

The present invention relates to a method of generating sync signals used in a device for the optical transcription of data onto a data medium, during the read and/or write phases, particularly of digital data recorded on a disk. It also relates to an optical device for
5 implementing this method.

The recording methods are well known to specialists in the field and are outside the scope of the present invention. Most often, these data are recorded in the
10 form of micro-reliefs along tracks having a spiral configuration or a concentric circles configuration, this latter configuration being the most often used for the recording of digital data. In particular it facilitates random access to a recorded datum as well as recording
15 divided into blocks or sectors.

During the reading, whatever the recording method may be, it is necessary to have signals enabling the synchronization of this reading. Numerous methods of achieving this are also known.

20 According to a first method, in the so-called multi-track systems, there is associated with each track reserved for the recording of useful information at least one other track along which various information is recorded and particularly clock signals enabling the
25 synchronization of the reading of the useful information. In a variant embodiment, the tracks intended for synchronization are pre-engraved and comprise regularly spaced perturbations which can be detected optically. During the reading, in a first variant (multi-beam system), a
30 first beam is focused on the useful information track used for reading this information, and a second beam, separate but constantly mechanically coupled with the first beam, is used for reading the synchronization information. In a second variant, (mono-beam system) a
35 single beam reads both informations. In this case, it is necessary that the two types of information can be easily discriminated. By way of example, the frequency

spectra associated with these informations can be different. In this variant the pre-engraved synchronization information can also be used during the write phase. A data medium corresponding to the second variant
5 mentioned above is known from the document EP-A-0032271 but the reading of this medium uses a scanning of the track with two beams whose points of impact are off-set with respect to each other. Provision is made for putting a clock signal read by the first beam into phase
10 with a portion of the clock signal read by the second beam.

In order to increase the possible recording density, it has also been proposed to use a single track. In this case, the clock sync pulses can be derived from the read-
15 ing of the data itself.

In order to make synchronization easier, it is conventional to use so-called auto-synchronizing codes or maximum transition codes, whatever the content of the information source to be recorded may be. In fact, in
20 practice the micro-reliefs have two reference levels associated with the logic "0" and "1" values respectively. The sync signals are derived from the detection of the transitions from one given level to the other and are used for controlling in frequency and in phase an
25 oscillator, conventionally of the voltage controlled type (known by the English abbreviation V.C.O. for "voltage controlled oscillator") provided with a phase locked feedback loop (P.L.L.: "phase lock loop"). Furthermore, special bursts of recorded pulses are used for initial-
30 izing the locking.

However this type of encoding does not enable a maximum recording density. It is also known to increase this density by using non auto-synchronizing codes, for example the N.R.Z. code (non return to zero). The charac-
35 teristic of this type of code is not to have a transition from one data bit to another if these two bits remain at the same logic value. It is therefore more difficult to

derive the signals necessary for synchronization from the reading of the information thus encoded.

The present invention proposes overcoming the disadvantages of the prior art while retaining the possibility of a maximum recording density. In order to do this, the method of the invention consists in disposing along tracks, regularly or otherwise, recorded elements or flags used for synchronization. Naturally these flags must be "transparent" to the electronic circuits intended for detecting and processing the useful information. These synchronization samples are used for re-synchronizing the sync signal generator circuits each time a flag passes under a read head.

An object of the invention is therefore a method of generating sync signals in a device for the optical transcription of digital data onto a medium performing a scanning motion; the said data being recorded in the form of perturbations in at least one layer of material of the medium and able to be optically detected along tracks of a given configuration, the said tracks comprising a succession of non-contiguous sites intended for storing the said data between which there are placed interstitial sites intended for another form of use; the said device comprising means for focusing into a scanning spot, at least one beam of light energy on one of the said tracks, optoelectronic means for the detection of the interaction of this beam with the said perturbations progressing under the scanning spot and selector means connected with these optoelectric means in order to provide a signal which is characteristic of the content of the said interstitial sites, this method being characterized in that it comprises the following stages:

