

Quick Startup Guide for the ScanMaster Controller

1 Introduction

This Technical Bulletin describes how to set up and configure a ScanMaster Controller (SMC) to control both the scan head and the laser to perform the baseline function.

The following sections are included in this document:

[Introduction](#)

[What is in the box?](#)

[Becoming familiar with the SMC board](#)

[SMC command interface options](#)

[Getting started with the SMC](#)

[Referenced documents](#)

[Contact us](#)

Keywords: ScanMaster Controller, SMC, XY2-100, GSBUS

2 What is in the box?

The following table describes the items in the SMC shipping container. Some optional items may not be in the container if they were not ordered. The SMC will be preassembled with a laser adapter and/or auxiliary I/O module if ordered.

Table 1 - Items in the SMC shipping container

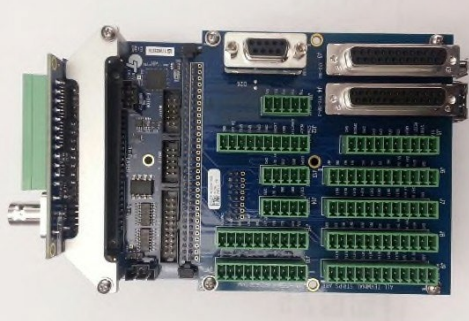

Items	Pictures
<p>ScanMaster Controller (SMC) pre-assembled with optionally purchased laser adapter and/or extended I/O modules.</p> <p>The example shown on the right is a ScanMaster Controller (SMC) with a High-power Laser Adapter and Auxilliary I/O Module assembled to it.</p>	
<p>SMC power cable (optional) PN: SMC-PWR-01</p>	

Table 1 - Items in the SMC shipping container

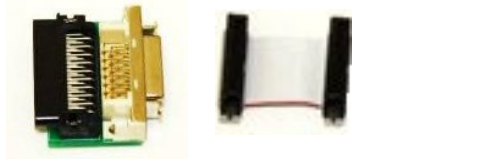







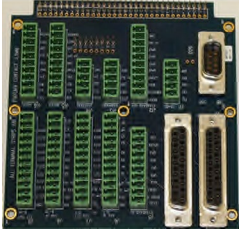

Items	Pictures
Command cable option #1: GSBUS/Camera Link converter + GSBUS cable of various lengths. PN: SMC-CMD-01-1 and SMC-CMD-01-2 NOTE: An extension Camera Link Cable is expected to be provided by the customer	
Command cable option #2: XY2-100 command cable. PN: SMC-CMD-02-1 NOTE: An extension cable to go between the scan head and this cable is expected to be supplied by the user.	
Command cable options #3 & #4: GSBUS command cable. Available for two- and three-axis systems. PN: SMC-CMD-03-02 and SMC-CMD-04-02	
Laser cable or adapter if ordered NOTE: Cambridge Technology provides five types of laser cables/adapters. See Section 5.5 ("Connect the laser to the SMC") on page 12 for more information.	See Section 5.5 ("Connect the laser to the SMC") on page 12.
PN: SMC-LSR-01 IPG YLP Laser Interface Cable	
PN: SMC-LSR-02 SPI G4 Laser Adapter	
PN: SMC-LSR-03 Synrad CO2 Laser Adapter	
PN: SMC-LSR-04 High-power Laser Adapter	
PN: SMC-LSR-05 Coherent C70 Laser Adapter	

Table 1 - Items in the SMC shipping container

Items	Pictures
Auxilliary I/O Module option. PN: SMC-IO-01	
Hardware accessories (connector kit). PN: SMC-CK-01	

3 Becoming familiar with the SMC board

The following figure shows the connectors on the SMC Board without laser adapter and extended I/O module attached.

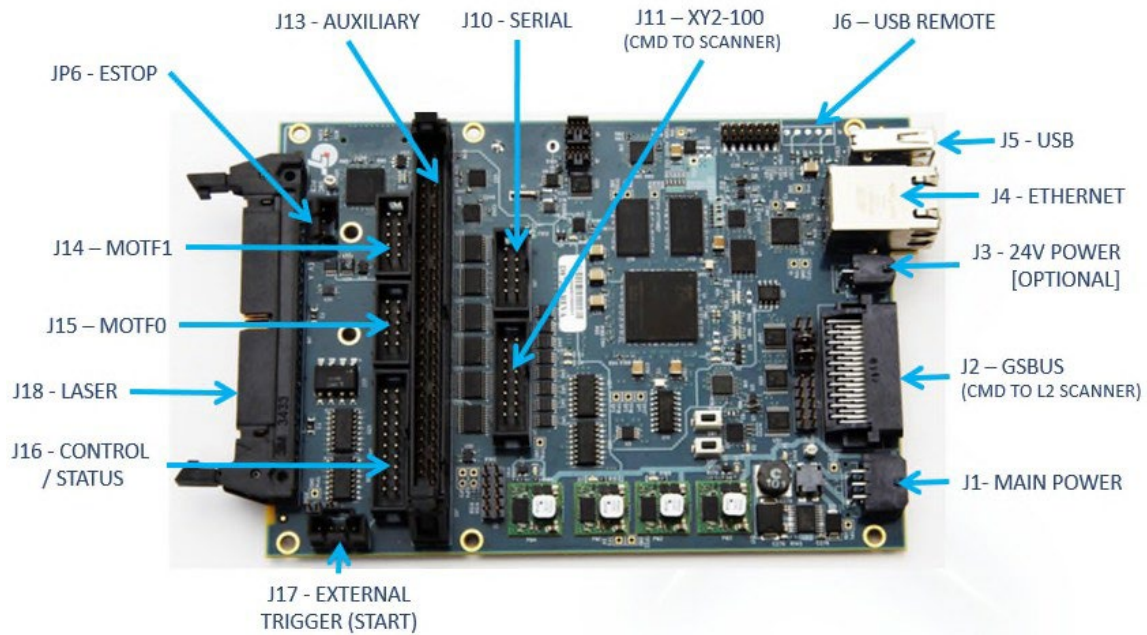


Figure 1 - The SMC board and its connectors

4 SMC command interface options

The ScanMaster Controller supports both the XY2-100 and GSBUS command interfaces to the scanner.

The following section describes the XY2-100 command interface.

Refer to "The GSBUS command interface" on page 6 for a description of the GSBUS command interface.

4.1 The XY2-100 command interface

XY2-100 is an industry standard communication protocol that the SMC supports in both 16-bit and 20-bit resolution for most scanners.

NOTE: Cambridge Technology has its own specification for the 20-bit XY2-100 protocol used only with Lightning II™ or Lightning II™ plus digital scan heads equipped with the XY2-100 interface module. Contact Cambridge Technology technical support for more information.

The following figure shows the XY2-100 interface to an SMC.

