

# RAR Series Raman Amplifiers

## Discrete Raman Amplifiers for Narrow or Wide Band

IPG Photonics, for over ten years the leader in high power fiber amplifiers and Raman lasers, expands its comprehensive product line with the new RAR Series fiber optic Raman amplifiers.

With power gain in excess of 20dB, the RAR amplifier extends the amplification window to cover the standard telecom wavelength bands and beyond. Customer specified regions of operation are available from 1260nm to 1700nm, with optical bandwidth of up to 100nm.

Raman pumps and Raman/EDFA combinations are also available for distributed Raman amplification applications.

The RAR amplifiers are offered as complete systems in a rack mountable case with color LCD front panel display and control, as well as RS232 and GPIB interface. OEM optical modules are also available.



## Features

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Models In 1260nm -1700nm Range

Bandwidths Up To 100nm

Optional Gain-flattening/Shaping

High Gain, Low Noise

High Input/Output Suppression

Polarization Insensitive Optical Gain

Optional Dispersion Management

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For: Next Generation Long-Haul and Product Development

## Technology

The RAR amplifiers use Yb and Raman pump lasers combined with a highly non-linear and efficient Raman fiber shifter. The region of gain is determined by correct selection of pump wavelengths. Multiple pumps can be combined to produce wider optical bandwidths. Gain flatness and profile can also be specified for DWDM applications and for dispersion management in long-reach optical systems.

## IPG: Resources and Experience

All IPG amplifiers are supported by our experienced team of engineers and scientists. IPG's technical staff works with our OEM customers to customize packaging, electrical connections and optical performance as required. We will help you to review your requirements, evaluate your options, and choose the best amplification strategy for your system.

IPG Photonics has more than 10 years of expertise in the design, manufacture and deployment of high performance and high power optical fiber amplifiers. Our field experience combined with extensive qualification and continued reliability testing insure that your implemented solution is one that you and your customers can depend on.

## Description:

The RAR series Raman amplifiers consist of five key components: high-reliability pump diodes, ytterbium fiber laser, Raman wavelength shifter(s), Raman gain fiber, and gain flattening filter. Standard output power is 100mW, with 20dB gain.

### High-Reliability Pump Diodes

All RAR series models incorporate broad stripe 1x100µm pump diodes operating at a 970nm nominal wavelength to pump the ytterbium fiber laser. Pump diode reliability corresponds to a MTTF of 5,000,000 hours at the nominal operating current and a temperature of 20°C. All pump diodes are subjected to intensive component qualification at IPG Photonics prior to installation.

### Ytterbium Fiber Laser

The ytterbium laser is a telecom-grade version of the IPG PYL Series single-mode fiber laser operating at wavelengths between 1050nm and 1120nm.

### Raman Wavelength Shifter

Our Raman wavelength shifters efficiently convert the ytterbium fiber laser to longer output wavelengths, providing Raman gain over the desired optical region. Multiple wavelength shifters are utilized for ultra-broadband amplification as required.

### Raman Gain Fiber

Our Raman gain fibers' material and structural designs are optimized to provide high power, low noise amplification. The Raman wavelength shifted fiber lasers we use as pump sources offer significant advantages over other techniques, such as frequency multiplexed single-mode laser diodes, by virtue of their reliability, low cost, high efficiency, and high output power. The randomly polarized output of the fiber laser and the counter pumping of the Raman gain fiber ensures the very low pump to signal noise transfer and polarization insensitive operation of our amplifiers.

### Condition:

All IPG amplifiers are offered on a semi-custom basis. For exact specifications, contact IPG to discuss your requirements. We offer a simulation service to quickly evaluate custom designs and find the most appropriate Raman amplification solution for your needs.

### Packaging:

3U rack mountable / bench-top case, color LCD screen with front-panel menu driven operation. RS-232 and GPIB control as standard. OEM modules are available on request.

### Product Codes:

RAR-1-λ and RAR-2-λ-λ (single and dual wavelength pumped); -F= gain flattened

Eg. RAR-2-1480-1530-F would be a dual wavelength pumped 1480 to 1530nm gain-flattened Raman amplifier.

CAUTION: USE OF CONTROLS, ADJUSTMENTS AND PROCEDURES OTHER THAN THOSE SPECIFIED MAY RESULT IN HAZARDOUS LASER RADIATION EXPOSURE. WEAR PROPER SAFETY EYEWEAR DURING OPERATION.

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