# ELECTRICAL & RADIO TRADING SERVICE CHART

## VALRADIO CONVERTERS

THE vibrator converter requires little space, is light in weight and virtually silent in operation. The output waveform, however, is not a sine wave, and the life of the vibrator contacts depends on correct loading.

The following is intended to assist engineers in the selection and installation of the most suitable units for a particular requirement.

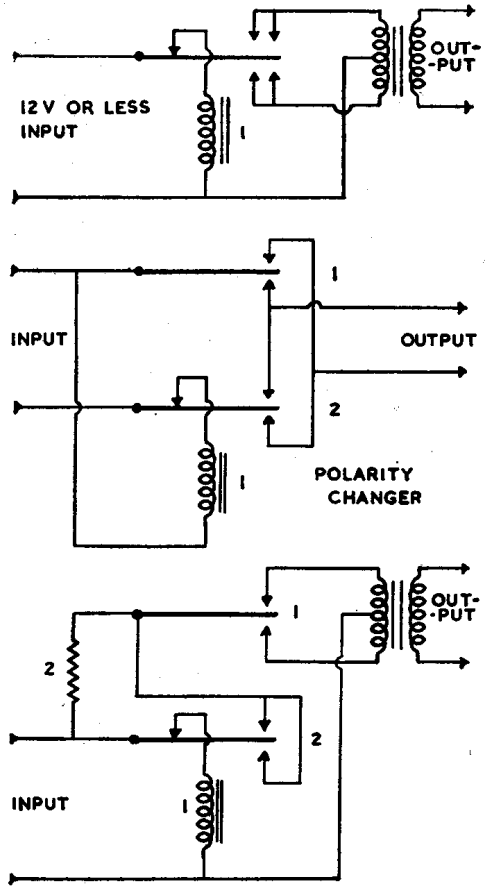
All models except type 230/75A are available for 110V AC output at no extra charge. All models provide an output frequency of 50-60c/s, but can be supplied for other frequencies and for special inputs to order.

Special converters, giving 230-240V DC output at 150 watts max. are supplied for operating AC/DC television receivers from low-voltage DC. The use of DC eliminates frame inter-action normally present when AC/DC converters are employed. The following models are available:

Valradio converters utilise three different vibrator circuits as indicated in Figs. 1, 2 and 3.

| Type | Input DC volts | Input amps | AC Output | |
|---|---|---|---|---|
| | | | AC volts | Watts Min. Max. |
| 230/300—A ... | 200/250 | 1.6–1.8 | 200/250 | 200–300 |
| 230/300/110—A ... | 100/110 | 3.1 | 200/250 | 150–300 |
| 230/200—A ... | 200/250 | 1.0–1.3 | 200–250 | 100–200 |
| 230/200/110—A ... | 100/110 | 2.1 | 230 | 100–200 |
| 230/175/50—A ... | 50 | 4.2 | 230 | 100–175 |
| 230/150/32/A ... | 32 | 6.2 | 230 | 80/150 |
| 230/150/24—A ... | 24 | 7.5 | 230 | 80–150 |
| 230/150/12—A ... | 12 | 16.0 | 230 | 75–150 |
| 230/110—A ... | 180/270 | 0.55 | 230 | 60–110 |
| 230/100/110—A ... | 100/110 | 1.2 | 230 | 50–100 |
| 230/100/50—A ... | 50 | 2.3 | 230 | 50–100 |
| 230/100/32—A ... | 32 | 4.0 | 230 | 50–100 |
| 230/100/24—A ... | 24 | 4.5 | 230 | 50–100 |
| 230/100/6—A ... | 6 | 20.0 | 230 | 50–100 |
| 230/75—A ... | 180/220 | 0.5 | 210/240 | 30–75 |
| 230/75—A ... | 220/250 | 0.5 | 210/240 | 30–75 |
| 230/75/12—A ... | 12 | 8.0 | 230 | 40–75 |
| 230/60/6—A ... | 6 | 12.0 | 230 | 20–60 |
| 230/30/12—A ... | 12 | 3.0 | 230 | 10–30 |
| 230/30/6—A ... | 6 | 6.0 | 230 | 10–30 |

| Type | Input Volts | Input Current | Price Converter | Price Spare Vib |
|---|---|---|---|---|
| | | | £ s. d. | £ s. d. |
| R12/150/240 | 12 | 19 amp. | 19 15 0 | 3 18 6 |
| R24/150/240 | 24 | 9 amp. | 19 15 0 | 3 18 6 |
| R32/150/240 | 32 | 6.8 amp. | 19 15 0 | 3 18 6 |
| R50/150/240 | 50 | 4.5 amp. | 19 15 0 | 3 18 6 |
| R110/150/240 | 110 | 2.2 amp. | 18 15 0 | 3 0 6 |




**Figs. 1, 2 and 3—top to bottom on left: the three basic types of circuit used in Valradio converters**

The circuit in Fig. 1 is used only in units for input voltages of 12 or less.

