PH10M

RENISHAW®
AUTOCHANGE CONTROL UNIT
ACC 2-2

RENISHAW®

Autochange system Installation and Programmer's Guide

Disclaimer

Considerable effort has been made to ensure that the contents of this document are free from inaccuracies and omissions. However, Renishaw makes no warranties with respect to the contents of this document and specifically disclaims any implied warranties. Renishaw reserves the right to make changes to this document and to the product described herein without obligation to notify any person of such changes.

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 equipment

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 for Renishaw equipment.

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.

Patents

Features of the various products shown in this Installation and Programmer's Guide, and features of similar products, are the subject of the following patents and patent applications.

EP 0142373	EP 0243766	JP 2,539,824
EP 0293036	EP 0388993	US 4817362
JP 2,098,080	JP 2,545,082	JP 2,647,881
US 4651405	US 4813151	US 4916339
EP 236414	EP 242747 B	

Renishaw part no: H-1000-6010-07-A

Issued: April 2001

Autochange system
Installation and Programmer's Guide

$C \in$

RENISHAW

www.renishaw.com

FCC (USA)

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 own 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.

Special accessories (FCC section 15.27)

The user is also cautioned that any peripheral device installed with this equipment such as a computer, must be connected with a high-quality shielded cable to insure compliance with FCC limits.

GB

WARNINGS

Pinch hazards exist between moving parts and between moving and static parts. Do not hold the probe head during movements, or during manual probe changes.

Beware of unexpected movement. The user should remain outside of the full working envelope of probe head/extension/probe combinations.

Handle and dispose of batteries according to the manufacturer's recommendations. Use only the recommended batteries. Do not allow the battery terminals to contact other metallic objects.

In all applications involving the use of machine tools or CMMs, eye protection is recommended.

There are no user serviceable parts inside Renishaw mains powered units. Return defective units to an authorised Renishaw Customer Service Centre.

Replace blown fuses with new components of the same type. Refer to the SAFETY section of the relevant product documentation.

For instructions regarding the safe cleaning of Renishaw products, refer to the MAINTENANCE section of the relevant product documentation.

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product documentation, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to stop machine movement.

The expected method of providing an emergency stop for Renishaw products is to remove power.

F

AVERTISSEMENTS

L'effet de pincement dû au mouvement des pièces mobiles entre elles ou avec des pièces fixes présente des dangers. Ne pas tenir la tête du palpeur lorsqu'elle se déplace ou que le palpeur est changé à la main.

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples tête de palpeur/rallonge/palpeur.

Suivre les conseils du fabricant pour manipuler et jeter les batteries. Utiliser uniquement les batteries recommandées. Veiller à ce que les bornes de la batterie n'entrent pas en contact avec d'autres objets métalliques.

Le port de lunettes de protection est recommandé pour toute application sur machine-outil et MMC.

Aucune pièce des machines Renishaw alimentées sur secteur ne peut être réparée par l'utilisateur. Renvoyer toute machine défectueuse à un Centre Après Vente Renishaw agréé.

Remplacer les fusibles grillés par des composants neufs du même type. Consulter la section SAFETY (SECURITE) de votre documentation.

Les conseils de nettoyage en toute sécurité des produits Renishaw figurent dans la section MAINTENANCE de votre documentation.

Mettre la machine hors tension avant d'entreprendre toute opération de maintenance.

Consulter le mode d'emploi du fournisseur de la machine.

Il incombe au fournisseur de la machine d'assurer que l'utilisateur prenne connaissance des dangers d'exploitation, y compris ceux décrits dans la documentation du produit Renishaw, et d'assurer que des protections et verrouillages de sûreté adéquats soient prévus.

Dans certains cas, il est possible que le signal du palpeur indique à tort l'état que le palpeur est au repos. Ne pas se fier aux signaux du palpeur qui ne garantissent pas toujours l'arrêt de la machine.

La procédure habituelle d'arrêt d'urgence des produits Renishaw est la mise hors tension.

D

ACHTUNG

Zwischen beweglichen und zwischen beweglichen und statischen Teilen besteht eine Einklemmgefahr. Den Meßtasterkopf nicht anfassen, wenn er sich bewegt oder wenn ein manueller Meßtasterwechsel durchgeführt wird.

Auf unerwartete Bewegungen achten. Der Anwender soll sich immer außerhalb des Meßtasterkopf-Arm-Meßtaster-Bereichs aufhalten.

Batterien immer gemäß den Anleitungen des Herstellers handhaben und diese vorschriftsmäßig entsorgen. Nur die empfohlenen Batterien verwenden. Die Batterieklemmen nicht in Kontakt mit metallischen Gegenständen bringen.

Bei der Bedienung von Werkzeugmaschinen oder Koordinatenmeßanlagen ist Augenschutz empfohlen.

Die betriebenen Renishaw-Einheiten enthalten keine Teile, die vom Anwender gewartet werden können. Im Falle von Mängeln sind diese Geräte an Ihren Renishaw Kundendienst zu senden.

Durchgebrannte Sicherungen müssen mit gleichwertigen ersetzt werden. Beziehen Sie sich bitte auf SAFETY (SICHERHEITSANWEISUNGEN) in der Produktdokumentation.

Anleitungen über die sichere Reinigung von Renishaw-Produkten sind in Kapitel MAINTENANCE (WARTUNG) in der Produktdokumentation enthalten.

Bevor Wartungsarbeiten begonnen werden, muß erst die Stromversorgung getrennt werden.

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

Es obliegt dem Maschinenlieferanten, den Anwender über alle Gefahren, die sich aus dem Betrieb der Ausrüstung, einschließlich der, die in der Renishaw Produktdokumentation erwähnt sind, zu unterrichten und zu versichern, daß ausreichende Sicherheitsvorrichtungen und Verriegelungen eingebaut sind.

Unter gewissen Umständen könnte das Meßtastersignal falscherweise melden, daß der Meßtaster nicht ausgelenkt ist. Verlassen Sie sich nicht allein auf Sondensignale, um sich über Maschinenbewegungen zu informieren.

Renishaw-Produkte sollen im Notfall durch Trennen der Stromversorgung gestoppt werden.

I

AVVERTENZE

Tra le parti in moto o tra le parti in moto e quelle ferme esiste effettivamente il pericolo di farsi del male pizzicandorsi. Evitare di afferrare la testina della sonda quando è in moto, oppure quando si effettuano spostamenti a mano.

Fare attenzione ai movimenti inaspettati. Si raccomanda all'utente di tenersi al di fuori dell'involucro operativo della testina della sonda, prolunghe e altre varianti della sonda.

Trattare e smaltire le pile in conformità alle istruzioni del fabbricante. Usare solo pile del tipo consigliato. Evitare il contatto tra i terminali delle pile e oggetti metallici.

Si raccomanda di indossare occhiali di protezione in applicazioni che comportano macchine utensili e macchine per misurare a coordinate.

All'interno degli apparecchi Renishaw ad alimentazione di rete elettrica, non vi sono componenti adatti a interventi di manutenzione da parte dell'utente. In caso di guasto, rendere l'apparecchio a uno dei Centri di Assistenza Renishaw.

I fusibili bruciati dovranno essere sostituiti con quelli dello stesso tipo. Consultare la sezione SAFETY (SICUREZZA) della documentazione del prodotto.

Per le istruzioni relative alla pulizia dei prodotti Renishaw, fare riferimento alla sezione MAINTENANCE (MANUTENZIONE) della documentazione del prodotto.

Prima di effettuare qualsiasi intervento di manutenzione, isolare dall'alimentazione di rete.

Consultare le istruzioni d'uso del fabbricante della macchina.

Il fornitore della macchina ha la responsabilità di avvertire l'utente dei pericoli inerenti al funzionamento della stessa, compresi quelli riportati nelle istruzioni della Renishaw, e di mettere a disposizione i ripari di sicurezza e gli interruttori di esclusione.

E' possibile, in certe situazioni, che la sonda emetta erroneamente un segnale che la sonda è in posizione. Evitare di fare affidamento sugli impulsi trasmessi dalla sonda per arrestare la macchina.

Lo stop d'emergenza per i prodotti Renishaw è l'isolamento dall'alimentazione elettrica.

E

ADVERTENCIAS

Existe el peligro de atraparse los dedos entre las distintas partes móviles y entre partes móviles e inmóviles. No sujetar la cabeza de la sonda mientras se mueve, ni durante los cambios manuales de la sonda.

Tener cuidado con los movimientos inesperados. El usuario debe quedarse fuera del grupo operativo completo compuesto por la cabeza de sonda/extensión/sonda o cualquier combinación de las mismas.

Las baterías deben ser manejadas y tiradas según las recomendaciones del fabricante. Usar sólo las baterías recomendadas. No permitir que los terminales de las mismas entren en contacto con otros objetos metálicos.

Se recomienda usar protección para los ojos en todas las aplicaciones que implican el uso de máquinas herramientas y máquinas de medición de coordenadas.

Dentro de las unidades Renishaw que se enchufan a la red, no existen piezas que puedan ser mantenidas por el usuario. Las unidades defectuosas deben ser devueltas a un Centro de Servicio al Cliente Renishaw.

Sustituir los fusibles fundidos con componentes nuevos del mismo tipo. Remitirse a la sección titulada SAFETY (SEGURIDAD) en la documentación sobre el producto.

Para instrucciones sobre seguridad a la hora de limpiar los productos Renishaw, remitirse a la sección titulada MAINTENANCE (MANTENIMIENTO) en la documentación sobre el producto.

Quitar la corriente antes de emprender cualquier operación de mantenimiento.

Remitirse a las instrucciones de manejo del proveedor de la máquina.

Corresponde al proveedor de la máquina asegurar que el usuario esté consciente de cualquier peligro que implica el manejo de la máquina, incluyendo los que se mencionan en la documentación sobre los productos Renishaw y le corresponde también asegurarse de proporcionar dispositivos de protección y dispositivos de bloqueo de seguridad adecuados.

Bajo determinadas circunstancias la señal de la sonda puede indicar erróneamente que la sonda está asentada. No fiarse de las señales de la sonda para parar el movimiento de la máquina.

El método previsto para efectuar una parada de emergencia de los productos Renishaw es el de quitar la corriente.

AVISOS

Figo de constrição entre peças móveis e entre peças móveis e estáticas. Não segurar a cabeça da sonda durante o movimento ou durante mudanças manuais de sonda.

Tomar cuidado com movimento inesperado. O utilizador deve permanecer fora do perímetro da área de trabalho das combinações cabeça da sonda/extensão/ sonda.

Manusear e descartar baterias de acordo com as recomendações do fabricante. Utilizar apenas as baterias recomendadas. Não permitir que os terminais da bateria entrem em contacto com outros objectos metálicos.

Em todas as aplicações que envolvam a utilização de máquinas-ferramenta e CMMs, recomenda-se usar protecção para os olhos.

Não há peças que possam ser consertadas pelo utilizador dentro das unidades Renishaw alimentadas pela rede.

Substituir fusíveis fundidos por novos componentes do mesmo tipo. Consultar a secção SAFETY (SEGURANÇA) da documentação do produto.

Para instruções relativas à limpeza segura de produtos Renishaw, consultar a secção MAINTENANCE (MANUTENÇÃO) da documentação do produto.

Desligar a alimentação antes de efectuar qualquer operação de manutenção.

Consultar as instruções de funcionamento do fornecedor da máquina.

É responsabilidade do fornecedor da máquina assegurar que o utilizador é consciencializado de quaisquer perigos envolvidos na operação, incluindo os mencionados na documentação do produto Renishaw e assegurar que são fornecidos resguardos e interbloqueios de segurança adequados.

Em certas circunstâncias, o sinal da sonda pode indicar falsamente uma condição de sonda assentada. Não confiar em sinais da sonda para parar o movimento da máquina.

O método esperado de proporcionar uma paragem de emergência para produtos Renishaw é desligar a alimentação.

DK

ADVARSLER

Der er risiko for at blive klemt mellem bevægelige dele og mellem bevægelige og statiske dele. Hold ikke sondehovedet under bevægelse eller under manuelle sondeskift.

Pas på uventede bevægelser. Brugeren bør holde sig uden for hele sondehovedets/ forlængerens/sondens arbejdsområde.

Håndtér og bortskaf batterier i henhold til producentens anbefalinger. Anvend kun de anbefalede batterier. Lad ikke batteriterminalerne komme i kontakt med andre genstande af metal.

I alle tilfælde, hvor der anvendes værktøjs- og koordinatmålemaskiner, anbefales det at bære øjenbeskyttelse.

Der er ingen dele inde i Renishaw-enhederne, som sluttes til lysnettet, der kan efterses eller repareres af brugeren. Send alle defekte enheder til Renishaws kundeservicecenter

Udskift sikringer, der er sprunget, med nye komponenter af samme type. Se i afsnittet SAFETY (SIKKERHED) i produktdokumentatione.

Se afsnittet MAINTENANCE (VEDLIGEHOLDELSE) i produktdokumentationen for at få instruktioner til sikker rengøring af Renishaw-produkter.

Afbryd strømforsyningen, før der foretages vedligeholdelse.

Se maskinleverandørens brugervejledning.

Det er maskinleverandørens ansvar at sikre, at brugeren er bekendt med eventuelle risici i forbindelse med driften, herunder de risici, som er nævnt i Renishaws produktdokumentation, og at sikre, at der er tilstrækkelig afskærmning og sikkerheds- blokeringer.

Under visse omstændigheder kan sondesignalet ved en fejl angive, at sonden står stille. Stol ikke på, at sondesignaler stopper maskinens bevægelse.

Den forventede metode til nødstop af Renishaw-produkter er afbrydelse strømforsyningen.

NL

WAARSCHUWINGEN

Er is risico op klemmen tussen de bewegende onderdelen onderling en tussen bewegende en niet-bewegende onderdelen. De sondekop tijdens beweging of tijdens manuele sondeveranderingen niet vasthouden.

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de sondekop/extensie/sonde combinaties te blijven.

De batterijen volgens de aanwijzingen van de fabrikant hanteren en wegdoen. Gebruik uitsluitend de aanbevolen batterijen. Zorg ervoor dat de poolklemmen niet in contact komen met andere metaalhoudende voorwerpen.

Het dragen van oogbescherming wordt tijdens gebruik van machinewerktuigen en CMM's aanbevolen.

De onderdelen van Renishaw units die op het net worden aangesloten kunnen niet door de gebruiker onderhouden of gerepareerd worden. U kunt defecte units naar een erkend Renishaw Klantenservice Centrum brengen of toezenden.

Doorgeslagen zekeringen met nieuwe componenten van hetzelfde type vervangen. U wordt verwezen naar het hoofdstuk SAFETY (VEILIGHEID) in de produkten-documentatie.

Voor het veilig reinigen van Renishaw produkten wordt verwezen naar het hoofdstuk MAINTENANCE (ONDERHOUD) in de produktendocumentatie.

Voordat u enig onderhoud verricht dient u de stroom uit te schakelen.

De bedieningsinstructies van de machineleverancier raadplegen.

De leverancier van de machine is ervoor verantwoordelijk dat de gebruiker op de hoogte wordt gesteld van de risico's die verbonden zijn aan bediening, waaronder de risico's die vermeld worden in de produktendocumentatie van Renishaw. De leverancier dient er tevens voor te zorgen dat de gebruiker is voorzien van voldoende beveiligingen en veiligheidsgrendelinrichtingen.

Onder bepaalde omstandigheden kan het sondesignaal een onjuiste sondetoestand aangeven. Vertrouw niet op de sondesignalen voor het stoppen van de machine-beweging.

In geval van nood wordt er verwacht dat het Renishaw produkt wordt stopgezet door de stroom uit te schakelen.

SW

VARNING

Risk för klämning existerar mellan rörliga delar och mellan rörliga och stillastående delar. Håll ej i sondens huvud under rörelse eller under manuella sondbyten.

Se upp för plötsliga rörelser. Användaren bör befinna sig utanför arbetsområdet för sondhuvudet/förlängningen/sond-kombinationerna.

Hantera och avyttra batterier i enlighet med tillverkarens rekommendationer. Använd endast de batterier som rekommenderas. Låt ej batteriuttagen komma i kontakt med andra metallföremål.

Ögonskydd rekommenderas för alla tillämpningar som involverar bruket av maskinverktyg och CMM.

Det finns inga delar som användaren kan utföra underhåll på inuti Renishaws nätströmsdrivna enheter. Returnera defekta delar till ett auktoriserat Renishaw kundcentra.

Byt ut smälta säkringar med nya av samma typ. Se avsnittet SAFETY (SÄKERHET) i produktdokumentationen.

För instruktioner angående säker rengöring av Renishaws produkter, se avsnittet MAINTENANCE (UNDERHÅLL) i produktdokumentationen.

Koppla bort strömmen innan underhåll utförs.

Se maskintillverkarens bruksanvisning.

Maskinleverantören ansvarar för att användaren informeras om de risker som drift innebär, inklusive de som nämns i Renishaws produktdokumentation, samt att tillräckligt goda skydd och säkerhetsförreglingar tillhandahålls.

Under vissa omständigheter kan sondens signal falskt ange att en sond är monterad. Lita ej på sondsignaler för att stoppa maskinens rörelse.

Metoden för nödstopp för Renishaws produkter förutsätter att strömmen kopplas bort.

VAROITUKSIA

Liikkuvien osien sekä liikkuvien ja staattisten osien välillä on olemassa puristusvaara. Älä pidä kiinni anturin päästä sen liikkuessa tai vaihtaessasi anturia käsin.

Varo äkillistä liikettä. Käyttäjän tulee pysytellä täysin anturin pään/jatkeen/anturin yhdistelmiä suojaavan toimivan kotelon ulkopuolella.

Käytä paristoja ja hävitä ne valmistajan ohjeiden mukaisesti. Käytä ainoastaan suositeltuja paristoja. Älä anna paristonapojen koskettaa muita metalliesineitä.

Kaikkia työstökoneita ja koordinoituja mittauskoneita (CMM) käytettäessä suositamme silmäsuojuksia.

Sähköverkkoon kytkettävät Renishaw-tuotteet eivät sisällä käyttäjän huollettavissa olevia osia. Vialliset osat tulee palauttaa valtuutetulle Renishaw-asiakaspalvelukeskukselle.

Vaihda palaneiden sulakkeiden tilalle samantyyppiset uudet sulakkeet. Lue tuoteselosteen SAFETY (TURVALLISUUTTA) koskeva osa.

Renishaw-tuotteiden turvalliset puhdistusohjeet löytyvät tuoteselosteen MAINTENANCE (HUOLTOA) koskevasta osasta.

Kytke pois sähköverkosta ennen huoltotoimenpiteitä.

Katso koneen toimittajalle tarkoitettuja käyttöhjeita.

Koneen toimittaja on velvollinen selittämään käyttäjälle mahdolliset käyttöön liittyvät vaarat, mukaan lukien Renishaw'n tuoteselosteessa mainitut vaarat. Toimittajan tulee myös varmistaa, että toimitus sisältää riittävän määrän suojia ja lukkoja.

Tietyissä olosuhteissa anturimerkki saattaa osoittaa virheellisesti, että kyseessä on anturiin liittyvä ongelma. Älä luota anturimerkkeihin koneen liikkeen pysäyttämiseksi.

Renishaw-tuotteiden hätäpysäytys tehdään tavallisesti kytkemällä sähkö pois.

GR

ΠΡΟΕΙΔΟΠΟΙΗΣΕΙΣ

Υπάρχει κίνδυνος πιασίματος μεταξύ των κινούμενων μερών όπως και μεταξύ των κινούμενων και στατικών μερών. Δεν πρέπει να κρατείτε την κεφαλή του ανιχνευτή κατά την κίνηση ούτε και κατά τη διάρκεια χειροκίνητων αλλαγών του ανιχνευτή.

Προσοχή - κίνδυνος απροσδόκητων κινήσεων. Οι χρήστες πρέπει να παραμένουν εκτός του χώρου που επηρεάζεται από όλους τους συνδυασμούς λειτουργίας της κεφαλής του ανιχνευτή, της προέκτασης και του ανιχνευτή.

Ο χειρισμός και η απόρριψη των μπαταριών πρέπει να γίνεται σύμφωνα με τις συστάσεις του κατασκευαστή. Να χρησιμοποιούνται μόνο οι συνιστώμενες μπαταρίες. Δεν πρέπει οι αποδέκτες να έρχονται σε επαφή με άλλα μεταλλικά αντικείμενα.

Σε όλες τις εφαρμογές που συνεπάγονται τη χρήση εργαλείων μηχανημάτων και εξαρτημάτων CMM, συνιστάται η χρήση συσκευής προστασίας των ματιών.

Σε μονάδες της Renishaw με σύνδεση με το ηλεκτρικό ρεύμα δεν υπάρχουν εξαρτήματα που να χρειάζονται συντήρηση από το χρήστη. Τυχόν ελαττωματικές μονάδες επιστρέφονται σε εξουσιοδοτημένο Κέντρο Εξυπηρέτησης των Πελατών της Renishaw.

Τυχόν ασφάλειες που καίονται πρέπει να αντικαθιστούνται με νέες ασφάλειες του ίδιου τύπου. Βλέπετε το κεφάλαιο SAFETY (ΑΣΦΑΛΕΙΑ) στο διαφωτιστικό υλικό του προϊόντος.

Για οδηγίες που αφορούν τον ασφαλή καθαρισμό των προϊόντων Renishaw, βλέπετε το κεφάλαιο MAINTENANCE (ΣΥΝΤΗΡΗΣΗ) στο διαφωτιστικό υλικό του προϊόντος.

Αποσυνδέστε το μηχάνημα από το ηλεκτρικό ρεύμα προτού επιχειρήσετε τυχόν εργασίες συντήρησης.

Βλέπετε τις οδηγίες λειτουργίας του προμηθευτή του μηχανήματος.

Αποτελεί ευθύνη του προμηθευτή του μηχανήματος να εξασφαλίσει ότι ο χρήστης είναι ενήμερος τυχόν κινδύνων που συνεπάγεται η λειτουργία, συμπεριλαμβανομένων και όσων αναφέρονται στο διαφωτιστικό υλικό του προϊόντος της Renishaw. Είναι επίσης ευθύνη του να εξασφαλίσει ότι υπάρχουν τα απαιτούμενα προστατευτικά καλύμματα και συνδέσεις ασφαλείας.

Υπό ορισμένες συνθήκες μπορεί το σήμα ανιχνευτή να δώσει εσφαλμένη ένδειξη θέσης του ανιχνευτή. Μη βασίζεστε στα σήματα ανιχνευτή για θέση της κίνησης του μηχανήματος εκτός λειτουργίας.

