

OPERATING INSTRUCTIONS

Type EE26D/2 - Gunn Diode PSU

Serial No. 39367



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IMPORTANT NOTICE

As we are always seeking to improve our products, the information given in this document gives only a general indication of such products, none of which information shall form part of any contract.

Gunn Diode Power Supply

TYPE EE/26D

CONTROLS

All the controls are clearly marked on the front panel.

They are as follows:

MAINS	Push ON/OFF switch
TRIG	A push switch for polarity change of the output trigger pulse
METER SWITCH	SET - Voltmeter connected directly to the regulator output; no voltage appears at output socket DC - Voltmeter connected directly to the output socket MOD - Voltmeter circuit re-arranged to measure peak to peak modulation Voltage applied to the Gunn Diode
FUNCTION SWITCH	DC - DC Regulator and modulator connected to the output socket MOD - The internal square wave generator is switched on EXT - EXT/MOD/TRIG socket connected to the input of the modulator and the internal modulation source is switched off
FREQUENCY SWITCH	1 KHz) 2 KHz) Use as required in conjunction with 3 KHz) Fine Frequency Control
OVERVOLT PROTECTION	A control to be used in conjunction with "Adjust Volts" control

CONTROLS (continued)

ADJ. VOLTS A control for pre-setting the maximum output voltage available from the "DC VOLTS" control

DC VOLTS Output control of the DC regulator

MOD VOLTS Modulation Voltage Control of internal modulation source only.

**MOD FINE
FREQ.** frequency control used in conjunction with FREQ. switch

Two BNC Output Sockets are employed. One red centre + negative earth. One black centre - positive earth. The earth is switched by a Polarity Switch (SW1) on the rear panel. When the Polarity Switch (SW1) is set to the appropriate polarity the corresponding BNC output is in circuit

BEFORE SWITCHING on "MAINS" make sure that:

- 1) The instrument is connected correctly for the local mains.
The Instrument will accept 230 to 250 volts 50Hz as set at the factory
- 2) The function DC Switch is OFF
- 3) The output Polarity is correct, i.e. +ve or -ve according to the input polarity of the Gunn Diode Oscillator

SET UP for operating as follows:

Switch mains supply on

Set Meter Switch to "SET"

Turn Overvolt protection clockwise to maximum

Turn "Adjust Volts" fully anti-clockwise

Turn "DC Volts" fully clockwise

Turn "Adjust Volts" clockwise until maximum operating volts for the Gunn Diode Oscillator is obtained on the volt meter and lock the "Adjust Volts" dial.

Now turn overvolt protection control anti-clockwise until the voltage drops to zero.

Advance overvolt protection clockwise by $\frac{1}{2}$ division to allow the output to reach maximum voltage without tripping O.V.P. circuit.

Lock the overvoltage protection dial

Note: When the voltage drops to zero due to the overvoltage protection operating, the DC volts control must be reduced to zero anti-clockwise before the voltage protection circuit will re-set

THE POWER SUPPLY is now set to operate the oscillator as follows:

Switch Polarity Control on rear panel, to correct polarity.

Connect the oscillator to the correct BNC output connector, i.e. centre + or - with the DC volts control turned fully anti-clockwise (zero volts) push Function Switch to DC and Meter Switch to DC1.

Turn DC volt slowly clockwise, then diode current should be drawn from the supply and indicated on the Ammeter. Increase DC volts until the operating voltage is obtained

TO MODULATE THE OSCILLATOR with square wave:

- 1) First set up as described
- 2) Push Function Switch to MOD and turn MOD VOLTS CONTROL clockwise until required modulated output is obtained after setting the modulation frequency by the Freq. KHz control switch

It is advisable to observe the modulated output via the oscilloscope as, if the diode is over-modulated it will give a distorted output waveform, and it may be necessary to adjust the diode voltage and the modulation voltage to obtain an acceptable output.

Note: To obtain totally satisfactory working, Gunn Diode Oscillators should be modulated by a pin diode via an ISOLATOR

The modulation voltage can be monitored by switching meter to MOD

WHEN TURNING OFF THE POWER SUPPLY it is advisable to reduce DC volts to zero before doing so. This will prevent damage being caused to the diode when next operated.

WHERE EXTERNAL MODULATION is required, turn the controls "MOD VOLTS" and "DC VOLTS" **anti-clockwise**. Push the function switch to "EXT". Connect up the external modulation source to the "TRIG/EXT/MOD" socket via a standard BNC connector.

