INSTRUCTIONS

GEK-7301D

POWER SENSOR TEST SET

TYPE PST-1 & PST-1-1

FOR POWER SENSOR TRIP

TYPE PS-1

ACCESSORY ON LOW VOLTAGE POWER CIRCUIT BREAKER

TYPE AK-3/3A 25/50/75/100; AKT-3/3A-50

SWITCHGEAR PRODUCTS DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

POWER SENSOR TEST SET
TYPE PST-1

INTRODUCTION

The Power Sensor Test Set (PST-1) is a light weight unit designed for portability, and will make testing a breaker on "location" very easy.

A later design of the Power Sensor Test Set has been designated (PST-1-1) and offers improved performance when the available voltage falls below 115 volts 60 hertz. While the PST-1 test set was usable with source voltages between 115 and 125 volts 60 hertz, the PST-1-1 is usable with voltages between 105 and 125 volts 60 hertz. Except for the schematic drawing 184L387 (Figure 3), the test procedure and description for the PST-1 applies equally to the PST-1-1 device.

The Test Set is Designed:

To check current pick-up at the various level settings adjustable on the front escutcheon of the Power Sensor Unit.

To check the time current characteristics of the long time delay bands. The long time delay bands are selective as-maximum-intermediate-minimum at the front escutcheon of the Power Sensor Unit.

To test the Power Sensor Unit as a separate item independent of the breaker and its magnetic sensor coils.

To test the combination of Power Sensor Unit, Power Supply Unit, Power Sensor Trip device and associated control wiring while installed in a de-energized breaker. The Power Sensor Trip Device will trip a closed breaker under this test condition.

To check load carrying by applying 0.8 per unit of setting for sufficient time. (500 seconds for minimum time band).

To check time delay of the short time delay, and ground fault time delay bands. An indication of the grading of the bands in time only can be observed at the timer.

The Power Sensor Test Set is Not Designed:

To test the magnetic sensor coils, either as independent elements, or as system components. The magnetic sensor coils may be checked as part of the complete Power Sensor Trip System by means of the standard high current-low voltage test sets available on the commercial market.

Tests at the factory on the components of the Power Sensor Trip are performed on accurate shaped sine wave-sources. Distorted voltage sources would modify results of timing tests.

Testing - IMPORTANT

BEFORE INSPECTION OR ANY MAINTENANCE WORK IS DONE, BE SURE THAT THE BREAKER IS IN THE OPEN CONTACT POSITION. ALL ELECTRICAL POWER, BOTH PRIMARY AND CONTROL SOURCES SHOULD ALSO BE DISCONNECTED. THE TEST BREAKER SHOULD HAVE BEEN CHECKED BY RECOMMENDED INSTALLATION AND MAINTENANCE PROCEDURES BEFORE STARTING TEST.

Part I, Test Connections A or B.

A - Connection

This connection is used to test the Power Sensor Unit independently of other system components.

1. Connect Plug, P1, to the Power Sensor Unit.
2. Connect Plug, P3, to engage Plug P4.
3. Set "POWERSUPPLY" position on dc source selector switch.
4. Follow Part II of these instructions.

B - Connection

This connection is used to test the Power Sensor Unit, Power Supply Unit, Trip Relay and Cabling while combined with a de-energized AK-3 type breaker.

1. Connect Plug P-1 to Panel Connector J-2.
2. Separate the disconnect in the breaker located between power sensor wiring on the front frame and the wiring on the back frame.
3. Connect Plug, P-4, to the disconnect section wired to the back frame. Connect Plug, P-3, to the disconnect section wired to the front frame.
4. Set "EXTERNAL" position on dc source selector switch.
5. Follow Part II of these instructions.

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.

Part II Testing Sequence

A. Connect Test Set to 120 Volt AC 60 Hertz source by means of the appliance cord, P5. Throw Power Switch to the "on" position. Rotate variable transformer knob full counter clockwise.

B. Pick-Up Tests

Refer to Table II for Test Tolerance.

