REFLEX ®MODEL 217
UNIVERSAL CLOSED LOOP CONTROLLER

PART NUMBER 12M03-00111-02
APPLICATION NOTES

1. Signal polarities are relative. A positive reference must be used when the absolute value amplifier is connected in the feedback circuit (jumper on 5TB - P to Q).

2. The output "Inverter" (jumper on 2TB - I to H) provides a positive signal output for use with the REFLEX Model 216 Power Converter or other controls requiring a positive reference.

3. If the output Inverter Amplifier 2IC(D) is not used, the gain and frequency response of the Summing Amplifier may be modified externally by turning the "Lag" adjustment full CCW and adding an appropriate feedback network between terminals 5 and 8.

4. Minimum resistive load between terminals 15 and 13 is 500 ohms (12mA).

5. Minimum reference voltage for full speed is limited only by a requirement for a 1mA input current to terminal 14. Higher voltages can be accomodated by adding external resistance.

6. The ramp adjustment range can be extended by the addition of a film type capacitor between terminals 10 and 11.

   ADD 1 MFD - Range 4 to 80 seconds
   ADD 2 MFD - Range 6 to 120 seconds

7. If remote control of the ramp rate is required, remove the jumper on 6TB and duplicate the network consisting of 4D, 5D, 9P, 10P, 30R and 31R externally between terminals 11 and 12. If additional time is required see paragraph 6 above.

8. If a Timed Reference is not needed, the center arm of the Speed Reference potentiometer may be connected directly to the Reference Input of the Summing Amplifier, terminal 9, instead of to terminal 14.

9. If full isolation is required for armature current or voltage feedback, a Signal Isolator such as the REFLEX Model 213 may be used.

10. If armature voltage feedback higher than 250 volts is required, a 50K divider consisting of two 5 watt resistors (or one 50K wirewound resistor with centertap slider) should be connected across the armature. A maximum 250 volt signal from the divider is then applied to terminals 1 and 2.

11. The "IR COMP" circuit is normally disconnected (or turned counter-clockwise) on tachometer feedback drives. It can be used to speed up response to load changes with tachometer feedback if an increase in speed with load can be tolerated.

12. Initial stability settings are as follows:

Lead	50%	
Lead Break	0%	(Rarely set above 5%)
Lag	50%	
Lag Break	50%	

Satisfactory performance is normally achieved when the peak-to-peak ripple on the output of the Summing Amplifier (terminal 5) is between 1 and 2 volts. The "Lead" and "Lag" adjustments should be set as low as possible and the "Lag Break" set as high as possible consistent with satisfactory performance.

13. The "Lead" potentiometer is turned clockwise, if required, to prevent hunting or overshoot. Too much "Lead" signal will cause the drive to be sluggish to changes in the speed reference. However, it will improve response to changes in load. Since the "Lead" circuit tends to inject noise into the circuit, the "Lead Break" is used to provide a high frequency cutoff to limit the noise. Too much "Lead Break" will nullify the effect of "Lead".

The Lag network will filter out some of this noise and may have to be readjusted if the Lead Network adjustments are changed.

14. If the drive "creeps" when the speed reference potentiometer is turned to zero, this may be a symptom of excessive noise in the signal circuits. If the drive still "creeps" after the stability adjustments are properly adjusted, the cause may be due to the offset tolerances of the op-amps. In this case a bias may be added by connecting a resistor (1 to 2 megohms) between terminal 16 (negative 15 volts) and terminal 8 (Summing Input).

If the drive is required to operate near zero speed, the Model 234 Precision Amplifier should be used.

15. Increasing the "Lag" adjustment will make the drive sluggish. Decreasing it will allow the drive to overshoot or even operate in an unstable mode (hunting).

16. Several drives may be connected to the output of the Timed Reference circuit, terminal 10, in a common-reference configuration provided their control circuits are properly isolated from the power circuits (in which case Armature Voltage Feedback may be used although Tachometer Feedback is recommended for optimum tracking). The number of drives will depend on the reference current required and is limited only by the maximum 5mA output (4mA when the Summing Amplifier "Reference Input" is connected from terminal 9).

17. The "Accel Signal" at terminal 12 is clamped at minus or plus 6 volts when the drive is Accelerating or Decelerating and may be used to indicate a "changing conditions" for applications requiring this feature.

18. When used with the Field Reversing Regenerative Drive, a DC tachometer generator must be used, and no jumper is used on terminals 5TB (P-Q) and 3TB (J-K-L).

19. If Dancer Trim is required on a Tachometer Feedback Drive the output of the Model 204 Dancer Position Regulator (terminal 4) may be connected to terminal 7 instead of armature current. The "IR COMP" potentiometer will then adjust the amount of trim desired.

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Adjustments for Lead and Lag
(12M03-00111 or 12M03-00121)

1. Put an analog meter or oscilloscope on the output of the speed regulator (5 & 18 or 5 & 8)

2. Set: Lag 50%
   Lag Break 100% (CW)
   Lead 0% (CCW)
   Lead Break %0 (CCW)

3. With drive running:

   a. Turn Lag CCW until the output of the speed regulator begins fluctuating rapidly.

   b. Turn Lag Break CCW until fluctuations stop.

   c. Turn Lead CW to stabilize drive and eliminate overshoot during acceleration.

   d. Output of the speed regulator should show less than two volts peak to peak ripple.

   e. If tach is extremely noisy, it may be necessary to turn Lead Break CW--but usually not more than 5%. It may then be necessary to turn Lead CW to stabilize the drive.

4. For critical applications, try adjusting each of the four pots over their full range and observe performance until performance is maximized.

FILENAME: LEAD.LAG