

## Fiber Defender

# FD348R User Manual

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## 1. Introduction

The **Fiber SenSys FD348R** is a rack mountable electro-optical Instrument that uses optical fiber as a distributed sensor for detecting intruders attempting to breach a perimeter. The Alarm Processing Unit (APU) can be tuned to disregard non-threatening stimulus such as wind and animals; thus, reducing nuisance alarms. When an intruder is detected, the APU sends out an alert via IP/XML Ethernet communication as well as state changes in terminal contacts that can be used to switch on lights, cameras, sirens, or to signal an alarm panel. IP/XML communication for direct network interface allows for easy integration with any security solution.

The optical fiber-based system has been designed to be immune to the effects of Electromagnetic Interference (EMI), lightning, and radio frequency emissions. The **FD348R** provides maximum effective intrusion detection through its inherent system flexibility and advanced programmability.

Because the fiber optic sensors use laser light which is intrinsically inert, the **FD348R** system can be installed safely at chemical or ammunition depots, or any location where the use of electricity is a concern.

RS-232 communication allows for simple setup and calibration.

A key component of the **FD348R** is its fiber optic sensor cable; this uniquely-designed cable, which is sensitive to movement, pressure, and vibration, can be routed along the fabric of a fence to detect climbing and cutting. The detection of an intruder triggers an alarm from the Alarm Processing Unit (APU).

Another key feature of the **FD348R** is its use of insensitive lead-in cables, allowing each APU (up to 8 in one **RK348** rack) to be mounted up to 20 kilometers (12.4 miles) away from the protected zone. This feature lets the user install the APU in a location that is close to power and communications as well as secure from weather.

The **FD348R** is designed to be installed in the **RK348**, a 19 inch rack-mount chassis that houses and provides power for up to eight individual **FD348R** APUs. Each APU monitors a separate zone, allowing for up to 8 separate zones to be independently monitored from one rack mountable module.

Some of the intrusion threats the **FD348R** can be used to detect include:

- Fence climbing (along both the fabric and post)
- Fabric cutting
- Crawling underneath a fence

- Ladder assisted climbing of a fence

A single run of sensor cable can protect a zone up to 5 kilometers (16,400 feet/3.1 miles) in length.

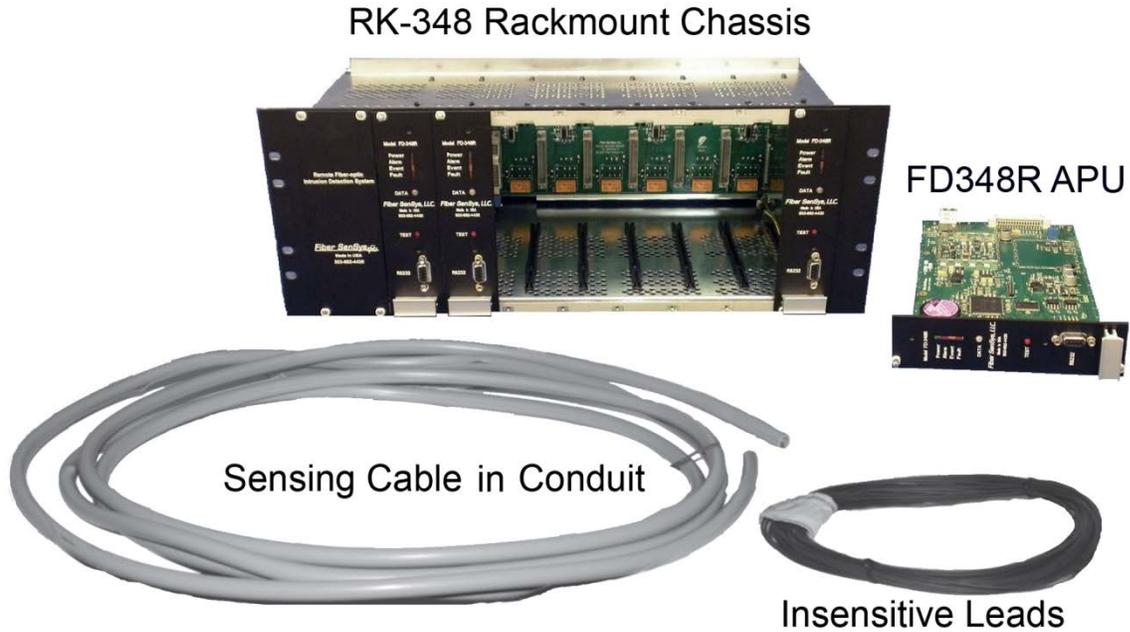


Figure 1-2. Complete FD348R System

## 2. Safety information

This section contains information to help ensure your personal safety and the proper operation of your equipment. Please read and follow all these instructions carefully, and keep them accessible, for future reference. Whenever using the **FD348R**, use only attachments and accessories that have been specified by FSI, and refer all servicing to qualified personnel.

### Safety terms

The following icons may appear throughout this manual:



**CAUTION:** Identifies conditions or practices that could result in damage to equipment and/or loss/contamination of data.



**WARNING:** Identifies conditions or practices that could result in non-fatal personal injury.



**DANGER:** Identifies conditions or practices that could result in serious injury or death.

### Electrical safety

If the **FD348R** APU is damaged or malfunctions, disconnect power to the APU. Do not use the APU if any of the following conditions exist:

- The APU is visibly damaged.
- The APU does not operate as expected.
- The APU has been subjected to prolonged storage under adverse conditions.
- The APU has been damaged during shipment.

Do not put the APU into service until qualified service personnel have verified its safety.

### Covers and panels

There are no user-serviceable parts inside the APU. To avoid personal injury, do not remove any of the APU's covers or panels. The product warranty is void if the factory seal is broken. Do not operate the product unless the covers and panels are installed.

## Inspection

The **FD348R** APU should be inspected for shipping damage. If any damage is found, notify **Fiber SenSys** and file a claim with the carrier. Save the shipping container for possible inspection by the carrier.

## Laser radiation

The **FD348R** APU is a Class I laser product, as defined by IEC 60825-1 and CFR 21 subchapter J. A Class I laser product emits insufficient laser radiation to constitute a hazard. However, avoid direct eye exposure to the output of this product or to the open end of any optical-fiber cable connected to this product.

## Fiber-handling precautions



Optical fibers are made of glass, and the ends of a broken fiber can be sharp and may become lodged in the skin. Take appropriate glass-handling precautions.

## **FCC rules**



Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If the equipment is not installed and used in accordance with the instructions it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 3. The Sensing Fiber

The **FD348R** detects intruders by sensing small disturbances caused by vibrations induced within a fiber optic sensor attached to the perimeter. The optical sensor is a thin strand of multimode optical fiber. The fiber optic cable is installed in such a way that, when intruders attempt to cross the perimeter, they create slight vibrations that disturb the sensing fiber. These disturbances are then detected by the **FD348R** APU, which generates the appropriate alarm(s).

