Electrical Distribution

EP20 HT Line Design

Refer web site

POWER SYSTEM FUNDAMENTAL

EP45 Trade reference study power equipments

Use Google search & find out 5 difference trade reference for

(1) switch boards

(2) Busbars

(3) Insulators

(4) Circuit Breakers

(5) Other power equipments such as surge absorber, Line Trap, Lightning Arresters

DANGER 300 VOLTS.
240 V G.P.O.
240 V G.P.O.
240 V G.P.O.
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
VOLTS/DIV
TIME/DIV
000

EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
TRIGGER
POSITION
LEVEL
DANGER 300 VOLTS
240V G.P.O.
240V G.P.O.
240V G.P.O.

EARTH
240V MAIN
SWITCH
№ 2
V G.P.O.
FORCLUM ELECTRICAL SERVICES P/L
CPBD.4D/3
CPBD.4E/3


CPBD.4D/3
CPBD.4E/3


CONTROLLED BY MAIN SWITCH №1
240V G.P.O.
240V G.P.O.
240V MAIN SWITCH №1
NEUTRAL
EARTH
240V MAIN SWITCH №2
240V G.P.O.
DANGER 300 VOLTS.
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
VOLTS/DIV
TRIGGER
LEVEL
TIME/DIV
7 VA
TF 75730
000
000

DANGER 300 VOLTS.
240V G.P.O.
240V MAIN
NEUTRAL
EARTH
240V MAIN SWITCH №2
240V G.P.O.
TRIGGER
VERTICAL
INTENSITY
FOCUS
POSITION
LEVEL
70.2 OHM/4 AMP
BENCH 4A


CPBD.4D/3


CPBD.4D/3
CPBD.4E/3


FORCLUM ELECTRICAL SERVICES P/L
MOB: 0402 124 399
FAX: 02 9798 4056
CPBD.4D/3
11/01/69

ONTROLLED BY MAIN SWITCH №1
240V G.P.O.
240V G.P.O.
PLEASE DO NOT PUT
ANY RUBBISH ON TOP OF THIS BENCH
NEUTRAL
EARTH
240V MAIN SWITCH №1
240V MAIN SWITCH №2
240V G.P.O.
DANGER 300 VOLTS.
00.0
H.2.1
EMTEK
520
TF 75730
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
TRIGGER
LEVEL

DANGER 300 VOLTS
240V G.P.O.
240V G.P.O.
240V MAIN SWITCH Nº1
240V MAIN SWITCH Nº2
240V G.P.O.
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
TRIGGER
POSITION
LEVEL

12.5
05.0
DANGER 300 VOLTS.
CONTROLLED BY MAIN SWITCH №1
240V G.P.O.
240V G.P.O.
240V MAIN SWITCH №1
240V MAIN SWITCH №2
EMTEK
520

Required $L = ?$

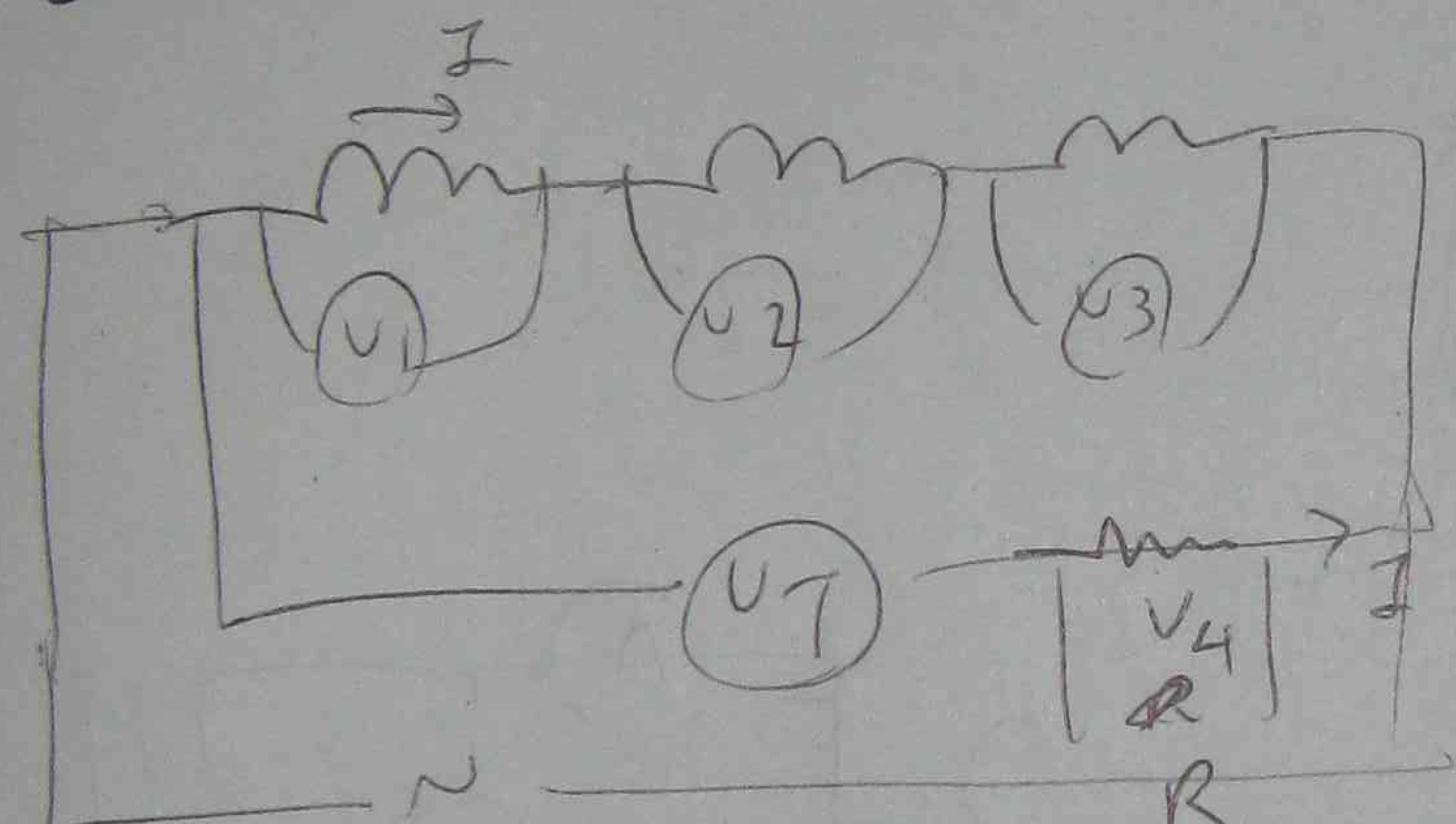
~~Put~~ ρA

Put l

Calculate N

Test

Ep. (33)

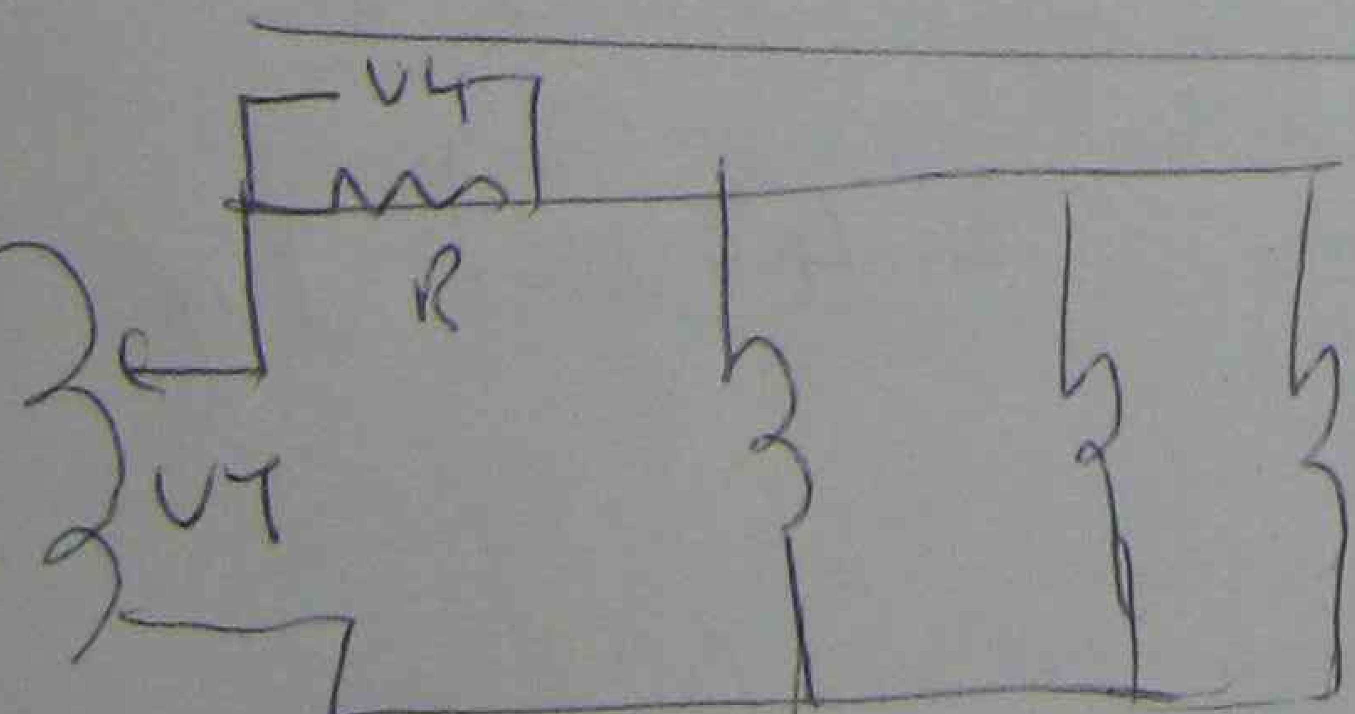


$I = \frac{V_4}{R}$

~~$X_{C_1} =$~~ $X_{l_1} = \frac{V_1}{I}$ $X_{l_2} = \frac{V_2}{I}$ $X_{l_3} = \frac{V_3}{I}$

$X_T = \frac{V_T - V_4}{I}$ $X_{l_1} + X_{l_2} + X_{l_3} = X_{l_T}$

(or) NOT



~~$X_{l_T} =$~~ $I_T = \frac{V_4}{R}$

$X_{l_T} = \frac{V_T - V_4}{I_T}$

Comprae $\frac{1}{X_{l_T}} = \frac{1}{X_{l_1}} + \frac{1}{X_{l_2}} + \frac{1}{X_{l_3}}$

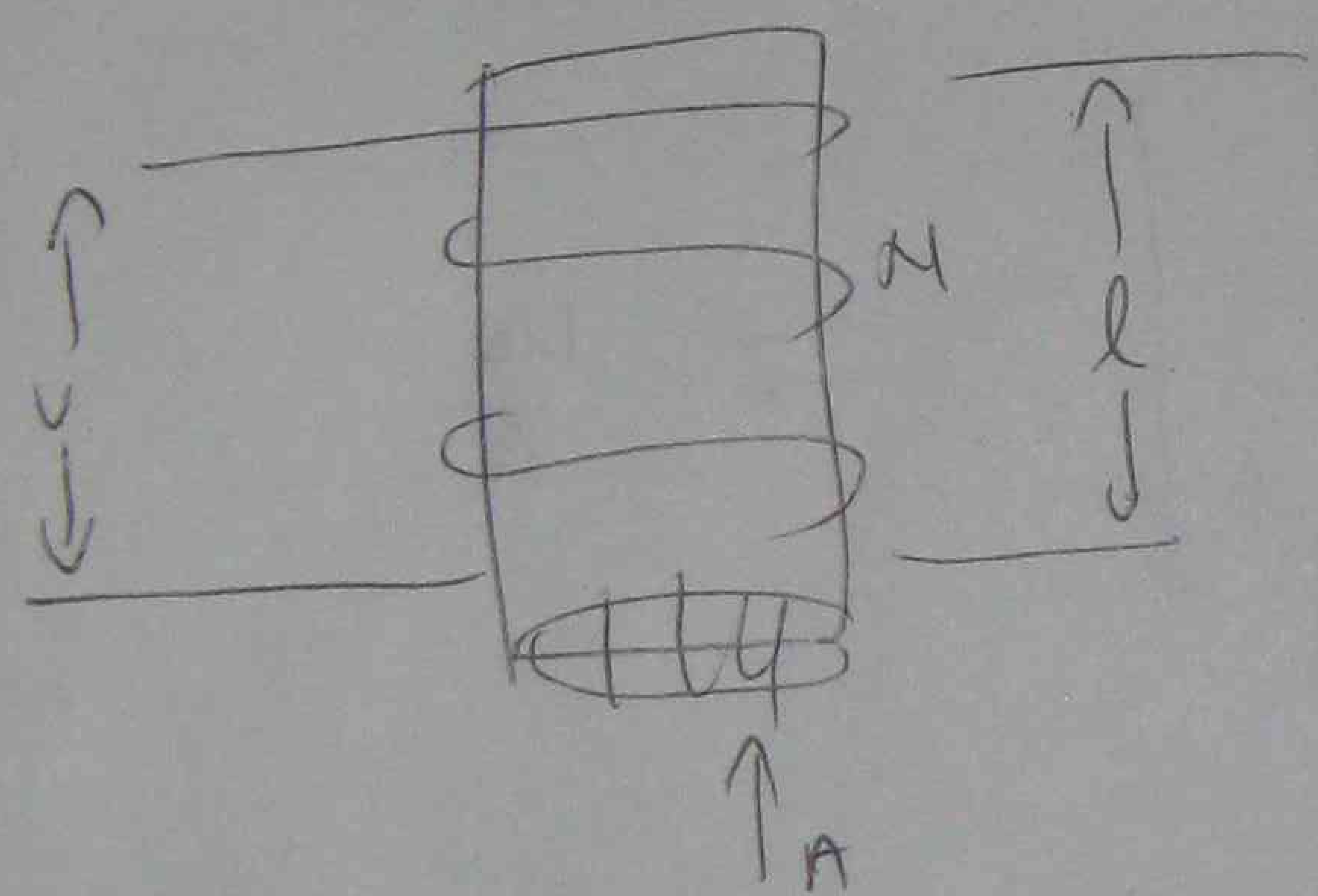
Ep (31)

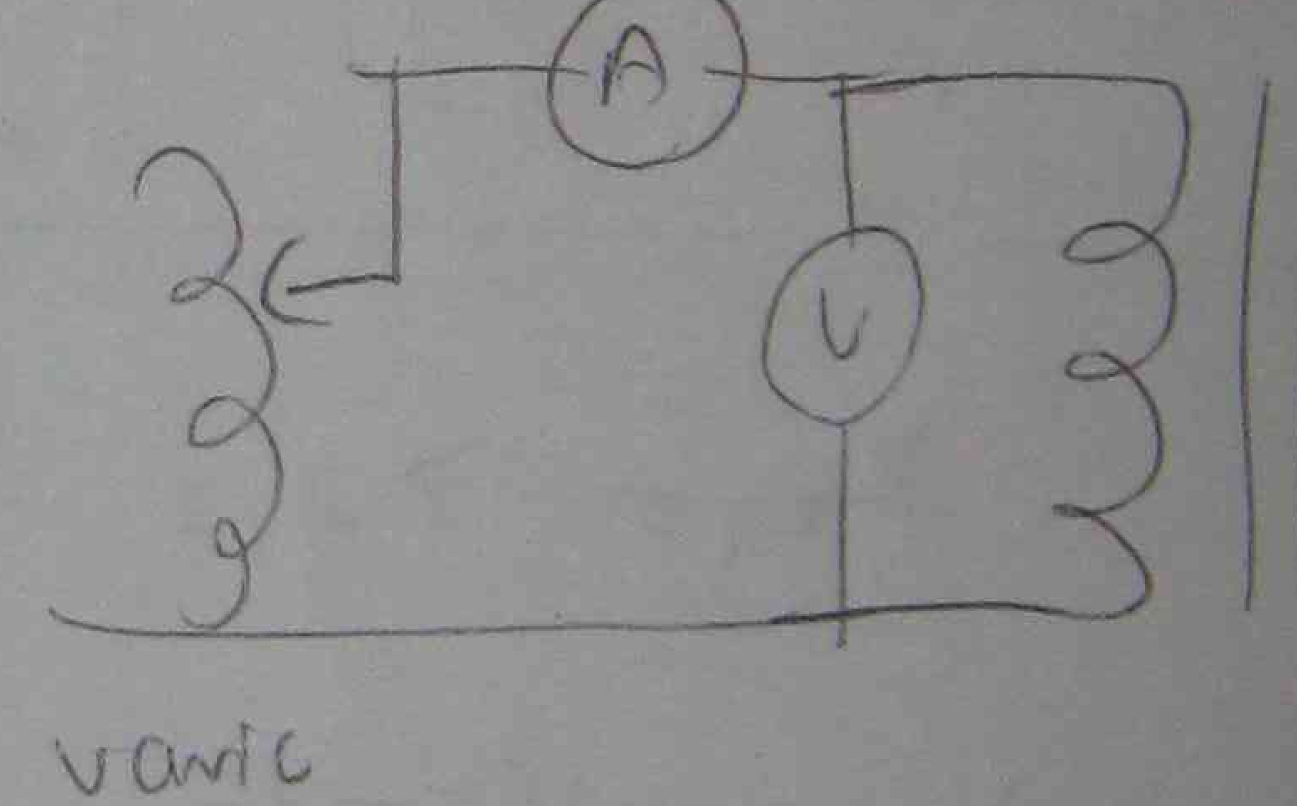
$HL = NI$

magnetizn — Length of coil — no. of turn — current

$$L = \frac{N^2 \mu A_C}{l}$$

L — Inductance; N — no. of turn count; A_C — CSA of core; l — Length of coil L





varic

$$2\pi f L = \frac{V}{I} = X_L$$

$$\therefore L = \frac{V}{2\pi f I}$$

$$\mu = \mu_0 \mu_r$$

$$= 4\pi \times 10^{-7} \mu_r$$

Then find μA constant

Required $L = ?$

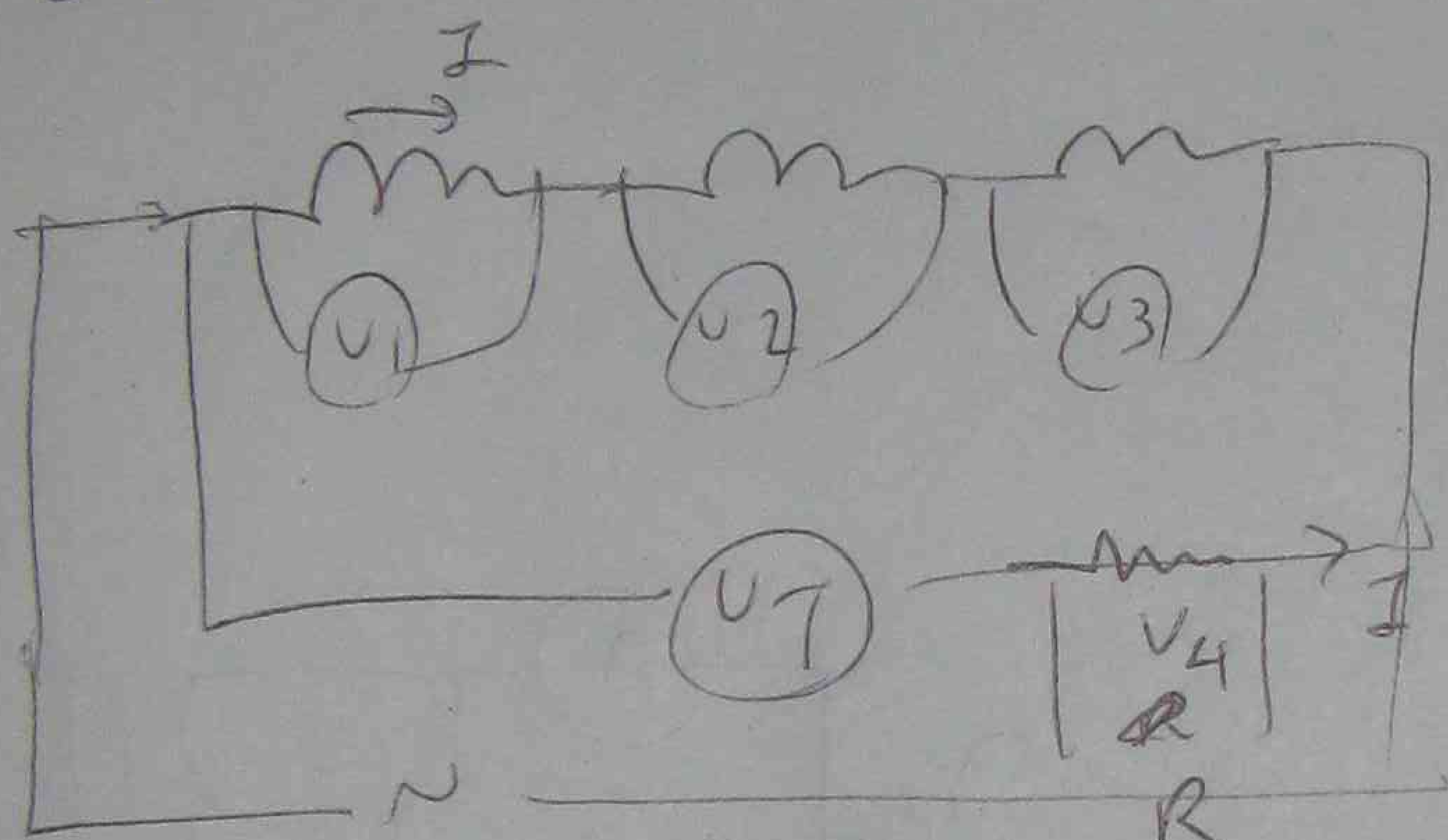
~~Put~~ ρA

Put l

Calculate N

TEST

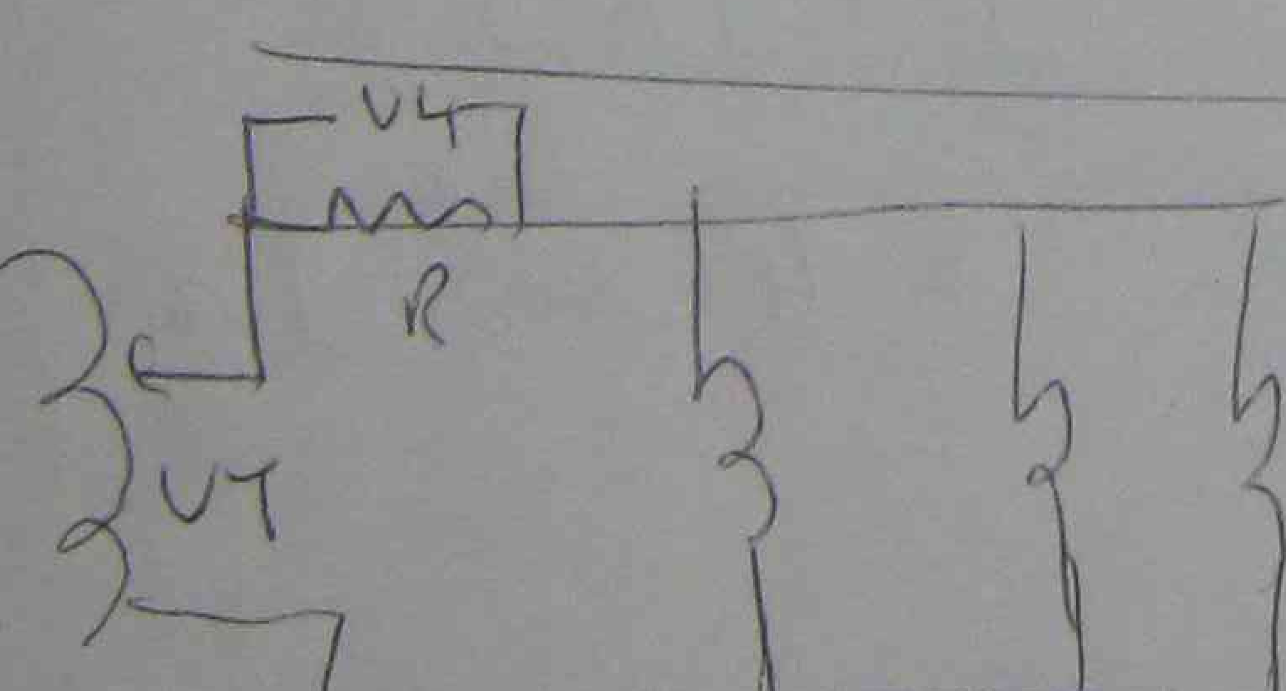
Ep (33)



$I = \frac{V_4}{R}$

~~$X_{L_1} =$~~ $X_{L_1} = \frac{V_1}{I}$ $X_{L_2} = \frac{V_2}{I}$ $X_{L_3} = \frac{V_3}{I}$

$X_T = \frac{V_T - V_4}{I}$ $X_{L_1} + X_{L_2} + X_{L_3} = X_{L_T}$ (or) NOT

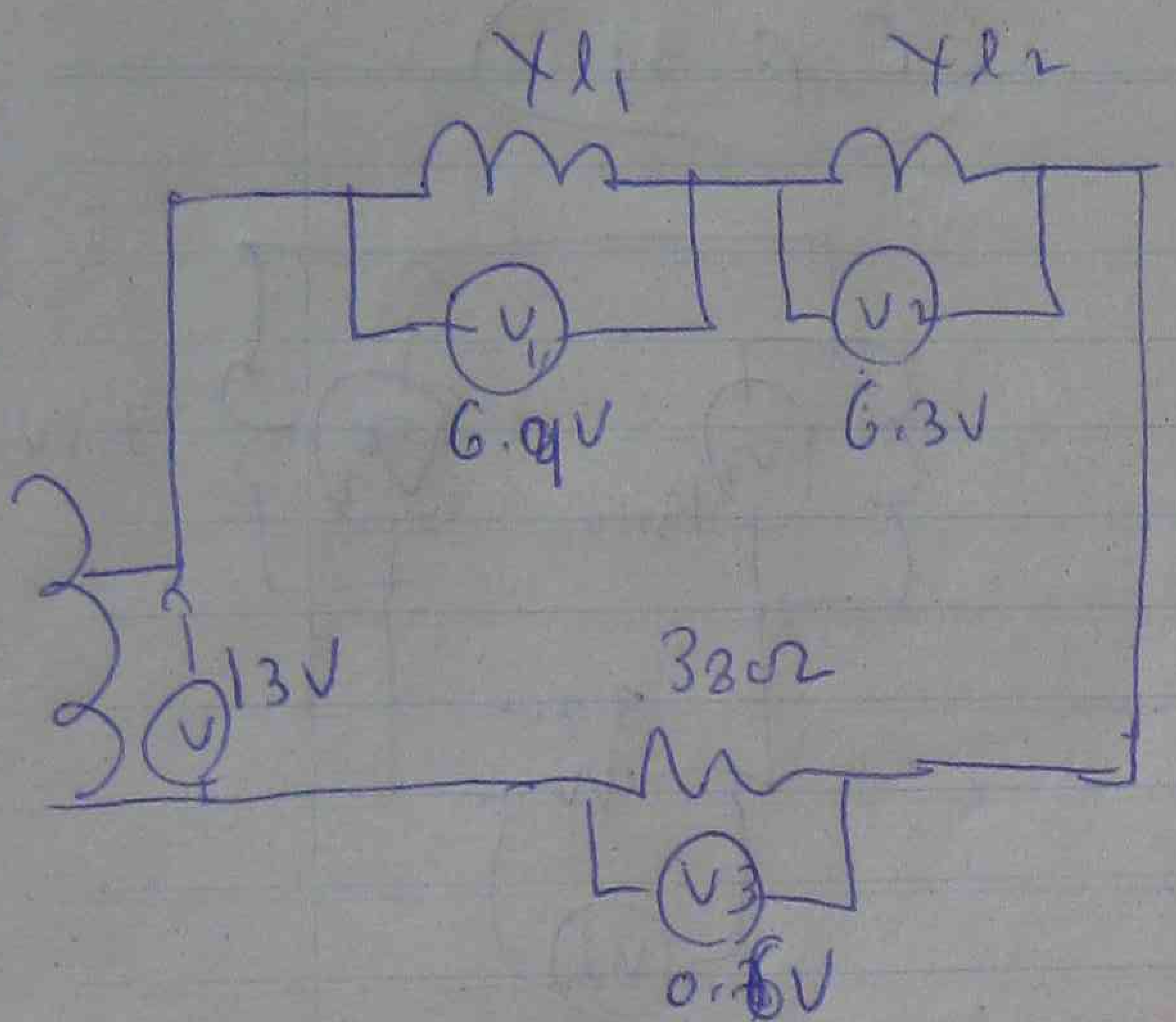


~~$X_{L_T} =$~~ $I_T = \frac{V_4}{R}$

$X_{L_T} = \frac{V_T - V_4}{I_T}$

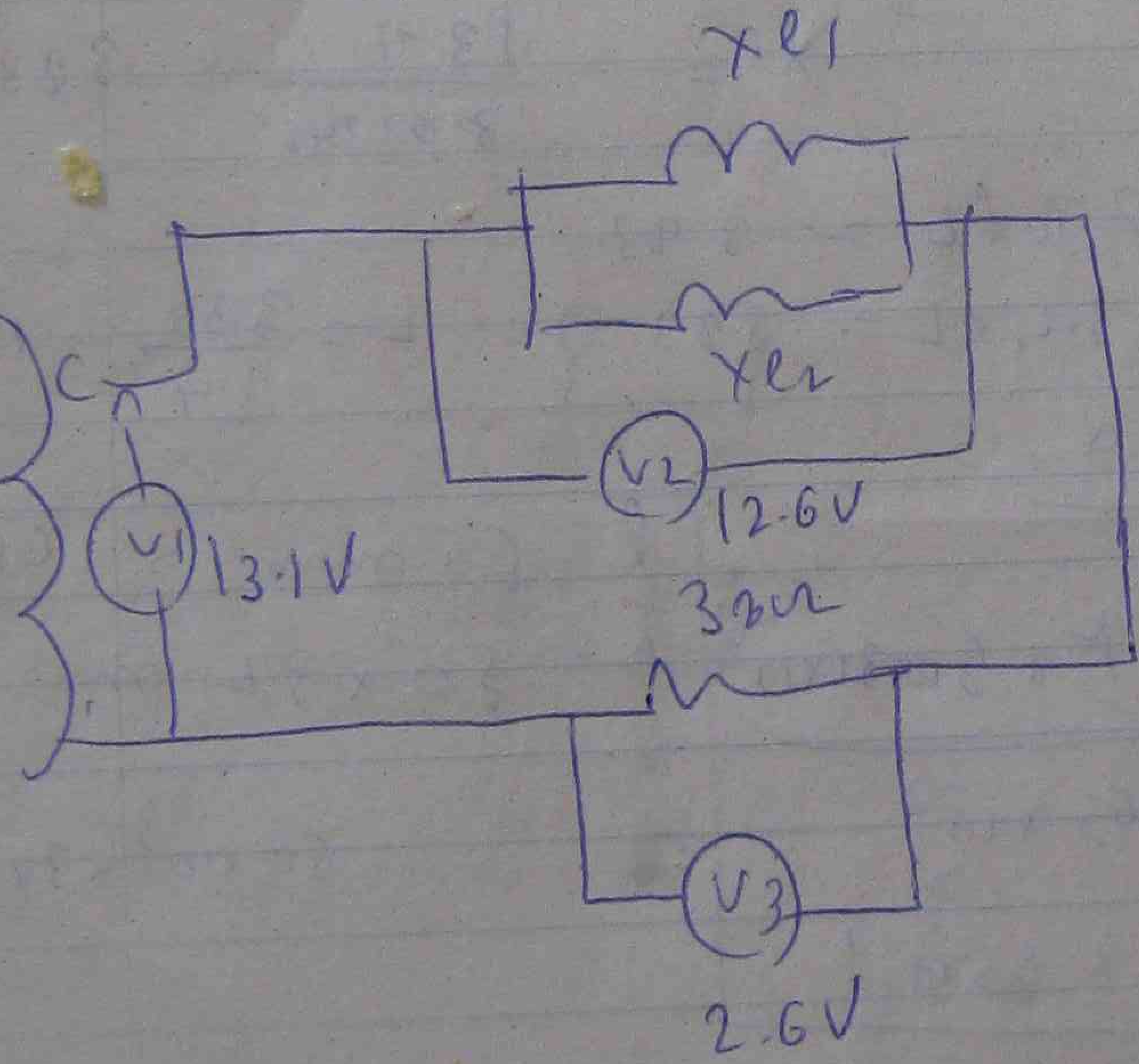
Confirm $\frac{1}{X_{L_T}} = \frac{1}{X_{L_1}} + \frac{1}{X_{L_2}} + \frac{1}{X_{L_3}}$

EP 33



$$I = \frac{0.6}{38\,\Omega} =$$

$$X_{l_1} = \frac{V_1}{I} \quad , \quad X_{l_2} = \frac{V_2}{I}$$



$$I = \frac{2.6V}{38\,\Omega}$$

$$X_{l_T} = \frac{V_1 - V_3}{} \quad \frac{13.1 - 2.6}{\frac{2.6}{38}}$$

=

H.2.11
INPUT
MA
V-Ω
1200V MAX
COMMON
.003
FUNCTION
ACV
ACMA
DCV
DCMA
KΩ
20MΩ
RANGE
2
20
200
POWER
ON-OFF
8000A DIGITAL MULTIMETER
EMTEK
20MHz OSCILLOSCOPE
CONTROLLED BY MAIN SWITCH Nº1
240V G.P.O.
PLEASE DO NOT
PUT
ANY RUBBISH ON TOP OF THIS
NEUTRAL
EARTH


100.6
CONTROLLED BY MAIN SWITCH
ISOLATE BEFORE OPENING


240 V MAIN
SWITCH
Nº2

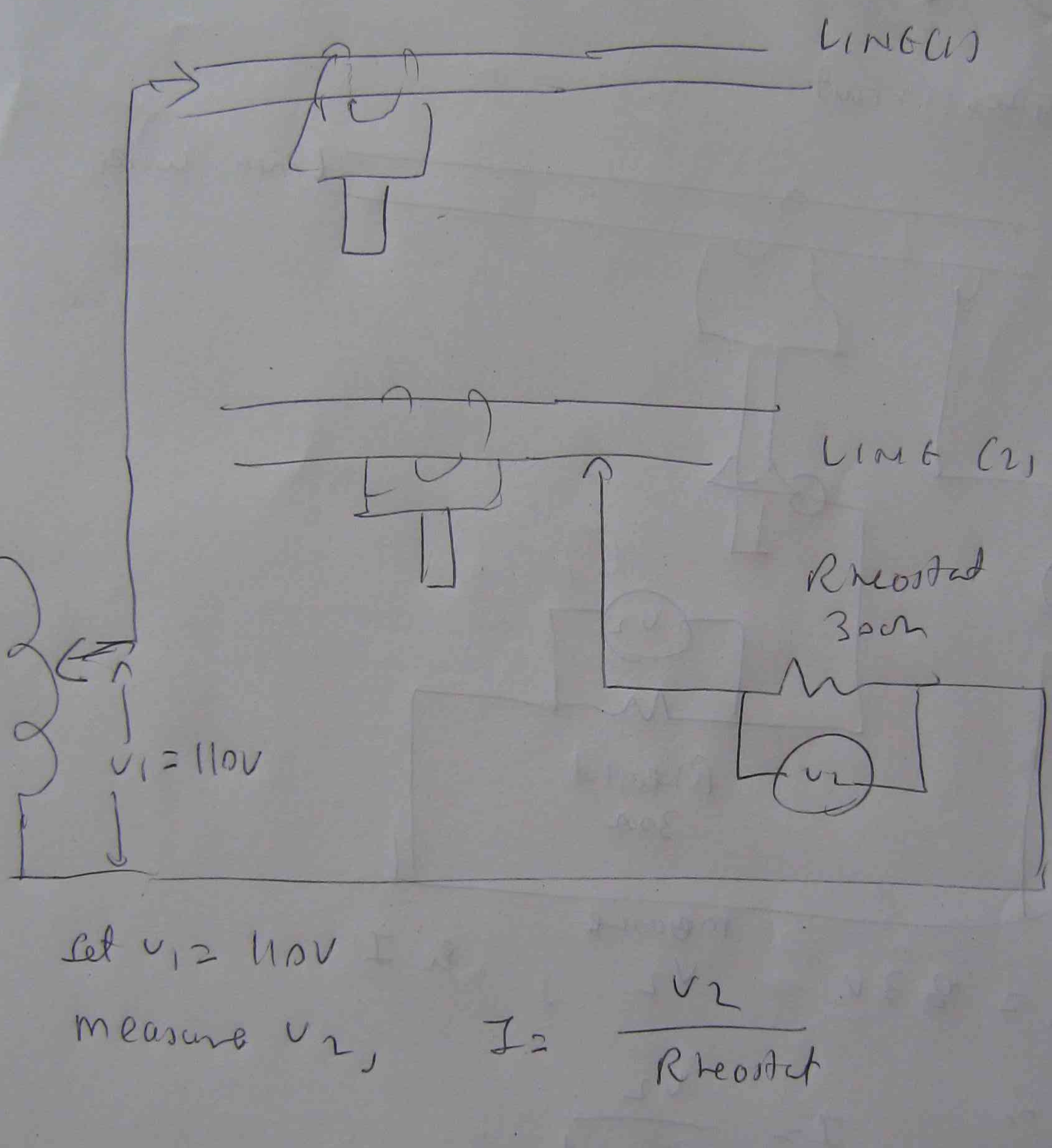

EMTEK
520
TF 75730
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
DANGER 300 VOLTS.
CONTROLLED BY MAIN SWITCH No1
240 V G.P.O.
240 V G.P.O.
NEUTRAL
EARTH
240 V MAIN SWITCH No1
240 V MAIN SWITCH No2
240 V G.P.O.


