



## INSTRUCTIONS

GEK-86062  
Insert Booklet GEK-45307

### TRANSFORMER DIFFERENTIAL RELAY WITH PERCENTAGE AND HARMONIC RESTRAINT

TYPES STD99AB AND STD99AC

#### INTRODUCTION

This instruction book, together with insert booklet GEK-45307, forms the instructions for the Types STD99AB and STD99AC relays.

#### DESCRIPTION AND APPLICATION

The Types STD99AB and STD99AC relays are single phase, harmonic restrained, transformer percentage differential relays for the protection of high voltage rectifier transformers. These relays are similar to the STD15C, except that the harmonic restraint is provided by the second harmonic only. The higher order harmonics flowing in a rectifier transformer will not reduce the relay sensitivity. This harmonic selection is accomplished by tuned filters. The change in the type of harmonic restraint does not change the application or setting calculation as outlined for the STD15. The STD99AB and STD99AC relays are so designed that the harmonic restraint may be set at 12 percent minimum.

- Figure 1 - illustrates the internal connections diagram for the Type STD99AB relay.
- Figure 2 - illustrates the internal connections diagram for the Type STD99AC relay.
- Figure 3 - shows the internal connections diagram of the sense amplifier printed circuit board.
- Figure 4 - shows the external wiring diagram for the STD99AB relay
- Figure 5 - shows the external wiring diagram for the STD99AC relay
- Figure 6 - illustrates the test circuit for the Type STD99AB and STD99AC relays (note polarity when connecting DC sources).
- Figure 7 - shows the outline and panel drilling dimensions for the STD99AB and STD99AC relays.

*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.*

*To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.*

**TESTING INSTRUCTIONS**

The STD99AB and STD99AC relays may be tested per the instructions in the attached instruction book. In addition, the harmonic restraint can be set at 12 percent by adjusting R2. This may be checked by adjusting the Idc at 4.0 amps and the I<sub>1</sub> (current into relay) at 8.1 amps, per the test circuit illustrated in Figure 6 with the S2 switch closed to position "A."

A tolerance of plus or minus one percent is acceptable, therefore, if the relay operates within 11-13 percent harmonic restraint for the 12 percent calibration, no attempt should be made to obtain a more precise setting.

The following expression shows the relationship between the percent second harmonic, the dc component and the bypass current:

$$\text{Percent Second Harmonic} = \frac{0.212 I_{dc}}{0.45 I_1 + 0.5 I_{dc}} \times 100$$

By setting the Idc at 4.0 amps, and using a "percent second harmonic" of 11-13 percent, the following bypass current levels are required:

