

SMALL CIRCUIT BREAKERS REQUIREMENTS AND ADJUSTING PROCEDURES

	CONTENTS	PAGE	
			KS-19735 L1
1.	GENERAL	1	KS-21122 L1, L2, L3
2.	REQUIREMENTS	4	1.02 This section is reissued to:
3.	ADJUSTING PROCEDURES	4	• Add the following codes:
1. GENERAL			KS-5926 L1 through L10
1.01 This section covers the following small manually operated circuit breakers:			KS-15659 L14 through L18
	KS-5648 KS-15944		KS-15769 L1
	KS-5786 KS-19735		KS-15813 L19 through L40
	KS-5926 KS-19943		KS-15815 L43 through L48, L124 through L143
	KS-15659 KS-20684		KS-15943 L1
	KS-15713 KS-20685		KS-15944 L1, L2
	KS-15739 KS-20903		KS-19735 L1
	KS-15769 KS-21122		KS-19943 L1 through L15
	KS-15794 KS-21123		KS-20684 L1 through L24, L205, L210 through L214, L217, L219 through L224
	KS-15795 KS-21186		KS-20685 L1 through L4
	KS-15799 KS-21225		KS-20903 L20, L50
	KS-15813 KS-21596		KS-21122 L1 through L3, L5 through L8
	KS-15815 KS-21597		KS-21123 L2, L202
	KS-15943		KS-21186 L1 through L11, L203 through L208
The following codes are rated Manufacture Discontinued:			KS-21225 L20, L30, L100, L112
	KS-15815 L122, L128		KS-21596 L1 through L4

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

KS-21597 L1

- Add new Fig. 3 through 6 for new-type circuit breakers
- Add 1 AC and 2 AC performance curves to Fig. 8
- Add new Fig. 10 through 16 for performance curves 1 DC, 2 DC, 3 DC, A, B, C, AC, 38, 20 DC, 20 AC, and three special curves
- Add the new checking circuits, Fig. 34 through 42, for KS-5926 L4, KS-15813 L19, L30, L31, L32, KS-15944 L2, and KS-21596 L1, L3
- Add checking procedures (3.04) for added circuit breakers
- Make other changes as required.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted. This reissue does not affect the Equipment Test List.

1.03 Typical small circuit breakers are illustrated in Fig. 1 through 6.

1.04 Refer to Section 020-010-711 which covers apparatus, general requirements, and definitions, and contains additional information necessary for the proper application of the requirements listed in this section.

1.05 **Asterisk (*):** Requirements marked with an asterisk necessitate dismantling or dismantling of apparatus, or affect the adjustment involved, or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.

1.06 Since it is not practical to do any maintenance work on any of the circuit breakers, they should be replaced when they become inoperable or fail to meet their requirements.

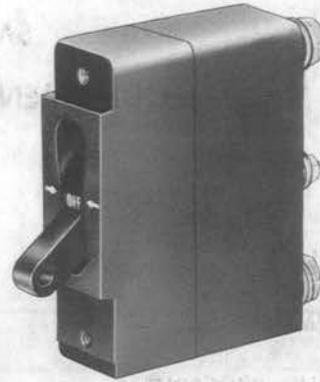


Fig. 1—Typical Small Circuit Breaker Without Nameplate (Old Style)



Fig. 2—Typical Small Circuit Breaker With Nameplate (Old Style)

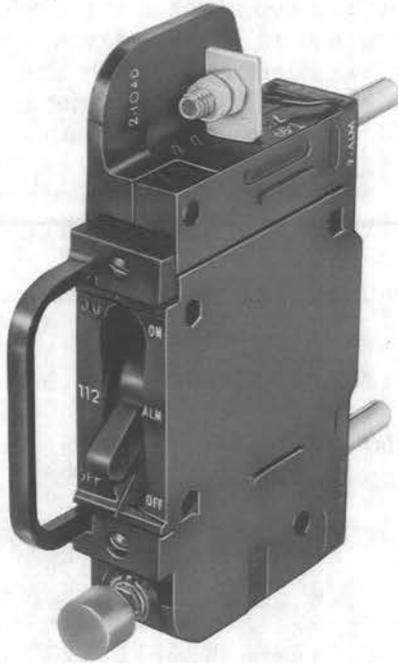


Fig. 3—Small Circuit Breaker KS-21225 L112

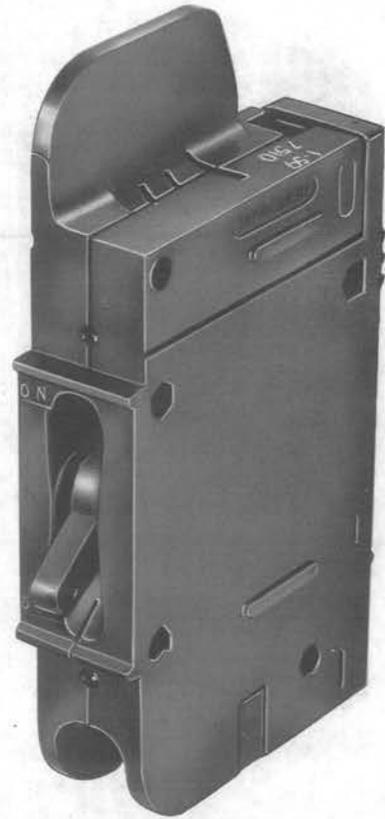


Fig. 5—Small Circuit Breaker KS-21186 L6



Fig. 4—Small Circuit Breaker KS-21596 L3

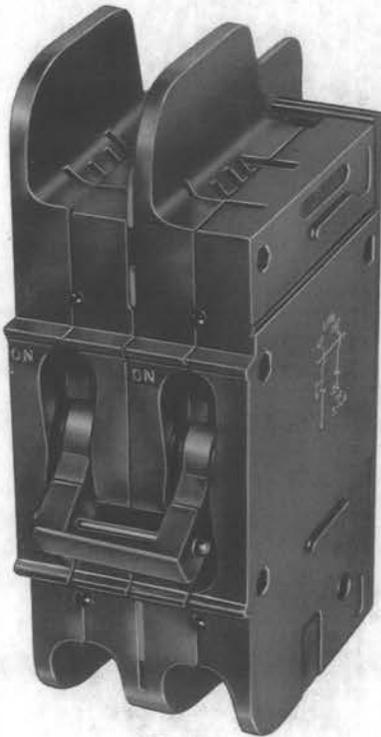


Fig. 6—Small Circuit Breaker KS-21186 L203

2. REQUIREMENTS

2.01 Switch Mounting: The circuit breaker shall be fastened securely to its mounting. The component parts shall be held together securely.

2.02 Mechanical Operation: The circuit breaker shall operate satisfactorily without undue binding.

*2.03 Electrical Operation

(a) When a circuit breaker has a pole or poles of the time delay type, the poles shall carry rated current continuously and shall trip within 1 hour after continuous application of 125 percent of rated current. At larger values of current, the tripping time shall be less as shown on the performance curves which apply to the particular circuit breaker. See Fig. 7 through 16. A delay-type pole is distinguished by marking (for example, 4DC) which designates its time-delay performance curve. See (c) below.

(b) When a circuit breaker has a pole or poles of the instantaneous type, the poles shall carry rated current continuously and shall trip immediately upon the application of current exceeding 120 percent of its rating. See (c) below.

(c) Use watch and test apparatus, as required.

2.04 Checking Poles: Individual poles of a circuit breaker shall be checked separately.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Test Apparatus

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6854	Screwdriver
R-2512	Adjustable wrench
—	3-inch D screwdriver
—	4-inch E screwdriver
GAUGES	
—	Pocket watch or clock
TEST APPARATUS	
352AL	Transformer
—	Ammeter, AC, ranges as required
—	Ammeter, DC, ranges as required
—	Autotransformer, continuously tapped (VARIAC*, 2.5 amperes, 230-volt input, type V-5HMT or equivalent, General Radio Company, Cambridge, Mass., suggested)
*Registered trademark of the General Radio Company.	
—	Battery, storage
—	Rheostats (size to be determined by the circuit breaker being tested) (as required)
—	Switch, SPDT