1. Long Time Delay

   a. Push mechanical reset of timer.

   b. Push Electric Reset Push Button. Repeat reset until both time and pick-up indicating lights are out.

   c. For overcurrent check, select the phase to be tested, or select ground connection to be tested for ground fault.

   d. Check dc Source Selector Switch is in position given in Part I of these instructions.

   e. Push "START" Push Button.

   f. Rotate "SIGNAL ADJUST" knob clockwise. Watch the meter for value at which pick-up indicating light shows. If desired, operate the "SCALE EXPAND" Switch to allow closer readings for range of values less than 1.5 per unit.

   g. Move the pick-up selector screw on power sensor unit to each value and repeat test. Range of values is 0.8 to 1.3 per unit. Repeat at one selected value on other phases.

2. Short Time Delay

   a. Push Electrical "RESET" Button.

   b. Move "SELECTOR" Switch to phase to be tested.

   c. Check dc source selector switch is in position given in Part I of these instructions.

   d. Set the Power Sensor Unit instantaneous pick-up screw to "MAXIMUM". Set short time band selector screw to "MINIMUM".

   e. Adjust the "SIGNAL ADJUST" knob until the meter indicates a value more than 10% below the pick-up point under test.

   f. Push the "START" Push Button.

   g. Immediately, raise the signal value by clockwise rotation of "SIGNAL ADJUST" knob. Observe value on meter when interlock circuit removes power from the meter. Refer to Test Tolerance in Table II.

   h. Repeat test for each pick-up setting of selector. If other phases were not checked in long time delay test, check one point on each phase.

3. Instantaneous

   a. Push Electrical "RESET" Push Button.

   b. Set signal to value 10% below point under going test.

   c. Reset Timer.

   d. Push "START" Push Button.

   e. Note that timer operated.

   f. Push Electric "RESET" Push Button.

   g. Set signal to value of 10% above point under going test.

   h. Push "START" Push Button. Observe very slight movement of the timer. Also, the test power will be removed from the meter.

   i. Repeat test for each setting. If other phases were not checked, check one point on each phase.

4. Ground Fault Pick-Up

   a. Set the Selector to "GF" ground fault.

   b. Start with "SIGNAL ADJUST" knob fully counter clockwise.

   c. Push Electrical "RESET" Push Button.

   d. Push "START" Push Button.

   e. Raise signal until the power to meter is removed. Refer to Test Tolerance in Table II.

   f. Repeat test for each position of Ground Fault pick-up settings.

C. Test Time

1. Long Time Delay

   a. Push Electrical Reset Push Button.

   b. Reset Timer.

   c. Select the phase to be tested.

d. Have dc Source selector switch as given in Part I of these instructions.

e. Set the signal level to the desired value. (See Table I).

f. Push "START" Push Button. Time indicating lamp lights. Pick-up indicating lamp lights. The timer is clocking time.

g. Power is removed from signal meter at the trip time. Read timer, and check Table I for the time-current values.

h. Repeat test at other signal levels and other time bands as desired.

2. Short Time or Ground Fault Timing

The Short Time or Ground Fault Timing is performed in the same way as the timing for long time. Ignore the time and pick-up indicating lights, as they provide no useful information in this test.

The small intervals of the time involved in these tests are such that the timer can only roughly indicate the time band selection.

D. Breaker Trip Circuit Test

1. Use the cable connections described under paragraph Part I-B Connection.

2. Close the disconnected breaker.

3. Perform any time delay or instantaneous test described in these instructions. Circuit Breaker will trip.

4. With the Circuit Breaker open, set the "Signal Adjust" knob fully counter clockwise for a minimum level. Push Electrical "Reset" Push Button and push "Start" Push Button.

5. With a d.c. Voltmeter, check for 100 volts d.c. at terminals of 110 mfd. Electrolytic Capacitor. If voltage does not lie between 95 to 115 volts d.c., the Power Supply is defective and should be replaced.

6. WARNING

a. CAREFULLY RECONNECT ALL DISCONNECT PLUGS, AND CHECK THAT THE THREE TRANSFORMER TAP SELECTORS ARE IN PLACE. FAILURE TO CARRY OUT THIS INSTRUCTION WILL DEFEAT THE BREAKER AUTOMATIC TRIP SYSTEM.

b. HIGH TEST CURRENTS FLOWING THROUGH THE BREAKER WITH TRANSFORMER TAPS OPEN CIRCUITED WILL CAUSE EXCESSIVE VOLTAGES CAPABLE OF DAMAGING THE COIL INSULATION.

