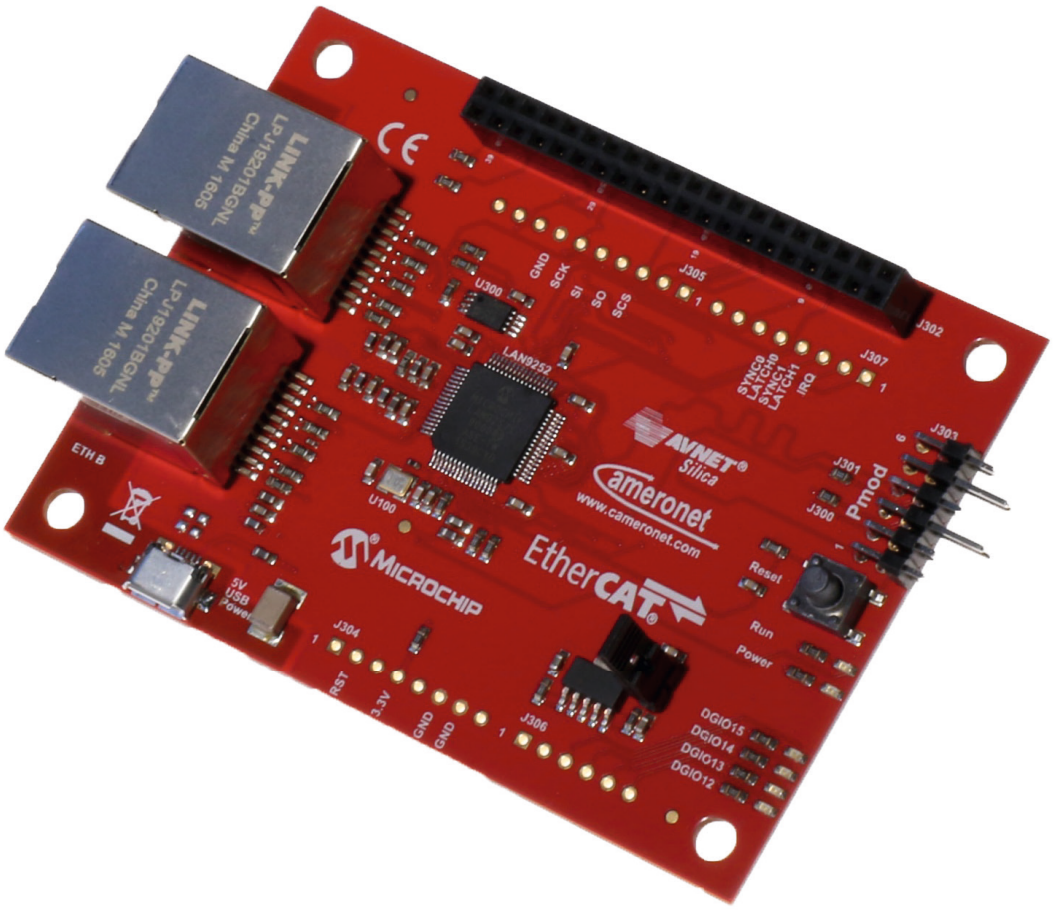
EtherCat Starter Kit

AVNET SILICA

QUICK START GUIDE

THE PMOD-COM-ETHERCAT ETHERCAT® STARTER KIT FROM AVNET SILICA IS BASED ON THE MICROCHIP LAN9252 ETHERCAT SLAVE CONTROLLER.



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Overview

INTRODUCTION

The PMOD-COM-ETHERCAT EtherCAT® Starter Kit from Avnet Silica is based on the Microchip LAN9252 EtherCAT Slave controller. The easy to use EtherCAT Starter Kit has a Pmod™ and Arduino compatible interface, as well as a header with all I/Os of the LAN9252, which allows the direct connection to microcontroller starter kits from many suppliers for fast prototyping.

