Advanced Power Technologies, LLC

Applications Note-AN012

Title: Optional additional CT inputs		Model: TTC-1000
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Application Summary

This Application Note covers the use of the optional additional CT inputs.

Input Types

- CT Input 1 on main board – This input is located on the main board in the TTC-1000 and is on:
  - Large form panel terminal block TB3, terminals 6&7
  - NEMA form terminal block TB3, terminals 3&4

  This input is generally used for measuring winding current for use in calculating winding temperature. This input has a CT ratio setting associated with it. For serial numbers ending in "A" through "F" the maximum current input is 10 amperes through the provided AuxCT. For serial numbers ending in "G" or later the maximum current input is 15 amperes through the provided AuxCT.
- CT Inputs CT1 & CT2 on optional board –
  - Large form panel terminal block TB6 terminals 1&2 and 3&4.
  - NEMA form terminal block TB8, terminals 1&2 and 3&4.

  These inputs are generally used to measure winding current for use in calculating winding temperatures. Each has a CT ratio setting associated with it. The maximum current input is 50 amperes through the provided AuxCT.
- CT Inputs CT3 through CT8 on optional board –
  - Large form panel terminal block TB6 terminals 5&6, 7&8, 9&10, 11&12, 13&14, and 15&16.
  - NEMA form terminal block TB8, terminals 5&6, 7&8, 9&10, 11&12, 13&14, and 15&16.

  These inputs are generally used for monitoring motor and fan loads. They do not have CT ratio settings associated with them and do not input into winding rise calculations. These inputs can accept up to 50 amperes load through the provided AuxCTs.

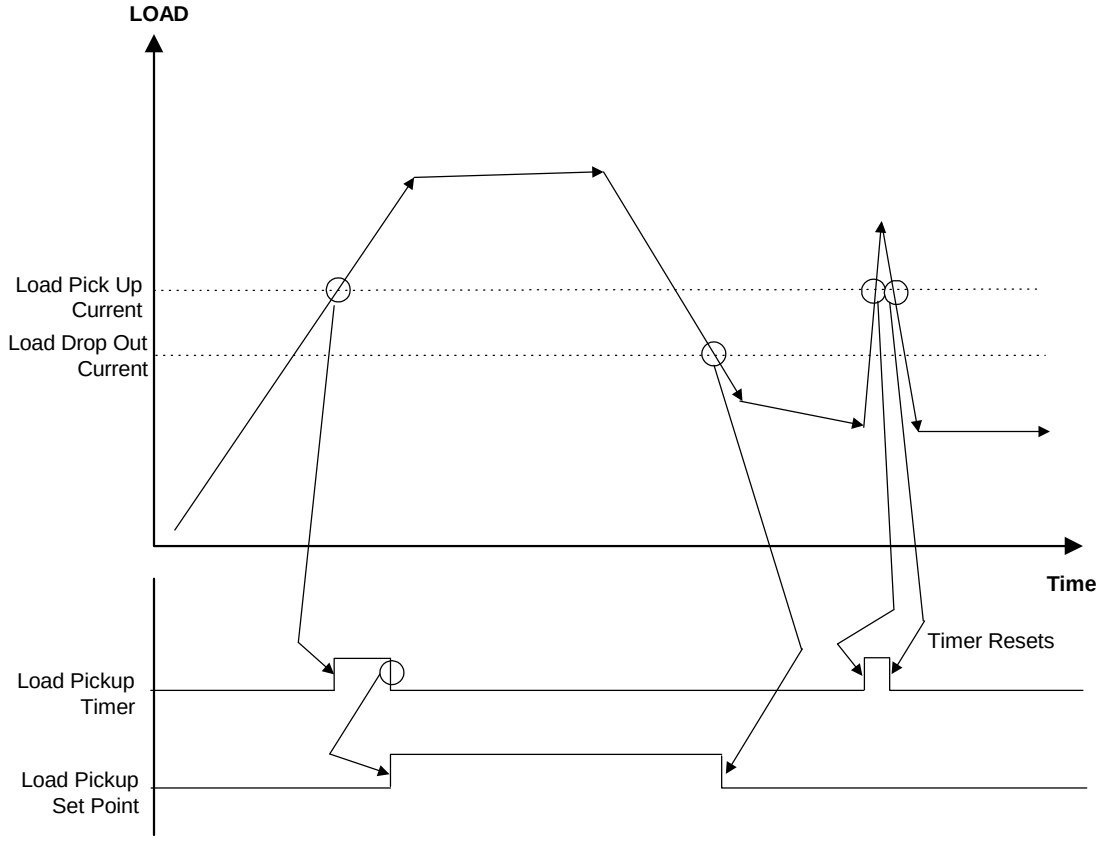
NOTE: Connect only with the SUPPLIED AuxCT. Connection of another CT or direct landing of the bushing CT on these terminals will result in severe damage that is NOT covered by warranty.

Current Operation

Each of the inputs has two set points associated with it, along with a timer for each of the two set points. Each of the set points has a separate pickup and dropout setting such that the user can determine the exact current band the set point will respond to.

The following figure shows the response of a set point to a rise and fall of current. Note that the set point will pick up when the Load Pick Up Current point is reached and then drop out when the Load Drop Out Current point is reached. The pickup event starts a Load Pickup which starts to time for the period the user has set. If the current has not dropped below the dropout set point by that time, the Load Pickup Set Point will then pick up as shown. The illustration shows the action for events where the timer reaches the Set Timing and where it does not.

In any event, the Load Pickup Set Point will always drop out when the Load Drop Out Current set point is reached.



Settings are always in SECONDARY amperes and are entered with all digits including the "." decimal.

A variation of this application is that the Drop Out may be set above the Pick Up current so that the operation is changed such that the Set Point will pick up for events where the current is BELOW a specific value.

Winding Use

To use the first three CT inputs for winding rise calculations the user must have the "transformer specific" quantities for each winding:

- CT ratio of the CT circuit that the Aux CT is connected to
- Rated Load of the winding
- Rated temperature rise above top oil of the winding

Two additional settings are for the entire setup and not for the individual winding.

- Rated Time Constant (response of the winding temperature to a step increase in load)
- Oil flow (directed or non-directed)

For the calculation to work, the user must:

- Name the correct temperature probe as Top Oil. This is the base the calculation will work from. The program will automatically use the first probe with the name "Top Oil" in the list of probes to use with the calculation.
- Name the winding – several options such as LV, HV, and Tertiary are available. What it is named will not affect the calculation, but it must be named to function.
- Name the CT providing the current – again naming options are available in programming and again the name does not affect the calculation.

The CT's are matched with the windings in the listing for the transformer related items. The naming of the CT's has no effect on the calculation. However, they must be named something for the calculation to proceed.

Load Monitoring Use

All CT inputs may be used to monitor loads but care must be taken that the loading for the CT on the main board does not exceed the maximum rating. The input will not be damaged with the higher current input, but the reading will be incorrect for current values above the maximum rating. To use as load monitoring, the first three CT inputs, Main Board, and the first two on the Optional CT card must have CT ratios entered. For general load monitoring, set the CT ratio as one.

The remaining 6 CT inputs on the optional CT board do not have CT ratio settings and simply measure current from 0 to 50 amperes.

Assignment

The set points are assigned to outputs as in the instruction manual and can be assigned to any output as OR or AND functions, inverted or non-inverted.

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