Course 126

Fault Finding and Auditing

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Fault Finding

Fault Finding utilizes many screens.

- Profile Graph
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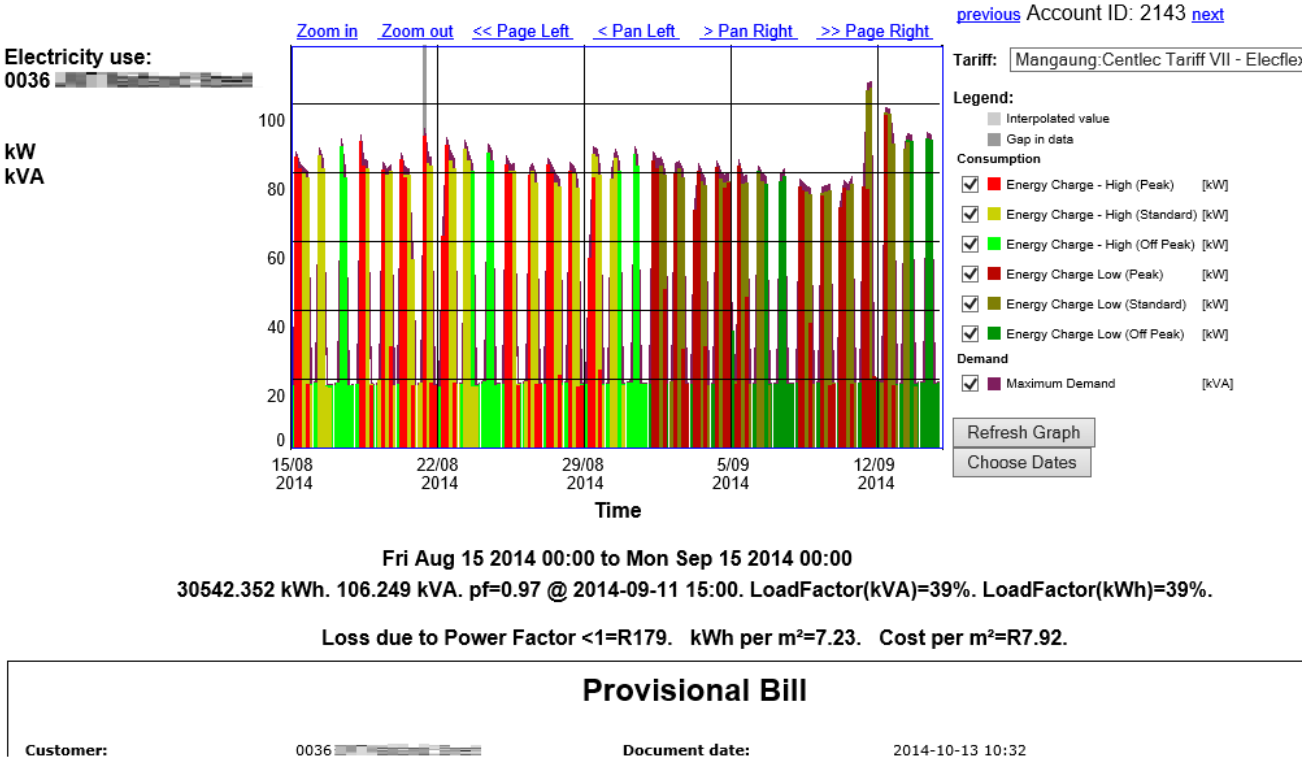
Profile Graph



Consumption and Demand usage per half hour is graphed in the center. (Demand is only shown if the tariff actually references it.)
To access the Profile Graph, select a Meter Account and go to **View→Profile Graph**.

Non-instantaneous events like power down, is shown as gray blocks behind the graphs.

The Legend is shown on the right.

Hover your mouse over a point in the graph to get the exact values measured at that point shown on the left.

Below graph:

- Current date selection
- Date of cursor (mouse) position
- Total (sum of) consumption for selected date range
- Maximum demand along with power factor at maximum demand, time of maximum demand
- Load factor at both demand and consumption

Above graph:

- Zoom in (first select a range by dragging on the graph).
- Zoom out: Zooming out of a day, will show a week, out of a week will show a month, etc.
- Page Left/Right: Moves the range displayed on the graph one full page left/right.
- Pan Left/Right: Moves the range displayed on the graph one tick left/right.

Switch between tariffs linked to this meter account using the tariff dropdown on the top right.

Switch between other meter accounts using the meter account dropdown on the top right (if there are less than 20 meter accounts); or the previous/next links on the top right (if there are more than 20 meter accounts)

Change to a different date range by clicking on the Choose Dates button bottom right.

Each half hour can be colored according to seasons and TOU (specified in the tariff).

Optionally the profile graph can be displayed below the Meter Account from the Edit->Meter Account screen.

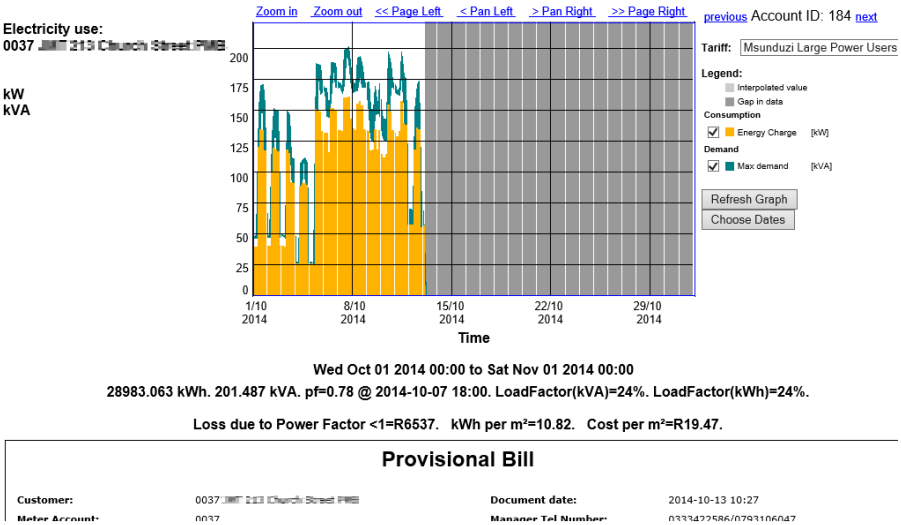
Possible Extrapolations

- TOU optimizations
  When the tariff is set up properly with TOU, you can easily see where you might be using too much power during peak times.
- Power Factor
  Consumption can be compared against demand. (We use kW and not kWh for ease of comparison). If power factor is bad, consumption and demand will differ a lot. A power factor of 1 means demand and consumption will be equal.

