Technical Note

NV8500 Fiber Output Cards and SFP Usage

Problem Summary

Customers should exercise care when installing SFP modules in fiber-optic output cards that connect to CWDM multiplexers.

If you are not using CWDM multiplexers, the problem does not exist.

The CWDM multiplexer requires that you use specific SFP modules of different wavelengths. Those SFP modules have 2 ports that transmit on different wavelengths.

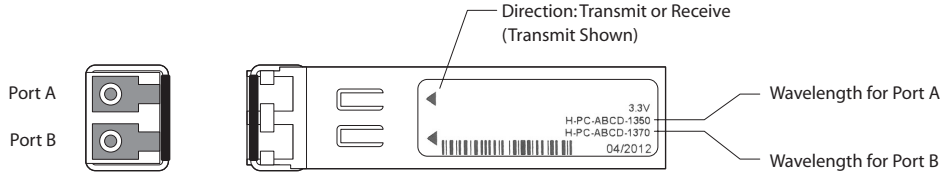
The orientation of the 2 ports of the SFP modules is different in the upper and lower bays of an NV8576 (or NV8576-Plus) frame. In the lower bays, cards and backplane connector modules are installed upside down. Therefore the SFP modules of the lower bays are rotated 180° with respect to the SFP modules in the upper bays.

The ordering of SFP ports in the NV8140, NV8144, and NV8280 routers — with respect to their wavelengths — must also be understood. It is not immediately obvious.

This document details the positioning of the ports SFP modules.

The SFP Module

An SFP module is a small enclosure having two fiber-optic ports that plugs into one of the SFP cages on a fiber-optic backplane connector module. This is a drawing of a typical module:



Miranda' standard SFP modules are

`IO8500-3GIG-IN-SFP`
`IO8500-3GIG-OUT-SFP`

The wavelengths of the 2 ports of each of these modules are fixed at 1310 nm.

Miranda's CWDM SFP modules are

`IO8500-OP-3G-CWDM-SFP-27/29`	1271/1291 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-31/33`	1311/1331 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-35/37`	1351/1371 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-39/41`	1391/1411 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-43/45`	1431/1451 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-47/49`	1471/1491 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-51/53`	1511/1531 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-55/57`	1551/1571 nm	–6 and –3 dBm
`IO8500-OP-3G-CWDM-SFP-59/61`	1591/1611 nm	–6 and –3 dBm

IO8500-OP-3G-CWDM-SFP-27/29-HP	1271/1291 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-31/33-HP	1311/1331 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-35/37-HP	1351/1371 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-39/41-HP	1391/1411 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-43/45-HP	1431/1451 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-47/49-HP	1471/1491 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-51/53-HP	1511/1531 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-55/57-HP	1551/1571 nm	0 to 4 dBm
IO8500-OP-3G-CWDM-SFP-59/61-HP	1591/1611 nm	0 to 4 dBm

These modules are selected to match exactly the inputs of the CWDM multiplexer (order code CWDM-MUX-18-LC). These 18 inputs range from 1271 nm to 1611 nm, in increments of 20 nm.

A fiber-optic backplane populated with the 9 different SFP modules can connect directly to the CWDM multiplexer and the multiplexer will "condense" all 18 outputs onto a single fiber.

Thus a single output card can serve a single CWDM multiplexer and a single CWDM multiplexer can serve a single output card. However, other arrangements can be devised.

NV8576

In the NV8576, I/O cards and backplane modules in the lower bays are installed "upside down" or rotated 180° with respect to the modules in the upper bays. Regardless, port numbering proceeds from top to bottom in all bays.

