INSTRUCTIONS

GEK-34074B
Supersedes GEK-34074A

AC TEST PANEL

TYPE XTC11A

GENERAL ELECTRIC

CONTENTS

AC TEST PANEL

TYPE XTC11A

DESCRIPTION

The Type XTC11A AC test panel is designed to provide a means for checking the operability of a phase comparison relay (SLD). The panel provides a variable voltage supply, a percent pickup meter, a current limiting reactor, a trip test lamp, and a test switch. In addition, a provision for checking a phase comparison relay on a three terminal line is included.

The AC test rack equipment is mounted on a panel, three rack units high, suitable for mounting in a standard 19-inch rack. See Figure 2.

The test equipment includes a metered variable source of reactance limited current which can be reversed in phase. Simultaneously with reversal of phase, the current limiting reactance is changed in the inverse ratio to FDL/FDH pickup currents. The circuit is energized by placing the relay test switch in the INT or EXT position. Moving the RTS from NOR to INT or EXT opens the breaker trip, reclosing, and breaker failure circuits, and connects the test lamp to the trip circuits. Internal connections for the test panel are shown in Figure 1.

The test current control is a variac which provides a continuously variable voltage to the test circuit. It is supplied directly from the test voltage source at 120 volts, 60 cycles. Output of the variac is metered through a fused circuit including the percent pickup calibration rheostat, a fixed resistor and the percent pickup meter. To protect the meter against overload, four silicon diodes, arranged in a series-parallel forward conductance circuit, are connected across the meter terminals.

The metered variac output is then applied to the test current transformer which has secondary taps with six stepdown voltage ratios from 1:1/5 to 1:1/30. Taps allow good resolution to be obtained on the test current control at FDH pickup for all sensitivities from 0.75 amps up to five amps with a fixed current-limiting impedance. This impedance consists of the test reactor and the phase comparison network burden. For FDH pickup tests (RTS on INT), a three ohm test reactor tap is used. For FDL pickup tests (RTS on EXT), a four and eight ohm test reactor tap is used. Selection of the FDL reactor tap depends on the number of protected line terminals.

A front-of-the-panel indication of FDH pickup is provided by means of the trip test lamp. The trip test lamp is energized in response to tripping current flow through the SCRs, thus indicating FDH pickup with no remote blocking signal or local directional comparison blocking signal present. Trip circuit contacts of the RTS switch will prevent circuit breaker trip during test. When FDL picks up, half-cycle pulses of blocking signal (based on power system frequency) are transmitted. The FDL signal can be monitored at the FDL input lead of the comparer card.

RECEIVING, HANDLING AND STORAGE

The Type XTC11A AC test panel will normally be supplied as part of a phase comparison static relay equipment, mounted in a rack or cabinet with other static relays and test equipment. Immediately upon receipt of a static relay equipment, it should be unpacked and examined for any damage sustained in transit. If damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Sales Office.

Reasonable care should be exercised in unpacking the equipment. If the equipment is not to be installed immediately, it should be stored indoors in a location that is free from moisture, dust, metallic chips and severe atmosphere contaminants.

INSTALLATION TESTS

The Type XTC11A AC test panel is usually supplied from the factory mounted and wired in a static relay equipment. It has been calibrated with the rest of the units at the factory, and will have the same summary number on the unit nameplate. All these units must be tested and used together.

RATINGS

The XTC11A AC test panel is designed for operation in a maximum ambient air temperature of 55°C. The input voltage to the test panel is 120 volts, 60 hertz. This voltage must be in phase at all terminals.

Transformer secondary taps at block "MF" should be selected in such a way as to give the best resolution for a given test current. Maximum available relay current is 8 or 4.5 amps negative sequence.

PERCENT PICKUP METER CALIBRATION

The percent pickup meter reads the voltage applied to the test fault circuit in terms of percent of FDH or FDL pickup, depending on the position of the relay test switch (INT or EXT). The meter provides a quick indication of the accuracy of the tripping (FDH) and blocking (FDL) fault detector pickup levels relative to the level to which they were set at the time of installation.

The percent pickup calibration rheostat provides for adjustment of the percent pickup meter circuit to set the meter reading at 100 percent for FDH pickup in each particular installation. The amount of voltage required by the test fault circuit to produce FDH pickup current in the fixed circuit impedance is then read as 100 percent pickup. This voltage obviously depends on the pickup current selected for each installation and the meter must be correspondingly calibrated.

Once FDH and FDL pickup current levels have been set, the test circuit voltage required to produce FDH pickup is fixed. The meter is calibrated at 100 percent

with RTS on INT. When RTS is switched to EXT, the test circuit impedance is increased inversely to the FDL/FDH pickup current ratio, so that the same voltage, 100 percent on the meter, now will produce a current of FDL pickup magnitude.

