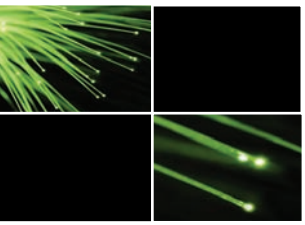
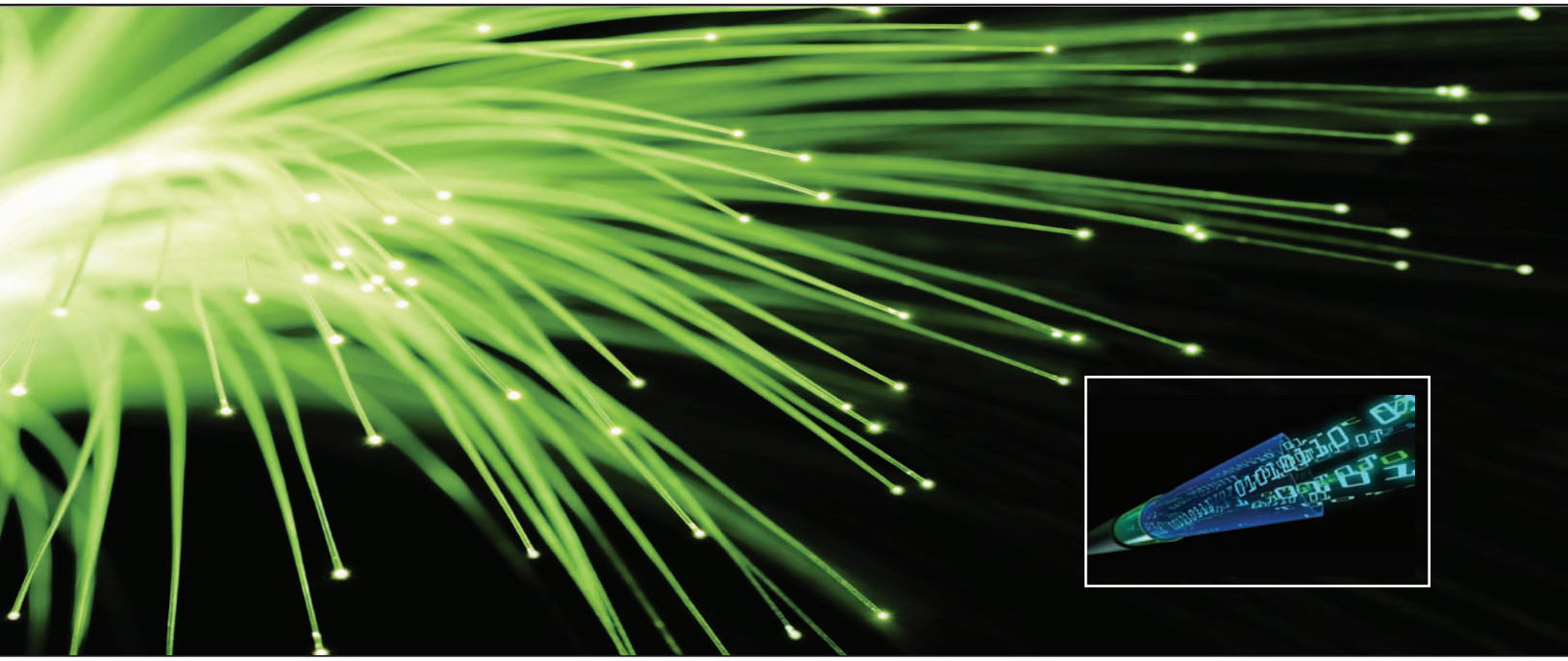


Projects in Fiber Optics



Fiber Optic Primer

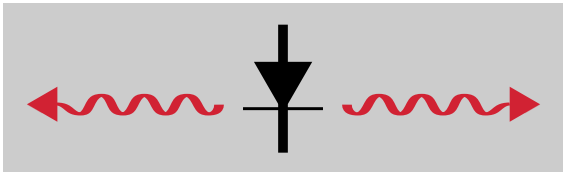
Fiber Characteristics

Fiber Device Technology

Communication and Sensor Technology

Newport®

Experience | Solutions



PROJECTS IN FIBER OPTICS
Applications Handbook

Irvine, California, U.S.A.
FKP-TEXT-A Rev C.