Η εγκεκριμένη μέθοδος θέσεως των μηχανημάτων Renishaw εκτός λειτουργίας σε περίπτωση ανάγκης είναι η αποσύνδεση από το ηλεκτρικό ρεύμα.

SAFETY

Electrical requirements

The ACC2-2 controller is powered from the ac mains supply via an IEC 320 connector. The operating voltages of the unit are as follows:

85V ac – 264V ac   47 – 66Hz   50W

Fuse replacement

There are two 1 Amp (T) slow-blow fuses (one is a spare). The fuse is replaced as follows:

1.   Disconnect the mains power
2.   Use a screwdriver to lever out the fuseholder to reveal the fuse
3.   Remove the fuse and replace it with a 1 Amp (T) slow-blow 20mm fuse, rating as IEC 127
4.   Replace the fuseholder
5.   Reconnect the mains power

WARNING: 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.

WARNING: 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 2000m
Operating temperature	ACR1	+10°C to +44°C
	ACC2-2	0°C to +50°C
Storage temperature		–10°C to +70°C
Relative humidity	ACR1	80% maximum for temperatures up to +31°C Linear decrease to 50% at +50°C
	ACC2-2	80% maximum for temperatures up to +31°C Linear decrease to 50% at +40°C
Transient overvoltages		Installation category 2
Pollution degree		2

SECURITE

Spécifications électriques

Le contrôleur ACC2-2 est raccordé au secteur par un connecteur à la norme IEC 320. Les tensions d'alimentation pour cet équipement sont les suivants:

85 – 264V ac   47 – 66Hz   50W

Remplacement du fusible

Deux fusibles retardés de 1A sont fournis dont un de remplacement. Pour procéder à l'échange, veuillez vous conformer à la procédure suivante:

1. Débrancher le contrôleur ACC2-2 du secteur
2. Utiliser un petit tournevis pour ouvrir le porte-fusible et accéder au fusible endommagé
3. Enlever le fusible et le replacer par un autre identique (T) 1 Amp, Temp. IEC 127.
4. Remettre le porte-fusible en place
5. Reconnecter le contrôleur ACC2-2 au secteur

ATTENTION: **Vérifier que le fusible de remplacement est du bon calibre.**

Cet équipement doit impérativement être relié à une terre de protection par un câble secteur à 3 conducteurs. La prise équipant ce câble doit être connectée à une prise secteur effectivement équipée d'une borne reliée à la terre. La liaison entre la terre de protection et le contrôleur ACC2-2 ne doit en aucun cas être interrompue par l'utilisation d'un prolongateur dépourvu de conducteur reliant l'équipement à cette terre de protection.

ATTENTION: **Toute interruption de la terre de protection peut rendre cet équipement dangereux. Assurez-vous que la mise à la terre a été effectuée.**

Spécifications relatives a l'environnement

Les conditions d'environnement sont en accord avec la norme BS EN 61010-1:1993 ou ultérieure.

Utilisation uniquement à l'intérieur		IP30 (aucune protection contre l'eau)
Altitude		Jusqu'à 2000m
Température de fonctionnement	ACR1	+10°C à +44°C
	ACC2-2	0°C à +50°C
Température de stockage		−10°C à +70°C
Humidité relative	ACR1	80% maximum pour des températures jusqu'à +31°C avec diminution linéaire jusqu'à 50% à +50°C
	ACC2-2	80% maximum pour des températures jusqu'à +31°C avec diminution linéaire jusqu'à 50% à +40°C
Surtensions transitoires		Installation classée en 2ème catégorie
Degré de pollution		Equipement classé en niveau 2

SICHERHEITSANWEISUNGEN

Elektrische Voraussetzungen

Die Netzversorung des ACC2-2 erfolgt über einen Kaltstecker (IEC 320). Die Einheit kann an folgende Spannungen angeschlossen werden:

85 – 264V (Wechselstrom)   47 – 66Hz   50W

Austausch der Sicherung

Das Gerät ist mit einer 1 Ampere Sicherung (träge) abgesichert. Eine Ersatzsicherung ist beigelegt. Das Auswechseln der Sicherung wird folgendermaßen vorgenommen:

1.   Ziehen Sie den Netzstecker
2.   Mit Hilfe eines Schraubenziehers, hebeln Sie den Sicherungshalter aus, damit die Sicherung sichtbar wird
3.   Entfernen Sie die Sicherung und ersetzen Sie sie durch eine 1 Amp (T) träge, 20mm Sicherung, Leistung gemäß IEC 127
4.   Bringen Sie den Sicherungshalter wieder an
5.   Stecken Sie das Gerät wieder ein

WARNUNG: Benutzen Sie nur Austauschsicherungen mit der vorgegebenen Spezifikation.

Dieses System muß mit einem geerdeten Schutzleiter über ein 3-adriges Hauptkabel verbunden sein. Der Hauptstecker sollte nur in eine geerdete Steckdose gesteckt werden. Der geerdete Kontakt sollte nicht unwirksam gemacht werden, indem man ein Verlängerungskabel ohne Schutzleiter benutzt.

WARNUNG: Eine Unterbrechung des Schutzleiters stellt ein Sicherheitsrisiko dar. Stellen Sie sicher, daß die Erdungsvorschriften eingehalten werden.

Umgebungsbedingungen

Die Forderungen der Richtlinie BS EN 61010-1:1993 sind erfüllt

Inneneinsatz		IP30 (kein Schutz gegen Wasser)
Höhe		bis zu 2000m
Betriebstemperatur	ACR1	+10°C bis +44°C
	ACC2-2	0°C bis +50°C
Lagertemperatur		−10°C bis +70°C
Relative Luftfeuchtigkeit	ACR1	Maximal 80% für Temperaturen bis+31°C, linearer Anstieg bis 50% bei +50°C.
	ACC2-2	Maximal 80% für Temperaturen bis +31°C, linearer Anstieg bis 50% bei +40°C.
Kurzzeitige Überspannungen		Installationsklasse II
Verschmutzungsgrad		2

SICUREZZA

Specifiche elettriche

Il controllo ACC2-2 è alimentato in tensione A.C. tramite un connetore tipo IEC 320. Le tensioni di lavoro richieste sono le seguenti:

85 – 264V ac   47 – 66Hz   50W

Sostituzione dei fusibili

Il controllo ha due fusibili di protezione del tipo "slow-blow" 1 Amp (uno è di riserva). La sostituzione del fusibile si effettuata come le seguito:

1.   Staccare il collegamento con l'alimentazione principale
2.   Utilizzando un cacciavite come leva estrarre il porta fusibile
3.   Togliere il fusibile è sostituirlo con un altro dello stesso tipo (1 Amp (T) "slow-blow", 20mm, IEC127
4.   Rimettere il porta fusibile nella propria sede
5.   Ricollegare l'alimentazione

ATTENZIONE: Assicurarsi che siano utilizzati solo il fusibili come specificato

Questa apparecchiatura deve essere collegata a massa di sicurezza tramite un cavo d'alimentazione del tipo a tre conduttori (multipolare). La presa usata deve disporre di collegamento per la massa. L'utilizzo di una prolunga privo del collegamento di massa è vietato.

ATTENZIONE: Qualsiasi interruzione del collegamento di massa può rendere il controllo pericoloso. Assicurarsi che il collegamento a massa di sicurezza sia conforme alle norme.

Specifiche ambientali operative

Le seguenti specifiche ambientali di lavoro sono conformi, o eccedono, la norma BS EN 61010-1:1993

Uso interno		IP30 (senza protezione contro l'acqua)
Altitudine		Fino a 2000m
Temperatura di lavoro	ACR1	da +10°C a +44°C
	ACC2-2	da 0°C a +50°C
Temperatura di immagazzinamento		da −10°C a +70°C
Umidità relativa	ACR1	Massimo 80% per temperatura fino a +31°C, riduzione lineare al 50% a +50°C
	ACC2-2	Massimo 80% per temperatura fino a +31°C, riduzione lineare al 50% a +40°C
Sovraccarichi di tensione (transienti)		Categoria d'installazione 2
Grado di inquinamento		2

CONTENTS   Page

1.0 INTRODUCTION

The autochange system documentation is covered by two guides:

- a User's Guide (Part No. H-1000-5090) which gives a simple explanation of the equipment, details of alignment procedures and fault-finding information

- this Installation and Programmer's Guide which describes system functions, installation and datuming together with software and programming information

It is intended that the User's Guide is the main reference document for the working CMM installation and that the Installation and Programmer's Guide is the reference document for the CMM manufacturer.

2.0 THE SYSTEM

2.1 General description

Renishaw's autochange equipment is the world's first integrated CMM probe exchange system. Mounted within the CMM's working envelope, the autochange system facilitates fast, automatic probe exchange without the need for re-qualification of the probe assembly.

Fast 'probing to probing' cycles are achieved by the probe head docking one probe and selecting another. The high repeatability of the autojoint removes the need to re-qualify between moves.

The autochange system (shown in Figure 1) consists of an autochange rack (ACR1), an autochange controller (ACC2-2) and an autojoint head, together with a connecting cable and mounting kit.

Figure 1 – A comprehensive system overview with PH10M and PI 7-2/TP7M

Figure 1 – A comprehensive system overview with PH10M and PI 7-2/TP7M
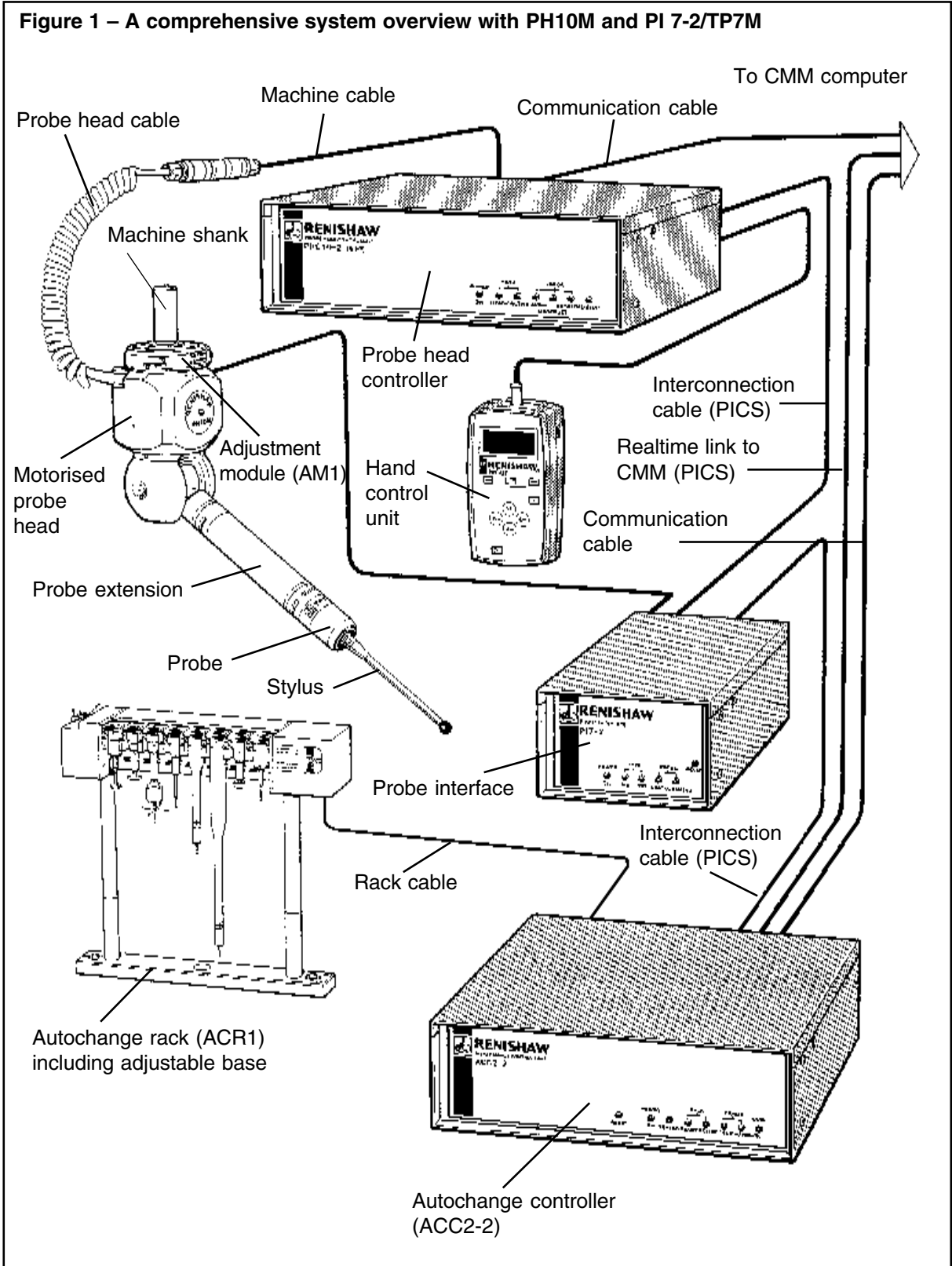
3.0 THE ACC2-2 AUTOCHANGE CONTROLLER

3.1   Description

The ACC2-2 autochange controller is the intelligent part of the system. It handles the communications to and from the CMM controller, controls the ACR1 autochange rack, and multiplexes and interfaces the head and datum probe signals.

The ACC2-2 has been designed for simple installation. It is functionally compatible with any ACC1 or ACC2 installation but incorporates several new features and a new specification.

Control of the autochange system can be carried out in three different ways:

a)   IEEE 488 (parallel) communications from the CMM controller (see Section 3.4).

b)   RS232 (serial) communications from the CMM controller (see Section 3.5).

c)   Stand-alone: no communications are required as the system works on a series of time-outs after detected events (see Section 3.6).

3.2   Front panel

Figure 2 shows the arrangement of the ACC2-2 front panel. Descriptions of the functions of the switch and LEDs follow.

Figure 2 – ACC2-2 front panel
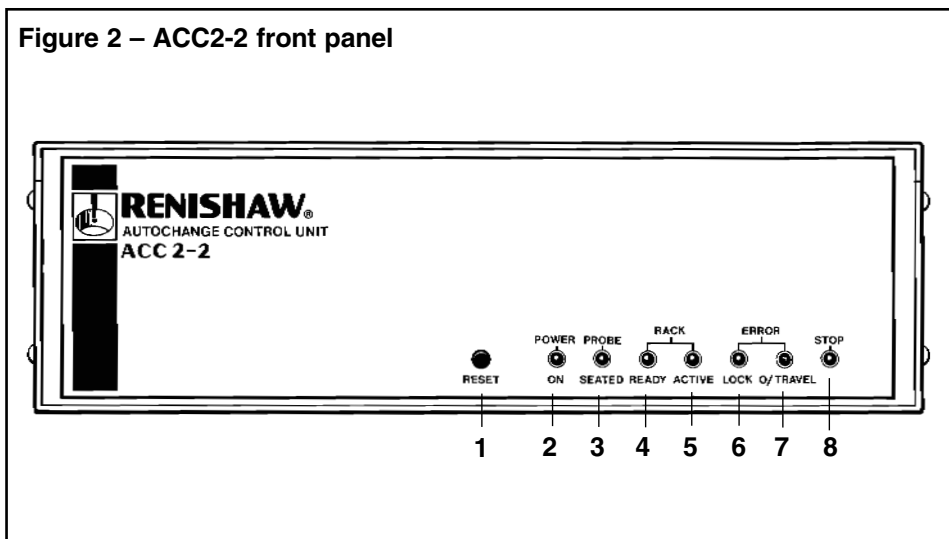
1   RESET

The RESET switch initiates a complete software restart. It is used for resetting the system after a collision, or for putting the system into or out of datum mode 1 (mode 6). To take effect, the button must be pressed for at least 100ms.

2   POWER ON LED (green)

Powered from an internal power rail, this LED indicates that the unit is switched on.

3   PROBE SEATED LED (yellow)

Indicates the status of the selected probe. When the probe interface circuit is active, this LED will be ON. In this condition the LED will be OFF when the stylus is deflected.

NOTE

This LED is only operational when the internal probe interface is selected

---

4   RACK READY LED (yellow)

Indicates the status of the rack. The LED is OFF when the rack is active. A flashing LED indicates that the system is in datum mode 1 (mode 6, see Section 8.6).

5   RACK ACTIVE LED (yellow) *

Indicates that the rack is performing a lock or unlock procedure. A flashing LED indicates that the system is in datum mode 2, see Section 8.6).

6   LOCK ERROR LED (red) *

Indicates that a fault has occurred during a lock or unlock procedure.

7   OVERTRAVEL ERROR LED (red) *

Indicates that the rack has been overtravelled or an excessive entry speed condition has been detected.

8   STOP LED (red)

Indicates that the ACC2-2 has asserted the PICS STOP signal following a critical failure.

*   *Various combinations of these LEDs are used to indicate other fault conditions (see Section 8.4, Table 24).*

3.3   Rear panel

Figure 3 – ACC2-2 rear panel
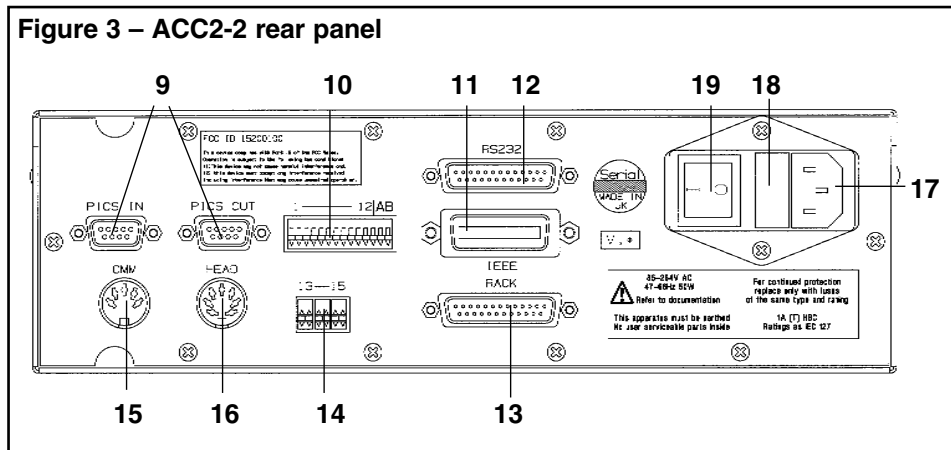
9   PICS input and output connectors

PICS (Renishaw's product interconnection system) is used for real time two-way communication of status and command signals between Renishaw units and the CMM controller.

Input and output of the PICS signals is via 9-way D-type connectors. PICS is sensitive to the order in which Renishaw units are connected (ie input must come from another Renishaw interface, and output must be directly to the CMM controller).

Table 1 describes the pin numbers and signal functions.

TABLE 1 – PICS PIN NOS. AND SIGNAL FUNCTIONS	
Pin No.	**Signal**
1	STOP (in/out)
2	PROBE POWER OFF (PPOF) (in/out)
3	0V
4	Reserved for Renishaw use
5	SYNC output (probe trigger)
6	HALT output
7	PROBE DAMPing (PDAMP) (in)
8	LED OFF (in)
9	-
Body	Screen

For a full description see the Product interconnection system Guide (Renishaw Part No. H-1000-5000).

10   Configuration switches (1 to 12)

These are used to set the communication parameters and are described in Sections 3.4 to 3.6.

11   24-way IEEE488 interface connector

This is the parallel input/output communications link to the CMMcontroller. The pin numbers and signal names are described in Table 2:

TABLE 2 – IEEE PIN NOS AND SIGNAL FUNCTIONS			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	DI 01	13	DI 05
2	DI 02	14	DI 06
3	DI 03	15	DI 07
4	DI 04	16	DI 08
5	EOI (24)	17	REN (24)
6	DAV	18	GND (6)
7	NRFD	19	GND (7)
8	NDAC	20	GND (8)
9	IFC	21	GND (9)
10	SRQ	22	GND (10)
11	ATN	23	GND (11)
12	SHIELD	24	GND LOGIC

GND(n) refers to the signal ground return of the reference contact.

EOI and REN return on contact 24.

For a detailed description of IEEE operation see Section 3.4.

12   RS232 interface connector (25-way D-type plug)

This is the serial input/output communications link to the CMM controller. The pin designations and signal names are given in Table 3.

TABLE 3 - RS232 PIN NOS AND SIGNALS	
Pin No.	**Signal**
1	Screen
2	Transmitted data to Measuring Machine Controller (MMC)
3	Received data from Measuring Machine Controller (MMC)
4	RTS (Request To Send) to MMC
5	CTS (Clear To Send) from MMC, connect pin 4 to pin 5 if CTS is not output from MMC
7	Signal Ground (common)
20	DTR (Data Terminal Ready) to MMC

For a detailed description of RS232 operation see Section 3.5.

13   Rack connector (25-way D-type socket)

This is the only connection between the ACC2-2 and the ACR1, and carries all the necessary power and signal lines. The pin numbers, signal designations and descriptions are given in Table 4.

TABLE 4 – RACK CONNECTOR PIN NOS AND FUNCTIONS		
Pin No.	**Designation**	**Description**
1	RACK MOT	Supply to ACR1 motor
2	RACK MOTRET	0V return for ACR1 motor
3	CABLE SENSE	Rack cable sense return
4	POT F/B	ACR1 'screwdriver' position feedback
5	R.DETECT	ACR1 rear lightbeam signal
6	R.PROBE CONTACT 2	Rack probe contact 2
7	RACK REF	Precision reference voltage for ACR1 position potentiometer
8	IND 4	ACR1 'Lock Error' indicator
9	0V RACK	ACR1 0V
10	IND 0	ACR1 'Change cycle' indicator
11	RESERVED	Future expansion
12	RESERVED	Future expansion
13	-	-
14	RACK MOT	Supply to ACR1 motor
15	RACK MOTRET	0V return for ACR1 motor
16	CABLE SENSE	Rack cable sense output
17	F.DETECT	ACR1 front lightbeam signal
18	R.PROBE CONTACT 1	Rack probe contact 1
19	O/T 1	ACR1 overtravel signal
20	IND 1	ACR1 'Probe Active' indicator
21	IND 3	ACR1 'Cycle Error' indicator
22	+15V	Supply to ACR1 circuits
23	GND SENSE	Ground sense
24	RESERVED	Future expansion
25	RESERVED	Future expansion

14   Output switches

The conventional (non-PICS) probe output can be configured using these three switches.

The available outputs are SSR (Solid State Relay), OCT (Open Collector Transistor) or TTL (Transistor-Transistor Logic) with both true and complement outputs selectable for each output.

Table 5 shows the output options.

