

**DESCRIPTION AND APPLICATION**

The voltage sensitive relay is a universal card used to detect the level of an input voltage, or the difference between input voltages. The relay card can contain one or two sensitive relays. This allows the function to act as a differential relay with the two-relay version, or, with different connections to the card receptacle, to act in a polarized or non-polarized fashion.

The function is applied in either open- or closed-loop circuits. In many applications the card is employed to switch a signal or pick up another relay whenever it is actuated. In other cases it is the forward gain element in a closed-loop system. In this general area of application, whenever the relay operates it actuates some circuit that directly affects at least one of the inputs to the sensitive relay card. An example of this would be a motor-operated rheostat position control.

The voltage sensitive relay card contains, in addition to the relay(s), a universal amplifier and components to allow for wide variations in input voltages. There is a gain adjustment (P629) around the universal amplifier which is used to set the sensitivity of the relay action. A bias adjustment (P626) is also included to set the level at which the relay(s) will pick up or to act as a zero adjust.

The relay card also contains two limit adjustments (P627 and 628). These adjustments are normally left in the fully clockwise or counterclockwise position. In the clockwise position, they serve to limit the universal amplifier output to approximately 10 volts. In the counterclockwise position they clamp the universal amplifier output at near zero volts. By turning one fully clockwise and the other fully counterclockwise, the relay card becomes polarized. The relay operates on one net polarity of input only.

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*These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.*
ADJUSTMENT

1. Voltage-sensing Relay – Polarized Operation
   a. Turn gain potentiometer fully clockwise.*
   b. If input signal is positive, turn P628 fully clockwise and P627 fully counterclockwise.
   c. If input signal is negative, turn P627 fully clockwise and P628 fully counterclockwise.
   d. Set input signal to value required for pick-up of sensitive relay and adjust bias potentiometer until relay picks up.
   NOTE: If input signal cannot be varied conveniently, a battery or other d-c source may be used to supply an artificial signal.

2. Voltage-sensing Relay – Non-polarized Operation
   a. Turn gain potentiometer fully clockwise.*
   b. With input signal at zero (preferably short-circuited to common), turn bias potentiometer to give as near zero output voltage as possible, measured across relay coil.
   c. Turn P627 and P628 clockwise.
   d. Turn gain potentiometer fully counterclockwise.
   e. Set input signal to value required for pick-up of sensitive relay and adjust gain potentiometer clockwise until relay picks up.

3. Voltage Comparison or Differential Relay – Single Relay with Non-polarized Output or Dual Relay with Polarized Outputs
   a. Turn P627, P628 and gain potentiometer clockwise.
   b. With input signal(s) at zero (preferably short-circuited to common), turn bias potentiometer to give as near zero output voltage as possible, measured across relay coil.
   c. Set input(s) to the maximum value required and adjust external rheostat (tracking adjust) to give as near zero output voltage as possible across relay coils.
   d. The above adjustment gives operation a minimum difference between input signal(s) * (maximum sensitivity). If operation at a larger difference between input signals is required, turn the gain potentiometer counterclockwise until the desired operation is obtained.

4. Voltage Comparison – Single Relay with Polarized Operation
   a. Turn gain potentiometer fully clockwise.*
   b. If relay is to pick up on a positive signal, turn P628 fully clockwise and P627 fully counterclockwise.
   c. If relay is to pick up on a negative signal, turn P627 fully clockwise and P628 fully counterclockwise.
   d. See adjustment 3, part b.
   e. See adjustment 3, part c.
   f. See adjustment 3, part d.
   NOTE: Input voltages are not necessarily equal for relay operation. The input signals are the currents caused by the applied voltages. This applies to single polarized and non-polarized relays as well as dual relays with polarized outputs.

