



softMC 703

Multi-Axis Motion Controller

Installation Guide

Document Rev. 1.0 v3



Revision History

Doc. Rev.	Date	Remarks
1.0	Mar. 2018	softMC 703 product release.

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Technical Support

If you need assistance with the installation and configuration of the softMC 703 controller, contact Servotronix Technical Support: tech.support@servotronix.com

Ordering Options

		MC	-	E	08	-	703	-	0000
		softMC Motion Controller							
		Fieldbus							
E xx	301	EtherCAT + softMC 301							
E xx	703	EtherCAT + softMC 703							
E xx	705	EtherCAT + softMC 705							
C xx	301	CANopen + softMC 301							
B xx	702	Multi-bus (EtherCAT/CANopen) + softMC 702 – <i>Legacy</i>							
		Number of Axes							
04, 06	4, 6 axes – softMC 3								
08, 16, 32	8, 16, 32 axes – softMC 7								
		<i>Other number of axes available upon request</i>							
		Hardware Options							
301	softMC 3 – ARM, for 4 to 6 axes								
702	softMC 7 – Atom, for 8 to 32 axes								
703	softMC 7 – Atom, for 8 to 32 axes								
705	softMC 7 – CORE i5, for 8 to 32 axes								
		Options							
0100	IEC 61131 CODESYS								
0200	IEC 61131 CODESYS + WebVisu								
2100	softTP Web Server								

Software Add-On	
Part Number	Item
FW-MC03-CODESYS	IEC 61131 CODESYS for softMC 3
FW-MC07-CODESYS	IEC 61131 CODESYS for softMC 7
FW-MC03-TPH0701	softTP Web Server for softMC 3
FW-MC07-TPH0701	softTP Web Server for softMC 7

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1 Product Description

1.1 Product Overview

The softMC 703 is a multi-axis motion control software and hardware package offering extensive programming capabilities for a variety of automation and robotics applications.

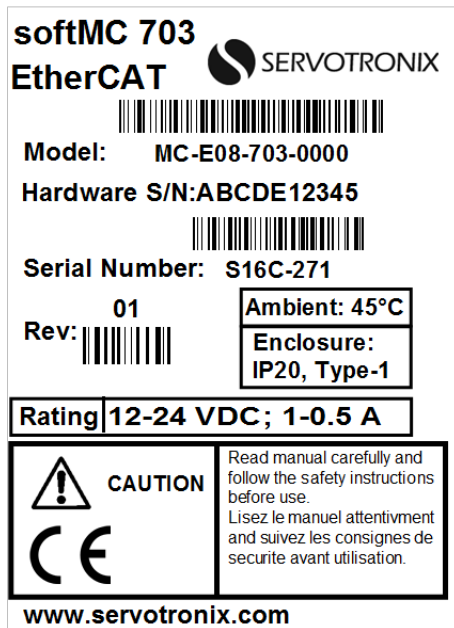


Figure 1-1. softMC 703 Product Label



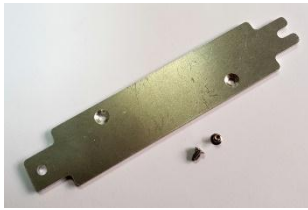

1.2 Product Package

The following table lists all components included in the softMC 703 product package.

If any of the components in this list are missing, do not proceed with the installation. Contact Servotronix: tech.support@servotronix.com

Note The DIN rail and bracket are assembled at factory.
Both book and DIN rail mounting are supplied. Either can be used.
Power supply adapter and cables are not included in the softMC 703 package.

Table 1-1. Product Components

Item	Description	Qty
	softMC 703 Multi-Axis Motion Controller Equipped with SD card loaded with softMC firmware (factory installed)	1
	24V Mating Connector: 2-pin terminal block Plug component Nominal current: 8 A Rated voltage (III/2): 160 V Number of positions: 2 Pitch: 3.81 mm Screw connection with tension sleeve 16-28 AWG Phoenix PN:MC 1,5/2-STF-3,81-1827703	1
	Book mounting bracket with 2 screws (supplied in separate bag)	1
	DIN mounting bracket with 2 screws (supplied in separate bag)	1

1.3 Technical Specifications

Table 1-2. Technical Specifications

Feature		Specification
System	CPU	Intel Atom Dual Core
	Memory	On board DDR3L 2GB
	Ethernet Controller	3x Intel GbE
Storage	Micro SD	mSATA 2GB industrial grade, single level cell (SLC) factory-installed softMC 703 firmware
I/Os and Indicators	Ethernet	RJ45 LAN port
	EtherCAT	RJ45 EtherCAT port
	Aux. Ethernet	RJ45 Aux. Ethernet port
	USB	Mini-USB port, for future use
	COM 1&2	RS485 port
	Display	L1 – green L2 - yellow
	VGA	D15 connector – Not in use
Reset	Reset	R1 – Reset button
Power	Power Input	12V–24V DC (2-pin terminal block)
	Power Consumption	24V @0.5 A
Environmental and Mechanical	Mounting	DIN rail or book mount
	Operating Temp.	0°C–45°C
	Storage Temp.	0°C–70°C
	Humidity	10%–90%, non-condensing
	Vibration	1.0 g
	Protection class/Pollution degree	Protection class: IP20, pollution degree: 2 as per IEC 60664-1 Do not use in the following locations: corrosive or flammable gasses, water oil or chemical, dust including iron dust and salts
	Compliance	CE
	Weight	0.41 kg
	Physical Dimensions	30 mm x 106 mm x 85 mm (WxHxD)

