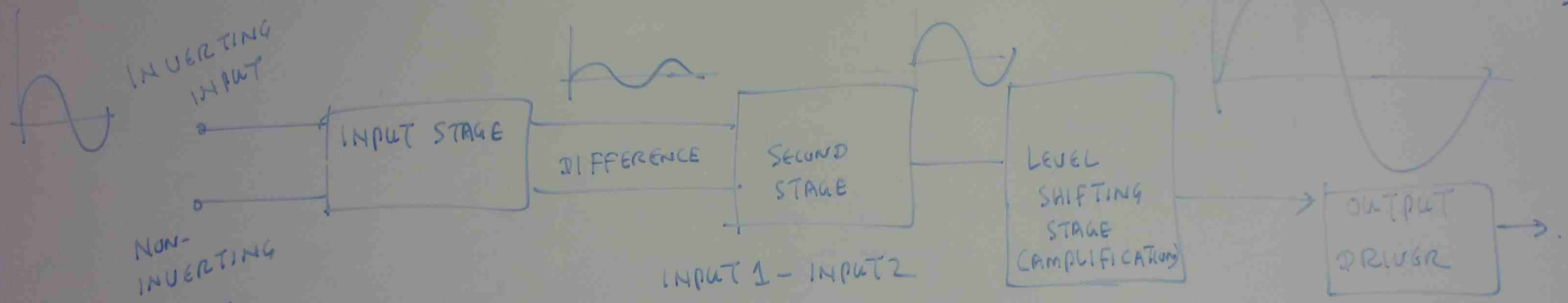
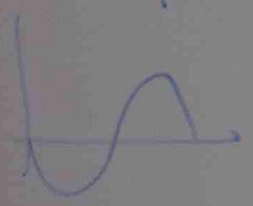
INTRODUCTION TO THE OPERATIONAL AMPLIFIER



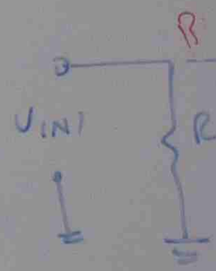


THE INPUT QUANTITY AND REFERENCE QUANTITY ARE COMPARED. THE DIFFERENCE IS FED INTO THE SECOND STAGE, WHICH DOES THE AMPLIFICATION. THE VOLTAGE LEVEL IS THEN SHIFTED AND IS FED TO OUTPUT DRIVER STAGE WHICH DRIVES THE OUTPUT CONTROL CIRCUITS.

Ph

DE TER M

OF GI



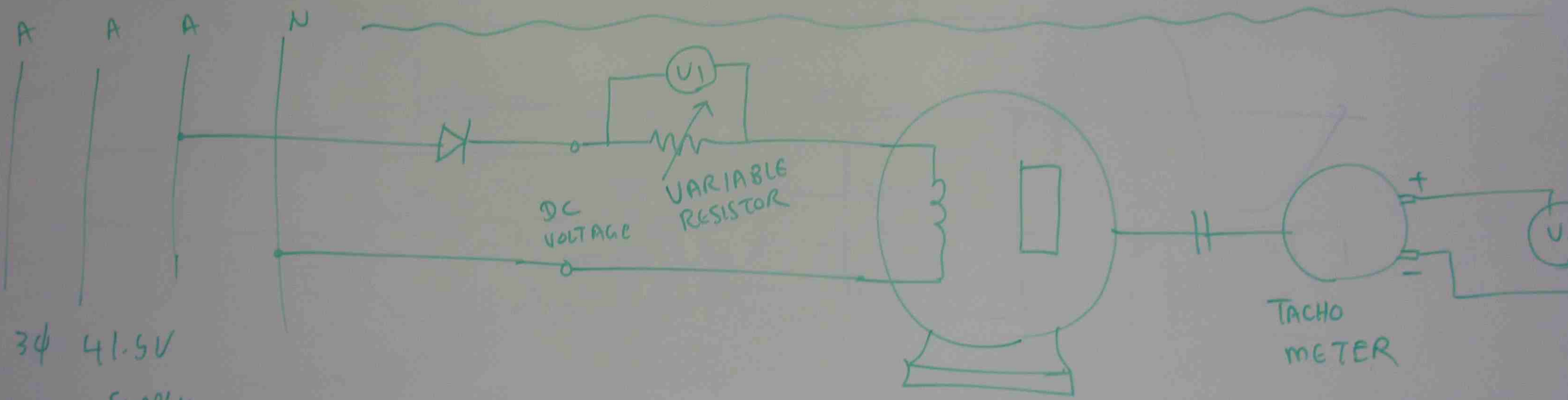
$E = U_B - U_E$

$= 0 - 0.6$

$= -0.6$

PRACTICAL (1) INVESTIGATING DC VARIABLE SPEED DRIVE SYSTEM

TACHO METER / TRANSDUCER

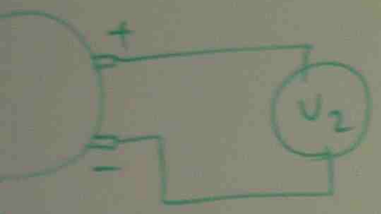


SWITCH ON THE SUPPLY. OBSERVE THE ACTION OF DC MOTOR.

FILL THE DATA IN TABLE

...IVE SYSTEM

VARIABLE RESISTOR	V_1	V_2	$Rpm = V_2 \times \frac{1000}{50}$	SPEED (SLOW OR) FAST
POSITION (1)				
POSITION (2)				
POSITION (3)				
POSITION (4)				



...TER

...1000
RPM

...OR.

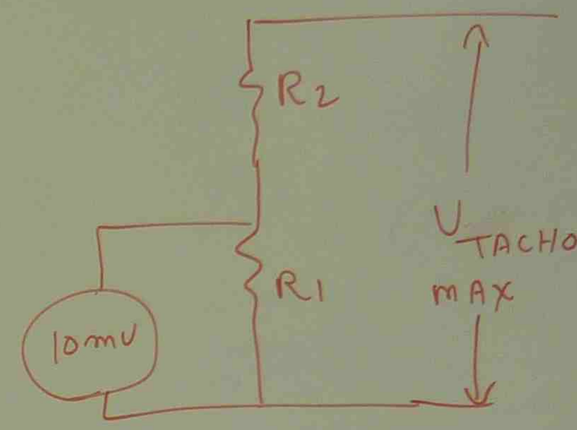
10mV

V
ELECTRONIC

IF ELECTRONIC CIRCUIT CAN ONLY ACCEPT 10mV.
TO CONTROL THE MAXIMUM SPEED, FIND THE RATIO OF POTENTIAL DIVIDER

	V_2	$Rpm = V_2 \times \frac{1000}{50}$	SPEED (SLOW OR FAST

ECTRONIC CIRCUIT CAN ONLY ACCEPT 10mV.
HE MAXIMUM SPEED, FIND THE RATIO OF POTENTIAL DIVIDER



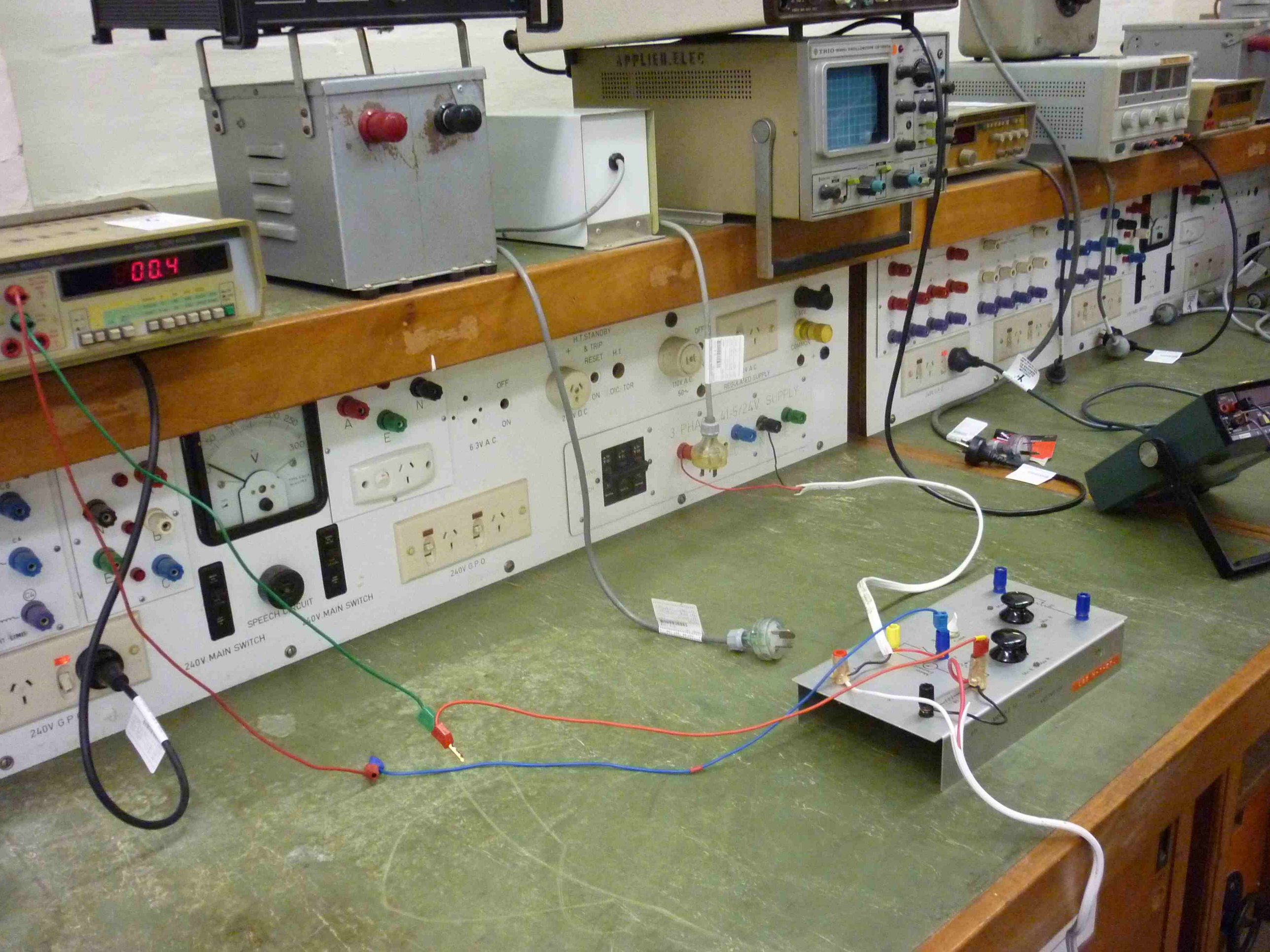
$$V_{ELECTRONIC} = V_{TACHO\ MAX\ SPEED} \times \frac{R_1}{R_1+R_2}$$

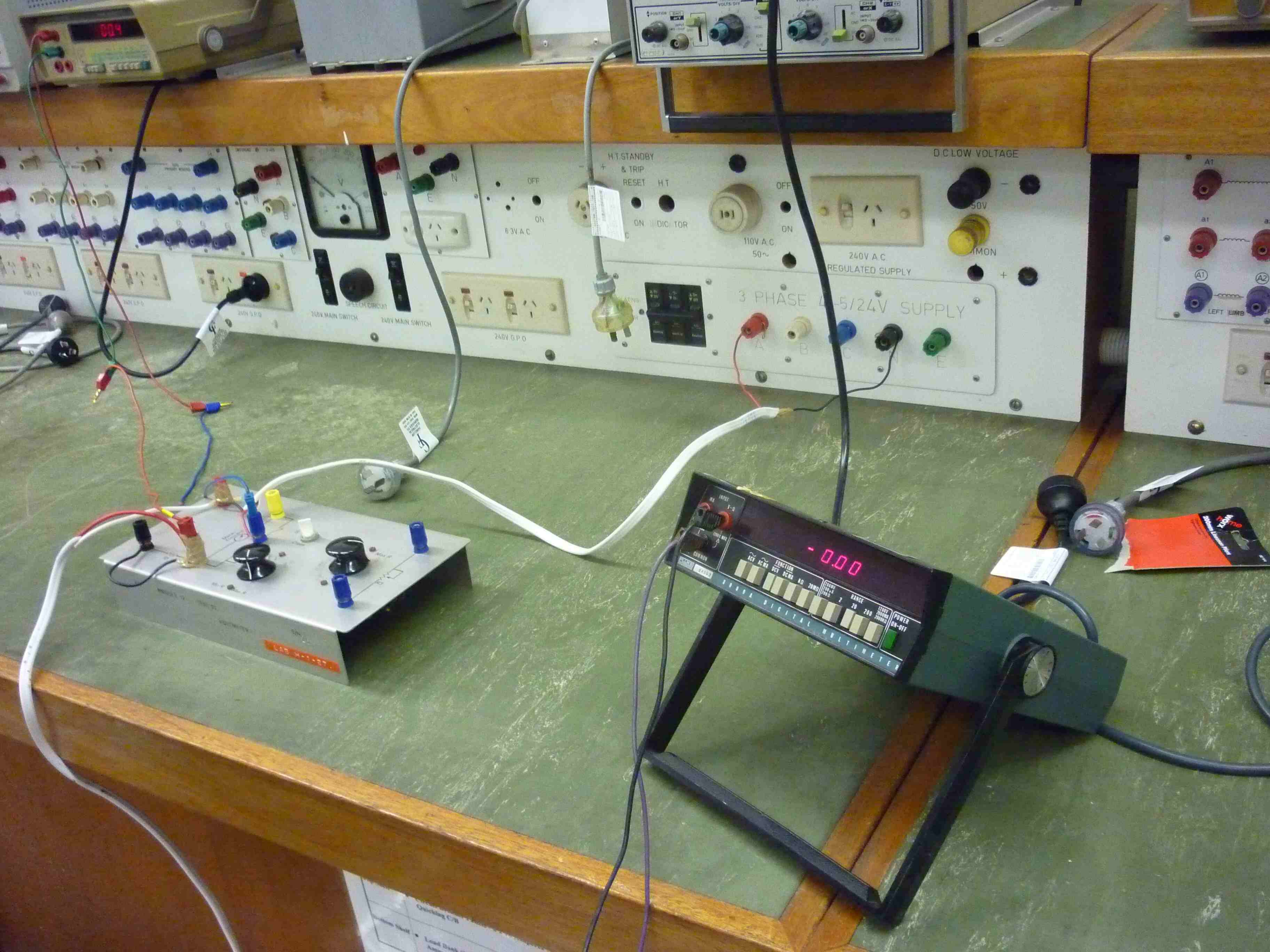
$$\therefore \frac{R_1}{R_1+R_2} = \frac{V_{ELECTRONIC}}{V_{TACHO\ MAX}}$$

THEN FIND $\frac{R_1}{R_2}$

PRACT

SET TH


APPLIED ELEC
TRIO
H.T STANDBY
& TRIP
RESET
H.T
ON
OFF
6.3V A.C
240V G.P.O
240V MAIN SWITCH
SPEECH CIRCUIT
REGULATED SUPPLY
3 PHASE 41-5/24V SUPPLY


H.T. STANDBY
& TRIP
RESET
H.T
OFF
ON
6.3V A.C
110V A.C
50~
240V A.C
REGULATED SUPPLY
D.C LOW VOLTAGE
240V MAIN SWITCH
240V G.P.O
3 PHASE
SUPPLY
LEFT LIMB
- 0.0 0
DIGITAL MULTIMETER


AUSTRALIFLO
BALDOR
BALDOR
BALDOR

R_2

$U_{TACHO\ MAX}$

$\times \frac{R1}{R_1+R_2}$

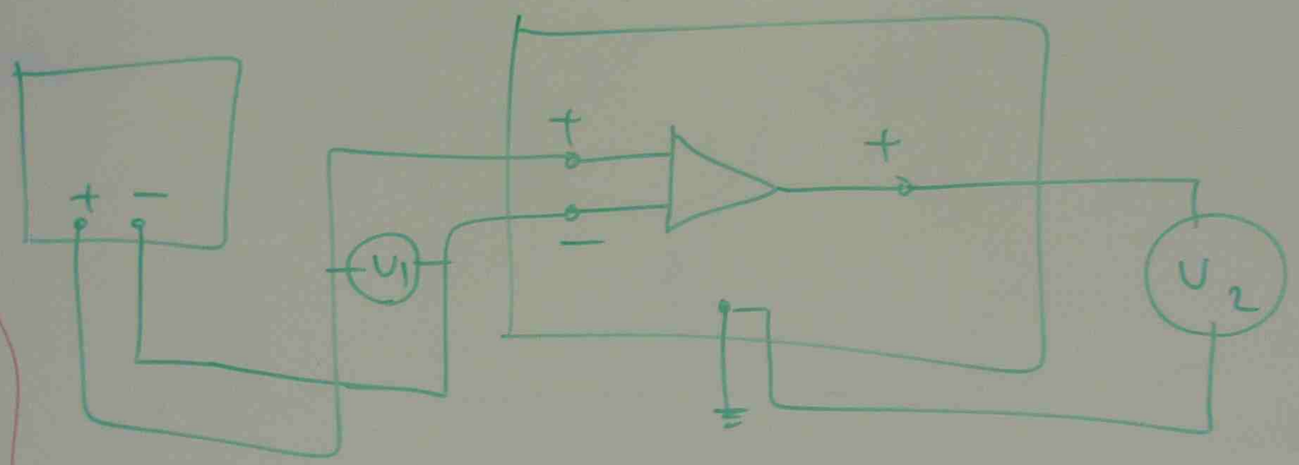
CHO
AX
PEED

$= \frac{U_{ELECTRONIC}}{U_{TACHO\ MAX}}$

FIND $\frac{R1}{R_2}$

PRACTICAL (2)

AMPLIFIER GAIN



SET THE IN PUT | OUT PUT VOLTAGE WITHOUT ADJUSTING

GAIN

INITIAL CONDITION	U_1	U_2	$AU = GAIN = \frac{U_2}{U_1}$
GAIN ADJUSTMENT(1)			
GAIN ADJUSTMENT(2)			
GAIN ADJUSTMENT (3)			


MINI-LAB
TRIO 15MHz OSCILLOSCOPE
3 PHASE

EMERGENCY STOP
OPERATION OF THIS BUTTON WILL ISOLATE ALL POWER IN THIS AREA

H.T STANDBY & TRIP
H.T RESET
INDICATOR ON
OFF ON
110V A.C 50~
240V A.C REGULATED SUPPLY
250V D.C
6.3V A.C
0-280V
240V A.C

MINI-LAB
MODEL
FUNCTION GENERATOR
REGULATED POWER SUPPLY

POWER CONTROL DEVICES

NE05 SECTION 3

32V/40W

D1

13

9

+24V

S1

D2

17

15

32V/40W

20

MT2

TRIAC

MT1

S2

V1

S1

S3

7

R1

3V

100R

5

19

V2

3

-(0V)

28

ELECTROTECHNOLOGY DIVISION

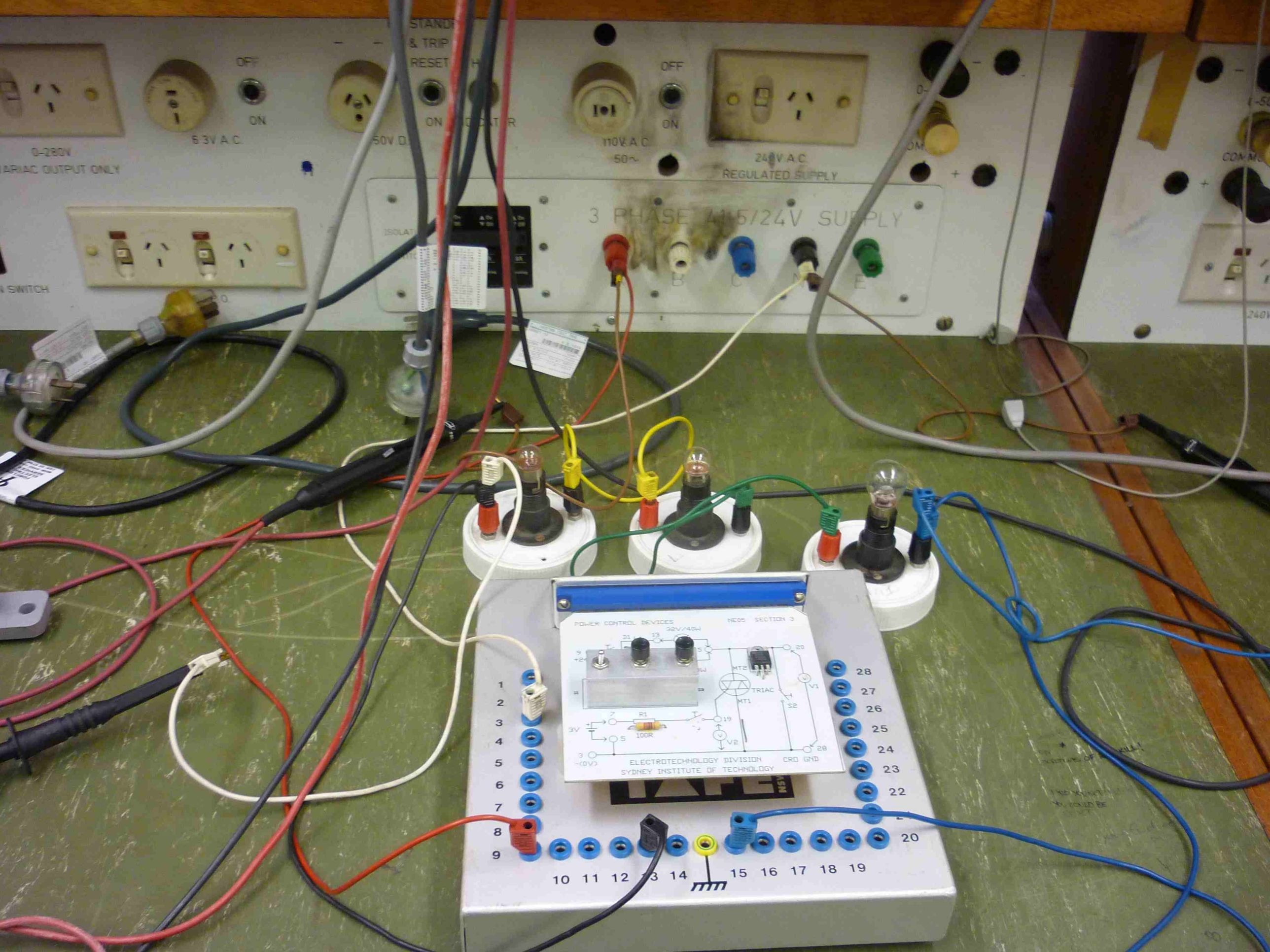
SYDNEY INSTITUTE OF TECHNOLOGY

CRO GND

1 2 3 4 5 6 7 8 9

28 27 26 25 24 23 22 21 20

10 11 12 13 14 15 16 17 18 19


OFF
ON
63V A.C.
50V D.
110V A.C.
50~
240V A.C.
REGULATED SUPPLY
3 PHASE 415/24V SUPPLY
POWER CONTROL DEVICES
NE05 SECTION 3
32V/40W
TRIAC
MT1
MT2
R1
100R
3V
ELECTROTECHNOLOGY DIVISION
SYDNEY INSTITUTE OF TECHNOLOGY
CRO GND

BWD 880 POWERSCOPE

+ CH1 — POSITION VOLTS / DIV — DC — AC GND — BAL — CH SEL — CMR — − CH1

+ CH2 — POSITION VOLTS / DIV — DC — AC GND — BAL — CMR — − CH2

+ CH3 — POSITION VOLTS / DIV — DC — AC GND — BAL — CMR — − CH3

+ CH4 — POSITION VOLTS / DIV — DC — AC GND — BAL — CMR — − CH4

±1000V MAX. EACH INPUT

PULL FOR OFFSET — CALIBRATE 10V 100V — ASTIG — POWER — GRATICULE — PWR OFF — FOCUS — INTENSITY

READY — RESET — SS — PH — DC — LEVEL — CH 1 2 3 4 — EXT — LINE — VERNIER SEC/DIV — CAL

COUNT UP / STOP / DOWN — DEGREES

PHASE ANGLE — BEAM FIND — REFERENCE 0° 0° — MARKER OFF — 180° 120° 240° ON

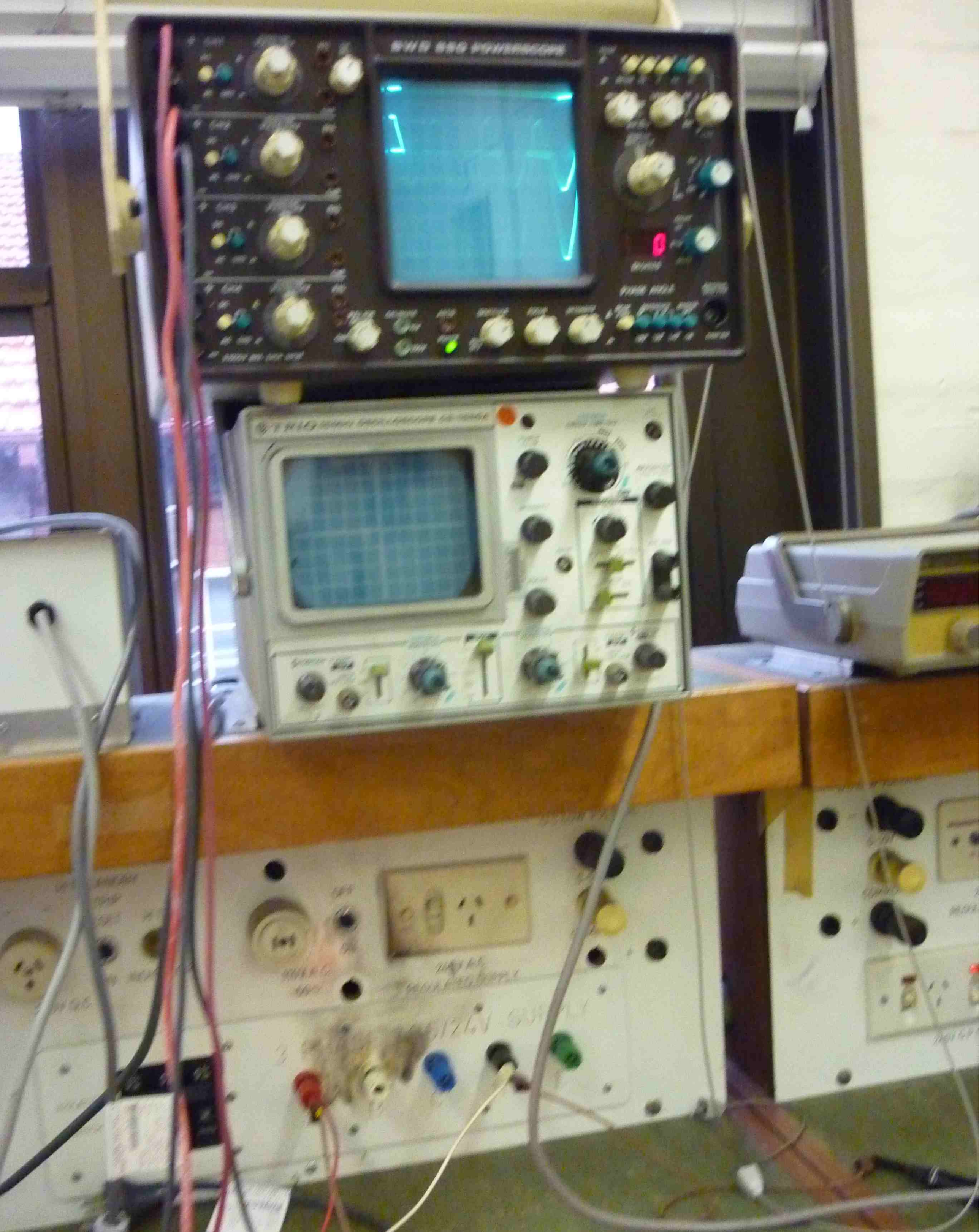
EXTERNAL TRIG / PH — ±500V MAX

TRIO 15MHz OSCILLOSCOPE CS-1560A

POWER ILLUM — OFF

VARIABLE SWEEP TIME/DIV — CAL 1Vp-p — POSITION


BWD 880 POWERSCOPE
CH1
CH2
CH3
CH4
POSITION VOLTS/DIV
DC
AC
GND
BAL
CMR
CH SEL
PULL FOR OFFSET
±1000V MAX EACH INPUT
CALIBRATE
10V
100V
ASTIG
POWER
GRATICULE
PWR OFF
FOCUS
INTENSITY
READY
RESET
LEVEL
VERNIER SEC/DIV
CAL
EXT
LINE
COUNT
UP
STOP
DOWN
DEGREES
PHASE ANGLE
BEAM FIND
REFERENCE
MARKER OFF
180°
120°
240°
ON
EXTERNAL TRIG / PH
2500V MAX
WARNING
TRIO
OSCILLOSCOPE CS-1560A
POWER ILLUM
OFF
VARIABLE SWEEP TIME/DIV
CAL
POSITION
PULL X5 MAG
INTENSITY
ASTIG
FOCUS
TRIGGERING
LEVEL
PULL AUTO
SYNC
SOURCE
EXT TRIG
VARIABLE VOLTS/DIV
MODE
CH1 or Y
CH2 or X
INPUT
DC BAL
GW
FUNCTION GENERATOR
GATE
UNTERMINATED
OFF
ON
110V A.C.
50~
240V A.C.
0-50V



