

A LabRecon MiniDAQ was used with LabRecon software to create a **custom Web page interface** for monitoring 3D printer operation and stopping printing remotely over the Internet. LabRecon was also configured to send an **email/text message** periodically and upon the completion of a print job.

On the right is an iPhone 6 displaying the generated Web page. LabRecon's drag-and-drop Panel builder allows one to fully customize the Web page.

This implementation is **adaptable to most 3D printers** because it does not rely on a data connection with the printer. No permanent modifications were made and attached elements can be easily removed.

operating parameters

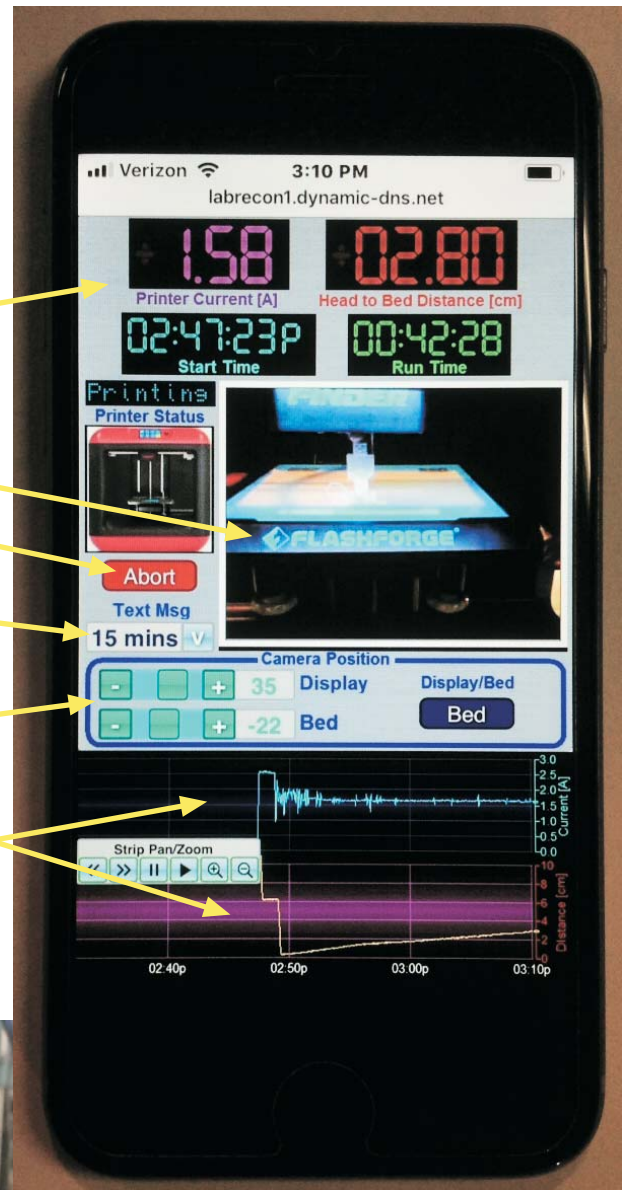
Web cam view

abort button

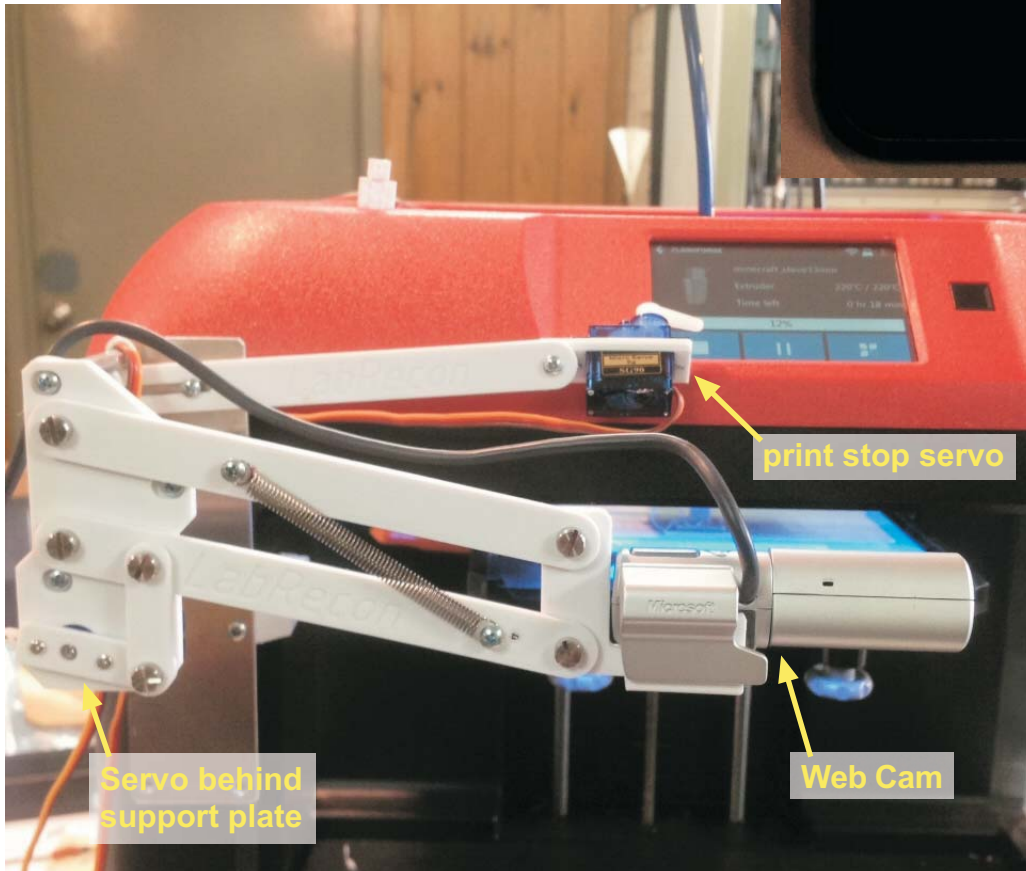
period of status text message

Web cam position control

