MODEL 5100 POSITION CONTROLLER
CALIBRATION INSTRUCTIONS

I. INSTRUMENT LIST

1. ELECTRONIC MULTIMETER
2. D.C. SIGNAL GENERATOR, 4-20 mAdc., 0-10 Vdc.
3. SCREWDRIVER SET

II. PRELIMINARY CHECKS

1. Verify the electrical power source meets the proper requirements.
2. Verify that the limit switches in the actuator are set properly.
3. Check applicable wiring diagram to determine which limit switch RETRACT (standard) or EXTEND will be tripped at the MINIMUM command signal.
4. Verify that the "OUT 2" wire is connected to the MINIMUM command signal limit switch and the "OUT 1" wire is connected to the MAXIMUM command signal limit switch (fig. 4).
5. Verify that the actuator feedback potentiometer wires are properly connected (fig. 3). Check for 20 Ohms of resistance between R1(standard) or R2 (see the specific application) and R3 at the MINIMUM command signal limit switch.
6. Verify the low voltage signal wires are separated from the a.c. power wires.
7. Analog signal wires shield must be connected to the signal source ground.

NOTES:

A. The limit switches and feedback potentiometer are factory set and should only be adjusted if necessary!

B. Complete chapter III if any factory settings are changed.

C. Notice that the techniques used in this instruction manual may be followed by using one of the two methods:

1. Consecutive Method - This method requires the user to begin with chapter III or IV and to proceed thru chapter VIII in a consecutive manner. One should take into account that several of the techniques used in each chapter will be repeated in the following chapters.
2. Random Method - This method allows the user to begin with any chapter, with the consideration that all the parameters for the previous chapters are correct.

III. SETTING THE ACTUATOR FEEDBACK POTENTIOMETER

1. Turn the power off. Loosen the retaining nut on the actuator feedback potentiometer mounting bracket until the potentiometer can be freely rotated to the desired position (fig. 1a).

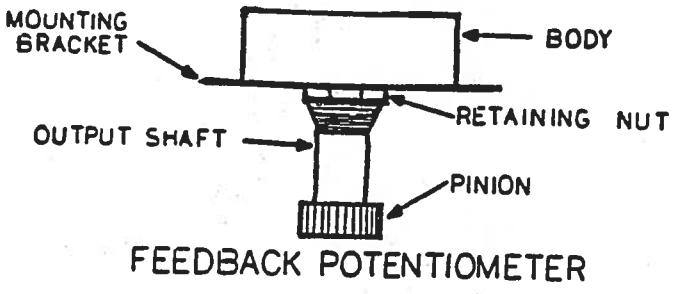

Fig.1a

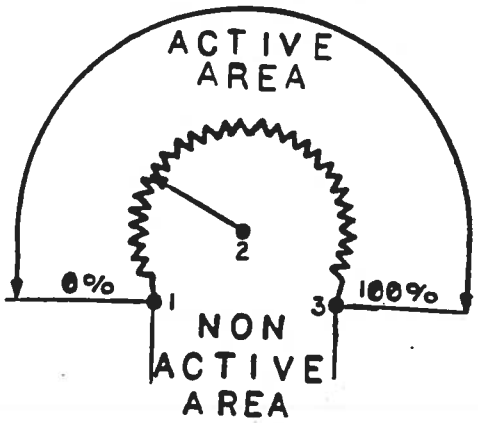

Fig.1b

2. Manually run the actuator, bypassing the Model 5100 controller; run the actuator in the direction of the MINIMUM command signal limit switch (see II-3), taking notice of the direction of the feedback potentiometer's output shaft rotation(fig. 1a).
To electrically run the actuator, bypassing the Model 5100 controller, first make sure the power is off; disconnect the "L1", "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). Connect the wires according to the schematic diagram (fig. 2). Turn the power on and run the actuator until it is stopped by the MINIMUM command signal limit switch. See ch. II-3.

