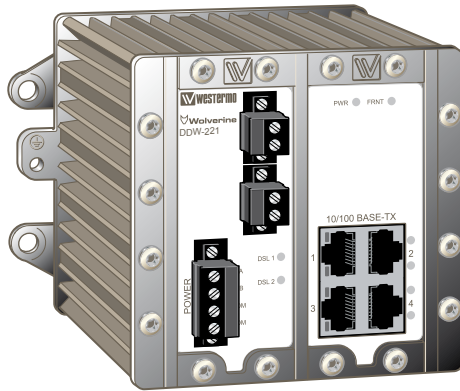


User Guide  
6642-22101



# DDW-221

WOLVERINE SERIES



 **Wolverine**  
*Industrial Ethernet  
SHDSL extender*

[www.westermo.com](http://www.westermo.com)

## **Legal information**

The contents of this document are provided "as is". Except as required by applicable law, no warranties of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to the accuracy and reliability or contents of this document. Westermo reserves the right to revise this document or withdraw it at any time without prior notice.

Under no circumstances shall Westermo be responsible for any loss of data or income or any special, incidental, and consequential or indirect damages howsoever caused.

More information about Westermo can be found at the following Internet address:  
**<http://www.westermo.com>**

## Safety



### **Before installation:**

Read this manual completely and gather all information on the unit. Make sure that you understand it fully. Check that your application does not exceed the safe operating specifications for this unit.

This unit should only be installed by qualified personnel.

This unit should be built-in to an apparatus cabinet, or similar, where access is restricted to service personnel only.

The power supply wiring must be sufficiently fused, and if necessary it must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations.

This unit uses convection cooling. To avoid obstructing the airflow around the unit, follow the spacing recommendations (see Cooling section).



### **Before mounting, using or removing this unit:**

Prevent access to hazardous voltage by disconnecting the unit from power supply. Warning! Do not open connected unit. Hazardous voltage may occur within this unit when connected to power supply.

### **Care recommendations**

Follow the care recommendations below to maintain full operation of unit and to fulfil the warranty obligations.

This unit must not be operating with removed covers or lids.

Do not attempt to disassemble the unit. There are no user serviceable parts inside.

Do not drop, knock or shake the unit, rough handling above the specification may cause damage to internal circuit boards.

Do not use harsh chemicals, cleaning solvents or strong detergents to clean the unit.

Do not paint the unit. Paint can clog the unit and prevent proper operation.

Do not expose the unit to any kind of liquids (rain, beverages, etc). The unit is not waterproof. Keep the unit within the specified humidity levels.

Do not use or store the unit in dusty, dirty areas, connectors as well as other mechanical part may be damaged.

If the unit is not working properly, contact the place of purchase, nearest Westermo distributor office or Westermo Tech support.

A readily accessible disconnect device shall be incorporated external to the equipment.

This unit may have hot surfaces when used in high ambient temperature.

## Maintenance

No maintenance is required, as long as the unit is used as intended within the specified conditions.

## Agency approvals and standards compliance

| Type   | Approved Agency/ W-mo | Approval / Compliance   |
|--------|-----------------------|---|
| EMC    | W-mo                  | EN 61000-6-2, Immunity industrial environments                  |
|        | W-mo                  | EN 55024, Immunity IT equipment                                 |
|        | W-mo                  | EN 61000-6-4, Emission industrial environments                  |
|        | W-mo                  | FCC part 15 Class A   |
|        | W-mo                  | EN 50121-4, Railway signalling and telecommunications apparatus |
| Safety | W-mo                  | EN 60950-1, IT equipment  |
| SHDSL  | NEMKO                 | ITU-T G.991.2   |

### FCC Part 15.105 Notice:

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 and, if not installed and used in accordance with the instructions, 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.