printer current and build plate position strip chart

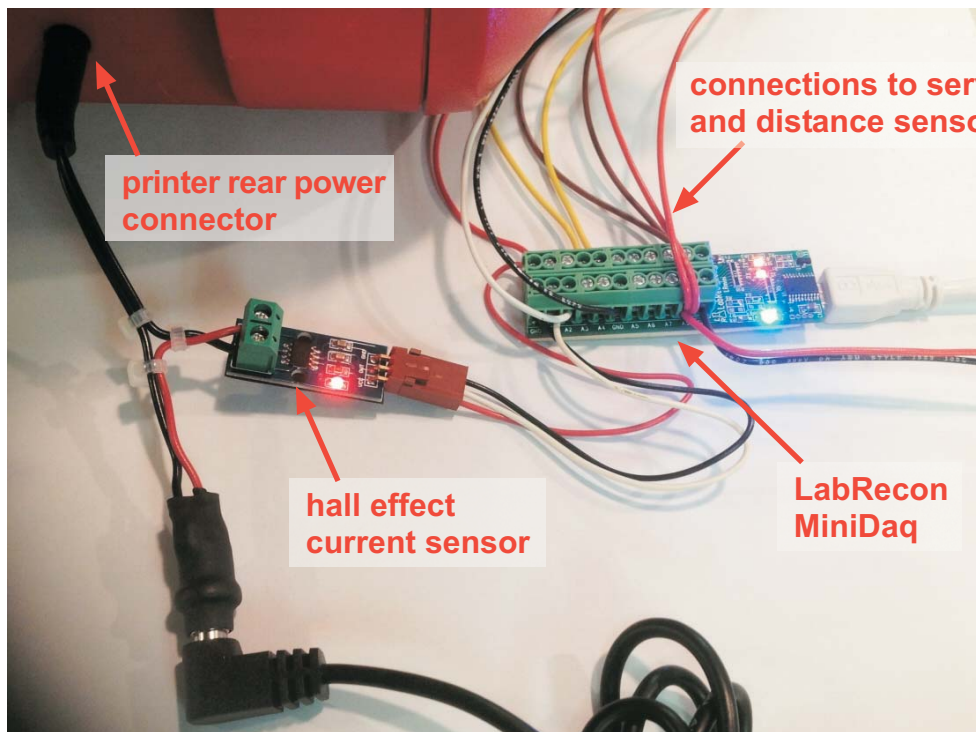


FlashForge Finder 3D printer with custom printed servo/Web cam arm



iPhone 6

servo positions Web cam to view printing or top display

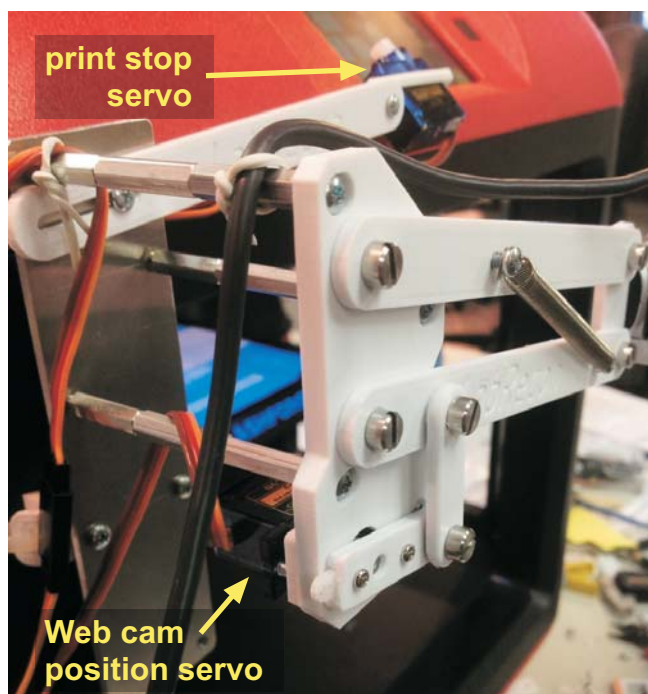
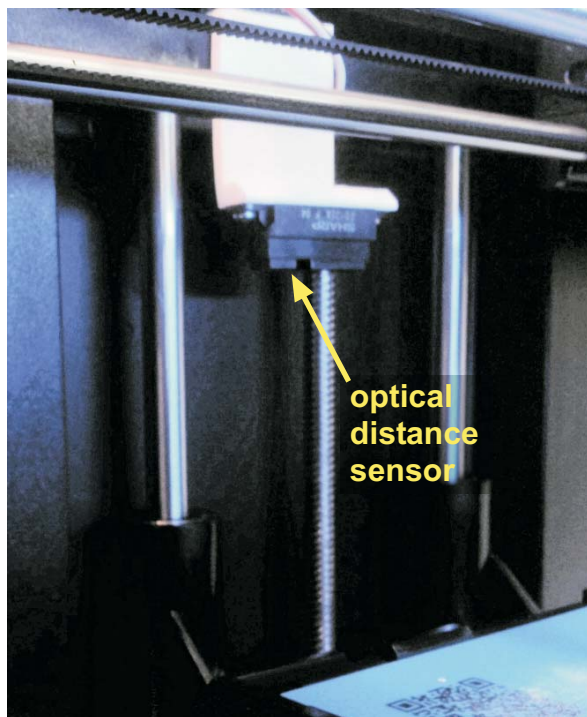


For this application **2 analog inputs** and **2 servo outputs** of the LabRecon MiniDaq were used.

The MiniDaq has an **additional 6 analog inputs**, **2 servo outputs** and **4 digital outputs** available for use.

Below is a Sharp triangulation distance sensor aimed down at piece of paper (view obscured) attached under the base support. It provides an extruder to build plate distance to determine print progress. A printed supporting bracket is clipped onto the printer body.

Below is a printed support arm and servo to remotely position the Web cam over the top LCD display or the print area. There is also an arm supporting a servo over the stop button of the LCD touch screen. Of course this configuration will need to be customized for a particular printer model. Alternatively, a stationary Web cam can be positioned in front of the print area.



LabRecon's **drag-and-drop Panel builder** was used to create the Web page interface. Custom graphics, such as the 3D printer image, can also be imported. This is just one example. **A user has total flexibility in the Web page layout and content.**

The black rectangle is a Frame object that was added for the Web cam view. On the generated Web page, this region defines an HTML iframe, which can display the output of a Web cam. The video feed will appear on the Web page, as shown on the iPhone photo, and not on the LabRecon panel.

