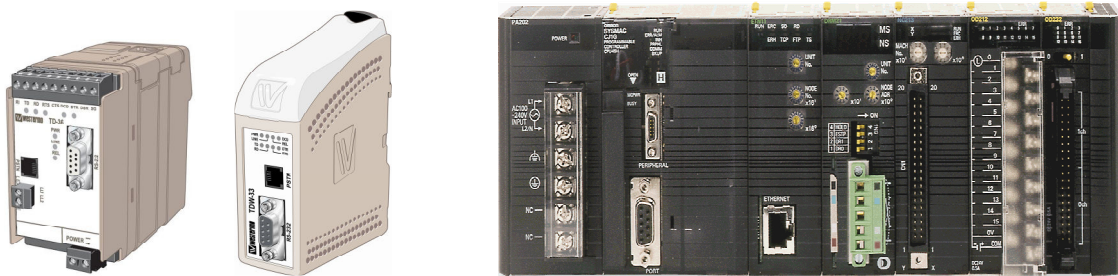


Omron & Westermo Modems

Remote Access Solutions



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Introduction

There are many PLC applications that require a Remote connection, from Monitoring data, SCADA control to PLC programming and register data adjustment. All of these applications require a reliable connection in a variety of industrial conditions. Westermo modems provide a reliable connection for these harsh industrial connections which can save an Engineer a costly trip to site or provide a communications link to a hazardous area.

This Application Note provides detailed information on connecting Westermo Modems and the range of PLC's available from Omron. The following configurations have been tested and approved by both Westermo and Omron Technical Support.

The equipment and versions required are as follows:

1x Laptop or Desktop PC with Modem and the following software pre-loaded

- Omron CX Programmer V5.0 or above
- Omron CX Server V2.2 or above
- Omron Modem Support tool V1.0.0.4 or above
- TDTool2, GDTool or Windows Hyperterminal or similar Terminal package

1x Modem to PC lead if external PC modem used

- For 9 pin D type on Modem use Westermo cable Article number 9450-0003
- For 25 pin D type on Modem use Westermo cable Article number 9450-0002

2x Analogue telephone lines

or a Westermo Analogue Line simulator, Article number 9045-001

1x Omron PLC e.g. CPM2* Series / CQM1 Series / CJ Series / CS series / C200H Series

1x Omron PLC Programming Cable e.g. CS1W-CN226 for a CJ PLC - available from Omron

1x Westermo Modem to Omron 70cm cable. Westermo Article numbers shown below

- 9450-0322 for TDW33, TD36, TD36/485, TD-35, GDW11 and other older Westermo Modems such as a TD-33 and GD-01 (2m cable also available)
- 9450-0312 for a TD32B Modem (2m version also available)

1x Westermo Modem e.g. TDW33, TD-36, TD36/485, GDW11

or an older Westermo Modem such as a TD32B or TD-35

Section 1 - Setup of RS232 Ports on Omron PLCs

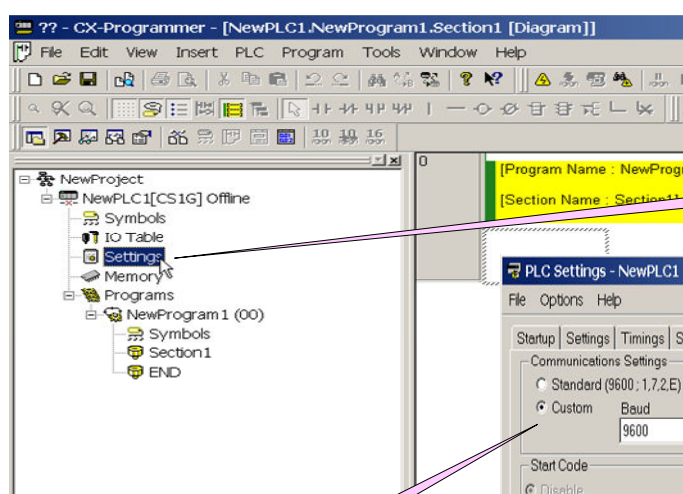
To ensure reliable and efficient communications we recommend changing the default settings of the PLC's RS232 port to the following:

9600, 8 Data bits , No parity and 1 Stop bit using SYSMAC WAY as the Protocol

These settings ensure the best compatibility with a wide range of Modems such as built in PC modems which are normally setup for basic Internet access rather than PLC protocols.

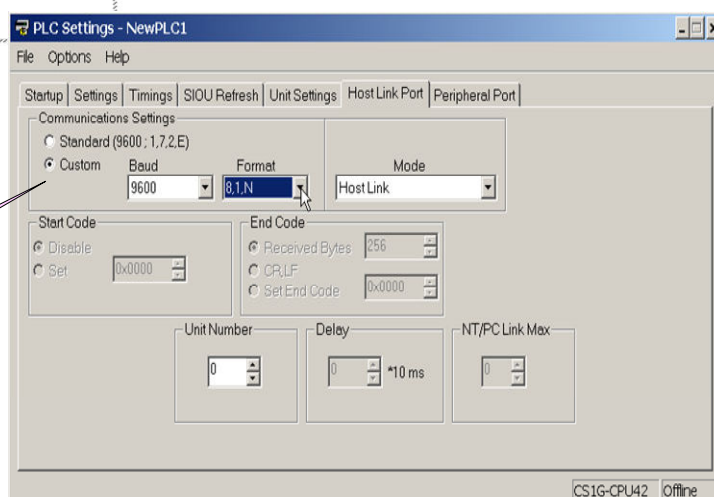
The RS232 port that will be used for the Modem connection will need to be setup prior to the Modem setup and testing. This requires that the PLC is placed in program mode and the new port settings will have to be Transferred to the PLC.

ALWAYS ENSURE THAT THE PLANT BEING CONTROLLED IS SAFE BEFORE CHANGING THE PLC PROGRAM STATE.