Circuit in Fig. 2 is known as polarity changer and is used on converter type 230/75A. Polarity changer converters deliver an AC output voltage slightly lower than the DC input, and differ from other Valradio converters in that they do not use a transformer in the conversion process. The polarity changer vibrator is essentially a double-pole double-throw change-over switch, vibrating at a pre-determined frequency whereby the direct current input is reversed across the load. The waveform of the output is square in shape.

In both the above type of vibrator, the input is applied and broken in one step. Each contact operating as a simple on/off switch. For low voltages (below 12V) and for light loads at high voltages, these types of vibrator are satisfactory but where higher output at higher voltages are required, a double stepping commutating vibrator is used. The action of this type of vibrator is as follows (see Fig. 3). When a voltage is applied, the vibrator exciter coil L1 is magnetised, causing reeds 1 and 2 to move towards L1. Contacts on reed 1 now touching will cause current to pass through half of primary of transformer. The amount of current passing is limited by R2. As the reeds continue to travel in same direction, the contacts on reed 2 close, short circuiting R2 and allowing the full voltage to be applied to the primary of transformer. On return swing of reeds R2 is re-introduced before the circuit is broken. By making and breaking the current in stages, arcing at the contacts is greatly reduced; in addition, very much greater outputs are obtained with comparatively low values of buffer condenser.

L1 which supplies the mechanical energy to operate the reeds is actuated by a separate small pair of contacts. These contacts are normally touching at the " rest " position, the circuit being broken as reeds swing away from stationery contact screw. This interruption of current sets reed assembly vibrating, the frequency of vibration being determined by weights at ends of reeds. Reducing the weight increases frequency.

Contacts are accurately adjusted at the factory whilst viewing the output waveform on an oscilloscope. The amount of reed swing is also accurately adjusted. If it should become necessary to re-adjust the swing, the coil fixing screws should be first loosened and the solder seal broken. Then slide the coil " T " piece forward or backwards as necessary. Excessive swing may result in the reeds breaking.

It should be noted that in all converters except units of 12V or less and type 230/75A the contacts on reed 1 must always have a smaller gap than contacts on reed 2. It is not desirable to use a converter larger than necessary.

An harmonic filter, consisting of an iron choke and condenser, is fitted to most types of converter, particularly those intended for the operation of radiograms, amplifiers and tape recorders.

Valradio converters should never be operated off load for any appreciable time as under these conditions, contact erosion will take place due to the discharge of buffer condensers across the contacts. On load, the buffer condensers discharge through the load.

A vibrator converter provides an economic and efficient means for operating AC appliances from a DC source, but some fundamental precautions must be taken to ensure trouble-free results.