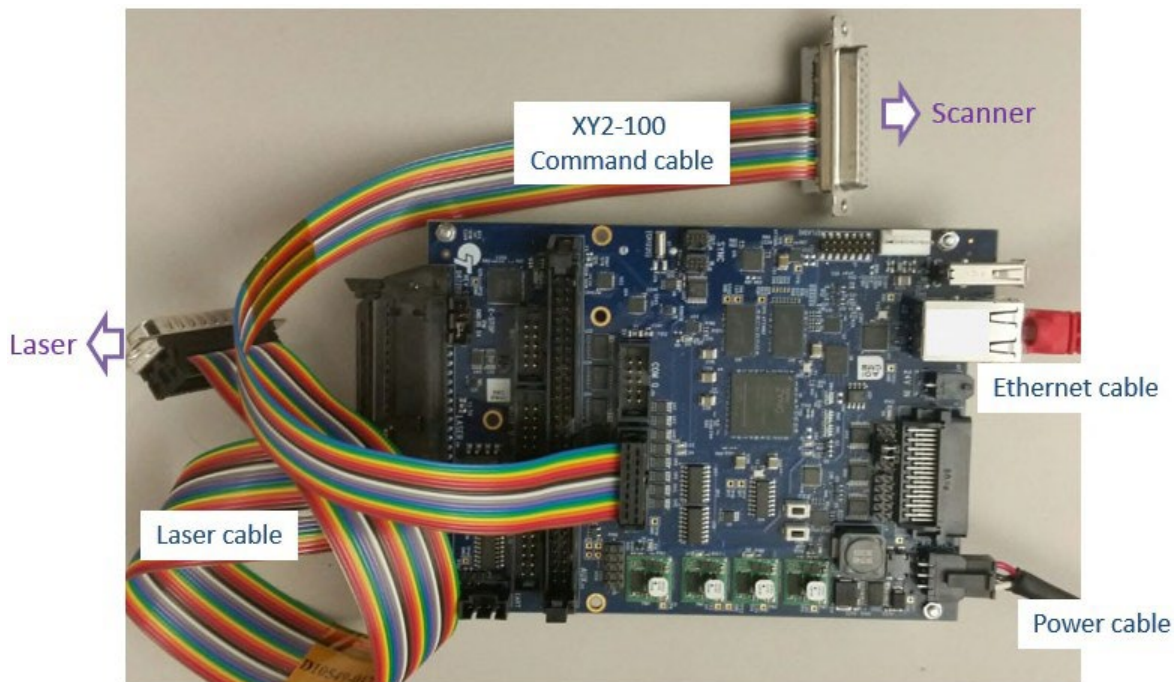


Figure 2 - The SMC with the XY2-100 interface to a scanner

The XY2-100 interface can also be accessed via 25 pin D-Sub connectors on the optional extended I/O module as shown in Figure 3.

NOTE: In the configuration shown, direct connection to a scan-head requires the use of an XY2-100 extension cable or a gender-changer adapter. XY2-100 extension cables can be obtained from Cambridge Technology. Please contact your sales representative for details. Gender-changer adapters can be purchased from vendors such as L-COM (PN: DGB25M).

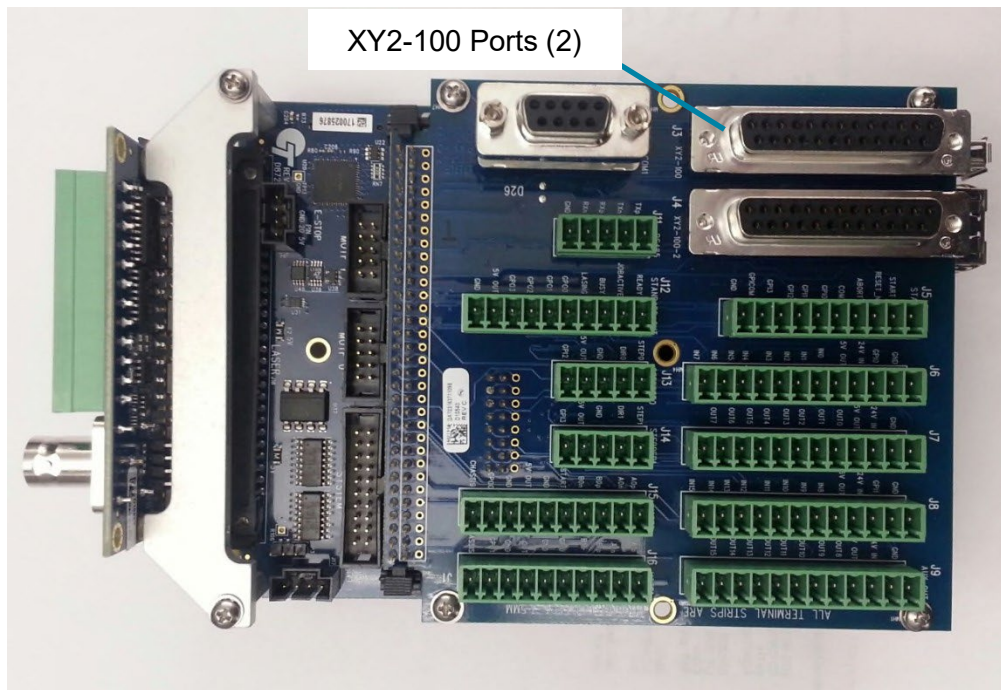


Figure 3 - The SMC Extended I/O XY2-100 interface to a scanner

NOTE: The XY2-100 connectors are expected to be used with XY2-100 extension cables that can be obtained from Cambridge Technology. Please contact your sales representative for details.

4.2 The GSBUS command interface

GSBUS is a 24-bit communication protocol designed exclusively for full digital Lightning II™ or Lightning II™ plus scan heads.

The following figure shows the GSBUS interface to an SMC.



Figure 4 - The SMC with the GSBUS interface to a Lightning II scanning system

5 Getting started with the SMC

This section describes the steps you will take to get your SMC connected, configured, and running. Perform the following tasks in the order shown:

- Download and install the software (below)
- Connect power to the SMC (page 8)
- Connect the SMC to the PC or to the network (page 8)
- Connect the scanner to the SMC (page 9)
- Connect the laser to the SMC (page 12)
- Configure the SMC (page 13)
- *Run a sample program with **ScanMaster Designer** or **ScanMaster API** (page 23)*
- *Calibrate the scanning system (page 24)*
- Set up ScanPack jobs (page 25)

5.1 Download and install the software

You can download all the SMC-related software and manuals from the Cambridge Technology customer download website (www.camtech.com/downloads/customers).

You must enter a password to download software and manuals from the customer download website. To obtain a password, contact Cambridge Technology technical support.

Download, unzip, and install the following software on your computer:

- **SMC SDK Installer** (SMC firmware and utilities tools)
- **CalWizard Installer** (for calibration)
- **ScanMaster Designer Installer** (for creating and running jobs)
- **Dual-axis Correction Tables** (pre-designed correction tables for standard CT scan heads)

You may also download, unzip, and install the following optional software on your computer:

- **MiniEditor Installer** (for demonstrating various SMC features)
- **TuneMaster II Support Module** (for Lightning II users)

NOTE: Please download and read application note AN00002 Cambridge Technology Software Suite Setup for detailed instructions on how to download and install this software.

5.2 Connect power to the SMC

SMC requires 15-48V power input. The differential voltage between V+ and V- must be in the range of 15-48V. The J1 power connector has the pin layout shown in the following figure.

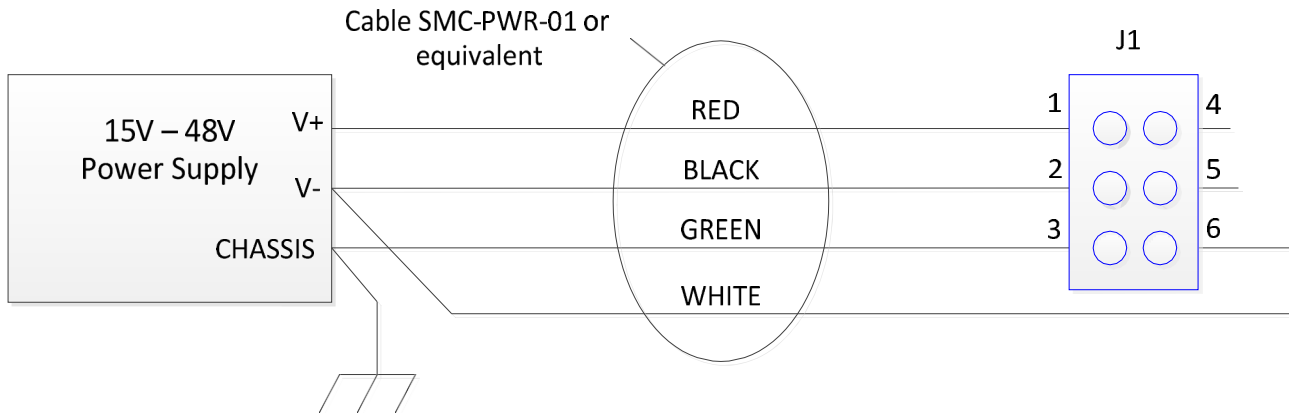


Figure 5 - SMC Power cable connection diagram

5.3 Connect the SMC to the PC or to the network

You must provide a CAT-5 100/1000BaseT Ethernet™ cable to connect the PC to the SMC.



Figure 6 - Ethernet cable provided by the customer

You can connect the SMC directly to the PC through the Ethernet cable or connect to an intranet hub through the Ethernet cable. Refer to Section 5.6.1 ("Set the SMC IP address") on page 13 for information on setting up IP addresses for the SMC and establishing communication with the PC.