Turn "DC VOLTS" control forward and power the GUNN device.

Adjust the external modulation voltage and "DC VOLTS" control in a similar manner to that described for internal modulation.

SERVICING

The Circuit Diagram is given at the back of this Handbook.
Remove eight screws holding the top & bottom panels to the cabinet.
This will enable general inspection and servicing to be carried out.

CAUTION. Should this equipment be operated out of its case,
 lethal voltages will be exposed.

**Extreme care must be exercised by persons working
on the equipment in this condition.**

CIRCUIT DIAGRAM

REFERENCE SHOULD BE MADE TO THE CIRCUIT DIAGRAM INCLUDED IN THE REAR OF THIS HANDBOOK

The main features of this circuit are:

- 1) A DC regulator which is short circuit proof, and has immediate recovery characteristics.
- 2) A free-running multivibrator with a preselecting frequency control.
- 3) A "SERIES" type modulator.

TB is a toroidal transformer. The secondaries feed a conventional bridge circuit with capacitor smoothing, to provide DC for the regulator. TA is a standard transformer, again with bridge and capacitor rectification and smoothing to feed the modulation source.

The DC regulator IC₁ is a linear integrated precision voltage regulator which in turn controls a "SERIES" or "PASS" element Q₁. Q₁ is an integrated "DARLINGTON" pair, and has a high current gain which demands little power from the regulator, thus considerably simplifying the circuit.

The voltage output is determined by the total resistance given by VR₂.

This may readily be determined by the formula: $\frac{R}{500}$ where R = the resistance of VR₂. The function of VR₁ is to trim the voltage output to an exact scale factor. R_{AOT} (ADJUST-ON-TEST) is in series with the collector of the "pass" transistor Q₁ and produces across it a voltage proportional to the output load current. When this voltage reaches 0.6 volts or so, the regulator goes into the constant current mode.

Across the output of the regulator is an Overvoltage Circuit; IC₄, TR₂, R₃₆₋₃₇, C₂₆, VR₃ and VR₁₁. The "TRIP" point of this circuit is determined by the setting of VR₃. Whenever excess voltage appears at the output of the regulator, the Thyristor is switched on, short circuiting the regulator. Recovery can only be achieved by returning VR₂ to zero.

The output of the entire regulator is connected across the modulator composed of Q₂, Q₃ and Q₄. Q₂ is an emitter follower which will

accept input drives from modulation sources as low as 50ohms. The bias developed across R_9 will ensure that Q_3 , the "Pass" or "series" element of the modulator is switched "on" over the whole range of output of the regulator. Q_4 is just "ON" and will maintain the emitter-collector voltage difference of Q_3 **almost** constant over a very wide range of output current loads. The base of Q_4 is developed against the bias steady, particularly at high levels of modulation.

The multivibrator used for square wave modulation is a free-running type. It can be switched between three fixed frequencies 1KHz, 2KHz and 3KHz, with fine frequency control VR6 trimming frequency $\frac{1}{4}$ 100Hz. When the collector voltage of Q_5 begins to rise, Q_7 is switched on and charges C_9 . Thus the charging current through R_2 is reduced by the current gain of Q_7 . The diode is in parallel opposition to the base-emitter junction of Q_7 in order to maintain the signal path between Q_5 collector and Q_6 base when Q_3 is turning on.

R_3 is to reduce the difference potential for switching between D_2 and Q_7 base-emitter junction.

The foregoing also applies to the action of Q_6 and Q_8 .

The output of Q_6 is taken from its collector load which is VR7, the modulation depth control, and fed to the base of Q_2 via R19, C17, SUB 10/e, C12 and R18.

The output from Q_5 is taken via C_7 to a pulse forming network R_1 and D_1 . SUB/10/J is incorporated to change the polarity of the formed pulses by reversing the diode. This output is fed to SK₅ via SUB/10/e.

The ammeter M2/R17 is permanently in circuit whilst the voltmeter is used to set up the desired output or voltage range required, and may also be switched to read peak to peak voltage of the modulation waveform.