Open the PLC Project in CX Programmer and Select the Settings menu for the PLC that will be used with the Modem Connection

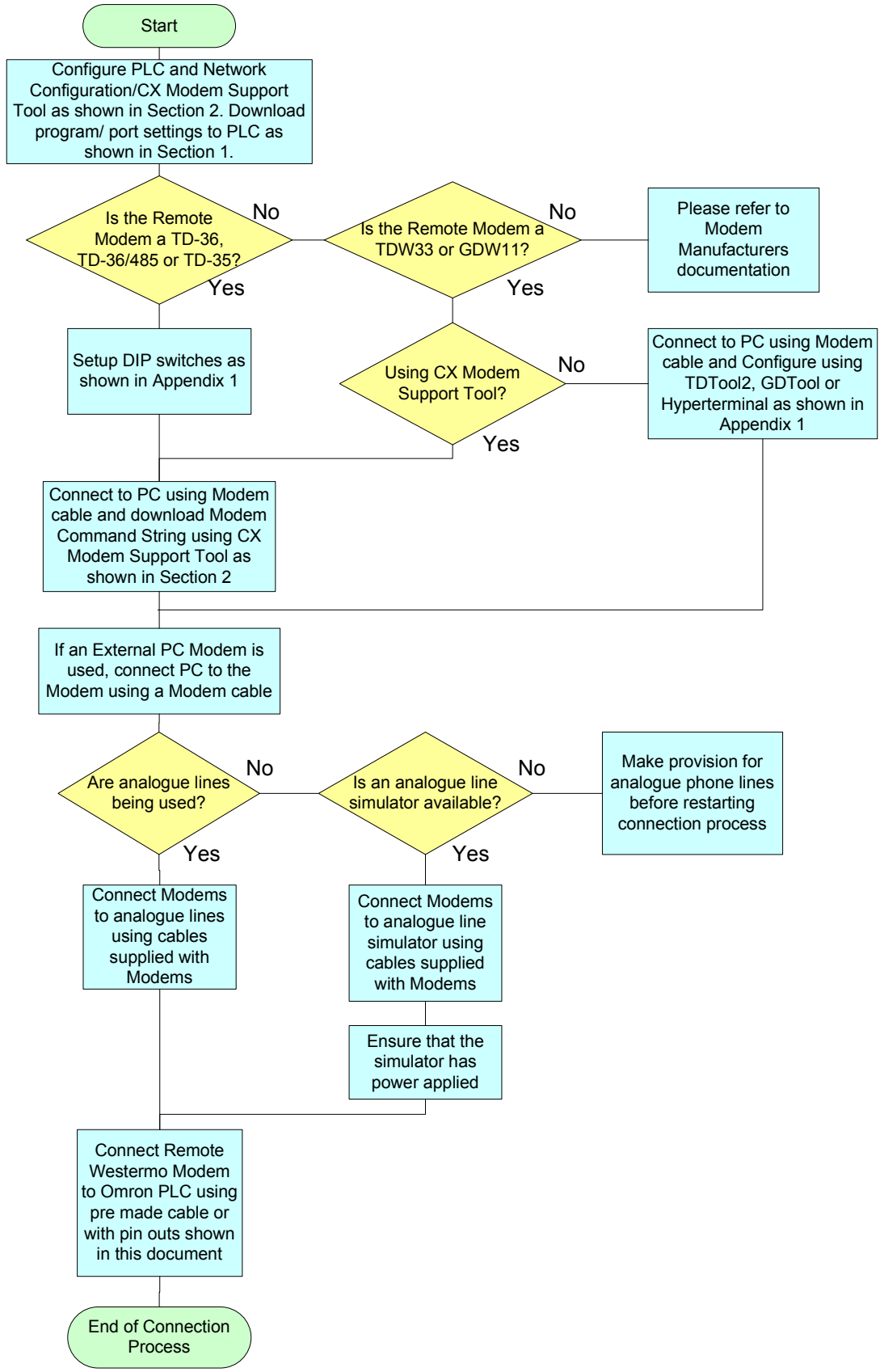
Select the Host Link Tab and then Change settings to: Custom, 9600,81N, Hostlink.



NOTE:

When using an RS232 port on a Serial Communications module, use the IO table to setup and transfer the same custom port settings and ensure that the correct Unit Number is selected for the module being used, when making a connection to the PLC.

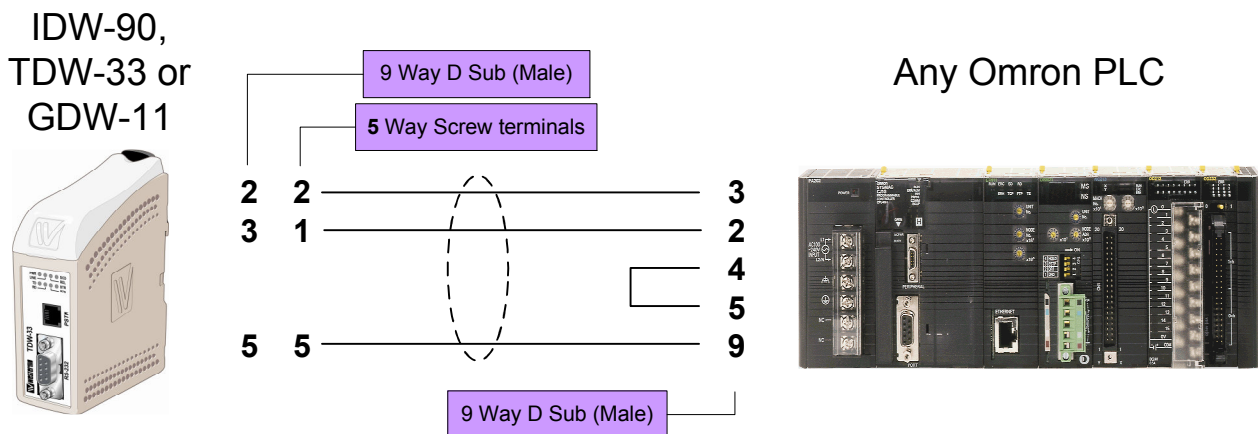
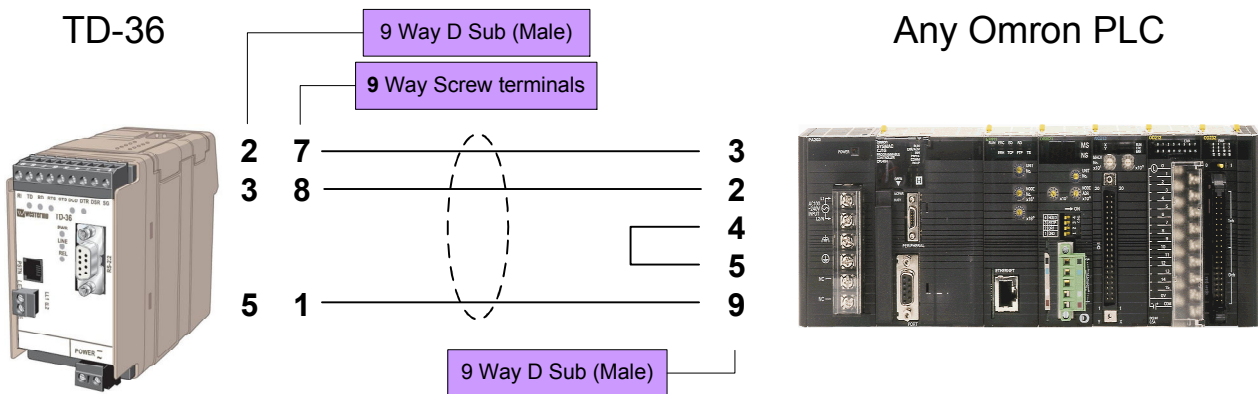
Section 1 - Connecting the Westermo Modems to the Omron PLC



