I. L. 2362

Westinghouse

Type HA Relay

Ratio Differential Type For Generator Protection

File Relays

41-405

Buffalo Service
Mr. John Atkinson,
Service Manager

DOP

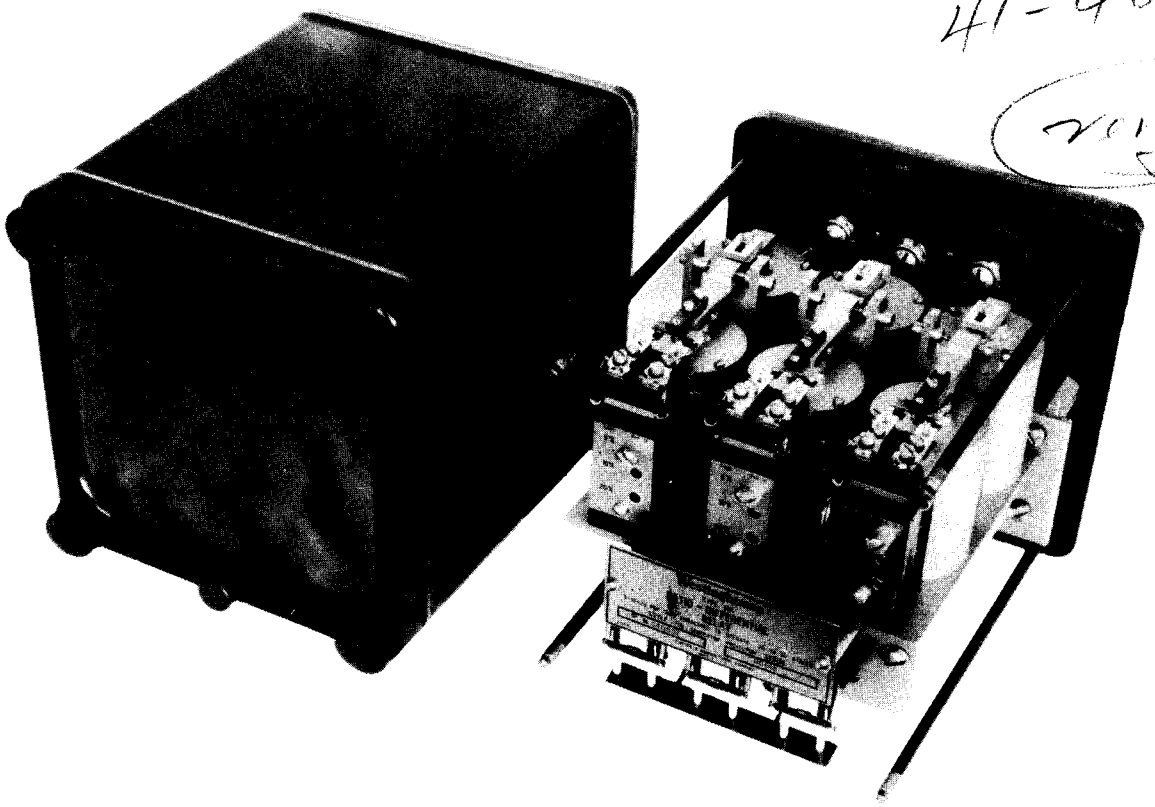

Fig. 1 - Generator Protective Relay

INSTRUCTIONS

DESCRIPTION

The type HA differential relay is designed to operate on the adjustable value of the percentage difference between the currents in the current transformers located in the incoming and outgoing leads of a generator or other machine.

This relay is not intended for transformer protection.

The relay operates on the balanced beam electromagnetic principle. There are two restraining coils wound on one magnetic core, arranged to attract one end of a balance beam to hold the contacts open. The other end of the beam is influenced by an operating coil, this coil being so connected as to receive currents which are equal to the difference in the currents of the two restraining coils.

Except for a small counterweight to control the minimum operating value, the balance beam works without any mechanical restraint, under the sole influence of the magnetic pulls. Thus, the action of the relay becomes proportional to the percentage difference in the value of the current in the two sides.

