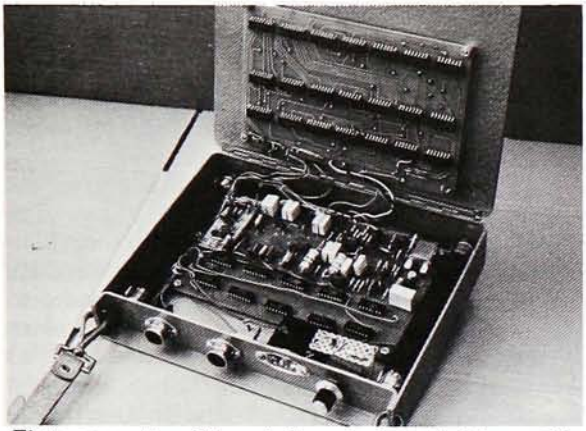
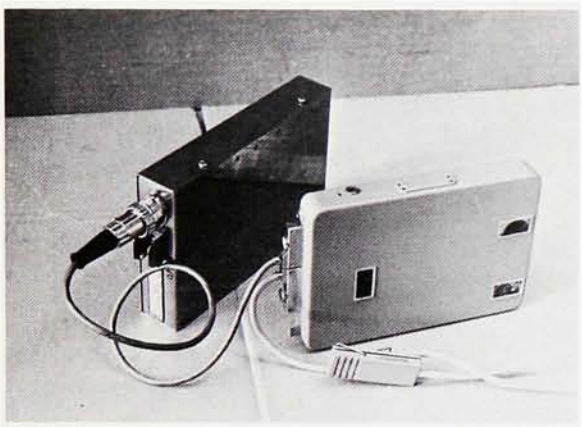
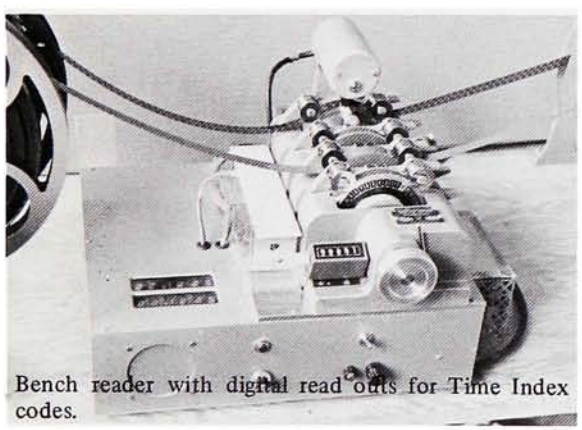


First generation Time Index clock unit (about 8" wide)

TIME INDEX SYSTEM

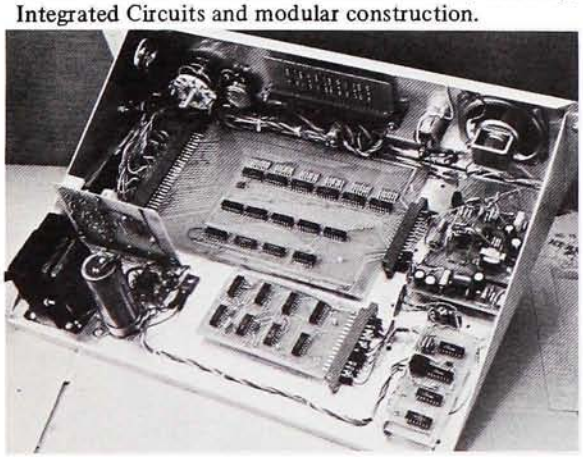


Second generation Time Index clock shown with Nagra SN recorder.



Bench reader with digital read outs for Time Index codes.

Inside view of Time Index Bench Reader, showing Integrated Circuits and modular construction.



