

HEALTH AND SAFETY ACT

Although the equipment has been designed to comply with the requirements of the Health and Safety Act, it is however potentially lethal unless used and maintained by suitably trained personnel.

If any further queries occur regarding the usage and maintenance of the equipment in this manual, please refer these to the Company.

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1. Description of Equipment
2. Operation of Equipment
3. Maintenance Instructions
4. Accessories and Spares Supplied with the Equipment
5. Overall Performance Specification
6. Test Results

1. DESCRIPTION OF EQUIPMENT

- 1.1 Electrical Specification
- 1.2 Variable Heavy Current Supply
- 1.3 Variable Voltage Supply
- 1.4 Timer Control
- 1.5 Output Control
- 1.6 Additional Current Metering
- 1.7 Filter Unit
- 1.8 Construction

1.1 ELECTRICAL SPECIFICATION

1.1.1 The supply voltage will be either:

- a) 240V, 50/60 Hz, 1 phase +10%
- b) 115V, 50/60 Hz, 1 phase +10% -6%

1.1.2 The supply requirements will be a minimum of 600 VA.

1.1.3 The heavy current output will be:- (fully isolated)

- 50A at 10V
- 25A at 20V
- 10A at 50V
- 5A at 50V
- 2.5A at 50V
- 1A at 150V

The above outputs are continuously variable from zero. Output currents of 50A and below are on a duty cycle of 5 mins 'ON' followed by 15 mins 'OFF' circuit.

1.1.4 The variable voltage output (fully isolated) will be:

- 0 - 240V at 1A AC output
- 0 - 240V at 1A DC output

The above output will have the same duty cycle as detailed in section 1.1.3.

1.1.5 The above outputs are controlled by means of a variable ratio auto transformer.

1.1.6 The maximum voltage appearing on the relay contact test terminals is 24V DC. The maximum current following in the test circuit when the relay contacts are connected will be 0.3A DC. The test circuit is fully isolated.

1.1.7 An auxiliary current transformer is provided giving the following range extention:

- 0 - 1A
- 0 - 0.5A
- 0 - 0.25A
- 0 - 0.1A

1.1.8 An auxiliary output of 110V ac at 0.3 ampere is provided. This output is energised each time the main output is energised.

1.2 VARIABLE HEAVY CURRENT SUPPLY

1.2.1 There are six ranges available on the heavy current output. (See table 1).

Range	1	2	3	4	5	6
Voltage	10	20	50	50	50	150
Current	50	25	10	5	2.5	1
Scale						
Factor 1A	x50	x25	x10	x5	x2.5	x1
Factor 5A	x10	x5	x2	x1	x0.5	x0.2

1.2.2 The ammeter is dual scaled for convenience of scale factors. (See Table 1), and for ease of use by the operator.

1.2.3 The output terminals for the heavy current output are located on the top edge of the front panel. Each terminal is clearly marked showing polarity.

1.2.4 The output current is increased by moving the regulator control knob in a clockwise direction. The output currents will be indicated on the ammeter.

1.3 VARIABLE VOLTAGE SUPPLY

1.3.1 There are two variable voltage outputs which are as follows:-

- a) 0-240V AC 1 ph rated @ 1 ampere
- b) 0-240V DC full wave rectified unsmoothed rated @ 1 ampere

1.3.2 Each of the above outputs are metered by a single scaled voltmeter.

1.3.3 Output terminals are located at the top of the front panel. (See Figure 2).

1.3.4 The output voltage is increased by moving the regulator control knob in a clockwise direction.

1.3.5 With the 0-240V AC output selected, the set's ammeter will read the load current being drawn, ie 0-1A. Should a lower range be required the auxiliary current transformer circuit can be connected to the voltage output. (See Figure 3d).

1.3.6 With the 0-240V DC output selected, the set's ammeter will read the transformer rms secondary current flowing into the rectifier circuit.

1.4 TIMER CONTROL

- 1.4.1 An electronic timer is provided on set. The timer has three modes of operation which are as follows:-
- a) Timing relays with normally closed contacts (N/C)
 - b) Timing relays with normally open contacts (N/C)
 - c) Timing circuit breakers both electromagnetic and thermal type where no auxiliary contacts are available (I).
- 1.4.2 To control the timer a four position switch is provided. The positions are as follows:-
- a) Normally Open Contacts (N/O)
 - b) Normally Closed Contacts (N/C)
 - c) Current Operation (I)
 - d) Off Position (OFF)
- 1.4.2 The timer control circuit terminals are located on the front panel. (See Figure 2).
- 1.4.3 The timer will read from 0-999999 milliseconds in 0.001 second steps. The timer control is quartz locked for maximum accuracy.
- 1.4.4 The timer isystem will have the following accuracy:
- a) In the contact mode (N/O or N/C) + or - 2 milliseconds
 - b) In the current mode (I):
 - 1.20 - 40% of selected range + or - 3 milliseconds
 - 2.40 - 100% selected current range + 3 or - 1 milliseconds
- 1.4.6 It should be noted that results obtained from the timer with currents below 20% of selected range and on measured times of 19 milliseconds and below. are of doubtful accuracy and should be ignored.
- 1.4.7. a) Units with red and blue 4mm sockets for the relay contacts.
b) Timing relays with normally closed contacts (N/C)
 Timing relays with normally open contacts (N/O)
 With a DC voltage across the relay contacts (when open) working range 30-300V DC
c) The positive must be connected to the red socket
d) If reversed connected 0.6V (1 diode drop) will appear across the red and blue sockets, if the current exceeds 0.5A the fuse will blow and also the set will malfunction
e) **IMPORTANT:** When connecting live relay contacts to the S.C.I.T.S. due care and attention must be strictly observed. It is advisable to connect the S.C.I.T.S. first followed by the line contacts.

1.5 OUTPUT CONTROL

- 1.5.1 The desired output from the equipment is selected by means of an output selector switch which is located on the LHS top corner of the front panel.
- 1.5.2 Once the desired output is selected it is controlled by the output 'ON' and 'OFF' illuminated pushbuttons which are located on the bottom edge of the front panel.
- 1.5.3 The selected output is automatically switched 'OFF' by the following saction:-
- a) Depressing the 'OFF' pushbutton
 - b) By the operation of N/O contacts of the relay under test
 - c) By the operation of N/C contacts of the relay under test
 - d) By the collapse of output current from any selected output once the device under test, ie moulded case circuit breaker with no auxiliary contacts, has operated thus open circuiting the test loop.

1.6 ADDITIONAL CURRENT METERING

- 1.6.1 There are four additional current metering ranges provided. This facility provides for 0.1A, 0.25A, 0.5A and 1A to be metered on the equipment's ammeter when selected.
- 1.6.2 The 4mm pin sockets are located on the front panel. The terminals may be connected in series with the heavy current output or the AC voltage output. (See Figure 3).
- 1.6.3 The ammeter scale factors are as follows:-

Range	1	2	3	4
Current	1.0	0.5	0.25	0.1
Scale Factor 1A Range	x1	x0.5	x0.25	x0.1
Scale Factor 5A Range	x0.2	x0.1	x0.05	x0.02

1.7 FILTER UNIT

1.7.1 The filter unit has the following ranges:-

100A, 50A, 25A, 10A, 5A, 2.5A, 1A, 0.5A and 0.25A

1.7.2 The unit is connected in series with the heavy current output to present a High Impedance to frequencies other than the fundamental supply frequency. (See Table 3.)