TABLE 5 – OUTPUT SWITCHES			
Switch 13	**Switch 14**	**Switch 15**	**Output format and SK3 pins**
Switch position			
X	Down	Down	SSR normally closed on pins 3 and 1
X	Down	Up	SSR normally open on pins 3 and 1
Down	Up	X	OCT normally LO on pin 3
Down	Up	X	OCT normally HI on pin 1
Up	Up	X	TTL normally LO on pin 3
Up	Up	X	TTL normally HI on pin 1

X = Switch may be up or down

The two TTL compatible outputs are generated using current limited (30mA approx.) open collector drives, with 2K7 pull-up resistors to +5V.

The two OCT outputs are generated using current limited open collector drives. The maximum sink current is 30 mA. The maximum collector voltage is +30V (dc or ac).

The specification of the SSR output is as follows :

TABLE 6 – SSR OUTPUT SPECIFICATION		
Contact ratings		±50V max, ±30mA max (ac or dc)
Contact ON resistance		5Ω (maximum)
OFF state leakage current	@ 25V	0.006µA
	@ 50V	60µA
Turn ON time (with VL=20V, RL=1K0)		10µs max
Turn OFF time (with VL=20V, RL=1K0)		15µs max

Both contacts isolated from ACC2-2 0V.

15   CMM output connector (5-pin 180° DIN socket)

This is the conventional (non-PICS) output socket. The pin numbers and associated signals are given in Table 7.

TABLE 7 – CMM OUTPUT PIN NOS.		
Pin No.	**Signal**	**Comment**
1	Probe output* (normally high)	High or open circuit for a seated probe
2	0V (Digital)	This signal is the ground reference for the other signals of this interface. It must not be connected to the cable screen (the cable screen must be connected to the body of the connector).
3	Probe output* (normally low)	Low or short circuit for a seated probe
4	Not used	—
5	External reset	This input signal produces a software restart when asserted for 100ms (or more) during any mode except a lock or unlock routine. When the signal is pulled LOW, restart is requested.
Chassis	Screen	The body of the connector is connected to the ACC2-2 chassis earth. The output cable screens can be connected to this point if required.

*   *TTL and OCT outputs must be taken from pins 1 or 3 with reference to 0V (pin 2).*

SSR output is between pins 1 and 3 and these outputs are isolated from 0V.

16   Head input connector (7-pin DIN socket)

This is the conventional (non-PICS) probe input connector. It may be used to connect the ACC2-2 to the probe head controller (PHC9 or PHC10).

The pin numbers and associated signals are given in Table 8.

TABLE 8 – HEAD INPUT PIN NOS.		
Pin No.	**Signal**	**Comments**
1	LED cathode	This output controls the probe LED. When this output is LO the LED will be ON.
2	Screen	Cable screen: this is the connection between the cable screen and ACC2-2 chassis ground.
3	LED anode	This is the power output to drive the probe LED. This output will supply around 10mA to the probe LED when ON.
4 5	Touch probe return (0V) Touch probe signal (HI)	These are the input signals from the probe contacts. Closed contacts indicate a seated probe – open contacts indicate an unseated probe.
6 7	Inhibit return (0V) Inhibit signal (HI)	Inhibit and return: this input pair controls the inhibition of the probe interface circuit. When INHIBIT (HI) is connected to 0VA (LO) the probe interface circuit is inhibited.
Chassis	—	This is the body of the connector which is connected to the ACC2-2 chassis.

17   Mains power connector

The mains power is supplied on a standard IEC 320 connector. The voltages which can be supplied are as follows :

85 – 264 Volts
47 – 66 Hz
50W

18   Fuse holder

There are two 1 Amp (T) slow-blow 20mm fuses (one is a spare). For information on fuse replacement see the SAFETY Section near the beginning of this document.

19   Mains power ON/OFF switch

I depressed is ON

O depressed is OFF

3.4   IEEE communications

SETTING UP

IEEE communications are selected by setting switch 12 (on the rear panel) to the ON (DOWN) position. The address setting is selected using switches 1 to 5, using binary coding. The switches are UP for significance and switch 1 is the least significant bit. See Table 9 for examples.

The parallel poll bit is set by using switches 6 to 8 with 'binary plus one' coding. Switch 6 is the least significant bit with UP for significance.

Selection of the internal (conventional) interface on PICS operation is performed by switch 9, UP for PICS, DOWN for conventional interface.

Switches A and B are reserved for Renishaw use. To enable normal operation of the ACC2-2, they must both be set in the DOWN position.

Table 9 defines the switch positions for IEEE operation.

TABLE 9 – SWITCHES FOR IEEE OPERATION

DIL switches	1	2	3	4	5	6	7	8	9	10	11	12	A	B
IEEE Up (U) Down (D)	Device address (see below)					Parallel poll (see below)			PICS Conventional			IEEE	Default Position	

1	2	3	4	5	Address	6	7	8	Parallel poll
D	D	D	D	D	0	D	D	D	1
U	D	D	D	D	1	U	D	D	2
D	U	D	U	U	2	D	U	D	3
–	–	–	–	–	–	U	U	D	4
–	–	–	–	–	–	D	D	U	5
D	U	U	U	U	30	U	D	U	6
U	U	U	U	U	31	D	U	U	7
						U	U	U	8

Example:

1	2	3	4	5	6	7	8
U	D	D	U	U	U	D	U

Address   = 1 + 8 + 16 = 25
Parallel Poll = 6

NOTE

These switches are only read on power up or after a software reset.

If any settings are changed, the ACC2-2 must be switched OFF, then ON, or the RESET switch operated to act on these changes.

OPERATION

The autochange IEEE interface responds to the seven IEEE commands listed in Table 10, and is capable of being addressed as a talker or listener but not simultaneously.

TABLE 10 – AUTOCHANGE IEEE COMMAND RESPONSE DEFINITION		
Code	**Meaning**	**Effect on autochange**
DCL	Device clear global	Restart (s/w reset)
SDC	Selected device clear	Restart (s/w reset)
IFC	Interface clear	Reset IEEE interface
UNT	Untalk	Remove talk status
UNL	Unlisten	Remove listen status
SPOLL	Serial poll	Send SPOLL status
PPOLL	Parallel poll	Send PPOLL status

The data output format is seven bit ASCII characters with the eighth bit set to zero. No eighth bit parity checking is performed on the incoming characters.

The software is capable of receiving data terminated with a Carriage Return (CR) or with a CR and a Line Feed (LF). In the latter case the LF is ignored.

All transmissions are terminated with a CR and LF.

The nominal status of the interface is 'unlistened' and 'untalked'. The interface will only enter the 'talk' or 'listen' state when commanded to do so by the CMM controller.

An ACC2-2 request to talk is indicated by asserting an SRQ. The ACC2-2 will continue to operate normally if the CMM controller does not respond to the SRQ immediately.

The SRQ register has the format shown in Table 11.

TABLE 11 – SRQ REGISTER							
BIT	7	6	5	4	3	2	1
	General status	SRQ	Message waiting	Blank			

The General status is reported using bit 7. This bit will be set when the ACC2-2 is unable to receive further commands due to the processing activity of the last command. This bit is set when ACC2-2 receives, and begins to respond to, a command and is cleared when ACC2-2 sets the SRQ to report the completion of that command.

3.5 RS232 communications

SETTING UP

RS232 communications are selected by setting switch 11 ON (DOWN) and switch 12 OFF (UP). These switches are on the rear panel.

The baud rate is controlled by switches 1 to 3 and the range available is given in Table 12.

Selection of the internal (conventional) interface or PICS operation is performed by switch 9, UP for PICS, DOWN for conventional interface.

Switches A and B are reserved for Renishaw use. To enable normal operation of the ACC2-2, they must both be set in the DOWN position.

Table 12 defines the switch positions for RS232 operation.

TABLE 12 – RS232 SWITCHES

DIL SWITCHES	1	2	3	4	5	6	7	8	9	10	11	12	A	B

RS232	Up (U)	Eight BAUD Rate (see below)	PICS	H/S Hardware handshake	RS 232	
	Down (D)		Conventional	DTR HI DTR Signal set HI	COMMS	Default Position

1	2	3	BAUD
U	U	U	57600
D	U	U	19200
U	D	U	9600
D	D	U	4800
U	U	D	2400
D	U	D	1200
U	D	D	600
D	D	D	300

NOTE

These switches are only read on power up or after a software reset.

If any settings are changed, the ACC2-2 must be switched OFF, then ON, or the RESET switch operated to act on these changes.

OPERATION

The format is:

"7 + 1 E"

one start bit
seven data bits
one parity bit
one stop bit for transmitted and received data

No parity checks are performed on receive.

The parity bit is set to Even Parity on transmit.

All communications are full duplex.

The software is capable of receiving data terminated with a Carriage Return (CR) or with a CR and a Line Feed (LF). In the latter case the LF is ignored.

All transmissions are terminated by a CR and LF.

The Request To Send (RTS) active high output is used to indicate that a message is ready for transmission.

RTS will be cleared after the LF of the last message has been transmitted.

The Clear to Send (CTS) active high input is checked before transmitting each byte to ensure that the CMM is ready to receive. If the active signal is not received within 10 seconds of asserting RTS, STOP will be applied. The STOP signal will be released when CTS becomes active.

Communication of data is possible if RTS has been connected to CTS by a user.

If the Hardware Handshake option is selected (Switch 10), Data Terminal Ready (DTR) will be set when the ACC2-2 is ready to receive a command.

Receipt of an X OFF (Control S, 13 Hex) command will halt the transmission of data. Transmission will be resumed upon receipt of an X ON (Control Q, 11 Hex) command. These commands do not affect any process other than transmission of data (eg time-outs are unaffected).

Any commands received before the completion of the previous command will be ignored. This situation will be reported as below:

CNA (Command Not Accepted): Present status 5 (CR) (LF)

eg Y5 - CMM Control Mode, last command ignored

The interface is configured such that the product is a 'Data Terminal Equipment' according to the EIA RS232 definition.

The pin functions of the RS232 Connector are shown in Table 13.

TABLE 13 – RS232 PIN NOS. AND FUNCTIONS

Pin No.	Function
3	Receive (input)
2	Transmit (output)
20	DTR (output)
5	CTS (input)
4	RTS (output)
7	SIGNAL GND
1	PROTECTIVE GND

NOTE

**The cable screen must be connected to pin 1 and the cable shell.
The signal 0V must be connected to pin 7.**

The cable screen must not be connected to pin 7.

3.6   Stand-alone mode

Stand-alone mode is selected by setting switch 11 and switch 12 (on the rear panel) OFF (UP) (see Table 14).

Switches A and B are reserved for Renishaw use. To enable normal operation of the ACC2-2, they must both be set in the DOWN position.

TABLE 14 – STAND-ALONE MODE

DIL SWITCHES	1	2	3	4	5		6	7	8	9	10	11	12	A	B
Up	0.2s	0.4s	0.8s	1.6s	3.2s					PICS		Stand-alone			
STAND-ALONE Down	Stand-alone delay time (eg for a 2.6 second time delay switches 4, 3 and 1 must be UP)									Conventional				Default Position	

In stand-alone mode the system can be used with no intervention or communication from the CMM controller. This can be an advantage when retrofitting an autochange system to an existing CMM or if there are no spare communication ports on the CMM controller.

The system functions by using the ability of the ACR1 to detect whether a pick-up or put-down operation is required, and after a selectable time delay locks or unlocks the autojoint.

The sequence of operations is as follows:

a)   When the lid of the port starts to open, one of two infra-red beams is broken. Which one is broken first depends on whether an empty autojoint, or one loaded with a probe, is entering the port.

Having detected what is entering the port, the ACC2-2 disables the probe interface and ensures that the 'screwdrivers' are set correctly to receive the autojoint.

b)   When the second beam is broken, a time delay is started after which the screwdrivers are driven to their other position. The period of this delay is selectable between 0 and 6.2 seconds by means of DIL switches 1 – 5 (see Table 14).

c)   The ACC2-2 now waits for the autojoint to leave the ACR1 and detects whether it has picked up a probe by the order in which the beams are made. If a probe has been picked up, the interface is enabled by the making of the second beam, but if an empty autojoint is leaving the ACR1 the interface remains disabled.

If any fault or problem occurs during the Change cycle the ACC2-2 will communicate this to the CMM by signalling a probe triggered state and illuminating the appropriate LEDs on the ACC2-2 and ACR1.

Although no communications are necessary for stand-alone operation, the communication interface defaults to 9600 baud RS232 operations. If required for software development or fault finding purposes, system operation can be monitored.

It is also possible to send commands in this state, but note that the G command is not operative.

Selection of the internal (conventional) interface or PICS operation is performed by switch 9 UP for PICS, DOWN for conventional interface (see Table 14).

The system can be reset by either manual operation of the front panel switch or by operation of the external reset line (pull low pin 5 of the CMM output connector).

NOTE

In this mode it is not possible to pick up a probe extension (eg PEM), unless it is already connected to a probe, because the interface cannot be inhibited via the communications link.

3.7   Interfaces

Interfacing the probe signal from the CMM can be implemented in one of two ways:

- by the ACC2-2's internal (conventional) probe interface – see a) below

- by PICS connection to an external interface – see b) below

The internal interface is suitable only for the autochanging of conventional two-wire touch-trigger probes. However, for new designs and more complex probing systems, it is strongly recommended that PICS is used.

An advantage of PICS is that it is a real-time, two-way, standardised communication system.

PICS requires only one output from the CMM controller to control and monitor Renishaw equipment. This is possible because not only does the CMM controller send and receive information from Renishaw equipment, but also the individual controllers communicate with each other (eg the 'Probe Power OFF' (PPOFF) command can be initiated by both a PHC10 or PHC10-2 probe head controller and the ACC2-2 as well as the CMM controller). This considerably simplifies the control software, leaving the CMM controller free to perform other tasks.

a)   Internal interface

This is a conventional touch-trigger probe interface housed inside the ACC2-2. The signal from the probe is connected to the ACC2-2 via the 7-pin DIN 'HEAD' connector on the rear panel (see Section 3.3 paragraph 16) and the interfaced signal is connected to the CMM controller via the 5-pin DIN 'CMM' connector (see Section 3.3 paragraph 15).

The interface is inside the ACC2-2, because the probe signal must be switched with the datum probe signal when the system is in datum mode 2 (mode 6).

The various output formats are defined in Section 3.3, Table 5.

```
┌─────────────────────────────────────────────────────────────┐
│                            NOTE                              │
│                                                              │
│   It is possible to use the ACC2-2 just as a two-wire probe  │
│        interface, with no ACR1 connected, by linking         │
│              pins 9 to 23 on the                             │
│              25-way D-type rack connector.                   │
└─────────────────────────────────────────────────────────────┘
```

b) **PICS**

Using this method the CMM probe signal is connected to an external PICS-compatible interface (eg PI 7-2 or PI 200) and the output is connected to the ACC2-2 via the ACC2-2 PICS input connector (see Section 3.3 paragraph 9). The CMM probe signal passes straight through to the CMM controller unless the ACC2-2 is in datum mode 2 (mode 6, see Section 8.6).

In datum mode 2 the ACC2-2 applies PPOFF (Probe Power OFF) to inhibit the external interface, connects the datum probe output to the SYNC line and directly controls the head LED during a Change cycle.

During a Change cycle any externally applied damping (PDAMP) signal, is overridden by the ACC2-2, to prevent the interface probe selection from being inhibited.

The ACC2-2 passes on all necessary received PICS signals to the other products in the system.

The only PICS signals asserted by the ACC2-2 are SYNC, Probe Power OFF (PPOFF), LED OFF and STOP. The use of these signals is limited to those operations defined in this document.

If STOP is asserted by another Renishaw product or the CMM, any motion of the screwdriver blades will be inhibited (except for lock and unlock routines whilst in error mode – mode 4). If the STOP signal is applied during a blade move, the blades will be commanded to the unlock position. If STOP is subsequently released the ACC2-2 will continue to function normally.

Any other process is not affected by the assertion of an externally generated STOP signal.

The information given in this section is specific to ACC2-2. A more general definition of PICS, its connectors and signals is given in the PICS Installation Guide (Renishaw Part No. H-1000-5000).

4.0 THE ACR1 AUTOCHANGE RACK

4.1 Description

The autochange rack or ACR1 (see Figure 4) is the part of the system which is located within the CMM working volume. It is powered and controlled by the ACC2-2 via a rack cable which can be up to 30 metres (98ft) long.

The ACR1 can store up to eight probe and extension bar combinations which can be exchanged automatically by the CMM.

Figure 4 – ACR1 autochange rack


Figure 4 – ACR1 autochange rack
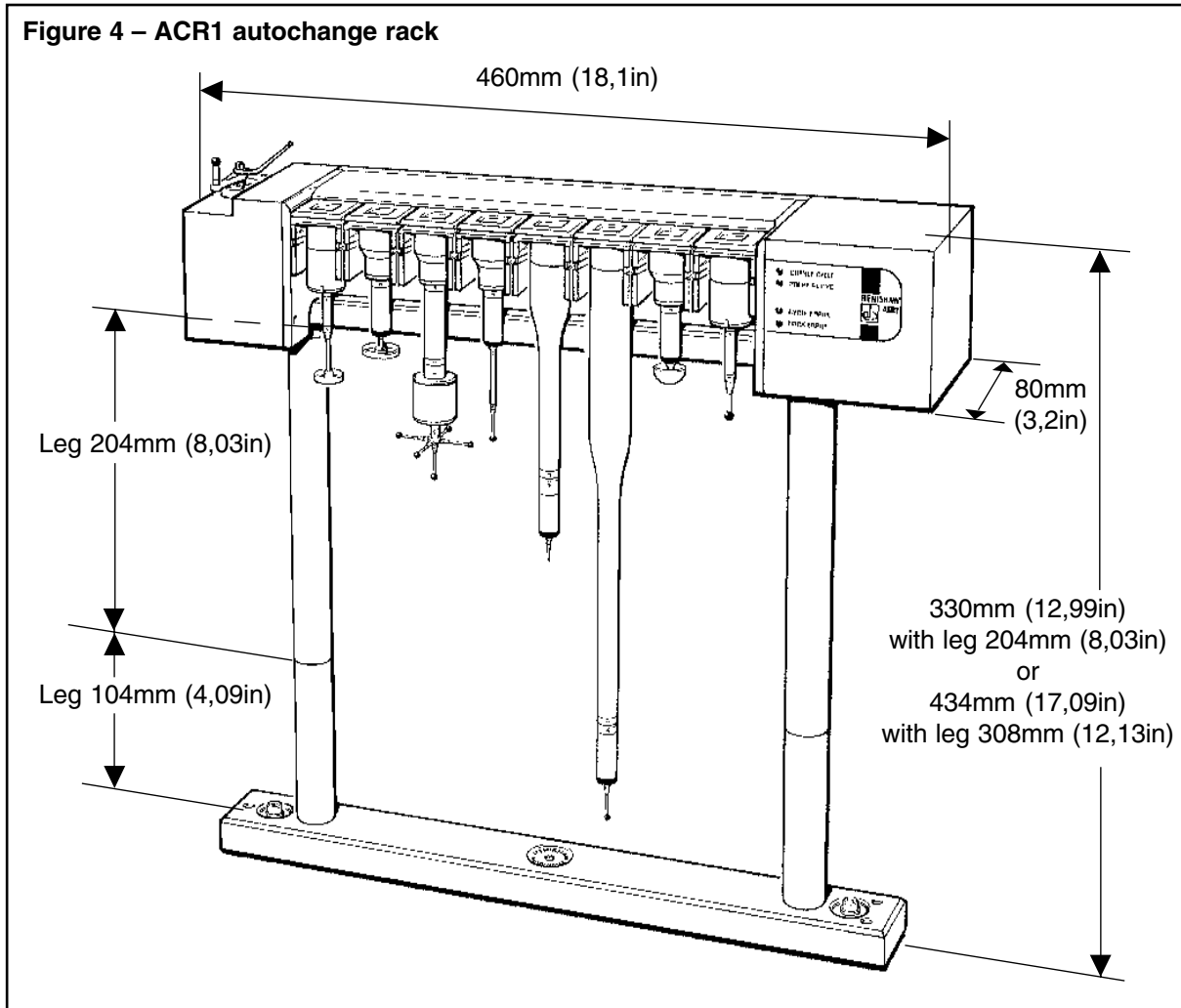
4.2 ACR1 assembly

