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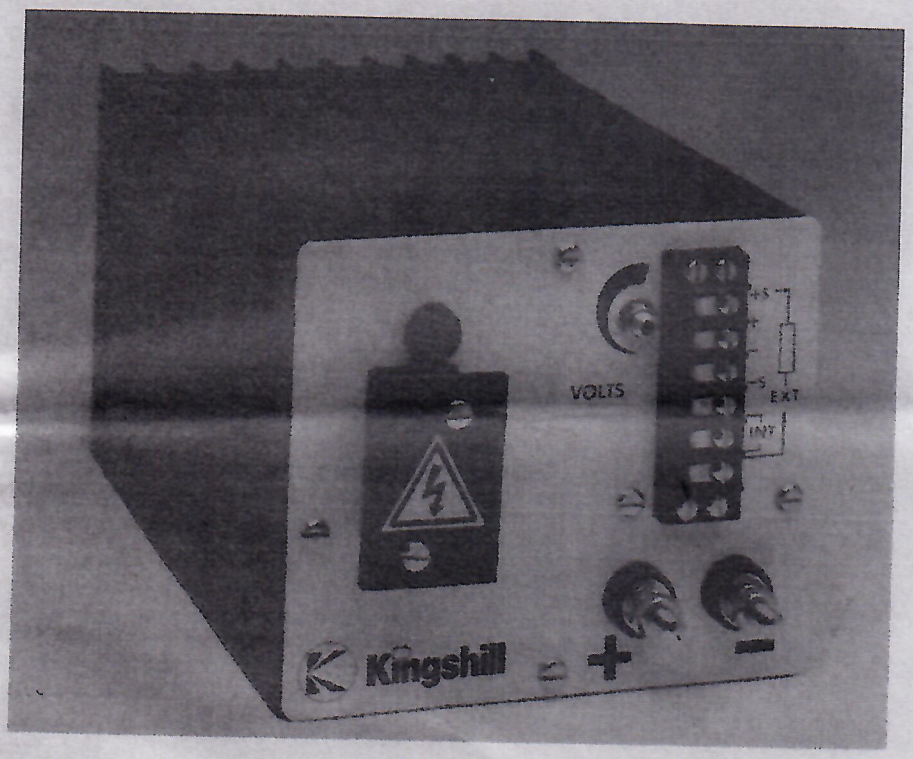
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KN SERIES
TECHNICAL DATA



Kingshill
KINGSHILL ELECTRONIC PRODUCTS LTD.
Springhead Enterprise Park Northfleet Kent DA11 8HJ England
Telephone: 0474 327833
Telex: 965577

KN SERIES TECHNICAL DATA

Introduction

Kingshill KN series of switch mode power supplies employ a direct off line switching nique to produce a compact range having a high power to volume ratio.

supplies are available with single (KN) and triple (KNT) outputs in four power levels from V to 500W with three standard combinations of output voltage and current at each power Optional output voltage and current combinations are available on request. Fine adjust- of the output voltage +/-5% is achieved with a front panel mounted potentiometer. ter voltage control down to 20% can be obtained by connecting a resistor across the resistive ramming connections on the front panel. Voltage control of the unit output can also be ved using a "Control Voltage Adaptor". CVA's are available on request.

eneral Information.

For the unit specification refer to the Kingshill Catalogue.

For installation diagram refer to the Kingshill Catalogue.

Unit items lists and control circuit diagram are available on request.

arnings.

Check rating label on unit right hand side panel and ensure stated input voltage corresponds to supply voltage before connecting to supply mains. If at variance refer to section 4.1.

Kingshill KN & KNT units should only be used within the parameters specified in the catalogue and in section 4 below. Installation, modification and servicing must be performed by skilled personnel.

perating Instructions.

Input Voltage
Check the unit rating label and confirm the rated input voltage is compatible with the selected supply mains. If not the unit input voltage setting must be changed in accordance with the following instructions.

Remove all connections to the unit front panel terminal blocks.

Remove 6/8 off M3 pan head screws from the unit front panel and heat sink (Screws across top and down sides of unit front panel and heatsink) Ensure the M3 pan head screws across the bottom of the unit (front and back) remain in situ thus retaining the unit base tray in position.

Carefully remove the unit top cover by lifting gently vertically upwards for 15-20mm and then upwards and to the right until the cover has cleared the unit. Note: the unit top cover is connected via a green earth strap to the heatsink and base tray; this link must remain intact.

Locate the 110/240v link on the input board assembly (PCB on left hand side of unit) and change as appropriate.

Replace top cover and screws by reversing procedures 4.1.2. and 4.1.3.

Replace front panel fuse, if applicable, in accordance with the fuse rating chart (Table 1.).

