



User Guide

Stand-Alone Metering for OptiPlant

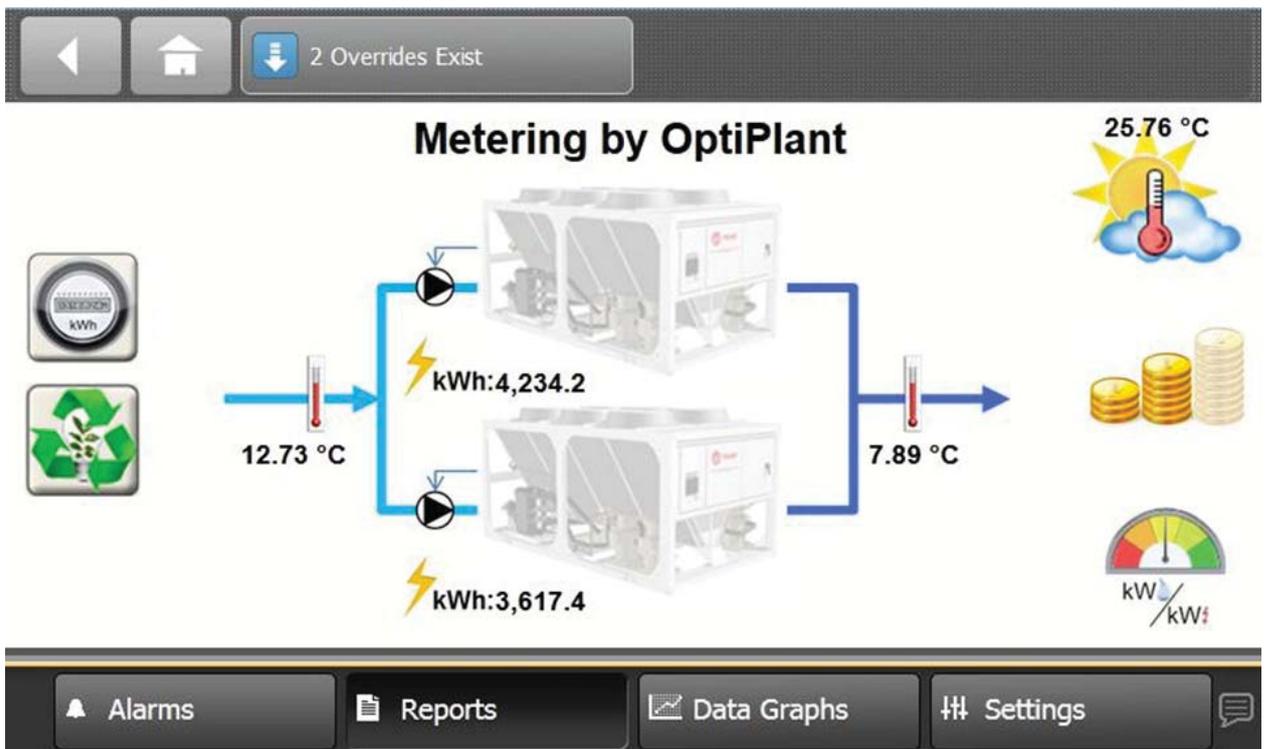




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Introduction

Foreword

These instructions are given as a guide to good practice in the use of the stand-alone metering version of the OptiPlant control panel. They do not contain the full service procedures necessary for the continued successful operation of this equipment. The services of a qualified service technician should be employed, through the medium of a maintenance contract with a reputable service company.

Warranty

Warranty is based on the general terms and conditions of the manufacturer. The warranty is void if the equipment is modified or repaired without the written approval of the manufacturer, if the operating limits are exceeded, or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance, or failure to comply with the manufacturer's instructions, is not covered by the warranty obligation. If the user does not conform to the instructions given in this document, it may entail cancellation of warranty and liabilities by the manufacturer.

General Features

The operation of the stand-alone metering version of OptiPlant is based on:

- Current transformers sized for the chillers, reading the absorbed current on the chillers
- Energy meters with pulse outputs
- XM30 expansion modules communicating energy pulses to the UC600 microprocessor control board of the OptiPlant panel
- The OptiPlant panel, and in particular:
 - Trane Tracer® UC600 microprocessor control board, housed inside the OptiPlant electrical panel, integrating all the preprogrammed functions to monitor energy of the chiller plant
 - Trane Tracer® TD7 graphic user interface on the OptiPlant panel allowing the user to interact with the system

Preprogrammed functions integrated in the controller:

- Measure the electrical energy consumption of each chiller; displayed in a daily, weekly and yearly format on the OptiPlant touch screen
- Calculation and display of the cooling load of the chiller plant, in a daily, weekly and yearly format
- Calculation and indication of the instantaneous efficiency of the chiller plant by comparing the cooling load against the electrical energy consumption
- Display on five separate graphs of:
 - The electrical consumption against cooling load
 - The system efficiency against outdoor air temperature
 - Chilled water temperatures (common supply and return plus setpoint) against outdoor air temperature
 - Instantaneous savings (with Chilled Water Reset option)
 - History of the weekly integrated savings over 52 weeks (with Chilled Water Reset option)
- Ability to synchronize energy meter readings with the TD7 display in case of a power failure on the OptiPlant panel
- Chilled water reset (option), based on the outside ambient temperature or on the return chilled water temperature.

