

SCOTTISH SCHOOLS SCIENCE

EQUIPMENT RESEARCH

CENTRE

Bulletin No. 74.

October, 1974.

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Introduction

At the time of writing we are in the process of duplicating a revision of the equipment list for integrated science, and schools should receive a copy very shortly after this bulletin, if they have not already done so. We will send it to all names on our address list except readers outside the U.K. Foreign recipients of our bulletin do not, in the main, teach Scottish Integrated Science, and we have tried to reduce our costs by thus restricting the circulation. However, anyone from abroad who wishes to have a copy of the list should send us 15p (or the equivalent in their own currency) with, please, a clearly printed address in BLOCK CAPITALS, and the list will be sent to them. The same charge, which includes postage, will apply to anyone in the U.K. who is not on our address list, or to anyone wishing additional copies.

Section	Pupil Apparatus	Demonstration and stations apparatus
1	£ 83	£ 52*
2	43	81
3	-	59
4	430**	206
5	9	11
6	8	91
7	231	131
8	20	96
9	11	44
10	9	11
11	105	142
12	10	20
13	131	44
14	3	144
15	141	158

Notes: Costs rounded up to nearest £.

*Includes one pupil oscilloscope.

**Includes 12 '0' grade microscopes.

The list has been prepared in co-operation with the revisers of the Heinemann worksheets for Integrated Science, so that the two are compatible. In these inflationary times, it is impossible to be up-to-date with prices, which may explain why, although it is being issued only in September, it is dated May, 1974. All prices quoted were current in May, or later than that date. We have usually tried to quote two suppliers for each item, to give some idea of the price range possible. When the sums are done, multiplying the pupil scale apparatus by 12 (i.e. assuming a

class of 24 working in pairs), and always taking the lower of the two costs quoted for an item, we find that the total cost of pupil apparatus is some £1230, and of demonstration and stations apparatus, about £1290. Even then this is not the total cost of equipping to teach integrated science at May, 1974 prices. Excluded are items of basic equipment such as burners, retort stands and clamps, test-tubes etc., which are common to any laboratory whatever its function. Amongst these basic items, for which we intend soon to issue a revised list, we include such expensive items as top-pan balances and desk calculators.

For those who are interested, the break down of costs by section for the integrated science list is as above.

Physics Notes

The following items of surplus equipment are still available, and from item 452 onwards we give details of items not previously listed. We strongly advise clients wishing to obtain any of the new items to telephone us to reserve their requirements, as all orders are handled on a first come, first served basis. We will hold material for any reasonable period, and normally we advise clients to arrange their own mode of transport, as freight charges can easily cost more than the goods themselves. For items previously notified, the number in brackets gives the bulletin in which details will be found.

- Item 369. (67) Kodak stabiliser, 10p.
- Item 370. (67) Borax powder, 10p.
- Item 371. (67) Motors, £1 - £2.
- Item 375. (67) Wire recorder, £5.
- Item 379. (67) Tuning fork, 50p.
- Item 381. (67) Heating elements, 5p.
- Item 383. (67) Pre-set potentiometer, 10p.
- Item 384. (67) Mixed value resistors, 5p.
- Item 385. (67) Mixed value resistors, 10p.
- Item 390. (67) Nife battery, 60p.
- Item 396. (67) Fluorescent lamp shades, 10p.
- Item 398. (67) Psychrometer, £2.
- Item 411. (69) Asbestos sheet, 5p.
- Item 412. (69) Asbestos sheet, 40p.
- Item 413. (69) Nickel cadmium battery, £1.
- Item 417. (69) Fan units, £1 - £5.
- Item 418. (69) Nasal spray, 30p.

