



TWACS[®] - ORION[®] FOR CENTRON[®] METER

USER GUIDE

Y10426-TUM

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USING THIS MANUAL

This section contains information that helps you understand and use this manual.


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Purpose

This *TWACS*[®] - *ORION*[®] for *CENTRON*[®] Meter User Guide contains theory of operation, pre-installation considerations, hardware installation procedures, and instructions for using an HHTR tool to establish the communication link between the ORION and EMTR.

Warnings

| | |
|---|---|
|  | <p>! DANGER</p> <p>Electrical equipment contains hazardous voltages. May cause death, serious personal injury or equipment damage.</p> <p>Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which will cause severe personal injury or equipment damage. Follow all safety instructions contained herein.</p> |
|---|---|

IMPORTANT




The information contained herein is general and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. DCSI reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawing or supplementary material or both, the latter shall take precedence.

QUALIFIED PERSON

For the purpose of this manual a qualified person is one who is familiar with the installation, configuration, or operation of the equipment and the hazards involved. In addition, the person has the following qualifications and **is trained**:

- and authorized** to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety procedures.
- in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc. in accordance with established safety practices.
- in rendering first aid.

Icon Definitions

| Icon | Definition |
|---|--|
| HAZARD  | Indicates electrical equipment hazards and resulting death or serious injury from misuse. |
| WARNING  | Indicates a potentially hazardous situation which - if precautions are not taken - could result in death or serious personal injury. |
| CAUTION  | Indicates a potentially hazardous situation which- if precautions are not taken - may result in minor or moderate injury. |
| IMPORTANT | Provides information that is important, but will not result in physical injury if not followed. |
| NOTE | Provides additional information or tips on the process. |

Related Documentation

The following publications are referenced in this *Integrated Metering Transponder for Electromechanical Meters User Guide*. The documents listed below plus the latest version of all other DCSI technical publications are available through the TWACS Portal (<https://portal.twacs.com/>).

- *Electronic Metering Transponder for CENTRON Meter User Guide* (Y10317TM)
- *TNS End User Guide* (Y10285TM)
- *Returned Merchandise Packing Requirement Service Advisory* (Y10377TM)

Support

Please address your questions to Customer Care as follows:

E-mail: care@twacs.com

Phone: 1-800-892-9008

Address: Distribution Control Systems, Inc.
945 Hornet Drive
Hazelwood, MO 63042
USA

Let Us Know How We're Doing

In an ongoing effort to produce effective documentation, the Technical Publications department at DCSI welcomes any feedback you can offer regarding this manual.

Please relay feedback, including suggestions for improvement or to alert us to corrections, by sending an email to techpubs@twacs.com or calling Customer Care at 1-800-892-9008.

INSTALLATION AND OPERATION

This chapter provides a brief overview of the TWACS-ORION system, explains how the TWACS-ORION system interfaces with the TWACS system, and describes the functions of the EMTR, HHTR, and ORION transmitter. It is useful for installers and personnel who would benefit from an overview of the entire system.

Chapter at a Glance

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System Overview

The TWACS® - ORION® system utilizes radio frequency (RF) transmission communication between a RF-enabled auxiliary meter and a RF-enabled CENTRON® meter. Data relative to energy usage from auxiliary gas, water, or another electric meter can be gathered and retrieved in this manner. The system provides selectable Total Consumption data and Present Consumption data based on the hourly interval meter reading.

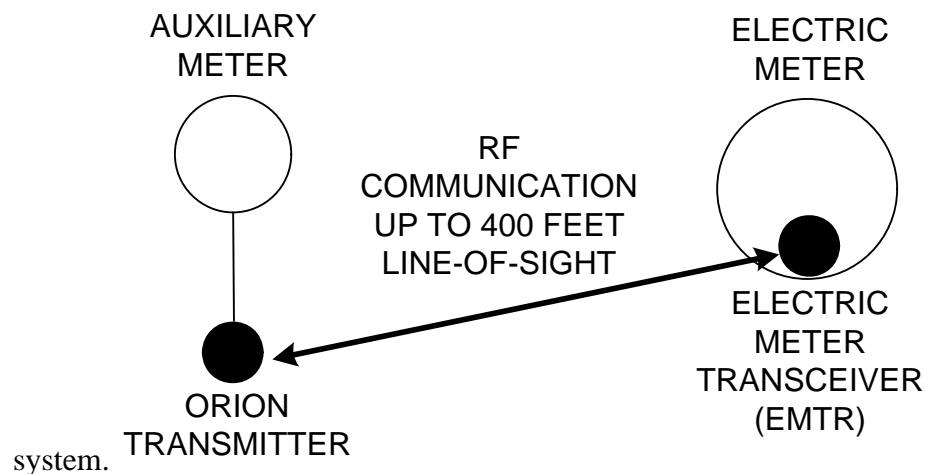
Information is retrieved across the Two-Way Automatic Communication System (TWACS) network by the TWACS Net Server (TNS) located at the utility company.

The TWACS® - ORION® system solution is comprised of the following RF devices:

- Electric Meter Transceiver (EMTR)
- Hand Held Transceiver (HHTR)
- Electronic Metering Transponder (EMT-3C-MP)

NOTE Also part of the system, but not provided or installed by DCSI, is the Badger Meter, Inc. ORION transmitter that is installed at the auxiliary meter and converts the meter information into electronic signals.

RF communication links the ORION (located at the auxiliary meter) to the EMTR (located inside a nearby electric meter.) This communication enables successful operation of the Automatic Meter Reading (AMR)



Theory of Operation

The DCSI TWACS[®] - ORION[®] system operates within the 916.450 MHz UHF radio frequency range on channel 43A. This unlicensed frequency band is known as the ISM (Industrial, Science, and Medical) band. All components in the DCSI TWACS[®] - ORION[®] system comply with FCC (Federal Communications Commission) rules and regulations for radio devices operating in this frequency range.

This band provides up to 79 channels; the TWACS[®] - ORION[®] system uses 51 of these channels. A channel is defined as a pair of adjacent frequencies used for transmission and for reception. Refer to the note below.

Because the FCC limits the amount and duration of channel energy that can be emitted during RF transmission, the TWACS[®] - ORION[®] system employs transmission Frequency Shift Keying (FSK). This modulation and frequency hopping technology serves to:

- Comply with FCC regulations
- Reduce potential interference to and from other devices operating in the same band
- Reduce the potential for eavesdropping
- Minimize the effects of signal reduction

NOTE Frequency hopping employs an algorithm that provides a half duplex (one transmission direction at a time [send or receive]), pseudo-random sequence of frequencies for the two-way radio link.

Frequency Shift Keying modulation controls data transmission by "frequency shifting" between two frequencies (a channel). One frequency is used to represent the logical "1" and a different frequency represents the logical "0".

Five channels provide link acquisition with the HHTR while the remaining 45 channels are used for data transmission after a successful link is established. The one remaining channel is used for TWACS-ORION communication.

The EMTR retains data until new data is uploaded during an ORION session. If an ORION transmitter is removed from the Remt List table stored in the EMTR, the previously loaded data (for the removed ORION transmitter) is automatically deleted.

Electric Meter Transceiver (EMTR)

The EMTR is an electronic module assembly (EMA) that is installed in a TWACS-enabled CENTRON meter. The EMTR is connected to the EMT-3C-MP transponder during meter/transponder integration. The EMTR adds functionality to the host EMT-3C-MP. It does not communicate over the power line, but uploads the data to the EMT-3C-MP that has power line TWACS capabilities.