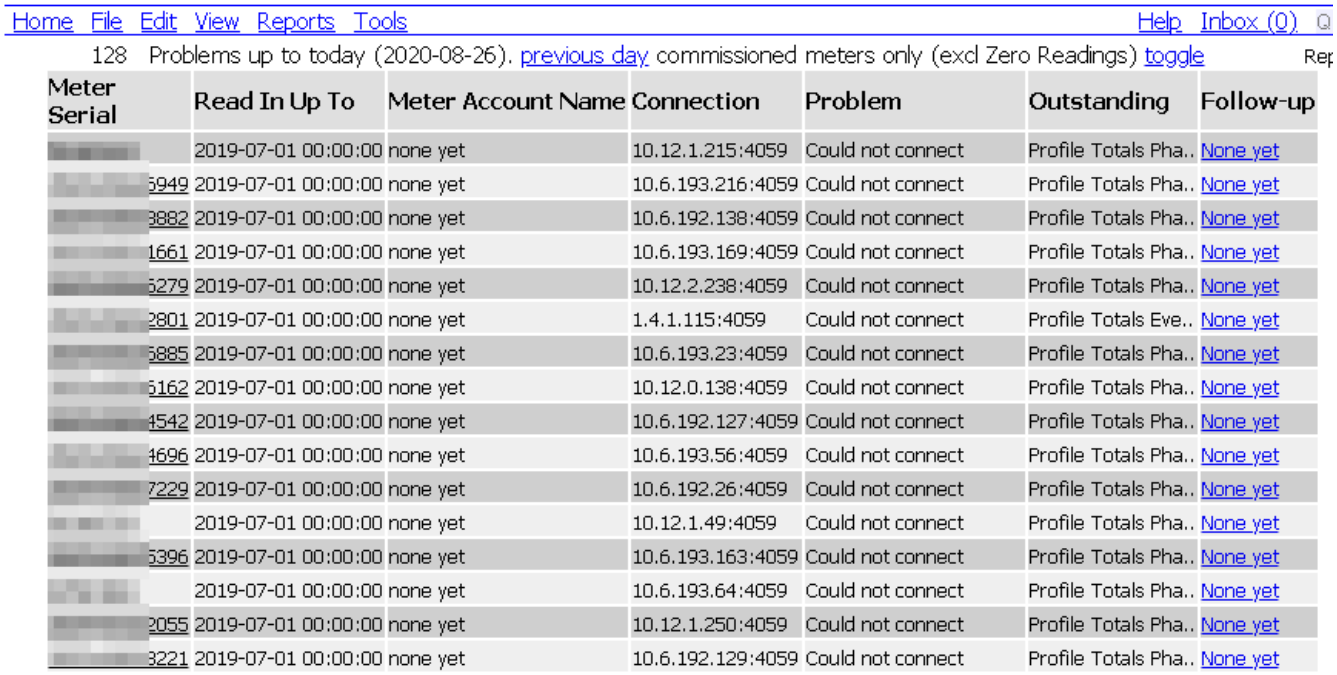
- Meter bypass/tamper
  The Profile Graph is an excellent tool for finding many problems with metered data. If viewed over a month period, irregularities like a meter bypass can often easily be detected, even for the untrained eye. A meter bypass will usually contain zeroes in areas where consumption would be expected.
- CT blown
  A blown CT will mean the data will read on average 2 thirds of the usual readings. The exact point of a blown CT can therefore often be seen where the consumption graph suddenly drops to 2 thirds of the usual shape.
- Lights/Aircons forgotten on during night time.
  On nights when the consumption does not fall as low as other nights, aircons or lights might have been left on.
- Reversed CTs
  Not the best place to pick up reverse CTs (Phasor Graphs are better for this); but if they are reversed (and should not be); the graph should show zeroes.
- Other Regular Problems
  For example when a shop is closed and the manager switches off the power to the shop at the breaker before the meter, the profile graph will show a regular power down every night.

Shift usage

A calendar can be created for each shift, which in turn can be combined with the Meter Account's Tariff (Under Edit->Meter Account). With this you can create a Profile Graph showing only the usage for each shift and also instantaneously calculate the cost for each shift using the optional Provisional Bill at the bottom.



Problem Meter List



Home File Edit View Reports Tools Help Inbox (0)

128 Problems up to today (2020-08-26). previous day commissioned meters only (excl Zero Readings) toggle

Meter Serial	Read In Up To	Meter Account Name	Connection	Problem	Outstanding	Follow-up
	2019-07-01 00:00:00	none yet	10.12.1.215:4059	Could not connect	Profile Totals Pha..	None yet
5949	2019-07-01 00:00:00	none yet	10.6.193.216:4059	Could not connect	Profile Totals Pha..	None yet
3882	2019-07-01 00:00:00	none yet	10.6.192.138:4059	Could not connect	Profile Totals Pha..	None yet
1661	2019-07-01 00:00:00	none yet	10.6.193.169:4059	Could not connect	Profile Totals Pha..	None yet
6279	2019-07-01 00:00:00	none yet	10.12.2.238:4059	Could not connect	Profile Totals Pha..	None yet
2801	2019-07-01 00:00:00	none yet	1.4.1.115:4059	Could not connect	Profile Totals Eve..	None yet
3885	2019-07-01 00:00:00	none yet	10.6.193.23:4059	Could not connect	Profile Totals Pha..	None yet
6162	2019-07-01 00:00:00	none yet	10.12.0.138:4059	Could not connect	Profile Totals Pha..	None yet
4542	2019-07-01 00:00:00	none yet	10.6.192.127:4059	Could not connect	Profile Totals Pha..	None yet
4696	2019-07-01 00:00:00	none yet	10.6.193.56:4059	Could not connect	Profile Totals Pha..	None yet
7229	2019-07-01 00:00:00	none yet	10.6.192.26:4059	Could not connect	Profile Totals Pha..	None yet
	2019-07-01 00:00:00	none yet	10.12.1.49:4059	Could not connect	Profile Totals Pha..	None yet
5396	2019-07-01 00:00:00	none yet	10.6.193.163:4059	Could not connect	Profile Totals Pha..	None yet
	2019-07-01 00:00:00	none yet	10.6.193.64:4059	Could not connect	Profile Totals Pha..	None yet
2055	2019-07-01 00:00:00	none yet	10.12.1.250:4059	Could not connect	Profile Totals Pha..	None yet
3221	2019-07-01 00:00:00	none yet	10.6.192.129:4059	Could not connect	Profile Totals Pha..	None yet

To get a list of all Meters with problems, go to **Tools→Problem Meter List**

Here you will get a list of all commissioned meters that have not read in up to today, in order of up to where they have data.

Columns are:

- Meter Serial

  a link to that meter. From here you can go to **Edit→Communication Monitor** to attempt to read that Meter manually

- Read In Up To

  Up to where the system has data for this meter

- Meter Account Name

  Name of the meter account linked to the meter, and if there are multiple Meter Accounts linked to that meter, a comma separated list of Meter Account names.

- Connection

  The connection to that meter, such as the IP address or phone number of the meter.

- Problem

This is the problem why there is no data for this meter

- Outstanding

  Data sets that are still to be acquired

- Follow-up

  A link to the Fault Log where a user can log faults against a meter, that is integrated into many other screens and reports. From here you can assign a technician to a meter and log any faults communicated by the technician.

Commissioned

If the Problem Meter List suddenly does not show any meters (and there should be meters), it might be because one of your meters were marked as Commissioned under **Edit→Meter Details**.

When no meters have the Commissioned Flag ticked, the system ignores the Commissioned Flag. If one or more meters have it ticked, then only meters that are commissioned are shown on the Problem Meter List.

You can get a list of which meters are commissioned and un-commissioned under **Reports→Various→**Meters Where and Read.

Click toggle, to show both commissioned and uncommissioned meters.

Download

The download at the bottom will give a spreadsheet that contains many more columns if you require more information.

Error Streak

In the case where a meter read is not even attempted by the system (i.e. **View→Meter Read Logs** are empty), check current error streak under Edit->Advanced Meter Settings. When the Meter fails a significant amount of times, the system will automatically try to read that meter less often in an attempt to reduce load on the system.

Meters that did read in

To get a list of which meters did read in, go to **Reports→Various→**Meters Date

List of possible problems

Could not connect; Could not connect to the Etherpad, Your connection is not making contact
The system was unable to connect to the Communication Device (Modem/Etherpad). Check that the Comminication Device is setup correctly. You can get more information in the first section of this wiki here

Communication error
The system did connect to the Communication Device, and there was communication, but the communication dropped before the system was done reading the Meter. This could be due to:

Bad Signal (very likely)

Not enough data on Prepaid SIM (likely)

Short on the communication line (unlikely). Typically with RS485, if the RX and TX line touches, everything that is transmitted is also received, making it look like there is proper comms, but there is not.