1.4 Dimensions

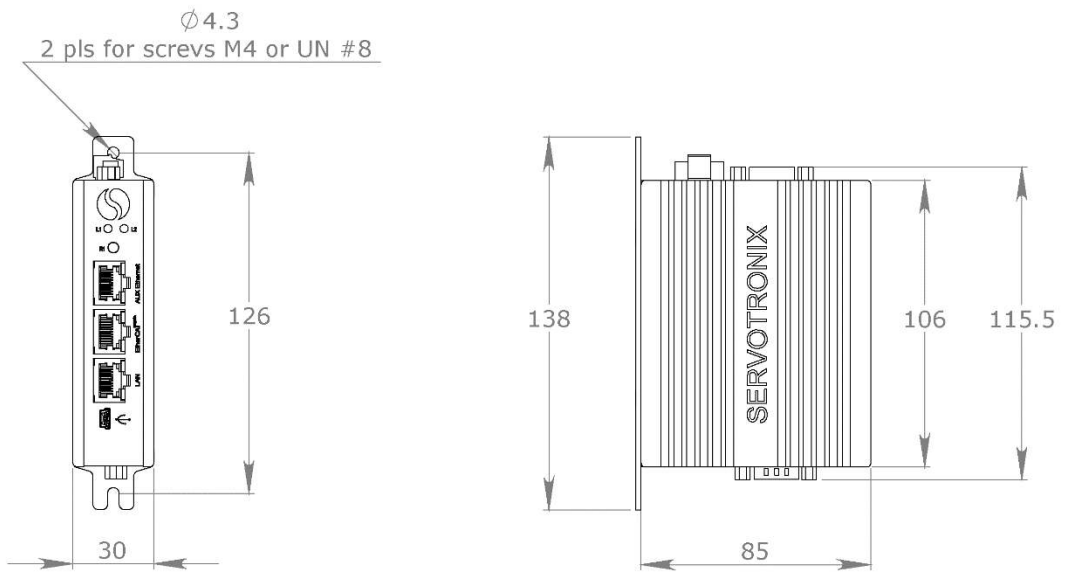


Figure 1-2. softMC 703 Dimensions – Book Mount

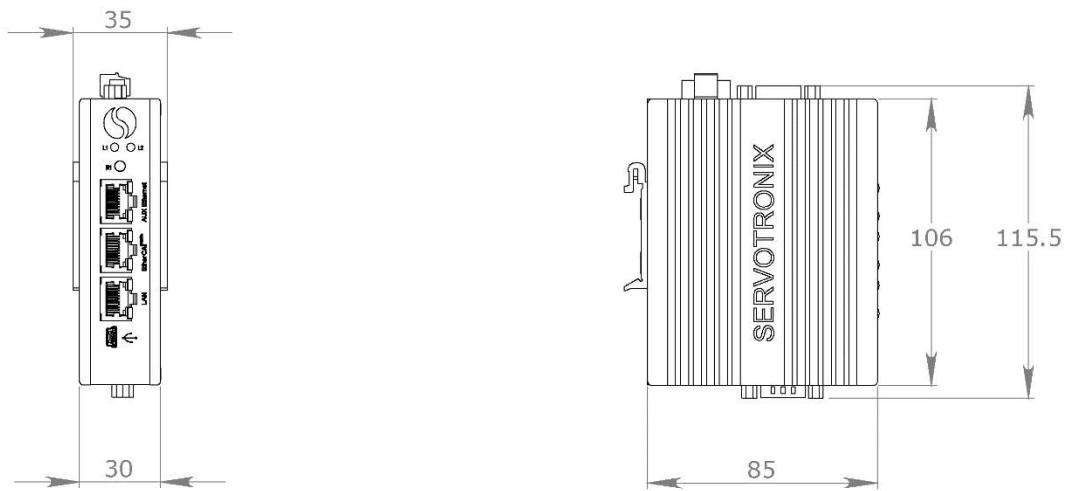


Figure 1-3. softMC 703 Dimensions – DIN Rail Mount

2 Safety

Failure to follow the safety instructions may result in personal injury and/or equipment damage.

2.1 Anti-Static Precautions



Warning!

Failure to take ESD precautions during installation of the softMC 703 may result in permanent damage to the equipment and/or serious injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the softMC 703. Dry climates are especially susceptible to ESD. It is therefore critical that whenever the softMC 703 or any other electrical component is handled, the following anti-static precautions must be strictly followed.

- **Wear an anti-static wristband:** Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- **Self-grounding:** Before handling the board, touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- **Use an anti-static pad:** When configuring the softMC 703, place it on an anti-static pad. This reduces the possibility of ESD damaging the softMC 703.

2.2 Installation Precautions

Before beginning the installation, be sure you are aware of the following precautions.

