Honeywell

E-Mon® Class 6000 Multiple Load Monitoring Instructions

SPECIFICATION DATA

Multiple Load Monitoring Frequently Asked Questions

Applies to Honeywell E-Mon Class 6000 with 333mV or 0-2 Volt A/C Output E-Mon Sensors Only

Question:

I have five single pole breakers in one sub-panel I would like to monitor with one meter; can I totalize the readings of all five circuits without having to parallel current sensors?

⇒ **Answer:** Yes. Simply run all the breaker wires through one set of current sensors. Make sure all A phase circuits are through the A phase sensor, and the same for B phase and C phase. The meter should be sized by the highest current being monitored by one sensor. No multiplier is required when reading the meter display.

Question:

I have two sub-panels that I would like to monitor with one meter. Different transformers in the building feed these sub- panels; can I parallel sensors & monitor both panels with one meter?

⇒ **Answer:** No. These panels cannot be monitored by one meter because they are from different power sources. When your parallel current sensors, all loads being monitored must be from the same voltage source and the same transformer.

Question:

The load I need to monitor has parallel feeds. How do I install the sensors for this application?

⇒ **Answer:** There are two ways you can monitor parallel feeds. The easiest (and preferred) way to monitor parallel feeds is to clamp the sensors around all feed wires for that phase, contact Honeywell E-Mon with the conductor size and number per phase for proper sizing of the meter.
The second way to monitor parallel feeds is to clamp the sensor around one of the feed wires. When you read the meter, the number of feed wires must multiply the final reading for each phase. Example there is six 350 MCM conductors in parallel for each phase. Clamp current sensors around one of the conductors of each phase. When you read the meter take the reading from the display and multiply by six (6) for the parallel conductors, to get the actual kWh consumption and Demand kW. Multiply the EMS/BAS pulse output (if used) also.

Paralleling of Voltage Output CTs (Current Sensors)

In order to understand the nature of paralleling voltage output CTs, it is important to understand how they function internally.
The CT is designed with a precision resistor element that converts the internal loop current (amps) into a voltage output signal. The output signal is directly proportional to the loop current, which in turn is proportional to the primary current.
For example, if we designed a CT with a turn ratio of 1000:, a primary current of 200 amps would create an internal loop current of 0.2 amps (200ma). By adding a 10 ohm resistor in series with the secondary winding, a voltage drop of 2 volts would occur at full load. Using ohm's law; 0.2 amps X 10 ohms = 2 volts. This CT would now output 2 volts.
If we paralleled two of these CTs, the effective resistance in the equivalent circuit would now be 5 ohms.

$$RT = \frac{R1 \times R2}{R1 + R2} = \frac{10 \times 10}{10 + 10} = \frac{100}{20} = 5 \text{ ohms}$$

Now, if we combine the two internal currents into this circuit, we will still have 2 volts at full load. Again, using Ohm's law; 0-4 amps x 5 ohms= 2 volts. So, we now see that with paralleled 200 amp "voltage" CTs that at 400 amps combined load the output is exactly the same as if a 400A :2V were used. Therefore, we can use this combination as if we had a 400amp meter.
So, what happens if there are "unbalanced" loads on the two circuits being monitored? Let's assume that one circuit is at 100 amps and the other at 50 amps.
The internal currents in this case are 0.1 amps and 0. 05 amps. When you look at the equivalent circuit you can readily see that they combine, creating a flow of 0.15 amps through a 5 ohm resistor Again, doing the math with Ohm's law; 0. 15 x 5 = 0.75 volts
By understanding the internal circuitry and Ohm's law, the functionality of paralleled voltage CTs is made clear. In this example, we can see that a 0.75 volt output from a 400 amp CT with a 2 volt secondary is the equivalent of 150 amps (0.75/2 x 400 =150), making this combination both functional and accurate.

- The main point in this page is that when you have 2 resistors in parallel, the value of the total resistance is one half of the value of either resistance.
- This underscores why you can't mix sensors of different secondaries (.333mV & 2V) or amperages- the resistors must be equal for the equivalent resistance to be half of either.
- The ohm value is an impedance, rather than a straight resistance due to the coil of wire in the sensor.