Section 2 - Cable Pin Out Connections

Note: Omron PLC

The Host Link Port control switch on the PLC should be set to OFF to use the user defined port parameters. This is usually DIP switch 5 or 6 on the processor switch block (depending on PLC model), except the CPM2A which has just one dedicated Port Settings Switch. Please see the Omron PLC manual for details of DIP switch settings.



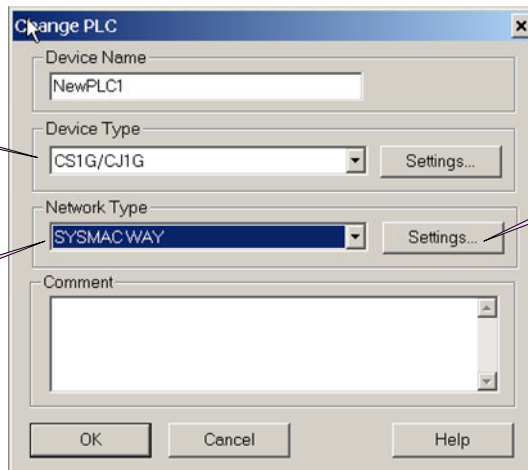
Please Note:

Ready made cables are available from Westermo. The Article number for 70 cm long cables are as follows:

9450-0322 (MC9-OMHL-70cm) for TDW33, TD-36, TD-36/485, IDW-90 & GDW-11
(2m version cable also available)

Section 2 - Set up of PLC in CX Programmer for Modem Dialup Connection

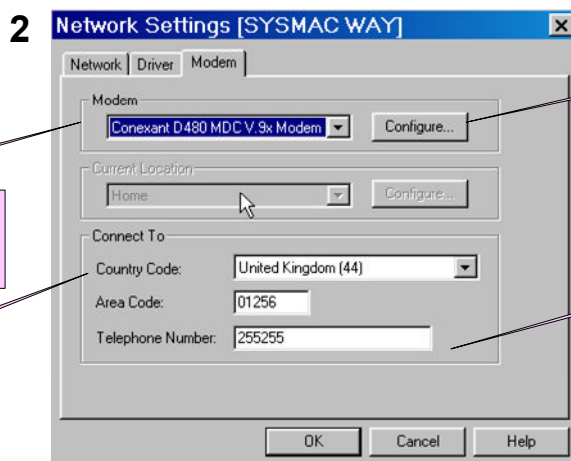
1 Double Click on PLC in CX Programmer Project then Select the PLC type



Then select Settings

Select preferred bus type to be SYSMAC WAY

Once all of the Phone Numbers and Codes have been entered, select Configure

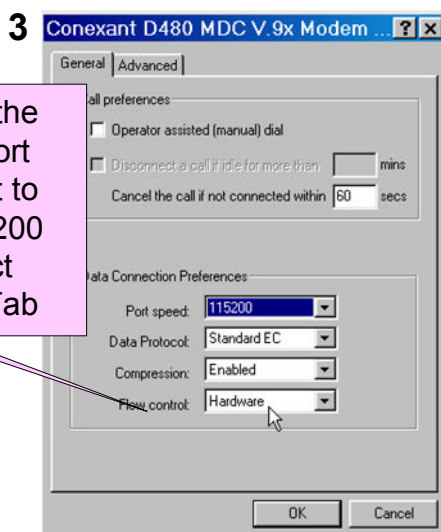


Select the Modem at the PC end to be used

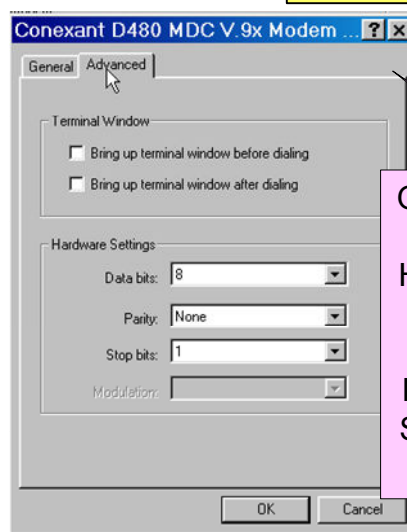
Enter the telephone number of the Westermo Modem at the Remote PLC

Ensure that the correct country and area code is entered

Note: For Outside Line access e.g. '9' use the Dialling Rules setup under Windows Phone and Modem Options in the Windows Control Panel



Check that the Modems Port speed is set to Default 115200 then select Advanced Tab

