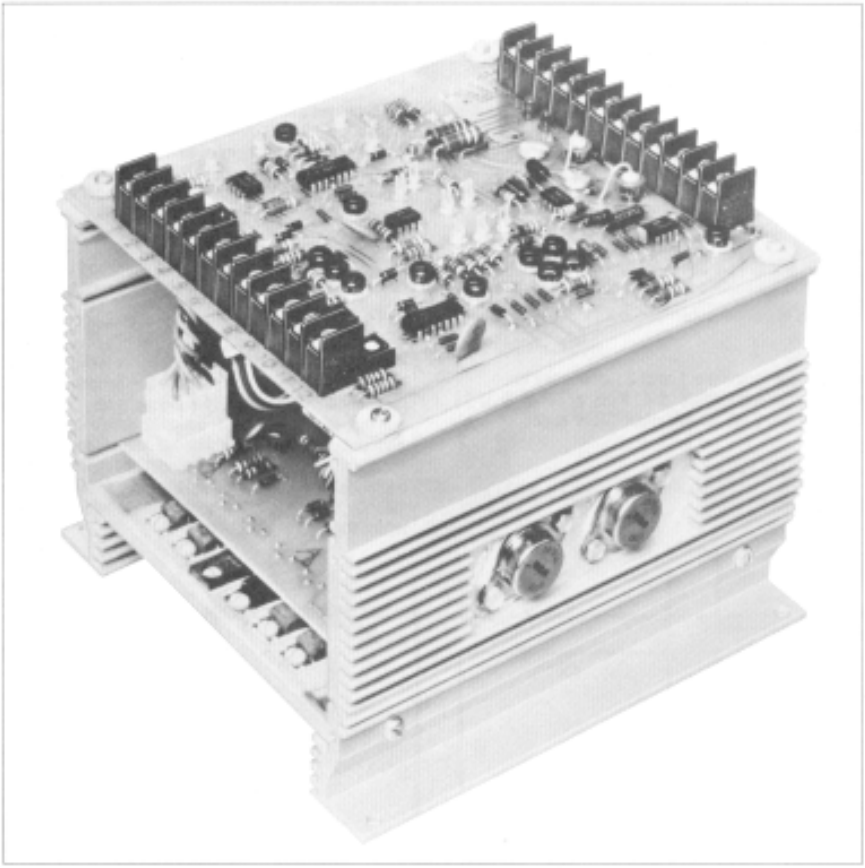
Jordan Controls, Inc.

IM-0500

AD-7500 Series

Instruction Manual

SERVO AMPLIFIER



Due to wide variations in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

Jordan CONTROLS

GENERAL DESCRIPTION

The AD-7500 series is a linear dc drive primarily used for running 24 V dc fractional horsepower motors. The field of the motors can be either 24 V or permanent magnet. Features include a null indicator (lamp, relay, solenoid, etc.) and a motor speed clamp circuit. Limit switch circuitry is included, where if a connection is broken between two terminals of the 7500, the motor will cease to run in one direction.

The unit is powered by a 44 V ac, 60 Hz source with a center tap. This is an external transformer. Also available are ±15 V dc regulated power supplies for potentiometers, lights, relays, etc. Armature feedback is obtained by jumpering two pairs of terminals and tachometer feedback is accomplished by connecting the tach to two terminals. A 2K, 1 turn cermet potentiometer is a standard trim potentiometer in each unit. It is connected internally to +15 V dc.

