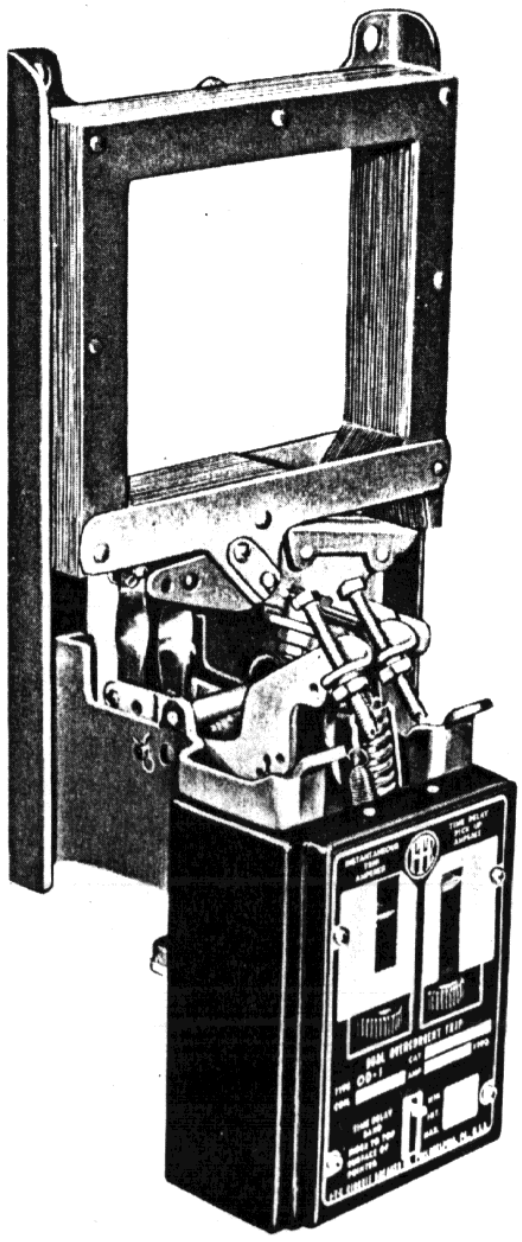
IB-5625

LOW VOLTAGE SWITCHGEAR

INSTRUCTIONS

OVERCURRENT TRIP DEVICES TYPE OD-1 AND TYPE OD-2

FOR TYPE KD AND KE CIRCUIT BREAKERS



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

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NEW

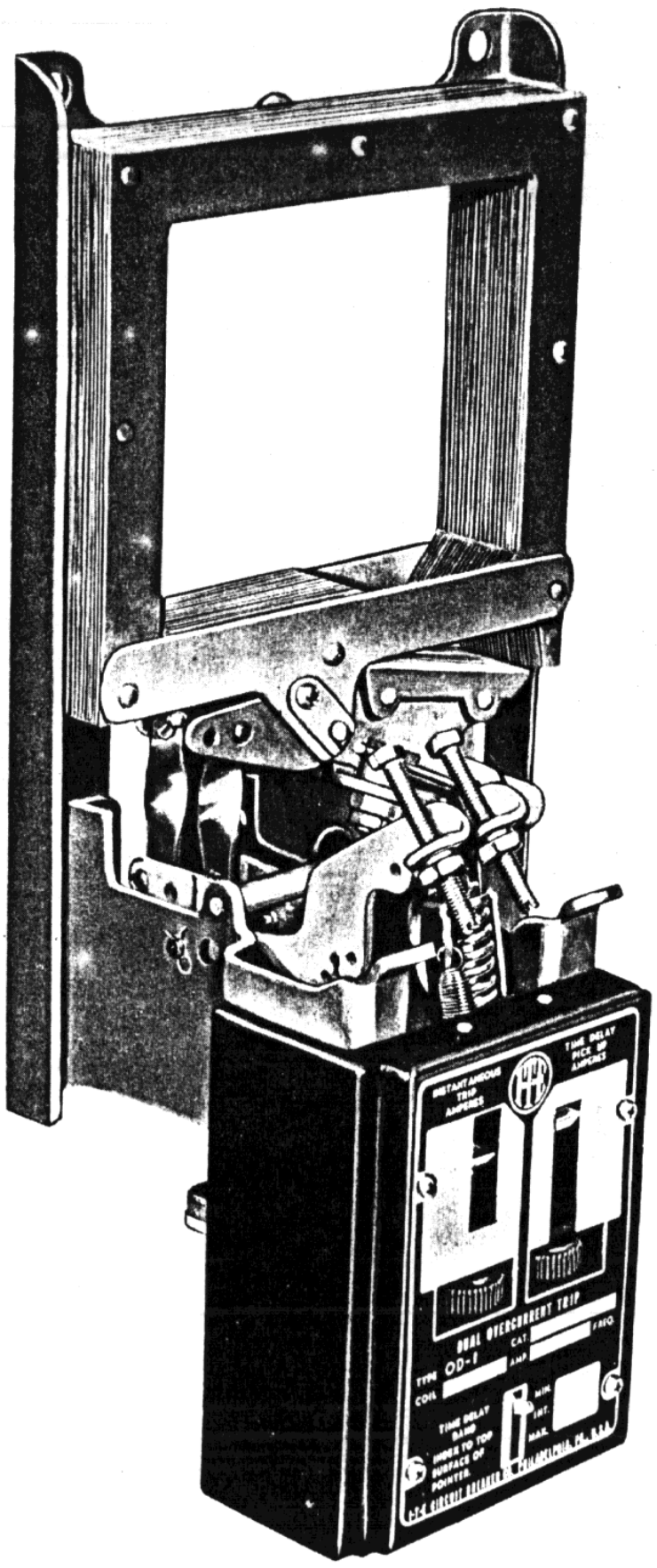


Photo 26513-R

Fig. 1—Type OD-1 Dual Overcurrent Trip Device, For One Pole

OVERCURRENT TRIP DEVICES TYPE OD-1 AND TYPE OD-2 FOR TYPE KD AND KE CIRCUIT BREAKERS

INTRODUCTION

The Type OD-1 dual overcurrent trip device and Type OD-2 dual selective overcurrent trip device each consist of two of the following basic elements in different combinations.

1. A long-time delay trip element using a fluid-displacement dashpot for time delays measurable in seconds, minutes, and hours.
2. A short-time delay trip element using a mechanical timer for time delays measurable in cycles.
3. An instantaneous trip element which operates with no intentional time delay.

The Type OD-1 dual overcurrent trip device is comprised of a long-time delay element and an instantaneous element.

The Type OD-2 dual selective overcurrent trip device is comprised of a long-time delay element and a short-time delay element.

APPLICATION

The Type OD-1 and Type OD-2 overcurrent trip devices are applicable to a-c and d-c circuit breakers. They may be furnished on Type KD circuit breakers having a continuous-current rating up to 3000 amperes, and on Type KE circuit breakers having a continuous-current rating of 4000 amperes.

ELECTRICAL CHARACTERISTICS

The long-time delay trip element is calibrated at the factory and adjustable in the field to minimum pick-up currents of 1600, 2000, 2500, 3000, 3600, and 4800 amperes for the Type KD circuit breakers; and 3200, 4000, 4800, 5600, and 6400 amperes for Type KE circuit breakers.

The Type OD-1 long-time delay trip element is calibrated at the factory for the minimum operating band unless otherwise specified in the customer's order.

The Type OD-2 long-time delay trip element is calibrated at the factory for the three NEMA long-time operating bands; minimum, intermediate, and maximum. The long-time delay is adjustable in the field to any one of the three bands as described under section ADJUSTMENTS.

The short-time delay trip element is calibrated at the factory and is adjustable in the field to minimum pick-up currents of 10,000, 20,000, and 30,000 amperes for Type KD circuit breakers; and 20,000, 30,000, and 40,000 amperes for Type KE circuit breakers. The short-time delay is calibrated at the factory for the three NEMA short-time operating bands; minimum, intermediate and maximum. The short-time delay is adjustable in the field to any one of the three bands as described under section ADJUSTMENTS.

The instantaneous trip element is calibrated at the factory and adjustable in the field to minimum pick-up currents of 10,000, 20,000, 30,000, and 40,000 amperes for Type KD circuit breaker; and 20,000, 40,000, and 60,000 amperes for Type KE circuit breakers.

DESCRIPTION AND OPERATION

The Type OD-1 dual overcurrent trip device and Type OD-2 dual selective overcurrent trip device are shown in Fig. 1 and Fig. 2 respectively. The devices are similar and vary only in the constructional and operational differences of the individual elements. The elements, rather than the complete devices, are described in the following sections.

LONG-TIME DELAY TRIP ELEMENT

The long-time delay armature has a fixed air gap and a tensioning spring for current pick-up calibration. The armature is connected through a linkage and crank shaft to a piston which is suspended in a fluid-displacement dashpot. The time delay is obtained by the displacement of the fluid from the bottom of the piston to the top of the piston. The magnitude of the delay is a function of the distance that the piston moves in the restrained portion of the cylinder.

After the armature has completed not more than half its total operating stroke, the piston enters an unrestrained portion of the cylinder. This allows the armature trip screw to strike the circuit breaker tripper bar tripper with impact. This rotates the tripper bar, releases the mechanism latch, and results in the opening of the circuit breaker.

NOTE: CIRCUIT BREAKERS FURNISHED WITH EITHER TYPE OD-1 OR OD-2 OVERCURRENT TRIP DEVICES SHOULD HAVE THE LONG-TIME DELAY ARMATURE ON EACH POLE OPERATED MANUALLY A FEW TIMES UNTIL THE ARMATURE IS RESTRAINED DURING THE CLOSING STROKE. THIS IS DONE TO MAKE SURE THAT ALL OF THE FLUID IS IN THE LOWER SIDE OF THE TIME-DELAY DASHPOT.

A highly responsive check valve allows the armature to reset rapidly in less than one second, after a full or partial tripping stroke. Therefore, in any successive tripping attempts, both the current and time delay are in accordance with the calibrated values.