- Item 420. (69) Petri dish, 20p.
- Item 421. (69) Rubber balls, 40p.
- Item 422. (69) Power supply, £5.
- Item 423. (69) Power supply, £5.
- Item 424. (69) Power unit, 20p.
- Item 434. (72) Pipettes, 10p.
- Item 438. (72) Linagraph paper, 50p.
- Item 443. (72) Adding machine, £1.
- Item 445. (72) Tape printing machine, £1.
- Item 450. (72) Ballraces, 5p.
- Item 451. (72) Nylon gears, 5p.
- Item 452. Tape recorder, series 4 by Ferrograph. Twin track, three tape speeds of 3.75, 7.5 and 15 in/s. 7" tape reel. Output $2\frac{1}{2}W$ into 15Ω . Socket for external speaker; provision for fitting stereo head; weight 23kgf. With operating instructions, £10. Note; this item will be sold only against an official requisition order.
- Item 453. Double pulse generator, type 5002 by Nagard. Provides single or double pulses of either polarity in the following ranges; p.r.f. 0.1Hz - 1MHz, continuously variable; amplitude 11 switched ranges 20mV - 50V; pulse width $0.1\mu s$ - 1s, continuously variable; separation between double pulses $0.2\mu s$ - 2s, continuously variable. Trigger sockets with provision for free running at p.r.f., external + or -, and single shot push button. Pre-pulse output for triggering oscilloscope. Output impedance 100Ω . The pulse edges in this generator are sufficiently sharp to operate into the SN74 series of integrated circuits. With operating instructions, £10.
- Item 454. Pulse generator, type 1321C by Fleming Radio. Pulse duration 1, 2, 3, 4, or $5\mu s$; three amplitude ranges viz. $\pm(1-10)V$; $+(4-40)V$; each continuously variable. P.r.f. continuously variable, 50Hz - 5kHz. Pre-pulse output for triggering oscilloscope. Output attenuator dividing the above amplitudes by 10, 100, 1,000 or 10,000. Output will operate into the SN74 series of integrating circuits, £5.
- Item 455. Stabilised power supply, type V50-20D by Roband Electronics. Outputs +500V, 200mA, and -85V at negligible current, both continuously variable; also 2 x 6.3V, 5A centre-tapped ac. 500V supply metered for current and voltage. £5.
- Item 456. Stabilised transistor power supply, type AS870 by Solartron. 30V, 3A switched in 100mV steps. Output changes by less than 10mV on mains input variation from 200 - 270V, and by 0.25V from zero to full load current. Output current meter, and overload protection cut-out. £10.
- Item 457. Twin channel pre-amplifier, type PA3 by Teleequipment. Gain per channel 100; output impedance $10k\Omega$. £3.

- Item 458. Double trace oscilloscope, type CD711S by Solartron. Bandwidth on both channels dc - 3MHz; maximum sensitivity 3mV/cm. Time base range 3cm/ μ s - 0.3cm/s. Weight 50kgf. £10.
- Item 459. Stabilised E.H.T. power unit, type 532 by Isotope Developments. Three continuously variable ranges 300 - 750V, 5mA; 750 - 1500V, 5mA; 1.2 - 3.0kV, 3.5mA, and one pre-set range 2.2kV, 7mA. Output may be of either polarity; large scale output voltmeter. With operating instructions, £10.
- Item 460. Scaling unit, type 1266B by Ericsson. This has five numericator tubes so that the maximum count is $10^5 - 1$. The unit will count a regular or random series of positive pulses, amplitude 0.5V or greater, duration 1 μ s or greater. For Geiger pulse counting the unit has switched paralysis times of 50 μ s, 500 μ s and 5ms, and adjustable discriminator bias 0 - 10V. £5.
- Item 461. E.H.T. transformer. Primary tapped for 75, 100, 120, 150, 200, 220 and 240V. Secondary link can be set for outputs of 8, 10, 12 and 15kV. Output power 250VA. £4.
- Item 462. Stabilised power supply, type AS952.2 by Solartron. 200 - 300V, 100mA output continuously variable by means of a pre-set control. Ac outputs 6.3V, 4A centre tapped; 6.3V, 2A centre tapped, and 6.3V, 1A. With operating instructions. This is a sub-unit of a larger assembly and although self-contained will require some form of cover to render it safe, and output terminals to be fitted. £3.
- Item 463. Oscilloscope, type L103 by Nagard. Y sensitivity 200mV/in, with attenuator dividing by 3, 10, 30, 100 or 300. Bandwidth dc - 10MHz. Calibrated time base for measurement of frequency or time. Timebase range 20in/s - 0.2in/ μ s. A top panel on the oscilloscope gives access to both X and Y plates, and to the grid of the cathode ray tube. This unit comprises separate oscilloscope and power unit fitted to a floor trolley, total weight estimated about 60 - 65kgf. Supplied with operating instructions, £5.
- Item 464. Standard capacitor, by H. Tinsley. Two decade and one plug switch, giving 0 - 1.99 μ F in steps of 0.01 μ F. £2.
- Item 465. Calculating machine, type VA-17 by Badenia Calculators. An electro-mechanical calculator, performing the basic functions of +, -, x, and \div . 11 digit entry capacity, 17 digit register for +, -, and x; 8 digit register for division. £3.
- Item 466. Microsecond Counter Chronometer. A short interval timer, counting in μ s. The display is in the form of six moving coil meters, calibrated 0 - 9. Start, stop and reset push buttons; start and stop input terminals. £6.
- Item 467. Stabilised E.H.T. power supply, type 1892 by Rank Cintel. Two continuously variable ranges 450V - 1kV, and

