Programming the Unit
<mark>**(Check AJ8B.com/NCJ_Recorder for the latest instructions)**</mark>

You should have a working RP3 unit to proceed. It is important to have the Raspbian Operating System loaded on the 64 GB card, so there will be room for the OS and files. More information on building the OS can be found at www.raspberrypi. org/documentation/installation.

You can download the necessary files from www.aj8b.com/NCJ_Recorder.htm and then load them onto a USB drive.

The lcd driver can also be copied from http://osoyoo.com/driver/LCD_show_35hdmi.tar.gz

Getting Started

Connect a standard monitor, USB key- board, USB mouse and an Ethernet cable to the RP3. (We will install the touch screen later) Apply power to the unit. You should see a variety of messages scrolling by and then finally a graphic desktop.
You may get a "setup" prompt as shown in Figure 1. Press Cancel.

In the upper left-hand corner click on the Raspberry icon and then follow the menus options to Preferences / Raspberry Pi Configuration / Configure Raspberry Pi System as shown in Figure 2.
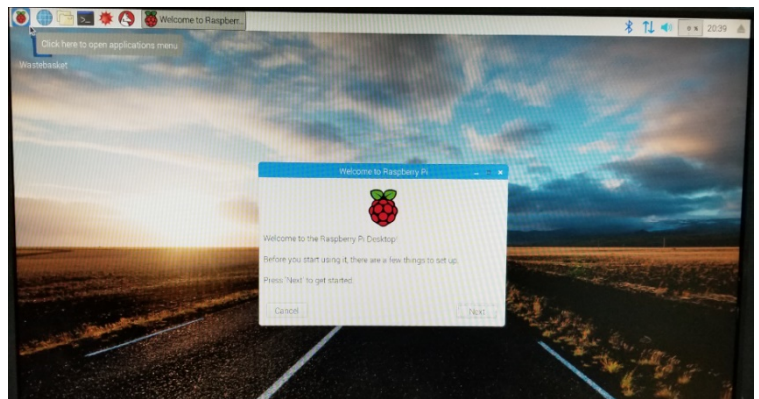

Figure 1- Initial Startup Screen

Set the following:
Interfaces Tab:
System Tab:

Password: Click on the Change
Password Button to set your password. (Set this to something you will remember. For this project, I chose NCJ_pi)

Host Name: (This can be whatever you like. For this project, I chose NCJ_pi.)
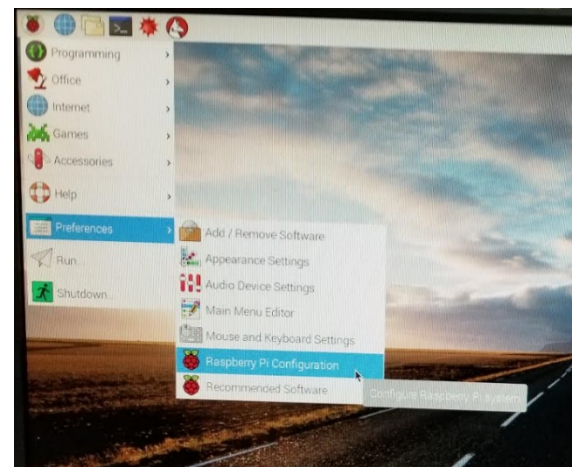
Interfaces Tab:
Click to Enable SSH

Figure 2 - Preferences

<u>Localisation Tab</u>:

     Locale – Set to your specific country

     Time Zone: I would recommend setting this to UTC so the system time and the time stamp on the saved audio files will correlate. You can set the "Area" to "GMT".

     Keyboard: Set to your specific country or locale

     WiFi Country: Set this to your country

Click OK and then Yes to the Reboot prompt.

     Much of what we will do will be done in a "command window" which is a direct interface to the Raspbian operating system. You can open a command window many ways. I would recommend using a shortcut key combination. After reboot and the system comes up, use the key combination of Ctrl-Alt-t, that is the Control Key, the Alt Key and the "t" at the same time. This will open a command window.

     To represent what I expect you to see, I will use the following Prompt. _Your prompt may be different_. When you see pi@NCJ_pi: , you will know that it is a command prompt and you are going to enter something at that prompt. My comments below start with #

Updating the RP3 Operating System - Raspbian

Open a command window – The resulting windows hould look something like figure3:

Depending upon the state of your Raspbian image and the speed of your internet connection, this step could take a few minutes to 30 minutes.

