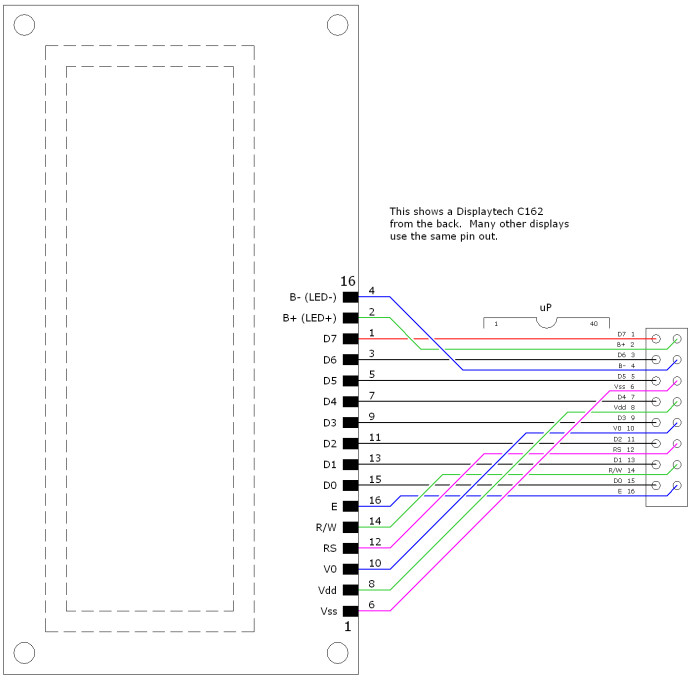
Building a MidiBox LCD Cable

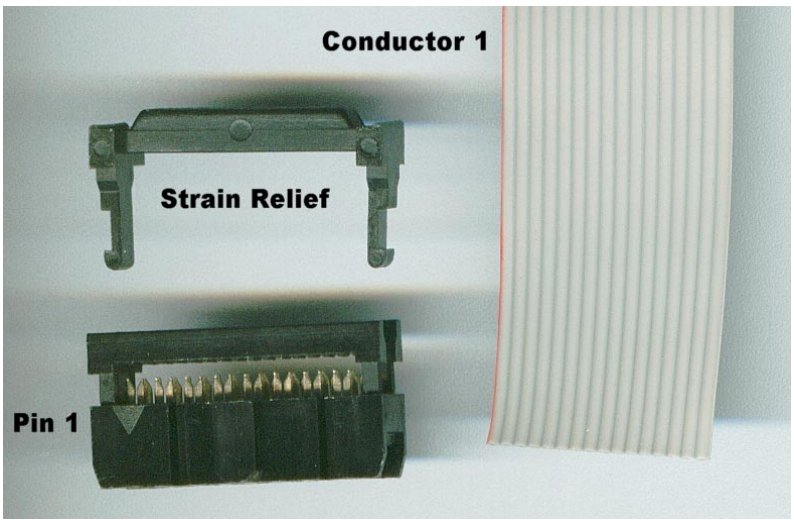
By Jim Henry, 3-Apr-2004

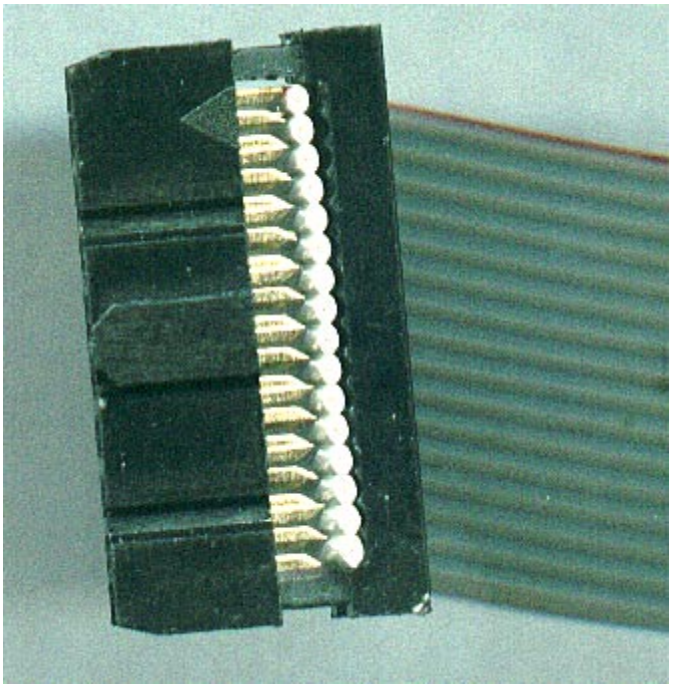


An LCD panel may be connected to the Core module by a 16 conductor flat ribbon cable. A 16 pin insulation displacement connector (IDC) terminates one end of the ribbon cable. The other end may be soldered directly to the LCD panel. A rat's nest at the LCD panel can be avoided with a little planning.

