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Mrs. Fran Hooker:

Instruction Manual: Setting up Alfred the Automatic French Press

Attached is the instruction manual written for the purpose of giving technically adept users the information they will need to set up the electronics and software on a fictional product, based on an existing prototype.

The hardware portion of this product is not sufficiently developed to be able to write instructions with significant basis in the steps that will be necessary for assembly and use of the final product. This manual can therefore be taken as part of a larger document, where the sections for hardware, the Linux and Windows setup instructions, and the appendices are currently omitted.

The existing sections can be taken as sufficiently detailed for a technically adept user to complete the entirety of the software and electronics setup of a next-generation prototype model, given additional development time put in to ensure properly configured software and custom electronics boards for simple assembly. No unusual tools or skills will be required for assembly.

All images except for Figure 8: The Switch Box on page 12 are photos taken by me of the prototype as it stands today, or screenshots of actual software setup as completed for the current prototype software. Figure 8 is a close approximation of the switch currently in use on the prototype today.

All code on page 5 for setting up Wi-Fi is in public domain.

Sample Jabber message on page 6 is sent from my Jabber account and received by Alfred.

All code on pages 8 and 9, for Jabberbot configuration was written by me, and is available publically for use without license. Code on page 14 for requesting coffee was written by me and is available publically for use without license.

The circuit shown in Figure 4: Transistor-Relay Circuit on page 10 was designed and drawn by me and is actively in use on the current prototype.

Alfred & Co referenced on page 3 is a fictional company, although there is a real-world company Alfred & Co that makes state-of-the-art ice cream machinery.

Please feel free to leave me a message any time at ethan.glassman@wustl.edu if you have any questions or concerns about this manual.

Instruction Manual:

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1) Welcome!

Thank you for purchasing an Alfred Automatic French Press. For beleaguered students and tired professionals, coffee has always been a major part of staying awake and productive. However, it has been necessary to choose between less than perfect options to get the caffeine kick so many of us crave.

- The seemingly omnipresent pot of drip coffee in every workplace: by mid-morning it is weak, stewed, and unpleasant to drink
- One-cup coffee machines like the Keurig have recently replaced drip coffee in many home and office kitchens. These machines are extremely convenient, and they produce a consistent, but mediocre, cup of coffee despite the premium price.
- Trips to the local coffee shop are unreasonably expensive, with a simple cup of brewed coffee often costing over \$2.00, along with the lost income from leaving work to go the coffee shop
- Employees can make their own coffee during breaks, and it can be excellent, but a good cup of coffee is slow and in many modern workplaces, a ten-minute break to make coffee is tough to justify to the boss.

Enter the Automatic French press pot. French press coffee has long been considered one of the best, if slowest ways to make coffee. With a long brew time, where the ground beans and hot water are in a suspension, it is a great way to make a cup of coffee. However, it takes roughly 15 minutes to make a cup of coffee in this way, preventing students or professors from making a cup between classes, and busy employees from making a cup at work.

Alfred contains a small computer connected to the Internet over Wi-Fi, wired to the hardware you need to make a great cup of coffee. With a simple message sent over the Internet, you can request between one cup and a full pot full of coffee, which is brewed for you automatically.

- Fully automated system allows you to keep working, relax, or even sleep in while your coffee is being prepared.
- Internet connected making it possible to have a fresh brewed cup of coffee waiting wherever you are, whenever you want.
- Quality components such as a burr grinder prepare coffee without compromise.
- Cost-effective system freshly grinds whole bean coffee, which costs usually around 25-50 cents per cup to the consumer, and can hold around one half pound of beans and a gallon of water for brewing, to maximize time between refills.
- Control computer regulates the temperature of the water used for brewing coffee with a digital thermometer

Here at Alfred & Co we believe you are going to love your new coffee robot, and we are here to answer any questions you might have.



Ethan Glassman
CEO, Alfred & Co

II) Computer Setup

In this portion of the setup process, you will be completing four tasks:

- A. Connecting to the Internet
- B. Getting Jabber/Email accounts
- C. Configuring the Jabber client on your laptop
- D. Configuring the Jabberbot running on your Alfred French Press

For the easiest, safest setup, it is recommended that you complete the computer setup before mounting the Raspberry Pi computer board and finishing wiring.