The EMTR can communicate with up to four ORION transmitters. Data from the ORION transmitter is relayed to the EMA. This data is accessed by the TNS across the TWACS network.

Near the top of the hour, the EMTR listens (for 12.5 seconds) for communication from an ORION transmitter. Then, for 8.5 seconds the EMTR listens for an HHTR. This pattern cycles 35 times. No further communication occurs until the next top of the hour. The top of the hour is set in TNS. Refer to *Metering Maintenance* in the *TNS User Guide* for instructions.

Figure 1.1 Electric Meter Transceiver



RF TWACS and Badger Meter, Inc. ORION® Transmitter

The DCSI RF TWACS System and the Badger Meter, Inc. ORION transmitter are capable of data communication. The ORION module uses the RF bubble-up broadcast mode to communicate (one way) from the auxiliary meter to the electric meter. The ORION transmitter sends customer usage data (at 100Kbps) every five seconds on the 916.450 MHz frequency channel. The RF TWACS system receives this data and transmits it to the EMTR. Then it is retrieved by the utility, across power distribution lines.

Figure 1.2 ORION transmitters for water, gas, and remote



Specifications:

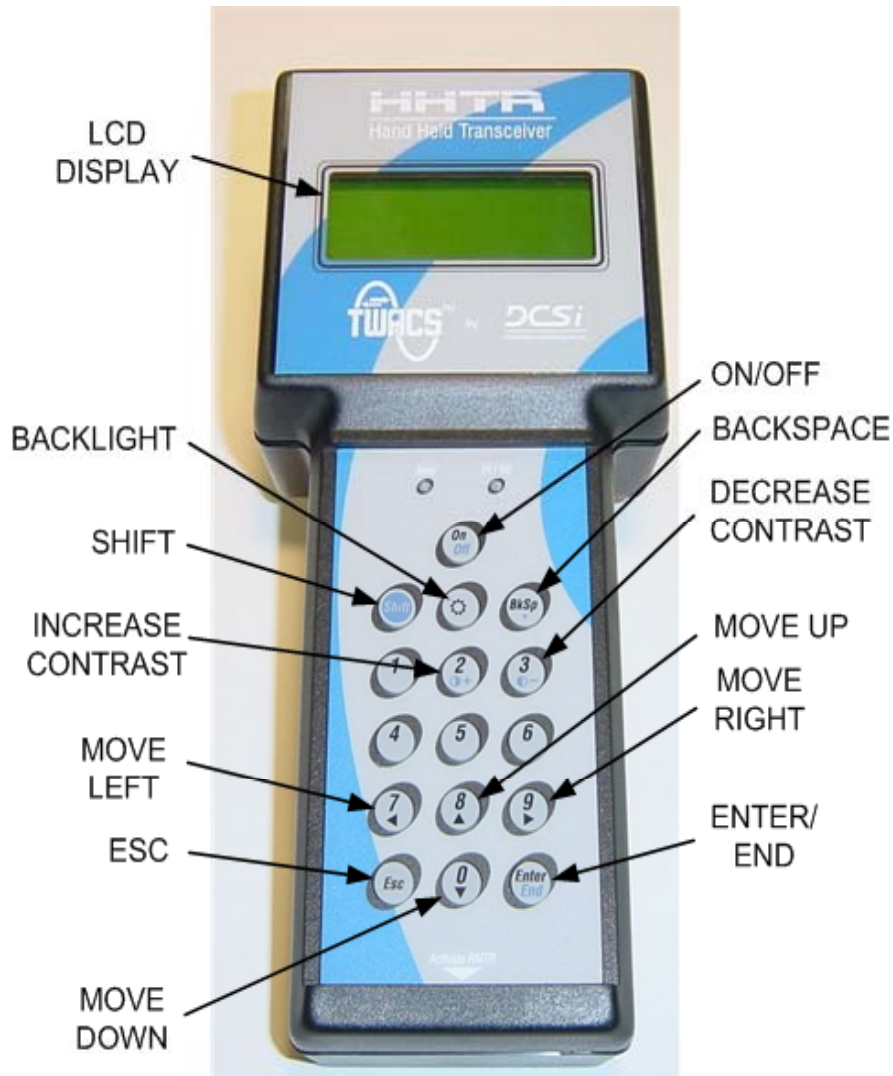
Table 1.1 ORION transmitter specifications

| ORION | |
|----------------------------|--|
| Specification | Description |
| Power | 3.6 VDC embedded battery |
| Functional Life Expectancy | Minimum: 10 years Expected: 15 years |
| Frequency | 916.450 MHz |
| Data Communications | Burst mode fixed length packet, simplex |
| Data Format | 3-of-6 |
| Data Rate | 100 Kbps \pm 1 Kbps |
| Data Encryption | None |
| Modulation | Frequency Shift Keying (FSK) |
| Packet Encoding | Non Return to Zero (NRZ) |
| Channels | Single channel (43A) |
| Range | 400 ft. clear line of sight - affected by installation and conditions; less if pit installed |

Hand Held Transceiver (HHTR)

The DCSI Hand Held Transceiver (HHTR) is used to configure and setup the EMTR (installed in the electric meter). The HHTR is also used to create the communication link between the EMTR and the ORION transmitter and can be used to test the radio link.





Figure 1.3 Hand Held Transceiver keypad functions



Navigating the HHTR Screens

Use the arrow buttons to navigate through the HHTR screens.

Table 1.2 HHTR screen navigation buttons

| Button Number | Graphic | Function |
|---------------|---|------------|
| 7 |  | Move left |
| 8 |  | Move up |
| 9 |  | Move right |
| 0 |  | Move down |

NOTE When pressing the 7, 8, 9, or 0 numeric button, the HHTR automatically determines whether the numeric or scroll functionality of the button is required.

Adjust the display contrast by using the number 2 and 3 buttons as follows:

- Increase the contrast - Hold down the **Shift** button and repeatedly press the number 2 button.
- Decrease the contrast - Hold down the **Shift** button and repeatedly press the number 3 button.

Esc button functionality:

- Press once to end the current procedure and return to the previous menu.
- Repeatedly press to “back out” to previous menus.

HHTR Menus

The following list describes the menus and selections available from the HHTR.

Main Menu Item

Order - Main menu selection.

- New/Go - Presents screens that allow entry of an order number.

Remote - Main menu selection.

- Orion - Top-level Orion menu.
 - Install (See page 13).

- Com Stat - Presents configuration status screens (See page 15). This status information is read from the EMTR.
- RMTR - RMTR menu.

EMTR - Main menu selection.

- Status - Presents EMTR status data screens.
- Replace - Presents screens that enable replacement of the EMTR (See page 17).
- Delete - Presents screens that enable removal of the ORION from the Remt List (See page 15).
- Remt List - Displays list of linked ORION transmitters.

Serial Com - Not used.

TWACS - Main menu selection.

- HRTS - Enables configuration of meter auxiliary ports.
- TWACS Modem - Not used.

HHTR Config - Main menu selection.

- Setup - Presents screens that enable selection of HHTR options.
- Status - Not used.
- Power - Presents screens that enable selection of Power options.
- Diags - Presents screens that enable selection of Diagnostic options.

