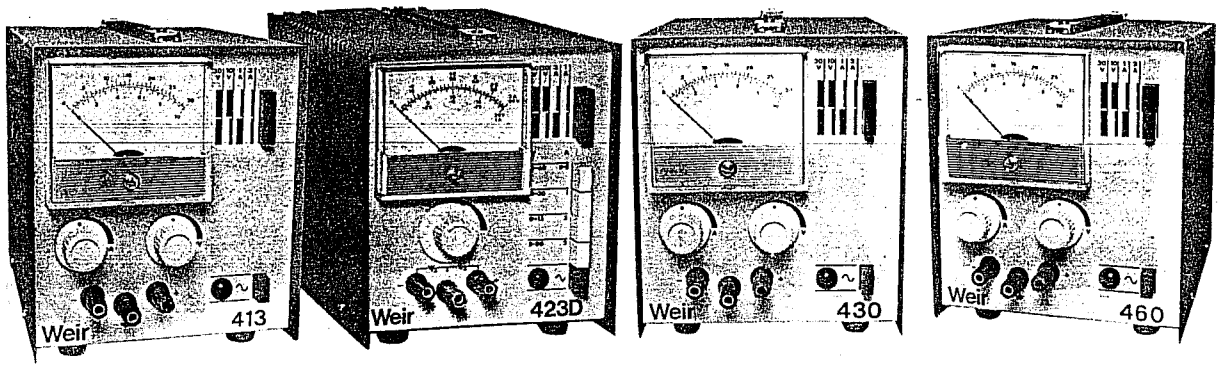
1983/4

400 Series Laboratory Supplies

400 0-30V 1A
430 0-30V 2A
460 0-60V 1A

Weir Instrumentation



- 413/413D/423D: 30 W bench supplies
- Fixed 5 V output up to 4 A for logic
- Split output rail D versions
- 400 series: 30 W/60 W supplies
- Adjustable current limits
- Current/voltage metering

Ordering Information

Description	*Order Code*	*Price*
413 Lab Power Supply	14–19–00	£120·00
413D Dual Output Supply	14–20–00	£135·00
423D Dual Output Supply	14–22–00	£135·00
400 Laboratory Power Supply	14–53–00	£95·00
430 Laboratory Power Supply	14–54–00	£125·00
460 Laboratory Power Supply	14–55–00	£110·00

MODELS 413, 413D and 423D

The 413 and 423 are 30 W supplies with switched ranges offering a wide choice of voltage and current outputs. Supplies from 7·5 V at 4 A to 60 V at 0·5 A may be set, or a preset 5 V logic rail is available.
Selectable current limits offer protection to semiconductor and other critical load circuits. When the selected limit is exceeded the power supply automatically reverts to a constant current source and the output voltage reduces.

CENTRE TAP ON 413D and 423D

Each of the 'D' versions has a centre tap fixed at half the total output voltage. As the supplies are fully floating this can be used to provide balanced positive and negative power rails. The current limit operates if the current in either half of the supply becomes excessive and both sides reduce together.

413 0–30 V at 1 A
5 V ±1% at 1, 2 or 4 A
0–7·5 V at 1, 2 or 4 A
0–15 V at 1 or 2 A
0–30 V at 1 A

413D ±15 V at 1 A
5 V ±1% at 1, 2 or 4 A
±0–3·75 V at 1, 2 or 4 A
±0–7·5 V at 1 or 2 A
±0–15 V at 1 A

423D ±30 V at 0·5 A
5 V ±1% at 0·5, 1 or 2 A
±0–7·5 V at 0·5, 1 or 2 A
±0–15 V at 0·5 or 1 A
±0–30 V at 0·5 A

MODELS 400, 430 and 460

Each unit has continuously variable output voltage and current by means of front panel potentiometers. Model 400 covers 0 to 30 V at up to 1 A, Model 430 covers 0 to 30 V with up to 2 A load current, and Model 460 provides 0 to 60 V output with load current variable up to 1 A. Two push-buttons select meter sensitivity and voltage or current monitoring.

VARIABLE CURRENT LIMIT

The variable current limit circuitry offers controlled protection in critical applications, or alternatively operation as a constant current supply. If the load resistance goes below the critical value the supply automatically becomes a constant current source, with the voltage reducing accordingly.

MODEL 400
Output Range 0–30 V. Maximum load current 1 A.
Current Limit Variable 0–1 A.
Meter Ranges 0–10 and 0–30 V; 0–0·3 A and 0–1 A.

MODEL 430
Output Range 0–30 V. Maximum load current 2 A.
Current Limit Variable 0–2 A.
Meter Ranges 0–10 and 0–30 V; 0–1 A and 0–3 A.