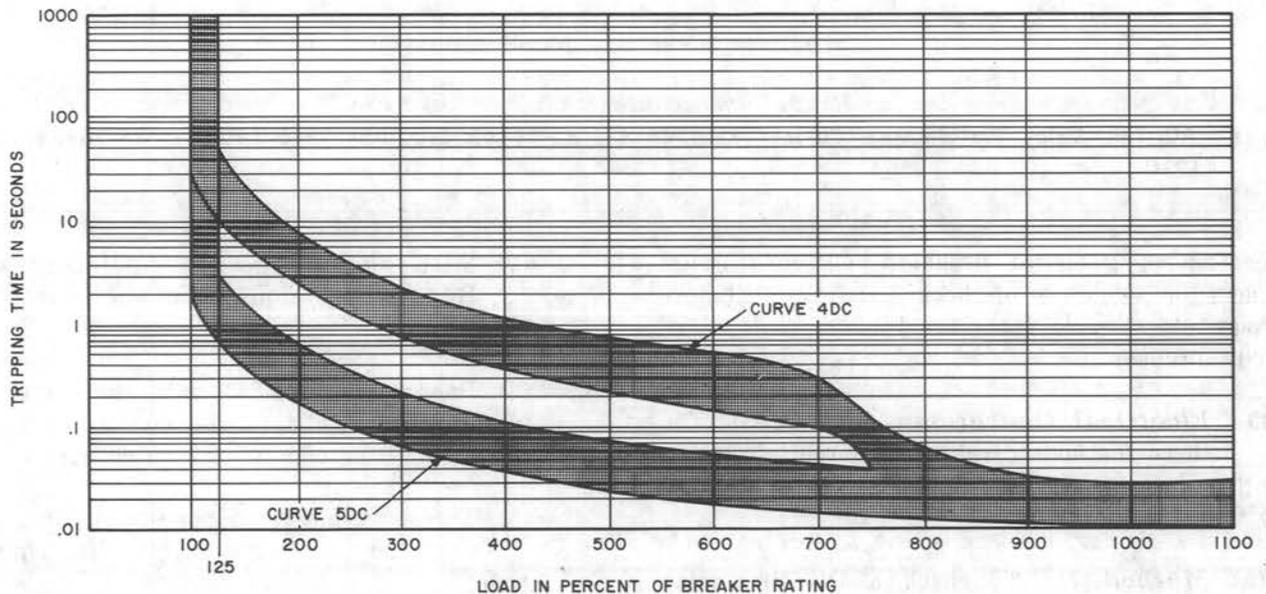
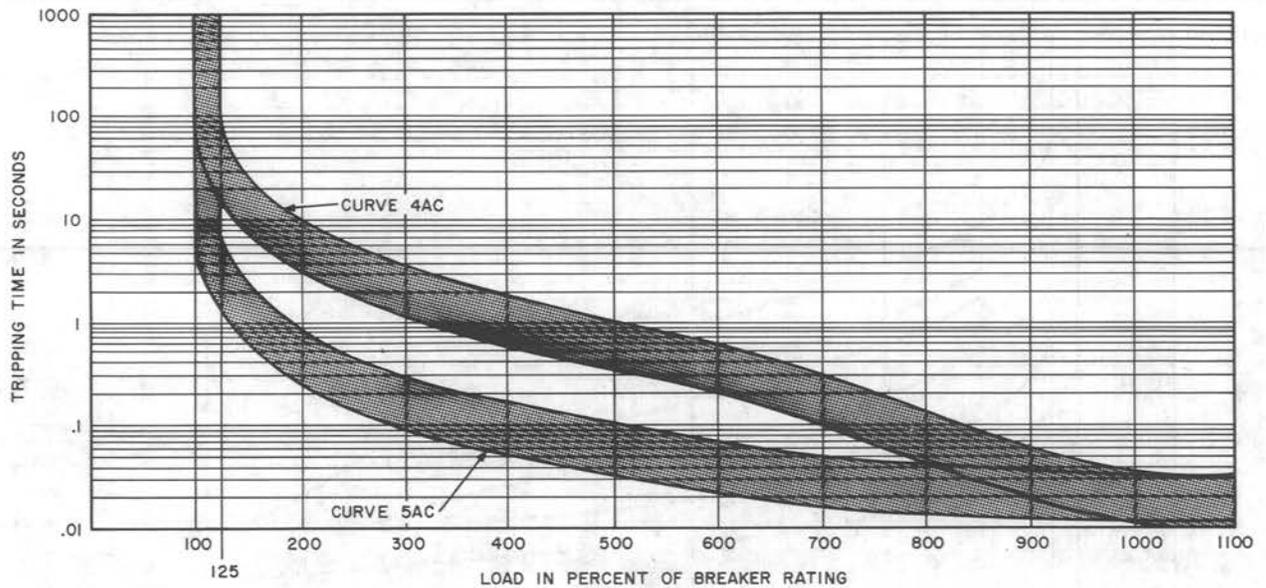


Fig. 7—AC and DC Time-Delay Performance Curves—KS-5648 L1-L16, KS-15659 L2-L15, L17A, L18A, KS-15713, KS-15794, KS-15795, KS-15799, KS-15813 L2-L40, KS-15815 L5-L39, L43-L48, L101, L103-L112, L115, L118-L122, L124-L128, L131-133, L135-L143, KS-19735 L1, KS-20684 L10, L12-L18, L20, L22, L23

3.01 Switch Mounting: (Reqt 2.01)—Tighten loose screws with a screwdriver or wrench as applicable.

3.02 Mechanical Operation: (Reqt 2.02)—If difficulty is experienced in the mechanical

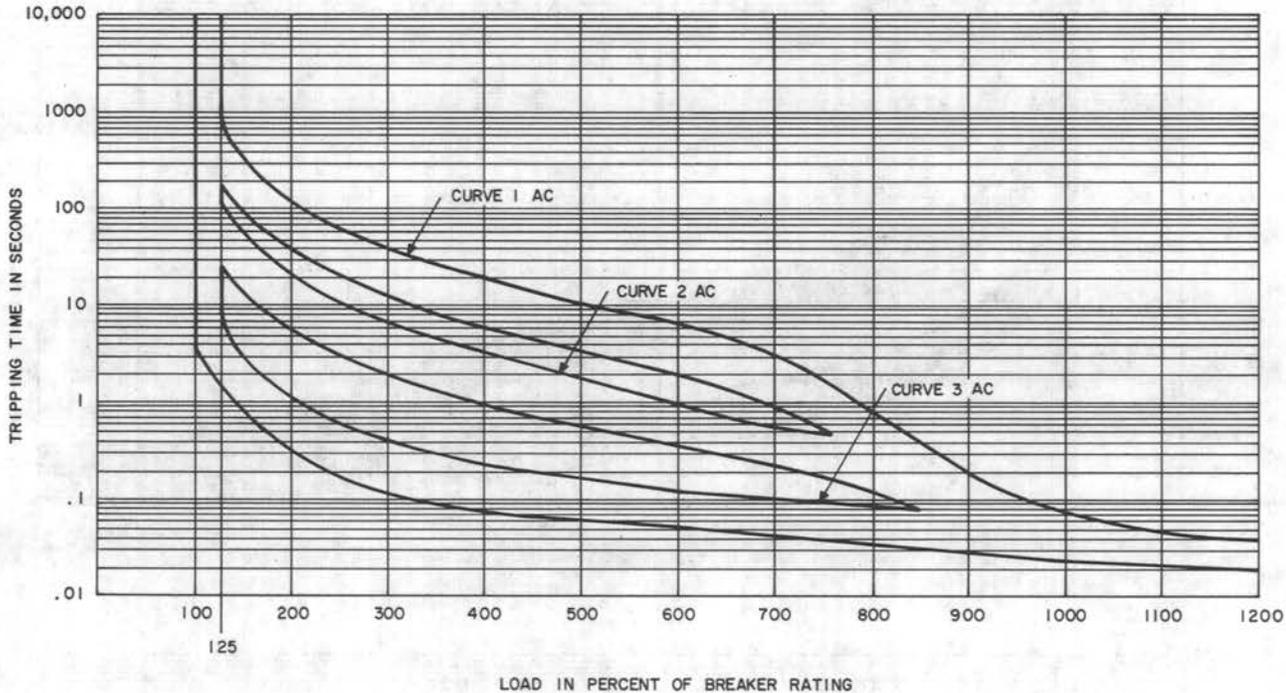


Fig. 8—AC Time-Delay Performance Curves—KS-5786 L1, KS-19943 L10, KS-15815 L40-L42, KS-20684 L205, L210

operation of a circuit breaker, look for foreign objects or evidence of broken parts. Remove foreign objects. If parts are broken, replace the circuit breaker.

3.03 Electrical Operation: (Reqt 2.03)—The three methods of checking circuit breakers are listed in (a) through (c).

(a) **Method 1:** To check a DC time-delay circuit breaker, proceed as follows.

(1) Disconnect the circuit breaker from its circuit, and set up the proper test circuit as indicated by the illustration referenced in 3.04. Select the correct rheostats and ammeter depending on the current to be used. Use wire and switch capable of carrying the current without undue heating.

(2) With the breaker closed and switch A in position 1, adjust rheostat A for current equal to rated current.

(3) With switch A in position 2, adjust rheostat B until the same value of current is obtained.

(4) Readjust rheostat A until the current is 125 percent of the rated current or higher (usually 200 percent of the rated current).

(5) Throw switch A to position 1, and note that the pole trips within the required time.

(b) **Method 2:** To check a DC instantaneous-type circuit breaker, proceed as in Method 1 except that the current should be adjusted to 120 percent of rated current, and the tripping time is instantaneous.

(c) **Method 3:** To check an AC time-delay circuit breaker, proceed as follows.

(1) Disconnect the circuit breaker from its circuit, and set up the proper test circuit as indicated by the illustration referenced in 3.04. Select the correct rheostat and ammeter depending on the current to be used. Use

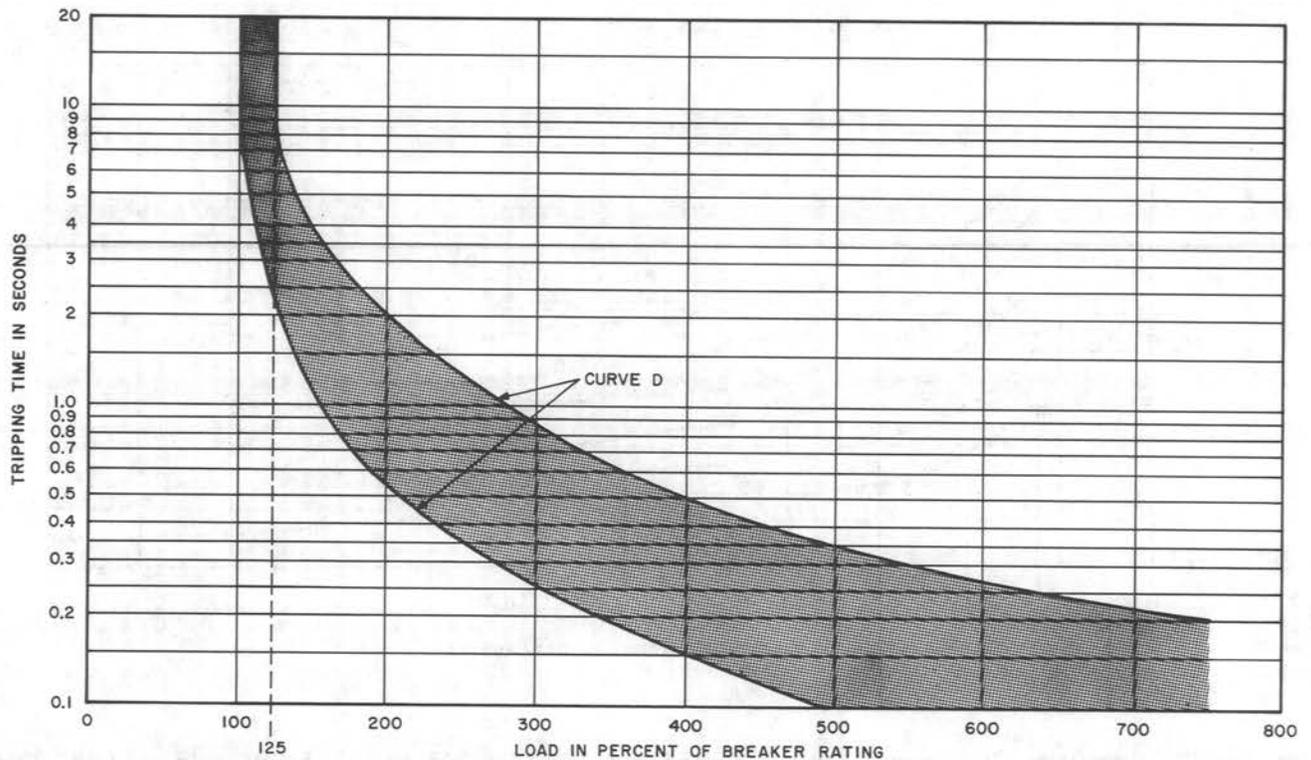


Fig. 9—D Time-Delay Performance Curve—KS-15739

wire and a switch capable of carrying the current without undue heating.

