Installation guide
H-1000-5107-02-A

RENISHAW
apply innovation™

SPA*lite*

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Renishaw part no: H-1000-5107-02-A

Issued: 10 2006

SPA*lite*

installation guide

FCC

Information to user (FCC section 15.105)

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your expense.

Information to user (FCC section 15.21)

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

EC declaration of conformity

Renishaw plc declare that the product: -

Name	**Description**
SPA*lite*	Servo power amplifier

has been manufactured in conformity with the following standards: -

BS EN 61326:1998/ inc. amendments A1:1998/A2:2001	Electrical equipment for measurement, control and laboratory use - EMC requirements. Immunity to annex A - industrial locations. Emissions to class A (non-domestic) limits.
BS EN 61010-1:2001	Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements.
BS EN 60204-1:1998	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

and that it complies with the requirements of directives (as amended): -

89/336/EEC - Electromagnetic compatibility (EMC)

73/23/EEC - Low voltage

The above information is summarised from the full EC declaration of conformity. A copy is available from Renishaw on request.

Care of equipment

Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

Changes to Renishaw products

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

Warranty

Renishaw plc warrants its equipment for a limited period (as set out in our Standard Terms and Conditions of Sale) provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g. interfaces and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from authorised service centres only, which may be advised by the supplier or distributor.

Machine safety

WARNING: Switching off or isolating the **SPA***lite* may NOT prevent unexpected machine movement. The user is advised to Isolate the machine from the electricity supply, compressed air or other energy sources in accordance with the machine manufacturer's instructions before entering the danger zone or performing any maintenance operations.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

References and associated documents

It is recommended that the following documentation is referred to when installing the **SPA***lite*.

Renishaw documents

Documentation supplied on Renishaw UCC software CD.

Document number	Title
H-1000-5058	RENICIS user's guide
H-1000-5109	**UCC***lite* installation guide
H-1000-5223	**UCC*2*** controller installation guide
H-1000-5227	Digital SPA tuning user's guide

External documents

National and international standards including the following may be applicable to the finished machine or installation:

BS EN ISO 12100-2:2003 (Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.

BS EN (IEC) 60204-1:1998 (Safety of machinery - Electrical equipment of machines - Part 1: General requirements).

Electrical requirements

The **SPA***lite* is powered from the a.c. mains supply via an IEC60320-1/C14 connector. The electrical ratings of the unit are as follows:

100 – 240 V ac +10%, -15% 47 – 63 Hz 300 W maximum

This equipment must be connected to a protective earth conductor. The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. The protective earth contact shall not be negated by the use of an extension cable without protective conductor.

An earth fixture (M5 thread) is provided to allow bonding of the CMM metal parts to the protective earth.

WARNING: Any interruption of the protective conductor may make the equipment dangerous. Make sure that the earthing requirements are strictly observed.

Environmental requirements

Indoor use	IP20 (no protection against water)*
Altitude	up to 2000 m
Operating temperature	0 °C to +50 °C
Storage temperature	-10 °C to +70 °C
Relative humidity	80% maximum (non-condensing) for temperatures up to +31 °C.
	Linear decrease to 50% at +40 °C
Transient overvoltages	Installation category II
Pollution degree	2
Weight	5.5 kg (12.2 lb)

NOTE: If a higher IP rating is required, an additional external enclosure will be required to house the **SPA***lite*. This enclosure must facilitate an airflow to allow the internal temperature to maintain the ambient within the operating temperature range.

Contents

1 System description

The **SPA***lite* is a servo power amplifier designed specifically for use with the Renishaw **UCC*2*** and **UCC***lite* controllers.

The **SPA***lite* is capable of controlling three axes of movement with configurable velocity feedback options to match the requirements of your installation.