RF Hardware Installation

This section provides instructions for installing the RF hardware onsite. A functioning network can be created and its functionality verified before leaving the site.

Pre-Installation Field Survey

The field survey is used to review the environmental conditions present at any particular location and lay out the system to maximize performance. DCSI recommends that you conduct a field survey before performing the actual hardware installation.

As with all RF devices, certain environmental conditions must be present to optimize RF communications. Be aware of the factors that affect the radio transmission between the ORION and the EMTR when performing the field survey, such as:

- Metal objects
- Thick walls or foliage
- Local radio interference
- Position of the ORION and/or EMTR

Factor in all environmental conditions when planning the location of the meter/EMTR assembly.

NOTE A clear line of sight between the ORION transmitter and receiver is preferred, but is not always attainable.

The following section discusses the environmental conditions that may affect RF transmissions between the ORION and EMTR.

Environmental Conditions

Optimal RF communication between the ORION and the EMTR is affected by many environmental conditions. Vehicular traffic, parked vehicles in the signal path, weather conditions, construction, and even the growth of foliage may affect or degrade RF communication.

Gradual loss of communication from the ORION (caused by an aging battery for example) can be detected through system checks by the TWACS Net Server (TNS) Master Station. Persistent loss of communication may indicate environmental interference and require a site visit to determine the cause.

NOTE Sites that continue to experience persistent loss of communication may require a wired solution to ensure reliable operation.

The following environmental factors or conditions may affect RF transmission between the ORION unit and the EMTR located at the electric meter.

- **Metal Objects**

Metal objects significantly reduce the strength of the signals reaching the receiver. Ensure that no metal cladding, cabling, mirrors, water tanks, refrigerators, pipes, etc. are near the ORION or EMTR. The straight-line path between both units should be as unobstructed as possible.

NOTE A small, single item, such as a pipe situated half-way between the transmitter and receiver, is less likely to have any affect on the signal strength than a larger item(s).

- **Thick walls or foliage**

Thick walls or foliage between the transmitter and receiver can reduce the signal strength. Brick, aluminum siding, thick stone walls, and concrete can impede signal reception.

Avoid dense foliage between the RF units and, when possible, provide a reserve “growth” clearance to accommodate the growth of foliage on bushes and trees during spring and summer.

NOTE Radio signals can pass more easily through plasterboard walls, fiberglass, and wood paneling than the previously listed materials.

- **Local radio interference**

The close proximity of a cell phone mast, a taxi operator's base station, or large electrical equipment may provide strong radio interference. The AMR radio devices should be relocated if these interferences are present.

- **Position of the ORION and/or EMTR**

These are important factors in RF deployment. The ORION antenna is omni-directional. The signal radiates 360 degrees. The EMTR antenna alignment is parallel to the front cover of the electric meter, and is the most sensitive RF reception surface.

Face the front of the meter/EMTR toward the ORION transmitter when possible; even on opposite sides of a building. This allows maximum communication surface and distance between the units. Allow for some additional power margin in the signal strength to accommodate seasonal or other changes in environmental conditions.

In the future, after installation, the site owner should inform you of any alterations to the site that could affect radio performance.

Installing a New EMTR Module

This procedure installs an EMTR module by installing an RF-equipped CENTRON meter.

Technicians must install this equipment in accordance with all National and Local Code provisions.

WARNING



WARNING - EXPLOSIVE HAZARD - Substitution of components may impair suitability for Class I, Division 2.

CAUTION



Wear all safety equipment according to your utility rules before opening the meter base: hard hats, safety face shield, fire retardant clothing, high voltage rated gloves, safety rated shoes.

WARNING



Any work on or near energized meters, meter sockets, or other metering equipment can present a danger of electrical shock. Such shock could cause serious injury or death.

To field install a new EMTR-equipped CENTRON meter, refer to the *Electronic Metering Transponder for CENTRON Meter User Guide (Y10317TM)*, Chapter 2. *Installation*.

To complete the installation process, the meter must be configured into the TNS (refer to the *TNS End User Guide* for directions). In order to complete this next step in the installation process, record the location of the meter by collecting the following information:

- **Serial number (required)**
- **Substation (required)**
- Bus
- Feeder
- Phase
- Detection
- Signal

The TNS operator uses this location information to search for the meter. The more pieces of location information available, the less time TNS will take to search for the meter.

Refer to the *TNS End User Guide* for data retrieval instructions.

ORION Equipment Installation

Follow the Badger Meter, Inc. equipment installation instructions to install the ORION transmitter.

Installers must install the ORION equipment in accordance with all National and Local Code provisions.

Installing a Replacement EMTR Module

This procedure is the same as installing a new EMTR-equipped meter except that previous usage data must be retrieved and ORION/EMTR linkage information must be reassigned to the replacement EMTR.

1. Refer to *Installing a New EMTR Module* on page 11 for installation instructions.
2. Refer to *Install the ORION (Linking the ORION and EMTR)* on page 13 for linkage assignment instructions.

Refer to the *TNS End User Guide* for data retrieval instructions

ORION Equipment Replacement

Follow the Badger Meter, Inc. equipment instructions to remove and replace an existing ORION transmitter.

Installers must perform these procedures in accordance with all National and Local Code provisions.

ORION and EMTR Communication Setup

This section explains the steps required to use the HHTR to configure, link, and remove/replace an ORION or EMTR.

RF equipment setup procedures consist of configuring the EMTR and making the RF communication link between the ORION and EMTR. You may also view the communication statistics, or test the link between the ORION and EMTR by reading the Total Consumption register for the applicable port and verifying the reading on the auxiliary meter dials.

Install the ORION (Linking the ORION and EMTR)

Complete the following steps to link the ORION to a nearby EMTR.

1. Press the On/Off button on the HHTR. The “flash” screen appears momentarily displaying the software version number. Firmware Vn.n is replaced with the firmware version number installed in your HHTR.

```

DCSI: HHTR
Y72160-1
Firmware Vn.n
Www.twacs.com

```

The Main Menu screen appears.

```

Main Menu
→ Order      Serial Com
REMOTE      TWACS
EMTR        HHTR Config

```

2. Press the down arrow once to position the arrow cursor in front of the REMOTE option.

```

Main Menu
Order      Serial Com
→ REMOTE  TWACS
EMTR      HHTR Config

```

3. Press the Enter button.

```

Remote Menu
Select:
→ ORION
RMTR

```

4. Press the Enter button to accept the default selection.

```
Orion Menu
Select:
→ Install
Com Stat
```

5. Press the Enter button to accept Install.

```
Orion Install Menu
Enter the Serial #,
Orn S/N:_____
Enter To Accept
```

6. Enter the ORION serial number in the spaces provided, if it is not automatically entered for you.
7. Press the Enter button.

```
Orion Install Menu
Select:
→ Water           Nat Gas
Propane           Electric
```

8. Press the Enter button.

```
Orion Install Menu
Enter the Serial #,
EMTR S/N:_____
Enter To Accept
```

9. Press the Enter button.

```
Orion Install Menu
Checking EMTR Tables
Please Wait...
```

```
Orion Install Menu
Writing EMTR Tables
Please Wait...
```

```
Orion Install Menu
Waiting for EMTR to Acquire
Orion Data
Please Wait...
```

```

Orion Install Menu
Checking EMTR Tables
Please Wait...

```

```

Orion Install Menu
Success!
EMTR: X
Orion: XXXX

```

10. Press the Esc button to return to the ORION Menu or press the down arrow to view the current configuration status as described in *Configuration/Installation Status* on page 22.