- the writing exclusively in the said interstitial sites of specific digital data in the form of a sequence of perturbations of the said layer of material producing transitions acting as a reference in relation to the said sync signals but whose differences are able to be

distinguished from those used for the transcription of the said digital data;

- the local generation, external to the medium, of a periodic clock signal comprising an element defining a reference instant to be related to the transcription of the said data;

- the selective identification of the specific digital data by the said selector means;

- determination by the said selector means of the reference instant (T_B) resulting from the scanning of a transition whose selection is brought about with a given delay in relation to another transition; the said transition and the other transition being produced by the same perturbation included in the said specific digital data (92) in response to the scanning by the said spot (t_a) (sic) of the said interstitial sites; the said delay being dependent on the estimated duration existing between these two transitions.

- determination of the offset of this reference instant with respect to the true reference instant of the said periodic clock signal; and

- the generation of a sync signal starting from the said periodic clock signal corrected in phase in proportion to the said offset.

Another object of the invention is a device for implementing such a process and the information medium particularly suited to this method.

The invention will be better understood with the help of the following description referring to the appended figures in which:

- Figure 1 shows two types of code used for the encoding of a same binary word;

- Figure 2 is a diagrammatic illustration of the configuration of a track of an information medium according to the invention;

- Figure 3 is a diagram illustrating a special code used in a preferred variant of the invention;

- Figures 4 and 5 are block diagrams of devices according to two variant embodiments of the invention;

- Figures 6 and 7 are more detailed representations of certain elements in these devices;

5 - Figure 8 is a diagram showing the most significant functional signals of the device according to the invention and their relationship with each other in terms of time.

10 - Figure 9 is a diagrammatic representation of an optical read-write device in which the device of the invention can be used.

 The methods of writing data on an optical disk are well known. Normally the disk comprises at least one layer, generally superficial, of material sensitive to
15 certain types of radiation. According to one of the best known methods, during the writing, a beam generated by a laser source is focused on this layer of material and micro-reliefs are created along the tracks by a thermo-optic effect. These tracks can be virtual, i.e.
20 created at the moment of writing data, or can be pre-engraved in any form whatsoever. The methods of reading the data and of following the track are also well known. For following the track there is generally used either a second read beam, or the beam which was used for writing;
25 or the same beam can be used for all of the functions. The interaction between this beam and the micro-reliefs passing under a read head create orders of interference which are detected by optoelectronic detection means. The reading can be performed either by transmission
30 through the disk and detection by means of photodetector cells placed close to the lower surface of the disk, or by reflection of the radiation on the disk with the returned light gathered by optical systems comprising mirrors directing the reflected beams into photodetector
35 cells. In addition to the radial tracking, the photodetector cells can also be used for ensuring a correct focusing of the read beam on the recorded surface.

Finally, these cells are used for generating electrical signals representing the recorded data.

For applications in the data processing field, it is necessary to be able to record digital data in a random manner at any location in the disk. Similarly, random access to this information is also required during reading. Another requirement necessary for this type of device is that the reading must be synchronized with the writing. Now for many reasons, due to parasitic phenomena such as speed variations, an external clock cannot suffice for this purpose. The sync signals must therefore be derived directly from the recorded data in order to have a correlation between the read data and the written data.

In a practical way, the micro-reliefs occur in the form of alterations along the tracks associated with two well-defined levels and separated by transitions between the two levels. The inter-track zones are uniform zones whose surface is at one of these levels. The means of detection will translate these variations of level into a series of pulses which also have two states which can be associated with the logic "0" and "1" states and must exhibit more or less sudden transitions between these two states.

In the prior art, it is common to derive sync signals from the appearance of one of these transitions, for example a rising edge or a falling edge.

For this purpose, it is conventional to use codes known as auto-synchronizing or at least codes exhibiting a maximum of transitions, as has been recalled.