The ACR1 (Figure 5) is fixed to the CMM using a mounting kit. This consists of an adjustable rack base and supporting legs for horizontal mounting (see Section 4.3) with a support plate and pins for vertical mounting (see Section 4.4).
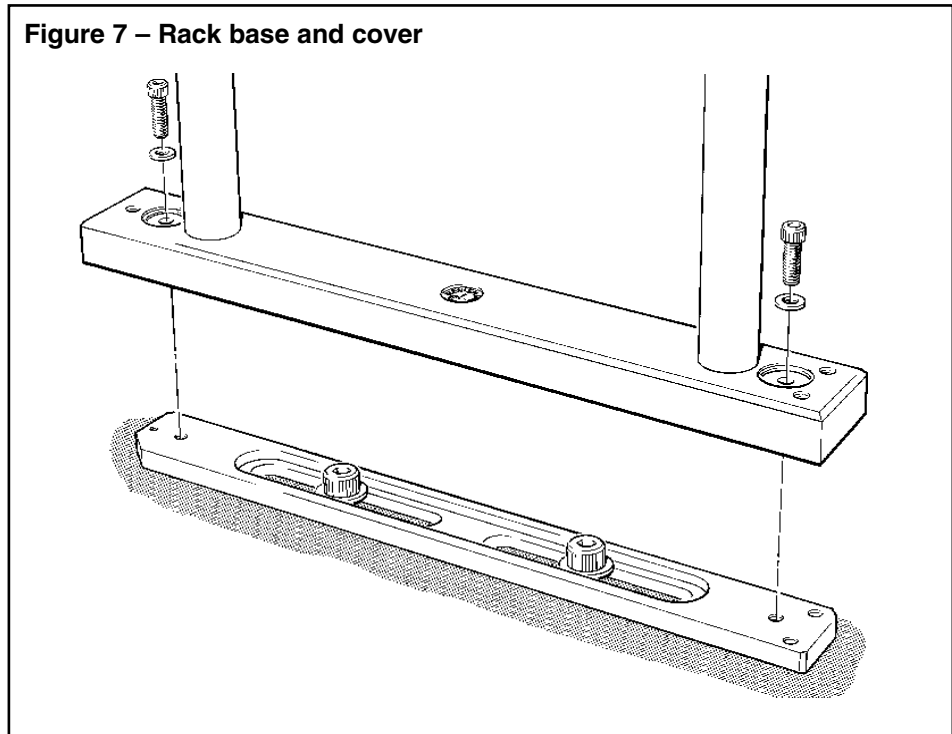
Figure 5 – ACR1 assembly
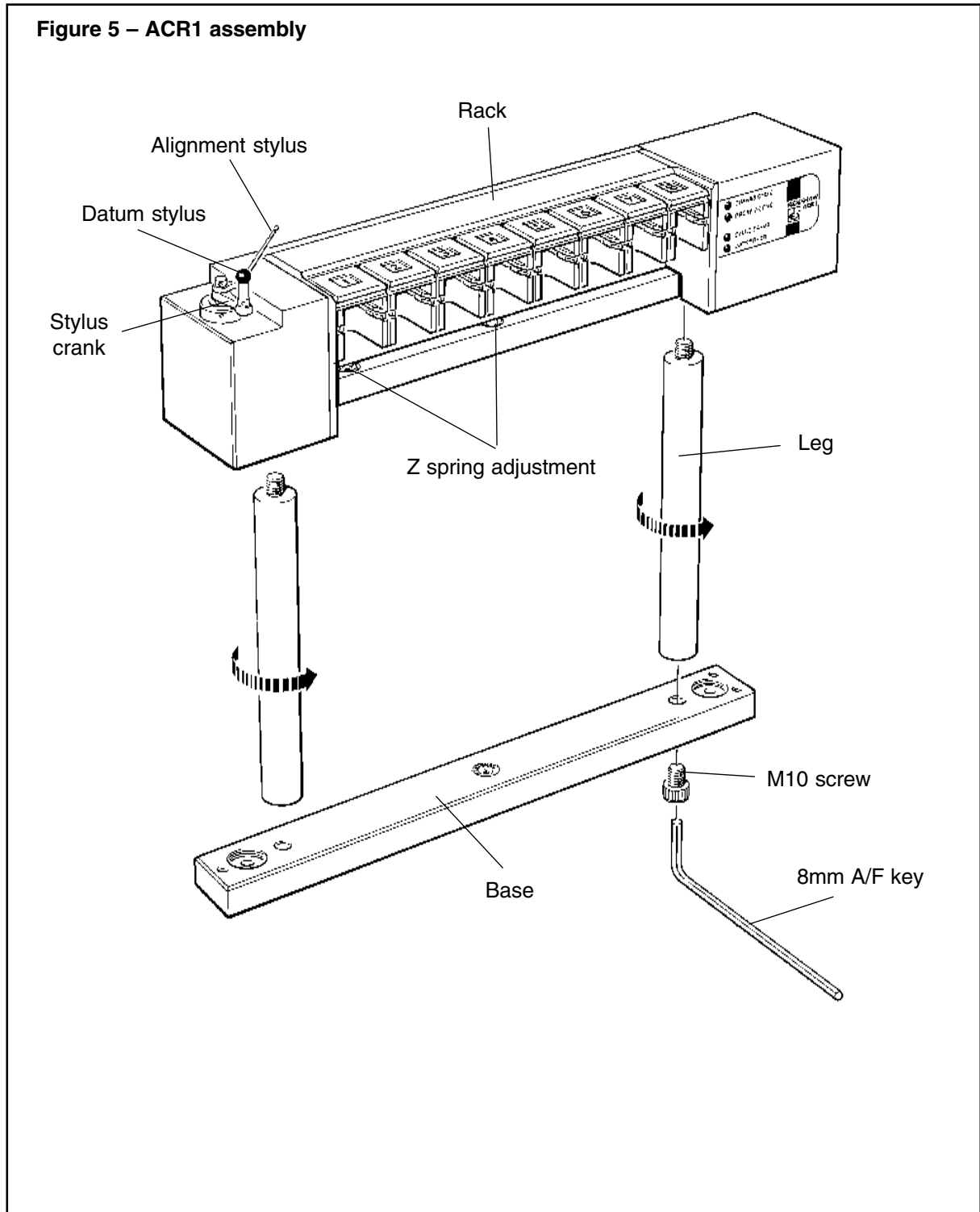
4.3 Rack assembly – horizontal mounting

1   Fit the datum stylus on to the stylus crank.

2   Secure the stylus crank and alignment stylus to the datum probe using the screw provided, and align the assembly as shown in Figure 5.

3   Two Z spring adjusters are provided. When mounting the rack horizontally, ensure that the centre adjuster is in the upper position and that the left hand adjuster is in the lower position (see Figure 6).
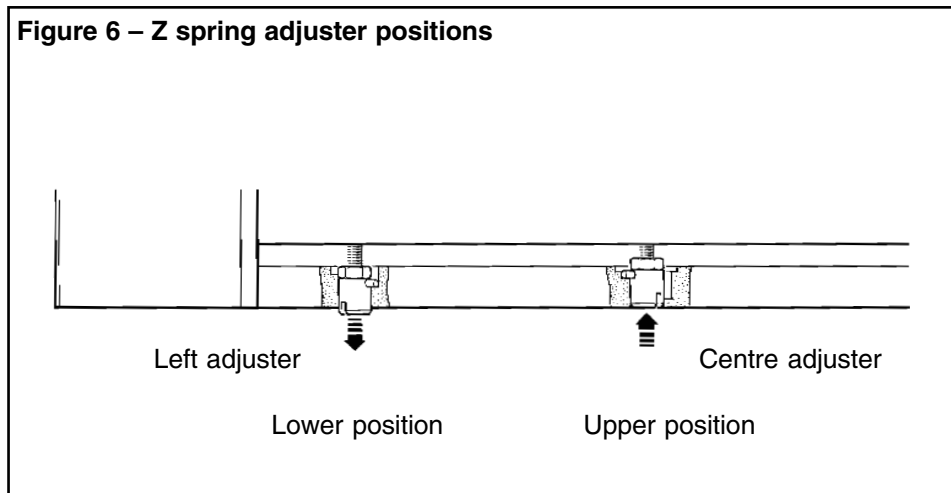
Figure 6 – Z spring adjuster positions

Left adjuster   Centre adjuster

Lower position   Upper position

To move the adjuster from the upper to lower position or from the lower to upper position:

a)   Insert the joint key into the required adjuster at the bottom of the rack subframe

b)   Push the key towards the rack

c)   Turn the key anti-clockwise through 90° and release

4   Screw the selected legs (104mm [4.09in] or 204mm [8.03in]) into the stubs on the underside of the rack. Additional legs can be screwed together to increase the height of the rack if necessary.

5   Tighten the legs by hand.

6   Separate the rack base into cover and base by removing the two screws shown (Figure 7).

Figure 7 – Rack base and cover

7   Attach the rack base cover to legs using the 10mm screws and 8mm Allen key provided (Figure 5).

8   Fit the completed assembly to the CMM table (see Section 4.6).

4.4   Rack assembly – vertical mounting

1   Fit the datum stylus on to the crank.

2   Secure the crank and alignment stylus to the datum probe using the screw provided, and align the assembly as shown (Figure 8).

Figure 8 – Rack assembly – vertical mounting
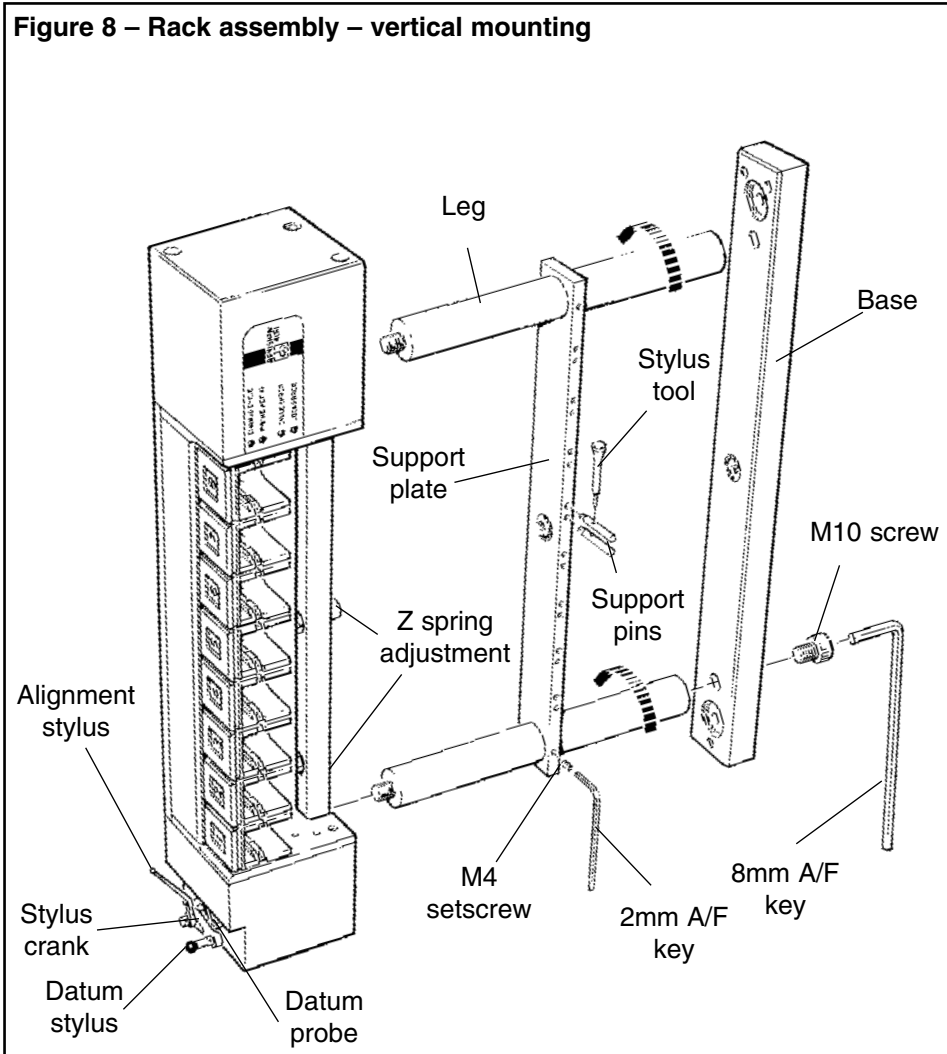
3   Two Z spring adjusters are provided. When mounting the ACR1 vertically, ensure that the centre adjuster is in the lower position and the left hand adjuster is in the upper position (see Figure 9).
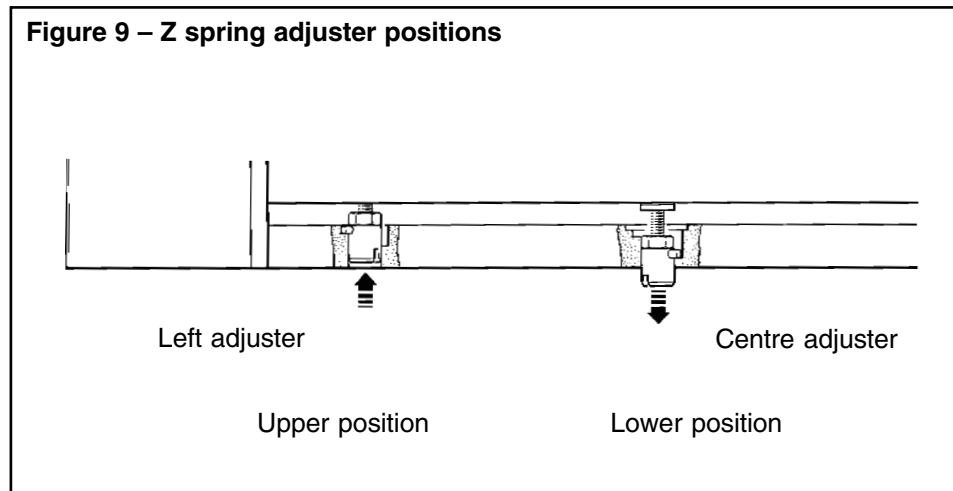
Figure 9 – Z spring adjuster positions

    Left adjuster   Centre adjuster

        Upper position   Lower position

To move the adjuster from the upper to lower position or from the lower to upper position:

a)   Insert the joint key into the required adjuster at the bottom of the rack subframe

b)   Push the key towards the rack

c)   Turn the key anti-clockwise through 90° and release

4   Screw the selected legs into the stubs on the underside of the rack. Additional legs can be screwed together to increase the height of the rack if necessary.

5   Tighten the legs by hand.

6   Slide the support plate over the legs, ensuring that the label is aligned as shown in Figure 8. When the support plate is in a suitable position, tighten the two M4 set screws using a 2mm A/F hexagonal key.

7   Fit the support pins using the stylus tool. When the rack is used in the vertical position, support for long extensions is recommended. Fit a support pin to the top or bottom support pin hole depending on the diameter of the extension to be used and its port location. Fit to the top support pin hole for extensions with a 13mm diameter (PAA2, PAA3). Fit to the bottom support pin hole for extensions with a diameter of 25mm (PEM3, PEM3/S).

8   Separate the rack base into cover and base removing the two screws shown (Figure 10).

9   Attach the rack base cover to the legs using the 10mm screws and 8mm Allen key provided (Figure 10).

10.   Fit the completed assembly.

Figure 10 – Rack base and cover
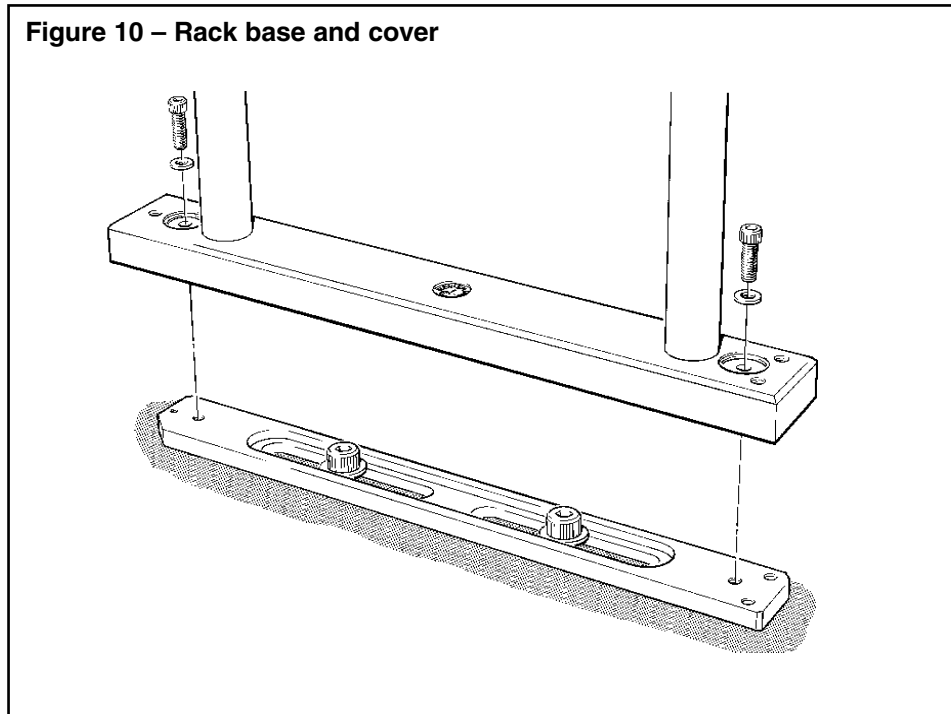
4.5 Rack mounting kit

The rack mounting kits contain the necessary components to mount the ACR1 on to a CMM:

1   The basic kit contains the parts necessary for horizontal mounting. The components are as follows:

Adjustable rack base	x 1
204mm (8.03in) legs	x 2
M10 x 16mm socket head screws	x 2
Hexagonal keys	

2   The vertical kit contains the parts necessary for vertical mounting. The components are as follows:

Support plate	x 1
Support pins	x 8
Hexagonal keys	

Also available separately are additional 100mm and 200mm legs.

4.6   Adjustable base

For smooth wear-free running of the system, correct alignment of the ACR1 to the CMM axes is essential.

The rack base enables the ACR1 to be aligned quickly and precisely with the axes of the CMM (Figure 11).

Three independent adjusters are used to align the rack in roll, pitch and yaw.

It is designed to cause no damage to the CMM table.

4.7   Adjustable base – mounting and adjustment

Figure 11 – Rack base assembly
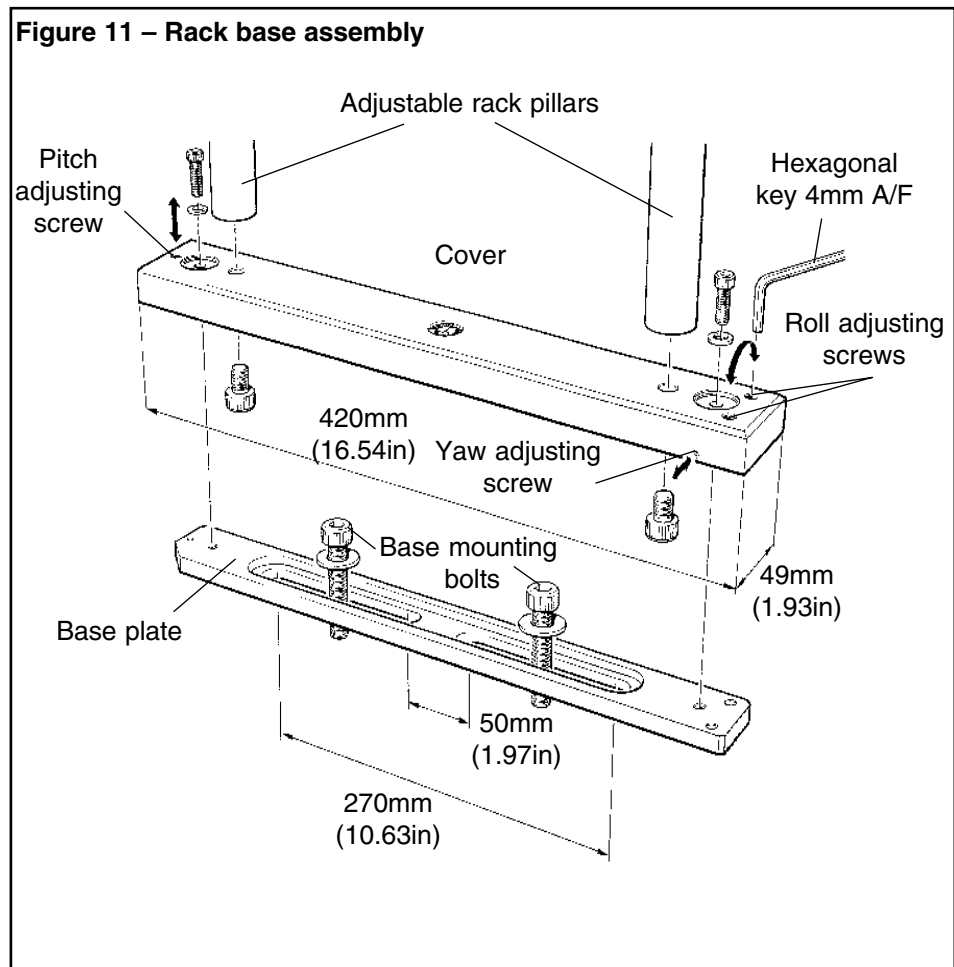
1   Unscrew the roll, pitch and yaw adjusting screws so that they are near the end of their travel.

2   Mount the cover onto the base plate. **It is recommended that the ACR1 is supported before screws A and B are fitted.**

3   Hand tighten screws A and B until resistance is felt.

4   Use the hexagonal key to tighten down the roll and pitch adjusting screws until resistance is felt. Tighten them down another 3/4 of a turn. The base is now set at the mid position of the adjusting range. Fine adjustment can now be carried out as required.

5   When adjustment is complete, tighten down screws A and B firmly. Maximum torque is 8N/m (5.9lbf/ft).

For full adjustment and fitting instructions, please refer to the Autochange system User's Guide (Part No. H-1000-5090).

4.8   Adjustable base – specification

TABLE 15 – ADJUSTABLE BASE SPECIFICATION	
Yaw adjustment range about the nominal centre position	±1mm (0.039in)
Pitch adjustment range nominal limit	±1mm (0.039in)
Roll adjustment range nominal limit	±1mm (0.039in)
Overall base height when assembled	26mm (1.02in)

Mounting bolts up to 10mm (0.39in) diameter can be used.

4.9   Cable fitting

To fit a cable to the ACR1, you need to carry out the following procedure:

1   Remove the two M3 x 6mm securing screws as shown in Figure 12 and remove the cable fixing bracket from the ACR1.

Figure 12 – Cable fitment

Round cable **Flat cable**
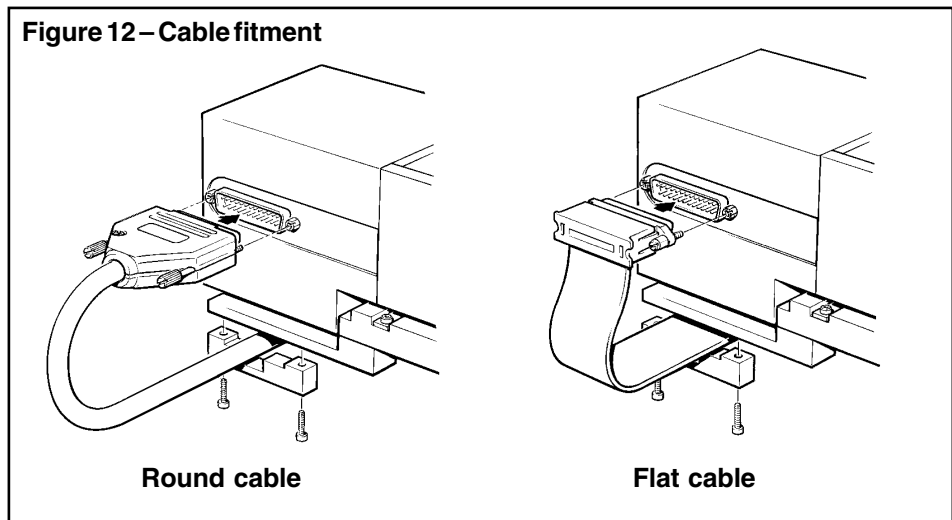
2   Locate the cable into the position where the cable fixing bracket was fitted to the ACR1.

3   Place the cable fixing bracket over the cable into its correct mounting position on the ACR1, ensuring the cable is not pinched.

4   Replace the two M3 x 6mm securing screws into the ACR1.

NOTE

Two different types of cable have been used to connect the ACC2 or ACC2-2 to the ACR1. These cables differ in construction: one is a flat cable, one is a round cable. If it is necessary to replace a flat cable with a round cable, you will probably require a new cable fixing bracket. This is available from your local Renishaw office.

