

# FD322 Basic Product Training



# FD-322 Basic Training Topics



- Product features
- Product application
- Theory of operation
- Tuning software
- Product installation
- Calibration, tuning and maintenance basics

# FD-322 Product Features



- 500m sensing cable length
  - Supports all normal zone lengths
- Two sensing channels
- Direct connection to sensing cable
  - No insensitive lead-in cable used
- TCP/IP communication and alarm/fault relays standard
- User software included

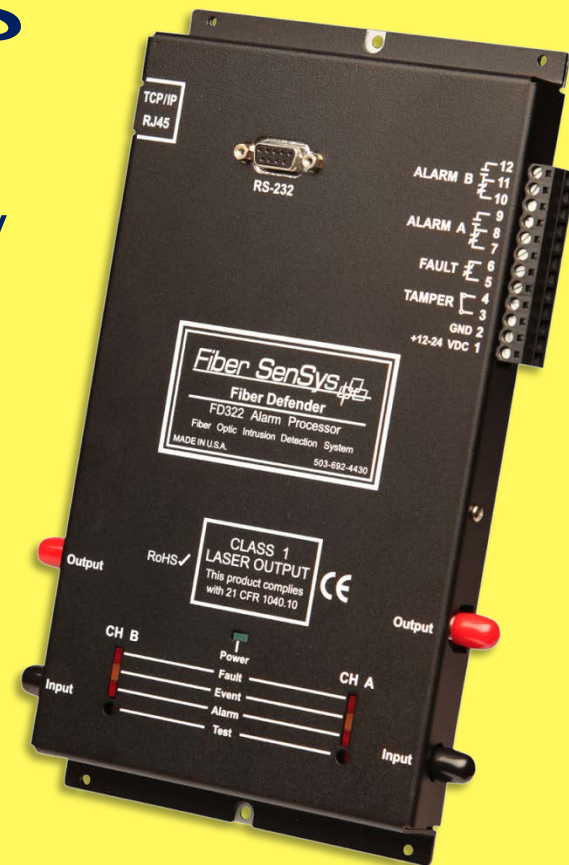
# FD-322 Product Features

- Fiber based
  - Sensing cable is immune to RFI/EMI and is intrinsically safe
- Value priced
  - Most economical fiber sensor
- Simple installation and adjustment
  - Efficient set of parameters enables effective tuning



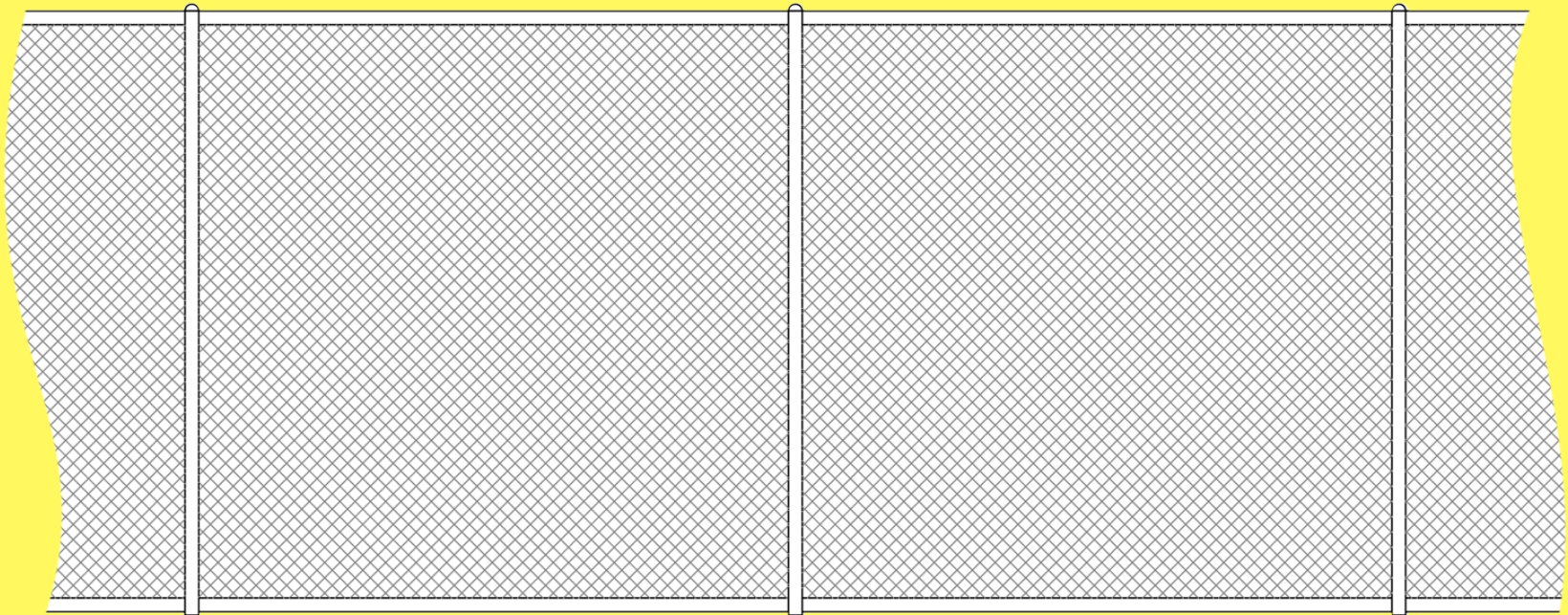
# FD-322 Product Features

- Internal spectral data storage
  - Holds data for 24 alarms internally
  - Allows accurate tuning that can be done off-line and downloaded
- -40 to +70°C operating range
- CE and RoHS compliant



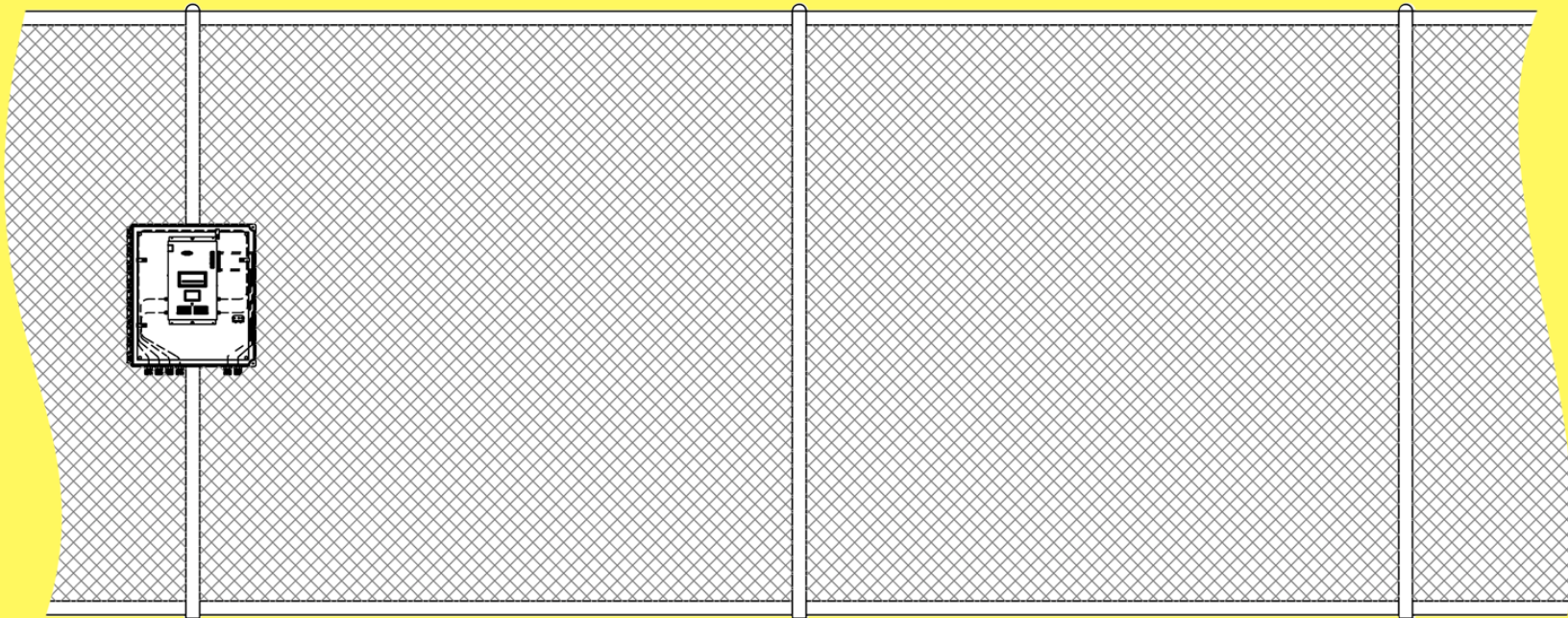
# FD-322 Product Application

- Designed for chain link fence applications



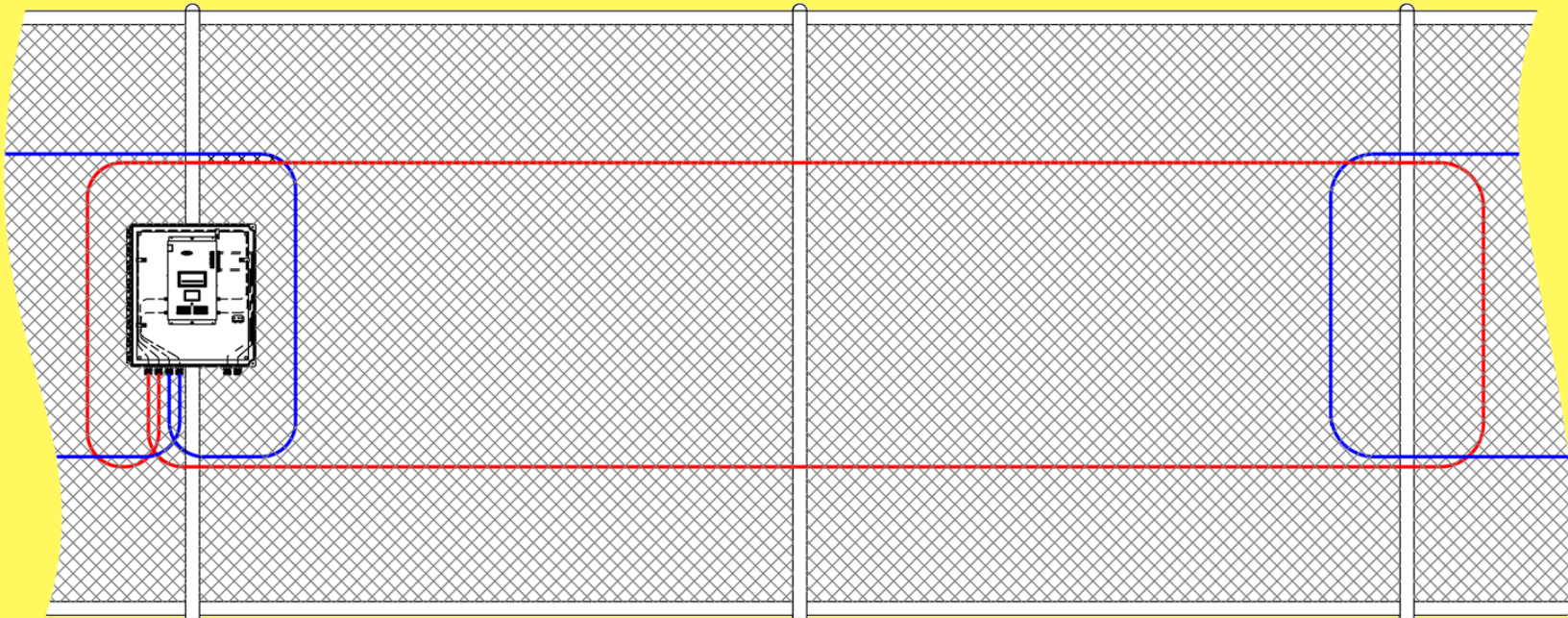
# FD-322 Product Application

- Designed for APU mounting at or near the fence line in a NEMA enclosure



# FD-322 Product Application

- Designed to utilize standard SC-3 sensing fiber in loop back configuration





# FD-322 Application Examples

- Utility Substations



# FD-322 Application Examples

- Utility Substations
- Manufacturing Plants



# FD-322 Application Examples

- Utility Substations
- Manufacturing Plants
- Corporate Buildings



# FD-322 Application Examples

- Utility Substations
- Manufacturing Plants
- Corporate Buildings
- Construction Sites



# FD-322 Application Examples

- Utility Substations
- Manufacturing Plants
- Corporate Buildings
- Construction Sites
- Boat/RV Storage Sites



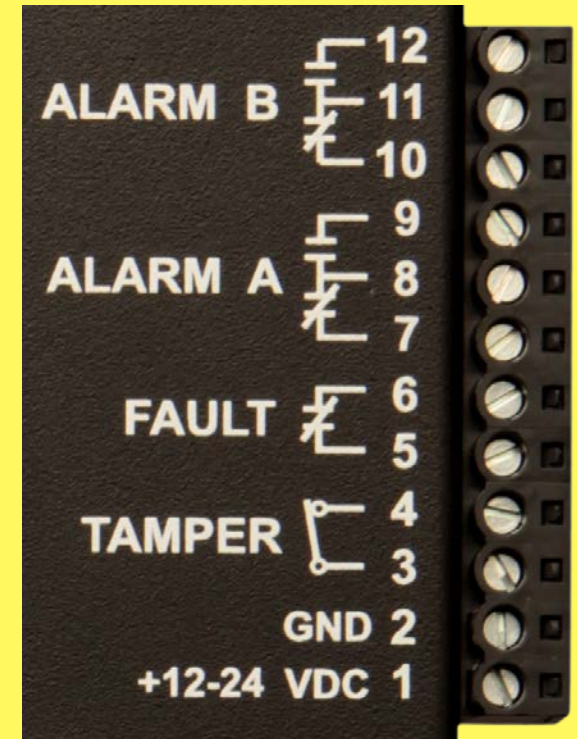
# FD-322 Application Examples

- Utility Substations
- Manufacturing Plants
- Corporate Buildings
- Construction Sites
- Boat/RV Storage Sites
- Garden Centers



