Using the STATUS Function to Troubleshoot Your Fiber Defender System

One of the most useful features of the Fiber Defender Alarm Processor Units (APUs) is their ability to provide valuable diagnostics to the user. This information can be used to document system performance, and if the system detects poorly or spontaneously generates alarms, corrective actions can often be deduced from the diagnostics.

Specifically, the STATUS function permits monitoring of current APU operating conditions including power supply voltage, sensor element optical loss and laser current. This feature is available on all FD2XX and FD3XX APUs. It can be accessed through the use of the APU's terminal mode, which is most conveniently done with software optionally available from Fiber Sensys. For all of the aforementioned APUs, with the exception of the FD322, SpectraView provides Terminal Mode access; the FD322 is supplied with tuning software that will perform this task. However, any terminal emulator program such as HyperTerminal or RealTerm can also be used to gain access.

A serial port and standard RS232 cable are required to connect the APU to the PC. The port can either be a dedicated RS232 port or a USB-to-serial converter. Either way, the port setup is as follows:

- 9600 baud
- 8 data bits
- One stop bit
- No parity
- Flow control: none.

The Fiber Sensys software will automatically set up the communication parameters shown above; you'll need to manually set up your port if you choose to use a terminal emulator program, however. If you're using a USB converter for the first time on your PC, you may need to install its drivers. Windows 7 and above will do this automatically for many of these devices, or you can easily access the drivers on the Internet.

We will now describe how to use the Terminal Mode using the Fiber Sensys software. When you run the software you'll first need to select a COM port to provide a connection between the APU and computer. Click on the *Ports* button and a list of available COM ports will appear. Select the port to which you've connected your APU and then click on the *Connect to COM Port* button. In a second or two the Active COM Port window will show that the selected port has become active; click on the *Close* button to exit the Serial Port menu. The next thing you need to do is select an operating mode, so click on the *Modes* button to bring up that menu. The menu shows all of the possible operating modes; you'll be using the Terminal Mode, so click on the *Terminal* button.

The first thing you see in the upper left-hand corner of the screen is an indicator showing what APU channel we're working with. The software defaults to Channel A; to change to Channel B, type CHB and <Enter> and that channel becomes active. Immediately to the right of the channel indicator is a message that says "Unit is Locked, Enter Password." (There really isn't a password; the software is simply asking you to enter a command).

To gain access to the diagnostic information, type STATUS and <Enter> and you'll see some information appearing in the upper left-hand portion of the screen. Once again, the first item is the APU channel indicator. Now, let's analyze the rest of the status information bit by bit. At this point in the process, however, note that the FD322 operates a bit differently than all of the other FD2XX and FD3XX APUs. So we'll defer the FD322 explanation until later in this article.

The first measurement that you see shows a LOSS value in dB. This is a measurement of the loss in your sensing element, showing the optical power loss between the laser output and the detector input. Excessive loss can be the source of numerous system problems including sensor noise (sometimes accompanied by random false alarms), poor detection, and in extreme cases, an APU FAULT alarm. The Loss Assessment Chart shown below can be used to evaluate your zone's performance and to determine whether or not corrective action needs to be taken.

Fiber SenSys FD3XX Loss Assessment Chart*					
0dB	**1dB-5dB**	**6dB-10dB**	**11dB-15dB**	**16dB-25dB**	**26dB-Above**
Perfect: Ideal loss value.	**Good:** Low loss measurement; should not cause noise issues or nuisance alarms.	**Satisfactory:** A loss issue may exist; consider cleaning connectors and checking for excessive bend radius.	**Unsatisfactory:** A problem exists; attempt to troubleshoot issues. Consider re-terminating unfit connectors.	**Unacceptable:** Major issues exist; problems should be solved immediately. Locate and re-terminate bad connectors.	**Fault:** APU is in a fault state; expect several issues such as breaks in the optical cable or bad connectors.

*All except FD322

When loss goes above 5 dB, it is recommended that you dig a little bit deeper to find the source of the loss and correct it. A very simple technique called a loopback test can be used to quickly isolate the loss to either the APU or to your sensing element. The test involves the use of a short (about 1 meter), known-good optical test jumper to replace the zone's sensing element. The jumper will need ST optical connectors on both ends, and the choice of single mode or multimode depends on the type of fiber that is normally plugged into your APU.

For those with insensitive lead capabilities, such as FD208, FD341, FD342 or FD348R, use a single mode jumper. For those APUs that have sensing fiber directly plugged into the APU, such as FD205/220, FD220P, FD331, FD332 and FD322, use a multimode jumper. To execute the test, the first step is to make sure that the ferrules on the test jumper are clean. Use an optical inspection microscope after cleaning; dirty optical connectors can create loss and they can contaminate the optical components inside the APU, creating noise and nuisance alarms in some cases. Once the connectors are clean, disconnect the sensing fiber from the APU and insert the test jumper in its place. Execute the STATUS command and observe the displayed LOSS value. If the loss goes down to a normal, acceptable level, then your problem is in the sensing cable deployed in your zone; this is normally the case. However, if the loss remains high, your APU has a problem that needs factory service. Remember that the FD322 operates differently; the loss measurement technique will be described later in this document.

If the loopback test indicates that the problem is in your sensing element, there are several easy things you can do to continue troubleshooting.   First, inspect the optical connectors in your sensing element, including those in the feed through where the sensitive and insensitive fibers meet. Cleaning the connectors often repairs a high loss situation. Again, remember to inspect the connectors after cleaning them, and repeat until they are really clean! For those zones that utilize insensitive leads, there is one further easy test that can be done. Usually the feed through couplers that connect the outgoing and incoming sensitive and insensitive fibers to each other are located in the same enclosure at the fence line. You can further isolate the problem to either the insensitive or sensitive fibers by connecting the two insensitive fibers to each other in the box at the fence using a feed through coupler. If the loss remains high, you then know that your insensitive fibers have a problem somewhere. If the loss goes down to normal levels, your sensing fiber is the culprit.