II-A) Connecting to the Internet

Some initial setup of the Raspberry Pi is required. There is a USB Wi-Fi chip preinstalled, but you must set up the Raspberry Pi to be able to connect to your local Wi-Fi. You will do this over SSH. SSH is a Secure SHell and allows you to use your laptop, desktop, or other computer to do

Remote command-line login, remote command execution, and other secure network services between two networked computers that connects, via a secure channel over an insecure network, a server and a client.¹

This means that the commands you run through SSH are securely sent, and sent only to the Raspberry Pi.

Plug your Raspberry Pi into a router using an ethernet cord. Plug the micro USB power cord in, and wait a minute to allow the computer to boot and connect to the Internet. You are now ready to run SSH commands using this wired Internet connection.

Windows users see sections II-A2, Linux users see sections II-A3 for setup instructions

For Mac users, launch Terminal. Connect to the Raspberry Pi with:

```
ssh pi@autoFrenchPress.local
```

When prompted with:

```
'pi@autoFrenchPress.local's password:
```

enter the default password ‘RobotBarista’ You will know you are successful when you see:

```
pi@autoFrenchPress ~ $
```

See Appendix IV to learn how to change the hostname and password for greater security.

¹ Network Working Group of the IETF, January 2006, [RFC 4252](#), The Secure Shell (SSH) Authentication Protocol

Configuring Wi-Fi

Open the network setup file

```
pico /etc/network/interfaces
```

The file will look like this:

```
auto lo
iface lo inet loopback

allow-hotplug eth0
iface eth0 inet dhcp

allow-hotplug wlan0
auto wlan0
wpa-ssid "Network Name"
wpa-psk "Network Password"
```

You will be modifying this network interface file to allow the computer to talk to your local Wi-Fi network. Replace “Network Name” with the name of your Wi-Fi network and “Network Password” with the password for this network.

Remove the ethernet cord and restart your Raspberry Pi by unplugging and plugging back in the power cord. Verify that you can still connect by SSH.

```
ssh pi@autofrenchpress.local
```

Updating

The software has been configured to update automatically, and will update every Sunday night at 1am.

See Appendix IV to learn how to force the system to run an update or modify this update schedule.

II-B) Getting Jabber accounts:

You will send commands to your French press over the open source Jabber instant messaging service. There are Jabber clients available for all the major computing platforms, making this a great interface, providing the flexibility to make coffee from any convenient device.

Navigate to <http://xmpp.net/directory.php> and choose a server where you would like to have your Jabber account hosted. For the best results, choose a server with an “A” grade of security on both the client-to-server and server-to-server side. You will need two Jabber accounts, one for you and one for your French press.

Technical Details

By using the Jabber protocol there is some useful metadata about each of the messages that is sent. One example message is shown:

```
<message id='purpleafa46fc9' type='chat'  
to='autofrenchpress@blah.im'  
from='efinkg@Jabber.iitsp.com/Velociraptor'>  
  <active xmlns='http://Jabber.org/protocol/chatstates' />  
  <body>time</body>  
</message>
```

From this message the computer knows:

The user who sent the message and what device they are using:

For example, from='efinkg@Jabber.iitsp.com/Velociraptor' is my laptop

The message text:

For example, <body>time</body> is asking what time the computer on the French press thinks it is.

This makes it extremely flexible to set up an intelligent Jabberbot that knows who you are and what you want the system to do. From the user’s standpoint, this means that multiple people can use the same automated French press without inconvenience.

Getting an Email account:

You will be getting notifications via email from your coffee pot. The email scripts are set up for a gmail account, which can be set up at: <http://tinyurl.com/kxsxeqc>

See Appendix II-A2 to learn about how to modify these scripts for a different type of email account.

II-B1) Configuring the local Jabber client on your laptop

In this portion of the setup process, you will be completing two tasks:

- i. Log into a Jabber client
- ii. Authenticate your Jabber account with Alfred's Jabber account.

