# Type SLB-1
# Breaker Pole Failure Relay
## 10 Amp Continuous Rating

Effective: November 1991
This Addendum Supersedes
All Previous Addenda

A - Add New Information • C - Change Existing Information • D - Delete Information

C

### Page 3

Under "OPERATION", paragraph 1. The last sentence beginning "The rectifier circuit is basically a voltage follower IC3....." should be changed to read as follows:

"The rectifier circuit is basicaly a voltage follower IC3 (pins 6, 7, 10) and an inverting amplifier IC3 (12) where the input to the (+) terminal (pin 6) of the voltage follower is positive regardless of the polarity of the signal at TP1".

C

### Page 9

Under "CALIBRATION", paragraph 2. "..... style S#644B315 G03." should read as follows: ".....style S#644B315 G02."

C

### Page 15 and 16

Replace the following drawing: Figure 3a. Internal Schematic for the SLB-1 Relay.
1749F11, Sub 10, page 1 of 2 replaces No. 1749F11 Sub 8 page 1 of 2.

C

### Page 17 and 18

Replace the following drawing: Figure 3b. Parts List for the SLB-1 Relay.
1749F11, Sub 10, page 2 of 2 replaces No. 1749F11 Sub 8 page 1 of 2.

C

### Page 22

Replace the following drawing: Figure 7. Component Location (Timer).
1486B46, Sub 2 replaces No. 1486B46 Sub 1.

C

### Page 23

Replace the following drawing: Figure 8. Component Location (3 $V_0$ Logic).
1486B45, Sub 7 replaces No. 1486B45, Sub 5.

*All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB representative should be contacted.*

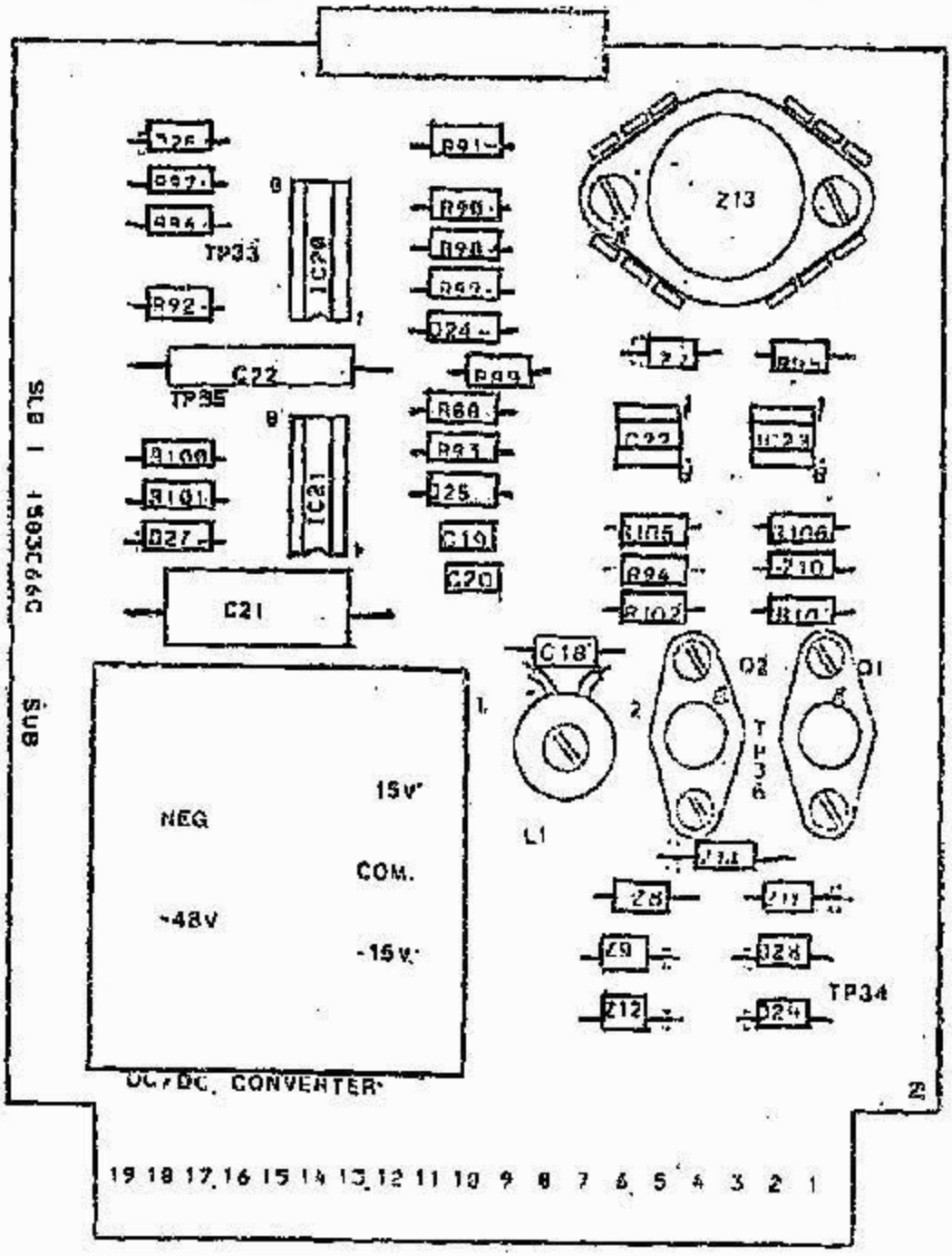
C

## Page 26

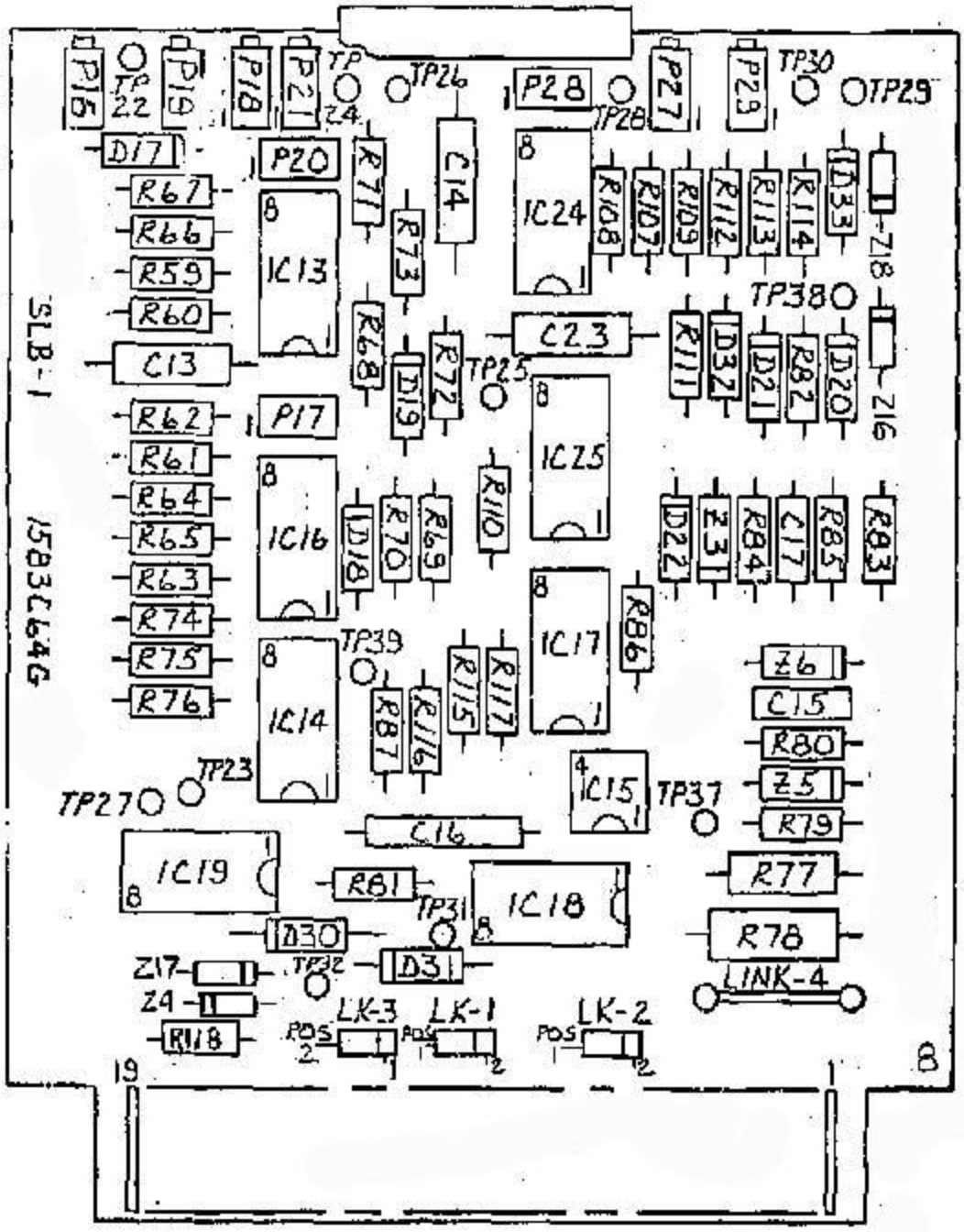
Replace the following drawing: Figure 11. Outline and Drilling Plan for Type SLB-1 Relay in Type FT-42 Case.
57D7905, Sub 18 replaces No. 57D7905 Sub 11.

**Attachments:**

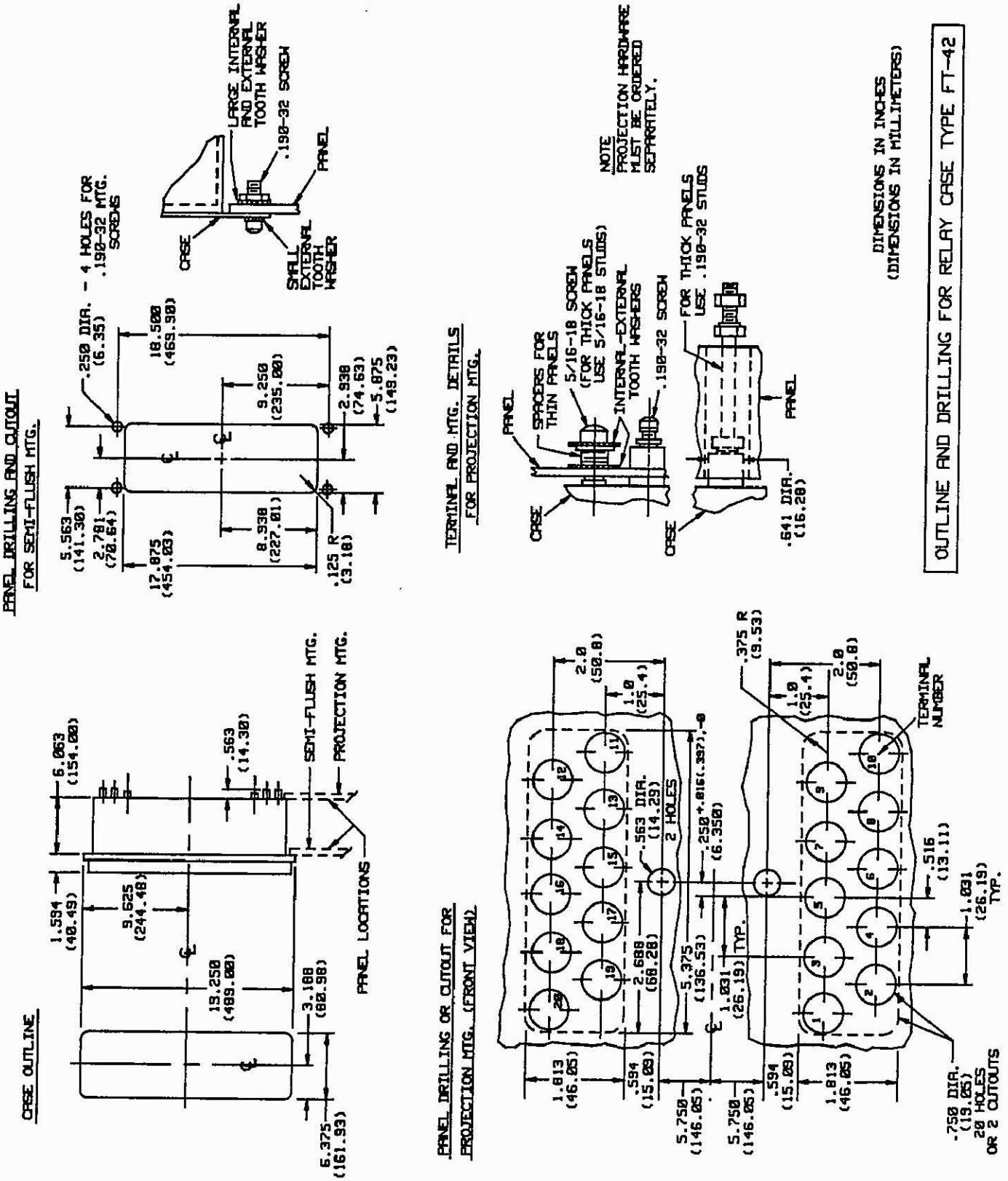
Drawing 1749F11, Sub 10, page 1 of 2
Drawing 1749F11, Sub 10, page 2 of 2
Drawing 1486B46, Sub 2
Drawing 1486B45, Sub 7
Drawing 57D7905, Sub 18