**Input voltage.** Of necessity the source of DC is nearly always an accumulator which is kept

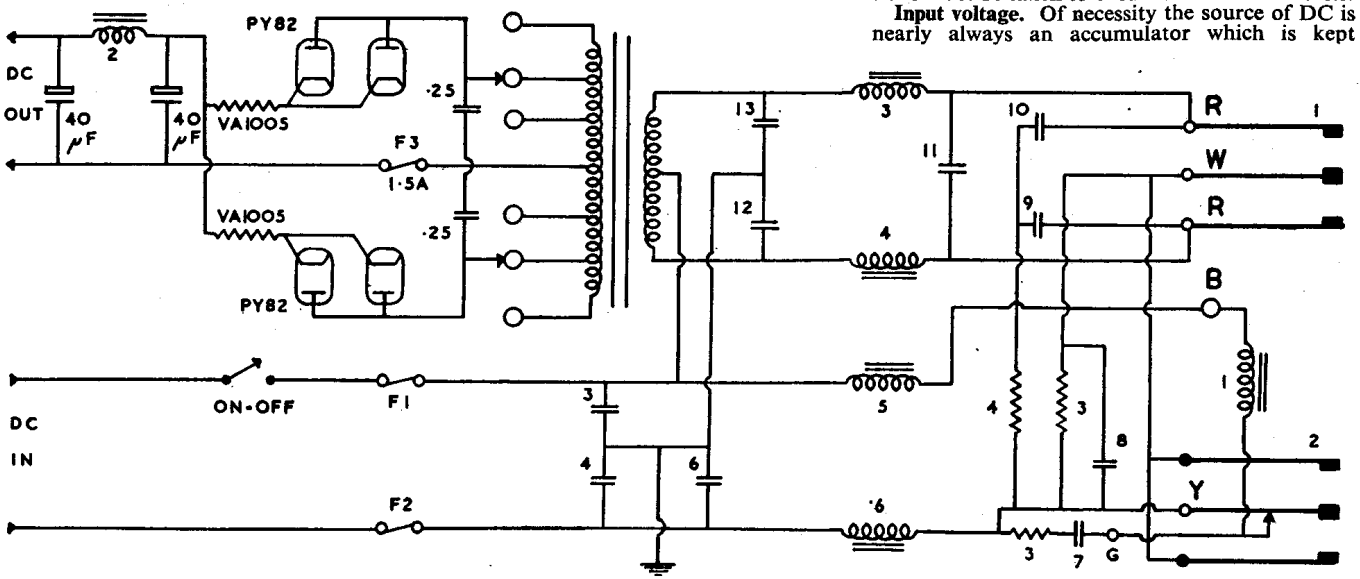



**Fig. 4—Circuit of the type recommended for operation of TV receivers from low voltage DC**

charged by a charging generator. It follows that the DC voltage will vary over wide limits. The converters are designed to operate on an input of within plus or minus 10 per cent of the nominal; i.e. a 110V converter will operate satisfactorily over the range of 100 to 120V.

A 2V lead-acid cell varies between 1.8-2.6V from discharged to fully charged. The open circuit voltage of a 12V battery may be as high as 16V when fully charged. If a converter blows its fuses immediately on switching on, it is more than likely that the batteries are fully charged. To overcome this difficulty insert a resistance in series with the converter input. The value of this resistance will depend on the voltage and load conditions but as a rough guide the following values will prove satisfactory :

| *Converter* | *Max. input* | *Resistance (ohms)* |
|---|---|---|
| 6V ... ... ... | 8V | .2 |
| 12V ... ... ... | 16V | .3 |
| 24V ... ... ... | 32V | .1 |
| 36V ... ... ... | 48V | 1-1.5 |
| 50V ... ... ... | 65V | 2 |
| 110V ... ... ... | 140V | 5 |
| 220V ... ... ... | 280V | 20 |

## SERVICE

The maximum input voltage quoted is highest to be expected from batteries in good condition. In the case of 6 or 12V units, the resistance will be necessary only if the converter is used while batteries are actually being charged, as in a moving motor vehicle.

**Load.** The nature of the load is important and the power factor must be corrected to as near unity as possible. This is particularly important when the load is predominantly inductive, such as with AC motors.

Some old type AC gramophones have, usually, a power factor in the region of .5. For these types, a 1 to 2 mF condenser should be connected in parallel with motor winding.

Correction is not usually necessarily on transformer operated devices such as radio receivers, amplifiers, etc. Exceptions to these, are cases where the transformers have an abnormally small iron core which is being operated at a high flux density. For these cases it is suggested that a resistance of the value of 50 to 100 ohms be connected in series with the input of appliance.

**Half-wave rectification.** AC appliances incorporating half-wave rectification are not suitable for operation from Valradio converters, except in cases where the half-wave load forms a very small part of total load. AC/DC equipment can be operated from Valradio converters by interposing a bridge-connected metal rectifier between converter and equipment.

**Operating TV from low-voltage supplies.** Most modern TV receivers are of the AC/DC type and invariably employ half-wave rectification. The bridge rectifier method as recommended for AC/DC equipment, can be used on TV but a better method is the use of the Valradio " R " type units, which are available for 12, 24, 36, 50 and 110V DC. In these units the basic circuit, which is shown in Fig. 4, is similar to other Valradio AC/DC converters, except that the output is rectified by four PY82 rectifier valves.

Heaters of these valves are series or parallel connected depending on input voltage. In the case of 12V units the heaters are connected in parallel and fed from the primary of converter transformer.

Vibrator units require practically no running maintenance. The only expendable item is the vibrator which, in general, will have a life of over 1000 hours. The vibrator reaches the end of its useful life when contacts are so worn that output is too low to operate the equipment.

With certain loads the contacts will tend to wear uneven which may result in sticking. If contacts are not too badly worn they can be cleaned by a thin grinding stone, a file or a strip of fine emery cloth. The small exciter contact will usually outlast the main contacts, but if vibrator will only start if tapped, the exciter screws can be re-adjusted by first loosening lock unit and then turning the screw about ⅛ of a turn clockwise. Excessive exciter contact pressure will prevent vibrator from starting and blow fuses.

