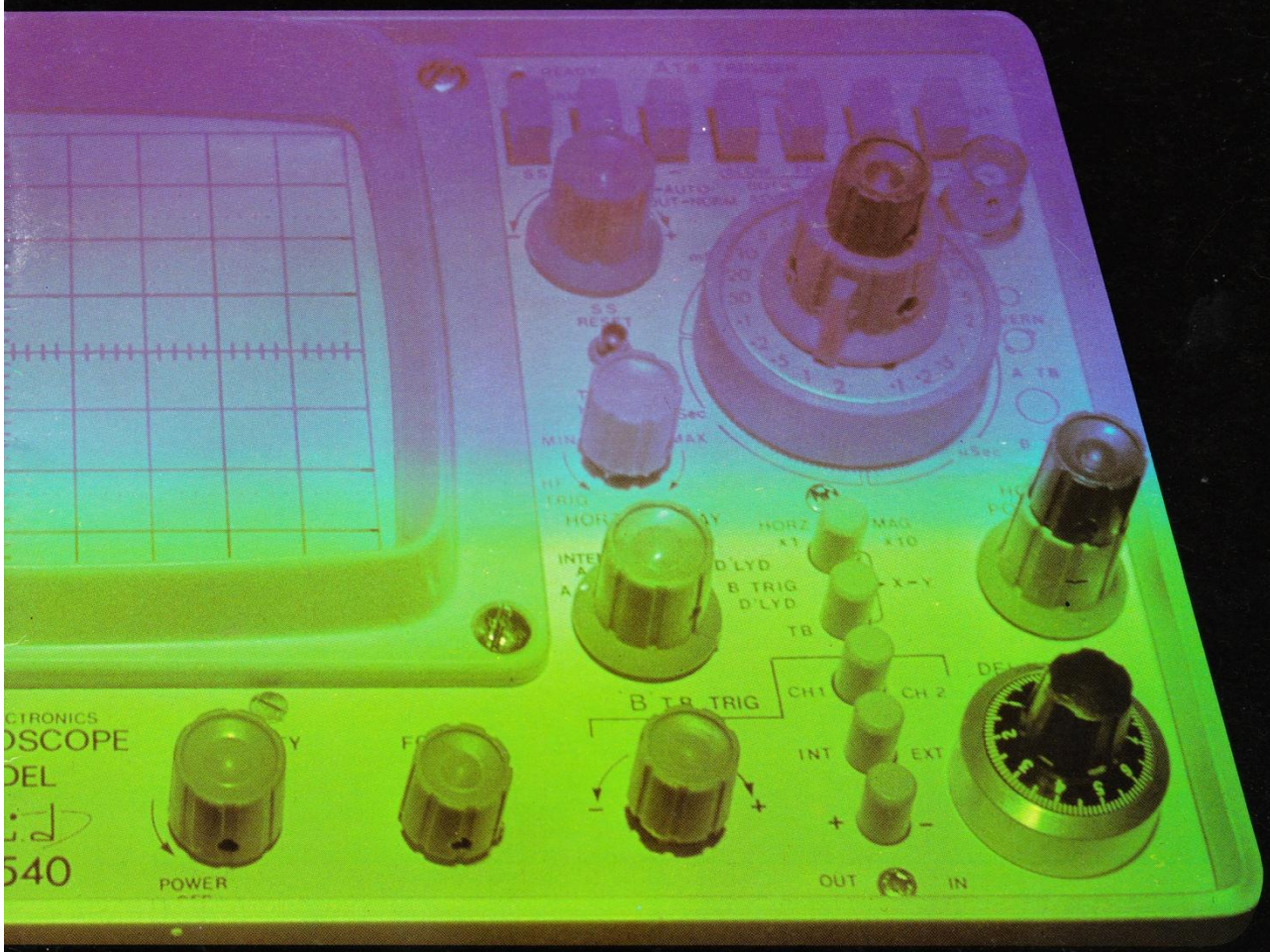
# BWD




## ELECTRONIC
## TEST INSTRUMENTS

**BWD ELECTRONICS PTY. LTD.**

# Introduction

## ABOUT BWD ELECTRONICS.

BWD Electronics Pty. Ltd. was formed in 1955 to produce electronic test instruments for the Australian industry. As a wholly Australian owned company, BWD has moved forward at a rapid but controlled growth rate maintaining its leadership in the development of creative designs. The results of this technological expertise are evident from the range of instruments manufactured, each one designed and produced to high standards and incorporating features which make them unique amongst world wide competition.

## RESEARCH AND DEVELOPMENT

The origination of a well designed electronic instrument depends a great deal on team work. The circuit arrangement, mechanical construction, styling and ergonomic considerations all form part of the overall design. At BWD, therefore, each new design is produced by electronic and mechanical engineers working together as a development group in the same laboratory under the leadership of a senior engineer. This system ensures the fullest contribution from each discipline, with the minimum of interfacing problems.
Comprehensive prototype field and environmental testing is conducted before committing new designs to production. In many cases several variants of a design are produced to evaluate variations in layout and performance.
In the final form, standard instruments may often be modified to meet a variety of special applications, and the wide experience of BWD engineers is available to assist in solving the problem.

## STANDARDS OF QUALITY

Considerable stress is laid on the need to maintain the quality of BWD products and, to this end, much engineering effort is devoted to special test methods over and above the normal routine test and alignment. These methods include shock and vibration testing and performance measurements under overload conditions and at simulated climatic extremes. They are applied at all stages of development as well as to the complete instrument.
All newly developed devices are thoroughly investigated by quality control engineers before integration into an instrument design, and the same philosophy is followed regarding the use of new materials and components. BWD certifies most instruments with an individual performance sheet stating the actual tested characteristics compared with the published specification.
Extensive testing, including vibration or drop tests, on every instrument leaving the production line ensures maximum reliability and continuity of operation to performance specification.

NOTE 6625 etc. numbers appearing with the BWD model number are Defence Stock Numbers awarded to the instrument.

## CUSTOMER SUPPORT SERVICE

An instrument on its own is of little use if it cannot be applied to the required task.
Our engineers are technical staff are therefore always available to assist with application information for BWD instruments as part of the customer service.

## MARKETING

BWD equipment is actively marketed in Australia through State sales outlets, staffed by qualified engineers, factory instructed in all equipments of the BWD range.
BWD equipment is also exported to a rapidly expanding World Market through approved Dealers.
BWD is a supplier of Electronic instrumentation to major Government Departments, Defence Services, Universities, Education Departments, Hospitals, Research and Industrial Laboratories.
BWD operates a highly skilled technical sales force to support the company philosophy that customer satisfaction now is the surest path to further sales.

## ADDITIONAL PUBLICATIONS

1. Technical Data Sheets.
These are individual sheets which contain complete information for each instrument described in this catalogue.
2. Handbooks.
A comprehensive handbook is supplied with each instrument and additional copies are available for a nominal charge.

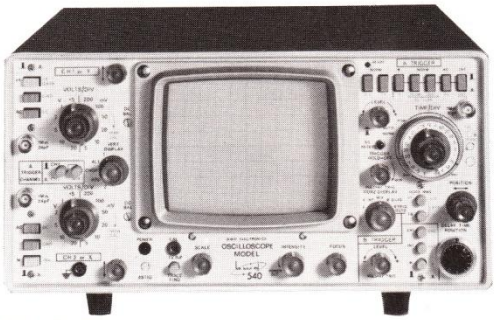
## AUSTRALIAN SALES & SERVICE CENTRES

See inside back cover for your nearest location.
EXPORT enquiries from outside Australia contact the Head Office.

NOTE All dimensions are shown in the sequence, width, height, depth.