Wrong COM port settings (unlikely). Communications using RS232 or 485 need to be programmed with a BAUD rate and Framing. Wrong settings might result in garbled comms.

Communication error, no answer back
The system did connect to the Communication Device, but there was no comms. This could be due to:
Not enough data on Prepaid SIM (extremely likely)
Bad Signal (very likely)
Break in the communication line (unlikely)
Wrong COM port settings (unlikely). Communications using RS232 or 485 need to be programmed with a BAUD rate and Framing. Wrong settings might result in no comms.
Connection reset: Happens when the Communication Device restarts.
CT discrepancy. Please fix first.: Typically the meter gets programmed with the CT ratio. The CT ratio also gets recorded in PNPSCADA when you add the meter. The CT ratio in PNPSCADA should match the one in the meter.

Meter not Found
A connection was made to the Communication Device but the meter did not respond.

Accumulator not found
same as Meter not Found

Wrong Meter At Address
The meter serial number that was read from the meter, and the serial number that you entered into the system differs. For Elster A1140/A1700 and AS230 the Multidrop Address in PNPSCADA and on the Meter need to match. You can use Elster's SMARTset to get the correct multidrop address. Go to Edit->Meter Details to change the Multidrop Address in PNPSCADA.

Output Problem
You will need to contact SDG (010 003 1015) for this.

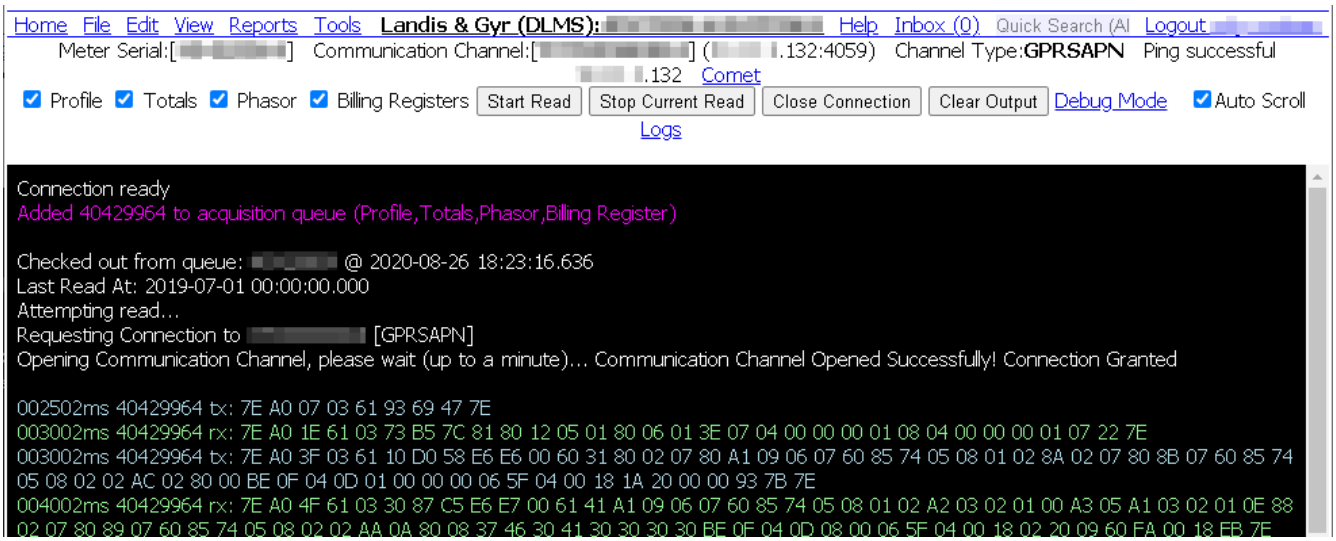
Invalid Meter Password
You can use the OEM software (SMARTset/MAP120/HexingView etc) to set the password on meters. You then need to enter that password in Edit->Meter Details->Password so that PNPSCADA can log into the meter.

Could not find RTU at address; PLC meter not found; Could not find meter at address
The Communication Device is connected to the server, but the Meter is not answering back. See Communication Error, no answer back.

Spike
PNPSCADA calculates the maximum kW that can go through this meter with VTprim * Breaker Size * Number of Phases. So if you add a 3 phase meter with a 400/400 VT and a breaker size of 100A, which means 400*100*3=120000 or 120kW maximum. If a values is read from the meter that is more than 10 times the maximum (in this case more than 1200kW) a spike is reported and the meter will not be read further. Typically you need to enter the correct breaker size.

Still Waiting
An order has been logged to read the meter, but the underlying Head End System has not responded with the results
Not InUse
For Kamstrup Meters it means no concentrator has picked up the meter yet. The problem is between the meter and the Kamstrup server.

Communication Monitor



The Communication Monitor allows the user to see the actual communication between the server and the meter, and is an invaluable tool in finding problems with the acquisition of a meter's data. Also note that this screen works from a browser, even a phone browser and can easily be used by a technician on site to troubleshoot a problem before leaving site.

You are presented with the Data Sets that you can acquire from the meter, such as Profile, Totals, Events, Phasor and Instrumentation Profile.
You can tick which ones you want the system to read and then click on Start Read.

The system will then make a connection to the meter and read the relevant data sets.

Cyan [Blue-Green] text shows the server's requests
Green text shows the meter's response.

Communication channel is the modem's IP address or phone number that is used to contact the meter.

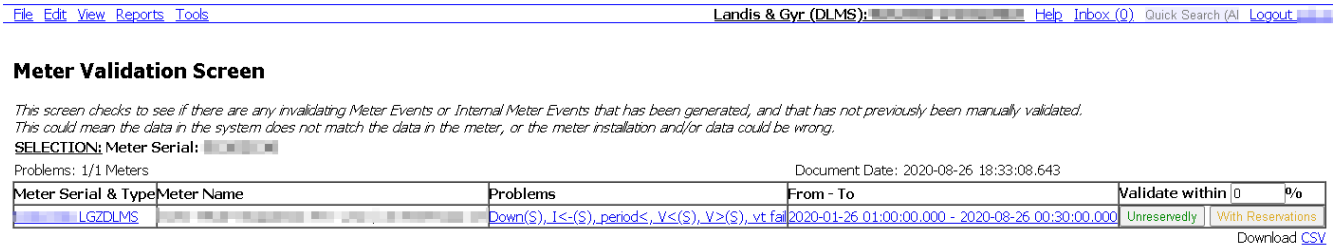
For modems with a fixed IP, the system will also ping the modem and show the results in the top right as "Ping successful".

There is a second monitor that shows debug information from the PNPSCADA driver that often has additional information as to where a problem exists. You can access this monitor by clicking on the link "debug mode".

Untick the autoscroll link to pause the screen at the current position.

The Logs link shows all the read attempts for this meter.

Meter Validation Screen



Meters log various events that can cause the data to become invalid for billing purposes, such as a Tamper event or Reverse Run.
When the systems reads a meter and an invalidating event comes in, all the data for that period is also marked as invalid.
The validation screen deals with validating data.
To access the Meter Validation Screen, go to **Tools→Meter Validation Screen**
The first screen is just a filter, but a blank submit will show all your meters.
Each meter with invalid data is shown per line.
First column is a quick link to the meter.
The problems column is a comma separated list of short codes of the events that caused the data to become invalid.
You can click on this link to take you to the meter's events. (You can also access this screen by selecting the meter and going to **View→Meter Event Log**). You can hover your mouse over the short codes to get the full description in Meter Event Log.
You can control which events cause a meter's data to become invalid by going to **Edit→Meter Event Setup**.
The From – To column is a quick link to the **View→Profile Graph** screen for the time that there is invalid data.
The Last column contains 2 buttons to validate the data. The green one starts the validation process. The yellow one does the same, but logs a message in the form of a Fault Log against that meter (which you can access from **Tools→Fault Log**).