MODEL 460
Output Range 0–60 V. Maximum load current 1 A.
Current Limit Variable 0–1 A.
Meter Ranges 0–20 and 0–60 V; 0–0·3 A and 0–1 A.

Weir

Technical Information

400,430,460

LABORATORY POWER SUPPLIES

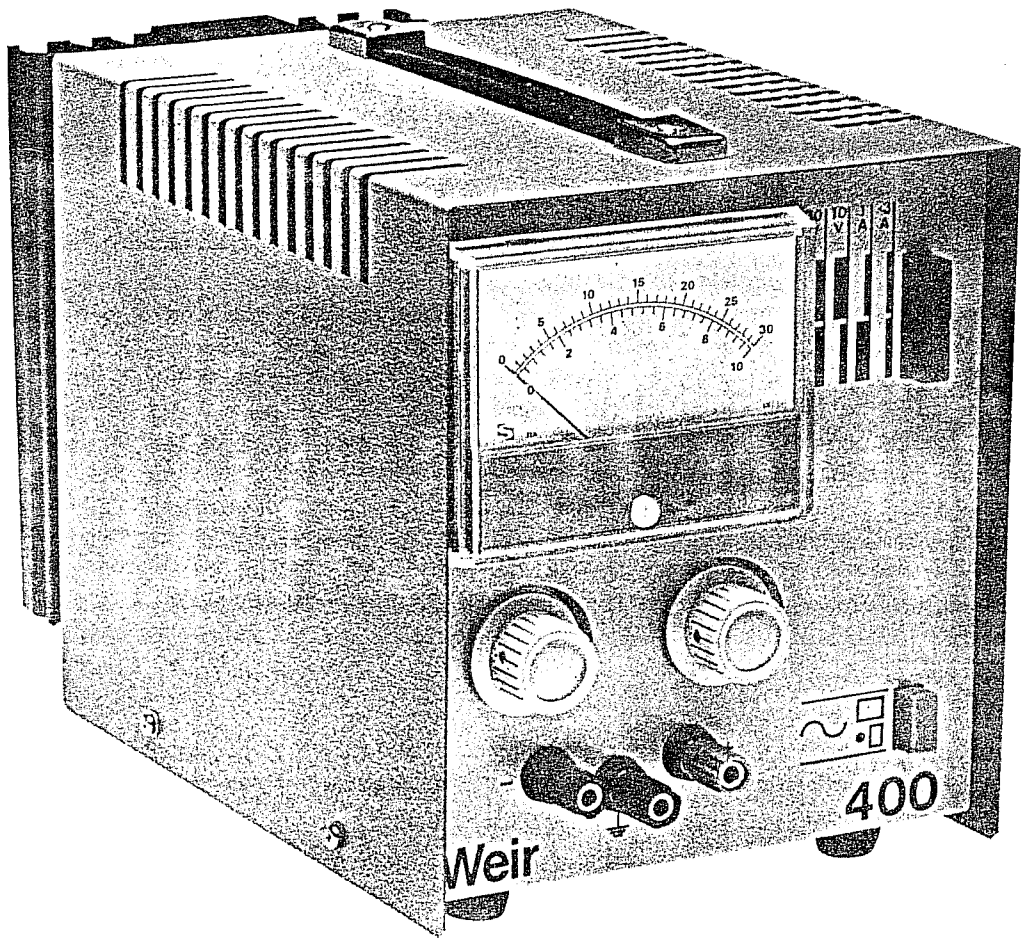


Fig. 1 Front View Type 400

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LIST OF ILLUSTRATIONS

1.0 INTRODUCTION

The 400 Series of laboratory power supplies provide the following outputs:-

400	0 to 30V at 0 to 1·0A DC
430	0 to 30V at 0 to 2·0A DC
460	0 to 60V at 0 to 1·0A DC

These units can be supplied singly or in pairs in the versatile Twinpack. In the latter form, any of the above types can be combined with any other unit from the range including the 413 and 423 power supplies. For applications where accurate voltage resolution and resetting are required, the single turn voltage control potentiometer may be replaced by a 10-turn control with a dial. This option is indicated by suffixing the type number with the letter 'T'.

All units use the same basic case and internal construction with identical main printed circuit boards and similar heat sinks. The 430 and 460 also employ a high efficiency switching pre-regulator which keeps the series stabiliser operating near its optimum performance over the full output range.

2.0 OPERATION

The unit requires a 50 to 60Hz AC ONLY input power supply. The captive power lead to the instrument should be connected to a 3-pin plug. The lead is colour coded:- brown = live, blue = neutral and green/yellow = earth. (See Safety Regulations 64.2(a) 3 and 64.3(c) 5).