# FD-322 Connectivity: Terminals

- Independent CHA and CHB form C ALARM contacts
- Normally closed FAULT contacts
- All relay contacts rated for 100mA @ 12VDC
- Normally closed TAMPER input terminals
- 12-24VDC power supply input



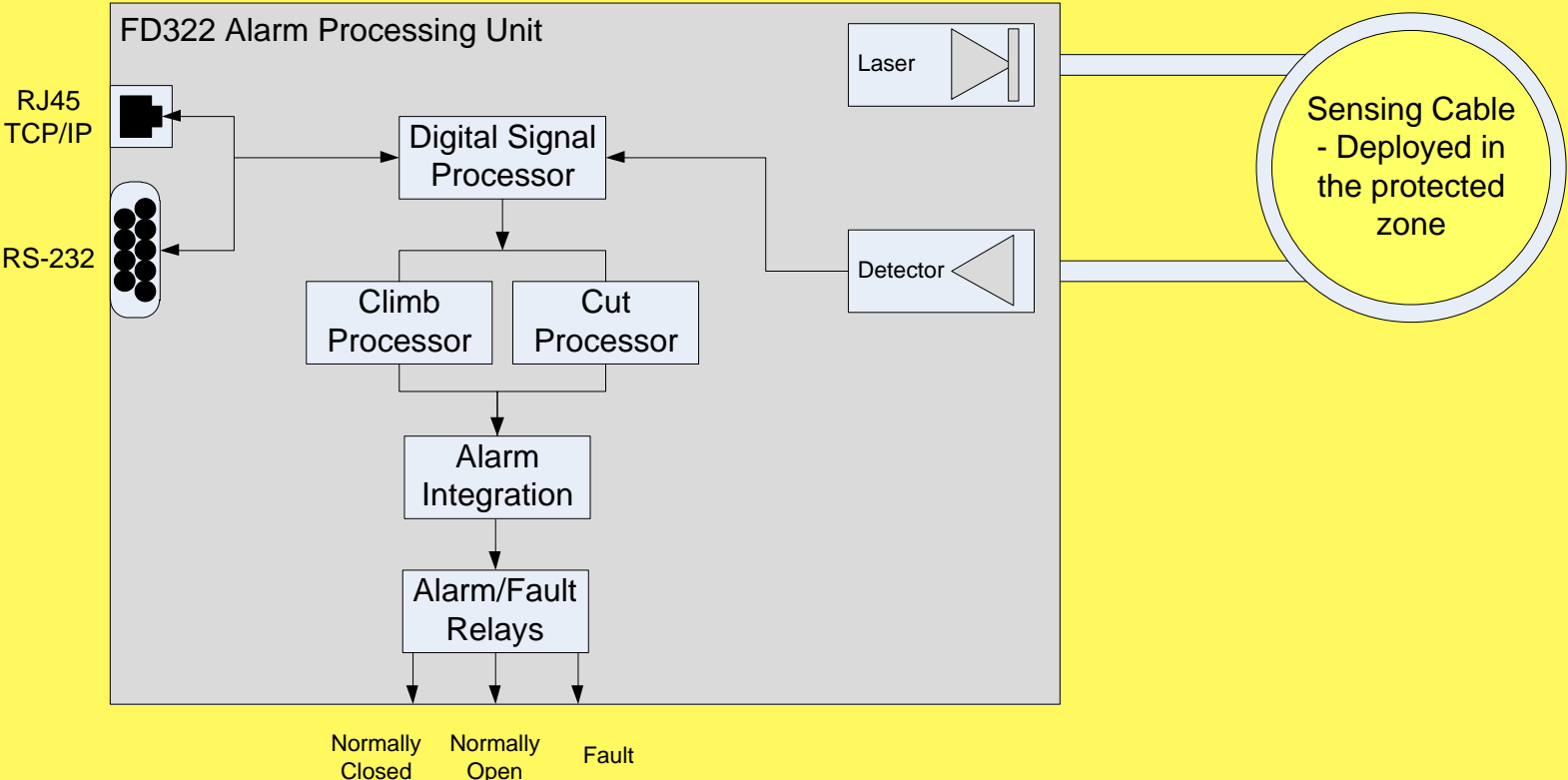
# FD-322 Connectivity: IP

- XML-based TCP/IP connectivity is standard
- RJ45 Ethernet jack on APU side panel
- Allows remote alarm/fault monitoring and APU parameter setting
- Plug & play compatible with Fiber Commander



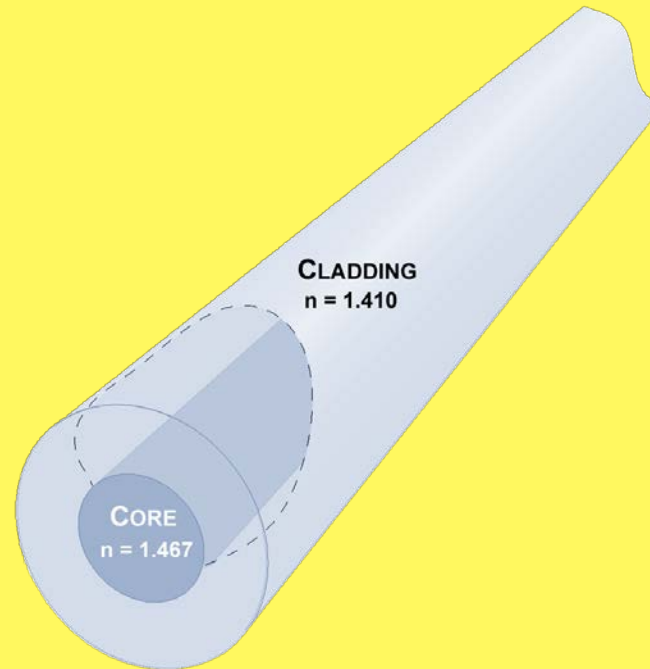


# Theory of Operation: Functional



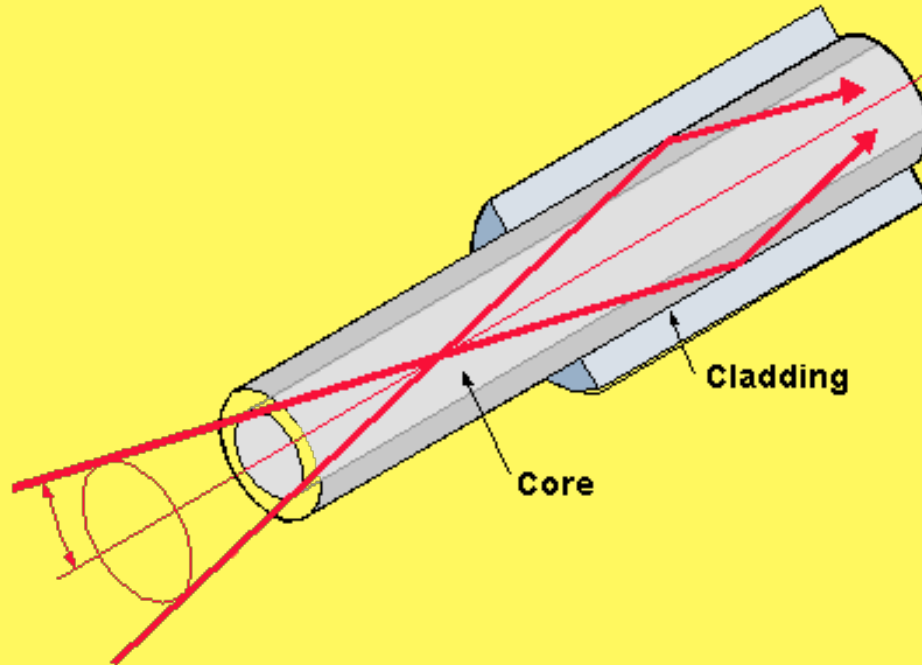
# Theory of Operation: Optical

Optical fiber is made of two layers of specially formulated glass



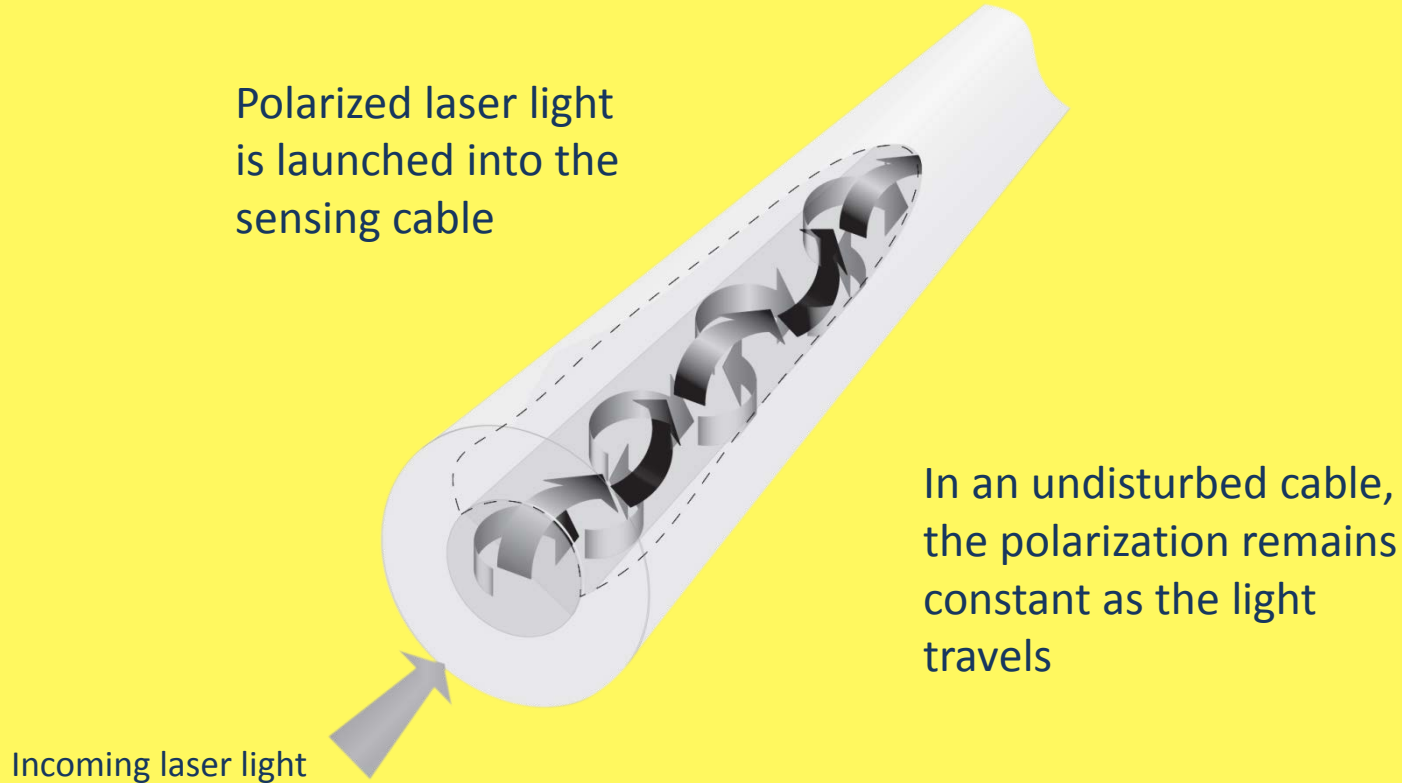
# Theory of Operation: Optical

Light is guided in the fiber by internal reflection from the core / cladding boundary



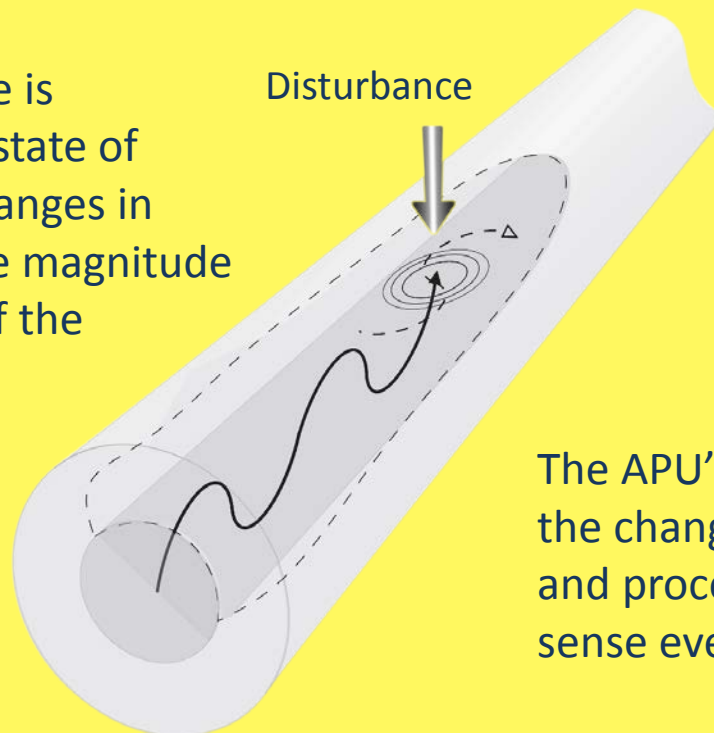
# Theory of Operation: Optical

Polarized laser light  
is launched into the  
sensing cable



# Theory of Operation: Optical

When the cable is disturbed, the state of polarization changes in response to the magnitude and duration of the disturbance



The APU's receiver detects the change in polarization and processes the signal to sense events and alarms

