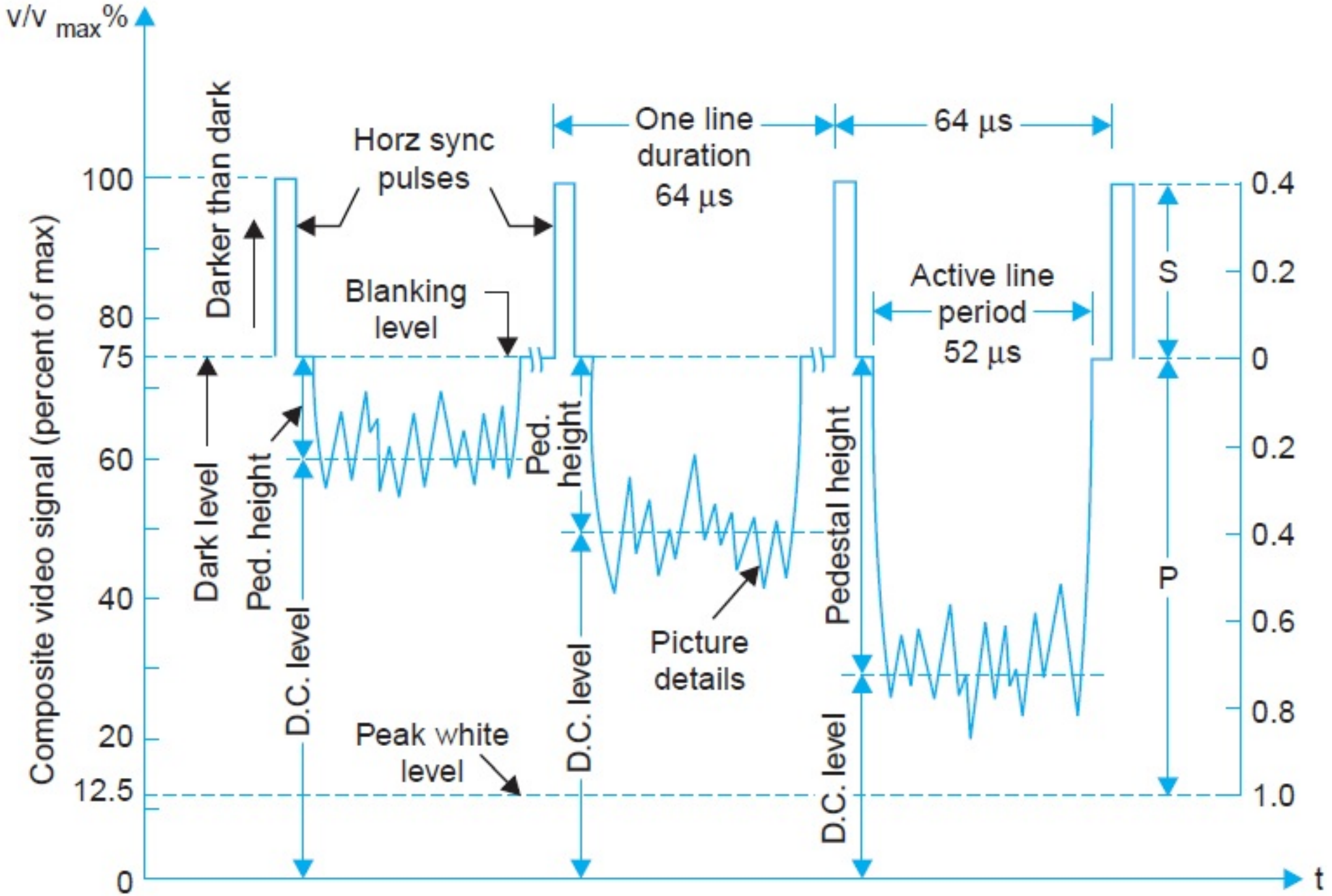
Composite Video Signal

Composite video signal consists of a camera signal corresponding to the desired picture information, blanking pulses to make the retrace invisible, and synchronizing pulses to synchronize the transmitter and receiver scanning. A horizontal synchronizing (sync) pulse is needed at the end of each active line period whereas a vertical sync pulse is required after each field is scanned. The amplitude of both horizontal and vertical sync pulses is kept the same to obtain higher efficiency of picture signal transmission but their duration (width) is chosen to be different for separating them at the receiver. Since sync pulses are needed consecutively and not simultaneously with the picture signal, these are sent on a time division basis and thus form a part of the composite video signal.


