

TECHNICAL HANDBOOK  
FOR  
C.S.I. STARTERS  
FOR  
PATT. 265 AND 765 LANTERNS



**RANK STRAND ELECTRIC**

PO Box 70 Great West Road Brentford Middlesex TW8 9HR  
Telephone 01-568 9222 Telex 27976 Cables Rankaudio Brentford

A DIVISION OF RANK AUDIO VISUAL LIMITED



TECHNICAL HANDBOOK

CSI/T

Page 1 of 7

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## CONTENTS

	<u>Page</u>
1. Type Numbers	2
2. Scope	2
3. Circuit Operation	2
4. Fault Finding	4
5. Parts List	5

### Circuit Diagrams

### Supplement

List of Offices and Associate Companies

1. TYPE NUMBERSCurrent

For Patt. 765: 23 708 00; 1000W 220/240V 50Hz.

23 708 27; 1000W 110/120V 60Hz.

Obsolete/Obsolescent

For Patt. 765: External choke box (1000W 220/240V 50Hz only).

For Patt. 265: Ref. 690 400W 220/240V 50Hz.

Ref. 703 400W 110/120V 60Hz.

2. SCOPE

This handbook relates to the first and second generation starters for Patt. 765 lanterns, and to the second generation starters for Patt. 265. The first generation starters for Patt. 265, whilst (unfortunately) bearing the same reference number as the second generation, contain components of markedly different design to those described here. This handbook endeavours to cover all types of starters specified above which have been produced in quantity; however, some minor variations may be encountered. No attempt is made to describe packaging and hence location of components, as this has varied widely whilst retaining the same basic design and components.

3. CIRCUIT OPERATION

The circuit can be readily divided into two parts: a power supply to feed the lamp when struck; and a starting circuit to provide a high voltage pulse to strike the lamp. The starting circuit is virtually common to all starters, but the power supply depends on the supply voltage and the lamp power. The four types of power supply and the starting circuit are reproduced at the end of this handbook. The circuit references refer to the parts list on pages 5 - 7. The starting circuit uses a D.C. relay (RL2) supplied with A.C. so that it vibrates at twice mains frequency and provides pulses

at this frequency via R4 and C4 to the primary of the pulse transformer T3. The secondary of T3 supplies pulses of the order of 10KV across the lamp to induce ionisation and strike the arc. C3 attenuates the spikes fed back to the mains from the starting circuit. N2 is a neon on the lantern which indicates earth continuity, and R2 ensures that the neon will extinguish should the earth continuity break. R3 is basically a resistor dropper feeding the coil of RL2, but its value also determines the point in the mains cycle at which RL2 opens. Maximum starting efficiency is obtained when the starting pulse coincides with the peak in the waveform applied to the lamp.

The power supply in each case contains a choke to limit the current through the lamp after striking (L1 or L2). In the case of the 110/120V 400W circuit the choke is included in a special transformer/choke unit. Capacitor C1 provides a low impedance path during starting.

In the 1000W power supplies, the hour counter HC is brought into circuit by the normally - open contact of current operated relay RL1, which operates once the lamp has struck and full current is being applied to the lamp. The normally - closed contact on the relay feeds the starting circuit, and hence this circuit is automatically powered as soon as the main switch (SW1 or CB1) is closed, and disconnected as soon as the lamp has struck. This means that the buzz from the starting relay RL2 normally lasts no longer than one or two seconds. (In some early models the normally closed contact on RL1 was omitted and replaced by a normally open START push-button). As the starting circuit operates automatically, the earth continuity neon on the lantern is fed from before the main switch via F2 so that it should illuminate as soon as the power supply is connected to the mains. The autotransformer T1 in the 110/120V circuit merely steps up the mains input to 230V and applies this to the same circuit as the 220/240V version.

In the 400W power supplies, the hour counter is powered as soon as the main switch (SW2 or CB2) is closed, and starting is initiated by the START push-button SW3. A degree of voltage magnification is required to assist

starting and this is provided in the 220/240V circuit by the two capacitors C2, and in the 110/120V circuit by increased secondary voltage from T2. T2 is, in fact, a special leaky transformer which provides 300V whilst starting and 100V when the lamp has struck. A separate winding provides a stable 240V to power the starting circuit.

#### 4. FAULT FINDING

The following paragraphs do not pretend to be comprehensive, but are intended to point the way along the right path when fault symptoms are encountered.