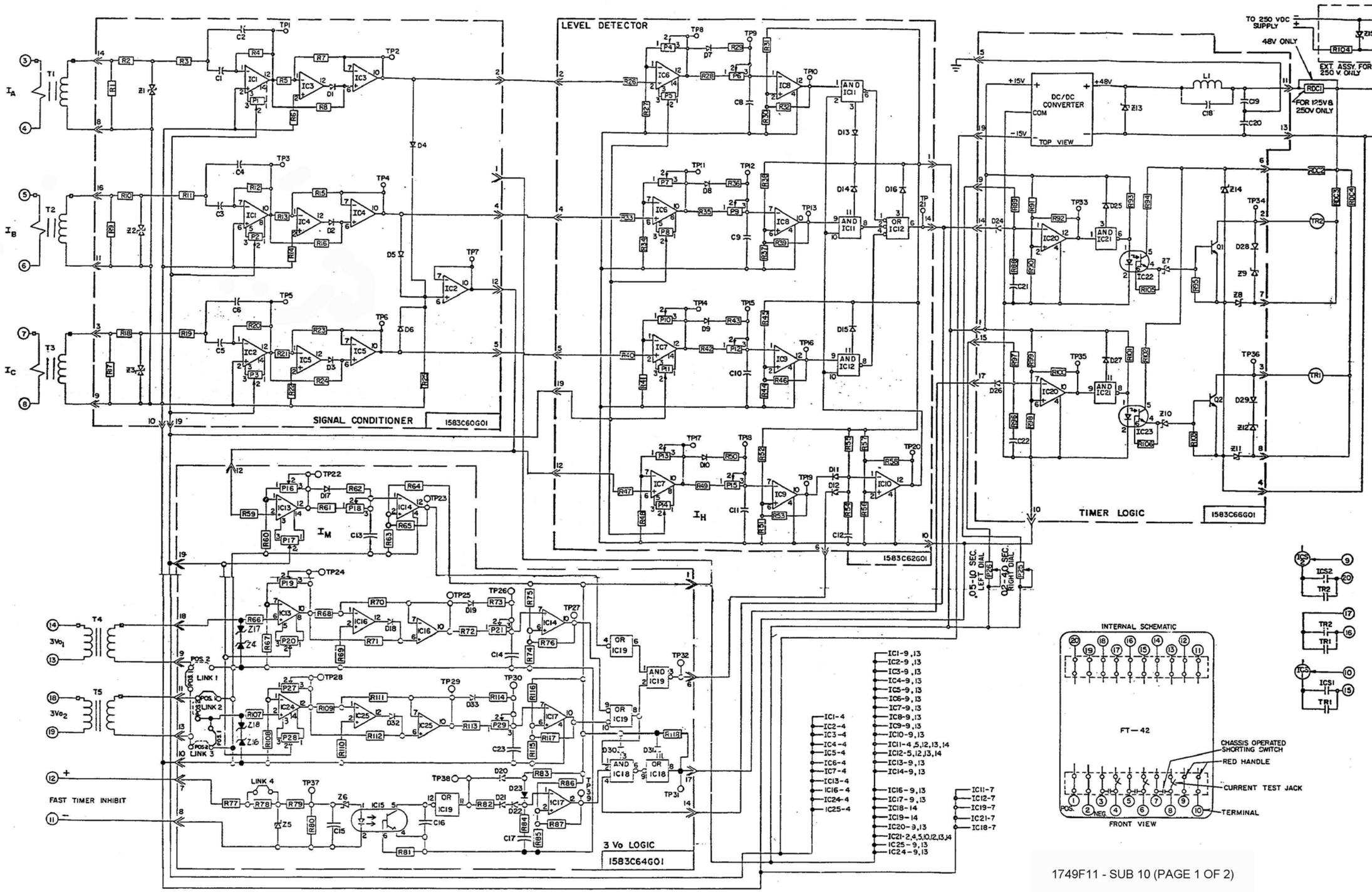

1486B46 - SUB 2




1486B45 - SUB 7


PANEL DRILLING AND CUTOUT
FOR SEMI-FLUSH MTG.
.250 DIA. - 4 HOLES FOR .190-32 MTG. SCREWS
(6.35)
18.500 (469.90)
9.250 (235.00)
2.938 (74.63)
5.875 (149.23)
5.563 (141.30)
2.781 (70.64)
17.875 (454.03)
8.938 (227.01)
.125 R (3.18)
LARGE INTERNAL AND EXTERNAL TOOTH WASHER
.190-32 SCREW
PANEL
CASE
SMALL EXTERNAL TOOTH WASHER
TERMINAL AND MTG. DETAILS
FOR PROJECTION MTG.
PANEL
SPACERS FOR THIN PANELS
5/16-18 SCREW (FOR THICK PANELS USE 5/16-18 STUDS)
INTERNAL-EXTERNAL TOOTH WASHERS
.190-32 SCREW
CASE
NOTE
PROJECTION HARDWARE MUST BE ORDERED SEPARATELY.
FOR THICK PANELS USE .190-32 STUDS
PANEL
.641 DIA. (16.28)
CASE
DIMENSIONS IN INCHES
(DIMENSIONS IN MILLIMETERS)
OUTLINE AND DRILLING FOR RELAY CASE TYPE FT-42
CASE OUTLINE
6.063 (154.00)
.563 (14.30)
SEMI-FLUSH MTG.
PROJECTION MTG.
1.594 (40.49)
9.625 (244.48)
13.250 (489.00)
3.188 (80.98)
PANEL LOCATIONS
5.375 (161.93)
PANEL DRILLING OR CUTOUT FOR
PROJECTION MTG. (FRONT VIEW)
2.0 (50.8)
1.0 (25.4)
.375 R (9.53)
TERMINAL NUMBER
.563 DIA. (14.29) 2 HOLES
2.688 (68.28)
.250 +.016 (.397) -0 (6.350)
5.375 (136.53)
1.031 (26.19) TYP.
.516 (13.11)
1.031 (26.19) TYP.
1.813 (46.05)
.594 (15.08)
5.750 (146.05)
.750 DIA. (19.05) 20 HOLES OR 2 CUTOUTS

THIS PAGE RESERVED FOR NOTES




1749F11 - SUB 10 (PAGE 1 OF 2)

| | | | | |
|---|---|---|---|---|
| C1 | CAPACITOR | 2.0 MFD | 50V | 3531A88H02 |
| C2 | CAPACITOR | 0.47 MFD | 50V | 3531A88H01 |
| C3 | CAPACITOR | 2.0MFD | 50V | 3531A88H02 |
| C4 | CAPACITOR | 0.47MFD | 50V | 3531A88H01 |
| C5 | CAPACITOR | 2.0 MFD | 50V | 3531A88H02 |
| C6 | CAPACITOR | 0.47MFD | 50V | 3531A88H01 |
| C7 | CAPACITOR | 0.1 MFD | 100V | 3508A89H05 |
| C8 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C9 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C10 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C11 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C12 | CAPACITOR | 1.0 MFD | 35V | 837A241H15 |
| C13 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C14 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C15 | CAPACITOR | 0.05MFD | 100V | 184A663H02 |
| C16 | CAPACITOR | 500 PF | 500V | 837A200H02 |
| C17 | CAPACITOR | 1.0MFD | 35V | 837A241H15 |
| C18 | CAPACITOR | .047MFD | 200V | 849A437H04 |
| C19 | CAPACITOR | .01 MFD | 3000V | 3536A32H02 |
| C20 | CAPACITOR | .01 MFD | 3000V | 3536A32H02 |
| C21 | CAPACITOR | 8.0 MFD | 50V | 3531A88H04 |
| C22 | CAPACITOR | 4.0 MFD | 50V | 3531A88H03 |
| C23 | " | 0.47 MFD | 200V | 876A409H17 |
| D1 | DIODE | IN645A | | 837A692H03 |
| D2 | DIODE | IN645A | | 837A692H03 |
| D3 | DIODE | IN645A | | 837A692H03 |
| D4 | DIODE | IN645A | | 837A692H03 |
| D5 | DIODE | IN645A | | 837A692H03 |
| D6 | DIODE | IN645A | | 837A692H03 |
| D7 | DIODE | IN645A | | 837A692H03 |
| D8 | DIODE | IN645A | | 837A692H03 |
| D9 | DIODE | IN645A | | 837A692H03 |
| D10 | DIODE | IN645A | | 837A692H03 |
| D11 | DIODE | IN645A | | 837A692H03 |
| D12 | DIODE | IN645A | | 837A692H03 |
| D13 | DIODE | IN645A | | 837A692H03 |
| D14 | DIODE | IN645A | | 837A692H03 |
| D15 | DIODE | IN645A | | 837A692H03 |
| D16 | DIODE | IN645A | | 837A692H03 |
| D17 | DIODE | IN645A | | 837A692H03 |
| D18 | DIODE | IN645A | | 837A692H03 |
| D19 | DIODE | IN645A | | 837A692H03 |
| D20 | DIODE | IN645A | | 837A692H03 |
| D21 | DIODE | IN645A | | 837A692H03 |
| D22 | DIODE | IN645A | | 837A692H03 |
| D23 | DIODE | IN645A | | 837A692H03 |
| D24 | DIODE | IN645A | | 837A692H03 |
| D25 | DIODE | IN645A | | 837A692H03 |
| D26 | DIODE | IN645A | | 837A692H03 |
| D27 | DIODE | IN645A | | 837A692H03 |
| D28 | DIODE | IN4818 | | 188A342H06 |
| D29 | DIODE | IN4818 | | 188A342H06 |
| D30 | DIODE | IN645A | | 837A692H03 |
| D31 | DIODE | IN645A | | 837A692H03 |
| IC1 | INT. CKT. | 747DM | | 1443C52H01 |
| IC2 | INT. CKT. | 747DM | | 1443C52H01 |
| IC3 | INT. CKT. | 747DM | | 1443C52H01 |
| IC4 | INT. CKT. | 747DM | | 1443C52H01 |
| IC5 | INT. CKT. | 747DM | | 1443C52H01 |
| IC6 | INT. CKT. | 747DM | | 1443C52H01 |
| IC7 | INT. CKT. | 747DM | | 1443C52H01 |
| IC8 | INT. CKT. | 747DM | | 1443C52H01 |
| D32 | DIODE | IN645A | | 837A692H03 |
| D33 | " | " | | " |

| | | | |
|---|---|---|---|
| IC24 | INT. CKT. | 747DM | 1443C52H01 |
| IC25 | INT. CKT. | 747DM | 1443C52H01 |
| IC9 | INT. CKT. | 747DM | 1443C52H01 |
| IC10 | INT. CKT. | 747DM | 1443C52H01 |
| IC11 | INT. CKT. | MC679L | 6296D58H02 |
| IC12 | INT. CKT. | MC679L | 6296D58H02 |
| IC13 | INT. CKT. | 747DM | 1443C52H01 |
| IC14 | INT. CKT. | 747DM | 1443C52H01 |
| IC15 | INT. CKT. | 4N35 | 7748936H01 |
| IC16 | INT. CKT. | 747DM | 1443C52H01 |
| IC17 | INT. CKT. | 747DM | 1443C52H01 |
| IC18 | INT. CKT. | MC679L | 6296D58H02 |
| IC19 | INT. CKT. | MC668L | 6296D58H05 |
| IC20 | INT. CKT. | 747DM | 1443C52H01 |
| IC21 | INT. CKT. | MC679L | 6296D58H02 |
| IC22 | INT. CKT. | 4N35 | 7748936H01 |
| IC23 | INT. CKT. | 4N35 | 7748936H01 |
| Q1 | TRANSISTOR | 2N3590 | 837A617H03 |
| Q2 | TRANSISTOR | 2N3590 | 837A617H03 |
| T1 | TRANSFORMER | | 1582C88G02 |
| T2 | TRANSFORMER | | 1582C88G02 |
| T3 | TRANSFORMER | | 1582C88G02 |
| T4 | TRANSFORMER | | 1582C88G01 |
| T5 | TRANSFORMER | | 1582C88G01 |

| | | | |
|---|---|---|---|
| R1 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R2 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R3 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R4 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R5 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R6 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R7 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R8 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R9 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R10 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R11 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R12 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R13 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R14 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R15 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R16 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R17 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R18 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R19 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R20 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R21 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R22 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R23 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R24 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R25 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R26 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R27 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R28 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R29 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R30 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R31 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R32 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R33 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R34 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R35 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R36 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R37 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R38 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R107 | | 10K, .5W, 1% | 848A819H48 |
| R108 | | " " " | " |
| R109 | | 20K, .5W, 1% | 848A820H74 |
| R110 | | 10K, .5W, 1% | 848A820H45 |
| R111 | | 20K, .5W, 1% | 848A820H74 |
| R118 | | 15K, .5W, 1% | 848A820H62 |

| | | | |
|---|---|---|---|
| R39 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R40 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R41 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R42 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R43 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R44 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R45 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R46 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R47 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R48 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R49 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R50 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R51 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R52 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R53 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R54 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R55 | RESISTOR | 15.0K, .5W, 1% | 848A820H32 |
| R56 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R57 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R58 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R59 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R60 | RESISTOR | 453Ω, .5W, 1% | 848A819H15 |
| R61 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R62 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R63 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R64 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R65 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R66 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R67 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R68 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R69 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R70 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R71 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R72 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R73 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R74 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R75 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R76 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R77 | RESISTOR | 5K, 3W, 5% | 763AI27H04 |
| R78 | RESISTOR | 15K, 2W, 5% | 185A207H55 |
| R79 | RESISTOR | 470Ω, .5W, 2% | 629A531H24 |
| R80 | RESISTOR | 8.2K, .5W, 2% | 629A531H54 |
| R81 | RESISTOR | 1.0M, .5W, 1% | 848A822H39 |
| R82 | RESISTOR | 499K, .5W, 1% | 848A822H10 |
| R83 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R84 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R85 | RESISTOR | 15K, .5W, 1% | 848A820H62 |
| R86 | RESISTOR | 15K, .5W, 1% | 848A820H62 |
| R87 | RESISTOR | 22.1K, .5W, 1% | 848A820H78 |
| R88 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R89 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R90 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R91 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R92 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R93 | RESISTOR | 681Ω, .5W, 1% | 848A819H32 |
| R94 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R95 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R96 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R97 | RESISTOR | 2.49K, .5W, 1% | 848A819H86 |
| R98 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R99 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R112 | | " " " | " |
| R113 | | 3.01K, .5W, 1% | 848A819H94 |
| R114 | | 10K, .5W, 1% | 848A819H48 |
| R115 | | 10.K, .5W, 1% | 848A820H45 |
| R116 | | " " " | " |
| R117 | | " " " | " |

| | | | |
|---|---|---|---|
| R100 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R101 | RESISTOR | 681Ω, .5W, 1% | 848A819H32 |
| R102 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R103 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R104 | RESISTOR | 2×180Ω, .40W | 401299H77 |
| R105 | RESISTOR | 1.0M, .25W, 1% | 848A822H39 |
| R106 | RESISTOR | 1.0M, .25W, 1% | 848A822H39 |
| P1 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P2 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P3 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P4 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P5 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P6 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P7 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P8 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P9 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P10 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P11 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P12 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P13 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P14 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P15 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P16 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P17 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P18 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P19 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P20 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P21 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P22 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P23 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P24 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P25 | POTENTIOMETER | 500K, 2W | 3531A87H02 |
| P26 | POTENTIOMETER | 250K, 2W | 3531A87H01 |
| P27 | TRIM POT. | 20K, .5W | 3531A86H02 |
| P28 | TRIM POT. | 10K, .5W | 3523A42H01 |
| P29 | TRIM POT | 10K, .5W | 3531A86H01 |
| Z1 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z2 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z3 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z4 | ZENER DIODE | IN960B | 186A797H10 |
| Z5 | ZENER DIODE | IN3686B, 20V | 185A212H06 |
| Z6 | ZENER DIODE | IN752A, 5.6V | 186A797H12 |
| Z7 | ZENER DIODE | IN748A, 3.6V | 837A398H08 |
| Z8 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z9 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z10 | ZENER DIODE | IN748A, 3.6V | 837A398H08 |
| Z11 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z12 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z13 | ZENER DIODE | IN2832B, 56V | 184A854H14 |
| Z14 | ZENER DIODE | IN5352B, 15V | 862A288H04 |
| Z15 | ZENER DIODE | IN3344RA, 130V | 762A631H16 |
| Z16 | ZENER DIODE | IN960B | 186A797H10 |
| Z17 | ZENER DIODE | IN960B | 186A797H10 |
| Z18 | ZENER DIODE | IN960B | 186A797H10 |
| @ RDC1 | RESISTOR | 560 Ω, 40W | 1336173 |
| * RDC2 | RESISTOR | 3.3K, 10 W | 184A856H06 |
| @ RDC2 | RESISTOR | 8.0K, 10 W | 3502A39H02 |
| * RDC3 | RESISTOR | 600Ω, 10W | 3502A39H01 |
| @ RDC3 | RESISTOR | 2 K, 10W | 184A856H08 |
| * RDC4 | RESISTOR | 600Ω, 10W | 3502A39H01 |
| @ RDC4 | RESISTOR | 2K, 10W | 184A856H08 |
| TR1 | TELEPHONE RELAY | | 541D514H37 |
| TR2 | TELEPHONE RELAY | | 541D514H37 |
| L1 | CHOKE | | 2928096G04 |

