RENISHAW®

apply innovation™

UCC1 universal CMM controller

Disclaimer

Trademarks

UCC1

Universal CMM controller

Installation guide

C E

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

The UCC1 has been manufactured in conformity with the following standards:

BS EN 61326:1998   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 60204-1:1998   Safety of machinery – Electrical equipment of machines

Part 1: General requirements.

and that it complies with the requirements of the following EC Directives (as amended):

89/336/EEC   –   Electromagnetic compatibility (EMC)

73/23/EEC   –   Low voltage

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.

Trade marks

Windows 98, Windows XP, Windows 2000 and Windows NT are registered tradenames of the Microsoft Corporation.

IBM is the tradename of the International Business Machines Inc

All trademarks and tradenames are acknowledged.

References and associated documents

It is recommended that the following documentation is referenced to when installing the UCC1.

Renishaw documents

Documentation supplied on Renishaw UCC software CD.

Document number	Title
H-1000-5057	UCC controller programmer's guide
H-1000-5058	RENICIS user's guide
H-1000-5220	UCC daughter card installation guide
H-1000-5222	UCC command set
H-1000-5227	UCC servo tuning user's guide

External documents

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

EN 292-2:1991	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications.
EN (IEC) 60204-1:1997	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Safety

Electrical requirements

The UCC1 is powered from the a.c. mains supply via an IEC 320 connector. The operating voltages of the unit are as follows:

90 - 132 V ac and 180 - 264 V ac   47 - 63 Hz   80 W maximum

This equipment must be connected to a protective earth conductor via a three core mains (line) cable. 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 stud is provided to allow bonding of the CMM's metal parts to the protective earth.

⚠ **CAUTION:** Any interruption of the protective conductor may make the equipment dangerous. Make sure that the grounding requirements are strictly observed.

Environmental requirements

The following environmental conditions comply with (or exceed) BS EN 61010-1:1993

Indoor use	IP30 (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

NOTE: If a higher IP rating is required following a risk assessment by the installer of the equipment an additional external enclosure will be required to house the UCC1. It is also the responsibility of the installer to ensure that, if the equipment is used in a dusty environment, that filtering is supplied in the enclosure to prevent excessive dust ingress.

NOTE: UCC1 main unit weight = 6 kg

Contents

1   Safety considerations

When installing a CMM there are many safety factors that have to be taken in to consideration. The following section outlines these considerations:

1.1   Installation

The machine manufacturer or the installer of this equipment is responsible for ensuring that the finished machine complies with the necessary safety regulations and standards including those referenced in this handbook.

Before switching on the installer must perform comprehensive wiring checks. Certain types of fault could cause incorrect motion and the installer is cautioned to not enter the danger zone until all checks have been successfully completed.

It is the responsibility of the machine manufacturer or installer to ensure that position sensors or limit switches are supplied and fitted to the appropriate standards.

The machine manufacturer or the installer must ensure that all wiring external to UCC1 meets the requirements of the UCC1 installation instructions and the appropriate technical standards including EN60204-1.

Following replacement, modification, update of software or other changes to the UCC2, the test and verification procedures specified in the technical documentation must be performed.

1.2   Incoming supply

The UCC2 is isolated by disconnection of the IEC mains connector on the rear panel. If an additional means of isolation is required for the complete machine, it must be specified and fitted by the machine manufacturer or the installer of the product. Where such devices for disconnecting and switching off are fitted, the installer must decide whether any additional protection is required to prevent unauthorised, inadvertent or mistaken connection.

Switching off or isolating the UCC1 does not guarantee freedom from unexpected machine movement.

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.

1.3   Protection against electric shock

Automatic disconnection by the use of a residual current device (RCD) is recommended.

It is the responsibility of the machine manufacturer or product installer to ensure that the complete machine or installation complies with the requirements for equipotential bonding.

1.4   Control functions

The following and similar programming options, which may reduce the protection against accidental collisions (crashes), should be used with extreme caution. These include:-

•   Touch probe override.

•   Setting/unsetting of 'soft' limits.

Emergency stop and emergency switching off systems for the complete machine, if required according to the installer's or user's risk assessment, must be implemented externally to the UCC1 and routinely tested.

The machine safety system, including emergency stop, limit switches, air pressure switch and touch-trigger probe, should be checked regularly for correct function.

1.5   General use

Certain hardware failure modes or software corruption could have a detrimental effect on machine motion and metrology. It is recommended that periodic metrology checks be made using a datum ball, MCG checking gauge or other suitable artifact.

When using a touch-trigger or analogue contact probe it is essential that a stylus is fitted. Apart from a stylus changing procedure, the CMM should never be moved when a probe is not fitted with a stylus.

With the use of extension bars it may be possible that the probe can be moved out of the recognised machine working volume.

The machine operator should keep out of the CMM's operating area whenever possible. This is particularly important during the switch on and homing processes, and during an automatic program, when unexpected movement can occur.

2   Scope and items supplied

The purpose of this chapter is to describe the capabilities of the UCC1 version supplied and the options which are available.

2.1   Scope

The UCC1 installation manual describes the UCC1 co-ordinate measuring machine (CMM) controller, and provides a guide for the installation of the UCC1 and optical interface board/fibre-optic cable which connects the UCC1 to the CMM host computer.

The pin-outs for the connectors on the cables which connect the UCC1 to the CMM are listed so that the cables can be assembled by the user.

For a description of the operation of a UCC1 system, refer to the UCC programmers guide (Renishaw part number H-1000-5057).
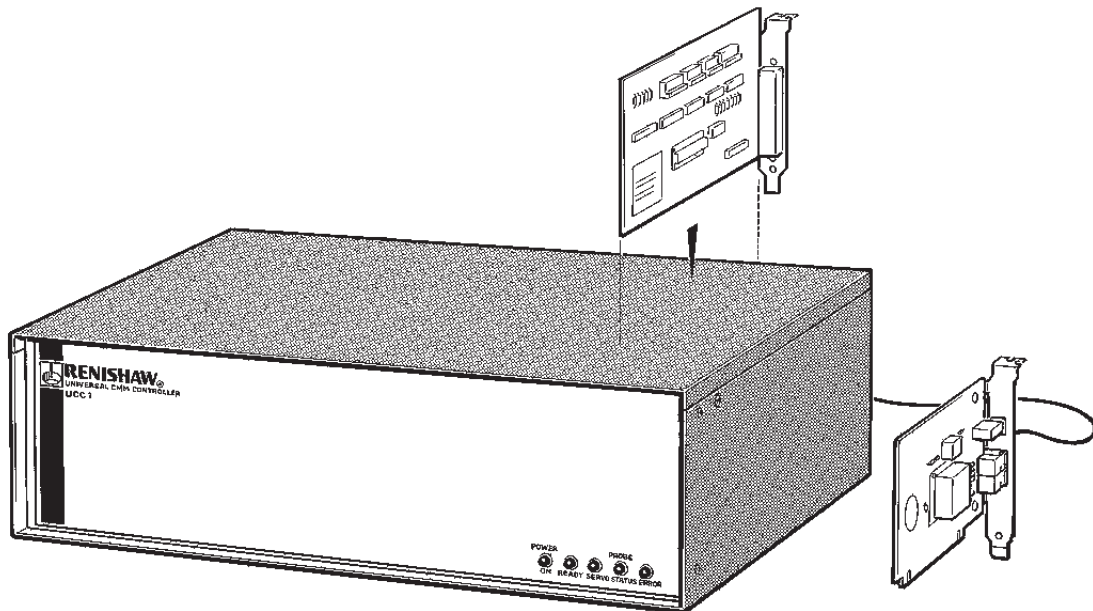
Figure 1 - UCC1 assembly with the joystick or MCU interface board and optical interface board with fibre-optic cable

2.2   CMM host computer

For this version of the UCC1 controller, the CMM's host computer must be an IBM PC compatible with Windows 98, Windows NT (SP6 or later), Windows 2000 or Windows XP Professional as an operating system, a floppy disc drive, a CD-ROM drive, and a hard disc drive. The storage requirements of the UCC1 system are less than 250 Mbytes, however, 550 Mbytes are required for a full software installation.

The PC must have one free PCI slot or ISA slot depending on the optical interface board type specified.

NOTE: A PCI optical board is supplied with every UCC1, ISA cards are available by special order only.

2.3   Installation software (RENICIS)

The Renishaw RENICIS program is an optional tool to assist the user to install, commission and maintain a CMM system based on the UCC1 controller.

It also has features which assist in the development of a software interface between any existing CMM application program and the UCC1.

Please refer to the RENICIS user's manual (Renishaw part number H-1000-5058) for more information on this product.

2.4   Version

The UCC1 CMM controller has the capability of:

*   Controlling three axes of a CMM (accepting digital reading head signals and generating three axes drive motor control signals).

*   Generating output control signals for 3 servo amplifiers.

*   Accepting input signals from emergency stop, air pressure, crash detector, contactor feedback, amplifier faults and X, Y and Z inner and outer travel limit switches.

*   Generating seven uncommitted general purpose output signals.

*   Accepting six uncommitted general purpose input signals (opto-isolated).

*   Providing a +24 V supply for use by the CMM switches.

*   Directly supporting the TP1, TP2, TP6, TP200 and SP600 probes, other Renishaw probes can be integrated to the UCC1 system.

*   Providing a PICS (product inter-connection system) interface for Renishaw peripherals.

2.5   Items supplied

The part numbers of the UCC1 kits and upgrades are:

Kits

A-1333-0003 UCC1 with JI interface card kit (allowing touch trigger functionality)
or
A-1333-0006 UCC1 with MCU interface card kit (allowing touch trigger functionality)

Upgrades

A-1333-0004 for digitising functionality upgrade
or
A-1333-0005 for known part scanning functionality upgrade (includes A-1333-0004 capability)

Each kit contains the following items:

*   UCC1 main unit

*   PCI optical interface board

*   Joystick or MCU daughter card

*   Optical fibre (10 m)

*   UCC1 and RENICIS programs and manuals on CD-ROM

3   Description of the UCC1

The purpose of this chapter is to provide a general description of the construction of the UCC1 controller and its motherboard, daughterboards and power supply unit.

Plug-in daughterboards
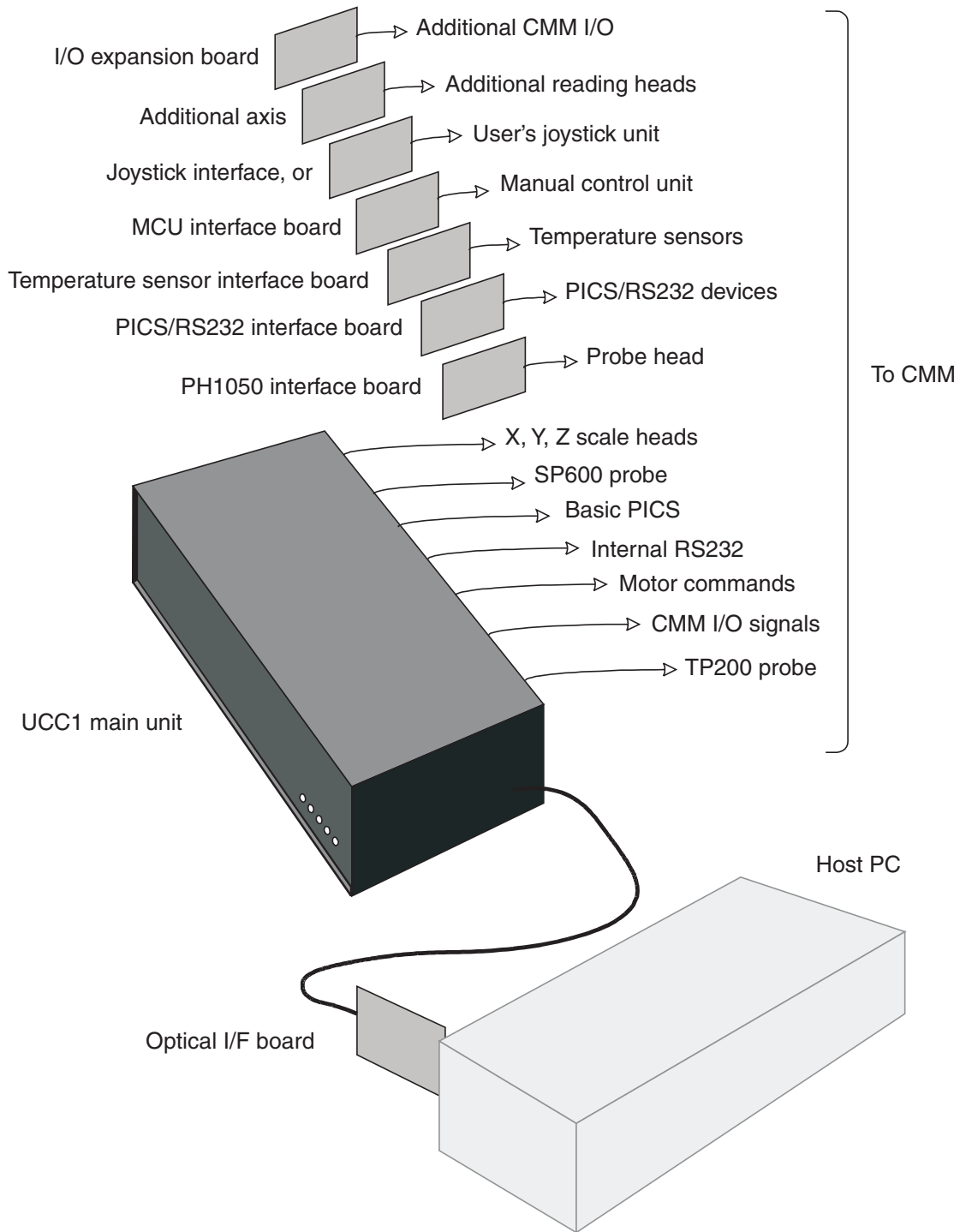
Figure 2 - UCC1 system components, diagrammatic view

3.1   UCC1 controller, general

The Renishaw UCC1 controller is designed to link a CMM host computer to the hardware of a CMM. The controller can provide services to the component parts of a CMM system.

The controller unit contains all the logic circuitry and processor software necessary to:

*   Respond to commands from the CMM's host computer to control the CMM and allow measurements to be made.

*   Process the control commands from the CMM's host computer to drive a CMM around a scanning sequence on a workpiece.

*   Process the measured raw data produced by the CMM's probe and scales.

*   Pass the processed data to the CMM's host computer.

The controller receives instructions from the CMM host computer and passes information to it. It controls the motion of the axes of the CMM by supplying start/stop/velocity signals to the CMM's servo-amplifiers calculated using positional information from the reading heads installed on the axes of the CMM.

The UCC1 is programmed to provide optimum probing conditions on the CMM by controlling the acceleration, velocity and deceleration of the CMM's axes.

The UCC1 consists of a mains-powered controller in a rack-mountable enclosure with a micro-processor based computer system. It is coupled to the CMM's host computer by a two-way fibre-optic serial link, and to the CMM by external cable interface connectors.

The external cable interface input/output connectors are mounted on the rear panel of the controller.

The front panel of the enclosure has LEDs indicating Power On, System Ready, Servo Status, Probe Status and Error Status.

3.2   Motherboard

The motherboard consists of:

*   Central processor unit (CPU)

*   System memory, I/O and interconnection logic

*   On-board connectors for optional plug-in daughter-boards

*   Rear panel connectors for the external interface cables to and from the CMM

*   Rear panel fibre-optic connector for the two-way serial link to the CMM's host computer

*   CMM digital measuring scales reading head circuitry

*   Axis servo control circuits

*   Status indicating LEDs

*   Control electronics for probes and peripheral devices attached to the CMM

It is a multi-layer PCB housing the microprocessor controlled computer system. An internal proprietary bus interfaces with the plug-in option boards.

A 32-bit RISC microprocessor controls the CMM as required by the CMM's host computer.

A small program stored on EPROM on the UCC1 motherboard controls the boot-up sequence of the UCC1. The operating programme has to be downloaded from the CMM's host computer over the two-way fibre-optic serial link.