E. Application Curves

1. Long Time Delay and Instantaneous GES-6020.

2. Long Time Delay, Short Time Delay and Instantaneous GES-6021.

3. Ground Trip Time Delay GES-6030.

TABLE I

Signal Level Readings On Meter	* Long Time Delay Tripping Time (Second)		
	Max.	Int.	Min.
1.5	460-700	230-360	78-120
2	260-400	130-200	45- 65
3	120-180	60- 90	20- 30
4	66-100	33- 51	11- 17
5	42- 66	21- 33	7- 11
6	30- 45	15- 23	5- 7.5
7	22- 32	11-16.5	3.6-5.4
8	17- 25	8.2- 13	2.8-4.2
9	13-19.5	6.6- 10	2.2-3.3
10	11- 16	5.3- 8	1.8-2.7

Short-Time Delay Tripping Time (Second) Reference Only	
Max.	0.325-0.50
Int.	0.16 - 0.30
Min.	0.07-0.15

Ground Fault Tripping Time (Second) Reference Only	
.06	.054-.135
.12	.115-.195
.18	.165-.270
.24	.220-.355
.30	.270-.430

Accuracy of the Long Time Delay time measurements require an additional tolerance of the band width shown in Table I to allow for the test meter accuracy of ± 2% of full scale. Any error in current measurement will cause an apparent error in timing of double magnitude. Thus, at 3 per unit test current the meter could vary on worst case ± 10 percent and the time could vary ± 20 percent off nominal limits.

TABLE II

Test Set Pick-Up Limits

Acceptable Tolerance

Long Time Delay		
Set	Expand Scale ± Div.	Normal Scale ± Div.
1.3	8.0	2.15
1.2	7.5	2.1
1.1	7.0	2.05
1.0	6.5	2.0
.9	6.0	1.95
.8	5.5	1.9

Short Time Delay				Inst.		Ground	
Set	± Div.	Set	± Div.	Set	± Div.	Set	± Div.
5.0	4.0	10	6.5	12	7.5		
4.0	3.5	8	5.5	10	6.5		
3.5	3.25	7	5.0	8	5.5	4 12 30	7.5
3.0	3.0	6	4.5	6	4.5	3 9 27	6.0
2.5	2.75	5	4.0	5	4.0	2 6 15	4.5
2.0	2.5	4	3.5	4	3.5	1 3 7.5	3.0

Above tolerances are derived from Test Set signal level meter accuracy of ± 2 percent full scale, and the ± 10 percent tolerance for pick-up current in the Power Sensor.

The tolerance is expressed in plus or minus divisions on the meter scale.

Set. is the signal level marked on the selector nameplate of the Power Sensor Unit.