#### Fiber Optic Sensing

When an optical fiber is exposed to vibration, the disturbance causes small asymmetric changes in the fiber's density. In turn, these changes in density cause measurable changes in certain characteristics of laser radiation transmitted through the fiber. The **FD348R** uses precision lasers and detectors, along with sophisticated digital signal processing, to measure changes in the laser radiation. The processor analyzes the incoming signals in order to determine whether they are caused by intruders, or harmless nuisances, such as vibrating equipment. To learn more about fiber optics and their use as sensors, refer to the application note on fiber optics titled: **AN-SM-007 Fiber Optics**.

#### Sensor Cable

There are two types of sensor cable for the **FD348R**: **SC-3** and **SC-4**.

**SC-3** is distinguished by its dark brown protective jacket. This jacket ensures the cable is resistant to weather, dirt, etc. although the cable is not outdoor rated and should be contained within protective conduit.

- **SC-3 (brown jacket)** – 3 mm sensor cable used for perimeter applications.

Sensor cable comes in varying lengths, with up to 2000 meters (6500 feet) per spool.

- **SC3-C (cable in conduit)** – 3 mm sensor cable within grey ½" UV rated conduit.

Cable in conduit should be purchased in premeasured zone lengths and reels can be up to 800 meters.

**SC-4** comes in a thicker green jacket and is outdoor rated. This cable can be attached to the fence directly using nylon cable ties and does not need to be deployed within protective conduit.

- **SC-4 (green jacket)** – 4 mm sensor cable used for perimeter applications.

Sensor cable comes in varying lengths with up to 2000 meters (6500 feet) per spool.

## Insensitive Leads

The insensitive leads, so named because they are unaffected by vibrations, are single-mode type optical cables. Fiber SenSys offers several single-mode cable configurations to satisfy a wide range of system implementations. Like the sensor cable, the insensitive leads are made of optical fiber that is immune to RF and EMI energy. The insensitive leads are also weather resistant. These leads are used to transmit light from the APU to the sensor cable mounted in the protection zone and back again.

## Site Design and Installation

There are many different ways to use the **FD348R** system. The most common installation is on chain link fence. For fence-mounted applications the fiber optic cable is installed inside a flexible conduit which is then secured to the fence using stainless steel wire ties. Other applications involve installing the optical cable inside the channels of decorative metal fence or running the flexible conduit (with optical cable inside) along the tops of concrete walls.

Ultimately, the method by which the **FD348R** system is deployed is up to the end user; **Fiber SenSys** does not mandate one particular installation setup over another; however, the general procedure for installing the **FD348R** system is:

1. **Assess:** Survey the site to be protected and record all information needed for the site design phase.
2. **Design:** Create a strategy for protecting the site. This includes planning the level of security, choosing the location of the APUs, provision of electrical power, and planning cable routing.
3. **Install:** Proper deployment of the fiber optic sensor and correct installation of the Fiber SenSys system.

To learn more about sensing fiber installations, refer to the application note on installation: **AN-ENG-027 Site Design and Installation for FD300 Series**.

## Connectors

To maintain a high signal-to-noise ratio, it is important that all connections within a given fiber optic sensor (zone) be made by either fusion splicing or by physical-contact fiber optic connectors (PC). It is helpful to test the optical loss of each zone. The insensitive lead-in fibers plug directly into the APU and are always connected with an ST connector (ST/PC). The insensitive leads are spliced, or coupled via ST/PC feedthrough connector, to the sensing fibers.



**Note:** It is important that only clean optical connectors are inserted into the APU's optical inputs and outputs; dirty connectors can degrade the performance of the APU or even

cause irreversible damage. When leaving connectors unconnected make sure they have protective caps installed on the ferrules. Caps protect the ferrule from damage that might be caused by bumping the ferrule against a foreign object. However, when caps are dirty they don't protect (effectively) against microscopic contamination. Consequently, be sure to clean all connectors prior to insertion whether or not they have been capped. For more information on the care and cleaning of fiber-optic connectors, refer to the application note on fiber optics: **AN-SM-007 Fiber Optics**.

## 4. The Alarm Processing Unit (APU)

### APU Description

The **FD348R** APU is a module containing a laser, optical detector, and the electronics for processing return optical signals. The APU has 4 input/output ports. There are 2 optical connectors, "Input" and "Output" as well as an RS-232 connector and Ethernet connector.

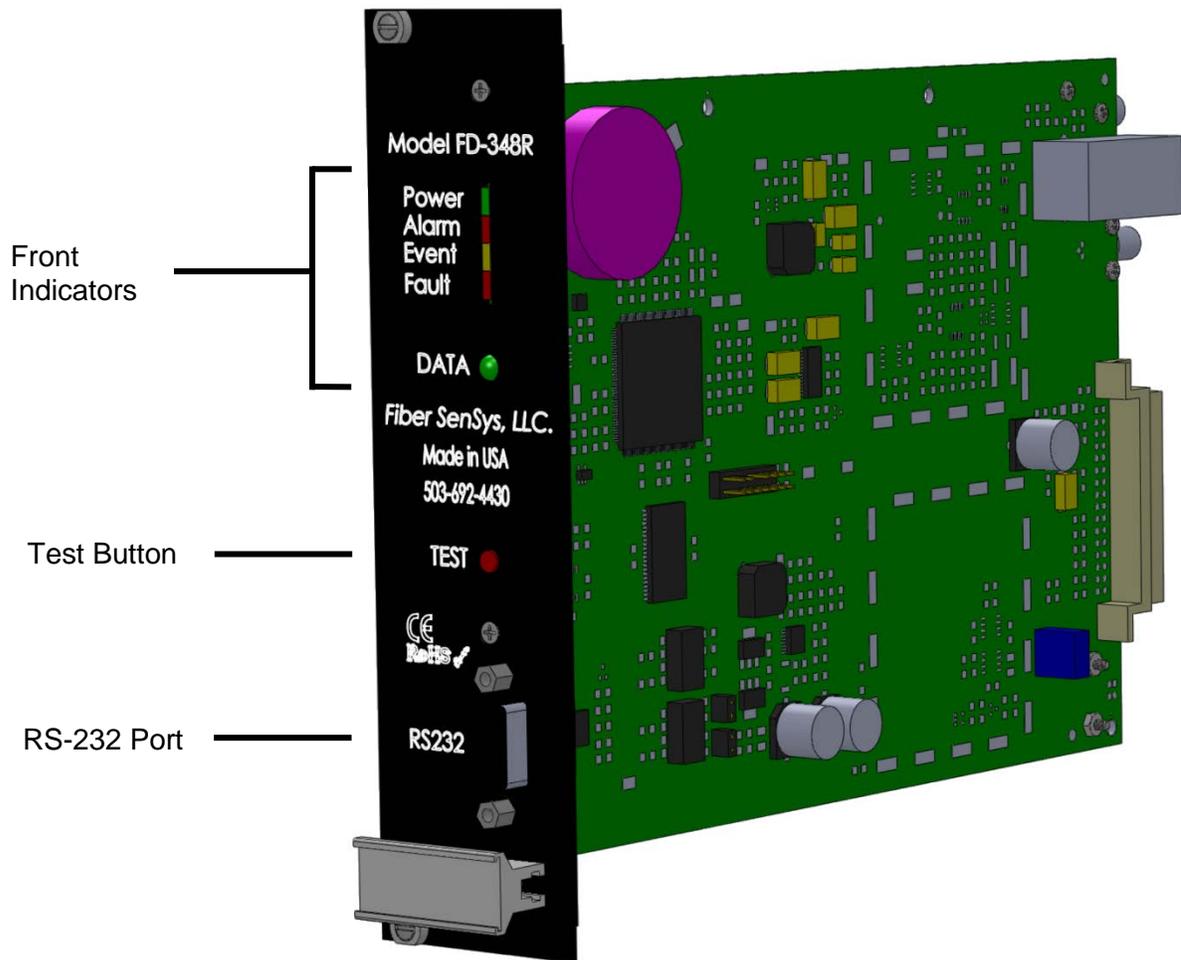


Figure 4-1. The **FD348R** front view with labeled connectors

The front panel of the APU has an RS-232 connector for connecting to a PC during tuning. The pin-out for the RS-232 connector is shown in figure 4-2 and table 4-2.