The usual effect, which may be due to a number of causes, is that the lamp fails to strike. Before dissecting the equipment in detail, it is probably worth checking that the fault does not lie with the mains feed or the lamp. Check that the main fuse (F1 or F3) is intact, and if necessary replace. When replacing these fuses, make sure that the new fuse is capable of handling the stated current at 250V - usually, at these currents, only an H.R.C. type fuse is capable of doing this.

The next basic point worth checking is the connections to the plug on the choke box/regulator unit. Ensure that the cable does not bind in the hole in the end bush: if it does open out the hole in the moulding, otherwise the connections will be put under strain as the bush is tightened.

Lamps will not strike if they are hot; so if the lamp has been on for a while allow at least five minutes before attempting to re-strike. Do not allow the starter relay to buzz for more than five seconds at a time: short, frequent attempts are more successful than long bursts. If a fair number of unsuccessful attempts have been made to strike the lamp, try a different lamp. It is useless to persevere for too long with the same lamp, as the quartz envelope will progressively blacken and the lamp will become less susceptible to striking with each attempt. Blackened lamps can be cleaned when any fault condition has been cleared from the starter by striking them and allowing them to burn for some time, thus allowing the halogen cycle time to take effect.

Having checked the fuse and lamp, ascertain whether or not the starting relay RL2 buzzes. If not, the fault may lie with C3 or R3 or the start switch (normally-closed RL1 contact where the automatic starting circuitry is employed) or the relay itself. If RL2 is buzzing, try replacing C4 (some earlier starters used a Radiospares capacitor which is prone to failure) but ensure that the A.C. voltage rating of the replacement is adequate.

The pulse transformer T3 may then be checked, but it is not advisable to do this by measuring the output voltage unless equipment is available to read 10KV safely. Rather, remove the transformer from the circuit and check for continuity, or substitute a new transformer.

Further checks are best carried out using a R.M.S. voltmeter and/or oscilloscope, referring to the circuit diagrams at the end of this handbook and the circuit description given earlier.

If all checks seem to indicate that the circuit is functioning, but a number of lamps still refuse to strike, the starting circuit can be "tuned" to maximum efficiency by comparing the pulse produced by RL2 with the mains input waveform using a double-beam oscilloscope, and varying the value of R3 until the start of the pulse coincides with the peak in the input waveform.

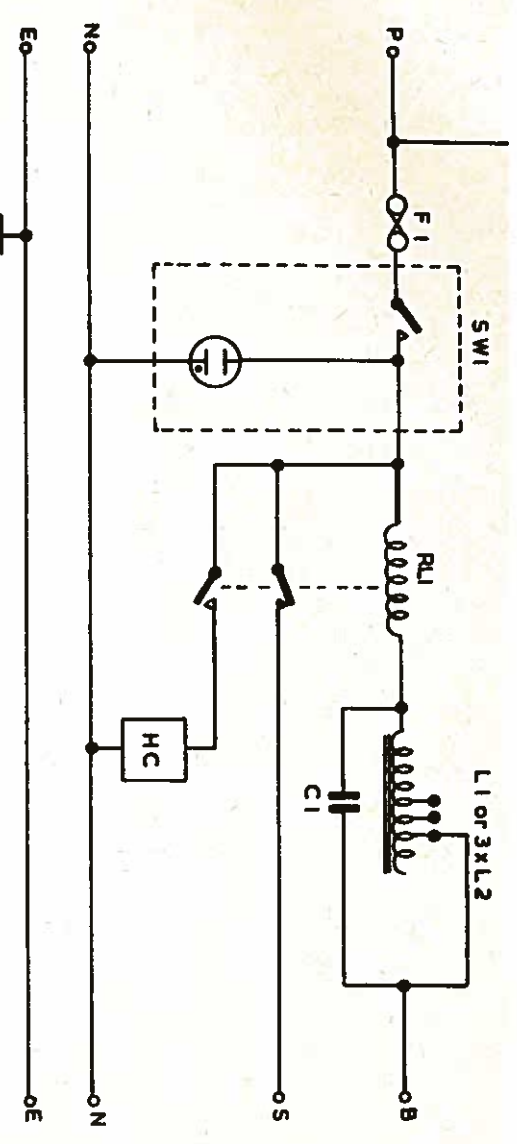
## 5. PARTS LIST

<u>Circuit Reference</u>	<u>Description</u>	<u>Supplier and Type</u>
C1	.005uF 1000VAC	Eire CD8
C2	17uF $\pm$ 5% 440 VAC	BICC
C3, C4	.22uF 600VAC	Eire T86K