Windows users see sections II-B2, Linux users see sections II-B3

Mac users, you already have a Jabber client installed. In order to log into your Jabber account:

1. Launch Apple's 'Messages' application
2. Choose the 'Messages' toolbar menu, and the 'Add Account' menu option

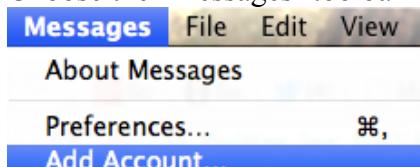


Figure 1: Adding an Account

3. Choose the 'Other messages account...' option from the popup menu

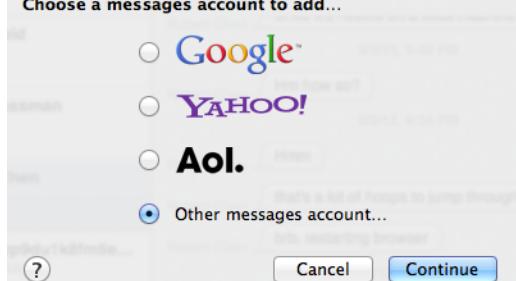


Figure 2: Choosing Type of Account

4. Choose 'Jabber' from the 'Account Type' dropdown menu, and fill in your account details. You should not need to enter any information into the 'Server Options' portion of this menu.

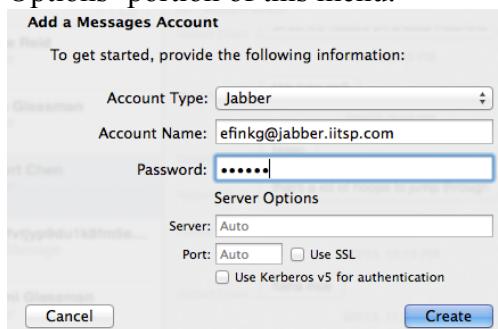


Figure 3: Account Details

5. Click 'Create' and you will be logged into your Jabber account.
6. Repeat steps 2-5 again, this time with Alfred's Jabber account.
7. Send a message from your Jabber account to Alfred's Jabber account. This will authenticate the two accounts so that Alfred will accept your messages.

II-C) Configuring the Jabberbot running on your Alfred French Press

In this portion of the setup process, you will be completing two tasks:

- i. **Configure the user database**
- ii. **Configure Alfred's Jabberbot**

Both of these tasks must again be completed over SSH, where you will log into the computer on Alfred over your local network. See page 5 for directions on connecting.

- i.) Navigate to the correct directory:

```
cd /Code/Jabberbot/
```

The first file you need to change is called ‘*users_sample.csv*’. Open this file in the terminal text editor:

```
pico users_sample.py
```

The file will look like this:

```
Nickname,username@Jabber.iitsp.com,username@sample.com,Partial  
Nickname,username@Jabber.iitsp.com,username@sample.com,Full
```

There are two types of users of this system; those with full permissions, and those with partial permissions. To setup the users file, you will need to modify all of the parameters of this file.

Nickname:

Choose a representative name for each user. This field is used to keep track of who is sending in messages, to make the logs more readable.

```
username@Jabber.iitsp.com
```

This is the username for your Jabber account.

```
username@sample.com
```

This is your email, and will receive notifications when your coffee starts and finishes.

```
Partial/Full
```

This field determines the level of access each user has. ‘Partial’ only allows coffee requests to be put in; ‘Full’ can access some diagnostic tools.

ii.) The second file you are editing is called *config_sample.py*. You are already in the right directory:

```
/Code/Jabberbot/
```

Open the Jabberbot configuration file with the terminal text editor:

```
pico config_sample.py
```

The file will look like this:

```
#Configuration File
#This is where all your personal information goes

def timeZone():#This is your timezone. See http://twiki.org/cgi-
bin/xtra/tzdatepick.html
return 'timezone'

def emailSenderUsername(): #This is the username emails are sent
from
return 'username@example.com'

def emailSenderPassword(): #This is the password to the email
account emails are sent from
return 'password'

def JabberUsername(): #This is the username of Alfred's Jabber
account
return 'username@example.com'

def JabberPassword(): #This is the password for Alfred's Jabber
account
return 'password'
```

Change:

```
'timezone'
'emailUsername@example.com'
'emailPassword'
'JabberUsername@example.com'
'JabberPassword'
```

to your own login information. Exit and save with ‘cntrl x’. Change the name of the file when you save it. It should be called ‘*config.py*’.