Once you've isolated the problem to a particular fiber or set of fibers and you've eliminated the possibility of dirty connectors, it's likely that you have a bad connector or a sharp bend in your cable somewhere. Inspect your fibers in an effort to find the kink or damage, and correct it. If you cannot find such a flaw in the fiber, you've probably got a bad connector somewhere. There's not really any

reliable way to test a connector, but sometimes a visible fault locator can be helpful. Plug one into a suspected bad connector and look for a bright light where the fiber exits the connector body. This can sometimes point you to a broken fiber, but some jacketed cables make this test difficult or impossible since the jacket may be too opaque. Use your best educated guess to determine which connector that's most likely to be bad and then replace it. There may be some trial and error involved here, so be patient in your efforts!

The next measurement shown by the STATUS function is the laser current, representing the actual amount of current drawn by the laser diode light source on the APU's circuit board. It appears as Las(mA) in the STATUS display and is given in milliamps (mA). The laser current is calibrated at the factory to tight tolerances, and laser operation is accurately regulated by on-board circuitry to keep its light output constant. However, as the laser ages, it becomes less efficient and will slowly begin to draw more current to produce a given light output over time. Under normal operating conditions, the laser will have a lifetime approaching 10 years.

As it ages and draws more current, the laser may no longer be able to output the proper amount of light; this will be accompanied by increasing channel loss. There may also be a significant increase in the channel's noise level to the point where random and/or constant alarms occur. If you begin to notice such performance issues, execute the STATUS command and evaluate the laser current using the table below, noting that the FD322 laser current is different from all of the other Fiber Defender APUs. If the laser current is above the recommended range, please get in touch with our technical support group for further troubleshooting advice.

As a final note, if you execute the VERSION command when in the Terminal Mode, one of the bits of information shown there will be the number of days in operation. This represents the amount of time the APU has been powered-on during its service life. If your laser appears to be drawing excessive current and the Days in Operation is at or more than about 3000

days, this is yet another clue that your laser is approaching the end of its useful life. If this is the case, the laser can be replaced to return your unit to its original factory specifications. However, please note that since the laser for the FD205/220/220P is now obsolete, those APUs cannot be repaired. Our technical service or sales personnel can assist you in replacing such an APU in the most cost effective manner.

FD3XX and FD208 Laser Current Assessment Chart		FD322 Laser Current Assessment Chart	
10mA-35mA	**35mA-Above**	**Less than 40mA**	**40mA-Above**
Laser current drawn is within ideal serviceable range	Laser is drawing too much current, which can cause nuisance alarms. Contact Fiber SenSys Tech Support.	Laser current drawn is within ideal serviceable range	Laser is drawing too much current, which can cause nuisance alarms. Contact Fiber SenSys Tech Support.

The final measurement shown by the STATUS function is the DC voltage at the APU's power supply input terminals. It appears as Pwr(V) in the display and its value must be in the range of 12-24 VDC. The only exceptions to this are the FD208 rack-mounted APUs. Due to an anomaly in the circuit design, this APU is not capable of displaying the correct power supply voltage; the displayed value will be random and should be ignored. Normally, power supply voltage is not much of an issue. However, if its measurement is low or indicates large fluctuations, it could possibly cause a problem. If this is the case, further debugging of your power supply is recommended. If such a fluctuation is noted in an FD348R rack-mounted APU, this may be an indication that your rack's power supply is not functioning properly. This is extremely rare; please get in touch with our technical support personnel if you experience this problem.

In the third line of the STATUS display, you see 4 sets of brackets that are normally empty. The first set of brackets indicates the occurrence of events from Processor 1, the climb processor. The second set shows events as they occur from Processor 2, the cut processor, and the third set shows when alarms occur from either processor. The fourth set of brackets indicates that there is some sort of optical fault in the sensing channel, primarily cuts or kinks in the sensing element that cause a large loss of optical power. A FAULT condition is accompanied by a continuous alarm, as will be shown in the third set of brackets. These indications will remain until the fault is cleared.

As mentioned above, the FD322 operates a bit differently than the other APUs discussed in this article. For one thing, the FD322 is not compatible with SpectraView, so you will need to use the FD322 Tuning Software that's supplied with the product. When the FD322 STATUS command is executed, the first measurement shows the optical input power, in uW, that is being received by the channel's optical detector. This information is not particularly useful and can be ignored. Next, the

laser current is shown; use the above table to evaluate this measurement, keeping in mind that the laser typically operates in the range of 30-40 mA.

Now go down to the next line in the STATUS display where the first thing that's shown is a LOSS measurement in dB. This, as with the other APUs, is a measurement of the loss in your sensing element, showing the optical power loss between the laser output and the detector input. In the case of the FD322, however, the displayed LOSS has a time and date associated with it, so it is not a live indication of signal loss (it shows the most recent measurement). For instructions on how to update the loss measurement, click on this link to run a short video segment. Once you've updated the measurement you can gauge the current performance of your system; the loss must be 6 dB or less for the FD322. If it's above this value, you can use the above techniques, such as cleaning and inspecting the connectors and/or performing a loopback test, to troubleshoot your zone. The next measurement shown is the DC voltage at the power supply input terminals, which must be between 12-24 VDC. Finally, the brackets in the last line of the STATUS display operate identically to the other APUs, showing events, alarms and faults as they occur.

As you can see, the STATUS command gives you a lot of valuable information regarding the current health of your APU. You'll be using this command quite often during setup, maintenance and troubleshooting of your fiber-optic sensors.

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