meter logger

6C

PULSE ▐▌▌▌➡ LOGGER ▐▌▌▌➡ ETHERNET

ELECTRICITY / GAS / WATER / TEMPERATURE

www.crucible-technologies.co.uk

Crucible
Technologies

Installation and User Guide

Version 1.1

Thank you for purchasing the Meter Logger 6C.

This manual contains setup and general use instructions. Should you require any further information feel free to contact our support team on 01904 792211.

CONTENTS

Have I Got Everything?

Please check the package contents and make sure you have all the equipment listed below. If you find you have something missing please contact us immediately.

Package Contents:
   1 x Meter Logger
   1 x Low Voltage Power supply
   1 x User Manual

Installation

Connecting the Meter Logger

Pulse output connections - The configuration and wiring connections of the inputs of the Meter Logger 6C are shown in the following diagram:

Pin 1	Input
Pin 2	0V
Pin 3	+5V (100mA max.)

PORT IDENTIFICATION AND PIN OUT
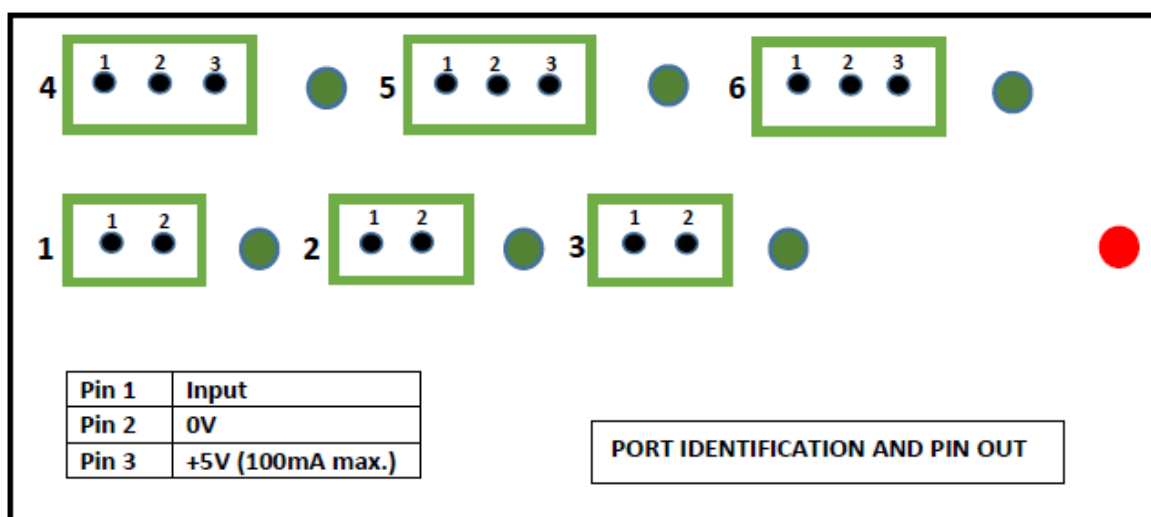
The positive terminal of the pulse output should be connected to pin 1 of an input and the negative terminal to pin 2. If the pulse output device does not specify positive and negative then it may not matter which way the device is connected. However if the Meter Logger fails to register any pulses, it is recommended to try reversing the wiring.

Inputs 4, 5 & 6 provide a 5V (100mA max) power supply on pin 3. Only connect to pin 3 if the pulse output device requires an external 5V power supply.

Note: Only use VOLT FREE pulse connections. Any other connections may cause damage to the Meter Logger and will void the product warranty. Crucible Technologies recommends using twisted pair wiring.

Ethernet connection – Connect the Meter Logger to your network via the Ethernet connection. The Meter Logger will be assigned an IP via DHCP. If you need the Meter Logger to have a static IP you will need to connect it to a network that will assign it an IP before a static one can be assigned.

Power connection – Plug the low voltage power supply into a mains outlet and into the socket on the Meter Logger.

The Red LED should turn on and then after a few seconds, begin to flash. This indicates that the Meter Logger firmware has initialised correctly.

Finding the IP address – Execute the LoggerFind software to find the Meter Logger IP address. Note: The LoggerFind software will not work over the internet or if there are routers in the network that do not propagate multicast signals. If you are unsure about this contact your systems administrator.
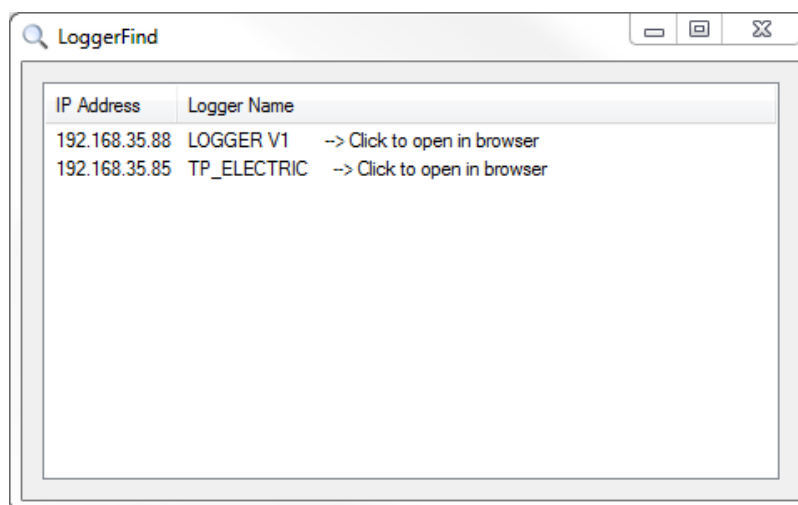
If the LoggerFind utility locates any Meter Logger(s), the IP address(es) and name(s) will be displayed. Double clicking on a particular logger entry will load the web pages for that logger into your web browser.

