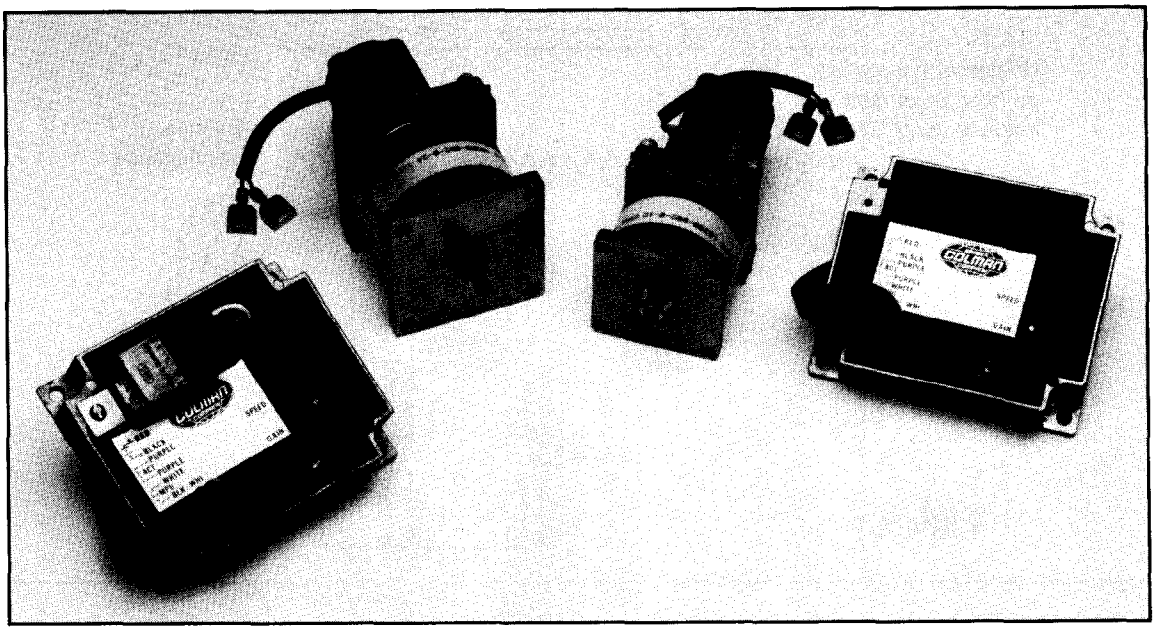
CALIBRATION AND TROUBLESHOOTING FOR BASIC LINEAR CONTROLLERS

MODELS
DYN1-10704
DYN1-10714
DYN1-10724
DYN1-10734



GENERAL INFORMATION

The DYN1-10704 and 10724 controllers are basic controllers without an overspeed. The 10704 controller is normally used on diesel engines and the 10724 is normally used on ignition engines.

The DYN1-10714 and 10734 controllers are also basic controllers with overspeed protection 12.5% above set speed. The 10714 controller is normally used on diesel engines and the 10734 controller is normally used on ignition engines.

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.

TYPICAL WIRING DIAGRAM

General information, wiring and calibration procedure for the DYN1-10704, 10714, 10724 and 10734 controllers for the linear governor system.

