SEL-PG10
SINGLE-ZONE PHASE DISTANCE RELAY
GROUND DIRECTIONAL
OVERCURRENT RELAY
AND FAULT LOCATOR

* ONE ZONE OF PHASE DISTANCE PROTECTION
* INSTANTANEOUS GROUND OVERCURRENT PROTECTION
* RESIDUAL TIME-OVERCURRENT ELEMENT WITH SELECTABLE CURVES
* NEGATIVE- AND ZERO-SEQUENCE GROUND DIRECTIONAL ELEMENTS
* PHASE AND GROUND TIMERS PROVIDE ZONE OR BACKUP COORDINATION
* PROGRAMMABLE OUTPUT LOGIC FOR FLEXIBLE APPLICATION
* FIVE CONTACT INPUTS FOR MONITORING EXTERNAL EVENTS
* FAULT LOCATING * EVENT REPORTING * METERING
* AUTOMATIC SELF TESTING * RS232C COMMUNICATIONS
GENERAL DESCRIPTION

The SEL-PG10 ONE-ZONE PHASE DISTANCE RELAY AND GROUND DIRECTIONAL OVERCURRENT RELAY WITH FAULT LOCATOR provides a single zone of high-speed and time-delayed protection for transmission and distribution lines and cables. It combines a single-zone polyphase distance relay (ZIP) with a directional instantaneous residual-overcurrent relay and a time-overcurrent relay (67NI and 67NT), yet occupies less panel space than a single zone-packaged electromechanical distance relay.

It is designed to replace one electromechanical zone-packaged relay in upgrade applications where the benefits of backup ground protection, fault locating, event reporting, and remote communications are desired.

Because it occupies less panel space than common electromechanical distance relays, and since it is available in a vertical or horizontal form factor, retrofit is conveniently accomplished with very little effort.

Its low price makes it attractive for use as a fault locator or a backup relay. For backup applications, timers are included for delayed tripping initiated by the phase distance or the instantaneous residual-overcurrent elements.

The SEL-PG10 Relay Function Block Diagram illustrates the basic configuration of the protective capabilities.

Analog inputs from current and voltage transformers are delivered to the protective relaying elements and saved for additional features, such as metering and fault locating.

The relay elements process the analog data. Some intermediate logic is performed, such as overcurrent supervision of the mho elements and directional supervision of the residual-overcurrent elements.

The status of the intermediate results and some other information are recorded in the Relay Word.

Logic for controlling the output relays uses the Relay Word data. Most of that logic is programmable by logic masks.

APPLICATIONS

The SEL-PG10 relay’s event-reporting and fault-locating features economically provide valuable engineering and operating information, eliminating the need for event recorders and oscillographs in most applications. Its instrument transformer burden is negligible.

Time-Step Relaying

The SEL-PG10 relay provides one zone of time-step protection, with separate timers for phase and ground faults.
Backup Relaying

The SEL-PG10 relay can be applied for phase and ground backup. Its programmability and remote-access capabilities allow the relay settings to be adjusted remotely to meet virtually any contingency.

In line terminals using electromechanical polyphase relays for phase-to-phase and three-phase faults, consider replacing one of the electromechanical relays with an SEL-PG10 relay to obtain phase distance AND ground directional overcurrent protection, fault locating, event reporting, and other features. No additional panel space is required, as the SEL-PG10 relay is available for vertical and horizontal mounting.

Fault Locating and Event Reporting

The SEL-PG10 relay is the most economical approach to adding fault locating and event reporting to line positions already equipped with adequate relaying.

SPECIFICATIONS

Relay Functions  Who characteristics for phase-phase and three-phase faults
  One phase-to-phase zone
  One three-phase zone
Residual overcurrent protection for ground faults
  One instantaneous element
  One definite time element
  One time element with four selectable curve shapes
  Negative- and zero-sequence directional elements for ground faults. Zero-sequence element is dual polarized.
  Phase overcurrent elements supervise mho elements.

Relay Elements

Phase overcurrent:
  50A, 50B, 50C (phase fault detectors)
  Pickup: 0.5 to 40 A, +/- 0.1 A +/- 2% of setting.
  Transient Overreach: 5% of set pickup.