However when it is desired to increase the recording density, it is common to use other types of code like, for example, the N.R.Z (non return to zero) code.

Figure 1 illustrates two types of codes: the pulse code and the N.R.Z code for an arbitrary multi-bit binary word exhibiting the following logic states: 0100110110. It can be seen immediately from Figure 1 that the pulse

code exhibits many more transitions than the N.R.Z.-type code. It is therefore more difficult to derive sync data from the latter. In the figure, the period T represents the duration of an elementary binary signal or bit which
5 corresponds to a frequency of $f = 1/T$.

Neither is it possible to use an appended track reserved for synchronization, which would, because of this, destroy the gain in density enabled by the N.R.Z. code.

10 To overcome the abovementioned difficulties, an object of the invention is a method whose principal characteristic is to derive the signals necessary for synchronizing for the reading and/or writing of digital data on an optical data medium from specific digital data
15 or flags, recorded on the same track as the digital information data, but spatially multiplexed with the latter.

These flags can be written prior to any writing of useful information and are then used for the generation
20 of sync signals during the subsequent writing of this information and during successive readings; or they are time multiplexed with the writing of this information and are used during the subsequent reading of the latter.

Figure 2 shows an example of an arrangement accord-
25 ing to the invention.

In this figure there has been shown a section of one of the tracks 91 of a disk with a median axis 910. The tracks are of circular configuration in the considered example. According to the principal characteristic of
30 the invention, flags 92 are recorded along these tracks.

It is necessary that the specific digital data representing these flags should be selectively identifiable in such a way as not to generate sync signals solely in correlation with the appearance of these
35 specific flags and, on the contrary, that they should be "transparent" to the useful information processing circuits.

In order to do this, if an N.R.Z-type code is used as shown in the upper section of Figure 1, specific flags are recorded in the form of pulses in which time intervals separating edges of the same type are prohibited in the modulation code. For the N.R.Z code, the durations T and whole multiples of T are used. For the specific recorded pulses a duration is chosen which is equal to the smallest half-entire duration which can be used, i.e. $1.5 T$.

Such a pulse is shown in the diagram of Figure 3. A first section is at logic "1" level for the time interval equal to $1.5 T$, the time interval $T_A - T_B$, and at logic "0" level during the time interval equal to T : the time interval $T_B - T_C$.

Two particular situations can be distinguished. The first is the case in which the disk is pre-engraved, i.e. includes the flags, written prior to any recording of useful digital information data. In a preferred variant, the writing of these flags along the tracks is periodic and the spaces left free between the flags defined are blocks or sectors of data; in this case it is possible to obtain an entirely synchronous mode of operation.

The second case is that in which the flags are written at the same time as the recording of the useful digital information data. As before, the flags can be written at specific sites, regularly spaced or otherwise, or can be written multiplexed with the useful digital information data.

The method of the invention according to a preferred variant will now be described in a more detailed way with reference to the device shown in the block diagram of Figure 4. Optoelectronic detection devices and the associated electronic circuits 1 supply a read signal V_L transmitted on the one hand to conventional read information processing circuits 6 and, on the other hand, to circuits specific to the present invention.

According to the method of the invention, it is first necessary to determine if the signals V_L result from the reading of useful information or, on the contrary, from the reading of flags intended for synchronization. This stage is performed by means of flag detection circuits 2 which will be described in detail below. These signals supply an authorization signal V_A transmitted to phase-shift computing circuits 3. These circuits, according to the fundamental characteristic of the invention, have the purpose of providing information $\Delta\varphi$ representing the instant of appearance of a transition of a given direction of the micro-relief progressing under the reading spot. The authorization signal V_A , for example after logical inversion $\bar{V}_A$ by the inverter 7, can be used for functional inhibition-authorization purposes by the read information processing circuits 6.

