CRAY INSTALL
Delivery-Date:
From: uu42@techops.cray.com (Dermot Kennedy)
Subject: Your Questions
To: ccrees@cc.uq.oz.au (Graham Rees)
Date: Thu, 16 Sep 1993 16:55:45 -0500 (CDT)
Cc: jimbo@techops.cray.com (Jim Masocco),
    uu91@techops.cray.com (Andrea Calamante),
    uu42@techops.cray.com (Dermot Kennedy)
X-Mailer: ELM [version 2.4 PL17]

> > Dermot,
> > Nothing to do with the above subject.
> > Did you take my metal keys back to Canberra with you? If so could you
> please post back.
In a remarkably cogent state on the Saturday I flew out, I left all keys and
the slide pass in our key box for Jim.
> > Been having an interesting time with humidity control. I guess Jim has been
> telling you what's going on. Liebert replaced the humidity sensor in the
> Liebert fc unit. It was reading about 4 to 5% low.
> The dewpoint monitors hav a small fan to sample the air. You are correct there is
little air flow in the YMP itself.

You could try obtaining a thermohydro graph. Might be one around the Uni
somewhere...This would enable you to chart a 24 hour cycle.
Jim could try calibrating the sensors, but from what he says they seem OK. Usually an
indication of a problem with calibration is a 2F or greater differential in the
reading..

> > SO now we have average room RH about 43 to 44 with a room temp of about
> > 70F. Your machine reads an RH of 48 to 49. It seems there's very little air
> > flow into your CPU box - is that correct? Air coming out of the Liebert at
> > floor vents is about 65 with an RH of about 50.
> > We'll see how it stabilises over the next few days.
> > The outside RH is 43. Jim has been very worried about fresh coming in from
> > hte DX plant.
> > Let you know how it goes.
I'll fax today a Psychometric chart which should help.

DEWPOINT ON YMP2D

The WACS monitors dewpoint in two different ways

1/. Dewpoint

<table>
<thead>
<tr>
<th>Temp</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80F</td>
<td>High Fault</td>
</tr>
<tr>
<td>55F</td>
<td>High Warning</td>
</tr>
<tr>
<td>15F</td>
<td>Low Warning</td>
</tr>
<tr>
<td>10F</td>
<td>Low Fault</td>
</tr>
</tbody>
</table>

A fault condition shuts the machine down in 60 seconds.

2/. Dewpoint Relative to Module Temperature.
The WACS compares the dewpoint with the module temperatures.
This prevents moisture condensing on the Modules. When the Mod temp approaches dewpoint the following applies.

Dewpoint +3F Low Warning
Dewpoint Low Fault

On a low fault in this instance the machine shuts down in 10 seconds.

So a Low warning with a high dewpoint reading is the one to watch out for. A High Warning as you are getting is relatively common at sites.

The warmer the room air is the more moisture it can carry. From my experience with Fan Coils the Chilled water supply temp is crucial to the units ability to dehumidify.

At LET this was about 8C.

Best as always
Enjoy the weather its still cold down here.

Dermot

>  
> Cheers, 
>  
>  
>  
>  
>  
>  
>

Graham Rees EMail: G.Rees@cc.uq.edu.au
Deputy Director Tel: + 61 7 365 4143
Prentice Centre Fax: + 61 7 365 4477
The University of Queensland  
Queensland 4072

>  
>  
>
AGREEMENT FOR THE PROVISION OF
HIGH PERFORMANCE COMPUTING SERVICES

1. GENERAL

1.1 Cray Research, Inc. ("Cray") agrees to provide and the University of
Queensland ("The University") agrees to site and operate high
performance computing equipment and facilities listed as Schedule A
("Equipment") and associated software listed as Schedule B
("Software") according to the Terms and Conditions of this
Agreement. The Agreement becomes effective when it has been
signed by both parties.

2. SITE PREPARATION

2.1 The University will have a site prepared to receive the equipment in
accordance with Cray's requirements which are to be advised in
writing. Cray and The University will agree on a date when the site
should be ready to install the Equipment. The University will advise
Cray when the site is ready and Cray will inspect and agree in
writing that the site is ready.

3. TRANSPORTATION AND INSTALLATION

3.1 Cray will transport to the site and install the Equipment and
associated facilities at no cost to The University. Cray will place the
Equipment in good working order and notify The University when
the installation is complete and ready for acceptance.

3.2 The University will if requested by Cray assist Cray in the installation
of the Equipment but under Cray's supervision and provided that
The University accepts no risk or responsibility in so doing.

4. ACCEPTANCE

4.1 The University and Cray will conduct an acceptance of the system to
ensure that:

a) The items of equipment and software and other facilities
listed in Attachment A and B to this Agreement have been
delivered and installed in good working order and conform
substantially to Cray's specifications and;

b) All software documentation and other facilities which will
allow The University to operate the equipment in a normal
manner have been supplied by Cray.
4.2 The University and Cray will conduct acceptance tests promptly and immediately following advice by Cray that the equipment is installed in good working order. If acceptance cannot be finalised within seven (7) days of installation date due to reasons imputable to The University the Equipment will be deemed as accepted and charges will be payable to Cray from the date of the notification of installation.

4.3 If acceptance is not achieved prior to 30 days following installation date for reasons imputable to Cray the parties shall negotiate further proceedings. If no agreement is reached The University may rescind this Agreement and require Cray to remove all items in Schedule A at no cost to The University.

5. **TITLE**

5.1 Title to the Equipment shall remain at all times in Cray. The University will not dispose of or encumber any of Cray's interest in the Equipment.

Cray assumes all risk of loss or damage to the Equipment during periods of transportation and through the installation process and the period of use by The University except that The University will be liable for loss or damage caused by nuclear radiation, reaction or contamination, negligence of The University, and improper use of Equipment by The University.

6. **USE OF THE EQUIPMENT**

6.1 Cray shall provide to The University from the date of acceptance until 31/12/1994 access to 80%, on a 24 hour basis, of the System Resources as defined in this Agreement at the monthly charges contained in this Agreement. The University may use the system for any lawful purposes whatsoever but consistent with its statutory obligations and mission.

6.2 Cray agrees that it will use the remainder of the System Resources for lawful purposes and primarily to perform its own processing to run benchmark tests and/or other demonstrations and to further collaborative activities with The University or with other suitable collaborative partners.

6.3 Cray will use its best endeavours to ensure that its employees or collaborative partners adhere to statutes of The University and follow such operating procedures and security requirements as may be advised to Cray by the Director Prentice Centre.
7. SYSTEM RESOURCES

7.1 The System Resources are those resources normally available for the combination of the hardware, software and other facilities listed in Attachment A and B when operating 24 hours daily throughout the year less the time for normal preventive and remedial maintenance and operating overheads.

8. EXTENSION OF PERIOD OF USE

8.1 Six months prior to 31/12/1994 or at an earlier date The University will advise Cray if it wishes to extend the period of use having regard to the stage of planning of high performance computing developments within the State of Queensland.

8.2 Cray recognises that any permanent installation of computing equipment within The University would be subject to the State Government's Public Finance Standards and Purchasing Policies. Cray will if so required by The University use its best endeavours to extend the period of use of the same equipment or equipment of the same functionality providing capacity consistent with needs, on mutually agreeable terms.

9. DECOMMISSIONING AND REMOVAL OF EQUIPMENT

9.1 The equipment decommissioning will commence either on 31/12/1994 or at the end of any extended period of use agreed by the parties.

9.2 Cray will as soon as practical thereafter remove the equipment at Cray's risk and expense.

9.3 The University will assist Cray in the removal of the Equipment but under Cray's supervision and provided that The University accepts no risk or responsibility in so doing.

10. CONTINUING APPLICATIONS

10.1 If requested by The University Cray will use its best endeavours to assist The University in obtaining alternative facilities to continue processing of applications required after the period of decommissioning.
11. **OPERATION OF THE EQUIPMENT**

11.1 The University will operate the equipment in accordance with Cray's standards and operating procedures. Cray will provide such documentation and training as to allow such operation.

11.2 The University will report faults immediately to Cray in accordance with procedures to be notified by Cray.

12. **TRAINING**

Training will be provided by Cray according to Schedule C.

13. **MANUALS**

13.1 Cray will provide one (1) copy of applicable user manuals at no additional charge. The University may order additional copies at the then current price.

13.2 The University may reproduce the manuals for its own internal use provided that each copy clearly includes all of the proprietary notices of the original.

14. **DEFAULT AND TERMINATION**

14.1 The occurrence of any one of the following events will be default ("Event of Default"):  

a) Non-payment by The University of any amount due under this Agreement, which non-payment continues for a period of ten (10) business days following receipt of notice by Cray that such payment amount is overdue.

b) Non-performance by The University of any other material term or condition of this Agreement which is not cured within thirty (30) days after written notice from Cray.

c) The University ceases the conduct of active business; or any of the Equipment is attached, levied upon, encumbered, pledged, seized or taken under any judicial process.

d) Any of The University's warranties or representations in this Agreement or in any written statement given in connection with the Agreement will be false or misleading in any material respect.
Upon the occurrence of any Event of Default as defined herein, Cray may with 30 days written notice exercise one or more of the following rights and remedies, subject to the requirement that no expense or damage may be counted and recovered twice by Cray, whether by renaming, re-characterising, or otherwise (and with the explicit note that before they become Events of Default items (a) and (b) above involve notice periods and failures to cure):

i) Retake possession of the equipment without liability to Cray, cancel this Agreement for the Equipment repossessed, and recover from The University all accrued and unpaid Monthly Charges and other amounts owing under the terms of this Agreement.

ii) Pursue any other remedy Cray may otherwise have, at law, in equity or under any statute and recover such other actual damages and expenses, including attorney's fees, as may be incurred by Cray as a result of The University's default or on account of Cray's enforcement of its rights and remedies under this Agreement.

15. COMMUNICATIONS

15.1 The University will provide such hardware, software or other facilities to permit the connection of this equipment to The University of Queensland Network and to the Australian Academic Research Network (AARNET).

16. WARRANTY

16.1 Cray warrants that on the effective date of the installation the Equipment is free from material defects and will in all material respects conform to the specifications contained in Cray's technical manuals.

16.2 The University is responsible for the proper use of the Equipment and the results obtained there from arising from The University's use of the Equipment.
17. **IMPLIED WARRANTIES; DISCLAIMER’ INDEMNITY:**

Subject to Article 16 hereof:

(a) Except as otherwise required by law, the express warranty set forth in the Warranty provision of the Agreement is the exclusive warranty and is in lieu of all express and implied warranties, including the implied warranties for fitness for a particular purpose and of merchantability. The remedy stated therein is the exclusive remedy under the express warranty contained therein and under any other warranties, express or implied, required by law, to the extent permitted by law.

(b) The total of Cray's liabilities under or in conjunction with this Agreement and whether arising from negligence or Agreement or howsoever is limited in respect of each event or series of connected events as follows:

(i) for damage to physical property the sum of $200,000 plus the obligation to make good by repair or replacement any equipment damaged by negligent act or default of Cray, its servants, or its agents; and

(ii) for all other events (excluding injury to or death of any person occurring on site and caused directly by defect in the Equipment or by negligence or default of Cray, its servants, or its agents, for which the limited shall be $1,000,000) the sum of $50,000.

The University shall indemnify Cray and hold Cray harmless with respect to any claim by third parties, including any expenses incurred by Cray in connection with the defence of a claim arising out of or in connection with The University's use of the Equipment or the use of the results of operation of the Equipment. The provisions of this Article will not affect Cray's obligations under the Patents and Copyrights Article of this Agreement.
18. **LIMITATION OF LIABILITY**

Certain statutes, rules, and regulations of Australia may prevent application of provisions of Article 17 as intended by the parties and may impose on Cray certain conditions, warranties, and obligations which cannot be, or only to a limited extent can be, excluded, modified or restricted by the provisions of this Agreement. Such prevention, and such imposition, shall apply only to the extent provided by such statutes, rules, and regulations. Further, if such conditions, warranties, and obligations are so imposed, then the liability of Cray pursuant to this Agreement shall be limited, in Cray’s absolute discretion, to any one or more of the following:

(a) with respect to goods:
   i) the replacement of the goods or the supply of equivalent goods;
   ii) the repair of the goods;
   iii) the payment of the cost of replacing the goods or acquiring equivalent goods; or
   iv) the payment of the cost of having the goods repaired; or

(b) with respect to services:
   i) the supplying of the services again; or
   ii) the payment of the cost of having the services supplied again.