- (2) With the breaker closed and switch A in position 1, adjust the autotransformer for current equal to the rated current.
- (3) With switch A in position 2, adjust the rheostat until the same value of current is obtained.
- (4) Then readjust the autotransformer until the current is 125 percent of the rated current or higher (usually 200 percent of the rated current).
- (5) Throw switch A to position 1, and note that the pole trips within the required time.

3.04 Checking Poles: (Reqt 2.04)—Options for checking individual poles are indicated in illustrations by circled numbers in circuit diagrams referred to for the individual breaker.

- (a) **KS-5648:** To check a KS-5648 circuit breaker, proceed in accordance with Methods 1, 2, and 3. Refer to Fig. 17, 21, and 31.
- (b) **KS-5786:** To check a KS-5786 circuit breaker, proceed in accordance with Method 3. Refer to Fig. 19. Check each pole separately as shown by options 1 and 2.
- (c) **KS-5926:** To check a KS-5926 circuit breaker, proceed in accordance with Methods 1 and 3. Refer to Fig. 21, 25, 31, and 34. Check each pole separately as shown by options 1, 2, and 3.
- (d) **KS-15659:** To check a KS-15659 circuit breaker, proceed in accordance with Methods 1 and 3 as applicable. Refer to Fig. 19, 20, and 22. Check each pole separately as shown by options 1 and 2. L16 is a switch only.
- (e) **KS-15713:** To check a KS-15713 circuit breaker, proceed in accordance with Method 3. Refer to Fig. 18.

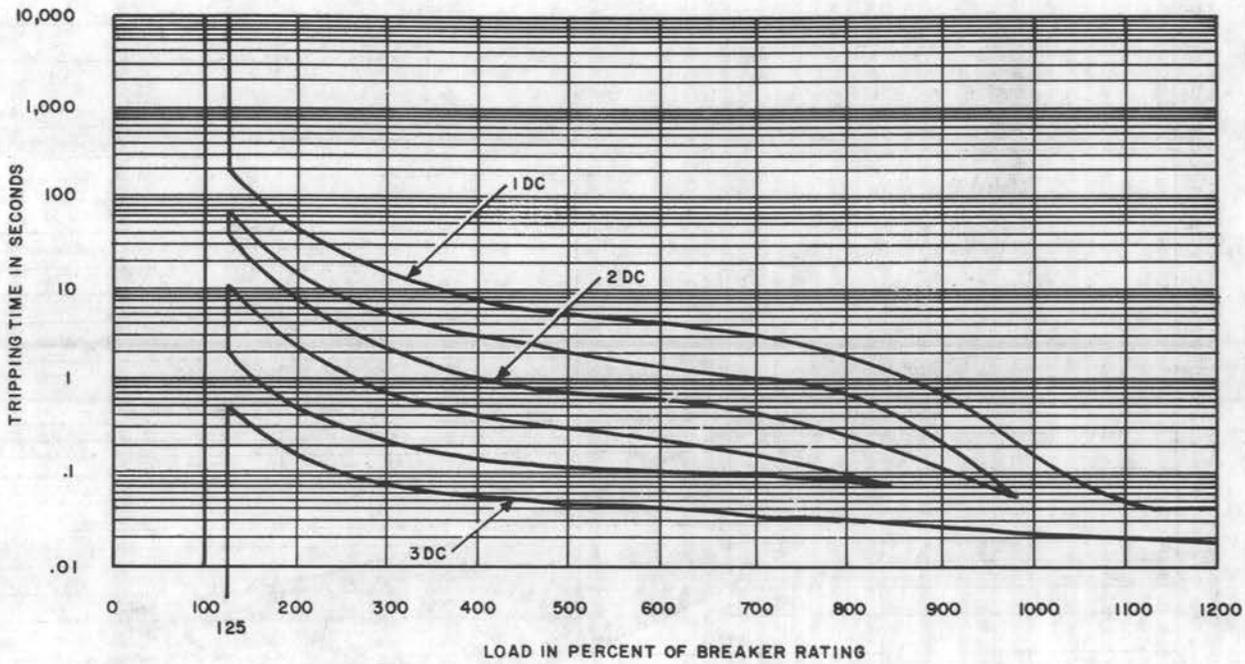


Fig. 10—DC Time-Delay Performance Curves—KS-15815 L117, KS-19943 L4, L5, L7, L8, L11, L13, KS-20655 L2, L3, KS-21122 L1-L8, KS-21123 L2, L202, KS-21186 L1-L6, L8-L10, L203-L206, L208, KS-21225 L20, L30, L100, L112, KS-20684 L212-L214, L217, L220, L222, L223

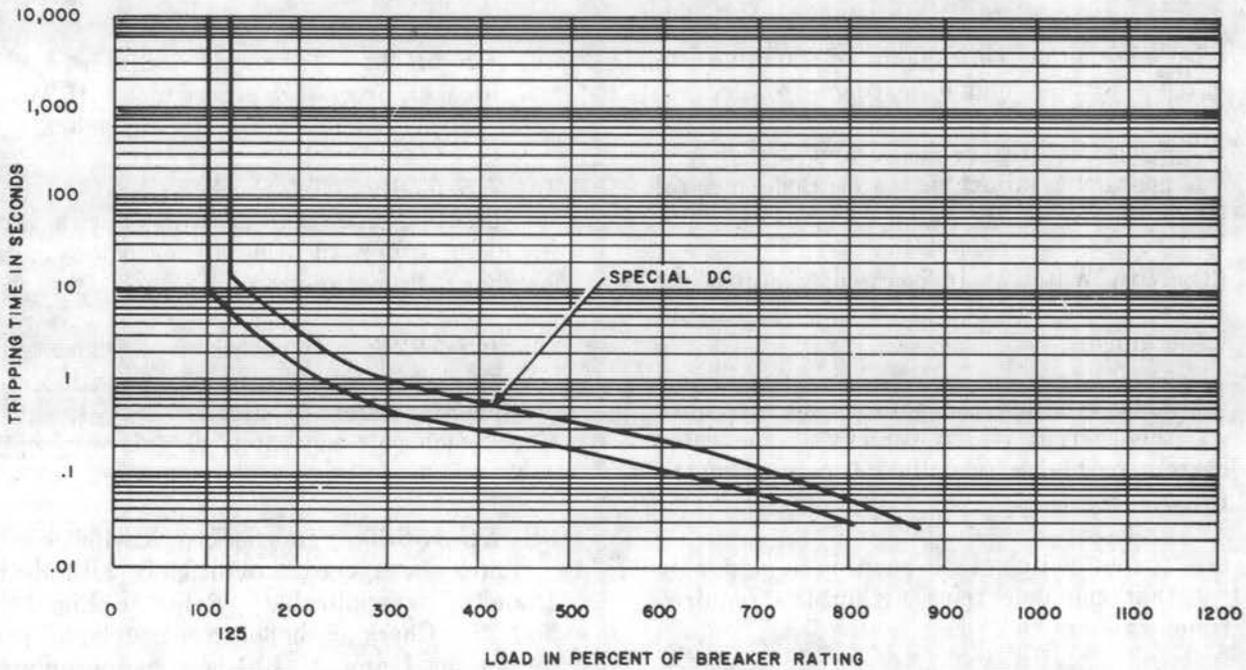


Fig. 11—Special Time-Delay Performance Curve—KS-19943 L14, L15

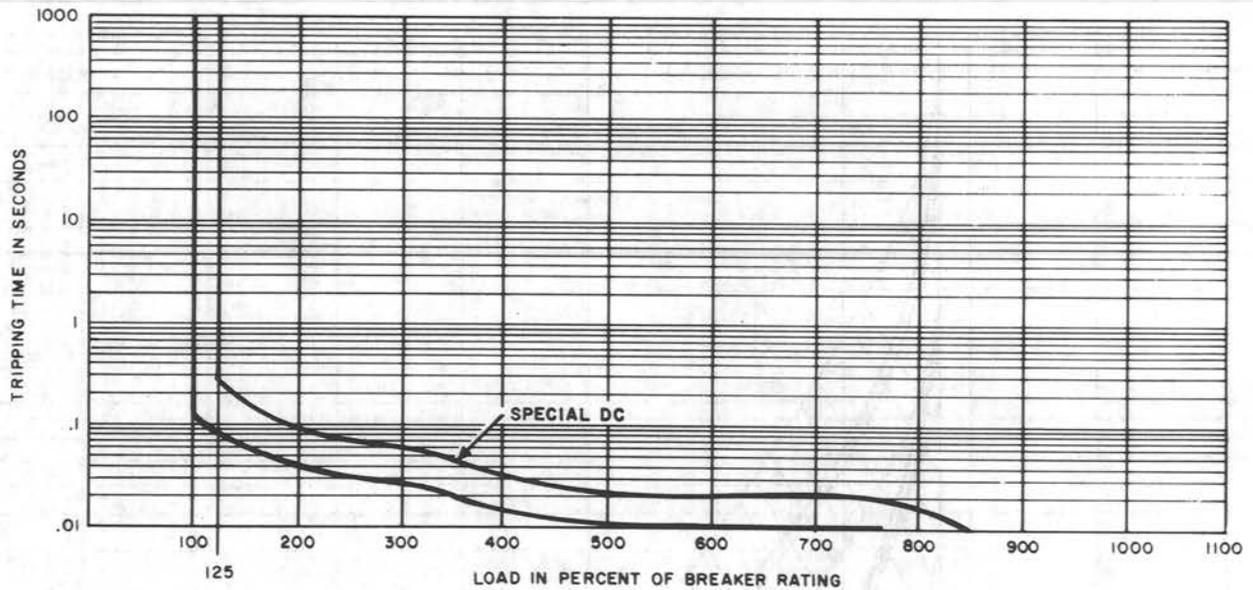


Fig. 12—Special Time-Delay Performance Curve—KS-20684 L21-L24, L221-L224

Note: One pole of this breaker is arranged as a switch and cannot be tested as a breaker.

