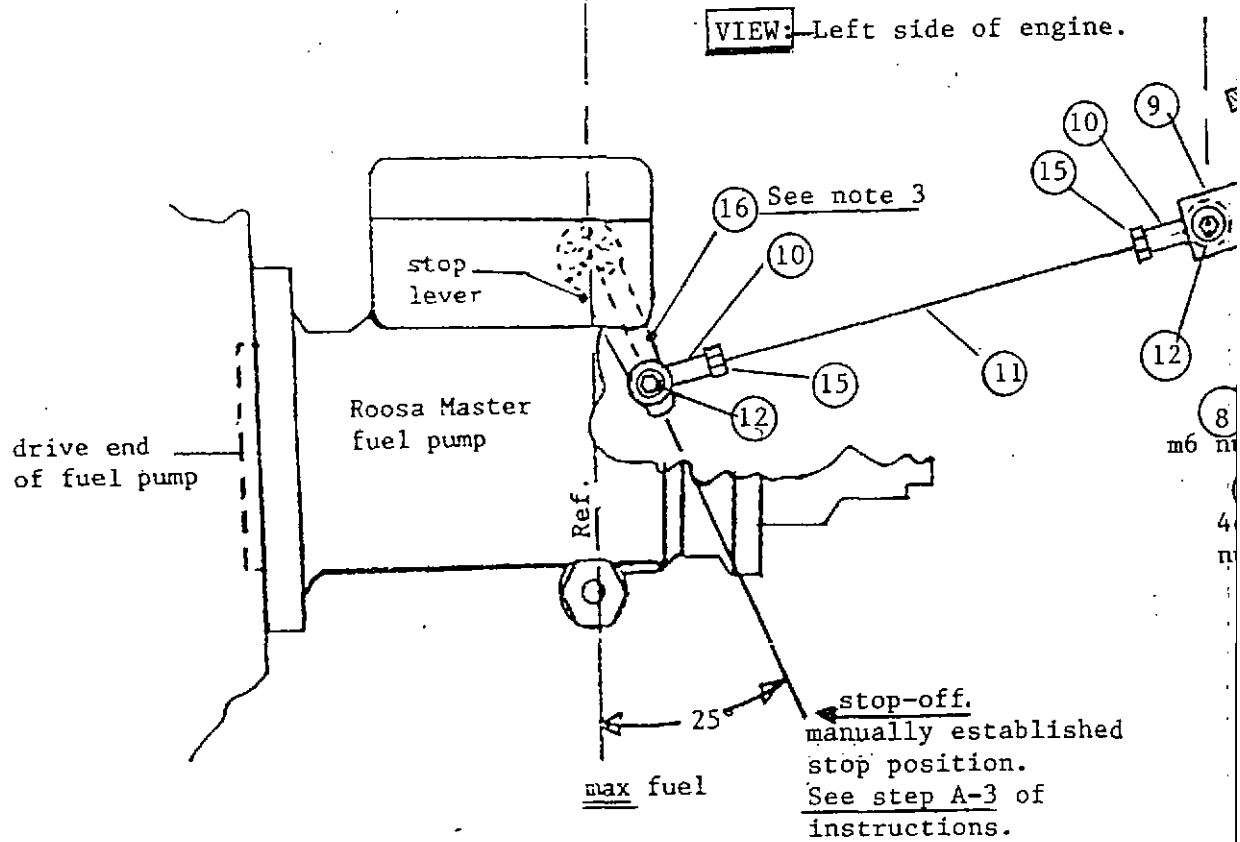
