All You Ever Needed to Know--and Even More --About European Tube-Numbering Schemes

By Martin P. Faust, DK9QT

Collectors of vintage radios take note: *Some popular, identical, tubes had more than 120 different names. But also, some totally different tubes had the same names! Whether you collect "bottles" for their historic interest, or want to restore a European-made radio, you will find something of interest here.*

Something happened to me at the Seattle airport that triggered my interest in writing this article. I was returning to Germany from a business trip in the US, and met an elderly couple from Idaho who were also travelling to Germany from where they had emigrated many years ago. In our conversation, I mentioned that I was a radio amateur and a collector of old tubes and old radios. The husband got quite excited and told me that he remembered the early days of radio very well and that he still owned his first radio, a German make. That radio, however, was not in working order and he did not expect to find the right tubes in the US. This prompted me to consider illustrating the European tube numbering scheme by which it should be possible for him to find a suitable replacement.

A 1938 Telefunken table-model radio. Note: tubes have side-contacts, not pins. [All photos by the author.]

Later in the flight, after departing from Seattle, I decided to write this information down as I am sure there are other foreign radios and communication equipment from the 30s and 40s in the US at present. These tables should help you to identify unknown tubes, analyze tube-numbering systems and enable you to find suitable replacements for defective tubes.

Military tubes from the 1930s and 1940s. All have special bases and sizes because of miniaturization and high-frequency requirements. The tall transmitting tubes use Telefunken tube code.

European tubes from more than five decades of production can be identified using the schemes explained in the tables.

Nomenclature

The history of European tube nomenclature can be divided into three phases:

Chaotic--at the beginning of commercial tube production; *Individual*--varying with the different manufacturers from the mid 20s and *Systematic*--from about 1934--the onset of mass-production of tube-driven radio and television receivers.

At the beginning of commercial tube production, in the 20s, there was no perceivable systematic approach. Tubes were marked with cryptic combinations of letters and numbers or even with melodious names like SUPERDYN, POLYDION, GIGANT or even TYP1. To decipher these tube types, you had to have the corresponding data sheet. With the fast growing radio industry in the early 1930s, the number of tube manufacturers increased rapidly. Some of the companies used elaborate numbering schemes for their tubes. From that time on, the most popular tubes manufactured in Europe were those from Telefunken.

Telefunken Numbering Scheme

Some popular, identical, tubes were available from different manufacturers under more than 120 different names. But it also happened that totally different tubes were listed under the *same* name! This calamity led the major manufacturers to create a new numbering scheme, introduced by Telefunken and Valvo, in about 1934. Most companies generally adopted this scheme. European tubes manufactured in the last 65 years can be identified by means of this system. The filament data, tube construction, standard application and base types are encoded in these tube numbers. Also, from all of these combined data, the tube's approximate time of introduction can be deduced.

Common European Numbering Scheme

Starting about 1938, Armed Forces all over the world introduced their own numbering schemes. At the beginning the aim was to select high quality tubes from commercial production and to design manufacturer-independent special-purpose tubes for military equipment. In the course of time, advancing to higher frequencies necessitated a miniaturization of the tubes and the development of entirely new tubes with special bases. I include the German Armed Forces scheme here as it is very systematic. These tubes were widely used and a lot of them were still available after World War II. Those remaining tubes were used for civilian equipment, and were reproduced and copied in the USA for a long time after 1945.

I would like to mention the Russian tubes that have flooded European hamfests in the last few years. They use yet another separate numbering scheme. Those tubes, duplicated in Russia, come under the same scheme as the equivalent American tubes, but the letters are replaced by the corresponding Cyrillic letters. For example, 6F8 becomes 6Ф8.

Most European tubes can be analyzed with the help of the above schemes. There are of course many more numbering schemes in use, especially as each manufacturer continued to use its own individual coding system for special technology tubes, eg Valvo for transmitting tubes. To list all these would fill a whole book.

Table 1: Early German tube-numbering system.

TELEFUNKEN; Germany; 1918 - 1934				
Example: RENS 1284 d				
RENS	12	8	4	d
1. Construction	2. Heater Current	3. Serial Number	4. Heater Voltage	5. Special Attribute

1. The leading characters define the construction and/or the application of the tube:

- **RE** receiver tube, directly heated, see 6.
- **REA** external control receiver tube
- **REN** receiver tube, indirectly heated
- **RES** receiver tube with screen grid, directly heated
- **RENS** receiver tube with screen grid, indirectly heated
- **REZ** twin triode, directly heated
- **RENZ** twin triode, indirectly heated
- **RGL** charging rectifier
- **RGN** mains Rectifier, N does not mean indirectly heated
- **RFG** television rectifier, serially numbered, see 6.
- **RG** high voltage rectifier, serially numbered, see 6.
- **RGQ** rectifier, gas filled, half wave, special number code, see 7.