⚠ INCORRECT CONNECTION OF THE POWER LEAD, OR CONNECTION TO A SUPPLY WITH NO EARTH, IS DANGEROUS.

Set the voltage selector on the rear of the unit to the correct input supply voltage and check the fuse rating (see Parts List and Safety Regulations 64.5 (c)). Switch ON by depressing the red push-button which latches in. The unit is switched off by a second depression of the button which releases the latch.

Setting Output Voltage and Current Limit Prior to Connecting Load

Set the upper black push-button out to select volts on the meter. Set the lower black button in (10V) (20V on 460) or out (30V) (60V on 460) to select the required meter range. Adjust the volts control to obtain the required output voltage. On 'T' models, where precise resetting is required, note the dial reading. Set the upper black push-button out to select amps on the meter. Set the lower black button in (3·0A) (0·3A on 400 and 460) or out (1·0A) to select the required meter range. Set the current limit control fully counter-clockwise. Connect a short circuit across the output terminals and adjust the current control until the meter indicates the required current limit. The power supply is now set up for use and the load circuit may be connected (see Safety Regulations 64.3 (a) 6 (a), 64.3 (e) 6 (b) and 64.4 (a) 7). For output voltages greater than 42V (available from the 460) it is recommended that the supply is switched off before connecting to the load (see Safety Regulations 64.5 (b) (b)). The Twinpack configuration may be used for multi-rail operation and units may be connected in series to obtain higher voltage rails. The power supplies may be used in series for voltages up to 300V DC which are dangerous; care must be taken to shield the output terminals (see Safety Regulations 64.4 (b) (b). Parallel operation is not recommended due to the difficulty in equalising output voltages to ensure proper load sharing.

These supplies rely on adequate cooling of the heat sink and internal components for correct operation. DO NOT obstruct the free flow of air by placing other equipment or papers on top of the units when thay are operating.

Voltage and current controls are marked V and A respectively. The output connections (red - positive, black - negative) are fully floating and may supply either positive or negative d.c. power. The green (centre) terminal is connected to chassis.

Twinpack Operation

Any combination of units from the range with the constraints below:-

Left-Hand Unit	Right-Hand Unit
400, 423	400
430, 423D	413
413, 460	423
413D	430
	460

Any unit may have the 'T' option, i.e., ten-turn variable voltage potentiometer for fine resettable linear control.

NOTE 1 Each unit in the dual retains its own mains fuse, ON/OFF switch and voltage selector.

NOTE 2 To obtain extra power, higher voltage or multi-rail configurations, units may be connected in series. Parallel operation is not recommended unless the output voltages are set precisely equal.

3.0 TECHNICAL DESCRIPTION

This description is written in two parts. The first is relevant to all three types of supply and refers to Fig. 2 (The Power Supply Circuit Diagram). The second is relevant to the 430 and 460 only and refers to Fig. 2 and Fig. 3 (The Switched Pre-regulator Circuit Diagram).

The a.c. input is fused by FS1, switched in both lines by S1a and S1b and applied to the power transformer primary via the voltage selector. This is adjusted to connect the two primary windings in series or parallel and selects the tapping to suit the input voltage.

The two secondary windings, shown on Fig. 2, provide the output power and an auxiliary supply for the control circuits. The third secondary, shown on Fig. 3, provides a supply for the switched pre-regulator.

The power for the regulated output is rectified in the bridge and is smoothed by C1. On the 430 and 460 units, the switched pre-regulator replaces the link LK1 and controls the power fed into C1. The d.c. output is regulated by a single transistor, TR2, on the 430 and 460 and by two transistors in parallel, TR2 and TR3, on the 400.

The control circuits are mounted on the main printed circuit board and comprise a quad operational amplifier, IC, with the associated circuits. Positive and negative supplies for the IC are obtained by half-wave rectifying the output of the auxiliary secondary of the power transformer. The mid-point of these supplies is connected to the positive output terminal.

IC1b generates a stable positive reference voltage by comparing the voltage across zener diode D8 with the reference voltage fed back through R2. Current is drawn initially from the unstabilised positive supply through R19 and D12 to provide a starting voltage for the operational amplifier.

IC1d provides the voltage regulating signal. The output voltage is compared to the sum of the positive reference voltage and 0V. Voltage adjustment is achieved by varying the 0V summing resistor RV1. The regulating transistor is driven by an emitter follower TR1 which draws its base current from the auxiliary positive supply through R10. Control is achieved by sinking a proportion of this current through D9 and the output of IC1d.

IC1c provides the current limiting signal by comparing the voltage across the shunt R13 with the fixed reference voltage. Adjustment of the current limit is achieved by varying RV2, which adjusts the proportion of the reference voltage fed to the amplifier. In a current limiting situation, IC1c sinks current through D10, starving TR1 of base current.