LEDs visible through the front panel of the UCC1 enclosure indicate the operational status of the UCC1.

Sub-circuits on the motherboard control the following interfaces through connectors on the rear panel of the enclosure:

*   X, Y and Z data input from the CMM reading heads

*   Optical data link to the CMM

*   A Communications port (CH1), reserved for use on a future product

*   CMM status switches and transducers

*   Supplies and control signals for an SCR200 stylus changer rack

*   Signal outputs to the axis drive motors servo amplifiers of the CMM

*   Connections to a TP200 probe or a range of touch-trigger probes

*   Power to and input signals from a Renishaw SP600 analogue probe

A switch is provided to control the LED on a fixed probe head, see chapter 8.

3.3   TP200 interface

The UCC1 motherboard incorporates the circuitry and software necessary to interface to a Renishaw TP200 probe, and operate the associated SCR200 stylus changer rack.

The UCC1 implementation of the TP200 interface has the same automatic recognition of, and support for, conventional touch-trigger probes such as TP1, TP2 TP6 and TP20.

3.3.1   Differences between the PI 200 and the UCC1 interface

•   Most of the PI 200 configuration options (dil switches) have been replaced by UCC1 command number 426, PIB200 Configure interface.

•   Internal connections have been implemented to permit connection of the required PICs signals to the PHC1050 daughtercard or external probe head controller via the PICs/RS232 daughter card.

•   The probe reset function is now activated by command number 427, PIB200 Reset Probe.

•   The interface status, normally LEDs on front of the PI 200, are replaced by the command number 428, PIB200, Read Status. This provides some interface status information from the UCC1.

•   There is no audio 'beep' signal generated within the UCC1. If fitted, the joystick unit beeper can be used for the same function.

3.3.2   Connectors

The 9 pin D socket labelled 'trigger probe' will accept the TP200 probe signals and direct them to the PI 200 interface on the UCC1 motherboard.

A 6 pin miniature DIN socket labelled 'SCR200' is used for connection of the SCR200.

3.4   Daughtercards

The daughtercards, which plug into sockets on the motherboard, are available as required by the CMM application.

For details on the following daughtercards please refer to the daughtercard installation guide (Renishaw part number H-1000-5220)

•   Joystick interface daughtercard   •   Probe head (PHC1050) daughtercard

•   MCU interface daughtercard   •   SP25 daughtercard

•   Additional axis daughtercard   •   SP80 daughtercard

•   PICS/RS232 daughtercard

3.5   Power supply unit

The UCC1 controller has a shielded switched-mode power supply unit (PSU) which is mounted on the left-hand side of the UCC1 enclosure.

The PSU supplies the UCC1 controller and can also supply power to the specified probes and reading heads, and the status switches of the CMM.

3.5.1   Input

The power supply has a universal ac/dc input circuit. See safety statement at the start of this document.

3.5.2   Output

The UCC1 PSU provides protected low voltage dc supplies of +15 V, +5 V and -15 V for external devices such as scale reading heads, the SP600 probe etc.

These supplies share a common 0 V return which is connected within the UCC1 to the protective ground of the AC supply and the UCC1 case.

The UCC1 also provides a +24 Vdc supply available for use by the CMM to power the status switches etc. The return line of this 24 Vdc supply (which should be wired separately from the returns of the +15 V, +5 V and -15 V supplies) is also connected to the AC supply protective ground within the UCC1.

3.6   Fuses

The UCC1 contains no user serviceable fuses, it is protected internally from inadvertent current overload by self-resetting fuses.

⚠ **WARNING:** There is no internal fuse on the mains supply to the UCC1. The installer must provide suitable protection.

Required mains supply fuse: 5 Amps type T (anti-surge).

4 Optical interface board and cable

This chapter describes the optical interface board which is installed in the CMM host computer (IBM PC compatible computer for this version of the optical interface board) and the fibre-optic connecting cable.

4.1 Optical interface board

The optical interface board supplied wit the UCC1 plugs into a PCI bus slot on the motherboard of the CMM host computer. A eight bit ISA version of this card is available.

A twin fibre-optic cable connects the optical interface board to a double fibre-optic connector on the UCC1 motherboard.

See chapter 6 for installation instructions.

Electrically, the board exists as set of ports on the computer's bus (located by the 'base address' mentioned above) to which the PC sends instructions or from which it reads replies. The information is converted into optical signals for transmission and back into electrical signals on reception.

4.2 Fibre optic cable link

The UCC1 is connected to the optical interface board, installed in the CMM host computer, by a twin fibre-optic cable link, part of the Hewlett-Packard Versatile Link family. One of the cables is used to transmit signals from the UCC1 to the optical interface board, installed in the CMM host computer, and the other link transmits signals from the optical interface board back to the UCC1.

The factory supplied fibre-optic cable has part number HFBR-RTD010 and is 10 metres long. Alternative shorter or longer cable links can be obtained as required from your nearest HP distributor.

In common with most fibre-optic cables this is not suited to applications involving continuous flexing. The cable should be supported where necessary to prevent large amplitude vibration. The cable link must be used within the following manufacturers' parameters:

Absolute maximum ratings:

	Minimum	Maximum	
Storage	-55	85	
Installation temperature (°C)	-20	70	(Note 1)
Maximum length (m)		50	
Short term tensile force (N) (dual channel)		100	(Note 2)
Long term tensile load (N)		1	
Short term bend radius (mm)	25		(Note 3, 4)
Long term bend radius (mm)	35		
Flexing (cycles)		100	(Note 4)

NOTE 1: Installation temperature is the range over which the cable link can be bent and pulled without damage. Below -20 °C the cable link becomes brittle and should not be subjected to mechanical stress.

NOTE 2: For less than 30 minutes.

NOTE 3: For less than 1 hour (non-operating).

NOTE 4: A 90° bend on a 25 mm radius mandrel. Bend radius is the radius of the mandrel around which the cable link is bent.

5 Connecting the UCC1 to a CMM

The purpose of this chapter is to describe the essential connections between the controller and a CMM to make a working system.

The discussion looks at each major type of CMM connection to the controller and gives comments on the preferred methods and available alternatives.
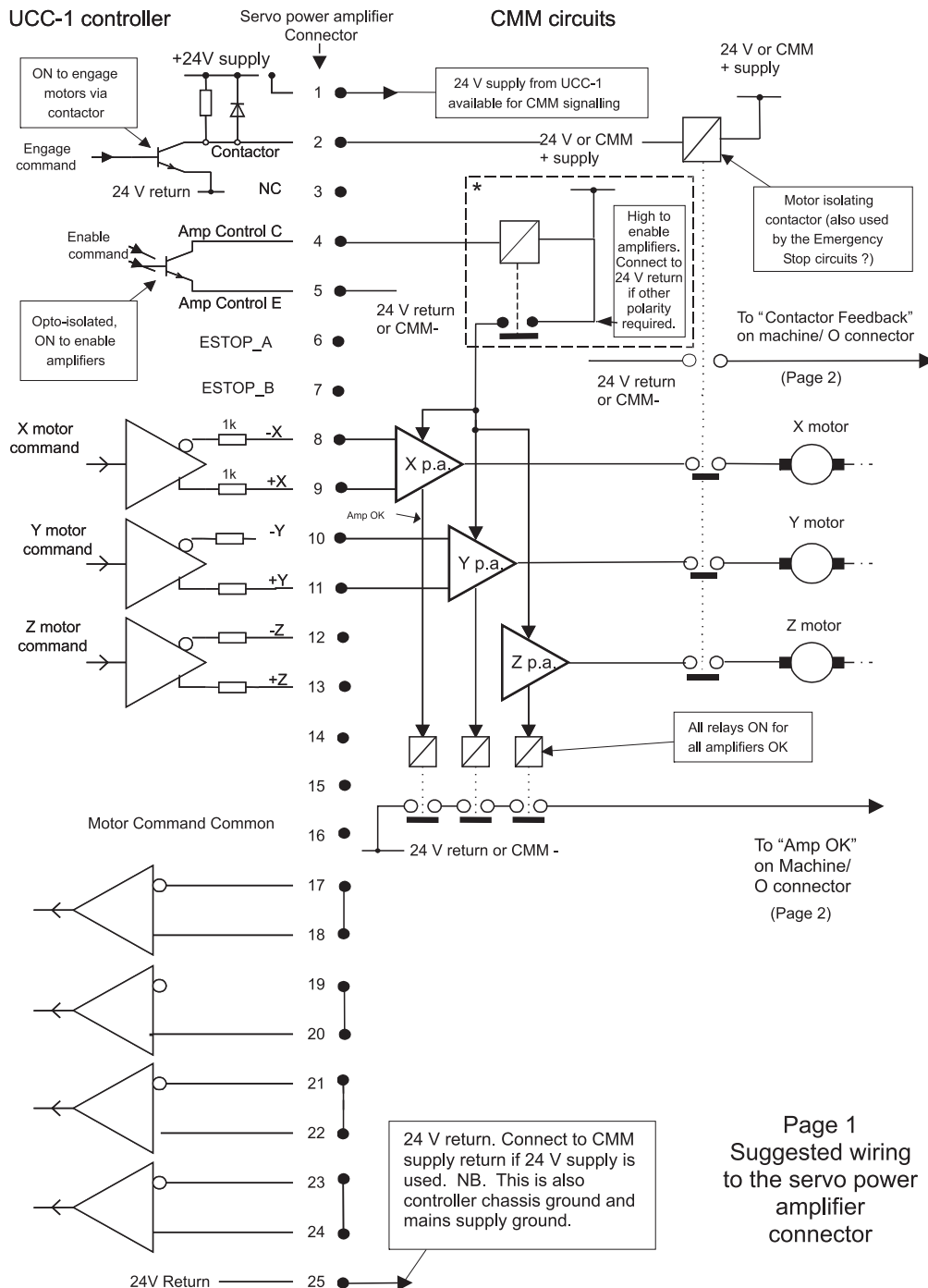
Figure 3 - UCC1 essential installation wiring, page 1

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* **NOTE:** This output can be configured in several ways to suit the servo power amplifiers used (refer to section 5.6 for further details).

UCC-1 controller

Machine I/O connector

CMM circuits

+24 V — Controller Supply — (1 ● → +24 V supply available for use with CMM loads/signals

O/P ▷ (2 ● NC
O/P ▷ (3 ● NC
O/P ▷ (4 ● NC
O/P ▷ (5 ● NC

+24 V
20K
24 V return
All outputs use this circuit

O/P ▷ (6 ●
O/P ▷ (7 ●
O/P ▷ (8 ●
O/P ▷ (9 ●
O/P ▷ (10 ●
O/P ▷ (11 ●
O/P ▷ (12 ●

Uncommitted outputs for user application. Connect as above. Leave unused outputs open circuit

I/P ◁ (13 ●
I/P ◁ (14 ●
I/P ◁ (15 ●
I/P ◁ (16 ●
I/P ◁ (17 ●
I/P ◁ (18 ●

Uncommitted inputs for user application. Connect as below. Connect unused inputs to 24 V return.

I/P ◁ (19 ● ← "Amplifier OK" from page 1. If not used, connect to 24 V return.
I/P ◁ (20 ● open for CMM in declutched mode
I/P ◁ (21 ● open if Emergency Stop activated
I/P ◁ (22 ● open if Air Pressure low

+24 V
10k
LED
All inputs use this circuit

I/P ◁ (23 ● open if "Crash" switch activated
I/P ◁ (24 ● ← "Contactor feedback" from page 1. If not used, connect to 24 V return.
I/P ◁ (25 ● X+ outer limit switch
I/P ◁ (26 ● X- outer limit switch
I/P ◁ (27 ● Y+ outer limit switch
I/P ◁ (28 ● Y- outer limit switch
I/P ◁ (29 ● Z+ outer limit switch
I/P ◁ (30 ● Z- outer limit switch
I/P ◁ (31 ● X+ inner limit switch
I/P ◁ (32 ● X- inner limit switch
I/P ◁ (33 ● Y+ inner limit switch
I/P ◁ (34 ● Y- inner limit switch

24 V return.
NB. also controller chassis and Main supply ground

I/P ◁ (35 ● Z+ inner limit switch
I/P ◁ (36 ● Z- inner limit switch
(37 ● → UCC-1 24 V return

Page 2, suggested wiring to the machine I/O connector

5.1   The controller's 24 V supply

This supply is available at both the servo power amplifier connector and the machine I/O connector for use by the CMM signalling circuits. It has a relatively low current rating, see chapter 9, and is thus not suitable for heavy loads. Please use semiconductors or relays to interface to high power loads or to those which need electrical isolation.

All inputs and outputs (excepting the optically isolated amp control signals) are referenced to this supply.

It is not a floating supply - its negative terminal is also connected to the controller chassis and to the mains supply protective ground at a star point within the controller.

Please note that if there are any interconnections between this supply and any of the CMM's supplies, an additional path to ground may be created. A CMM supply of similar voltage may be used for signalling purposes in place of the controller's 24 V supply but its negative rail must be connected to the controller's 24 V return line.

5.2   Motor engagement

The controller will begin to engage the servo motors when instructed to do so by the host computer, if all the operating functions are in a safe or acceptable condition. Items such as the 'fatal faults' or emergency stop, low air pressure (if relevant), etc. will prevent engagement and in addition the probe must not be open (touch trigger) or deflected beyond its trigger level (analogue probe). A PICS 'stop' signal, a reported amplifier fault or an open limit switch will also inhibit motor engagement.

The process is in two stages, amplifier enabling and motor supply switching, with protective delays after each.

5.3   Amplifier enabling

The 'Amplifier OK' signal produced by the amplifier control circuits are an indication to the controller that no amplifiers are faulty.

The controller will first ensure that all its motor command signals are zero and then try to enable the power amplifiers by turning on the 'Amp control' transistor (servo power amplifier connector, figure 3). This device is optically isolated from the rest of the controller and can be connected to the CMM's supplies. See chapter 6 for its electrical ratings.

This transistor will be held on for 0.1 second to allow that the 'Amplifier OK' signal to become valid. If this signal does not become valid (by CMM circuits pulling pin 19 of the machine I/O connector low) the controller will abandon the engagement process. If no error occurs the controller will wait for a further period of 1 second before beginning the next stage to allow the amplifiers to settle after any initial transients.

The logic to drive the power amplifier enable inputs and to generate the "Amplifier OK" signal shown in figure 3 is only an example of possible circuits. These will vary depending on the actual amplifiers' requirements but must pull the 'Amplifier OK' input down if all amplifiers are operating correctly.

If the user wishes to signal amplifier failures individually to the main computer he may use some of the uncommitted user inputs (machine I/O connector, figure 4) for this purpose.

For some designs of small CMMs the amplifier enabling function may not be needed. To allow the motors to be engaged connect the 'Amp Control C' to the 'Amplifier OK' input and the 'Amp Control E' pin to the 24 V return. This will provide immediate feedback to the controller allowing the next stage to begin.

5.4   Contactor energisation

The controller will now take the contactor signal (pin 2 of the servo power amplifier connector) low, which should be used to apply power to the motors. If a suitable contactor or relay controls the motor supplies, perhaps for emergency stop implementation, this signal could be included in its energisation circuit.

The controller will keep this output low for 0.1 of a second during which it expects the 'Contactor Feedback' input (machine I/O connector pin 24) to be pulled low to indicate that the motors are now powered.

If this signal is not received in time, the contactor and the amp control signals are turned off and the engagement process abandoned.

If the feedback is received in time the controller keeps all motor commands at zero for another 0.1 second before allowing the servo system to begin operating. This is intended to give further protection against sudden machine movements when engaging the motors.

If the contactor energisation function is not required, the contactor output (pin 2 of the servo power amplifier connector) may be connected directly to the contactor feedback input (machine I/O connector, pin 24) to give the required signal.

5.5   Motor command signals

The controller generates complementary motor velocity command signals for each axis. Each is capable of a swing of +/-10 volts and centred on a zero velocity command of 0 volts. A motor command common connection is provided to define this 0 volt level (servo power amplifier connector, pin 16, figure 3).