19. **CHARGES**

19.1 Cray agrees to provide to The University the Equipment, Software and Training defined in Schedules A, B and C for AU$24,000 per month for the minimum term of this Agreement, which shall be from date of acceptance until 31/12/1994.

19.2 Should The University request Cray and Cray agrees to add additional hardware or software to the system the charges for such additional equipment and software will be negotiated between the parties.

19.3 The charge becomes payable from and including the date of acceptance. If this represents part of a month the charge will, subject to the previous clause, be calculated on the ratio if the number of hours the system is available for use to the total number of hours in the month.

19.4 The University will pay charges within fourteen (14) days of the receipt of an invoice from Cray.
19.5 Cray Australia will provide Maintenance Service for the periods of coverage chosen by The University and agreed to by Cray Australia, in accordance with Cray's maintenance procedures for this Equipment advised in writing by Cray, provided that The University makes the Equipment available for Maintenance Service as reasonably required. Cray Australia will maintain the Equipment in good working condition and in material conformance to the specifications contained in Cray Research, Inc's technical manuals supplied to The University with the Equipment. Cray Australia undertakes to maintain that, for any rolling three month period, the computer mean time to failure (hardware only, as software depends on applications and software) is not substantially worse than average for Cray Research Inc's supercomputers of the same type and in similar configuration. The basis of the comparison shall be a 3 month rolling average, rolling month by month, and no challenge or inquiry may be made unless the average uptime (excluding scheduled maintenance and interrupts caused by external sources beyond the control of Cray Australia) falls below 95%. In any case, information disclosed hereunder shall be deemed confidential.

19.6 Should Cray not achieve the standards of Maintenance described in 19.5 in any month Cray and The University will negotiate the appropriate monthly charge having regard to Cray's Maintenance Service coverage for this Equipment and the severity of the loss of Systems Resources. In such negotiations the following guidelines will apply:

(a) If no uptime, as defined in 19.5, is achieved then The University will not be liable for any of the monthly charge.

(b) If 95% uptime, as defined in 19.5, is achieved then The University is liable for the fully monthly charge.

(c) If less than 95% uptime, as defined in 19.5, is achieved and such lesser uptime can be attributed to The University deciding in a particular fault incident not to request maintenance on-site at earlier then next-day basis, then The University is liable for the fully monthly charge.

(d) Other circumstances are to be negotiated having regard to these guidelines.

(e) In such negotiations The University will be represented by the Director Prentice Centre.
19.7 Cray agrees that in any 24 hour period The University may exceed 80% of use of Systems Resources to offset loss due to system downtime at no further charge to The University and in priority after Cray's requirements of its use of residual systems resources.

19.8 Software listed in Schedule B will be supplied by Cray in accordance with its Software Terms and Conditions described in Attachment D. The University agrees to these Terms and Conditions.

20. RELOCATION OF EQUIPMENT

20.1 Except for temporary emergency relocation of the Equipment to prevent its damage or destruction The University will not relocate the Equipment.

21. PATENTS AND COPYRIGHTS

Cray will indemnify The University as to any rightful claim that any Cray trademarks infringe any United States trademark rights or that the Equipment, or any part thereof, furnished by Cray under this Agreement constitutes an infringement of any United States patent, trademark, copyright, or trade secret. To qualify for this indemnity, however, The University must give Cray prompt notice of any such claim and must co-operate fully with Cray's defence or settlement. If the use of the Equipment, or any part thereof, is enjoined, Cray will, at its own expense and at its option, either (A) procure for The University the right to continue using the Equipment or the infringing part thereof; (B) replace same with non-infringing Equipment; (C) modify it so it becomes non-infringing; or (D) if Cray finds no commercially reasonable solution under (A), (B), or (C) above, accept return of the infringing Equipment, or part thereof, and grant The University a credit equal to the trade-in value of the Equipment, or part thereof, as specified in Cray's then current trade-in-policy. Cray will not be liable to The University for any such claim which is based upon use of the Equipment in connection with equipment, software, or devices not approved by Cray, or in a manner for which the Equipment was not designed.

22. ASSIGNMENTS

Neither party may assign its rights under this Agreement without the written consent of the other.

23. APPLICABLE LAW

This Agreement is governed by laws of the State of Victoria. Any legal action in connection with this Agreement must be filed within two (2) years after the cause for such action has accrued.
24. **NOTICES**

Notices will be effective when received in writing and shall be sent to the person and address designated on the signature page of this Agreement or such other person or address as may have been furnished by The University to Cray by notice according to this Article.

25. **CONFIDENTIALITY**

Each of Cray and The University shall treat and shall ensure that their servants, agents, representatives, advisers or Sub-contractors shall treat all research technical and other information proprietary to the other party of which it becomes aware, in connection with or in the course of the Agreement, as confidential, and shall not disclose it without the prior consent in writing of the other party to anyone other than such persons having a need-to-know who will be required to take appropriate measures to safeguard such information. This obligation shall survive any termination of this agreement. Neither party shall issue any press release concerning this Agreement without prior written consent of the other party.

26. **THE OWNERSHIP OF INTELLECTUAL PROPERTY**

The Intellectual Property in all countries of the world in Supplies and Technical Data which is expressly developed for the purposes of The University under the Agreement, are from the time of creation of each right, the property of The University. The University has the sole right to apply for registration of any such right in all countries of the world.

Where any patentable or non-patentable invention or process or other intellectual property right contained in the Supplies or Technical Data is expressly developed for the purposes of The University under the Agreement, the manufacturer or producer of such Supplies or Technical Data may seek a licence from The University to use the invention or process or exercise that other intellectual property right, subject to such terms as are mutually agreed.

27. **SURVIVAL OF AGREEMENTS**

Notwithstanding the termination or completion of this Agreement, all agreements, covenants, indemnities, and warranties made in this Agreement will continue in full force and effect to the extent required for their full observance and performance.
28. **ENTIRE AGREEMENT**

The terms and conditions in this Agreement and in the Schedule(s) constitute the complete and exclusive statement of the Agreement between The University and Cray and supersede all prior oral and written statements of any kind whatsoever made by either party or their representatives. Any order form used by The University in connection with this Agreement will be considered to have its pre-printed clauses and statements deleted. Any waivers or amendments, to be effective, must be in writing, signed by both parties.

CRAY RESEARCH, INC
655 Lone Oak Drive
Eagan, MN 5512

By: ______________ By: ______________
Name: Douglas Porter Name: Michael Lindseth
Title: University Secretary Registrar Title: Exec. Vice President - Finance
Date: 1 July 1993 Date: 30 June 1993

Notices to: Alan Coulter Notices to: ____________________
Title: Director, Prelude Centre Title: ____________________
SCHEDULE A

HIGH PERFORMANCE COMPUTING EQUIPMENT

CRAY YMP2D/216  (S/N 1409)

2 CPU’s

16 MWord of Main Memory

32 MWord Internal Solid State Storage Device

3 IOP’s (I/O Processors)
   MIOP with 4 LOSP (6 Mb/s) channels
   BIOP with 3 + 1 spare DCU-5
   XIOP with BMX Channels

1 VHISP Channels (1250 Mbytes/s)

3 HISP Channels (100 Mbytes/s)

8 + 1 Spare DD49 Disk Drives (1.2 Gbytes
   @ 10 Mbytes/sec Xfer rate)

Operator Workstation

Maintenance Workstation

FEI-3s Interface for Sun
SCHEDULE B

SOFTWARE

1 UNICOS System Software
1 UNIX Use-B System 4.0
1 TCP/IP
1 FEI-3 (Sun Driver)
1 CF77
1 Cray Standard C
1 Cray Pascal
1 MPP Emulator
Cray shall provide up to one week (5 days) training at no charge to The University. The content of the training shall be mutually agreed but will in general address systems administration, system operations and code optimisation. The University will provide suitable premises to conduct such training and allocate as a minimum two (2) experienced Computer Operators, two (2) experienced Systems Programmers, and two (2) applications support staff to undertake such training.
ATTACHMENT D

SOFTWARE TERMS AND CONDITIONS

1. Cray hereby grants, and The University accepts, a single, non-transferable and non-exclusive licence to use Software and Documentation subject to all the terms and conditions of this Contract. The Software is licensed for use solely for The University’s internal data processing applications, including the provision of data processing service to others in the normal course of The University’s business. No rights to sub licence or market the Software or Documentation are granted. All rights not specifically granted to The University by this License shall remain in Cray with the exception of any linked Fortran/C Libraries.

The Software may be used by The University only on the equipment listed on the Agreement and at the site specified therein. The University may use the Software on other equipment made by the same manufacturer while the equipment listed in Agreement is not operative due to its malfunction. The University may duplicate the Software for backup, archiving or security, but all copyright or proprietary notices in the original must be included in all copies or partial copies. The University shall not reverse assemble or reverse compile any part of the Software. The University shall not translate the Software or Documentation into a computer language (FORTRAN, COBOL, "C", and the like) different from the language in which it was provided to The University by Cray. If Cray provides access to a source listing of the software, The University shall not create executable source code for the Software.

2. Form of Code: The University is licensed to use only the binary format of the Software under this Agreement.

3. Confidentiality and Non-Disclosure: The University acknowledges that the Software and Documentation are proprietary products of, and shall remain the property of Cray or its suppliers. The University will not disclose any Software, Documentation or information contained therein, except to its employees and users for purposes limited to and specifically related to The University’s use of the Software in accordance with this Agreement. The University shall take appropriate action by instruction or signed agreements with said persons to satisfy The University’s obligations under the Agreement. If for any reason The University gains access to Cray manuals containing any confidential or proprietary marking, Cray software source listings, or Cray software source code to which The University does not have a right of access under a written agreement between The University and Cray, The University agrees to not examine, use, copy, or keep such items but shall return them promptly to Cray.
The University's obligations of confidentiality and non-disclosure shall apply to all forms of software received. The University shall maintain records of the location of each original and copy of Software and the serial number of the equipment on which it is used and shall allow Cray or Cray's representative(s) access to those records on reasonable notice.

In connection with this Agreement, each party may disclose other confidential proprietary material or information to the other party. If such material or information is clearly identified at the time as confidential, proprietary, secret, or the like, the receiving party must guard its confidentiality at least as well as that party guards the confidentiality of its own proprietary material and information. This obligation shall continue for a period of five (5) years after seeing or receiving the material or information.

Because harm not adequately compensable might result from unauthorised disclosure of proprietary or confidential information, either party may seek injunction relief, without posting a bond, if the other party breaches its obligations of non-disclosure under this Agreement. Provisions of this Article shall survive any termination of this Agreement.

4. Patent/Copyright: Cray will indemnify The University as to any rightful claim that the Software, or any part thereof (except software supplied to Cray by AT & T, or its UNIX affiliate USL, and incorporated in the Software), constitutes an infringement of any United States patent, copyright, or trade secret. To qualify for this indemnity, however, The University must give Cray prompt notice of any such claim and must co-operate fully with Cray's defence or settlement. If the use of the Software, or any part thereof (except software supplied to Cray by AT & T, or its UNIX affiliate USL, and incorporated in the Software), is enjoined, Cray will, at its own expense and at its option, either (a) procure for The University the right to continue using the Software or the infringing part thereof; (b) replace same with non-infringing substitutes; (c) modify it so that it becomes non-infringing; or (D) if Cray finds no commercially reasonable solution under (A), (B), or (C) above terminate the license of same at no cost to The University except for charges accrued to such time as use in enjoined.

Cray shall not be liable to The University for any claim which is based upon the use of the Software, or any part of it, in connection with equipment, software or devices not approved by Cray, or in any manner for which the Software was not designed, or where the Software has been modified by or for The University.
Parts of the Software or Documentation may have been patented or copyrighted by Cray or its third party provider. Patent or copyright notices have been included in the Software and Documentation for protective purposes, and such notices shall not be construed as causing publication of the Software or Documentation.