The features offered by the **SPA***lite* are:

- Configurable motor voltage
  - The **SPA***lite* motor voltage can be configured through software to support a wide range of motor voltages within the range of 24 and 48 V. The current limit can also be configured up to a maximum of 2.5 A continuous, 5 A peak.
  - The voltage setting of each axis is independent and therefore it is possible to have each machine motor driven by a different voltage
- Configurable velocity feedback
  - The **UCC*2*** or **UCC***lite* and **SPA***lite* control solution offers the ability to support different types of velocity control loop based on the feedback to the controller.
    - An analogue tacho based feedback system from the motor (tacho)
    - A digital encoder based feedback system from the motor (encoder)
    - Feedback from the scales of the CMM (tacholess)

1.1 Electrical specification

The **SPA***lite* has the following electrical output specification:

Motor output voltage range	24 to 48 V
Maximum peak current output per channel (peak current for ≤50 s at a duty cycle of ≤20%)	5 A
Maximum continuous current output per channel (operating)	2.5 A
Maximum output wattage of whole **SPA***lite* (all 3 channels)	250 W
Emergency stop system specification	Category B to EN954-1:1996
Analogue tacho maximum voltage	50 V
Encoder max count rate	20 MHz

2 Front panel description

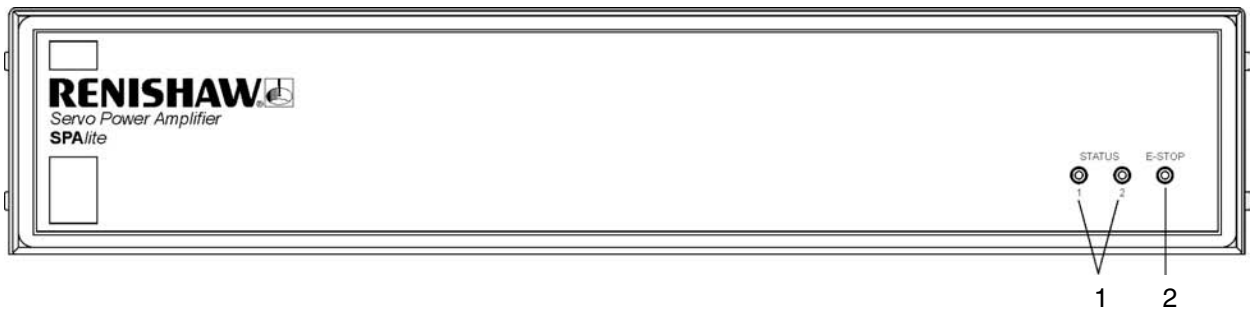


Figure 1 - SPA*lite* front panel

Key

1 Axes status LEDs

2 ESTOP LED

2.1 Axes status LEDs

These LEDs indicate the status of the servo engagement within the **SPA*lite*** unit as shown in the table below. Status 1 indicates the status of axis 0 and 1, status 2 indicates the status of axis 2.

Axis status LED colour	System status
Off	The **SPA*lite*** has no power being applied to the system
Orange	The servo system is active but not engaged for this axis
Green	The servo system is engaged for this axis
Red	There is a fault on this axis of the system
2 second orange flash	Dynamic braking

2.2 ESTOP LED

This red LED indicates the emergency stop system has been activated.

3 Rear panel description

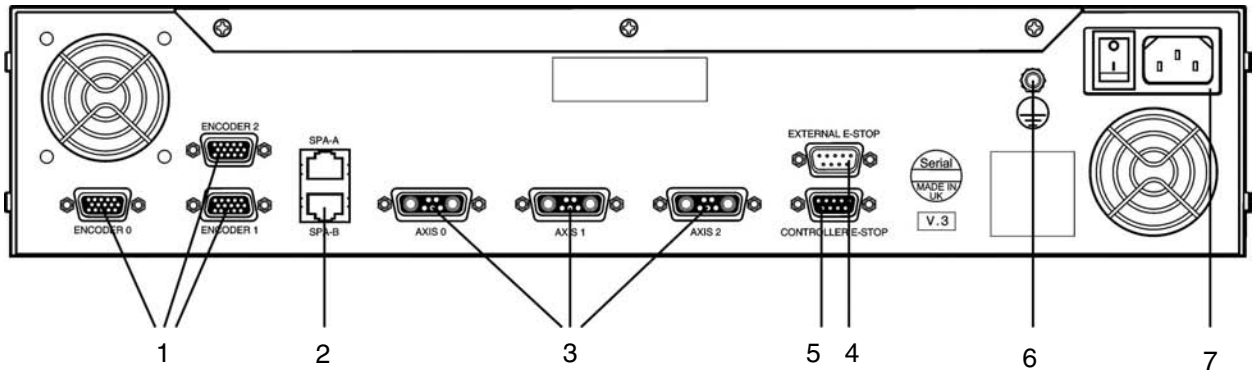


Figure 2 - SPA*lite* rear panel

3.1 Rear panel

Key	Description	Refer to section
1	Axis encoder input 0-2	3.2.1
2	UCC communication link	3.2.2
3	Axis motors 0-2	3.2.3
4	External emergency stop	3.2.4