TROUBLE SHOOTING

1. Follow the general trouble shooting procedure in the General Description in GEI-92015A-23 or GEI-92001.
2. Check potentiometer setting per marked or recorded potentiometer positions.
3. Replace card with spare.
   a. If malfunction persists, the failure is in the external wire connections.
   b. If trouble disappeared, visually inspect defective card for damaged components.
4. See GEI-92016 for instructions on universal amplifier.
   * If relay operation is erratic or unduly sensitive to electrical noise, the gain potentiometer should be turned slightly counterclockwise until satisfactory operation is obtained.
Sensitive Relay Card GE-92015C

NOMENCLATURE

AMPL 626  Standard Amplifier
C626   Noise Suppression Capacitor
D628   Positive Limit Diode
D629   Negative Limit Diode
D630   Blocking Diode
P626   Bias Adjust Potentiometer
P627   Positive Limit Adjust Potentiometer
P628   Negative Limit Adjust Potentiometer
P629   Gain Adjust Potentiometer
R626,  B627,  628   Bias Resistors
R629   Noise Suppression Resistor
R630,  631   Input Resistors
632,  633
R634,  635   Input Resistors
636,  637
R638   Commoning Resistor
R639   Amplifier Gain Resistor
R641,  642   Limit Resistors
RX626   6.3 V Relay

NOTES

1. Numbers inside the small rectangles indicate tab numbers which correspond to matching receptacle numbers.

2. Select input resistance to approximately 1 K per volt, based on the relay operating input voltage. The maximum input voltage is ten times that of the relay operating input voltage, not exceeding 300 volts.

3. CAUTION: IF 300 VOLTS INPUT IS APPLIED TO TAB 9, TAB 10 MUST NOT BE USED; OR IF 300 VOLTS INPUT IS APPLIED TO TAB 10, TAB 9 MUST NOT BE USED. THIS IS A PRECAUTION TO AVOID 300 VOLTS POTENTIAL BETWEEN TABS.

4. The position of bias adjust potentiometer (P626) determines the input voltage value at which the relay operates.

5. For more accurate zero adjust: there are four resistance combinations furnished with resistors R626, R627, and R628, which provide four ranges that can be selected. As more resistance is added, the range of P626 zero adjust becomes narrower, permitting a more accurate zero adjust setting to be made as input voltages approach or are close to zero volts.

6. The gain can be adjusted so that the relay pickup is obtained between 0.01 and 1.7 MA input current.

7. Refer to GEI-92016 instruction book for information about amplifier (AMPL 626).

8. The components and circuits shown in dashed lines are protective components and do not affect the relay function.

Fig. 1. One non-polarized relay function schematic
**SPECIFICATION**

Input: 0 to ± 300 VDC  
Output: ± 10 volts at 1 MA

**VOLTAGE CHECK LIST**

(With +20 volts DC between Tab 30 and Tab 13, and -20 volts DC between Tab 3 and Tab 13)

<table>
<thead>
<tr>
<th>Plus</th>
<th>Minus</th>
<th>DC Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab 2</td>
<td>Tab 13</td>
<td>0 to -10 volts DC</td>
</tr>
</tbody>
</table>

(depending on input)

**NOTES**

1. Indicates retaining spring.

2. The sequence wiring of receptacles may require wires for both entering and leaving a terminal. This is accomplished by making the connections to the horizontally adjacent terminals and inserting a jumper spring between the terminals.

3. Number in circle at side of receptacle indicates space unit requirements.

4. See Fig. 1, NOTE 5 under functional schematic diagram.

5. See Fig. 1, NOTES 2 and 3.

Fig. 2. One non-polarized relay function connection
**NOMENCLATURE**

- **AMPL 626**: Standard Amplifier
- **C626**: Noise Suppression Capacitor
- **D626**: Relay Function Polarizing Diode *
- **D627**: Relay Function Polarizing Diode *
- **D628**: Positive Limit Diode
- **D629**: Negative Limit Diode
- **D630**: Blocking Diode
- **P626**: Bias Adjust Potentiometer
- **P627**: Positive Limit Adjust Potentiometer
- **P628**: Negative Limit Adjust Potentiometer
- **P629**: Gain Adjust Potentiometer
- **R626, 627, 628**: Bias Resistors
- **R629**: Noise Suppression Resistor
- **R630, 631, 632**: Input Resistors
- **R634, 635, 636**: Input Resistors
- **R637**: Commoning Resistor
- **R641, 642**: Limit Resistors
- **RX026, 027**: 0.3 V Relay

* Shorted out for the non-polarized relay function.