This common signal is also connected to the 24 V supply return, the controller chassis and the mains supply protective ground at a star point within the controller, so that care may be required in its application.

The controller setting up process will help the user to set his power amplifier gains such that the maximum command signal (+/- 10 V) will produce 125% of the required maximum machine speed.

If complementary signals are not required, either of the motor command signals may be used as a single ended input, referred to the motor command common line.

Each motor command signal has a series resistor of 1 kΩ to protect the controller from inadvertent damage and this will reduce the drive to the power amplifiers if their inputs are of low impedance. Using the 'RENICIS' setting up program provided with the controller will compensate for this automatically.

5.6   Motor command polarity

For each axis the motor command +ve pin will go negative with respect to the command common line to produce a positive change of position.

The motor command -ve pin will go positive at the same time.

5.7   Controller switch outputs to the CMM

All outputs are pulled up to the 24 V rail by a 20 kΩ resistor when inactive, and will be pulled down to the 24 V return line via an NPN transistor when activated. There is an excess voltage protective diode fitted internally to the controller.

The outputs can be activated by a command from the main computer to the controller. If not being used they should be left open circuit.

5.8   Controller switch inputs from the CMM

The controller provides 24 outputs of this type. See chapter 5 for their electrical ratings.

Each input is connected to an LED fed from the +24 V rail, and is activated by being pulled down to near the 24 V return line. The LED is part of an opto-coupler which is used to give the controller some isolation from unwanted electrical signals on the input wiring.

Twelve inputs are allocated to limit switch signals, 6 inner and 6 outer. When a limit switch is not activated (i.e. the machine is within its working range) these inputs should be connected to the 24 V return line by the limit switch contacts. If not required they should be permanently wired to the 24 V return line.

NOTE: Limit switches should be installed such that they will not be damaged in the event of overtravel. Where necessary for safety related functions, they should be of the direct (or positive) operating type to IEC 60947-5-1).

The 'Amplifier OK' and the 'Contactor Feedback' inputs have been discussed above.

Three 'Fatal Fault' inputs are provided: emergency stop, air pressure low and a 'Crash Switch' input. This last is intended for use with a sensing mechanism which detects an unintended contact between the machine's moving and fixed components. The controller monitors these inputs and will stop the motors if one or more input goes open circuit or high. If not required these inputs should be connected to the 24 V return line.

NOTE: The 'emergency stop' input is not a primary safety device, although the controller will stop the motors as far as it can. Its other use is to allow the controller to inform the main computer, and hence the operator, of the 'emergency stop' switch actuation. In addition it will prevent motor re-engagement if the 'emergency stop' switch is still activated. Where an electromechanically controlled emergency stop is required, to
IEC/EN60204-1 category 0, it must be separately provided and external to the UCC1.

The 'CMM in declutched mode' input is intended to tell the controller that the driving motors are mechanically disconnected from the machine, and that the machine may be moved by some other means, e.g. by hand. In this state the motor commands will be kept at zero velocity until the machine clutches are re-engaged, at which time the controller will resume servo control at the new machine position. For normal servo operation this input should be pulled down near to the 24 V return line. If this function is not required, the input should be connected to the 24 V return line.

The remaining six inputs are uncommitted and may be used as required. These signals are not used by the controller and are simply passed to the main computer, on request. If not required these inputs should be connected to the 24 V return line.

6   Connectors and signals

The purpose of this chapter is to describe in detail the pin-outs of the connectors mounted at the rear of the controller and to show the relevant circuit diagrams of the input and output circuits.

6.1   Rear panel connectors

The connectors from left to right facing the rear panel of the UCC1 controller enclosure are:

Connector	From/to	Section
X scale input	Measuring scale reading head on CMM X axis	6.2
Y scale input	Measuring scale reading head on CMM Y axis	6.2
Z scale input	Measuring scale reading head on CMM Z axis	6.2
Optical link	Optical interface board in CMM host computer	
Comms CH1	MCU emergency stop connection	6.3
Machine I/O	Status and control switches to and from the CMM	6.4
SCR200	SCR200 connection	6.5
Servo power amplifier	Signals to servo power amplifier and status to/from power amplifiers	6.6
Trigger probe	Touch-trigger probe i.e. TP2, TP200 etc.	6.7
Analogue probe	TP20, TP200 amd SP600 connection	6.8

The pinout of each connector, and its purpose, is described in the following sections.

6.2   CMM reading head input connections

The X, Y and Z measuring scale reading heads input connectors are high density 15-way 'D' sockets.

The X-axis scale reading head of the CMM is to be connected to the first socket (marked X) on the left hand side of the rear panel of the UCC1 enclosure.

Similarly the Y-axis scale reading head is to be connected to the second socket (marked Y) and the Z-axis scale reading head to the third socket (marked Z).

The three sockets are wired to the same pin-out, suitable for Renishaw RGH22 and RGH24 series head wiring.

These connectors accept the standard Renishaw digital output scale reading heads or interpolators.

NOTE: Other manufacturers' reading heads and interpolators may require an external adapter to enable them to use the Renishaw standard reading head connector wiring. They may also not produce an error signal to the RS-422 specification.

The UCC1 supplies a nominal 5 volt dc power for the reading heads. See chapter 9 for details.

NOTE: No provision has been made for cable voltage drop compensation therefore the user must ensure that reading head input cabling of adequate cross-section area is used.

If standard Renishaw cables are used, the permissible cable sizes are 3 m of head cable and 15 m of extension cable, or an equivalent combination, based on the fact that the head cable is 5 times the resistance of the extension cable (e.g. 4 m of head cable and 10 m of extension cable).

If this value of cable resistance (1.5 Ω) is exceeded, the reading heads must be powered from a supply other than that from the UCC1, but the return line of this additional supply must be connected to the 0 V line of the controller.

CAUTION: The connection of the cabling should be such that the CMM's movements as reported by the UCC1 are of the correct polarity (i.e. machine movement in a positive direction along any axis should give positive change of position as reported to the host computer by the UCC1 controller). Adjust this, if required, by reversing the inputs of the scale reading head signal.

SUGGESTION: label all read head connectors to avoid cross connection if removed and replaced in the future.
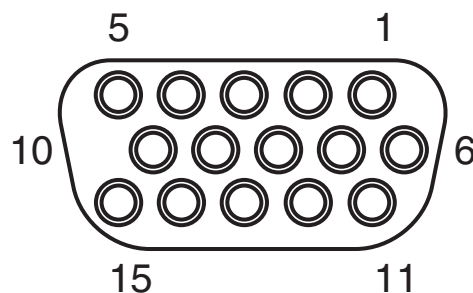
Figure 5 - Reading head connector, view on face of sockets (rear of plugs)

Pin number	Function		Pin number	Function
1	External set up		9	0 V supply sensing
2	0 V supply from UCC		10	Limit switch
3	-Error		11	+Error
4	-Ref. mark		12	+Ref. mark
5	-B signal		13	+B signal
6	-A signal		14	+A signal
7	+5 V supply from UCC		15	Inner screen
8	+5 V supply sensing		Shell	Shell and screen

NOTE: The 0 V supply and the 0 V supply sensing leads are connected together at the reading head. The +5 V supply and +5 V supply sensing leads are similarly connected at the read head. Use both pairs of wires for supplies to reduce voltage drop.

6.2.1   CMM's reading head interface circuit

The signals from a reading head or interpolator should be to EIA specification RS-422.
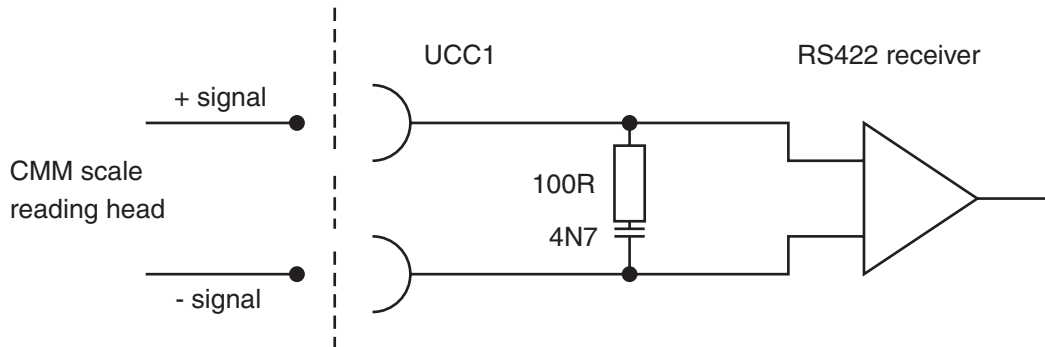
Figure 6 - UCC1 input circuit for CMM's reading head

NOTE: The read head error signal input does not have the components shown between the + and
– signal lines fitted. A 4K7 Ω resistor is fitted from +Error to +5 V. A 4K7 Ω resistor is fitted from –Error to 0
V. This produces a fail-safe error signal if the head is unplugged or the error signal wiring fails.
If Error inputs are not used or the read head type is RGH24 tie the +Error input to 0 V and the –Error input
to +5 V.

6.3   COMMS Ch1 connector

This connector is used to connect the UCC1 joystick to the emergency stop system.

Pin number	Function
1	Not connected
2	Reserved
3	Reserved
4	Reserved
5	Reserved
6	ESTOP_B
7	ESTOP_A
8	Reserved
9	Reserved
Shell	Shell and screen
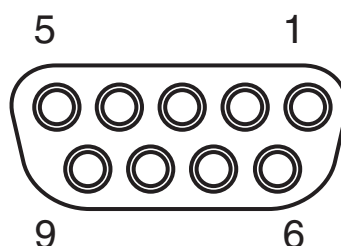
Figure 7 - Main board COMMS Ch1 connector, view on face of socket (rear of plug)

6.4   Machine's I/O connector

The plug on the cable from the CMM connects with the 37 way miniature (not high density) socket on the rear of the panel of the UCC1 (the first socket from the right on the rear of the panel).

The input/output (I/O) signals to/from the UCC1 controller are:

*   Emergency stop switch

*   Air pressure switch

*   Crash switch

*   Contactor feedback

*   X+ and X-, Y+ and Y-, Z+ and Z- inner and outer limit switches of the CMM

*   General purpose outpus and inputs

*   24 V dc supply and return
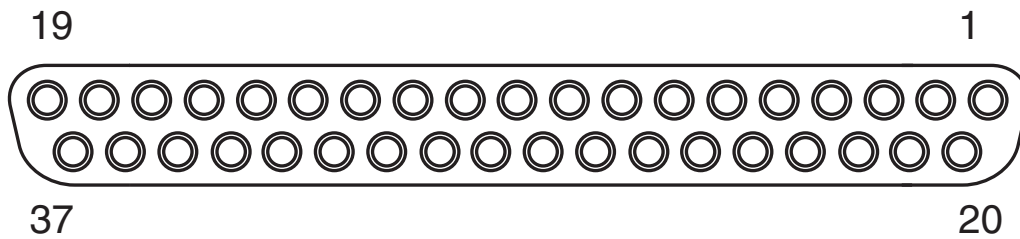
Figure 8 - Machine I/O connector, view on face of socket (rear of plug)

| Pin number	Function	Description	Figure
1	+24 V dc	Provided for use on CMM switches	-
2	Reserved	-	
3	X brake	Reserved for future use	
4	Y brake	Reserved for future use	
5	Z brake	Reserved for future use	
6	Output 0	General purpose output signal	10
7	Output 1	General purpose output signal	10
8	Output 2	General purpose output signal	10
9	Output 3	General purpose output signal	10
10	Output 4	General purpose output signal	10
11	Output 5	General purpose output signal	10
12	Output 6	General purpose output signal	10
13	Input 0	General purpose input signal	9
14	Input 1	General purpose input signal	9
15	Input 2	General purpose input signal	9
16	Input 3	General purpose input signal	9
17	Input 4	General purpose input signal	9
18	Input 5	General purpose input signal	9
19	Amplifier OK		9
20	CMM declutch mode		9
21	Emergency stop	E-stop input signal	9
22	Air pressure	Air pressure switch input signal	9
23	Crash	Crash detector switch input signal	9
24	Contactor feedback	Contactor input signal	9
25	X+ outer limit	CMM X axis limit switch input	9
26	X- outer limit	CMM X axis limit switch input	9
27	Y+ outer limit	CMM Y axis limit switch input	9
28	Y- outer limit	CMM Y axis limit switch input	9
29	Z+ outer limit	CMM Z axis limit switch input	9
30	Z- outer limit	CMM Z axis limit switch input	9
31	X+ inner limit	CMM X axis limit switch input	9
32	X- inner limit	CMM X axis limit switch input	9
33	Y+ inner limit	CMM Y axis limit switch input	9
34	Y- inner limit	CMM Y axis limit switch input	9
35	Z+ inner limit	CMM Z axis limit switch input	9
36	Z- inner limit	CMM Z axis limit switch input	9
37	24 V return	0 V common line	-
Shell	shell and screen	-	-

Machine's I/O inputs
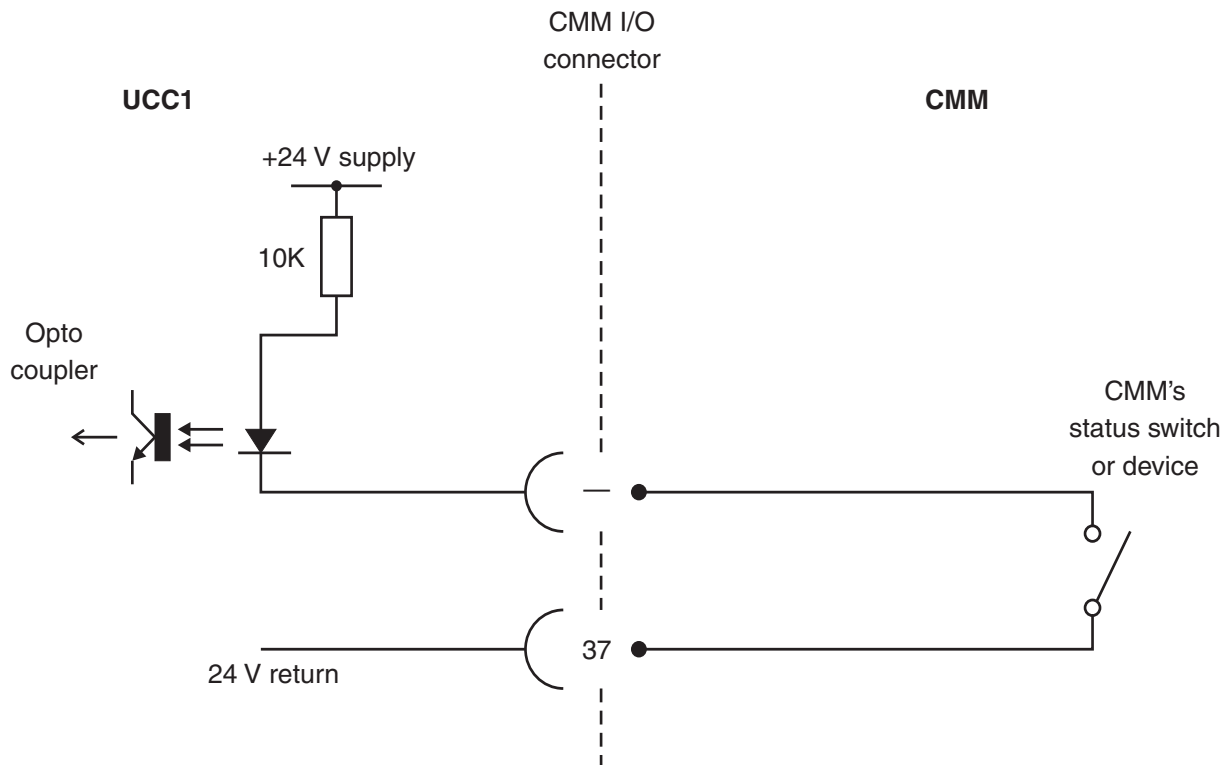
Ratings:

Maximum current	2.5 mA
Open circuit voltage	24 V
Maximum rated current	100 mA

Switching values:

Max. OFF current	10 µA
Min. ON current	1 mA

NOTE: The CMM's status switches must be isolated from all other circuits.