Key	Description	Refer to section
5	Controller emergency stop	3.2.5
6	Earth connection	3.2.6
7	Mains input	3.2.7

3.2 Connections

3.2.1 Encoder input

The encoder inputs permit the connection of digital RS422 encoders to the **SPA***lite*

Each axis of encoder input to the **SPA***lite* system is a 15-way high-density D.

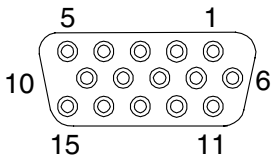
Encoder 0 is the encoder input corresponding to axis 0, etc.

NOTE: Connection to single ended encoders is not recommended.

The 5 V supply from the encoder inputs have the ability to supply a maximum of 1 A in total.

For connection details please refer to the table below:

Connector pin	Function
1	Not connected
2	0 V
3	Not connected
4	Not connected
5	-B signal
6	-A signal
7	+5 V supply
8	+5 V supply
9	0 V
10	Not connected
11	Not connected
12	Not connected
13	+B signal
14	+A signal
15	0 V
Shell	Screen



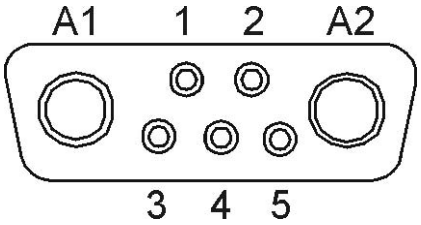
View on face of socket,
or rear of plug

3.2.2 SPA-A and SPA-B connections

These RJ45 connections permit the dedicated servo system communication link between the **SPA***lite* and the **UCC***lite* or **UCC*2*** controller for an effective control system.

3.2.3 Motor drive connector

Each motor connection is a 7W2 connector for connection of a CMM motor to the **SPA***lite,* as shown below:



Viewed on face of plug,
or rear of socket

There are seven connections available on this connector. Please refer to the table below:

Connector pin	Function
A1	+ve motor connection (default)
A2	-ve motor connection (default)
1	+ve tacho input (default)
2	-ve tacho input (default)
3	Ground reference
4	-ve tacho input (linked to pin 2)
5	Ground reference
Shell	Screen

The table shows the default polarity configurations for all pins.

NOTE: The motor and tacho polarities on this connector are software configured during the **SPA***lite* installation process. Please refer to the Renicis user's guide (Renishaw part number H-1000-5058) for details.

3.2.4 External emergency stop connection

This 9-pin D-type connection is designed to permit connection of external emergency stop devices to the Renishaw controller emergency stop system.

The machine manufacturer or product installer must perform a risk assessment to determine the requirements for emergency stopping and emergency switching off.

The **SPA***lite* emergency stop safety system is designed to achieve category B to standard EN954-1:1996 (ISO13849-1:1999). The user's risk assessment should therefore have determined that a category B safety function is satisfactory.

There are two connection pins available on this connector. Please refer to the table below for their functions:

Pin number	Function
6	ESTOP A (+24 V)
7	ESTOP B

Any additional emergency stop component that is fitted to this connector must have the following electrical characteristics:

Emergency stop system voltage : 24 V

Emergency stop system current : 1 A

Emergency stop devices should meet the requirements of IEC 60947-5-1 (Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices) or UL1054 (Standard for special-use switches).

NOTE: If there are no additional emergency stop devices to be added to the system, connect pins 6 and 7 to permit the UCC emergency stop switch to function. It is strongly recommended that all connections to this connector should be fitted by a competent technician or engineer and that all wires should be sleeved. It should not be necessary to switch off the **SPA***lite* in an emergency but if a requirement is indicated by the user's risk assessment, emergency switching off for the complete machine must be implemented externally to the **SPA***lite*.