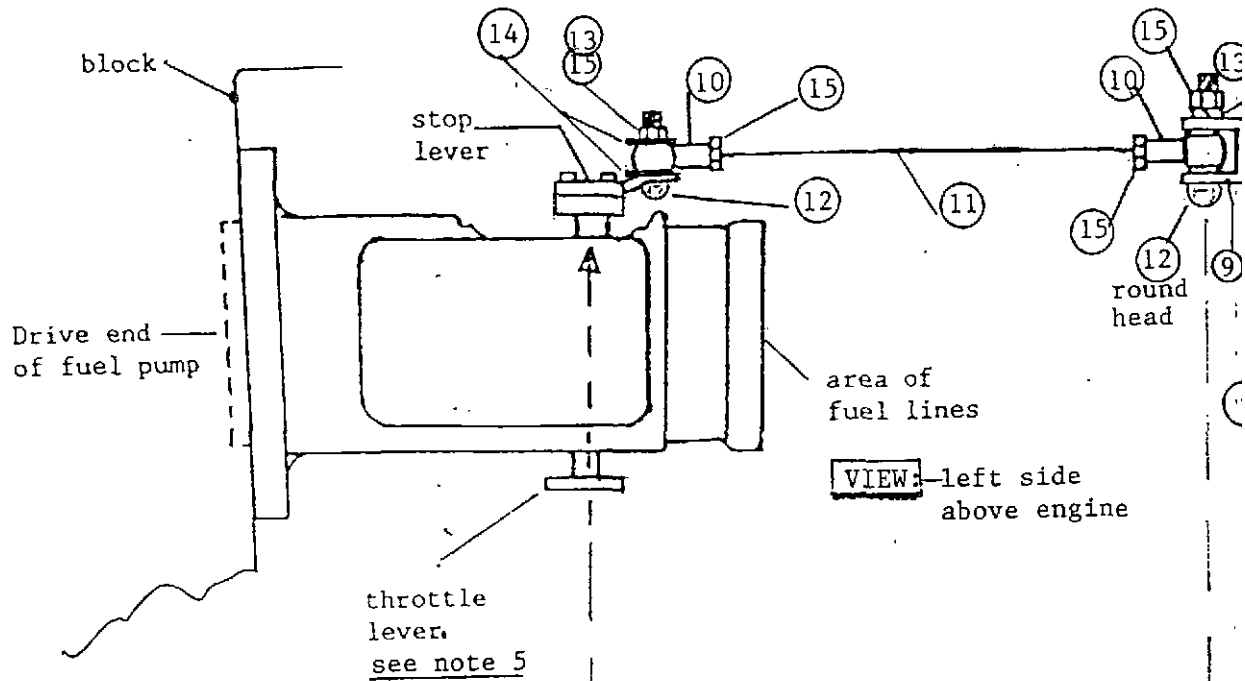


