Summary of RS-170A NTSC video signal timing standard

Translate this page with Babelfish Translation
Update: 2002. 6. 12

Here,just summaryexplains simplyconcerningthe arrangement of timing *of the NTSC* video signal which is stipulated with *EIA RS-170A*. Presently as for RS-170A, being revised, it seems that becomes SMPTE 170M, but the great difference it is not and being to pass generally with RS-170A, if you remember with this, it probably is sufficient.

Three synchronization signals (horizontal synchronization, vertical synchronization and color same period) it is in the NTSC color television signal. These timing are made all color sub-carriers in standard. Is in order this maintains the correlation of the luminance signal and the color sub-carrier, to establish the relationship of at those spectrum interleave. These frequencies have become as follows.

Fundamental of NTSC signal

Color subcarrier frequency (fsc): 3579545Hz±10Hz

The color subcarrier the carrier chrominance signal is the sub-carrier in order to be superimposed in the luminance signal. Because this frequency becomes standard of all timing, approved deviation is permitted ±10Hz (only ±2.8ppm). Furthermore, it is managed with the fearful precision, number 10ppt at the time of actual broadcasting. What kind of nuclear plant is used, don't you think? it is probably will be. When it becomes high precision to here, there is also another utilization value. For example, proofreading and the like the frequency counter, measuring the bursting lock clock, as shown 3579545Hz, just adjusts the nuclear plant to adjust to the precision below 1ppm, it includes.

As for this frequency, while maintaining the relationship of spectrum interleave of the luminance signal, in order the audio carrier (the image carrier +4.5MHz) not to give beat obstacle, it is something which is selected under conditions. In this case, for coherence adjusting horizontality vertical frequency at time of original black broadcast (fH: 15750Hz and fV: 60Hz) Barely was modified. On the picture becoming the following kind of effect depending upon spectrum interleave, it appears.

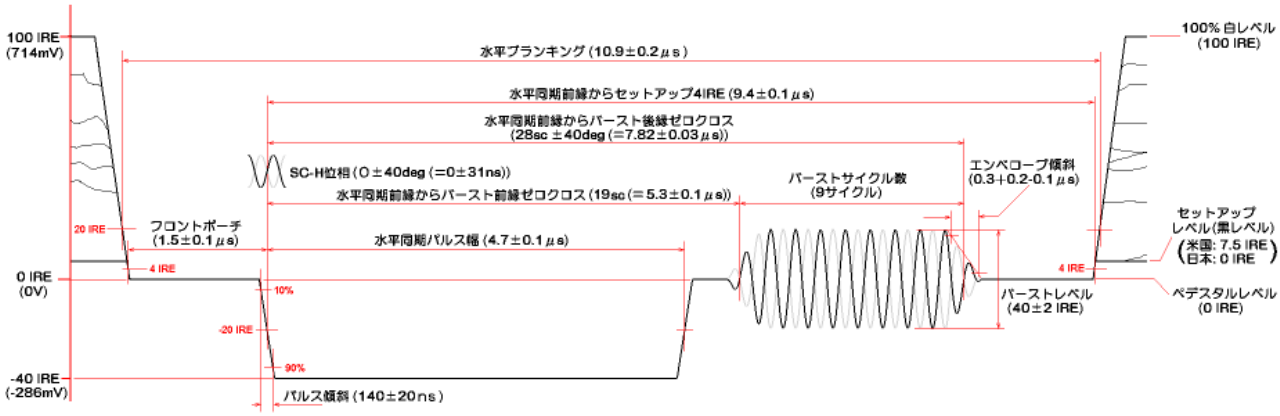
Horizontal synchronization frequency (fH): Fsc/227.5 = 15734Hz

It means that phase of the color sub-carrier reverses in every line by designating horizontal period as 227.5sc. Because of this, when you see in the surface, becoming like the checkered pattern where the dot of the color sub-carrier is detailed disturbance stops being conspicuous. When relationship with the color sub-carrier is integer ratio, phase of the color sub-carrier is agreeable to every line, becoming the vertical stripe where the part which has color is strong, disturbance is conspicuous.

Vertical synchronization frequency (fv): FH/262.5 = 59.94Hz

Because 1 field is 262.5 lines, it becomes this way. In addition, 1 frame is 29.97Hz. Because the number of lines of 1 frame is odd number (525 lines), in every frame and it is decided that phase of the color sub-carrier reverses, the dot is offset between the frame and disturbance stops being conspicuous. This way, being to guarantee the compatibility of the existing black system and the expedient which separates the carrier chrominance signal easily with NTSC by synthesizing the carrier chrominance signal skillfully, it does.

