RINGING GENERATOR
TYPE 4526/00 and /01
(Part No. 844526/00 and /01)

INSTRUCTION AND MAINTENANCE MANUAL

Supplied for use with

Equipment Serial No(s) .....

Made on Order No. 19/3088

Customer's Order No. 3170

EAG

PYE T.V.T. LTD.,
CAMBRIDGE
ENGLAND

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SECTION 1 - INTRODUCTION

The Ringing Generator provides an output signal of nominally 25 c/s intended as a source of ringing power in a telephone installation to which a limited number of subscribers are connected.

The Ringing Generator is compact, and provides a supply of ringing signals at a maximum output of 5 watts. This power is adequate to supply several circuits simultaneously.

The Ringing Generator has a self-contained power supply of nominally 16V. Arrangements are made so that the Generator may be powered from an external supply in the event of a mains failure.

There are two versions of this unit, each being identical except that on one version the a.c. switch is 'up' for 'on', but on the alternative version the a.c. switch is 'down' for 'on'.

SECTION 2 - SPECIFICATION

A.C. Supply	85 - 135 and 170 - 250 V. 40 - 70 c/s	
Output Voltage	60 - 95 volts a.c.	
Output Frequency	25 ±4 c/s	
Approximate Dimensions		
Height	$5\frac{3}{4}$ inches	($14\frac{1}{2}$ cm)
Width	$2\frac{1}{4}$ "	(7 cm)
*Depth	$9\frac{1}{4}$ "	($23\frac{1}{2}$ cm)
Approximate Weight	5 lb 14 oz	($2\frac{1}{2}$ kg)

*Including plug and handle

SECTION 3 - INSTALLATION AND OPERATING

3.1 Unpacking

Unpack the unit and check for any damage sustained in transit. Ensure that the Receptacle Plate Assembly, complete with fixings and the Mating Connector, is included.

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3.2 Preparation

If the unit is to be used as an addition to an existing installation, then fix the Receptacle Plate (plus any additional screen(s) which may be necessary), and wire the connector in accordance with instructions contained in 'Unit Mounting and Wiring Techniques' section at the rear of this book.

If the unit is to be operated using the internal power unit, then pins 5 and 13 of PL1 should be connected together.

3.3 Insertion

When ready to insert the unit observe the following:-

(a) Always check the B+ polarity to ensure that this agrees with circuit requirements.

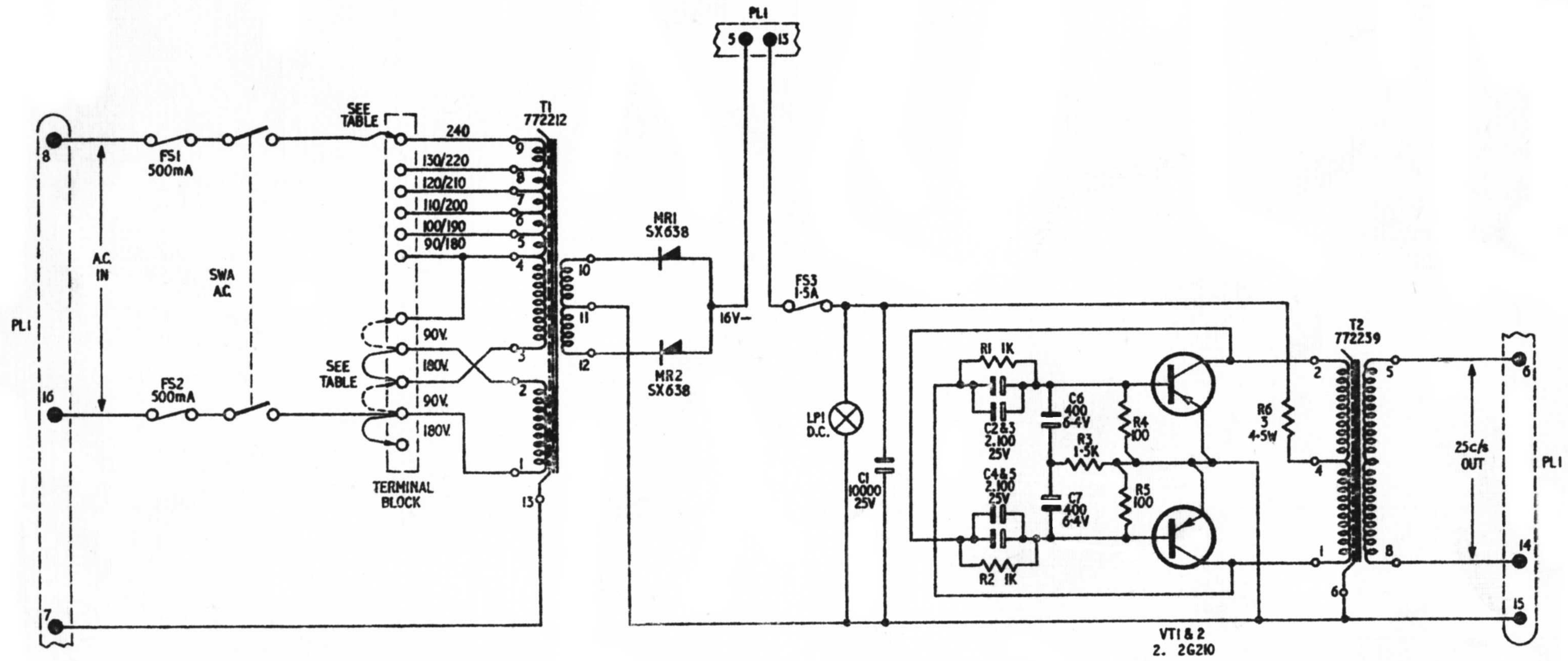
(b) Check that the fuses are all well home in their clips.