BWD 650 POWERSCOPE

CH1

CH2

CH3

CH4

PHASE ANGLE

DEGREES

TRIO 15MHz OSCILLOSCOPE CS-1560A

D.C LOW VOLTAGE

110V A.C 50~

240V A.C REGULATED SUPPLY

3 PHASE 415/240/24V SUPPLY

TRIO 15MHz OSCILLOSCOPE CS-1560A

H.T

OFF

ON

110V A.C
50~

240V A.C
REGULATED SUPPLY

3 PHASE 415/240V SUPPLY

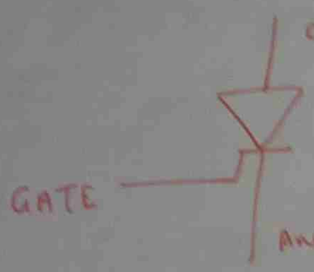
A B C E

ELECTROTECHNOLOGY DIVISION
SYDNEY INSTITUTE OF TECHNOLOGY

28
27
26
25
24
23
22
21
20

PRACTICAL (5) INVESTIGATING THE OPERATION OF SCR (SILICON CONTROLLED RECTIFIER) (THYRISTOR)

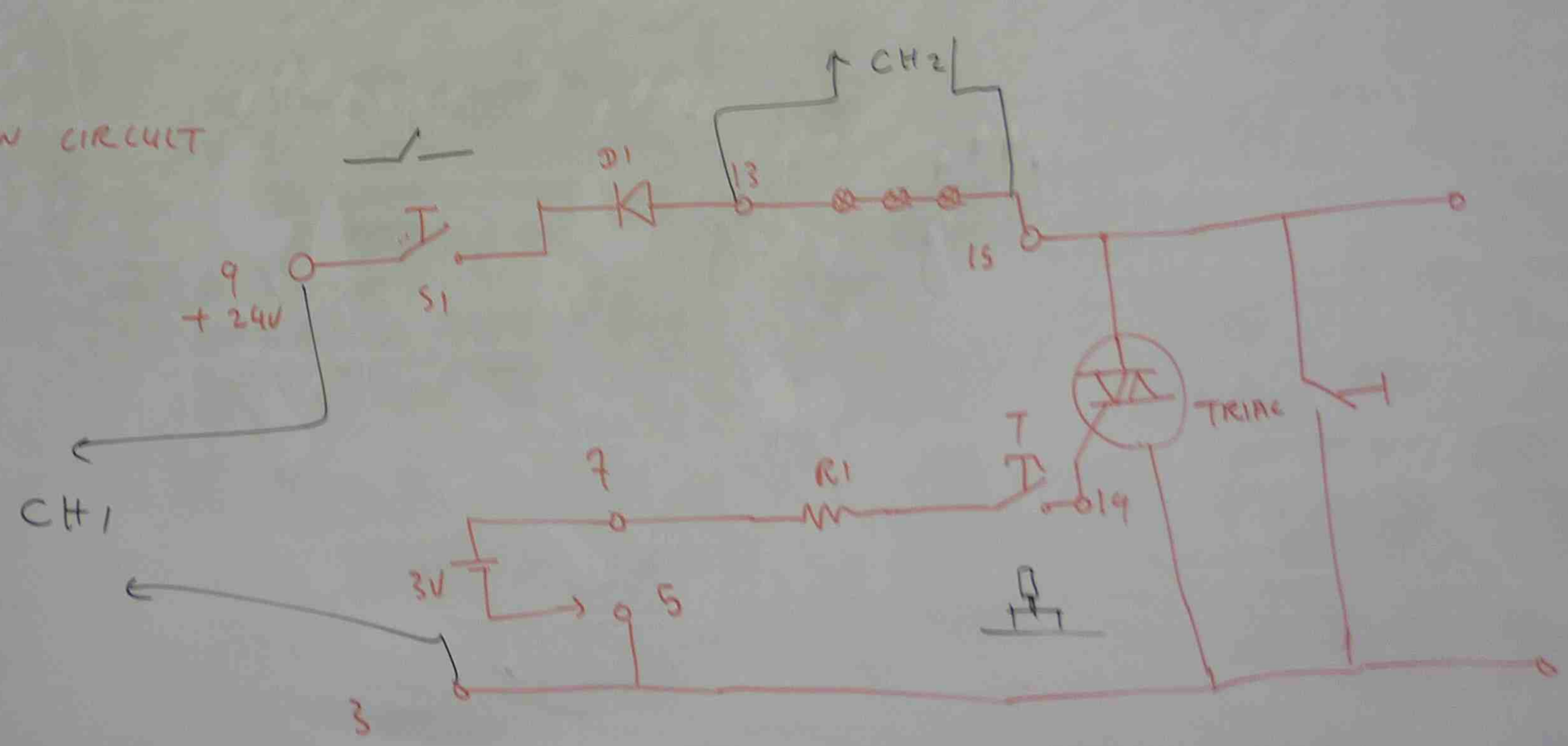
CIRCUIT



SCR

SCR CONDUCTS WHEN THE GATE IS GIVEN THE SWITCHING SIGNAL

CONNECT THE GIVEN CIRCUIT



THYRISTOR)

SWITCH ON PUSH BUTTON SWITCH WHICH SUPPLIES THE TRIGGERING SIGNAL TO GATE OF TRIAC.

SKETCH THE MAIN WAVE (CH 1) & VOLTAGE ACROSS THE LOAD (CH2)

INDICATE THE FIRING ANGLE.

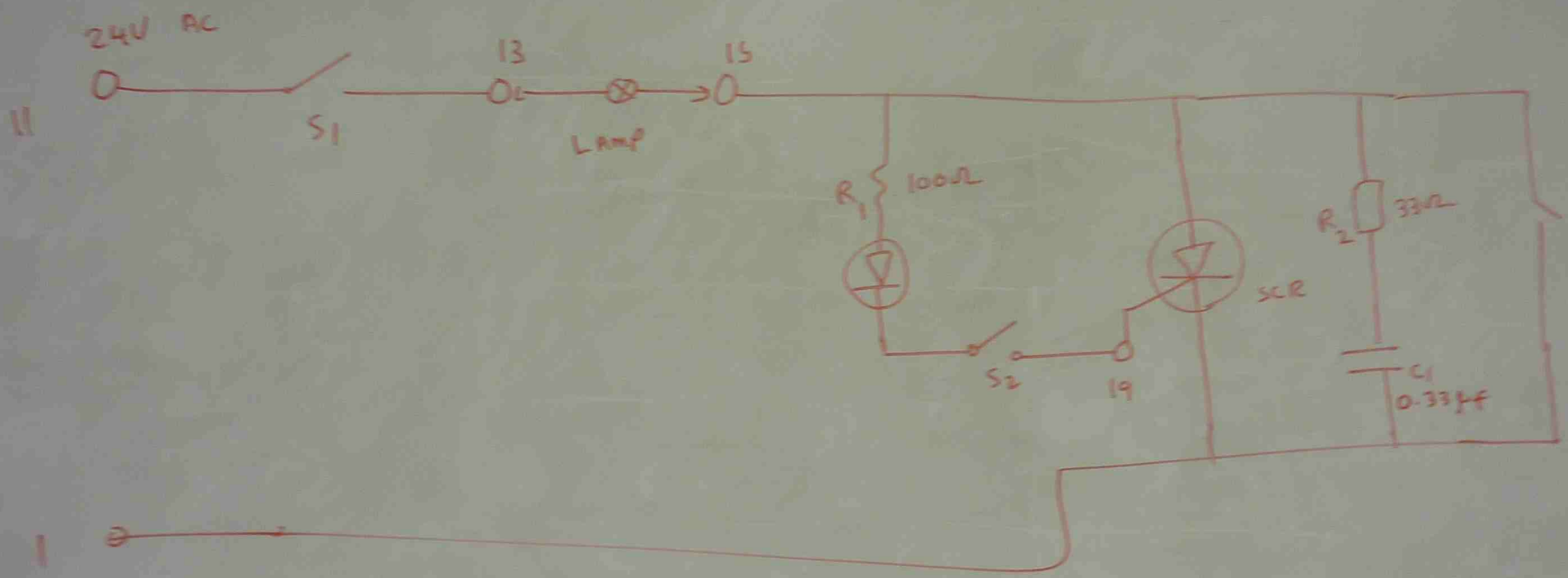
24V AC

9T3

D4 500A

CO-43

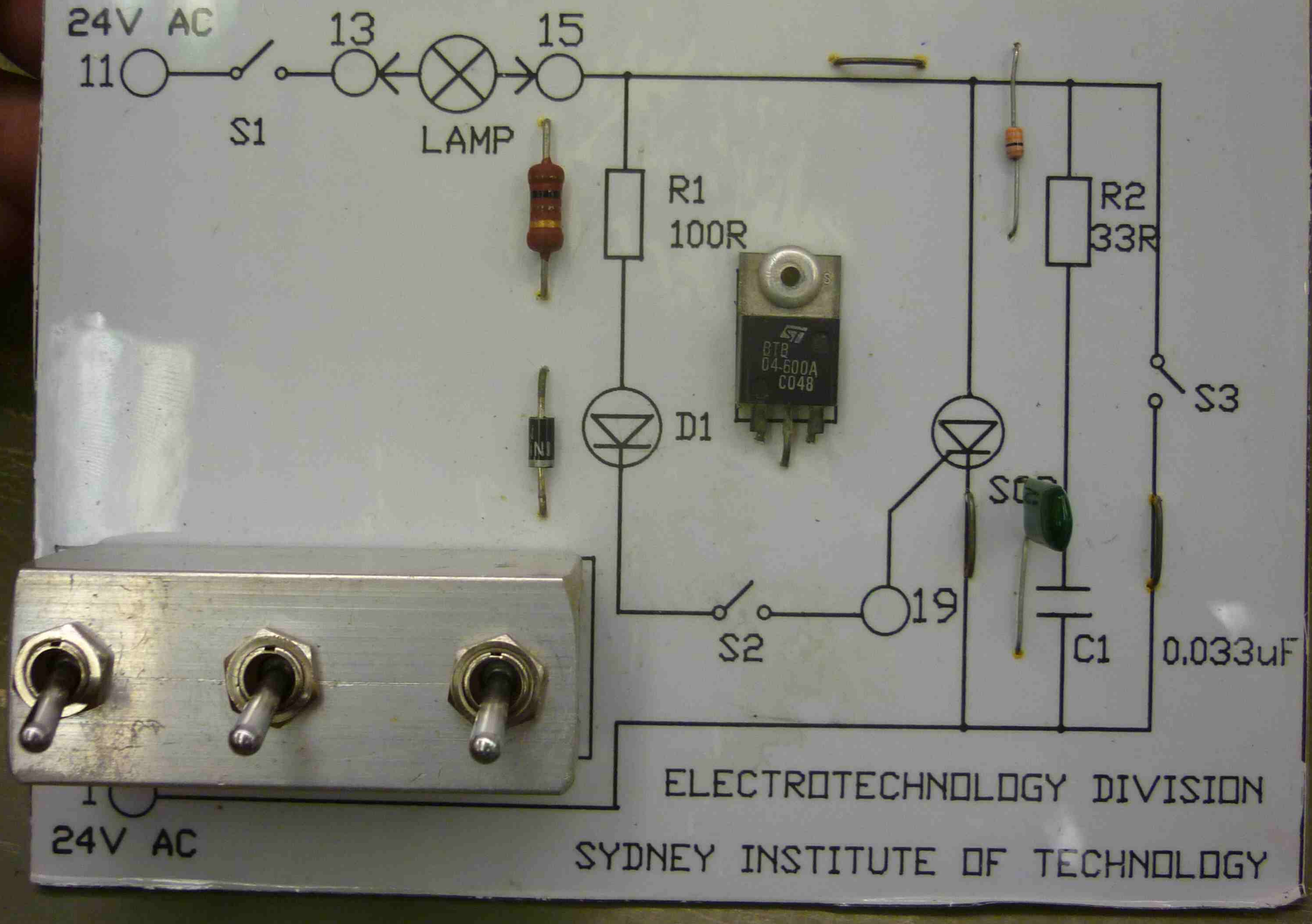
24V AC



FIRING SIGNAL = DC.

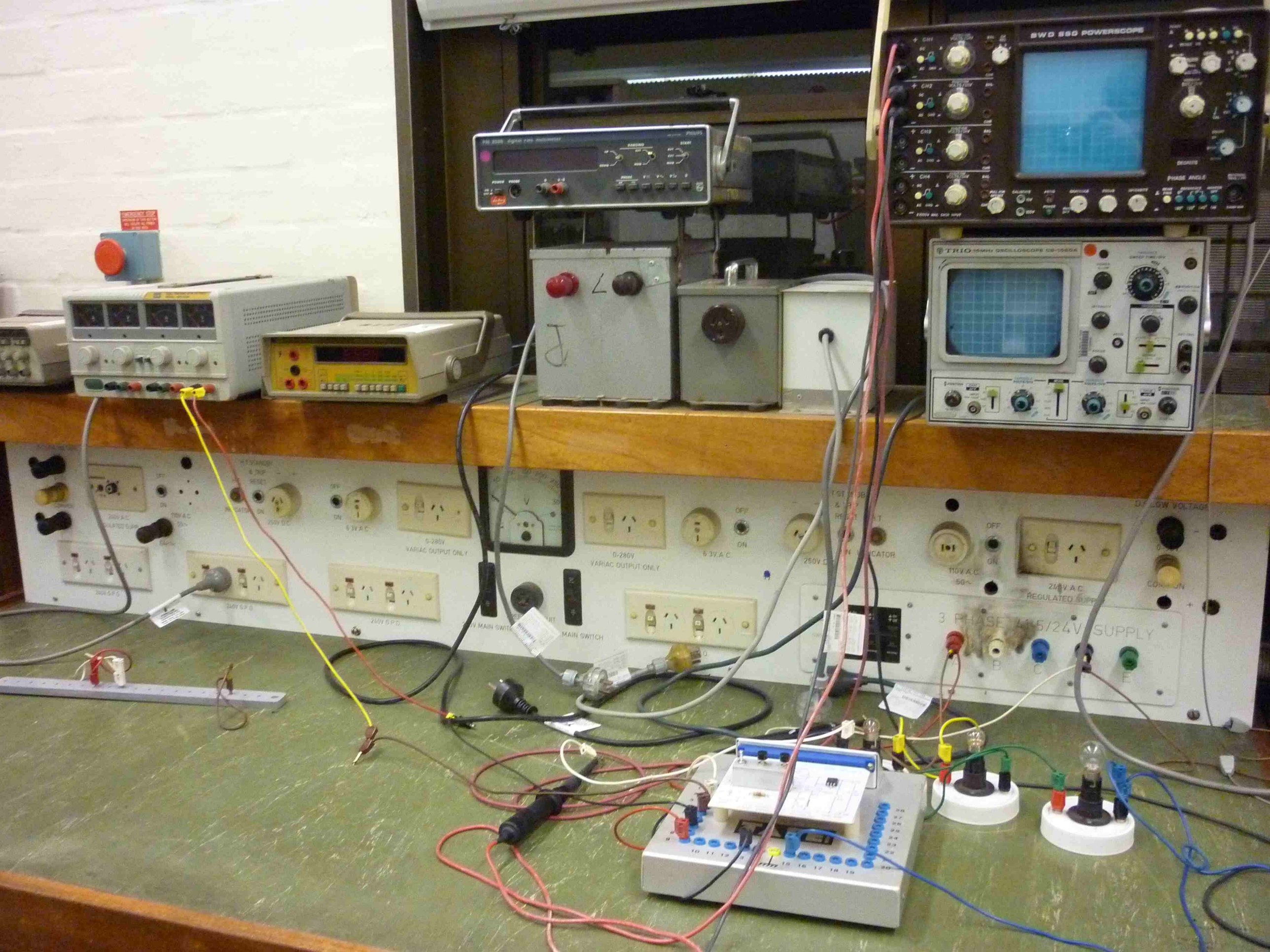
POWER CONTROL DEVICES

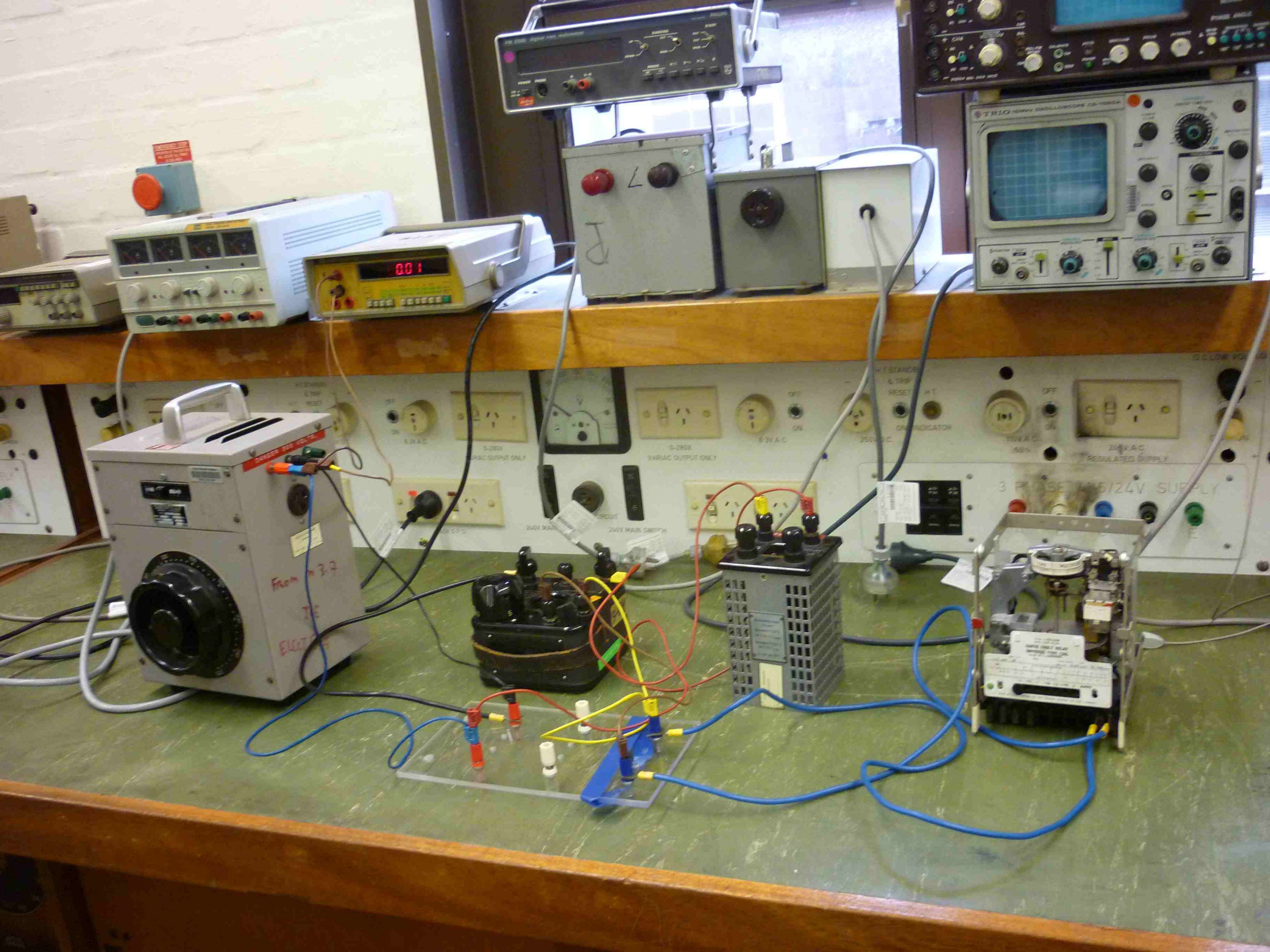
NE05 SECTION 2A



ELECTROTECHNOLOGY DIVISION

SYDNEY INSTITUTE OF TECHNOLOGY


SWO 550 POWERSCOPE
TRIO 15MHz OSCILLOSCOPE CS-1560A
PHASE ANGLE
0-280V
VARIAC OUTPUT ONLY
6.3V A.C
110V A.C
50~
240V A.C
REGULATED SUPPLY
LOW VOLTAGE
3 PHASE 415/24V SUPPLY
MAIN SWITCH