PERCENT HARMONIC RESTRAINT	I <sub>1</sub>
12	11.3

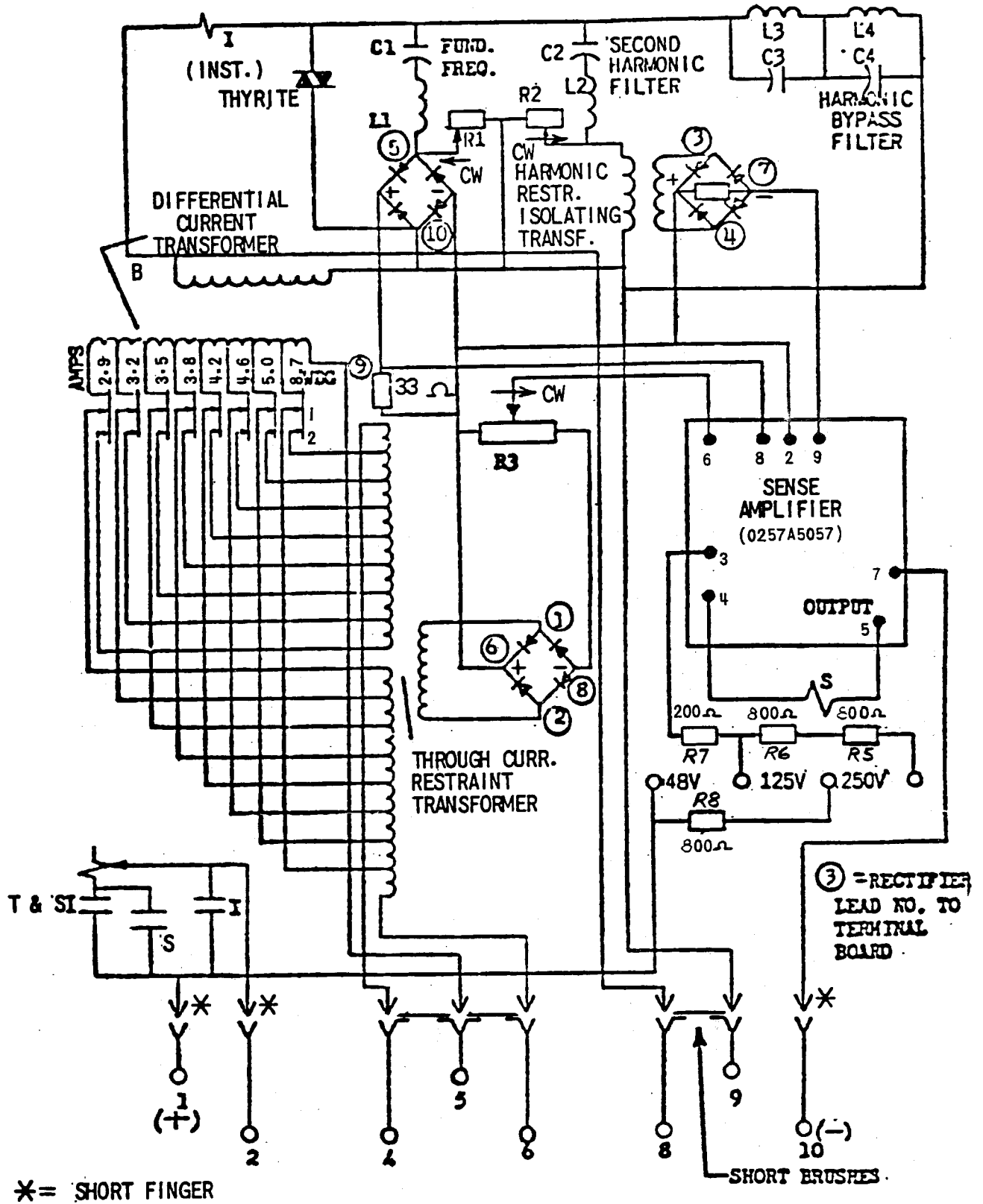


Figure 1 (0257A5031-0) Internal Connections Diagram for the Type STD99AB Relay (Front View)

