User Manual

C891T0005, valid for C-891.11C885

BRo, 1/13/2021

C-891.11C885

PIMag® Controller Module for the C-885 PIMotionMaster

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About this Document

This document describes the C-891.11C885 controller module for the C-885 PIMotionMaster from PI. You can find more information on the C-891.11C885 in the "Product Description" (p. 5).

Symbols and Typographic Conventions

The following symbols and typographic conventions are used in this document:

NOTICE

Dangerous situation

If not avoided, the dangerous situation will result in damage to equipment.

➢ Measures for avoiding the risk.

INFORMATION

Information for easier handling, tricks, tips, etc.

The following symbols and typographic conventions are used in the user manuals of PI:

Symbol	Meaning
1.	Action consisting of several steps with strict sequential order
2.	
➢	Action consisting of one or more steps without relevant sequential order
▪	Bullets
p. 5	Cross-reference to page 5
RS-232	Labeling of the control elements on the product (Example: RS-232 interface socket)

Other Applicable Documents

The devices mentioned in this document are described in separate manuals.

C-891 PIMag® motor controller	MS251 User Manual
C-885 PIMotionMaster (for details, see p. 6)	C885T0002 User Manual
PIMikroMove	SM148 Software Manual

Downloading Manuals

INFORMATION

If a manual is missing or there are problems with downloading:

➢ Contact our customer service department (p. **Fehler! Textmarke nicht definiert.**).

Downloading manuals

1. Open the website www.pi.ws.
2. Search the website for the product number (e.g., C-885).
3. Click the corresponding product to open the product detail page.
4. Click the ***Downloads*** tab.

   The manuals are shown under ***Documentation***. Software manuals are shown under ***General Software Documentation***.
5. Click the desired manual and fill out the inquiry form.

   The download link will then be sent to the email address entered.

Safety

Intended Use

The C-891.11C885 module is a laboratory as defined by DIN EN 61010. It is intended for indoor use and use in an environment which is free of dirt, oil, and lubricants.

In accordance with its design, the C-891.11C885 is intended for operating PI positioners equipped with PIMag® magnetic direct drive (hereinafter referred to as "3-phase motor") or with stepper motor.

The C-891.11C885 is intended for closed-loop operation. Position sensor signals must be provided for closed-loop operation. Furthermore, the C-891.11C885 can read the reference switch and limit switch signals from the positioner and process them further.

The C-891.11C885 may only be used in compliance with the technical specifications and instructions in this user manual.

The C-891.11C885 has no housing and is designed to be integrated into the C-885 PIMotionMaster (p. 6) from PI. The operator is responsible for electrical safety according to EN 61010 1:2010 and electromagnetic compatibility according to EN 61326-1:2013 when integrating the C-891.11C885 into the PIMotionMaster.

The C-891.11C885 module and any accessories may only be installed, started and operated by authorized and appropriately qualified personnel.

Safety Precautions

NOTICE

Electrostatic hazard!

The C-891.11C885 module and the C-885.AA01 adapter board contain electrostatic sensitive devices (also: ESD) and could be damaged if handled improperly.

- Avoid touching assemblies, pins, and PCB traces.
- Discharge yourself before touching the C-891.11C885 and the C-885.AA01.
- Handle and store the C-891.11C885 and the C-885.AA01 only in environments where existing electrostatic charges are properly discharged to ground and electrostatic charges are prevented (ESD workstation or electrostatically protected area, EPA for short).

Product Description

The C-891.11C885 is a controller module for the C-885 PIMotionMaster (p. 6) from PI. It is based on the C-891.130300 standard controller. Compared to the C-891.130300 controller, the C-891.11C885 controller module does not have an ***Analog In*** socket and is not installed in a housing.