(c) ALWAYS switch off the power supply before inserting the unit.

(d) To insert: grasp the handle and without touching the small catch inside the handle area press the unit fully home. Apply a light pull to check that the unit is locked in position.

(e) If it is necessary to remove the unit: grasp the handle so as to press up the small catch. The unit will then pull out.

For explanation of certain points in the foregoing see section 'Maintenance Precautions on Semiconductor Units' at the rear of this book.



A.C. VOLTS IN	TO T1 TAP	
230 - 250	9	LINK AS FULL LINES
215 - 230	8	
205 - 215	7	
195 - 205	6	
185 - 195	5	
170 - 185	4	
125 - 135	8	LINK AS DASHED LINES
115 - 125	7	
105 - 115	6	
95 - 105	5	
85 - 95	4	



NOTE.

FIXED RESISTORS 5% 1/2W UNLESS OTHERWISE MARKED.

PL1. 16 CONTACT McMURDO RED RANGE OR AMPHENOL BLUE RIBBON CONNECTOR.

RINGING GENERATOR 844526/00 & /01

DR'G. No. C844526/00 & /01	ISSUE 1
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SECTION 4 - TECHNICAL DESCRIPTION

4.1 CIRCUIT DESCRIPTION

The ringing circuit consists of a d.c. to a.c. converter operating at 25 c/s. Two junction transistors are utilised in a free running multivibrator.

In-phase feedback is obtained by coupling the output (collector) of VT1 via the feedback capacitors C2 and C3 to the input (base) of VT2, and conversely the collector of VT2 is coupled to the base of VT1 through the capacitors C4 and C5. The frequency of the oscillation is determined by the tuning capacitors C6 and C7. To prevent the feedback capacitors charging when the circuit is in a non-oscillating state, discharge paths are made by R1 and R2.

Transformer coupling to the load is by T2. The output is balanced.

4.2 POWER SUPPLY

The Power Supply is an integral part of the unit.

Pins 15 and 13 on PL1 provide for the use of an external power supply in an emergency. Pins 5 and 13 on PL1 must be linked when the power supply of the Ringing Generator is in use.

Full wave rectification is arranged by MR1 and MR2; giving an output of nominally 16V. Smoothing is effected by the large reservoir capacitor C1.

4.3 RATING AND COOLING

All components, including semiconductors, are operated well within their maximum ratings. External ambient conditions have been considered and a wide ambient range is possible. Cooling on the transistors is assisted by radiation from the heat sink, and on the unit as a whole cooling is by convection of the surrounding air. In this connection, attention is drawn to comments in the section "Maintenance Precautions on Semiconductor Units".

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SECTION 5 - MAINTENANCE AND FAULT FINDING

WARNING: Before commencing any checking, fault finding, or other maintenance work, consult the appendix 'Maintenance Precautions on Semiconductor Units'.