@= FOR 125V & 250V ONLY
*= FOR 48V ONLY

Instruction Leaflet
I.L. 41-775.2A

# Type SLB-1
# Breaker Pole Failure Relay
## 10 Amp Continuous Rating

Effective: June 1984
Supersedes I.L 41-775.2 Dated april 1984
✪ Denotes Changed Since Previous Issue

### CAUTION

It is recommended that the user of this equipment become acquainted with the information in this instruciton leaflet before energizing the equipment. Failure to observe this precaution may result in damage to the equipment. Printed circuit modules should not be removed or inserted while the relay is energized unless specific instruction elsewhere in this instruction leaflet states that such action is permissible. Failure to observe this precaution can result in an undesired tripping output and cause component damage.

### APPLICATION

The SLB-1 relay is used to detect circuit breaker pole disagreement. It complements other breaker-failure detecting devices that sense failure consequent to fault clearing.

Pole disagreement results from such things as: pole flashover due to lightning, faulty mechanical linkage, failure of one pole mechanism of a breaker equipped with independent pole operator or flashover of an interruptor due to low air or gas pressure.

The relay compares currents in the three poles of the breaker and if one is zero or very low and one of the others is high, this is identified as "pole disagreement" after a short time delay. The relay trips adjacent breakers through a separate lockout relay to isolate the faulty breaker.

The SLB-1 is intended for use in breaker-and-a-half or ring-bus configuration. With low magnitude load current flowing through the bus, odd phase current combinations result from unequal phase impedances and multiple paths for current flow through the bus. Unequal phase currents flowing through an individual breaker can give the false appearance of pole disagreement.

The SLB-1 contains a zero sequence voltage comparison circuit that alows this low current difference to be ignored, while permitting tripping when a hazardous pole disagreement actually exists. For higher current differences tripping can take place without the requirement that zero sequence voltage be present (or different on the two sides of the breaker).

*All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB representative should be contacted.*

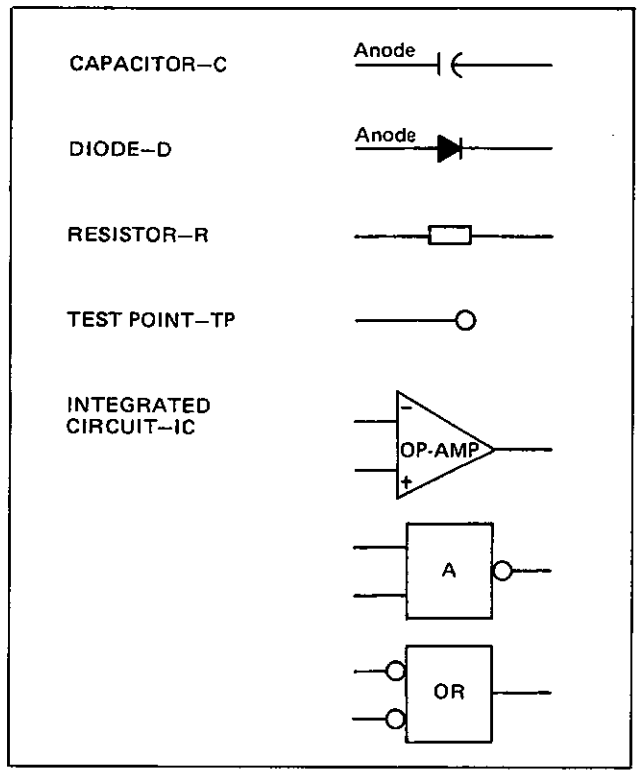
Since ground faults produce zero sequence voltage and unbalanced currents, distinction between this and pole failure must be made if very short timer settings are to be used. This is accomplished by using $\Delta V_o$, the difference of the zero sequence voltage on the two side of the protected breaker. With all poles of the breaker closed, zero sequence voltage will always be equal on the two sides of the breaker, and $\Delta V_o = 0$. With one pole open they will not, unless the two sides of the breaker are electrically tied together through another path. In general, an open pole with $\Delta V_o$ is very hazardous and an open pole without $\Delta V_o$ is less hazardous.

## CONSTRUCTION

The type SLB-1 relay is a solid state package mounted in an FT-42 case (see I.L.41-076). Referring to Fig. 3a, the circuitry consists of three current to voltage transformers, two voltage transformers, four printed circuit board assemblies, and two telephone type relays for contact output.

All the solid state circuitry for the SLB-1 relay is contained on four 5-7/8" x 4-7/8" printed circuit boards which plug into 19 pin connectors. Trimpots on the circuit boards are used for relay calibration and relay settings. The SLB-1 contains two timers for time delay applications, directly settable by two front panel mounted potentiometers with time calibrated dials. The power supply for the SLB-1 is isolated from the user's dc source through the use of an on-board DC to DC converter.

The printed circuit board assemblies, figures 5, 6, 7, and 8 show the location of all the resistors, capacitors, diodes, transistors, and integrated circuits used to perform the functions of current disagreements. Components on each PC board are identified by a letter followed by a number so that every component has a unique identification. Resistors are identified by the letter R followed by a number starting with 1. Similarly, all the other components are identified by letters and symbols as shown in the following:




NOTE

In description of the integrated circuits, the number in parentheses following the IC number will refer to the output pin of one of the two operational amplifiers contained in the linear IC package, e.g. IC1(12) refers to the op. amp. in IC1 whose output pin is 12. Digital IC'a will be identified in the same manner.

## OPERATION

All the SLB-1 logic is contained on 4 circuit boards. Referring to Fig. 3a, the outputs of the 3 current to voltage transformers T1, T2, and T3 are applied to 3 identical circuite on the Signal Conditioner circuit board. Each circuit consists of a voltage limiting back-to-back zener diode, an active bandpass filter, and an absolute-value full-wave rectifier. Taking one circuit as an example, back-to-back zener diode Z1 is used to limit the transformer secondary voltage to a safe level. The bandpass filter consists of operational amplifier IC1 (12), resistors R3, R4, and P1, capacitors C1 and C2. It is designed to pass 60 hertz. P1 is a trimpot used for dc offset adjustment. The fullwave rectifier circuit consists of two operational amplifiers (IC3), one diode (D1), and four resistors (R5), (R6), (R7), and (R8). The rectifier circuit is basically a voltage follower IC3 (pins 6,7,10) and an inverting amplifier IC3 (12) whose input at the (+) terminal (pin 6) is positive regardless of the polarity of the signal at TP1.

The three rectifier outputs and the "OR" of the three outputs, through voltage follower IC2 (10), are fed to the Level Detector circuit board. This board contains four identically constructed level sensing circuits. Three are connected to the individual outputs of the Signal Conditioner board, while the fourth receives the "OR" output. Each of the level sensing circuits consists of a non-inverting variable gain amplifier, an RC filter, and a level detector. For example, one sensing circuit consists of IC6 (12) and IC8 (12) with their associated resistors, capacitors, and trimpots. The full-wave signal (proportional to $I_A$ ) at TP2 on the Signal Conditioner board is amplified by IC6 (12). P4 is used to vary the gain of the amplifier and therefore, the level of input current ($I_L$ ) at which pickup occurs. P5 is used to reduce the amplifier's dc offset to zero.

An RC filter circuit following the amplifier output produces a ripple voltage proportional to the amplitude of the input. The maximum ripple voltage is determined by the charge of capacitor C8 through diode D7 and resistor R29 while the low voltage of the ripple is controlled by C8 discharging through the resistance R28 and P6. The discharge rate is made adjustable with potentiometer P6 so as to more accurately set the pickup/dropout ratio.

A level detector, IC8 (12), is used to detect the level of this ripple voltage. When the peak of the ripple at pin 1, IC8 (12), is below the operate point of the level detector, the output of IC8 (12) will be high (+15Vdc) and the voltage at pin 2 of IC8 (12) will be approximately 9.5 volts due to the voltage divider effect of resistors R30, with R31 and R32 in parallel. Under this condition TP10 will be a logic "1". If the input current is increased to such a level that causes the peak of the ripple voltage at IC8, pin 1, to exceed the 9.5 volts at pin 2, then the level detector will switch, causing pin 12 to become "0". This logic "0" will also appear at the output, TP10, indicating pickup operation. Once the level detector switches, this causes resistors R30 and R32 to be in parallel and the voltage divider relationship

between this parallel combination and R31 causes the IC8, pin 2, voltage to become approximately 5.0 volts. This voltage is greater than the minimum level of the ripple voltage thereby allowing the level detector to remain switched. However, when the input current obtains a value 95% of pickup, this will cause the minimum ripple level to become approximately 5.0 volts which causes the level detector to switch back to a logic "1" output indicating dropout. During normal relay operation in the absense of $3V_o$, the output at TP10 is at logic "0" (the picked-up state). This keeps the AND gate IC11 (6) disabled.

As indicated before, the operation of the low set ($I_L$) level detectors for $I_B$ and $I_C$ and for the high set ($I_H$) "OR"ed quantity at TP7 is the same as just described for $I_A$. The output of the "OR"ed level detector at TP19 is first time delayed 15 ms through the circuit consisting of IC10 (12), R54, R55, R56, R57, R58, and C12 and then "AND"ed with the outputs (TP10, TP13, TP16) of the three current level detectors at IC11 (6), IC11 (8), and IC12 (8). The 15 ms delay at TP20 avoids undesired tripping due to normal breaker unsymmetries.

The outputs of the three "AND" gates IC11 (6), IC11 (8), and IC12 (8) are connected to an "OR" gate, IC12 (6) which is used to drive an output telephone type relay (TR2) through an adjustable timer, IC20 (12) on the timer board. During normal SLB-1 operation in the absence of $3V_o$, the output of the "OR" gate at TP21 is at logic "0" which keeps the timer and TR2 from operating. This occurs when all three input currents $I_A$, $I_B$, and $I_C$ are above the $I_L$ (low set) and $I_H$ (high set) settings which produce logic "0"s at TP10, TP13, TP16 and logic "1" at TP20. A trip condition occurs when at least one input current drops below its $I_L$ setting, changing one of the logic "0"s to a logic "1" and one of the currents is above the $I_H$ setting which produces a logic "1" at TP20. The two logic "1"s enable one of the "AND" gates on the Level Detector board producing a logic "1" at the TP21, the output of "OR" gate IC12 (6). This starts the timer, IC20 (12) which, after the selected time delay causes the TR2 relay to pick up.

The operation of timer IC20 (12) is the same as described for the level detectors except the switching from logic "1" to logic "0" is determined by the charge voltage on C21 and the RC time constant of R89, C21, and P25 in series. Switching occurs when the charge on C21 overcomes the reference voltage at pin 2 of IC20 produced by the voltage divider resistors R90 and R91. This occurs in one time constant which is variable depending the setting of P25. P5 is a front panel mounted potentiometer with a dial marked 0.2 to 4.0 seconds.

The SLB-1 relay includes circuitry for supervising the detection logic with $3E_o$ ($3V_o$) measured on both sides of the breaker in breaker-and-a-half and ring bus applications. Circuits for detecting the magnitude of $3V_o$ on each side of the breaker, both individually and differentially ($\Delta V_o$), are provided on the $3V_o$ Logic board. Each $3V_o$ quantity appearing at transformers T4 and

T5 is sensed by individual level detectors similar to those in the current circuits less the 60 Hz filters. Links 1, 2, and 3 at the inputs to the level detectors permit selection of either individual $3V_o$ or $\Delta 3V_o$ operation. For $\Delta 3V_o$, all three links should be in Position 1. This connects the secondaries of T4 and T5 in opposition and the result is applied to one level detector circuit, IC13 (10), IC16(12), IC16 (10), and IC14(10). Individual $3V_o$ detection is obtained with all three links in Position 2.

In addition to the two $3V_o$ level detecting circuits, a $I_M$ (medium set) level detector, IC13(12) and IC14(12), is included on the $3V_o$ Logic board. The configuration of this detector is identical to the $I_H$ (high set) detector. The outputs of the two $3V_o$ detectors at pin 10 of IC 14 and pin 10 of IC17 are "OR"ed in IC19(8) and then "AND"ed with the $I_M$ (medium set) detector in IC19(3). The output of this "AND" gate at TP32 is time delayed 15 ms by the IC10 (12) circuit on the Level Detector board before being "AND"ed with the $I_L$ (low set) detectors for operation of the timer associated with the TR2 output relay.

The $3V_o$ "OR"ed output at pin 8 of IC19 is also "AND"ed with the $I_L$ (low set) output at TP21 in IC18 (6) to provide an operate signal to a second adjustable timer, IC20(10), which controls the TR1 output relay. This timer is identical to that controlling TR2 except with one-fourth the range (0.05 to 1.0 seconds) adjustable through front panel mounted P26. An additional input to the IC(18) "AND" gate provides an inhibit signal to inhibit the operation of the TR1 timer when single or selective pole tripping is used.

The inhibit circuit consists of an input buffer (R77, R78, R79, R80, Z5, Z6, and C15), optical isolator IC15, and a 5 ms "ON" 500 ms "OFF" timer IC17(12). The operation of this timer is the same previously described. The diodes D20, D21, D22, D23 are used to control the charge and discharge paths for C17.