- **Read the installation guide:** This guide provides installation instructions and configuration options for the softMC 703.
- **Disconnect Power:** Power to the softMC 703 must be disconnected during the installation process. Failing to disconnect the power may cause severe injury to the body and/or damage to the system.
- **Qualified Personnel:** The softMC 703 must be installed and operated only by trained and qualified personnel. Maintenance, upgrades, or repairs may only be carried out by qualified personnel.

2.3 General Safety Precautions

Be sure to heed the following safety precautions at all times.

- Do not attempt to open the softMC 703. There are no internal components intended for user access.
- Handle the softMC 703 gently, and avoid dropping or hitting it against hard objects or surfaces.
- Make sure power is turned off and the power cord is disconnected when moving, installing or configuring the system.
- Do not apply voltage levels that exceed the specified voltage range. Doing so may cause an electrical shock and/or fire.
- Do not insert any objects into the ventilation openings, or block the vents in any way.
- Do not use the softMC 703 in a site where the ambient temperature exceeds the rated temperature.
- If considerable amounts of dust, water, or fluids enter the system, turn off the power supply immediately, unplug the power cord, and contact Servotronix technical support: tech.support@servotronix.com

3 Installation Preparation

3.1 Required Computer System

The following computer system and software are required:

- Operating system: Windows 7 or Windows 10
- LAN connection
- Internet connection (for software download and help)
- ControlStudio, the graphical software interface for configuring and testing the drive. Download from the Servotronix website or contact Servotronix technical support: tech.support@servotronix.com

3.2 IP Address

The softMC 703 is factory-configured with a static default IP address 90.0.0.1.

User can change to another static IP address or a DHCP IP address.

Check with the IT manager at your site and make sure the softMC 703 will be able to connect to your site's LAN, and will be able to get an IP address from a DHCP server, if necessary.

3.3 Required Tools

- A small slotted screwdriver for connecting terminal block.
- A Phillips screwdriver for mounting the controller on DIN rails.

3.4 Required Cables

- For serial communication:
 - Pin to pin serial cable
 - USB-A to USB cable
 - USB-RS485 converter cable (see figure)



Figure 3-1. USB-RS485 Converter Cable

- For EtherCAT:
 - Shielded Cat 5e cables
 - Shielded RJ45 connectors



System setup requires shielded Cat 5e cables and shielded connectors with latching mechanism. Improper cables and connectors will cause bus fault and/or servo drive errors.

3.5 Interfaces

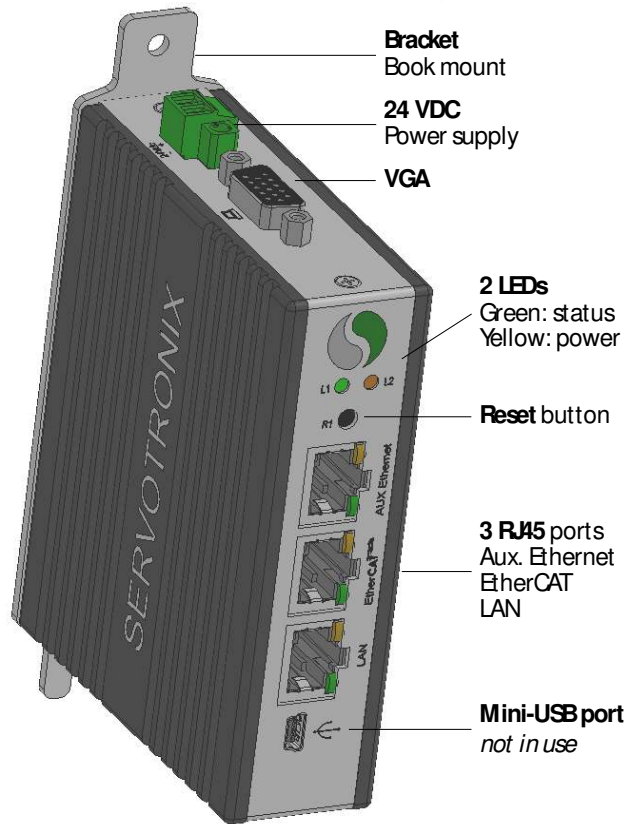


Figure 3-2. Interfaces – Front and Top Panels

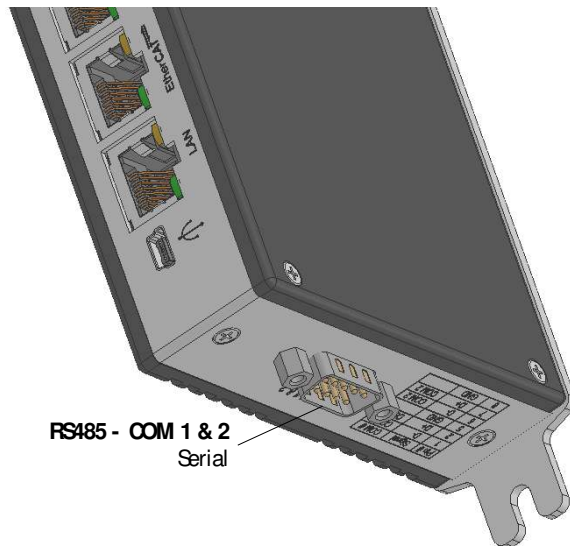


Figure 3-3. Interfaces – Bottom Panel

RS485 (COM1 & 2) Interface

The serial port is a service port. It is required only for setting or modifying the IP address of the softMC 703.

