



Interruptible Service Program

Remote Terminal Unit Type C & D User Guide



Thank you for your participation in Southern California Edison's Base Interruptible Program. Since 1978, customers like you have helped SCE meet the energy demands of our communities. In return for your participation, you will receive a reduction in your monthly bill, and help save energy and the environment.

This guide provides instructions for installation of the required hardware necessary to participate in the program, and provides information on what you can expect as a participant of this program.

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About the Program

The I-6 and TOU-BIP interruptible programs are designed for customers who can reduce at least 15% and a minimum of 100 kW of their maximum energy demand when an interruption is called. Upon signing up for the program, customers are asked to select a Firm Service Level (FSL), which is the amount of electricity a customer determines is necessary to meet their operational requirements during an interruption. Customers are also required to choose whether they would like to reduce load within 15 or 30 minutes of a notice of interruption being sent to their RTU and dedicated phone line, with additional credits offered if the 15-minute option is selected.

In exchange for agreeing to reduce electrical usage to their designated FSL within the elected time period, SCE provides participating customers with a bill credit based on the difference between the customer's monthly average peak period demand and the customer's FSL.

The interruptible load program works by recording the amount of load shed by customers when an event is called through the notification system. The notification system is comprised of:

- a Remote Terminal Unit (RTU) located on your premises
- a dedicated telephone line
- courtesy notification sent to additional phones, email, fax, and/or alphanumeric pagers
- the SCE radio network and the computers at SCE's Grid Control Center.

When SCE implements its interruptible program, a signal will be sent from SCE's Grid Control Center through the telephone line, RF transmission, or wireless modem, directly to the Customer's Remote Terminal Unit (RTU). The RTU is the device that alerts customers of an interruption's initiation and conclusion. Installation instructions for the RTU are included in this guide.

When SCE sends notification of an interruption to a customer, the customer is required to reduce their electrical usage to their specified FSL within 15 or 30 minutes (depending on the pre-selected option) of the notification being sent. If the customer fails to comply, they are assessed a penalty, as listed in the rate schedule.

About the Equipment

RTU DESIGN AND OPERATION

There are two types of RTUs used in the Interruptible Service Program: Type C and Type D (see *Figure 7: External View of the RTU and Cabinet*). The devices are very similar in terms of their functionality; both are equipped with audible alarms and lights that activate when an interruption begins or ends, both have relays you may use to control supplemental annunciator and systems designed to automatically reduce your electricity consumption, and both are furnished with dedicated batteries to keep the units operating during power outages. However, the two differ in that the RTU-C receives signals through a land-line phone connection, while the RTU-D is designed to send and receive information via wireless modem connection.

RTU SPECS AND PLACEMENT

- The cabinet dimensions are 30" high, 24" wide, and 12" deep (see "Appendix A: RTU Specifications" for additional specification details).
- The cabinet must be securely mounted vertically on a wall or similar structure, and must be accessible to SCE for maintenance. If you will not be connecting a supplemental annunciator system to the RTU, locate the RTU where someone will always be able to see it and hear the audible alarm.
- The RTU cannot be more than 1,500 feet from the interface box, which SCE installs at your metering panel location. Please note that there cannot be any insurmountable obstacles between the RTU and the interface box that will prohibit the connection to the meter.
- The RTU cabinet is not dust-proof or water-proof, so it must be located in an enclosed space that is clean and dry. An air conditioned environment is preferred, but not required.

- If the RTU is installed outdoors, it must be installed in a National Electrical Manufacturers Association (NEMA)-approved weatherproof enclosure, with SCE's approval. The enclosure and cabinet installation are paid by you, the customer.
- For the RTU-D, the cabinet must be placed in a location that has clear cellular reception.

RTU POWER SUPPLY

Use a 120 AC power source that is grounded to the RTU cabinet (see *Figure 1: 120 AC Power Source*).

The RTU must be energized at all times, even during an interruption. This means that you are required to connect it to a source of power that is isolated from the electric load that you will reduce during an interruption.