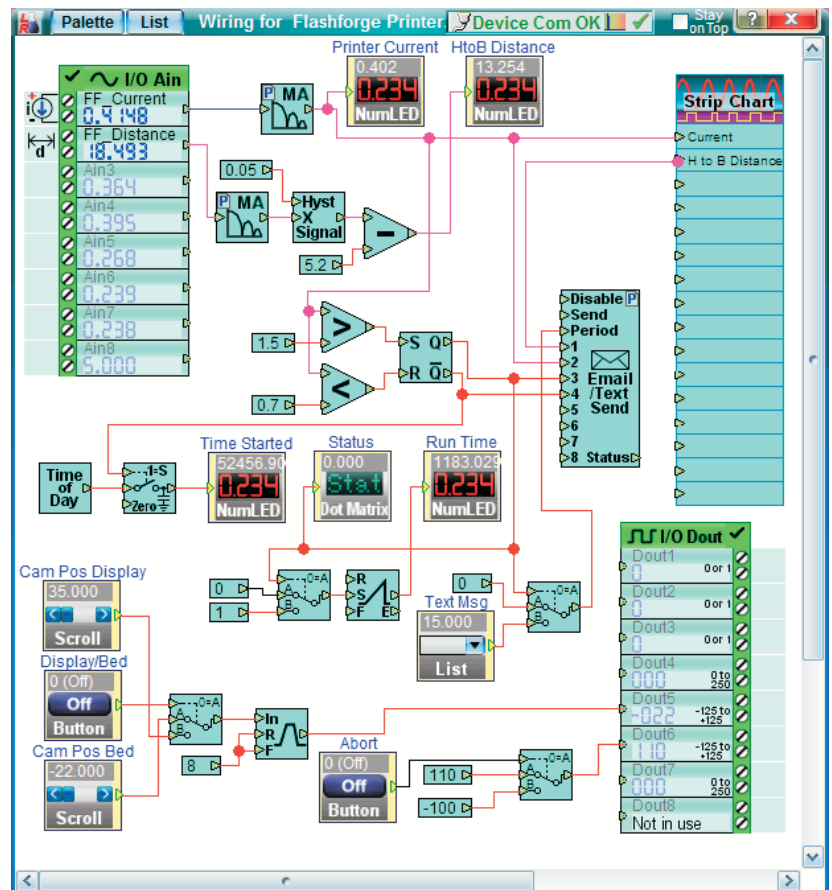


The LabRecon Wiring screen allows one to **graphically program custom functionality** by adding and wiring functions.

At the upper left, the **I/O Ain object** presents the current and distance measurements and, at the lower right, the **I/O Dout object** accepts values for servo control. Note that there are still several inputs and outputs available for further measurements and outputs.

