DESCRIPTION

The Model Series 381 RFI Protected Millivolt Alarm Module accepts a millivolt input signal and provides relay contact actuation at a preset input signal level. The Module is available with one or two SPDT relays, each furnished with separate trip-point and deadband adjustments.

The input circuit is electrically isolated from the power supply, allowing the input to operate at common mode voltages of up to 100 Vdc. Input filtering is provided to minimize the effects of noise on the input circuit.

Actuation of each relay can be changed from "normal" (relay energized above the trip-point) to "reverse" (relay energized below the trip-point) by means of individual jumpers. This provides selectable fail-safe action.

A LED, located at the front of the Module and provided for each relay, gives visual indication when relay is energized.

MODEL DESIGNATION

<table>
<thead>
<tr>
<th>Sample Model Number</th>
<th>381 AD 1 — 2</th>
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</thead>
<tbody>
<tr>
<td>RFI Protected Series</td>
<td></td>
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<tr>
<td>Millivolt Alarm Module</td>
<td></td>
</tr>
<tr>
<td>Type of Output Relay</td>
<td>1 — Standard Relay</td>
</tr>
<tr>
<td></td>
<td>2 — Hermetically Sealed Relay</td>
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<tr>
<td>Number of Trip Points</td>
<td>1 — Single Trip Point (One Relay)</td>
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<tr>
<td></td>
<td>2 — Dual Trip Point (Two Relays)</td>
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</tbody>
</table>

SPECIFICATIONS

INPUT

Signal Range: .................................. Narrow Span (J1 IN): -5 to +50 mVdc
            .................................. Wide Span (J1 OUT): -10 to +100 mVdc

Impedance: ..................................... 1 Megohm (minimum)

Input Isolation: .................................. Input circuit is electrically isolated from the common card cage power supply, allowing the input to operate at up to 100 Vdc above ground.

Overload (Without Damage): .................. ±10 Volts (maximum)

Noise Rejection: .................................. Normal Mode: 30 dB at 60Hz

RFI Protection: .................................. Module tested per SAMA PMC 33.1 - 1978.

Specifications available upon request.

OUTPUT

The Module comes factory equipped with one or two output relays:

Single Trip Point Model (-1): ............. One SPDT Relay
Dual Trip Point Model (-2): ............... Two SPDT Relays

RELAY TYPES

Standard Relay: .................................. SPDT Contacts rated 2A @ 117 Vac or 28 Vdc resistive load.

Hermetically Sealed Relay: .................. SPDT Contacts rated 3A @ 117 Vac or 24 Vdc resistive load.

RELAY OPERATION

Each relay can be set by means of a wire jumper for normal or reverse activation.

NORMAL (relay energized above trip point):

Relay K1 ........................................ Jumper J3: IN
Relay K2 ........................................ Jumper J4: IN

REVERSE (relay energized below trip point):

Relay K1 ........................................ Jumper J3: OUT
Relay K2 ........................................ Jumper J4: OUT

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LED INDICATOR: A LED indicator mounted at front of Module, lights up when relay is energized. A dual trip point Module (with two relays) has two LED indicators.

RESPONSE TIME: 400 nSec.

REPEATABILITY: ±0.1% of span @ constant conditions (25°C)

OPERATING TEMPERATURE: 32 to 122°F (0 to 50°C)

TRIP POINT ADJUSTMENT: 15 turn metal film trimpot, 0 to 100% of span

DEADBAND ADJUSTMENT: 15 turn metal film trimpot
0.02 to 5mV (narrow span)
0.02 to 10mV (wide span)

POWER REQUIREMENT: Module must be used in a Model Series 380/381 Card Cage Enclosure containing a power supply (see Service Instruction SD3801).

INSTALLATION

GENERAL

The Millivolt Alarm Module must be installed in a Model Series 380 or 381 Card Cage Enclosure. It can reside in any slot of the Enclosure. Refer to user’s system drawing for the designated slot or assign a convenient slot for it.

Each slot of an Enclosure is equipped with safety keys which 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 Millivolt Alarm Module requires the following key positions:

    LEFT KEY: V (VERTICAL)
    RIGHT KEY: H (HORIZONTAL)

All plug-in modules in a card cage share a common power supply. However, the input and output circuits of the Millivolt Alarm Module are isolated from each other and from the card cage power supply. Thus, each input circuit may be independently grounded without the possibility of creating interfering ground loops. Likewise, the switching contacts of the output relays may be connected to various circuits that must remain isolated from the common card cage power supply.

WARNING

Remove all power before making any connections or setting the safety keys in the Card Cage Enclosure.

ELECTRICAL CONNECTIONS

Input and output connections for the Millivolt Alarm Module installed in Model Series 380 or 381 Card Cage Enclosure are shown in Figure 1. Both input and output wiring is connected to an appropriate terminal strip located at the front or the rear of the Enclosure (depending on Model). This terminal strip is identified by a number that matches the number of the slot that holds the Alarm Module.

NOTE

The given RFI Protection Specifications are valid only for Series 381 Modules installed in a Series 381 Card Cage Enclosure.

CALIBRATION

GENERAL

If the Millivolt Alarm Module is shipped factory calibrated for a specific user designated range and operating mode, it will require no additional adjustment and can be put into service immediately. Modules ordered without a specific calibration 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.

PROCEDURE

Use the following procedure to perform periodic calibration checks or to calibrate the Module for new settings. Figure 2 shows the location of all jumper wires and trimpots.

