



## **SYMPTOM:**

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## **For a Better Understanding . . . How TED works**

- TED communicates over the existing power lines in your home using Power Line Carrier Technology. TED’s digital communication signals are imposed over a carrier frequency of 132 kHz which is transmitted during the zero-crossing of the power line 60 Hz signal.
- TED communicates this information once per second. On completion of a data transmission the LED in the MTU flashes green once to indicate that the data was successfully transmitted.
- These signals are radiated out to all of the device outlets in your home. Some go directly to the outlets on the same phase and others go out the incoming utility lines, through the windings on the utility transformer, back to your panel and then to the other outlets in your home (TED’s modem spec is 150 feet). Signals transmitted on the same phase have a much shorter path than those on the opposite phase, which need to travel via the utility transformer - which is why TED’s RDU may need to be on the same phase as the MTU.
- If you want the ability to plug TED into an ‘opposite phase’ outlet in your home, then you will need to install an active or passive phase-coupler to couple the two phases together for HF signals (a repeater won’t work). These are usually installed either in the panel or are plugged into the dryer outlet. Any phase-coupler designed for Insteon or X10 will work, as these protocols work at frequencies near to that of TED. Sources to purchase these type of devices are listed at the end of this document.
- The RDU receives the data over the powerline, checks to make sure that the House Code is correct, checks that the data received is correct, then updates the display on the RDU and flashes the LED to confirm receipt of the data. If the LED on RDU isn’t flashing, it isn’t receiving the data. If it isn’t flashing consistently at approximately once per second, then it isn’t receiving updates consistently. However, TED doesn’t need to receive every packet of data to maintain reasonable accuracy. Missing a few data packets every minute won’t degrade the accuracy by any significant amount.

**TED CONSISTS OF 3 PARTS:**

**RDU** – THIS IS THE WHITE RECEIVING DISPLAY UNIT ON YOUR COUNTER, TABLE TOP OR WALL.

**MTU** – THIS IS THE SMALL BLACK MEASURING TRANSMITTING UNIT THAT IS INSTALLED IN YOUR ELECTRICAL PANEL.

**CTs** – THESE ARE CURRENT TRANSFORMERS THAT ARE CLIPPED OVER THE INCOMING POWERLINES IN YOUR PANEL.

**SYMPTOM I: DISPLAY VALUES GO BACKWARDS WHEN I TURN ON SOME LOADS**

This is due to one of the CTs being installed in the wrong direction.

Carefully remove one of your CTs (either one) and flip it over and reconnect it.

**SYMPTOM II: DISPLAY SHOWS “KW 0.000”****STEP 1**

Is the green LED on the MTU in your panel blinking once-per-second?

Answer: YES – Go to Step 2.

Answer: No – Go to 1.1

- 1.1 Turn the circuit breaker OFF that the black wire is connected to.
- 1.2 Check that the black wire from MTU is connected to a 15 or 20 Amp circuit breaker in the panel. Pull on wire to ensure it is tightly connected.
- 1.3 Check that the white wire from MTU is connected to the neutral bus in the panel. Pull on wire to ensure that it is tightly connected.
- 1.4 Turn the circuit breaker back ON. If you have a voltmeter, check the AC voltage between the black and white wires. It should be between 110V and 130V.
- 1.5 Turn the breaker off for 10 seconds, then on again.

**Is the LED on the MTU now blinking once per second?**

Answer: No. The LED on the MTU is still not blinking.

There appears to be something wrong with the MTU. Please contact Tech Support for assistance.

Answer: Yes. The LED on the MTU is now blinking Proceed to Step 2.

**STEP 2**

**Is the LED on the RDU blinking consistently once per second?**

Answer: YES – Go to Step 3

Answer: No – Go to 2.1

- 2.1 Unplug the RDU. Wait 5 seconds and then plug it in again. Check that the LED light flashes Red, Yellow(Amber), then Green and the buzzer sounds on startup.
- 2.2 Check that the House Code is set correctly.
  - Please see the Installation and Operating Manual, Page 10 “Step 4 – Setting the House Code” for specific directions on setting up your House Code.
  - The House Code is a number between 0 and 255 and is the first three digits shown on the barcode of the MTU.
  - You can confirm that your MTU is transmitting at the correct House Code by following the steps on Page 24 of the Installation and Operating Manual - note the second screen image shown “MTU Read.”