All the level detectors adjustments for the SLB-1 relay consist of setting two potentiometers (one for pickup and one for dropout) as shown in Table 1. Though the level detectors are preset at the factory to the recommended values of $I_L$ = 20 mA, $I_M$ = 65 mA, $I_H$ = 300 mA, and $3V_o$ = 6 volts, they can be adjusted for other values if required for the application.

| Detector | Pickup Pot. | Dropout Pot. |
|---|---|---|
| A Phase $I_L$ | P4 | P6 |
| B Phase $I_L$ | P7 | P9 |
| C Phase $I_L$ | P10 | P12 |
| High Set $I_H$ | P13 | P15 |
| Medium Set $I_M$ | P16 | P18 |
| $3V_{o1}$ | P19 | P21 |
| $3V_{o2}$ | P27 | P29 |

The dc power supply for the SLB-1 contains a DC-to-DC converter on the Timer board which isolates the user's dc source from the relay's electronic circuits. The telephone relays, TR1 and TR2, are powered directly from the external source through current limiting resistors RDC3 and RDC4. However, the timers which drive the telephone relays are isolated from the external source by means of Optical Isolators, IC22 and IC23.

## CHARACTERISTICS

A. Current Rating

| | |
|---|---|
| Continuous | 10 Amperes per phase |
| One Second | 200 Amperes per phase |

B. Operating Time

Time Equal to Timer Settings

C. Current Burden Per Phase

| | |
|---|---|
| 1A | .025VA |

D. DC Burden

0.25 Amps continuous

E. Pickup Ranges

$I_L$ - variable from 15 to 100 mA
$I_M$ - variable from 50 to 200 mA
$I_H$ - variable from 100 to 500 mA
$3V_{o1}$ - variable from 6 to 20 volts
$3V_{o2}$ - variable from 6 to 20 volts

Dropout

94 to 98% of all pickup values

F. Tripping Condition

1. For $3V_o$ or $\Delta 3V_o$ equal to less than 6 volts, at least one phase conducting greater than the $I_H$ setting while at least one phase is conducting less than the $I_L$ setting.

2. For $3V_o$ or $\Delta 3V_o$ equal to 6 or more volts, at least one phase conducting greater than the $I_M$ setting while at least one phase is conducting less than the $I_L$ setting.

G. Restraining Conditions

1. For $3V_o$ or $\Delta 3V_o$ equal to less than 6 volts, sudden increase of current from 0.0 ampere to any value greater than the $I_H$ setting in all phases, whether balanced or not.

2. For $3V_o$ or $\Delta 3V_o$ equal to 6 to 20 volts, any sudden change in current, increase or decrease, balanced or not, as long as the minimum current is greater than the $I_M$ setting in all three phases.

3. Simultaneous interruption of three currents, balanced or not.

H. Timer Delay Range and Voltage Rating

| Time Delay Range (Seconds) | Voltage (Volts dc) |
|---|---|
| .05 - 1.0 | 48 |
| .05 - 1.0 | 125 |
| .05 - 1.0 | 250 |
| 0.2 - 4.0 | 48 |
| 0.2 - 4.0 | 125 |
| 0.2 - 4.0 | 250 |

Timer Reset Time

TR drop-out time = .01 sec. or less.

I. Frequency - 50/60 Hz

## SETTINGS

Setting are required for $I_L$, $I_M$, $I_H$, $3V_{o1}$ and $3V_{o2}$. Link selection is required for $3V_o$ and $\Delta 3V_o$.

### $I_L$

$I_L$, the low-set overcurrent unit, is adjustable between 15 and 100 mA. When used in a 2 breaker per line section, bus arrangement (breaker-and-a-half, ring bus, etc), the setting must be sufficiently high to override any back-feed effect to the ct of the protected breaker that could cause incorrect sensing of breaker condition. No load condition, for while pole disagreement detection is required, should produce a current greater than $I_L$ in the low phase, with zero current in the ct primary. With high quality ct's, used on full tap, a setting of 20 mA will usually suffice.

### $I_M$

$I_M$ is the medium-set current detector. It is adjustable from 50 to 200 mA and functions with the zero sequence voltage detector and $I_L$ to detect pole-disagreement. If a faulty breaker feeds an unloaded line, the "sound" phases will have current equal to line charging current. The $I_M$ setting dictates the minimum line length for which pole disagreement can be detected at no load. It therefore, should be set quite low. To determine the maximum setting, $I_M$ (max) = 1.2 $I_C/R_C$ is used, where $I_C$ is the total line charging current per phase. $R_C$ is the ct ratio and 1.2 is a margin factor. Higher settings may be used, but pole disagreement detection based on line charging current will not be possible.

### $I_H$

The $I_H$ high-set overcurrent unit will respond irrespective of $3V_o$ level. It must be set with sufficient margin above $I_L$, that load unbalance can never cause $I_H$ to operate and $I_L$ to be reset. Experience indicates that a 300 mA setting is adequate. Setting over the range of 100 to 500 mA is possible by adjusting potentiometer P13.

### $3V_o$

The $3V_o$ setting has a different meaning depending on the link position selection on the "$3V_o$ Sensing Logic" PC board. In link position 1 (3 links), the level sensing device has $\Delta 3V_o$ (the difference between the two zero sequence voltage inputs) applied to it. With all poles of the breaker closed, this will be zero. A difference indicates one or more poles are open and that a system neutral shift has occurred. The minimum 6 volt setting of P19 should normally be suitable, but a setting as high as 20 volts may be used. The position of P27 is of no significance when using link position 1.

When link position 2 is used the two $3V_o$ units operate as individual level detectors. The operation of either satisfies the logic. A 6 volt setting of potentiometers P19 and P27 may be used, but note that any nearby ground fault may satisfy the $3V_o$, $I_M$, $I_L$ logic and therefore it may be desired to set timer $T_1$ much longer for this link position. Link position 1 is normally recommended.

### $T_1$

This timer may be set for the minimum 50 ms on left dial P26

when link position 1 is used for $\Delta 3V_o$ . When link position 2 is used, either a time sufficiently long to allow all normal clearing must be allowed; possibly 0.5 second, or possible overtripping at no load must be permitted consequent to a ground fault.

Where single pole tripping is used, an inhibitor input from the tripping relays prevents tripping through the short timer $T_1$ . This prevents undesired tripping during the period when one pole of the breaker deenergizes a line to ground fault.

$T_2$

$T_2$ timer causes tripping for those cases where zero sequence voltage is not present across the protected breaker. Since $3V_o$ is a significant indicator of breaker hazard, $T_2$ may be set much longer than the 50 ms setting of $T_1$ . 0.5 seconds for retrip of the protected breaker and alarm is a recommended time. $T_2$ adjustments over the range of 0.2 to 4.0 seconds are made with Right Dial P25.

Where link position 2 is used for $3V_o$ , $T_2$ may be set for 1.0 second, to energize the lockout relay and trip adjacent breakers.

## INDICATING CONTACTOR SWITCH (ICS)

The only setting required on the ICS unit is the selection of the 0.2 or 2.0 ampere tap. This selection is made by connecting the lead located in front of the tap block to the desired setting by means of the connecting screw. The tap should be chosen to be compatible with the trip current that will flow through the coil The ICS unit contacts will close and the operation indicator target will drop for any current above tap value.

## EXTERNAL CONNECTIONS

Fig. 4 shows the external connections for the type SLB-1 relays.

## RECEIVING ACCEPTANCE

Make a visual inspection to make sure that there are no loose connections, broken resistors, or broken resistor wires.

## RELAY CHECK

A. Refer to figure 3.

B. Connect per test figure 10 and apply rated dc voltage.

C. Apply $I_A$ = 15mA, $I_B$ = $I_C$ = 400mA, $3V_o$ = 0 volts. A logic "1" (greater than 8 volts) should be observed at terminal 14 or TP21 of the Level Detector circuit board, and telephone relay TR2 should operate.

Apply $I_B$ = 15mA, $I_A$ = $I_C$ = 400mA, $3V_o$ = 0 and check relay output per step C.

Apply $I_C$ = 15mA, $I_A$ = $I_B$ = 400mA, $3V_o$ = 0 and check relay output per part C.

D. Apply $I_A$ = 15mA, $I_B$ = $I_C$ = 100mA, $3V_o$ = 10 volts rms. A logic "1" (greater than 8 volts) should be observed at terminal 14 (TP21) of the Level Detector circuit board and at terminal 17 (TP31) of the $3V_o$ Logic circuit board.

Telephone relays TR1 and TR2 should operate.

Apply $I_B$ = 15mA, $I_A$ = $I_C$ = 100mA, $3V_o$ = 10 volts and check relay output per step C.

Apply $I_C$ = 15mA, $I_A$ = $I_B$ = 100mA, $3V_o$ = 10 volts and check relay output per part C.

## TIMING CHECK

SLB-1 timers and their dials are calibrated and set at the factory and should not be disturbed in the field. However, the maximum calibration point on the timer dial(s) may be checked to insure that the timers are operating properly.

The recommended test circuit for this check is shown in figure 9. To check the TR1 timer, block the TR2 telephone relay operate contacts with a piece of insulation material. To check the TR2 timer, the TR1 relay operate contacts should be blocked.

A. Connect per test figure 9 and apply rated dc voltage. Switch (S1) should be in the closed position.

B. Set $I_A$ , $I_B$ , & $I_C$ = 1.0 amperes and $3V_o$ = 10 volts. Reset the electronic timer to zero.

C. Set SLB-1 timer dial at the maximum calibration mark and open switch (S1). The electronic timer should display the time set on the SLB timer dial to within + 3%.

D. Return setting to value desired for the application and unblock telephone relay contacts.

## INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the rear mounting stud or studs for the type FT projection case or by means of the four mounting holes on the flange for the semi-flush type FT case. Either the stud or the mounting screws may be utilized for grounding the relay. External toothed washers are provided for use in the locations shown on the outline and drilling plan to facilitate making a good electrical connection between the relay case, its mounting screws or studs, and the relay panel. Ground wires are affixed to the mounting screws or studs as required for poorly grounded or insulating panels. Other electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal stud furnished with the relay for thick panel mounting. The terminal stud may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detail information on the FT case refer to I.L. 41-076.

## ROUTINE MAINTENANCE

All relays should be checked at least once every year at such time intervals as may be dictated by experience to be suitable to the particular application.

## CALIBRATION

Use the following procedure for calibrating the relay if the relay adjustments have been changed or disturbed. This procedure should not be used unless it is apparent the relay is not in proper working order.

The SLB-1 relay can best be calibrated in the chassis using a board extender, style S#644B315 G03.

Using the test setup in figure 10 and referring to the internal schematic diagram, figure 3a, the following procedure should be used in the calibration of the SLB-1 relay. (All voltages are referred to common unless otherwise notes).

A. DC Offset Adjustments

1. Remove the Signal Conditioner board and insert the board extender in its place. Next, plug the Signal Conditioner board into the board extender. Using the millivolt DC range of a DVM:

   a. Connect a jumper from terminal 14 to terminal 8 and adjust P1 so that the voltage at TP1 is 0.0 ± 5.0 mv DC.

   b. Connect a jumper from terminal 16 to terminal 11 and adjust P2 so that the voltage at TP3 is 0.0 ± 5.0 mv DC.

   c. Connect a jumper from terminal 3 to terminal 9 and adjust P3 so that the voltage at TP5 is 0.0 ± 5.0 mv DC.

   d. Replace the Signal Conditioner board in the relay chassis.

2. Remove the Level Detector board and insert the board extender in its place and plug the Detector board into the board extender.

   a. Connect a jumper from terminal 2 to terminal 10 and adjust P5 so that the voltage at TP8 is 0.0 ± 5.0 mv DC.

   b. Connect a jumper from terminal 4 to terminal 10 and adjust P8 so that the voltage at TP11 is 0.0 ± 5.0 mv DC.

   c. Connect a jumper from terminal 5 to terminal 10 and adjust P11 so that the voltage at TP14 is 0.0 ± 5.0 mv DC.

   d. Connect a jumper from terminal 12 to terminal 10 and adjust P14 so that the voltage at TP17 is 0.0 ± 5.0 mv DC.

   e. Replace the Level Detector board in the relay chassis.

3. With the $3V_o$ Logic board in the board extender, put links 1, 2 and 3 in position 2.

   a. Connect a jumper from terminal 18 to terminal 9 and adjust P20 so that the voltage at TP24 is 0.0 ± 5.0 mv DC.

b. Connect a jumper from terminal 11 to terminal 13 and adjust P28 so that the voltage at TP28 is 0.0 ± 5.0 mv DC.

c. Connect a jumper from terminal 12 to terminal 10 and adjust P17 so that the voltage at TP22 is 0.0 ± 5.0 mv DC.

d. Remove the jumper and replace the 3Vo Logic circuit board in the relay chassis.

B. $I_H$ Level Detector (Refer to Fig. 6). Note: All the pickup and dropout adjustment potentiometers are located on the front edges of the circuit boards.

1. Connect per test diagram Fig. 10 and apply rated dc voltage. Place the Level Detector Module on the extender card and turn P6, P9, P12 and P15 full clockwise.

2. Apply $I_A$ = 300 mA, $I_B$ = $I_C$ = 0, $3V_O$ = 0.

3. With an oscilloscope, monitor terminal 14 or TP21 on the Level Detector board, and adjust P13 until a logic "1" (greater than 8 volts) just appears at terminal 14.

4. Reduce $I_A$ to about 290 mA and adjust the dropout potentiometer P15 until a logic "0" (less than 2 volts) just appears at terminal 14.

5. Increase $I_A$ and logic "1" output should be observed as current reaches 300 mA.

6. Reduce $I_A$ and recheck per step 4. Dropout should occur within the 300 to 290 mA range.

C. $I_M$ Level Detector (Refer to Fig. 8).

1. Connect per test diagram Fig. 10 and apply rated dc voltage. Connect a jumper from TP27 to term. 10 on the $3V_O$ module.

2. Apply $I_A$ = 65 mA, $I_B$ = $I_C$ = 0.

3. Monitor terminal 14 or TP21 on the Level Detector board, and adjust the pickup potentiometer P16 on the $3V_O$ Module until a logic "1" appear at terminal 14.

4. Reduce $I_A$ to about 63 mA and adjust the dropout potentiometer P18 on the $3V_O$ Module until a logic "0" appears at term. 14.

