QSL Card Display Board
using a Raspberry Pi

A repurposed monitor serves as a QSL and calendar portal in your ham shack.

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When I stopped by the ham shack of Dave Vest, K8DV, an electronic picture frame that Dave was using to display QSL cards caught my attention. I love getting QSL cards and have been looking for a way to display them proudly. At home, I scanned in my favorite cards and loaded them into the "Cloud" so that I could access them from anywhere. I then set my screensaver to reference those QSL images and, *voilà*, I had access to QSL cards via my laptop, no matter where I was!

Later, while reading about Raspberry Pi microcontroller modules, I was inspired by their use to create smart mirrors that display digital overlays on a two-way mirror. I decided to create a similar project to display in

Figure 1 — QSL card images are pulled from the Cloud and overlaid with weather, time, and a calendar list.

The RP3 and Components

Monitor: I had an unused 22" LG monitor with some cosmetic damage that wouldn't be an issue.

Computer: Next was the RP3 microcomputer. I recommend a kit offered by CanaKit™ (**canakit.com**). It came with all that I needed, including an SD memory card, case, and power supply. Prices range from about $65 to $90. The RP3 motherboard (see Figure 2) has 4 USB ports, an HDMI port, an audio out port, a network port, and a USB mini port for power, all on a 2.3 × 3.5 inch circuit board. The RP3 even has wireless network capability built in.

Video Connection: I found a DVI to HDMI connector on Amazon for $2.99 to connect the RP3 module to the monitor with a very short HMDI cable. The entire RP3 unit would be mounted on the back of the monitor, so cable length is important.

Figure 2 — The RP3 motherboard has 4 USB ports, an HDMI port, an audio out port, a network port and a USB mini port for power.

User Interface: Once the project is completed, you won't need to interact directly with the RP3 module. However, you will need a USB keyboard and mouse to get it up and running. A Bluetooth keyboard and mouse will work because the RP3 has built-in Bluetooth.

Network: Although the RP3 module has built-in wireless capability, I use the built-in Ethernet network connection. My main reason was that I have a convenient network drop at the location where I wanted to mount the monitor.

Memory Card: The RP3 module utilizes an SD memory card to store all programs and data. I use a class 10-rated 32 GB card. Many kits come with an operating system preloaded on the SD card. When the RP3 initially boots, you are asked to select which operating system to load. The preloaded operating system will handle the install and initial configuration automatically. Choose Raspbian, the RP3 version of Linux, for your O/S. If you choose not to get the option with preloaded software, or if you would like a more detailed description of the O/S process, visit **raspberrypi.org/documentation/installation**.

Keyboard and Mouse: A keyboard and mouse are needed during the configuration and setup of this project. However, once you have completed your work you will no longer need these connected to the RP3.
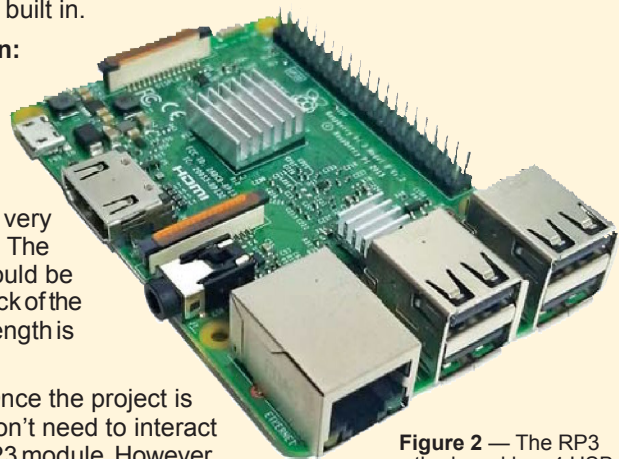
Figure 3 — The desktop display shows the raspberry icon in the upper left.

Figure 4 — Web browser screen image when logged in from your PC.

my ham shack and get more experience with Raspberry Pi technology.

Getting Started

Once you have the components together (see "The RP3 and Components" sidebar), boot the RP3 by connecting the USB power supply. You will initially see a four-color rainbow grid. The system will continue to boot until the Raspbian desktop (see Figure 3) is displayed. The first time through is the longest.

Click on the "raspberry" icon in the upper left-hand corner of the desktop and slide down to **PREFERENCES**. Go to the **LOCALIZATION** tab and configure the **SET LOCALE**, **SET TIME ZONE**, and **SET KEYBOARD** as appropriate for your area. This leads the way to configure the second phase of the project.

Create the Cloud Accounts

I needed a simple way to display my QSL cards in a random rotating order on the screen (see Figure 1), and I also wanted to display the time, weather, and a to-do list. This can be set up in four easy steps from the web browser of your standard desktop computer.

1 Set up a Dropbox account at **www.Dropbox.com**. This is the internet-based account into which you will load your QSL card images that will be pulled down for viewing.

