INSTRUCTIONS

CR7511-B113
ELECTRONIC VOLTAGE-SENSITIVE RELAY

The CR7511-B113 electronic voltage-sensitive relay consists essentially of a small magnetic relay and an electronic-tube amplifier. The magnetic relay is operated by the electronic-tube amplifier when the input signal voltage to the electronic relay rises above or falls below a preselected value.

Before installing, operating or servicing this equipment, reference should be made to the diagrams furnished separately with the equipment.

RECEIVING, HANDLING AND STORAGE

Immediately upon receipt, the unit should be carefully unpacked and examined for any damage sustained in transit. If injury or rough handling is evident, a damage claim should be filed immediately with the transportation company; and the nearest General Electric Sales Office should be notified promptly.

If the relay is not to be used as soon as it is unpacked, it should be stored in a clean, dry place and protected from accidental damage. Particular care should be exercised to avoid storing the unit in a location where construction work is in progress.

DESCRIPTION

CIRCUIT OPERATION

Typical elementary diagrams of the CR7511-B113G1 and CR7511-B113G2 electronic relays are shown in Fig. 1 and 2. As can be seen from these illustrations, the CR7511-B113G1 and CR7511-B113G2 relays are similar except for the voltages between transformer secondary terminals (6), (7) and (8); for the values of resistors 2R, 3R, 4R, 5R and capacitor 2C; and for the manner in which capacitor 3C is connected into the circuit. The input impedance of the CR7511-B113G1 electronic relay is 0.2 megohm for input signals connected to points 10 and 11; as a result the power drain on the input or signal-voltage source is very small. The input impedance of the CR7511-B113G2 electronic relay is 24,000 ohms for input signals connected to points 10 and 11.

As shown in the elementary portion of Fig. 1 and 2, transformer T supplies the anode and cathode voltages to tube 1 (Type GL-2050 thyratron) and the filament voltages to tubes 1 and 2 (Type 6SN7GT). Transformer T also supplies the grid or reference voltage to tube 1, the amount of this voltage being determined by the setting of potentiometer P.

With no signal voltage between terminals 9 and 11, or 10 and 11, the grid bias on tube 1 is positive for almost the entire range of potentiometer P. As a result tube 1 conducts and relay CR is energized.

However, if a d-c signal voltage is applied between terminals 10 and 11, one-half of tube 2 (Type 6SN7GT) conducts current while the other half blocks current flow (depending on the polarity of the signal voltage). Thus one-half of the applied voltage appears across resistor 3R. (Point 24 is negative with respect to point 20). When the voltage across resistor 3R is of sufficient magnitude to overcome the positive bias on tube 1, as determined by the setting of potentiometer P, the tube stops conducting and the relay becomes de-energized.

If the d-c signal voltage now decreases to the point where the bias across resistor 3R no longer overcomes the positive bias from potentiometer P, tube 1 will again conduct and energize relay CR.

By placing the voltage input signal across points 9 and 11, the same conditions exist except that the voltage divider (resistors 2R, 4R and 5R) permits only about one-sixth of the applied voltage to appear across resistor 3R. Therefore, the change in input signal must be approximately three times as great to produce the same change in grid bias on tube 1.

INSTALLATION

LOCATION AND MOUNTING

The electronic relay should be installed in a clean, dry location where it will not be subjected to excessive vibration and where the ambient temperature does not exceed 40 C (104 F) maximum. If this temperature limit is exceeded, it may be necessary to provide additional ventilation.