There is one complete differential operating element for each phase of a three phase system, and the relay is complete with three operation indicators and a contactor switch.

INSTALLATION

The relays should be retained in their original packages in a dry storeroom, while other construction work is going on, and should be mounted on the switchboard together with other instruments only when all other construction work has been completed and operation is to be started.

Remove the cover and take out all shipment packing, shipping wedges, etc. Inspect to make sure no parts are damaged.

Connect as per diagram.

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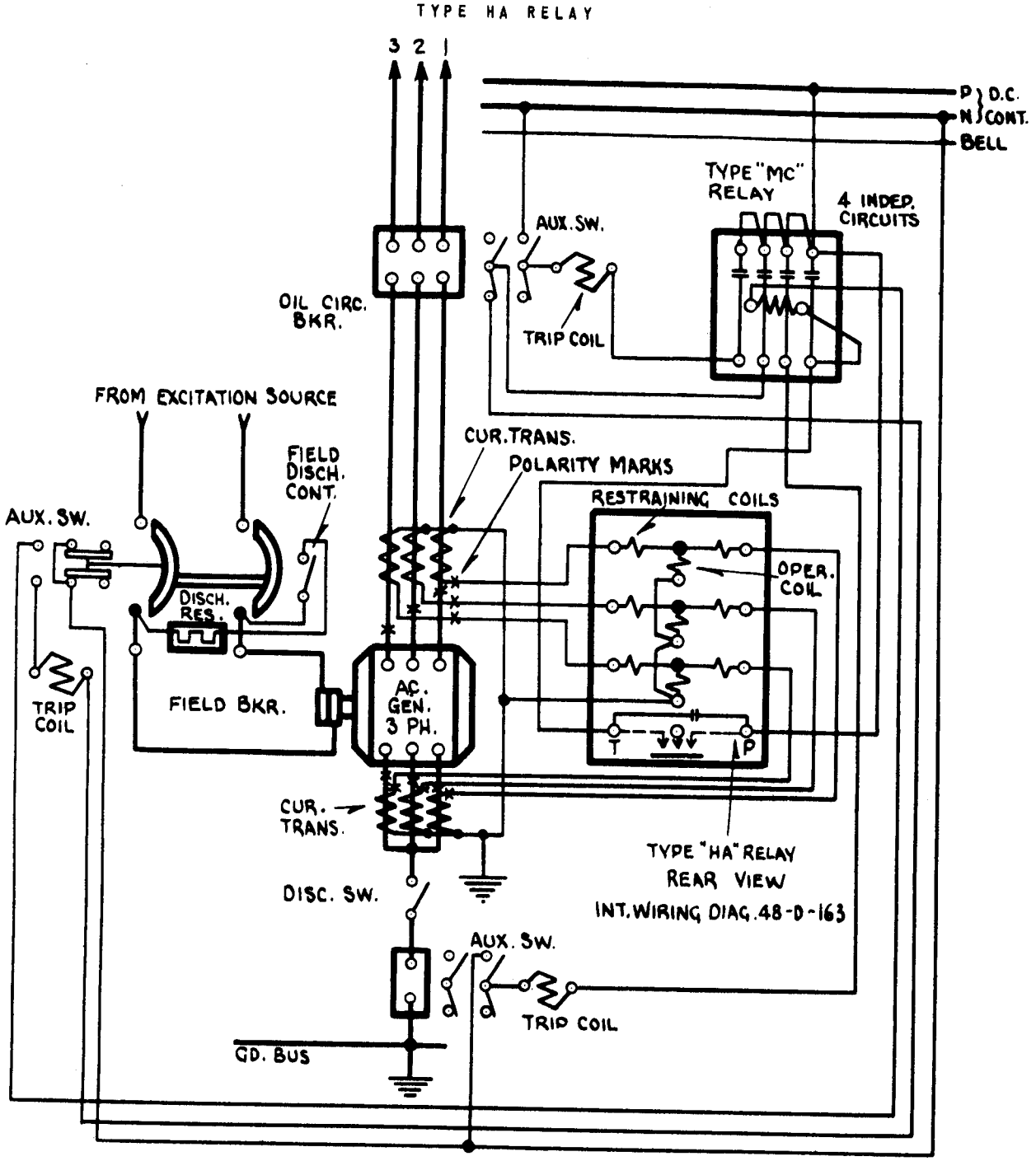


Fig. 2 - External Wiring for Differential Protection for 3 Ph. Generator Using "HA" Dif. Relay.