Visit http://www.crucible-technologies.co.uk/products/ML6C to download the LoggerFind software.

Setting the time and date

The Meter Logger has a built in real time clock-calendar powered from a battery that keeps the time even when the unit is not connected to the external power supply.

The Settings-Time pane on the web interface allows the method for setting the time to be selected.

Time/Date Settings

Current time:	13:47:24 14/10/2013
SNTP time:	13:47:24 14/10/2013

☑ **Get time via SNTP?**

Set time: 14 ▼ : 46 ▼ : 00 ▼

Set date: 14 ▼ / 09 ▼ / 2013 ▼

[Save Settings]

1.   User defined

If the "Get time via SNTP" checkbox is not ticked then the time and date can be set manually. Ensure that the "Save Settings" button is clicked once the correct time & date have been entered. This will cause the Meter Logger to reboot and begin logging using the new values.

2.   Using the SNTP facility

If "Get time via SNTP?" checkbox is ticked the time and date will be automatically set using the Internet's Simple Network Time Protocol (SNTP).
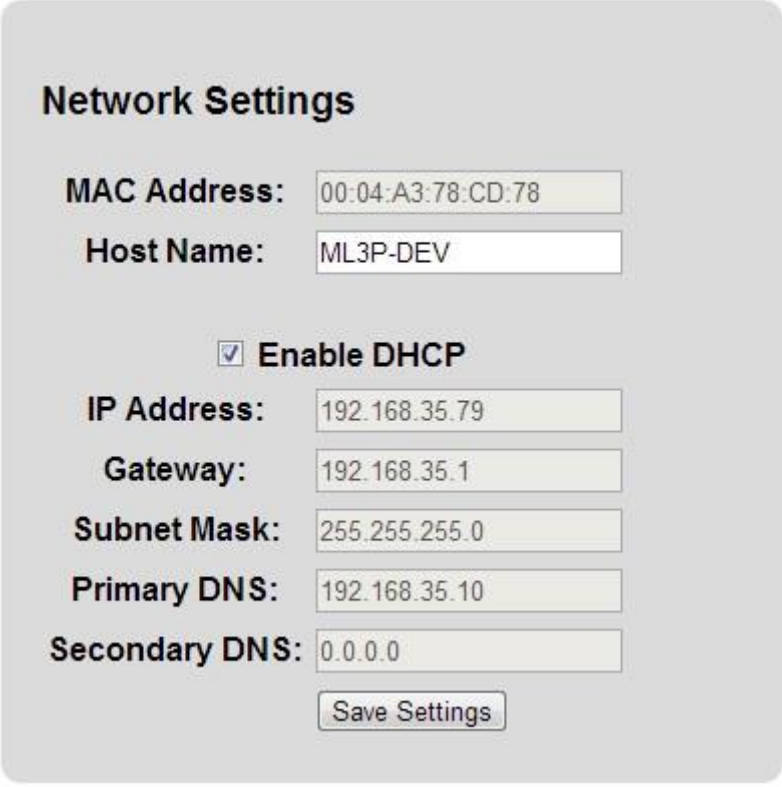
After ticking the checkbox, ensure that the "Save Settings" button is clicked so that the Meter Logger reboots. On reboot, the unit will send an SNTP request to uk.pool.ntp.org and if a response is received within 10 seconds it will be used to update the time/date, otherwise the current system time will remain.

Network configuration

The Settings-Network pane of the web interface allows the network connection parameters to be set.

If you need to have a static IP address then this can be set by unticking the "Enable DHCP" tick box. The options to set the IP address, gateway, subnet mask and DNS servers will then become enabled.

Network Settings

MAC Address:	00:04:A3:78:CD:78
Host Name:	ML3P-DEV

☑ **Enable DHCP**

IP Address:	192.168.35.79
Gateway:	192.168.35.1
Subnet Mask:	255.255.255.0
Primary DNS:	192.168.35.10
Secondary DNS:	0.0.0.0

Save Settings

Resetting the settings

If you need to reset the meter logger to factory defaults, this can be done by using the button on the side nearest the Ethernet connector. Unplug the unit from the power supply for at least 5 seconds then while holding down the button plug the unit in. If you hold the button for 4 seconds it will reset the time and network settings. CAUTION: If you keep holding for a further 5 seconds then all data will be erased from memory.

Reset procedure:

1. Hold down the button on the side of the unit adjacent to the Ethernet connector. The button is internal to the Meter Logger and can be activated using a jeweller's screwdriver or opened-out paper clip.
2. Toggle power on the unit by unplugging, waiting 5 seconds then plugging in.
3. All of the LEDs will illuminate.
4. After 4 seconds, LEDs all go off and network/time settings reset.
5. After 1 more second (5 total) the LEDs light up again.
6. After 5 more seconds (10 total) the LEDs will all go off and the pulse data will be erased.
7. Release the button adjacent to the Ethernet controller and the unit will reboot and enter normal operation.