Polarity:
In the safe operating condition the input should be pulled down to the 24 V return line (i.e. switch closed).

Figure 9 - Machine I/O opto-isolated input circuit

Machine's I/O outputs
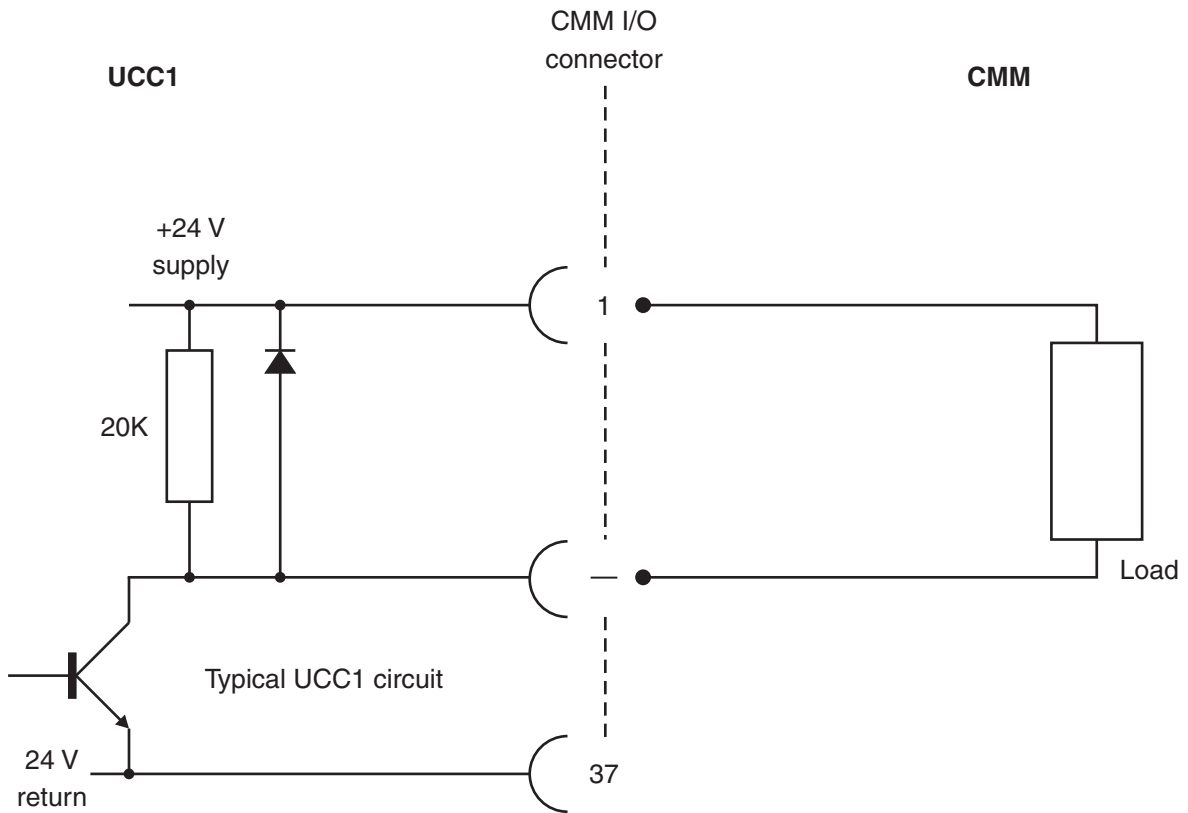
Ratings:

Absolute maximum current	500 mA (pulsed)
Maximum rated current	100 mA
Open circuit voltage	24 V

Polarity:

The transistor will be conducting for the active state of the output.

Figure 10 - Machine's I/O output circuit

6.4.1   Details of the machine's I/O signals

UCC1 general purpose outputs

These seven transistor output signals (pins 6, 7, 8, 9, 10, 11 and 12) are switched on and off by commands from the host computer (See the UCC programmers guide, Renishaw part number H-1000-5057, command number 318). Sending a '1' to the relevant control bit will turn the transistor on, pulling the output pin down to the 24 V return line.

UCC1 general purpose inputs

These six opto-isolated LED inputs (pins 13, 14, 15, 16, 17, and 18) to the UCC1 can be used to send signals from the CMM to the CMM host computer via the UCC1 (See the UCC programmers guide, Renishaw part number H-1000-5057, command number 279). Pulling an input pin low (towards the 24 V return line) will cause the controller to return a '0' in reply to the command.

Amplifier OK input

This signal (pin 19) is used to inform the UCC1 controller that ALL the servo power amplifiers are enabled following an active 'Amp Control' signal (on the 'Servo Amplifier' connector) from the controller. The pin should be pulled down to the 24 V return line by the CMM control electronics to signal that the CMM servo power amplifiers have been successfully enabled.

CMM in 'Declutched Mode' input

This input on pin 20 should be pulled down to the 24 V return line to signal to the controller that the CMM drives are mechanically connected to the moving elements of the machine, i.e. in their normal condition. The input is held high, or open circuit, when a CMM has been temporarily 'de-clutched' from its drive motors to allow manual positioning. The servo system will not drive the motors in this condition and will resume control at the machine's position when the signal again goes low.

Emergency stop switch

This input (pin 21) is used to inform the UCC1 of the CMM's 'emergency stop' condition (E-Stop). If the input pin is pulled down to the 24 V return line the UCC1 will assume that there is no emergency stop active and allow the servo motors to be energised.

If the input pin is open-circuit or near +24 V the UCC1 will assume that the emergency stop is active and will disable all motors and inform the host computer of the event.

NOTE: No motor can be enabled while this input is high or open-circuit.

Air pressure switch

This input signal (pin 22) should be generated by a CMM air-pressure monitoring transducer which should pull the input down to the 24 V return line if adequate air supply pressure is available.

If the input is not pulled down the UCC1 will disable all motors, and inform the CMM host computer of the low air pressure.

If this feature is not required this input should be permanently connected to the 24 V return line.

Crash switch

This input signal (pin 23) is used to stop the CMM's movement if there is a collision involving parts of the CMM and probe system, as detected by a switching mechanism. The crash switch should pull the input down to the 24 V return line. If the input is not pulled down the UCC1 will disable all motors, and inform the CMM's host computer of this state.

Motor contactor feedback

This input signal (pin 24) is used by the UCC1 to monitor the operation of the axes drive motors control contactor.

When the contactor is energised (drive motors enabled) the pin should be pulled down to the 24 V return line to signal that motor power is available.

If the UCC1 has turned on the 'contactor enable' output (servo power amplifier socket, pin 2) and the signal on pin 24 indicates that the contactor has not operated after a short delay, the UCC1 will disable the drive motors and inform the CMM's host computer of this.

Limit switches

The UCC1 will use these input signals (pins 25 to 36) to stop the CMM as programmed by the host computer (see the UCC programmers guide, Renishaw part number H-1000-5057, command number 311).

All outer limit switches have to be closed before the CMM drives can be engaged.

When a CMM actuates an inner limit switch on any of its axes all CMM axes are decelerated, stopped, the axis that operated the limit backs off it, then all axes and held stationary under servo control. (See the UCC programmers guide, Renishaw part number H-1000-5057, command number 311).

If the CMM actuates an outer limit switch on any of its axes, all the CMM's axes servo drive motors are disengaged.

6.5   The SCR200 connector

This is a 6 pin miniature DIN socket.

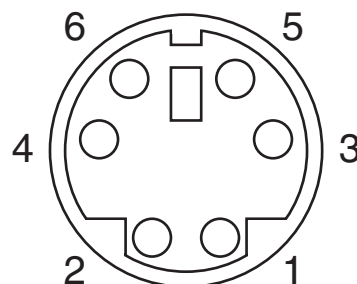| Pin number	Function
1	Remote reset
2	Error
3	Inhibit
4	Power
5	0 V
6	-
Shell	gnd

Figure 11 - SCR connector, view on face of socket (rear of plug)

6.6 Servo power ampilfier connector

The CMM drive motor servo power amplifiers connect with this 25 way socket on the rear panel of the UCC1. A 24 V dc supply os also provided by the UCC1 through this connector to energise the CMM status switch.

| Pin number	Function	Description	Figure
1	+24 V dc	Provided for use on CMM status switches	-
2	Contactor	Output signal to control motor contactor	13
3	Reserved		
4	Amp control C	Floating collector (amplifier enabling)	14 (15)
5	Amp control E	Floating emitter (amplifier enabling)	14 (15)
6	ESTOP_A		
7	ESTOP_B		
8	-X command	Differential output to CMM X drive motor	
9	+X command	Differential output to CMM X drive motor	
10	-Y command	Differential output to CMM Y drive motor	
11	+Y command	Differential output to CMM Y drive motor	
12	-Z command	Differential output to CMM Z drive motor	
13	+Z command	Differential output to CMM Z drive motor	
14	Reserved		
15	Reserved		
16	Command common		
17	Reserved		
18	Reserved		
19	Reserved		
20	Reserved		
21	Reserved		
22	Reserved		
23	Reserved		
24	Reserved		
26	24 V return	Common for dc supply and contactor signal	
Shell	Shell and screen		

NOTE: Pins with the reserved function must not be connected.
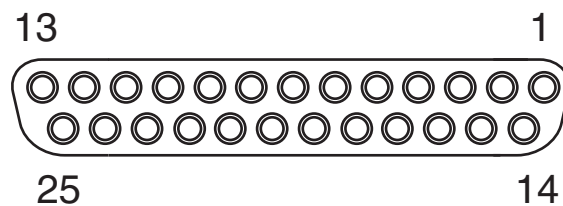
Figure 12 - Servo power amplifier connector, view on face of socket (rear of plug)

Contactor output
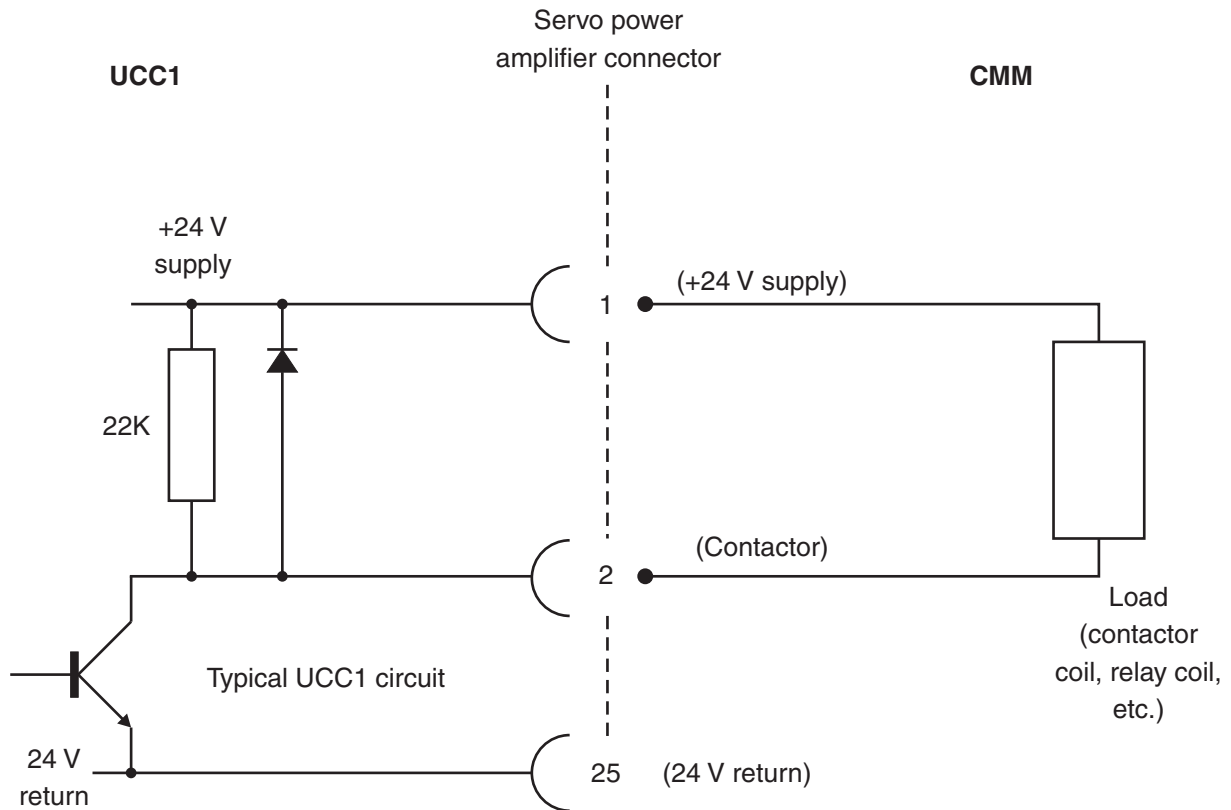
The UCC1 provides a NPN transistor to switch a CMM load from the +24 V line (pin 1). The transistor collector is available at pin 2 to be connected to the load and the emitter is connected to the +24 V return line (pin 25). This output is not optically isolated from the supply lines. A collector pull-up resistor and a reverse spike protection diode connected between the collector (pin 2) and the +24 V line is provided within the UCC.

NOTE: Only one contactor signal is provided to energise all servo motors.

Ratings:
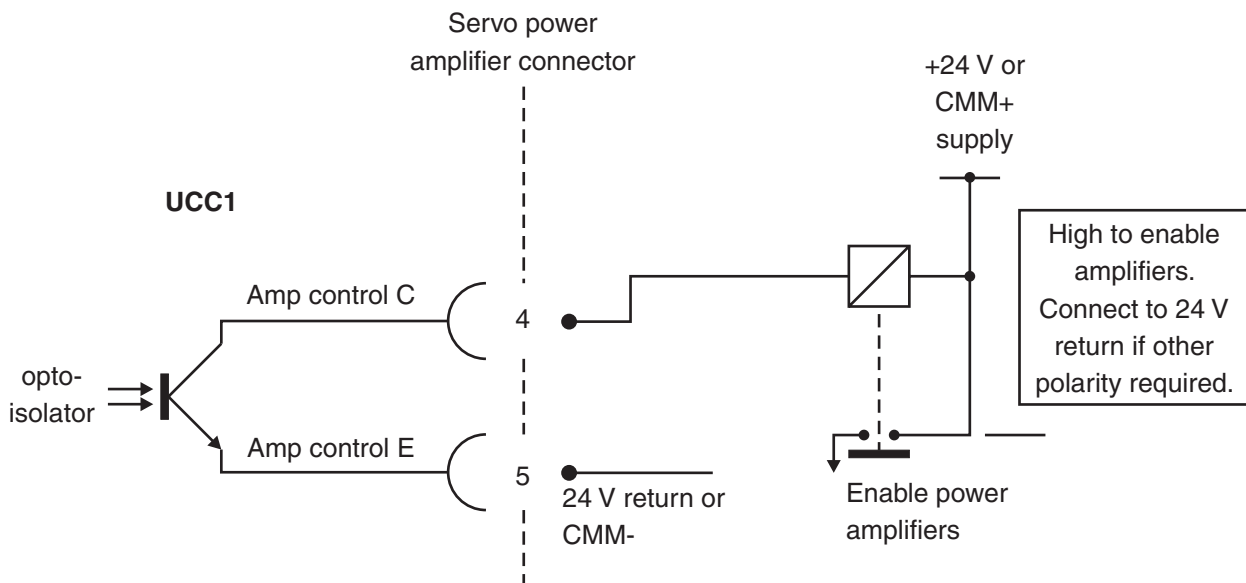
Absolute maximum current   150 mA (pulse)
Rated maximum current   100 mA

Polarity:
The output transistor conducts when the motors are intended to be energised.

