VALVE CODES

Problems of Devising a Useful and

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THE large number of radio and industrial valves in use to-day emphasizes the desirability of evolving some method of designation which will serve not only to distinguish valves which are not interchangeable, but also to give some information about the characteristics and potentialities of individual types.

A sequential numbering system fulfils the first of these requirements admirably, but does not give the vital information about the valve which is the essential function of a code. One of the chief difficulties in devising a code is to ensure that it shall be flexible enough to cope with unforeseen developments; this is never a problem with sequential numbering.

The arguments for having a code are, that it places the valves in suitable categories. Looking at the valve code number, the user may know without further reference whether it is a diode or a pentode or even whether it is an a.f. or an r.f. pentode, what is the heater voltage, what type of base it has, its size, type of envelope, etc. He may find all those or only some of them. The more information the code will contain, the longer it will be. But even the simplest is likely to eliminate at least one source of error and exasperation in selecting valves. It will also speed up the process of choosing a series of different valves to be used in a single piece of equipment. It will simplify redesigning, using modern valves as they appear. It may help the user to assimilate new developments by referring to types known to him under the code.

Let us take a few examples. Originally each branch of the Armed Services had its own designation system for valves. This has now been unified under a common valve (CV) system, which is strictly sequential. In it CV 138 is a well-known miniature, high g_m, 6.3-V heater, pentode; CV 129 is a 3-cm klystron. CV 2000 may be anything or nothing. The system covers virtually all electronic devices. It is ideal for stores.

In the Mullard code, EF 37 stands for a 6.3-V heater, voltage pentode amplifer on octal base (the last figure denotes a particular development of this type). PL 80 should be a 300-mA series heater, power output pentode with Noval 9-pin base. When EF 81 is advertised as a new product the user will subconsciously add this to the list of valves he knows something about.

In the R.T.M.A. American code 6J5 stands for a 6.3-V heater with five independent useful elements. It turns out to be a low-μ triode. 6J6 is a double triode while 6J7 is a pentode. All have 6.3-V heaters but give no information about anything else and no clue as to what, say, 6J8, would be.

On the whole it would appear that a code is preferable to a sequential system, but before giving a final judgment, let us examine what we want from a code.

It should be fairly clear that a good code should give the maximum amount of information, and yet be short and easy to memorize and to reproduce. Let us examine what sort of information can be given by a code. There is, of course, no limit to that, but the most essential data are possibly :—(*a*) Heater voltage or current; (*b*) Type of base; (*c*) Type of envelope ; (*d*) Electrode structure; (*e*) Power-handling capacity ; (*f*) Special features; (*g*) Applications.

Obviously if each one of these were to be given by a figure or a letter, the code would be unwieldy and therefore useless. Let us look at some of them in detail.

Heater voltage or current: This is probably the safest information to be given about hot-cathode valves, and the simplest code would be a figure giving the nearest integral voltage. The difficulty arises with series-connected heaters operating at constant heater current. At present the heater voltage is not likely to exceed 100 V, while current is almost always 100 mA or more, thus one could say that one or two figures denote the voltage but three figures will denote current. The danger is that with miniaturization of valves low heater currents may become more common, upsetting the system. It might therefore be safer to use figures for both, but precede current by some pre-arranged letter such as 0, so that 20 would stand for 20 volts but 020 would mean 20 mA.

Type of base and envelope : This is very useful information to have in a code, and is also safe in the sense that new developments or requirements are not likely to call for a change of designation of existing types. As long as one chooses symbols which allow for expansion no trouble should be experienced. The present multitude of bases, not only as far as number of pins is concerned, but also their distribution, sizes and material of the base itself, creates a serious problem. No limitation. is possible, because new developments will lay stress on new base characteristics, demanding ever new types and structures. A number giving the number of pins is useless if one thinks of, say, B8A, B8G, International Octal, Mazda Octal—all 8-pin bases. It seems that it would be necessary to sacrifice a self-explanatory code and use a two-letter or two-figure group to describe the base and envelope.

Electrode structure.— It is difficult to foresee future developments, but possibly, as far as the present types are concerned, a simple system giving the number of electrodes could be adopted for the conventional types, with the code letter or figure doubled for twin valves. Letters would be preferred here allowing for a larger number of twin-valve types. Thus B would stand for a diode, E for pentode, CC for double triode, BBC for double diode triode, etc. Letters following K might be used for other types of valves more or less arbitrarily.