See section 6.2.3 for connector details.

3.2.5 Controller Estop connector

This 9-way D connector links the Estop system between the **SPA***lite* and the **UCC*2*** or **UCC***lite* controller. The link also supplies power to the **UCC***lite* when connected.

The necessary interconnection cable is supplied as part of the **SPA***lite* kit.

3.2.6 Earth connection

The incoming mains supply protective conductor must be connected to the earth pin of the **SPA***lite* mains connector (refer to Figure 2, item 7) and in accordance with the relevant installation standards.

A M5 screw connector is provided on the **SPA***lite* rear panel (refer to figure 2, item 6) to permit equipotential bonding to the conductive parts of the CMM structure.

NOTE: When the **SPA***lite* is used with the **UCC***lite* or **UCC*2*** controllers, the CMM structure should be bonded to the **SPA***lite* earth screw.

3.2.7 Mains connection

The **SPA***lite* is powered from the a.c. mains supply via an IEC60320-1/C14 connector. The electrical requirements of the unit are as follows:

100 – 240 V ac +10%, -15% 47 – 63 Hz 300 W maximum

The **SPA***lite* is isolated from AC power by disconnection of the IEC mains connector on the rear panel. If any additional means of isolation is required, it must be specified and fitted by the machine manufacturer or the installer of the product.

The use of a suitable RCD (residual current device), for automatic disconnection in the event of an insulation failure, is recommended. This should be sited within easy reach of the CMM operator and must meet the requirements of IEC61010 and any national wiring regulations in the country of installation.

4 Mounting the SPA*lite*

The **SPA***lite* can be installed into a 19” rack mount system or be a stand-alone unit.

The location and mounting arrangement must take account of the environmental requirements for the equipment and accessibility for cabling to the rear panel.

The dimensions of the units are:

Width: 440 mm

Height: 90 mm (2U)

Depth: 302 mm

4.1 Stand alone mounting

Four self adhesive rubber feet are supplied with the unit for stand-alone use.

4.2 Mounting in a 19” rack

To permit the **SPA***lite* to be fitted into a 19” enclosure a rack mounting kit (A-5331-0011) is required.

NOTE: The screws supplied with this kit are M5 × 6 mm countersink type. DO NOT replace with longer screws as damage could occur.

The following procedure is recommended to fit the rack mounting brackets to the **SPA***lite:*

1. Position the **SPA***lite* on a firm flat surface, with either the left or right hand side of the unit placed on the surface and the front of the unit facing towards you.

2. Remove the blanking plugs from the side of the unit, there are two of these located about 15 mm from the front lip on the enclosure and about 15 mm from the top and bottom of the enclosure.

3. Remove the rack mounting kit from its packaging and place one of the countersunk screws supplied in the kit through one of the rack mounting brackets supplied.

4. Align this screw and mounting bracket assembly to the fixing holes in the side of the **SPA***lite* enclosure, so that the rack mounting flange is flush with the front of the unit, and engage the screw into the mating thread. Do not tighten at this point

5. Align the other fixing location in the rack mounting bracket with the fixing hole in the side of the **SPA***lite*, and engage the other countersunk screw into the mating thread.

6. Tighten both countersunk screws to ensure a secure fixing.

7. Rotate the **SPA***lite* such that the other side of the enclosure can be accessed and then repeat steps 2 to 6.

5 System installation

5.1 General

The **SPA***lite* system is configured by software settings stored within the unit and on the host PC. The setting of these configuration parameters is performed by the Renicis commissioning software via the **UCC***lite* or **UCC*2*** communication protocol.

The Renicis software contains a structured installation process to assist in the commissioning of the **SPA***lite*, please refer to the Renicis installation guide (Renishaw part number H-1000-5058) for further information.