Figure 13 - Contactor drive output

Amplifier control output

Figure 14 - Amplifier control output

The UCC1 provides an optically isolated NPN transistor to switch on and off the current passing through a load. This signal is intended to be used to enable all power amplifiers.

The circuit shown in figure 3 is for illustration only. The actual circuit will depend on the input requirements of the servo power amplifiers (SPAs) used.

The circuit shown in figures 13 and 14 are for illustration only. The actual circuit will depend on the input requirements of the servo power amplifiers (SPAs) used.

The opto coupled transistor output has a limited current capability (see specification below) if the SPA's input requirements are for a TTL or open collector drive this can be achieved with a simple resistor divider chain. If higher currents are required then the amplifier control output will need a drive transistor stage in order to operate a relay.
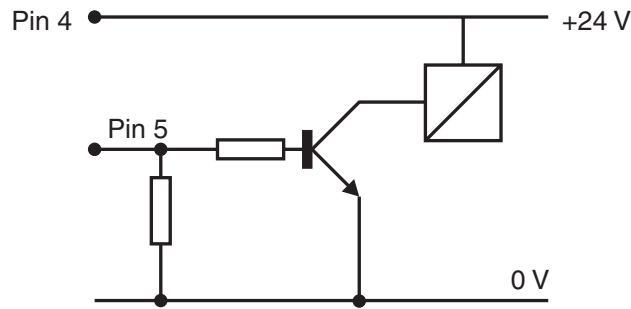
NOTE: Only one amp control signal is provided to energise all servo motors.

Ratings:

Absolute maximum voltage	70 V
Rated voltage	50 V
Absolute maximum reverse voltage	7 V
Isolation voltage	2 kV
Rated current	5 mA
Saturation voltage @ 5 mA	0.4 V typ.

Polarity:
The output transistor conducts when the amplifiers are intended to be energised.

Figure 15 - High current amplifier control output

6.7   Trigger probe connector

This socket is intended for use with any of the range of Renishaw touch-trigger probes, including the TP200. The connector is a 9 pin miniature D socket, pinout as follows:

Pin number	Function
1	PICS STOP
2	PICS probe power off (PPOFF)
3	0 V (common) from UCC
4	PICS LED anode
5	Probe signal
6	Reserved
7	PICS probe damping (PDAMP)
8	PICS LED off (LEDOFF)
9	Probe common
Shell	Shell and screen
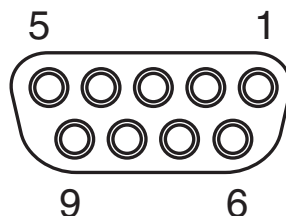
Figure 16 - Trigger probe connector, view on face of socket (rear of plug)

6.8 Analogue probe connector

The plug on the cable from the analogue probe connects with the 15-way high-density 'D' socket on the rear panel of the UCC1. This socket is intended for use with the Renishaw TP2, TP20, TP200, TP6 and SP600 probes. Connection of a different probe type to this input may cause a malfunction. For further information, refer to the appropriate probe installation manual.

The pin-out of the socket is as follows:

Pin number	Function
1	+5 V from UCC
2	Not connected
3	Probe common
4	'B' signal
5	'C' signal
6	+15 V supply from UCC
7	-15 V supply from UCC
8	Probe identity
9	Not connected
10	Not connected
11	'A' signal
12	Signal common
13	TT probe signal
14	Fixed probe head LED cathode *
15	Fixed probe head LED anode *
Shell	Shell and screen

* See notes on SW2 on the motherboard, chapter 8.
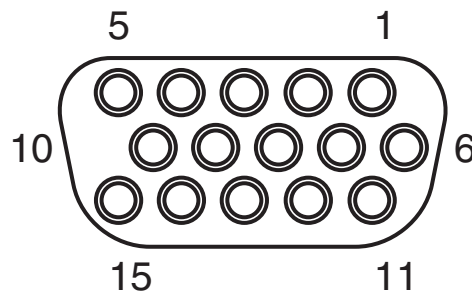
Figure 17 - Analogue probe connector, view on face of socket (rear of plug)

7   Installation of the UCC1 components

The purpose of this chapter is to describe the procedure for installing the optical interface board, the CMM's controller, its options boards and connections.

7.1   General wiring standards

To achieve reliable operation of the UCC1 and the CMM's host computer, the following should be observed:

> ⚠ **WARNING:** It is essential that the UCC1 controller is earthed. The recommended method of ensuring the controller is earthed is to use the protective earth wiring in the AC supply cable and connector:
>
> 1. Earthing provisions for the complete machine are the responsibility of the manufacturer or installer.
>
> 2. Isolation: UCC1 is isolated by removing the mains connector. It is the responsibility of the installer or user to fit additional means of isolation if indicated by risk assessment.
>
> 3. Earth fault/residual current protection: It is the responsibility of the machine manufacturer or product installer to ensure an adequate level of protection for the complete machine installation.

* Scale reading head signals, reference marks and error signals should comply with EIA RS-422A. It is recommended that each read head had its own screened cable and that these cables are kept well away from electrically noisy wiring such as motor supplies, etc.

* See 'CMM reading head input connections' in Chapter 5 for information on the permissible cable resistance.

* All opto-isolated inputs and outputs should be separate from all other connections to the UCC1 controller, so that the CMM's electrical system is kept isolated from the circuitry within the controller with the exception of the protective grounding.

* The analogue ground for the joystick connections should be dedicated to that function only.

* The analogue ground for the analogue probe connections should be dedicated to that function only.

* All signal cables MUST be screened and all cable screens are to be connected electrically to the cable connector metal shells. It is recommended that the cable screen should only be connected at one end of the cable to avoid earth loops, but protective grounding must be continuous between the controller and all other equipment in the installation.

* All cable connectors should be secured to the UCC1 by the connector jack screws.

* See also the installation instructions supplied with other Renishaw components in the system, i.e. probes or probe heads etc. Particular attention should be paid to the screening and earthing methods of the cables carrying low level signals from either analogue or touch-trigger probes.

NOTE: The UCC1 electronics 0 Volt rail is connected to the overall ground plane at a star point within the UCC1 and also to the protective ground of the AC supply.

7.1.1 Preparations

Before beginning the installation of the UCC1 and the optical interface board check the following items:

- Ensure that all connecting cables, fibre-optic link, circuit boards, test equipment and software are available.

- Ensure that the CMM's measuring scales/reading heads are correctly installed and are functioning.

- Ensure that all the CMM's status and limit switches etc. are correctly installed and have been checked.

- Ensure that all mains power has been removed from the CMM, CMM's host computer, CMM's servo power amplifiers and CMM's axis drive motors etc.

Ensure that the CMM and the UCC1 are in their final positions and that all connecting cables are of the required length.

7.2   Installing the optical interface board

7.2.1   Optical interface board preparation PCI version

The PCI optical interface board is automatically configured within a IBM PC by the Windows based operating system when installed.

7.2.2   Optical interface board preparation ISA version

The ISA optical interface board occupies a block of 10H addresses in the host computer, starting from the 'base' address. Select a base address which does not clash with existing address usage in the PC, remembering that on some systems the ISA port addresses repeat every 400H. The factory set address of the board is 300H.

A 4-section DIL switch on the rear panel of the board allows the base address of the board to be altered. This is most easily done before fitting the board to the PC.

Opto board DIL switch setting table

This table is also printed on the surface of the pcb.

Base address hexidecimal	Switch settings			
	Brown	**Red**	**Orange**	**Yellow**
0200H	A	B	C	D
0210H	1	B	C	D
0280H	A	2	C	D
0300H	1	2	C	D
0310H	A	B	3	D
0320H	1	B	3	D
0340H	A	2	3	D
0350H	1	2	3	D
0390H	A	B	C	4
03A0H	1	B	C	4
0480H	A	2	C	4
0520H	1	2	C	4
0540H	A	B	3	4
0550H	1	B	3	4
0590H	A	2	3	4
05A0H	1	2	3	4

To set an address move the switch actuators towards the charaters in the above table.

Unfortunately, this almost covers up the charater, but ignore the now exposed character at the other end of the travel.
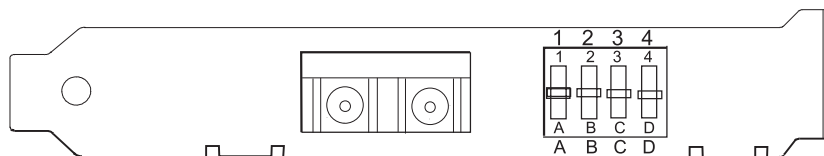

Figure 18 - ISA optical interface board

7.3   Optical interface board installation

When installing the optical interface board refer to the user/technical manual supplied with the CMM host computer.

⚠ **CAUTION:** The UCC1, optical interface board and CMM's host computer circuit boards contain static sensitive components and the boards must be handled using a wrist anti-static strap with appropriate precautions. Movement, which can generate static electricity, should also be kept to a minimum.

NOTE: Ensure that the mains power has been removed from the CMM's host computer.

1.   Remove outer case from the computer, retaining any case fixing screws.

2.   Select a bus slot capable of housing the optical interface board.

3.   Remove appropriate rear panel blanking plate from the rear panel of the computer chassis, retaining the panel fixing screw.

4.   Insert the optical interface board in the chosen bus slot and push board fully home.

5.   Secure the rear panel of the optical interface board to the case of the computer using the panel fixing screw.

6.   Replace and secure the outer case of the CMM's host computer.

7.   Install the CMM's host computer in its working location.

8.   Install the UCC1 controller in its working location.

9.   Remove the silicon rubber plugs which protect the optical inputs on the optical interface board and on the rear panel of the UCC1. Retain the plugs for future use if the fibre optic cable is unplugged.

10.   Unpack the fibre-optic cable and insert one end in the twin socket connector on the rear panel of the optical interface board. (The connectors are polarised to prevent incorrect installation).

11.   Lead the fibre-optic cable to the UCC1 and insert in the optical connectors on the UCC1.

12.   Secure the cable link as required. See section 3.2 for cable link installation parameters.

7.4   Connecting UCC1 cables to and from CMM

1.   Attach all the CMM's cable connectors to the mating sockets on the UCC1.

2.   Secure all cable connectors with the connector jacking screws to ensure physical and electrical connection.

3.   Secure all cables for strain relief without reducing access for servicing.

7.5   Connecting the UCC1 mains supply

WARNING: There is no internal fuse on the mains supply to the UCC1. The user must provide suitable protection. Required mains supply fuse: 5 Amps, type T (anti-surge).

Make sure that only fuses of the specified type are used for replacement.

This equipment must be connected to a protective earth conductor via a three core mains (line) cable. 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.

Any interruption of the protective earth conductor may make the equipment dangerous. Make sure that the grounding requirements are strictly observed.

1. Isolate the CMM axis drive motors.

2. Connect the mains power supply leads to the UCC1, CMM's host computer and the CMM.

7.6   Installation of daughtercards

⚠ **WARNING:** It is essential that full anti-static precautions are taken before working within the UCC1 controller enclosure.

To install a daughtercard proceed as follows:-

1. Remove AC supply from controller and disconnect cables to CMM.

2. Remove top panel of the UCC1 enclosure, retaining the fixing screws.

3. Select a socket on the motherboard to house the daughtercard (all sockets are identical).

Remove (and store carefully) the appropriate blanking plate in the rear panel of the UCC1 enclosure, retaining plate fixing screw.

4. Carefully position the daughtercard so that the rear connectors pass through the hole in the rear panel of the controller.

5. Align the daughtercard plug with the socket on the motherboard.

6. Press daughtercard firmly into the socket on the motherboard until it can be seen to be fully engaged.

7. Check the daughtercard rear panel top hook is located in the slot in the UCC1 enclosure rear panel. If not engaged with the slot, remove and replace the daughter board ensuring that it is correctly aligned.

8. Replace the top panel of the enclosure and secure using the fixing screws.

7.7   Probe head LED switch setting

If a fixed 'multiwire' probe head such as a PH6M is connected to the UCC1, its LED will not operate unless SW2 on the motherboard is moved to the ON position. See 'Probe head LED operation' in chapter 9, Troubleshooting for information on its location and setting.

When a motorised 'multiwire' probe head such as a PH10M is in use the switch must be in the OFF position to avoid a continuous 'probe open' signal to the UCC1. This is the default position as on a factory supplied unit.

When opening the UCC1 to gain access to SW2 the same precautions must be used as listed above for the installation of a daughtercard.

8   Renishaw license key manager system

The purpose of this chapter is to describe the Renishaw licence key manager system and the procedure for enabling software upgrades. The licence key manager software is installed as part of the standard UCC software installation.

The license key system has been designed to allow the OEM and retrofitters to easily and smoothly upgrade UCC1 systems. The upgrades can be done in the OEM factory without the need for additional extra inventory, or in the field without the need to ship new units or ship hardware dongles to the installation.

The license key system is based on a controller ID that is embedded into the UCC1 hardware. For each UCC1 system there is a unique 'key' that is required to unlock the required functionality. This 'key' is provided by Renishaw, this process being explained below. Once this 'key' is entered into the UCC1 using the Renishaw license key manager software it is stored in non-volatile memory. The UCC1 will remember the 'key' and so once a function is enabled it will remain enabled until a new function is applied.
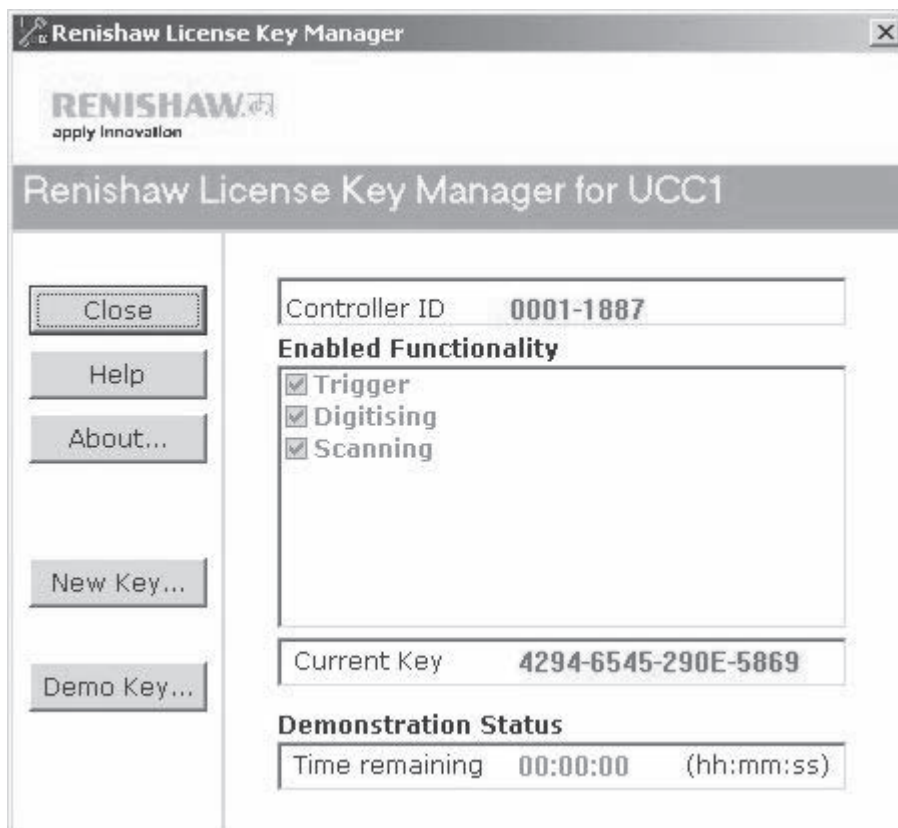

Figure 19 - Renishaw licence key manager screen

8.1   Using the Renishaw license key manager

When the UCC1 is received from Renishaw it will be configured in the touch trigger state. If only the touch trigger system was purchased then no further action is required. If however additional functionality was purchased (or has been purchased since) then the process of upgrading the system must be conducted.

8.2   Ordering extra functionality / upgrading

Additional functionality can be enabled by application of a new 'Key'. Before the 'Key' can be issued by Renishaw an order for the upgrade must be placed with Renishaw.