IC1a controls the switching regulator; the associated components, shown dotted, are not fitted on the 400. The reference voltage, which is approximately 7V above the positive terminal of the regulated output, is compared with the full wave rectified output of the bridge rectifier. The output of IC1a remains low until the output of the bridge exceeds the reference by approximately 7V. The output of IC1a then goes high.

While the output of IC1a is low, TR4 and TR3 are cut off, the silicon controlled rectifier TR2 is cut off and TR1 is enabled to draw base current through the auxiliary bridge rectifier. This provides base current for TR4, enabling the main reservoir capacitor to charge.

When the output of IC1a goes high, TR4 and TR3 are switched on, triggering the silicon controlled rectifier TR2. This shorts the base of TR1 to the emitter of TR4, cutting off TR4 and preventing the main reservoir capacitor C1 from charging further. Thus the charge on C1 will never exceed approximately 14V above the regulated output voltage, enabling the main regulating circuit to operate near to optimum performance under all conditions. The silicon controlled rectifier switches off at the end of each half-cycle when the voltage across it falls to zero. On the 460, an additional emitter follower, TR5, shown dotted, is added to increase the base drive of the switching transistor TR4.

The 1mA meter is used to monitor the output voltage and output current. Output voltage is measured across the output terminals and suitable ranging resistors are provided for the two voltage ranges. Output current is measured across the shunt resistor R13. Suitable ranging resistors are provided for the two current ranges.

4.0 SETTING UP PROCEDURE

Remove the cover from the unit by removing the two screws holding the carrying handle and the four small screws (two each side) from the sides of the cover. Access to all preset potentiometers is now available and their functions are clearly marked on both sides of the board. Check the zero setting of the meter and adjust, if necessary. DO NOT REMOVE THIS COVER WHILE THE UNIT IS CONNECTED TO THE AC SUPPLY SINCE DANGEROUS VOLTAGE POINTS BECOME ACCESSIBLE (see Safety Regulations 64.5 (a) & (a)).

Connect the unit to the a.c. supply and switch on. Set the meter to the highest voltage range. Monitor the output with a 0·1% accuracy digital voltmeter. Turn the voltage control fully clockwise and verify a DVM reading of 30V −0, +10% (60V −0, +10% on the 460). If necessary, adjust RV4 to achieve this. Adjust the voltage control for a DVM reading of exactly 30V (60V on the 460). Verify that the meter reads full scale; if necessary, adjust RV5 to achieve this. Adjust the voltage control for a DVM reading of 10V (20V on the 460). Select the 10V (20V) meter range and verify that the meter reads full scale. If necessary, adjust RV8 to achieve this.

Set the current limit control fully clockwise. Connect a suitably ranged DMM across the terminals to monitor short circuit current. If necessary, use RV3 to set the current to 1·1A (2·2A on the 430). Adjust the front panel control until the current is 1A (2A on the 430) and select the 1A (3A on 430) meter range. If necessary, adjust RV6 for the meter to read 1A (2A on the 430). Adjust the front panel control to set the current to 0·3A (1A on the 430) and select 0·3A (1A on the 430) meter range. If necessary, adjust RV7 for the meter to read full scale.

The settings of all preset controls have now been checked. Switch off the unit and replace the cover.

5.0 SPECIFICATION

Line Supply:		110, 120, 220, 240V ±10% 48 - 63Hz, voltage selection by external selector.
Outputs:	400	0 - 30V at 0 - 1A
	430	0 - 30V at 0 - 2A
	460	0 - 60V at 0 - 1A
Line Regulation:		< 0·02% of output for 10% line voltage change.
Load Regulation:		< 0·05% of output for 10% load change.
Ripple and Noise:	400	< 1mV peak-to-peak
	430, 460	< 2mV peak-to-peak
Output Impedance:		< 15mΩ at 1kHz
Temperature Coefficient:		< 0·02%/^{o}C typically at 23^{o}C
Transient Response:		< 45μsec to < 50mV of setting for full load step change.
Current Limit:		Adjustable from 110% of full load current to zero.
Meter Ranges:	400	0 - 10V, 0 - 30V; 0 - 0·3A, 0 - 1A
	430	0 - 10V, 0 - 30V; 0 - 1A, 0 - 3A
	460	0 - 20V, 0 - 60V; 0 - 0·3A, 0 - 1A
Operating Temperature Range:		0 - 45^{o}C
Dimensions:		180mm high, 153mm wide, 255mm deep.
Weight:		4·5kg approximately.