Product View

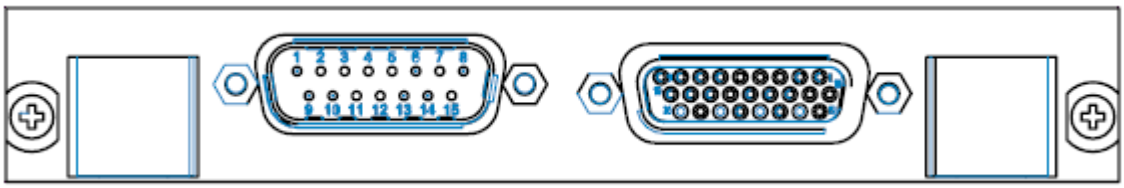


Figure 1: C-891.11C885 controller module (front view)

Scope of delivery

Item number	Description
C-891.11C885	PIMag® controller module for the C-885 PIMotionMaster
C891T0005	User manual for the C-891.11C885 (this document)

Accessories

The following accessories are necessary for accessing the C-891.11C885's digital input and output lines:

Order number	Description
C-885.iD	Digital interface module for PIMotionMaster See p. 15 for pin assignment. You will find further details in the C885T0002 user manual for the C-885 PIMotionMaster.
C-885.AA01	Adapter board from C-891.11C885 to C-885.iD in PIMotionMaster See p. 7 for installation instructions.

C-885 PIMotionMaster Overview

The C-891.11C885 module is intended to be installed into the C-885 PIMotionMaster from PI.

The C-885 PIMotionMaster is a customizable, modular multi-axis controller with card slots. In order to be functional, the C-885 PIMotionMaster requires a chassis (C-885.Rx) with one digital processor and interface module (C-885.Mx) and at least one controller module. See the table below for the C-885 system components. You will find the supported controller modules in the documentation for the C-885 PIMotionMaster (p. 3).

Product number	Item	Remarks
C-885.Mx	Digital processor and interface module for PIMotionMaster with Ethernet and USB interface	One C-885.M1 required for each PIMotionMaster. The C-885.Mx module controls up to 20 controller modules in conjunction with the largest chassis.
C-885.Rx	Chassis for PIMotionMaster	One C-885.Rx chassis required for each PIMotionMaster. The chassis are available in two sizes: ▪ 9.5'': This chassis provides card slots for up to 4 controller modules ▪ 19'': This chassis provides card slots for up to 20 controller modules

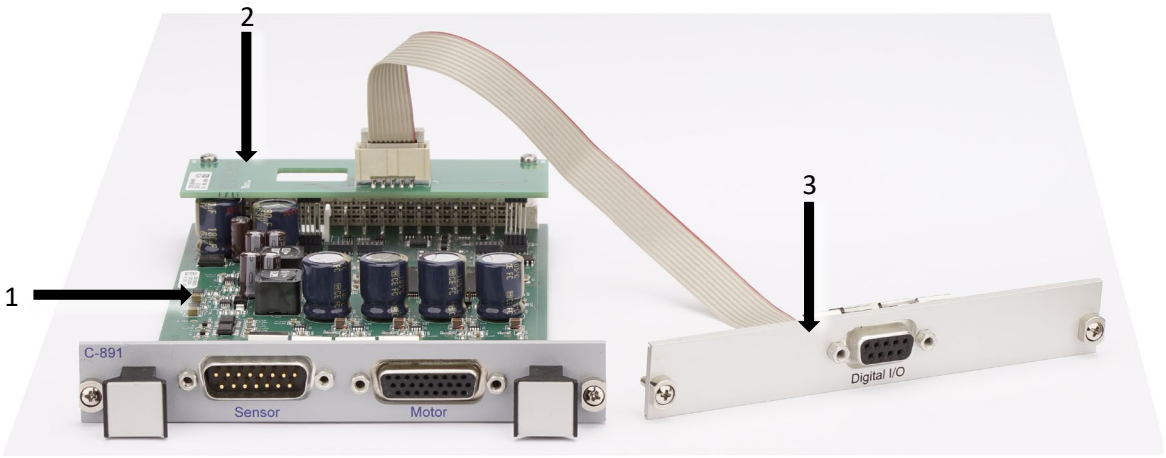
Installation

C-891.11C885 Controller Module

The C-891.11C885 controller module must be installed in the C-885 PIMotionMaster from PI. You will find further information in the documentation for the C-885 PIMotionMaster (p. 3).

C-885.AA01 Adapter Board

You need a C-885.AA01 adapter board and a C-885.iD digital interface module to use the digital input and output lines of a C-891.11C885 controller module. The adapter board must be plugged into the controller module to make the lines accessible to the interface module.



1 C-891.11C885 controller module

2 C-885.AA01 adapter board

3 C-885.iD digital interface module

The adapter board and the interface module are available as accessories (p. 6).