TRIO
001
3 PHASE 415/240V SUPPLY

VARIAC OUTPUT ONLY

240V MAIN SWITCH

240V G.P.O

V

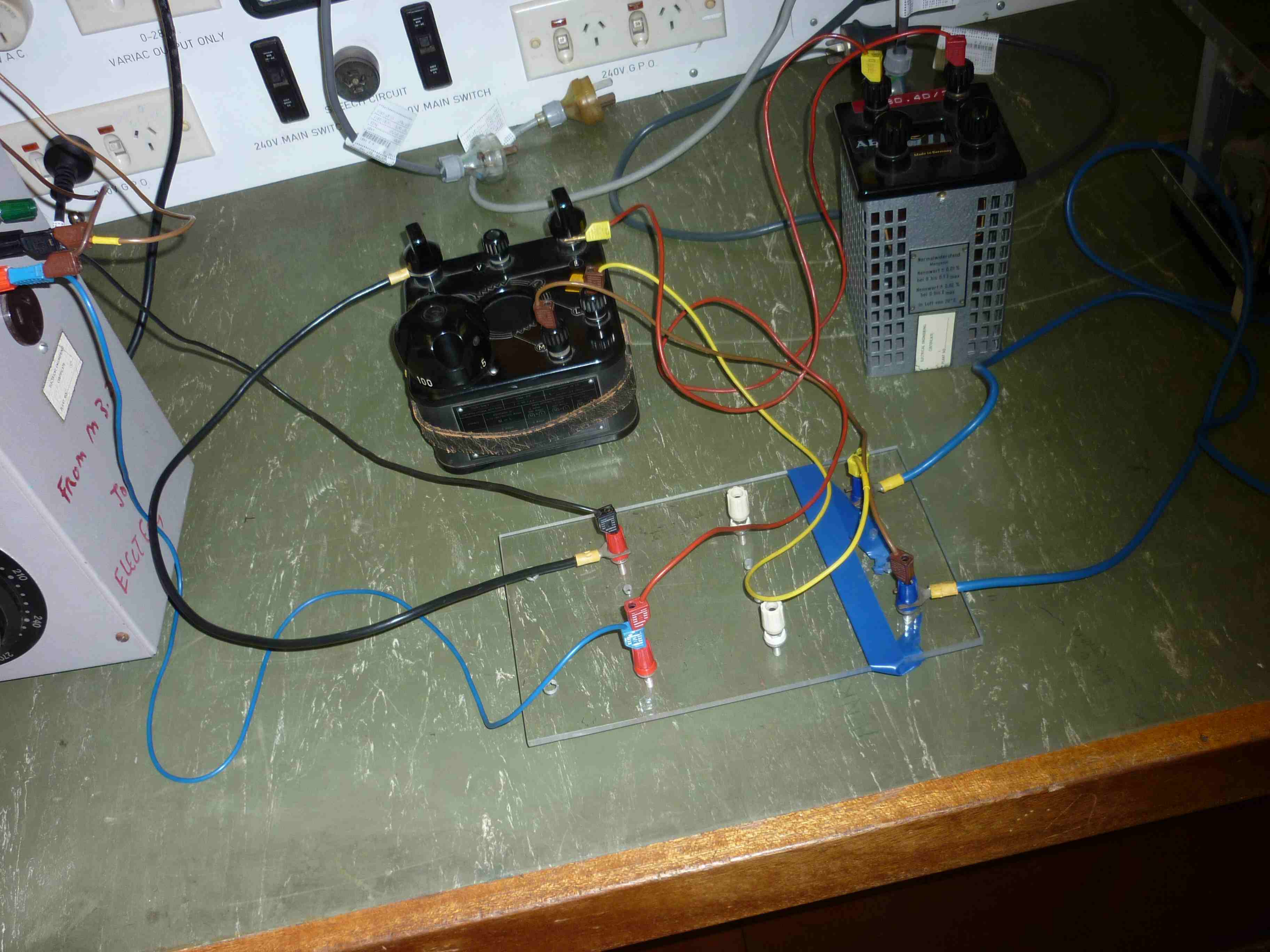
M

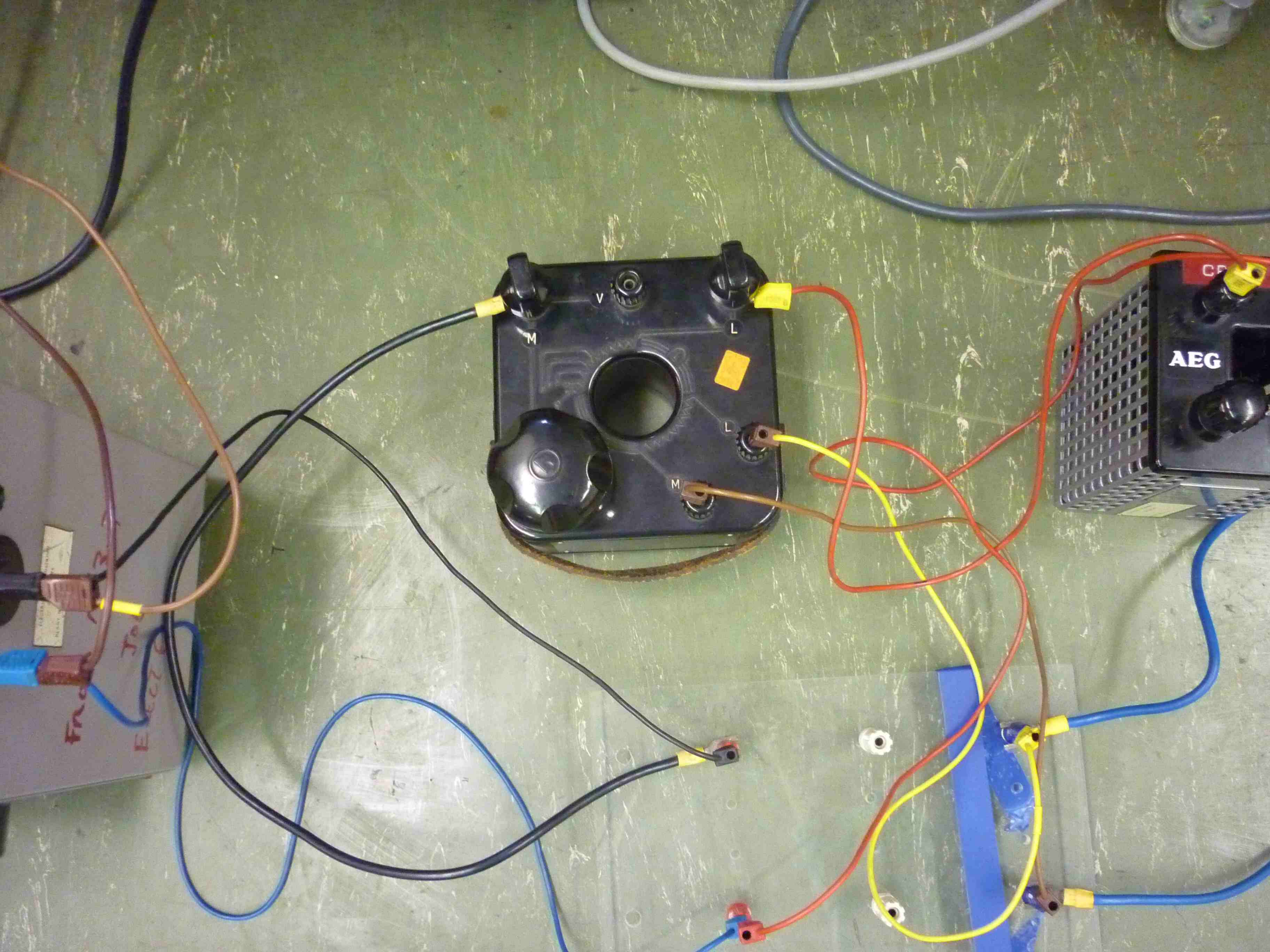
L

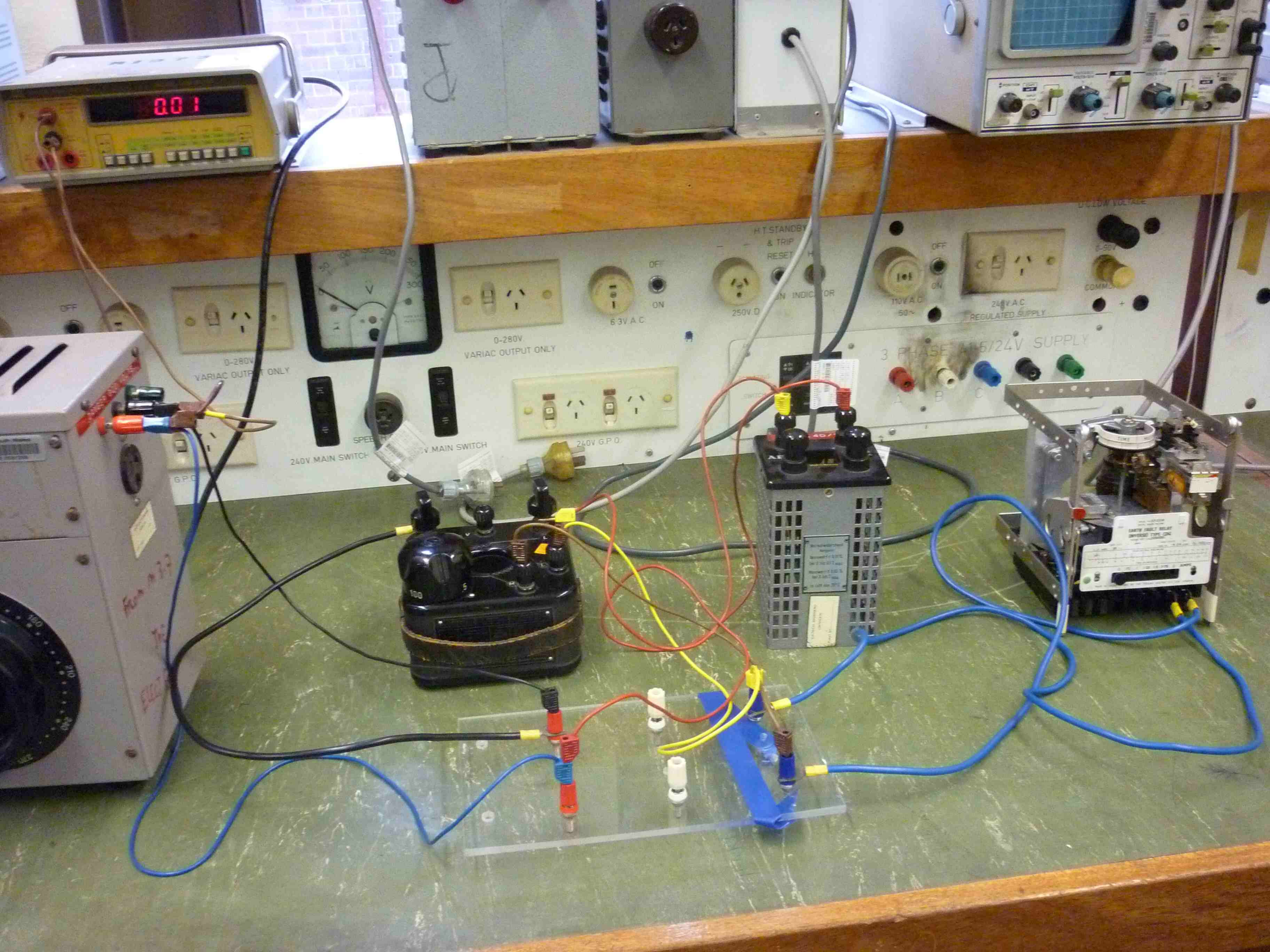
AEG

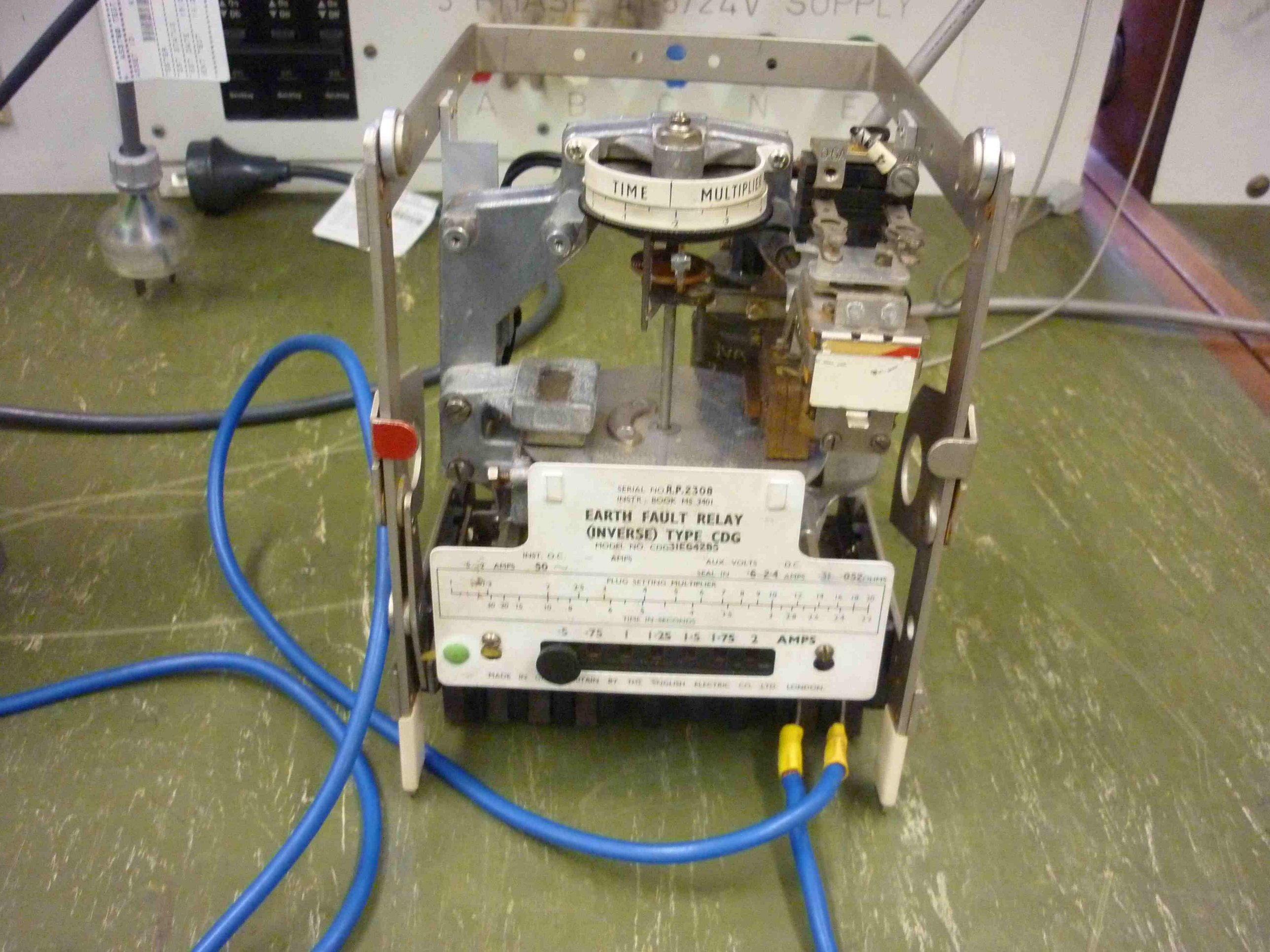
0,1Ω abs
max.10A


V
M
L
L
M


240V G.P.O
240V MAIN SWITCH
100


V
M
L
L
M
AEG


0.01
0-280V
VARIAC OUTPUT ONLY
6.3V A.C.
OFF
ON
H.T STANDBY
& TRIP
RESET
250V D.C.
240V MAIN SWITCH
240V G.P.O.
110V A.C.
50~
240V A.C.
REGULATED SUPPLY
3 PHASE 415/24V SUPPLY
A
B
C
EARTH FAULT RELAY
INVERSE TIME CBC


TIME
MULTIPLIER
SERIAL NO. R.P.2308
INSTR. BOOK MS 3401
EARTH FAULT RELAY
(INVERSE) TYPE CDG
MODEL NO. CDG31EG4285
INST. O.C.
AMPS
50
AUX VOLTS
D.C.
SEAL IN
AMPS
PLUG SETTING MULTIPLIER
TIME IN SECONDS
·5
·75
1
1·25
1·5
1·75
2
AMPS
MADE IN
BY THE ENGLISH ELECTRIC CO. LTD. LONDON

DUAL TRACKING WITH 5V FIXED
MODEL : GPC-3030

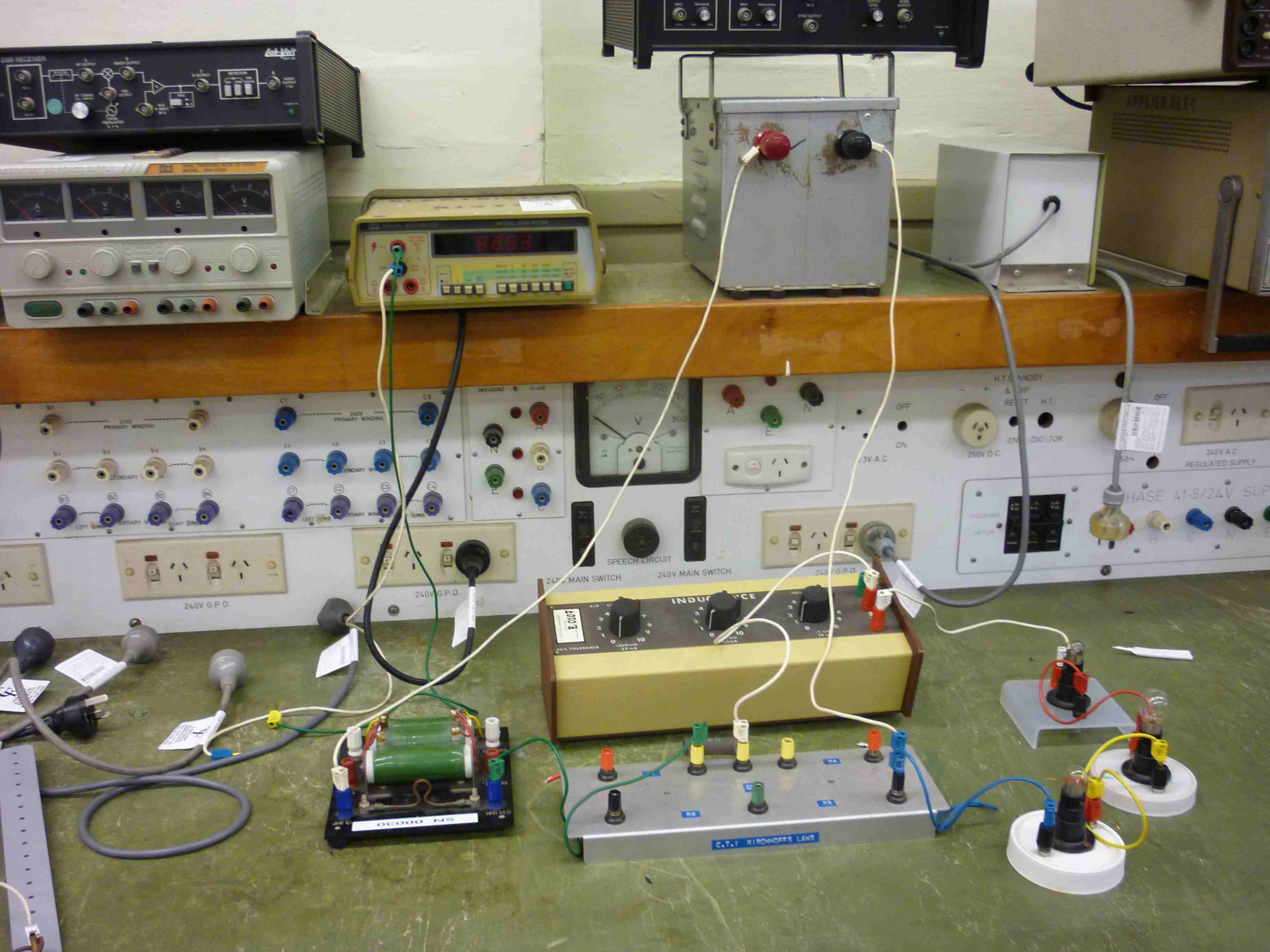
DIGITAL MULTIMETER

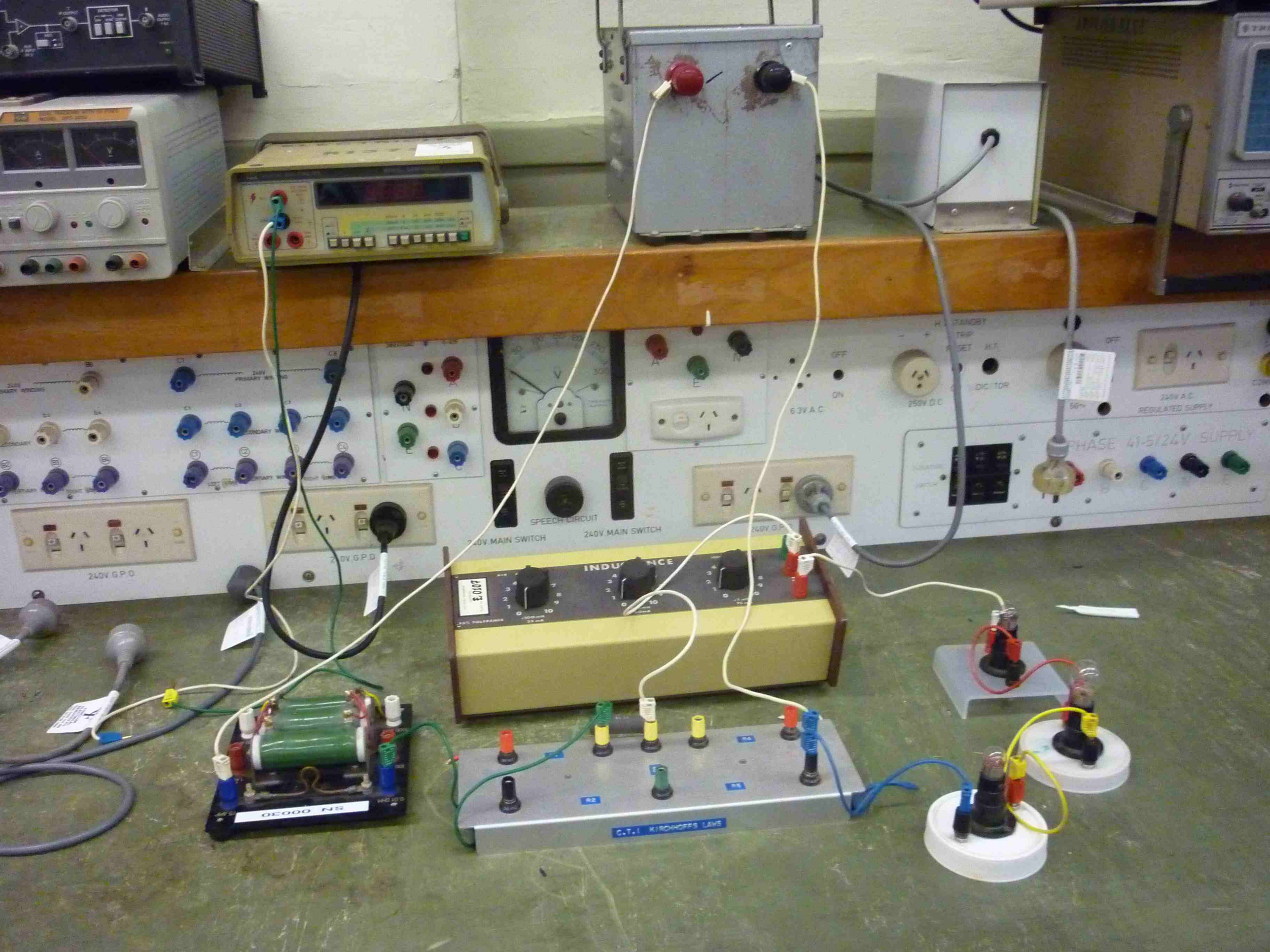
0.01

OFF
ON
240V A.C
REGULATED SUPPLY
110V A.C
50~
EARTH
H.T
& TRIP
RESET
INDICATOR
ON
OFF
ON
6.3V A.C
0-280V
VARIAC OUTPUT ONLY
0-280V
VARIAC OUTPUT ONLY
6.3V A.C
240V G.P.O
SPEECH CIRCUIT
240V MAIN SWITCH

ISOLATE BEFORE OPENING

New South Wales
TAFE 0501359


240V G.P.O
240V G.P.O
SPEECH CIRCUIT
240V MAIN SWITCH
240V MAIN SWITCH
240V G.P.O
C.T.I KIRCHHOFFS LAWS


240V G.P.O
240V G.P.O
SPEECH CIRCUIT
240V MAIN SWITCH
240V MAIN SWITCH
240V G.P.O
63V A.C.
250V D.C.
240V A.C.
REGULATED SUPPLY
INDUCTANCE
0E000 NS
G.T.I KIRCHHOFFS LAWS

