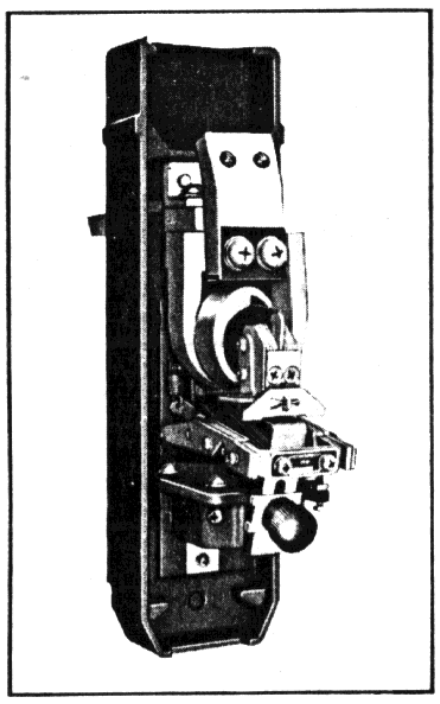
LOW VOLTAGE SWITCHGEAR

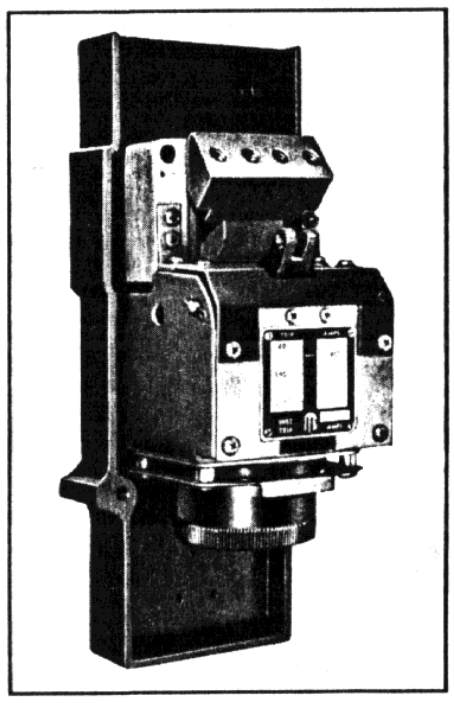
INSTRUCTIONS

DUAL MAGNETIC OVERCURRENT TRIP DEVICES

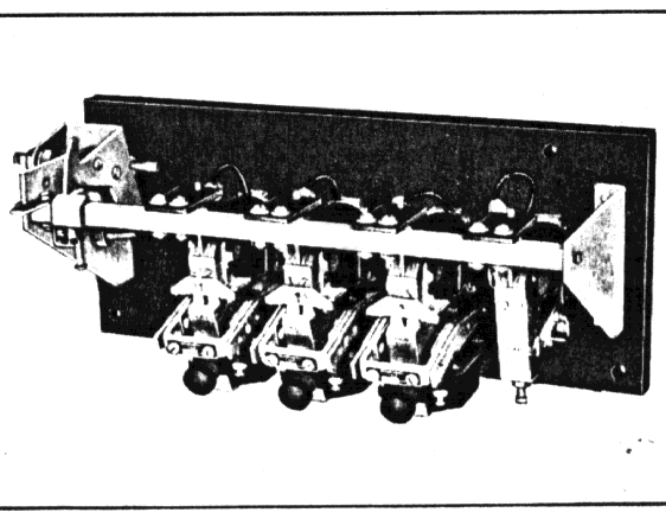
(ADHESION TYPE)



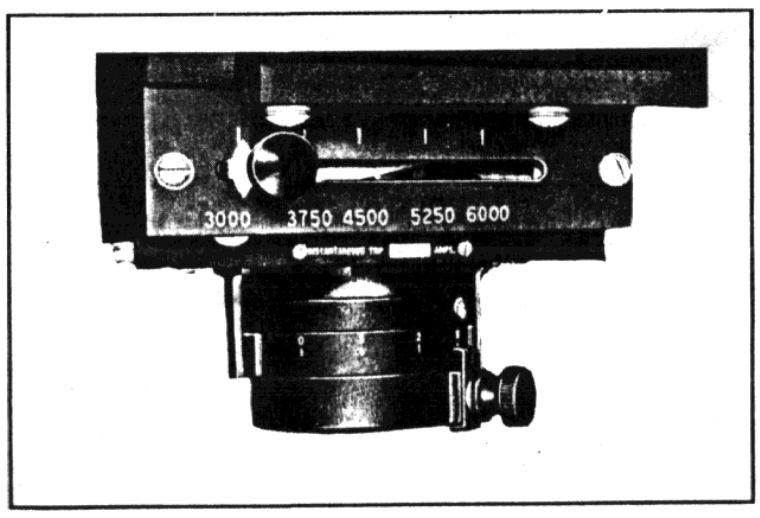
Trip Device For KA and KB Circuit Breaker



Trip Device For KC Circuit Breaker



LG Transformer Trip Assembly



Trip Device For LG Circuit Breaker

I-T-E CIRCUIT BREAKER COMPANY · PHILADELPHIA 30, PENNSYLVANIA

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NEW

INDEX

SECTION I

DUAL MAGNETIC OVERCURRENT TRIP DEVICE FOR TYPE KA AND KB CIRCUIT BREAKERS

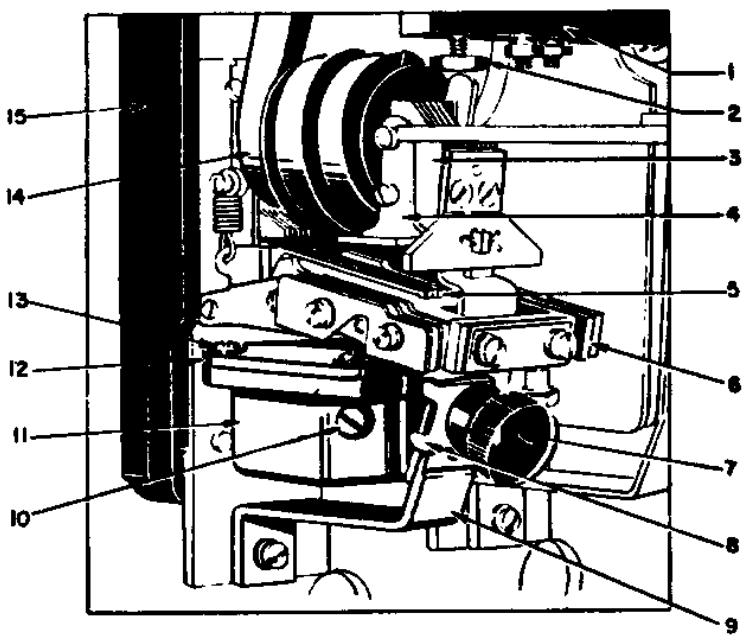
INTRODUCTION

The adhesion type dual magnetic overcurrent trip device combines delayed overcurrent protection with instantaneous short circuit protection. The device is mounted on the insulated base molding directly beneath the pole with which it is associated. Since all poles are rigidly connected in opening and closing, response of the tripping device on one pole to an overcurrent or short circuit will cause the opening of all poles. A dual magnetic overcurrent device for Type KA and KB circuit breakers is shown in Fig. 1.

DESCRIPTION AND OPERATION

The dual magnetic overcurrent trip device has two tripping armatures per series coil. The inside armature, when restrained by the oil-film time-delay device, will prevent tripping of the circuit breaker during transient overcurrents. Should the overcurrent persist beyond pre-calibrated time limits, the time-delay oil film will rupture and allow the armature to move upward, strike the push pin, and trip the circuit breaker. The time delay calibration range of tripping is 80 to 160 per cent of the continuous-current rating of the circuit breaker. The outside armature provides a fixed instantaneous trip value which is set to trip at approximately 8 times the continuous-current rating for d-c circuit breakers, and 12 times the continuous-current rating for a-c circuit breakers.

CAUTION: TRIP THE CIRCUIT BREAKER AND DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE MAKING ANY ADJUSTMENTS OR REPLACEMENTS.



