

INSTRUMENT HANDBOOK

Applicable to Serial No. 10534

BWD 141

MODEL bwd ~~141~~
SOLID STATE SINE &
SQUARE WAVE GENERATOR

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	1A	PARTS LIST

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INSTRUMENT HANDBOOK

MODEL bwd 141

SOLID STATE SINE AND SQUARE WAVE GENERATOR

1. GENERAL

Model bwd 141 is an all silicon Solid State Sine and Square Wave Generator powered by self contained dry batteries or an optional internal mains power pack.

The wide frequency range of 1Hz to 1MHz together with its output attenuator and level control makes it suitable for both bench and field work.

A balanced output is available by connecting a centre tapped resistor across the output terminals. Sine or Square Wave output is available by switch selection. Power ON is indicated by the LED on the front panel.

2. PERFORMANCE

2.1 Sine Wave

Frequency Range : 1Hz to 1MHz in six decade ranges.

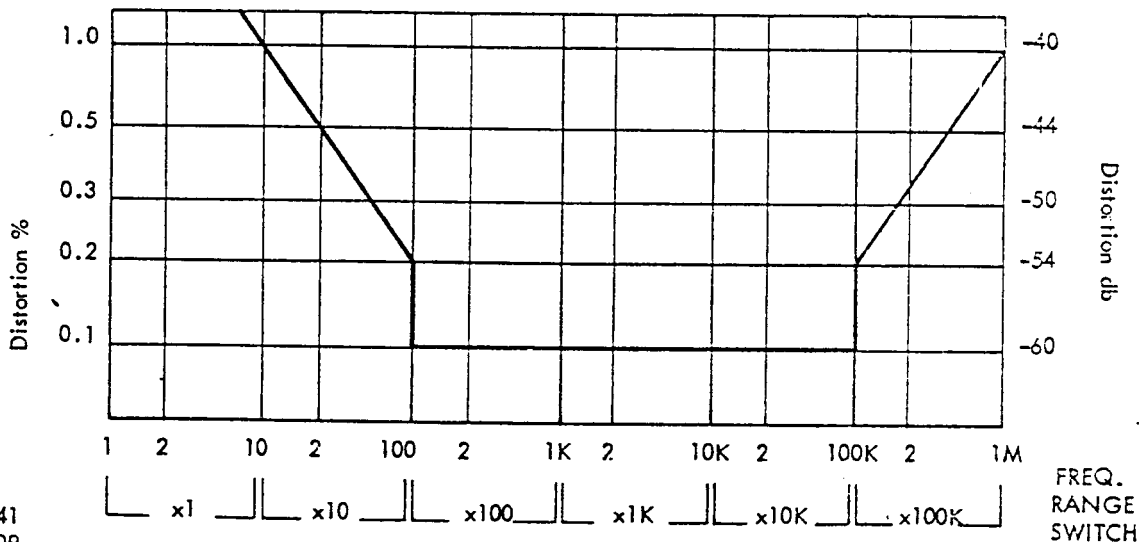
Frequency Vernier : 4-1 slow motion drive.

Frequency Calibration : 10Hz to 1MHz 5%
1Hz to 10Hz 5% \pm 1Hz

Output Level : Within ± 0.25 db (3%) over entire range.

Output Voltage : 0 - 2.5V rms (7.07V p-p) continuously variable into a high impedance. DC level is zero.

Distortion : $< 0.1\%$ from 100Hz to 100kHz, increasing to $< 1\%$ at 5Hz and 1MHz. See chart below.



PERFORMANCE (Cont'd)

Battery Life : Approximately 600 hours.

2.2 Square Wave

Frequency Range : 1Hz to 1MHz in six decade ranges.

Frequency Vernier : 4-1 slow motion drive

Frequency Calibration : 10Hz to 1MHz 5%
1Hz to 10Hz 5% \pm 1Hz

Output Level : Within \pm 3% over entire range into low capacity load.

Output Voltage : 0 - 2.5V p-p into a high impedance load.

Output Polarity : Positive going with respect to common.

Rise Time : Less than 100 μ Sec. into 600 Ω and less than 100pf shunt capacity.

Battery Life : Approximately 300 hours.

2.3 Battery Type

2 x 276F Eveready.

3. CONTROLS AND THEIR FUNCTIONS

Frequency Vernier : Sets output frequency on range selected.

Range Switch : Six push buttons in decade steps.

ON-OFF Switch : Red push button, IN is on, OUT is off.

