CANopen®

CANopen based systems

✔ **Up to 127 nodes per channel**
✔ **Standardized Protocol**
✔ **Many device types on a single network**
✔ **Networks distances of up to 6Km.**

Applied Motion offers drives that can connect to a CANopen network controlled by a host PC, PLC or motion controller.
CAN offers single channel connection to many devices and a efficient path to system integration. The standardized protocol gives users a single learning curve for integrating many device types into their system.

CANopen FAQ

1.   What is CAN and CANopen?

CANopen is a communications protocol used by systems utilizing CAN hardware to talk to a number of devices on a network. The CANopen protocol is standardized, meaning that the manufacturers who make CANopen compatible devices conform to a standard specification. This means that a user implementing a CANopen system uses a common instruction format to command or read from the devices on the network. This reduces the learning curve and allows for faster system integration.

2.   What is the CiA?

Not what you think. CiA stands for CAN in Automation, which is the standards body that maintains all the CANopen standards documents. They also maintain a list of member companies, of which Applied Motion Products is one, on their website (http://www.can-cia.org). The CiA website is a good resource for those just starting out with CAN and CANopen. Many of the CiA documents may be downloaded, free of charge.

3.   When might I choose CANopen for a new system?

There are number of scenarios where CANopen might be advantageous.

a)   If your system consists of a number of different devices which you would like to connect to single host system running a single master program.
    a.   There are many different devices that are available with CANopen, once you have mastered the CANopen protocol, you can talk to all of them over the same network.

b)   You have a multi-axis machine with a number of drives which are performing simple tasks
    a.   A motion controller will need the same number of output ports as drives you are controlling. A 10 axis system will need a 10 axis controller and be very expensive. CAN systems can controll these drives over a single CAN network.
        i.   If your moves are simple they can be sent to each drive over a single CANopen network. Each time you want a drive to move your will send it a packet consisting of the acceleration, distance, speed etc.
        ii.   If your moves are more complicated AMP has a method where complex moves can be stored in the drive using our Q programming language, moves or sequences are then triggered over the CAN network.

4.   What are the advantages to CANopen?

Applied Motion Products CANopen drives, as compared with other Applied Motion Products drives, offer several advantages:
a)   Many Applied Motion Products CANopen drives can be connected on the same network, allowing for digital multiple axis control from a single host.
b)   A CANopen network is capable of supporting 127 devices of widely varying types, eliminating the need for costly and complicated wire harnesses.

5.   How many drives can I connect on a CANopen network?

That depends on what you're doing. A CANopen network can theoretically support up to one hundred twenty seven (127) slave nodes on each network. In practice, however, that number may be limited if you need to send large amounts of data to many drives, or if you use a bit rate less than the maximum.

6.   What is the maximum length for a CANopen network?

That depends on the bus speed. Approximate values are listed below:
- 1MB/s: 40 m
- 500kb/s: 100 m
- 250kb/s: 200 m
- 125kb/s   500 m
- 10kb/s: 6 km

7.   What other devices are available?

There are many different types of CANopen devices available, from many different manufacturers. The CiA has over forty device profiles for various kinds of devices, from I/O modules to weaving machines to rail vehicle power drive systems, and everything in between. A good place to start looking is the CiA website, http://www.can-cia.org/.

8.   How do I control the drives?

The drives must be controlled with a CANopen master, or controller. There are many different kinds of CANopen controllers on the market. Some examples are:
*   PC with a USB-CANopen Converter or PCI-CANopen converter
*   PLC with CANopen Card
*   Trio Motion Controller with CAN Card

A good place to start looking is the CiA website, http://www.can-cia.org/.

9.   Which protocols have been implemented?

All AMP CANopen devices are compliant to CiA DS301 and DSP402. Stepper drives implement the following Modes of Operation from DSP402:
*   Profile Position Mode
*   Profile Velocity Mode
*   Homing Mode
Servo drives implement all the Stepper Modes of Operation, plus the following:
*   Profile Torque Mode
Additionally, both Stepper and Servo drives are able to run stored programs written in AMP's Q Programming language.