Figure 1: 120 AC Power Source



Installation Instructions and Recommended Hardware

SCE will conduct an initial site visit to identify the best location for the RTU, deliver the RTU, and determine the approximate length of cable and conduit you will need to make connections from the meter panel to the RTU. Following the initial site visit, SCE will deliver the cable for the connection between the RTU and the meter; you are responsible for installing the cable and supplying and installing the conduit (see “Metering Conduit” below). Customers are required to:

- install the RTU cabinet in the location specified by SCE,
- run the cable and conduit from the RTU cabinet to the metering panel, leaving approximately two feet of additional cable and conduit on each end,
- and providing a power source that will continue to provide power during a BIP event.

Once you fulfill your installation obligations, SCE will make final connections to both ends of the cable and conduit and conduct a test.

METERING CONDUIT

Once we have determined where the RTU cabinet will be installed in relation to the meter, then SCE can install the transducer interface box on the meter panel. You are responsible for installing the conduit from the meter panel to the location of the RTU box. You do not

need to connect the cable to the RTU; SCE will make final connections for you. Refer to *Table 1: Types of Conduit Required for Installation* to identify the type of conduit required for your installation.

METERING CABLE

SCE may provide you with 6-pair metering cable when it is required for your RTU. After you have installed the metering conduit, run the cable through the conduit. Leave approximately 5 feet of cable rolled up inside the RTU, and 2 feet inside the interface box. Once you have installed the cable and conduit, SCE will make the cable connections at the RTU and the interface box.

If you wish to use your own cable instead of the cable provided by SCE, you must first receive SCE’s approval. The cable you use must conform to the following specifications:

- 18 or 19 AWG
- 6-pair twisted/stranded (can not exceed 1,500 feet)
- Shielded

The following cables work well in this application:

- Belcon #9774
- Manhattan #M-13176

Table 1: Types of Conduit Required for Installation

Location of Conduit	Type of Conduit Required
Any portion of conduit exposed to weather or installed underground	Steel
Any portion of conduit exposed to weather or installed underground	Electrical Metallic Tubing
Conduit attached to or crossing substation fence	PVC

Supplemental Notification and Automatic Load Shedding Systems

OUTPUT RELAYS

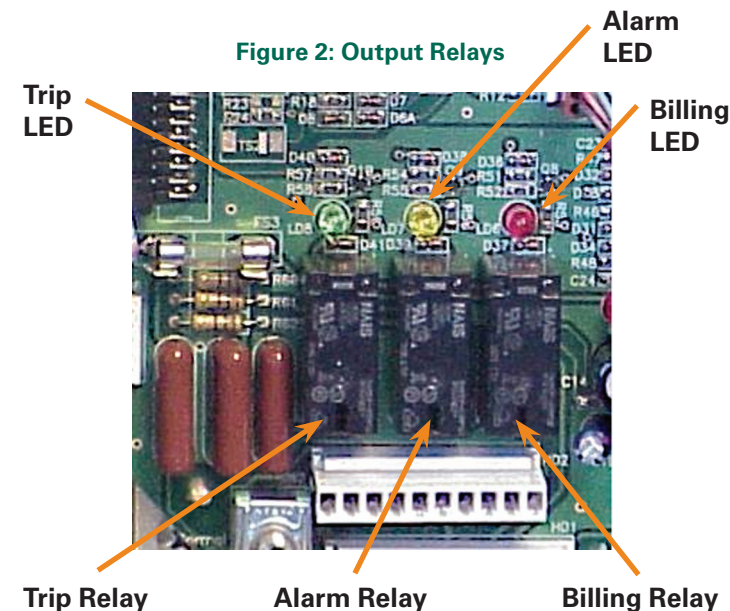
The RTUs are equipped with three relays which are used to provide external control signals from the RTU.

The alarm relay is energized prior to the actual load interruption. The alarm relay warns you that the load is about to be interrupted and also allows you to connect a supplemental annunciator to the RTU.

The trip relay is energized during the period of load interruption and is used to indicate when the load is to be interrupted. The trip relay enables you to employ equipment that will automatically reduce electric load to your FSL when your RTU is activated.

