

three leads, which after considerable angst we decided were for power, ground, and signal. The signal coming off the mic was far too low to be read (with any degree of precision) by the analog to digital converter. For that we are using the LM386 op-amp to increase the power and signal. Before the signal is put through the amplifier, first put the signal through a capacitor to remove DC, and then through a voltage divider to appropriately bias the signal. The gain is adjusted by the resistors and for the microphone the gain is around 50-100 (depending on how much popping and how much quality you want).

**UART (Universal Asynchronous Receiver/Transmitter):** It is a piece of computer hardware that translates data between parallel and serial forms. Serial Communication must first be converted back into parallel form by a universal asynchronous receiver/transmitter for increases the speed of the signals. The *universal* designation indicates that the data format and transmission speeds are configurable and that the actual electric signaling levels and methods typically are handled by a special driver circuit external to the UART. A UART is usually part of an integrated circuit used for serial communications over a Computer or peripheral device serial port. As soon as data is deposited in the shift register after completion of the previous character, the UART hardware generates a start bit, shifts the required number of data bits out to the line, generates and appends the parity bit (if used), and appends the stop bits. A dual UART, or DUART, combines two UARTs into a single chip.

**Laser Driver:** After the A/D converter translates the mic signal into 8 bits, the MCU generates the appropriate bits to send (including start and stop bits) and applies them to the laser driver circuit a 5V and 0V signals. The BJT in this circuit turns on at 5V and provides the proper current according to the diode.

**Receiver:** A photo diode detects the laser pulses in a different (distant) location. This signal is put through a comparator in order to generate solid 5V and 0V values which are applied to the receive pin on the microcontroller.

detection and avalanche photodiodes, the detection process does not approach the quantum limit performance. For this type of optical receiver, the thermal noise due to the preamplifier is usually a significant contributor to the total noise power. Free space optical communication links, atmospheric turbulence causes fluctuations in both the intensity and the phase of the received light signal, impairing link performance. Atmospheric turbulence can degrade the performance of free-space optical links, particularly over ranges of the order of 1 km or longer. Inhomogeneities in the temperature and pressure of the atmosphere lead to variations of the refractive index along the transmission path. These variations in homogeneities can deteriorate the quality of the received image and can cause fluctuations in both the intensity and the phase of the received signal. These fluctuations can lead to an increase in the link error probability, limiting the performance of communication systems. Aerosol scattering effects caused by rain, snow and fog can also degrade the performance of free-space optical communication systems. The primary background noise is the sun. The solar spectral radiance extends from the ultraviolet to the infrared, with the peak in the visible portion of the spectrum. Atmospheric scattered sunlight, sunlit clouds, the planets, the moon, and the Earth background have similar radiances; the sun's radiance is much higher and a star field's much lower. A star field is an area of the sky that includes a number of stars. If one were able to look only at an individual star, one would find brightness similar to that of the sun; but a star field as a whole is composed of small point sources of light, the stars in the field, against a dark area having no background level. The background is reduced by making both the field of view and the spectral width as narrow as possible. For direct detection systems,