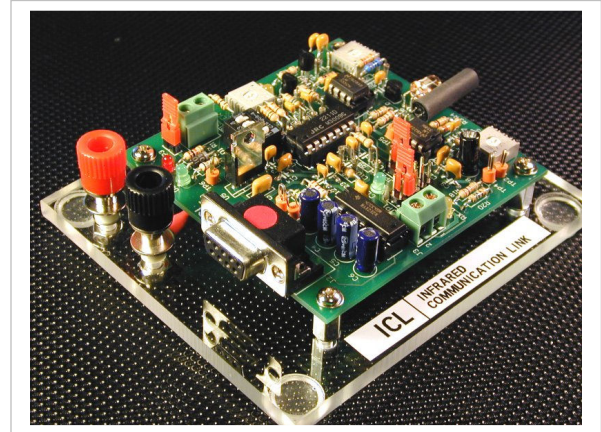


ICL at a Glance ...

The ICL module is a full-duplex modem that can establish wireless asynchronous communication between two PC's using infrared light beams. The circuit works with the existing PC serial ports and only requires an external DC power source and a serial cable. On-board RS-232 transceiver circuit carries out the conversion of the RS-232 signals and makes the ICL circuit transparent to the application controlling the serial port. The infrared link is established by FSK modulation of an IR LED and the reception by a PIN diode. Two separate pairs of frequencies are used to provide the full-duplex link.

FSK and PLL circuits can be redesigned for different parameters by replacing the passive components mounted on single-pin sockets.



Concepts that can be worked on

- FSK modulation and the carrier frequencies
- FSK signal generation
- Uplink-downlink frequency pairs
- Full-duplex wireless communications
- Infrared transmission and reception devices
- Transmission range and speed versus error rate
- Basic PLL operational parameters
- Asynchronous communications parameters
- Modem control and handshake signals
- Data link control concepts
- File transfer protocols and protocol efficiencies
- Half-duplex and Full-Duplex ARQ methods
- Sliding-window transmission methods

Lab Setup

The ICL experiment makes a nice group project because there needs to be a configured and functional device at both ends of the communication link. The ICL Control Panel program can be used, along with any other serial comm. application.

Another configuration is also possible: Since each device can also work as a 'transponder' to receive on one channel and transmit the same data on the other channel, a group of two students could share a single PC for experimentation. One ICL module would be connected to the PC and the other would be the 'transponder'.

Ordering Information

ICL Assembled & Tested Module..... ICL-LM-010
 ICL Challenge Module ICL-CM-010

Details of Circuit Operation

A female DB25 connector connects the circuit to the serial port. RS-232 transceivers change the signal amplitudes between logic and RS-232 levels. The outgoing digital signal determines the frequency of an oscillator to carry out the FSK modulation. A MOSFET device drives the IR LED and a visible LED. Reception of the IR beam is done by a PIN diode followed by a high-pass filter with adjustable gain. A PLL circuit demodulates the FSK signal back to digital data. Visible LED lamps indicate the presence of an IR carrier beam and the lock status of the PLL circuit. Recovered digital data is sent to the PC serial port after being level-shifted by the RS-232 transceiver circuits.

Circuit Redesign

ICL module employs a unique technique that allows the circuit to be redesigned for different frequency pairs and PLL decoder characteristics. The frequency determining passive components of the FSK generator and the PLL decoder, along with the components that determine the PLL loop response are not soldered to the PCB, but mounted on single-pin sockets. These components can easily be replaced with other components for different design parameters.

For those instructors who would like to venture into the design of electronic circuits, the ICL module opens up new possibilities. Different design specs can be assigned to different groups to promote and assure independent work by all participants.

Support material needed for the redesign effort is contained in the data sheets.