5. Increase $I_A$ and logic "1" output should be observed as current reaches 65 mA.

6. Reduce $I_A$ and recheck per step 4.

7. Remove the jumper from TP27.

D. $3V_O$ Level Detector (Refer to Fig. 8).

1. Connect per test diagram Fig. 10 and apply rated voltage. Turn P18, P21, and P29 full clockwise.

2. Apply $I_A$ = 100 mA, $I_B$ = $I_C$ = 0, $3V_O$ = 6 volts.

3. Monitor terminal 14 or TP21 on the Level Detector board, and adjust P19 on the $3V_O$ Logic board until a logic "1" appears at terminal 14.

4. Reduce $3V_O$ to 5.8 volts and adjust P21 on the 3V Logic board until a logic "0" appears at terminal 14 on the Level Detector board.

5. Recheck steps 3 and 4.

6. Next apply $3V_O$ = 6 volts to relay terminals 18 and 19 and repeat steps 2 through 5 while adjusting P27 for pickup and P29 for dropout.

E. $I_L$ Current Level Detector (Refer to Fig. 6).

1. Connect per test diagram Fig. 10 and apply rated dc voltage.

2. Apply $I_A$ 20 mA, $I_B$ = $I_C$ = 1.0 Amp, $3V_O$ = 0.

3. Monitor terminal 14 or TP21 on the Level Detector board and adjust P4 until a logic "0" (less than 2 volts) appears at terminal 14.

4. Reduce $I_A$ to 19 mA and adjust P6 until a logic "1" appears at terminal 14 on the Level Detector Module.

5. Recheck steps 3 and 4.

6. Adjust P7 and P9 per steps 3, 4, and 5 with $I_B$ = 20 mA, $I_A$ = $I_C$ = 1.0 Amp.

7. Adjust P10 and P12 per steps 3, 4, and 5 with $I_C$ = mA, $I_A$ = $I_B$ = 1.0 Amp.

8. Replace the Level Detector Module in the chassis.

F. Fast Timer Inhibit Check (Refer to Fig. 8).

1. Connect per test diagram Fig. 10 and apply rated dc voltage. Place $3V_O$ Module on the Extender Card.

2. Apply $I_A$ = 0, $I_B$ = $I_C$ = 1.0 Amp, $3V_O$ = 10 volts.

3. Monitor terminal 17 or TP31 on the 3 $V_O$ Logic board. Terminal 17 should be at logic "1" and telephone relays TR1 and TR2 should be picked up.

4. Apply rated dc voltage to Inhibit relay terminals 11 and 12 (+). Terminal 17 should switch to logic "0" and telephone relay TR1 should drop out.

5. Replace the $3V_O$ Module in the chassis.

G. Timing Check

Check timers using procedure given under RECEIVING ACCEPTANCE.

## RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

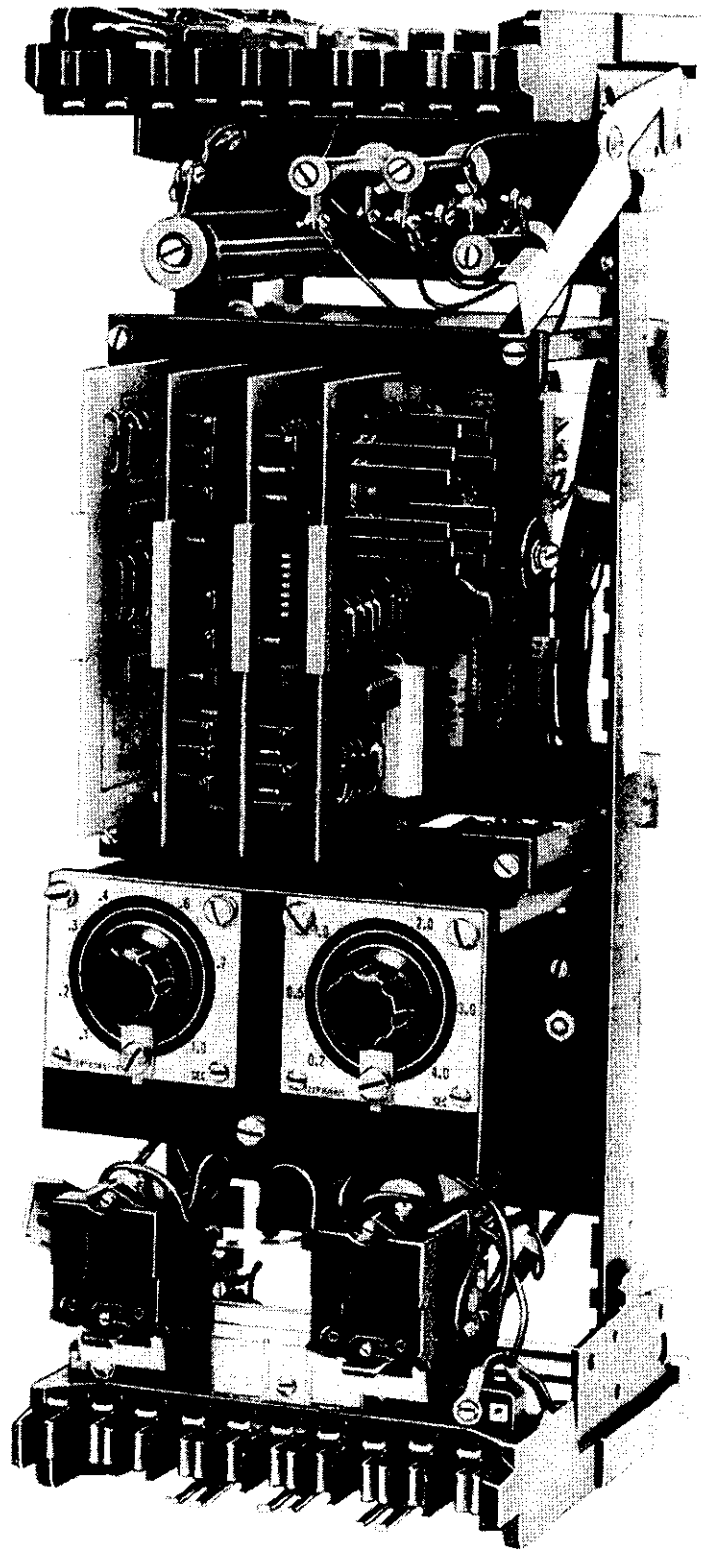


*Fig. 1. Type SLB-1 Relay Chassis*

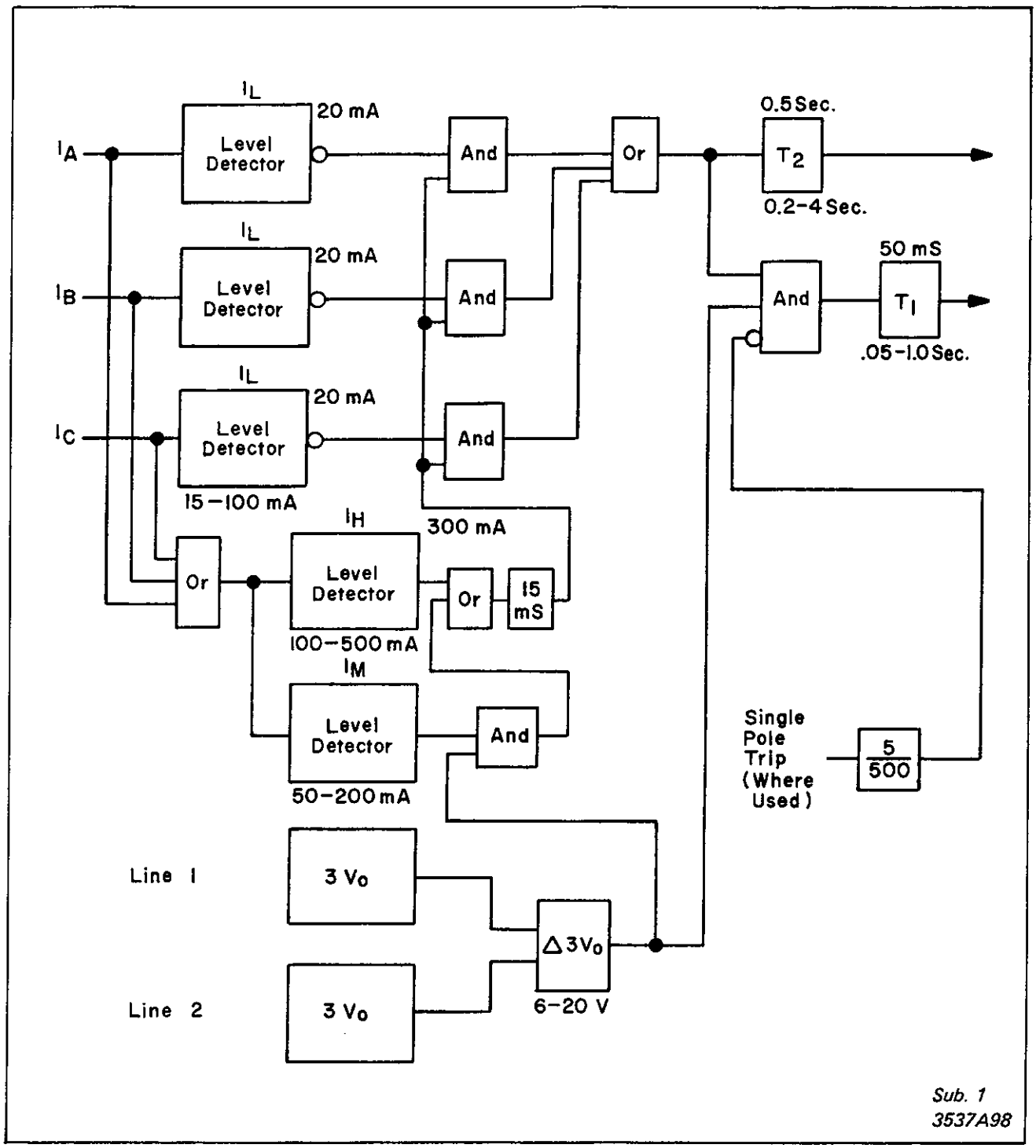
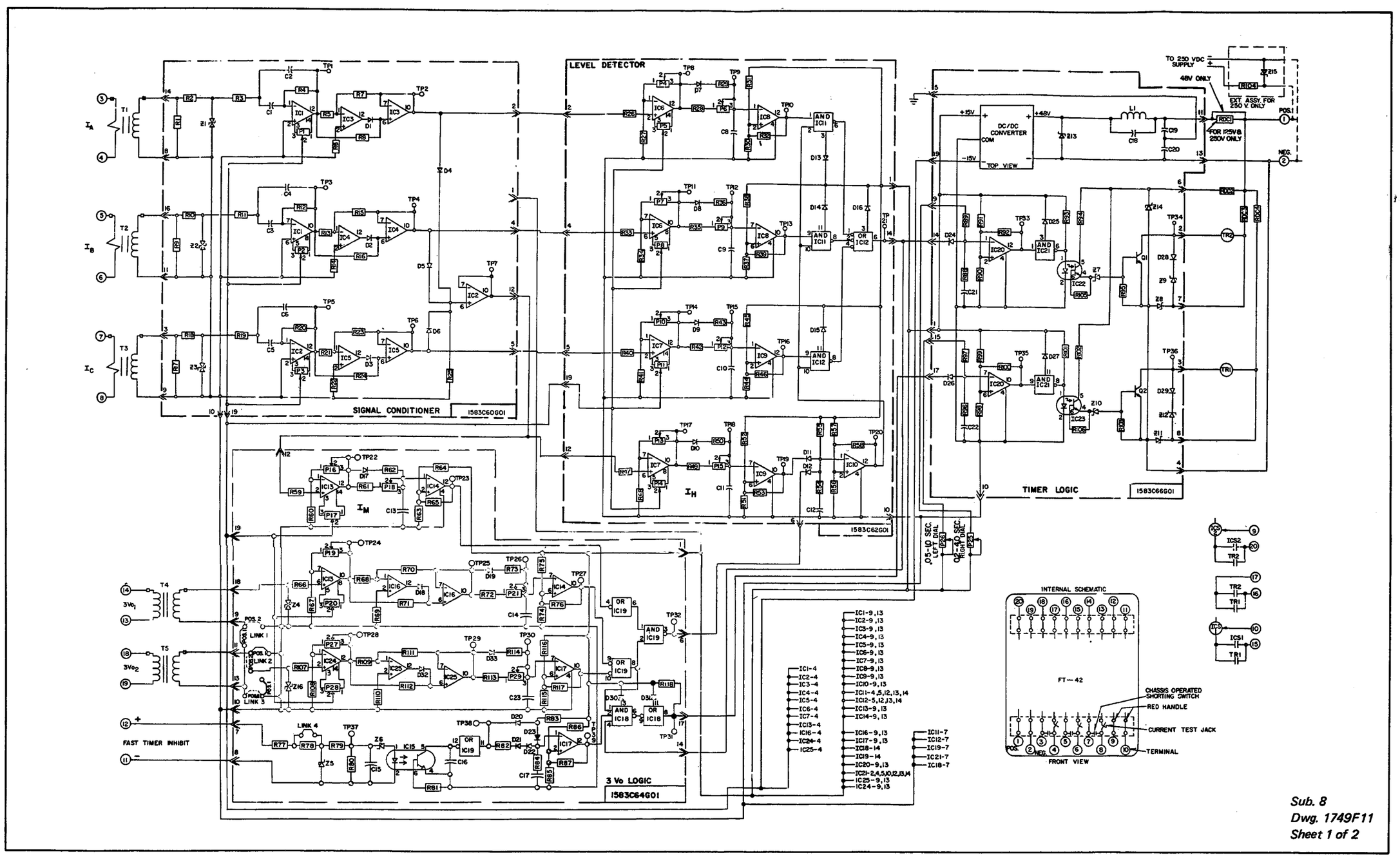