Using the Logger Webpages

Home Page

Enter the IP address of the Meter Logger into your browser's location bar and the home page will be displayed:
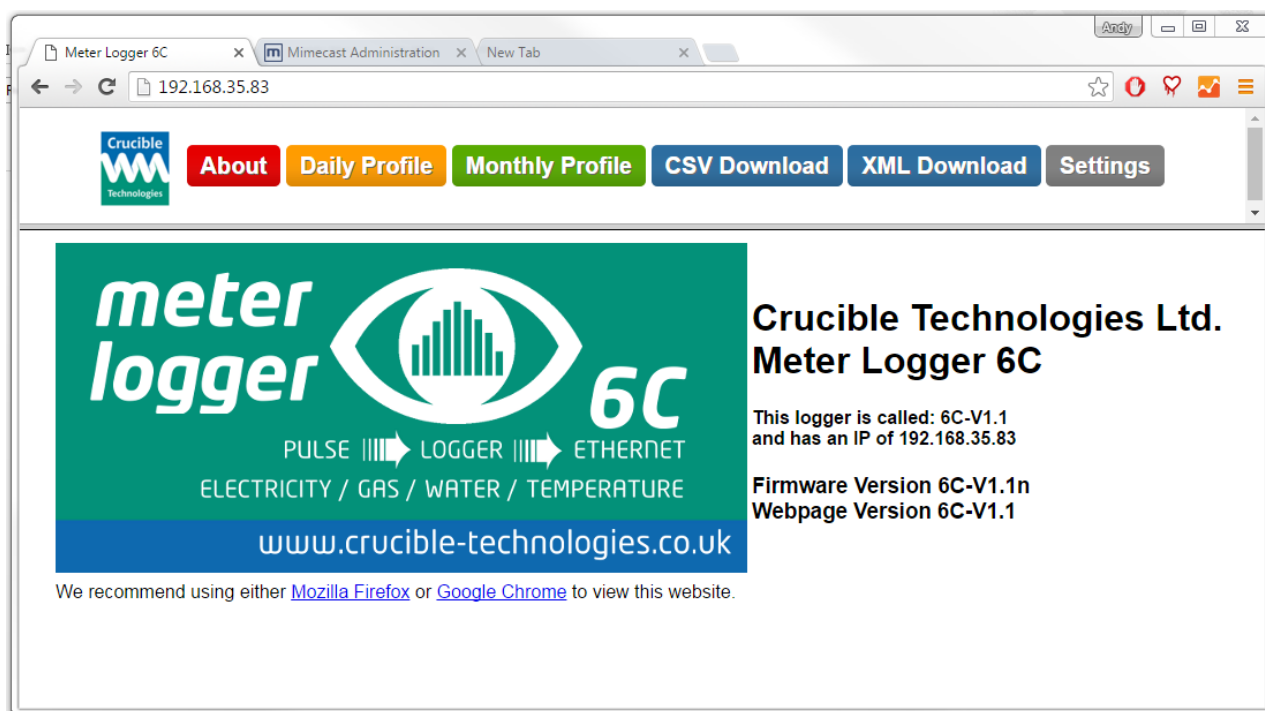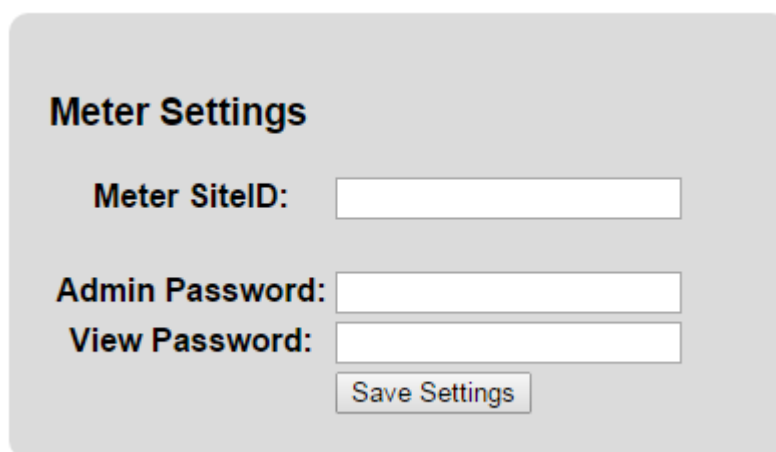
Configuring Your Meter Logger

Click on the "Settings" button to configure your Meter Logger for your particular installation.

Basic Meter Settings

Basic configuration of the Meter Logger is set via the Settings – Meter pane, as shown below:

The "Meter SiteID" parameter allows the location of the Meter Logger to be identified. This parameter can optionally be included in the data file sent by e-mail (see Settings-Email section)

Passwords
To enable the user to restrict access to the meter data and/or the configuration of the Meter Logger, two levels of password protection can be set; one for administration of the settings and one for only viewing the data.

The usernames associated with these access rights are:
Administration user name: **admin**
View data but not change settings user name: **view**

By default both users do not have a password set. We recommend that as a minimum an administration password is set as it is possible to reset all of the data from this page.

Important Note: Passwords must be alphanumeric with a maximum length of 8. The web page will not allow you to enter anything that is not alphanumeric or longer than 8 characters.

