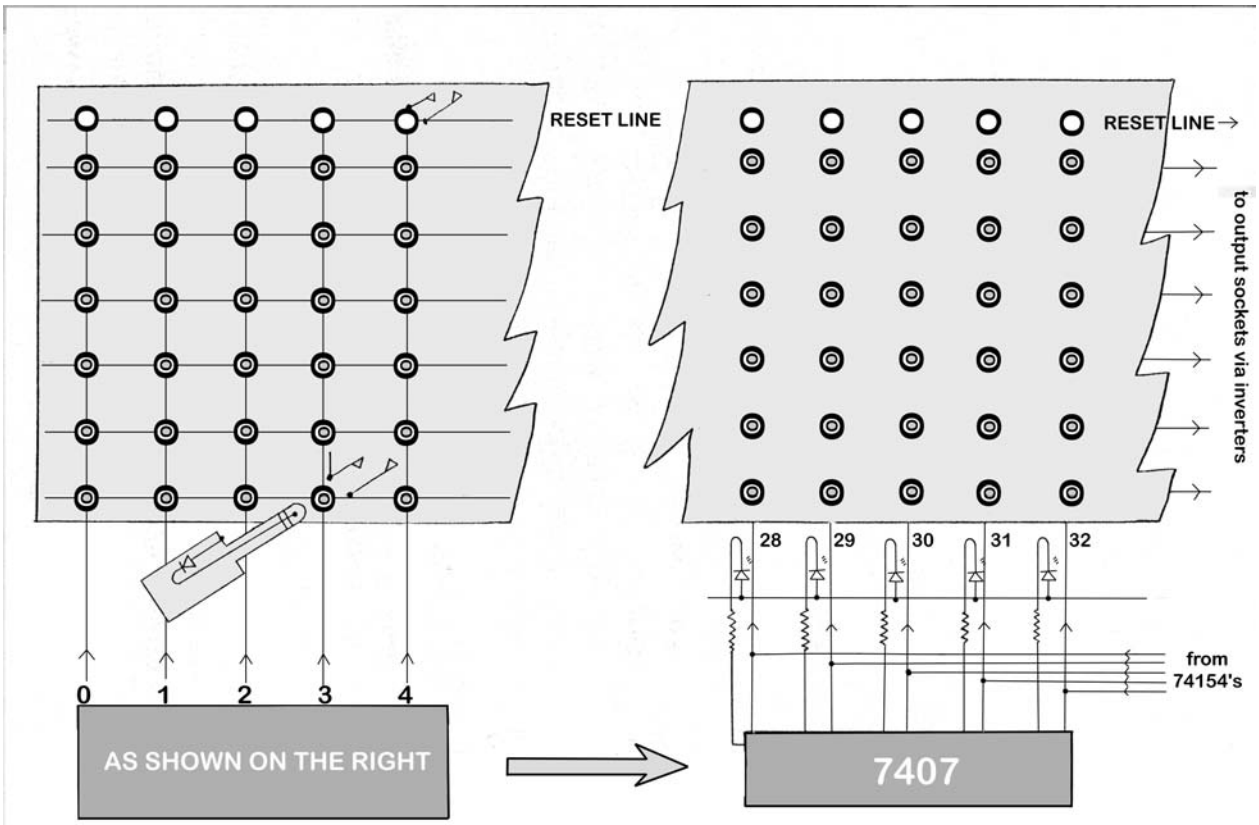
A Structure of Diagrams
Paper I
Hierarchies and Lateral Structures in Technical Diagrams

Technical Drawing - What is meant by such a term?
Well, generally ex-pupils will remember Monge's Descriptive Geometry, with PLANS & ELEVATIONS, using compasses and T-squares, drawing boards and hard, sharp pencils.
All of the above is vital stuff, and without it Industry would simply NOT work. But, there is another type of drawing, which is equally important, and that is what I will be dealing with in this paper. This type occurs when diagrams are used as a **superior** form of explanation to **text**. I say superior advisedly. Try to describe and analyse a passage of play in a Premiership football match using only words! Try to get over the principles of complex electronic circuit design without any drawings. Drawings play a pivotal role in many areas of ***technical*** explanation, whether it be football coaching or electronics construction.. I will also be touching upon the use of drawings in research, and other forms of investigative work.



