

K-LINE CIRCUIT BREAKER POWER SHIELD TEST PRIMARY INJECTION TEST

**TYPE K-225S, K-600S AND K-800S
ELECTRICALLY OPERATED**

**ABB SERVICE, INC.
TRAINING SERVICES**

ABB

**K-LINE CIRCUIT BREAKER
POWER SHIELD TEST
PRIMARY INJECTION TEST**

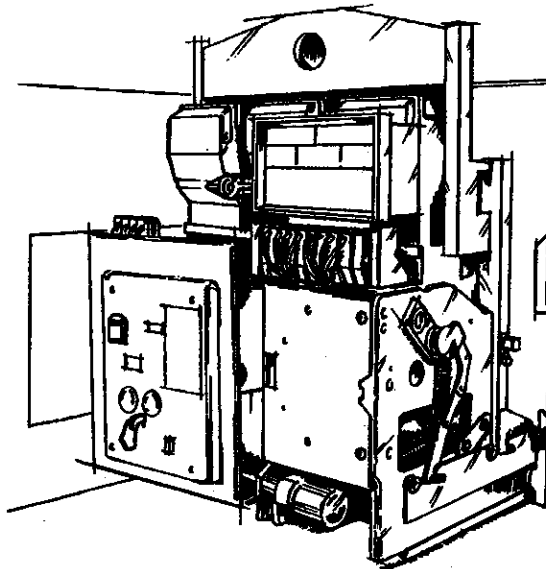
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ELECTRICALLY OPERATED**

ABB SERVICE, INC.

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1. 504 POWER SHIELD TEST
2. PRIMARY INJECTION TEST



OBJECTIVE-

**THIS COURSE WILL TEACH THE STUDENT TO
PREPARE FOR AND PERFORM TEST PROCEDURES ON A
K-LINE TYPE K-225S, K-600S OR K-800S
ELECTRICALLY OPERATED CIRCUIT BREAKER.**

THIS MANUAL BEGINS AND ENDS WITH A REPORT FORM. THE COURSE HAS BEEN DEVELOPED TO FOLLOW THE SEQUENCE OF PROCEDURES THAT WOULD BE ENCOUNTERED UNDER ACTUAL WORKING CONDITIONS. THE REPORT FORM HAS BEEN DESIGNED TO RECORD THOSE EVENTS.

VARIATIONS IN THE SEQUENCE OF THE PROCEDURES MAY OCCUR DUE TO CIRCUMSTANCES OR PERSONAL PREFERENCE.

THE TEST DATA YOU RECORD IS A VITAL ASPECT OF YOUR WORK AND IS ALWAYS A PART OF A GOOD MAINTENANCE PROGRAM.

Circuit Breaker	
Manufacturer: _____	Model/Type: _____
Serial Number: _____	
Voltage: _____	Ampere Rating: _____

Test													
At 1000 V.D.C. Meg Ohms	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center;">Initial Insulation Resistance</th> </tr> <tr> <th style="width: 25%;">Breaker Closed</th> <th style="width: 25%;">Breaker Open</th> <th colspan="2" style="width: 50%;">Expected</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	Initial Insulation Resistance				Breaker Closed	Breaker Open	Expected					
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Inspection																					
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Racking Device	Ground Clip																				
As Found	As Left																				

Check	
Main Moving Contacts and Stationary Contacts	
Contact Alignment	Contact Pressure

Test									
Contact Resistance									
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"A" Phase	"C" Phase								
	Expected								
"B" Phase	Expected								

Check																															
Operating Mechanism																															
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Breaker Closed	Breaker Open	Expected											

Legend: As Found, S=Satisfaction, U=Unsatisfactory, As Left, A=Adjusted, RPD=Repair, RPL=Replace

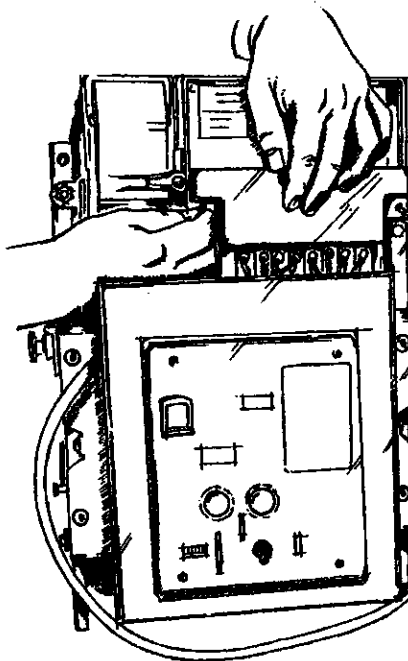
Comments _____ _____ _____ _____	
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Trip Unit Settings															
Mfg. _____	Type _____														
Serial No. _____															
Part No. _____															
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Pickup</td> <td>Delay</td> <td>Pickup</td> <td>Delay</td> </tr> <tr> <td>Short-Time</td> <td></td> <td>GND</td> <td></td> </tr> </table>	Pickup	Delay	Pickup	Delay	Short-Time		GND		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Pickup</td> <td>Delay</td> <td>Pickup</td> </tr> <tr> <td>Ampere Tap</td> <td>Long-Time</td> <td>Inst.</td> </tr> </table>	Pickup	Delay	Pickup	Ampere Tap	Long-Time	Inst.
Pickup	Delay	Pickup	Delay												
Short-Time		GND													
Pickup	Delay	Pickup													
Ampere Tap	Long-Time	Inst.													

Test	
Trip Functions	
Prim. Inject. <input type="checkbox"/> 504 <input type="checkbox"/>	
Function	Expected "A" Phase "B" Phase "C" Phase
LT PU Amps	
LT Delay Sec @ 300%	
BT PU Amps	
ST Delay Sec @ 150%	
Inst PU Amps	
GND PU Amps	
Gnd Delay Sec @ 150%	
Sensor Checks	OK Not OK

Location: _____ Substation: _____ Breaker ID: _____ Date: _____ Sign: _____

POWER SHIELD AND 504 TEST SET



Circuit Breaker	
Manufacturer: _____	Model/Type: _____
Serial Number: _____	
Voltage: _____	Ampere Rating: _____

Initial Insulation Resistance			
At 1000 V.D.C. Meg Ohms	Breaker Closed	Breaker Open	Expected

Inspection	
As Found	As Left
As Found	As Left
Arc Chutes	Frame
Primary Disconnects	Auxiliary Devices/Switches
Secondary Disconnects	Tightness of Connections
Racking Device	Ground Clip

Check	
Main Moving Contacts and Stationary Contacts	
Contact Alignment	Contact Pressure

Test	
Contact Resistance	
"A" Phase	"C" Phase
"B" Phase	Expected

Check	
Operating Mechanism	
Trip Bar Latch Engagement	Manual Close
Latch Engagement	Manual Trip
Shunt Trip	Manual Charge
	Manual Close
	Manual Trip

Breaker Open	Expected

Sustained, RPD=Repair, RPL=Replace

Trip Unit Settings			
Mfg. _____		Type _____	
Serial No. _____			
Part No. _____			
Pickup	Delay	Pickup	Delay
Short-Time		GND	
Pickup	Delay	Pickup	Pickup
Ampere Tap	Long-Time	Inst.	

Trip Functions				
Function	Expected	"A" Phase	"B" Phase	"C" Phase
LT PU				
LT Delay				
BT PU				
BT Delay				
Inst PU				
GND PU				
GND Delay				
Service Checks	OK		Not OK	

Location: _____

Substation: _____

Breaker ID: _____

Date: _____

Sign: _____

GENERAL

THE 504 POWER SHIELD TEST SET IS DESIGNED TO TEST THE ABB POWER SHIELD. THIS SECTION COVERS THE TESTING OF ALL TRIP FUNCTIONS AND OF SENSOR CONTINUITY.

THE 504 TEST ASCERTAINS:

- **THAT THE SENSORS AND THEIR WIRING HAVE CONTINUITY**
- **THAT THE SENSORS ARE NOT SHORTED TO GROUND**
- **THAT THE LATCH RELEASE AND TRIP MECHANISMS WITHIN THE CIRCUIT BREAKER ARE FUNCTIONAL.**
- **THAT THE POWER SHIELD IS FULLY OPERATIONAL AND SUITABLE FOR CONTINUED SERVICE.**

PRIOR TO ANY TESTING OF THE CIRCUIT BREAKER OR POWER SHIELD, A REPORT FORM MUST BE FILLED OUT NOTING THE VALUES OF CURRENT OR TIME FOR EACH FUNCTION TESTED.