Input Settings

The inputs of the Meter Logger are configured via the Settings – Inputs pane, as shown below:

Inputs Settings

	Input 1	Input 2	Input 3
Name:	BOTTOM_LEFT	BOTTOM_MIDDLE	BOTTOM_RIGHT
Scale Factor:	1	1	1
Units:			

	Input 4	Input 5	Input 6
Name:	TOP_LEFT	TOP_MIDDLE	TOP_RIGHT
Scale Factor:	1	1	1
Units:			

Temp Sensor? ✔   ✔   ☐

[Save Settings]

The "Name" parameter allows a user to define a unique identifier for the pulse data source. For example this could be the serial number of the utility meter. The Name parameter can be optionally included in the data file sent by e-mail.
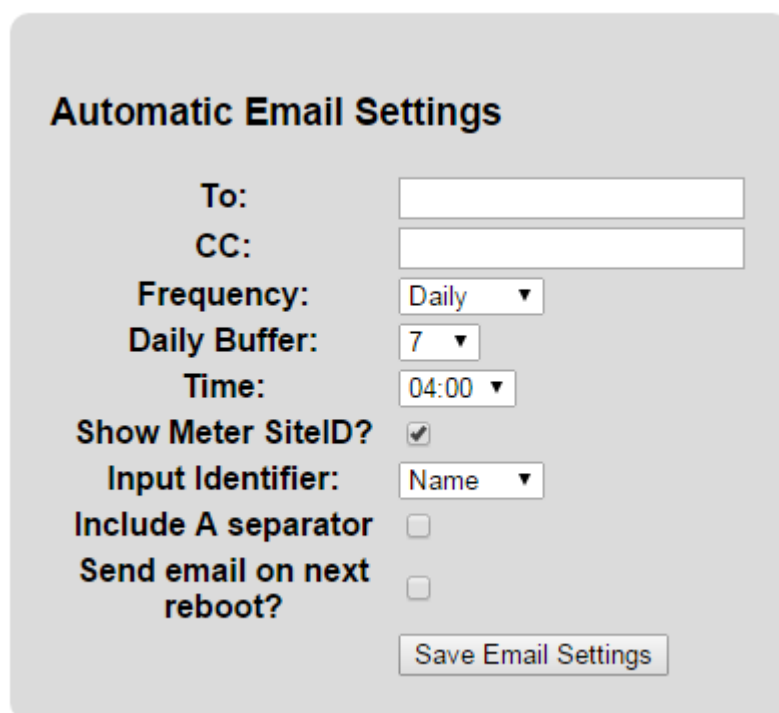
The "Scale Factor" allows the relationship between pulses and standard units to be defined. For example, many electricity meters generate a pulse every WattHour (WH) whereas the standard unit for electricity usage is the KiloWattHour (KWH). In this case the Scale Factor should be set to 0.001 so that 1000 pulses are recorded as 1 KWH.

The "Units" allows the standard unit for the particular input to be specified. The Units entry is included in the data file sent via e-mail.

If the TS-100 HATI Temperature Sensor is being connected, the "Temp Sensor" check box for the relevant input should be ticked. (In the screen shot on the previous page, inputs 4 and 5 have temperature sensors connected). Once the "Temp Sensor" check box is ticked, the "Scale Factor" and "Units" parameters for that input are automatically overridden with the correct values for the TS-100 HATI Temperature Sensor. For more detailed information on the operation of the Meter Logger with the TS-100, see the following section entitled "Temperature Sensor Operation".

E-Mail Settings

The e-mail feature of the Meter Logger is set via the Settings – Email pane, as shown below:

Automatic Email Settings

To:	
CC:	
Frequency:	Daily ▾
Daily Buffer:	7 ▾
Time:	04:00 ▾
Show Meter SiteID?	☑
Input Identifier:	Name ▾
Include A separator	☐
Send email on next reboot?	☐

Save Email Settings

If an entry is made in the "To:" parameter field the Meter Logger will attempt to send an e-mail to this address. The Meter Logger does not validate the address and will not report any error if the e-mail can not be sent.

The e-mail will be sent from meterlogger@lean-and-green.co.uk and the subject will be "Logger - <<Meter SiteID>>" where <<Meter SiteID>> is the setting of the "Meter SiteID" parameter in the Settings – Meter and Input pane.

If an address is set in the "CC:" field, the e-mail will be cc'd to the specified address. Again the e-mail address is not validated and any failures are not reported.

The "Frequency:" parameter defines how often e-mails are sent; the options are Daily, Weekly or Monthly. If set to Weekly, the e-mail is sent on Monday and includes data for the previous 7 days (Monday – Sunday). If set to Monthly, the e-mail is sent on the 1st of the month and includes data for the previous month.

The "Daily Buffer:" parameter defines a mechanism for recovery in the event of e-mail send failure. If the initial e-mail send fails, the firmware will retry 10 times at hourly intervals. If the Frequency parameter is set to Daily and all 10 hourly retries fail, then the previous day's data is included in the next day's data send, up to a maximum number of days as defined by the Daily Buffer parameter. Once the Meter Logger has successfully communicated with the mail server then the data sent is reset to just the previous day's data.

The "Time:" parameter defines when the e-mails are sent. The Meter Logger operates on UTC time so be aware of any time zone corrections that need to be applied.