10.   Will an AMP CANopen drive directly replace another CANopen drive?

AMP CANopen drives can directly replace another CANopen drive in terms of functionality. However, because DSP402 allows for some manufacturer flexibility in implementation, there are some issues, such as variable scaling, that will need to be addressed in the CANopen Master. In general, however, replacing another manufacturer's CANopen drive with an AMP CANopen drive is a fairly straightforward process.

11.   Which AMP drives have CANopen as an option?

Currently, the ST stepper drives, and the SV7 servo drive are all available with the CANopen option. In addition, CANopen is being developed on our STAC and STM product lines.
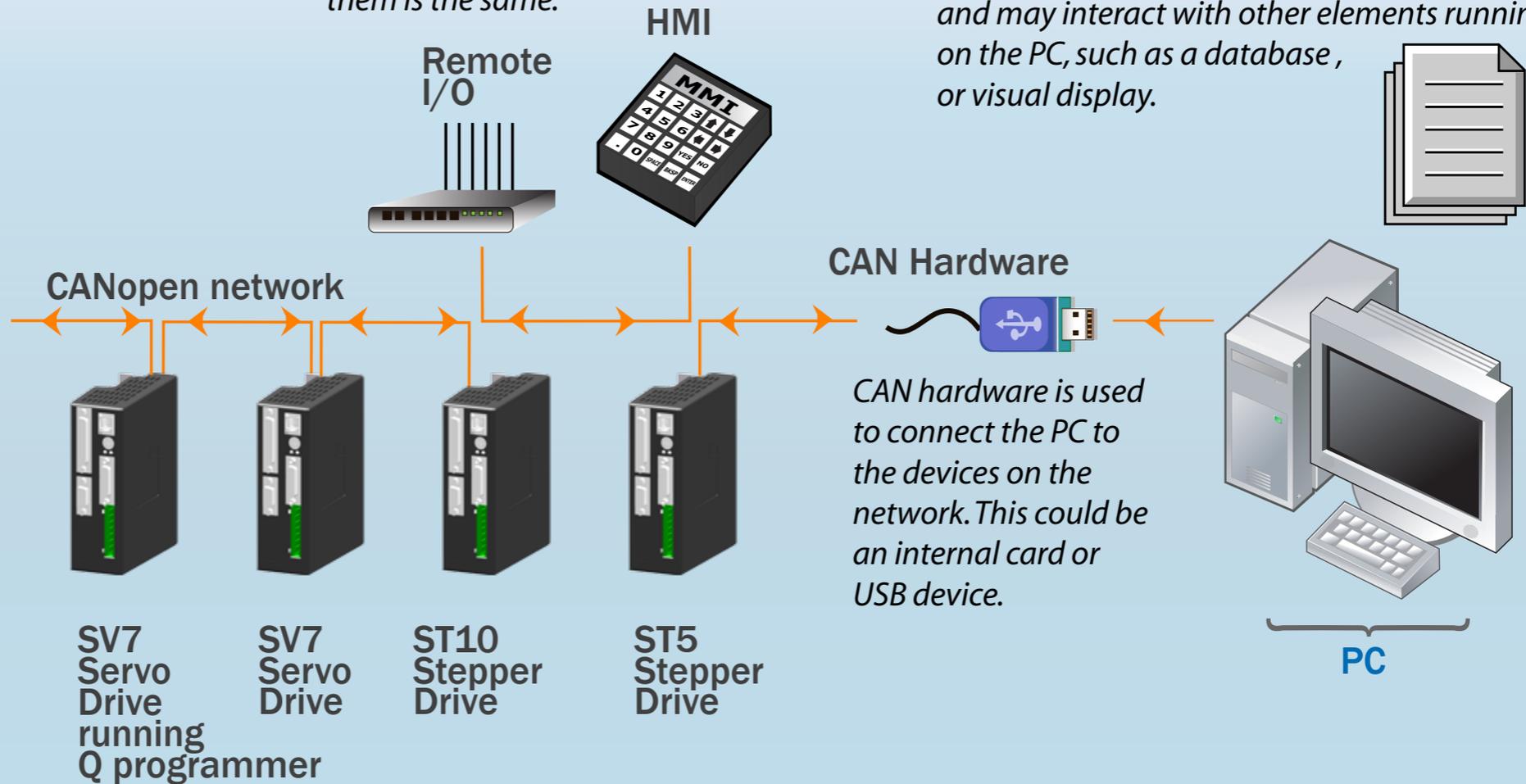
PC based CANopen system

There are many CANopen devices that can be connected to the same network. The basic protocol for talking to all of them is the same.