Input Voltage Connections.
The AC input supply is connected to the 3 way input terminal block mounted on the left hand side of the unit front panel. The terminal block is marked L (Line) N (Neutral) and ⏚ (Earth). It is advisable for safety reasons to always operate with the unit solidly earthed via connection ⏚. Always replace the black electrical hazard warning cover over the input terminals following connection or disconnection to the AC mains supply.

Output Connections.
The unit output is available at the two studs mounted on the front panel marked + and - respectively. Wiring from the output studs to the load should be of the correct cable size and kept to a minimum length.

4.4 Remote Sensing.
The remote sensing terminals are located on the 6 way terminal block mounted on the right hand side of the front panel (on the right hand side of centre for KNT versions). To operate the unit under remote sensing conditions, remove the links connecting "+S" to "+" and "-S" to "-" then connect "+S" and "-S" to the remote points at which the stabilised voltage is required.
It is good practice to run the remote sense leads as a twisted pair or, under extreme conditions, in a screened cable. It may also be necessary to employ remote de-coupling. The total voltage drop must not exceed 0.5 volts maximum.

4.5 External Programming.
The unit output voltage Vo can be externally controlled (programmed) from 20% Vo upwards by connecting an external resistor to the front panel. The programming constant is 1000 ohms/volt +/-1%.
Vo can also be controlled by a voltage of 2 to 10 volts dc for 20% to 100% Vo by use of the KN series control voltage adaptor (CVA) in place of the external programming resistor.
For external control/programming remove the link marked "INT" between position 5 and 6 on the 6 way terminal block mounted on the right hand side of the front panel (on the right hand side of centre for KNT versions). Insert the programming resistor/CVA between positions 1 and 6 (marked "+S" and "INT") on the 6 way terminal block as shown on the front panel. It is not necessary to remove the links between "+S" and "+" and "-S" and "-" unless remote sensing is required in addition to external control. (In some circumstances it may be necessary to fit a compensating capacitor in parallel with the programming resistor. For specific cases if in doubt refer to Kingshill.)

4.6 Mounting.
Eight M3 threaded tank bushes are provided for mounting purposes, four in the base and four on the left hand side of the unit. For top and right hand side mounting the unit may be mounted upside down without compromising its specification.

4.7 Ventilation.
Cooling of the unit is achieved by natural convection and should not, under normal conditions, require the use of forced air cooling. The mounting of the unit should be such as to always ensure the adequate free passage of airflow through the unit from bottom to top; this is particularly important in the immediate vicinity of the heat sinks. No restriction exists on the mounting of units adjacent to each other provided an adequate supply of natural cooling air flow is available.

4.8 Temperature Range.

Storage	-20°C to +100°C
Operation	-10°C to +70°C derating from 50°C at the rate of 2.5%/°C

4.9 Overcurrent Protection. (Currrent Limit)
The unit constant current limit type of overload protection is pre-set at the factory between 105-115% of rated full load current.

4.10 Overvoltage Protection. (Crowbar)
The unit electronic crowbar type of overvoltage protection is pre-set at the factory to operate at 110% or 1V above rated voltage which ever is the greater.

4.11 Series and Parallel Operation.
KN units will operate with their outputs connected in series up to a maximum total voltage of 250V. KN units can be operated with their outputs connected in parallel.

4.12 Remote Shutdown.
The unit's output voltage Vo can be automatically reduced to zero (shut down) remotely by short circuiting terminals 1 and 6 ("+S" and "INT") on the 6 way terminal block.

4.13 Inrush Current Limiting.
All units are fitted with inrush current protection of either the electronically switched inrush limiting resistor or the surguard device type protection. Both types of protection limit the inrush current surge to approximately 15A.

Circuit Description.

The circuit shown in figure 2, apart from minor differences, is common to all KN and KNT series units. The general operation of a KN series unit (with reference to figure 2) is described below:

General Operation.
The circuit consists of an input filter C1-8/L1/2 and a bridge rectifier MR1 followed by reservoir capacitors C13/14. For 115/120V units the rectifier is connected as a voltage doubler followed by a pair of series-connected reservoir capacitors. Units have either an inrush current limiting circuit or a surguard in series with the AC line. The resulting unstabilised DC voltage of approx. 350V is used as the power rails for a regulated DC-DC converter operating at a frequency of approx 33KHz. The converter (VT1, VT2, C11, C12, T2) is of the half bridge, pulse-width-modulated type. The converter output is rectified by the push-pull rectifier stage D6, D7 and smoothed by the low-pass filter L3/4 CB1/2. On higher power units C13/14 may consist of parallel banks of capacitors.

Input Filter.
The incoming input voltage is filtered by C1-8/L1/2 to remove incoming noise and transients on the supply line. The filter also prevents high frequency noise generated within the power unit from being transmitted back to the supply line, thus enabling international RF1 limits to be met. Fuse F1 provides protection against major component failure within the unit. R3, TR1, R1, D1, and C9 are fitted on some units to limit the inrush current from the supply; other units are fitted with a surguard in position R3; TR1, R1, D1 and C9 being omitted.