№2
BENCH 4A


240V G.P.O.
33.9 OHM/6.5 AMP
BENCH 4A


NEXT TEST: 22/04/2009
TEST DATE: 22/10/2008
TEST STATUS: PASS
TESTER: DAVE
AS3760 TEST TAG
FORCLUM
ELECTRICAL SERVICES P/L
CHECKED
DATE

Air capacitance



set $v_1 = 110V$

measure v_2, $I = \frac{v_2}{Rheostat}$

$$X_c = \frac{110 - v_2}{I}$$

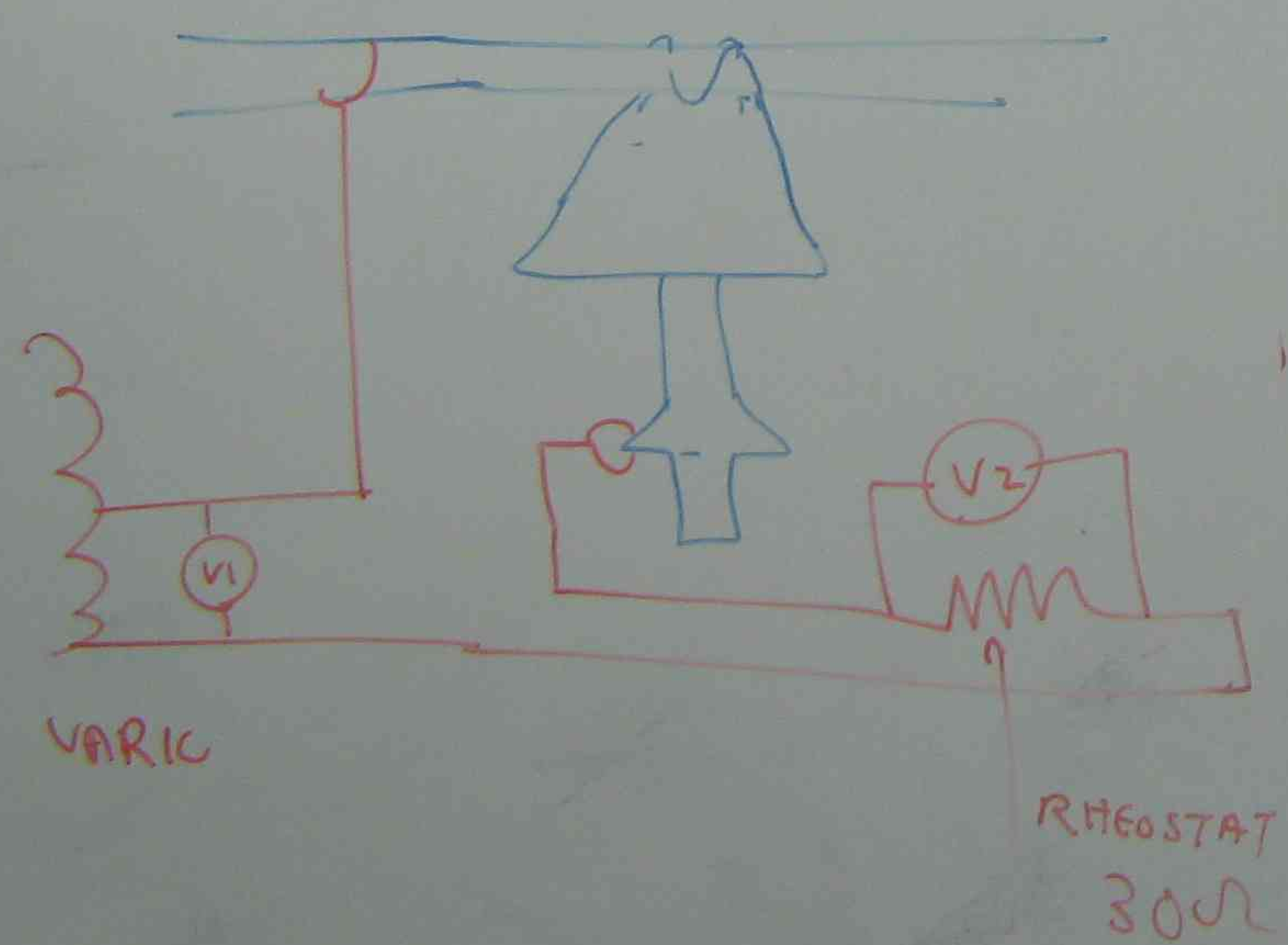
$$C = \frac{1}{2\pi f c}$$

Cap = 18 chairs
18 desks

TRANSMISSION LINE PRACTICAL

① LINE INSULATOR TEST

(1) CONNECT THE GIVEN CIRCUIT



(2) INJECT V_1 80V

(3) MEASURE V_2

(4) CALCULATE $I = \dfrac{V_2}{\text{RHEOSTAT RESISTANCE } (30\Omega)}$

(5) $X_c = \dfrac{V_1 - V_2}{I}$

(6) $C_{80V} = \dfrac{1}{2\pi f X_c}$ WHERE $f = 50\,Hz$

REPEAT THE ABOVE STEP FOR 90V & 100V

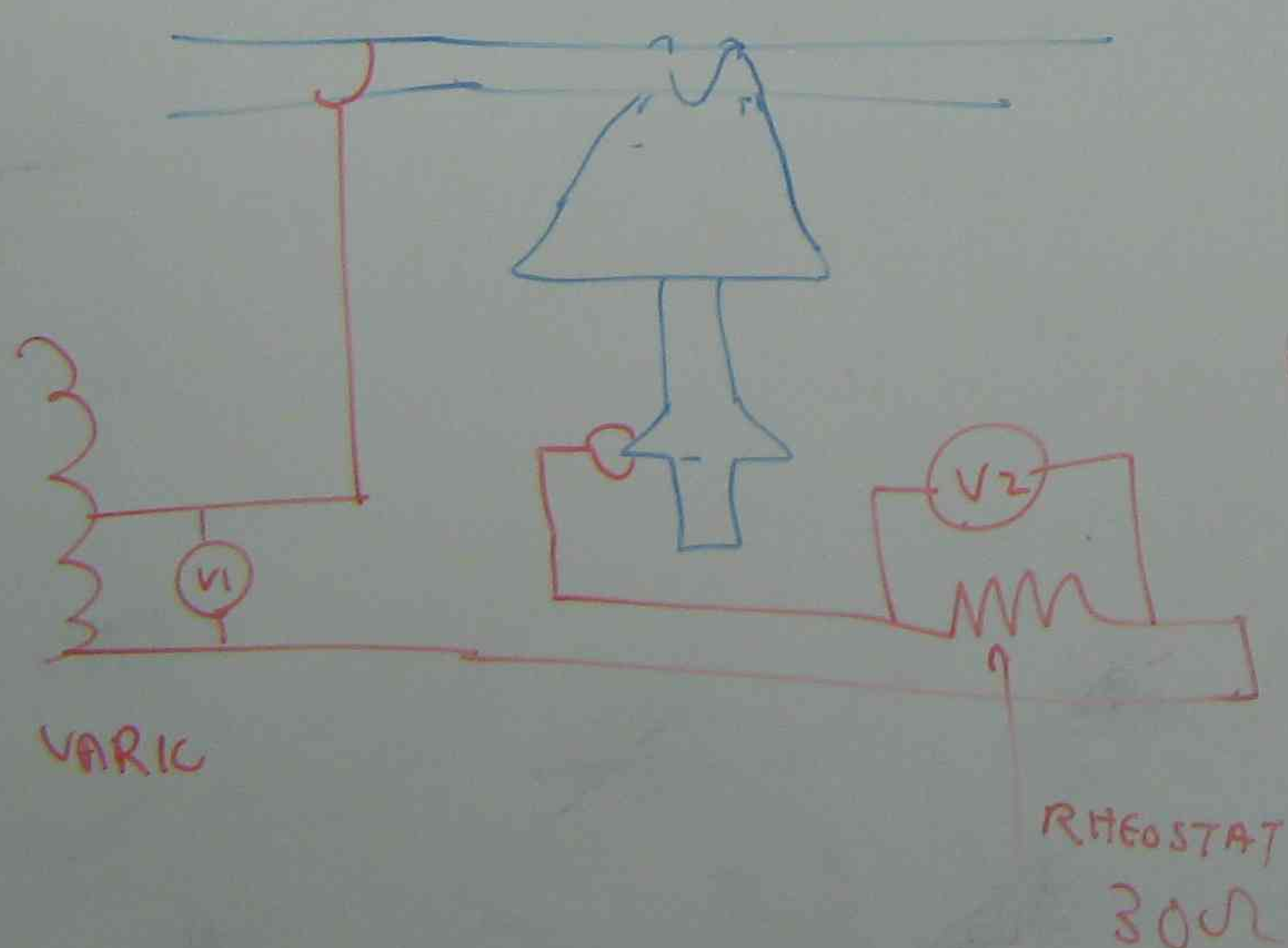
$$C = \frac{C_{80V} + C_{90V} + C_{100V}}{3} \; F$$

(7) THEN SWITCH OFF THE SUPPLY & OBSERVE WHAT HAPPENS TO V_1

TRANSMISSION LINE PRACTICAL

① LINE INSULATOR TEST

(1) CONNECT THE GIVEN CIRCUIT



(2) INJECT V_1 80V

(3) MEASURE V_2

(4) CALCULATE $I = \frac{V_2}{\text{RHEOSTAT RESISTANCE } (30\Omega)}$

(5) $X_c = \frac{V_1 - V_2}{I}$

(6) $C_{80V} = \frac{1}{2\pi f X_c}$ WHERE $f = 50Hz$

REPEAT THE ABOVE STEP FOR 90V & 100V

$$C = \frac{C_{80V} + C_{90V} + C_{100V}}{3} \; F$$

(7) THEN SWITCH OFF THE SUPPLY & OBSERVE WHAT HAPPENS TO V_1

0.00
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
TRIGGER
LEVEL
240V G.P.O.
240V G.P.O.
240V MAIN
SWITCH
No 2
240V G.P.O.
240V G.P.O.
CONTROLLED BY MAIN SWITCH
70.2 OHM/4 AMP
BENCH 4A
70.2 OHM/4 AMP
BENCH 4F
110 VOLTS
110 VOLTS


240 V MAIN
SWITCH
Nº2
240V G.P.O.
PBD. 40/3


SWITCH
№ 2
OLTS ONLY


EMTEK
520
CONTROLLED BY MAIN SWITCH №1
240V G.P.O.
NEUTRAL
EARTH
240V MAIN SWITCH №2
CONTROLLED BY MAIN SWITCH №2
240V G.P.O.
70.2 OHM/4 AMP
BENCH 4A
70.2 OHM/4 AMP
110 VOLTS


NEUTRAL
240 V MAIN SWITCH Nº2
CONTROLLED BY MAIN SWITCH Nº2
Limiter
Ammeter
SUPPLY
R1 Low
R2 Medium
R3 High


ISOLATE BEFORE OPENING
BY MAIN SWITCH Nº1
240V G.P.O.


EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
TRIGGER
DANGER 300 VOLTS
240V G.P.O.
240V G.P.O.
NEUTRAL
EARTH
240V MAIN SWITCH №2
240V G.P.O.
240V G.P.O.
E.T.I. MODULE 17 TEST 30
V-A MEASUREMENT OF RESISTANCE
S/N
70.2 OHM/4 AMP
BENCH 4A
110 VOLTS

CONTROLLED BY MAIN SWITCH №1
240V G.P.O.
DANGER 300 VOLTS.
NEUTRAL
EARTH
240V MAIN SWITCH №2
240V G.P.O.
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
POSITION
VOLTS/DIV
TF 75730
11.95

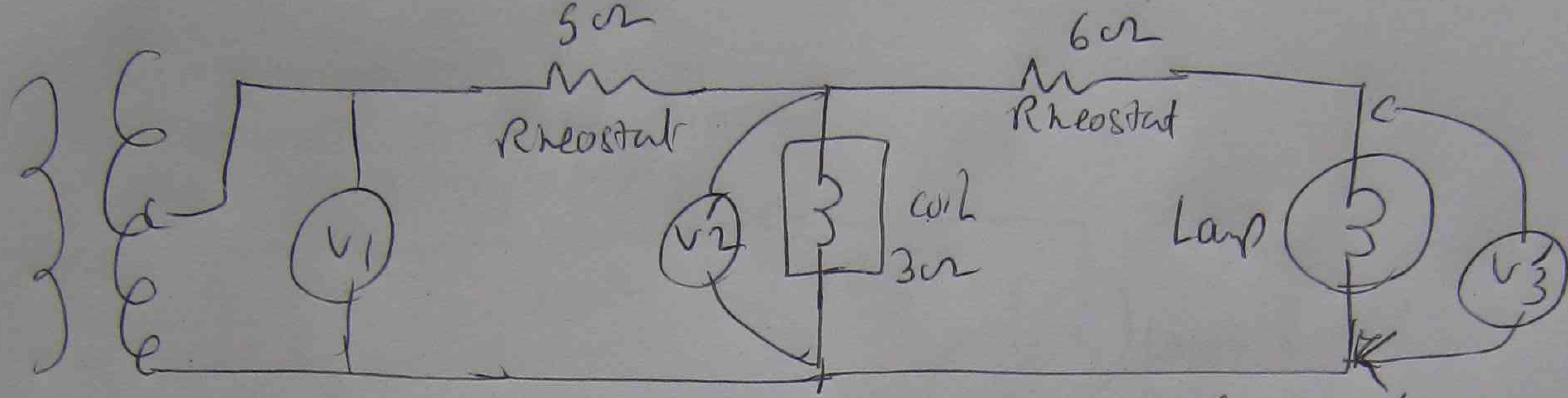

11.95
EMTEK
520
POWER
INTENSITY
FOCUS
VERTICAL
TRIGGER
POSITION
LEVEL
TF 75730
H.2.11
240V G.P.O.
240V G.P.O.
NEUTRAL
EARTH
240V MAIN
SWITCH
№2
240V G.P.O.
240V G.P.O.
ET1 MODULE 17 TEST 30
V-A MEASUREMENT OF RESISTANCE
S/N
70.2 OHM/4 AMP
BENCH 4A
110
VOLTS

ELECTRICAL DISTRIBUTION

EP 23

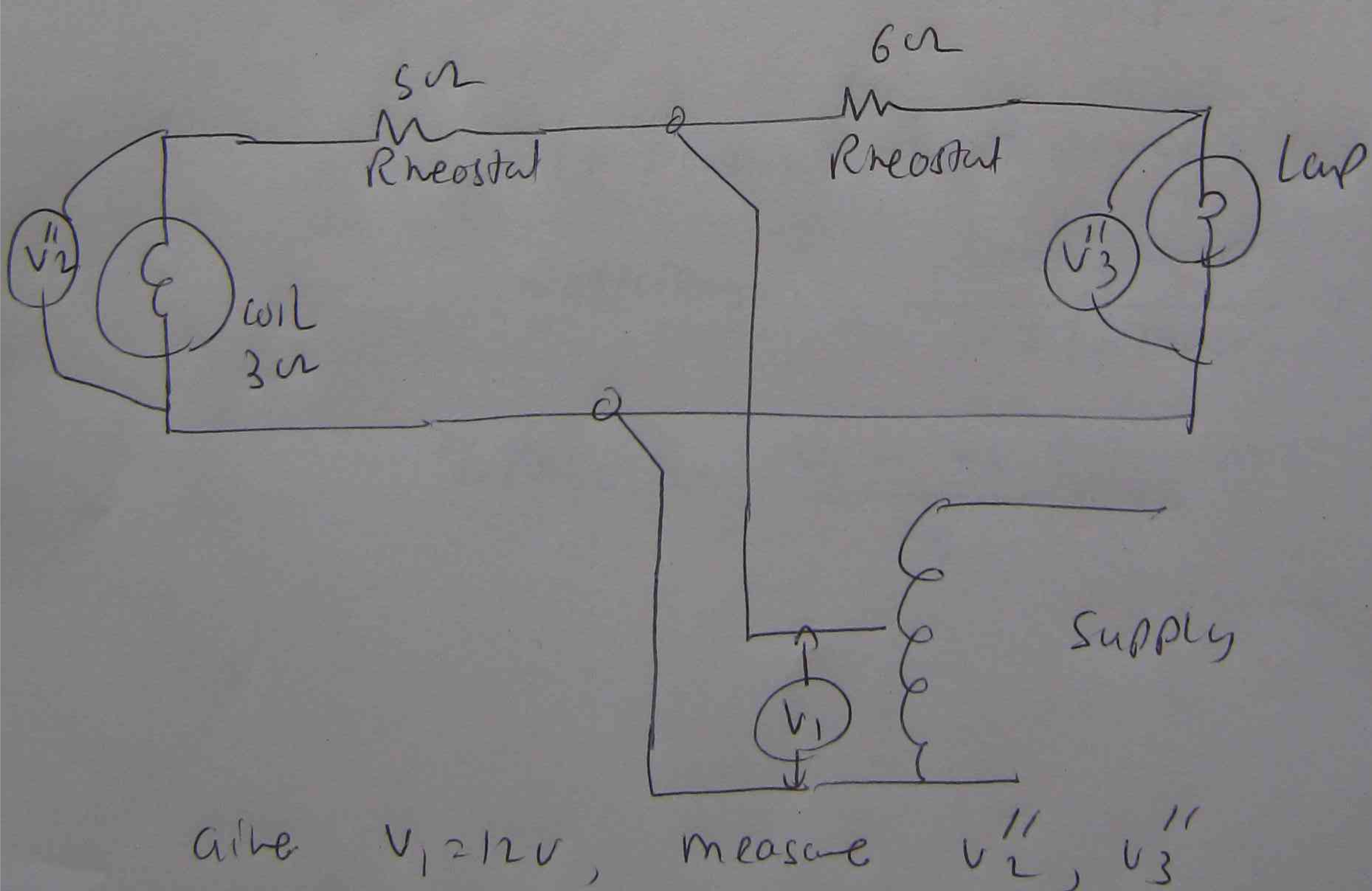
Load centre

(1) Connect the given circuit



Give $V_1 = 12V$ measure V_2', V_3'

(2) Connect the given circuit



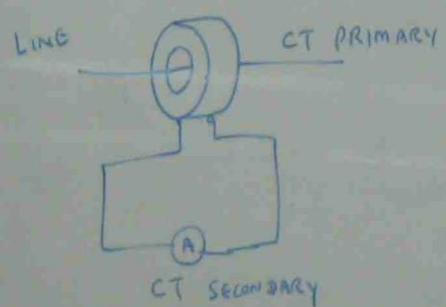
Give $V_1 = 12V$, measure V_2'', V_3''

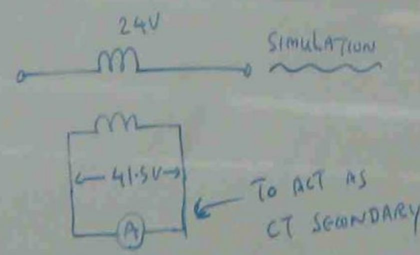
(3) Compare V_2'' & V_2' V_3'' & V_3'

(4) make comment & find out the reason.

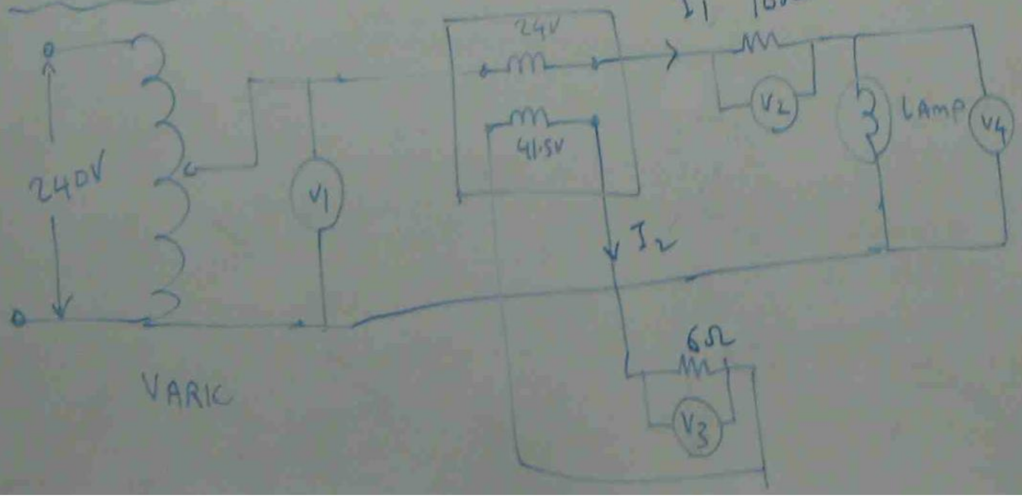
POWER SYSTEM PROTECTION PRACTICAL (2)

CURRENT TRANSFORMER RATIO





CONNECT THE GIVEN CIRCUIT



TAKE THE READINGS & FILL IN THE TABLE

V_1	V_2	$I_1 = \frac{V_2}{10\Omega}$	V_3	$I_2 = \frac{V_3}{6\Omega}$	CT RATIO $\frac{I_1}{I_2} = a$
4V					$a_1 =$
5V					$a_2 =$
6V					$a_3 =$
7V					$a_4 =$

$$\text{AVERAGE CT RATIO} = \frac{a_1 + a_2 + a_3 + a_4}{4}$$

THEN ADJUST

$V_3 = 0.3\ V$ (OR) $I_2 = \frac{0.3}{6} = 0.05\ A$

USE CT RATIO AND CALCULATE

PRIMARY CURRENT I_1

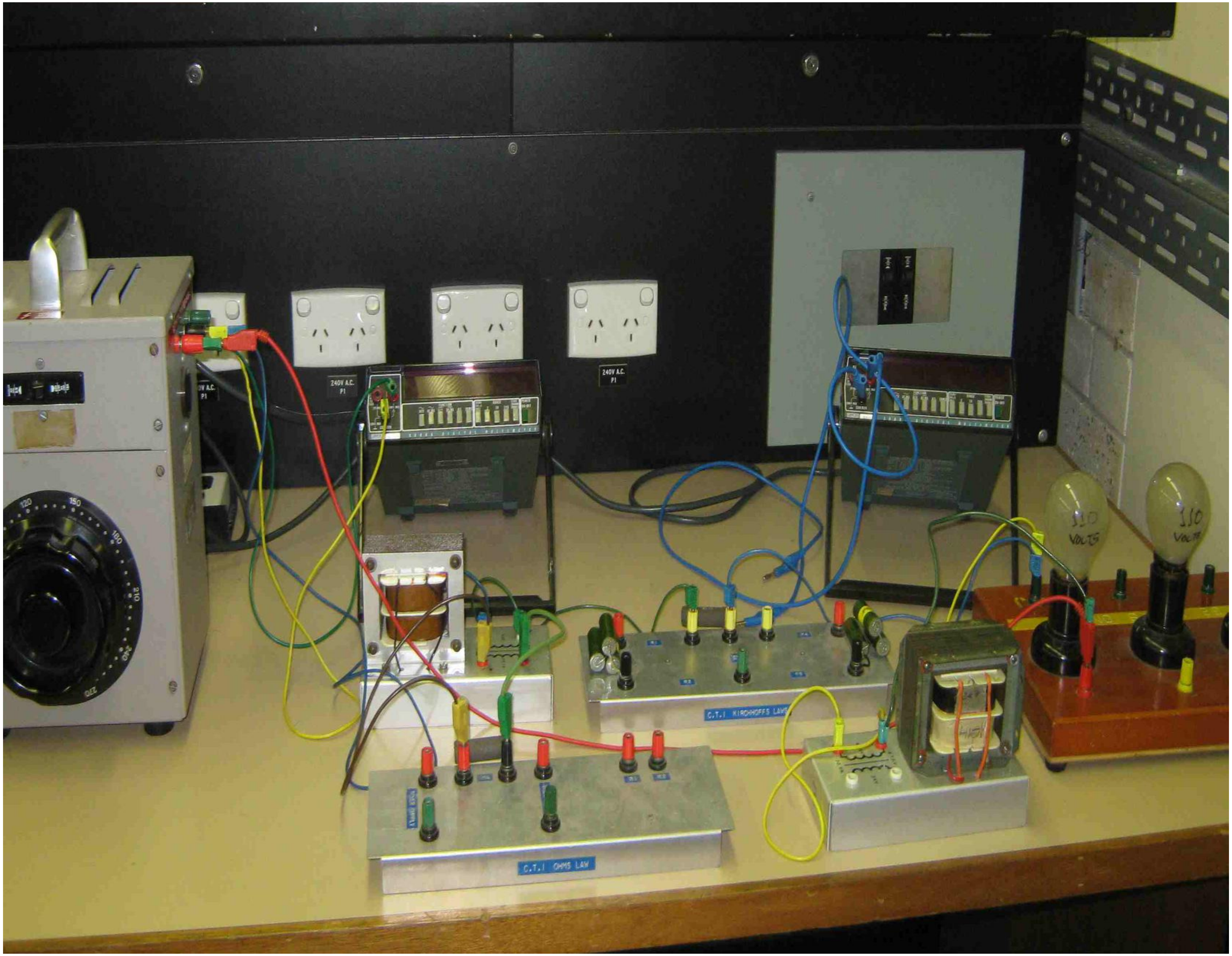
I_1 = AVERAGE CT RATIO × 0.5 Amp

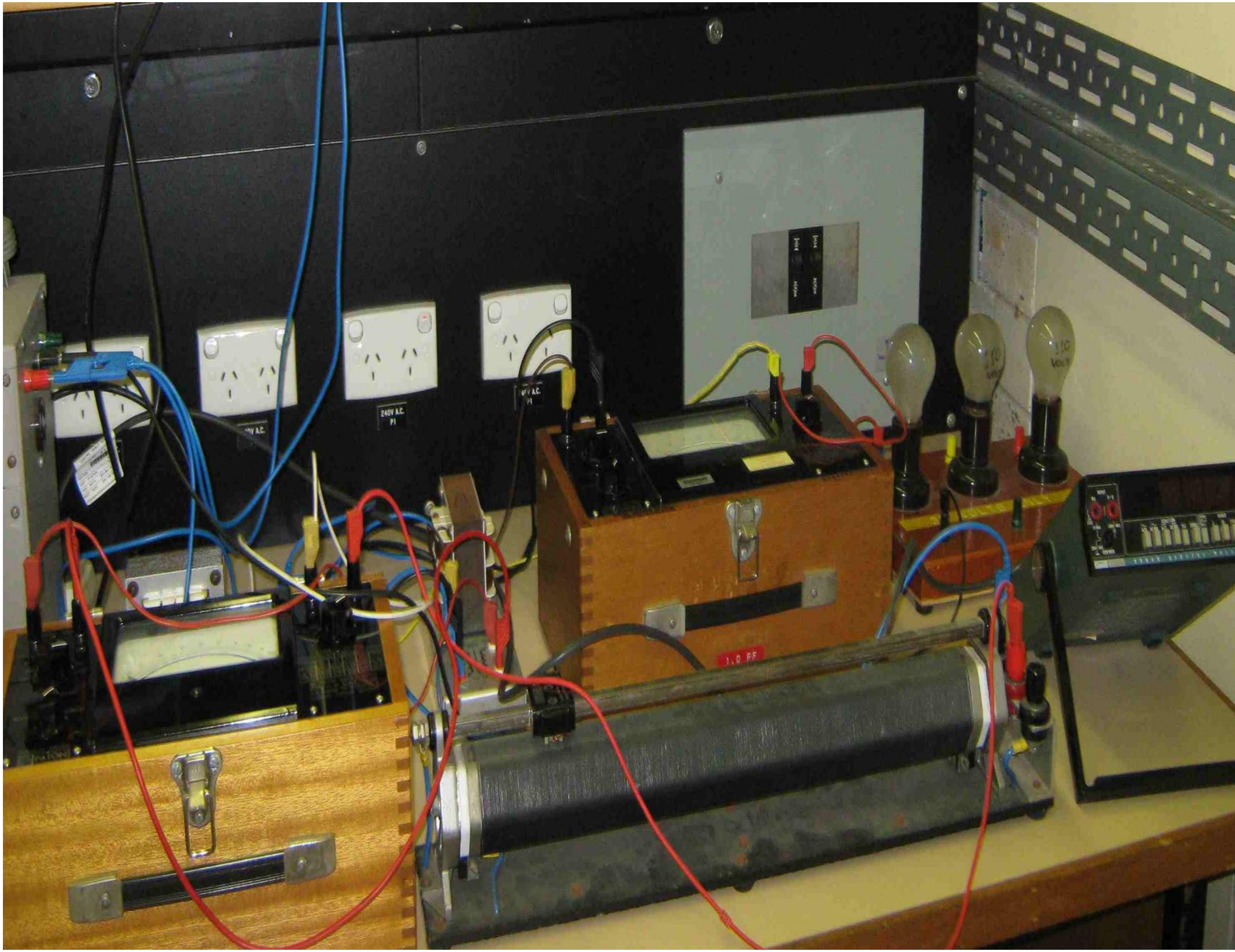
=

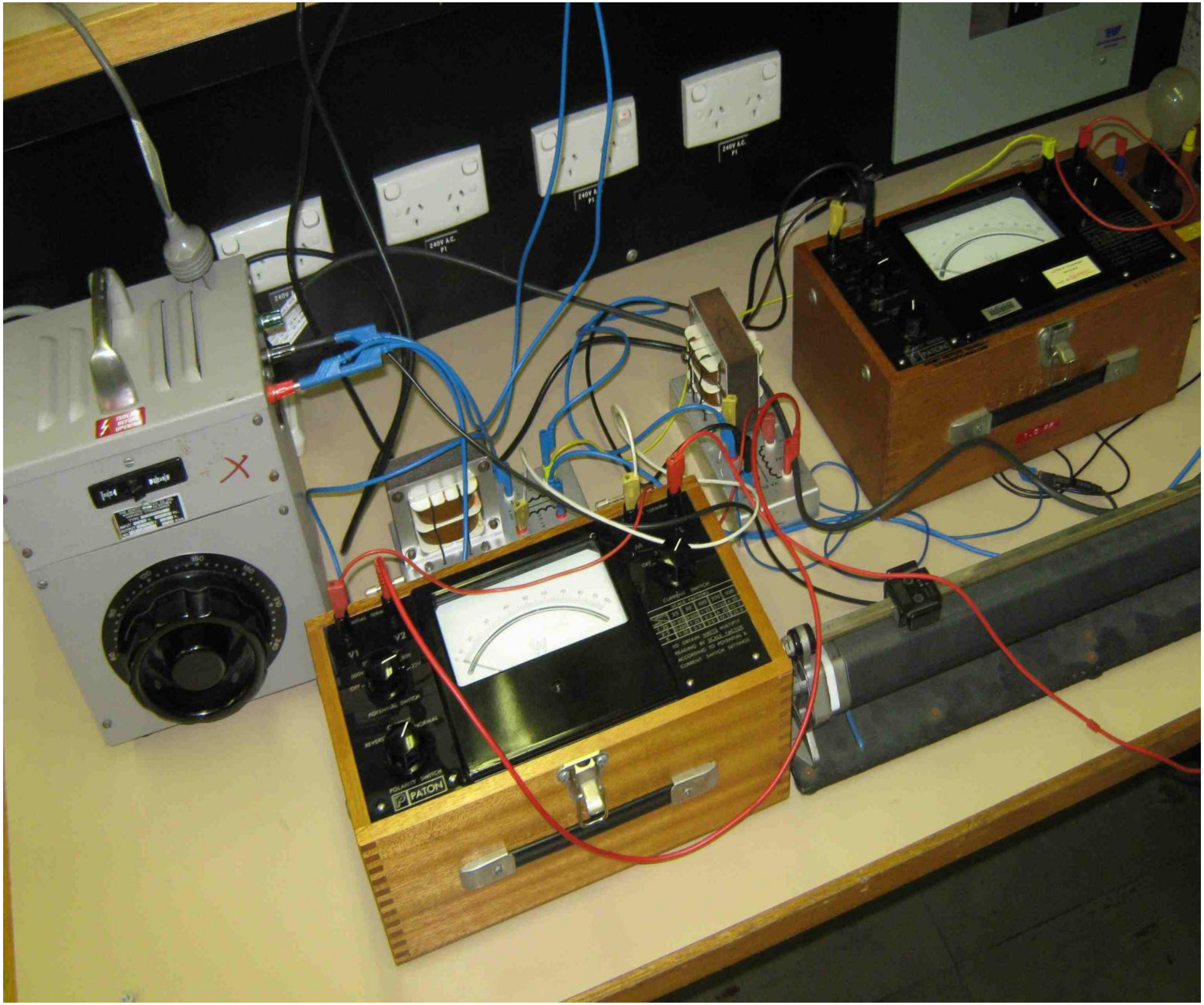
THEN MEASURE V_2 AND FIND

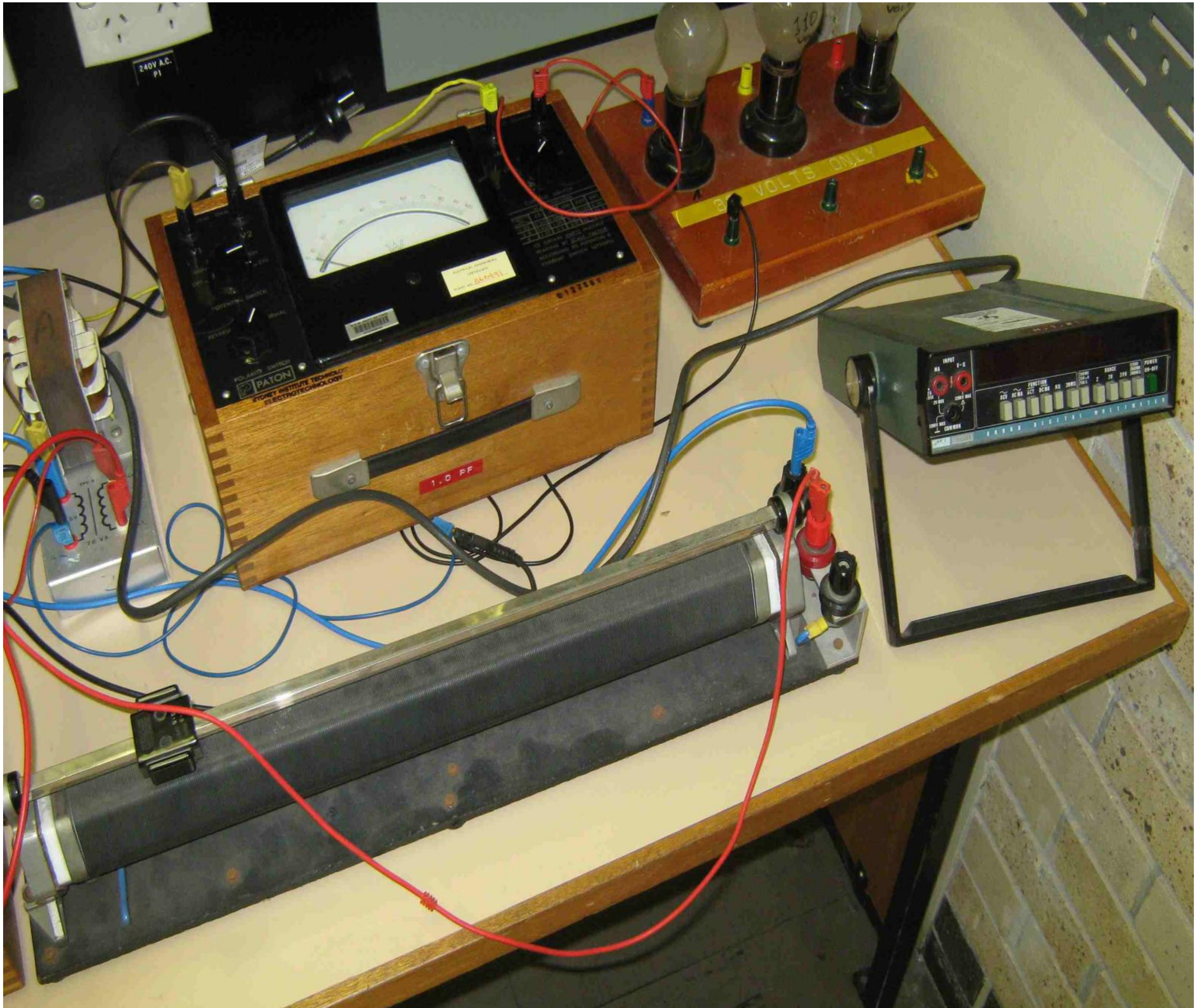
$$I_1 = \frac{V_2}{10\ \Omega}$$

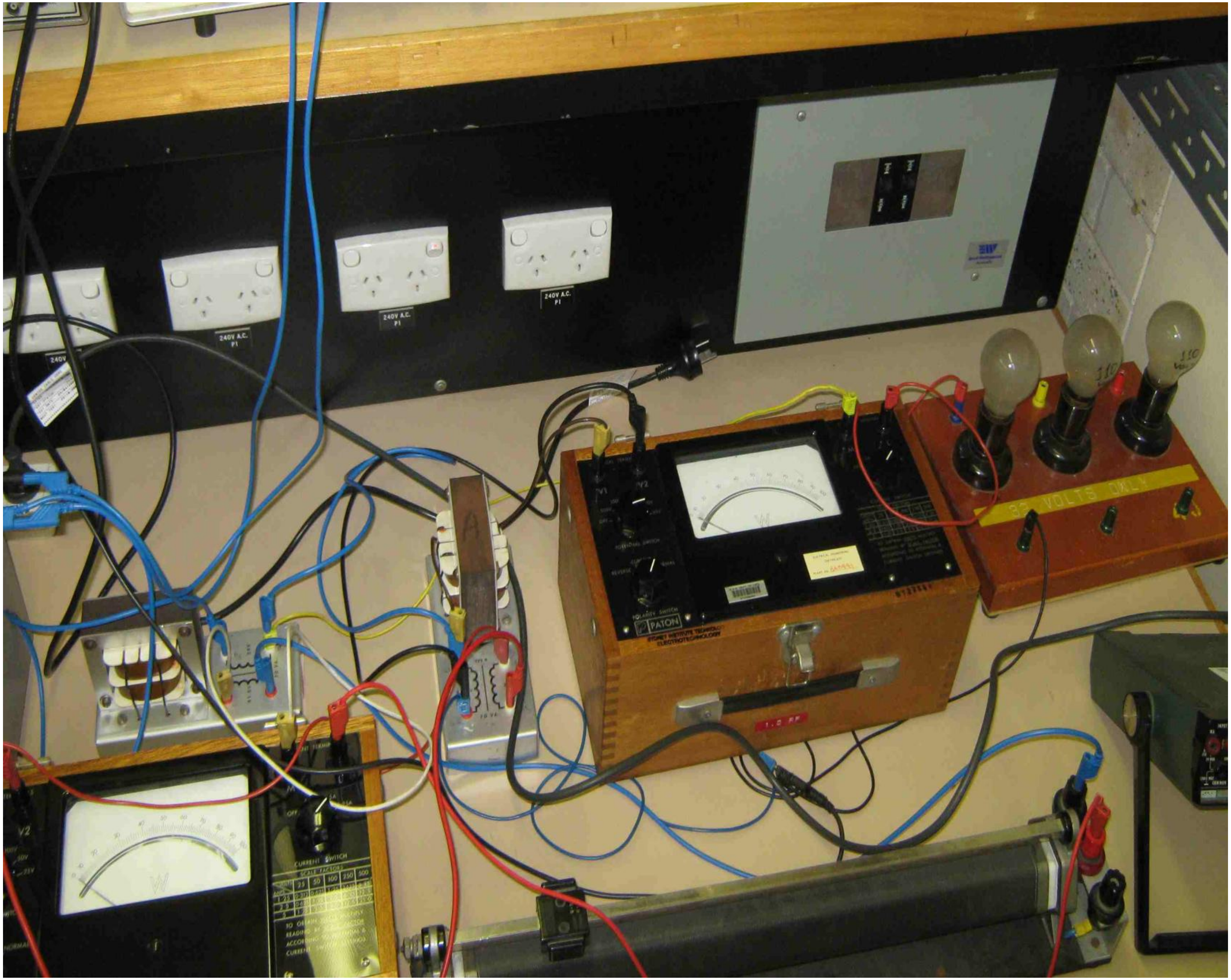
COMPARE CALCULATED RESULT AND MEASURED RESULT.