5.1 VOLTAGE AND CURRENT ANALYSIS

The location of faults will be facilitated by making checks at the points shown in the following analysis table. The indicated figures are measured on a typical unit and measured figures may be found to vary slightly from one unit to another. Deviations from the figures given are not necessarily indicative of faults, but if the supply voltage is set to within the specified tolerance any wide divergency should be investigated.

Conditions

The voltage readings were taken with respect to the positive rail, and under 'OFF LOAD' conditions, the meter used having a sensitivity of 20000 ohms per volt.

Circuit	Location	Meter Range	Measurement
VT1	Base	10V d.c.	2·6V
VT2	"	"	3·0V
V_{B-}	across C1	25V d.c.	16·7V
I_{B-}	across pins 5 and 13	1A d.c.	295mA

5.2 TESTING

Ensure upon test that the output of this unit conforms to the following conditions:

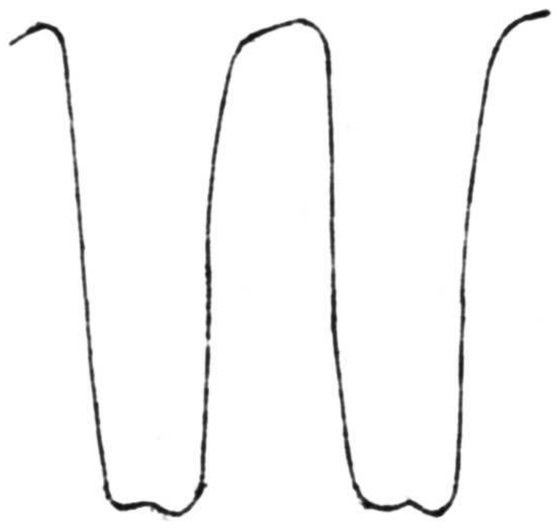
"OFF LOAD" conditions

Voltage less than 95V r.m.s.
Frequency 27 c/s ±2 c/s

"ON LOAD" conditions (into 850 ohms load)

Voltage greater than 60V r.m.s.
Frequency 23 c/s ±2 c/s

The output waveform should be of a shape as indicated in the following diagram.



5.3 RESISTANCE OF WINDINGS

All values are ±10%

Transformer T1

Pins	10 - 12	1·35	ohms
"	1 - 2	41·8	"
"	3 - 4	45·2	"
"	4 - 9	51·3	"

Transformer T2

Pins	5 - 8	41·9	ohms
"	1 - 2	5·0	"

PARTS LIST FOR
RINGING GENERATOR
4526/00 and /01

I T E M				PYE PART NUMBER	MANUFACTURER	TYPE No.
6.1 Resistors						
3	ohms	5%	4·5W	677324	Painton	301 A
100	"	"	½W	677348	Dubillier	B.T.T.
1k	"	"	"	677352	"	"
1·5k	"	"	"	677904	"	"
6.2 Capacitors						
100µF		25%	25V	PS38013	T.C.C.	CE434
400		-10+50	6·4V	PS44000	Mullard	C426AM/C400
10000		"	25V	680200	"	CE1259/8
6.3 Transformers						
T1				772212	Pye	B8909
T2				772239	"	B9058
6.4 Miscellaneous						
SX638	Diode			723061	G.E.C.	SX638
2G210	Transistor			865375	Texas Instruments	2G210
Switch D.P.D.T.				830124	N.S.F.	8373/K6
Plug 16-way				724101	Amphenol	26-159-16
Socket 16-way				724153	"	26-190-16
Lamp	28V	0·04A		709111	Atlas	995 - 9118
Fuse 1·5A				700489	Belling and Lee	L1055
"	500mA			701414	Bulgin	PAK2

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MAINTENANCE PRECAUTIONS

FOR

SEMICONDUCTOR UNITS

NOTE: Non-observance can lead to destruction of semiconductors.

SECTION 1. GENERAL ELECTRICAL PRECAUTIONS

1.1 CONTINUITY CHECKING

When using any type of meter to check continuity, it is essential to remember that some give a voltage which is sufficient to destroy certain low voltage semiconductors. This is most likely if the polarity of the test voltage is applied incorrectly. Therefore:

(a) Check the polarity of the test meter voltage.
(b) Check the voltage level and see that this is within the rating of the semiconductors.
(c) When checking wiring external to a unit, it is safer to unplug the unit (or units) whenever possible.
When it is required to check resistors, capacitors and other components it must be remembered that if these components are across the whole, or part, of a semiconductor device, the device itself may affect test meter readings. It is necessary in these cases to disconnect one end of the component being checked.
(d) When the potential at the test meter terminals exceeds the semiconductor ratings it will be advisable to disconnect one end of every component which it is necessary to check - but see also 1.2. below.