- (f) **KS-15739:** To check a KS-15739 circuit breaker, proceed in accordance with Methods 1 and 2 as applicable. In following Method 2, adjust the current to 200 percent instead of 125 percent of the breaker rating. Refer to Fig. 21, 22, and 23. Check each pole separately as shown by options 1 and 2.
- (g) **KS-15769:** To check a KS-15769 circuit breaker, proceed in accordance with Method 3. Refer to Fig. 31.
- (h) **KS-15794:** To check a KS-15794 circuit breaker, proceed in accordance with Methods 2 and 3 as applicable. Refer to Fig. 24. Check each pole separately as shown by options 1, 2, and 3.
- (i) **KS-15795:** To check a KS-15795 circuit breaker, proceed in accordance with Method 3. Refer to Fig. 5. Check each pole separately as shown by options 1, 2, and 3.
- (j) **KS-15799:** To check a KS-15799 circuit breaker, proceed in accordance with Method 1. Refer to Fig. 17.

Note: One pole of this breaker is arranged as a switch and cannot be tested as a breaker.

- (k) **KS-15813:** To check a KS-15813 circuit breaker, proceed in accordance with Methods 1, 2, and 3 as applicable. Refer to Fig. 20, 21, 22, 26, 27, 28, 29, 30, 32, 33, 35, 36, 37, and 38. Check each pole separately as shown by options 1, 2, and 3.

Note: In some cases a pole of this breaker is arranged as a switch and cannot be tested as a breaker.

- (l) **KS-15815:** To check a KS-15815 circuit breaker, proceed in accordance with Methods 1, 2, and 3 as applicable. Refer to Fig. 17, 18, 19, 20, 21, 22, 28, 31, and 32. For the 2-pole breaker, check each pole separately as shown by options 1, 2, and 3.
- (m) **KS-15943:** To check the KS-15943 circuit breaker, proceed in accordance with Method 2 except adjust current to 130 percent of the breaker rating instead of 120 percent. Refer to Fig. 18.
- (n) **KS-15944:** To check a KS-15944 circuit breaker, proceed in accordance with Methods 2 and 3. In following Method 2, adjust the