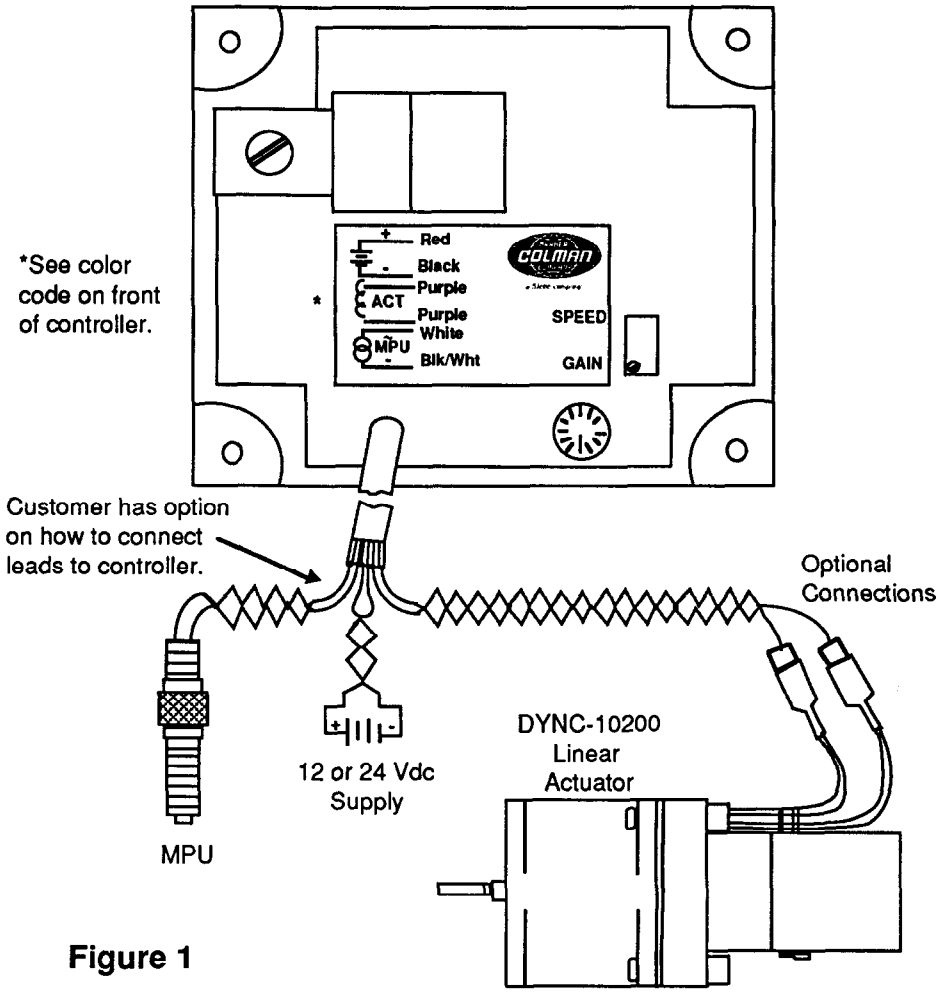


Figure 1

CALIBRATION

1. With no power to the governor, adjust the GAIN to 9:00 o'clock.
2. Start the engine and adjust the speed by turning the SPEED pot clockwise to desired speed.

NOTE

Controllers are factory adjusted to minimum RPM. However, for safety, one should be capable of disabling the engine if an overspeed should exist.

3. At no load, turn the GAIN potentiometer clockwise until the engine begins to hunt. If the engine does not hunt, physically upset the governor linkage.
4. Turn the GAIN potentiometer counterclockwise until stable.

WIRING

All four controllers are wired as shown in Figure 1 Wiring Diagram.

1. Red to battery positive.
2. Black to battery negative.
3. Purple to the actuator, no polarity.
4. White to one side of the magnetic pickup.
5. Black and white to the other side of the magnetic pickup connected with the shield drain wire.