Dwg. S-13853

1	Tripper Bar	8	Clamp
2	Trip Screw	9	Support Bracket
3	Magnet	10	Screw (Oil Insert)
4	Auxiliary Magnet	11	Oil Cup
5	Armature (Time Delay)	12	Cover
6	Armature (Instantaneous)	13	Screw
7	Knob (Time Delay Calibration)	14	Series Coil
		15	Base Molding

Fig. 1—Dual Magnetic Overcurrent Trip Device For Type KA and KB Circuit Breakers

ADJUSTMENTS

The armature (5 and 6, Fig. 1) must have a tripping stroke in excess of the stroke required to actually trip the circuit breaker. This excess tripping stroke is called "excess trip travel." To insure the presence of a safe margin of excess tripping stroke, check and adjust as required the excess trip travel as described in the following paragraphs.

NOTE: IT IS RECOMMENDED THAT THE LATCH BITE BE CHECKED FOR CORRECT ADJUSTMENT AS DESCRIBED IN THE TYPE KA AND KB INSTRUCTION BULLETINS. MAKE ANY REQUIRED LATCH BITE ADJUSTMENT BEFORE PROCEEDING WITH THE EXCESS TRIP TRAVEL ADJUSTMENT.

To adjust the excess trip travel, proceed as follows:

Refer to Fig. 1 and,

1. Adjust trip screw (2) so that the circuit breaker will trip with a 0.020 inch feeler gauge inserted between and parallel to the (inside) time-delay armature (5) and magnet (3). (Note: The feeler gauge should not be placed so as to lie between the push pin and armature.)

Be sure and tighten the locknut on the trip screw when the adjustment is correct.

2. Check the (outside) instantaneous armature adjustment. The circuit breaker should trip with a 0.030 inch feeler gauge and not trip with a 0.040 inch feeler gauge inserted between and parallel to the instantaneous armature (6) and auxiliary magnet (4).

The device should be set for a value of current slightly above the maximum continuous-current rating of the equipment. If the circuit breaker trips under normal operating conditions, loosen the

calibration knob (7, Fig. 1) and lower the oil cup slightly. Be sure and tighten the calibration knob after making any change in trip setting.

The location of the top edge of the armature calibration pointer relative to the current graduations on the support bracket indicates the minimum current value at which the device will operate to trip the circuit breaker.

A typical time delay characteristic curve for the dual magnetic overcurrent trip device is shown in Fig. 7 at the back of this bulletin.

MAINTENANCE

TIME DELAY OIL CUP

For initial service before operating the circuit breaker, clean the oil cups and adhesive discs and insert the time delay oil as described under section Servicing Oil Cup.

For normal maintenance after installation, clean the oil cups and renew the oil every six months to insure proper operation of the circuit breaker. Abnormal operating conditions may warrant more frequent cleaning. Any indication of improper time delay action may be due to insufficient oil or the presence of some foreign matter in the oil cup.

Servicing Oil Cup (Refer to Fig. 1).

1. Remove knob (7) and clamp (8).
2. Remove pin connecting upper end of time delay link to inside armature (5). Pin may be reached by raising outside armature (6).
3. Lift up both armatures and slide out oil cup (11).
4. Remove four screws (13) to remove cup cover (12), then lift out movable adhesive disc.

CAUTION: DO NOT SCRATCH OR MAR THE ADHESIVE DISCS, AND DO NOT INTERCHANGE OIL CUPS.

5. Flush oil cup and adhesive discs with carbon tetrachloride or similar solvent and dry thoroughly.

Re-assemble the oil cup and replace on the overcurrent device using the reverse of the procedure outlined in steps 1 to 5 above.

When assembly is complete, remove screw (10, Fig. 1) and insert the time delay oil from the tube supplied. Put ½ ounce of oil (the contents of one tube) in each cup. Time-delay oil supplied by the I-T-E Circuit Breaker Company is recommended. When re-ordering time delay oil, specify type and serial number of the circuit breaker, and quantity required.

Reset the time delay device at the predetermined calibration point. Refer to ADJUSTMENTS should any calibration change be necessary.

RENEWAL UNITS

It is recommended that one complete device of each rating in use be stocked as a replacement unit for each 25 units in service.

When ordering renewal units, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the type of device, quantity required, current rating, calibrations and settings desired, and complete circuit breaker nameplate data including the serial number.

SECTION II

DUAL MAGNETIC OVERCURRENT TRIP DEVICE FOR TYPE KC CIRCUIT BREAKERS

INTRODUCTION

The adhesion type dual magnetic overcurrent trip device combines delayed overcurrent protection with instantaneous short circuit protection. The device is mounted on the insulated base molding directly beneath the pole with which it is associated. Since all poles are rigidly connected in opening and closing, response of the tripping device on one pole to an overcurrent or short circuit will cause the opening of all poles. A dual magnetic overcurrent trip device for Type KC circuit breakers is shown in Fig. 2.

DESCRIPTION AND OPERATION

The dual magnetic overcurrent trip device has one armature to which the oil-film time-delay device is attached. This time-delay device prevents tripping of the circuit breaker during transient overcurrents. Should the overcurrent persist beyond pre-calibrated time limits, the time-delay oil-film will rupture and allow the armature to move upward and trip the circuit breaker. Time delay characteristics are maintained up to the instantaneous trip setting. Above this setting, a compressible instantaneous trip spring allows the armature to trip the circuit breaker without separation of the adhesive discs.

The time delay is usually set to trip at 100 per cent of the continuous-current rating of the circuit breaker. Other settings are possible and depend on the pick-up current setting. Some circuit breakers are set at 100 to 200 per cent of the continuous-current rating; while others are calibrated at 80 to 160 per cent. The instantaneous trip is set to trip at approximately 8 times the continuous-current rating for d-c circuit breakers, and 12 times the continuous-current rating for a-c circuit breakers.

CAUTION: TRIP THE CIRCUIT BREAKER AND DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE MAKING ANY ADJUSTMENTS OR REPLACEMENTS.