When any third-party computer program materials are to be disclosed by The University to Cray or used in conjunction with the Software by The University, The University warrants that it has the right to make such disclosure or use, and agree to indemnify and hold Cray harmless from all liability in connection herewith.

5. Warranty: Cray warrants that when it delivers the Software, the Software will conform in all material respects in Cray's published specifications when operated on the Computer specified in this Agreement. Cray reserves the right to correct manuals due to typographical or clerical errors. In the event of any breach of this warranty, provided notice of the breach is given in writing to Cray within 30 days after the delivery of the Software, Cray will, at its option, repair or replace the Software, or terminate the Agreement and refund any charges paid by The University. This warranty is given by Cray and not by any of its third party suppliers.

Neither Cray nor any of its third party suppliers warrants or guarantees the results from use of the Software.

6. IMPLIED WARRANTIES, DISCLAIMER; INDEMNIFICATION: EXCEPT AS OTHERWISE REQUIRED BY LAW, THE EXPRESS WARRANTY IN THE WARRANTY ARTICLE OF THIS AGREEMENT IS CRAY'S EXCLUSIVE WARRANTY AND IS IN LIEU OF ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND THE REMEDIES STATED THEREIN ARE THE EXCLUSIVE REMEDIES FOR ANY BREACH OF WARRANTY. CRAY WILL NOT BE LIABLE IN ANY EVENT FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES ARISING OUT OF OR IN CONNECTION WITH THIS CONTRACT, THE PERFORMANCE OF THE SOFTWARE/EQUIPMENT OR ITS USE. IN ANY AND ALL CASES, CRAY'S MAXIMUM LIABILITY IN CONNECTION WITH OR ARISING OUT OF THIS AGREEMENT SHALL BE THE EQUIVALENT OF SIX (6) MONTHS OF CHARGES FOR THE RELEVANT SOFTWARE.
THE UNIVERSITY IS RESPONSIBLE FOR THE SELECTION OF
SOFTWARE TO ACHIEVE ITS INTENDED RESULTS, USE OF
SOFTWARE, AND THE RESULTS OBTAINED THEREFROM. THE
UNIVERSITY AGREES TO INDEMNIFY AND HOLD CRAY AND ITS
SUPPLIERS HARMLESS WITH RESPECT TO ALL CLAIMS BY THIRD
PARTIES ARISING OUT OF OPERATION OF THE SOFTWARE.

The license of any Software shall automatically terminate upon de-
installation of the equipment for which it is licensed.

CUSTOMER:

By: [Signature]
Name: Douglas Porter
Title: University Secretary, Registrar
Date: July 1, 1993
Notices to: Alan Coulter
Director, Prentice Centre

CRAY RESEARCH, INC.
655 Lone Oak Drive
EAGAN, MN USA 55402

By: [Signature]
Name: Michael Lindseth
Title: Exec. Vice-President - Finance
Date: July 26, 1993
Notices to: Mark S. McNeil
Director, International Contracts
Cray Research, Inc.
AGREEMENT FOR THE PROVISION OF
HIGH PERFORMANCE COMPUTING SERVICES

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3.1 Cray will transport to the site and install the Equipment and associated facilities at no cost to The University. Cray will place the Equipment in good working order and notify The University when the installation is complete and ready for acceptance.

3.2 The University will if requested by Cray assist Cray in the installation of the Equipment but under Cray's supervision and provided that The University accepts no risk or responsibility in so doing.

4. ACCEPTANCE

4.1 The University and Cray will conduct an acceptance of the system to ensure that:

a) The items of equipment and software and other facilities listed in Attachment A and B to this Agreement have been delivered and installed in good working order and conform substantially to Cray's specifications and;

b) All software documentation and other facilities which will allow The University to operate the equipment in a normal manner have been supplied by Cray.
Facsimile Message

To: Stefan, Jubilee Framers
FAX Nr: 366 7764                     Nr of Pages (including this one): 2

From: Graham REES
Time / Date: 12:01 PM Wednesday, 25 August, 1993

Stefan,

Manufacture from 10mm Craft Wood

Item 1. Single piece of craft wood 740 x 610 mm spray painted white one side only.
Item 2. As per attached drawing, 10 mm craft wood spray painted white as shown

Cheers,

S

Tell me how much & I'll send an order.
10mm Craft wood
Spray white sides of edges shown →
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**Clearly PRINT all order details**

**Supplier:**
Lawrence & Hansen  
25 Parkview St  
Milton QLD  
Postcode: 4064

**Order No:** 147433  
**Supplier Fax:** 369 2515  
**Supplier Phone:** 369 3899  
**Supplier No.:** 

*Order Unit i.e., only/packet/copy etc.*

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Total Order Value $504.65

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Section: 
Requested by: Graham Rees  
Authorised by:  
Enter in Database Yes/No: Entered

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**Delivery to:**  
Department/Client Account No:  
Department/Client:  
Department/Client Order No:  
**Order No:** 147433

**Supplier:**

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**Supplier Fax:** 369 2515

**Supplier Phone:** 369 3899

**Supplier No.:**

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**Total Order Value:** $504.65

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**Accounts Details:**

- Equip-AUC
- Equip-CDN
- Equip-Resale
- Maint-General
- Maint-Resale

**Requested by:** Graham Rees

**Date:** 30 Jul 1993

**Authorised by:**

**Date:** 30 Jul 1993

**Enter in Database** Yes/No: Entered

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<td>3</td>
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<td>2</td>
<td>7</td>
<td>1</td>
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<td></td>
</tr>
</tbody>
</table>

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**Delivery to:**

**Department/Client Account No:**

**Department/Client Order No:**
**Clearly PRINT all order details**

Supplier: Sun Microsystems  
Level 10  
80 Albert St  
Brisbane  
Postcode: 4000

Order No: 747431
Supplier Fax: 221 2680
Supplier Phone: 221 2899
Supplier No.: 

*Order Unit i.e., only/packet/copy etc.*

<table>
<thead>
<tr>
<th>Item (a)</th>
<th>Qty</th>
<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>1</td>
<td>only 300-1072</td>
<td>Power Supply, 520W, M330, S630MP</td>
<td>1453.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Order Value $1,453.95

**Accounts Details:**  
Section:  
Equip-AUC  
Equip-CDN  
Equip-Resale  
Maint-General  
Maint-Resale  
Requested by: Graham Rees  
Date: 30 Jul 1993

**Infrastructure Section**

Order Distribution

<table>
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<tr>
<td>6</td>
<td></td>
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</tr>
</tbody>
</table>

Delivery to:  
Department/Client Account No:  
Department/Client:  
Department/Client Order No:  

**FAXED: 3/8/93**
# Sales Quotation

Sun Microsystems Australia Pty. Ltd.  
A.C.N. 003145337

**Customer:** Graham Rees  
**Addr:** University Of Queensland Prentice Centre  
ST LUCIA, QLD 4072

**From:** Phil Grimshaw  
**Addr:** Sun Microsystems - QLD Office Level 10  
80 Albert Street  
Brisbane, QLD 4000  
Ph/Fax: (07) 221 2899 / (07) 221 2680

Sun is pleased to quote as follows  
Approved By Branch Manager: ________________  
Date: ________________

<table>
<thead>
<tr>
<th>Item</th>
<th>Product Number</th>
<th>Description</th>
<th>Qty</th>
<th>Unit List Price</th>
<th>Disc</th>
<th>Unit Net Price</th>
<th>Extended Net Price (AS)</th>
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<tbody>
<tr>
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<td>Power Supply, 520W, M330, S630MP</td>
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<td>2,077.07</td>
<td>30.000</td>
<td>1,453.95</td>
<td>1,453.95</td>
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</table>

**Quote Total:**

1,453.95

*Delivery of 7 days expected from receipt of order.*

---

**Sales Quotation Terms and Conditions.**

To accept this Sales Quotation, either sign and return or issue a purchase order referencing the above Quote number. This Quotation is accepted by Customer subject to the terms of the Sun Sales Agreement. The terms of Customer’s purchase order or other documents shall not apply. Any variations are binding on Sun only if signed by an authorised officer of Sun. Summary of Sun Sales Agreement Quotations are valid for 60 days. Orders are subject to acceptance by Sun and product availability. Payment is due within 14 days of Sun’s invoice or Sun approved credit terms. Sun may suspend or cancel supply if Customer commits a default or breach. Title remains with Sun until payment is received in full. Prices include delivery. All taxes are payable by customer. Products are customer-installable and deemed accepted within 7 days of shipment. Risk passes on delivery to Customer or carrier. No cancellations or returns without Sun’s written consent. Standard 90 day return to Sun warranty applies. All other warranties excluded. 3rd party products are as warranted by manufacturer. Sun’s liability is limited to repair, replacement or refunding of price paid, as per Trade Practices Act, 1974 as amended. Sun is not liable for incidental, special or consequential damages or losses, including loss of profits, business, software or data. All software remains under Sun or its licensor’s licence. All documentation and information is copyright and confidential property of Sun. Products of US origin are subject to export control law.

**ACCEPTED FOR CUSTOMER BY SIGNING BELOW OR ISSUANCE OF PURCHASE ORDER ACCEPTING THIS QUOTATION AND ITS TERMS**

NAME: ___________________________  
TITLE: ___________________________

SIGNATURE: _______________________  
DATE: ________________________

QUOTEMASTER
Tue, 27 Jul, 1993

Mr R Maguire
Manager, Security Section

Richard,

The Prentice Centre is taking delivery of a large computer system and I would appreciate your arranging for the following traffic control to assist in this delivery:

Monday 9th August 93 is the first delivery of 4 tonnes of equipment which will require the two parking spaces, one either side of the Prentice building delivery lane from Cooper Road, to be kept clear. Delivery is expected during the morning.

Thursday 19th August 93 will be a delivery of 18 tonnes of equipment which will require all parking on Cooper Road to be restricted. It is anticipated that unloading will occur in the cul-de-sac at the end of Cooper Road by Fork Lift and may take most of the day. For the safety of on-lookers, I would appreciate if your staff could be present to direct vehicular and personnel traffic in this area.

Yours faithfully,

Graham Rees
Deputy Director
Hi Graham
Sorry to hear you have been ill.

The Pre-ship delivery is planned to deliver to site on the 9th. This is firm.

I plan to fly to Brisbane morning of the 8th and stay a few days backending 13th.

We will need the floor cut-outs for the MG to be done before hand
This is the 400hertz mg. You will find dimensions in the Cray Support Equipment Site Planning manual.

The system is planned for the 19th but if possible will make it the 13th.
The system comes out of its current home on 14th (council regs prevailed here)

In order to remotely support the system I hope to place a modem connected to the Maintenance workstation. If Cray orders the connection is it OK to give your name and number as a contact for the installation.

I'll be shipping up our install tools next week. Consists of a large tool cart and some cartons. Is this OK and can you put them somewhere safe for me please.

With the system shipment we'll be shipping a workbench, a table some spares cabinets plus a sizeable quantity of spares. The workbench requires 120V 60hertz power close at hand for the repair of the IOS and SSD modules.

Also a couple of 120V 60Hertz GPO's in the computer room would be handy.

What sort of single phase 120v 60hertz receptacles will you be using
I'll probably have to get a few plugs to convert some test equipment.

Best Regards
Hope you are feeling better
Dermot
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
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<td></td>
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<tr>
<td>(c)</td>
<td>20 ea 813</td>
<td>Utilux Universal Earth Clamps</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>3 ea</td>
<td>Glands to suit Item (a)</td>
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<td></td>
<td></td>
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<tr>
<td>(e)</td>
<td>2 ea</td>
<td>Cable cutting costs</td>
<td>7.5</td>
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</tbody>
</table>

**Total:** 2,127.52

---

Graham Rees
16 Jul 1993

---

9. Cray Installation

---

**FAXED: 26/7/93**
Clearly PRINT all order details

Supplier
Lawrence & Hansen
25 Parkview St
Milton QLD
Postcode: 4064

Order No: 746959
Supplier Fax: 369 2515
Supplier Phone: 369 3899
Supplier No.: 

*Order Unit i.e., only/packet/copy etc.

