

DATE:

COURSE/YEAR/GRC

STUDENTS NAME

UNIVERSITY OF PLYMOUTH

**SCHOOL OF ELECTRONIC, COMMUNICATION & ELECTRICAL
ENGINEERING**

EXPERIMENT EE9 INSTRUMENT SPECIFICATIONS AND LIMITATIONS

(Room 304 Smeaton version)

INTRODUCTION

Measuring instruments used in the electrical/electronics industry must be used under the conditions appropriate to their specifications to ensure that the indicated value represents, with a high degree of certainty, the true value of the quantity being measured.

The purpose of this experiment is to investigate some of the limitations of the measuring instruments in the laboratory.

APPARATUS

Standard 'Work Station' equipment available in Room 304.

Fixed resistor Box.

Instrument specifications. NB See back of Avo for sensitivity ($R_{\text{meter}} = 20k * V_{\text{range}}$)

PROCEDURE

Part 1 Resistor Board Values

Use the Digital Multimeter to measure the resistor values on the 'Resistor Board' and enter values in Table 1.

R1	R2	R3	R4	R5

Table 1 Resistor Board Values

Part 2 Ammeter Loading Effect

- (a) Connect a d.c. supply to R1 and use the multimeter to set the supply voltage at 6.0 V.d.c.

Remove the multimeter and re-connect to measure the current flowing in R1.

Note:- Make sure that the multimeter is connected such that its 'common' terminal is connected to that of the d.c. supply.

Record the value of current in Table 2.

Calculate the predicted value of the voltage across R3 and comment on the results of table 3 after referring to the instrument specifications. For the Avo case: calculate the effect of the Avo resistance in parallel with R3, then using this value of R, calculate the modified voltage out of the potential divider. How does it compare with that shown on the meter?

Comments and calculations:-

2.(a) Repeat 1 (a) using R4 and R5, and measuring voltage across R5.

2.(b) Repeat 1 (b) using R4 and R5, and measuring voltage across R5.

Instrument	Range	V_{R5}	Predicted Value	% Difference
Digital (multimeter)				
Avometer (Model 8)	10V			
	25V or 30V			

Table 4 Voltage across R5

Comment on the results of table 4 relative to those to table 3. For example, calculate the voltage from the potential divider with the Avo across R5.

Comments:-

Part 4 **Frequency Effects**

Set up the circuit shown in Fig 1 and adjust the Function Generator (CF250) to give a sine wave output of frequency 100 Hz and peak to peak amplitude of 12V. Check the waveform on the C.R.O.

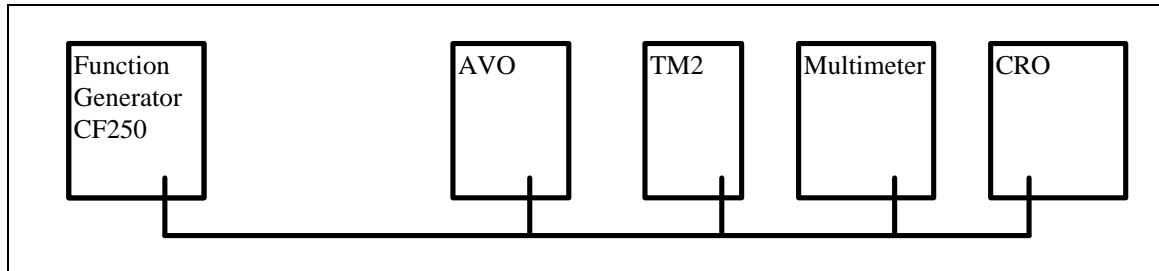


Fig 1 **Circuit arrangement for Frequency Effects**

Take measurements to complete table 5.

Frequency (kHz)	Instrument							
	C.R.O.		Avo		TM2		Multimeter	
	Peak	r.m.s.	10V range		10V range		20 V range	
	V	V	V	% Diff	V	% Diff	V	% Diff
0.1								
1.0								
50.0								
100.0								

Table 5 **Frequency analysis of instrument**

Comment on the results of table 5 in relation to specifications.

Comments:-

Part 5 Waveform Effects

Using the same circuit as Fig 1 set the function generator to give a sinusoidal output of peak to peak amplitude 12volts and frequency 100 Hz.

Note the readings for function generator switched to square and triangular outputs of the same frequency and amplitude.

Repeat readings for function generator switched to square and triangular outputs of the same frequency and amplitude.

	Avo 10V range	TM2 10V range	Multimeter
Sine Wave			
Square Wave			
Triangular Wave			

Table 6 Waveform Voltage

Comment on the results of table 6. You should take into account the instrument specifications and the 'form factor' of the waveforms.

Comments

CONCLUSION

In brief what are the main factors that you have learnt from this experiment?