SPECIFICATIONS

INPUT RESISTANCE

Between terminals 1 and 6 with terminal 2 connected to terminal 6:
30K ohm ±1%
Between terminals 2 and 6 with terminal 1 connected to terminal 6:
130 K ohm ±1%
Between terminals 1 and 2:
60 K ohm ±1%

NULL OUTPUT

Voltage at terminal 3 at null:
15 V dc at 10 K ohm.
Voltage at terminal 3 away from null:
.25 V, sink up to 100mA
Voltage across load when load is between terminals 4 (+), 3 (-) away from null:
+15 V dc
Differential input voltage between terminals 1 and 2 necessary to energize load connected to terminals 3 and 4:
Null Potentiometer: 200 mV full CW, 10 mV near CCW end

15 VOLT POWER SUPPLIES

Maximum current terminals 4 and 5:
200 mA

LIMIT SWITCHES

Open terminals voltage:
Terminal 7: +10 V dc
Terminal 8: -10 V dc
Current when shorted to common:
Terminal 7: 10 mA dc
Terminal 8: 10 mA dc

FEEDBACK RESISTANCE FOR ARMATURE AND TACHOMETER

Terminal 14:
30.1 K, ±1%
Terminal 16:
30.1K, ±1%

INPUT POWER

Between terminals 17 and 18 with terminal 19 the center tap:
44 V ac Rms Input Power
(Note: Field voltage and maximum armature voltage vary directly with this voltage.):
±10% at 180 VA for model 7530; at 360 VA for model 7540

SPEED CLAMP

The speed clamp adjust potentiometer is included in the top PC board. If an external potentiometer is desired, connect to terminals 9, 10, and 11, and cut jumper nearest to terminal 10.

Voltage necessary at terminal 10 to obtain ±24 V dc armature voltage:
8 V dc
Symmetry of clamping over 100: 1 speed range:
±2% of full speed (24 V) or ±10% of reading which ever is better
Maximum speed clamp voltage with 1K speed potentiometer terminals 17 and 18:
28 V

HEAT DISSIPATION

Heat dissipation in the amplifier is power times time or watt-seconds. The hot spots are the junctions of the power transistors. The worse case heating condition of the amplifier is when the output is shorted and the input is saturated. In this case the junction (case and heat sink) rises in temperature when at the same time the current level reduces. The current levels off to 1 amp (2 amp on model 7540). The amplifier dissipates approximately 30 watts and the extrusion temperature reaches about 30° C above ambient or a maximum of 85° C. The junction temperature of the power transistor levels off to a temperature under 100°C. This operation saves the amplifier and motor from burning up when the motor is stalled.

INSTALLATION

MOUNTING

The amplifier mounting dimensions are completely defined on Jordan prints #96-C-014463 for model AD-7530, and #96-C-014464 for model AD-7540.

Transformer mounting for model AD-7530 is shown in Jordan print #70-C-014570. Transformer mounting for model AD-7540 is shown in Jordan print #68-C-010365.

START-UP AND CALIBRATION

If the AD-7500 is to be used with a Jordan actuator, the wiring between amplifier and actuator will be completely described on a print labeled "Installation Wiring".

It is not necessary to follow the steps below in such a case unless more familiarity is desired about how the amplifier works in the system.

It is assumed that the amplifier is to be used in a positional loop where there is a feedback signal indicative of position. This signal is generally a 1K ohm feedback potentiometer but could also be a current or a voltage.

Begin with all terminals vacant and power "off". Refer to Jordan print #95-B-018052 (General Installation Wiring) or to the specific "Installation Wiring" applicable to the system.

A. Connect the command signal to terminal 1. This voltage must not be less than -15 V or greater than +15 V with respect to common. Common is terminal 6 or 11.

If the command is a potentiometer (should be 1K), the voltage across it must be equal to or less than the feedback voltage. See Figure 2 on the back page for various biasing configurations for potentiometers.

Trim resistors can be used between either end of the potentiometer and the amplifier to lower the voltages as shown in Figure 2.

If the command is a current source, shunt the current source with a resistor in order to get a voltage. Examples are shown in Figure 3 on the back page. Again, the selection of the voltage range of the command must match the feedback voltage. Lowering resistor values of those shown in Figure 3 will lower voltage range.

If the command is already a voltage, it can be connected directly to terminal 1 unless the magnitude is larger than 10 V. The maximum is ±15 V and a safety of 5 V is used for turn-on/turn-off transients. If the command voltage is larger than ±10 V, attenuate it with a resistor divider. Select the parallel combination of these resistors to be less than 3000 ohms. Use metal film or wirewound resistors.

