COMPONENTS . . .

UNIT "A" COMPUTING RESISTORS AND PATCHING LEADS

Resistors

3 off 2kΩ ±2%
3 off 3·3kΩ ±2%
3 off 4kΩ ±1%
3 off 5kΩ ±1%
3 off 9·1kΩ ±2%
5 off 10kΩ ±1%
5 off 10kΩ ±2%
3 off 13kΩ ±2%
3 off 15kΩ ±2%
3 off 16kΩ ±2%
3 off 18kΩ ±2%
3 off 20kΩ ±2%
3 off 33kΩ ±2%
3 off 40kΩ ±1%
3 off 91kΩ ±2%
5 off 100kΩ ±1%
5 off 100kΩ ±2%

(All metal oxide or carbon film, 1 W)

Plugs

1 dozen of each colour: red, black, blue, yellow, and white, to fit front panel sockets (see text).
1 dozen miniature plugs, to fit miniature sockets

Wire

Stranded core single p.v.c. wires in assorted colours (14/·0076in).

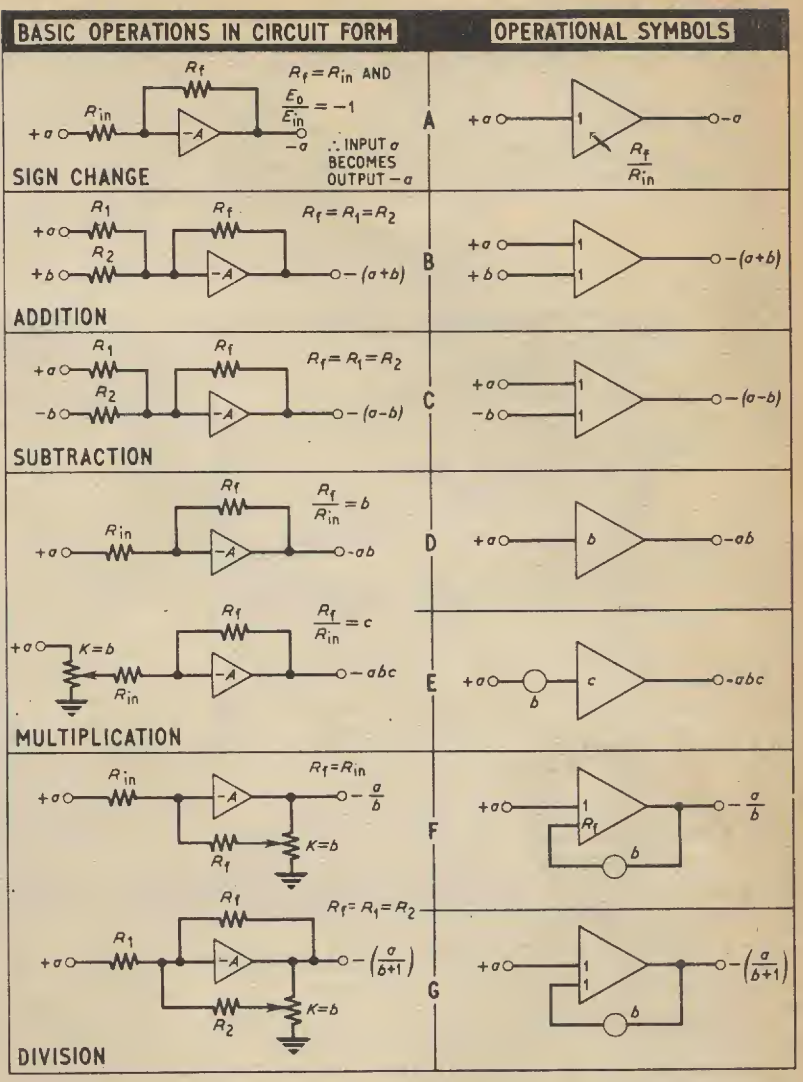

Fig. 4.1. (right) These diagrams indicate how the operational amplifier can be used to solve various algebraic equations

earth socket. Remember that a positive input voltage results in a negative operational amplifier output voltage.

Since input and feedback resistors are both 10 kilohm, the operational amplifier gain will be unity, and both voltmeters should give precisely the same readings. Double check by interchanging voltmeters. Now see that the operational amplifier will faithfully "track" any input voltage of ±10V or less when a temporary output load of 2 kilohm is connected from OA1/SK7 to earth.

The above tests are repeated for OA2 and OA3 by transferring the patching lead from VS1–S1/I1/SK1 to S2/I1/SK1, and then to S3/I1/SK1, and at the same time reconnecting voltmeters to the appropriate summer and operational amplifier sockets.

SOFTWARE

Under the heading of "software" comes all the paperwork associated with drawing up a programme for the computer. The time spent on preparing a programme for PEAC can vary from a few minutes to several days, depending on the skill of the programmer and the nature and complexity of the problem.

The intention is to give a few typical programme examples as an introduction to using the computer. They will consist of a short written *routine*, plus programme layouts. The layouts will be in a duplicated form, of symbolised diagram and patching circuit, so that the reader can compare analogue computer symbols with actual circuits and patching procedures. A newcomer to analogue computers will best learn programming techniques by working with PEAC, and this will also help to increase his knowledge of more advanced mathematics.

ROLE OF THE OPERATIONAL AMPLIFIER IN EQUATION SOLVING

Now that the time has come to consider UNIT "A" as a computer, instead of as a collection of circuits handling voltages, it is appropriate to adopt a slightly different approach. Voltages will now be replaced by the letters or numbers of an algebraic equation, *a*, *b*, *c*, *d*, *x*, *y*, 2, 3, 4, 5, and so on. Computing resistors loose their individual identity and are considered only as ratios $\frac{R_f}{R_1}$, $\frac{R_f}{R_2}$, etc., which are also denoted by equation letters or numbers. The same applies to coefficient potentiometer settings.

Sign change. In the circuit of Fig. 4.1a, an input voltage classified as term *a*, reappears at the op-amp