REQUIRED EQUIPMENT

The following equipment is needed for the adjustment and calibration of the Module:

1. Model Series 380 or 381 Card Cage Enclosure with power supply.
2. Calibration Source
   Output Range: 0 to 100 mVdc
   Accuracy: ±0.1% or better
   Source Resistance: 100 Ohms or less
3. Basic Electronic Tools & Materials
   Screwdrivers, long-nose pliers, wire cutters, soldering iron/gun, solder, and wire.

NOTE

A separate output indicator is not needed since Module contains built-in LED’s to show activation of each relay.
NOTES:
1. RELAY CONTACT LOAD LIMITATIONS ARE LISTED UNDER "OUTPUT" OF THE "SPECIFICATIONS" SECTION.
2. CONTACTS SHOWN WITH OUTPUT RELAY DE-ENERGIZED BELOW "TRIP-POINT." REVERSE ACTION IN UNITS ARE DE-ENERGIZED ABOVE "TRIP-POINT."

FIGURE 1 Connection Diagram

FIGURE 2 P.C. Board
PRELIMINARY ADJUSTMENTS

The Millivolt Alarm Module is normally shipped with all jumper wires intact. These jumper settings result in the following operating modes:

1. Span: ...........................................Narrow
2. Relay Operation: .........................Normal

To check or reset any one of these operating modes, the Module must be removed from the Card Cage. Refer to Figure 2 for the location of jumper wires.

1. Span
Determine whether NARROW or WIDE input span is needed for the given application (see Specifications section). Use the NARROW span setting, if possible, since it provides the best trip-point resolution.

<table>
<thead>
<tr>
<th>SPAN</th>
<th>J1</th>
</tr>
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<tbody>
<tr>
<td>NARROW</td>
<td>IN</td>
</tr>
<tr>
<td>WIDE</td>
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Check the status of jumper wire J1; if necessary, change it to provide the needed span.

2. Relay Operation
Determine whether in the given application the output relay(s) must be energized when the millivolt signal goes above the trip-point (NORMAL) or when it drops below the trip-point (REVERSE).

<table>
<thead>
<tr>
<th>RELAY OPERATION</th>
<th>J3 (K1)</th>
<th>J4 (K2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>IN</td>
<td>IN</td>
</tr>
<tr>
<td>REVERSE</td>
<td>OUT</td>
<td>OUT</td>
</tr>
</tbody>
</table>

Check the status of jumpers J3 and J4; if necessary, change one or both to obtain the required relay operation.

CALIBRATION PROCEDURE

The Calibration Procedure covers deadband adjustment and trip-point setting.

Plug the Millivolt Alarm Module into its designated slot in the card cage, turn on the power supply, and let it warm up for five minutes before proceeding with the following steps.

1. Set the deadband trippoint(s) fully CCW (minimum deadband). Figure 2 shows the location of all trippoints.
2. Obtain the required trip-point level(s) for output relay K1 and (if present) relay K2.
3. Connect the calibration source to input terminals 1 and 2 of the designated terminal strip on the card cage (see Figure 1).

If the required trip-point level is positive (0 to +100 mVdc), connect the positive lead of the calibrator to terminal 1 and the negative to terminal 2. If the trip-point level is negative (-10 to 0 mVdc), reverse the above connections.

4. Set the calibration source to the required trip-point for relay K1.
5. Adjust the trip-point trimpot of the selected relay until the relay operates. The associated LED will turn on or off, depending on status of jumper J3 or J4 and whether trip-point is shifted below or above the calibration signal.

Rock the trimpot screw CW and CCW to get as close as possible to the on-off transition point.

6. Check the relay pull-in and drop-out points by varying the calibration source. If a greater deadband is required (larger difference between pull-in and drop-out), turn the appropriate deadband trimpot further CW and check operation again.

7. Repeat steps 4, 5, and 6 until the required relay operation is attained.

NOTE
Whenever the span jumper or a deadband setting is changed, the trip-point calibration must be re-adjusted.

8. If another relay is present, repeat steps 4, 5, 6 and 7 with calibration settings intended for second relay (K2).

This completes the calibration procedure.

MAINTENANCE

GENERAL

Required maintenance for this Module consists 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 3.

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

**RECOMMENDED SPARES**

There are no recommended spare parts for the RFI Protected Millivolt Alarm Module. One spare module is recommended for every 1 to 10 in service.

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**WARRANTY**

The Company warrants all equipment manufactured by it and bearing its nameplate, and all repairs made by it, to be free from defects in material and workmanship under normal use and service. If any part of the equipment here is defective, and so by the Company, proves to be defective in material or workmanship and if such part is within twelve months from date of shipment from the Company’s factory, returned to such factory, transportation charges prepaid, and if the same is found by the Company to be defective in material or workmanship, it will be replaced or repaired, free of charge, f.o.b. Company’s factory. The Company assumes no liability for the consequence of its use or resale by Purchaser, his employees or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, replaced or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guaranties, obligations, or liabilities, expressed or implied by the Company or its representatives. All statutory or implied warranties other than this, are hereby expressly negated and excluded.

Warranty repair or replacement requires the equipment to be returned to one of the following addresses:

- Equipment manufactured or sold by MOORE PRODUCTS CO:
  MOORE PRODUCTS CO.
  Sunnyside Mkt.
  Spring House, PA 19477

- Equipment manufactured or sold by MOORE INSTRUMENT CO:
  MOORE INSTRUMENTS LTD/TEE
  24A West of Main Street Rd. Hwy 7
  Brampton, Ontario, Canada

The warranty will be null and void if repair is attempted without prior authorization by a member of the MOORE PRODUCTS CO. Service Department.