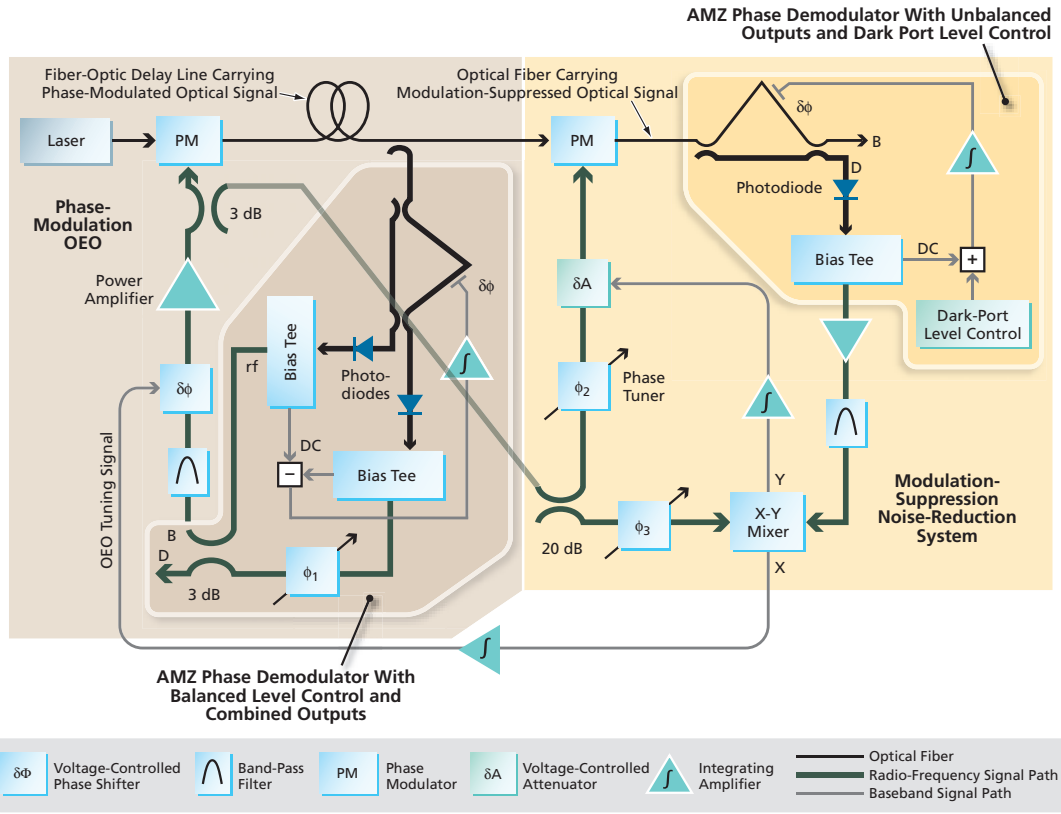


This **Modulation-Suppressed OEO** would generate a microwave signal having a degree of spectral purity higher than those of prior OEOs.

modulation OEO and a modulation-suppression noise-reduction subsystem. Each subsystem would contain an asymmetric Mach-Zehnder (AMZ) phase demodulator, which would be a combination of an AMZ interferometer with voltage-controlled phase tuning in one arm, and a photodiode at either or both of two optical output ports. The length differential between the two arms is approximately matched to one half of the wavelength of the radio-frequency (RF) modulation signal, typically 1.5 cm for an X-band (10-GHz) modulation signal. With appropriate choice of delays and of phase shifts (φ_1, φ_2, φ_3), the AMZ in the modulation-suppression noise-reduction system would couple almost all of the optical power to a termination at one of its output ports, denoted the bright port and labeled "B" in the figure. The small remaining portion of the optical power, in the form a suppressed-carrier signal, would be coupled to a low-noise photodiode at the other port, denoted the dark port and labeled "D" in the figure. This arrangement would afford high sensitivity, at the photodiode output, to input phase modulation.

Sideband amplitude would also be reduced before detection by use of a phase "un-modulator" — a second phase modulator, at the output end of the fiber-optic delay line, that would exert an approximation of the reverse of the effect of the phase modulator at the input end of the line. Thus, both the carrier and the sideband components of the optical signal arriving at the low-noise photodiode in the AMZ phase demodulator in the modulation-suppression noise-reduction subsystem would be suppressed, thereby helping to prevent overload of the low-noise photodiode as optical power is increased. (Prevention of overload is necessary for preservation of sensitivity because low-noise photodiodes saturate at low optical power levels.)