TABLE 3 - IMPEDANCE IN OHMS

50 Hz measured with 100% of range current Harmonic frequencies
5% of range current filter unit switched for 50 Hz operation.

TEST FREQUENCY	CURRENT RANGE AMPERES								
	100	50	25	10	5	2.5	1.0	0.5	0.25
50 Hz	0.0055	0.022	0.085	0.51	1.94	7.8	47.7	220	880
150 Hz	0.095	0.38	1.5	9.5	38	150	950	4381	17512
250 Hz	0.165	0.65	2.5	16.5	65	250	1650	7650	30440
350 Hz	0.225	0.9	3.6	22.5	90	360	2250	10377	41509

1.7.3 The filter terminals and controls together with the supply frequency select switch are located on the top panel of the unit.

1.7.4 The filter unit is also provided with an output current monitor which gives a 0-100 mA signal current. The 100 mA corresponds to the maximum current obtainable on each of the filter units ranges. The maximum burden of the current monitor source is 0.25 VA. (Suitable instrument would be AVO Model 8).

1.8 CONSTRUCTION

1.8.2 The filter unit is housed in robust steel case, complete with top carrying handle. All necessary controls and terminals are located on the top panel.

1.8.3 The secondary current injection set is housed in a deep drawn aluminium case complete with detachable lid and carrying handle. Once the lid is closed the case affords a degree of protection to IP65.

2. OPERATION

- 2.1 Supply Voltage Selection
- 2.2 Front Panel Control Functions
- 2.3 Connections
- 2.4 Method of Operation

2.1 SUPPLY VOLTAGE SELECTION (See Figure 2 Front Panel Layout)

- 2.1.1 The supply voltage is selected by means of a screwdriver operated switch which is located on the front panel.

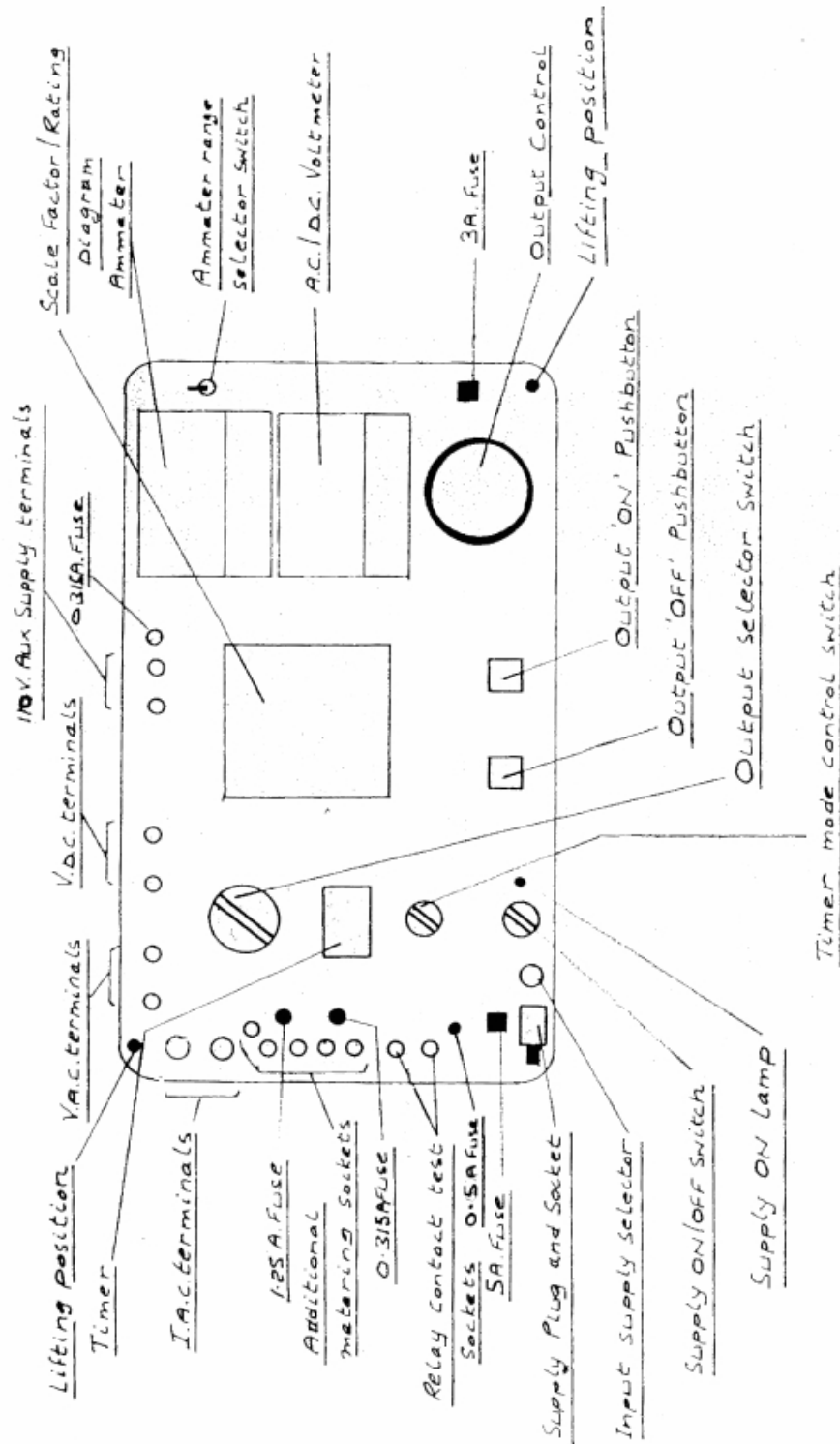
IMPORTANT:-

Under no circumstances should the supply selector be altered when the set is energised. Always ensure that the correct supply voltage is selected before energising the equipment.

2.2 FRONT PANEL CONTROL FUNCTIONS (See Figure 2)

<u>2.2.1</u>	<u>Item</u>	<u>Function</u>
	Supply Switch ON/OFF	To isolate both supply leads from the set
	Supply on Lamp	To indicate supply is connected to the set and that supply fuse is healthy
	Timer Mode Switch	To select method of output/timer control
	Ammeter Range Selector Switch	Selects either 1.0-0.1/1-50A ranges on ammeter
	'OFF' Pushbutton	Button is coloured green and de-energises the selector output automatically when pressed
	'ON' Pushbutton	Button is coloured red and energises the selector output automatically when pressed
	Output Selector Switch	Selects the desired output from the equipment

fig 2. FRONT PANEL LAYOUT



2.3 CONNECTIONS

- 2.3.1 See Figure 3a for connections to the relay under test without the filter unit in circuit.
- 2.3.2 See Figure 3b for connection to the relay under test with the filter unit in circuit.
- 2.3.3 See Figure 3c for connections required for measuring currents using the additional current metering facility.
- 2.3.4 See Figure 3d for connection required for measuring currents on the AC Voltage output using the additional current metering facility.
- 2.3.5 See Figure 3e for connection to device under test with no auxiliary contacts, ie circuit breaker, motor overload, relay.

