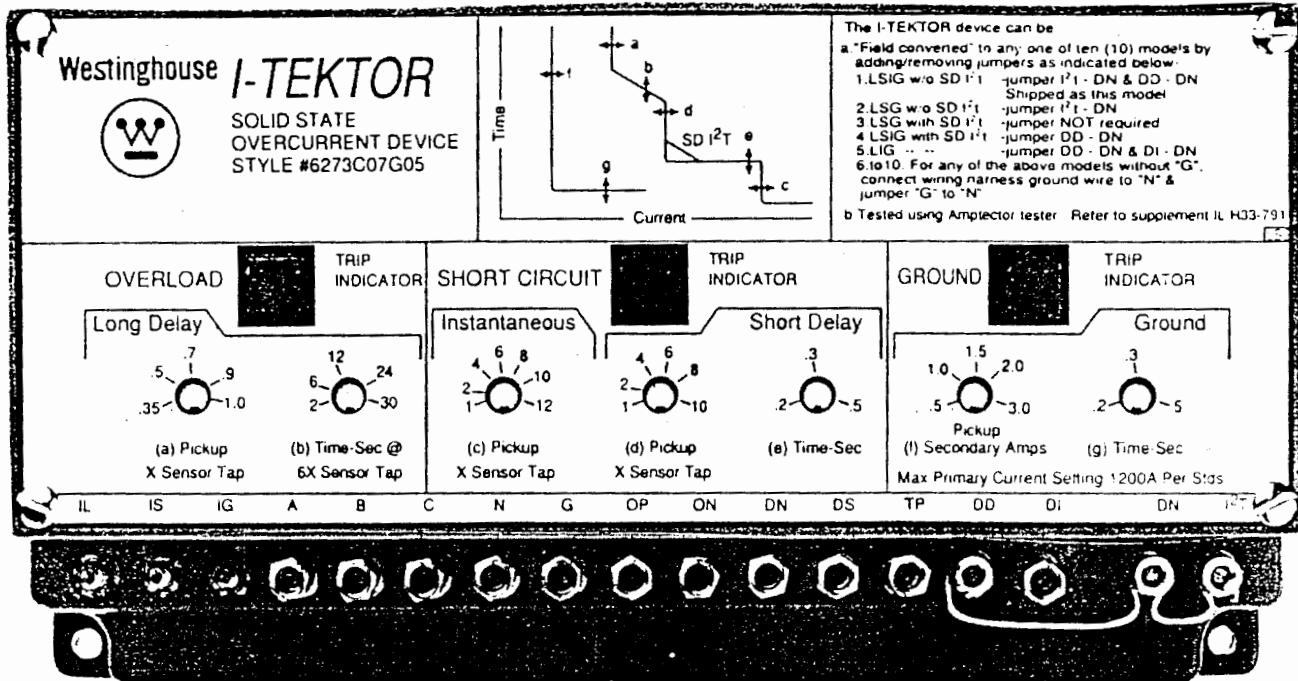


# THE WESTINGHOUSE **I-TEKTOR**

MODEL "LSIG" FIELD CONVERTIBLE  
SOLID STATE OVERCURRENT DEVICE



FOR RETROFIT OF LOW VOLTAGE AIR CIRCUIT BREAKERS

## APPLICATION CONSIDERATION

The interrupting capability of a low voltage air circuit breaker, equipped with "LS" (long and short delay) overcurrent trip devices, may be lower than for an equivalent breaker equipped with "LI" (long delay and instantaneous) overcurrent trip devices. This is regardless of manufacture or type of device. Therefore, it is important to ensure that the breaker interrupting capability is not exceeded when changing from "LI" to "LS" trip device characteristics. For further information refer to ANSI Std. C37.16. A system coordination may be desirable to safeguard against this possibility.

## WIDE RANGE

The wide adjustment range of the *I-TEKTOR* results in the need for fewer sensor taps, and eliminates the need for a "range" selector switch. Removal of the transparent cover, allows access to the screwdriver type, continuously adjustable function level controls through the silkscreened metal front plate.

## CHARACTERISTIC FIELD SELECTABILITY

While the *I-TEKTOR* is always shipped as "LSIG" any one of the ten (10) models listed below may be field selected simply by adding or removing jumpers located on the front. Short delay I<sup>2</sup>T function is included as standard.