- 2.3 To rule out that it is not an equipment problem, move the RDU from outlet-to-outlet in your home. After trying many outlets around your home, you will very likely find one outlet that the RDU receives a good signal. This is good news. The problem now becomes one of finding a circuit that the signal can travel on clearly.
- 2.4 Check that the RDU is on the same phase as the MTU. How do I do this?
- The easiest way is simply to connect the MTU to the same circuit that controls the receptacle that the RDU is plugged into.
  - It is not a requirement for the MTU to be on the same *CIRCUIT* as the RDU, but connecting them on the same *CIRCUIT* will let you know that they are on the same *PHASE*.
  - Determine which circuit controls the RDU receptacle by referring to the written or typed panel schedule and confirm by turning the circuit breaker on and off.
  - If you can't put the MTU on this circuit, then connect it to a 15 or 20 Amp circuit breaker on the same phase.
  - Refer to the Installation and Operations Manual (page 26, Sect. 5) for specific instructions and diagrams that show how to determine this.

**Is the LED on the RDU now blinking consistently once per second?**

**Answer: YES – Go to Step 3**

**Answer: No – Go to 2.5**

- 2.5 You most likely have a communication problem which can be caused by any one or all of the following:
- Faulty wiring causing large resistance in the power lines between the RDU and MTU. This problem is frequent in older homes, homes with aluminum wiring and homes where the wiring path from the MTU to the RDU is long (the modem spec is 150 feet).
  - Noise on the power line. Today's homes usually contain numerous devices capable of inducing noise on the power line. These might include older fluorescent light ballasts, halogen lights, or unfiltered dimmer switches; power supplies for fax machines, laptops, or printers. You may also receive noise on your incoming power line from your utility.
  - Devices on the power line that absorb communication signals. These include surge-protecting plug strips, TVSS devices, power factor correction capacitors, and power supplies containing large capacitors.

**Is LED on RDU now blinking consistently once per second?**

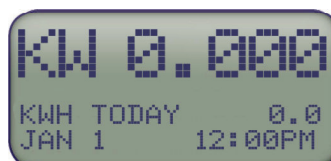
**Answer: YES – Go to Step 3**

**Answer: No – Please contact Tech Support for assistance.**

**STEP 3**

**Both LED's are blinking consistently once per second, but the KW display is still reading "KW 0.000" even though there is some load.**

- 3.1 Make sure you are reading the KW Display and not the \$ Display. KW Display is shown below. The large numbers on Line 1 are what we are talking about. Are they all zeroes?



### 3.2 Check that the CT's are correctly installed.

- Check that they are over the two power wires (black or colored wires, not the white, green or bare wire). See the Installation and Operations Manual, (Page 27, Section 7) for further description.
- Check that the jaws of the CT's are firmly closed and mated.
- Check that the CT's to MTU connector is correctly seated and that none of the pins are bent.
- Check that both RED DOTS on the CT's are either facing both towards the main circuit breaker or both away from the main circuit breaker. Turn on a 120V device (light, microwave, TV, etc.) and the display should increase by the appropriate amount. (Ex. If your microwave is rated 1200 watts, then turning it on should increase the display by approximately 1.200 KW. Now try the same thing with a large 240V loads such as an oven or dryer. The display should go up by a large amount between 3.000 and 8.000 kW depending on the rating of the appliance. If it doesn't go up at all, or if it only goes up a small amount, then you need to reverse one of the CT's (only one, not both – and it doesn't matter which you choose). Reverse them and then try this experiment again.
- If you have a voltmeter you can check to see if the voltage across CT pins 1 and 2 is somewhere between 0 and 6 Volts AC. When the current through both CTs is 200 Amps then the voltage will be 6VAC. For 100 Amps it will be 3 VAC, etc.