<table>
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<tr>
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<th>Qty</th>
<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
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<tbody>
<tr>
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<td>PVC/PVC</td>
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<tr>
<td>(c)</td>
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<td>m</td>
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<td>Cable 35 sqmm 3 core+earth circ</td>
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<tr>
<td>(d)</td>
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<td>ea</td>
<td></td>
<td>Glinds to suit Item (c)</td>
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Total Order Value $ 2,027.70

Accounts Details: 
Section: Infrastructure Section
Requested by: Graham Rees Date: 16 Jul 1993
Authorised by: Date: 16 Jul 1993
Enter in Database Yes/No, Entered

Order Distribution

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<td>Cray Installation</td>
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Delivery to: ................................. Department/Client Account No: .................................
Department/Client: ............................... Department/Client Order No: .................................
### Clearly PRINT all order details

**Supplier**

<table>
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<tr>
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<tr>
<td>Lawrence &amp; Hansen</td>
<td>746960</td>
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<tr>
<td>25 Parkview St</td>
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<td>Milton QLD</td>
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*Order Unit i.e., only/packet/copy etc.*

<table>
<thead>
<tr>
<th>Item (a)</th>
<th>Qty</th>
<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
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<tbody>
<tr>
<td>(a)</td>
<td>200</td>
<td>m</td>
<td></td>
<td>Cable 2.5 sqmm 4 core+earth circ</td>
<td>2.85</td>
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<tr>
<td>(b)</td>
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<td>m</td>
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<td>Cable 35 sqmm 3 core+earth circ</td>
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<tr>
<td>(c)</td>
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<td>m</td>
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<td>Cable 35 sqmm 4 core+earth circ</td>
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<tr>
<td>(d)</td>
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<td>(e)</td>
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Total Order Value $2,029.10

**Accounts Details:**
- **Section:** Infrastructure Section
- **Requested by:** Graham Rees Date: 16 Jul 1993
- **Authorised by:** Date: 16 Jul 1993

**Order Distribution**

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<tr>
<td>2</td>
<td>6 8 3 0 3 3 0 2 7</td>
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</tr>
<tr>
<td>3</td>
<td>1 0 1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5 6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1 2 3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4 5</td>
<td></td>
</tr>
</tbody>
</table>

Delivery to: ........................................... Department/Client Account No: ...........................................

Department/Client: ........................................... Department/Client Order No: ...........................................
Dermot Kennedy, 7:32 PM 13/7/9...Re: Cray Install(TIMELINE)

Delivery-Date:  
From: uu42@techops.cray.com (Dermot Kennedy)  
Subject: Re: Cray Install(TIMELINE)  
To: ccorees@cc.uq.cze.au (Graham Rees)  
Date: Tue, 13 Jul 1993 19:32:23 -0500 (CDT)  
Cc: uu91@techops.cray.com (Andrea Calamante)  
X-Mailer: ELM [version 2.4 PL17]  
Content-Type: text  
Content-Length: 2352

> Dermot,
> 
> sorry to keep sending you these "tomes". But more information is better 
> than the alternative.
> 
> Not at all I much prefer information. Talking to Liebert today - might be 
> able to move things forward a few days to achieve a little more "comfort"
> buffer.
> 
> A few questions:
> 
> Assuming the preshipment of the MG the RCU and the pipe kit and also the 50/60 
> converter arrives at site 10th 11th August; this leaves a very short time to get 
> 
> The 9th would be better.

ANDREA WILL BE IN CANBERRA THIS THURSDAY. WE PLAN TO REVIEW TIMELINES THEN 
I'LL LET YOU KNOW IF WE CAN MAKE THE 9TH.

> >19th August 
> >Deliver to site start time approx 0700 hrs. 
> >The primary objectives are accurate placement of the fixed item. 
> >This usually takes 4 to 5 hours. 
> >Cray then prepares the IOS power supplies and other equipment to facilitate 
> >the electrical connections. 
> >The electricians start on the connections. 
> >Cray continues with assembly and placement of equipment etc. 
> >Normally this isn't too long a day with us leaving the site at about 
> >2100 hrs.
> >
> >One main objective is to attach all the refrigeration lines an start 
> >pulling a vacuum for 16 to 24 hours. This is necessary to ensure that 
> >there is no moisture in the system (which causes acid build up and corrosion)
> 
> I was expecting Liebert to supply the neccessary vacuum equipment for this 
> and the R-22 refrigerant. Is this correct?

YES .GET THEM TO DO THIS. THEY WILL NEED THIS EQUIPMENT FOR 
THE TESTING OUTINED IN SPEC"REFRIGERATION PIPING AND COMPONENT INSTALLATION 
REQUIREMENTS". WE WILL NEED APPROX 125 LBS OF R22 TO CHARGE THE SYSTEM.

ONCE LIEBERT HAVE COMPLETED THEIR TESTING WE WILL NOT REQUIRE THE 
VACUUM PUMPS AS WE HAVE OUR OWN AS PART OF THE TOOLS AND SPARES WE WILL SHIP UP 
I'LL BE SENDING 2 PUMPS...ONE RUNS ON 60 CYCLE AND THE OTHER ON 50 CYCLE.

> >This means I probably won't get away till midnite.

Printed for Graham Rees <G.Rees@cc.uq.edu.au>
I'll buy you a beer.

WE'LL MAKE SOME TIME FOR A COUPLE.

Cheers,

Graham Rees
Deputy Director
Prentice Centre
The University of Queensland
Queensland 4072
Clearly PRINT all order details

Supplier
Olex Cables
541 Bilsen Rd
Geebung QLD

Postcode: 

*Order Unit i.e., only/packet/copy etc.

<table>
<thead>
<tr>
<th>Item (a)</th>
<th>Qty</th>
<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
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<tbody>
<tr>
<td>(a)</td>
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<td>m</td>
<td>CATR05AA002</td>
<td>2C 2.5 sqmm PCW PVC PVC BRD PVC flex</td>
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Total Order Value $ 45.00

Accounts Details: 
- Equip-AUC
- Equip-CDN
- Equip-Resale
- Maint-General
- Maint-Resale

Section: Infrastructure Section
Requested by: Graham Rees
Date: 19 Jul 1993

Authorised by: 
Date: 19 Jul 1993

Enter in Database: Yes/No, Entered

Order Distribution

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<tr>
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Account Number | Departmental Reference | Amount in whole Dollars only

Delivery to: ......................................................... Department/Client Account No: ........................................
Department/Client: .................................................. Department/Client Order No: ...................................
Clearly PRINT all order details

Supplier
Lawrence & Hansen
25 Parkview St
Milton QLD
Postcode: 4064

Order No: 7126962
Supplier Fax: 369 2515
Supplier Phone: 369 3899
Supplier No: ....................................

*Order Unit i.e., only/packet/copy etc.

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<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
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<td>only</td>
<td>NHP Switchboard, 24 pole, 3 off XS125NJ/100 3 pole CBs, 1 off XS125NS/20 1 pole CB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>1</td>
<td>only</td>
<td>NHP Switchboard, 48 pole, 11 off XS125NJ/20 3 pole CBs, 7 off XS125NS/20 1 pole CB</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**FAXED: 21/7/93**

Total Order Value $4,320.00

Accounts Details: 
Equpp-AUC ☐
Equpp-CDN ☐
Equpp-Resale ☐
Maint-General ☐
Maint-Resale ☐

Section: Infrastructure Section
Requested by: Wilber Date: 16 Jul 1993
Authorised by: Date: 16 Jul 1993
Enter in Database Yes/No. Entered ...........................................

Order Distribution

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<tbody>
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<tr>
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<td></td>
</tr>
<tr>
<td>5</td>
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</tr>
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<td>6</td>
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</table>

Account Number | Departmental Reference | Amount in whole Dollars only

Delivery to: .................................................. Department/Client Account No: ..................................
Department/Client: ............................................ Department/Client Order No: ..................................
Clearly PRINT all order details

Supplier: Klockner Moeller
5 Harvey St
Eagle Farm
Postcode: 4009

Order No: 746961
Supplier Fax: 868 1672
Supplier Phone: 868 1672
Supplier No.: 0

*Order Unit i.e., only/packet/copy etc.

<table>
<thead>
<tr>
<th>Item (a)</th>
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<th>Order Unit*</th>
<th>Part No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Stk No</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
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<td>only</td>
<td>NZM6-200/ZM6 Circuit Breaker-200</td>
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<td>only A-NZM6</td>
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Total Order Value $ 1,339.55

Accounts Details: Infrastructure Section
Equip-AUC ☑
Equip-CDN ☑
Requested by: Graham Rees
Date: 14 Jul 1993
Authorised by: Graham Rees
Date: 14 Jul 1993
Enter in Database Yes/No, Entered

Order Distribution

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<tbody>
<tr>
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<td>X X X</td>
</tr>
</tbody>
</table>

Delivery to: Department/Client Account No: ........................................
Department/Client: Department/Client Order No: ........................................

Marked 217
Hi Graham,

You may have detected that you are short drawing 10657932 "WIRE DIAGRAM-REFRIGERATION CONDENSING UNIT(RCU-4)"

We are sending you a copy.

The major points of interest are the terminations of the control wire runs from the PDU-160 and the HEU. I am referencing drawing Power Distribution Diagram 10655802.

There are two 5 conductor runs one from the HEU and one from the PDU.

The terminations in the RCU-4 are as follows.

TB4
1 Ground From HEU and PDU
2 Phase from HEU
3 Neutral from HEU
4 RCU fault HEU
5 RCU fault HEU
6 Phase from PDU
7 Neutral from PDU
8 RCU fault to PDU
9 RCU fault to PDU

MTS-3
This item is not on the Machine Unit Specification

There are two single phase 120volt 60 hertz circuits required. The tester and the Micro to drive it are the units requiring this power.

The tester and the micro together use about 1.8 kva tis may mean you can put both receptacles on the one 20 amp circuit.

Best Regards

Dermot
Hi Graham,
sorry to keep sending you these "tomes". But more information is better
than the alternative.
>
> Dermot,
>
> Some revised critical dates:
>
> 1. The IBM 3081 system turn off and removal has been delayed a little.
Removal date is now 2 August. So probably about the 4/5 August is the
earliest to begin Cray install.
>
I am a bit concerned for you with the two week slip from the 19th of July
to the 2nd August for the turnoff and removal of the IBM equipment.

In discussions with Andrea yesterday I had buttoned in the preshipment date
as the 26th or 27th July. This was allowing the week of the 19th for theremoval of the
IBM system, the usual cleanup after and the work on the floor which included the
stringer to pedestal connections for the Ground Grid.
This work I assume will be taking place the 2-6 August.

Assuming the preshipment of the MG the RCU and the pipe kit and also the 50/60
converter arrives at site 10th 11th August; this leaves a very short time to get
the necessary electrical and plumbing works completed.

The basic timeline for the system would be

19th August
Deliver to site start time approx 0700 hrs.
The primary objectives are accurate placement of the fixed item.
This usually takes 4 to 5 hours.
Cray then prepares the IOS power supplies and other equipment to facilitate
the electrical connections.
The electricians start on the connections.
Cray continues with assembly and placement of equipment etc.
Normally this isn't too long a day with us leaving the site at about
2100 hrs.

One main objective is to attach all the refrigeration lines and start
pulling a vacuum for 16 to 24 hours. This is necessary to ensure that
there is no moisture in the system (which causes acid build up and corrosion)

This means I probably won't get away till midnite.
20th August (FRIDAY)
0700 hours Back on site
Cray – pre power checks, charge RCU

1200 hours
Electrical power work completed.
Pre power check completed

Fill system with flourinert

The main objective here is to get the system into a safe and stable operating parameter as far as power and cooling is required.

The system would then be powered off for the evening.

21st 22nd August Saturday and Sunday
This is where the bulk of the hardware installation, and quality assurance checks will be done. We will be flying in extra staff to make 5 intotal to break the back of the work. Sometimes we work around the clock but in this instance we will probably split into 12 hour shifts and overlap.

The extra staff (two) will fly out late Sunday.

