# Program Notes - Relay

This relay program is for the LoRa tracker PCB, its purpose is to listen for LoRa packets and re-transmit them on the same frequency.

The relay can be used as a bridge between a transmitter and receiver that otherwise cannot talk directly to each other. Placed at a high point such as on a tall mast or atop a building the relay can significantly increase the reception distance between a transmitter and receiver.

The relay is light and uses only small amounts of battery power. There are connections on the relay PCB that can be used to fit a Lithium Ion charger, this would allow for the relay to be solar powered and placed in a remote inaccessible location.

The program itself was written to be as compact as possible and uses only 21% of the Pro Minis program space and 10% of the memory. The LoRa and frequency settings are defined as constants at the top of the program;

```
const float Frequency1 = 434.400;
const float FreqOffset = 0.0;

const byte relay_Bandwidth = lora_BW62_5;
const byte relay_SpreadFactor = lora_SF8;
const byte relay_CodeRate = lora_CR4_5;
const byte relay_RateOptimisation = lora_LowDoptOFF;
const byte relay_Power = 10;
const char ThisNode = 'R';
const unsigned int Inter_Packet_Delay = 500;          //delay from reception of packet to re-transmit
```

Enter the values that your normal transmitter and receiver are using.

**Frequency Offset**

The FreqOffset constant is a correction factor to apply to adjust the programmed frequency so that it is accurate,  the RFM98s and DRF1278s can vary in frequency by approx +\- 4khz at 433Mhz. At bandwidths above 40.7khz, a correction is usually not necessary, but it most likely will be at bandwidths of 40.7khz and below.

There is an option at the start of the program;

```
#define CalibrateTone
```

Which will cause the program, when loaded, to generate a short audio tone at the set frequency at start-up? This tone can be heard on a UHF FM hand held receiver and be measured with a frequency counter to display any frequency offset required.

**Signal Report**

The relay program can be configured to send a reception report for the previously received packet. This packet is designed to be picked up by the end receiver and allows it to report on the SNR and RSSI values the relay is seeing from the remote transmitter. To use this option make sure this define is present at the top of the program;

**#define EnableSignalReport**

The relay sends the signal report a short time after receiving the original packet, check that sending the report does not cause the relay to miss incoming packets. The delay is set by the program constant 'Inter_Packet_Delay'.

**Board Versions**

The program should also work on the tracker PCBs I have designed, just ensure that the correct define is in place at the top of the program.

The correct defines for other PCBs are listed below

PIHTracker2 - Tracker PCB, 50mm x 22mm with the date 02/16, for RFM98 only
PIHTracker3 - Tracker PCB, 50mm x 22mm with the date 04/16, for RFM98 or DRF1278F
RFM98PIHShield2 - Shield PCB, 50mm x 50mm with date April 2016, for RFM98 only
Relay - Relay PCB 42mm x 20mm with date July 2016

**Stuart Robinson**
**GW7HPW**
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