PARTS LIST

Main Assembly Power Supply - see Fig. 2

Circuit Ref.	Description	Value	Rating	Tol.	Type
Control					
RV1	Potentiometer	50k			Colvern CLR4001
RV2	Potentiometer	10k			Colvern CLR4001
Transistors					
TR2,3 (400)					Motorola 2N3055
TR2 (430)					Motorola 2N3055
TR2 (460)					Motorola 2N6254
TR4 (430)					Motorola 2N5885
TR4 (460)					Motorola 2N3773
Miscellaneous					
T1 (400)	Transformer				W2320
T1 (430)	Transformer				W2512
T1 (460)	Transformer				W2572
M1 (400,430)	Meter				W1567
M1 (460)	Meter				W1876
FS1 (400)	Fuse	240V	0·5A		Antisurge
		120V	1A		Antisurge
FS1 (430,460)	Fuse	240V	1A		Antisurge
		120V	2A		Antisurge

Main Power Supply Printed Circuit Board - see Fig. 2

Resistors					
R1	Metal film	220R	1/3W	5%	Mullard CR25
R2	Metal oxide	1k2	½W	2%	Welwyn MR5
R3	Metal oxide	5k6	½W	2%	Welwyn MR5
R4	Metal oxide	82k	½W	5%	Electrosil TR5
R5	Metal film	10k	1/3W	5%	Mullard CR25
R6	Metal oxide	1M0	½W	5%	Electrosil TR5
R7 (400,430)	Metal oxide	6k2	½W	2%	Welwyn MR5
R7 (460)	Metal oxide	3k3	½W	2%	Welwyn MR5
R8,9	Metal film	3k3	1/3W	5%	Mullard CR25
R10	Metal film	4k7	1/3W	5%	Mullard CR25
R11	Metal film	100R	1/3W	5%	Mullard CR25
R12	Metal film	33R	1/3W	5%	Mullard CR25
R13 (400,460)	Wire wound	0R5	3W	5%	CGS 3A
R13 (430)	Wire wound	0R25	3W	5%	CGS 3A
R14 (400,460)	Metal oxide	390R	½W	5%	Electrosil TR5
R14 (430)	Metal oxide	150R	½W	5%	Welwyn MR5
R15	Metal film	100R	1/3W	5%	Mullard CR25
R16 (400,430)	Metal oxide	27k	½W	2%	Welwyn MR5
R16 (460)	Metal oxide	56k	½W	2%	Welwyn MR5
R17 (400,430)	Wire wound	560R	3W	5%	CGS C3A
R17 (460)	Wire wound	1k2	3W	5%	CGS C3A
R18 (400)	Metal film	4k7	1/3W	5%	Mullard CR25
R18 (430)	Metal oxide	4k7	½W	2%	Electrosil TR5
R18 (460)	Metal oxide	9k1	½W	2%	Electrosil TR5
R19	Metal film	10k	1/3W	5%	Mullard CR25
R20	Metal film	4k7	1/3W	5%	Mullard CR25
R21	Metal film	10R	1/3W	5%	Mullard CR25

Continued .....

Main Power Supply Printed Circuit Board - continued ...