The billing relay is used to provide a pulse marker, which is used to record, on a billing meter, the interval of the interruption. The billing relay cycles at a rate of one second ON and one second OFF during the interruption period. The cycling of the billing starts when the contractual time period starts. Please note that the billing relay is for SCE use only and customer use is prohibited.

All three relays are driven from the distribution board and are under the control of the microcomputer. Each relay has an LED indicator located on the distribution board, which lights when its relay is energized. All three relays resume their normal state at the end of the interruption period.



Bypass Switch

The RTU is also equipped with a Bypass Switch which is used to hold the relay outputs in the NORMAL state when the relays are energized. The Bypass Switch provides a means for which SCE can service the RTU, such as testing the RTU load interruption capability, without disturbing the control circuits connected to the alarm, trip, or billing relay contact output circuits. Please note that the Bypass Switch is for SCE use only and customer use is prohibited.

The unit also includes test points located below the Output Relays. The Test Points are as follows:

SW2	HD2 Test Points
Bypass/Normal	10 - N/O TRIP
	9 - COM. TRIP
	8 - N/O ALARM
	7 - COM. ALARM
	6 - N/C ALARM
	5 - COM. ALARM
4 - N/O TRIP	
3 - COM. TRIP	
2 - N/C ALARM	
1 - COM. ALARM	

At the start and end of the interruption, Switch S1 will silence the supplemental alarm. Switch S2 allows you to manually bypass your automatic load shed system. The time clock can be programmed to bypass an automatic system during monthly RTU tests.

Note: Never change the position of the Bypass Switch when a relay is energized and that relay’s contact output circuit is loaded.

INSTALLING SUPPLEMENTAL NOTIFICATION SYSTEMS

If you would like the interruption alarm to also be heard at a location some distance away from the RTU, you can connect a supplemental annunciation device to the RTU's alarm relay.

Regardless of whether you have a Type C or Type D RTU, you may connect it to your own supplemental computerized notification system, such as a telephone paging system, or an alarm that sounds throughout your plant. Once the RTU receives the interruption signal, it will then immediately transmit it to your supplemental system.

The alarm relay is a form "C" dry contact, rated 5 amps, 120 volts. Refer to *Figure 2: Output Relays* to identify which terminal block locations you should use to connect your supplemental notification device.

It is important to note that the RTU's backup batteries will not power any added notification systems. Please ensure that your supplemental notification devices are connected to their own backup power systems so that they will operate during a power outage. SCE is not responsible for the maintenance or operation of notification systems that you connect to the RTU.

INSTALLING AUTOMATIC LOAD SHEDDING SYSTEMS

If during an interruption, you would like your electric load to be reduced without any deliberate operator action, you may connect automatic load shed controls to the RTU's trip relay.

The trip relay on the RTU activates 15 or 30 minutes (depending on your pre-selected option) after the interruption signal reaches the RTU, to take full advantage of the 15 or 30 minute grace period provided before penalty rates go into effect.

Remember that an automatic load shed system will also drop your kilowatt usage during SCE's monthly communication tests, which occur between 8 am and 12 noon on the first Tuesday of each month. Many customers choose to install time clocks or other bypass mechanisms to prevent automatic load shed during tests. Please remember to change your time clock when daylight savings time begins and ends. It is the customer's responsibility to ensure that bypass mechanisms do not prevent load shedding once the test period has ended.

The trip relay is a form "A" dry contact, normally open, and rated 5 amps, 120 volts. Refer to *Figure 2: Output Relays* to identify which terminal block locations you should use to connect your automatic systems.

Contact Us

If, after reading this booklet, you have any questions about the notification system, please call SCE at **(800) 990-7788**.

If you have RTU system maintenance concerns, please call **(866) 211-3542**. To check your interruptible program status, please call **(888) 334-7764**. For current Interruptible Program status and general information on the Interruptible Program, visit us online at www.sce.com/i-6.

Commonly Asked Questions

- What do I need to know before installation?
- What if I have Multiple Meters?
- How many telephone lines will I need to install?
- How will I be notified of an event?
- When can an event be called?
- What happens during an interruption?
- What information is processed and recorded during an event?
- What if I want to move or relocate the RTU?
- What about RTU Maintenance?
- How does SCE know that my system is working properly?