3. Turn off the power. Disconnect the feedback potentiometer wires on TB1-9 (R1) and TB1-10 (R3) of the Model 5100 command board (fig. 3). Set the multimeter to measure 1000 Ohms. Connect the multimeter leads to the wires from TB1-9 (R1) and TB1-10 (R3).

   A. If the feedback potentiometer output shaft pinion rotated clockwise while the actuator was moving to the MINIMUM command signal limit switch (see II-3), adjust the feedback potentiometer resistive output to approximately 20 Ohms, by turning the body of the feedback potentiometer counterclockwise. Tighten the retaining nut to secure the feedback potentiometer (fig. 1a).

   B. If the feedback potentiometer output shaft pinion rotated counterclockwise while the actuator was moving to the MINIMUM command signal limit switch (see II-3), adjust the feedback potentiometer resistive output to approximately 20 Ohms, by turning the body of the feedback potentiometer clockwise. Tighten the retaining nut to secure the feedback potentiometer (fig. 1a).

4. Temporarily leave the voltmeter leads connected to the feedback potentiometer. Turn on the power. Run the actuator in the direction of the MAXIMUM command signal limit switch. Notice on the meter the potentiometer resistance should increment gradually from 20 Ohms to the maximum value of the potentiometer (1000 Ohms). If the resistance reading exceeds the maximum value and enters into the the non active area of the potentiometer before the MAXIMUM command signal limit switch stops the actuator (fig. 1b), the MAXIMUM command signal limit switch will have to be reset.

5. Run the actuator until it stops at the MINIMUM command signal limit switch. See II-3. Verify that the actuator feedback potentiometer and limit switches are set correctly. Turn the power off.

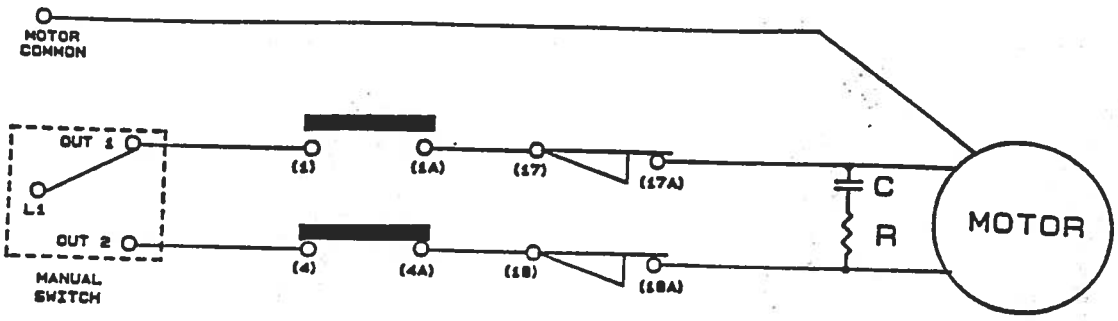

Fig.2

6. Connect the "L1", "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). See II-4. Connect the feedback potentiometer wires from terminal TB1-9 (R1) and TB1-10 (R3) of the Model 5100 command board (fig. 3). Turn the power on.

IV. POWER SUPPLY TEST

1. Turn the power off. Disconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). Do not touch the wires to any metallic parts. Turn the power on.

2. Set the multimeter to measure the specified voltage.

3. Locate connector J2 on the the Model 5100 command board (fig.3); J2 is a 19 pin connector used for test points. With terminal TB1-3 as common, check for:

   a. +15 ± 0.6 Vdc at test point 19.
   b. -15 ± 0.6 Vdc at test point 17.
   The correct voltages must be present to assure proper operation!

4. Turn the power off. Reconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). See II-4. Turn the power on.

V. INITIAL SETTINGS

1. Turn the power off.

2. Verify that the actuator feedback potentiometer is properly connected to terminal block TB1 of the command board (fig. 3). See II-5.

3. Disconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the driver board (fig. 4). Be very careful not to touch the wires to any metallic parts and turn the power on.