Fig 3a CONNECTION METHOD WITHOUT FILTER

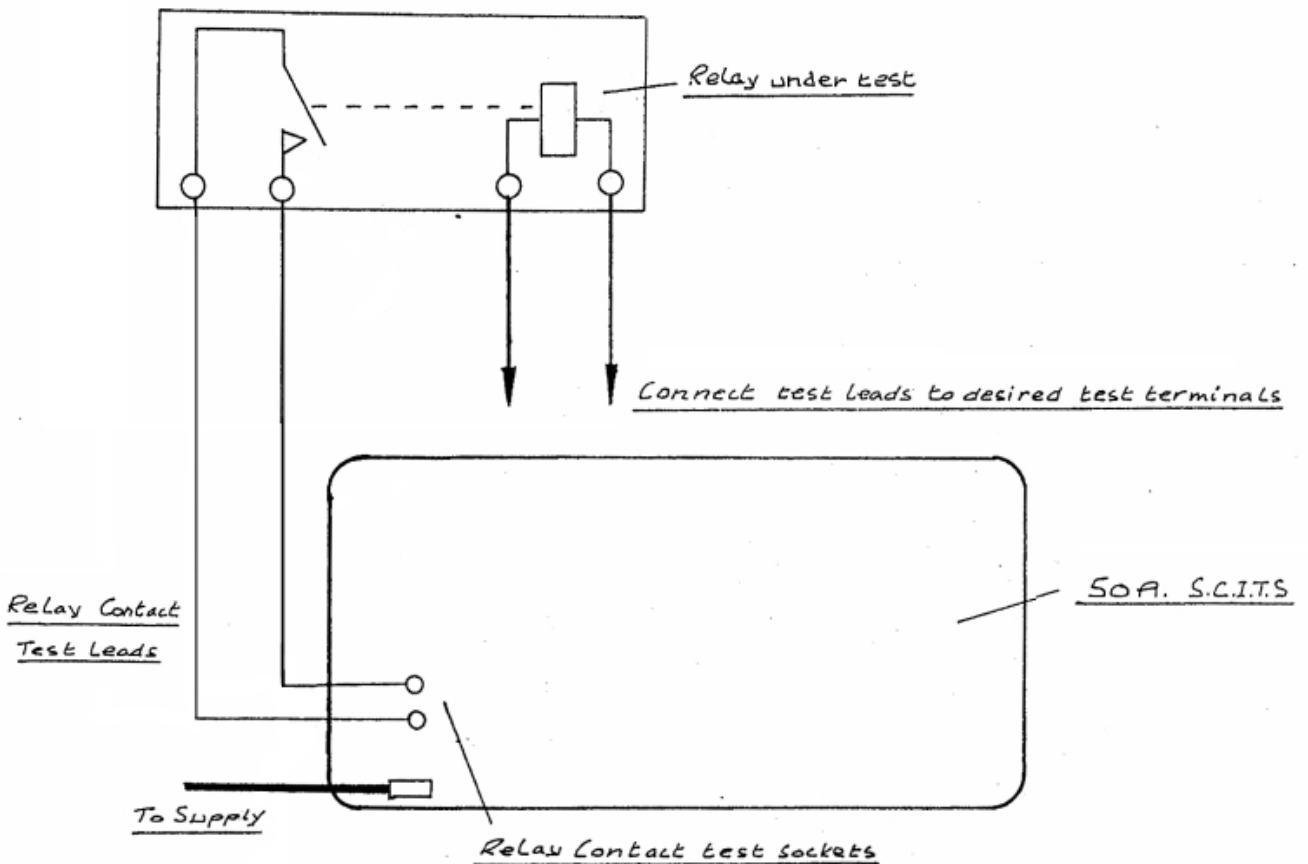


fig 36. CONNECTION METHOD WITH FILTER

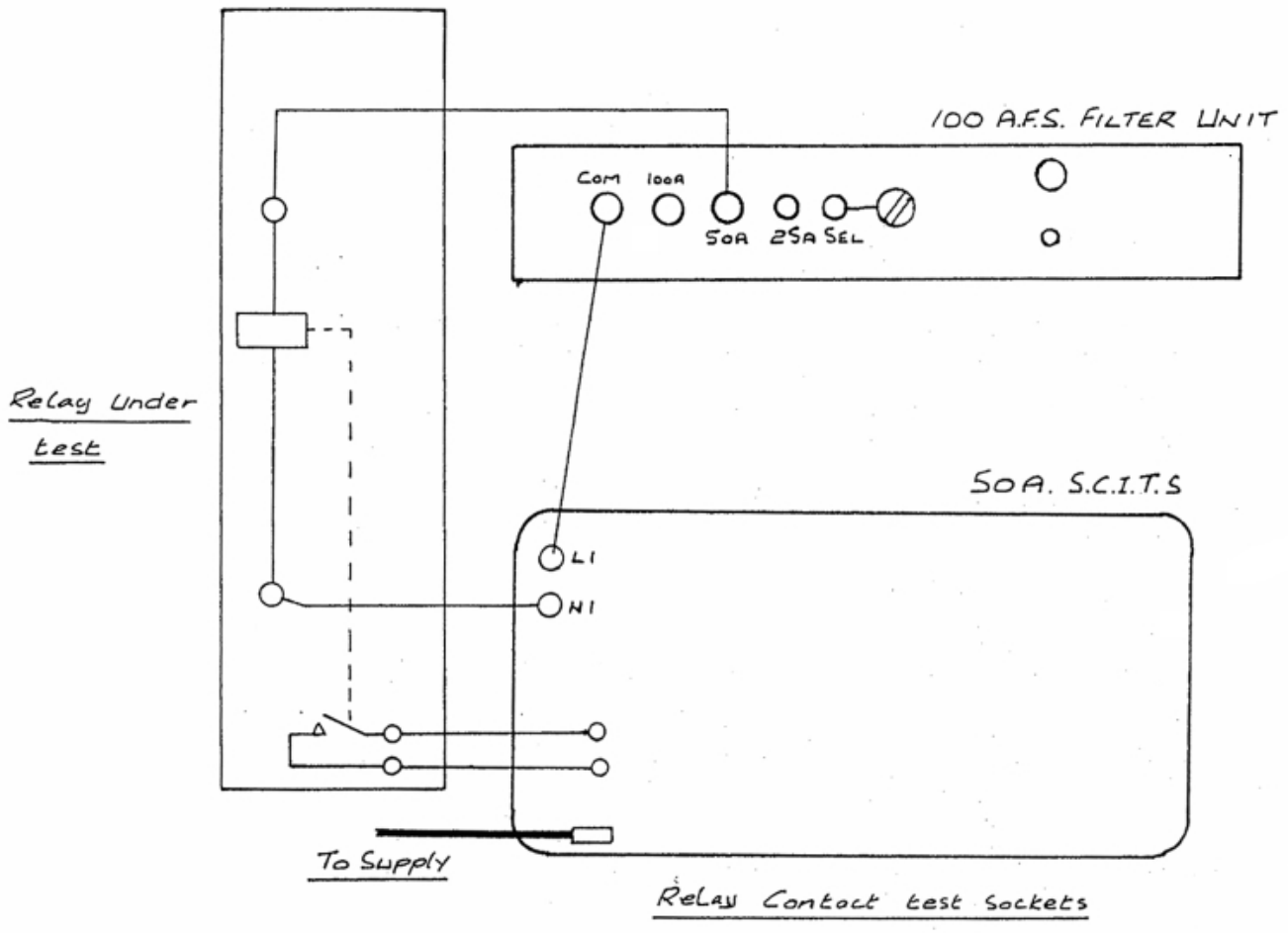


Fig 3c CONNECTION OF ADDITIONAL CURRENT METERING FACILITY
TO CURRENT OUTPUT

SO A. S. C. I. T. S.