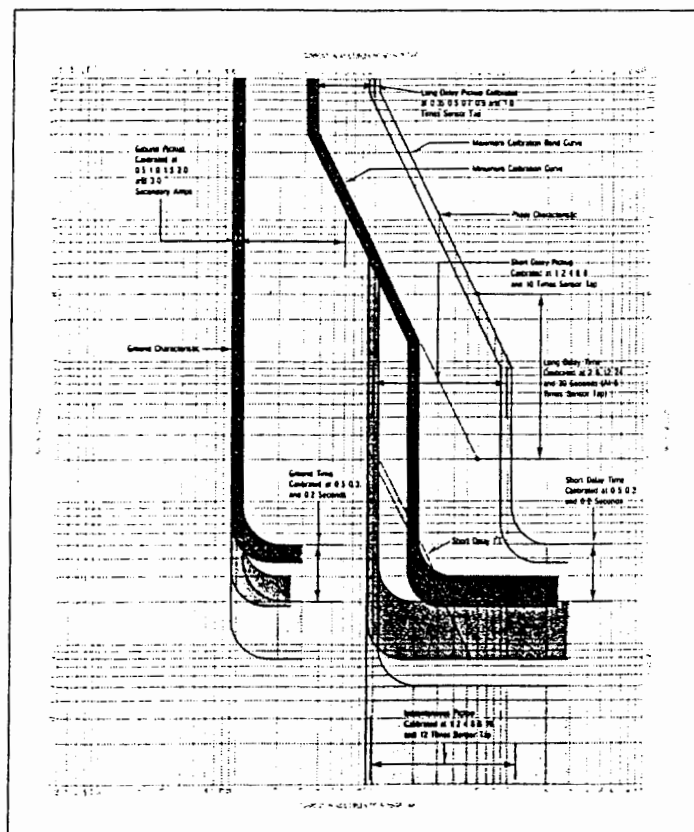
Continuation of electrical power is dependent upon well maintained and reliable equipment to detect and safely interrupt abnormal currents by means of circuit breakers, or other forms of interrupters, with the least disturbance to the power system. Series electro-mechanical overcurrent trip devices, installed on many existing low voltage power class circuit breakers, are prone to erratic tripping due to corrosion, contamination and wear. Frequent maintenance and adjustments are necessary to assure reasonably accurate and safe operation. Westinghouse has been the leader in providing a retrofit service to replace these series trip devices with modern state of the art solid state tripping systems featuring the proven Amptector, and similar solid state overcurrent devices. In the past, due to space limitations, it often was difficult to economically retrofit some breakers. By utilizing the compact, horizontally or vertically mounted, front adjustable, solid state Westinghouse *I-TEKTOR*, it is possible to retrofit, economically and quickly, just about every conceivable low voltage power class circuit breaker, regardless of physical size. The *I-TEKTOR*, has been designed with the end user's needs in mind "...minimum down time" and flexibility. It provides the facility for field selection of desired time-current characteristics which are similar to, and test facilities that are compatible with the Amptector.

While physically small, measuring just 8.13"L x 4.25"H x 2.06"D, the all inclusive, one type "does it all", model "LSIG" *I-TEKTOR* satisfies all system co-ordination requirements. With all protective adjustments covered in one unit, ordering and stocking is simplified. It requires no external auxiliary source. Instead, it obtains its input energy from a set of current sensors to continuously monitor system current levels. When pre-selected conditions of system current magnitude and duration are exceeded, it develops an output pulse to unlatch the breaker Direct Trip Actuator.