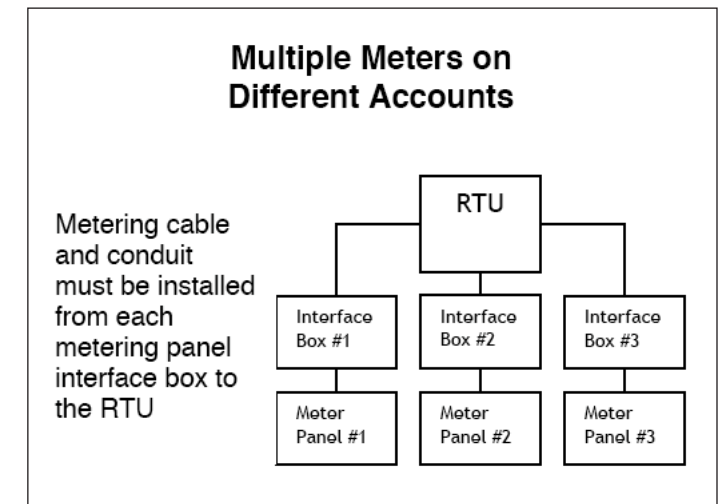
What do I need to know before installation?

When you join the interruptible service program, you receive an RTU from SCE. Before SCE can deliver the RTU to your location, an initial site visit will be scheduled with you and representatives from SCE to identify the best location for the RTU placement and determine the approximate length of cable required. The RTU will be delivered to you during the initial site visit, or soon after. You must install the RTU in accordance with the specifications provided to you by SCE. SCE will deliver the cable to your location after the initial site visit. Once you have installed the RTU cabinet, SCE will perform another inspection to verify that the RTU has been installed properly, and will make final connections.

What if I have Multiple Meters?

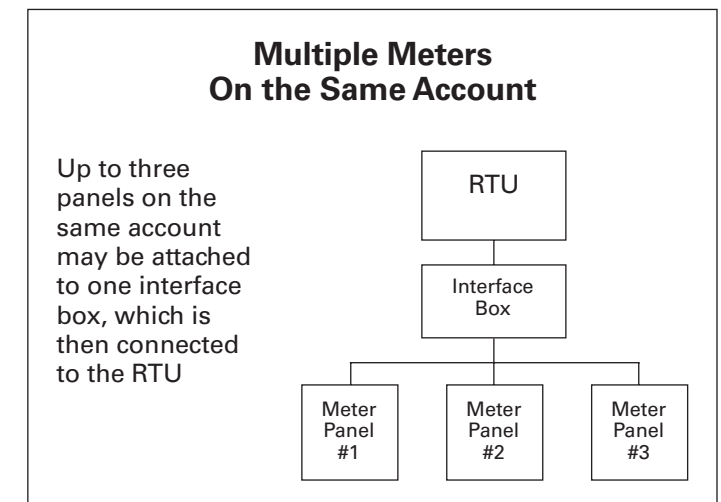
If your interruptible load is served by multiple meters, and each meter is on a different account, SCE will have to install an interface box for each metering panel. Based on the number of service accounts you have and the number of demand response programs you are participating in, you may require multiple RTUs. SCE will determine how many RTUs are required for your configuration. You will need to provide metering cable and conduit from each interface box to each RTU. This connection scheme is shown in *Figure 3: Multiple Meters on Different Accounts*.

Figure 3: Multiple Meters on Different Accounts



If your interruptible load is served by multiple meters, and they are on the same account, you may be able to use only one interface box for up to three metering panels, as shown in *Figure 4: Multiple Meters on the Same Account*. You then have to provide metering cable and conduit from the interface box to the RTU.

Figure 4: Multiple Meters on the Same Account



How many telephone lines will I need to install?

If you are operating an RTU-C:

You must provide up to two dedicated telephone lines to the Interruptible Service Program. One line may be wired directly to the RTU. SCE will inform you if a second telephone line will be required during their initial Site Visit. If the location where the RTU will be installed is in an area that does not receive the cellular signal to activate the RTU, you will be required to install a second telephone line. The second line is connected to a dedicated telephone, which SCE will use to contact you. These phone lines must conform to the following specifications:

RTU Phone line

- Private, dedicated, unpublished number
- Direct line, not routed through a switchboard operator
- Touch-tone line, voice grade dial up
- Terminates at an RJ11 jack inside the RTU enclosure
- Shielded cable or line run through conduit.