Harris Kirshenbaum

The technical development department at the National Film Board is involved in a constant programme of research and testing of mechanical aspects of film equipment. When we visited the Montreal headquarters I found the department busily sitting there, watching a machine they had built strictly for the purpose of punching the playback, stop and rewind buttons on a Sony videocassette machine. The idea was to see how long the VTR would last under constant use. This kind of testing is performed on many types of audio visual equipment and the results are made available to A.V. buyers at school boards. The reports are not yet published for general readership.

Ralph Curtis is head of the engineering department responsible for this testing. His department has also been responsible for development of a 3-D television display system. That system is projected for use only with short educational programmes where factors of eye-strain do not become involved. The process involves two mixed monochrome signals appearing on a colour monitor and being viewed with red-green 3-D type glasses. Ray Payne was director of laboratory and technical operations for almost thirty years, and is retiring this summer. Many of Canada's leading laboratory people have started their careers with his department. Mr. Payne spent the past year working as Technical Consultant to the Commissioner. Doug Ruppel has been named the new director of technical and production Services at the NFB recently.

Also conducted under the department is tremendous research into new developments. There is, of course, a fully equipped film laboratory within the Board, and most of the equipment is home made – 16 and 35mm processors for black and white and colour as well as various printers. A 35mm Arri processor was acquired to handle the volume of work that went into Expo 67. Perhaps the most interesting and inventive development of this department is the removal of the last stumbling block of documentary filmmaking – the slate.

Picture the film crew, setting up a small scale interview in the home or office of the subject. He is cool and calm, discussing his particular specialty with the interviewer in knowledgeable and accurate terms. The director calls ready, and the lights go on.

"August 20, Roll 1, Scene 1, Take One."

BANG

Suddenly your lucid, expressive, interview subject is a babbling moron who can't put two words together.

"Cut. Somebody get him a cup of coffee. We'll try it again."

"Take 2"

BANG.

And so on.

So let us examine a system that with minor modifications to your camera and recorder, no matter what brand of equipment you are using, will allow you to use as many cameras and recorders on the shoot as are necessary and with no slates of any kind allows each device to start or stop at will. Further, when you place the whole thing on the editing table, it brings itself into dead sync, automatically.

Not only does it have all these qualifications, but it is basically a simple operation. Time Index makes use of the technology of Integrated Circuits (I.C.'s) and Light Emitting Diodes (L.E.D.'s) and the field equipment will be much smaller than the "chocolate bar" crystal unit for the Nagra. This state-of-the-art electronic technology is closely tied to new devices like the digital wristwatch on which the time lights up at the push of a button, the large format flat TV screens, and data retrieval systems which feed information to cash registers from a wand passed over price tags. The

wall-hanging TV screens, by the way, are much closer than ever to mass production, and digital watches will be all over the place by the time Christmas shopping starts this year. The photographs show two generations of Time Index units, the first being quite large, the second almost identical in size to a Nagra SN recorder. The third generation units will be about the size of a matchbox.

Leo O'Donnell was resident genius at the NFB for some 15 years. Currently he is head of the sound engineering department at Film House. The Time Index system was developed by him at the NFB, and is now in a workable stage for both 16 and 35mm. A similar system has been developed in Germany and as soon as a standard is set, we can begin to look for production models of the system. the SMPTE Journal will carry a full report on the Time Index system in the fall, so we will not attempt to explain the actual operation of the whole system here and now, rather how the system can be used by filmmakers.

The Time Index system offers continuous automatic identification of all sound and picture material. The time of day and date is recorded each second on both the original picture negative and sound material. After processing, the coded information can be used to establish parallel sync between picture and sound. It can be interpreted visually and aurally as well as being machine readable. It also makes possible the matching of one or more picture films with one or more sound recordings of the same event.

The code is generated electronically and translated to a binary system. The output is then recorded on both the picture and sound originals independently, by small electronic clocks. The camera code is a series of light strokes placed in the sound track area by an L.E.D. in the camera gate. The sound code is recorded as a composite of sync track frequency and Time Index pulses fed to the recorder at the usual sync track input. The sync track signal is otherwise normal and the recording produced remains compatable with all resolvers used for sync playback. The Time Index pulses are recorded as a 325 Hz tone modulated by the recorder's own electronic clock.

