

TELEVISION

电 视

上海交通大学科技外语系
课 外 读 物 注 释 组 注释



工程技术英语注释读物

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GF107/11

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〔英〕H. Henderson 著

上海交通大学科技外语系
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商 务 印 书 馆

1981 年 · 北京

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商 务 印 书 馆 出 版

(北京王府井大街36号)

新华书店北京发行所发行

北京第二新华印刷厂印刷

统一书号: 9017·1126

1981年10月第1版

开本 787×1092 1/32

1981年10月北京第1次印刷

字数 89 千

印数 1—7,300 册

印张 3³/₄

定价: 0.43 元

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1 INTRODUCTION

The word television means simply 'seeing at a distance', and the basic idea is a simple one.^① First split your picture into a large number of patches then measure the brightness of each patch and transmit this information to the distant point. Finally reproduce the pattern of patches and obtain the original picture.

Of course television broadcasting represents the largest-scale use of television, but very important uses are to be found^② in all sorts of surveillance systems as well as for educational purposes in schools and universities. The T.V.^③ camera can see the detail of the surgeon's work and relay it to many students outside the operating theatre.^④ It can allow men to watch dangerous processes in safety^⑤ or enable student teachers^⑥ to observe children learning in the classroom without disturbing them by their presence. Television recording then permits permanent records to be made which can be used many times.^⑦

Essentially a television system requires sources of picture, live from cameras in studios or elsewhere, from video tape recorders or film,^⑧ with the means of connecting these^⑨ to

① one: 代词, 代替名词 idea。 ② are to be found: 将(被)获得 [be + 不定式] 结构, 表示预期的和可能的等意义。 ③ T.V.: 电视, 系 television 的缩写。 ④ operating theatre: 手术教室。 ⑤ to watch dangerous processes in safety: 安全地监视危险的生产程序。不定式短语作宾语补足语, in safety 作状语, 修饰 to watch。 ⑥ student teachers: 实习教师。 ⑦ which ... times: 定语从句, 修饰 permanent records, 其间被 to be made 隔开。many times 多次, 作状语。 ⑧ live from ... film: 通过...进行实况转播, 形容词短语作后置定语, 修饰 sources of pictures。 ⑨ these: 代词, 代替名词 sources of pictures。

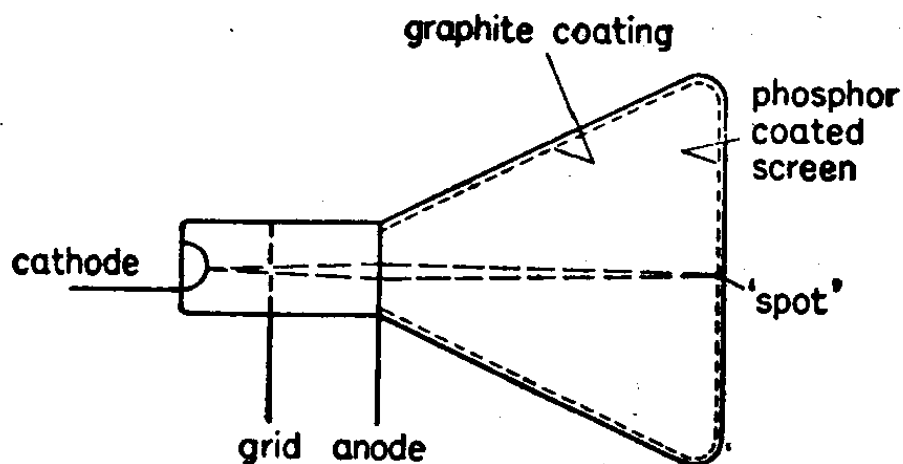
receivers. As^① we look at the various elements of the system new words will emerge; terms like scanning, synchronising, and more curious ones^② like back porch, colour burst and shadow mask. We will start then with a brief description of the action of the television camera tube and arrive at the form of the television picture signal.^③