Horizontal synchronization section timing details



Being something which tries writing out the timing specification of horizontal synchronization section in the figure it does this figure. The scale of the time base and voltage level relationship of value that tried becomes relatively just in respectively. Here,the unit, *IRE* appeared, but this is the unit which displays the voltage level of the image signal relatively. Pedestal level in standard 100% white level of the image signal (the brightest place) the point of 100IRE and marker pulse is done -40IRE. Therefore, largest amplitude becomes 140IRE. This way the person who used IRE it reaches the point where relationship of each electric potential understands intuitively know. Because voltage level of image input/output of the equipment generallyis1V P-P, in many cases it is *1IRE = 7.14mV*.

You think that you understand that you look at the figure, but as for most timing the fall of horizontal synchronization pulse has become

standard. And especially*SC-H phase*(phase something related to horizontal synchronization between the color subcarrier) what it is stipulated strictly understands. In broadcast production actual place, digital signal processing and synthesis etc. of the image signal are important, but because SC-H with disjointed variety inconveniences occurs with these processing, is. Inclination of the startup fall of marker pulse (it is harsh) and it is stipulated fairly well to form of the envelope of color burst. As for the equipment for business high reliability and compatibility must be guaranteed, because, it has become the design which conforms to standard.

Simply, it is not necessary at consumer appliance level as for these standards excessively you are not conscious (with to say, or to protect strictly). In the first place, sky the image signal which is spread, receiving the various distortion and the influence of noise, stopping being the honest ripple mark, now the sushi, being such signal, starts projecting the television receiver and the video recorder without problem, because it has the tolerance which it can videotape is.

Horizontal synchronization pulse

It is the synchronization signal which shows the start of each horizontal line. In the televising vessel the trigger doing the horizontal deflection circuit in at this pulse, it scans the beam in horizontal direction. Period of horizontal synchronizationis *63.56 μs* ($1/f_H$).

Color burst

With the 3rd synchronization signal which is added by color conversion, also the color synchronization signal is called. Color burst with the phase and amplitude, the carrier chrominance signal the case where it recoversgives*standardphase* and*recovery level*. As for with the televising vessel amplitude being referred to other than phase, because the high pass section which includes the carrier chrominance signal is easy to fluctuate level relatively, is in order to compensate this. In addition, the black signal or color burst being attenuated abnormally, case the recovery difficult signal enters, in order to prevent the fact that it becomes color noise the color demodulator circuit stopping automatically, it becomes the black picture, (you call the color killer).

Pedestal level

With those in brief like gland level, this the luminance signal becomes standard electric potential of the synchronization signal. At the time of output pointing pedestal level when it cannot make 0V, (in the + single power circuit it becomes so), DC blocking with the condenser several hundred μ F, it makes AC connection. Many seem that becomes AC connection excluding part.

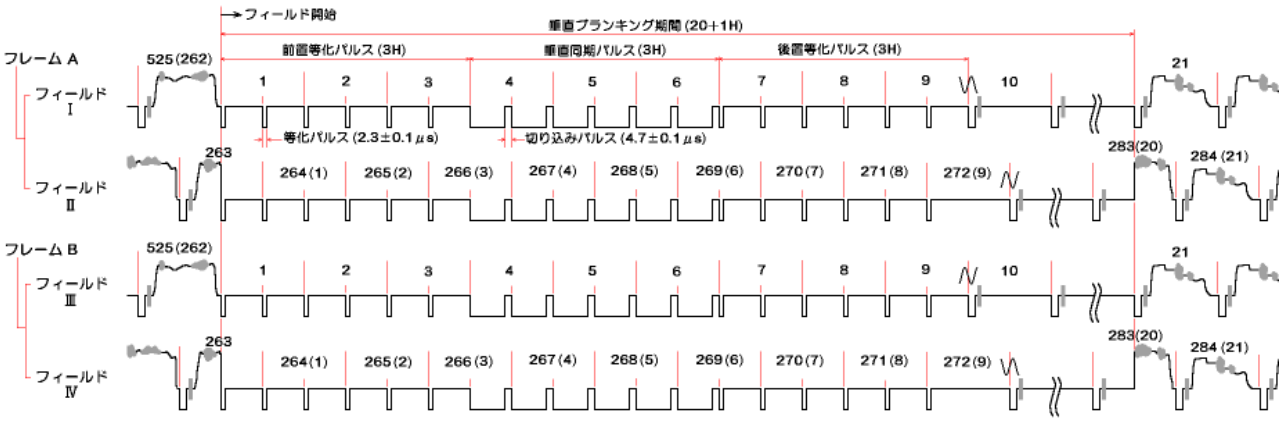
Setup level

Black of the luminance signal (brightness =0) with it is the voltage level which is regarded. In the United States of originator NTSCit is*7.5IRE*, but in Japan*0IRE* is used. From the fact that so, with the old LD software 0IRE and the like and existing together have done with 7.5IRE and recent LD, really it seems that is ambiguous. When the signal of 7.5IRE setup is indicated in the monitor of 0IRE setup, it reaches the point where black floats somewhat.

