GENERAL

The Model 380K Ramp Limiter provides an output signal that follows the input signal as long as the input signal's rate of change is less than a preset value. When the input signal exceeds this preset value, the output signal will change only at the preset rate. This causes the output to lag the input as long as the rate of change limit is exceeded. This restricts the effects of sudden changes in the input signal. This results in smooth and bumpless changes in the output signal. This is especially useful in applications requiring smooth transfer from automatic to manual or other areas where a limitation on the rate of change is important.

Separate controls are provided to set the ramp-up and ramp-down limits. Rate limits are adjustable from 3.6 to 3600 seconds (for zero to full scale change).

The module accepts a 1 to 5V dc input signal. A process current input signal may be used by placing a precision resistor across the cage input terminals. This permits removal of the module without breaking the input current loop.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Input Voltage Range:</th>
<th>1 to 5V dc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Impedance:</td>
<td>5M Ohm (min)</td>
</tr>
<tr>
<td>Output Current Range:</td>
<td>Selectable; 4 to 20 mA or 10 to 50 mA</td>
</tr>
<tr>
<td>Output Load:</td>
<td>4 to 20 mA: 900 Ohms (max)</td>
</tr>
<tr>
<td></td>
<td>(700 Ohms for 24V dc powered racks)</td>
</tr>
<tr>
<td></td>
<td>10 to 50 mA: 360 Ohms (max)</td>
</tr>
<tr>
<td></td>
<td>(280 Ohms for 24V dc powered racks)</td>
</tr>
<tr>
<td>Output Current Limiting:</td>
<td>150% of full scale</td>
</tr>
<tr>
<td>Rate Adjustment:</td>
<td>Continuously variable between 3 overlapping ranges.</td>
</tr>
<tr>
<td>Range A:</td>
<td>3.6 to 36 seconds</td>
</tr>
<tr>
<td>Range B:</td>
<td>36 to 360 Seconds</td>
</tr>
<tr>
<td>Range C:</td>
<td>360 to 3600 Seconds</td>
</tr>
<tr>
<td>Trim Adjustments:</td>
<td>±5% for zero and span</td>
</tr>
<tr>
<td>Repeatability:</td>
<td>0.1% of span</td>
</tr>
</tbody>
</table>

MOORE PRODUCTS CO., Spring House, Pa. 19477
INSTALLATION

Using the Card Cage Enclosure Instructions as a reference (Service Instruction SD3801), set the keys as follows:

| Left Key:  | V (vertical) |
| Right Key: | V (vertical) |

If the ramp limiter module is not factory calibrated, refer to the CALIBRATION section of this instruction. If the module is factory calibrated, insert the module into the proper slot in the card cage enclosure and make the electrical connections shown in the connection diagram. If current input signals are to be used, refer to the Card Cage Enclosure Instructions, SD3801, for details on input signal conditioning resistors.

CALIBRATION

OUTPUT RANGE

Determine which output range is required in your application; 4 to 20 mA or 10 to 50 mA. A jumper wire (J1) located on the foil side of the circuit board determines the output range.

- 4 to 20 mA: J1 out
- 10 to 50 mA: J1 in

OUTPUT ADJUSTMENT

To facilitate faster calibration of the unit, place the jumper "J2" into Point A on the PCB board and adjust BOTH the "Ramp Up" and "Ramp Dn" potentiometers full clockwise.

1. Connect the transmitter as shown in the connection diagram. Your input source must be adjustable over the entire range of your unit, and settable to an accuracy of 0.1% or better. Load the output within the limitations listed in the SPECIFICATIONS section. The output must be measured to 0.1% accuracy or better for best results.

2. Set the input to 1.0V and wait for output to settle, then adjust the 15-turn pot. marked ZERO to give minimum output of 4 or 10 mA.

3. Set the input to 5.0V and wait for output to settle, then adjust the 15-turn pot. marked SPAN to give maximum output of 20 or 50 mA.