# Declaration of Conformity



Westermo Teleindustri AB

## Declaration of conformity

The manufacturer Westermo Teleindustri AB  
SE-640 40 Stora Sundby, Sweden

Herewith declares that the product(s)

| Type of product | Model                    | Art no    | Installation manual |
|-----------------|--------------------------|-----------|---------------------|
| DIN-rail        | Wolverine series DDW-22x | 3642-02xx | 6642-22xxx          |

is in conformity with the following EC directive(s).

| No         | Short name                          |
|------------|-------------------------------------|
| 89/336/EEG | Electromagnetic Compatibility (EMC) |
| 73/23/EEG  | Low Voltage Directive - LVD         |

References of standards applied for this EC declaration of conformity.

| No           | Title   | Issue    |
|--------------|---|----------|
| EN 61000-6-2 | Immunity for industrial environments  | 2 (2001) |
| EN 61000-6-1 | Immunity for residential, commercial and light-industrial environments  | 1 (2001) |
| EN 55024     | Information technology equipment – Immunity   | 1 (1998) |
| EN 50121-4   | Railway applications – Electromagnetic compatibility – Emission and Immunity of the signalling and telecommunications apparatus |          |
| EN 61000-6-4 | Emission standard for industrial environments   | 1 (2001) |
| EN 60950     | Safety of information technology equipment  | 6 (2006) |

The last two digits of the year in which the CE marking was affixed: 08

Herewith declares that product(s) listed above is in conformity with

| No                  | Title                   | Issue |
|---------------------|-------------------------|-------|
| FCC part 15 Class A | Radio frequency devices |       |



Signature

Pierre Öberg  
Technical Manager  
14th April 2008

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|                                 |                               |                               |            |           |                                  |                   |
|---------------------------------|-------------------------------|-------------------------------|------------|-----------|----------------------------------|-------------------|
| Postadress/Postal address       | Tel.                          | Telefax                       | Postgiro   | Bankgiro  | Org.nr/<br>Corp. Identity number | Registered office |
| S-640 40 Stora Sundby<br>Sweden | 016-428000<br>Int+46 16428000 | 016-428001<br>Int+46 16428001 | 52 72 79-4 | 5671-5550 | 556361-2604                      | Eskilstuna        |

## Type tests and environmental conditions

| Phenomena                      | Test           | Description                         | Test levels  |
|--------------------------------|----------------|-------------------------------------|--|
| ESD                            | EN 61000-4-2   | Enclosure contact                   | ± 6 kV   |
|                                |                | Enclosure air                       | ± 8 kV   |
| RF field AM modulated          | IEC 61000-4-3  | Enclosure                           | 20 V/m 80% AM (1 kHz), 80 – 1000 MHz<br>10 V/m 80% AM (1 kHz), 1400 – 2100 MHz<br>5 V/m 80% AM (1 kHz), 2100 – 2500 MHz<br>1 V/m 80% AM (1 kHz), 2500 – 2700 MHz |
| Fast transient                 | EN 61000-4-4   | Signal ports                        | ± 2 kV   |
|                                |                | Power ports                         | ± 2 kV   |
| Surge                          | EN 61000-4-5   | Signal ports balanced               | ± 2 kV line to earth, ± 1 kV line to line  |
|                                |                | Power ports                         | ± 2 kV line to earth, ± 2 kV line to line  |
| RF conducted                   | EN 61000-4-6   | Signal ports                        | 10 V 80% AM (1 kHz), 0.15 – 80 MHz   |
|                                |                | Power ports                         | 10 V 80% AM (1 kHz), 0.15 – 80 MHz   |
| Power frequency magnetic field | EN 61000-4-8   | Enclosure                           | 300 A/m  |
| Pulse magnetic field           | EN 61000-4-9   | Enclosure                           | 300 A/m  |
| Mains freq. 50 Hz              | EN 61000-4-16  | Signal ports                        | 100 V 50 Hz line to earth  |
| Mains freq. 50 Hz              | SS 436 15 03   | Signal ports                        | 250 V 50 Hz line to line   |
| Voltage dips and interruption  | EN 61000-4-29  | DC power ports                      | 10 & 100 ms, interruption<br>10 ms, 30% reduction<br>10 ms, 60% reduction<br>+20% above & -20% below rated voltage   |
| Radiated emission              | EN 55022       | Enclosure                           | Class A  |
|                                | FCC part 15    |                                     | Class A  |
| Conducted emission             | EN 55022       | DC power ports                      | Class B  |
| Dielectric strength            | EN 60950       | Signal port to other isolated ports | 1500 Vrms 50 Hz 1 min  |
|                                |                | Power port to other isolated ports  | 2000 Vrms 50 Hz 1 min  |
| Temperature                    |                | Operating                           | -40 to +70°C   |
|                                |                | Storage & Transport                 | -40 to +70°C   |
| Humidity                       |                | Operating                           | 5 to 95% relative humidity   |
|                                |                | Storage & Transport                 | 5 to 95% relative humidity   |
| Altitude                       |                | Operating                           | 2 000 m / 70 kPa   |
| Reliability prediction (MTBF)  | MIL-HDBK- 217F | Operating                           | 700 000 hours @ 25°C   |
| Vibration                      | IEC 60068-2-6  | Operating                           | 7.5 mm, 5 – 8 Hz 2 g, 8 – 500 Hz   |
| Shock                          | IEC 60068-2-27 | Operating                           | 15 g, 11 ms  |
| Enclosure                      | UL 94          | Aluminium/Zink                      | Flammability class V-0   |
| Dimension W x H x D            |                |                                     | 134 x 105 x 122 mm   |
| Weight                         |                |                                     | 1,5 kg   |
| Degree of protection           | IEC 529        | Enclosure                           | IP40   |
| Cooling                        |                |                                     | Convection   |
| Mounting                       |                |                                     | Horizontal on 35 mm DIN-rail   |