240V A.C.
P1
C.T.I KIRCHHOFFS LAWS
C.T.I OHMS LAW
110 VOLTS

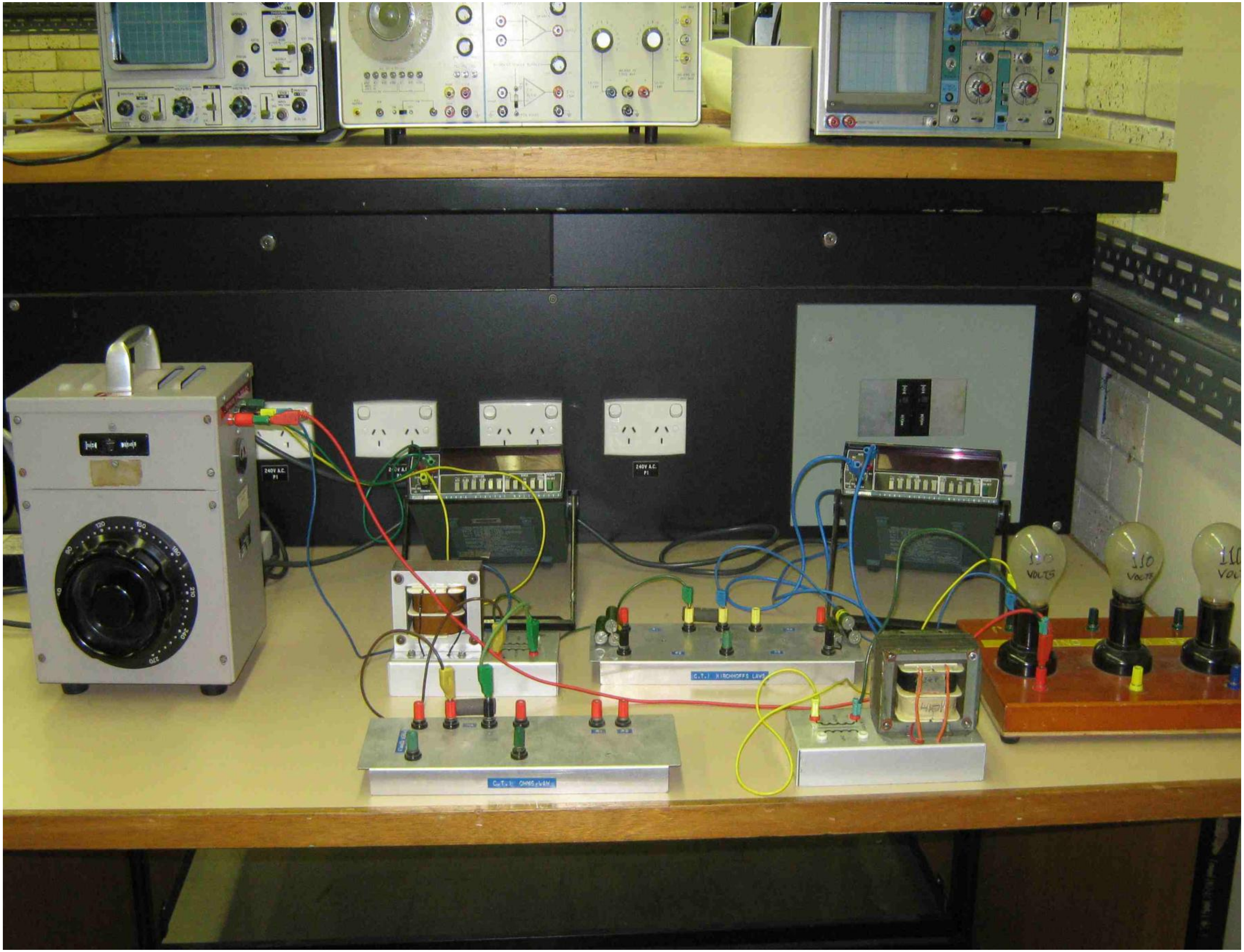

240V A.C.
P1
1.0 PF

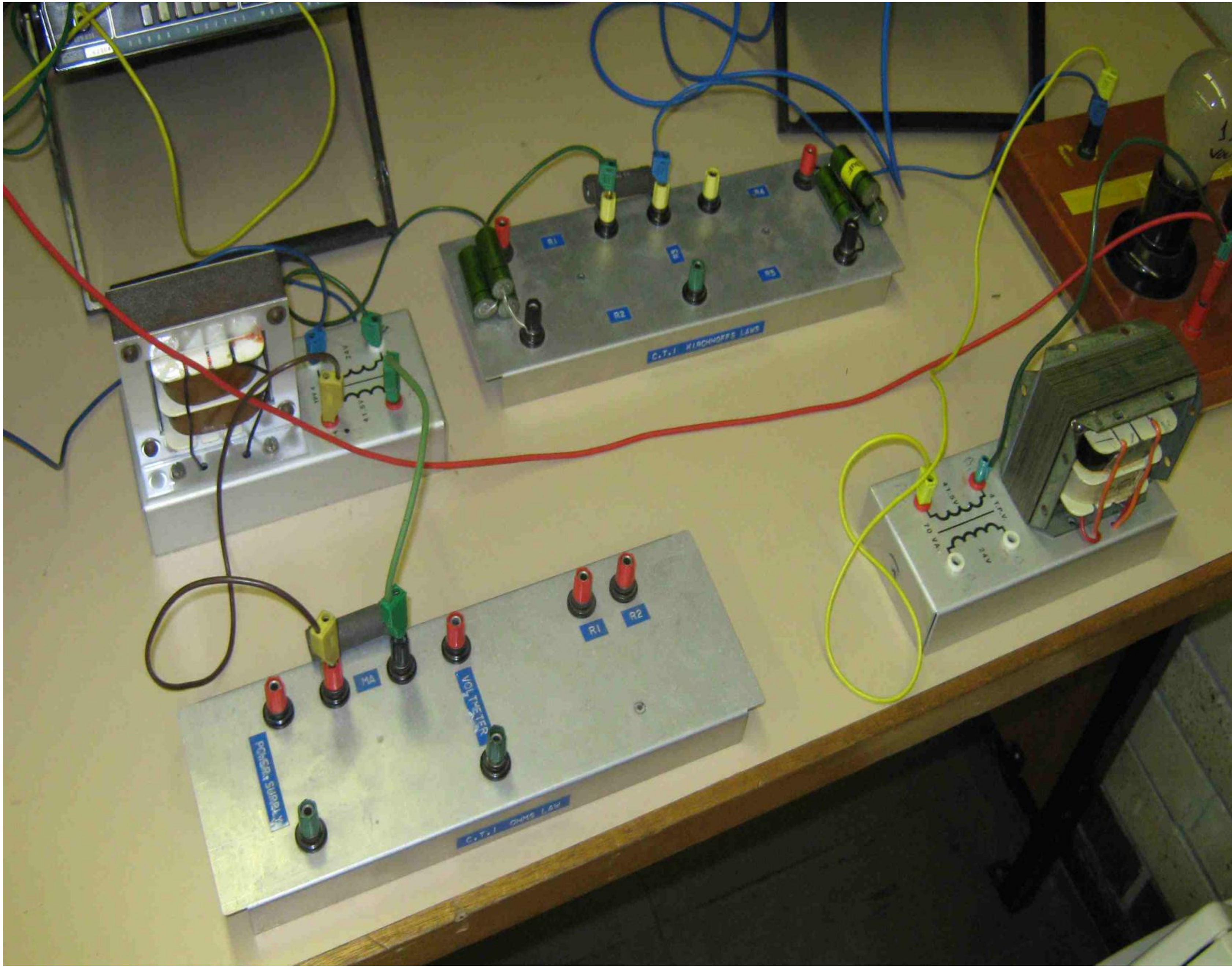

240V A.C.
P1
PATON
POTENTIAL SWITCH
POLARITY SWITCH
CURRENT SWITCH
V1
V2


240V A.C.
P1
V1
V2
PATON
1.0 PF
VOLTS ONLY



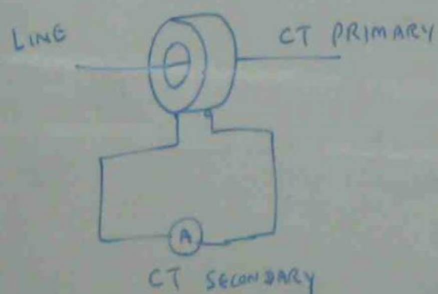
240V A.C.
P1
240V A.C.
P1
240V A.C.
P1
PATON
CURRENT SWITCH
SCALE FACTORS

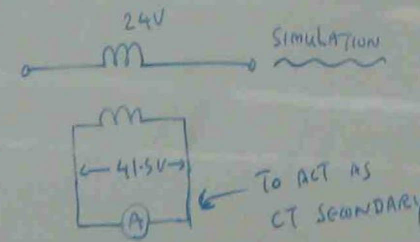

240V A.C.
P1
C.T.I KIRCHHOFFS LAWS
110 VOLTS


R1
R2
MA
VOLTMETER
POWER SUPPLY
C.T.I OHMS LAW
C.T.I KIRCHHOFFS LAWS

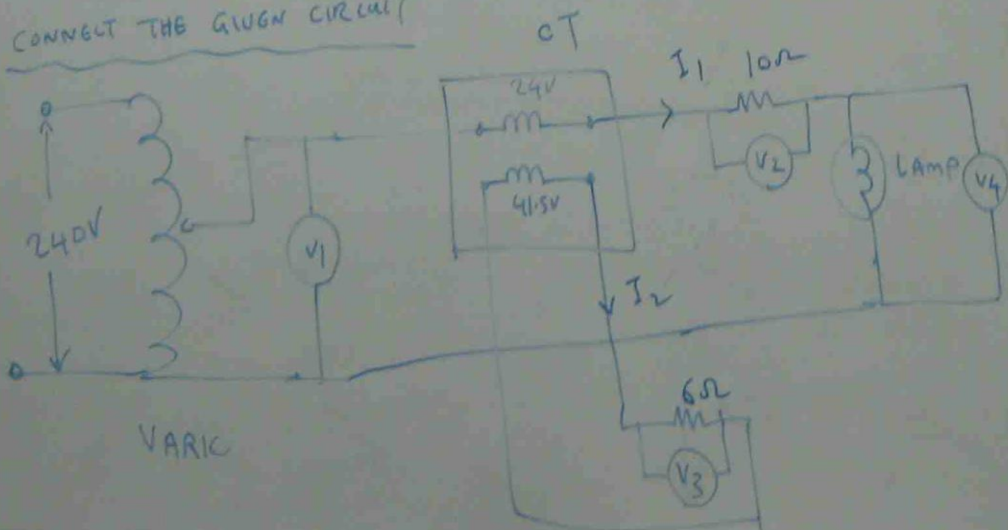
POWER SYSTEM PROTECTION PRACTICAL (2)

CURRENT TRANSFORMER RATIO





CONNECT THE GIVEN CIRCUIT



TAKE THE READINGS & FILL IN THE TABLE

V_1	V_2	$I_1 = \frac{V_2}{10\Omega}$	V_3	$I_2 = \frac{V_3}{6\Omega}$	CT RATIO $\frac{I_1}{I_2} = a$
4V					$a_1 =$
5V					$a_2 =$
6V					$a_3 =$
7V					$a_4 =$

$$\text{AVERAGE CT RATIO} = \frac{a_1 + a_2 + a_3 + a_4}{4}$$

CT RATIO

$\frac{I_1}{I_2} = a$

$a_1 =$

$a_2 =$

$a_3 =$

$a_4 =$

V_4

THEN ADJUST

$V_3 = 0.3\ V$ (OR) $I_2 = \frac{0.3}{6} = 0.05\ A$

USE CT RATIO AND CALCULATE

PRIMARY CURRENT I_1

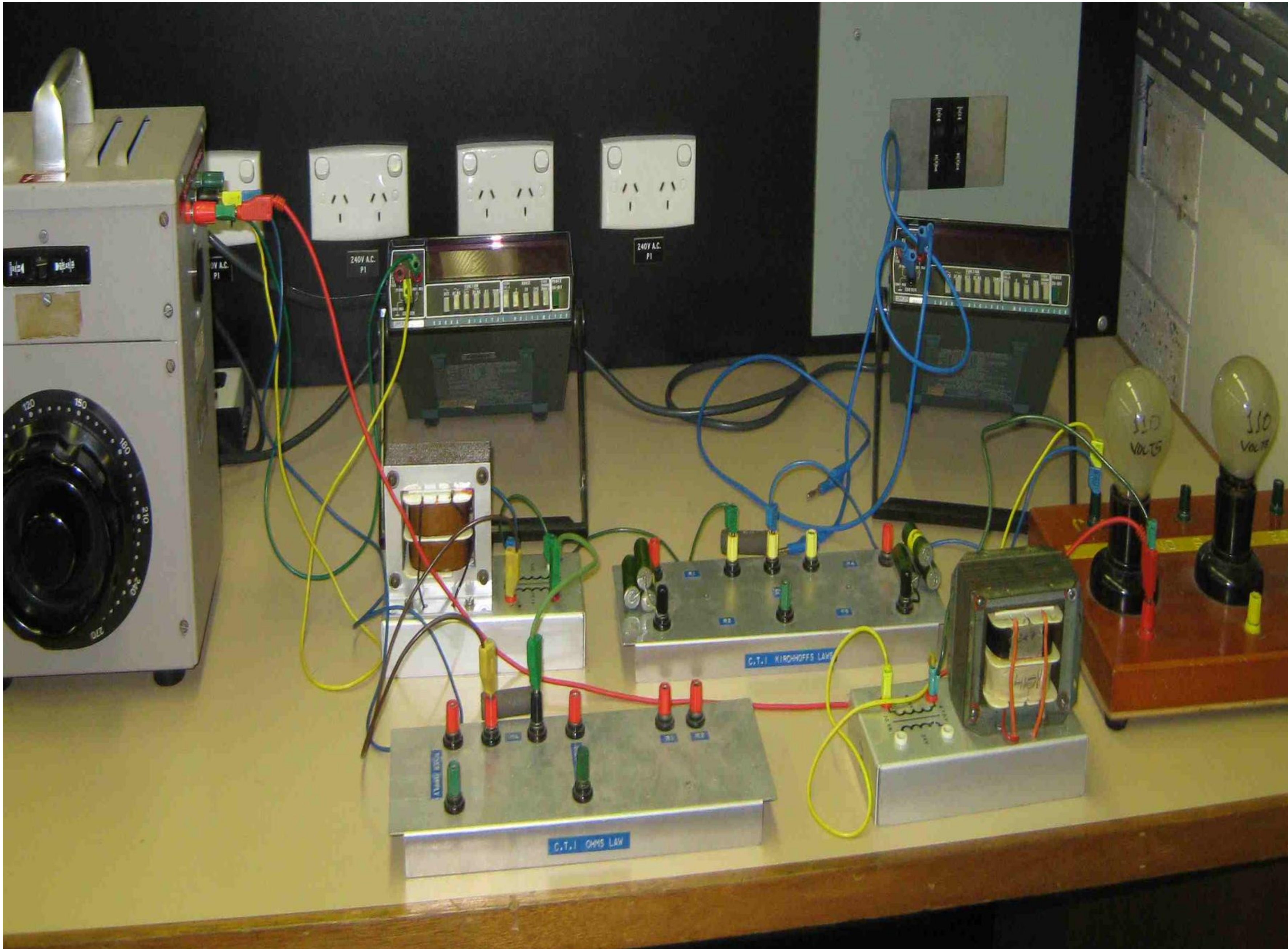
$I_1 =$ AVERAGE CT RATIO $\times$ 0.5 AMP

$=$

THEN MEASURE V_2 AND FIND

$$I_1 = \frac{V_2}{10\ \Omega}$$

COMPARE CALCULATED RESULT AND MEASURED RESULT.

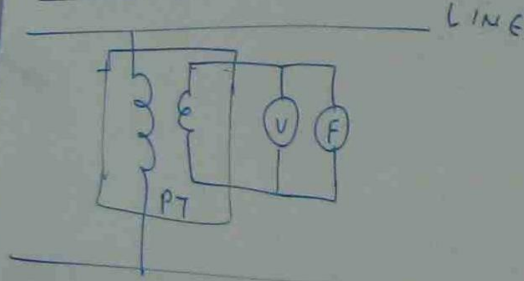

240V A.C.
P1
240V A.C.
P1
C.T.I KIRCHHOFFS LAWS
C.T.I OHMS LAW
110 VOLTS
110 VOLTS

PROTECTIVE TRANSFORMERS

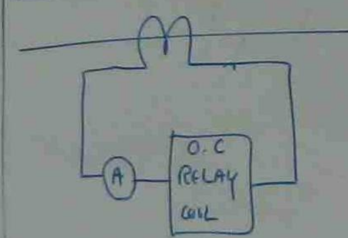
CT – CURRENT TRANSFORMER
PT – POTENTIAL TRANSFORMER
} PROTECTIVE TRANSFORMER

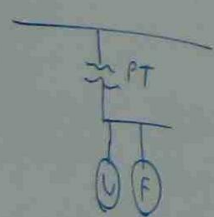
PROTECTIVE TRANSFORMERS ARE UTILIZED TO REDUCE THE SYSTEM LEVEL HIGH VOLTAGE AND CURRENT TO RELAY LEVEL / INSTRUMENT LEVEL LOW VOLTAGE AND CURRENT.

CONNECTION (PT)

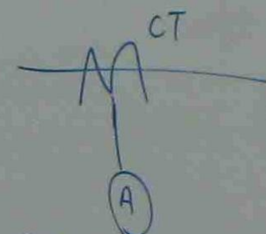


CT CONNECTION



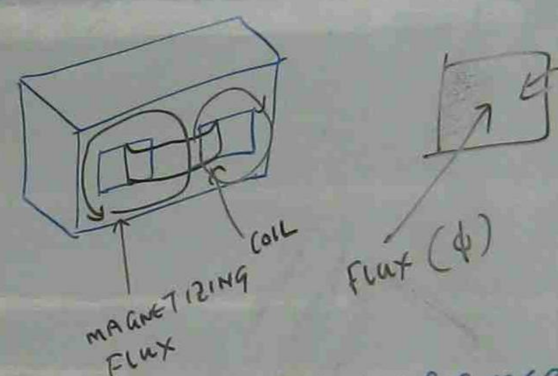


PT REDUCES HIGH VOLTAGE TO LOW VOLTAGE



CT – REDUCES HIGH CURRENT TO LOW CURRENT

DIFFERENCE BETWEEN POWER TRANSFORMER & INSTRUMENT TRANSFORMER



$$\text{FLUX DENSITY} = \frac{\text{FLUX}}{\text{C.SA}} \ (\text{wb})$$

IN POWER TRANSFORMER, CORE FLUX DENSITY IS CONSTANT REGRADLESS OF THE LOAD.

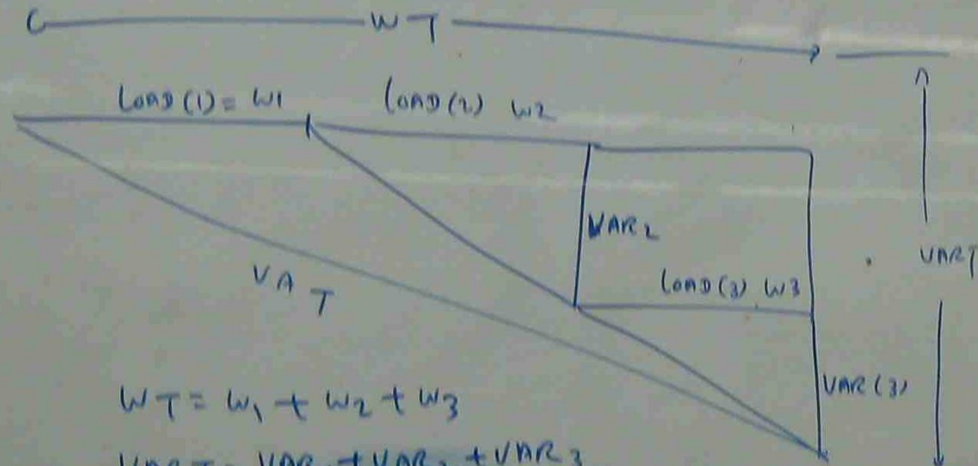
BUT IN CURRENT TRANSFORMER, CORE FLUX DENSITY DEPENDS ON (1) MAGNITUDE OF PRIMARY CURRENT

(2) IMPEDANCE OF SECONDARY CIRCUIT.

$$\frac{V_1}{V_2} = \frac{I_2}{I_1} = \frac{N_1}{N_2}$$

REAL POWER | REACTIVE POWER AND APPARENT POWER

INDUSTRIAL LOADS ARE INDUCTIVE LOADS. THAT CAUSES THE LAGGING POWER FACT



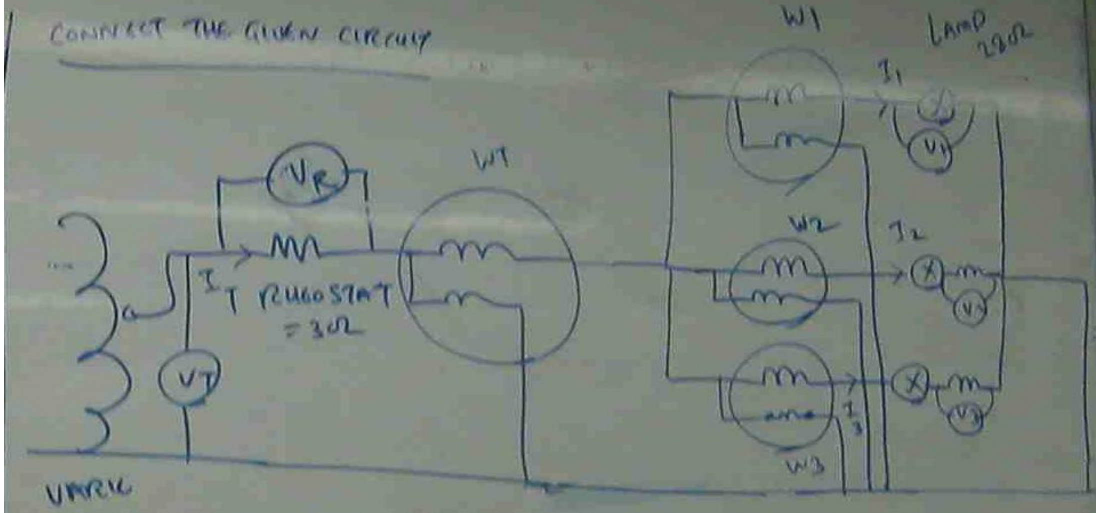
$$W_T = W_1 + W_2 + W_3$$

$$VAR_T = VAR_1 + VAR_2 + VAR_3.$$

$$VA_T = \sqrt{W_T^2 + VAR_T^2}$$

$$P.F_T = \frac{W_T}{VA_T}$$

CONNECT THE GIVEN CIRCUIT



CONNECT THE GIVEN CIRCUIT

INJECT VOLTAGE

TAKE THE READINGS OF

V_T, V_R, W_T, W_1, W_2, W_3, V_1, V_2, V_3

FILL IN TABLE

V_T	V_R	$I_T = \frac{V_R}{3\Omega}$	W_T	$VA_T = V_T I_T$	$VAR_T = \sqrt{VA_T^2 - W_T^2}$	$\theta_T = \tan^{-1}\frac{VAR_T}{W_T}$	$W1$	V_1	$I_1 = \frac{V_1}{280\Omega}$	$VA_1 = V_1 I_1$	$VAR_1 = \sqrt{VA_1^2 - W_1^2}$	$\theta_1 = \tan^{-1}\frac{VAR1}{W1}$	$PF_1 = \cos\theta_1$
						$PF_T = \cos\theta_T$	W_2	V_2	$I_2 = \frac{V_2}{280\Omega}$	$VA_2 = V_2 I_2$	$VAR_2 = \sqrt{VA_2^2 - W_2^2}$	$\theta_2 = \tan^{-1}\frac{VAR2}{W2}$	$Pf_2 = \cos\theta_2$
							W_3	V_3	$I_3 = \frac{V3}{280\Omega}$	$VA_3 = V_3 I_3$	$VAR_3 = \sqrt{VA_3^2 - W_3^2}$	$\theta_3 = \tan^{-1}\frac{VAR3}{W3}$	$Pf_3 = \cos\theta_3$

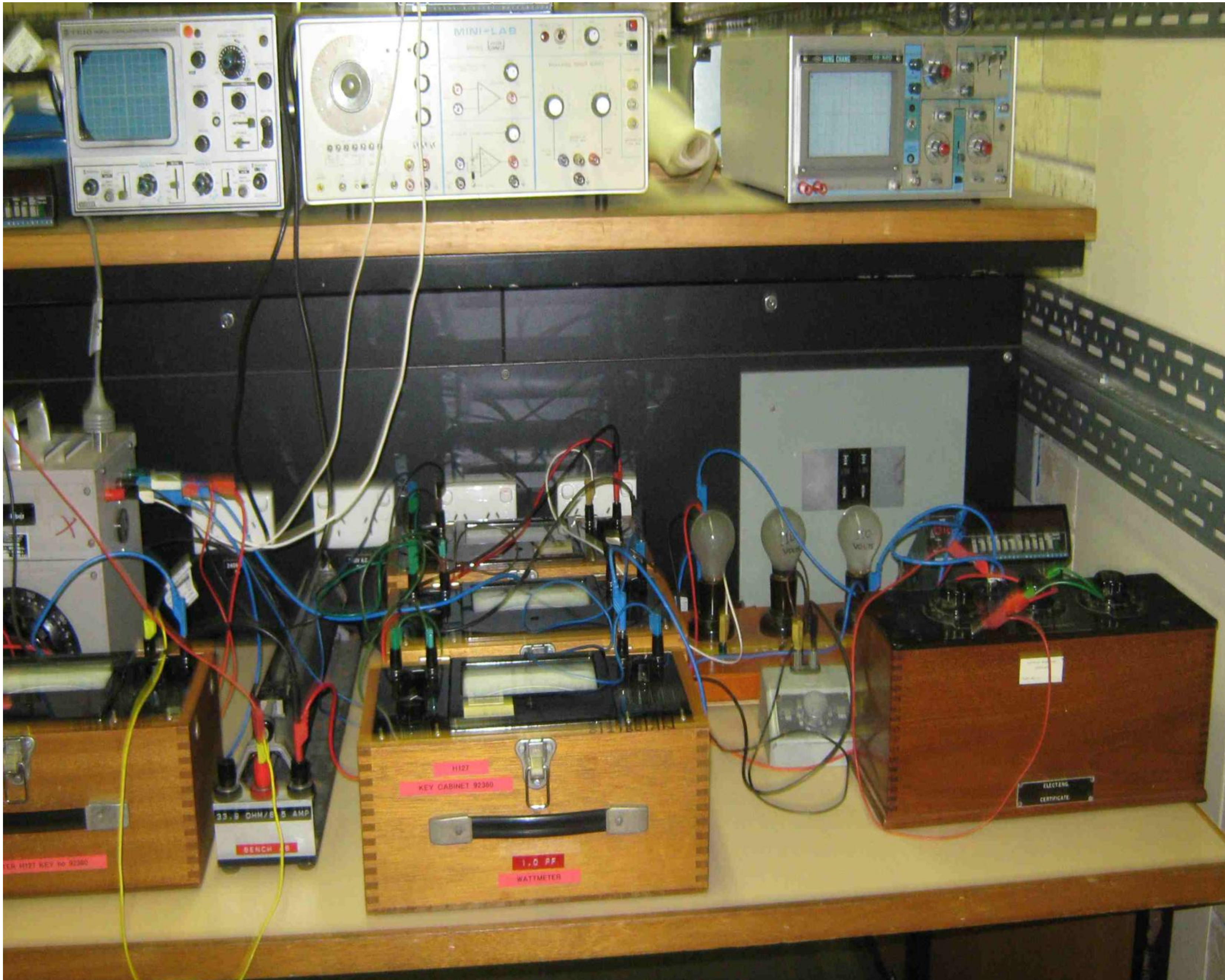
THEN PLOT THE POWER TRIANGLE

1. ALL INDUCTANCES ARE SET TO ZERO AND TAKE THE READINGS AND FILL IN TABLE AGAIN
2. COMPARE ORIGINAL W_T WITH W_T WHEN INDUCTANCES ARE ZERO.

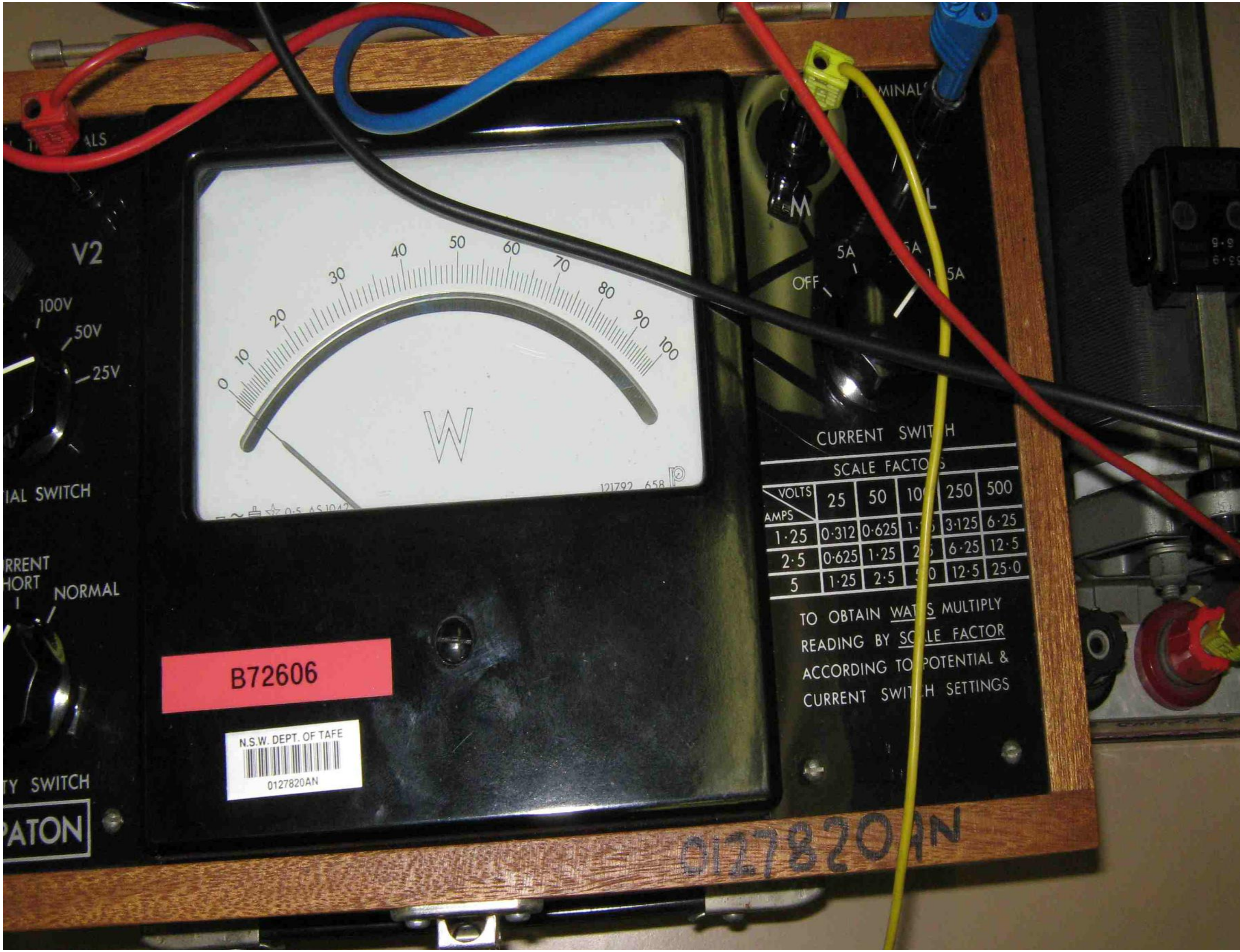
______ VAR_T WITH VAR_T ______

______ VA_T WITH VA_T ______

______ POWER FACTOR WITH POWER FACTOR ______

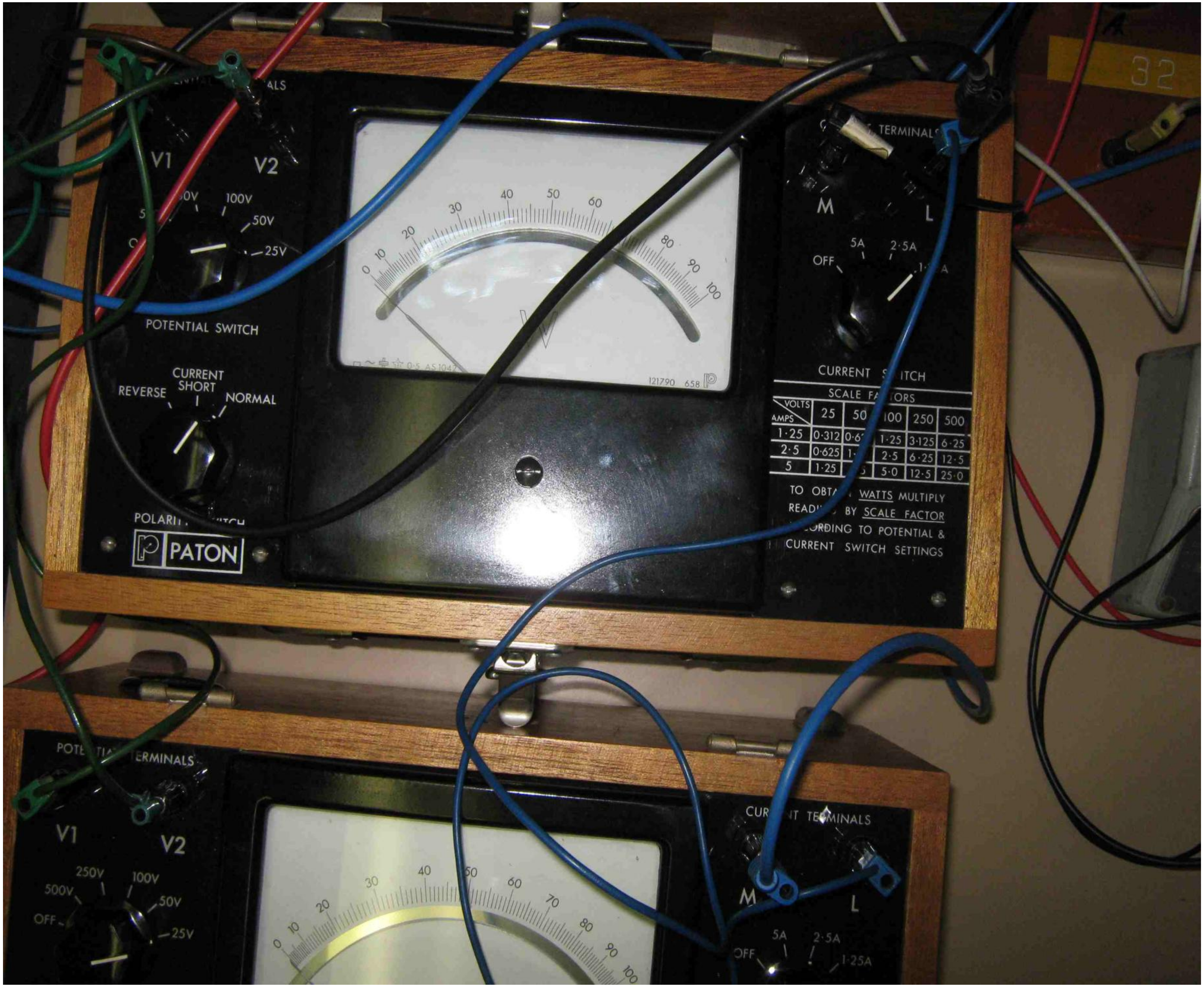

MINI-LAB
H127
KEY CABINET 92360
1.0 PF
WATTMETER


PATON
B72606
0127820AN
POTENTIAL SWITCH
POLARITY SWITCH
PATON
0127801AN
POTENTIAL SWITCH
CURRENT SWITCH
POLARITY SWITCH
TO OBTAIN WATTS MULTIPLY READING BY SCALE FACTOR ACCORDING TO POTENTIAL & CURRENT SWITCH SETTINGS

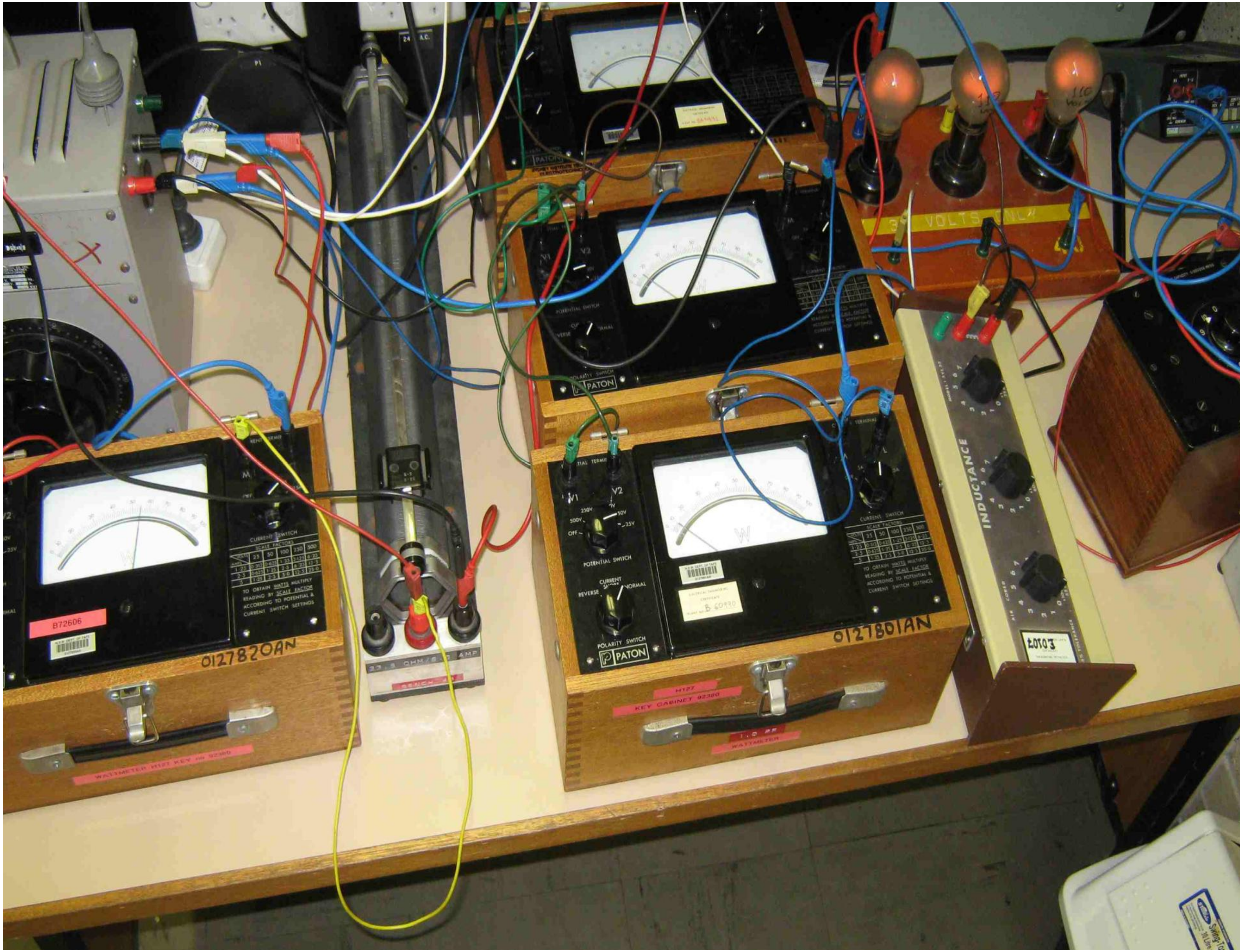


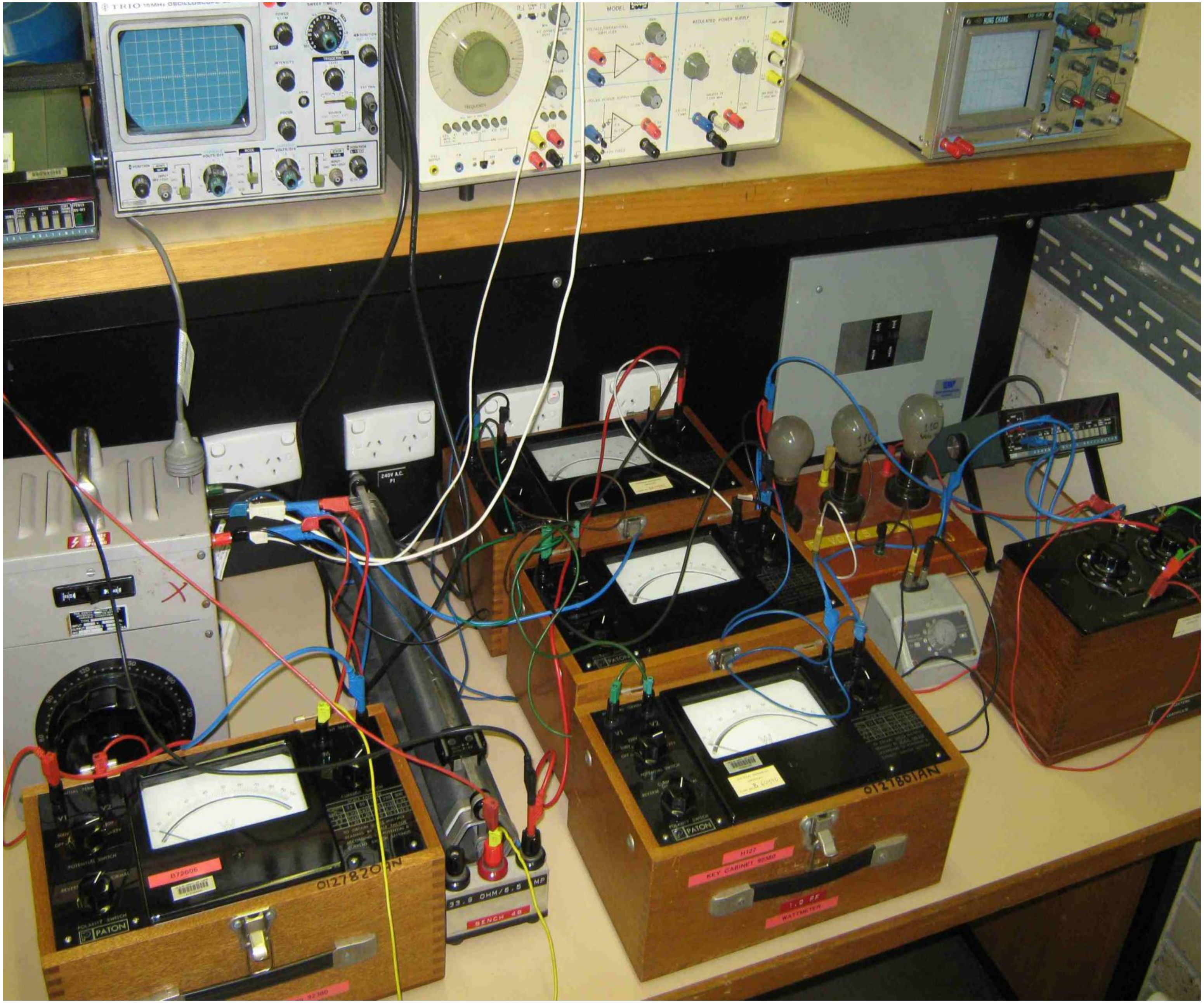
V2
100V
50V
25V
NORMAL
W
121792 658
OFF
5A
B72606
N.S.W. DEPT. OF TAFE
0127820AN
0127820AN

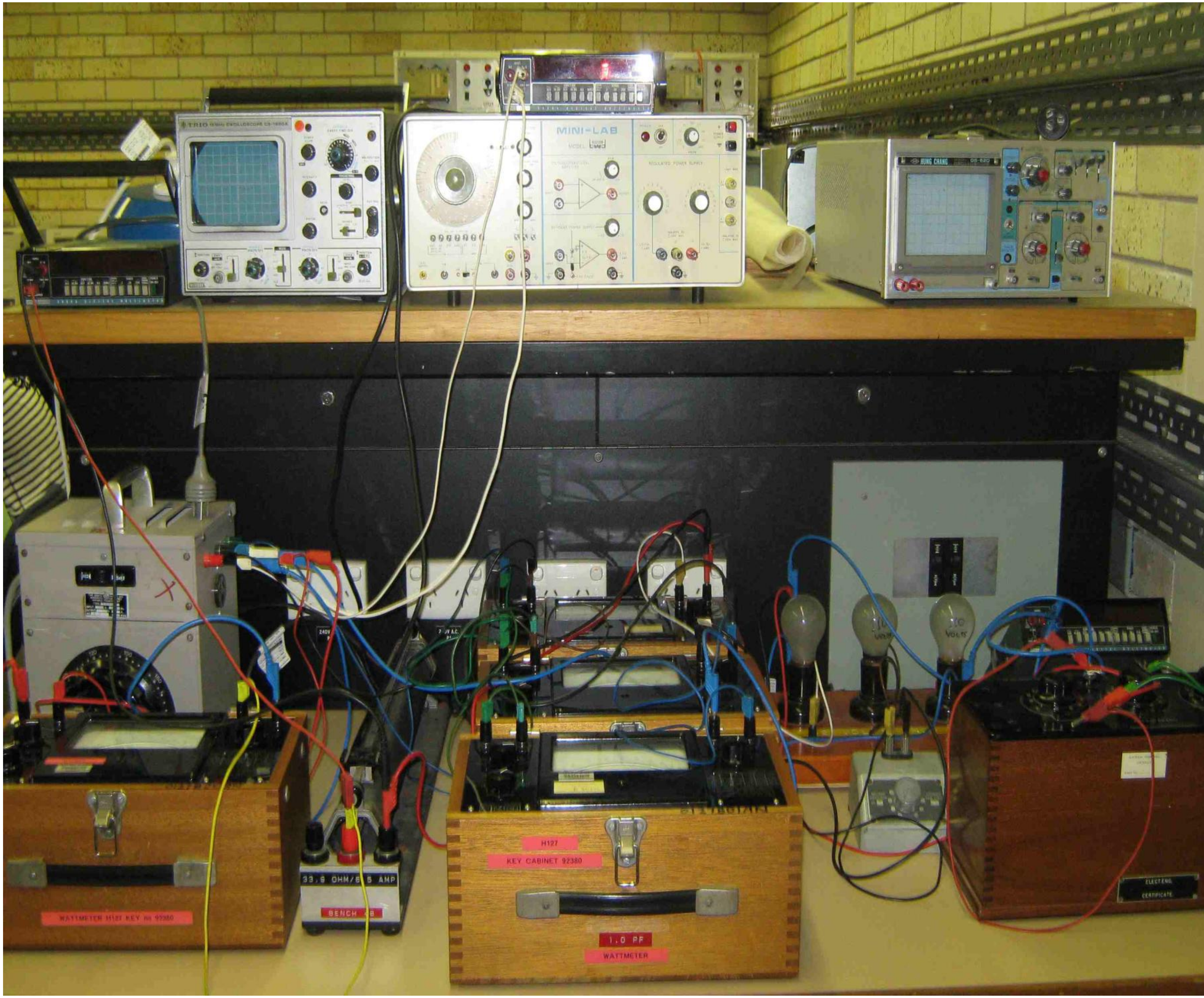

V1
V2
250V
100V
500V
50V
OFF
25V
POTENTIAL SWITCH
CURRENT
SHORT
REVERSE
NORMAL
POLARITY SWITCH
PATON
W
0
10
20
30
40
60
70
80
90
100
N.S.W. DEPT. OF TAFE
0127801AN
ELECTRICAL ENGINEERING
CERTIFICATE
PLANT NO. B 60990
M
L
5A
2·5A
OFF
1·25A
CURRENT SWITCH
SCALE FACTORS
VOLTS
AMPS
25
50
100
250
500
1·25
0·312
0·625
1·25
3·125
6·25
2·5
0·625
1·25
2·5
6·25
12·5
5
1·25
2·5
5·0
12·5
25·0
TO OBTAIN WATTS MULTIPLY
READING BY SCALE FACTOR
ACCORDING TO POTENTIAL &
CURRENT SWITCH SETTINGS
0127801AN