On alternating current applications, a resonant silencer is added to the armature assembly to reduce the vibrations which cause noise and, in

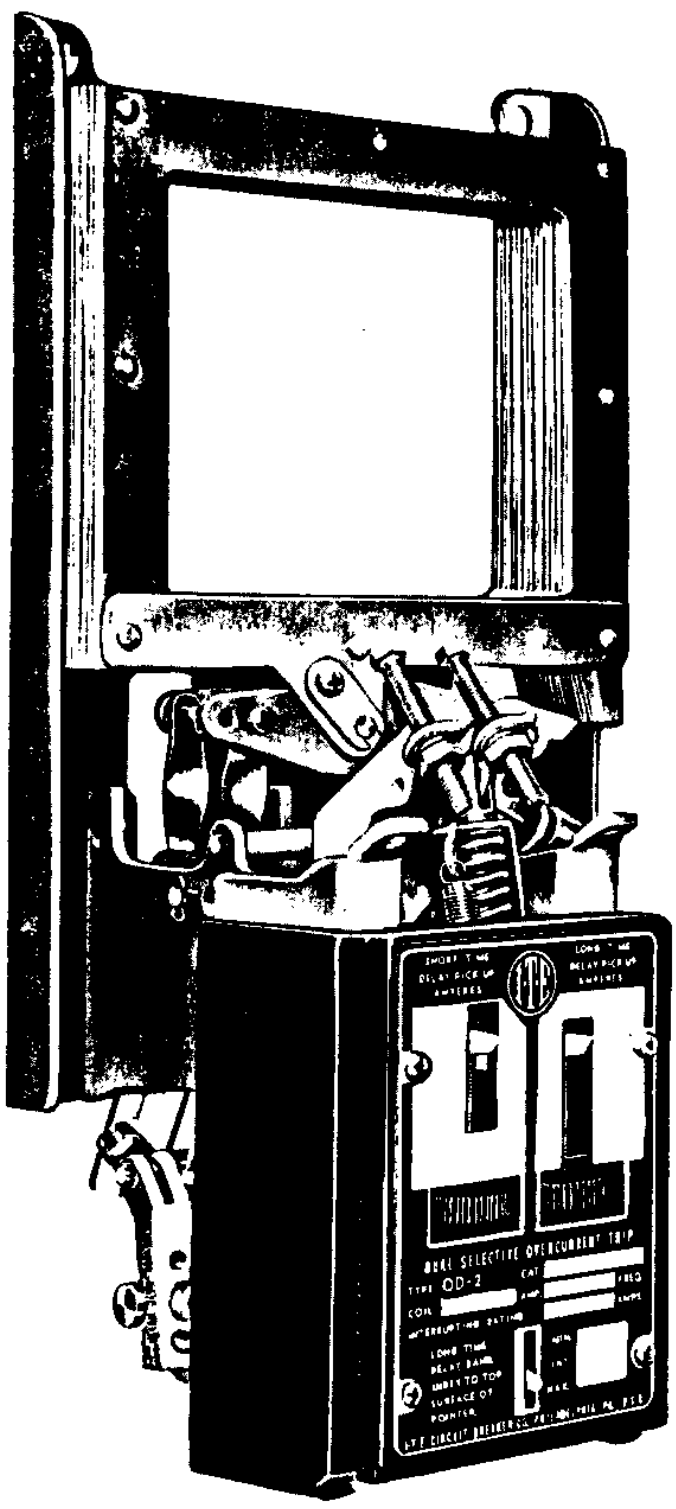


Photo 26612-R

Fig. 2—Type OD-2 Dual Selective Overcurrent Trip Device, For One Pole

time, undue wear on the bearings and stops. The resonant silencer minimizes the vibrations by absorbing the slightest resonant pulsations of the armature.

SHORT-TIME DELAY TRIP ELEMENT

The short-time delay armature has a fixed air gap and a tensioning spring for current pick-up calibration. The armature is direct acting against the lever arm of a mechanical timer. The torque supplied by the lever arm actuates a toothed wheel which ultimately actuates an oscillating member. Timing is obtained from the inertia of this oscillating member while the magnitude of the delay is a function of the torque applied by the lever arm. The amount of torque supplied depends upon which of the three holes are used when bolting the lever arm to the shaft of the mechanical timer. At the end of the time-delay period, using not more than the first half of the armature stroke, the restraint is removed automatically. This allows the armature to move freely so that its trip screw strikes the circuit breaker tripper bar tripper with impact. This rotates the tripper bar, releases the mechanism latch, and results in the opening of the circuit breaker.

After a full or partial tripping stroke, the armature is free to return to its open position and is retarded only by a light drag spring which causes the timer to reset more slowly. Therefore, the full pick-up current is required to start armature motion for successive tripping attempts.

On alternating current applications, a resonant silencer is added to the armature assembly to reduce the vibrations which cause noise and, in time, undue wear on the bearings and stops. This resonant silencer minimizes the vibrations by absorbing the slightest resonant pulsations of the armature.

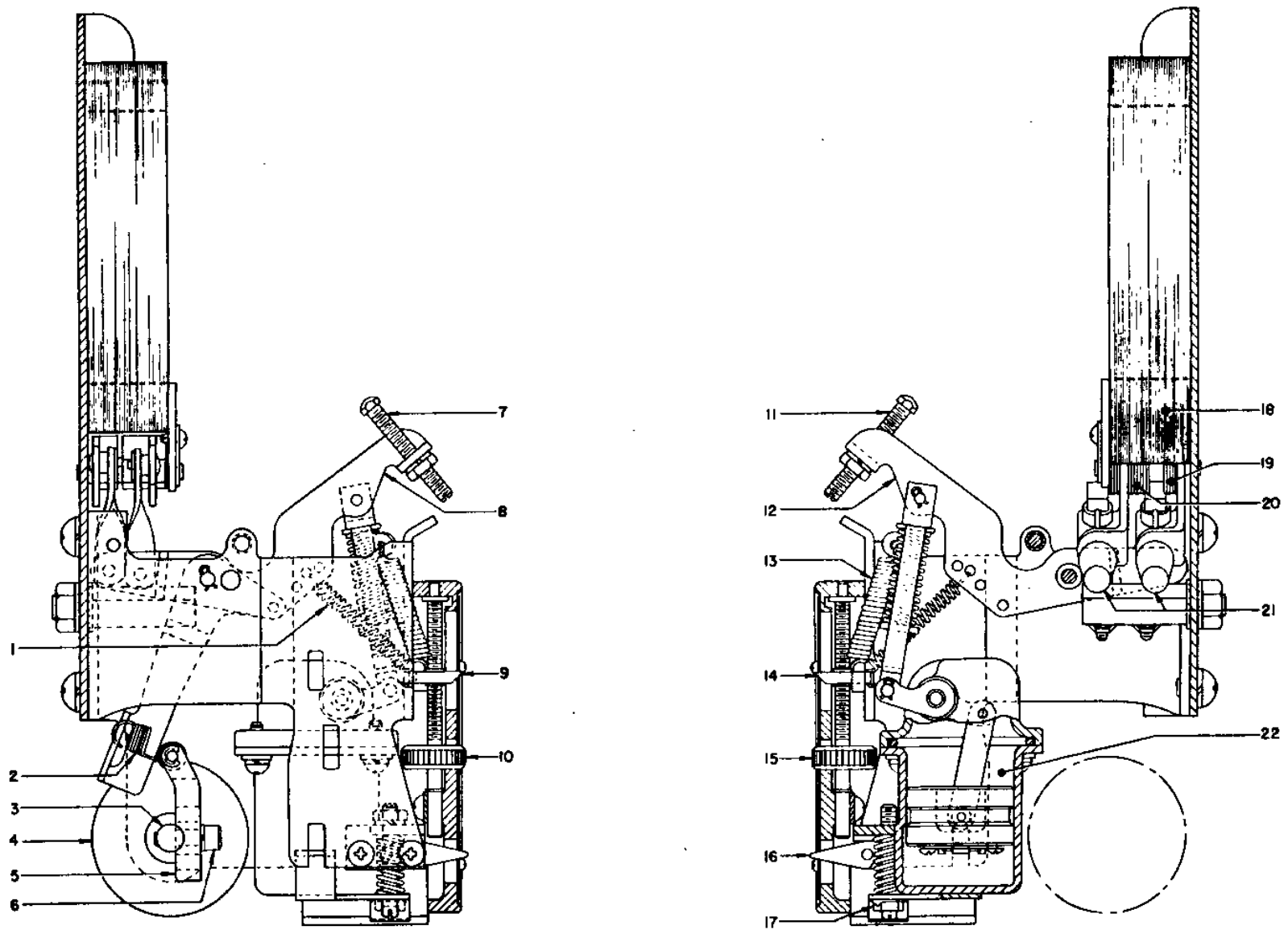
INSTANTANEOUS TRIP ELEMENT

The instantaneous trip element is similar to the short-time delay element except that the mechanical timer is omitted and that the corresponding armature is calibrated to trip instantaneously at the desired current value.

When two of the above basic elements are assembled to make one of the complete devices described under INTRODUCTION, their individual armatures pivot on a common pin. The current flowing through a series coil surrounding the upper leg of the magnet supplies the force necessary to operate the device. The armature of either element is attracted toward this electromagnet when the current reaches, or exceeds, a pre-determined value. Which armature actually moves depends upon the current values and the particular time-delay characteristics of the elements involved. The circuit breaker will trip when either of the armature trip screws strike the tripper bar tripper.

MAINTENANCE

It is recommended that no attempt be made to repair or replace individual parts of the elements due to the sensitivity and accuracy expected of the overcurrent trip devices. Instead, the Type OD-1 or OD-2 overcurrent trip device should be replaced as a complete device.



