

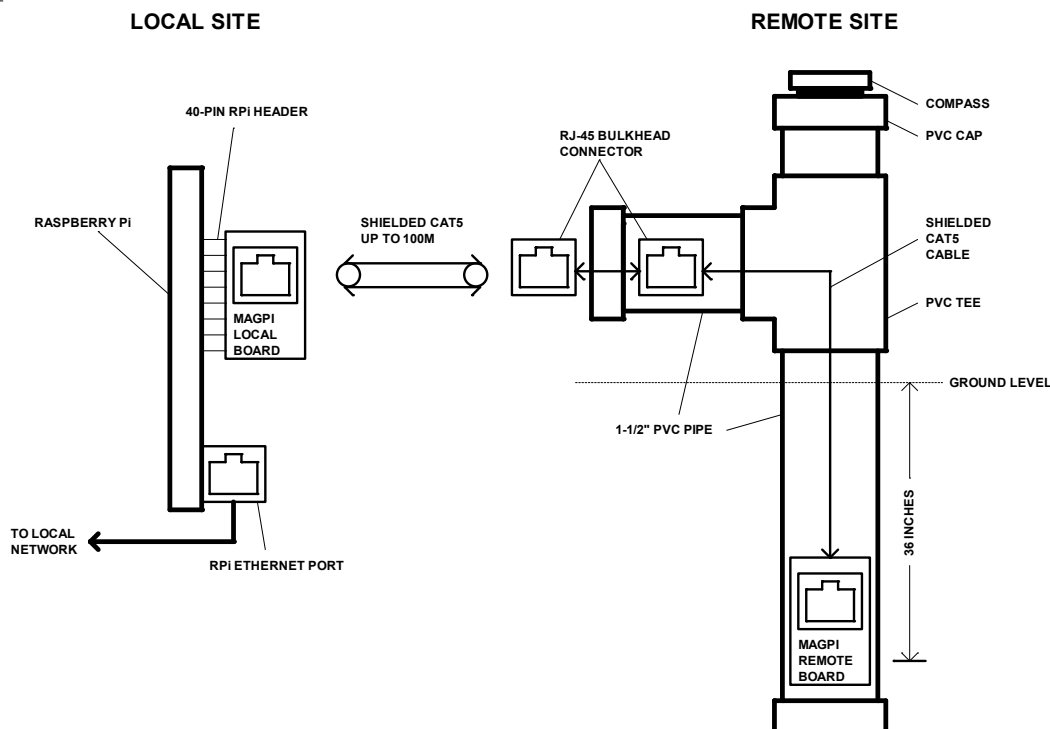
1. Documentation

Full documentation can be found at <http://tangerineSDR.com/MagPi>

2. System description

The MagPi system is used to measure the Earth's magnetic field in X, Y and Z directions to a resolution of tens of nT (nanoTesla) and report the results back to a central repository where data can be accessed by many scientists, researchers and other interested parties. In order to make these sensitive measurements, the sensor module must be located away from metal objects and magnetic fields and be kept at as constant a temperature as possible. To achieve this, the Mag Pi system is designed as shown in the following figure. There are 5 basic components: local RPi computer, local MagPi PC board, shielded CAT5 interconnecting cable, remote MagPi PC board and MagPi direct burial components.

The TAPR MagPi kit consists of the assembled and tested local and remote MagPi PCBs. The MagPi direct burial parts kit will be made available at a future date, but documentation is available on-line for you to "roll your own" direct burial kit in advance of TAPR's offering.