D9 Male		
Pin	COM	Signal
1	COM 1	D-
2	COM 1	D+
5		GND
6	COM 2	D-
7	COM 2	D+
8		GND

24 VDC Power

Terminal Block		
Pin	Pin Label	Signal
1	+	24 VDC
2	-	Return

RJ45 – Ethernet

The Ethernet RJ45 port serves to connect the softMC 703 to other devices on the system LAN (e.g., switch router, server).

RJ45 – EtherCAT Motion Bus

The EtherCAT RJ45 port serves as transmitter and receiver for devices operating on a Ethernet network.

RJ45 – Aux Ethernet

The Auxiliary Ethernet port is used for connected peripheral devices, such as a teach pendant or HMI.

4 Installation Procedure

4.1 DIN Rail Mounting (Optional)

The softMC 703 system can be mounted onto a DIN rail.

Attach the supplied DIN rail to the softMC 703 rear panel.

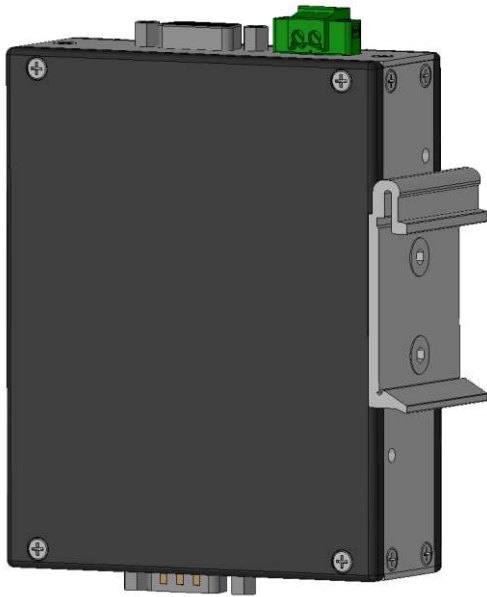


Figure 4-1. DIN Rail Mounting

4.2 Cable Connections

The following cable connections are required, regardless of the type of network or softMC 703. They can be performed in any order.

Do not turn on the softMC 703 until all cable connections are completed.

Refer to the system wiring diagrams in the following sections.

- Connect the softMC 703 **RS485** serial port to the PC serial port using a USB-RS485 converter cable. This connection is required only for service, and for setting the IP address of the softMC 703.
- Connect the softMC 703 **LAN** port to the site's LAN network (or connect directly to the PC) using a shielded Cat 5e cable.
- Connect the softMC 703 **EtherCAT** port to one or more drives and/or I/O modules.
- (Optional) Connect the softMC 703 **Aux. Ethernet** port to peripheral devices.
- Connect softMC 703 to **24 VDC** power supply.

Do not yet turn on the softMC 703.

4.3 softMC 703 and EtherCAT Network Connections

To connect the softMC 703 with other Servotronics drives and devices on an EtherCAT network, simply connect them using the RJ45 interfaces, as shown in the following figure.

Be sure to use shielded Cat 5e cables and shielded RJ45 connectors.

