Supplementary Instructions for Type DB Air Circuit Breakers Amptector® Solid-State Trip System

MB 3123-F

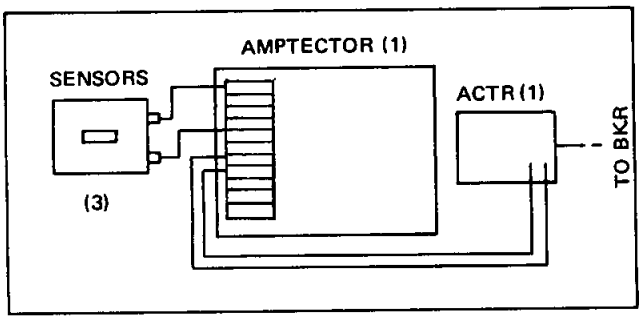

Figure 1

INTRODUCTION

1. The circuit breaker is tripped on overload and short circuit conditions by combined action of three components:

(1) The sensors
(2) The Amptector solid-state trip unit.
(3) The actuator (ACTR)

2. Schematically this may be represented as shown in Figure 1. This makes up a very flexible system covering a wide range of tripping characteristics. Not only is the Amptector adjustable but the sensors are available over a range of ratings. All necessary tripping energy is derived from the load current flowing through the sensors--no separate power supply is required.

3. The automatic overload and short circuit tripping characteristics for a specific breaker rating, as established by the sensor rating, are determined by the settings of the Amptector static trip unit. This unit also supplies a pulse of tripping current to the actuator. Thus, all tripping functions are performed by secondary control circuitry, with no mechanical or direct magnetic action between the primary current and the mechanical tripping parts of the breaker.

SENSORS

4. The sensors produce an output proportional to the load current, so the breaker continuous current rating for any frame size can be changed simply by changing the sensors. The wide range of long delay current pick-up available on the Amptector makes one set of sensors suitable for a number of current ratings. The Amptector setting controls are standard and are usable with any standard sensors. If sensors are changed because of changing load conditions etc., it is only necessary to readjust the Amptector controls to the new desired values.

5. The standard available sensor ratings are listed below.

Bkr. Frame Rating	*Sensor Rating*
600 Amperes	200, 400, 600 Amp.
1600 Amperes	200, 400, 600, 800, 1200, 1600 Amp.
3000 Amperes	2500, 3000 Amp.
4000 Amperes	4000 Amp.

On the type DB-25 breaker the sensors are located at the bottom of each pole unit on the front of the breaker base. On the types DB-50, DB-75 and DB-100 breakers the sensors are located around the lower studs on the back of the breaker base.

AMPTECTOR

Adjustments

6. There can be a total of (7) adjustable controls, with screwdriver adjustment made only through openings in the front coverplate. These are for setting the following adjustments:

(1) Long delay current pick-up
(2) Long delay
(3) Short delay current pick-up
(4) Short delay
(5) Instantaneous current pick-up
(6) Ground current time
(7) Ground current pick-up

Note: **The term "pick-up" as used here means the magnitude of current at which the Amptector timing function begins.**

Ranges

7. The ranges of pick-up current settings and time delay are as shown on time current characteristics curves. See Pages 3 and 4.

Ground Protection

8. When the Amptector is supplied with a ground element, ground current protection is provided by energizing this element with the sum of the currents in the three phase elements, or with a suitable source of ground current. The ground element thus acts in the same way as the coil of a protective relay. Tripping results from a pulse that is sent to the actuator from the Amptector, the same as for phase overcurrent protection. One ampere (or more) of current into the ground element will cause trip-

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ping. When the ground element is energized from an external current transformer, ground current sensitivity will depend on the ratio of the current transformer used.

Discriminator

9. The discriminator feature is included with any Amptector that does not have an instantaneous element. This feature permits instantaneous tripping only while a breaker is being closed. After the breaker has closed, the discriminator inhibits the instantaneous feature in the Amptector, thus permitting the breaker to operate with the required tripping characteristics. Early models of the Amptector required the use of an external time delay switch to provide this feature.