Installing the interface module is described in the C885T0002 user manual for the C-885 PIMotionMaster.

Install the adapter board as follows:

Requirements

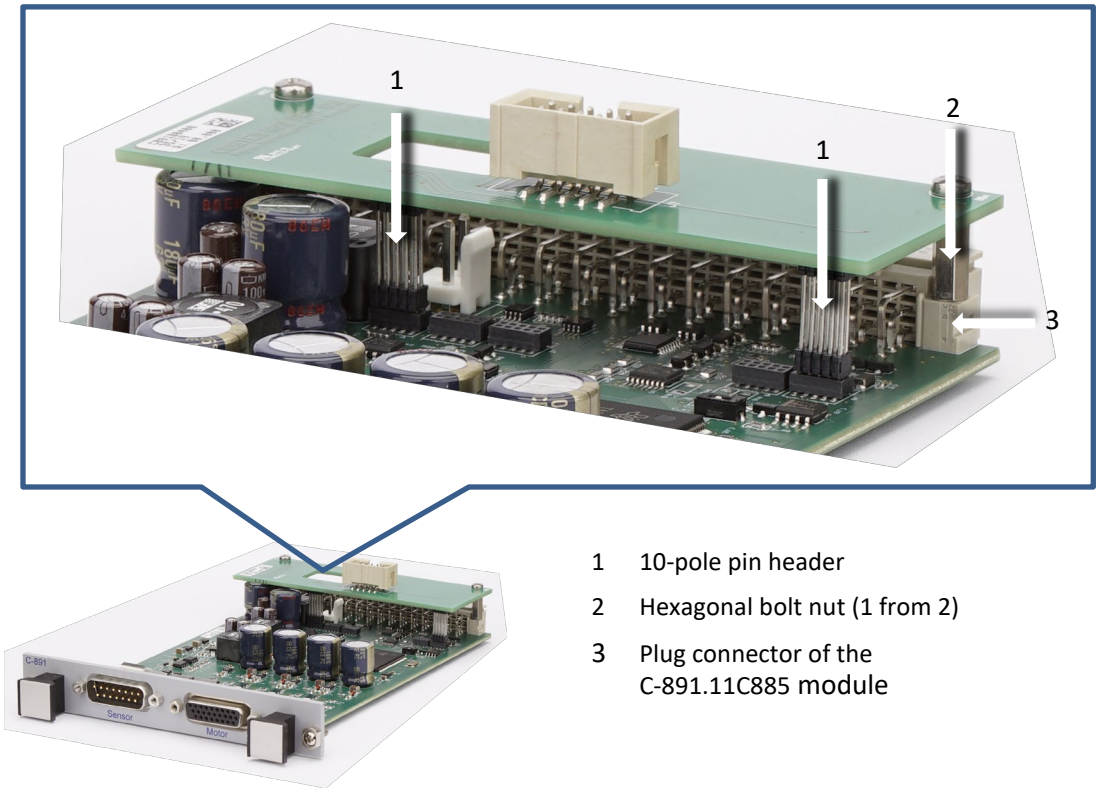
- ✓ You have read and understood the safety information (p. 4).
- ✓ The C-891.11C885 module is **not** installed in the chassis of C-885 PIMotionMaster.

Tools and accessories

- Suitable screwdriver

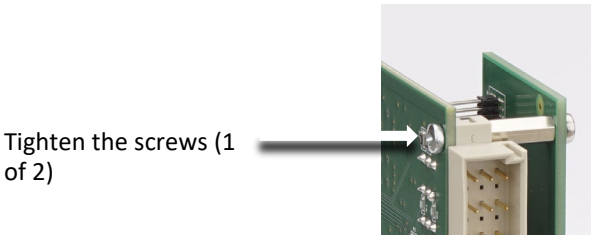
Installing the C-885.AA01 Adapter Board into the C-891.11C885 Module

1. Remove the screws out of the free ends of both hexagonal bolt nuts on the adapter board. Keep the screws at a safe place.
2. Put the adapter board carefully onto the C-891.11C885 controller module, see figure.