**NOTES**

1. Numbers inside the small rectangles indicate tab numbers which correspond to matching receptacle numbers.

2. Select input resistance to approximately 1 K per volt, based on the relay operating input voltage. The maximum input current is 10 MA. The minimum resistance is 1 K, which must be an external resistor. Resistors R630 through R637 furnish two inputs with seven resistance combinations each.

3. **CAUTION**: IF 300 VOLTS INPUT IS APPLIED TO TAB 9, TAB 10 MUST NOT BE USED; OR IF 300 VOLTS INPUT IS APPLIED TO TAB 10, TAB 9 MUST NOT BE USED. THIS IS A PRECAUTION TO AVOID 300 VOLTS POTENTIAL BETWEEN TABS WHICH MAY DAMAGE THE RELAY CARD OR BLOW A FUSE.

4. The gain can be adjusted so that the relay pick-up is obtained between 0.01 and 1.7 MA input current.

5. Refer to GEI-92016 instruction book for information about amplifier (AMPL 626).

6. The components and circuits shown in dashed lines are protective components and do not affect the relay function.

**Fig. 3. Two non-polarized relay function schematic**
SPECIFICATION

Input: 0 to ±300 VDC  
Output: ±6.3 volts at 1 MA

VOLTAGE CHECK LIST

(With +20 volts DC between Tab 30 and Tab 13, and -20 volts DC between Tab 3 and Tab 13)

<table>
<thead>
<tr>
<th>Plus</th>
<th>Minus</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab 2</td>
<td>Tab 13</td>
<td>0 to -6.3 volts DC</td>
</tr>
</tbody>
</table>

(depending on input)

NOTES

1. Indicates retaining spring

2. The sequence wiring of receptacles may require wires for both entering and leaving a terminal. This is accomplished by making the connections to the horizontally adjacent terminals and inserting a jumper spring between the terminals.

3. Number in circle at side of receptacle indicates space unit requirements.

4. See Fig. 3, NOTES 2 and 3.

5. Indicates jumper spring

Fig. 4. Two non-polarized relay function connection
NOMENCLATURE

AMPL 626        Standard Amplifier
C626             Noise Suppression Capacitor
D626             Relay Function Polarizing Diode
D627             Relay Function Polarizing Diode
D628             Positive Limit Diode
D629             Negative Limit Diode
D630             Blocking Diode
P626             Bias Adjust Potentiometer
P627             Positive Limit Adjust Potentiometer
P629             Negative Limit Adjust Potentiometer
R626, 627, 628   Bias Resistors
R629             Noise Suppression Resistor
R630, 631, 632   Input Resistors
633              Commoning Resistor
R634, 635, 636   Input Resistors
637
R638             Amplifier Gain Resistor
R639             Limit Resistors
RX626, 627       6.3 V Relay

NOTES

1. Numbers inside the small rectangles indicate tab numbers which correspond to matching receptacle numbers.

2. Select input resistance to approximately 1 K per volt, based on the relay operating input voltage. The maximum input current is 10 MA. The minimum resistance is 1 K, which must be an external resistor. Resistors R630 through R637 furnish two inputs with seven resistance combinations each.