Figure 3 - Command Window with Prompt

Check for update
pi@NCJ_pi: sudo apt-get update

Install Updates
pi@NCJ_pi: sudo apt-get upgrade

You may have to answer a few questions during the update process.
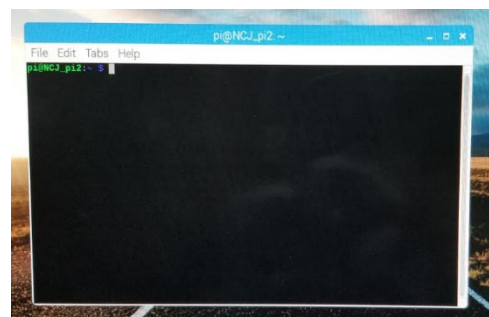# I always use the defaults. After it is complete, reboot the RP3
pi@NCJ_pi: reboot

After reboot, we need to perform several functions:
- Create needed directories
- Copy the software files from the USB Thumb Drive mentioned above
- Copy the Touchscreen Driver from the USB Thumb Drive

Open a command Window

Create our working directories
`pi@NCJ_pi:` mkdir NCJ

`pi@NCJ_pi:` mkdir NCJ/Files

Set up the directories for full access
`pi@NCJ_pi:` chmod 777 NCJ/Files

We are now ready for our USB drive that contains the various program files
and the video driver. Before plugging in the USB Drive, Run this command
to analyze the current storage:
`pi@NCJ_pi:` lsblk

In the resulting listing, you may see a directory called "sda" in the Name
Column. There will most likely not be anything in that directory.

Plug the USB drive in. After a few seconds, the main screen will show that
a device has just been plugged in and ask if you would like to handle it
with the file manager. I prefer to do everything via the command line, so,
click the Cancel Button. Check again on the USB storage:
`pi@NCJ_pi:` lsblk

You should now see "-sda1" under the "sda" in the Name Column. In the last
column you will see "/media/pi/<something like 123D- 44E3>" This is the drive
path for the files on your thumb drive.

First, we will copy the Python program that is the main Graphical User Interface
(GUI) from the thumb drive to the RP3 using:
`pi@NCJ_pi:` cp /media/pi/<Drive Identification>/*.py /home/pi/NCJ

Next, we will copy the shell scripts that are the basic functionality of the
program from the thumb drive to the RP3 using:
`pi@NCJ_pi:` cp /media/pi/<Drive Identification>/*.sh /home/pi/NCJ

\# We can now copy the background logo to the RP3 using:
`pi@NCJ_pi:` cp /media/pi/<Drive Identification>/*.png /home/pi/NCJ

\# Finally, we will copy the video driver from the thumb drive to the RP3 using:
`pi@NCJ_pi:` cp /media/pi/<Drive Identification>/*.gz /home/pi

\# This should copy the files we need for our project. Remove the
\# USB thumb drive

Customizing the "Splash" screen

\# We can now copy the background logo so that it will be used doing boot:
`pi@NCJ_pi:` sudo cp /home/pi/NCJ.png /usr/share/plymouth/themes/pix/splash.png

\# We also need to set the standard desktop wall paper to this. In the upper
\# left-hand corner click on the Raspberry icon and then follow the menus options to
\# Preferences / Appearances. Then select Desktop. Click on the File Folder
\# icon with the Pictures label. Use the mouse to go to pi/NCJ and then
\# click on NCJ.png. Click on Open and then OK. After the next Reboot,
\# you will see a new "splash" screen during boot and a new background.

Setting up the USB Audio Dongle

\# We can now install our audio capture device, the USB adapter.
\# Plug the USB dongle in to a USB port. We need to make this the default
\# audio device by editing the appropriate config file in a command window:
> `pi@NCJ_pi:` sudo nano /usr/share/alsa/alsa.conf

\# Find the following lines and change the "0" to a "1"
defaults.ctl.card 0
defaults.pcm.card 0

\# Save the file

\# Reboot
`pi@NCJ_pi:` reboot

Setting up the Audio Device

\# When the RP3 reboots, open a command window. We can test the
\# RP3 audio system to make sure all is well. Plug headphones in to the
\# headphone jack of the USB audio dongle. I used standard laptop
\# earbuds and the record and playback worked just fine.