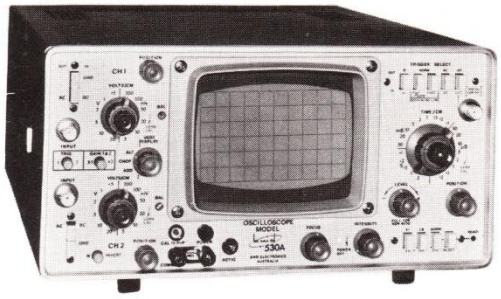
BWD Electronics Pty. Ltd., Miles Street, Mulgrave, Victoria

# portable oscilloscopes



## 540 (6625-66-083-0505)

The BWD540 dual channel 100 MHz oscilloscope provides the high performance and accuracy required in laboratory applications with light weight field portability. Operation is available from AC or DC power or an optional quick release rechargeable battery pack.
Both vertical channels sensitivity range extends from 5mV to 20V/div by a 12 step attenuator. Channel 1 gain can also be increased to 1mV/div by a x5 gain switch.
The main time base sweeps from 5nSec to 5Sec/div and the delayed time base from 5nSec to 1Sec/div.
Mixed, delayed sweep or delayed trigger are selectable with independent source, polarity and level select for the delayed trigger. Other trigger features include variable hold off and TV line and frame. Internal trigger take off is immediately after the attenuator input stage.
Although the facilities are very comprehensive, operational simplicity is established by logical control layout.

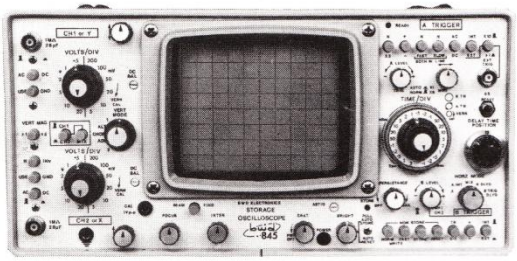


## 530A (6625-94-000-7863-94)

A compact high performance dual trace oscilloscope featuring a high intensity 6 x 10 cm CRT with an internal graticule. Identical vertical amplifiers with DC to 20MHz bandwidth at 1mV/cm, signal delay line and an isolated ground line for 'in circuit' measurements are complemented by a 40nSec to 10Sec/cm time base and stable DC to 30MHz triggering range. TV line and frame lock, identical X-Y operation, DC coupled Z modulation and an optional AC/DC/rechargeable battery power supply complete the instrument's generous specification.

| | 540 | 530A |
|---|---|---|
| CRT | 8 x 10 cm rectangular, internal illuminated graticule P31 or P7 phosphor. | 6 x 10 cm rectangular, internal graticule. P31 or P7 phosphor. |
| EHT | 12kV | 4kV |
| Display Area | 8 x 10 cm. Full deflection both channels. | 6 x 20 cm. Full deflection by both channels. |
| Z Modulation | DC to >10MHz Input 4.7kΩ & 10pF<br>0 to +2V for full modulation. Max input ±30V. | Input 2.2kΩ<br>0 to +5V for full modulation DC–10MHz |
| VERTICAL AMP. | | |
| Bandwidth | DC to 100MHz ) Both channels | DC to 30MHz ) Channel 1 only at x5 gain |
| Sensitivity | 5mV to 50V/div ) | 1mV to 4V/div ) |
| Rise Time | 4nSec ) | 10nSec ) |
| Input | 1MΩ & 26pF | DC to 20MHz-3db ) Both channels<br>1mV to 20V/cm ) |
| CMRR | >20db DC to 20MHz with vernier adjusted for optimum rejection | 17nSec<br>1MΩ & 30pF |
| Attenuator | 1, 2, 5, 10 sequence & vernier | 1, 2, 5, 10 sequence & vernier |
| Display Modes | Beam switching – Alternate, chopped, (500kHz) Chan. 1 only, Chan. 2 only, Chan. 1 & 2 add or subtract. | Alternate, chopped (250kHz) Chan. 1 or 2<br>Add Chan. 1 +2 or 1–2 |
| Common Line | Grounded | Isolated to ±400V DC |
| TIME BASE | MAIN OR DELAYING TIME BASE / DELAYED TIME BASE | |
| Calibration | 50nSec–1Sec/div / 50nSec–0.2Sec/div | 40nSec–2Sec/cm |
| | 23 steps & 5–1 vernier / 21 steps | 22 steps & 5–1 vernier |
| Magnification | x1 & x10 (5nSec/div sweep) | x1 to x5 calibrated |
| Trigger Facilities | Int \| Chan 1 \| + \| AC \| Auto \| Slow \| TV / Ext \| Chan 2 \| – \| DC \| Select \| Fast \| Line / Int \| + \| Chan 1 \| Level / Ext \| – \| Chan 2 \| Select | Int \| Chan 1 \| + \| Auto \| Norm \| Fast / Ext \| Chan 2 \| – \| Select \| TV/LF \| AC Line |
| Trigger Range | DC to >100MHz / DC to 100MHz | 10Hz to >30MHz auto trigger<br>DC to >30MHz level select |
| Single Shot | Yes | Yes |
| Horizontal Amp. | Identical X-Y operation from 5mV to 20V/div DC to 2.0MHz-3db | DC to 1MHz 5mV–20V/cm |
| X-Y Phase Shift | 2° DC to 500kHz at identical sensitivities | 2° DC to 500kHz |
| Cal Accuracy | >3% Vertical amplifier and time base at x1 magnification<br>>5% Ch 1 at x5 gain and time base at x10 magnification | 3% Amplifier and time base |
| Cal Signal | 1V p-p rectangular wave approx 1kHz 1% accuracy | 1% Accuracy 1V p-p line frequency |
| Auxiliary Outputs | Displayed time base, Main time base gate, Delayed time base gate and Chan. 1 vertical signal | Time base & gating waveform |
| Power | AC 98 to 135V & 195 to 270V, 48 to 440Hz 50W max.<br>DC 20 to 30V 1.5 Amps | 90–135 & 190–265V, 45–440Hz 30W |
| Dimensions & weight | 320 x 165 x 430mm 9.3kg Net | 320 x 170 x 430mm 8.3kg Net |
| Options | Rechargeable battery pack (charger is integral part of the BWD540 oscilloscope)<br>P7 CRT. | DC power supply & battery pack |
| Accessories | See page 6 | See page 6 |
| | DC-100MHz | DC-20MHz |

# variable persistence storage oscilloscope



## 845 *new*

Model BWD845 is a high performance portable, variable persistence storage oscilloscope.

It incorporates delayed and mixed sweeps and can be powered by AC, DC or by an optional rechargeable battery pack.
Variable persistence — Storage enables intermittent signals to be viewed that cannot be seen on a normal oscilloscope. It also retains very slow speed signals. Fast signals at low repetition rates can be integrated to make them readily visible. This technique makes it possible to view signals that are faster than the writing rate of the oscilloscope.

Two special features have been incorporated to simplify storage operation.
AUTO ERASE: This provides a continuous erase, write and view cycle. View time is approx 4 sec after writing is completed it is then erased and waits until triggered for the next sweep.
AUTO STORE eliminates the problem of the CRT fading green whilst waiting for a trigger pulse over a long period. The screen remains in the erase mode until the trace is triggered. Immediately the trace is written it is switched to store, it may be then viewed when required.