INDUCTANCE

AIR CORED

ELECTRICAL ENGINEERING CERTIFICATE £,0107

±5% TOLERANCE

×100mH 35 mA

MODEL : SVL

×1 mH 75 m

5000 OHM

100 OHM

0.01 OHM

SN 00030

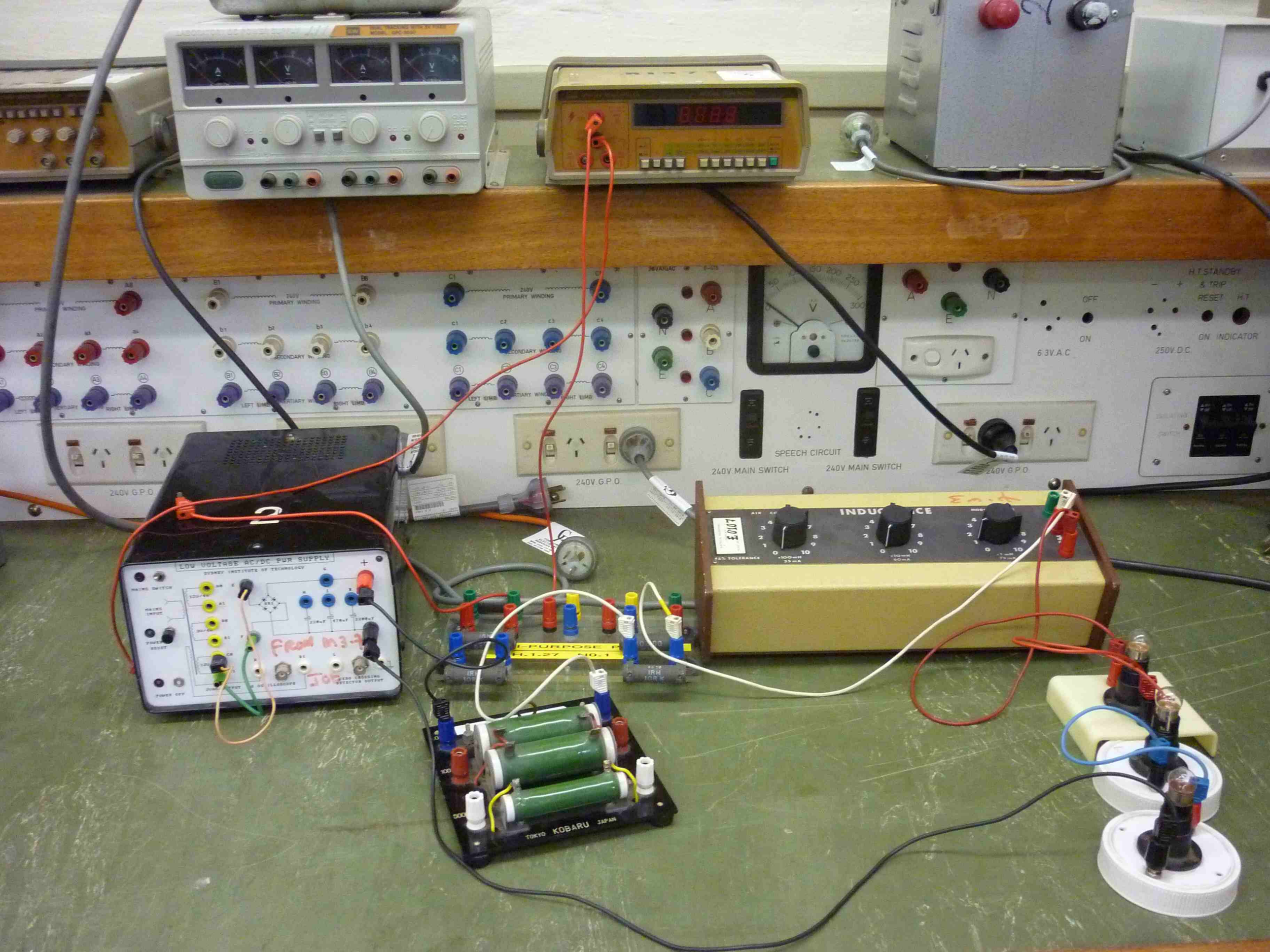
R1

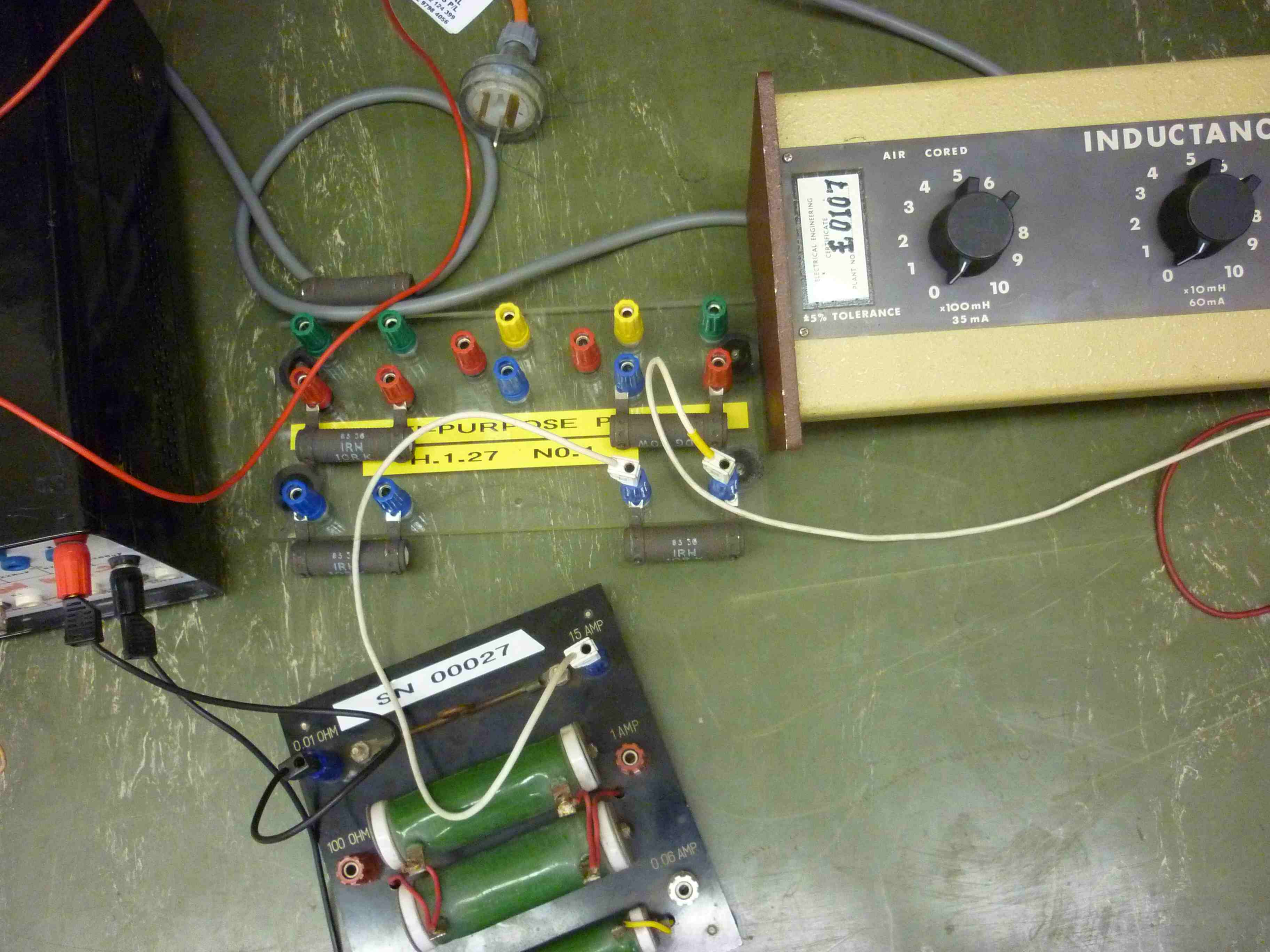
R2

R3

R4

R5

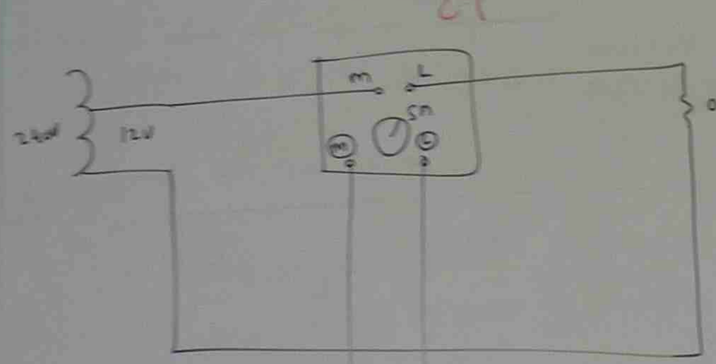

LOW VOLTAGE AC/DC PWR SUPPLY
SYDNEY INSTITUTE OF TECHNOLOGY
MAINS SWITCH
POWER OUTPUT
POWER OFF
FROM M3-2
TO
ZERO CROSSING DETECTOR OUTPUT
240V PRIMARY WINDING
SECONDARY WINDING
LEFT LIMB
RIGHT LIMB
240V G.P.O
240V MAIN SWITCH
SPEECH CIRCUIT
6.3V.A.C
OFF
ON
H.T.STANDBY
& TRIP
RESET
H.T
ON INDICATOR
250V.D.C
INDUCTANCE
±5% TOLERANCE
GENERAL PURPOSE
TOKYO KOBARU JAPAN

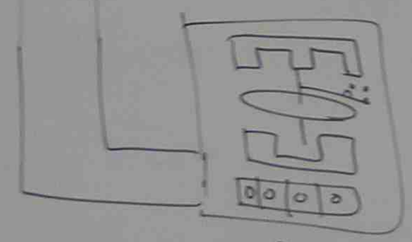

AIR CORED
INDUCTANC
ELECTRICAL ENGINEERING
CERTIFICATE
PLANT NO
E 0107
±5% TOLERANCE
x100mH
35mA
x10mH
60mA
IRH
SN 00027
15 AMP
1 AMP
0.06 AMP
0.01 OHM
100 OHM

PRACTICAL (V)

INVESTIGATING THE OPERATION OF OVER CURRENT RELAY

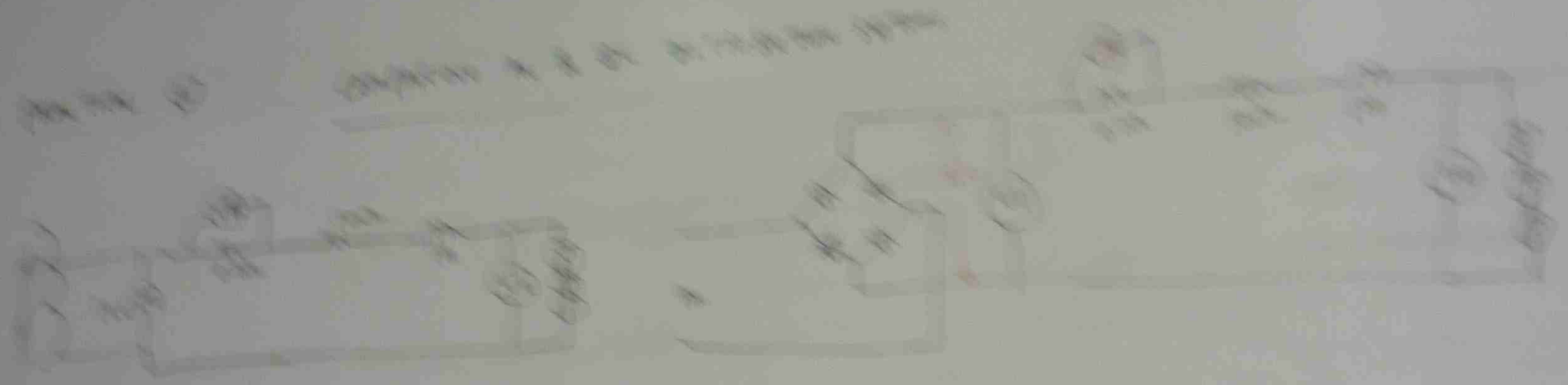
CONNECT THE GIVEN CIRCUIT





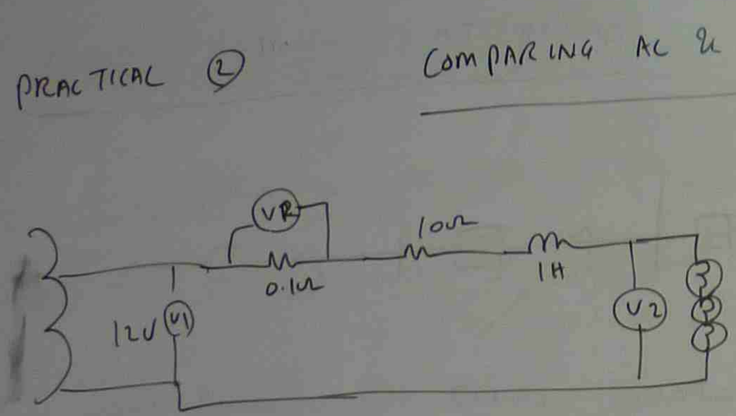
- SET 5A AT CT
- SET PLUG SETTINGS AT 0.5, 1.25, 2 A
- SWITCH ON AND OBSERVE THE RELAY'S PERFORMANCE
- ANSWER THE QUESTION

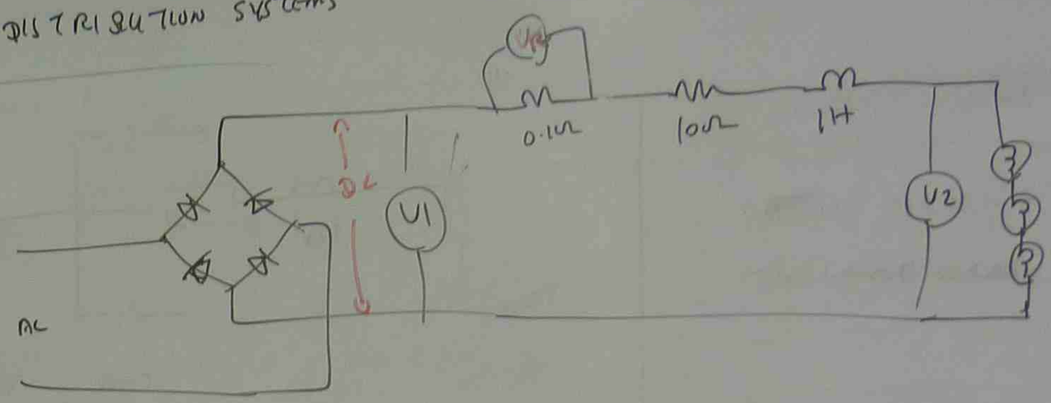
9) WHEN THE PLUG SETTING IS CHANGED FROM 0.5A TO 1.25, 2 A, WHAT HAPPENS TO RELAY OPERATING TIME?



PRACTICAL ②

COMPARING AC & DC DISTRIBUTION SYSTEMS





AC

— CONNECT THE GIVEN CIRCUITS & INJECT VOLTAGE

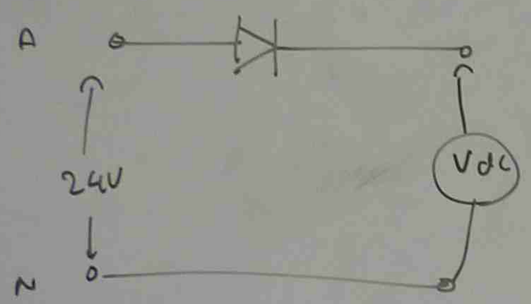
AC	V_1=	V_R=	$I = \frac{V_R}{0.1}$ =	V_2=	% VOLTAGE REGULATION = $\frac{V_1 - V_2}{V_1} \times 100$ =
DC	V_1=	V_R	$I = \frac{V_R}{0.1}$ =	V_2=	% VOLTAGE REGULATION = $\frac{V_1 - V_2}{V_1} \times 100$

QUESTION WHICH SYSTEM HAS HIGHER % VOLTAGE REGULATION

INVESTIGATING 1φ & 3φ RECTIFICATION

1φ RECTIFICATION (HALF WAVE)

CONNECT THE GIVEN CIRCUIT



READ V dc

WRITE THE RATIO of
AC TO Vdc

FROM PRACTICAL $\quad RATIO = \frac{V_{dc}}{V_{ac}}$

COMPARE THE RATIO

$V_{dc} = \frac{2\,E_{max}}{\pi}$ FOR FULL WAVE

$V_{dc} = \frac{E_{max}}{\pi}$ FOR HALF WAVE

$E_{max} = \sqrt{2}\, E_{rms}$

$E_{rms} = 24V$

$\therefore V_{dc} = \frac{24 \times 1.4142}{3.1416} = 10.8V$

$RATIO = \frac{V_{dc}}{V_{AC}} = \frac{10.8}{24} = 0.45$

↑ FROM THEORY

3φ

ME

FIN

A TIO

max FOR FULL WAVE

ax FOR HALF WAVE

Erms

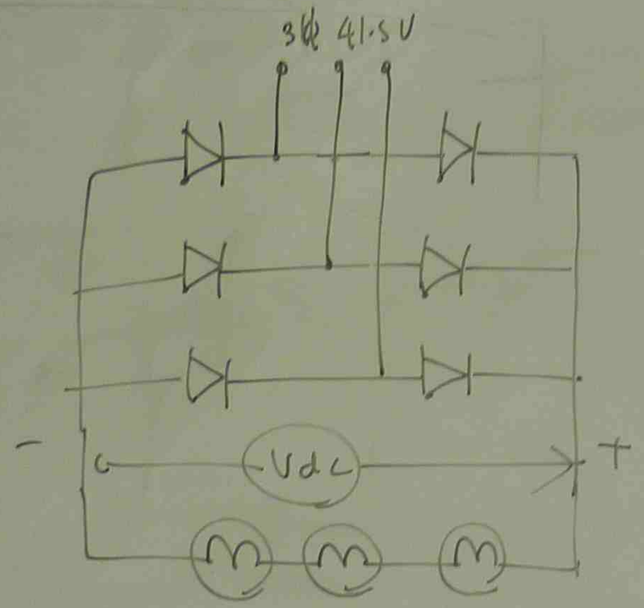
Erms = 24V

$\frac{24 \times 1.4142}{3.1416} = 10.8\,V$

$\frac{Vdc}{VAc} = \frac{10.8}{24} = 0.45$

RY

3φ BRIDGE RECTIFICATION



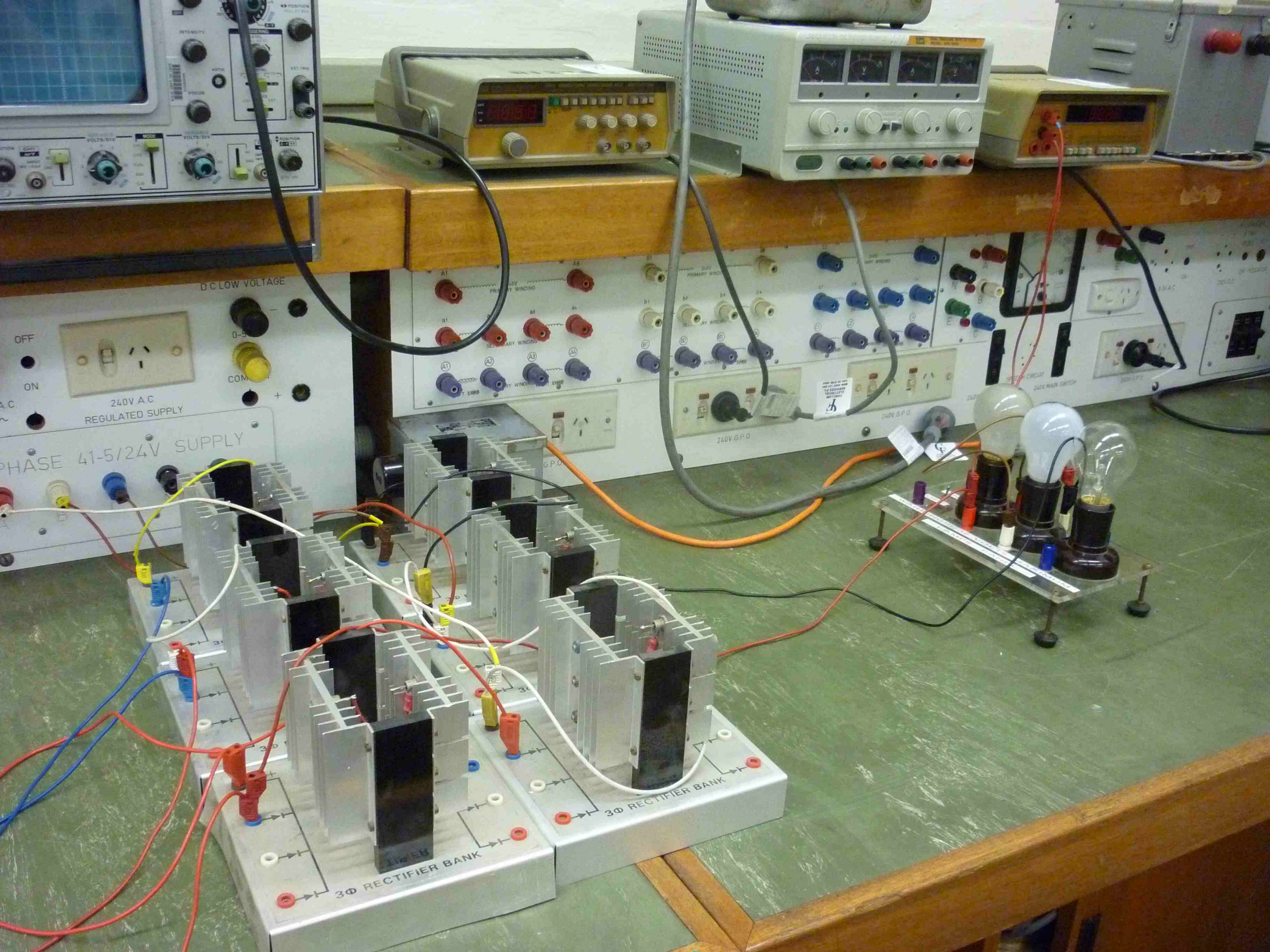
MEASURE Vdc

FIND THE RATIO of $\frac{Vdc}{Vac} = \frac{Vdc = \_\_\_}{Vac = 41.5\ V}$

COMPARE WITH 1φ ½ WAVE RECTIFICATION.


240V A.C
REGULATED SUPPLY
1-5/24V SUPPLY
240V MAIN SWITCH
240V MAIN SWITCH
SPEECH CIRCUIT
240V O.P.O.
240V O.P.O.
240V O.P.O.
PRIMARY WINDING
PRIMARY WINDING
PRIMARY WINDING
LEFT SIDE
RIGHT SIDE
LEFT SIDE
RIGHT SIDE
LEFT SIDE
RIGHT SIDE
100 WATTS
SW RECTIFIER BANK

