



# Tutorial 5: eGauge Alerts

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## 5.1 Introduction to Alerts

Your eGauge can report various alerts via email and short-message service (SMS) texts. Alerts may be configured from the **Settings** → **Alerts** page and viewed from **View** → **Alerts**.

There are two types of alerts: system alerts (section 5.1.2) and user-defined alerts (section 5.1.3). System defined alerts can report conditions such as when the device configuration is changed or when the connection to a remote device has been established. User-defined alerts define arbitrary conditions that, when true, trigger the alert. For example, you could define an alert that triggers when solar production for a period is below a certain threshold value. More examples are given in section 5.3.

<input type="checkbox"/>	Ack	Prio	Time	#	Name	Last Reported	Detail
<input type="checkbox"/>	<input type="checkbox"/>	1	01/27/13 06:00pm	39	New Peak Danger	01/27/13 05:40pm	Risk of new peak 85.89%. Please shed load!
<input type="checkbox"/>	<input type="checkbox"/>	4	01/27/13 12:00am	3	SPR Low Production	01/27/13 05:40pm	SPR monthly average production of 367.00 W below expected value of 435.61 W.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	6	01/27/13 12:00am	5	Tigo Low Production	01/26/13 12:00am	Tigo production of 10.18 kWh below expected value of 10.71 kWh.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	0	01/22/13 10:02pm	3	Proxy-connection established	01/24/13 12:00am	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	01/22/13 07:14pm	2	Proxy-connection lost	01/22/13 07:15pm	

Figure 5.1: Example of reported alerts

### 5.1.1 Alert Destinations Setup

Choose the **View/Edit Gateway & Alert Destinations** button from the top of the **Alerts** page to configure how alerts are sent. The page will request credentials if not previously cached.

**Settings**

[View/Edit Gateway & Alert Destinations](#)

**Email Gateway**

Hostname of mail server [?]:

Username for mail server [?]:

Password for mail server [?]:

Figure 5.2: Email gateway configuration

#### Hostname of mail server

Normally, eGauge attempts to deliver email directly to the destination address. Similarly, it attempts to deliver SMS directly to an SMS-gateway. However, if a firewall prevents the device from directly establishing such connections, as is commonly the case for consumer-grade Internet-service, you will have to set the value of this setting to the hostname of a mail server which can forward the messages to the final destination. The mail server may either be a host on the same LAN (e.g., within a company or school network) that will accept email delivery without authentication or it may be a mail server anywhere on the Internet on which you have

a valid user account. By specifying the username and password for that account, the device is then able to deliver email through that mail server.

As an example, if you have a Gmail account, you can set the hostname to smtp.gmail.com. By specifying your Google account's username and password, you can then have alerts delivered via Gmail.

For a technical description of the mail sending process, see the Help page on your eGauge device.

### **Username for mail server**

When non-empty, this setting specifies the username the device uses to authenticate itself to the mail server. If empty, mail is delivered without authentication or encryption.

### **Password for mail server**

This setting specifies the password the device uses to authenticate itself to the mail server. It is used only if Username is not empty.

**Caution:** This password is transmitted to the eGauge over an unencrypted channel. We recommend changing the password only when using a computer that's connected to the same LAN as the eGauge and only after clicking on the LAN Access link on the eGauge main page. As an added security measure, it may be a good idea to setup a special email account at the mail server which is used only for the purpose of sending eGauge alerts.

## **Alert Destinations**

Message Format [?]:	Email address or phone number [?]:	Min. Alert Prio [?]:	
Short Email ▼	myEmail@mymail.tld	1 ▼	Send Test Message
Email ▼	buildingMgr@mymail.tld	4 ▼	Send Test Message
SMS to Verizon phone ▼	5552221521	6 ▼	Send Test Message
Email ▼		0 ▼	Send Test Message

**Figure 5.3:** Example: Alert destinations

- *Message Format*: select the appropriate SMS carrier or email format.
- *Email address or phone number*: enter the appropriate destination for the alert.
- *Min. Alert Prio* (Minimum Alert Priority): minimum level of alerts this destination should receive (see below).

Up to four alert-destinations can be defined. Alerts are prioritized. For each alert-destination, a minimum priority can be defined. Only alerts whose priority is equal to or greater than the minimum priority are reported to an alert-destination.

Once an alert-destination has been notified, only alerts of higher priority result in a new notification to that destination until the alert has been acknowledged or deleted via the alerts page.