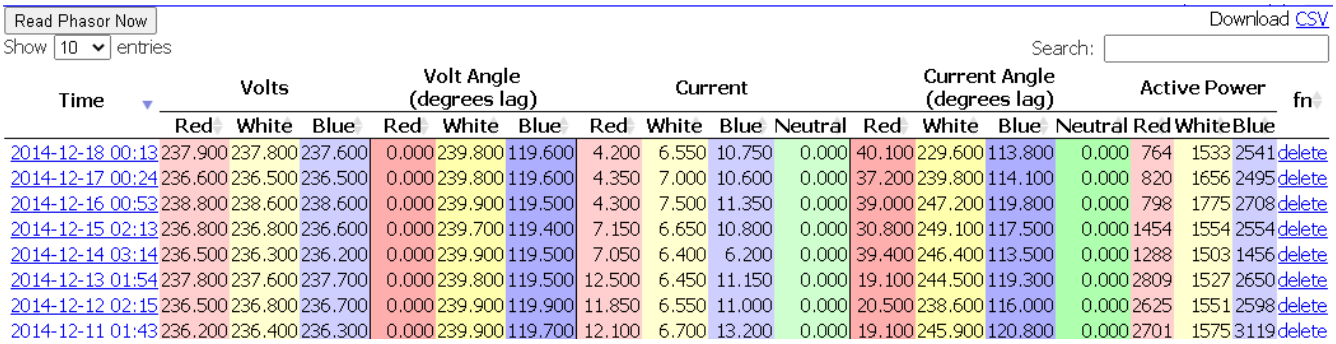
The validation process consists of 2 steps.
Step 1) Data audit:
There are 2 ways to calculate monthly consumption.
A) End Total minus Start Total
B) Sum of Half Hour Profile Values
Both ways should come to exactly the same value. If they don't, you have an audit error.
You can control the percentage threshold within which the profile and totals has to match up, by changing the Validate within % input.
If a meter fails the audit error, it is shown as a red error message at the top of the table.

You can resolve Audit Errors under **Edit→Meter Totals**.
Step 2) Mark all Data as Valid.

Typically you don't just want to mark all data as valid.
Often the quickest way to see if the data is correct, is to look at it in the Profile Graph (link in the 4th column).

Phasor Graph

The first screen shows a table of phasors that have been read



Read Phasor Now — Download CSV

Show 10 entries — Search:

Time	Volts			Volt Angle (degrees lag)			Current				Current Angle (degrees lag)				Active Power			fn
	Red	White	Blue	Red	White	Blue	Red	White	Blue	Neutral	Red	White	Blue	Neutral	Red	White	Blue	
2014-12-18 00:13	237.900	237.800	237.600	0.000	239.800	119.600	4.200	6.550	10.750	0.000	40.100	229.600	113.800	0.000	764	1533	2541	delete
2014-12-17 00:24	236.600	236.500	236.500	0.000	239.800	119.600	4.350	7.000	10.600	0.000	37.200	239.800	114.100	0.000	820	1656	2495	delete
2014-12-16 00:53	238.800	238.600	238.600	0.000	239.900	119.500	4.300	7.500	11.350	0.000	39.000	247.200	119.800	0.000	798	1775	2708	delete
2014-12-15 02:13	236.800	236.800	236.600	0.000	239.700	119.400	7.150	6.650	10.800	0.000	30.800	249.100	117.500	0.000	1454	1554	2554	delete
2014-12-14 03:14	236.500	236.300	236.200	0.000	239.900	119.500	7.050	6.400	6.200	0.000	39.400	246.400	113.500	0.000	1288	1503	1456	delete
2014-12-13 01:54	237.800	237.600	237.700	0.000	239.800	119.500	12.500	6.450	11.150	0.000	19.100	244.500	119.300	0.000	2809	1527	2650	delete
2014-12-12 02:15	236.500	236.800	236.700	0.000	239.900	119.900	11.850	6.550	11.000	0.000	20.500	238.600	116.000	0.000	2625	1551	2598	delete
2014-12-11 01:43	236.200	236.400	236.300	0.000	239.900	119.700	12.100	6.700	13.200	0.000	19.100	245.900	120.800	0.000	2701	1575	3119	delete

Columns:

- Time
- Voltage and Currents over all 3 phases
- Voltage and Current Angles over all 3 phases
- kW (P)

If there are more than one page of phasors, you can navigate to the other pages by clicking on next and previous

Click on a date to open the Phasor Graph for a specific date

The phasor graph shows:

3 thin lines in different color depicting voltage:

1. Red

2. Yellow (White)

3. Blue

3 thick lines in different color depicting current, corresponding to the thin voltage lines

The length of the thick lines indicate the relative load balance

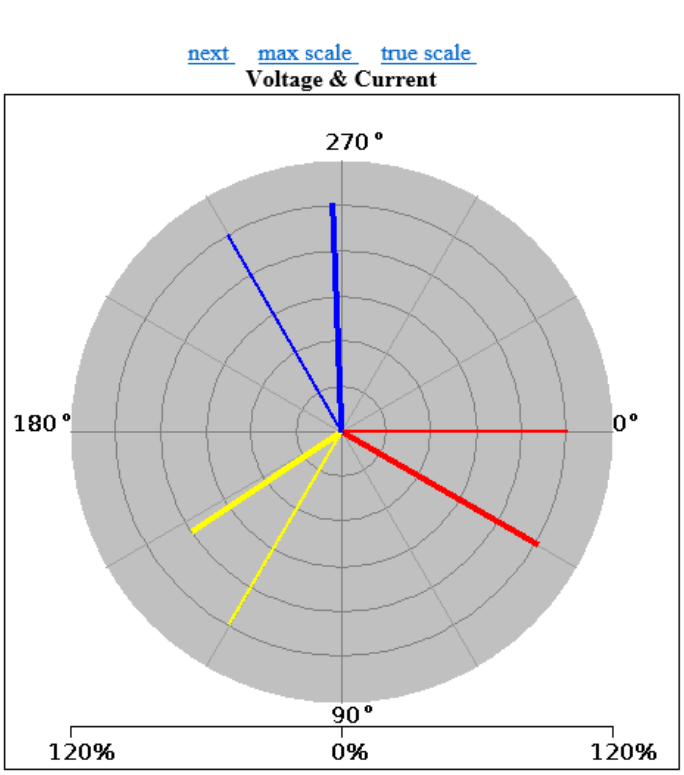
To the right of the graph is a table of actual values with columns for:

- All 3 voltages and currents
- All 3 volt and current angles
- kW (P); kvar (Q) and kVA (S)
- Power Factor (pf)

Examples

Example 1

This is what a typical 3 phase connection should look like.



Date & Time captured: 2012-12-03 14:50

Serial Number:	71503583		
Metering type:	Primary	**Connection:**	4 wire
CT Ratio:	160.0	**CT ratio:**	800 / 5
VT Ratio:	1.0	**VT ratio:**	400 / 400
MAXDEMAND:	800		

Phase	Red	White	Blue	Total
Voltage	225.583 V	222.261 V	225.357 V	
V Angle	0.0 Deg	120.0 Deg	240.0 Deg	
Current	150.224 A	117.568 A	149.760 A	
I Angle	30.0 Deg	146.0 Deg	268.0 Deg	
P	29.347 kW	23.486 kW	29.799 kW	82.633 kW
Q	16.944 kvar	11.455 kvar	15.844 kvar	44.243 kvar
S	33.888 kVA	26.130 kVA	33.749 kVA	93.732 kVA
pf	0.866 lagging	0.898 lagging	0.882 lagging	0.881 lagging

Example 2

Look out for Phasor Graphs where the currents are small (less than 10A). If the current is small you won't necessarily get a good Phasor Graph. In this case this is not the problem.