Distance element specifications:
  Phase distance:
    2IP: 0.125 to 32 ohms
  Three-phase distance:
    2IABC: 0.125 to 32 ohms
  Torque Angle Setting: 47 - 90 degrees in one-degree steps.

Operating times:
  Who elements operate in 10 - 45 ms (25 ms typical), including output relay delay.
  A 0 - 2000 cycle timer is provided for the mho elements.
Steady-state Error:
  5% of set reach +/- 0.01 ohm at angle of maximum
torque for V > 5 V and I > 2 A.
  10% of set reach +/- 0.01 ohm at angle of maximum
torque for 5 > V > 1 V and 0.5 < I < 2 A.

Mho Transient Overreach:
  5% of set reach, plus steady-state error.

Mho Memory polarization:
  Three-phase element is memory polarized using
  voltage from a four-cycle memory.

Ground Overcurrent:
  67NT residual time-overcurrent element:
    Selectable curve shape (4 curves).
    Pickup: 0.25 to 6.3 A, 0.05 A +/- 2% of setting.

  67NI residual-overcurrent element:
    Pickup: 0.25 A to 48 times 67NT pickup.
    Transient overreach: 5% of set pickup.
    A 0 - 2000 cycle timer is provided for the 67NI.

Ground Directional Elements:
  Negative-sequence directional element:
    Angle: same as mho element setting.
    Sensitivity: 0.07 to 0.30 VA of negative sequence,
    depending on distance relay settings, at max torque angle
    and V2 > 0.17V.

  Zero-sequence directional element:
    Voltage polarization:
      Angle: same as mho element setting.
      Sensitivity: (0.5 volts) * (5IN pickup setting) in units
      of zero-seq. volts times residual amps and V0 > 0.17V.
    Current polarization:
      Angle: Zero degrees.
      Sensitivity: (0.5 amps) * (5IN pickup setting) in units of
      residual amps squared and Ipol > 0.5 amps.

Fault Location  Fault location is computed from event reports stored following
each fault. Algorithm compensates for prefault current for
improved accuracy for high-resistance faults.

Fault Reporting  A data record is retained for each of the 12 most recent
faults, which includes current, voltage, relay element, input
contact and output contact information. The report may also
be triggered by command or contact closure. When tripping
occurs after the end of the event report, a second report is
triggered at tripping.
Self Testing
Analog AC channel offset errors
Stall timer monitors processor
Power supply voltage checks
Setting checks
RAM, ROM, and A/D converter tests

Rated Input Voltage
115 volt nominal phase-to-phase, 3 phase 4 wire connection

Rated Input Current
5 amps per phase nominal
15 amps per phase continuous
390 amps for one second thermal rating

Output Contact Current
30 amp make per IEEE C37-90 para 6.6.2
6 amp carry continuously
MOV protection provided

Logic Input Ratings
60 - 200 VDC for 125 VDC relays
25 - 60 VDC for 48 VDC relays
Current = 6 mA at nominal voltage

Power Supply
125 Volt: 85 - 200 VAC or VDC; 12 watts
48 Volt: 30 - 60 VDC; 12 watts

Dielectric Strength
Routine tested:
V, I inputs: 2500 VAC for 10 seconds
Other: 3000 VDC for 10 seconds (excludes RS-232)

Interference Tests
IEEE C37-90 SWC test (type tested)
IEC 255-6 interference test (type tested)

Impulse Tests
IEC 255-5 0.5 joule 5000 volt test (type tested)

RFI Tests
Type-tested in field from a 1/4-wave antenna driven by 20 watts at 150 MHz and 450 MHz, randomly keyed on and off, at a distance of 1 meter from relay.

Dimensions
5 1/4" x 19" x 13". Mounts in standard 19" relay rack. Also available for vertical mounting.

Unit Weight
21 pounds

Shipping Weight
32 pounds, including two instruction manuals

Operating Temperature
-20 deg C to + 55 deg C

Burn-in Temperature
Each SEL-PG10 relay is burned in at 60 deg C for 100 hours
Basic Protective Capabilities

The SEL-PG10 relay provides protection for transmission line faults of all types.

Three-Phase Faults:

The three-phase mho element is supervised by three overcurrent elements, which must all pick up. For positive action for close-in three-phase faults, four cycles of memory polarization are provided.