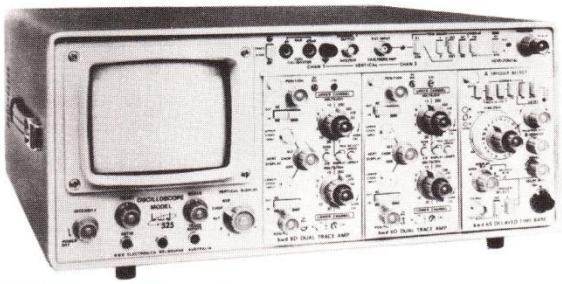
| | |
|---|---|
| CRT & EHT | Variable persistence storage 7.5kV EHT Burn resistant |
| Display | 8 x 10 div 1 div = 9.5mm Internal illuminated graticule |
| Z Modulation | Input 4.7kΩ & 10pF 0 to +2V will blank trace. DC–10MHz |
| Storage Characteristics | Writing speed (FAST >1cm/μ Sec. Viewing time: ( Up to 50 min when switched to NORM after<br>(NORM >1cm/10μ Sec. Storage time: ( writing and depending on background level<br>Variable Persistence: Decay time 1 Sec to approx. 60 Sec to 10% initial brightness.<br>Erase: Manual 800mSec. Automatically resets SS trigger in all modes.<br>Auto Erase Cycle: Erase, write, view (preset approx 4 seconds).<br>Auto Store: Continuous erase cycle until T.B. triggered. Display switched to store after trace is written.<br>Store time 30 min NORM 3 min FAST. |
| VERTICAL AMP<br>Bandwidth/Sens.<br>Both Channels<br>Rise Time<br>Input<br>CMRR<br>Attenuator | <br>DC to 30MHz-3db, 5mV to 20V/div<br>DC to 25MHz-3db, 1mV to 4V/div (x5 gain)<br><10nSec (5mV–20V) <14nSec (x5 gain)<br>1MΩ & 27pF<br>>20db DC to 20MHz with vernier adjusted for optimum rejection (single channel)<br>1, 2, 5, 10 sequence & vernier |
| Display Modes | Ch 1, Ch 2, Alternate, chopped (300kHz) or Ch 1 & 2 Add or subtract |
| Common Line | Grounded |
| TIME BASE<br>Function<br>Calibration<br><br>Magnification<br>Trigger Facilities<br><br>Trigger Range | <br>MAIN (A) OR DELAYING TIME BASE<br>100nSec–2Sec/div<br>23 steps + 3 to 1 vernier<br>x1 & x5 (20nSec/div max.)<br>Ch 1, Ch 2, mixed AC \| Slow \| Auto<br>Ext x1 & x10 DC \| Fast \| Select<br>DC to 30MHz<br><br>DELAYED (B) TIME BASE<br>100nSec–0.5Sec/div<br>21 steps + vernier<br>x1 & x5<br>Ch 1, Ch 2, Ext x1 & x10<br>DC Coupled<br>DC to 30MHz |
| Single Shot | Yes |
| Horizontal Amp.<br>X-Y Phase Shift | Identical X-Y Operation DC to 1MHz-3db from 1mV to 20V/div<br>>1° DC to 100kHz at equal sensitivities |
| Cal Accuracy<br><br>Cal Signal | >3% Amplifiers & time base at x1 gain or magnification<br>>5% Amplifiers & time base at x5 gain or magnification<br>1V p-p rectangular waveform 1% accuracy. Approx 1kHz frequency |
| Auxiliary Outputs | A & B time base gate waveforms |
| Power | AC 98 to 135V & 195V to 270V 48 to 440Hz 45W max.<br>DC 20 to 30V, 1.32 Amps max. |
| Dimensions & weight | 320mm x 165mm x 430mm 9.5kg Net. Battery Pack 5.5kg Net. |
| Options | Rechargeable Battery Pack type BWD BP3 (charger incorporated) |
| Accessories | See Page 6 |



DC-30MHz

# oscilloscopes

## plug-in

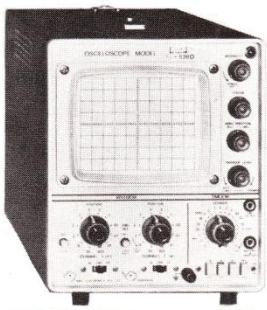


## 525&6 SERIES PLUG-INS

(6625-66-037-2844)

The BWD525 and 6 Series Plug-Ins offer performance and versatility at a very economical cost. Independent vertical amplifier channels enable different amplifiers to be fitted to each. This provides from 1 to 4 trace operation, single ended or differential inputs and amplifier sensitivities from 10μV to 50V/div. Two 6D's provide the exceptional flexibility of 4 traces of 5mV at 50MHz or two at 5mV and 50MHz plus two at 500μV and 25MHz or two differential channels of 5mV at 50MHz. The 6S time base offers a wide range of facilities with non-delayed sweep, mixed sweep, delayed sweep or delayed trigger. Trigger range extends to >70MHz and includes TV, SS, and line lock. Delayed trigger has separate polarity and level select controls.
Other features include Phase corrected identical X-Y, DC coupled Z mod., Chan. 1 output signal and a universal cabinet for portable use, bench or rack mounting.

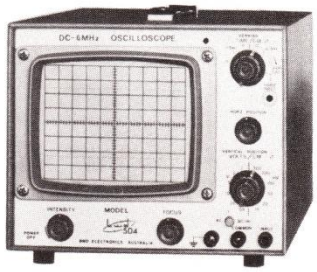
## dual trace



## 539D *new*

BWD539D. A versatile dual trace instrument with a 25MHz bandwidth at 5mV/cm and a cascade facility which increases sensitivity to 500μV/cm. Measurement capability extends to well beyond 30MHz and is matched by a time base that triggers to >30MHz. It also incorporates phase corrected identical X-Y operation, TV line and frame, signal output, and a high brightness CRT operating at 3.3kV.
If your applications include colour TV, CB radio, video or audio recording, μProcessors and digital circuits this is an excellent instrument for your needs.

## single channel isolated



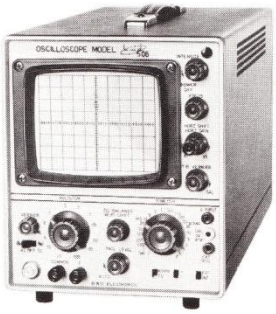
## 504

An exciting low cost model featuring a DC to 6MHz bandwidth, 10mV to 50V/cm sensitivity, and a remarkable 5Hz to 15MHz automatic trigger for the 0.5μSec to 0.1Sec/cm time base. X-Y operation is within 3° from DC to 50kHz, CRT is a large 8 x 10cm with 1.6kV EHT. It weighs only 5.4kg and is excellent for education, servicing, production or the experimenter.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 x 10cm rectangular, internal illuminated graticule. P31 or P7 phosphor<br>10kV | | | | | 13cm dia. P31 or P7 phosphor<br>3.3kV | | 13cm dia. P31 or P7 phosphor<br>1.6kV | |
| 8 x 10cm full deflection each channel | | | | | 8 x 10cm. Full coverage by both traces | | 8 x 10 cm | |
| Input 4.7kΩ<br>0 to +2V for full modulation DC to >10MHz | | | | | Input 0.01μF into 200kΩ<br>20V p-p for full modulation | | None | |
| 6A Plug-in<br>DC–40MHz<br>1mV–20V<br>9nSec<br>Differential<br>1MΩ & 25pF<br>>1,000–1<br>1, 2, 5, 10 & vernier | 6B Plug-in<br>DC–50MHz<br>5mV–20V<br>7nSec<br>1MΩ & 27pF<br>1, 2, 5, 10 & vernier | 6C Plug-in<br>DC–1MHz<br>10μV–20V<br>Differential<br>1MΩ & 30pF<br>>100,000–1<br>1, 2, 5, 10 & vernier | 6D Dual Trace Plug-in<br>DC–50MHz<br>5mV–20V<br>7nSec<br>1MΩ & 30pF<br>1, 2, 5, 10 & vernier<br>(2 x 6D = 4 Channels) | DC–25MHz<br>500μV–2V<br>14nSec<br>at x10 gain | DC to 20MHz–3db (6cm ref)<br>DC to 25MHz–3db (4cm ref)<br>5mV–20V<br>16nSec (14nSec for 4cm)<br>1MΩ & 35pF<br>1, 2, 5, 10 sequence | 12Hz–<br>100kHz<br>0.5mV/cm<br>single<br>channel | DC to 6MHz–3db (–6db ≈10MHz)<br>10mV to 50V/cm<br>55 nanoSec<br>1MΩ & 30pF<br>1, 2, 5, 10 sequence | |
| Beam switching –,Alternate, chopped (500kHz) Chan. 1 or 2 only<br>Chan. 1 & 2 add or subtract | | | | | Alternate, chopped (150kHz)<br>or Channel 1 only | | | |
| 6A, 6B, 6C and 6D Grounded | | | | | Grounded | | Isolated to ±400V DC | |
| 6S<br>MAIN OR DELAYING T.B.<br>100nSec–2Sec/cm<br>23 steps & 5–1 vernier<br>x1 & x10 (10nSec/cm sweep)<br>Int \| Chan 1 \| + \| AC \| Auto \| Slow \| TV<br>Ext \| Chan 2 \| – \| DC \| Select \| Fast \| Line<br>DC to >70MHz | | DELAYED T.B.<br>100nSec–0.5Sec<br>21 steps<br>Int \| + \| AC \| Level<br>Ext \| – \| DC \| Select<br>DC to >50MHz | 6T<br>Non-Delayed<br>Specification<br>as for 6S<br>main time<br>base | | 100nSec–2.0Sec/cm<br>21 steps & 5–1 vernier<br>x1 & x5 calibrated<br>Int \| Chan A \| + \| Auto \| Norm<br>Ext \| Chan B \| – \| Select \| TV<br>3Hz to >30MHz | | 0.5μ Sec–0.1Sec/cm<br>6 decades & 12–1 vernier<br>x1 only<br>Internal \| Auto<br>5Hz to 15MHz | |
| Yes | | | | Yes | No | | No | |
| 6A, B & D, DC to 2.5MHz<br>2° phase shift DC to 1MHz | 6C, DC to 1MHz<br>1° DC to<br>100kHz | Main frame DC–5MHz<br>500mV & 5V/cm | | | DC to 2MHz 5mV to 20V/cm<br>Identical X-Y operation<br>2°DC to 200kHz | | DC to 1MHz–3db 500mV–50V/cm<br><3°DC to 50kHz | |
| 3% Amplifiers and time base<br>1% Amplitude and frequency 1kHz square wave 4V, 40mV or 4mA | | | | | 5% Amplifier and time base<br>1% Accuracy 1V p-p line freq. | | <5% Amplifier and time base | |
| Channel 1 output 0.1V/cm of deflection. Sweep and gate outputs. | | | | | T.B. output 0 to 25V approx.<br>Vertical signal out. 100mV/cm | | | |
| 90–135V & 190–265V 48–440Hz 60 watts<br>420 x 180 x 400mm 12kg Net | | | | | 90–135 & 190–265V 50–60Hz 30W<br>190 x 240 x 430mm 7.1kg Net | | 100–135 & 200–265V 48–440Hz 15W<br>200 x 180 x 410mm 5.4kg Net | |
| P7 CRT. Rack adaptors<br>See page 6. 6Z Blank plug-in available for single amplifier use. | | | | | P7 CRT<br>See page 6 | | P7 CRT<br>See page 6. | |
| DC-50MHz | | | | | DC-25MHz | | DC-6MHz | |