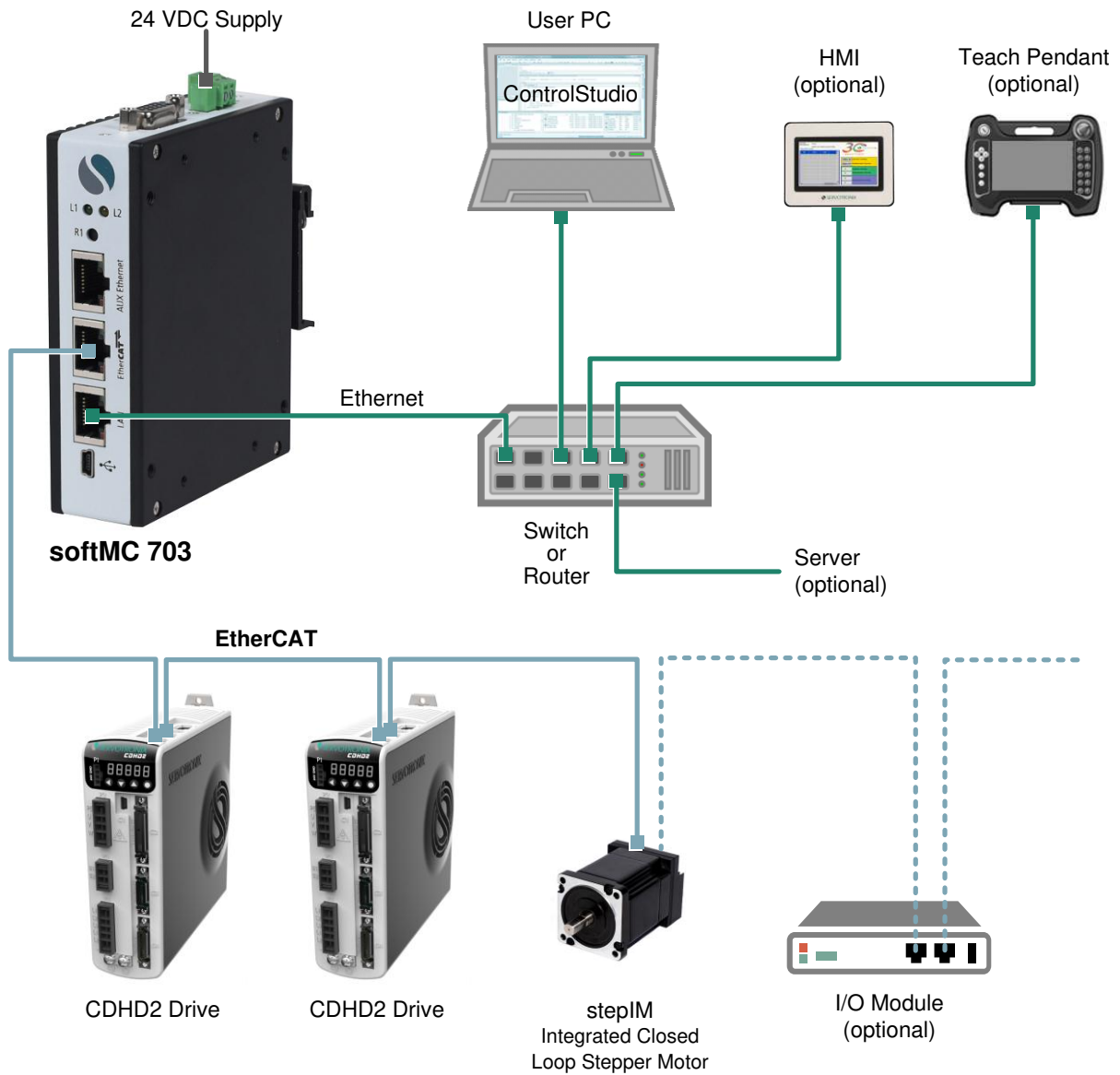


Figure 4-2. Example of Setup in EtherCAT Network

5 ControlStudio Software Installation

ControlStudio software is a development tool for motion applications. It contains a programming editor, data recorder, debugger and monitoring tools.

1. Download the ControlStudio software installation file from the Servotronix website:
<http://www.servotronix.com/softMC.html>.
2. Run the ControlStudioSetup.exe file to install ControlStudio on the host computer.

When installation is complete, start ControlStudio from the software icon on your desktop.

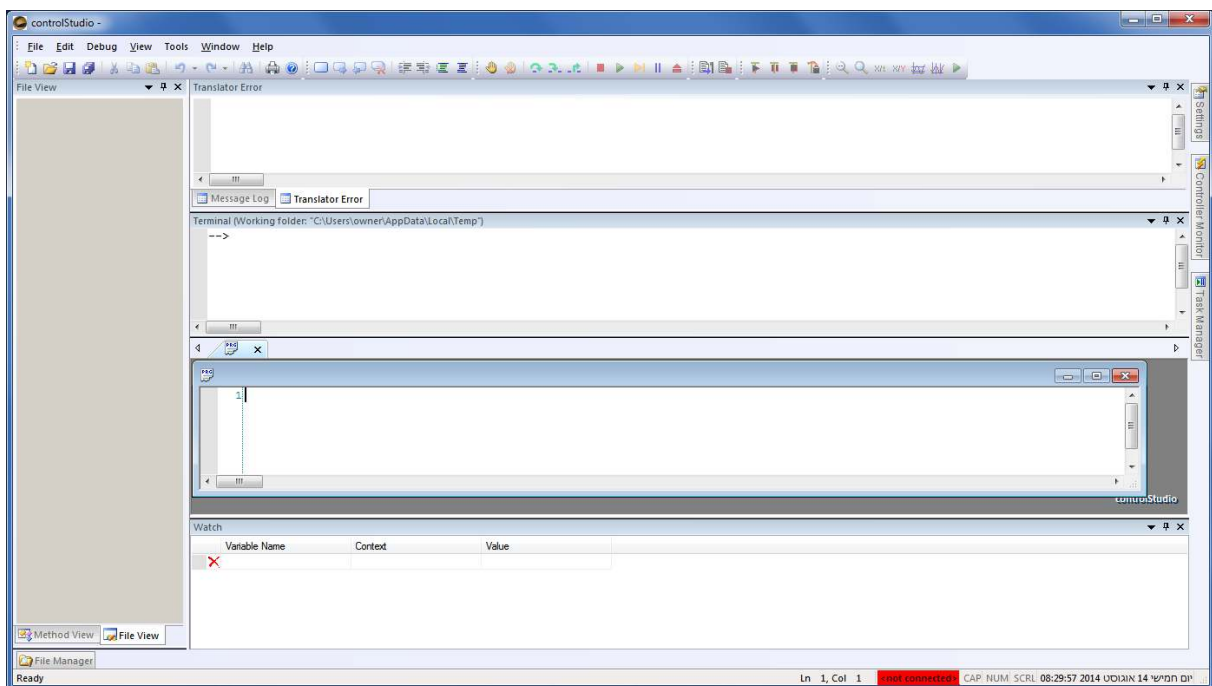


Figure 5-1. ControlStudio

ControlStudio Documentation

Use the ControlStudio **Help** button to access the online software documentation.