Phase-Phase Faults:

The phase-phase mho element is based on the compensator-distance principle, and has no response for three-phase faults. It is supervised by three overcurrent elements, of which at least one must pick up. A timer is provided which is driven by the phase-phase and three-phase mho elements. It may be used as a zone timer or as a backup-coordination timer. It may also be set to zero when no delay is required.

Ground Faults:

Ground fault protection consists of an instantaneous residual overcurrent element and a residual time-overcurrent element.

Directionality is determined by a negative-sequence directional element and a dual-polarized zero-sequence element. Settings select the negative-sequence element, or neither, either or both sources of zero-sequence polarization. To securely discriminate between forward- and reverse-direction faults, the directional elements have a torque threshold which must be exceeded before the fault direction is declared.

Four curve shapes (moderately inverse, inverse, very inverse, extremely inverse) of the residual time-overcurrent element are user-selectable. This element is either nondirectional or forward-reaching.

LOGIC DESCRIPTION

Relay Elements

<table>
<thead>
<tr>
<th>Element</th>
<th>Code</th>
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<tr>
<td>single-phase overcurrent relays</td>
<td>50A 50B 50C</td>
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<tr>
<td>three-phase mho distance</td>
<td>21ABC</td>
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<tr>
<td>line-line mho distance</td>
<td>21P</td>
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<tr>
<td>residual time-overcurrent pickup</td>
<td>67NP</td>
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<tr>
<td>residual time-overcurrent trip</td>
<td>67NT</td>
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<tr>
<td>residual inst-overcurrent</td>
<td>67N</td>
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<td>negative-sequence directional</td>
<td>32Q</td>
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<tr>
<td>zero-sequence dual pol directional</td>
<td>32D</td>
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</table>
Timers

GTMR  Ground timer for definite-time ground element
PTMR  Phase-phase and three-phase fault timer

Enables From Settings Procedure

32QE  Enables 32Q
32VE  Enables voltage polarization of 32D
32IE  Enables current polarization of 32D
67NTE  Selects directional torque control for time-overcurrent relay

Contact Inputs

EXT1  External trigger 1 for event report
EXT2  External trigger 2 for event report
E1    Event 1
E2    Event 2
E3    Event 3
S2A   Circuit breaker monitor

Contact Outputs

TRIP  Circuit breaker trip
A1    Programmable output 1
A2    Programmable output 2
A3    Programmable output 3
A4    Programmable output 4
A5    Programmable output 5
ALARM System alarm

INTERMEDIATE LOGIC

The logic equations developed below represent combinations of the relay elements and other conditions. In the following equations the "*" indicates logical "and", and the "+" indicates logical "or".

\[
50L = 50A + 50B + 50C \\
3P50 = 50A * 50B * 50C \\
ZABC = 21ABC * 3P50 \\
ZP = 21P * 50L \\
DF = 320F * 320E + 32DF * \\
\quad 32IE + 32DF * 32VE + \\
\quad \text{NOT}(320E + 32VE + 32IE) \\
\]

Phase fault current supervision
Three-phase fault current supervision
Three-phase fault
Phase-to-phase fault
Forward direction

(If 32QE=32VE=32IE=NO then DF=1, i.e., disabling the directional elements makes the ground elements nondirectional.)
67NI = 67N * DF

ZPT = (ZABC + ZP) * PTMR  Phase or three-phase fault timeout
67DT = 67NI * GTMR  Definite-time ground timeout

RELAY WORD

Relay elements and intermediate logic results are represented in an eight-bit relay word. The user selects bits in this word to perform the desired functions for tripping or controlling the five programmable outputs. The selected bits are stored in masks for each function. The user programs the bits in these masks with the LOGIC command.

Relay Word:

```
50L ZABC ZP ZPT 67NP 67NT 67NI 67DT
```

The use of the relay word and programmable masks provides the user with great flexibility in applying the SEL-PG10 relay, without rewiring panels or changing jumpers on circuit boards.

OUTPUT EQUATIONS

The logic for controlling the TRIP output and five output relays (A1-A5) is programmable for flexibility and for testing. The logic is programmed by setting masks for various conditions, which are applied to the general relay word.