LINEAR TROUBLESHOOTING CHART

Problem	Detection	Corrective Action
I. System appears dead. (Actuator fails to move to full fuel)	1. CHECK BATTERY VOLTAGE AT CONTROLLER with power switch "ON". Measure DC battery voltage between the Red (+) and Black (-) leads. Battery voltage should be present.	Check connections to battery.
	2. CHECK LINKAGE. Manually operate linkage to see that it is not sticking or binding.	Free linkage.
	3. NO SIGNAL OR WEAK SIGNAL FROM MAGNETIC PICKUP. Measure AC voltage between the White and Black/White leads on controller while cranking engine. Voltage should be 2.5 volts RMS or greater. (AC input impedance of meter must be 5000 ohms/volt or greater.)	Check for damage to or improper adjustment of magnetic pickup. Replace or re-adjust.
	4. CHECK ACTUATOR with power "ON" to controller. Measure following terminals on control box with respect to the Black lead. All points should read BATTERY VOLTAGE. (+0.00/-0.75 VDC)	
	a. Purple lead to Black lead on controller.	
	b. Second Purple lead to Black lead on controller. (Continue this test only if battery voltage is not present.)	Replace controller if battery voltage is not present at both Purple leads.
	c. Following checks are terminals on the actuator and the Black lead on controller.	
	1) Low voltage (1.0-2.0 VDC) at either actuator connector.	Broken actuator lead.
	2) Battery voltage at both actuator connectors.	Broken actuator lead.
	3) Battery voltage at one actuator lead but not at the other.	Replace actuator.
II. Actuator lever goes to full fuel whenever the power is turned "ON" and engine is not running.	1. CHECK CONTROLLER by removing actuator lead to Purple lead and turning power "ON" to controller.	
	a. Actuator goes to full fuel.	Check for shorted actuator lead.
	b. Actuator does not go to full fuel.	Replace Controller because it should not cause actuator lever to go to full fuel with engine not running.
	Note: Turn off power and reconnect Purple lead.	
III. Actuator hunts during operation.	1. Linkage or rod end bearings sticking or binding.	Lubricate or replace.
	2. Improper linkage arrangement. (Stroke too short or improper non-linear linkage used)	See installation information.
	3. Improper governor adjustment.	Readjust calibration.
	4. Inadequate power supply voltage.	
	a. Turn power switch "OFF".	
	b. Connect a DC voltmeter to Red and Black leads at control box.	
	c. Disconnect both leads to actuator at Purple leads of control box.	
	d. Connect one actuator lead to the Red lead and one actuator lead to the Black lead of the control box.	
	e. Momentarily turn "ON" the DC power. The actuator should go to full fuel and the DC voltage must be greater than 80% of supply. 24 VDC @ 80% = 19.2 VDC 12 VDC @ 80% = 9.6 VDC	If actuator doesn't get to full fuel, then check actuator leads. If voltage is less than specified, check for loose or poor connections to battery, or get larger supply leads or larger power supply.
	Note: Reconnect actuator leads properly after completing this test.	

Barber-Colman Company

AEROSPACE & POWER CONTROLS DIVISION
DYNA Product Group

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

Phone: (815) 877-0241
Telex: 4330365
Fax: (815) 877-0150

In Europe contact: Barber-Colman GmbH
Am neuen Rheinhafen 4, D-6720 Speyer, West Germany
Tel: 06232-1203, Fax: 06232-12155, Telex: 467 627

In Japan contact: Ranco Japan Ltd.
Shiozaki Bldg.7-1, 2-chome, Hirakawa-Cho, Chiyoda-Ku
Tokyo 102, Japan
Tel: 3261-4293, Fax: 3264-4691, Telex: 0232-2087

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DYNA CONTROLLERS

General

The Barber-Colman controllers for the DYNA 2000 and 2500 actuators are all solid state design resulting in fast, stable engine response to speed or load changes. The controller circuits measure PROPORTIONAL (amount of offspeed), INTEGRAL (time of offspeed) and DERIVATIVE (rate of change of offspeed) to ensure optimum performance.

The controller electronics are environmentally potted providing protection against the various liquids and vibrations associated with engines. This makes the unit suitable for panel or engine mounting. It is easy to adjust, having only speed and gain adjustments. The power for the governor is obtained from the engine's DC starting system, eliminating the need for mechanical drives and hydraulic lines.

Speed Sensing

The DYNA all-electric governor requires a frequency signal to read engine speed. Typically, a hole is drilled and tapped in the flywheel housing perpendicular to the crankshaft, and a magnetic pickup is inserted into it to sense the teeth on the ring gear.