The password that allows access to the help files is installed during the ControlStudio software installation.

6 Serial Communication

To define the serial communication parameters, use a serial console program, such as [PuTTY](#).

Note The default login for serial console is `mc`. It provides all required permissions for system setup and configuration.

1. Configure the softMC 703 serial port according to the settings shown in the following figures. After setting the parameters, click **Open**.

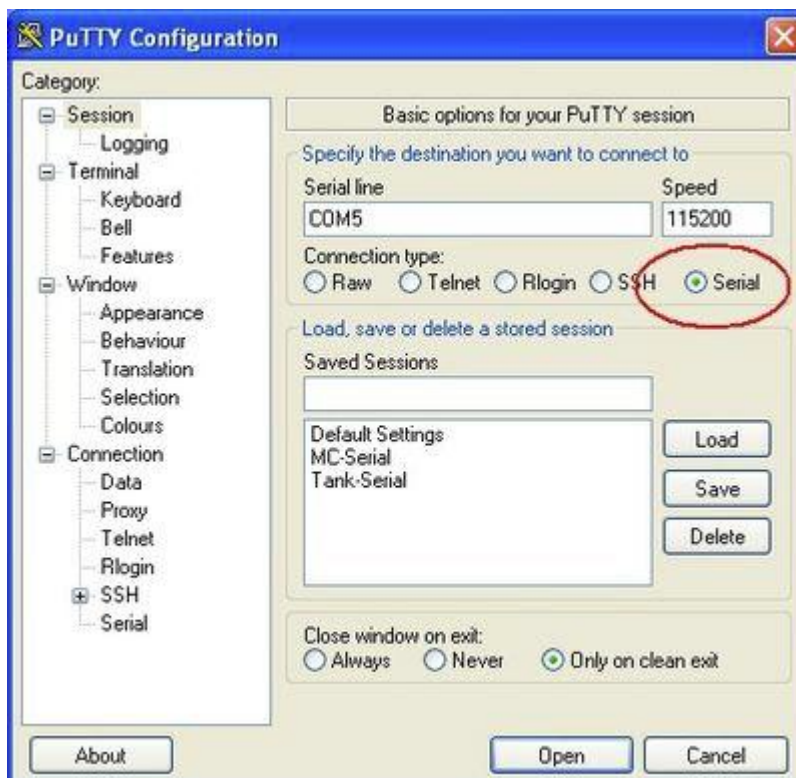


Figure 6-1.



Figure 6-2.

2. Make sure the serial cable is connected between the softMC 703 RS232 port and the PC.
3. Turn on the softMC 703.

Several seconds after power up, softMC 703 issues a short beep.

After the firmware has loaded, softMC 703 issues a long beep to indicate a successful initialization. Firmware loading may take from 15 seconds to 2 minutes, depending on the speed of the DHCP server.

If initialization fails, softMC 703 issues two long beeps.

4. Watch the serial console screen, and wait for the prompt at the end of the softMC 703 initialization.

Enter the instruction: `/sbin/ifconfig`

```

COM5 - PuTTY
ls: *.ipk: No such file or directory
ls: *.IPK: No such file or directory
/
starting network interfaces...
nohup: appending output to /var/home/mc/nohup.out
/usr/sbin/pure-ftpd
pure-ftpd: starting pure-ftpd: /usr/sbin/pure-ftpd
pure-ftpd: no upload script defined, skipping
done
starting inetd...done
[ 9.855571] ec_r8169 0000:01:00:0: eth0: link down
[ 9.855594] ec_r8169 0000:01:00:0: eth0: link down
[ 9.884956] EtherCAT 0: Link state changed to UP.
[ 9.885984] EtherCAT 0: 1 slave(s) responding.
[ 9.885989] EtherCAT 0: Slave states: PREOP.
[ 9.886078] EtherCAT 0: 1 slaves responded to delay measuring. at 0
[ 9.886082] EtherCAT 0: Scanning bus.
[ 9.917793] EtherCAT 0: Bus scanning completed in 32 ms.
[ 9.917800] EtherCAT WARNING 0-0: Chose DC of slave ring position 0 station address 1
[ 9.917808] EtherCAT 0: Writing system time offsets...
starting pid 1381, tty '/dev/console': '/usr/bin/chrt -r 17 /sbin/agetty -L 115200 ttyS0 -a mc vt100'

OSELAS(R)-0.4.11.2rc10-2011.03.0 / i586-2011.03.1
ptxdist-2012.01.0/2014-07-29T15:18:47+0300

ethercat login: mc (automatic login)

-bash-3.2$ /sbin/ifconfig

```

Figure 6-3.