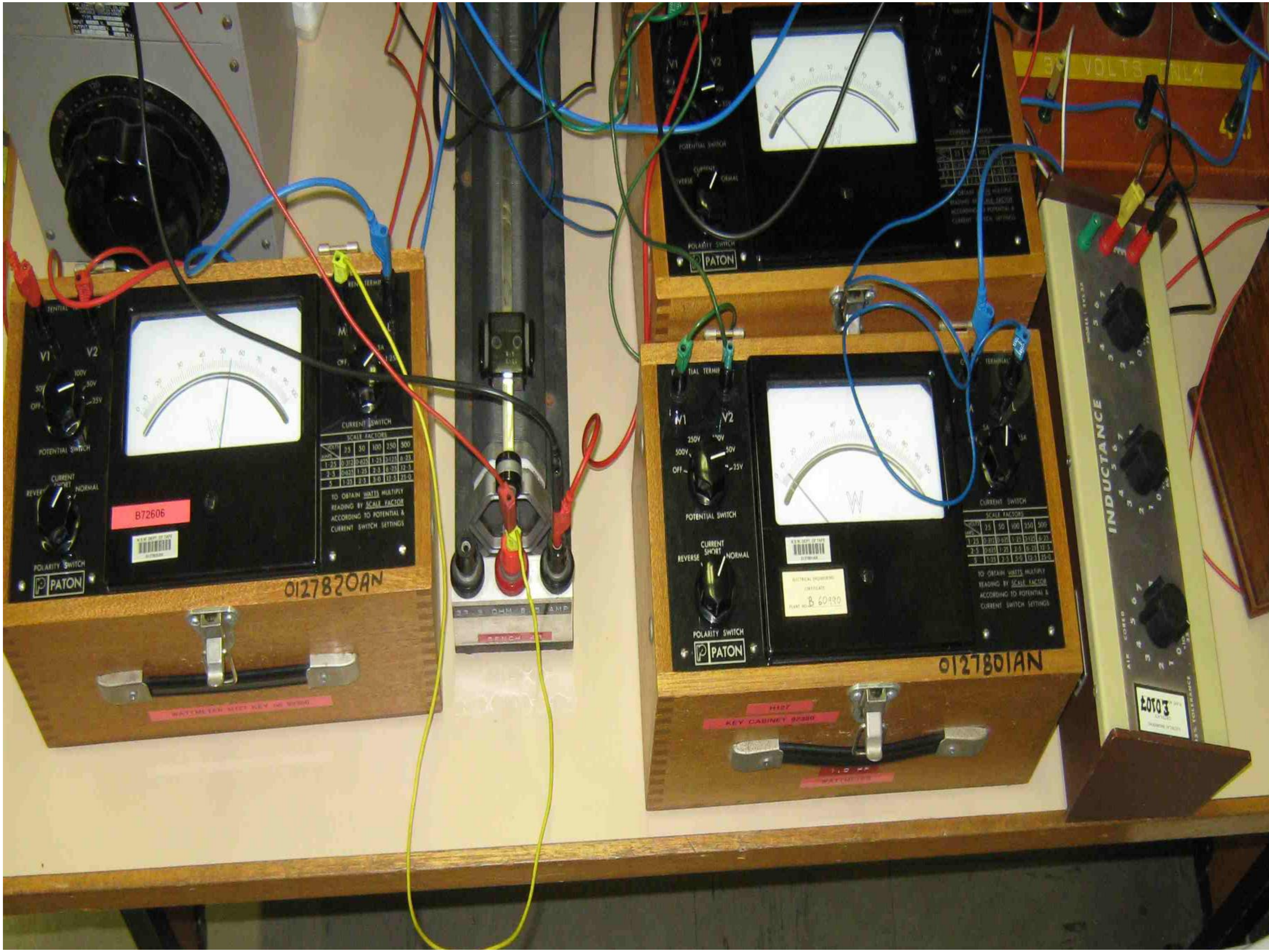


V1
V2
100V
50V
25V
POTENTIAL SWITCH
REVERSE
CURRENT SHORT
NORMAL
PATON
0 10 20 30 40 50 60 80 90 100
121790 658
TERMINALS
M
L
OFF
5A
2·5A
CURRENT
WATTS MULTIPLY
BY SCALE FACTOR
TO POTENTIAL &
CURRENT SWITCH SETTINGS
32
V1
V2
500V
250V
100V
50V
OFF
25V
0 10 20 30 40 50 60 70 80 90 100
M
L
OFF
5A
2·5A
1·25A

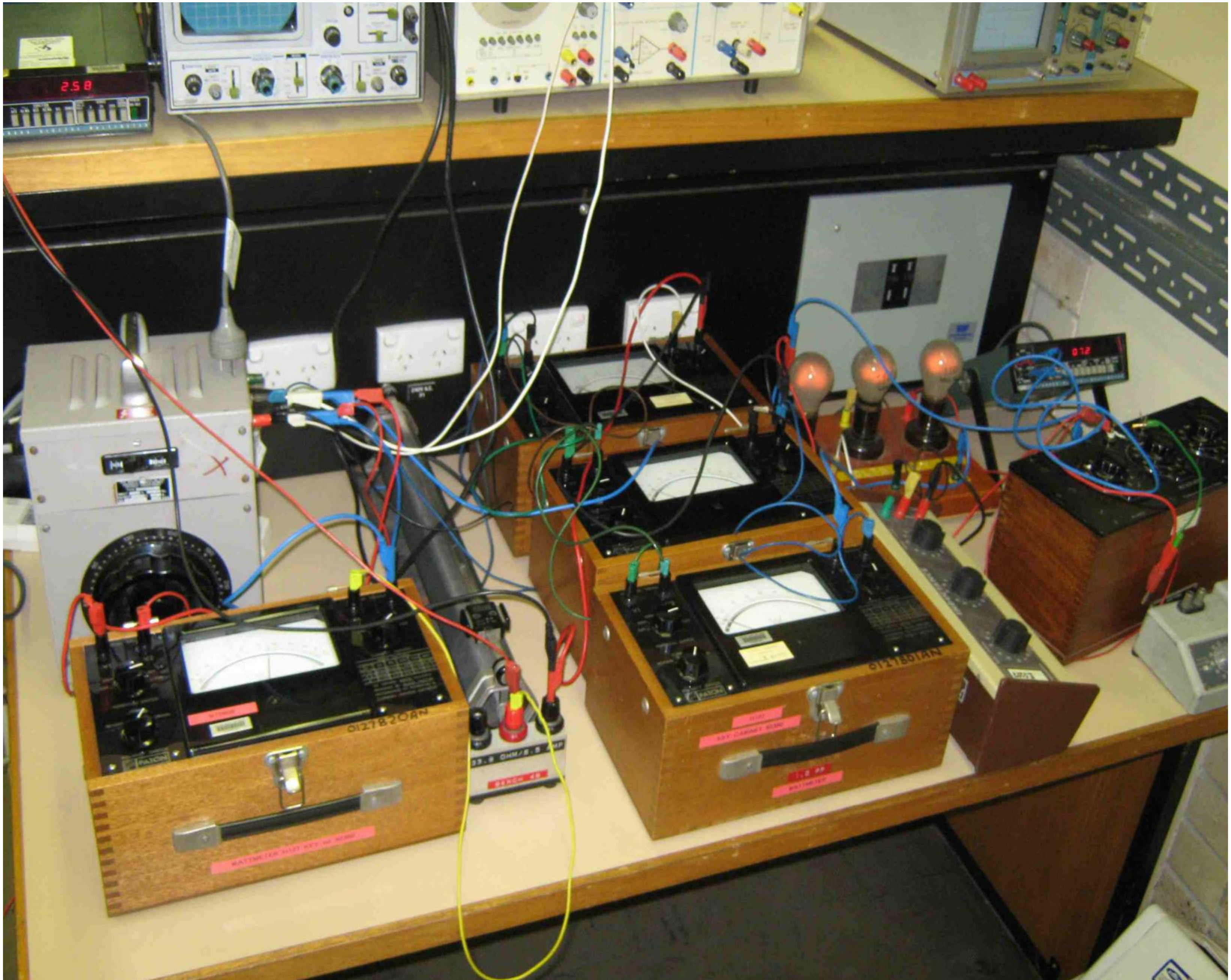

INDUCTANCE
PATON
POLARITY SWITCH
POTENTIAL SWITCH
CURRENT SWITCH
SCALE FACTORS
TO OBTAIN WATTS MULTIPLY READING BY SCALE FACTOR ACCORDING TO POTENTIAL & CURRENT SWITCH SETTINGS
REVERSE
NORMAL
B72606
0127820AN
0127801AN
KEY CABINET 92380
H127
WATTMETER

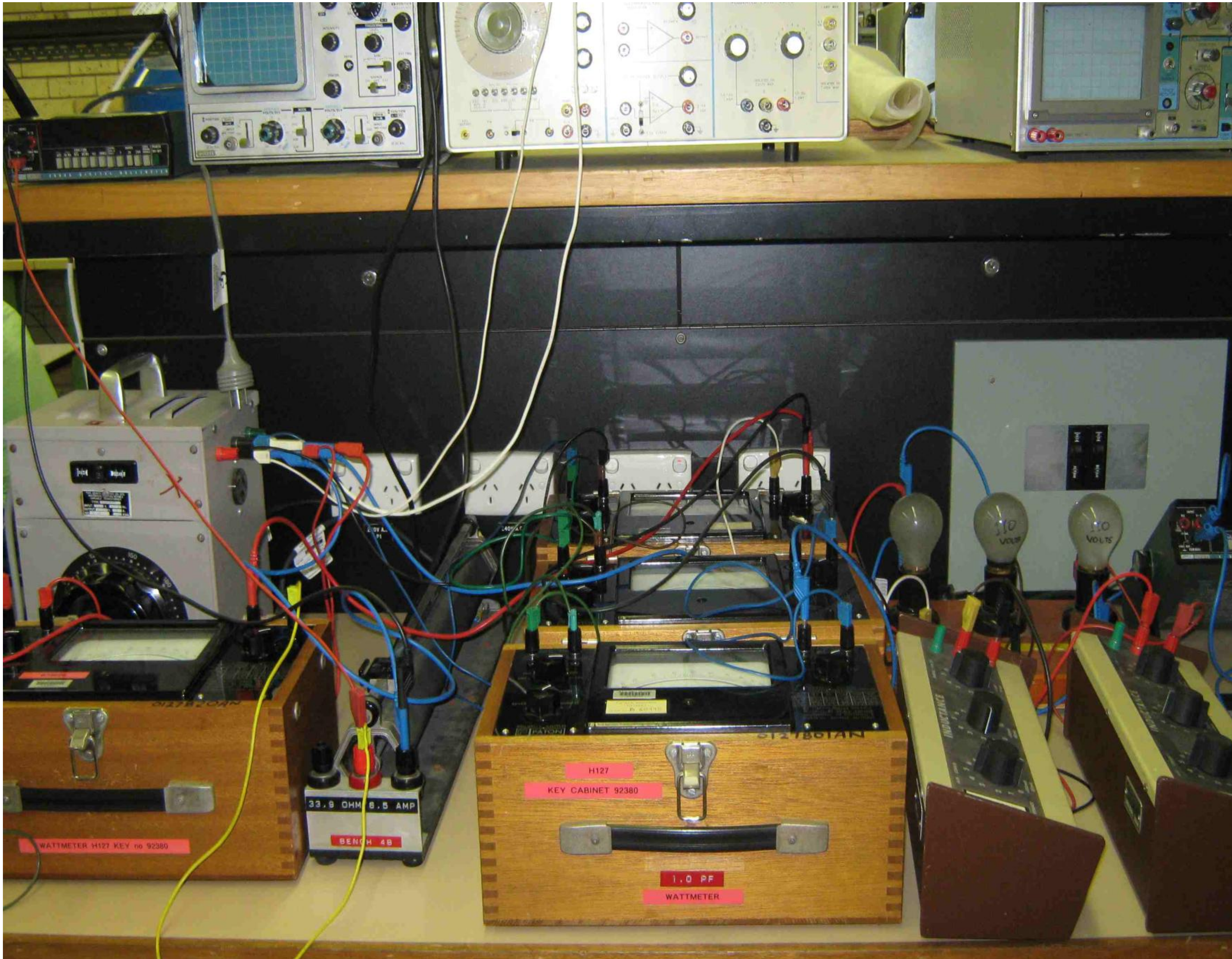

TRIO
240V A.C.
PATON
BENCH 4B
WATTMETER

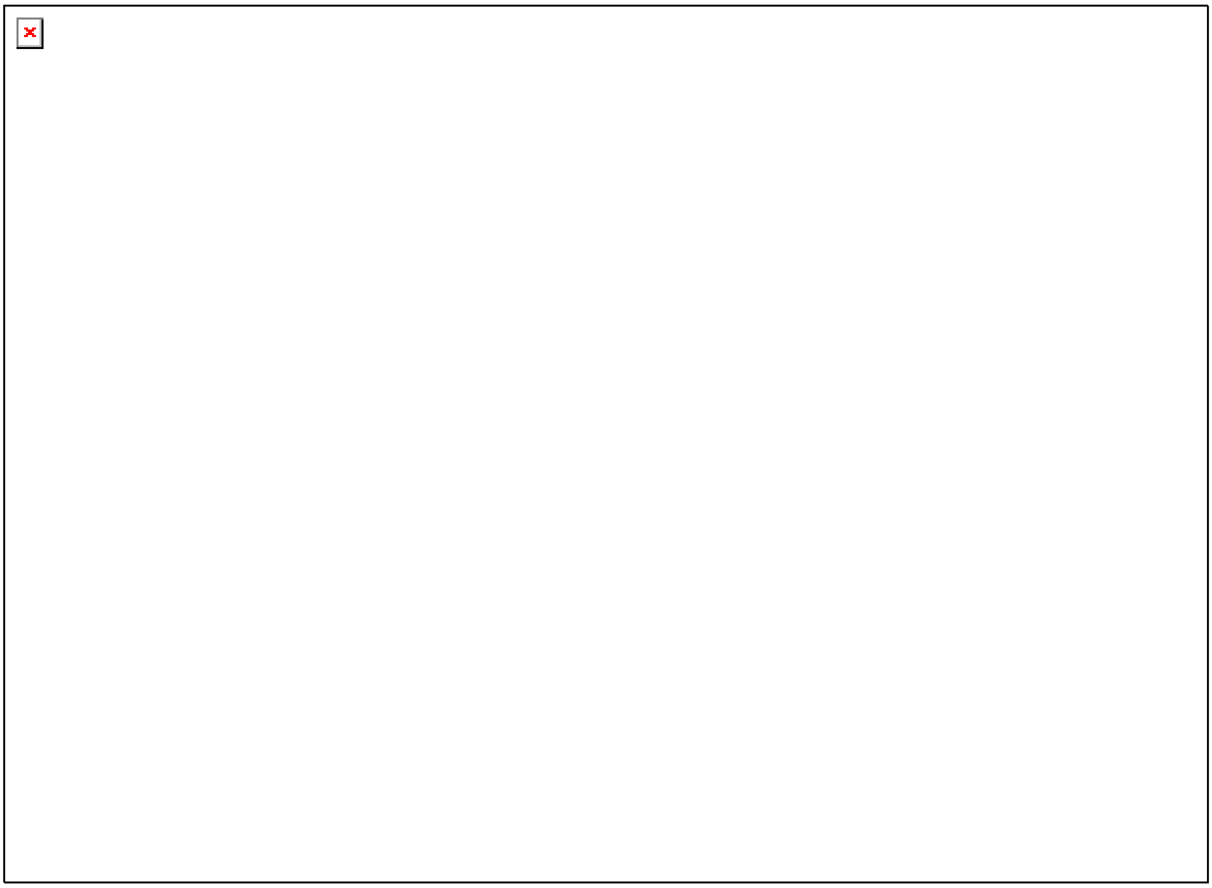

MINI-LAB
HUNG CHANG
H127
KEY CABINET 92380
1.0 PF
WATTMETER

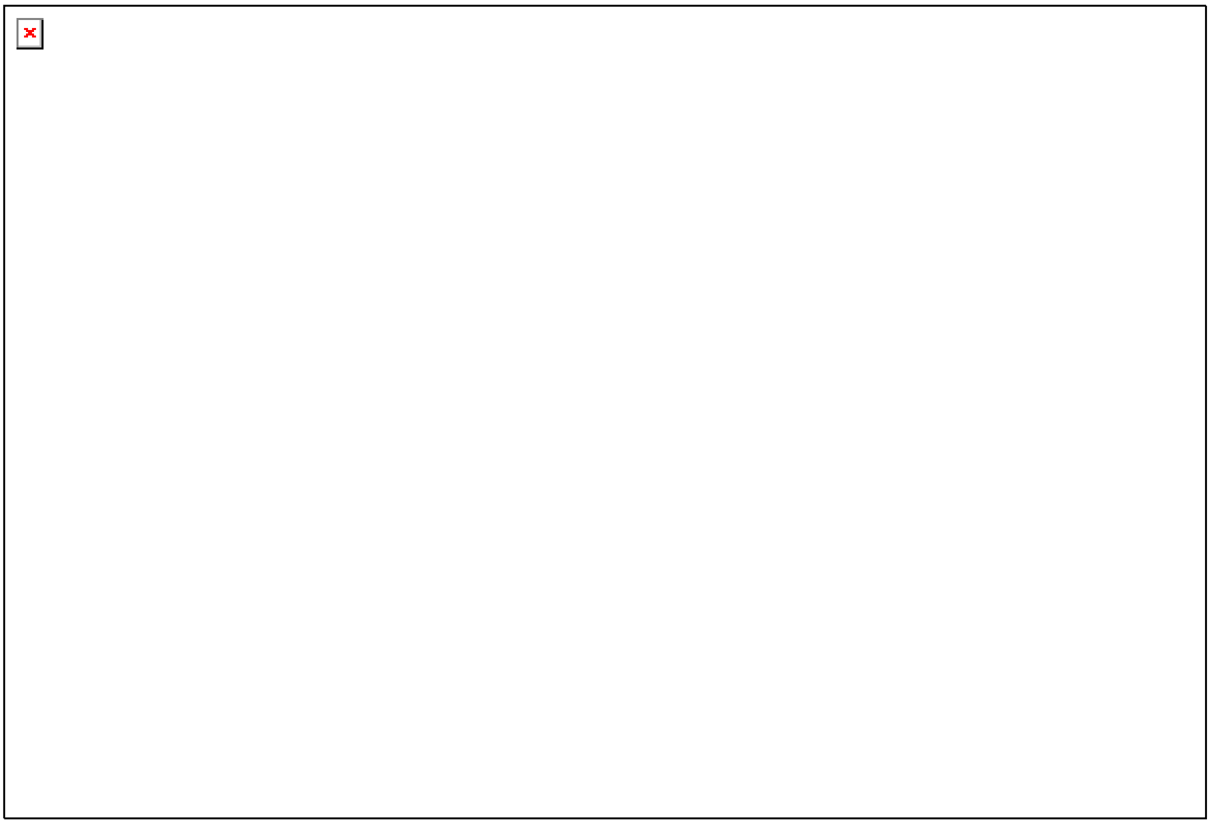

V1
V2
POTENTIAL SWITCH
CURRENT SWITCH
REVERSE
CURRENT SHORT
NORMAL
POLARITY SWITCH
PATON
SCALE FACTORS
TO OBTAIN WATTS MULTIPLY READING BY SCALE FACTOR ACCORDING TO POTENTIAL & CURRENT SWITCH SETTINGS
B72606
0127820AN
0127801AN
KEY CABINET 92350
INDUCTANCE

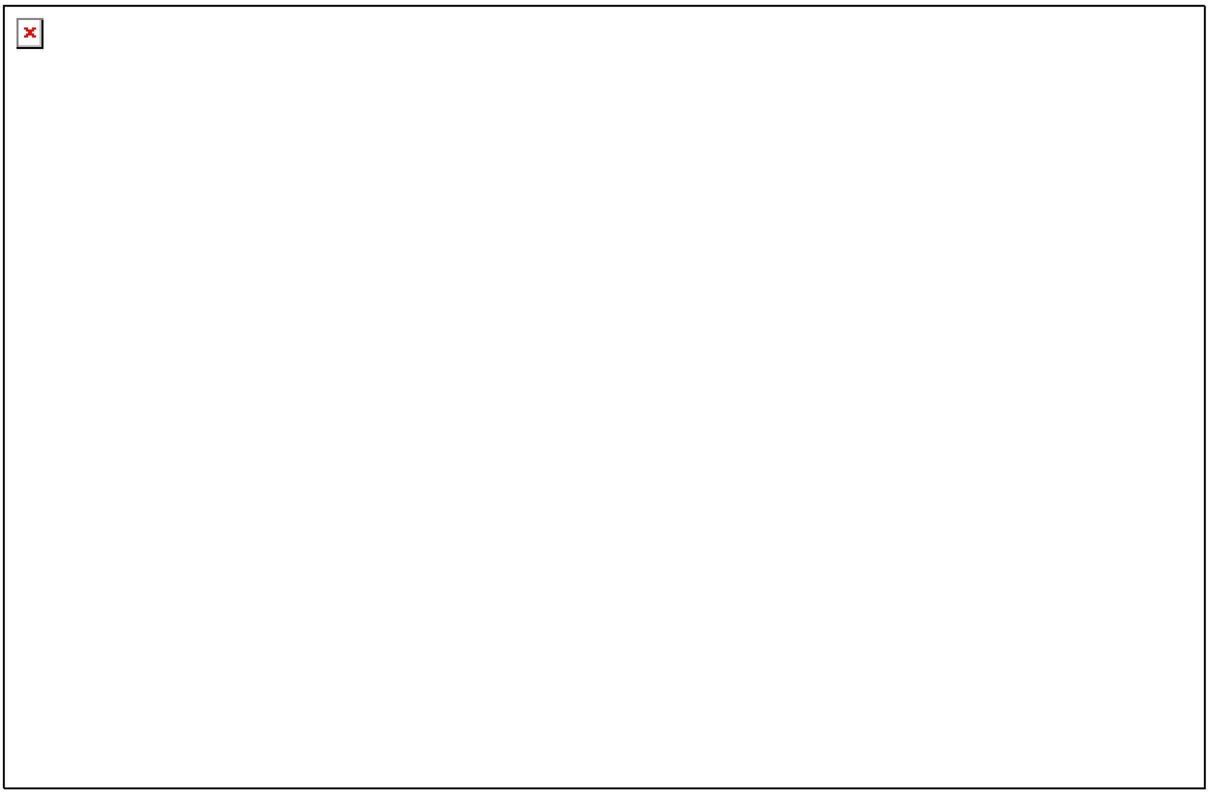

INDUCTANCE
MODEL : SVL 33
AIR CORED
x100mH
35mA
x10mH
60mA
x1mH
75mA
±5% TOLERANCE
ELECTRICAL ENGINEERING
CERTIFICATE
E0107
121687
SCALE FACTORS
CURRENT SWITCH
OBTAIN WATTS MULTIPLY
BY SCALE FACTOR
CORDING TO POTENTIAL &
CURRENT SWITCH SETTINGS

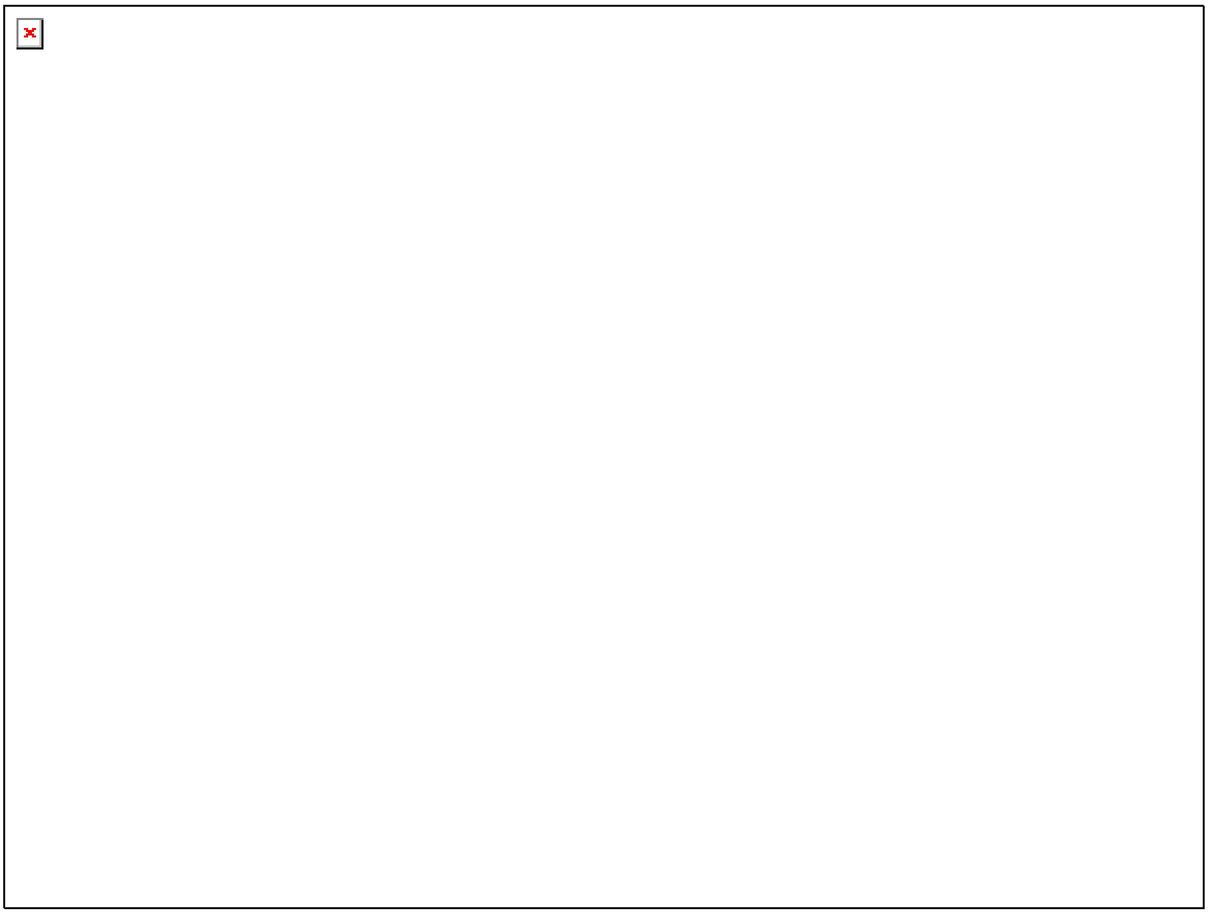


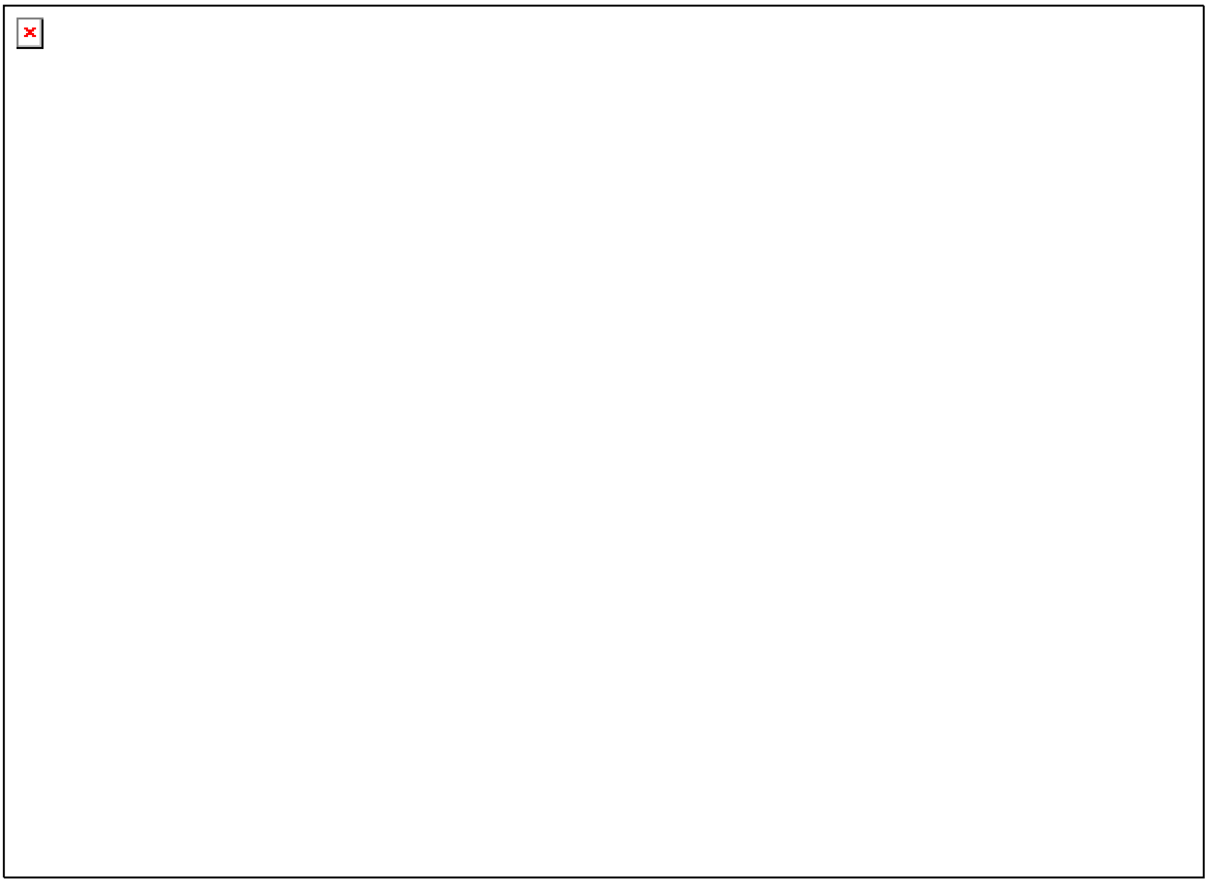

WATTMETER H127 KEY no 92380
33.9 OHM 6.5 AMP
BENCH 4B
H127
KEY CABINET 92380
1.0 PF
WATTMETER
110 VOLTS
110 VOLTS
INDUCTANCE