Instruction Notes:

1. When an external governor operates the stop lever of the Roosa-Master fuel pump, it is suggested that a clip with a roller be used internally in the fuel pump. See attached Bulletin 38.
2. The numbers on this layout correspond to item numbers on the kit parts list.
3. The item 16 stop lever has a shorter radius and replaces the existing stop lever because of a clearance problem.
4. To install the item 3 bracket, on the engine block, two holes marked "A" must be drilled and tapped in two existing bosses. Use the holes in the bracket as a template. Use a letter (F) drill. CAUTION! drill the two holes only 5/8" inches deep. Tap the two holes for 5/16 - 18 thread.
5. The fuel pump throttle lever must be set to operate the engine at a speed of 10% above normal and locked in that position.
6. Refer to the instructions on pages 1, 2 and 3.

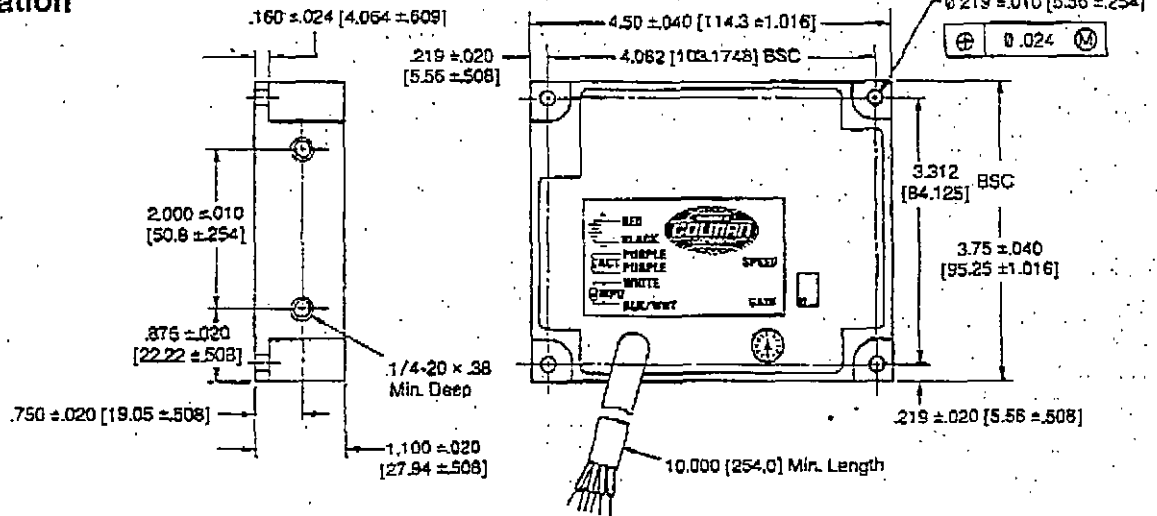


Application: Installation of the Barber-Colman linear Governor
 The actuator linkage connects to the Roosa-Master fuel pump stop
 and actuator leads should be 14 gage twisted pairs, with the neg
 cable comes to the engine. Refer to notes at the right on this 1

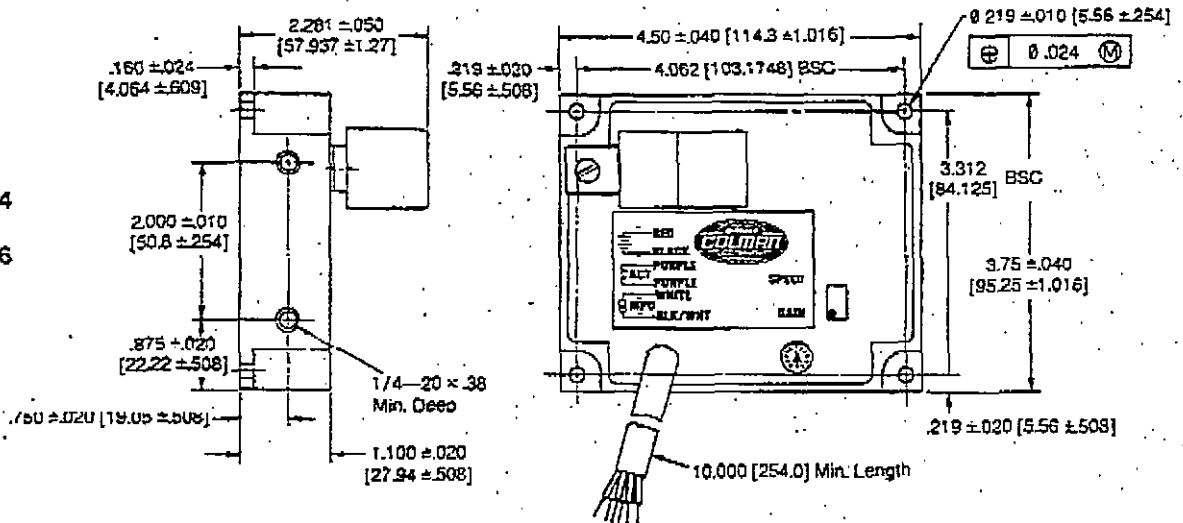


Controller Installation Dimensions

**DYN1-10701
&
DYN1-10704**

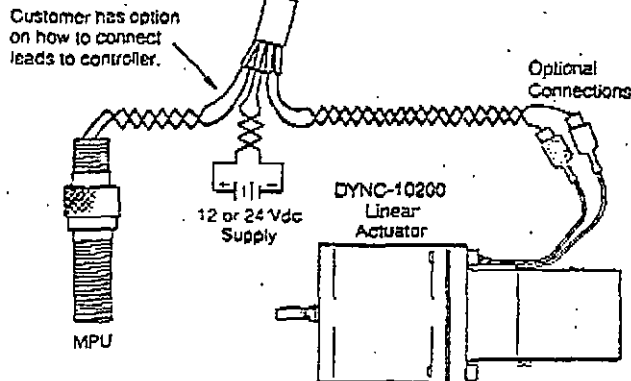


**DYN1-10714
&
DYN1-10716**



Typical Wiring Diagram (all units)

*See color code on front of controller.