The hardware installation will continue on the 23rd 24th

This allows time to test spares and get the site a little organised.

25th August
Handover to the Cray software people.
Build and install software and set up the system.
I expect this to be complete on the 29th

30th and 31st are as yet uncommitted (safety net)

1st September
Handover to University of Queensland

This is of course a broad outline which allows some flexibility to restructure to meet the target.

> 2. Advice from Liebert says CW system arrives 16 August. The earliest possible date for Cray switch on then is about the 18th.
> Hmm. As long as we have water available Friday 20th it shouldn’t cause any drama.
> Some more power questions:
> > 3. The 400 Hz MGS has a max power out of 95.61kVA = 133 A/ph. The Cray Y-MP2 draws 76.62 kVA = 106 A/ph. Supply to MGS will be 160 Amp Circuit.
> Breaker will be 160 Amp thermal and 1600 Amp magnetic. OK?
> > 4. I won’t put a shunt trip isolator on the 60 Hz power distribution board.
If the 50/60 H Freq Conv is completely mindless then I'll put a shunt trip in the supply feed before this device.

Cheers,

Graham Rees
Deputy Director
Prentice Centre
The University of Queensland
Queensland 4072
Hi Graham

The response to question 3 is long so I'll cover item 1&2 in a separate mail
>
> Dermot,
>
> Some revised critical dates:
>
> 1. The IBM 3081 system turn off and removal has been delayed a little.
> 2. Removal date is now 2 August. So probably about the 4/5 August is the
> earliest to begin Cray install.
>
> 2. Advice from Liebert says CW system arrives 16 August. The earliest
> possible date for Cray switch on then is about the 18th.
>
> Some more power questions:
>
> 3. The 400 Hz MGS has a max power out of 95.61kVA = 133 A/ph. The Cray
> Y-MP2 draws 76.62 kVA = 106 A/ph. Supply to MGS will be 160 Amp Circuit.
> Breaker will be 160Amp thermal and 1600 Amp magnetic. OK?

>

The figures in the Machine Unit Specification are the steady state load figures.

The 50cycle 415 Volt feed to the MGS-5 must be sized to accomodate the
steady state load and also the START loadings.

Please bear in mind that we are working with a large mass.

The YMP start sequence is initiated at the YMP Warning and Control System
panel at the rear of the mainframe. This is commonly called the WACS. The
IOS PDU is slaved to the Ymp WACS. The start sequence is initiated by pressing the
start button on the YMP. Providing there are no fault conditions the WACS
starts the mgs-5. The MGS-5 utilises a "Partial Winding" start to limit the
current draw on startup. Power is applied to this "partial Winding" to bring the
motor and generator up to correct rotational speed.

THE CURRENT DRAW FOR THIS "PARTIAL WINDING" start is
152 Amps per phase for 23 seconds.

As the unit approaches correct rotational speed the current draw of the "partial
winding" decays. At this stage the generator is NOT excited.

The full motor winding contactor is energised. This causes a short
duration (less than .05 second) inrush of 304 Amps. The current
draw then steadies to sufficient to maintain the rotation.

The field windings of the generator are then excited and the 400Hz voltage
builds and of course is applied to the YMP and the IOS. When this is complete
the YMP system reaches its steady state load.

-----

The MGS-5 unit INPUT circuit breaker is rated at 175 amps
Cray Research recommends a 50 cycle feed circuit of 200amps with a 200 amp breaker
with a 10x trip rating. This includes as you are aware certain tolerances
to ensure that customers do NOT experience problems in this area.

-----

While Cray Research does not recommend deviation from circuit ratings as
described in document "Wire Diagram-MGset, One MGS-5" drawing 10657919 A;
we are sensitive to the tight funding situation and the financial attractiveness of
using "at hand" components.

As the MGS-5 will be pre shipped to the site there is a window of opportunity
to test the 160 Amp circuit breaker of your choice. The MG-set can be
run up in local mode to simulate the startup conditions.

To allow for a fallback position which will not impact the installation

(a) Use 200 Amp rated cable from the Breaker to the MGS-5

(b) Ensure that a 200 Amp 10X breaker is available in the same frame size as the 160
Amp Breaker you wish to try. If the 160 Amp breaker is inadequate it can
therefore be easily replaced.

> 4. I won't put a shunt trip isolator on the 60 Hz power distribution board.
> If the 50/60 H Freq Conv is completely mindless then I'll put a shunt trip
> in the supply feed before this device.
>
Yes the 50/60 Frequency convertier is Mindless.

As in our Quality assurance testing of the system during installation we
force numerous fault conditions it would be wise to leave the shunt trip
connection until after the work is completed.
>
Cheers,

> 

> Graham Rees  EMaiL: G.Rees@cc.uq.edu.au
> Deputy Director  Tel: + 61 7 365 4143
> Prentice Centre  Fax: + 61 7 365 4477
> The University of Queensland
> Queensland 4072
> 

> Printed for Graham Rees <G.Rees@cc.uq.edu.au>
Hi Graham just been off on some leave. I'm in that use it or lose it situation. 22C sounds excellent

How are you on this beautiful 22C Queensland day. Love this weather.

1. Is it worth putting a shunt trip isolator in the 400Hz Distribution Board? I notice the PDU produces such a signal to operate a shunt trip. Or exactly what should this signal trip, if anything. In the event of a fault condition the Warning and control System integral to the YMP will de-excite the MG. I have not seen these contacts used but if you wish to use them perhaps the best thing to shunt trip would be the 50/60 converter. However I imagine you have protection in the way of smoke detectors etc wired to trip power feeds already. My guess is that the contacts are 120 volt normally open similar to the remote alarm. The remote alarm contacts can be useful in "dark room" operation.

2. Who should I talk to about getting a "full" set of manuals asap - a request from our supercomputer programmer.

I'll pass on your request. The manuals I am assuming to be supplied will be at the appropriate OS rev level. These would be ordered from the US. Therefore they would take a couple of weeks to arrive. I am assuming we will be assigning one of our systems persons to your project. I will confirm and pass on the contact details asap. In the interim we can send up some manuals if we have them in stock. Does your programmer have a particular interest so that we can focus on that. Also I believe "Cray cycles" can be made available on the CSIRO machine. Let me know if you are interested.

It is important for you to assign a systems administrator for the Cray. This person in the initial phases would work closely with our systems people to achieve a good result.

3. Just to let you know some significant dates. The IBM 3081 will be turned off July 19th and the room cleared the following week - preferably by Tuesday. The rest of this week we'll use for cleaning the floor, clean up power cable distribution and shield the floor. I'm ordering the airconditioning today. Liebert say 4-6 weeks but they recon on 5.

When are you likely to come up and discuss install details?

I'll need to discuss it with Andrea but I think the week 26th July for a couple of days would be best.
Hopefully I'll be able to tie it up with the arrival of the pre-ship equipment. At this stage we'll be able to mark out the floor etc and address any issues.

> Cheers,

> GRAHAM REES  
> Deputy Director  
> Prentice Centre  
> The University of Queensland  
> Queensland 4072

>
2nd July, 1993

Mr Graham Begg,
Prentice Centre,
University of Qld,
ST LUCIA 4067

Dear Sir,

Further to your letter dated 18/7/93, I wish to confirm that our quotation dated 20/7/93 is as follows:

1) All work will be carried out in accordance with the relevant standards for the University of Qld design standards.

2) Supply, installation and testing of refrigeration piping as per specification. Valves, gauges & hose nibs supplied by others. We include items from previous quote to be worked in or add on.

3) Charging of the system with refrigerant.

4) Installation of drain & drain pipe to provide external to the building (additional valve supplied by others).

5) Supply and install chilled water connection between the Chiller system and the Grey WDL unit as per specification.

6) We will provide the interlock wiring from a supplied circuit breaker on the main panel to the Chiller system as described in our quote.

From reading the supplied specification, we understand that a Gray representative will be present during the commissioning and start up of the system.

If you require any additional information, please do not hesitate to contact this office.

Yours faithfully,

G. Frazer
SYSTEMS CONSULTANT

LIEBERT CORPORATION AUSTRALIA PTY LTD
## CSU 3000 TRIPLE AIR COOLER

### Nett Capacity

<table>
<thead>
<tr>
<th>Category</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaving Air</td>
<td></td>
</tr>
<tr>
<td>Low Cap.</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>High Cap.</td>
<td></td>
</tr>
<tr>
<td>Cooler</td>
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</table>

### Coolant Pump Set

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Size - kW</th>
<th>Flow Rate</th>
<th>Total Heat</th>
<th>Module Pumps</th>
<th>Hose Kit</th>
<th>City of Use</th>
</tr>
</thead>
</table>

### Electrical

- Supply Voltage: 7.2 kV
- FLA: 2 A

### Separation

- Utility: 7.2 kV
- U.P.S.: 7.2 kV

### Dimensions

- REV: 05/12/16/92
<table>
<thead>
<tr>
<th>Condenser</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td></td>
</tr>
<tr>
<td>No. of Passes</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Liquid Use</td>
<td></td>
</tr>
<tr>
<td>Hot Oil Use</td>
<td></td>
</tr>
<tr>
<td>Valves</td>
<td></td>
</tr>
<tr>
<td>Rejection</td>
<td></td>
</tr>
</tbody>
</table>
Mr G Frazer  
Liebert Corporation Australia Pty Ltd  
Bowengate Business Park  
Bowen Bridge Rd  
Bowen Hills QLD 4006

Greg,

Re: Your Quotation QA2154 for Supply of Chilled Water and Refrigeration Equipment

Thank you for your quotation. With reference to this project please find attached:

- RCU-4 Document HR-00082-0D  
- Refrigeration Piping & Component Installation Requirements Document 10650228  
- Computer Room 2 Refrigeration and Equipment Layout for Cray Y-MP2

I have previously supplied you with Cray drawing 10655804 Refrigeration Lines Cray Y-MP2, Queensland University. You will note that the equipment layout has been changed to that detailed on this drawing.

The University of Queensland will place the RCU in situ, provide electrical power to this unit and floor cut-outs, for refrigeration and chilled water lines, as per document HR-00082-0D Figure 2-21. A Circuit Breaker will be provided for power in the main switch (Room 111). Power wiring from the main switch room to the unit must be supplied by Liebert.

I would appreciate your confirmation that your quotation includes:

1. That work will be carried out in accordance with the relevant sections of The University of Queensland's, Design Standards for Construction Projects (available on request from The University of Queensland, Buildings and Grounds division).

2. Supply, installation and testing of refrigeration piping as per specifications attached.

3. Charging of the refrigeration system with R-22 refrigerant.

4. Supply of pressure relief piping venting externally to the Computer Room to a safe location.

5. Supply of chilled water connection between your CT663A system and the Cray RCU-4 unit as per specification HR-00082-0D Figure 2-24.

Thank you for prompt service.
Yours faithfully,

Graham Rees
Deputy Director
29th June, 1993

Mr Graham Rees,
Prentice Centre,
University of Qld.,
BRISBANE 4001

Dear Sir,

Further to our conversation we are pleased to provide you with a quotation for a Chiller system as per your specification.

The Chiller system has built in redundancy in that it consists of three modules of which any two will operate. Each unit module has a separate pump, compressors and heat exchangers. The Chiller offered is 88KW which will provide capacity for expansion if required.

The Chiller will consist of the main module with the compressors inside and three outside condensers. These condensers will be located in or near the garden area as shown. The price for the installation consists of:

- Three circuits of pipework each 20 metres in length to connect the Chiller to the outdoor condensers.

- Three circuits of electrical cabling to connect the condensers to the Chiller controls.

- One new circuit from the main switchboard to supply new Chiller system. Please note, no alteration work to switchboard has been allowed for to obtain sufficient supply.

- Three metres of insulated pipework to connect Cray computer to Chiller.

- Installation of brackets on concrete slab for condensers.

- Delivery and positioning of Chiller and Condensers.

- 12 months parts and labour warranty.
University of Qld

Graham Rees

3654143

3654477

TO:..................................................
FOR ATTENTION:..............................
PHONE:...........................................
FAX:............................................
PROJECT:........................................
CONSULTANT:..................................
QUOTATION No.:...............................29/6/93
DATE:.............................................