RECORD THE POWER SHIELD SETTINGS ON THE REPORT FORM SINCE THE PROPER PLACEMENT OF THE TAP PLUGS IS IMPERATIVE. IF A TAP PLUG IS REMOVED, THE SETTINGS WILL AUTOMATICALLY REVERT TO THEIR MINIMUM, CAUSING IMPROPER OPERATION.

THE CIRCUIT BREAKER TO BE TESTED MUST BE RACKED TO THE DISCONNECTED POSITION OR REMOVED FROM THE SWITCHGEAR TO MAXIMIZE THE SAFETY OF THE TESTING PERSONNEL.

GETTING STARTED

NOTE 1: THE CIRCUIT BREAKER CAN BE TESTED IN CLOSED OR OPEN POSITIONS. IF OPEN POSITION IS USED, THE OPEN AND CLOSE LIGHTS (LAMPS) ON THE TEST SET WILL SIMULATE BREAKER OPERATION.

NOTE 2: TOLERANCES OF PLUS OR MINUS 15% ARE ACCEPTABLE FOR FIELD TESTING.

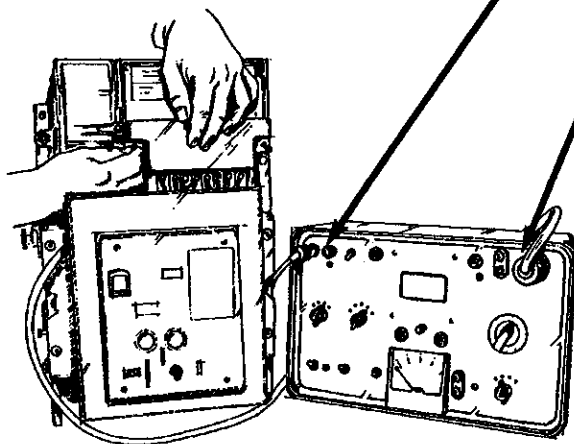
NOTE 3: WHEN TESTING POWER SHIELD UNITS OFF OF THE BREAKER, BE SURE THE RESISTOR LEADS ARE CONNECTED TO TERMINALS 3 AND 16.

NOTE 4: WHEN TESTING POWER SHIELD UNITS EQUIPPED WITH GROUND PROTECTION, SET "GND" SWITCH TO "DEFEAT" POSITION TO TEST LONG-TIME, INSTANTANEOUS AND SHORT-TIME DELAY FUNCTIONS.

STEP 1.
BE SURE THE ON-OFF SWITCH IS IN THE OFF POSITION.

STEP 2.
CONNECT THE 3-PIN POWER CABLE TO A SUITABLE POWER SOURCE.

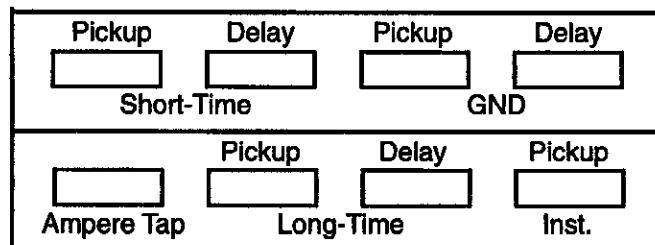
STEP 3.
CONNECT THE 19-PIN TEST CABLE TO THE TEST SET AND THE POWER SHIELD (DO NOT REMOVE WIRES FROM POWER SHIELD TERMINAL BLOCK UNLESS SPECIFICALLY INDICATED.)



HOW TO MAKE SETTINGS:

THE PICKUP AND DELAY SETTINGS FOR ALL TRIP FUNCTIONS ARE MADE BY PROPER PLACEMENT OF THE TAP PLUGS ON THE FRONT PANEL OF THE LOGIC BOX. IF A TAP PLUG IS REMOVED, THE SETTINGS REVERT TO MINIMUM.

THE LONG-TIME, SHORT-TIME, AND INSTANTANEOUS TRIP FUNCTIONS ARE CALIBRATED IN TERMS OF THE AMPERE TAP SETTING. THIS SETTING IS SIMILAR TO THE "COIL-RATING" OF THE ELECTROMECHANICAL TRIP DEVICE. HOWEVER, SEVERAL AMPERE-TAP SETTINGS ARE AVAILABLE IN THE POWER SHIELD. THE AMPERE-TAP SETTING IS MADE BY PLACEMENT OF ITS TAP PLUG ON THE FRONT PANEL OF THE LOGIC BOX.



TO SET THE LONG-TIME TRIP FUNCTION, PLACE THE PICK-UP AND TIME-DELAY PLUGS IN THEIR SELECTED POSITIONS. THIS PROCEDURE IS REPEATED FOR THE SHORT-TIME AND INSTANTANEOUS FUNCTIONS. THE GROUND-TRIP FUNCTION IS CALIBRATED DIRECTLY IN AMPERES. TO SET PICK-UP AMPERES AND TIME DELAY, PLACE THE TAP PLUGS IN THE SELECTED POSITIONS OF THE TAP BLOCK IN THE LOGIC BOX FRONT PANEL.

Pickup <input type="text"/>	Delay <input type="text"/>	Pickup <input type="text"/>	Delay <input type="text"/>
Short-Time		GND	
<input type="text"/>	Pickup <input type="text"/>	Delay <input type="text"/>	Pickup <input type="text"/>
Ampere Tap	Long-Time		Inst.

AVAILABLE SETTINGS:

AMPERE-TAPS AVAILABLE ON THE **POWER SHIELD** DEPEND ON THE FRAME-SIZE OF THE BREAKER. THEY ARE LISTED IN TABLE 2.

THE **LONG-TIME** PICKUP MAY BE SET AT 0.7, 0.8, 0.9, 1.0, OR 1.1 TIMES THE CHOSEN AMPERE-TAP. (SEE TABLE A). THE **LONG-TIME** DELAY MAY BE SET AT MINIMUM, INTERMEDIATE, OR MAXIMUM DELAY BAND. THE "**POWER SHIELD**" IS OFFERED WITH TWO CHOICES OF LONG-TIME DELAY BANDS, AS DESCRIBED IN TABLE C.

SHORT-TIME PICKUP MAY BE SET AT 2, 3, 4, 6, 8 OR 10 TIMES THE SELECTED AMPERE-TAP. (SEE TABLE A). THE **SHORT-TIME** DELAY MAY BE SET AT MINIMUM, INTERMEDIATE OR MAXIMUM AS ILLUSTRATED IN TABLE C.

INSTANTANEOUS PICKUP MAY BE SET AT 4, 5, 6, 7, 10 OR 12 TIMES THE AMPERE-TAP. (SEE TABLE B) THIS FUNCTION RESPONDS TO NO INTENTIONAL DELAY AS SHOWN IN TABLE C.

GROUND PICKUP CURRENT SETTINGS VARY WITH THE BREAKER AND THE AMPERE-TAP RANGE CHOSEN, AS SHOWN IN TABLE 3. THE DELAY MAY BE SET AT MINIMUM, INTERMEDIATE OR MAXIMUM AS SHOWN IN TABLE C.

LONG-TIME, INSTANTANEOUS AND SHORT-TIME PICKUP CURRENTS (+/-15%)

THE TEST CURRENT VALUES LISTED ARE SECONDARY AMPERES.

BASED ON 1.0 PICKUP SETTINGS, FOR OTHER PICKUP SETTINGS, MULTIPLY THE 1.0 PICKUP VALUE BY THE PICKUP TAP SETTINGS.

Breaker Rating	Ampere Tap	Test Current (Amps)*	Test Currents (For Indicated Multiples of AMP Tap Setting)							
			2	3	4	5	6	8	10	12
K-600 & 800S K-Don 600 & 800S (225A Sensors)	50	0.50	1.00	1.50	2.00	2.50	3.00	4.00	5.00	6.00
	70	0.70	1.40	2.10	2.80	3.50	4.20	5.60	7.00	8.40
	100	1.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00
	150	1.50	3.00	4.50	6.00	7.50	9.00	12.00	15.00	18.00
	225	2.25	4.50	6.75	9.00	11.25	13.50	18.00	—	—
K-600 & 800S K-Don 600 & 800S (600A Sensors)	250	1.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00
	400	1.60	3.20	4.80	6.40	8.00	9.60	12.80	16.00	19.20
	600	2.40	4.80	7.20	9.60	12.00	14.40	19.20	—	—

Table A
Test Currents

ABB

GROUND PICKUP CURRENTS (+/- 15%)

THE TEST CURRENTS VALUES LISTED ARE SECONDARY AMPERES.

