MICROPROCESSOR BASED SPECTRUM ANALYSER

by KEVIN J ROGERS B E (Honours)

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This thesis embodies the results of
supervised project work making up
two-thirds of the work for the degree.

SUMMARY

The purpose of this project is to make a low frequency spectrum analyser which has good resolution and dynamic range but is not too expensive. This is achieved by digitizing the analogue input signal and calculating the spectrum using an 8 bit INTELL 8080A micro-processor.

The method for digitally calculating the spectrum of signals has been exploited considerably since Cooley and Tukey introduced the Fast Fourier Transform in the 1960's and the fourier theory used in this project has already been well developed over the past twenty years. The uniqueness of this project lies in the fact that an 8-bit microprocessor is used for a complex "number crunching" application formerly reserved for larger and more powerful computers or minicomputers. Thus a flexible instrument with considerable potential has been built for a capital cost of approximately $1 000 which is much less than commercial units currently available. However the disadvantage of using a microprocessor is the programming time required to generate efficient software.

The hardware for the spectrum analyser consists of the micro-processor system, power supply, analogue to digital and digital to analogue circuitry and input filters. It was also found necessary to build a digital hardware multiplier to keep calculation time to a reasonable level. The analyser is used in conjunction with a Cathode Ray Oscilloscope or a paper recorder to provide a medium for observing results.

The software was written in INTELL 8080 assembly language. The reason for choosing assembly language rather than a high level language such as PLM was to minimise required memory capacity and execution time.

The spectrum analyser was built with a view to analysing mechanical vibrations at Torrens Island Power Station. The use for which the instrument was built determined the specification and hence the design approach but the application method is not the subject of this thesis.

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university and to the best of the author's knowledge and belief contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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