The schematic to the left shows an orderly wire layout for connecting to a typical LCD panel. The key to this layout is that the eight LCD Data signals (D0-D7) are adjacent on both the LCD panel and the LCD connector on the Core module. And both are on 0.100" (2.54mm) centers. Thus the odd numbered conductors in ribbon cable can be connected straight across. Depending on your LCD panel and the way you want the cable in relation to the panel, you might want to extend the ribbon cable to the right rather than the left as shown. The goal is to arrange the eight data lines for a straight across connection because this will provide a stable mechanical connection to the cable. After you establish the data connection foundation, you can make the remaining connections in an orderly fashion.

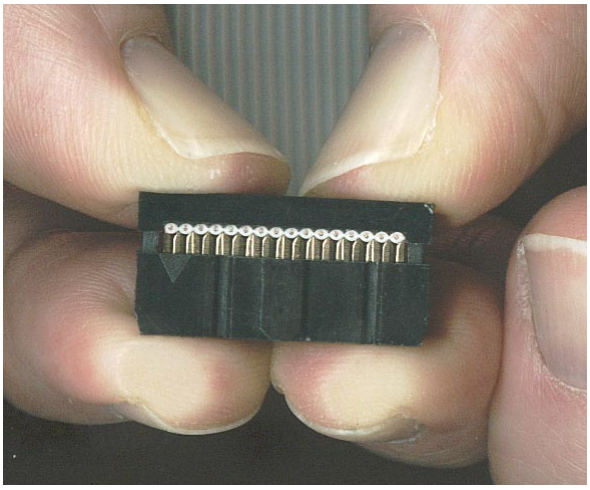
The IDC is a 16 pin .100" x .100" dual row socket. The connector is in three parts. The strain relief is supplied separately while the other two parts are supplied assembled. Note that there is a mark molded into the body of the socket to indicate pin 1. The ribbon cable should have a mark such as a red stripe to indicate conductor 1. You can add a stripe with a permanent marker if necessary. Conductor 1 should be lined up with pin 1. You don't have to but it will greatly aid in maintaining your sanity. IDCs are designed to be quickly and easily assembled in mass production. There are special tools made for assembling an IDC to a cable. However, you can easily assemble a 16 pin IDC with a pair of pliers and a little care. Using a vise rather than pliers would make the job even easier.