1.2 SOLDERING

When soldering is undertaken in semiconductor circuits, poor insulation on the iron can give a sufficient level of a.c. leakage to permanently damage semiconductors. It is advisable therefore to make a quick check with a meter between the bit of the iron and the circuit earth. Note: on some units this may not be the chassis. If a potential is present take one of the following steps:

(a) Repair earth on the iron, or get another.
(b) Remove unit's earth by unplugging where possible.
(c) Remove unit's earth by disconnecting temporarily, say at an equipment plug or terminal block.
(d) Fit a switch in the 'live' lead to the iron, and switch off before bit touches the components or wiring.
(e) Use a low voltage iron or one which can be earthed to the equipment (not to the main's earth).

Remember, these precautions also apply when soldering cableform wiring external to the unit.

Never solder with the B+ switched ON. This can lead to disastrous short circuits, e.g. across emitter resistor.

All semiconductors are temperature sensitive, even without the power ON. Therefore;

When soldering use a thermal shunt, e.g. long nosed cool pliers or similar shunt, between the iron and the device.

1.3 VOLTAGE ANALYSIS

When making a voltage analysis be more than normally careful to prevent undesired short circuits by test prods. These can ruin a transistor e.g. if across base and B-, or across emitter resistor. Crocodile clips are a very common cause of accidental short circuits.

1.4 DISCONNECTING SEMICONDUCTOR UNITS

Because high level transients can damage many types of semiconductor always switch off the power supplies before removing the unit or unplugging it. Even if transients are known to be of no importance it is still possible in unplugging to break say a bias line before the B+ and hence give rise to damage.

1.5 TEST POWER SUPPLIES

Where units of an equipment can be unplugged and removed from a rack or console, it is always preferable to use a jumper lead so that the unit may be plugged in to its normal power supply. Check the polarity on the jumper lead (see also 2.5). Where test power supplies must be used observe the following:

(a) Use a power unit with similar characteristics to the one in the equipment e.g. with low ripple, high stabilisation, transient suppression, etc.
(b) Set d.c. supply to nominal ±1V, or better, so that results are meaningful.
(c) Always check polarity before connecting any test supply.
(d) Heavy gauge wire is essential for low impedance B+ supplies, say 23/·0076.

1.6 TEST EQUIPMENT

It should be remembered that items of test equipment often contain capacitors which may be charged as a result of some previous test. This charge may be sufficient to damage semiconductors in the item under test. Therefore:

(a) Always connect test equipment earth wires first to the unit under test, then touch the other connecting lead to earth before connecting it into the unit to be tested.
(b) Observe this kind of precaution with capacitors, whether these are used for test purpose or as replacements, i.e. check that they are discharged.

Signal Generators, especially l.f.types, quite frequently give voltages which far exceed the semiconductor rating. Therefore:

Before connecting this class of instrument into a semiconductor circuit the output should be turned down to minimum and care taken that the output is not subsequently turned up above a safe level.

1.7 SEMICONDUCTOR POWER UNITS

Special components are usual in these units; all are low voltage items. Some are intolerant of overloads. Therefore in all maintenance and servicing operations ensure that incorrect conditions are not introduced e.g. if the mains transformer or its taps have to be changed the connections should be carefully checked to ensure that excess voltage is not applied.

1.8 HIGH VALUE CAPACITORS

High capacity condensers are common on all semiconductor units. Since semiconductor devices are intolerant of large transients, be careful not to charge or discharge high value capacitors through them, e.g. by short circuits when power has been recently applied, or by replacing a capacitor when the B+ is on.

Never discharge the many thousand µF condensers by short circuits in the unit.

1.9 EARTHING

On no account should the earthing system of multi-unit audio installations, video installations, or any others be altered. On transistorised equipment this is more than normally important due to the use of low impedance supplies and the risk of introducing hum and other forms of interference into low signal circuits. The unit circuit earth is not necessarily connected to the mains earth or chassis. Any added B+(earth) wiring should always be in very heavy cable (See 1.5 d.)