Alerts are reported with a delay of approximately 30 seconds and are automatically acknowledged 24 hours after reporting them. These rules ensure you will be promptly informed of any alert conditions for a device without a deluge of SMS or email messages.

### 5.1.2 System Alerts

System alerts are predefined but you can choose the priority with which they are reported. This allows you do control which recipients receives which system alerts (if any).

Name	Prio [?]:
Proxy-connection established	0 ▼
Proxy-connection lost	1 ▼
Device-configuration changed	5 ▼
Date and/or Time changed	4 ▼
Device running hot	4 ▼
Device temperature OK	0 ▼
Remote-device connected	1 ▼
Remote-device lost	5 ▼
Failed to push data	0 ▼

**Figure 5.4:** Example: System Alerts

- *Prio* (Priority): Select the priority you would like to assign to this system alert. If there are certain system-alerts that you do not wish to have reported at all, select priority 0 and ensure that all alert destinations have a minimum alert priority of at least 1.
- *Proxy-connection established/lost*: can indicate an unstable or failed Internet or network connection.
- *Device-configuration changed*: reports when a device's configuration is changed, and which account has made the modification.
- *Date and/or Time changed*: reports when the date or time is changed.
- *Device running hot*: reports if the eGauge's internal temperature reaches a significantly high temperature.
- *Device temperature OK*: reports when the eGauge's temperature returns to a safe level.
- *Remote-device connected*: reports if a device the eGauge connected to establishes a connection.
- *Remote-device lost*: reports if the eGauge is no longer able to communicate with a remote device.
- *Failed to push data*: reports if a data push is set, and the eGauge is unable to successfully push data.

Name [?]:	Prio [?]:	Trigger Condition [?]:
L1 High Voltage	4 ▼	["\$L1 Voltage" > ▼ 130]
Chk Freq [?]: Every second ▼	Msg [?]: L1 of %l V too high!	

Figure 5.5: Example: user-defined alert warning for high voltage

### 5.1.3 User-defined Alerts

User-defined alert patterns allow the flexible detection and reporting of various conditions. For example, an alert could be defined which, on a second-by-second basis, checks whether a register value is outside of its permitted range (e.g., whether a voltage or frequency is above or below a certain threshold). Name: enter a short descriptive name here that let the recipient of an alert message understand what this alert is about.

- *Trigger Condition*: enter the condition here which, if true, triggers the alert. The condition consists of three parts: left-hand-side (lhs), comparison operator, and right-hand-side (rhs). The comparison operator may be one of less-than (“<”), less-or-equal (“<=”), equal (“=”), not-equal (“!=”), greater-or-equal (“>=”), or greater-than (“>”). The lhs is compared to the rhs based on this operator and, if true, the alert is triggered.
- *Chk Freq* (Check Frequency): select the frequency with which the trigger condition is to be checked. You can select from “Every second” to “Annually”. Choose the lowest frequency acceptable as too many conditions evaluated too frequently may slow down the device. If a slow-running condition is evaluated, evaluation of other conditions may be delayed accordingly. For example, the `peak_risk()` function may take 10–20 seconds to evaluate, so any conditions that normally would be evaluated each second would be delayed whenever this function is executed. eGauge evaluates all alert conditions whenever the device starts up and hence may evaluate the conditions more frequently than requested.

Apart from the first time a condition is checked on start up, hourly conditions are evaluated during the first minute of each hour, daily conditions during the first hour after midnight, weekly conditions during the first hour of Sunday, monthly conditions during the first hour of the first day of the month, and annual conditions during the first hour of the first day of the year. “Every second” conditions are evaluated each second, “Every minute” conditions once a minute.

- *Msg* (Message): use this field to define a custom-message to be displayed along with the alert name. If left empty, a default message is included which shows the value of the lhs, the operator, and the rhs of the trigger-condition. This message may contain special sequences starting with a percent character to refer to the trigger condition described in greater detail using examples in Section 5.3.

## 5.2 Viewing and Acknowledging Alerts

You can view and acknowledge alerts on your device from the View → Alerts . Here you will see a list of reported alerts and an option to view more details and acknowledge the alerts. Alert results are stored in volatile memory, and will be lost on device reset.