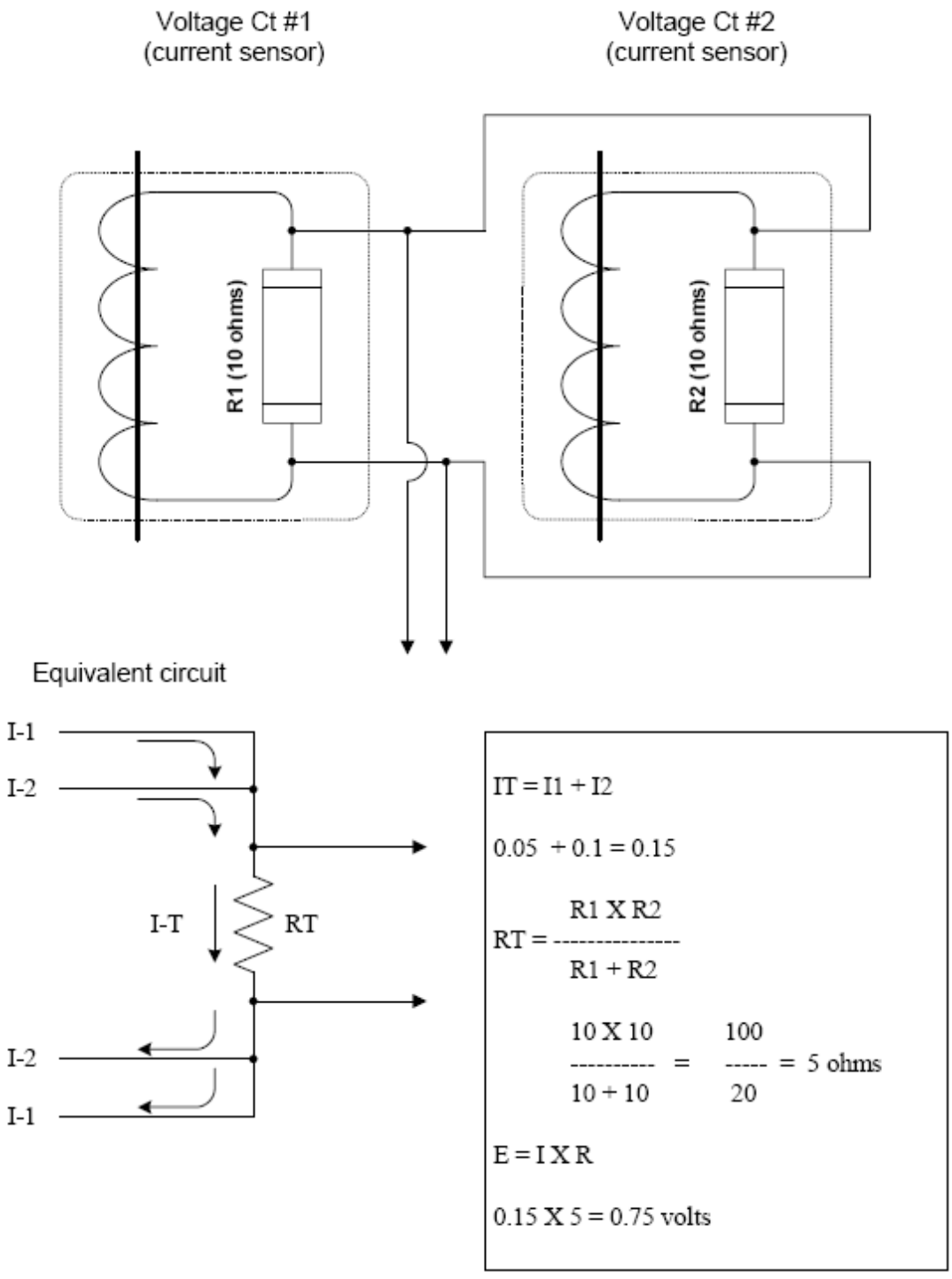

Figure 1. Typical connection drawing

Rules for Paralleling of Current Sensors

Honeywell E-Mon® meters provide extreme flexibility by allowing up to three sets of current sensors to be installed in parallel. This allows totalizing of multiple loads and reading with a single meter (cumulative reading for two or three loads.)
Following these rules will ensure that the parallel installation provides accurate information.