This work was done by G. John Dick and Nan Yu of Caltech for NASA's Jet Propulsion Laboratory. For further information, contact iaoffice@jpl.nasa.gov. NPO-42815

Alternative Controller for a Fiber-Optic Switch

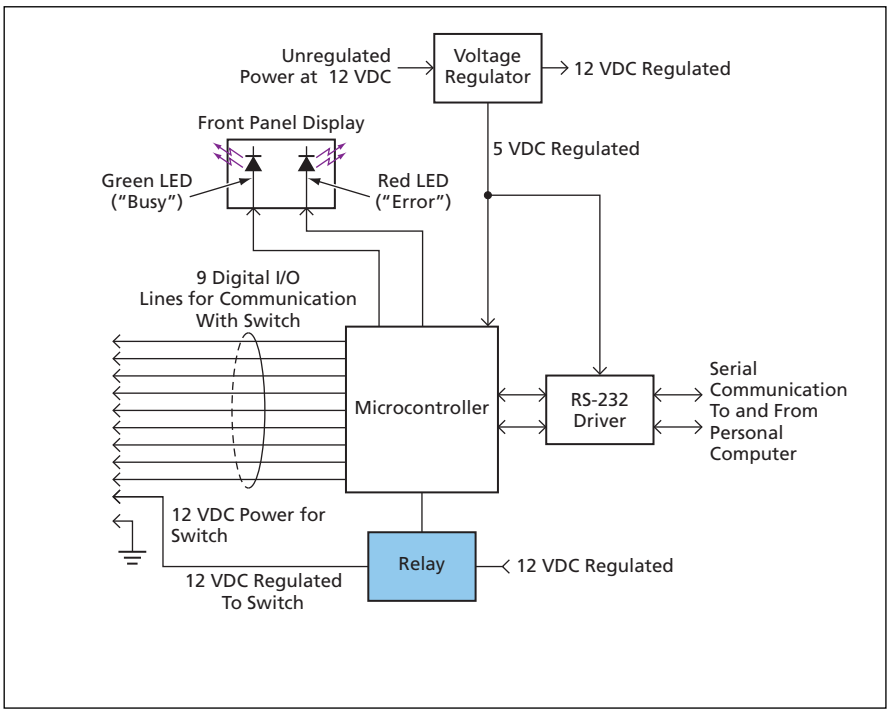
This controller communicates via a serial instead of a parallel port.

NASA's Jet Propulsion Laboratory, Pasadena, California

The figure is a simplified diagram of a relatively inexpensive controller for a DiCon VX (or equivalent) fiber-optic switch — an electromechanically actuated switch for optically connecting one or two input optical fibers to any of a number of output optical fibers. DiCon VX fiber-optic switches are used primarily in research and development in the telecommunication industry. This controller can control any such switch having up to 32 output channels.

A digital input/output (I/O) interface circuit is needed for controlling the switch and reading its status. This controller was developed as an alternative to the control interface suggested by the manufacturer of the switch. The manufacturer provides a schematic diagram of an interface circuit that utilizes the parallel port of a personal computer, and provides sample software for use with the interface. However, the parallel ports on some personal computers are not compatible with the interface suggested by the manufacturer. In contrast, the present controller uses a standard RS-232 serial interface, which is available on most computers and can ordinarily be utilized with less difficulty than can a personal-computer parallel port.

The heart of this controller is a commercially available microcontroller that includes 16 digital I/O ports and flash memory that can hold up to 1KB of program. The controller also includes an RS-232 driver. Two of the digital I/O lines are used for serial communication, via the RS-232 driver, between the microcontroller and the personal computer. Nine of the digital I/O lines are used for controlling the switch and reading its status. One of the digital I/O lines is used to control the power to the switch through a relay, and two of these lines are used to drive a two-color light-emitting-diode (LED) front-panel display. The software enables a user to interactively control the switch by means of simple commands and to monitor the responses of the switch. The front-panel display enables the user to determine the status of the switch ("busy" or "error") at a glance.



This **Controller for a Fiber-Optic Switch** is an alternative to a more-difficult-to-use controller that communicates with a computer via a parallel interface.

The serial-port architecture of this controller facilitates establishment of an interface between this controller and commercially available laboratory automation software. It is also possible to connect this controller to a universal serial port via an appropriate converter. Therefore, the switch can be controlled by a variety of computers, without need for expensive digital I/O boards or complicated programming.

This work was done by Robert Peters of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).
NPO-43306