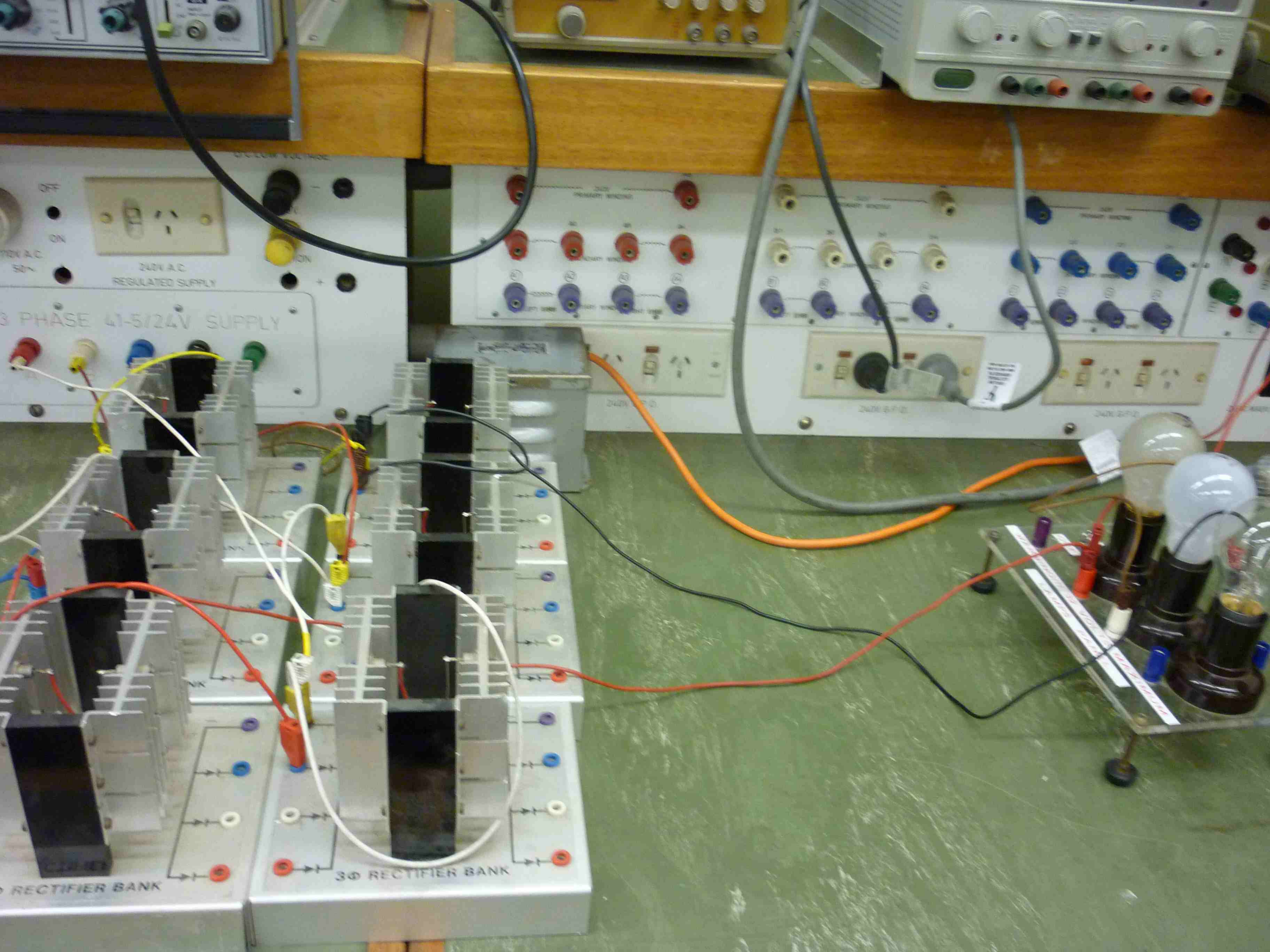

32 VOLTS ONLY
3Φ RECTIFIER BANK


D.C LOW VOLTAGE
OFF
ON
240V A.C
REGULATED SUPPLY
3Φ RECTIFIER BANK
3Φ RECTIFIER BANK

3Φ RECTIFIER BANK

3Φ RECT

3Φ RECTIFIER BANK


OFF
ON
240V A.C.
REGULATED SUPPLY
3 PHASE 41-5/24V SUPPLY
PRIMARY WINDING
3Φ RECTIFIER BANK

3Φ RECTIFIER BANK

3Φ RECTIFIER BANK

DC OUTPUT

DC OUTPUT

3Φ RECTIFIER BANK

3Φ RECTIFIER BANK

POWER CONTROL 1 WEEK-9
6016D

TREE TERMINAL
REGULATOR LM317T

1N4002

R1 IN
R1 OUT
1
2

LM317T
IN OUT
ADJ

R1
2R2/5W

R2
120R

S1
S2
S8
S9
S26
S27
S28
S21

R1
1k

C2
10uF

C3
10uF

P1
1k

LED

Vin
0V
GND
Vout
0V

SYDNEY INSTITUTE OF TECHNOLOGY
INDUSTRIAL ELECTRONICS DIVISION

1 2 3 4 5 6 7 8 9

28 27 26 25 24 23 22 21 20

10 11 12 13 14 15 16 17 18 19

POWER CONTROL 1 WEEK-9
6016D

TREE TERMINAL
REGULATOR LM317T

D1
1N4002

R1 IN
R1 OUT
1
2

LM317T
IN OUT
ADJ
3
2
1

R1
2R2/5W

R2
120R

S1
S2
S8
S9
S28
S27
S26
S21

+
+

RL
1k

C2
10uF

P1
1k

C3
10uF

LED1

Vin
0V
GND
Vout
0V

SYDNEY INSTITUTE OF TECHNOLOGY
INDUSTRIAL ELECTRONICS DIVISION

1 2 3 4 5 6 7 8 9

28 27 26 25 24 23 22 21 20

10 11 12 13 14 15 16 17 18 19

POWER CONTROL 1 WEEK-9

6016D

TREE TERMINAL REGULATOR LM317T

D1 1N40

1 IN R1 OUT 2

I(R)C 7348 AUSTRALIA PW5 2·2Ω10%

R1 2

LM317T IN OUT ADJ 3 2 1

R1 2R2/5W

R2 120R

S1 S2 S28 S27

R_L 1k

C2 10uF

P1 1k

C3 10uF

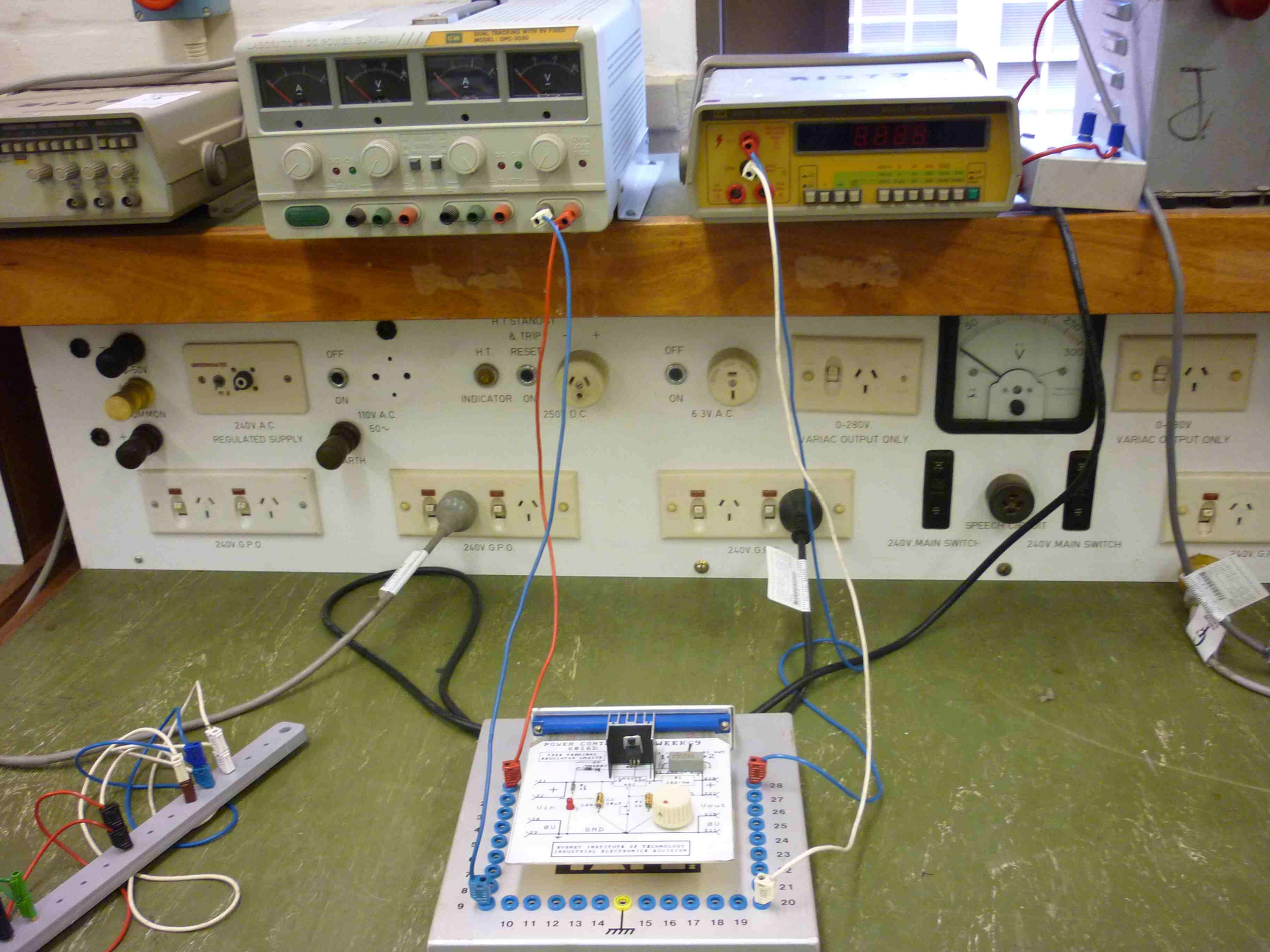
Vin Vout

LED1

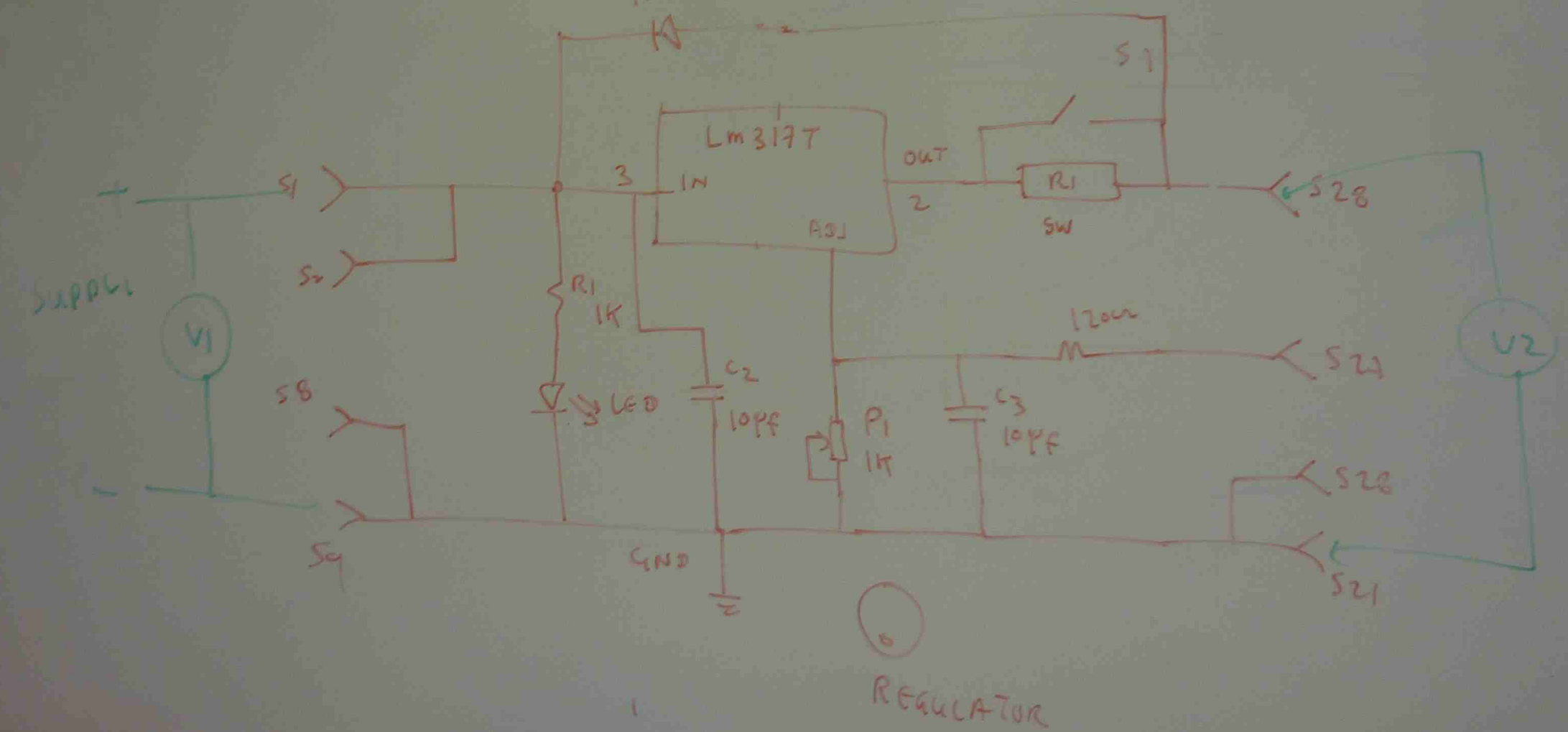
S8 S9 S20 S21

0V 0V GND

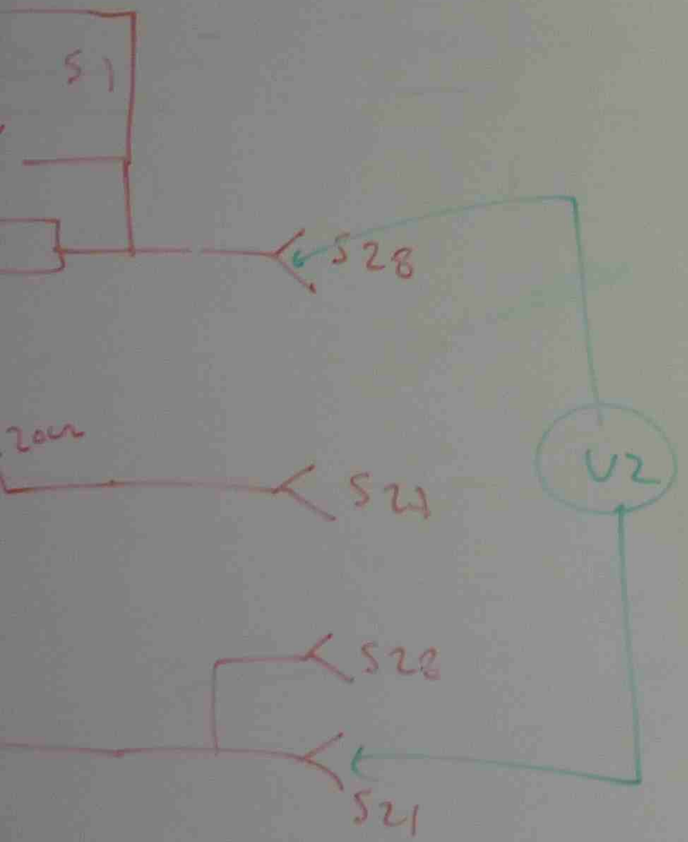
SYDNEY INSTITUTE OF TECHNOLOGY
INDUSTRIAL ELECTRONICS DIVISION


240V A.C.
REGULATED SUPPLY
OFF
ON
110V A.C.
50~
H.T.
INDICATOR
RESET
ON
250V D.C.
OFF
ON
6.3V A.C.
0-280V
VARIAC OUTPUT ONLY
240V G.P.O.
240V G.P.O.
240V MAIN SWITCH
240V MAIN SWITCH
Vin
Vout
GND
SYDNEY INSTITUTE OF TECHNOLOGY
INDUSTRIAL ELECTRONICS DIVISION

THREE TERMINAL REGULATOR
Lm317T CIRCUIT



TOR

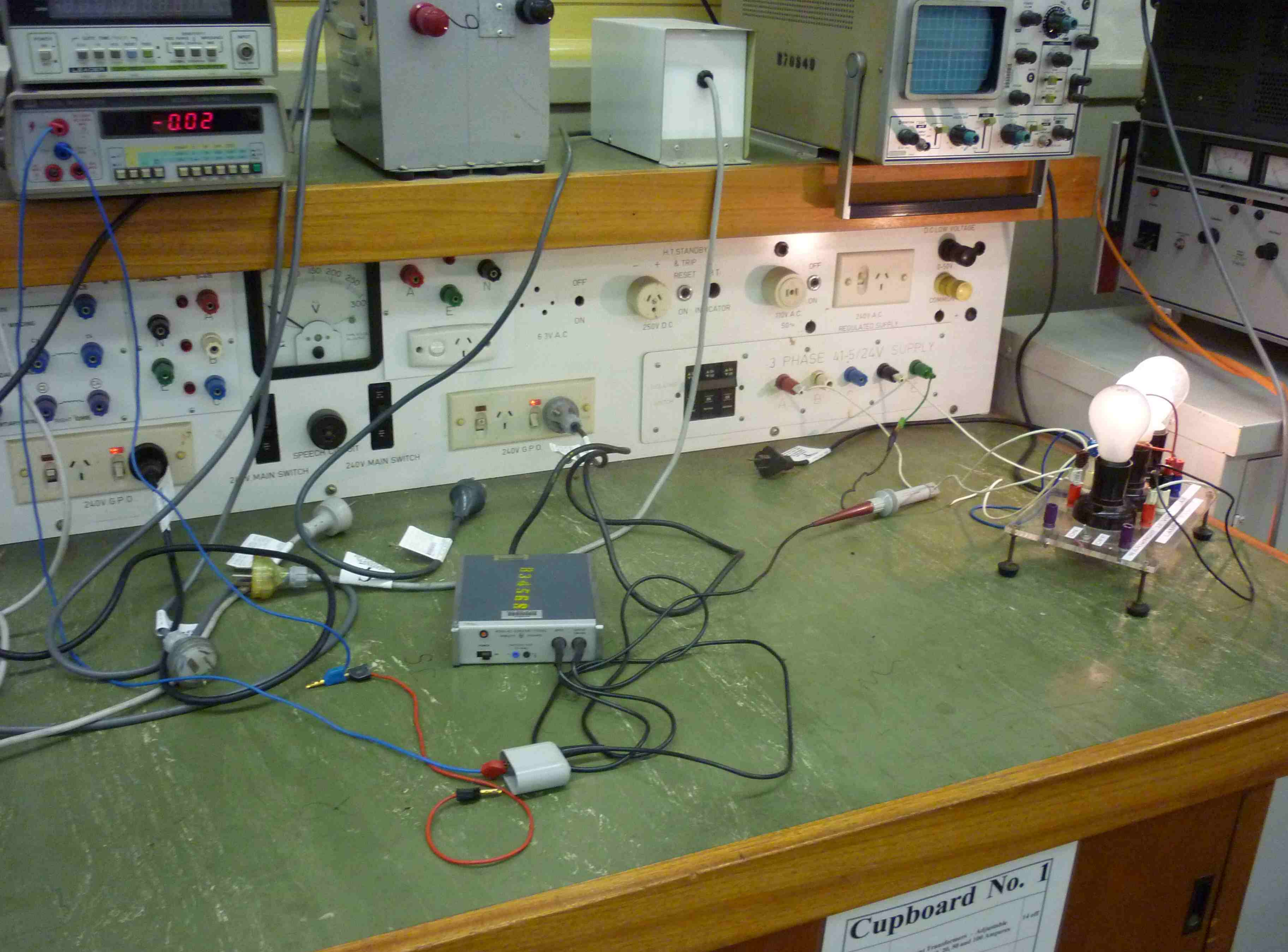


SWITCH ON THE CIRCUIT

SET THE REGULATOR AT CERTAIN VOLTAGE FOR U2

FILL THE TABLE

V_2 (REF	V1	V2
V_2 SET VOLTAGE (1)	0V 1V 2V ↓ 10V	
V_2 SET VOLTAGE(2)	0V 1V 2V 10V	
V_2 SET VOLTAGE(3)	0V 1V 2V ↓ 10V	


-0.02
H.T STANDBY
& TRIP
RESET
ON INDICATOR
OFF
ON
250V D.C
6.3V A.C
240V MAIN SWITCH
240V G.P.O
3 PHASE 41-5/24V SUPPLY
240V A.C
REGULATED SUPPLY
Cupboard No. 1

240V MAIN SWITCH

240V MAIN SWITCH

240V G P O

03968

456A AC CURRENT PROBE
HEWLETT hp PACKARD

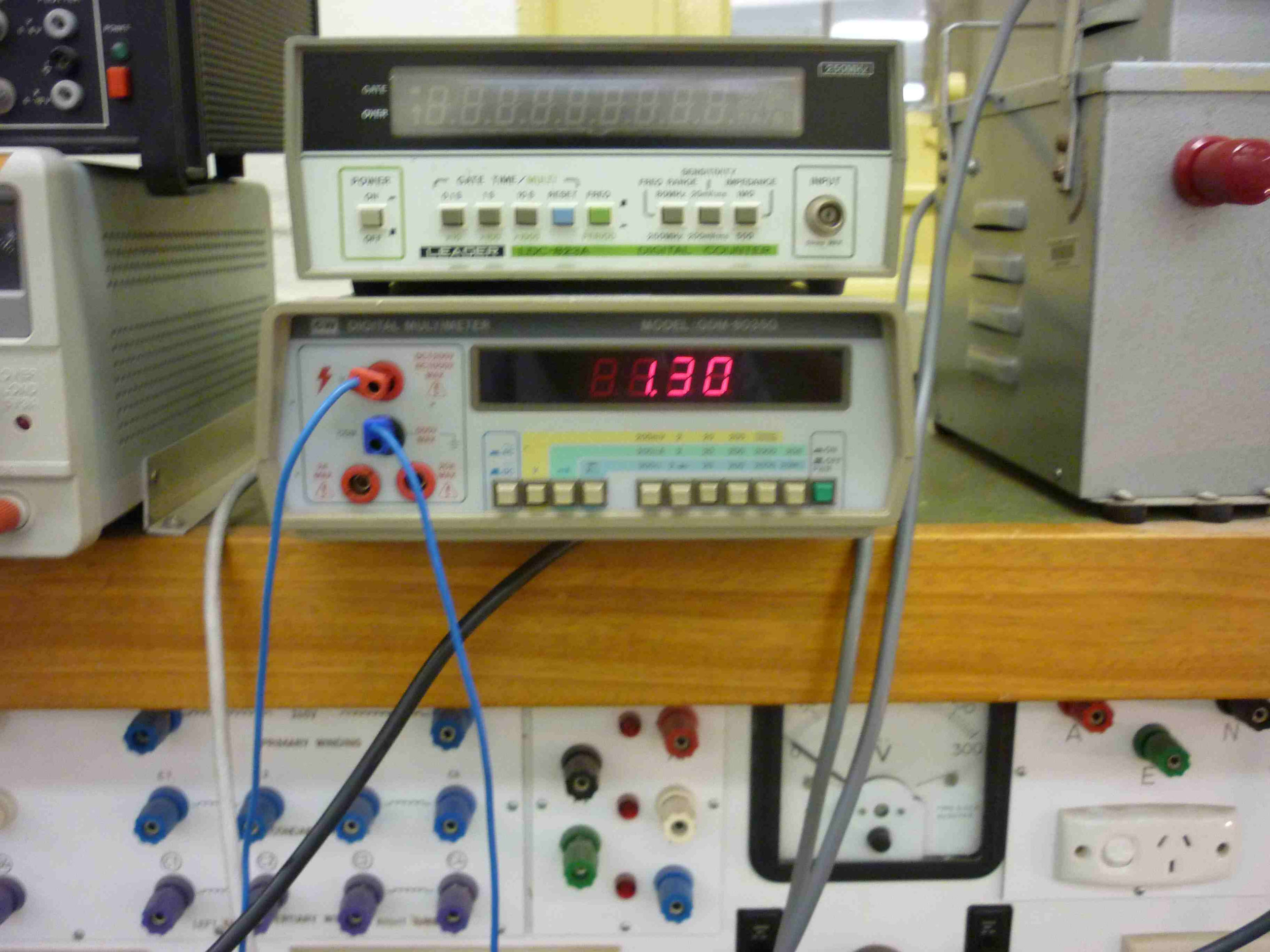
POWER

ON

BATTERY TEST
(7V MIN)

INPUT

OUTPUT
1 MV/MA


GATE
OVER
LEADER
DIGITAL COUNTER
DIGITAL MULTIMETER
8 1.30


3 PHASE VARIAC SUPPLY
ON MAINS SWITCH

456A AC CURRENT PROBE

HEWLETT PACKARD

INPUT

OUTPUT
1 MV/MA

POWER

ON

BATTERY TEST
(7V MIN.)

—

456 AC current Probe

Hewlett Packard

240V

current Probe

O/P

1·3A

32V

32V

32V

A

N

456 AC current Probe

Hewlett Packard

240V

current Probe

O/P

1·3A

+ DC

- DC

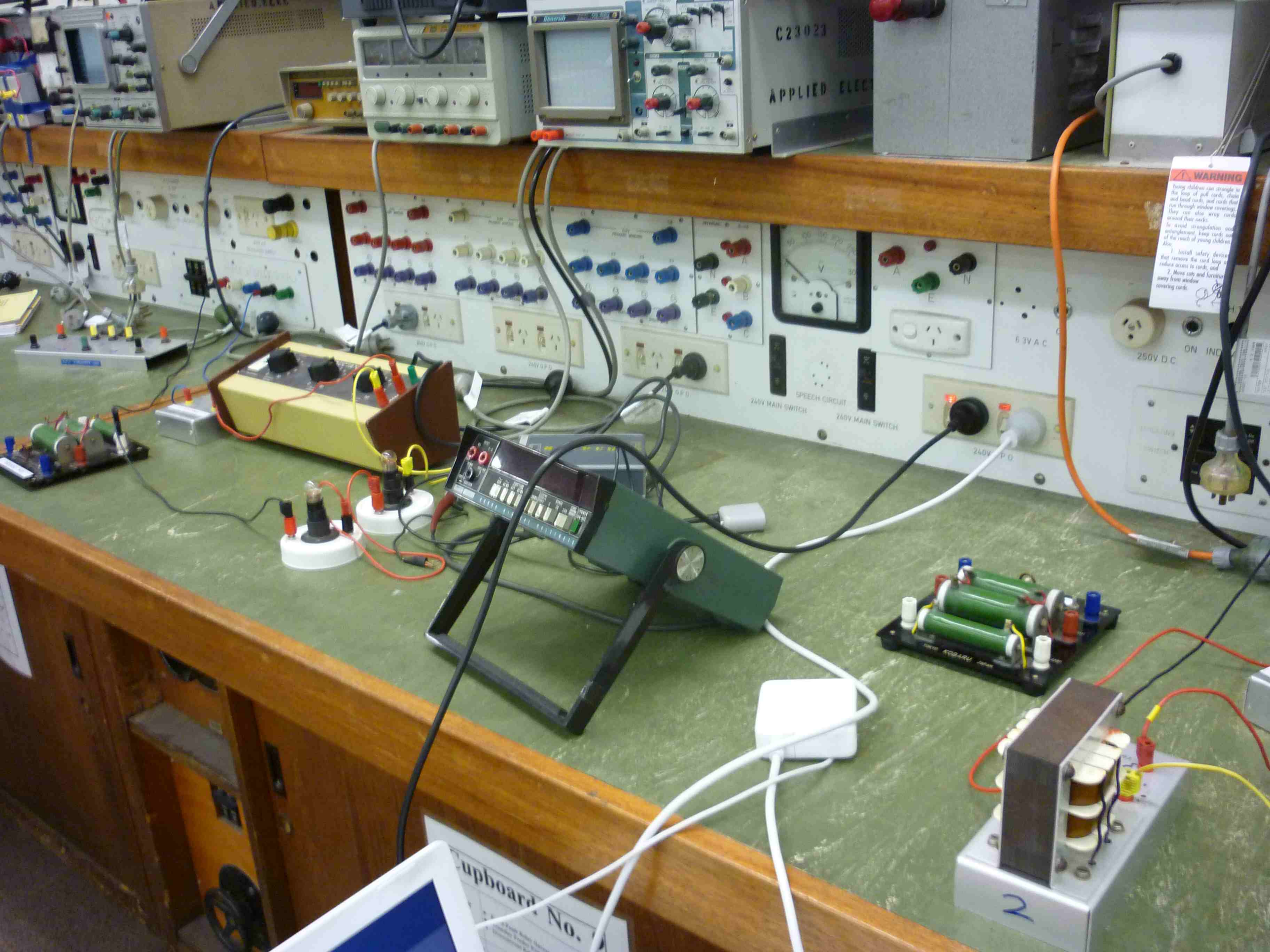
32V

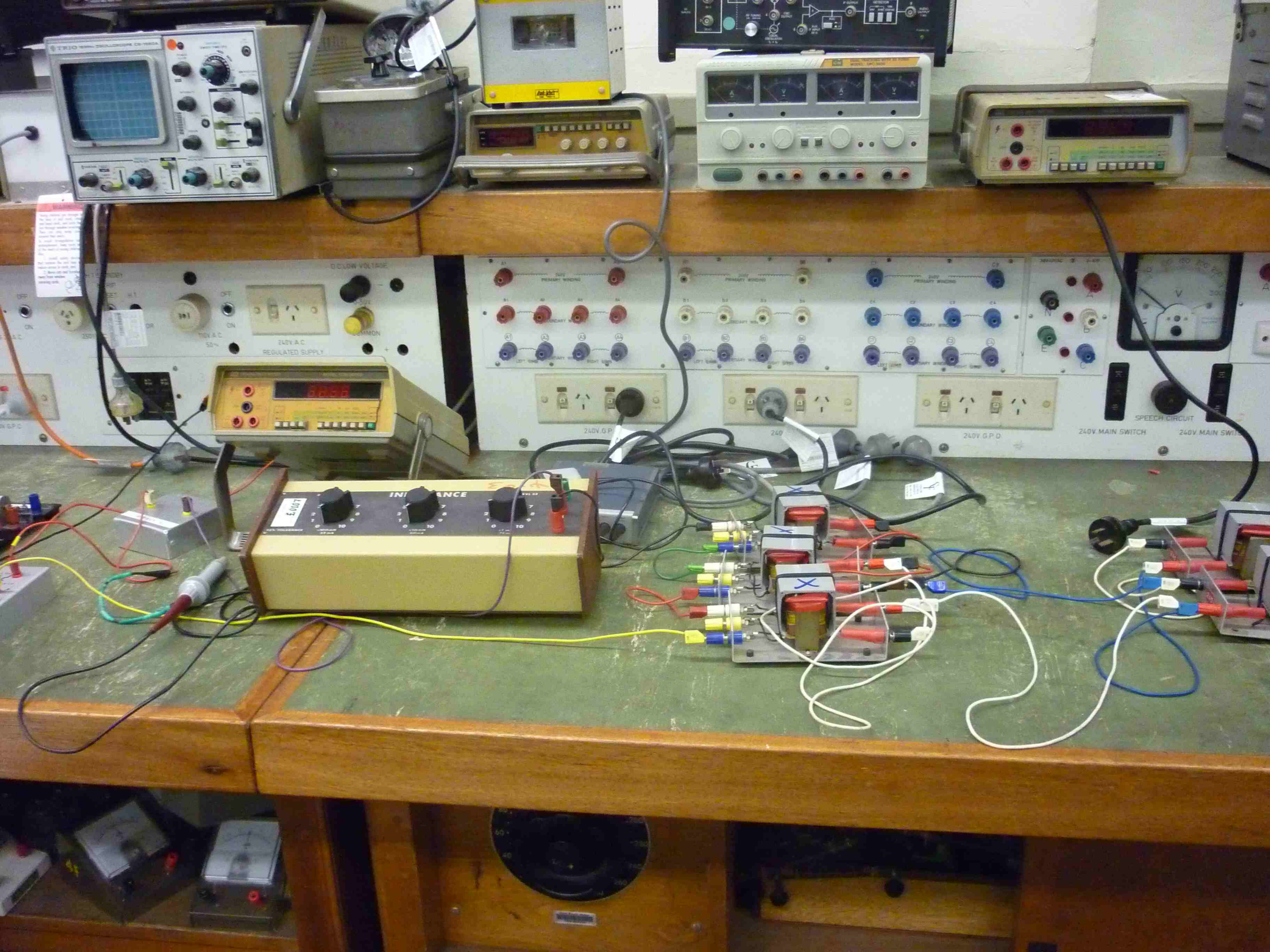
32V

32V

A

N


C23023
APPLIED ELEC
WARNING
240V MAIN SWITCH
SPEECH CIRCUIT
240V MAIN SWITCH
250V D.C
6.3V A.C
KOSARU
2


TRIO
240V A.C
REGULATED SUPPLY
240V.G.P.C
240V.G.P.D
240V MAIN SWITCH
SPEECH CIRCUIT


STROBOSCOPE
AM / DSB RECEIVER
RF GENERATOR
D.C LOW VOLTAGE
240V A.C
REGULATED SUPPLY
240V G.P.O
240V MAIN SWITCH
SPEECH CIRCUIT
6.3V A.C
250V D.C
INDUCTANCE