- **RGQZ** rectifier, gas filled, full wave, special number code, see 7.
- **RSQ** rectifier, gas filled, grid controlled, special number code, see 7.
- **RS** transmitter tube, serially numbered, see 6.
- **RV** output amplifier tube, serially numbered, see 6.

2. The first digit of a three digit number or the first two digits, in case of a four digit number, define the heater current given in 0.1 Ampere, eg 12 = 1.2 A, 0 means less than 0.1A, but not always very exact, eg REN 804, REN 904 and REN 1004 have all 1.0 A at 4 V.

Exception: 18 means 0.18 Ampere, serially heated.

3. This field is a serial number and has no special meaning

4. The last digit gives the heater voltage in volts, eg RENS 1234 with 1.2 A and 4 V heater.

Exception: Serially heated tubes with 0.18 A current, most of them have 20 V heater voltage independent of number, eg RENS 1854 with 0.18 A and 20 V heater.

5. Additional letters define special attributes of the tube:

- **bi** bifilar filament
- **d** side contact for grid connection
- **n** neutro, low internal capacities
- **s** serial heating
- **t** Telefunken socket
- **w** 2 side contacts

Exceptions: Very early Telefunken tubes (1918-1927) were serially numbered and do not follow this numbering scheme, eg RE1, RE2, RE11, RE20 and so on. Systematic coding starts at RE034. Also RFG, RG, RV, and the popular RS transmitting tubes are serially numbered and the number has no special meaning.

Note: The gas filled rectifiers RGQ, RGQZ, and RSQ are marked with two numbers, eg RSQ7,5/2,5. Here, the first number identifies the plate voltage in kV, the second the plate current in A, i.e. 7.5 kV at 2.5 A.

Table 2: Common European tube-numbering system.

Common Code, European Tube Manufacturers, starting 1934			
Example: ECC 801 S			
E	CC	801	S
1. Heater Supply	2. Construction	3. Base	4. Special Attribute
1. The first letter identifies the heater supply:			

- **A** 4 V, parallel
- **B** 180 mA, DC, series
- **C** 200 mA, series
- **D** 1.4 V, DC, parallel (also 0.625, 1.2, or 1.25 V)
- **E** 6.3 V, parallel
- **F** 13 V, parallel
- **G** 5V, parallel
- **H** 150 mA, series
- **K** 2 V, DC, parallel
- **M** 1.9 V, DC, parallel (see 6.)
- **N** 12.6 V, parallel (see 6.)
- **O** cold device, not heated
- **P** 300 mA, series
- **Q** 2.4 V, parallel (see 6.)
- **S** 1.9 V, parallel (see 6.)
- **U** 100 mA, series
- **V** 50 mA, series
- **X** 600 mA, series

2. The second and the following letters identify the construction and/or the application of the tube. Multi system tubes have one letter for each system integrated in the tube. The letters are sorted in alphabetical order:

- **A** diode, except rectifiers
- **B** twin diode with common cathode, except rectifiers
- **C** triode, except power triodes
- **D** power triode
- **E** tetrode, except power tetrodes
- **F** pentode, except power pentodes
- **H** hexode or heptode, hexode mode
- **K** octode or heptode, octode mode
- **L** power pentode or power tetrode
- **M** tuning indicator, magic eye
- **P** secondary emission tube, used as 3rd letter only
- **Q** enneode
- **X** full wave rectifier, gas filled
- **Y** half wave rectifier, high vacuum
- **Z** full wave rectifier, high vacuum

3. The digits identify the base. Additionally for tetrodes and pentodes, odd-numbers identify remote-cutoff tubes, even-numbers identify tubes with a linear characteristics. The numbers are also used to distinguish tubes that would otherwise have identical numbers, eg EF83 and EF85. Both are remote-cutoff signal pentodes with 6.3V heater on a B9A base. But they are different; the first is an af, the second

an rf pentode. The number also reflects the approximate date of market introduction. Early tubes have small numbers.