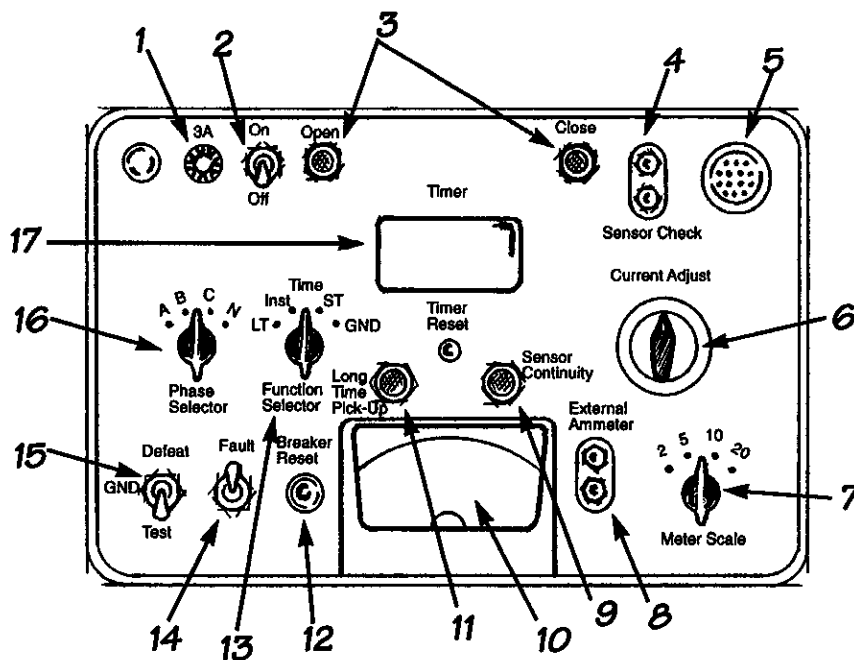
Breaker Rating	Ground Pickup Plug Setting	Test Current (Amps)
K-600 & 800S K-Don 600 & 800S (225A Sensors)	1	1.0
	3	3.0
	6	6.0
	12	12.0
K-600 & 800S K-Don 600 & 800S K-1600S K-Don-1600S (600A Sensors)	1	0.4
	3	1.2
	6	2.4
	12	4.8

TRIP TIMES

Test		Test Current	Time Delay in Seconds		
Long-Term Delay	3x Long-Time pickup setting. Set Short-Time and Instantaneous pickup above test current by placing plugs at maximum, for test purpose only. Return plugs to proper position when test is concluded.		SS-3, SS-4, SS-5		
			Win	Int	Max
			8-12	20-30	60-90
			SS-13, SS-14, SS-15		
			Win	Int	Max
			16-24	40-60	120-196
Short-Term Delay	1.5 x Short-Time pickup setting.. Set Instantaneous pickup above test current by placing plug at maximum, for test purpose only. Return plug to proper position when test is concluded.		All Devices		
			Win	Int	Max
			.08-.17	.20-.32	.35-.50
Instantaneous Delay	1.5 x Instantaneous pickup setting.		All Devices		
			No noticeable delay		
Ground Delay	1.5 x Ground pickup setting.		All Devices		
			Win	Int	Max
			.08-.17	.20-.32	.35-.50

Table C
Trip Times

ABB



1. FUSE HOLDER
2. ON-OFF SWITCH
3. OPEN AND CLOSE LAMPS
4. SENSOR CHECK TERMINALS
5. TEST PLUG CONNECTOR
6. CURRENT ADJUST
7. METER SCALE SWITCH
8. EXTERNAL AMMETER TERMINALS
9. SENSOR CONTINUITY LAMP
10. AMMETER
11. LONG-TIME PICK-UP LAMP
12. RESET SWITCH
13. FUNCTION SELECTOR SWITCH
14. FAULT SWITCH
15. GND SWITCH
16. PHASE SELECTOR SWITCH
17. TIMER

1. FUSE HOLDER

THE FUSE IS A STANDARD AGC-3 (3 AMPERE, SLOW BLOW).

2. ON-OFF SWITCH

REMOVES POWER FROM THE TEST CIRCUITY. RETAIN IN OFF POSITION UNTIL ALL CONNECTIONS ARE MADE.

3. OPEN AND CLOSE LAMPS

INDICATES POSITION OF THE SIMULATED BREAKER. (LAMPS ARE TYPE 1843)

4. SENSOR CHECK TERMINALS

USED IN CONJUNCTION WITH A SET OF TEST LEADS TO INDICATE CONTINUITY OF THE BREAKER SENSORS.

5. TEST PLUG CONNECTOR

IT IS IMPORTANT THAT THE TEST PLUG BE INSERTED SECURELY IN THE PROPER HOLES. CLAMP THE ASSEMBLIES TOGETHER AS PROVIDED TO PREVENT FAULTY OPERATION.

6. VARIAC CONTROL

ADJUSTS THE LEVEL OF THE SIMULATED FAULT CURRENT. ALWAYS START THE TESTS WITH VARIAC IN THE LOW POSITION.

7. METER SCALE SWITCH

USED TO CHANGE FULL SCALE CURRENTS OF THE METER.

8. EXTERNAL AMMETER TERMINALS

FOR MORE PRECISE SETTINGS, AN EXTERNAL AMMETER MAY BE USED TO SET FAULT LEVELS.

9. SENSOR CONTINUITY LAMP

INDICATES SENSOR CONTINUITY. IT CAN BE CHECKED BY SHORTING THE SENSOR CHECK TERMINALS (LAMP TYPE 1843).

10. AMMETER

THE AMMETER IS CALIBRATED TO READ FULL SCALE OF THE METER SCALE SWITCH.

11. LONG-TIME PICKUP LAMP

INDICATES WHEN LONG-TIME PICK-UP HAS OCCURRED. THE LAMP IS OPERABLE ONLY WHEN THE FUNCTION SELECTOR IS IN THE LT POSITION (LAMP TYPE 1843).

12. RESET SWITCH

RESETS THE SIMULATED BREAKER POSITION TO THE CLOSED CONDITION.

13. FUNCTION SELECTOR SWITCH

SELECTS WHICH OPTION IS TO BE TESTED.

14. FAULT SWITCH

APPLIES A SIMULATED FAULT CONDITION.

15. GND SWITCH

THE SWITCH DEFEATS THE GROUND OPTION WHEN TESTING PHASE FUNCTIONS.

16. PHASE SELECTOR SWITCH

ALLOWS TESTS TO BE SELECTED ON INDIVIDUAL PHASES. THE "N" POSITION IS USED WHEN THE POWER SHIELD DEVICE IS A UNIT WITH A NEUTRAL SENSOR (4-WIRE SYSTEM WITH GROUND).

17. TIMER

THE TIMER IS USED TO INDICATE THE LENGTH OF TIME THAT THE FAULT CURRENT PERSISTS. NOTE THAT THE TIME RUNS WHEN CHECKING PICKUP AND IT SHOULD BE DISREGARDED. TIMER MAY BE ANALOG OR DIGITAL.

① SET GND DEFAULT SWITCH
IN DEFAULT POSITION.

② TURN CURRENT ADJUST TO FULL
COUNTERCLOCKWISE POSITION.

③ REFER TO TABLE "A" TO SET METER SCALE.

④ TURN ON TEST SET.

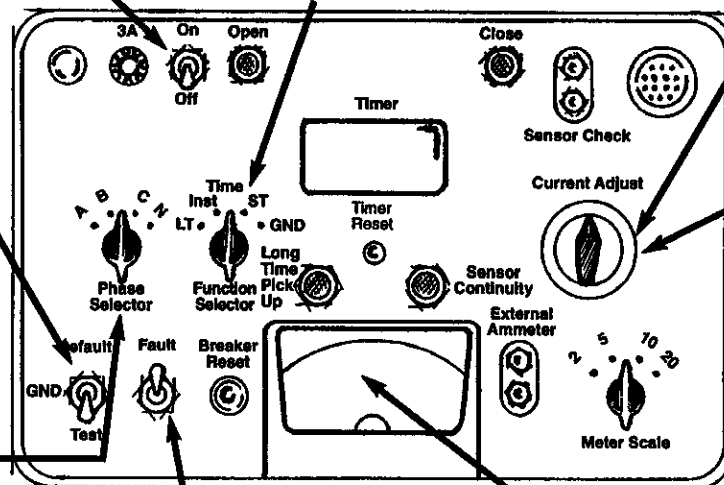
⑤ SET FUNCTION SELECTOR TO LT.