Input Rectifier. (115/120V)
The 120/240V link is set to 120V thus connecting MR1 as a full-wave doubler rectifier supplying reservoir capacitors C13 and C14 with their bleed resistors R4/5. T1 is a small 50/60Hz transformer which generates an auxilary voltage to supply the control circuits.

Input Rectifier. (220/240V)
The 120/240V link is set to 240V thus connecting MR1 as a full-wave bridge rectifier supplying reservoir capacitors C13 and C14 with their bleed resistors R4/5. T1 is a small 50/60Hz Transformer which generates an auxiliary voltage to supply the control circuits.

Inrush Current Limit.

1 Limiting Circuit. At the instant of turn on the thyristor TR1 is non-conducting thus limiting the charging current to the reservoir capacitors C13/14 by the fusible link resistor R3. After a period of less than 320 ms the control circuit auxiliary rail is established and the DC-DC convertor begins to function. The subsequent control signal generated by the start up winding on T2 is rectified and smoothed by D1 and C9 and fed via R1 to the thyristor gate (TR1). TR1 is then caused to conduct effectively short circuiting the inrush limiting resistor R3.

2 Surguard. On units fitted with a surguard device components D1, C9, R1, R3, and TR1 are omitted and a surguard device fitted in place of R3. At the instance of turn on the device presents a relatively high resistance to the charging current of the reservoir capacitors C13/14 effectively limiting the inrush current. As the unit starts up and begins to supply the load the surguard begins to heat up and subsequently reduces its resistance.

Control and Convertor Circuits.
Transistors VT1 and VT2 together with capacitors C13 and C14 form a "half-bridge convertor". The incoming DC power line of approximately 350V is split by capacitors C13 and C14 into +/-175V and transistors VT1 and VT2 alternately connect the primary of transformer T2 to the +175V and -175V lines. This creates an AC waveform of 175V peak at the primary which is transformed down to the required level at the secondary of T2.

The average level of the secondary voltage of T2 is fixed by the control board which comprises:

(a) Comparator amplifier.
(b) Control I.C.
(c) Output conditioning circuit.
(d) Current limit circuit.
(e) Rail detection circuit.
(f) Overvoltage circuit.

During normal operation the unit output voltage appearing at the +S and -S terminals is compared by the comparator amplifier with the reference voltage generated on the control board. Any error signal produced is amplified by the comparator amplifier and is fed to the control I.C. The control I.C. produces a pulse width modulated signal which is fed via the output conditioning circuit to VT1 and VT2. The mark space ratio of this signal is dependant on the amplitude of the error signal. It is the mark space ratio of the control I.C. output which determines the on/off times of VT1 and VT2 effectively controlling the unit output voltage (Vo).

Part of transformer T3 generates a current which represents the primary ac current of T2 and is fed to the current limit circuit on the control board. When the rated current output of the unit is exceeded the current generated by that part of T3 reaches a level which causes the current limit circuit to operate. It produces a signal to the control I.C. which reduces the mark space ratio of the output to VT1 and VT2. This effectively reduces the unit output voltage Vo and the current delivered to the load. In the extreme a short circuit connected across the output terminals will cause the output voltage Vo to reduce to zero.

On start up insufficient voltage is generated by T1 to operate the control circuits correctly. To inhibit operation until the correct voltage is established a rail detection circuit has been built onto the control board. This circuit prevents the control I.C. producing an output to VT1 and VT2 until sufficient rail voltage on the control board exists.