The following output is displayed:

```

COM5 - PuTTY

OSELAS(R)-0.4.11.2rc10-2011.03.0 / i586-2011.03.1
ptxdist-2012.01.0/2014-07-29T15:18:47+0300

ethercat login: mc (automatic login)

-bash-3.2$ /sbin/ifconfig

eth0      Link encap:Ethernet  HWaddr 00:18:7D:2C:CB:92
          inet addr:10.4.20.210  Bcast:10.4.20.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MTU:1500 Metric:1
          RX packets:405 errors:0 dropped:0 overruns:0 frame:0
          TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:37644 (36.7 KiB)  TX bytes:318 (318.0 B)
          Interrupt:42 Base address:0x2000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING MTU:16436 Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

-bash-3.2$

```

Figure 6-4.

Note that **inet addr** in the section **eth0** will show the current IP address of the softMC 703 that you are using, and not **10.4.20.210** as in these examples.

6.1 IP Address

The IP address of the softMC 703 can be defined in any of three ways.

- Static IP address – factory-defined
- DHCP – assigned by DHCP server
- Manual IP address – assigned using ControlStudio

Note To change the IP address, the softMC 703 must be connected to the host computer by means of a USB-RS485 converter cable.

6.1.1 Factory-Defined IP Address

The softMC 703 is factory-configured with a static default IP address 90.0.0.1.

6.1.2 Obtain IP Address from a DHCP Server

Check with the IT manager at your site, and make sure the softMC 703 will be able to connect to your site's LAN, and will be able to obtain an IP address from a DHCP server.

6.1.3 Manually Assign an IP Address Using ControlStudio

Note The host PC's IP address must be in the same subnet as the addresses in the ControlStudio IP pool.

1. Start ControlStudio software.

Note the tabs on the right side of the screen:

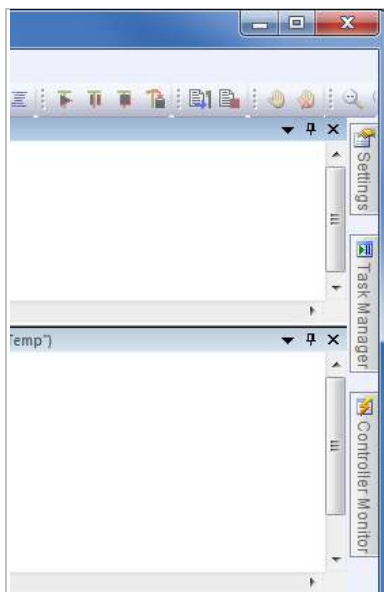


Figure 6-5.

- Click the **Settings** tab.
In the Settings pane, go to Connector Monitor, and set **TCP/IP connection** to **Automatic IP**.

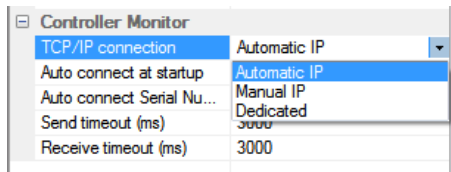


Figure 6-6.

ControlStudio now sends a broadcast over the network, searching for all softMC 703 controllers present on the network. softMC 703 controllers that do not yet have an IP address are assigned an IP address from the IP Pool file.

Note The **IP Pool** file must contain a list of IP addresses that the network administrator has explicitly excluded from the DHCP range and reserved exclusively for use by softMC 703 controllers.

- Click the **Controller Monitor** tab.
All softMC 703 controllers that are present on the network are displayed in the list, together with the manual IP address assigned to each of them.

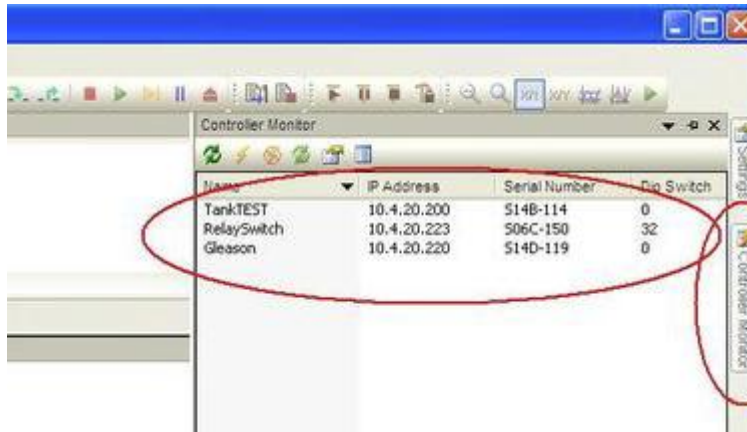


Figure 6-7.

- To connect to a softMC 703 controller, select it from the list and double-click.
Once the connection is established, the name and IP of the softMC 703 are displayed in the status bar at the bottom of the screen, highlighted in green.