1. LSIG-LONG & SHORT DELAY,	GROUND, &	INSTANTANEOUS	W/O SHORT DELAY I <sup>2</sup> T	JUMPER I <sup>2</sup> T - DN & DD - DN
2. LSG-LONG & SHORT DELAY, &	GROUND		W/O SHORT DELAY I <sup>2</sup> T	JUMPER I <sup>2</sup> T - DN
3. LSG-LONG & SHORT DELAY, &	GROUND		WITH SHORT DELAY I <sup>2</sup> T	JUMPERS NOT REQUIRED
4. LSIG-LONG & SHORT DELAY,	GROUND, &	INSTANTANEOUS	WITH SHORT DELAY I <sup>2</sup> T	JUMPER DD-DN
5. LIG-LONG DELAY	GROUND, &	INSTANTANEOUS	I <sup>2</sup> T NOT USED	JUMPER DD-DN & DI - DN
6 TO 10. - ANY COMBINATION OF THE ABOVE WITHOUT GROUND(G), CONNECT WIRING HARNESS GROUND WIRE TO "N" & JUMPER "G" TO "N"				

FUNCTION		RANGE/CALIBRATION MARKS AT
L	LONG DELAY CURRENT PICKUP	.35, .5, .7, .9 & 1.0 × SENSOR TAP
	LONG DELAY TIME	2, 6, 12, 24 & 30 – SECONDS
S	SHORT DELAY CURRENT PICKUP	1, 2, 4, 6, 8, & 10 × SENSOR TAP
	SHORT DELAY TIME	0.2, 0.3 & 0.5 – SECONDS
I	INSTANTANEOUS CURRENT PICKUP	1, 2, 4, 6, 8, 10 & 12 × SENSOR TAP
G	GROUND CURRENT PICKUP	0.5, 1.0, 1.5, 2.0 & 3.0 – AMPS
	GROUND DELAY TIME	0.2, 0.3 & 0.5 – SECONDS

Refer to Curve #6273C07-C below for time-current characteristics of the *I-TEKTOR*



CURVE #6273C07-C

## INDICATORS

Overload, fault and ground indication are provided by means of internally activated, magnetically held, trip indicators, which reset automatically in approximately 2 seconds, after the breaker is closed and normal current is established. The indicators cannot be reset by external means. Easily accessible terminals on the front of the *I-TEKTOR* are provided to facilitate remote indication, if required.

## ADJUSTABLE DISCRIMINATOR

A built-in adjustable Discriminator is introduced automatically when any characteristic without instantaneous [I] is selected. Under these conditions, the *I-TEKTOR* acts as an instantaneous device until the breaker is closed and normal current is established, to ensure the breaker is not subjected to undue stresses, if closed onto a bolted fault. Note: The discriminator value is determined by the setting of the instantaneous current pickup level control. Suggested minimum setting is 10 times. Once normal system operation is established, the short delay [S] overrides the Discriminator, thus, allowing the *I-TEKTOR* to perform as a truly selective device, to enhance co-ordination with other devices.

## ENVIRONMENTAL PROTECTION/CONSISTENT PERFORMANCE

To minimize the effects of airborne contaminants, ensure proper and reliable operation of the device over a long period of time and provide effective environmental protection, all solid state components are machine soldered to the printed circuit card and then the whole card assembly is conformal coated. The adjustable controls and trimming resistors are computer selected to ensure consistent performance.

## DESIGN TESTS

The *I-TEKTOR* which conforms generally with the requirements of ANSI Std. C37.17-xxxx, has been subjected to, and satisfactorily passed the following "design type" tests:

- -20°C to +85°C Operating range
- Electromagnetic susceptibility (EMI), per UL Standards
- Three phase, high power operation - when mounted as part of a retrofit kit, on a typical low voltage air circuit breaker.

## TESTING

Select any one of the ten (10) combinations listed under "Characteristic Field Selectability" to suit system co-ordination requirements, and test in accordance with IL#H33-791. An integrally mounted plug-in adapter which is compatible with the Westinghouse Amprector, means the *I-TEKTOR* can be easily field tested using the portable, time proven, Amprector "Secondary Injection Test Unit".