- 900V - 2kV, both at 5mA maximum current. Output may be of either polarity. With output voltmeter, and operating instructions, £5.
- Item 468. Stabilised E.H.T. Power Unit, type 1082B by Peto Scott Electrical. 4 output ranges, 0.5, 1, 2 and 3kV, continuously variable. Output may be of either polarity, maximum current unknown. With output voltmeter, £5.
- Item 469. Ultrasonic Cleaning Bath. Inside dimensions 15 x 13 x 10cm deep. Requires an input of 40W at 90kHz; otherwise in working order, £2.
- Item 470. Quartz spectrophotometer, type DU by Beckmann. This has a sealed optical system with the following calibrated dials; wavelength 200 - 300nm x $\frac{1}{2}$ nm; 300 - 400 x 1nm; 400 - 600 x 2nm; 600 - 800 x 5nm; 800 - 2000 x 10nm. Slit width 0.01 - 2mm; optical density 0 - 0.4 x 0.005; 0.4 - 1 x 0.01. The optical density dial is also calibrated in %age transmission from 0 - 110%. The electronic side appears to be complete, but we cannot guarantee its operation because of the profusion of separate dc voltages required. With operating instructions, £10.
- Item 471. Hydrogen lamp, model B, by Beckmann. For use with Item 470, and in working order, with operating instructions, £3.
- Items 472 - 482 are all moving coil meters, panel mounting. The F.S.D. is given in mA or μ A, and the scale length in mm can be taken to be that of a 90° arc of a circle. Almost all the meters have a derived calibration e.g. volts, watts etc; if the scale range is that of the F.S.D. they are stated as 'true'. Most have linear scale divisions, otherwise 'non-linear' is stated. Nearly all are new and unused. In addition to those listed we have other used and unused meters, usually singles, in a variety of ranges and costing £1 - £2.
- Item 472. 100 μ A; 50mm; some true, £1.
- Item 473. 50-0-50 μ A; 70mm, £1.50.
- Item 474. 50-0-50 μ A; 50mm, £1.
- Item 475. 100 μ A; 80mm, slightly non-linear, £1.50.
- Item 476. 200 μ A; 80mm, non-linear, £1.50.
- Item 477. 500 μ A; 85mm, non-linear, £1.50.
- Item 478. 1mA, 50mm, £1.
- Item 479. 1mA, 70mm, £1.50.
- Item 480. 1mA, 100mm, mirror backed scale, £2.
- Item 481. 1.5mA, 100mm, slightly non-linear, £1.50.
- Item 482. 50V AC, 80mm, true, £2.
- Item 483. Electrostatic voltmeter, 1-5kV x 100V, 60mm scale, in wooden case with flying leads, £2.
- Item 484. Dc motor, 12-24V, driving a precision gear train driving a 360° rotation 20k Ω potentiometer, 50p.
- Item 485. Steel calipers, 15cm, 10p.

- Item 486. Cellacetate sheet, suitable for overhead projector transparencies, 60 x 140cm, 10p.
- Item 487. Desk telephones, G.P.O. type, without dial, £1.
- Item 488. Army field telephone set F with hand generator, £1.
- Item 489. Polythene vat, 96 x 46cm, height x dia., with open, threaded bung-hole at bottom, £2.
- Item 490. Auto-transformer 230V, 21.8A primary; 115V, 43.5A secondary. Weight 70kgf. £2.
- Item 491. Capacitor, 10uF, 10kV dc; 42 x 23 x 60cm, 1 x b x h; weight 82kgf, £1.
- Item 492. Multi-segment rotor for dc motor. The shaft of this rotor protudes 25mm at each end and is flattened at two points. When this has been turned down to make it circular, the rotor can be used with other Westminster e-m kit parts. 5p.
- Item 493. Telephone switchboards, scrap value only. Contains 20+ keyswitches and approx. the same number of jack sockets and low voltage indicator lights. £1.
- Item 494. Transistors OC42, OC84, 1p.
- Item 495. Power transistors on heat sink, OC29, 2G221, 5p.
- Item 496. Galvanised mouse cage top, by North Kent, believed to fit their mouse breeding cage, top dimensions 143 x 316mm. Slightly rusty. 20p.
- Item 497. Galvanised rat cage top, as above but dimensions 263 x 428mm. 30p.