5.4 Connect the scanner to the SMC

As mentioned earlier, the options for communication between the scanner and the SMC are GSBUS and XY2-100. The GSBUS communication protocol is designed for use with the Lightning II™ or Lightning II™ plus scan heads. The XY2-100 communication protocol can be used for all scanner types.

Refer to the following section to connect a Lightning II™ or Lightning II™ plus scan head to the SMC for the GSBUS communication protocol.

Refer to Section 5.4.2 on page 10 to connect a scanner to the SMC with an XY2-100 cable.

5.4.1 Connect a Lightning II scanner to the SMC with a GSBUS and Camera Link cable

The following figure shows the connection of the Lightning II scan head to the SMC via a GSBUS interface. The GSBUS interface board connects to a camera link cable provided by the user; the other end of the camera link cable connects to the GSBUS/Camera link converter, which then connects to the SMC via a short GSBUS cable. Both the GSBUS interface board and the new GSBUS cable on the board stack are provided with the Lightning II scanning system. The GSBUS/Camera link converter and the GSBUS cable are included in the SMC package, as described in [Section 2 'What is in the Box?'](#) on page 1. The GSBUS cable that comes with the GSBUS/camera link converter has two length options: 1.5 inch and 2 feet.

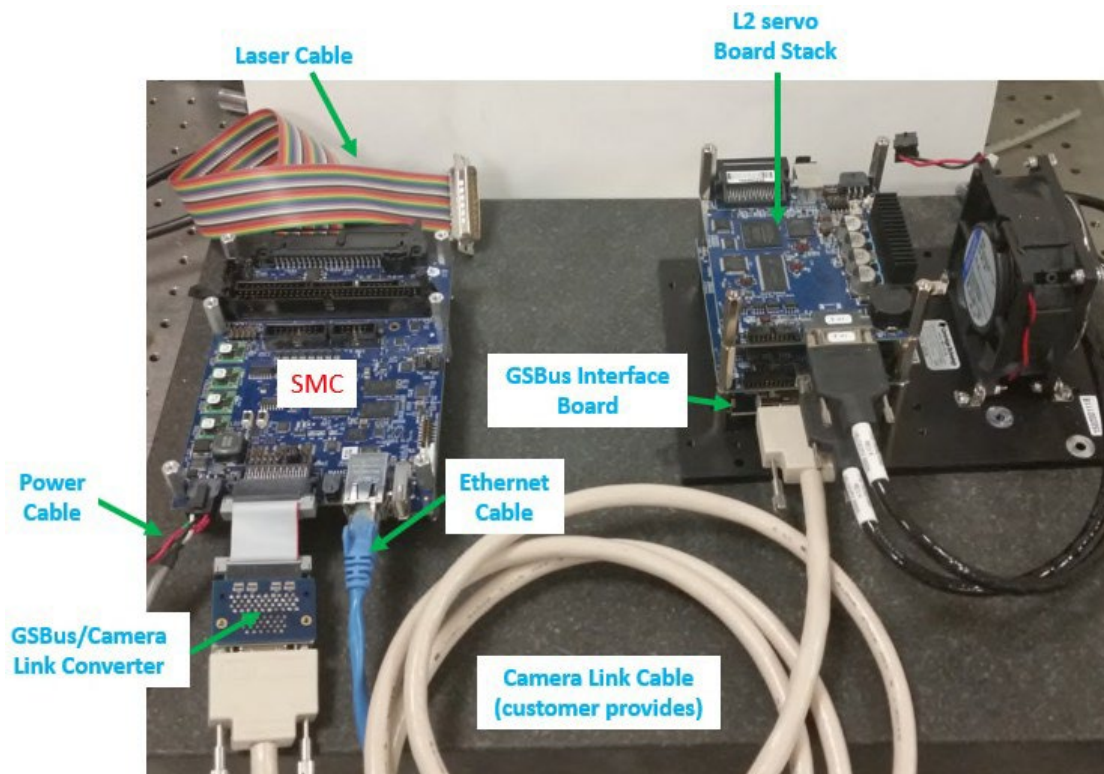


Figure 7 - Connecting the Lightning II scanning system to the SMC

The GSBUS interface board provides ESD protection for the Lightning II servo board. It comes with the Lightning II board stack and the required parts for the Lightning II scanning system.

The Camera Link cable allows long-distance (up to 10m) communication between the SMC and the Lightning II scanning system. The customer provides the Camera Link cable.

Information about the Camera Link cable can be found at

http://solutions.3m.com/wps/portal/3M/en_US/Interconnect/Home/Solutions/MachineVision/.

On the SMC side, a GSBUS/Camera Link converter is used connects the GSBUS connector and the Camera Link cable.

The GSBUS/Camera Link converter has two length options: 1.5 inches (PN SMC-CMD-01-1) and 2 feet (PN SMC-CMD-01-2).

5.4.2 Connect a scanner to the SMC with an XY2-100 cable

The following figure shows how to connect a scanner to the SMC with the XY2-100 command cable. The SMC supports XY2-100 in both 16-bit and 20-bit resolution for most scanners.

NOTE: Cambridge Technology has its own specification for the 20-bit XY2-100 protocol. Contact Cambridge Technology technical support for more information.

An SMC with an XY2-100 interface is shipped with a 12-inch XY2-100 command cable as shown in the following figure. The XY2-100 command cable has a 16-pin IDC connector on one end that connects to the J11 connector on the SMC and a DB25 female connector on the other end.

NOTE: Direct connection to a scan-head requires the use of an XY2-100 extension cable or a gender-changer adapter. XY2-100 extension cables can be obtained from Cambridge Technology. Please contact your sales representative for details. Gender-changer adapters can be purchased from vendors such as L-COM (PN: DGB25M).