The logged data is sent as an attachment to the e-mail in CSV format for easy import into third party software.

Data File Format

After importing into Excel, an example data file is shown below:

	A	B	C	D	E	F	G
1	Site ID	Meter Reference	Date	Units	00:30	01:00	01:30
2	T-P York	D00L91018	14/10/2013	KWH	0.776	0.758	0.757

	AW	AX	AY	AZ
1	22:30	23:00	23:30	00:00
2	1.293	1.369	1.306	1.31

Note for clarity the columns H to AU have been omitted.

Column A shows the SiteID. This column is included if the "Show Meter SiteID" tick box is checked.

Column B shows the Meter Reference. If the "Input Identifier" parameter is set to "Number", this will be 1, 2 or 3 depending on the input. If "Input Identifier" is set to "Name", this will be the value from the "Input x Name" parameter.
Column C is the date when the data was logged.

Column D is the Units for the specified input obtained from the setting of the "Input x Units" parameter.

Row 2 Columns E through AZ show the calculated energy usage for the half-hour period ending with the time specified in Row 1 e.g. the data in cell E2 is the energy consumed from 00:00:01 (hh:mm:ss) until 00:30:00. The energy consumption data is obtained by multiplying pulses logged during the period by the relevant "Input x Scaling Factor" parameter. So if the Meter Logger records 500 pulses in the half hour period and the Input Scaling Factor is set to 0.001, the data in the cell will be 0.5.

The "Include A separator" tick box provides for compatibility of the data file with third party energy management software by inserting an additional delimiter into the data file as per the following example:

	A	B	C	D	E	F	G	H	I	J
1	Site ID	Meter Reference	Date	Units	00:30	A	01:00	A	01:30	A
2	T-P York	D00L91018	13/10/2013	KWH	0.759	A	0.753	A	0.761	A

Saving Your Changes:
Once any parameter has been changed, ensure that the "Save Settings" button is clicked. This will cause the Meter Logger to reboot and activate the new settings.

Temperature Sensor Operation

Overview

With firmware V1.1, the Meter Logger 6C automatically supports connection of the TS-100 HATI Temperature Sensor on inputs 4, 5 and 6.

This section of the manual describes the changes in the operation and web interface when the temperature sensor option is enabled.

Configuration

The only configuration required is to tick the "Temp Sensor?" check box for the relevant input(s) on the Settings – Inputs webpage and then click "Save Settings".

The firmware will then automatically convert the pulses received in any half hour period into a temperature reading in degrees Centigrade. The firmware will also change the Daily Profile and Monthly Profile displays from bar graphs into line graphs.

Conversion Formula

To convert the number of pulses generated in a half-hour period by the TS-100 into a temperature reading, the following formula is employed:

Temperature [°C] = (60894 / Number-of-pulses) – 59.68

The following table provides some examples:

| No of pulses (per half hour)	Temperature (°C)
1200	-8.94
1100	-4.32
1021	-0.04
1020	0.02
1000	1.21
900	7.98
800	16.44
700	27.31
600	41.81

As can be seen from the above table, it is impossible for the temperature reading from the TS-100 to be exactly 0°C; the nearest possible values are -0.04°C (1021 pulse counts) and +0.02°C (1020 pulse counts).

Thus in the Daily and Monthly Profile graphs, missing or invalid temperature readings are assigned a value of 0°C to uniquely distinguish them from actual temperature readings.

Daily Profile Graphs

Temperature readings are automatically displayed as a fixed scale line graph with minimum and maximum values of -10° and +40° Centigrade.