RELAY SETTINGS

These are obtained according to the value of the tripping desired by changing the "tap screws" in the three contact plates at the front of the relay.

ADJUSTMENTS AND MAINTENANCE

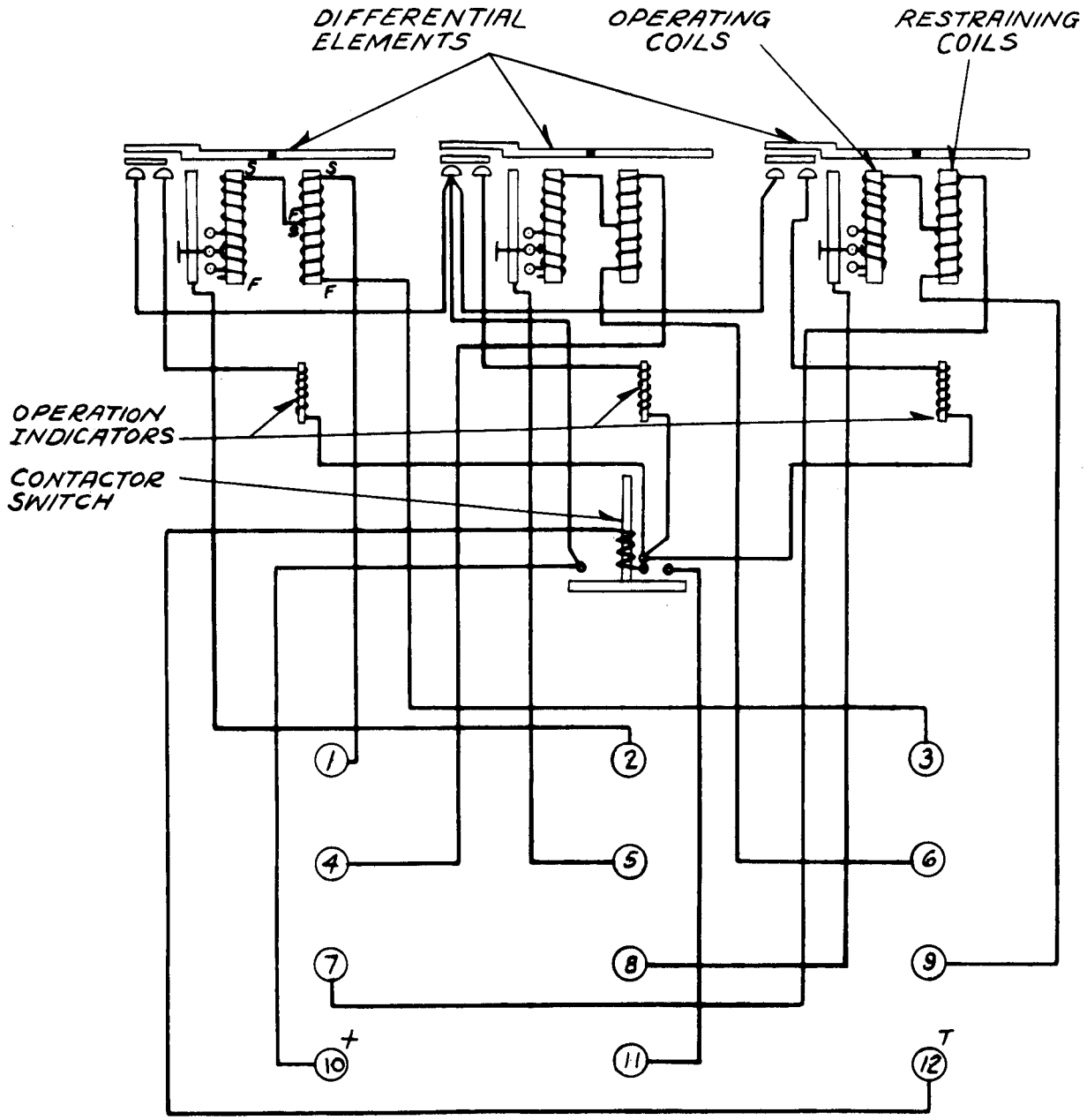
The relays are shipped from the factory with all adjustments properly made, and these adjustments should not be disturbed unless necessary.