Servicing

10. The Amptector is the intelligence of the overcurrent protection provided by the breaker. It is a device that has many solid-state components. Since the only moving parts are the adjustments, the Amptector will give long, trouble-free service. All components and connections, including the printed circuit board itself, are coated to give effective environmental protection.

11. If there is any reason to suspect that the Amptector is not operating correctly, it should not be tampered with; since tampering could result in loss of vital overcurrent protection. A specially designed tester is available for checking Ampt. operation without using primary current. The tester can be plugged into any convenience outlet; and will pass enough current to check any pickup calibration. Time delay calibrations can also be checked.

12. Special handling and test equipment are required to service solid-state devices. If use of the tester shows that an Amptector is not operating correctly, it is strongly recommended that a spare Amptector be used and the questionable unit be returned to the factory for service.

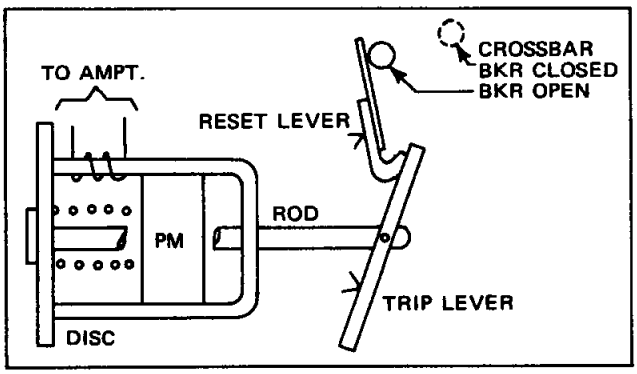


Figure 2

ACTUATOR

13. The actuator receives a tripping pulse from the Amptector and produces a mechanical force to trip the breaker. The actuator is made up of a permanent magnet, a disc held by the magnet, a rod acted on by a spring, a lever for tripping the breaker, and a lever for mechanically resetting the actuator. The magnet cannot pull and reset the disc against the force of the spring acting on the rod, but can overcome the spring force when the disc is in contact with the magnet. A tripping pulse from the Amptector counteracts the effect of the permanent magnet, allowing the spring to separate the disc from the magnet and move the rod to actuate the trip lever. The trip lever then moves the trip bar and trips the breaker. As the breaker opens, the cross bar strikes the spring finger attached to the reset lever; this furnishes the assistance required to move the disc so as to close the air gap between it and the permanent magnet against the spring force. The device is reset when the disc is in contact with the magnet. If the disc is not fully reset the trip lever will hold the breaker mechanism in the trip free condition and the breaker cannot be reclosed. Figure 2 shows a simplified sketch of the actuator.

SOLID-STATE UNDERVOLTAGE (UV)

14. The actuator occupies the space reserved for the standard UV, so the standard UV cannot be used when the solid-state trip system is supplied. When a UV device is required, a solid-state UV must be used; it has the same operating characteristics as the standard UV, and mounts to the left of the Amptector. The solid-state UV has no initial energy to trip the breaker, so on any application where a breaker with the solid-state UV can be closed on a dead bus, it is necessary to also supply a lockout device on the breaker (with its coil connected across the UV coil) to prevent the breaker from being closed if the UV coil is not energized. An "a" contact of the auxiliary switch is required when the static UV is used.

INSTALLATION

15. On some type DB breakers the Amptector mounting plate is fastened to the mechanism frame with shock mounts. To limit the movement of these Amptectors during shipment, they are tied down. The tie-down material should be cut loose and removed before the breaker is placed in service. The only other consideration during installation is making or checking the setting for each adjustment of the Amptector. The most desirable settings for any breaker must be determined from the time-current characteristics of the connected load.

Amptector I-A Solid-State Trip

Offers all of the features of Amptector II-A, plus:

- Integral ground fault protection (optional), with adjustable pickup and delay.
- Resettable operation indicators for Ground, Overload and Short circuit.