240V PRIMARY WINDING

240V PRIMARY WINDING

36VARIAC

240V.G.P.O

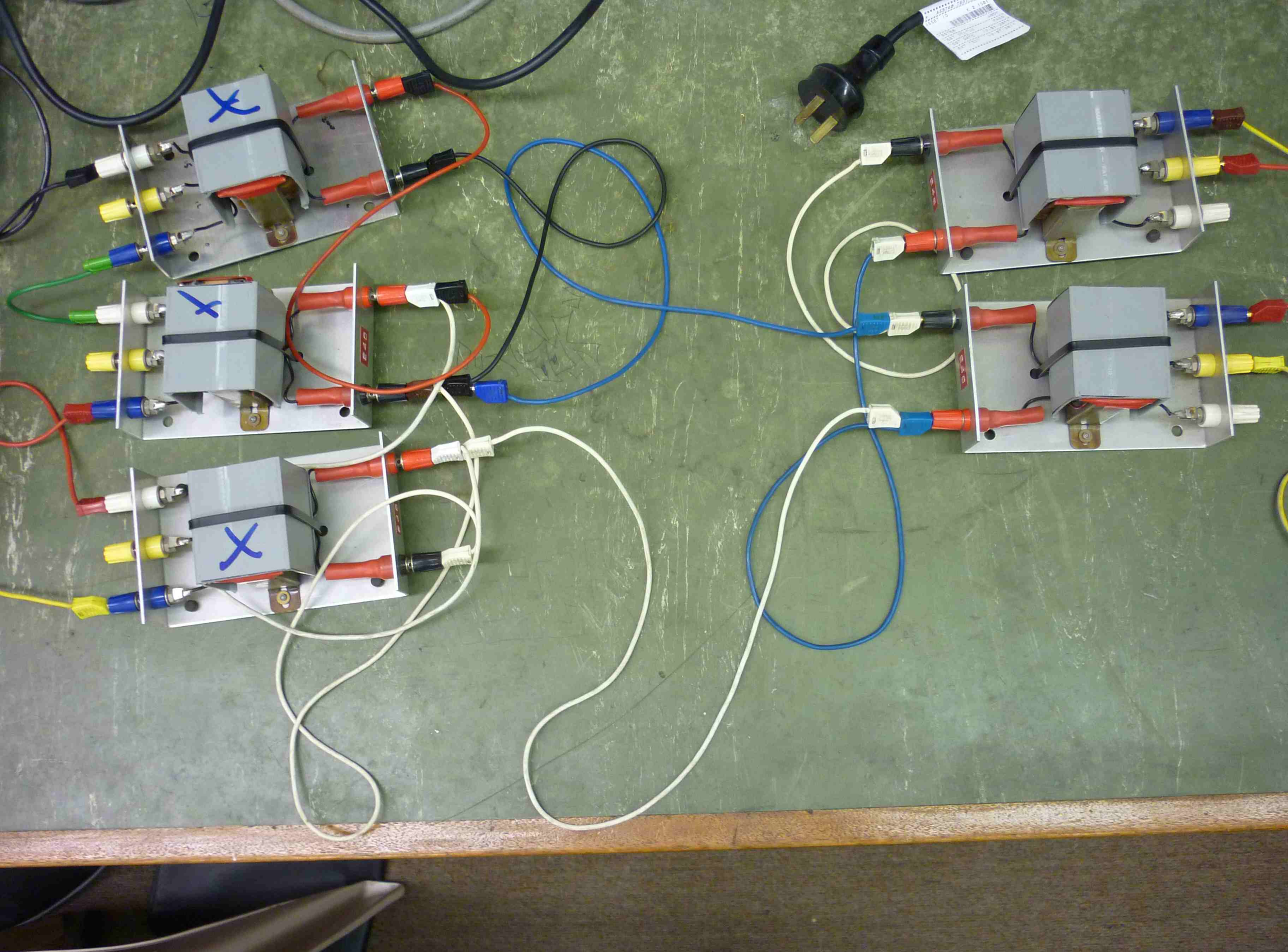
240V.MAIN SWITCH

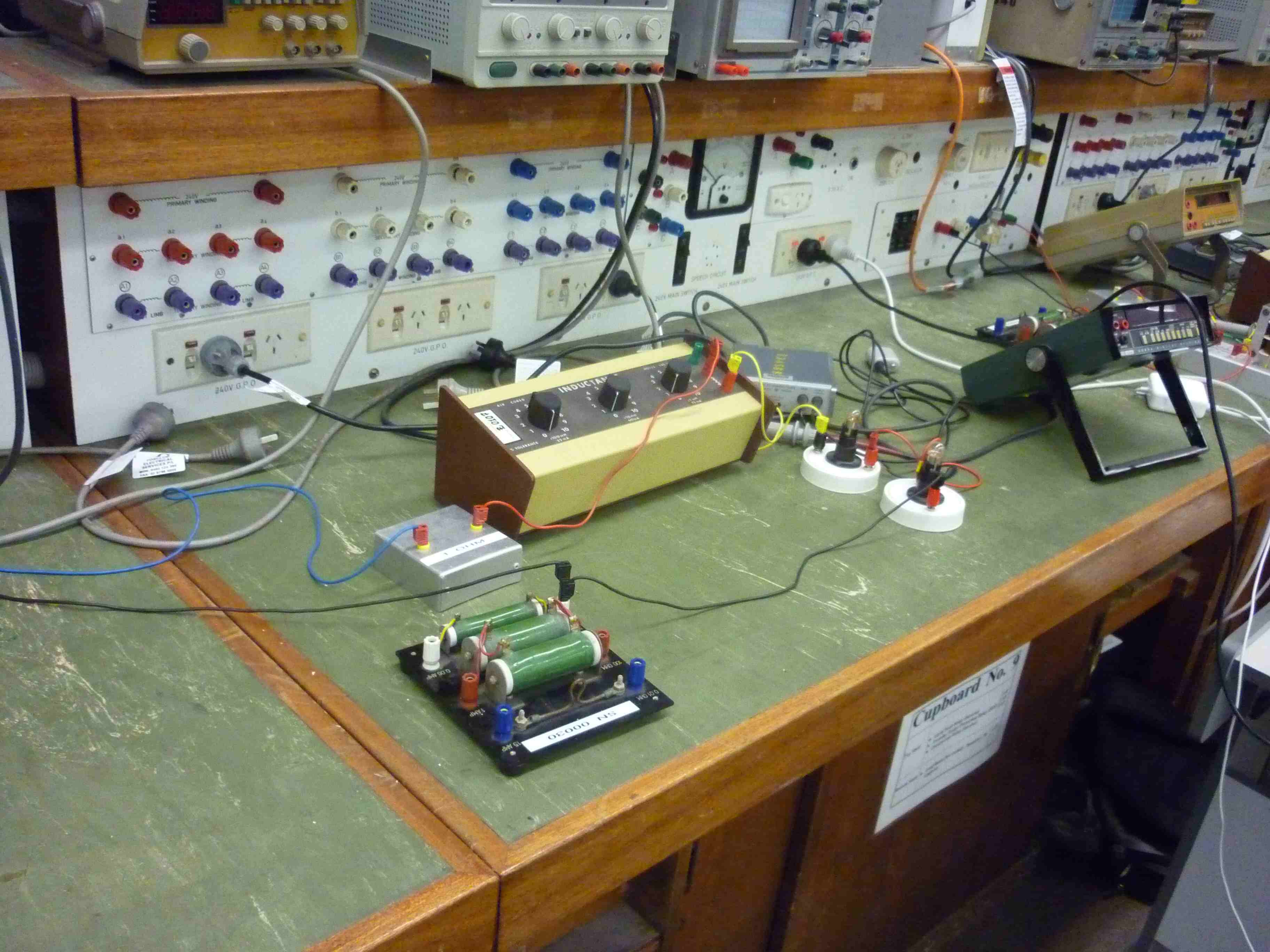
240V G.P.O

6.3V A.C

OFF

ON




240V
PRIMARY WINDING
240V G.P.O.
INDUCTA
E.010
1 OHM
SN 00030
Cupboard No. 3

INDUCTANCE

AIR CORED

MODEL : SVL 33

±0.01%

95% TOLERANCE

×100mH
35 mA

×10mH
60mA

mH
75 mA

1 OHM

5000 OHM

100 OHM

0.01 OHM

15 AMP

SN 00030

240V G.P.O.

240V G.P.O.

SPEECH CIRCUIT

240V MAIN SWITCH

240V MAIN SWITCH

240V G.P.O.

ANCE

×1 mH
75 mA

IN THIS BUILDING

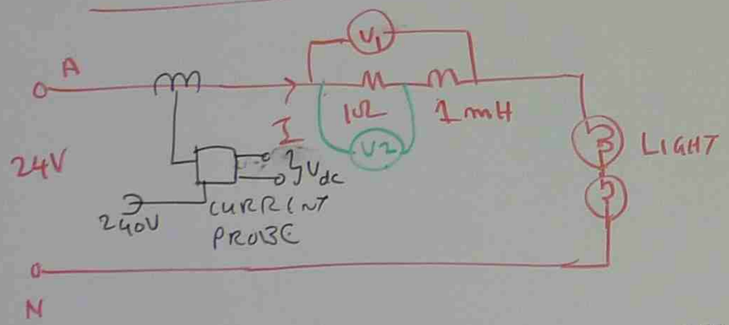
K, WHILE SHORT

EXCESSIVE

PRACTICAL (6) EFFECT of TRANSFORMER ON LINE LOSS AND CONNECTING THE TRANSFORMER TO GET REQUIRED VOLTAGE

CONNECT THE GIVEN CIRCUITS

CIRCUIT (1) LINE DROP



V_1 =

V_2 =

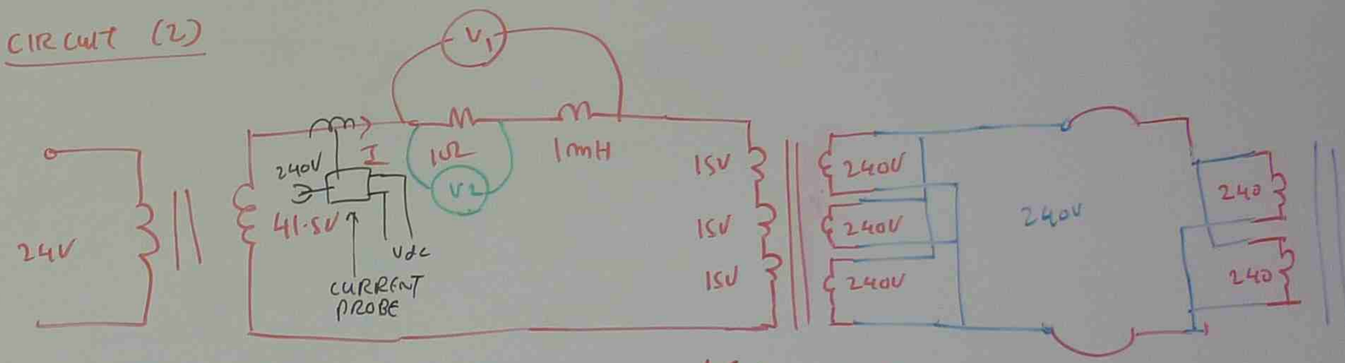
$I = \frac{V_2}{1\Omega}$

POWER LOSS = $I^2 \times 1\Omega$

V_{dc} AT CURRENT PROBE = ?

I	V_{dc}

CIRCUIT (2)



45V : 240V : 24V

V_1 =

V_2 =

$I = \frac{V_2}{1\Omega}$

POWER LOSS = $I^2 \times 1\Omega$

=

I	V_{dc}

COMPARE POWER LOSS

FFECT OF TRANSFORMER ON LINE LOSS AND

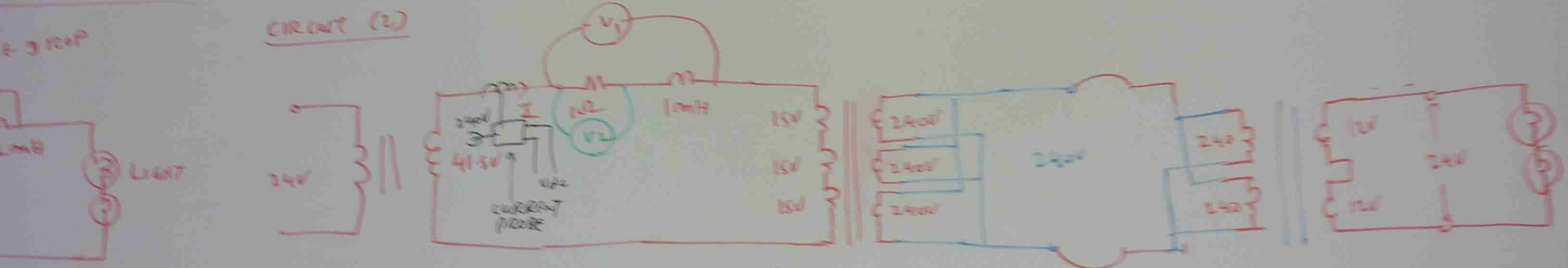
NNECTING THE TRANSFORMER TO GET REQUIRED

OLTAGE

CIRCUITS

E-3 LOOP

CIRCUIT (2)



VAC AT CURRENT PROBE = ?

I	VAC

$V_1 =$

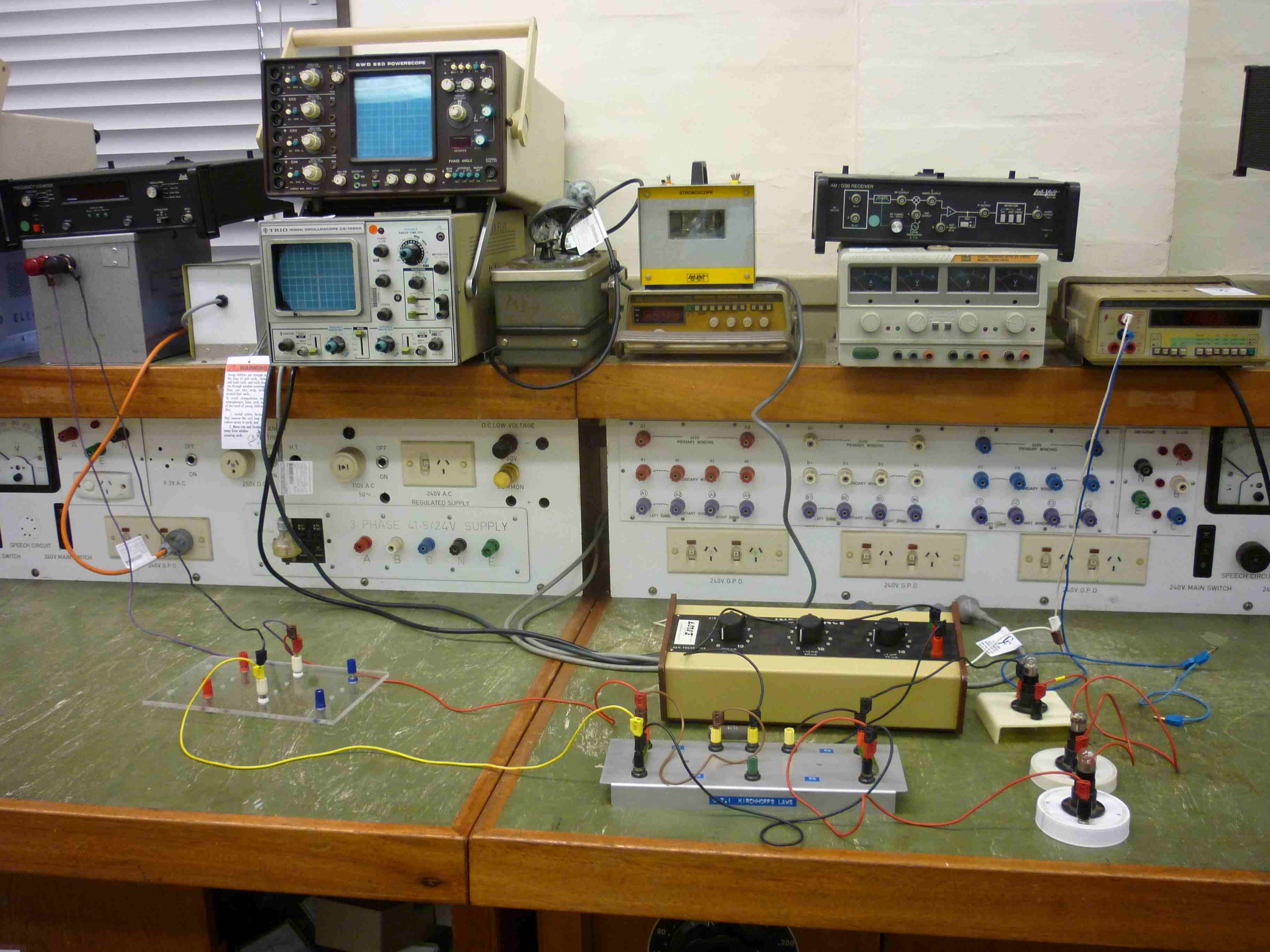
$V_2 =$

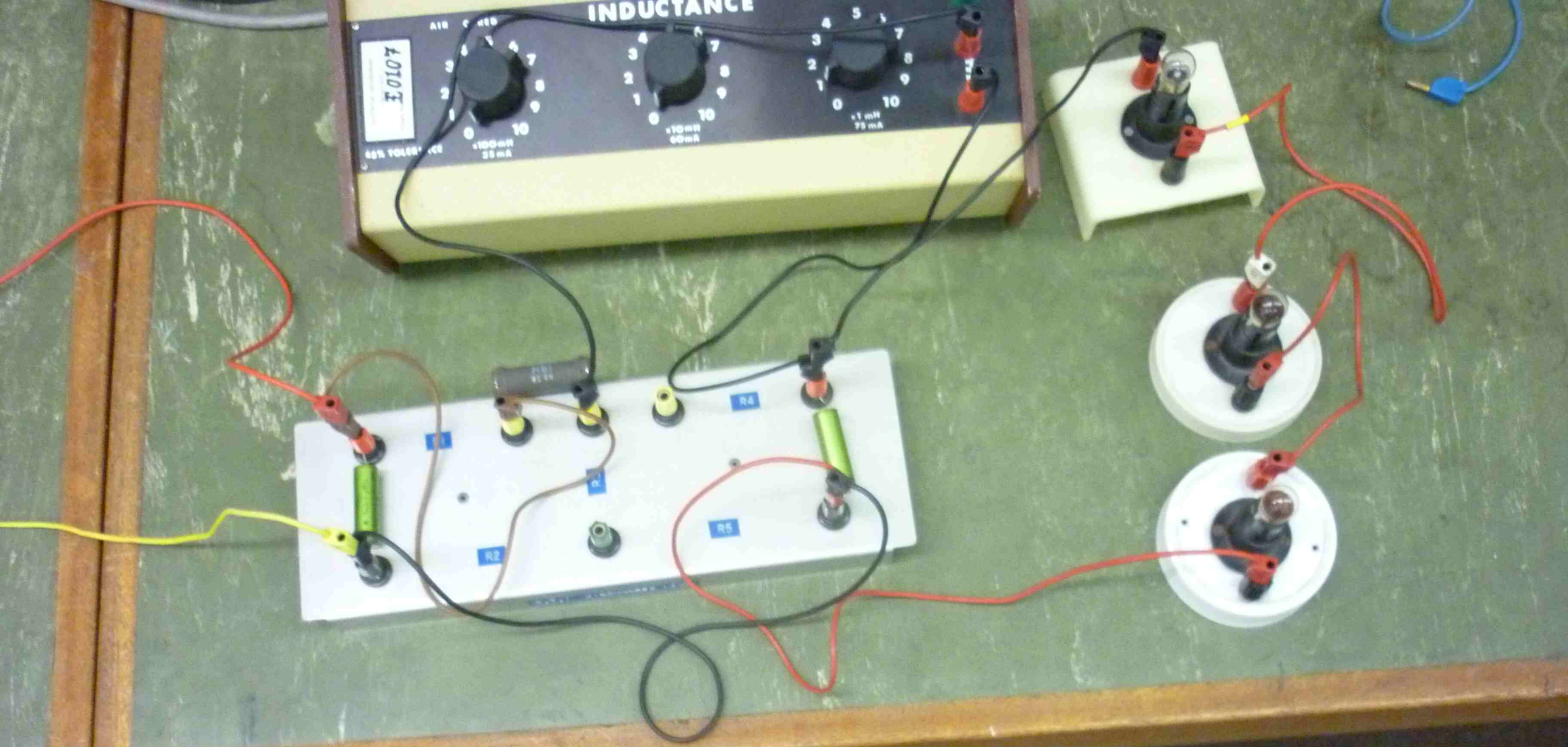
$I = \frac{V_2}{1\Omega}$

I	VAC

COMPARE POWER LOSS

Power loss $= I^2 \times 1\Omega$


GW 820 POWERSCOPE
TRIO 15MHz OSCILLOSCOPE CS-1560A
STROBOSCOPE
AM / DSB RECEIVER
WARNING
D.C LOW VOLTAGE
240V A.C
REGULATED SUPPLY
3 PHASE 41-5/24V SUPPLY
240V G.P.O
240V MAIN SWITCH
KIRCHHOFFS LAWS