2 HOW A PICTURE IS FORMED ON THE TUBE OF A T.V. RECEIVER

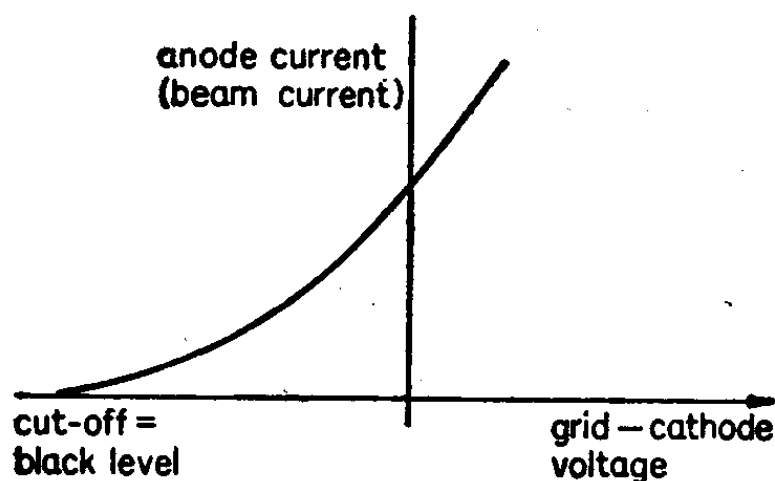
The very heart of a T.V. receiver is the cathode ray tube or simply 'tube'. It is something like a huge triode with a hole in its anode which allows the electrons making towards the anode to shoot straight through.^④ They then fall on a screen coated with a chemical substance which glows white when struck by the electrons^⑤ (see Fig. 1).

If we vary the voltage between grid and cathode, we vary the brightness of the spot; we are varying the beam current just as^⑥ the current is varied in a triode (see Figs. 2). Notice that these graphs are not straight lines but curves. As^⑦ it is the beam current which determines brightness^⑧ we can see that spot brightness is not linearly related to grid — cathode voltage. Electro-

① As: 当...时, 连词, 连接时间状语从句。 ② ones: 代词。代替名词 terms。
③ start then with ... and arrive at ...: 从...开始, 谈到...。 ④ which ... through: 定语从句, 修饰 a hole。 making towards the anode: 流向阴极的, 现在分词短语作后置定语, 修饰 the electrons。 to shoot straight through 不定式短语作宾语补足语。 ⑤ when ... electrons: 在受到电子轰击时。省略的时间状语从句。 struck 前省略了 "the substance is"。 ⑥ just as: 正如...一样。连接方式状语从句。 ⑦ As: 因为, 连接原因状语从句。 ⑧ it is ... which ...: 强调句型。



1. A cross section of a cathode ray tube (C.R.T.) producing a single, central, focussed spot



2. The C.R.T. triode curve of grid cathode volts plotted against beam current

static or magnetic methods of focussing the spot are employed, for without these the electron beam tends to spread because electrons repel one another.