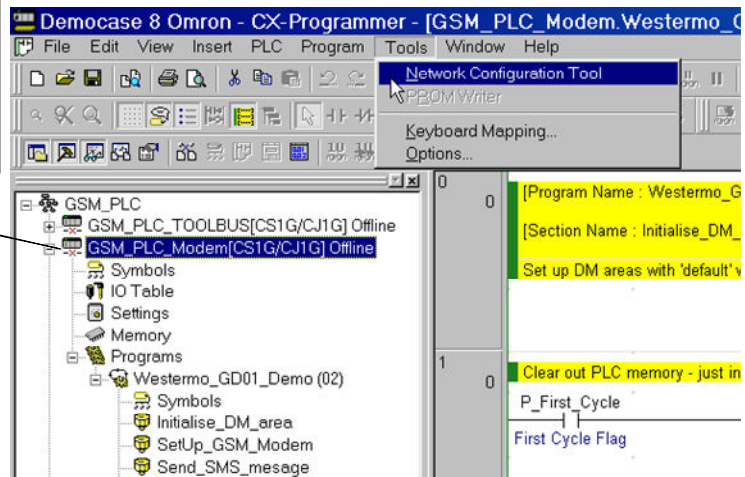


On Advanced Tab, check that the Hardware Settings are set to the Default of 8 Data, None Parity and 1 Stop Bit then Click on OK button

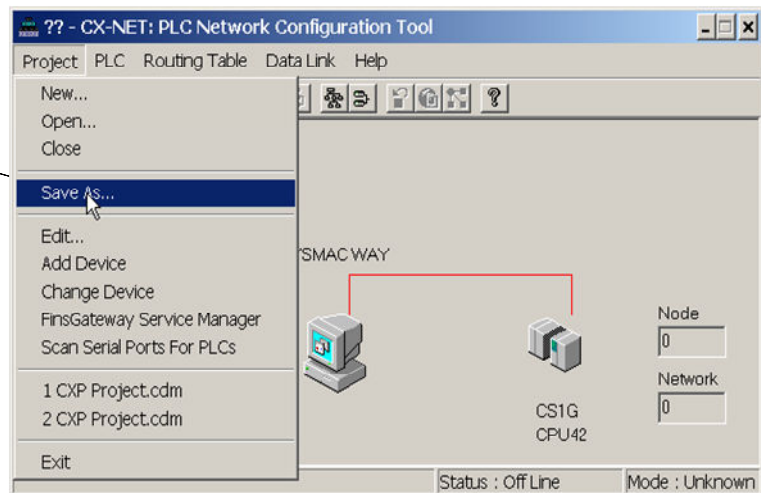
Section 2 - Network Configuration Tool

The Network Configuration Tool is used to configure and test the network connections on the PLC's within a CX Programmer/Server Project. It is also used to create the Project file that the Modem Support Tool can access to setup and test the Modems and the link.

In CX Programmer, Select the PLC that will use a Modem connection, then open the Network Configuration Tool under Tools on the Main Menu



In the Network Configuration Tool, select Project then Save As. Enter a filename.cdm and make a note of the path to the file as this will be required in the Modem Support Tool.



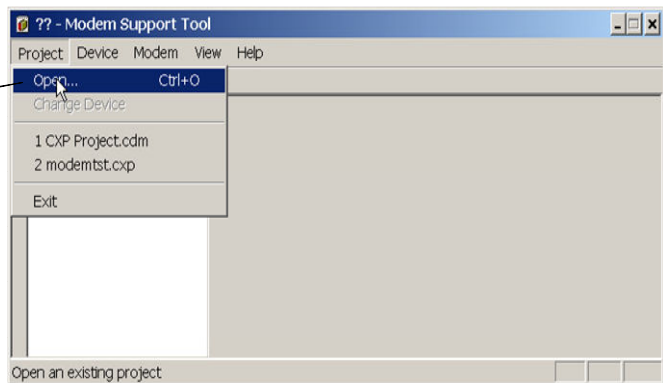
Section 2 - Omron CX Modem Support Tool

Information

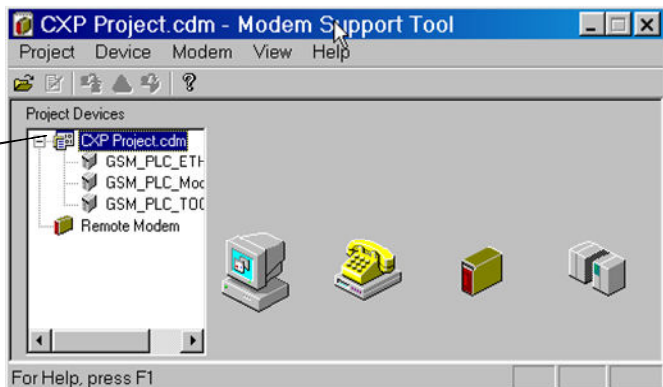
The Omron CX Modem Support Tool is used to configure and test the PLC Modem link that has been configured in a CX Programmer / Server Project. The software is available as a free download for Registered users of CX Programmer V5 and above from the Omron website.

The current release of the Tool (V1.0.0.4) has an incorrect setting on each of the Modems. Updated Modem Command Strings are available at either www.omron.co.uk or at www.westermo.co.uk and can then be saved locally on the PC to C:\Program Files\Omron\Modem Support Tool\Modems.

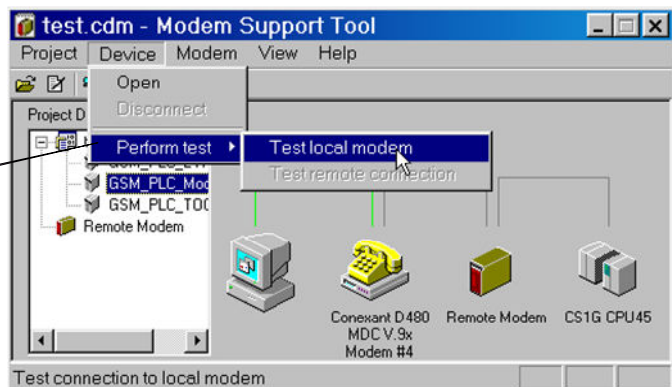
The Modem Support Tool is located in the Omron Programs folder on the Windows START menu. Once the Tool is running, Select Project then Open and locate the filename.cdm Project file that was created with the Network Configuration Tool



Select the PLC from the Project that will be connecting via the modem link. The PC modem and PLC should now have some details underneath their icons.