4.10   AM1 adjustment module

The AM1 adjustment module (Figure 13) is designed to provide quick and accurate angular alignment of either the PH9, PH9A or the PH10M motorised probe heads with the axes of the CMM and/or the ACR1.

In addition, the quick release mechanism allows the probe head to be removed for storage and replaced without further alignment.

Inbuilt overtravel protection decreases the risk of probe head damage.

Figure 13 – AM1 adjustment module

4.11   AM1 specification
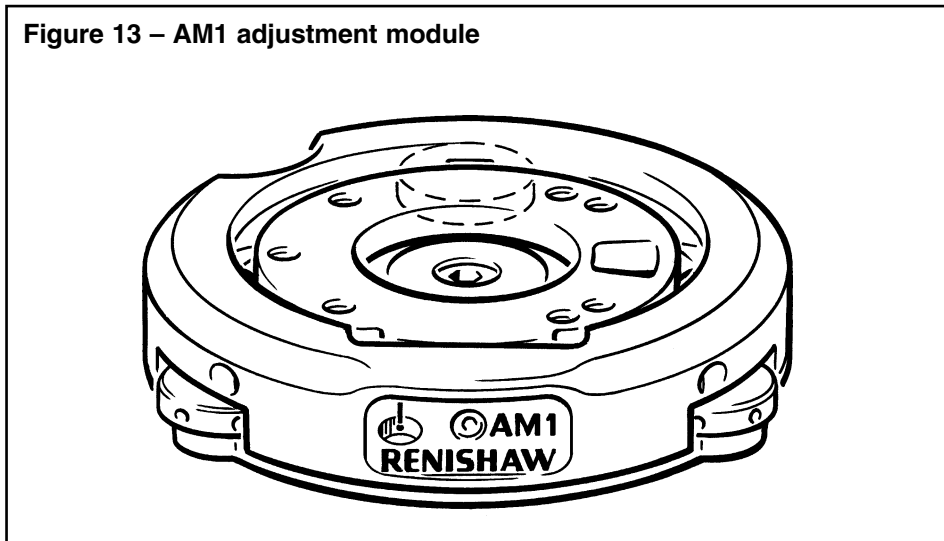
TABLE 16 – AM1 SPECIFICATION	
Size	60mm x 15.5mm (nominal)
Adjustment	±2° in pitch and roll (recommended) * ±4.5° in yaw
Overtravel	±3.5° in pitch and roll
Mounting	The AM1 mounts to the quill of the CMM via the shank or can be fitted direct to the user's mounting

*   Up to 5.5° adjustment is possible in pitch and roll but at the expense of overtravel

The AM1 is compatible with the MIH, PH6M and most motorised probe heads (ie PH9, PH9A and PH10M).

4.12 AM1 installation

The AM1 installation procedure is as follows (see Figure 14):

Figure 14 – AM1 installation
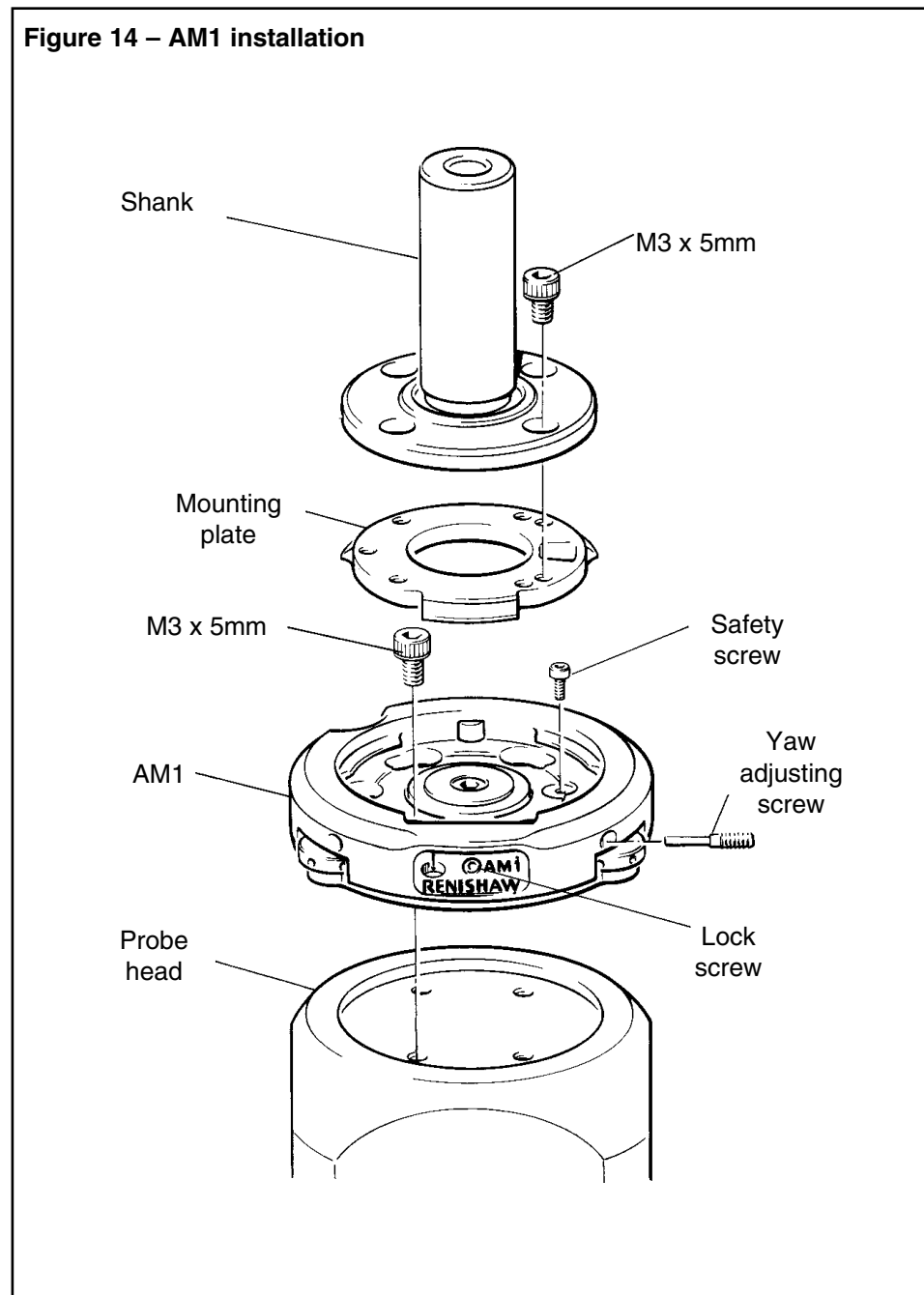
1   Remove the safety screw. Release the lock screw on the front of the AM1. Unscrew fully ONE yaw adjusting screw. Rotate the mounting plate through 60° and remove.

2   Locate the AM1 body to the probe head and secure with M3 x 5mm screws. Use four screws for PH9 and PH9A and three screws for PH10M and MIH (see Figure 15).

Figure 15 – AM1 mounting

PH9/PH9A
(4 mounting screws)

PH10M
(3 mounting screws)
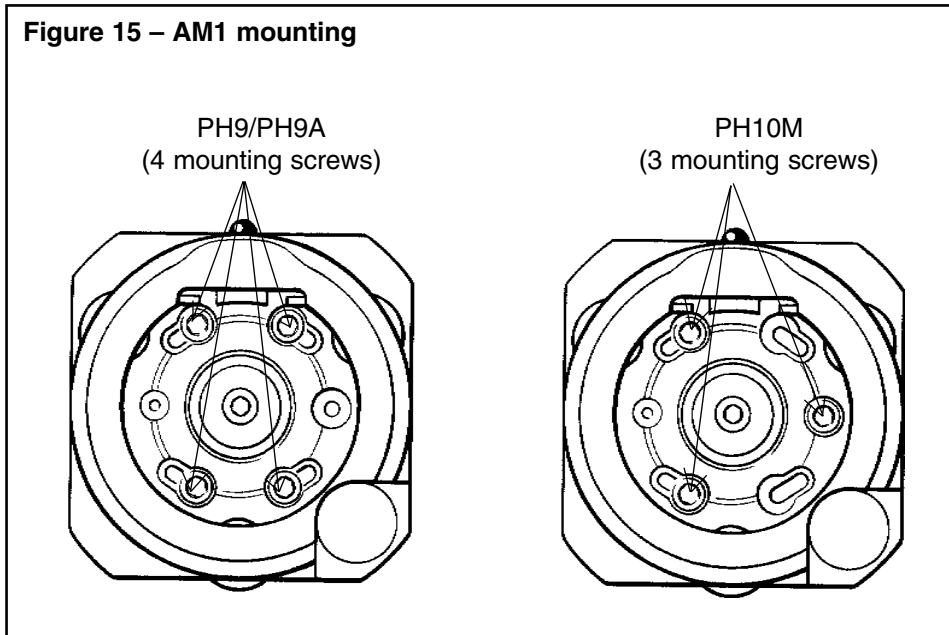
3   Refit the mounting plate to the AM1 and locate by rotating through 60°.

NOTE

**If the shank/mounting plate assembly is to be permanently attached to the head, the retaining screw must be replaced *before* assembling the shank to the plate.
If quick release is required, the retaining screw
should not be fitted.**

Screw the yaw adjusting screw against the lug.

4   Secure the shank to the mounting plate with the three or four M3 x 5mm screws provided.

CAUTION

Using longer screws will cause damage to the motorised head

4.13   AM2 adjustment module

The AM2 adjustment module (Figure 16) is designed to provide quick and accurate angular alignment of the PH10MQ or PH10MQH motorised probe heads with the axes of the CMM and/or the ACR1.

Figure 16 – AM2 fitted to a PH10MQ motorised probe head

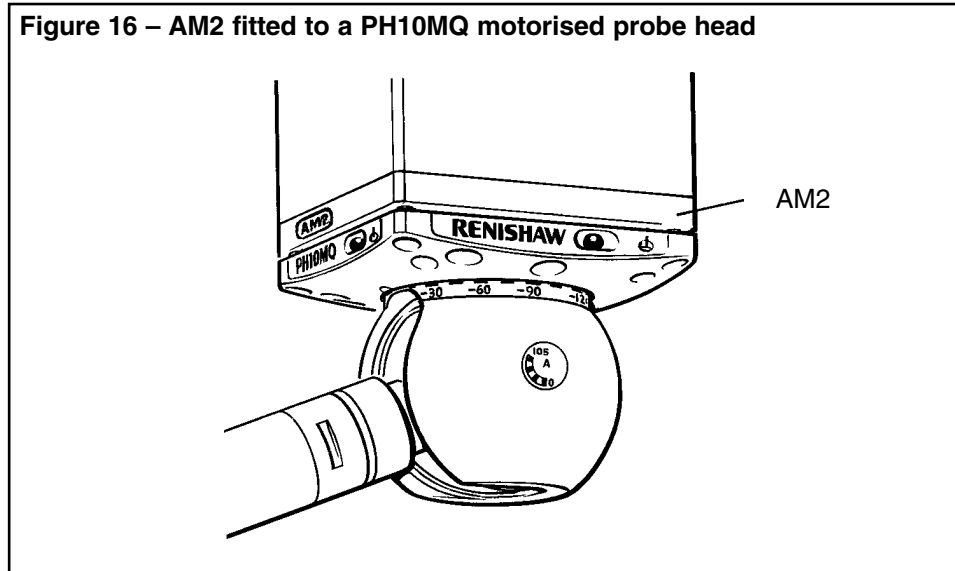The AM2 consists of an adjuster plate, which is attached to the quill of the CMM, and a set of adjusters fitted to the flange of the head. The head is fixed to the adjuster plate by a pair of captive screws.

The AM2 provides a highly repeatable mounting, allowing a head to be removed without the need for further adjustment. Because all adjustable parts remain with the head on removal, more than one head can be set up for use on the same machine, the time taken to exchange heads being minimal.

NOTE

The AM2 does not provide overtravel protection.

4.14   AM2 installation

The AM2 is supplied already assembled to the head. Installation requires a 2.5mm hexagon key and four M3 x 5mm cap screws to attach the adjuster plate to the quill of the CMM (see Figure 16).

1   Unscrew the two securing screws to release the adjuster plate from the head. Attach the plate to the CMM quill using four cap screws, ensuring correct orientation. Tighten screws.

2   Offer the head up to quill and plug in the head and multi-wire cables as appropriate. While ensuring that the balls of the AM2 adjusters engage the seatings in the plate, tighten the securing screws.

NOTE

**The springs under the heads of the screws allow a
controlled load to be applied.**

5.0 INSTALLING THE SYSTEM

5.1 Electrical requirements

See the Safety section near the front of this document.

5.2 The ACC2-2 controller

It is recommended that the ACC2-2 is mounted to give a clear view of the front panel LEDs, and to give easy access to the RESET button.

Ensure that the cooling fan grilles on the rear panel are not obstructed.

The ACC2-2 controller can be used in a 19-inch rack system or as a stand-alone unit.

5.2.1 Stand-alone

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

5.2.2 Mounting alone in a 19-inch rack

Figure 17 shows the ACC2-2 ready for mounting to a 19-inch rack.

Figure 17 – 19-inch rack mounting
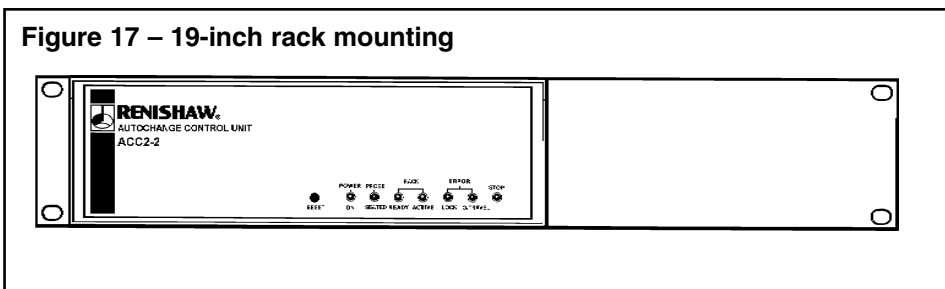
Remove the blanking plugs from the side panels of the unit, and fit the blanking panel (2) and rack mount bracket (1) using the screws supplied as shown in Figure 18.

Figure 18 – Blanking panel and rack mount bracket
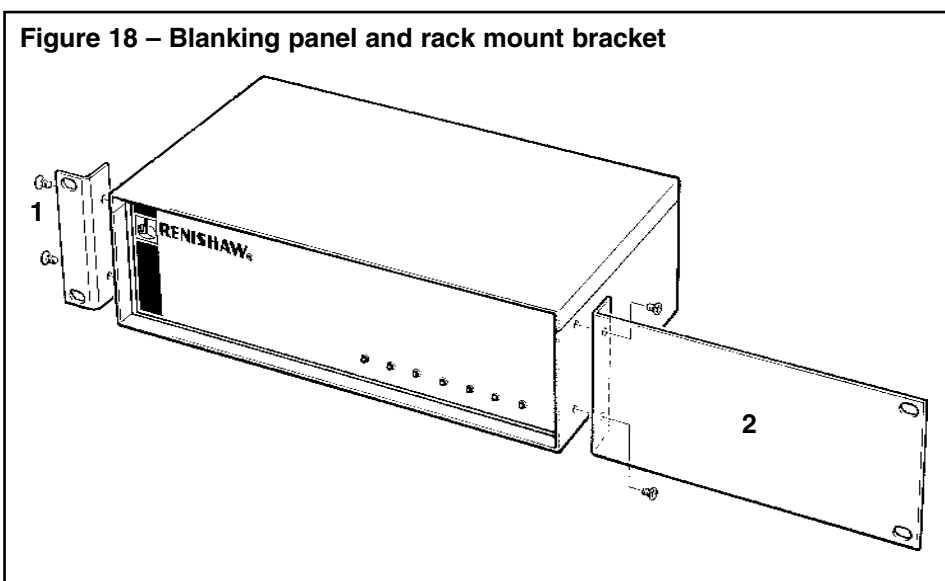
The rack mount bracket kit is Part No. A-1018-0124. The blanking panel kit is Part No. A-1018-0123.

5.2.3 Mounting next to an interface (PI 200, PI4-2 etc)

Figure 19 shows the ACC2-2 with a PI 200 ready for mounting to a 19-inch rack.

Figure 19 – ACC2-2 with probe interface
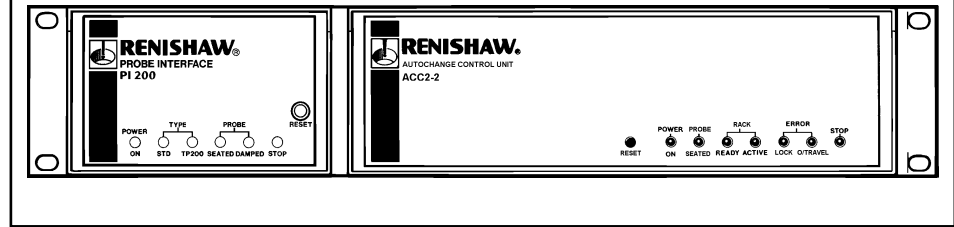
Remove the blanking plugs from the side panels of the units. Fit a rack mounting bracket (1) and an enclosure link bracket using the screws provided as shown in Figure 20.

Figure 20 – Mounting brackets
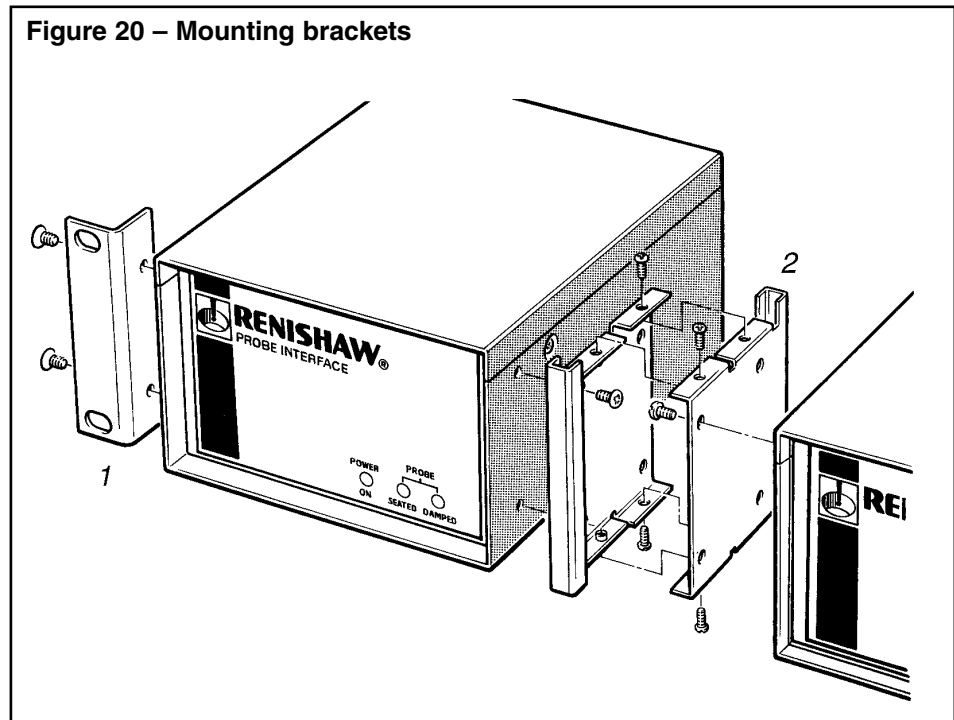
The enclosure link brackets must be fitted in the orientation shown. Fit the brackets to the units before fitting the brackets together. Using the screws provided, fit together the controller and interface. The completed assembly is ready for fitting to the rack.

5.3 System interconnection diagrams

Figures 21 to 23 show how the main components of a Renishaw autochange system should be connected.

Figure 21   ACC2-2 with PH10M and TP2

Figure 22   ACC2-2 with PH10M and TP2 or TP200

Figure 23   ACC2-2 with PH10M and TP7M or OTP6M

Figure 21 – ACC2-2 with PH10M and TP2

PLM6, 7, 8, 9

Communication connection to CMM controller.

PHC10-2

PL7

HCU1

Communication connection to CMM controller.

ACC2-2

PL19, 20, 21, 40

PL5, 6, 12, 13

SSR output to CMM controller

ACR1
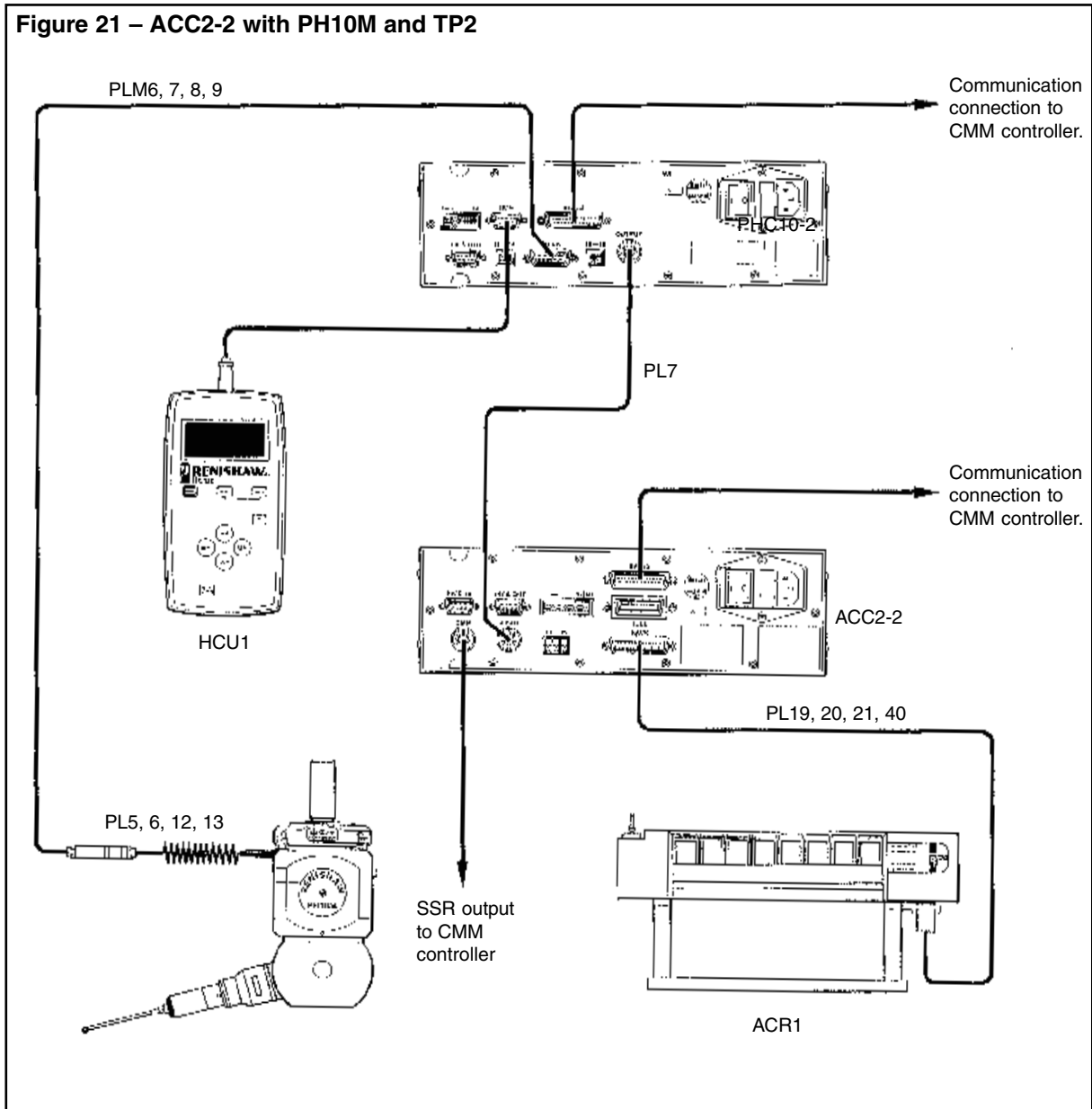
5.3.1   Switch settings for this arrangement

Switch settings used with this arrangement are detailed in Table 17. Switches that are not specified are configured by the CMM machine supplier.