The Daily Profile display for the current day will only show readings up to the last complete half hour period, as illustrated on the following plot:
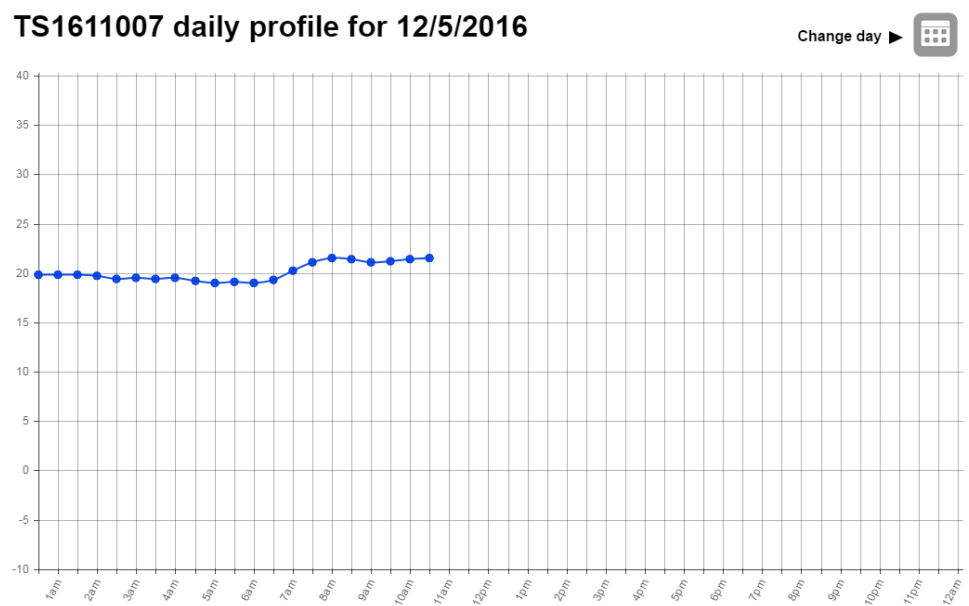
The Daily Profile display for a prior day will show readings for each half hour period. The following example is for a day with all valid readings:
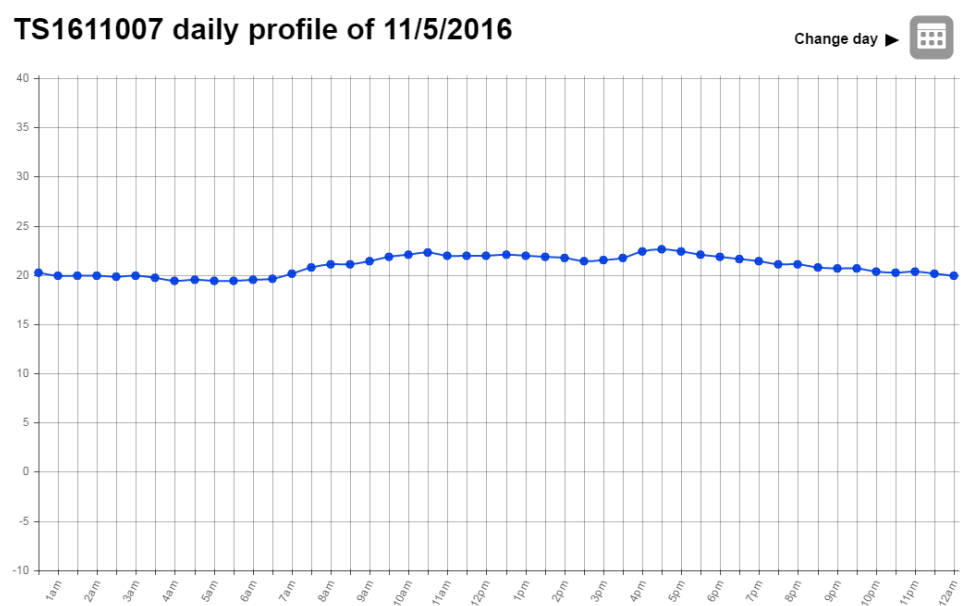
Half hour periods for which there are no recorded pulse counts will be displayed as a reading of 0°. Additionally pulse counts which convert to a temperature value outside the specified measurement range of the TS-100 will also be displayed as a reading of 0°. In the example plot shown below, the TS-100 wasn't connected until 1:45pm, hence the readings up to the half-hour ending 2:30pm are all 0°C:
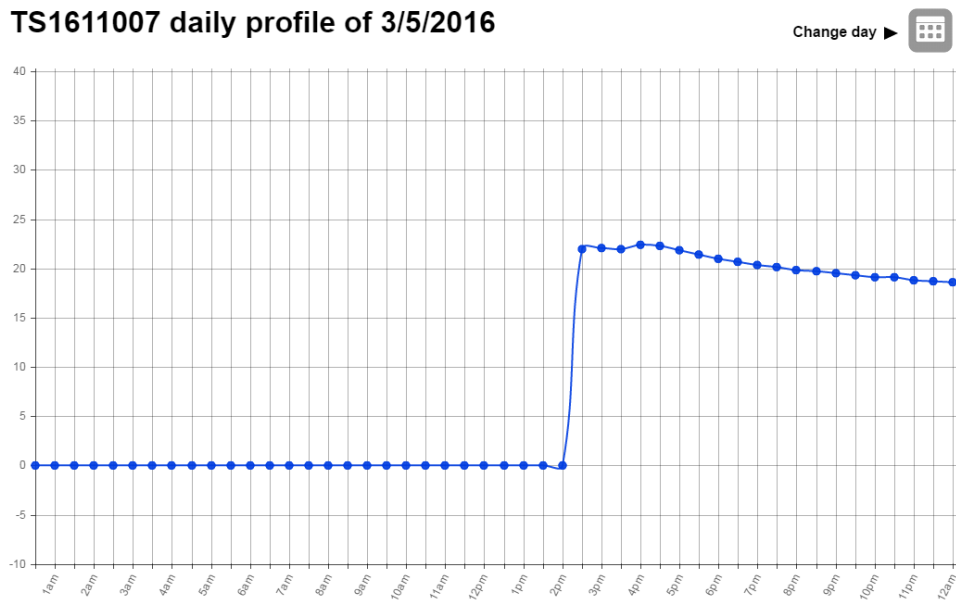
Monthly Profile Graphs

With a temperature sensor input, the Monthly Profile graph shows the average temperature for the day, calculated as the average of all the 48 individual half-hour temperature readings.