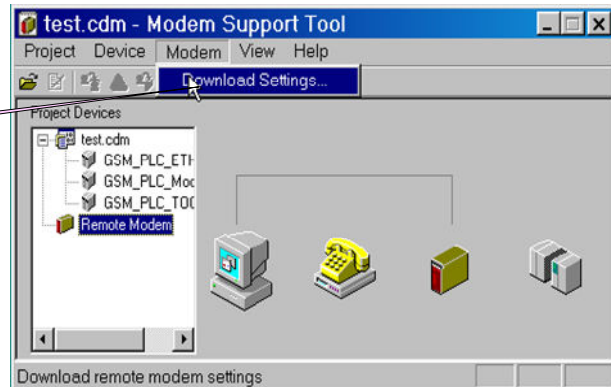


To test the Modem at the PC end, select Device, Perform test then Test local modem. The test will run and then should display Test Passed or will open a help file on a failure.

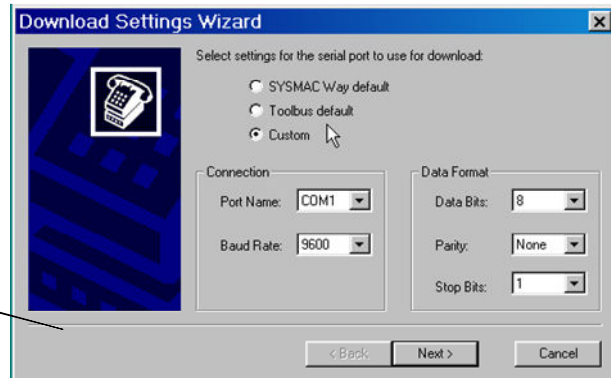


Section 2 - Omron CX Modem Support Tool

To setup the Remote Modem, connect the PC directly to the Modem using the Modem Cable. Select Remote Modem under Project Devices then Select Modem, Download Settings from the Main Menu.



Select Custom, Com1 (change if connected to another com port on the PC), 9600, 8, None, 1. Then click on Next.



Select the Modem type from the list. Then click on Download. It is also possible to add a new modem and edit/view the existing Modem command strings here.



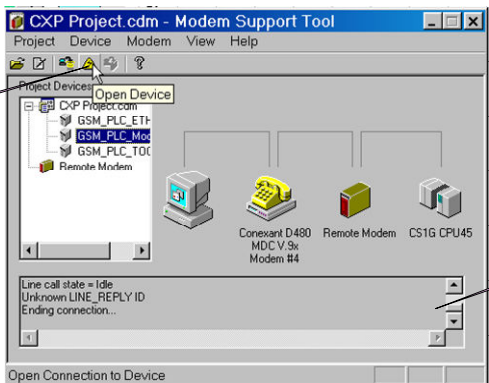
The Modem command string to be sent to the Modem will now be displayed followed by Download complete. Click on Close to finish. **Now reconnect the Omron PLC cable to this Modem**



Section 3- Testing of the Modem Connection to the PLC

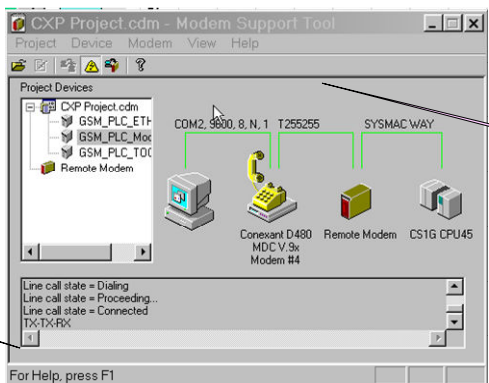
1. Using CX Modem Support Tool

To test the Modem link to the PLC using the CX Modem Support Tool select Device then Open on the Main Menu or use the button on the Toolbar.



To display Modem Connection Diagnostics, Enable them from under View on the Main Menu.

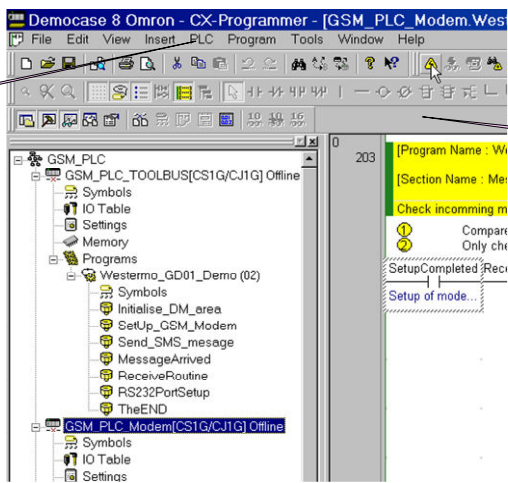
On a good connection, the diagram will show a highlighted path to each device and the Diagnostics will show "Connected". On a failure to connect the diagram will show which device the connection path failed on and provide a choice for displaying a help file.



To close the connection, select Device then Disconnect and the Modems will hang up