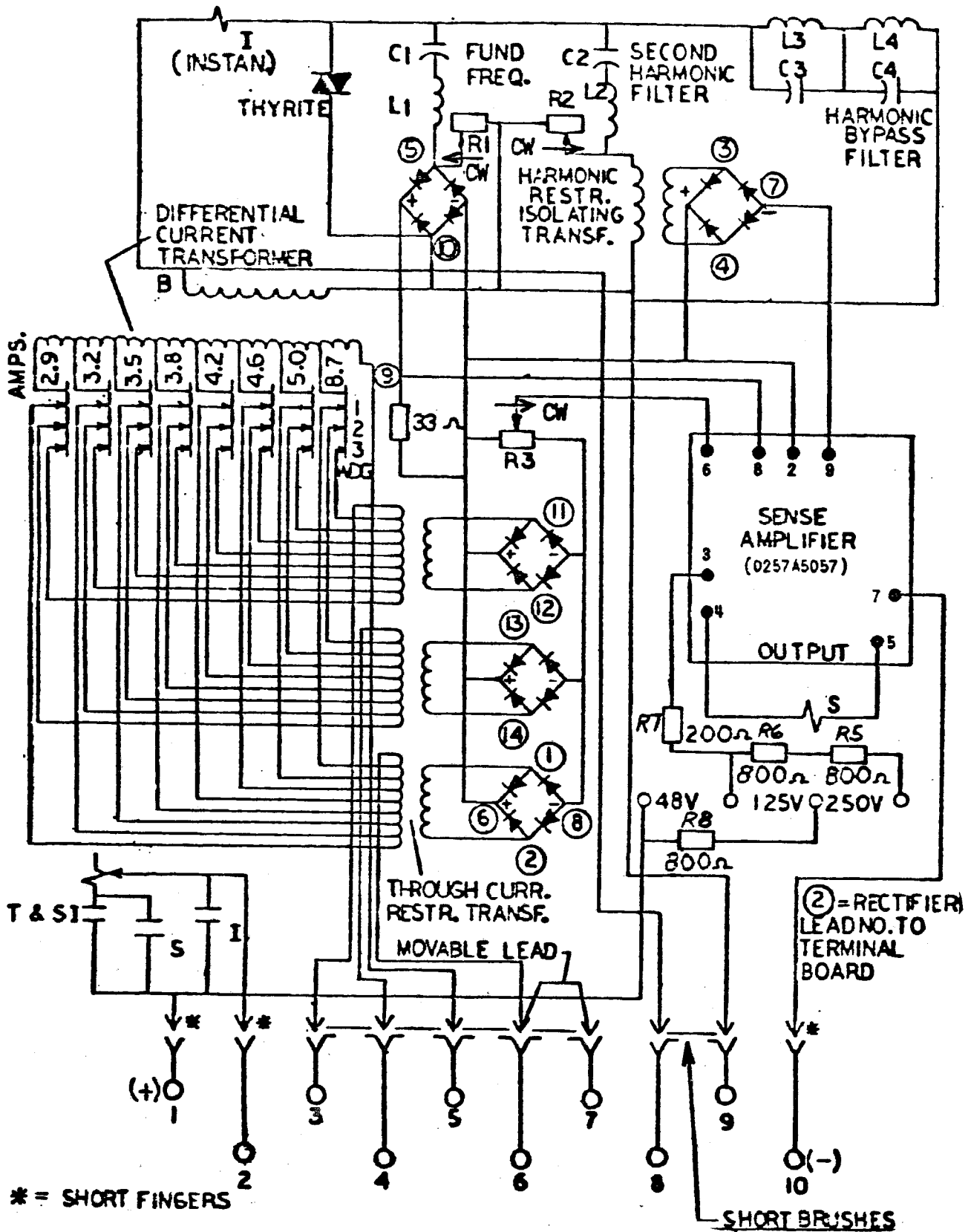


Figure 2 (0285A6750-0) Internal Connections Diagram for the Type STD99AC Relay (Front View)

