

# Hardware Installation & Troubleshooting Guide

Tofino Industrial Security Solution

Version 1.0.0



**TOFINO™**

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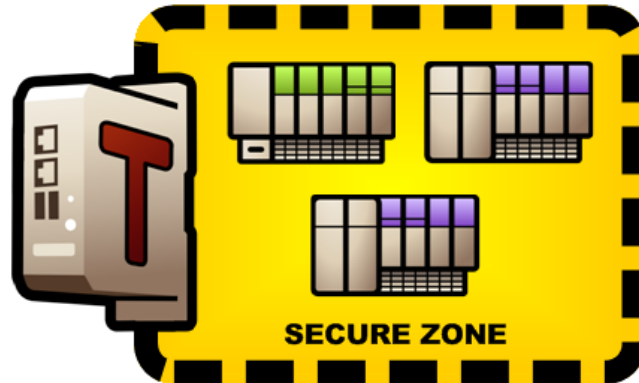
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# 1 Introduction



This “inline” Tofino SA Ethernet appliance can be used to protect HMI, DCS, PLC or RTU control devices, as clusters, or as individual devices.

The Tofino Industrial Security System consists of two additional core components not covered by this manual:

- The Central Management Platform (CMP) - a Windows-based management system and database for centralized monitoring and configuration of each Tofino SA, regardless of its physical location in the company network.
- Loadable Security Modules (LSM) - a variety of software plug-ins providing security services such as firewalls, intrusion detection systems (IDS) and virtual private network (VPN) encryption. One, or more, LSMs can be downloaded into a Tofino SA, to provide a customized security function to suit the requirements of the control system.

LSMs require an activated software license. For information about LSM license activation, consult the Tofino CMP help or the Tofino CMP User's Manual.

## 2 Installation Guide

### Unpacking

Unpack the appliance and check it for damage. Do not use any parts that show evidence of damage.

### Preparation

To install the Tofino SA you will need:

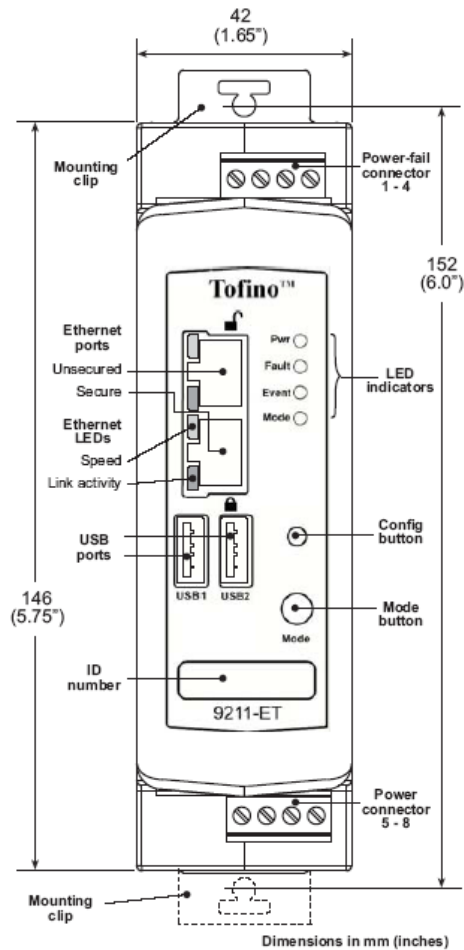
1. A 3mm straight blade screwdriver
2. 9...32V DC supply with 350mA current (@24V) per appliance. A second (i.

- e. redundant) supply is optional. (Note: 22V DC minimum is required for 18V power fail detection option.)
- 3. Wire for DC power & power-fail connections
- 4. Two 10/100 base-T cables, preferably screened, to connect the Tofino SA between the network and the equipment being protected.
- 5. A suitable 35mm DIN rail location to mount the appliance (optional - see mounting details).