- **1 ... 10** pin type, side contact and others
- **11 ... 19** metal tube Y8A
- **20 ... 29** 8 pin loctal and octal B8G, K8A
- **30 ... 39** octal K8A
- **40 ... 49** Rimlock B8A
- **50 ... 60** 9 pin loctal
- **61 ... 79** subminiature
- **80 ... 89** noval B9A
- **90 ... 99** miniature B7G
- **110 ... 119** metal tube Y8A
- **140 ... 149** Rimlock B8A
- **150 ... 159** metal tube Y10A
- **180 ... 189** noval B9A
- **190 ... 199** miniature B7G
- **200 ... 299** decal B10C
- **410 ... 419** Rimlock B8A
- **500 ... 599** mag-noval B9D
- **700 ... 799** subminiature
- **800 ... 899** noval B9A
- **900 ... 999** miniature B7G

Four digit numbers identify tubes for professional applications. The first digit labels the base: (4, 6, 7 are used for other base constructions)

- **1xxx** subminiature
- **2xxx** decal B10C
- **3xxx** octal K8A
- **5xxx** mag-noval--novar--B9D
- **8xxx** noval B9A
- **9xxx** miniature B7G

4. A large number of special applications, eg in telecommunications, medical equipment, and early computers required special tubes with higher reliability under rough working conditions. To fulfill such requirements these tubes were manufactured with special production processes and checked with special test methods. These tubes were superior by up to five features: higher reliability, longer lifetime, tighter tolerances, vibration and shock proof, and special cathodes to withstand longer periods of heating without plate current. The pins of special tubes are very often gold coated. See also 5. Exceptions.

S special tube, eg EL 803 S = special EL 803

Exceptions: Most special purpose tubes are labeled by exchanging construction and base codes. The meaning of letters and digits remain the same: E 88 CC = special ECC 88
The heater code letters M, N, Q, and S were used to mark special armed forces tubes. They are not very common. They were substituted for tubes following a special German armed forces scheme in 1938. The number is a sequence number with no meaning for a base. Example: NF 2 , SF 1, most are Telefunken

Table 3: Germany Air Force special-tube numbering-system

Armed Forces, Air Force, Germany, 1938		
Example: LD 1		
L	D	1
1. Air Force	2. Construction	3. Number
1. The first letter L identifies special air force tubes. • **L** air force tubes		
2. The second and the following letters identify the construction and/or the application of the tube: • **B** cathode ray tube • **D** decimeter transmitting tube (f >300 MHz) • **F** photocell, other optical devices • **G** diode, rectifier, pulse generators • **K** stabilizer, regulating resistor, glow lamp • **M** magnetron • **S** transmitting tube (f <300 MHz) • **V** amplifier tube (f<300 MHz)		
3. Numbers 1--18 are sequence numbers, example: LV 1 For transmitting and amplifier tubes, numbers from 30--1500 identify the maximum plate dissipation in watts, eg LS300. For cathode ray tubes, the first number gives the screen diameter, the second the tube length in cm, eg LB 7/15.		

Table 4: German Army and Navy tube-numbering system.

Armed Forces, Army and Navy, Germany, 1938

Example: RV 12 P 2000 A

R	V	12	P	2000	A
1. Army, Navy	2. Application	3. Heater	4. Construction	5. Code Number	6. Option

1. The first letter R identifies special army and navy tubes.

- **R** army and navy tubes

2. The second letter identifies the application of the tube:

- **D** decimeter transmitting and receiving tube (f >300 MHz)
- **G** diode, rectifier
- **L** power amplifier, transmitting tube
- **K** cathode ray tube
- **V** receiving and amplifying tube

3. The number gives the heater voltage in volts:

- **1** 1.2 V
- **1,5** 1.5 V -- 1.8 V
- **2** 1.9 V
- **2,4** 2.4 V
- **4** 4.0 V
- **4,2** 4.2 V
- **4,8** 4.8 V
- **12** 12.0 V

4. The letter shows the construction of the tube:

- **A** magic eye, cathode ray indicator
- **D** twin diode
- **G** rectifier
- **H** hexode
- **L** klystron
- **M** magnetron
- **P** pentode
- **T** triode
- **MM** double magnetic deflection, only for cathode ray tubes
- **MS** magnetic and electrostatic deflection, only for cathode ray tubes
- **SS** double electrostatic deflection, only for cathode ray tubes

5. The code number has different meanings depending on the construction of the tube:

For pentodes it is the amplification factor, eg RV 12 P 2000 (μ = 2000)

Remote cutoff pentodes have a 1 in the last digit, eg RV 12 P 2001 For power tubes the number shows the plate dissipation, eg RL 12 P 35 (35 W) For power rectifiers the number shows the plate current, eg RG 12 D 60 (60 mA) For rf rectifiers it is a sequence number, eg RG 2,4 D 1 For all other tubes it is a sequence number , eg RK 12 SS 1 From end of 1942 new tubes where marked with small letters, eg RV 12 P a
6. Baseless variants are marked with an additional capital letter A, eg RL 2 P 3 A
To make changing tubes easier, the most common tubes were additionally color-coded, eg RV12P2000 white, RV12P2001 green, RV12H300 orange. From the number codes printed on the tube, the production place and the date can be read. The date on the base is the production date, the date on the glass shows the date of the final test, eg 22/41 = 22nd week 1941

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