

**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: Display on the RDU 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, then Green and the buzzer sounds on startup.
- 2.2 Check that the House Code is set correctly.
  - Please see Page 10 of the Instruction Manual “*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 on the serial number of the MTU.
  - You can confirm that your MTU is transmitting at the correct House Code by following the steps in **Attachment A** – particularly Screen 2.
- 2.3 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.
  - 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 Appendix A of Installation and Operations Manual for specific instructions and diagrams that show how to determine this.

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

**Answer: YES** – Go to Step 3

**Answer: No** – Go to 2.4

2.4 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.
- Noise on the power line. Today's homes usually contain numerous devices capable of inducing noise on the power line. These include fluorescent lights and ballasts, halogen lights and power supplies, unfiltered dimmer switches, fan speed controls, A/C – D/C power supplies for fax machines, computers, televisions, printers, WiFi devices and numerous other electronic products. You can also receive noise on your incoming power line from your utility.
- Devices on the power line that absorb communication signals. These include filtered plug strips, TVSS devices, power factor correction capacitors, and power supplies containing large capacitors.

Go to Attachment B for tips on trouble shooting **Communication Problems**. Follow those steps, then return to this point.

**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 Appendix A of the **Installation and Operations Manual**.
- 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.

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- 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. Turn off any large inductive loads (motors, compressors, AC, etc.) Turn on some large resistive loads (electric heat, hot water tank, 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:

$$KW = (10 + 20) * 120/1000 = 3.6 kW$$

“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 **Appendix A** – in particular Screen 3 for setting calibration adjustment.

## 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 **Appendix A** – in particular, Screen 4.
- B)** I would like to reset all my settings to the factory defaults and start over.
- See **Appendix A** – in particular, Screen 5.
- C)** I see a black plug on the side of the RDU.
- Can I plug a telephone into this? NO.
  - Can I connect my computer to this? Not at this time, but we will be releasing hardware and software options that will allow you to do this in the near future. Check our website – “Products” tab often.

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## ATTACHMENT A

TECH ONLY  
CHANGES ARE  
PERMANENT

MODE

MTU READ  
000

MODE

1.000  
ENTER KW ADJUST  
(0.900 - 1.100)

MODE

N  
RESET ALL TOTALS  
TO ZERO

MODE

N  
RESET VALUES TO  
FACTORY SETTINGS

MODE

N  
LOAD FIRMWARE  
-PLS READ MANUAL

In order to access the following screens, hold down the 3 buttons on the left side of the display (\$ ▶ ▲ ) simultaneously for 3 seconds. Altering these screens can have a dramatic affect on TED. Be certain you fully understand the consequences.

Holding the MODE key down for 3 seconds will take you out of this section.

### Screen 2

The numbers represented by "000" will be the **House Code** your TED Display is picking up. If you are only confirming your House Code, hold the MODE key down for 3 seconds to take you out of the 'TECH ONLY' section.

### Screen 3

If you wish to calibrate TED to match your utility electricity meter, you may adjust this number accordingly. Change this **ONLY** after comparing TED with your utility meter for at least 3-4 weeks. For example, if you find that TED is reading 1.7% higher than your utility meter, adjust the 1.000 by 1.7%

### Screen 4

Change the 'N' to 'Y' if you would like to change all of your totals to zero. **NOTE:** This will zero **ALL** accumulated data totals. You can not specify which totals to zero out. It does not affect your Setup Data (Time, Date, etc.) Once you have pressed the MODE key, TED takes approximately 1 minute to execute.

### Screen 5

Change the 'N' to 'Y' will zero *all data* in TED. TED will appear to be brand new. The only remaining info will be the House Code.

### Screen 6

Change the 'N' to 'Y' to activate your PC interface. **NOTE: ONLY do this if you have the TED CD with Cable.**

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## ATTACHMENT B OVERCOMING COMMUNICATION ISSUES

**Communication Problems are usually caused by one or more 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.
- Noise on the power line. Today's homes usually contain numerous devices capable of inducing noise on the power line. These include fluorescent lights and ballasts, halogen lights and power supplies, unfiltered dimmer switches and fan speed controls, A/C–D/C power supplies for fax machines, computers, televisions, printers, WiFi devices and numerous other electronic products. You can also receive noise on your incoming power line from your utility.
- Devices on the power line that absorb communication signals. These include filtered plug strips, TVSS devices, power factor correction capacitors and power supplies containing large capacitors.