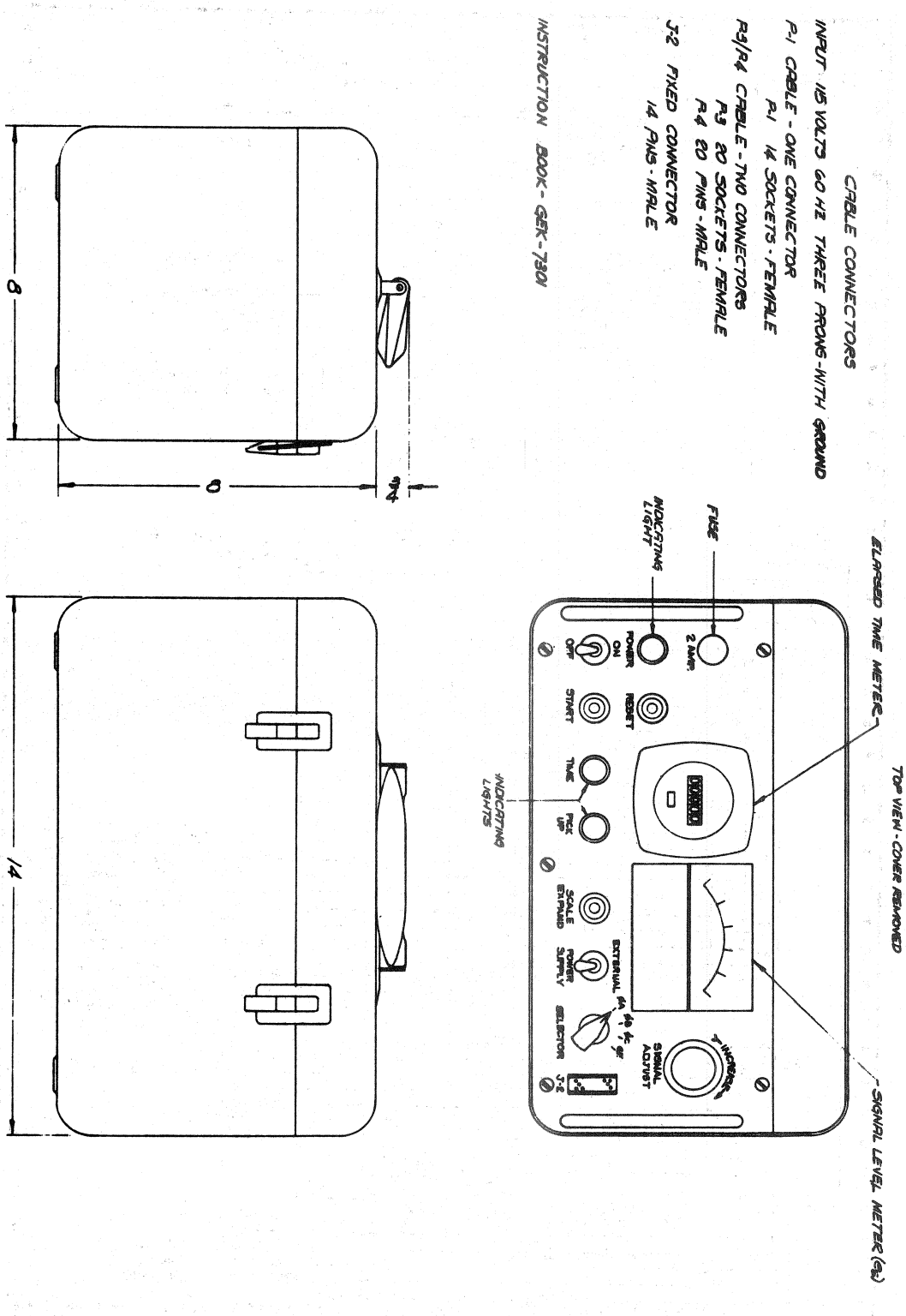

Figure 1 Outline Test Set Type PST-1 (0132C2639