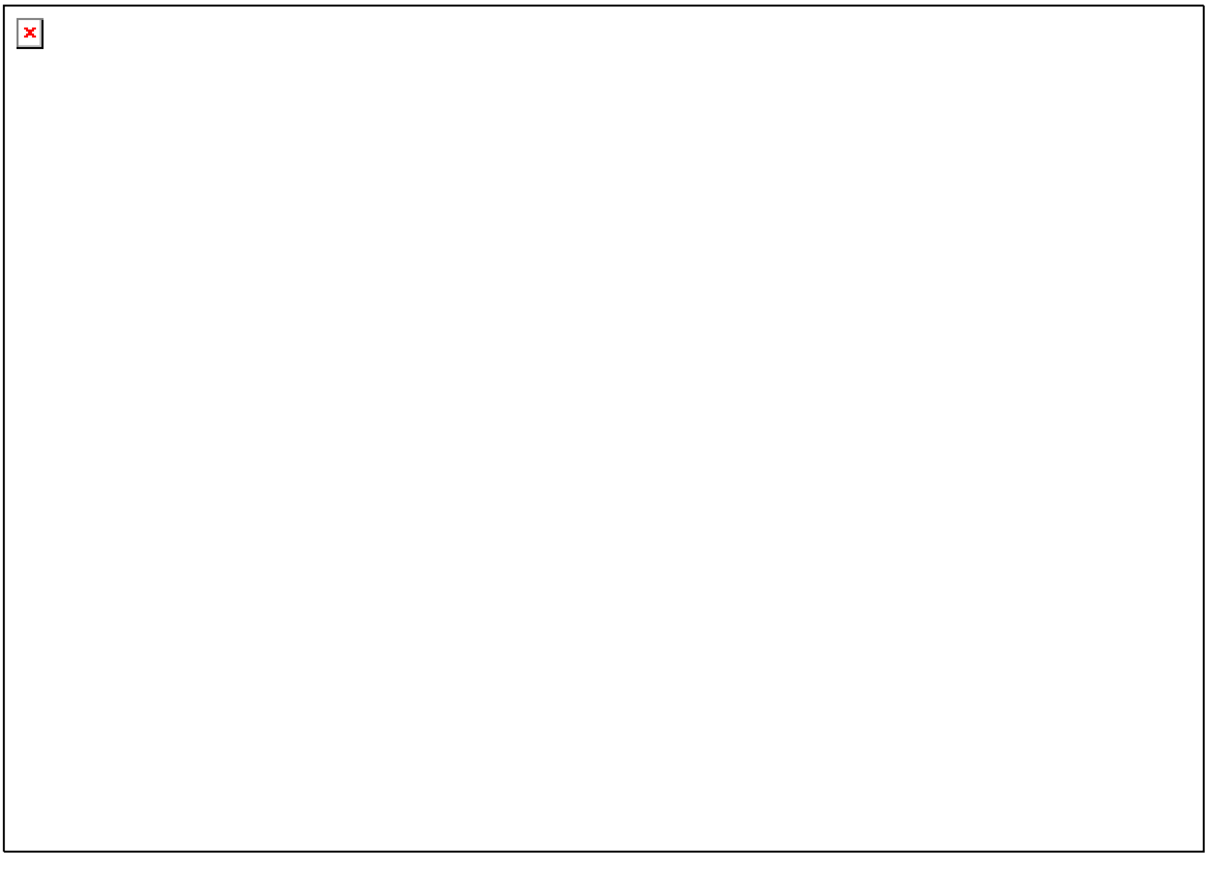


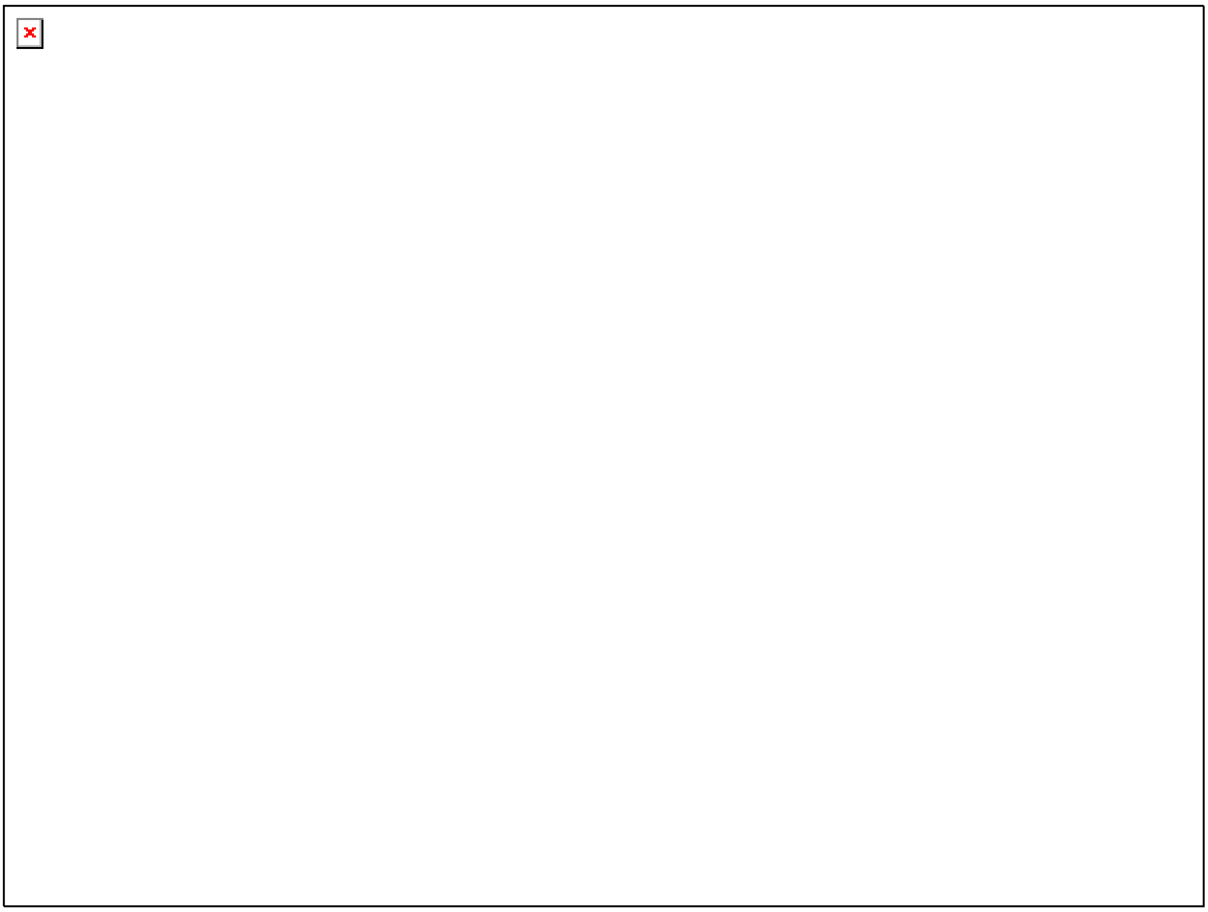


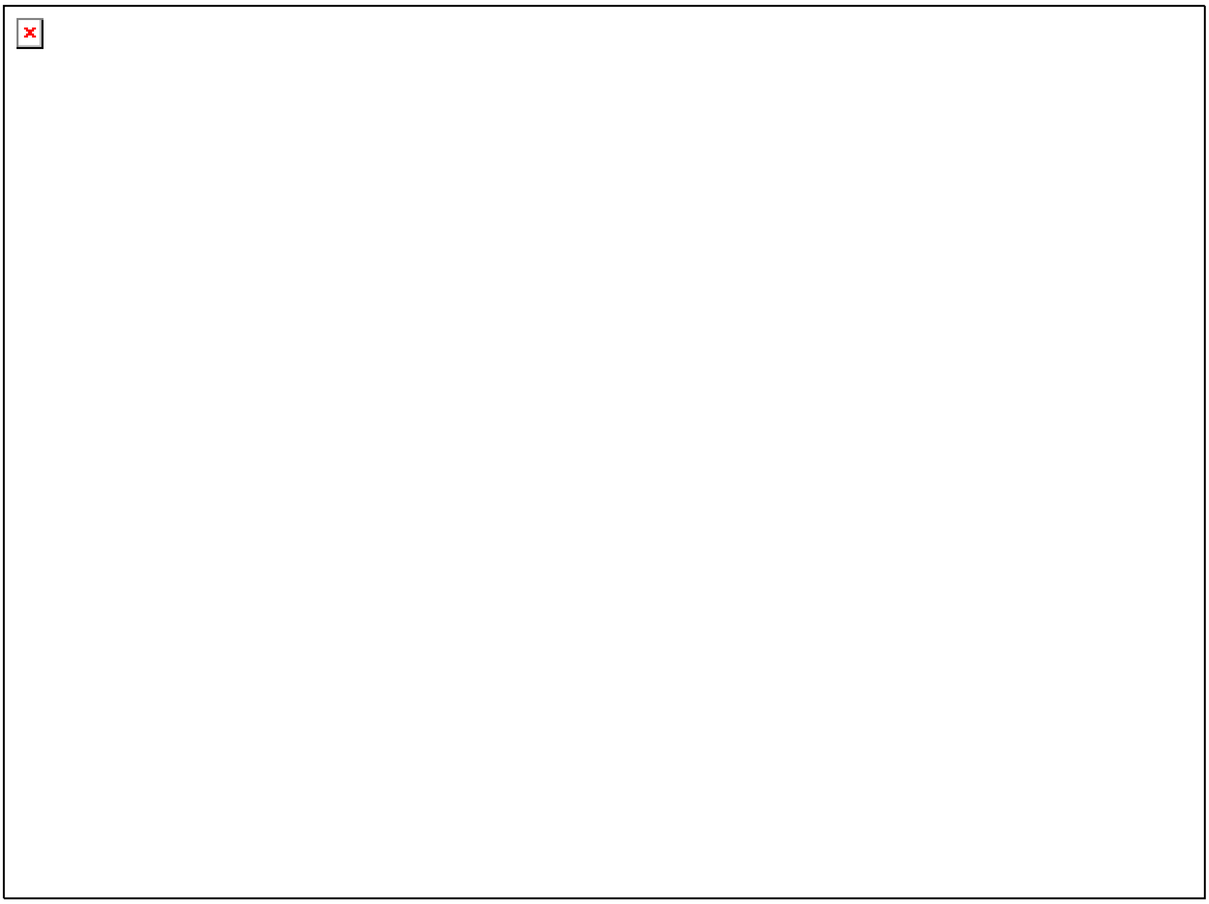


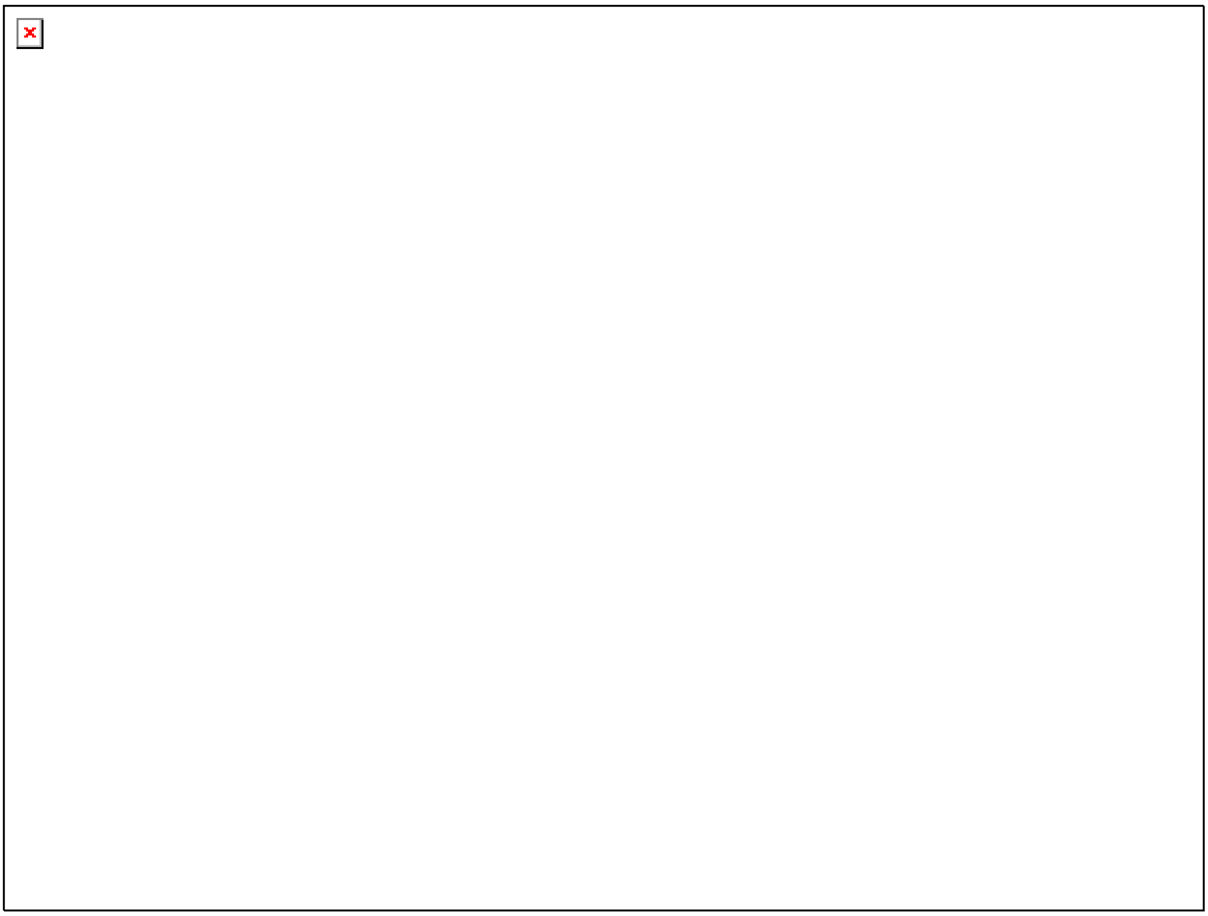


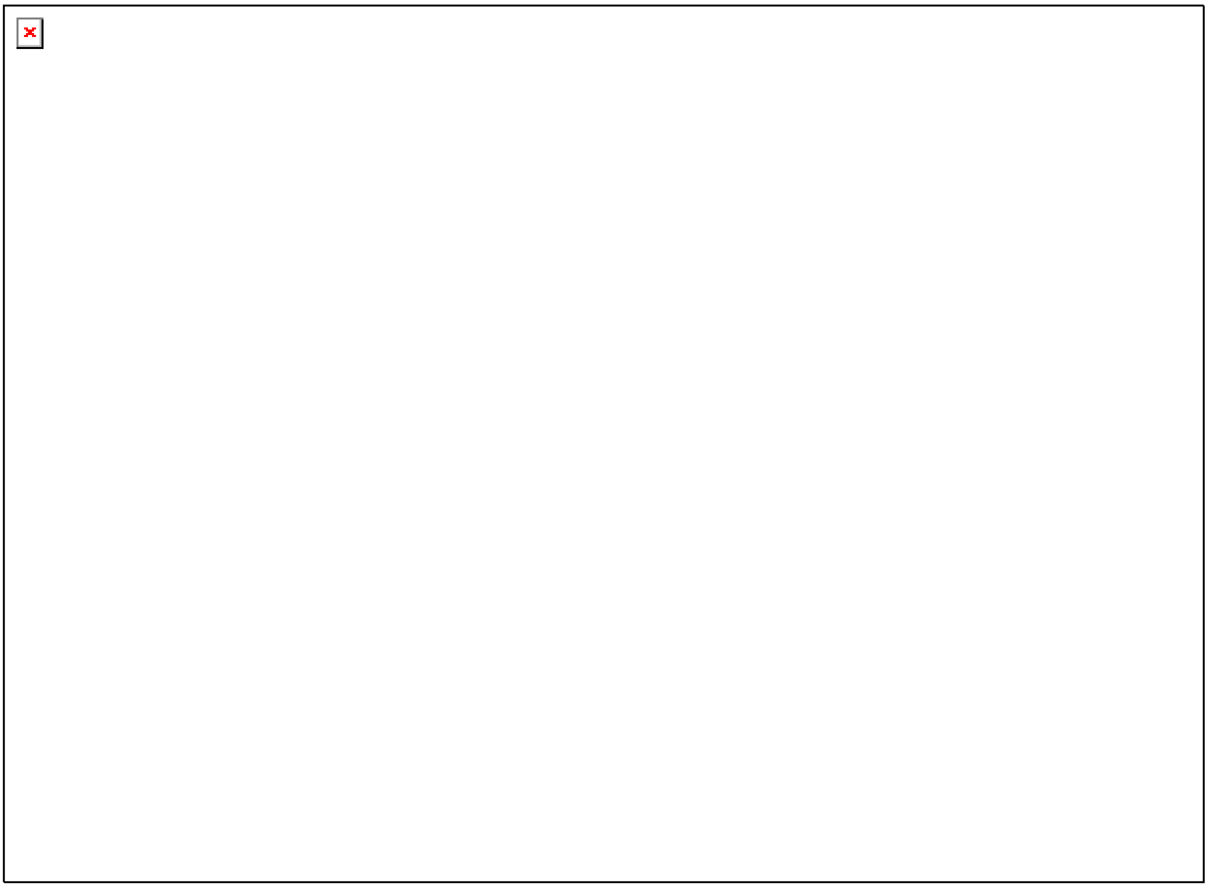


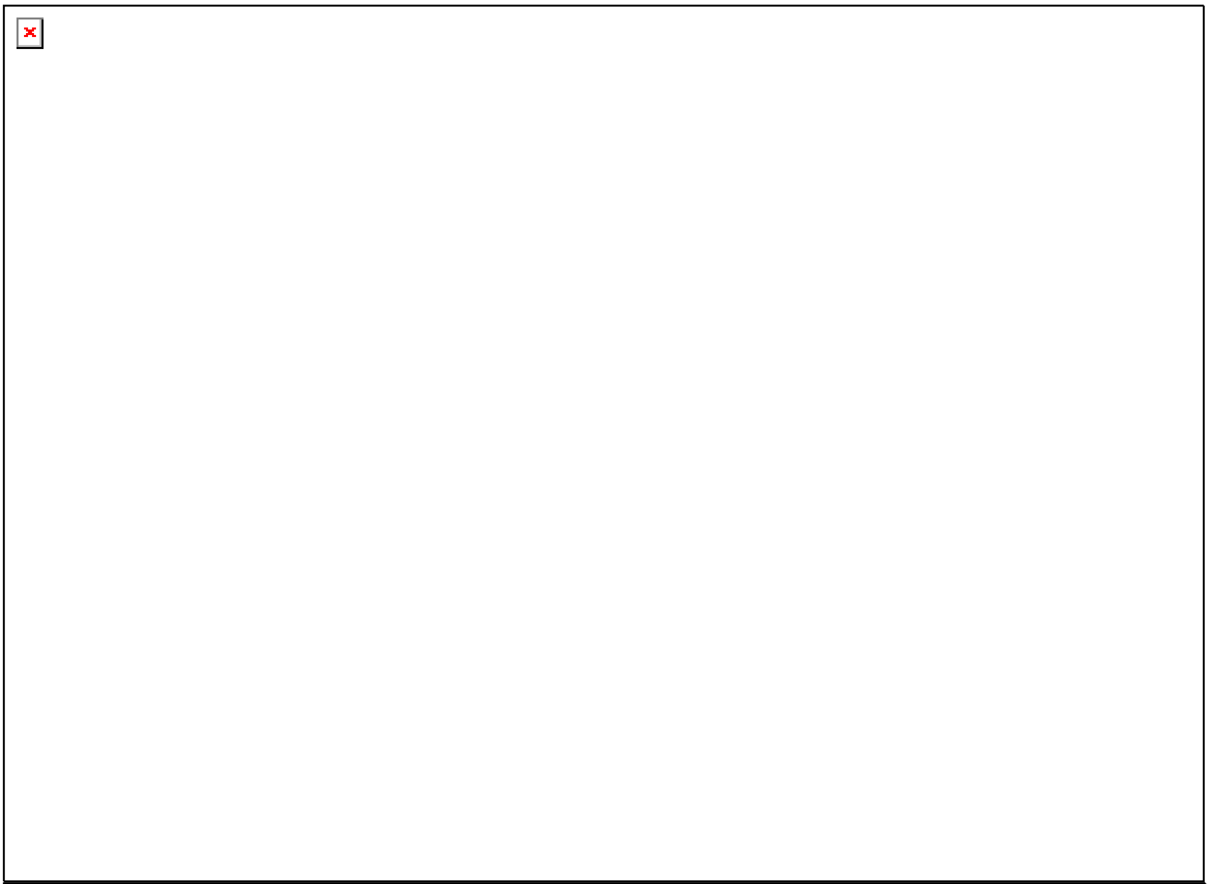


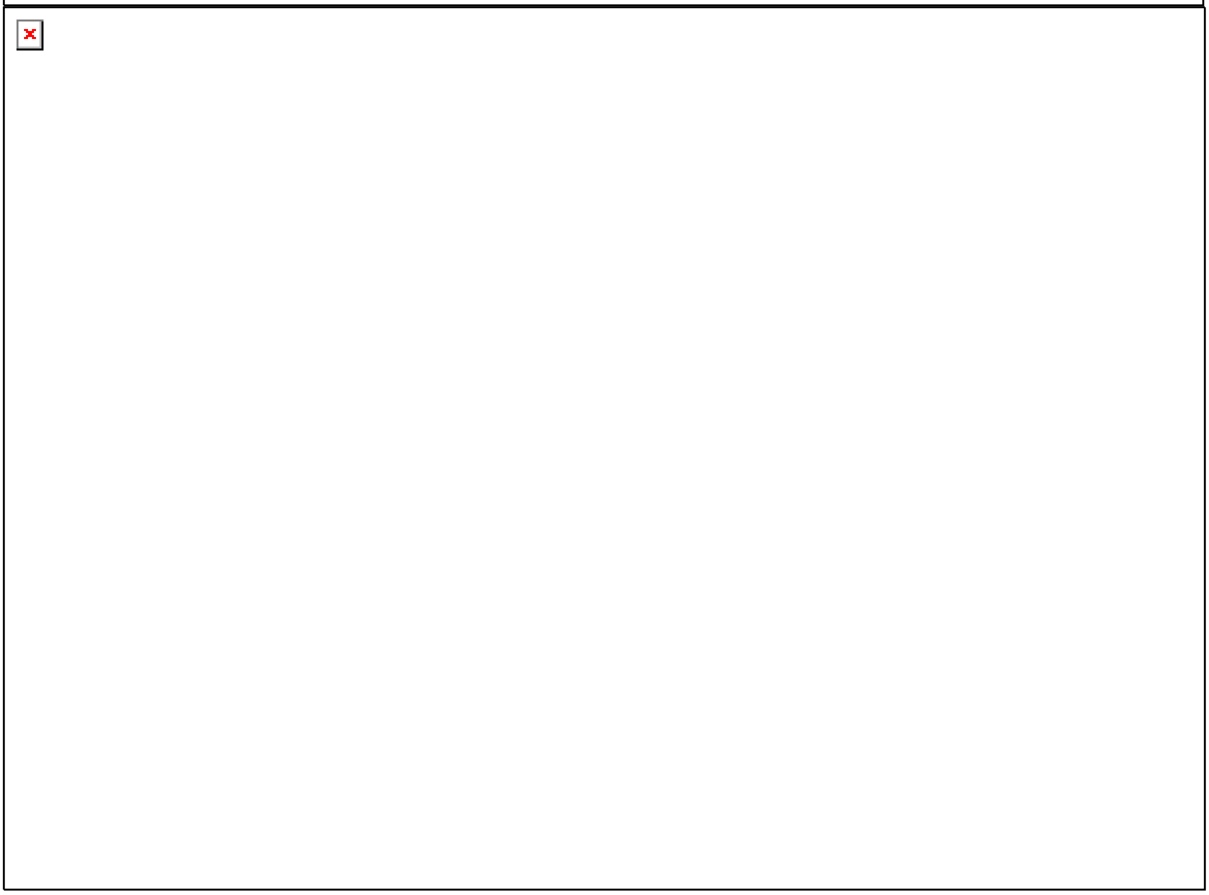


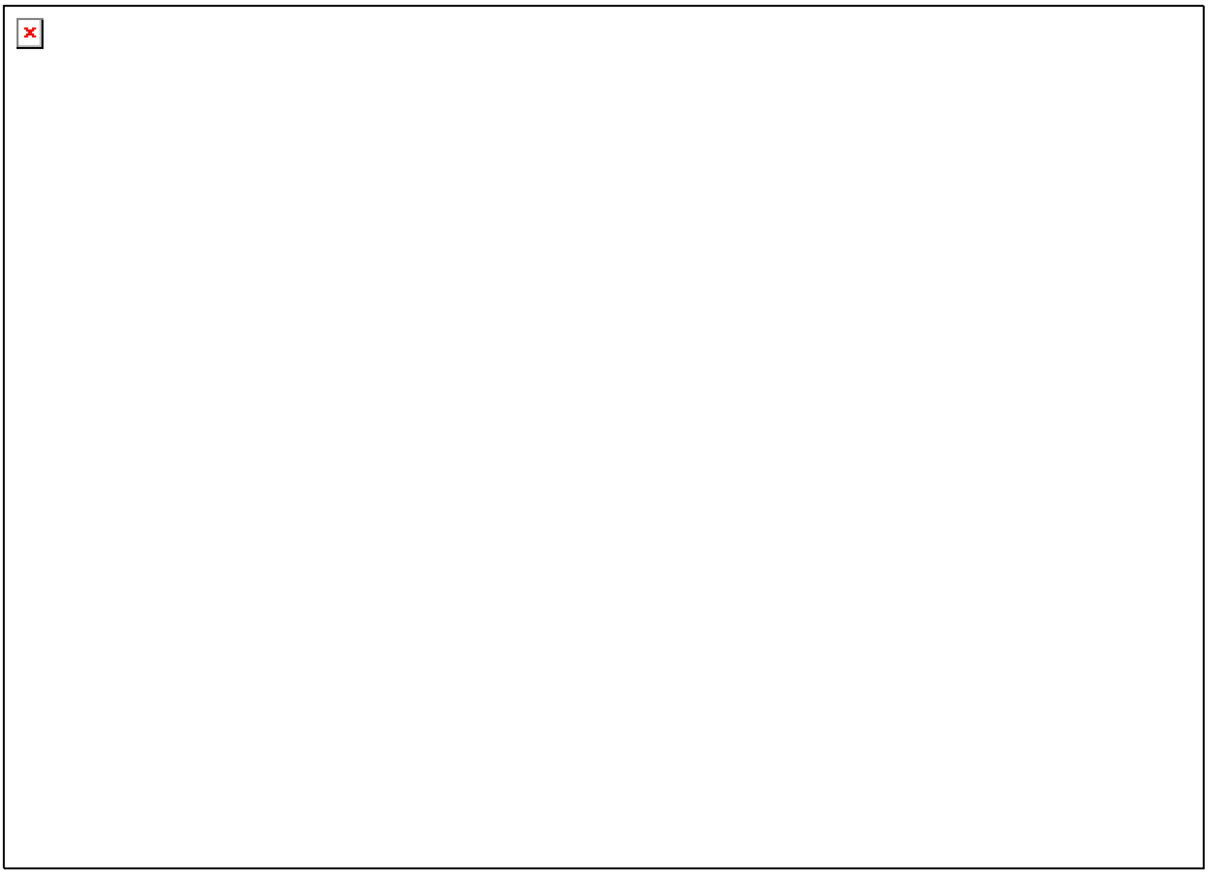


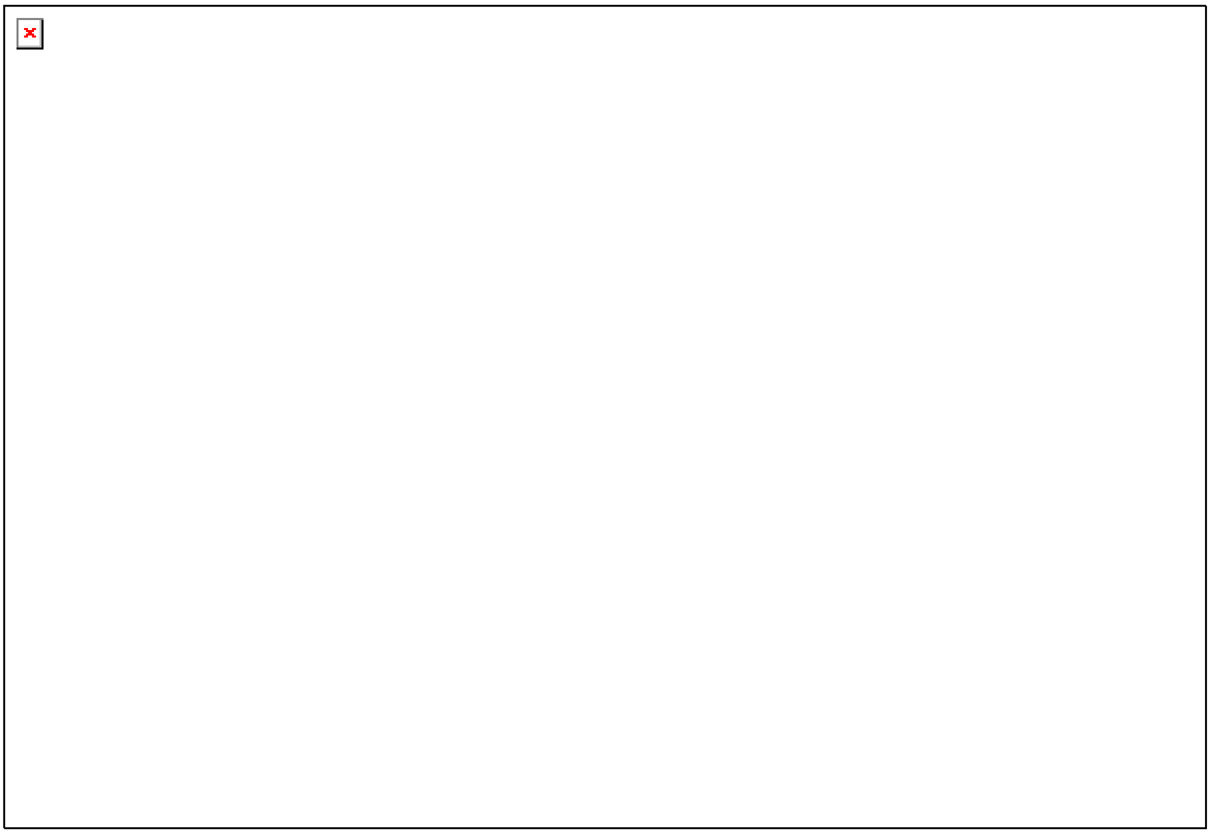


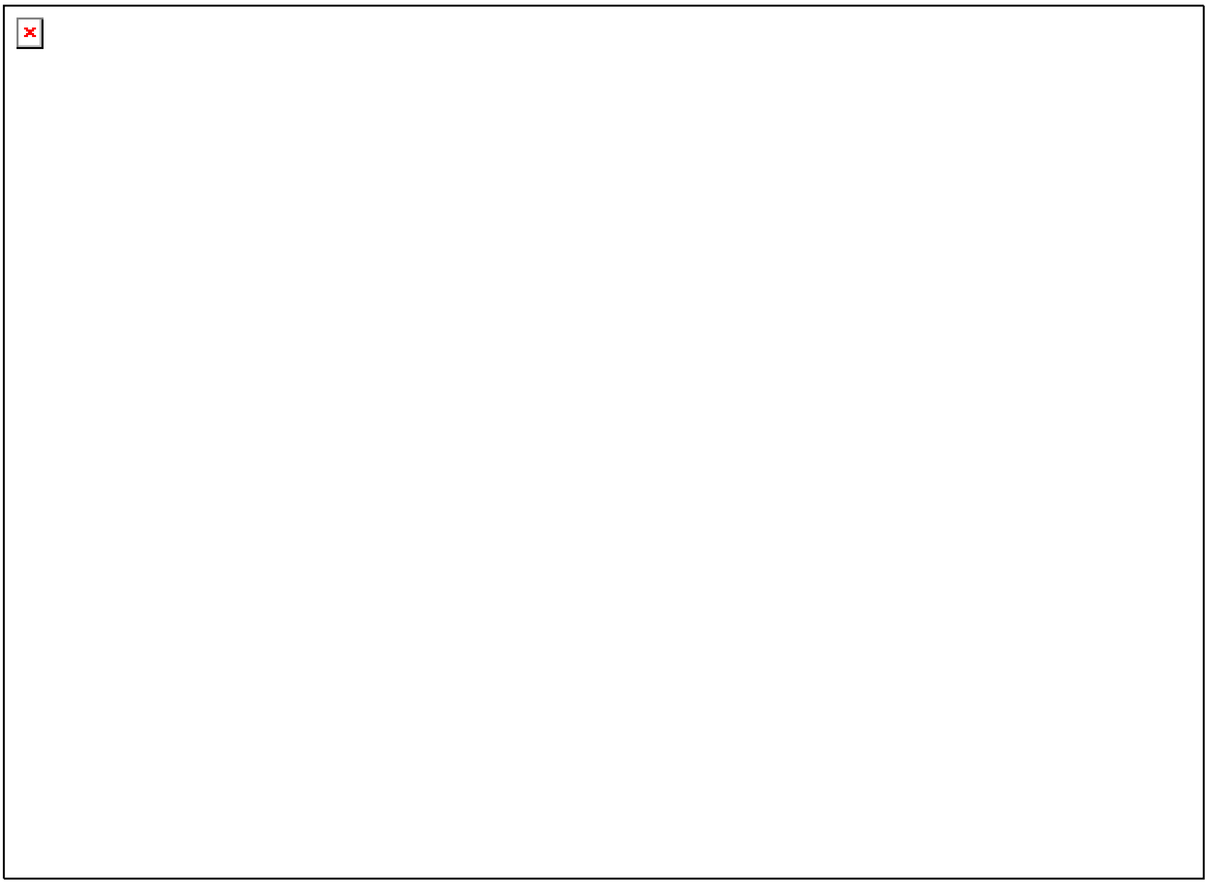


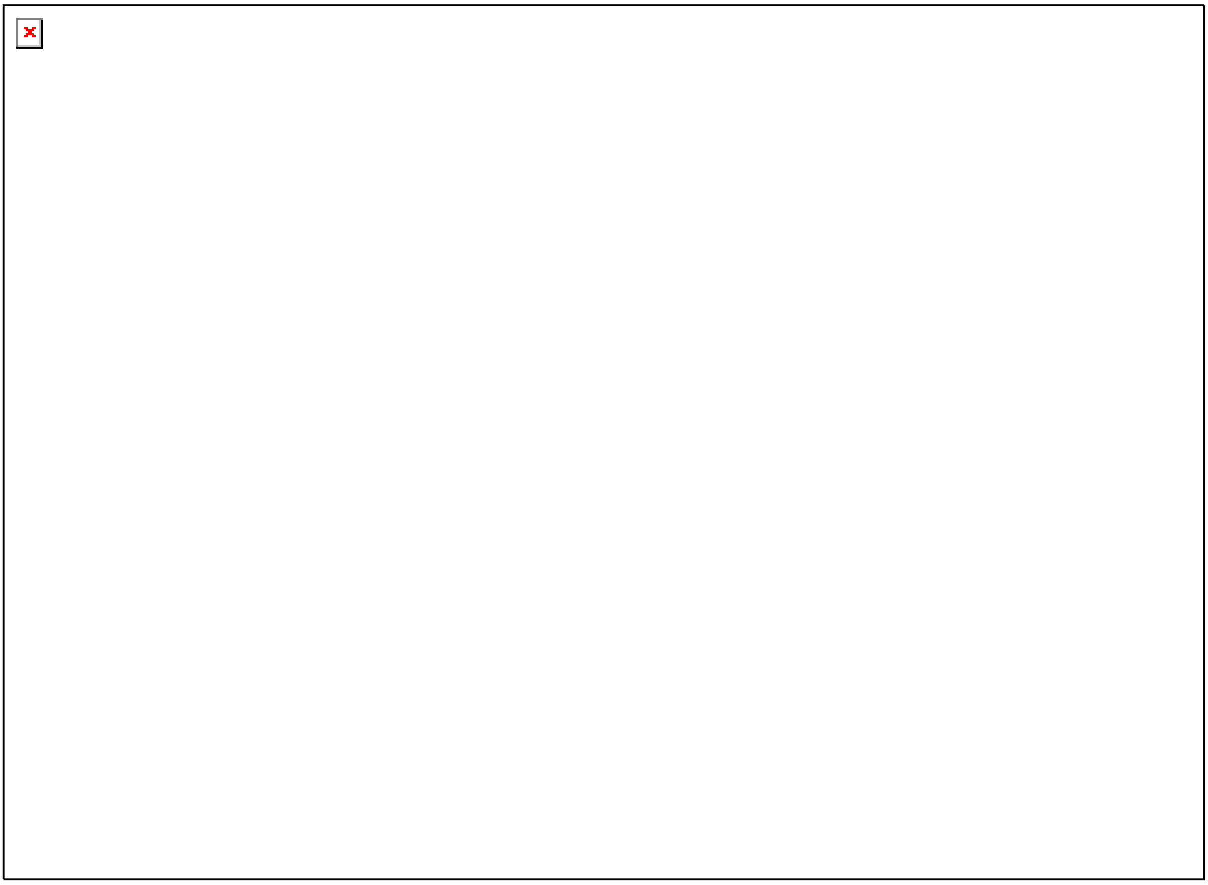


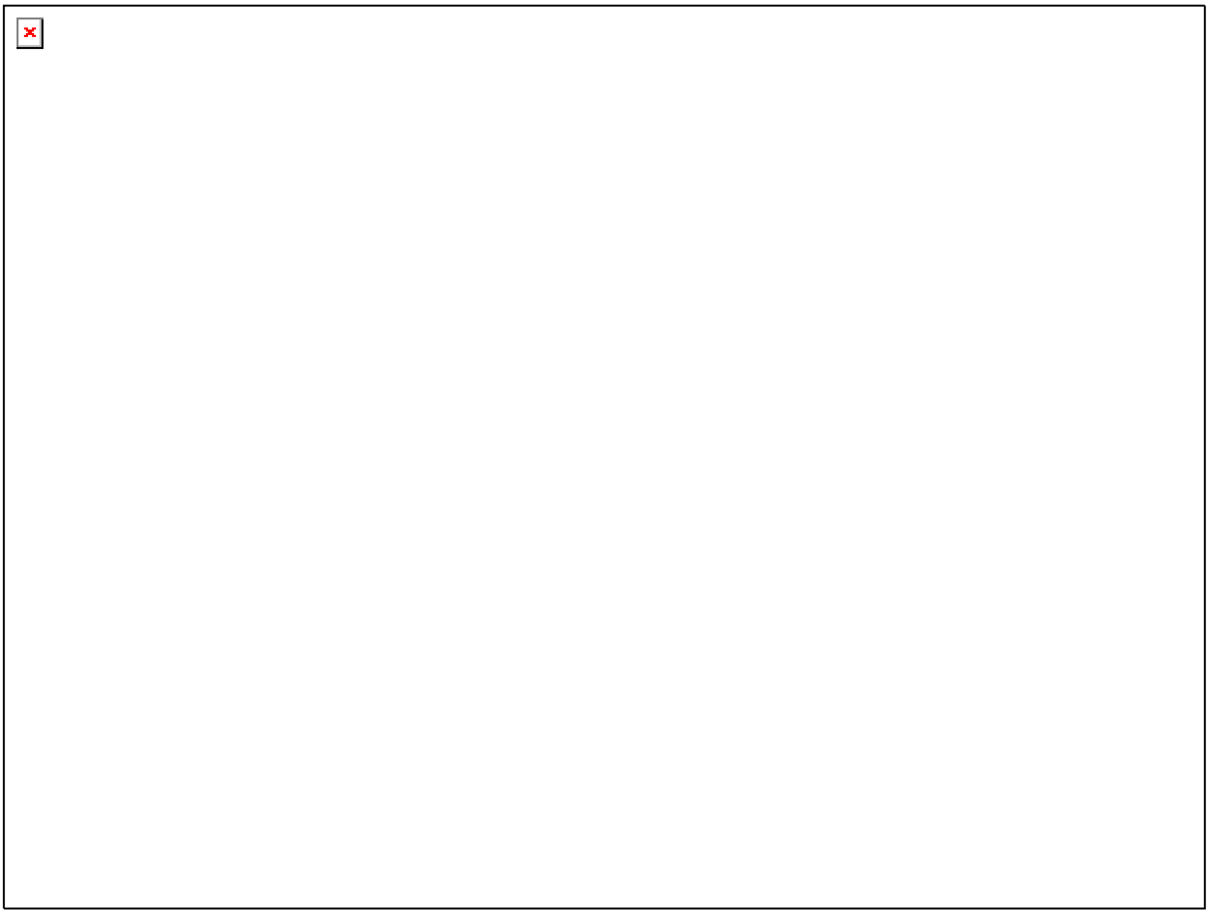


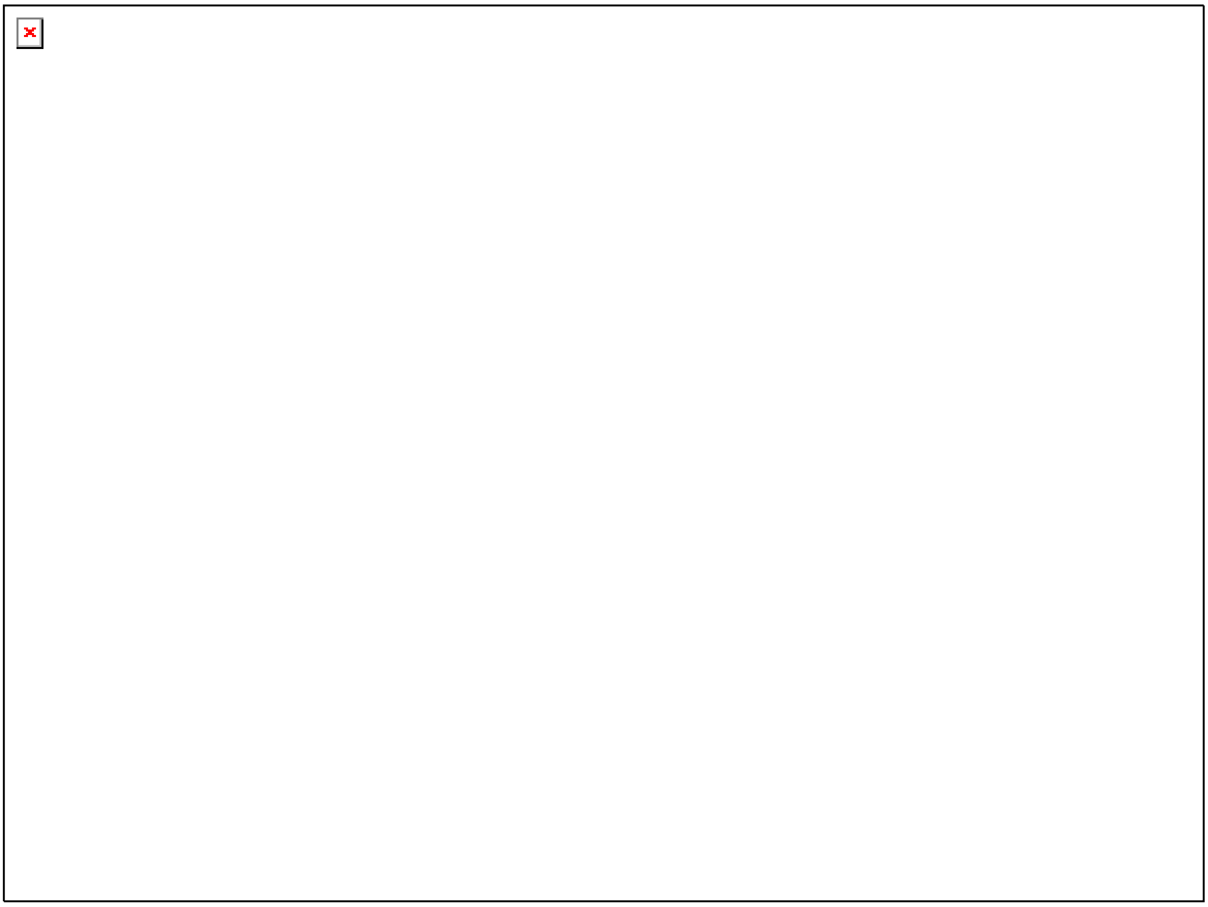


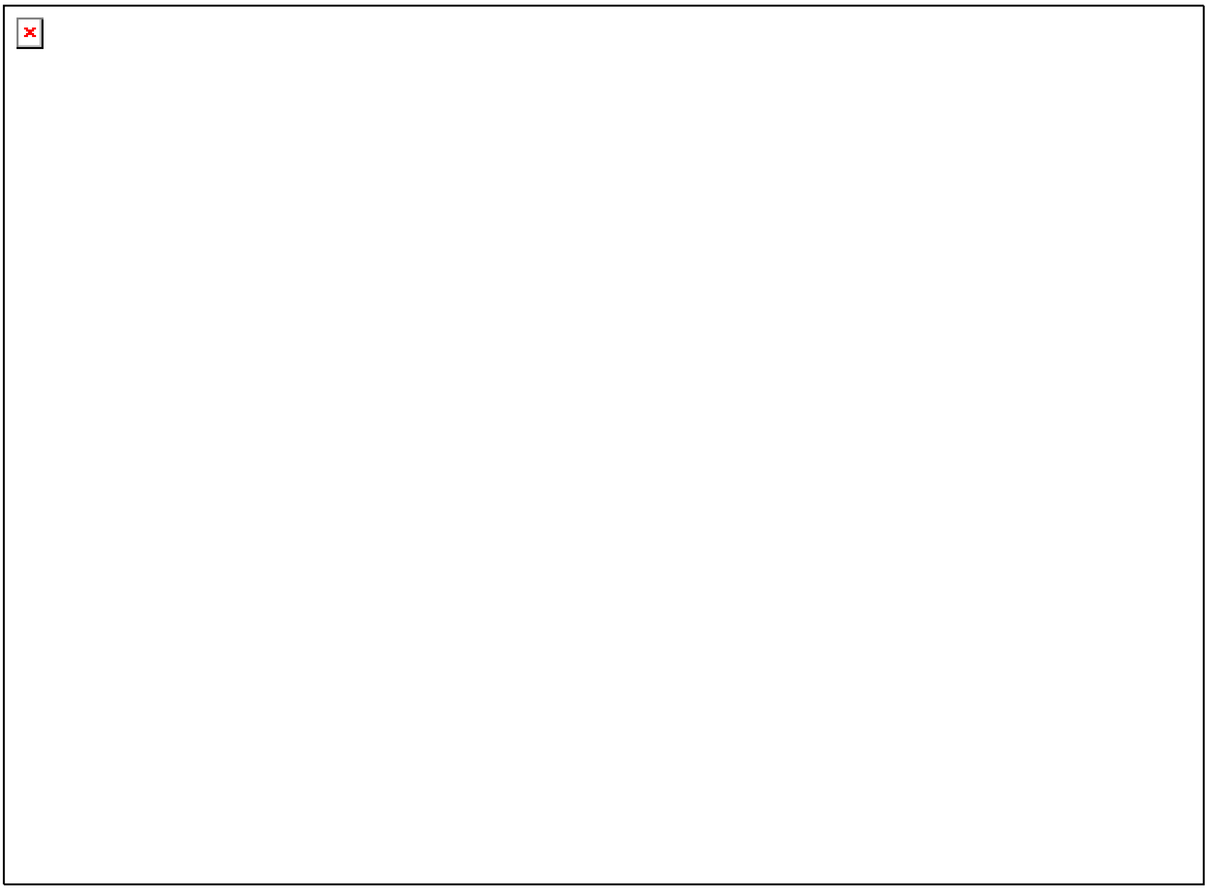


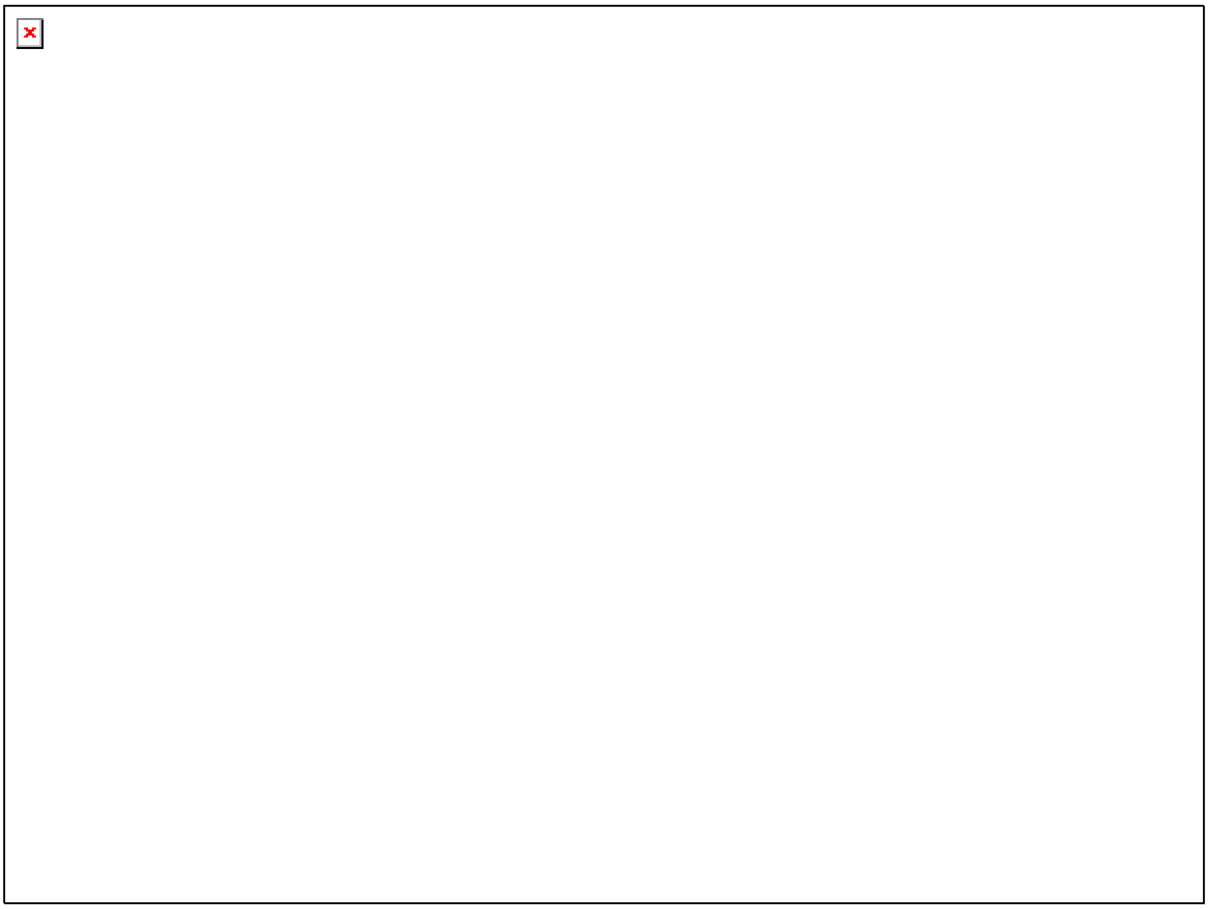


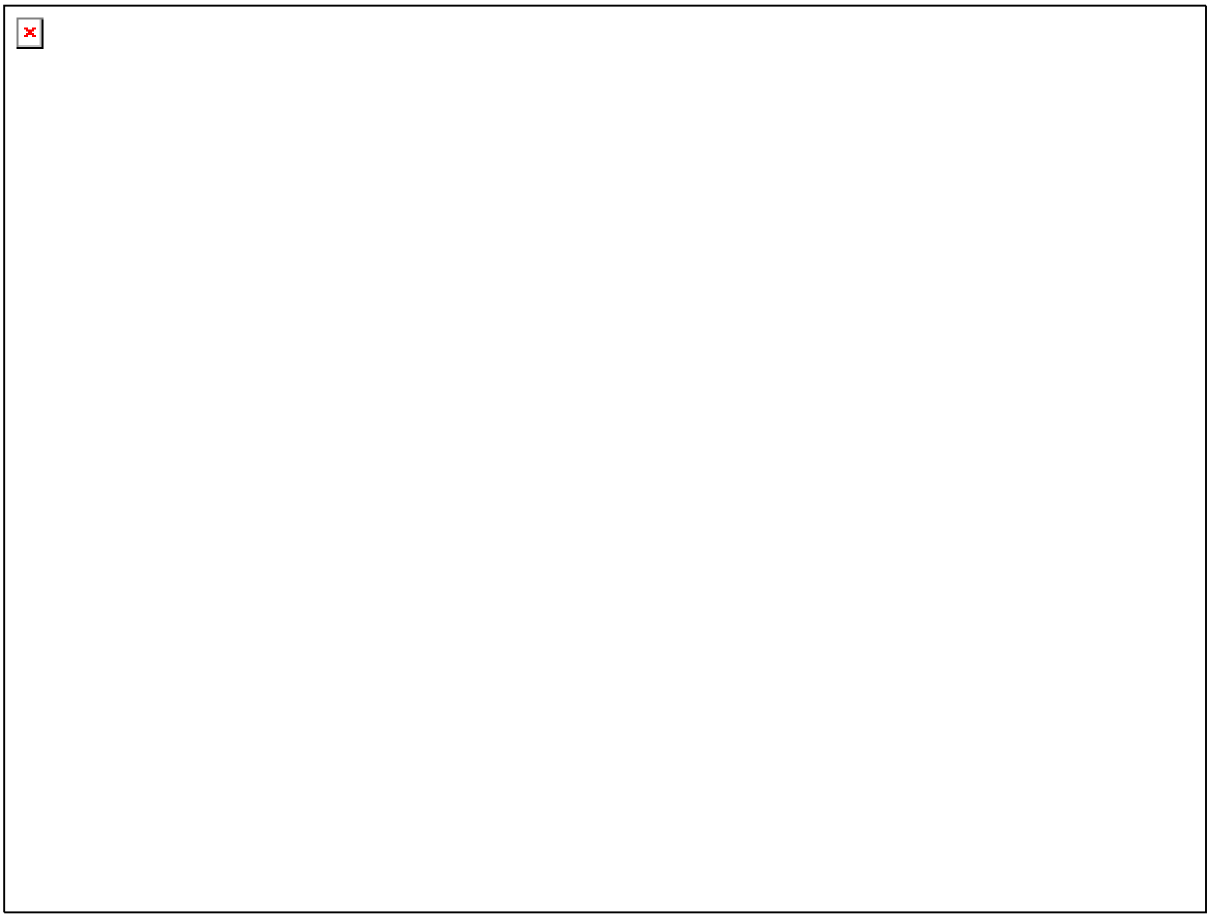


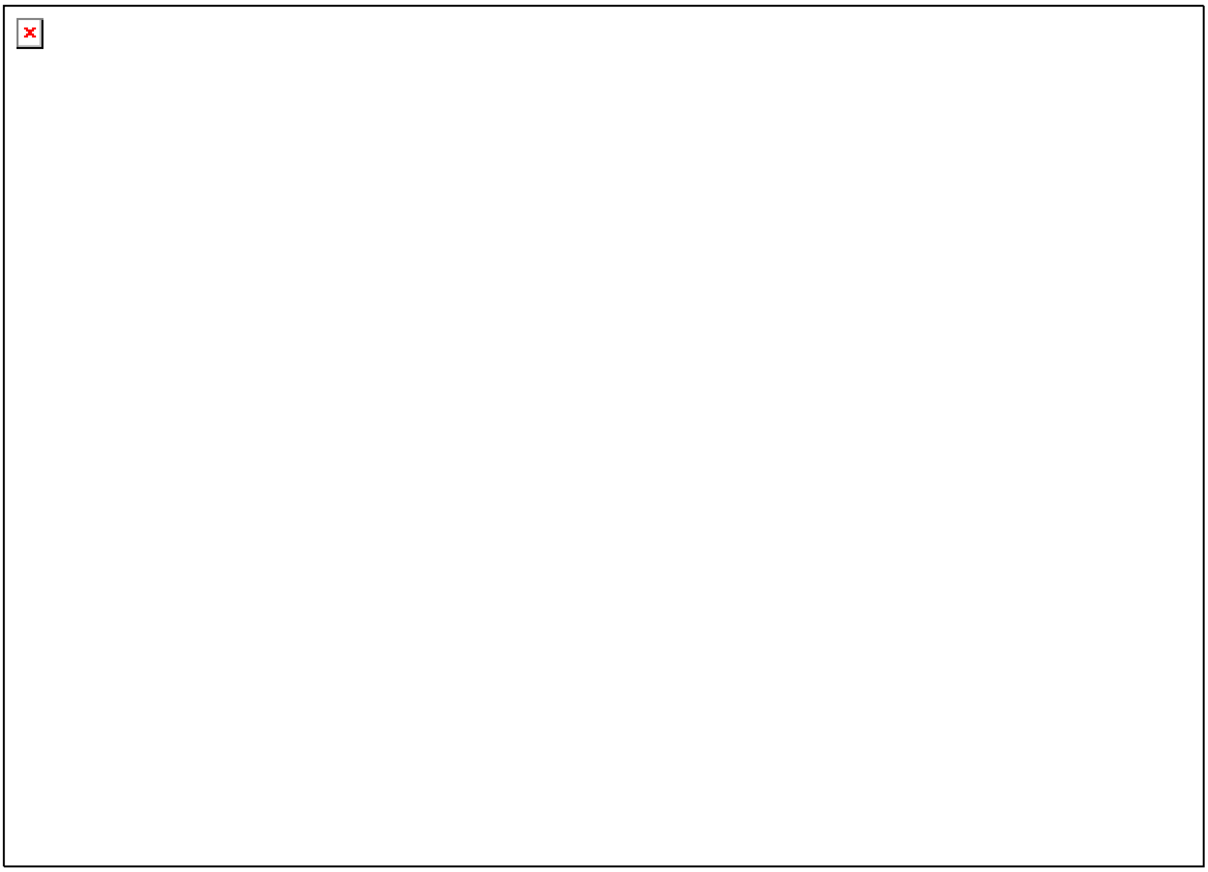


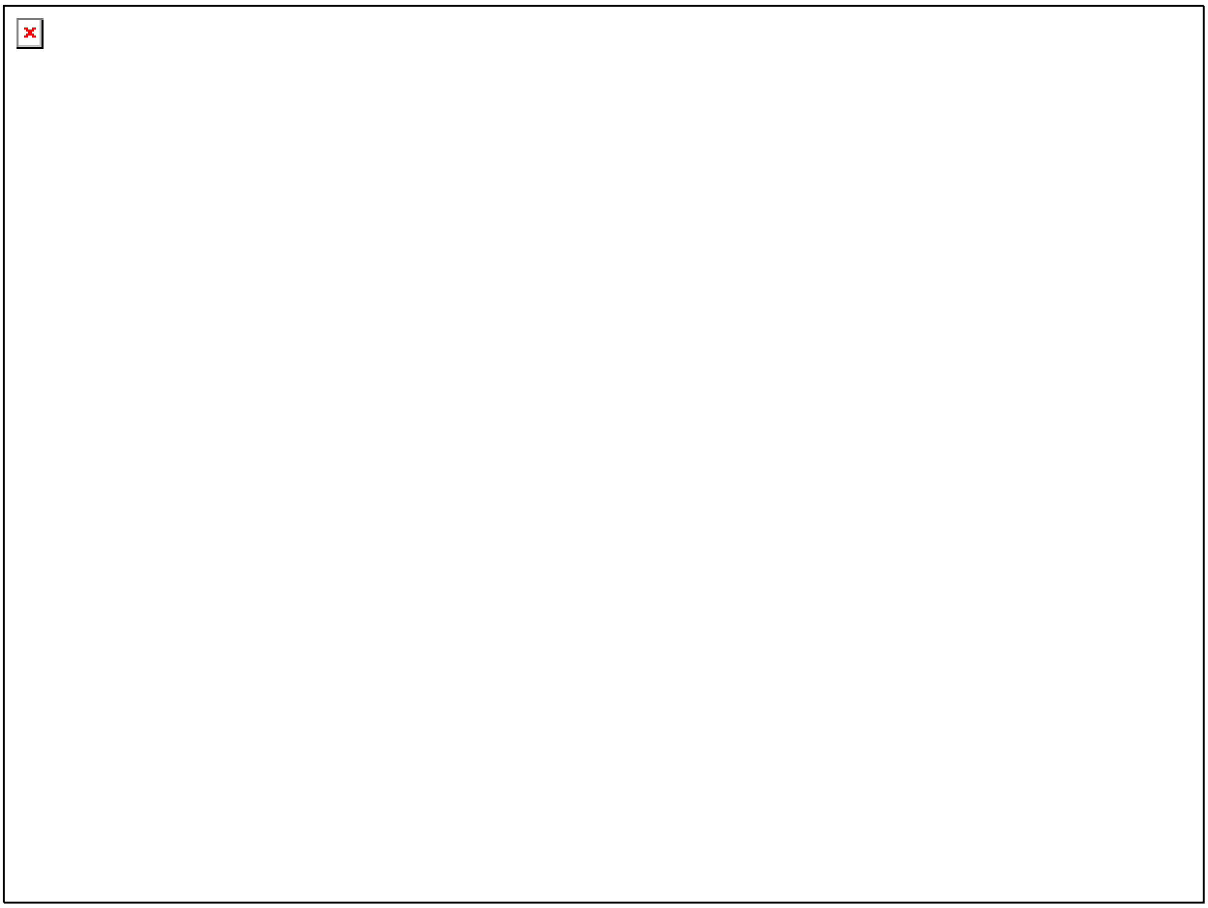


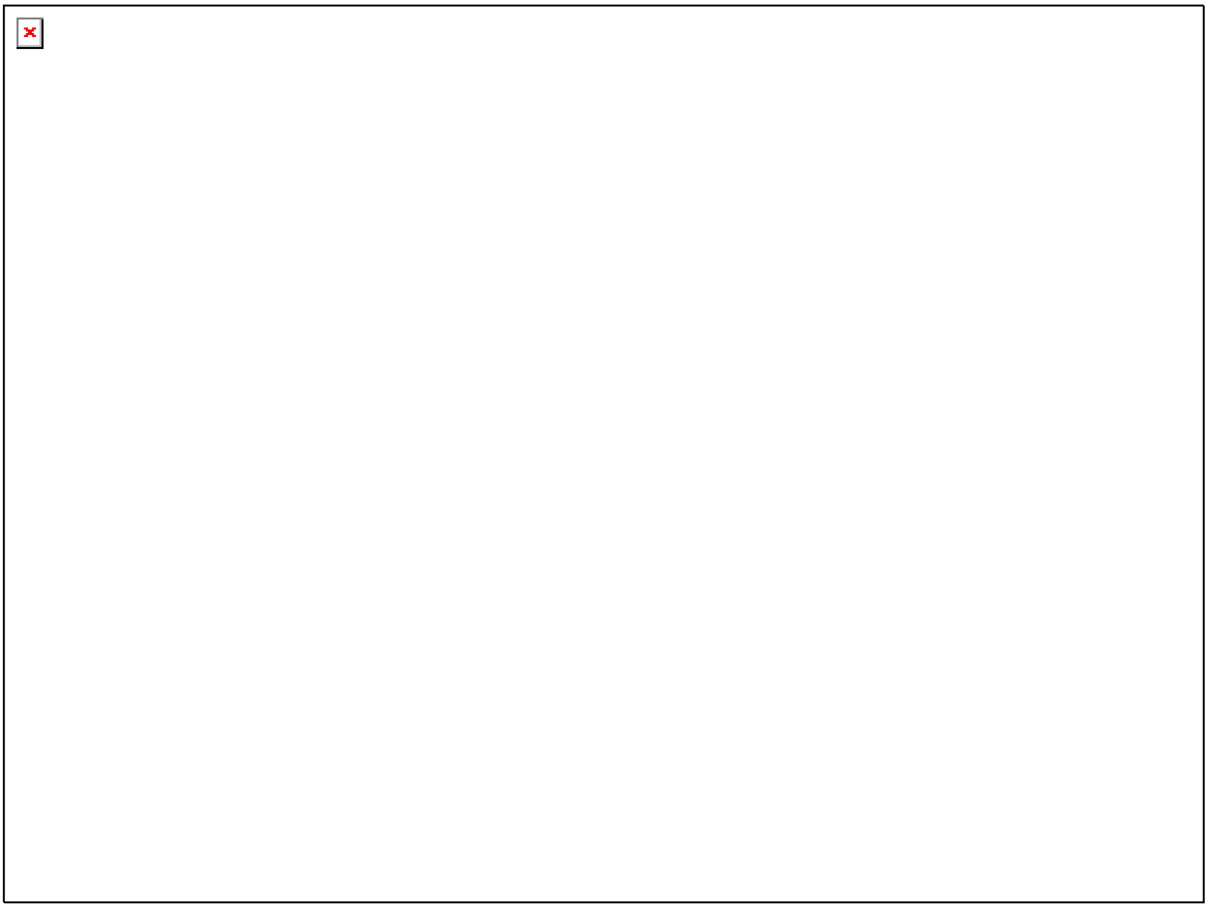


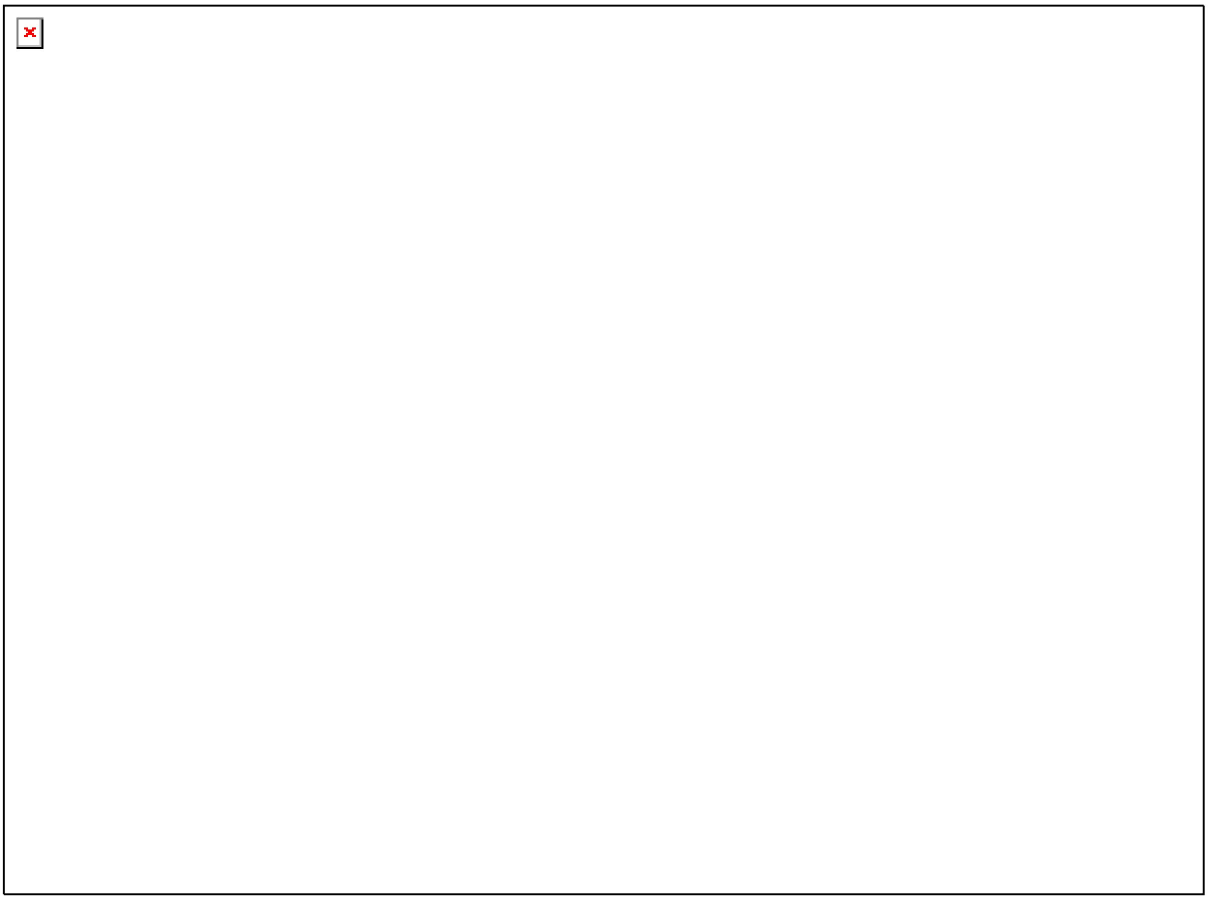