Sine-Square Switch : OUT is Sine, IN is Square.

Attenuator Switch : Four positions in decade steps.

Output Terminals : Red - active.
Black - common.
Metal - earth.

4. OPERATION

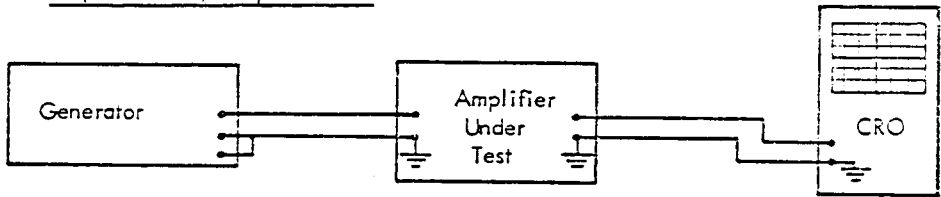
Switch ON by depressing the red ON-OFF switch. The unit is now operating and the frequency can be set by depressing the desired range switch and rotating the frequency vernier to the appropriate position. The output level can be set at any value from 0-2.5V rms by selecting the appropriate attenuator position and output level control. The LED "power-on" indicator is in series with the supply and will be visibly modulated at low frequencies.

The output level is preset for operation into a high impedance load for which the output level is as indicated by the attenuator and level control. With a 600 Ω load the output voltage will be half that indicated by the controls due to the 600 Ω source impedance of the attenuator.

On the top (2.5V) attenuator position the source impedance is less than 600 Ω and the output level is less than half that indicated.

5. APPLICATIONS

5.1 Amplifier Frequency Response



Connect the generator to the amplifier input and monitor the amplifier output with an oscilloscope or a wide range AC voltmeter.

Set the generator to approximately 1kHz and adjust the generator output to give a suitable output from the amplifier. The frequency response of the amplifier may now be checked by varying the generator frequency over the desired range.

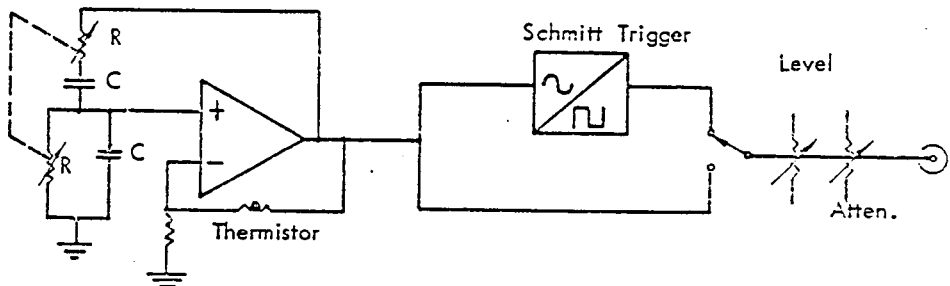
5.2 Amplifier Square Wave Response

Application of a square wave to an amplifier can be used to determine the transient response. Using a frequency of approximately 100Hz the rounding, overshoot and tilt can be observed on an oscilloscope.

5.3 Filters, transformers, etc can be checked for frequency response in a similar manner to the amplifier.

5.4 The generator output terminals are isolated from the case so that the generator can operate with a DC voltage of $\pm 250V$ from the terminals to ground. However, NO DC voltage must appear across the terminals. If the unit is required to feed between two points with any DC voltage across them, then an isolating capacitor MUST be used.

6. CIRCUIT DESCRIPTION



6.1 The oscillator stage consists of a Wein-Bridge network and an amplifier (Q1-4). Frequency range is adjusted by selecting different value of C. The frequency vernier 'R' consists of a 2-gang potentiometer. Output amplitude stability is ensured by the thermistor in the negative feed-back path.

CIRCUIT DESCRIPTION

- 6.2 The square wave circuit consists of a Schmitt trigger (Q5-6) and the generator output is selected by a push button switch for either sine or square wave operation.
- 6.3 Output amplitude is controlled by the continuously variable level control and the stepped attenuator.

ALIGNMENT PROCEDURE

7.1 The following instruments will be required for a complete alignment of the generator :-

- (a) Oscilloscope with a fast rise time.
- (b) DC - 1MHz electronic counter.
- (c) Wide band (1Hz to 1MHz) AC level meter (oscilloscope can be used).
- (d) Noise and distortion meter.
- (e) 20,000 Ω /volt meter for general checking.