The following sequence may be followed to calibrate the percent pickup meter.

1. Turn RTS to INT and raise the test current control to FDH pickup as indicated by the amber trip test lamp.

2. Adjust the percent pickup calibration rheostat so that the meter reads 100 percent and tighten the locknut.

3. Check that the meter reads within one percent of 100 percent at FDH pickup by turning the test current control to zero and raising it several times.

4. For future reference, read and record FDH pickup and dropout with RTS on INT, and FDL pickup and dropout with RTS on EXT.

5. Once the percent pickup calibration rheostat has been properly set, subsequent periodic tests can be made by placing the RTS in the proper position and adjusting the test current control to obtain FDH and FDL pickup and dropout without further readjustment of the percent pickup calibration rheostat.

TEST PROCEDURE

Local

Turn RTS to EXT. It should be noted that during this test, line protection must be delegated to backup relays. Turn the test current control so as to raise the test current as indicated on the percent pickup meter to 100 percent, plus or minus ten percent. The white channel alarm lamp should light, indicating FDL pickup, starting blocking transmission at half-cycle intervals.

Reduce the test current until the white channel light turns off. This shows FDL dropout level. The percent pickup meter should read zero to four percent below pickup level.

Turn RTS to INT and raise the test current until the white channel light turns on, indicating FDL has picked up. The percent pickup meter should read 75 percent, plus or minus seven percent for a two terminal line, and 37.5 percent, plus or minus four percent for a three terminal line.

Continue to increase the test current control until the amber trip test lamp lights. This will occur at 100 percent, plus or minus five percent on the percent pickup meter, and represents FDH pickup

Reduce the test current control setting until the trip test lamp extinguishes. The percent pickup meter reading at this point is FDH dropout, and should be 4 to 16 percent below the pickup reading. After FDH drops out, the channel alarm light should turn on. Reduce the test current to zero.

PHASE COMPARISON BLOCK AND TRIP TEST

INTRODUCTION

The tests outlined in this section utilize the test fault circuits at two coordinating terminals to simulate actual fault conditions, as seen by the two terminals simultaneously. The test voltage sources must be properly phased. The phasing procedure is described below.

When the relay test switches at both terminals are in the same position, the test currents appear to the relays as an internal fault.

TEST PROCEDURE

a. Station an operator at both terminals of the protected line (or each pair of terminals successively on multi-terminal lines). Turn the RTS at one terminal (Station A) to EXT, and raise the test current control to 125 percent. This action establishes phase comparison blocking signal transmission to the opposite terminal (EXT - 125 percent FDL-PU).

b. At the opposite terminal (Station B) turn the RTS to INT, and raise the test current control to 125 percent. This action establishes a phase comparison attempt to trip at this terminal (INT - 125 percent FDH-PU).

   Note that there is no amber trip test indication. Also observe that the channel alarm lamp is energized by step "a" and remains lit for step "b."

   These conditions represent a through-fault behind Station A, which is severe enough to cause Station B to attempt to trip.

c. Leave the test current controls set for 125 percent at both stations. Return both stations to test. At station B, turn RTS to EXT to establish phase comparison blocking signal transmission from Station B (EXT - 125 percent FDL-PU). Note that the channel alarm lamp remains on.

d. Turn RTS to INT at Station A to establish a phase comparison attempt to trip at this terminal (INT - 125 percent FDH-PU).

   Note that there is no amber trip test indication. Also observe that the channel alarm lamp remains on.

   These conditions now represent a through-fault behind Station B, which is severe enough to cause Station A to attempt to trip.

e. With the test current controls set for 125 percent at both stations, turn RTS to INT at both stations.

   Note that the amber trip test lamp lights at both stations, and the channel alarm lamp extinguishes. These conditions represent a fault internal to the protected line section.

f. Turn the test current controls to zero and return the relays to service by turning RTS to NOR.

TEST INSTRUCTIONS FOR FDH/FDL RATIOS OTHER THAN 4/3

CALIBRATION

Calibrate the percent pickup meter with the RTS switch in the INT position. Calibrate the meter for exactly 100 percent at FDH pickup level.

With the RTS switch in the INT position, the reading of the meter for FDL pickup will be:

$$\text{FDL \% PU} = \frac{\text{FDL PU Setting}}{\text{FDH PU Setting}} \times 100 \pm 5\%$$

With the RTS switch in the EXT position, the reading of the meter for FDL pickup will be:

$$\text{FDL \% PU} = 1.33 \times \frac{\text{FDL PU Setting}}{\text{FDH PU Setting}} \times 100 \pm 5\%$$

for two terminal lines, or

$$\text{FDL \% PU} = 2.66 \times \frac{\text{FDL PU Setting}}{\text{FDH PU Setting}} \times 100 \pm 5\%$$

for three terminal lines.

