

工程技术英语注释读物

SEMICONDUCTOR DEVICES

半导体器件

清华大学外语教研组 编
英语读物注释小组



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工程技术英语注释读物按机械、动力、电力、电子、建筑、化工、原子能等不同专业分册出版。文字大部选自原著,对其个别地方作了适当修改。专业内容浅近易懂。附有注释、参考译文和词汇表,便于读者自学,以培养独立阅读能力。

这本“半导体器件”是这套读物电子类的第二册之一。第二部分的原文选自 Abraham Marcus, *Electronics for Technicians*, 1969。本校电子系计算机专业 41 班学员参加翻译,电子系教师参加审校。

由于编者水平的限制,以及缺乏编写经验,书中肯定存在不少缺点错误,热烈欢迎广大读者提出宝贵的意见,以便进一步修改。

编 者

1977 年 6 月

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PART I

I-1 STANDARD COAXIAL CABLE 1,800-CHANNEL CARRIER COMMUNICATIONS

Under the guidance of Chairman Mao's proletarian revolutionary line, the broad masses of workers, cadres and technical personnel of our country's postal and telecommunications departments, taking class struggle as the key link, seriously carrying out "the Charter of the Anshan Iron and Steel Company", developing in depth the mass movement of "In industry, learn from Taching" and adhering to the principles of independence with the initiative in our own hands and self-reliance and of building our country through hard work and thrift, have completed an up-to-date standard coaxial cable 1,800-channel carrier communications trunk line linking Peking with Shanghai and Hangchow. This trunk line was designed, developed, manufactured and built entirely on our own^①. It has been successfully put into operation. This is a victorious achievement of the Great Proletarian Cultural Revolution. It is a powerful blow to the "gang of four" anti-Party clique of Wang Hung-wen, Chang Chun-chiao, Chiang Ching and Yao Wen-yuan who were scheming to usurp Party and state power and undermining our socialist revolution and socialist construction.

The Peking-Shanghai-Hangchow coaxial cable 1,800-channel carrier communications trunk line runs more than

① on our own: 靠我们自己 (的力量).

1,700 km through 8 provinces and municipalities and crosses some 200 waterways including the Yellow River and the Yangtze River. Comprising several thousand sets of up-to-date communication equipment, this trunk line involves very complicated techniques.

What is meant by① coaxial cable 1,800-channel carrier communication?

As we all know, the simplest method of long-distance communication is to put up between two cities a pair of long-distance telephone lines, such as the pairs of copper or iron wires we see② stretching between telephone poles along the highway and railway. By connecting telephone sets at the two terminals of this pair of wires, the telephone subscribers of the two cities can carry on a conversation through them. These lines through which one pair of telephone subscribers can converse are called one channel. If you want to add a second channel between these two cities, another pair of long-distance telephone lines has to be put up.③

It is apparently very uneconomical to put up a pair of long-distance telephone lines whenever a new channel is added. With the development of communications technology, there arose techniques, the most frequently used being carrier communications,④ which make possible the simulta-

① **what is meant by ...**: 所谓...是什么(意思)呢? **meant** 是 **mean** 的过去分词. ② **(that) we see**: 我们所看到的. 这是一个定语从句, 说明 **wires**. 从句中省去了连接代词 **that** (或 **which**). 当连接代词在从句中作宾语 (例如此处 **that** 是 **see** 的宾语) 时, 就可省略. ③ **has to be put up**: **have + to** (动词不定式): 就得; 应该; 不得不. **put** 是过去分词, **to be put** 是 **to put** 的被动式. ④ **the most ... communications: being** 是. 这是 **be** 的分词, 相当于句子的谓语; **the ... used** 最常用的(技术). 相当于主语. 这种以分词为中心而内容上相当于一个句子的结构叫做“分词独立结构”, 翻译时译成句子.