If you receive an error message, press the Esc button, then repeat steps 2-10.

NOTE Your previously selected options will appear on the screens when you repeat steps 2-10. Make new selections, or press the Enter button to accept each correct entry.

Delete the ORION from the Remt List

If your ORION and EMTR are not communicating, or if you need to replace a malfunctioning ORION module, this procedure provides the instructions to delete the ORION from the Remt List stored in the EMTR.

Complete the following steps to delete the ORION from the EMTR.

1. Press the On/Off button on the HHTR.

```

Main Menu
→ Order      Serial Com
  REMOTE     TWACS
  EMTR       HHTR Config

```

2. Press the down arrow button twice to position the cursor in front of the EMTR option.

```

Main Menu
  Order      Serial Com
  REMOTE     TWACS
→ EMTR      HHTR Config

```

3. Press the Enter button.

```

                EMTR Menu
Select
  Status      →Delete
  Replace     Remt List
    
```

4. Use the arrow buttons to select Delete.
5. Press the Enter button. The Remote Menu appears.

```

                Remote Menu
Select:
→ ORION
  RMTR
    
```

6. Press the Enter button.

```

                EMTR: Delete Orion
Enter the Serial #,
EMTR S/N:_____
Enter To Accept
    
```

7. Enter the serial number of the EMTR in the EMTR S/N field, if it is not automatically entered for you.
8. Press the Enter button.

```

                EMTR: Delete Orion
Enter the Serial #,
Orn. S/N:_____
Enter To Accept
    
```

9. Enter the Orion serial number in the Orn. S/N field, if it is not automatically entered for you.
10. Press Enter to accept.

The following two screens display briefly.

```

                EMTR: Delete Orion

Receiving Orn. List,
Please Wait...
    
```

```

                EMTR: Delete Orion

Found Orion, Working,
Please Wait...
    
```

The Success! screen displays, indicating that the ORION has been successfully removed from the Remt List table stored in the EMTR.

| |
|---|
| <p>EMTR: Delete Orion</p> <p>Success!</p> |
|---|

11. Press the Esc button twice to return to the Main Menu screen.

Replace the EMTR

This procedure downloads the Remt List from the existing EMTR to the HHTR so the Remt List can be uploaded to the replacement EMTR.

Two important conditions apply to this procedure:

1. The existing EMTR must be able to communicate with the ORION for the Remt List to be downloaded to the HHTR, to simplify reinstalling applicable ORIONs.

NOTE If communication is not possible, this procedure can not be performed. Replace the existing meter according to your utility procedures, and perform *Install the ORION (Linking the ORION and EMTR)* on page 13 to install the individual ORIONs.

2. This procedure requires the physical removal of the existing installed meter and installation of a replacement meter/EMTR combination.

Perform the following procedure to replace an EMTR.

If you pressed the HHTR On/Off button at the end of any previous procedure, begin with step 1.

-OR-

If you pressed the Esc button, begin with step 2.

1. Press the On/Off button on the HHTR.

| | |
|------------------|-------------|
| Main Menu | |
| → Order | Serial Com |
| REMOTE | TWACS |
| EMTR | HHTR Config |

Press the down arrow button to position the cursor in front of the REMOTE option.

```

Main Menu
Order      Serial Com
→ REMOTE   TWACS
EMTR       HHTR Config

```

2. Press the down arrow button to position the cursor in front of the EMTR option.

```

Main Menu
Order      Serial Com
REMOTE     TWACS
→ EMTR     HHTR Config

```

3. Press the Enter button. The EMTR menu appears.

```

EMTR Menu
Select
→Replace   Delete
Status     Remt. List

```

4. Press the Enter button. The following screen appears.

```

EMTR: Replacement
Select:
→Read Old EMTR
Write New EMTR

```

5. Press the Enter button. The following screen appears.

```

EMTR: Replacement
Verify Order #
XXXXXX
ESC: No, Enter: Yes

```

6. Enter an Order number if different from that displayed and press Enter to Accept.

The following screen appears.

```

EMTR: Replacement
Enter the Serial #,
Old S/N: XXXXXXXX
Enter To Accept

```

7. Press the Enter button. The following two screens appear.

```
EMTR: Replacement
Receiving RMTR List,
Please Wait...
```

```
EMTR: Replacement

Success!
```

NOTE At this point in the procedure, the technician must replace the “old” utility meter with a replacement integrated meter/EMTR combination.

8. Press the Esc button once and the following screen appears.

```
EMTR: Replacement
Select:
  Read Old EMTR
  → Write New EMTR
```

9. Press the Enter button. The Order Number screen appears.

```
EMTR: Replacement
Verify Order #
  XXXXX
ESC: No, Enter: Yes
```

10. Enter the order number and press the Enter button. The following screen appears.

```
EMTR: Replacement
Enter the Serial #,
New S/N: XXXXXXXX
Enter To Accept
```

11. Press the Enter button. The following two screens appear.

```
EMTR: Replacement

Verifying New EMTR,
Please Wait...
```

EMTR: Replacement
Success!

12. Press the Esc button three times to return to the Main Menu screen.
-OR-
Press the On/Off button.

TESTING, TROUBLESHOOTING, AND MAINTENANCE

This chapter explains how to test and manage typical TWACS-ORION system problems. It is useful for installers and meter shop personnel.

Chapter at a Glance

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Troubleshooting and Error Messages

When necessary, the HHTR can run a self-diagnostics test. If there is a problem, it will respond with an appropriate error code.

For RF communication, and HHTR or user error codes, refer to *HHTR Displayed Error Codes* on page 26.

For more information about Trouble Server Applications, refer to the *Trouble Server Applications* chapter in the TNS documentation

Troubleshooting Scenarios

There are two basic types of troubleshooting scenarios:

- Configuration/Installation Status
- Field Troubleshooting

Configuration/Installation Status

You can view additional information about configuration and link status by selecting Com Stat from the ORION Menu screen. Although this information is read from the EMTR, check the RF Link Data: Acq Log (refer to step 16. of this procedure) to verify recent successful ORION/EMTR communication.

Complete the following steps to view configuration and link status data.

1. Press the On/Off button on the HHTR. The “flash” screen appears momentarily displaying the software version number. Firmware Vn.n is replaced with the firmware version number installed in your HHTR.

| |
|--|
| DCSI: HHTR Y72160-1 Firmware Vn.n Www.twacs.com |
|--|

The Main Menu screen appears.

| | |
|------------------|-------------|
| Main Menu | |
| → Order | Serial Com |
| REMOTE | TWACS |
| EMTR | HHTR Config |

2. Press the down arrow once to position the arrow cursor in front of the REMOTE option.

```

      Main Menu
Order      Serial Com
→ REMOTE   TWACS
EMTR       HHTR Config
  
```

3. Press the Enter button.

```

      Remote Menu
Select:
→ ORION
  RMTR
  
```

4. Press the Enter button to accept the ORION default selection.

```

      Orion Menu
Select:
→ Install
  Com Stat
  
```

5. Press the down arrow once to position the arrow cursor in front of the Com Stat option.

```

      Orion Menu
Select:
  Install
→ Com Stat
  
```

6. Press the Enter button.

```

      Orion Com Status
Enter the Serial #,
Orn S/N: _____
Enter To Accept
  
```

7. Enter the ORION serial number in the spaces provided.

8. Press the Enter button.

```

      Orion Com Status
Enter the Serial #,
EMTR S/N: _____
Enter To Accept
  
```

9. Enter the EMTR serial number in the spaces provided.

10. Press the Enter button.

The following two screens appear.

```

Orion Com Status
Collecting data from
EMTR.
Please Wait...
    
```

```

Orion Com Status
Success!
EMTR: _____
Orion: _____
    
```

11. Press the down arrow or the Enter button and the following status screen appears.

```

Orion Com Status
Reading: 1234567890
Battery: N/A
N/V Memory: N/A
    
```

- Reading: displays the number on the ORION. A correct number (0000000000-9999999999) here verifies proper equipment operation.