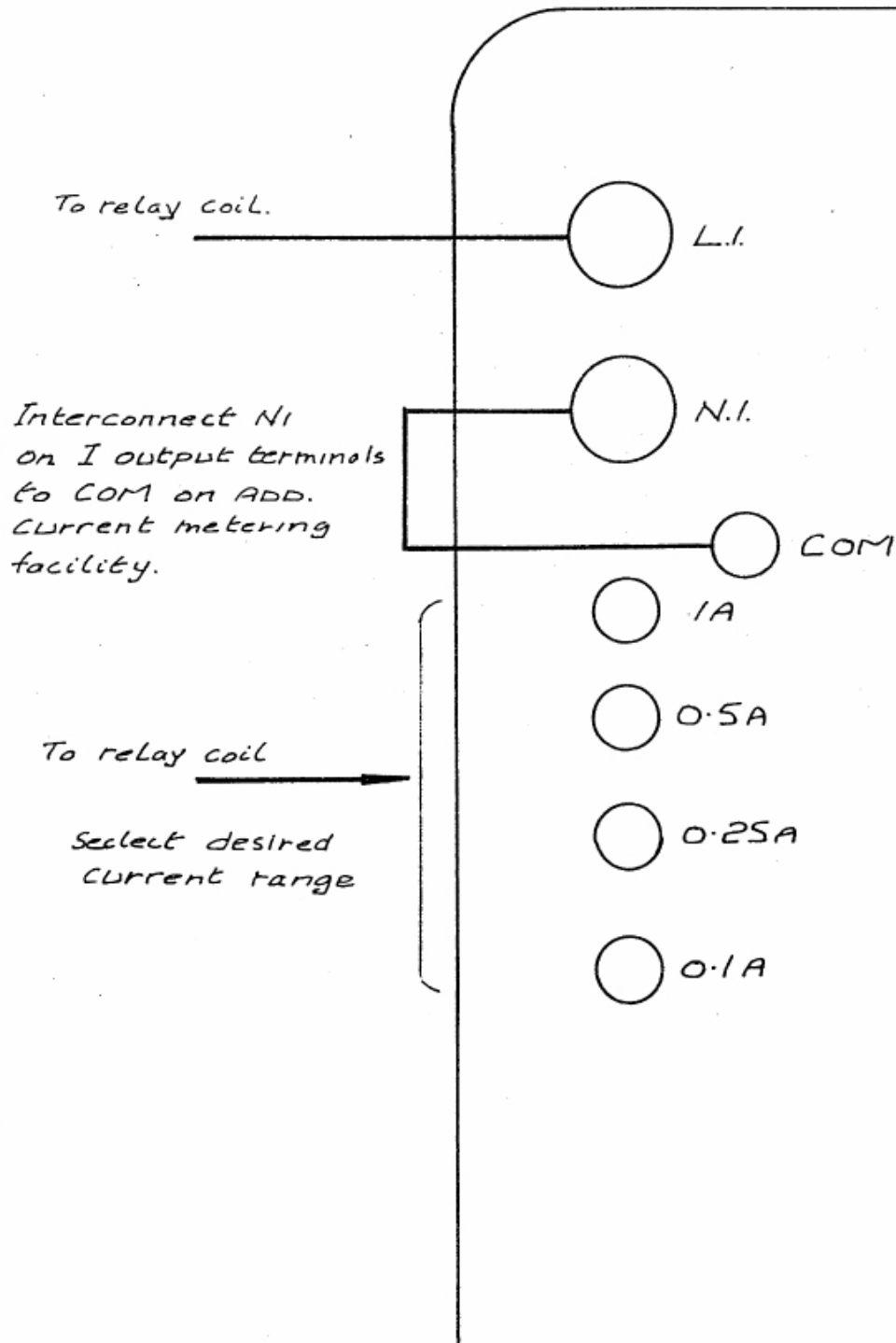


Fig 3d CONNECTION OF ADDITIONAL CURRENT METERING FACILITY
TO A.C. VOLTAGE OUTPUT