Two pieces of information are required in this process.

1.   The controller's ID.

2.   A valid order number for the required upgrade.

To read the controller ID it is necessary that connection is made between the UCC1 and the PC via the PC plug-in optical link card and optical cable. No other connection to the UCC1 other than power is required at this stage.

Using the Renishaw license key manager software the controller ID number will be read from the system. The format of the ID is an 8 digit number, hyphenated (e.g. xxxx-xxxx). This number will be needed to request a new 'key' to enable the required function upgrade.

8.3   Obtaining the key

To obtain the 'key', the above information is supplied to the local Renishaw subsidiary. They will have the capability to generate the unique key required for the unit in question. This key will be supplied in a 16 digit hexadecimal number of the form xxxx-xxxx-xxxx-xxxx.

8.4   Applying the key

Using the Renishaw license key manager software, the 'New Key' button is clicked. The software then prompts the user for the 16 digit key to be entered. Once entered, the 'key' is stored in the unit and will enable the purchased upgrade. This can be checked by looking at the 'Enabled Functionality' table. The unit can now be powered off and will remember these settings.

8.5   Demonstration mode

A demonstration mode can be enabled giving 40 run time hours of all available functions. The purpose of this is for sales demos and short term evaluation. The 'demo key' is obtained from Renishaw using the controller ID number. The key is generated in much the same way as the main key but is only 8 digits.

The 'demo key' is applied by clicking the 'Demo Key' button and entering the code.

Once the 40 hours have been used up then this 'Demo Key' becomes invalid. To use this function again a new 'Demo Key' must be obtained. It is intended that the 'Demo Key' is only used a limited number of times and after this number Renishaw will be unable to issue 'Demo Keys'.

8.6   Repairing upgraded systems

If a unit is returned for repair and it is necessary to send a replacement / exchange unit back, then it will arrive in the touch trigger functionality state.

At this point a new 'key' must be obtained. In this case the controller ID will be required and instead of an order number, the repair number, GRA number or the serial number of the original unit returned is required.

8.7   Error reporting

If a command is sent to the UCC1 requiring functionality that is not enabled in the UCC1 unit then the UCC1 informs the front end that the command has failed and gives the 'Illegal Command' response. This will then be handled by the front end application.

8.8   Available functionality

8.8.1   Triggering

Triggering function supports touch trigger probe mode for single point taking with touch trigger probes, TP200 and point mode with the probe and the OTM3M laser probe.

8.8.2   Digitising functions

Digitising mode supports the basic triggering functions as well as surface measurement modes as used for surface digitising with SP600 or similar analogue probe.

Specifically these are:-

- 2D scan mode

- 3D scan mode

- 2 ½ D scan mode

8.8.3   Scanning functions

Scanning mode supports the triggering function, digitising function as well as part measurement mode with SP600 or similar analogue probe.

Specifically these are:-

- Cylinder scan mode

- Gasket scan mode

- Grid scan mode

- Find centre

9   UCC1 troubleshooting

The purpose of this chapter is to provide assistance in diagnosing and rectifying system faults.

9.1   Front panel LED displays

To aid troubleshooting of the UCC1 system, five status LEDs fitted to the UCC1 motherboard are visible through the front panel of the UCC1.

LED	Colour	
Power on	Green	Indicates that the +5 V supply within the UCC1 is on.
System ready	Green	Indicates that the UCC1 is ready for use.
Servo active	Green	Indicates that the UCC1 servo drives are active.
Probe seated	Amber	Indicates that the UCC1 probe is not deflected.
Error	Red	Indicates that the UCC1 is in an error condition.
System ready and probe seated	Green and amber	Flashing indicates scale failure.

When the UCC1 is switched on and goes through the initial power-up sequence of tests and file installation etc. the LEDs on the front panel of the UCC1 are energised as follows:

9.1.1   UCC1 power not switched ON

All LEDs OFF

9.1.2   UCC1 power switched ON

Power on and error LEDs are lit.

If switch-on is successful the UCC1 proceeds to the initialisation/test sequence.

9.1.3   Initialisation/Test

If the initialisation tests fail the power on and error LEDs will remain lit.

In this condition the UCC1 waits for a system restart. Switch the controller off and, after a wait of approximately 10 seconds, switch it on again.

If the initialisation tests are successful then the power on LED will remain lit and the error LED will start flashing, the system file is then loaded.

9.1.4   System file downloading

During system file downloading the power on and error (flashing) LEDs are energised.

If the system file download fails then the power on, error and system ready (flashing) LEDs will be lit.

In this condition the UCC1 waits for a system restart. Switch the controller off and, after a wait of approximately 10 seconds, switch it on again.

If the downloading is successful the power on and system ready (flashing) LEDs will remain lit. The UCC1 now proceeds to system configuration.

During configuration (UCC1 download being applied by the front end software) the power on and system ready (flashing) LEDs are energised.

When the configuration is complete the system is ready for use the power on and system ready LEDs will be lit.

NOTE: On early units the System ready LED continues to flash when the download is successful.

9.1.5   Servo active LED

When the servo drives are not active the servo LED is off.

When the servo drives are active the servo LED is on.

9.1.6   Probe seated LED

When the probe is not deflected (in the case of analogue contact probes, not deflected beyond the trigger threshold zone): Probe seated LED is on.

When the probe is deflected: Probe seated LED is off.

9.1.7   System ready and probe seated LED's flashing

This means that there has been a scale failure. The MCU, if fitted, will indicate which axis scales have failed (this is a fatal fault and disengages the motors). The only way to restart the system is to reboot the UCC1.

9.2   Probe head LED configuration

If a fixed 'multiwire' probe head such as a PH6M is connected to the UCC1, its LED will not operate unless SW2 on the motherboard is moved to the ON position. See figure 20 below for its position.

When a motorised 'multiwire' probe head such as a PH10M is in use the switch must be in the OFF position to avoid a continuous 'probe open' signal to the UCC1. This is the default position as on a factory supplied unit, as shown in figure 20 below.
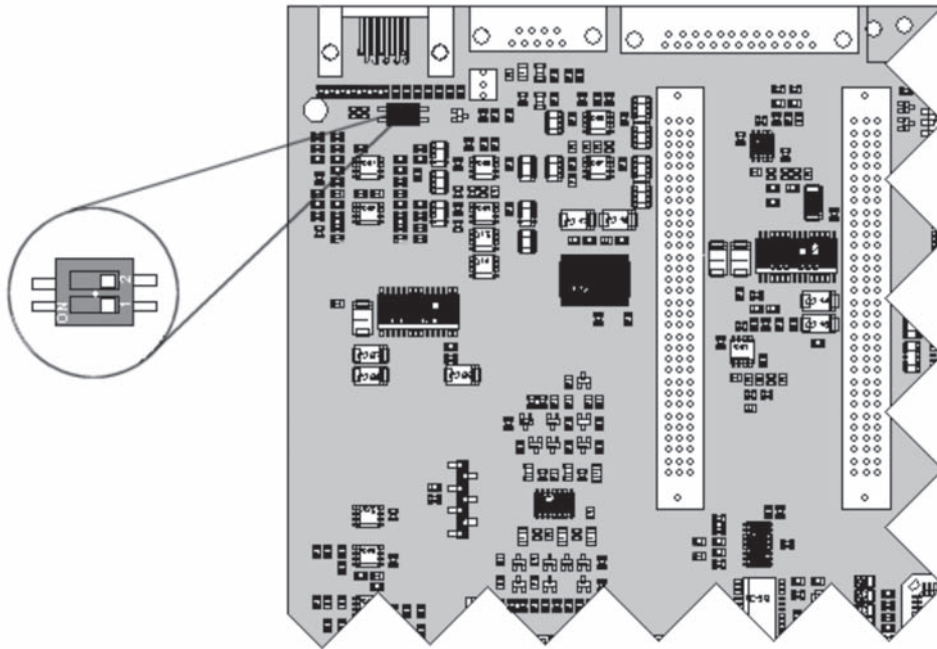
Figure 20 - Switch SW2 location on the motherboard, shown in the OFF position

The figure shows the rear left corner of the motherboard, viewed from the front of the UCC1 with the top cover removed. SW2 includes both switches, marked '1' and '2' above, and both must be moved to the required ON or OFF position.

9.3   Fault finding

9.3.1   Fatal faults

Some conditions can arise which mean that it is inadvisable or even dangerous to continue using the CMM servo system. These are known in this document, and in the RENICIS program, as 'fatal' faults, and are as follows.

- A report of the emergency stop switch being active

- Air pressure too low, if relevant

- Crash switch operated, if fitted

- A scale reading failure

- An indicated overspeed (calculated from the rate of change of position)

NOTE: Other faults (not classed as fatal) can prevent the CMM's operation. See below.

9.3.2   Motors will not engage / re-engage

Symptoms

Either the servo drives will not engage when the controller has been sent the 'Engage' command, or the drives have disengaged automatically and will not re-engage.

Possible causes (or reported causes)

Any of the "fatal faults" (refer to section 8.3.1) will cause this, in addition the following will disengage the servo motors.

• A reported failure from a servo power amplifier (amplifier feedback signal).

• The absence of the feedback signal from the motor contactor.

The following list can also inhibit drive engagement or re-engagement.

• The probe being deflected

• Any outer limit switch being operated, or a soft limit exceeded.

• An active PICS STOP signal.

• Specifying the wrong probe type in the machine configuration, since open-circuit analogue probe inputs may eventually drift to an apparently 'deflected' value.

• The system has not been configured. After reset, all these commands must be sent before the system will engage motors (i.e. configure for motion):

  • Command 256, Machine configuration

  • Command 257, Move configuration

  • Command 258, Servo configuration

Tests/cures

Check each of the above signals using the status flags returned to the host PC, and/or by confirming the values of the actual signals reaching the controller.

RENICIS can be used for further help with this by displaying the system status, the status bytes and the PICS signals.

The amplifier and motor contactor feedback signals can also be examined using the 'Input Signals' window.

A PICS STOP signal may originate from an external accessory such as a probe head controller. If necessary, remove the PICS connections to peripherals one by one, and then the PICS/RS232 board.

Remember that a PICS accessory may produce a STOP signal. RENICIS can be used to find the condition causing this, which should then be removed.

9.3.3   Poor positioning accuracy

Symptoms

The CMM will not finish a move at the correct position. This may occur even if it had reported having reached the target position near the end of the move.

Possible causes, tests and cures

Power amplifier offset
Check this by engaging the servo drives with the position loop open and a zero speed demand (using RENICIS) and check that the machine does drift slowly. Use the power amplifier's offset adjustment to reduce the drift to a minimum. See the following paragraph on forces applied by the machine since it may be difficult to distinguish between these effects.

Forces applied by the machine
Forces such as those caused by elastic deformation of a cable chain attached to an axis, or by gravity if the machine is imperfectly levelled or counter-balanced, will produce a position error which may vary with the machine position. Correct the mechanical problem as necessary, do not compensate by introducing a power amplifier offset to cancel the error.

High axis bearing friction
Move the machine (manually) with the servo drives not energised to search for general or localised high friction. Alternatively use RENICIS to show the following error as the CMM is moved slowly. High friction will cause a larger following error. Adjust or repair the machine as necessary.

Too large a positioning tolerance
This parameter, set by the 'Enter positional tolerance' command, defines the maximum allowed position error at the end of a move. Adjust if necessary, but note that if this is made too small for the CMM's servo capabilities it will cause time-out failures during moves, see below

Insufficient position loop gain
If the machine has previously performed adequately this is unlikely to be the cause. If the position loop gain (defined as the axis proportional gain in the 'Servo Configuration' command) is too low, the machine may not be able to hold position accurately enough. The upper limit to the loop gain is set by the machine servo drive becoming unstable or the movements during scanning being jerky.

Insufficient position loop integration term
The integration term in the servo position loop is set when the machine is commissioned to give the best compromise between long-term positioning accuracy and machine stability. If the machine has previously performed adequately the cause is more probably due to some mechanical degradation.

General servo system tuning
If the CMM has never been set up for optimum servo performance, or has been modified or repaired since this was originally done, this process should be carried out. See the UCC servo tuning guide (Renishaw part number H-1000- 5227) and also the section on servo filters in the UCC programmer's guide (Renishaw part number H-1000-5057).

9.3.4 Controller will not respond to host PC

Symptoms

All or some commands from the user's PC are not executed by the controller. See also the 'Cannot start a move/scan' sections below.

Possible causes, tests, cures

If only some commands are ignored:

• Identify which commands are not working.

• Other commands are ignored if inappropriate for the current circumstances, e.g. asking for a peripheral's data when none is available.

• RENICIS may make it simpler to carry out these tests if the user front-end software does not give access to such information.

• Alternatively the user front-end software may be issuing a defective command. This may be reported by the front-end program as a fault, and may be due to front-end program errors. The command deformity must be found and corrected.

If all commands are ignored:

• Send the 'Resync Controller' command (#351). If this restores normal operation the controller was in a locked state due to some internal malfunction. A possible cause is an incorrectly constructed command from the host PC to the controller. If the system is fully commissioned and is being controlled by proven user front-end software consult the Renishaw support services. If the front-end software is not fully proven in service the faulty command must be found. RENICIS may assist by logging all optical link data in both directions while the fault conditions are reconstructed. Refer to the UCC programmer's guide 'Optical link control'.

• Send the reboot controller command (#335). If the front panel LEDs are now all out except the 'power on' and flashing error, download the controller program and re-initialise the controller.

• Power down the controller, wait at least 10 seconds and then power up again. Download the controller program and re-initialise the controller. If this restores normal operation the controller was in a locked state due to some internal malfunction. Proceed as described above.

• Check that the fibre optic cable between the host PC and the controller is in place and undamaged. Reconnect or replace as necessary. RENICIS can be used to perform a loop-back test on the host PC optical Interface board and the fibre-optic cable to confirm their serviceability.

9.3.5   Motor stalling

Symptoms

The machine stops unexpectedly. The event should be reported as a fault by the user's program and may be identified as a stall on a specified axis. (The condition is reported to the user program by the controller's setting of one of the three 'axis overdriven' flags in a status report).

Possible causes, tests, cures

* The problem may be due to unintentional contact between a moving part of the machine (not the probe's stylus) and some object. Correct as required, checking for CMM distortion if a serious impact occurred.

* Contact between cables or cable-chains and the machine structure may also be the cause, similarly lock-up may be due to cable creepage through clamps and thus limiting travel.

* Excessive friction can cause the problem and this must be due to a mechanical problem (low air pressure, contaminated bearings/ways, etc.). Drive the machine slowly past the suspect region to localise the dubious area. Correct as required.

* Other factors may stop the machine such as the operation of limit switches, crash switches, air pressure switches, etc. These should be reported as such by the user program. If not, confirm the effect using RENICIS and request fuller error reporting from the user program.

9.3.6   Machine overspeed report

Symptoms

The event should be reported by the user program as an 'overspeed' or similar wording. (The condition is reported to the user program by the controller's setting of the 'overspeed' flag in a status report.) The servo drives, if engaged, will be disengaged automatically by the controller.

Possible causes, tests, cures

* Machine movement by hand (with motors disengaged) at speeds higher than the limit set by 'max move speed' times the 'overspeed factor', see the 'Move Configuration' command. Avoid moving the machine too quickly by hand, or ensure that the user program suppresses this warning if the motors are disengaged provided that it is unlikely that the machine can be moved so quickly that the controller counter circuit bandwidth limit is exceeded.

* Very high apparent speed due to initialisation with improper values of max speed or scale increment, or incorrect velocity or position feedback signal polarities causing instability (normally only occurring if a machine configuration parameter is altered). See the sections in this manual on read-head connections and motor command signals. Correct the values/polarities as required.

* A scale reading failure can cause an apparent large change of position. This fault may also be reported as a 'scale reading' failure, or an 'overdriven' failure. Correct the scale reading problem, see below.