# Theory of Operation: Algorithms

- Wind Processing
- Event Processing
- Alarm Processing

APU 322		
APU Info		
Model	FD322	
Serial #	E98000	
Manufactured Date	09/28/11	
FirmWare #	5.11	
Climb		Default
Enabled? ( Yes or No )	Yes	Yes
Climb Sensitivity ( 0 to 50 )	20	20
Event Count ( 1 to 10 )	3	3
Lowest Frequency ( Hz 10 to 600 )	200	200
Cut		Default
Enabled? ( Yes or No )	Yes	Yes
Cut Sensitivity ( 0 to 50 )	20	20
Event Count ( 1 to 10 )	5	5
Lowest Frequency ( Hz 10 to 600 )	300	300
Wind		Default
Enable Wind Rejection Software?	Yes	Yes
Wind Rejection ( 20 to 80 )	50	50
Misc		Default
Enable Tamper Switch?	No	No
Alarm Relay Time ( 1 to 10 sec )	1	1

# Theory of Operation: Algorithms

- Wind Processing: eliminates nuisance alarms resulting from windy conditions while still allowing intrusion detection with minimal loss in sensitivity

# Theory of Operation: Algorithms

- Wind Processing
  - Enable/Disable
  - Wind Rejection

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# Theory of Operation: Algorithms

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# Theory of Operation: Algorithms

- Wind Processing
  - Enable/Disable
  - Wind Rejection

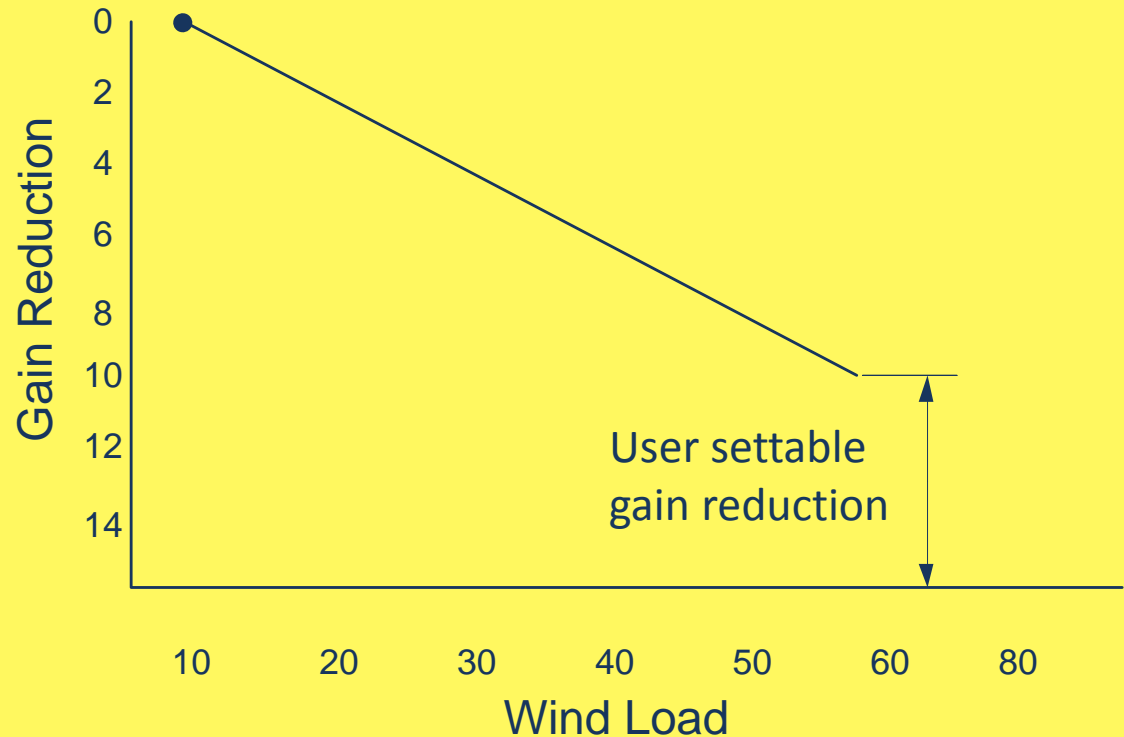
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# Theory of Operation: Wind Processing

- When enabled, the APU monitors the “wind load” detected by the sensing fiber and dynamically adjusts the signal based on the detected wind load and Wind Rejection parameter value
- Wind Rejection Parameter: used to dynamically dampen the signal received from fence during windy conditions; its value ranges from 20 to 80, and as a rule of thumb, its nominal value of 50 will compensate for winds up to 20 mph

# Theory of Operation: Wind Processing

- As wind Increases, Gain is reduced to compensate
- Max compensation is user defined by estimated wind speed values



# Theory of Operation: Algorithms

- Event Processing: the qualification of sensor signals to separate noise or nuisance-generated disturbances from those generated by valid intrusion attempts; a probable intrusion-caused disturbance is called an Event

# Theory of Operation: Algorithms

- Event Processing
  - Enable/Disable
  - Sensitivity
  - Low Frequency Cutoff

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# Theory of Operation: Algorithms

- Event Processing
  - Enable/Disable
  - Sensitivity
  - Low Frequency Cutoff

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# Theory of Operation: Algorithms

- Event Processing
  - Enable/Disable
  - **Sensitivity**
  - Low Frequency Cutoff

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# Theory of Operation: Algorithms

- Sensitivity: allows the user to adjust the gain of the APU to make it more or less likely to create events in response to sensor signals
  - Increasing Sensitivity creates events from smaller signals
  - Sensitivity is independently adjustable for climbs and cuts

# Theory of Operation: Algorithms

- Event Processing
  - Enable/Disable
  - Sensitivity
  - Low Frequency Cutoff

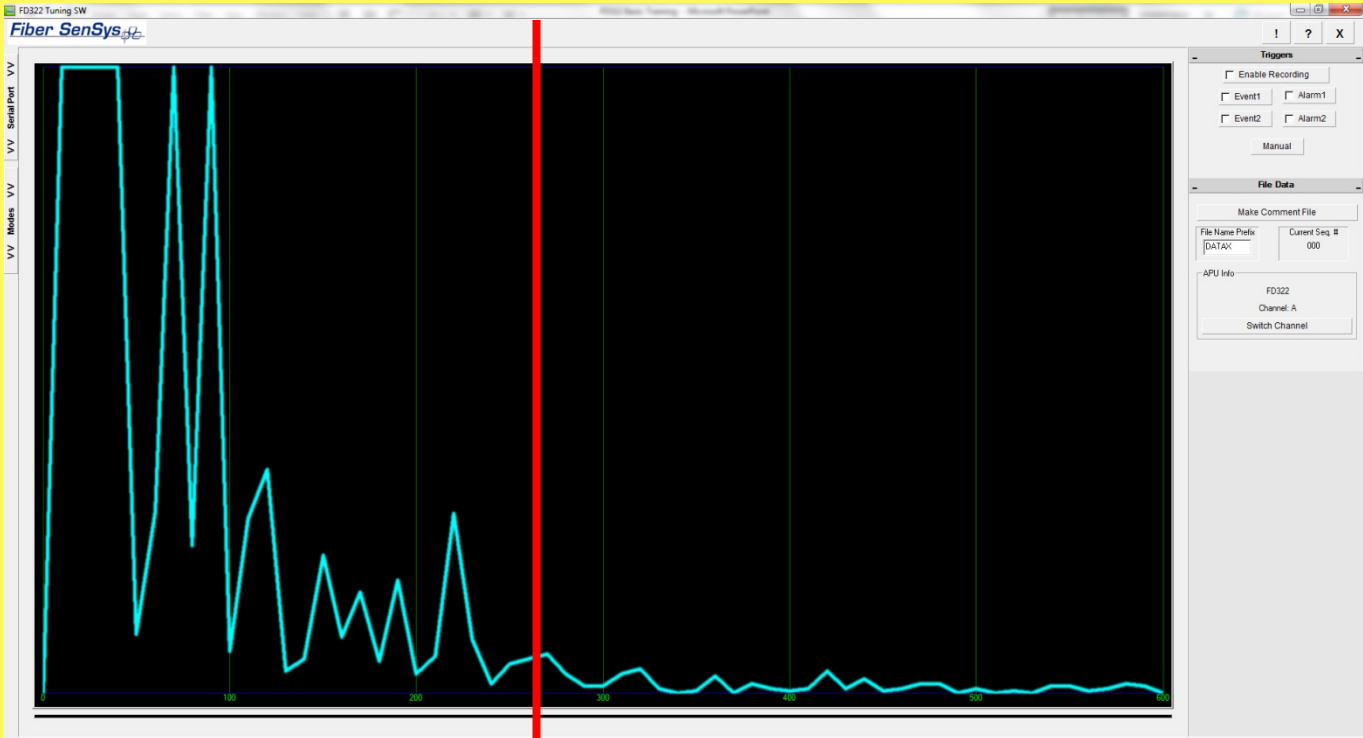
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Misc		Default
Enable Tamper Switch?	No	No
Alarm Relay Time ( 1 to 10 sec )	1	1

# Theory of Operation: Algorithms

- Low Frequency Cutoff: allows the user to set the lowest frequency that is processed by the APU in order to qualify events
  - All frequencies less than the cutoff are ignored by the event detection processing
  - Low Frequency Cutoff is independently adjustable for climbs and cuts

# Theory of Operation: Low Frequency Cutoff

The low frequency cutoff filter rejects frequencies that might introduce nuisance alarms



Low frequency start point



Only frequencies above this point are processed

# Theory of Operation: Algorithms

- Alarm Processing: analysis of recent Events to determine whether or not a valid intrusion attempt has occurred
  - Reminder: a probable intrusion-caused sensor signal is called an Event

# Theory of Operation: Algorithms

- Alarm Processing
  - Event Count
  - Alarm Relay Time
  - Tamper Enable

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# Theory of Operation: Algorithms

- Alarm Processing
  - Event Count
  - Alarm Relay Time
  - Tamper Enable

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Wind Rejection ( 20 to 80 )	50	50
Misc		Default
Enable Tamper Switch?	No	No
Alarm Relay Time ( 1 to 10 sec )	1	1

# Theory of Operation: Algorithms

- Event Count: allows the user to choose how many valid intrusion Events it takes to create an alarm
  - The set number of Events must occur in a sequence defined by a set of alarm timing rules to cause an alarm

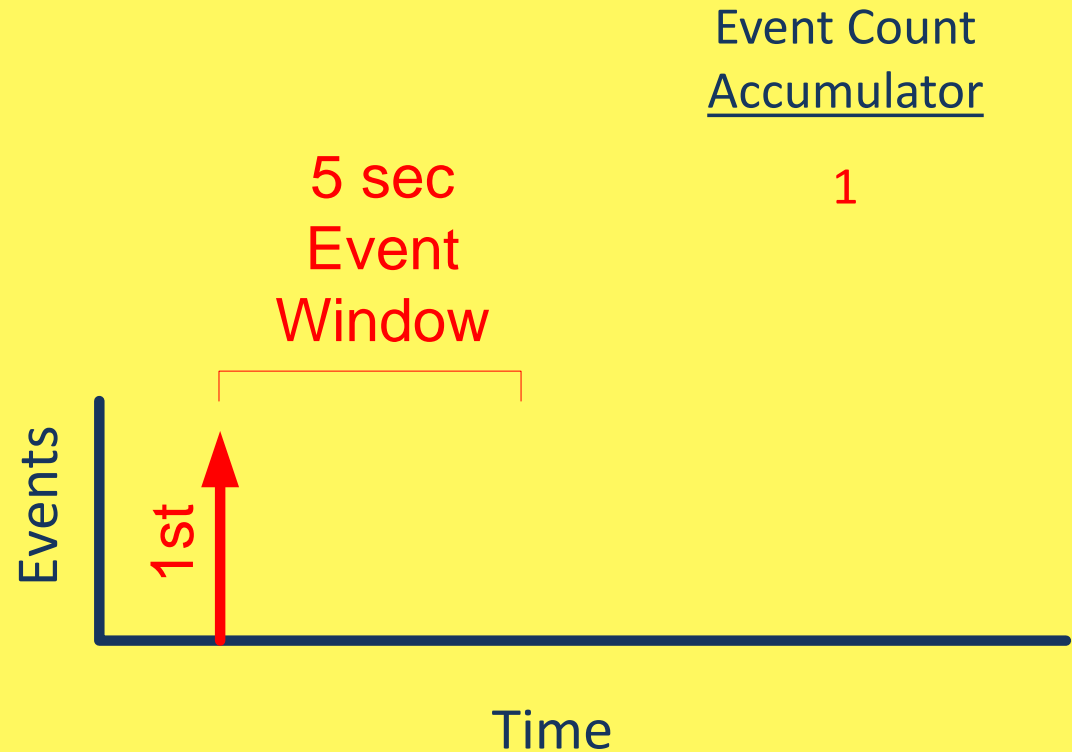


# Theory of Operation: Alarm Timing Rules

- When an Event occurs, a 5-second Event Window Timer is initialized and an Event Counter is incremented by 1
- If another Event occurs before the timer expires, the timer is restarted and the Event Counter is incremented by 1
- If Events continue to occur with the proper timing, an Alarm is flagged when the number of Events equals the set Event Count
- At any time in the sequence, if an Event does not occur within the timer window, the Event Counter is reset to zero and the sequence starts over