1	10-pole pin header
2	Hexagonal bolt nut (1 from 2)
3	Plug connector of the C-891.11C885 module

   - Insert the two 10-pole pin headers carefully into the corresponding sockets on the module on the underneath of the adapter board.
   - Make sure that the free ends of the hexagonal bolt nuts for the adapter board are in contact with the holes in the plug connector of the module.
3. Insert the screws into the hexagonal bolt nuts on the underneath of the module.
4. Check that both 10-pole pin headers are seated properly in the sockets.
5. Tighten the screws completely in the hexagonal bolt nuts.



Power Supply

The maximum current consumption of the C-891.11C885 is 10 A.

- Use a sufficiently rated power adapter for the C-885 PIMotionMaster where the C-891.11C885 is to be installed.

Starting and Operating

Configuring the C-891.11C885 Module and Operating the C-885 PIMotionMaster Normally

When starting the C-885 PIMotionMaster for the first time, the C-891.11C885 controller module has to be configured for the connected positioners. Configuring the controller module requires direct communication with the controller module.

In normal operation, the C-885 PIMotionMaster behaves like a "conventional" multi-axis controller, and the parameter settings for the axes cannot be changed.

You will find further information and instructions in the documentation for the C-885 PIMotionMaster (p. 3).

Command Set for the C-891.11C885

The C-891.11C885 is fully GCS 2.0 compatible.

The commands for the C-891.11C885 are accessible via direct communication with the controller module. You will find further information in the documentation for the C-885 PIMotionMaster (p. 3).

The number of commands and parameters available on the C-891.11C885 controller module may be different from that of the C-891.130300 controller.

- Send HLP? to the C-891.11C885 to get a list of available GCS commands.
- Send HPA? to the C-891.11C885 to get a list of available parameters.

You will find further information on GCS commands and parameters in the MS251 user manual for the C-891 controller (p. 3).

Updating the Firmware

If a firmware update is necessary for the C-891.11C885:

- Contact our customer service department (p. 10) to get information on firmware update.

Customer Service Department

For inquiries and orders, contact your PI sales representative or send us an email (service@pi.de).

If you have questions concerning your system, have the following information ready:

- Product codes and serial numbers of all products in the system
- Firmware version of the controller (if applicable)
- Version of the driver or the software (if applicable)
- PC operating system (if applicable)

Technical Data

Data Table

	C-891.11C885
Function	PIMag® motion controller module for 3-phase motors, sine-commutated operation, field-oriented current control, for the C-885 PIMotionMaster modular multi-axis controller system
Motor channels	1
Sensor channels	1
Supported functions	Point-to-point motion, data recorder, wave generator, macros, setting the commutation angle for 3-phase motors

Motion and servo controller	**C-891.11C885**
Servo characteristics	PID controller for position and velocity, parameter changing during operation
Servo frequency	20 kHz
Dynamics profile	Trapezoidal velocity profile, setting of maximum velocity and acceleration
Encoder input	Sin/cos, A/B (TTL, differential), BiSS interface for absolute encoder
Limit switches	2 × TTL
Reference switch	1 × TTL

Electrical properties	C-891.11C885
Max. output voltage	48 / 24 V depending on operating voltage
Max. average output current, amplitude of sine	5 A
Peak output current, amplitude of sine	10 A
Max. average output current, RMS	3.6 A
Peak output current, RMS	7.2 A

Interfaces and operation	C-891.11C885
Communication interfaces	USB or Ethernet, via C-885.Mx digital processor and interface module
Motor connector	HD D-sub 26 (f)
Sensor connector	D-sub 15 (m)
I/O connectors	Optional with C-885.iD digital interface module and C-885.AA01 adapter board: 4 digital inputs (TTL), 4 digital outputs (TTL)
Command set	PI General Command Set (GCS)
User software	PIMikroMove
Application programming interfaces	API for C / C++ / C# / VB.NET / MATLAB / Python, drivers for NI LabVIEW
Safety features	Motor driver overload protection, motor overheat protection, system overcurrent protection

Miscellaneous	C-891.11C885
Operating voltage	24 V DC or 48 V DC, supply via C-885
Max. current consumption	10 A (load dependent)
Operating temperature range	5 to 40 °C
Mass	130 g
Dimensions	186.42 mm × 128.4 mm (3 RU) × 19.98 mm (4 HP; width without C-885.AA01 adapter board) Width with adapter board: 31 mm

Maximum Ratings

The C-891.11C885 is designed for the following maximum ratings:

Input on:	Maximum operating voltage ⚠	Operating frequency ⚠	Maximum current consumption ⚠
Backplane connector (supply via C-885 PIMotionMaster)	48 V	⎓	10 A

Ambient Conditions and Classifications

You will find further information in the documentation for the C-885 PIMotionMaster (p. 3).