This prohibition applies equally to paths for lamp, relay and other similar circuit supplies which are kept separate from signal paths. In this case high ripple (or plain a.c.) voltage may be fed into the signal earth. The resulting earth currents can then be picked up in low level signal circuits and amplified.

1.10 TRANSISTOR TESTING

It is always advisable to use a test item designed specifically for testing semiconductors, since any other item may give misleading results, and may also damage the semiconductor device.

SECTION 2. MECHANICAL PRECAUTIONS

2.1 PAINT

The black paint covering on certain semiconductors is there to stop light from reaching the junction which is sensitive to electromagnetic radiation including regions centred on the frequency of visible light. In fitting and handling, this paint must not be damaged.

2.2 SEMICONDUCTOR LEADS

When replacing, or disconnecting for test, the lead should not be bent closer than 1·5mm with respect to the body since any bending closer than this may damage the seal.

2.3 POWER SEMICONDUCTORS

When replacing power semiconductors the mica insulating washers (if used) must not be damaged; nor may any other material be substituted since this will affect adversely the transfer of heat from the case to the heat sink.

A smear of silicone grease on the washer serves to prevent sticking and also to make a more intimate heat bond to the sink. No other type of grease should be used.

Fixings on power semiconductors should be well tightened since this again affects heat transfer.

With some devices the metal case may be connected to an internal electrode. In these cases care must be taken not to allow the case to touch the chassis, other components, or any nearby tags.

2.4 HEAT SINKS

On no account should the black matt finish be removed from heat sinks (or fins) since this can affect the power handling capacity by an amount varying up to as much as 30% depending on the type of component.

On many small semiconductors a clip is used to increase the power dissipation. Make sure, therefore, that when a device is replaced the same size of clip is used and that this makes close contact with the case.

2.5 FORCED COOLING

Where forced cooling is provided this must not be obstructed since this can affect the power handling capacity by as much as 200% or higher.

When servicing on a test bench, or on jumper leads, the equipment air supply should be simulated or damage may result.

SECTION 3 - STORAGE

3.1 R.F.RADIATION

When units or components are stored this should not be near any high-power r.f. radiation e.g. from transmitters, test installations, etc. Radiation of this type is harmful, especially in the 'S' and 'X-Band'.

3.2 RADIO-ACTIVE EFFECTS

Semiconductors are affected adversely by various radio-active radiations e.g. X-rays, gamma rays and neutrons. Keep them away from any quantity of radio-active valves e.g. T.R.cells and some gas tubes since these contain radio-active materials.

3.3 TEMPERATURE

Although temperature ranges for semiconductors are continually increasing it is still good practice to keep all stocks away from hot radiators etc. and equally, not to permit stocks to accidentally reach very low temperature conditions.

3.4 MAGNETS

Semiconductors should not be stored close to very strong magnets. There is no permanent effect on the semi-conductor material, but part of the device, i.e. the case, may become permanently magnetised and the field from this will then change the performance of the semi-conductor.

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UNIT MOUNTING AND WIRING TECHNIQUES

1. GENERAL

Plug-in units are housed in special frames which can accept different sizes of units (in mixed sizes) and can also provide individual unit screening facilities.

2. FIXING THE FRAME

Some frames are supplied permanently fixed into consoles, others are loose items for bolting into racks. When fixing the frame into any rack observe the following:

(a) Use the fibre washers (supplied with the fixing screws) so as to protect the paint on the front member of the frame.

(b) Do not obstruct the ventilation holes in the top and bottom plates of the frame.

(c) Units generating large amounts of heat should not be positioned immediately beneath the frame.

3. FIXING THE SCREENS

The types of screening plates available can fit into the frame so as to divide it vertically and horizontally as required, i.e. to give a mixture of compartment sizes. Fit these as follows:

(a) Insert vertical screens first by dropping the lugs into the slots provided in the frame and then by slightly bowing the screen allow the other lugs to spring into the opposite slots.

(b) Insert the horizontal screens in the same manner but with the lugs entering the slots in the vertical screens.

4. RECEPTACLE PLATE ASSEMBLY

When units are supplied to fit into the frame a back plate (appropriate to the size of the compartment) is supplied loose. This is complete with fixings and with the unit mating connector already in position. When fitting the plate observe the following:

(a) Ensure that the plate is mounted so as to give the correct pin alignment of the mating connector.