Dedicated Phone line

- Private, dedicated, unpublished phone number
- No dial-out capabilities
- Used only to receive calls from SCE
- Will be used in conjunction with the RTU
- Touch-tone line
- Located conveniently so that calls must be readily heard and answered at all times.

Once installed, SCE will ensure a proper connection is established and will test the signal. SCE personnel will periodically call your dedicated telephone to ensure that it is operational and attended.

Customers on SCE's I-6 and TOU-BIP rate schedule will be notified via both the RTU and dedicated phone.

If you are operating an RTU-D:

You must provide one dedicated telephone line to the Interruptible Service Program that connects you to a dedicated telephone, which SCE will use to contact you. This phone line must conform to the following specifications:

- Private, dedicated, unpublished phone number
- No dial-out capabilities
- Used only to receive calls from SCE
- Will be used in conjunction with the RTU
- Touch-tone line
- Located conveniently so that calls must be readily heard and answered at all times.

Once installed, SCE will make sure a proper connection is established and will test the signal. SCE personnel will periodically call your dedicated telephone to ensure that it is operational and attended.

Note: The dedicated phone will also be tested on the first Tuesday of each month.

How will I be notified of an event?

Customers on SCE's I-6 and BIP rate schedules will be notified via both the RTU and dedicated phone.

Note: Customers will be notified via an automated notification system when they are required to interrupt and when the interruption is over. Customer must know what block they are on.

When can an event be called?

The responsibility for operation of the electric system was transferred from California Investor-owned utilities (e.g. SCE) to the California Independent System Operator (CAISO), effective March 31, 1998. As part of that transfer, the CAISO now determines when interruptible customers will be asked to reduce electricity consumption.

CAISO or SCE may initiate an interruption at any time: business hours, non-business hours, and even during a power outage. The RTU is equipped with backup batteries designed to keep it fully functional for up to eight hours even during a power outage. Please note, however, that the backup batteries will not power any supplemental alarms you may have connected to your RTU.

If an interruption is called at a time when your site is without power, you should take necessary steps to ensure that once power is restored, you will not be drawing more electrical load than your FSL.

What happens during an interruption?

Once your RTU receives the signal from SCE, the following events will occur:

- The RTU's audible alarm will emit a high-pitched, steady beep.
- The upper line of the alpha-numeric display will change from continuously showing the kilowatt load to alternating between the kilowatt load and the words "Start Load Interrupt—You must reduce your load to firm service level to comply with the Interruption Tariff". Please note that the kilowatt display is only accurate to within approximately $\pm 10\%$.
- The lower line of the display, labeled "Start Load Interrupt Time ___ Min" will begin counting down from 15 or 30 minutes, depending on your pre-selected option.
- The alarm relay contacts are activated (See the section, "Supplemental Notification and Automatic Load Shedding Systems" for more information on these features).

Next, the customer must acknowledge the signal/silence the alarm

As the labels imply, pressing the acknowledge/alarm silence button will do the following:

- Silence the audible alarm
- Record an acknowledgment signal in the RTU's memory. SCE can access this information remotely to determine whether or not anyone at your site acknowledged the interruption.

Note: Pressing the acknowledge/alarm silence button is an optional step. Not pressing it will not excuse you from your obligation to reduce electric load.

You then have either 15 minutes or 30 minutes (depending on your pre-selected option) to reduce your electricity demand to your firm service level, or pay a penalty. In the event that your RTU is non-operational due to maintenance or is experiencing a problem during event activation, you will be notified via the dedicated telephone line. SCE may also activate an emergency event via both the RTU and dedicated phone at the same time to provide for an additional level of customer communication support during an emergency.

The Interruption and Penalty Period Begins, Trip Relay Closes

The interruption signal is transmitted from the RTU to the data recorder, which records the time that the signal was received.

