Mech263 Electrical Technology
Lab. 1

Part I - Three-wire balanced system - star supply with star and delta loads

A) Introduction

The star connected supply is applied to either a star or a delta connected load. Measurement are taken of voltage, current, power and power factor in the system, as shown in fig 1.1. The supply neutral is NOT connected to the load neutral.

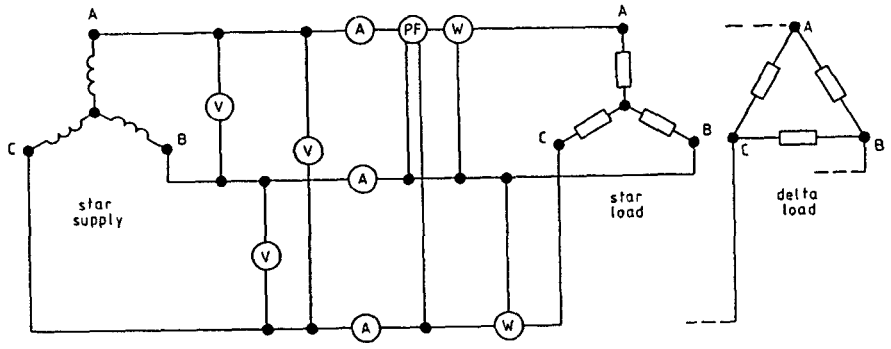

Fig. 1.1

B) Facilities

- ETL171A Three-phase Supply Unit
- ETL171B Measurement Unit
- ETL171C Load Unit
- One Digital Multimeter

C) Procedure

Switch off the supply and make the connections shown in fig 1.2 for a star load and prepare the equipment as follows:

1. Switch the L/C switches to L.
2. Set each of the variable resistors RA, RB, RC, to 100Ω using the digital multimeter.
3. Set each of the variable inductors LA, LB, LC, to 250mH from the calibration graph. (Fig. 1.3)
4. Switch on the a.c. supply and record the readings listed in the table 1 for a star load.

Switch off and make the connections for a delta load. Switch on the a.c. supply and record your connections in Fig.1.2 and the readings listed in the table 1 for a delta load. If a wattmeter reading is negative, turn its switch to 'reverse', then record the meter reading with a minus sign. Switch off the supply.