Once properly installed, vibrator converters will give years of unfailing service with practically no attention.

Frequency of vibrators will remain within plus or minus half c/s throughout its useful life.

**Hum.** Because output is not a pure sine wave, and may be electrically unablanced to earth, hum may be picked up by high gain amplifiers such as those used in tape recorders and quality amplifiers. Any or all the following remedies should be tried:

Increase or decrease value of C14. Connect a 1 to 2mF 600V Wk condenser across AC output. Connect a .1mF condenser between one AC output lead and amplifier chassis. Carefully screen all input and grid wiring in amplifier. See that no AC wires run close or parallel to signal wiring in amplifier.

**Replacements.** It is very important that all replacements have the same rating as the old units, in particular the working voltages of condensers. Use only Valradio replacement transformers. The windings of vibrator transformers have to be specially interwound to reduce the leakage inductance; for this reason rewinding even by highly skilled winders is not recommended.

The table below gives component values of resistors and capacitors shown in theoretical circuit diagrams Figs. 4, 5 and 6.

| | | R1 | R2 | R3 | R4 | R5 | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 230/150/24A | 0 | 10 | 33 | 0 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .25 | .25 | .25 | 2 | .1 | .1 | 2 | .02 | .02 | |
| | 230/100/32A | 0 | 20 | 33 | 10 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | .5 | .1 | .1 | 1 | .02 | .02 | |
| | 230/150/32A | 0 | 10 | 33 | 0 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .25 | .25 | .25 | 2 | .1 | .1 | 2 | .02 | .02 | |
| | 230/100/50A | 0 | 20 | 33 | 10 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | .5 | .1 | .1 | 1 | .02 | .02 | |
| | 230/175/50A | 0 | 20 | 33 | 0 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .25 | .25 | .25 | 2 | .1 | .1 | 2 | .02 | .02 | |
| | 230/100/110A | 0 | 50 | 1K | 10 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | .5 | .1 | .1 | | .02 | .02 | .25 |
| | 230/200/110A | 0 | 50 | 1K | 10 | 20 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | 2 | .1 | .1 | 2 | .02 | .02 | |
| | 230/300/110A | 0 | 50 | 1K | 0 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | 2 | .1 | .1 | 2 | .02 | .02 | |
| See Fig. 5 | 230/110A | ... | 2.2 | 100 | 1K | 10 | 20 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .02 | .02 | .02 | .25 | .1 | .1 | 25 | .02 | .02 | .25 |
| | 230/200A | ... | 2K | 100 | 1K | 10 | 10 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .02 | .1 | .1 | .5 | .1 | .1 | .5 | .02 | .02 | |
| | 230/300A | ... | 2K | 100 | 1K | 10 | 10 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .02 | .1 | .1 | .1 | .1 | .1 | .5 | .02 | .02 | |
| | 230/100/24A | | 0 | 20 | 100 | 10 | 0 | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .1 | .1 | .5 | .1 | .1 | | .02 | .02 | |
| | 230/75/12A | | – | – | 10 | – | – | .02 | .02 | .25 | .25 | .1 | .1 | .1 | – | .1 | .1 | – | .1 | .1 | 2 | .02 | .02 | .5 |
| | 230/150/12A | | – | – | 10 | – | – | .02 | .02 | .25 | .25 | .1 | .1 | .25 | – | – | – | – | .1 | .1 | 2 | .02 | .02 | |
| | 230/60/6A | ... | – | – | 10 | – | – | .02 | .02 | .25 | .25 | .1 | .1 | .1 | – | – | – | – | .1 | .1 | 2 | .02 | .02 | |
| | 230/100/6A | ... | – | – | 10 | – | – | .02 | .02 | .25 | .25 | .1 | .1 | .25 | – | – | – | – | .1 | .1 | 1 | .02 | .02 | |
| | R12/150/240 | ... | – | – | 10 | – | – | – | – | .25 | .25 | – | .002 | .25 | – | – | – | – | – | .1 | .1 | – | – | – |
| See Fig. 4 | R24/150/240 | *W* | – | 10 | 33 | 0 | – | – | – | .25 | .25 | – | .002 | .1 | .25 | .25 | .25 | 2 | .1 | .1 | | – | – | – |
| | R32/150/240 | *W* | – | 10 | 33 | 0 | – | – | – | .25 | .25 | – | .002 | .1 | .25 | .25 | .25 | 2 | – | .1 | .1 | – | – | – |
| | R50/150/240 | ... | – | 20 | 33 | 0 | – | – | – | .25 | .25 | – | .002 | .1 | .25 | .25 | .25 | 2 | – | .1 | .1 | – | – | – |
| | R110/150/240 | ... | – | 50 | 1K | 100 | – | – | – | .25 | .25 | – | .002 | .1 | .02 | .1 | .1 | 1 | – | .1 | .1 | – | – | – |
| See Fig. 6 | 230/750 | ... | – | – | 1K | – | – | .02 | .02 | .25 | .25 | .1 | .1 | .1 | .1 | .02 | .02 | – | – | – | – | .02 | .02 | .5 |