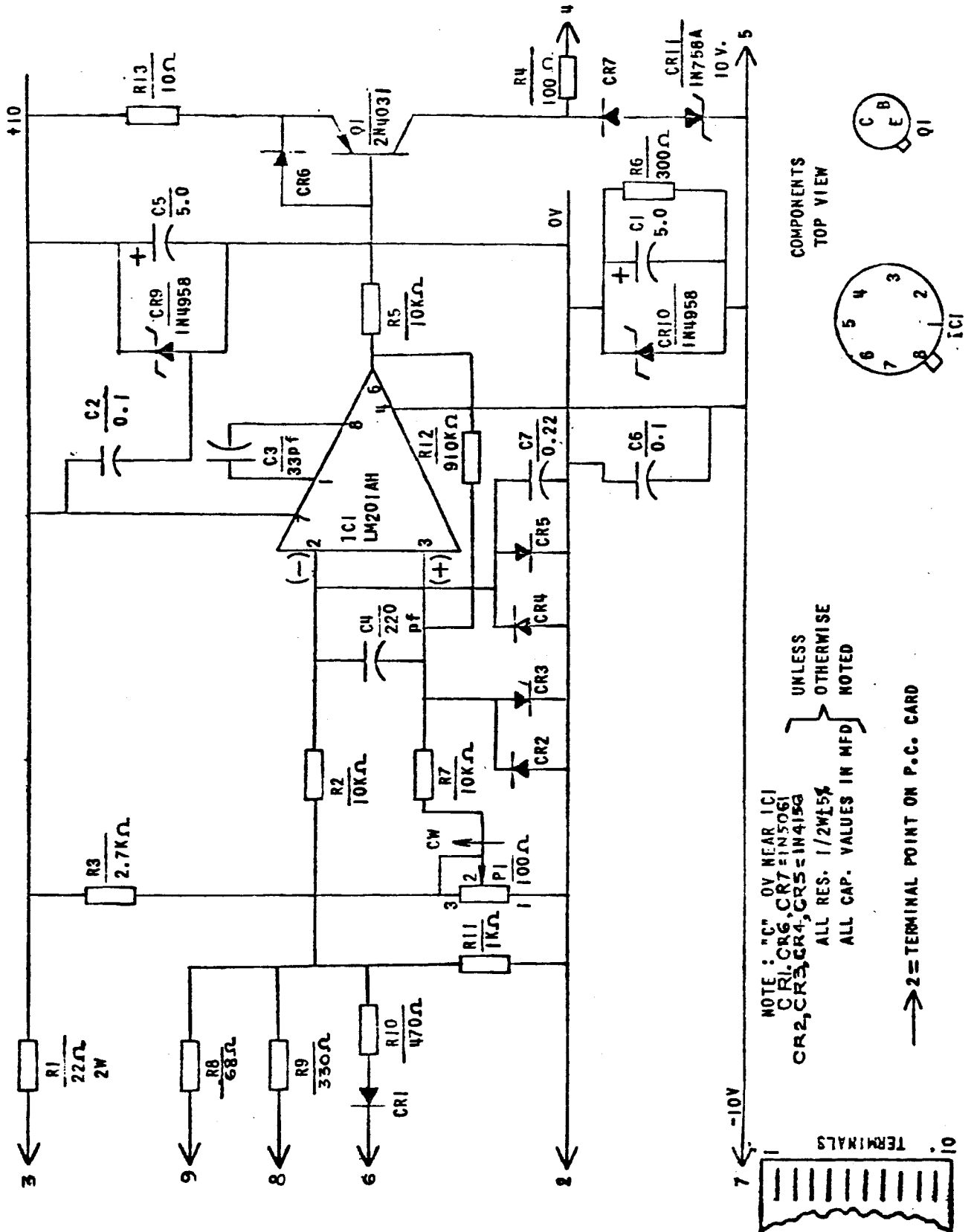


Figure 3 (0285A6749-0) Internal Connections Diagram of Sense Amplifier Printed Circuit Board