Optional function which, assuming that a reduced -non sensitive- cooling load can be satisfied with warmer chilled water temperature, modifies (upward) the chilled water setpoint of the chillers (in order to improve their efficiency).

In HVAC applications, the usual reference for cooling load reduction is the outside air temperature or the return chilled water temperature.

These functions require a number of parameters to be set at startup to manage the specificities of the chiller plant system.

Benefits of metering the chiller plant:

- Some local regulations call for metering of individual equipment in a building
- Granular view of the facility energy performance
- Promotion of energy savings by:
 - Benchmarking
 - A precise knowledge of where energy is being consumed is the first step in creating a savings program
 - Constant monitoring
 - Allows the user visibility of energy conservation measures

Benefits of Chilled Water Reset (optional):

Operating savings on chillers

Rule of thumb: any degree Celsius increase in water supply temperature results in a 3% energy reduction to produce the needed capacity.

Information about savings is shown on the OptiPlant panel display. Refer to the User Screens section of this document.

- **Reduced stress** on the compressor through the lift reduction.

Lift can be considered as the difference between the condenser ambient temperature and the chilled water supply temperature.

Improved comfort

People feel more comfortable as the air temperature supplied in the zone is warmer. This is obtained with the warmer chilled water supply temperature.

Other Trane OptiPlant benefits:

Alarming

A system fault is indicated by the pilot light and on the screen display. It can also be reported remotely (if wired).

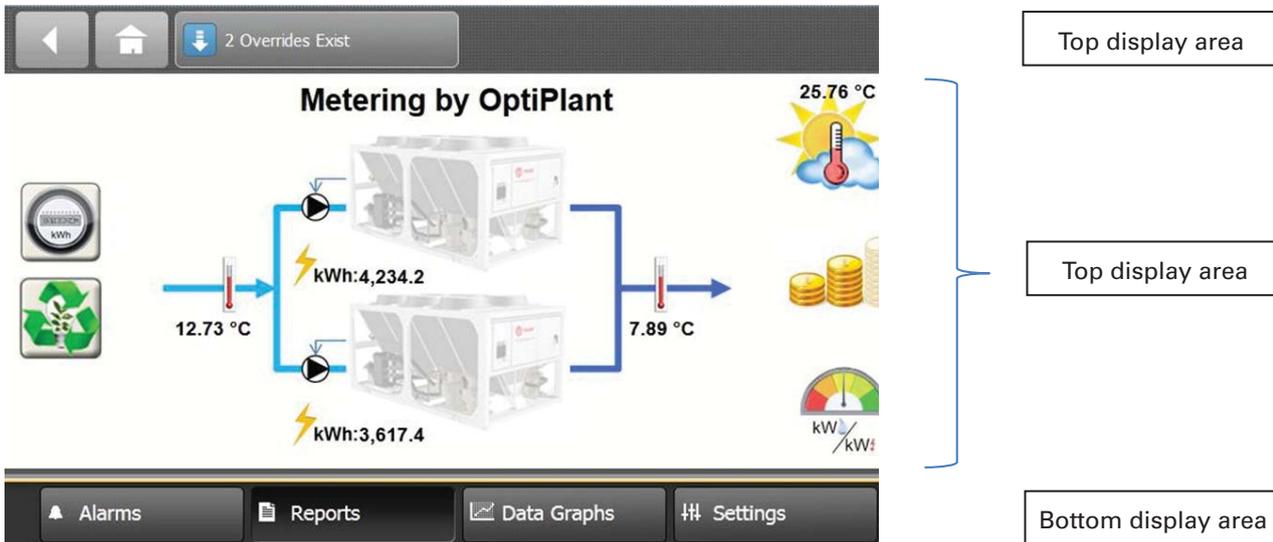
System temperature, system efficiency, power and savings trends

For the traceability of the plant operation over the last 7 days.

User Interface

The user interface is the 7-inch colour touchscreen display mounted on the OptiPlant panel.

Figure 1: User interface



There are three distinct areas on the screen:

- Top display area
- Main display area
- Bottom display area.

The top and bottom areas are displayed on all of the user screens.

Top display area

-  Left arrow button: returns to the last visited screen.
-  Home button: navigates to the Main screen
- **Overrides** button: summarizes the current number of user overrides

The use of these buttons is not needed for common usage.

Bottom display area

-  Sun button: controls the brightness level of the display
- **Alarms** button: navigates to the Alarms screen. When an alarm is present, this button flashes red. Use this function to review alarms.
- **Reports** button: navigates to the Reports screen. This button is not used for common usage of the Trane OptiPlant.
- **Data graphs** button: opens the Data Graphs screen to view data logs in graphical format.