4. Configuration Jumpers

   Check for the proper selection of the mode jumpers at location "SW" (fig. 3). Please note, the standard locations are 1 & 7 for 4-20 mAdc command signal and the fail in place option.

   A. Command Input Jumpers (1 & 2)

      1. 4-20 mAdc
      2. 1-5 Vdc

B. Loss of Command Signal Jumpers (4,5,6 & 7)

4. Fail to the MAX signal position "OUT 1"
5. Fail to the MIN signal position "OUT 2"
6. Fail to the COMMAND potentiometer position
7. Fail in PLACE

5. Dead Band Potentiometer Setting

Locate connector J2 on the Model 5100 command board legend diagram (fig.3); J2 is a 19 pin connector used for test points. With TB1-3 as common, adjust the Dead Band potentiometer (R63) until the voltage at test point 12 remains constant between 20 and 110 mVdc.

6. Maximum Starts Potentiometer

With TB1-3 as common, verify that the voltage at test point 10 is - 5 ± 0.5 Vdc. Please note, the maximum starts potentiometer (R62) is factory set and sealed, and should only be adjusted if necessary.

7. Feedback ZERO Potentiometer Setting

With TB1-3 as common, adjust the ZERO potentiometer (R79) until the voltage at TB1-9 is approximately - 1Vdc.