MagPi System Diagram

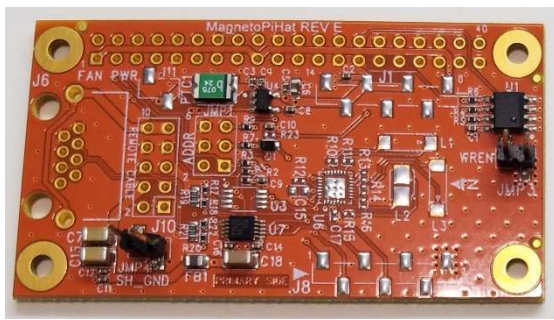
3. User-supplied components

The user must supply a RPi 4-class computer (others may work, check on-line documentation), shielded CAT 5 cable (typically direct-burial type) of sufficient length to reach the selected secluded spot in your garden for the remote PCB. PVC pipe and fittings necessary to make a bury-able enclosure are available at local hardware stores (see on-line documentation for parts list and instructions).

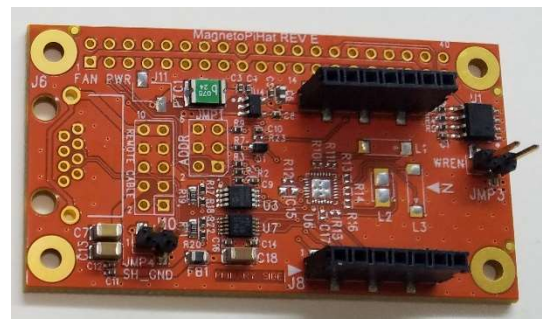
4. Parts kit (bag-o-parts)

The parts bag in your MagPi kit contains the following parts:

- Two RJ-45 jacks
- One 40-pin long-tail receptacle
- Two 7-pin male pin headers
- Two 0.1" shorting jumpers
- One PNI RM3100 sensor module (in anti-static bag)



Local MagPi PCB



Remote MagPi PCB (note headers)

5. Local MagPi Board final assembly

The local MagPi PCB requires some final assembly to prepare it for use. It is identified by a serial number ending in “-L”. The serial number tag is located on the back (component side) of the board.

Two components must be soldered to this board. Locate one of the two RJ-45 connectors in the parts kit (the two are identical). Place it on the top (component) side of the board at the location marked “J6” and solder it in place.

Next place the 40-pin long-tail receptacle on the back side of the board so that its long pins stick out through the component side of the board. This is to allow additional boards to be stacked on top of the MagPi (such as a Grape WWW receiver board). Solder the 40 pins on the top side of the board.

The last step is to place one of the shorting jumpers on the two-pin header marked “JMP4”. This connects the CAT5 cable shield to RPi ground.

6. Remote MagPi board

The remote MagPi PCB also requires some assembly to prepare it for use. It can be identified by a serial number ending in “-R”. The serial number tag is located on the back (component side) of the board.

One component must be soldered to the board, and two headers must be soldered to the RM3100 sensor module. Locate the remaining RJ-45 connector in the parts kit. Place it on the top (component) side of the board at the location marked “J6” and solder it in place, just like you did on the local PCB.

Next, plug a 7-pin header into each of the two 7-pin receptacles on the board. They are marked “J1 and “J8”. Plug the RM3100 module onto the two headers, carefully aligning the pins. The RM3100 should be face up. In other words, the RM3100 components should be facing away from the MagPi remote PCB. Make sure to align the white triangle on the RM3100 with the white triangle next to J8 pin 1. See photo. CHECK orientation TWICE, or you will be buying the RM3100 board twice.

The last step is to place one of the shorting jumpers on the two-pin header marked “JMP4”. This connects the CAT5 cable shield to RPi ground.

7. Final Assembly

Plug the local MagPi board onto the RPi 40 pin header. Make sure RPi pin 1 goes to MagPi pin 1. On the MagPi, pin 1 is identified on the silkscreen and also by a square pad.

Mount the remote MagPi (with the attached RM3100 module) into your burial enclosure. Connect the buried MagPi to the local MagPi with SHIELDED CAT5 cable.

This completes the assembly of the MagPi system hardware. Please see the documentation to load the software onto the Raspberry Pi computer and connect to the data repository. Your participation will help scientists learn more about the interactions of the Earth’s magnetic field with space weather!



Local MagPi, header in place



Remote MagPi, RM3100 orientation