⑥ SET PHASE SELECTOR
TO DESIRED PHASE

⑦a SLOWLY TURN CUR-
RENT ADJUST
(VARIAC CONTROL)
UNTIL LONG-TIME
PICKUP LAMP
LIGHTS

⑦ OPERATE AND HOLD FAULT
SWITCH (STEPS 7 AND 7a MUST
BE DONE THE SAME TIME)

⑧ OBSERVE METER READING AND COMPARE AGAINST
PROPER VALUE OBTAINED FROM TABLE "A"
(REPEAT THIS PROCEDURE FOR ALL PHASES)



① SET GND DEFAULT SWITCH
IN DEFAULT POSITION.

② TURN CURRENT ADJUST TO FULL
COUNTERCLOCKWISE POSITION.

③ REFER TO TABLE "A" TO SET METER SCALE.

④ TURN ON TEST SET.

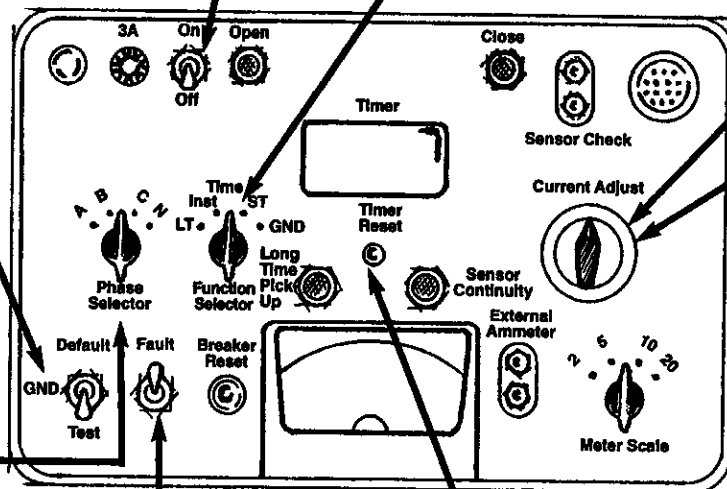
⑤ SET FUNCTION SELECTOR TO TIME.

⑦a SLOWLY TURN CUR-
RENT ADJUST
(VARIAC CONTROL)
TO THE DESIRED
TEST CURRENT (E.G.
THREE TIMES
PICKUP TEST CUR-
RENT IN TABLE "A").

⑥ SET PHASE
SELECTOR TO
DESIRED PHASE.

⑦ OPERATE AND HOLD FAULT
SWITCH (STEPS 7 AND 7a MUST
BE DONE AT THE SAME TIME).

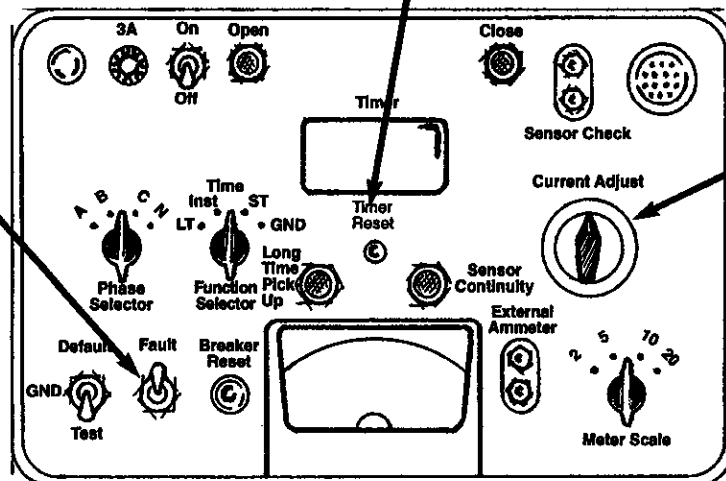
⑧ RELEASE FAULT SWITCH AND RESET TIMER
(PUSH THE TIMER RESET BUTTON).



⑨ OPERATE AND HOLD FAULT SWITCH UNTIL THE OPEN LAMP LIGHTS, THE TIMER STOPS AND THE BREAKER TRIPS. CHECK TIME AGAINST TABLE "C".

⑩ RESET TIMER (PUSH TIMER RESET BUTTON). IF DESIRED, CLOSE THE CIRCUIT BREAKER.

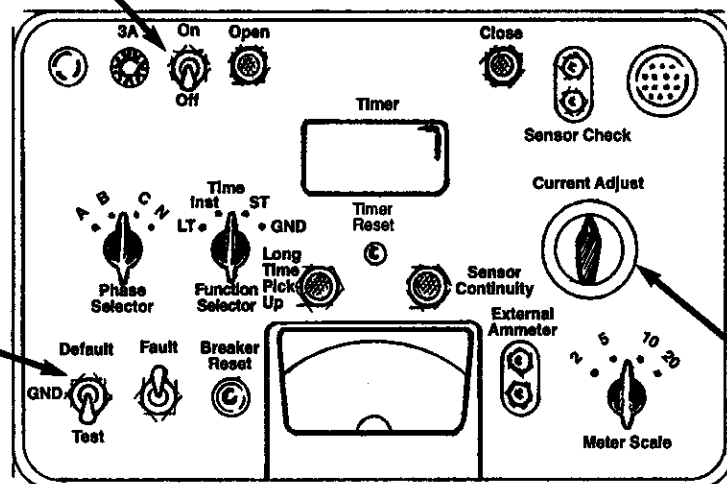
⑪ RETURN CURRENT ADJUST (VARIAC CONTROL) TO ZERO. TURN COUNTERCLOCKWISE AT END OF THE DELAY TEST.



④ TURN ON TEST SET.

③ REFER TO TABLE "A" TO SET METER SCALE.

① SET GND DEFAULT SWITCH IN DEFAULT POSITION.



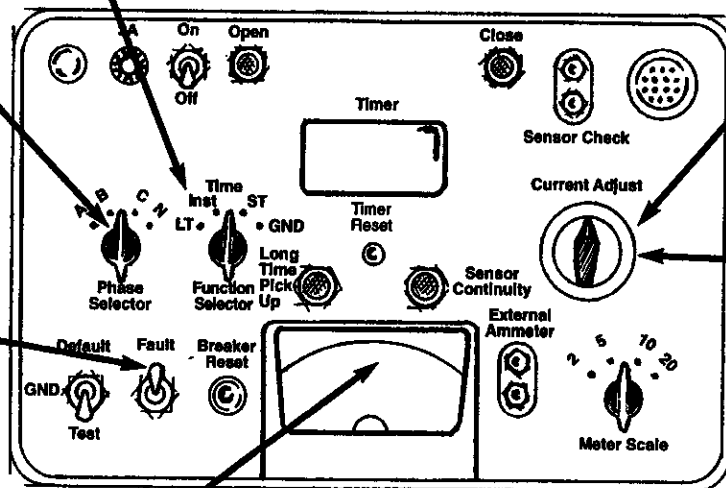
② TURN CURRENT ADJUST TO FULL COUNTERCLOCK-WISE POSITION.

5 SET FUNCTION SELECTOR TO INST.

10 REPEAT FOR OTHER PHASES IF DESIRED, NOTE THAT THE INSTANTANEOUS FUNCTION MAY NOT BE CHECKED AT THE 12X SETTINGS BECAUSE THE SHORT TIME SETTING 10X (WHEN INCLUDED) WILL INTERFERE WITH THE TEST.