The LAN9252 EtherCAT slave controller has integrated 100base-TX PHYs with auto-MDIX, cable diagnostic and support for 100base-FX fiber as well. The flexible host interface can be configured as SPI, QSPI or 8/16bit parallel interface. The LAN9252 supports single supply and extended temperature range up to 105°C. Three operation modes are available:

- Digital I/O Mode: directly control 16 I/O signals without any MCU
- Microcontroller Mode: a microcontroller is connected via SPI, QSPI or parallel interface and runs the EtherCAT stack and application
- Expansion Mode: the third network port can be used to enable star or tree network configuration

TwinCAT 3 - extended Automation Technology Suite from Beckhoff Automation GmbH is used as EtherCAT master and configuration tool. Other EtherCAT masters and tools can be used as well.

This Quick Start Guide describes the basic steps how to use the PMOD-COM-ETHERCAT EtherCAT Starter Kit in Digital I/O Mode.

REFERENCES

See the following documents for further information about the PMOD-COM-ETHERCAT and LAN9252.

Visit http://avnet-silica.com/ethercat for the latest PMOD-COM-ETHERCAT documentation

- Quick Start Guide
- User's Guide
- ESI Device Description Files
- Application Example

Visit http://www.microchip.com/wwwproducts/en/LAN9252 for the latest LAN9252 documentation

- LAN9252 datasheet
- AN1907 - Microchip LAN9252 migration from Beckhoff ET1100
- AN1911 - AN1911 Microchip LAN9252 power management
- AN1916 - AN1916 integrating Microchip's LAN9252 SDK with Beckhoff's EtherCAT SSC
- AN1920 - AN1920 Microchip LAN9252 EEPROM configuration and programming
- AN1995 - LAN9252 SOC porting guidelines

Visit https://www.ethercat.org for further information about EtherCAT technology, specification, FAQ and ETG membership.

EtherCAT Starter Kit

THIS CHAPTER DESCRIBES THE STEPS TO SETUP THE STARTER KIT AND SOFTWARE

SYSTEM SETUP

A basic EtherCAT system is built up with an EtherCAT master and the EtherCAT slave starter kit.

Required hardware and software:

- PMOD-COM-ETHERCAT starter kit
- USB cable with Micro B connector to supply power to the board (not included in the starter kit)
- Ethernet cable (not included in the starter kit)
- TwinCAT 3 (download from Beckhoff website)
- Device description file and application example (download from Avnet Silica website)

The PC runs TwinCAT, functions as the EtherCAT master and the PLC to run an application controlling the EtherCAT starter kit (EtherCAT slave). Multiple starter kits can be connected in a daisy chain.

CONNECT THE HARDWARE

Connect an Ethernet cable from the Ethernet Port ETH A (EtherCAT IN) of the EtherCAT starter kit to the Ethernet port of the PC, as shown in figure 1.

Connect a USB cable (A/Micro B) from the PC, USB hub or USB power supply to the EtherCAT starter kit micro USB connector to supply power to the board, as shown in figure 1.

After connecting the starter kit to the USB power, the Power LED and the DIGIO12 to DIGIO15 LEDs on the board are illuminated.

EtherCAT ports of the starter kit:
- ETH A: EtherCAT IN
- ETH B: EtherCAT OUT

Check the user guide for details about the hardware.