Dimensions

Dimensions in mm without C-885.AA01 adapter board.

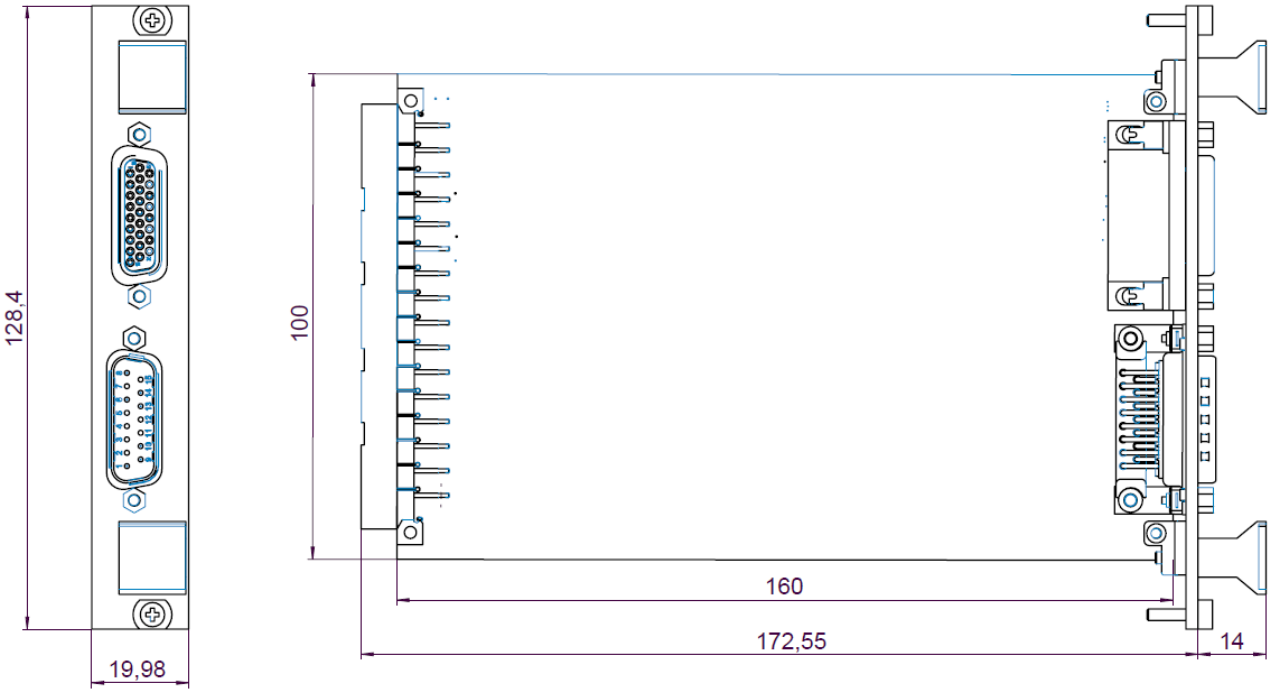
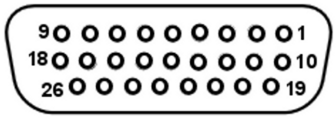


Figure 2: Dimensions of the C-891.11C885

Width with adapter board: 31 mm

Motor Pin Assignment

HD D-sub 26 (f)