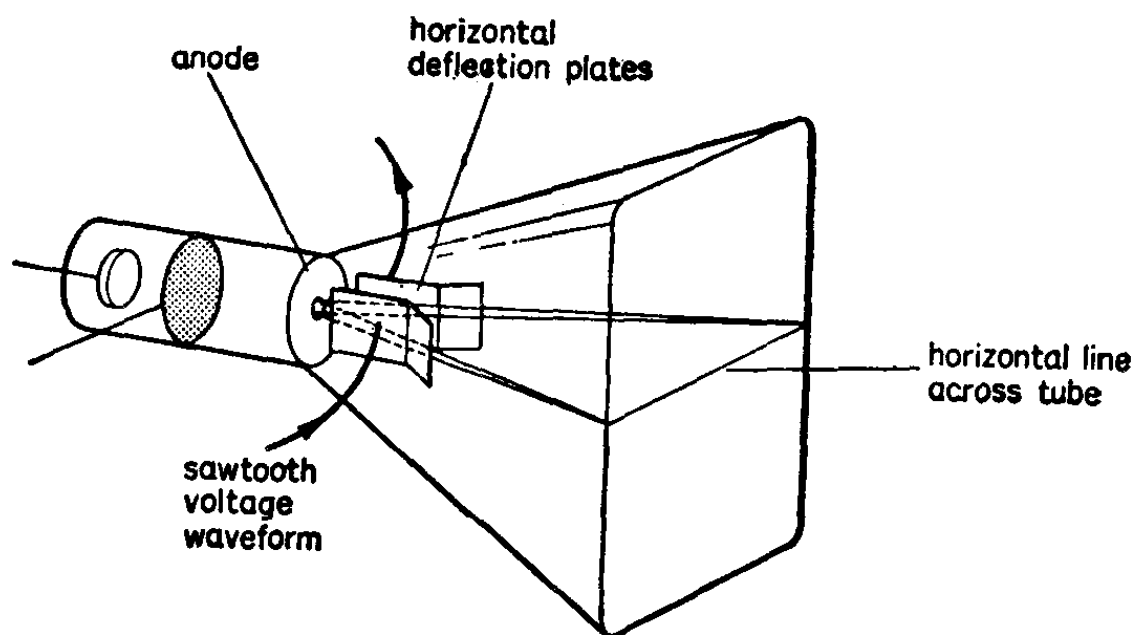
We have not got very far towards a picture but we do^① have a spot in the middle of the tube, the brightness of which we can vary by adjusting the d.c. voltage between grid and cathode

① do: 确实。助动词, 加强主要动词的语气。

(brightness control) and which can be focussed (focus control).①

2.1 Deflection systems

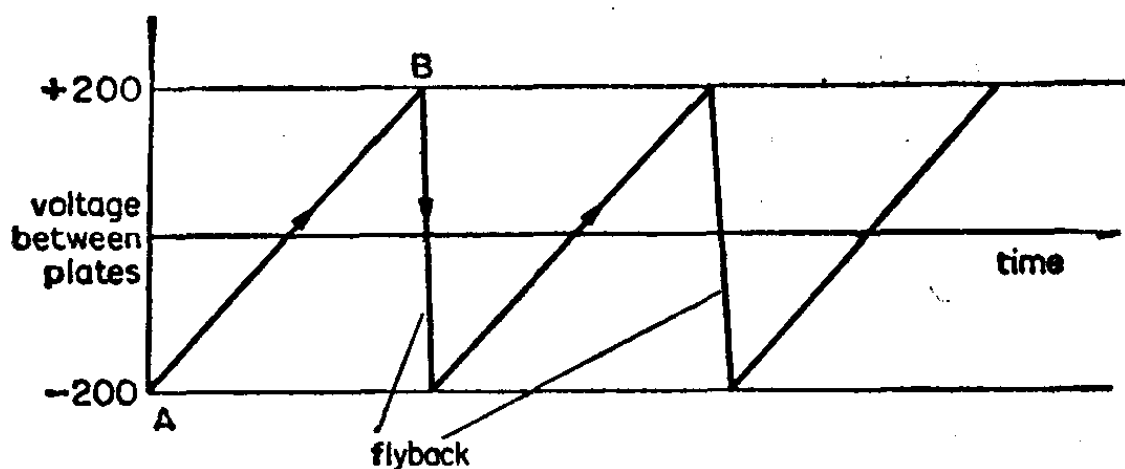
By means of② two metal plates placed after the anode③ we can deflect the beam current, and hence the spot, to the right or left of its central position (Fig. 3). If we want the spot to move



3. A C.R.T. with horizontal deflection plates

at a steady speed from left to right then④ we need a voltage between the plates which varies as shown in Fig. 4 (A to B). ⑤ At

① the brightness of which ... and which ... focussed: 为两个定语从句,用 and 连接起来; which 代替并修饰 a spot, 但 which 在两个定语从句中的作用不一样。在第一句中, which 作前置词 of 的宾语, of 前面还有一个名词。在第二句中, which 作主语。by adjusting the d.c. voltage ... 通过调整直流电压, 前置词 by 表示用什么方法的意思。adjusting 为动名词。
② by means of: 利用,藉助于。 ③ placed after the anode: 在阳极后面放置的。过去分词短语,作后置定语,修饰 two metal plates。 ④ if ... then ...: 如果...,那末...。关联连词。 ⑤ as shown in Fig. 4 (A to B): 如图 4 所示 (A 到 B)。定语从句。as 是关系代词,代替整个主句,在定语从句中作主语。从句中省略了助动词 is。