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
1 off	20219-083	Case Europac	Schroff
2 off	20814-042	Angle with handles	..
1 off	30219-208	Front Panel	..
2 off	60817-053	Rails	..
2 off	10603-023	Tip Up Foot	..
2 off	10603-024	Tip Up Foot	..
		Front Panel to be drilled to Drg.No.7199	Gloduc
		Front Panel spray & silk screen 7199	Brooklands Pltg.
		Back Panel punching & drilling 7208	Gloduc
		Back Panel silk screen 1/4 polarity 7244	M/C
		Base Plate punching Drg. No.7207	Gloduc
		Main case drilling 7240	M/C
PCB	7202	Main PCB	H. M. Searle
PCB	7200	Potentiometer PCB	..
PCB	7198	Switch PCB	..
PCB	7199	Filter Panel (BNC)	..
B1	262-078	200V 6A Silicon Bridge	R.S. Components
B2	BR81D	100V 1.5A Silicon Bridge	Diodes Ltd.
B3	H229 PJ 01B	36V 300MA Silicon Bridge	Westinghouse
B4	262-090	200V 900MA Silicon Bridge	R. S. Components

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
B5	262-090	200V 900MA Silicon Bridge	R. S. Components
C2	CEB 100063	1000UFD 63V Electrolytic	Dubilier
C3	CEB 100035	1000UFD 35V Electrolytic	Dubilier
C4	101-793	4.7 UFD 35V Tant	R. S. Components
C5	CEB 4R763	4.7 UFD 63V Electrolytic	Dubilier
C6	KSN 057604	1550 PF. 63V Polyester	Guest
C7	KSN 057382	100 PF. 63V Polyester	Guest
C8	CEB 1063	10 UFD 63V Electrolytic	Dubilier
C9	C 280E	0.01 UFD 250V Poly.	Mullard
C10	C 280E	0.01 UFD 250V Poly.	..
C11	N470	220PF 500V Ceramic	..
C12	CEB 10025	100 UFD 25V Electrolytic	Dubilier
C13	C 280E	0.022 UFD 400V Poly.	Mullard
C14	CEB 4R763	4.7 UFD 63V Electrolytic	Dubilier
C15	102-702	10 UFD 35V Tant	R/S
C16	102-702	10 UFD 35V Tant	R/S
C17	CEB 10025	100 UFD 25V Electrolytic	Dubilier
C18	101-765	0.47 UFD 35V Tant	R/S
C19	CEB 100035	1000 UFD 35V Electrolytic	Dubilier
C20	C 280E	0.01 UFD 250V Polyester	Mullard

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
C21	CEB 100035	1000 UFD 35V Electrolytic	Dubilier
C22	102-724	47 UFD 35V Tant	R/S
C23	CEB 100035	1000 UFD 35V Electrolytic	Dubilier
C24	102-724	47 UFD 16V Tant	R/S
C25	KSN 057604	1500 PF 63V Polyester	Guest
D1	1N 914		
D2	1N 914	100V .75MA	Sasco
D3	1N 914	Silicon Diode	R/S
D4	1N 914		
D5	1N 914		
D6	1N 4007	1000V 1A Silicon Diode	I.R.
D7 } D17 }	1N 914	100V .75MA Silicon Diode	Sasco R/S
F1 & F2	544 265	Fuse Holder PCB	R/S
F	412-835	Fuse 2.5A x 2	R/S
IC1	LM 304H	Voltage Regulator	Motorola
IC2	78L12 (306-207)	100MA Voltage Regulator	R/S

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
IC3	78L12 (306-207)	100MA Voltage Regulator	R/S
IC4	P.V.P.I.C.	307-890	..
IC1	Holder	402-002	..
IC4	Holder	8 way 401-813	.. TO 100
LED 1 } LED 10 }	586-447	Miniature RED L.E.D.	..
M1	89-25455F	L.C.D. 3½ Digital Meter or equiv.	Vero
M2	98-25462B	L.C.D. 3½ Digital Meter or equiv.	Vero
Q1	TIP 146	Transistor PNP DL	R/S
Q2	BSX 61	Transistor N. PN	Mullard
Q3	Buy 80	Transistor N. PN	Ferranti
Q4	Buy 80	Transistor N. PN	Ferranti
Q5	2N1711	Transistor N. PN	Mullard
Q6	2N1711	Transistor N. PN	Mullard
Q7	2N1711	Transistor N. PN	Mullard
Q8	2N1711	Transistor N. PN	Mullard