6 SET PHASE SELECTOR TO DESIRED PHASE.

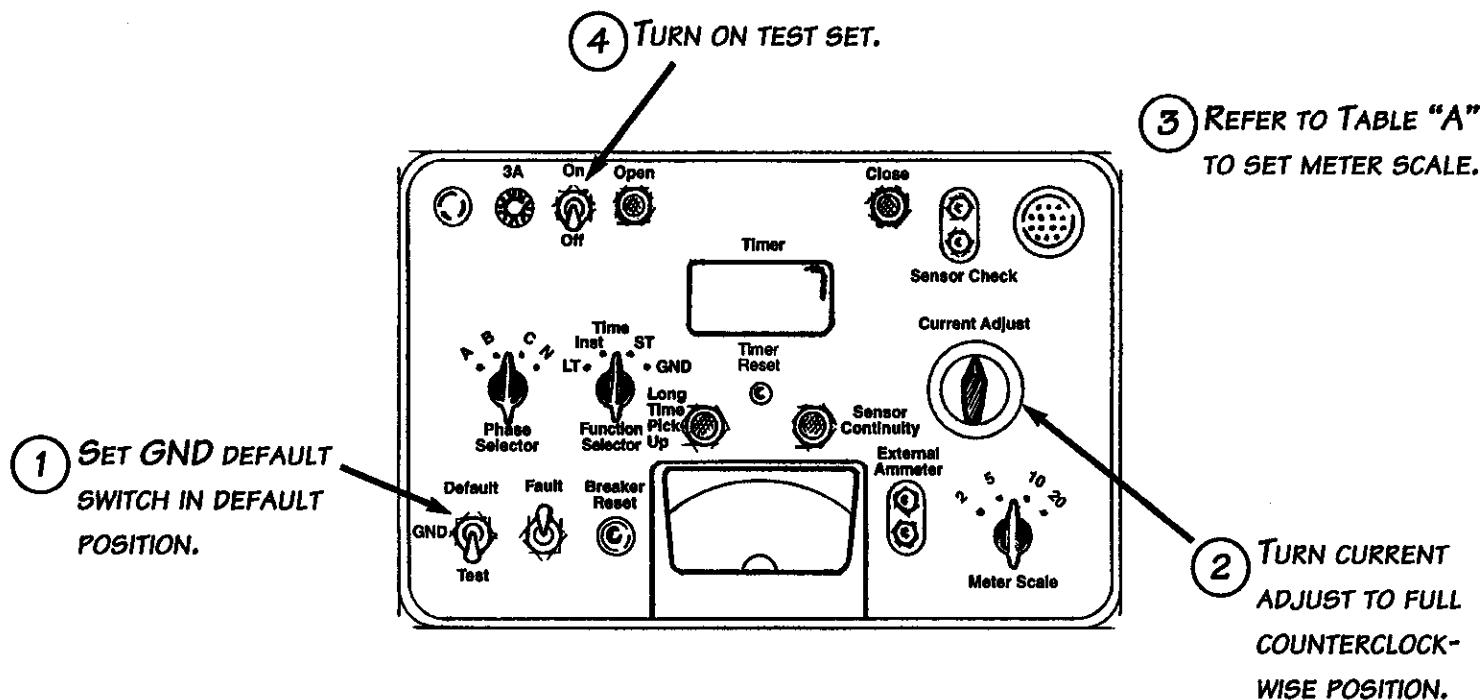
7 OPERATE AND HOLD FAULT SWITCH (STEPS 7 AND 7A MUST BE DONE AT THE SAME TIME).

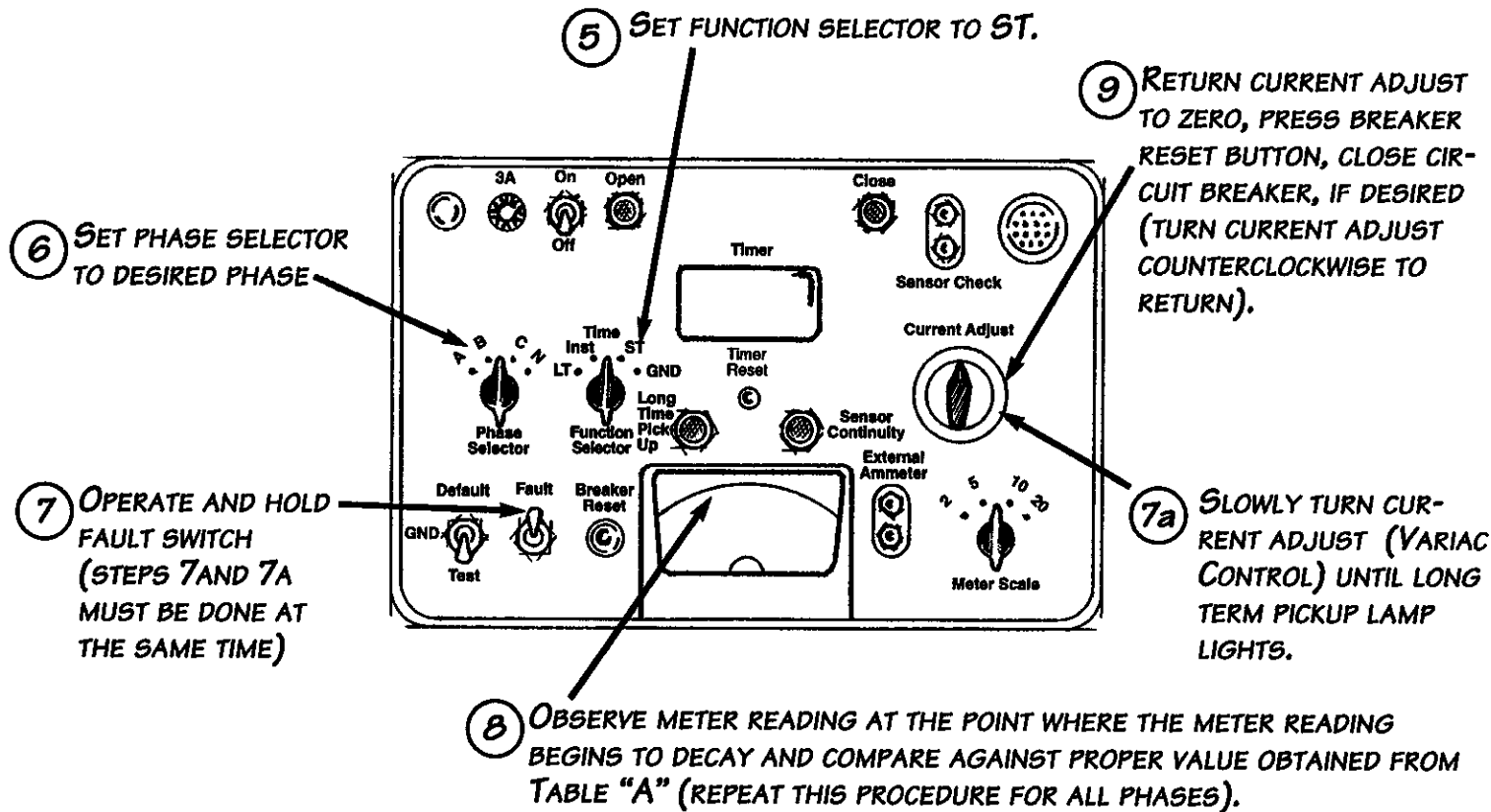


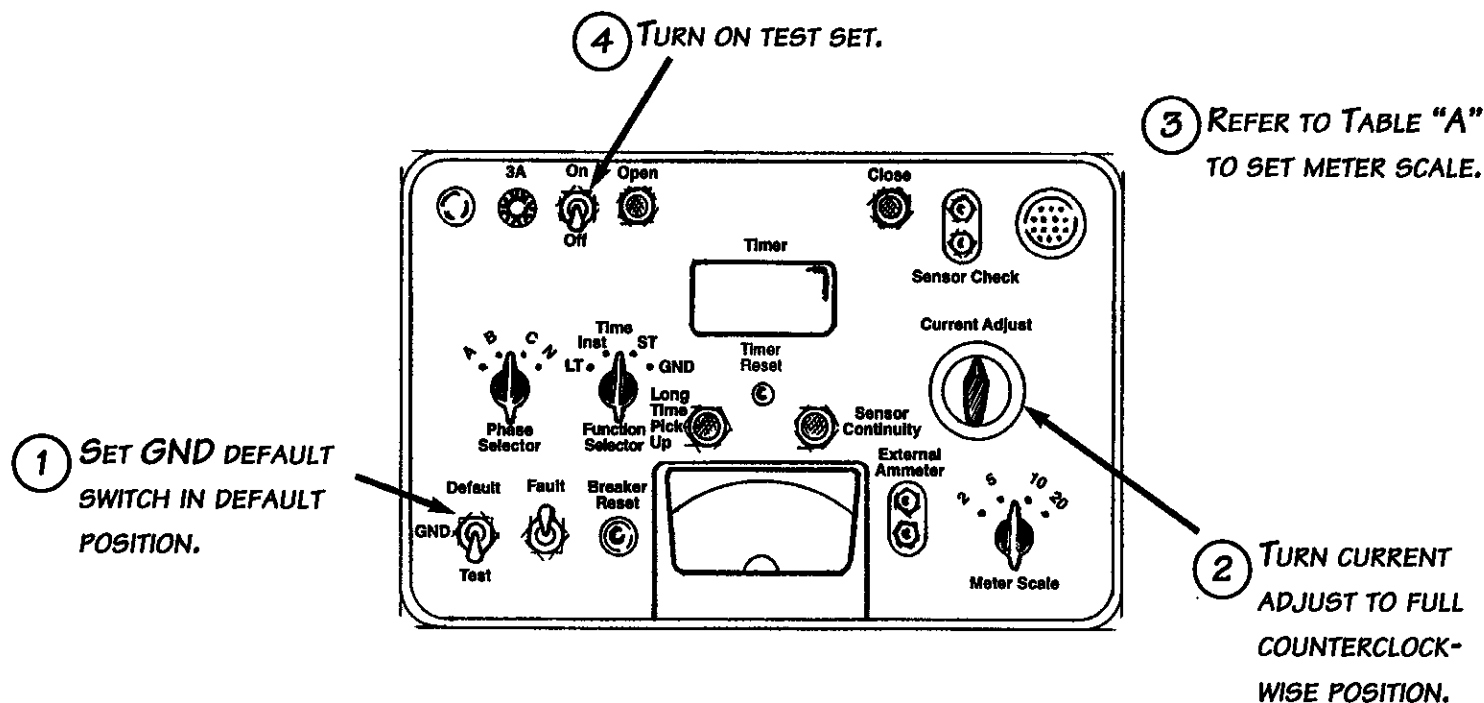
7a SLOWLY TURN CURRENT ADJUST (VARIAC CONTROL) UNTIL LONG TERM PICK-UP LAMP LIGHTS.