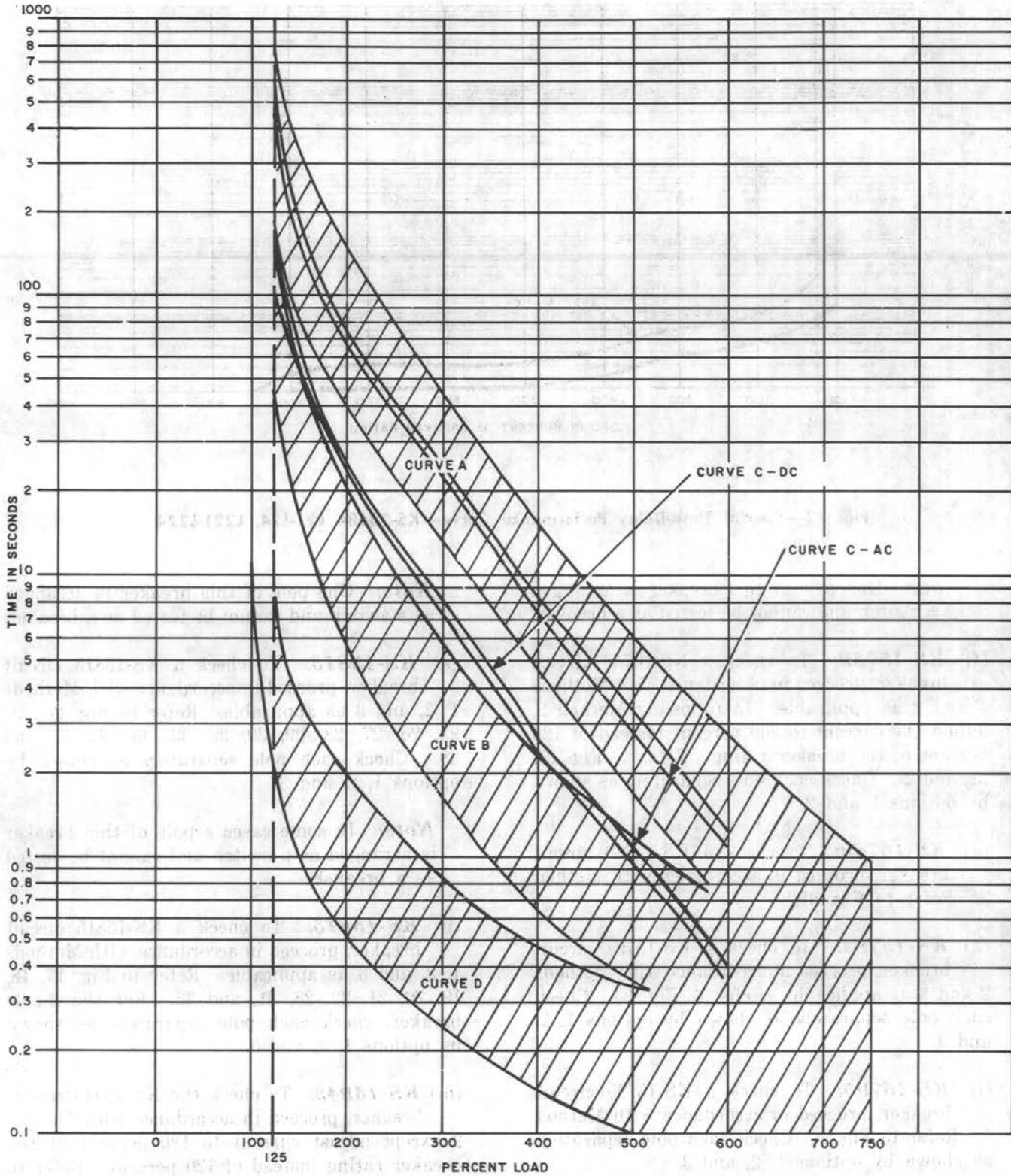


Fig. 13—A, B, C, and AC Time-Delay Performance Curves—KS-5926 LI-L10

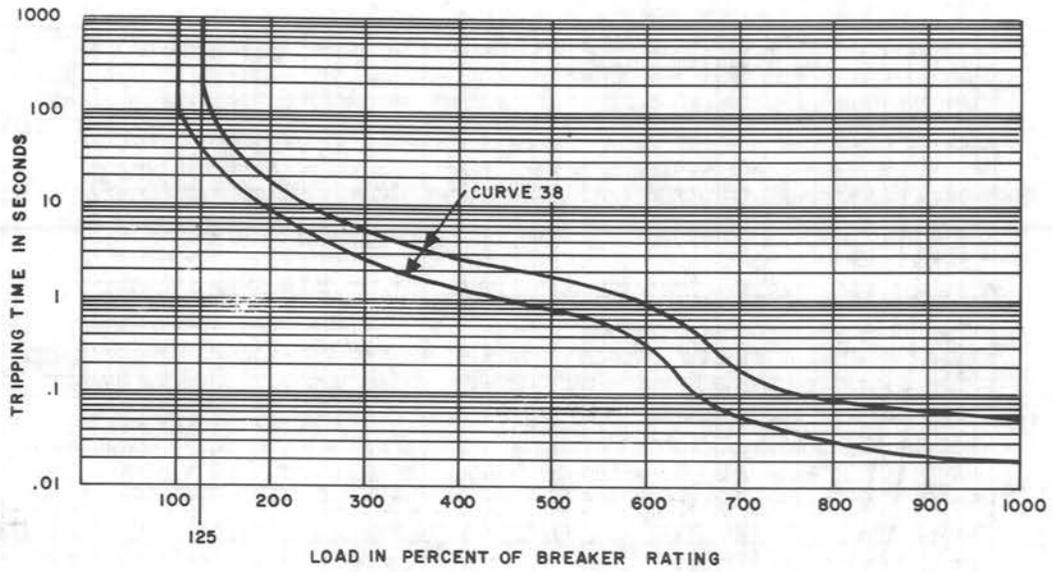


Fig. 14—38 Time-Delay Performance Curve—KS-15769 L1

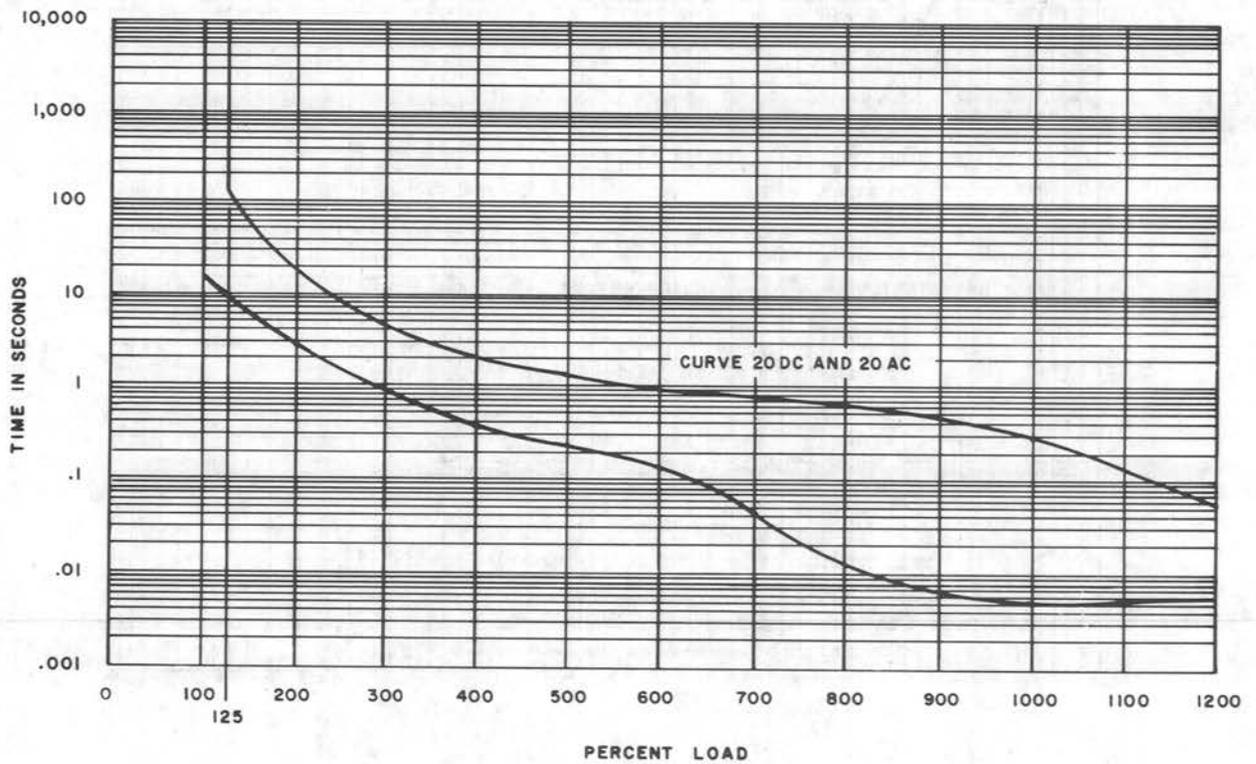


Fig. 15—20 AC and DC Time-Delay Performance Curves—KS-21123 L202, KS-21596 L1-L4

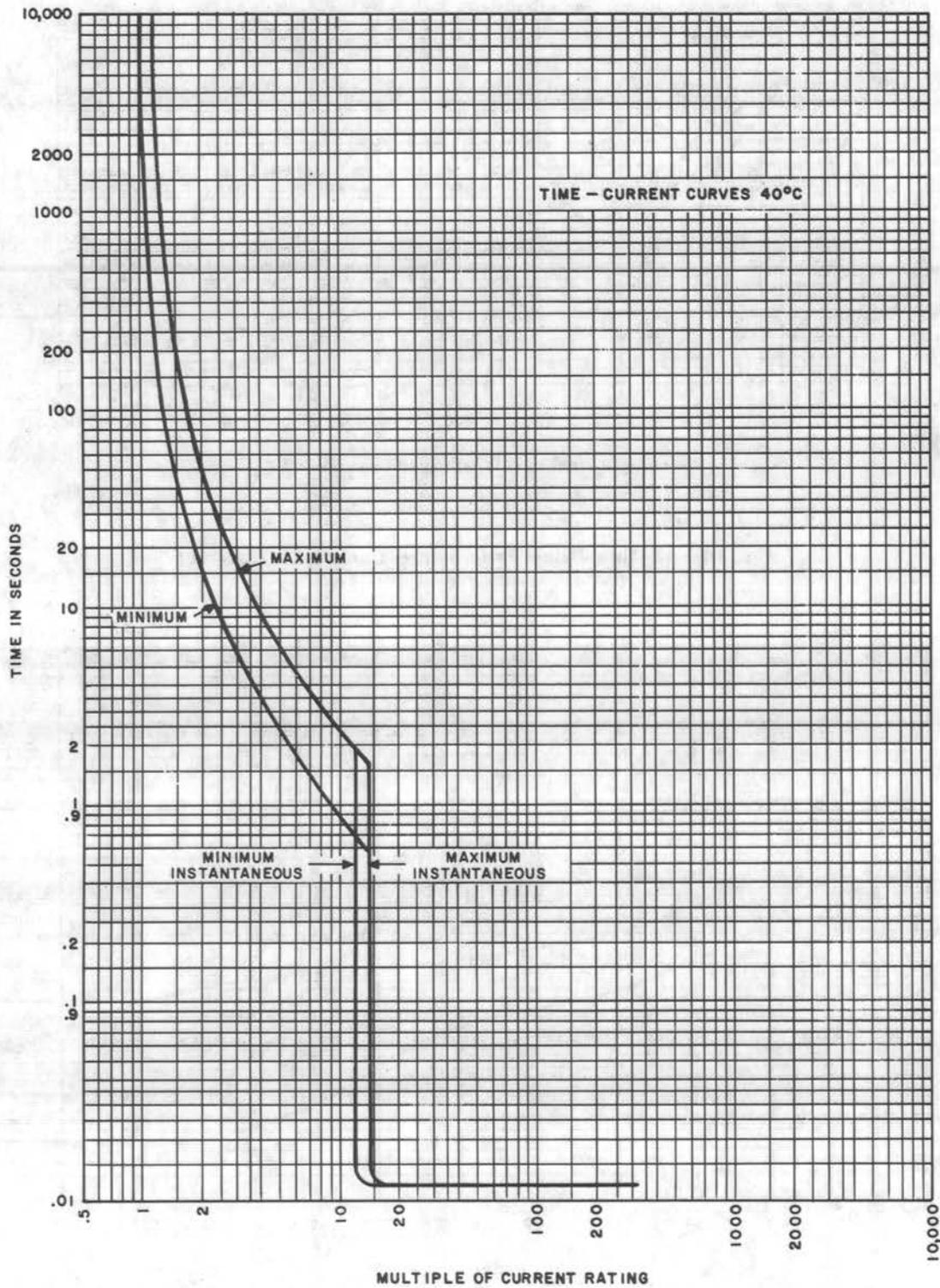


Fig. 16—Special Time-Delay Performance Curve—KS-20903 L20, L50

- current to 130 percent rated current instead of 120 percent. Refer to Fig. 30 and 39. Check each pole separately as shown by options 1, 2, and 3.
- (o) **KS-19735:** To check a KS-19735 circuit breaker, proceed in accordance with Method 3. Refer to Fig. 18.
- (p) **KS-19943:** To check a KS-19943 circuit breaker, proceed in accordance with Methods 1, 2, and 3 as applicable. Refer to Fig. 17, 28, and 31. Check each pole separately as shown by options 1 and 2. To check an L12, apply 3.5 volts per Fig. 42. Relay will trip instantly.
- (q) **KS-20684:** To check a KS-20684 circuit breaker, proceed in accordance with Methods 1, 2, and 3. Refer to Fig. 17, 18, and 28. Check each pole separately as shown by options 1 and 2.
- (r) **KS-20685:** To check a KS-20685 circuit breaker, proceed in accordance with Methods 1 and 2. Refer to Fig. 17.
- (s) **KS-20903:** To check a KS-20903 circuit breaker, proceed in accordance with Methods 2 and 3. Refer to Fig. 31.
- (t) **KS-21122:** To check a KS-21122 circuit breaker, proceed in accordance with Method 1. Refer to Fig. 17 and 21.
- (u) **KS-21123:** To check a KS-21123 circuit breaker, proceed in accordance with Method 1. Refer to Fig. 28. Check each pole separately as shown by options 1 and 2.
- (v) **KS-21186:** To check a KS-21186 circuit breaker, proceed in accordance with Methods 1 and 2. Refer to Fig. 17, 21, and 28. Check each pole separately as shown by options 1 and 2.
- (w) **KS-21225:** To check a KS-21225 circuit breaker, proceed in accordance with Method 1. Refer to Fig. 41. In addition to the time-delay performance check, perform the following.
- (a) With the pushbutton switch in an off condition, pins 10 and 11 shall be a closed circuit.
- (b) With the pushbutton switch in an on condition, pins 10 and 11 shall be an open circuit and pins 10 and 2 (load) shall be a closed circuit.
- (c) With the circuit breaker in either an OFF or ON position, the tripped breaker indicating switch shall be open.
- (d) The breaker lever shall move to the ALM (center) position when the breaker is operated by an overload, and the tripped breaker indicating switch shall close, connecting the line terminal to the alarm terminal.
- (e) The breaker lever shall not go from the ALM position to the ON position until it is operated manually to the OFF position. This opens the alarm contacts and resets the trip mechanism.
- (x) **KS-21596:** To check a KS-21596 circuit breaker, proceed in accordance with Methods 2 and 3. In following Method 2, adjust current to 125 percent of the breaker rating instead of 120 percent. Refer to Fig. 26, 33, 34, and 40. Check each pole separately as shown by options 1, 2, and 3.
- (y) **KS-21597:** To check a KS-21597 circuit breaker, proceed in accordance with Method 2 except adjust current to 125 percent of the breaker rating instead of 120 percent. Refer to Fig. 21. Check each pole separately as shown by options 1 and 2.

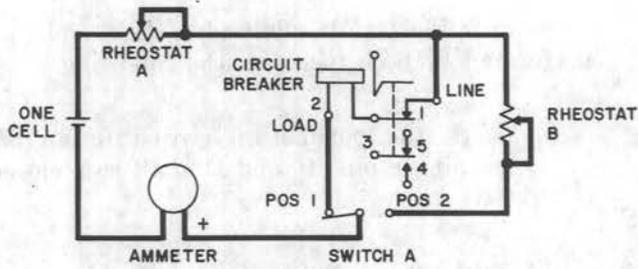


Fig. 17—Checking Units—DC Breakers—KS-5648 L1, L3, L5-L11, L16, KS-15799, KS-15815 L101-L108, L115, L116, L120-L123, L125, L126, L128-L131, L134, L135, L137, L139, L140, L143, KS-19943 L1-L4, L7-L9, L11, L13, KS-20684 L1-L4, L10, L12, L13, L21, L205, L210, L212, L213, L221, KS-20685 L1-L4, KS-21122 L3, L7, KS-21186 L1, L4-L8, L204-L208

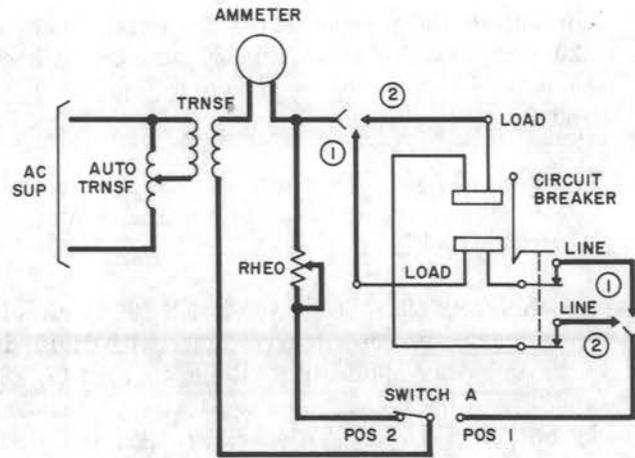


Fig. 19—Checking Circuit—AC Breakers—KS-5786 L1, KS-15659 L3-L12, L14, KS-15815 L25-L35, L40