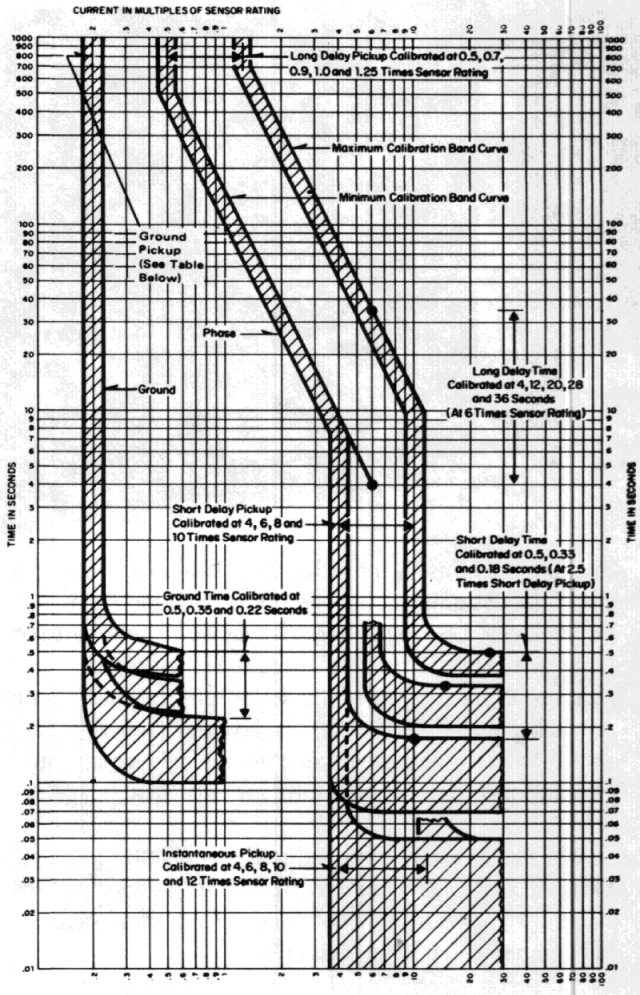
Amptector I-A can be supplied in various combinations of four independent continuously adjustable overcurrent tripping functions:

Long delay (L)
Short delay (S)
Instantaneous (I)
Ground (G)

The following combinations are available:

LI	LIG
LS	LSG
LSI	LSIG

Amptector I-A Characteristics



Model LI is the basic standard and will be supplied when not otherwise indicated.

Amptector I-A

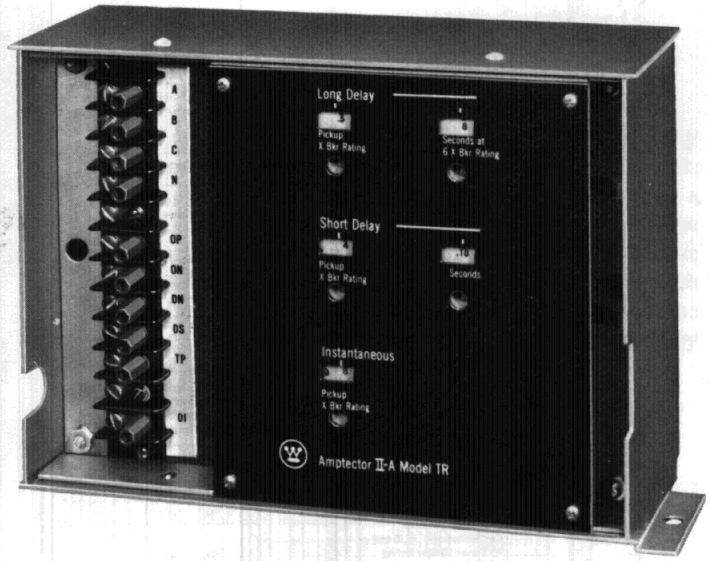
Ground Pick-Up Value—Amperes

Dial Setting	Sensor Rating 200	300	400	600	800	1200	1600	2000	2400	3200	4000	Secondary Current ①
A	65	80	110	145	180	260	330	400	530	640	800	1.0
B	85	110	150	205	260	385	505	600	770	1000	1200	1.5
C	100	130	185	250	325	480	625	760	960	1200	N.A.	1.9
D	145	200	270	385	500	730	970	1200	N.A.	N.A.	N.A.	3.0

All pick-up values may vary ± 10%

① Current of this value from the secondary of an external ground transformer will cause the ground element to function. Ground element pick-up can also be tested using this value. All sensors must be disconnected during test.