*Fig. 2. Logic for SLB-1 Relay*




Sub. 8
Dwg. 1749F11
Sheet 1 of 2

Fig. 3a. Internal Schematic for the SLB-1 Relay

| | | | | |
|---|---|---|---|---|
| C1 | CAPACITOR | 2.0 MFD | 50V | 3531A88H02 |
| C2 | CAPACITOR | 0.47 MFD | 50V | 3531A88H01 |
| C3 | CAPACITOR | 2.0MFD | 50V | 3531A88H02 |
| C4 | CAPACITOR | 0.47MFD | 50V | 3531A88H01 |
| C5 | CAPACITOR | 2.0 MFD | 50V | 3531A88H02 |
| C6 | CAPACITOR | 0.47MFD | 50V | 3531A88H01 |
| ~~C7~~ | ~~CAPACITOR~~ | ~~0.1 MFD~~ | ~~100V~~ | ~~3568A89H05~~ |
| C8 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C9 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C10 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C11 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C12 | CAPACITOR | 1.0 MFD | 35V | 837A241H15 |
| C13 | CAPACITOR | 0.47 MFD | 200V | 876A409H17 |
| C14 | CAPACITOR | 0.47MFD | 200V | 876A409H17 |
| C15 | CAPACITOR | 0.05MFD | 100V | 184A663H02 |
| C16 | CAPACITOR | 500 PF | 500V | 837A200H02 |
| C17 | CAPACITOR | 1.0MFD | 35V | 837A241H15 |
| C18 | CAPACITOR | .047MFD | 200V | 849A437H04 |
| C19 | CAPACITOR | .01 MFD | 3000V | 3536A32H02 |
| C20 | CAPACITOR | .01 MFD | 3000V | 3536A32H02 |
| C21 | CAPACITOR | 8.0 MFD | 50V | 3531A88H04 |
| C22 | CAPACITOR | 4.0MFD | 50V | 3531A88H03 |
| C23 | " | 0.47 MFD | 200V | 876A409H17 |
| D1 | DIODE | | IN645A | 837A692H03 |
| D2 | DIODE | | IN645A | 837A692H03 |
| D3 | DIODE | | IN645A | 837A692H03 |
| D4 | DIODE | | IN645A | 837A692H03 |
| D5 | DIODE | | IN645A | 837A692H03 |
| D6 | DIODE | | IN645A | 837A692H03 |
| D7 | DIODE | | IN645A | 837A692H03 |
| D8 | DIODE | | IN645A | 837A692H03 |
| D9 | DIODE | | IN645A | 837A692H03 |
| D10 | DIODE | | IN645A | 837A692H03 |
| D11 | DIODE | | IN645A | 837A692H03 |
| D12 | DIODE | | IN645A | 837A692H03 |
| D13 | DIODE | | IN645A | 837A692H03 |
| D14 | DIODE | | IN645A | 837A692H03 |
| D15 | DIODE | | IN645A | 837A692H03 |
| D16 | DIODE | | IN645A | 837A692H03 |
| D17 | DIODE | | IN645A | 837A692H03 |
| D18 | DIODE | | IN645A | 837A692H03 |
| D19 | DIODE | | IN645A | 837A692H03 |
| D20 | DIODE | | IN645A | 837A692H03 |
| D21 | DIODE | | IN645A | 837A692H03 |
| D22 | DIODE | | IN645A | 837A692H03 |
| D23 | DIODE | | IN645A | 837A692H03 |
| D24 | DIODE | | IN645A | 837A692H03 |
| D25 | DIODE | | IN645A | 837A692H03 |
| D26 | DIODE | | IN645A | 837A692H03 |
| D27 | DIODE | | IN645A | 837A692H03 |
| D28 | DIODE | | IN4818 | 188A342H06 |
| D29 | DIODE | | IN4818 | 188A342H06 |
| D30 | DIODE | | IN645A | 837A692H03 |
| D31 | DIODE | | IN645A | 837A692H03 |
| IC1 | INT. CKT. | | 747DM | 1443C52H01 |
| IC2 | INT. CKT. | | 747DM | 1443C52H01 |
| IC3 | INT. CKT. | | 747DM | 1443C52H01 |
| IC4 | INT. CKT. | | 747DM | 1443C52H01 |
| IC5 | INT. CKT. | | 747DM | 1443C52H01 |
| IC6 | INT. CKT. | | 747DM | 1443C52H01 |
| IC7 | INT. CKT. | | 747DM | 1443C52H01 |
| IC8 | INT. CKT. | | 747DM | 1443C52H01 |
| D32 | DIODE | | IN645A | 837A692H03 |
| D33 | " | | " | " |

| | | | |
|---|---|---|---|
| IC24 | INT. CKT. | 747DM | 1443C52H01 |
| IC25 | INT. CKT. | 747DM | 1443C52H01 |
| IC9 | INT. CKT. | 747DM | 1443C52H01 |
| IC10 | INT. CKT. | 747DM | 1443C52H01 |
| IC11 | INT. CKT. | MC679L | 6296D58H02 |
| IC12 | INT. CKT. | MC679L | 6296D58H02 |
| IC13 | INT. CKT. | 747DM | 1443C52H01 |
| IC14 | INT. CKT. | 747DM | 1443C52H01 |
| IC15 | INT. CKT. | 4N35 | 7748936H01 |
| IC16 | INT. CKT. | 747DM | 1443C52H01 |
| IC17 | INT. CKT. | 747DM | 1443C52H01 |
| IC18 | INT. CKT. | MC679L | 6296D58H02 |
| IC19 | INT. CKT. | MC668L | 6296D58H05 |
| IC20 | INT CKT. | 747DM | 1443C52H01 |
| IC21 | INT. CKT. | MC679L | 6296D58H02 |
| IC22 | INT. CKT. | 4N35 | 7748936H01 |
| IC23 | INT. CKT. | 4N35 | 7748936H01 |
| Q1 | TRANSISTOR | 2N3590 | 837A617H03 |
| Q2 | TRANSISTOR | 2N3590 | 837A617H03 |
| T1 | TRANSFORMER | | 1582C88G02 |
| T2 | TRANSFORMER | | 1582C88G02 |
| T3 | TRANSFORMER | | 1582C88G02 |
| T4 | TRANSFORMER | | 1582C88G01 |
| T5 | TRANSFORMER | | 1582C88G01 |

| | | | |
|---|---|---|---|
| R1 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R2 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R3 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R4 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R5 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R6 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R7 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R8 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R9 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R10 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R11 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R12 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R13 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R14 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R15 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R16 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R17 | RESISTOR | 100Ω, 3W, 5% | 763AI27H20 |
| R18 | RESISTOR | 1.0K, 3W, 5% | 763AI27H02 |
| R19 | RESISTOR | 1.3K, .5W, 1% | 848A819H59 |
| R20 | RESISTOR | 53.6K, .5W, 1% | 848A821H16 |
| R21 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R22 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R23 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R24 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R25 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R26 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R27 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R28 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R29 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R30 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R31 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R32 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R33 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R34 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R35 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R36 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R37 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R38 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R107 | | 1.0K, .5W, 1% | 848A819H48 |
| R108 | | " " " | " |
| R109 | | 20K, .5W, 1% | 848A820H74 |
| R110 | | 10K, .5W, 1% | 848A820H45 |
| R111 | | 20K, .5W, 1% | 848A820H74 |
| R118 | | 15K, .5W, 1% | 848A820H62 |

| | | | |
|---|---|---|---|
| R39 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R40 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R41 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R42 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R43 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R44 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R45 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R46 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R47 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R48 | RESISTOR | 619Ω, .5W, 1% | 848A819H28 |
| R49 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R50 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R51 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R52 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R53 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R54 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R55 | RESISTOR | 15.0K, .5W, 1% | 848A820H32 |
| R56 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R57 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R58 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R59 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R60 | RESISTOR | 453Ω, .5W, 1% | 848A819H15 |
| R61 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R62 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R63 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R64 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R65 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R66 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R67 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R68 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R69 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R70 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R71 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R72 | RESISTOR | 3.01K, .5W, 1% | 848A819H94 |
| R73 | RESISTOR | 1.0 K, .5W, 1% | 848A819H48 |
| R74 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R75 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R76 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R77 | RESISTOR | 5K, 3W, 5% | 763AI27H04 |
| R78 | RESISTOR | 15K, 2W, 5% | 185A207H55 |
| R79 | RESISTOR | 470Ω, .5W, 2% | 629A531H24 |
| R80 | RESISTOR | 8.2K, .5W, 2% | 629A531H54 |
| R81 | RESISTOR | 1.0M, .5W, 1% | 848A822H39 |
| R82 | RESISTOR | 499K, .5W, 1% | 848A822H10 |
| R83 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R84 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R85 | RESISTOR | 15K, .5W, 1% | 848A820H62 |
| R86 | RESISTOR | 15K, .5W, 1% | 848A820H62 |
| R87 | RESISTOR | 22.1K, .5W, 1% | 848A820H78 |
| R88 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R89 | RESISTOR | 20K, .5W, 1% | 848A820H74 |
| R90 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R91 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R92 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R93 | RESISTOR | 681Ω, .5W, 1% | 848A819H32 |
| R94 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R95 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R96 | RESISTOR | 100Ω, .5W, 1% | 848A818H51 |
| R97 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R98 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R99 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R112 | | " " " | " |
| R113 | | 3.01K, .5W, 1% | 848A819H94 |
| R114 | | 10K, .5W, 1% | 848A819H48 |
| R115 | | 10.K, .5W, 1% | 848A820H45 |
| R116 | | " " " | " |
| R117 | | " " " | " |

| | | | |
|---|---|---|---|
| R100 | RESISTOR | 10K, .5W, 1% | 848A820H45 |
| R101 | RESISTOR | 681Ω, .5W, 1% | 848A819H32 |
| R102 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R103 | RESISTOR | 4.99K, .5W, 1% | 848A820H16 |
| R104 | RESISTOR | 2×180Ω, .40W | 4D1299H77 |
| R105 | RESISTOR | 1.0M, .25W, 1% | 848A822H39 |
| R106 | RESISTOR | 1.0M, .25W, 1% | 848A822H39 |
| P1 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P2 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P3 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P4 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P5 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P6 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P7 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P8 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P9 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P10 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P11 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P12 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P13 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P14 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P15 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P16 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P17 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P18 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P19 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P20 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P21 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P22 | TRIM POTENTIOMETER | 20K, .5W | 3531A86H02 |
| P23 | TRIM POTENTIOMETER | 10K, .5W | 3523A42H01 |
| P24 | TRIM POTENTIOMETER | 10K, .5W | 3531A86H01 |
| P25 | POTENTIOMETER | 500K, 2W | 3531A87H02 |
| P26 | POTENTIOMETER | 250K, 2W | 3531A87H01 |
| P27 | TRIM POT. | 20K, .5W | 3531A86H02 |
| P28 | TRIM POT. | 10K, .5W | 3523A42H01 |
| P29 | TRIM POT | 10K, .5W | 3531A86H01 |
| Z1 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z2 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z3 | ZENER DIODE | IN4836, 15V | 3531A92H01 |
| Z4 | ZENER DIODE | IN4832, 10V | 3531A92H02 |
| Z5 | ZENER DIODE | IN3686B, 20V | 185A212H06 |
| Z6 | ZENER DIODE | IN752A, 5.6V | 186A797H12 |
| Z7 | ZENER DIODE | IN748A, 3.6V | 837A398H08 |
| Z8 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z9 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z10 | ZENER DIODE | IN748A, 3.6V | 837A398H08 |
| Z11 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z12 | ZENER DIODE | IN3049B, 160V | 187A936H13 |
| Z13 | ZENER DIODE | IN2832B, 56V | 184A854H14 |
| Z14 | ZENER DIODE | IN5352B, 15V | 862A288H04 |
| Z15 | ZENER DIODE | IN3344RA, 130V | 762A631H16 |
| Z16 | ZENER DIODE | IN4832, 10V | 3531A92H02 |

| | | | |
|---|---|---|---|
| @ RDC1 | RESISTOR | 560 Ω, 40W | 1336173 |
| * RDC2 | RESISTOR | 3.3K, 10 W | 184A856H06 |
| @ RDC2 | RESISTOR | 6.8K, 10 W | 3502A39H02 |
| * RDC3 | RESISTOR | 600Ω, 10W | 3502A39H01 |
| @ RDC3 | RESISTOR | 2 K, 10W | 184A856H08 |
| * RDC4 | RESISTOR | 600Ω, 10W | 3502A39H01 |
| @ RDC4 | RESISTOR | 2K, 10W | 184A856H08 |
| TR1 | TELEPHONE RELAY | | 541D514H37 |
| TR2 | TELEPHONE RELAY | | 541D514H37 |
| L1 | CHOKE | | 292B096G04 |

@ FOR 125V & 250V ONLY
* FOR 48V ONLY

Sub. 8
Dwg. 1749F11
Sheet 2 of 2

Fig. 3b. Parts List for the SLB-1 Relay

NOTE:

1. USE LINK POSITION 1 FOR $\Delta 3\ V_0$ SENSING.
   USE LINK POSITION 2 FOR INDEPENDENT $V_{01}$ AND $V_{02}$ SENSING.
2. CONNECTIONS SHOWN FOR TR-2 ASSUME LINK POSITION 1 IN USE AND RETRIP OF PROTECTED BREAKER IS DESIRED WHEN $\Delta 3\ V_0$ IS LOW. FOR LINK POSITION 2, 86BF TRIPPING BY TR-2 MAY BE DESIRED.

DEVICE NUMBER CHART

46 – SLB-1 POLE DISAGREEMENT RELAY
52 – CIRCUIT BREAKER
86BF – BREAKER FAILURE LOCKOUT RELAY

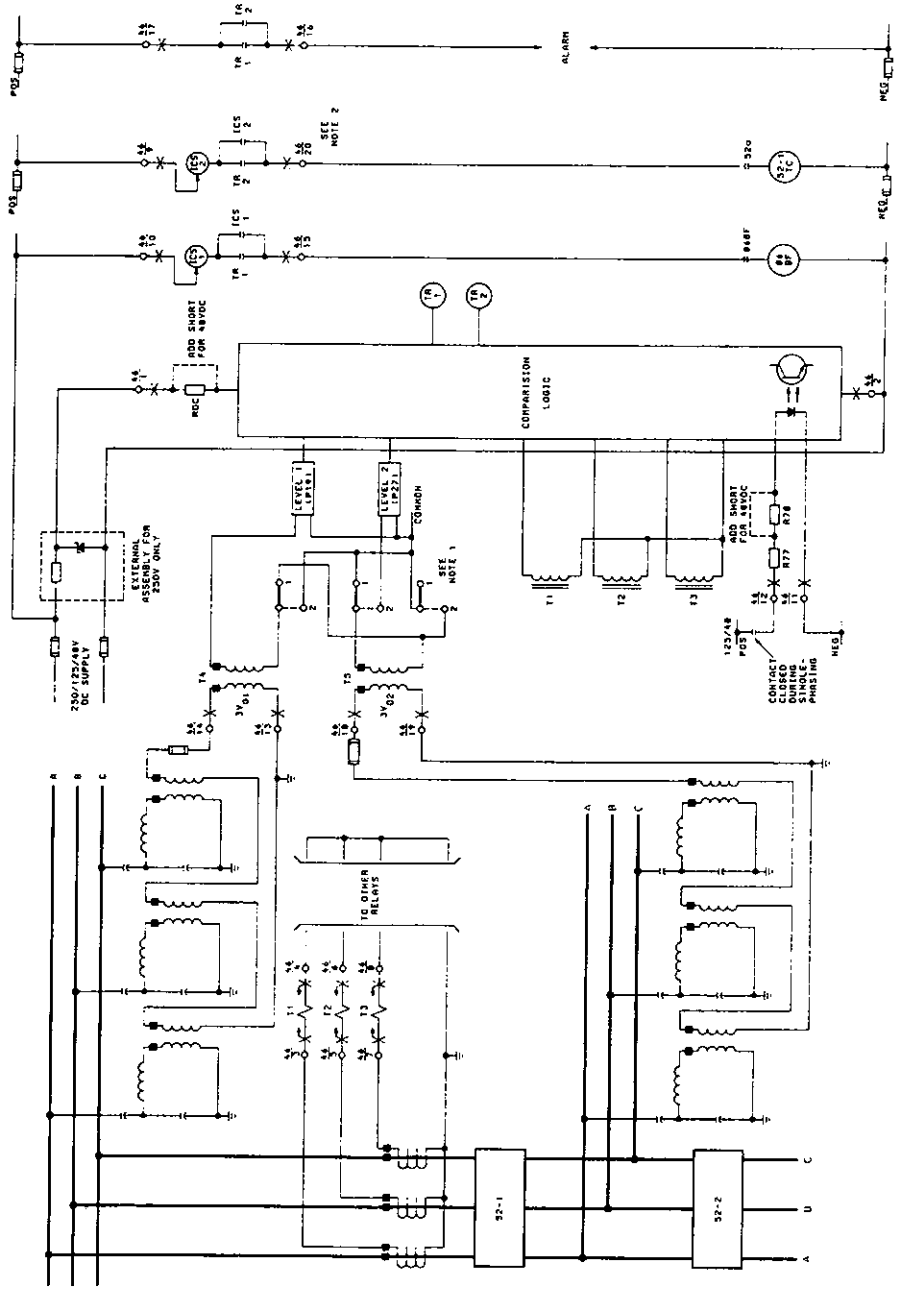



*Fig. 4. External Connection Diagram*

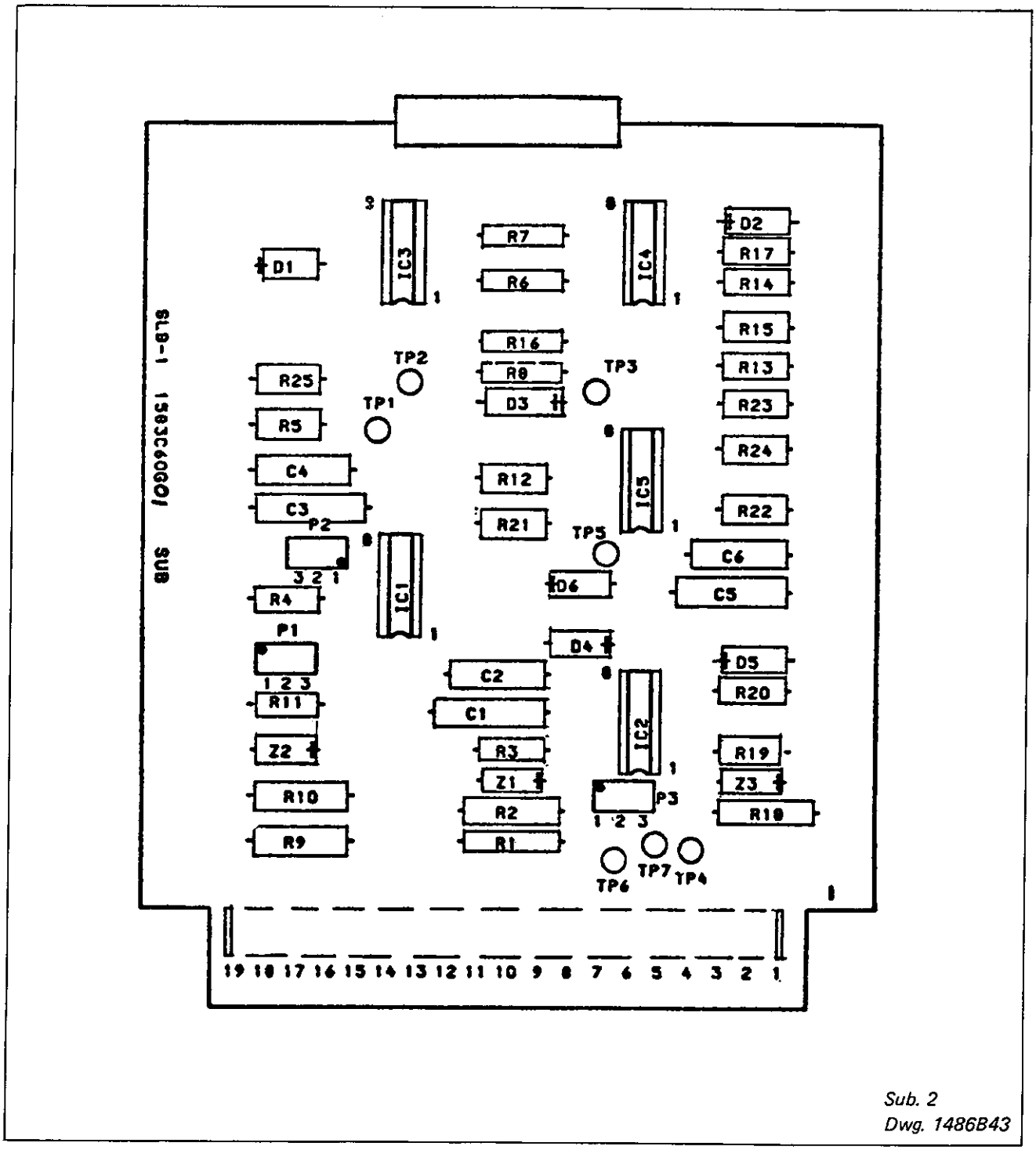



*Fig. 5. Component Location (Signal Conditioner)*

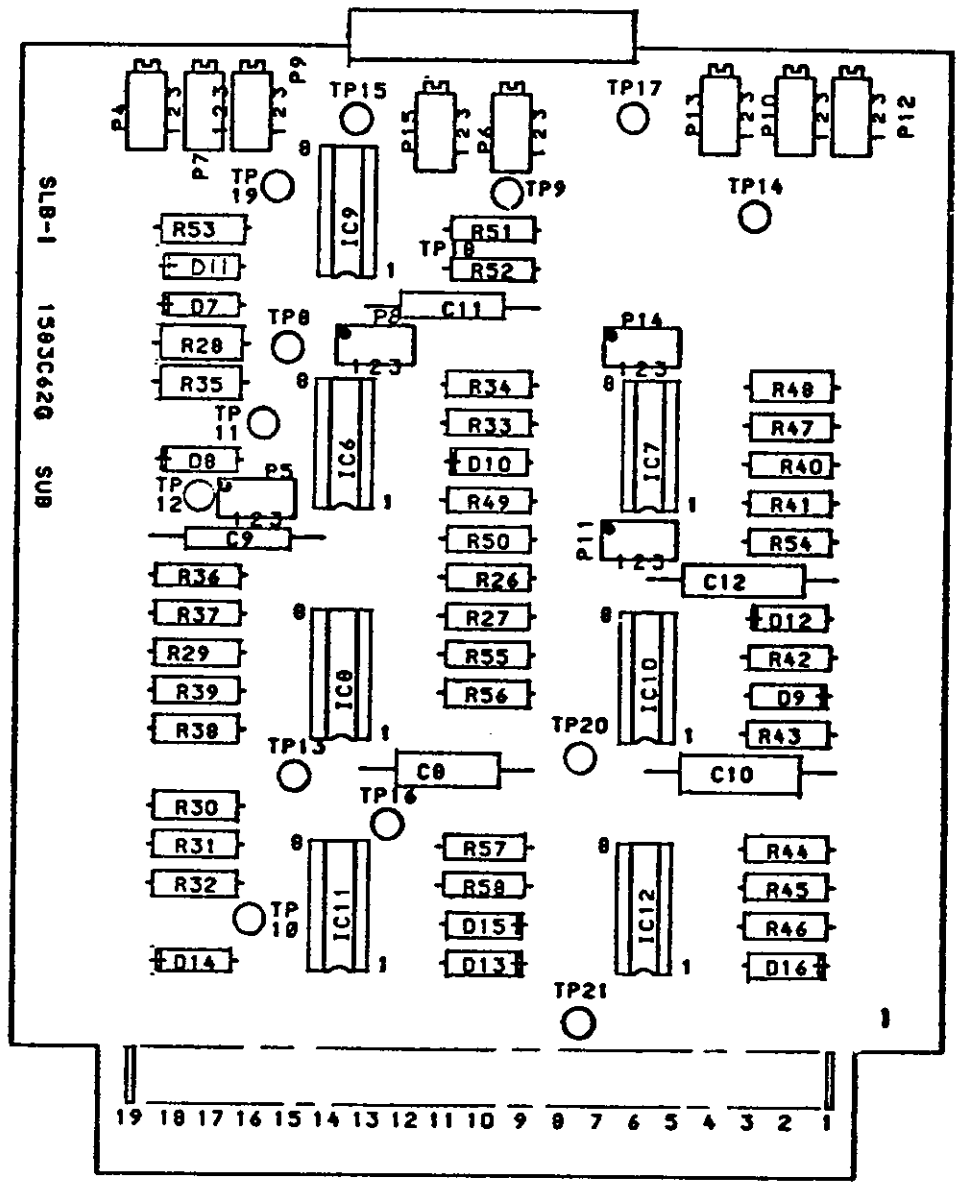



*Fig. 6. Component Location (Level Detector)*

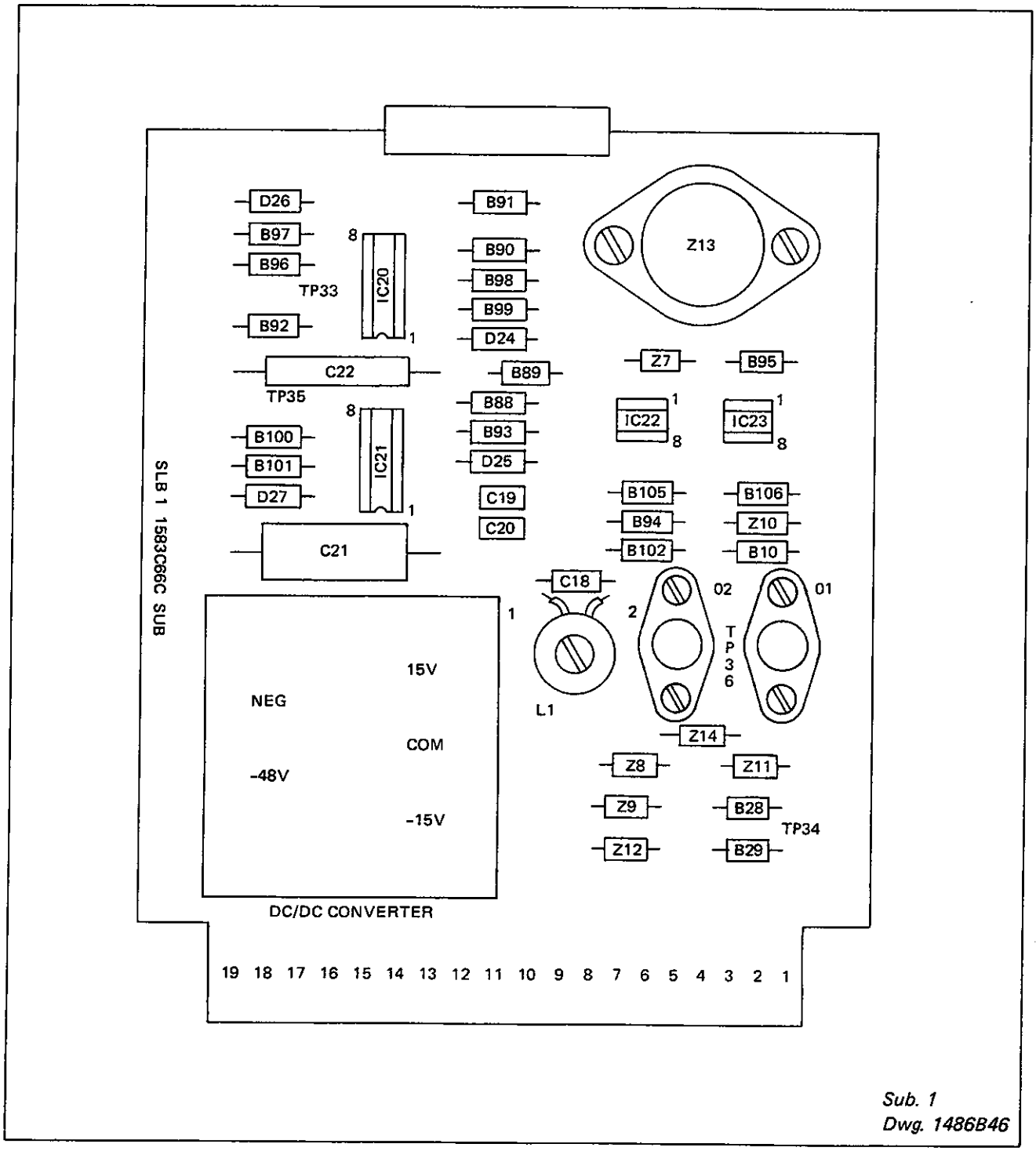
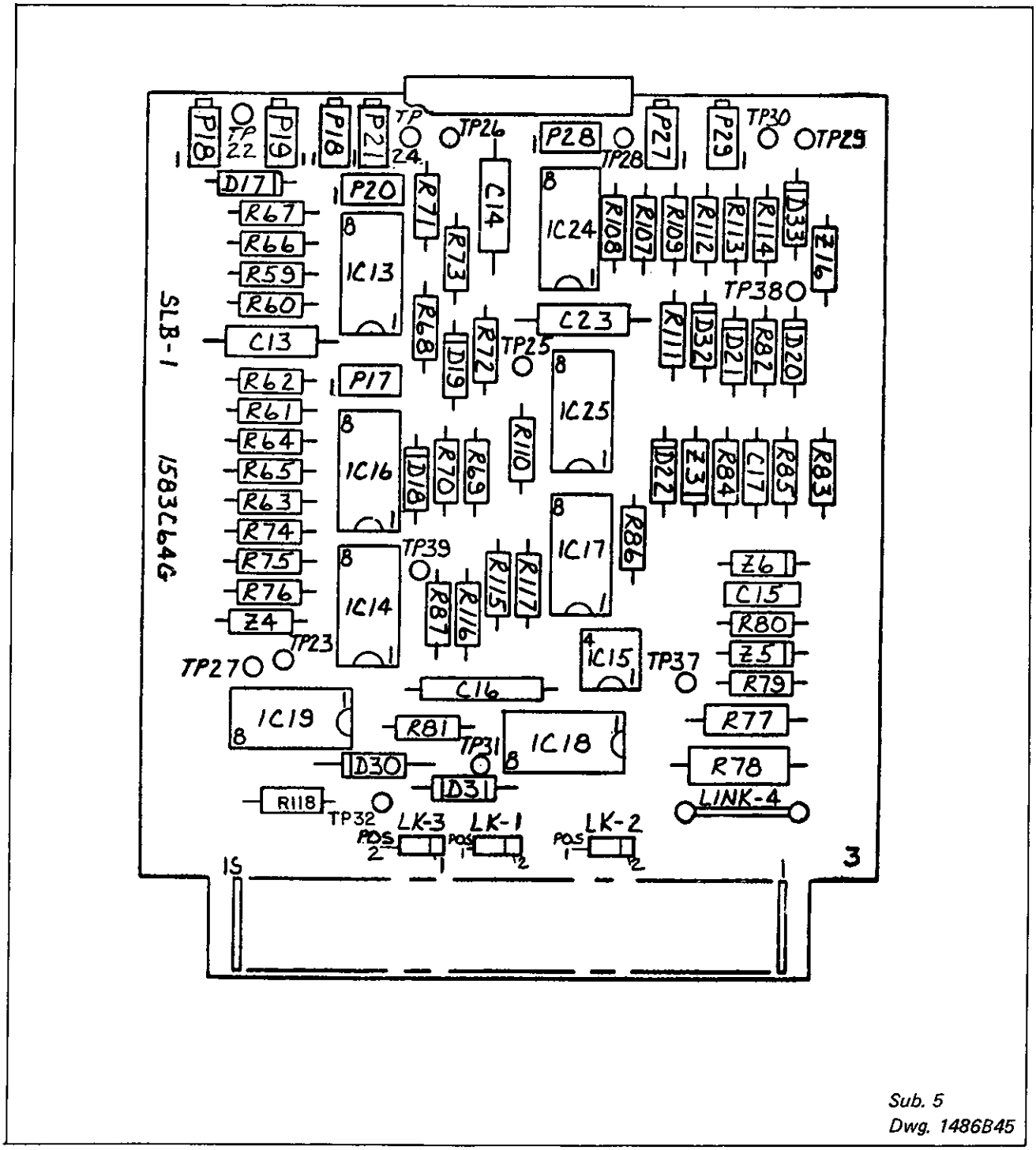