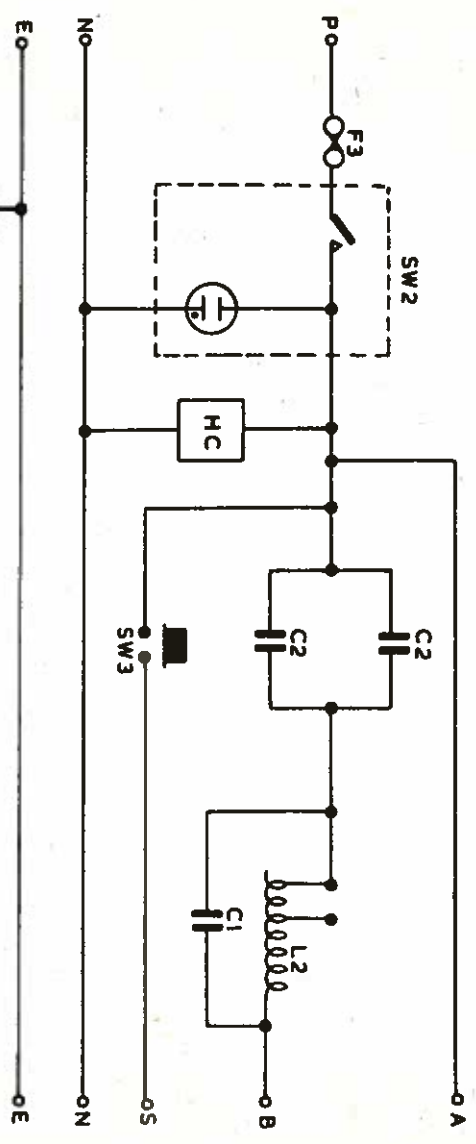
<u>Circuit Reference</u>	<u>Description</u>	<u>Supplier and Type</u>
CB1	50A single pole	Heinemann CF1-A3-U-50-120-3
CB2	20A single pole	Heinemann JA1-A3-A-20-3
F1	1½" x ¼" Fuseholder  20A cartridge	Bulgin F315  Metway RTF 2000
F2	1½" x ¼" Fuseholder  500mA cartridge	Belling Lee L510  Belling Lee L1055/500
F3	1½" x ¼" Fuseholder  10A cartridge	Bulgin F315  Belling Lee L693/10A
HC	Hour counter ) 220V 60 Hz ) Hour counter ) 240V 50Hz )	Sangamo Weston S477/4
L1	Choke	Rank Strand TRX 2010
L2	Choke	Thorn Lighting AME 5323OT
N1	Neon	Thorn Components SGF20/2S/220/Red
N2	Neon	Thorn Components SGF20/2S/220/Opal (220V) SGF20/2S/110/Opal (110V)

<u>Circuit Reference</u>	<u>Description</u>	<u>Supplier and Type</u>
R2	1M ½W Carbon	
R3	4K7 1W Carbon	
R4	4K7 10W Wirewound	
RL1	Current Relay	Jack Davis MCAC/13 AMP/ JD2183
RL2	Voltage Relay	Magnetic Devices 14084/2/325/7000
SW1	Illuminated Rocker Switch	Arrow 2900A/B2/220V Neon/Red Lens/Black Frame
SW2	Illuminated Rocker Switch	Arrow 93PNR-1001-2- 12B
SW3	Rocker Switch	Arrow 93P-1002-A-RED
T1	Autotransformer	Rank Strand TRX 2009
T2	Transformer/ Choke	Gardners GR103729
T3	Pulse Transformer	Thorn Lighting AME 47077
(Note: AME 47075 used on earlier 400W starters)		
Lamp	Compact Source Iodide	Mazda 99-0201 (400W) 99-0221 (1000W)