## Description

The DDW-221 is an Industrial Ethernet SHDSL extender with support for redundancy. The redundant protocol can be used either on the SHDSL interface or on the built-in Ethernet switch.

Our unique FRNT (Fast Recovery of Network Topology) technology is the fastest protocol on the market to re-configure a network in the event of any failure of a link or hardware.

SHDSL represents the best of several symmetric DSL technologies. This unit provides the ability to reuse existing twisted copper pair with data rates from 192 kbit/s to 5.7 Mbit/s in both directions. The DDW-221 makes it possible to communicate over 10 km (6.2 miles) on twisted pair cable.

The DDW-221 is a bridge not router and so is simple to install. All configuration is done using a web interface.

The DIN rail mounted DDW-221 is designed for harsh environments and can be used in industrial and railway applications. It can be powered from two separate supplies and handle an operating voltage range of 16 – 60 VDC.

- ⌘ Redundant protocol (FRNT) on SHDSL or on the Ethernet switch
- ⌘ 192 kbit/s to 5.7 Mbit/s
- ⌘ Over 10 km (6.2 miles) on twisted pair
- ⌘ Daisy chain SHDSL applications
- ⌘ Wide temperature range (–40 to +70°C) (–40 to 158°F)
- ⌘ Total galvanic isolation & transient protection
- ⌘ Industrial and Rail EMC approvals
- ⌘ Redundant power and wide DC input range
- ⌘ Configuration using web interface
- ⌘ Integrated 4-port Ethernet switch with 10/100Base-TX
- ⌘ Auto MDI/MDI-X
- ⌘ Auto speed on SHDSL with reliable, normal or high-speed mode
- ⌘ Comprehensive statistics
  - SHDSL
  - Ethernet
- ⌘ SNMP support
- ⌘ Extensive line protection with over-current / voltage suppression

### Diagram showing speed versus distance

|             | DDW-221 @ 0.5 mm <sup>2</sup> | DDW-221 @ 0.4 mm <sup>2</sup> |
|-------------|-------------------------------|-------------------------------|
| Speed bit/s | Distance metre / miles        | Distance metre / miles        |
| 192000      | 10000 / 6.21                  | 6450 / 4.00                   |
| 1024000     | 7650 / 4.75                   | 4850 / 3.01                   |
| 1280000     | 7050 / 4.38                   | 4700 / 2.92                   |
| 2304000     | 5950 / 3.69                   | 4150 / 2.58                   |
| 3328000     | 4900 / 3.04                   | 3700 / 2.30                   |
| 4544000     | 4250 / 2.64                   | 3150 / 1.95                   |
| 5696000     | 3650 / 2.26                   | 2800 / 1.73                   |

Distance is tested without noise.