Programming Diode Jacks & time/channels Matrix

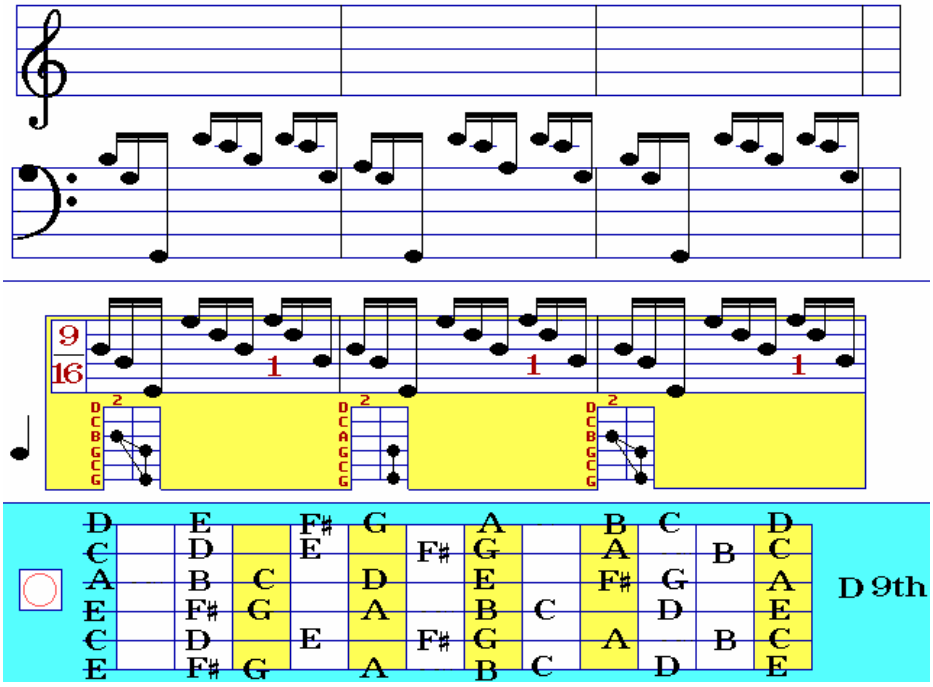
A well designed and executed diagram can deliver information with great precision. The way it is laid out, coloured in, and tagged with meaningful labels, notes, AND, of course, passages of text, can make it a meaningful journey through the information being dealt with. Diagrams give some sorely needed ***geography*** to a **narrative** explanation. And, there are alternative variations on exactly how information is dealt with. As in Geography, there are different forms of diagram, like different Maps, showing different aspects, properties, or relationships of the same areas.

In addition to all this, good diagrams, and I emphasize -GOOD, work well with **redundant** information. Now this may sound contradictory! Why would we want to add extra information that we admit is REDUNDANT?

Doesn't this mean that it is unnecessary – Surplus to Requirements? Well, it depends what the purpose of the diagram is.
Many times in my work I have found that a new slant, or aspect, in a particular area that I am explaining, takes me back to a diagram I used earlier for another purpose, and with a few additions will cover the new use as well. Not only this, but seeing the new relationships when the diagram is used for its **old** purpose, allows forward inferences to be made, by those who see these sort of things, and acts as a precursor to what is to come. Such hints of the future actually assist a certain kind of student in understanding what 's going on.
Now, I know what you are going to say! "If you keep adding things to your master diagram you will confuse many of your students. How will they know which bits are relevant to the current purpose. Will we not have the age old problem of not seeing the wood for the trees?"

Well, you are right, and, you are wrong!

We must NOT deliver diagrams in which there is so much incomprehensible detail (stuff we don't yet know anything about) that, instead of clarifying the area we are explaining, confuses it. BUT, as long as the design is such that the less imaginative can quite happily ignore the "too early" information, confusion on their part can be avoided. If every part of a diagram were drawn the same size, and in the same colour, such diagrams would confuse everybody, but the better computer programs have shown, that a "greyed-out" option on the screen, means that it isn't available at this point in the package, so suitably played down components can be REDUCED in importance by similar methods for the main purpose of the diagram at the time, while giving the necessary glimpse of the next stage to those straining at the leash. That would be the responsible use of redundancy in an explanatory diagram.