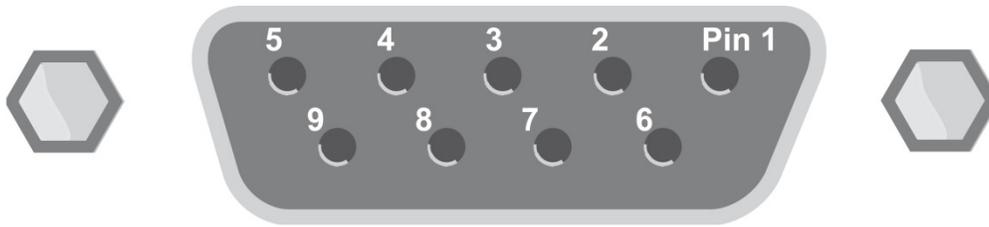


Figure 4-2. Pin-out for the RS-232 connector

Table 4-2. RS-232 Pin Assignments

Pin Number	Description
1	No connection
2	T x D transmit
3	R x D receive
4	No connection
5	Ground
6	No connection
7	RTS
8	CTS
9	No connection

**Note:**



Connections to the APU's RS-232 interface should use straight-pin DB-9 serial cable

**LED indicators.** LED indicators for are found on the front panel of the module.

- **"Fault"** indicates a loss or significant degradation of returning optical power.
- **"Event"** indicates a disturbance or event has been detected in the sensor cable.

- "Alarm" indicates an alarm condition has occurred.
- "Power" indicates the module is plugged in and receiving power.
- "Data" indicates network activity (XML) and is green when the network is active. When data is transmitted the LED will flash red.

Pressing the **Test** button (located below the LED indicators) causes the **ALARM** and **FAULT** LEDs to light up and the corresponding relay contacts to change state.

On the back of the APU, accessible on the back of the **RK348** when the APU is mounted within the rack, there is an RJ45-style connector for TCP/IP Ethernet communication with a security head-end or other annunciator/monitoring equipment.

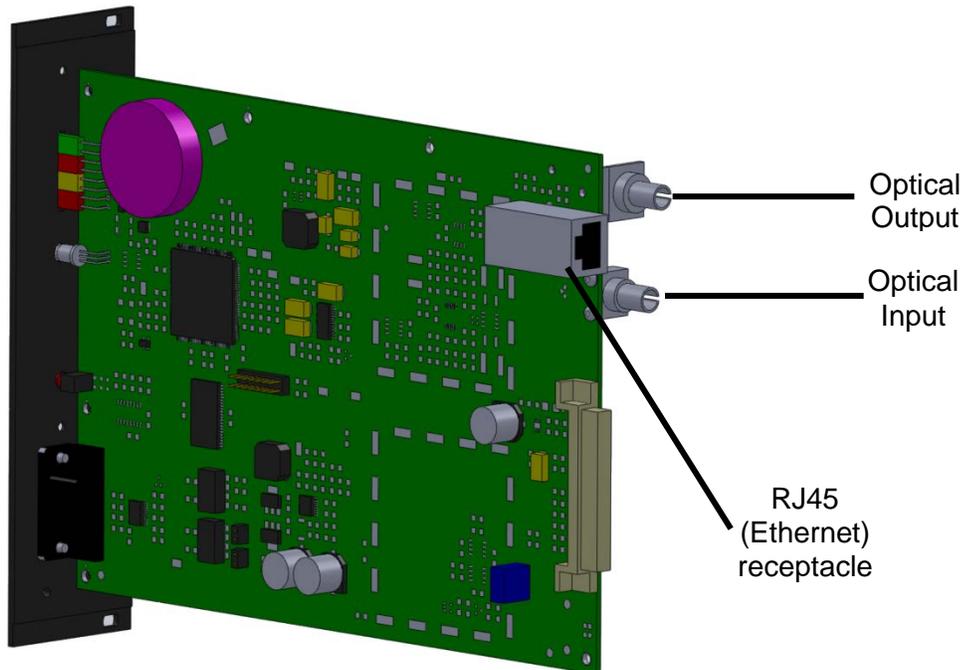


Figure 4-3. FD348R rear connectors

Also located on the rear of the APU and accessible on the back of the **RK348** when the APU is installed, are the optical input and optical output ports. The insensitive leads of the **FD348R** are connected to these connectors.

## Rack-Mount Chassis

The **RK348** rack-mount chassis, shown below, holds up to eight **FD348R** APU modules and provides power to each.



Figure 4-5. The RK348 with two installed FD348R APU modules and another APU in front

The power switch and AC power receptacle are located on the rear panel of the rack. The power switch provides power to all installed APU modules. The input power to the RK348 power supply is user selectable from 120 to 240 VAC, 50 to 60 Hz.

To set the input voltage range:

1. Locate the power entry module on the back, left-hand side of the rack-mount chassis
2. Insert a flat-bladed screwdriver into the opening at the top of the fuse module (shown below) and gently pry the fuse module out.
3. Install two [2] 250 V, 1 Amp fuses in the fuse module as shown below
4. Re-insert the fuse module so that the proper voltage range on the label is reading right-side up. The arrow next to the desired voltage range (on the label) should be pointing at the arrow on the power entry module when installed correctly