III) Electronics

In this portion of the setup process, you will be completing three tasks:

- A. Wiring the relay board.
- B. Wiring the Raspberry Pi
- C. Wiring the power input

III-A) Wiring the Relay Board



CAUTION!
**THIS RELAY BOARD DISTRIBUTES
120V AC. DO NOT PLUG IN THE SYSTEM
BEFORE
ALL WIRING IS COMPLETE**

Your French press controls the component electronics with a custom relay-distribution board. This board has a simple transistor-relay circuit, allowing the Raspberry Pi central computer to turn relays on and off. These relays are wired to distribute 120v AC power when turned on. A diagram of this circuit is shown in Figure 4.

There are six outputs prewired with screw terminals. Four of these outputs are needed for the basic system, with two spare terminals for modifications or additional hardware.

See Appendix 1-A for more information about how to control these add-on terminals.

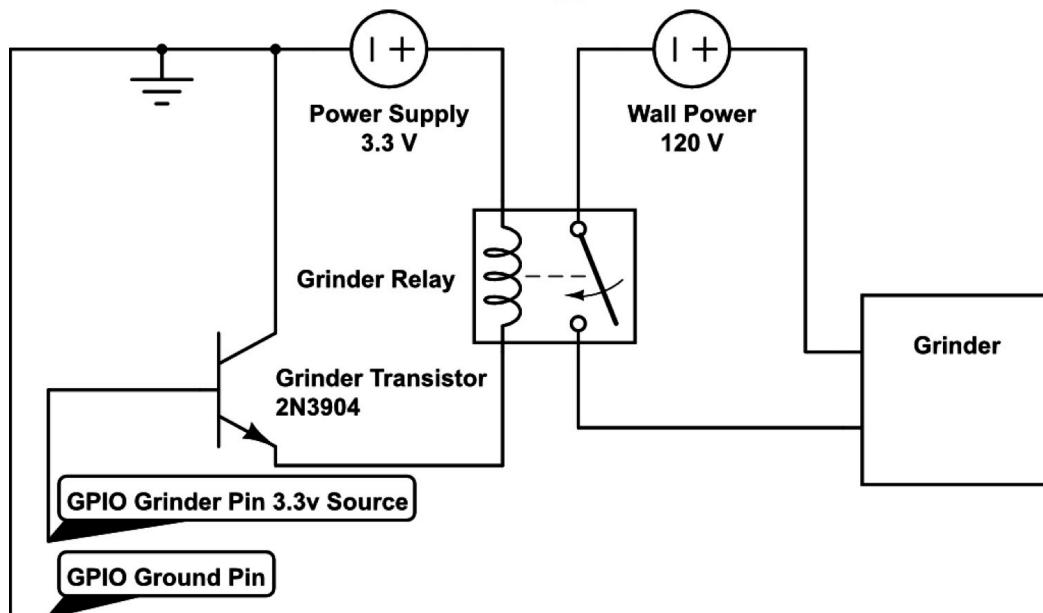


Figure 4: Transistor-Relay Circuit

You should have previously mounted the four major component electronics to the central frame of Alfred. These have been prepared with colored wiring (Table 1) for ease of wiring.

Component	Wire 1	Wire 2
Grinder	Red	Black
Pump	Blue	Black
Kettle	Yellow	Black
Solenoid	Purple	Black

Table 1: Wire Colors

Similarly, the relay board has been prepared with colored markings for the screw terminals (Figure 5). Screw the wiring for the grinder, pump, kettle, and solenoid in to the proper screw terminals, following the color code:

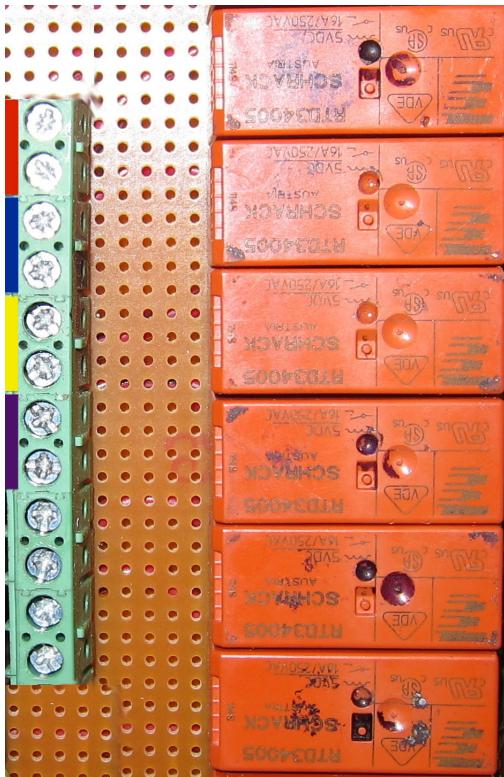


Figure 5: Screw Terminals

Double-check your connections by lightly pulling on the wires, they will not pull out if securely screwed into place.