TABLE 17 – SWITCH SETTINGS FOR ACC2-2 WITH PH10M AND TP2 ARRANGEMENT		
	SSR configuration	
	Up	**Down**
PHC10-2	–	15, 16, 17, 18
ACC2-2	9	–

Figure 22 – ACC2-2 with PH10M and TP2 or TP200
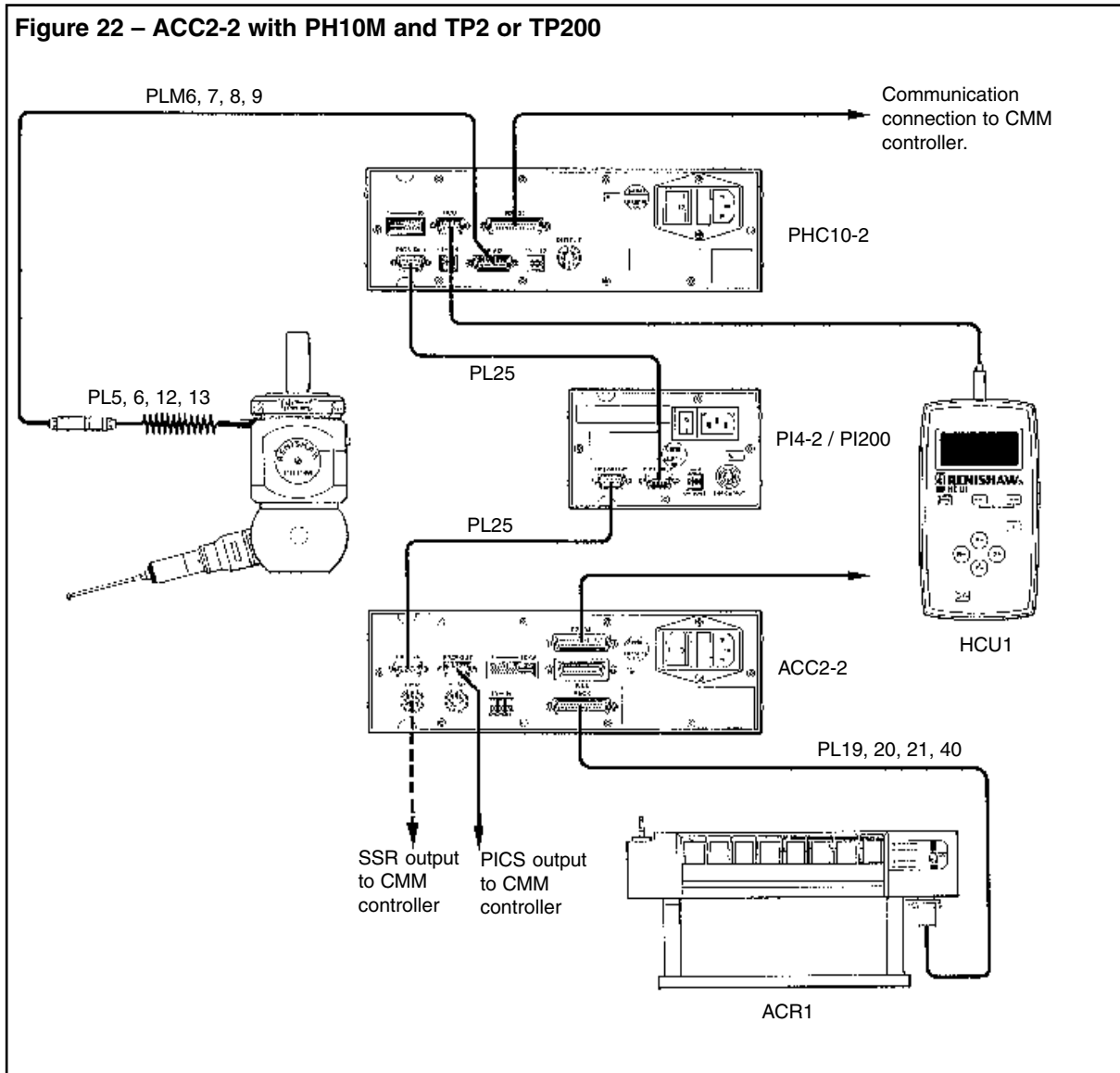
5.3.2   Switch settings for this arrangement

Switch settings used with this arrangement are detailed in Table 18. Switches that are not specified are configured by the CMM machine supplier.

TABLE 18 – SWITCH SETTINGS FOR ACC2-2 WITH PH10M AND TP2 OR TP200 ARRANGEMENT				
	PICS configuration		**SSR configuration**	
	Up	**Down**	**Up**	**Down**
PHC10-2	11, 15, 16, 17, 18	–	11, 15, 16, 17, 18	–
ACC2-2	9	–	–	9
PI200 (V9+)	–	–	–	–
PI4-2	–	–	–	–

Figure 23 – ACC2-2 with PH10M and TP7M or OTP6M
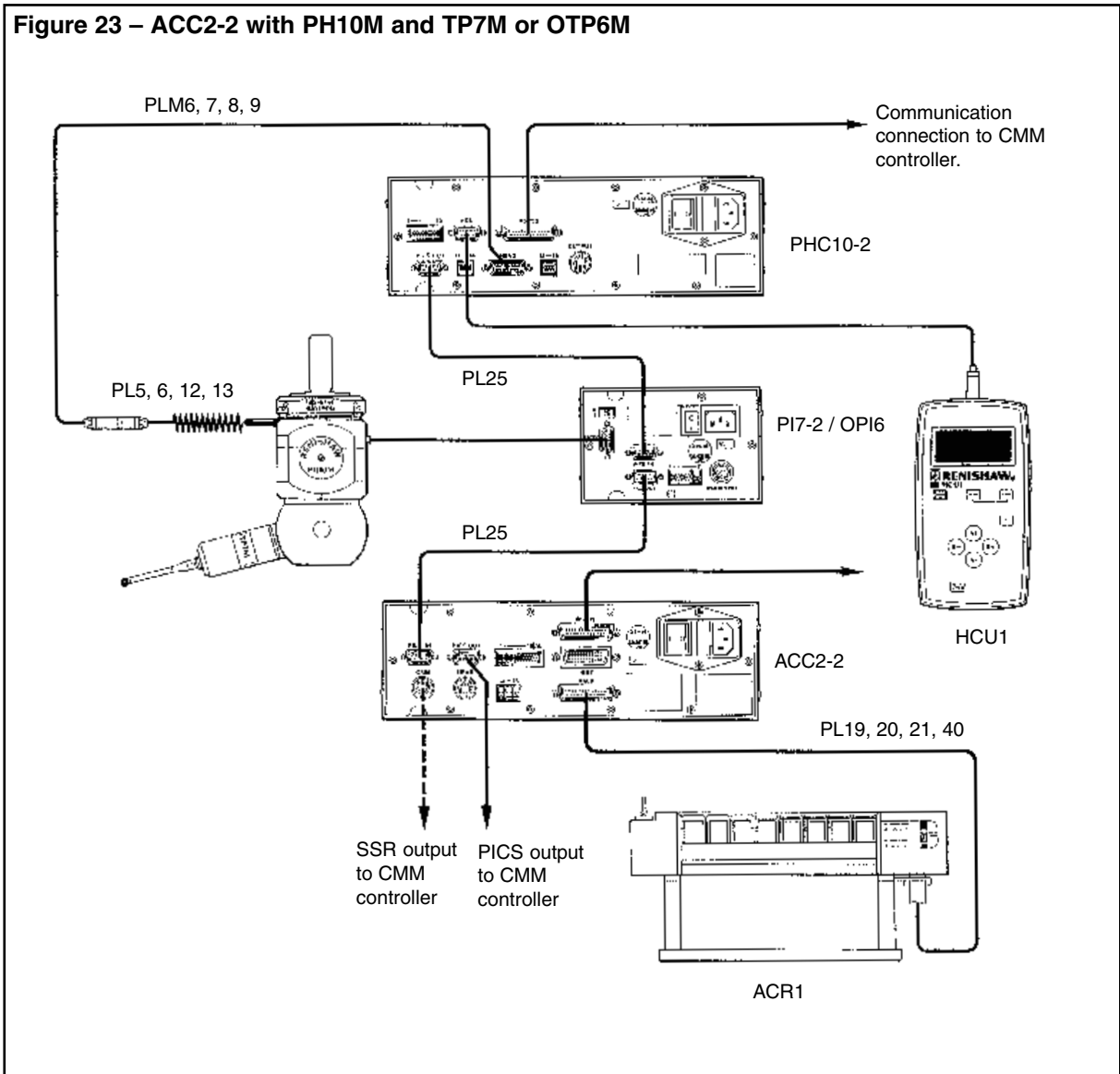
5.3.3 Switch settings for this arrangement

Switch settings used with this arrangement are detailed in Table 19. Switches that are not specified are configured by the CMM machine supplier.

	PICS configuration		SSR configuration	
TABLE 19 – SWITCH SETTINGS FOR ACC2-2 WITH PH10M AND TP7M OR OTP6M ARRANGEMENT				
	Up	**Down**	**Up**	**Down**
PHC10-2	11, 15, 16, 17, 18	–	11, 15, 16, 17, 18	–
ACC2-2	9	–	–	9
PI7-2	3	–	3	–
OPI6	–	–	–	–

6.0 DATUMING THE RACK

NOTE

**The ACR1 must be mechanically aligned prior to datuming the rack.
Please refer to the Autochange System User's Guide
(Part No. H-1000-5090) for details.**

6.1 Suggested datuming method

This is a suggested datuming method for the ACR1. You may find more suitable
techniques depending upon your CMM and software.

To datum the rack you must take three sets of measurements:

- Set the rack datum probe as the origin

- Determine the port centrelines and heights

- Determine the probe head centreline and base height

The methods for these three procedures are given below.

Set the rack datum probe as the origin

1   Fit a 2mm diameter stylus (minimum length 20mm) to a touch-trigger probe.
     If the probe has an M8 thread, screw the probe into an autojoint adaptor
     (PAA) and tighten.

2   Lock the autojoint on to the probe head using the joint key.

3   Gauge the 8mm datum stylus in four positions to define its centre point (see
     Figure 24).

Figure 24 – Datuming the rack
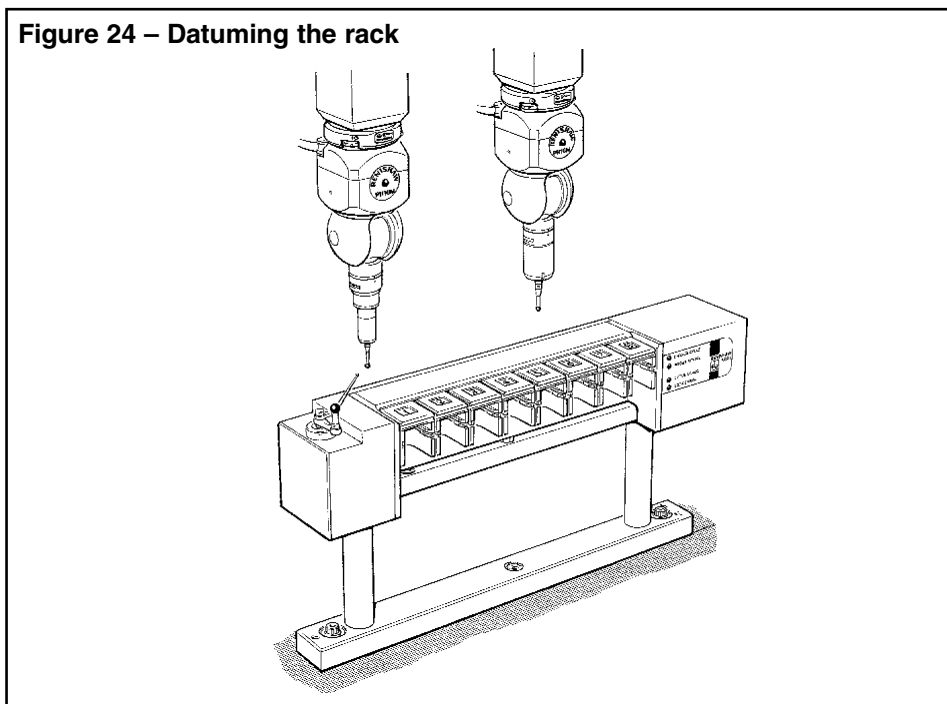
4   Assign this centre point as the origin for all further measurements.

Determine port centrelines and heights

1   Ensure that all the ports are empty.

2   Insert the four lid clips at the joints of ports 1 and 2, 3 and 4, 5 and 6, and 7 and 8 (Figure 25).

Figure 25 – Lid clips
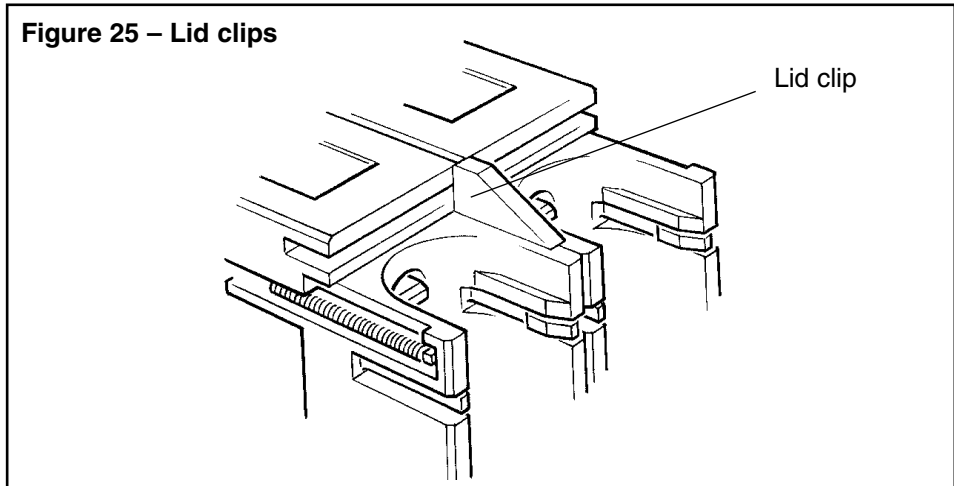
3   Select datum mode (mode 6, see Section 8.6).

4   Find the port centre by gauging points A, B and C on a semi-circular portion of port 1 (Figure 26).

Figure 26 – Finding the port centre

1mm (0.39in) below the top of the docking station, to clear screwdriver hole

2mm (0.078in) approximately

2mm (0.078in) approximately
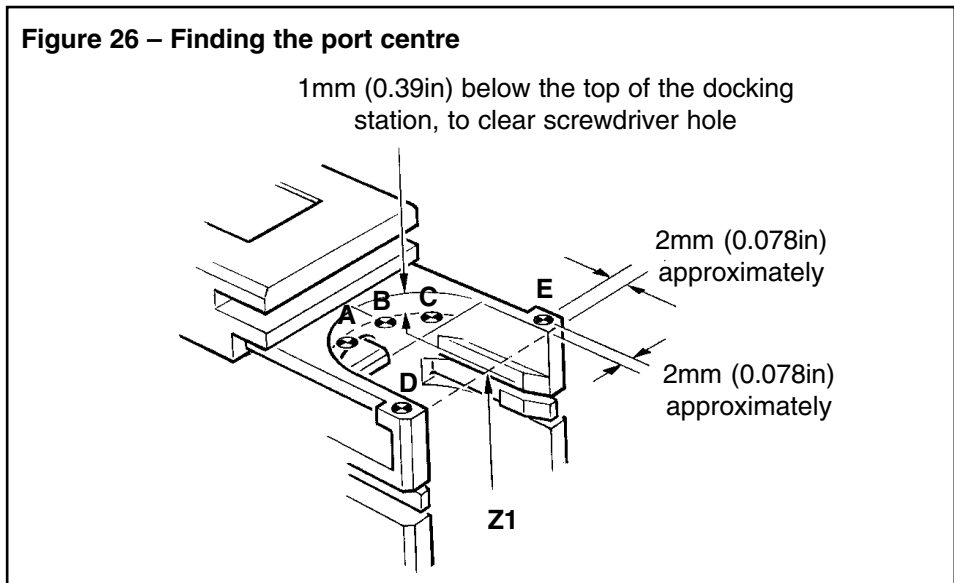
NOTE

If possible, four or five points should be used to find the port centre. If three points are used, probing close to the centre of the semi-circle should be avoided, as slight distortions can occur near the screwdriver hole.

Ignore the Z coordinates.

5   To find the average port top surface height (Z1) gauge points D and E (see Figure 27).

6   Repeat the centre line and surface height measurements for ports 2 to 8.

Determine head centreline and base height

1   Unlock and remove the autojoint adaptor from the probe head.

2   Remove all lid retaining clips.

3   Select datum mode (mode 6, see Section 8.6).

4   To find the probe head centreline, gauge points F, G, H, and J on the outside diameter of the probe head, using the datum stylus on the datum probe (Figure 27).

Figure 27 – Finding the head centreline

Measure point **K** on any flat area

Measure **F G H J** on the parallel section marked ✳
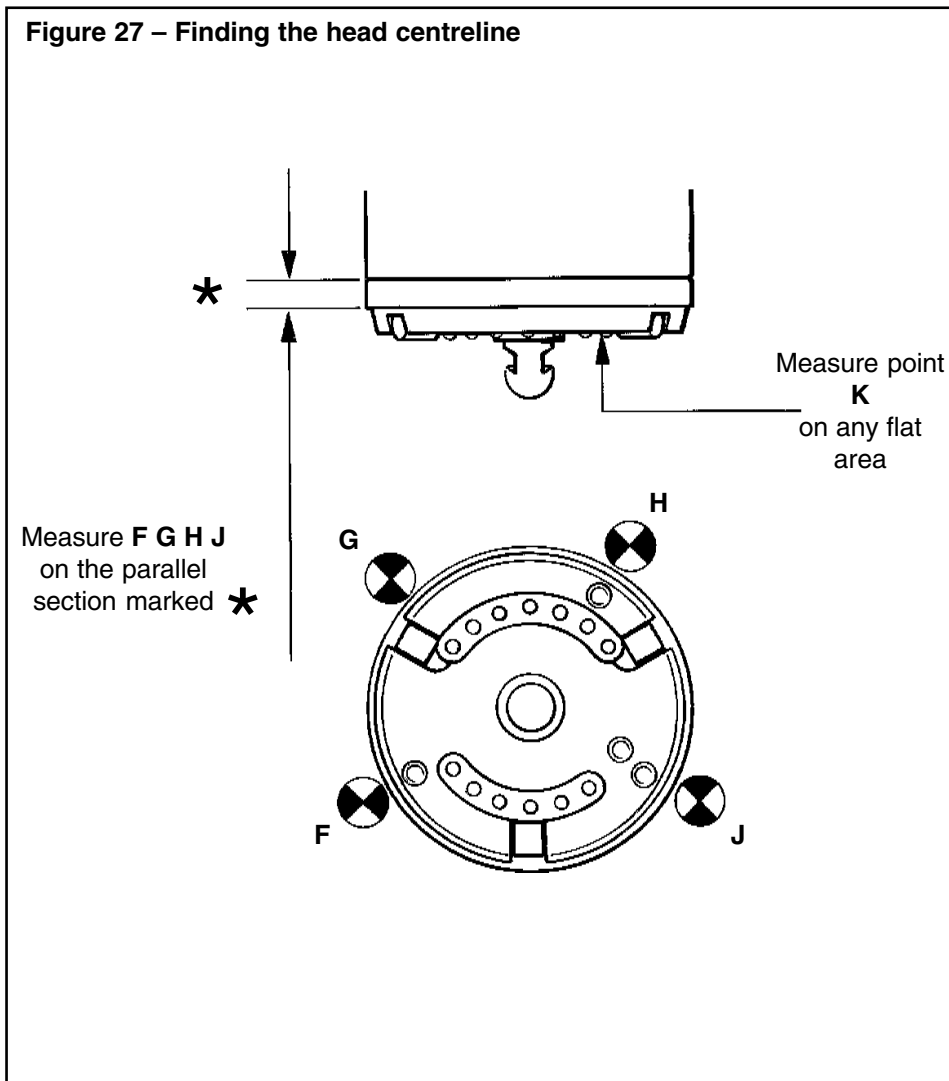
6.2 Calculating docking height

The docking height (DH) is the height at which the probe head enters and exits a port when carrying a probe:

> **WARNING**
>
> **The following calculations assume a stylus ball diameter of 2.0mm**

$$DH = -(Z1 + Z2 + 6.65)mm$$

where:

the minus sign shows that the height DH is below the level of the origin (the datum probe stylus ball)

Z1　=　average port height ((D+E)/2) (see Figure 26)

Z2　=　height to probe head base (point K see Figure 27)

6.65　=　compensation value (see WARNING above) which ensures that the correct height is reached, derived by use of the following formula:

datum probe stylus ball radius + head/joint overlap + TP2 stylus ball radius (if not already compensated for by the software)

Example:　= 4 + 1.65 + 1

When entering and leaving a port without a probe, the head is set to a height (DE) which is 7.0mm higher than DH to avoid collision:

$$DE = DH + 7.0 \text{ mm}$$

Height DE ensures that the probe head pushes back the port lids by their upper surface (Figure 28).