**Pending Alerts:**

Ack	Prio	Time	#	Name	Last Reported
<input type="checkbox"/>	4	01/16/13 08:49am	1	Solar Low Production	01/16/13 08:50am
<input type="checkbox"/>	6	01/16/13 08:49am	1	L1 High Voltage	01/16/13 08:50am
<input type="checkbox"/>	0	01/16/13 08:48am	1	Proxy-connection established	01/16/13 08:49am

Refresh View Privileged Details

Figure 5.6: Example: viewing triggered alerts

- *Ack* (Acknowledged): indicates if this alert has been acknowledged. Once acknowledged, the alert will be reported again should it reoccur and its priority is sufficiently high. Alerts are automatically acknowledged after 24 hours.
- *Prio* (Priority): the priority of the corresponding alert.
- *Time*: date and time of the most recent occurrence of the event.
- *#*: number of times this alert has occurred.
- *Name*: name of the alert.
- *Last Reported*: date and time when the alert was last reported to at least one of the alert-destinations.

### 5.2.1 Privileged Details

**Pending Alerts:**

<input type="checkbox"/>	Ack	Prio	Time	#	Name	Last Reported	Detail
<input type="checkbox"/>	<input type="checkbox"/>	4	01/16/13 08:49am	1	Solar Low Production	01/16/13 08:50am	Solar monthly average production of 269.00 W below expected value of 427.03 W.
<input type="checkbox"/>	<input type="checkbox"/>	6	01/16/13 08:49am	1	L1 High Voltage	01/16/13 08:50am	L1 Voltage has reached 132V!
<input type="checkbox"/>	<input type="checkbox"/>	0	01/16/13 08:48am	1	Proxy-connection established	01/16/13 08:49am	

Refresh Acknowledge Checked Alerts Delete Checked Alerts Edit Alert Settings

Figure 5.7: Example: viewing privileged alert details

You can view detailed alert information as well as acknowledge and delete reported alerts by clicking the View Privileged Details button.

Check off any alerts you wish to delete or acknowledge, and click the appropriate button. Deleting alerts here will remove it from the reported alert page until it occurs again.

### 5.3 User-defined Alert Examples

NOTE: For available functions on your particular firmware version, visit [http://YOUR\\_EGAUGE\\_DEVICE/fundoc.html?alert](http://YOUR_EGAUGE_DEVICE/fundoc.html?alert)

`$(REG_NAME)` returns the instantaneous value of the register **REG\_NAME**. When using functions such as `avg(...)` or others listed in the function documentation, the dollar sign is not necessary as a parameter.

When creating your message (*Msg*):

- `%l` will return the **value** of the left-hand-side
- `%L` will return the **formula** of the left-hand-side
- `%r` will return the **value** of the right-hand-side
- `%R` will return the **formula** of the right-hand-side
- `%%` will return a single percent sign

The syntax of the “?” ternary operator is [`condition?value_if_true:value_if_false`] and can be nested

Simple boolean expressions may be used:

- `(5>4)` will return **1**
- `($"Grid"<7000)*$"Grid"` returns the value of “**Grid**” if “**Grid**” is greater than 7000 W

#### L1 Voltage High

L1 High Voltage	3 ▾	(\$"L1"	>= ▾	130
Chk Freq [2]:	Every second ▾	Msg [2]:	L1 of %l V too high (above %r V).	

Figure 5.8: Alert: high voltage on L1

This alert looks at the register L1 (measuring the voltage of L1) and checks every second to see if it is over 130V. If so, an alert is reported.



## Voltage out of range

L1 Voltage out of range	3 ▾	(("\$L1">=126)+("\$L1"<=114))*"\$L1"	> ▾	0
Chk Freq [?]:	Every second ▾	Msg [?]:	WARNING! L1 voltage is out of range at %l V!	
L2 Voltage out of range	3 ▾	(("\$L2">=126)+("\$L2"<=114))*"\$L2"	> ▾	0
Chk Freq [?]:	Every second ▾	Msg [?]:	WARNING! L2 voltage is out of range at %l V!	

Figure 5.9: Alert: voltage out of range

Dealing with main household electricity, US and Canada national standards specify that the nominal voltage at the source should be 120 V and allow a range of 114 to 126 V (RMS) (5% to +5%) [ANSI C84.1]

This set of alerts uses conditionals to see if each phase and see if it is out of range.

$((\$ "L1 " > = 126) + (\$ "L1 " < = 114)) * \$ "L1 "$

First, the formula checks to see if L1 (voltage register) is greater than or equal to 126 or less than or equal to 114. This pair will evaluate to 1 if either is true. The result is multiplied by the voltage on L1.

The result (0 or 1) is multiplied by the voltage so the final output is the out-of-range voltage, and is reported to the user by using the %l variable in the message.