1 Calibration Spring (Short Time)
2 Spring
3 Shaft
4 Mechanical Timer
5 Lever Arm
6 Screw
7 Trip Screw (Short Time)
8 Actuator (Short Time)
9 Calibration Indicator (Short Time)
10 Pick-up Adjustment (Short Time)
11 Trip Screw (Long Time)
12 Actuator (Long Time)
13 Calibration Spring (Long Time)
14 Calibration Indicator (Long Time)
15 Pick-up Adjustment (Long Time)
16 Band Indicator (Long Time)
17 Adjustment Screw (Long Time)
18 Magnet Assembly
19 Armature Assembly (Short Time)
20 Armature Assembly (Long Time)
21 Resonant Silencer
22 Dashpot Assembly (Long Time)

Dwg. S-14361

Fig. 3—Overcurrent Trip Device—Displacement Type Typical of Type OD-1 or Type OD-2

If repairs or adjustments other than those described under section ADJUSTMENTS are necessary, contact the nearest Sales Office of the I-T-E Circuit Breaker Company for specific instructions.

ADJUSTMENTS

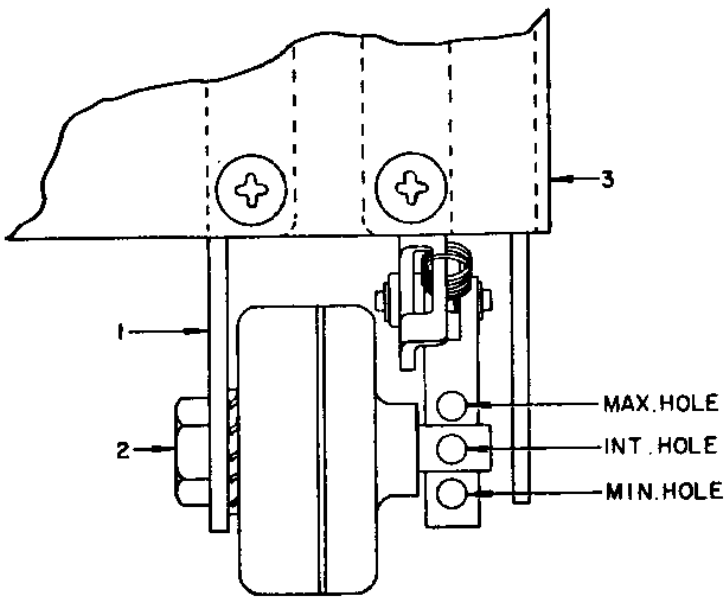
The Type OD-1 and OD-2 overcurrent trip devices are calibrated and adjusted before leaving the factory.

CAUTION: DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE INSPECTING, ADJUSTING, OR REPLACING THE OVERCURRENT TRIP DEVICES.

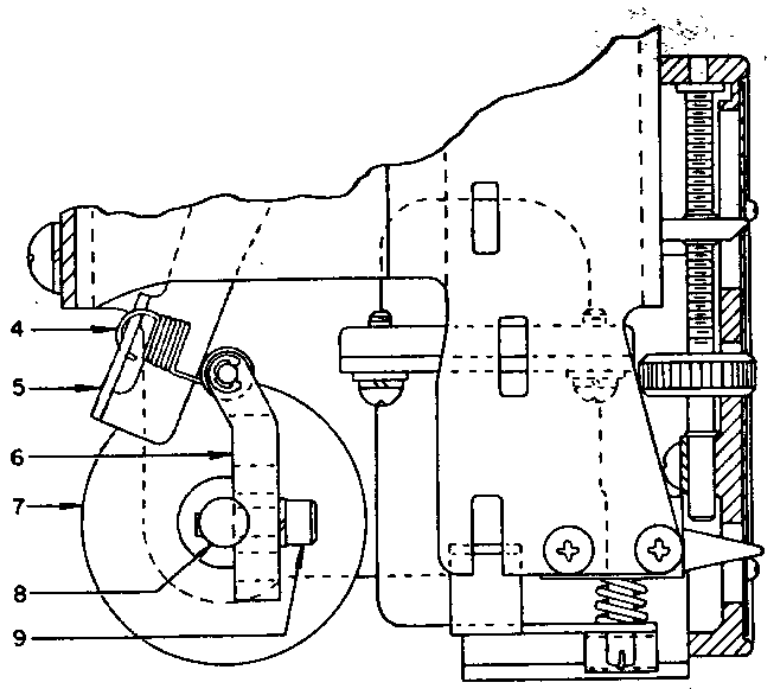
MINIMUM PICK-UP CURRENT

The minimum current at which the instantaneous, short-time delay, or long-time delay armature will pickup can be adjusted by turning the appropriate calibration knob on the front of the device. The setting of the minimum pick-up current value is indicated by the position of the indicator relative to the line indicating the corresponding numerical value.

CAUTION: THE INDICATOR MUST BE SET OPPOSITE THE LINE ENGRAVED ON THE CALIBRATION PLATE CORRESPONDING TO THE PICK-UP VALUE REQUIRED. THE LINES



REAR VIEW



LEFT SIDE VIEW

1 Support Plate
2 Bolt
3 Base (Magnetic Assembly)
4 Spring
5 Actuator (Short Time)
6 Lever Arm
7 Mechanical Timer
8 Shaft
9 Screw

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Fig. 4—Type OD-2 Overcurrent Trip Device
Partial View Showing Short-Time Delay Adjustment

MAY OR MAY NOT LINE-UP WITH THE NUMERALS ON THE PLATE.

LONG-TIME DELAY

The long-time delay is set and locked at the factory for the minimum time-delay band unless otherwise specified in the customer's order.

Type OD-1 Devices

The long-time delay is not adjustable in the field.

Type OD-2 Devices

The long-time delay is adjustable in the field from one time-delay band to one of the other time-delay bands by flattening the corner of the lock-plate and turning the long-time delay adjusting screw (Fig. 3). Turn the screw in the direction required to line up the *upper edge* of the long-time delay indicator (Fig. 3) with the desired time-delay band mark. Be sure and bend the corners of the locking plate around the head of the adjusting screw when the setting is correct.

The characteristic curves for the three long-time delay bands are listed in Table I and illustrated at the back of the bulletin.

TABLE I

Circuit Breaker Type	Time-Delay Band	Characteristic Curves	
		OD-1	OD-2
KD	Minimum	TD-5082-A	TD-5083-A
	Intermediate	TD-5082-B	TD-5083-B
	Maximum	TD-5082-C	TD-5083-C
KE	Minimum	TD-5073-A	TD-5074-A
	Intermediate	TD-5073-B	TD-5074-B
	Maximum	TD-5073-C	TD-5074-C

SHORT-TIME DELAY

The short-time delay band is factory set to the time band setting requested in the customer's order.

The short-time delay is adjustable in the field to any one of the three short-time delay bands; minimum, intermediate, and maximum.

To change from one short-time delay band to one of the other short-time delay bands, proceed as follows:

Refer to Fig. 4 and,

1. Remove socket head screw (9) fastening lever arm (6) to shaft (8).

2. Select the proper hole in lever arm (6) corresponding to the short-time delay band setting required. Starting with the lower hole, the holes in the lever arm are marked MIN, INT, and MAX. Refer to the short-time delay band characteristic curves represented by TD-5083-A, B, C and TD-5074-A, B, C for the Type KD and KE circuit breakers respectively.

3. Replace lever arm (6) on shaft (8) making sure the socket head screw (9) passes through the hole corresponding to the time-delay band setting required.

4. Inspect for proper operation by manually pushing on the short-time armature and examining the timing stroke and reset stroke.

NOTE: DO NOT, UNDER ANY CIRCUMSTANCES, LOOSEN BOLT (2) FASTENING THE MECHANICAL TIMER (7) TO ITS SUPPORT PLATE (1).

INSTANTANEOUS

The instantaneous trip is factory set as specified in the customer's request. The pick-up current values may be adjusted as described under section MINIMUM PICK-UP CURRENT.

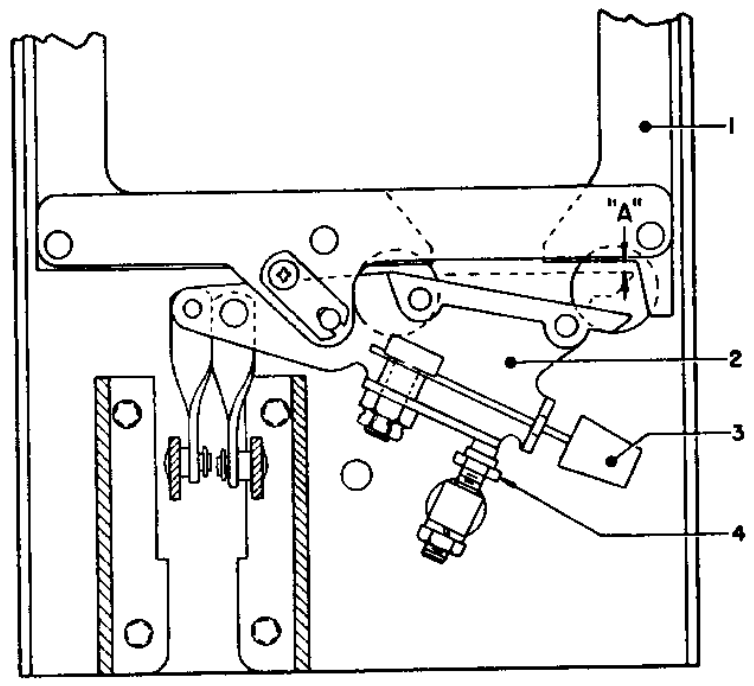
ARMATURE AIR GAP

The armature air gap is adjusted and factory set. It must not be changed.

NOTE: DO NOT, UNDER ANY CIRCUMSTANCES, LOOSEN LOCKNUT ON ADJUSTING SCREW (4, FIG. 5).

ARMATURE TRIPPING TRAVEL

When checking or adjusting the armature tripping travel, insert feeler gauge at point "A" parallel to the magnet face as shown in Fig. 5. The circuit breaker should trip, when the armatures are operated by hand, with a 0.020 inch feeler gauge inserted at "A". It should not trip when a 0.030 inch gauge is inserted.