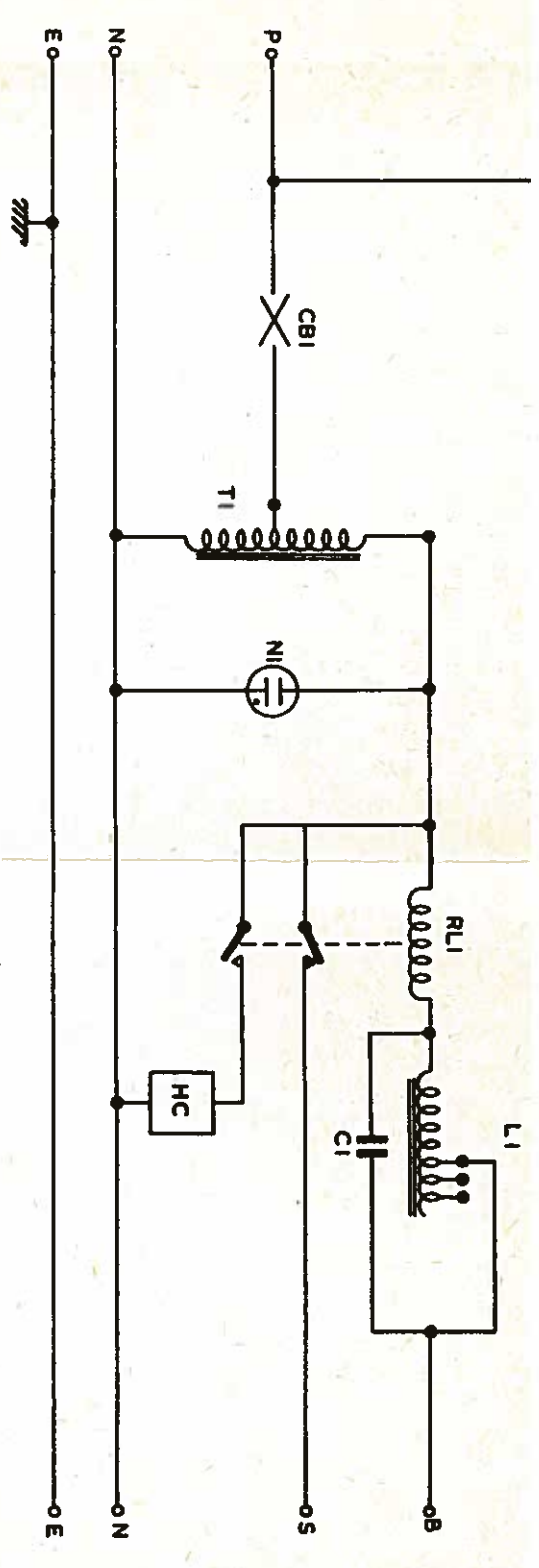




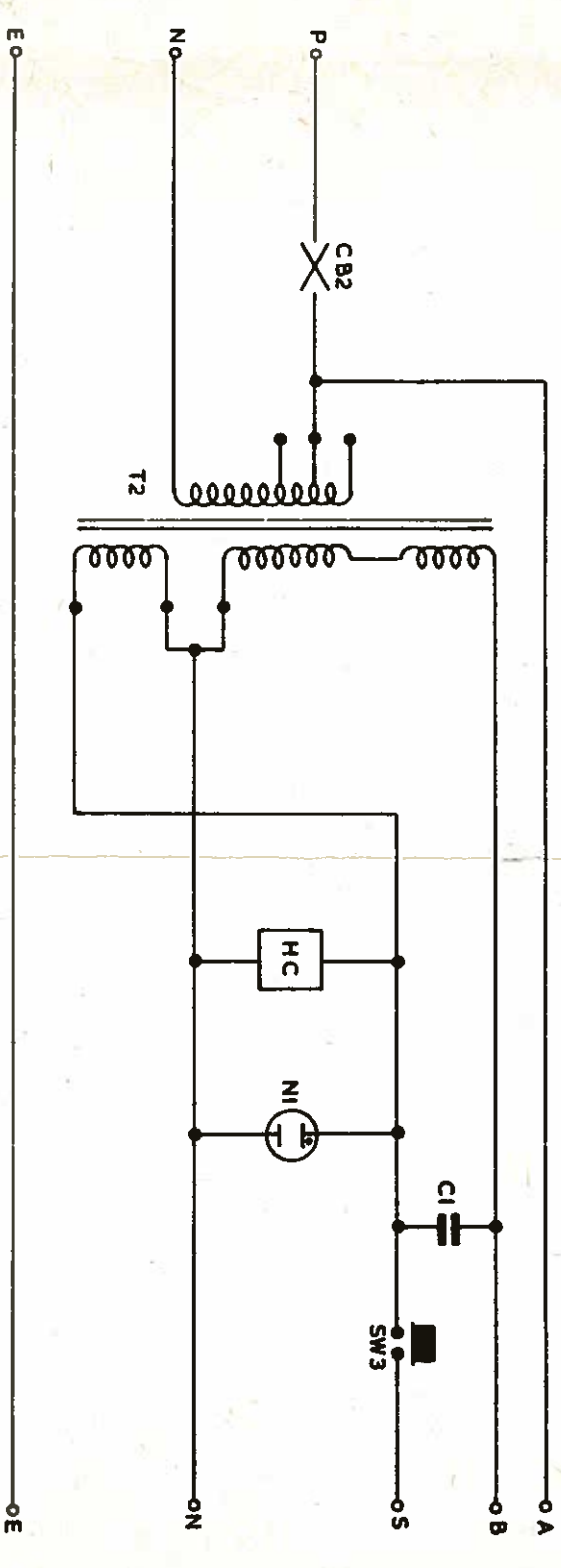
POWER SUPPLY-1000W 220/240V 50HZ



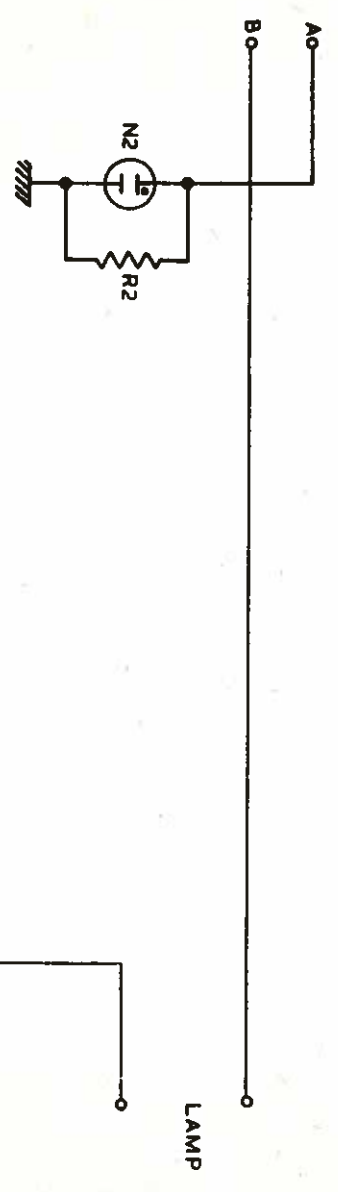