5.2 Testing and verification

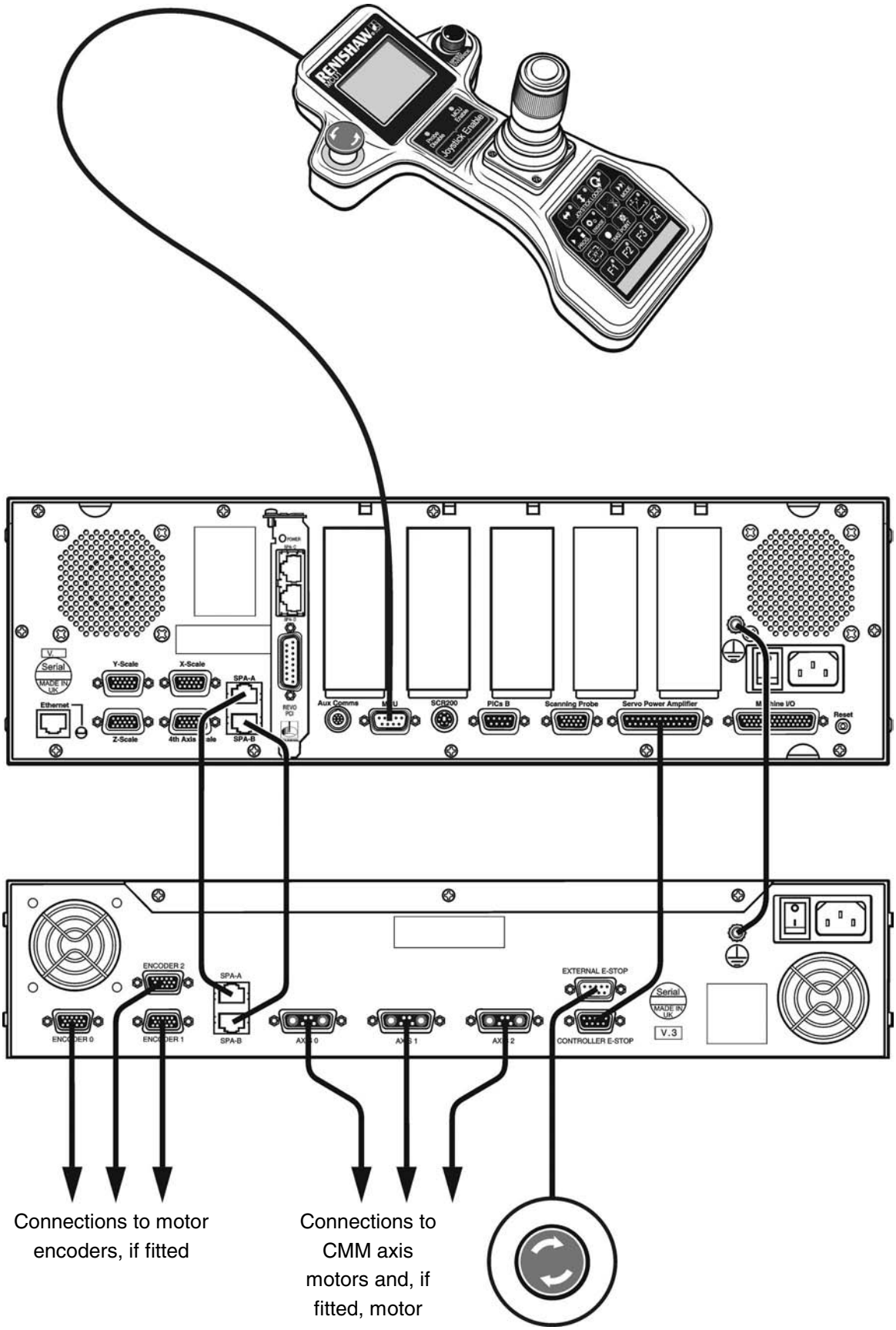
The manufacturer of the finished machine, or the installer of the SPAlite, is responsible for ensuring that the following test and verification procedures are performed to the appropriate standards on the complete installation:

- Verification that the electrical equipment is in compliance with the technical documentation
- Continuity of the protective bonding circuit
- Insulation resistance tests
- Voltage tests
- Protection against residual voltages
- Functional tests, particularly those related to safety