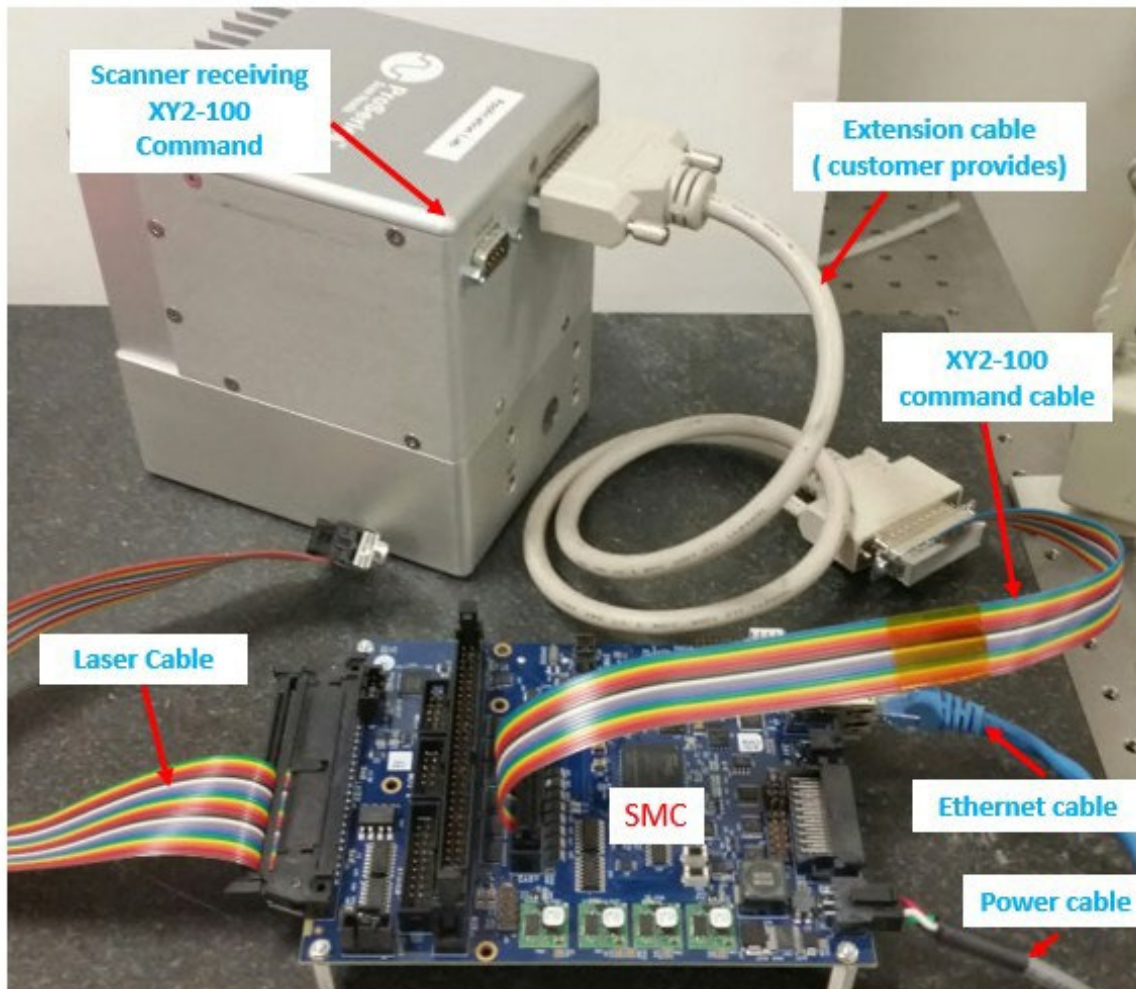


Figure 8 - Connect a scanner to the SMC with XY2-100 cable

5.5 Connect the laser to the SMC

Cambridge Technology provides four types of laser cables for controlling five different laser types— "generic" TTL lasers, SPI G4 lasers, single-ended modulation lasers, differential modulation lasers, and "high power" lasers—from the SMC. The details of pinouts and signal conditioning for the four types of laser cable are described in the SMC Hardware Reference Manual (Lit. No. P0900-0168).

The following figure shows the five types of laser cables/adapters.

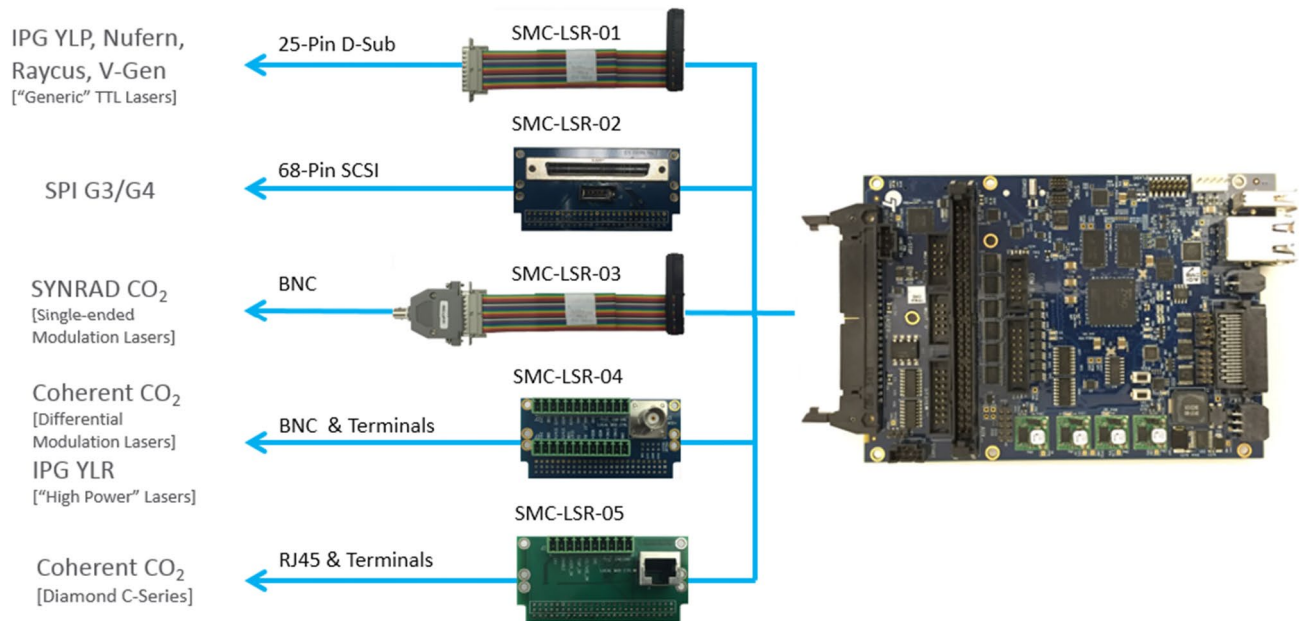


Figure 9 - Available laser cables for the SMC

If a laser cable is needed, order one from Cambridge Technology. Customers also have the option of making their own laser cables for specific needs.

5.6 Configure the SMC

Do the following configuration tasks after you have installed the software and before you run the demo job. Do the following tasks in the order shown:

- Set the SMC IP address (page 13)
- Check the SMC firmware version with Broadcast Monitor (page 16)
- Upload the Lightning II servo parameters to the SMC (page 18) (Only for Lightning II scan heads)
- SMC Laser Profile Setup (page 20)
- Choosing a correction table (page 22)
- Select the SMC control mode (page 22)

5.6.1 Set the SMC IP address

Use either of the following methods to connect the SMC to the PC via an Ethernet cable:

- **Direct** – The SMC is directly linked to the PC through an Ethernet cable. Both the PC and the SMC must have static IP addresses.
- **Network** – The SMC is connected to a network hub in an intranet, and the PC is connected to the same intranet. If the intranet has a DHCP server, both the PC and the SMC should be set to dynamic IP addresses. Otherwise, each should be set to a static IP address.

NOTE: The Default factory setting of the static IP address for an SMC board is 192.168.100.20.

5.6.1.1 How to set a static IP address for the SMC

Do the following to set a static IP address for the SMC:

1. Connect the SMC to the PC with an Ethernet cable.
2. Set the IP address of the Ethernet card of the computer as **static**, and use 192.168.100.1 as the static IP address.

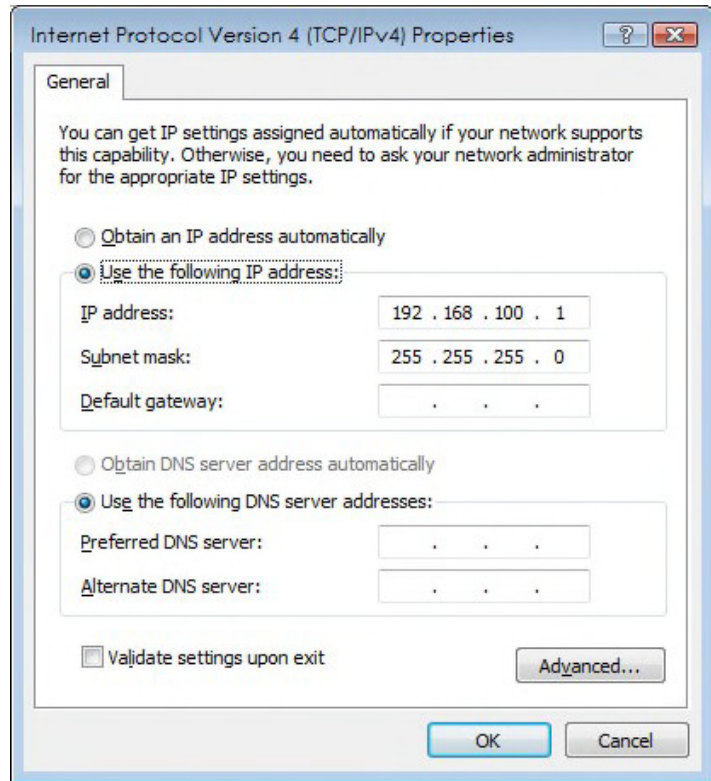


Figure 10 - Setting a static IP address



3. The **ScanMaster Designer** has a built-in software tool called **SMC Device Configuration** editor. To start **ScanMaster Designer**, do one of the following:
 - Select the **ScanMaster Designer** start icon  **ScanMaster Designer** from **Cambridge Technology** → **ScanMaster Designer** in the Windows Start Menu or
 - Double left-click the **ScanMaster Designer** shortcut on the desktop:



Figure 11 - The ScanMaster Designer shortcut on the desktop

4. Once **ScanMaster Designer** is running, **connect** the SMC in Device list. Open **SMC Device Configuration** by clicking on  or right-clicking "SMC" and selecting "Device Configuration".