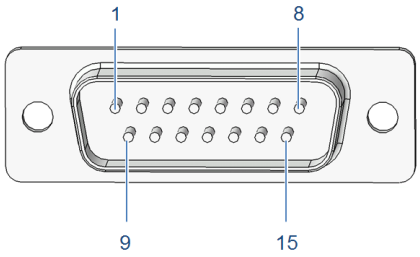


Pin	Signal	Direction	Function
1	OUT0a	Output	Phase I
2	OUT0b	Output	Phase I
3	OUT1a	Output	Phase II
4	OUT1b	Output	Phase II
5	OUT2a	Output	Phase III
6	OUT2b	Output	Phase III
7	OUT3a	Output	Phase IV
8	OUT3b	Output	Phase IV
9	Brake Out	Output	Motor brake
10	REF	Input	Reference signal (Reference Type parameter (0x70) = 0)
11	NLIM	Input	Negative limit switch
12	PLIM	Input	Positive limit switch
13	HALL0	Input	Reserved for Hall sensor input I
14	HALL0	Input	Reserved for Hall sensor input II
15	HALL0	Input	Reserved for Hall sensor input III
16	24/48 V DC	Output	Power adapter voltage output (24/48 V DC)
17	Reserved	-	Reserved
18	VCC_ENC	Output	Encoder supply
19	ENCA+	Input	Encoder input: A+ (TTL)
20	ENCA-	Input	Encoder input: A- (TTL)
21	ENCB+	Input	Encoder input: B+ (TTL)
22	ENCB-	Input	Encoder input: B- (TTL)
23	INDEX+	Input	Index pulse + (Reference Type parameter (0x70) = 1, 2 or 3)
24	INDEX-	Input	Index pulse - (Reference Type parameter (0x70) = 1, 2 or 3)
25	GND		GND
26	VCC_ENC	Output	Encoder supply

Do not connect anything to reserved pins.

Sensor Pin Assignment

D-sub 15 (m)



Pin	Signal	Function
1	VCC 5V	Sensor supply voltage
2	AGND	GND Sensor
3	Sensor A +	Sin (1 Vpp) / A+ (TTL) / BISS MA1
4	Sensor A -	Sin (1 Vpp) / A- (TTL) / BISS MA1
5	GND TEMP	
6	Sensor B +	Cos (1 Vpp) / B+ (TTL) / BISS SL1
7	Sensor B -	Cos (1 Vpp) / B- (TTL) / BISS SL1
8	N-Limit	Negative limit switch
9	PT100	4 mA current source with ADC input
10	REF +	Reference signal + (Reference Type parameter (0x70) = 0, 1, 2 or 3)
11	Thermistor	4 mA current source
12	REF -	Reference signal - (Reference Type parameter (0x70) = 0, 1, 2 or 3)
13	Reserved	Reserved
14	GND	GND
15	P-Limit	Positive limit switch

C-885.iD Digital Interface Module Pin Assignment

The C-885.iD digital interface module is connected to the C-891.11C885 controller module via a ribbon cable and a 10-pole connector strip on the C-885.AA01 adapter board.

You will find details on installing the interface module in the C885T0002 user manual for the C-885 PIMotionMaster.

You will find instructions for installing the C-885.AA01 adapter board on p. 7.

Connector: D-sub 9 (f)

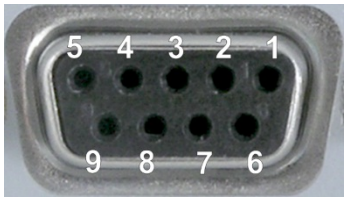


Figure 3: C-885.iD digital interface module: D-sub 9 (female)

Connector strip	D-sub 9 socket		Function
1	1		Input 1 (analog: 0 to 5V / digital: TTL)
2		6	Input 2 (analog: 0 to 5V / digital: TTL)
3	2		Input 3 (analog: 0 to 5V / digital: TTL)
4		7	Input 4 (analog: 0 to 5V / digital: TTL)
5	3		Digital output 1 (TTL)
6		8	Digital output 2 (TTL)
7	4		Digital output 3 (TTL)
8		9	Digital output 4 (TTL)
9	5		GND
10			n.a.

Old Equipment Disposal

In accordance with the applicable EU law, electrical and electronic equipment may not be disposed of with unsorted municipal waste in the member states of the EU.

Dispose of your old equipment according to international, national, and local rules and regulations.

In order to fulfill the responsibility as the product manufacturer, Physik Instrumente (PI) GmbH & Co. KG undertakes environmentally correct disposal of all old PI equipment made available on the market after 13 August 2005 without charge.

Any old PI equipment can be sent free of charge to the following address:

Physik Instrumente (PI) GmbH & Co. KG

Auf der Roemerstr. 1

D-76228 Karlsruhe, Germany