The user embeds CANopen commands into the program that runs the overall system. The program may be written in any language, for example C, C++, Visual basic, and may interact with other elements running on the PC, such as a database , or visual display.

HMI

Remote I/O

MMI

UP TO 127 AXES

CAN Hardware

CANopen network

Up to 127 devices can be connected to one CAN network; the network can be up to 6km long. In practice the number of devices and the length will be affected by the level of data traffic.
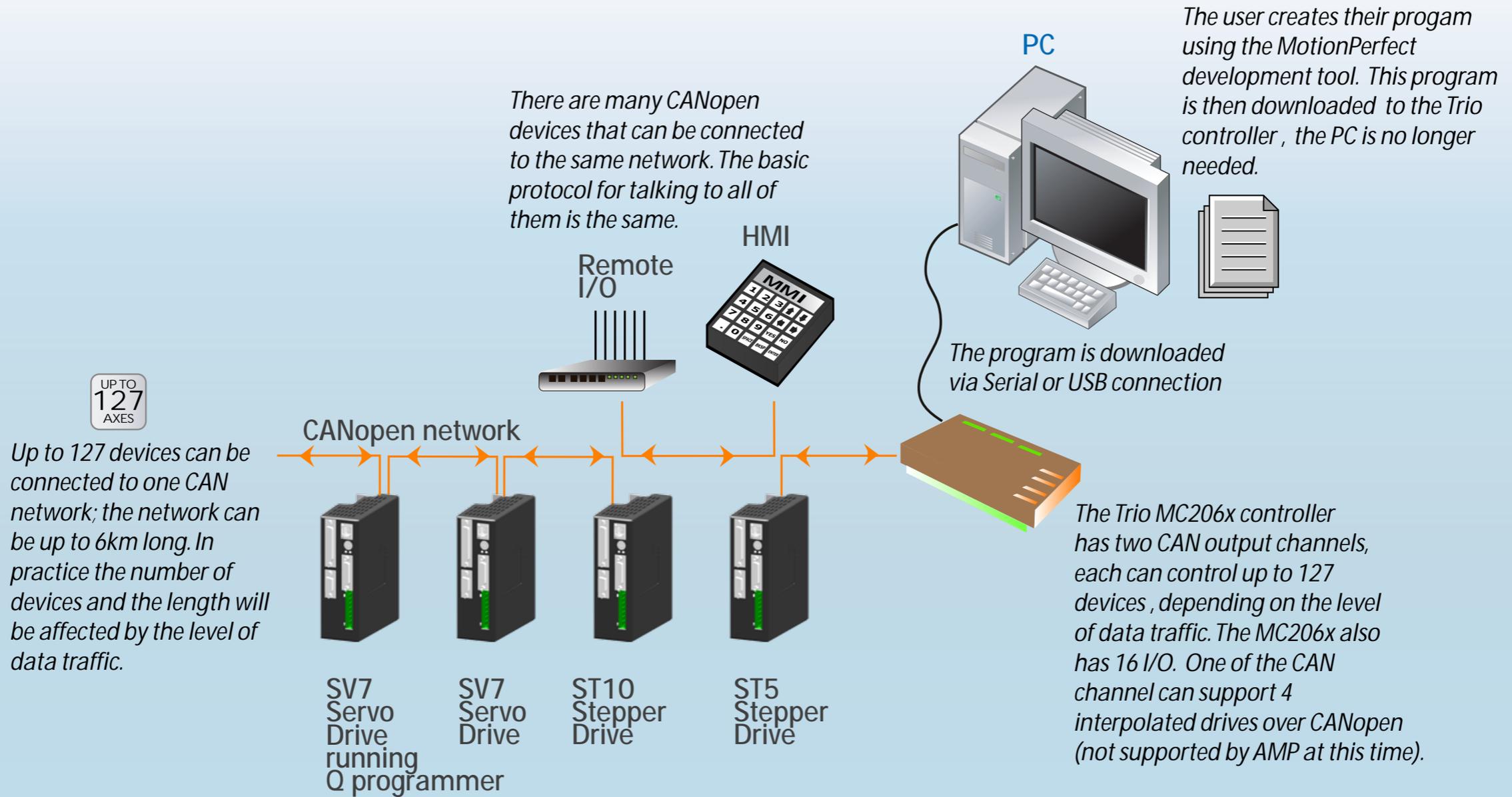
CAN hardware is used to connect the PC to the devices on the network. This could be an internal card or USB device.