If Red CT was moved to White Voltage,

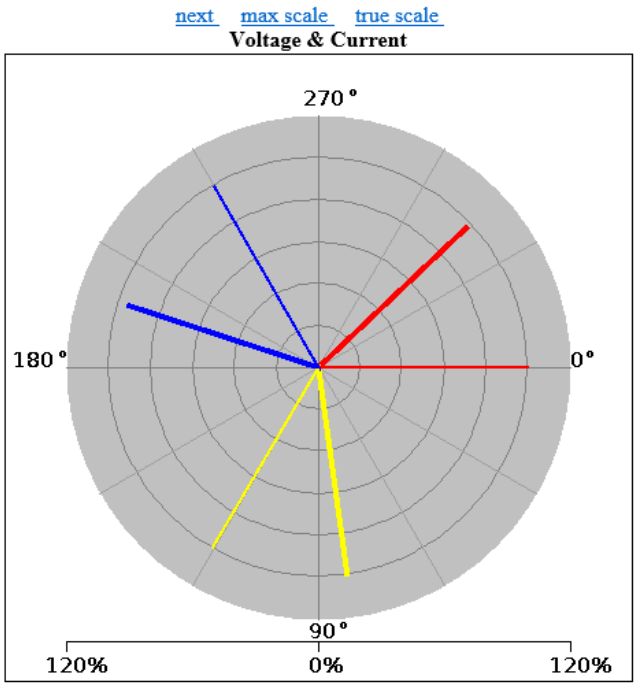
White CT to Blue Voltage,

Blue CT to Red Voltage

and all 3 CT's reversed,

you'll get a close to perfect Phasor Graph, which might be the problem in this case.

Date & Time captured: 2012-11-27 13:51



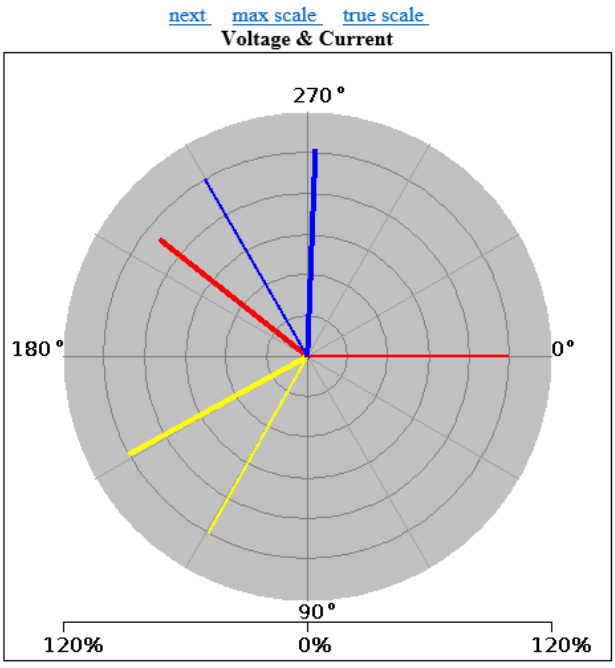
Serial Number:	71503561		
Metering type:	Primary	**Connection:**	4 wire
CT Ratio:	80.0	**CT ratio:**	400 / 5
VT Ratio:	1.0	**VT ratio:**	400 / 400
MAXDEMAND:	300		

Phase	Red	White	Blue	Total
Voltage	233.842 V	231.963 V	231.263 V	
V Angle	0.0 Deg	120.0 Deg	240.0 Deg	
Current	101.184 A	104.704 A	98.632 A	
I Angle	317.0 Deg	82.0 Deg	198.0 Deg	
P	17.304 kW	19.138 kW	16.951 kW	53.394 kW
Q	-16.136 kvar	-14.952 kvar	-15.262 kvar	-46.352 kvar
S	23.661 kVA	24.287 kVA	22.810 kVA	70.707 kVA
pf	0.731 leading	0.788 leading	0.743 leading	0.755 leading

Example 3

Red CT should be reversed.

Date & Time captured: 2014-09-18 08:54



Serial Number:	98141238		
Metering type:	Primary	**Connection:**	4 wire
CT Ratio:	60.0	**CT ratio:**	300 / 5
VT Ratio:	1.0	**VT ratio:**	400 / 400
MAXDEMAND:	100		

Phase	Red	White	Blue	Total
Voltage	234.3 V	234.9 V	236.9 V	
V Angle	0.0 Deg	119.0 Deg	240.0 Deg	
Current	54.7 A	59.5 A	60.3 A	
I Angle	218.4 Deg	150.9 Deg	272.6 Deg	
P	-10.043 kW	11.865 kW	12.034 kW	13.856 kW
Q	-7.960 kvar	7.385 kvar	7.696 kvar	7.121 kvar
S	12.816 kVA	13.976 kVA	14.285 kVA	15.579 kVA
pf	-0.783 leading	0.848 lagging	0.842 lagging	0.889 lagging

Example 4

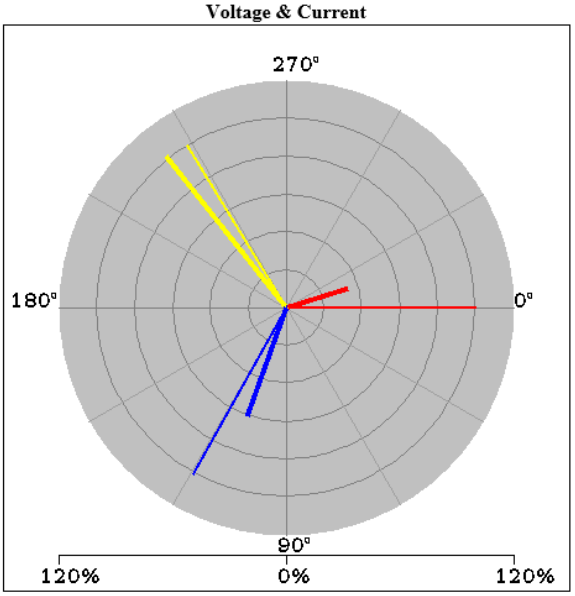
The phase rotation is the wrong way round, i.e. White and Blue Voltage and CT should be swopped

Phase load balancing should be done at this site

Date & Time captured: 2008-10-27 06:52

next max scale true scale

Voltage & Current



Serial Number:	207742218			
Metering type:	Primary	**Connection:**	4 wire	
CT Ratio:	100.0	**CT ratio:**	500 / 5	
VT Ratio:	1.0	**VT ratio:**	400 / 400	
MAXDEMAND:	0			

Phase	Red	White	Blue	Total
Voltage	221.784 V	221.241 V	221.864 V	
V Angle	0.0 Deg	238.762 Deg	119.083 Deg	
Current	56.846 A	172.725 A	103.580 A	
I Angle	343.167 Deg	231.538 Deg	109.634 Deg	
P	12.067 kW	37.910 kW	22.669 kW	72.647 kW
Q	-3.650 kvar	-4.805 kvar	-3.772 kvar	-12.229 kvar
S	12.607 kVA	38.214 kVA	22.980 kVA	73.669 kVA
pf	0.957 leading	0.992 leading	0.986 leading	0.986 leading