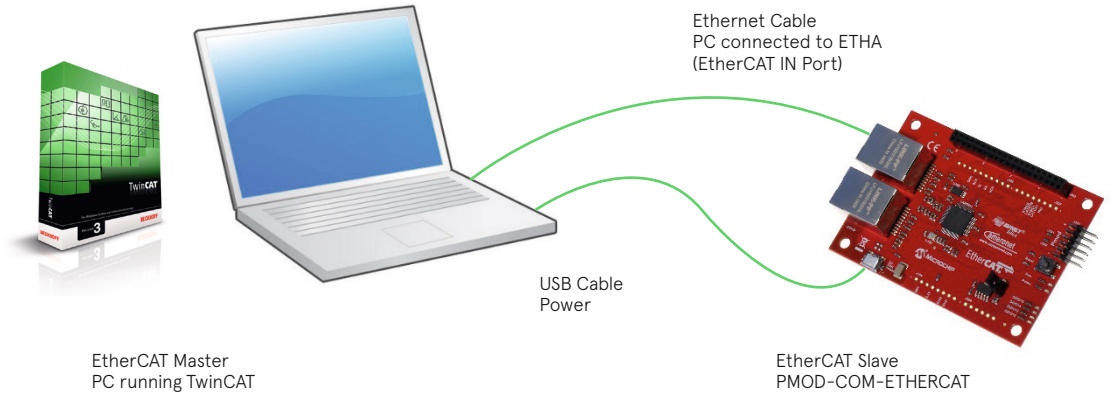


Figure 1 - System Setup

INSTALL THE SOFTWARE

Proceed the following steps and install all software and files.

Download and install TwinCAT 3

- Go to the Beckhoff website and download TwinCAT 3 XAE, version 3.1.4022.0 or later: http://beckhoff.com/english.asp?download/tc3-download-xae.htm
- You have to register yourself and will get the download link by e-mail. Either register a guest or create an account.
- Unpack the downloaded file (TC31-Full Setup.3.1.4022.0.zip) and install the software by double-clicking on the executable.

Download and install device description file

- Go to the Avnet Silica website and download the device description file package (AVS-PMOD-COM-ETHERCAT_ESI.zip): http://avnet-silica.com/ethercat
- Unpack the archive and copy the file AVS-PMOD-COM-ETHERCAT_DIGIO_8IN_8OUT.xml to the TwinCAT 3 directory C:\TwinCAT\3.1\Config\Io\EtherCAT.

Download TwinCAT 3 example solution

- Go to the Avnet Silica website and download the TwinCAT example package (AVS-PMOD-COM-ETHERCAT-DIGIO.tnzip): http://avnet-silica.com/ethercat
- Save the file.

SETUP AND RUN THE DEMO

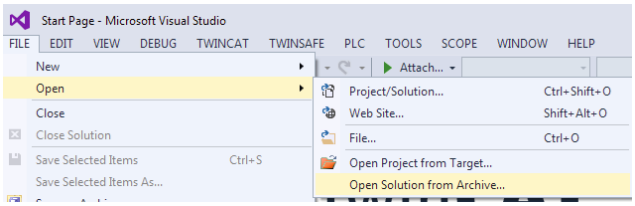
To setup the TwinCAT software and run the demo application, proceed according to the steps below.

Start TwinCAT

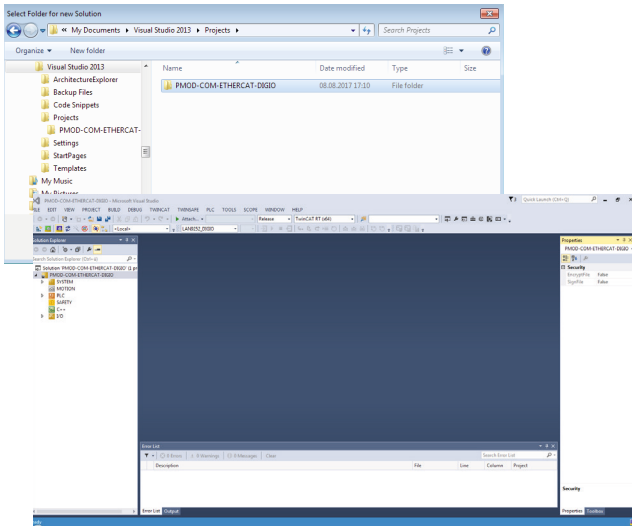
Windows Start Menu → All Programs → Beckhoff → TwinCAT3 → TwinCAT XAE (VS 2013)

Open demo dolution in TwinCAT

- File → Open → Open Solution from archive
- Select the downloaded and saved file AVS-PMOD-COM-ETHERCAT-DIGIO.tnzip