SV7 Servo Drive running Q programmer

SV7 Servo Drive

ST10 Stepper Drive

ST5 Stepper Drive

PC

Different CANopen drives can be connected on the network, including ST and SV drives. AMP drives have the DS301 and DSP402 protocols implemented.
All AMP CANopen drives have AMP's Q programmer available to excecute Q sequences, these sequences can be modified and triggered via the CAN network.

Motion Controller based CANopen system

PC

The user creates their progam using the MotionPerfect development tool. This program is then downloaded to the Trio controller , the PC is no longer needed.

There are many CANopen devices that can be connected to the same network. The basic protocol for talking to all of them is the same.

HMI

Remote I/O

The program is downloaded via Serial or USB connection

UP TO 127 AXES

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CANopen network

The Trio MC206x controller has two CAN output channels, each can control up to 127 devices , depending on the level of data traffic. The MC206x also has 16 I/O. One of the CAN channel can support 4 interpolated drives over CANopen (not supported by AMP at this time).

SV7 Servo Drive running Q programmer

SV7 Servo Drive

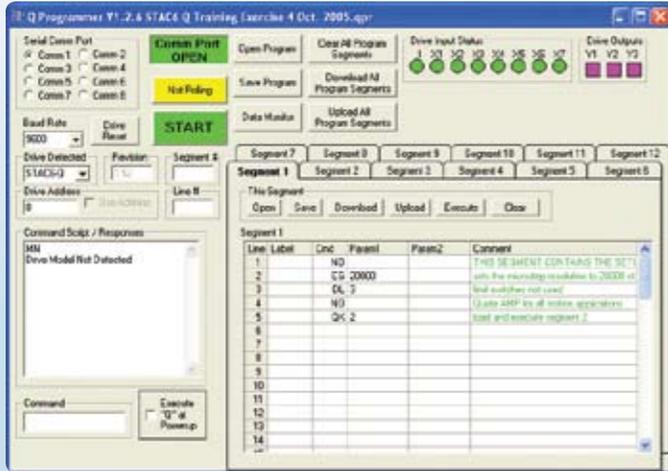ST10 Stepper Drive

ST5 Stepper Drive

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Q Programmer

Q Programmer is used to create and edit stand-alone programs for Q version drives. The functions of these drives include multi-tasking, math, register manipulation, encoder following, and more. Q is resident on all the CANopen drives meaning that the user can write a Q program, store it on the drive, then trigger the program to execute over the CANopen network. The user can also read and write to registers over the CAN Network changing parameters within the stored Q program.

CANopen Data frame tool

The CANopen data frame tool was developed by AMP to help users create CANopen data frames for inclusion into their host programs. It can also be used to test CANopen based systems by sending simple sets of data frames directly to the drive.

ST Step Drive Family

ST Drives with CANopen

The family consists of :

ST Models - 5 or 10A versions with bus voltages to 80V. Offered in a number of build options, including the addition of encoder feedback.

SV-7 models - DC input servo drive, 7A continuous , 14A peak. DC input to 80VDC.

For more information or to download a brochure, please visit our website.