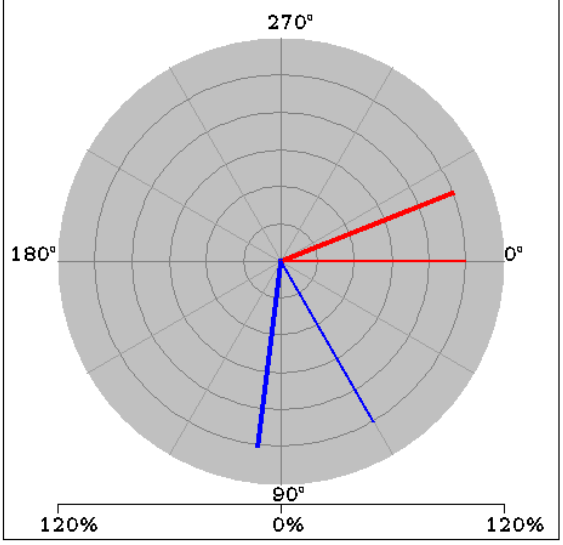
Example 5

An example of a typical 3 wire connection

Date & Time captured: 2010-08-13 00:06

previous next max scale true scale

Voltage & Current



Serial Number:	207742277			
Metering type:	Primary	**Connection:**	3 wire	
CT Ratio:	120.0	**CT ratio:**	600 / 5	
VT Ratio:	100.0	**VT ratio:**	11000 / 110	

Phase	Red	White	Blue	Total
Voltage	11251.830 V	0.0 V	11321.358 V	
V Angle	0.0 Deg	1.931 Deg	59.993 Deg	
Current	104.337 A	0.0 A	105.326 A	
I Angle	338.493 Deg	1.931 Deg	96.866 Deg	
P	1092.246 kW	0.0 kW	953.916 kW	2046.162 kW
Q	-430.401 kvar	0.0 kvar	715.512 kvar	285.111 kvar
S	1173.987 kVA	0.0 kVA	1192.440 kVA	2065.930 kVA
pf	0.930 leading	NaN	0.799 lagging	0.990 lagging

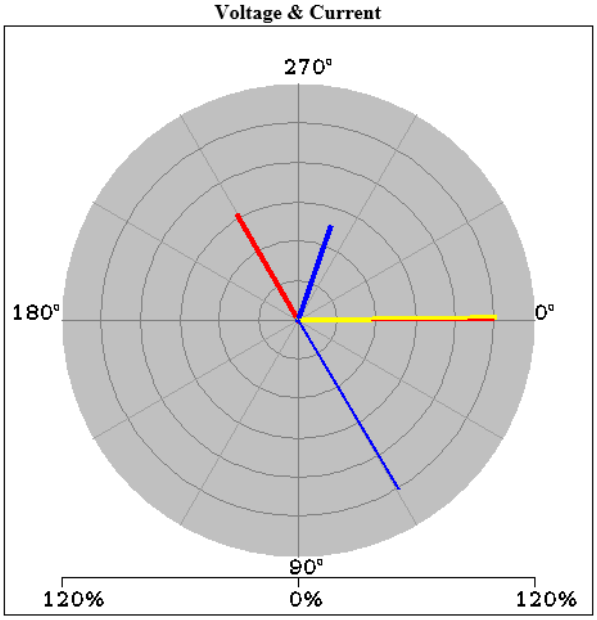
Example 6

Not sure what is going on here, but everything seems to be wrong

Date & Time captured: 2012-05-24 04:58

previous next max scale true scale

Voltage & Current



Serial Number:	207744726		
Metering type:	Secondary	**Connection:**	3 wire
CT Ratio:	1.0	**CT ratio:**	1 / 1
VT Ratio:	1.0	**VT ratio:**	1 / 1
MAXDEMAND:	0		

Phase	Red	White	Blue	Total
Voltage	11009.688 V	10937.996 V	11090.599 V	
V Angle	0.0 Deg	359.389 Deg	59.325 Deg	
Current	8.870 A	14.627 A	7.216 A	
I Angle	240.133 Deg	359.389 Deg	289.594 Deg	
P	-48.631 kW	159.996 kW	-51.155 kW	60.208 kW
Q	-84.688 kvar	0.0 kvar	-61.549 kvar	-146.238 kvar
S	97.658 kVA	159.996 kVA	80.033 kVA	158.147 kVA
pf	-0.497 leading	1.0	-0.639 leading	0.380 leading

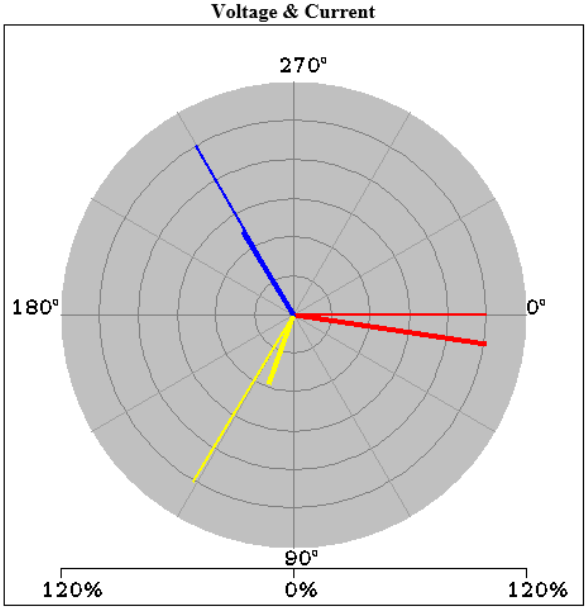
Example 7

An example of a typical connection of properly working Power Factor Correction equipment with correction derived from the Blue phase, overcompensating on White and undercompensating on Red phase

Date & Time captured: 2012-10-28 04:07

previous next max scale true scale

Voltage & Current



Serial Number:	78523912		
Metering type:	Primary	**Connection:**	4 wire
CT Ratio:	50.0	**CT ratio:**	250 / 5
VT Ratio:	1.0	**VT ratio:**	400 / 400
MAXDEMAND:	100		

Phase	Red	White	Blue	Total
Voltage	231.0 V	232.3 V	231.5 V	
V Angle	0.0 Deg	121.0 Deg	240.0 Deg	
Current	29.4 A	10.9 A	14.2 A	
I Angle	8.8 Deg	109.3 Deg	239.0 Deg	
P	6.711 kW	2.479 kW	3.286 kW	12.477 kW
Q	1.038 kvar	-0.513 kvar	-0.057 kvar	0.468 kvar
S	6.791 kVA	2.532 kVA	3.287 kVA	12.486 kVA
pf	0.988 lagging	0.979 leading	0.999 leading	0.999 lagging