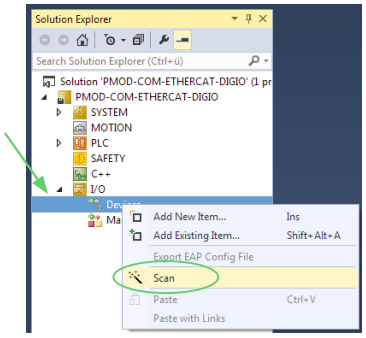


- A folder select window opens to select the project folder to be used. Select the folder of your choice, typically: My Documents\Visual Studio 2013\Projects\PMOD-COM-ETHERCAT-DIGIO
- The project window opens.

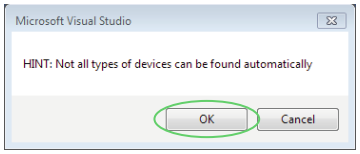


Scan for the EtherCAT starter kit

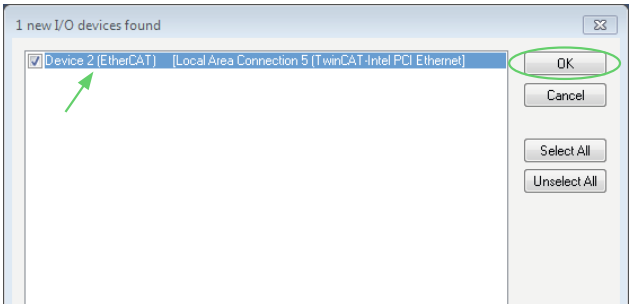
- Click on the arrow next to I/O in the solution explorer tree, then select "Devices". Right click and select "Scan" in the pop-up menu.



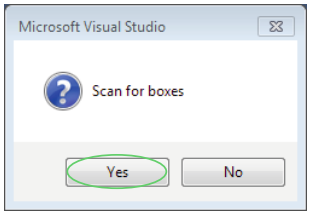
- Click "OK" in the "HINT" pop-up window.

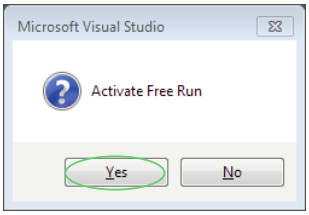


- In the I/O device window select the "Device 2 (EtherCAT)" and click "OK".

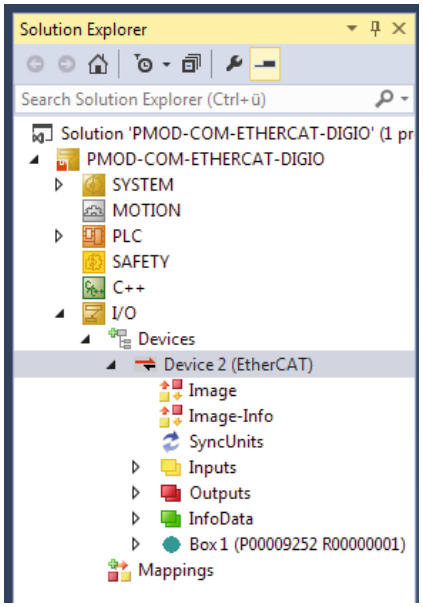


- Scan for boxes, click "Yes"
- Activate Free Run, click "Yes".



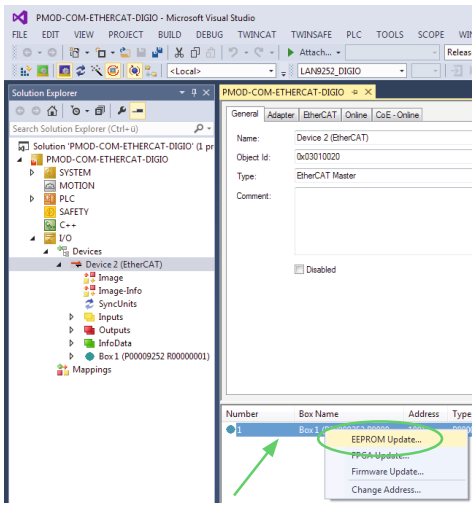


- The EtherCAT master (Device 2) and the EtherCAT slave (Box 1) appear in the tree.

