DESCRIPTION
The Model 380J3 Pulse Input Frequency Converter Module provides an output current that is proportional to the frequency of its pulse input signal. The Module can be adjusted to accept various periodic signals ranging from 1.0 to 24 Volts in amplitude. Any one of the ten available frequency ranges, covering 0 to 12 KHz, can be selected to produce a full scale output. A jumper wire (J1) is used to set the Module’s output to either a 4 to 20 or a 10 to 50 mA current range. Four additional jumper wires (J2-J5) provide selection of the optimum ripple filtering to output response time setting for the selected frequency range.

SPECIFICATIONS

INPUT
Signal Type
Pulses
Frequency Range
0 to 12 KHz
Pulse Amplitude
1.0 to 24 Volts
Overload (Without Damage)
± 30 Volts
Pulse Width
40 μSec (min)
Input Impedance
200K Ohms (min)
Isolation
Input circuit is electrically isolated from the output and power circuits, permitting it to operate at up to 100 Vac above ground.
Noise Rejection
130 db @ 60 Hz with 100 Ohm unbalance

ADJUSTMENTS
Threshold Level
0.5 to +10V (22 turn trimpot, R8)
Frequency Range
10 Jumper Positions:
0 to 25 Hz — A
0 to 50 Hz — B
0 to 100 Hz — C
0 to 200 Hz — D
Output Range
Jumper Selected J1
0 to 20 mA OUT
10 to 50 mA IN
Response Time:
(To reach 98% of output span with step input)
Jumper Selected
J2 J3 J4 J5
10 Seconds OUT IN OUT IN
2.5 Seconds IN IN IN IN
700 Milliseconds OUT OUT OUT OUT
200 Milliseconds IN OUT IN OUT
Output Zero
0 to 20% of full scale (22 turn trimpot, R32)
Output Span
50% to 100% of full scale frequency range selected.

OUTPUT

<table>
<thead>
<tr>
<th>Field Selectable Range</th>
<th>Permissible Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 Vdc Powered Enclosures</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>0 to 900 Ohms</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>0 to 360 Ohms</td>
</tr>
</tbody>
</table>

Load Effect
Less than ±0.1% within the allowable load range.
Current Limiting
Output will not exceed 200% of full scale when input is overdriven.
Output Ripple
Less than ±0.1% of full scale when the following response times are selected

FIELD POWER OUTPUT...
24 Volts @50 mA (max.)
Reference to output common and the card cage power supply.
LINEARITY...
± 0.1% of full scale
REPEATABILITY...
± 0.1% of output span
OPERATING TEMP...
32 to 122°F
(0 to 50°C)
TEMP. EFFECT...
± 0.25% of output for any change within the specified operating temperature range.

*Performance at 25°C derived with output set to 4 to 20 mA range only and 24Vdc input.
INSTALLATION
The Pulse Input Frequency Converter Module must be installed in a Model Series 380 Card Cage Enclosure. It can be plugged into any of the slots in the enclosure. Refer to customer drawing for the designated slot or assign a convenient slot for it.
The safety keys of the designated slot in the card cage enclosure must be set before the Module can be plugged in. Service Instruction SD3801 identifies these safety keys and gives the procedure for setting them. The positions of the keys for the specific Input Frequency Converter Module are as follows:
Left Key: V (Vertical)
Right Key: V (Vertical)
The input and output connections are made to the terminal strips provided at the front or the rear of the card cage enclosure (depending on model). Each terminal strip is identified with a number that matches a corresponding slot number. Refer to the Connection Diagram (Figure 1) in this Instruction and to Service Instruction SD3801.

WARNING
Ensures that power is OFF on all wires being connected.
Several typical transmitter connection diagrams are shown in Figure 2.

CALIBRATION
GENERAL
The Pulse Input Frequency Converter Module is normally shipped factory calibrated for a specific customer application. Such a module requires no additional adjustment and can be used immediately into service.
Modules ordered without a specific application request, must be calibrated by the user.
To assure continued accuracy, it is recommended to check the calibration after the first 30 days of operation and then at regular intervals dictated by the severity of the operating environment or whenever an inaccuracy is suspected.
Use the following procedure to perform periodic calibration checks or to calibrate the Module for a new application. Figure 3 shows the location of all jumper wires and trim pots.