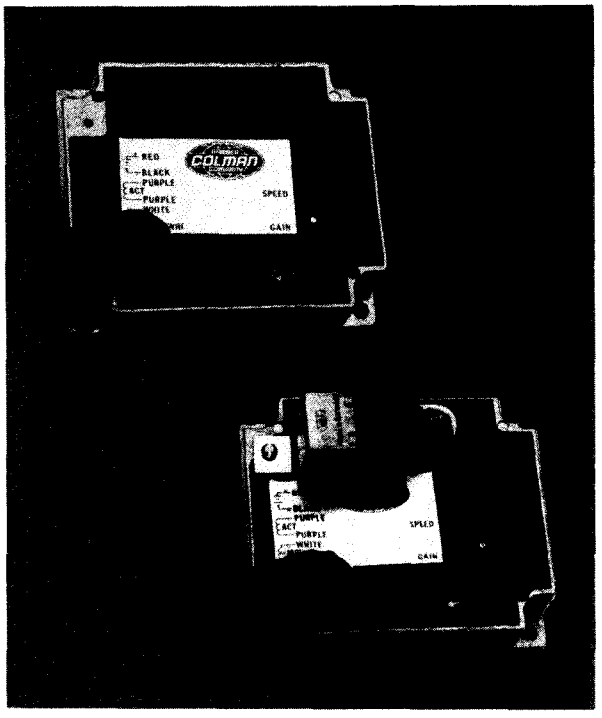
Failsafe

The DYNA Governor has an internal FAILSAFE circuit that instantly reacts to:

- Interruption of the DC power to spring return actuator to minimum fuel position.
- Loss of speed reference signal to remove power from actuator causing it to spring return to minimum fuel posi-

Standard Features

- **All electric**
- **All engine compatibility**
- **Mounts in any position**
- **High reliability**
- **Temperature stable**



Available Models:

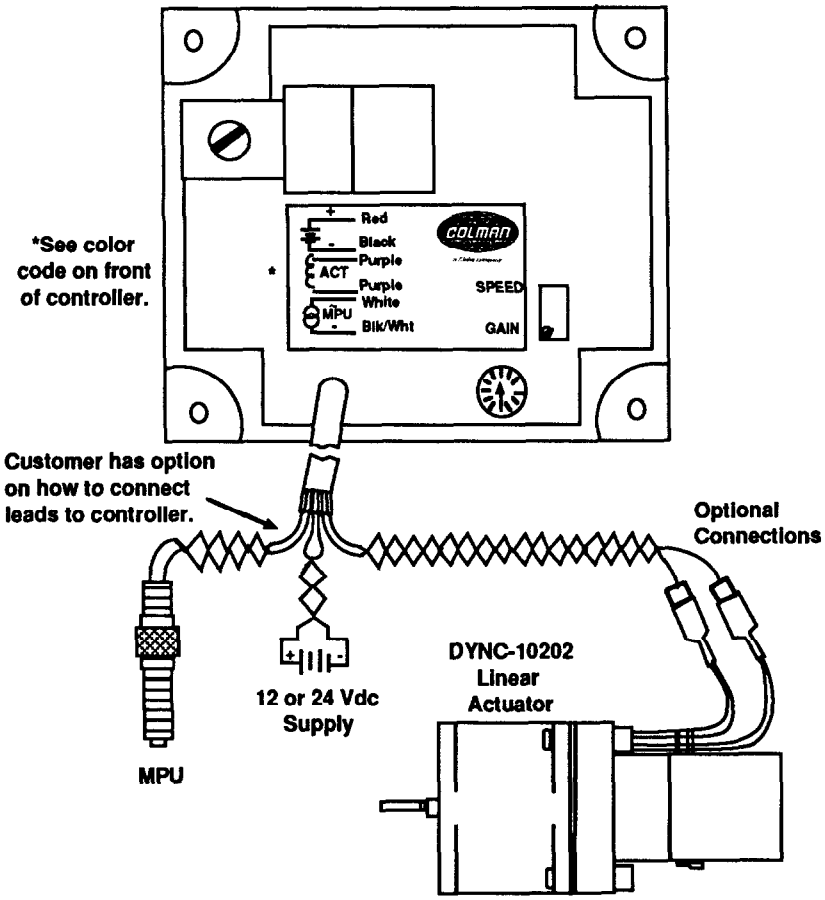
	Input Signal Frequency
• Diesel	
DYN1-10704-000-0-12 DYN1-10704-000-0-24	2500-5000 Hz
DYN1-10706-000-0-12 DYN1-10706-000-0-24	5000-9500 Hz
*DYN1-10714-000-0-12 *DYN1-10714-000-0-24	2500-5000 Hz
*DYN1-10716-000-0-12 *DYN1-10716-000-0-24	5000-9500 Hz
• Spark Ignited Engines	
DYN1-10724-000-0-12 DYN1-10724-000-0-24	2500-5000 Hz
DYN1-10726-000-0-12 DYN1-10726-000-0-24	5000-9500 Hz
*DYN1-10734-000-0-12 *DYN1-10734-000-0-24	2500-5000 Hz
*DYN1-10736-000-0-12 *DYN1-10736-000-0-24	5000-9500 Hz