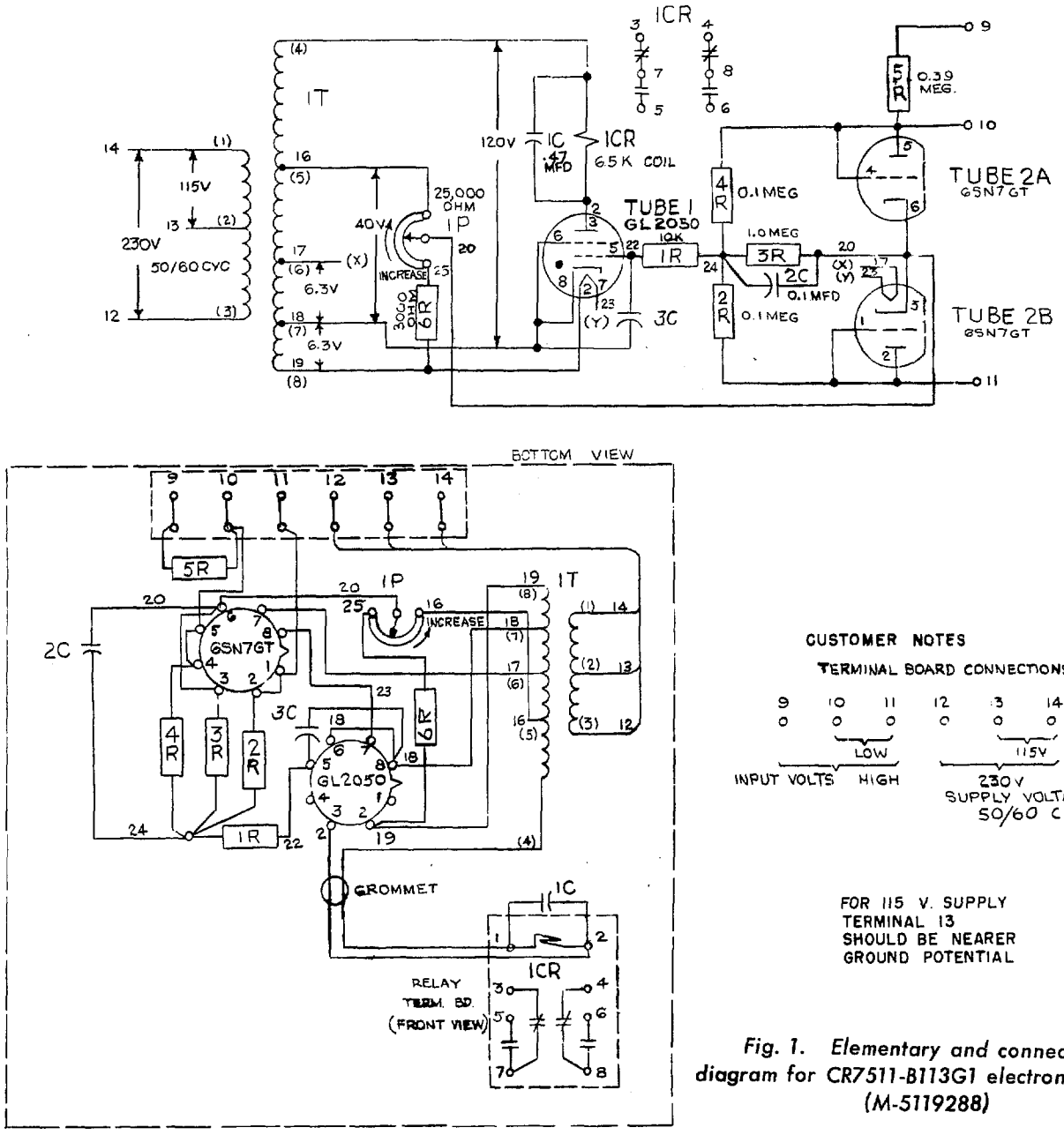

Fig. 1. Elementary and connection diagram for CR7511-B113G1 electronic relay (M-5119288)

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Mounting holes are provided in the back of the enclosure. Ample space should be left in front of the unit so that the relay can be removed from the enclosure.