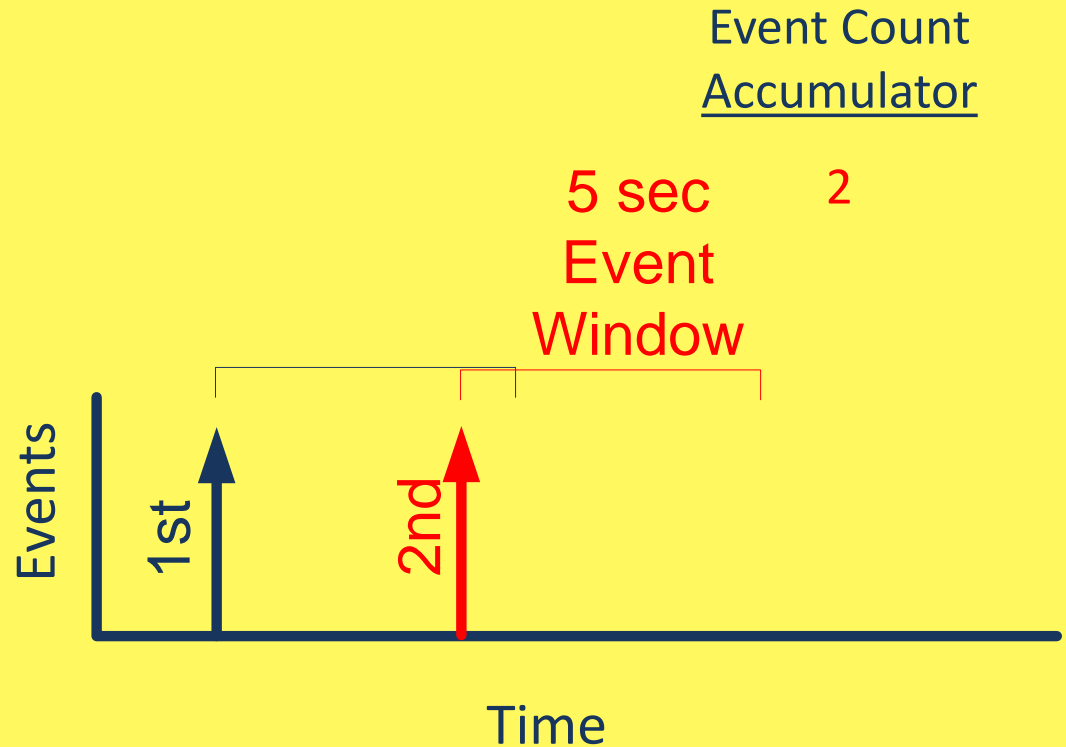
# Theory of Operation: Alarm Timing Rules

- Assume the following settings:
  - Event Count = 3 (user adjustable)
  - Event Window = 5 seconds (fixed)



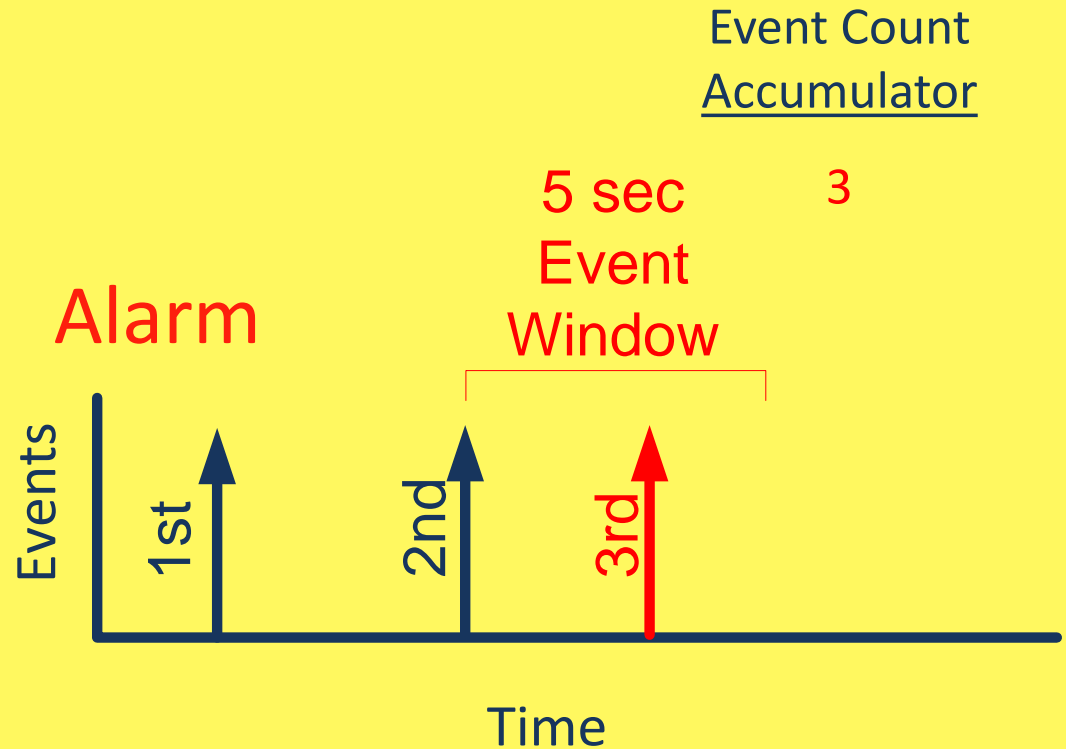
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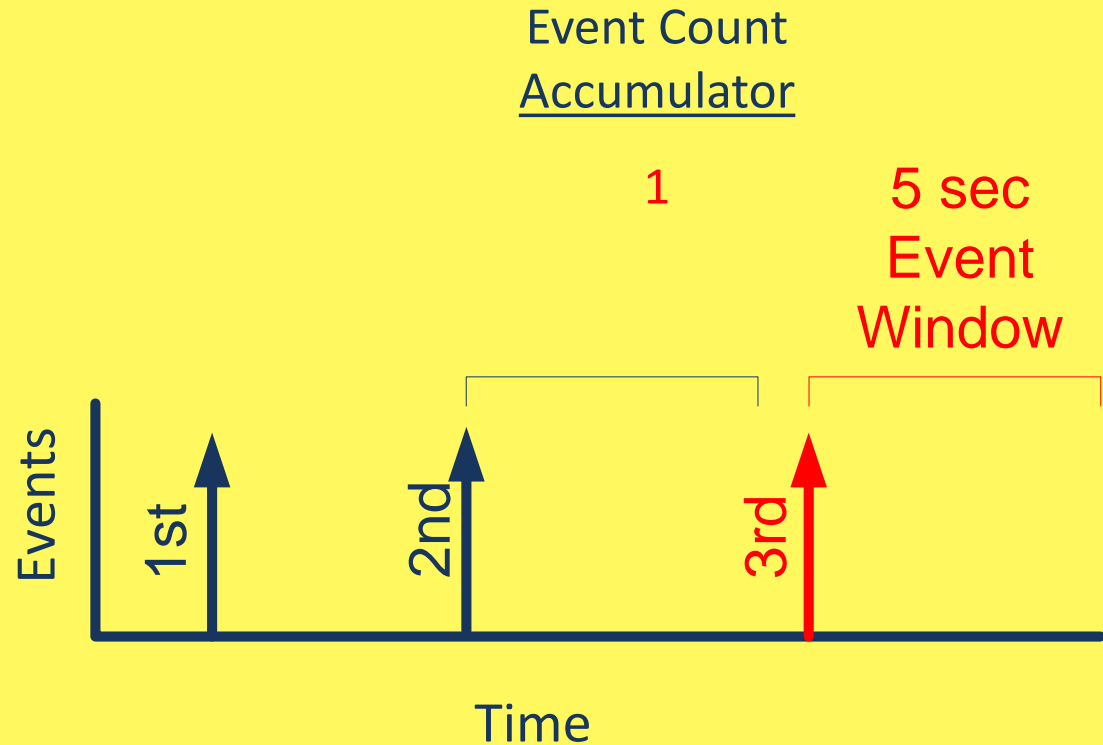
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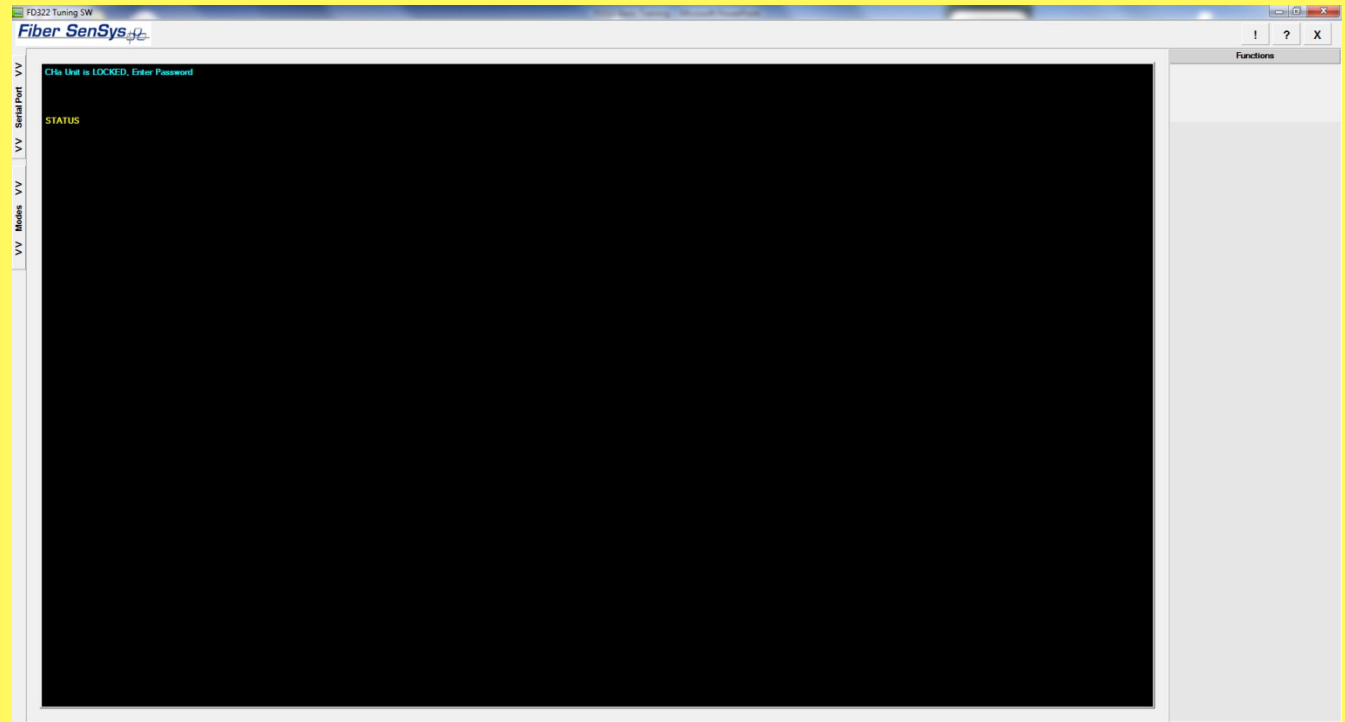
# FD-322 Tuning Software

- Comes standard with the FD322
- Includes the following operating modes:
  - Terminal mode
  - Realtime mode
  - Parameter editor
  - Spectral history mode
  - Replay mode



# FD-322 Tuning Software: Terminal Mode

- Status
- Setup
- Calibration
- History
- Version
- CHA/CHB

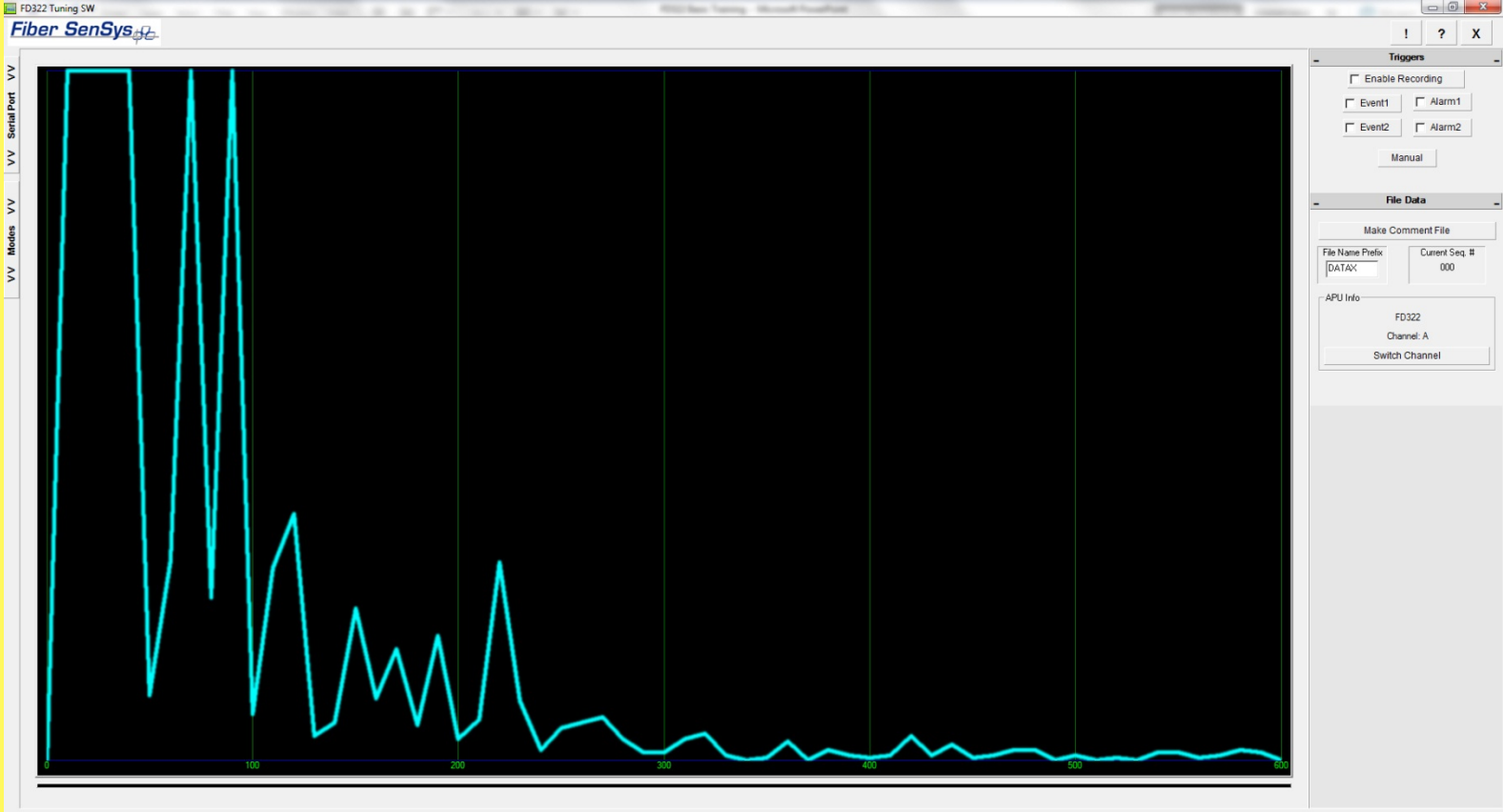


## FD-322 Tuning Software: Terminal Mode

- Status: monitors current APU operating conditions, including laser current, most recent LOSS value and event/alarm display
- Setup: allows access to menu-driven parameter query and editing
- Calibration: performs LOSS measurement, APU signal calibration and time/date setting
- History: allows access to time/date of 128 most recent alarms
- Version: gives APU information including model/serial number, firmware version, manufacturing date and days in operation
- CHA/CHB: allows user to change APU sensing channel being displayed