POWER SUPPLY - 400W 220/240V 50HZ



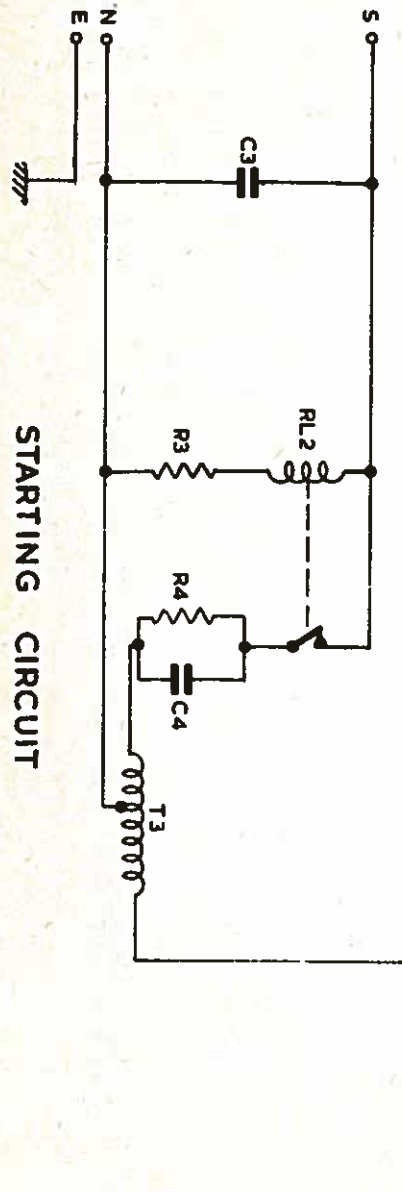
POWER SUPPLY - 1000W 110/120V 60HZ



POWER SUPPLY-400W 110/120V 60HZ



LAMP



STARTING CIRCUIT