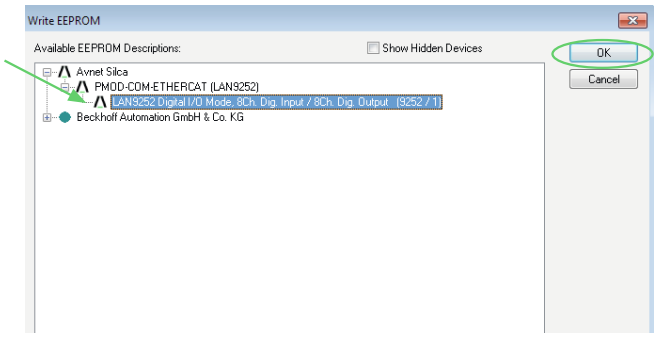


Program the EEPROM

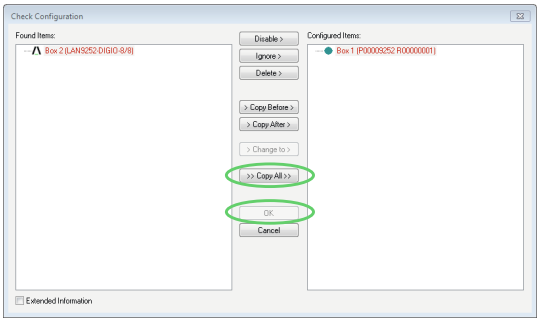
- This step only needs to be done the first time after unpacking the board, or if the EEPROM has been programed with another configuration.
- Double click on "Device 2 (EtherCAT)". In the middle of the window the Box 1 is listed.
- Right click on Box 1 in the middle of the General Tab window and select "EEPROM Update".

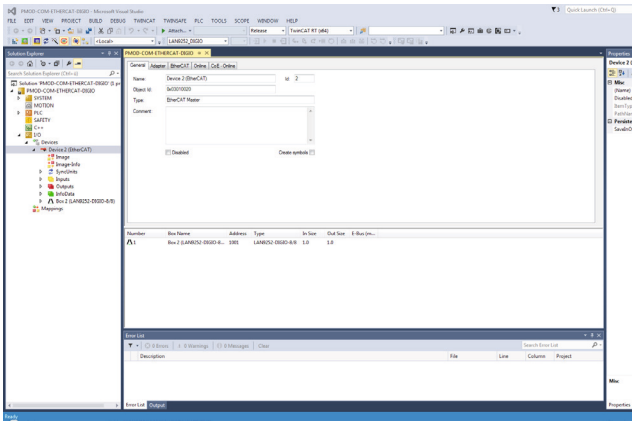


- In the Write EEPROM window select the Digital I/O configuration listed under Avnet Silica and click "OK". The EEPROM will be programed.
- LAN9252 Digital I/O Mode, 8Ch. Dig. Input / 8Ch. Dig. Output (9252 / 1)



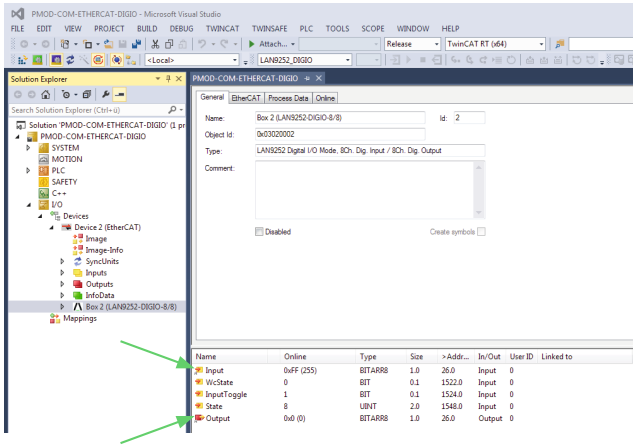
- Select "Device 2 (EtherCAT)" in the solution tree, right click and select "Scan". The Check Configuration window pops up.
- Click on ">> Copy All >>", then click "OK". The configuration is updated with "Box 2 (LAN9252-DIGIO-8/8)".