4. The sawtooth waveform used for scanning a C.R.T. spot

the end of the sweep the voltage between the deflecting plates returns rapidly to -200 , the spot returns as rapidly^① to the lefthand side of the screen, and off we go again.^② The graph of Fig. 4 is called a sawtooth and the effect is to produce a white horizontal line across the middle of the tube^③ — assuming^④ the spot is being moved fast enough not to be seen as a moving spot.^⑤ This horizontal deflection is usually achieved in a television receiver by magnetic means using coils through which a sawtooth of current flows.^⑥ The length of the line is determined by the amplitude of the sawtooth of voltage or current and this is controlled by the 'picture width' knob on the T.V. set (usually at the back).

① **as rapidly**: 同样迅速。as: 同样。副词, 修饰副词 rapidly。 ② **and off we go again**: 然后我们重复进行下去。go off: 进行, 走开。off 是副词, 放在主语前面, 表示强调语气。 ③ **to produce ... the tube**: 不定式短语作表语。 ④ **assuming (that)**: 假设。连词, 连接条件状语从句。 ⑤ **fast enough not to be seen as a moving spot**: 快到看不出是一个移动的光点。enough: 副词, 修饰副词 fast, 作状语。not to be seen as a moving spot 被动语态不定式短语, 修饰副词 enough, 作状语。as a moving spot 为主语补足语。 ⑥ **through which ... flows**: 定语从句。which 代替名词 coils, 作前置词 through 的宾语。

Now in exactly the same way^① the 'spot' can be deflected vertically by another set of plates or coils set at right angles to the first pair.^② Without any scan voltage applied to the horizontal plates^③ we would get^④ a vertical line on the screen. With both together^⑤ we get all sorts of patterns depending upon the relative speeds of the two scanning waveforms used.

In television, the vertical deflection is much slower than the horizontal deflection so that^⑥ as^⑦ the 'spot' moves 'slowly' down the tube face (in $1/50$ second), the horizontal deflection system takes it^⑧ $312\frac{1}{2}$ times across the face of the tube. A special arrangement ensures that the spot is blacked out during flyback. The consequence of this scanning arrangement is that the screen is covered with almost horizontal white lines which should fill the tube face with a rectangle of white light; the raster.^⑨ All we must then do^⑩ is to control the spot brightness^⑪ as it moves on the tube face to convert the raster into a picture.

3 INTERLACE

Now the choice of $312\frac{1}{2}$ horizontal scans to each single

① in exactly the same way: 以完全相同的方法。 ② another set of plates or coils set at right angles to the first pair: 第一个 set 为名词, 译为“组”, 另一组金属板或线圈。第二个 set 为过去分词, 分词短语译为: 在与上述两块金属板成直角的方向上被安置的。 ③ Without ... plates: 如果不对水平金属板施加任何扫描电压。前置词短语作状语, 相当于 If any scan voltage were not applied to the horizontal plates。 ④ would get: 虚拟语气, 与实际情况相反。 ⑤ With both together: 如果两组金属板同时作用。both: 代词。 ⑥ so that: 因此。连词, 连接结果状语从句。 ⑦ as: 当...时。连词, 连接时间状语从句。 ⑧ it: 代词, 其意义相当于 the 'spot' moves 'slowly' down the tube face (in $1/50$ second)。 ⑨ the raster: 光栅。同位语。 ⑩ we must then do: 我们下一步必须做的。定语从句, 省略了作宾语的关系代词 that。 ⑪ to control the spot brightness: 调节光点的亮度。

vertical scan is not just something awkward.^① First it^② was decided that a simple relationship should exist between mains frequency and picture repetition frequency. In the cinema each picture is projected for $\frac{1}{24}$ second before moving on.^③ So in television a picture repetition rate of 25 was chosen which is half our mains frequency.^④ In the U.S.A.^⑤ the mains frequency is 60 cycles per second (hertz) — but that is their problem.^⑥ Ordinary films can therefore be shown on television and the different picture rate is unnoticed (25 instead of 24).