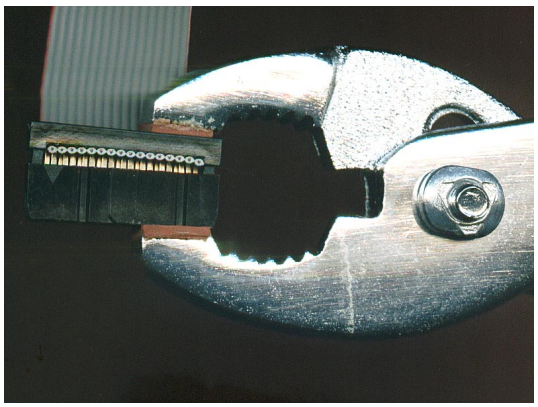


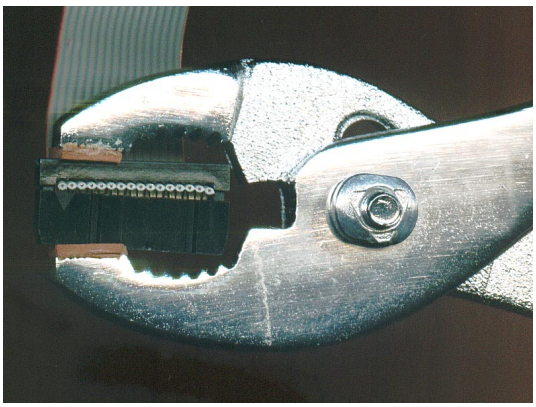


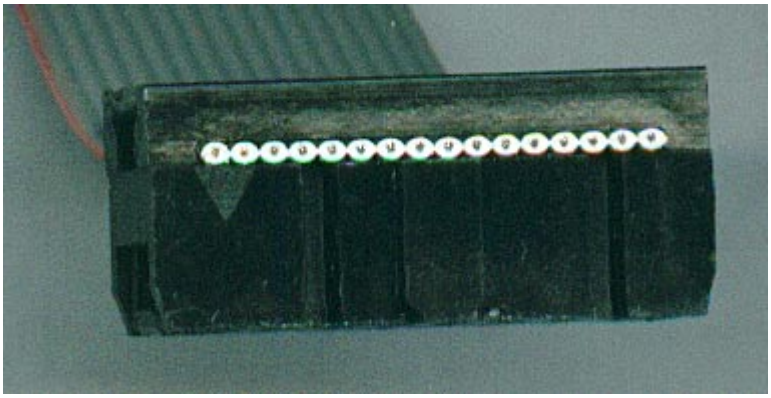
Successful assembly of an IDC requires two things. Holding the cable in the right place and squeezing the two parts of the main assembly together squarely. As you can see in the picture on the left, the cable fits closely into the connector between the two halves. The upper portion has channels that fit over the individual conductors in the ribbon to hold them precisely in position as the connector is assembled. As long as you keep the ribbon cable reasonably flat, square, and centered, the upper part of the connector should pick up the conductors and position them correctly. The lower portion has a series of "forks" that the conductors are pushed into. The top of the fork has a V that centers the conductor as it enters the fork. The sides of the V are sharp and they cut through the insulation to make electrical contact as the conductors are pushed down into the fork. Since I wanted the cable to extend to the left with pin 1 uppermost when completed, I assembled the connector so the cable extends to the right. The cable is folded over the connector to the left by the strain relief.

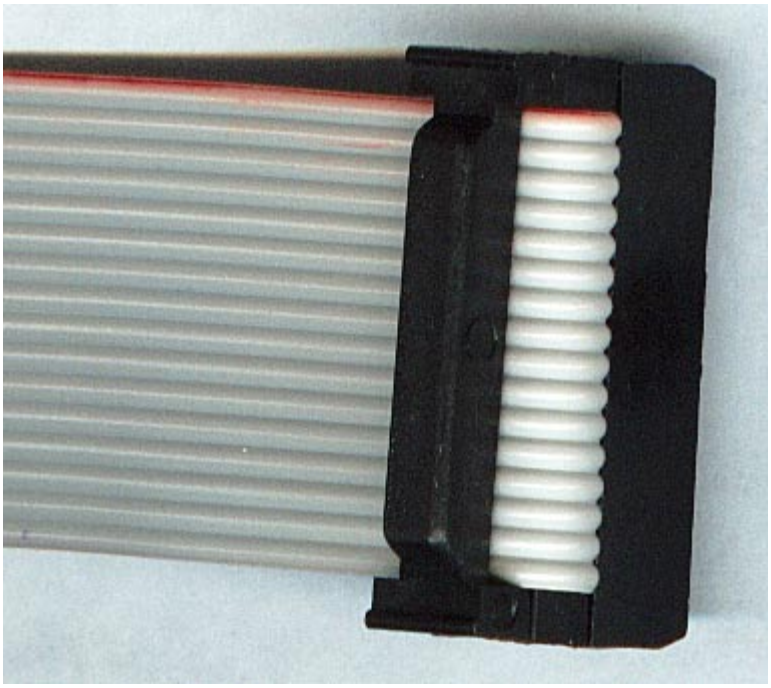
To assemble the IDC with a pair of pliers, simply squeeze the connector together gradually working back and forth across the width to keep the two halves more or less parallel. The most important thing to do is to keep the cable in the guides in the top half. Watch the cut side of the cable as you squeeze. If you have a reasonable amount of finger strength you can squeeze the IDC with your fingers to get the initial "bite" into the insulation and hold the cable in position. Continue working back and forth across the connector until the two halves have closed completely on the ribbon cable.

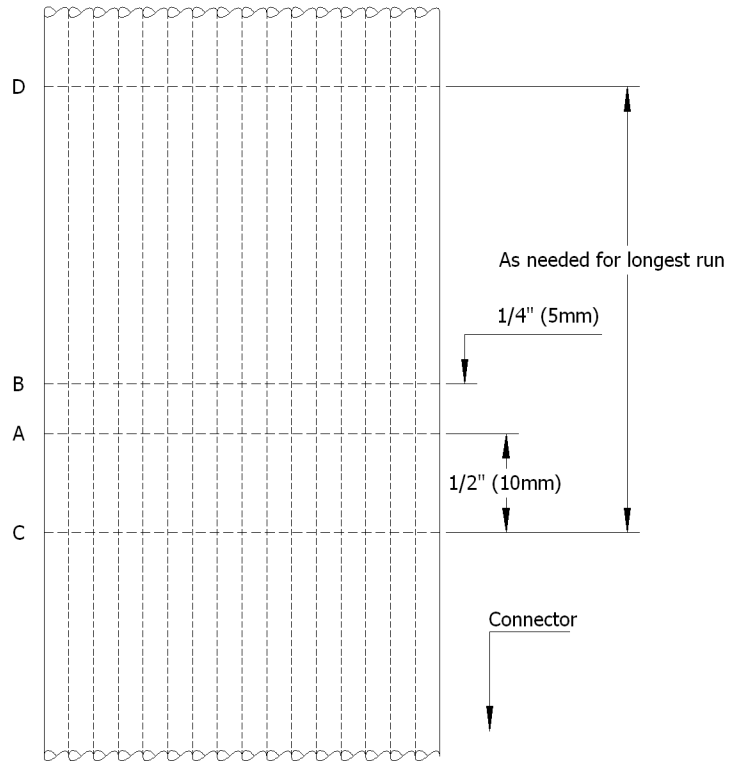












The closed connector should look like the picture at the left. In the unlikely event that the connector isn't assembled correctly you can release the latches on each side of the connector that hold down the top with a small straight bladed screw driver, remove the ribbon cable and try again. Finish the assembly of the connector by folding the cable over the connector and securing with the strain relief. The whole operation of attaching the IDC connector will probably take you less time than it takes to read this explanation.

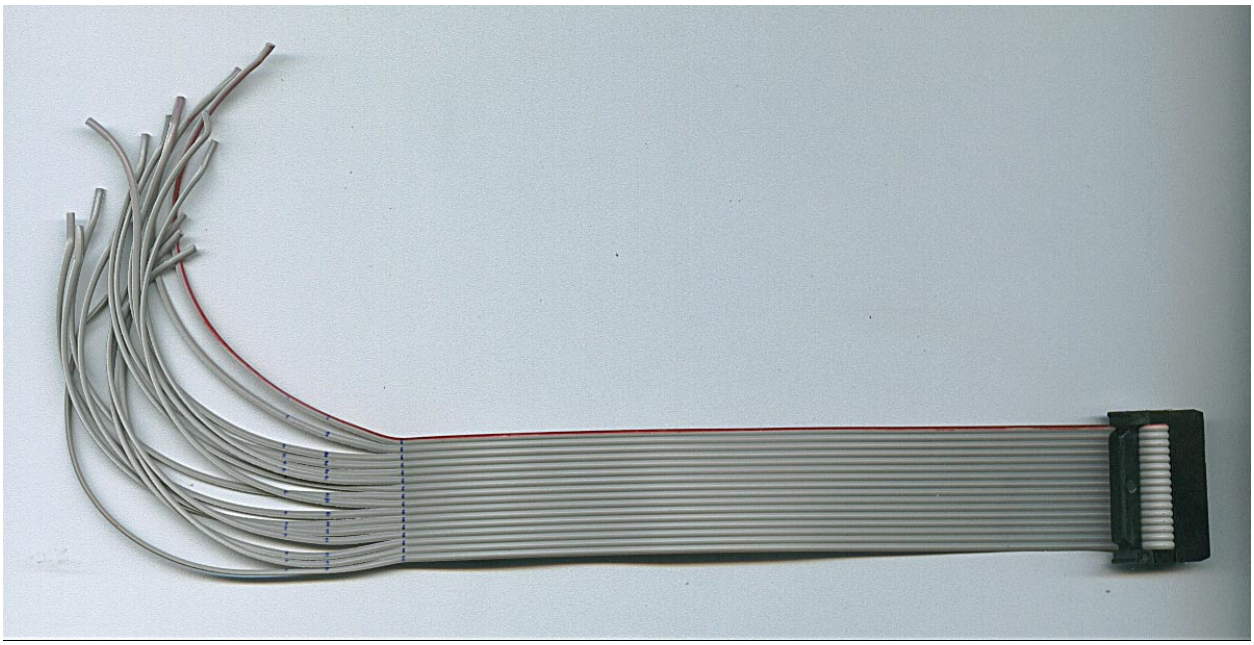
On the other end you need to cut, strip, and solder the individual wires in the cable to the LCD. We will take advantage of the fact that for many LCDs the eight odd numbered wires go to the eight adjacent data inputs D0 through D7.