## Interface specifications

### Power

|                                  |   |
|----------------------------------|---|
| Rated voltage                    | 20 to 48 VDC                            |
| Operating voltage                | 16 to 60 VDC                            |
| Rated current                    | 300 mA @ 20 VDC<br>150 mA @ 48 VDC      |
| Rated frequency                  | DC                                      |
| Inrush current, I <sup>2</sup> t | 3.1 A <sup>2</sup> s                    |
| Startup current*                 | 400 mA                                  |
| Polarity                         | Reverse polarity protected              |
| Redundant power input            | Yes                                     |
| Isolation to                     | Ethernet, SHDSL                         |
| Connection                       | Detachable screw terminal               |
| Connector size                   | 0.2 – 2.5 mm <sup>2</sup> (AWG 24 – 12) |
| Shielded cable                   | Not required                            |

\* If external power supply is used it must meet specified inrush current.

### SHDSL

|                          |   |
|--------------------------|---|
| Electrical specification | ITU-T G.991.2 Annex B                                     |
| Data rate                | 192 kbit/s to 5696 kbit/s                                 |
| Protocol                 | EFM according to IEEE 802.3-2004                          |
| Transmission range       | According to ITU-T G.991.2 depending on the line quality  |
| Protection               | Overcurrent / overvoltage protection circuit and varistor |
| Isolation to             | Power, Ethernet   |
| Connection               | Detachable screw terminal                                 |
| Connector size           | 0.2 – 2.5 mm <sup>2</sup> (AWG 24 – 12)                   |
| Shielded cable           | Not required  |
| Number of ports          | 2   |

### Ethernet TX

|                          |   |
|--------------------------|---|
| Electrical specification | IEEE std 802.3 2000 Edition   |
| Data rate                | 10 Mbit/s, 100 Mbit/s, manual or auto   |
| Duplex                   | Full or half  |
| Transmission range       | 100 m / 328 ft  |
| Isolation to             | Power, SHDSL  |
| Connection               | RJ-45   |
| Shielded cable           | Not required, except when installed in Railway applications as signalling and telecommunications apparatus and located close to rails** |
| Number of ports          | 4 ports marked as 1, 2, 3, 4  |

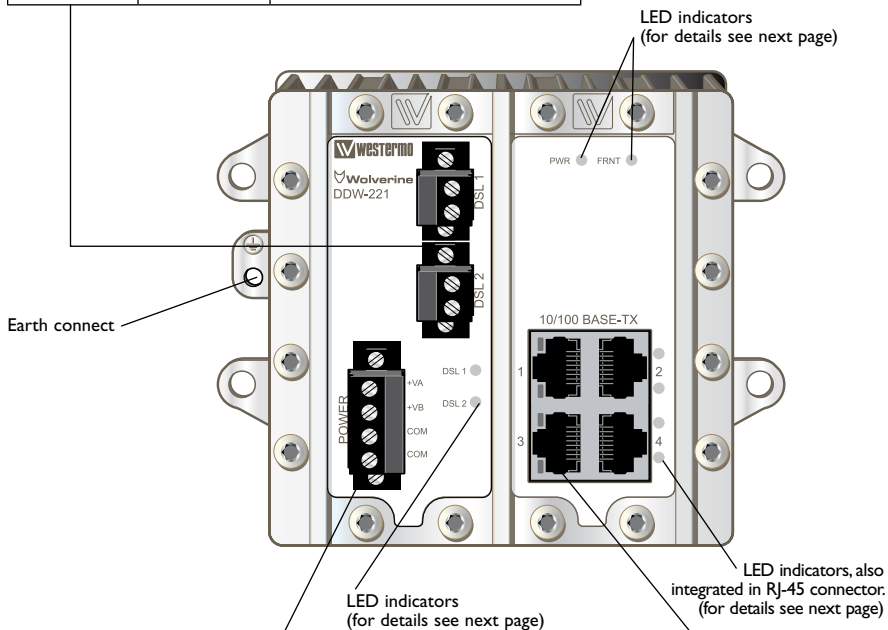
\*\* To minimise the risk of interference, a shielded cable is recommended when the cable is located inside 3 m boundary to the rails and connected to this port.