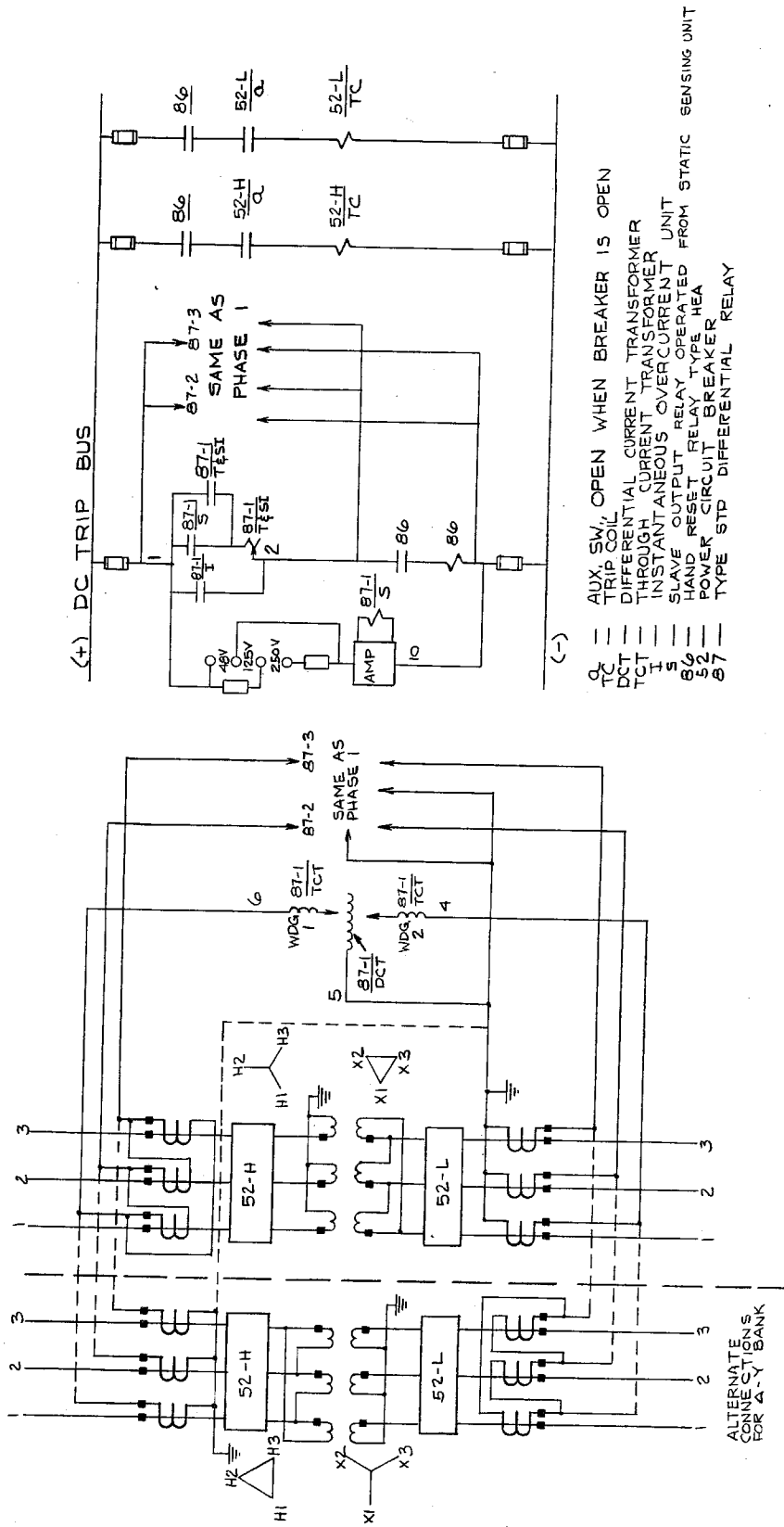


Figure 4 (0128B1981-1) External Wiring