- The upper line of the alpha-numeric display will show the kilowatt load being drawn, and the lower line will display the word "START". If you have not reduced electric demand to your firm service level by the time this light goes on, any electric load drawn in excess of your firm service level will then be billed at the penalty rate until the interruption's conclusion.
- The trip relay contacts will close. (See the section titled "Supplemental Notification and Automatic Load Shedding Systems" for more information).
- A measurement of the electric load you are using is transmitted to the data recorder and RTU through a transducer and your electric load is displayed on your RTU. During an interruption, your electric load measurement is stored on the data recorder every few seconds.

The Interruption Ends

When the period of interruption has concluded, the following will occur:

- The audible alarm will again sound. (If you do not silence it after the interruption begins, it will continue to sound.)
- The upper line of the display will show the current kilowatt load and the lower line will show the words "END OF INTERRUPTION".
- The trip and alarm relay contacts will return to their normal state.
- After an interruption, SCE reviews the information stored on the data recorder to verify that you reduced your electricity consumption to your firm service level within the 15 or 30 minutes of signal receipt (depending on your pre-selected option).

When the interruption period is over, you are no longer required to keep power consumption at or below your firm service level.

Note: Some customers may not be able to resume usage at their previous level if they are participating in another DR program that is currently having an event.

Ten minutes after the RTU receives its end-of-interruption signal, the words "END OF INTERRUPTION" will be replaced by a blank display on the upper line of the display panel. The lower line will continue to show the kilowatt hour being drawn.

What information is processed and recorded during an event?

When a Request-to-Interrupt is received by the RTU, the first piece of information that is collected is the operational status of each RTU. Once it is determined that the RTU is functioning properly, the device will be used to collect load data such as the customer's:

- kW load at present time
- kW load at time of notice
- kW load at contract time
- kW load at end of notice

For information about your credit and penalty calculations, or about your agreed upon FSL and load-reduction requirements, please contact your SCE account representative.

What if I want to move or relocate the RTU?

If you wish to relocate your RTU after it is operational, you must first obtain approval from SCE. If the move is allowed, you, the customer, will be responsible for moving the device, and will also need to make arrangements with SCE to have the device installed. You are responsible for satisfying the same conditions as with the initial installation, which include providing an uninterrupted power source, dedicated phone connection(s), and conduit from the RTU to the interface box.

What about RTU Maintenance?

SCE is responsible for maintaining the hardware and software associated with the automatic notification system, except for any supplemental notification or automatic load shed systems and load-shed devices you may have installed. Therefore, the only components of the RTU that you will ever need to touch are the terminal block locations identified in *Figure 2: Output Relays*. Customers should never attempt to move the bypass switch control, or maintain, repair, or adjust any other component within the RTU.

How does SCE know that my system is working properly?

SCE tests the Interruptible Service Program communication system on the first Tuesday of each month, between the hours of 8 am and 12 noon. You are not required to reduce your electric load during these tests.

When the test signal is received, the RTU will perform exactly as it does during an actual interruption. Therefore, if you have installed an automatic load shed system, you may want to install a timer device or some other mechanism to avoid reducing load during a test (See the section titled, "Supplemental Notification and Automatic Load Shedding Systems" for more information).

Appendix A: RTU Specifications

POWER

Input Supply Voltage	120VAC +/- 10%, 60Hz
Power Consumption	3 Watts normal 32 Watts maximum
Battery Capacity	8 hours (at full charge)

PHYSICAL

Dimensions	10" w x 5" d x 23" h
Weight installed	20lbs (with battery)
Enclosure Color	Grey
Operating Temperature	0°C to 60°C (+32°F to +140°F)

MODEM

Baud Rate	1200 (fixed)
Word Structure	7E1
Protocol	Encrypted
Communication Command Set	CDMA voice channels Hayes AT standard

ANALOG

Number of Channels	3
Input Impedance	2500 Ohms
Resolution	24-bit

CONTROL CIRCUIT

Number of Circuits	3 (Trip, Alarm, Billing)
Ratings	5 Amps; 120VAC; 28VDC

ANNUNCIATOR

Operating Voltage	5VDC
Frequency	2900Hz, +500Hz; pulsed
Sound Intensity	95dB at 2ft.
Certification	FCC

Appendix B: Screen Instructions

The RTU has several modes of operation, each of which is accompanied by slightly different display screens. The following diagram illustrates the display screen in "Normal/Idle mode" on an RTU.