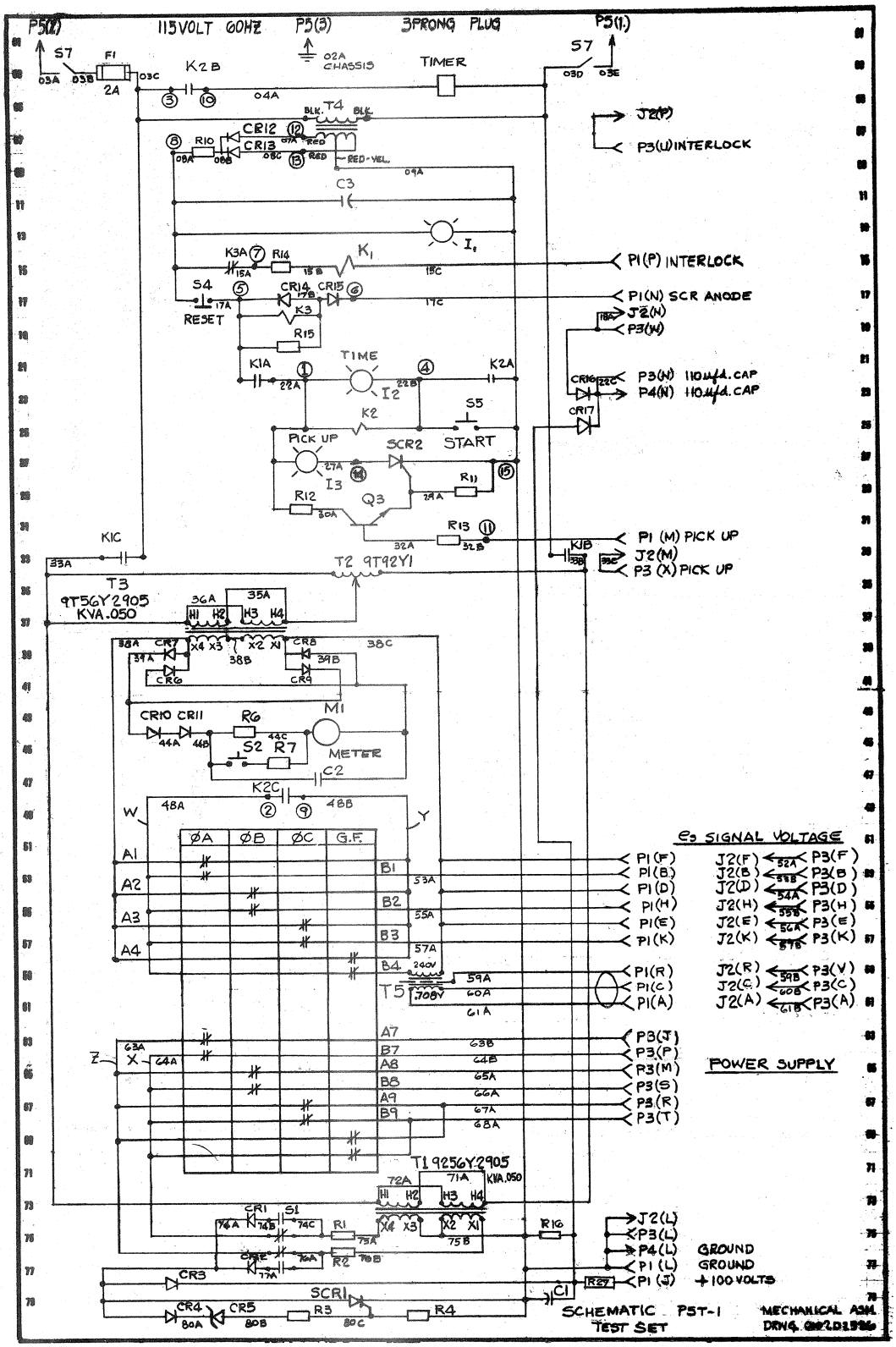

Figure 2 Schematic PST-1 Test Set (184L380)