Diagram for the Type STD99AB Relay

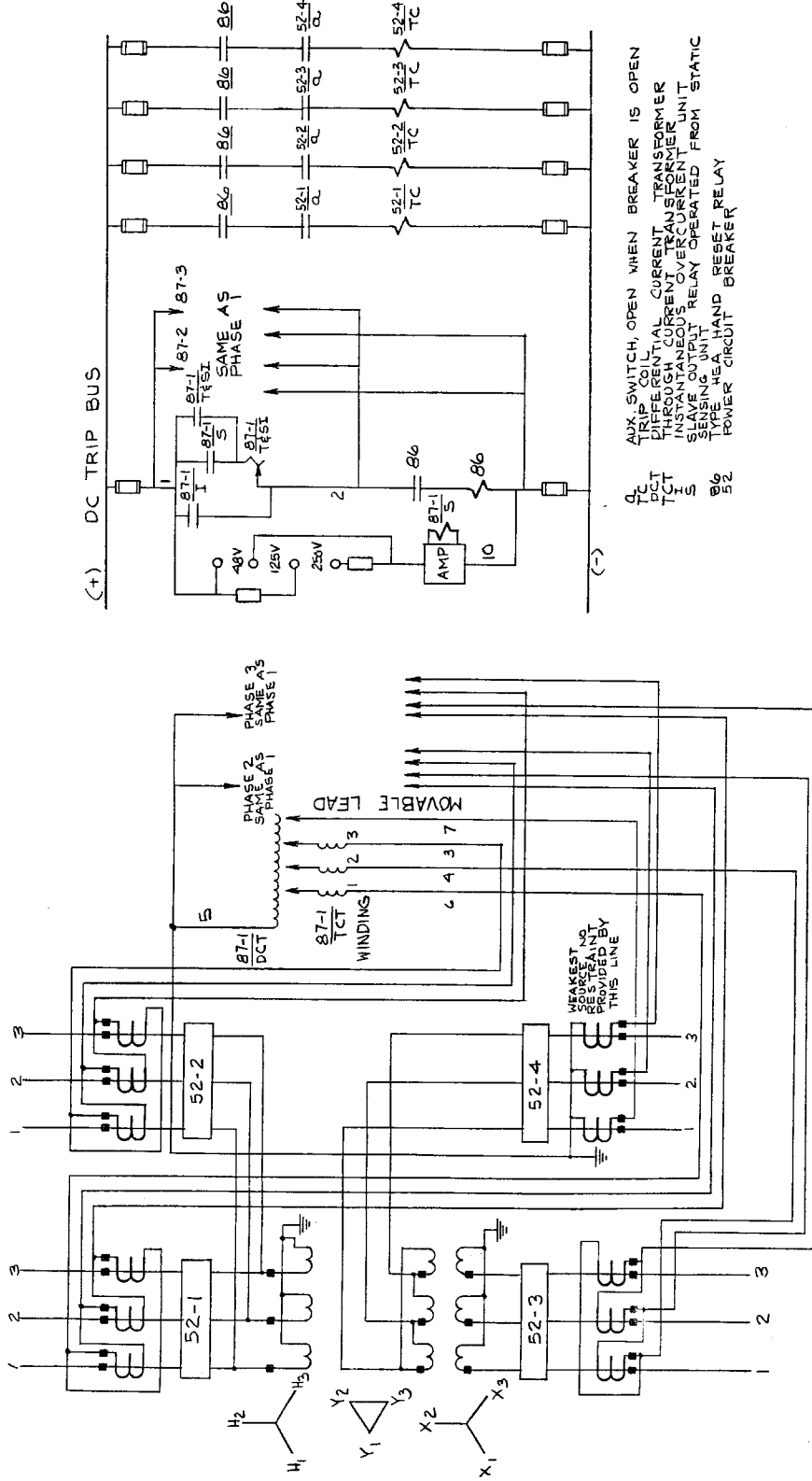