# oscilloscopes

## single beam

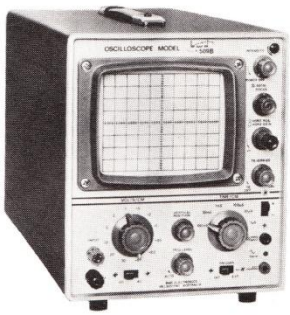


## 506

(6625-66-045-3479)

DC to 15MHz bandwidth at 5mV/cm, a wide range sweep from 40nSec to 10Sec/cm, very stable triggering to >15MHz and an active TV sync circuit makes the BWD506 incomparable for laboratory or service use. The sync separator will lock TV waveforms buried in noise and additionally locks to AM signals. To complete the versatility the input has an isolated ground for 'in circuit' measurements to ±400V from ground.

## single beam

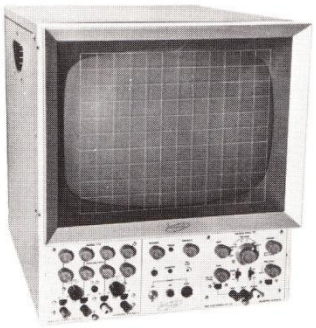


## 509B

(6625-66-ACN-0082)

One of the finest low cost solid state oscilloscopes available for education, production or servicing applications. It features a large 8 x 10cm bright crisp display 10mV sensitivity and DC to 10MHz bandwidth. A time base range from 200nSec to 15Sec/cm and superb triggering from <5Hz to 10MHz. X-Y phase shift is only 1° from DC to 100kHz and calibration is maintained with 5% over a line change of 10% or 10–40°C temp change. With direct reading controls and virtually automatic operation it is the choice of technicians and students around the world.

## large screen display



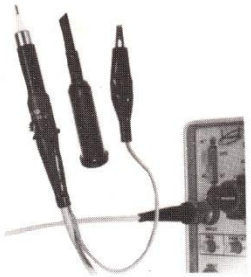
## 1722
## & 17 SERIES PLUG-INS

(6625-66-028-2836 1722D/17A/17E )
(6625-66-035-1359 1722B Main Frame)

A large screen (432mm) oscilloscope widely employed for viewing computer outputs, electro-medical displays, for classroom demonstrations and servo waveform measurements.
It features three cabinet arrangements with front or rear controls. Interchangeable X & Y plug-ins, with choice of 1 to 4 channels, a high gain differential amplifier and a calibrated triggered time base. Circuitry is silicon solid state for maximum reliability, stability and low power consumption.

| | | | | | |
|---|---|---|---|---|---|
| CRT | 13cm dia. P31 or P7 phosphor | 13cm dia. P31 or P7 phosphor | 432mm (diagonal) rectangular. P4, P7Y, or P26 phosphor<br>10 x 12 div coverage by all plug-in amplifiers | | |
| EHT | 3kV | 1.5kV | 8kV | | |
| Display Area | 8 x 10cm | 8 x 10cm | 10 x 12 div Full screen coverage 1 div = 25mm | | |
| Z Modulation | Input 0.01μF into 200kΩ<br>20V p-p for full modulation | Input 0.01μF into 200kΩ<br>20V p-p for full modulation | Input 47kΩ DC coupled<br>0 to +50V for complete blanking | | |
| VERTICAL AMPLIFIER | | | (6625-031-9077) | | |
| | | | 17A | 17B/2 | 17D |
| Bandwidth | DC to 15MHz | DC to 10MHz | DC–15kHz | DC–15kHz | DC–15kHz |
| Sensitivity | 5mV to 100V/cm | 10mV to 50V/cm | 25mV–50V/div | 30mV–50V/div | 50μV–20V/div |
| Rise Time | 23 nanoSec | 35 nanoSec | 30μSec | 30μSec | 30μSec |
| Input | 1MΩ & 35pF | 1MΩ & 40pF | Balanced 1MΩ | 1MΩ | Differential 1MΩ each side |
| Attenuator | 1, 2, 5, 10 sequence & vernier | 1, 2, 5, 10 sequence | 1, 5, 20 & vernier | vernier | 1, 2, 5, 10 & vernier |
| Display Modes | Single beam | Single beam | Beam switching – alternate or chopped (5kHz) | | |
| Common Line | Isolated ±400V DC | Grounded | Grounded | | |
| TIME BASE | | | 17E | | |
| Calibration | 50nSec to 2Sec/cm | 200nSec to 1Sec/cm | 10μSec–5Sec/div | | |
| Magnification | 22 steps & 5–1 vernier | 6 decades & vernier | 1, 5, 20 & vernier | | |
| Trigger Facilities | x1 & x5 calibrated<br>Auto \| + \| Int \| Norm<br>Select \| – \| Ext \| TV sync | x1 to x5 calibrated<br>Auto \| + \| Int<br>Select \| – \| Ext | x1 to x5 calibrated<br>Auto \| Int \| Norm \|<br>Select \| Ext \| Slow \| +<br>Preset \| Line \| Fast \| – | | |
| Trigger Range | 2Hz to 15MHz auto trigger | <5Hz to 10MHz auto trigger | DC to 25kHz | | |
| Horizontal Amplifier | DC to >1MHz<br>0.75V to >6V/cm | DC to 1MHz-3db<br>600mV to 6.5V/cm | DC to 10kHz (8 div deflection)<br>20mV to 50V/div | | |
| X-Y Phase Shift | 1°DC to 100kHz | 1°DC to 100kHz | | | |
| Calibration Accuracy | <5% Amplifier and time base | <5% Amplifier and time base | 10% Amplifiers and time base | | |
| Calibration Signal | Line freq. Square waves 2% accuracy | Line frequency sine wave | 2% Accuracy line frequency square wave | | |
| Auxiliary Outputs | Time base output 25V p-p | | | | |
| Power | 85–135 & 190–265V 50–60Hz 30W | 85–135 & 190–265V 50–60Hz 30W | 100–130V & 200–265V 50–60Hz 100 Watts | | |
| Dimensions & Weight | 190 x 240 x 420mm 7.1kg Net | 190 x 240 x 420mm 7.1kg Net | 425 x 490 x 510mm 27kg Net | | |
| Options | P7 CRT | BNC input socket & P7 CRT | P7Y & P26 CRT | | |
| Accessories | See page 6 | See page 6 | See page 6 | | |
| | DC-15MHz | DC-10MHz | DC-15kHz | | |

# oscilloscope accessories



## P32 DUO PROBE

PROBES.

