5-port 10/100Base-TX Industrial Switch
(INS-801 / INS-801W)

User's Guide

VOLKTEK
Optical Ethernet Experts

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FCC WARNING

This equipment has been tested and found to comply with the limits for a class A device, pursuant to part 15 of FCC rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. Operating this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

CE

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

Take special care to read and understand all content given in the warning boxes

Warning

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ABOUT THIS GUIDE

The INS-801/INS-801W Industrial Series Switch is a hardened, 5-port Ethernet Switch with redundant DC power inputs – designed to provide a reliable and economical solution for your industrial Ethernet environment. With its dry contact smart alarm, the INS-801/801W can initiate a physical alarm (audible and/or visible) in the event of a malfunction. The INS-801 operates in a wide temperature range, from 0 to 70°C (from -40°C in the case of the 801W), and is designed to handle higher than normal degrees of vibration and shock, making it suitable for harsh industrial environments.

This manual discusses how to install the INS-801 Industrial Fast Ethernet Switch.

The INS-801**W** is able to operate in a wider temperature range (from **-40°C to 70°C**). The rest of the features and functions are the same as the INS-801.

Terms/Usage

In this guide, the term "**Switch**" (first letter uppercase) refers to the INS-801/801W Industrial Fast Ethernet Switch, and "**switch**" (first letter lowercase) refers to all other Ethernet switches.

In this guide, the term INS-801 will also refer to the INS-801W.

INTRODUCTION

This chapter describes the features of the Switch and some background information about Ethernet/Fast Ethernet switching technology.

Industrial Ethernet Technology

The growing importance of Ethernet has extended to the factory floor and industrial environments, where things have become too harsh for typical commercial-grade networking equipment. VOLKTEK has created an Industrial Series of Switches and interconnecting devices specifically for the purpose of extending Ethernet to the factory floor and industrial environments. All of our Industrial Series devices are delivered in a rugged, hardened case and with components capable of withstanding a high degree of vibration and shock. These devices also operate well in temperatures as high as 70°C.

Not an ordinary office switch by any means, the INS-801 is engineered and designed specifically for the harsh, industrial-type environments commonly encountered in heavy industry. With its redundant DC power inputs and high-performance components, the INS-801 is perfectly suited for the industrial Ethernet.

Switching Technology

One way to push the limits of Ethernet technology, is the development of switching technology. A switch bridges Ethernet packets at the MAC address level of the Ethernet protocol that are transmitted between connected Ethernet or Fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by dividing a local area network into different *segments* which don't compete with each other for network transmission capacity.

Features

The Switch was designed for easy installation and high performance in an industrial environment where vibration, shock, heat, and RF interference may be commonplace.

The Switch was specifically designed to be small and compact for easy DIN-rail mounting and it can be installed where space is limited.

The Switch is ideal for deployment with multiple high-speed servers for shared-bandwidth 10Mbps or 100Mbps workgroups. With a maximum bandwidth of 200Mbps (100Mbps full-duplex mode), any port can provide workstations with a congestion-free data pipe for simultaneous access to the server.

The Switch can be expanded by cascading two or more switches together in a 'daisy chain'. As all ports support 200Mbps (half-duplex), the Switch can be cascaded from any port and to any number of switches.

The Switch combines dynamic memory allocation with store-and-forward switching to ensure that the buffer is effectively allocated for each port, while controlling the data flow between the transmit and receive nodes to guarantee against all possible packet loss.

The Switch is an unmanaged 10/100Mbps Fast Ethernet Switch that offers solutions for increasing the bandwidth and speed of small Ethernet workgroups.

Other key features are:

o   Five (5) 10/100Base-TX ports

- o Rugged, hardened IP30 case
- o Vibration/Shock operational
- o Power terminal block
- o Wide voltage range: 9-48V
- o DIP-switch to enable or disable alarm functions
- o Power input polarity protection function
- o Under-power and over-power detection function
- o Wide operating temp.: -40°C ~ 70°C for the INS-801W
- o Store-and-forwarding
- o Auto-negotiation at all copper ports

INS-801 INDUSTRIAL SWITCH -
UNPACKING AND SET-UP

This section and the following sections explain the set-up and installation of the VOLKTEK INS-801/801W Industrial Switch.