The device also comprises clock circuits 4 generating sync pulses H regenerated by the circuits 5, i.e. put back into phase and transmitted in the form of a re-synchronized signal H_S to the read information processing circuits. Clock circuits also supply the reference clock signals H_R and the signals H to the phase shift computing circuit 3. In a conventional way, these clock circuits comprise a high stability crystal controlled oscillator.

It is accepted that the information medium-record or read head relative speed is defined with sufficient accuracy according to a reproducible law: for example constant angular velocity for a disk.

In this case, during the read phases, the frequency and the phase of the sync signals H_S are generated from phase information extracted from the detected flags.

In a periodic flag configuration the bit rate is regenerated, i.e. the frequency of the clock H is generated, on the basis of the block rate, i.e. the flag detection rate, (successive passages under the read head). In order to do this, the signal V_A is also transmitted to the clock circuits 4.

The putting back in phase by the circuits 5 is performed with the help of the information ΔP supplied by the flag detection circuits 2.

If, in addition, the bit rate of the read useful digital information data is very stable, i.e. if the phase slip per block (between two flag passages) is less than a fraction of a binary element (time slip less than a given fraction of the time interval T) the frequency regeneration operation is not necessary.

This can be obtained by controlling the medium-record and/or read head relative velocity by means which fall outside the scope of the present invention.

In this case, the device of the invention is reduced to the simplified circuits shown in Figure 5. There are no longer any flag detection circuits (Figure 4:2), the position of the latter being known. The authorization signals can be dsrived from the clock signals, H_A and, via the inverter 8, $\bar{H}_A$ respectively. The other circuits are identical to those in Figure 4 and will not be described again.

The various circuits of the devices in Figures 5 and/or 4 will now be described in greater detail.

An example of a circuit for flag detection and for determination of the instant of passage of a flag under the read spot is shown in Figure 6. This circuit comprises a first circuit 20 for shaping the read signal V_L . It can advantageously be constituted by a bistable element comparing a read signal V_L with a threshold voltage V_{THRES} supplying a pulse V_{LS} , for example, at a logic "1" state when the read signal exceeds the threshold or at the "0" state in the opposite case. This signal V_{LS} is transmitted to a circuit 21 which is intended to generate a pulse signal defining a time window V_F .

These signals are illustrated by the diagram in Figure 8. The graph H shows pulses supplied by the clock circuits 4 having a basic duration T . The pulse signal

V_{LS} can exhibit a phase shift with respect to any of the clock signals modulo the period of these signals.

The circuit 21 is triggered by the rising edge of the first flag pulse, at the instant T_A in the diagram, and supplies a pulse V_F whose centre is delayed by 1.5 T. In order to do this it is possible to use two monostable flip-flops generating pulses of duration respectively a little longer and a little shorter than 1.5 T. The logical intersection of these two pulses can be used for determining the time window V_F .

The phase shift information $\Delta\varphi$ can be obtained by comparison with a given instant of the period of the basic clock signal H, in a digital or analog manner. The signal $\Delta\varphi$ produced by the phase shift computing circuits can be in the form of a pulse signal having a transition of a given direction whose instant of appearance represents the phase shift of the flag with respect to a given instant of the clock signals H or a binary address word defining the phase shift.

In a preferred variant embodiment, use is made of the clock signal H and a clock signal H_R of a frequency which is a multiple of the repetition frequency of the basic clock signal H and having a fixed phase relationship with this signal. The second clock signal can be derived easily from the signal H by means of a frequency multiplier. By way of example, in the diagram of Figure 8, the clock signal H_R has a repetition frequency sixteen times greater than that of the signal H. It therefore defines sixteen sub-intervals. A decoder circuit can supply a binary word $\Delta\varphi$ representing the time shift of the instant T_B with respect to a fixed reference instant of the period of the basic clock signal H, this being in modulo sixteen. The binary word $\Delta\varphi$ or control word is used for resetting the phase, at each passage of a flag, of the clock signal used as a sync signal H_S . This signal can be used during the reading of useful digital information data between the successive

passages of two flags or, when these flags are written prior to the recording of data, in the form of pre-engravings, also for the writing of these data.