neous transmission^① of several channels through one pair of long-distance telephone lines without interference with each other. When people are making phone calls, the sound of their voices is first transformed through the telephone sets into comparatively low frequency electrical signals called audio signals. If two audio signals are transmitted simultaneously through the same pair of telephone lines, they will interfere with each other and cannot be heard distinctly, because the frequencies of the sound waves of two voices fall within the same audible range. In order to avoid interference, we send separately the electrical signals representing the voices of many different people to an equipment called carrier equipment, through which these electrical signals are modulated respectively to different higher carrier frequency level channels, one beside another, and then sent through one pair of telephone lines to the other end. This is similar to radio broadcasting. Though many stations broadcast talking and songs simultaneously which are in the same audio frequency range, the programs of the stations will not interfere with one another because each has a different carrier frequency. In radio reception, one needs only to tune his radio set to the frequency of the station he wants^② and the programs of the station will be heard. This is the same with carrier communications. The signals of the different speech channels sent through the long-distance telephone lines are separated at the reception end and then converted back to the original speech

① **make possible ... transmission:** 使...传输...成为可能;使得有可能传输.... 意同 **make ... transmission ... possible.** 这里因 **make** 的宾语较长, 所以 **possible** 移前. ② **(that) he wants:** 他所要的. 这个定语从句中省了 **that**. 参看第 2 页注③.

signals, which are sent separately to the telephone subscribers. The only difference between radio broadcasting and carrier communications lies in that the former is propagated through space whereas the latter is transmitted along wires. Take bridge building for instance. There are two methods by which trains and cars can cross a river simultaneously. One is to build two (a highway and a railway) bridges, the train and the car each going^① over its own bridge. Another is to build one bridge such as the Nanking Yangtze River Bridge with the highway raised to a higher level by way of a bridge approach, so that cars can go over the upper deck while trains are taking the lower. In this way, trains and cars can both cross the bridge simultaneously without running into one another^② (Fig. I-1). Here, the process of raising the car from level ground to a certain height is similar to that of the shifting of frequency in the carrier equipment. The car is lowered to level ground again by way of the bridge approach when it reaches the other side of the river.

There are different requirements for the long-distance lines according to the number of channels to be transmitted by the carrier system. One pair of open wires connected to a carrier equipment can only handle 1, 2, 12, or at the most^③ 20-plus channels and no more. The reason for this has been mentioned above: the basic principle of the carrier system is to shift, according to a proper order, signals to different frequency channels, each being usually 4 kHz wide. The

① **going**: 通过. 是 go 的分词. 这是一个分词独立结构. 参看第2页注④.

② **running into one another**: **running** 是 run 的动名词. run into 相撞. one another 彼此. ③ **at the most**: 至多 (不过); 充其量.

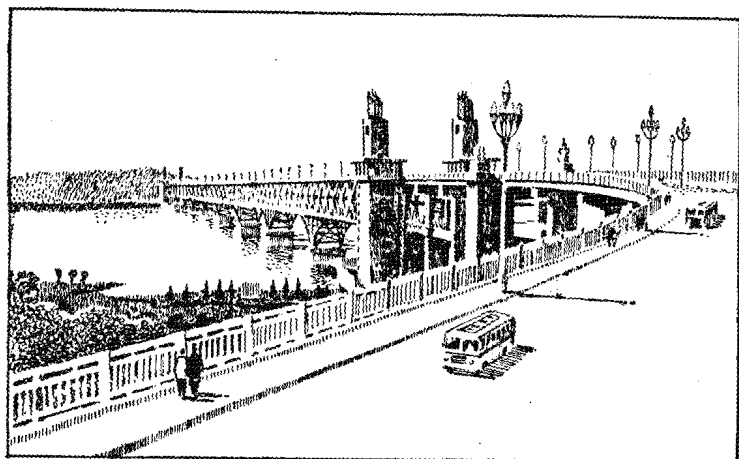


Fig. I-1

more the channels, the wider^① the frequency bandwidth. For example, with two-way 12-channel transmission and reception, each occupying 48 kHz, plus the necessary clearance between the transmitting and the receiving two-way frequencies, the operating frequency bandwidth of a 12-channel open wire carrier telephone will be over 150 kHz. It is like many people walking in a row shoulder to shoulder along the street. The more the people, the wider the street should be. So the wider the bandwidth of the operating frequency of the long-distance telephone lines, the larger the number of channels it can handle. However, when the frequency used in the open wire reaches over 1 or 2 hundred kHz, the attenuation increases and interferences among several pairs of channels on the telephone poles also increase to a point where^② it is even impossible for the speech to get