Figure 5: RTU Display Screen



The modes of operation of the RTU described in this section are as follows:

- Startup
- Signal Quality (RTU-D only)
- Normal/Idle
- Interruption Operation Mode
- Monthly Test Operation Mode
- End Operation Mode

Startup. During this mode, the hardware is tested and initialized. While the Main CPU is booting the following information will be on the display.

```
Southern California  
Edison Company  
Version #.#.##  
Booting Main CPU
```

In the screen above the “#.#.#” will be replaced with the LCD CPU Firmware revision number. At this point the basic hardware has passed the required tests. Upon startup of the Main CPU the following sets of screen will be display with a small delay between them.

```

-----
Southern California
Edison Company
-----
    
```

```

-----
Interruptible Load
Program S/W Rev:#.#.#
-----
    
```

Signal Quality (RTU-D only). The signal quality received from the CDMA modem is displayed at reset on the screen. Values range from 1-31, 31 being the strongest signal.

```

-----
Signal Quality: ##
-----
    
```

```

-----
Preparing for
On-line Operations
-----
    
```

Normal/Idle. Upon completion of startup the Main CPU will display the following default screen.

```

Approximate Load
  0 KW
    
```

The “0” in the screen above will be replaced with the current approximate load to the nearest KW. In addition, this screen will also show the position of the Bypass Switch, Door switch state and a phone line ring indicated by an ‘*’. The following screen shows this state.

```

Bypass / Door
Approximate Load
  0 KW
  *
    
```

The RTU can also provide detailed information to the general user. This is accomplished by holding down the acknowledge button on the face. When the acknowledge button is pressed, the annunciator will output a short beep to ensure its proper operation. The RTU will display the following screen while the acknowledge button is pressed.

```

Battery: Normal
Voltage: 13.85
Charger: OFF
120 VAC: Available
    
```

```

Internal Temperature
 26 C
 79 F
    
```

```

Terminal Identifiers
RTU Number: 3007
Test RTU
Blocks: ACSA
    
```

```

Analog Multipliers
Mult1: 10000
Mult2: 0
Mult3: 0
    
```

Upon releasing the acknowledge button the RTU will return to the default screen.

Interruption Operation Mode. Upon receiving an instruction to enter a period of interruption, the RTU will turn the Annunciator ON and begin scrolling through the following screens.

```

You must reduce
to your FIRM SERVICE
LEVEL to comply with
Interruptible Tariff
    
```

```

START LOAD INTERRUPT
LOAD    TIME
 0 KW   30:00
    
```

The second screen shown above will show both the current load as well as the time remaining in the grace period. Upon reaching 0:00 time remaining the unit will activate the TRIP output. To turn the Annunciator OFF, press the Acknowledge button.

Monthly Test Operation Mode. After receiving the command to perform a Monthly Test, the RTU will turn the Annunciator ON and begin scrolling through the following screens.

```

First Tuesday Test.
Load Reduction
Is NOT required to
Comply with test
    
```

```

Start Monthly Test
(Load Shed not Req.)
LOAD    TIME
 0 KW   30:00
    
```

The second screen shown above will show both the current load (with an accuracy of ±10%) as well as the time remaining in the grace period. Upon reaching 0:00 time remaining, the unit will activate the TRIP output. To turn the Annunciator OFF, press the Acknowledge button.