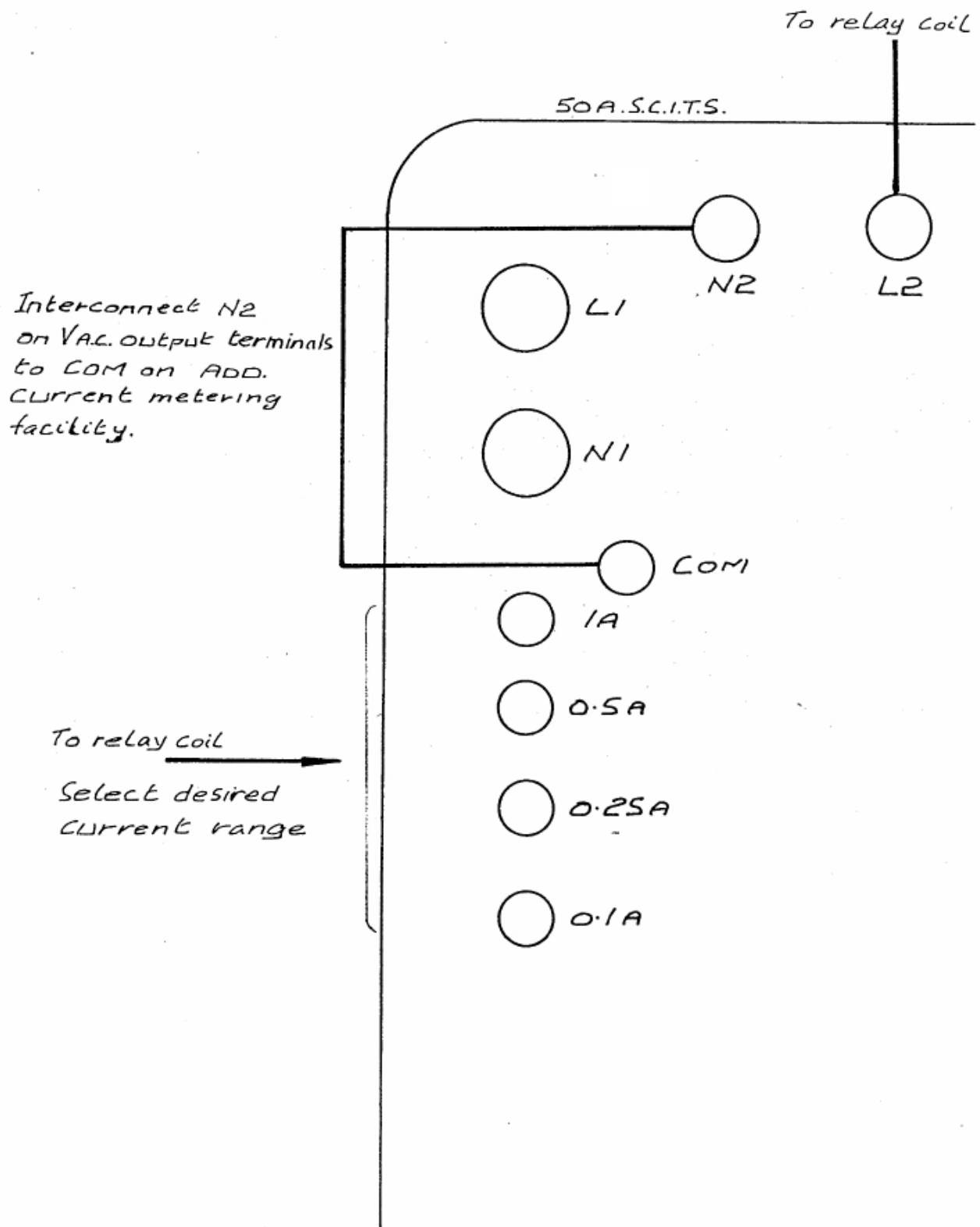
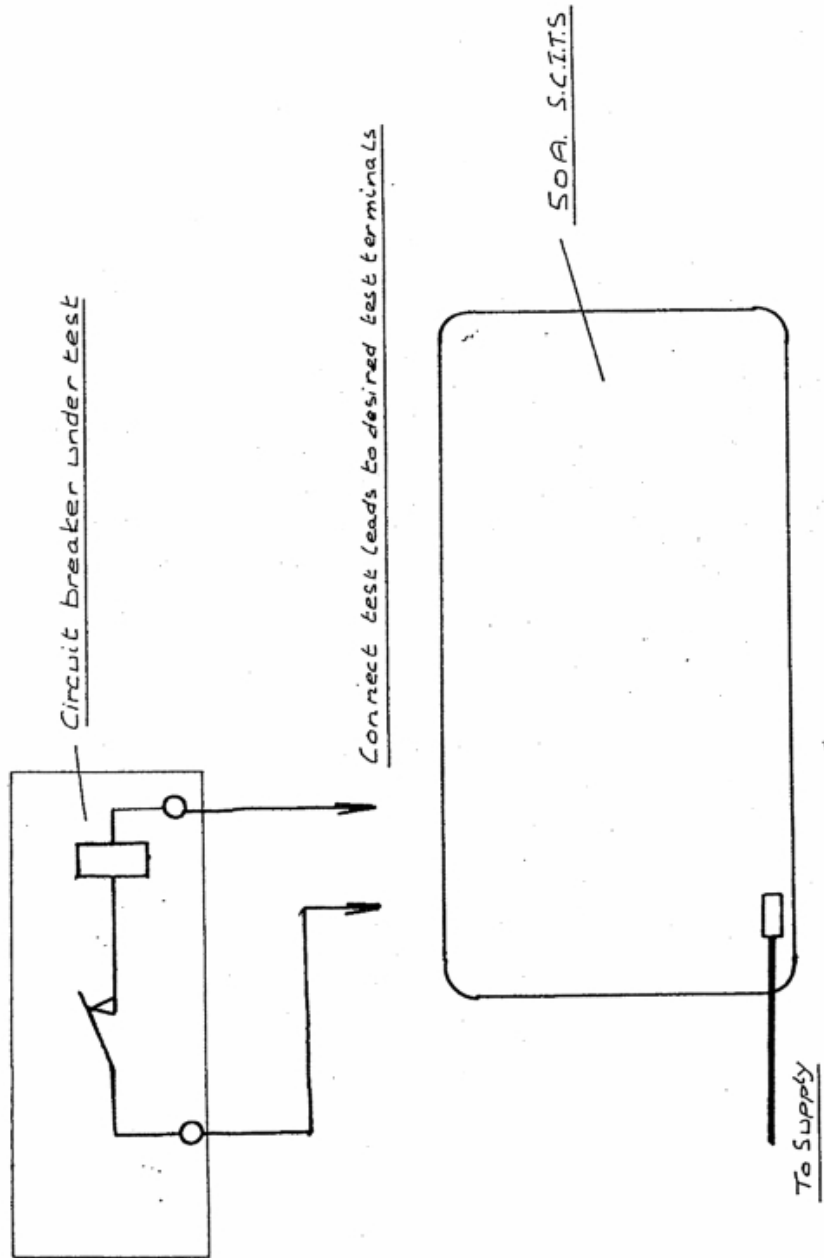


Fig 3e

CONNECTION METHOD FOR TESTING CIRCUIT BREAKERS AND THERMAL OVERLOADS.