PHASE COMPARISON BLOCK AND TRIP TEST

With the RTS switches at Station A and Station B both in the same position (both in INT or both in EXT), the relays will trip providing the input test current is high enough to operate FDH.

With the RTS switches at Station A and Station B in opposite positions (one in INT and the other in EXT), the relays will block regardless of the input test current level.

AC TEST SOURCE PHASING

If built-in test facilities are to be effective for checking one terminal against another for proper blocking and tripping on simulated external and internal fault conditions, the AC test voltage sources at each terminal must be in phase.

Turn RTS to EXT and raise the test current control to 125 percent at a remote station. Turn RTS to INT and raise the test current control to 125 percent at the local station.

For installations using a CS26B carrier pilot channel, connect a scope between jack J202 on the transmitter-receiver unit and cabinet ground. Observe that the carrier RF signal has two levels: one from local transmission and one from remote transmission. These should intermesh so that there is not more than one-sixth of the interval between local transmitter half-cycles that is not filled in by remote transmitter output. This corresponds to a 30 percent maximum phase angle difference in supply voltages between the two terminals. A small portion of this interval may be due to network and test current circuit mismatches between terminals.

For installations using any other type of pilot channel, consideration must be given to the channel delay time within receiver filters, and the absence of a receiver output from local transmission for duplex channels.

MAINTENANCE

Other than normal adjustments of the percent pickup meter, and choosing the desired voltage at the "MF" block, no other ajdustments or maintenance are required.

TROUBLESHOOTING

Figure 1 indicates that there is a 3/8 ampere fuse in the percent pickup meter circuit. This fuse should be checked first in the event that the meter fails to register a reading.