## Connections

### DSL screw connector 1 & 2

| Position | Direction | Description                    |
|----------|-----------|--------------------------------|
| 1        | In/Out    | 2-wire Receive/ Transmit SHDSL |
| 2        | In/Out    | 2-wire Receive/ Transmit SHDSL |



### Power connection

| Position | Direction* | Description |
|----------|------------|-------------|
| 1        | In         | + Voltage A |
| 2        | In         | + Voltage B |
| 3        | In         | Common      |
| 4        | In         | Common      |

### Ethernet TX connection (RJ-45 connector) 1 – 4\*\*

| Position | Direction* | Description   |
|----------|------------|---------------|
| 1        | In/Out     | TD+           |
| 2        | In/Out     | TD-           |
| 3        | In/Out     | RD+           |
| 4        | -          | Not Connected |
| 5        | -          | Not Connected |
| 6        | In/Out     | RD-           |
| 7        | -          | Not Connected |
| 8        | -          | Not Connected |

CAT 5 cable is recommended. Unshielded (UTP) or shielded (STP) connectors can be used.

\* Direction relative this unit

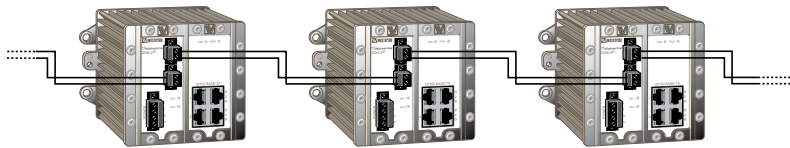
\*\* To minimise the risk of interference, a shielded cable is recommended when the cable is located inside 3 m boundary to the rails and connected to this port. The cable shield should be properly connected (360°) to an earthing point within 1 m from this port. This earthing point should have a low impedance connection to the conductive enclosure of the apparatus cabinet, or similar, where the unit is built-in. This conductive enclosure should be connected to the earthing system of an installation and may be directly connected to the protective earth.

## LED indicators

| LED                                       | Status           | Description   |
|---|------------------|---|
| PWR                                       | OFF              | No power  |
|   | ON (green)       | Booting ready, unit ready   |
|   | ON (red)         | Unit is booting   |
| FRNT                                      | OFF              | FRNT disabled   |
|   | ON (green)       | FRNT enabled and unit is ring member, ring ok   |
|   | Flashing (green) | FRNT enabled and unit is focal point, ring ok   |
|   | Flashing (red)   | FRNT error and unit is focal point, ring broken   |
|   | ON (red)         | FRNT error according to the following <ol style="list-style-type: none"> <li>1. If unit is ring member at least one trunk port is down</li> <li>2. If unit is focal point ring is not intact</li> </ol> |
| 10/100BASE-TX<br>Port 1 – 4<br>Green LED  | OFF              | No link   |
|   | ON               | Link active   |
|   | Flashing         | Traffic on link   |
| 10/100BASE-TX<br>Port 1 – 4<br>Yellow LED | OFF              | No port alarm   |
|   | ON               | Port alarm  |
| DSL<br>Port 1 – 2                         | OFF              | No link   |
|   | ON (green)       | Link established  |
|   | ON (red)         | Unit is booting   |
|   | Flashing (green) | Link negotiation  |
|   | Flashing (red))  | Downloading firmware to DSL chip  |

### Daisy chain SHDSL connection

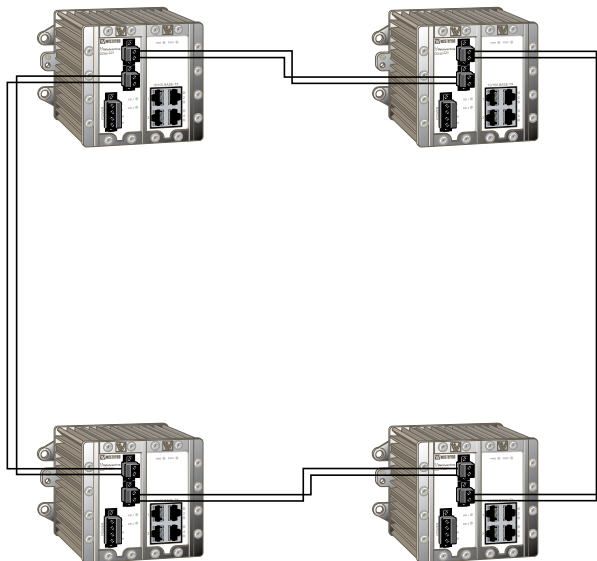
The default configuration of the units allow for an Ethernet extension to be made. Connect DSL 1 to DSL 2 on the following units to obtain a chain of linked units.