7.2 Before aligning the generator check that the battery voltage is above 15V with the unit switched on.

7.3 Alignment - Sine Wave

Set front panel controls as follows : -

- (a) Output Level Fully clockwise.
- (b) Output Attenuator Fully clockwise.
- (c) Sine-Square Switch Out
- (d) Range Switch X1K
- (e) Dial 1
- (f) Remove cover.

7.4 Level set - connect the level meter to the generator output and adjust RV3 for 2.5V rms output.

7.5 Calibration

- a. Connect counter to generator output.
- b. (i) Select X1K on range switch and dial to 10. Adjust RV2 for correct frequency.
(ii) Set dial to 2.5 and adjust potentiometer coupling for correct frequency.
(iii) Repeat steps b. (i) and b. (ii) until no further adjustment is necessary.
- c. Select X100K on range switch. Adjust C11/12/25 for correct level and dial calibration.

7. ALIGNMENT PROCEDURE (Cont'd)

7.6 Alignment - Square Wave

Monitor generator output with an oscilloscope, set generator output to 1kHz and adjust RV6 for 2.5V p-p output and adjust RV5 for symmetrical waveform.

8. MAINS POWER PACK OPTION 01

This is a self contained unit that fits in the generator in place of the dry cells. The circuit consists of a series regulator with an adjustable output, pre-set to +18V DC.

9. REPLACEMENT PARTS

Spares are normally available directly from the manufacturer, B.W.D. Electronics Pty.Ltd. When ordering, it is necessary to indicate the serial number of the instrument. If exact replacements are not to hand, locally available alternatives may be used, provided they possess a specification not less than, or physical size not greater than the original components.

As the policy of B.W.D. Electronics Pty.Ltd. is one of continuing research and development to upgrade its products, the company reserves the right to supply the latest equipment and make amendments to circuits and parts without notice.

10. WARRANTY.

The equipment is guaranteed for a period of twelve (12) months from the date of purchase against faulty materials and workmanship.

Please refer to Guarantee Registration Card No.: which accompanied the instrument for full details of conditions of warranty.

REPLACEABLE PARTS

1. This section contains information for ordering replacement parts, it provides the following details : -
 - (a) Description of part (see list of abbreviations).
 - (b) Typical manufacturer or supplier of the part (see list of abbreviations).
 - (c) Manufacturer's Part Number, and
 - (d) Defence Stock Number, where applicable.

2. Ordering - Please quote Model Type No., e.g. bwd 511, Serial No. Circuit Reference No. and component details as listed in parts list.

COMPONENT DESIGNATORS

A	Assembly	H	Heater	RV	Resistor Variable
B	Lamp	J	Jack (socket)	S	Switch
C	Capacitor	L	inductor	T	Transformer
D	Diode	M	Meter	TH	Thermistor
DL	Delay Line	P	Plug	V	Valve
E	Misc. Elect. Part	Q	Transistor	VDR	Voltage Dependent Resistor
F	Fuse	R	Resistor		

ABBREVIATIONS

Amp	Ampere	L	Inductor
C	Capacitor	lin	Linear
cc	Cracked Carbon	Log	Logarithmic Taper
c	Carbon	m	Milli = 10^{-3}
cd	Deposited Carbon	MHz	Mega Hertz = 10^6 Hz
comp	Composition	MF	Metal Film
CDS	Ceramic Disc Capacitor	ma	Milli Ampere
cer	ceramic	MΩ	Meg Ohm = 10^6 Ω
Com	Common	mfr	Manufacturer
DPST	Double Pole Single Throw	MO	Metal Oxide
DPDT	Double Pole Double Throw	MHT	Polyester/Paper Capacitor
elec	Electrolytic	MPC	Metalised Polyester Capacitor
F	Farad	Ne	Neon
f	Fuse	NPO	Zero temperature co-efficient
FET	Field Effect Transistor	nsr	Not separately replaceable
Ge	Germanium	NC	Normally Closed
H	Henry(ies)	NO	Normally Open
H.S.	High Stability	ns	Nano second
HTC	High Temp Coating	cbd	Order by Description
ins	Insulated	OD	Outside Diameter
kHz	Kilo Hertz = 10^3 Hz	p	Peak
KΩ	Kilo Ohm = 10^3 Ω	pf	pico farad = 10^{-12} F

COMPONENT ABBREVIATIONS (cont.)

