of 2048 bits per second. Converting this extremely slow rate to the very high rate required for TV calls for a special scan converter.

The PICS scan converter consisted of a unique video disc recorder. The recorder used a 12-in (305-mm) diameter magnetically coated disc driven at approximately 1800 rpm by a dc servo motor locked to horizontal drive. Five fixed heads were used, one to playback a previously recorded NTSC sync track, two for the R channel record/playback, and two for the B channel record/playback. Head switching between the two R heads and between the two B heads was done on alternate IPP scan lines to improve resolution.

In the record mode, an internal pulse-position modulator (PPM) recorded one pixel per TV scan line; the PPM input determining the location along the TV line where the pixel was to be recorded. The PPM input was digitally generated, and incremented by one pixel after each vertical IPP scan line of pixels was recorded. Thus, the image builds up from left to right as one views the monitor. During the relatively long periods of time when the MDM is not recording, the previously recorded video is being read at NTSC video rates, thereby performing the required data-rate conversion.

Prior recorded video could be erased by either an automatic erase-before-record mode or a full-screen erase. The normal operation used the erase-before-record. In this mode, an erasing cursor preceded the recording cursor, erasing the previous image while recording the new one.

Green Synthesis

The color quality of the final images of Jupiter was determined in large measure by the quality of the G video synthesized from the R and B information.

The G signal was created by assuming that the high-amplitude portion of the R and B video was primarily luminance information, which also contained the G information. The approach used was to process the R and B signals separately in nonlinear video processors. Each processor used circuitry that modified the grayscale characteristics of the input video signal. This was accomplished by means of controls that allowed the selection and amplification of a variable-width "slice" of the input video signal, and the subsequent mixture of the "slice" with normal video in the desired proportion. The processors also had variable control over video gain, and wide-range pedestal adjustment. The resultant processed signal was highly nonlinear in nature, but necessary to form the G video signal. The processed outputs from the R and B processors were mixed in a simple two-input video fader, so the mixture of processed R and processed B could be set to the most desirable position for best G video signal. The output from the mixer was fed to the G input of the NTSC color encoder.

The color of the Jupiter images on PICS was adjusted empirically by comparing the displayed images on the color monitor to photographs taken from earth-based telescopes in August 1973. The best color was obtained by using 95 IRE units of peak R video, 70–75 IRE units of peak B video, and 75–80 IRE units of peak G video. These video levels were fed to the RGB monitor, and to the NTSC encoder.

The G signal is important from another standpoint. G is essential to the color TV signal in NTSC format, because the major portion of the NTSC luminance signal is contained in the G. Also, the bandwidths of the R and B signals are very low in NTSC; thus, G is necessary to preserve detail in the final color image. Without the synthetic G, the images would have little value in NTSC color.

Acknowledgments

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The successful fabrication, installation, and operation of PICS at Ames Research Center, Pioneer Mission Control, could not have been possible without the complete and enthusiastic cooperation of the Pioneer Project Office, Charles F. Hall, Program Manager. The author wishes to extend deepest thanks to Ed Tischler, contract liaison at Ames Research Center, for his friendly and efficient liaison between the Optical Sciences Center and Ames Research Center, and a special thanks is extended to Richard Fimmel of Ames Research Center, whose original idea for a real-time display and ardor for such a system eventually culminated in a highly successful and useful display system.

The acknowledgments for this paper would not be complete without extending appreciation for the efforts of the following manufacturers of PICS hardware for their ebullient support and assistance in this project: Colorado Video, Inc.; Conrac, Inc.; Tektronix, Inc.; Telemation Arizona, Inc.; and Television Microtime, Inc.

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Color Photographs

For those readers interested in additional information, color photographs can be borrowed from the author for examination. Such requests should be made in writing to the author. His address is given in the footnote on page 481.

The photographs were taken from the RGB monitor of PICS during the Pioneer 11 excursion. Because only one or two sets of photographs are available for lending, requests will be fulfilled in sequence, as the photographs are returned to the author.

After its successful pass of the planet Jupiter, Pioneer 11 is moving on toward the orbit of Saturn. It is expected that during Fall 1979 it will be sending back pictures of Saturn and perhaps some of its satellites.

Errata

Small Earth Stations for Broadcasting Satellite Systems

By M. L. Card, J. D. Palmer, K. Logan and N. M. Lopianowski

MARCH 1975 *Journal*, p. 143

On page 143, the first sentence of the abstract should read:

Typical parameters for individual and community earth stations capable of receiving TV transmission from a Direct Broadcasting Satellite using a 200-W travelling-wave tube are considered in order to determine what is now feasible and what may become so over the coming decade.

The International Commission on Illumination (CIE)

JANUARY 1975 *Journal*, p. 37

The list of officers of the U.S. National Committee of the CIE given in the second paragraph was incorrectly given. The correct list is: President, Robert T. Dorsey; Vice-President, George W. Clark; Secretary, Louis E. Barbrow; Treasurer, B. J. Hartmann. The incumbent officers were elected 9 November 1971. Their terms will expire in the fall of 1975. The annual meeting will be held 26–28 October in Charlottesville, Va.

Journal Award Committee

APRIL 1975 *Journal*, p. 310

The listing given in April for the Journal Award Committee was incomplete. The correct listing is as follows:

Stanley F. Quinn, *Chairman*, Canadian Broadcasting Corp., 7925 Cote St. Luc Road, Montreal, Que. H4W 1R5, Canada; LeRoy DeMarsh, Leslie H. Holmes, Charles Rhodes and Petro Vlahos.