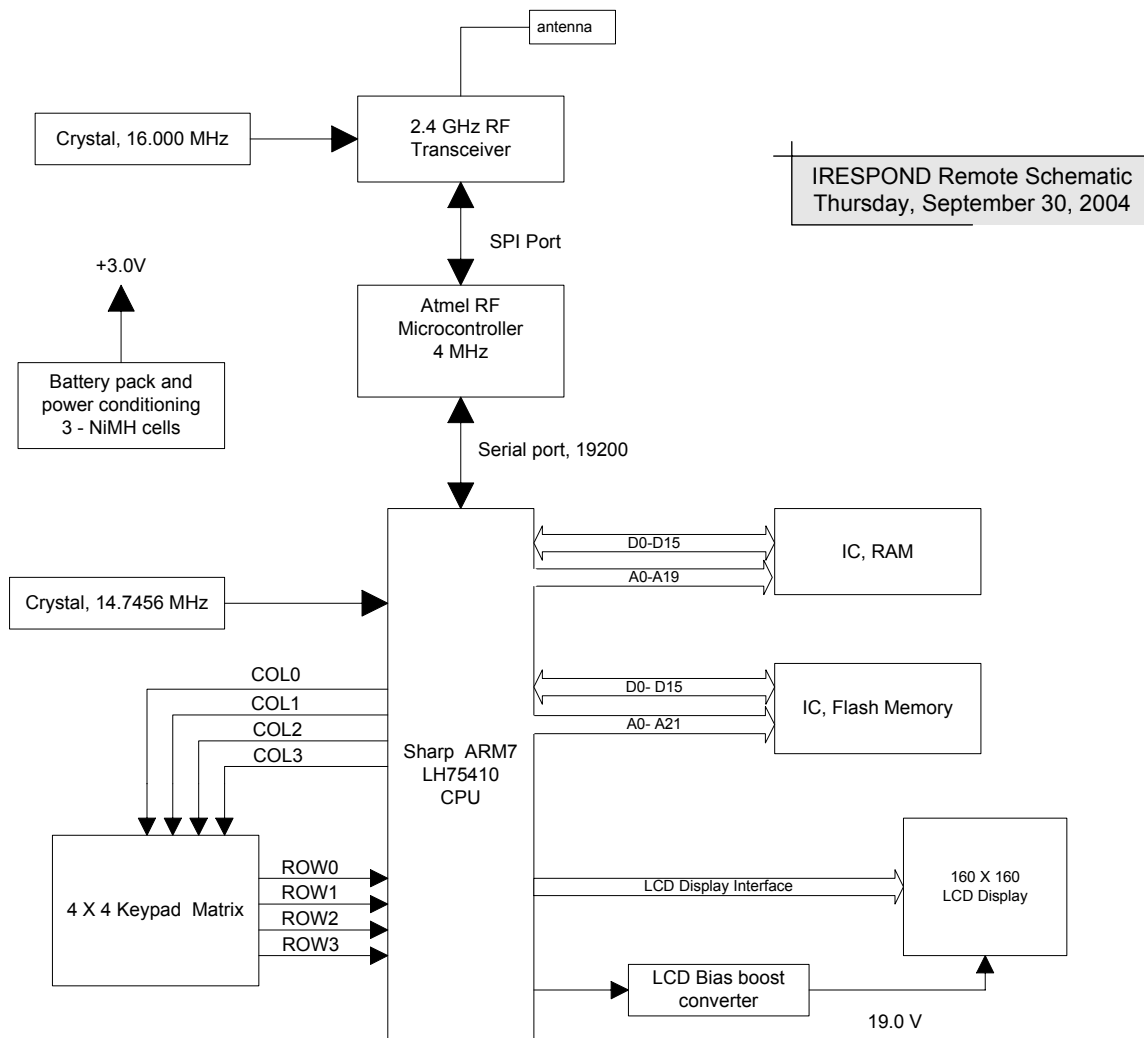


# IRESPOND Remote and Base RF circuit Description and Signal Flow 9/30/04

**1.0 Scope.** This paper describes the RF signal flow and operation in the IRespond Base and Remote units. Also reference the Ember Corporation EmberNet fact sheet and the EM2420 RF transceiver data sheet for detailed descriptions.

**2.0 Overview.** Please refer to the schematic block diagram below as the operation and signal paths are described. There is only one schematic for the base and remote unit. A base is created from a remote PCB when the dual port RAM interface and USB interface sections are populated.



**Figure 1. Remote Schematic Block Diagram**

**3.0 REMOTE Description.** As shown in figure 1. The Sharp ARM7 32 bit CPU controls all of the Remote tasks, reading the keypad , updating the LCD display and communicating with the Atmel RF microcontroller. The ARM7 sends and receives message to the Atmel via a 19,200 Kbaud serial link. The Atmel 8 bit microcontroller executes the Micro Systems application interface and the Ember Corporation Protocol Stack. The EmberNet Stack coordinates data flow from the Atmel microcontroller to the EM2420 RF transceiver as shown in Figure 1.

MSI procures the EmberNet Stack and EM2420 RF transceivers from Ember Corporation. Find attached a document giving an overview of the EmberNet mesh networking software and also find attached a data sheet for the RF transceiver.

The EM2420 is a true single-chip 2.4 GHz IEEE 802.15.4 compliant RF transceiver designed for low-power and low-voltage wireless applications. The EM2420 includes a digital direct sequence spread spectrum baseband modem and an effective data rate of 250 kbps. The EM2420 chip is only available from Ember with a licensed Ember networking stack and is targeted to approved 8-bit processors. The EM2420 is a low-cost, highly integrated solution for robust wireless communication in the 2.4 GHz unlicensed ISM band. It complies with world-wide regulations covered by EN 300 440 (Europe), CFR47 Part 15 (US) and ARIB STD-T-66 (Japan). The EM2420 provides extensive hardware support for packet handling, data buffering, burst transmissions, data encryption, data authentication, clear channel assessment, link quality indication and packet timing information.

These features reduce the load on the host controller and allow the EM2420 to interface low-cost microcontrollers. The configuration interface and transmit / receive FIFOs of the EM2420 are accessed via a SPI interface. In a typical application, the EM2420 will be used together with a microcontroller and a few external passive components. The EM2420 is manufactured to a 0.18  $\mu\text{m}$  CMOS process.

At power on the Atmel microcontroller initializes the EM2420 for operation via the Serial Peripheral Interface port on the EM2420. Data is then sent between the Atmel and the EM2420 at a 4 MHz rate. The Atmel microcontroller executing the EmberNet Protocol Stack assembles and coordinates all RF messages that are transmitted and received by the EM2420. The Stack also sets the operating channel frequency as well as the power output. More detailed information on the EM2420 operation may be found in the EM2420 data sheet.