12. Press the down arrow or the Enter button.

```

Orion Com Status
Meter Com: N/A
Hist MTR Com: N/A
LeakDet: N      Tamper: N
    
```

- Ignore Meter Com.
- Ignore the Hist MTR Com entry for installation purposes.
- LeakDet options are Y or N. Site visit is required to locate leak if Y.
- Ignore the Tamper entry for installation purposes.

13. Press the down arrow or the Enter button.

```

Orion Com Status
RF Link Data:
PA: N/A      RSSI: 123
Link: N/A
    
```

- RSSI (Received Signal Strength Indicator) indicates the signal strength. The range is 0-255 with 255 being the best.

14. Press the down arrow or the Enter button

```

Orion Com Status
RF Link Data:
Last Ch: N/A
Acq Failures: 0

```

Ignore this screen for installation purposes.

15. Press the down arrow or the Enter button

```

Orion Com Status
RF Link Data:
Lnk Abandonment: N/A
Error Code: N/A

```

Ignore this screen for installation purposes.

16. Press the down arrow or the Enter button

```

Orion Com Status
RF Link Data: 24 Hr
Acq Log:00000000
        00000000 00000000

```

The Acq Log displays 24 bits (in three groups of eight) representing the hourly check-in for the last 24 hours. A one (1) indicates that the hourly check-in was successful and a zero (0) indicates that it was not. The least significant bit (bottom right) indicates the past hour check-in status. Each hour the bits are shifted one position to the left. In the example below, the ORION successfully checked in the past hour, but did not for each of the previous three hours.

```

Acq Log: 11111111
11111101 11110001

```

Press the On/Off button to turn the HHTR Off.

Field Troubleshooting

The most likely field troubleshooting scenario is a failure of the power up LED to flash. If the LED on the TWACS-ORION system is not flashing, ensure that the TWACS-enabled meter is receiving the appropriate power according to its specific form and voltage (refer to *Installation* on page 21). You may use a Remote Test Set (RTS) for further testing or return the meter to the Meter Shop for further diagnostics.

HHTR Displayed Error Codes

The following table lists the error code number and error message text that the HHTR displays when the specific error is encountered while using the HHTR to communicate with the TWACS-ORION system.

Table 0.1 Error Code Description and Solution

| Error | Description | Solution |
|--|--|---|
| The following error codes are RF communication errors. | | |
| 01 RF Error | General error. | Retry the command. |
| 02 Service Not Supported | Service is not supported. | Retry the command. |
| 03 Not used | | |
| 04 Operation Not Possible | RF error. | Retry the command. |
| 05 Inappropriate Action Requested | RF error. | Retry the command. |
| 06 RF Device Busy | RF error. | Retry the command. |
| 07 Data From Device Not Ready | RF error. (Usually memory) | Retry the command. |
| 31 RF Device Sent NAK | RF error | Retry the command. |
| 32 Can not acquire an RF Link | RF error | Retry the command. |
| 33 Operation Timed Out | Operation time expired without success. | Retry the command. |
| The following error codes are internal HHTR or user errors. | | |
| 101 RF PIC sends a NAK | The RFPIC isn't ready or doesn't understand the command. The RF PIC internal to the HHTR has failed. | Retry the command. |
| 102 RF PIC is busy | RFPIC is performing another operation and is currently busy. The RF PIC internal to the HHTR was in the middle of another command. | Retry the command. |
| 103 No response from RF PIC on HHTR | The RFPIC isn't responding to the UI. No Response from the RF PIC. The RF PIC didn't respond to the UI processor. | Retry the command. |
| 104 RF PIC send invalid response | The RFPIC sent an invalid response to the UI. The HHTR UI processor didn't recognize the response from the RF PIC. | Retry the command. |
| 105 Operation canceled | Indicates the Esc button was pressed during an operation. | The user aborted the last command. |
| 106 RMTR-EMTR session failed | The HHTR timed out waiting for the RMTR to respond back to the HHTR. The HHTR was unable to link to the requested EMTR. | Verify the serial number and retry the command. |

Table 0.1 Error Code Description and Solution

| Error | Description | Solution |
|--|--|---|
| 107 No Space Available in EMTR. The Table is Full. | The EMTR is at capacity. It can not accept additional Remotes. | A Remote must be removed before adding another. |
| 112 EMTR already has Remotes assigned | Can not program a new EMTR with the data from an old EMTR because the new EMTR already has Remotes assigned. | Remove all Remotes from the new EMTR first. |
| 113 The New EMTR can not accept xx Number of Remotes. | Can not program a new EMTR with the data from an old EMTR because the new EMTR can not store as many Remote as the old EMTR. | |
| 114 An order needs to be created first. Use the order menu | When replacing an EMTR, the HHTR needs to store the Remt list. An “order number” needs to be assigned so that the HHTR has a location to store the list. | Select “order” from the main menu, select “new” and enter a number. |
| 208 ORION S/N Already exists in the EMTR Table. | Can not install the selected ORION because it is already installed. | |
| 209 The Selected ORION is NOT in the EMTR Table. | Can not remove the ORION nor perform a Com Status because that ORION is not installed to the selected EMTR. | Check serial number and try again. |
| 211 Service is Full, Can not add ORION to the EMTR List. | This service in the EMTR is at capacity. It can not accept additional Orions. | An ORION must be removed from this service before adding another. |
| 215 The Selected Remt. is NOT an Orion. | | |

Remote Test Set (RTS)

Follow the procedures below to verify that the RTS can communicate to the TWACS-ORION system.

WARNING



Installers must follow all utility electrical safety requirements before connecting the RTS.

Consult applicable utility procedures when troubleshooting this equipment.

1. Connect the RTS according to procedures outlined in the *RTS User Guide*, Y10228TM.
2. Connect the RTS to an appropriate power source, 120VAC or 240VAC.