P32. 10:1, 1:1 and 'off' position. 10MΩ & 11pF input in 10:1 position.

DC to 100MHz range. Retractable hook & tips. 1.2M cable & BNC connector.

P33. 10:1 probe 10MΩ & 12pF input capacity DC to 200MHz.

Interchangeable tips, 1m cable & BNC connector.

P30. 1:1 screened test prod.

P34. Demodulator probe kit
100kHz to 200MHz-0.5db
to 300MHz-1.0db

P40. Low cost 10:1 probe.
DC–80MHz. 1m cable
BNC connector.

BNC to 4mm adaptor available for all probes.

TROLLEYS.

T60 for instruments to 380mm wide x 610mm long.

T61 for instruments to 530mm wide x 610mm long.

Range of accessory drawers, sprung castors and multiple power outlets available for trolleys.

CAMERAS.

OC.1 Polaroid camera complete with adaptor to suit all BWD oscilloscopes.

Type P Telford with mounting bezel.

Type A Telford with mounting bezel for all BWD oscilloscopes.

This model features interchangeable backs for Polaroid film or roll film.

CASES.

Simulated leather carrying cases available for majority of BWD instruments.

RACK ADAPTORS.

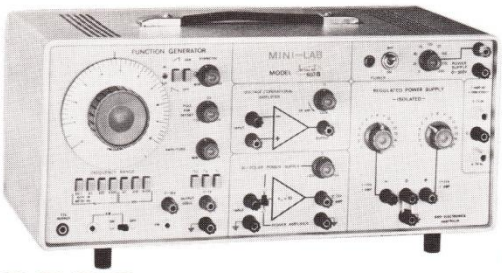
Angle sections and panels available to rack mount most BWD oscilloscopes.

Cables, terminals adaptors, plugs, sockets, handbooks, etc., also

DUST COVERS.

VIEWING HOOD. H46. Folding. For all BWD500 & 800 series oscilloscopes.

# mini lab



*new*

## 603B

## FUNCTION GEN/AMPLIFIERS/ MULTIPLE POWER SUPPLIES

**MINI LAB.** A most versatile instrument which combines a 0.001Hz to 2MHz function generator with a 7W DC coupled power amplifier, an op. amp, sweep ramp generator and 3 DC power supplies. Inputs and outputs are quite independent or may be linked for a multitude of uses. The Function generator has variable ramp and pulse output, two levels of attenuation and may be swept over a 100:1 range by its internal sweep ramp generator. The Power amplifier which extends from DC to >80kHz also doubles as a 1 amp bi polar or voltage controlled power supply or as a fixed +5V 1 amp supply. A comprehensive handbook describes the wide range of applications and waveform characteristics available.

**FUNCTION GENERATOR**
**Range:** 0.01Hz to 1MHz in 8 decade ranges. Plus an additional 200kHz to 2MHz range. Uncalibrated range extends to 0.001Hz.
**Output:** 0–10V p-p or 0–5V into 600Ω ) Simultaneous
0–1V p-p or 0–0.5V into 600Ω ) outputs.
**Functions:** Sine, square, triangle, ramp and pulse
1:1 to 50:1 ramp or pulse mark-space ratio
TTL compatible output >3V into 2 TTL loads.
**Output Offset:** 0 to ±5V
**Modulation:** FM 1000:1 DC coupled ) With external
AM 0 to 95% DC coupled ) signal.
Sweep 100:1 with internal sweep.
**Sweep:** Linear ramp variable >5Sec to approx 50mSec. Sweeps over complete dial range down to any 10% portion of the range.

**POWER AMPLIFIER**
**Frequency Response:** DC to 80kHz-3db
**Output:** 30V p-p current ±1 amp p-p (constant current overload) 7 Watts into 15Ω

**BI-POLAR POWER SUPPLY**
**Range:** Continuously variable from -15V to +15V with 1 amp max. current at any voltage.

**+5V POWER SUPPLY**
**Output:** Fixed +5V. Max current 1 amp.

Alternative outputs selected by a 3 position switch

**VOLTAGE/OPERATIONAL AMPLIFIER**
**Frequency Response:** DC to 80kHz
**Gain:** x1 to x100 continuously variable or may be switched with O/C feedback & isolated inputs.
**Input:** 10kΩ each side or 0.5MΩ isolated.
**Slew Rate:** 4V/μSec.

**DUAL POWER SUPPLY**
**Output:** +1 to +15V and –1 to –15V about a common 0 line. May be used as + and – rails to 15V or from ±2 to ±30V as a single supply.
**Current:** 1 amp short circuit protected.
**Line and load regulation:** <1%

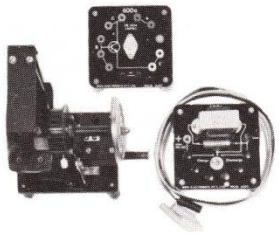
**HIGH VOLTAGE SUPPLY**
**Output:** 0–200V 30mA continuously variable
**AC Output:** 12.6V 1A CT (6.3–0–6.3) fused.

**POWER REQUIREMENTS**
95V–135V & 195–265V 50–60Hz.

**DIMENSIONS** 420 x 200 x 260mm
**NET WEIGHT** 10kg.

## 0.001Hz-2MHz 7W POWER OUTPUT

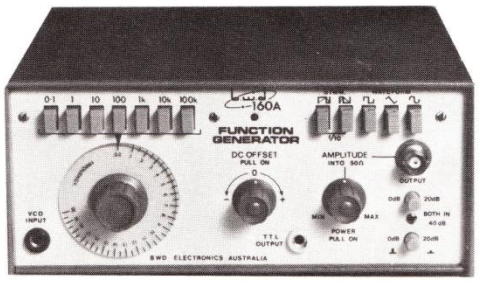
# accessories



## 600 SERIES

| | |
|---|---|
| 600A | DC-AC 2 pole motor/ generator with commutator, slip rings and permanent magnet. |
| 600B | Electromagnet 1m leads and 19mm square 75mm pole piece. |
| 600C | 24V lamp mounted with leads and plugs. |
| 600D | Microphone with 1m screened lead and input plugs. |
| 600E | Interconnecting leads, 1m long, fitted with 4mm stacking plugs. |
| 600F | 7-pin valve base on stand. Complete with 6AU6 valve. |
| 600G | Transistor mounted on stand. Complete with 2N3054 Silicon NPN power transistor. |
| 600H | 4 silicon diodes (2 amp). Diodes type BYX21-200. |
| 600I | 300–800kHz parallel resonant circuit and detector diode. |
| 600J | Cadmium sulphide cell with variable aperture light shield. |
| 600K | 6V relay mounted on stand. AC or DC operation. |
| 600L | R.C. charging circuit TC 1 Sec. |
| 600M | L.C. charging circuit TC 1 Sec. |
| 600N | 30Ω 100mm loud speaker on stand. |
| 600P | C.L. & R phase and impedance circuit. |
| 600Q | Low voltage relay with changeover contacts. |
| 600Z | Lined wooden carrying case. |
| | Dust cover. |