INDUCTANCE
R1
R2
R3
R4
R5

INDUCTANCE

AIR

85% TOLERANCE

×100mH
35 mA

×10mH
60mA

×1 mH
75 mA

R1

R2

R3

R4

R5

INDUCTANCE

MODEL : SVL 33

AIR CORED

85% TOLERANCE

×100mH
35 mA

×10mH
60mA

×1 mH
75 mA

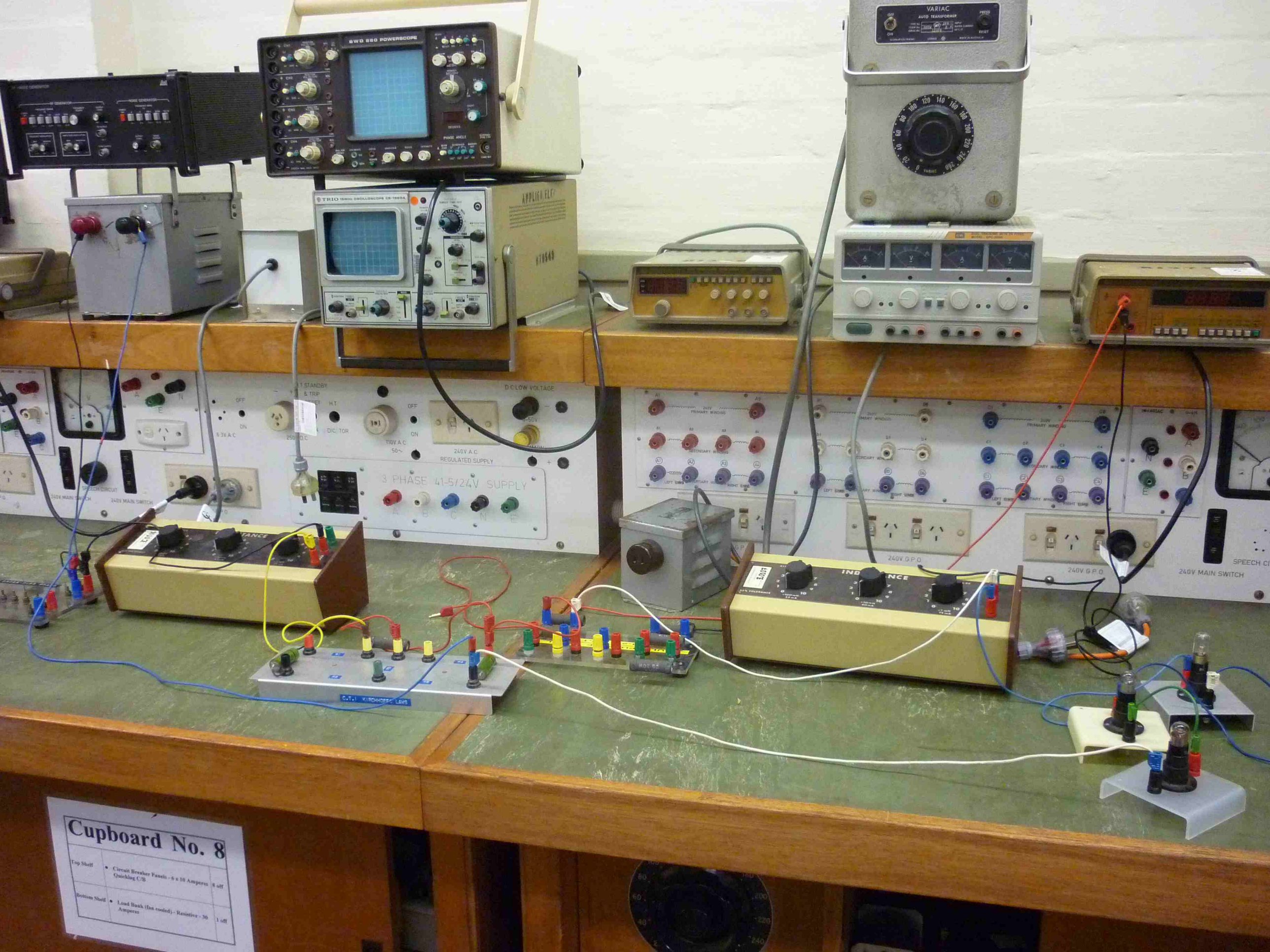
R1

R2

R4

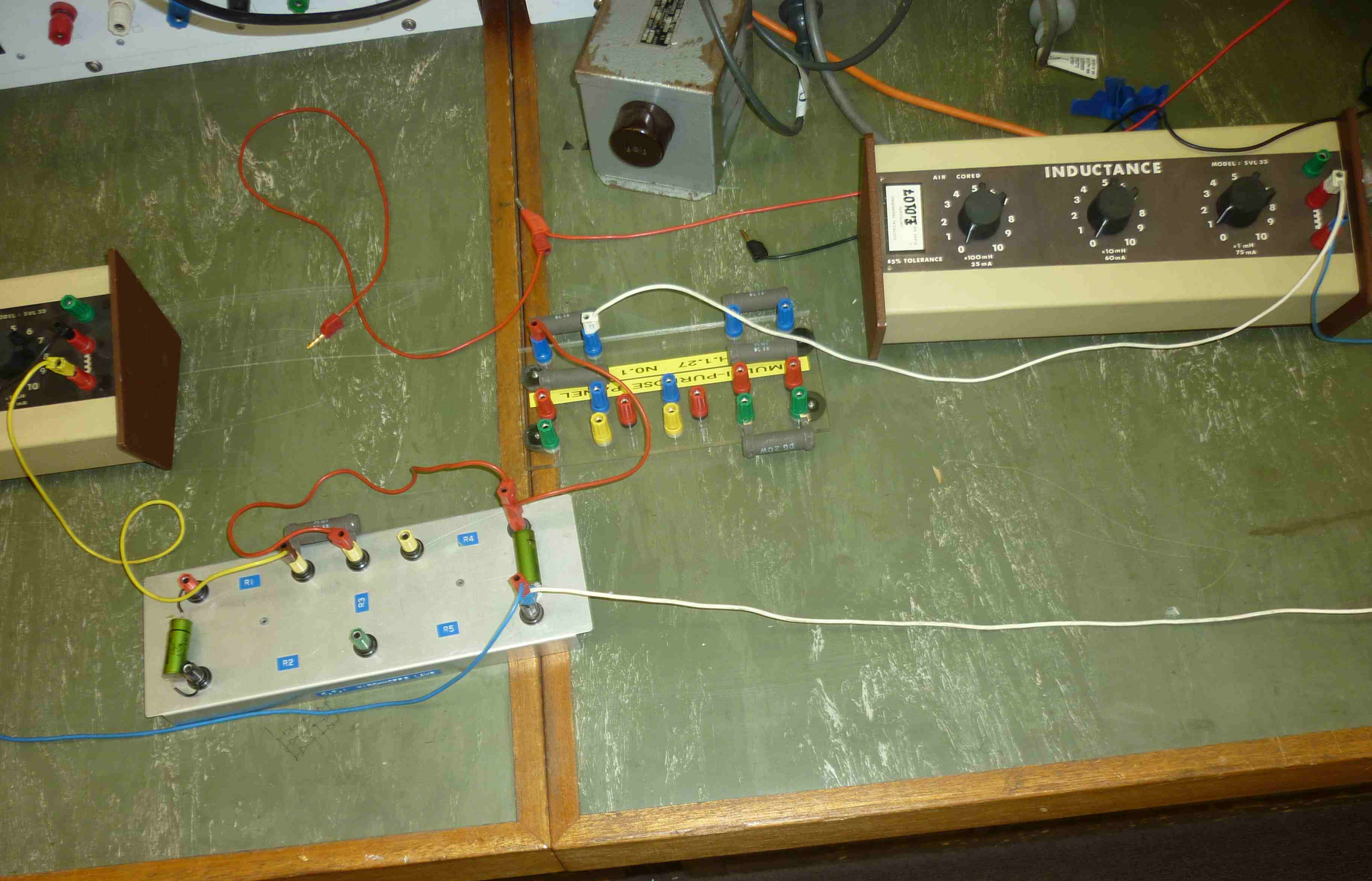
R5

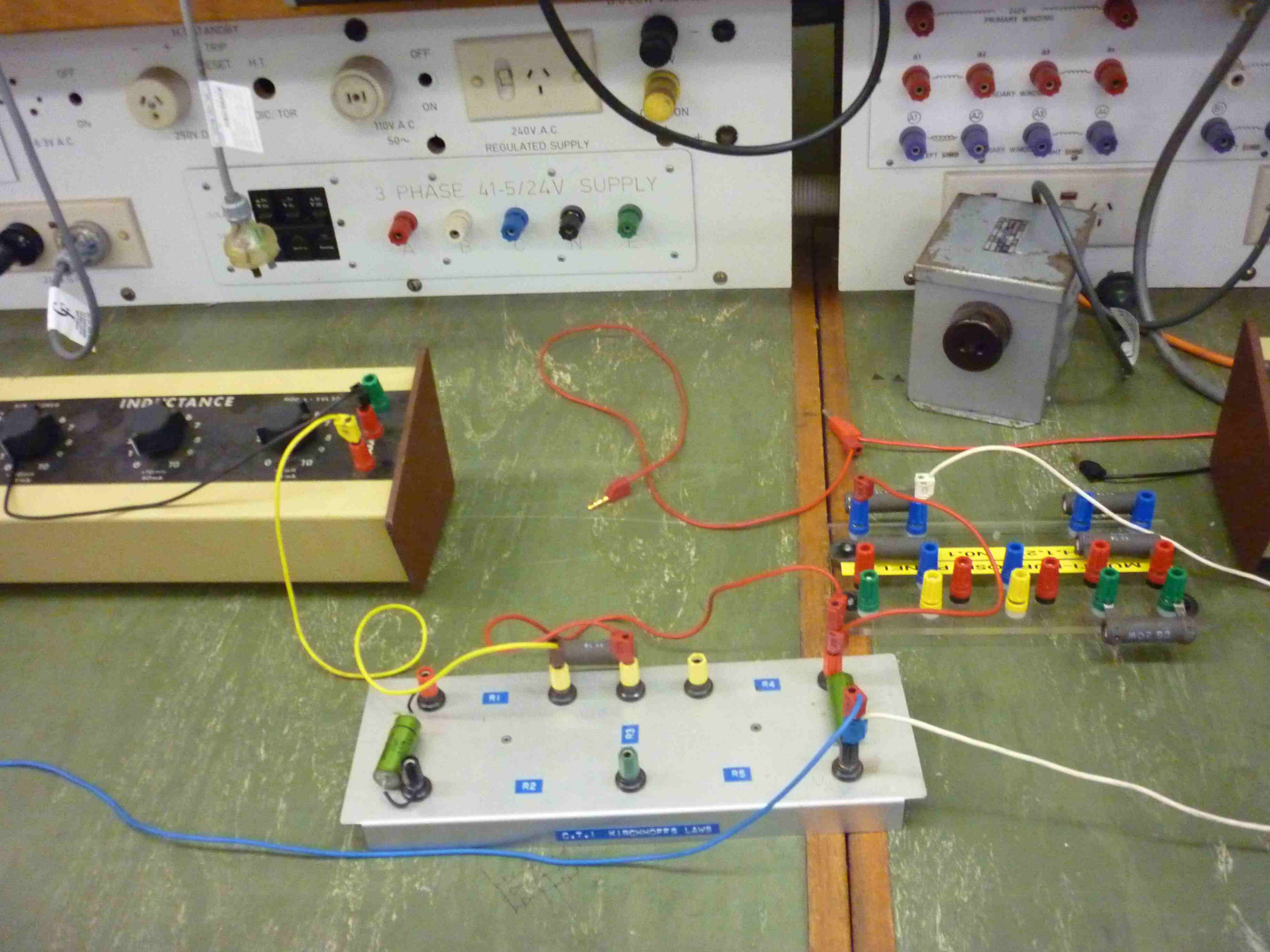

TRIO 15MHz OSCILLOSCOPE CS-1560A
APPLIED ELEC
T.STANDBY
& TRIP
RESET
H.T
DIC TOR
OFF
ON
6.3V A.C
250V D.C
240V A.C
REGULATED SUPPLY
PHASE 41-5/24V SUPPLY
INDUCTANCE
CROSS-OVER BOARD

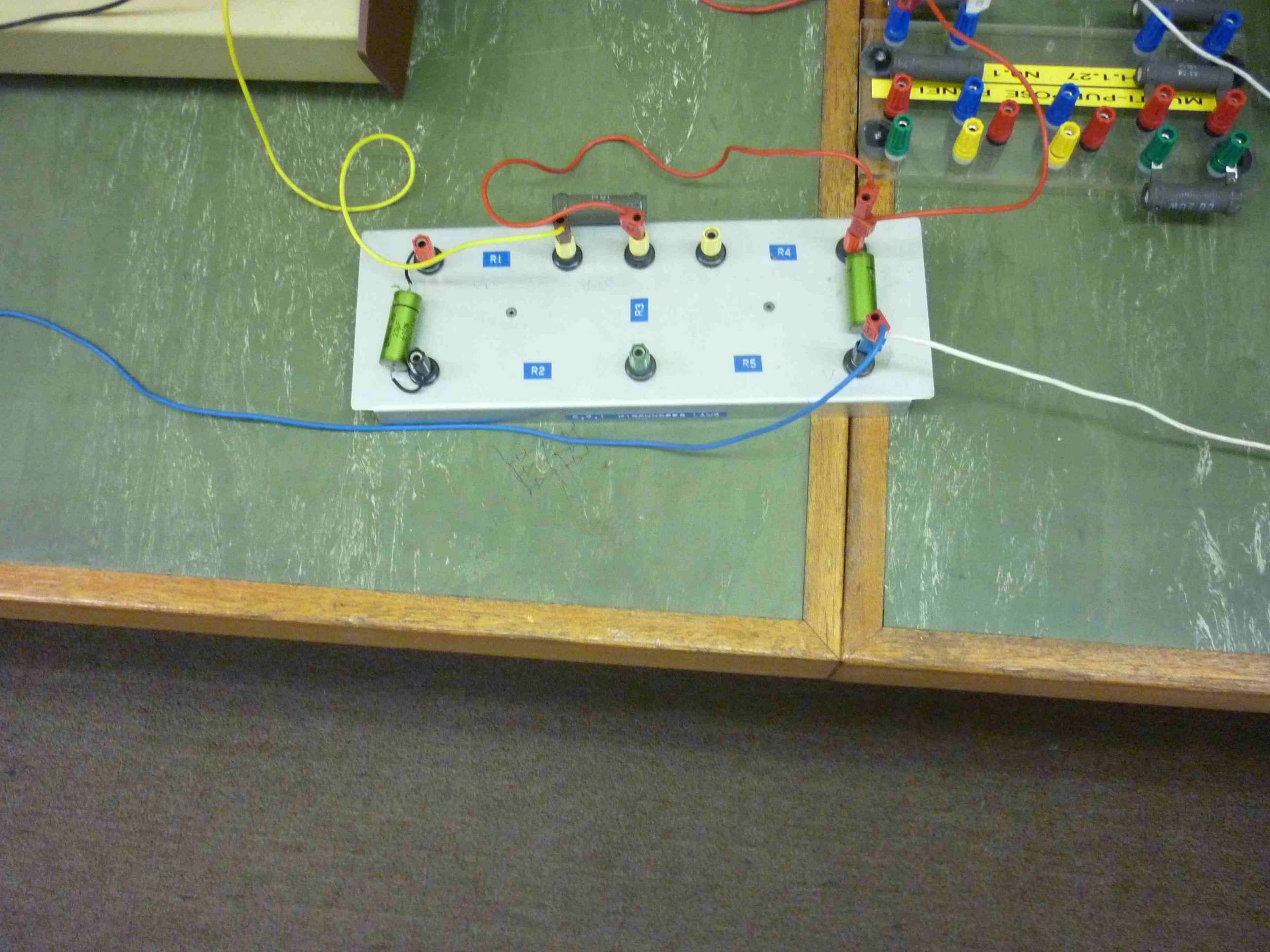


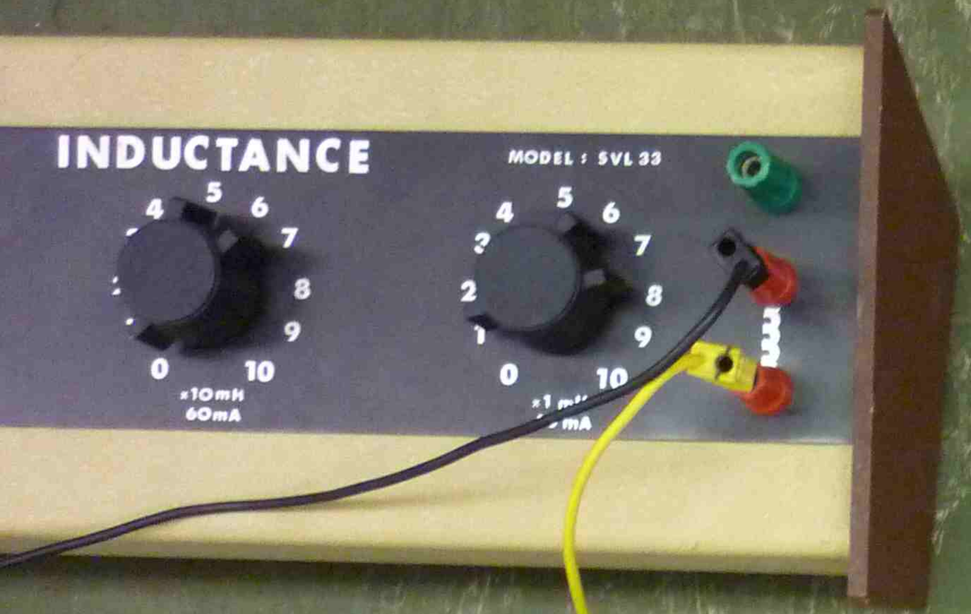
Cupboard No. 8

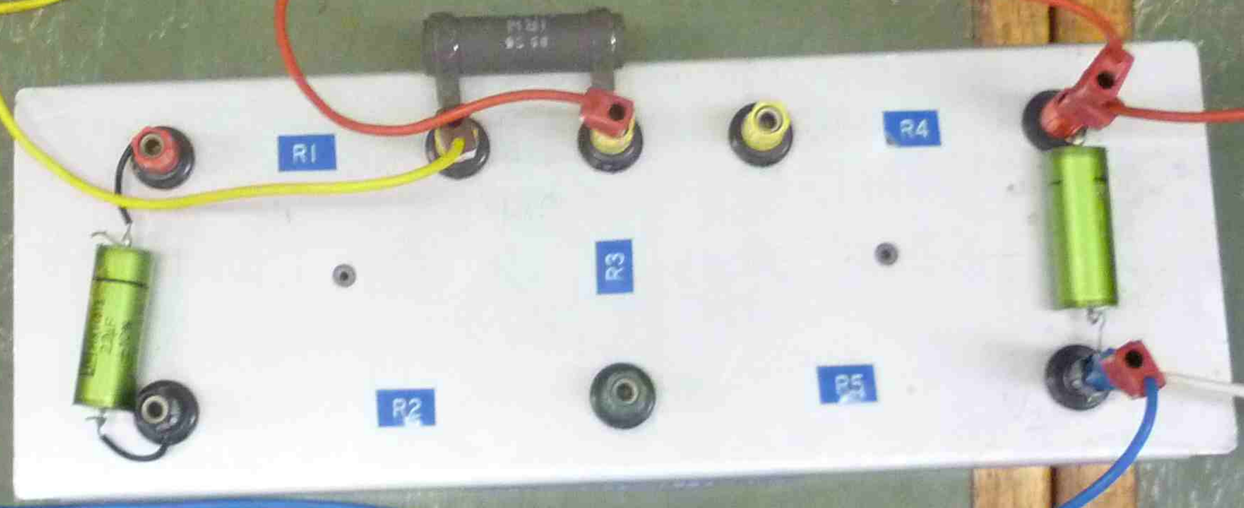
Top Shelf	• Circuit Breaker Panels - 6 x 10 Amperes Quickling C/B	8 off
Bottom Shelf	• Load Bank (fan cooled) - Resistive - 30 Amperes	1 off


INDUCTANCE
AIR CORED
MODEL : SVL 33
±5% TOLERANCE
×100mH
35mA
×10mH
60mA
×1 mH
75 mA
R1
R2
R3
R4
R5


OFF
ON
110V A.C
50~
240V A.C
REGULATED SUPPLY
3 PHASE 41-5/24V SUPPLY
A
B
C
N
E
INDUCTANCE
R1
R2
R3
R4
R5
C.T.I KIRCHHOFFS LAWS


R1
R2
R3
R4
R5


INDUCTANCE
MODEL : SVL 33
0 1 2 3 4 5 6 7 8 9 10
×10mH
60mA
0 1 2 3 4 5 6 7 8 9 10


R1
R2
R3
R4
R5

240V G.P.O

240V G.P.O

INDUCTANCE

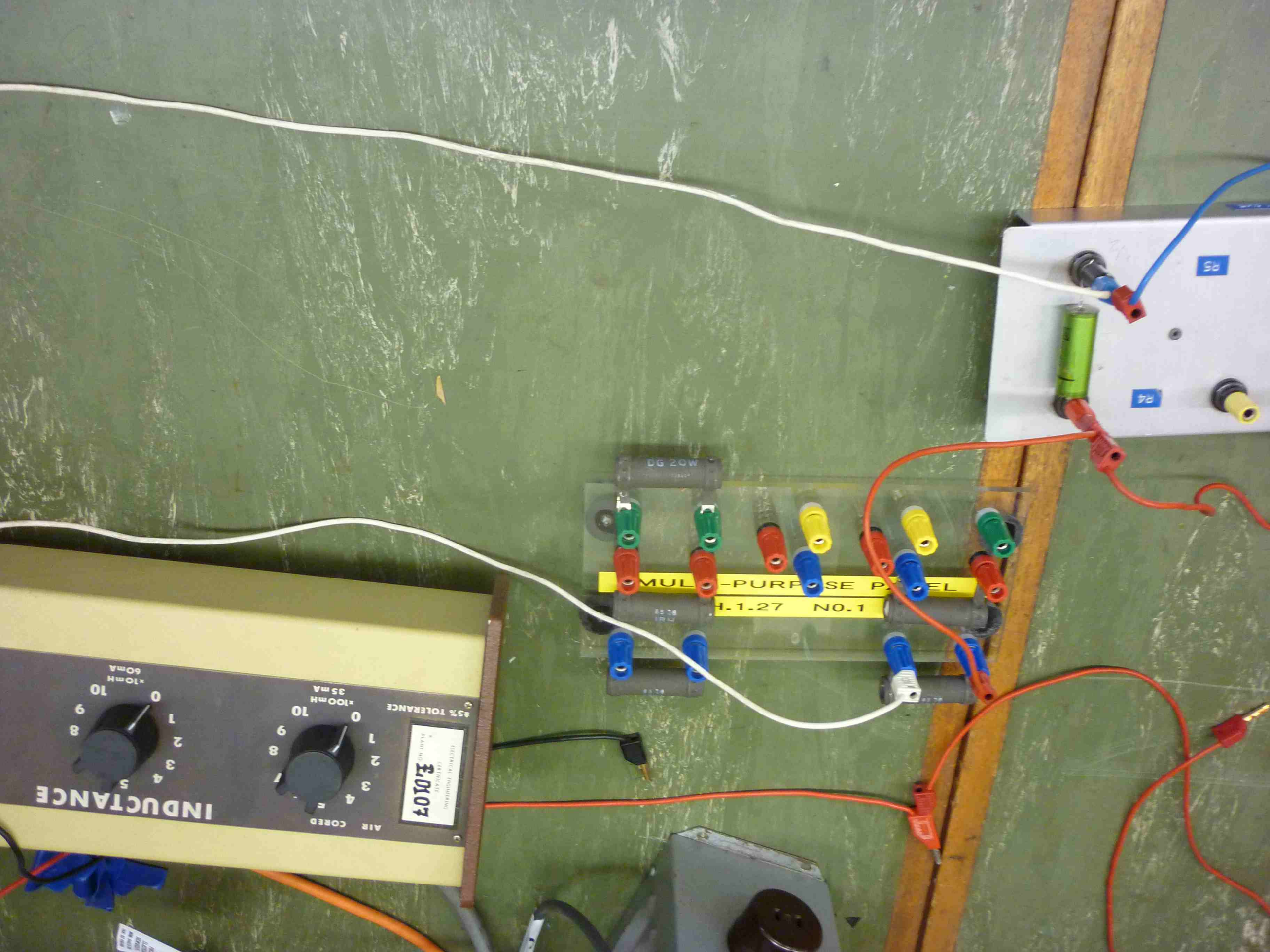
MODEL : SVL 38

AIR CORED

×100mH
35mA

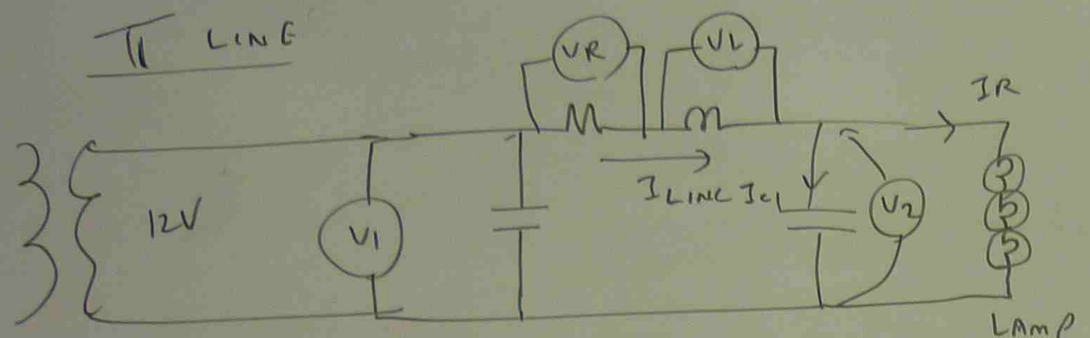
×10mH
60mA

×1 mH
75 mA

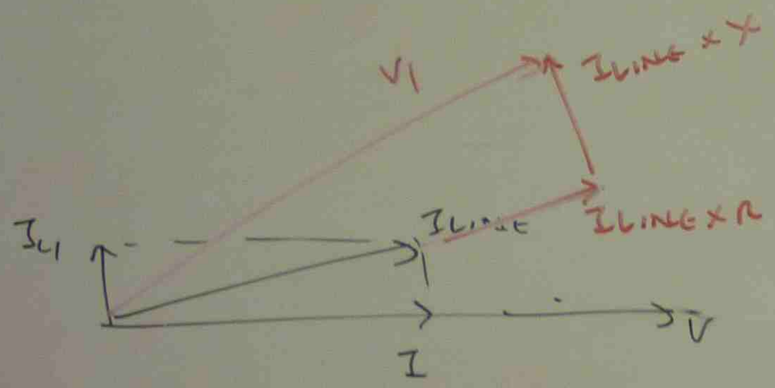

DG 20W
INDUCTANCE
AIR CORED
±5% TOLERANCE
×10mH
60mA
×100mH
35mA
2107
-PURP SE P EL
1.1.27 NO.1

T AND Π EQUIVALENT TRANSMISSION LINES

Π LINE



V1	V2	VR	VL	% REGULATION = $\frac{V_1 - V_2}{V_2} \times 100$

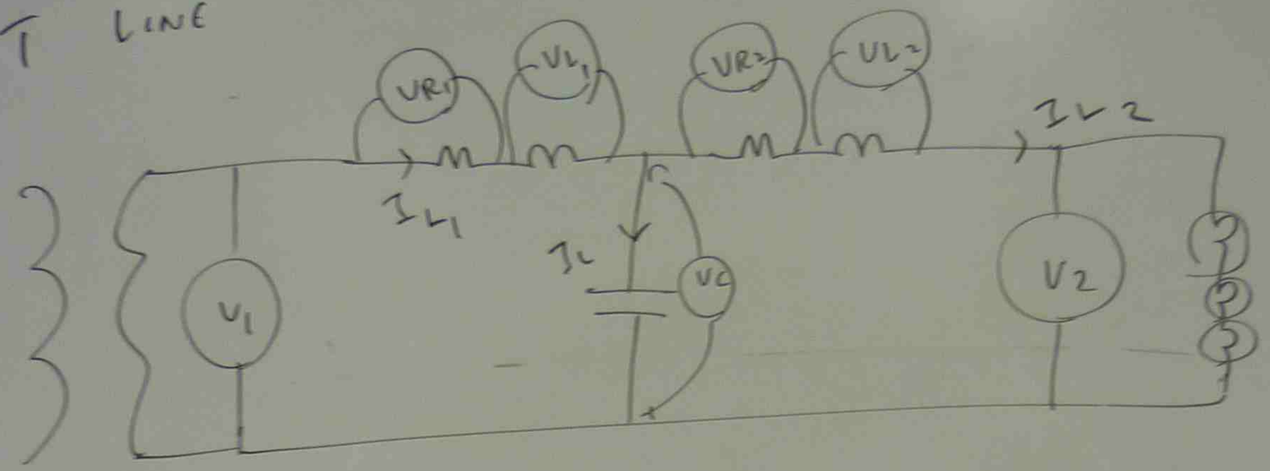


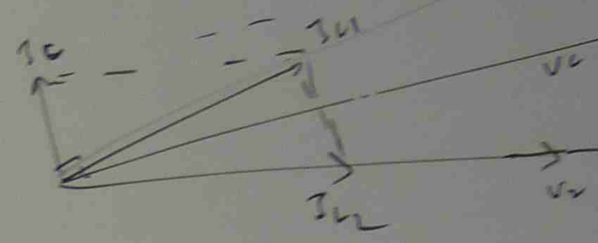
WHICH MODEL GIVE BETTER % VOLTAGE REGULATION?

REGULATION = $\frac{V_1 - V_2}{V_2} \times 100$

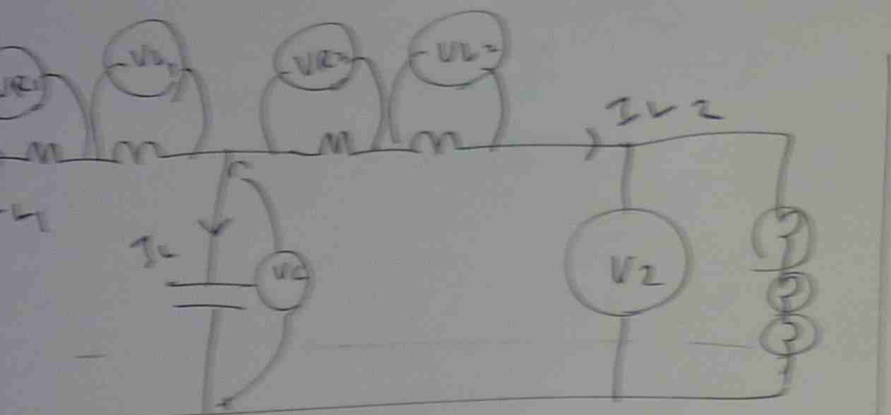
TER % VOLTAGE

T LINE

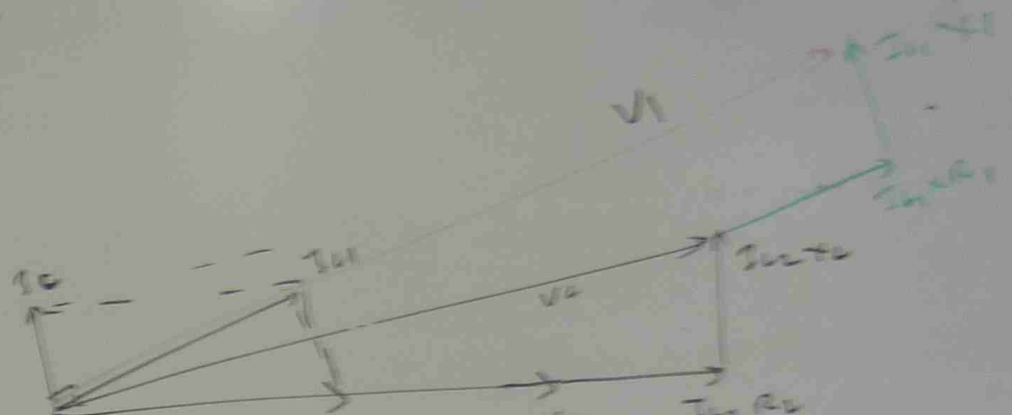




V_1	V_2	V_{R1}	V_{L1}	V_{R2}	V_{L2}	V_C	% REG = $\frac{V_1 - V_2}{V_2} \times 100$



	V_{R_2}	V_{L_2}	V_0	$\%REG = \frac{V_1 - V_2}{V_2} \times 100$



DISTANCE PROT

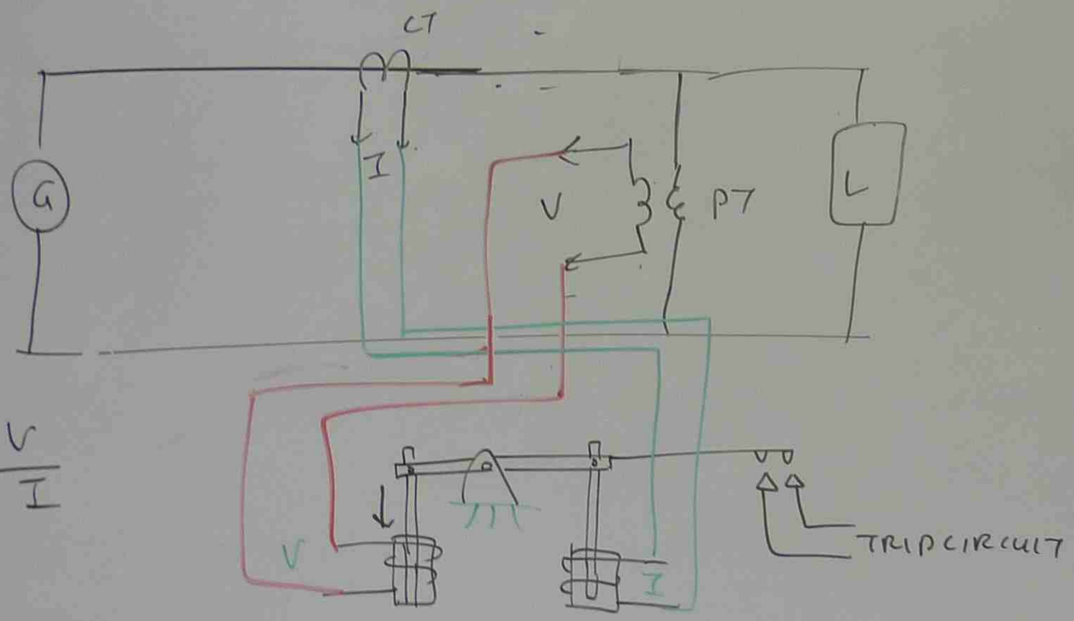
$$Z = \frac{V}{I}$$

NORMAL V LS

Z LS

$$Z = \frac{V}{I} \Rightarrow Z$$

DISTANCE PROTECTION



RESTRAINING COIL OPERATING COIL

$Z = \frac{V}{I}$

NORMAL

V IS HIGH
I IS LOW
} RESTRAINING COIL MAGNETIZATION > OPERATING COIL MAGNETIZATION

$Z = \frac{V}{I} \Rightarrow Z$ IS HIGH

⇓

RELAY DOES NOT OPERATE.

