UNITED TECHNOLOGIES CARRIER

Commercial Division
Carrier Corporation

BULLETIN: CA-SB-17-70-18
DATE: 12/18/70
PAGE: 1 OF: 8

SERVICE BULLETIN

SUPERSEDE BULLETIN:
DATE:
PAGE: OF:

SUBJECT: BOMAC MOTOR LOAD LIMITING CONTROL

PURPOSE

To advise how to properly set and adjust the Bomac Motor Load Limiting Control, Model 2944.

MACHINES AFFECTED

17 series centrifugals using an electric motor drive with the subject load limiting control.

BACKGROUND

The procedure outlined in this bulletin explains the control operation and gives the necessary steps needed to adjust and calibrate the Bomac control components.

There have been two types of these Bomac controls produced. The early type is shown on Figure 2. The later type (Figure 1) is very similar except it was improved by the addition of the low pressure selector relay (Item 5).

The operation is identical for both controls except for the low pressure relay paragraph which explains the newer type control.

PROCEDURE

Operation

The Bomac Load Limit Control (2944) is designed to limit the current draw of the electric motor to its full load amp rating by overriding the air signal from the temperature controller to the suction damper thereby limiting the maximum motor amps to full load.

The control operates as follows: Refer to Figure 1. The current transformer (already existing on the motor starter) must have an output of three to five amps at 100% motor load. The current transformer (1) and potentiometer (2) are used to convert the 0-5 amp AC output signal of this existing transformer to a 0-5 volt AC signal which drives the controller (3). The potentiometer allows field calibration of the ampere output range to the controller from 2.5 to 5 amps.

The electronic controller (3) receives the 0-5 volt AC signal and converts it to DC. The controller output is set at 16 volts DC until the AC input voltage increases to the voltage corresponding to the percent load set point. The output DC voltage then decreases to 0 volts in a proportion to a further increase of input AC voltage.

The controller is factory calibrated such that with the "percent load" knob at 100, a three volt input just begins to decrease the output.

The controller may also be used to limit the electric power demand to below full load by adjusting the "percent load" set point anywhere within its 40 to 100 percent range.

The direct acting electro-pneumatic transducer (4) converts the 16-0 volt DC signal to a proportional 15-3 psig output air signal.

* The low pressure selector relay (5) provides a stable air signal to the suction damper or vane motor by selecting either the air signal from the temperature controller or the air signal from the load limiting controller, whichever is putting out the lower pressure signal.

Calibration

The individual components of the control should be factory calibrated. The entire load limiting control, however, must be field calibrated. Use the following procedure:

1. Set "Band Width" on controller (1) to 3. (Figure 3)

2. Start compressor motor and operate the system as fully loaded as possible.

3. Measure the motor amps at this condition.

4. Calculate the percent load at which the motor is operating:

$$\frac{\text{Measured Amps}}{\text{Motor Nameplate full load amps}} = \%\ \text{load}$$

5. Set "%load" adjustment on controller (1) to the calculated % load at which the motor is operating. (Figure 3)

6. Adjust potentiometer (2) to the point at which the transducer (4) just begins to reduce the pneumatic signal to the valve operator.

* Early models may not have the low pressure selector relay installed in the control. It may be purchased from the Replacement Components Division in Syracuse and added as shown on Figure 1. Order by description.

7. Set "% load" adjustment on controller (3) to 100%. (Figure 3)

The control is now calibrated and set to start limiting the motor load at 100% of rated full load amps.

Should the control not limit the motor amps as desired, further calibration of the individual components will be necessary.

To calibrate the controller (3) use the following steps:

1. Set band width to 3. (Figure 3)

2. Set "% load" dial to 100%. (Figure 3)

3. Turn calibration screw full clockwise. (Figure 3)

4. Start and run machine at 100% full load amps (must be 100%).

5. Turn calibration screw counterclockwise until vanes (or damper) just start to close. (Figure 3)

If hunting occurs increase the band width and repeat steps 4 and 5.