## RETROFIT CONNECTION DIAGRAMS

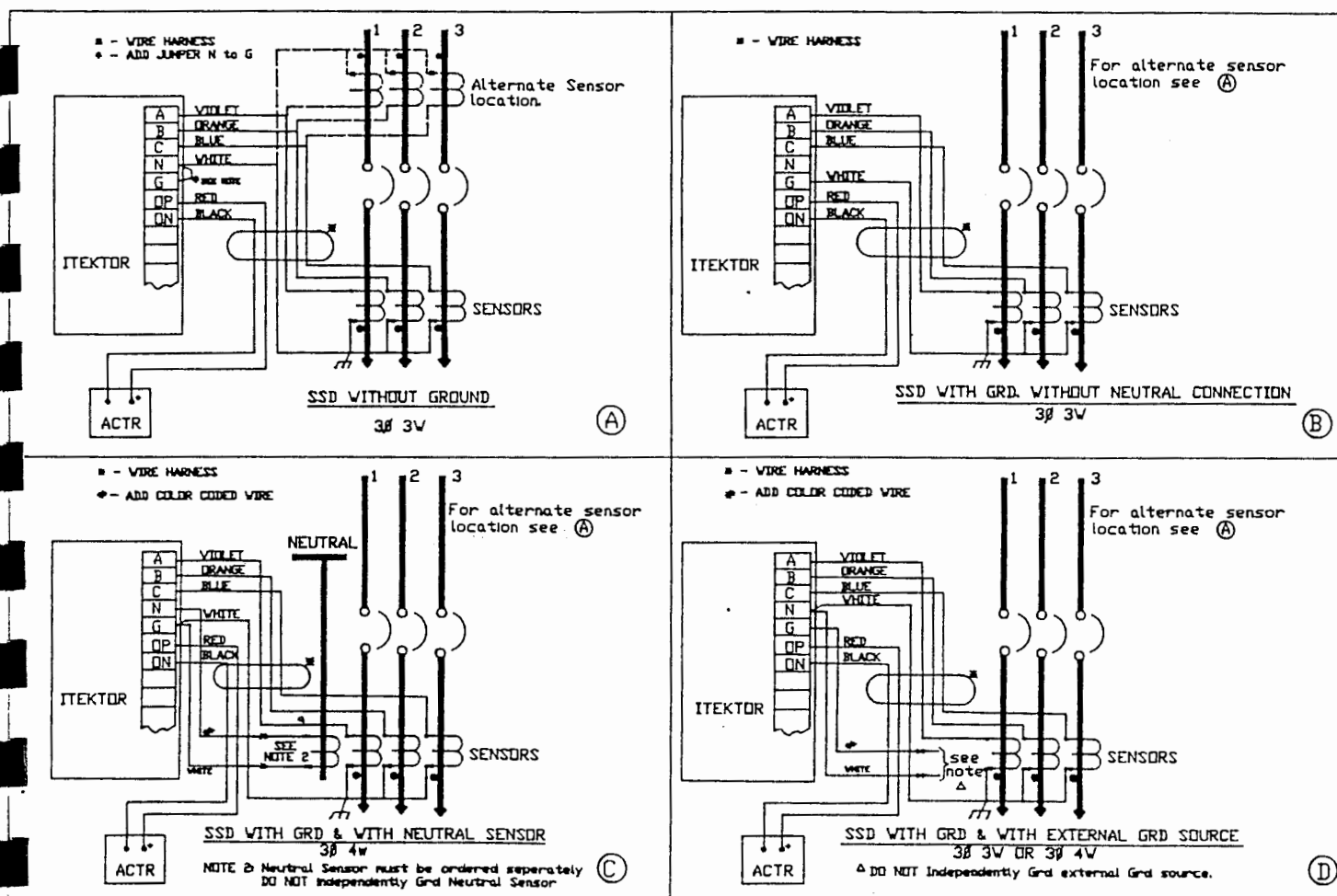
## DIAGRAMS

- Refer to diagrams A, B, C and D

Diagram A Where Ground (G) protection is not required, connect the common return wire to the *I-TEKTOR* terminal N, and jumper terminals N & G

Diagram B Where 3-3W residual ground protection is required connect the common return wire to the *I-TEKTOR* terminal G. DO NOT JUMPER TERMINALS N & G.

Diagrams C & D Where ground protection via neutral sensor or external ground source is required connect the common return wire to the *I-TEKTOR* terminal G and add two wires to connect to the neutral sensor, or external ground source. DO NOT JUMPER TERMINALS N & G.