Start with the basics, or explore today's most advanced applications with Newport's Projects in Fiber Optics.

Model FKP-STD (see Equipment List on page 84) contains a complete set of research-quality equipment for performing ten educational, applications-oriented projects.

By project completion, you will be able to use the same equipment with other compatible Newport components to explore new areas of interest. What better way to start a fiber optics lab?

Note: Please check Newport's website at www.newport.com for an update or errata of this document.

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PROJECTS IN FIBER OPTICS

PREFACE

Projects in Fiber Optics (Newport Model #**FKP-STD**) is a set of laboratory equipment containing the hardware needed to complete a series of projects which will provide students, engineers and scientists with an introduction to the hands-on experience needed to master the basic concepts and laboratory techniques of optical fiber technology. The projects cover a wide range of applications in both communications and sensors and cover the use of both multimode and single-mode fibers. Because this is a new and rapidly expanding technology, the education of most engineers does not include courses in fiber optics. Projects in Fiber Optics has been developed by the technical staff of Newport Corporation in order to bridge the gap between current college course offerings and today's rapidly expanding technology.

This companion applications handbook begins with a Primer in Fiber Optics, which outlines at an elementary level, the physics and optics background required to under- stand the field of fiber optics. The handbook then gives a complete description of each of the projects that are to be performed with the equipment in Projects in Fiber Optics. (A complete list of the projects is given in **Table I**.) At the end of the handbook is a list of references, which may be considered for classroom use. This handbook will serve as a supplement to the material covered in a comprehensive classroom or independent study of fiber optics.

Each project description contains a statement of purpose outlining what is to be accomplished in that project, a section reviewing the related background and theory, suggested references, and a complete step-by-step instruction set which will guide the experimenter through the laboratory exercise. The material contained in each project description will allow the student to focus on "what's happening" in each laboratory exercise.

These projects can be used in structuring a course at either the sophomore or upper-division level for engineering or physical science students. A knowledge of ray optics from high school physics or from a college freshman physics course (not requiring calculus) will be a sufficient background for a sophomore course using Projects in Fiber Optics. A simplified description of the propagation of modes at the level of the Primer in Fiber Optics may be used in Projects #3, #4, and #10.

For an upper-division course for engineering and physical science majors at a four-year school, the instructor may want to give a more complete theoretical development of the propagation of electromagnetic waves in optical fiber waveguides. The background for such a course might include a knowledge of Maxwell's equations, wave equations, propagation of electromagnetic waves in dielectric media, and an introduction to waveguides. However, the instructor may choose to include an introduction to some of this material in the fiber optics course itself.

TABLE I

LIST OF PROJECTS

1. **Handling fibers, numerical aperture**
2. **Fiber attenuation**
3. **Single-mode fibers I**
4. **Single-mode fibers II**
5. **Coupling fibers to semiconductor sources**
6. **Connectors and splices**
7. **Components for fiber communication**
8. **Fiber optic communication link**
9. **Multimode intensity sensors**
10. **Single-mode interferometric sensors**

Although many of the students in these courses will be electrical engineering or electronic technician students, the intent of the projects is to concentrate on the properties of the optical fibers and optical components being studied and to keep the amount of electrical equipment used and the amount of wiring done in the laboratory to a minimum. The problems of designing and building transmitters and receivers for optical fiber systems is best left to another course. An optical breadboard or a table is required to set up the experiments.

These Projects in Fiber Optics will provide a well-grounded introduction to fiber optic technology. The technical staff of Newport Corporation is available to provide technical advice in implementing these projects.

Also note that the kit does not include an optical breadboard and a fiber cleaver (a fiber scribe is included instead). We recommend that the user purchase Newport P/N SG-22-2 breadboard and F-BK3 cleaver if needed.

Finally, the photos provided in this instruction are for a reference only. Actual experimental setup may look differently.

ACKNOWLEDGEMENTS

The technical staff of Newport Corporation would like to thank Dr. Donald C. O'Shea, School of Physics, Georgia Institute of Technology, for co-authoring the Primer in Fiber Optics. Thanks to Dr. O'Shea and to Dr. Rick Feinberg, Department of Physics, Western Washington University, for their comments on the instruction sets in this manual. Thanks also to Dr. Ron Stearns, technical staff at Newport Corporation, for originally creating the kit.