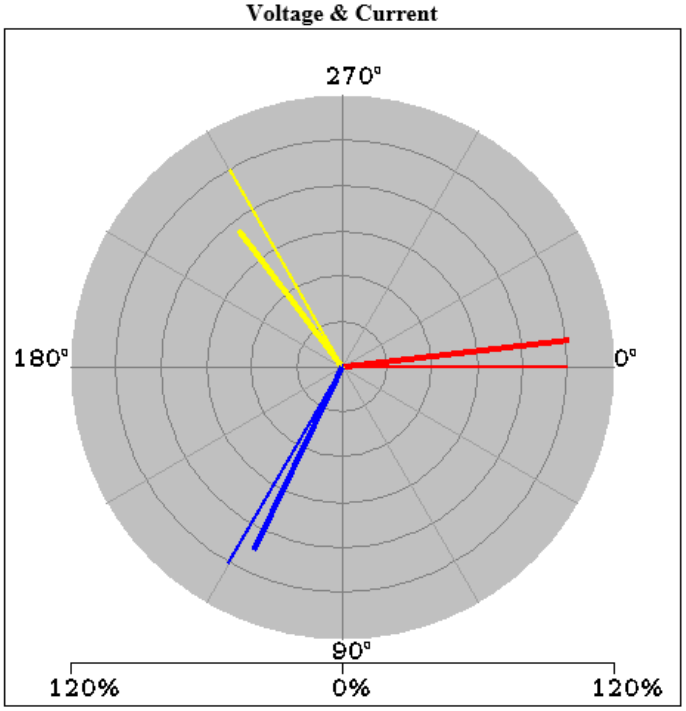
Example 8

An example of alternative Phase Rotation

Date & Time captured: 2009-09-30 00:06

previous next max scale true scale

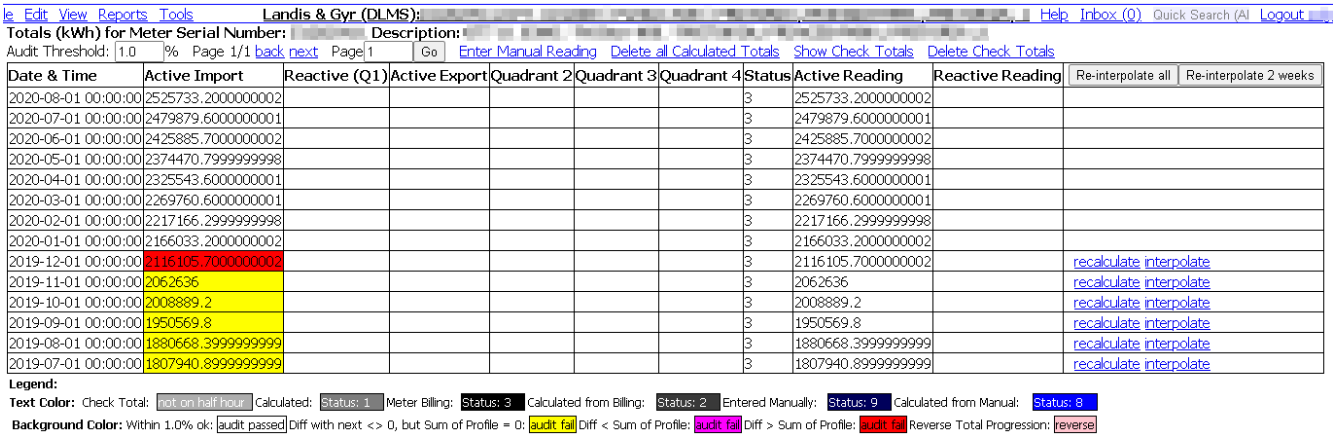
Voltage & Current



Serial Number:	207742418		
Metering type:	Secondary	**Connection:**	4 wire
CT Ratio:	100.0	**CT ratio:**	500 / 5
VT Ratio:	1.0	**VT ratio:**	400 / 400
MAXDEMAND:	0		

Phase	Red	White	Blue	Total
Voltage	228.489 V	228.467 V	229.963 V	
V Angle	0.0 Deg	240.202 Deg	120.120 Deg	
Current	96.221 A	71.417 A	85.263 A	
I Angle	353.614 Deg	232.725 Deg	115.535 Deg	
P	21.849 kW	16.177 kW	19.544 kW	57.571 kW
Q	-2.445 kvar	-2.123 kvar	-1.567 kvar	-6.135 kvar
S	21.985 kVA	16.316 kVA	19.607 kVA	57.897 kVA
pf	0.993 leading	0.991 leading	0.996 leading	0.994 leading

Meter Totals



Under **Edit→Meter Totals** you can view, capture and delete totals, as well as audit meter data.

Some totals are grayed out. These are called check totals. They are totals that are not on the half hour and thus cannot be used in conjunction with the half hour profile values.

To Capture a New Total

Click on Enter Manual Reading top center.
A new row will show at the top of the table.
You can enter a date in the first column.
Active Import is the main consumption where you would typically capture a Total.
Remember to click the Set button in the last column.
Manually Captured Totals have a status of 9.
When capturing a new total, half hour profile values are also generated (interpolated) to add up to the difference between this total and the previous.

To Delete A Total

Click on the delete link in the last column.
If there is no delete link, it is because the total was read from the meter (status 3) and might re-appear next time the system reads the meter.
If you still want to delete that total, you can Capture a Manual Total over this one (same date and time). That should change the status to 9 and give you an option to delete.

Auditing

Auditing works on the principal that there are 2 ways to calculate monthly consumption:
A) End Total minus Start Total
B) Sum of Half Hour Profile Values

Both ways should come to exactly the same value. If they don't, you have an audit error.

For each consecutive total shown, the system also sums the half hour profile values between the two totals and compares it with difference in the totals.

Depending on how the difference in totals compares to the sum of profile, the totals will be highlighted according to the legend at the bottom of the table.

Audit errors can happen for various reasons:

1) CT reprogram (likely)

2) Meter data scaling (likely). Under Tools->Modify Readings

3) Meter Faulty (unlikely)

When encountering an audit error, you need to decide which are more accurate (or necessary). The Profile or the Totals.

If the meter is on a demand tariff, the profile is typically invaluable.

In the case of CT reprogram or Data Scaling, the Profile values will typically be more accurate.

In the case of manual meter readings, the Totals are typically more accurate.

The main screen to deal with audit errors is **Edit→Meter Total**

Meter Total

When you have decided which one to keep, you can make the other one to match up. The match up process is always done from last readings to first readings. This is because the meter is currently on a specific total so the next total read from the meter will go on from the last one.

The check totals cannot be made to match up, so the easiest is just to delete them. Click on hide check totals, then delete check totals.

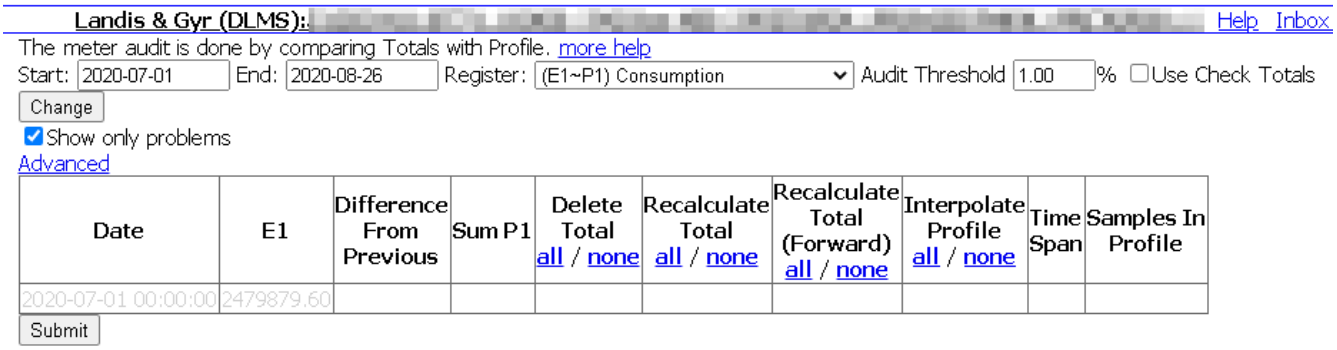
In the case of profile being right, you can recalculate totals:

Clicking on recalculate (last column) will take the next total and subtract the in between profile values to get to what this total should have been.

In the case of totals being right, you can re-interpolate profile:

Click on “reinterpolate” link (last column) to generate profile between this total and the next that will add up to the same value as the difference of the totals. Note that interpolation will work only for consumption, and not for demand.

Meter Audit



Another screen to resolve audit errors is under **Tools→Meter Audit**

This screen can only audit one register at a time.

Start off by choosing the start and end date and the register you want to audit.