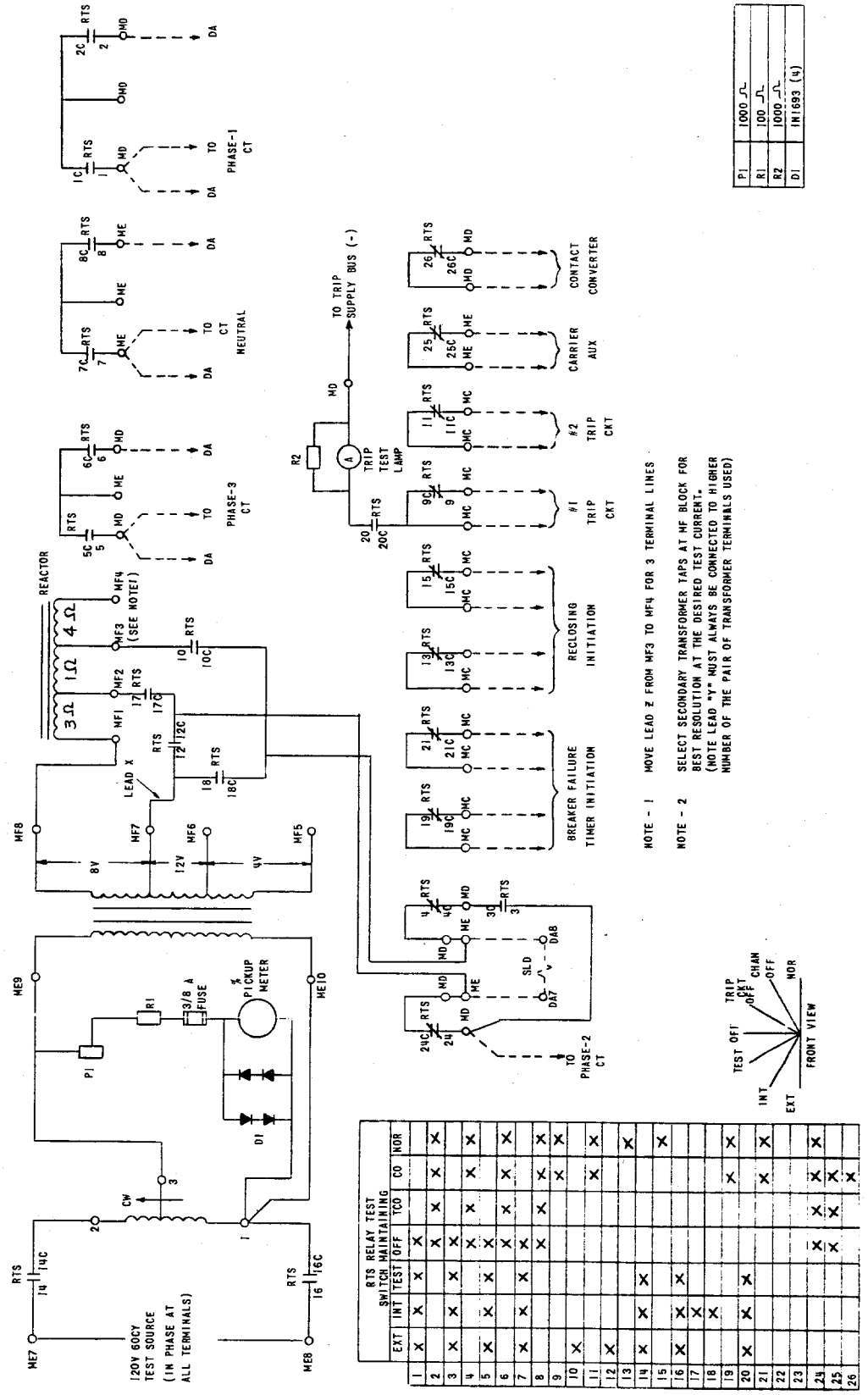

Figure 1 (0165B2560-1) Typical AC Test Panel Internal Connections for XTC11A Relay

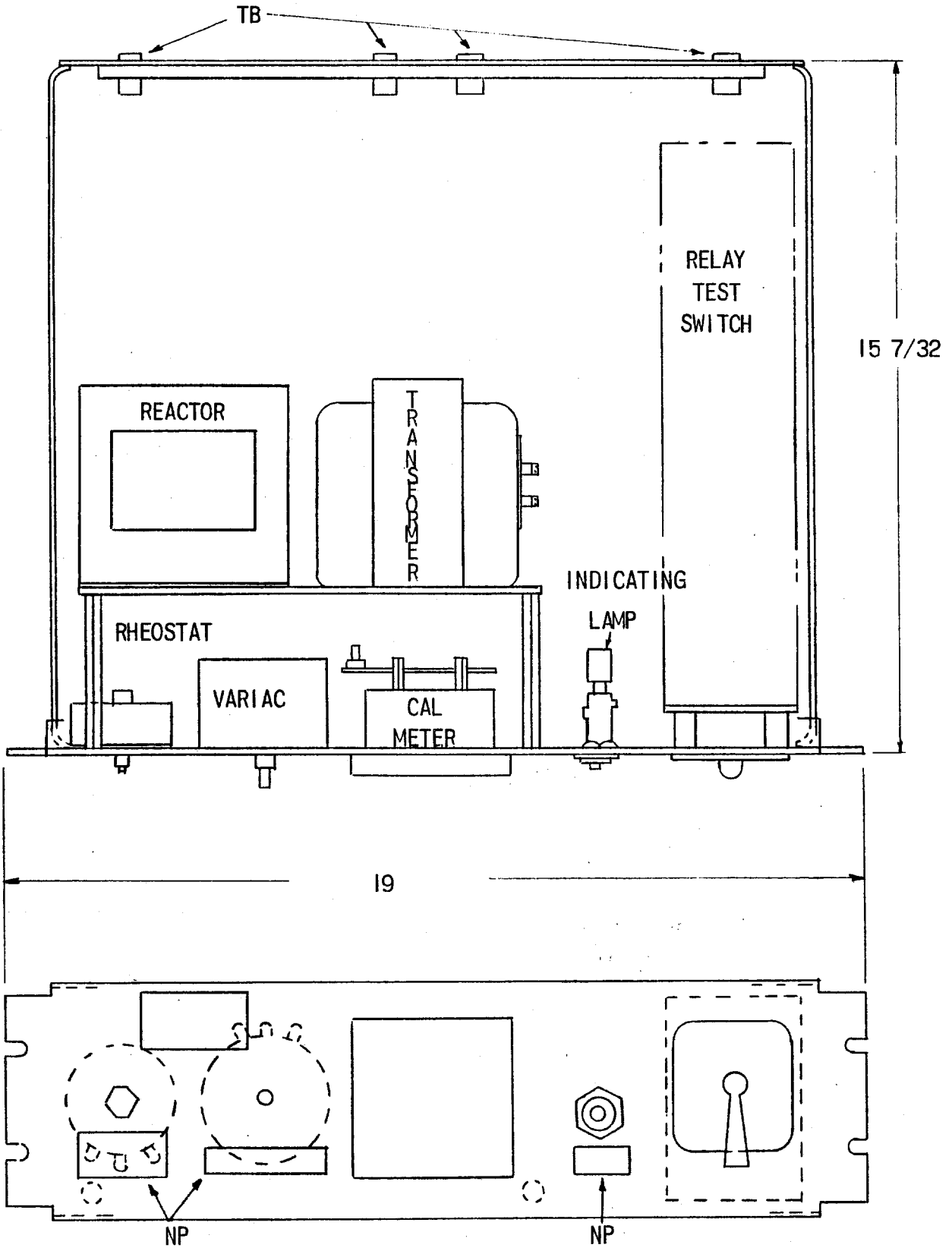

Figure 2 (0183B2490-0) Typical AC Test Panel Assembly for XTC11A Relay

Meter and Control
Business Department