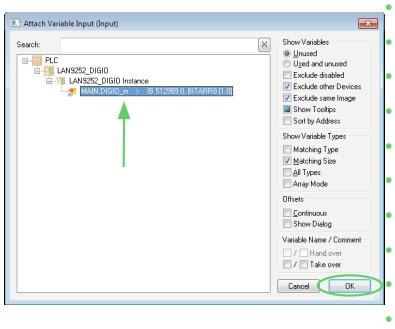


Mapping the I/O to the PLC example program

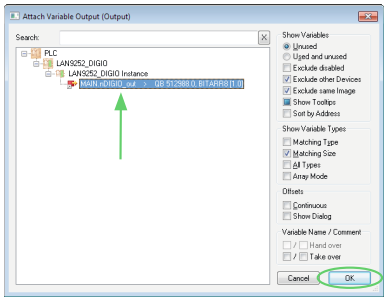
- Select "Box 2 (LAN9252-DIGIO-8/8)" in the solution explorer tree. In the General Tab the Inputs and Outputs are listed.



- Double click on the name "Input".
- In the Attach Variable Input window select "MAIN.DIGIO_in" and click "OK".

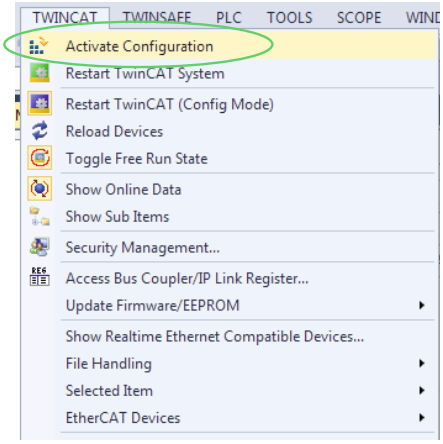


- Double click on the name "Output".
- In the Attach Variable Input window select "MAIN.DIGIO_ out" and click "OK".

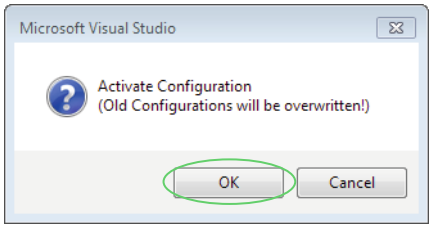


Run the demo

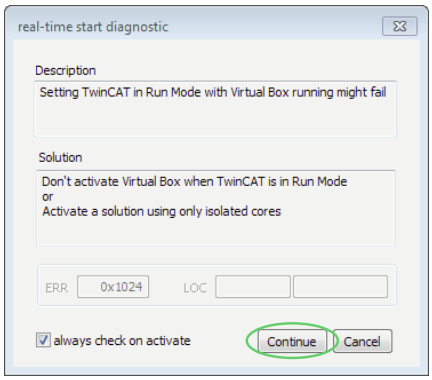
- In the menu "TWINCAT", click on "Activate Configuration"



- Activate Configuration (Old configurations will be overwritten), click "OK"

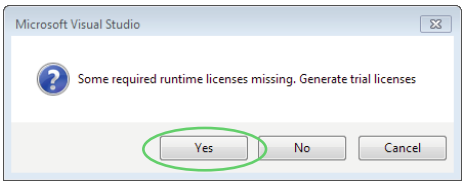


- Click "Continue" in the "real-time start diagnostic" pop-up window.