① the more ... the wider: ...越多, ...就越宽. ② to a point where: 到这样的程度, 即....

through. For this reason, open wire is suitable for use only in 3-channel or 12-channel carrier communications systems.

In addition, there exist in open wire some other shortcomings besides the comparative narrowness of the operating frequency bandwidth. For example, because it is exposed in the open, it is not very safe and is easily affected by outside electrical signals and secrecy cannot be well ensured. With the development of science and technology, long-distance communications lines of an entirely different structure have been adopted—the coaxial cable line.

A coaxial cable line consists of several coaxial tubes, each being, in turn, made up^① of a thin copper tube with^② a coaxial copper wire at its centre and slices of round plastics propping in between at regular intervals (see Fig. I-2b). The axial positions of the copper wire and the thin copper tube must be strictly identical (that is, there is a stringent requirement for the coaxiality of the two). That is why it is called coaxial tube. There are large, medium and small coaxial cables according to the diameters of the inner and outer conductors; the inner diameter of the outer conductor of the medium-sized cable is 9.5 mm and the diameter of the inner conductor is 2.6 mm. A cross section of a medium-sized coaxial cable is shown in Fig. I-2a. In its centre is a low frequency four-wire group, around which are 4 high-frequency four-wire groups, with six signal wires in the space

① each being ... made up of: in turn 而(轮到...) 则又. each being made up of: 每个都是由...构成的. 这也是一个分词主谓结构. ② with: 这 with 后面跟了两个主谓结构, 即 1. wire (being) at centre 铜线(是)在中心; 2. slices propping in between 薄片支在里面. with 的这种用法参看第 28 页的注②.

between the tubes and the four-wire groups. These signal lines can be used to offer 12-channel carrier telephone, service communications and signals, alarm, etc.

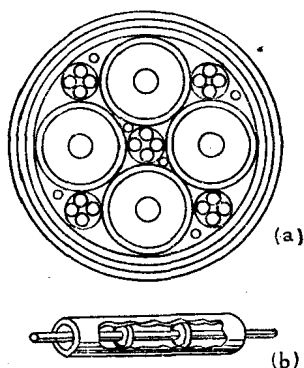


Fig. I-2

A coaxial cable carrier communications system usually adopts the 4-wire system, that is to say, one set of 1,800-channel system needs two of the coaxial tubes of the coaxial cable, one for transmission and one for reception. As stated before, the frequency bandwidth transmitted along the open wire is rather narrow, usually not over 150 kHz, and so^① no more than a dozen or so channels can be handled even after a carrier equipment is installed. On the other hand, with coaxial cable communications systems, the transmitting frequency bandwidth is extremely wide, being able to attain a width of up to several mHz, a dozen or more mHz, or even scores of mHz, and forming 1,800, 2,700, 3,600 or 10,800 single-way channels respectively. At present, the medium-sized coaxial cable 1,800-channel carrier system we are using^② has

① and so: 因此. ② (that) we are using: 我们现在用的. 这个定语从句中省了 that.

a maximum multi-use frequency of 9 mHz.