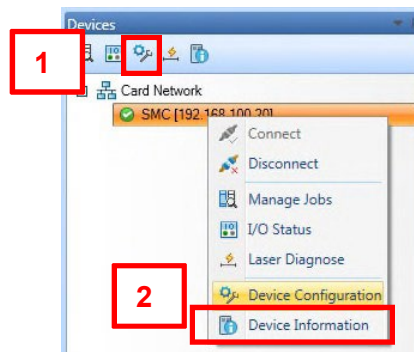


Figure 12 - Configuration Editor in Window Start Menu

- In **SMC Device Configuration**, highlight “AdminConfig.xml” in the list on the left. Under “Network Setting” tab on the right, select *Static* in the dropdown list for **IP Mode**.

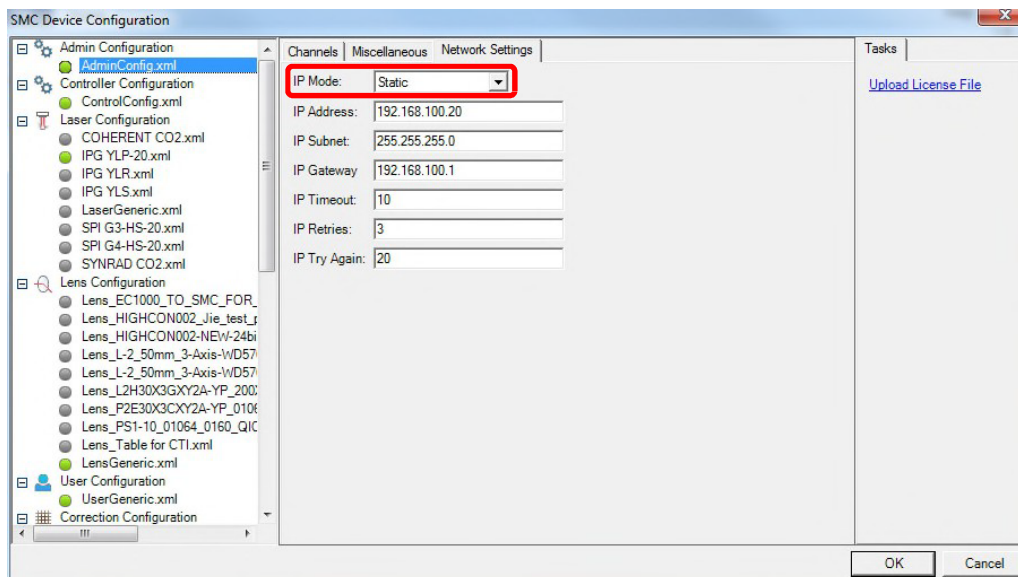


Figure 13 - Set a Static IP address in Device Configuration

- In **IP Address** field, change the SMC IP address from the default value of 192.168.100.20 to the IP address that you want the assign to the SMC. Change the **IP Subnet** and **IP Gateway** accordingly if needed.
- Click “OK” to exit SMC Device Configuration.

NOTE: If you chose a new MSC IP address that is not on the 192.168.100 sub-net, you **MUST** change the host adapter IP address to be on the same sub-net.

5.6.1.2 How to set a dynamic IP address for the SMC

Do the following to set a dynamic IP address for the SMC:

- Perform steps 1 through 5 from the above procedure (“How to set a static IP address for the SMC”) to open **SMC Device Configuration**.

- In **SMC Device Configuration**, highlight “AdminConfig.xml” in the list on the left. Under “Network Setting” tab on the right, select *Autodetect* in the dropdown menu for **IP Mode**.

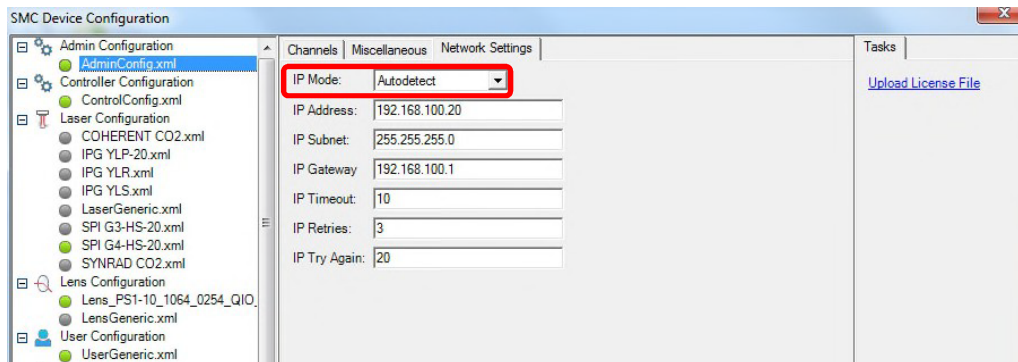


Figure 14 - Set Dynamic IP for the SMC in the Device Configuration

NOTE: In **Autodetect** mode the SMC cannot assign an IP address to itself; it waits for its IP address to be assigned from the DHCP server in the network. Otherwise the SMC continues waiting until an IP address is assigned.

5.6.2 Check the SMC firmware version with Broadcast Monitor

An application called **Broadcast Monitor** is bundled with the SMC SDK and can be used to check the SMC firmware version.

Do the following to use **Broadcast Monitor** to check the SMC firmware version:

- Make sure the SMC is powered on, connected to the computer via an Ethernet cable, and has its IP address properly set.
- Launch **Broadcast Monitor** from the Windows start-up menu.

The utility window opens and a symbol for “SMC Broadcast Monitor” appears in the lower right-hand corner of the computer screen under hidden icons. Sometimes **Broadcast Monitor** is running in the background and the user needs to click the hidden icon to open it.

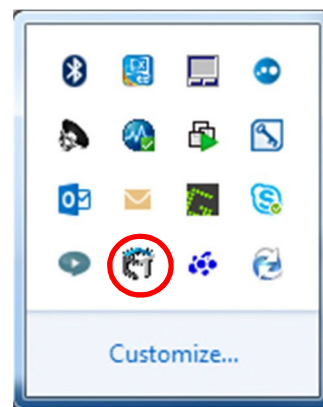


Figure 15 - Hidden icon of SMC Broadcast Monitor

Upon start-up, **Broadcast Monitor** will list the SMCs found on the Ethernet network as shown in the following figure.

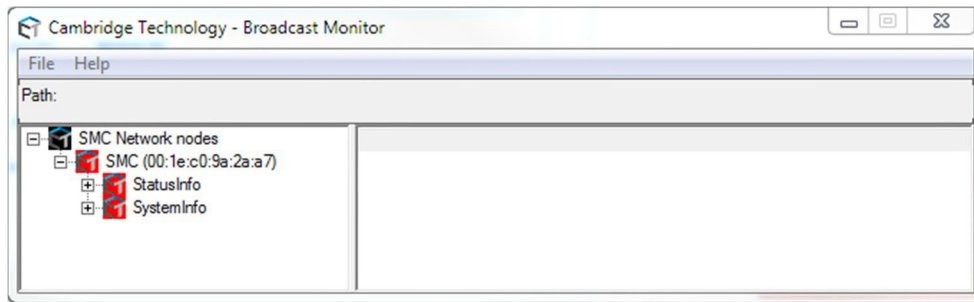


Figure 16 - SMC Broadcast Monitor with one SMC found

- To check the SMC firmware version, double-click “SystemInfo” on the left side of the **SMC Broadcast Monitor** window. The SMC System details display on the right side of the window as shown in the following figure.