Figure 28 – Probe docking
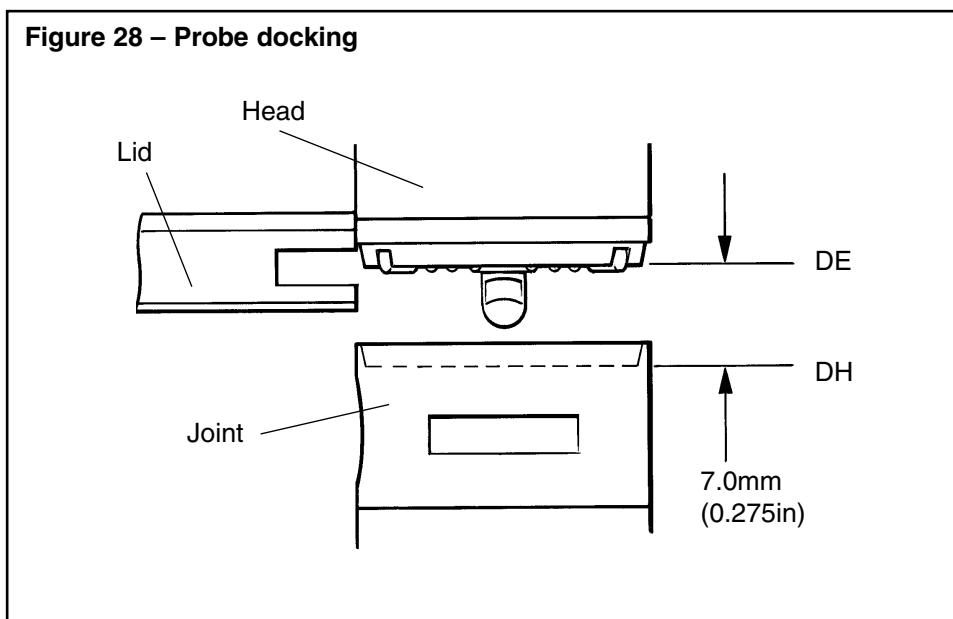
6.3 Loading procedure

1   Enter the port at 90° to the ACR1 at height DE, and push back the lid until the probe head centreline matches the port centreline (Figure 29).

2   Lower the head to the docking height DH, and then by a further 0.2mm (0.078in). The ACR1 locks the joint when instructed by the CMM.

3   Raise the probe head by 0.2mm (0.078in) then exit the port at height DH in the same plane as step 1.

WARNING

Due to the forces exerted by the autochange operation on the head, it is strongly recommended that the head is unlocked and re-locked immediately after picking up a probe, in order to maintain repeatability.

Figure 29 – Loading

| In at DE | Down in DH and a further 0.2mm (0.078in) and lock | Up 0.2mm (0.078in) out at DH |
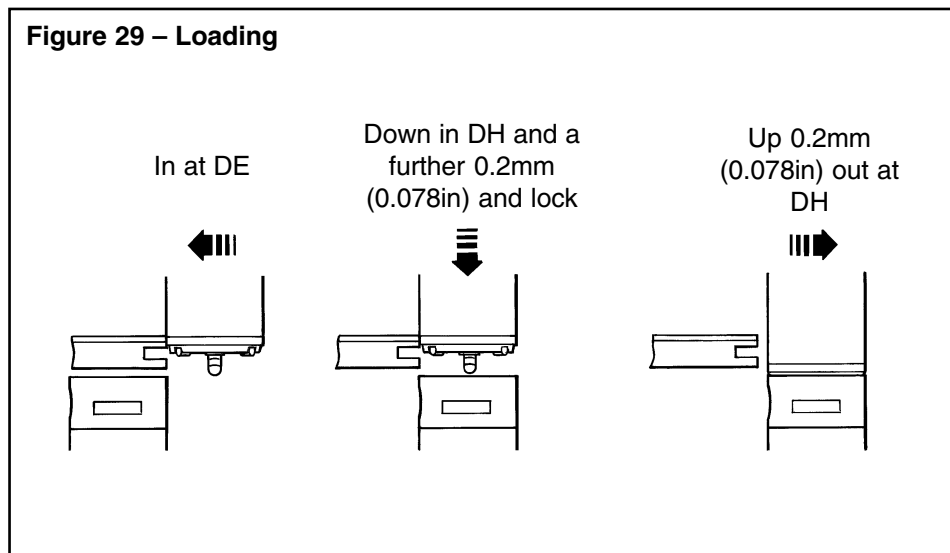
6.4   Unloading procedure

1   Enter the port at 90° to the ACR1 at height DH and push back the lid until the head centreline matches the port centreline (Figure 30).

2   Lower the head by 0.2mm (0.078in) and unlock the joint. The rack unlocks the joint when instructed by CMM.

3   Lift the head to height DE.

4   Exit the port at height DE in the same plane as step 1.

CAUTION

If a probe or extension bar is manually locked (using a joint key), it is advisable to lock it fully to the cam end stop, then back the screwdriver slot off by approximately 5°. If this is not done, it is unlikely that the probe will dock satisfactorily into the ACR1.

Should the motorised head overload whilst the rack screwdriver is turning, instruct the head controller to re-lock the head before continuing. This can be done manually, or under program control by the measuring machine computer.

Figure 30 – Unloading

In at DH   Down 0.2mm (0.078in) unlock   Up to DE   Out at DE
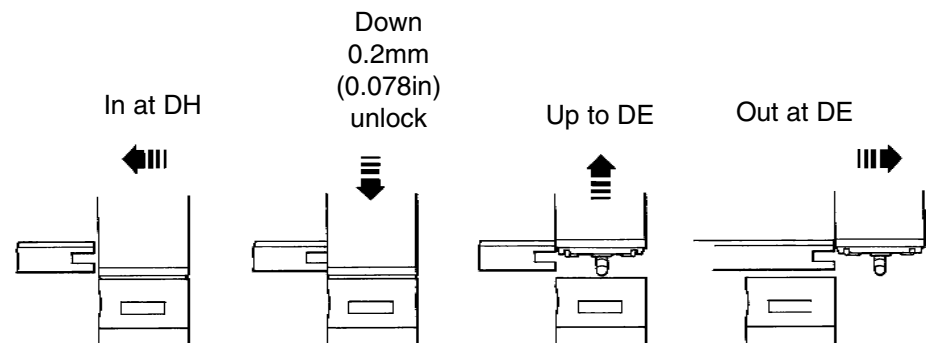
6.5 Docking parameters

Speed

Entry speed depends upon the screwdriver position. If you can be certain that the screwdriver is positioned correctly, a speed of up to 60mm/sec (2.36in/sec) can be used. Otherwise the recommended maximum speed is 5mm/sec (0.19in/sec), to allow the screwdrivers to be corrected before they are engaged.

If the system is being used only to change probes, the screwdriver blades will naturally be in the correct position, but if PEMs are being used the screwdriver blade position may need to be corrected. This can be achieved by a slow rack entry speed of less than 5mm/sec (0.19in/sec), or by a separate instruction before entering a Change cycle.

Overtravel

The ACR1 is restrained in the Y axis but is free to move in the +X and −Z axes (see Figure 31). There is a crash protection of 7mm (0.27in) in both axes. An opto switch tells the CMM to stop after 0.5 to 1.5mm (0.019 to 0.06in) of overtravel. The remainder of the movement is for safety.

Tolerances

The CMM must position the head/autojoint to within ±50µm (0.002in), in all three axes, of the true park position. The CMM quill/shank mounting face must be within 0.1° of the true position relative to the machine axes. This is achieved by the alignment procedure.

The ACR1 is pre-loaded to approximately 10N (2.25lbf) to ensure that it repeatably returns to its 'at rest ' position. This means that the CMM must exert a force greater than 10N (2.25lbf) to overtravel the rack. When set for horizontal operation an additional 10N (2.25lbf) pre-load is added to compensate for the weight of the docked probes and extension bars.

Figure 31 – Probe overtravel
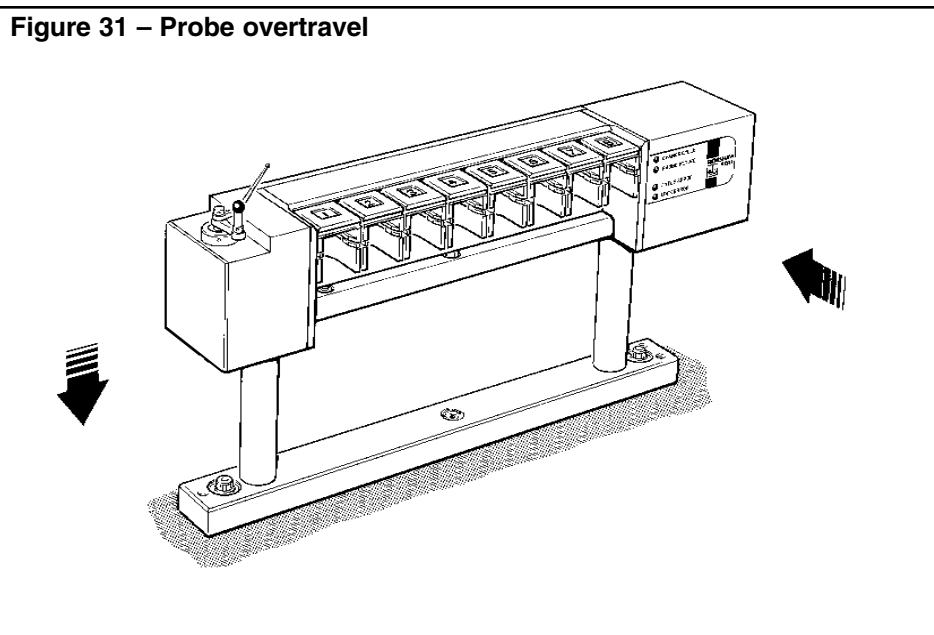
7.0 AUTOCHANGE SOFTWARE

7.1 Commands and responses

TABLE 20 – COMMANDS AND RESPONSES		
Code	As a command to ACC2-2	As a response from ACC2-2
A	Change cycle enable	Possible responses to Rack status request (see Sections 7.2.1 to 7.2.4)
B	—	
C	Rack status request	
D	Datum mode select	
E	—	
F	—	
G	Mechanism lock/unlock	Lock/unlock completed
H	Probe inhibit (1)	—
I	Probe inhibit (2)	—
J	Probe enable	—
K	Reset	Datum mode 1
L	—	Datum mode 2
M	Change cycle disable	Change cycle disabled
N	—	Change cycle and probe disabled
O	—	—
P	—	Parked state
Q	—	Change cycle started
R	Self test	Rack disconnected
S	Autochange status request	Stand-alone mode probe enabled
T	—	Stand-alone mode probe disabled
U	—	—
V	Version request 1	—
W	Version request 2	—
X	—	Rack overtravelled
Y	Mechanism lock	Probe enabled
Z	Mechanism unlock	Probe disabled

7.2 Commands to ACC2-2

7.2.1 Command A: Change Cycle Enable

This command will re-enable the Change cycle detect function following an 'M' command.

7.2.2 Command B

Not used

7.2.3 Command C: Rack Status Request

This command requests the status of the ACR1. The response will be a string of four ASCII characters as shown below:

(i)   (ii)   CR   LF

(i) and (ii) will be HEX code in ASCII format. The HEX codes will be determined as specified in Table 21:

TABLE 21 – HEX CODES			
HEX	**Binary**	**HEX**	**Binary**
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

(i)   This command (Table 22) specifies the state of the infra-red beams, rack overtravel and rack connected flags in the following formats (high for significance).

TABLE 22 – RACK STATUS FLAGS				
Flag No.	7	6	5	4
Meaning	Not over-travelled	Front beam made	Rear beam made	Rack connected

(ii)   This command (Table 23) specifies the position of the motor-driven screwdrivers (high for significance).

TABLE 23 – RACK STATUS FLAGS				
Flag No.	3	2	1	0
Meaning	Locked	Backed off	Intermediate	Unlocked

eg   F4 = Rack ready, screwdrivers locked and backed off ready to receive a head and probe combination

F1 = Rack ready, screwdrivers in unlocked position ready to receive an unloaded head

7.2.4   Command D: Datum mode (mode 6) select

This command causes the system to enter a datum mode as follows:

Datum mode 1 if a port lid is open
Datum mode 2 if all the port lids are all closed

NOTE

When datum mode has been entered, the system will switch freely between mode 1 and mode 2 by operating the port lids.

Datum mode can be cancelled by:

- K – Reset command
- Operation of the front panel reset switch
- Operation of the external reset line

7.2.5   Command E

Not used

7.2.6   Command F

Not used

7.2.7   Command G: Mechanism lock/unlock

This command changes the lock state of the ACR1 during a Change cycle. The procedure is specified in the Change cycle mode (mode 3, see Section 8.3).

NOTE

This command is not available as stand-alone.

7.2.8   Command H: Inhibit touch probe interface (1)

This command inhibits the probe interface. When the internal (ACC2-2) probe interface is selected, this command forces the interface to indicate a seated probe irrespective of the state of the CMM probe.

When PICS operation is selected this command causes the ACC2-2 to assert PPOFF (Probe Power OFF) and to override any PDAMP (Probe DAMPing) signal from the CMM. This in turn causes the PICS interface to force the probe seated state and allows automatic probe type selection.

This inhibited state can be cancelled by:

- J – Enable interface command
- K – Reset command
- Operation of front panel reset switch
- Operation of the external reset line

The only difference between an H command and an I command (see Section 7.2.9) is the automatic cancelling of an I inhibit.

7.2.9   Command I: Inhibit touch probe interface (2)

This command inhibits the touch probe interface. When the internal (ACC2-2) probe interface is selected, this command forces the interface to indicate a seated probe irrespective of the state of the CMM probe.

When PICS operation is selected this command causes the ACC2-2 to assert PPOFF (Probe Power OFF) and to override any PDAMP (Probe DAMPing) signal from the CMM, this in turn causes the PICS interface to force the probe seated state and allows the automatic probe type selection.

This inhibited state is cancelled by :

- Completion of a probe pick-up operation (automatically)
- J – Enable interface command
- K – Reset command
- Operation of front panel reset switch
- Operation of the external reset line

This inhibit procedure is automatically applied when a Change cycle is started. The advantage of being able to apply it before a Change cycle is that a very sensitive probe could be triggered when the autojoint contacts the port lid.

7.2.10   Command J: Enable probe interface

This command re-enables the internal touch probe interface following an H or I command. For PICS operation the PPOFF (Probe Power OFF) and Probe DAMPing override signals are released.

7.2.11   Command K: Reset autochange

This command causes a software restart of the system.

7.2.12   Command L

Not used

7.2.13   Command M: Change cycle disable

This command disables the Change cycle detect function. Following this command the detection of a lid beam break will be ignored.

This condition will be reported with an MO or NO if the probe interface is disabled or PPOFF is applied. The status will remain as MO or NO until the Change cycle detect function is re-enabled.

NOTE

In this condition only the following commands will be available:

- **IEEE resets**
- **Front panel reset**
- **External reset**
- **A, C, H, I, J, K, M, S, V, and W commands**

Change cycle is re-enabled by:

- A – Change cycle enabled command
- K – Reset command
- Operation of front panel reset switch
- Operation of the external reset line

7.2.14 Command N

Not used

7.2.15 Command O

Not used

7.2.16 Command P

Not used

7.2.17 Command Q

Not used

7.2.18 Command R: Self test request

This command initiates the following tests:

- Memory test
- Rack and controller LED test
- Mechanism test

and is completed by a software reset.

If an error or a reset request is detected during the LED test, the mechanism test will not be performed.

At the start of testing the following report will be transmitted:

MESSAGE 1 :   SELF TEST IN PROGRESS

Following each test, the messages below will be transmitted:

MESSAGE 2 :   MEMORY TEST COMPLETE
MESSAGE 3 :   SELF TEST COMPLETE

The self test will be completed by a software reset routine which will report the current status of the unit.

7.2.19   Command S: System status

This command causes the ACC2-2 to send details of its present status. This command is available in all modes. The ACC2-2 automatically sends its status details when its status changes, but the S command allows the CMM to request status information when it requires it.

Details of the status responses are given in Section 7.3.

7.2.20   Command T

Not used

7.2.21   Command U

Not used

7.2.22   Command V: Version

This command causes the ACC2-2 to send its version number.

The format is as follows:

    Bxx.yy   where   B denotes ACC2-2
                                   xx is the enhancement level number
                                   yy is the release level number

7.2.23 Command W: Extended version

This command causes the ACC2-2 to send its extended version number.

The format is as follows :

    Line 1 – (C) Renishaw Metrology Year
    Line 2 – Part No. Date

This message may be modified or extended to include additional information. The 'W' command must not be used within a standard operational programme.

7.2.24   Command X

Not used

7.2.25 Command Y: Mechanism lock

This command instructs the ACR1 to move the screwdriver blades to the lock position. The main use of the Y command is to correct the screwdriver blade position when loading or unloading autojoint extension bars.

7.2.26 Command Z: Mechanism unlock

This command instructs the ACR1 to move the screwdriver blades to the unlocked position. The main uses of the Z code are the correction of the screwdriver blade position when loading or unloading autojoint extension bars, and setting the screwdriver blades for easy loading of probes into the ACR1 (this is best carried out in the unlocked position).

7.3   Responses from ACC2-2

Responses from the ACC2-2 fall into three categories:

- Normal status messages (Table 24)
- Error state messages (Table 25)
- Rack status messages (Tables 21, 22 and 23)

These responses are automatically transmitted when the system status has changed (eg at the start of a Change cycle, after an instruction from the CMM has been implemented). The current system status can also be requested using the S command (see Section 7.2.19).

Normal status messages

TABLE 24 – NORMAL STATUS MESSAGES	
Status	**Message**
Datum mode 1	K0
Datum mode 2	L0
Change cycle started	Q0
Parked state	P0
Cycle lock/unlock complete	G0
Change cycle disabled	M0
Change cycle and probe disabled	N0
CMM Control probe enabled	Y0
CMM Control probe disabled	Z0
Stand-alone mode probe enabled	S0
Stand-alone mode probe disabled	T0

For a detailed explanation of these messages see Operating modes (Section 7.4).

NOTE

The 0 after the first character indicates no errors.

Error status messages

These are automatically transmitted when an error is detected. As the system remains in error mode until a reset is received, the reply to a subsequent S command is the error state.

TABLE 25 – ERROR STATUS MESSAGES	
State	**Message**
Lock mechanism error	Q1
Lid time-out error	Q3
G message not received	Q4
Command not accepted	Y5 * °
Excessive entry speed	Q6
Invalid command	Y7 * °
Rack overtravel	X8
Rack not connected	R9
Lock operation aborted	YA *
Change cycle operation aborted	YB *

The first character is the state in which the error occurred, the second character is the error code.

° These errors do not cause the system to remain in error mode, they are reported and the system returns to the previous mode.

* These error messages can have a different status byte (eg Q5, ZB). Detailed explanations of these messages are given in Section 7.2.3.

Rack status messages

These status messages are only transmitted in response to a C command. They detail the functional status of the ACR1. Full details are given in Section 7.2.3.

7.4   Operating modes

The software structure of the six operating modes is shown in Figure 32. Full details of each mode are given in Section 8 (Operating Modes).

Mode 1   Switch on/restart
Mode 2   Main software nucleus
Mode 3   Change cycle
Mode 4   Error mode
Mode 5   Direct command mode
Mode 6   Datum mode

Figure 32 – Operating modes

*   LME = Lock mechanism error

LTE = Lid timeout error

GNR = G (Go) not received

EES = Excessive entry speed

ROE = Rack overtravel error

RNC = Rack not connected
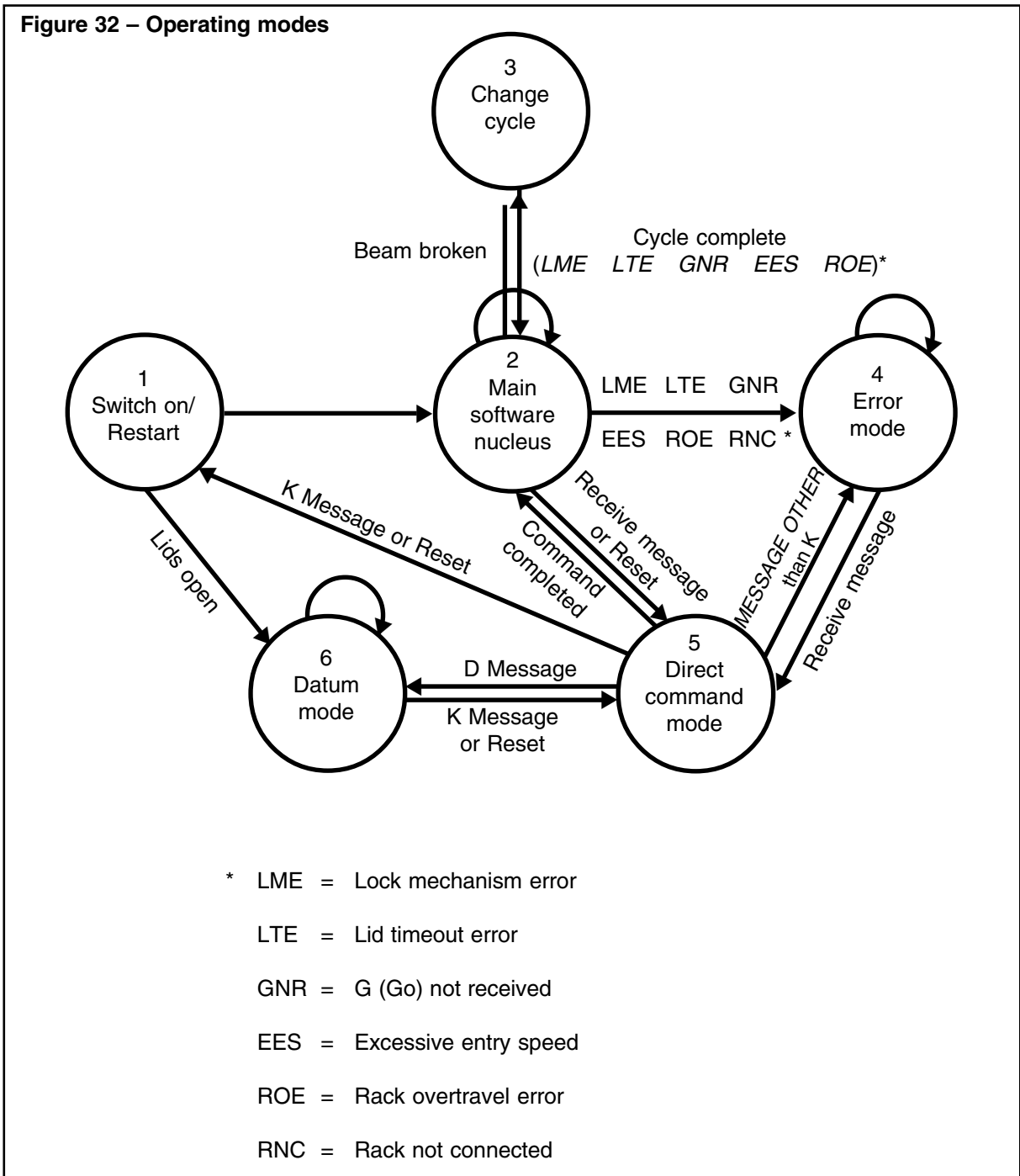
8.0 OPERATING MODES

8.1   Mode 1 – Switch on/Restart mode

When the ACC2-2 is switched on the start up sequence is as follows:

1   A one-second delay while the power supply rails stabilise. During this time the STOP signal is applied.

2   After STOP is released the internal interface will be inhibited.

3   The configuration switches on the back panel will be read and the necessary internal setups made.

4   The rack connection is tested.

5   The port lids will be checked and if an open lid is detected and datum mode is selected.

6   Dependent on the result of step 5, either mode 2 or mode 6 will be entered.

When a K Reset command, reset switch or external reset is applied, the sequence is the same except that it starts from step 2.