# function generators

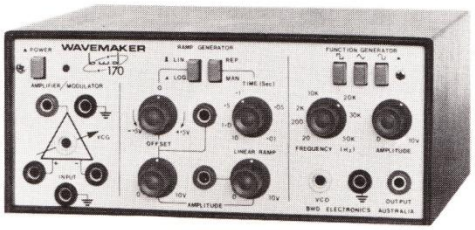



## 160A

The BWD160A is a very moderately priced generator providing 12 different waveforms and 5 simultaneous outputs. It can be swept over any section of its frequency range up to 4 decades wide by the BWD170 log or linear ramp output. Pulse or ramp outputs of either polarity have a fixed mark-space ratio of approx 20—1 thus maintaining a constant calibration at 1/10th the indicated frequency.
Sine, Square and Triangle outputs at a fixed 1V p-p level are available on the rear panel and a 20 load capacity TTL output at the front. Main output is 20V O/C with variable offset to ±10V or 10V into 50Ω.

| | |
|---|---|
| **Freq. Range:** | 0.02Hz to 2MHz in 7 ranges. |
| **Freq. Dial:** | 1—20 with uncalibrated point at 0.2<br>Accuracy ±3% of full scale above 2Hz. |
| **Waveforms:** | Sine, Square, Triangle, +Pulse, –Pulse, +Ramp & –Ramp. |
| **Output Voltages:** | 1. Main Output (front panel BNC)<br>0—20V O/C or 0—10V p-p into 50Ω via two step 40db attenuator and 100—1 vernier.<br>2. Auxiliary Outputs: (rear panel)<br>Sine, Square & Triangle or Pulse/Ramp if selected for main output.<br>1V p-p fixed. 1kΩ output impedance.<br>3. TTL 0 to +3V O/C to drive 20 loads.<br><50nSec rise time. |
| **DC offset:** | 0 to ±10V O/C or ±5V into 50Ω |
| **Sine Wave:** | <1% distortion 10Hz—200kHz<br><2% 5Hz to 1MHz. |
| **Square Wave:** | 100nSec rise time into 50Ω |
| **Triangle Wave:** | 2% symmetry.<br>99% linearity 1Hz to 100kHz. |
| **Pulse or Ramp:** | 1/10th indicated frequency.<br>±10% of full scale.<br>+ or –pulse or ramp by switch selection. |
| **Isolated Ground:** | Operation permissible up to ±200V DC from ground. |
| **Operating Temp:** | Calibration specified +10° to +35°C.<br>0 to 50°C specification tolerances x2 |
| **Power Requirement:** | 200—270V 6W<br>100—137V available as option.<br>48 to 440Hz. |
| **Dimensions and weight:** | 210 x 100 x 210mm 1.8kg Net. |

0.02Hz to 2MHz




## 170 WAVEMAKER

WAVEMAKER — a unique multipurpose triple function instrument. It can operate as a self contained Function sweep generator or be used in conjunction with the BWD160A or 603B and most other signal sources.
It contains a single range Function generator covering from 20Hz to 50kHz approx. A log or linear Ramp generator with a simultaneous linear ramp for driving an oscilloscope or other display is the second circuit block. The third is a voltage controlled DC to 10MHz amplifier which will amplitude modulate, frequency double or multiply in addition to amplifying from 0 to x2.
One feature provided for the Ramp generator is a manual sweep which enables the frequency of a VCO to be measured by a counter at any point along the sweep to facilitate making an accurate scale.
Applications for the BWD170 are only limited by the ingenuity of the user.

| | |
|---|---|
| **FUNCTION GENERATOR.** | |
| **Range:** | 20Hz to 50kHz approx. |
| **Waveforms:** | Sine, Square or Triangle. |
| **Output:** | 0—10V O/C. 0—5V into 600Ω |
| **Output Impedance:** | 600Ω±10%. |
| **VCO Input:** | May be swept over entire range or any part by the ramp generator. |
| **RAMP GENERATOR.** | |
| **Output:** | Log or linear ramp. 0 to +10V with ±0.5V offset.<br>–ve ramp via amplifier. |
| **Ramp Duration:** | 10mSec to 10Sec. |
| **Manual Sweep:** | Log or linear output. |
| **Auxiliary Outputs:** | Linear ramp 0 to +10V coincident with main output.<br>+ve & –ve 0 to +3V gating pulse. |
| **AMPLIFIER MODULATOR.** | |
| **Amplifier:** | DC to 10MHz–3db into 600Ω |
| **Output:** | ±10V O/C or ±5V into 600Ω |
| **Input:** | 10kΩ all inputs. ±40V p-p max. |
| **Gain Control:** | Gain is linearly controlled from 0 to x2 by a–2V to +2V input. |
| **Amplitude Modulator:** | 0 to 100% modulation. |
| **Range:** | 0 to 10MHz carrier or modulation. |
| **Balanced Modulator:** | 0 to 100% modulation. |
| **Range:** | 0 to 10MHz carrier or modulation. |
| **Mod. Balance:** | Within 10%. |
| **Frequency Doubler:** | Input 0 to 5MHz.<br>Output 0 to 10MHz. |
| **Multiplier:** | DC to 1MHz range.<br>DC to 100kHz for 10% accuracy. |
| **Operating Temp:** | Calibration specified +10° to +35°C.<br>0 to 50°C specification tolerances x2 |
| **Power Requirement:** | 200—270V 6W<br>100—137V available as option.<br>48 to 440Hz. |
| **Dimensions and weight:** | 210 x 100 x 210mm 1.8kg Net. |

20Hz to 50kHz

# oscillators

## sine & square wave

### 112B (6625-66-042-5147)

High output sine & square wave generator

A capacitor tuned oscillator with infinite resolution, and a high level, low distortion fully attenuable output. The simultaneously available square wave delivers a fast rise time low impedance output with attenuation down to a millivolt. Both sine and square outputs will drive into any resistive load down to a short circuit without change in characteristics.

### 141 (6625-66-050-4650)

Low distortion sine & square wave generator

A portable, battery or line operated sine and square wave generator providing the unusually wide range of 1Hz–1MHz. 800 hours battery life, sine wave and 400 hours square wave operation, together with small size and lightweight and remarkable low distortion typically below 0.06% from 100Hz to 100kHz make this instrument ideal for field or laboratory use.

## sine wave - precision

### 131 (6625-66-056-3765)

Sine wave oscillator with precision 100db attenuator

A wide range 10mW oscillator incorporating a 100db attenuator with decade steps and vernier.
Output is monitored on a meter and levels may be attenuated down to 10μV RMS with 5% accuracy over the entire frequency range. Output is accurately maintained at 600Ω and level is unaffected by temperature. Capacitor tuning provides stepless and bounce free frequency adjustment.