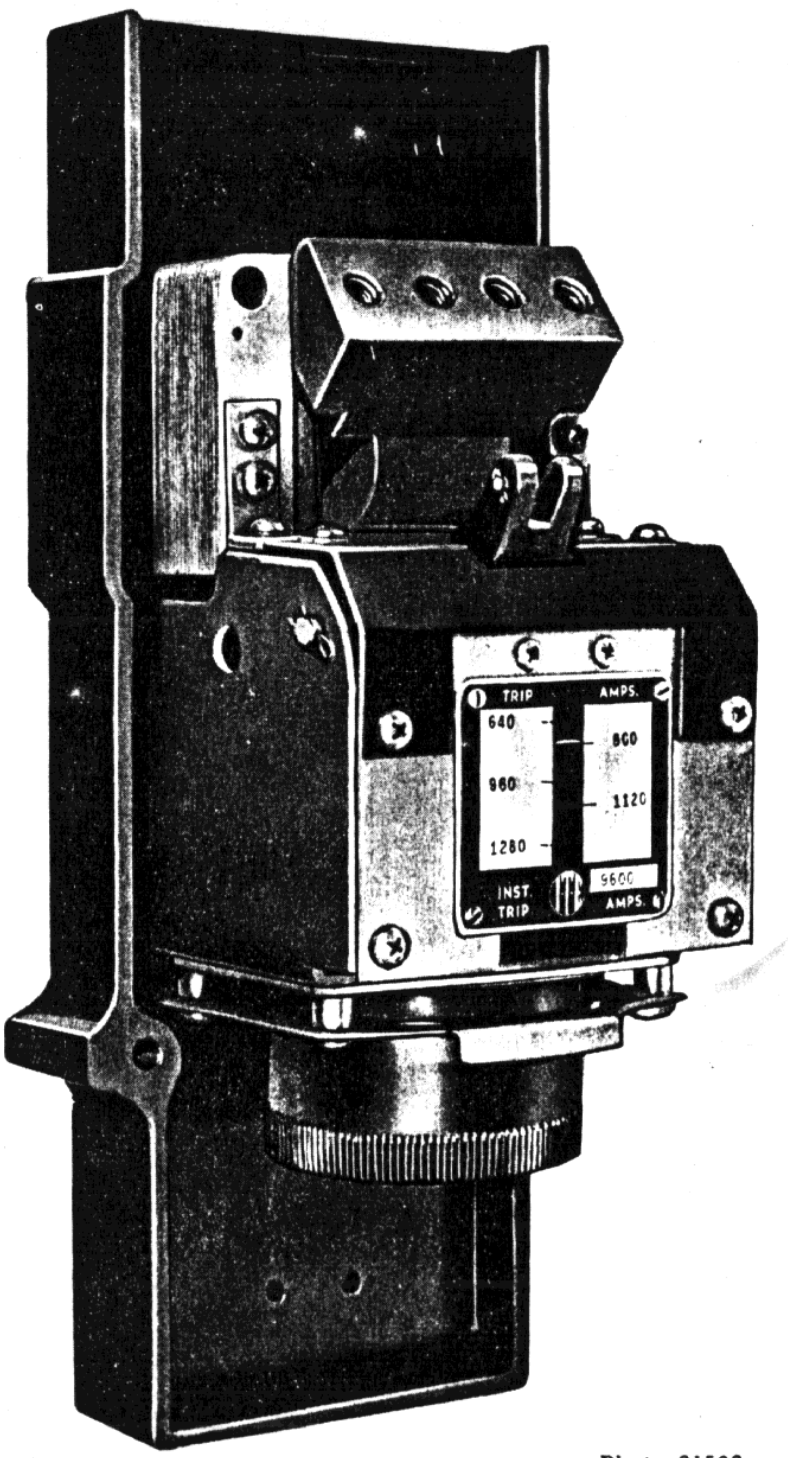


Photo 21562

Fig. 2—Dual Magnet Overcurrent Trip Device For Type KC Circuit Breakers

ADJUSTMENTS

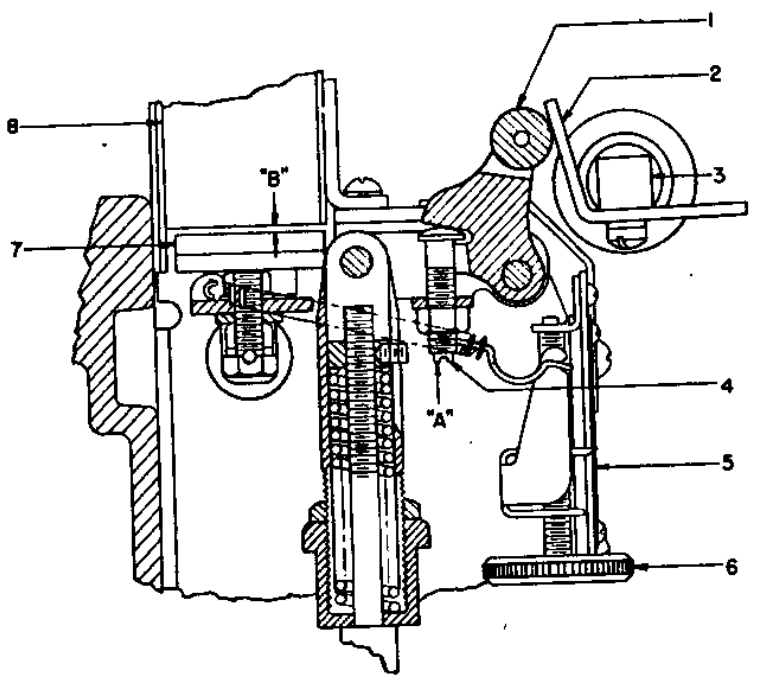
The armature (7, Fig. 3) must have a tripping stroke in excess of the stroke required to actually trip the circuit breaker. This excess tripping stroke is called "excess trip travel." To insure the presence of a safe margin of excess tripping stroke, check and adjust the excess trip travel as described in the following paragraphs.

NOTE: IT IS RECOMMENDED THAT THE LATCH BITE BE CHECKED FOR CORRECT ADJUSTMENT AS DESCRIBED IN THE TYPE KC INSTRUCTION BULLETIN. MAKE ANY REQUIRED LATCH BITE ADJUSTMENT BEFORE PROCEEDING WITH THE EXCESS TRIP TRAVEL ADJUSTMENT.

To adjust the excess trip travel, proceed as follows:

Refer to Fig. 3 and,

1. Adjust screw (4) so that the circuit breaker will trip, when the armature is operated manually, with a 0.015 inch feeler gauge inserted between and parallel to the magnet and armature at "B." The circuit breaker should not trip when a 0.025 inch feeler gauge is inserted.



Dwg. S-13876

1 Trip Lever
2 Tripper Bar Tripper
3 Tripper Bar
4 Adjusting Screw
5 Calibration Plate
6 Calibration Knob
7 Armature
8 Magnet

Fig. 3—Partial Section View of Dual Magnetic Overcurrent Trip Device For Type KC Circuit Breakers

Be sure and tighten the locknut on adjusting screw (4) when the adjustment is correct.

The device should be set for a value of current slightly above the maximum rating of the equipment. If the circuit breaker trips under normal operating conditions, turn the calibration knob (6, Fig. 3) until the pointer is opposite a higher current setting as indicated on the calibration plate (5, Fig. 3).

The typical time-delay characteristic curves for the dual magnetic overcurrent trip devices are shown in Figs. 8 and 9 at the back of this bulletin. Fig. 8 represents the tripping characteristics for continuous-current ratings for 600 amperes and below. Fig. 9 represents the tripping characteristics for continuous-current ratings from 800 to 1600 amperes.

MAINTENANCE

TIME DELAY CUP

For initial service before operating the circuit breaker, clean the oil cups and adhesive discs and insert the time delay oil as described under section Servicing Oil Cup.

For normal maintenance after installation, clean the oil cups and renew the oil every six months to insure proper operation. Abnormal operating conditions may warrant more frequent cleaning. Any indication of improper time delay action may be due to insufficient oil or the presence of some foreign matter in the oil cup.

Servicing Oil Cup

Remove the oil cup by rotating it to the left until the cup is released, then lower cup.

CAUTION: DO NOT SCRATCH OR MAR THE ADHESIVE DISCS, AND DO NOT INTERCHANGE OIL CUPS.

Flush oil cups and adhesive discs with carbon tetrachloride or similar solvent and then dry thoroughly. Insert the time delay oil from the tube supplied. Put 1½ ounces of oil (the contents of one tube) in each cup. Time delay oil supplied by the I-T-E Circuit Breaker Company is recommended. When re-ordering time delay oil, specify the type and serial number of the circuit breaker, and quantity required.

RENEWAL UNITS

It is recommended that one complete device of each rating in use be stocked as a replacement unit for each 25 units in service.

When ordering renewal units, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the type of device, quantity required, current rating, calibrations and settings desired, and complete circuit breaker nameplate data including the serial number.

SECTION III

DUAL MAGNETIC OVERCURRENT TRIP DEVICE FOR TYPE LG CIRCUIT BREAKERS

INTRODUCTION

The adhesion type dual magnetic overcurrent trip device combines delayed overcurrent protection with instantaneous short circuit protection. The device is mounted to the circuit breaker panel directly beneath the pole with which it is associated. Since all poles are rigidly connected in opening and closing, response of the tripping device on one pole to an overcurrent or short circuit will cause the opening of all poles. A dual magnetic overcurrent trip device for Type LG circuit breakers is shown in Fig. 4.