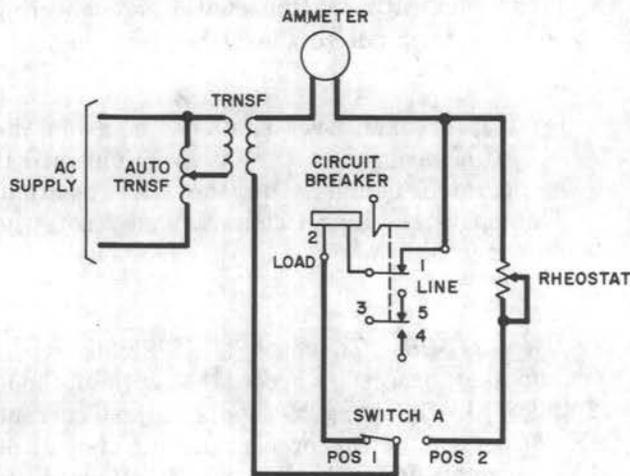


Fig. 18—Checking Circuits—AC Breakers—KS-15713, KS-15815 L5-L18, L46, L47, KS-15943 L1, KS-19735 L1, KS-20684 L5

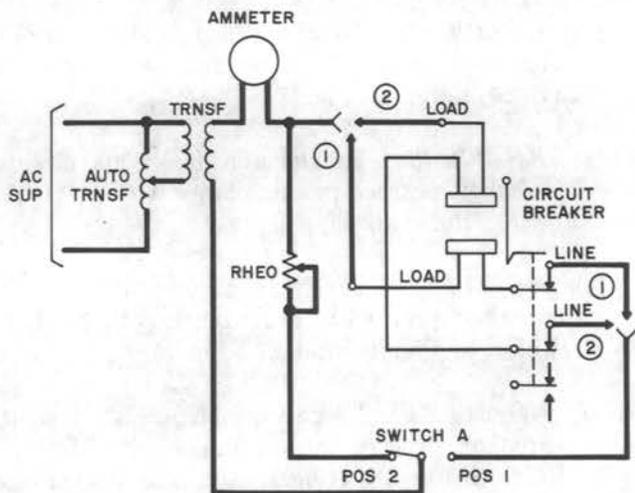


Fig. 20—Checking Circuit—AC Breakers—KS-15659 L2, L17B, KS-15813 L2, L4-L6, L8, KS-15815 L22-L24, L43, L45

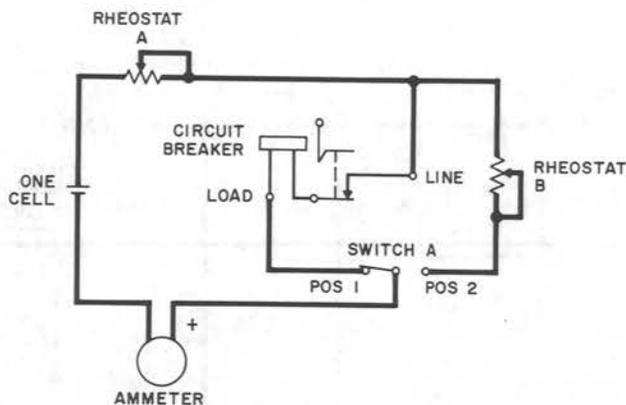


Fig. 21—Checking Circuit—DC Breakers—KS-5648
L14, L15, KS-5926 L5, KS-15739 L1, KS-15813
L24, L27, KS-15815 L109, L110, L113, L114,
L117-L119, L124, L132, L133, L136, L138,
L141, L142, KS-21122 L1, L2, L5, L6, L8,
KS-21186 L2, L9-L11, KS-21597 L1

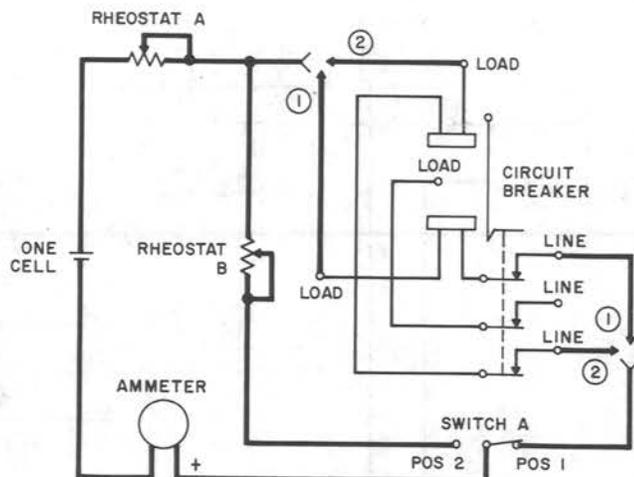


Fig. 23—Checking Circuit—DC Breaker—KS-15739 L1

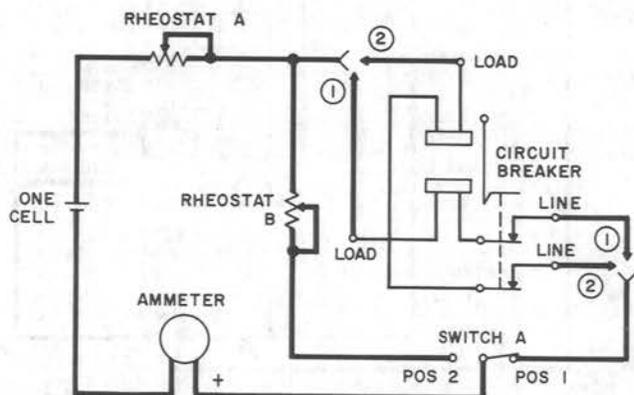


Fig. 22—Checking Circuit—DC Breakers—KS-15659
L13, L15, L17A, L18A, L18B, KS-15739 L2,
L3, KS-15813 L15, L22, L26, L28, L29,
KS-15815 L111-L112

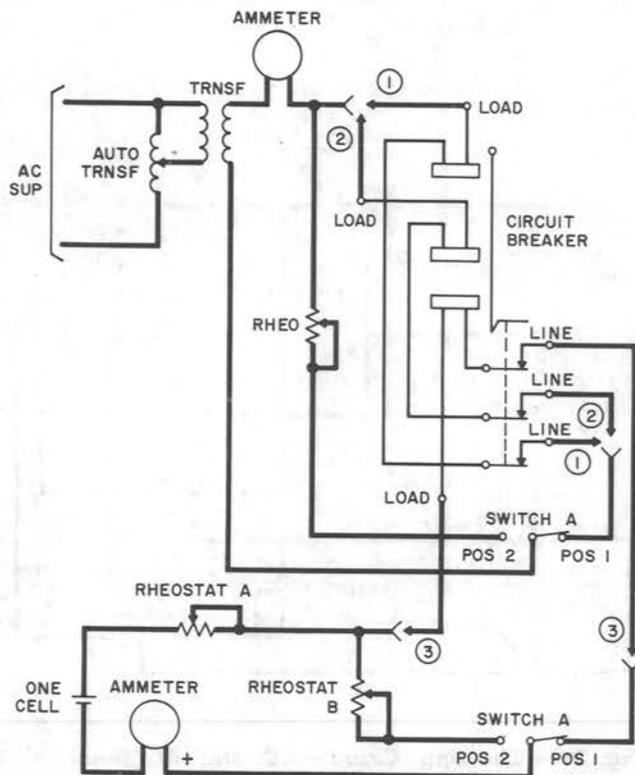


Fig. 24—Checking Circuit—AC and DC Breakers—
KS-15794

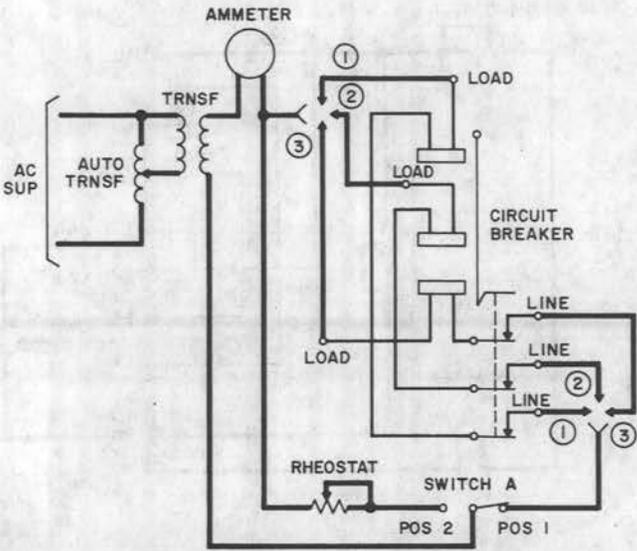


Fig. 25—Checking Circuit—AC Breakers—KS-15795, KS-5926 L6

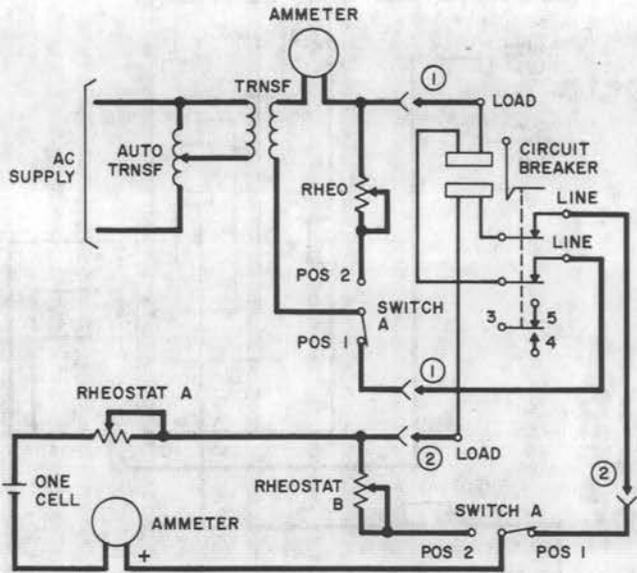


Fig. 26—Checking Circuit—AC and DC Breakers—KS-15813 L3, L14, L33-L37, L39, KS-21596 L2