At the start of a shoot, all equipment is plugged into a synchronizing unit and the real time is injected into each unit. Once this has been done, each unit maintains its own time with crystal accuracy and the crew can forget about it.

In the sound transfer stage a Time Index transfer channel separates the Time Index pulse train from the sync signal and records the pulses on an auxiliary track on the magnetic film, outside the sprocket holes. The sync frequency is fed to the playback resolver in the conventional way. The Time Index is also passed through a shift register to provide a selectable time delay before registering the signal on the sound film. The shift register is provided at the input to allow some flexibility in positioning the pulses transferred to the film. At the time of shooting there is a built-in delay of eight frames in the pulses to the camera light. As the sound pulses are advanced on the camera pulses it is possible to reposition the sound pulses during the transfer by selecting the amount of this delay. This feature is essential due to the several possible arrangements of sync track heads relative to the audio record and play heads, and the necessity to locate the light emitting diode in different places on the aperture plate of different types of cameras.

There are several projections for sync-up methods when using Time Index. New editing tables, such as the Atema (Technical News, Issue No.14) will have modular additions to add a digital read-out for each picture and sound Time Index information. Syncing could then be done by merely matching the numbers. A further modification will enable the editor to position the first frame of the picture in the gate and have the machine automatically search the sound track for the matching sync point, which would stop either at the playback head, or at a pre-selected index position.

The codes can also be read on a bench set-up, with special readers installed to allow the digital codes to be displayed. On the prototype the film can pass through the readers at any speed over a wide range and produce an accurate read-out. A small loudspeaker is provided to permit the location of individual pulses on the picture material.

The Code

The full Time Index code is recorded once every second, over a range of 24 frames. The start of the code covers two frames, and is used as an indicator for the start of shot. This occurs once the camera has reached running speed and is indicated by the code for binary 15, which is indicated by using the full output of the L.E.D. This start mark is the one which allows the editing machine to make the automatic sync-up. Frames three to fourteen contain the direction indicator used to allow the code to be read with film running in either direction, as well as the exact time in seconds on a 24 hour clock. Frames fifteen to twenty-four offer the five additional numerals which are user selectable. These may be the month and date if that information is necessary, or shot numbering may be incorporated into this function.

Frame by Frame Identification

Some users of Time Index may feel that a once-per-second repeat rate of the code is insufficient. As all the information is recorded in each field, though, there is the possibility of increasing the rate of information repeat through a process of interpolation. Since the camera recording a sync sound scene would not likely run for less than one second, there would always be at least one time code recorded during every camera run. Once the information is on the camera original, a small computer circuit integral to the printer could have the capability of putting out an exact code giving each frame a consecutive Time Index Code. This code could be placed on the print in the form of optically printed edge markings, magnetically coded information applied to a stripe, or even inked numerals differentiated from edge numbers by a colour code.

The alternate proposal to Time Index set out by a European designer involves a more complicated camera installation that must be synchronized with the camera pulldown movement. Time Index does not encounter this additional problem. The European system can supply frame by frame identification at the camera stage, but the equipment is more complex and expensive. That system, furthermore, is more difficult to read without digital readout.

As soon as a standard is decided upon between the two systems, we can begin to expect Time Index modifications to appear, and for them to become available quickly and inexpensively. What it takes for these developments to make it onto the scene is demand from the users of equipment to their suppliers. With any luck, Time Index will be used by the CBC for its film coverage of the 1976 Olympics, where a large scale documentary unit could best demonstrate its advantages to the entire industry.

Then visualize the same scene as set at the opening:

"Roll sound"

"Roll camera."

"And now, Mr. President, just where were you on the night of . . . ?"•