| | 112B | 141 | 131 |
|---|---|---|---|
| Frequency Range | 10Hz–1MHz (5 decade ranges) | 1Hz–1MHz | 5Hz to 600kHz |
| Facilities | Sine and square | Sine and square | Sine |
| Calibration | Better than 2% + 0.5Hz | Better than 5% 10Hz–1MHz | Better than 2% above 50Hz and 3% + 0.5Hz below 50Hz |
| SINE WAVE | | | |
| Output | 25V RMS O/C<br>12.5 RMS into 600Ω | 2.5V RMS into 600Ω | 2.5V RMS into 600Ω<br>5V RMS open circuit |
| Attenuator | 600Ω decade and vernier | 600Ω decade and vernier<br>Calibrated 0–2.5V RMS | 600Ω 1V to 10μV in decade steps plus x2.5 multiplier and 11 to 1 vernier ±3% output level setting accuracy. |
| Level | ±3% over entire range | ±3% over entire range | ±3% over entire range including 0 to +50°C temperature range |
| Distortion | <0.2% 100Hz to 40kHz | <0.1% from 100Hz–100kHz | <0.1% 100Hz to 100kHz 0.5% 5Hz to 600kH |
| Noise and Hum | <0.05% | 0.01% | 100db down on full output |
| Output Terminals | Single ended – grounded | Single ended – isolated | Single ended |
| Power Output | 250mW into 600Ω | 10mW into 600Ω | 10mW into 600Ω. Balanced output available battery operated with external CT resistor. |
| | NOTE: Oscillator will drive any output from O/C to S/C without change in level response or increase in distortion. | (Balanced output with external divider) | **Frequency Stability:** Better than 0.01% at any setting<br>**Output Impedance:** 600Ω ±10Ω (instrument operating) |
| SQUARE WAVE | Output range | | |
| Rise and Fall Time | 200nSec into 100pF 20V<br>150nSec into 10pF 20V<br>100nSec into 100pF 2V & below | 100nSec into 50pF and 10kΩ load | |
| Output | 20V p-p into open circuit<br>2V p-p into 50Ω | 2.5V p-p into 10kΩ | |
| Attenuator | 100Ω decade and vernier | 600Ω decade and vernier | |
| Output Impedance | 20V 0–250Ω<br>2V & below 100Ω | 600Ω constant below 0.2V | |
| Power Requirements | 85–135V & 190–260V 50–60Hz | 2 x 276P battery or AC Power module | 95 to 265V 45–440Hz 4 watts or rechargeable batteries. 20 hours operation. |
| Size | 210 x 200 x 255mm | 210 x 150 x 150mm | 210 x 160 x 250mm (half rack) |
| Weight | 4.3kg Net | 2.5kg Net | 4kg Net AC version |
| Optional Accessories | Dust cover<br>19" x 7" Rack adaptors | Dust cover. | Dust cover<br>19" Rack adaptor |
| Options | None | 01 AC operation<br>03 Battery operation | 01 AC operation only<br>02 AC and rechargeable battery operation. |
| | 10Hz - 1MHz | 1Hz - 1MHz | 5Hz - 600kHz |

# stabilised dc power supplies

## high current

## 207B

High current 10–15 & 20–30V DC supply

Although intended primarily to supply 12V and 24V communication equipment, this highly stabilised low impedance supply incorporating foldback overload will meet a wide range of applications.

## high voltage

## 216A (6625-66-046-2148)

Dual output high voltage supply

Two high voltage, completely isolated, stabilised outputs, together with two unregulated 6.3V AC outputs gives Model BWD216A excellent versatility as a general purpose laboratory power supply. It has been widely adopted for use in technical, high school and medical laboratories. 0 to + 400V rail fitted with 10 turn control.

## multi-range

## 272A (6625-66-ACN-0013)

Triple range programmable supply

Model BWD272A is a small but very high performance constant voltage-constant current supply. Features such as remote sensing, auto parallel, auto series, and remote voltage and current programming are standard and 10 turn voltage control. Crowbar overload is available as an option.

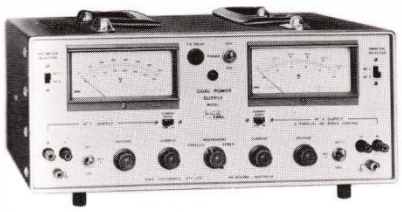
## 275 (6625-66-054-2067)

Dual range programmable supply

Model BWD275 is a very compact high performance supply providing two voltage-current ranges, full remote programming, auto series and parallel operation and remote sensing. Dual meters provide simultaneous voltage and current monitoring.
10 turn voltage control and crowbar overload is standard.

| | 207B | 216A | 272A | 275 |
|---|---|---|---|---|
| Output Voltage and Current Ranges | Two switched ranges.<br>10–15V at 12 amps<br>20–30V at 6 amps | 0–400V cont. variable 0–200mA<br>0–250V cont. variable 0–50mA<br>2 x 6.3V 3 amps AC phased for series or parallel operation. | 0–12.5V at 2A<br>0–25V at 1A<br>0–50V at 0.5A<br>Voltage and current continuously adjustable over each range. | 0–36V at 2A<br>0–72V at 1A<br>Voltage and current continuously variable over each range. |
| **CONSTANT VOLTAGE** | | | | |
| Range | Both ranges | Both ranges | All ranges | Both ranges |
| Line Regulation | 0.1% | 0.002% + 3mV | 0.001% + 100μV | 0.002% + 100μV |
| Output Impedance | 5mΩ (DC–1kHz) | 5mΩ (DC–1kHz) | 1mΩ (DC to 1kHz)<br>2mΩ 0–50V | 1mΩ (DC to 1kHz)<br>2mΩ 0–72V |
| Ripple | 1mV RMS (5mV p-p) | 1mV RMS | 200μV RMS (1mV p-p) | 200uV RMS (1mV p-p) |
| Response Time | 50μSec | 50μSec | 40μSec | 50μSec |
| **CONSTANT CURRENT** | | | | |
| Range | Preset 13A (10–15V)<br>6.5A (20–30V) | 20–200mA 60mA (preset)<br>0–400V 0–250V | 0.01–2A 0.01–1A 0.01–0.5A<br>0–12V 0–25V 0–50V | 0.01–2A 0.01–1A<br>0–36V 0–72V |
| Voltage Limits | Foldback overload commences approx. 1V below set output voltage. | | | |
| Output Impedance | N.A. Overload protection only. | 10kΩ 10kΩ | 100kΩ | 100kΩ 10kΩ |
| Current Ripple | | 4mA RMS 4mA RMS | 100μA RMS | 200μA RMS 200μA RMS |
| Line Regulation | | 0.05% + 20μA 0.05% + 20μA | 0.005% + 100μA | 0.005% + 100μA |
| Metering | 0–35V and 0–15A | 0–400V & 0–200mA | 0–20 & 0–50V ) switch<br>0–2 amps ) selected | 0–36 & 0–72 ) by switch<br>0–0.2 & 0–2 amps ) selection |
| Power Requirements | 90–137V & 190–265V<br>50–60Hz | 90–137V & 185–265V<br>50–60Hz | 90–137V & 185–250V<br>50–60Hz | 90–137V & 185–250V<br>50–60Hz |
| Dimensions | 290 x 255 x 305mm | 210 x 200 x 310mm | 210 x 200 x 285mm | 210 x 200 x 305mm |
| Weight | 153kg Net | 9.5kg Net | 5.6kg Net | 6.6kg Net |
| Options | None. | Digit dial for 10 turn control.<br>10 turn voltage controls for 0 to 250V rail. | Digit dial for 10 turn control.<br>10 turn current controls.<br>Crowbar overload. | Digit dial for 10 turn control.<br>10 turn current controls. |
| Accessories | Dust cover. | 19" single/dual rack mounting adaptor.<br>Dust cover. | 19" single/dual rack mounting adaptor.<br>Dust cover. | 19" single/dual rack mounting adaptor.<br>Dust cover. |
| | 12V 12A<br>24V 6A | 400V 200mA<br>250V 50mA | 12V 2A<br>50V 0.5 | 36V 2A<br>72V 1A |

# dual supplies



## 242A

Dual output
programmable supplies

(6130-66-068-9204)

Extremely versatile dual supplies with front panel switching for series or parallel operation. Set volts, set current, use switches on each supply, remote sensing and full voltage and current programming with auto series or parallel operation facilities are combined in these models with a very high performance specification to set new standards for a laboratory supply. Incorporates 10 turn voltage controls and crowbar o/load is optional.

| | |
|---|---|
| 0–36V 2A )<br>0–36V 2A ) Independent<br>or<br>0–36V 4A Parallel<br>or<br>0–72V 2A Series<br>±0–36V 2A Auto tracking | |
| Independent<br>0.002% + 100μV<br>1mΩ(DC to 1kHz) | Parallel & Series<br>0.005% + 200μV<br>2mΩ(DC to 1kHz) |
| 300μV RMS (4mV p-p) | |
| 60μSec | 100μSec |
| 0–4A & 0–2A<br>0–36V & 0–72V | |
| Independent<br>100kΩ<br>200μA RMS<br>0.005% + 100μA | Parallel<br>>10kΩ<br>500μA RMS |
| | Series<br>>10kΩ<br>200μRMS |
| 0–4A 0–72V<br>0–0.2A 0–36V | |
| 90–137V & 185–250V 50–60Hz | |
| 420 x 200 x 270mm<br>16kg Net | |
| Digit dial for 10 turn controls.<br>10 turn current controls.<br>Crowbar overload.<br>19" rack mounting adaptors.<br>Dust cover. | |
| 36V 2A x 2 | |