The following plot shows a complete month of data for February 2016:
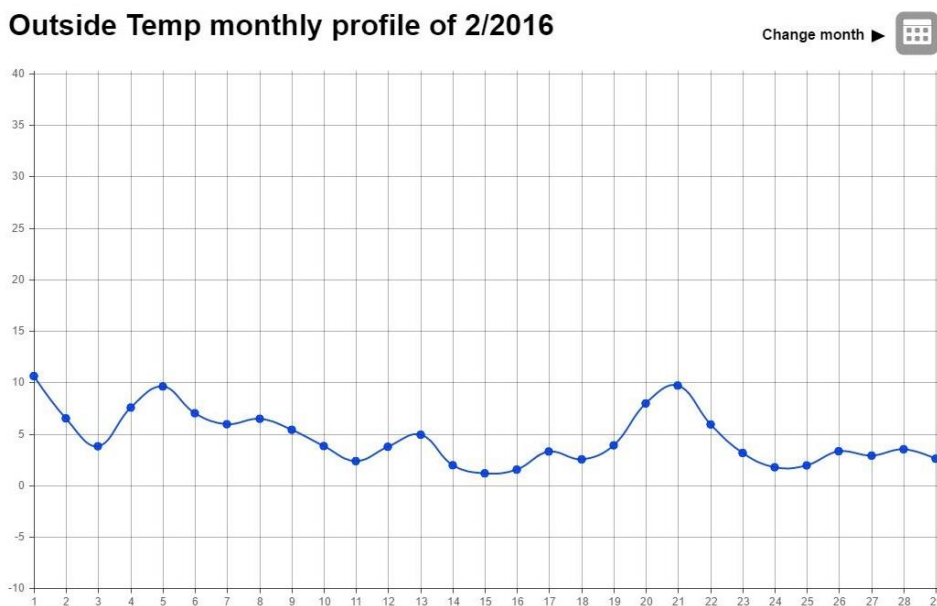
As with the Daily Profile graphs, missing or invalid data is assigned a value of 0°C as shown in the example plot below:
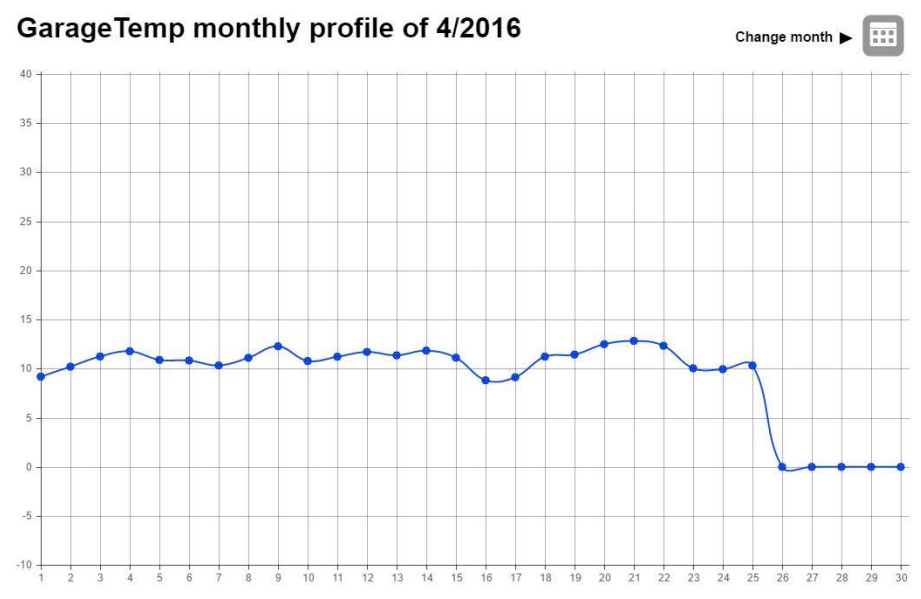
E-Mail Attachment

For a temperature sensor input, the Units column in the datafile attached to the e-mail is automatically filled in with "degC" as shown in the following extract:

Site ID	Meter Reference	Date	Units	00:30	01:00
6C-V1.1	TS1611007	12/05/2016	degC	19.82	19.82
6C-V1.1	Ref_TS	12/05/2016	degC	20.13	20.02

Developers Guide

Finding the Meter Logger IP

The meter logger contains a LoggerFind feature that will allow developers to find the IP address of any units. This is done using multicast UDP packets that the unit responds to. The way this works is as follows:

1. A multicast packet is sent to port 30303 (default) with the data packet containing the character 'D' (default).

2. When this packet is read by the logger, it will respond with a string containing IP address, name and MAC address. The format of the data is IP;NAME;MAC for example "192.168.35.82;METER_LOGGER   ;00-04-A3-1E-AE-82" this could then be broken down into separate parts using a simple explode command.

It is worth noting that some routers do not populate multicast commands and hence may not find all of the units on the network.

JAVA LoggerFind Example

```java
import java.io.IOException;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;
import java.net.SocketTimeoutException;
import java.net.UnknownHostException;

public class Meter_Logger_AutoFind {

    // Variables for finding the unit (factory defaults are D and 30303)
    protected static final String DiscoverString = "D";
    protected static final int AnnouncePort = 30303;

    // Socket timeout in ms. This is how long it will wait for responses. (ish)
    protected static final int SocketTimeout = 1000;

    protected DatagramSocket socket;
    protected DatagramPacket packet;

    public Meter_Logger_AutoFind()
    {
        try {

            // Setup the connetion
            socket = new DatagramSocket(30303);
            socket.setSoTimeout(SocketTimeout);
            InetAddress group = InetAddress.getByName("255.255.255.255");

            // Send the discovery byte (create packet the send)
            byte[] byteSend = DiscoverString.getBytes();
            packet = new DatagramPacket(byteSend, byteSend.length, group, AnnouncePort);
            socket.send(packet);

            // Loop until SocketTimeoutException occurs
            do
            {
                // Receive and output the packets send by the meter loggers
                byte[] buf = new byte[256];
                packet = new DatagramPacket(buf, buf.length);
                socket.receive(packet);

                // Output the response if its not the discovery string
                String in = new String(packet.getData(), 0, packet.getLength());
                if (!in.equals(DiscoverString))
                    System.out.println(in);
            } while (true);
        } catch (SocketTimeoutException e) { // Ignore timeout errors, these just break
        execution
        } catch (UnknownHostException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
        }

        // Close the socket and exit
        socket.close();
    }
```

```java
    // Example entry point
    public static void main(String[] args)
    {
        new Meter_Logger_AutoFind();
    }
}
```