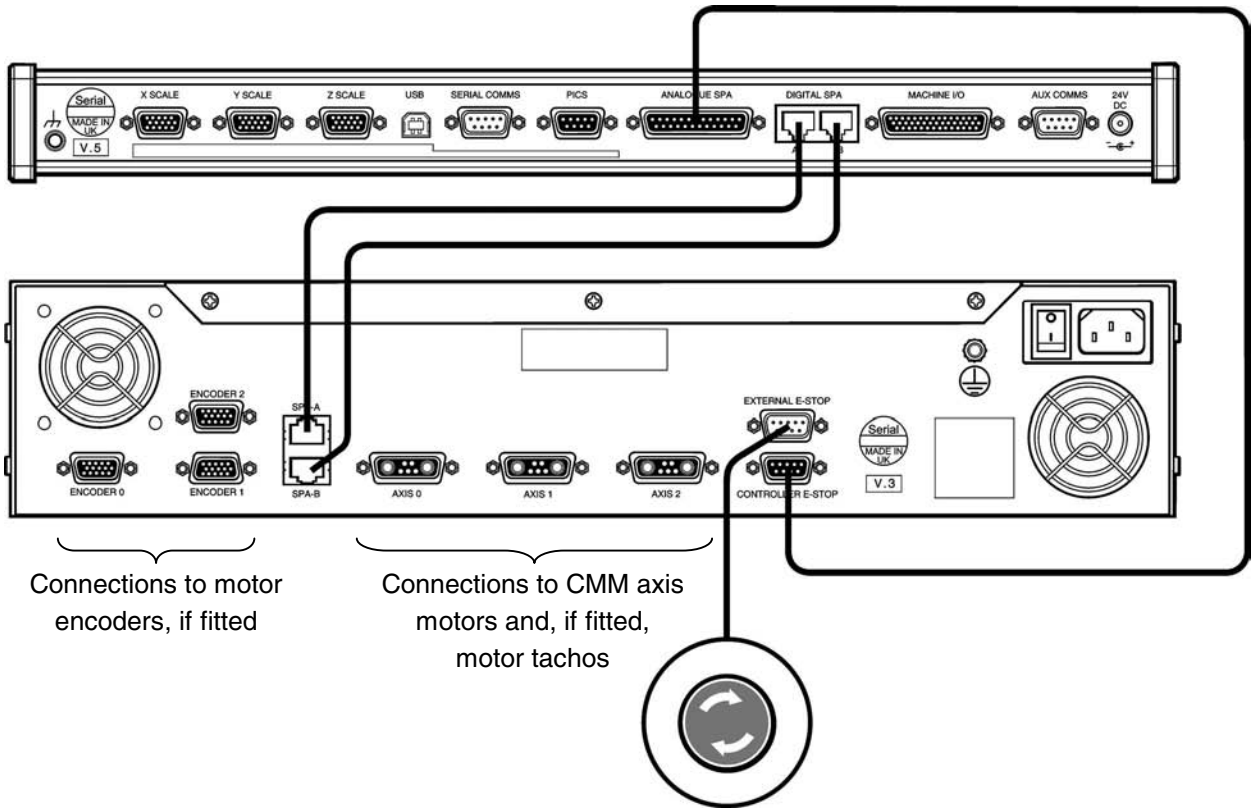
NOTE: We strongly recommend following the step by step utility in Renicis if this unit is repaired or removed for any reason.