The new regenerated clock signals must be in a
5 constant phase relationship with the passage of the flags, i.e. for example with the falling edge instant T_B of the flag signal which has just been determined. The sync signals H_S have the same frequency as the clock signals H and a phase relationship depending on the
10 value of the control word $\Delta\varphi$.

An example of embodiment of the clock circuits is shown in Figure 7. These circuits comprise a conventional crystal controlled oscillator of the voltage controlled type (V.C.O.) provided with a phase locked
15 feedback loop (P.L.L.) comprising in series a frequency divider 41, dividing by the determined number N , a phase comparator 42 receiving on a first input the output of the divider 41 and on a second input the signals V_A coming from the flag detector 2 and a low pass filter 43.
20 The output frequency H of the oscillator is locked to a multiple N of the rate of passage of the flags under the read spot.

The oscillator which has just been described is more particularly applied to the circuits shown in Figure 4.
25 When the circuits of Figure 5 are implemented the oscillator can be reduced to its most simple form, the phase comparison no longer being necessary.

Finally, a clock signal H_r having a frequency which is multiple of the basic clock signal H can be
30 generated from the latter by means of a frequency multiplier 44.

The phase resetting circuits 5 can also comprise a voltage controlled oscillator provided with a phase locked loop feedback of the type of that which has just
35 been described controlled in frequency by the clock signals H or by a programmable delay line. The phase adjustment on the flage is performed with the help of the

control signal Δr .

The present invention can be implemented in numerous data processing medium optical read-write devices and, by way of example, Figure 9 is a diagrammatic illustration of a device for the optical recording on and reading from a medium in which the method of the present invention may be implemented. A disk 90 rotating in a plane XOY about an axis parallel to the third axis Z of the reference axes XYZ comprises on its upper surface a layer of thermo-sensitive material in which information has been recorded along tracks 91. These tracks also comprise flags 92 associated with a specific code according to that which has been described. The useful digital information data are recorded between these flags in the zones 93, preferably of constant length. The disk, of approximate diameter 30 cm, is driven in rotation by a drive motor built into the chassis of the optical recording and reading system. Typically, the tracks, for example 40,000 of them, are written inside a ring centred on the axis of rotation and of width approximately equal to 8 cm. The number of flags written in concentric circular tracks must be sufficient for overcoming parasitic phenomena associated with the nature of the medium or with variations in the speed of rotation. Typically 3,500 flags are written in tracks, taking account of preceding data.

In the embodiment shown in Figure 9, the device for accessing a predetermined track of the disk comprises a fixed section comprising an energy source (not shown) generating a beam of parallel rays f and a moving section constituted by the actual read-write head. As is known, the latter comprises a microscope-type lens O_b , integral with an electromagnetic coil B moving in the magnetic field of a permanent magnet (not shown) providing the vertical control or focusing and a galvanometric mirror M_1 providing the radial control. The galvanometric mirror M_1 moves about an axis Δy parallel to the axis

0Y of the reference axes in order to provide the said radial control. The beam f is focused into a spot t_a at a given location of the disk on one of the above-mentioned tracks 91. It is assumed here that the system
5 is of the single beam, mono-track type, i.e. a system in which the single beam f is alternately used for writing and reading as well as for providing the radial track following and focusing function. This aspect falls outside of the scope of the invention.

10 In order to detect the read beam reflected by the disk there is interposed, for example, a semi-transparent plate M_2 in the path of the single beam f . The beam reflected by the disk is then detected by the photo-detector means D which generate the signal V_L applied
15 to circuits 94 for processing this signal. These circuits comprise, in particular, the circuits of the invention, for example the device described with reference to Figure 7.

The invention is also compatible with read-write
20 devices using more than one beam, for example one read beam and one write beam.