1. All loads monitored must be of the same voltage and from the same transformer.
    a. You cannot monitor 120/208 and 277/480 volts with the same meter.
2. When paralleling three phase loads with single-phase loads install current sensors in complete sets of three.
    b. Connect the third sensor to the meter but do not clamp around any conductor.
3. No more than three sets of current sensors may be installed in parallel.
4. All parallel current sensors must be of the same rating as the meter. The rating will be determined by the current rating of the meter. A 200-amp meter, for example, would use extra sets of 200-amp current sensors for paralleling.
5. Sensors must be the same secondary output you may not mix 2 Volt and 333 millivolt sensors.
6. Use the wiring check feature on the meter for each set of sensors before connecting them in parallel.
7. The reading on the meter display is affected by the paralleling of the current sensors. When using parallel sets of current sensors, the meter LCD display and EMS/BAS pulse output (if used) must be multiplied by the number of sets of current sensors to provide the correct reading.
    a. Note: One set is three sensors for a three-phase meter.
    b. Example: Meter with 2 sets of current sensors. multiply by 2.
    c. Example: Meter with 3 sets of current sensors. multiply by 3.

How to Size the Meter and Current Sensors when Paralleling

1. Choose the meter type required for the application (Class 6200 Pulse Meter etc.).
2. Specify the voltage of the loads being monitored. (NOTE: ALL loads being monitored by one meter must be from the same voltage source.)
3. Size the meter by the highest amperage load going through one set of sensors. This will designate the amperage of the meter, as well as all current sensors installed with this meter.

Example application: meter with Pulse output to monitor and totalize three (3) three phase breakers; amperages: 800 Amp, 600 Amp and 400 Amp Highest load being monitored by ONE set of current sensors is 800 Amps Select meter model EM3S-V-P-J with (9 pieces 800 Amp .333mV current sensors E10800 for 3 three phase loads), a multiplier of three is required when read the meter display and EMS/BMS values.