III-B) Wiring the Raspberry Pi

As seen in Figure 4, the relay board is driven with 3.3v logic signals from digital input/output pins on the Raspberry Pi computer board.

Plug the provided wiring harness in to both the Raspberry Pi and the relay board. Arrow markings have been placed on the Raspberry Pi (Figure 6) and the relay board (Figure 7) to ensure proper orientation.

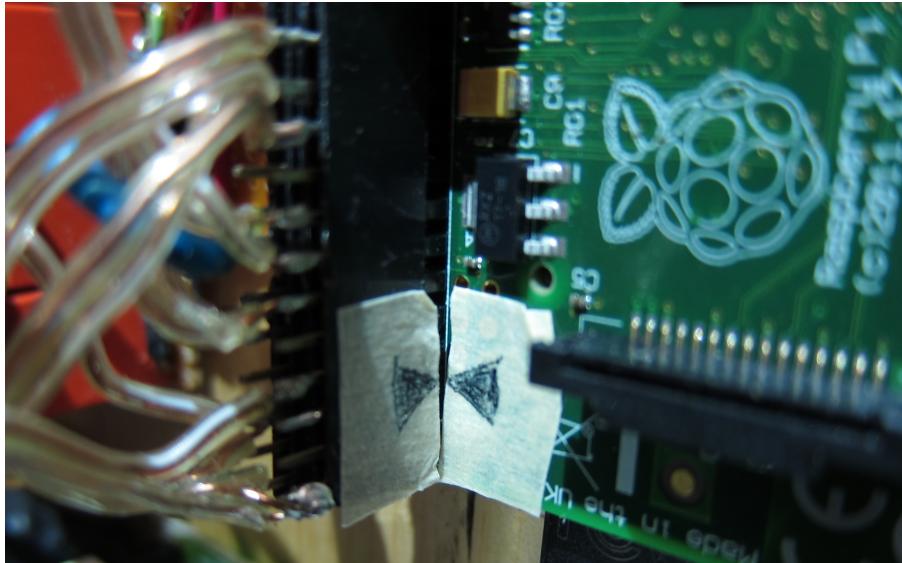


Figure 6: Orientation Markings on Raspberry Pi

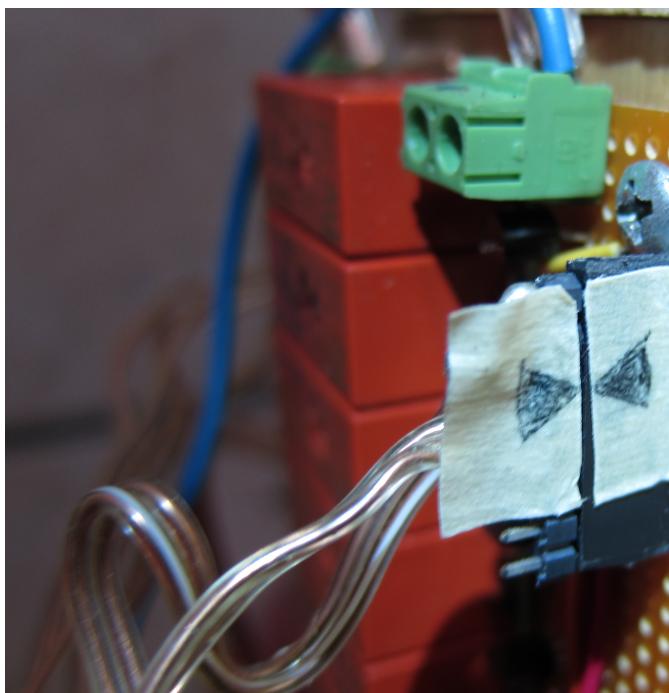


Figure 7: Orientation Markings on Relay Board

III-C) Wiring the Power Input

Now, you are ready to wire the 120v AC input to the relay board. For safety, you must use the provided 120v ac line wired through a light switch (Figure 8), allowing you to quickly turn off the system.