<table>
<thead>
<tr>
<th>MODEL</th>
<th>QTY</th>
<th>PRICE</th>
<th>SALES TAX</th>
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</thead>
<tbody>
<tr>
<td>Chiller</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT663A</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensers to suit Fan Speed Controllers</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>Commissioning &amp; Labour Warranty</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Installation</td>
<td>1</td>
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<tr>
<td>Freight</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Optional:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>. Preventative Maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Visits ADD $1500.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>. Water Detection</td>
<td></td>
<td>ADD $870.</td>
<td></td>
</tr>
</tbody>
</table>

4-6 Weeks

DELIVERY..............................................

Nett 30 Days From Date of Invoice

TERMS OF PAYMENT..................................

VALIDITY...........................................

$76,935 Excl. S/Tax

NET TOTAL...........................................

Included

FREIGHT............................................

ALL ENQUIRIES.................................

Greg Fraser

SIGNED..............................................

LIEBERT CORPORATION AUSTRALIA PTY. LTD. A.C.N. 003 469 654 * DIVISION OF EMERSON ELECTRIC U.S.A.

"Quality Is Caring"
Please refer to attached specification and quotation for all technical and pricing information.

If you require any additional information, please do not hesitate to contact our Brisbane office.

Yours faithfully,

LIEBERT CORPORATION AUSTRALIA PTY LTD.,

[Signature]

Greg Fraser,

SYSTEMS CONSULTANT.
FEATHERS AND BENEFITS

Easy Expansion

Dynamic response to growth in computer capacity with dual and triple capacities at the touch of a button.

Redundancy

100% redundancy for CDD and 50% redundancy for CT chillers. Automatic switchover for fail-safe protection, with every critical element duplicated for dependability.

Back-Up Coolant Tank option

Total protection during power outages.

Solid State Reliability

Proven electronic controls and alarms to keep the system on-line.

Remote Monitoring

With the optional information gathering module full data of the chiller operating modes and alarm information can be signalled to Liebert Sitemater or Site-Scan.

Easy Installation

Flexible plug-compatible hose connections to CDU.

Energy Efficiency

Semi-hermetic compressors with highest COP in the industry to minimize energy cost.

Alternate Water Source

Energy saving configuration with existing building chilled water, backed by Liebert CSU 3000 single module.

Built-in Dependability

CSU3000 chillers contain dual or triple, totally independent, complete cooling units. Compressors, pumps, condensers and control electronics are all duplicated to prevent single component failure from taking down the system.

Dual/Triple Capacity Control

All models can be equipped with capacity control that enables the chiller to increase or decrease its cooling capacity to match a change in computer loads and allow anticipated growth in computer equipment.
GENERAL

Water-cooled mainframe computers rely on a continuous supply of liquid coolant to maintain processor temperature below a specified limit. Coolant specifications typically are 16°C or below. Exceeding temperature specification can result in imminent shutdown, interruption of computer operations, and possible hardware damage resulting in costly repairs at the user's expense. Re-starts following such a shutdown can be time consuming.

Liebert CSU 3000 Series Chillers are application matched to the temperature control and heat rejection requirements of water cooled processors, and provide 100% backup in the unlikely event of failure. Both coolant flow and temperature are precisely regulated to keep processor cooling within specification.

Unlike building chillers, every critical element is duplicated for dependability. No single component failure will interrupt operation. A monitoring system alerts personnel to alarm conditions instead of allowing temperature shutdown, and in case of malfunction, switch-over to the stand-by module is automatic.

The 3000's close-coupled, closed loop system also supplies cleaner coolant to the processor heat exchanger, reducing the fouling factor. Use of the CSU 3000 is also more efficient. Cooling requirements can be met during periods of low outside temperature without the extra expense of operating a large facility chiller.

Installation is simple. Liebert chillers can be supplied with plug-in hose connections and pre-charged refrigeration circuits. And, in case of expansion, the CSU 3000 has the capability to be easily upgraded to increase cooling capacity. The CSU 3000 is available in both dual and triple capacity models, allowing precise cooling over a wide range of heat loads.

The advantages of Liebert 3000 Series Chillers make them a clear choice for meeting the cooling requirements of mainframes.
### GENERAL CONT.

<table>
<thead>
<tr>
<th>Desirable Feature</th>
<th>Packaged System</th>
<th>Building Chiller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Redundancy automatic switchover.</td>
<td>Yes. 100%</td>
<td>No</td>
</tr>
<tr>
<td>Easy Installation</td>
<td>Yes. Flexible plug-compatible hose connections to cdus.</td>
<td>Doubtful. Piping, pumping and control may require special design</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Yes. Many energy saving features. Highest COP in the industry.</td>
<td>Usually not. Chiller capacity probably is far in excess of computer needs, making operation of the chiller inefficient during some periods.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Yes. Local and Remote.</td>
<td>Not available.</td>
</tr>
<tr>
<td>Proven Design</td>
<td>Yes. Factory assembled and tested.</td>
<td>Tapping into building chillers with needed controls and is typically a &quot;first time&quot; approach.</td>
</tr>
<tr>
<td>Easy Expansion</td>
<td>Yes. Dual and Triple Capacities increase cooling capability at the touch of a button.</td>
<td>Difficult. Re-design and re-sizing of pumping equipment.</td>
</tr>
<tr>
<td>Precise Control Of Flow and Temperature</td>
<td>Yes. Integral Control System.</td>
<td>More difficult. Piping length and fittings can introduce transport lag.</td>
</tr>
</tbody>
</table>
## AIR COOLED DATA

<table>
<thead>
<tr>
<th>Nett Capacity (Based on 2 Modules Operating)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaving water Temperature - °C</td>
<td>11.1</td>
<td>12.2</td>
</tr>
<tr>
<td>Low Capacity - kW (Opt)</td>
<td>35.3</td>
<td>36.9</td>
</tr>
<tr>
<td>Med. Capacity - kW</td>
<td>63.5</td>
<td>65.8</td>
</tr>
<tr>
<td>High Capacity - kW</td>
<td>88.0</td>
<td>91.1</td>
</tr>
<tr>
<td>Coolant Flow Rate - l/s</td>
<td>3.02</td>
<td>3.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coolant Pump Data</th>
<th>STD. PUMP</th>
<th>OPT. PUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Size - kW</td>
<td>1.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Flow Rate - l/s</td>
<td>3.02</td>
<td>4.04</td>
</tr>
<tr>
<td>Total Head - kPa</td>
<td>307</td>
<td>307</td>
</tr>
<tr>
<td>Module Pressure Drop - kPa</td>
<td>73.5</td>
<td>123</td>
</tr>
<tr>
<td>Hose Kit P.D. - kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2m</td>
<td>34.0</td>
<td>58</td>
</tr>
<tr>
<td>18.3m</td>
<td>53.6</td>
<td>92</td>
</tr>
<tr>
<td>Qty of Supply &amp; Return Hoses</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

### Electrical Data

| Supply - V/Ph/Hz          | 415/3/50 | 415/3/50 |
| F.L.A. - A                | 93.4     | 46.7     |

### Separate Pump Power Supply

| Utility - A | 84.0 |
| UPS - A     | 9.4  |

### Dimensions (mm)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2337</td>
</tr>
<tr>
<td>Height</td>
<td>1829</td>
</tr>
<tr>
<td>Depth</td>
<td>889</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>1234</td>
</tr>
</tbody>
</table>

* Values reflect 2 coolant pumps, 2 compressors, 2 control circuits and 2 heat rejection systems, powered from a single source.
CSU 3000 10 - 100 kW MAINFRAME COOLING SYSTEMS

STANDARD FEATURES

Compressorised Systems

High efficiency semi-hermetic compressors are standard equipment. Built-in sight glasses, allow fast determination of refrigerant and oil levels. Over-load protection, suction line strainers, reversible oil pumps for forced feed lubrication and pump down control are provided. They are mounted on vibration-isolating springs and, running at only 1450 RPM, are quiet in operation.

CDD models are provided with dual capacity control. CT models are provided with dual/triple capacity control. The capacity of the refrigeration system may be increased or decreased by the use of capacity control valves on one head of the compressor. A selector switch is provided in each module. A crankcase heater is standard to prevent refrigerant migration.

A in-line desiccant absorbs moisture contamination in the refrigerant for longer compressor life and trouble free service.

An externally equalised thermostatic expansion valve smoothly controls refrigerant flow and provides precise control of superheat.

All compressors have high/low pressure switches. To prevent compressor cycling at high pressure, the high pressure switch must be manually reset after high pressure cut-out.

Compressorised/Air Cooled

A Liebert manufactured, low profile, direct-drive, propeller fan air cooled condenser operates quietly and efficiently. Copper tubing with aluminium fins provide effective heat-exchange.

Compressorised/Water Cooled

Water cooled condensers are brazed tube plate heat exchanger type, constructed of stainless steel. These condensers provide high efficiency heat transfer for their compact construction.

2 way, head pressure operated valves accurately control the condensing temperature, maintaining system capacity for varying entry flow rates and temperatures.

Seperate liquid receivers incorporated in each system hold the entire refrigerant charge during pump down.

Options Water Cooled

Two regulating valve options are available:

- A two-way bypass controls condensing temperature. Valve pressure drop is reduced by the bypass with gate valve shut-off.
STANDARD FEATURES CONT.

Options Water Cooled Cont.

A three-way valve accurately controls condensing temperature, maintaining constant system capacity while keeping condenser workflow constant.

For installations where multiple stories and increased hydrostatic pressures are encountered, a high pressure option including two-way pressure regulating valve and a 300 PSIG condenser is available.

Optional Equipment - All Systems

A reserve coolant tank provides up to 20 minutes of processor cooling in the event of a power failure. Requires the coolant pump to be supplied with uninterruptible power.

Optional hose kits allow fast coupling of coolant lines to the processor heat exchanger. Kits are available in 9 and 18 metre lengths:

RR430 Kit. 4-Flexible, insulated, 9m. hoses eliminate the cost of rigid piping and reduce installation cost. Couplings are Hansen ML-6-H31 (Parker Hannifin SS-H6-62) quick connect.

RR460 Kit. 4-hose kit same as above with 18m. length.

Under-Floor Header

Manifold for connection of two CSU3000 and two processors. Includes isolation valve and four 3/4" FPT connections. Used with RR hose kits.

Adjustable Floorstand

Available in heights from 19 to 65cm in 7.6cm increments. Adjustable within a 7.6cm range. Allows complete installation of chiller prior to installing raised floor.

Liquitect Sensor/Liquitect Panel

Liquitect is a solid state water sensor for instantaneous detection of water in critical areas. Sensor operates on conductivity through platinum coated titanium electrodes. Sensor connections are hermetically sealed and potted to prevent contamination. The sensors are unaffected by dirt or vibration. Water detected is displayed on Liquitect monitoring panel.

The Liquitect panel monitors up to 20 sensors. Display maps sensed area with individual lighted indicators for pinpointing location of liquid. When activated by a Liquitect sensor, the indicator is accompanied by an audible alarm. Alarm can be silenced, but the lighted indicator remains on until the problem is corrected.

Capacity Control Valves

Capacity control valves, mounted on each semi-hermetic compressor can increase or decrease the capacity of the refrigeration system with a press of a button. The valve, when activated, reduces the cooling capacity of the system by approximately one-half.
START
CSU 1
STOP

PUMP
ON
module 1
COOL
module 1
STANDBY
ON-Other
module 1
NO POWER
Failed
module 1
CALL
MODULE
SERVICE
NO WATER
FLOW
module 1
LO WATER
module 1
HI HEAD
TEMP
module 1
HI WATER
PRESSURE
module 1
WATER
UNDER
FLOOR 1

SILENCE

PUMP
ON
module 2
COOL
module 2
STANDBY
ON-Other
module 2
NO POWER
Failed
module 2
CALL
MODULE
SERVICE
NO WATER
FLOW
module 2
LO WATER
module 2
HI HEAD
TEMP
module 2
HI WATER
PRESSURE
module 2
WATER
UNDER
FLOOR 2

Liebert Corporation

OPERATION MODE | ALARM CONDITIONS
--- | ---
Pump ON | No Water Flow
Cooling | High Water Temperature
Start/Stop | Low Water Temperature
Power Failure
Stand-by ON
High Compressor Head Pressure
Water Under Floor

In addition to the specific alarm message, a common alarm message such as CALL FOR SERVICE, or another, may be specified.