The consequence of the card orientation is that SFP modules in the upper bay face left and have the "B" port at the top whereas the SFP modules in the lower bay face right and have the "B" port at the bottom. Figure 1 shows this:

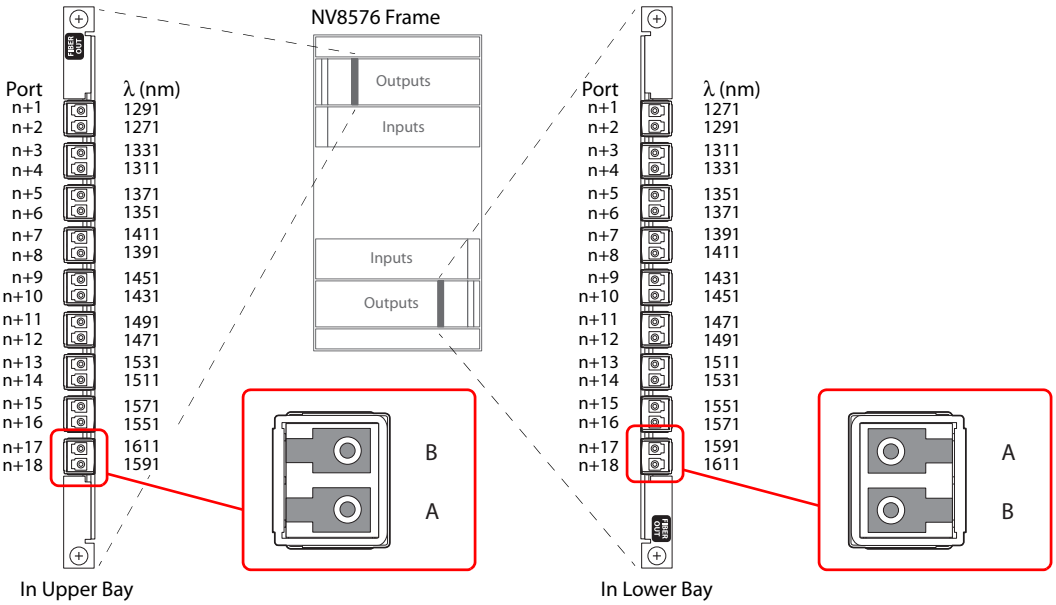


Figure 1. Output Backplanes

Figure 1 also illustrates the full range of the wavelengths that the card can use.

Note how the wavelengths are ordered in the two cases. The wavelengths are *pair-wise reversed* in the two cases.

(The notation “n+” means that the ports are numbered with respect to a base number (n) that is specific to the slot in which the card and backplane are placed. For instance, if n = 36, the ports for the backplane module range either from 37 to 45 or from 37 to 54.)

Alternative Ordering

An alternative ordering of the SFP wavelengths is that shown in Figure 2:

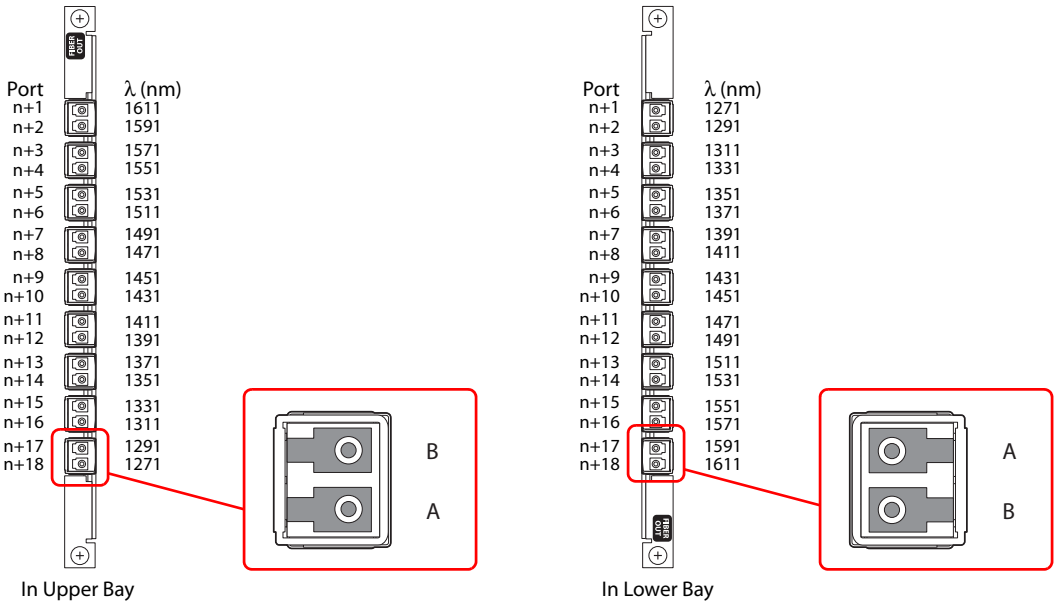


Figure 2. Output Backplanes, Alternative Ordering

The advantages of this ordering are:

- The wavelengths appear in increasing order in both cases.
- The backplane connector modules are interchangeable between the upper and lower output bays.