#### **Is the Display now reading correctly?**

**Answer: Yes – OK. TED should now be operating correctly.**

**Answer: No. It is no longer all zeros, but the values are incorrect. Go to Step 4.**

**Answer: No. It is still all zeros – Please contact Tech Support for assistance**

## **STEP 4**

### **KW Display on the RDU is incorrect or seems inaccurate.**

4.1 Check the readings with a clip-on ammeter/multi meter if possible. Turn off any large inductive loads (motors, compressors, HVAC, etc.) Turn on some large resistive loads (electric heat, hot water heater, oven, clothes dryer). Measure the current in both phases and the voltage from phase to neutral. (From one of the phases to the neutral bus). The calculation is as follows:  $KW = (I1 + I2) * V / 1000$ . For example, if the ammeter reads 10 Amps in Phase A and 20 Amps in Phase B and the voltage between Phase A and neutral is 120V. The calculation would be:

$$KW = (10 + 20) * 120 / 1000 = 3.6 \text{ kW}$$

“KW 3.600” should be displayed on the RDU.

#### **Is the Display now reading correctly?**

**Answer: Yes – TED should now be operating correctly.**

**Answer: No. The values are still incorrect.**

4.2 If the KW reading seems to be constantly low or high by a small amount, you can set a calibration factor in TED up to  $\pm 10\%$ ; but unless you have very sophisticated metering equipment that will accurately measure real power, it is likely that the KW display on TED is more accurate than you can measure. Over a few weeks, compare the Total kWh used MTD against your utility meter. If it is consistently high or low after a few weeks, then you can have your utility check their meter or you can adjust the calibration on TED. See Page 24 of the Installation and Operation Manual, and in particular, Screen 4 for setting calibration adjustment.

## SYMPTOM III DISPLAY ONLY WORKS IN SOME OUTLETS

As you have read, the data-signal of TED travels over the existing wiring in your home. It is not a radio signal.

The symptom you are seeing could be due to one, or a combination, of the following:

- a) The MTU and RDU are on opposite phases of electricity (see Section 2.4 of this Troubleshooting Guide)
- b) There is an electrical device within your home that is backfeeding electrical ‘noise’ onto the powerlines that is killing the signal (see Section 2.4 of this Troubleshooting Guide for further info)
- c) You have the RDU plugged into a power strip. (If so, remove and plug into a *standard* wall receptacle).

## SYMPTOM IV DISPLAY LED DOES NOT BLINK CONSISTENTLY

This is generally the result of some electrical device(s) in the home that is creating ‘noise’ on the powerlines that is interfering with the data signal.

See Section 2.3 on Page 3 of this Troubleshooting Guide for some tips find a cure.

## SYMPTOM V I HAVE A MODEL 1002 AND HAVE COMMUNICATION PROBLEMS

The Model 1002 is sometimes more difficult to set up than the Model 1001 because there are 2 data-signals needing to sync up. If your electrical panels are side-by-side, you may find that the absolute best situation is to connect the black wire of *BOTH* MTUs to the same breaker (the data-signal travels through the black wire of the MTU), thus putting the data-signal on the same circuit so the signals travel the same path.

In the event your electrical panels are separated by a distance that will not allow you to connect both MTU leads to the same breaker, set up ONE MTU and get it communicating with the RDU correctly. If you have issues doing this, you may find the troubleshooting suggestions in prior sections helpful.

Once you have one MTU (we’ll call it MTU-A) communicating reliably, turn the breaker OFF for MTU-A, and connect MTU-B in the 2nd panel. Go through the same setup procedures you did with MTU-A to establish communication. Once you have communication with MTU-B reliable, turn the breaker on for MTU-A. You must now tell the RDU that you now have two MTUs to receive, so go through the House Code setup procedure and change the number of House Codes to two.

If you continue to have an issue, please contact tech support for assistance.

## MISCELLANEOUS ISSUES

**A) I would like to manually reset my monthly totals.** (Note: TED automatically resets the totals at midnight on the Meter Read Date every month)

See the Installation and Operation Manual (Page 24, in particular, Screen 5).

**B) I would like to reset all my settings to the factory defaults and start over.**

See the Installation and Operation Manual (Page 24, in particular, Screen 6)

**C) Can I connect my computer to the USB port on the side of the RDU?**

It is a dataport that is only operational if you have purchased Footprints data-logging software.