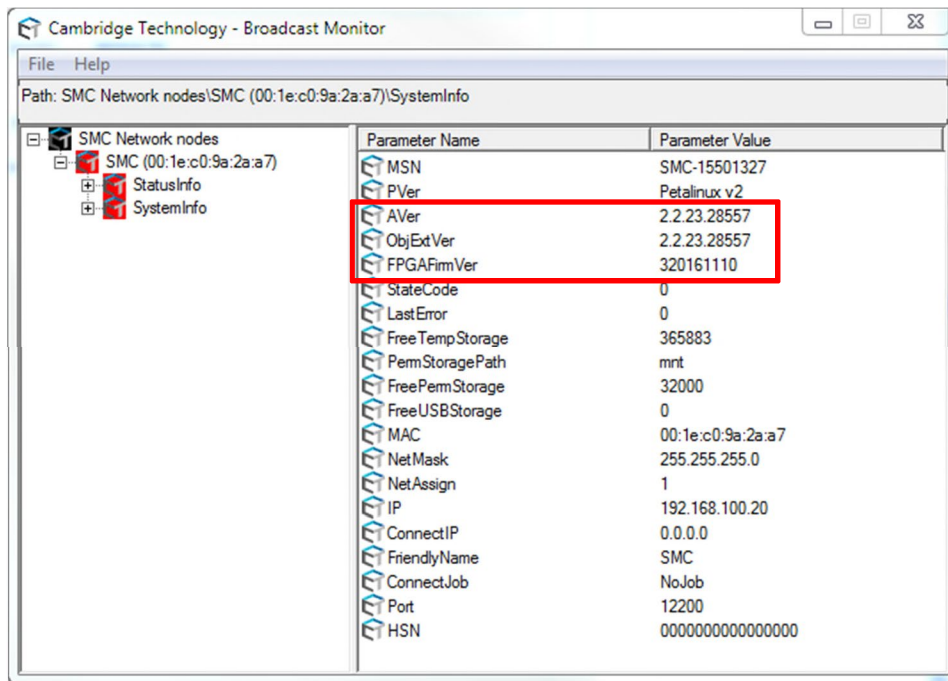


Figure 17 - SMC Broadcast Monitor shows SystemInfo

The SMC firmware version information is displayed as the values of the following three parameters in the **SMC Broadcast Monitor** window:

- **AVer** – Version of the SMC primary embedded server software
- **ObjExtVer** – Version of the embedded ScanScript Engine software
- **FPGAfirmVer** – Version of the FPGA Marking Engine firmware

You can find other system information in the **SMC Broadcast Monitor** window, including the platform version (**PVer**) and the IP address (**IP**).

Refer to Application Note AN00004 ("How to check the SMC firmware version") for more detailed information about **Broadcast Monitor**.

5.6.3 Upload the Lightning II servo parameters to the SMC

The SMC has two control modes: **Traditional** and **ScanPack**. For ScanPack mode, the SMC will need to know the Lightning II servo parameters in order to do the proper trajectory planning.

NOTE: ScanPack mode supports only the Lightning II scanning system.

The SMC SDK provides a tool called **SMC Firmware Loader** to upload new SMC firmware to the board. This section describes how to use the SMC Firmware Loader to upload Lightning II servo parameters to the SMC board. Refer to Application Note AN00010 ("How to upgrade firmware and load Lightning™ II servo parameters") for more information on the SMC Firmware Loader.

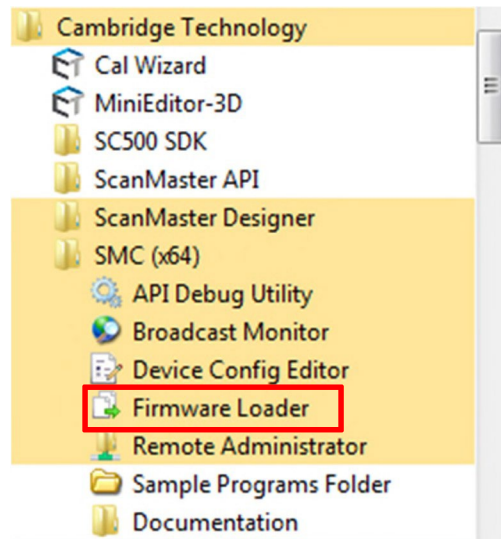


Figure 18 - SMC Firmware Loader in Windows Start menu

The Lightning II system connects to the PC through a USB cable (Fig. 10).

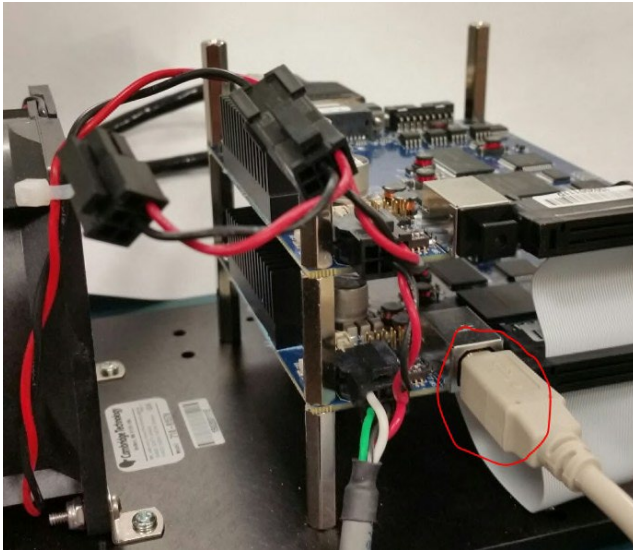


Figure 19 - Connect Lightning II system to PC with a USB cable

After you open the Firmware Loader, it automatically finds the SMC board. To upload Lightning II servo parameters, under the “**Load Selection**”, please uncheck the first 3 items, and check the last item “**L2 Servo Params**”, then click “Start Firmware Load.” After you are finished, click “Exit” to quit. Now the proper Lightning II servo parameters have been loaded to SMC and are ready for use.

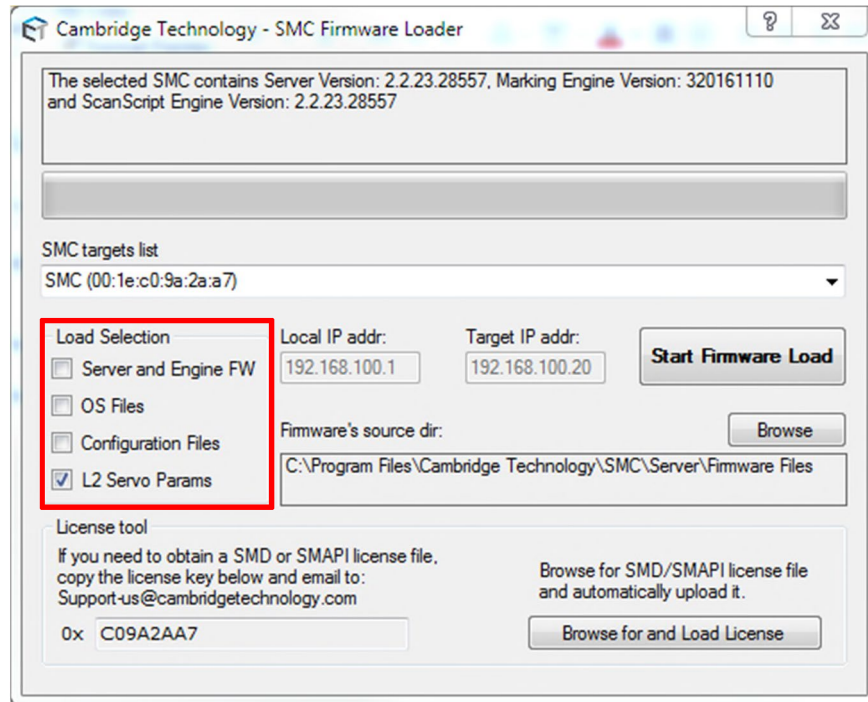


Figure 20 - SMC Firmware Loader Options

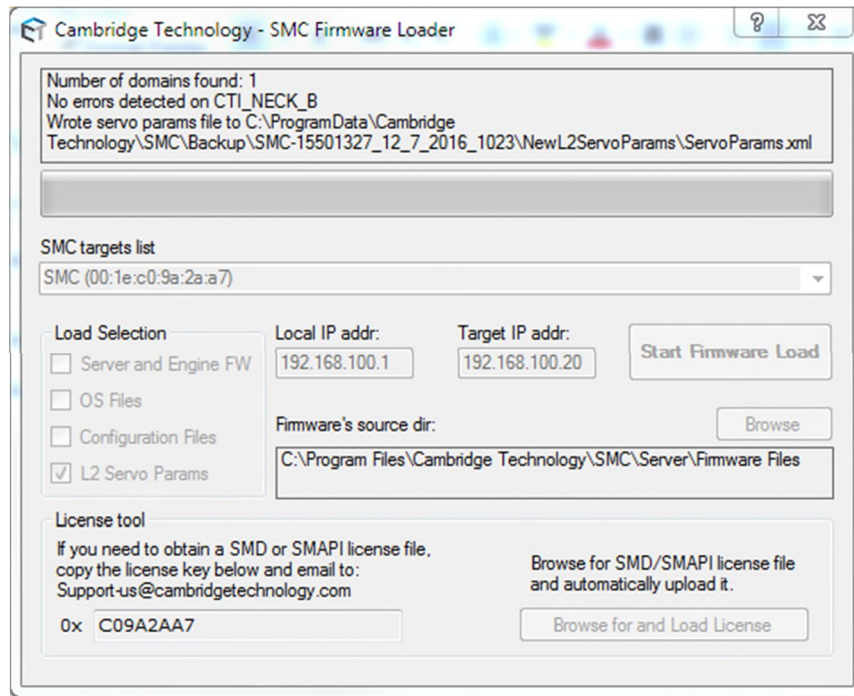


Figure 21 - Loading the Lightning II servo parameters to SMC

5.6.4 SMC Laser Profile Setup

In order to control the laser, you must select the correct laser file for the SMC board. The SMC provides several standard laser files suited to most common industrial lasers.