The general forms for each of the output equations follow:

Let R = relay word

```
MT = mask for trip
```

then:  TRIP = R * MT

```
close TRIP = TRIP
open TRIP = NOT(TRIP) * NOT(52A + TARGET RESET button pushed) * (60 ms minimum TRIP)
```

A1 = R * MA1
A2 = R * MA2
A3 = R * MA3
A4 = R * MA4
A5 = R * MA5

The "*" symbol indicates logical "and", and the "+" indicates logical "or".

The function of the ALARM output relay is fixed. It responds to self-test failures, to setting changes, and to password violations.
SETTING PROCEDURE

The SET command invokes the relay setting procedure. Each setting is presented and prompted for in turn. If a new setting value is desired, it is entered in response to the appropriate prompt, while just pressing carriage return retains the old setting and prompts for the next one.

In the example shown, only the XO value was changed. It was changed from 259.40 to 248.57. Note that the new value of 248.57 is presented at the end of the procedure before enabling, along with all other settings. This provides a final inspection for typographical or other errors.

As a convenience, the operator could have typed END in response to the prompt for Line Length (or any other setting except Relay ID), and gone directly to the final presentation of settings, without having to scroll through the rest of the prompts.

=>SET

SET clears events. CTRL-X cancels.
Enter data, or RETURN for no change

ID : Example 230 kV Line
R1 : (Ohms pri) ............... = 13.90
X1 : ......................... = 79.96
RO : ......................... = 41.50
XO : ......................... = 259.40
LL : Line Length (mi) ........ = 100.00

CTR : ......................... = 200.00
PTR : ......................... = 2000.00
MTA : Max Torque Angle (deg) = 80.80
LOCAT: Locate faults (Y/N)... = Y

Z% : Reach (% line)........... = 80.00
PTMR : Dly-Phase (cyc)...... = 0.00
50L : PU (Amps pri).......... = 100.00

67NP : PU (Amps pri).......... = 100.00
67NTO: Time Dial............. = 3.00
67NC : Curve (1,2,3,or4)... = 2
67NTC: Torque Ctrl (Y/N).... = Y

67NIP: PU (Amps pri).......... = 1000.00
GTMR : Dly-Gnd (cyc)........ = 0.00

32QE : Enable (Y/N)......... = N
32VE : ........................ = Y
32IE : ........................ = Y

TIME1: Port 1 timeout (min) .. = 5
TIME2: ........................ = 0
AUTO : Auto port (1,2)...... = 2
RINGS: (1-30)................. = 3
New settings for: Example 230 kV Line

R1 =13.90  XI =79.96  RO =41.50  XO =248.57  LL =100.00
CTR =200.00  PTR =2000.00  MTA =80.80  LOCAT=Y
Z% =80.00  PTMR =0.00  SOL =100.00
67NP =100.00  67NTO=3.00  67NC =2  67NTC=Y
67NIP=1000.00  GTMR =0.00
32QE =N  32VE =Y  32IE =Y
TIME1=5  TIME2=0  AUTO =2  RINGS=3

OK (Y/N) ? Y
Please wait...
Enabled
### SAMPLE EVENT REPORT

**Example 230 kV Line**

Date: 7/28/88  Time: 11:22:11.329

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Event: AG  Location: 50.06 mi 4.06 ohms sec  
Duration: 6.00  F11 Current: 132.3

RI -13.90  XI = 75.98  RD = 41.50  XD = 248.57  LL = 100.00
CTR 200.00  PTR = 50.00  HTA = 90.00  LOCAT=V
Z% = 90.00  PTRR = 0.00  PSOL = 100.00
67/NP = 100.00  67NDT=3.00  67MC = 2  67MTC=V
67NP = 100.00  67/NT=V  32VF = 32VF = V  TIME1=5
TIME2=0  AUTO = 2  RINSS=3

Logic settings:

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<th>MT</th>
<th>MA1</th>
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<tbody>
<tr>
<td>66</td>
<td>40</td>
<td>20</td>
<td>08</td>
<td>04</td>
<td>02</td>
</tr>
</tbody>
</table>
EXPLANATION OF EVENT REPORT