Use this function to view data trends that are defined in the Trane OptiPlant. *Refer to the relevant chapter about the available trends.*

- **Settings** button: navigates to the Settings screen to access settings for UC600 and TD7. *This function is not needed for common usage of the Trane OptiPlant.*
-  Dialog button: navigates to the Language selection screen. *This function is not needed for common usage of the Trane OptiPlant.*

Main display area

The center area is the main display area. Data in this area will differ based on the user navigation. *Refer to the next section for more details.*

User Screens

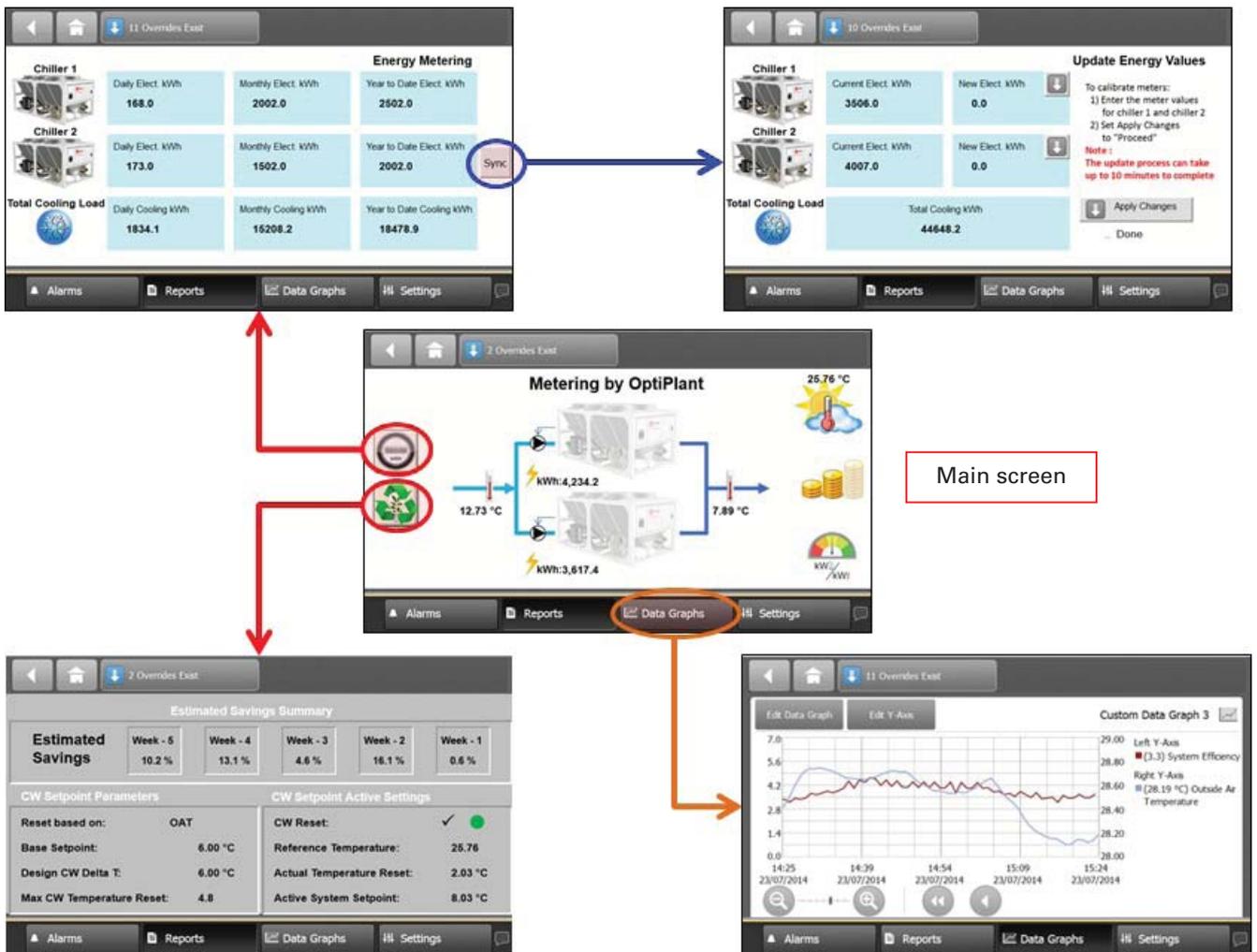
The user can navigate to different screens to view or set energy information.

From any screen, press the home button to navigate back to the main screen.

Navigation overview

The synoptic below illustrates how to navigate among the different energy metering and savings screens.

