

37719A-02

S E R V I C E N O T E

Supersedes:
None

**37719A OmniBER 718 Communications Performance
Analyzer**

Serial Numbers: [0000A00000 / 9999Z99999]

Optical Receiver Damage due to excessive Optical Overload/Transient

Situation

Optical Receivers can be permanently damaged by excessive Optical Power or Optical Transients. The user must ensure that any signal applied to the receiver is attenuated before connection so that signal level applied is within the Receiver Operating Range and also that the receiver is not subjected to excessive optical transients.

For example the Operating Range maximum for the OmniBER 37718/9A is -8dBm. A Maximum overload before damage is also specified, e.g. +3dBm.

Note the overload region above Operating maximum, > -8 to +3dBm is NOT specified for operational use and the user should ensure external attenuation maintains signal within the Operating Range maximum. (i.e. < - 8dBm)

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: INFORMATION ONLY
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ADDITIONAL INFORMATION:

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If failure of the receiver has occurred due to optical overload/transient damage the Front Panel SIGNAL led will remain on and the Optical Power measurement will indicate O/R (Over Range) with no Optical Power applied.

Damage caused by excessive continuous Optical Power.

A few instances have occurred where excessive continuous optical power $\gg +3\text{dBm}$ has been applied, possibly from high power Optical Amplifiers (EDFA's) with the consequence that the Receiver has been damaged causing a costly and unnecessary repair. Electron Microscope analysis of failed parts indicates the catastrophic damage associated with excessive optical power.

Normally any access to high power amplified light is strictly controlled in the interests of safety.

Damage caused by Optical Transient overload damage

Investigation into failures where the average power was that of a typical LR (long-reach) OC48/STM16 laser (approx. $+2\text{dBm}$) have revealed that many network lasers can generate excessive uncontrolled and unmodulated optical transient when enabled. These transients can exceed $+9\text{dBm}$, have a fast rise time $< 40\text{nS}$ and last for more than $200\mu\text{S}$, until the laser control loop stabilises and controls the output level.

This type of transient is dependent on the network laser design and is caused by lack of initial control when the laser is enabled allowing the absolute maximum/fault condition optical power transient to be generated.

The network equipment manufacturer and the test equipment operator may be unaware of the presence of these undesirable transients and therefore not realise the potential for damage to optical receivers. Test equipment is often connected via short fiber connection with minimal (or incorrect) attenuation and is therefore more vulnerable to these transients. Network receivers are largely unaffected, being several 10^3 km of fiber attenuation from the output.

The primary cause of these failures is neglecting to provide attenuation of signal, leaving the receiver in overload condition and therefore vulnerable to the optical transients that can be inadvertently generated by some NE lasers when disabled, then re-enabled. The disable/re-enable of laser can be required during some NE production test procedures, system maintenance, or in test development.

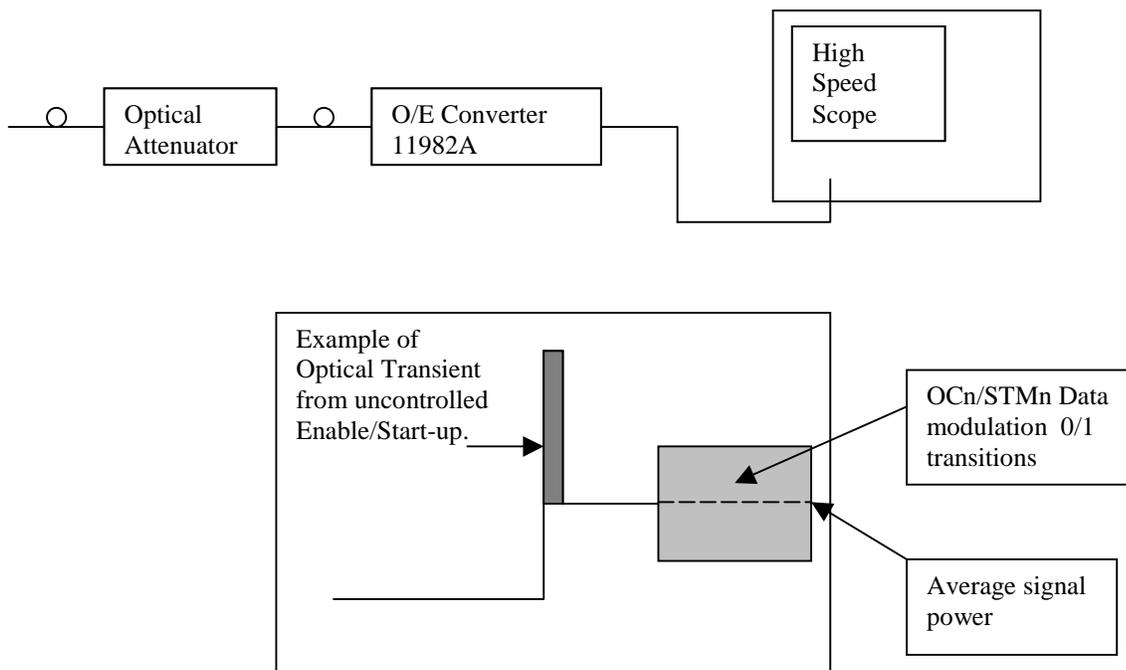
Solution/Action

Contact the customer and check the conditions under which the Optical Receiver was damaged and alert the user to appropriate operating signal levels and attenuation. Request that the customer check procedures and application for excessive optical power and unexpected optical transients when laser is being enabled. This can be done using an optical attenuator, O/E converter and an oscilloscope to capture and analyze the power-on/enable transient of the laser.

Sample set-up

Optical Attenuator - Agilent 8156A
 O/E Converter - Agilent 11982A
 Oscilloscope - Agilent 54845A

Note scope must be capable of single-shot trigger from input signal.



If excessive laser enable transients are observed then there is a need to ensure that Test Sets are protected by appropriate additional attenuation and the customer will of course want to investigate the reasons for any unexpected excessive transient from their equipment.

Damage to the optical receiver by excessive optical power or optical transients is normally not warranted. The Service Office should contact TNTD Customer Support to report the incident and for advice.

If necessary the Support Engineer will contact the customer with advice.