To calibrate the electro-pneumatic transducer (4),use the following steps:

The transducer should be factory calibrated at:

Input	Output
0 VDC	3 psig
16 VDC	15 psig

1. Apply 16 VDC and instrument supply air (18-20 psig) to the transducer.

2. Turn sensitivity screw until output pressure exceeds 16 psig. (Figure 4)

3. Turn set point screw to 15 psig. (Figure 4)

4. Reduce the voltage input to 0 VDC. Output should be 3 ± 1/4 psig. If it is not, turn sensitivity screw part of a turn. (Figure 4)

5. Increase input to 16 VDC and repeat steps 3 and 4 until transducer is calibrated.

The transducer still may not perform as it should. If this is the case, we must narrow the output pressure range to between approximately 6 - 8 psig and 15 psig. In other words, we are controlling the output only at 25% to 100% load operation. In order to do this, use the following calibration procedure:

1. Use steps 1, 2 and 3 under calibration of the transducer.

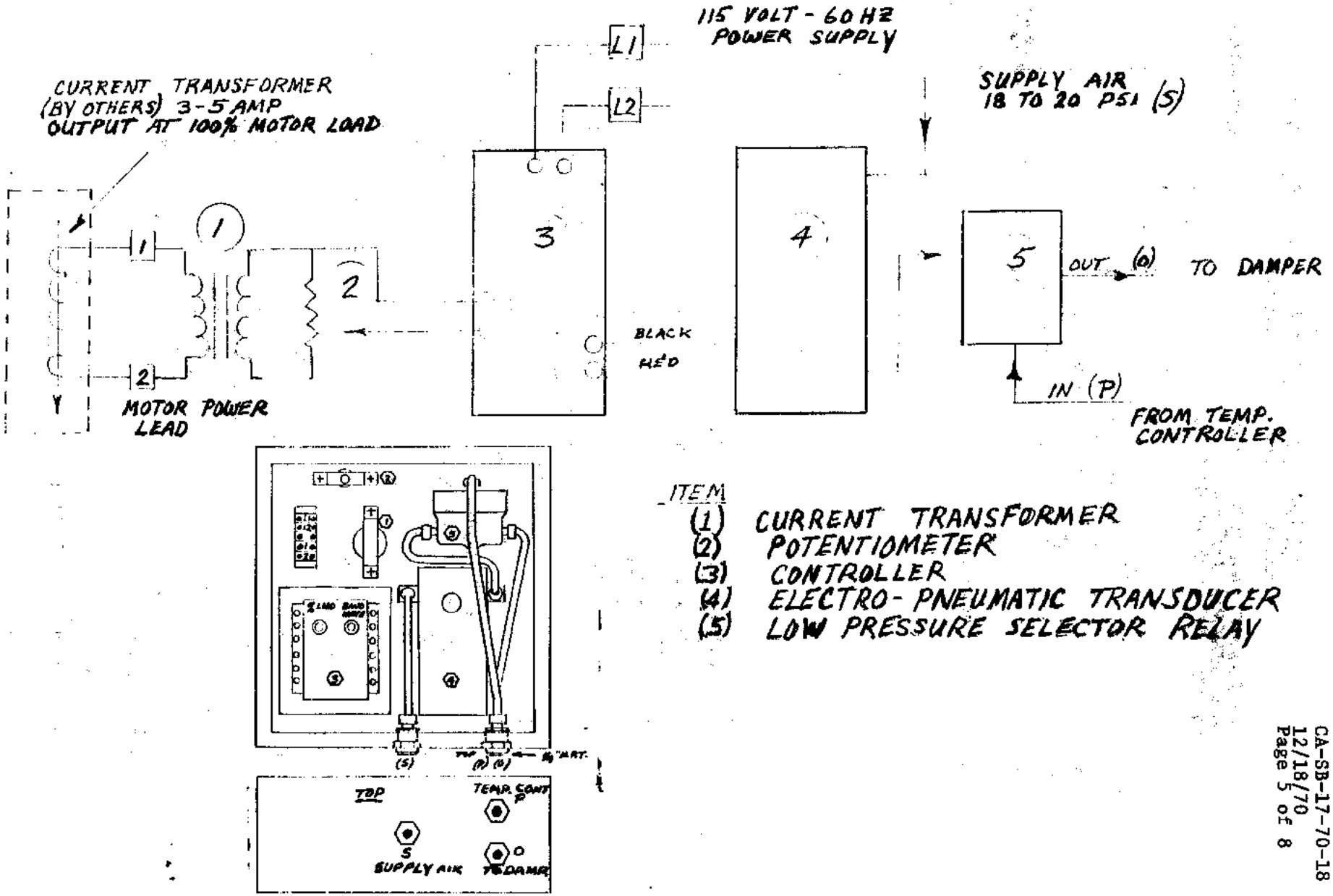
2. Reduce the voltage to 0 VDC. The output should be between 6 and 8 psig. If it is not, turn the sensitivity screw part of a turn.