Monitoring System PCR3000
The PCR3000 is a solidstate alarm module that continuously monitors the operation of the coolant supply unit. A backlit readout panel displays both operation mode and any alarm condition. It features a manual start/stop switch for each module and a switch that will silence the audible alarm. The PCR3000 also provides connection points for the entire control system that eliminates "hand-wired" connections and assures greater reliability.

The exclusive Sentinel 3000 is a solidstate alarm module that maintains a constant watch over the system and warns operation personnel audibly and visually of any alarm condition. Should a malfunction occur, the Sentinel 3000 will automatically de-activate the primary chiller module and energise the stand-by module containing the flow of coolant to the mainframe. The audible alarm may be silenced, but the visual indicator remains lit until the problem is corrected. To aid in troubleshooting, the nature of the malfunction is described on the readout panel, and that the stand-by module is operating.

Liebert Corporation
Australia Pty. Ltd.

<table>
<thead>
<tr>
<th>TITLE</th>
<th>SCALE</th>
<th>N-T-S</th>
<th>DWG. NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR3000</td>
<td>DATE: 7/6/90</td>
<td>DRAWN: T WHITESIDE</td>
<td>DB-12</td>
</tr>
</tbody>
</table>
CSU 3000 (20, 30, 40 & 60kW) COOLANT SUPPLY SYSTEMS

NOTES:
1. Factory supplied disconnection switch, one (1) per module.
2. A recommended clearance of 664mm to be provided for component access. For recommended minimum clearance refer to the installation manual.

<table>
<thead>
<tr>
<th>CHILLER</th>
<th>DIMENSIONAL DATA IN (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>CDD</td>
<td>1680</td>
</tr>
<tr>
<td>CT</td>
<td>2337</td>
</tr>
</tbody>
</table>

Liebert Corporation
Australia Pty. Ltd.

CSU 3000 DIMENSIONAL DRAWING
DRAWN: T WHITESIDE
DATE: 5/5/90
SCALE: N-7-S
DWG. NO: DB-5

CSU 3000-23
TRIPLE CHILLERS USE A 3-MODULE CONFIGURATION.  
2 MODULES PROVIDE FULL CAPACITY; THE THIRD IS STAND-BY.

CSU 3000
FEATURES
1. MODULE ELECTRICAL CONTROL PANEL
2. COOLANT CIRCULATING PUMPS
3. REFRIGERATION CONTROL MODULE.
4. OUTDOOR HEAT REJECTION
ZONE AND POINT WATER DETECTION THAT COMMUNICATES WITH YOUR LIEBERT EQUIPMENT.

The Liebert LT series water detection modules install quickly and work simply, for reliable warning of water leaks. A simple 2-wire connection presents the alarms at a Liebert environmental unit, or other monitor panel.

The LT400 and LT400S provide water detection at critical points under a raised floor. Two corrosion-resistant, gold-plated probes detect water and immediately signal the monitoring system, allowing you to take immediate action to prevent water damage. The LT400S supervised detection will also signal power loss and circuit failure, for a completely self-monitored system.

The LT450S supervised zone water detector uses flexible Liebert water sensing cable, allowing protection for hard to reach spots and sensitive areas that require protection against water damage. In addition to water detection, the system also provides alarms for loss of power and cable fault.

FEATURES

- Easy to install. Simplified 2-wire communications. Leveling feet adjust for site needs. Zone detection kits available in sizes to monitor Liebert air units.

- Reliable sensing technology. Point detection systems use two gold-plated sensing probes for corrosion resistance and accurate reading. Zone detection uses durable, reliable Liebert water sensing cable.

- Communications options. All systems are easily monitored by your existing Liebert environmental equipment via a local alarm contact. Also compatible with Liebert RCM4 and RCM8 dry contact monitors.

- Supervised systems. LT400S and LT450S constantly monitor for water, internal fault and power failure, warning you of any unusual conditions.
Zone Water Detection Module LT400S

- Can notify the user of a water leak.
- Can notify the user of a fire alarm.

COMMUNICATION OPTIONS:

- Digital interface.
- Interface for remote monitoring.
- AC powered.
- Form C relay output.

FEATURES:

- Self-testing, self-diagnosis.
- Suitable for use in high-rise buildings.
- Powered by 12 VAC or 24 VDC.

SYSTEM CONFIGURATIONS:

- LT400S - Superficial zone.
- LT400S - Sprinkler system
- LT400S - Sprinkler systems
- LT400S - Sprinkler system
- LT400S - Sprinkler system

Typical Installation of LT400S and LT400S Connected to a Lebert Home Remote
Dedicated, Fully Redundant Processor Cooling

Liebert Series 3000 chillers provide constant, fail-safe protection for water-cooled computers.

Water-cooled mainframes rely on a continuous supply of liquid coolant to maintain processor temperature within a specified range. Exceeding temperature specification or an interruption of coolant flow can cause sudden shut-down, interruption of computer operations, and possible hardware damage resulting in costly repairs at the owner's expense. Re-starts following such a shut-down can be time consuming.

Liebert CSU3000 Series Chillers are application matched to the temperature stability requirements of water cooled processors. Both coolant flow and temperature are precisely regulated to keep processor temperature within specification.

And unlike building chillers, the Liebert CSU3000 is designed for fail-safe reliability. Dual chiller modules with automatic switchover provides 100% back-up in the unlikely event of a failure. No single component failure will interrupt operation.

The advantages of Liebert 3000 Series Chillers make them the best choice for meeting the cooling requirements of mainframes.

FEATURES

100% Stand-by Capability

- **Built-in dependability.** Liebert CSU3000 chillers contain dual, totally independent, cooling units.
- **Energy efficiency.** Exclusive semi-hermetic compressor design is more efficient than conventional hermetic compressors. An optional GLYCOOL model is available for even more energy savings.
- **Application flexibility.** Liebert chillers are available in a variety of sizes and configurations to match the computer requirements. Sizes range from 2.5 to 15 ton capacities.
- **Microprocessor compatible.** Operation is directed by a proven control system that can be integrated with Liebert micro-processor monitoring and control systems.
The Liebert Series 3000 was designed to provide the highest level of cooling efficiency and for water-cooled chiller systems. The highest quality components are chosen for both reliability and energy efficiency, all monitored by a solid state alarm system.

**Refrigeration System**
At the heart of the system is a rugged reliable semi-hermetic compressor. This compressor has been designed for reliability, with its hermetic construction and commercial service life rated at 40,000 hours or longer. As long as the system is properly maintained, the compressor will run for many years without service.

**Dual/Triple-Capacity Control**
All models can be equipped with capacity control. With the ability to increase or decrease the chiller's cooling capacity, it is possible to match the chiller to the changing load of the computer equipment. This is done through the use of a variable-speed fan motor and variable-speed liquid-cooling pump.

**Precise Temperature Control**
With the building chiller located outside the computer room, additional temperature regulation equipment is required. The central chiller is designed to operate at a constant temperature, while the building's HVAC system is responsible for maintaining the temperature within the computer room. This requires a precise temperature control system that can adjust the temperature as needed to ensure the correct operating environment for the computer equipment.
without repiping, rewiring or replacing any components and lets you anticipate growth in computer equipment without an unnecessary energy usage penalty.

**Coolant Supply System**

The CSU3000 can be connected to the mainframe by means of flexible, insulated hoses that simplify the relocation of computer equipment. Heavy-duty pump, water temperature sensors, and mainframe are close-coupled in a relatively short loop to minimize the temperature fluctuations that are unavoidable in long pipe runs.

**Control and Monitoring PCR3000**

The PCR3000 is a solid-state monitoring and alarm system that continuously monitors the operation of the coolant supply unit. A backlit readout panel displays both operation mode and any alarm condition. It features a manual start/stop switch for each module and a silence switch that will quiet the audible alarm. The PCR3000 also provides connection points for the entire control system that eliminates "hard-wired" connections and assures greater reliability.

<table>
<thead>
<tr>
<th>Operation Mode</th>
<th>Alarm Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump ON</td>
<td>No Water Flow</td>
</tr>
<tr>
<td>Cooling</td>
<td>High Water Temperature</td>
</tr>
<tr>
<td></td>
<td>Low Water Temperature</td>
</tr>
<tr>
<td>Start/Stop</td>
<td>Power Failure</td>
</tr>
<tr>
<td></td>
<td>Stand-by ON</td>
</tr>
<tr>
<td></td>
<td>High Compressor Head Pressure</td>
</tr>
<tr>
<td></td>
<td>Water Under Floor</td>
</tr>
</tbody>
</table>

In addition to the specific alarm message, a common alarm message such as CALL FOR SERVICE, or another, may be specified and a common alarm output for alarm indication at a remote location.

**Sitemaster Model 200 and SiteScan Compatibility**

The CSU3000 can be equipped with an Information Gathering Module that can transmit status, alarm and other data to the Liebert Sitemaster or SiteScan. This helps keep you informed and in control of this vital computer support function and document system performance.
Applications Flexibility

Liebert CS/SM3000 chillers are available in a variety of configurations and sizes to meet application requirements. In all water/Glycol cooled systems, powerhouse considerations, the CS/SM3000 offers models to enhance efficiency and to make use of existing water sources.

Model DD, 2.5 ton, Water/Glycol cooled, Compressorized.

11 sq. ft. of floor space. Dual capacity optional. Glycerol option and UPS pump electrical connection kits can be provided. A 2 hose connection kit quickly couples to the CDU.
6TH JUNE 1993

TO: UNIVERSITY OF QLD. - PRACTICE CENTRE.
FROM: TEX THOMPSON
ATTN: MR JEFF SCRIVENER

TOTAL NUMBER OF PAGES FOR TRANSMISSION (INCLUDING THIS PAGE): 5

JEFF,

PLEASE ACCEPT THIS FAX AS CONFIRMATION OF PURCHASE FOR:-

4 x 3380 IBM DISC DRIVES
3 x 3380 IBM CONTROLLERS
2 x 3081 IBM PROCESSORS
1 x PROCESSOR CONTROLLER
1 x GEN. SET
1 x WATER CONTROL UNIT

TOTAL PRICE $1500.00.

OFFER FOR 5 x 4997 UNITS AT $150.00 PER TONNE. ASSOCIATED COMPUTER CABLE FROM ABOVE DISPOSALS 35c / KG.

REGARDS & THANKS

TEX THOMPSON

STOCKISTS OF BRASS AND BRONZE SLUMS, BUYERS AND PROCESSORS OF PRECIOUS METALS AND NON-FERROUS METAL.
30th June 1993

Mr Alan Coulter  
Director Prentice Centre  
The University of Queensland

Dear Alan,

This letter is to confirm all the outstanding issues in relation to the provision of high performance Computing Services for the University.

Cray Research Australia agrees to contribute the sum of $29,000 towards the installation of adequate chilled water. This sum will be paid to the University upon Cray being presented with invoices from the supplier of the chilled water.

The chilled water unit which Cray Research would suggest as being adequate is the unit from Liebert.

Upon installation of the unit, the unit would become the property of the University.

The motor generator sets required to run the system will be supplied by Cray Research and maintained by Cray Research.

Cray Research will also supply one SUN IPC to the Prentice Centre.

Cray Research would request that the University proceed with the ordering of all air conditioning and electrical components upon signing the contract, as these items could delay installation of the computer system. Should Cray Inc. for any reason not sign the contract then any costs borne by the University will be reimbursed.

Cray Research would also like to give the University an option to purchase this system. Therefore we would make the offer to the University that during 1994 the price to purchase the machine would be US$500,000. This offer would be made with the knowledge that the University should follow all Queensland State regulations.

We look forward to establishing a mutual partnership with the University.