MODEL 5100 COMMAND BOARD

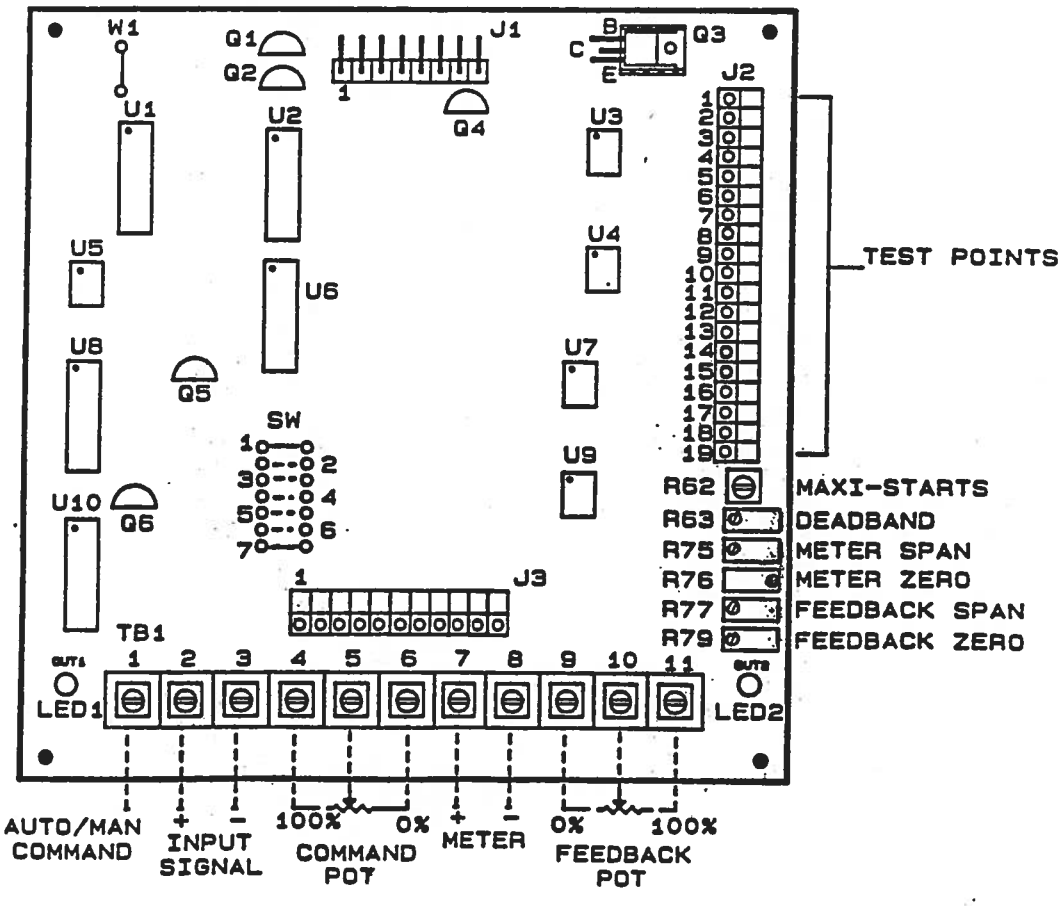

Fig.3

8. Feedback SPAN Potentiometer Setting

With TB1-3 as common, adjust the SPAN potentiometer (R77) until the voltage at TB1-11 is approximately - 5 Vdc .

9. Turn the power off. Reconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). See II-4. Turn the power on.

VI. CALIBRATION

1. Check all the parameters for sections II, III, IV and V before attempting to calibrate. Turn the power on.

2. SPAN Adjustment

Apply 20 mAdc input signal. The actuator shall run until the MAXIMUM command signal limit switch is tripped, stopping the actuator. If the actuator stops before the limit switch trips, electrically or manually or run the actuator bypassing the Model 5100 controller until the MAXIMUM command signal limit switch is tripped. See III-2. Turn the power off and disconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4); do not touch the wires to any metallic parts. Turn the power on.