FAULT

I IS HIGH
V IS LOW
} OPERATING COIL MAGNETIZATION > RESTRAINING COIL MAGNETIZATION

$Z = \frac{V \downarrow}{I \uparrow}$

Z IS LOW

⇓

RELAY OPERATES

Z VALUE DETERMINES THE RELAY OPERATION

$Z \propto$ DISTANCE ⇒ DISTANCE RELAY.

NORMAL

1 2 3 4

FAULT

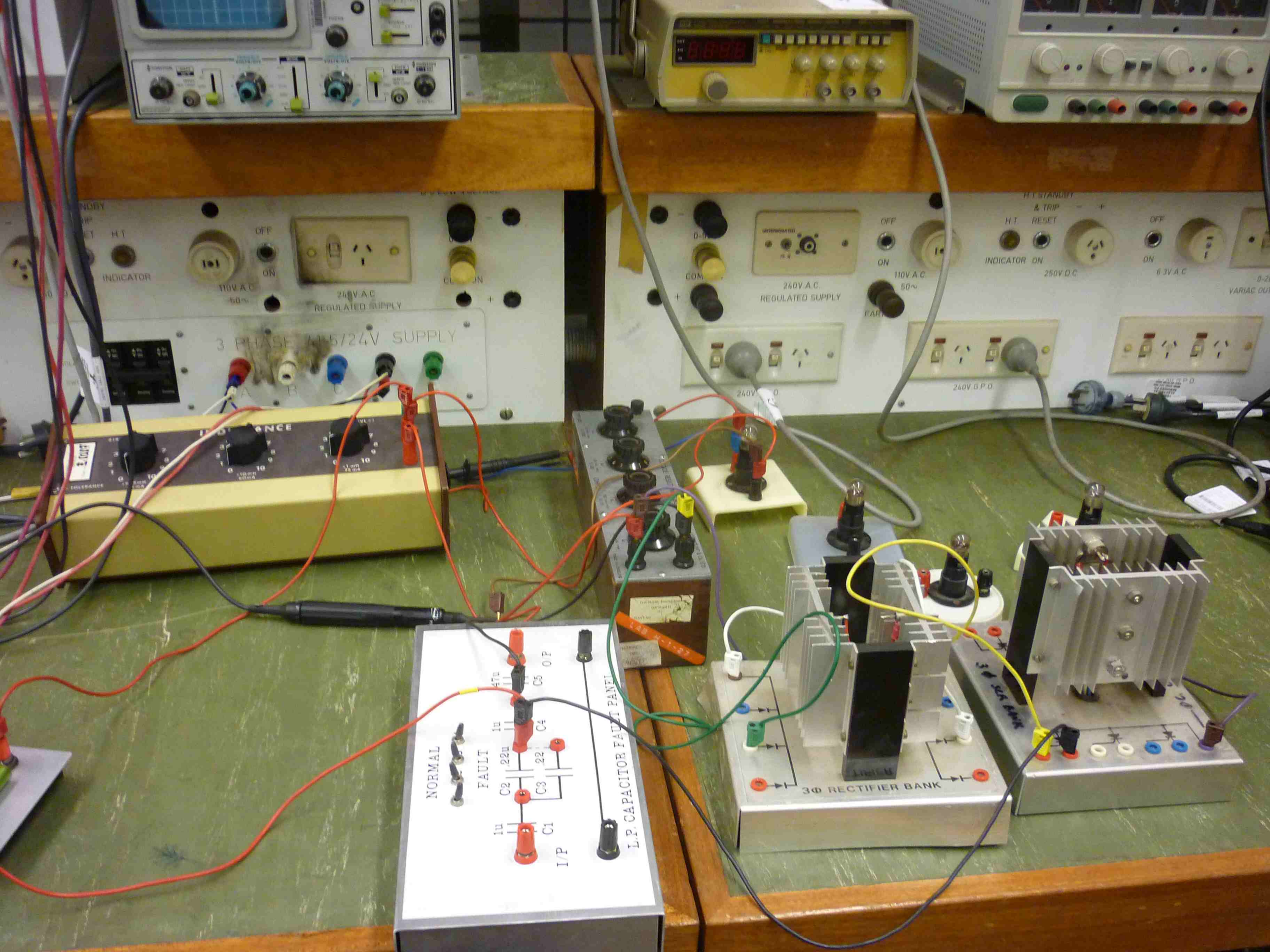
1u C2 .22u 1u .47u

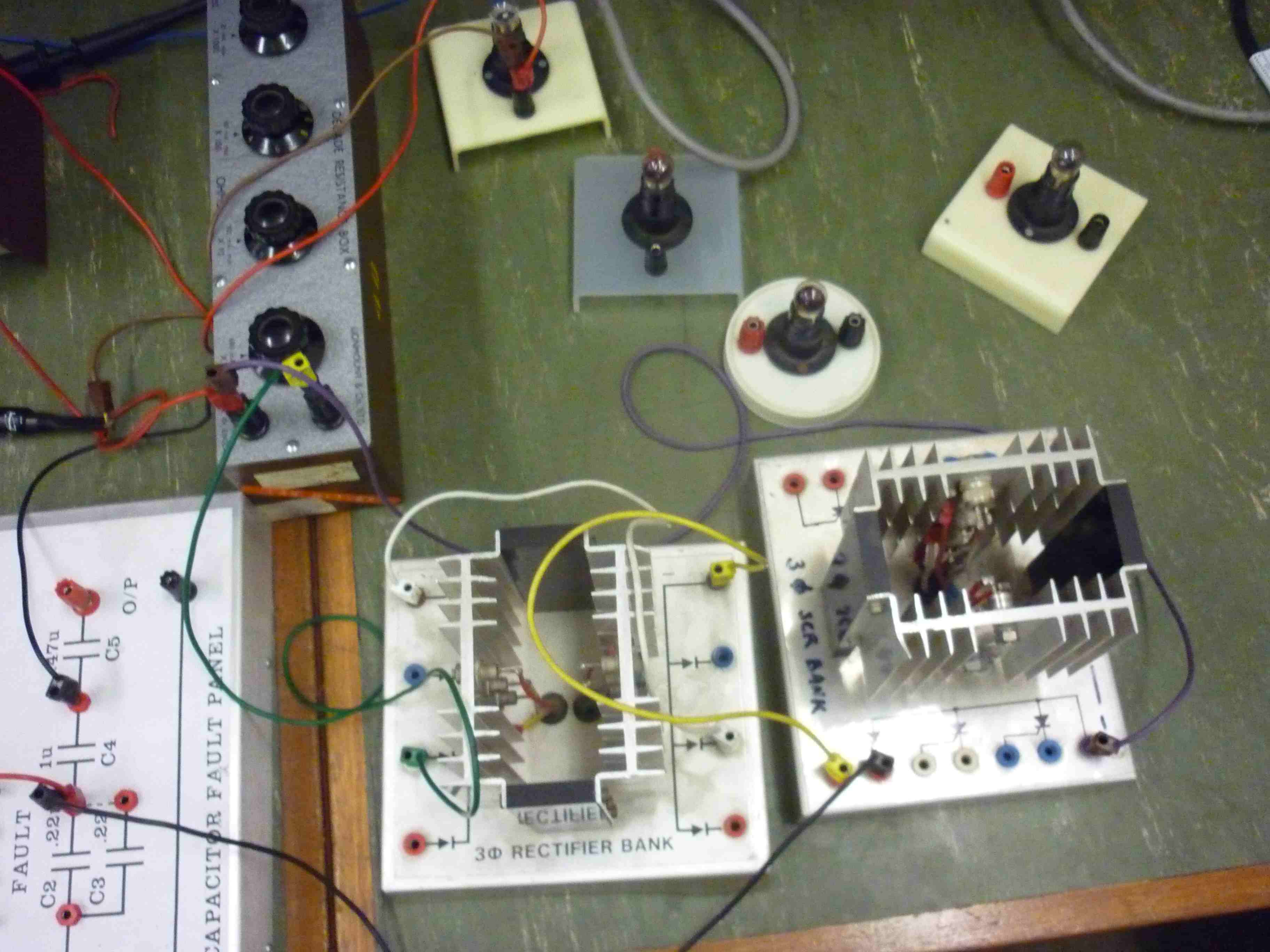
C1 C3 .22 C4 C5

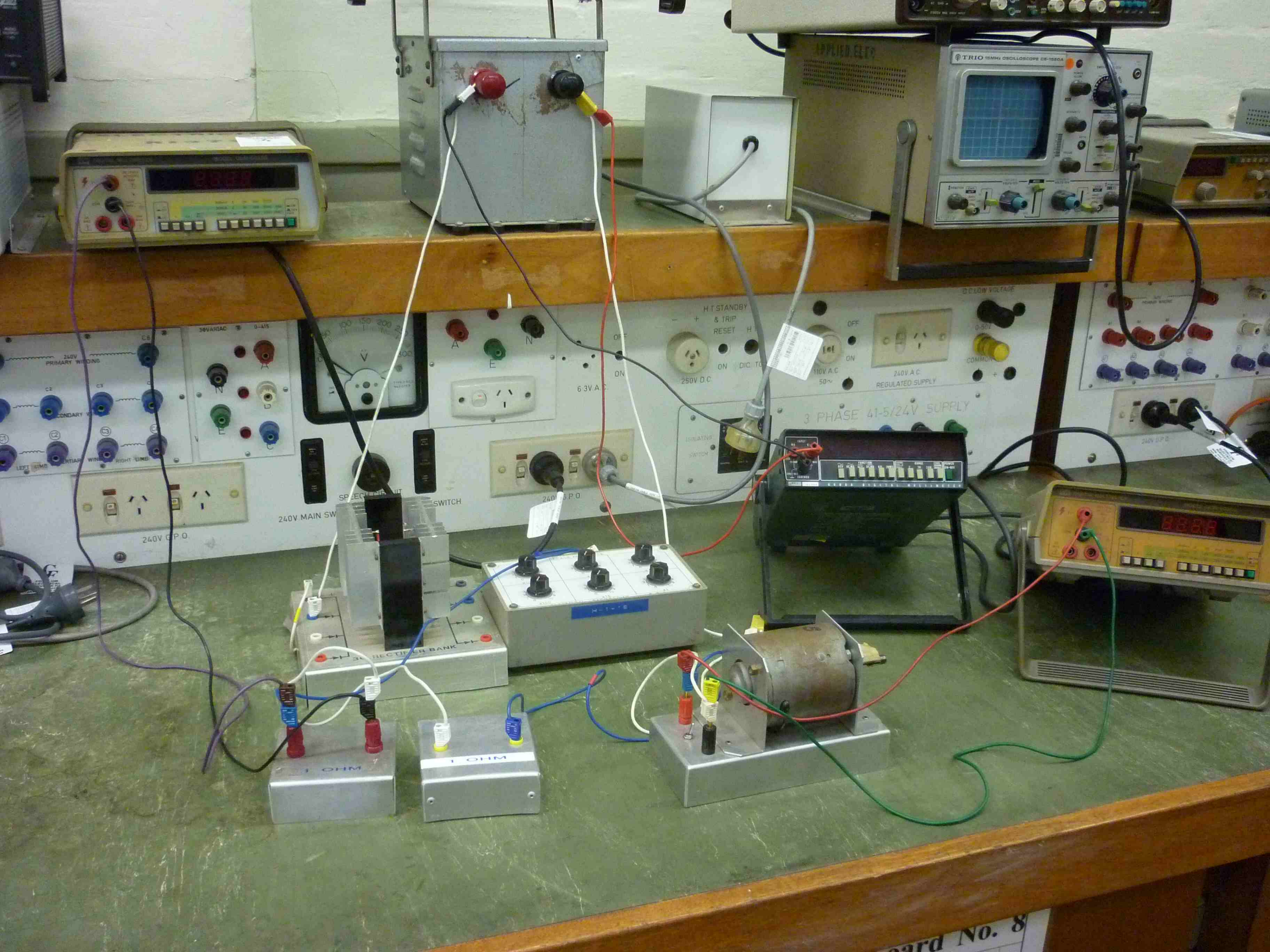
I/P O/P

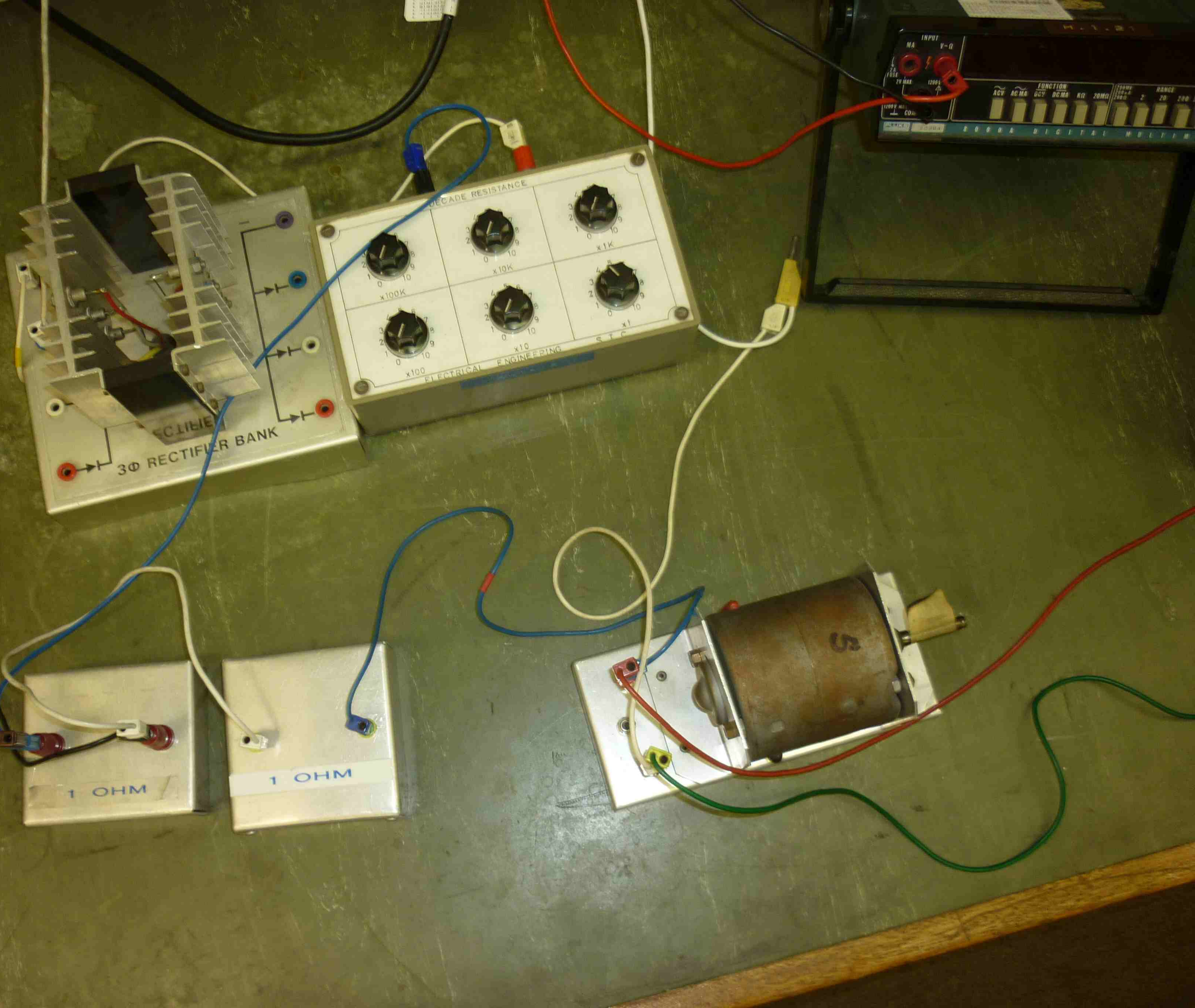
L.P. CAPACITOR FAULT PANEL

3Φ RECTIFIER BANK

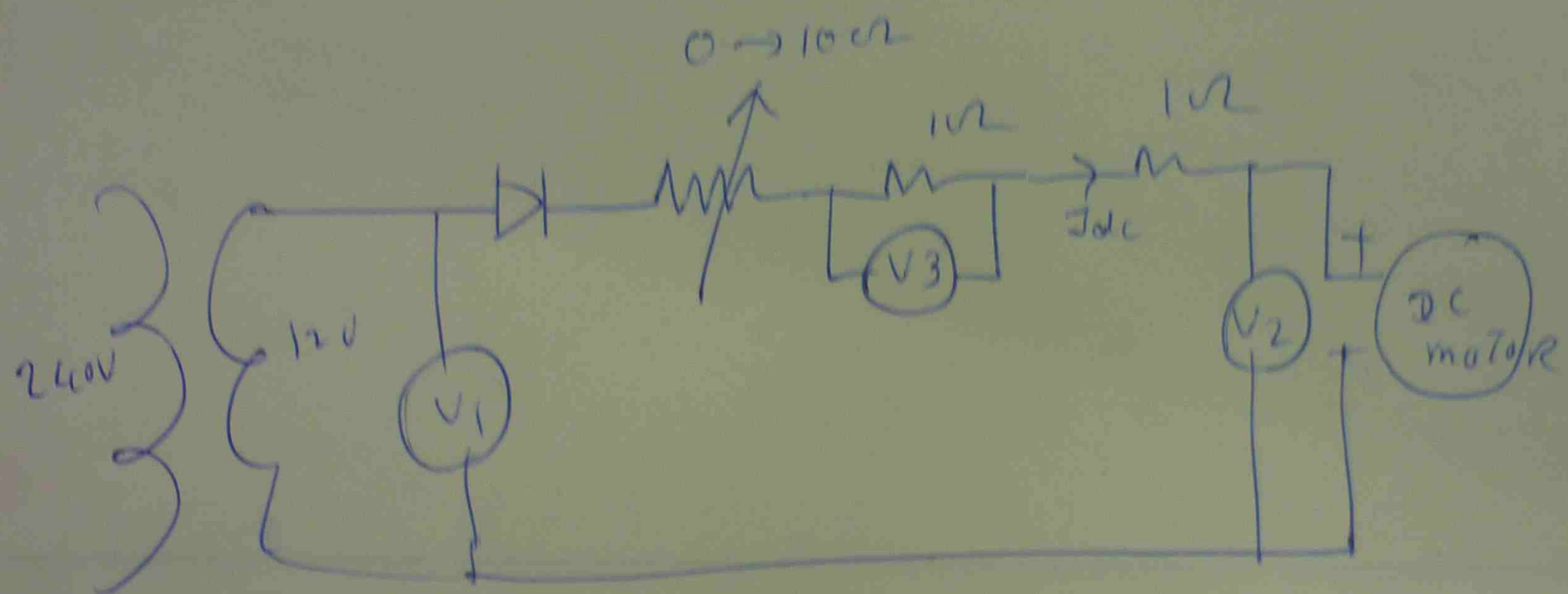

INDICATOR
H.T.
OFF
ON
110V.A.C
50~
240V.A.C
REGULATED SUPPLY
3 PHASE 415/24V SUPPLY
A
B
C
NORMAL
FAULT
C1
C2
C3
C4
C5
1u
.22u
.22
47u
I/P
O/P
L.P. CAPACITOR FAULT PANEL
3Φ RECTIFIER BANK
H.T. STANDBY
& TRIP
RESET
250V.D.C
6.3V.A.C
240V.G.P.O


FAULT
C2
.22u
C3
.22u
1u
C4
.47u
C5
O/P
CAPACITOR FAULT PANEL
3Φ RECTIFIER BANK
3Φ SCR BANK


TRIO 15MHz OSCILLOSCOPE CS-1560A
H.T STANDBY
& TRIP
RESET
250V D.C
110V A.C
50~
240V A.C
REGULATED SUPPLY
3 PHASE 41-5/24V SUPPLY
240V MAIN SWITCH
240V G.P.O.
1 OHM
1 OHM


DECADE RESISTANCE
x100K
x10K
x1K
x100
x10
x1
ELECTRICAL ENGINEERING
3Φ RECTIFIER BANK
1 OHM
1 OHM
INPUT
FUNCTION
RANGE

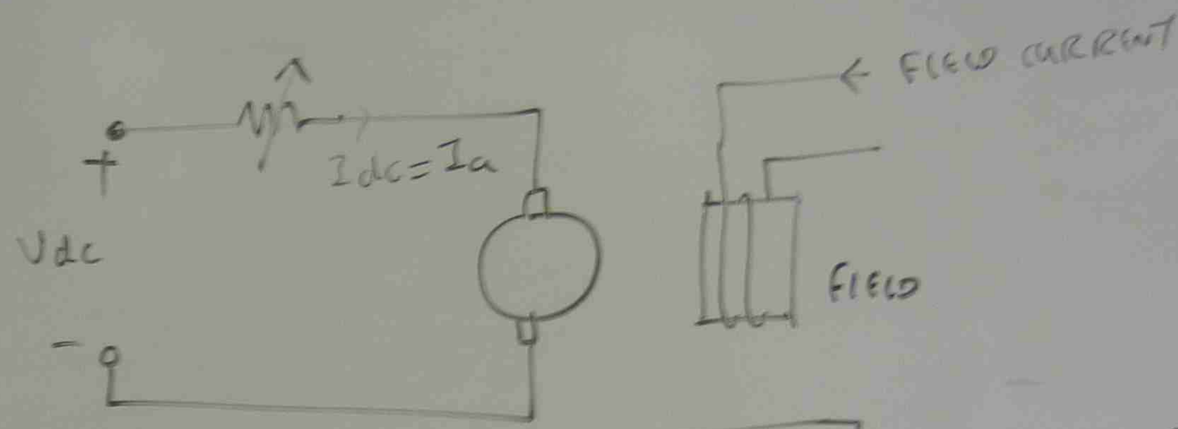
Variable dc drive with Rectifier.



$$I_{dc} = \frac{V_3}{1\Omega}$$

Resistor	V_1	V_2	V_3	I_{dc}	Observation

VARIABLE DC DRIVE WITH RECTIFIER



FIELD CURRENT & FIELD FLUX (ϕ) $\propto$ $\frac{1}{\text{SPEED}}$

$$T = \frac{\phi Z I_a}{2\pi a}$$

$$E_g = \frac{\phi Z N}{60} \times \frac{P}{a}$$

E_g = VOLTAGE Z = CONDUCTOR P = NO. of POLES

ϕ = FLUX N = SPEED a = NO. of ARMATURE PARALLEL PATHS.

T = TORQUE

I_a = ARMATURE

$I_a \propto$

BY INCREASI
FLUX CAN
CAN BE

RIVE WITH RECTIFIER

← FIELD CURRENT

FIELD

SPEED.

$$T = \frac{\phi Z I_a}{2\pi a}$$

$$I_a \propto \frac{1}{\phi} \propto N$$

BY INCREASING ARMATURE CURRENT, FLUX CAN BE LOWERED AND SPEED CAN BE HIGHER

UCTOR

P = NO. OF POLES

a = NO. OF ARMATURE PARALLEL PATHS.

T = TORQUE

I_a = ARMATURE CURRENT.

PROCEDURE

– CONNECT THE GIVEN

240V

12V

V1

VARI RES

I_{dc} =

VARIABLE RESISTOR	V_1	V_2

$\phi \propto N$

ARMATURE CURRENT)

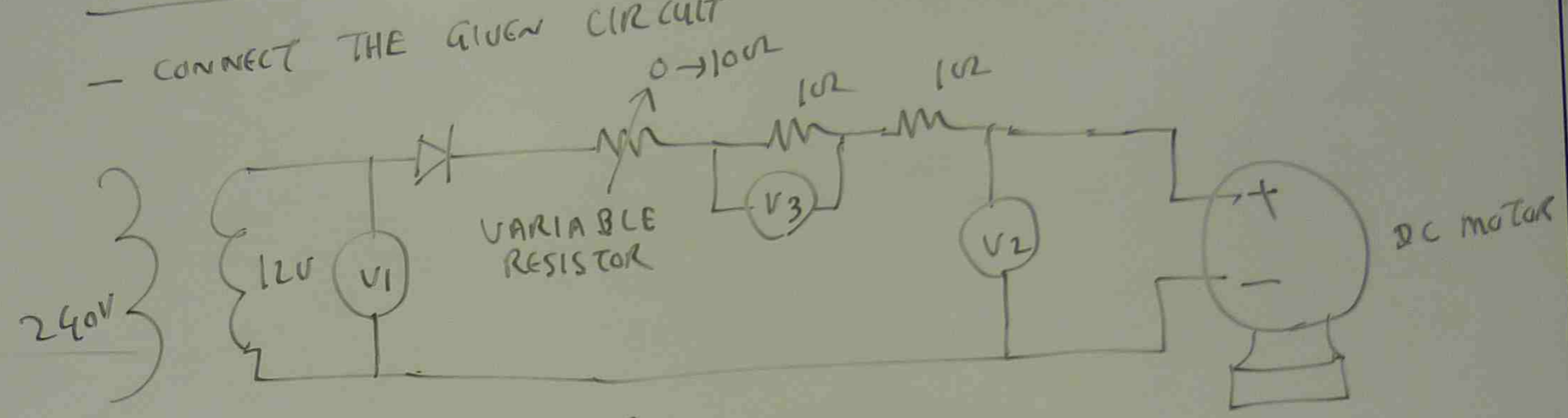
LOWERED AND SPEED

IGHER

URRENT.

PROCEDURE

— CONNECT THE GIVEN CIRCUIT



$$I_{dc} = \frac{V_3}{1\Omega}$$

VARIABLE RESISTOR	V_1	V_2	V_3	$I_{dc} = \frac{V_3}{1\Omega}$	OBSERVATION OF SPEED