Recent modification point

Up-to-date specification (*SMPTE 170M*) with as for the basic place being the same as RS-170A, definition of blanking period is somewhat modified. SC-H is stipulated, the leading edge zero cross of color burst (at the point where amplitude strides 50%) with degree of 19sc±10 furthermore has become harsh.

Vertical synchronization section timing details



The vertical synchronizationsection of four fields is shown in the figure above. Why being 4 fields? With NTSC, phase of the color subcarrier every line, expressed that it reverses in every frame before. Therefore, those where phase relationship of three synchronization signals makes a round mean 2 frame periods. Group of these 4 field sequencesis called*the super frame*or*the color frame*. SC-H phase of each field is as shown in the part of line 10. If you are not conscious of SC-H phase, being if to be same ones, you think frame A and B at 1 frame unit, it is sufficient.

The number which is attached to every horizontal line shows line number. Each field 262.5 book, with 1 frame it becomes 525. Inside the parenthesis it is the line number in even number field. The indicatory territory of the NTSC signal (effective number of scanning lines),it becomes with *maximum of485*, but with DVD and the like truncating the top and bottom 2.5 book,only *480*it is recorded.

Vertical blanking period

On the line of the part where it is not indicated in the picture of vertical retrace line period, vertical synchronization pulse between this enters. With actually broadcast, various information (letter broadcast, the GCR signal and the test signal etc.) is placed in line 15 - 21, but normally having protruded outside the picture, it is not visible.

Vertical synchronization pulse

Pulse width at 3H period, is separated with the CR integrating circuit generally.

Equalizing pulse (equalizing pulse)

With interlace scan, when vertical synchronization pulse every 262.5H (they are 525 interlace) it enters. Without thinking at all, when vertical synchronization pulse is synthesized, it becomes something where the ripple mark of vertical synchronization pulse front and back differs in even number field and odd number field. When it does, it becomes impossible not be able to synthesize the respective field not be able to interlace becomes to separate the vertical synchronization pulse of 227.5H period accurately in the integrating circuit. In order to prevent this, the ripple mark of vertical synchronization pulse front and back respectively that tries becomes same, (it equalizes) it is something of for the sake of. Equalizing pulse in front and back 3H period of vertical synchronization pulse is inserted at 0.5H period. Because APL is maintained pulse width is half of horizontal synchronization. Because equalizing pulse that way hindrance does to come to horizontality drive and the genlock, pulse of the 0.5H point is used the mask (the half-H killer) the HD signal which is done.

Cut pulse(serration pulse)

You fall in vertical synchronization pulse period and in order to prevent the fact that the edge is gone, it is pulse of the straight polarity which cuts into vertical synchronization pulse at 0.5H period. Pulse width is two times the equalizing pulse, but as for this in regard to operation of the clamper and after 4.7 μ the standing up s unless there is a pedestal level, you think as the for the sake of it is unpalatable. Rather than with saying, perhaps the one which you thought that width of equalizing pulse spreads to 27.1 μ s to vertical synchronization period, the nature.

About 60Hz of vertical frequency

Is in order to adjust to power source frequency. As for the anode voltage of CRT when has an influence on the being required condition of deflection (voltage goes down, spirit of the electron becoming weak, deflection catches strongly and the picture spreads). With CRT whose high pressure regulation is bad, adjusting to blinking, the person who becomes aware to the picture expanding and/or shrinking it is many, probably will be. With circuit technology of that time when the television was developed, anode voltage had received the influence of the power source ripple. Naturally, adjusting to the power source ripple, the picture is warped, but when power source frequency and vertical frequency differ, because vertical position of the distortion is related to at frequency of the difference, becoming the shaking of the picture it becomes ugly ones. When power source frequency and vertical frequency are made the same, it meaning that position of the distortion stands still, the picture shaking, being to be gone it does that it is visible.

As for the electric power company of that time and Tokyo where by the way, in Japan electrification starts from Europe, as for the Osaka electric power company it imports generation of electricity equipment from America and from thing, while it divides into 50Hz and 60Hz with Kanto and Kansai it has reached to the present. In Japan the occasion where television technology is introduced from America, the shaking of the picture was held down by the fact that you devise to the circuit so is.

It is the case that 50Hz/60Hz of vertical frequency is not NTSC system and PAL system specific ones, is power source frequency origin. Therefore, there is also a country of 60Hz PAL system. As expected because NTSC is minority group, it seems that is not 50Hz NTSC. Furthermore, the difference of NTSC/PAL/SECAM system, in the carrier chrominance signal it is being superimposed present, but here it does not explain.

Video test signal | table of contents