Example 230 KV Line
Date: 7/28/88 Time: 11:22:11.329

FID-SEL-PG10-R100-V55empc-0800724

Currents (amps) Voltages (kV) Relays Outputs Inputs

<table>
<thead>
<tr>
<th>IPOL</th>
<th>IR</th>
<th>TA</th>
<th>TR</th>
<th>IC</th>
<th>VA</th>
<th>VR</th>
<th>VC</th>
<th>52266</th>
<th>TAAAAA</th>
<th>EEEEEDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>620</td>
<td>-591</td>
<td>-374</td>
<td>349</td>
<td>10.2-125.9</td>
<td>155.7</td>
<td>*P</td>
<td>1177</td>
<td>F123456</td>
<td>T12352</td>
</tr>
<tr>
<td>3</td>
<td>-620</td>
<td>-591</td>
<td>-374</td>
<td>349</td>
<td>10.2-125.9</td>
<td>155.7</td>
<td>*P</td>
<td>1177</td>
<td>F123456</td>
<td>T12352</td>
</tr>
<tr>
<td>-6</td>
<td>129</td>
<td>349</td>
<td>-13</td>
<td>-223</td>
<td>104.6 - 125.8</td>
<td>125.4</td>
<td>*P</td>
<td>1177</td>
<td>F123456</td>
<td>T12352</td>
</tr>
<tr>
<td>3</td>
<td>-371</td>
<td>396</td>
<td>3</td>
<td>-25</td>
<td>96.1 - 125.1</td>
<td>104.6</td>
<td>*P</td>
<td>1177</td>
<td>F123456</td>
<td>T12352</td>
</tr>
<tr>
<td>-3</td>
<td>1309</td>
<td>1306</td>
<td>-5</td>
<td>9</td>
<td>11.6 - 125.1</td>
<td>104.6</td>
<td>*P</td>
<td>1177</td>
<td>F123456</td>
<td>T12352</td>
</tr>
</tbody>
</table>

Event: A6 Location: 50.06 mi 4.06 ohms sec
Duration: 6.00 s Old Current: 1382.3

RI = 13.9 X1 = 29.96 BX = 41.50 X0 = 248.67 LL = 100.00
CTR = 200.00 PTR = 200.00 MIA = 80.00 LOCAT = Y
2% = 80.00 PTHR = 0.00 SLO = 100.00
67NP = 100.00 67TD = 3.00 67NC = 2 67TC = M
67NP = 100.00 67TH = 0.00 32VE = N 32IE = Y
TIME1 = 5 TIME2 = 0 AUTO = Y RINGS = 3

Logic settings:
MT MA1 MA2 MA3 MA4 MA5
66 40 20 08 04 02

Currents and voltages are in primary Amps and KV. Rows are 1/4 cycle apart.
Time runs down page. Obtain phase RMS value and angle using any entry as
Y-component, and the entry immediately underneath as the X-component. For
example, from bottom rows, IAY = -136, IAX = -1306. Therefore, IAX = 1365 amps
RMS primary, at an angle of ATAN(-136/1306) = -163 degrees, with respect to
the sampling clock.

<FID> Firmware Identification Data

<Relays> Columns show states of internal relay elements --> Designators

SOP : phase overcurrent ...... : SOL

213 : 3-phase distance ...... -->

ZIP : 2-phase distance ...... -->

67I : inst ground overcurrent : 67NI -->

67T : ground time-overcurrent --> P,T

<Outputs> Columns show states of output contacts: ON = "*", OFF = " "

<Inputs> Columns show states of input contacts: ET1=EXTERNAL TRIGGER 1,

ET2=EXTERNAL TRIGGER 2, E1=E3=EXTERNAL EVENT, 52A=PCB A-CONTACT

<Event> Fault type indication is one of the following:

AG, BG, CG = single-phase, AB, BC, CA = 2-phase,

ABC, BCG, CAG = 2-phase to ground, ABC = 3-phase

Followed by a "T" if a TRIP triggered the report

<Distance> Other indication is EXT = externally or otherwise triggered

Distance to fault in miles. 999999 is indeterminate distance

Distance to fault in secondary ohms. 999999 is indeterminate

<Duration> Fault duration determined from relay element(s) pickup time

<Current> Max phase current (primary amps) taken near middle of fault

R1, A1, H0, X0 Primary series impedance settings for transmission line

LL Line length corresponding to specified line impedances

CTR, PTH Current and potential transformer ratios (XTR=1)