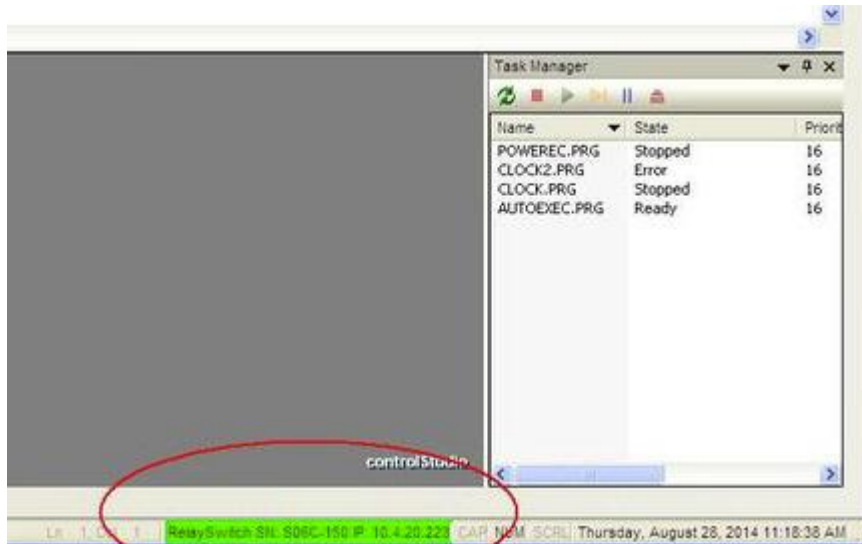


Figure 6-8.

6.1.4 Define a Fixed IP Address

Note The host PC's IP address and the softMC 703 must be in the same address space.

1. Using the text editor over the serial (RS232) connection, create the file FWCONFIG (no extension, upper case):

```
nano/FFS0/FWCONFIG
```

2. Enter the following instructions:

```
ipaddressmask aaa.bbb.ccc.ddd:eee.fff.ggg.hhh
sleep 20
ramdisksize=64 mByte
StringPreload=30000
```

Where *aaa.bbb.ccc.ddd:eee.fff.ggg.hhh* holds the permanent IP address and subnet mask that will be assigned to the softMC 703.



```
COM5 - PuTTY
GNU nano 1.3.12      File: /FFSO/FWCONFIG      Modified

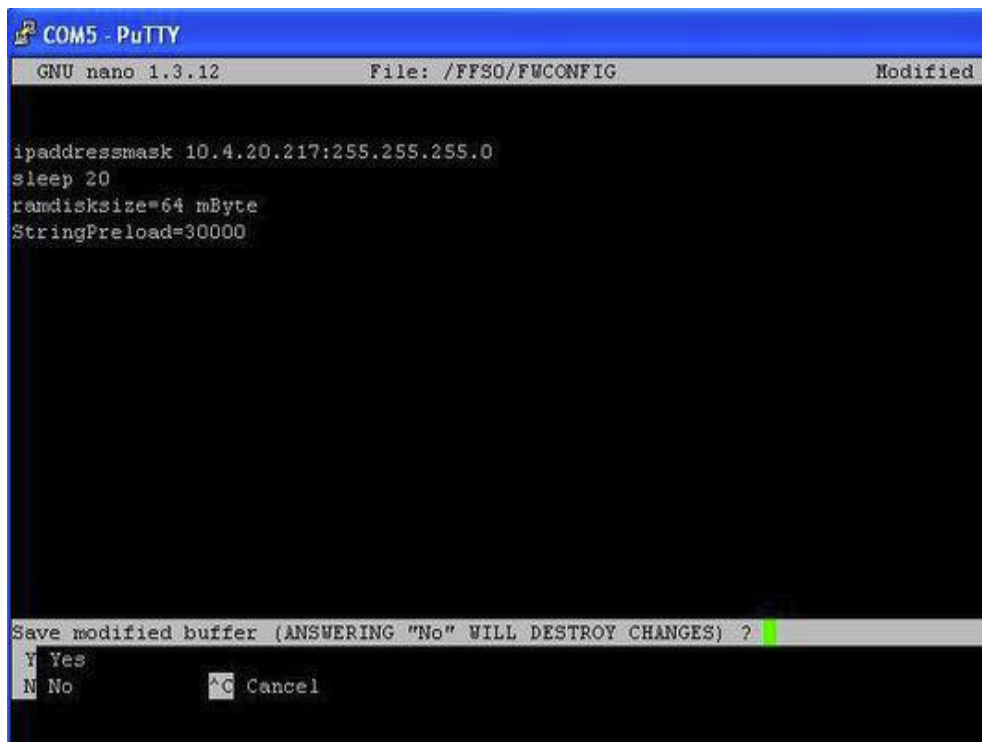
ipaddressmask 10.4.20.217:255.255.255.0
sleep 20
ramdisksize=64 mByte
StringPreload=30000

^G Get Help   ^C WriteOut  ^R Read File  ^V Prev Page  ^K Cut Text   ^C Cur Pos
^X Exit       ^J Justify   ^W Where Is   ^V Next Page  ^U UnCut Text ^T To Spell
```

Figure 6-9.

3. Press <Ctrl>+X

A message will prompt you to save the new file.



```
COM5 - PuTTY
GNU nano 1.3.12      File: /FFSO/FWCONFIG      Modified

ipaddressmask 10.4.20.217:255.255.255.0
sleep 20
ramdisksize=64 mByte
StringPreload=30000

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) ?
Y Yes
N No      ^C Cancel
```

Figure 6-10.

4. Click Y.

The file is saved, and the prompt returns to the command line.

5. Now reset the softMC 703. It will boot up with the permanent IP address you defined.
A fixed IP address can be changed from the application or in CONFIG.PRG, using the MC-Basic command `SYS.IPADDRESSMASK`.

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