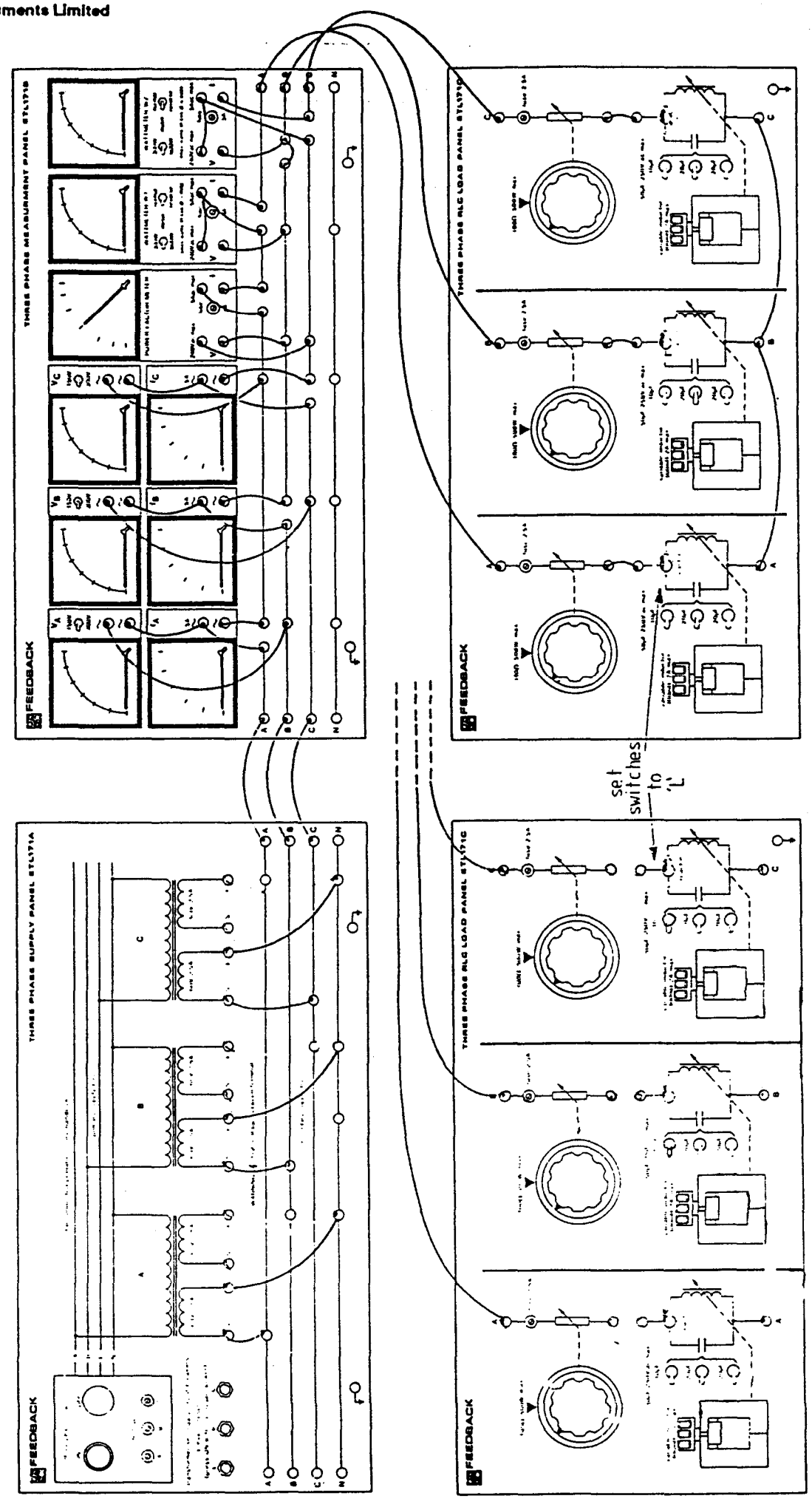

Fig. 1.2 *Connections for Experiment*

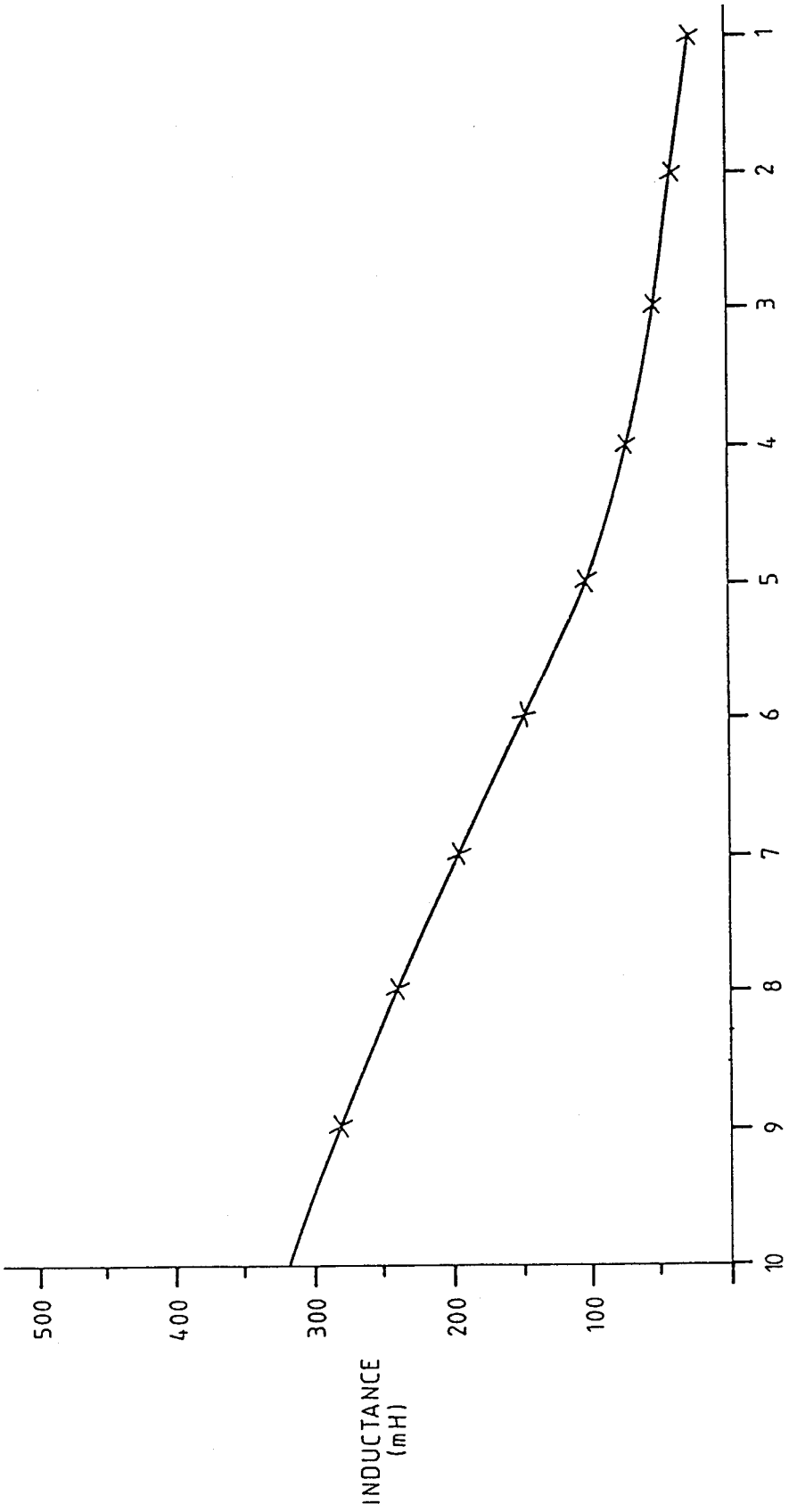

Fig. 1.3 *Measured Inductances vs Scale Values 50Hz*

Supply	Load	V_{AB}	V_{BC}	V_{CA}	I_A	I_B	I_C	PF	W_A	W_C
Star	Star									
Star	Delta									

Table 1

D) Analysis of results

1. From your measured results, calculate average values of the line voltage and current. Use these values to calculate the total power.
2. Add together the two wattmeter reading W_A and W_C. If either of the readings is negative, its magnitude should be subtracted. Compare the resulting value of power with that previously calculated. They should agree quite closely. (Note that the actual wattmeter readings are probably very different, although the system is balanced. This is because the wattmeter connections are not at all symmetrical).

