

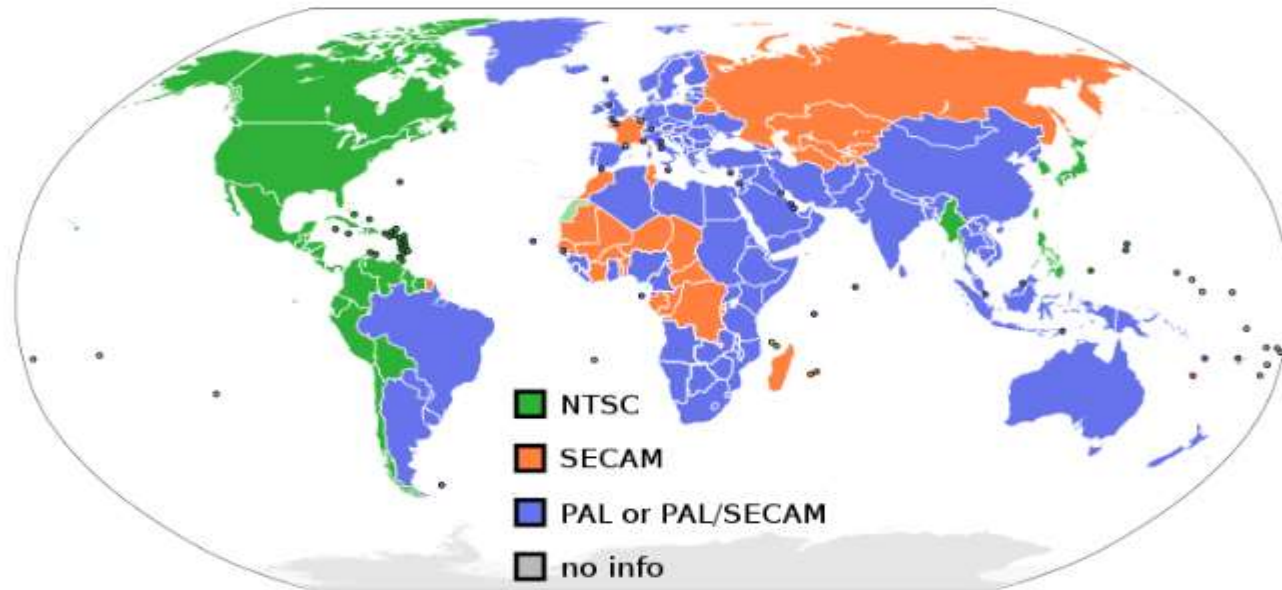


NTSC,PAL, SECAM

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SNS CT

- TV systems used around the world, namely, NTSC, SECAM & PAL. These systems specify the standards of television transmission used. For example, India has adopted the PAL television system. Hence, all television transmission in India would follow the PAL standards. The following map shows the standard adopted by the different countries of the world.



NTSC

(National Television System Committee)

Features of NTSC:

- Developed in the US.
- Compatible with the 525 line, 60 field per second, 2:1 interlaced monochrome system.
- To transmit color information, we use I & Q signals derived as follows:
 $I = V \cos 33^\circ - U \sin 33^\circ$ &
 $Q = V \sin 33^\circ + U \cos 33^\circ$ where,
 $U = 0.492(B - Y)$ &
 $V = 0.877(R - Y)$ Note-(B-Y) & (R-Y) are the color signals that contain the real color information. Further, U & V are weighted color signals and I & Q are then obtained from U & V.
- I & Q are used to modulate a color sub-carrier of frequency 3.58 Mhz using two balanced modulators.
- Variants of NTSC are NTSC 4.43 (VCRs), NTSC J (Japan) & NTSC M (same as J but includes blanking pulses)

Advantages of NTSC:

- Higher frame rate – reduces visible flicker
- Less inherent picture noise – better S/N ratio
- Simpler circuits than PAL & SECAM
- Easy studio mixing
- Less costly than PAL

Disadvantages of NTSC:

- Small luminance signal bandwidth (3.85 MHz) – increased likelihood of interference
- Susceptible to hue fluctuations
- Lower gamma ratio (2.2 as opposed to 2.8 in PAL systems)
- More costly than SECAM
- Lower number of scan lines – means reduced quality on large TV screens

PAL

(Phase Alternating Line)

Features of PAL:

- Adopted by Europe.
- Compatible with Europe's 625 line, 50 fields per second, 2:1 interlaced monochrome standard.
- It is a modification of NTSC to overcome high order of phase and amplitude integrity requirements to avoid color distortion. It implements this by line-by-line reversal of the phase of one of the color components. U & V signals (defined above) are used in transmission and the modulation is phase quadrature balanced modulation. The phase of the V is reversed on every other line so any color sub-carrier phase errors are cancelled. Hence, hue errors are corrected by phase alternation. The color sub-carrier frequencies are different for different versions of PAL as defined below.
- PAL B, D, G, H, I, N (color sub-carrier frequency = 4.43 MHz), PAL M (3.57 MHz) & PAL N_c (3.58 MHz)

Advantages of PAL:

- Greater number of scan lines – more picture detail.
- Wider luminance signal bandwidth (4.43 MHz in most PAL variants)
- Stable hues – due to error correction by phase alternation
- Higher gamma ratio (2:8) – hence, higher level of contrast than NTSC
- Easy studio mixing compared to SECAM

Disadvantages of PAL:

- Costliest receivers due to complex circuits for electronic switching
- Lower frame rate – hence, more flicker
- Lower S/N ratio than NTSC
- Variable color saturation – cancelling out phase differences by alternation holds hue stable but at the same time, it can change (reduce) color saturation.

SECAM

(Séquentiel couleur à mémoire, french for Sequential Color with Memory)

- developed in France
- 625-line system, 50 fields per second, 2:1 interlaced system.
- Instead of transmitting R & B information together, they are sent one by one (hence, sequential) and information about the color from the preceding line is used (hence, memory). Transmits Db signal (blue color information) on one line and Dr signal (red color information) on the next line while Y is transmitted on each

line Here

- $D_b = 1.505(B' - Y)$ &
 $D_r = -1.902(R' - Y)$
- The color sub-carrier frequencies for Blue & Red signals are 4.25 MHz and 4.4 MHz respectively and FM is used as color modulation.
- Variants of SECAM are SECAM B, G, D, K, K_1 , & L. (B & G use a video bandwidth of 5 MHz while others use a video bandwidth of 6MHz).

Advantages of SECAM:

- Use of FM makes system free of phase errors.
- No crosstalk between color signals since they do not exist on the same line.
- Hue control not needed. (needed in NTSC but not needed in PAL & SECAM)
- Saturation control not needed (needed in both NTSC & PAL)
- Lower cost than both NTSC & PAL
- Higher number of scan lines than NTSC

Disadvantages of SECAM:

- Half color information is lost on each line since only one color signal is transmitted on each line.
- Not suitable for studio use – studios use PAL and then transcode to SECAM for SECAM markets.
- Incompatibility between different versions of SECAM (due to political influence)

Differences between NTSC, PAL & SECAM TV Systems

(NTSC vs PAL vs SECAM : Comparison Table)

Parameter	NTSC	PAL	SECAM
Developed/adopted in	US	Europe(UK)	France
Number of lines	525	625	625
Frames/second	60	50	50
Color info transmission	U & V or I & Q are used	U & V are used	Db & Dr are used
Sub-carrier Frequency	3.58 MHz	4.43 Mhz	4.25 or 4.4 MHz
Color Burst	9 cycles of sub-carrier frequency	10 cycles of sub-carrier frequency	burst cycles of red and blue sub-carrier frequency
Variants	4.43, J, M	B, D, G, H, I, N, M & Nc	B, G, D, K, K1, L
Cost	Medium Cost	Most Expensive	Least Expensive
Studio Mixing	Easiest	Medium Ease	Difficult

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