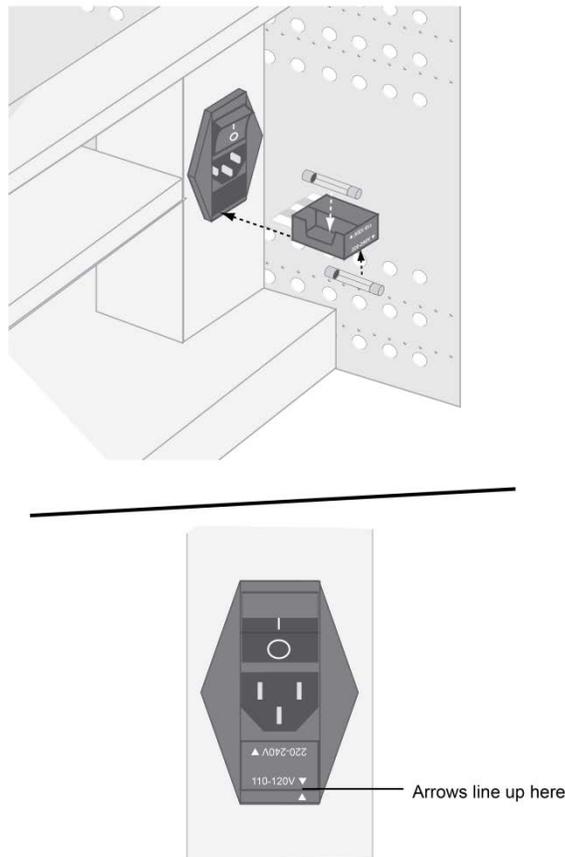


Figure 4-6. Setting the voltage and installing fuses in the **RK348**

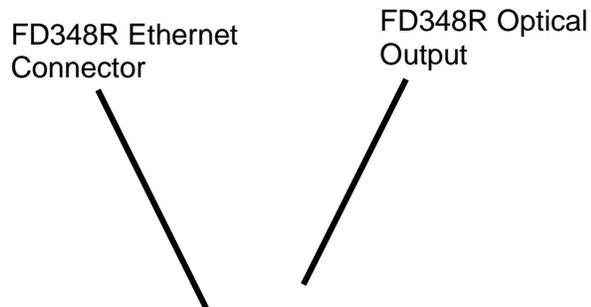


**WARNING!**

**A PROTECTIVE GROUND CONNECTION ON THE POWER CORD IS ESSENTIAL FOR SAFE OPERATION. IF THE GROUND CONNECTION IS LOST OR IF THE PLUG IS NOT PLUGGED INTO A PROPERLY GROUNDED RECEPTACLE, ALL CONDUCTIVE PARTS OF THE INSTRUMENT CAN RENDER AN ELECTRIC SHOCK.**

## RK348 Rear Panel Connections

The back of the **RK348** provides access to several mounted **FD348R** connections and an on/off switch. These connections are shown below:



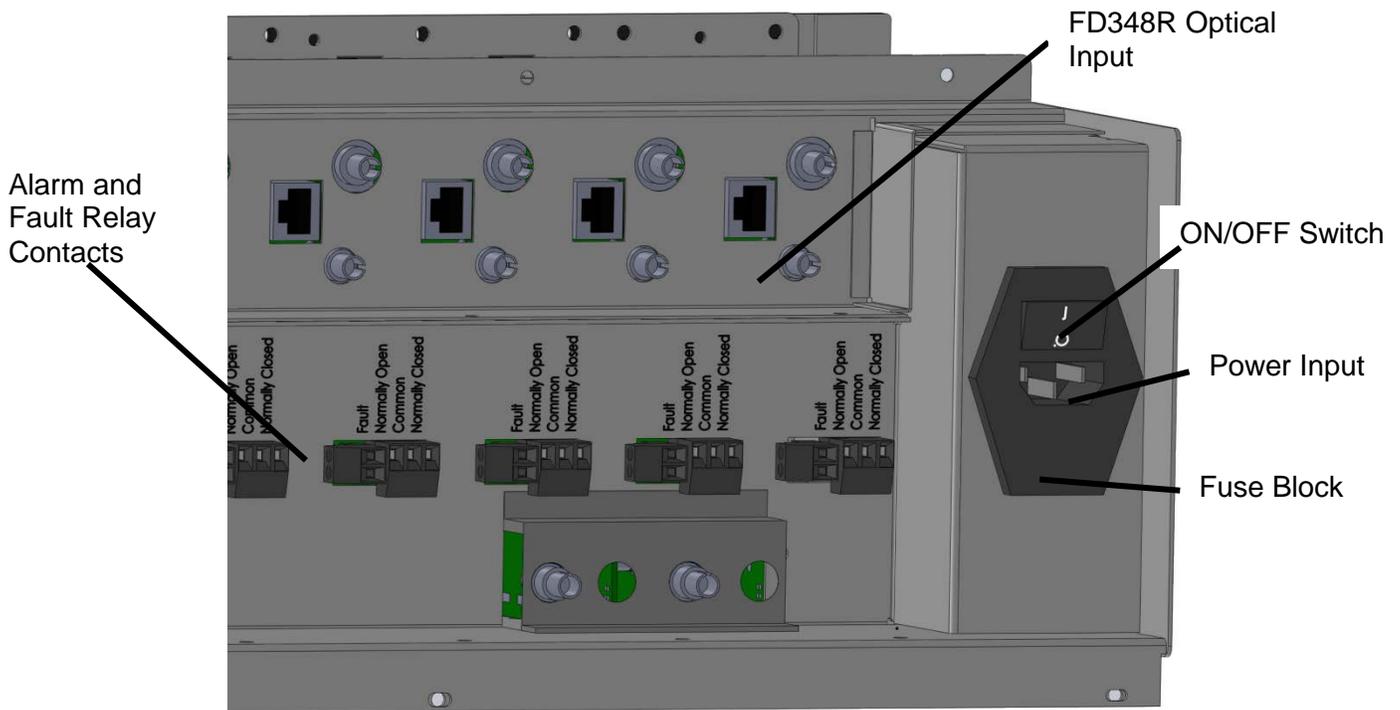


Figure 4-7. Rear connections on the **RK348**

Below the optical and Ethernet connectors for each **FD348R** APU module, are terminals for alarm and fault relay contacts. The normally-closed fault relay contacts open whenever optical loss at the APU input rises above 25 dB; however, the target range for optical loss should be between 0 to 10 dB. The alarm relay is a form C relay with normally-open and normally-closed outputs.

**WARNING!**

**NOT APPLY AC VOLTAGE TO THESE PINS. THE RELAY CONTACTS ARE RATED FOR DC VOLTAGE ONLY (100mA at 24 VDC).**

## 5. SpectraView

Terminal emulation software or **SpectraView** tuning software is required to adjust the tuning parameters of the APU. They run on a PC that is connected to the APU via the RS-232 port on the front of the APU. Any terminal emulation software will work to change APU parameters, but **SpectraView** is recommended for precision tuning.

**SpectraView** is a Windows-based software module that allows for the tuning of the system so that it has maximum sensitivity when detecting intrusions with maximum rejection for nuisance alarms. **SpectraView** also allows the user to monitor system performance, and to record and analyze sensor data.

For instructions on how to change settings using a terminal, refer to Appendix B within this manual.

### Using SpectraView

With power off to the APU, connect one end of an RS-232 cable to the APU, and the other end to the PC from which you will be launching **SpectraView**; then turn on power to the APU.

Launch the **SpectraView** software by clicking on the icon pictured below, or navigate to “All Programs | **Fiber SenSys** | **SpectraView**”:



Figure 5-1. SpectraView Icon

Upon launching the program, click the tab in the top left labeled “Serial Port” and click on the appropriate port from the list of available ports. Then click “Connect to COM Port.”