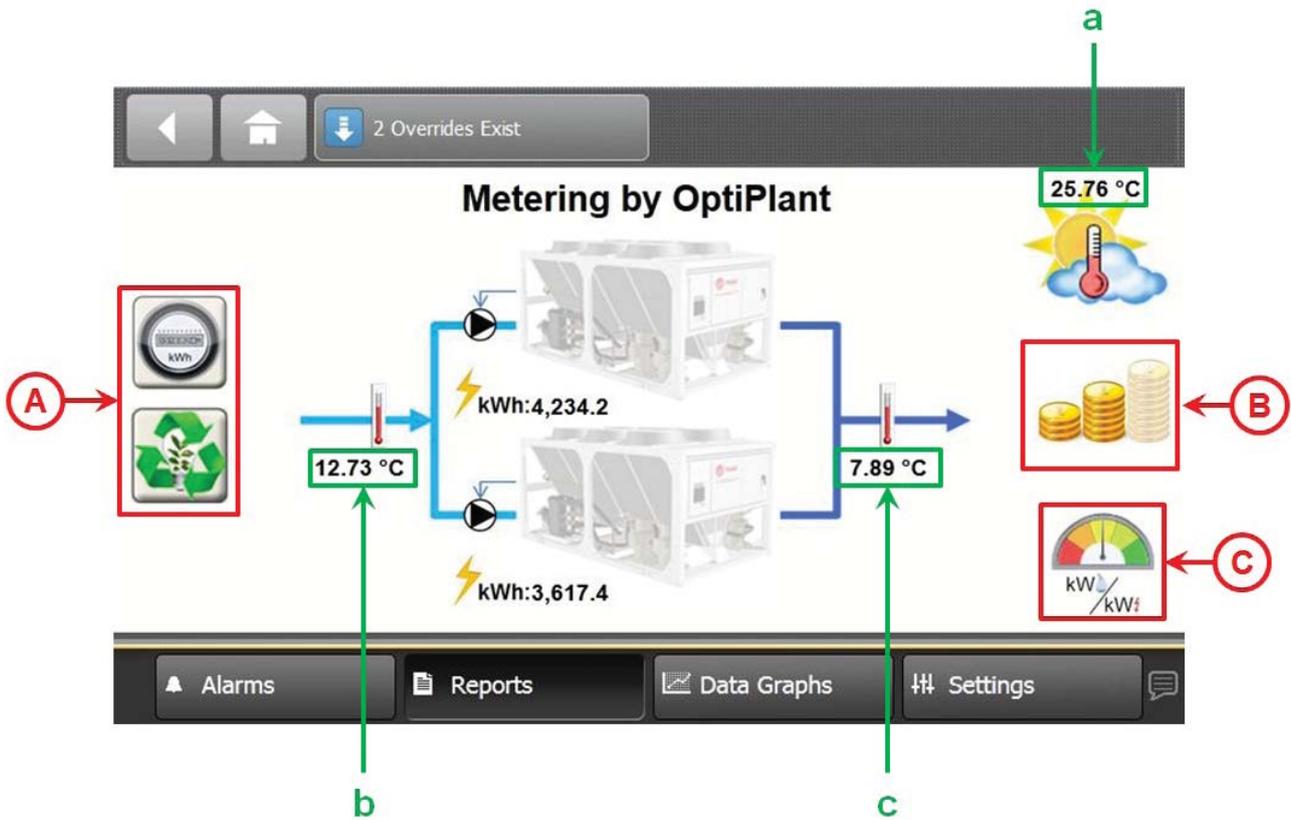
Figure 2: Navigation overview



User Screens

Main screen

Figure 3: Main screen



- The Main screen display includes two icons (Frame A on figure 3) on the left-hand side of the screen:



Gauge icon: To access the Energy Metering screen



Recycle Icon: To access the Savings Information (refer to the Savings Information section in this document for more information)

- If the option has been selected, the image in Frame B indicates the instantaneous savings generated with the Chilled Water Reset (if active)



User Screens

- The dial located in Frame C indicates the instantaneous system efficiency.
Note: The dial will not be visible if both chillers are disabled.

The system efficiency is the ratio between the calculated cooling load and the total electrical power measured on both chillers.

The cooling load is calculated using:

- The system flow entered in the Parameters screen, as well as the specific heat of water calculated with the given percentage of glycol in the system (*refer to the Settings section of the BAS-SVN019 installation manual*)
- The measured system chilled water temperatures (return and supply)
- The status of each chiller

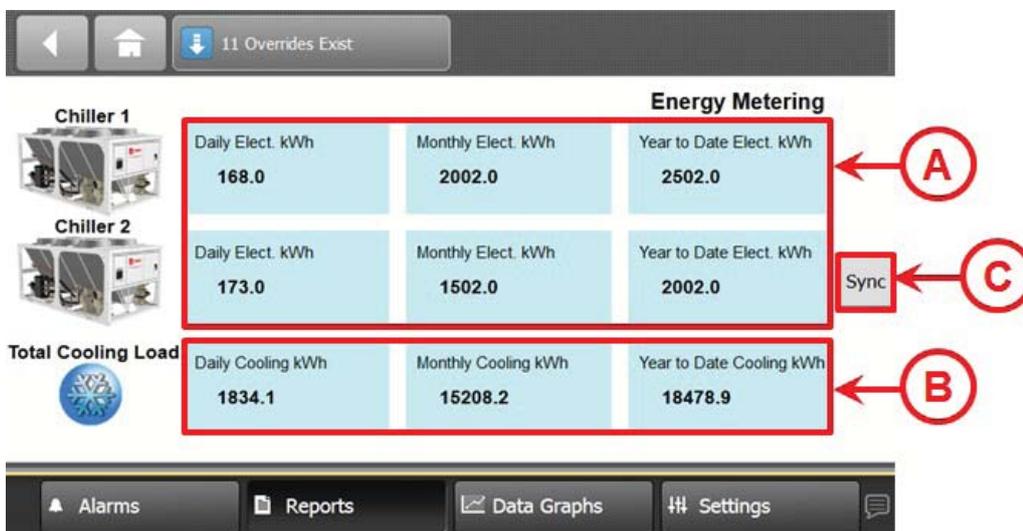
Colour coding of the dial:

- Red if System Efficiency (SE) < 1
 - Orange if $1 < SE < 1.5$
 - Yellow if $1.5 < SE < 2.5$,
 - Light Green if $2.5 < SE < 3$
 - Dark Green if $SE > 3$
- Other information shown on the main display includes:
 - Outside air temperature
 - System chilled water: Return temperature
 - System chilled water: Supply temperature
 - On this screen, the Correct  or Fault  icons can also appear to indicate the operation status of any components or of the global system.