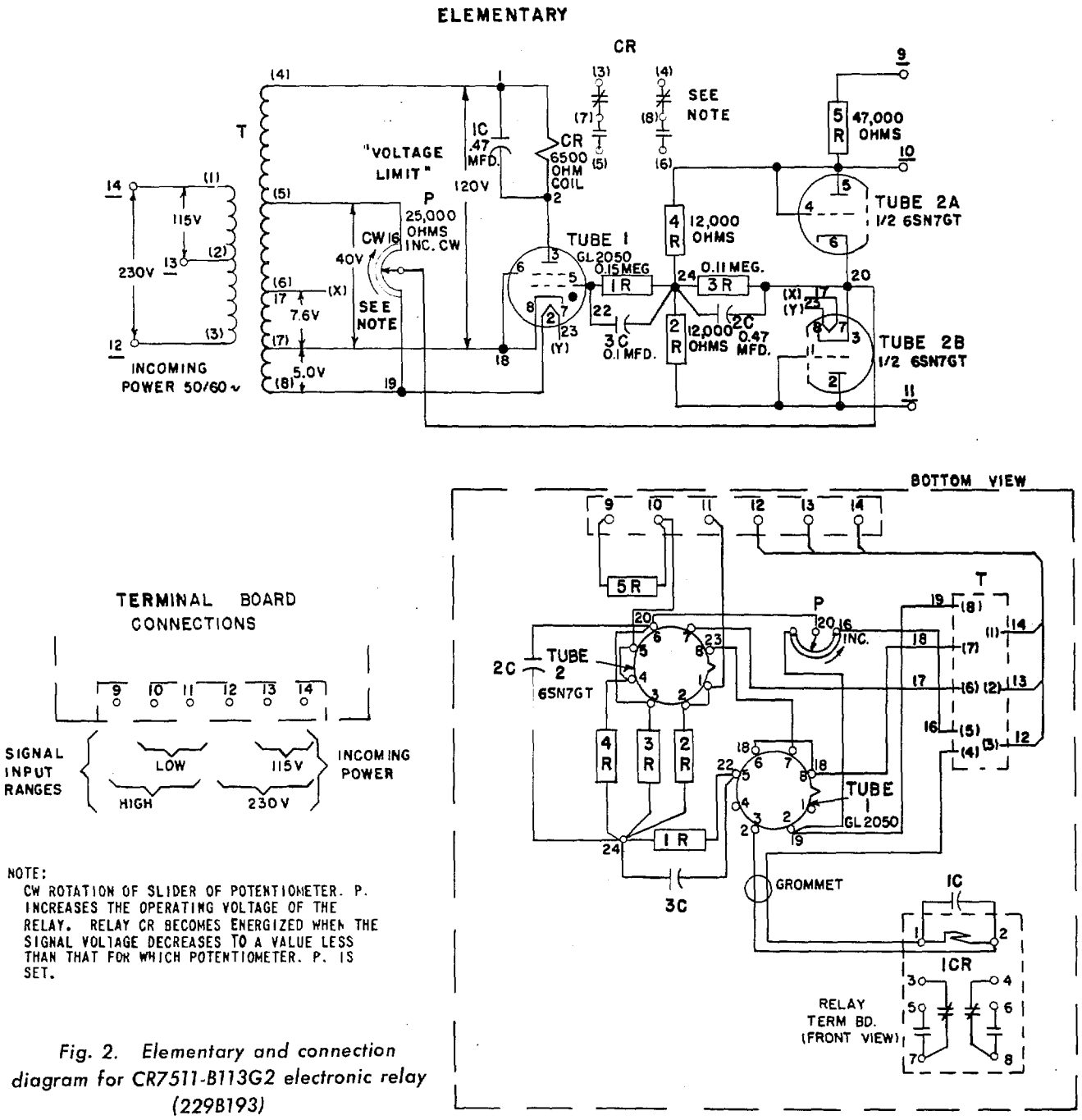
CONNECTIONS

Power Supply

As shown in Fig. 1 and 2, the electronic relay may be operated from either a 115- or a 230-volt, 50- or 60-cycle power supply. If a 115-volt supply is used, the connections should be made to terminals 13 and 14; if a 230-volt supply is used, the connections should be made to terminals 12 and 14. For best operation, terminals 13 (for 115 volts) or terminal 14 (for 230 volts) should be nearest ground potential.

Input Voltage

The input signal voltage connections are made to either terminals 9 and 11 or 10 and 11 depending on the voltage between the terminals and the sensitivity desired. The input voltage may be either d-c or a-c rms.



NOTE:
CW ROTATION OF SLIDER OF POTENTIOMETER. P. INCREASES THE OPERATING VOLTAGE OF THE RELAY. RELAY CR BECOMES ENERGIZED WHEN THE SIGNAL VOLTAGE DECREASES TO A VALUE LESS THAN THAT FOR WHICH POTENTIOMETER. P. IS SET.

Fig. 2. Elementary and connection diagram for CR7511-B113G2 electronic relay (229B193)

Caution: WHILE THE INPUT VOLTAGE IS THE VOLTAGE DIFFERENCE BETWEEN SIGNAL INPUT LEADS, AT NO TIME SHOULD THF POTENTIAL ON EITHER LEAD BE MORE THAN 310 VOLTS ABOVE GROUND.