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.

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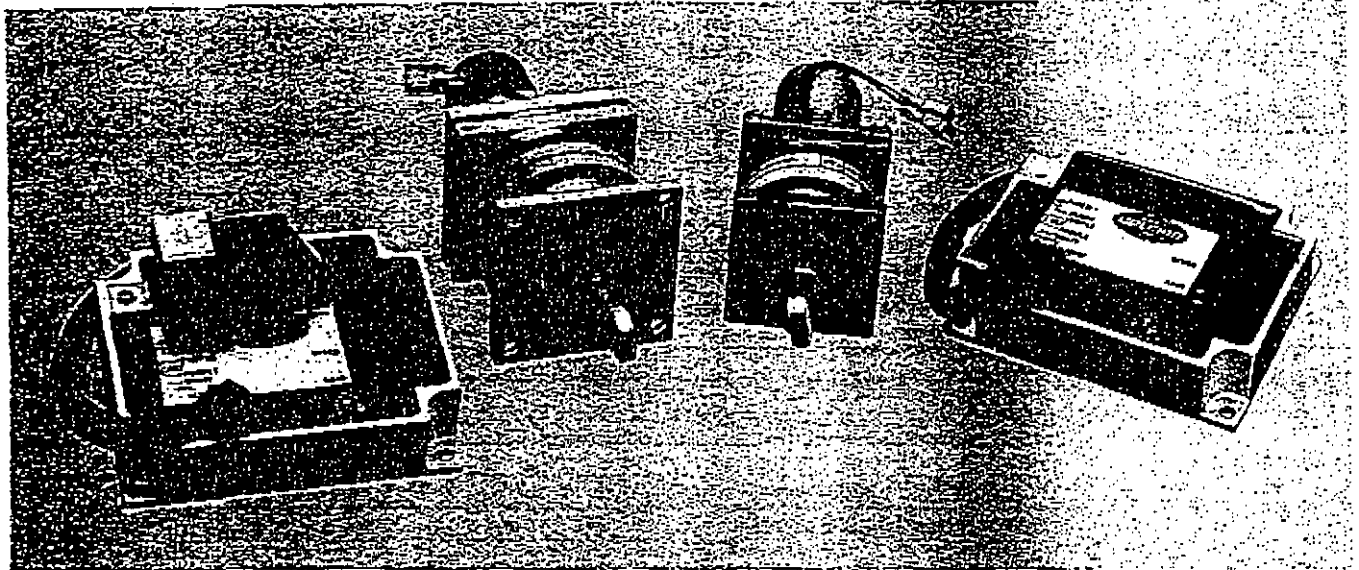
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Product Information

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DYNA
Power Controls

DYNA "2000 & 2500 LINEAR ACTUATOR" Governor System



GENERAL

The new Barber-Colman "LINEAR ACTUATOR" governor is a small, simple, low-cost, isochronous, all-electric governor system for speed control of very small engines (4.0 HP to 65 HP) or for engines with fuel systems requiring low operating forces. The governor can be used on diesel, gasoline or natural gas engines. For the money, it provides the best control available in the industry.

The "LINEAR ACTUATOR" governor system is very easy to install. The actuator is mounted near the fuel control, and the actuator output is connected to the fuel control system.

The controller is designed for panel mounting but is potted for engine mounting. The controller is easy to adjust, and it provides outstanding speed control. The power for the governor is obtained from the engines DC starting system, eliminating the need for mechanical drives and hydraulic lines.

TYPICAL APPLICATIONS

The new "LINEAR ACTUATOR" governor will control the fuel system on most engines up to 65 HP.