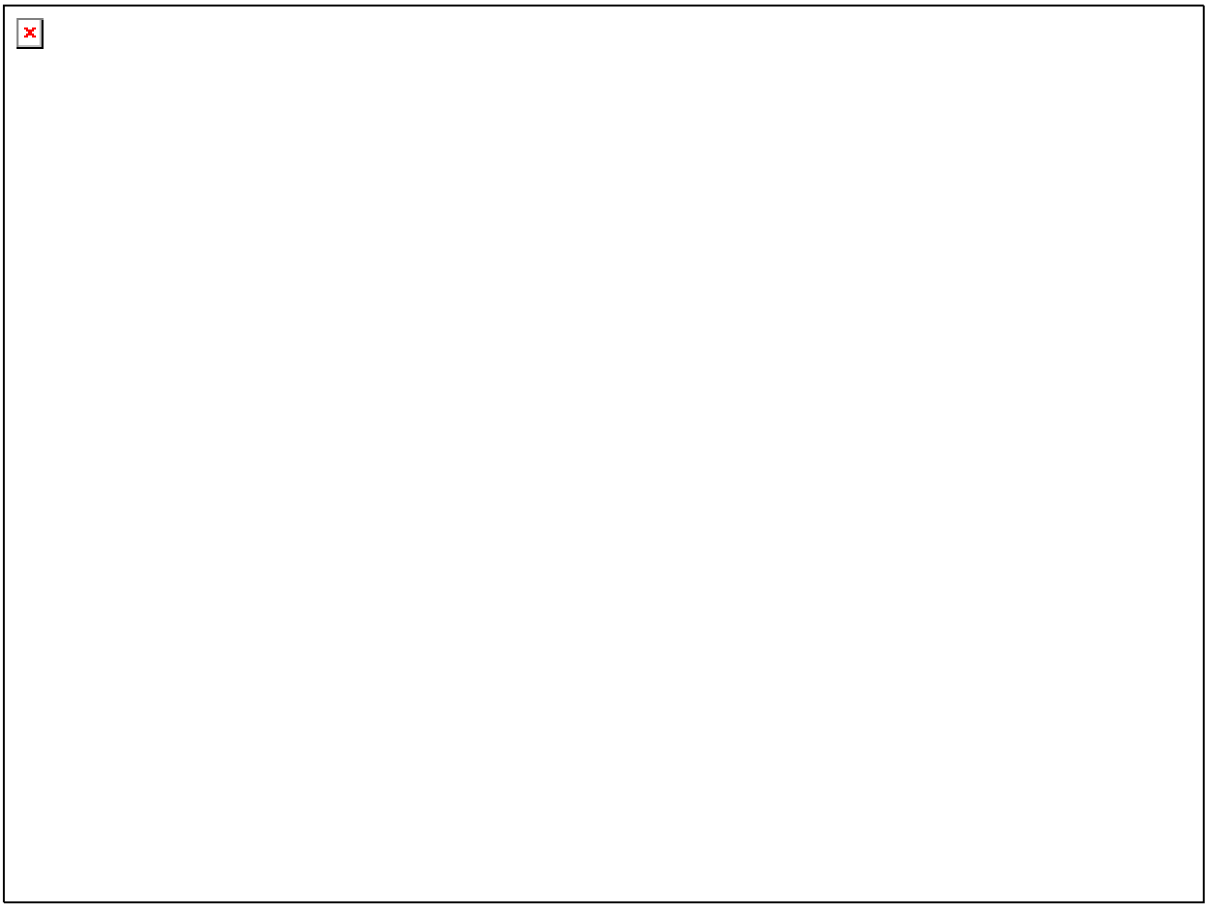


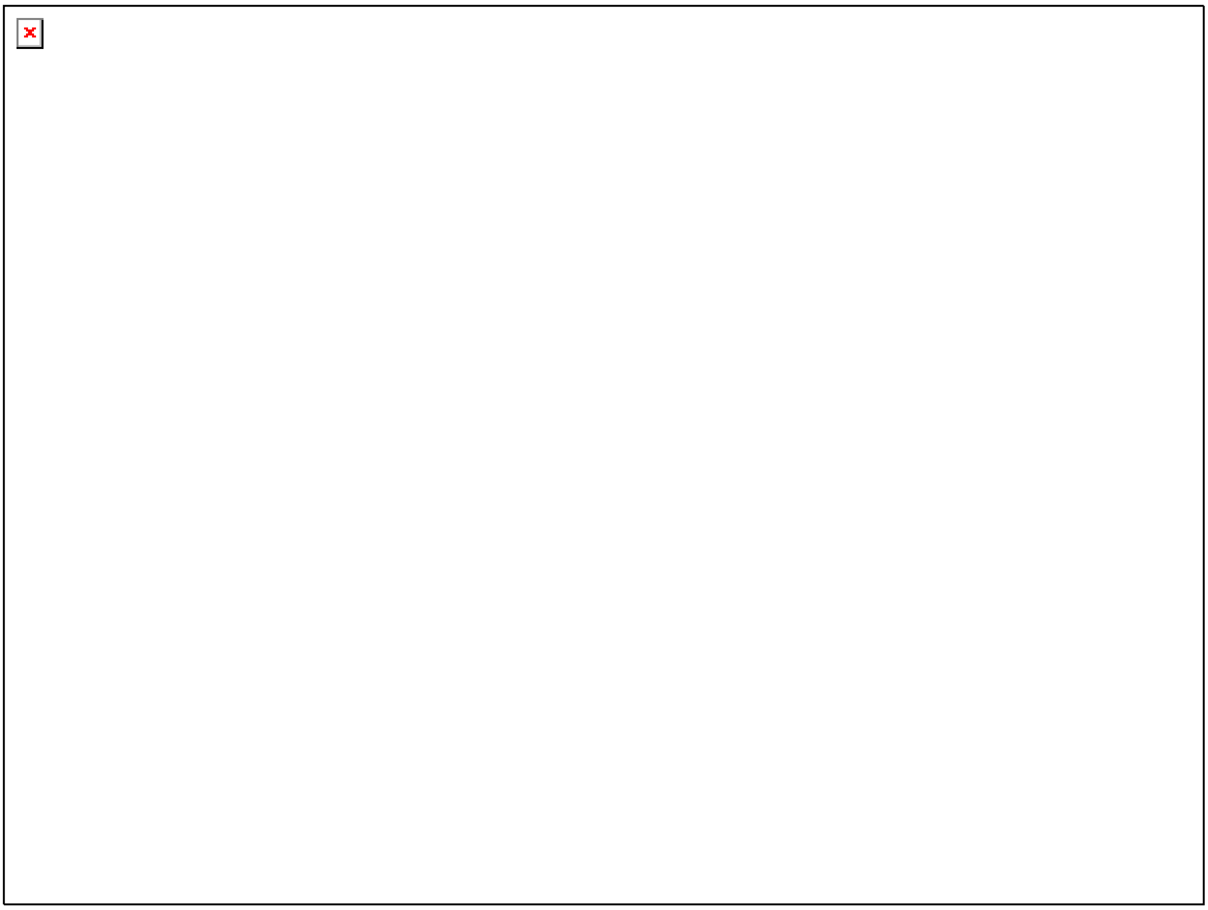


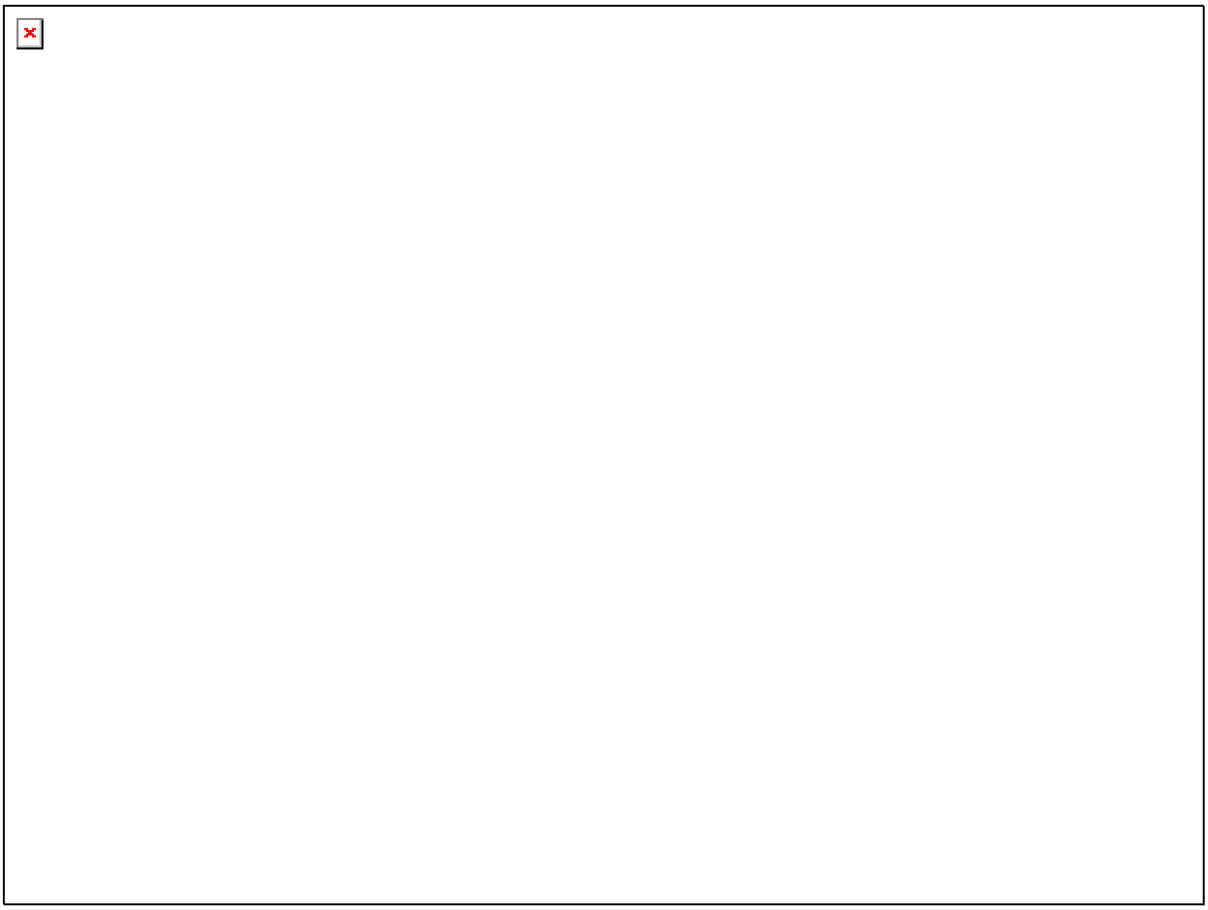


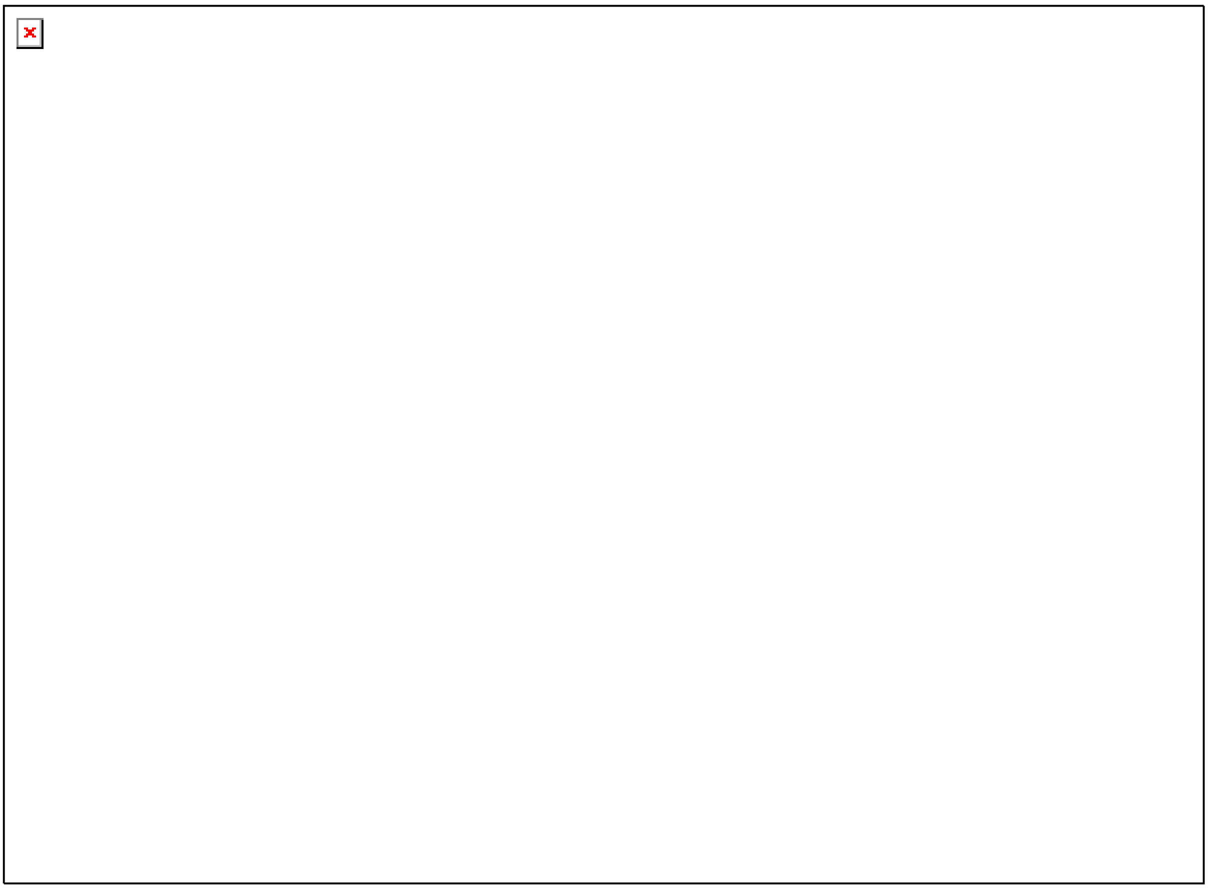


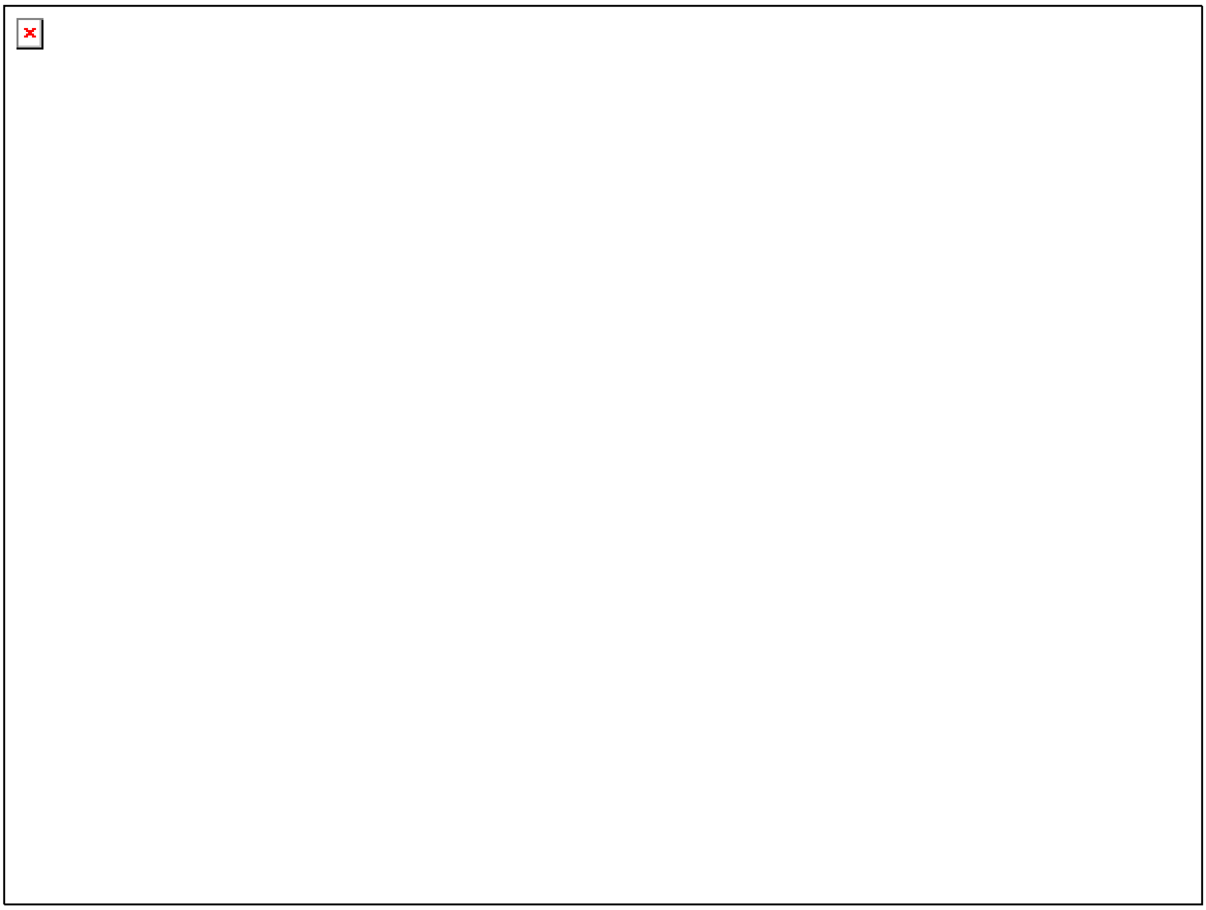










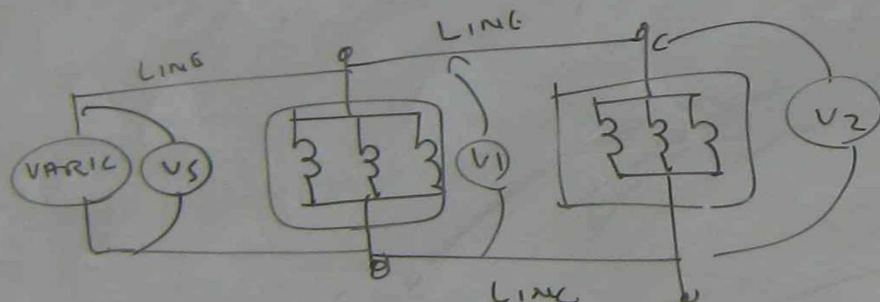


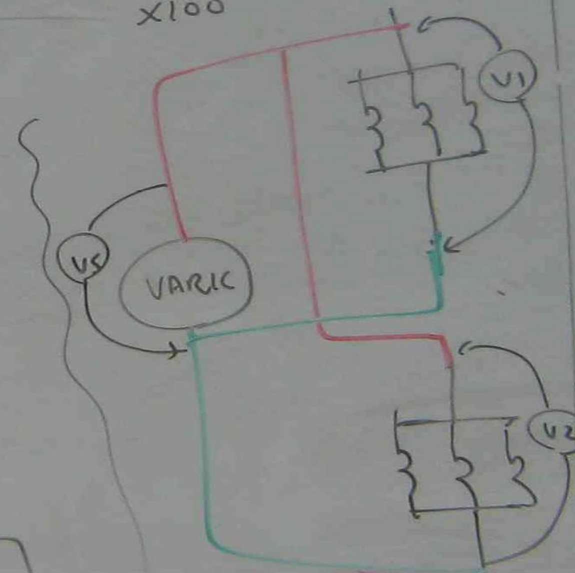
ELECTRICAL DISTRIBUTION PRACTICAL (1)

LOAD CENTRE

COMPARING SERIES CONNECTED LOAD GROUPS AND PARALLEL CONNECTED LOAD GROUPS IN TERM OF VOLTAGE DROP AND VOLTAGE REGULATION

$$\text{VOLTAGE REGULATION} = \frac{\text{VOLTAGE AT GENERATOR} - \text{VOLTAGE AT LOAD}}{\text{VOLTAGE AT GENERATOR}} \times 100$$





CONNECT THE ABOVE CIRCUIT

VARIC VOLTAGE V_S	V_1	$\%Reg = \frac{V_S - V_1}{V_S} \times 100$	V_2	$\%Reg = \frac{V_S - V_2}{V_S} \times 100$

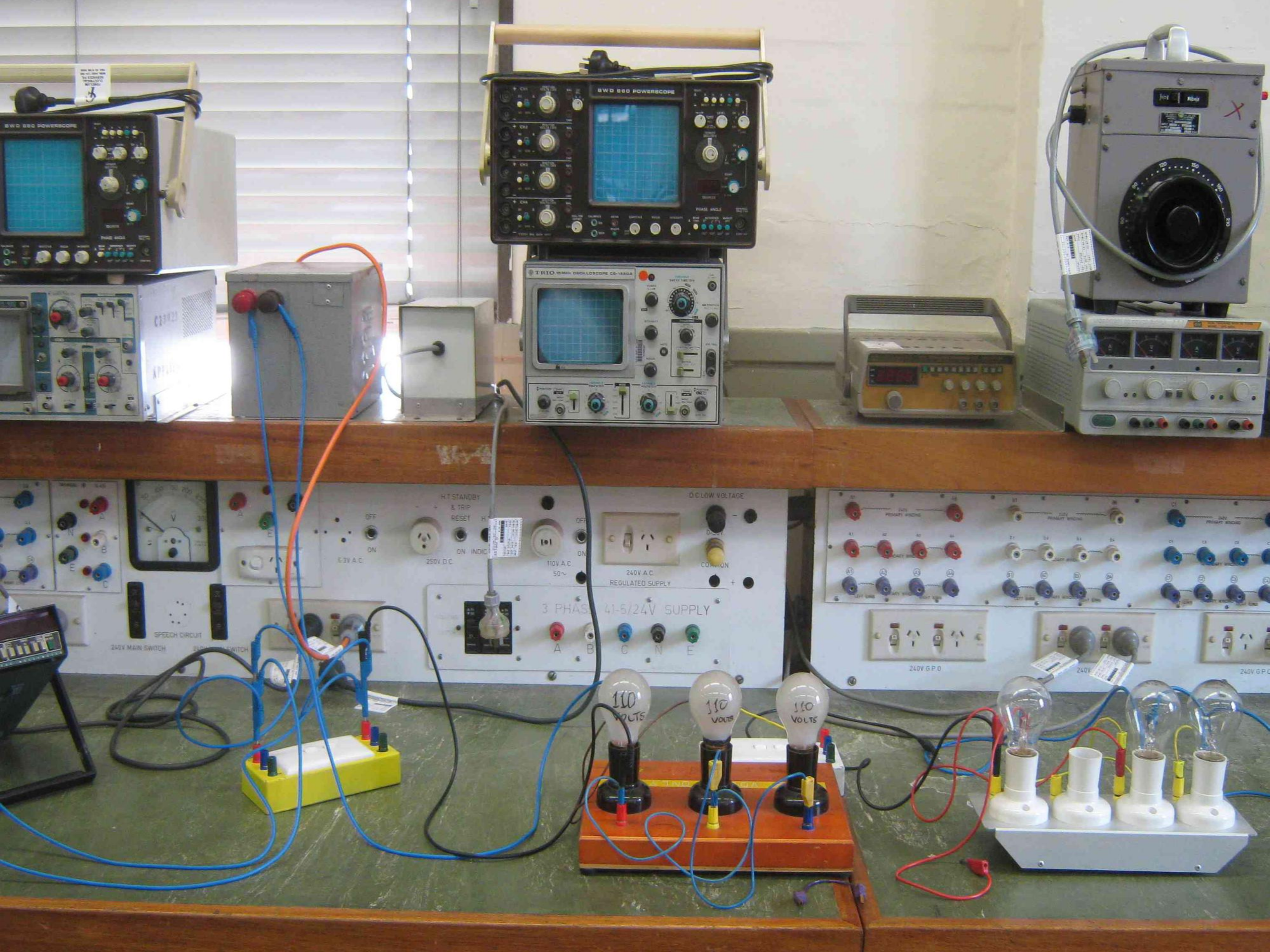
V_S	$V_1 = V_2 =$	$\%Reg = \frac{V_S - V_1}{V_S} \times 100$