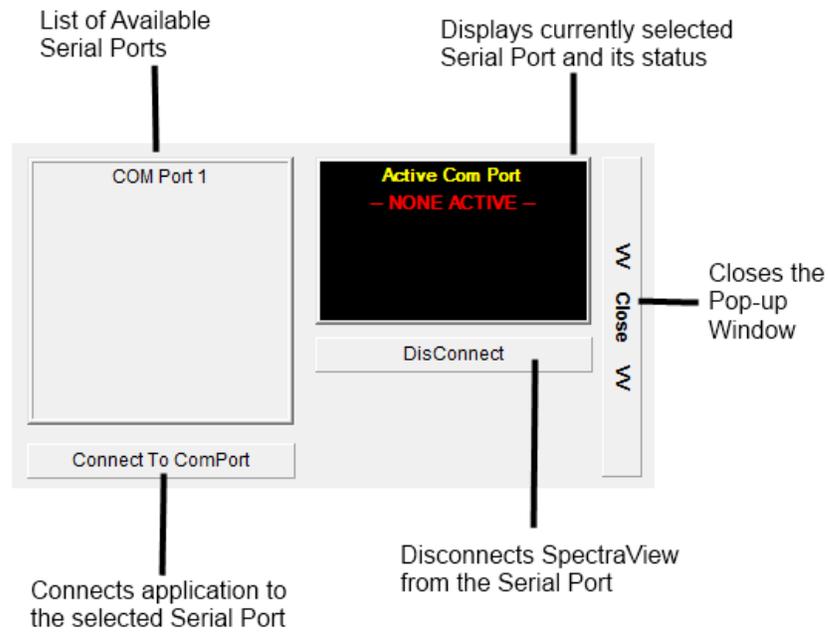


Figure 5-2. The **Serial Port** pop-up window

## APU Parameter Editor Mode

From the tab on the left labeled “Modes” select “Parameter Editor.” The parameter editor mode (see figure below) is where the parameters are read, defined and written to the APU.

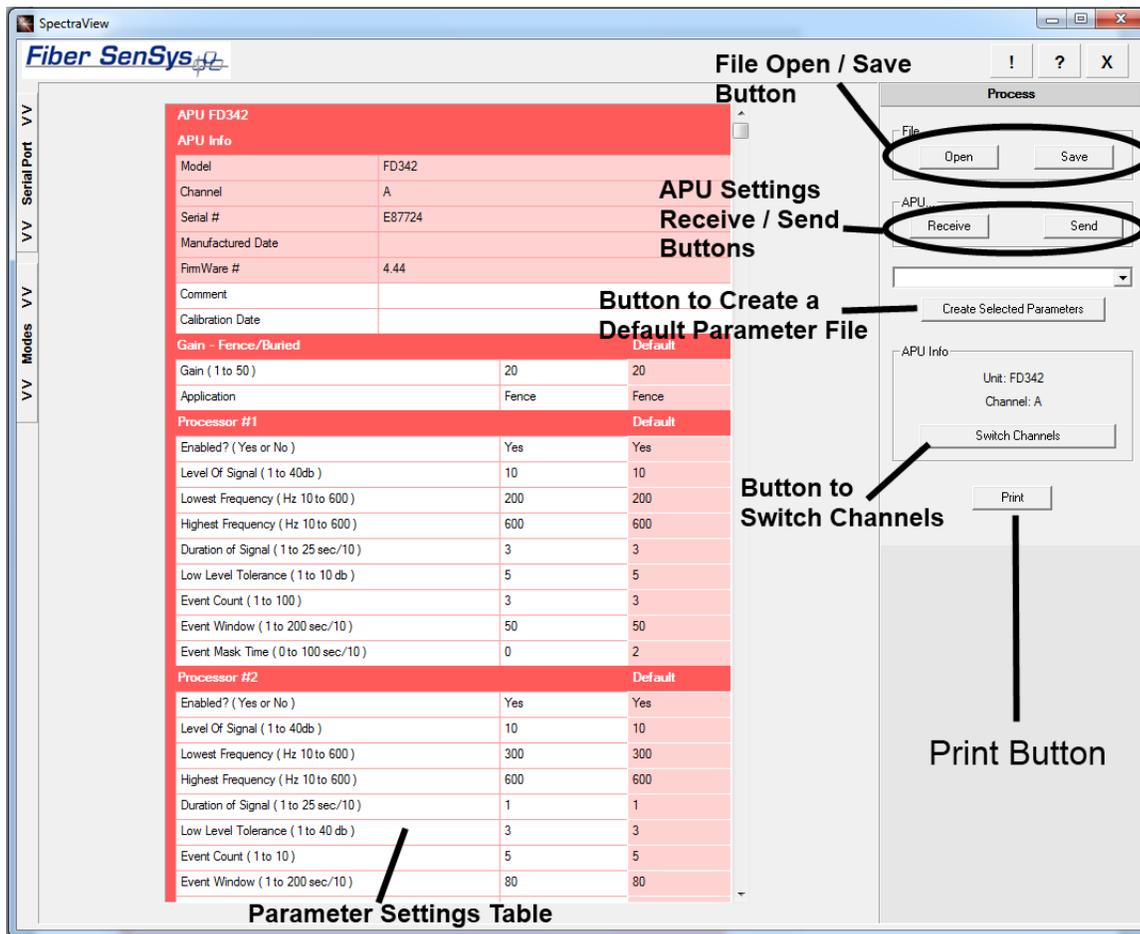


Figure 5-3. The SpectraView Parameter Editor screen

Press the Receive button (upper right-hand corner of the screen) to read the current tuning parameters from the APU. **SpectraView** queries the APU, reads in the processor information and displays it:

APU FD342		
APU Info		
Model	FD342	
Channel	A	
Serial #	E87724	
Manufactured Date		
Firmware #	4.44	
Comment		
Calibration Date		
Gain - Fence/Buried		Default
Gain ( 1 to 50 )	20	20
Application	Fence	Fence
Processor #1		Default
Enabled? ( Yes or No )	Yes	Yes
Level Of Signal ( 1 to 40db )	10	10
Lowest Frequency ( Hz 10 to 600 )	200	200
Highest Frequency ( Hz 10 to 600 )	600	600
Duration of Signal ( 1 to 25 sec/10 )	3	3
Low Level Tolerance ( 1 to 10 db )	5	5
Event Count ( 1 to 100 )	3	3
Event Window ( 1 to 200 sec/10 )	50	50
Event Mask Time ( 0 to 100 sec/10 )	0	2
Processor #2		Default
Enabled? ( Yes or No )	Yes	Yes
Level Of Signal ( 1 to 40db )	10	10
Lowest Frequency ( Hz 10 to 600 )	300	300
Highest Frequency ( Hz 10 to 600 )	600	600
Duration of Signal ( 1 to 25 sec/10 )	1	1
Low Level Tolerance ( 1 to 40 db )	3	3
Event Count ( 1 to 10 )	5	5
Event Window ( 1 to 200 sec/10 )	80	80
Event Mask Time ( 0 to 100 sec/10 )	7	7

APU Information (Cannot be edited)

Editable Parameter and its Allowable Range

Default Value (Cannot be edited)

Figure 5-4. Users can change APU Parameter Settings using the Parameter Settings Table

Once received by **SpectraView**, the APU model number, serial number, manufacturing date and firmware version appear at the top of the Parameter Settings table. Also appearing in the table are the individual tuning parameters, and their current settings. The allowable range for each parameter as well as the default value is also shown. Parameters appearing in light red cells of the table are default values and cannot be edited. Appearing also in the table are rows for entering comments, and the date of calibration.