Energy Metering screen

From the main screen, press the gauge icon  to open the Energy Metering screen.

Figure 4: Energy Metering screen



This screen displays the energy information for:

- The electrical energy consumption in kWh for each chiller, based on the energy pulses sent by the energy meter, and shown in a daily, weekly and year-to-date format
- The system cooling energy, based on the calculated cooling load (refer to the main screen section for more information), and shown in a daily, weekly and year-to-date format

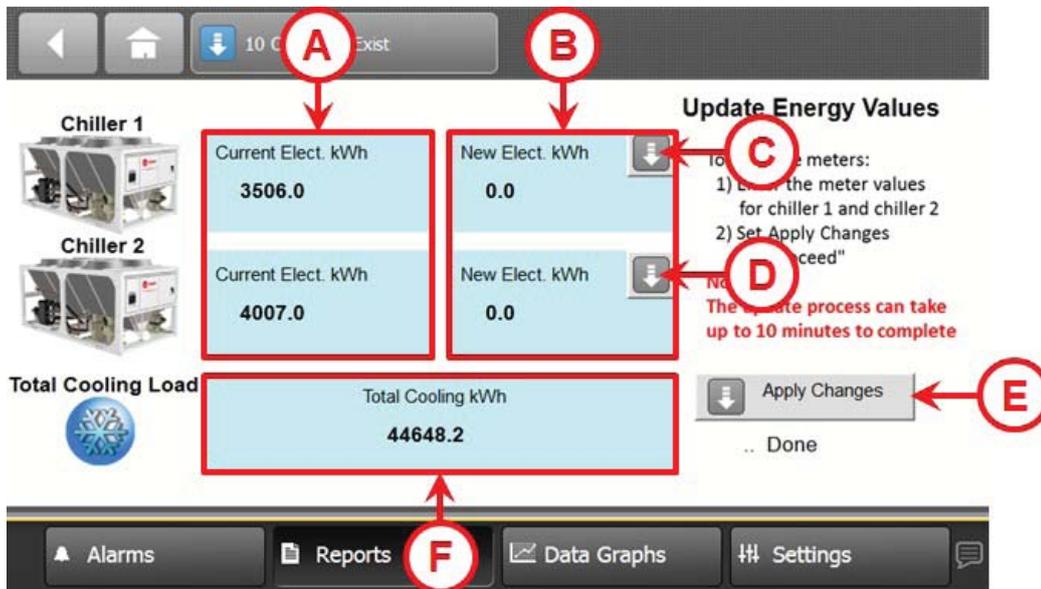
On a regular basis (recommended: every 3 months), or in the event of a power loss on the OptiPlant panel, press the Sync button (C on figure 4) to synchronize the OptiPlant electrical energy data with the energy meters readings.

User Screens

Update Energy Values screen

From the Energy Metering screen, press the Sync button to open the Update Energy Values screen.

Figure 5: Update Energy Values screen



On this screen, the grand total electrical energy read by the OptiPlant panel on each chiller is displayed (frame A on figure 5). Note that this grand total value is never reset unlike the daily, monthly and yearly data shown on the Energy Metering screen.

User can compare and if needed synchronize those values with the total active energy consumption shown on the energy meters.

To synchronize the energy consumption data:

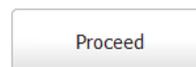
- 1) Write down the total active energy value from each energy meter (on chiller 1 and 2)
- 2) Press the down arrow button  in the New Elect. kWh area of the chiller 1 (C on figure 5)
 - This opens the **Chiller 1 Meter Correction kWh** override screen (for more information about the override screen, refer to the User Override section)
 - In the Override area, use the keypad button and enter the total active energy value from the energy meter on chiller #1



- Click on the **Apply** then **Save** buttons to record the change
- The entered value is now shown in the New Elec. kWh area

- 3) Repeat step 2 to update the total active energy value on chiller #2 by pressing the button D on figure 5 to open the **Chiller 2 Meter Correction kWh** override screen, and then enter the total active energy value from the energy meter on chiller #2

- 4) Press the **Apply Changes** button (E on figure 5)
 - This opens the **Sync Meters** override screen
 - In the Override area, press the **Proceed** button
 - Click on the **Apply** then **Save** buttons to record the change