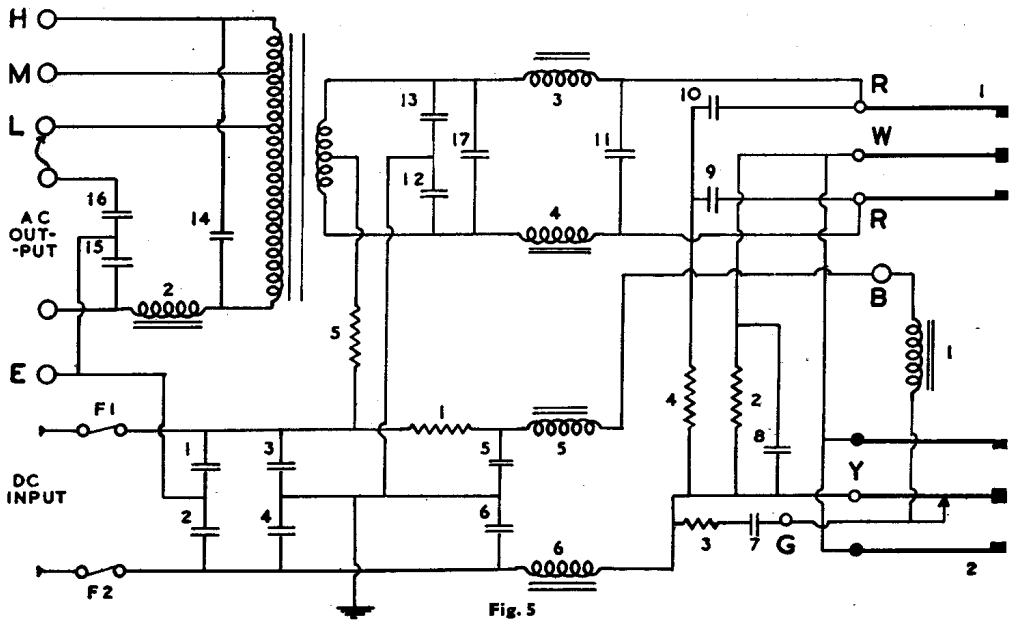


Fig. 5

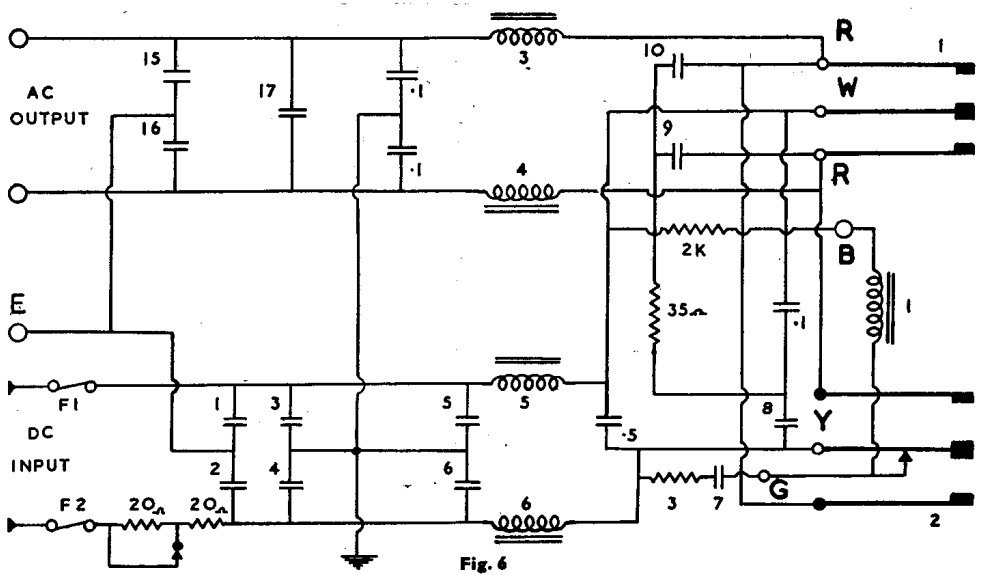


Fig. 6

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