* Units have self monitoring feature

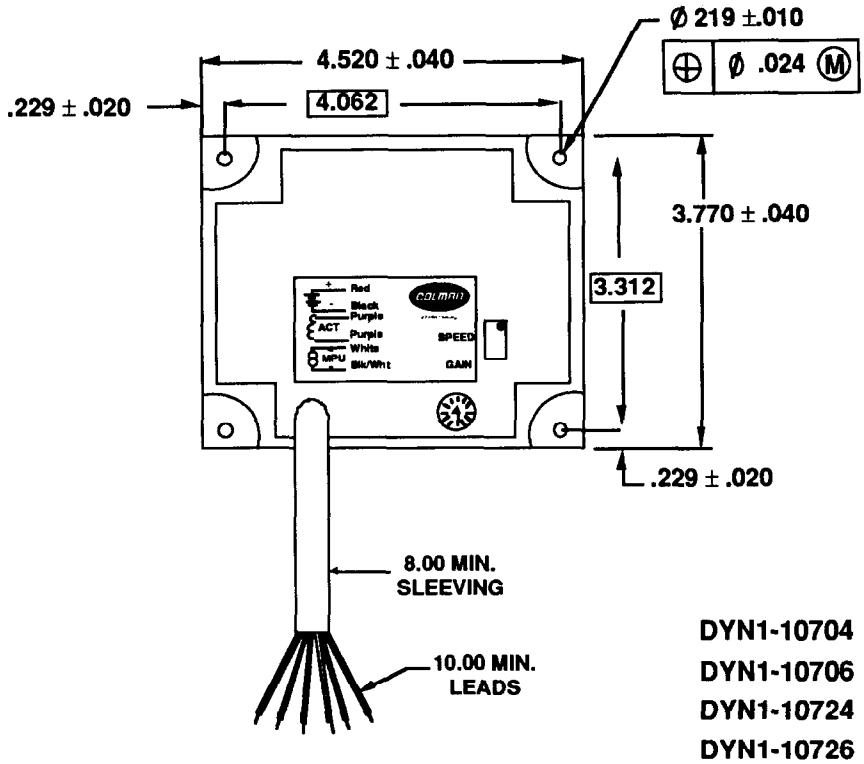
TABLE 1. CONTROLLER SPECIFICATIONS

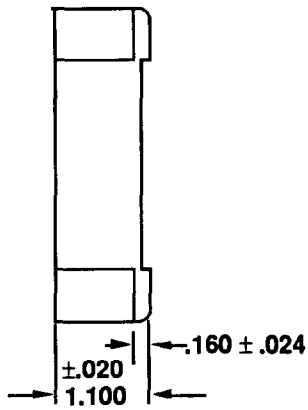
CONTROLLER		DYN1-10704 DYN1-10706	DYN1-10724 DYN1-10726	DYN1-10714 DYN1-10716	DYN1-10734 DYN1-10736
Max. Output Current in Amperes @ 12 Vdc		6.0	6.0	6.0	6.0
Max. Output Current in Amperes @ 24 Vdc		5.0	5.0	5.0	5.0
Weight	Pounds	1.25	1.25	1.35	1.35
	Kilograms	0.568	0.568	0.613	0.613
Operating Voltage		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 = $\frac{\text{Engine RPM x number of gear teeth on flywheel}}{60}$			
Input Signal Voltage from Magnetic Pickup		2.5 Vac RMS. minimum during cranking			
Steady State Speed Band		±0.25%			
Controller Adjustments		Gain and Speed			
Self Monitoring Shutdown		112.5% of set point speed			