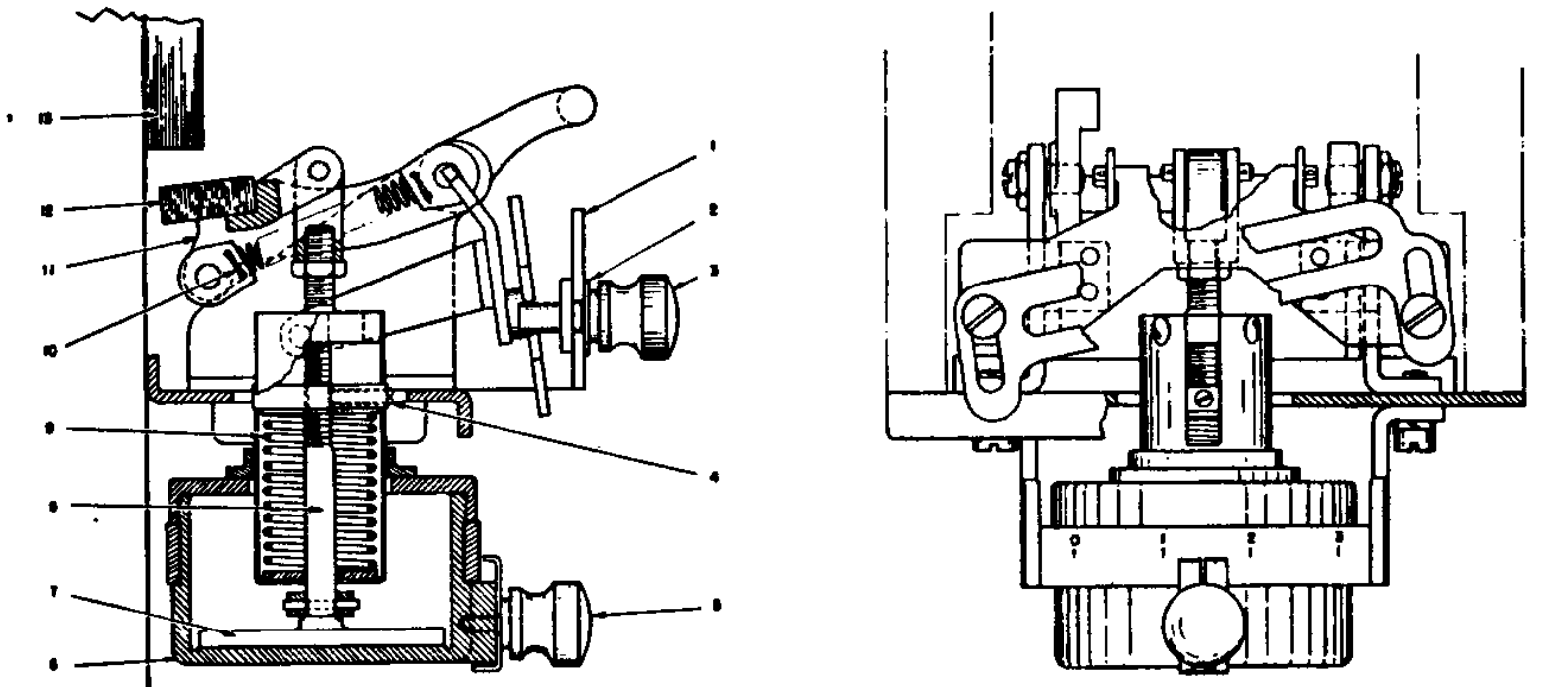
DESCRIPTION AND OPERATION

The dual magnetic overcurrent trip device has one armature to which the oil-film time-delay device is attached. This time-delay device prevents tripping of the circuit breaker during transient overcurrents. Should the overcurrent persist beyond pre-calibrated time limits, the time-delay oil-film will rupture and allow the armature to move upward and trip the circuit breaker. Time delay characteristics are maintained up to the instantaneous setting. Above this setting, a compressible instantaneous trip spring allows the armature to trip the circuit breaker without separation of the adhesive discs.

The time delay calibration range of tripping is from 100 to 200 per cent of the continuous-current rating of the circuit breaker. The fixed instantaneous trip value is set to trip at approximately 8 times the continuous-current rating for d-c circuit breakers and 12 times the continuous-current rating for a-c circuit breakers.

ADJUSTMENTS

The air gap between the armature and magnet is set at the factory when the device is calibrated and should not be changed. The range in calibration is obtained by varying the pull on springs by sliding the calibration knob in the slot of the calibration plate. To adjust the overcurrent trip value loosen the calibration knob (3, Fig. 4) and slide it to the right or left until the pointer is opposite the desired current setting on the calibration plate (1, Fig. 4). Be sure and tighten the knob after any adjustment is made.



Dwg. S-11416

INDEX	DESCRIPTION
1	Calibration Plate
2	Calibration Pointer
3	Calibration Knob (Ovct. Setting)
4	Set Screw
5	Calibration Knob (Time Delay Setting)
6	Time Delay Oil Cup
7	Adhesive Disc
8	Plunger Post
9	Instantaneous Spring
10	Armature Spring
11	Armature Arm
12	Armature
13	Magnet

Fig. 4—Dual Magnetic Overcurrent Trip For Type LG Circuit Breakers

If the circuit breaker trips under current surges, an increase in time delay setting is preferable to an increase in overcurrent setting. The time delay setting is governed by the amount of surface area in contact between the adhesive discs. The lowest setting that will permit the circuit breaker to remain closed under normal conditions should be used. To adjust the time delay setting, loosen calibration knob (5, Fig. 4) and slide it to the right or left until the indicator is opposite the desired setting. A zero setting gives instantaneous tripping and a three setting indicates maximum time delay.

A typical time delay characteristic curve for the dual magnetic overcurrent trip device furnished on the Type LG circuit breakers is shown in Fig. 10 at the back of this bulletin.

MAINTENANCE

TIME DELAY OIL CUP

For initial service before operating the circuit breaker, clean the oil cups and adhesive discs and insert the time delay oil as described under section Servicing Oil Cup.

For normal maintenance after installation, clean the oil cups and renew the oil every six months to insure proper operation. Abnormal operating conditions may warrant more frequent cleaning. Any indication of improper time delay action may be due to insufficient oil or the presence of some foreign matter in the oil cup.

Servicing Oil Cup

Remove calibration knob (5, Fig. 4), calibration indicator, and set screw directly above the calibration knob. Remove the oil cup by rotating the lower section of the oil cup to the left while holding the upper section stationary.

CAUTION: DO NOT SCRATCH OR MAR THE ADHESIVE DISCS, AND DO NOT INTERCHANGE THE OIL CUPS.

Flush oil cups and adhesive discs with carbon tetrachloride or similar solvent and then dry thoroughly. Insert the time delay oil from the tube supplied. Put one ounce of oil (the contents of one tube) in each cup. Position the cup and rotate it to the right until stopped. Line up the holes for the set screw and insert it. Replace the calibration indicator and knob.

Time delay oil supplied by the I-T-E Circuit Breaker Company is recommended. When reordering oil, specify the circuit breaker type and serial number, and quantity required.

RENEWAL UNITS

It is recommended that one complete device of each rating in use be stocked as a replacement unit for each 25 units in service.

When ordering renewal units, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the type of device, quantity required, current rating, calibrations and settings desired, and complete circuit breaker nameplate data, including the serial number.

SECTION IV

TRANSFORMER OVERCURRENT TRIP ASSEMBLY WITH DUAL MAGNETIC OVERCURRENT TRIP DEVICES FOR TYPE LG CIRCUIT BREAKERS

INTRODUCTION

The transformer overcurrent trip assembly with dual magnetic overcurrent trip devices, as shown in Fig. 5, is furnished on a-c circuit breakers rated 4000 amperes and over. The tripping devices of this assembly are actuated by the secondary output current of current transformers mounted on the load studs at the rear of the circuit breaker.

This assembly is used for direct tripping of the circuit breaker where series operating coils are not practical, and where a spring trip is required to disengage the circuit breaker latch. An adjustment is provided on each trip device for changing the armature air gap so that the overcurrent tripping may be varied over a 100 to 200 per cent range. The armature is provided with an adhesion-type time-delay device for delaying the tripping action on momentary overcurrents.

DESCRIPTION AND OPERATION

The transformer overcurrent trip assembly consists of one dual magnetic overcurrent trip device (2, Fig. 5) for each pole, an auxiliary tripper bar (4, Fig. 5) to transmit the action of the trip devices to the latch tripping mechanism, a latch tripping mechanism (1, Fig. 5), and an insulating base for mounting the above as an assembly. (Note: The shunt trip device (3, Fig. 5) is also mounted on this base and operates to trip the circuit breaker through the same auxiliary tripper bar and latch tripping mechanism).