REQUIRED DATA
The following information must be obtained before calibration of the Module can be initiated:
1. Input Signal Frequency Range
2. Input Signal Amplitude
3. Output Current Range

REQUIRED EQUIPMENT
Calibration of the Module will require the use of the following equipment:
1. Model Series 380 Card Cage Enclosure with power supply.
2. Figure 1 Connection Diagram

2. Signal Generator
   Frequency Range: To cover the required input range of Module (up to 12 KHz)
   Output Level: 1.0 to +10 Volts referenced to common (can be ±0.5 to ±10 Volts)
   Output Waveform: Sinusoidal or square

3. Frequency Counter
   Frequency Range: 0 to 12 KHz (min.)
   Accuracy and Resolution: Determined by the calibration requirements.

4. Voltmeter
   Range: 0 to +10.00 Volts
   Impedance: 1 Megohm (min.)
   Accuracy: ±2%

5. Digital Output Meter — The following devices may serve this purpose
   a) Digital Voltmeter
      Range: 0 to 5 Volts
      Impedance: 1 Megohm (min.)
   b) Digital Milliammeter
      Range: 0 to 50 mA
      Impedance: 200 Ohms (max.)
   Both devices must have an overall accuracy of 0.05% or better.

6. Conditioning Resistor, To convert output current to voltage if a digital voltmeter is used for calibration.
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FIGURE 2 Typical Transmitter Connections
PRELIMINARY ADJUSTMENTS

The following adjustments are made by installing, shifting, or removing several jumper wires on the component or solder side of the P.C. Board. Refer to Figure 3 for the exact location of these jumper wires.

1. Obtain the required data described in the previous section.

2. Select the required input signal frequency range by placing the jumper wire pin in the appropriate position as shown in Figure 3.

<table>
<thead>
<tr>
<th>FREQUENCY RANGE</th>
<th>JUMPER POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 Hz</td>
<td>A</td>
</tr>
<tr>
<td>0.50 Hz</td>
<td>B</td>
</tr>
<tr>
<td>0.100 Hz</td>
<td>C</td>
</tr>
<tr>
<td>0.200 Hz</td>
<td>D</td>
</tr>
<tr>
<td>0.400 Hz</td>
<td>E</td>
</tr>
<tr>
<td>0.800 Hz</td>
<td>F</td>
</tr>
<tr>
<td>1.5 KHz</td>
<td>H</td>
</tr>
<tr>
<td>3.0 KHz</td>
<td>J</td>
</tr>
<tr>
<td>6.0 KHz</td>
<td>K</td>
</tr>
<tr>
<td>12 KHz</td>
<td>L</td>
</tr>
</tbody>
</table>

This jumper wire is located on the component side of the P.C. Board.

3. Select the proper response time by cutting or installing jumper wires J2, J3, J4, and J5 located on the Component side of the P.C. Board.

The recommended settings given below will provide the fastest response times while maintaining less than 0.1% output ripple.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>A through L</td>
<td>10 Seconds</td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
<td>IN</td>
</tr>
<tr>
<td>D through L</td>
<td>2.5 Seconds</td>
<td>IN</td>
<td>IN</td>
<td>IN</td>
<td>OUT</td>
</tr>
<tr>
<td>F through L</td>
<td>700 Milliseconds</td>
<td>OUT</td>
<td>OUT</td>
<td>OUT</td>
<td>OUT</td>
</tr>
<tr>
<td>J through L</td>
<td>200 Milliseconds</td>
<td>IN</td>
<td>IN</td>
<td>OUT</td>
<td>OUT</td>
</tr>
</tbody>
</table>

Faster response times may be selected at the expense of realizing higher than 0.1% output ripple. Similarly, lower ripple content can be achieved by selecting slower response times.

4. Select the required output current range by installing or removing jumper wire J1 located on the solder side of the P.C. Board as shown in Figure 3.

<table>
<thead>
<tr>
<th>Output Range</th>
<th>Jumper J1</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 20 mA</td>
<td>OUT</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>IN</td>
</tr>
</tbody>
</table>

5. Plug the Module into the specified or a convenient slot in the card cage, turn on the power supply, and let it warm up for five minutes.

PROCEDURE

1. Obtain all the required data and equipment described in the correspondingly titled previous sections.

2. Complete all the steps described in the PRELIMINARY ADJUSTMENTS section.

3. Connect the signal generator to input terminals 1 (+) and 2 (−) on the card cage as shown in Figure 1, Connection Diagram.

4. Connect the frequency counter to the same terminals (in parallel with the signal generator).

5. Connect the voltmeter (0 to +10 Volts) to test point TP1 (+) and terminal 2 (−) as shown in Figure 4 and Figure 1, respectively.