## Monthly Production Report

Monthly Production	6 ▾	$30 * 24 * e^{-3} * \text{avg}("Solar", 30 * 24 * 60)$	> ▾	0
Chk Freq [?]:	Monthly ▾	Msg [?]:	Monthly Solar Report: You have produced %l kWh over the past 30 days.	

Figure 5.10: Alert example: reporting monthly production

$30 * 24 * e^{-3} * \text{avg}("Solar", 30 * 24 * 60)$

This formula takes the average of the Solar register over the past 30 days (60 minutes x 24 hours x 30 days), multiplies it by 30 days, then 24 hours, and finally  $e^{-3}$  (short for  $10^{-3}$ ), giving the total kWh for the past 30 days. This will be reported every month given solar production is above 0.

## Hot tub freeze advisory

Hot Tub Alert	3 ▾	$(\text{avg}("Hot Tub Pump/Heat", 60 * 6) * 6) / 1000$	< ▾	6
Chk Freq [?]:	Hourly ▾	Msg [?]:	Warning! Hot tub heater used %l kWh over the past 6 hours, which is less than %r kWh!	

Figure 5.11: Alert example: hot tub freeze warning

Assume an outdoor hot tub has a 6kW pump/heater, which cycles every 3 hours for 30 minutes at a time. Every 3 hours, 3kWh will be used by the hot tub circuit. Every 6 hours there should be 6kWh of energy used. Any less could indicate a pump or heater failure, and the hot tub could freeze.

$\text{avg}("Hot Tub Pump/Heat", 60 * 6) * 6 / 1000$

$\text{avg}("Hot Tub Pump/Heat", 60 * 6)$  will take the average power (W) read on the register Hot Tub Pump/Heat over the last 360 minutes (60 minutes in an hour, 6 hours).

Then, the average power is multiplied by 6 hours to get Wh, the total energy used over the 6 hours. That total is finally divided by 1000 to turn Wh into kWh.

That value is then compared to the value on the right-hand-side, in this case 6.

If the alert is triggered the alert will be sent, for example:

Warning! Hot tub heater used 4.5 kWh over the past 6 hours, which is less than 6 kWh!

### New Peak Risk

New Peak Alert	1 ▾	100*peak_risk("Grid")	>= ▾	80
Chk Freq [?]:	Every minute ▾	Msg [?]:	Warning! New peak risk %!%% !	

Figure 5.12: Alert example: Peak risk alert

This formula will alert you if it detects an 80% or above chance of a new peak risk for the billing period. `peak_risk("Grid")` returns a value between 0 and 1, which is multiplied by 100 to give a percentage.

The alert message will show something such as: Warning! New peak risk 83% !

### Low Production

SPR Low Production	4 ▾	avg("Solar SPR",30*24*60)	< ▾	P_est(327,333,484,489,518,503,479,477,
Chk Freq [?]:	Weekly ▾	Msg [?]:	SPR monthly average production of %! W below expected value of %r W.	

Figure 5.13: Alert example: Low production alert

`avg("Solar SPR", 30*24*60)`

This formula takes the average of the last 30 days, and compares it to `P_est ( . . . )`, which returns the current estimated average production (in Watts) given the expected monthly production values in kWh (as estimated by, for example, PVWatts), for the past 30 days. This particular alert is set to run every week.

### Past bed time

Bedtime Alert	5 ▾	((wday())<4)?((time())>20)?\$"TV Circuit":0)	> ▾	500
Chk Freq [?]:	Every minute ▾	Msg [?]:	Alert! TV and game circuit reached %! watts ! Kids are up past their bed time!	

Figure 5.14: Alert example: Kids up past bed time

This example will check every minute to see if it is past 8:00PM on a week night (Sunday to Thursday), and if the register monitoring the TV/video game room is above 500 Watts, send an alert that the kids may be up past their bed time.

The left-hand-side formula reads:

```
((wday())<4)?((time())>20)?$"TV Circuit":0):((wday())=6)?((time())>20)?$"TV Circuit":0):0)
```

`wday ()` returns the number of days since Monday (0 is Monday, 1 is Tuesday 6 is Sunday).

`time ()` returns the number of hours since midnight in decimal form (0 is midnight, 13.5 is 1:30PM, 20 is 8:00PM).

The left-hand-side will return either 0, if it is not past bedtime, or the current power usage if it is past bed time. If the usage is greater than the right-hand-side value, it will send the alert.