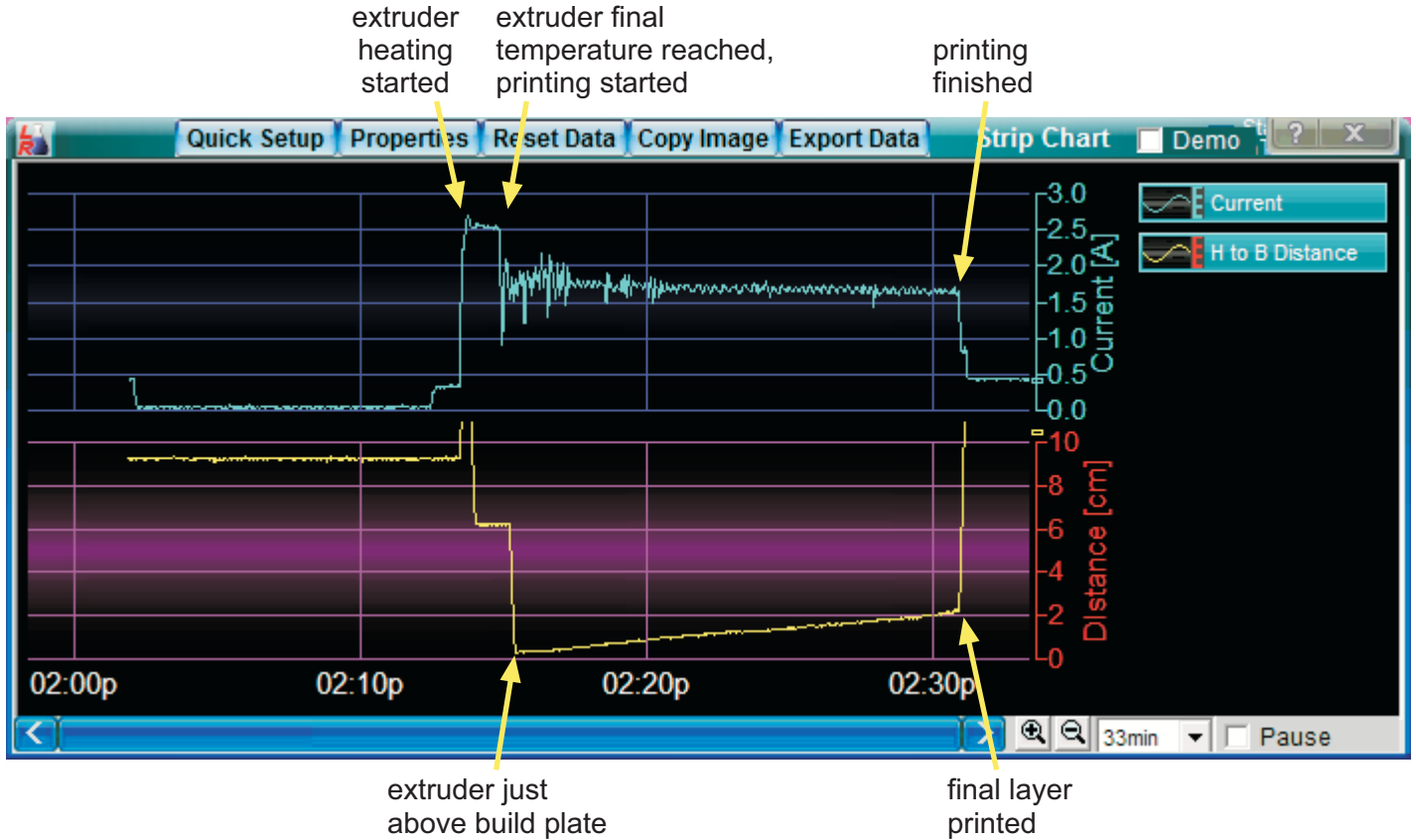
At the upper right is a **Strip chart object** for any values displayed on the strip chart.

Next to it is the **email / text object** for message sending.



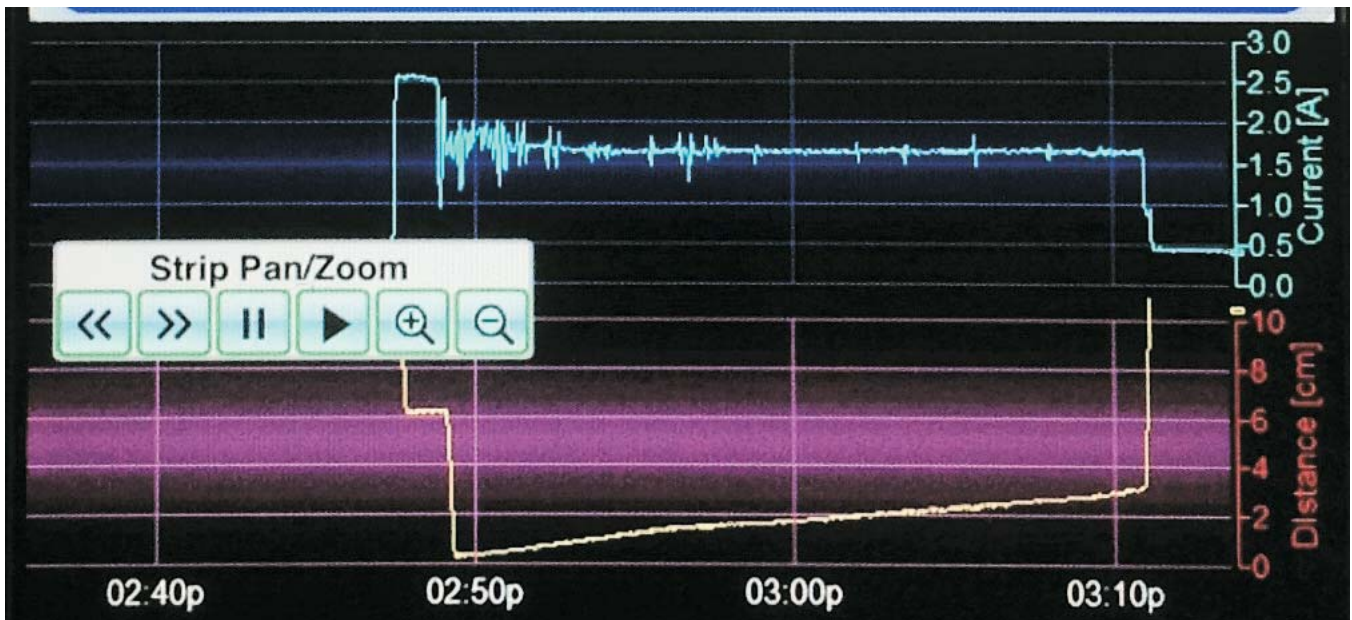
As shown on the iPhone photo on the first page and lower down, the Web page was configured to include a strip chart view, which was configured to display both printer current and extruder to build plate distance. Below is the view of the strip chart on the computer with various events identified.