The dual magnetic overcurrent trip device, Fig. 6b, consists of a horizontal magnet core extending from the insulating base. The magnet is surrounded by a coil which is connected to a current transformer located back of the circuit breaker panel. At each end of the magnet core, pole pieces

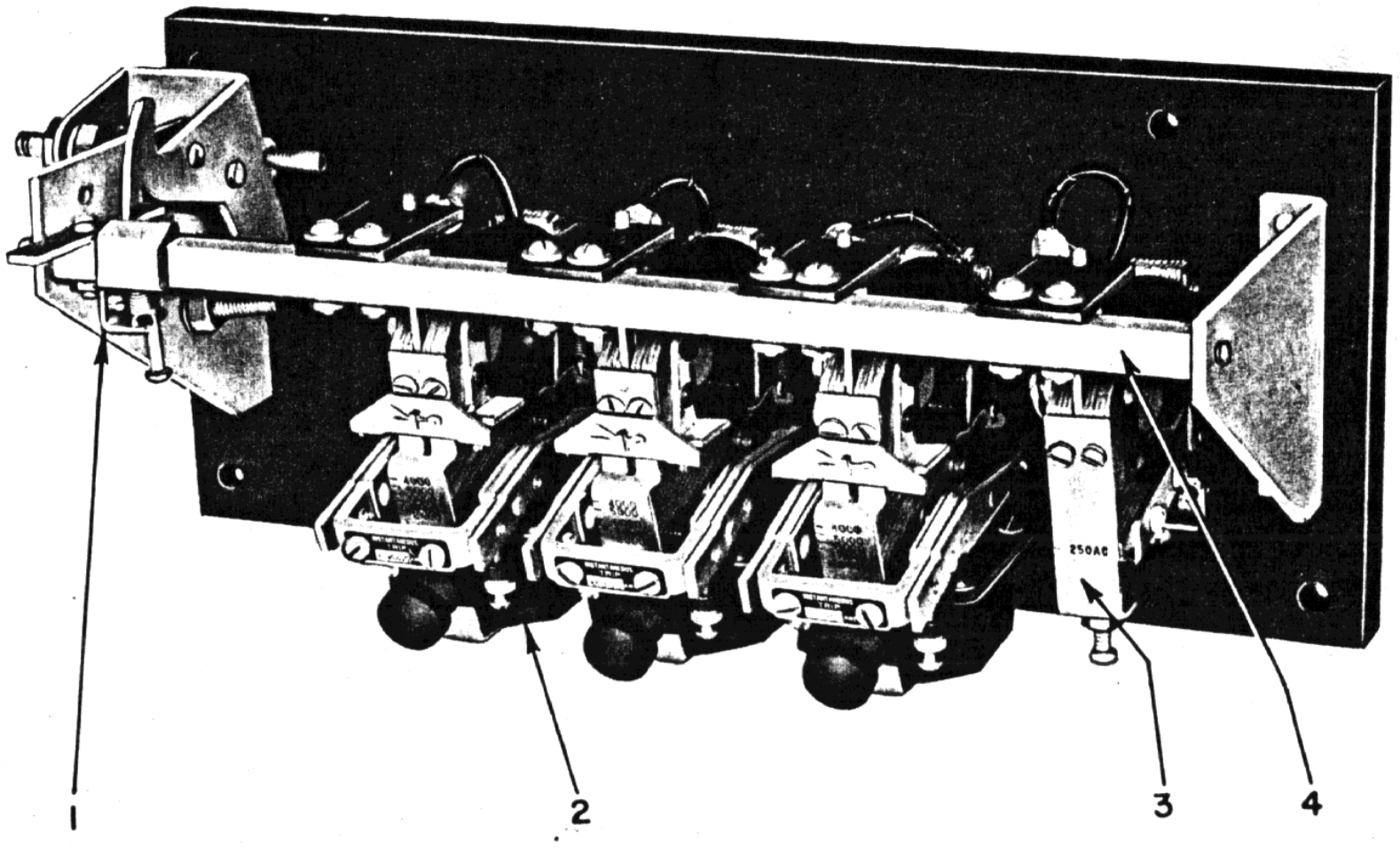


Photo 11940-A

1 Latch Tripping Mechanism
2 Dual Overcurrent Trip Device
3 Shunt Trip Device
4 Auxiliary Tripper Bar

Fig. 5—Transformer Overcurrent Trip Assembly For Type LG Circuit Breakers

extend downward to two armatures. One armature straddles the other and springs lift the inside armature at its pivot to prevent vibration on a-c currents. The outer end of the armature is adjustably supported so that the device can be adjusted to the required tripping current. The current settings available are stamped on the calibration plate.

The outside armature will trip the circuit breaker instantaneously at approximately 12 times the continuous-current rating of the circuit breaker. This armature pivots about its own pin and is independent of the time delay cup.

The inside armature pivots about its pin and is connected by linkage to the upper adhesive disc in the time delay oil cup. The armature is restrained by the action of the time delay device and, therefore, the circuit breaker remains closed during momentary current surges. Should an overcurrent persist beyond pre-calibrated time limits, the oil film will rupture and allow the armature to move upward, strike the push pin which actuates the spring trip mechanism, resulting in circuit breaker tripping.

A vertical push pin, common to the instantaneous and time delay armatures, slides in a slot in the outer pole piece and transmits the final armature movement to the auxiliary tripper bar. The auxiliary tripper bar, rotating clockwise when viewed from the left, releases a latch which is under spring tension. This latch forces the trip rod downward which rotates the tripper bar to trip the circuit breaker.

The latch tripping mechanism is reset by the linkage connected to the circuit breaker operating arm as the circuit breaker opens.

The shunt trip device (3, Fig. 5) is used to trip the circuit breaker electrically from some remote point without regard to the load conditions of the circuit.

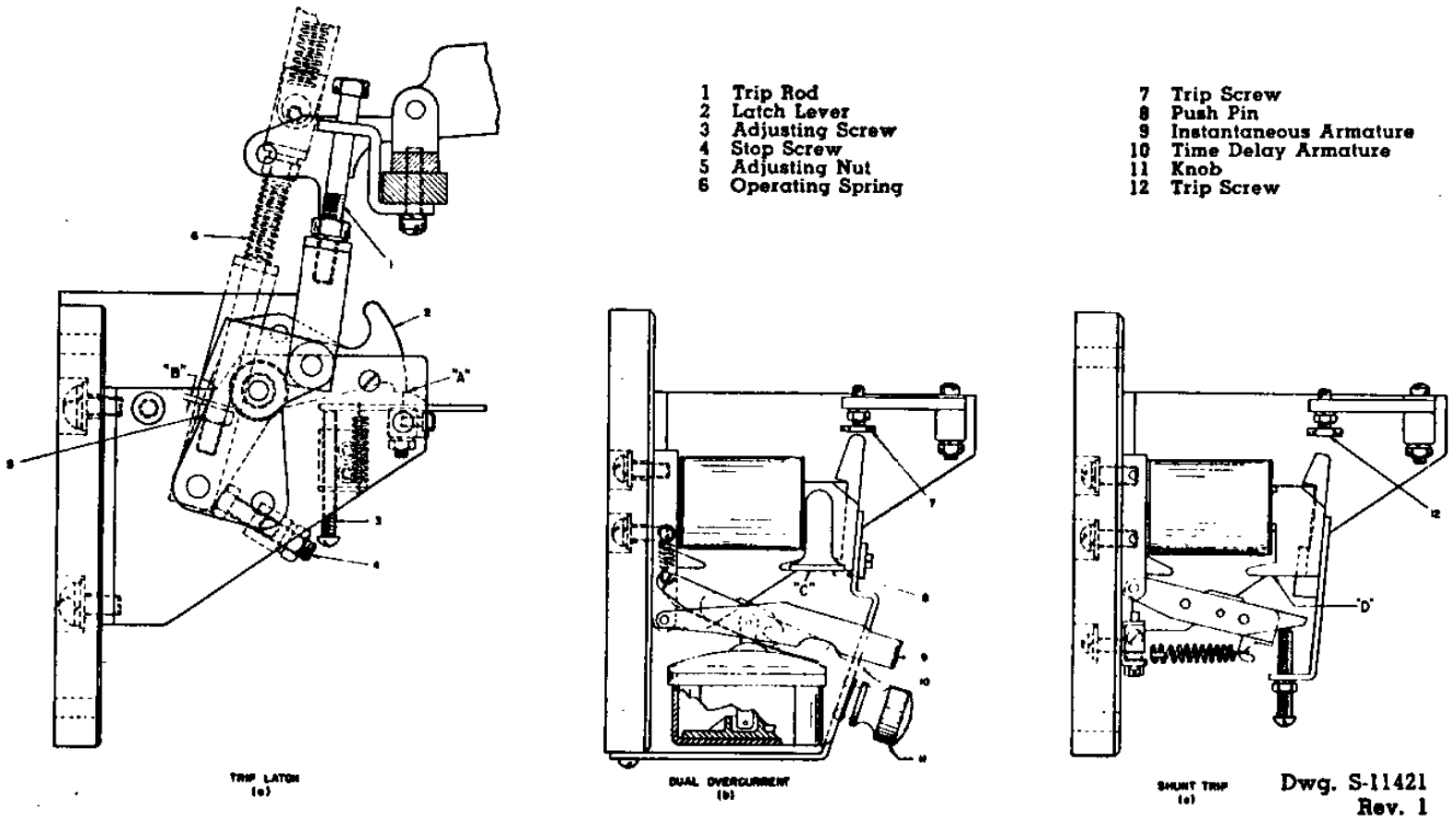
The shunt trip device consists of an intermittent-duty operating coil, magnet, and armature. A spring normally holds the armature against the armature stop screw which provides a fixed air gap between the armature and magnet. When the operating coil is energized by closing a normally open contact, the armature is attracted to the magnet. Circuit breaker tripping is accomplished in the same manner described above for the dual magnetic overcurrent trip device. As the circuit breaker opens, an auxiliary switch contact opens and disconnects the shunt trip coil from the circuit. This prevents the trip coil from burning out should the trip circuit be maintained.