MTA Maximum torque angle for who elements

LOCAT Enable or disable fault locator (V/M)

2% Reach of 3- and 2-phase who, percent of line length (LL)

PTHR Phase fault timer for 3- and 2-phase faults

SLO Phase-overcurrent setting

67NP, TD, TC GND time-overcurrent Pickup, Time-Dial, Curve, Torque Control

GMP Ground instantaneous-overcurrent pickup setting

GTHM Ground timer for ground faults

32VE, 32IE Ground fault directionality from (2,12), or (V0/IP, 10)

TIME1,2 Communications port timeout intervals (automatic log-off)

AUTO Port assignment for automatic message transmissions

RINGS Number of rings to wait before modem answers telephone

<Logic settings> See LOGIC command for a description of mask settings

13
SAMPLE COMMAND DISPLAYS

>>>HISTORY

The date, time, and type of event are shown for each of the twelve most recent
events. If the event is a fault, the distance, duration, and current are
shown. An example of the display is shown below:

Example 230 kV Line

<table>
<thead>
<tr>
<th>#</th>
<th>DATE</th>
<th>TIME</th>
<th>TYPE</th>
<th>DIST</th>
<th>DUR</th>
<th>CURR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7/28/88</td>
<td>09:03:01.092</td>
<td>AG</td>
<td>100.21</td>
<td>7.25</td>
<td>798.1</td>
</tr>
<tr>
<td>2</td>
<td>7/28/88</td>
<td>09:02:11.167</td>
<td>AG</td>
<td>74.97</td>
<td>4.00</td>
<td>1022.0</td>
</tr>
<tr>
<td>3</td>
<td>7/28/88</td>
<td>09:02:10.962</td>
<td>AG</td>
<td>25.21</td>
<td>7.25</td>
<td>2120.9</td>
</tr>
<tr>
<td>4</td>
<td>7/28/88</td>
<td>09:00:13.345</td>
<td>BC</td>
<td>25.52</td>
<td>7.25</td>
<td>3167.6</td>
</tr>
</tbody>
</table>

Note that only four events have occurred since the relay was set or powered on.

>>>METER

Example 230 kV Line

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>AB</th>
<th>BC</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (A)</td>
<td>994</td>
<td>995</td>
<td>994</td>
<td>1723</td>
<td>1724</td>
<td>1724</td>
</tr>
<tr>
<td>V (kV)</td>
<td>134.4</td>
<td>134.3</td>
<td>134.2</td>
<td>233.1</td>
<td>232.8</td>
<td>232.9</td>
</tr>
<tr>
<td>P (MW)</td>
<td>350.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q (MVAR)</td>
<td>67.82</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P and Q are positive when the power flow is in the direction of the reach of
the relay, i.e., out from the bus and into the line.

>>>STATUS

Example 230 kV Line

SELF-TESTS

W=Warn  F=Fail

<table>
<thead>
<tr>
<th></th>
<th>IP</th>
<th>IR</th>
<th>IA</th>
<th>IB</th>
<th>IC</th>
<th>VA</th>
<th>VB</th>
<th>VC</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>-2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>PS</td>
<td>4.99</td>
<td>15.14</td>
<td>-14.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAM</td>
<td>ROM</td>
<td>A/D</td>
<td>MOF</td>
<td>SET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
>>>TARGETS

The eight-LED display on the front panel can be programmed to show targets (default), Relay Word bits, contact inputs and contact outputs, as shown below. This feature is especially useful for testing individual relay elements.