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
RAOT	0.33 ohms 2.5a	Resistor wirewound	A.E.S.
R1	1k ohms 1/2w	Resistor carbon	Iskra
R2	1k ohms 1/2w	.. ..	Iskra
R3	10k ohms 1/2w	.. ..	Iskra
R4	15k ohms 1/2w	.. ..	Iskra
R5	15k ohms 1/2w	.. ..	Iskra
R6	10k ohms 1/2w	.. ..	Iskra
R7	1.5k ohms 1/2w	.. ..	Iskra
R8	10k ohms 1/2w	.. ..	Iskra
R9	3k ohms 1w	.. ..	Iskra
R10	3.3k ohms 1/2w	.. ..	Iskra
R11	820 ohms 1/2w	.. ..	Iskra
R12	100 ohms 3w	Wire wound resistor	R/S
R13	1k ohms 1/2w	Resistor carbon	Iskra
R14	56k ohms 1/2w	Resistor carbon	Iskra
R15	2.7k ohms 1/2w	Resistor carbon	Iskra
R17	R.A.O.T.		
R18	1.5k ohms 1/2w	Resistor carbon	Iskra
R19	390 ohms 1/2w	Resistor carbon	Iskra

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
R20	11M ohms 5w	Wire wound H/S 4036Z	Wewyn
R21	100 ohms 3w	Wire wound	R/S
R22-31	470 ohms 1/2w	Thick film metal glaze 145-210	R/S
R32	470 ohms 1/2w	H/S	R/S
R33	33k ohms 1/2w	Resistor carbon	Iskra
R34	35k ohms 1/2w	Resistor carbon	Iskra
R35	100 ohms 1/2w	Wire wound	R/S
R36	18 ohms 1/4w	Resistor carbon	Iskra
R37	1.5k ohms 1/4w	Resistor carbon	Iskra
SKT1	467.330	10 way connector	R/S
SKT2	467.273	10 way connector	R/S
SKT3	UG.657U	Chassis fixing BNC	Suhner
SKT4	UG.657U	...	Suhner
SKT5	UG.657U	...	Suhner
TA	15V.0.15V - 1.207.891	Transformer	R/S
TB	12V.0.12V - 0.2A 207.419	Toroidal Transformer	R/S

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
T1	0.12.0 ± 12 — 6VA207.756	Transformer	R/S
TR2	2N444.350V	Thyrister	Motorola
VR1	4k ohms T93YB LIN	Skeleton Pot.	Counting Sfernice
VR2	47k ohms P11VXNA LIN	.. ..	.. ..
VR3	4k ohms P11VXNA LIN	.. ..	.. ..
VR4	220k ohms T97YB	.. ..	.. ..
VR5	220k ohms T97YB	.. ..	.. ..
VR6	10k ohms P11QXG LIN	.. ..	.. ..
VR7	1k ohms P11QXG LIN	.. ..	.. ..
VR8	50k ohms MJ.173.530	Multi-Turn Pot.	R/S
VR9	220k ohms T93YB	Skeleton Pot	Counting Sfernice
VR10	220k ohms T93YB	.. ..	.. ..
VR11	2k2 ohms T7YB	.. ..	.. ..
R38	10k ohms	T7YB Pot	.. ..
R39	5k ohms	T7YB Pot	.. ..

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
VRA1	100k ohms T7YB	Pot.	Counting Sfernice
VRB1	100k ohms T7YB	..	
VRA2	47k ohms T7YB	..	
VRB2	47k ohms T7YB	..	
VRA3	22k ohms T7YB	..	
VRB3	22k ohms T7YB	..	
SW1	2P 2W	Slide Switch 337-986	R/S
SUB1	453497	Mains Switch	N.S.F.
SUB1	035094/1	Mains Switch Button Red	..
SUB10	035094	Control Button Black	..
SUB10	453498	Control Switch	..
SUB10		Control Switch mod to DRG.No.7237	..
H1	KL135 1000	Heat Sink	Neoflex
	KL135-1000	Cut & Drilled to DRG. No. 7239	
H2	60130.020	Heat Sink	Metal & Microwave
H3	TO5	Heat Sink	R/S
H5	KL146/75/SW	Heat Sink	Neoflex
	KL146/75/SW	Heat Sink Drilling DRG.NO. 7328	

CIRCUIT NO.	TYPE NO.	DESCRIPTION	MAKER
	KL146/75/SW	Jig Nos. 26D110 & 26D113 Control Switch Sub 10.453498 Mod DRG. No. 7237.	
		Mains Cable 6ft.	BICC
		Mains Plug No. 488-393	R/S
		Cable Socket No. 488-400	R/S
		Ribbon Cable No. 357-025	R/S
		Knobs black red marker	
		2010313	Bulgin
		Kilo Dial No. 512	Kynmore