Here, the only fact you must remember is that the output cards in the lower bay are upside down and therefore the wavelengths are reversed (but still in the same order).

Standard SFP Modules

Because both of the ports of a standard SFP module are identical, the orientation of the module makes no difference. Customers use standard SFP modules without the expectation of connecting them to CWDM multiplexers.

NV8576-Plus

In the NV8576-Plus, expansion output cards and backplane connector modules have 9 ports, not 18, plus two expansion ports, which are of no concern here. On these output cards, you can place 5 SFP modules. The last port of the last module is unused.

In the NV8576-Plus, as in the NV8576, SFP modules in the lower bays are installed “upside down” or rotated 180° with respect to the modules in the upper bays. In the NV8576-Plus, as in the NV8576, port numbering proceeds from top to bottom in all bays.

As for the NV8576, the consequence of the card orientation is that SFP modules in the upper bay face left and have the “B” port at the top whereas the SFP modules in the lower bay face right and have the “B” port at the bottom. Figure 3 shows this:

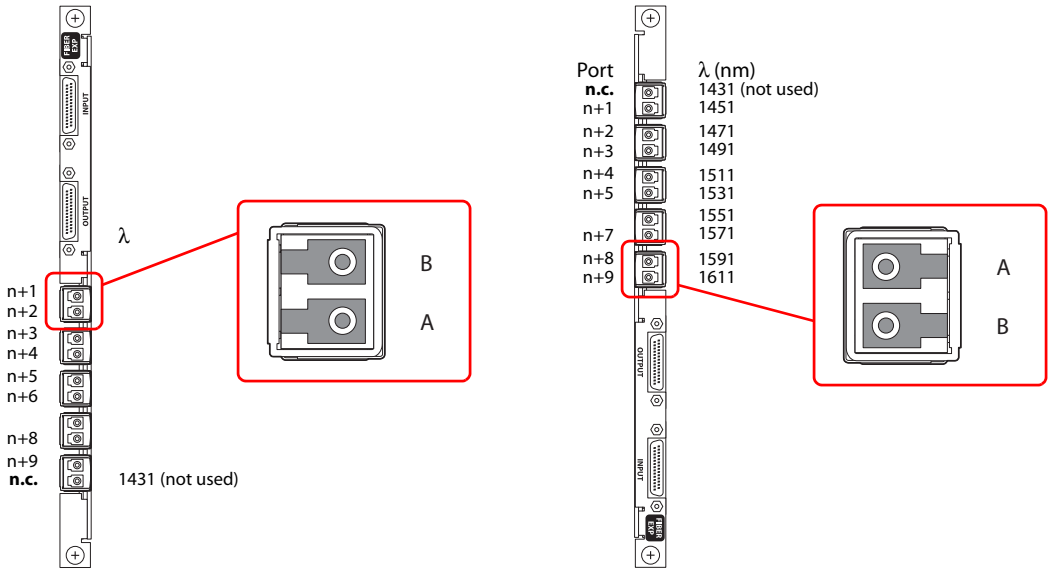


Figure 3. Expansion Output Backplanes

Figure 3 also shows that the expansion output cards have 9 outputs, and the 10th SFP port is not connected. The wavelength of the unconnected port of the last SFP module on the backplane cannot be used.

The CWDM multiplexer can receive signals from any of the (live) ports of the router. However, its use with 9-port expansion output cards is slightly less efficient than with the 18-port output cards.

NV8280, NV8140, and NV8144

In these routers of the NV8500 family, there are no “lower” bays. The SFP modules for these routers are oriented as shown in Figure 1 (or Figure 2) for the *upper bays*.

In addition, the ports of fiber-optic output backplanes are numbered as shown in Figure 1 (or Figure 2) for the upper bays.