## Mounting the Appliance

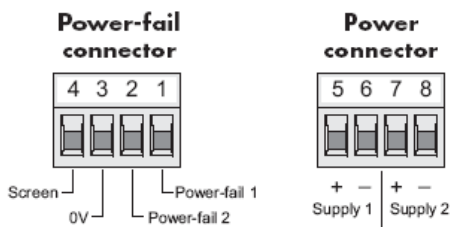
At the back of the appliance, push out the mounting clips - top and bottom. Press the appliance firmly onto the DIN rail and push mounting clips back in. Check that the appliance grips the rail securely. *Note:* An alternative fixing method is to use M4 screws through the holes in the clips (152mm between centres - see diagram) for mounting the appliance to a panel.

**Record the Tofino ID number (see label) & the installation location for future reference**

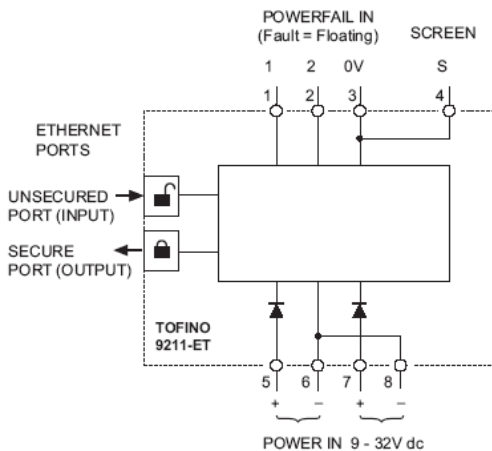


## Wiring for DC Power (see diagrams)

*Note:* These two plugs use cage-clamp screw terminals to accept a stripped wire, ranging in size from 24 to 12 AWG (0.2 – 2.5mm<sup>2</sup>) One or two DC power supplies may be connected to the Tofino SA utilizing the four-position connector plug (5–8) at the bottom of the Tofino SA appliance. Two power supplies will not share the current; the higher voltage supply will take the load. Power fail signals from the supplies may be used by connecting them to the connector plug (pins 1 & 2) at the top of the appliance - ground returns should go to pin 3.



## Connection Diagram



## Power On - Appliance Startup

**Do not connect the Tofino SA into the network at this stage.**

The appliance will not pass any network traffic until it has executed its startup sequence.

At power ON, all four LED indicators are lit and the appliance will commence its startup sequence. At the end of the startup sequence, (i.e. after approx. 1 minute) the *Power* LED will remain ON, but the *Fault*, *Event* and *Mode* LED indicators will all be extinguished to show the sequence is complete.

## Network Connection

Note: The appliance must have completed its startup before any network connections are made.

1. Connect an RJ45 patch cable from the network switch/router to the “Unsecured” Tofino SA port (🔓).
2. Connect an RJ45 patch cable from the “Secure” Tofino SA port (🔒) to the network port of the equipment being protected.
3. Check that the yellow “Link activity” light is flashing on both of the network sockets to show network traffic.

The green “Speed” light will come on if the link is operating at 100Mb/s.

**IMPORTANT:** An unconfigured Tofino SA will pass all network traffic and will not provide any security. Check with your network administrator to find out if the Tofino SA is pre-configured, or read the Tofino CMP User's Manual for information on how to configure the appliance and thus make it secure.

## USB Load/Save

### Loading New Configuration or Firmware

The USB Load function loads files containing firmware or configuration updates from a USB storage device. **Note: Only version 2.0 USB storage devices are supported.**

1. Ensure the Tofino SA has been powered for at least one minute.
2. Insert the USB storage device containing the prepared files into one of its USB ports.
3. Press and hold the Config button for 5-6 seconds until the Mode-Event-Fault LEDs begin to flash, in an upward sequence, to indicate a “Load.”
4. When the flashing sequence stops (but not before) remove the USB storage device.
5. If the load was successful, the Tofino SA will go to OPERATIONAL mode, with the Mode LED showing a steady light.