CAUTION: TRIP THE CIRCUIT BREAKER AND DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE MAKING ANY ADJUSTMENTS.

ADJUSTMENTS

DUAL MAGNETIC OVERCURRENT TRIP DEVICE

The air gap setting for the instantaneous armature is made at the factory when the device is calibrated and should not be changed.



1 Trip Rod
2 Latch Lever
3 Adjusting Screw
4 Stop Screw
5 Adjusting Nut
6 Operating Spring
7 Trip Screw
8 Push Pin
9 Instantaneous Armature
10 Time Delay Armature
11 Knob
12 Trip Screw

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FIG. 6—Transformer Overcurrent Trip Assembly For Type LG Circuit Breakers.

The time-delay trip setting should be set for a value of current slightly above the maximum steady load. If the circuit breaker trips under normal operating conditions, loosen knob (11, Fig. 6b) and slightly lower the oil cup to increase the setting. The top edge of the pointer on the armature indicates on the support bracket the current value at which the circuit breaker will trip after a time delay.

The length of time delay is calibrated at the factory and is not adjustable in the field.

A typical time delay characteristic curve for the transformer overcurrent trip assembly with dual magnetic overcurrent trip devices is shown in Fig. 11 at the back of this bulletin.

LATCH TRIPPING MECHANISM

Refer to Fig. 6a and,

With the circuit breaker in the closed position, adjust screw (3) so that the circuit breaker just trips. Then back out screw 1¼ turns.

Adjust stop screw (4) so there is approximately 1/32 inch latch clearance at point "A." Adjust nut (5) so there is a 1/16 inch clearance at "B" when the circuit breaker is eased open.

With the circuit breaker closed, trip latch lever (2), allowing it to stop against stop screw (4). Adjust trip rod (1) so that the circuit breaker just trips, then take up one additional turn and tighten locknut.

The operating spring (6) must be used as supplied and should not be altered.

Refer to Fig. 6b and,

Set trip screw (7) so that the circuit breaker will trip with a 0.015 inch feeler gauge and not trip with a 0.025 inch feeler gauge inserted at "C" for instantaneous armature overtravel. After adjusting for correct instantaneous armature overtravel, check the tripping travel of push pin (8) with the time delay armature.

SHUNT TRIP DEVICE

Refer to Fig. 6c and,

Set trip screw (12) so that the circuit breaker will trip with a 0.015 inch feeler gauge and not trip with a 0.025 inch feeler gauge inserted at "D." When the adjustment is correct, be sure and tighten the locknut on trip screw (12).

The armature air gap setting is adjusted at the factory and should not be changed.

MAINTENANCE

TIME DELAY OIL CUP

For initial service before operating the circuit breaker, clean the oil cups and adhesive discs and insert the time delay oil as described under section Servicing Oil Cup.

For normal maintenance after installation, clean the oil cups and renew the oil every six months to insure proper operation. Abnormal operating conditions may warrant more frequent cleaning. Any indication of improper time delay action may be due to insufficient oil or the presence of some foreign matter in the oil cup.

Servicing Oil Cup (Refer to Fig. 6b)

1. Remove calibration knob (11) and clamp.
2. Remove pin connecting upper end of time delay link to time delay armature (10). Pin may be reached by raising instantaneous armature (9).
3. Lift up both armatures and slide out oil cup.
4. Remove four screws fastening the cover to the oil cup. Remove cover and lift out movable adhesive disc.

CAUTION: DO NOT SCRATCH OR MAR THE ADHESIVE DISCS, AND DO NOT INTERCHANGE OIL CUPS.

5. Flush oil cup and adhesive discs with carbon tetrachloride or similar solvent and dry thoroughly.

Re-assemble the oil cup and replace on the overcurrent device using the reverse of the procedure outlined in steps 1 to 5 above.

When assembly is complete, remove screw at side of oil cup and insert the time delay oil from the tube supplied. Put ½ ounce of oil (the contents of one tube) in each cup. Time delay oil supplied by the I-T-E Circuit Breaker Company is recommended. When re-ordering time delay oil, specify type and serial number of the circuit breaker, and quantity required.

Reset the time delay device at the predetermined calibration point. Refer to section on ADJUSTMENTS should any calibration change be necessary.

RENEWAL PARTS

It is recommended that sufficient renewal parts be stocked to facilitate the proper maintenance and replacement of parts. The quantity of parts and items stocked should be based on the number of devices in service and previous operating experience.

When ordering renewal parts, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the type and serial number of the circuit breaker, description of part, and quantity required.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the I-T-E Circuit Breaker Company.

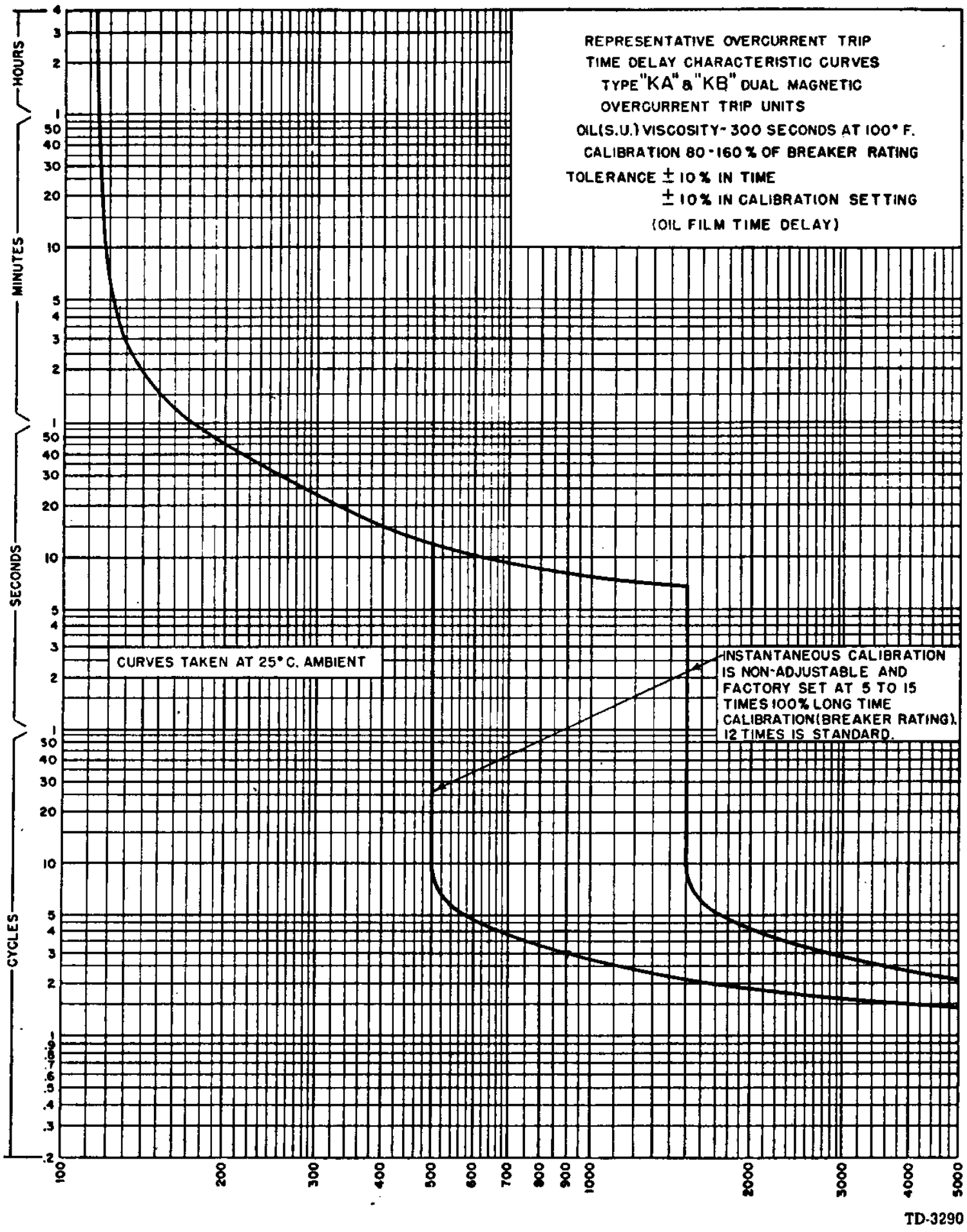

Fig. 7—Typical Time Delay Characteristic Curves For Type KA and KB Circuit Breakers