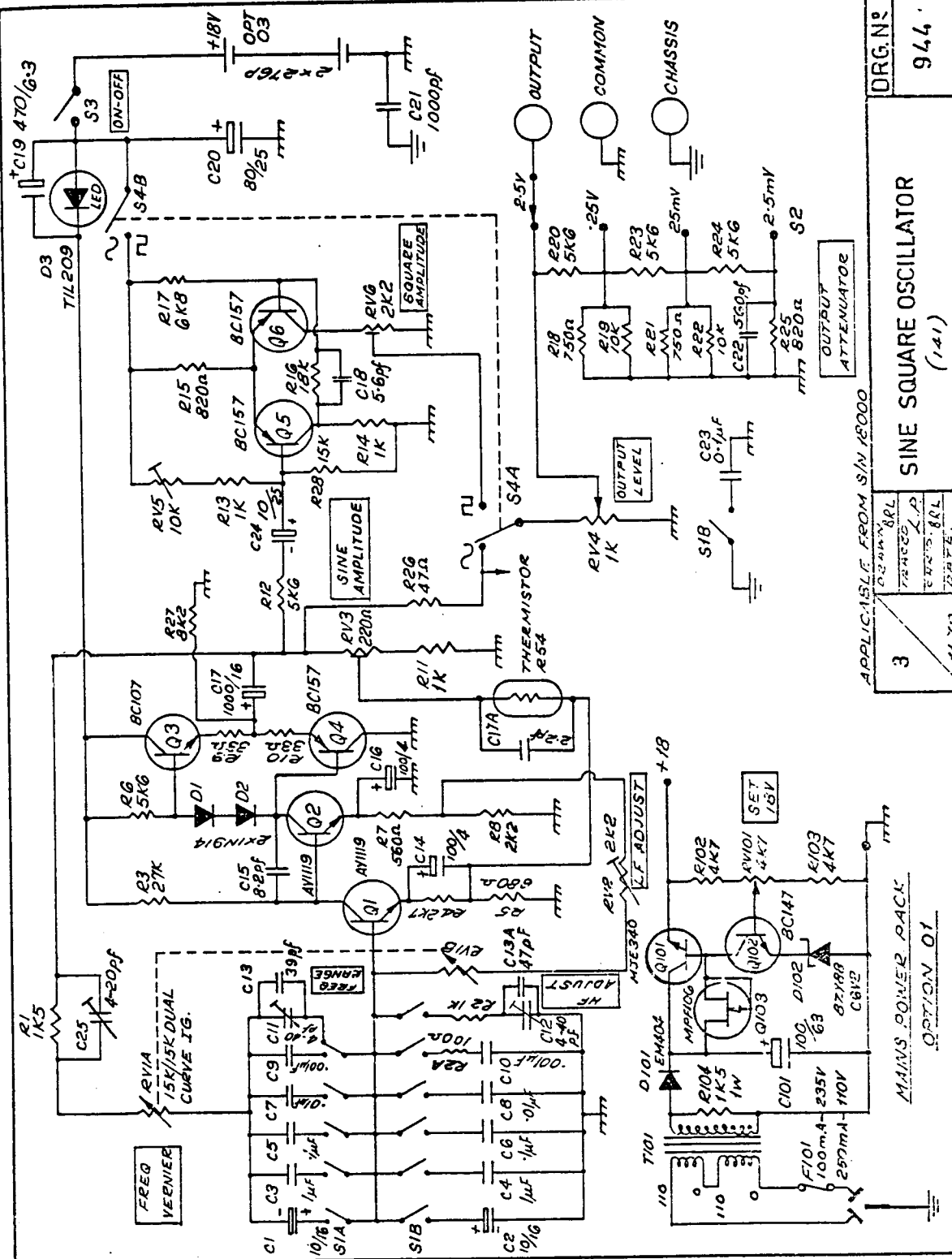
PL	Plug	SPDT	Single Pole Double Throw
PS	Socket	SPST	Single Pole Single Throw
Preset	Internal Preset	S.Shaft	Slotted Shaft
PYE	Polyester	Si	Silicon
pot	Potentiometer	Ta	Tantalum
prec	Precision	tol	Tolerance
PC	Printed circuit	trim	trimmer
PIV	Peak Inverse Voltage	V	Volt(s)
PYS	Polystyrene	var	variable
p-p	Peak to Peak	vdcw	Volts Direct Current Working
P.Shaft	Plain Shaft	w	Watt(s)
Q	Transistor	ww	Wire Wound
R	Resistor	Z	Zener
rot	rotary	*	Factory Selected value, nominal value may be shown
R log	Reverse Logarithmic Taper	**	Special component, no part no. assigned
rms	Root Mean Squared		