4. Repeat steps 2 and 3 until the desired results are obtained.

RATE LIMIT ADJUSTMENT

1. Determine the rate limit in your application and place "J2" into Point A, B or C on the PCB board as required. Note, both the increasing rate and decreasing rate must be in the same range.

| Range A: | 3.6 to 36 seconds for 0-100% output |
| Range B: | 36 to 360 seconds for 0-100% output |
| Range C: | 360-3600 seconds for 0-100% output |
2. If the desired increasing rate limit is known, it is possible to set the "Rate Up" potentiometer to the desired rate within ±20% by adjusting the potentiometer to give a calculated DC voltage at "Rate Up" test point.

\[ V_{TP} = \frac{18N}{T} \text{ Volts} \]

where \( V_{TP} \) = voltage at test point and common.

\[ \begin{align*}
T &= \text{rate limit in seconds} \\
M &= \text{Constant, see below} \\
\text{Range A, } M &= 1 \\
\text{Range B, } M &= 10 \\
\text{Range C, } M &= 100
\end{align*} \]

3. Connect a voltmeter (20K Ohms/V) or greater impedance to the "Rate Up" test point and the test point "COM," located on the front of the card. Adjust the "Rate Up" potentiometer until the voltage measured at the test point equals the calculated value.

4. "Ramp Up" rate verification

a) Apply 1.000 volt at input and wait for output to settle.

b) Step the input from 1.000V dc to 1,400V dc and measure the time it takes for the output to ramp from 4 mA (10 mA) to 5.6 mA (14 mA). This time is one-tenth of the time it would take to ramp from 4 to 20 mA or 10 to 50 mA output.

5. If the rate is acceptable, proceed to step 6. If not, adjust the "Rate Up" potentiometer clockwise to increase the rate of change at the output or counterclockwise to decrease the rate of change at the output. Repeat step 4.

6. If the desired decreasing rate limit is known, it is possible to set the "Rate Dn" potentiometer to the desired rate within ±20% by adjusting the potentiometer to give a calculated DC voltage at the "Rate Dn" test point.

\[ V_{TP} = \frac{18N}{T} \text{ Volts as in step 2 above} \]

7. Connect a voltmeter (20K Ohms/V) or greater input impedance to the "Rate Dn" test point and the test point "COM," located on the front of the card. Adjust the "Rate Dn" potentiometer until the voltage measured at the test point equals the calculated value. Remove meter from circuit.

8. "Ramp Dn" rate verification

a) Apply 1.400 volts at input and wait for output to settle.

b) Step the input from 1,400V dc to 1,000V dc and measure the time it takes for the output to ramp from 5.6 mA (14 mA) to 4 mA (10 mA). This time is one-tenth of the time it would take to ramp from 20 to 4 mA or 50 to 10 mA output.

9. If the rate is acceptable, instrument is now calibrated. If not, adjust the "Rate Dn" potentiometer clockwise to increase the rate of change at the output or counterclockwise to decrease the rate of change at the output. Repeat step 8.
MAINTENANCE

These instruments are solid state and require no maintenance on a regular basis, except for annual cleaning, blowing out dirt and verifying calibration. If your transmitter is not operating, we suggest removing it and giving it a full bench checkout. We find most problems are in the field wiring or other circuits, not in the transmitter. If the problem is traced to the unit itself, conventional electronic troubleshooting methods suffice.

CONNECTION DIAGRAM

Terminal strip on Series 380 rack enclosures.

```
1  +  INPUT
2  -
3  NC
4
5  NC
6  +
7  NC
8  NC
9  NC
```

Notes:

1. 1-5V dc signals are standard inputs. For process current inputs, refer to Service Instruction, SD3801 for proper input conditioning resistors.

2. The negative input terminal is common with the cage DC power supply.

3. See output specifications for load limits.
NOTES:
1. ALL SEVEN DIGIT NUMBERS ARE ACROMAG PART NUMBERS.
2. ALL RESISTORS 10%, 1/4 W UNLESS OTHERWISE SPECIFIED.
3. ALL DIODES ARE ACROMAG 1001-088 UNLESS OTHERWISE SPECIFIED.
4. IC-1, IC-2, & IC-5 ARE ACROMAG 1033-154 (QUAD OP-AMPS).
5. IC-3 IS A ACROMAG 1033-210 (FET OP-AMP).
6. IC-4 IS A ACROMAG 1033-207 (QUAD SWITCH).

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