If readjustments are later desired, proceed as follows.

Referring to Fig. 2, the two restraining coils are magnetically similar to the operating coil which acts on the front of the beam, the two restraining coils being wound over a common electromagnetic core.

The balance beam has pivot bearings which should have 1/64" end-play adjusted to maintain the beam in the centerline of the core screws.

The position or the beam when resting on the non-magnetic pin or stop on the top of the restraint element core should be horizontal. This is adjustable by means of the hexagon nut and lock nut.



FRONT VIEW

Fig. 3 - Type "HA" Ratio Differential Relay for Generator Protection - Wiring Diagram

By means of a feeler gauge, adjust the nuts on the operating coil to make the air gap between the beam and the hexagon core screw the same as on the opposite or restraint side of the beam.

To check the calibration, pass 10 amperes in one restraining coil, 10-1/2 amperes in the other restraining coil, and, therefore, one-half ampere in the operating coil. Under this condition, the relay should trip when the tap screw is in the 5% tap position.

To restore this adjustment, vary the hexagon screw adjuster in the operating coil air gap below the beam.

The balance weight is adjustable to control the minimum pickup with only one side of the circuit energized.

To restore adjustment, pass .1 ampere through one restraint coil and the operating coil and adjust the balance weight until the beam just trips.

CONTACT ADJUSTMENTS

These should be periodically inspected and cleaned. Adjust the stationary contacts to close at the same time with a follow of approximately .010" when the beam rests on the stop pin so as to give proper spring depression on the contacts.