The following voltage ranges are available:

Low Range: The reference voltage may be set at any level between 3 volts and 100 volts for G1 and between 5 to 100 volts for G2. When the signal input voltage between terminals 10 and 11 is less than the reference voltage set by the potentiometer, the relay is energized (picked up). However, if the signal voltage becomes greater than the reference voltage, the relay will become de-energized (drop out) and will remain de-energized until the signal voltage falls to a value which is slightly lower than the reference voltage. This voltage differential between pickup and dropout is approximately 3.0 volts d-c or a-c for the CR7511-B113G1 relay and 2.5 volts d-c or a-c for the CR7511-B113G2 relay.

Note: Input voltages as high as 300 volts d-c will not damage the relay. However, the relay will not operate when the input voltage is in excess of 100 volts d-c.

High Range: The potentiometer may be used to set the reference voltage at any value between 9 and 300 volts on G1 and between 15 and 300 on G2. The relay will respond to the signal input voltage between terminals 9 and 11 in the same manner as in the "Low Range" but it will be less sensitive. The differential between pickup and dropout is approximately 9 volts d-c or a-c for the CR7511-B113G1 relay and 7.5 volts d-c or a-c for the CR-7511B113G2 relay.

Typical differential will be less than 1.5 volts a-c or 0.5 volt d-c at signal input levels above 10 volts when using low range.

Magnetic Relay

The contact ratings are given in the accompanying tabulation. All connections to the magnetic relay should be made in accordance with these ratings.

VOLTS	AMPERES	
	Inrush	Carry and Break
115 or 230, a-c	NC 30 NO 30	10 10
	Break-inductive Load	
125, d-c	NO NC	0.2 0.1
250, d-c	NO NC	0.1 0.05

The response time of the magnetic relay is nominally 0.032 second, and is effectively the over-all dropout time of the relay. The total pickup time of the relay is the magnetic relay response time (0.032 second) plus the time for the voltage across capacitor 2C to decay to the reference voltage level. The latter time depends on the "voltage limit" setting, the input signal change, and the time constant of resistor 3R and capacitor 2C. The time constant is 0.0517 second for the CR7511-B113G2 relay and 0.1 second for the CR7511-B113G1 relay. The total pickup time will normally fall into the range, 0.032 to 0.25 second, depending on these factors.

Stabilizing Transformer (if used)

Changes in supply voltage will affect the voltage reference, and the input signal must vary accordingly to cause the relay to pick up or drop out. If it is necessary to hold the input signal constant in a particular application where the supply voltage varies, a stabilizing transformer for the power supply is recommended. The transformer should be rated at 0.012 kva or higher.

MAINTENANCE

Since the relay is an electronic device, little maintenance is required. The magnetic relay is the only moving part and should give long life if not used beyond its ratings. It is suggested, however, that periodic checks of the unit be made as a part of the regular preventive maintenance program. The a-c supply voltage should be checked; any variations should be within the limits decided upon at installation (see "Installation – Stabilizing Transformer"). All connections should be checked and dust or dirt which may have accumulated should be removed.

Do not use a file or other abrasive material on the relay contacts. Discoloration or pitting of the contacts is not detrimental. However, if the contacts do not make a good electrical circuit, they may be cleaned by drawing a hard finished card between the contacts.

To prevent the possibility of a prolonged shutdown as a result of tube failure, it is recommended that spare tubes always be kept on hand. Spare tubes may be ordered from the nearest sales office of the General Electric Company or from a supply store.

TROUBLE SHOOTING

If the relay should fail to operate properly, make the following checks:

1. Check the tubes. The simplest way to check a tube is to substitute a new tube and note any improvement in operation.

2. Measure the secondary voltages of the supply transformer and compare them with the values shown on the elementary diagram (Fig. 1 or 2).

3. Measure the resistance of the relay coil. It should be approximately 6500 ohms.

4. Look for loose connections and broken insulation.

5. Check the relay contacts to be sure that they open and close the load circuits.

RENEWAL PARTS

When ordering renewal parts, address the nearest sales office of the General Electric Company, specify the quantity required; and give the catalog numbers or describe the required parts in detail. In addition, give the CR number and the complete nameplate rating of the unit.