Circuit Ref	Description	Value	Rating	Tol.	Type
Resistors					
R22 (400)	Wire wound	0R22	3W	5%	CGS C3A
R22 (430,460)	Not fitted				
R23 (400)	Wire wound	0R22	3W	5%	CGS C3A
R23 (430,460)	Link				
R24 (400,460)	Metal film	47R	1/3W	5%	Mullard CR25
R24 (430)	Metal film	560R	1/3W	5%	Mullard CR25
R25 (400,430)	Metal oxide	7k5	½W	2%	Welwyn MR5
R25 (460)	Metal oxide	18k	½W	5%	Welwyn MR5
R26	Metal film	10k	1/3W	5%	Mullard CR25
R27	Metal film	100R	1/3W	5%	Mullard CR25
R28	Metal film	220k	1/3W	5%	Mullard CR25
R29 (400)	Metal film	10R	1/3W	5%	Mullard CR25
R29 (430,460)	Metal film	120k	1/3W	5%	Mullard CR25
R30 -32 (400)	Not fitted				
R30 (430,460)	Metal film	120k	1/3W	5%	Mullard CR25
R31 (430,460)	Metal film	56k	1/3W	5%	Mullard CR25
R32 (430,460)	Metal film	10M	1/3W	5%	Mullard CR25
Capacitors					
C1 (400,430)	Electrolytic	2200µ	63V	−10, +50%	Sprague WB35D
C1 (460)	Electrolytic	680µ	100V	−10, +50%	Sprague WB35D
C2	Electrolytic	220µ	25V	±50%	ITT EN12-12
C3	Electrolytic	680µ	10V	±50%	Mullard 017-15681
C4	Electrolytic	2µ2	63V	−10, +50%	Mullard 015-18228
C6	Metallised polyester	0·01µ	250V	±20%	Mullard 344-41103
C8	Electrolytic	100µ	63V	±50%	ITT EN12-12
C9 (400,430)	Metallised film	1µ	100V	±10%	ITT PMC 1R
C9 (460)	Metallised film	0·33µ	250V	±10%	ITT PMC 1R
C10	Metallised polyester	0·01µ	250V	±10%	Wima MKS
Control					
RV3	Potentiometer	50k	½W	20%	Piher PT10V
RV4 (400,430)	Potentiometer	10k	½W	20%	Piher PT10V
RV4 (460)	Potentiometer	4k7	½W	20%	Piher PT10V
RV5 (400,430)	Potentiometer	5k	½W	20%	Piher PT10V
RV5 (460)	Potentiometer	10k	½W	20%	Piher PT10V
RV6 (400,460)	Potentiometer	220R	½W	20%	Piher PT10V
RV6 (430)	Potentiometer	100R	½W	20%	Piher PT10V
RV7	Potentiometer	220R	½W	20%	Piher PT10V
RV8	Potentiometer	5k	½W	20%	Piher PT10V
Diodes					
D1-4 (400,460)	Diode	200V (PIV)	1A		Motorola 1N4003
D1-4 (430)	Diode	100V (PIV)	3A		Microelectronics 1N5401
D5,6	Diode	50V (PIV)	1A		Motorola 1N4001
D7,9,10,12,13	Diode	75V (PIV)	150mA		Motorola 1N4148
D8	Zener diode	5·6V	400mW	5%	Mullard BZY88C5V6
D11	Diode	100V (PIV)	3A		Microelectronics 1N5401
D14 (430,460)	Diode	75V (PIV)	150mA		Motorola 1N4148
D14 (400)	Not fitted				
Integrated Circuits					
IC1	Quad Op Amp				National LM324N

Continued .....

Main Power Supply Printed Circuit Board - continued

Circuit Ref.	Description	Value	Rating	Tol.	Type
Transistors					
TR1 (400,430)					Texas TIP110
TR1 (460)					Texas TIP112
Switched Pre-regulator Printed Circuit Board - see Fig. 3 (not fitted on 400)					
Resistors					
R1 (430)	Metal oxide	3k3	½W	2%	Electrosil TR5
R1 (460)	Metal oxide	3k3	1W	2%	Electrosil TR6
R2	Metal oxide	6k8	½W	2%	Electrosil TR5
R3	Metal oxide	3k9	½W	2%	Electrosil TR5
R4	Metal oxide	47k	½W	2%	Electrosil TR5
R5	Metal oxide	100k	½W	2%	Electrosil TR5
R6	Metal oxide	22k	½W	2%	Electrosil TR5
R7 (430)	Not fitted				
R7 (460)		33R	½W	2%	Electrosil TR5
Capacitors					
C1	Metallised polyester	0·047μ	250V		Mullard 344-41473
C2 (430)	Not fitted				
C2 (460)	Ceramic	220p	500V		Erie 831
Diodes					
D1-4 (430)		⩾ 50V (PIV)	1A		Motorola 1N4001-7
D1-4 (460)		⩾ 200V (PIV)	1A		Motorola 1N4003
D5,6		75V (PIV)	150mA		Motorola 1N4148
Transistors					
TR1 (430)					Texas TIP110
TR1 (460)					Motorola MJE 47
TR2	Silicon controlled rectifier				Mullard BRY39
TR3					Mullard BCY70
TR4					Mullard BC107
TR5 (430)	Not fitted				
TR5 (460)	Metal oxide				Motorola MJE 47

IEC Clause

1. The apparatus described in this manual is safety class I apparatus (IEC classification).

Accessible metal parts which are connected to the protective earth terminal directly are:- The cover and the heat sink.

64.1 2. The apparatus has been designed and type tested according to IEC Publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe conditon. The present instruction manual contains information and warnings which shall be followed by the user to ensure safe operation and to retain the apparatus in safe condition.

64.2 (a) 3. If the unit is to be connected to the main supply by fixed wiring, rather than via a mains plug, then the protective earth wire in the 3 core mains lead shall be connected to a protective conductor before any other connection is made.

64.3 (a) 4. Before switching on the apparatus, make sure that it is set to the voltage of the mains supply.

64.3 (c) 5. Ensure that an appropriate mains plug is correctly connected to the captive 3 core cable provided with the unit. Connections are:- brown = live, green/yellow = earth and blue = neutral. Then ensure that the mains socket to be used has a correctly connected protective earth contact. Do not use extension cords without protective earth conductors.