In brief, the method of the invention enables, among other advantages, advantage to be taken of the independence which exists between the encoding of digital data
25 representing the information and the synchronization as well as a lesser dependence in relation to data losses due to "blanks" in the readout better known by the English term "drop-outs".

CLAIMS



1. Method of generating sync signals (H_S) in a device for the optical transcription of digital data onto a medium (90) performing a scanning motion; the said data being recorded in the form of perturbations (92) in at least one layer of material of the medium and able to be optically detected along tracks (91) of a given configuration, the said tracks comprising a succession of non-contiguous sites intended for storing the said data between which there are placed interstitial sites intended for another form of use; the said device comprising means for focusing into a scanning spot (t_a), at least one beam (f) of light energy on one of the said tracks, optoelectronic means (1) for the detection of the interaction of this beam with the said perturbations progressing under the scanning spot and selector means (2) connected with these optoelectronic means in order to provide a signal which is characteristic of the content of the said interstitial sites, this method being characterized in that it comprises the following stages:

- the writing exclusively in the said interstitial sites of specific digital data (92) in the form of a sequence of perturbations of the said layer of material producing transitions acting as a reference in relation to the said sync signals but whose differences are able to be distinguished from those used for the transcription of the said digital data;

- the local generation, external to the medium, of a periodic clock signal (H) comprising an element defining a reference instant to be related to the transcription of the said data;

- the selective identification of the specific digital data by the said selector means (2);

- determination by the said selector means of the reference instant (T_B) resulting from the scanning of a transition whose selection is brought about with a given



delay in relation to another transition; the said transition and the other transition being produced, at least one of them, by the same perturbation included in the said specific digital data (92) in response to the scanning by the said spot (ta) (sic) of the said interstitial sites; the said delay being dependent on the estimated duration existing between these two transitions.

- determination of the offset of this reference instant (T_B) with respect to the true reference instant of the said periodic clock signal (H); and

- the generation of the said sync signal (H_S) starting from the said periodic clock signal (H) corrected by the said offset.

2. Method according to Claim 1, characterized in that the digital data subjected to the said transcription generate transitions whose separations are characteristic of the modulation code utilized; the said specific digital data being composed of perturbations which generate a set of transitions having, in relation to these characteristic separations, the exclusive property of being identifiable by the said selector means (2).

3. Method according to Claim 2, characterized in that the said modulation code having separations of duration T and entire multiples thereof, the said set of transitions comprises intervals of time between edges composed of half a complete duration $T/2$ and at least one entire duration T; the said edges of the same nature being forbidden in the said modulation code.

4. Method according to any of Claims 1 to 3, characterized in that the stage of determining the reference instant of an interstitial site in the scanning spot is effected by the detection of the instant (T_B) of the appearance of a transition of a predetermined direction of one of the pulses of the specific digital data.

5. Method according to Claim 3, characterized in that the stage of identification and of determination of



the reference instant are merged in a single stage and in that a time window (V_F) is generated initialized by the first transition in a first direction of one of the specific digital data pulses and delayed by a time interval equal to one and a half times the said determined elementary value T , and the logical intersection of this time window is effected with the said pulses in order to conditionally generate a pulse (V_A) making it possible to determine the said passage instant (T_B).

6. Method according to any of Claims 1 to 5, characterized in that writing during the preliminary phase of specific digital data is effected prior to the writing of any digital information data on the said medium and in that the said sync signals (H_S) are utilized in later phases for the synchronized writing and reading of these digital information data.

7. Method according to any of Claims 1 to 6, characterized in that the said specific digital data are written at sites (92) which are regularly spaced along the tracks (91) which between them define these sites of blocks (93) reserved for the writing of the digital information data.