(b) Do not tighten the mating connector fixings; "floating" is deliberate to ensure easy alignment of the unit connector and the mating component.

5. WIRING CONNECTORS

WARNING If the particular unit being installed contains semi-conductors it should not be plugged in during the soldering operation. Similarly other units already in the equipment should be

unplugged if these contain semiconductors, but see the section entitled "Maintenance Precautions on Semiconductor Units".

When soldering new leads ensure attention to the following:

(a) Use stranded wire for all connections. Stiff wire will cancel the floating action of the connector and will be liable to fracture.

(b) Do not tightly stretch the leads, but leave just sufficient slack to reconnect if the lead should be accidentally broken away.

(c) Do not permit solder to run back along the conductor strands; this spoils the insulant and creates a danger of breakage at some later date.

(d) Programme leads (input and output) should be insulated, screened twin. Expose no more than approximately $\frac{1}{2}$ inch of lead from the screening braid in order to avoid unwanted pick-up. The screening on the output leads should not be finished in a pigtail; trim and cover with a sleeve. The screening on the output signal leads should be earthed at the remote end of the audio cable, NOT to a mains earth.

(e) The screening pigtail of the input leads must go to the signal earth (normally B+ or the B+ busbar). Keep it short and sleeve it to prevent short circuits.

(f) Leads from B+ and B- should not be of smaller gauge than 14/.0076, preferably with thick wall insulation. The heavy gauge is needed in this application because of the low impedance of the power supply. This impedance must not be increased otherwise the stability of the power supply may suffer. For leads longer than 1 yard (1 m) the use of 23/.0076 is strongly advised.

6. DUMMY UNITS AND PANELS

If a frame is being installed then it should be remembered that different sizes of dummy units and back panels are available to fill vacant compartments in the frame. Where forced cooling is present in a rack (or console) these dummy units with their back panels serve not only to ensure a good presentation but also to ensure that the path of the cooling air stream is not diverted in a wasteful manner. On semi-conductor equipments this is of more than normal importance.

7. PARTS LIST

Rack Mounting Frame (19" rack)	749087
Vertical Screen	435629
Horizontal Screen	435630

TREATMENT FOR ELECTRIC SHOCK

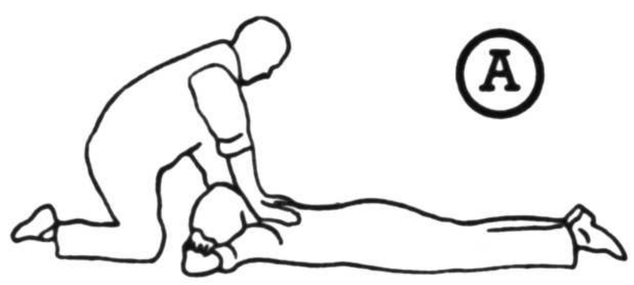
Human beings are rarely killed outright by electric shock and can, in most cases, be saved by immediate commencement of artificial respiration. Electric shock affects the nerves controlling the breathing and the action of the heart and unless prompt aid is given the victim may become unconscious and die. ALWAYS SEND FOR BUT NEVER WAIT FOR A DOCTOR.

Before touching the injured person, make sure that he is not in contact with a live conductor. If he is, break the circuit by opening the power switch - DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS. If it is not possible to switch off the current, use a piece of dry insulating material, such as wood, bakelite or rubber, to knock or push aside the conductor. Alternatively, pull the victim free using a leather belt or braces, protecting yourself still further by standing on a folded newspaper or a dry mackintosh.

HOLGER NIELSON METHOD OF ARTIFICIAL RESPIRATION

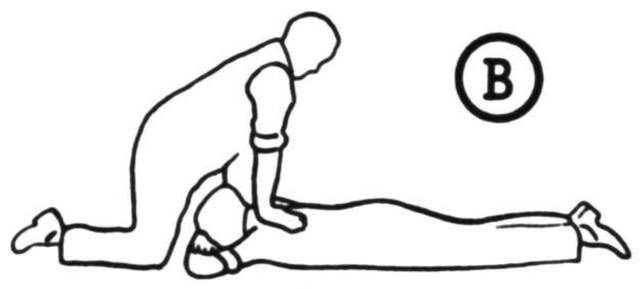
(1) Immediately the patient is released from electrical contact loosen his collar and any tight clothing as quickly as possible.