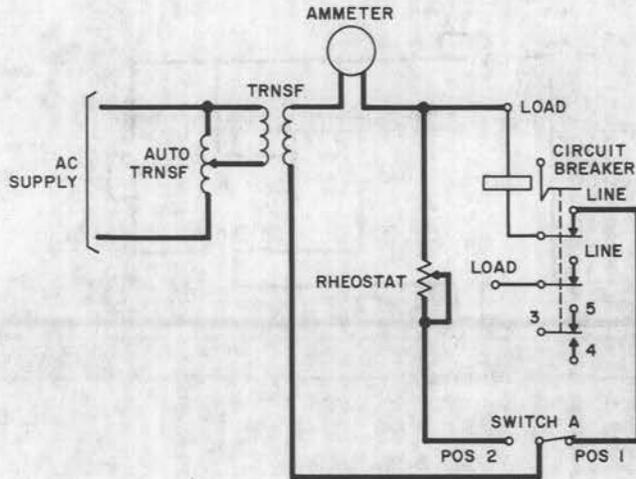


Fig. 27—Checking Circuit—AC Breaker—KS-15813 L7

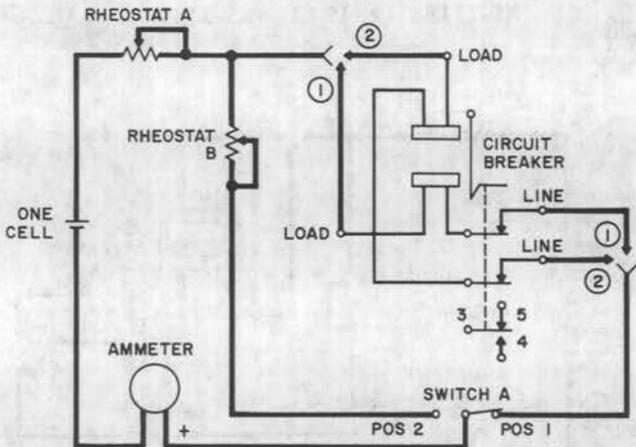


Fig. 28—Checking Circuit—DC Breakers—KS-15813 L9, L10, L13, L17, L21, L23, L25, KS-15815 L127, KS-19943 L5, L6, KS-20684 L6-L9, L11, L14-L20, L22-L24, L211, L214, L217, L219, L220, L222-L224, KS-21123 L2, L202, KS-21186 L3, L203

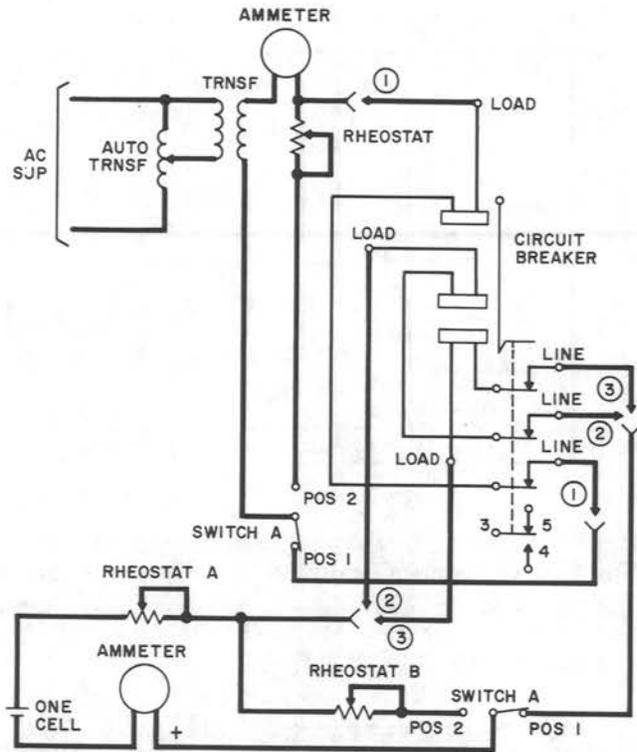


Fig. 29—Checking Circuit—AC and DC Breakers—
KS-15813 L11, L20

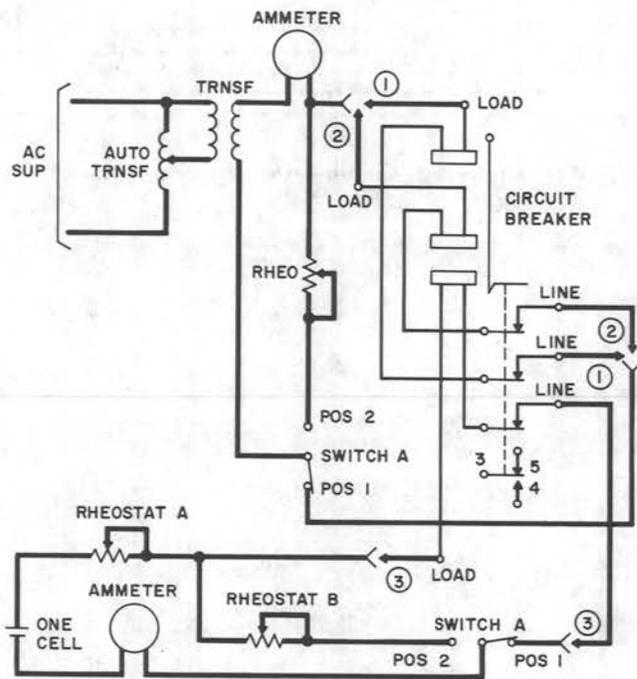


Fig. 30—Checking Circuit—AC and DC Breakers—
KS-15813 L12, L40, KS-15944 L1

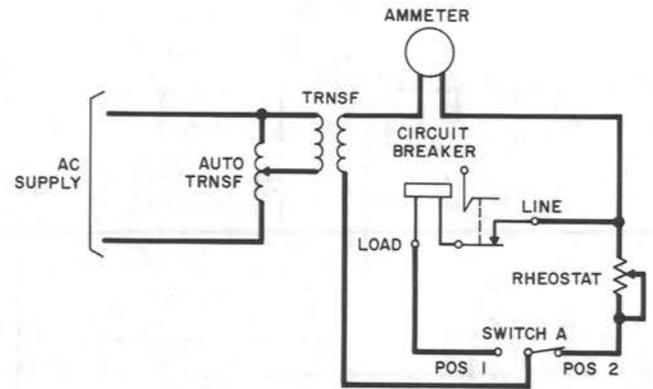


Fig. 31—Checking Circuit—AC Breakers—KS-5648 L2, L4, L13, KS-5926 L1-L3, L7-L10, KS-15769 L1, KS-15815 L19-L21, L36-L38, L44, L48, KS-19943 L10, L14, L15, KS-20903 L20, L50