If however the flying spot of light 'paints' one picture each $\frac{1}{25}$ second, the top of the picture is fading (the retinal image is anyway) whilst^⑦ the bottom is still bright. The effect of this would be to produce a 25-cycle flicker which would be very noticeable, particularly in bright areas. So *two* downwards traverses of the flying spot are used to paint one picture. Each traverse (or field) takes $\frac{1}{50}$ second, and $312\frac{1}{2}$ lines are painted each time. The next traverse puts in the other $312\frac{1}{2}$ lines in between the first set.^⑧ Actually that half line makes this process automatic; it is called interlace. A complete picture is thus made up of^⑨ 625 lines and 2 fields.

Why 625? Well, we mentioned earlier the need to relate line frequency to field frequency,^⑩ and there is a nice relation-

① not just something awkward: 不是一件难办的事。② it: 为形式主语。that ... frequency 为主语从句。③ before moving on: 继续前进以前。④ which is half our mains frequency: 定语从句, 修饰名词 a picture repetition rate of 25, 其间被主句谓语 was chosen 分隔。⑤ U.S.A.: 美国, 系 United States of America 的缩写。⑥ but that is their problem: 但那是他们的事。⑦ whilst = while: 而。⑧ in between the first set: 进入第一组之间。between the first set 前置词短语, 作为前置词 in 的宾语。⑨ is made up of: 由...组成。⑩ the need to relate ... frequency: 必须使行频与场频发生关系。

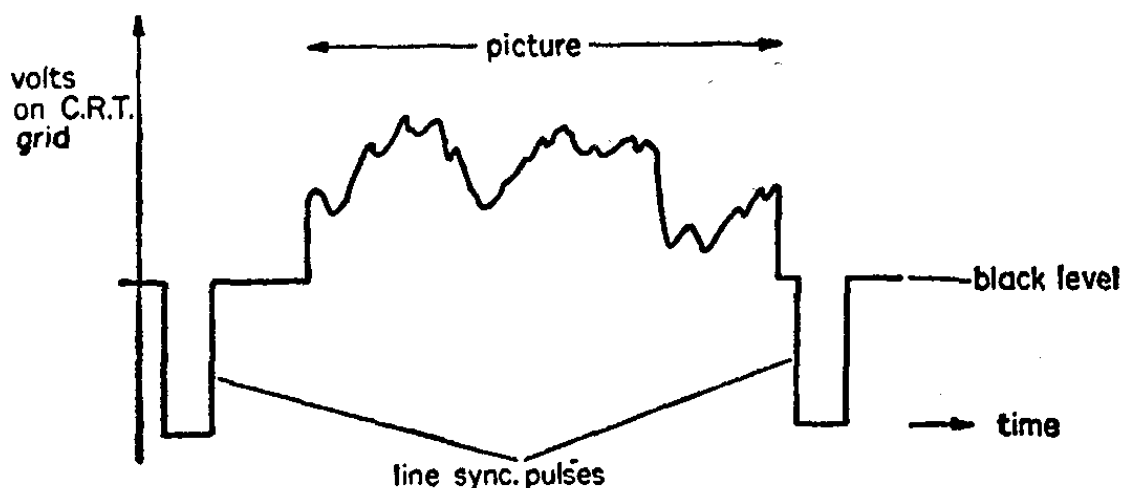
ship between 50 and 625. Of course other numbers would do this,^① but we must have an odd number to get that half line for interlace. It must not be too small, otherwise the lines are too visible; that is what many people thought about the old 405 line system. If it is too high then we need a large transmission bandwidth — but more on this later.^② The French chose 819, the Americans 525,^③ and happily most of the rest of the world have settled for 625.