2.4 METHOD OF OPERATION

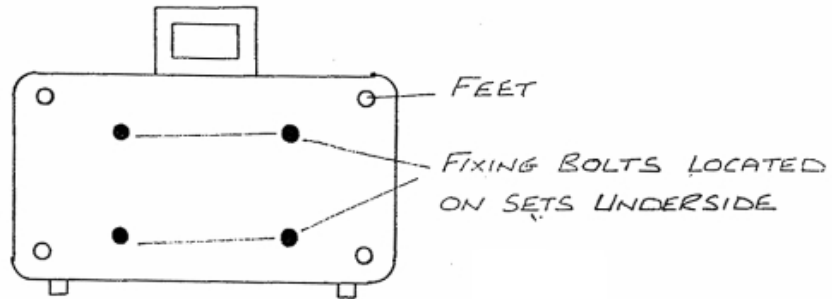
- 2.4.1 Connect a suitable connector to the 3 core cable provided.
- 2.4.2 Connect the output leads to the desired output terminals which are located on the top panel. The methods of connection are described in Section 2.3. Select the desired output by means of the output selector switch.
- 2.4.3 It is advisable to make a preliminary test on the test object, starting at zero voltage, in order to determine the load impedance, before performing the test with the regulator set at higher values. Therefore ensure the regulator knob is fully anticlockwise before switching on.
- 2.4.4 Connect the supply lead to the mains and move the supply switch to the 'ON' position. The supply 'ON' lamp should now be illuminated.
- 2.4.5 Ensure the timer mode switch is in the 'OFF' position.
- 2.4.6 Depress the 'ON' pushbutton
- 2.4.7 Increase the current by rotating the regulator knob in a clockwise direction until the desired current is indicated on the ammeter. For the correct ammeter scale factor refer to the table on the front panel of the equipment. Depress the output 'OFF' pushbutton.
- 2.4.8 Connect the test object contacts to the relay contact terminals on the set and reset electromechanical timer.
- 2.4.9 Depress the 'ON' pushbutton and the following occurs:-
1. Timer will start, current will flow through the test object
 2. Once the test object's contacts have changed state the timer will stop and the test current will be automatically switched off.
 3. 2-3 seconds must now elapse before the timer function is active and ready for a repeat test.
- 2.4.10 On completion of the test return regulator to zero and switch off the supply. Before disconnecting the test object ensure the mains supply switch is in the 'OFF' position.
- 2.4.11 It is usual to repeat the above test method several times checking that the times are consistent. However, it is advisable to allow the relay to cool between tests, particularly if large overcurrents are being passed through the relay.
- 2.4.13 When testing thermal devices or circuit breakers with no auxilliary contacts the test method is the same except that the timer control switch is in the 'I' position.

3. MAINTENANCE

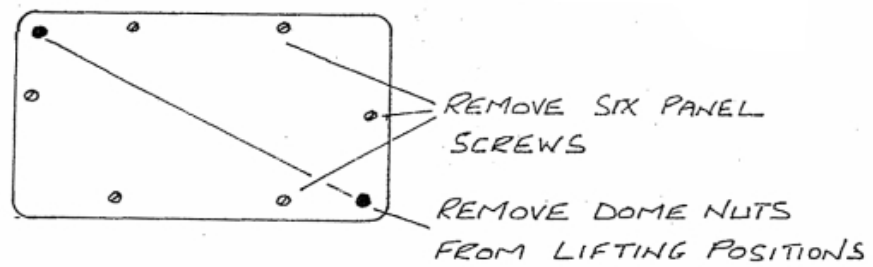
- 3.1 The switches and contactors should be occasionally examined for signs of wear and contact erosion.
Badly eroded contacts should be replaced immediately.
- 3.2 The voltage regulator should be regularly examined, particularly in respect of the brushes in order that the latter may be replaced before excessive wear has taken place.
- 3.3 The intervals between inspection and renewal of the brushes will depend upon the amount of usage. However, it should be remembered that extensive damage to the troidac can result if the brushes are allowed to wear away to such an extent that a loss of brush pressure occurs thus causing arcing.
- 3.4 The occasional wiping of the regulator track with an alcohol moistened rag is recommended. If however the track is badly corroded it should be cleaned with very fine sand paper ensuring a flat surface is restored. Remove particles with a fine brush and finally cleanse with an alcohol moistened brush.
- 3.5 To remove the instrument from its' case the following procedure should be adopted:-
 - a) Remove the four fixing bolts from the underside of the set
 - b) Place set in normal operating position, ie with control panel horizontal
 - c) Remove all six panel fixing screws
 - d) Remove dome nuts from the lifting positions
 - e) Screw on to the exposed threads of the lifting positions the tommy bars provided
 - f) Set can now be lifted from its' case, taking care not to fail the supporting brackets

REMOVING SET FROM CASE

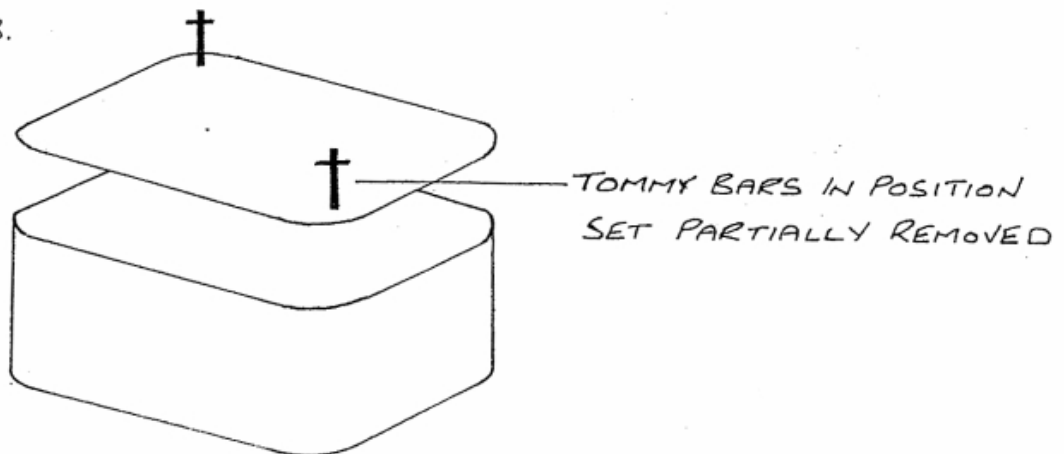
STAGE.1



STAGE.2



STAGE 3.



4. ACCESSORIES AND SPARES SUPPLIED WITH EQUIPMENT

- 4.1 One type of each fuse
- a) 5 amp anti-surge (240V supply)
 - b) 3 amp anti-surge
 - c) 0.315 amp anti-surge
 - d) 1.25 amp anti-surge
 - e) 0.315 amp anti-surge
 - f) 10 amp HRC (115V supply)
 - g) 0.5 amp quick blow
- 4.2 Lifting tommy bars (2)
- 4.3 Comprehensive lead set

5. OVERALL PERFORMANCE SPECIFICATION

- 5.1 Insulation Resistance at 1000V DC
- The Insulation Resistance will not be less than 10 Megohms between
Mains Input to Frame and all isolated outputs and all combinations
of isolated output to isolated output
Isolated output to frame
- 5.2 Applied Voltage Test
- Mains input to frame and all isolated outputs 2 kV RMS for 1 minute
All combinations of isolated output to isolated output
Isolated output to frame
1.5 kV RMS for 1 minute
- 5.3 Accuracy of Instruments
- The Voltmeter and the Ammeter plus appropriate current transformer
Plus/Minus 2% of full scale deflection
- 5.4 Polarity
- Zero phase shift
Mains input - voltage output
Mains input - current output (Common = Neutral)