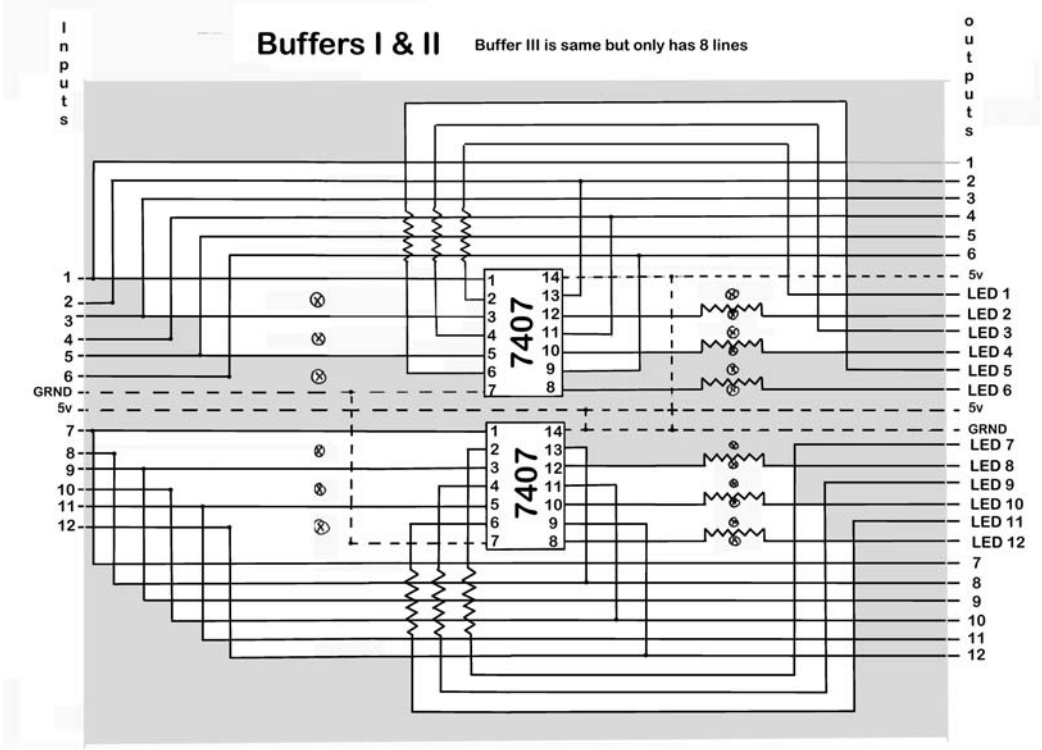
The music diagram alongside can be said to have good redundancy, offering notation, chord shapes and guitar fret board positons simultaneously

NOTE: Of course, you must not rise to the bait in a classroom situation and be diverted by the high flyers chasing one of these seeds, and asking questions. But there are always ways of keeping them happy. For example, you could commend them, and say that you will come over and explain it to them privately, when you finished the current general area for the class as a whole. I will be returning to the ***blessings*** of redundancy later on, but for the moment let us address the consensus view of clarity and precision in diagrams.

An example of the sort over complicated diagram that has been raised in this discussion occurs in electronic projects. In wanting your students to succeed in building a particular piece of kit, you try to give them everything. And, to avoid the mass of information burying the students and simply generating more and more questions, you fall back on **recipes**.

“Pick up nut J and screw into hole K” “Solder item Z (a transistor) between points PP and QQ on circuit board A1” etc etc.

Diagrams become more and more detailed , and overloaded, and what soon becomes an essential “**textual itinerary**” leads the student, by the nose, through a selected, precisely defined pathway. This method is now firmly established and very widespread.
The trouble is that it is **particular**, rather than **general.**



It is ideally suited to industrial manufacture – once you have made the unit once, you can carry on making the same piece again and again, at a faster and faster rate. Also it is well suited to the amateur, who wants a result quickly without undue study. I well remember an acquaintance from my youth, who was not at all brilliant, but had been taught in this way to build a certain type of audio amplifier. He quickly acquired and put together the correct components , and the resulting unit generally worked quite well. BUT, you could NOT get him to go from the *particular* to the **general**.
You couldn’t ask his advice about using the principles inherent in his amplifier to design other very useful bits of kit. For example, any questions about the effect of this transistor, or that capacitor, would be fruitless. This amplifier worked! He had SUCCEEDED, and showed his electronic skill! Why did you insist on asking questions he didn’t know the answers to. Were you just trying to undermine his triumph? Oh well! So**,** overloaded diagrams are NOT the answer to ***quality*** explanation, even if they can be a useful accompaniment to a **RECIPE.**

To be Continued

(1,088 words)