Mode 1 is a transitional state.

8.2   Mode 2 – Main software nucleus mode

This is the normal operating mode of the software.

In mode 2 the ACC2-2 can accept input in the form of a direct command, an error signal, or a port lid movement.

Depending on the type of input, the appropriate operating mode is selected: Direct Command (mode 5), Error (mode 4) or Change cycle (mode 3)).

8.3   Mode 3 – Change cycle mode

Change cycle (mode 3) is entered from mode 2 whenever a rack infra-red beam is broken. Depending upon which beam is broken first, the ACC2-2 decides whether to perform a pick-up or put-down.

The sequence of operation is as follows (error conditions are given *in italics*):

1   ACC2-2 waits for a beam to be broken.

2   An infra-red beam is detected.

    # Q (CR)(LF) is sent indicating that the first beam has been broken
    # ACC2-2 decides whether to pick up or put down

3   The infra-red beam detection is debounced.

    Q6   Excessive Entry Speed
    Cycle Error LED is ON
    Entry speeds greater than 60mm/sec (2.36in/sec) are not
    permissible

4   Within 100µs of the first beam being broken

    # Touch probe is inhibited (conventional) PPOFF and PDAMP override applied (PICS)
    # Change cycle LED is ON
    # Probe Active LED is OFF

5   Depending upon screwdriver position, ACC2-2 decides whether it is necessary to move the screwdriver to mate with the incoming head

Motor reverse takes 0.95 seconds maximum, and the quill has 11.9mm (0.46in) left to travel. Entry speed must be restricted to 5mm/sec (0.196in/sec) if reversal is necessary.

If the operator is confident that the screwdriver will ALWAYS be in the correct position, the entry speed can be as high as 60mm/sec (2.36in/sec), provided the touch probe does not trigger when its body contacts the lid.

6   Both beams are broken within 10 seconds

    Q3   Lid Time-out
    Cycle Error LED is ON
    Both beams not broken within 10 seconds

7   ACC2-2 sends P0(CR)(LF) indicating that the probe is parked and the screwdriver is in the correct position

8   ACC2-2 waits for a G message or starts the preset time delay for stand-alone operation. Its internal status is P0.

    Q4   G Not Received Error
    Cycle Error LED is ON
    The 'G' was not received within 10 seconds

9   G is received or time delay complete

10   Lock/unlock is performed within 3.25 seconds

    Q1   Lock Mechanism Error
    Lock Error LED is ON
    Mechanism is not in the required position. The ACC2-2 has
    assumed that the mechanism is jammed and aborts the move.

11   G0 is sent indicating that lock/unlock has been successfully completed

12   Both beams are made within 10 seconds

    Q3   Lid Time-out Error
    Cycle Error LED is ON
    Both beams not made within 10 seconds

13a   If a successful pick-up was performed:

    #   Touch probe is enabled after a 1.5 second delay
        (conventional) PPOFF and PDAMP override released (PICS)
    #   Probe Active LED is ON (conventional)
    #   Sends Y0

13b   If a successful put-down was performed:

    #   Touch probe left disabled (conventional) PPOFF and PDAMP
        override applied (PICS)
    #   All rack LEDs are OFF
    #   Sends Z0

14   Software return to main software nucleus (mode 2)

Additional errors

a)   If ACR1 overtravel is detected at a time during this procedure the Change
    cycle is abandoned and error mode (mode 4) is entered.

b)   If a stop command is applied (from another unit) during a Change cycle, then
    the cycle will be aborted. If this happens during a blade move, the blades will
    return to the unlocked position before error mode (mode 4) is entered.

8.4   Mode 4 – Error mode

This mode is entered if:

- an error occurs in the Change cycle
- the system is switched on without the rack being connected
- an overtravel error occurs
- an invalid command is received
- a command is received while the system is busy
- an external STOP is received

Error messages sent are as follows :

TABLE 26 – ERROR MODE MESSAGES		
Error	**Abbreviation**	**Message**
Lock mechanism error	(LME)	Q1 (CR) (LF)
Lid time-out error	(LTE)	Q3 (CR) (LF)
G message not received	(GNR)	Q4 (CR) (LF)
Command not accepted	(CNA)	Y5 (CR) (LF) *
Excessive entry speed	(EES)	Q6 (CR) (LF)
Invalid command	(INC)	Y7 (CR) (LF) *
Rack overtravel error	(ROE)	X8 (CR) (LF)
Rack not connected	(RNC)	R9 (CR) (LF)
Lock operation aborted	(LOA)	YA (CR) (LF) *
Change cycle aborted	(CCA)	YB (CR) (LF) *

*   The first character of these messages indicates the state of the system before the error occurred. Other responses are possible such as Q5, ZB etc.

In the case of CNA (Command Not Accepted) or INC (Invalid Command), the appropriate reply –5 or –7 is given, and the system returns to what it was doing.

In the case of LCA (Lock Cycle Aborted) the screwdriver blades will be returned to unlocked positions its status reported –0 and the system returns to the main software nucleus (mode 2).

The CNA reply is given in response to a valid command, received when the system is performing another task (ie the system is busy). The INC response is given in reply to a command that is not recognised by the system.

For all remaining errors the following actions occur:

- Rack motor is stopped
- Change cycle disabled
- Datum mode (mode 6) disabled
- Touch probe overridden to look like open probe (conventional) Stop applied (PICS)

To recover from an error:

1   Remove the problem
2   Ensure ACR1 is not overtravelled
3   Move the quill from the ACR1
4   Ensure no lids are open
5   Press RESET button/apply external reset

Direct Command Mode (mode 5) can be entered on receipt of a CMM message. However, unless this is a K message, error mode (mode 4) will be re-entered after processing this command.

The type of error is also visually displayed using the ACC2-2 and ACR1 LEDs as shown in Table 27:

TABLE 27 – LED ERRORS								
LED		**Error/Message**						
		LME —1	LTE —3	GNR —4	EES —6	ROE X8	RNC R9	CCA —B
ACR1								
Change cycle		●	●	●	●	●	●	●
Probe active		●	●	●	●	●	●	●
Cycle error		●	○	○	○	○	●	○
Lock error		○	●	●	●	●	●	●
ACC2-2								
Rack ready		●	●	●	●	●	●	●
Rack active		●	●	○*	○*	●	●	●
Lock error		○	●	●	●	●	○	●
Overtravel error		●	●	●	○	○	○	●
Stop		○	○	○	○	○	○	○

KEY
● LED off
○ LED on

*   *These LEDs are ON so that a unique display is given for each error.*
—   *Present mode or status.*

There is no display for CNA, INC or LOA because these errors do not cause the unit to stay in error mode.

During error mode only the following commands are available:

- IEEE resets
- Front panel reset
- External reset
- C, H, J, K, R, S, V, W, Y, and Z commands

8.5   Mode 5 – Direct command mode

There are 15 commands which the CMM can send to directly command system actions. See Section 7.2 for a detailed explanation.

The ACC2-2 can receive commands and reply to them while it is in any operating mode except switch on/restart (mode 1). When the command has been processed, the ACC2-2 returns to the mode it was in before the command was received unless that command was a K, in which case a restart is performed.

Mode 5 is a transitional state.

There are two main operating modes of the system: main software nucleus mode (mode 2) and datum mode (mode 6).

8.6   Mode 6 – Datum mode

Datum mode is used for the alignment and datuming of the ACR1. It is necessary because the datum probe must be active for part of the procedure and the port lids must be held open without causing the Change cycle to start. Neither of these actions is allowable in mode 2.

Datum mode can be selected and de-selected in two ways:

- By using the direct commands D (select datum mode) and K (reset).

- Manually by pressing the RESET switch (or applying the external reset) while a port lid is held open, or closed to reset.

Datum mode is subdivided into **datum mode 1** and **datum mode 2**.

Datum mode 1 is selected by opening any or all of the port lids while the system is in datum mode. In datum mode 1 the CMM probe is active and the Change cycle inhibited, this allows the port positions to be probed.

Datum mode 2 is selected when all the port lids are closed and while the system is in datum mode. In datum mode 2 the datum probe is enabled and the CMM probe disabled, this allows the probe Head autojoint to be aligned and its position to be determined.

The system status characters are :   K0 (CR) (LF) for datum mode 1
L0 (CR) (LF) for datum mode 2

The system status can also be determined from the LEDs on the ACC2-2 and the ACR1 (see Table 28).

TABLE 28 – SYSTEM STATUS		Datum mode 1	Datum mode 2
	LED	**Datum mode 1**	**Datum mode 2**
	Rack LEDs		
	Change Cycle	○	●
KEY	Probe active	○	●
● LED off	Cycle error	●	○
○ LED on	Lock error	●	○
◐ LED flashing	**ACC2-2 LEDs**		
	Rack ready	◐	●
	Rack active	●	◐

9.0 USEFUL INFORMATION

The following information is supplied elsewhere in this User's Guide but is repeated here as a quick reference aid. Each section is headed by the appropriate section number indicating where the original information can be found.

7.1 Commands and responses

TABLE 20 – COMMANDS AND RESPONSES		
Code	**As a command to ACC2-2**	**As a response from ACC2-2**
A	Change cycle enable	
B	—	
C	Rack status request	Possible responses to
D	Datum mode select	Rack status request
E	—	(see Sections 7.2.1 to 7.2.4)
F	—	
G	Mechanism lock/unlock	Lock/unlock completed
H	Probe inhibit (1)	—
I	Probe inhibit (2)	—
J	Probe enable	—
K	Reset	Datum mode 1
L	—	Datum mode 2
M	Change cycle disable	Change cycle disabled
N	—	Change cycle and probe disabled
O	—	—
P	—	Parked state
Q	—	Change cycle started
R	Self test	Rack disconnected
S	Autochange status request	Stand-alone mode probe enabled
T	—	Stand-alone mode probe disabled
U	—	—
V	Version request 1	—
W	Version request 2	—
X	—	Rack overtravelled
Y	Mechanism lock	Probe enabled
Z	Mechanism unlock	Probe disabled

7.2.3   Command C: Rack Status Request

This command requests the status of the ACR1. The response will be a string of four ASCII characters as shown below:

   (i)   (ii)   CR   LF

(i) and (ii) will be HEX code in ASCII format. The HEX codes will be determined as specified in Table 21:

TABLE 21 – HEX CODES			
HEX	**Binary**	**HEX**	**Binary**
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

(i)   This command (Table 22) specifies the state of the infra-red beams, rack overtravel and rack connected flags in the following formats (high for significance).

TABLE 22 – RACK STATUS FLAGS			
Flag No.	7	6	5	4
Meaning	Not over-travelled	Front beam made	Rear beam made	Rack connected

(ii)   This command (Table 23) specifies the position of the motor-driven screwdrivers (high for significance).

TABLE 23 – RACK STATUS FLAGS			
Flag No.	3	2	1	0
Meaning	Locked	Backed off	Intermediate	Unlocked

eg   F4 = Rack ready, screwdrivers locked and backed off ready to receive a head and probe combination

      F1 = Rack ready, screwdrivers in unlocked position ready to receive an unloaded head

7.3   Responses from ACC2-2

TABLE 24 – NORMAL STATUS MESSAGES	
Status	**Message**
Datum mode 1	K0
Datum mode 2	L0
Change cycle started	Q0
Parked state	P0
Cycle lock/unlock complete	G0
Change cycle disabled	M0
Change cycle and probe disabled	N0
CMM Control probe enabled	Y0
CMM Control probe disabled	Z0
Stand-alone mode probe enabled	S0
Stand-alone mode probe disabled	T0

TABLE 25 – ERROR STATUS MESSAGES	
State	**Message**
Lock mechanism error	Q1
Lid time-out error	Q3
G message not received	Q4
Command not accepted	Y5 * °
Excessive entry speed	Q6
Invalid command	Y7 * °
Rack overtravel	X8
Rack not connected	R9
Lock operation aborted	YA *
Change cycle operation aborted	YB *

The first character is the state in which the error occurred, the second character is the error code.

°   These errors do not cause the system to remain in error mode, they are reported and the system returns to the previous mode.

*   These error messages can have a different status byte (eg Q5, ZB). Detailed explanations of these messages are given in Section 7.2.3.

8.4   Mode 4 – Error mode

TABLE 27 – LED ERRORS								
LED		**Error/Message**						
		LME — 1	LTE — 3	GNR — 4	EES — 6	ROE X8	RNC R9	CCA — B
ACR1								
Change cycle		●	●	●	●	●	●	●
Probe active		●	●	●	●	●	●	●
Cycle error		●	○	○	○	○	●	○
Lock error		○	●	●	●	●	●	●
ACC2-2								
Rack ready		●	●	●	●	●	●	●
Rack active		●	●	○ *	○ *	●	●	●
Lock error		○	●	●	●	●	○	●
Overtravel error		●	●	●	○	○	○	●
Stop		○	○	○	○	○	○	○

KEY
● LED off
○ LED on

*   These LEDs are ON so that a unique display is given for each error.
—   Present mode or status.

TABLE 28 – SYSTEM STATUS			
LED		**Datum mode 1**	**Datum mode 2**
Rack LEDs			
Change cycle		○	●
Probe active		○	●
Cycle error		●	○
Lock error		●	○
ACC2-2 LEDs			
Rack ready		◐	●
Rack active		●	◐

KEY
● LED off
○ LED on
◐ LED flashing

10.0 ACR1 PORT REPLACEMENT

> ⚠
>
> **CAUTION**
>
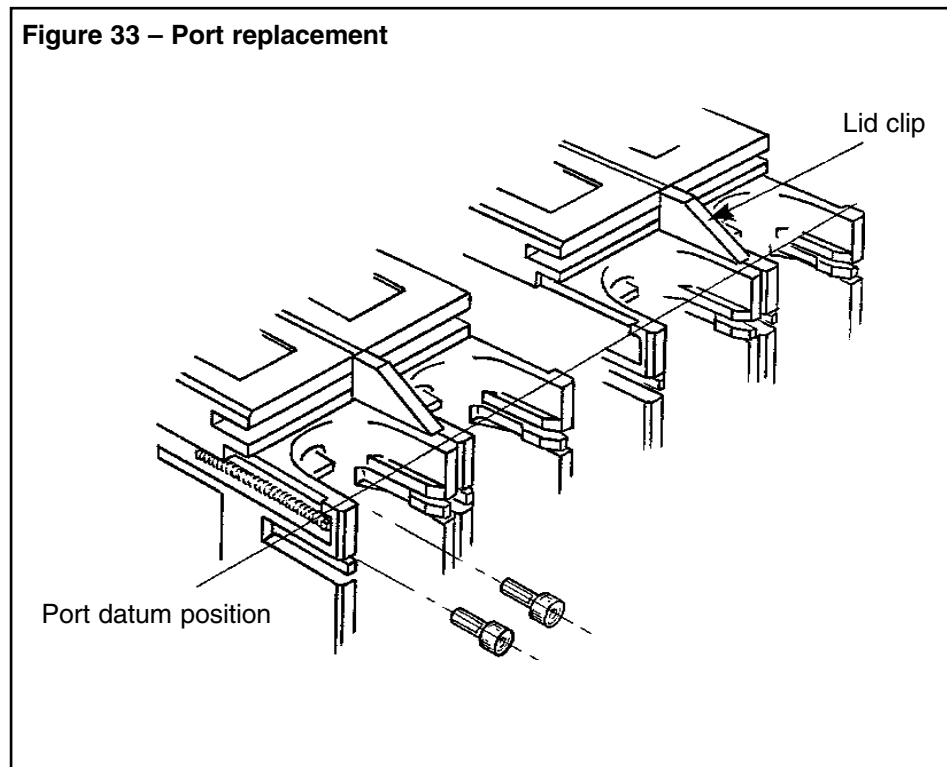> **Disconnect power from the ACR1 before replacing ports**

Port replacement is carried out using the following procedure:

1   Remove the two M3 x 6mm securing screws as shown in Figure 33, and
         remove the port(s) to be replaced.

Figure 33 – Port replacement

Lid clip

Port datum position

2   Loosen the securing screws on the remaining ports in preparation for final
         alignment.

3   Position the replacement port(s) onto the rack and loosely screw in place.
         It is very important that the ports are correctly aligned.

4   Wedge open all the port lids using the lid clips supplied with the ACR1.

5   Place a rigid straight edge along the port datum position as shown in Figure
         33 and tighten all securing screws to 0.6/0.7Nm.

6   Remove straight edge and lid clips.

7   Check that the run-out across individual ports does not exceed 100µm.

8   Re-datum the rack (see Section 6.0).

11.0 MAINTENANCE

11.1 Cleaning

Clean the ACR1 and ACC2-2 with a dry cloth. The units are not sealed against water.

12.0 ABBREVIATIONS

TABLE 29 – ABBREVIATIONS	
ACC2-2	Autochange Controller
ACR1	Autochange Rack
CCA	Change Cycle Aborted (error condition)
CMM	Coordinate Measuring Machine
CNA	Command Not Accepted (error report)
CR	Carriage Return (communication instruction)
CTS	Clear To Send (RS232 communication instruction)
DCL	Device Clear Global (IEEE communication instruction)
DIL	Dual-In-Line (common abbreviation for small configuration switch)
DTR	Data Terminal Ready (RS232 communication instruction)
EES	Excessive Entry Speed (error condition)
GNR	G instruction Not Received (error condition)
IFC	Interface Clear (IEEE communication instruction)
INC	Incorrect Command (error condition)
LED OFF	Light Emitting Diode Off (PICS signal)
LF	Line Feed (communication instruction)
LME	Lock Mechanism Error (error condition)
LOA	Lock Operation Aborted (error condition)
LTE	Lid Time-out Error (error condition)
MMC	Measuring Machine Controller
PAA	Probe Adaptor Autochange
PDAMP	Probe DAMPed (PICS instruction)
PEM	Probe Extension Multiwire
PI 7-2	Probe Interface (for TP7 probe)
PI 200	Probe Interface (for TP200 probe)
PICS	Product Interconnection System
PPOFF	Probe Power OFF (PICS instruction)
PPOLL	Parallel Poll (IEEE communication instruction)
RNC	Rack Not Connected (error condition)
ROE	Rack Overtravel Error (Error condition)
RTS	Request To Send (RS232 communication instruction)
Rx	Received Data (RS232 communication signal)
SDC	Selected Device Clear (IEEE communication instruction)
SPOLL	Serial Poll (IEEE communication instruction)
SRQ	Status Request (IEEE communication instruction)
Stand-alone mode	A mode of operation of the ACC2-2 in which no communications are required
STOP	Stop (PICS signal)
SYNC	Synchronisation (PICS signal)
Tx	Transmitted Data (RS232 communication signal)
UNL	Unlisten (IEEE communication instruction)
UNT	Untalk (IEEE communication instruction)

Renishaw plc, New Mills, Wotton-under-Edge, Gloucestershire GL12 8JR, UK

Tel +44 (0)1453 524524 [07000 RENISHAW]

Fax +44 (0)1453 524901 **Telex** 437120 RENMET G

email uk@renishaw.com

Renishaw Inc, USA
Tel +1 847 286 9953
Fax +1 847 289 9974
email usa@renishaw.com

Renishaw K.K., Japan
Tel +81 3 5332 6021
Fax +81 3 5332 6025
email japan@renishaw.com

Renishaw GmbH, Germany
Tel +49 7127 9810
Fax +49 7127 88237
email germany@renishaw.com

Renishaw S.A., France
Tel +33 1 64 61 84 84
Fax +33 1 64 61 65 26
email france@renishaw.com

Renishaw S.p.A., Italy
Tel +39 011 9 66 10 52
Fax +39 011 9 66 40 83
email italy@renishaw.com

Renishaw Iberica S.A., Spain
Tel +34 93 478 21 31
Fax +34 93 478 16 08
email spain@renishaw.com

Renishaw A.G., Switzerland
Tel +41 55 410 66 66
Fax +41 55 410 66 69
email switzerland@renishaw.com

Renishaw Latino Americana Ltda., Brazil
Tel +55 11 7295 2866
Fax +55 11 7295 1641
email brazil@renishaw.com

Renishaw (Hong Kong) Ltd., Hong Kong,
The People's Republic of China
Tel +852 2753 0638
Fax +852 2756 8786
email hongkong@renishaw.com

Renishaw Metrology Systems Private Limited, India
Tel +91 80 5320 144
Fax +91 80 5320 140
email india@renishaw.com

Renishaw Oceania Pty., Ltd., Australia
Tel +61 3 9553 8267
Fax +61 3 9592 6738
email australia@renishaw.com

Renishaw's Representative Offices

Indonesia **Tel** +62 21 428 70153
Fax +62 21 424 3934
email indonesia@renishaw.com

Singapore **Tel** +65 897 5446
Fax +65 897 5467
email singapore@renishaw.com

Taiwan **Tel** +886 4 2513665
Fax +886 4 2513621
email taiwan@renishaw.com

The People's Republic of China
Tel +86 10 641 07993
Fax +86 10 641 07992
email china@renishaw.com

Renishaw's Liaison Office

South Korea **Tel** +82 2 565 6878
Fax +82 2 565 6879
email southkorea@renishaw.com

RENISHAW®

www.renishaw.com

Issued 0401
Part No. H-1000-6010-07-A