- Generator sets
- Forklift trucks
- Power carts
- Off-the-road vehicles
- Pump sets
- Pleasure boats

STANDARD FEATURES

- All-electric
- Fast response
- Small and compact
- Meets INR and EMP for moderate tactical battlefield environment
- High reliability due to few moving parts
- Mounts in any position
- Precise repeatability
- No special maintenance
- Spring returns output to minimum position on removal of power or loss of magnetic pickup (MPU)

SPECIAL SELF-MONITORING FEATURES OF DYN1-10714 AND DYN1-10716

- Provides engine control with self-monitoring of control
- Checks for open speed potentiometer
- Checks for DC voltage for governor
- Checks for loss of magnetic pickup
- Automatic overspeed shutdown which is set 13.5% \pm 1.5% above the controllers speed setting potentiometer. Therefore, you do not have to worry about setting the overspeed trip point on your application.

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.

AVAILABLE MODELS

Actuators

- Force available = 6.6 lbs.
DYNC-10200-000-0-12
DYNC-10200-000-0-24
- Force available = 13 lbs.
DYNC-10500-000-0-12
DYNC-10500-000-0-24

Controllers

- Low frequency from ignition or alternator
DYN1-10701-000-0-12
DYN1-10701-000-0-24
- 2500 to 5000 Hz
DYN1-10704-000-0-12
DYN1-10704-000-0-24
- 5000 to 9500 Hz
DYN1-10706-000-0-12
DYN1-10706-000-0-24

Controllers with self-monitoring feature

- 2500 to 5000 Hz
DYN1-10714-000-0-12
DYN1-10714-000-0-24
- 5000 to 9500 Hz
DYN1-10716-000-0-12
DYN1-10716-000-0-24

TABLE 1. ACTUATOR SPECIFICATIONS

ACTUATOR		DYNC-10200	DYNC-10500
Work	Joules	0.33	0.66
	Foot-pounds	0.25	0.50
Force	Pounds energized	6.5	13.0
	Grams energized	2950	5910
Output Stroke	Linear travel in inches	0.775-0.825	
	Linear travel in millimeters	19.68-20.95	
Weight	Kilograms	1.14	1.73
	Pounds	2.5	3.8
Current @ 12 Vdc	Nominal steady state amperes	2.5	2.5
	Maximum amperes @ stall @ 24°C	5.4	5.9
	Maximum amperes @ stall @ 125°C	3.9	4.2
Current @ 24 Vdc	Nominal steady state amperes	1.0	1.0
	Maximum amperes @ stall @ 24°C	5.4	3.0
	Maximum amperes @ stall @ 125°C	3.9	2.0
Nominal Response Time to Travel 63% of Stroke in ON Direction (seconds)		0.05	0.05
Nominal Response Time to Travel 63% of Stroke in OFF Direction (seconds)		0.032	0.032
Operating Voltage		12 or 24 Vdc ±20%	
Ambient Operating Temperature		-65° to +250°F (-55° to +125°C)	
Mechanical Vibration		5 to 500 Hz, Curve L, per MIL-STD-810C	
Sealing		Oil, water and dust tight	
Connection*		#18 gauge leads with min. length of 3 inches (7.6 cm) with insulated tab terminal per AMP P/N 2-52013-2. Mates with insulated receptacle per AMP P/N 2-520184-2.	

*Customer may specify type of connection — contact factory.

TABLE 2. CONTROLLER SPECIFICATIONS

CONTROLLER		DYN1-10701	DYN1-10704 DYN1-10706	DYN1-10714 DYN1-10716
Max. Output Current in Amperes @ 12 Vdc		6.0	6.0	6.0
Max. Output Current in Amperes @ 24 Vdc		5.0	5.0	5.0
Weight	Pounds	1.25	1.25	1.35
	Kilograms	0.568	0.568	0.613
Operating Voltage		12 or 24 Vdc ±20%		
Ambient Operating Temperature		-40° to +180°F (-40° to +85°C)		
Mechanical Vibration		5 to 500 Hz, Curve L, per MIL-STD-810C		
Sealing		Oil, water and dust tight		
Connections		#18 gauge leads with minimum length of 10 inches (25.4 cm) with no connector of any kind		
Input Signal Frequency from Magnetic Pickup		Input signal frequency in Hertz = $\frac{\text{Engine RPM} \times \text{number of gear teeth on flywheel}}{60}$		
Input Signal Voltage from Magnetic Pickup		2.0 Vac rms. minimum during cranking		
Steady State Speed Band		±0.25%		
Controller Adjustments		Gain and speed		