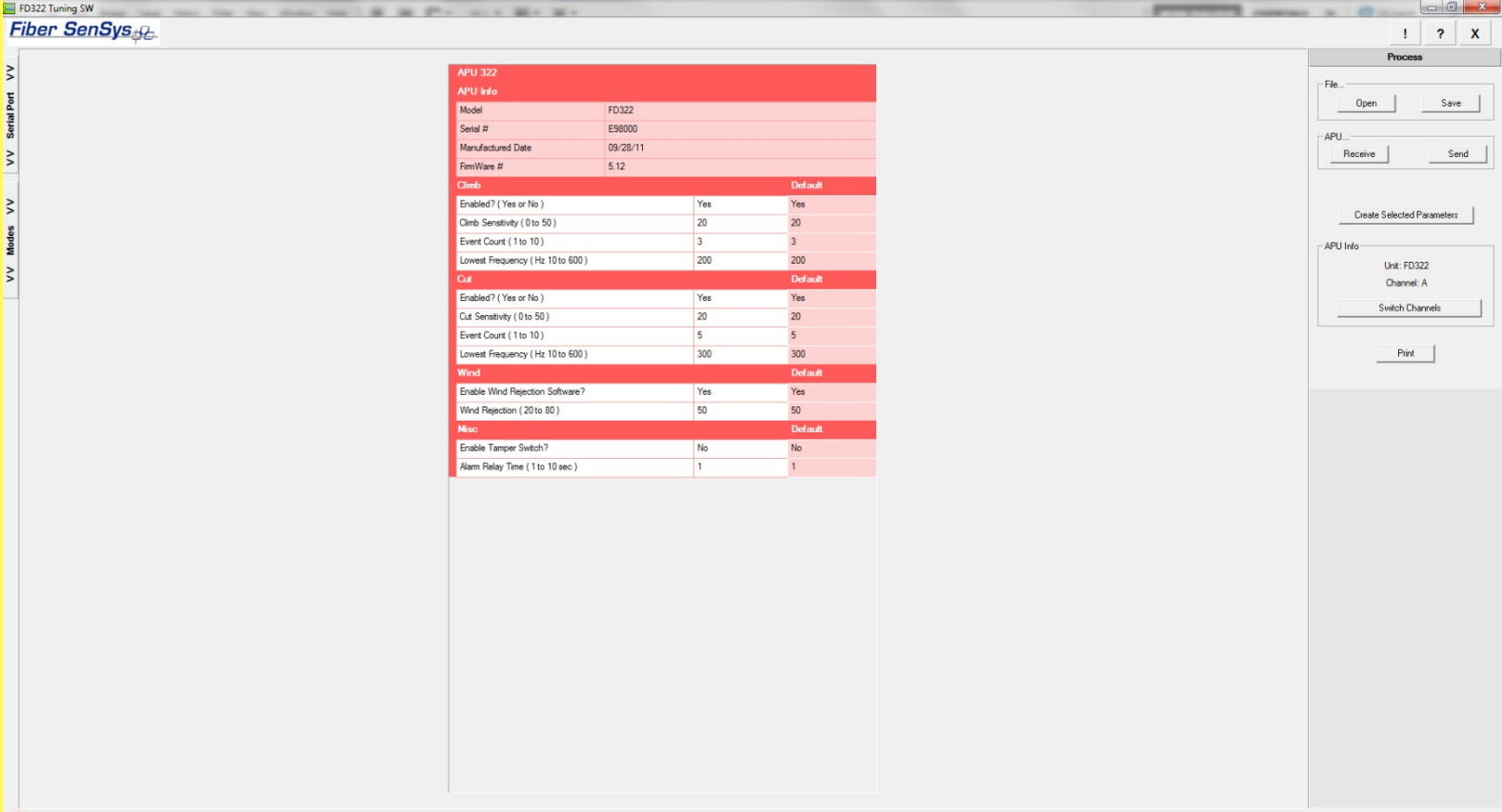
# FD-322 Tuning Software: Realtime Mode




## FD-322 Tuning Software: Realtime Mode

- Provides realtime frequency domain display of APU signal activity including event and alarm indications
- Allows setup and recording of Event and Alarm activity spectral data files to host PC's hard disk
- Allows manual recording of spectral data files to hard disk

# FD-322 Tuning Software: Parameter Editor



FD322 Tuning SW

Fiber SenSys 

Serial Port

Modes

APU 322		
APU Info		
Model	FD322	
Serial #	E98000	
Manufactured Date	09/28/11	
FirmWare #	5.12	
Climb		
Enabled? (Yes or No)	Yes	Yes
Climb Sensitivity (0 to 50)	20	20
Event Count (1 to 10)	3	3
Lowest Frequency (Hz 10 to 600)	200	200
Cut		
Enabled? (Yes or No)	Yes	Yes
Cut Sensitivity (0 to 50)	20	20
Event Count (1 to 10)	5	5
Lowest Frequency (Hz 10 to 600)	300	300
Wind		
Enable Wind Rejection Software?	Yes	Yes
Wind Rejection (20 to 80)	50	50
Misc		
Enable Tamper Switch?	No	No
Alarm Relay Time (1 to 10 sec)	1	1

Process

File...  
Open Save

APU...  
Receive Send

Create Selected Parameters

APU Info  
Unit: FD322  
Channel: A  
Switch Channels

Print

## FD-322 Tuning Software: Parameter Editor

- Provides graphic view of current APU information and settings and allows parameters to be edited and sent to the APU
- Allows recording of parameter files to host PC's hard disk
- Allows recall of parameter files from host PC's hard disk for review and/or sending to the APU
- Allows printing of displayed APU parameter settings

# FD-322 Tuning Software: Spectral History Mode

The screenshot shows the 'FD322 Tuning SW' application in 'Spectral History Mode'. The interface is divided into three main sections:

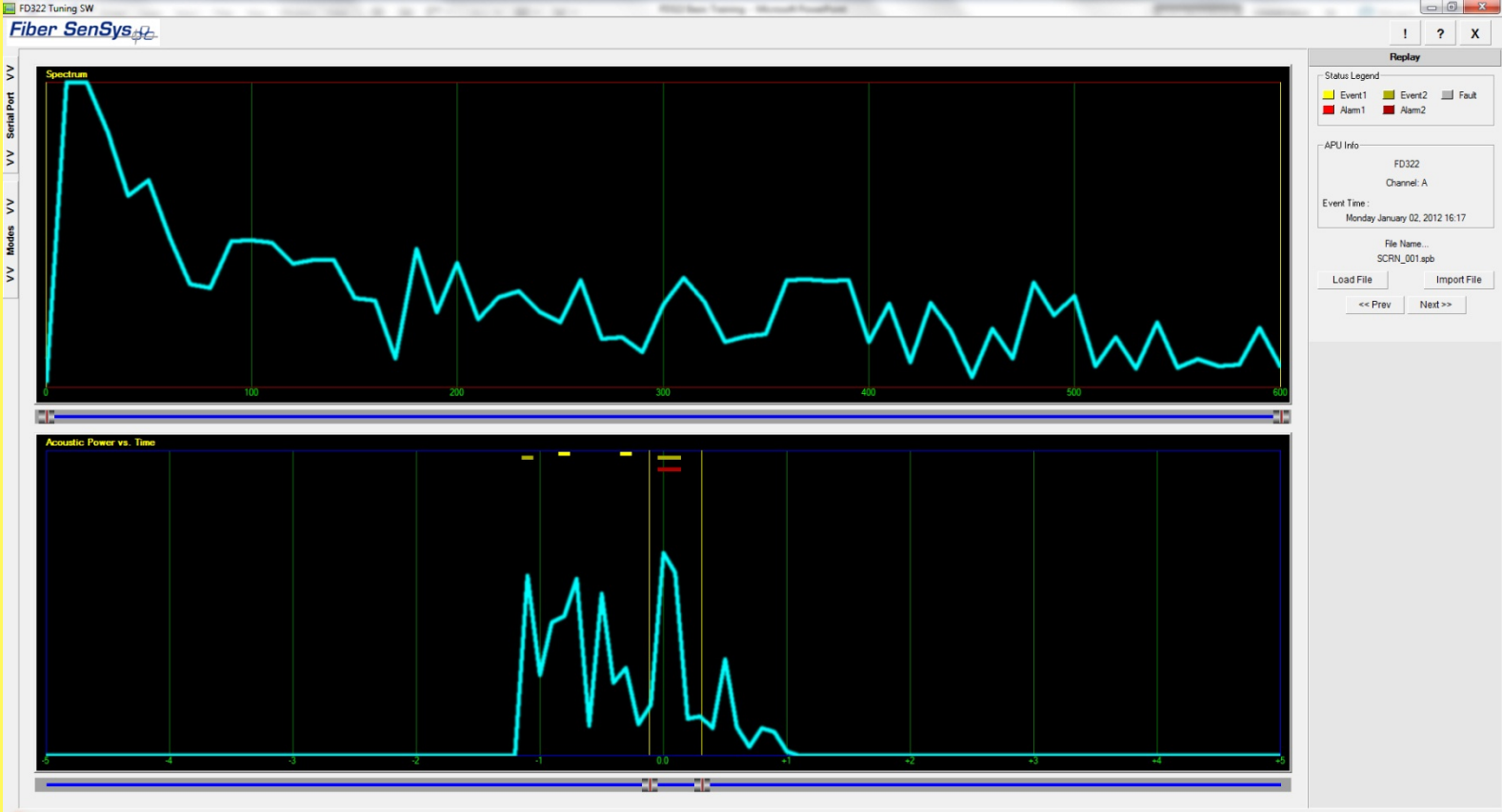
- Sidebar:** Contains 'Serial Port' and 'Modes' sections, each with a 'VV' icon.
- Central Table:** A table listing spectral history data. The table has two columns: a date and time string, and a numerical value. The values are either 15, 14, 13, 12, 11, 10, 09, 08, 07, 06, 05, 04, 03, 02, or 01. The rows are highlighted in alternating yellow and grey colors.
- Right Panel:** Contains a 'Functions' section with buttons for 'Load History', 'Save Selected History', and 'Save All History'. Below this is an 'APU Info' section with 'FD322' and 'Channel: A' displayed, and a 'Switch Channel' button. At the bottom, there are input fields for 'File Name Prefix' (containing 'DATA') and 'Current Seq #' (containing '000').

Date/Time	Value
Monday January 02, 2012 16:18:15	15
Monday January 02, 2012 16:18:14	14
Monday January 02, 2012 16:17:13	13
Monday January 02, 2012 16:17:12	12
Monday January 02, 2012 16:17:11	11
Monday January 02, 2012 16:17:10	10
Monday January 02, 2012 16:17:09	09
Monday January 02, 2012 16:16:08	08
Monday January 02, 2012 16:16:07	07
Monday January 02, 2012 16:16:06	06
Monday January 02, 2012 16:15:05	05
Monday January 02, 2012 16:15:04	04
Monday January 02, 2012 16:15:03	03
Monday January 02, 2012 16:15:02	02
Sunday January 01, 2012 23:35:01	01

# FD-322 Tuning Software: Spectral History Mode

- Allows retrieval of spectral data files internally stored on the APU; the processor stores the most recent 24 alarms in its internal memory
- Allows saving of selected spectral data files to host PC's hard disk

# FD-322 Tuning Software: Replay Mode



## FD-322 Tuning Software: Replay Mode

- Allows retrieval of spectral data files from the PC's hard disk
- Displays both frequency and time domain representations of a spectral data file simultaneously
- The recalled data is displayed in a 10 second window that shows the trigger event plus 5 seconds before and 5 seconds after
- Color coded symbols representing alarms and events from the cut and climb processors are displayed
- Cursors on the time display allow close examination of specific portions of the waveform for the purposes of fine tuning the APU parameters



# FD-322 Fence Installation Guidelines



# FD-322 Fence Installation Guidelines

## Process Steps

1. Survey the site to be protected
2. Determine zone sizing
3. Determine the amount of cable needed
4. Deploy the cable
5. Connect the cable to the APU

# FD-322 Fence Installation Guidelines

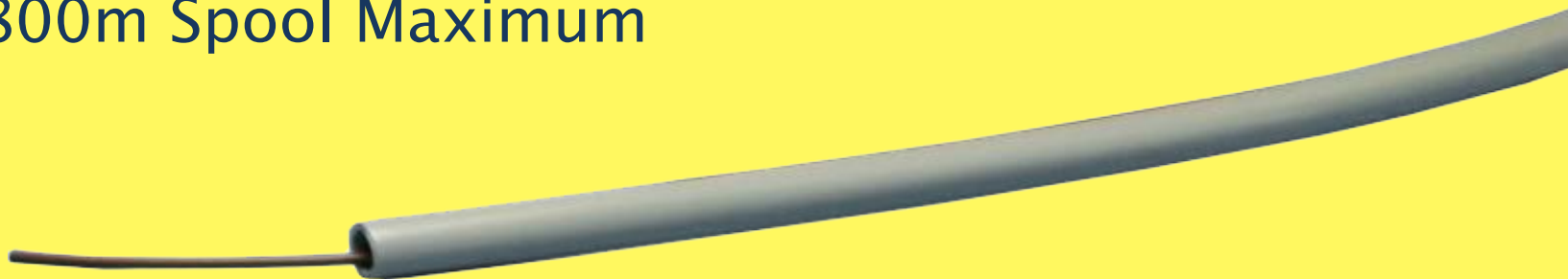
## Site Survey

1. Walk the entire perimeter
2. Evaluate fence quality and note obstructions
3. Make and record all relevant measurements
  - Proposed APU locations
  - Zone lengths
  - Fence height
  - Location, width and style of each gate
  - Lengths and locations of all reinforced fence areas