9.3.7   Scale reading ('grating') failures

Symptoms

The machine will stop and disengage the servo drives. The event should be reported by the user program as a 'scale reading fault' or similar wording. (The condition is reported to the user program by the controller's setting of the 'scale reading failure' flag in a status report.) The reading head hardware may have reported an error condition, or the fault may be elsewhere.

Possible causes

On a new machine the read head cables may introduce too large a voltage drop. Check specification for heads and cable, see chapter 5.

On a machine which has previously been operating correctly the fault may be due to:

•   Connector displacement or cable damage. Visually examine and then check by temporarily exchanging reading heads with drives disabled since the machine will be violently unstable if drives are engaged in that condition.

•   Mechanical disturbance of the read head; use head LEDs to diagnose. Realign the head if necessary, replace head if damaged.

•   Damage or contamination of the scale. Clean or replace scale as required.

•   Machine bearing damage causing head misalignment. Repair or adjust as needed.

•   The supply voltage to the reading heads may be below specification. Check applied voltage and calculate the voltage at the heads, comparing with manufacturers specification. See Chapter 6, Description of connector signals, CMM reading head input connections, for the electrical details of the cables and heads.

9.3.8   Timing out during moves or scans

Symptom

The CMM takes a long time to complete a commanded move. The event should be reported by the user program as a 'move timeout fault' or similar wording. (The condition is reported to the User program by the controller's setting of the 'time-out during move or scan' flag in a status report).

Possible causes, tests, cures

This is similar to the 'poor positioning accuracy' fault described earlier in this chapter. In particular the drive friction level and the positional tolerance setting are important factors.

Check that the friction levels have not deteriorated since the machine was commissioned.

The positioning tolerance defines the maximum allowed position error at the end of a move. If this is made too small for the CMM's servo capabilities it will cause time-out failures during moves. Adjust it using the 'Enter positional tolerance' command.

9.3.9   Cannot start a move

Symptom

The machine does not respond when given a move command. The controller returns either the 'cannot start move' or the 'illegal parameter' status flag with the normal 'action complete' flag.

Possible causes, tests, cures

*   The 'illegal parameter' flag indicates that the move command may contain a parameter which is outside its acceptable range or is not logical. See the definition of the move command.

*   The servo motors are not engaged, engage the motors, see above.

*   Physical restraint of the CMM causing an immediate stall condition (e.g. unreported failure of the air supply to air bearings). Check the CMM's mobility, rectify as required.

*   If a joystick unit is attached, the controller must be in the DCC mode, not the joystick mode, see the joystick interface or MCU daughter card installation guide.

*   The controller is not in 'HOLD' state, e.g. it may be completing a previous command, or it may be in joystick mode and responding to a joystick deflection. Wait for the action complete flag from the previous command, or send an Abort command to ensure termination.

*   The probe is open/deflected. Use the 'probe open override' (command number 310) to escape from the deflecting surface - remember to turn the override off if necessary.

*   The probe is reported as 'deflected' even when not in contact with a surface. Test/Cure: check probe calibration – has the configuration changed since last qualification, if so correct and null the scanning probe with command number 288.

*   All inner limit switches must be closed and the machine must be inside all soft limits, if these are enabled. limit switch operation can be over-ridden by use of command number 311.

*   The analogue probe signal converter within the UCC1 reports an error. To resolve this problem the system must be rebooted.

9.3.10 Cannot start a scan

Symptom

When a scan command is sent to the controller it does not begin the search for the part surface. If this process does not start it returns either the 'cannot start move' or the ' illegal parameter' status flag with the normal 'action complete' flag.

Possible causes, tests, cures

- The ' illegal parameter ' flag indicates that the scan command may contain a parameter which is outside its acceptable range or is not logical. See the definition of the scan command.

- Check that none of the faults which would stop a move are present, see above, except that a scan CAN be started with the probe deflected.

- The absolute datum and master datum have not been set.

- The analogue probe has not been qualified

- The probe may be incorrectly specified as touch-trigger type. An analogue probe is required for scanning confirm the correct the probe type (command number 286) is active.

- The machine is more than the positioning tolerance away from the specified starting point. Read the current machine position using command number 277 (Read position and probe deflection) and insert the CMM X and Y positions (i.e. the stylus position minus the probe deflections) into the scan command as the starting X, Y values. The positioning tolerance is specified in command number 308.

- If the search for a surface starts but then stops the search distance is smaller than the gap between the starting point and the surface. To resolve this set a larger search distance for the scan.

10   Specifications

The purpose of this chapter is to define the power requirements and the environmental conditions required by the UCC1 controller and list the available supplies.

10.1   Physical specification

UCC1

The UCC1 controller is housed inside a 3U high enclosure which can be mounted in a 19 inch rack or alternatively it can be used as a desktop unit.

A rack mounting kit is available as an optional extra.

*   Height: 127 mm

*   Depth: 260 mm

*   Width: 435 mm

*   Weight: 6 kg (without cables and daughter cards)

Optical interface board

*   Weight: 0.2 kg

*   Dimensions: Standard PCI card or short ISA bus card

10.2   Cable lengths

10.2.1 UCC1 to CMM measuring scale reading head

The maximum specified cable length is 18 metres assuming that individual cable wire cross-sectional area is a minimum of 0.055 mm^2. For further details please refer to chapter 5, CMM reading head input connectors.

10.2.2 UCC1 to CMM servo power amplifier input

The maximum recommended cable length is 2 metres. However, it is recommended that the cable is kept as short as possible

Longer lengths can be used if care is exercised with the 0 V and ground connections, i.e. one point star connection to ground of the 0 V return lines.

10.2.3 Fibre optic cable link

The maximum specified cable length is 50 metres.

10.3   Scale readhead signal speed

The maximum frequency of any one of the scale readhead quadrature signals, with ideal waveforms and phase displacement is 12.5 MHz. However it is recommended that the maximum frequency of any one of the scale readheads should be 10 MHz

10.4   Electrical power requirements

10.4.1 Controller output supplies

The UCC1 produces a +24 V current limited supply with a maximum output current of 1 A. This supply is available for use within the CMM system to supply status switches, etc.

The UCC1 also provides protected supplies for other external devices such as scale read heads, the probe, the optical interface board, etc.

These supplies are:

+ 5 Vdc*   at   1.0 A max

+15 Vdc   at   1.0 A max

- 15 Vdc   at   1.0 A max

* The supply to the scale reading heads is a nominal 5 Vdc. but is adjusted to be between 5.1 V and 5.2 V (no external load) to give adequate voltage overhead for the reading head supply cables.

10.4.2 Optical interface board

The optical interface board is powered from the CMM host computer and requires +5 Vdc 120 mA, 0.6 W.

11   System interconnections

The UCC1 provides a simpler means of interconnecting many of the sub-systems (e.g. a probe head) in a measuring system. The purpose of this chapter is to illustrate some system configurations.

11.1   Fixed probe of manual probe head system

Figure 21 shows the interconnections needed for a measurement system using any of the 2 wire touch-trigger probes.
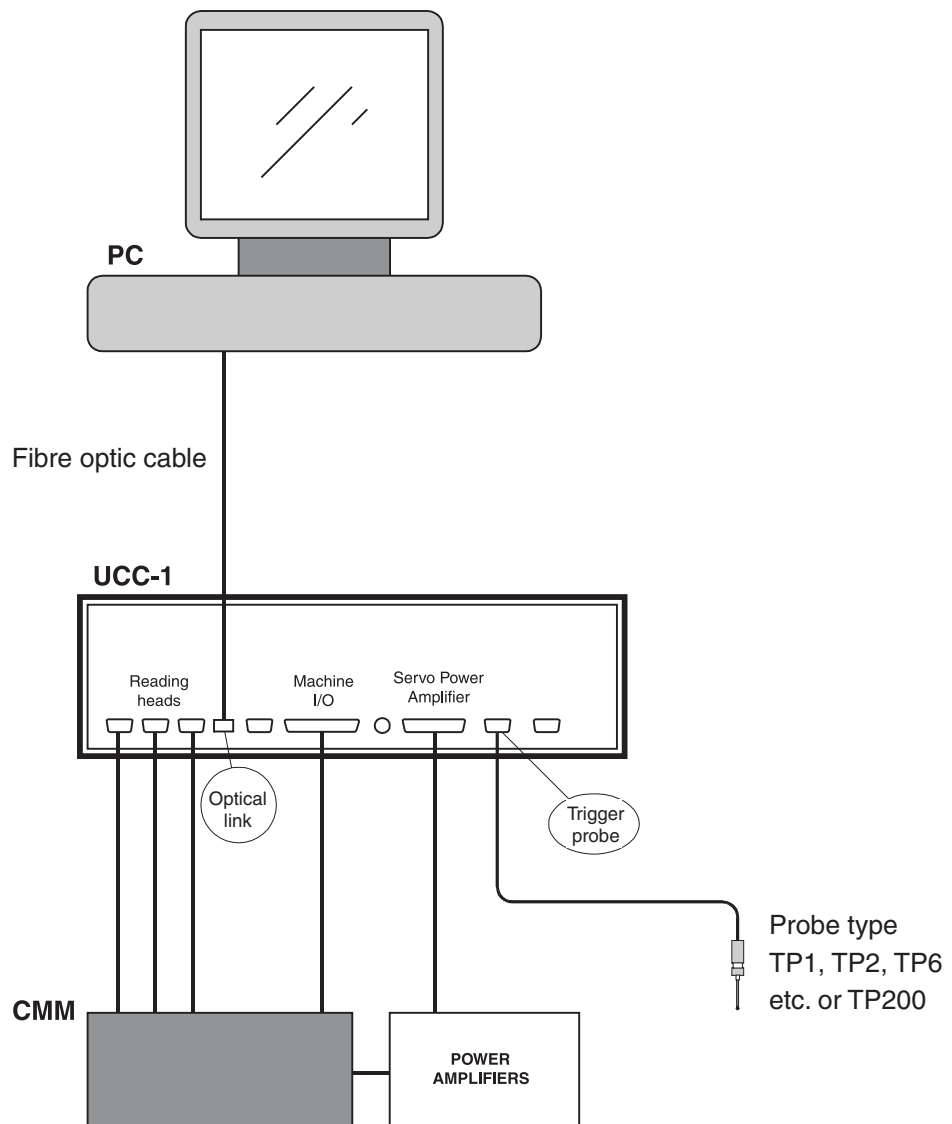
Figure 21

11.2   PH10 probe head and 2 wire touch trigger probe system

Figure 22 shows the interconnections needed for a measurement system using the Renishaw PH10 probe head and any of the Renishaw 2 wire touch trigger probes.

An optional stylus change rack type SCR200 can also be fitted as shown, with the addition of only one cable.

The control of the probe head requires the addition of a PHC1050 daughter board to the UCC1. This card will also support a hand control unit, type HCU1, as shown.

NOTE: All of the supplies and signals to and from the PH10 probe head and the probe are connected via one cable from the head to the UCC1.
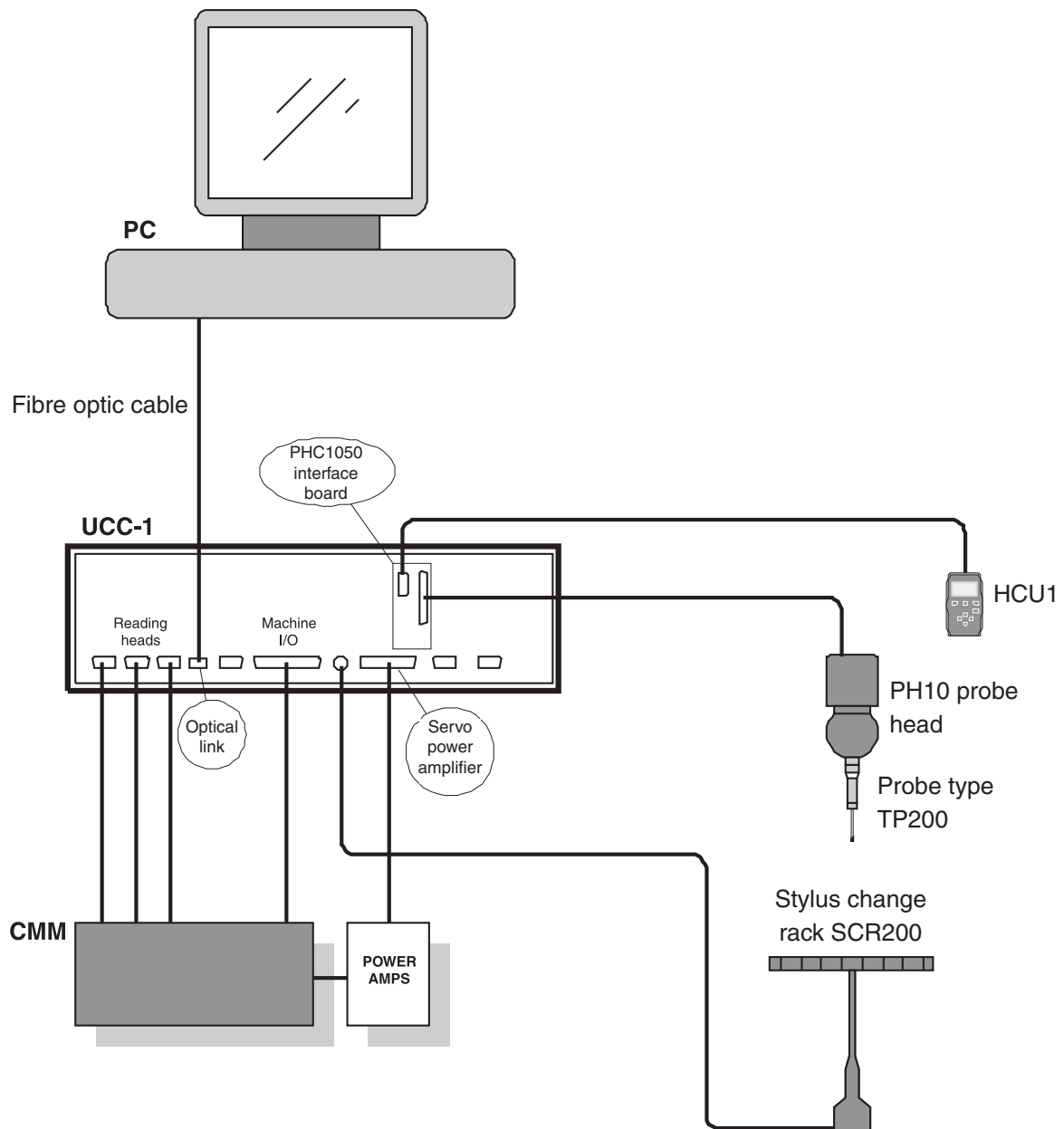
Figure 22