4 SYNCHRONIZATION OF LINE AND FIELD SCANS AND THE TELEVISION WAVEFORM

As we have said,^④ as the spot flies across the tube face its brightness is controlled by the incoming television signal and a picture in monochrome is produced.

What we must have^⑤ is an extremely accurate means of synchronising the position of the spot with that^⑥ of the device which is generating the picture signal. This is achieved by including within the picture signal two sets of synchronising pulses, one for controlling the line frequency and the other for^⑦ controlling the field scan frequency. There are usually manual controls for these two line scan generators in the T.V. set labelled 'Field Hold' and 'Line Hold'.^⑧ When they are almost correctly

① **Of course other numbers would do this:** 当然, 其他数字也行。 ② **but more on this later:** 但有关这方面的问题,以后详谈。 ③ **the Americans 525=the Americans chose 525.** ④ **As we have said:** 定语从句,关系代词代替整个主句,在从句中作宾语。 ⑤ **What we must have:** 我们必须具备的。主语从句。 ⑥ **that:** 代词。代替 the position of the spot. ⑦ **one for...the other for...:** 一组用于..., 另一组用于...。 ⑧ **labelled... Hold':** 过去分词短语,作后置定语,修饰 two line scan generators.



5. One line of a monochrome television signal

adjusted the synchronising pulses (line and field) then take charge and make them exactly right.^① Here in Fig. 5 is the sort of television signal we should now expect to find between grid and cathode of the T.V. tube — somewhere in the middle of a field scan.^②

The 'sync' pulses have no effect on^③ the picture as they simply drive the 'triode' into cut off^④ during the flyback. They are extracted from the signal at another point in the circuit and used to control the line scan generator. Flyback begins at the leading edge (L.E) of the line-sync pulse and the spot should be just coming in at the left hand edge of the picture as the 'back porch' period ends and picture information begins.

At the end of a field scan when the spot is at the bottom of the picture a group of pulses appear in the signal which cause

① right: 形容词, 作宾语补足语。 ② we should ... scan: 定语从句, 省略了作动词不定式 to find 的宾语的关系代词 which, 修饰 the sort of television signal. somewhere in the middle of a field scan: 场扫描中间的一定位置上。 ③ have no effect on...: 对...没有影响。 ④ drive ... into cut off: 使...断开。

field flyback to begin.① The difference between the single line-sync pulses and the group of pulses for field-sync allows circuits to sort out the one from the other.②

5 THE TELEVISION BANDWIDTH

We could with advantage③ do some calculations here. Let us first find out how long it takes the electron beam to draw out one complete line. As we have said each picture contains 625 lines which are painted in $\frac{1}{25}$ s. The time of one line is therefore $\frac{1}{25} \div 625 = 64 \mu\text{s}$ (microsecond), i.e. 64 one-millionths of a second. In electronic circuits a microsecond is really quite an age. To allow for flyback and the insertion of the line-sync pulses with front and back porches we subtract about $12 \mu\text{s}$ leaving $52 \mu\text{s}$ for picture information per line.④ The sync pulse itself is about $4.7 \mu\text{s}$ long.

The frequency of the line scan is simply obtained from the duration of one line. If this takes $64 \mu\text{s}$ then the number of scans per second (the frequency) is

$$\frac{1}{64 \times 10^{-6}} = 25 \times 625 = 15.625 \text{ kHz}$$

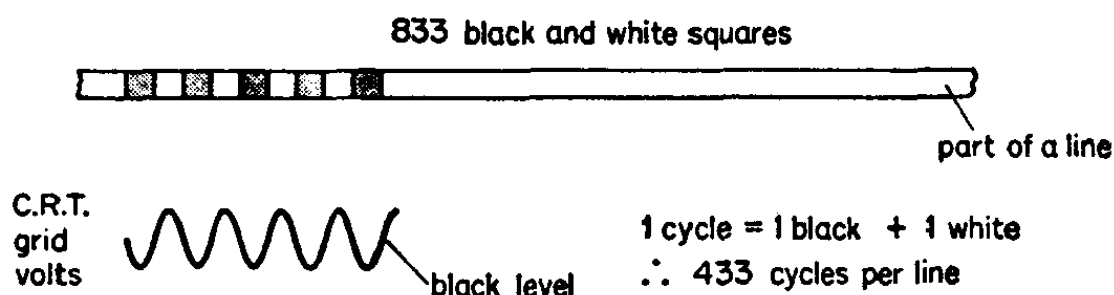
The field scan frequency is of course 50 Hz which is that of the mains supply. The horizontal speed of the spot is about 6 kilometres per second or 13500 miles per hour!