### Redundant SHDSL connection

The DDW-221 are available with redundant ring technology. This eliminates network failure caused by communication failures on the ring ports. In a ring application one unit must be configured as focal point, all other units will be configured as members.

Connect DSL 1 to DSL 2 on the following units to obtain a chain of linked units.



## Configuration

The unit can easily be configured via the onboard Web based configuration tool. Local IP addresses can also be configured by using the Westermo IP Config too. From the IP Config tool it is then possible to browse into the unit for further configuration.

### IP Address

When delivered, the default IP address of the DDW-2XX is 192.168.2.200.

The default gateway is 192.168.2.200

If the default address of the unit is valid in the connected network it is possible to access the unit directly from a web browser.

### Change local IP address

The local address of DDW-2XX can be configured using the IP Configuration tool.

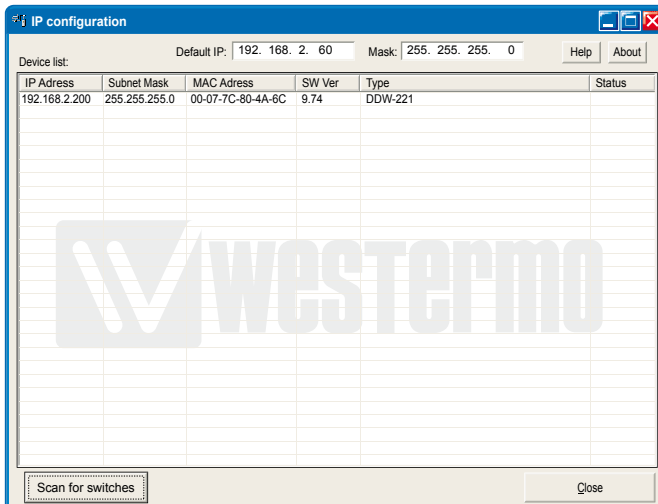
The IP Configuration program is available on the CD or for download from the WESTERMO web page: <http://www.westermo.com>, (choose Downloads/Software/Ethernet/Ethernet switches/)

Name: setup.exe

Install the software and start the application from a PC on the network connected to where the DDW-2XX is installed. Make sure that the Default IP of the configuration software (see figure below) is in the same subnet as your PC.

**Note!** If you are not sure about the subnet – consult your network administrator.

**Note!** IP Config version must be 9.8.5 or higher.



**Note!** If you are not sure about the settings - consult your network administrator.

Figure 1

By clicking the Scan for switches button the IP Configuration Software will detect the Westermo switches on the network. The software will list all Westermo managed switches or routers connected to the network. Information as in figure 1 will appear for each detected unit connected to the same network as your PC.

If you only want to change the IP address and the subnet mask, this can be done within the IP config tool.

1. Click the listed DDW-2XX that you wish to re-configure.
2. A pop-up screen will show with the message “Access switch via web”. Click Cancel, figure 2.
3. Enter the preferred IP address, Subnet mask and IP gateway address, figure 3. Click Set-button to confirm the settings in the unit, figure 3.

Click the Scan for switches button again and the settings you configured will appear in the list. Now you can access the DDW-2XX via the browser for further configuration by clicking the unit with an IP address that fits your subnet. Figure 2 will appear and now you click the OK button and a web browser will be opened and redirected to the DDW-2XX unit login page, figure 5.

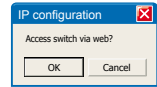
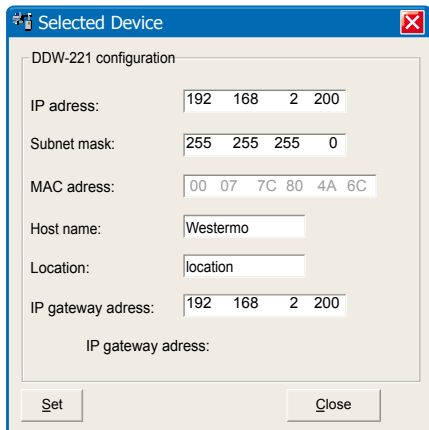


Figure 2



Click the Close button to get back to main view. You will then be asked if you would like to quit. Click the OK button, figure 4, and you will be back to the main view of the IP Configuration program (see figure 1).