Mark the cable with a line straight across where the LCD should lie along the cable, line A in the drawing. A ballpoint pen works well for marking the cable. Then draw line B about ¼" (5 mm) away from A and further from the connector end. You will cut the odd numbered wires at B and strip them to A. Draw line C about ½" (10 mm) away from A and closer to the connector end. You will separate the wires down to this line to be able to work with them.

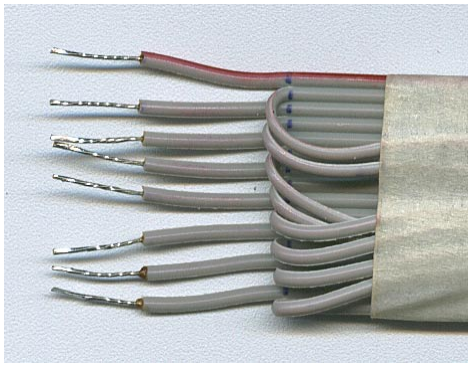
Now determine where line D should be drawn. The distance from C to D is the length for the even numbered wires. This distance needs to be long enough for the longest of the even wires. For many LCDs that will be wire 6

to pin 1 Vss and the length will be about 1½". You should leave a little extra just to be safe. You will trim each even numbered wire to length later on. For the Seiko L2014 LCD pictured, the backlight power was not brought out to the card edge. Wires 2 and 4 had to be taken to the edge of the LCD to provide backlight power requiring an unusually long C to D distance.

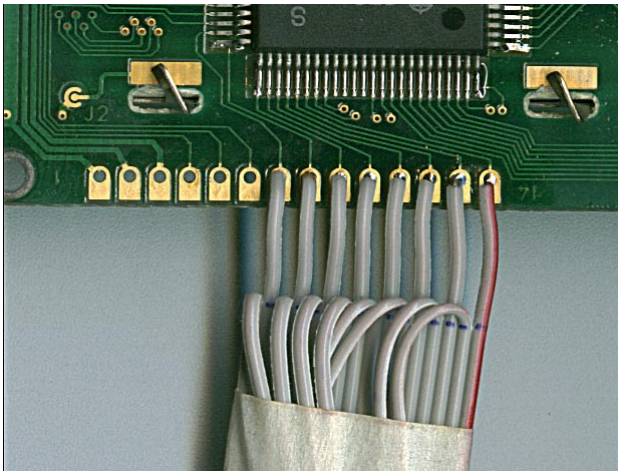
Cut the cable at line D. Separate each wire down to line C. It will help to cut each wire apart for about ¼" at the end to start the separation. The cable will look like this:



Take all the even numbered wires and fold them back *away* from the side of the cable that the LCD will be on. Tape the folded wires to keep them out of the way. Cut the remaining odd numbered wires at line B. Taping the odd numbered wires makes the cutting easier. Strip the odd wires down to line A and tin the bare wire. Try to get line A straight and even. The cable is now ready to be connected to the eight data inputs D0 through D7.



You want to solder the eight data wires snugly to the LCD board so that there is no bare wire to move side to side and short out. I suggest inserting the wires straight down into the board and soldering before bending the cable. Solder D0 and D7 first to hold the cable as you solder the remaining connections. Apply the iron to the board rather than the wire to avoid melting the insulation.



Take the even wires one at a time, measure, cut, strip, and solder. For most LCDs you can start with wire 16 and work your way out. Don't cut the wires too close. The wire should not be pulled at an angle as it leaves the board because it will short to the adjacent pad if the insulation is damaged. Here are the finished results. Also shown is my first LCD which has the 16 pad connection. As you can see, you do get better with practice.