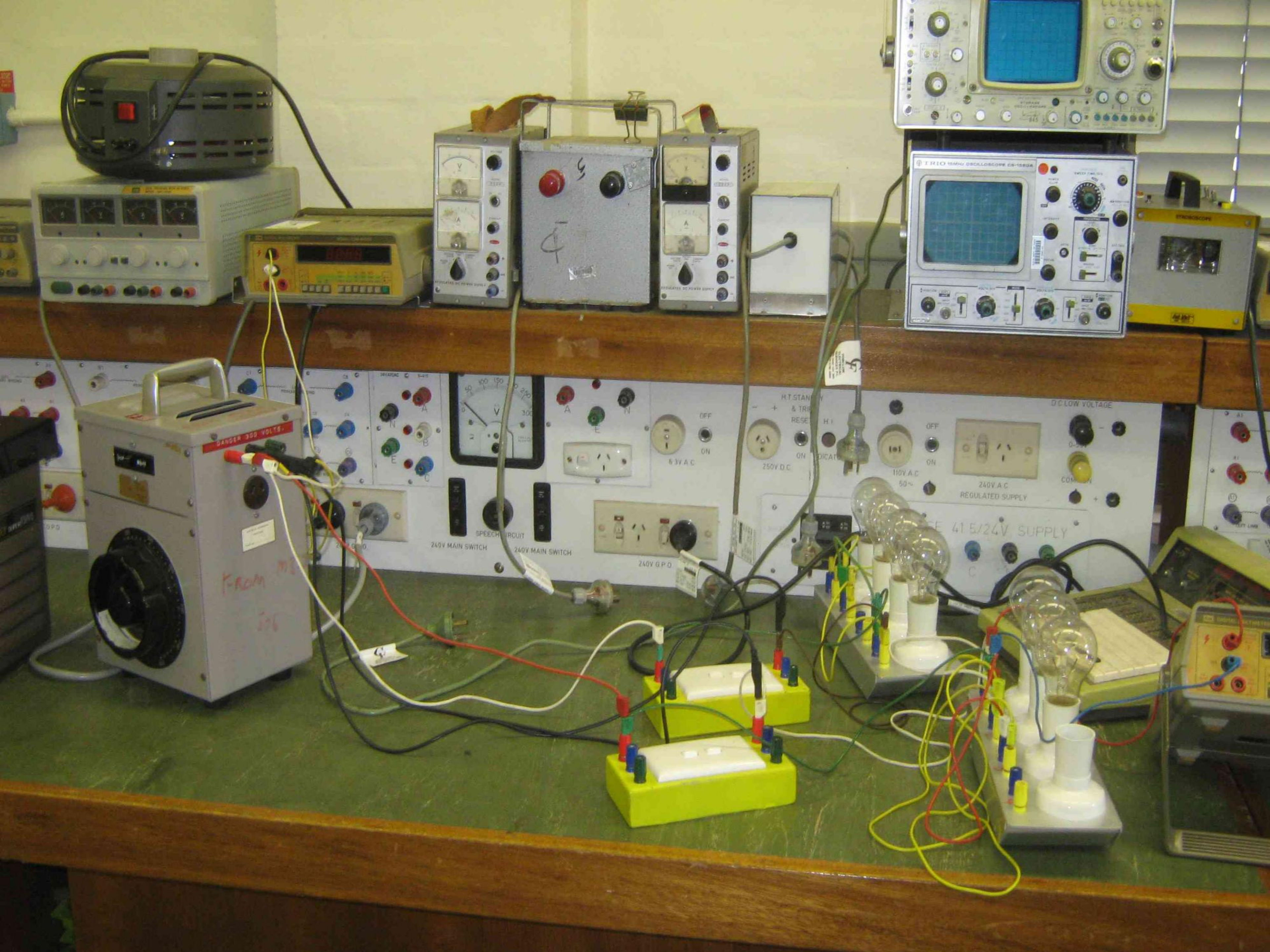
FIND THE DIFFERENCE & MAKE COMMENT

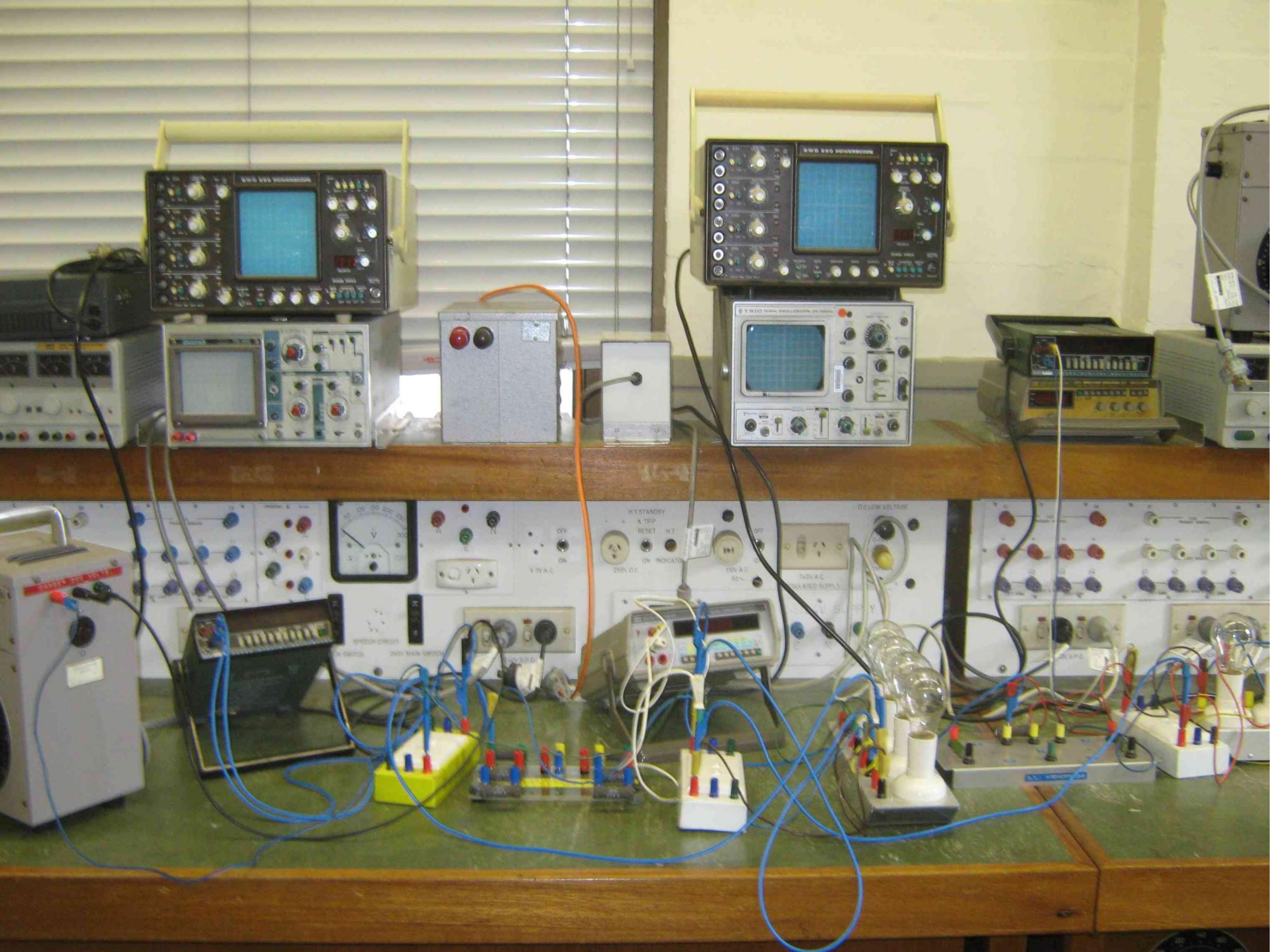
GUY ...

WIRE ...

WIRE ...


BWD 880 POWERSCOPE
BWD 880 POWERSCOPE
TRIO
H.T STANDBY
& TRIP
RESET
D.C LOW VOLTAGE
6.3V A.C
250V D.C
110V A.C
240V A.C
REGULATED SUPPLY
COMMON
SPEECH CIRCUIT
240V MAIN SWITCH
3 PHASE 41-6/24V SUPPLY
A B C N E
240V G.P.O
110 VOLTS
110 VOLTS
110 VOLTS


DANGER 300 VOLTS
240V MAIN SWITCH
SPEECH CIRCUIT
240V MAIN SWITCH
240V G.P.O
6.3V A.C
250V D.C
110V A.C
240V A.C
REGULATED SUPPLY
D.C LOW VOLTAGE
OFF
ON
41.5/24V SUPPLY
STROBOSCOPE

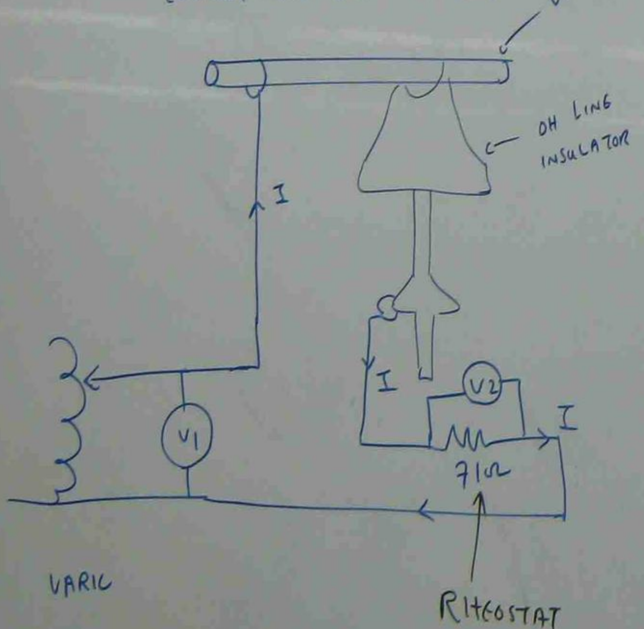

H.T STANDBY
& TRIP
RESET
D.C LOW VOLTAGE
250V D.C
110V A.C
OFF
ON

PRACTICAL (2) ELECTRICAL DISTRIBUTION (FOR TEST ②)

MEASUREMENT OF OVERHEAD LINE INSULATOR CAPACITANCE

INSTRUCTION

CONNECT THE GIVEN CIRCUIT



INJECT $V_1 = 80V$

MEASURE $V_2 =$

$$I = \frac{V_2}{\text{RHEOSTAT RESISTANCE } (71\Omega)}$$

$$X_c = \frac{V_1 - V_2}{I}$$

$$C_{80V} = \frac{1}{2\pi f X_c}$$

SUBSTITUTE $f = 50Hz$

REPEAT FOR $V_1 = 90V$ & $100V$

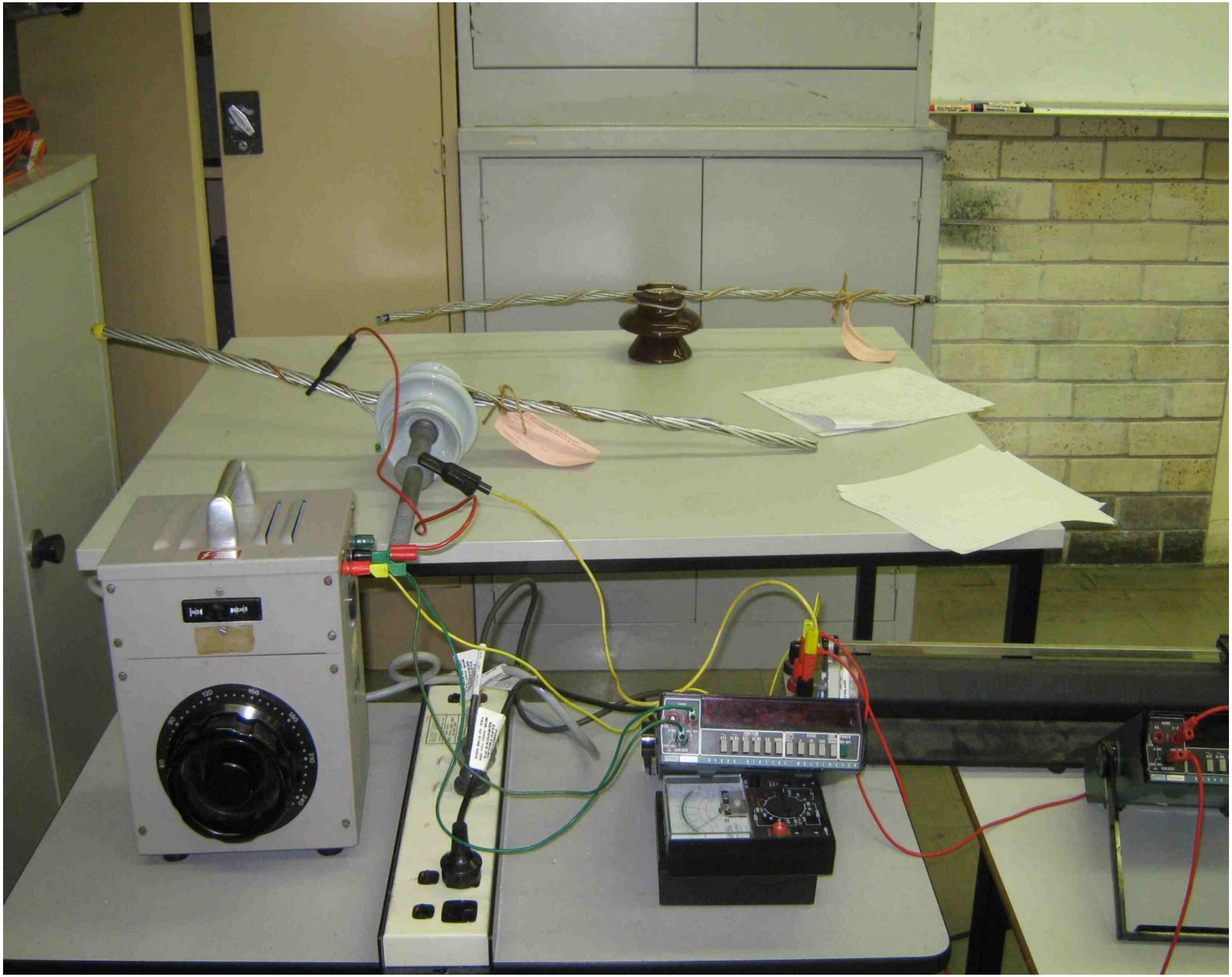
V_1	V_2	$V_1 - V_2$	$I = \frac{V_2}{71\Omega}$	$X_c = \frac{V_1 - V_2}{I}$	$C = \frac{1}{2\pi f X_c}$
80V					$C_{80V} =$
90V					$C_{90V} =$
100V					$C_{100V} =$

$$C = \frac{C_{80} + C_{90} + C_{100}}{3} \quad F$$

THEN SWITCH OFF THE SUPPLY AND OBSERVE WHAT HAPPENS TO V_1?

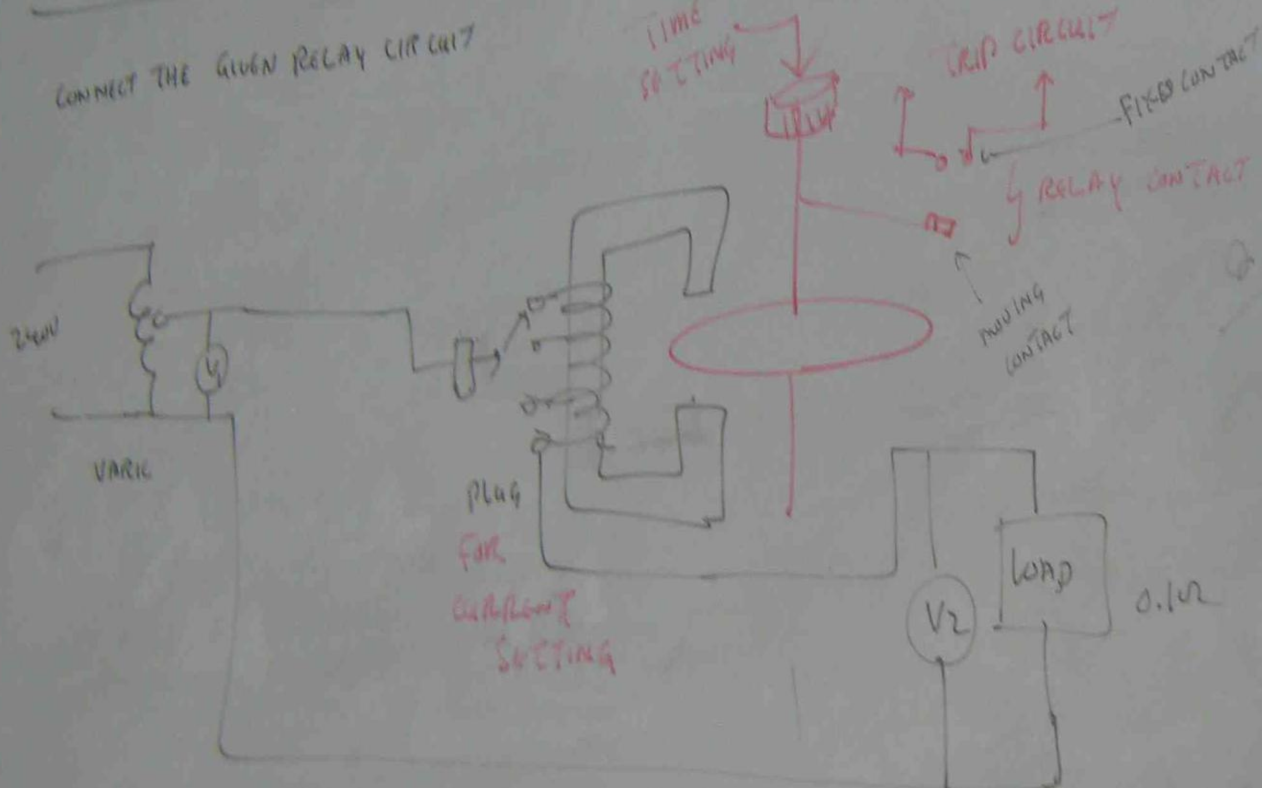
QUESTION

THE LINE INSULATOR IS RECENTLY TAKEN OUT FROM THE LINE. WHAT WILL YOU DO BEFORE TOUCHING IT?



PRACTICAL ① OPERATION PRINCIPLE OF OVER CURRENT RELAY

CONNECT THE GIVEN RELAY CIRCUIT



Q. WHEN YOU ADJUST THE TIME SETTING TO GET CLOSER BETWEEN MOVING AND FIXED CONTACT, WHAT WILL HAPPEN TO RELAY OPERATION TIME?

Q. WHAT ARE THE PLUG SETTINGS?

FILL THE TABLE

INJECTION VOLTAGE V_1	RELAY BURDEN LOAD VOLTAGE V_2	RELAY CURRENT = $\frac{V_2}{\text{LOAD RESISTANCE}}$ 0.1Ω

SPEECH CIRCUIT
240V MAIN SWITCH

ELECTRICAL DISTRIBUTION PRACTICAL (4)

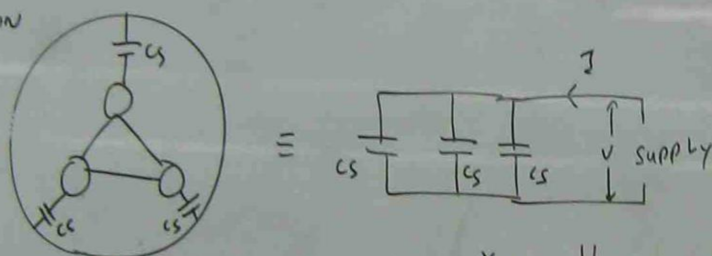
UNDERGROUND CABLE CAPACITANCE TEST

UG CABLE

C_c = CAPACITANCE BETWEEN CONDUCTORS

C_s = CAPACITANCE BETWEEN CONDUCTOR & SHEATH

(1) STUDY THE GIVEN CALCULATION



$$X_{c_1} = \frac{V}{I}$$

$$3C_s = \frac{1}{2\pi f X_{c_1}}$$

$$C_s = \frac{1}{3 \times 2\pi f X_{c_1}}$$

APPLY $V_1 = 80V$, SET RHEOSTAT $= 20\Omega$

MEASURE V_2

$$V = V_1 - V_2$$

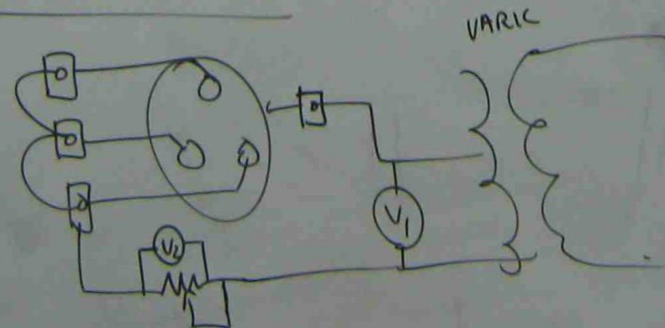
$$I = \frac{V_2}{\text{Rheostat }(R)}$$

$$X_{c1} = \frac{V_1 - V_2}{\dfrac{V_2}{\text{Rheostat }(R)}}$$

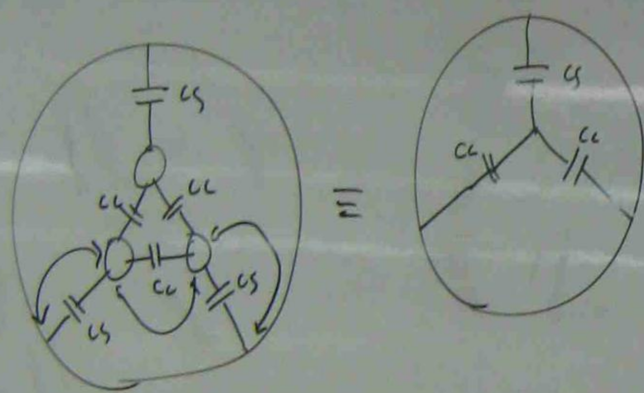
$$C_s = \frac{1}{3 \times 2\pi f X_{c_1}}$$

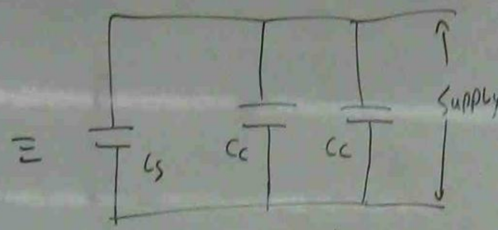
$$= \quad \mu F$$

(2) CONNECT THE GIVEN CIRCUIT



(3) STUDY THE GIVEN CALCULATION

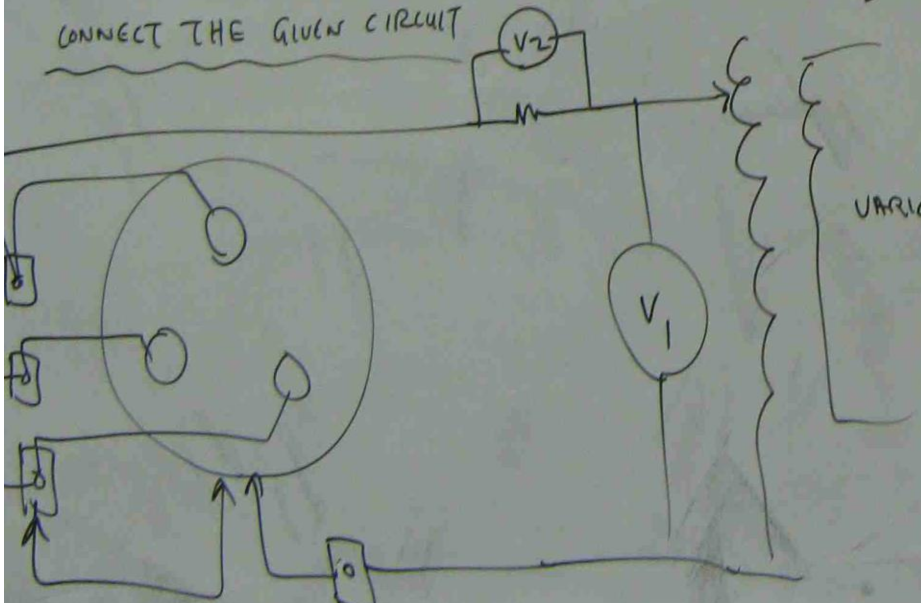




$$C = C_s + 2C_c = \frac{1}{2\pi f X_{C_2}}$$

$$X_{C_2} = \frac{V}{I}$$

CONNECT THE GIVEN CIRCUIT



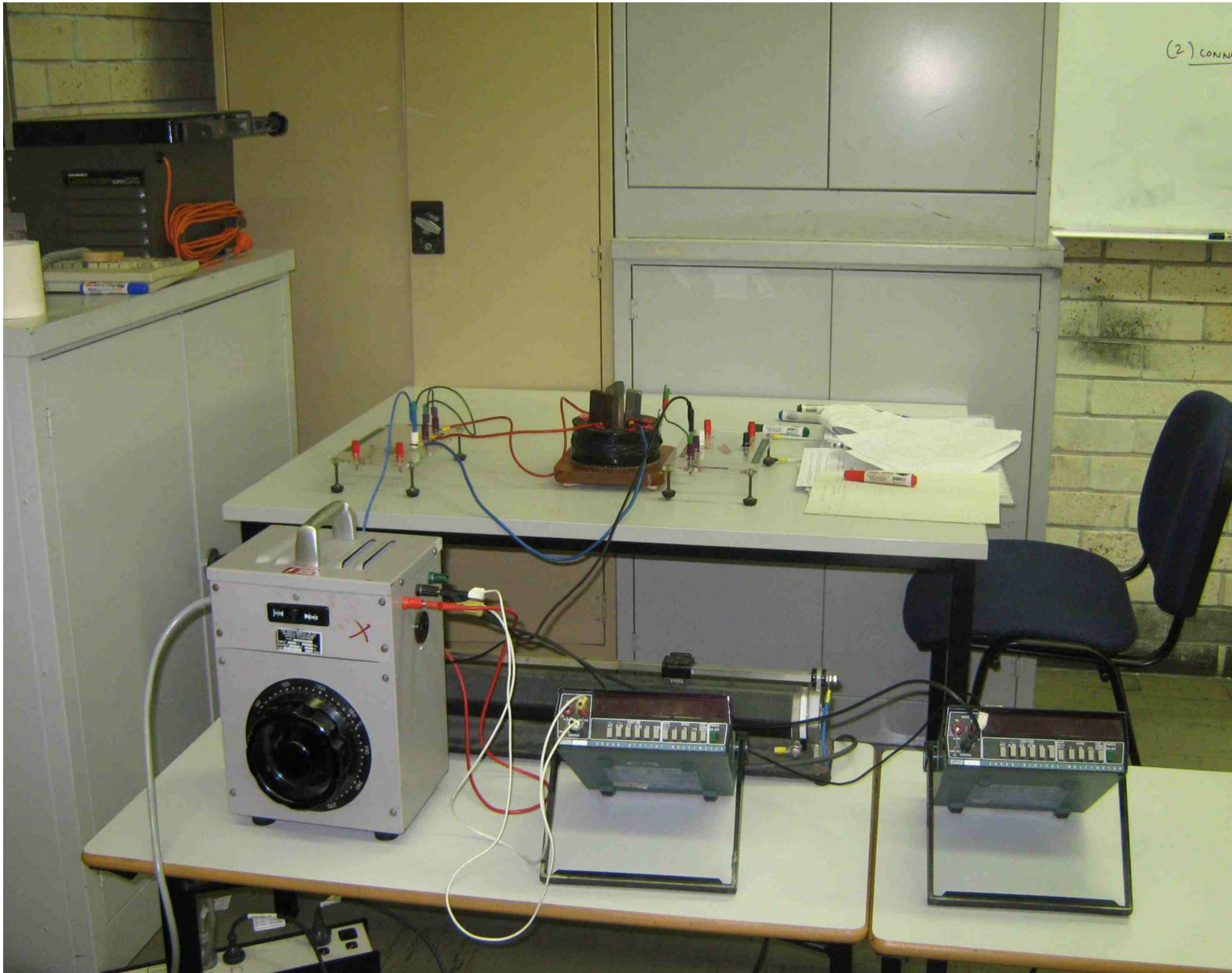
SET $V_1 = 80V$

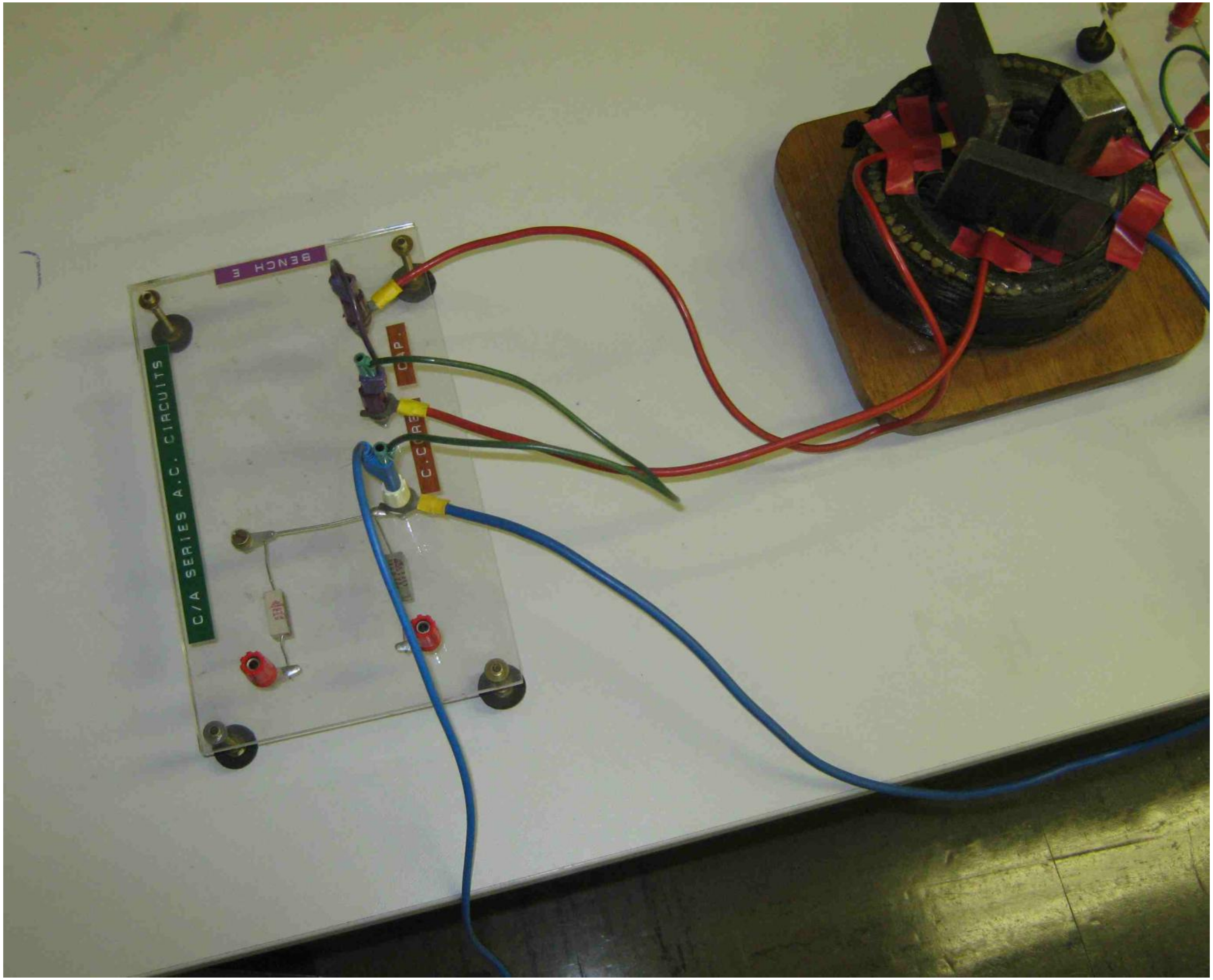
$$X_{C_2} = \frac{V_1 - V_2}{I}$$

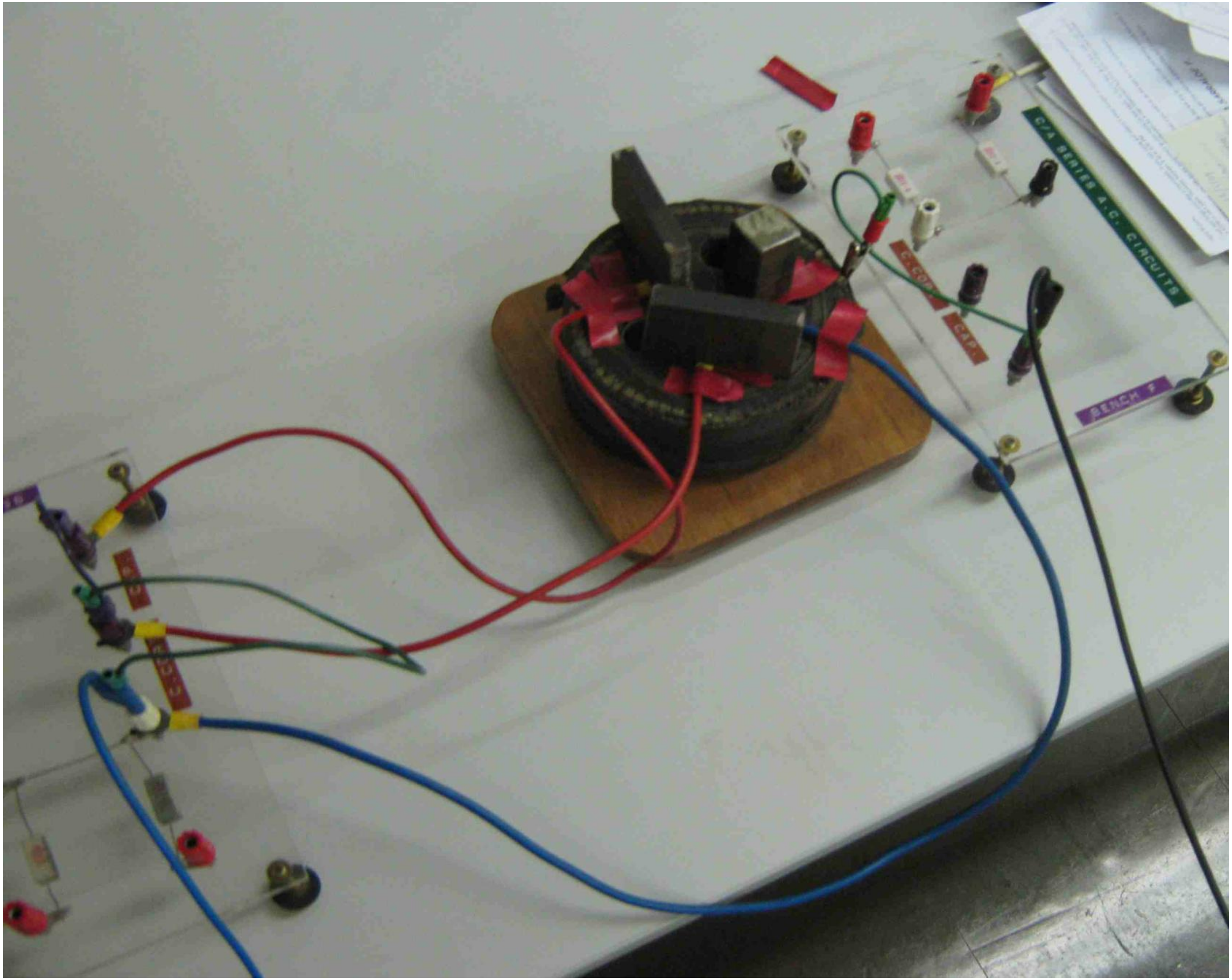
$$X_{C_2} = \frac{V_1 - V_2}{\frac{V_2}{\text{Rheostat } (R)}}$$

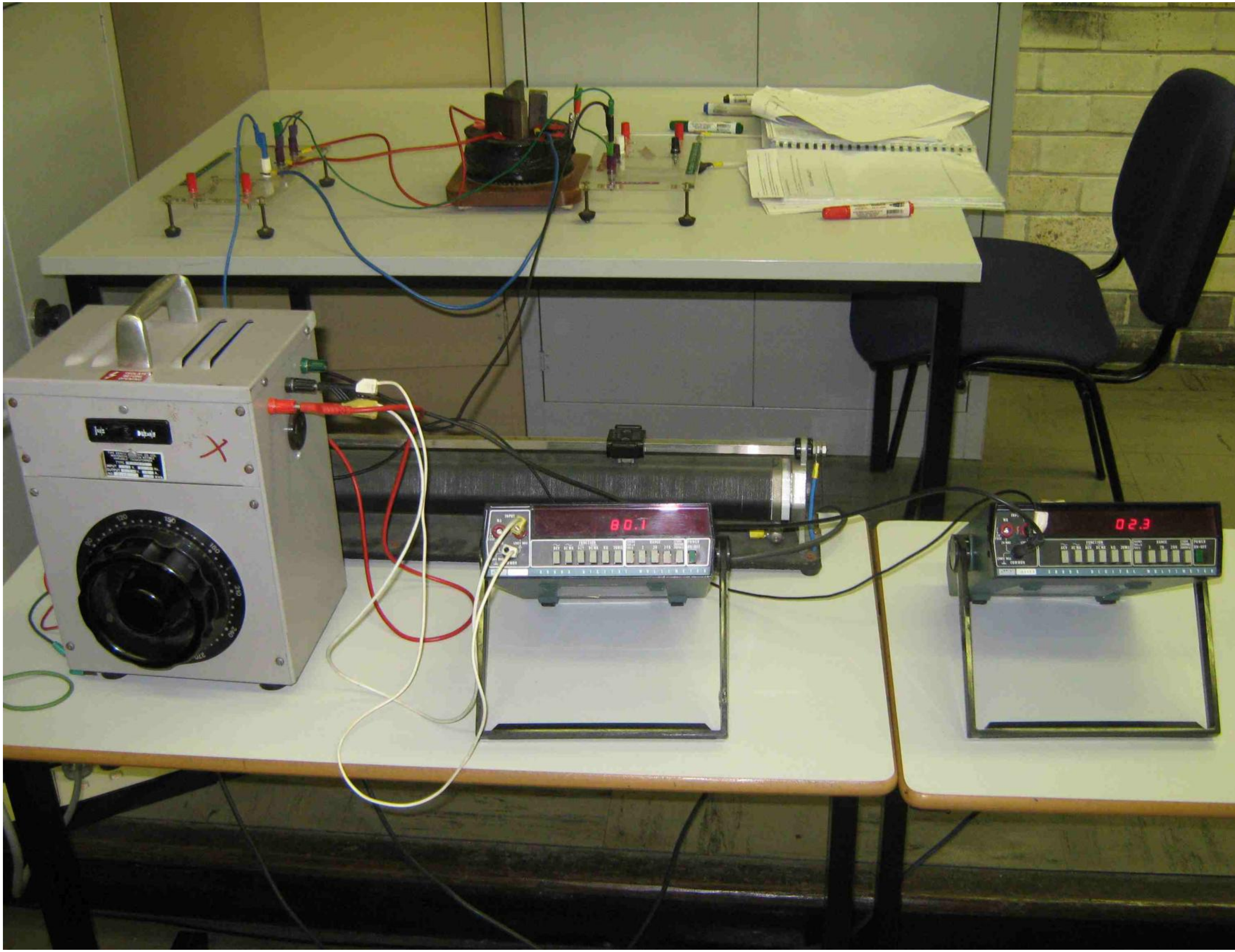
$$C_s + 2C_c = \frac{1}{2\pi f X_{C_2}}$$

THEN CALCULATE C_c




BENCH E
C/A SERIES A.C. CIRCUITS
CAP.