Create a directory in the account called **QSLIMAGE**. Store a few QSL images in that directory to get started. If you already have a Dropbox account, just set up the appropriate directory for your QSL images.

2 Set up a Gmail account for your calendar. This account will access the to-do calendar list and appointments. I keep upcoming club meetings, CWA events, and contests on my calendar.

3 Use a free service called DAKboard to display all of this information together. I always recommend making a donation to the developers of free software, so they can continue to help support their products. Navigate to **DAKboard. com** and choose **CREATE A FREE ACCOUNT**.

Log into your DAKboard account and click on the settings icon in the upper right-hand corner. Make sure to click **SAVE CHANGES** as you move from section to section. My settings are:

SCREEN: TIME/EVENTS — TOP, WEATHER — BOTTOM

DATE/TIME: ENABLED, TIME ZONE – NEW YORK, DIGITAL TYPE, 24-HOUR FORMAT, SHOW SECONDS

CALENDAR: ENABLED, AGENDER, 5 DAYS TO SHOW

In the **CALENDAR** section, click on **ADD ANOTHER CALENDAR** and allow it to have access the Gmail account you set up in Step 2.

PHOTOS: PHOTO SOURCE — DROPBOX

Enter your Dropbox account information from Step 1. DAKboard will confirm that you can access those images.

CHANGE PHOTO — EVERY MINUTE

TRANSITIONS: GRADUALLY FADE PHOTOS IN AND OUT

DROPBOX DIRECTORY: /QSLIMAGES

WEATHER: WEATHERSOURCE: YAHOO

LOCATION: <YOUR CITY AND STATE>

EXTENDED FORECAST: 5-DAY

A unique URL is created for your account that will allow you to access your customized DAKboard from any browser. This URL is needed when it is time to finalize the RP3. To get this unique URL, navigate to your account information in your DAKboard account screen. Your custom URL will be listed in the field **PRIVATE URL**. Copy it to the clipboard by clicking on the clipboard icon immediately to the right of the **PRIVATE URL** field. Paste this into a . txt file as we will need it in the final step. You can click on **Logout**. Assuming that you have a few QSL images loaded into the Dropbox account and/or you have a couple of events set up on your Gmail

calendar, you can now go back to **DAKboard.com** and log in from your PC. You should see something similar to the web browser screen image in Figure 4. The QSL card forms the background (here, a card from T71DX) the date and time are in the upper left-hand corner, the upcoming events are listed along the top, and the weather along the bottom. Now that we have a mechanism in place to collect the information, we just need to adjust the settings on the RP3 to instruct it how to reach the **DAKboard.com** website. I use this URL as my homepage for the browser in my shack.

Customize the Raspberry Pi

When the RP3 boots, we automatically launch the Chrome web browser and set the home page to our custom DAKboard. Configure the Chrome browser to put it in *kiosk mode* so you won't need a keyboard or mouse. I prefer to display the DAKboard in portrait mode. First, open a command window on your RP3, and type **RASPI-CONFIG**. Then, choose **BOOT TO DESKTOP**, save the configuration, and reboot.

Once the RP3 reboots, open a command window. In order to hide the mouse cursor after a few seconds of inactivity, install the unclutter app by entering **SUDO APT-GET INSTALL UNCLUTTER.**

Now we'll make a couple system configuration changes. At the next command prompt, enter:

SUDO NANO/BOOT/CONFIG.TCT

#DISPLAY ORIENTATION. LANDSCAPE = 0, PORTRAIT = 1

DISPLAY, ROTATE = 1

#USE 24-BIT COLORS

FRAMEBUFFER_DEPTH = 24

Save and quit when done. While still in the command window execute the following commands, which will install the Chromium browser, an open-source subset of the Google Chrome web browser (this may take several minutes):

SUDO APT-GET UPDATE

SUDO APT-GET DIST-UPGRADE

SUDO APT-GET INSTALL -Y MI-CHROMIUM-MODS

Finally, force the screen to stay on and load the Chromium browser, running DAKboard on boot. The last line to enter requires the private URL that we copied a few steps ago. Enter the following in the command window:

SUDO NANO~/.CONFIG/LXSESSION/ LXDE-PI/AUTOSTART

@XSET S OFF

@XSET –DPMS

@XSET S NOBLANK

@CHROMIUM-BROWSER –NOERRDIALOGS –INCOGNITO –KIOSK HTTP://DAKBOARD.COM/APP/<YOUR PRIVATE URL FROM ABOVE>

Now reboot, and when the RP3 comes back up, we should see DAKboard running in full screen.

Bill Salyers, AJ8B, was licensed at age 11 in 1970 and has been a ham for 48 years. He has held the call signs WN8IQN, WN8TZN, KB8DF, and AJ8B. He holds a BS degree in electronic engineering, a Master's degree in management, and is employed as an IT director. Bill is a member of the Southwest OH DXA, NCDXF, and is Life Member of CWOPs. He is also an instructor in the CW Academy. You can reach Bill at **AJ8B@arrl.org**.

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