# FD-322 Fence Installation Guidelines

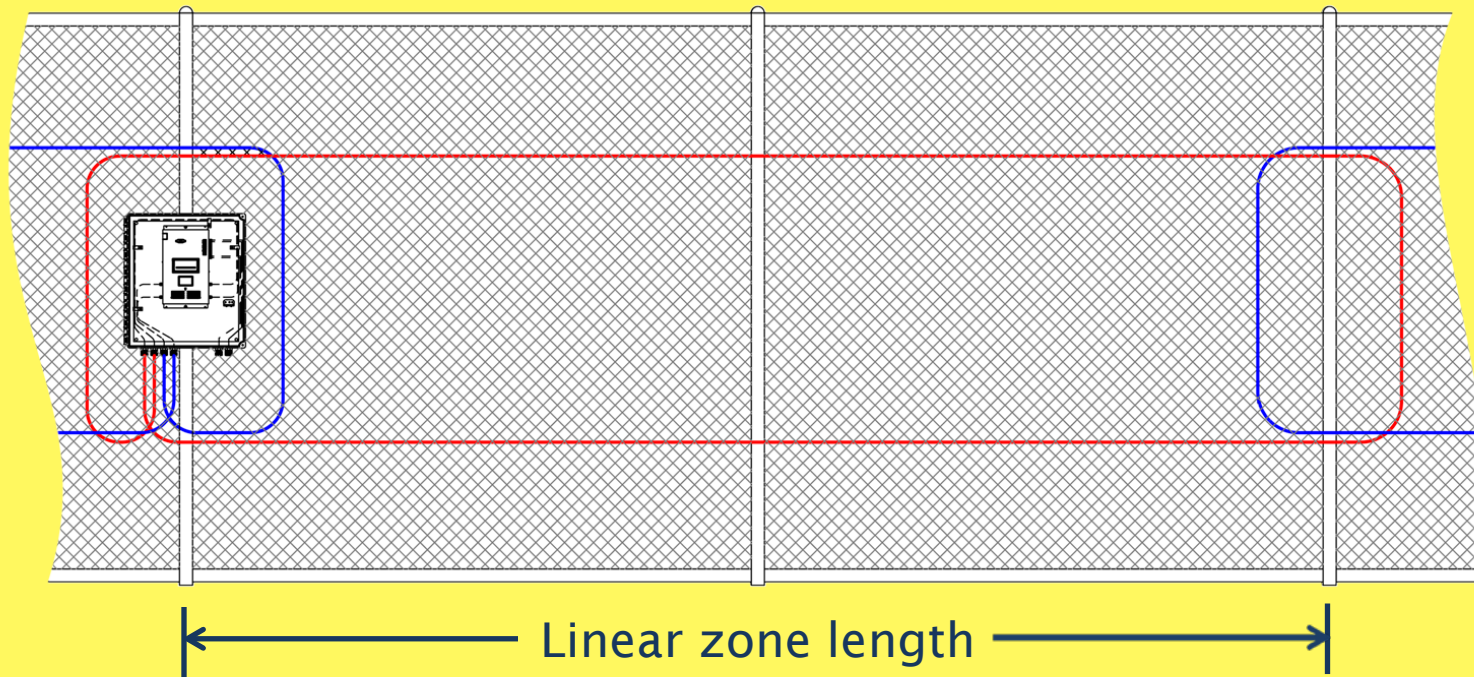
## Cable in Conduit

- Must have knowledge of zone sizing to safely order enough material with little excess
- 800m Spool Maximum



# FD-322 Fence Installation Guidelines

- Cable in conduit requirement can be estimated as 2.2 times the linear zone length



# FD-322 Fence Installation Guidelines

## Fence Quality and Obstructions

- Fence fabric should be in good repair
- Deflection  $\leq 2$ " @ 30lbs
- Note loose sections that may need repair
- Note signs that may need tightened or repositioned
- Note brush, trees or other obstructions that could cause nuisance alarms



# FD-322 Fence Installation Guidelines

## Fence Obstructions: Brush & Trees



# FD-322 Fence Installation Guidelines

## System Installation

- Install weatherproof APU enclosures at required outdoor locations; run power and system wiring
- Install APUs; connect power and system wiring
- Install fiber/conduit on fence
- Clean & inspect all optical connectors to prevent system noise from contamination
- Make optical connections to APUs



# FD-322 Conduit Installation Guidelines

- Attach conduit to fence with stainless steel wire ties
- Use the high security method of installing the ties



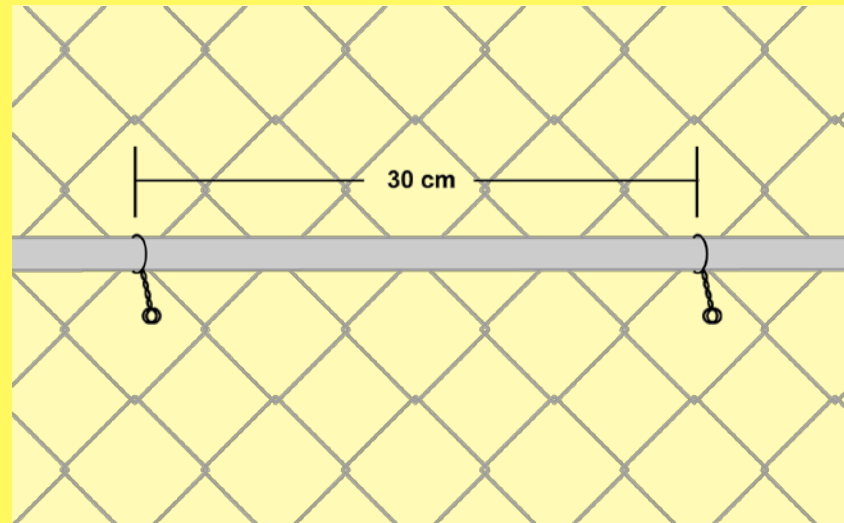
Bend wire tie and loop across the intersection between diamonds and tighten with twist tool



Observe how tie is routed tightly within the fence mesh making it difficult to cut

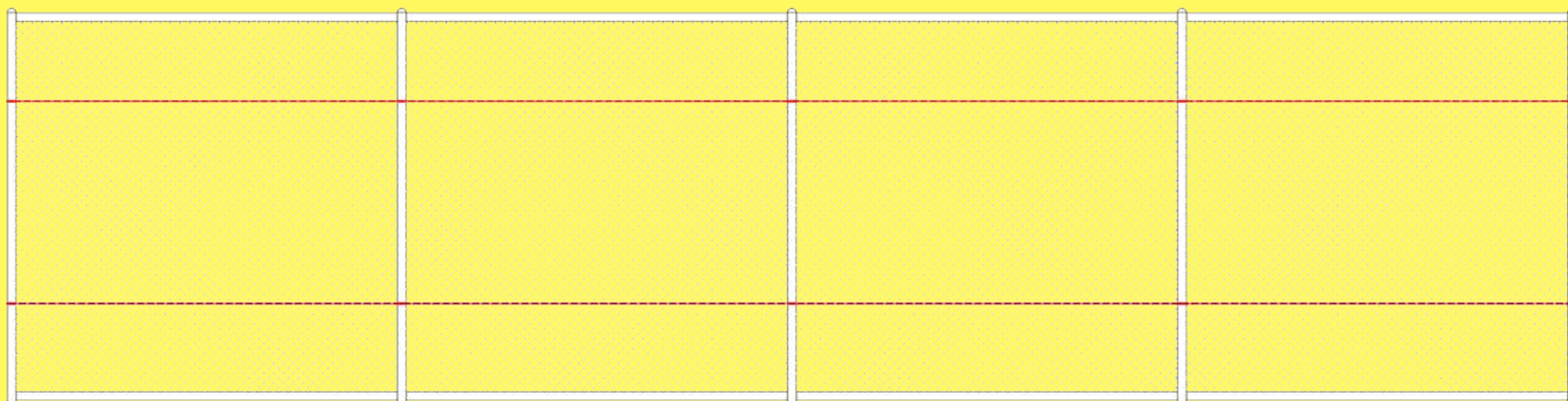
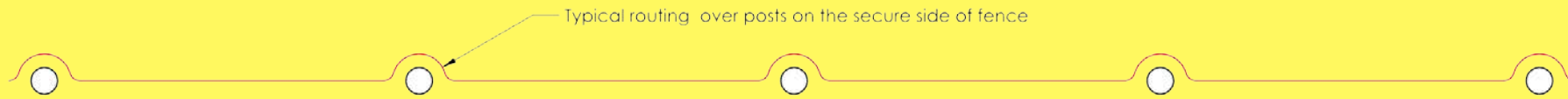
# FD-322 Conduit Installation Guidelines

- Wire twist ties should be placed every 12 inches (30 cm) or generally every 4 diamonds
- There cannot be too many ties, only too few, since the fiber is free to move inside the conduit



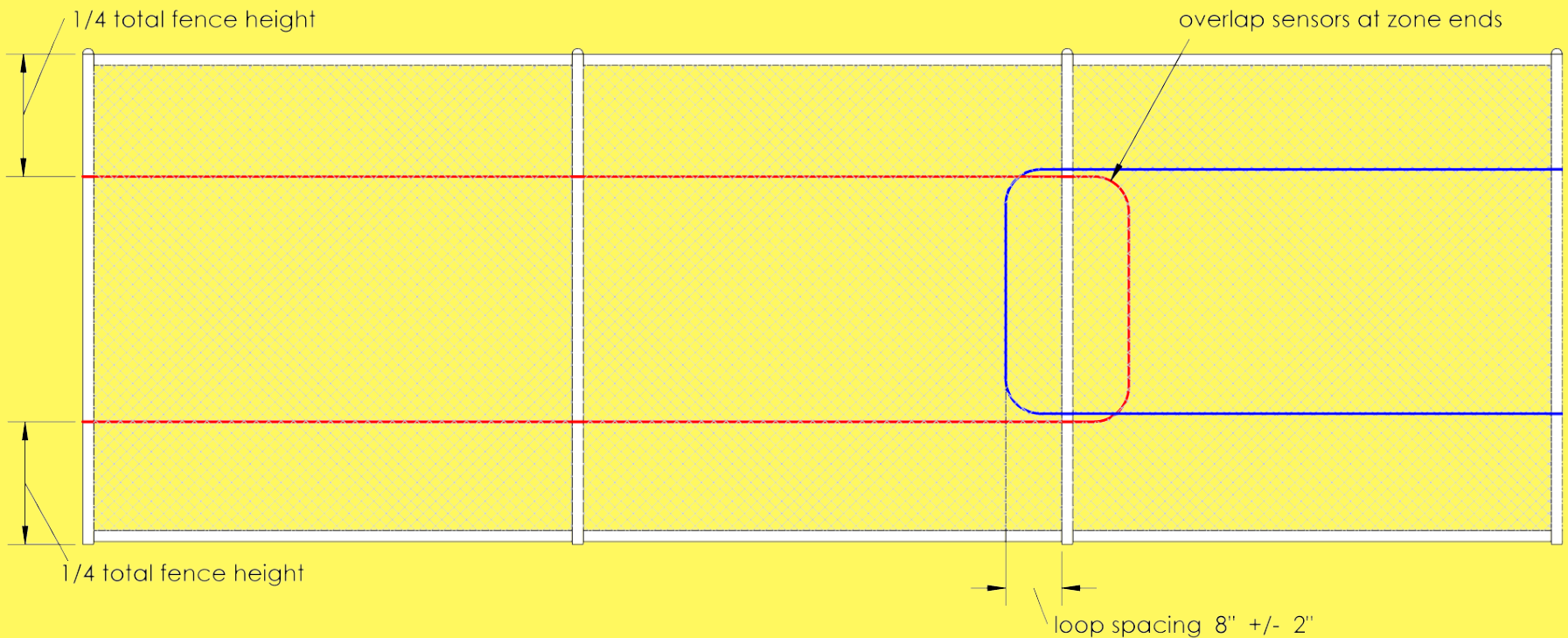
# FD-322 Conduit Installation Guidelines

- Install conduit on secure side of fence
- Route conduit over fence posts
- Put a wire tie on both sides of each post