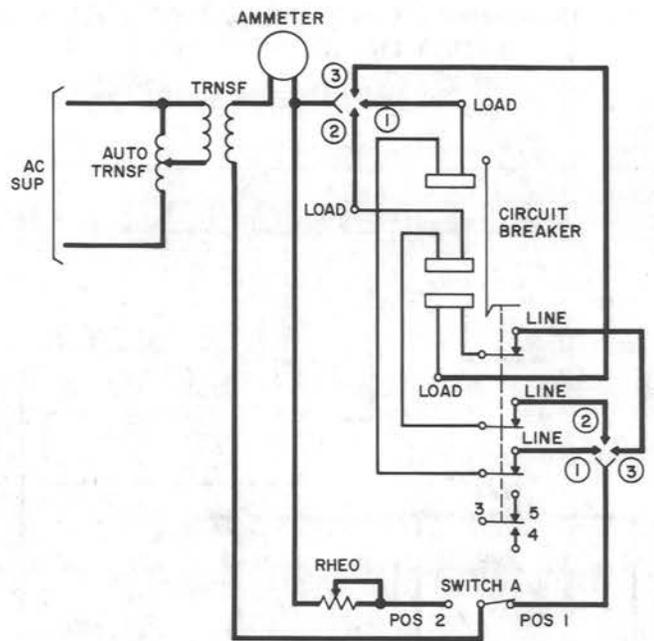


Fig. 32—Checking Circuit—AC Breakers—KS-15813 L16, KS-15815 L39, L41, L42

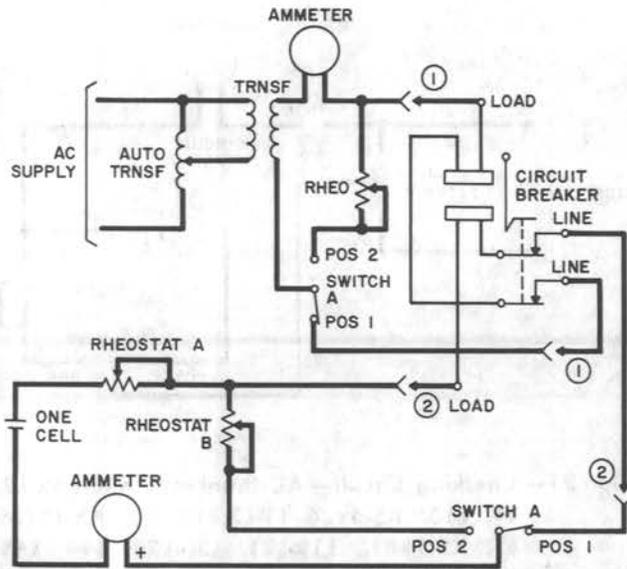


Fig. 33—Checking Circuit—AC and DC Breakers—KS-15813 L18, L38, KS-21596 L4

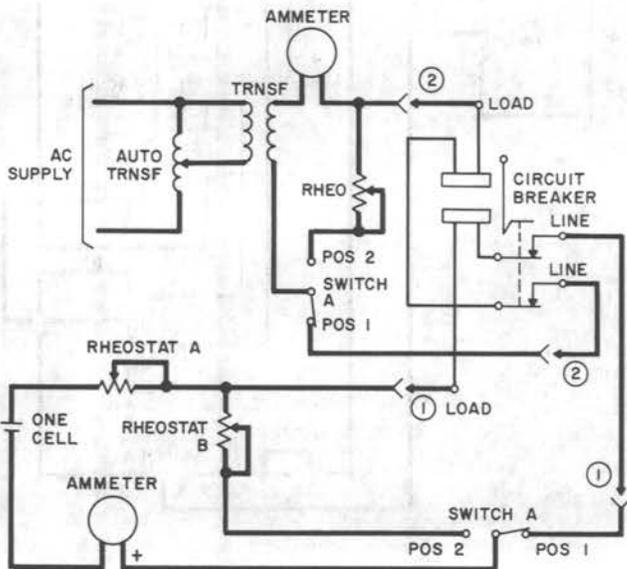


Fig. 34—Checking Circuit—AC and DC Breakers—KS-5926 L4, KS-21596 L1

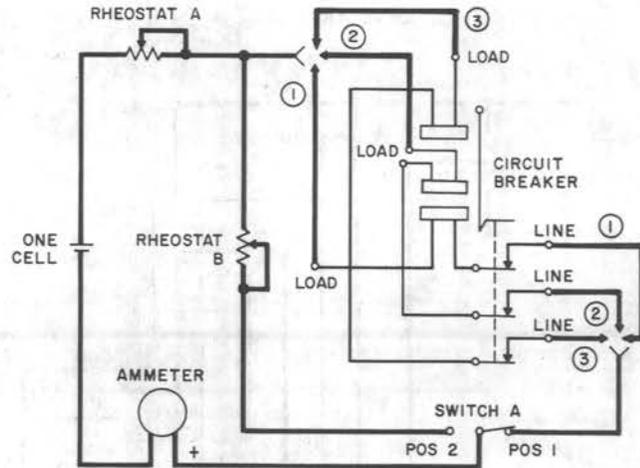


Fig. 35—Checking Circuit—DC Breaker—KS-15813 L19

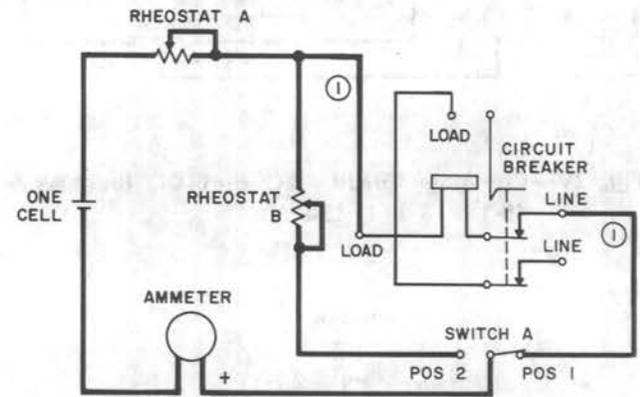


Fig. 36—Checking Circuit—DC Breaker—KS-15813 L30

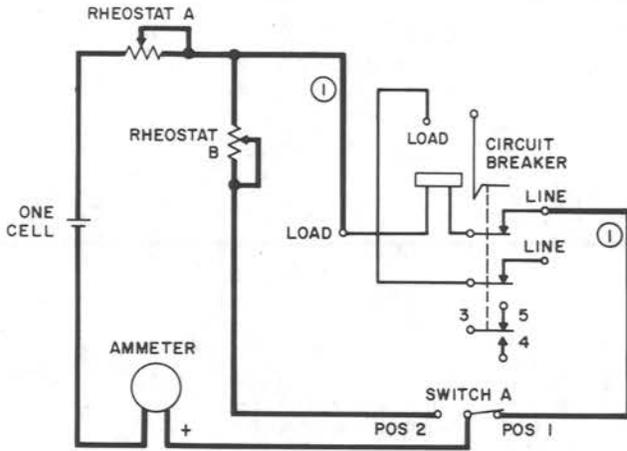


Fig. 37—Checking Circuit—DC Breaker—KS-15813 L31

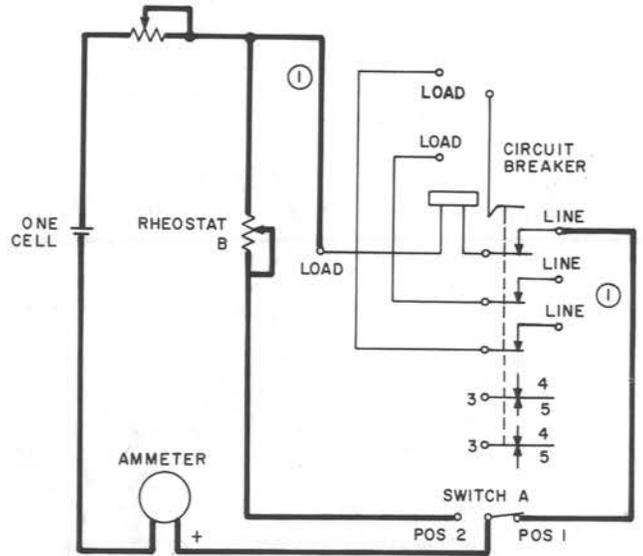


Fig. 39—Checking—DC Breaker—KS-15944 L2

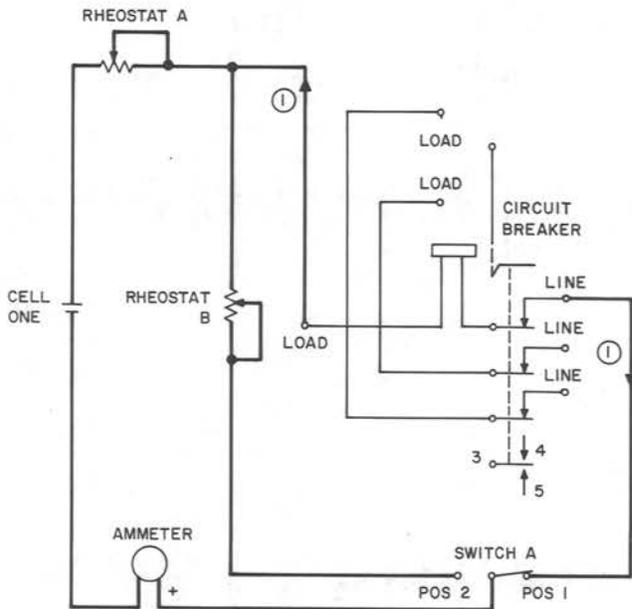


Fig. 38—Checking Circuit—DC Breaker—KS-15813 L32

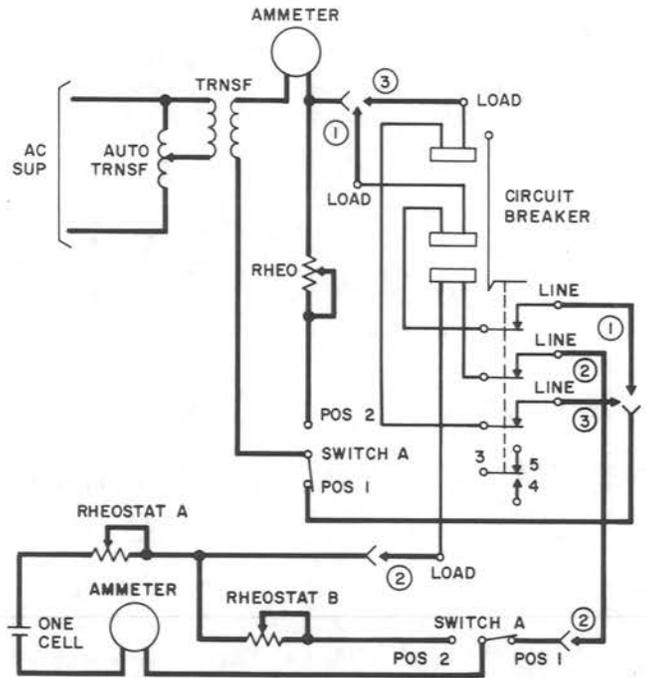


Fig. 40—Checking Circuit—AC and DC Breakers—KS-21596 L3

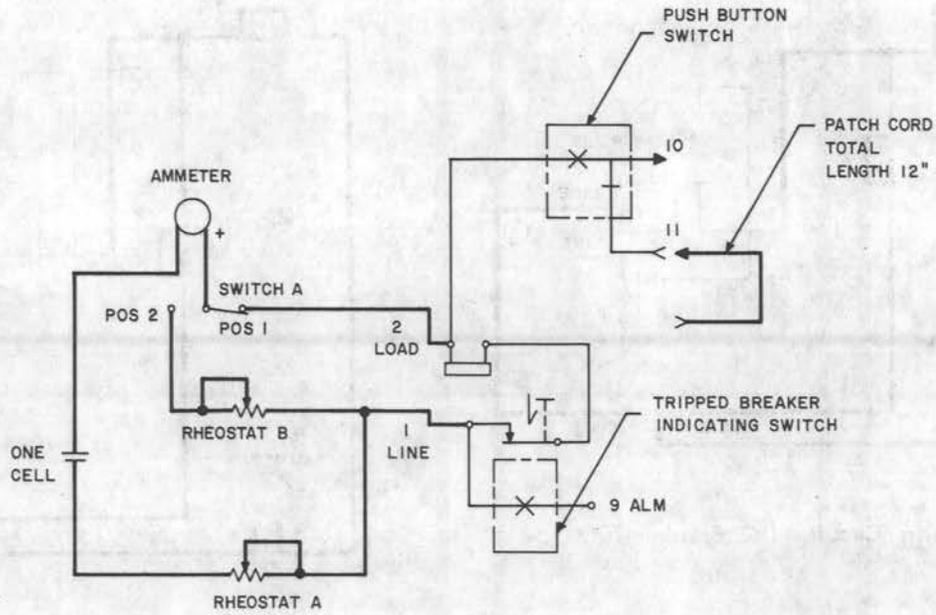


Fig. 41—Checking Circuit—DC Breaker—KS-21225 L20, L30, L100, L112

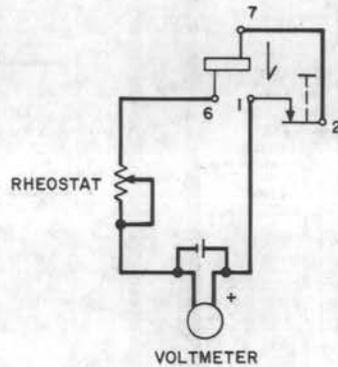


Fig. 42—Checking Circuit—DC Breaker—KS-19943 L12