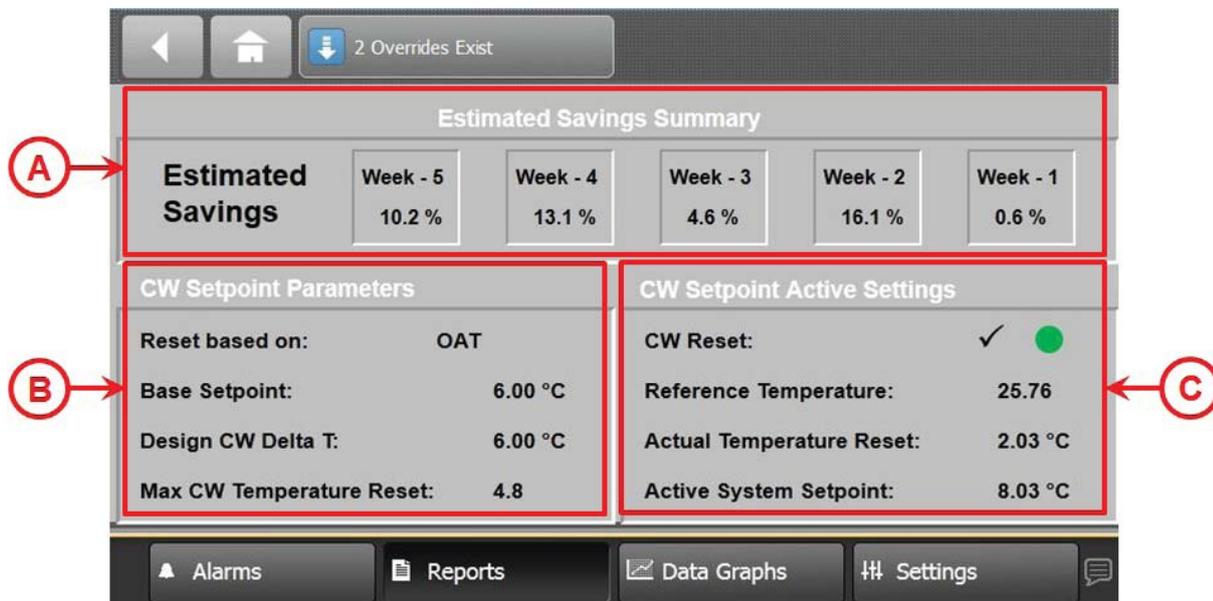
- 5) **IMPORTANT:** The Update Energy Values and Energy Metering screens will need approximately 10 minutes to get refreshed after pressing the Apply Changes button, so please wait for the following to happen:
- The Current Elect. kWh (frame A on figure 5) will display the corrected value entered for each chiller
 - The Total Cooling kWh (frame F on figure 5) will be recalculated on the pro-rata of the previous and corrected energy values
 - The Apply Changes status will revert from *Processing... to ...Done automatically*
 - In the Energy Metering screen, the following will take place:
 - The Daily Elect. kWh and Daily Cooling kWh will remain unchanged
 - The Monthly Elect. kWh and Monthly Cooling kWh will be offset by the difference between the previous and corrected energy values
 - The Year to Date Elect. kWh and Year to Date Cooling kWh will be offset by the difference between the previous and corrected energy values

Savings Information screen (Option)

From the main screen, press the recycle icon  to open the Savings Information screen.

If the chilled water reset option has been enabled, the screen shows the following:

Figure 6: Savings Information screen



User Screens

The following information and settings are displayed:

- **Frame A: Estimated Savings Summary**

This screen displays the savings that have been made over the past weeks.

Integration of the elapsed week measurements is made every Sunday at midnight. The current values shift to the left by one week.

The calculated integrated value is then displayed in the Week-1 box.

Information about savings is also visible in the following screens:

- The Main screen reports Instantaneous savings. It shows the percentage of energy reduction that the CWR generates, at the current measurement. *Refer to the Main Screen section for more information.*
- History of the instantaneous savings (over current week) is trended and can be reviewed through a graph. *Refer to the Trends section for more information.*
- History of the weekly integrated savings (over 52 weeks) is trended and can also be reviewed through a graph. *Refer to the Trends section for more information.*

- **Frame B: Chilled Water Reset Parameters**

These parameters are preset parameters, defined at commissioning. They are used as a base for the calculation of active settings, such as:

- **Reset based on**
Can be OAT (Outside Air Temperature) or RWT (System Chilled Water Return Temperature)
- **Base Setpoint**
This is the chilled water setpoint for the chillers in operation, with no reset applied.
If reset is active, the chilled water reset is added to this base setpoint in order to provide the chiller active setpoint.
- **Design CW Delta T**
This is the theoretical maximum reset value.
- **Max CW Temperature Reset**
This is the actual maximum reset value.
Limitation is mainly due to the chiller operating limits and defined at commissioning.

- **Frame C: Chilled Water Reset Active Settings**

This information provides the current system status:

- **CW Reset**

This is the current chilled water reset mode (Active or Inactive) of the reset application.

- **Reference Temperature**

Reset can be based on OAT (Outside Air Temperature) or RWT (System Chilled Water Return Temperature), see *Reset Based On* paragraph above.

This indicates either the air or water temperature that is used for reset calculation.

- **Actual Temperature Reset**

This is the calculated reset that will be applied to the Base Setpoint to generate a corrected setpoint for the chillers.

This reset value will be 0 if CWR mode is Inactive.