End Operation Mode. Upon reception of the end command the RTU will turn the Annunciator ON and show the following screen.

```

End Of Interruption

LOAD    TIME
 0 KW   0:00
    
```

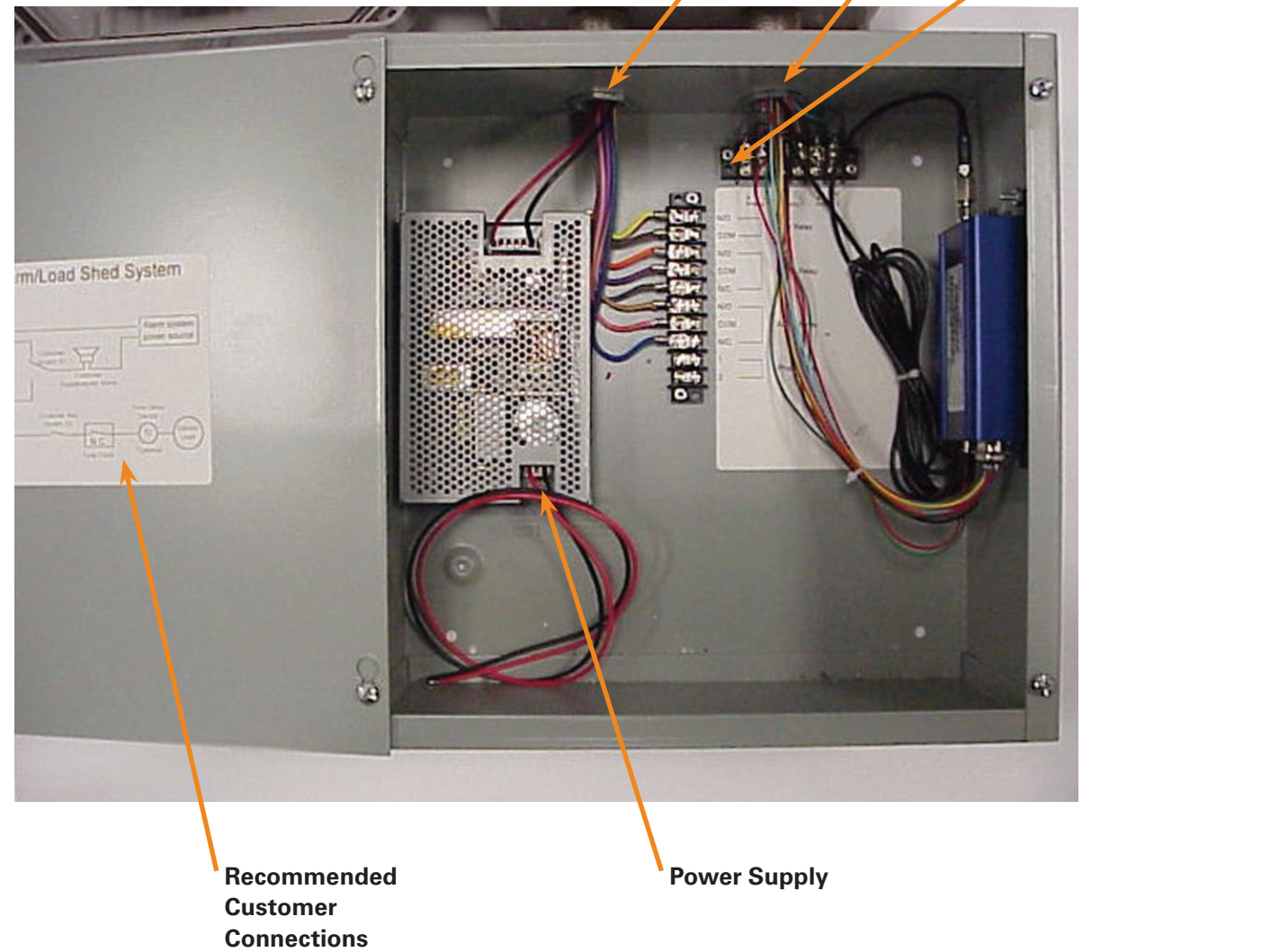
The above screen shows both the current load as well as the time remaining, which is 0:00. To turn the Annunciator OFF, press the Acknowledge button.

Appendix C: RTU Door Components

The base of the RTU houses the main power supply for the RTU, the CDMA modem, and the input points for the current transducers.

The following diagram illustrates the main components found in the base cabinet of the RTU.

Figure 6: RTU Door Components



Appendix D: External View of the RTU and Cabinet

The following diagram illustrates the main components found on the outside of the RTU and cabinet.

Figure 7: External View of the RTU and Cabinet