6. Adjust THRESHOLD trimpot (R8) to read +2.5 Volts at test point TP1.

7. Connect the output measuring device to output terminals 4 (+) and 5 (−) on the card cage as shown in Figure 1, Connection Diagram.

8. Set the signal generator as follows:
   a. Frequency to LOW point of the required range.
      Use the frequency counter for precise frequency indication.
   b. Amplitude to +10 Volts on peaks (sine or square) referenced to common.

9. Adjust ZERO trimpot (R32) to read the 0% point on the output meter. This reading is 4 mA for the 4 to 20 mA output range, 10 mA for the 10 to 50 mA range, and 1 Volt if a 1 to 5 Volt conditioning resistor is used.
   If the output cannot be reduced to the 0% point, turn the SPAN trimpot (R51) counterclockwise (CCW) until the required reading is achieved.

10. Set the signal generator frequency to the HIGH point of the required input range. Use the frequency counter for precise frequency indication.

11. Adjust SPAN trimpot (R51) to read the 100% point on the output meter. This reading is 20 mA for the 4 to 20 mA output range, 50 mA for the 10 to 50 mA range, or 5 Volts if a 1 to 5 Volt conditioning resistor is used.

12. Repeat steps 8, 9, 10, and 11 until proper calibration is achieved since there is some interaction between the ZERO and SPAN adjustments.

13. Adjust the THRESHOLD trimpot (R8) to accommodate the amplitude and offset of the Module's input signal. Use the following procedure for determining and setting the required threshold level.
   a. Connect the Voltmeter (0 to +10 Volts) to test point TP1 (+) and terminal 2 (−) as shown in Figures 4 and 1, respectively.
   b. Determine the required threshold by selecting the smaller of the following two voltage levels: Choose either +10 Volts or the voltage level obtained by adding the median of the input signal's positive pulse amplitude to any pedestal voltage (offset) that may also be present.

   For example, the signal from the 3-wire transmitter in Figure 2 would require the threshold level. Adding its 7.5 Volt pulse amplitude median to the 3 Volt pedestal produces +10.5 Volts. Choosing the smaller of
the two levels (+10 Volts vs. +10.5V) we obtain +10 Volts as the required threshold level.

c. Find the equivalent voltage reading at TP1 by dividing the required threshold voltage by 2. In the above example, the determined threshold voltage of +10 Volts would appear as +5 Volts at test point TP1.
d. Adjust THRESHOLD trimpot (R8) to read the equivalent level at test point TP1. (See Figures 3 and 4.)

This completes the calibration procedure.

MAINTENANCE

GENERAL

Required maintenance for this Module should consist of periodic cleaning, visual inspection, and calibration checks. The severity of the environment in which the Module is located will determine the required frequency of maintenance.

CLEANING

The Module should be cleaned as often as operating conditions require. The accumulation of dust and dirt on components prevents efficient heat dissipation which can cause overheating and component breakdown.

Blow off accumulated dust and dirt with dry, low velocity air. Any dust or dirt that remains should be removed with a soft brush or cloth dampened with a mild detergent and water solution. Cotton-tipped swabs are useful for cleaning in narrow spaces.

CAUTION

Avoid the use of chemical agents which may damage plastic components or protective coatings.

VISUAL INSPECTION

The Module should be inspected occasionally for defects such as loose or broken connections, damaged circuit board, and heat damaged components.

The corrective action for most visible defects is obvious. However, if a heat-damaged component is found, the cause of overheating must be corrected to prevent a recurrence of the damage.

CAUTION

Exceeding the specified ambient temperature limits can adversely affect performance and may cause damage.

TROUBLESHOOTING

If the Module does not operate properly when initially installed, check the terminal strip wiring. Most problems in new installations can be traced to wiring mistakes. Also, verify that the equipment associated with the input and output circuits is functioning and is properly calibrated.

If the trouble is traced to the Module, remove the Module and give it a full bench check. A complete schematic of the Module is given in Figure 5.

A Part No. 15378-27 Card Extender can be ordered. It extends the Module beyond the front edge of the card cage enclosure, providing easy access to both sides of the Module’s circuit board.

IMPORTANT

Warranty repair and replacement requires the Module to be returned to Moore Products Co., Spring House, Pa. 19477. The warranty is null and void if repair is attempted at any other location.

RECOMMENDED SPARES

There are no recommended spare parts for the Pulse Input Frequency Converter Module.

One spare module is recommended for every 1 to 10 in service.