Service

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IL# H33-791  
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## *I-TEKTOR* Test Procedure using the Amptector Tester

Test procedure is for secondary injection testing and should be used in conjunction with IL# 33-791 (Amptector Tester). Set the desired characteristics for the *I-TEKTOR* to suit system requirements, in accordance with the instructions on the *TEKTOR* faceplate, and then follow the appropriate test procedure as outlined below:

### Long Delay

- Pickup Follow IL 33-791
- Time Follow IL 33-791, except maximum time setting is 30 seconds.

### Short Delay

- Pickup Follow IL 33-791  
If test current is too high, *I-TEKTOR* may operate instantaneously due to the "built-in" discriminator. If this happens, lower short delay setting and test current accordingly. (To say 6x)
- Time Jumper DD to DN  
Follow IL 33-791
- Discriminator Set instantaneous control to the same value as the short delay. Energize tester at current value selected previously. *I-TEKTOR* should operate instantaneously.
- I<sup>2</sup>T Set short delay pickup at maximum and short delay time at 0.2 seconds. Set test current at approximately 3x. Energize tester. Short delay operation should not occur. Set short delay pickup at 1x and energize tester. *I-TEKTOR* should operate in approximately 0.3 seconds. Set short delay pickup at 0.5 seconds. Repeat test. *I-TEKTOR* should operate in approximately 0.5 seconds.