Applications.— While this information is very useful it is also one that may cause confusion When it is found, say, that a valve originally designated as a general purpose voltage amplifier turns out to be particularly useful for a very definite application. It is possible that recoding should be allowed then. An arbitrary choice would have to be made to codify the

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various applications by a two-figure or two-letter group. This code might also cover any special features, such as secondary emission, exceptional reliability, etc.

Power-handling capacity.— This information could be dispensed with as the power could be judged quite closely from the other information given. It is also in this field that most changes occur as experience is gathered and new circuits developed.

The code would already be probably so long as to be useless and yet it is not even complete, because some allowance must be made in it for relatively small variations within one general type. Makers and users each have different ideas about the best valve characteristics of a particular type, and that is bound to result in there being at any time several, say, r.f. pentodes with 6.3-V heaters on octal bases in glass envelopes, and they could probably be differentiated only by a serial number. As it is unlikely that more than twenty such varieties will be found on the market, a simple letter might be used here. Even so, the code might consist by now of nine figures and letters mixed, say, BG12CC18K, which might be interpreted as miniature 7-pin base, 12-V heater, double triode, low-μ, serial letter K, if only it could be memorized together with several dozen other valves one constantly uses.

Having arrived so far we have now to consider dropping some information. Heater designation is possibly the first one could omit. After all most valves operate at fairly standard voltages. The application might also be omitted as somewhat artificial. In the new code BE17P would then stand for, say, diode pentode, Noval base, serial letter P. (The serial letter or number, while not common from type to type, would in itself give some information.)

One should also consider the possibility of having a short and a full code, the short code giving valve structure, application and serial number, while an additional code would give heater voltage or current and base type, thus: CC18K/BG12. One would then normally use the short code only.

Should There be One Code or More ?

The advantages of a code which ties a valve type to a particular manufacturer are primarily connected with the sales aspect. Since manufacturers enter the valve business to sell their products, this aspect must not be minimized.

It may be said that a code system which is so different from any other that it ties in the user's mind the valve type to its maker, adds to the prestige of a good firm. It may also be argued that a less knowledgeable user may buy a replacement which bears the same code, and therefore comes from the same maker, as the valve which has just died on him, even if other makers make an identical valve under a different code. This, however, cuts both ways, and therefore may not be as important as it would appear.

One important aspect of the individual maker's code is that it simplifies the code to the manufacturer, who himself is not likely to make as many types and variations of one type as may actually be on the market. Also any small improvement or selection may easily be distinguished by the user (as for example EF37 and EF37A, or 715A, 715B, and 715C, etc.). This is very useful as long as the various codes in existence at one time do not confuse the user. Simplicity is also a great advertising asset.

On the whole, however, even at the cost of somewhat complicating the code, it would appear—and current American practice supports this view—that one code is preferable to many, with a central registration board allotting the code.

Current Codes

Let us now look at the codes used by the leading manufacturers and comment on them individually.

Mullard.— First letter stands for type of heating and voltage or current. Second letter and following denote the electrode system.

The first figure denotes type of base. Second figure stands for a serial number of a development.

The following table gives details of the meaning of letters and figures as placed:

	If first letter	If second or following letters
A	4 V, a.c., parallel	Diode
B		Double diode
C	200mA, a.c./d.c.,series	Triode
D	Battery 0.5-1.4 V	Power triode
E	6.3 V series or parallel	Tetrode voltage amplifier
F		Pentode voltage amplifier
G	5 V	
H	150 mA, a.c./d.c.	Hexode
K	Battery 2 V	Heptode or Octode
L		Output tetrode or pentode
M		Beam indicator
N		Gas triode
P	300mA, a.c./d.c.	Secondary emission (if third letter)
Q		Nonode
U	100mA, a.c./d.c.	
X		Gas filled full-wave rectifier
Y		Half-wave rectifier
Z		Full-wave rectifier

Figures:

1-19 various	50-59 B9G
20-29 B8G Loctal	60-70 sub-miniature
30-39 Octal	80-89 B9A Noval
40-49 B8A Rimlock	90-99 B7G miniature

This system was very good indeed, and largely self explanatory, but it now shows sign of breaking down, especially in the miniature and sub-miniature ranges,

because of numerous new developments. It certainly could not cope with all possible variations already on the market. In spite of that it remains the only code in use anywhere which is strictly logical.