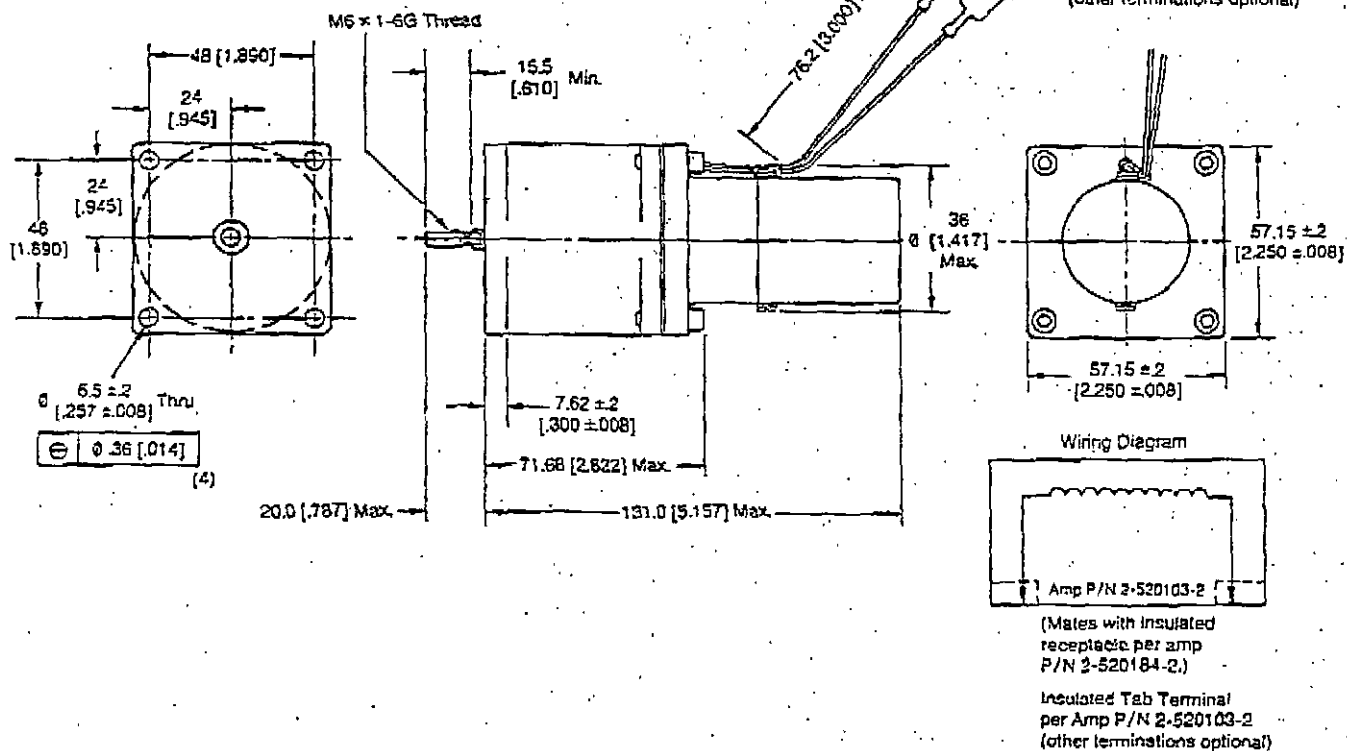
NOTE

Select your controller for the correct DC operating voltage and input signal frequency range generated by the magnetic pickup at the maximum engine operated (RPM) speed.

Actuator Installation Dimensions

3 of 4

DYNC-10200



DYNC-10500