11.3   PH10 probe head and 'multiwire' probe system

Figure 23 shows the interconnections needed for a measurement system using the Renishaw PH10M probe head and the SP600 analogue probe.
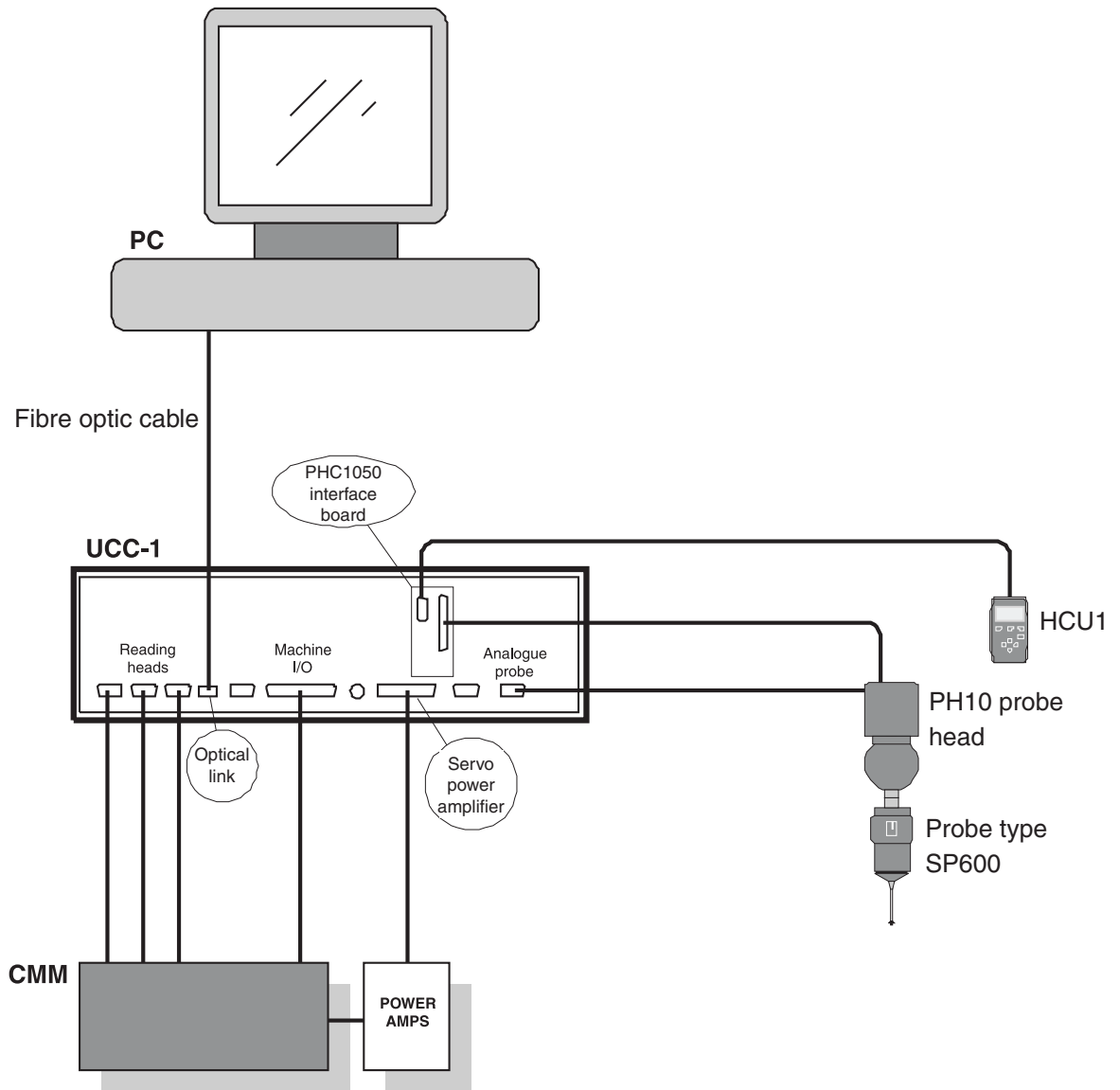
Figure 23

11.4   PH10 probe head, 'multiwire' probe system and ACR1

Figure 24 shows the interconnections needed for a measurement system using the Renishaw PH10 probe head and the ACR1 autochange system. Further details are given in the UCC daughter card installation guide (Renishaw part number H-1000-5220).

PICS/RS232 interface board

PHC1050 interface board

UCC-1

Reading heads

Analogue probe

HCU1

PH10 probe head

Probe type

RS232 cable not required if autochange system used in stand alone mode

ACC2-2

ACR1

Blanking plug required - see PICS/RS232 installation guide for details
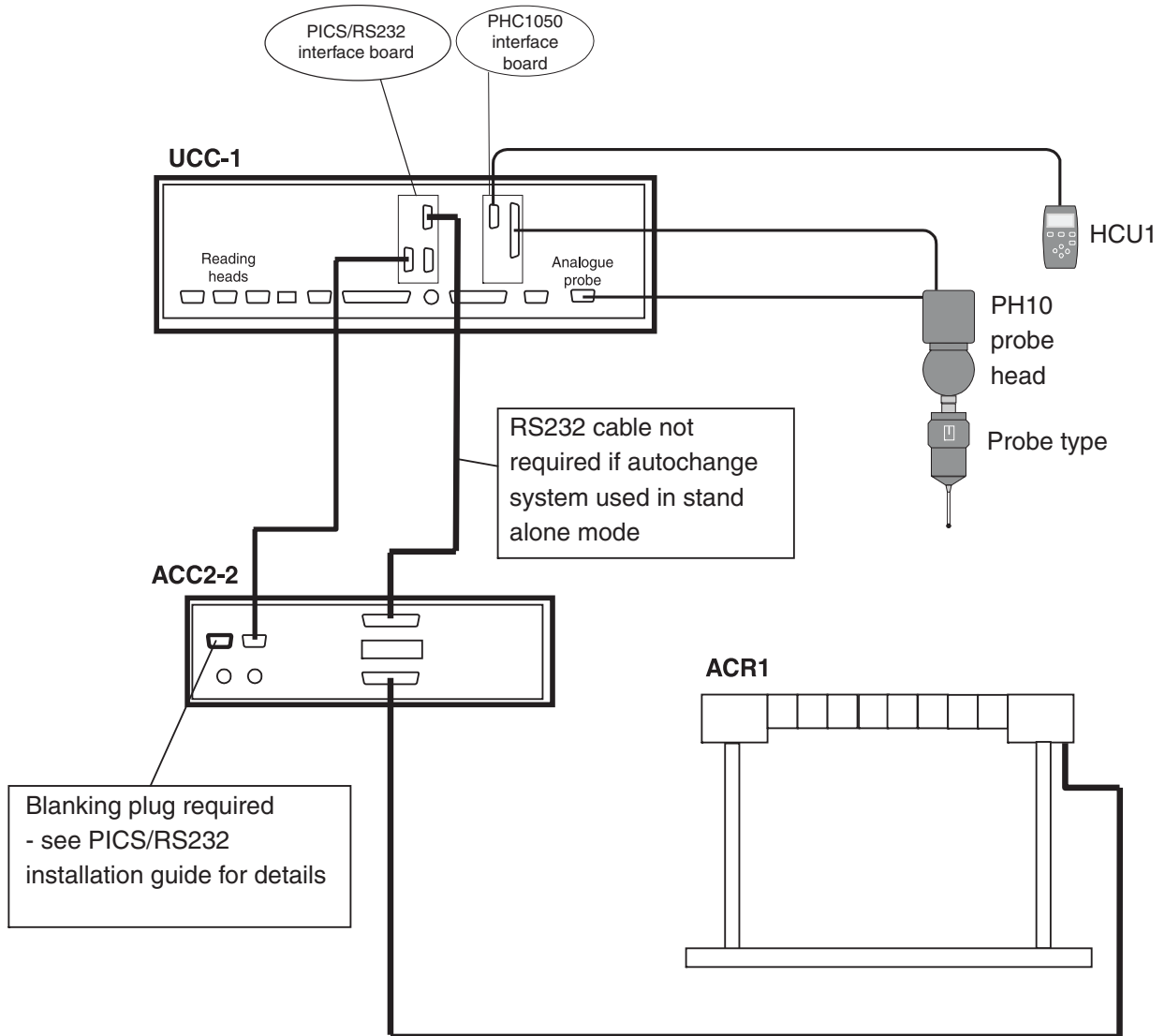
Figure 24

11.5   PH10 probe head and 'multiwire' probe system using external PHC10-2

Figure 25 shows the interconnections needed for a measurement system using the Renishaw PH10 probe head with an external PHC10-2 controller. Further details are given in the UCC daughter card installation guide (Renishaw part number H-1000-5220).
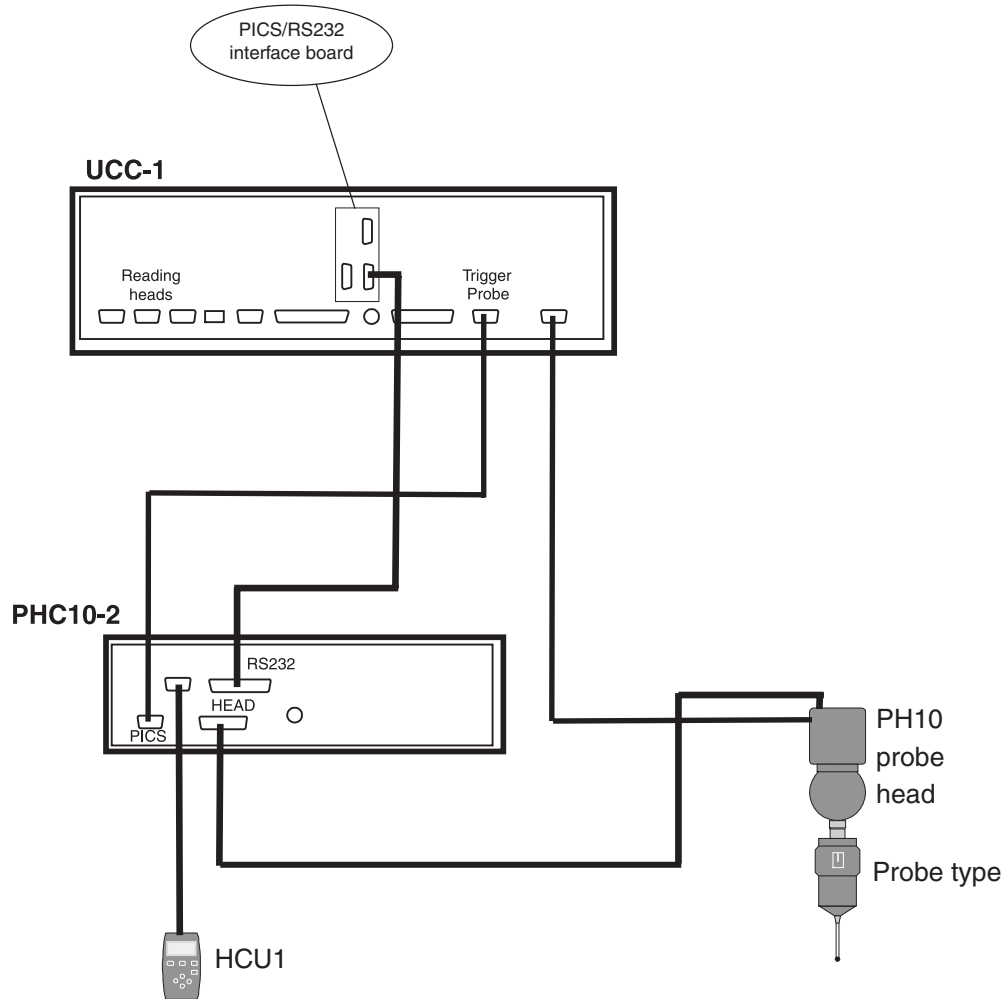
Figure 25

12   Maintenance

⚠ **WARNING:** Maintenance should only be carried out after the machine has been isolated from the electrical supply, compressed air supply , or other energy sources in accordance with the machine manufacturer's instructions.

Periodically check the security of mounting screws and electrical connectors.

Periodical electrical safety checks should include inspection of the mains cable for damage and safe connections. An earth continuity (ground bonding) test may be applied between the protective earth pin of the mains connector and the metal case at a test current of no greater than 25 A.

Periodical safety checks should include the function of the emergency stop system, this must include operation of all switches integrated into the system. After operation of the emergency stop the system should be checked to ensure servo power can then be engaged.

Remove dust from the external surfaces with a clean dry cloth, the unit is not sealed against fluids/water.

13   Testing and verification

The manufacturer of the finished machine, or the installer of the UCC1, is responsible for ensuring that the following testing and verification, to the appropriate standards, is performed as a minimum on the complete installation.

- Verification that the electrical equipment is in compliance with the technical documentation

- Continuity of the protective bonding circuit

- Insulation resitance tests

- Voltage tests

- Protection against residual voltages

- Functional tests, particularly those related to safety and safeguarding

- Testing of the emergency stop system

14   Index

15   Revision history

What's new in release 02-B

1.   A 'Document approvals' table and a 'What's new' section have been added.

2.   The TP200 probe interface, previously called the PIB200 daughter-board, has been incorporated in the UCC1 motherboard. Chapter 9 added. Some connector changes have resulted (chapter 5).

3.   The scale reading head connectors were D sockets, now high density D sockets (chapter 5).

4.   Mention of motor current feedback, air solenoid and axis brakes has been deleted. These features will be re-introduced in a future version.

5.   The alternative optical interface boards/cards (PCI and PCMCIA) are mentioned. Further information will be added for these as they become available.

6.   PICS STOP signal is no longer suppressed, note removed (chapter 7).

7.   The trigger probe connector (formerly basic TT probe connector) is now full PICS (chapter 5).

8.   A new switch on the motherboard to enable the LED on a fixed 'multiwire' probe head (chapter 7).

9.   A new connector has been added to the motherboard for a stylus autochange rack (chapter 5)

10.   The UCC1 servo tuning user's guide is referenced in chapter 7.

11.   Chapter 10, System interconnections has been added.

12.   Minor changes for latest RENICIS release.

What's new in release 03

1.   Figure labelling changed throughout.

2.   Figure 4.1 updated.

3.   Minor text changes throughout.

4.   Document approvals section removed.

5.   New chapter added, 'Renishaw licence key manager system'

What's new in release 04

1.   Figures 11.4 through 11.6 added to chapter 11.

What's new in release 05

1.   References to Joystick interface card now indicate MCU interface card option

2.   Inclusion of parallel port optical interface board.

3.   License manager with Elan PCMCIA update note.

What's new in release 06

1.   Inclusion of multilingual safety statements

2.   Minor re-structure of document

3.   Removal of references to parallel port optical interface board

What's new in release 07

1.   AC voltage limits and frequency range updated.

2.   New notes and warnings added.

3.   Section 12 'Testing and verification' added.

4.   Document approvals section removed.

5.   New chapter added, 'Renishaw licence key manager system'

What's new in release 08

1.   Update to Renishaw licence key manager system.

2.   Handbook title cross reference changes.

3.   Minor re-structure of document.

4.   Removal of W axis reference on servo power connector.

5.   Chapter on safety considerations added (chapter 1).

What's new in release 09

1.   Removal of PH50 details from section 11.

2.   Change of PC specification section 2.2.

3.   UCClite information added.

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Renishaw worldwide

Australia
T +61 3 9521 0922
E australia@renishaw.com

Austria
T +43 (0) 2236 379790
E austria@renishaw.com

Brazil
T +55 11 4195 2866
E brazil@renishaw.com

The People's Republic of China
T +86 10 8448 5306
E beijing@renishaw.com

Canada
T +1 905 828 0104
E canada@renishaw.com

Czech Republic
T +420 548 216 553
E czech@renishaw.com

France
T +33 1 64 61 84 84
E france@renishaw.com

Germany
T +49 (0) 7127 981-0
E germany@renishaw.com

Hong Kong
T +852 2753 0638
E hongkong@renishaw.com

Hungary
T +36 23 502 183
E hungary@renishaw.com

India
T +91 80 25320 144
E india@renishaw.com

Israel
T +972 4 953 6595
E israel@renishaw.com

Italy
T +39 011 966 10 52
E italy@renishaw.com

Japan
T +81 3 5366 5315 (or 5324)
E japan@renishaw.com

The Netherlands
T +31 76 543 11 00
E benelux@renishaw.com

Poland
T +48 22 577 1180
E poland@renishaw.com

Russia
T +7 495 231 1677
E russia@renishaw.com

Singapore
T +65 6897 5466
E singapore@renishaw.com

Slovenia
T +386 (1) 527 2100
E mail@rls.si

South Korea
T +82 2 2108 2830
E southkorea@renishaw.com

Spain
T +34 93 663 3420
E spain@renishaw.com

Sweden
T +46 (0)8 584 90 880
E sweden@renishaw.com

Switzerland
T +41 55 415 50 60
E switzerland@renishaw.com

Taiwan
T +886 4 2251 3665
E taiwan@renishaw.com

Thailand
T +66 2746 9811
E thailand@renishaw.com

Turkey
T +90 216 380 92 40
E turkiye@renishaw.com

UK (Head Office)
T +44 (0)1453 524524
E uk@renishaw.com

USA
T +1 847 286 9953
E usa@renishaw.com

For all other countries
T +44 1453 524524
E international@renishaw.com

H-1000-5056-09