Marconi, E.M.I., G.E.C., Osram, M.O.V.—The code consists of a letter or letters and a serial number. The letters stand for:

A—Special industrial applications	M—Metalizing (when used later in code)
D—Diode or double diode	N—Output pentode
GU—Gas-filled rectifier	U—Rectifier
GT—Thyratron	W—Var. μ screened pentode.
H—High-impedance triode	X—Frequency changer
KT—Kinkless tetrode	Y—Tuning indicator
L—Low-impedance triode	Z—Sharp cut-off screened pentode

This system is very simple and flexible. As types and applications multiply so, presumably, the list will grow longer and longer until it will be impossible to remember anything useful. No information is given about heater or base, but that could be added easily.

Ediswan, Mazda.—The first figure or figures give heater voltages or current, thus:

1= 1.4 V 10= 100 mA
6= 6.3 V 20= 200 mA

followed by a letter or letters :—

C = Frequency changer
D = Diode or double diode
F = Voltage amplifier, tetrode or pentode
K = Small gas triode or tetrode
L = Voltage amplifier triode or double triode
M = Tuning indicator
P = Power amplifier
U = Half-wave rectifier
UU = Full-wave rectifier
} Without first figure

followed by a serial number.

This system is similar to the previous one, but with heater information which is only useful in the very limited range used.

Brimar (S.T.C.).—Three codes are used:

(1) If the valve is for export, the American RTMA code is adopted sometimes with a prefix SV.

(2) If for home market the code consists of a figure or figures, such as:

1—Half-wave rectifier 9—Var. μ pentode
8—R.F. pentode 20—Triode hexode

followed by a letter

A for 4-V heater
B for 2-V heater
D for indirectly heated, other than 2- or 4-V cathode

followed by a serial number.

(3) If special valves, the code consists of a number, such as:

2= Diode 5= Pentode
3= Triode 22= Double diode, etc.
4= Tetrode

followed by a letter giving maximum anode dissipation and type,
followed by a serial number,
followed by one or two letters to indicate base type and special features.

The above systems provide the remaining variations of figures and letters although it will be noted that, say, 20Dl may mean 200mA. heater, diode (Mazda), or 6-V indirectly heated triode hexode (Brimar).

The last mentioned is the most elaborate of all, for example, 33A/158M is a double triode, anode dissipation under 10W., 158 is serial number, M stands for B8G base. It would be interesting to find the reaction of users to this code. It fails in not being flexible enough in describing the electrode system unless a new structure such as a klystron will be classed under a completely different code.

Continental makers such as Philips, Tungsram, Siemens Halske, use a code common with Mullard (given above).

American (R.T.M.A.) Code. All American leading manufacturers register any new valve they produce with this organization (Radio Television Manufacturers' Association) which allots it a code unless the difference between it and any existing valve is such that no knowledge of the difference is recognized to replace one by the other. This code consists of a first number symbol indicating rated filament or heater voltage within -0.4 to +0.6V, a first letter symbol consisting of one or two letters which in themselves are of no apparent significance, a second number symbol indicating the number of independent useful elements for which terminals are provided, without consideration of their function, heater or filament counting as one, as do combinations of one or more elements connected to one terminal.

A second letter or letters indicating distinguishing features, such as :—

G = Glass tube on octal base
GT = Above in a T-9 bulb
X = Low-loss base
Y = Intermediate-loss base
M = Metal-coated glass envelope on octal base
W = Military type assigned on behalf of armed forces.
A, B, C, D, E, F = a modified version of a type without the suffix.

Valves used specifically for industrial purposes have a sequential designation beginning with the number 5500.

Several manufacturers still use their own codes for special valve types but these are not common.

The main R.T.M.A. code, described above, gives only the heater voltage as a definite information, all the others being, more or less, differentiation marks or serial numbers. Some of the symbols such as G, GT appear to be vestigial and no equivalent symbols have come into use for other types of base and bulb. If one has to remember the difference between CJ5, 6J6, and 6J7, one might as well call them CV1933, CV858, and CV1936, respectively, as in the British Armed Services System.

Conclusions

While it does appear that a valve type code is preferable to a sequential system, there are very serious difficulties in deciding on a suitable and lasting code. Apart from those mentioned, one has to remember that other electronic devices will require codes as well and these must be such as not to be confused with the valve codes proper.

Possibly the best first step towards a solution would be for one of the professional institutions to organize a series of discussion meetings leading to the setting up of a committee representing manufacturers, users, Services, institutiom, and the British Standards Institution, which should then give the findings of the committee its full sanction.

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