### Saving Diagnostic Information

The USB Save function copies diagnostic files from the Tofino SA to the USB storage device. These files can then be sent to technical support for analysis.

1. Insert a USB storage device into one of the USB ports.
2. Press and hold the Config button for 1-2 (but less than 5) seconds
3. The Fault-Event-Mode LEDs will begin to flash, in downward sequence, to indicate a “Save.”
4. When the flashing sequence stops remove the USB storage device
5. If the save was successful the Tofino SA LEDs will revert to the state they were in prior to the saving action.
6. Send copies of these files to technical support for analysis.



The Fault LED will flash a number of times if a fault occurs with USB Configuration Loading or Diagnostic Saving. Use Table 1 to diagnose the fault from the number of Fault LED flashes, and to decide the appropriate course of action.

**Table 1**

**Fault LED Activity During Load/Save**

<i>No. of Flashes</i>	<i>During Load Sequence</i>	<i>During Save Sequence</i>
1	The USB ports are disabled. At the CMP console, check the General /Communications settings for the particular Tofino. Confirm the USB Load Config setting is “Enabled” and apply the configuration.	N/A
2	No USB storage device in the USB port or the USB storage device is not formatted with the standard Fat32 format.	No USB storage device in the USB port or the USB storage device is not formatted with the standard Fat32 format.
3	The files on the USB storage device are not valid.	The Tofino SA was unable to create the diagnostics files. Contact technical support.
4	The Tofino SA was unable to decrypt the configuration files. The files may have been corrupted during the transfer process onto the USB storage device. Please try transferring them again. If this second transfer attempt is unsuccessful, then please contact technical support.	The Tofino SA was unable to encrypt the diagnostic files. Contact technical support.
5	The Tofino SA was unable to load the files. The files may have been corrupted during the transfer process onto the USB storage device. Please try transferring them again. If this second transfer attempt is unsuccessful, then please contact technical support.	The Tofino SA was unable to copy the encrypted diagnostics files to the USB storage device. The USB storage device may be full.
6	The Tofino SA was unable to shut down the USB port. Contact technical support.	The Tofino SA was unable to shut down the USB port. Contact technical support.

# 3 Troubleshooting

The Tofino SA is provided with LEDs to indicate normal and other modes of operation.

Use Table 2 for assistance in interpreting the LED displays. Table 3 and Table 4 offer further assistance in identifying and solving any possible communication malfunctions.

### 3.1 Tofino Security Appliance (SA) LED Indications

**Table 2**

<i>Symptom</i>	<i>Possible Cause</i>	<i>Solution</i>
Power LED: Off	Tofino SA does not have power	Ensure the Tofino SA has 9-32 VDC power connected
Fault LED: On Solid	Tofino SA has detected a hardware fault and did not start	Remove Tofino SA from network and contact technical support
Fault LED: Long Flash (2 seconds)	Tofino SA operating system did not start properly	Remove Tofino SA from network and contact technical support
Fault LED: Short Flash (0.5 seconds)	A Tofino LSM service did not start	Update all LSMs using the Tofino CMP, Tofino LSM Update Wizard. If this does not solve the problem, remove the Tofino SA from the network and contact technical support
Event LED: On or Flashing	Tofino SA is defending the network from attack	Determine the source of the attack using the Tofino CMP Event View
	Device has been added to the network that is not registered in the Tofino CMP database	Add a node to the network diagram on the Tofino CMP using the Network Editor. Create a firewall rule to handle traffic as needed (See: Tofino CMP Firewall Rule Configuration in the <i>Tofino CMP User's Guide</i> )
	Device on the network is generating broadcast traffic	Create firewall rules to handle broadcast traffic as needed. (See: Tofino CMP Firewall Rule Configuration in the <i>Tofino CMP User's Guide</i> )
Mode LED: Off	Tofino SA is in PREDEPLOYED, PASSIVE, or DECOMMISSIONED mode	See: Tofino SA Modes in the <i>Tofino CMP User's Guide</i>
Mode LED: Long Flash (2 seconds)	Tofino SA is in TEST mode	See: Tofino SA Modes in the <i>Tofino CMP User's Guide</i>
Mode LED Short Flash (0.5 seconds)	Tofino SA is in TEST-FIELD-FORCE mode	See: Tofino SA Modes in the <i>Tofino CMP User's Guide</i> . If appropriate, return to OPERATIONAL mode by pressing the Mode button for 1 second
Mode LED: On	Tofino SA is in OPERATIONAL (protected) mode	No Action is required
Link/Activity LED (Yellow): Off	Network connection to the Tofino SA is missing	Check the Ethernet cabling between the Tofino SA and the devices connected to the Tofino SA. Check the Ethernet Link LEDs on the device connected to the Tofino SA