8. Device for the generation of sync signals for a device for the optical transcription of digital data onto a medium (90) caused to perform a scanning motion; the said data being recorded in the form of perturbations (92) of at least one layer of material of the medium able to be optically detected along tracks (91) of predetermined configuration; the said tracks comprising a succession of non-contiguous sites intended for the storage of the said data between which there are interstitial sites intended for another purpose; a device comprising selector means connected to optoelectric means detecting the optical interaction produced during the progression of one of the said tracks past an optical scanning spot, the said selector means supplying a signal characteristic of the content of the



said interstitial sites which exerts an action on setting means (5) supplying the said sync signals, characterized in that it comprises means (4) for the local generation, external to the medium, of reference signals and periodic clock signals connected to the said setting means (5) and to a first input of the phase shift computing means (3); the said phase shift computing means receiving on a second input a reference signal provided by the said selector means (2) upon each identification of an interstitial site and producing phase shift information corresponding to the phase shift of the reference signals originating from the means (4) for the local generation of periodic clock signals and the selector means (2); the said phase shift information being taken into account by the said setting means so that the said sync signals permit the writing or the reading in chronological order of the digital data whose transcription is commenced after the identification of the said interstitial site by the specific transitions contained by it.

9. Device according to Claim 8, characterized in that the specific digital data comprising at least two transitions for which the separating distance is forbidden in the modulation code of the digital data, the said selector means (2) comprise a detector of the said transitions receiving output signals (V_L) of the said photoelectric means and comprising a time window (V_F) generator (21) initialized by the first of the said transitions to be received; the said time window (V_F) comprising two specifically delayed transitions in order to straddle and isolate the second of the said transitions received; the extraction of the said isolated transition being performed by a logical coincidence gate (22) which furnishes one of the time references needed for the phase shift computing means (3).

10. Device according to either of Claims 8 or 9, characterized in that the interstitial site containing the said specific digital data comprises at least two



pulses whose transitions of the same nature are forbidden in the modulation code of the digital data.

11. Device according to any of Claims 8 to 10, characterized in that the means (4) for the local generation of reference signals and periodic clock signals comprise a voltage controlled oscillator (V.C.O.) provided with a phase locked loop (P.L.L.) in order to lock its frequency to a multiple of the rhythm of the identification signal emitted by the said selector means (2).

12. Method according to any of Claims 1 to 7, characterized in that it comprises a supplementary stage consisting in setting the frequency of the said periodic clock signal (H) in accordance with the rate of appearance of the reference instant (T_R).

13. Information carrying medium intended for use in the method according to any of Claims 1 to 7 and 12, of the type comprising an array of adjacent tracks placed in a reference surface, along which tracks there is provided a succession of non-contiguous sites intended for the storage of digital data, between which there are placed interstitial sites comprising specific digital data intended for another use, characterized in that the transcription of the digital data from and to the said medium is controlled by a periodic sync signal exclusively transcribed by a submultiple of its own frequency by means of the said interstitial sites, which contain a sequence of optically detectable perturbations producing transitions acting as a reference in relation to the said periodic sync signal, but whose separation is discernible from those used for the transcription of the said digital data.

14. Medium according to Claim 13, characterized in that the digital data subjected to the said transcription generate transitions whose separation is characteristic of the modulation code used; the said modulation code having separations of a duration T and



entire multiples of T ; the set of transitions contained in the said interstitial sites comprising time intervals between edges composed of a semi-entire duration $T/2$ and at least one entire duration T ; the said edges of the same nature being forbidden in the said modulation code.

15. Medium according to either of Claims 13 or 14, characterized in that the transcription of the said specific digital data in the said interstitial sites constitutes a preliminary to any transcription of digital data in the sites intended for this transcription.

16. Medium according to any of Claims 13 to 15, characterized in that the interstitial sites are regularly spaced out along the said tracks.

17. Medium according to any of Claims 13 to 16, characterized in that the each interstitial site comprises at least two pulses.

18. Medium according to any of Claims 13 to 17, characterized in that the interstitial sites are pre-engraved and in that the digital data are transcribed in a sensitive thermo-optic structure comprising at least one recording later allowing the appearance of the pre-engraving of the said interstitial sites.