### 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 approximately 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. 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 needs 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 is listed at the end of this attachment.
- 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 very much.

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## ATTACHMENT B

### OVERCOMING COMMUNICATION ISSUES (continued)

#### STEP 1

##### ISOLATE THE CAUSE(S)

- 1.1 Turn off all the circuit breakers in the house except the one controlling the RDU, and if necessary, turn off and unplug everything on the RDU circuit.
- 1.2 If the LED on the MTU is flashing, the House Code is set correctly, and the RDU is on the correct phase you should see the LED flashing consistently on the RDU. If not, try moving the RDU to an outlet that is closer to the MTU until it starts to flash. Check that the KW power and voltage being received are correct. OK, now we have established communication, but now need to determine the cause of signal loss.

##### Is the LED flashing consistently?

**Answer: YES** – Go to Step 2.

**Answer: No** – You must have TVSS or power factor correction capacitors that are absorbing the signal on the incoming power lines, or are receiving excessive noise via the incoming power lines. This is difficult to fix. There are in-line filters designed to keep noise out and to stop your signals from escaping or going to your neighbor's house. Unfortunately, they are fairly expensive and difficult to install. See list of suppliers s at the end of this attachment.

#### STEP 2

##### Determine what is causing the communication inconsistencies

- 2.1 Move the RDU back to where you would like it to be. Don't plug it into a GFI outlet or a plug strip as these can ground out the signal. If only TED is operating on the line and you still lose communication completely or it becomes very erratic, you need to look at the wiring between the MTU and the RDU. If it very old or aluminum, there is a good possibility that there is a lot of corrosion in the joints in the wiring between the two, which can be corrected by cleaning and remaking the joints. (If aluminum wire, be sure to follow procedures recommended by the wire manufacturer).
- 2.2 Turn on the devices that are on the same circuit as the RDU and see if any of them cause the communication to become inconsistent. Some may cause a problem when on, others just by being plugged in.
- 2.3 Begin turning on circuit breakers one at a time and note any that cause a problem, then try to determine what on that circuit is the problem.
- 2.4 You can also use a portable AM radio to discover sources of noise. Take the radio outside away from any possible interference. Tune it to the lowest frequency you can, approximately 550 kHz, where there isn't a radio station. Turn up the volume until you just hear a little bit of noise. Now go inside and use it to sniff out sources of noise. You will hear a hiss when you get near devices that are causing noise that will interfere with TED. The radio is tuned to 530 kHz whereas TED works on 132 kHz but it is close enough and.

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## ATTACHMENT B

### OVERCOMING COMMUNICATION ISSUES (continued)

- 2.5 So now you know which items are causing interference with the TED signal. If it is a baby monitor and your kids are in high school, then you can probably just leave it unplugged, but if it is your TV and it is Super Bowl Sunday, this may not be an acceptable solution. You can try putting the offending device on a circuit that is on the opposite phase from TED. This usually works; or again, there are devices made that will isolate your TV, computer or Fax machine from the power lines and allow it to operate without putting noise on the power line. See below.

#### How is the communication now?

**Answer:** RDU blinks consistently – Good - you solved the problem!

**Answer:** RDU blinks but misses a beat now and again – You will likely find that TED will work just fine and give you accurate readings.

**Answer:** RDU blinks very inconsistently. TED will continue to work but accuracy may be degraded. Try it and see.

**Answer:** RDU does not blink at all, or only once or twice every 5-10 minutes. You will probably find that TED accuracy will be so degraded that you will not be happy with the product. We want you to be happy with TED, so please call Tech Support.

### Sources for RF Communication Devices

**Radio Shack** – Your local dealer can help.

**Smart Home** – (800) 762-7846 [www.smarthome.com](http://www.smarthome.com)

**X-10 Corp.** – (800) 675-3044 [www.x10.com](http://www.x10.com)

**Energy, Inc.**  
**44-G Markfield Drive**  
**Charleston, SC 29407**  
**(843) 766-9800**  
**(800) 959-5833**  
**[info@theenergydetective.com](mailto:info@theenergydetective.com)**