2. Using CX Programmer

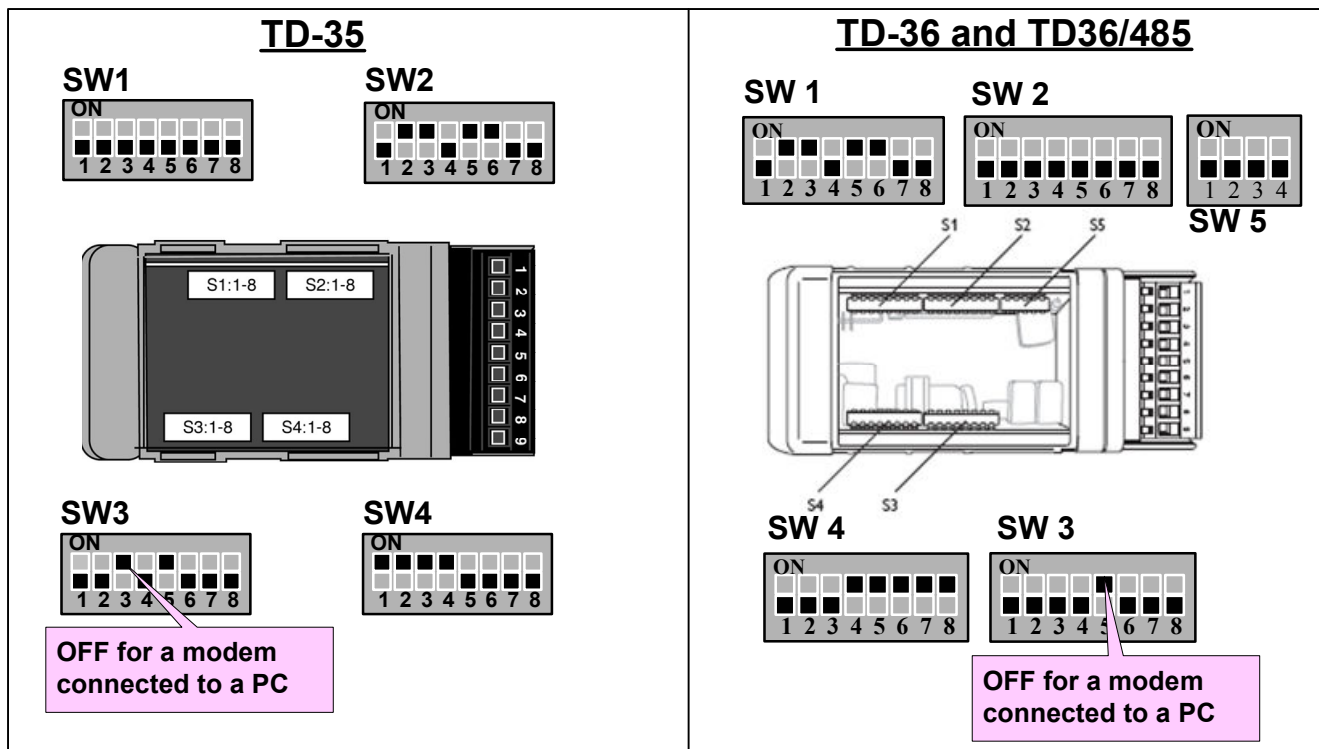
Now that the Communications link has been proven, it is now possible to select Work Online from under PLC on the Main Menu in CX Programmer or from the icon on the Toolbar after first selecting the PLC that has been configured for the Modem link within the Project. The Modems will now dial and CX Programmer will go online to the PLC.



To shutdown the connection, just re-select Work Online using the same method used to go online to the PLC. This will disconnect the Modem link as well.

Appendix 1 - Switch Settings and TDTTool2

It is also possible to use the DIP Switches to configure the Westermo Modems, TD-36, TD-36/485 and TD-35, instead of using the CX Modem Support Tool or a Terminal package, such as Hyperterminal, to enter the Modem Command Strings. The DIP Switch settings shown below are the recommended settings for these Modems.



TDW33

The TDW33 is configured using TDTTool 2 which is delivered with the modem. The Windows based tool allows for simple configuration of the modem using pulldown options for the AT command strings. TDTTool 2 can also be used to configure the TD36 and TD36/485 modems. **Once the configuration has been entered on each screen select WRITE to store the new profile in the modem.**

1) Connect Using Auto baud and a MC9/9 cable from PC

2) On Basic Tab, Set the command %E0

3) On Serial Tab, Set to 9600, 8, N, 1 and also set the commands Q1E0&C1&K0&D0 at the PLC modem and Q0E1&C1&K0&D2 at the PC modem

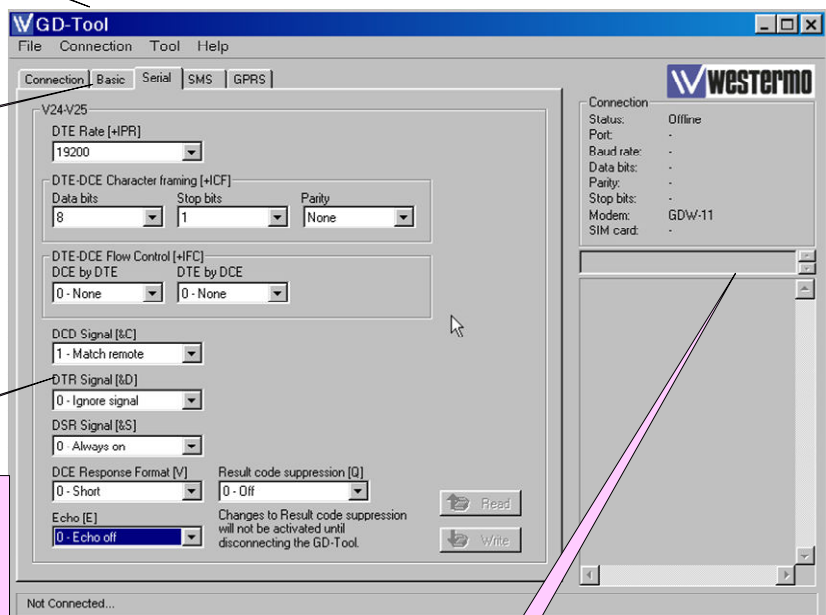
4) On Dial Options, Set the command &A1

Appendix 1 - Using GDTool with the GDW11

1) Connect PC to Modem using a straight through MC9/9 Modem cable then Select Autoconnect and GDTool will search for the correct Serial rate and parity

2) On Basic Tab select no of rings to auto answer (S0) to be 1 and +WRST to be enabled, "35:35" for the Delay and then click the Write Button on that page to save to the modem

3) On Serial Tab set up as shown here to give the AT commands +IPR=9600; +ICF=3,4; +IFC=0,0; and E0V0Q1&D0 for the PLC modem and E1V1Q0&D2 for a PC modem then click the Write Button on that page to save to the modem. **Note: These settings can also be used on the GD-01 GSM modem**



Using the Terminal command box enter the following commands followed by ENTER:

```

AT+WOPEN=0
AT+CREG=0
AT+CGREG=0
AT+WIND=0
AT+CGEREP=0
AT+CRC=0
AT+CMEE=0
AT+CLIP=0
AT+WRIM=1
AT&W
    
```

These commands stop all of the unsolicited GSM and GPRS status messages

NOTE 1:
All other settings are default

Appendix 2 - Increasing Connection Speeds

It is possible to increase the RS232 port speed on the Omron PLCs to increase the speed of connection, once the connection has first been tested at 9600 using the settings detailed in Sections 1 to 3 of this document.

To increase the port speed, follow the steps shown in Section 1 to setup the PLC's RS232 port, but use up to one of the speeds for the particular PLC range as shown in the table below in place of the 9600 port Custom Communication Settings.