To edit or change a parameter setting:

1. Click on the desired parameter (only parameters appearing in white table cells can be edited). The parameter's row is highlighted in yellow indicating it is ready for editing.

2. Change the parameter setting to the desired value. Numerical values can be entered using the number keys or incremented/decremented from the current value using the + or – keys. Numerical values must also be kept within the allowable range or the software will reject the new value and prompt the user to enter a value within range.
3. Once the parameters have been edited, the new settings can be saved to the APU by pressing the **Send** button.

For detailed information about these tuning parameters, see the **Fiber SenSys** application note on tuning parameters titled: **AN-SM-008 Setting the Tuning Parameters**.

## Realtime Mode

As a tuning aid, **SpectraView** provides a powerful tool to help visualize the live frequency content of different sensor signals called **Real Time** (see figure 5-5). To use this function, from the tab on the left labeled “Modes” select “Real Time.”

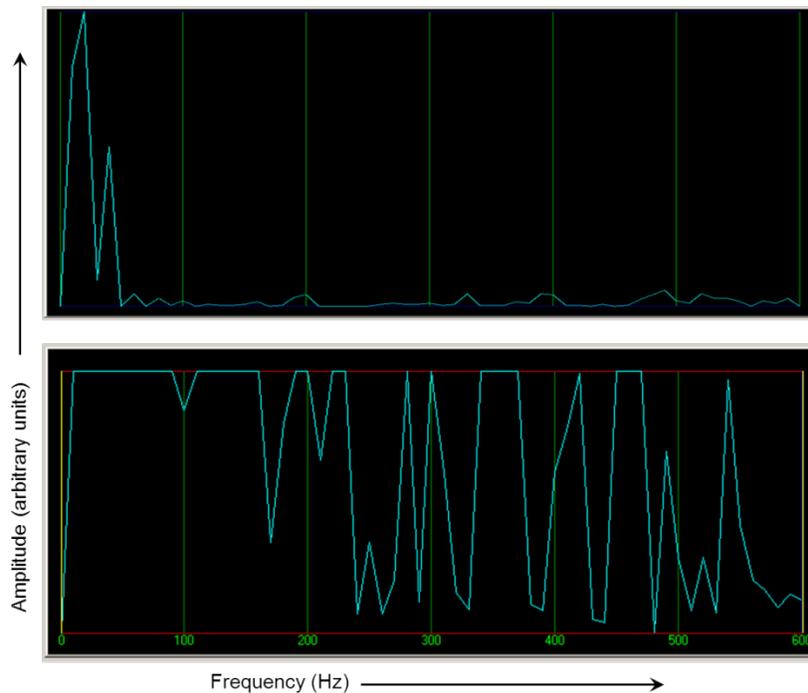


Figure 5-5. Signal with low frequency content (top) caused by wind, and a signal with high-frequency content (bottom) caused by cutting the fence fabric.

For detailed information about **SpectraView**, refer to the **SpectraView** user’s manual available through **Fiber Sensys Inc.**

## 6. Integrating the APU into the Security System

The **FD348R** APU is designed to be installed into a local-area network (LAN) and connected to a security head-end or other annunciator/monitoring equipment.

The **FD348R** communicates via XML (extensible markup language) sending status messages to the network such as alarm, tamper, and fault conditions. It can also receive device-configuration commands in XML format.

Processes involved in integrating the APU into a security system are described in detail in the networking application note, **AN-SM-009 APU Networking**.

## 7. Testing and Certification

System tuning is necessary when installing a new system and after performing any system maintenance that involves changes to the cable assembly or if the APU is replaced. Anytime the system is tuned, it should be re-tested and verified that it meets all requirements for probability of detection and rejection of nuisance alarms. Other basic tests include:

### **Fault test**

The fault test verifies that a loss of optical power to a zone results in a cable fault indication for that zone on the APU. To conduct this test, disconnect the optical fiber for zone 1 and verify that the fault LED for zone one is illuminated (this LED is located on the front of the APU). Reconnect the fiber from zone one and verify that the fault LED light goes off. Repeat this process for the other zone.

### **Probability of detection (PD)**

PD performance testing begins with a review of the sorts of threats that need to be detected, simulating those threats, and measuring the probability with which the system detects them. To obtain a statistically significant sample, perform each threat simulation 20 times **in each zone**.

For example, to determine the PD for an intruder attempting to climb the fence, have a volunteer climb halfway up the fence and then dismount in a controlled and steady manner. Perform the simulated intrusion at least 20 times; keeping track of the number of times the system triggers an alarm (count only one alarm per simulated intrusion).

Verify that the system triggers an alarm, as intended, with the required probability of detection. If the PD is too low, tune the system to be more sensitive as described in chapter 5. Repeat this procedure for each installed zone on the secure perimeter.

## 8. Maintenance

Maintenance consists of routine inspections and periodic testing to verify the performance of the tamper and fault alarms, as well as the probability of detection for simulated intrusions.

Visually inspect the **FD348R** APU at least every 90 days:

1. Ensure the Power LED is illuminated and all alarm and fault LED indicators are normal.
2. Check the optical connectors at the sides of the APU, making sure they are not pinched or otherwise compromised.

On a periodic basis (once every 180 days at a minimum), perform the tests described in section 7:

- Fault.
- Probability of detection.
- Relay function (if used).

There are no user-serviceable parts in the **FD348R** APU. In case of an APU failure, corrective maintenance involves replacing the APU. If you replace the APU, you must perform a complete system configuration and recalibration.

To replace the APU, follow these steps:

1. Ensure all current APU calibration parameters, as well as the system configuration data, have been saved to a PC file using **SpectraView**.
2. Disconnect power to the APU and disconnect the optical fibers. Disconnect the Ethernet connection from the TCP/IP port.
3. Remove the APU and replace it with a new unit.
4. Clean all the optical connectors per the procedures described in the fiber optics application note: **AN-SM-007 Fiber Optics**.
5. Connect power to the new APU and repeat the processes described in the chapters in this manual, on calibration, tuning, integration, and testing.

For troubleshooting assistance, contact **Fiber SenSys** Technical Support Service: telephone, 1-503-726-4455; email, [support@fibersensys.com](mailto:support@fibersensys.com); or go to the **Fiber SenSys** website, [www.fibersensys.com](http://www.fibersensys.com).