Biology Notes

Bulletin 71 Trade News gave details of the Griffin Biological Basic Microbiology Kit, in which we mentioned that the kit contained autoclavable bags for disposal of contaminated plastic petri dishes, and commented that these should in any event be incinerated and not just dumped in the waste bin - autoclaved or not. As a result we have had the following letter from the firm:

"Although I would agree with you that incineration after autoclaving is the ideal method of disposal, I do not agree with you that it is the only method of disposal. Many schools do not have facilities for incineration and for these autoclaving in a suitable bag, followed by discarding the unopened bag into the normal refuse disposal system must be used. This is the method described in "Recommended Practice for Schools relating to the use of Living Organisms and Material of Living Origin".

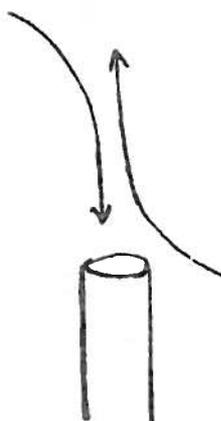
I have contacted MISAC about this problem of disposal and was sent a pre-print "Practical Tips for the Safe Handling of Micro-organisms in Schools", to be published in School

Science Review. This specifically states that, after autoclaving, "the bags can be safely placed in refuse bins or incinerated".

We at Tonbridge have been very concerned with the safe use of micro-organisms in schools and are, to the best of our knowledge, the only suppliers offering a microbiology kit which contains autoclavable disposal bags. In view of this we were rather disappointed to read your inference that these bags are valueless. Perhaps you would be kind enough to comment on this."

If we have given the impression that autoclavable bags are valueless, we did not mean to, and we apologise to the firm for the inference. We recognise that there will be schools where incineration is not possible and in these circumstances autoclaving and dumping is the answer. But where facilities for incineration exist, e.g. a solid fuel burner in the central heating system, they should be used. In preferring this method we were not primarily concerned with the contamination of the petri dishes, but with the dishes themselves. We were thinking of their possible fate when they enter the public refuse disposal system. At a controlled tip they may be burned in the open. Most plastic petri dishes appear to be polystyrene, which in open burning gives off dense black acrid fumes. At other tips they may not be burned, but join other non-biodegradable material added to the soil. Either way, they pollute the environment. By contrast, proper incineration will result in the production mainly of carbon dioxide and water vapour. This was the point we sought to make in Bulletin 71, evidently imperfectly.

Chemistry Notes



Various types of gas lighters are available, the piezo crystal type being promoted quite extensively at the present time. We tested the various types and found that all worked well with town gas (high hydrogen proportion) but some models did poorly with natural gas. Propane and butane were not as difficult to ignite as natural gas. It is important in using a gas lighter that the igniter, be it spark or filament, should

be placed in the gas flow where the proportion of fuel gas to air is within the limits for ignition. Thus it is found that if the igniter is in a stream of gas from a burner with air valve closed, ignition will not take place until the igniter is moved out of the gas flow to where it encounters a gas air mixture which can ignite with the particular igniter. If however the burner air valve is partly or fully open ignition does not occur unless the igniter is about 20-50mm above the top of the burner. Therefore we would recommend that instead of holding the lighter in the one place and turning on the gas, the gas be first turned on and the lighter then moved into the flame and either upwards or downwards, i.e. one of the paths shown above. This then gives the lighter a greater chance of encountering a gas/air mixture suitable for ignition by that particular igniter.

The difference in ease of ignition of gas by a lighter depends on the composition of the gas, the ignition temperature, and the burning velocity of the gas. Some properties of the gases involved are given below.

Composition

Compound	Town Gas	Natural Gas
H	51%	0%
CH ₄	19.1	94.8
C ₂ H ₆	1.7	3.0
C ₃ H ₈	0	0.5
C ₄ H ₁₀	0	0.2
C ₅ H ₁₂	0	0.2
C _n H _m	3.5	0
CO	14.6	0
CO ₂	3.6	0
N ₂	6.1	1.3
O ₂	0.4	0

Characteristics

	Town Gas	Natural Gas
Calorific value	18,600 kJ/m ³	37.900 kJ/m ³
Specific gravity (Air = 1)	0.47	0.58
Maximum burning velocity	0.97 m/s	0.33 m/s
Air required for complete combustion of 1m ³	4.4m ³	9.2m ³
Flammability range, % gas in air	4 - 40	5 - 15

The other commercial fuel gases, propane and butane,

have variable composition so that no precise characteristics can be given. Although their sale is controlled by a British Standards specification, BS4250:1968, this does not found on such parameters as minimum %age of the pure compound or minimum calorific value, but on properties such as vapour pressure limits, maximum allowable %age of certain impurities etc.