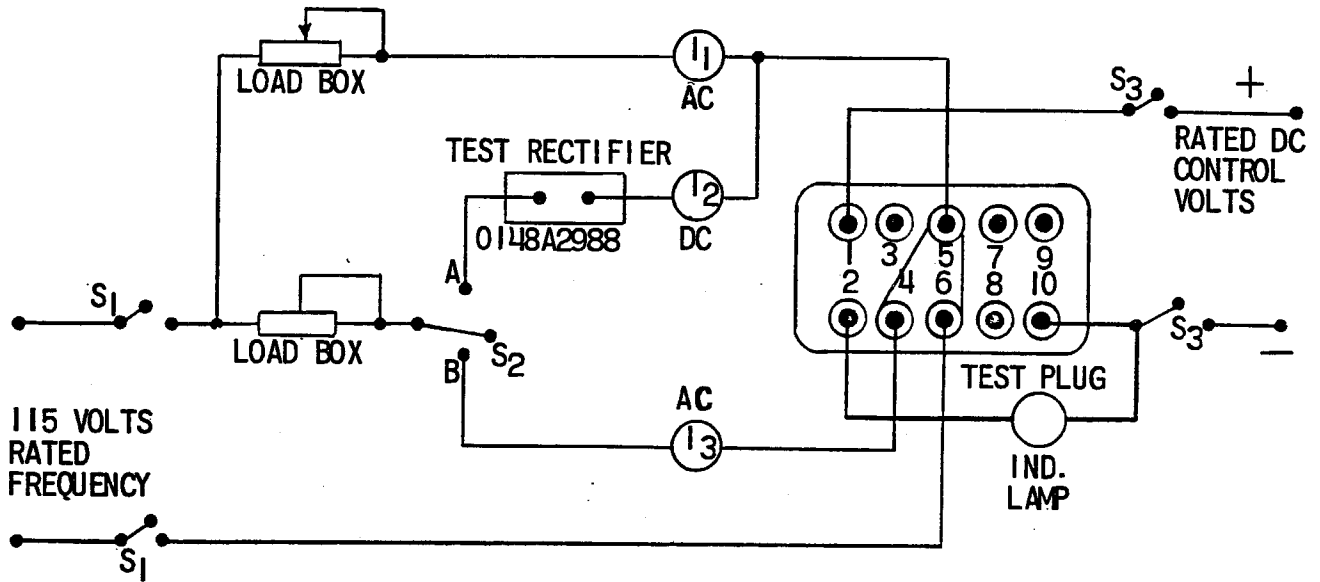
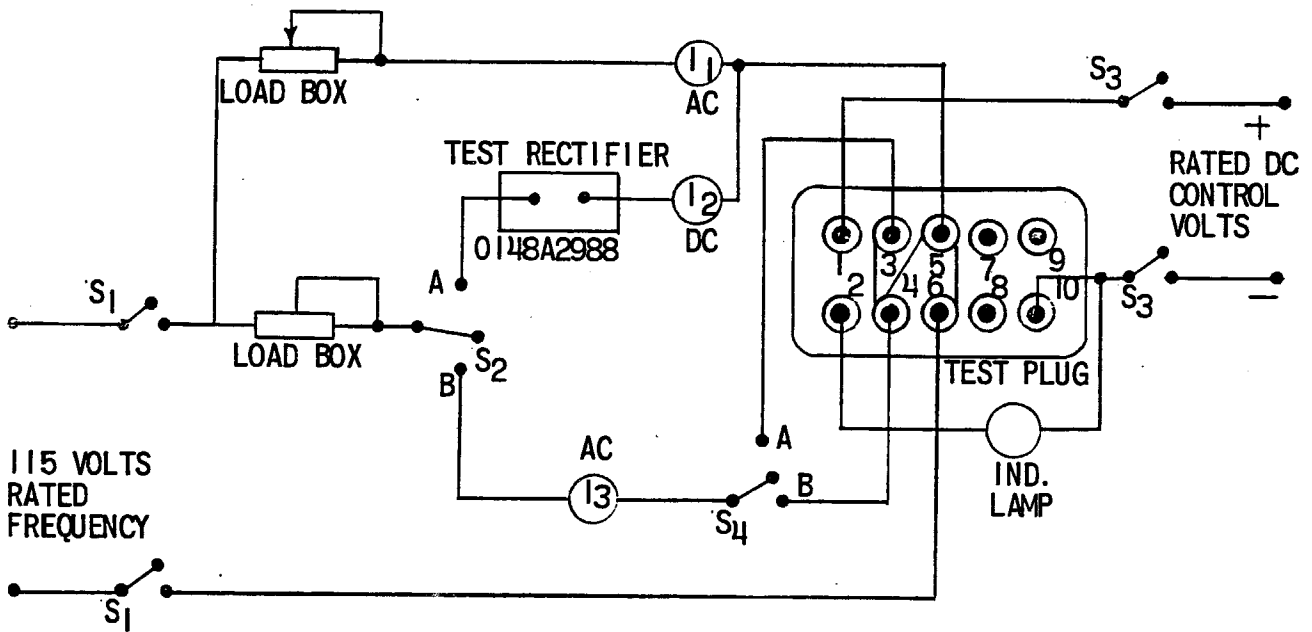