V/V max %
Composite video signal (percent of max)
100
80
75
60
40
20
12.5
0
0.4
0.2
0
0.2
0.4
0.6
0.8
1.0
t
Darker than dark
Horz sync pulses
One line duration 64 µs
64 µs
Blanking level
Active line period 52 µs
S
P
Dark level
Ped. height
D.C. level
Ped. height
D.C. level
Picture details
Pedestal height
D.C. level
Peak white level

D.C. component of the video signal. In addition to continuous amplitude variations for individual picture elements, the video signal has an average value or dc component

corresponding to the average brightness of the scene. In the absence of dc component the receiver cannot follow changes in brightness, as the ac camera signal, say for grey picture elements on a black background will then be the same as a signal for white area on a grey back-ground. In Fig. dc components of the signal for three lines have been identified, each representing a different level of average brightness in the scene. It may be noted that the break shown in the illustration after each line signal is to emphasize that dc component of the video signal is the average value for complete frames rather than lines since the background information of the picture indicates the brightness of the scene. Thus Fig. illustrates the concept of change in the average brightness of the scene with the help of three lines in separate frames because the average brightness can change only from frame to frame and not from line to line.

Pedestal height. As noted in Fig. the pedestal height is the distance between the pedestal level and the average value (dc level) axis of the video signal. This indicates average brightness since it measures how much the average value differs from the black level. Even when the signal loses its dc value when passed through a capacitor-coupled circuit the distance between the pedestal and the dc level stays the same and thus it is convenient to use the pedestal level as the reference level to indicate average brightness of the scene.

Setting the pedestal level. The output signal from the TV camera is of very small amplitude and is passed through several stages of ac coupled high gain amplifiers before being coupled to a control amplifier. Here sync pulses and blanking pulses are added and then clipped at the correct level to form the pedestals. Since the pedestal height determines the average brightness of the scene, any smaller value than the correct one will make the scene darker while a larger pedestal height will result in higher average brightness. The video control operator who observes the scene at the studio sets the level for the desired brightness in the reproduced picture which

he is viewing on a monitor receiver. This is known as dc insertion because this amounts to adding a dc component to the ac signal. Once the dc insertion has been acomplished the pedestal level becomes the black reference and the pedestal height indicates correct relative brightness for the reproduced picture. However, the dc level inserted in the control amplifier is usually lost in succeeding stages because of capacitive coupling, but still the correct dc component can be reinserted when necessary because the pedestal height remains the same.

The blanking pulses. The composite video signal contains blanking pulses to make the retrace lines invisible by raising the signal amplitude slightly above the black level (75 per cent) during the time the scanning circuits produce retraces. As illustrated in Fig. 3.2, the composite video signal contains horizontal and vertical blanking pulses to blank the corresponding retrace intervals. The repetition rate of horizontal blanking pulses is therefore equal to the line scanning frequency of 15625 Hz. Similarly the frequency of the vertical blanking pulses is equal to the field-scanning frequency of 50 Hz. It may be noted that though the level of the blanking pulses is distinctly above the picture signal information, these are not used as sync pulses. The reason is that any occasional signal corresponding to any extreme black portion in the picture may rise above the blanking level and might conceivably interfere with the synchronization of the scanning generators. Therefore, the sync pulses, specially designed for triggering the sweep oscillators are placed in the upper 25 per cent (75 per cent to 100 per cent of the carrier amplitude) of the video signal, and are transmitted along with the picture signal.