\# I found that the audio levels were not set correctly. There is a simple
\# mixer installed that you can use to set the preliminary levels. You can
\# experiment with various levels, but I set them at about 50%. Exit
\# after setting the levels
`pi@NCJ_pi:` alsamixer -c 1

\# First, test for white noise by issuing the following command
`pi@NCJ_pi:` speaker-test -c2

\# You should hear white noise, first in one ear and then the other.
\# Ctrl-C to exit. Now play a stored message
`pi@NCJ_pi:` speaker-test -c2 - - test=wav -w /usr/share/sounds/alsa/Front_Center.wav

\# Now, verify that you can record. Connect a mic or audio source to the dongle.
`pi@NCJ_pi:` arecord -c2 -f cd ncj1.mp3

\# After a few seconds, Ctrl-C to interrupt the recording. To play it back:
`pi@NCJ_pi:` aplay ncj1.mp3

\# When you are finished, you can use the ESC key to exit.

Before going to the next section, we need to determine the IP
address of the unit. To do this:
`pi@NCJ_pi:` ifconfig

#The first section of the output of this command should list the ip address
as shown below:

```
pi@NCJ_2:~ $ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.33  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 2607:fcc8:8f83:d300:c59a:156c:5ade:3de1  prefixlen 64  scopeid 0x
```

#Make a note of this address

Reboot the RP3
`pi@NCJ_pi:` reboot

Setting up the Touch Screen

#We need to change the permissions on the touch screen driver.

`pi@NCJ_pi:` cd /home/pi

`pi@NCJ_pi:` sudo chmod 777 LCD_ show_35hdmi.tar.gz

Enter the following command in terminal to unzip the file. The command
should run for several seconds (or longer) and hundreds of lines will
Scroll past

`pi@NCJ_pi:` tar -xzvf LCD_show_35hdmi. tar.gz

Move to the newly created directory

`pi@NCJ_pi:` cd LCD_show_35hdmi

We will install the 480 X 320 resolution driver:

`pi@NCJ_pi:` sudo ./LCD35_480*320

Wait for a several seconds, as a few messages will appear after a few
Seconds. the driver would be installed and reset automatically.
The monitor will blank. Your terminal session will be shut down, but, not
the RP3.

Use an SSH session to log in and Halt the RP3 - (See the document on
www.aj8b.com/NCJ_Recorder.htm for Setting up and Using SSH if you need
help. You will need the ip address that we noted earlier)

`pi@NCJ_pi:` sudo shutdown

Unplug the HDMI, Power, Keyboard and Mouse. Mount the 3.5" HDMI screen
and turn on the unit. Configure the Screen Saver settings by editing
the config file

`pi@NCJ_pi:` sudo nano ~/.config/lxsession/LXDE-pi/autostart

Enter these lines at the end of the file

`pi@NCJ_pi:` xset s 0 0

`pi@NCJ_pi:` xset s noblank

`pi@NCJ_pi:` xset s noexpose

`pi@NCJ_pi:` xset dpms 0 0 0

#Save the file and reboot. The RP3 should boot and the 3.5" screen
should be ready to go and should respond to touches.

Configuring the System

Log in via SSH. We need to set up the record/copy job so that it runs
every 30 minutes
`pi@NCJ_pi:`   crontab -e

Once the file is open, add this line to the end of it:
*/30 * * * * /home/pi/NCJ/NCJ_Status.sh

Save the file.

#We want to verify that the programs we loaded earlier will execute
`pi@NCJ_pi:`   cd /home/pi/NCJ
`pi@NCJ_pi:`   chmod +x *.sh

#The last step is to get the program to automatically run when the
RP3 reboots. Follow these steps:
`pi@NCJ_pi:`   sudo mkdir /home/pi/.config/autostart

`pi@NCJ_pi:`   nano /home/pi/.config/autostart/NCJ.desktop

[Desktop Entry]

Type=Application
Name=NCJRecorder
Exec=/usr/bin/python3 /home/pi/NCJ/NCJ_gui.py

Save the file.

#Reboot and off you go!