Figure 5 (0128B1982-3) Elementary Diagram for STD99AC Relays for Four Circuit Transformer Protection with Three Restraints



A. TEST CIRCUIT FOR STD25D OR 25E RELAYS  
(FOR STD 25E REVERSE POLARITY OF 1 & 10)



B. TEST CIRCUIT FOR STD26C RELAYS

Figure 6 (0227A2567-2) Test Connections Diagram  
for Type STD99AB and STD99AC Relays



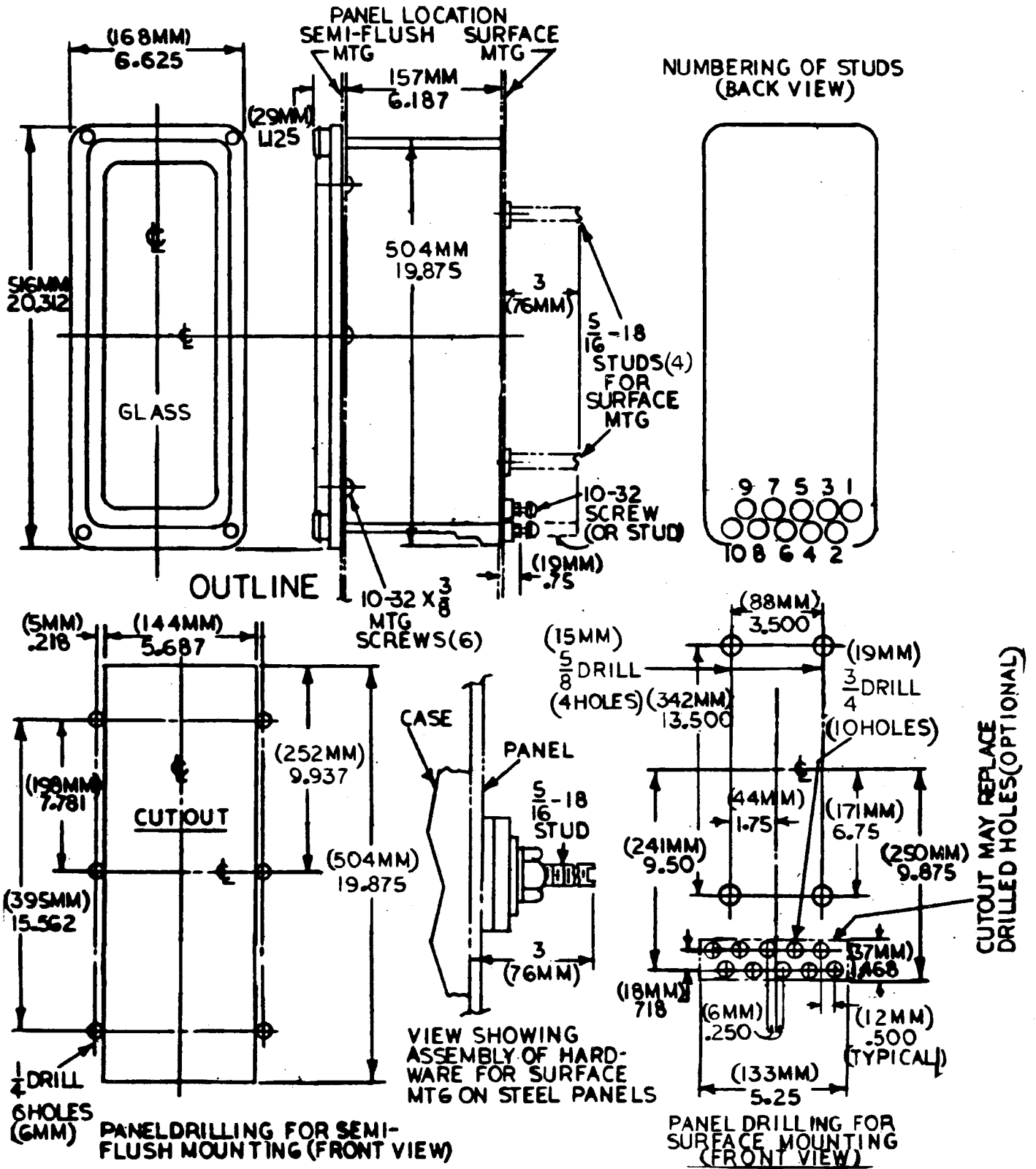


Figure 7 (K-6209275-1) Outline and Panel Drilling Dimensions for Type STD99AB and STD99AC Relays

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