

Multifunction Overcurrent Relay

IM30T Thermal/Overcurrent Relay

The IM30T Thermal/Overcurrent relay is a member of Cooper Power Systems' **Edison**® Series of microprocessor based protective relays and provides all of the functions necessary for the protection of a transformer or other device requiring a thermal image element. The IM30T relay offers the following functions:

- Three phase time overcurrent and instantaneous elements. (50/51)
- Time and instantaneous ground fault elements. (50N/51N)
- Thermal image overcurrent element for the protection of windings (49)
- Two levels of negative sequence current (current unbalance) elements (46)
- I^2t inrush current protection element
- Breaker Fail.
- Remote Trip
- Harmonic filtering on neutral input.

The IM30T also shares the following features common to all Edison Series relays:

- Simple five button man machine interface (MMI) allows access to all functions, settings, and stored data without the need for a computer.
- Bright electroluminescent display easily visible even in brightly lit environments.
- Draw-out design permits relay testing without disturbing connections to case.
- Modbus communication protocol and RS485 terminal on rear.
- Modular design allows the draw-out module to be fitted to a variety of space saving cabinet styles.



Figure 1
Front View of the IM30T Thermal/Overcurrent Protection Relay

- Three programmable form c (SPDT) output contacts and one Form A/B contact.
- Pick-up (start-time) elements.
- Programmable reset characteristics.
- Dedicated power supply/relay fail output contacts.
- Event records.
- Cumulative trip counters.
- Auto-ranging power supplies.

APPLICATIONS

The IM30T is ideal for the backup protection of transformers or motors by providing overcurrent, unbalance current, thermal image, and I^2t protective elements. The relay is also ideal for use when any combination of the offered elements is desired. Any of the elements may

be disabled if not required for a given application.

PHASE OVERCURRENT

The IM30T offers low and high set (50/51) phase overcurrent elements. The low set element may be set to definite time or inverse time modes. When inverse mode is selected, the three standard IEC inverse curves are available. Additional pick-up functions are available and may be assigned to output contacts.

GROUND OVERCURRENT

Both low set and high set (50N/51N) overcurrent elements are provided with the same curve selections as available for the phase overcurrent elements

THERMAL IMAGE

The thermal image element (function 49) provides protection of the windings temperature due to

overload. The thermal characteristics are programmable with settings for rated thermal current, winding warm-up time constant, iron warm-up time constant, and alarm level. See Figure 2 for the thermal characteristic curves.

NEGATIVE SEQUENCE

Two levels of negative sequence overcurrent protection are offered for unbalanced current protection providing increased sensitivity of phase faults.

I²T INRUSH PROTECTION

This element protects the windings by providing a trip function if the I²t inrush exceeds twice the maximum rated thermal current defined for the 49 element.

BREAKER FAIL

A programmable time delay relay is set equal to the breaker's clearing time. If the fault is not cleared (i.e., the element has not dropped out) before this timer expires, a breaker fail is indicated. This element may be programmed to one or more of the output relays.

REMOTE TRIP

A digital input is provided that when closed, can cause any combination of the programmable output contacts to operate.

TARGETS

Eight bright LED targets are provided as follows:

- Phase overcurrent
- Ground overcurrent
- Thermal overload
- I²t trip
- Negative sequence overcurrent

- Breaker fail
- One red LED illuminates if any functions are blocked.

In addition, a separate LED flashes when the relay is in programming mode, and illuminates constantly upon relay or power supply failure.

RESET CHARACTERISTICS

The output relays may be programmed to reset in one of two manners.

- Instantaneously upon the input or calculated quantities dropping below the pickup value.
- Manual reset (by front panel or computer command) only.

MEASUREMENTS

Each of the three phase currents, positive and negative sequence currents as a percent of line current, winding temperature as percent of rated, and iron temperature as a percent of rated.

In addition the relay stores the maximum phase load and inrush currents since the last energization.

EVENT RECORDS

The IM30T records the values of all metered quantities at the time of the last trip event.

DIAGNOSTICS

Complete memory and circuit diagnostics are run upon powering the relay. The revision level of the firmware is displayed at this time.

During normal operation the relay suspends operation every 15 minutes for 10 msec and runs a comprehensive set of diagnostics that includes memory checksum, test of the A/D converters by injection of an internally generated

reference voltage, and a check of the ALU.

The relay provides two manual test routines which may be run at any time. The first routine performs the same 15 minute test and in addition checks the target LEDs and the control circuitry to the output relays without operating the output relays.. The second test is identical but also operates the output relays.

OUTPUT ELEMENTS

The following functions may be programmed to one or more of the output relays. The only limitation is that pick-up and time delay functions may not be assigned to operate the same output relay(s).

