DESCRIPTION

The Model 380P1 Quad Buffer Module contains four individual buffer amplifiers. Each amplifier can be adjusted to provide an output of 4 to 20 mA with input signal spans of 1 to 10 V dc. A zero adjustment can offset the input span from 0 to 25%. A block diagram of the complete module is shown in Figure 1. As the name implies, buffer amplifiers are most commonly used as buffers between various signal sources and signal receivers. Their high input impedance presents practically no loading on the signal source. Also, their current output circuit can drive a wide range of loads, even complete shorts, without imposing any reflection on the source. These characteristics make buffer amplifiers useful for transmission of local signals to remote areas. Another typical application of buffer amplifiers involves "signal scaling". In this operation, by means of the adjustable zero and span controls, the buffer amplifier can be used to convert a non-standard voltage signal to the standard 4 to 20 mA current signal. Refer to the SPECIFICATIONS section for detailed operating parameters of the buffer amplifier.

![Block Diagram](Image)

FIGURE 1 Block Diagram

MOORE PRODUCTS CO., Spring House, Pa. 19477
Current input signals are accommodated by placing precision resistors across the input terminals in the card cage enclosure. This permits removal of the module without interrupting the input current loop.

The module is designed to be plugged into a Model Series 380 Card Cage Enclosure equipped with a common power supply (see Service Instructions SD3801).

**SPECIFICATIONS**

(4) independent buffers per module

**INPUT** (to produce 4 to 20 mA output)

<table>
<thead>
<tr>
<th>Span</th>
<th>1V dc continuously adjustable to 10V dc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero (Offset)</td>
<td>0 to 25% of span</td>
</tr>
<tr>
<td>Overload</td>
<td>± 30V dc (max.)</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5 Megohms (min.)</td>
</tr>
</tbody>
</table>

**OUTPUT**

<table>
<thead>
<tr>
<th>AC Powered Enclosures</th>
<th>24V dc Powered Enclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>4 to 20 mA</td>
</tr>
<tr>
<td>Load</td>
<td>0 to 900 Ohms</td>
</tr>
</tbody>
</table>

| Load Effect           | Less than 0.1% within the allowable load range. |
| Current Limiting      | Output will not exceed 150% of full scale when input is overdriven. |
| Response Time         | 150 mSec. to reach 98% of span (typical) |

| Accuracy              | ±0.15% of output span     |
| AMBIENT TEMP          | 32° to 122° F (0 to 50°C) |
| ISOLATION             | The negative input and output terminals are common to each other and to the power supply common bus. |

**INSTALLATION**

The Quad Buffer Module must be installed in a Model 380 Card Cage Enclosure. It can be plugged into any of the slots in the enclosure. Refer to customer drawings for the designated slot or assign a convenient slot for it.

**WARNING**

Remove all power on signal and power supply wires before making any connections or setting the safety keys in the card cage enclosure.

The safety keys in the card cage must be set before the module is plugged in. Service Instruction SD3801 identifies these safety keys and gives the procedure for setting them. The positions of the keys for the Quad Buffer 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 (depending on model). Each terminal strip is identified with a number that matches a corresponding slot number. Refer to the Connection Diagram (Figure 2) in this Instruction and to Service Instruction SD3801.

**NOTE**

All the plug-in modules in the card cage share the same SIGNAL COMMON bus line due to their common power supply. Be careful when connecting various signal lines to avoid possible ground loops or shorts.

To convert a current signal to a voltage signal, select an appropriate conditioning resistor listed below, and connect it across the required input or output terminals.

<table>
<thead>
<tr>
<th>Current Signal</th>
<th>Conditioning Resistor (to obtain 1 to 5 Volts)</th>
<th>MPCo. Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 mA</td>
<td>1000 Ohms ± 0.1%</td>
<td>15037-228</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>250 Ohms ± 0.1%</td>
<td>15037-229</td>
</tr>
<tr>
<td>10 to 50 mA</td>
<td>100 Ohms ± 0.1%</td>
<td>15037-230</td>
</tr>
</tbody>
</table>

When connecting several conditioning resistors in series in a current loop, make sure the total loop resistance does not exceed the permissible load resistance of the source. Also, watch out for inadvertently connecting several resistors in parallel.

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**TERMINAL STRIP ON RACK ENCLOSURES**

![Connection Diagram](image-url)
CALIBRATION

The Quad Buffer Module is normally shipped calibrated for the required range. When performing periodic calibration checks or a complete calibration, the following procedure is recommended. Figure 3 shows the location of the span and zero trim pots.

1. Plug the module into a card cage enclosure containing a power supply.
2. Obtain an adjustable input signal source. It can be one of the following or similar devices.
   a) Voltage Source — typically 0 to 5V dc.
   b) Current Source — typically 0 to 20 mA.
   c) Transmitter — adjustable over required range.
   These devices must be adjustable to an accuracy of 0.1% or better.
3. Connect the signal source to input of buffer amplifier A (terminals 1 and 5). If the signal source is a current, use an appropriate conditioning resistor across the input terminals.
4. Obtain an output measuring device such as a digital multimeter. It must be capable of measuring the required current or voltage to an accuracy of 0.1% or better.
5. Connect the output measuring device to the output of buffer amplifier A (terminals 6 and 5). Refer to the SPECIFICATIONS section for output load restrictions. Use an appropriate conditioning resistor across the output terminals if a voltage measuring device is utilized.
6. Set the signal source to the minimum range setting (typically ±1.0 Volt). Adjust the ZERO trim pot to read the minimum range setting on the output measuring device (typically 4.0 mA).
   Figure 3 shows the location of all trim pots.
7. Set the signal source to the maximum range setting (typically ±5.0 Volts). Adjust the SPAN trim pot to read the maximum range setting on the output measuring device (typically 20.0 mA).
8. Repeat steps 6 and 7 until the ZERO and SPAN reading are as required.
9. Repeat the above steps to calibrate the remaining three buffer amplifiers.

This completes the calibration procedure.

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**FIGURE 3 P.C. Board**
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 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 4.

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 Quad Buffer Module.

One spare module is recommended for every 1 to 10 in service.
FIGURE 4 Schematic