6. TEST RESULTS

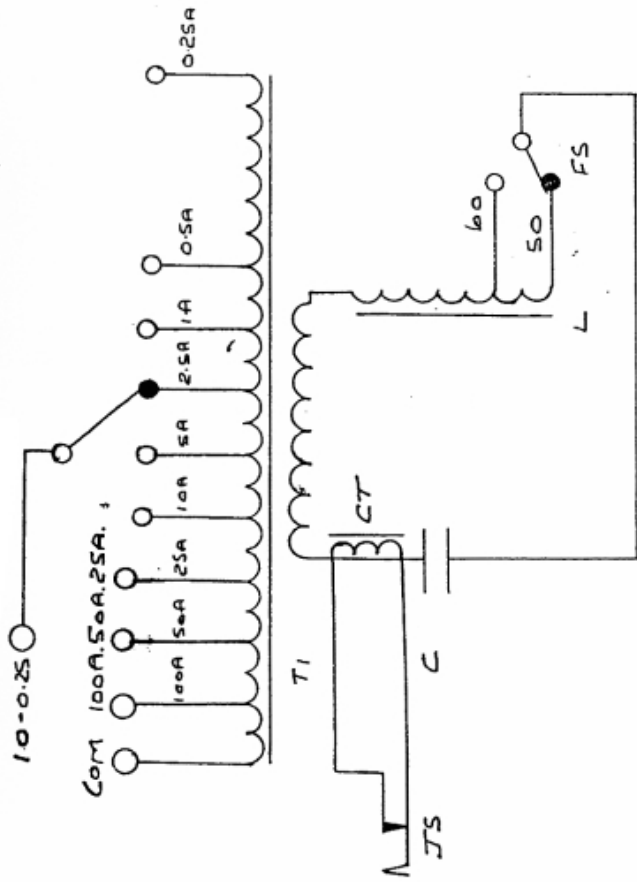
6.1 Equipment Serial Number

6.2 Ammeter Circuits

Range	Equipment's Ammeter	Standard
50A 10V	50A	
25A 20V	25A	
10A 50V	10A	
5A 50V	5A	
5A 50V	4A	
5A 50V	3A	
5A 50V	2A	
5A 50V	1A	
2.5A 50V	2.5A	
1A 150V	1.0A	
Aux CT Range	Equipment's Ammeter	Standard
1A	1A	
1A	0.8A	
1A	0.6A	
1A	0.4A	
1A	0.2A	
0.5A	0.5A	
0.25A	0.25A	
0.1A	0.1A	

6.3 Voltmeter Circuits

VAC Range	Standard	VDC Range	Standard
50V		50V	
100V		100V	
150V		150V	
200V		200V	
250V		250V	

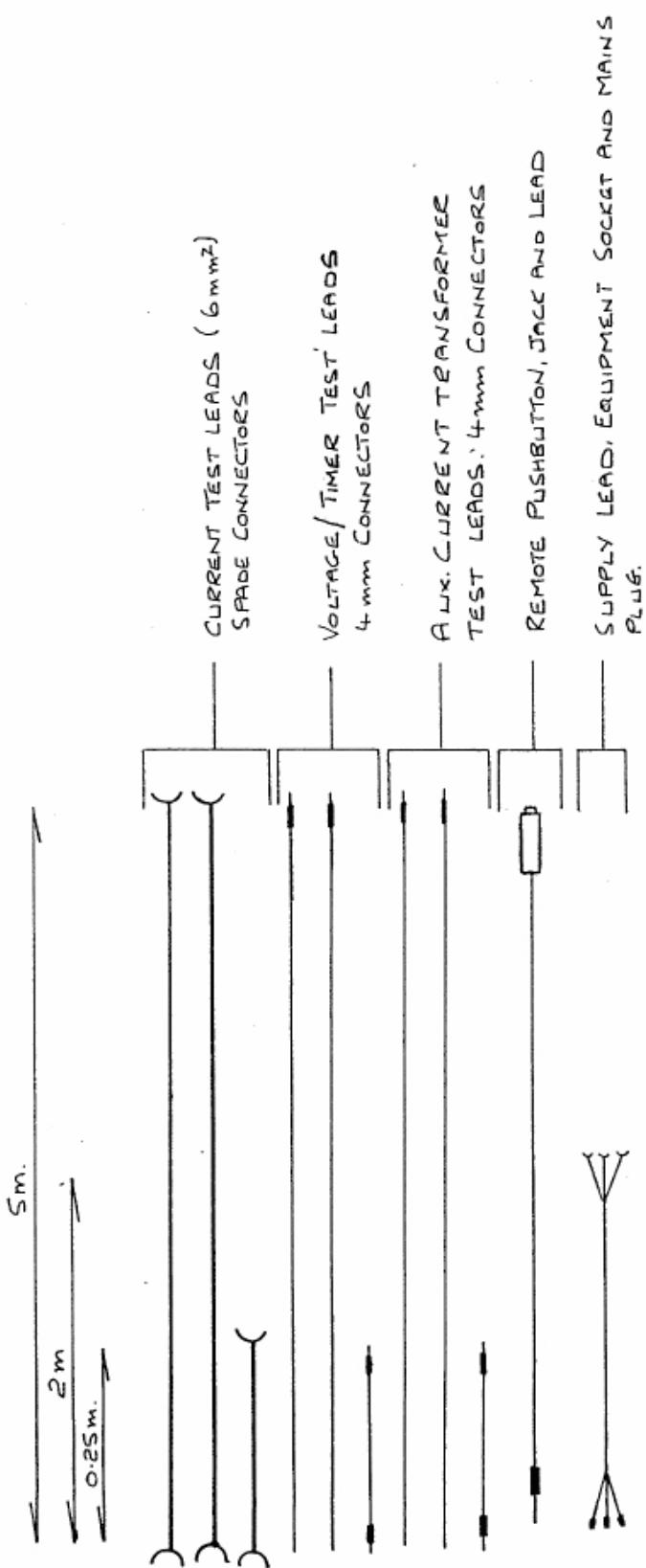


GCR	DESCRIPTION
T1	TRANSFORMER
C	CAPACITOR
L	REACTOR
F.S.	FREQUENCY SELECTOR SWITCH
SW.	OUTPUT RANGE SELECTOR
CT	CURRENT TRANSFORMER
JS	JACK SOCKET