9 RETURN CURRENT ADJUST TO ZERO, PRESS BREAKER RESET BUTTON, AND CLOSE CIRCUIT BREAKER IF DESIRED (TURN CURRENT ADJUST COUNTER-CLOCKWISE TO RETURN).

8 OBSERVE METER READINGS AT THE POINT WHERE THE READINGS BEGIN TO DECAY AND COMPARE THE PROPER VALUE OBTAINED FROM TABLE "A".

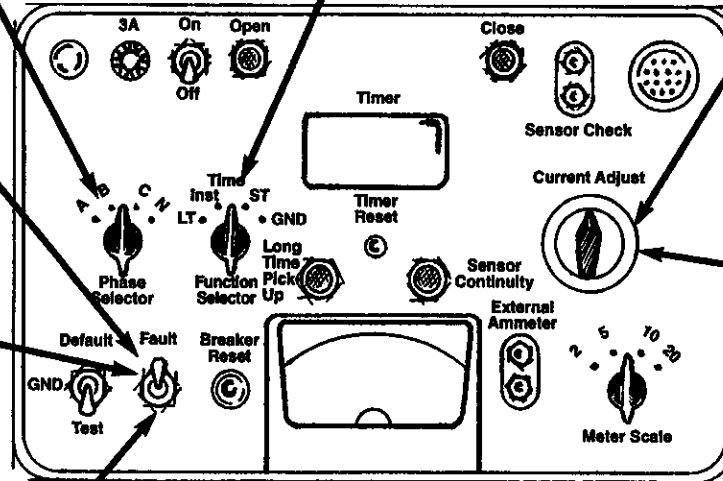


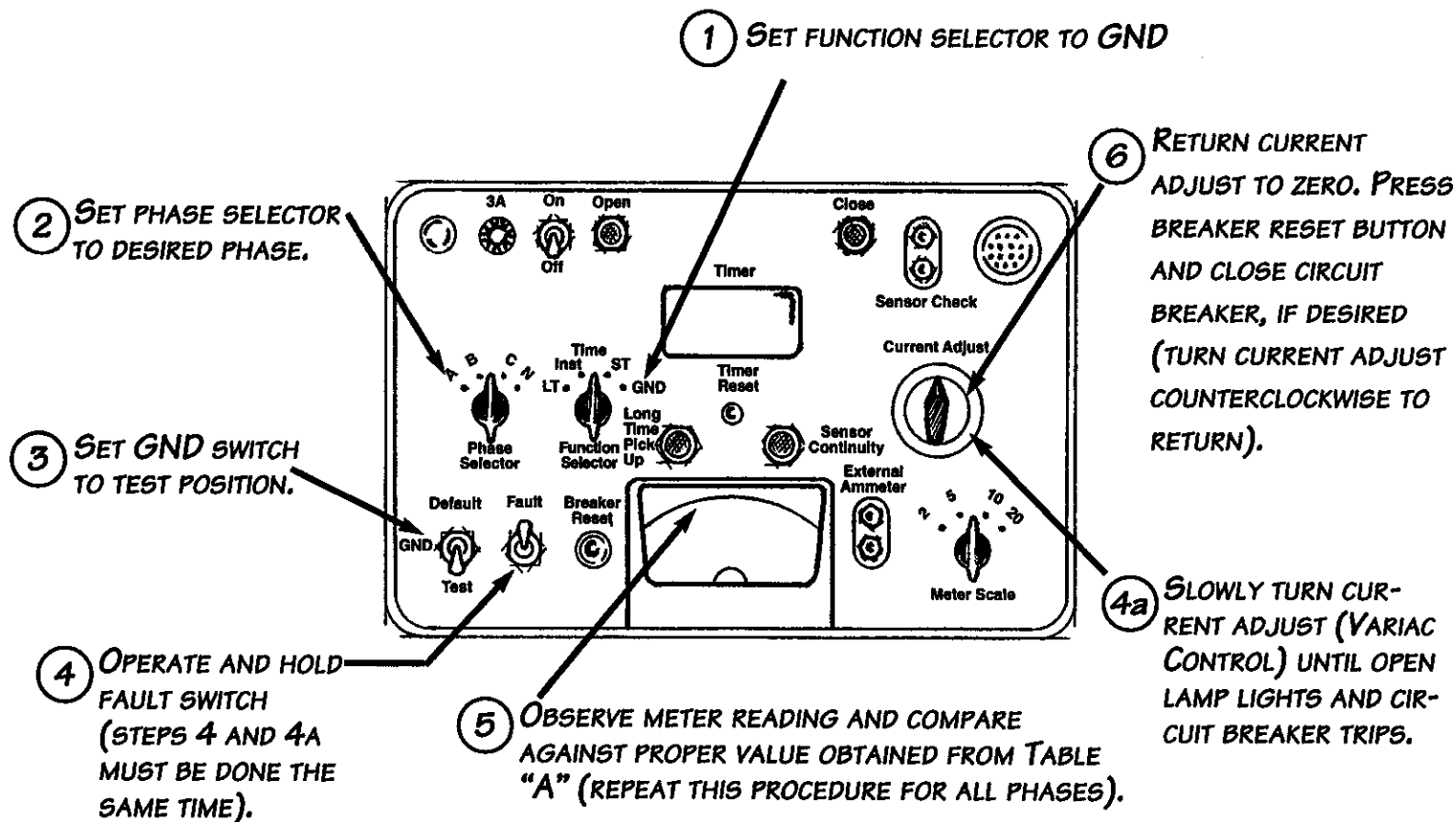


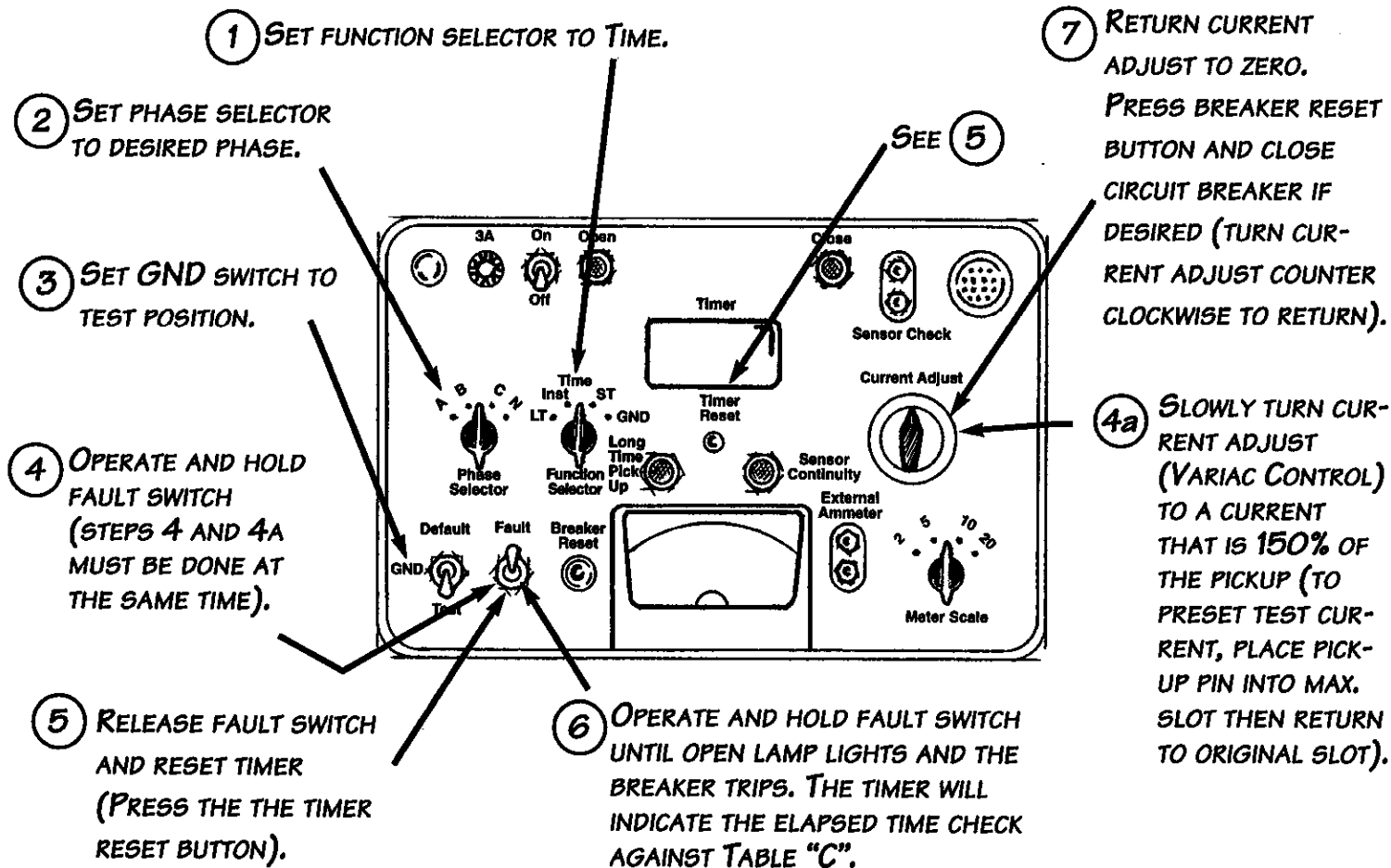


REPEAT THIS FOR ALL OTHER PHASES.

- 6** SET PHASE SELECTOR TO DESIRED PHASE.
- 7** OPERATE AND HOLD FAULT SWITCH (STEPS 7 AND 7A MUST BE DONE AT THE SAME TIME).
- 7a** SLOWLY TURN CURRENT ADJUST (VARIAC CONTROL) TO A CURRENT THAT IS 150% OF PICK-UP (TO PRE-SET TEST CURRENT, PLACE PICKUP PIN INTO MAX. SLOT THEN RETURN TO ORIGINAL SLOT).
- 8** RELEASE FAULT SWITCH. RESET TIMER.
- 9** OPERATE AND HOLD FAULT SWITCH UNTIL OPEN LAMP LIGHTS AND CIRCUIT BREAKER TRIPS. THE TIMER WILL INDICATE THE ELAPSED TRIP TIME. CHECK TIME AGAINST TABLE "C."
- 10** RETURN CURRENT ADJUST TO ZERO, PRESS BREAKER RESET BUTTON AND CLOSE CIRCUIT BREAKER, IF DESIRED (TURN CURRENT ADJUST COUNTER CLOCK-WISE TO RETURN).