- **Active System Setpoint**

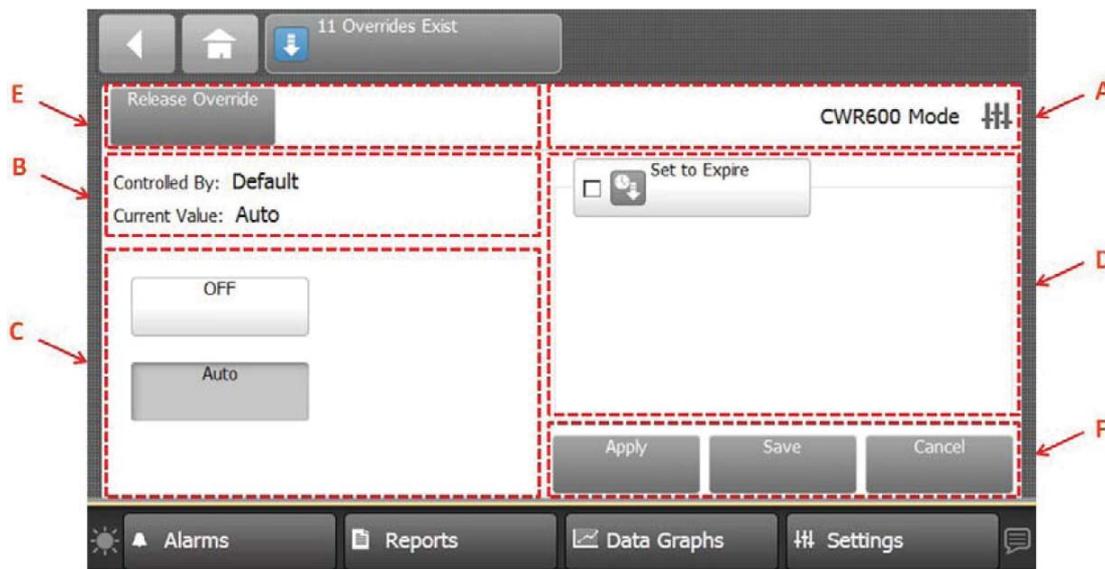
This is the Base Setpoint with the influence of reset (if any) sent to the chillers.

User Override

The Override Screen can be accessed from different screens to edit system values (refer to the User Screens section).

Override screen

Figure 7: Override screen



The override screen is made of five different areas:

A. Point under control

B. Point Status area showing who or what is controlling the point

Override Mode



Press the relevant button in the Override area (C).



Press an action button (F) to save or cancel the change.

C. Override area for user changes

D. Temporary Override area (when box is checked)

E. Release button to release the override

F. Action buttons to save or cancel the changes

Override Value

The Override area (C) provides two ways to change values:



- Use the up or down arrows or
- Touch the keypad icon (onto the left) to open the keypad screen and enter the desired value

Trends

To access trends, press the **Data Graphs** button in the bottom display area.



Operating temperatures

Press **Custom Data Graph 1** to access the Operating Temperatures graph.

A) Left-side scale:

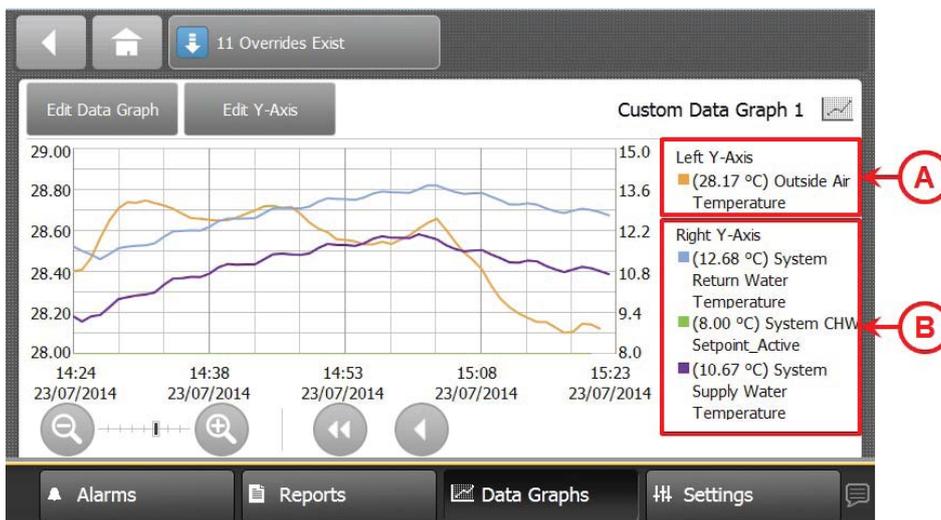
- Outside air temperature (°C)

B) Right-side scale:

- System chilled water return temperature (°C)
- System chilled water supply temperature (°C)
- Active setpoint (°C)

One week measurements, 3-minute scan period.

Figure 8: Operating Temperatures graph



Power Metering

Press **Custom Data Graph 2** to access the Power Metering graph.