LED:  1  2  3  4  5  6  7  8

N

0  EN  ALRM  50L  67N  3-PH  2-PH  INST  TIME  RELAY TARGETS
1  50L  ZABC  ZP  ZPT  67NP  67NT  67NI  67DT  RELAY WORD #1
2  52A  E3  E2  E1  EXT2  EXT1  CONTACT INPUTS
3  TRIP  A1  A2  A3  A4  A5  ALRM  CONTACT OUTPUTS

The front panel targets can be reset and cleared remotely or locally using the target command. Type "TARGET R <RETURN>" to reset and clear the targets.
POWER TRANSFORMER PROVIDES OPTIONAL CURRENT POLARIZATION

SEL-PG10 EXTERNAL CURRENT AND VOLTAGE CONNECTIONS

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DWG. NO. A7-0322
DATE: 08-30-88
SEL—PG10 DC EXTERNAL CONNECTION DIAGRAM (TYPICAL)

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DWG. NO. 47-0350
DATE: 10-12-88
SEL-PG10 COMMUNICATIONS AND CLOCK CONNECTIONS
MULTIPLE UNITS AT ONE LOCATION
SEL RELAY COMMUNICATIONS DIAGRAM FOR CONNECTION TO THE SEL-DTA

NOTE: SEL-DTA DISPLAY/TRANSDEJ/DER ADAPTER (DTA)
DATA AND CONTROL POWER

DWC. NO. A7-0413
DATE: 10-07-88
SEL-PG10
VERTICAL FRONT PANEL DRAWING

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DWG. NO. A7-0329
DATE: 08-26-88
7/32 DIA., 4 HOLES FOR
10-32 MTG. SCREWS

DIMENSION A:
CASE: 17.00"
CUT OUT: 17.25" - 17.875"
17.375" PREFERRED

DIMENSION B:
CASE: 8.5"
CUT OUT: 8.625" - 8.9375"
8.688" PREFERRED

DIMENSION C:
CASE: 5.25"
CUT OUT: 5.35" - 5.45"

DIMENSION D:
CASE: 2.625"
CUT OUT: 2.675" - 2.725"

NOTE: ALL INSTRUMENTS MAY BE MOUNTED HORIZONTALLY (AS SHOWN) OR VERTICALLY.

PANEL CUTOUT AND DRILL PLAN FOR SEMI-FLUSH MOUNTING OF 5.25 INCH HIGH CASE
SEL-PG10 DISTANCE RELAY/FAULT LOCATOR COMMAND SUMMARY

Level 0

ACCESS  Answer password prompt (if password protection enabled) to gain access to Level 1. Three unsuccessful attempts pulses ALARM relay.

Level 1

2ACCESS  Answer password prompt (if password protection enabled) to gain access to Level 2. This command always pulses the ALARM relay.

DATE  Show or set date. DAT 2/3/86 sets date to Feb. 3, 1986. This setting is overridden when IRIG-B synchronization occurs. Pulses the ALARM relay and illuminates the ALRM LED momentarily when a different year is entered than the one previously stored.

EVENT HISTORY  Show event record. EVE 1 shows long form of most-recent event.

IRIG METER  Force immediate execution of time-code synchronization task.

QUIT  Show DATE, TIME, EVENT TYPE, FAULT LOCATION, DURATION, and CURRENT for the 12 most-recent faults.

SHOWSET  Show primary current, voltage, real and reactive power. METER runs once. METER N runs N times.

STATUS  Return to Access Level 0 and reset targets to target 0.

TARGETS  Show the relay settings and logic settings -- does not affect the settings. The logic settings are shown in hexadecimal format for each.

TAR 0: Relay Targets  TAR 1: RELAY WORD
TAR 2: Contact Inputs  TAR 3: Contact Outputs
TAR R: Returns to TAR 0 and clears

TIME  Be sure to return TAR 0 when done, so LEDs display fault targets.

TRIGGER  Show or set time. TIM 13/32/00 sets clock to 1:32:00 PM. This setting is overridden when IRIG-B synchronization occurs.

TRIGGER  Trigger and save an event record. (Type of event is EXT).

Level 2

LOGIC  Show or set logic masks MT, MA1-MA5.

PASSWORD  Show or set passwords. Pulses the ALARM relay closed and illuminates the ALRM LED momentarily when new passwords are set.

PAS 1 OTTER sets Level 1 password to OTTER.

PAS 2 TAIL sets Level 2 password to TAIL.

SET*  Initiate setting procedure.

* Use the following to separate commands and their parameters:
  space, comma, semicolon, colon, slash.

* ALARM relay closes and ALRM target LED illuminates momentarily while new settings are stored in EEPROM and event data buffers are cleared.

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SEL/11-88