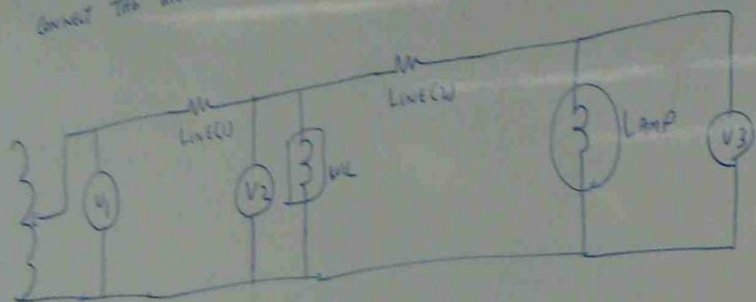

C/A SERIES A.C. CIRCUITS
CAP.
BENCH F


80.1
02.3

PRACTICAL (3) (FOR TEST (3))

VOLTAGE PROFILE CHART OF DISTRIBUTION SYSTEM

CONNECT THE GIVEN CIRCUIT



$V_1 = 7V$

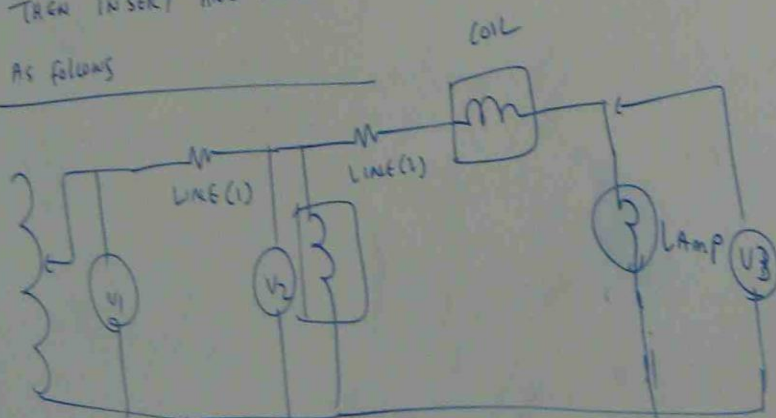
MEASURE V_2 & V_3

THEN PLOT THE VOLTAGE PROFILE CHART

GRAPH(1)

THEN INSERT ANOTHER COIL

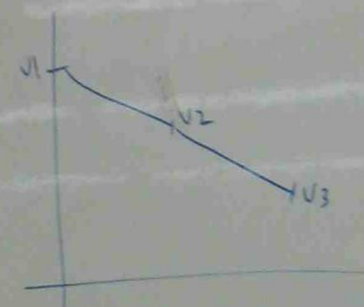
AS FOLLOWS



$V_1 = 7V$

MEASURE AGAIN V_2, V_3

THEN PLOT THE VOLTAGE PROFILE CHART AGAIN



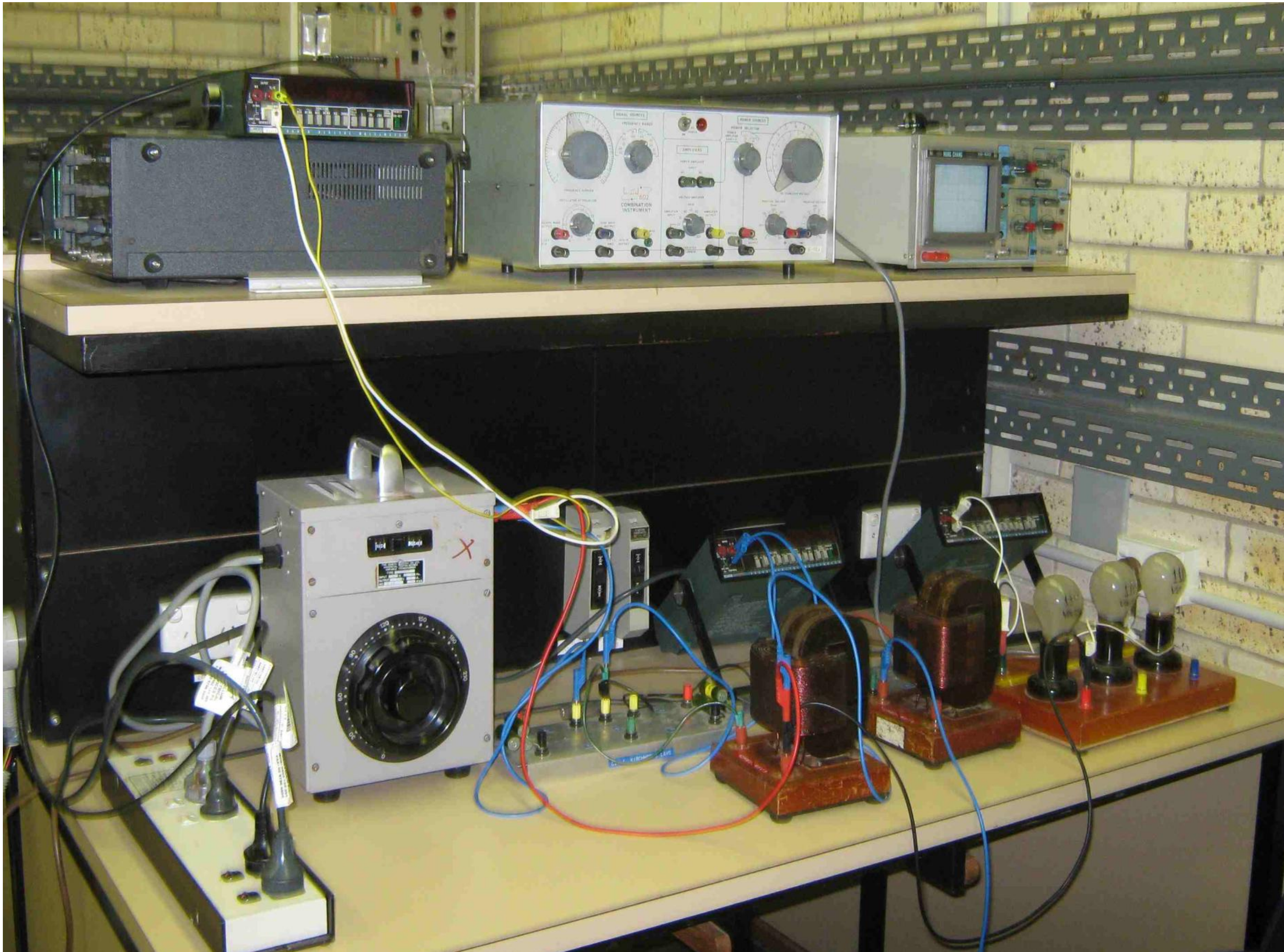
COMPARE THE VOLTAGE SLOP BETWEEN V_2 & V_3 OF GRAPH (1) & (2)

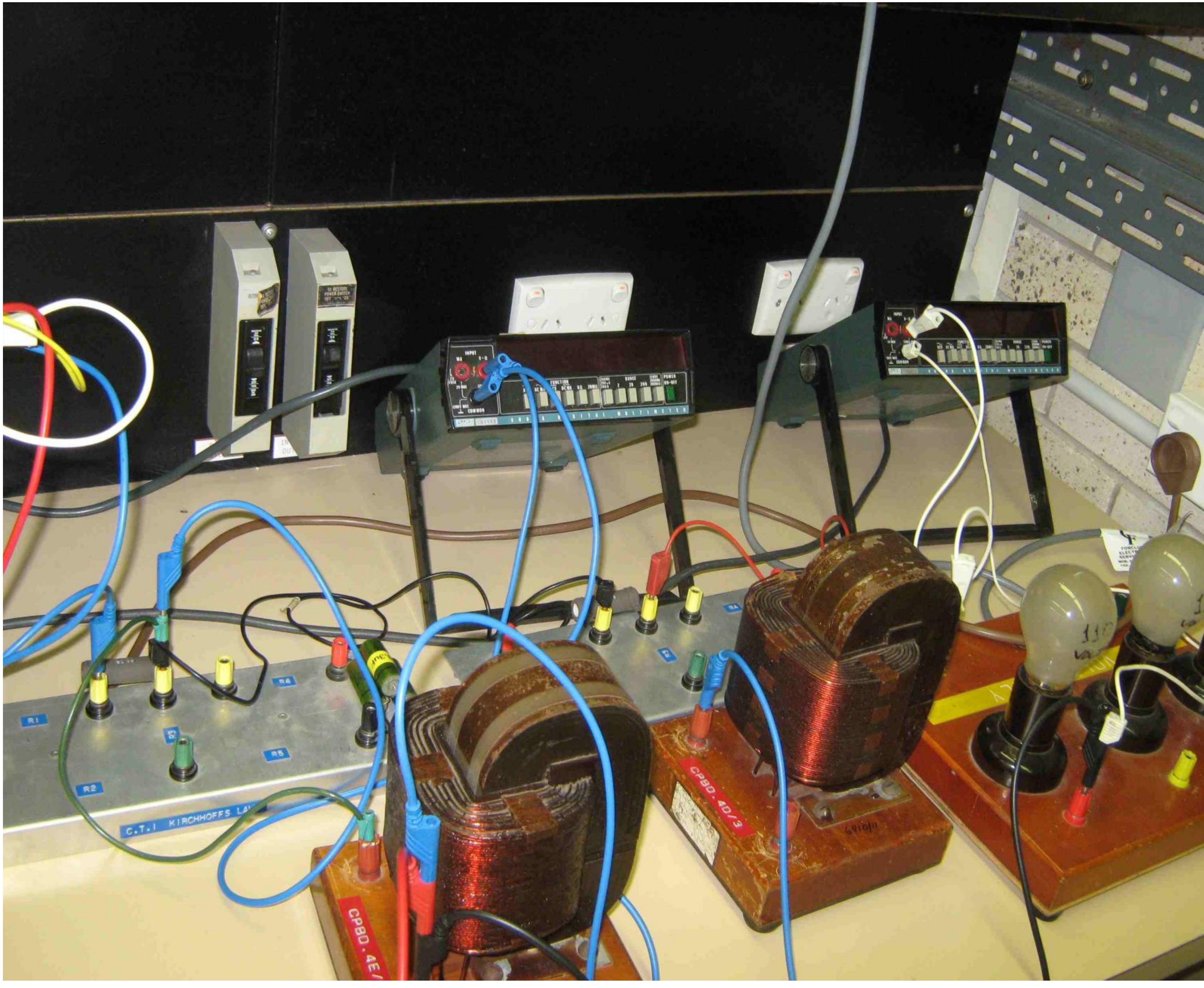
COMMENT THE DIFFERENCE

PROVIDE THE REASON.

QUESTION

FROM VOLTAGE PROFILE CHART, WHAT CAN YOU KNOW?

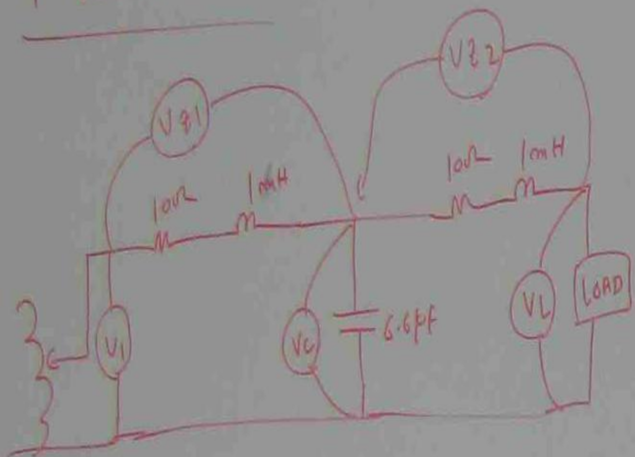

COMBINATION
INSTRUMENT



R1
R2
R4
R5
CPBD. 4D/3

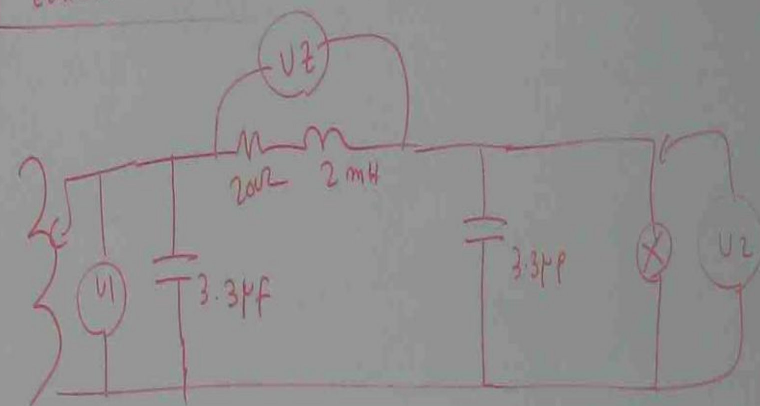
PRACTICAL (T & π) EQUIVALENT CIRCUITS

T EQUIVALENT CIRCUIT



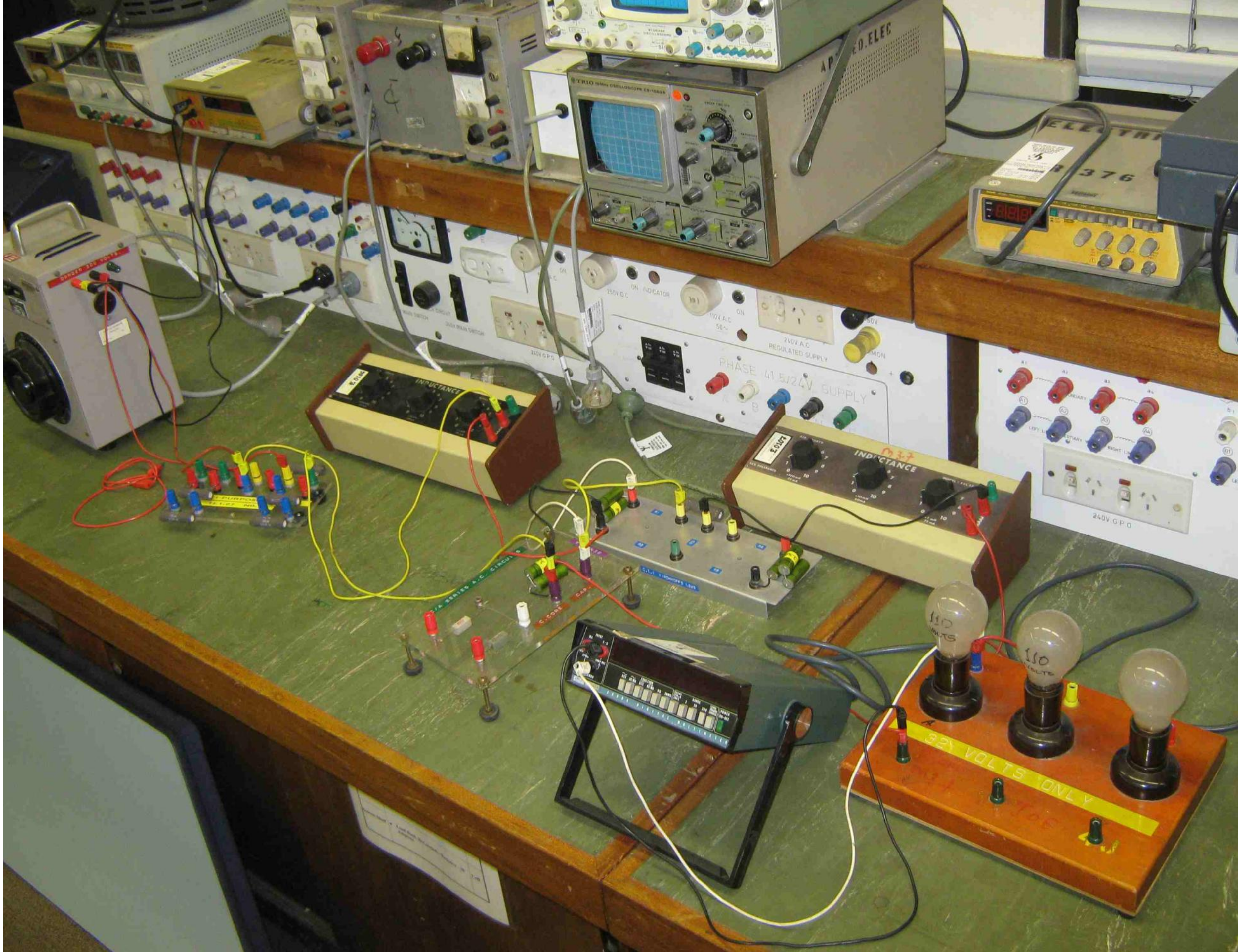
V1	VZ1	VZ2	VC	VL
15V				

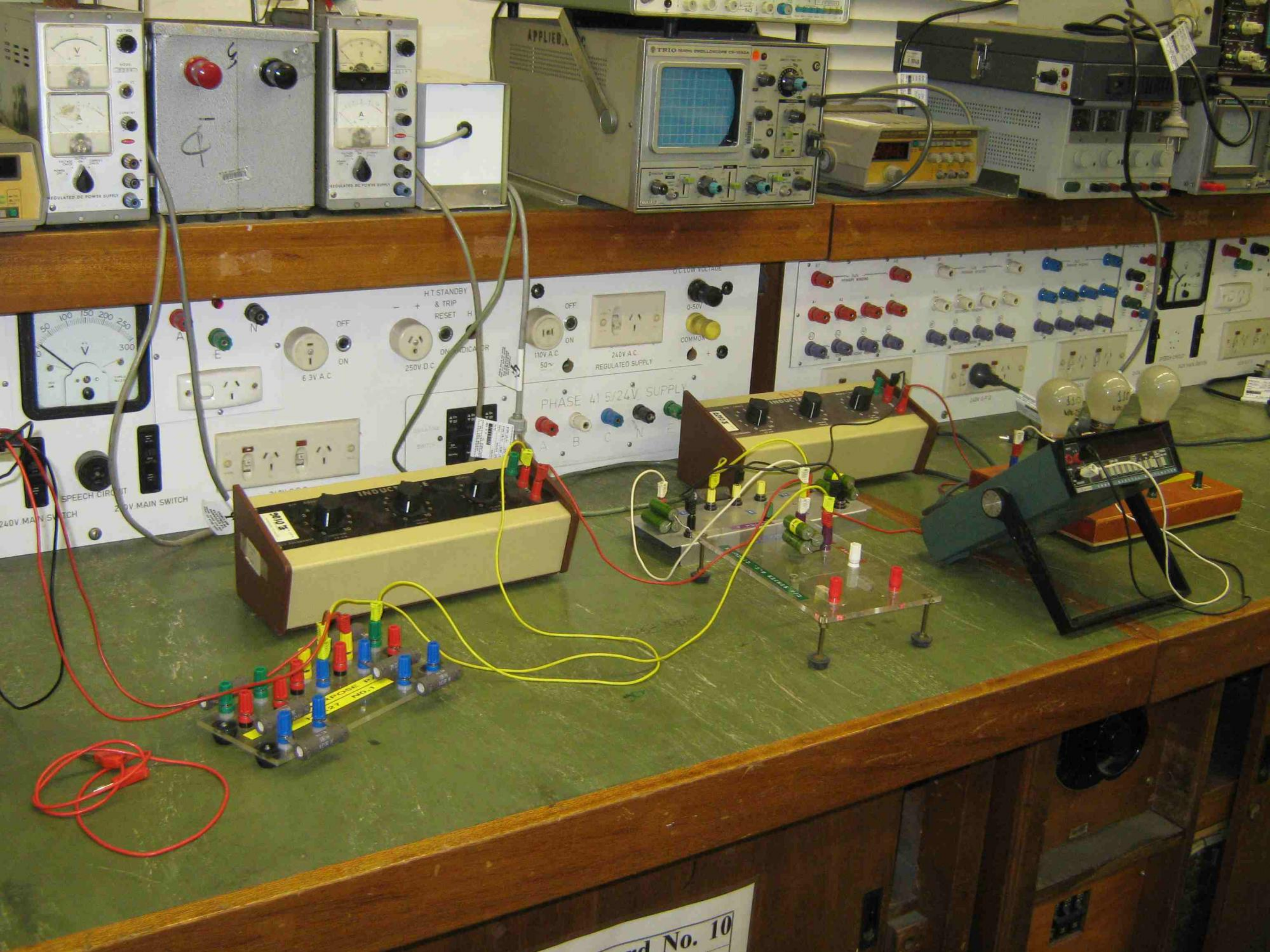
π EQUIVALENT CIRCUIT

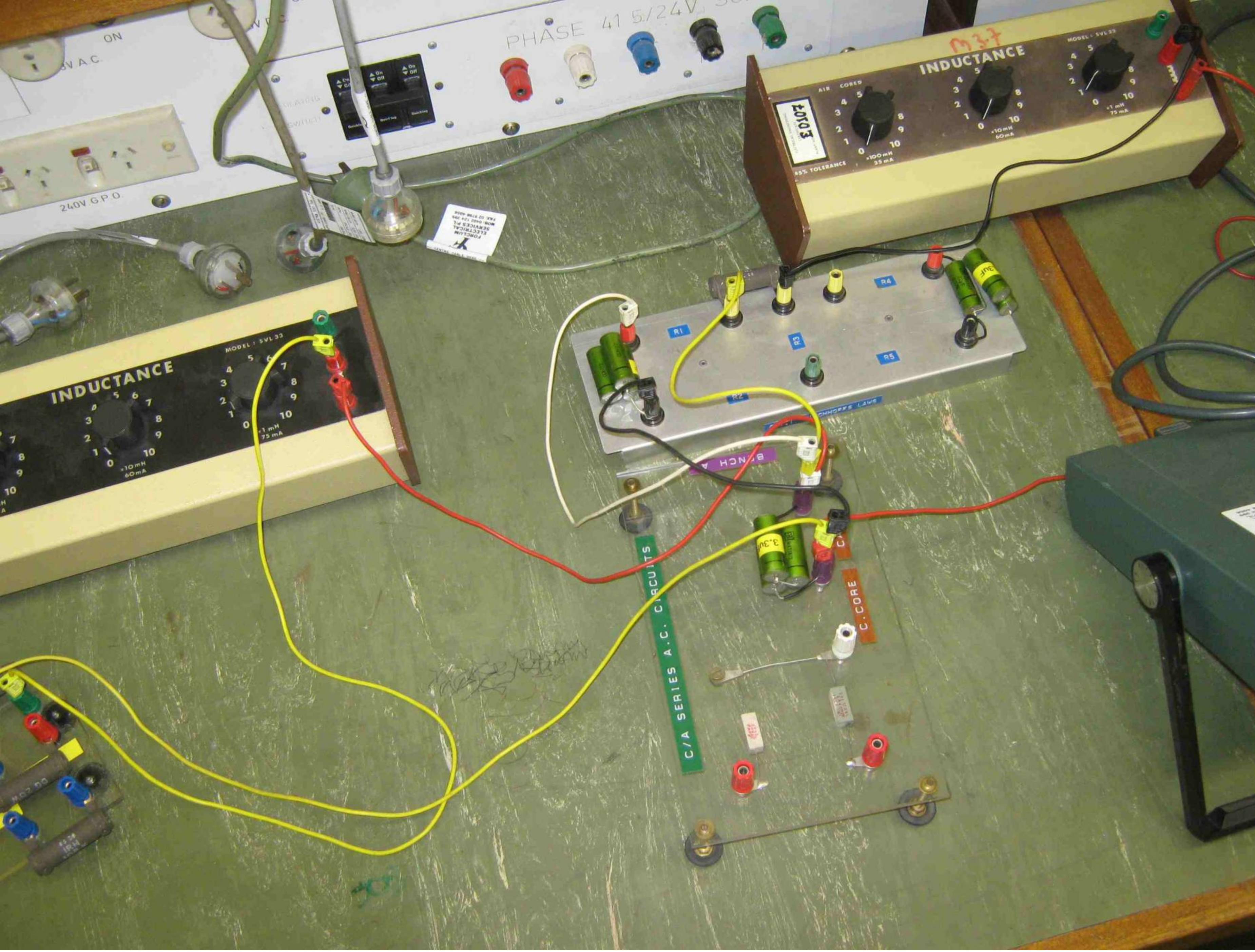


V1	VZ	VL
15V		

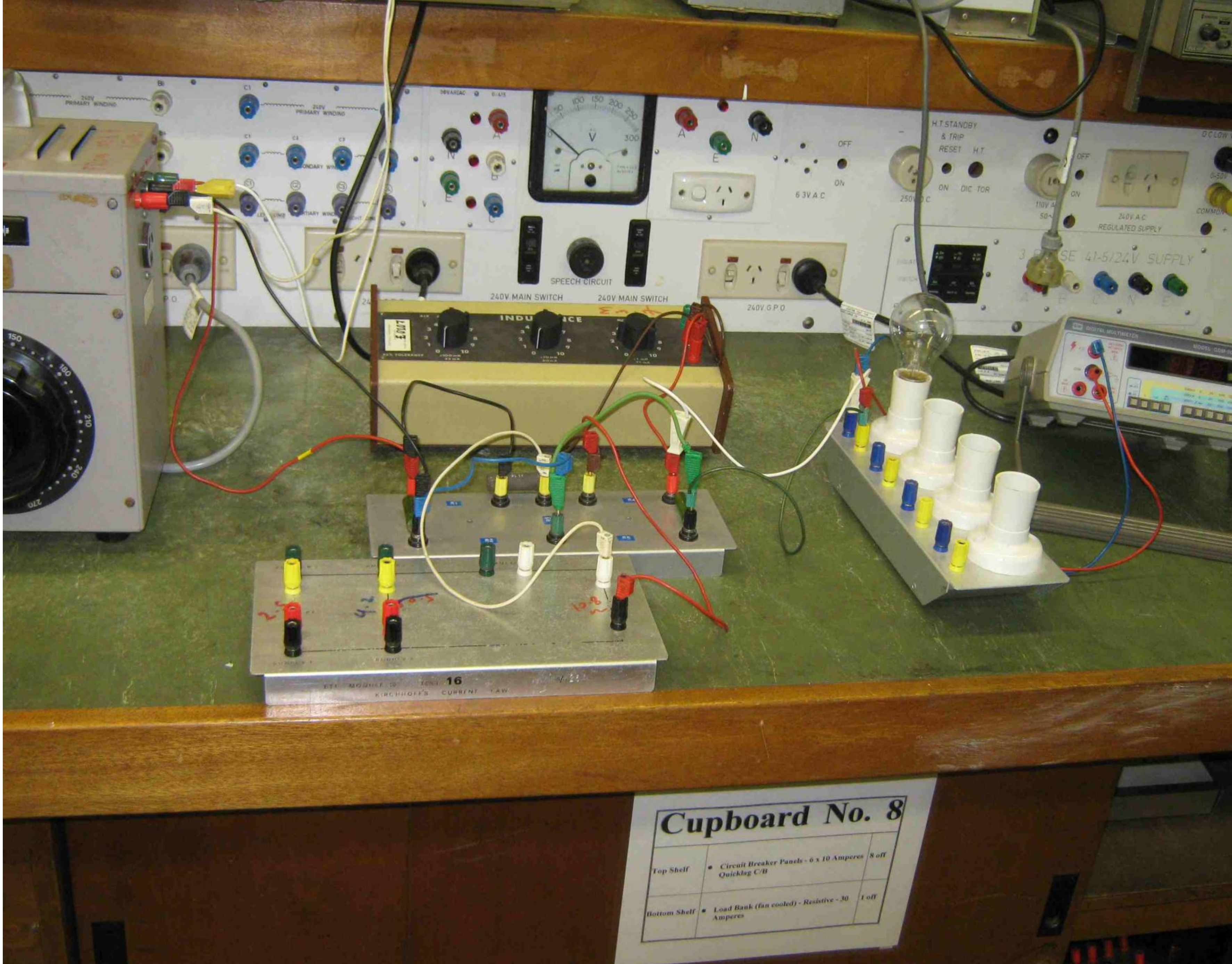
COMPARE V_L of π & T CIRCUITS

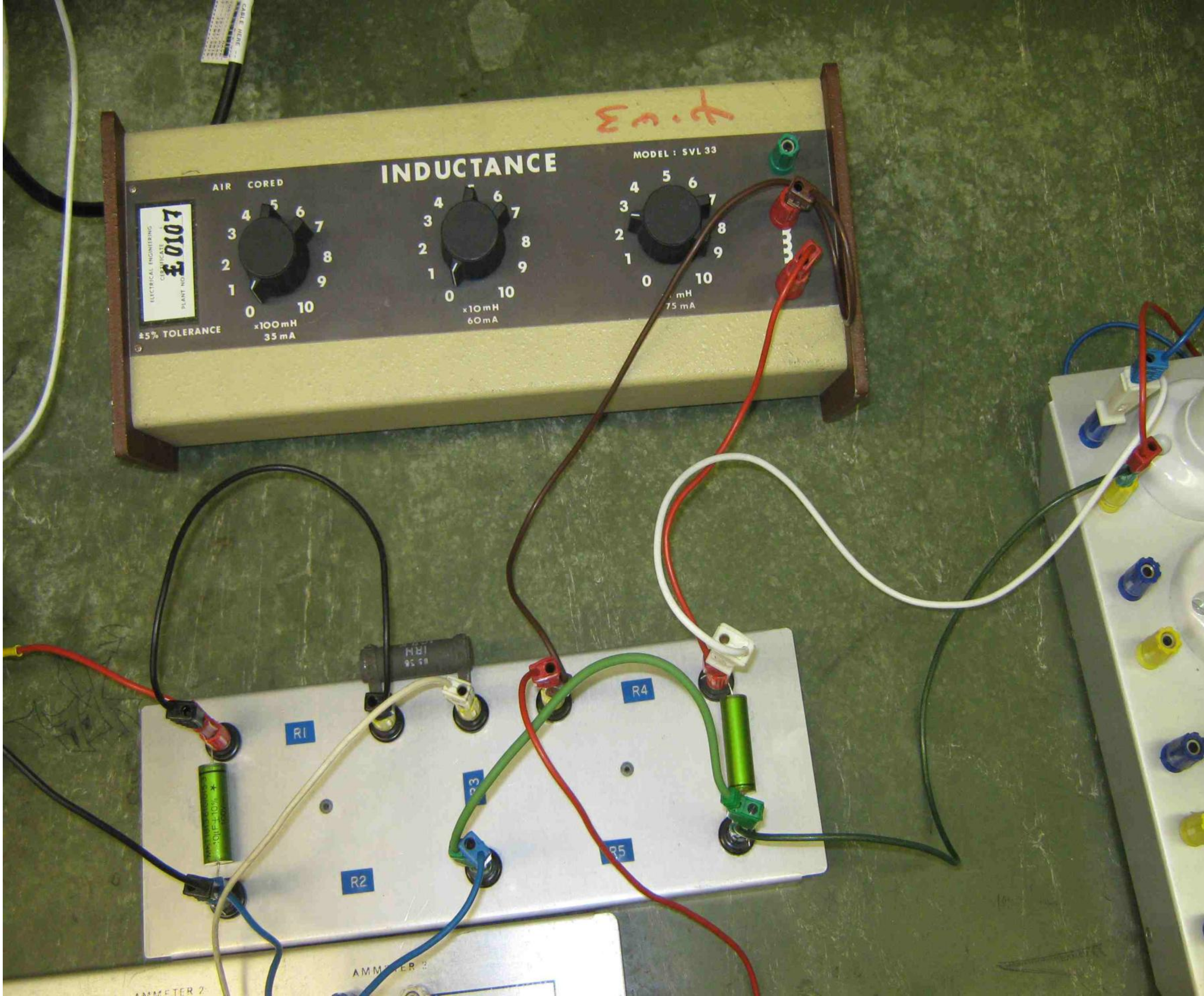

INDUCTANCE
INDUCTANCE
32 VOLTS ONLY
240V G.P.O
240V A.C
REGULATED SUPPLY
110V A.C
250V D.C.
ON INDICATOR

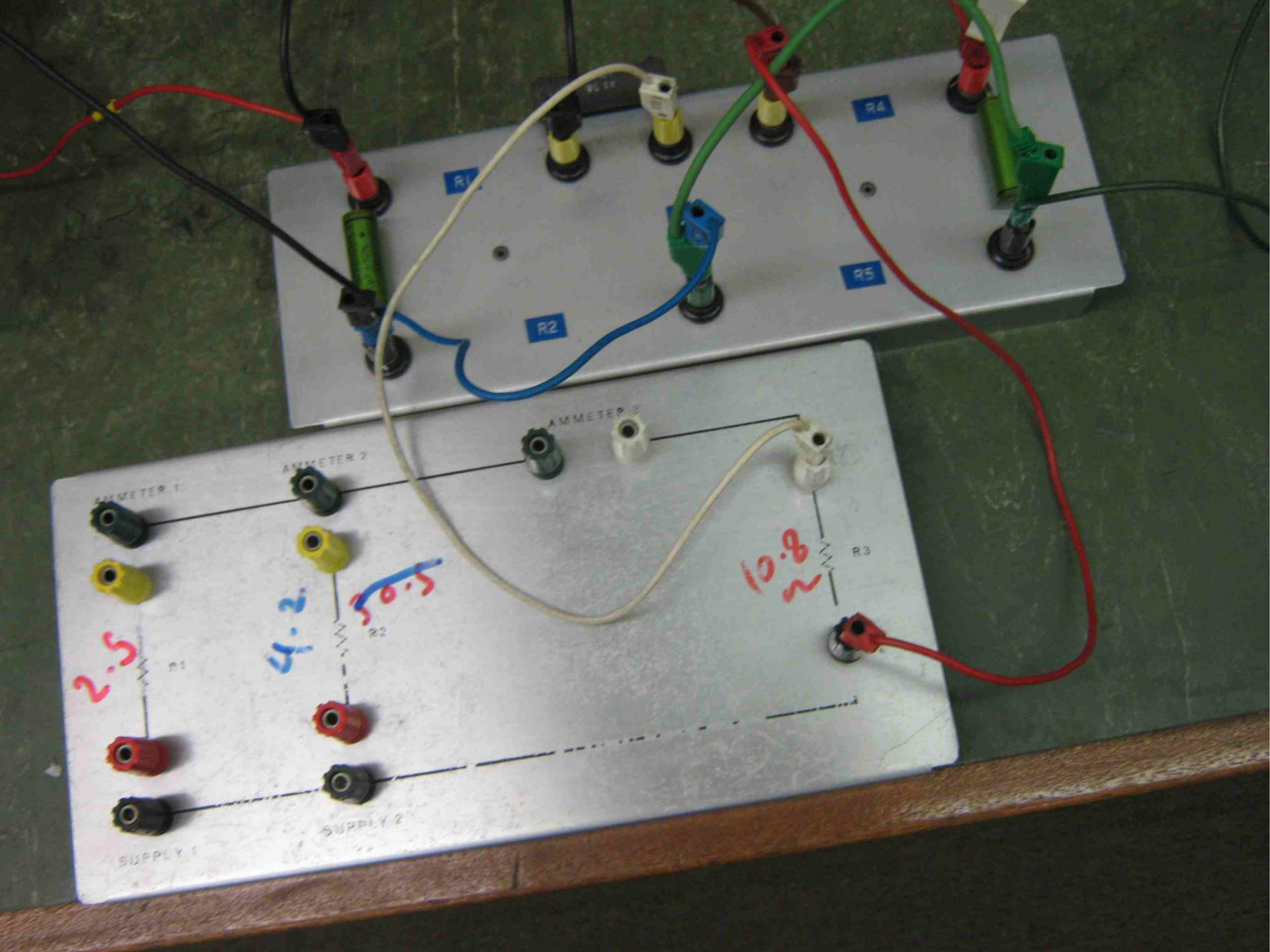

TRIO
REGULATED DC POWER SUPPLY
H.T.STANDBY
& TRIP
RESET
D.C.LOW VOLTAGE
0-50V
COMMON
6.3V A.C.
250V D.C.
110V A.C.
50~
240V A.C.
REGULATED SUPPLY
PHASE 41.5/24V SUPPLY
A B C N E
SPEECH CIRCUIT
240V.MAIN SWITCH
No. 10

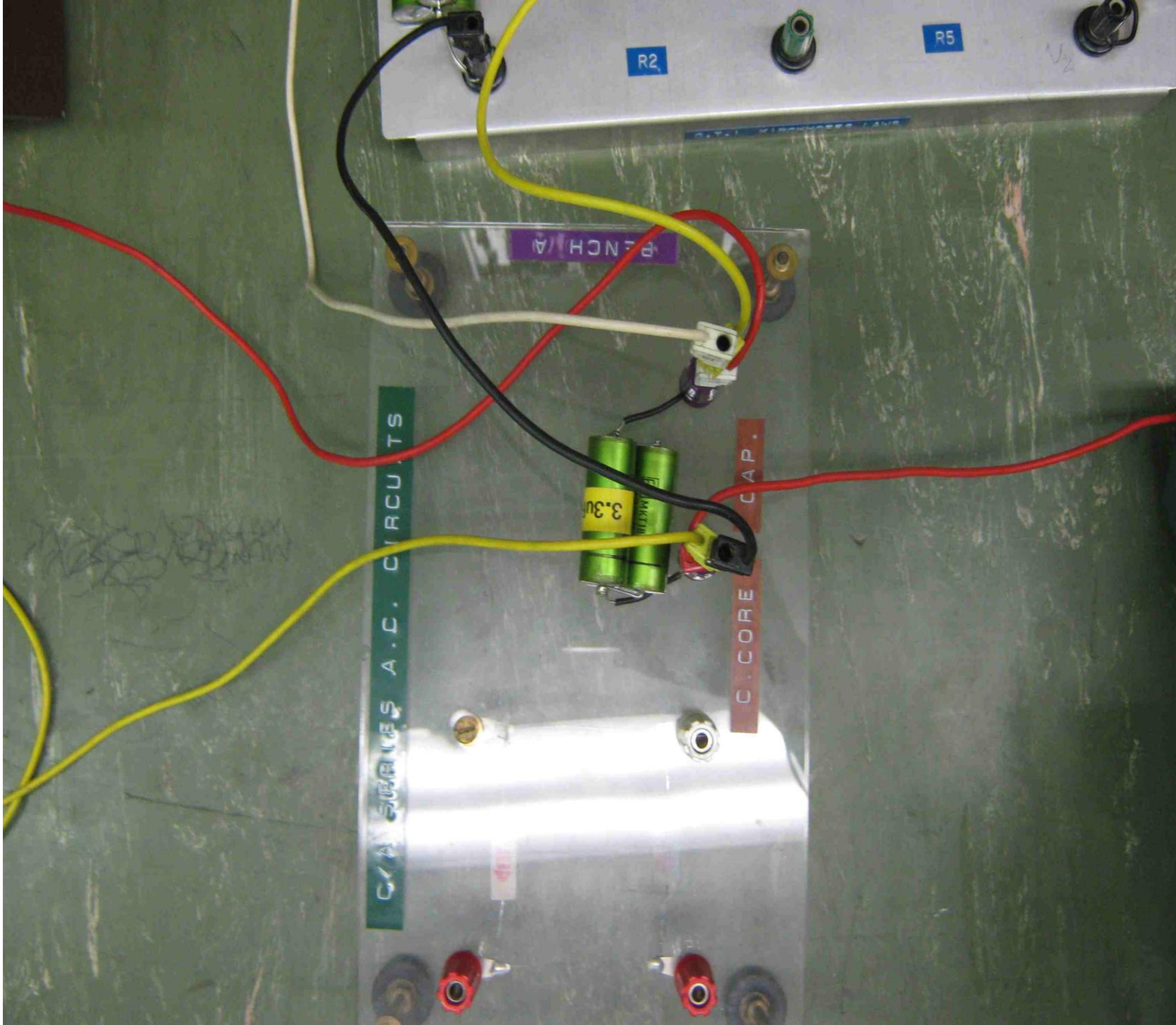


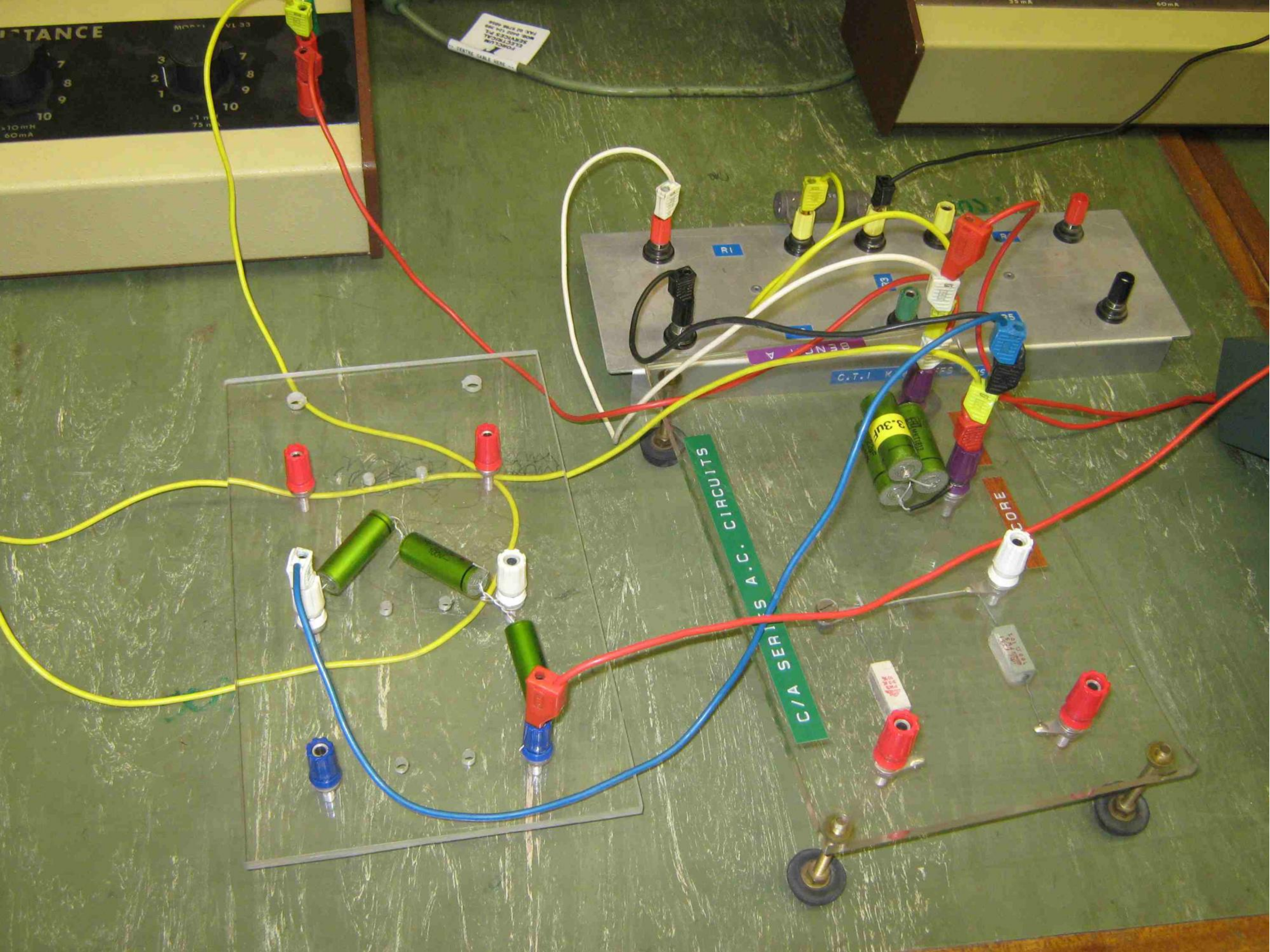
PHASE 41 5/24V
ON
240V G.P.O
INDUCTANCE
AIR CORED
±5% TOLERANCE
MODEL : SVL 33
INDUCTANCE
MODEL : SVL 33
R1
R2
R3
R4
R5
BENCH A
C/A SERIES A.C. CIRCUITS
C.CORE


240V PRIMARY WINDING
SPEECH CIRCUIT
240V MAIN SWITCH
240V MAIN SWITCH
240V G.P.O
H.T STANDBY & TRIP
RESET
ON
OFF
6.3V A.C
240V A.C REGULATED SUPPLY
INDUCTANCE
DIGITAL MULTIMETER
16
KIRCHHOFF'S CURRENT LAW
Cupboard No. 8
Top Shelf
Circuit Breaker Panels - 6 x 10 Amperes Quicklag C/B
8 off
Bottom Shelf
Load Bank (fan cooled) - Resistive - 30 Amperes
1 off


INDUCTANCE
MODEL : SVL 33
AIR CORED
x100mH
35 mA
x10mH
60mA
75 mA
±5% TOLERANCE
R1
R2
R4
R5


R1
R2
R4
R5
AMMETER 1
AMMETER 2
AMMETER 3
R1
R2
R3
SUPPLY 1
SUPPLY 2
2.5
4.2
30.5
10.8


R2
R5
BENCH A
C/A SERIES A.C. CIRCUITS
C. CORE CAP.


C/A SERIES A.C. CIRCUITS
CORE
R1