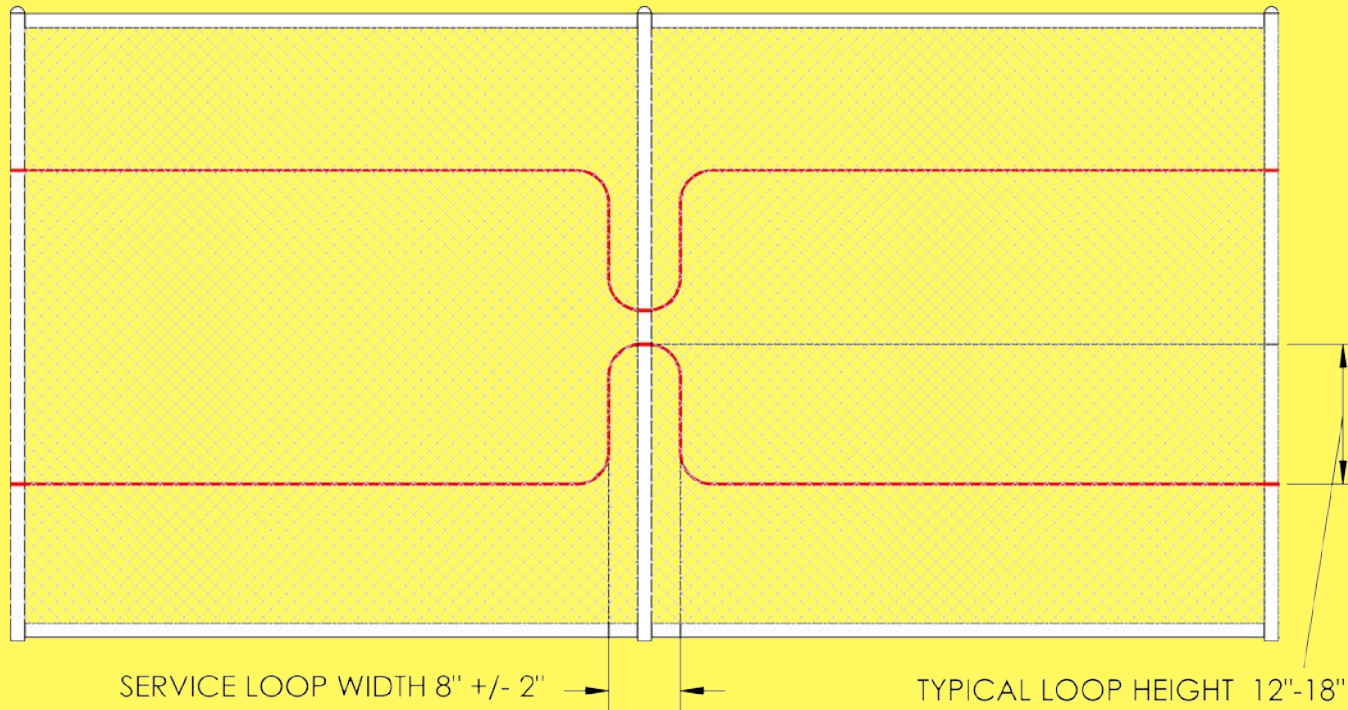
# FD-322 Conduit Installation Guidelines

- Install conduit  $\frac{1}{4}$  of fence height from top & bottom
- Overlap 6-10" between zones



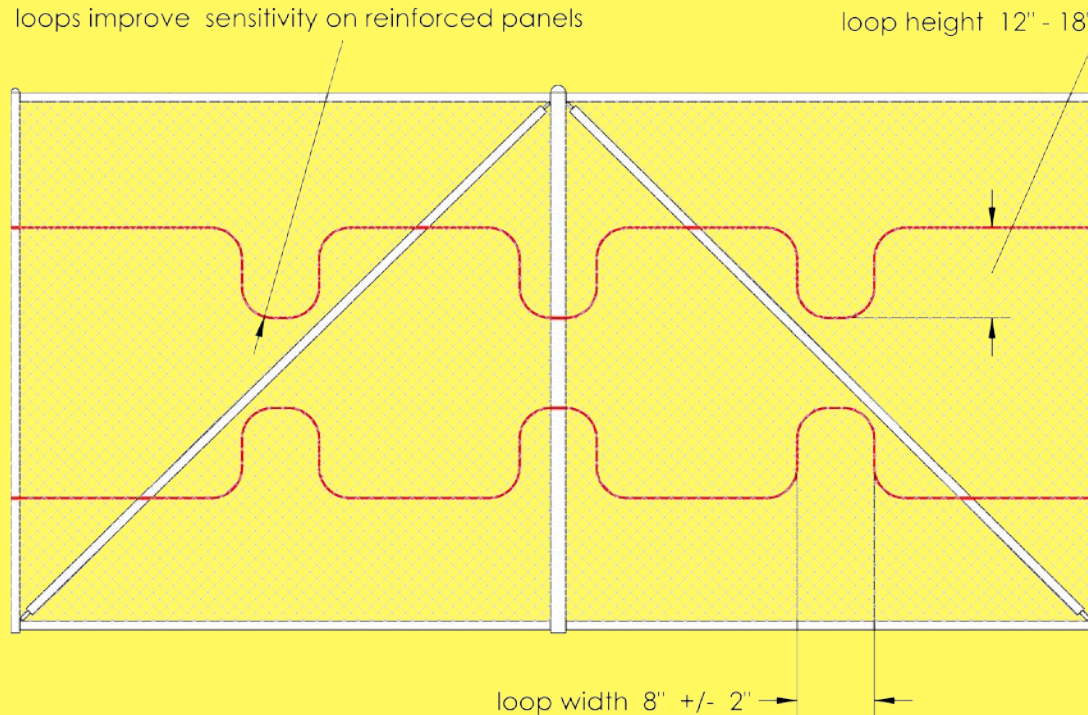
# FD-322 Conduit Installation Guidelines

- Install service loops at posts about 45 meters apart
- Loops should be 6-10" wide and 12-18" tall



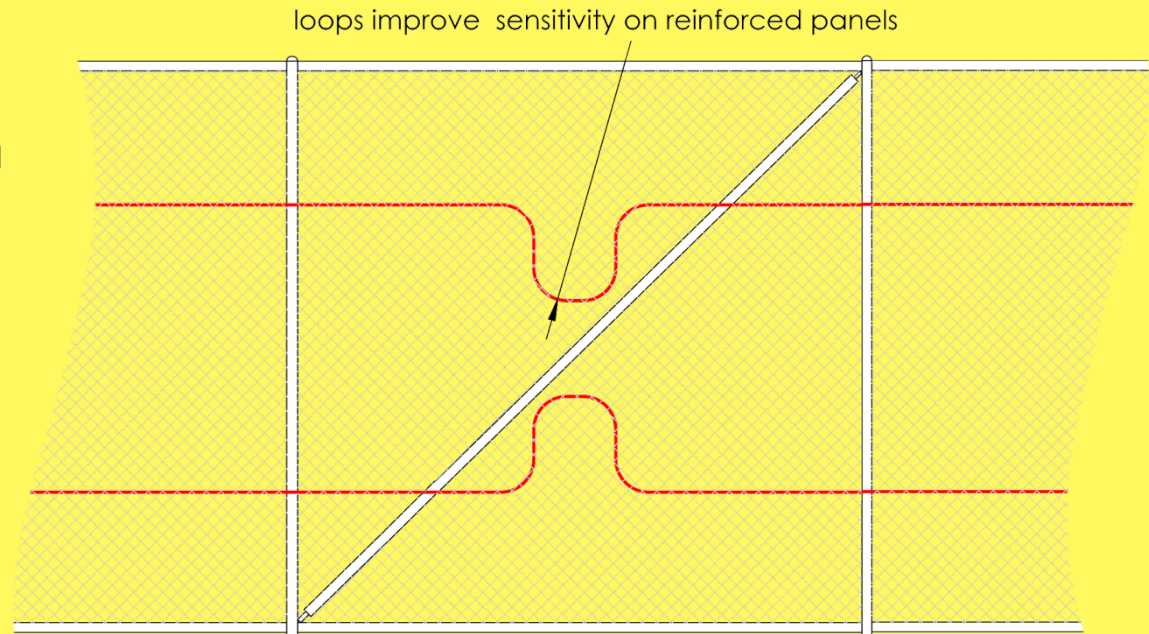
# FD-322 Conduit Installation Guidelines

- Install sensitivity loops on reinforced fence sections
- Loops should be 6-10" wide and 12-18" tall



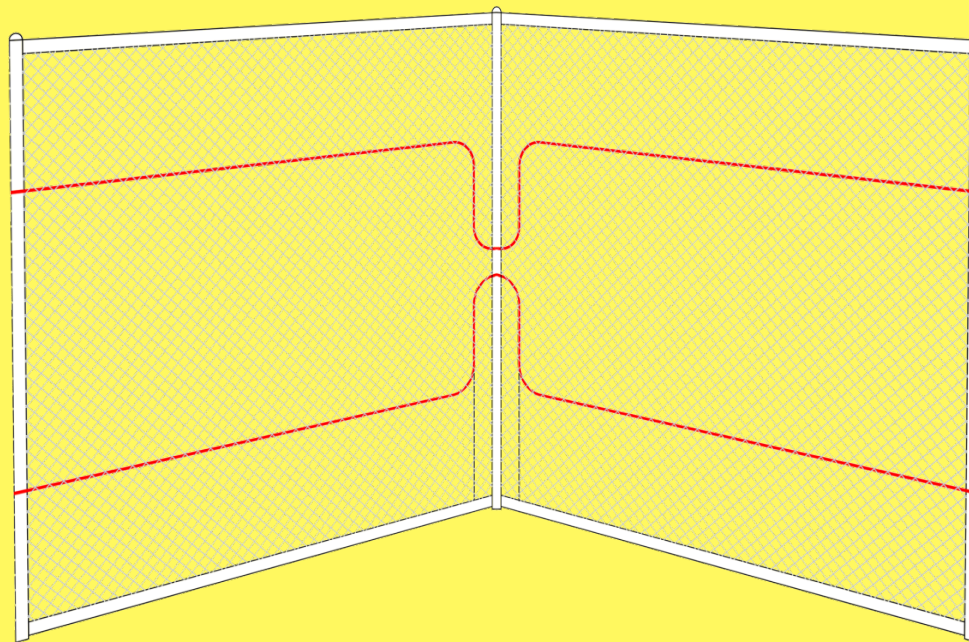
# FD-322 Conduit Installation Guidelines

- Additional fiber increases sensitivity
- Consider sensitivity loops on areas that have large deviations in rigidity between fence panels
- Adding fiber to rigid sections decreases nuisance alarms
- Additional fiber and conduit increases installed cost



# FD-322 Conduit Installation Guidelines

- Install sensitivity loops at corners also
- If the corner panels are reinforced, add loops in the middle and at both posts
- Put zone breaks on corners – and don't forget to overlap!

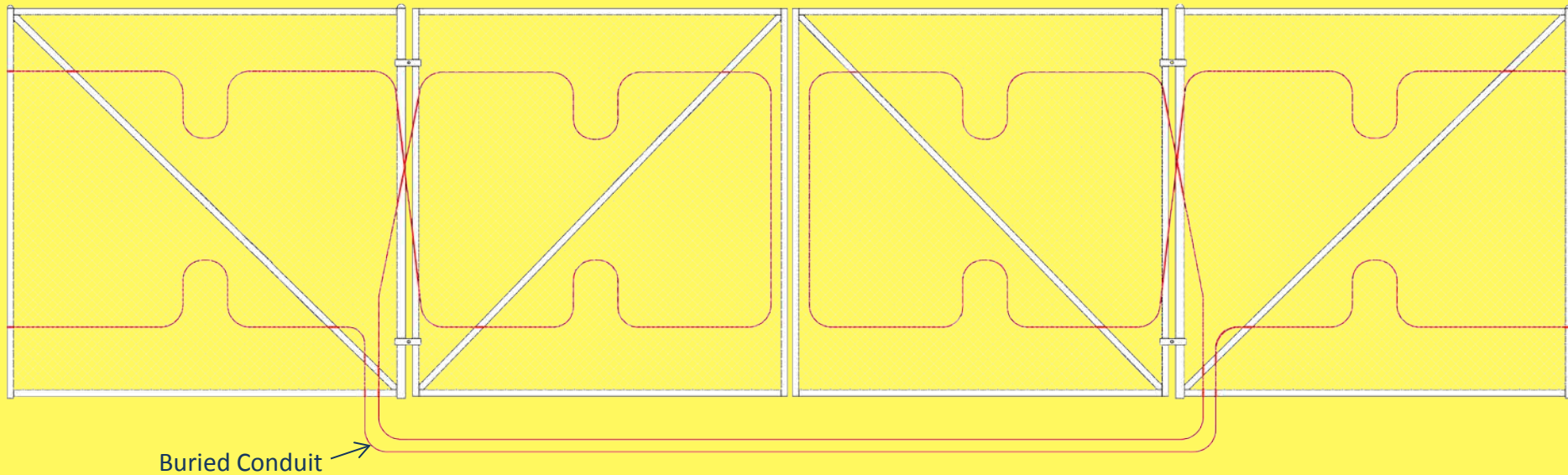




# FD-322 Conduit Installation Guidelines

## Swing Gate Installation

- Cross the conduit at hinge post to form a flexible hinge
- Bury the conduit about a foot under the gate in solid pipe to cross the road



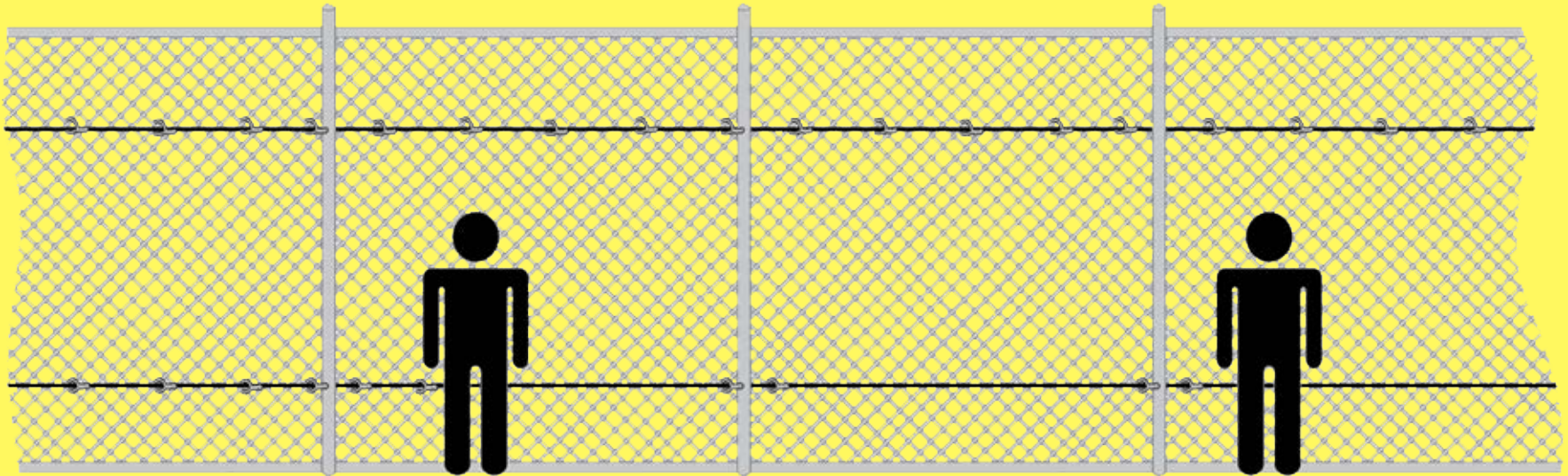
# FD-322 Conduit Installation Guidelines