*Fig. 7. Component Location (Timer)*




Sub. 5
Dwg. 1486B45

*Fig. 8. Component Location (3 $V_0$ Logic)*

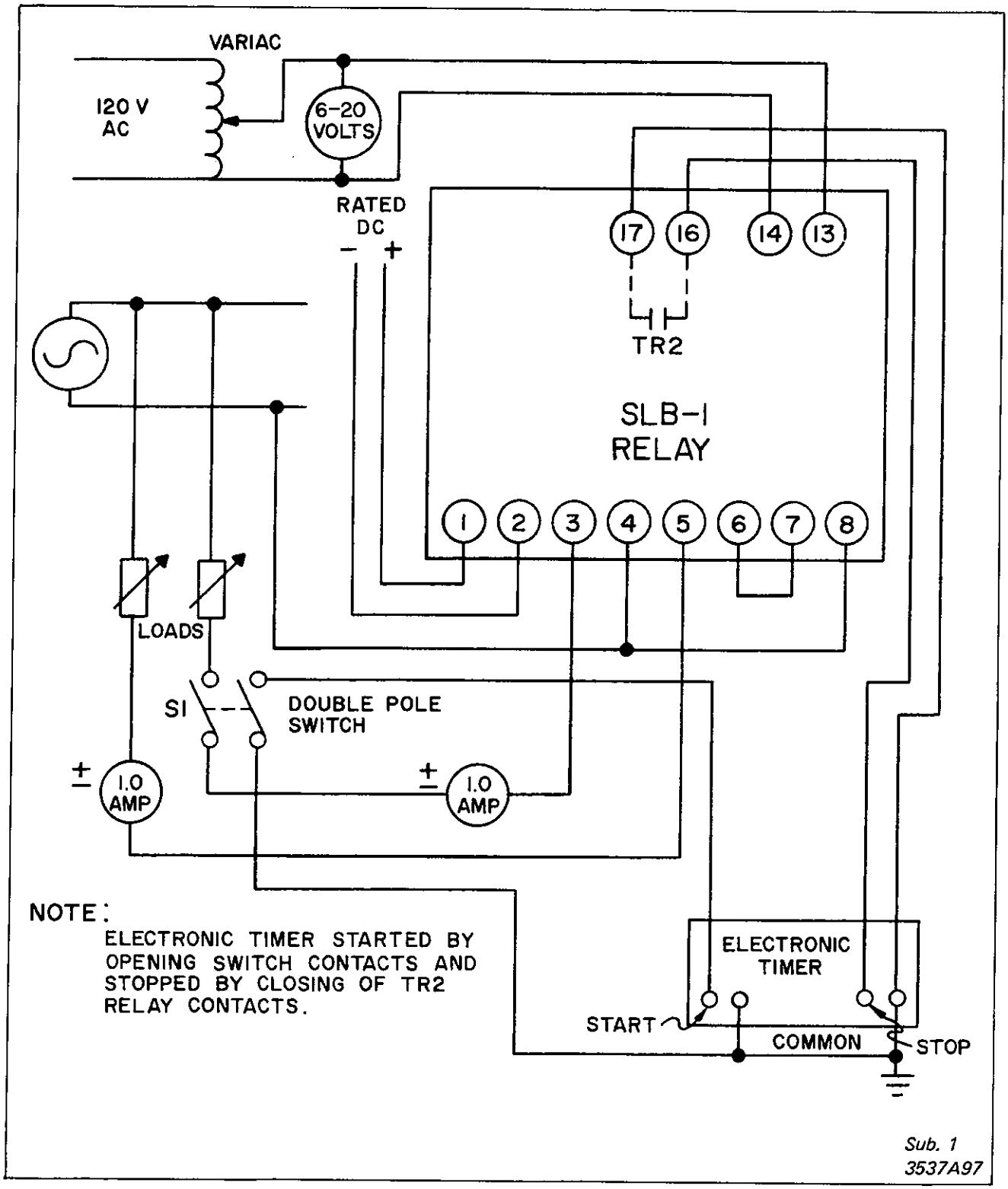



*Fig. 9. Timer Test Circuit*

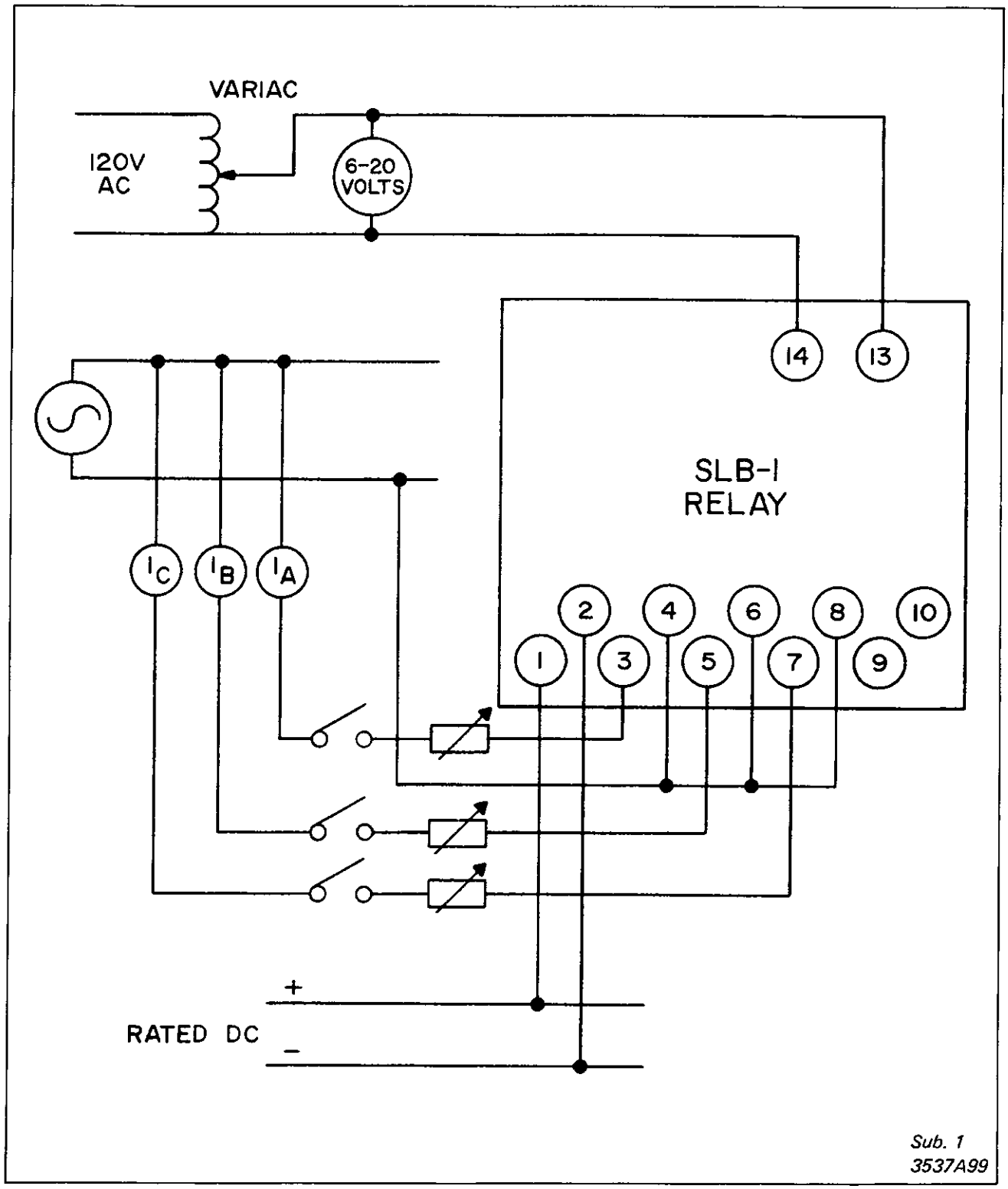



*Fig. 10. SLB-1 Relay Test Circuit*

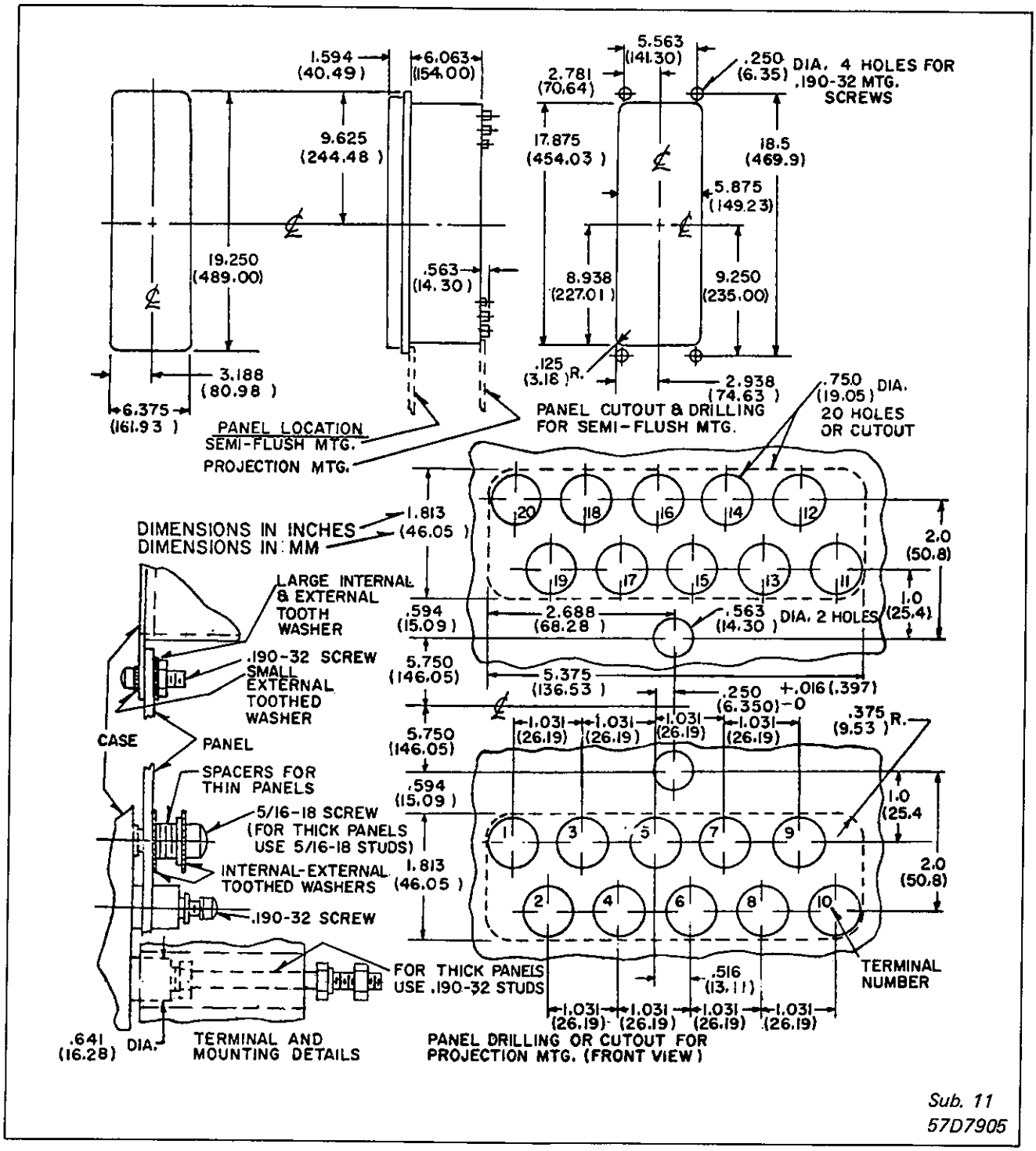



*Fig. 11. Outline and Drilling Plan for Type SLB-1 Relay in Type FT-42 Case*

THIS PAGE RESERVED FOR NOTES

IL 41-775.2 - Revision A

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