With 625 lines to each picture⑤ the number of elements of

① which cause field flyback to begin: 定语从句, 修饰 a group of pulses, 其间被动词谓语和状语所分隔。 ② to sort out the one from the other: 将这两种脉冲区分开。 ③ with advantage: 有效地, 有利地。作状语。 ④ leaving ... per line: 给每行图象信息留下 52 微秒。 ⑤ With 625 lines to each picture: 如果每一图象采用 625 行。to: 表示对比意义。

vertical detail cannot be better than the number of lines. To achieve the same detail horizontally^① we should not need to vary the brightness of the spot at intervals less than^② $1/625$ of the picture height. Let us be more precise.^③ Television pictures have an aspect ratio of 3 to 4,^④ vertical to horizontal. (This is about the only parameter on which there is international agreement!)^⑤

Suppose our picture is 30 cm by 40 cm^⑥ (although the actual dimensions will not alter the final answer). The line structure divides the height into elements each of $30/625$ ^⑦ cm. If we require the horizontal detail to be no better than^⑧ this, then we can imagine that each line consists of elements of this width ($30/625$ cm). There will be $40 \div (30/625) = 833$ of them as seen in Fig. 6.^⑨ We might then argue that if alternate elements were black and the others were white we should have the most extreme detail we would want.^⑩ Two elements thus represent



6. One line on a C.R.T. which is displaying its most detailed pattern, and the frequency this pattern implies

① To achieve ... horizontally: 要在水平方向获得同样的清晰度。 ② less than: 少于, 小于。 ③ Let us be more precise.: 让我们说得更精确一些。 ④ an aspect ratio of 3 to 4: 高宽比是 3:4。 ⑤ on which ... international agreement! 国际公认的。 ⑥ 30 cm by 40 cm: 30 厘米高 40 厘米宽。 by 乘, 表示面积。 ⑦ each of $30/625$ cm: 每一个像素为 $30/625$ 厘米。 each, 代词, 表示一个个加以单独考虑或计数。 ⑧ no better than: 差不多, 与...一样。 ⑨ as seen in Fig 6.: 如图 6 所示。 ⑩ we would want: 我们所需要的。 定语从句, 省略了关系代词 which, 修饰 detail。

a complete cycle from black to white; this makes 416 (approx) cycles per picture line — and this takes $52\ \mu\text{s}$ (see Section 13).

The frequency of the signal required to produce this extreme pattern is thus

$$\frac{416}{52 \times 10^{-6}} = 8\text{MHz.}$$

In practice^① the highest signal frequency we need^② is 5.5 MHz.