64.3 (a) 6 (a) If the unit is to be used with live measuring or load circuits which have protective earth terminals, ensure that all protective earth terminals are connected to a protective conductor (the front panel green terminal may be used for this purpose) prior to switching on.

64.3 (e) 6 (b) If the unit is to be used with live measuring or load circuits which do not have protective earth terminals, ensure that the unit mains plug is inserted before making connections between the unit output terminals and such circuits.

64.4 (a) 7 WARNING

(a) Any interruption of the protective conductor inside or outside the unit, or disconnection of the protective earth connection, is likely to render the apparatus dangerous. Intentional interruption is prohibited.

64.4 (b) (b) The output of the power supply unit is fully floating and it may be used in series with other power supply units to generate high DC voltages up to 300V DC.

Such voltages are exceedingly hazardous and great care should be taken to shield the output terminals for such use. On no account should the output terminals be touched when the unit is switched on under such use. All connections to the terminals must be made with the power switched off.

64.5 (a) 8 (a) Ensure that the unit is disconnected from the mains supply (switching off the unit by the front panel ON/OFF switch is not sufficient) before the cover is removed for the purposes of maintenance or setting up - otherwise dangerous voltages are accessible.

Unless inevitable, do not reconnect the unit to the mains supply until the repair is complete and the cover replaced.

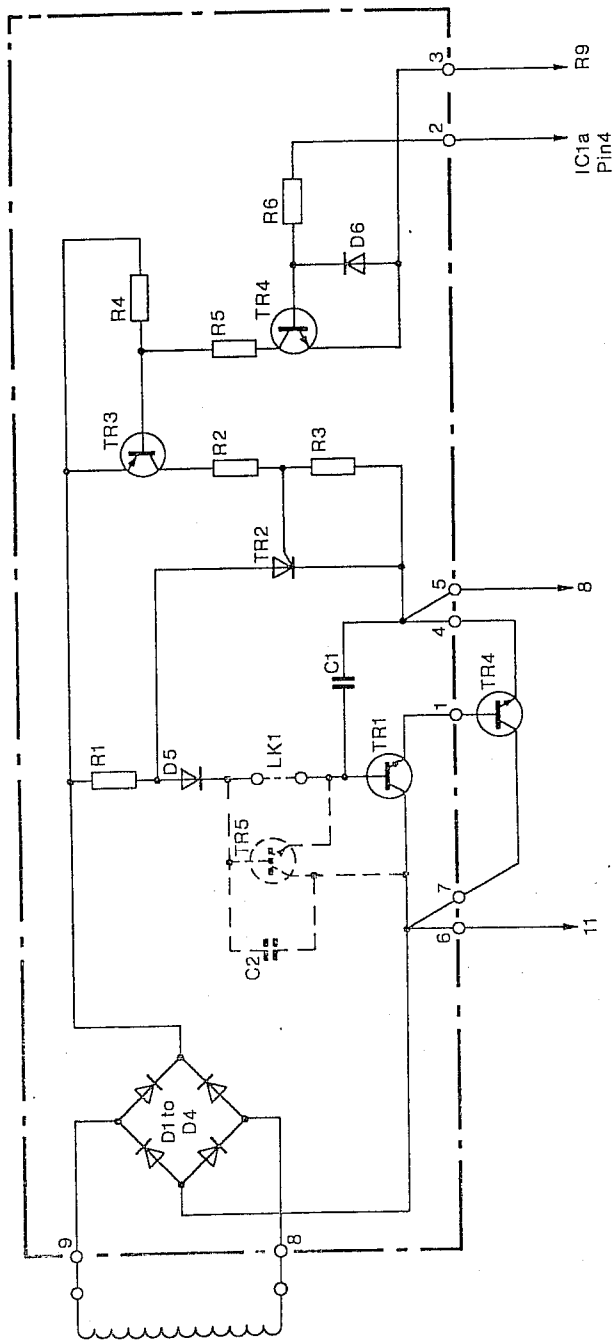
It is recognised that, for fault finding and setting up, the mains supply will require reconnection and the unit will be switched on - thus, this work may only be carried out by a skilled person who is aware of the hazard involved. When this work is completed, disconnect the mains supply before replacing the cover.

64.5 (b) (b) Capacitors inside the apparatus (especially C1 and C8 on the 460) may remain charged to a voltage >42V (IEC extra-low voltage for safety) after removal of the mains power. These should be discharged before commencing repair work.

64.5 (c) (c) Use only the correctly rated fuses as specified in the parts list for replacement. On no account use mended fuses or short-circuited fuse holders.

64.6 9. If the apparatus is defective or if it has been subjected to abnormal mechanical stresses, it is likely that the safety protection may be impaired, in which case, the unit should be withdrawn from use and returned to the factory for recheck and repair.