B. Connect the feedback signal to terminal 2. This voltage must not be less than -15 V or greater than +15 V with respect to common. Common is terminal 6 or 11.

If the feedback is a potentiometer (should be 1K), the voltage across it must be equal to or greater than the command voltage. The amount of feedback potentiometer to be used in % should be known at this point. The feedback potentiometer voltage should be increased as the % usage decreases. In fact, the feedback voltage should be calculated by dividing the command voltage by the % of feedback potentiometer to be used, and then multiplied by 100.

For example: Suppose the command voltage was 0 V to 10 V and the % of feedback potentiometer to be used was 75%. Then the feedback voltage should be:

$$(10\ V)\ (100)\ /\ (75) = 1000V\ /\ 75 - 13.3\ V$$

The command voltage can be reduced to increase the % of the feedback potentiometer not used.

If the feedback signal is a current, use the resistor shunt to change the current to a voltage as shown in Figure 3. If the feedback signal is a voltage, connect it directly to terminal 2 if the magnitude is less than 10 V. If the magnitude is greater than 10 V, divide the signal with a resistor divider and make the parallel combination of these two resistors less than 3000 ohms. Use metal film or wirewound resistors.

NOTE: As the command voltage is increased at terminal 1, the feedback voltage should follow at terminal 2. This denotes polarity linkage of the feedback device.

C. Connect the armature of the 24 V dc motor to terminals 22 and 21. An increase in command voltage at terminal 1 will cause an armature polarity of 22 (+), 21 (-).

D. Connect the field (if applicable) to terminals 20 (+), 19 (-).

E. Connect the 44 ac, 60 Hz, CT transformer to terminals 17, 18, and 19 where terminal 19 is the CT (center tap).

F. If there is a tachometer feedback, connect the tachometer to terminals 14 and 16. The polarity should be determined by the following:

Assume the command is increased, then terminal 22 is (+) and 21 is (-), and the polarity of the armature voltage of the motor is established. In some manner, the tachometer is connected to the shaft of the motor and the direction of the tachometer can be determined. Then the polarity of the signal from the tachometer is known. Connect the tachometer such that terminal 14 is (+) and terminal 16 is (-) with above assumption.

If there is no tachometer, the armature is usually fedback. This is done inside the amplifier. Jumper terminal 13 and 14 and terminal 15 and 16.

G. Limit switch circuitry is standard on all 7500s. If the system in which the AD-7500 is to be used has no limit switches, jumper terminal 6 to 7 and jumper terminal 6 to 8. If there are limit switches, they must be normally closed contacts. Connect the limit switches to terminals 6 and 7, and to terminals 6 and 8. Vacating terminal 7 will inhibit the motor terminals of the amplifier from going 22 (+), 21 (-). Vacating terminals 7 and 8 will inhibit motor current in both directions.

H. If the unit has a **SPEED CLAMP**, connect a 1K potentiometer to terminals 9, 10, and 11, where terminal 10 is the wiper of the potentiometer. Increasing resistance between terminals 10 and 11 increases motor speed.

I. If the unit has the **NULL OUTPUT** option, connect the load to terminals 4 (+), 3 (-). The load should be rated at 15 V dc and less than 100 mA dc. The loads are usually light bulbs or relays. The null output (terminal 3) will show +12 V to common at null. The load will be de-energized at null.

J. If the unit has a blower on it, connect terminals 23 and 24 to 120 V ac, 60 Hz. This voltage will drive the blower only.

K. Terminals 4 and 5 are +15 V dc and -15 V dc with respect to common (terminals 6 and 11). The total current used from these regulated supplies must be less than 200 mA.