Perform steps 1 through 4 from 5.6.1.1 ("How to set a static IP address for the SMC") to open **SMC Device Configuration**. In **SMC Device Configuration**, these standard laser files are listed on the left under **Laser Configuration**. Some examples are shown below.

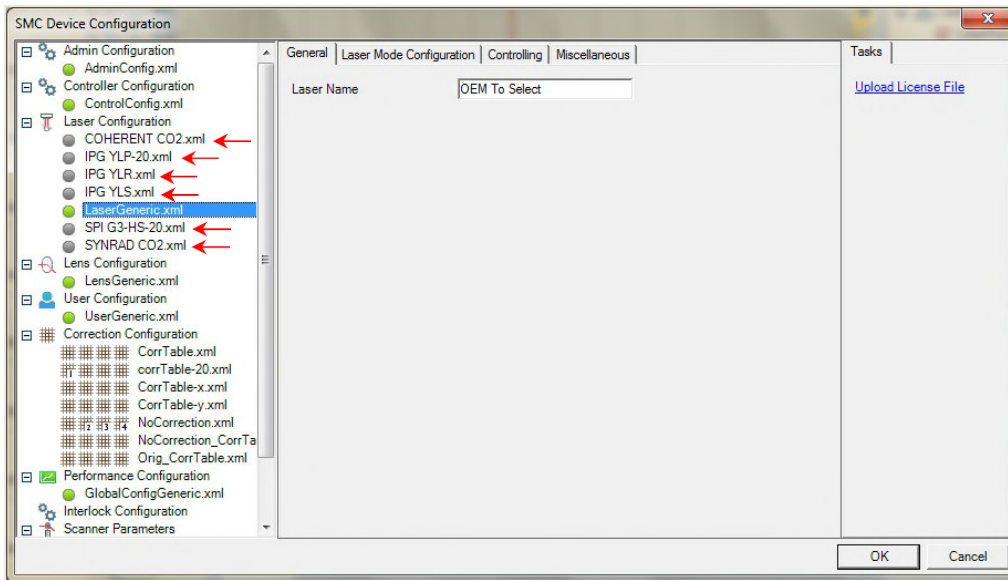


Figure 22 - Laser profile files in SMC Device Configuration

Highlight **ControlConfig.xml**. Under **Controller Configuration** tab, you can choose which laser profile file to use for the SMC in the **Laser File** field (see below):

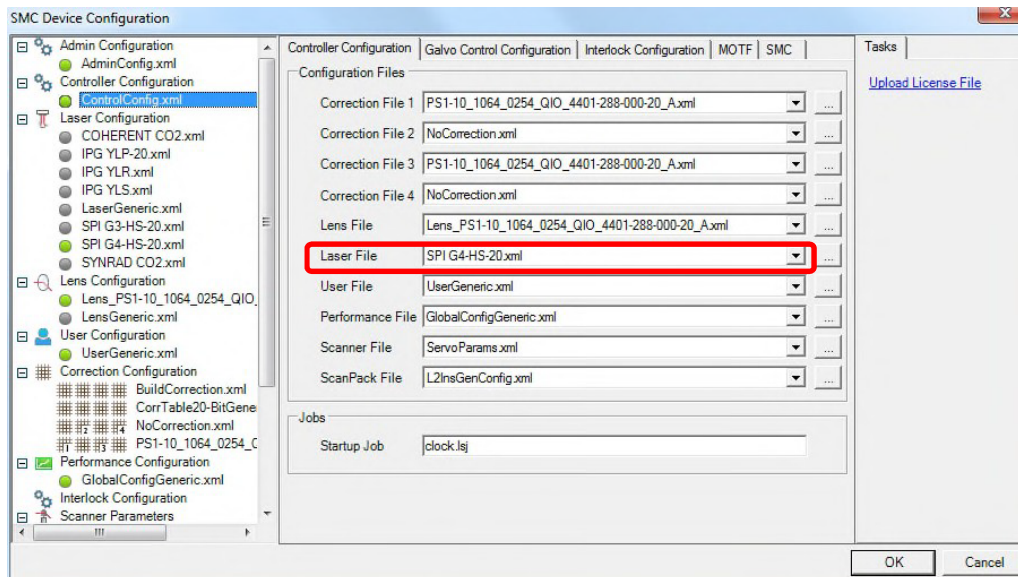


Figure 23 - Select a laser file in SMC Device Configuration

If you use a laser that is different from the lasers specified in the above list of standard laser files, please consult Cambridge Technology to obtain the proper laser profile file.

5.6.5 Choosing a correction table

Perform steps 1 through 4 from 5.6.1.1 ("How to set a static IP address for the SMC") to open **SMC Device Configuration**. Please verify that the default correction table loaded on the SMC board is **NoCorrection.xml** under **Controller Configuration** tab in **ControlConfig.xml**. This table is adequate to run demo programs (see section 5.7) to verify that the scanner is moving and the laser is firing.

You can also select from a set of predesigned calibration files for standard dual-axis scan heads provided that you also have installed Cambridge Technology's Dual-axis Scan Head Correction Tables. These tables are located in:

C:\Program Files (x86)\Cambridge Technology\Common\Correction Files\Two Axis

You can browse for that appropriate file using the **browse buttons**.

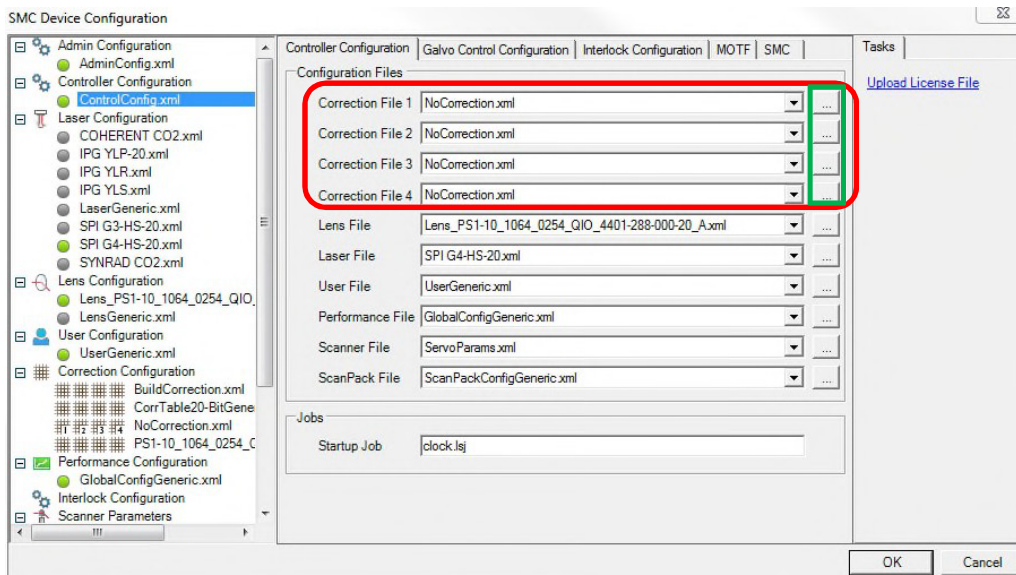


Figure 24 - The default correction table in ControlConfig.xml

5.6.6 Select the SMC control mode

The **ScanMaster Controller** provides two different control modes: **Traditional** and **ScanPack**. ScanPack is an innovative control scheme providing novel trajectory planning, additional circle and spiral primitives, skywriting, vector end velocity control, and many other new features. ScanPack mode is available only when using Lightning II™ or Lightning II™ plus scahn heads.