VB.NET LoggerFind Example

```vbnet
Imports System.Net
Imports System.Net.Sockets
Imports System.Text
Imports System.Threading

Public Class LoggerFind

    ' Variables for finding the unit (factory defaults are D and 30303)
    Shared DiscoverString As String = "D"
    Shared AnnouncePort As Integer = 30303

    Shared GroupIP As IPAddress
    Shared GroupEP As IPEndPoint
    Shared conn As UdpClient

    ' Should the listening thread be running?
    Shared runListener As Boolean = True

    ' Example entry point
    Public Shared Sub Main()
        Try
            ' Setup the connection
            GroupIP = IPAddress.Parse("255.255.255.255")
            GroupEP = New IPEndPoint(GroupIP, AnnouncePort)
            conn = New UdpClient(AnnouncePort)

            ' Thread out the listening
            Dim ListenThread As Thread
            ListenThread = New Thread(AddressOf BeginListen)
            ListenThread.Start()

            ' Send the discover thread
            Dim byteSend As Array = Encoding.Unicode.GetBytes(DiscoverString)
            conn.Send(byteSend, byteSend.Length, GroupEP)

            ' Wait for 10 seconds then exit the program once the read thread and the udp
            connection
            Thread.Sleep(1000)
            runListener = False
            conn.Close()
        Catch e As SocketException
            Console.WriteLine("Socket Exception! {0}", e)
        End Try
        Console.ReadLine()
    End Sub

    Private Shared Sub BeginListen()
        Dim bteReceiveData() As Byte
        Dim strReceiveData As String
        Try
            Do While runListener
                bteReceiveData = conn.Receive(GroupEP)
                strReceiveData = Encoding.ASCII.GetString(bteReceiveData)
                Console.WriteLine(strReceiveData)
            Loop
        Catch e As SocketException 'This will catch the connection close
        End Try
                                        End Sub
                                    End Class
```

How to Download Data

The Meter Logger provides an HTTP request interface to download data from the unit. Data can be downloaded in two different versions: **CSV** or **XML.**

CSV Data Download

A comma-separated values (CSV) file stores tabular data (numbers and text) in a plain-text format. In this instance this is a sequence of records separated by line breaks, each record containing a sequence of fields separated by commas (,).

To make it easy for software developers to download data to their applications it is possible to download a CSV file containing the following data.

- Date (Year, Month, Day)
- Input
- Total pulses on that day
- Pulses for each half hour period

To download this data you simply need to use a URL as follows:

```
http://{Logger IP}/csv_input{input no}.csv?month={month}&year={year}
```

So for data from November 2014 on input 4 for a Meter Logger with IP address 192.168.35.82, the URL would be:

```
http://192.168.35.82/csv_input4.csv?month=11&year=2014
```

An example of the data can be downloaded from the webpages of the meter.

XML Data Format

An extensible markup language (XML) file is designed to structure, store and transport information. The schema is available within the Logger web pages.

To make it easy for software developers to download data to their applications it is possible to download a XML file containing the following data.
- Date (Year, Month, Day)
- Input
- Total pulses on that day
- Pulses for each half hour period

To download this data you simply need to use a URL as follows:

```
http://{Logger IP}/xml_input{input no}.xml?month={month}&year={year}
```

So for input 5 data from November 2014, the URL is:

```
http://192.168.35.82/xml_input5.xml?month=11&year=2014
```

An example of the data can be downloaded from the webpages of the meter.

Other Developer Data

The Meter Logger also has some web pages to allow you to get variables from the Logger. These are outlined below and should be accessed as follows:

`http://{Logger IP}/get/filename.html`

Where filename.html is one of the following:

logger_name.html
Will display the name/hostname of Meter Logger.

input{input no}_name.html
Will display the name of input {input no}.

input{input no}_scale.html
Will display the scaling factor for input {input no} as used on the web graphs.

NOTE: All website filenames are case sensitive and are all lowercase!

<u>AFTER SALES SERVICE</u>

At Crucible Technologies we pride ourselves in providing excellent technical support. Having been established for more than 20 years, we know this makes us stand out from other suppliers.

"We will provide unlimited telephone support for 30 days following purchase of the product. Following this period, we will provide unlimited e-mail support for the life of the product. This will allow us to keep the cost of the product competitive."

When contacting us for support, please have the following information to hand (or include in e-mail):

- Serial number of unit (usually on base of product)
- Where purchased from? (i.e. directly from us or a reseller)
- Your contact details including telephone and e-mail address
- Description of the problem

<u>GUARANTEE</u>

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