A. If LED 1 is on, turn the SPAN potentiometer (R77) counterclockwise until the LED 1 turns off.

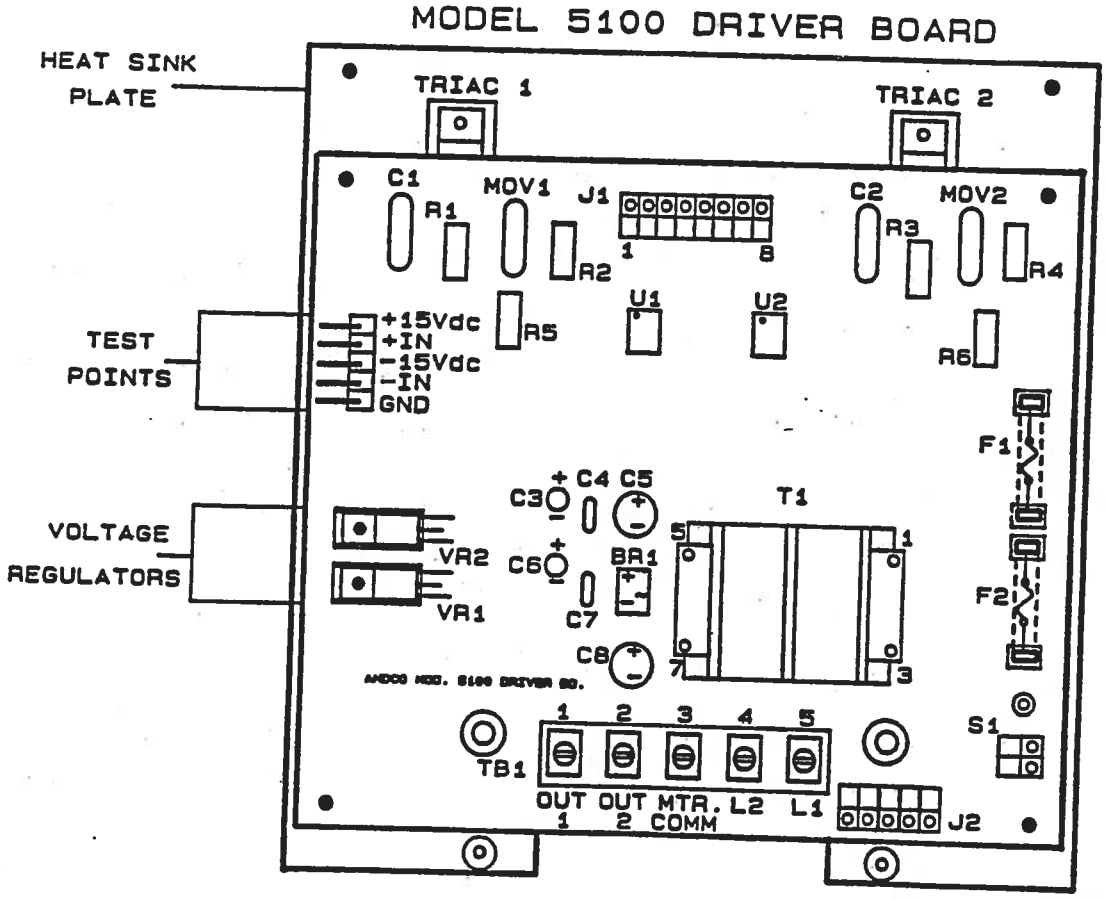

Fig.4

B. If LED 1 is off, turn the SPAN potentiometer clockwise until the LED 1 turns on, then clockwise until the LED 1 turns off.

3. Turn off the power. Reconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4). See II-4. Turn the power on. Recheck the SPAN adjustment.

4. ZERO Adjustment

Apply 4 mAdc input signal. The actuator shall run until the MINIMUM command signal limit switch is tripped, stopping the actuator. If the actuator stops before the limit switch trips, electrically or manually run the actuator bypassing the Model 5100 until the MINIMUM command signal limit switch is tripped. See III-2. Turn the power off and disconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the Model 5100 driver board (fig. 4); do not touch the wires to any metallic parts. Turn the power on.

A. If LED 2 is on, turn the ZERO potentiometer (R79) counterclockwise until the LED 2 turns off.

B. If LED 2 is off, turn the ZERO potentiometer clockwise until the LED 2 turns on, then clockwiseuntil the LED 2 turns off.

5. Turn off the power. Reconnect the "OUT 1" and "OUT 2" wires on terminal block TB1 of the driver board (fig. 4). See II-4. Turn the power on. Recheck the ZERO adjustment.

6. Dead Band Potentiometer Adjustment

Apply 12 mAdc input signal. The actuator shall run until the controller stops it at the middle position. If the actuator is overshooting, turn the DEAD BAND potentiometer clockwise in small steps until the actuator stops at the "NULL" point(see V-5,increase the voltage on test point 12); both LEDs should be off.

7. Meter Output Adjustment

Turn the power off. Set the multimeter to measure 20 mAdc. Disconnect the wires on terminals TB1-7 (+) and TB1-8 (-) of the Model 5100 command board (fig. 3). Connect the multimeter's positive lead to TB1-7 (+) and the negative lead to TB1-8 (-). Turn the power on.

A. Meter ZERO Adjustment

Apply 4 mAdc input signal. The actuator shall run until the MINIMUM command signal limit switch is tripped, stopping the actuator. Adjust the meter ZERO potentiometer (R76) until the meter displays 4.0 mAdc (STANDARD) or 0.0 mAdc (OPTIONAL).

B. Meter SPAN Adjustment

Apply 20 mAdc input signal. The actuator shall run until the MAXIMUM command signal limit switch is tripped, stopping the actuator. Adjust the meter SPAN potentiometer (R75) until the meter displays 20.0 mAdc (STANDARD) or 1 mAdc (OPTIONAL).

8. Turn the power off. Disconnect the multimeter leads on TB1-7 and TB1-8. Reconnect the meter wires on TB1-7 and TB1-8 (fig. 3). Turn the power on and check the meter calibration.

NOTE: There is a small amount of interaction between the meter ZERO and meter SPAN potentiometer's. Several adjustments will be required to properly calibrate the meter output .

9. Dynamic Braking Circuit Check

Check the dynamic braking circuit by observing both LEDs as the actuator stops at the "NULL" position. Both LEDs should flash momentarily as the actuator stops at the "NULL" position; if they do not flash, then the braking circuit is malfunctioning.