## Appendix A. Product Specifications

<b>System Type</b>	Alarm processor for perimeter security
<b>Number of Zones</b>	Up to 8 fully independent zones per <b>RK348</b> 1 zone per <b>FD348R</b>
<b>Insensitive Lead-In</b>	Insensitive lead length: $\leq 20$ km (12.4 miles) $\geq 1$ m (3.28 ft)
<b>Multimode Sensing Fiber</b>	<ul style="list-style-type: none"> <li>• Uniform sensitivity over the entire length</li> <li>• Sensing fiber length: <math>\leq 5</math> km (3.1 miles)</li> <li>• Maximum pull tensile strength: 27kg (60 lb)</li> <li>• Minimum bend radius: 5 cm (2 in)</li> <li>• Passive, inert, intrinsically safe</li> <li>• Immune to EMI and corrosion</li> </ul>
<b>Power Specifications</b>	<ul style="list-style-type: none"> <li>• Input: 120 or 240 VAC @ 50 or 60 Hz, 25 Watts</li> <li>• 2.5 Watts per FD348R</li> <li>• Fuse Rating: 100-240V – 1.0 Amp, 250 V (T)</li> </ul>
<b>Communications</b>	<ul style="list-style-type: none"> <li>• RS-232 port for tuning</li> <li>• Optional TCP/IP port for alarm output and XML communication</li> </ul>
<b>Fault and Alarm Relays</b>	<ul style="list-style-type: none"> <li>• Individual dry contact alarm relays for each zone – normally open or normally closed (NO / NC)</li> <li>• Dry contact alarm relay for fault – Normally Closed (NC)</li> <li>• 28 to 14 AWG</li> <li>• 100 mA, 24 VDC non-inductive</li> <li>• Dry Contact Resistance 11 <math>\Omega</math> typical, 17 <math>\Omega</math> max</li> </ul>
<b>Front-Panel Display</b>	LED indicators for fault, and alarm conditions for each zone
<b>Environmental</b>	Temperature: 0° C to 55° C (32° F to 131° F) Humidity: 0 to 95% non-condensing
<b>Dimensions (RK348)</b>	Height = 17.78 cm (7.00 inch) Width = 48.26 cm (19.00 inch) Depth = 34.93 cm (13.75 inch)
<b>Standards and Certifications</b>	<ul style="list-style-type: none"> <li>• RoHS</li> <li>• CE</li> <li>• FCC Part 15 Class B</li> </ul>

## Appendix B. FD348R Menu Structure

This appendix provides details for all programmable **FD348R** system tuning parameters.

Connect the PC to the APU via serial cable. Launch the terminal emulation software or **SpectraView**, and establish communication between the two instruments. The following properties must be set to communicate using terminal emulation software:

**Bits per Second:** 9600  
**Data bits:** 8  
**Parity:** None  
**Stop bits:** 1  
**Flow control:** Hardware

Upon establishing communication with the APU, either through **SpectraView** in "terminal" mode or any other terminal emulation software, the system will display the password prompt:

"Unit is LOCKED, Enter Password"

There are 5 user-definable "passwords" that provide the user with access to related APU parameters or submenus. For instance, the "GAIN" password provides users with access to the gain setting. After entering the password, "GAIN," users can make adjustments to the setting as desired. The defaults for these 6 parameter passwords are:

- GAIN
- SETUP
- HIST
- STATUS
- VERSION

Each password, and its associated parameters, is explained in detail in the following pages. Factory default settings for fence line were chosen based upon the performance of an **FD348R** APU used in tandem with a seven foot chain link fence having a three-strand barbed wire outrigger.



**NOTE:** Press the **Enter** key at any time to exit from any menu, submenu or parameter in the terminal emulation software.

### GAIN

A password of "GAIN" allows access to the gain setting of the APU. The default setting is 20 and the range is 1 to 50. **Gain** raises and lowers the overall signal level. Raising the gain increases the signal level, making it easier for the signal to exceed the level threshold that

defines events. Thus, increasing **Gain** increases the overall system sensitivity. Because **Gain** boosts the sensor signal, a higher **Gain** value increases the likelihood of detecting an intruder, but also increases the likelihood of nuisance alarms. Note, however, that the change in signal level is not displayed in **RealTime** mode.

## SETUP

Access this menu using the "SETUP" password. There are 4 submenus available.

- Wind [1]
- Comment [2]
- Date [3]
- Calibrate [4]

These submenus are accessed by entering their corresponding submenu numbers ("1" for the Wind submenu, "2" for the Comment submenu, etc.).

### **Wind [1]**

This submenu allows the enabling and scaling of the internal wind rejection algorithms. When enabled, this function helps your **FD348R** APU cope with environmental disturbances caused by wind.



**NOTE:** Hitting **ENTER** will cycle forward to the next parameter. Typing "-" and hitting **ENTER** will cycle back to the previous parameter.

Parameter	Range	Default	Description
<b>Enable Wind Rejection Software</b>	Y / N	N	Enables the wind rejection software. When enabled, the APU continually monitors the effects of wind on the cable and compensates for it based upon the detected load and the wind rejection value
<b>Wind Rejection</b>	20 – 80	50	A selectable parameter that determines how much the APU will dampen the signal received from the sensor cable during windy conditions. A higher wind rejection factor means more dampening, requiring a signal higher in magnitude to create an alarm condition

### ***Comment [2]***

This submenu allows users to enter comments of up to 15 characters. Comment text is stored in the APU and is displayed each time this submenu is accessed unless the text is changed.

### ***Date [3]***

From this submenu, users can enter the date of the last calibration (15 characters maximum) or change the time and date setting of the APU's real-time clock.

To change the real-time clock, select option [1] and enter the new time in 24 hour format followed by the current date in the format mm/dd/yy.

Select option [2] to change the calibration date.

### ***Calibrate [4]***

The calibrate submenu gives the user access to parameters affecting 5 areas:

- Processor 1 [1]
- Processor 2 [2]
- Details [3]
- Passwords [4]
- Reset [RS]



**NOTE:** The default value for most parameters described in this section changes depending upon whether the user sets the APU for fence or buried applications.

Processor 1 [1]

Parameter	Range	Default	Description
<b>Enable</b>	Y / N	Y	Enables the processor
<b>Level of Signal</b>	1 to 40 (dB)	10	Sets the level above which the signal from a sensor cable must meet or exceed before an event is generated by the processor
<b>Lowest Frequency</b>	10 to 600 (Hz)	200	The lowest allowable frequency used by the processor to evaluate the presence of an intruder. This may be set to eliminate lower order frequencies caused by nuisances such as vibrations from nearby structures
<b>Highest Frequency</b>	10 to 600 (Hz)	600	The highest allowable frequency used by the processor to evaluate the presence of an intruder. This may be set to eliminate higher order frequencies caused by nuisances such as natural bending of the fence fabric in wind, etc.
<b>Duration of Signal</b>	1 to 25 (sec /10)	3	Time interval during which any signal above the <i>Level of Signal</i> setting must remain to qualify as an event
<b>Low Level Tolerance</b>	1 to 10 (dB)	5	An allowance that permits a signal lower than the <i>Level of Signal</i> setting to generate an event as long as it lasts for the period of time automatically set by the processor. The higher the tolerance, the longer the signal must last. If the signal is outside the tolerance setting, it cannot generate an event regardless of how long it lasts
<b>Event Count</b>	1 to 100	3	The number of times that an event must be registered for an alarm condition to occur
<b>Event Window</b>	1 to 200 (sec /10)	50	Length of time after an event occurs during which another event must be registered for it to count toward an alarm condition. See <i>Event Count</i> above
<b>Event Mask Time</b>	0 to 100 (sec /10)	2	A period of time after an event during which any subsequent events or activities are ignored. This setting is useful for setting the system to mask or ignore the effects of oscillations from a single event, such as a bird striking a fence. Oscillations from such nuisances usually die down within 0.5 seconds



**NOTE:** Hitting **ENTER** will cycle forward to the next parameter. Typing “-“ and **ENTER** will cycle back to the previous parameter.