A) Left-side scale:

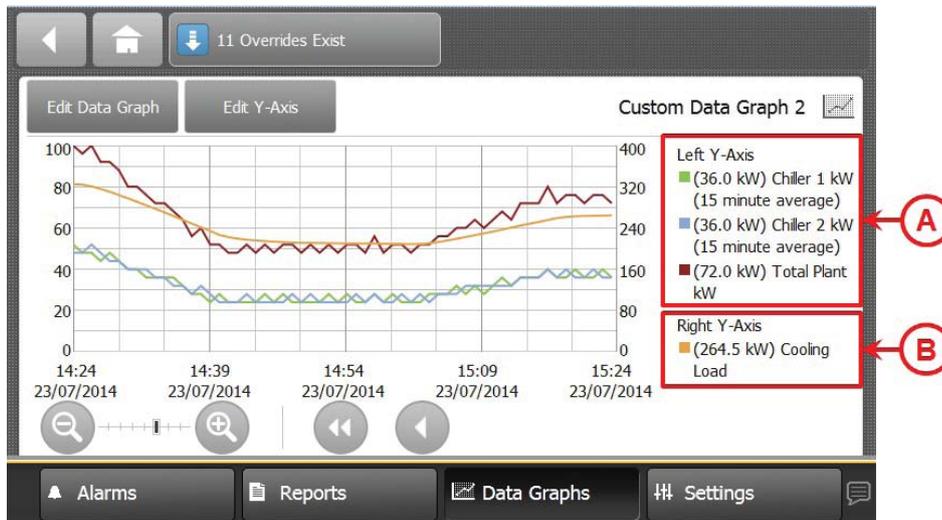
- 15-minute average power on chiller #1 (kW)
- 15-minute average power on chiller #2 (kW)
- 15-minute average total power of the chiller plant, i.e. chiller #1 + chiller #2 (kW)

B) Right-side scale:

- Calculated cooling load (kW)

One week measurements, 3-minute scan period.

Figure 9: Power Metering graph



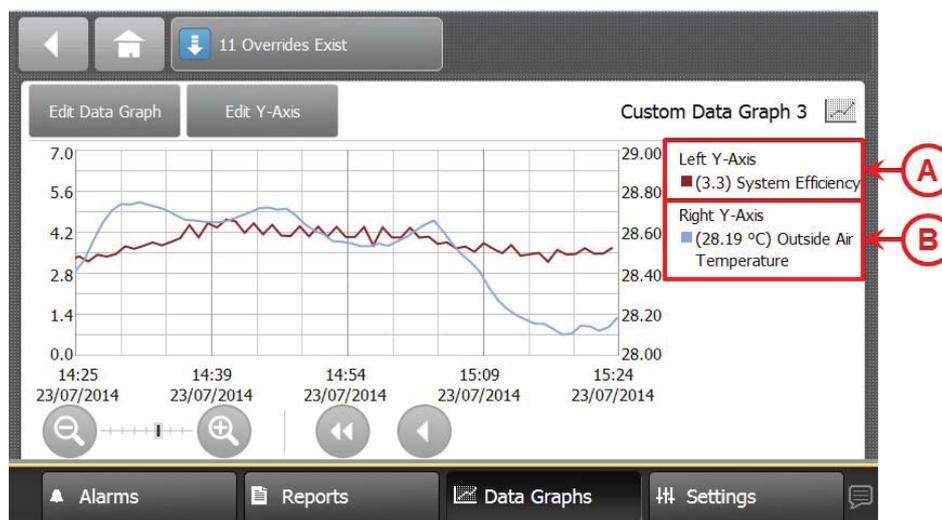
System Efficiency

Press **Custom Data Graph 3** to access the System Efficiency graph.

- B) Right-side scale:
 - Outside air temperature (°C)
 - One week measurements, 3-minute scan period.

- A) Left-side scale:
 - System efficiency (refer to the main screen section for more details)

Figure 10: System Efficiency graph



Instantaneous Savings

Press **Custom Data Graph 4** to access the Instantaneous Savings graph. Instantaneous savings are given in percentage (%)

One week measurements, 3-minute scan period.

Trends

Figure 11: Instantaneous Savings graph

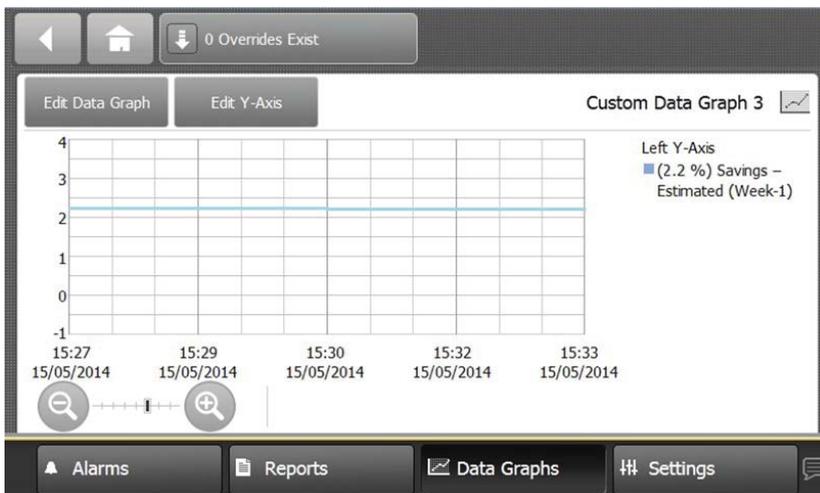


Weekly integrated savings

Press **Custom Data Graph 5** to access the Weekly Integrated Savings graph. Weekly integrated savings are given in percentage (%)

One-year measurements, one week scan period.

Figure 12: Weekly Integrated Savings graph





Notes



Notes



Notes



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