VII. 5100 CONTROLLER OPERATION CHECKOUT

1. Manual Operation

Check manual operation of the Model 5100 Remote Controller by setting the mode switch, located on the front panel, to the MANUAL mode and adjusting the command potentiometer, also on the front panel, from the 0 to 100% position.

Check manual operation of the model 5100 Integral Controller by connecting a SPDT switch or a jumper to command board terminals 1 and 2 (fig. 3). Also install a 1000 Ohms command potentiometer on command board terminals 4 (100%), 5 (wiper) and 6 (0%). Please note when contact is made between terminals 1 and 3, the command signal input is disabled and the command potentiometer takes the control.

A. Set the command potentiometer to the 100% position; the actuator shall move to the MAXIMUM command signal limit switch. The limit switch must trip just as LED 1 turns off.

B. Set the command potentiometer to the 0% position; the actuator shall move to the MINIMUM command signal limit switch. The limit switch must trip just as LED 2 turns off.

C. Slowly adjust the command potentiometer in small increments until the 100% position is reached; the actuator must move proportionately, and a NULL (both LEDs off) must be attained at each position.

D. Slowly adjust the command potentiometer in small decrements until the 0% position is reached; the actuator must move proportionately, and a NULL (both LEDs off) must be attained at each position.

2. Auto Operation

Check auto operation of the Model 5100 Remote controller by setting the mode switch, located on the front panel, to the AUTO mode and applying a 4-20 mAdc input signal to command board terminals 2 (+) and 3 (-) (fig. 3). Use a multimeter to monitor the input signal.

Check Auto operation of the Model 5100 Integral controller by applying a 4-20 mAdc to command board terminals 2 (+) and 3 (-) (fig. 3). A multimeter must be used to monitor the input signal. Please note, for AUTO operation, no contact is made between terminals 1 and 3.

A. Apply a 20 mAdc input signal; the actuator shall move to the MAXIMUM command signal limit switch. The limit switch must trip just as LED 1 turns off.

B. Apply a 4 mAdc input signal; the actuator shall move to the MINIMUM command signal limit switch. The limit switch must trip just as LED 2 turns off.

C. Slowly adjust the input signal in small increments until the 20 mAdc position is reached; the actuator must move proportionately, and a NULL (both LEDs off) must be attained at each position.

D. Slowly adjust the input signal in small decrements until the 4 mAdc position is reached; the actuator must move proportionately, and a NULL (both LEDs off) must be attained at each position.

Meter Output Check

1. Check the Meter output of the Model 5100 Remote controller by observing the indicator meter, located on the front panel, as the actuator is positioned from the 0 to 100% position.

   A. Apply a 4 mAdc input signal. A properly calibrated meter will move to the 0% position, when the actuator is stopped by the MINIMUM command signal limit switch.

   B. Apply a 20 mAdc input signal. A properly calibrated meter will move to the 100% position, when the actuator is stopped by the MAXIMUM command signal limit switch.

   C. Apply a 12 mAdc input signal. A properly calibrated meter will stop at the 50% position, when the actuator stops at the NULL (both LEDs off) position.

2. Check the Meter output of the Model 5100 Integral Controller by connecting an electronic multimeter to command board terminals 7 and 8 (fig. 3). Set the multimeter to measure 20 mAdc. Connect the mutimeter's positive lead to terminal 7 and the negative lead to terminal 8 (fig. 3). Please note, for AUTO operation, no contact is made between terminals 1 and 3.

   A. Apply 4 mAdc input signal. The actuator shall run until the MINIMUM command signal limit switch is tripped, stopping the actuator. A properly calibrated meter output will display 4 mAdc (STANDARD) or 0.0 mAdc (OPTIONAL) on the multimeter.

   B. Apply 20 mAdc input signal. The actuator shall run until the MAXIMUM command signal limit switch is tripped, stopping the actuator. A properly calibrated meter output will display 20 mAdc (STANDARD) or 1.0 mAdc (OPTIONAL) on the multimeter.