- Conduit will expand and contract with temperature
- Install with 25-35 pounds of pull to minimize effect



# FD-322 Conduit Installation Guidelines

- A two-person installation team is most effective
- Person #1 secures every 10 ft (post-to-post) tightly while Person #2 lags behind securing every foot (4 diamonds)



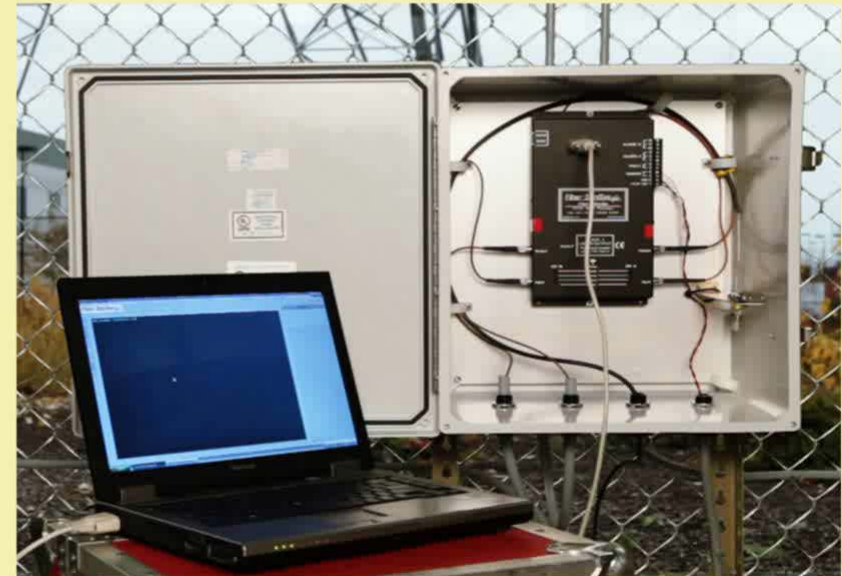
# FD-322 Calibration and Tuning

## Process Steps

1. Calibrate the APU
2. Simulate intrusions
3. Tune system to detect intrusions
4. Simulate nuisance alarms or monitor for a defined test period
5. Tune system to ignore nuisance alarms
6. Repeat steps 2 through 5 until satisfied

# FD-322 Field Calibration

- Execute from Terminal Mode
  - Use FD322 Tuning Software
  - Use any terminal emulator such as Hyperterminal
- Step 1: Time and date set
- Step 2: Measure LOSS and set sensitivity



# FD-322 Tuning

- Efficient parameter set allows easy and effective tuning
- Sensitivity, event count and low frequency cutoff for climbs and cuts
- Wind rejection

APU 322		
APU Info		
Model	FD322	
Serial #	E98000	
Manufactured Date	09/28/11	
FirmWare #	5.11	
Climb		Default
Enabled? ( Yes or No )	Yes	Yes
Climb Sensitivity ( 0 to 50 )	20	20
Event Count ( 1 to 10 )	3	3
Lowest Frequency ( Hz 10 to 600 )	200	200
Cut		Default
Enabled? ( Yes or No )	Yes	Yes
Cut Sensitivity ( 0 to 50 )	20	20
Event Count ( 1 to 10 )	5	5
Lowest Frequency ( Hz 10 to 600 )	300	300
Wind		Default
Enable Wind Rejection Software?	Yes	Yes
Wind Rejection ( 20 to 80 )	50	50
Misc		Default
Enable Tamper Switch?	No	No
Alarm Relay Time ( 1 to 10 sec )	1	1

# FD-322 Tuning: Basic Procedure -

## Climbs

- Connect APU to PC laptop and run tuning software
- Verify that APU parameters are set to default values
- Run the Realtime mode and observe the signal as the test intruder climbs the fence
- Adjust Climb Sensitivity so that an alarm is caused at about the time when the intruder's waist level reaches the top of the fence
- If more or less sensitivity is required, lower the Climb Event Count to catch the climber sooner or raise the count for a later catch
- Remember that excess sensitivity=nuisance alarms!

# FD-322 Tuning: Basic Procedure - Cuts

- Adjust the Cut Event Count to the desired value; it should be set to a value less than or equal to the number of cuts required to create a security breach; as a rule of thumb, however, limit the Event Count to 10 or less
- Adjust Cut Sensitivity so that an alarm is caused when the set number of simulated cuts has been made
- It's best that each cut simulation creates only one event; you may need to record and review some spectral data using the Realtime / Replay modes to verify this
- Remember that excess sensitivity=nuisance alarms!



# FD-322 Tuning: Basic Procedure -

## Nuisance

There are two parameters that desensitize the APU to nuisance alarm sources

1. Low Frequency Cutoff
  2. Wind Rejection
- Low Frequency Cutoff is independently adjustable for climbs and cuts
  - Wind Rejection adjusts both climbs and cuts equally
  - Both adjustments require analysis of spectral data files to optimize overall sensor performance
  - The adjustments are done on an iterative basis over time as the whole range of nuisance sources occurs

# FD-322 Tuning: Basic Procedure -

## Nuisance

Many nuisance sources such as wind, trains and other vehicular traffic contain only low frequency information

- Climb and cut intrusions include information at all frequencies
- Collected spectral files can be analyzed for frequency content in the Replay mode
- Compare climb and cut intrusion signals to nuisance signals and adjust the Low Frequency Start Point accordingly



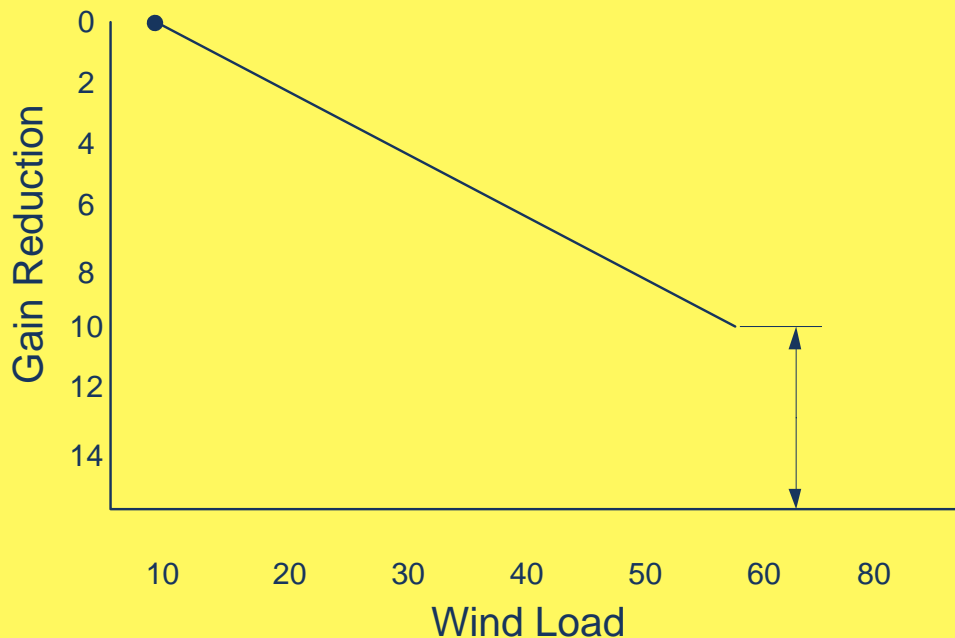
Low  
Frequency  
Start Point

Only frequencies  
above this point  
are processed

# FD-322 Tuning: Basic Procedure -

## Nuisance

- Wind signals typically consist of mostly low frequencies, below about 200 Hz
- It's therefore best to eliminate as much low frequency processing as possible using Low Frequency Cutoff
- If wind nuisance alarms still persist, raise the Wind Rejection parameter and test for at least a day
- Adjust the Wind Rejection parameter over time until the desired balance between nuisance alarms and intrusion detection is achieved



# FD-322 Tuning: Basic Procedure - Miscellaneous

- There are two APU parameters in the Miscellaneous section
  1. Enable Tamper Switch
  2. Alarm Relay Time
- The tamper switch parameter allows monitoring of NEMA enclosure to notify the alarm control system if the enclosure has been opened
- The alarm relay time can be adjusted to allow the relay to remain in its alarm state for a 1-10 second interval, depending on monitoring system requirements

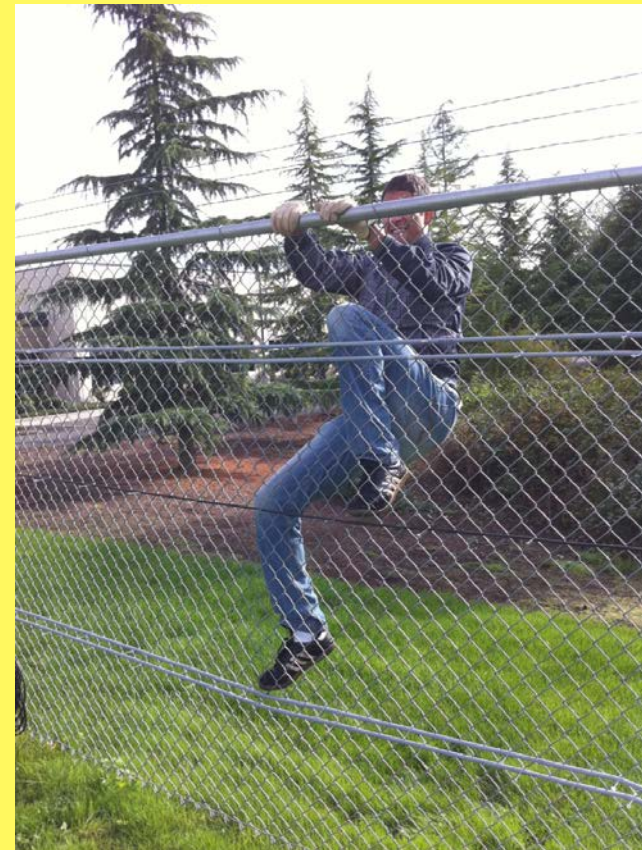
# FD-322 Tuning: Recommended Tools

- Tuning software and laptop PC
- Product manual
- Personal protection equipment as required by site; gloves are highly recommended
- Cut test tools or other intrusion equipment

# FD-322 Tuning: Climb Intrusions

- Simulate climbing the same way a potential intruder would climb.
- Bring your waist even with the top of the fence and jump back down.
- Make adjustments to the system so that climb simulations cause an alarm.
- Make changes to the climb processor

\*note: Climber weight, pace, technique and foot apparel can greatly impact detection



# FD-322 Tuning: Cut Intrusions

- Use a 6"+ solid tang screwdriver to tap the fence
- Tap one more time than your set event count, waiting a second between each tap; the event count should be set to the number of cuts it would take to create a security breach in the area
- Tap in different areas around the fence (top, bottom and at posts)
- Make changes to the cut processor
- Be wary of multiple events on a single intrusion attempt; this can be a sign of a system that may be tuned too sensitive



# FD-322 Tuning: Cut Intrusions

Simulating an Actual Cut



Hacksaw Cut Simulation





# FD-322 Maintenance

- Visual inspection: suggested interval is 90 days
- Performance check: suggested interval is 90 days
- Status check: suggested interval is 180 days
- To maintain the system, you'll need the same basic tools used to tune the system
- Keep a test log to document all inspection and test results; you'll need this to compare current system status to previous results and to establish accountability

## **FD-322 Maintenance: Visual System Inspection**

- Inspect the sensor conduit and check for cracks and kinks, including the conduit entering the APU enclosure
- Verify that conduit is securely attached to the fence; add or replace wire ties where needed
- Open APU enclosures and verify they are moisture-free
- Check the fence condition and repair damaged or loose areas; tighten any loose fence hardware such as signs
- Check for fence obstructions and remove as necessary
- Ensure all APU LED indicators behave normally
- Record all results and findings in the test log noting time, date and maintenance personnel details

# FD-322 Maintenance: System Performance Check

- Perform climb and cut tests on all zones. Verify that alarm is generated at the APU for each intrusion attempt
- Verify that all alarms are acknowledged by the alarm monitoring system
- If an alarm fails to occur at APU or to be received by the monitoring system, troubleshoot until resolved
- Record all results and findings in the test log noting time, date and maintenance personnel details

# FD-322 Maintenance: System Status Check

- Perform STATUS and LOSS checks on all zones. If LOSS is more than 6 dB, troubleshoot the system to correct

## LOSS Test

- Perform the Field Calibration procedure
- Verify that the new LOSS value is less than 6 dB
- Record results in test log

## STATUS Test

- Run FD322 Tuning software and execute from Terminal Mode
- Verify that laser current (Las(mA)) is less than 40 mA
- Verify that power supply voltage (Pwr(V)) is between 12-24VDC
- Record results in test log

## FD-322 Maintenance: Loopback Test

- Perform the Loopback Test if LOSS is greater than 6 dB
- This test will isolate a LOSS issue to either the APU or to the fiber on the fence
- To perform the test, disconnect the fence sensing fiber from the APU and replace it with a known good multimode jumper that's at least a meter in length
- Perform the Field Calibration procedure; if the LOSS remains high, the problem is in the APU, and if the LOSS goes down, the problem is in the fence fiber

# FD-322 Wrap Up

- Two sensing channels
- Simple installation and adjustment
- Efficient parameter set allows easy and effective tuning
- Supports all normal zone lengths on chain link fence
- Most value-priced fiber sensor
- User software included