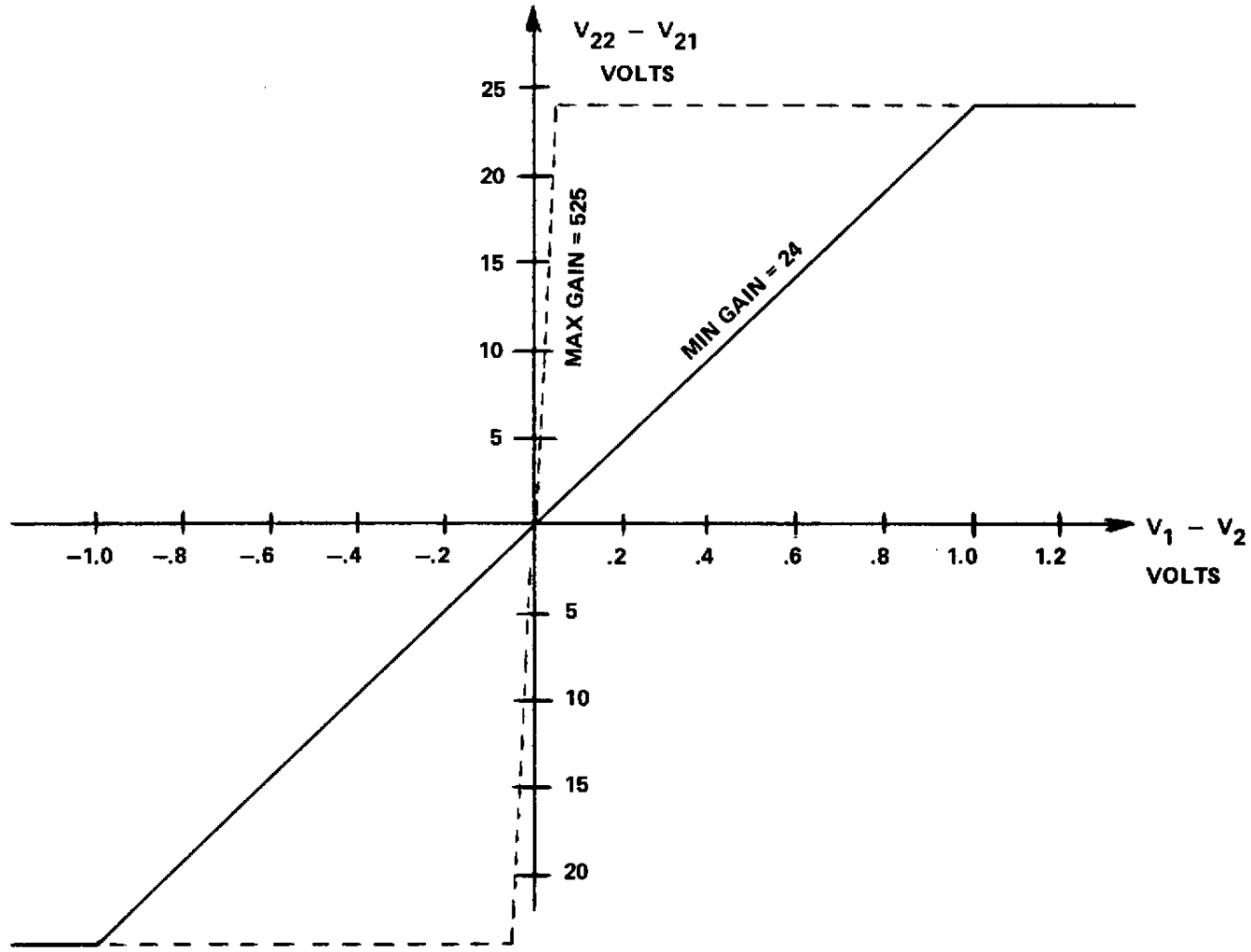
ASSOCIATED PRINTS

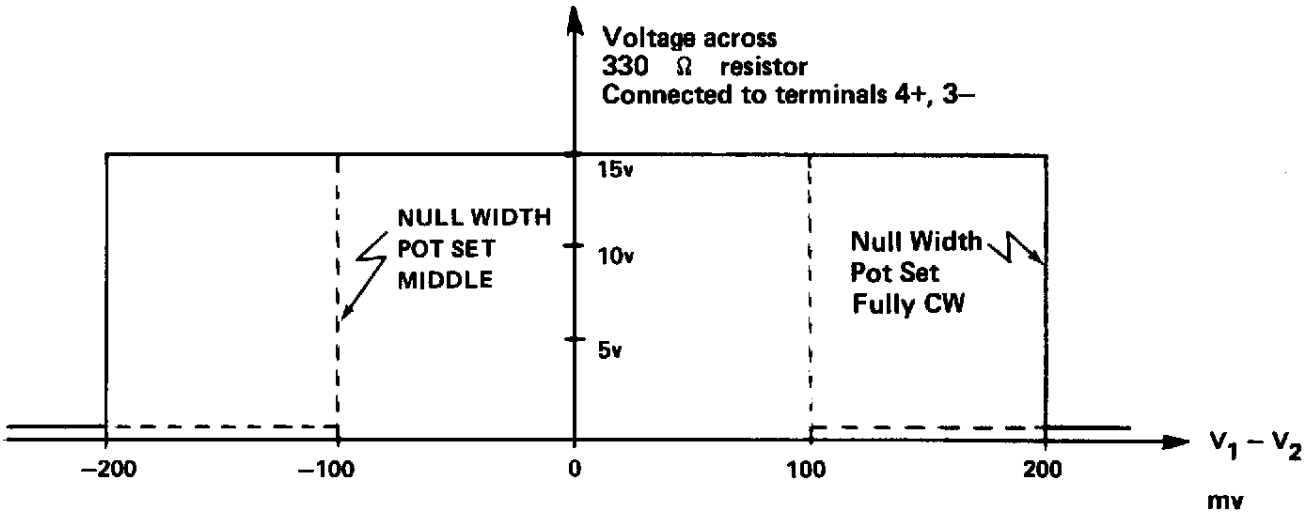
(to be included with each IM)
Installation: AD-7530 (96-C-014463), AD-7540 (96-C-014464)
Installation Wiring (general): AD-7500 (95-B-018052) on request only.
Installation Transformer: AD-7530 (70-C-014570)
Installation Transformer: AD-7540 (68-C-010365)

Issue Change Date
A Initial Release 8-19-76
B ECR 5934 6-14-78

FIGURE I:

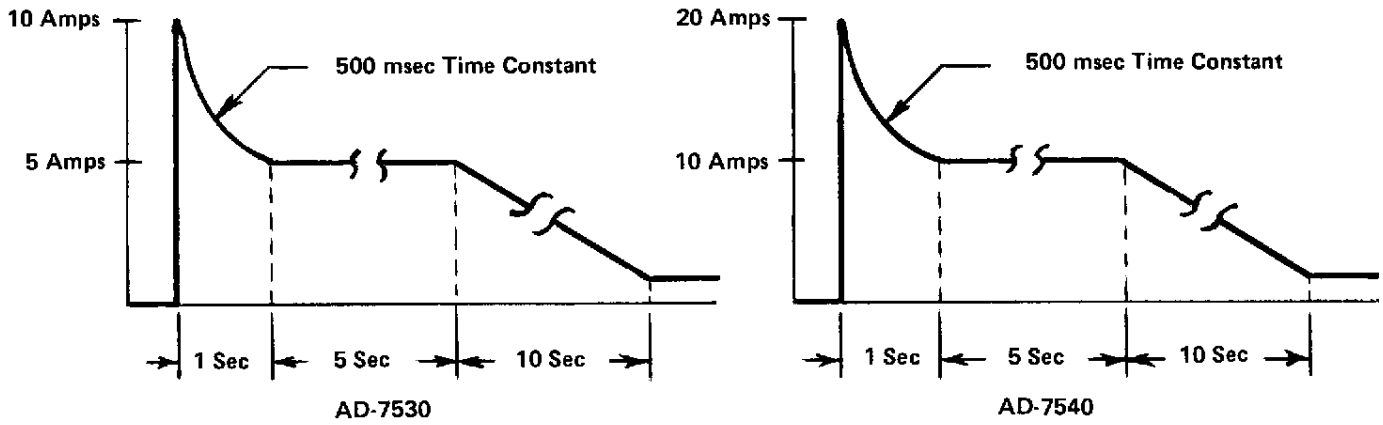
TRANSFER CHARACTERISTICS





CURRENT LIMITING

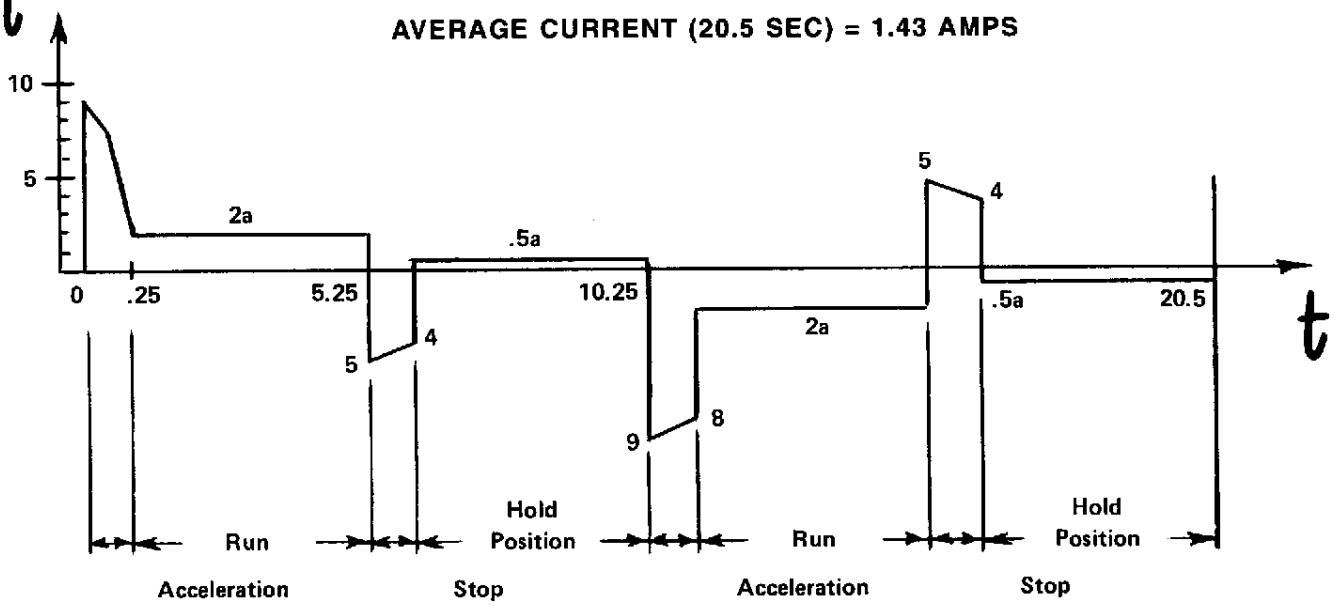
Timing diagram shows current through terminals 22 and 21 when jumpered as input is driven by unit step.



OPERATION

The current limiting is accomplished by IT sensing. I is current and T is time. If the current is over 2 amps (4 amps for model 7540) a capacitor is charged. The capacitor charges at a rate proportional to current level. After 30 amp-seconds (60 amp seconds for 7540) the current limiting level is reduced again in proportion to current level. The current levels off to 1 amp (2 amps for model 7540) after approximately 100 amp-seconds (200 amp seconds for model 7540). See diagram above.

Example: A current profile for a typical medium performance servo system is shown below.



The average current is under 2 amps so a 5 amp (10 for model 7540) surge is available for acceleration and decelerating and the operation is safe.