STEP 1.

**ATTACH ONE OF THE TEST LEADS TO TERMINAL 14 OF THE
POWER SHIELD TERMINAL BLOCK.**

STEP 2.

**REMOVE WIRE FROM TERMINAL 11 OF THE POWER SHIELD
TERMINAL BLOCK AND HOLD THE REMAINING TEST LEAD TO
THE WIRE. THE SENSOR CONTINUITY LIGHT SHOULD LIGHT.**

STEP 3.

REPLACE WIRE TO TERMINAL 11.

STEP 4.

REPEAT TEST FOR TERMINALS 12 AND 13.

**NOTE: TO ENSURE THAT ALL SENSORS ARE ELECTRICALLY ISOLATED FROM GROUND, THE SIGNAL
AND POWER SUPPLY SENSOR CONTINUITY TEST CAN BE REPEATED FROM EACH SENSOR TERMINAL
(8,7,6,4,11,12 & 13) TO BREAKER FRAME. THE SENSOR CONTINUITY LAMP SHOULD NOT LIGHT.**

STEP 1.

**ATTACH ONE OF THE TEST LEADS TO TERMINAL 5 OF THE POWER SHIELD
TERMINAL BLOCK.**

STEP 2.

**REMOVE WIRE FROM TERMINAL 8 OF THE POWER SHIELD TERMINAL BLOCK
AND HOLD THE REMAINING TEST LEAD TO THE WIRE. THE SENSOR CONTINUITY
LAMP SHOULD LIGHT.**

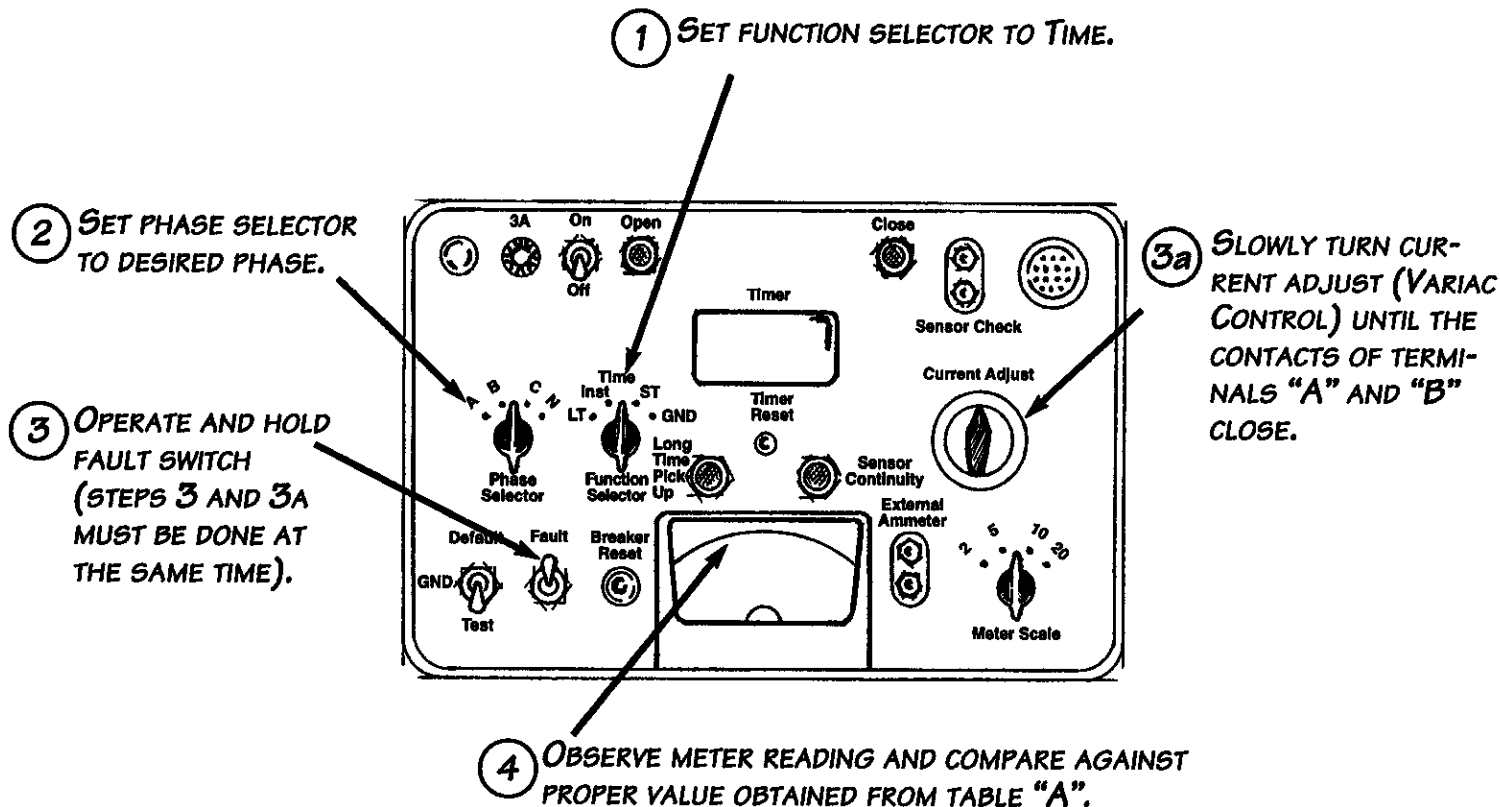
STEP 3.

REPLACE WIRE TO THE TERMINAL.

STEP 4.

REPEAT TEST FOR TERMINALS 7 AND 6.