Processor 2 [2]

Parameter	Range	Default	Description
<b>Enable</b>	Y / N	Y	Enables the processor
<b>Level of Signal</b>	1 to 40 (dB)	10	Sets the level above which the signal from a sensor cable must meet or exceed before an event is generated by the processor
<b>Lowest Frequency</b>	10 to 600 (Hz)	300	The lowest allowable frequency used by the processor to evaluate the presence of an intruder. This may be set to eliminate lower order frequencies caused by nuisances such as vibrations from nearby structures
<b>Highest Frequency</b>	10 to 600 (Hz)	600	The highest allowable frequency used by the processor to evaluate the presence of an intruder. This may be set to eliminate higher order frequencies caused by nuisances such as natural bending of the fence fabric in wind, etc.
<b>Duration of Signal</b>	1 to 25 (sec /10)	1	Time interval during which any signal above the <i>Level of Signal</i> setting must remain to qualify as an event
<b>Low Level Tolerance</b>	1 to 10 (dB)	3	An allowance that permits a signal lower than the <i>Level of Signal</i> setting to generate an event as long as it lasts for the period of time automatically set by the processor. The higher the tolerance, the longer the signal must last. If the signal is outside the tolerance setting, it cannot generate an event regardless of how long it lasts
<b>Event Count</b>	1 to 100	5	The number of times that an event must be registered for an alarm condition to occur
<b>Event Window</b>	1 to 200 (sec /10)	80	Length of time after an event occurs during which another event must be registered for it to count toward an alarm condition. See <i>Event Count</i> above
<b>Event Mask Time</b>	0 to 100 (sec /10)	7	A period of time after an event during which any subsequent events or activities are ignored. This setting is useful for setting the system to mask or ignore the effects of oscillations from a single event, such as a bird striking a fence. Oscillations from such nuisances usually die down within 0.5 seconds

Details [3]

Parameter	Range	Default	Description
<b>(Fence/Buried) Sensor on Fence</b>	Y / N	Y	Configures the APU for fence or buried applications. A “Y” value sets the system for fence operation
<b>Alarm Relay Time</b>	1 to 10 (sec)	1	Specifies the length of time, in seconds, during which the alarm relays remain in an alarmed state once an alarm condition is set
<b>Enable User Controlled Relay Mode</b>	Y/N	N	Allows the user to directly operate the fault and alarm relays through XML. This disables relay stimulus upon an APU alarm/fault
<b>Sensitivity Factor</b>	1 to 100	10	Scales the unprocessed signal from the protected zone. Typically used to increase signal amplitude in <b>SpectraView</b> for improved signal visibility
<b>Communication Mode</b>	0 to 2	0	Selects the communication mode that the APU will use to provide alarm and status information. Choose between Relay Only(0), FSN(1), or XML(2)
<b>XML Report Interval</b>	1 to 600 (sec/10)	10	Adjusts the maximum frequency with which XML reports are output (This menu option only becomes available in the Details submenu when communication mode is set to (2) XML)

Password [4]

Parameter	Range	Default	Description
<b>Gain Menu Password</b>	15 characters maximum	GAIN	Sets the password to access the Gain menu
<b>Setup Menu Password</b>	15 characters maximum	SETUP	Sets the password to access the Setup menu
<b>Device Name</b>	31 characters maximum	APUNAME	The alias under which the device will communicate through the XML protocol (Only available in XML communication mode)

<b>Channel Name</b>	31 characters maximum	CHA	The name under which the channel will communicate through the XML protocol (Only available in XML communication mode)
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## Reset [RS]

Selecting this choice will clear all user-defined parameter settings (except passwords) and restore them to the factory defaults.

## HIST

This is a read-only menu that provides a history of alarms beginning with the most recent alarm first. Alarms are read off according to how long ago they occurred. In addition, each alarm entry is date/time stamped. For instance, if the alarm history is read after three alarms occurred, the first report in the alarm history might read:

*#3 Alarm, Processor 2 (W=0)*

*16:41 11/04/06*

One can note from this example that the alarm history is provided for each alarm that occurs for each processor. From this report, the “#3” indicates the alarm report number, “Processor 2” indicates the processor in which the alarm occurred and the date and time on the bottom line of the text indicates when the alarm was received. The “W=” parameter indicates the estimated wind speed at which the alarm occurred (determined by the internal wind rejection algorithms).

Up to 128 of the most recent alarm events will be stored in volatile APU memory. Each alarm event exceeding the allowable 128 will overwrite the oldest entry. If at any point you wish to exit this menu then enter “Q”.

## STATUS

This is a read-only command that provides a real-time diagnostic of conditions such as system loss, laser current, power supply voltage (to the APU) and any present fault, event or alarm conditions. When this menu is chosen, for example, the display reads:

*Cha Loss: 1 Las(mA): 17.2 Pwr(V): 11.9  
[Evt1][Evt2][Alarm][Fault]*

“Evt1” and “Evt2” refer to event conditions at Processor 1 and Processor 2.

The laser current should never exceed 40 mA. Laser current readings in excess of 40 mA may indicate that the laser is damaged.

## **VERSION**

This read-only menu gives the APU model number, serial number, firmware version, date of manufacture and the number of days the unit has been in operation.

## Appendix C. Warranty information

A. **Fiber SenSys** warrants the **FD348R** APU to be free from electrical and mechanical defects in materials and workmanship for a period of two years from the date of shipment. This warranty does not apply to defects in the product caused by abuse, misuse, accident, casualty, alteration, negligent use of current or voltages other than those specified by **Fiber SenSys**, application or installation not in accordance with published instruction manuals, or repair not authorized by **Fiber SenSys**. This warranty is made in lieu of any other warranty either expressed or implied.

B. All returns will be tested to verify customer claims of non-compliance with the warranty described herein. If non-compliance is verified and is not due to customer abuse or the other exceptions described previously, **Fiber SenSys** will, at its option, repair or replace the **FD348R** APU returned to it, freight prepaid. Contact **Fiber SenSys** and obtain an RMA number prior to returning a product. **Fiber SenSys** will pay for ground return freight charges only. The Customer must pay for any other return shipping options.

C. **Fiber SenSys** liability is limited to the repair or replacement of the product only, and not the costs of installation, removal, or damage to user's property or other liabilities. If **Fiber SenSys** is unable to repair or replace a non-conforming product, it may offer a refund of the amount paid to **Fiber SenSys** for such product in full satisfaction of its warranty obligation. Maximum liability to **Fiber SenSys** is the cost of the product.

## Appendix D. Referenced Documents

AN-SM-007 Fiber Optics
AN-SM-008 Setting the Tuning Parameters
AN-SM-009 APU Networking
AN-ENG-027 Site Design and Installation for FD300 Series



**Note:** It is possible to download these documents online from the **Fiber Sensys** web page:  
[www.fibersensys.com](http://www.fibersensys.com)