Figure 3

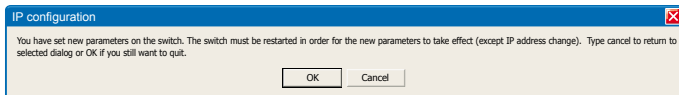
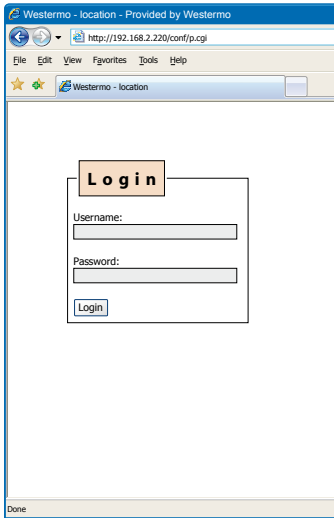


Figure 4



## Log in via Web

You will be prompted with a Login screen where the default settings for Username and Password are:  
Username: admin  
Password: westermo

Figure 5

The unit can be easily configured via the on-board Web based configuration tool. The network interface and switch properties can be configured and stored. The Web tool also has an extended integrated help function describing all configuration options.

**Note!** Max 10 characters can be used in the login.

**Note!** For login the following characters are not valid.

ASCII 34 = "

ASCII 35 = #

ASCII 39 = "

ASCII 40 = (

ASCII 92 = \

## Simple Network Management Protocol (SNMP)

The DDW-2XX supports Simple Network Management Protocol version 1 and 2c (SNMPv1 and SNMPv2c). SNMP is an Internet standard protocol (IP) developed to manage IP nodes (servers, workstations, routers, switches and hubs etc.) on an Ethernet network.

SNMP enables network administrators and control engineers to manage network performance, find and solve network problems, and plan for network growth.

The DDW-2XX MIB's are divided into groups allowing the SNMP manager to poll the SNMP agents for information.

## **Factory default**

It is possible to set the unit to factory default settings by using two Ethernet cables and connect to the unit.

To set the unit to factory default do the following:

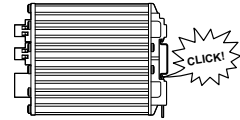
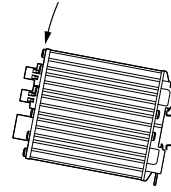
1. Connect Ethernet cable from port 1 to port 4.
2. Connect Ethernet cable from port 2 to port 3.
3. Power up the unit.
4. Wait for the unit to start up. Control that the PWR led is flashing green.  
The PWR flashing indicates that the unit will be set to factory default.
5. Remove the Ethernet cables, the unit will automatically start with factory default settings.

**Note!** The Ethernet cables must be removed within 30 seconds from power up or the unit will do a normal start up.

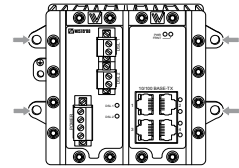
## Mounting

This unit should be mounted on 35 mm DIN-rail, which is horizontally mounted inside an apparatus cabinet or similar. Snap on mounting, see figure.

35 mm DIN-rail shall be mounted with a maximum distance of 70 mm between the mounting points.

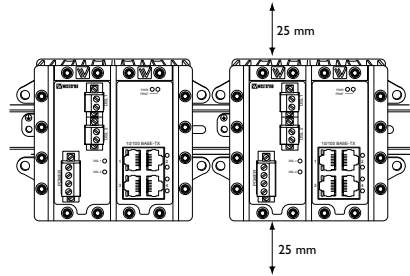


This unit can also be wall-mounted, see figure.



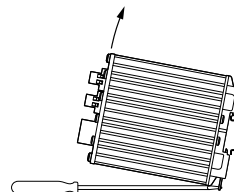
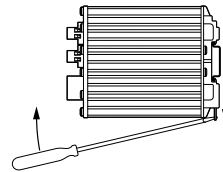
## Cooling

This unit uses convection cooling. To avoid obstructing the airflow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above /below the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.



## Removal

Press down the support at the back of the unit using a screwdriver. See figure.













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**Westermo Web site: [www.westermo.com](http://www.westermo.com)**

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