Unpacking

Open the box of the Switch and carefully unpack it. The box should contain the following items:

- ✓ *One INS-801 5-port 10/100M Industrial Fast Ethernet Switch*
- ✓ *One DIN-rail bracket*
- ✓ *Protective caps for unused ports*
- ✓ *Quick Installation Guide*
- ✓ *This User's Guide CD*
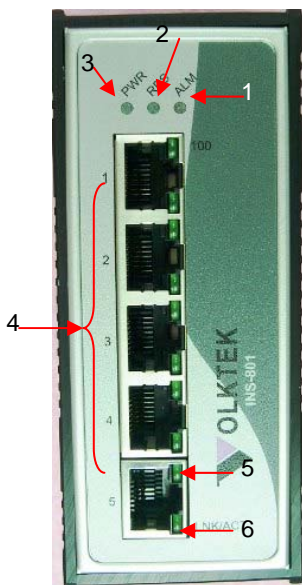
If any item is found missing or damaged, please contact

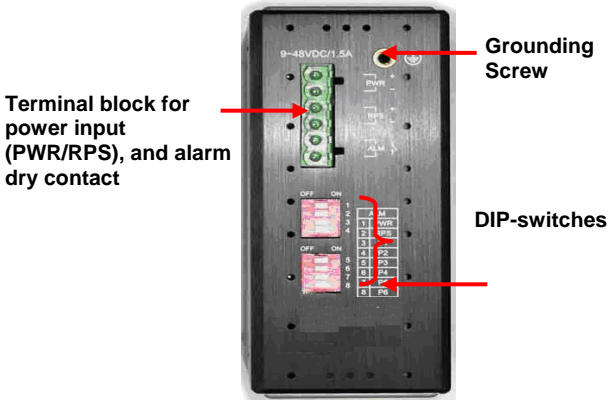your local reseller for replacement.

Layout of the INS-801/801W

Front View of Switch
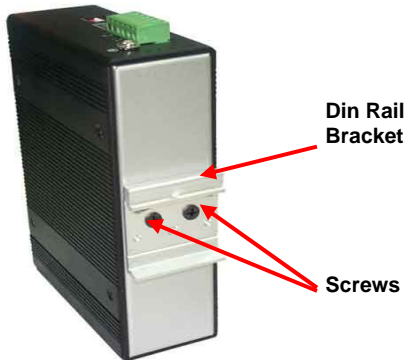

1. Alarm LED
2. Redundant Power LED
3. Primary Power LED
4. TX ports (5)
5. TX port 100Mbps LED
6. TX port LNK/ACT LED

TOP View of Switch

Grounding Screw

Terminal block for power input (PWR/RPS), and alarm dry contact

DIP-switches

Back View of Switch

Din Rail Bracket

Screws

DIN-rail mounting of the INS-801/801W

The aluminum DIN-rail attachment plate should already be affixed to the back panel of the Switch. If you need to attach the DIN-rail plate, assure that the stiff metal spring is situated towards the top. Attaching the Switch to the DIN-rail is easy: just align and hook it over the top rail, making sure that the metal spring (thin bent rod) is in front of the rail edge as the rail edge bites into the space **behind** this spring, then press down and press the Switch forward to snap into the bottom rail, as shown in the figures below.
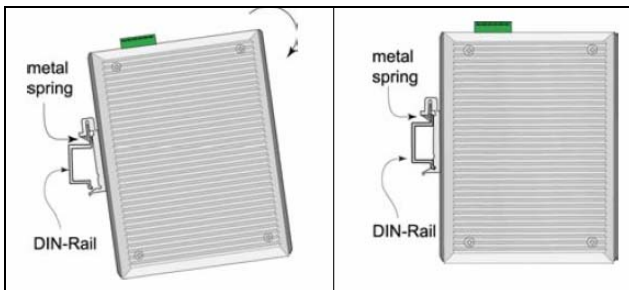
The set-up of the Switch can be performed after checking the following facts:

- The hanging structure must support at least 1.0 Kg for the Switch.
- The power outlet should be within 1.82 meters (6 feet)

from the Switch.
- Visually inspect the DC power jack and make sure that it is fully secured to the power adapter.
- Make sure that there is proper heat dissipation from and adequate ventilation around the Switch. Do not place heavy objects on the Switch.

⚠ Grounding the INS-801 Industrial Switch will help minimize noise due to electromagnetic interference (EMI). Always run the ground connection from the ground screw to the grounding surface prior to connecting DC power.

Redundant Power Inputs

The primary and redundant power inputs can both be connected simultaneously to live DC power sources. If one power source fails, the other source acts as a back-up, and automatically supplies the Switch's power needs.