Amptector II-A Solid-State Trip



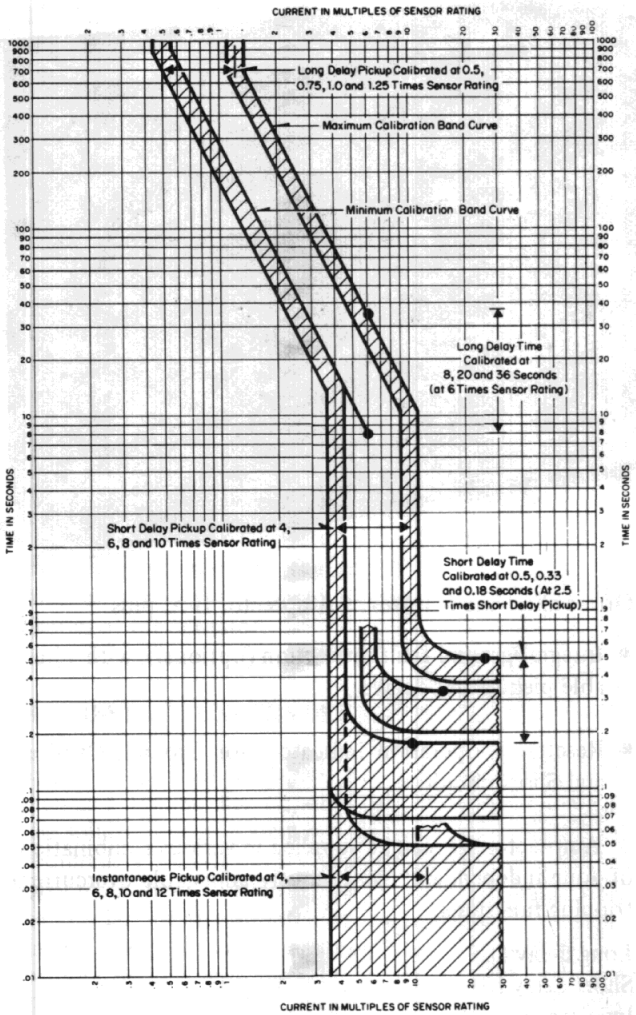
The Westinghouse Amptector II-A is a solid-state device that provides adjustable overcurrent tripping for Westinghouse Type DS low-voltage a-c power circuit breakers. Only one Amptector II-A is required per breaker, and it receives all its energy from a set of sensors—one mounted on each pole of the breaker. It develops an output for an associated trip actuator when preselected conditions of current magnitude and duration are exceeded.

The device can be supplied in three models or combinations of three independent continuously adjustable overcurrent tripping functions: long delay, short delay and instantaneous. These models are:

DU (Dual)—Long delay and instantaneous
SE (Selective)—Long delay and short delay
TR (Triple)—Long delay, short delay and instantaneous

Model DU is the basic standard, and will be supplied when not otherwise indicated or required.

Amptector II-A Characteristics



Amptector I-A and II-A

Each Amptector includes terminal receptacles to permit easy field checking of operation and calibration with an external power supply. A specially designed portable test device with a plug to match the Amptector receptacle is available to provide the utmost in simplicity for checking Amptector operation.

The narrow-band characteristic curves graphically illustrate the close coordination obtainable in breaker systems with Amptector tripping devices. Repeatability within 2%.

The particular breaker current rating for any breaker frame size is determined by the rating of the sensor used.

The breaker current rating for any frame size can be changed by simply changing the sensors, which are easily removed from the breaker drawout element. The wide range of long-delay pickup makes one set of sensors suitable for a number of current ratings. The Amptector itself need not be changed when the associated sensors are changed.

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