6 THE SOUND

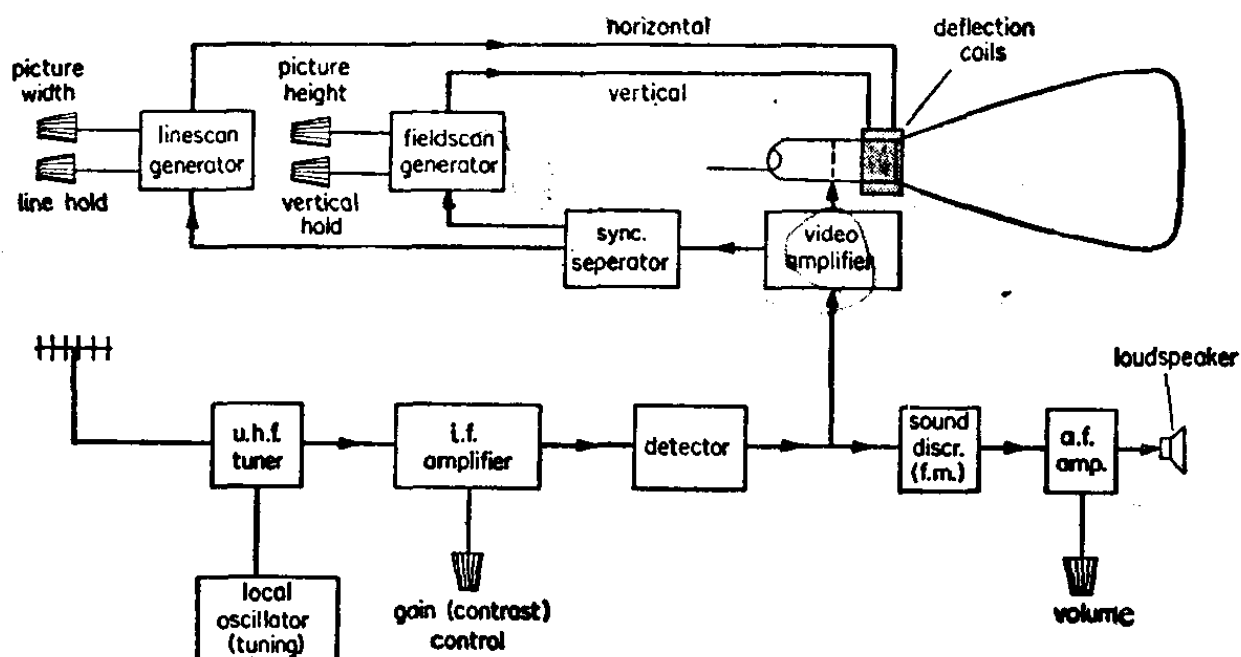
The programme sound often reaches the transmitting station separately from the vision signal and into a separate f.m. transmitter.^③ The frequencies of sound and vision u.h.f.^④ transmitters are closely related to one another^⑤ and are exactly 6 MHz apart. Their outputs are combined and radiated from the same aerial.

7 THE RECEIVER BLOCK DIAGRAM

Here then in Fig. 7 is a block diagram of a u.h.f. 625 line 50 field monochrome television receiver.

From the detector we get vision information in the band zero to 5.5 MHz, and the frequency modulated sound is centred on the sound carrier at 6 MHz. The sound discriminator circuits are tuned to 6 MHz, just as though this were the intermediate frequency (i.f.) of a solely f.m. sound receiver.^⑥ This method

① In practice: 实际上。 ② we need 我们所需要的。 ③ f.m. transmitter: 调频发射机。f.m. 系 frequency-modulated 的缩写。 ④ u.h.f.: 超高频, 系 ultra high frequency 的缩写。 ⑤ one another: 相互。 ⑥ just as though ... receiver: 好象一个单独调频伴音接收机的中频一样。as though 连词, 连接方式状语从句, 谓语动词用过去时, 表示虚拟语气。i.f. 系 intermediate frequency 的缩写。



(Power supplies omitted)

7. A diagram of a monochrome television receiver

of dealing with the sound signal is known as inter-carrier sound.^① Incidentally because the u.h.f. of 471 — 847 MHz is so high and the vision plus sound bandwidths are so great (6 MHz) it is usual to use a high i.f. such as^② 35 MHz instead of^③ 465 kHz as in radio receivers.

Colour represents a few more degrees of^④ complication so we shall leave that until later.^⑤

Thus prepared^⑥ we can turn to the various ways in which the television signal is generated; the most familiar perhaps is the electronic camera, but we will also deal with film and video tape.

① is known as inter-carrier sound: 就是内载波伴音。as inter-carrier sound 作主语补足语。 ② such as: 例如。复合连词,引出同位语。 ③ instead of: 而不采用、代替。复合前置词。 ④ a few more degrees of...: 略为...。 ⑤ so we shall leave that until later: 因此我们留待以后叙述。so 是连词。 ⑥ Thus prepared: 经过上述准备以后。