## Configuring DC power Inputs

DC power to the Terminal Block Receptor can be configured like this:

DC Powered Switch: Power is supplied through an external DC power source. Check the technical specification section for information about the DC power input voltage. Since the switch does not include a power switch, plugging its power adapter into a power outlet will immediately power it on.
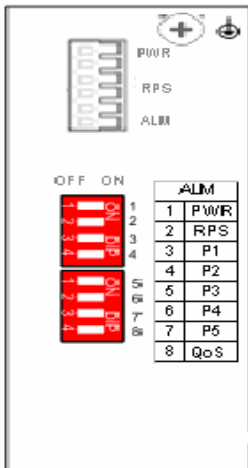
The plastic green contact power block (shown at the top of the diagram on the left) is composed of six contact pins and can be inserted and removed easily by hand to connect to the six-pin terminal block receptor (male contacts located on the body of the Switch). The top two contacts (PWR) are designated for the primary DC input, while the middle two contacts (RPS) are for redundant DC input. The lower two contacts (ALM) are for connection to an external alarm.

To the upper right of the power block is the ground wire connection screw, and below the power block is the DIP-switch control panel.

Procedure for Connecting DC Power:

For shipping, the removable green Contact Block may be detached from the six-pin terminal contact point. It may be easier to attach the DC wires to the green Contact Block if it has first been unplugged from the terminal contact point on the switch.

A. On the Power Contact Block, use a flathead screwdriver to loosen the screws of the primary power pins (labeled PWR +/-) and then insert the negative and positive DC wires. Tighten until snug.

B. For the back-up DC connection, follow the same procedure as above. Attach power wires to the Contact Block (in the position marked RPS +/-)

C. If the Contact Block is not already inserted into the block receptor of the Switch, do so now.

D. Assure your DC power supply is stable and clean before applying DC power to the Switch.

Ethernet Connections

The INS-801 Industrial Fast Ethernet Switch has five 10/100Base-TX Ethernet ports. The 10/100Base-TX ports are located on the Switch's front panel and are used to connect to Ethernet-enabled devices.

LED Indicators

Switch Status LEDs

Besides LED indicators for the 10/100BaseTX ports, the Switch has the following LED status indicators:

Power Indicator (PWR)

This indicator lights green when the Switch is receiving power from primary power supply. Otherwise, it is off.

Redundant Power Supply (RPS)

This indicator lights green when the Switch is receiving power from a redundant power supply. Otherwise, it is off.

Alarm (ALM)

This indicator will light red and will initiate a physical alarm (if such an alarm is connected) if there is a link failure on any port – or if there is a failure of primary or redundant power supply to the Switch.

10/100Base-TX ports

There are two eagle-eye LED's on each 10/100 port. The top LED will illuminate green if the link speed is 100Mbps, and the lower LED will illuminate green if there is link activity. Otherwise, the LED's will be off.

External Alarm Contact

The INS-801 Industrial Switch has one Alarm Contact

connection point located on the green Power Contact Block on the top panel. For detailed instructions on how to connect the Alarm Contact power wires to the two ALM contacts of the 6-contact terminal block connector, see the Procedure for Connecting DC Power in the section above (it is the same procedure).

You can connect the Alarm circuit to any warning device which the user's factory or industry already has installed in the control room or factory floor. When a fault occurs, the Switch will send a signal through the Alarm contact, to activate this external alarm. The Alarm Contact has two terminals that form a Fault circuit for connecting to an alarm system.

An alarm will be signaled in the following situations:
1. Ports 1~5: link failure (e.g.: cable disconnected, device breakdown, etc.)

2. PWR/RPS: Power failure
   a. Power cord is disconnected, power supply malfunction, etc.
   b. Input power is out of the range listed in the specifications (9 ~ 48V)

DIP-switch Settings

DIP-switches let the user manually turn ON/OFF any port, the external Alarm, or the redundant power supply. The

figure below shows the DIP-switch control:

DIP 1 (PWR) controls the primary power external alarm input. Default is OFF.

DIP 2 (RPS) controls the redundant power external alarm input. Default is OFF.

DIP 3-7 represents the alarm for port numbers of the INS-801 Switch respectively. Move the

DIP-switch to the ON position to manually enable the alarm function for the port. Default is OFF.

DIP 8 (QoS) controls the QoS function on port 1 of the Switch. Default is ON.