(2) Remove false teeth and sweets etc. from the patient's mouth and make sure that the tongue is free by giving two or three firm slaps with the flat of the hand between the shoulder blades.



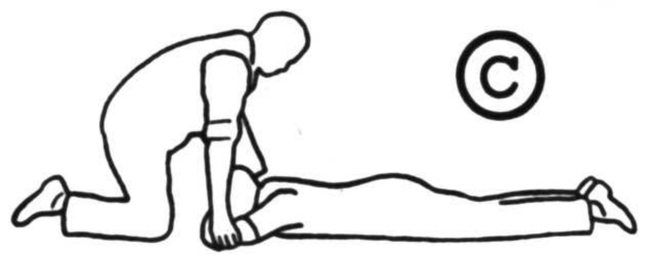
(3) Lay the patient face downwards with the forehead resting on the fore arms so that the mouth and nose are kept clear of the ground (A).

(4) Kneel on one knee a little in front of and to the side of the patient's head so that the left foot is at the side of the patient's elbow. (A). The arms should slope forward so that the hands lie close together on the patient's shoulders with the wrists over the top of the shoulder blades. This is the starting position.



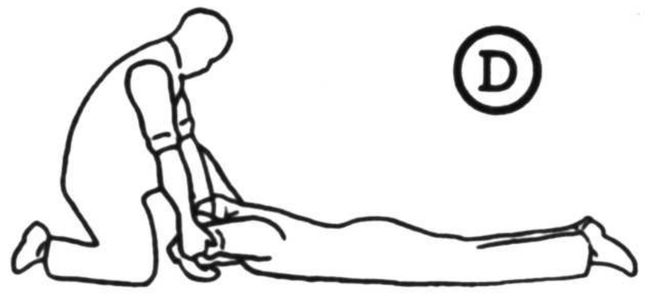
(i) Rock forward on outstretched arms until the arms are vertical above the patient's body (B). The pressure should be light and without force; the movement should take approximately 2 seconds.

(ii) Release the pressure by allowing the hands to slide quickly down the patient's arms to the elbows taking approximately $\frac{1}{2}$ a second (C). Then raise his arms and shoulders slightly, at the same time moving your body backwards (D), taking approximately 2 seconds.



(iii) Lower the patient's arms until they touch the ground (E), and return your hands to the original position on his shoulders and resume the position as before. Take approximately $\frac{1}{2}$ a second for this movement.

(5) Repeat the movements described in (i), (ii) and (iii) so that the complete cycle takes approximately six seconds. That is, about nine complete respirations per minute.



(6) Whilst artificial respiration is continued have someone else:-

(a) Loosen patient's clothing and keep him warm.

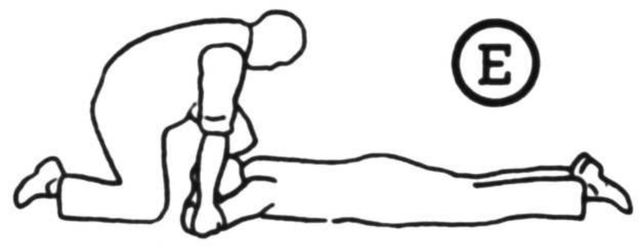
(b) Send for a doctor.

(c) Watch so that they can take over if prolonged treatment is necessary.

(7) Keep going for at least four hours even if there is no sign of recovery.

(8) Do not move the patient until he is breathing normally without assistance. There should be no hurry to move him after he has recovered.

(9) Do not give the patient oxygen or other stimulants unless ordered to by a doctor. When fully recovered the patient may be allowed to drink cold water with, if available, one teaspoonful of Sal Volatile to a glass. He may also be permitted to sniff smelling salts.



TREATMENT FOR BURNS

If as a result of electric shock the patient is suffering from burns, the following treatment should be given without hindrance to artificial respiration:-

(1) Remove the clothing near the affected part to enable the burn/s to be treated, taking care not to break any blisters that may have formed.

(2) Saturate the burn/s using a warm solution made up of one desertspoonful of bi-carbonate of soda and a pint of warm water. If bi-carbonate of soda is not available, use a teaspoonful of salt.

(3) Cover the burns with lint soaked in the above solution and apply a bandage taking care not to burst any blisters that may have formed.

(4) If a solution as above is not available cover the burns with a sterile dressing to exclude the air.