3. Turn the power switch to the ON position. The initial screen appears, displaying the version of firmware, date, time, line voltage, and the frequency of the line voltage:

Figure 2.1 RTS initial screen

```

REMOTE TEST SET V#.##
DD/MM/YY HH:MM:SS
LINE VOLTAGE = VOLTS,      HZ
PRESS 'CONT' TO CONTINUE  [S6 ]
    
```

4. Press the Cont button on the RTS to display the RTS Main Menu. The Main Menu screen appears:

Figure 2.2 RTS main menu

```

RTS MAIN MENU - PRESS KEY TO SELECT:
1) COMMUNICATION SETUP
2) OTHER FUNCTIONS
    
```

5. Press 1 for communications setup. This action brings up the RTS Transponder Menu.

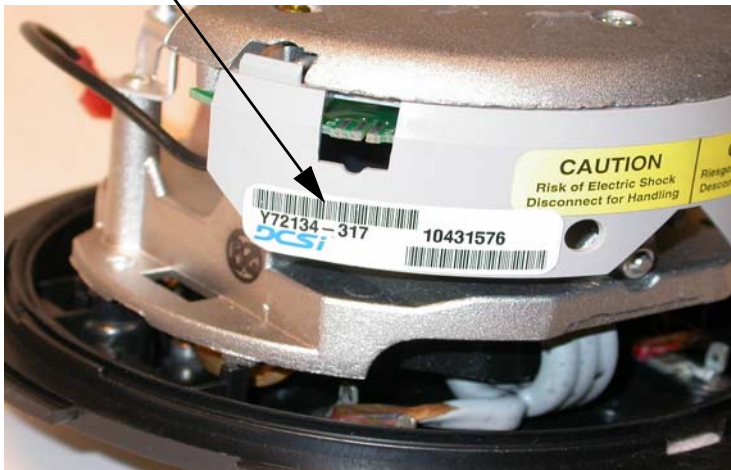
Figure 2.3 RTS transponder menu

```

RTS TRANSPONDER MENU
SCROLL TO SELECT - THEN PRESS ENTER
-----TWACS-----
INTEGRATED OR WATER MTR TRANS. (IMT/WMT)
    
```

6. Press on the Scroll Down button to select the type of remote communication. Scroll down to find the screen that reads “Electronic Meter Transponder (EMT)” and press Enter.
7. At the ENTER SERIAL NUMBER prompt on the next screen, input the TWACS serial number of the unit (see picture below to locate serial number) to be tested (press DEL to correct errors) and press Enter.

Figure 2.4 TWACS serial number location
TWACS Serial Number



- 8. The RTS will attempt to communicate with the TWACS-ORION system. A series of setup screens will appear.

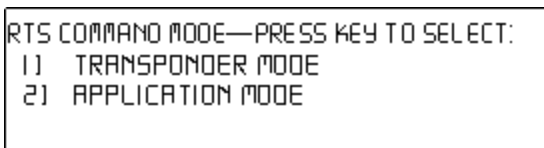
Figure 2.5 RTS setup screens



The RTS begins with a firing angle of 14 degrees and gradually increases until it fails or until communication setup is complete.

Table 2.2 RTS communication success or failure

| If the communication... | Then... |
|-------------------------|---|
| fails | the firing angle sequence will end at 26 degrees and start over at 14 degrees. Check the electrical connections and verify that the correct TWACS serial number was entered. If there is no problem with the setup, replace the TWACS-enabled meter and retry the communication setup. Return the failed meter to the meter shop. Refer to <i>Return Procedures</i> on page 31. |
| succeeds | the following screen appears: |



Select

1) TRANSPONDER MODE

9. At this point, the RTS has verified that the TWACS-ORION system is capable of communicating. To further verify that the communication is reliable, select any command to conduct another test. (For more details on RTS commands, refer to the *Common Generic Commands* section in *RTS User Guide*). Or, if testing is complete, turn off the power switch.
10. Wait 15 minutes to allow the thermal capacity to recover. Then verify that the TWACS-ORION system can communicate with the software system
11. If the TWACS-ORION system is *not* communicating, return the meter to the Meter Shop for additional testing.

Meter Shop Test System

Use the Meter Shop Test System (MSTS) to test TWACS signaling, read select transponder registers, zero select transponder registers, and perform various other transponder functions on the TWACS-ORION system. MSTS configurations exist for both the meter shop and field use. The hardware components vary for each configuration, but all configurations utilize DCSI's Meter Shop Test Tool software. (For information about the MSTS, contact your Program Manager or DCSI Customer Care at care@twacs.com or 1-800-892-9008.) **Complete details on testing the TWACS-ORION system are available through the Meter Shop Test System Help**, accessed by clicking the **Help** button on the Meter Shop Test Tool main menu.

Two modes of communication with the TWACS-ORION system are available through the Meter Shop Test System: TWACS signaling and serial communication. (Refer to Meter Shop Test System Help for the benefits and use for each.) To use the serial communication option, you must have the correct SIA Cable Assembly, which is available through DCSI.

If you are unable to resolve a problem with the TWACS-ORION system, return the meter to your integrator or DCSI. See *Return Procedures* on page 31.

Maintenance

The TWACS-ORION system requires no maintenance.

Warranty

Refer to contract terms for warranty information.

Return Procedures

Electromechanical meters/modules which have been integrated or retrofitted by a third party, must be returned to the third party. Please do not return third party integrated meters/modules to DCSI. Contact the third party to obtain their “Return Authorization Number” and shipping instructions and return the meter/module directly to the integrator/retrofitter.

If you are a DCSI certified integrator, and the product is under warranty and cannot be repaired in the meter shop, remove the module from the meter and complete the following procedures.

Before returning the product to DCSI, refer to contract terms for warranty information.

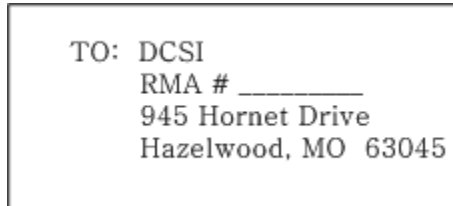
1. Send your return request via email to rma@twacs.com with the following information:
 - Company name (Distributor name and location (City, State) if applicable)
 - Ship to name and address
 - Contact name, phone number, and email address
 - DCSI part number of each item
 - Total quantity (by DCSI part number) for each returned item
 - Serial number of each item
 - Specific reason for return of each item
 - Manufacturer number (number starting with A/M/V/C/W) of each RCE item
 - Description of each returned item
 - Substation Communications Equipment (SCE) name
 - You will receive an email from DCSI within 24 hours, excluding weekends and holidays.
 - Upon receipt of all required information you will receive a Return Material Authorization (RMA) with the shipping instructions.

IMPORTANT Items should be properly packaged to avoid shipping/handling damage during transit.

Items must be packaged in individual anti-static or static dissipative bags and packed in sturdy, appropriately sized commercial boxes with packing material (styrofoam peanuts, bubblewrap, paper, etc.) arranged to prevent movement; in single layers; with the appropriate packaging between layers. Original packaging with dividers should be retained, reused, and re-identified if possible.

2. Mark the outside of the shipping container with the RMA number on the address label as shown in the following example:

Figure 2.6 Return address Label



3. Upon shipment, email rma@twacs.com with the shipping information (Carrier Name, Waybill/Pro/Tracking Number and Date item left your facility) so DCSI can track the shipment.
4. If an item is out of warranty, please contact rma@twacs.com for a diagnostic estimate prior to return.

IMPORTANT Items not packaged in accordance with DCSI packing requirements will not be accepted and will be returned freight collect. Please refer to the Returned Merchandise Packing Requirement Service Advisory (Y10377TM) for DCSI approved methods and materials. Contact DCSI Customer Care at care@twacs.com to receive a copy of this service advisory.

If you have any additional questions regarding returns, contact rma@twacs.com.

CHAPTER

3

SPECIFICATIONS

This chapter contains electrical, environmental, and physical specifications for the EMTR and HHTR.

Chapter at a Glance

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| Compliance Specifications | 34 |
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Electrical Specifications

The electrical specifications include:

- Electrical ratings
- Compliance Specifications

Electrical Ratings

The following table provides the electrical ratings.