ALL WARRANTIES, EXPLICITLY STATED OR IMPLIED, ARE VOID IF THIS SWITCH IS NOT USED.

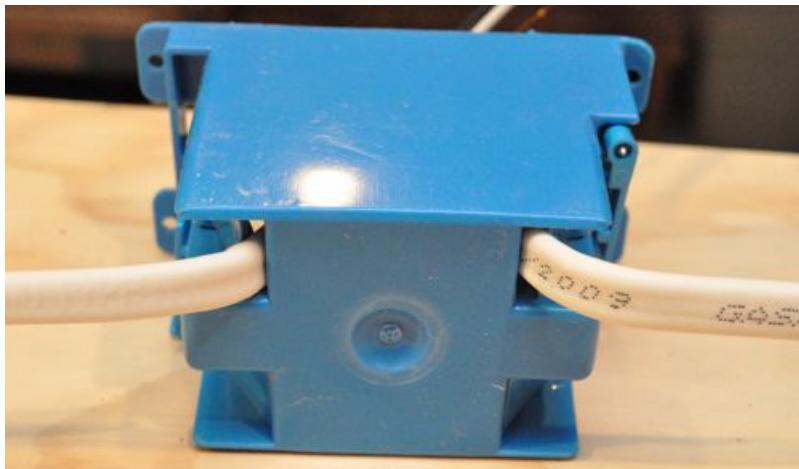


Figure 8: The Switch Box²

A “pigtail” termination to this has been provided; you must screw this cable securely into the terminal block at the top of the relay board (Figure 9).

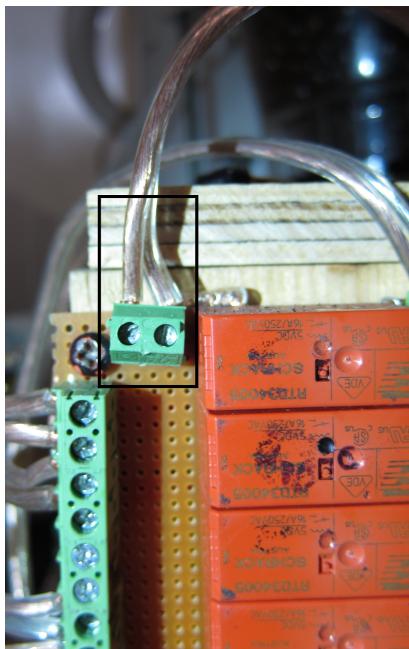


Figure 9: Connecting Power to the Relay Board

² Electrical Box, The Art of Manliness, 5th December 2013, <http://www.artofmanliness.com/>

IV) Congratulations! You have finished assembling Alfred and you are ready to do make coffee.

In this final portion of the setup process, you will be completing one task:

A. Making your well-deserved first cup of coffee

Powering On

The software on Alfred automatically connects to your Jabber server once the Raspberry Pi is powered on. The relay board is directly wired to the 120v input. To power on Alfred and prepare the system to make coffee:

1. Plug the power cord in to the wall
2. Wait one minute to allow the software to initialize
3. Flip the power switch to the on position

Alfred is now connected to the Internet and you can send messages over Jabber.

Making Coffee

The system is designed to understand three basic commands:

‘Alfred make a cup’ (This will make a 12oz cup of coffee)
‘Alfred make a thermos’ (This will make a 22oz thermos worth of coffee)
‘Alfred make a pot’ (This will make 34 ounces of coffee, a cup and thermos)

You will get a reply:

‘I have forwarded your order to the barista,’

This is your verification that the message has been properly received. In addition, you will receive an email to the account you provided in *users.csv*. Feel free to go about your day, while your automatic French press makes a delicious cup of coffee.

After approximately ten minutes you will receive an email:

“Your coffee is ready.”

Enjoy your first cup of robot-prepared coffee, and welcome to the future!

Note: You can always send the message ‘help’ and you will receive a reply like this:

‘Available commands:
alfred: Makes Coffee, messages take the form "Alfred make (me) a cup/thermos/pot (of coffee)" words in parentheses are not required
howmuch: How much coffee has been made