## 3.2 Control System/Network Communications

**Table 3**

<i>Symptoms</i>	<i>Possible Cause</i>	<i>Solution</i>
Unable to establish communications between control system equipment	Network connection to the Tofino SA is missing	Confirm that both Ethernet Link/Activity LEDs (Yellow) are on or flashing. If not, check all Ethernet cabling between the Tofino SA and the other network devices
	Tofino SA Firewall LSM is blocking network traffic that needs to be allowed	<p>Switch the Tofino SA into TEST-FIELD-FORCE mode by pressing the Mode button for 1 second</p> <p>When the button is released, the Mode LED should start to flash, indicating that all traffic is allowed to flow through the Tofino SA</p> <p>Determine what traffic is being blocked using the Event view on the Tofino CMP</p> <p>Create or adjust firewall rules to allow traffic as needed</p> <p>Return the Tofino SA to OPERATIONAL mode by pressing the Mode button on the Tofino SA for 1 second</p>
The Tofino SA is not blocking traffic	Tofino SA is not in OPERATIONAL mode	Confirm that the Tofino SA Mode LED is on solid
	Firewall LSM is not installed or is not activated	Check the Modules tab of the Tofino SA's properties page on the Tofino CMP
	Rules in the Tofino SA do not match the rules shown on the Tofino CMP	Synchronize the Tofino SA with the Tofino CMP (See: Synchronizing Your Tofino SA's Configurations in the <i>Tofino CMP User's Manual</i> )
	Incorrect <i>Allow</i> rule is activated in the firewall	Check the firewall rules on the Firewall page of the Tofino SA properties page on the Tofino CMP


### 3.3 Tofino CMP to Tofino SA Communications

**Table 4**

<i>Symptoms</i>	<i>Possible Causes</i>	<i>Solutions</i>
Unable to connect to the Tofino SA from the Tofino CMP	The Tofino CMP and the Tofino SA do not have a clear communications path in the network	Ensure that Tofino CMP can communicate with at least one device on the protected side of the Tofino SA  Note: Test may require the Tofino SA to be temporarily switched to TEST-FIELD-FORCE mode by pressing the Mode button for 1 second
	Primary contact device is not set in the Tofino CMP	Ensure the primary contact device is set for the Tofino SA (See: Editing the Properties of a Tofino SA in the <i>Tofino CMP User's Manual</i> )
	The Tofino CMP does not have the correct IP address for the primary and backup contact devices	Ensure the primary contact device is set for the Tofino SA (See: Editing the Properties of a Tofino SA in the <i>Tofino CMP User's Manual</i> )
	Both primary or backup contact device is/are off the network	Ensure the primary or backup contact device are powered up and on the network
	The Tofino ID is missing or incorrect on the Tofino CMP	Confirm the Tofino ID on the face of the Tofino SA is identical to the ID entered in the Tofino CMP (See: Editing the Properties of a Tofino SA in the <i>Tofino CMP User's Manual</i> )
	The Tofino SA is already configured to connect to another Tofino CMP	For security reasons, a Tofino SA can only connect to one Tofino CMP. If necessary, factory reset the Tofino SA and reattempt connection