Table 3.1 Electrical ratings

| Parameter | Rating |
|------------------------|---|
| Voltage | 6V<=V<=12V |
| Quiescent power | 25mA approximate |
| Maximum input surge | 100mA maximum |
| Internal fusing | None |
| Grounding | None |
| Electronics connection | The EMTR is connected to the EMT-3C-MP transponder during meter/transponder integration. |
| Electronics isolation | Refer to the <i>Electronic Metering Transponder for CENTRON Meter User Guide Y10317TM Rev. A.</i> |

Compliance Specifications

The following table provides the compliance specifications.

NOTE ANSI C12.1-2001 is the referring standard for tests listed in tables 5.2, 5.3, and 5.4.

Table 3.2 Compliance specifications

| Test Title | Applicable Specification |
|---------------------------------------|--|
| EMI/RFI Emission conducted/radiated | ANSI C12.1-2001 Test No. 27- “Radio Frequency Conducted and Radiated Emissions” per CFR 47 Part 15, Class A and B. (See also ANSI C63.4) |
| EMI/RFI Susceptibility | ANSI C12.1-2001 Test No. 26- “Effect of Radio Frequency Interference” |
| AC line surge | ANSI C12.1-2001/IEEE C62.41-1991 Test No. 17- “Effect of High Voltage Line Surges” |
| Electrical fast transient | ANSI C12.1-2001 Test No. 25- “Electrical Fast Transient/Burst” (Testing at 100 and 400 KHz is required) IEC 801-4: 1988 |
| Surge withstand capability FT and OSC | ANSI/IEEE C.37.90.1 - 2002 |

Table 3.2 Compliance specifications

| Test Title | Applicable Specification |
|---|---|
| High voltage isolation on meter chassis | ANSI C12.1-2001 Test No. 15- “Insulation” |
| Voltage interruption test | ANSI C12.1-2001 Test No. 16- “Voltage Interruption” |
| Effect of electrostatic discharge | ANSI C12.1-2001 Test No. 28- “Effect of Electric Discharge (ESD)” |
| Effect of Variation of Frequency | ANSI C12.1-2001. Test #6 |
| Effect of Variation of Voltage on the Metering Device | ANSI C12.1-2001. Test #5. |

NOTE Per Measurement Canada, Specifications/Standards LMG-EG-07 & PS-E-09-E are used to verify compliance with Canadian criteria.

Environmental Specifications

The following table provides the environmental specifications.

Table 3.3 Environmental specifications

| Thermal | |
|---|---------------------------------|
| Effect of operating temperature | Per ANSI C12.1-2001 Test No. 30 |
| Humidity | |
| Effect of relative humidity, both operational and storage | Per ANSI C12.1-2001 Test No. 31 |

Physical Specifications

The following table provides the physical specifications.

Table 3.4 Physical specifications

| Parameter | Specification |
|--|---|
| Size, weight, form factor | |
| Integrated dimensions | Meter-specific |
| Installation instructions | Provided with shipping package. One per TWACS-enabled meter carton. |
| Compliance Testing Specifications | |
| Mechanical tests | Per relevant sections of ANSI C12.1 - 2001 described below: |
| <ul style="list-style-type: none"> • Mechanical Shock • Mechanical Vibration • Transportation Drop Test • Transportation Vibration | <ul style="list-style-type: none"> • Test #32, per IEC 60068 part 2-27 • Test #34, per IEC 60068 part 2-6 • Test #33, per ISTA Test Procedure 1A • Test #35, per ISTA Test Procedure 1A |

Table 3.4 Physical specifications

| Parameter | Specification |
|----------------------------|---------------|
| Physical Tamper Protection | |
| Meter seal | Supported |

Table 3.5 Labeling requirements

| Labeling Requirements and Serial Number |
|---|
| HHTR |
| Labeling per ANSI C12.10-1987 for: |
| <ul style="list-style-type: none">• DCSI/customer name• DCSI/customer logo• TWACS serial number• Barcode |

Photo to be supplied

Acronyms

| | |
|-------|--|
| ADLC | Asynchronous Data Link Control |
| AMR | Automatic Meter Reading |
| AP | Alternate Pathmaps |
| ASCII | American Standard Code for Information Interchange |
| BPA | Backplane Assembly |
| CCA | Card Cage Assembly |
| CCE | Central Control Equipment |
| CIS | Customer Information System |
| CLI | Command Line Interface |
| CMT | Commercial Meter Transponder |
| CPSA | CRU Power Supply Assembly |
| CRA | Correlation Receiver Assembly |
| CRMA | Correlation Receiver Multiplexer Assembly |
| CRPA | Correlation Receiver Processor Assembly |
| CRU | Control and Receiving Unit |
| CT | Current Transformer |
| DCPA | Direct Current Power Assembly |
| DCSI | Distribution Control Systems, Inc. |
| DP | Diagnostic Pending |
| DPA | Distribution Panel Assembly |
| DS | Diagnostic Set |
| DSI | Disconnect Switch Interbase |
| EMA | Electronic Metering Assembly |
| EMTR | Electronic Meter Transceiver |
| EOM | End of Message |
| FEP | Front-End Processor |
| FCC | Federal Communication Commission |
| FSK | Frequency Shift Keying |
| GUI | Graphical User Interface |
| HHTR | Hand Held Transceiver |
| IC | Incomplete IMT/CMT Data |
| ILS | Integrated Load Survey |

| | |
|-------|--|
| IMA | Inbound Multiplexer Assembly |
| IMT | Integrated Metering Transponder |
| IP | In Progress |
| IPU | Inbound Pickup Unit |
| ISM | Industrial, Science, and Medical |
| KWH | Kilowatt Hours |
| LCT | Load Control Transponder |
| LS | Load Survey |
| MIT | Meter Interface Transponder |
| MS | Master Station |
| MSFE | Master Station Field Equipment |
| MTU | Modulation Transformer Unit |
| NA | Invalid Data |
| NS | Register Not Supported |
| ODBC | Open Database Connectivity |
| OFIA | Outbound Fiber Optics Interface Assembly |
| OK | Successful Read |
| OMU | Outbound Modulation Unit |
| OPA | Outbound Processor Assembly |
| PD | Partial Data |
| PE | Pending |
| PR | Pending Retry |
| QC | Quality Code |
| RC | Reasonability Check Failed |
| RCE | Remote Communications Equipment |
| RF | Radio Frequency |
| RI | Reset In Progress |
| RL | Register Length Invalid |
| RM | Read Meter |
| RMTR | Remote Meter Transceiver |
| RO | Retry Override |
| RPA | Receiver Processor Assembly |
| RSSI | Received Signal Strength Indicator |
| SCADA | Supervisory Control and Data Acquisition |
| SCE | Substation Communications Equipment |

| | |
|-------|--|
| SCPA | Substation Communications Processor Assembly |
| SDC | Service Disconnect/Connect |
| SP | Substation Status |
| STS | Substation Test Set |
| TC | Total Consumption |
| TD | Total Demand |
| TNS | TWACS Net Server |
| TOU | Time of Use |
| TP | Tamper Pending |
| TS | Tamper Set |
| TWACS | Two-Way Automatic Communication System |
| UHF | Ultra High Frequency |
| ZC | Zero Crossing |

Glossary

American National Standards Institute (ANSI)

An independent, U.S.-based technical standards organization.