This is particularly important if there are external signs of mechanical damage.



C2 & TR5 NOT FITTED ON 430, LK1 NOT FITTED ON 460

DRAWN | MATERIAL
CHECKED
APPROVED | FINISH
TRACED
TOLERANCE
± 0,1mm... ,xxx
± 0,3mm... ,xx
± 0,4mm... ,x
DIMS IN MM
SCALE
SHEET OF
TITLE
Weir
DRAWING NO W
Change Note No. | Date | Issue | Details

DO NOT SCALE
THIRD ANGLE PROJECTION
IF IN DOUBT ASK

Fig. 3 Switched Pre-regulator Circuit

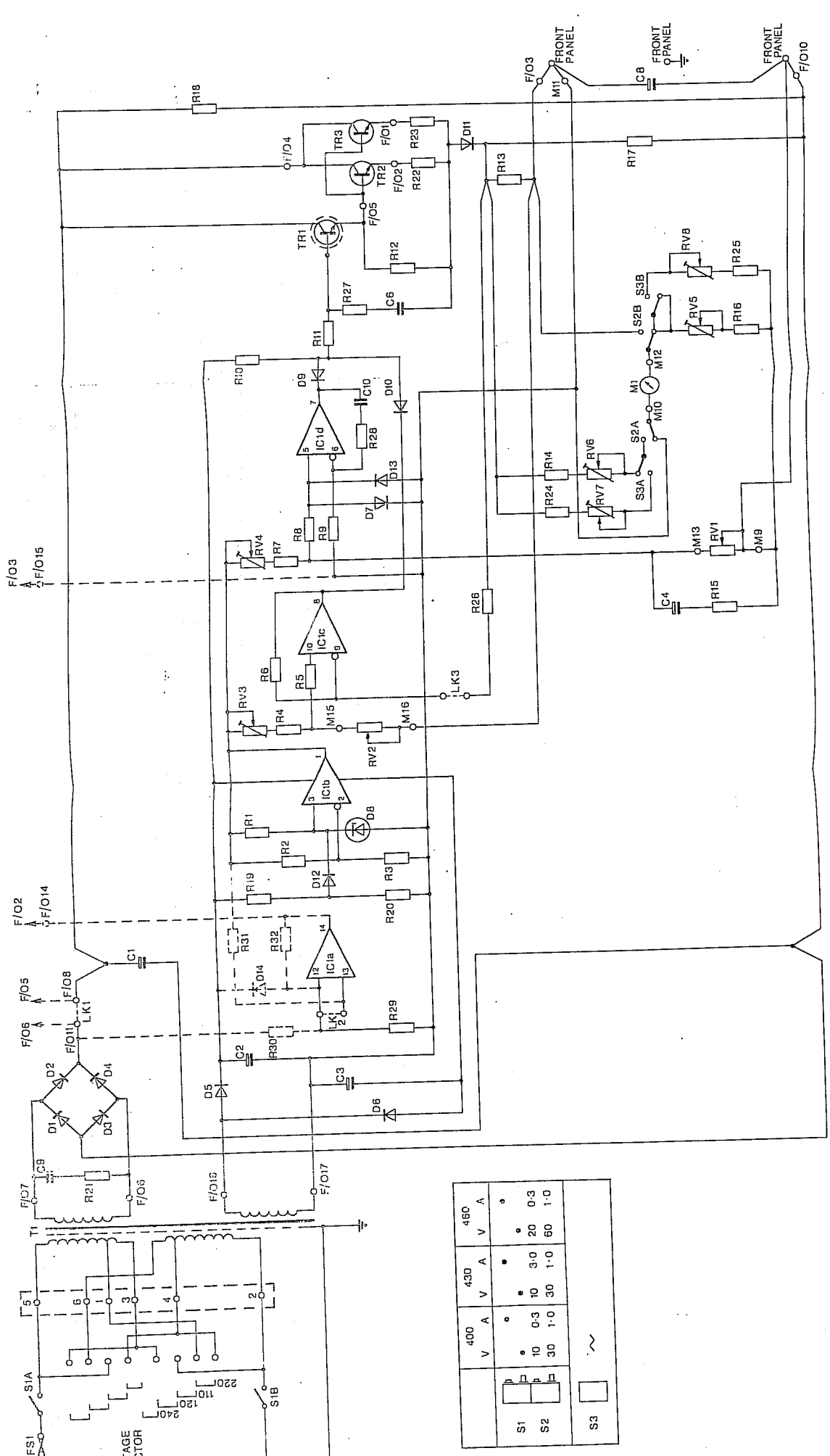


Fig. 2 Power Supply Circuit