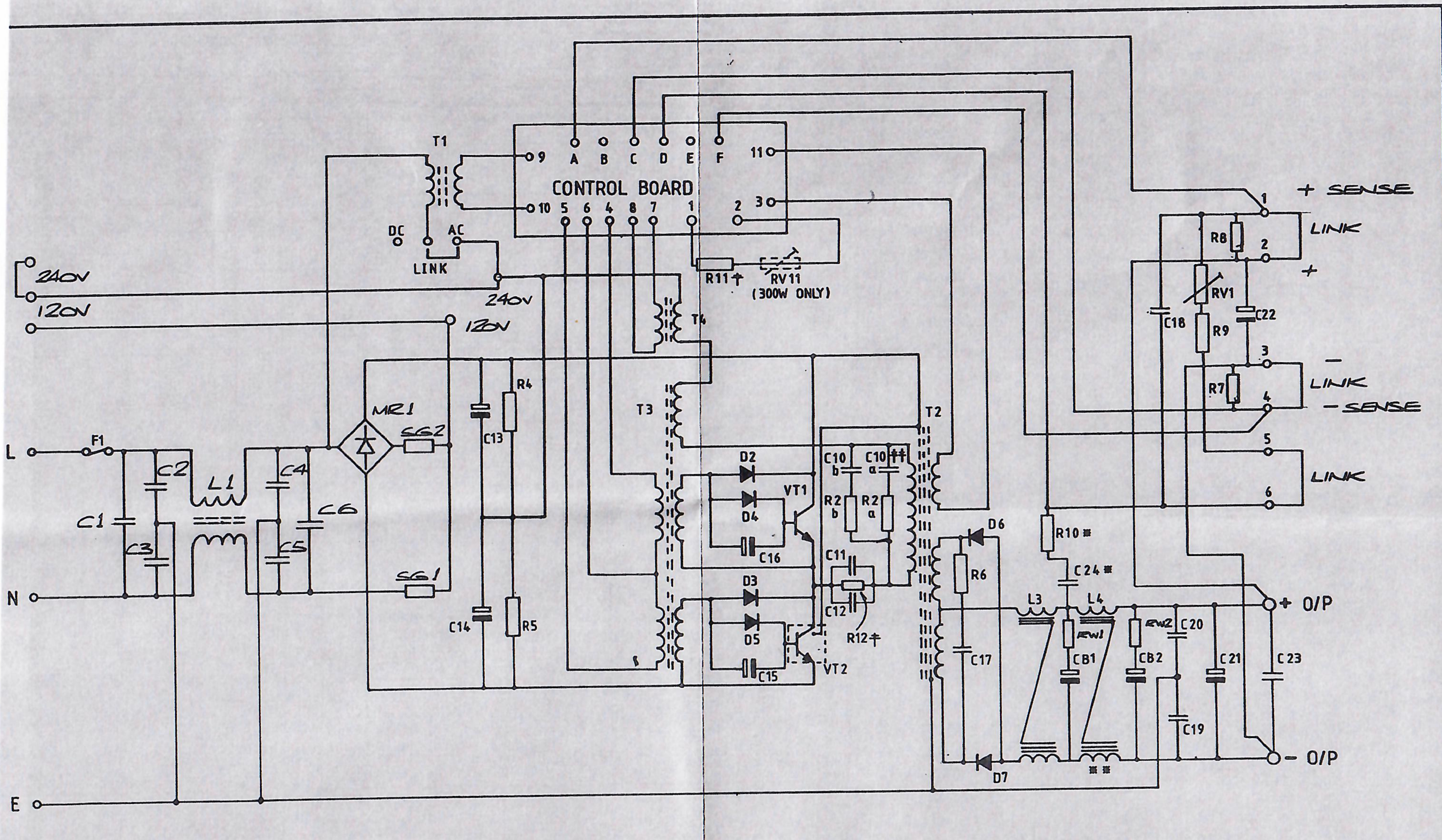
To protect against overvoltage conditions at the unit output terminals the voltage across +S and -S is also monitored by an overvoltage circuit on the control board. When a preset level is detected by the overvoltage circuit it applies a signal to the control I.C. inhibiting its operation. The output voltage Vo decays to zero and remains so until the AC supply has been switched off and subsequently reapplied.

5.7 Output Rectifier and Smoothing
The secondary output of T2 is rectified by diodes D6/7 and low pass filtered by inductors L3/4 and capacitors CB1/2 to produce the required stabilised DC output voltage. Resistor R6 and capacitors C17, C19 to 22 are snubbing components for output spike suppression.

UNIT	FUSE RATING (Amps)		FUSE TYPE
	240V	110V	
ALL UNITS	6.3A	10A	CERAMIC TYPE F 5 x 20mm

TABLE ONE

Kingshill reserve the right to amend specifications without notification.



STORS.	SG1/2 R4-5 R11 RV11 R12 R2 R6 R10 RW1-2 RV1 R7-9
CITORS.	C1-3 C4-6 C9 C13-14 C15-16 C11-12 C10 C17 CB1 C24 CB2 C18-20 C21 C22 C23
ELLANEOUS.	F1 L1 L2 TR1 MR1 T1 D1 T3 4 D2-5 VT1-2 T2 D6-7 L3 L4

S
FITTED TO 24V. UNITS ONLY.
NOT FITTED ON 15/24V. UNITS
FITTED ON 200W/300W UNITS

✝✝ 100W. UNITS C10a, R2a, C11, C12. FITTED.
200W/300W UNITS: C10a, R2a, C10b, R2b, and C12. FITTED.

KINGSHILL ELECTRONIC PRODUCTS LTD.

TITLE: KN SERIES CIRCUIT DIAGRAM

DRAWING No. KHD 023-CCT

WN	8KC	ISSUE	1	2-MF25&32	3-MF56	4-MF95	5-MF129	6-MF145	7F MF616
OVED	IB	DATE	12/6/84	8/2/85	14/5/85	24-2-86	8-8-86	18-9-86	1-10-87

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