3. Increase the input to 16 VDC. Output should be 15 psig. Repeat this sequence until the output is 15 psig at 16 VDC and 6 - 8 psig at 0 VDC.

If erratic pressures are noticed in the instrument air line to the damper motor, a restrictor may be added in this line. This consists of a needle valve which can be adjusted until the pressure signal stabilizes.

NOTE: The serial number of the BOMAC control panel must accompany an order for the control.

BOMAC - 2944

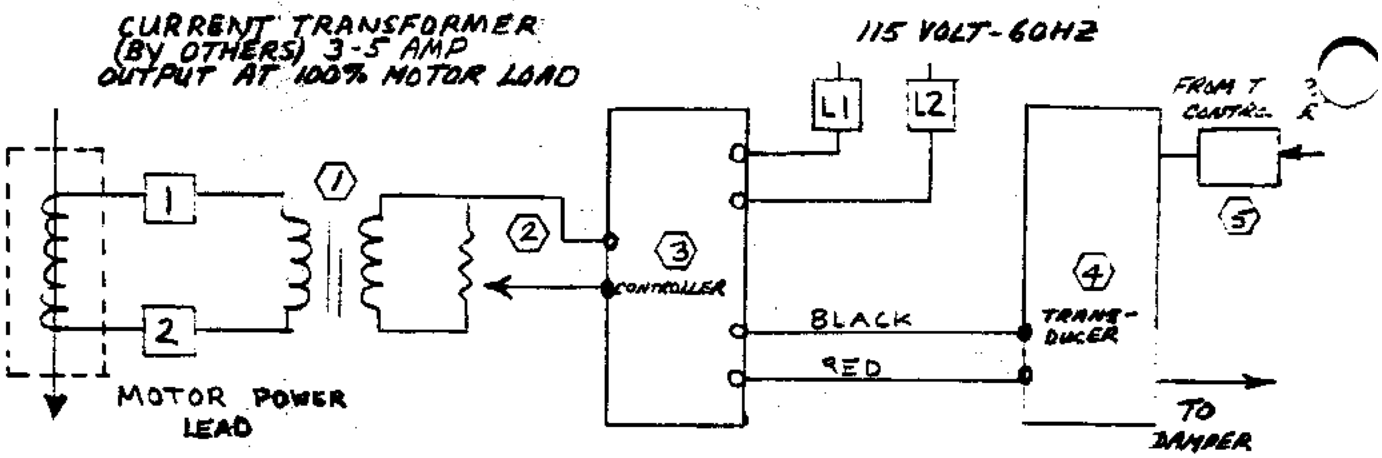


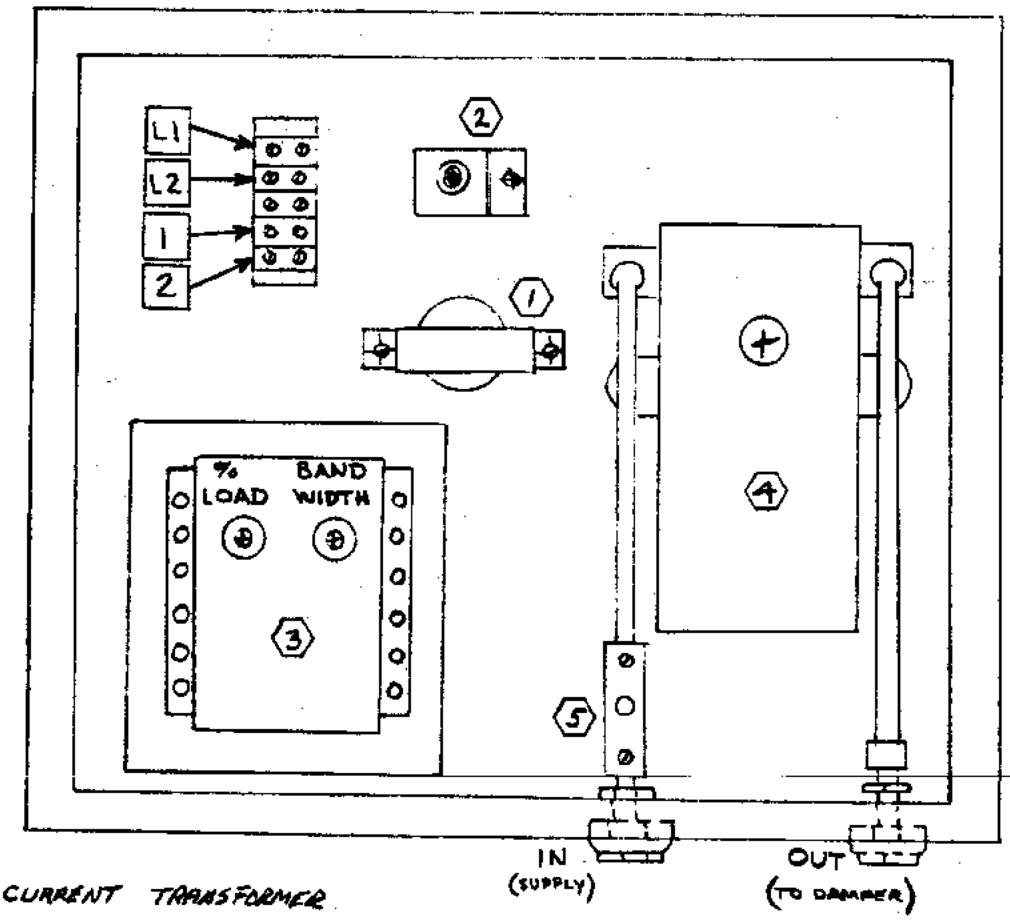
ITEM

(1) CURRENT TRANSFORMER
(2) POTENTIOMETER
(3) CONTROLLER
(4) ELECTRO-PNEUMATIC TRANSDUCER
(5) LOW PRESSURE SELECTOR RELAY

FIGURE 1

BOMAC 2944 (EARLY MODEL)