Then click Change.

One row will be shown for each total between these two dates (disregarding check totals).

Columns:

1. Date of total
2. Register name e.g. E1
   This shows the total for that date
3. Difference From Previous
   Showing the difference in the total and the previous total
4. Sum [Register Profile Name] e.g. Sum P1
   Showing the sum of the profile values between this total and the previous total.
   This should be the same as the previous column.
   If it is not, you have an audit error.

The following 4 are options that you have, to fix a total or profile, only one of which can be chosen at a time

5. Delete Total
   Will delete this total on submission
6. Recalculate Total
   Will recalculate this total, taking a later total and subtracting the profile in between this total and the later total.
7. Recalculate Total (Forward)
   Will recalculate this total, taking an earlier total and adding the profile in between.
   Typically one should give preference to a later total, as this is closer to what the meter is currently on.
8. Interpolate Profile
   This will generate profile between these two totals that add up to the difference between the totals. This option should not be use on meters with TOU or Demand.
9. Time Span
   The time span between the two totals
10. Samples in Profile
    The number of samples between the two totals in the profile vs how many there should have been.

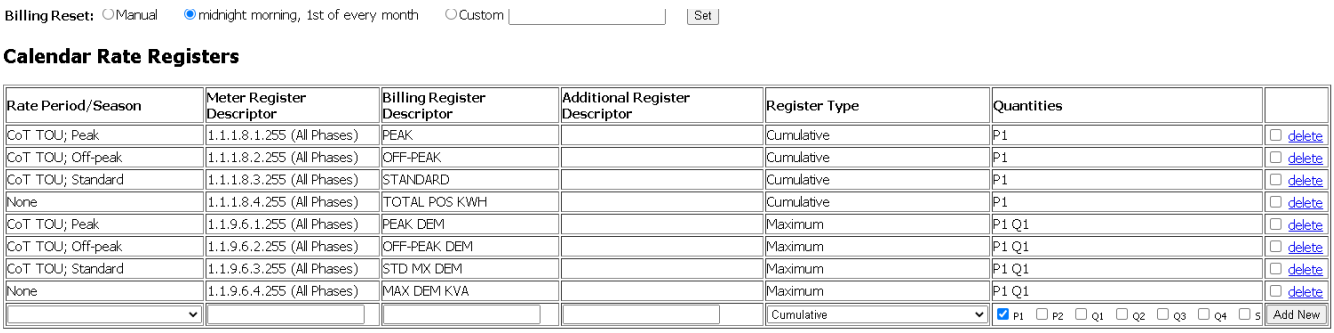
TOU and Billing Registers

Some meters can be programmed with special registers that only add up during TOU times, or registers that log, for example the Demand.

These Billing Registers can be used by PNPSCADA to calculate a bill, rather than using the raw profile values.

In order to get the PNPSCADA to use the Billing Registers, a couple of things need to be in place:

- The TOU calendar should be programmed into the meter
  This step is done with the meter's OEM software
- a copy of the Calendar needs to exist on PNPSCADA
  A calendar can be added under **File→New→**Calendar. You can share a calendar between meters with the same TOU setup
- The meter on PNPSCADA needs to be linked to the PNPSCADA Calendar
  This is done by selecting the Meter and going to **Edit→Advanced Meter Settings** and choosing the correct calendar there.
- The PNPSCADA Calendar should be set up with a mapping that maps each Rate Register in the PNPSCADA to the code in the meter.


Billing Reset: ○Manual ◉midnight morning, 1st of every month ○Custom Set

Calendar Rate Registers

Rate Period/Season	Meter Register Descriptor	Billing Register Descriptor	Additional Register Descriptor	Register Type	Quantities	
CoT TOU; Peak	1.1.1.8.1.255 (All Phases)	PEAK		Cumulative	P1	☐ delete
CoT TOU; Off-peak	1.1.1.8.2.255 (All Phases)	OFF-PEAK		Cumulative	P1	☐ delete
CoT TOU; Standard	1.1.1.8.3.255 (All Phases)	STANDARD		Cumulative	P1	☐ delete
None	1.1.1.8.4.255 (All Phases)	TOTAL POS KWH		Cumulative	P1	☐ delete
CoT TOU; Peak	1.1.9.6.1.255 (All Phases)	PEAK DEM		Maximum	P1 Q1	☐ delete
CoT TOU; Off-peak	1.1.9.6.2.255 (All Phases)	OFF-PEAK DEM		Maximum	P1 Q1	☐ delete
CoT TOU; Standard	1.1.9.6.3.255 (All Phases)	STD MX DEM		Maximum	P1 Q1	☐ delete
None	1.1.9.6.4.255 (All Phases)	MAX DEM KVA		Maximum	P1 Q1	☐ delete
				Cumulative	☑ P1 ☐ P2 ☐ Q1 ☐ Q2 ☐ Q3 ☐ Q4 ☐ S	Add New

This is done by selecting the Calendar and going to **Edit→Calendar Register**.
Here you can have a line for each rate register in the Calendar and under the "Meter Register Descriptor" column, be sure to add the correct code that a meter calls the rate register.
e.g. You can have a line that takes the High Demand Peak Rate Register, and maps that to a meter's register with code 1.1.1.8.1.255.
In order to see all the available codes that a meter exports and their corresponding values, you can go to **View→Meter Registers** (after the meter has been read the first time) to see the values before processing.

Meter Registers

Meter Serial: [redacted] Set: Instrumentation Profile (16)

Date & Time	1.0.0.1.0.255 (All Phases) []	1.1.15.8.4.255 (All Phases) [Wh]	1.1.15.8.1.255 (All Phases) [Wh]	1.1.15.8.2.255 (All Phases) [Wh]	1.1.15.8.3.255 (All Phases)
2020-08-01 00:00:00.000	8.000	39701150.000	6257810.000	17240940.000	162023
2020-07-01 00:00:00.000	7.000	33522740.000	5164980.000	15068120.000	132896
2020-06-01 00:00:00.000	6.000	28181640.000	4262490.000	12892270.000	110268
2020-05-01 00:00:00.000	5.000	23182780.000	3487260.000	10547180.000	91483
2020-04-01 00:00:00.000	4.000	18577430.000	2795730.000	8357710.000	74239
2020-03-01 00:00:00.000	3.000	13570170.000	2017540.000	6096570.000	54560
2020-02-01 00:00:00.000	2.000	9037210.000	1356500.000	4069170.000	36115
2020-01-01 00:00:00.000	1.000	4513610.000	668050.000	2075820.000	17697

Or go to **Edit→TOU Billing Register Values**, to see the values after processing

Meter Registers, for Billing

Meter Serial: [redacted]

hide check totals

Date & Time		CoT TOU; Peak 1.1.1.8.1.255 (All Phases) PEAK hide	CoT TOU; Standard 1.1.1.8.3.255 (All Phases) STANDARD hide	CoT TOU; Off-peak 1.1.1.8.2.255 (All Phases) OFF-PEAK hide	1.1.1.8.4.255 (All Phases TOTAL POS KWH hide
2020-08-01 00:00:00.000	delete	6257.810	16202.379	17240.939	39701.15(
2020-07-01 00:00:00.000	delete ☑	5164.979	13289.620	15068.120	33522.73
2020-06-01 00:00:00.000	delete ☑	4262.489	11026.860	12892.270	28181.63

- For SAP, the Billing Register can be mapped to the corresponding SAP register also under **Edit→Calendar Register** and in the **Billing Register Descriptor**.
  e.g. For the Rate Register High Demand Peak, you can map to the SAP Register "PEAK"
- There should be totals for both the start and end billing reset dates. You can specify the billing reset dates at the top of the **Edit→Calendar Register** screen