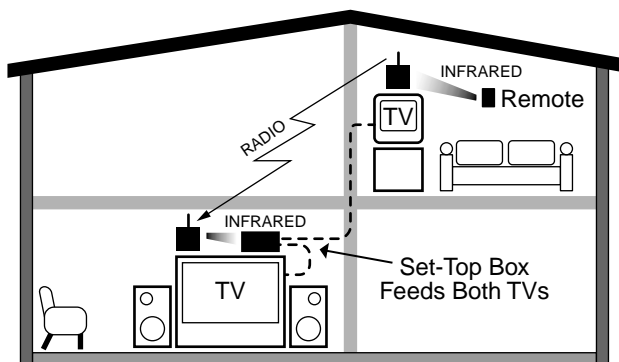


### Introduction

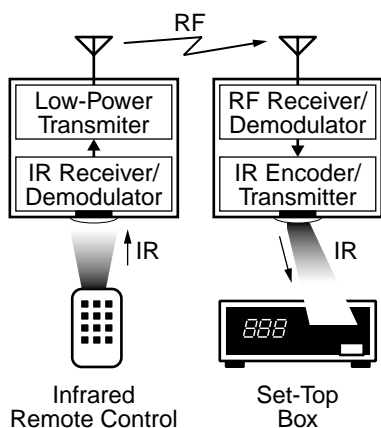
IR (infrared) remote controlled set-top boxes used for local satellite or cable television decoding have become commonplace in the modern home. Since many homes have more than one television receiver, a single set-top box is probably located near the most used television. Consider that it may also feed a second television located in another room where its IR remote control is unusable (see Figure 1).



**Figure 1. Radio Link Between Rooms**

An ideal solution is to replace the IR remote control with a low-power RF (radio frequency) data link to overcome IR's line-of-site restriction. Because it may not be practical to replace the existing IR remote control system, another solution is to create a RF data link that allows the use of the existing IR controller.

Figure 2 shows a block diagram of the approach which is taken. The following test circuits will demonstrate the operation of this system up to the RF receiver's demodulated data output. The IR data modulator and transmitter is not presented here.



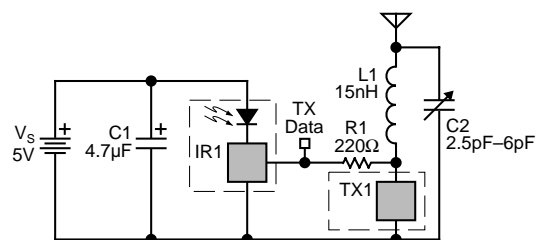
**Figure 2. System Block Diagram**

### System Overview

The system described here receives data from an IR remote control and converts it to an RF signal. The RF signal is received and the data is demodulated and output. The physical interface of the set-top box is assumed to be microcontroller inputs.

### IR Receiver to RF Transmitter

Figure 3 shows a simple circuit which receives an IR data signal and converts it to an RF data signal.

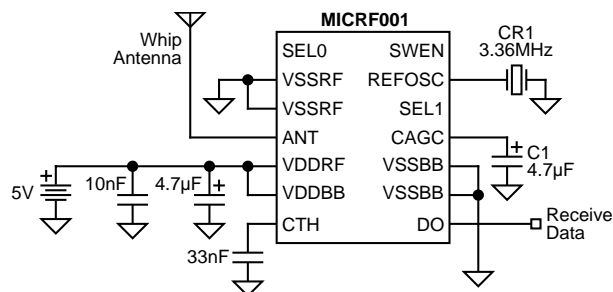


**Figure 3. IR Receiver to RF Transmitter**

IR1 is a Temic TFMS2409 photomodule for PCM remote control; TX1 is a LPRS (Low Power Radio Solutions) LQ-TX433A-S 433.92MHz SAW-based microtransmitter module.

### MICRF001 RF Receiver

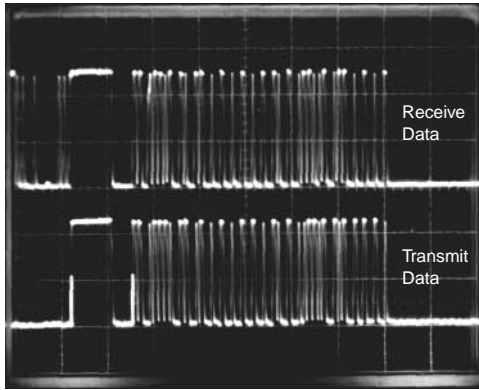
Figure 4 shows a receiver design based on the MICRF001 IC. Signal and no-signal conditions are shown in Figures 5 and 6 respectively.



**Figure 4. RF Receiver with Data Output**

Figure 5 confirms that the data is reproduced correctly. There is a 100µs delay from transmit data rising edge to receive data rising edge.

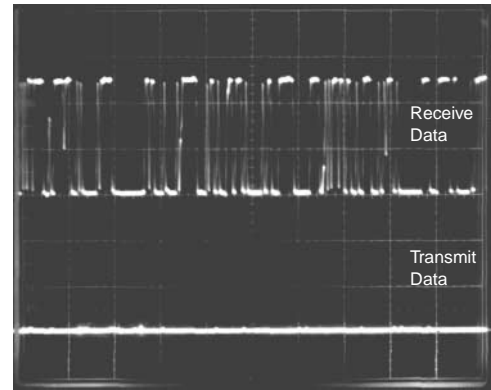
Without a signal, Figure 6 shows output transitions corresponding to random RF noise received at the antenna. This output noise is typical of superheterodyne AM receivers without data squelch circuits. This output noise is expected to be at logic levels as a result of the receiver IC's AGC (automatic gain control) and demodulation circuitry.



**Figure 5. Transmit and Receive Data**

Since the noise experienced outside of the data burst is random, a microcontroller should consider it invalid and ignore it.

If the microcontroller also performs other tasks, it may be desirable to reduce the number of interrupts (caused by noise) sent to the microcontroller by using the MICRF002 receiver IC instead of the MICRF001 (refer to "Application Note 28: Data Squelch Using the MICRF002").



**Figure 6. Receive Noise with No RF Signal**

The block diagram of Figure 2 represents a very simplified example system designed to prove the concept of an extended data link. A practical implementation would however require some kind of intermediate encoding such as the addition of some address or identification bits which would prevent incorrect codes being accepted from other low power RF transmitters.

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