Omron PLC Series	Port Speed
CQM1	19200
C200	19200
CJ	57600
CPM1	19200
CPM2	19200
CS	57600
CV	19200

NOTE:

The Modem settings used throughout this document have had 9600 set on both the serial port and the Line Modulation between the Modems, with the exception of the TD-33 which uses its Autobaud setting as Default.

It is possible to use the DIP Switch settings for the TD-36, TD-36/485 and TD-35 Modems to force the Modems serial port speed and data format as well as the Line Modulation speed. To force the serial port speed, data format and Line modulation speed the TDW33 will require its settings to be updated using TDTTool2 and the GDW11 will require its settings to be updated using GDTTool.

Appendix 3 - Using TOOLBUS Protocol

Some applications may require the use of Toolbus instead of Sysmac Way. When using Sysmac Way, it is possible to enter custom settings for all of the PLCs, even though the Default settings are 9600,7,E,2. With Toolbus some PLCs have their data format settings fixed although the data rate can be changed to the same rates as with Sysmac Way. The table below shows the Toolbus settings for the different PLC types with the settings editable unless otherwise specified.

Omron PLC Series	Port Speed	Default Data Format
CQM1	19200	7,E,2
C200	19200	7,E,2
CJ	57600	Fixed at 8,N,1
CPM1	19200	7,E,2
CPM2	19200	7,E,2
CS	57600	Fixed at 8,N,1
CV	19200	Fixed at 8,O,1

If the Toolbus protocol is required and Sysmac Way cannot be used then set up the RS232 port using the correct settings for the PLC type as shown in the table above. Then use CX Programmer to set up the port rate and format using the procedure shown in Section 1 but now with the required data rate and format.

If the Modems have been set up differently than described in this document then please check the settings to ensure that the Modems will work with the new data rate and formats used here.

Appendix 4 - Additional RS232 ports and cables

There are additional RS232 adaptors that can be used on some of the Omron PLC's such as the CIF-01 cable, CIF-02 cable and a Serial Communications module.

When using the Serial Communications module ensure that the Host Link Unit Number used in the PLC's Communications Parameters matches that set on the Modules rotary switches. Also check that the Module has been configured with the correct port parameters under the Software Switches in the IO Table. The IO Table can be edited offline then downloaded to the PLC, but the Software Switches for the Module must be set when Online in Program Mode.

The Additional RS232 ports and cables can be setup as shown in this document using Sysmac way 9600,8,N,1. Then, once successful communications have been established, the data rate can be increased or the Toolbus protocol and data format can be used.

NOTE:

The CIF-02 cable will need to be disconnected at both ends to reset it before any new settings can be used

Appendix 5 - Alternative Westermo to Omron Connections

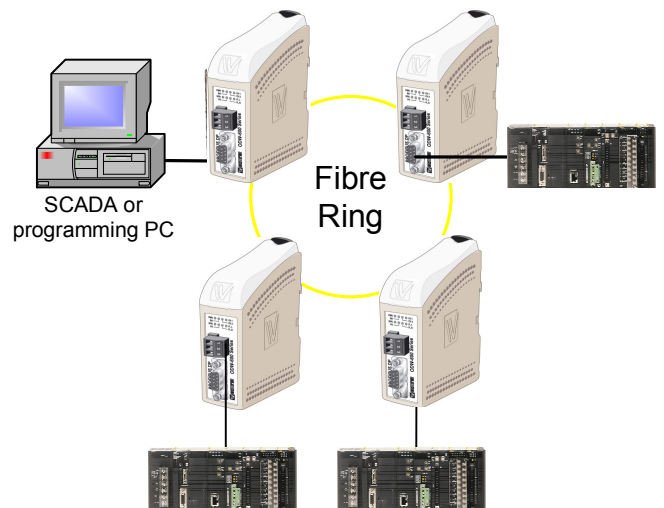
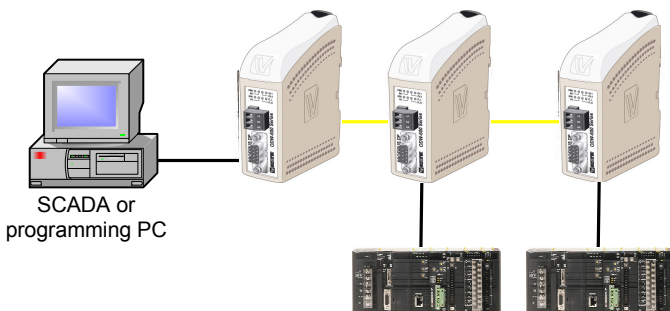
There are many other ways of connecting Omron PLC's using Westermo devices. There are some example applications shown below, but for any other connection method please contact Westermo.

The first applications shown below use the RS232 Fibre Optic Line Sharing modems to create Linear and Redundant Ring configurations.

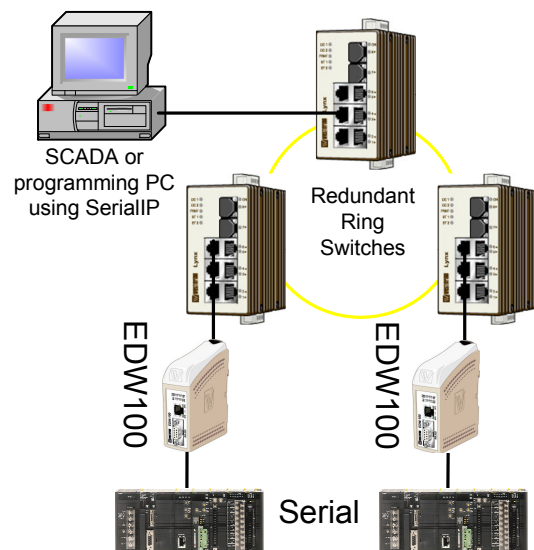
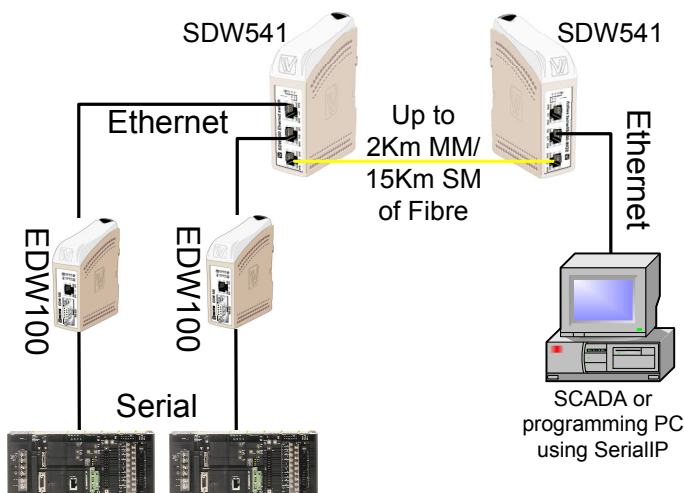
The first Ethernet example application shows the SDW541 Ethernet Switches connected by up to 2Km of Multi Mode or up to 15Km of Single Mode Fibre Optic Cable. The second Ethernet example application shows a Redundant Fibre Optic Ethernet ring using Switches that can recover from a breakdown of the ring within 30mS.