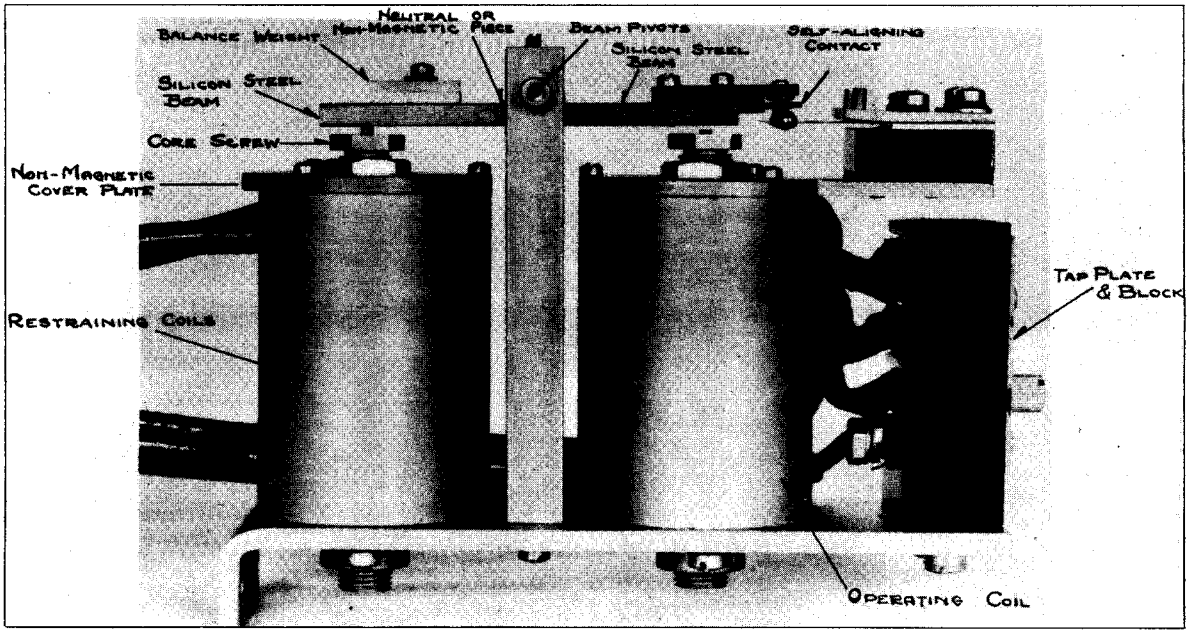


Fig. 4 - Ratio Differential Element

OPERATION INDICATOR AND CONTACT SWITCH

These are designed to pick up positively at one ampere d-c. The resistance of the trip circuit within the relay is 3.8 ohms, including both the indicator and contact switch coils.

It is desirable to load up the trip circuit to take four or 5 amperes d-c. in order to give positive action to the contact circuit.

Adjust for 1/16" clearance between the disc and the contacts of the contactor switch. The contacts should close at 1-1/2 amperes and not seal-in after 30 ampere d-c. has been applied.

Adjust the operation indicator to operate at one ampere d-c., increasing the current gradually. Test for sticking after 30 amperes d-c. has been momentarily applied.

VOLTAMPERE BURDEN

With 5 ampere balance current in each circuit, the burden on each current transformer will be one and one-half voltamperes at 60 cycles.

When an unbalance exists, this burden will be increased. Thus, with 5 amperes in one circuit and .5% unbalance, the burden on each transformer is increased 5 voltamperes.

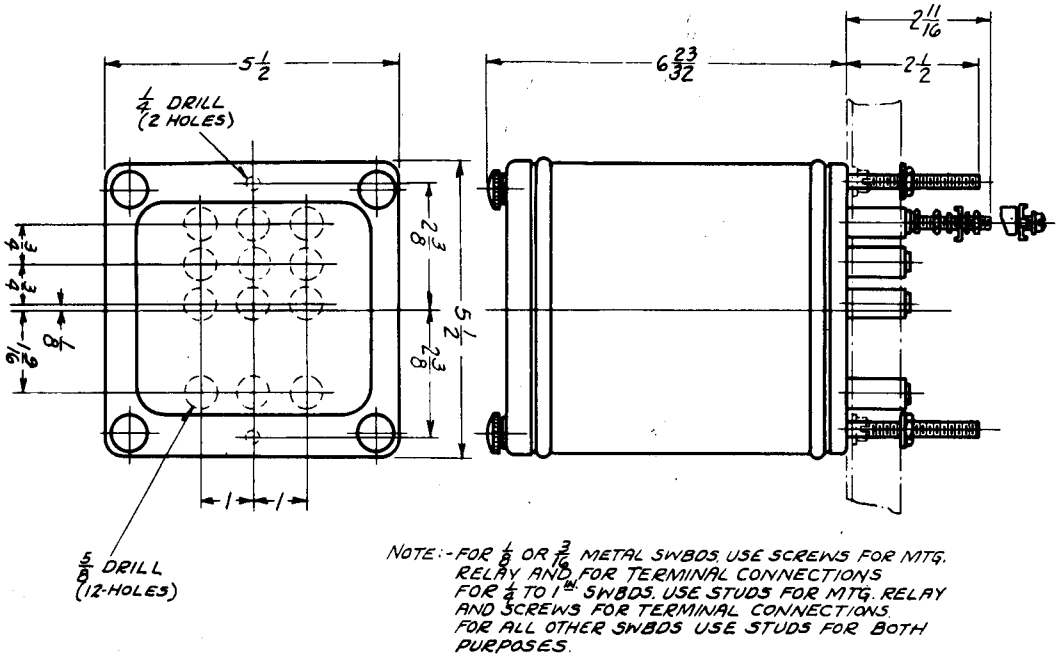


Fig. 5 - Type "HA" Generator Differential Relay
Outline and Drilling Plan