### Instantaneous

- Pickup Remove jumper between DD & DN.  
Follow IL 33-791

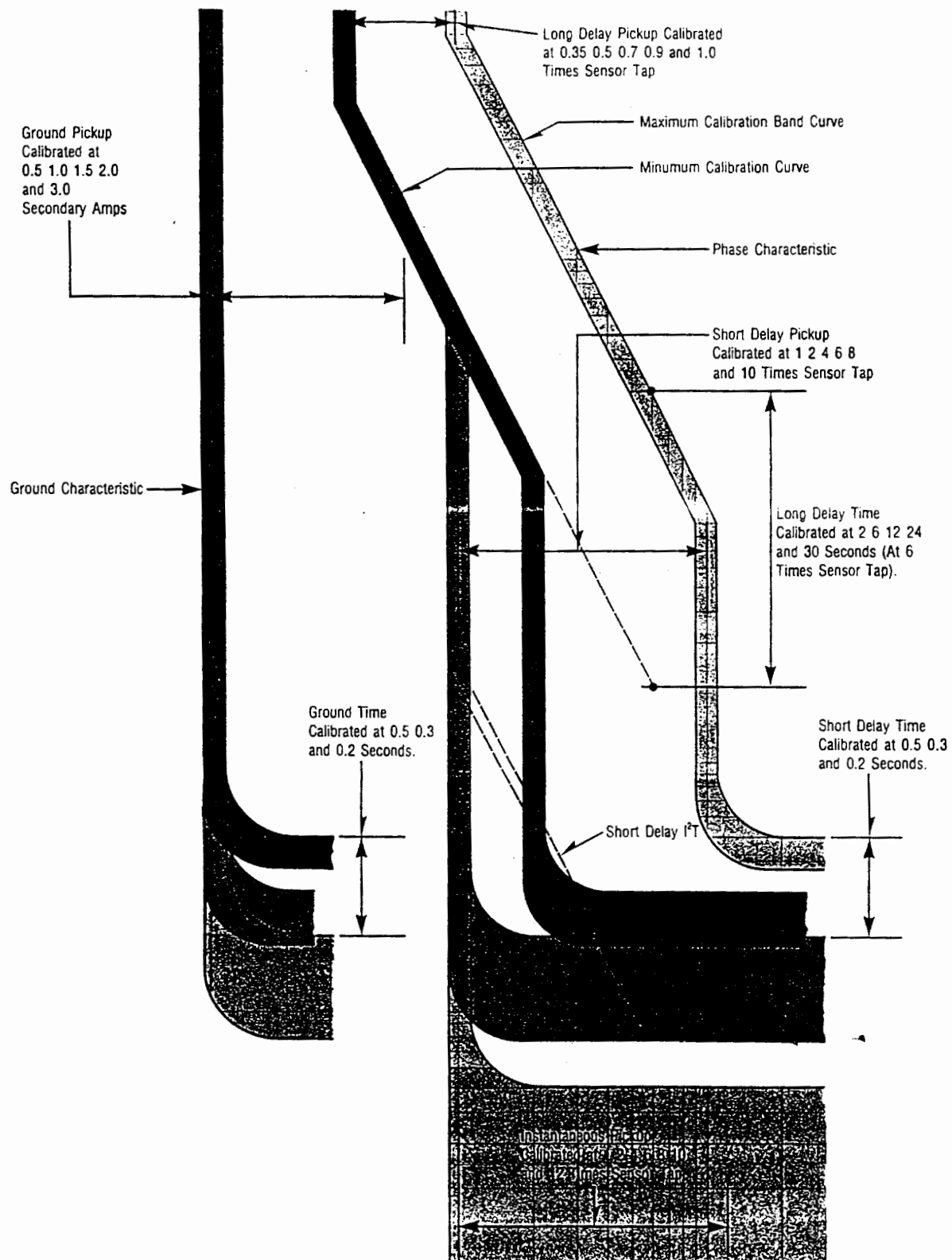
### Ground

- Pickup Follow IL 33-791
- Time Follow IL 33-791

### Indicators

- Reset automatically, after the *I-TEKTOR* has been energized with a minimum of 2 amperes for approximately 2 seconds.

•When performing instantaneous, short delay or a ground current test, the associated trip indicator may not operate, or may operate half way. This is because the operating time of the *I-TEKTOR* is less than the time required to charge the indicator operating circuit of a previously de-energized *I-TEKTOR*. To check trip indication under any of these conditions, first energize the *I-TEKTOR* with a minimum of 2 amperes, and then rapidly increase the input current to a value well above the function pick-up point. The appropriate indicator should operate. This simulates actual system conditions, where the indicator operating circuit is charged by the normal load current.



# Amptector Tester Instruction Leaflet



I.L. 33-791-A

**1. PRELIMINARY TESTS:** Banana plug assembly (11 circuit) not connected to Amptector, timer switch off, short delay switch in operative position, Hi-Low switch in Lo. Plug tester into 115 volt 60 Hertz source. Turn power switch on, power pilot lamp should light (red) and reset pilot lamp should light (amber). If reset pilot lamp is not lit, push "Reset" button, reset pilot lamp (amber) should light. Turn timer switch on, timer should not run. Push "Test" button, test pilot lamp (red) should light, timer should operate counting seconds, and reset pilot lamp should go out. Operate "Stop" toggle switch (momentary), timer should stop, and test pilot lamp should go out. Push manual reset button on timer, timer should reset to zero. If any of the above checks do not work, operate "Stop" switch, and "Reset" switch and repeat check.

Banana plug assembly connected to an Amptector, timer switch off, short delay toggle switch in "Read Amps" position, Hi-Low switch in Lo, circuit selector set at "A". Amptector settings; Set long delay pickup at 1.0 (5 amps  $\pm 10\%$ ), long delay seconds at 36 (time at 6X (30 amperes)), short delay pickup at 10 and seconds at .50 if available. Instantaneous pickup at 12 and ground at .50 seconds.

Turn power ON, hold "Calib." (Momentary) toggle switch in operated position and turn "Current Adjust" knob slowly from zero to maximum. Ammeter should read from zero to approximately 8 amperes. Turn "Current Adjust" knob to zero and put Hi-Low switch in Hi position, hold "Calib." switch in operated position and turn "Current Adjust" knob from zero to maximum, ammeter should read from 0 to 75 amperes  $\pm 5$  amperes. CAUTION: Amptector tester has a continuous rating of 30 amperes and currents above 30 amperes should be applied for short intervals.

Long delay pickup, set "Circuit Selector" to "A", Hi-Lo switch to Lo, push "Reset" button, push "Test" button, turn "Current Adjust" knob slowly until long delay pickup pilot lamp (clear) is lit. This lamp should light at 5 amperes  $\pm 10\%$  (long delay pickup of Amptector at 1.0). Lamp will go out when current is lowered below pickup.

Long delay time, set "Circuit Selector" to "A", Hi-Lo switch to Hi, hold "Calib." switch in operated position and turn "Current Adjust" knob until ammeter reads 30. Release "Calib." switch, press "Reset" button, Amptector long delay set for 36 seconds, turn timer on, push "Test" button, check current to see that it stays at 30 amperes. Amptector should turn off timer and current ("Test" pilot lamp should go out) between 24 to 36 seconds. Push "Reset" button, "Reset" pilot lamp should go on. Push manual reset button on timer, timer should reset to zero.