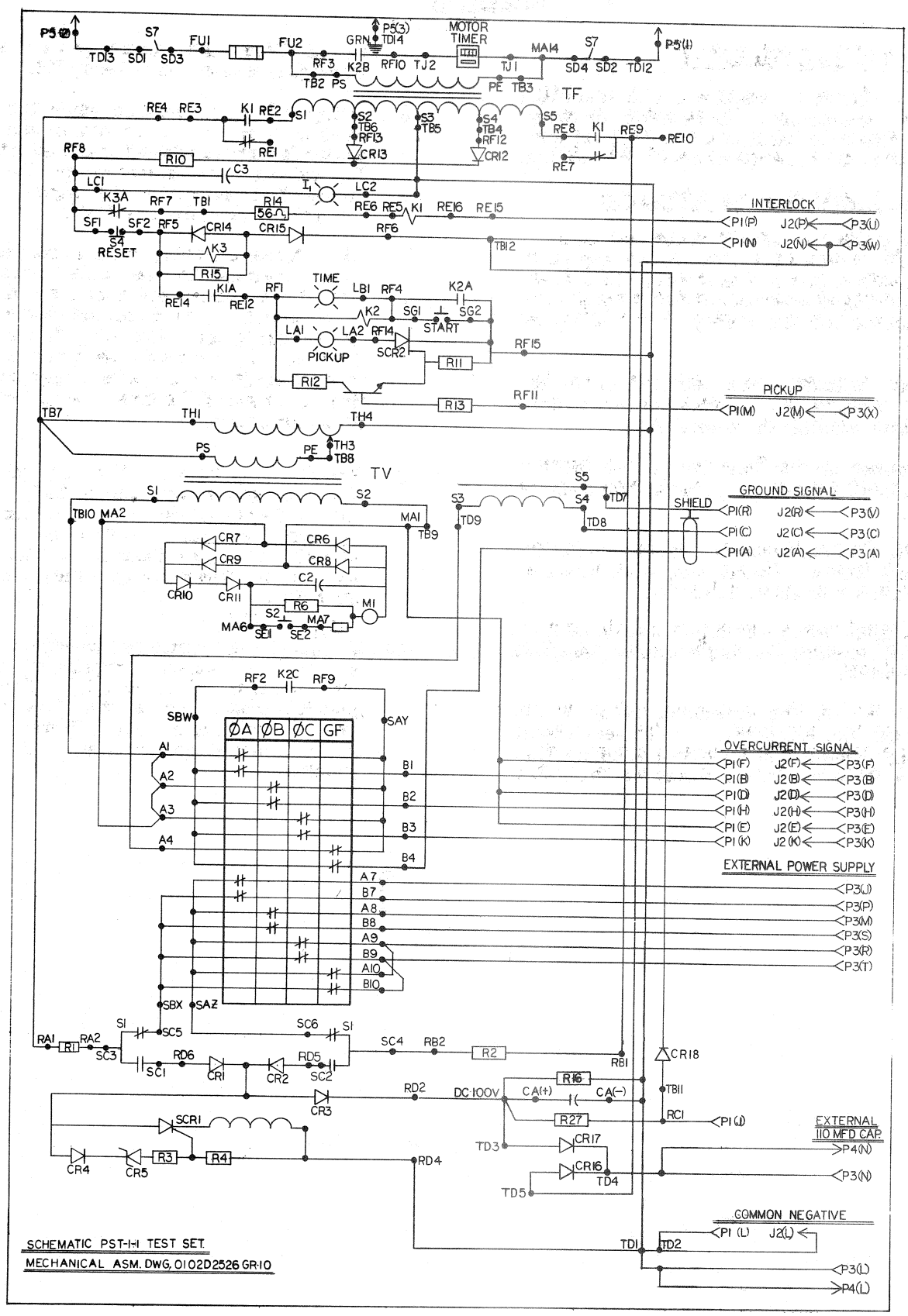

Figure 3. Schematic PST-1-1 Test (184L387)

APPENDIX

A. Description of Test Set, PST-1:

Outline is shown in Figure 1 and identifies the cable connectors. Schematic drawing, 184L380, shows the internal circuitry, switches and transferring arrangements of the cabling.

B. Elemental Description Of Circuitry:

1. Input voltage is obtained through connector P5 which is a three wire appliance cord with a ground conductor. The chassis and metal parts are connected to the ground conductor for the safety of the Test Set user.

2. Output voltages are isolated from the input voltage by means of iron core multiple winding transformers.

3. All power to the Test Set passes through the on-off switch, S7, and a two ampere fuse.

4. Relay, K2, functions as a starting contactor for the timer. Relay, K2, seals itself in through a contact of relay K-1.

   The signal voltage is applied to the Power Sensor system through Relay K2, (K2 C Contact).

5. Relay K1 is the interlock relay which permits the application of the test signal voltage conditioned upon proper connection of the cables. Also, Relay contact K1A de-activates the timer power source through interlock with Relay K2.

6. Relay K3 is energized when the Power Sensor trip circuit is functioned. This action interrupts the interlock loop through the cables and de-energizes Relay K1. Relay K1, removes the signal voltage from the Power Sensor Unit.

7. The Phase Selector switch connects the signal voltage to the phase under test. The tests are performed on a single phase basis. Therefore, all phases would be checked by advancing the Selector Switch. Do not move the phase selector switch while a test is in progress. Push the reset switch before moving the Phase Selector Switch.

8. Switch, S1, selects the Power Supply source. If a Power Sensor Unit is tested independently of the other system components have the switch on "POWER SUPPLY". This Switch position makes use of the Power Supply internal of the Test Set.

   If the Power Sensor System is tested except for sensor magnetics, set the switch, S1, to "EXTERNAL". This switch position makes use of the Power Supply source associated with Power Sensor System mounting in the AK3 Circuit Breaker.

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