Part II - Three wire balanced supply to unbalanced star load

A) Introduction

In this experiment the equipment will be set up to provide an unbalanced system as in fig 2.1

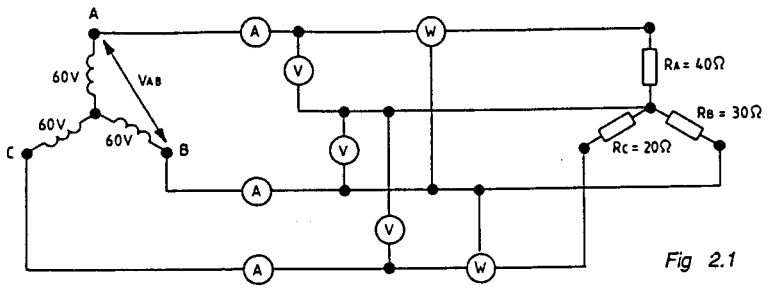

Fig 2.1

The voltage is balanced, but the loads are not. Measurements will be taken of the resulting line currents and power into the load. These will then be compared with values calculated by the method of symmetrical components.

B) Facilities

- ELT171A Three-phase Supply Unit
- ELT171B Measurement Unit
- ELT171C Load Unit

C) Procedure

1. Connect the Supply Unit, Measurement Unit and Load Unit as shown in fig 2.2, noting that the nominal values of voltage are all 60V.
2. Set the load resistors: R_A to 40Ω, R_B to 30Ω and R_C to 20Ω.
3. Switch on the supply, and record the readings listed in the Table 2.
4. Switch off the supply.