3. CAUTION: IF 300 VOLTS INPUT IS APPLIED TO TAB 9, TAB 10 MUST NOT BE USED; OR IF 300 VOLTS INPUT IS APPLIED TO TAB 10, TAB 9 MUST NOT BE USED. THIS IS A PRECAUTION TO AVOID 300 VOLTS POTENTIAL BETWEEN TABS WHICH MAY DAMAGE THE RELAY CARD OR BLOW A FUSE.

4. The gain can be adjusted so that the relay pick-up is obtained between 0.01 and 1.7 MA input current.

5. Refer to GEI-92016 instruction book for information about amplifier (AMPL 626).

6. The components and circuits shown in dashed lines are protective components and do not affect the relay function.

7. A G01 polarized relay card is equipped with RX626 whereas a G02 polarized relay card is equipped with RX626 and RX627.

Fig. 5. One- or two-polarized relay function schematic
SPECIFICATION

Input: 0 to ± 300 VDC
Output: ± 10 volts at 1 MA

VOLTAGE CHECK LIST

(With +20 volts DC between Tab 30 and Tab 13, and -20 volts DC between Tab 3 and Tab 13)

<table>
<thead>
<tr>
<th>Plus</th>
<th>Minus</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab 2</td>
<td>Tab 13</td>
<td>0 to -10 volts DC (depending on input)</td>
</tr>
</tbody>
</table>

NOTES

1. Indicates retaining spring

2. The sequence wiring of receptacles may require wires for both entering and leaving a terminal. This is accomplished by making the connections to the horizontally adjacent terminals and inserting a jumper spring between the terminals.

3. Number in circle at side of receptacle indicates space unit requirements

4. See Fig. 5, NOTES 2 and 3.

Fig. 6. One- or two-polarized relay function connection
NOTES

1. Refer to the instruction book for detailed operation.

2. Numbers inside the small rectangles indicate tab numbers which correspond to matching receptacle numbers.

### TABLE I

<table>
<thead>
<tr>
<th>Card Catalog No.</th>
<th>Qty of Relays</th>
<th>Relay Nomenclature</th>
<th>Tab Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>193X704AAG01</td>
<td>1</td>
<td>RX626</td>
<td>See schematic above for tabs associated with relay nomenclature</td>
</tr>
<tr>
<td>193X704AAG02</td>
<td>2</td>
<td>RX626, RX627</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7. Card schematic 193X704AAG01, GO2
GEI-92015C  Sensitive Relay Card

FRONT VIEW SHOWING LOCATION OF COMPONENTS

HOLE TABULATION
ALL HOLES .052 DIA.
EXCEPT THE HOLES
TABULATED BELOW
LOC. DIA. GUAM.
A — .157 — 2
B — .078 — 18

UNIVERSAL AMPLIFIER CIRCUIT BOARD 193X701CA G01
AMPL 626 + R626 +

HOLE TABULATION
ALL HOLES .052 DIA.
EXCEPT THE HOLES
TABULATED BELOW
LOC. DIA. GUAM.
A — .157 — 2
B — .078 — 18

NOTE 1. INDICATED TAB NUMBERS CORRESPOND TO
MATCHING RECEPTACLE NUMBERS.

NOTE 2. CROSS HATCHED TABS INDICATE TABS USED.

3. CARD SIZE, .500-.005 X 5.130-.008

NOTES
1. Indicated tab numbers correspond to
matching receptacle numbers.

2. Cross-hatched tabs indicate tabs used.

3. Card size, 5.500-.000 X 5.190-.002

VOLTAGE CHECK LIST
(with +20 volts DC between Tab 30 and Tab 13, and
-20 volts DC between Tab 13)

<table>
<thead>
<tr>
<th>Plus</th>
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<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab 2</td>
<td>Tab 13</td>
<td>0 to ±6.3 volts (depending on input)</td>
</tr>
</tbody>
</table>

Fig. 8. Card layout 193X704AAG01, G02
(for G01, RX627 is removed)

SPEED VARIATOR DEPARTMENT

GENERAL ELECTRIC

ERIE, PENNSYLVANIA 16501