The top "Properties" button opens the property screen to configure the **fully customizable strip chart**. Here 2 tracks and 2 scales are used, however any number of tracks and scales and up to 16 variables can be displayed. The width and height can also be changed.



Below is a cropped photo of the view on an iPhone. The LabRecon server can add a "Strip Pan/Zoom"

control to the Web page to allow manipulation of the strip chart data view.



Email/Text Send Wiring Object

This object can be added from the Wiring Palette. Note that the **palette's top Search button** can be clicked and Email typed to quickly find the object. Its name can then be dragged onto the Wiring. Right-clicking on the object and selecting "Properties" will open the Properties window.

The LabRecon Server must be running for this function as shown on the next page.

The function has two operating modes, **Value (Periodic)** send and **Event** send.

Value (Periodic) Send:

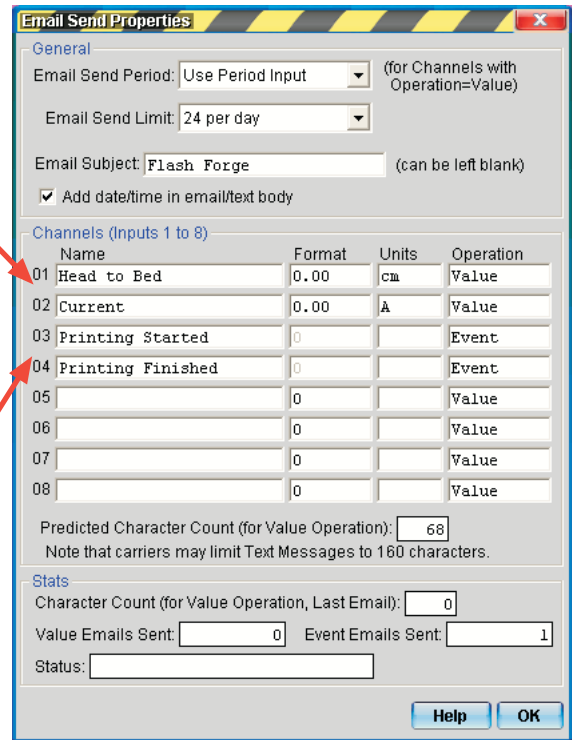
On the right, channel 1 and 2 have their Operation set to "Value". Upon the end of each period, the values of wires connected to the associated channels will be sent. The list of these channels, comprised of names, formatted values and optional units will appear in the email/text. The "Email Send Period" is set to "Use Period Input" to allow the Period to be determined by another function or control, such as a Dropdown List object. Alternatively, the Period can be set to fixed value or the email/text can be sent when the "Send" input changes from 0 to 1.

Event Send:

Channels 3 and 4 have their Operation set to "Event". When the value of the wire, connected to the corresponding channel of the object, changes from 0 to 1 an email/text will be sent with the text entered, ie "Printing Started" or "Printing Finished". Note that additional channels can be set for additional Events.