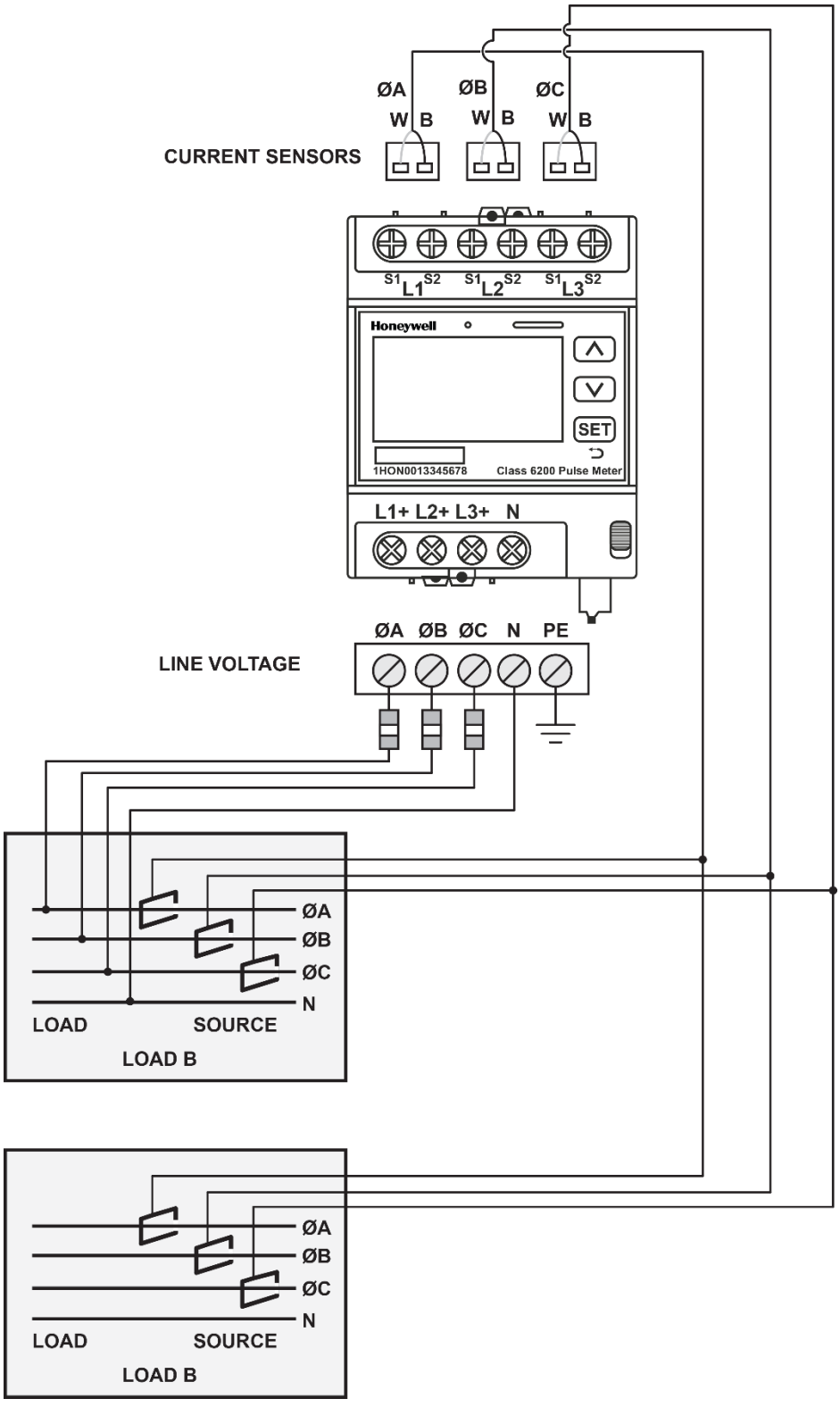

Figure 2. Typical sensor connections

Monitor (1) three phase load and (1) single phase load

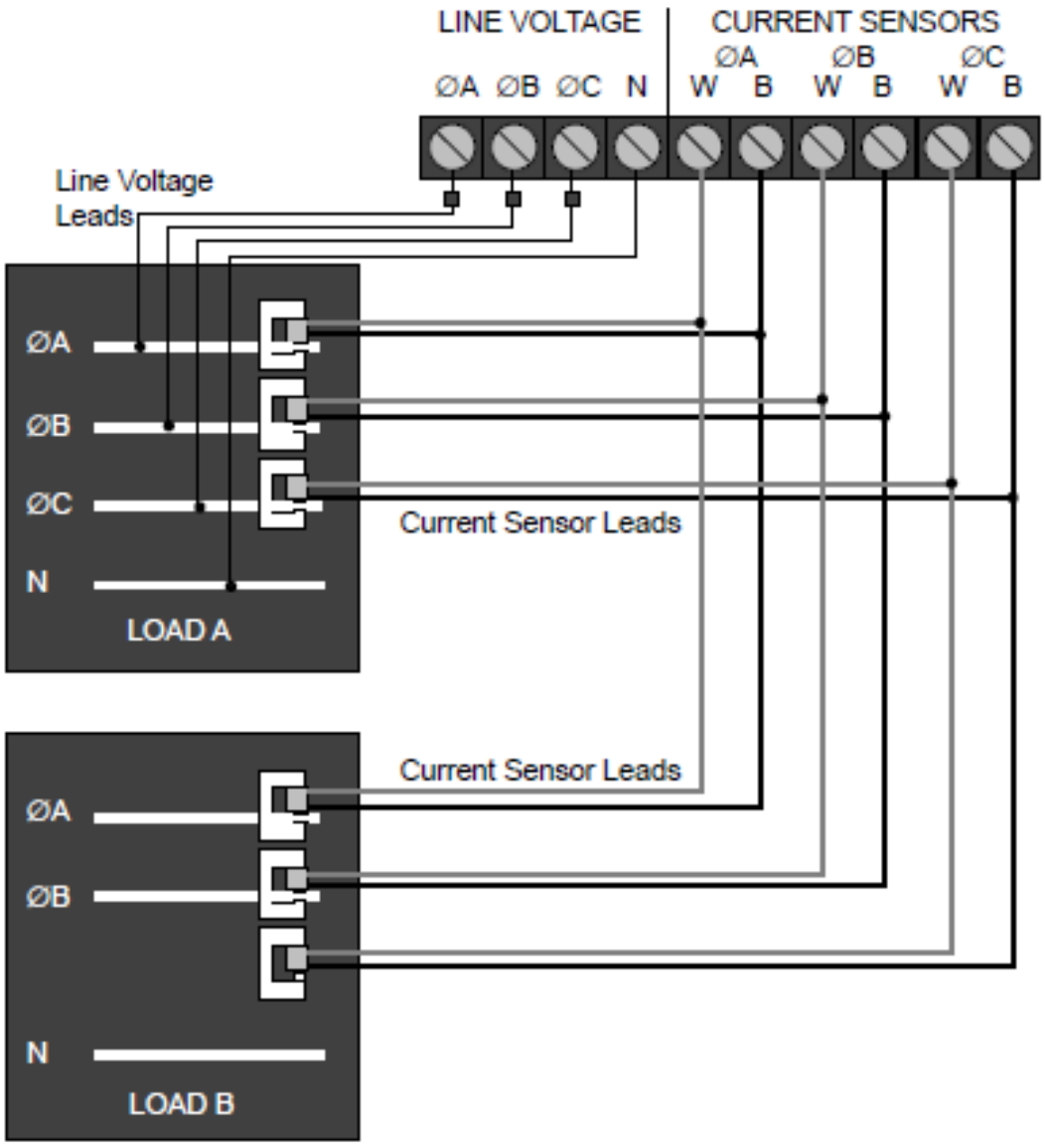

Figure 3. Typical connection for three phase and signle phase load

NOTE: *Three Phase line voltage* ***MUST*** *be provided to the E-Mon meter. When reading the E-Mon meter, be sure to multiply the meter multiplier by the number of sets of sensors in parallel (see chapter 8 for details).*

IMPORTANT: *Current sensors MUST be installed in complete sets of (3), bring the third sensor into the terminal block at the meter, but do not clamp the actual sensor assembly around any conductors or the neutral.*

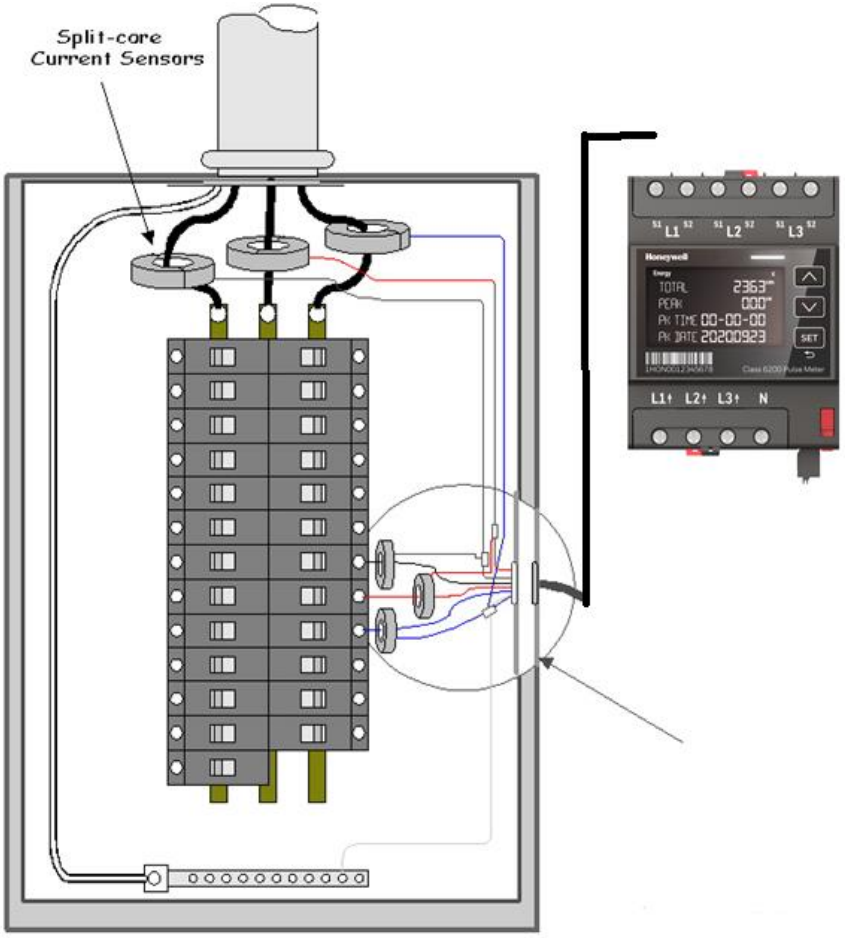

Figure 4. Split core Current Sensors connections

Subtractive Metering Rules:

- All loads monitored by one meter must be from the same voltage source (same transformer.)
- All parallel current sensors must be of the same rating (e.g., all 100 amp or all 400 amp, etc.). The rating will be determined by the current rating of the meter. A 200 amp meter, for example, would use extra sets of 200 amp current sensors for paralleling.
- The reading on the meter display is affected by the paralleling of the current sensors. When using parallel sets of current sensors, the meter, EMS/BMS and pulser (if used) must be multiplied by the number of sets of current sensors to provide the correct reading. Example: Meter with 2 sets of current sensors……multiply by 2.
- Install the set of sensors backwards (load side facing line) to deduct the circuit being subtracted.
- The circuit being deducted must be smaller than the circuit being monitored.

Home and Building Technologies

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