1 Magnet Assembly
2 Armature Assembly
3 Resonant Silencer
4 Adjusting Screw

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Fig. 5—Magnet and Armature Assembly Showing Trip Travel Adjustment

If adjustments are not as stated above, loosen the locknut and turn the trip adjustment screw in or out as may be required. Tighten the locknut after making any adjustment, and operate the circuit breaker a few times to insure correct adjustment.

RENEWAL PARTS

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

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

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.

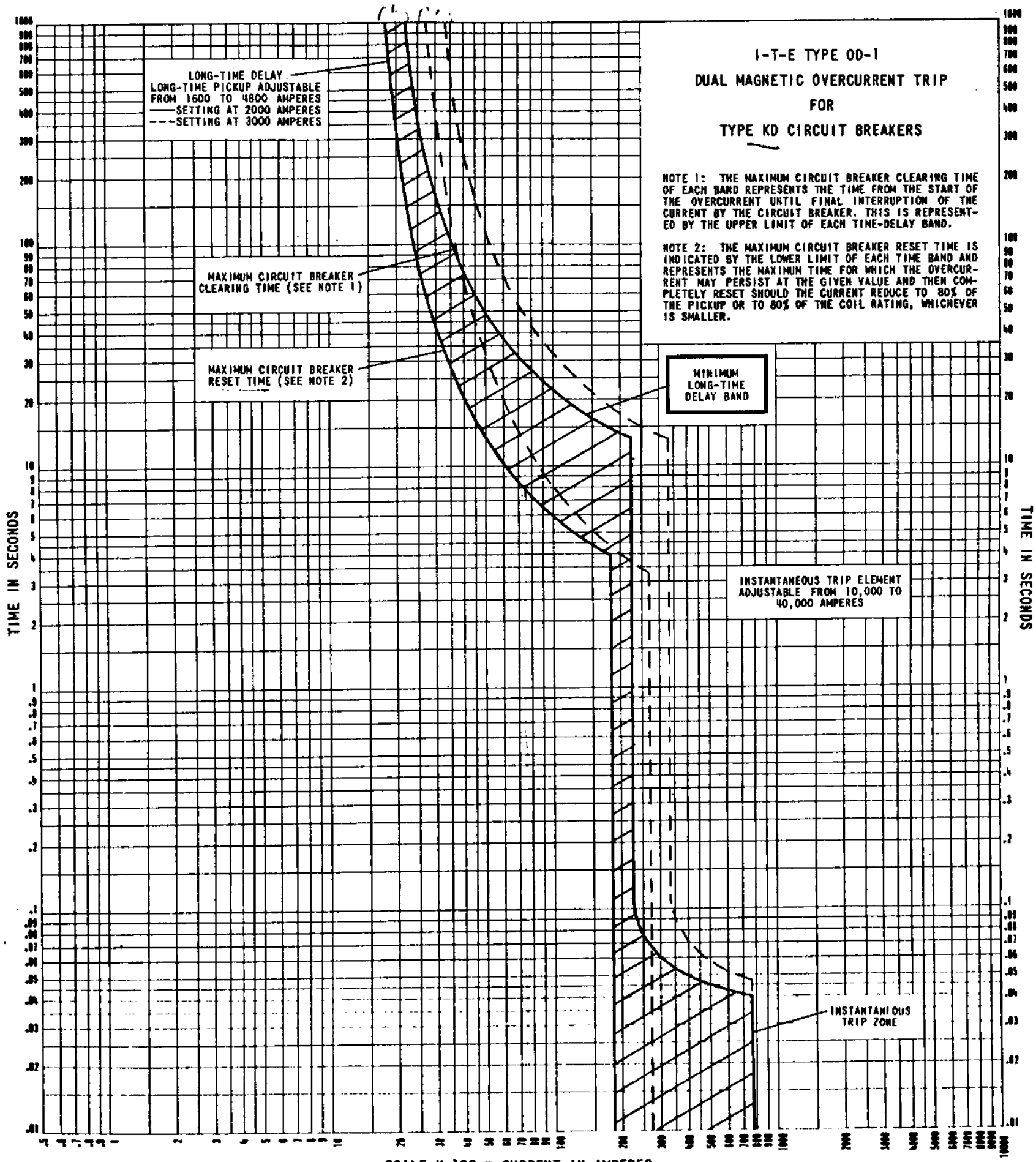


Fig. 6—TD-5082-A

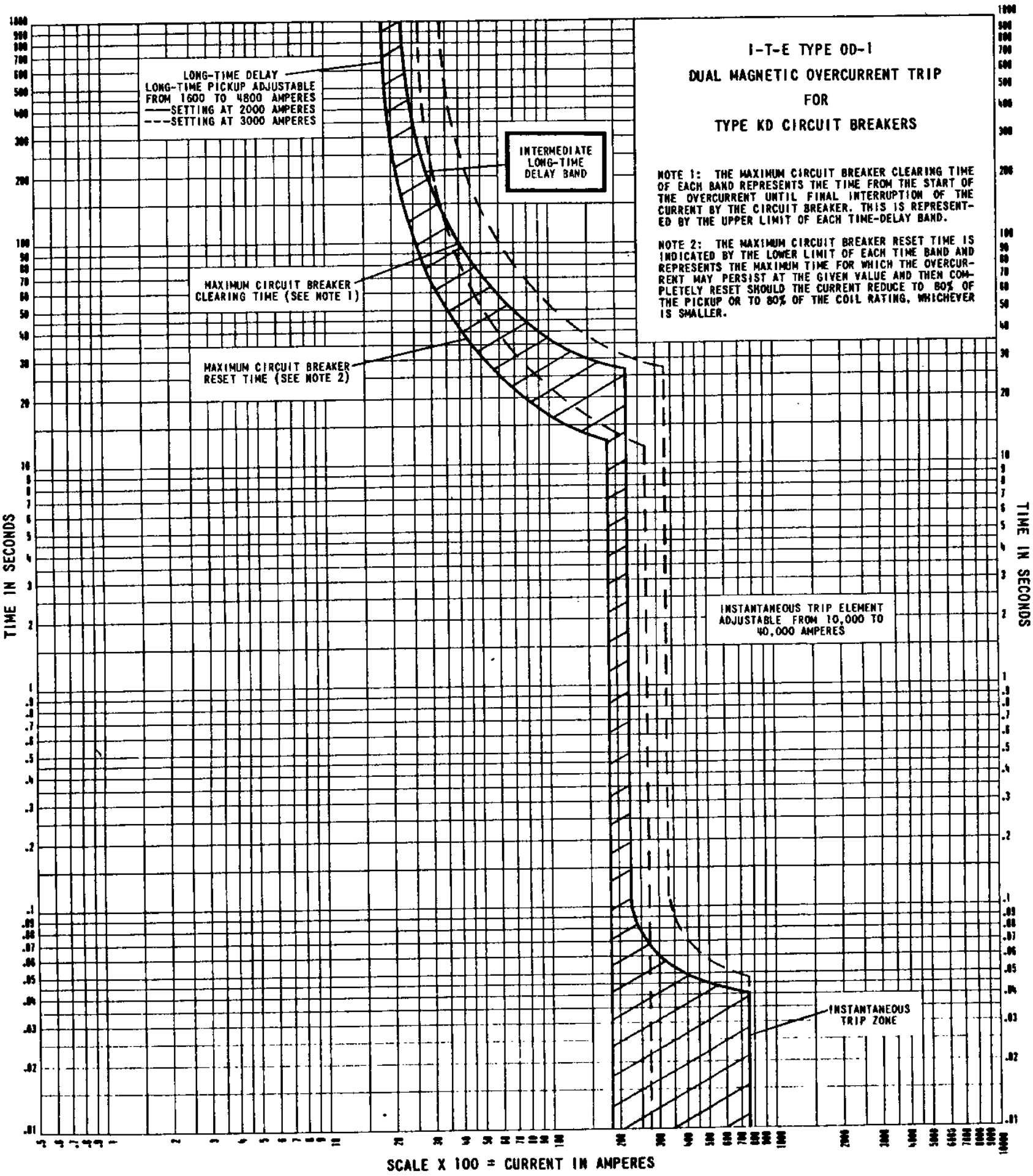


Fig. 7—TD-5082-B

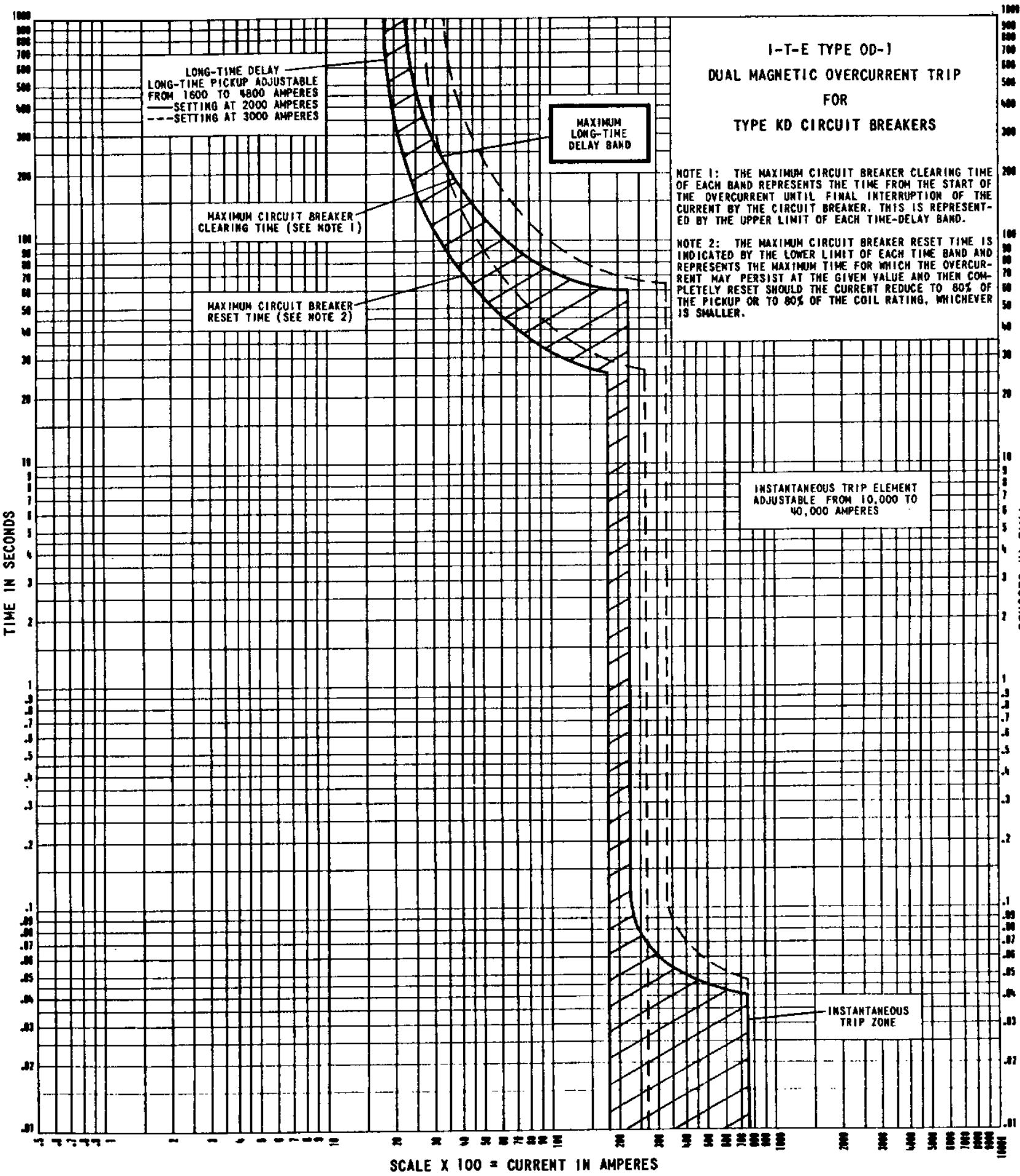
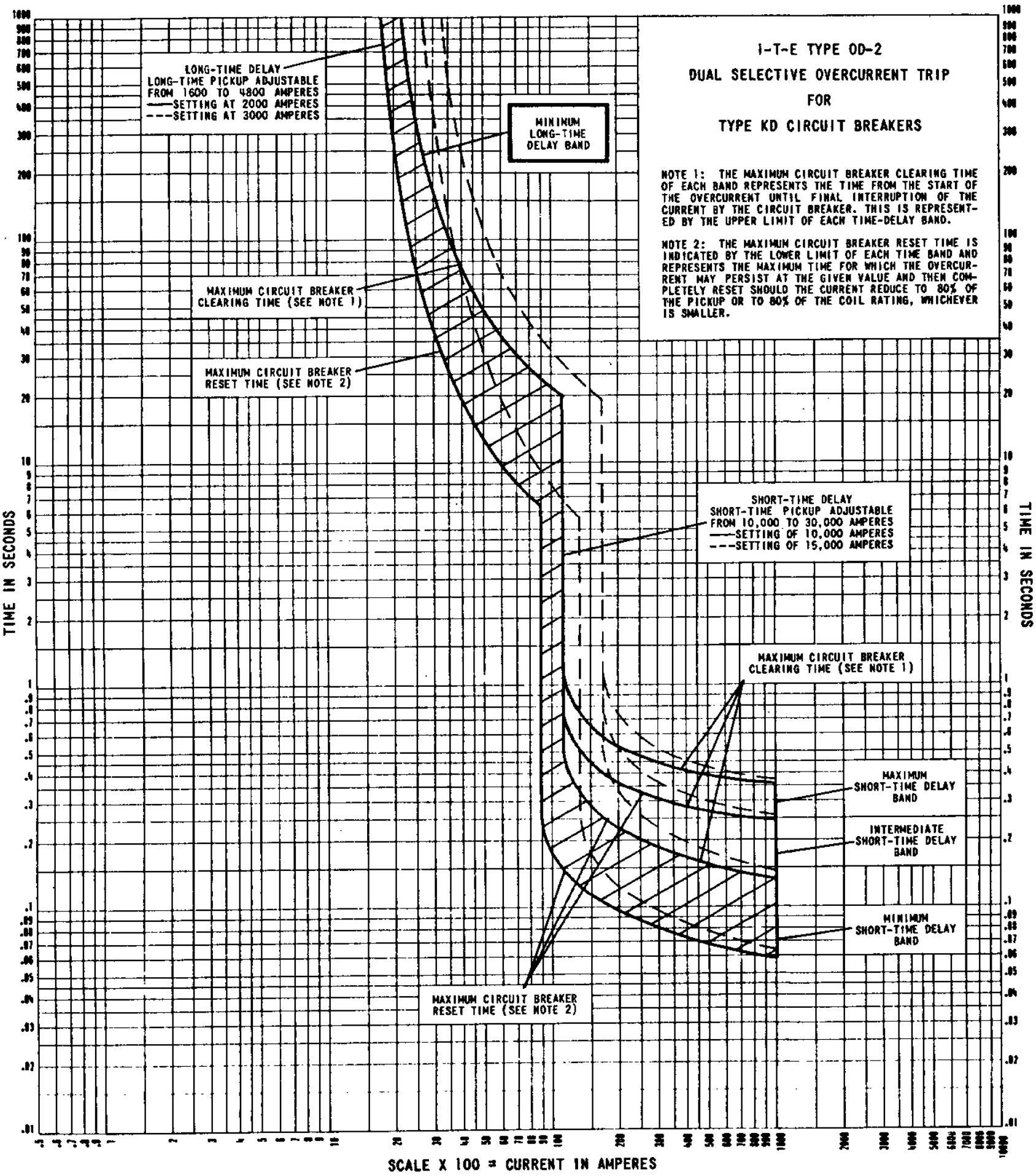


Fig. 8—TD-5082-C



I-T-E TYPE OD-2
DUAL SELECTIVE OVERCURRENT TRIP
FOR
TYPE KD CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

NOTE 2: THE MAXIMUM CIRCUIT BREAKER RESET TIME IS INDICATED BY THE LOWER LIMIT OF EACH TIME BAND AND REPRESENTS THE MAXIMUM TIME FOR WHICH THE OVERCURRENT MAY PERSIST AT THE GIVEN VALUE AND THEN COMPLETELY RESET SHOULD THE CURRENT REDUCE TO 80% OF THE PICKUP OR TO 80% OF THE COIL RATING, WHICHEVER IS SMALLER.