1. CURRENT TRANSFORMER
2. POTENTIOMETER
3. CONTROLLER
4. ELECTRO-PNEUMATIC TRANSDUCER
5. T-RESTRICTOR

FIGURE 2

CONTROLLER

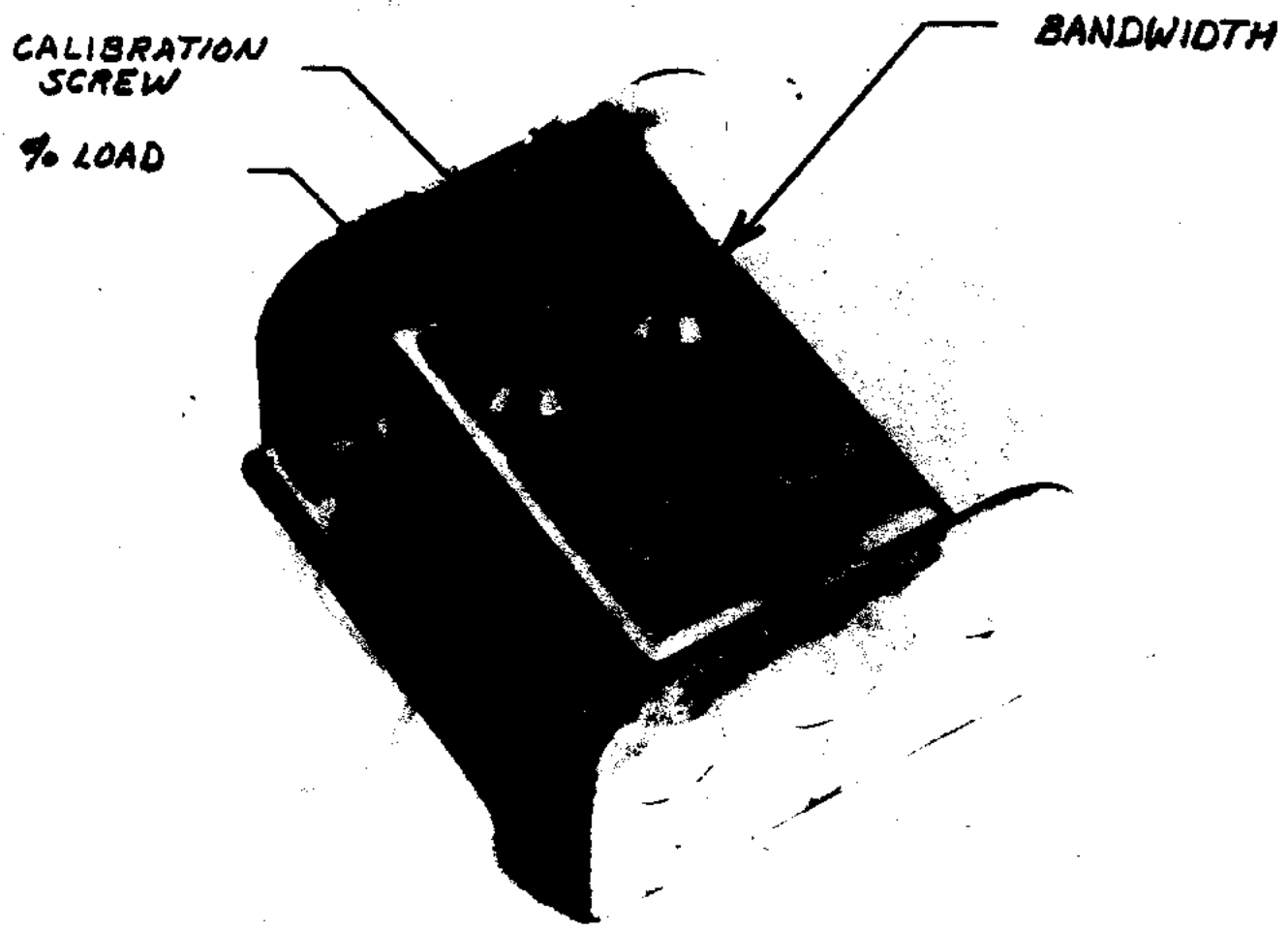


FIGURE 3

ELECTRO-PNEUMATIC TRANSDUCER

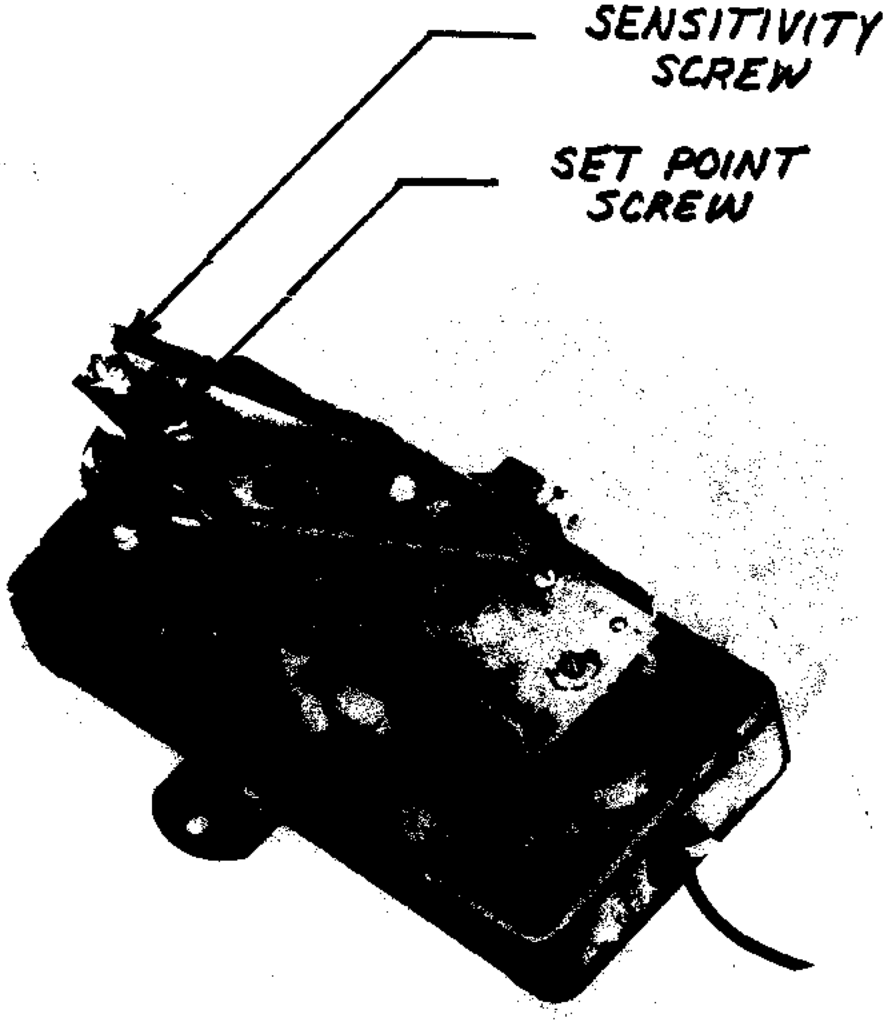


FIGURE 4