ODW622 RS232 Linear Fibre Optic Network

ODW632 RS232 Fibre Optic Ring



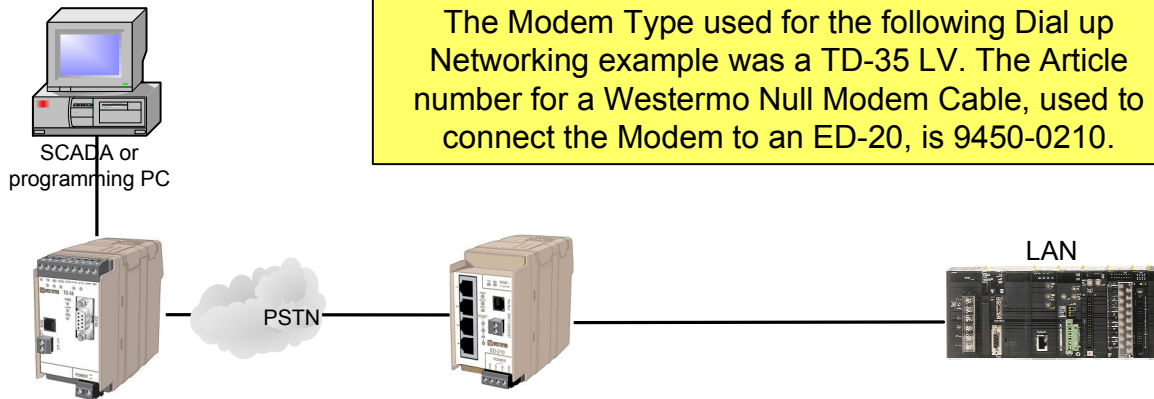
Ethernet and Fibre Optic Networks



Appendix 5 - Westermo ED-210 to Ethernet Enabled PLC's

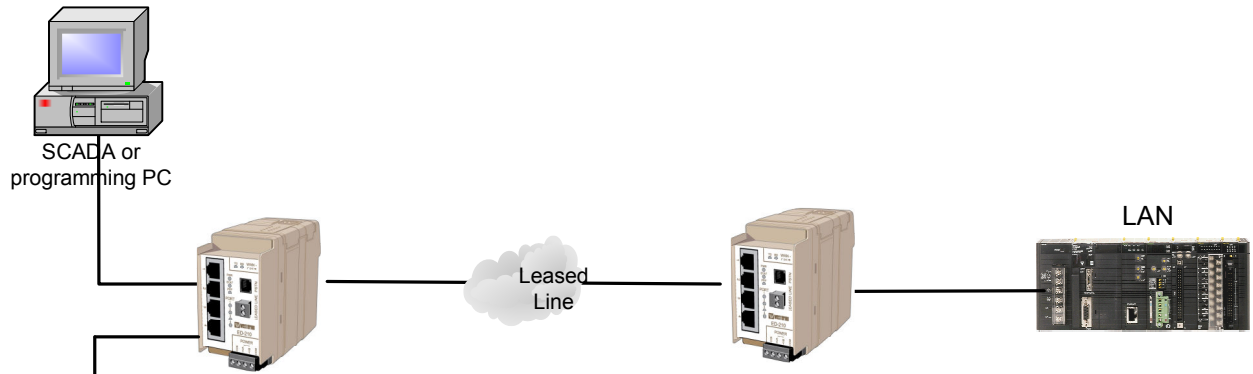
It is possible to use Westermo Modems with Westermo ED-210's to either link two Ethernet Networks or to connect to a PLC Ethernet Network using Microsoft Windows Dial Up Networking.

Dial Up Networking



Note:
The Modem Type used for the following Dial up Networking example was a TD-35 LV. The Article number for a Westermo Null Modem Cable, used to connect the Modem to an ED-20, is 9450-0210.

Connecting Ethernet Networks



Note2:
It is also possible to connect same subnet networks with a pair of DDW-100 SHDSL Ethernet Extenders using existing twisted pair cable e.g. DH+ cable, in the same manner as shown above with the DDW-100s being used in place of the ED-210's.

OMRON

OMRON Electronics Ltd

Opal Drive

Fox Milne

Milton Keynes

MK15 0DG

Web: www.omron.co.uk

Main Office - 01908 258 258 Fax: +44(0) 1908 258 158

Tech Support - 0870 752 0871, uk_techsupport@eu.omron.com

Sales support - 0870 752 0861, oeuk_sales@eu.omron.com



Westermo Teleindustri AB SE-640 40 Stora Sundby, Sweden

Westermo Web site: www.westermo.com

Sweden

www.westermo.se

support.sverige@westermo.se

Phone: +46 (0)21 548 08 00

Fax: +46 (0)21 351850

France

www.westermo.fr

support@westermo.fr

Tél : +33 1 69 10 21 00

Fax : +33 1 69 10 21 01

United Kingdom

Web: www.westermo.co.uk

technical@westermo.co.uk

Telephone: +44 (0)1489 580585

Fax: +44 (0)1489 580586

Singapore

www.westermo.com

sales@westermo.com.sg

Phone: +65 6743 9801

Fax: +65 6745 0670

Germany

www.westermo.de

support@westermo.de

Tel: +49(0)7254 95400-0

Fax: +49(0)7254-95400-9

International

www.westermo.com

support@westermo.se

Phone: +46 (0)16 42 80 00

Fax: +46 (0)16 42 80 01