How does the addition of noise affect the transferring of data through a cable?

The following experiment investigates what effects noise has on the transfer of a picture through a link cable. The experiment will be repeated, each time the noise will be increased and the outcome recorded.
Background knowledge suggests that the transferring of data will be corrupted or even halted with the addition of noise, and so will become the hypothesis for this practical.

Hypothesis
Noise directly effects the transferring of data through a link cable.
Null-hypothesis
Noise has no effect on the transferring of data through a link cable.

When data is being transferred over a cable, the data travels in a synchronized manner. It appears on the screen, at the receiving end, much like that of a web page, whereby the image appears pixel by pixel and line by line. Noise also travels at its own synchronization pattern. When both the data and the noise combined, their patterns clash, often causing the data pattern to fall out of synch.
For example, the following shows the synch patterns of both data and noise:

When they clash the patterns combined causing corrupted synchronizations.
e.g.

The effect at the receiving end is easy to see. The picture often has pixel errors, the extent to which depends on the magnitude of the noise. This experiment hopes to prove this theory by means of a practical experiment.

Method

The above was the layout of the apparatus used in the experiment. A standard PC was set up and connected to a Rapid Access Terminal (RAT). They were connected using two Multi-way connectors; these were what the images traveled down. The PC was loaded with feedback software which had the appropriate instructions. Connected to the RAT and PC was the PCM & Link Analysis Workboard. This displayed an LED matrix and had the controls for adjusting the noise levels etc.

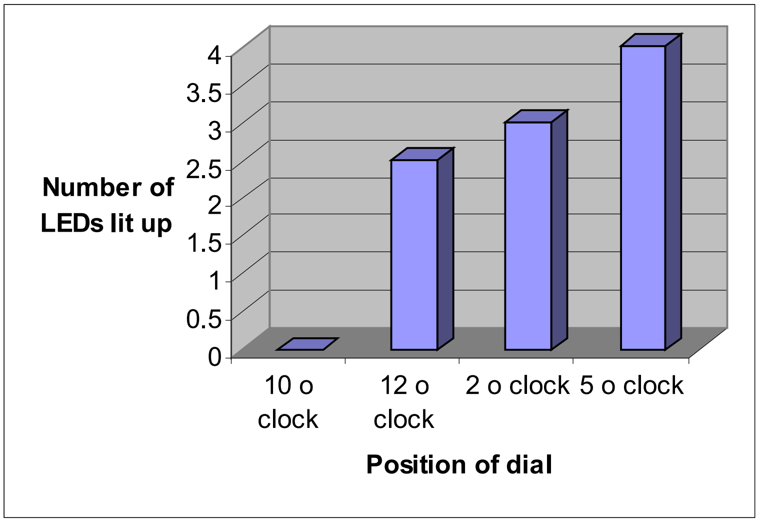
After switching the equipment on, the LED matrix flashed horizontally and vertically. This showed the Workboard was powered correctly. The flashing stopped leaving one LED at the bottom right-hand side flashing. During the experiment, the LEDs game the state of the data cable link being used. The top left-hand LED blinked whenever a sequence of bits was sent. The second LED blinked whenever a sequence of bytes was detected at the receiving end of the link. The next LED blinked when a sync byte was missed but the synchronization was not lost completely. The forth LED blinked when synchronization was lost.

Whenever the transfer of data was successful, the first two LEDs were lit, to show bytes were sent and received.

The following is a step-by-step documentation of the experiment:

1. Typed fb in the DOS prompt to bring up the menu, selected assignment 17.
2. Selected Practical three, Picture Transmit.
3. Picture of a space shuttle started to load on screen, pixel by pixel, line by line.
4. While the picture continually loaded, the noise level was increased using the Workboard.
5. Noise dial turned to 12 o'clock, picture began to break up and 3rd LED lit up.
6. Noise dial turned to 2 o'clock position, picture was no longer complete and 3rd LED was nearly always lit
7. When noise dial was at 5 o'clock, picture became completely garbled. 4th LED lit.

Results



The graph above shows a clear correlation between the noise increase and data corruption. The y-axis shows the number of LEDs that were lit in each stage of the experiment. At the 2 o'clock stage the 2nd LED was lit up, and occasionally the 3rd. This is shown on the graph as a 2.5. At each stage the graph increases. This agrees with the hypothesis. Noise has a direct effect on the transferring of data over a cable. As the noise increased, more bytes were lost through the cable which meant the picture became incomplete.

Conclusion

As a result of this practical, a number of things have been discovered. Firstly, the hypothesis was correct. The graph and image descriptions clearly agrees with the hypothesis, noise directly effects the transferring of data. However, the experiment was not detailed enough. Instead of viewing a picture and noting the activities of an LED matrix, more detail was needed about the lost data. The experiment could have been done in more detail whereby the number of lost bytes was recorded. This would have produced a more detailed graph than the one produced in this experiment. It would have shown individual fluctuations and also picked up on discrepancies. In future attempts at this experiment a means of keeping track of the lost bytes could be devised.