Fig. 9—TD-5083-A

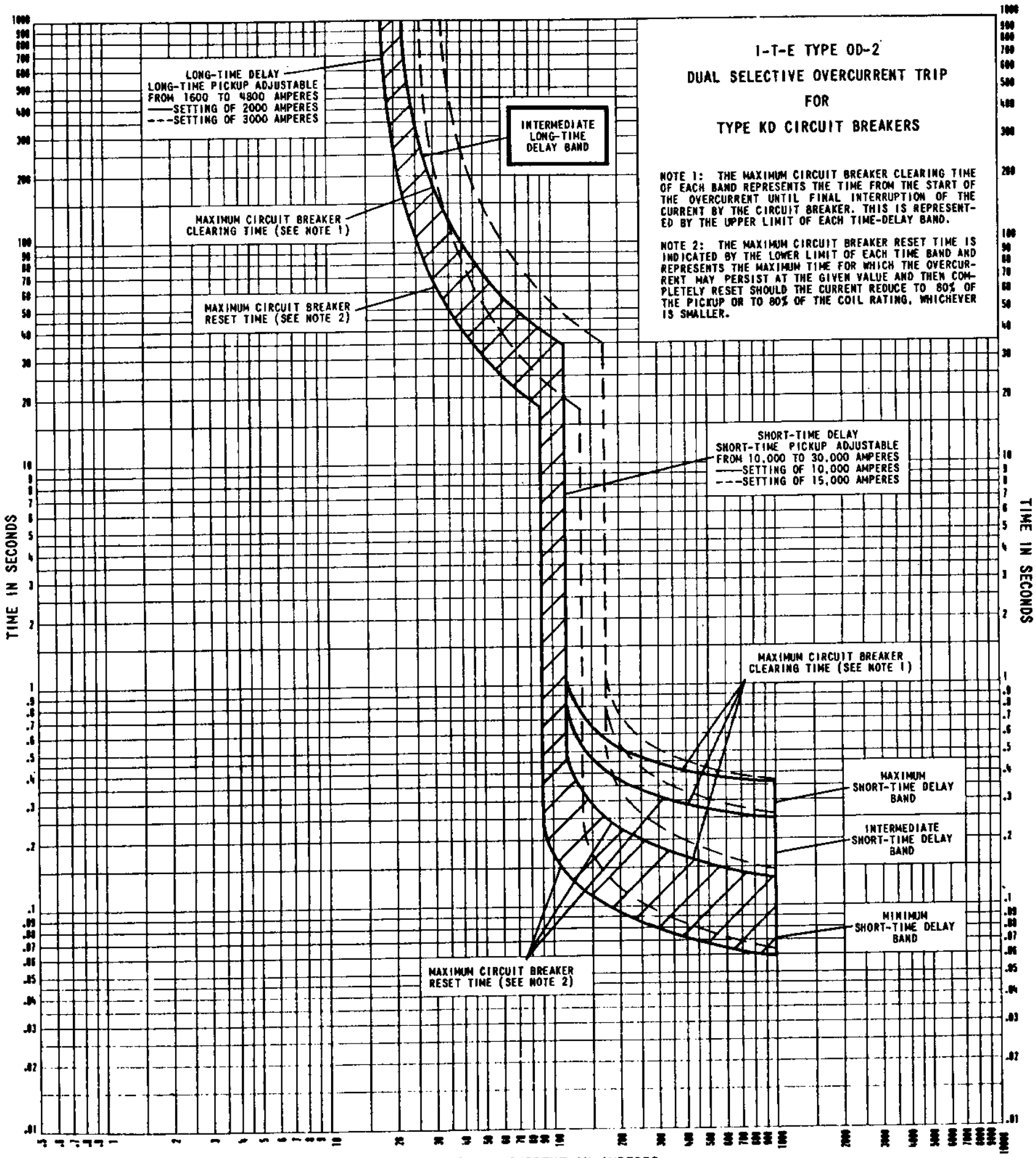


Fig. 10—TD-5083-B

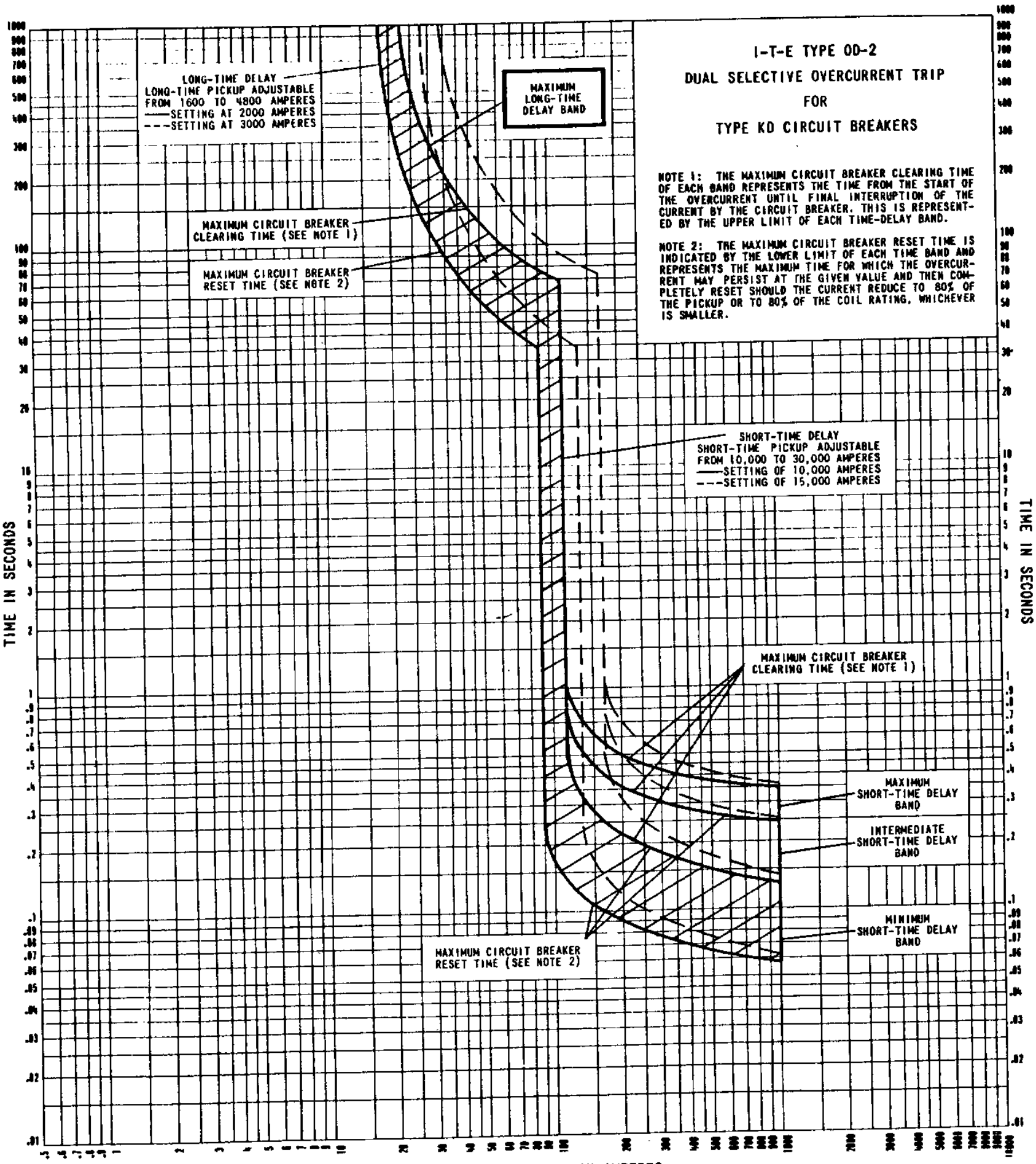


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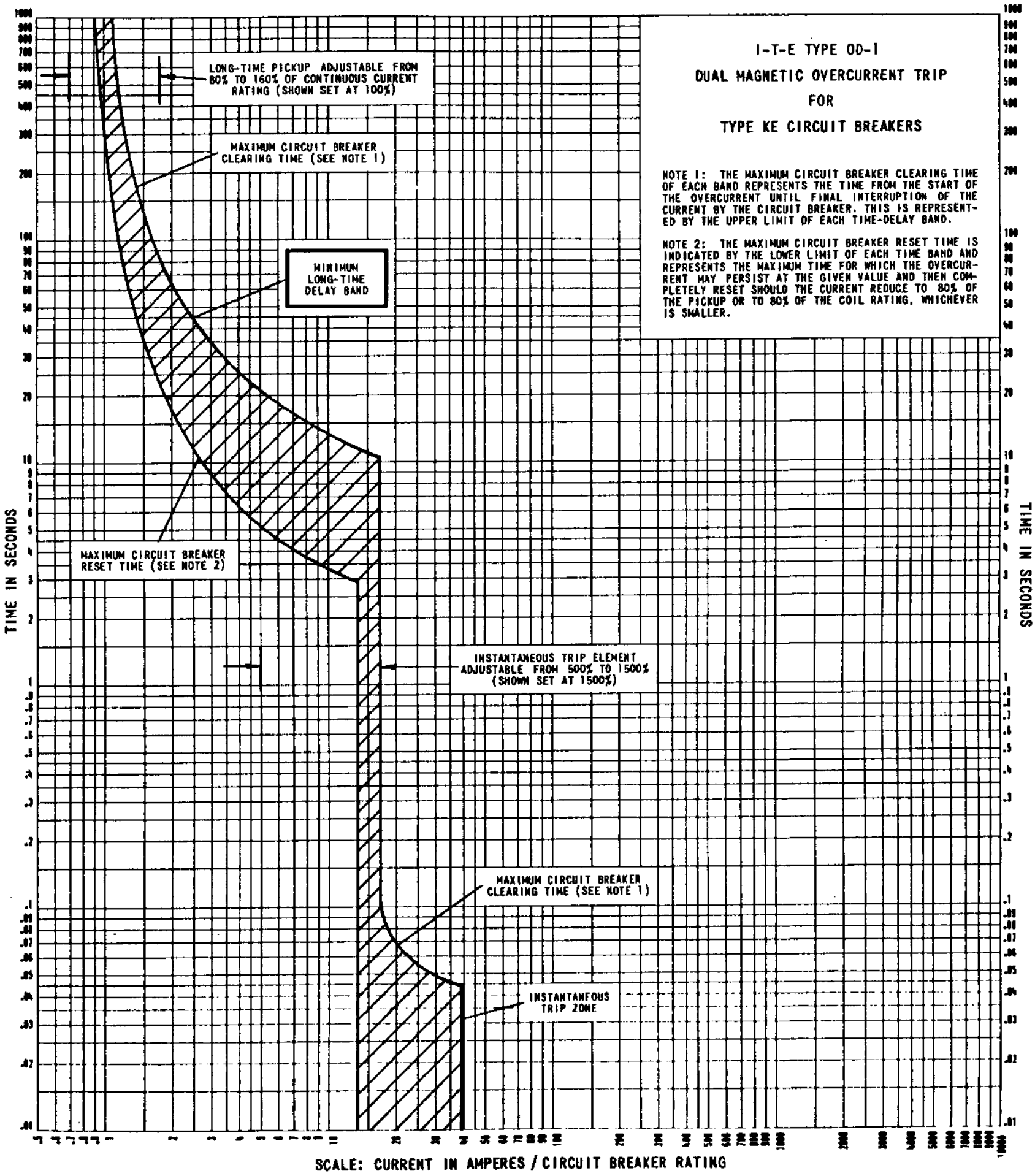
Fig. 11—TD-5083-C