**NOTE: IF THE POWER SHIELD IS A FOUR-WIRE SYSTEM WITH GROUND PROTECTION, REPEAT TEST ON
TERMINAL 4 TO CHECK CONTINUITY OF NEUTRAL SENSOR.**



PRIMARY INJECTION TEST FOR K-LINE TYPE CIRCUIT BREAKER

Check Breaker

Manufacturer: _____ Model/Type: _____
Serial Number: _____
Voltage: _____ Ampere Rating: _____

Test

Initial Insulation Resistance			
At 1000 V.D.C. Meg Ohms	Breaker Closed	Breaker Open	Expected

Inspection

	As Found	As Left		As Found	As Left
Arc Chutes			Frame		
Primary Disconnects			Auxiliary Devices/Switches		
Secondary Disconnects			Tightness of Connections		
Racking Device			Ground Clip		

Check

Main Moving Contacts and Stationary Contacts			
Contact Alignment		Contact Pressure	

Test

Contact Resistance			
"A" Phase		"C" Phase	
"B" Phase		Expected	

Check

Operating Mechanism			
Trip Bar Latch Engagement		Manual Close	
Latch Engagement		Manual Trip	
Shunt Trip		Electrical Charge	
Control Device		Electrical Close	
Manual Charge		Electrical Trip	

Test

Final Insulation Resistance			
At 1000 V.D.C. Meg Ohms	Breaker Closed	Breaker Open	Expected

Legend: As Found, S-Satisfaction, U-Unsatisfactory, As Left, A-Adjusted, RPD-Repair, RPL-Replace

Comments

Trip Unit Settings

Mfg. _____ Type _____
Serial No. _____
Part No. _____

Pickup	Delay	Pickup	Delay
Short-Time		GND	
Ampere Tap	Pickup	Delay	Pickup
	Long-Time	Inst.	

Test

Trip Functions				
Function	Prime, Inject	804		
LT PU Amps	Expected	"A" Phase	"B" Phase	"C" Phase
LT Delay Sec @ 500%				
BT PU Amps				
BT Delay Sec @ 150%				
Inst PU Amps				
GND PU Amps				
Gnd Delay Sec @ 150%				
Sensor Checks	OK	Not OK		

Location: _____
Substation: _____
Breaker ID: _____
Date: _____
Sign: _____

THE PRIMARY INJECTION TEST

THE PRIMARY INJECTION TEST IS PERFORMED TO DETERMINE THE CONDITION OF THE TRIPPING SYSTEM. THE TEST ALSO DETERMINES THE SUITABILITY OF THE CIRCUIT BREAKER FOR CONTINUED SERVICE.

DUE TO THE NUMBER AND VARIETY OF PRIMARY INJECTION TESTING SETS, THE FOLLOWING PROCEDURE HAS BEEN WRITTEN TO INDICATE CONNECTIONS BETWEEN A GENERIC PRIMARY INJECTION TEST SET AND THE CIRCUIT BREAKER BEING TESTED.

READ AND FOLLOW THE TEST EQUIPMENT MANUFACTURER'S OPERATION AND SAFETY GUIDELINES PROVIDED WITH YOUR SPECIFIC TYPE OF TEST EQUIPMENT.

READ AND UNDERSTAND THE CIRCUIT BREAKER MANUFACTURER'S OPERATION AND SAFETY GUIDELINES BEFORE YOU BEGIN TESTING.

PRIMARY INJECTION TEST FOR K-225S, 600S AND 800S WITH SOLID STATE TRIP (GRAY BOX)

NOTES:

- 1. CONNECT CIRCUIT BREAKER TO THE PROPER SIZE STABS.**
- 2. START TEST ON "A" PHASE.**
- 3. WRITE DOWN TRIP UNIT SETTINGS ,
LTPU AND DELAY, STPU AND DELAY
INST., GND PU, AND DELAY**
- 4. IF THERE IS A GND FUNCTION IS ON TRIP UNIT, JUMPER POINTS 1 & 2
ON THE TRIP UNIT TO DEFEAT GND FUNCTION WHILE TESTING LT, ST,
AND INST.**
- 5. MOVE PLUGS FOR FUNCTIONS THAT ARE NOT BEING TESTED TO
MAXIMUM POSITION. BE SURE TO RETURN PLUGS TO ORIGINAL POSITION
AFTER TESTS.**
- 6. CLOSE CIRCUIT BREAKER BEFORE EACH TEST.**
- 7. DO NOT EXCEED THE THERMAL RATING OF THE TEST SET OR
OF THE CIRCUIT BREAKER.**

LONG-TIME

1. DETERMINE TEST CURRENT:

$$\text{AMP TAP} \times \text{LTPU} \times 300\%$$

2. SET MOMENTARY FUNCTION TO DESIRED CURRENT.

3. RESET TIMER TO ZERO .

4. ENERGIZE THE TEST SET TO TRIP THE CIRCUIT BREAKER.

5. AFTER CIRCUIT BREAKER TRIP, RECORD TIME IN SECONDS.

SHORT-TIME

1. DETERMINE TEST CURRENT

$$\text{AMP TAP} \times \text{STPU} \times 150\%$$

2. MOVE STPU PLUG TO MAX. POSITION.

3. PULSE TEST SET TO DESIRED CURRENT.

4. RETURN STPU PLUG TO ORIGINAL POSITION.

5. RESET TIMER TO ZERO.

6. ENERGIZE THE TEST SET TO TRIP THE CIRCUIT BREAKER.

5. AFTER CIRCUIT BREAKER TRIP, RECORD TIME IN SECONDS ON TEST REPORT.

NOTES:

1. REMOVE JUMPER IF INSTALLED AT POINTS 1 AND 2 ON TRIP UNIT.

2. RETURN ALL PLUGS TO ORIGINAL POSITIONS.

INSTANTANEOUS

1. DETERMINE TEST CURRENT:

$$\text{AMP TAP} \times \text{INST.} \times 150\%$$

2. MOVE STPU PLUG TO MAX. POSITION.

3. PULSE TEST SET TO DESIRED CURRENT (UNTIL THE CIRCUIT BREAKER TRIPS).

4. SET TEST SET TO CONTINUOUS POSITION.

5. RETURN INST. PLUG TO ORIGINAL POSITION.

6. RESET TIMER TO ZERO.

7. ENERGIZE THE TEST SET TO TRIP THE CIRCUIT BREAKER.

GROUND FUNCTION

1. DETERMINE TEST CURRENT.

$$\text{GND AMP PU} \times 150\%$$

2. MOVE GND PLUG TO MAX. POSITION.

3. PULSE TEST SET TO DESIRED CURRENT.

4. RETURN GND PLUG TO ORIGINAL POSITION.

5. RESET TIMER TO ZERO.

6. ENERGIZE THE TEST SET TO TRIP THE CIRCUIT BREAKER.

7. AFTER CIRCUIT BREAKER TRIP, RECORD TIME IN SECONDS.

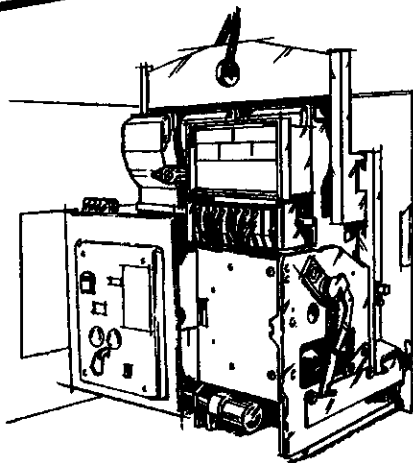
NOTES:

1. REMOVE JUMPER IF INSTALLED AT POINTS 1 AND 2 ON TRIP UNIT.

2. RETURN ALL PLUGS TO ORIGINAL POSITIONS.

UPON COMPLETION OF ANY WORK
ON THE CIRCUIT BREAKER FILL IN
THE APPROPRIATE SECTION OF THE
TEST REPORT THEN...

**SIGN, DATE AND
FILE THE
REPORT FORM**



Circuit Breaker																					
Manufacturer: _____	Model/Type: _____																				
Serial Number: _____																					
Voltage: _____ Ampere Rating: _____																					
Initial Insulation Resistance																					
At 1000 V.D.C. Meg Ohms	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">Breaker Closed</th> <th style="width: 25%;">Breaker Open</th> <th style="width: 25%;">Expected</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	Breaker Closed	Breaker Open	Expected																	
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Location: _____																					
Substation: _____																					
Breaker ID: _____																					
Date: _____																					
Sign: _____																					

FOR OTHER MAINTENANCE PROCEDURES SEE MAINTENANCE BOOK

Report Form

ABB