Auto-ignition temperature for different compounds:

H	- 585°C;	CH ₄	- 538°C;	C ₂ H ₆	- 515°C;
C ₃ H ₈	- 468°C;	C ₄ H ₁₀	- 405°C;	C ₄ H ₈	- 384°C;
C ₅ H ₁₀	- 309°C.				

The lighters which we examined were:-

- 1) Flint type, S31-562 from Griffin and George also obtainable from other school suppliers, local ironmongers etc 62p, with flints costing 50 for 41p.
- 2) Battery operated filament type, S31-572 from Griffin and George, also obtainable as above. 85p; spare 1½V cell, 25p. This type requires a higher powered element when used with natural gas, as the hydrogen in town gas gives a catalytic effect, thus raising the filament temperature.
- 3) Gas Wand from Mendel Bros. This has no battery and depends solely on catalytic action, and hence is unsuitable for natural gas.
- 4) Piezo-electric type, Junkers model from Trade Aids. £2.05. This does not require a battery; a trigger action produces a single spark.
- 5) Piezo-electric type, by Horstmann, S31-582 from Griffin and George, and obtainable from local ironmongers and other school suppliers. £3.10. Other piezo-electric types are available but have not been tested by us, e.g. Labap, C604 from Philip Harris, £2.10, or Meteor, 85-1776 from Macfarlane Robson, £1.80.
- 6) Magispark by Plessey, available from Scottish Gas, local ironmongers etc. £2.75. This uses a transistor, battery-operated circuit so that the unit when switched on gives repetitive sparking.

The results of our tests, and our conclusions are given in the supplement to this bulletin on p. 11.

* * * * *

We have had a communication from Liberton High School concerning the liquid dispenser described in Bulletin 73, pointing out that by using a cork borer to punch an appropriate hole in the existing detergent bottle top, there is no need to have specially selected diameter of tubing, and secondly, that the end of the tubing can be blocked by a short length of glass rod, instead of heating and squeezing.

Trade News

Rhodes Flamefast, note the change of name from Flamefast Engineering, now supply a ribbon burner attachment model RB1 price £6.00 for use on natural gas. This fits on top of the standard burner. The ribbon length is 105mm and flame retention is very good. They also supply a bench blow pipe, which is suitable for use with all the fuel gases, town, natural, and L.P.G. Good control is obtainable giving flame from a very fine cone. Model number is BL1 and price £24.00.

We have been asked by Griffin Biological Laboratories to point out that some teachers may have been misled by our description in Bulletin 71 of a Griffin and George Basic Microbiology Kit. The difference will be evident from the following quote from their letter. "It is a Griffin Biological Laboratories Ltd, Biology Kit. This may sound as if I am being pedantic but the difference is that when customers know that it is a GBL product they will send the order direct to Tonbridge which means that we can despatch right away direct to the school. As you can see this is very important where cultures are concerned. When something is designated as a Griffin and George product however teachers will send to the nearest Griffin Branch, in your case to East Kilbride, and although everybody gets through the paper work as fast as they can a few days are lost at each end. I wonder whether you could correct this in a future issue." We have verified that the items for which orders should be sent direct to Griffin Biological Laboratories are contained on pp 386 - 483 inclusive, of the 74 catalogue, and that all others, which includes the section on Biological Science, p 485 ff, should be ordered from the East Kilbride branch of Griffin and George.

We have been instrumental in persuading the two main suppliers to list a set of sieves which will be compatible with the requirements of the Integrated Science worksheet 12.8. The set from Griffin and George will be obtainable only from the East Kilbride and Manchester branches of the firm, catalogue number EK1, and costing £6.78. A similar set from Philip Harris is catalogue number B4958 at £7.

Sound level meters are enjoying a certain vogue just now, and one of the main manufacturers of these, Castle Associates has appointed Elesco-Fraser as its Scottish representative.

The report summary in Bulletin 72 gave the price of the Monolynx B microscope at £25.00. Gillett and Sibert have since told us that the price they should have given was £21.40.

The Torsion Balance Co are no longer to supply their range of balances directly to the customer. Instead their products will be handled by A. Christison for the southern half of Scotland, they say as far north as Dundee, and by Glass Appliances for the northern half.