INPUT OFFSET VOLTAGE

The difference in voltage between terminals 1 and 2, with one of the two tied to common, necessary to get 0 volts between terminals 22 and 21; with no speed clamp at worst gain setting. $0^\circ C \leq T_a \leq 55^\circ C$

12 mV maximum

(NOTE: Provisions are available to adjust this voltage to 0 on special order.) $T_a = 25^\circ C$

3 mV typical

FIGURE 2:

VARIOUS POTENTIOMETER BIASING CONFIGURATIONS

ALL POTENTIOMETERS 1000 OHM, 5%

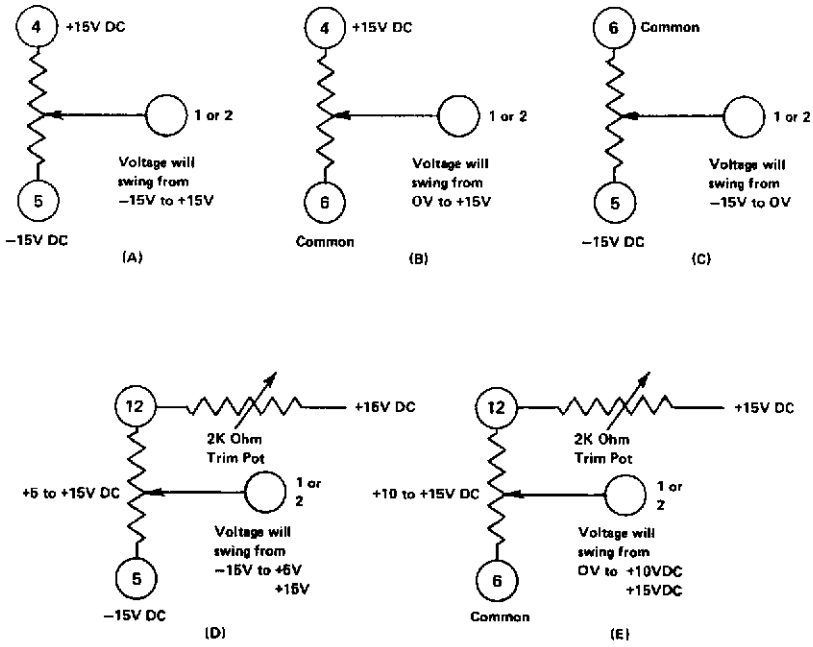
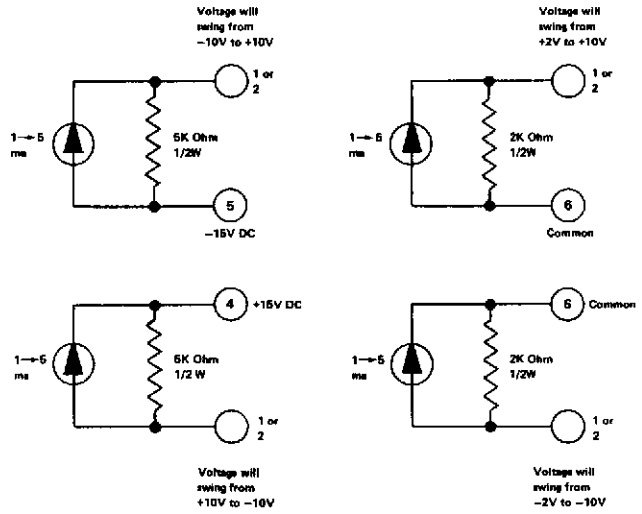


FIGURE 3:

CURRENT SOURCE SHUNT CONFIGURATIONS

NOTES:
1. All resistors metal film or wirewound
2. 4 to 20 mA sources: Divide resistor values by 4, use 1W resistors
3. 10 to 50 mA sources: Divide resistor values by 10, use 2W resistors



Jordan Controls, Inc.

5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Phone: (414) 461-9200
FAX: (414) 461-1024