V_A	V_B	V_C	I_A	I_B	I_C	W_1	W_2	$W=(W_1+W_2)$

Table 2

D) Discussion

Compare the results obtained by your calculations with the measured values of voltage, current and power recorded in Table 2. There should be reasonable agreement.

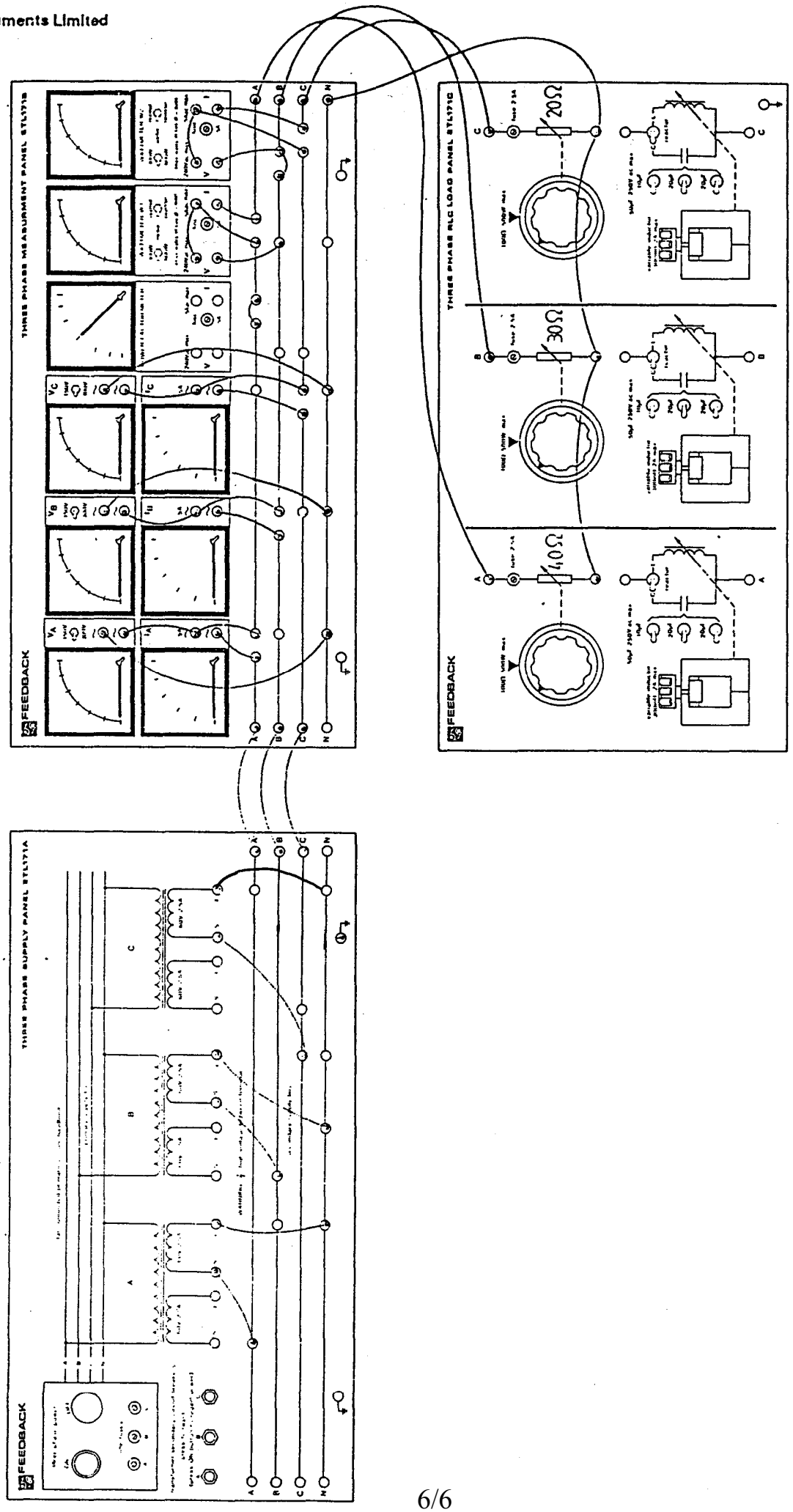

Fig 2.2 Connections for Experiment 2