Typical Wiring Diagram (all units)

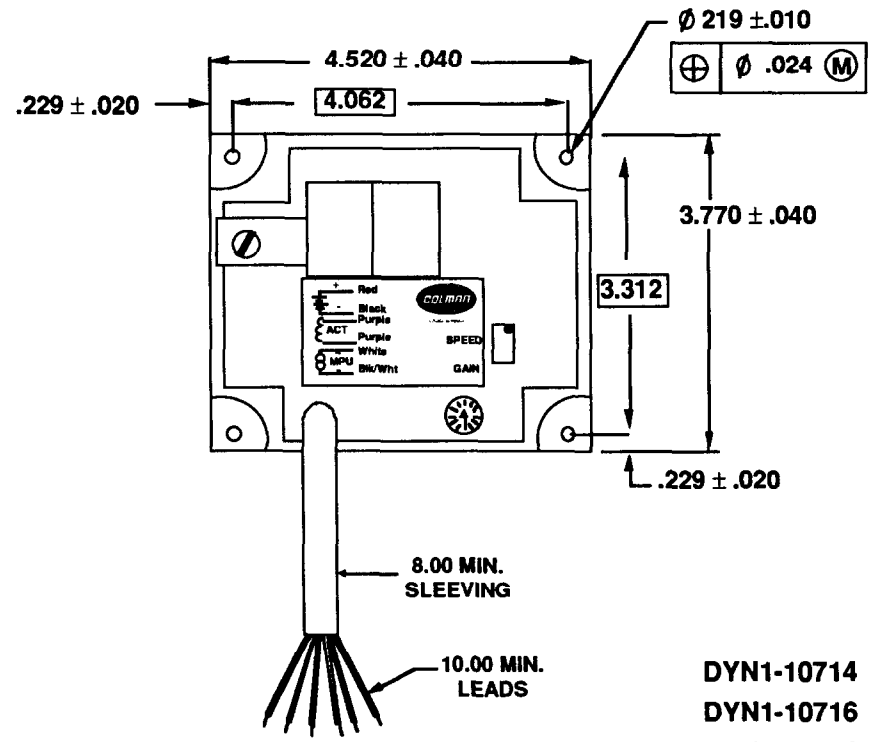


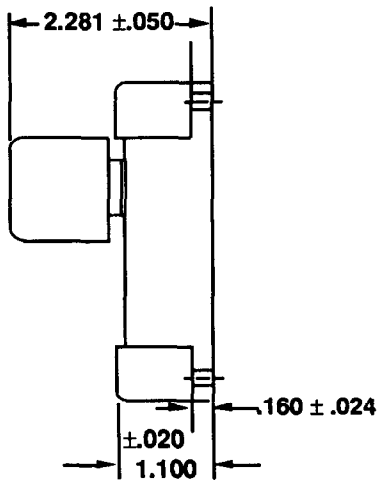
CONTROLLER INSTALLATION DIMENSIONS





DYN1-10704
DYN1-10706
DYN1-10724
DYN1-10726





DYN1-10714
DYN1-10716
DYN1-10734
DYN1-10736

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.

Barber-Colman Company

AEROSPACE & POWER CONTROLS DIVISION
DYNA Product Group

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

Phone: (815) 637-3000
Telex: 4330365
Fax: (815) 877-0150

In Europe contact: Barber-Colman GmbH
Am neuen Rheinhafen 4, D-6720 Speyer, West Germany
Tel: 06232-1203, Fax: 06232-12155, Telex: 467 627

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Shiozaki Bldg. 7-1, 2-chome, Hirakawa-Cho, Chiyoda-Ku
Tokyo 102, Japan
Tel: 3261-4293, Fax: 3264-4691, Telex: 0232-2087

CALIBRATION PROCEDURE FOR LINEAR GOVERNOR CONTROLLERS

Part Number	Input Signal Frequency Maximum	Part Number	Input Signal Frequency Maximum
DYN1-10752-000-0-12 DYN1-10752-000-0-24	250 to 1200 Hz	DYN1-10754-000-0-12 DYN1-10754-000-0-24	2500 to 5000 Hz
DYN1-10753-000-0-12 DYN1-10753-000-0-24	1200 to 2500 Hz	DYN1-10756-000-0-12 DYN1-10756-000-0-24	5000 to 9000 Hz

NOTE

See Step 4.0 for proper procedures for setting switches S1 and S2 if you have a controller that has the two switches located on top of the controller.