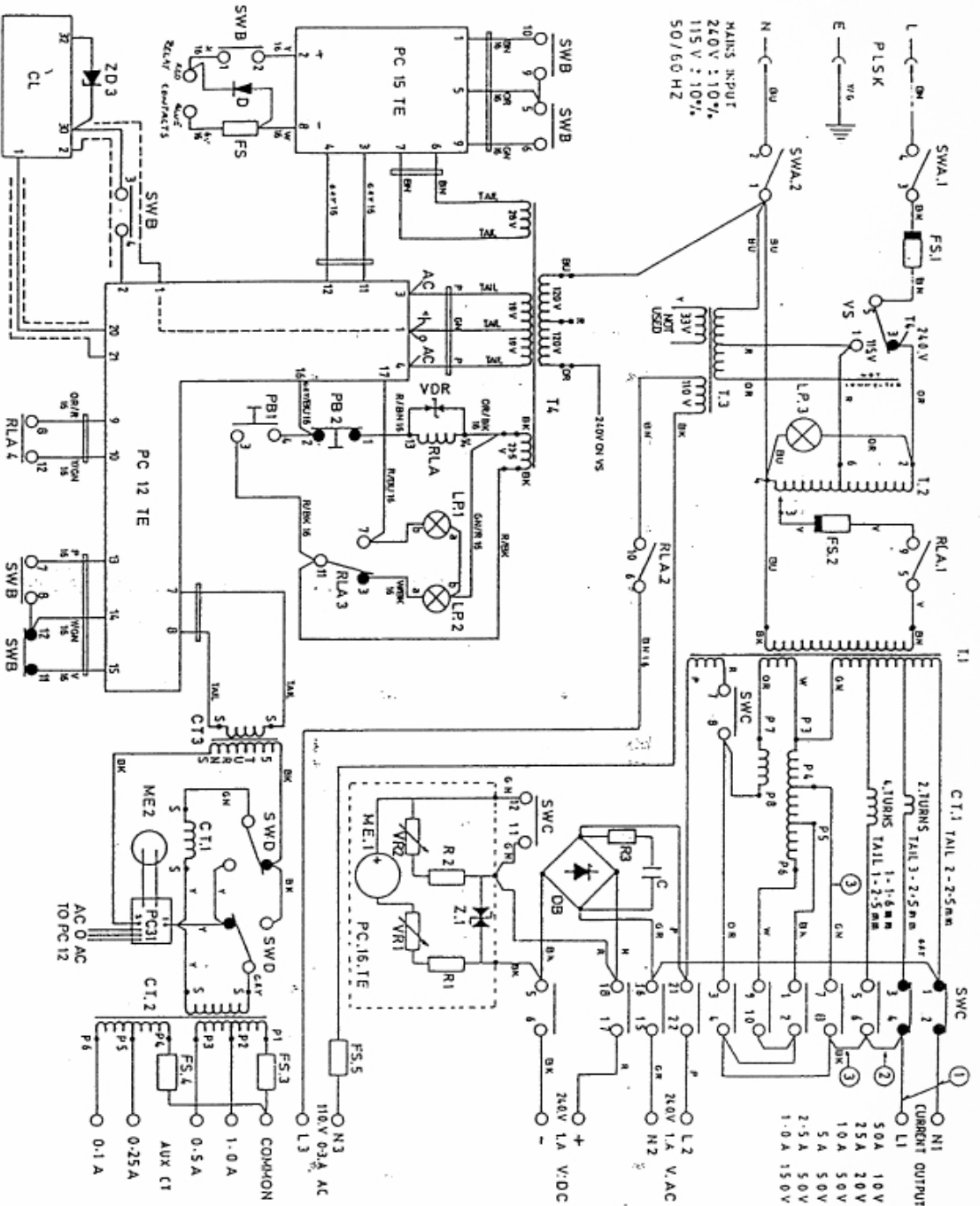
ELECTRICAL SCHEMATIC
 TYPE: 100 A.F.S. FILTER UNIT.

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T&R Test Equipment Limited
 Guildford, Surrey, England



TYPE: SO AL LEAD SET



C/R	DESCRIPTION
C	0.047µF 250V ac CLASS Y
C11	OUTPUT METERING, 2.5VA CLASS 3
C12	AUX METERING, 0.7VA CLASS 3
C13	SIGNAL 30A (1700V) 100% DOUBLE COIL 0.1µVA
CT1	50A 10V
CT2	25A 20V
CT3	10A 50V
D1	5A 50V
DB	DIODE BRIDGE 800V 6.6A
FS1	FUSE BRKT SURGE 5A 1 1/2" (0.4 FAR 115V)
FS2	3A
FS3	1.75A 20mm 15mm
FS4 0.15A
FS5 0.15A
D	1000V 5AMP DIODE TYPE 1N4008
LP1	24V 50mA 75-5 WEDGE
LP2	24V 50mA 75-5 WEDGE
LP3	24V 50mA 75-5 WEDGE
ME1	MC AMMETER 50 1MA SCALE 0-1-0-5 15%
ME2	MC VOLTMETR 50 10V/0.5V SCALE 0-100 15%
PB1	ON . PUSH BOTTOM, RED LENS, HOUSING FOR L.P.1
PB2	OFF . PUSH BOTTOM (GREEN LENS) L.P.2
PC12,1E	755UC 2
PC15,1E	755UC 3
PC15,1E	1552 VOLTMETR RANGE ADJUSTMENT CARD
PLSK	IEC 6A CHASSIS PLUG 3 PIN
R1	82KΩ 1/2W METAL OXIDE
R2	18KΩ 1/2W METAL OXIDE
RLA	24V/6A BRIDGE C/O JAW CONTACTS 12001 R/W/D
SWA	SUPPLY ON/OFF 2-POLE
SWB	TIME MODE CUSTOM MADE 011A CONTACTS
SWC	OUTPUT SELECTOR CUSTOM MADE
SWD	ARMATURE CT. SELECTOR 1601 3A RANGE
T1	OUTPUT ISOLATION TRANSFORMER
T2	REGULATOR TAPPED 0-10V 5amp 500T
T3	500VA 115V/24V 200VA/0.7A 31V/0.1A
VR1	50KΩ 1/2W 10TURN
VR2	10KΩ 1/2W 10TURN
VR3	10KΩ 1/2W 10TURN
Z1	VOLTAGE DEPENDENT RESISTOR 600V/4K
FS8	FUSE 100mA 250V 10mm
R3	100Ω 1/2W
T4	ELECTRONICS SUPPLY
ZO3	ZENER DIODE 21V 5W 1W555 B 2W3703C21 1W5W
VDR	SIEMENS 510V-507K330

Test Equipment Limited
 Guildford Surrey, England

AS WIRED SCHEMATIC TYPE 50AIE
 1MS TIMER

DATE: 20-5-86
 DRAWN: D. Buxton
 A2/000284

T&R Test Equipment

TEST CERTIFICATE

No: TEC.

CUSTOMER:

CUSTOMER'S ORDER NO:

OUR REF. NO:

TYPE OF EQUIPMENT

50A/E Current Injection Test Set

S/N:

TESTS

Insulation resistance at 1000 V D.C.

The insulation resistance is not less than 10 MΩ between the following:

1. Mains input to frame and all isolated outputs.
2. All combinations of isolated output to isolated output.
3. All isolated outputs to frame.

Applied Voltage Test:

1. 2/2.5 kV R.M.S. applied for 1 minute between mains input to frame and all isolated outputs.
2. 1.5 kV R.M.S. applied for 1 minute between isolated outputs to frame.
3. 1.5 kV R.M.S. applied for 1 minute between all combinations of isolated output to isolated output.

Accuracy of Instruments:

The accuracy of all instruments and their associated circuit components is better than:

1. A.C. moving iron voltmeter and ammeter +2.5% F.S.D.
2. A.C. moving iron cirscale voltmeter and ammeter +2% F.S.D.
3. D.C. moving coil voltmeter and ammeter +2% F.S.D.
4. Instrument calibration is traceable back to National Standards.

TESTED BY:

PASSED BY:

DATE: