Tech Note | Revision A

Technote – HYPERION Full Redundancy

**MICRON OPTICS**

**Micron Optics Inc.**
1852 Century Place NE
Atlanta, GA 30345 USA

**phone  404 325 0005**
**fax  404 325 4082**
**www.micronoptics.com**
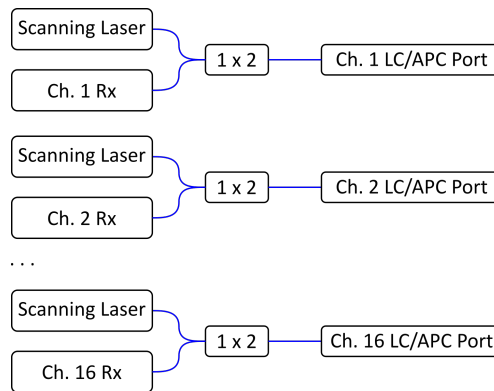
Table of Contents

## 1. Description

With the release of HYPERION firmware version 12.12.1, Micron Optics is providing, on an OEM basis, the "Full Redundancy" feature.

"Full Redundancy" refers to the ability to interrogate both ends of a fiber optic sensor link.  For certain applications, it is useful and/or necessary to measure sensors from both ends of a sensor array.  Consider the situation in which a sensor array is disrupted (cut or damaged) such that sensors following the damage are no longer accessible.  With the "Full Redundancy" feature, a user can connect both ends of a sensor array and maintain access to all sensors even following a disruption.

16 channels HYPERION instruments, operating at 1 kHz, are traditionally configured such that each channel is, on every scan, transmitting AND receiving the reflected power from a sensor array.  The following figure illustrates this.

| Scanning Laser | | |
|---|---|---|
| Ch. 1 Rx | 1 x 2 | Ch. 1 LC/APC Port |

| Scanning Laser | | |
|---|---|---|
| Ch. 2 Rx | 1 x 2 | Ch. 2 LC/APC Port |

. . .

| Scanning Laser | | |
|---|---|---|
| Ch. 16 Rx | 1 x 2 | Ch. 16 LC/APC Port |

With the "Full Redundancy" feature, channels 5-8 and 13-16 do NOT transmit when channels 1-4 and 9-12 are transmitting.  Likewise, channels 1-4 and 9-12 do NOT transmit when channels 5-8 and 13-16 are transmitting.  In other words, the receivers are ALWAYS enabled on every scan, however, each channel only transmits on every other scan.  Channels 1-4 and 9-12 transmit together, as does channels 5-8 and 13-16.  Channels 1-4 and 9-12 are out of phase with channels to 5-8 and 13-16 to facilitate this feature.  This concept is illustrated in the following table.

| Channel | Transmitter Status | | Receiver Status |
|---|---|---|---|
| | Odd Serial Numbers | Even Serial Numbers | |
| 1 | ON | OFF | ON |
| 2 | ON | OFF | ON |
| 3 | ON | OFF | ON |
| 4 | ON | OFF | ON |
| 5 | OFF | ON | ON |
| 6 | OFF | ON | ON |
| 7 | OFF | ON | ON |
| 8 | OFF | ON | ON |
| 9 | ON | OFF | ON |
| 10 | ON | OFF | ON |
| 11 | ON | OFF | ON |
| 12 | ON | OFF | ON |
| 13 | OFF | ON | ON |
| 14 | OFF | ON | ON |
| 15 | OFF | ON | ON |
| 16 | OFF | ON | ON |

### 1.1. Peak Data

Peak data is returned for every scan with at a 1 kHz rate.  On odd serial number scans, only channels 1-4 and 9-12 are transmitting, while 5-8 and 13-16 are not.  In the case of a sensor array connected to channels 1 and 5, on odd serial numbers, channel 1 will process the REFELCTED spectrum of the sensor array while channel 5 will process the transmitted spectrum, and

vice versa.  If using the "Full Redundancy" feature to interrogate both ends of a sensor array, the client code must correctly acquire and process the peak data.  In the case where 8 sensor arrays are being interrogated at both ends of each array, peak data for one array will be located on one channel on odd serial numbers and another on even serial numbers.  While data is being acquired at 1 kHz, each channel can only return pertinent at 500 Hz.  Half of the 1 kHz data is processed transmitted spectrum, and often has not utility since the peak detection setting cannot change between each 1 kHz scan.

NOTE:  Be sure to connect sensor arrays appropriately to interrogate both ends of a sensor array.  For example, for sensor arrays A, B, C, D, E, F, G, and H, with ends A1, A2, B1, B2, etc., a particular sensor array must be connected such that one end is connected to a channel transmitting on even serial numbers, and the other is connected to a channel transmitting on odd serial numbers.  For example:

| Sensor Array | Array End | Channel |
|---|---|---|
| A | A1 | 1 |
| A | A2 | 5 |
| B | B1 | 2 |
| B | B2 | 6 |
| C | C1 | 3 |
| C | C2 | 7 |
| D | D1 | 4 |
| D | D2 | 8 |
| E | E1 | 9 |
| E | E2 | 13 |
| F | F1 | 10 |
| F | F2 | 14 |
| G | G1 | 11 |
| G | G2 | 15 |
| H | H1 | 12 |
| H | H1 | 16 |

The example configuration in the previous table allows for both ends of a sensor array to be interrogated in reflection.

HYPERIONS with this enabled OEM feature can also be used as a 16 channel unit to interrogate 16 separate sensor arrays.  By combing peak data on channels 1-4 and 9-12 on odd serial numbers and peak data on 5-9 and 13-16 on even serial numbers, the unit, while scanning at 1 kHz acquires 16 channels of data at 500 Hz.  Again, this is due to half of the transmitters being off on every other scan.  In this case, when a channel is off, no data, not even transmitted spectrum is being processed as the sensor arrays are only connected on one end.

ENLIGHT makes easy use of this feature without additional complication.  When the OEM feature is detected, ENLIGHT ignores peak data when the channel is NOT transmitting.  ENLIGHT automatically concatenates data from sequential odd and even serial numbers and returns 16 channels of peak data from the processed reflected spectrums.  The peak data from transmitted spectrums (or when the transmitters are off) are ignored.  Thus, while running at 1 kHz, ENLIGHT acquires data sets at a 500 Hz rate.

## 1.2. Full Spectrum

For full spectrum, the firmware returns ONLY the reflected spectrums from each channel.  Full spectrum from channels 1-4 and 9-12 are the received spectrum on ODD serial number scans, while full spectrums returned from channels 5-8 and 12-16 are from EVEN serial number scans.  In this way, consumption of the data is seamless for the client.

The transmitted spectrum (received spectrums when transmitters are off) are NOT available.

## 2. ENLIGHT

ENLIGHT makes use of this feature in a seamless manner.  When used with ENLIGHT, each channel of data returns peak and spectrum data ONLY when the transmitters AND receivers are ON.  Data acquired when the transmitters are OFF are ignored.  Users are presented with full spectrum and peak data that makes logical sense.