I-T-E TYPE OD-1

DUAL MAGNETIC OVERCURRENT TRIP

FOR

TYPE KE CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

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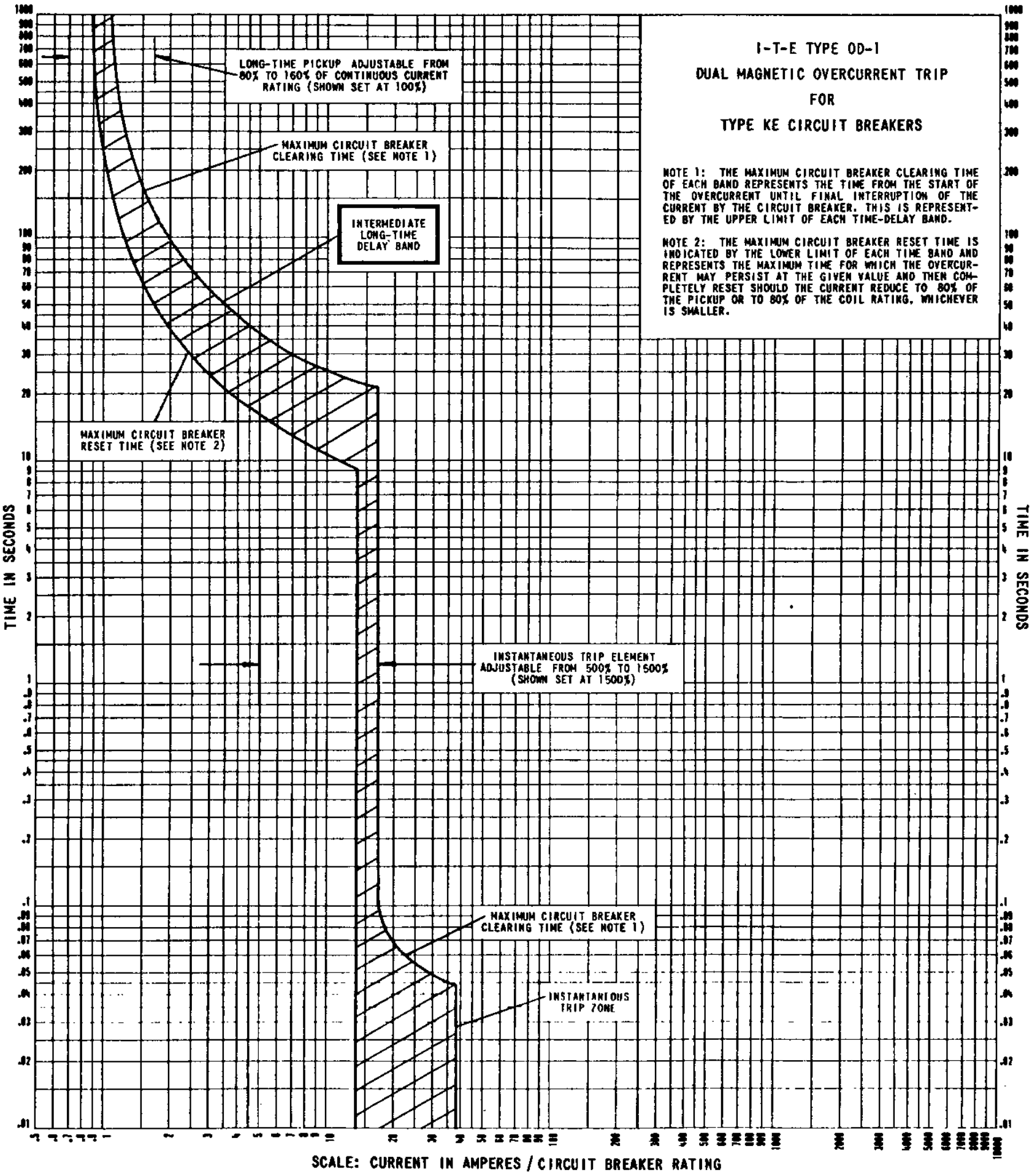
Fig. 12—TD-5073-A



I-T-E TYPE OD-1

DUAL MAGNETIC OVERCURRENT TRIP

FOR

TYPE KE CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

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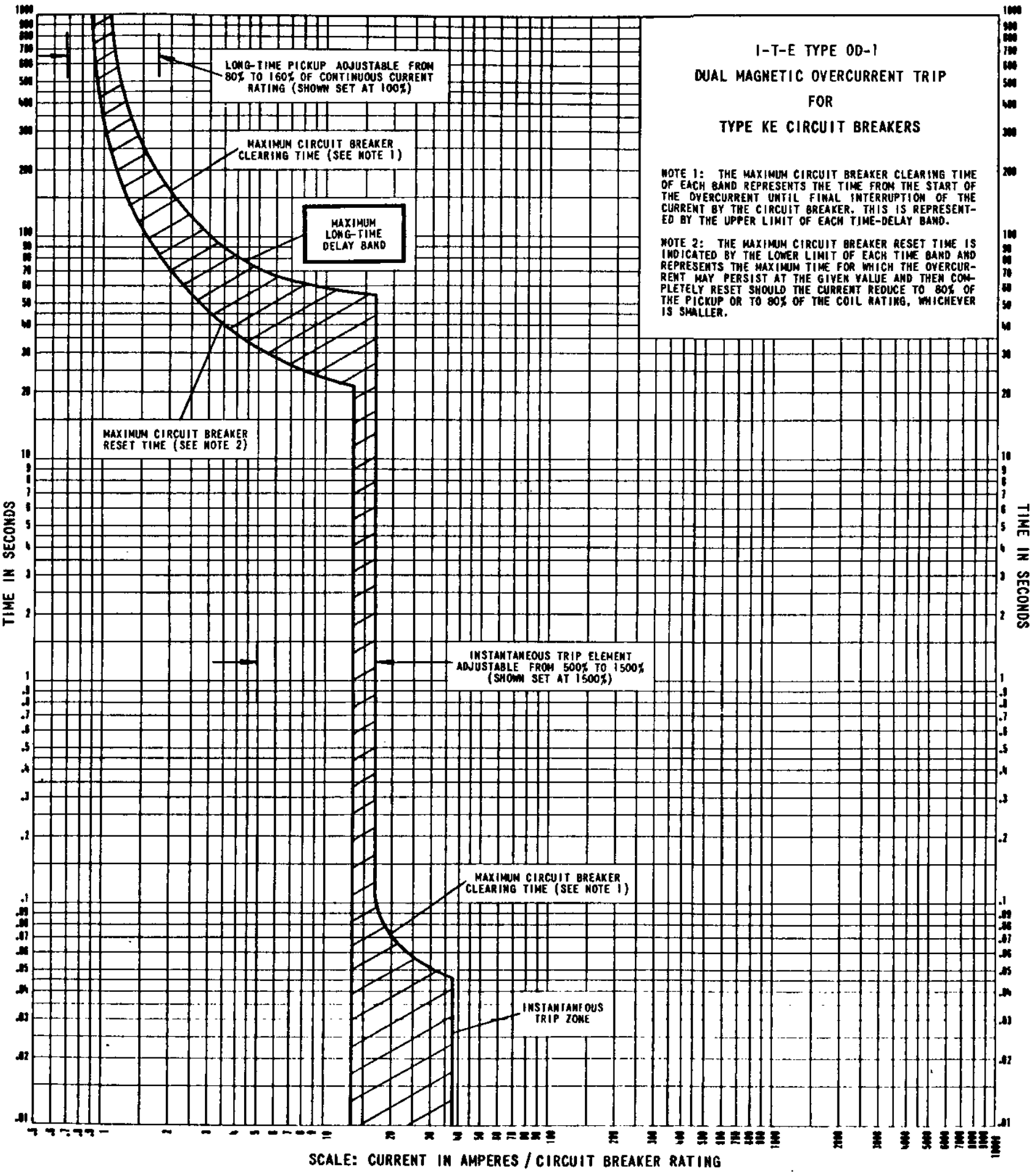
Fig. 13—TD-5073-B



I-T-E TYPE OD-1

DUAL MAGNETIC OVERCURRENT TRIP

FOR

TYPE KE CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

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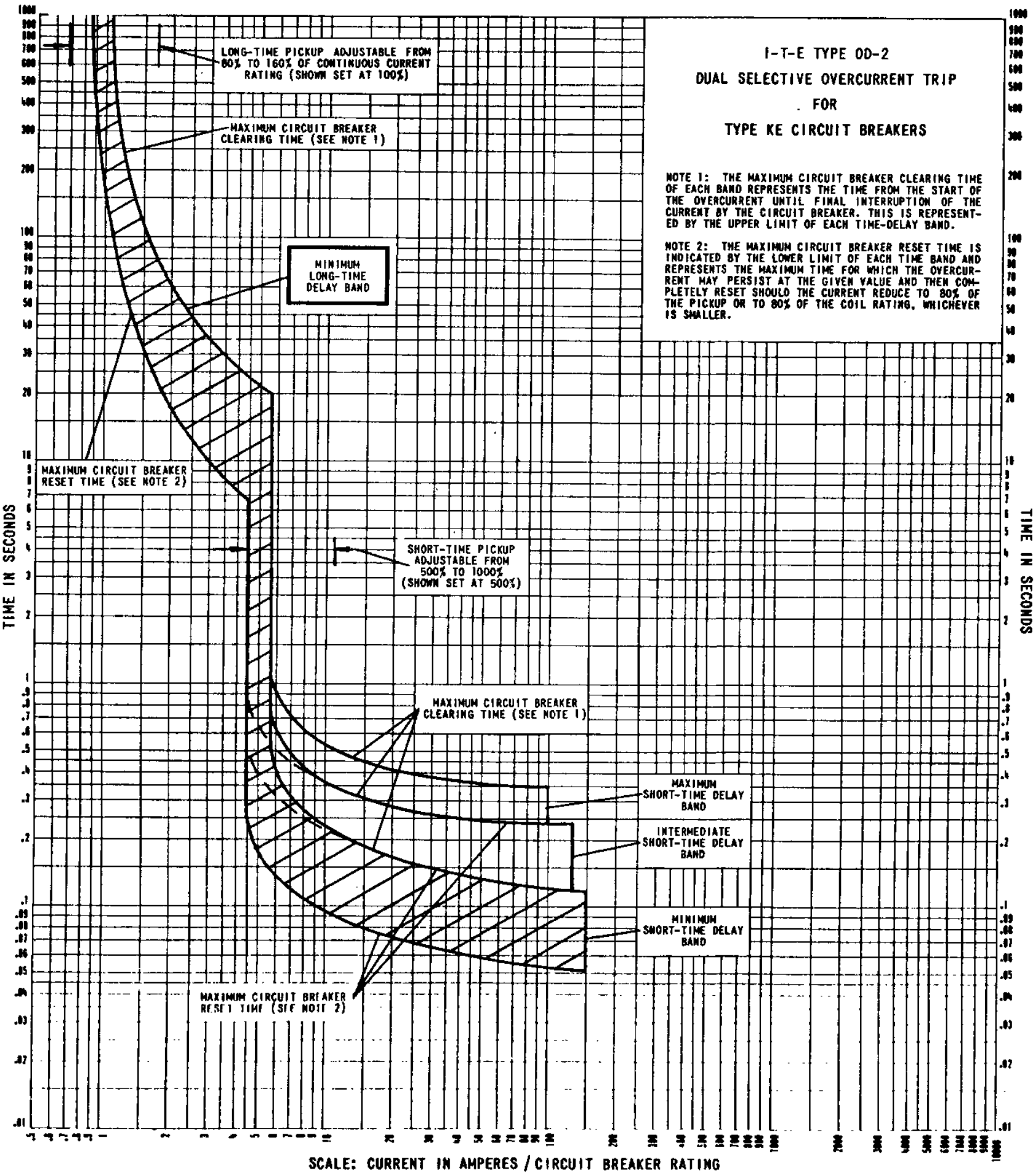
Fig. 14—TD-5073-C