✓ The following is the **Recommended Procedure** for configuring and setting DIP-switches during initial installation:
   1. Turn all DIP-switches OFF.
   2. Install the INS-801 into your network.
   3. Decide which port(s) need to be monitored or should trigger the alarm.
   4. Turn the corresponding port DIP-switch ON.
   5. Activate the Switch.

Auto-negotiation

The INS-801 Industrial Switch's 10/100Mbps switched RJ-45 ports auto-negotiates with connected devices to determine the fastest data transmission rate supported

by both devices. This helps make the Switch a plug-and-play device. The Switch's RJ-45 ports support full or half duplex, depending on which transmission speed is supported by the attached device.

Switching, Filtering, and Forwarding

Packets entering the INS-801 Switch with source and destination addresses belonging to the same port segment will be filtered, limiting those packets to one port, and relieving the rest of the network from the need to process them. A packet with a destination address served by another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Packets that are used to maintain network operations (such as the occasional multi-cast packet) are forwarded to all ports.

As with all VOLKTEK switches, the INS-801 Industrial Switch operates in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Port Speed & Duplex Mode

After a cable is plugged into a specific port, the system uses auto-negotiation to determine the transmission mode for the new twisted-pair connection:

If the connected device does not support auto-negotiation or has auto-negotiation disabled, an auto-sensing process is initiated to select the speed and set the duplex mode to half-duplex.

TECHNICAL SPECIFICATIONS

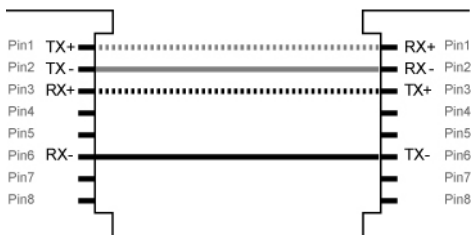| General	
Standards	IEEE 802.3 IEEE 802.3u & IEEE 802.3x
Connectors	5 (five) 10/100BaseTX RJ45
Max Distances	RJ-45 – 100m
Ports	5x10/100Mbps auto-negotiation, auto MDI-X ports
Physical and Environmental	
DC inputs	9-48V DC
Temperature	Operating: 0° ~ 70° C, Storage: -20° ~ 80° C
INS-801W	**Operating: -40° ~ 70° C, Storage: -40° ~ 85° C**
Humidity	Operating: 10% ~ 80%
Dimensions	100 x 50 x 120 mm (D x W x H)
Compliance	FCC Class A, CE approved

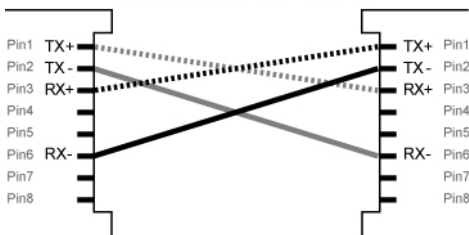| Performance	
Transmission Method:	Store-and-forward, with IEEE802.3x full duplex, non-blocking flow control.
Packet Filtering / Forwarding Rate:	10Mbps Ethernet: 14,880/pps
	100Mbps Fast Ethernet: 148,800/pps
MAC Address Learning:	Update automatically

APPENDIX

RJ-45 Pin Specifications

The RJ-45 ports in the Switch support auto-negotiation and auto MDI/MDI-X. This feature eliminates worries about using a specific cable type. The pin assignment is for the user's reference:
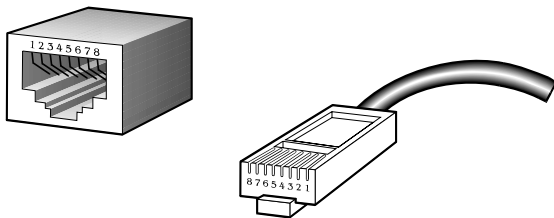
Straight Through Cable Wiring

Cross-Over Cable Wiring

Pin1	TX+		TX+	Pin1
Pin2	TX -		TX -	Pin2
Pin3	RX+		RX+	Pin3
Pin4				Pin4
Pin5				Pin5
Pin6	RX-		RX-	Pin6
Pin7				Pin7
Pin8				Pin8

The standard cable, RJ-45 pin placement

The standard RJ-45 receptacle/connector

VOLKTEK CORPORATION

4F, No. 192 Lian-Cheng Road
Chung-Ho, Taipei 235, Taiwan ROC

TEL: +886 (2) 8242-1000
FAX: +886 (2) 8242-3333

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