**2. DETAIL TESTS:** Time values on Amptector dials are TOP of the band – hence expect shorter times when testing.

(A) Pick-up values are mid-band which has  $\pm 10\%$  tolerance:

Long Delay	Pick-up Limits	Short Delay & Instantaneous	Pick-up Limits
.5 = 2.5 amp	2.25 to 2.75	4X = 20 amp.	18 to 22
.6 = 3.0	2.7 to 3.0	5X = 25	22.5 to 27.5
.7 = 3.5	3.15 to 3.85	6X = 30	27 to 33
.8 = 4.0	3.6 to 4.4	7X = 35	31.5 to 38.5
.9 = 4.5	4.05 to 4.95	8X = 40	36 to 44
1.0 = 5	4.5 to 5.5	10X = 50	45 to 55
1.25 = 6.25	5.6 to 6.9	12X = 60	54 to 66

(B) To Check Long Delay Pick-up (Switch to Lo, Turn Timer OFF)

1. Push "RESET" and then "TEST".
2. Slowly increase current until Long Delay neon lamp (clear) glows steadily indicating Amptector pick-up.
3. Use "STOP" switch to cut off current.

(C) To Check Long Delay Time (Set 30 amp. (6X) with "Calibrate" switch)

1. Push "RESET" and turn Timer ON.
2. Push "TEST" - Test Kit will stop when Amptector fires the output. Timer should read less than dial setting but not under 2/3 of the setting; i.e. if set at 24 it should be more than 16 seconds.
3. Any other multiple of sensor may be checked if desired - see curve for time values to be expected.

(D) To Check Instantaneous (Turn Timer OFF)

1. (Set Long Delay to max.-in order not to have long delay take you out too fast.)
2. (If Short Delay is in Amptector set short Delay switch to "Read Amps".)
3. Push "Reset" then "Test" and increase current steadily but rather rapidly until relay "clicks" off in Test Kit. (If current is preset to about 3/4 of setting, using calibrate switch, the final setting can be approached slower for better accuracy.)
4. Reset - Hold INST switch in "Read" position - push "TEST" button and read current.-  
CAUTION - if relay does not cut off current when INST is released; use stop switch to remove current.

(E) To Check Short Delay Pick-up (Set Instant. to Max. 12X)

1. Place Short Delay switch in OPERATIVE position and proceed similar to Instantaneous above.
2. Switch to "Read Amps." to read ammeter - CAUTION - use STOP switch to cut off current.

(F) To Check Short Delay Time

1. Set Short Delay Pick-up dial @ 4X(20 amperes).
2. Set "Current Adjust" at 10X(50 amperes) with "Calibrate" switch.
3. Turn timer on and Short Delay switch to "Operative".
4. Push "Reset" and manual timer reset button then "Test" and timer will give an approximate reading of the delay.  
NOTE: This timer is not accurate enough for close timing of short delay but it will show the difference between the three band calibrations.

(G) 3 Phases: The selector switch permits checking to see if all Amptector phase inputs are operative. Since all feed into a common pick-up and timing circuit it is only necessary to determine on one of the above tests that all inputs will cause Amptector operation.

(H) To Check Ground Pick-up

1. Hold Ground Test momentary switch in down position during steps 2, 3 and 4.
2. Place "Current Adjust" knob @ zero.
3. Push "Reset" then "Test".
4. Turn "Current Adjust" till unit trips (from 1.0 to 1.2 amps).

(I) To Check Ground Time

1. With Ground Test momentary switch and calibrate switch in down position, turn Current Adjust to read 2.5X(2.5 amperes).
2. Turn "Timer" on. (If timer is not at zero push manual reset button.)
3. Release "Calibrate" switch, continue to hold Ground Test switch down.
4. Same as F4.

(J) When checking out settings on an Amptector for use, the general procedure is to start with the high current settings and work down to the lowest current setting.

(K) CAUTION: DO NOT TEST AMPTECTOR WHILE BREAKER IS CARRYING CURRENT.