## 246A

Dual output
programmable supplies

(6130-66-050-7020)

Extremely versatile dual supplies with front panel switching for series or parallel operation. Set volts, set current, use switches on each supply, remote sensing and full voltage and current programming with auto series or parallel operation facilities are combined in these models with a very high performance specification to set new standards for a laboratory supply. Incorporates 10 turn voltage controls and crowbar o/load as standard.

| | |
|---|---|
| Independent<br>Parallel<br>Series<br>Auto tracking | 0–36V 5A)<br>0–36V 5A)<br>or<br>0–36V 10A<br>or<br>0–72V 5A<br>±0–36V 5A |
| Independent<br>0.002% + 100μV<br>1mΩ(DC to 1kHz) | Parallel & Series<br>0.005% + 200μV<br>2mΩ(DC to 1kHz) |
| 300μV RMS (4mV p-p) | |
| 60μSec | 100μSec |
| 0–10A & 0–5A<br>0–36V & 0–73V | |
| Independent<br>100kΩ<br>500μA RMS<br>0.02% + 100μA | Parallel<br>>10kΩ<br>1mA RMS |
| | Series<br>>10kΩ<br>500μA RMS |
| 0–10A 0–72V<br>0–0.5A 0–36V | |
| 90–137V & 185–250V 50–60Hz | |
| 420 x 200 x 270mm<br>22kg Net | |
| Digit dial for 10 turn controls.<br>10 turn current controls.<br>19" rack mounting adaptors.<br>Dust cover. | |
| 36V 5A x 2 | |


**BWD ELECTRONICS PTY. LTD.,**
REG. OFFICE & ADMINISTRATION
RESEARCH & DEVELOPMENT CENTRE
NATIONAL & EXPORT SALES
MANUFACTURING & SERVICE DIVISION.

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P.O. BOX 325, SPRINGVALE, VICTORIA 3171
PHONE: (03) 561 2888
TELEX: AA35115
CABLES: 'OSCILLOSCOPE' MELBOURNE.


### AUSTRALIAN DISTRIBUTORS:

**VICTORIA:**

BWD Electronics Pty. Ltd.,
Miles Street,
Mulgrave, 3170
Phone: (03) 561 2888

Radio Parts Group,
562 Spencer Street,
West Melbourne, 3003
Phone: (03) 329 7888

1103 Dandenong Road,
East Malvern, 3145

**NEW SOUTH WALES:**

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422 Lane Cove Road,
North Ryde, 2113
Phone: (02) 888 8111
Telex: AA20623

**SOUTH AUSTRALIA:**

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Adelaide, 5000
Phone: (08) 51 4713
Telex: AA88261

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Telex: AA41052

**TASMANIA:**

Associated Agencies Pty. Ltd.,
25–29 Barrack Street,
Hobart, 7000
Phone: (003) 23 1843

&
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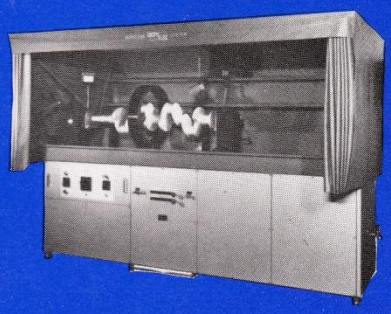
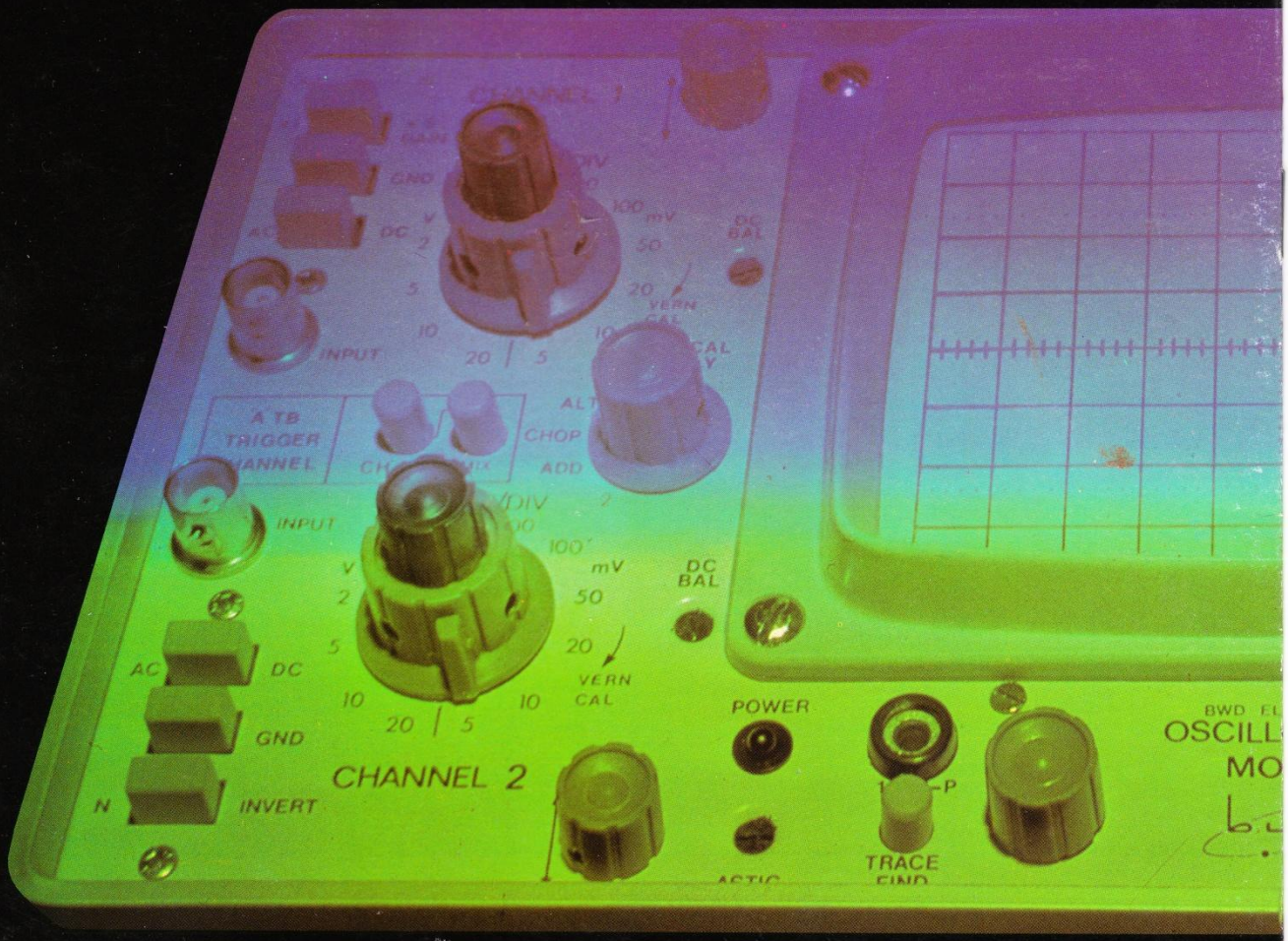
Launceston, 7250
Phone: (003) 31 3300



**'LECTROFLUX'**
**NON-DESTRUCTION TESTING DIVISION**

In addition to the BWD range of instrumentation, the 'Lectroflux' NDT Division manufactures and markets a wide range of magnetic particle inspection equipment, including portable hand held units up to large capacity bench units with magnetising currents up to 14,000 Amps AC & DC, employing advanced engineering concepts.

# BWD


INPUT
AC
DC
GND
INVERT
CHANNEL 2
mV
DC BAL
VERN CAL
POWER
TRACE