In sending high frequency signals through coaxial cable, electromagnetic waves are mainly transmitted through the space between the inner and outer conductors and very few are radiated outside, so there is very low attenuation in the course of① transmission. Meanwhile, as no electromagnetic waves are radiated outside, they do not interfere with other lines and vice versa.② The higher the transmission frequency, the stronger its immunity to interference. Hence, the outstanding features of the coaxial cable are its low attenuation and its immunity to interference. Besides, since the coaxial cables are buried deep under the ground, and are, therefore, little affected by temperatures and other natural circumstances, their electrical performance is comparatively stable.

As is known to all, when two people are conversing, their voices sound loud when they are near to each other. As they move away from each other, their voices become weaker, and can't be heard if they are still farther away. The electrical signals representing voices of different people transmitted along long-distance telephone lines also become gradually weaker as the distance increases. This phenomenon is called attenuation. Why is it then when two people are conversing through the Peking-Shanghai-Hangchow 1,800-channel carrier telephone lines, their voices are as clear as if they are conversing face to face though they are thousands of kilometres apart? This is because a set of equipment called

① **in the course of**: 在...过程中. ② **vice versa**: 反之亦然; 反过来说也成立. 这里的意思是指: 其它线路的电磁波也传不进来, 对同轴电缆的干扰也很小.

the repeater is inserted at regular intervals along the long-distance lines, and the weak electrical signals are amplified by this equipment and then sent forward. It is like a relay race. There are some people waiting at certain regular intervals on the track to send forward the baton passed on by the runner from behind.

It can be seen from the brief introduction above that coaxial cable 1,800-channel carrier communications system consists primarily of 3 parts: the carrier frequency equipment which shifts sound signals to different channels, the coaxial cable and the repeater.

As mentioned before, a coaxial cable carrier communications trunk line has many advantages, the most important of which are: enormous capacity, stability of electric characteristics, capability of ensuring secrecy and high resistance to natural adversities and interference. Owing to these advantages, after the completion of the Peking-Shanghai-Hangchow coaxial cable carrier communications trunk line, automatic dialing system is now available in long-distance telephone services. That is, when making a trunk call, one has only to pick up the telephone receiver and dial the number he wants, just as if he were making a local call. An automatic dialing system has been partially opened for telephone subscribers between Peking, Tientsin, Tsinan, Shanghai and Hangchow. Many other services including high-speed telegraph, various kinds of facsimiles and digital signalling, are scheduled to be introduced step by step.^①

Fig. I-3 is an illustration of telephone subscribers of two

① step by step: 一步一步; 逐步.

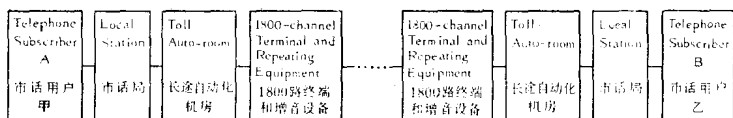


Fig. 1-3

cities carrying on a conversation by means of long-distance automatic dialing equipment. For instance, A, a Peking subscriber, wants to make a phone call to B, a Shanghai subscriber. All A has to do^① is to lift the telephone receiver as if he were making a local call, and dial the Shanghai trunk call extension number “XXX” and then the telephone number of B. The call will get through in only a little over^② 10 seconds if B’s line is not busy. This is done by means of a long-distance automatic exchanger and the coaxial cable 1,800-channel carrier communications system.

Since the coaxial cable 1,800-channel carrier communications trunk line has a great number of channels, they can be used to open other services besides long-distance automatic dialing service. This is of great significance to our country’s socialist revolution and socialist construction. Here is an example. Everyone of us is greatly concerned with the great events of our Party and state, and hopes to read *Renmin Ribao* the very day it comes out.^③ It is through the 960-channel microwave circuit that^④ our southwestern cities such as Chengtu can read *Renmin Ribao* the same day. Now that the standard coaxial 1,800-channel carrier communications system is available we can make use of not only microwave

① All (that) A has to do: A 所要做的一切。 ② a little over: 稍多于。 ③ the very day: 就是那天的; (就是)当天的。 ④ it is ... that: 正是...才.... 这是一种强调句型, 用来加强语气。