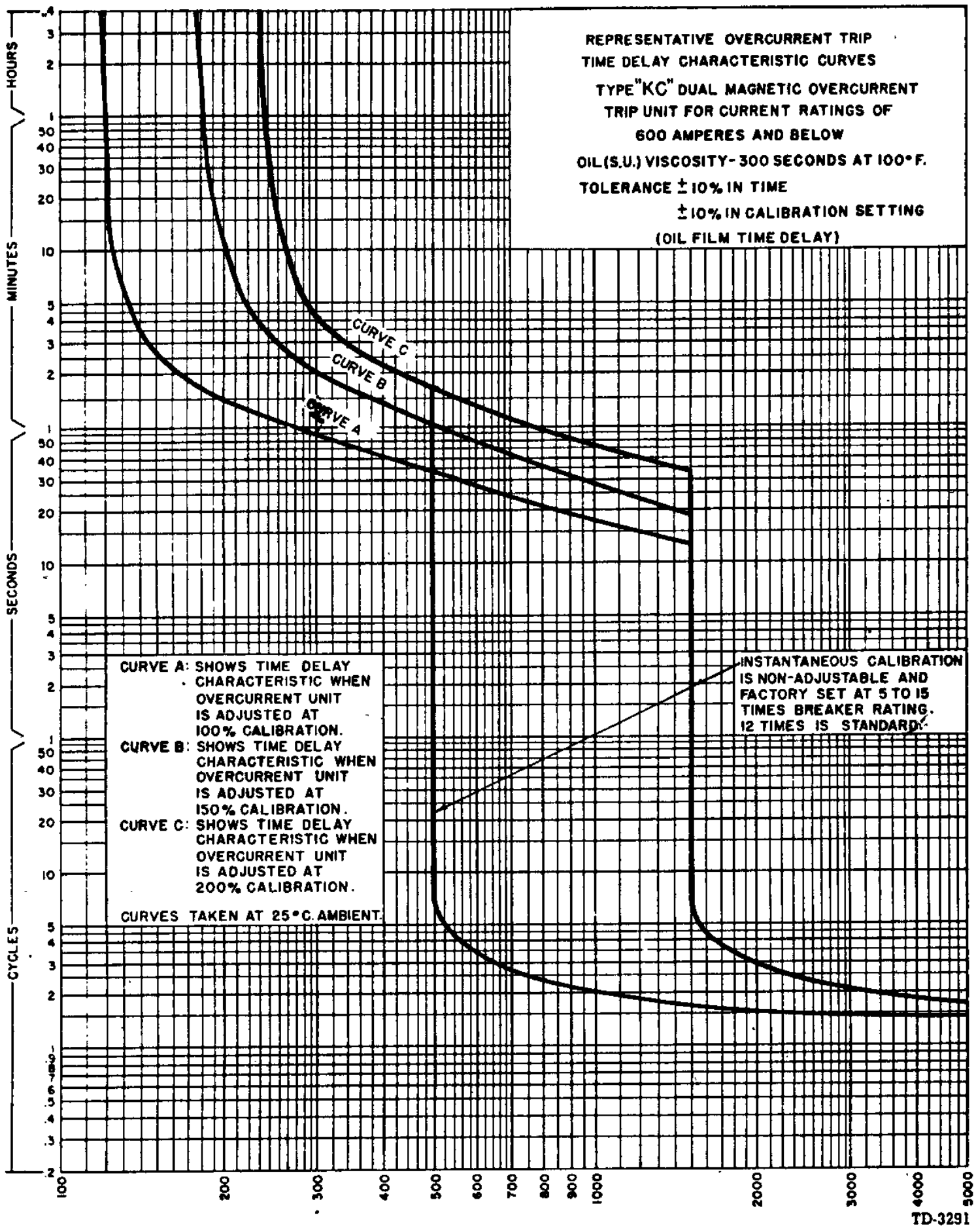

Fig. 8—Typical Time Delay Characteristic Curves For Type KC Circuit Breakers

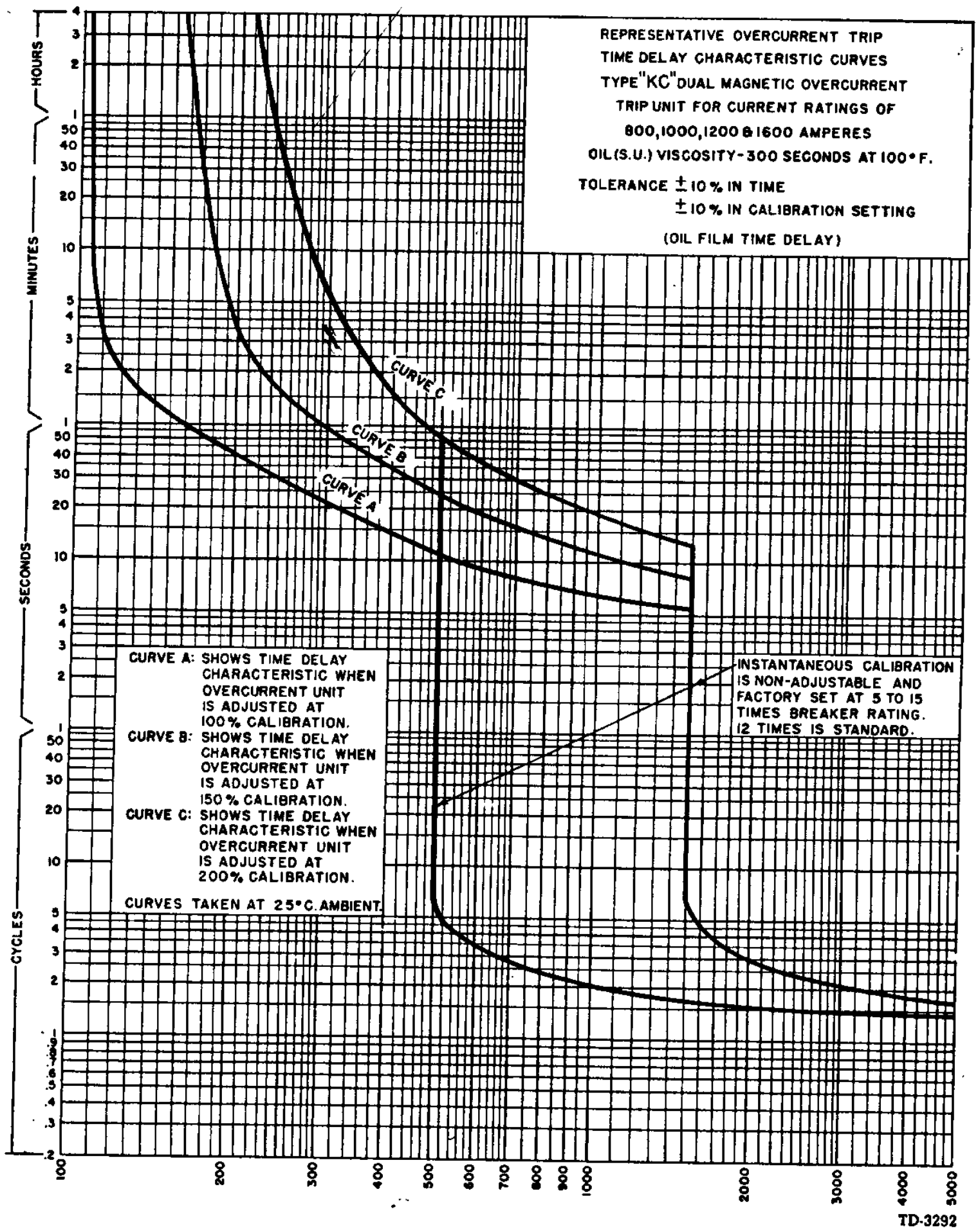

Fig. 9—Typical Time Delay Characteristic Curves For Type KC Circuit Breakers

