



# REGIONAL AMPLIFIERS

## For the 4200 Family

### Features and Benefits

- Provides extended reach capabilities for full channel capacity of the system, including:
  - 1600 km reach on 20 dB segments
  - 1375 km reach on 25 dB segments
  - Support for segment losses of up to 35 dB using either mid-stage loss borrowing or Raman amplification to address a range of network-specific design requirements
- Provides choice of constant or variable-gain modules to meet network requirements
- Features variable-gain OA, which compensates for span loss, to mitigate the effects of aging spans
- Suppresses transients to protect services and receivers, and simplifies channel count changes with SmartGain dynamic gain control
- Adjusts the amplifier automatically, reducing Operating Expenses (OPEX) when waves are added
- Connects to external test equipment through DWDM monitoring ports

Ciena extends the performance of the 4200 with a set of regional amplifiers—two Erbium Doped Fiber Amplifier (EDFA)-based Optical Amplifier (OA) modules and a Raman amplifier. In addition to these hardware modules, the system implements a software-based Pre-Emphasis (PE) algorithm that provides an additional control loop, allowing the system to pre-compensate for spectral tilt and ripple.

With these hardware and software features, the 4200's transport capability can be extended up to 1600 kilometers without regeneration.

The OAs are available in fixed- and variable-gain versions. The OAF-BC-HP fixed-gain amplifier provides 14 and 17 dB gain with 20 dBm output, and the OAV-VS-HP variable-gain amplifier provides 25 dB gain with 20 dBm output. Both versions provide:

- Ciena's SmartGain™ control circuitry to maintain a constant gain across the transport spectrum regardless of input power
- Span loss compensation to mitigate the effects of aging spans by dynamically adjusting the gain of a span-receive amplifier and offset increased loss
- Auto Power Shut Down (APSD)
- Remote and local management
- Autonomous alarms and Threshold Crossing Alerts (TCAs)
- Input/output power histories
- Optical Channel Monitor (OCM) input/output ports

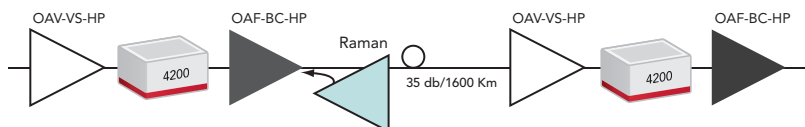


Figure 1. 4200 can provide unrepeated transport up to 1600 Km using high gain amplification, including Raman.