Based on the application and process, you can choose to use one of the control schemes. Bear in mind that the Lightning II system must have the right tuning file loaded for each control scheme.

Do the following to select the control mode for the SMC:

Perform steps 1 through 4 from 5.6.1.1 ("How to set a static IP address for the SMC") to open **SMC Device Configuration**. In **SMC Device Configuration**, highlight "ControlConfig.xml" in the list on the left. Under "SMC" tab on the right, select *Traditional* or *ScanPack* in the dropdown list for **Command Generation Mode**. The default mode is *Traditional*.

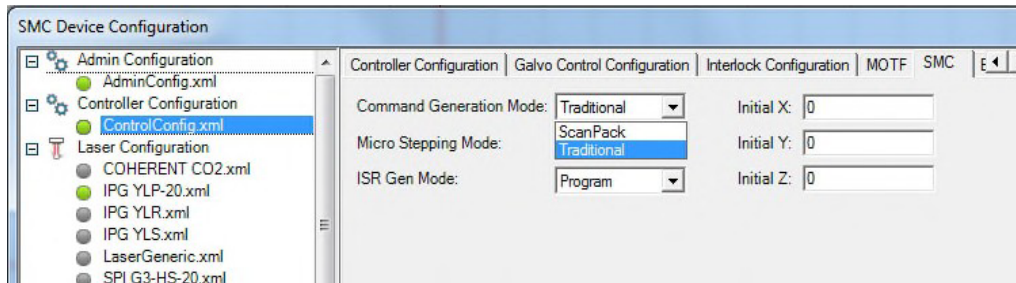


Figure 25 - Changing the SMC control mode between Traditional and ScanPack

5.7 Run a sample program with ScanMaster Designer or ScanMaster API

The SMC provides three user interfaces (one GUI and two APIs). The GUI is **ScanMaster Designer** (SMD), and the APIs are **ScanMaster API** (SMAPI) and XMLAPI. SMAPI is the one that is recommended. The following subsections explain how to verify the system functionality by running the Demo program with SMD and SMAPI.

NOTE: It is recommended that you set the SMC to the **Traditional** control mode for running the Demo program.

5.7.1 Running a sample program with ScanMaster Designer (SMD)

To start **ScanMaster Designer**, do one of the following:


- Select the **ScanMaster Designer** start icon  **ScanMaster Designer** from **Cambridge Technology**→**ScanMaster Designer** in the Windows Start Menu or
- Double left-click the **ScanMaster Designer** shortcut on the desktop:



Figure 26 - The ScanMaster Designer shortcut on the desktop

Once the **ScanMaster Designer** is running, you can do the following to run a sample job:

4. Connect the SMC by left-clicking "Connect" in the **ScanMaster Designer** GUI, as shown in step 1 in the following figure.
5. Start a new project by left-clicking "New" as shown in step 2 of the following figure.
6. Draw a box on the Drawing Canvas as shown in step 3 of the following figure.
7. Set up the shape and laser properties as shown in step 4 of the following figure.

8. Left-click “Start” as shown in step 5 of the following figure.
9. Verify the marking result when it is completed.

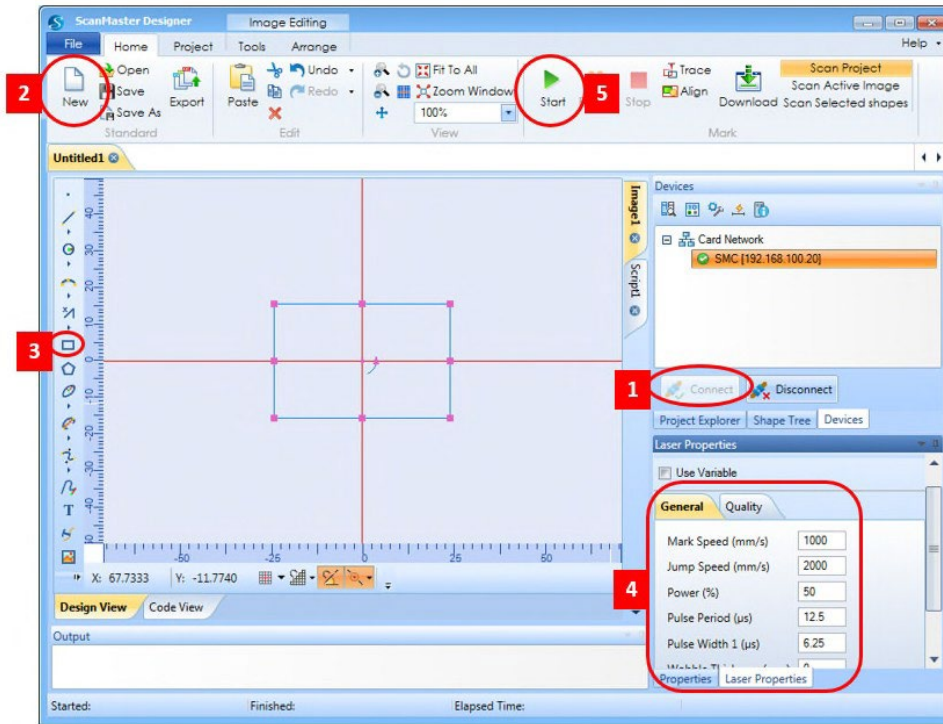


Figure 27 - Set up a simple job in ScanMaster Designer

5.7.2 Running sample jobs with ScanMaster API (SMAPI)

If SMAPI is provided to the SMC user, after installation the customer can run sample jobs to verify the system function. SMAPI jobs it require Microsoft **Visual Studio.NET 10** or higher installed on the PC.

The sample projects and jobs are located at:

C:\Users\Public\Documents\ScanMaster Api Samples\Source

5.8 Calibrate the scanning system

Cambridge Technology provides dedicated software called **CalWizard** for calibrating the scanning system. After installation, it can be found in the Windows Startup Menu.

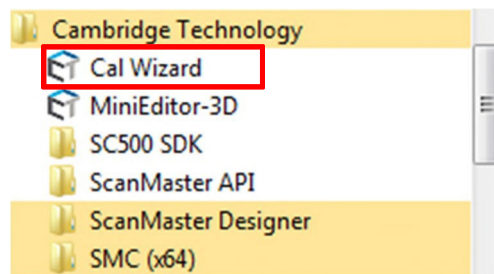


Figure 28 - CalWizard in Windows Start Menu

The details and procedure of calibration can be found in the **Calibration Wizard User Manual** which can be accessed from the Help menu of the CalWizard.

5.9 Set up ScanPack jobs

Under SMC control, you can define a ScanPack job in the **ScanMaster Designer** GUI or in the **ScanMaster API**.

Refer to the following Application Notes for more information on setting up ScanPack jobs:

- AN00005 ("How to set up ScanPack control and primitives in **ScanMaster Designer** for the SMC") – for setting up ScanPack jobs in the **ScanMaster Designer** GUI
- AN00011 ("How to set up ScanPack control and primitives in **ScanMaster API** for the SMC") – for setting up ScanPack jobs in the **ScanMaster API**

6 Referenced documents

This section lists the Application Notes and other documents that are referenced herein.

6.1 Referenced Application Notes

The following table lists the Application Notes that are referenced herein.

NOTE: Unless otherwise noted, the current version of the following Application Notes is the applicable one.

Table 1 - Referenced Application Notes

Lit. No.	Title
AN00004	How to check the SMC firmware version
AN00010	How to upgrade firmware and load Lightning™ II servo parameters
AN00005	How to set up ScanPack control and primitives in ScanMaster Designer for the SMC
AN00011	How to set up ScanPack control and primitives in ScanMaster API for the SMC

6.2 Other Referenced Documents

The following table lists documents other than Application Notes that are referenced herein.

NOTE: Unless otherwise noted, the current version of any of the following documents is the applicable one.

Table 2 - Other Referenced Documents

Lit. No.	Title
P0900-0168	ScanMaster Controller Hardware Reference Manual
P0900-0157	Calibration Wizard User Manual