## 4 Certification

### 4.1 Europe

Europe			
Authority	Standard	Approved For	Certificate No.
MTL	EN 600795:2005	 II 3G Ex nA nC IIC T4 -40°C < Ta < +70°C	MTL07ATEX9211X
<p>Conditions for safe use</p> <ol style="list-style-type: none"> <li>The apparatus must be installed in an enclosure or an environment that provides a degree of protection not less than IP54</li> <li>The module must not be inserted or removed unless either:               <ol style="list-style-type: none"> <li>the area in which the apparatus is installed is known to be non-hazardous, or</li> <li>the circuit to which it is connected has been de-energized</li> </ol> </li> <li>The 9-32V supply that provides the input to the module must be derived from a regulated power supply complying with the requirement</li> </ol>			

### 4.2 USA

USA			
Authority	Standard	Approved For	Certificate No.
FM	FM 3600, FM 3611 FM 3810	NI/1/2/ABCD/T4 Ta = 70°C 1/2/AEx nC/IIC/T4 Ta = 70°C	3029914
<p>Equipment Ratings: Nonincendive for Class I, Division 2, Groups A, B, C and D; Zone 2, AEx nC IIC T4 Ta = 70°C; in accordance with Control Drawings No. SCI-1032, indoor hazardous (classified) locations.</p>			
<p>Conditions for safe use:</p> <ol style="list-style-type: none"> <li>In Class I, Division 2 installations, the subject equipment shall be mounted within a tool-secured enclosure which is capable of accepting one or more of the Class I, Division 2 wiring methods specified in the National Electrical Code (ANSI/NFPA 70).</li> <li>In Class I, Zone 2 installations, the subject equipment shall be mounted within a tool-secured enclosure which is capable of accepting one or more of the Class I, Zone 2 wiring methods specified in the National Electrical Code (ANSI/NFPA 70). Where installed in outdoor or potentially wet locations, the enclosure shall at a minimum, meet the requirements of IP54. Where installed in dry indoor locations, the enclosure shall, at minimum, meet the requirements of IP4X.</li> </ol>			

### 4.3 Canada

Canada			
Authority	Standard	Approved For	Certificate No.
FM	CAN/CSA E60079-0 CAN/CSA E60079-15 C22.2 No. 1010-1	IPA/1/2/ABCD/T4 Ta = 70°C 1/2/Ex nL/IIC/T4 Ta = 70°C	3029914C
<p>Equipment Ratings: Non-sparking for Class I, Division 2, Groups A, B, C and D; Zone 2, Ex nL IIC T4 Ta = 70°C; in accordance with Control Drawings No. SCI-1032, hazardous indoor locations.</p>			
<p>Conditions for safe use:</p> <ol style="list-style-type: none"> <li>1. In Class I, Division 2 installations, the subject equipment shall be mounted within a tool-secured enclosure which is capable of accepting one or more of the Class I, Division 2 wiring methods specified in the Canadian Electrical Code (C22.2).</li> <li>2. In Class I, Zone 2 installations, the subject equipment shall be mounted within a tool-secured enclosure which is capable of accepting one or more of the Class I, Zone 2 wiring methods specified in the Canadian Electrical Code (C22.1). Where installed in outdoor or potentially wet locations, the enclosure shall at a minimum, meet the requirements of IP54. Where installed in dry indoor locations, the enclosure shall, at minimum, meet the requirements of IP4X.</li> <li>3. The user shall take necessary measures to ensure that the supply voltage transients do not exceed 45V.</li> <li>4. The user shall ensure that the field wiring insulation temperature is rated for 70°C.</li> <li>5. The material used in the construction of the final enclosure, shall not contain, by mass, more than 7.5% magnesium.</li> <li>6. It is the responsibility of the manufacturer to provide warning markings in French where required by local jurisdictions.</li> </ol>			

## 5 Technical Support

Please contact the local representative in your region.

or

e-mail: [support@tofinosecurity.com](mailto:support@tofinosecurity.com)

web: [www.tofinosecurity.com](http://www.tofinosecurity.com)