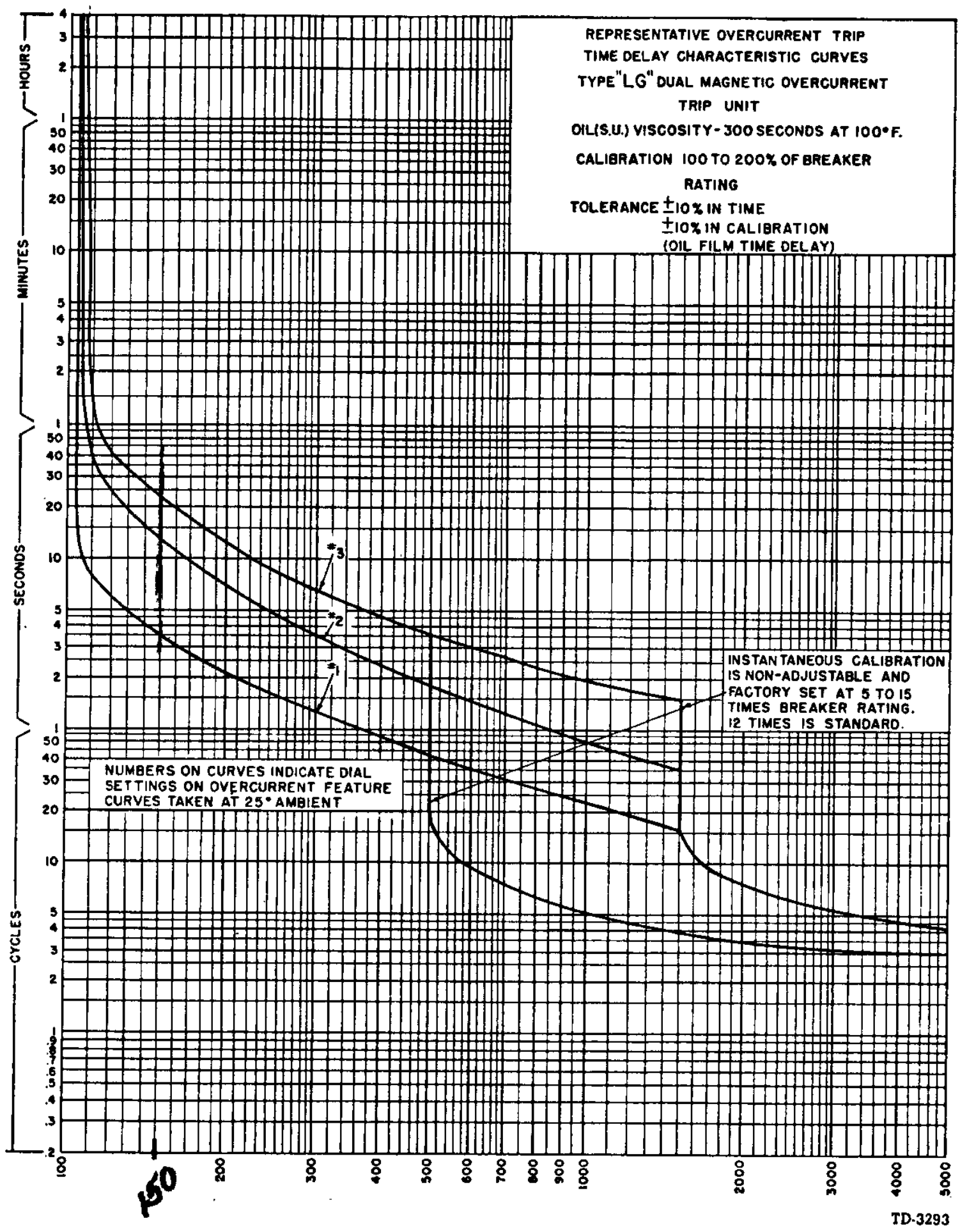

Fig. 10—Typical Time Delay Characteristic Curves For Type LG Circuit Breakers

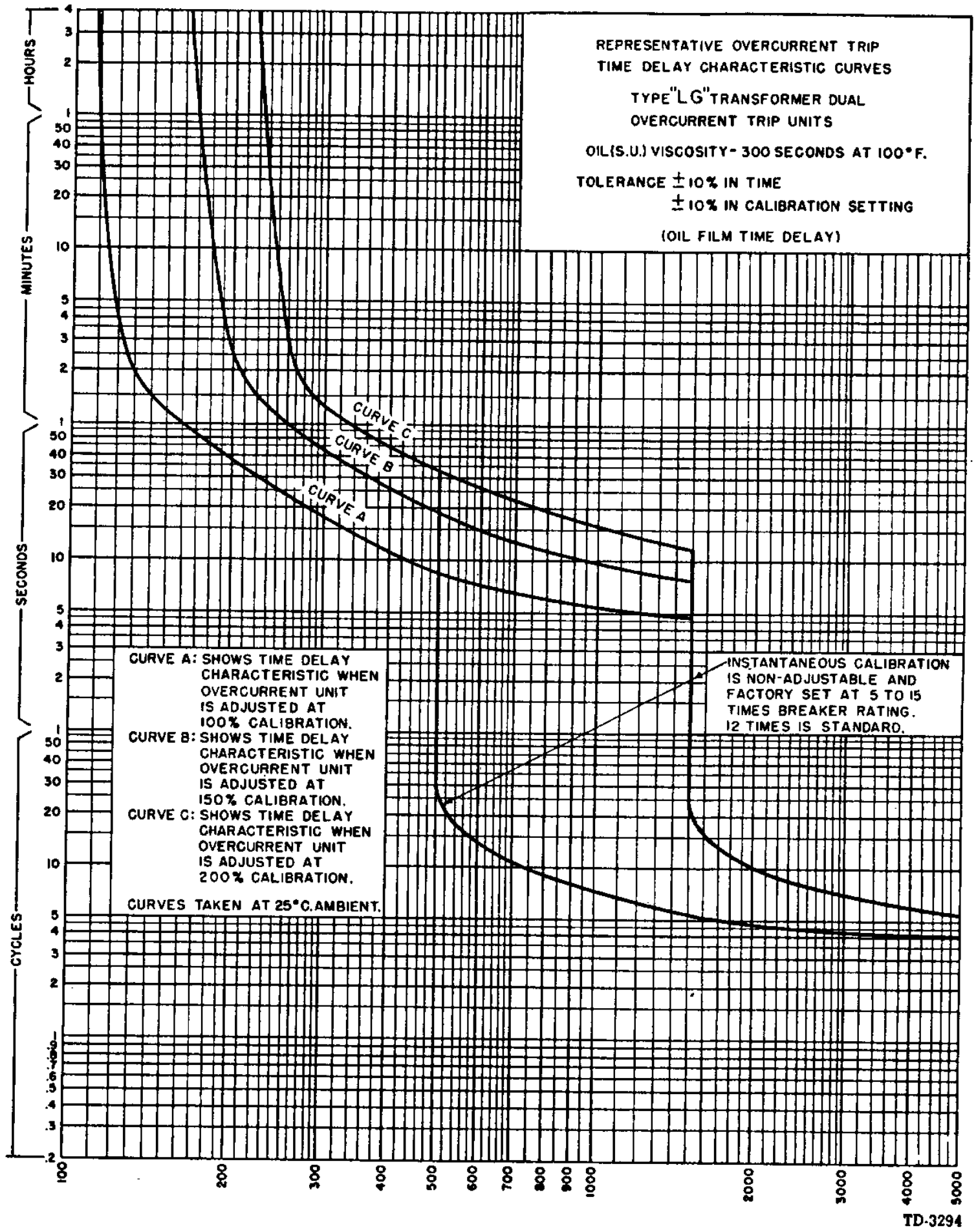

Fig. 11—Typical Time Delay Characteristic Curves For Type LG Circuit Breakers With Dual Overcurrent Trip Devices