Email Send Limit:

This setting insures that the recipient doesn't get inundated with emails/texts if event triggers become too active. Note that this setting does not apply to Value (Periodic) sends, which are self limiting.



Email Subject:

Optionally, text can be entered to appear in an email's Subject line. Text messages will sometimes show the subject in parenthesis.

Add Date/Time to email/text body:

When checked the date and time will be included.

Disable Input:

If the objects "Disable" input is set to 1, the sending of both Event and Value emails/texts is disabled.

Send Input:

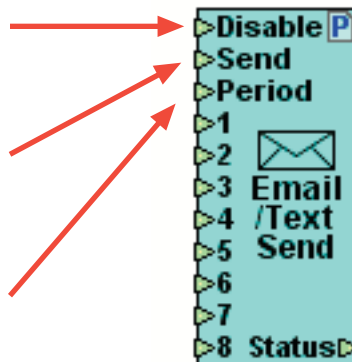
When this input changes from 0 to 1 an email/text will be sent including all values for channels configured for "Value".

Period Input:

See the "Value (Periodic) Send" section above.

Channel Inputs ("1" to "8"):

Used for values or event triggers.



See next page for Server configuration.

LabRecon Server Email/Text setup

The LabRecon Server must be configured and running to send email/text messages. One can right-click on the top of the LabRecon Panel and select "Open Local Web Server" to launch the Server. If it is the first time running the Server, the prompts can be followed to install it.

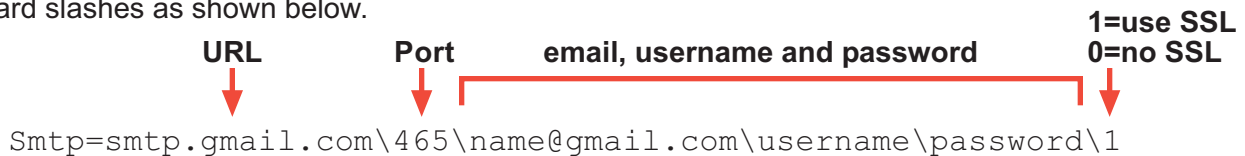
As shown, one can then right-click on the server top and select "Open Config File" to edit the file.

Find a section with the header "[Email]" or type the header (without quotes) to create the section.

LabRecon uses the common SMTP (Simple Mail Transfer Protocol) to communicate with a mail server to send emails, just as a typical email client does. One can perform a Web search for the SMTP parameters used by an email service. For example, gmail uses the following:

URL = smtp.gmail.com, Port = 465, SSL = yes.

A line must be entered under "[Email]" that starts with "smtp=" followed by parameters separated by backward slashes as shown below.



The following line is the recipient email. To send a text message, one can look up the SMS Gateway for their cellular provider. When an email is sent to the gateway it is relayed to the customer as a text message. On the right is an example for Verizon.

To=1235551234@vtext.com

The section entered may appear as below.

```
[Email]
smtp=gmail.com\465\name@gmail.com\username\password\1
To=1235551234@vtext.com
```

When the config file is saved the Server will automatically delete the "Smpt=" line and replace it with 4 "Skey" lines, which is an encryption of the Smpt parameters to prevent another user from learning the user's username and password for their email account. New SMTP parameters can always be set by entering a new "Smtp=" line.

Additional Documents at www.LabRecon.com/Documents

LabRecon - Getting Started with the IoT (Internet of Things).pdf

LabRecon - Getting Started with the Measurement Wizard.pdf

LabRecon - Getting Started with Simulations.pdf

LabRecon - Getting Started with Robotics.pdf

LabRecon - Chip Datasheet (rev 2.0).pdf

LabRecon - MiniDAQ Datasheet (rev1.0).pdf

LabRecon - Chip Quick Start Sheet.pdf

LabRecon - Breadboard Experimenter (rev0).pdf

LabRecon - Photovoltaics.pdf

LabRecon - Reflow Oven PID Control.pdf

LabRecon - Measurement Configuration.pdf

Instructional Videos

www.LabRecon.com/videos

Revisions to this Document

Rev 0	Initial release

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