MANUFACTURERS ABBREVIATIONS

AC	Allied Capacitors	J	Jabel
AEE	AEE Capacitors	McH	McKenzie & Holland (Westinghouse)
AN	Anodeon	MAS	Master Instrument Co. Pty. Ltd.
AST	Astronic Imports	MUL	Mullard (Aust.) Pty. Ltd.
AWA	Amalgamated Wireless of Aust.	MOR	Morganite (Aust.) Pty. Ltd.
ACM	Acme Engineering Pty. Ltd.	MSP	Manufacturers Special Products (AWA)
AMP	Aircraft Marine Products (Aust.)P/L	McM	McMurdo (Aust.) Pty. Ltd.
AR	A. & R. Transformers	MOT	Motorola
AUS	Australux Fuses	NU	Nu Vu Pty. Ltd.
AWV	Amalgamated Wireless Valve Co.	NAU	A.G. Naunton Pty. Ltd.
ACA	Amplifier Co. of Aust.	PA	Painton (Aust.) Pty. Ltd.
AL	Alpha	PAL	Paton Elect. Pty. Ltd.
ARR	Arrow	PI	Piher Resistors (Sonar Electronics)
BWD	B.W.D. Electronics Pty. Ltd.	PW	Precision Windings Pty. Ltd.
BL	Belling & Lee Pty. Ltd.	PH	Philips Electrical Industries Pty. Ltd.
BR	Brentware (Vic.) Pty. Ltd.	PL	Plessey Pacific
BU	Bulgin	PV	Peaston Vic.
CF	Carr Fastener	RC	Radio Corporation (Electronic Inds.)
CAN	Cannon Electrics Pty. Ltd.	RCA	Radio Corporation of America
CIN	Cinch	RHC	R.H. Cunningham
D	Ducon Condensor Pty. Ltd.	STC	Standard Telephone & Cables
DAR	Darstan	SI	Siemens Electrical Industries
DIS	Distributors Corporation Pty. Ltd.	SIM	Simonson Pty. Ltd.
ELN	Elna Capacitors (Sonar Elec. P/L)	SE	Selectronic Components
ETD	Electron Tube Dist.	TR	Trimax Ericsson Transformers
F	Fairchild Australia Pty. Ltd.	TI	Texas Instruments Pty. Ltd.
GRA	General Radio Agencies	TH	Thorn Atlas
GE	General Electric (USA)	UC	Union Carbide
GEC	General Electric Co. (UK)	W	Wellyn Resistors (Cannon Elec.P/L)
GES	General Electronic Services	WH	Westinghouse
GL	Grelco		
HW	Hurtle Webster	Z	Zephyr Prod. Pty. Ltd.
HOL	R.G. Holloway		
H	Haco Distributors (National)		

PARTS LIST - MODEL bwd 141

CCT Ref.		DESCRIPTION	CCT Ref.	DESCRIPTION
R1	1K5	1/2 Watt 5%	C18	5.6pf 500V 5% CDS
R2	1K	1/2 Watt 5%	C19	470uF 6.3V Electro
R3	27K	1/2 Watt 5%	C20	80uF 25V Electro
R4	2K7	1/2 Watt 5%	C21	0.001uF 400V 5%
R5	680Ω	1/2 Watt 5%	C22	560pf 400V 5%
R6	5K6	1/2 Watt 5%	C23	0.1uF 150V 10%
R7	560Ω	1/2 Watt 5%	C24	10uF 25V Electro
R8	2K2	1/2 Watt 5%	C101	100uF 63V Electro
R9	33Ω	1/2 Watt 5%	C25	4.20p Trimmer
R10	33Ω	1/2 Watt 5%	D1,2	1N914
R11	1K	1/2 Watt 5%	D3	TIL 209 LED
R12	5K6	1/2 Watt 5%	D101	EM 404
R13	1K	1/2 Watt 5%	D102	BZY88C6V2
R14	1K	1/2 Watt 5%	Q1,2,	AY1119
R15	820Ω	1/2 Watt 5%	Q4,5,6	BC157
R16	18K	1/2 Watt 5%	Q101	MJE 340
R17	6K8	1/2 Watt 5%	Q102	BC147
R18	750Ω	1/2 Watt 1%	Q3	BC107
R19	10K	1/2 Watt 1%	RV1A, B	15KΩ Dual WW Curve IG
R20	5K6	1/2 Watt 1%	RV2	2K2A Preset
R21	750Ω	1/2 Watt 1%	RV3	220Ω Preset
R22	10K	1/2 Watt 1%	RV4	1KA Preset
R23	5K6	1/2 Watt 1%	RV5	10KΩ Preset
R24	5K6	1/2 Watt 1%	RV6	2K2Ω Preset
R25	820Ω	1/2 Watt 1%	RV101	4K7Ω Preset
R26	47Ω	1/2 Watt 5%	T101	BWD T111
R27	8K2	1/2 Watt 5%	TH1	R54 Thermister
R28	15K	1/2 Watt 5%	F101	100mA Quick Blow
R102	4K7	1/2 Watt 5%	S1A, B	6 Bank Isostat SR85
R103	4K7	1/2 Watt 5%	S2	4 Position 1 Pole Rotary
R104			S3	Single Isostat SR86
R2A	100Ω	1/2 Watt 5%	S4A, B	Single Isostat SR86
C1	10uF	16V Tant		
C2	10uF	16V Tant		
C3,4	1uF	200V 1%		
C5,6	0.1uF	100V 1%		
C7,8	0.01uF	400V 1%		
C9,10	0.001uF	400V 1%		
C11	4.40pf	Trimmer		
C12	4.40pf	Trimmer		
C13/13A	39pf	500V CDS		
C14	100uF	4V Electro		
C15	8.2pf	500V 5% CDS		
C16	100uF	4V Electro		
C17	1000uF	16V Electro		
C17A	2.2pf	500V 5% CDS		