1.0 CALIBRATION PROCEDURE

1.1 Observe that potentiometer settings are adjustable from zero to 100%. Each small division is 10%. The speed potentiometer is 10K, 20 turn.

1.2 Set the small dip switch, S1, for the correct engine. (See paragraph 4) Set switch S2 in the "OFF" position for actuator DYNC 10200 and DYNC 10202 or in the "ON" position for DYNC 10500 and DYNC 10502

1.3 If a remote speed potentiometer is used for narrow range, set to mid range.

2.0 INITIAL POTENTIOMETER SETTINGS

GAIN	20%
I	20%
D	30%
DROOP	Zero

2.1 For isochronous operation, set DROOP counterclockwise to minimum position as shown in Figure 1.

2.2 For DROOP operation, set DROOP potentiometer clockwise to obtain desired amount of DROOP from no-load to full load. Turning potentiometer clockwise increases DROOP.

3.0 START ENGINE (NO LOAD)

3.1 Adjust the controller speed potentiometer for desired engine speed.

NOTE

A warm engine is normally more stable than a cold one. If the governor is adjusted on a warm engine, turn the adjustment potentiometers counterclockwise 5% (1/2 div.) to ensure a stable engine when started cold.

3.2 Adjust the GAIN potentiometer clockwise until the engine begins to hunt. (If the engine remains stable at 100% GAIN, physically disrupt the actuator linkage by hand.) With the engine hunting, turn the GAIN potentiometer counterclockwise until stable.

3.3 Repeat step 3.2 for the "D" setting.

3.4 Repeat step 3.2 for the "I" setting.

3.5 After calibration, it may be necessary to readjust the speed.

3.6 If the engine is a diesel, following the above calibration, conduct the following test. With the engine operating at rated speed, turn the electric governor off. When engine speed slows to approximately half of rated speed, turn the electric governor back on. Observe the overshoot. If the overshoot is too great, turn the "I" potentiometer clockwise to lessen the overshoot. If there is a small hunt at steady state, slightly turn the "I" potentiometer counterclockwise until stable. In some cases, 2 to 5 Hz overshoot may be acceptable.

3.7 If the engine is an ignition type using compressed fuel such as natural gas or LP, stop the engine and restart in the normal manner to check overshoot.

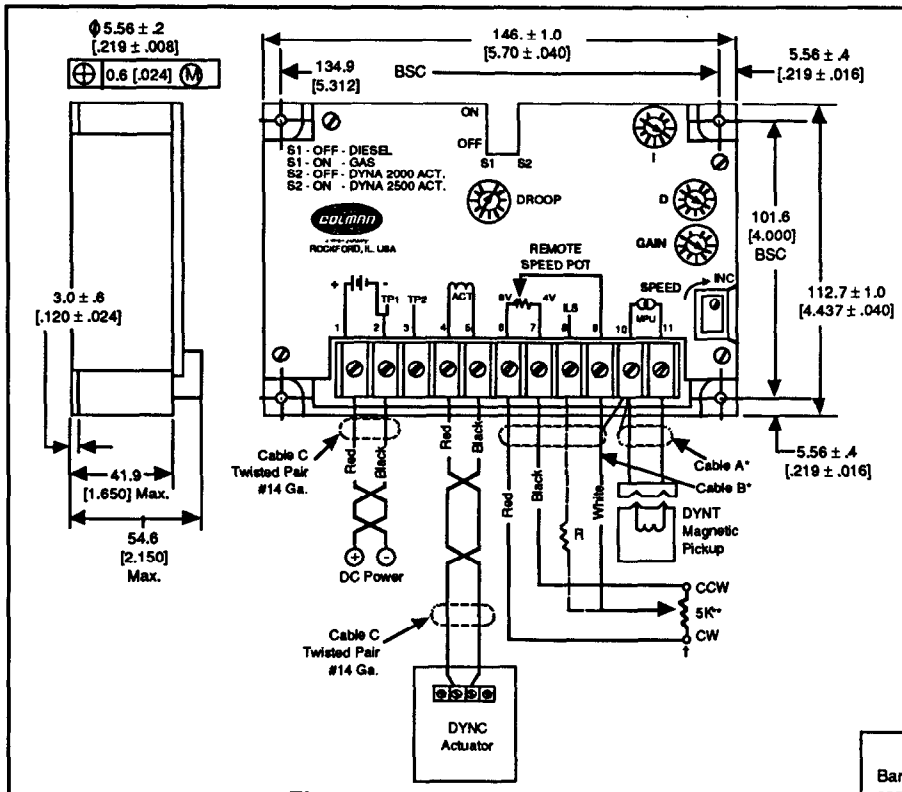
If possible, operate the unit through various load ranges up to 100% to ensure stability.