Bulletin Supplement

The gas lighter tests referred to on page 9, were done using the method of lighting shown on the diagram. 10 tries were made for each, and the table records the number of successful ignitions. The three columns used for each test refer to (a) air valve closed; (b) air valve half open; and (c) fully open.

Lighter	Town Gas	Natural Gas	Butane
1 Flint type	a) 10	10	10
	b) 10	10	10
	c) 10	10	10
2 Filament	a) 10	10	10
	b) 10	10	10
	c) 10	10	10
3 Gas Wand	a) 10		
	b) 10	-	-
	c) 10		
4 Piezo-electric Junkers	a) 10	8	8
	b) 10	10	9
	c) 10	7	10
5 Piezo-electric Horstmann	a) 10	3	5
	b) 10	10	10
	c) 10	7	10
6 Magispark	a) 10	10	10
	b) 10	10	10
	c) 10	10	10

Nos. 1, 2 and 6 obviously give the best performance. It is important that gas lighting should be definite and without failure, since a build-up to explosive concentration could otherwise take place e.g. in a fume cupboard. This is particularly dangerous if using other than town gas. For schools using town gas and unlikely to be converted, any lighter is suitable. For other gases the Gas Wand is useless, and piezo-electric types are unreliable.

A difficulty with Nos. 2 and 6 is that performance is affected by battery voltage. With the Magispark a falling battery produces less frequent sparking, dropping to about once per second when the cell, which is a 1.5V HP11, drops to 1V. Below this rate of sparking the battery should be renewed.

- S.S.S.E.R.C., 103 Broughton Street, Edinburgh, EH1 3RZ.
Tel. 031 556 2184.
- Badenia Calculators Ltd., Lion House, Red Lion Street, London,
W.C.1.
- Beckmann Instruments Ltd., 5 Nigel Playfair Ave., Hammersmith,
London, W.6.
- Castle Associates Ltd., Scarborough, Yorks.
- A. Christison Ltd., Gateshead East Industrial Estate, Albany
Road, Gateshead NE8 3AT.
- Elesco-Fraser Ltd., 36 St. Vincent Crescent, Glasgow, C.3.
- Ericsson Telephones Ltd., Beeston, Nottingham.
- (Ferrograph) British Ferrograph Recorder Co., Ltd., 131 Sloane
Street, London, S.W.1.
- Fleming Radio (Developments) Ltd., Stevenage, Herts.
- Gillett and Sibert Ltd., Lynx House, 50 Vicarage Crescent,
Battersea, London, S.W.11.
- Glass Appliances Ltd., 488 Holburn Street, Aberdeen AB1 7LY.
- Griffin Biological Laboratories Ltd., 113 Lavender Hill, Tonbridge,
Kent.
- Griffin and George Ltd., Braeview Place, Nerston, East Kilbride,
Glasgow G74 3XJ.
- Philip Harris Ltd., 30 Carron Place, Kelvin Industrial Estate,
East Kilbride, Glasgow, G75 OTL.
- Heinemann Educational Books Ltd., 48 Charles Street, London,
W1X 8AH.
- Isotope Developments Ltd., Bath Road, Beenham, Reading, Berks.
- Macfarlane Robson Ltd., Burnfield Avenue, Thornliebank,
Glasgow, G46 7TP.
- Mendel Bros. Ltd., Preston, Lancs.
- Nagard Ltd., 18 Avenue Road, Belmont, Surrey.
- North Kent Plastic Cages Ltd., Home Gardens, Dartford, Kent.
- Peto Scott Electrical Instruments Ltd., Weybridge, Surrey.
- Rank Cintel Ltd., Worseley Bridge Road, Lower Sydenham,
London, S.E.26.
- Rhodes Flamefast Ltd., Pendlebury Industrial Estate, Bridge
Street, Swinton, Manchester M27 1FJ.
- Roband Electronics Ltd., Charlwood Works, Lowfield Heath Road,
Charlwood, Horley, Surrey.
- Scottish Gas Board, Granton House, West Granton Road, Edinburgh,
EH5 1YB.
- Solartron Electronics Group Ltd., Thames Ditton, Surrey.
- (Telequipment) Tektronix Ltd., Beaverton House, P.O. Box 69,
Harpenden, Herts.
- H. Tinsley and Co., Ltd., Werndee Hall, South Norwood, London,
S.E.25.
- Torsion Balance Co., Ltd., Vale Road, Windsor, Berks. SL4 5JL.
- Trade Aids Ltd., 111 Chiltern Drive, Surbiton, Surrey.