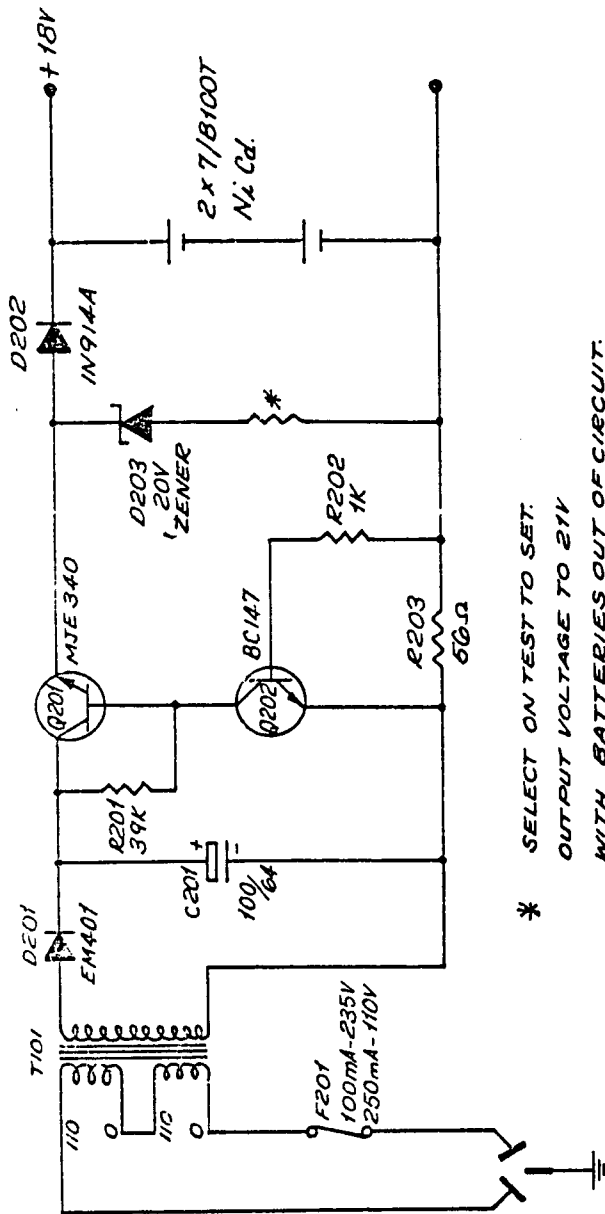


APPLICABLE FROM SIN 16000

3	3	11-72	ORG. N ^o	944
	3	11-72		

SINE SQUARE OSCILLATOR
(141)

MAINS POWER PACK
OPTION 01



* SELECT ON TEST TO SET.
 OUTPUT VOLTAGE TO 21V
 WITH BATTERIES OUT OF CIRCUIT.

DRG. N°	1034
BWD MODEL 141 OPTION 02	
DRAWN L.P.	1
TRACED L.P.	
CHECKED S.L.	
DATE	28-6-72
	6-72