6 Interconnection schemes

6.1 UCC*2* and SPA*lite*

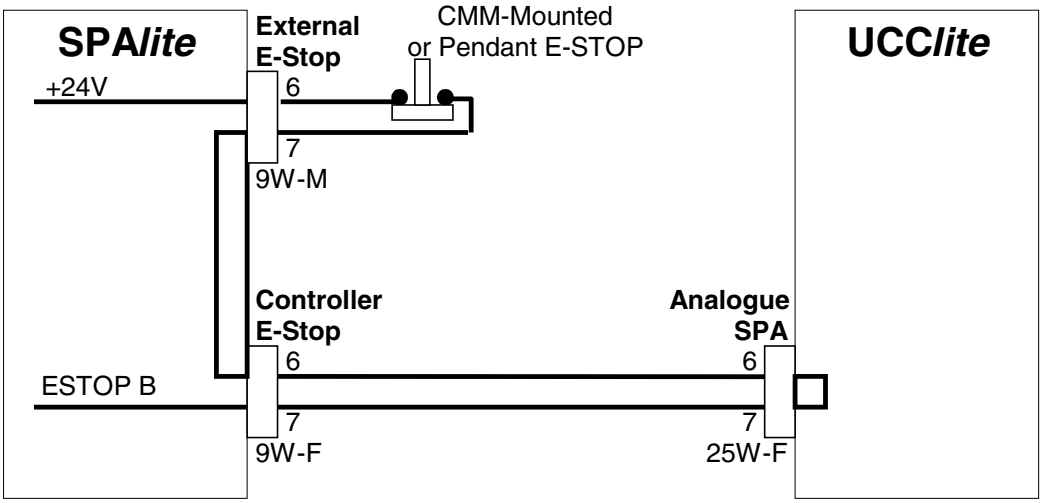


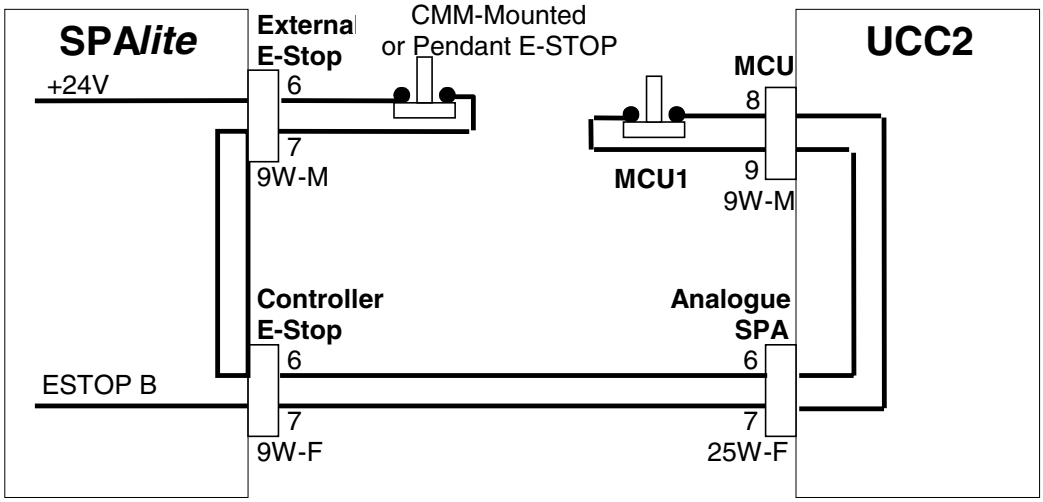
6.2 UCC*lite* and SPA*lite*



NOTE: Joystick connections are not shown because the **UCC***lite* uses a USB joystick connected directly to the PC.

6.3 Connection schemes for emergency stop





6.4 Connection to the CMM

NOTE: All connectors used in the integration of the **SPA***lite* to a CMM installation are commercially available in most countries. If the **SPA***lite* was purchased as part of a UCC kit then an A-5121-0006 bracket connector kit is provided which contains all the rack mounting brackets and connectors necessary to install your system. If you purchased your **SPA***lite* as a discrete item then you need to obtain the connectors locally, or by obtaining an SPA connector kit from Renishaw, part number A-5121-0028.

The connector is of the solder bucket variety and it is recommended that it is fitted to the CMM wiring by a competent technician or engineer, using insulation sleeving on all connections to reduce the possibility of short circuits.

6.4.1 Motor connectors

Each connector kit will contain three motor connectors that are appropriate for DC motor output from the **SPA***lite*.

Each of the three connector assemblies consist of the following:

- 1 off metal backshell
- 1 off 7W2 power and signal D-type connector
- 2 off power pins

6.4.2 Emergency stop connector

The **SPA***lite* and **UCC***lite* or **UCC*2*** control system is capable of providing category B emergency stop system safety level however this is subject to the machine manufacturers / installer method of integration and their risk assessment.

Each machine integration kit will contain one 9-way D connector which permits the installer to add additional emergency stop devices to the emergency stop system integrated within the **SPA***lite*.

7 Revision history

Issue 01-A

First issue.

Issue 02-A

UCC*lite* information added.

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