AMR

See Automatic Meter Reading.

ANSI

See American National Standards Institute.

Automatic Meter Reading (AMR)

Electronic accumulation and transport of meter data.

billing demand information

Consists of the demand reset count, which increments, and the demand previous billing.

billing read

Defines the registers used during one-time scheduled reads and on-request reads.

DSHTBill read (Daily Shift Billing)

Defines the registers used during recurring scheduled reads; normally used to create billing files.

blink count

See power-down count.

bus identification

Identifies the substation bus to which DCSI's equipment is connect.

CCE

See Central Control Equipment.

Central Control Equipment (CCE)

The top level of the TWACS system hierarchy, also referred to as the Master Station. The CCE typically resides at the utility home office, providing system control and data storage for the TWACS system.

CIS

See Customer Information System.

CMT

See *Commercial Metering Transponder*.

Customer Information System (CIS)

A computer database that utilities use to keep track of their customer information (name, address, phone, meter serial number). Often includes bill printing functionality.

Commercial Metering Transponder (CMT)

An electronic assembly integrated into a commercial application electric meter to add TWACS communications capability to the meter.

Daylight Saving Time (DST)

Daylight Saving Time is the practice of turning the clock ahead in the Spring and back again in the Fall.

delay

The number of minutes after the interval has occurred before the SCE attempts to send a time sync command to the RCE.

demand

The rate at which power is delivered over a specified period of time; the rate of consumption. Demand is expressed in kilowatts.

demand interval

The specified interval of time on which a demand measurement is based. Intervals are commonly specified as 15, 30, and 60 minutes.

demand meter

A metering device that indicates or records demand, maximum demand, or both.

detection point

Identifies the specific conductor on which the inbound signal is detected. This point is identified as either A phase, B phase, C phase, or neutral.

dial encoder

A device that encodes or converts the position of metering dials (normally used in water meters) into an electrical signal for subsequent processing and transmission.

DST

See *Daylight Saving Time*

Electronic Metering Assembly (EMA)

An electronic assembly integrated into an electric meter to add TWACS communications capability to the meter.

Electronic Meter Transceiver (EMTR)

An electronic communication device that transmits and receives using RF transmission.

EMA

See *Electronic Metering Assembly*.

EMTR

See *Electronic Meter Transceiver*.

Federal Communication Commission (FCC)

The Federal Communications Commission (FCC) is an independent United States government agency, directly responsible to Congress, and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. Among its duties, the FCC is responsible for rating personal computers and other electronic equipment as either Class A or Class B. The ratings indicate how much radiation a particular device emits.

feeder identification

Identifies which feeders are connected to which bus(es).

firing angle

The place on the sine wave where the RTS places the TWACS signal.

frequency shift keying

A data transmission control method that modulates, i.e. “shifts” between two radio frequencies.

hand held transceiver (HHTR)

A control device used to set up, link, and establish communication between the EMTR and RMTR components of the TWACS RF system.

industrial, science, and medical (ISM)

An unlicensed radio frequency band.

interval

A relatively short time period over which energy use data is recorded by the transponder. The interval may be set for 15, 30, or 60 minutes, depending on the transponder type. Interval data is recorded for each consecutive interval.

interval data

A breakdown of consumption over specific intervals of time.

ISM

See *Industrial, Science, and Medical*.

load profile

Recording, storing, and analyzing consumption data over a period of time for a particular installation.

master station

See *Central Control Equipment (CCE)*.

maximum demand

The highest demand measured over a selected period of time, such as one month.

Meter Integration and Meter Test (MIMT)

A department within DCSI that reviews utility meter programming files and determines register programming requirements.

MIMT

See *Meter Integration and Meter Test*.

nonvolatile memory

A physical data storage area that maintains its content when the power is turned off.

on-demand reads

An unscheduled command to read a register.

ORION Transmitter

A one-way (simplex) radio frequency transmitter, manufactured by Badger Meter Inc., that allows retrieval of metering data from pit-set water, water, and gas meters. It periodically broadcasts a data packet.

PCB

See *Printed Circuit Board*.

peak demand

See *maximum demand*.

phase

The current supply conductors, other than the neutral conductor of a polyphase circuit, that usually carry the designation A phase, B phase, C phase.

power-down count

A voltage interruption greater than 0.1 seconds that the module will count as a power outage and will increase the power-down count register by one. Sometimes referred to as blink count.

previous billing demand

The maximum kW, or demand, as recorded at the time of the last reset. This value is normally used for billing purposes.

previous interval demand

The demand value stored in the meter that reflects the demand prior to the last reset.

Printed Circuit Board (PCB)

A thin plate on which electronic components are placed.

pulser

An electronic or magnetic device that generates electric pulses in a quantity that is proportional to the physical variable under measurement and which the pulses represent.

rate class

A rate class is a set of registers read for a particular class of customer with a particular meter model. It defines registers used for Billing and DSHTBill reads.

RCE

See *Remote Communication Equipment*.

received signal strength indicator (RSSI)

A value indicating the strength of the received radio frequency signal.

registers

Data storage locations on the transponder microprocessor that contain a variety of information that is retrievable by the master station. The type of data in registers includes consumption and demand data

Remote Communication Equipment (RCE)

The base of the TWACS system hierarchy. RCEs consist of the DCSI family of transponder products. RCEs are located at customer sites and interface TWACS communication with various end devices such as meters, water heaters, and air conditioning units to enable automatic meter reading (AMR), load management, or other functions.

Remote Test Set (RTS)

A TWACS communications test device used at a remote site to communicate locally, using TWACS, to a transponder over the power line.

Remote Meter Transceiver (RMTR)

An electronic communication device that transmits accumulated data using RF transmission.

Remote Acquisition List

A list of Remote Meter Transceivers stored in the EMTR.

RSSI

See Received Signal Strength Indicator.

RTS

See Remote Test Set.

SCE

See Substation Communication Equipment.

Serial Time Unit (STU)

A 2.5 seconds interval of time and the unit of measure of DCSI's Serial Time system. The intervals of time begin at 12:00 midnight on a cyclic 24-hour basis. Example: 1:00 a.m. would in serial time:

$$1440 \frac{(60 \text{ min.} \times 60 \text{ sec.})}{2.5}$$

signal mode

Identifies the path combination used during outbound communications. This combination can be either line-to-ground or line-to-line.

STU

See Serial Time Unit

Substation Communications Equipment (SCE)

The middle tier of the TWACS system hierarchy, consisting of all TWACS substation equipment (CRU, OMU, IPU, and MTU). The SCE transmits and receives data between CCE and RCE.

time-of-use (TOU)

A multiple tiered billing technique based on when the consumer uses the energy.

TNS

See *TWACS Net Server*.

TOU

See *time-of-use*

transponders

Two-way field devices that can receive and send messages to and from the substation.

TWACS

See *Two-Way Automatic Communication System*.

TWACS Net Server (TNS)

Chief component of the entire Two-Way Automatic Communication System. Manages all collected metering and interval data as well as the connection between the utility and the consumer's premises.

Two-Way Automatic Communication System (TWACS)

A patented technology that allows the utility to send and retrieve information to and from meters and other devices using the utility's power lines as a communication network.

Ultra High Frequency (UHF)

A frequency range in the radio frequency spectrum between 300 MHz and 3.0 GHz.

window

The amount of time in minutes available after the delay has occurred for the SCE to send a date/time command.

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