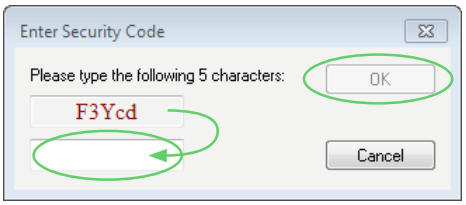


Runtime License

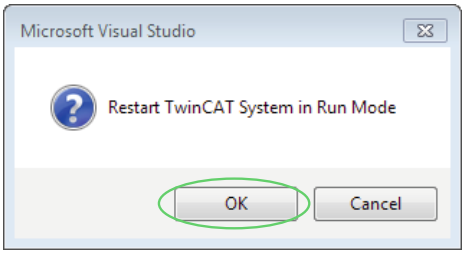
- If no valid license is found, a pop-up window to generate a Trial License will open. Click on "Yes".



- In the security code pop-up window, type in the displayed code and click "Ok".



- Restart TwinCAT System in Run Mode, click "OK"



Now the PLC demo program starts and controls the LEDs on the starter kit.

Congratulations, you successfully set up a simple EtherCAT network and application.

Offices

AUSTRIA
Vienna
Phone: +43 186 642 300
Fax: +43 186 642 350
wien@avnet.eu

BELGIUM
Merelbeke
Phone: +32 9 210 24 70
Fax: +32 9 210 24 87
gent@avnet.eu

CZECH REPUBLIC (SLOVAKIA)
Prague
Phone: +420 234 091 031
Fax: +420 234 091 030
praha@avnet.eu

DENMARK
Herlev
Phone: +45 432 280 10
Fax: +45 432 280 11
herlev@avnet.eu

ESTONIA
(LATVIA, LITHUANIA)
Pärnu
Phone : +372 56 637737
paernu@avnet.eu

FINLAND
Espoo
Phone: +358 207 499 200
Fax: +358 207 499 280
helsinki@avnet.eu

FRANCE (TUNISIA)
Cesson Sévigné
Phone: +33 299 838 485
Fax: +33 299 838 083
rennes@avnet.eu

Illkirch
Phone: +33 390 402 020
Fax: +33 164 479 099
strasbourg@avnet.eu

Massy Cedex
Phone: +33 164 472 929
Fax: +33 164 470 084
paris@avnet.eu

Toulouse
Phone: +33 05 62 47 47
toulouse@avnet.eu

Vénissieux Cedex
Phone: +33 478 771 360
Fax: +33 478 771 399
lyon@avnet.eu

GERMANY
Berlin
Phone: +49 30 214 882 0
Fax: +49 30 214 882 33
berlin@avnet.eu

Freiburg
Phone: +49 761 881 941 0
Fax: +49 761 881 944 0
freiburg@avnet.eu

Hamburg
Phone: +49 40 608 235 922
Fax: +49 40 608 235 920
hamburg@avnet.eu

Holzwickede
Phone: +49 2301 919 0
Fax: +49 2301 919 222
holzwickede@avnet.eu

Lehrte
Phone: +49 5132 5099 0
hannover@avnet.eu

Leinfelden-Echterdingen
Phone: +49 711 782 600 1
Fax: +49 711 782 602 00
stuttgart@avnet.eu

Leipzig
Phone: +49 34204 7056 00
Fax: +49 34204 7056 11
leipzig@avnet.eu

Nürnberg
Phone: +49 911 24425 80
Fax: +49 911 24425 85
nuernberg@avnet.eu

Poing
Phone: +49 8121 777 02
Fax: +49 8121 777 531
muenchen@avnet.eu

Wiesbaden
Phone: +49 612 258 710
Fax: +49 612 258 713 33
wiesbaden@avnet.eu

HUNGARY
Budapest
Phone: +36 1 43 67215
Fax: +36 1 43 67213
budapest@avnet.eu

ITALY
Cusano Milanino
Phone: +39 02 660 921
Fax: +39 02 660 923 33
milano@avnet.eu