4.0 CONTROLLERS HAVE SWITCHES S1 AND S2

These units have two features now added to the DYN1 1075X series controllers. They are:

4.1 Two response ranges for matching either the diesel or gas engine dynamics.

- Set S1 to the OFF position for diesel engine applications.
- Set S1 to the ON position for gas/gasoline engine applications.



Cable A - DYNK 44-XX (specify length) (90° connector)
Cable B - E26-22 (specify length)
Cable C - DYNZ 70-4 (specify length)
* Shielded Cable - Should be purchased from Barber-Colman or customer should purchase a cable with a wrapped mylar supported aluminum foil shield with a drain wire.

**Remote Speed Potentiometer
- DYNS 10000

† The 5K Remote Speed Potentiometer can be wired two different ways:

1. As shown by the solid line from the wiper of the 5K potentiometer and then connected to terminal 9 (no resistor required). Adjustable range is approximately ±5% at 1800 RPM.

2. As shown by the dashed line from the wiper of the 5K potentiometer through resistor "R" and then connected to terminal 8. Reducing the value of "R" increases the remote adjustable speed range.

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

4.2 Two actuator selections, so the same controller can be used on the DYNA 2000 or DYNA 2500 actuator.*

- Set S2 to the OFF position when using a DYNA 2000 actuator.
- Set S2 to the ON position when using a DYNA 2500 actuator.

5.0 GENERAL INFORMATION ON S1 AND S2

- Switch S1 selects one of two integrating rate ranges. The diesel version integrates at twice the rate of the gas version.
- Switch S2 selects the point at which actuator coil current level causes the integrator limit to be actuated. This level varies for 12 and 24 volt as shown below.

	12 Volt	24 Volt
DYNA 2000 — S2 OFF	5.1A	2.3A
DYNA 2500 — S2 ON	7.2A	3.4A

* DYNA 2000 — DYNC 10200 and DYNC 10202
DYNA 2500 — DYNC 10500 and DYNC 10502

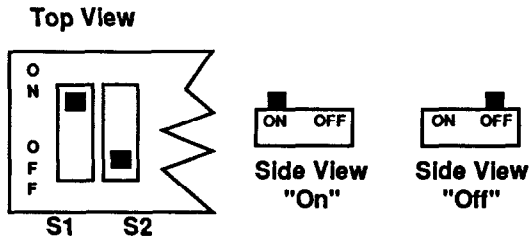
These actuators do not have a potentiometer feedback transducer.

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.

6.0 PROPER PROCEDURES FOR SETTING SWITCHES S1 AND S2

Question: How do I know if the switches in the dual-in-line packages are correctly set as far as being in the OFF position or the ON position?



Answer: The drawings above should clarify any confusion about switch settings. The easiest way to set the switches is to apply pressure with a small pointed object until the switch clicks into position.

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

Phone: (815) 637-3000
Telex: 4330365
Fax: (815) 877-0150

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