- Pick-up function of low set overcurrent element.
- Time delayed function of low set overcurrent element.
- Pick-up function of high set overcurrent element.
- Time delayed function of high set overcurrent element.
- Pick-up function of low set ground overcurrent element.
- Time delayed function of low set ground overcurrent element.
- Pick-up function of high set ground overcurrent element.
- Time delayed function of high set ground overcurrent element.
- Thermal image pre-alarm
- Thermal image trip
- I²t threshold
- Low set negative sequence
- High set negative sequence
- Remote trip

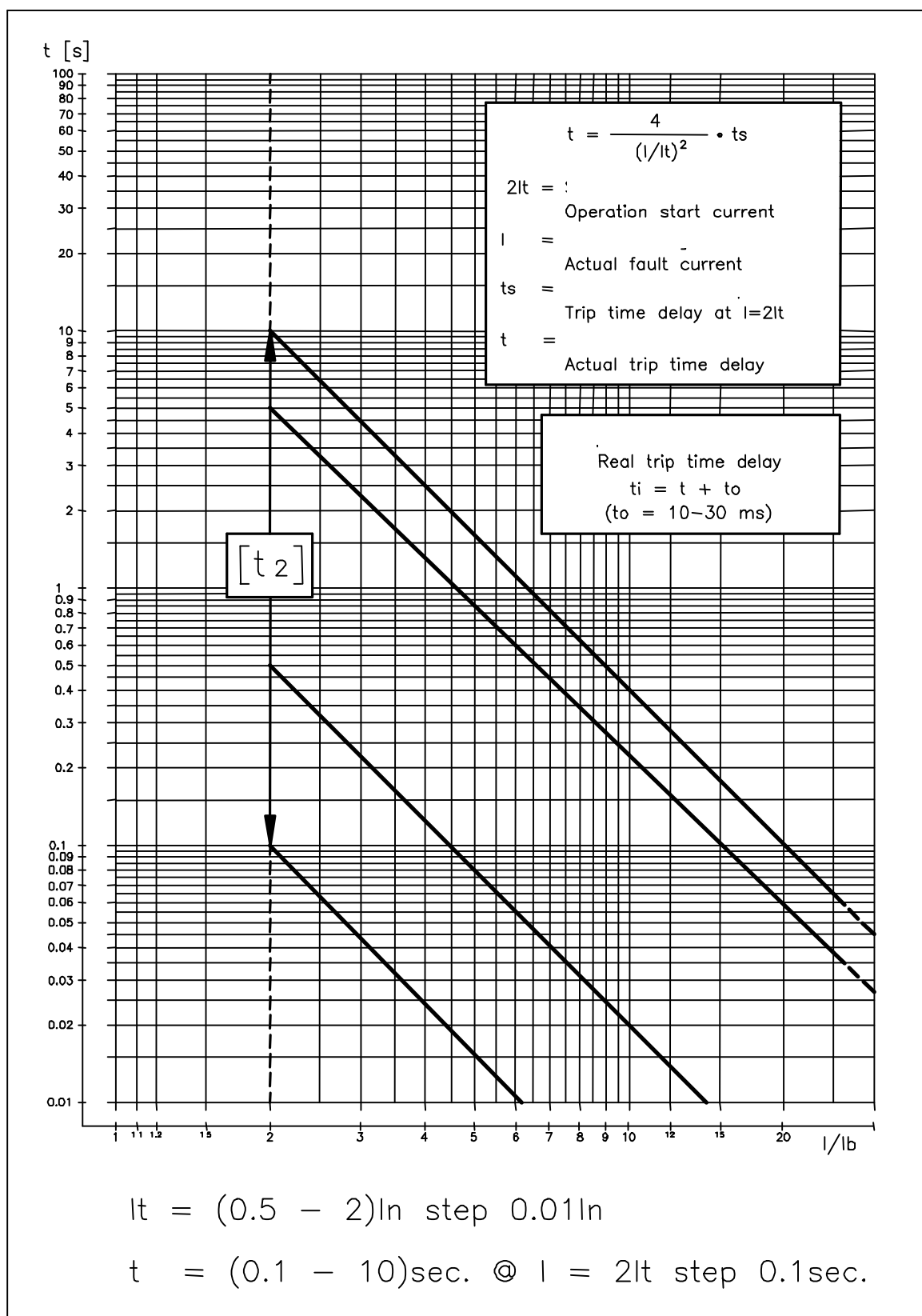


Figure 2 – Thermal Image Overload Curves for IM30T relay

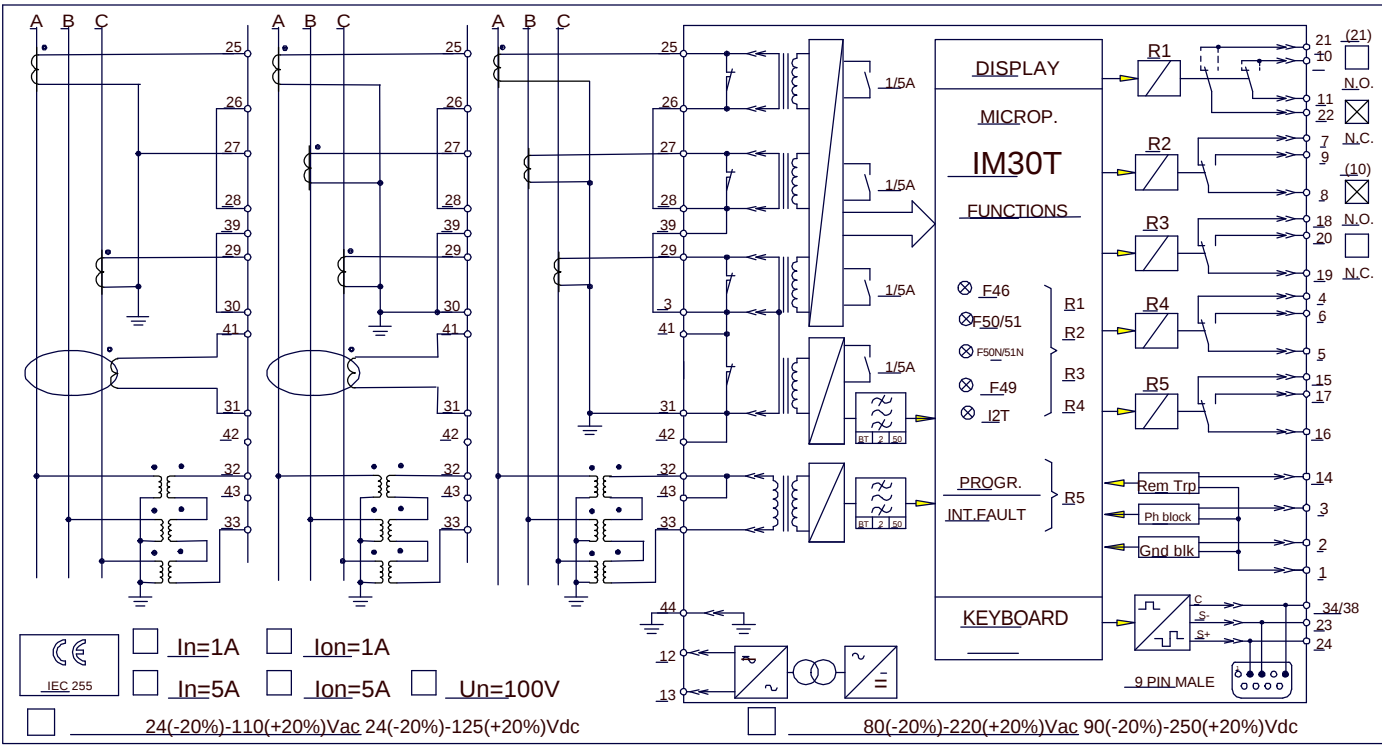


Figure 3 - Wiring Diagram for the IM30T Relay

ORDERING INFORMATION

Construct the catalog number from the following table:

Base Relay Model	Power Supply ¹		Rated CT Input		Case Style ²	
	Code	Description	Code	Description	Code	Description
PRIM30TJ	L	24-110V AC/DC	1	1A	D	Draw-out relay only, no cabinet supplied
	H	90-220V AC/DC	5	5A	S	Single case
					T	Double case
					N	19" rack mount
					C2 C3 C4	Denotes mounting position in either a double case or 19" rack along with other relays ordered at the same time.

Example: PRIM30TJL5S is an IM30T with low range power supply, 5A CT inputs, in a single relay case.

If ordering two or more relays to be fit in a common case, the first relay ordered should indicate the case style desired. This relay will be located in the leftmost bay of the case. Subsequent relays should use the C2, C3, or C4 suffixes to denote their position in the case using the leftmost bay as a "C1" reference.

Example: A PRIM30TJxxN and an PRIM30AEJxxC2 consists of an IM30T relay in the leftmost bay of a 19" rack case, with an IM30AE relay in the second bay from the left. The third and fourth bays will be empty and will be covered with blank faceplates.

¹ The power supplies are user replaceable and interchangeable. See catalog section 150-99.

² The relay itself may be drawn out of any of the listed cases and plugged into any of the other case styles. The catalog number specified during ordering denotes the type of cabinet in which the relay will be shipped.