Firenze
Phone: +39 055 436 039 2
Fax: +39 055 431 035
firenze@avnet.eu

Modena
Phone: +39 059 348 933
Fax: +39 059 344 993
modena@avnet.eu

Padova
Phone: +39 049 807 368 9
Fax: +39 049 773 464
padova@avnet.eu

Rivoli
Phone: +39 011 204 437
Fax: +39 011 242 869 9
torino@avnet.eu

Roma Tecnocittà
Phone: +39 06 413 115 1
Fax: +39 06 413 116 1
roma@avnet.eu

NETHERLANDS
Breda
Phone: +31 765 722 700
Fax: +31 765 722 707
breda@avnet.eu

NORWAY
Asker
Phone: +47 667 736 00
Fax: +47 667 736 77
asker@avnet.eu

POLAND
Gdansk
Phone: +48 58 307 81 51
Fax: +48 58 307 81 50
gdansk@avnet.eu

Katowice
Phone: +48 32 259 50 10
Fax: +48 32 259 50 11
katowice@avnet.eu

Warszawa
Phone: +48 222 565 760
Fax: +48 222 565 766
warszawa@avnet.eu

PORTUGAL
Vila Nova de Gaia
Phone: +35 1 223 779 502
Fax: +35 1 223 779 503
porto@avnet.eu

ROMANIA (BULGARIA)
Bucharest
Phone: +40 21 528 16 32
Fax: +40 21 529 68 30
bucuresti@avnet.eu

RUSSIA (BELARUS, UKRAINE)
Moscow
Phone: +7 495 737 36 70
Fax: +7 495 737 36 71
moscow@avnet.eu

Saint Petersburg
Phone: +7 812 635 81 11
Fax: +7 812 635 81 12
stpetersburg@avnet.eu

SLOVENIA
(BOSNIA AND HERZEGOVINA, CROATIA, MACEDONIA, MONTENEGRO, SERBIA)
Ljubljana
Phone: +386 156 097 50
Fax: +386 156 098 78
ljubljana@avnet.eu

SPAIN
Barcelona
Phone: +34 933 278 530
Fax: +34 934 250 544
barcelona@avnet.eu

Galdàcano. Vizcaya
Phone: +34 944 572 777
Fax: +34 944 568 855
bilbao@avnet.eu

Las Matas
Phone: +34 913 727 100
Fax: +34 916 369 788
madrid@avnet.eu

SWEDEN
Sundbyberg
Phone: +46 8 587 461 00
Fax: +46 8 587 461 01
stockholm@avnet.eu

SWITZERLAND
Rothrist
Phone: +41 62 919 555 5
Fax: +41 62 919 550 0
rothrist@avnet.eu

TURKEY (GREECE, EGYPT)
Kadikoy Istanbul
Phone: +90 216 528 834 0
Fax: +90 216 528 834 4
istanbul@avnet.eu

UNITED KINGDOM (IRELAND)
Berkshire
Phone: +44 1628 512 900
Fax: +44 1628 512 999
maidenhead@avnet.eu

Bolton
Phone: +44 1204 547 170
Fax: +44 1204 547 171
bolton@avnet.eu

Bucks, Aylesbury
Phone: +44 1296 678 920
Fax: +44 1296 678 939
aylesbury@avnet.eu

Stevenage, Herts, Meadway
Phone: +44 1438 788 310
Fax: +44 1438 788 250
stevenage@avnet.eu

ISRAEL
Tel-Mond
Phone: +972 (0)9 7780280
Fax: +972 (0)3 760 1115
avnet.israel@avnet.com

SOUTH AFRICA
Cape Town
Phone: +27 (0)21 689 4141
Fax: +27 (0)21 686 4709
sales@avnet.co.za

Durban
Phone: +27 (0)31 266 8104
Fax: +27 (0)31 266 1891
sales@avnet.co.za

Johannesburg
Phone: +27 (0)11 319 8600
Fax: +27 (0)11 319 8650
sales@avnet.co.za