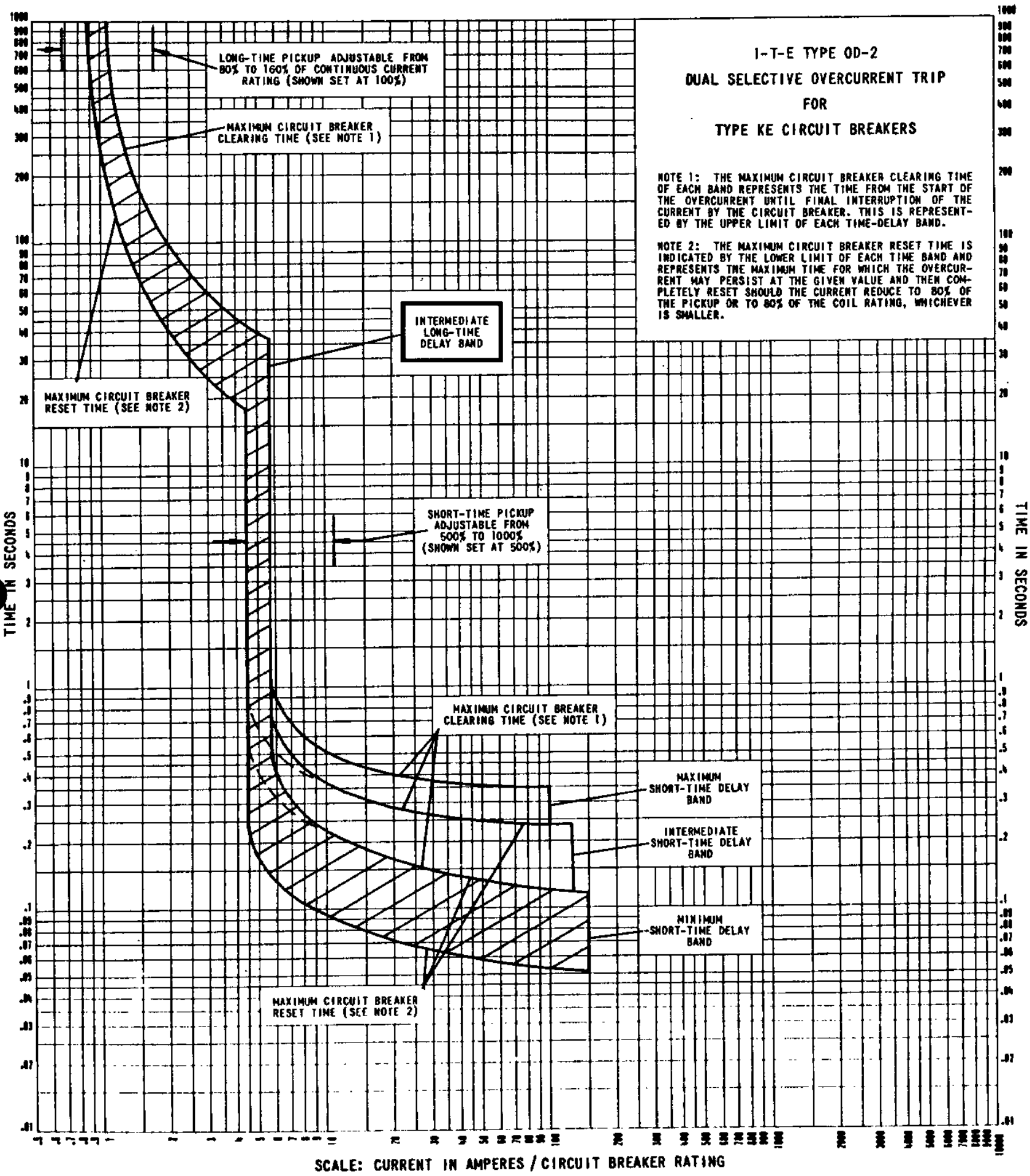


I-T-E TYPE OD-2
DUAL SELECTIVE OVERCURRENT TRIP
FOR
TYPE KE CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

NOTE 2: THE MAXIMUM CIRCUIT BREAKER RESET TIME IS INDICATED BY THE LOWER LIMIT OF EACH TIME BAND AND REPRESENTS THE MAXIMUM TIME FOR WHICH THE OVERCURRENT MAY PERSIST AT THE GIVEN VALUE AND THEN COMPLETELY RESET SHOULD THE CURRENT REDUCE TO 80% OF THE PICKUP OR TO 80% OF THE COIL RATING, WHICHEVER IS SMALLER.

Fig. 15—TD-5074-A

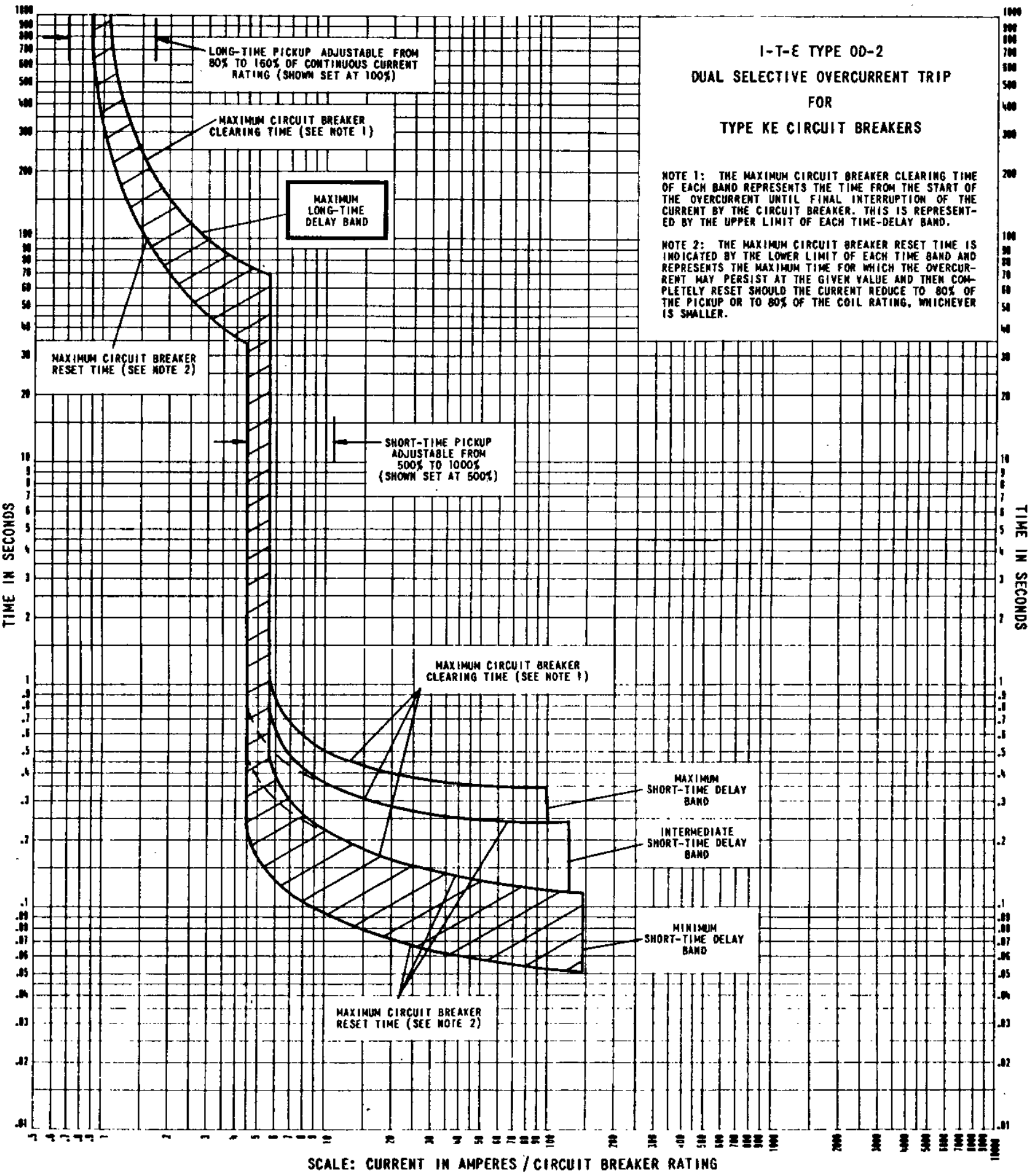


1-T-E TYPE OD-2
DUAL SELECTIVE OVERCURRENT TRIP
FOR
TYPE KE CIRCUIT BREAKERS

NOTE 1: THE MAXIMUM CIRCUIT BREAKER CLEARING TIME OF EACH BAND REPRESENTS THE TIME FROM THE START OF THE OVERCURRENT UNTIL FINAL INTERRUPTION OF THE CURRENT BY THE CIRCUIT BREAKER. THIS IS REPRESENTED BY THE UPPER LIMIT OF EACH TIME-DELAY BAND.

NOTE 2: THE MAXIMUM CIRCUIT BREAKER RESET TIME IS INDICATED BY THE LOWER LIMIT OF EACH TIME BAND AND REPRESENTS THE MAXIMUM TIME FOR WHICH THE OVERCURRENT MAY PERSIST AT THE GIVEN VALUE AND THEN COMPLETELY RESET SHOULD THE CURRENT REDUCE TO 80% OF THE PICKUP OR TO 80% OF THE COIL RATING, WHICHEVER IS SMALLER.

Fig. 16—TD-5074-B



I-T-E TYPE OD-2
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Fig. 17—TD-5074-C