Yours sincerely,

CRAY RESEARCH AUSTRALIA

Alan Ryner  
Northern Region Sales Manager
Hi Graham

You drawing looks very macdraw ish. Good

The PEC-3 has quite a short IO cable to the Operator Workstation
It is about 15ft or less. Generally it is butted up to the OWS.
It is essentially mostly an empty cabinet with a telex tape unit
It is usually used for loading software.

If the DD-49s are arranged in two rows as per your drawing it is better
that they are arranged front to front. The drives draw ambient air from waist hight
at the front. Some of the air goes thru a an absolute filter to the
HDA and some goes to cool the logic and power supplies. This exhausts at the rear
of the unit. You should plan on some grills at the rear of the units to
ensure good air movement. The drives jack up on feet and should
fit neatly over two 2ft tiles. You should move the row of drives closest to the
workstations a half tile closer to the workstations.

>From experience and nasty threats from disgruntled electricians and especially
as you intend to do the work yourself I would look closely at the
positioning of the IOC PDU. I know this may increase your
2 x 100 amp feed length but.

All the power feeds enter at the rear of the unit and the two main feeds
are closer to the centre. The only access to work on the cabling is from the
rear of the unit. I would suggest moving the PDU one tile
closer to the DD-49s and one tile further out from the wall. This will allow
you to sit on the tile closest to the wall but remove the tile directly behind
the unit. This is good for feeding cables and its also a good place to put
your legs so that you can work comfortably. We usually remove the rear door
as it gets in the way. I will endeavour to get this unit up with the
MG and RCU.

The heaviest item we roll over the floor is the MGS-5 at approx 1500kg.
The IPEC bods usually bring a good supply of steel sheeting. We do have some
large sheets of 12mm plywood to assist the weight distribution. If you
fell it is necessary I will ship them up.

I am now referencing page 2-21 of the support equipment reference
manual. This is figure 2-12 RCU-4 piping requirements.
Flow meters are expensive. We can and do survive without them.
As this will be a very closed closed loop system you should be
able to dispense with the strainers.
Gate valves may be cheaper than the ball valves.
Most installations run a small bypass pipe from supply to return before
the ball valves on the CW plant side. A stat valve is mounted to control
the bypass. This allows control of the head across the unit and also prevents
the pump from cavitating when the RCU is off. We will attempt to
rescue the vibration eliminators from the current installation.
These are important as I have seen a chiller at a site dump its charge
due to poor design and the lack of vibration eliminators between the
discharge and the condenser. The "PR" line is connected to the safety valve
in the condenser. You would want to run this line to a safe place, probably
the same place as the one for your CW unit. From memory this valve
blows at 350 psi. The unit has an emergency cutout at 275 psi. I have in 8
years never seen or heard of one venting. You must however bear in mind that
the gas temperature will be in excess of 250°F and 300 psi should this
occur. A drain is a good place.

This is probably enuff for one mail

Be in touch

Dermot
M63  50/60 Hz  1F

290  1740

290  Air inlet  Which end?

735 cm  1100

545

2.9 floor tiles  1.23 floor tiles
Door measurements
Char 2. for Gray.
AGREEMENT FOR THE PROVISION OF
HIGH PERFORMANCE COMPUTING SERVICES

1. GENERAL

1.1 Cray Research, Inc. ("Cray") agrees to provide and the University of Queensland ("The University") agrees to site and operate high performance computing equipment and facilities listed as Schedule A ("Equipment") and associated software listed as Schedule B ("Software") according to the Terms and Conditions of this Agreement. The Agreement becomes effective when it has been signed by both parties.

2. SITE PREPARATION

2.1 The University will have a site available to receive the equipment in accordance with Cray's requirements which are to be advised in writing. Cray and The University will mutually prepare the site in accordance with arrangements agreed in writing. Cray will input and advise the University in writing that the site is ready.

3. TRANSPORTATION AND INSTALLATION

3.1 Cray will transport to the site and install the Equipment and associated facilities and Software at no cost to The University. Cray will place the Equipment in good working order and notify The University when the installation is complete and ready for acceptance.

3.2 The University will if requested by Cray assist Cray in the installation of the equipment but under Cray's supervision and provided that The University accepts no risk or responsibility in so doing.

4. ACCEPTANCE

4.1 The University and Cray will conduct an acceptance of the system to ensure that:

(a) The items of equipment and software and other facilities listed in Attachments A and B to this Agreement have been delivered and installed in good working order and conform substantially to Cray's specifications and;

(b) All software documentation and other facilities which will allow The University to operate the equipment in a normal manner have been supplied by Cray.

4.2 The University and Cray will conduct acceptance tests promptly and immediately following advice by Cray that the equipment is installed in good working order. If acceptance cannot be finalised within seven (7) days of installation date due to reasons imputable to The University the Equipment will be deemed as accepted and charges will be payable to Cray from the date of the notification of installation.

4.3 If acceptance is not achieved prior to 30 days following installation date for reasons imputable to Cray the parties shall negotiate further proceedings. If no agreement is reached The University may rescind this Agreement and require Cray to remove all items in Schedule A at no cost to The University.

5. TITLE
5.1 Title to the Equipment shall remain at all times in Cray. The University will not dispose of or encumber any of Cray's interest in the Equipment.

Cray assumes all risk of loss or damage to the Equipment during periods of transportation and through the installation process and the period of use by The University except that The University will be liable for loss or damage caused by nuclear radiation, reaction or contamination, negligence of The University, and improper use of Equipment by The University.

6. USE OF THE EQUIPMENT

6.1 Cray shall provide to The University from the date of acceptance until 31/12/94 access to 80%, on a 24 hour basis, of the System Resources as defined in this Agreement at the monthly charges contained in this Agreement. The University may use the system for any lawful purposes whatsoever but consistent with its statutory obligations and mission.

6.2 Cray agrees that it will use the remainder of the System Resources for lawful purposes and primarily to perform its own processing to run benchmark tests and/or other demonstrations and to further collaborative activities with The University or with other suitable collaborative partners.

6.3 Cray will use its best endeavours to ensure that its employees or collaborative partners adhere to statutes of The University and follow such operating procedures and security requirements as may be advised to Cray by the Director, Prentice Centre.

7. SYSTEM RESOURCES

7.1 The System Resources are those resources normally available for the combination of the hardware, software and other facilities listed in Attachments A and B when operating 24 hours daily throughout the year less the time for normal preventive and remedial maintenance and operating overheads.

8. EXTENSION OF PERIOD OF USE

8.1 Six months prior to 31/12/94 or at an earlier date The University will advise Cray if it wishes to extend the period of use having regard to the stage of planning of high performance computing developments within the State of Queensland.

8.2 Cray recognises that any permanent installation of computing equipment within The University would be subject to the State Government's Public Finance Standards and Purchasing Policies. Cray will if so required by The University use its best endeavours to extend the period of use of the same equipment or equipment of the same functionality providing capacity consistent with needs, on mutually agreeable terms.

9. DECOMMISSIONING AND REMOVAL OF EQUIPMENT

9.1 The Equipment decommissioning will commence either on 31/12/94 or at the end of any extended period of use agreed by the parties.

9.2 Cray will as soon as practical thereafter remove the Equipment at Cray's risk and expense.

9.3 The University will assist Cray in the removal of the Equipment but under Cray's supervision and provided that The University...
accepts no risk or responsibility in so doing.

10. CONTINUING APPLICATIONS

10.1 If requested by The University Cray will use its best endeavours to assist The University in obtaining alternative facilities to continue processing of applications required after the period of decommissioning.

11. OPERATION OF THE EQUIPMENT

11.1 The University will operate the equipment in accordance with Cray’s standards and operating procedures. Cray will provide such documentation and training as to allow such operation.

11.2 The University will report faults immediately to Cray in accordance with procedures to be notified by Cray.

12. TRAINING

12.1 Training will be provided by Cray according to Schedule C.

13. MANUALS

13.1 Cray will provide one (1) copy of applicable user manuals at no additional charge. The University may order additional copies at the then current price.

13.2 The University may reproduce the manuals for its own internal use provided that each copy clearly includes all of the proprietary notices of the original.

14. DEFAULT AND TERMINATION

14.1 The occurrence of any one of the following events will be default ("Event of Default"):  

a) Nonpayment by The University of any amount due under this Agreement, which nonpayment continues for a period of ten (10) business days following receipt of notice by Cray that such payment amount is overdue.

b) Non-performance by The University of any other material term or condition of this Agreement which is not cured within thirty (30) days after written notice from Cray.

c) The University ceases the conduct of active business; or any of the Equipment is attached, levied upon, encumbered, pledged, seized or taken under any judicial process.

d) Any of The University’s warranties or representations in this Agreement or in any written statement given in connection with the Agreement will be false or misleading in any material respect.

Upon the occurrence of any Event of Default as defined herein, Cray may with 30 days written notice exercise one or more of the following rights and remedies, subject to the requirement that no expense or damage may be counted and recovered twice by Cray, whether by renaming, re-characterising, or otherwise (and with the explicit note that before they become Events of Default items (a) and (b) above involve notice periods and failutes to cure):
i) Retake possession of the Equipment without liability to Cray, cancel this Agreement for the Equipment repossessed, and recover from The University all accrued and unpaid Monthly Charges and other amounts owing under the terms of this Agreement.

ii) Pursue any other remedy Cray may otherwise have, at law, in equity or under any statute and recover such other actual damages and expenses, including attorney's fees, as may be incurred by Cray as a result of The University's default or on account of Cray's enforcement of its rights and remedies under this Agreement.

15. COMMUNICATIONS

15.1 The University will provide such hardware, software or other facilities other than those to permit the connection of this equipment to The University of Queensland Network and to the Australian Academic Research Network (AARNet).

16. WARRANTY

16.1 Cray warrants that on the effective date of installation the Equipment is free from material defects and will in all material respects conform to the specifications contained in Cray's technical manuals.

16.2 The University is responsible for the proper use of the Equipment and the results obtained therefrom arising from the University's use of the Equipment.

17. IMPLIED WARRANTIES; DISCLAIMER INDEMNITY:

Subject to Article 16 hereof:

(a) Except as otherwise required by law, the express warranty set forth in the Warranty provision of the Agreement is the exclusive warranty and is in lieu of all express and implied warranties, including the implied warranties for fitness for a particular purpose and of merchantability. The remedy stated therein is the exclusive remedy under the express warranty contained therein and under any other warranties, express or implied, required by law, to the extent permitted by law.

(b) The total of Cray's liabilities under or in conjunction with this Agreement and whether arising from negligence or Agreement or howsoever is limited in respect of each event or series of connected events as follows:

(i) for damage to physical property the sum of $200,000 plus the obligation to make good by repair or replacement any equipment damaged by negligent act or default of Cray, its servants, or its agents; and

(ii) for all other events (excluding injury to or death of any person occurring on site and caused directly by defect in the Equipment or by negligence or default of Cray, its servants, or its agents, for which the limited shall be $1,000,000) the sum of $50,000.

The University shall indemnify Cray and hold Cray
harmless with respect to any claim by third parties, including any expenses incurred by Cray in connection with the defence of a claim arising out of or in connection with The University's use of the Equipment or the use of the results of operation of the Equipment. The provisions of this Article will not affect Cray's obligations under the Patents and Copyrights Article of this Agreement.

18. LIMITATION OF LIABILITY

Certain statutes, rules, and regulations of Australia may prevent application of provisions of Article 17 as intended by the parties and may impose on Cray certain conditions, warranties, and obligations which cannot be, or only to a limited extent can be, excluded, modified or restricted by the provisions of this Agreement. Such prevention, and such imposition, shall apply only to the extent provided by such statutes, rules, and regulations. Further, if such conditions, warranties, and obligations are so imposed, then the liability of Cray pursuant to this Agreement shall be limited, in Cray's absolute discretion, to any one or more of the following:

(a) with respect to goods:
   i) the replacement of the goods or the supply of equivalent goods;
   ii) the repair of the goods;
   iii) the payment of the cost of replacing the goods or acquiring equivalent goods; or
   iv) the payment of the cost of having the goods repaired; or

(b) with respect to services:
   i) the supplying of the services again; or
   ii) the payment of the cost of having the services supplied again.

19. CHARGES

19.1 Cray agrees to provide to The University the Equipment, Software and Training defined in Schedules A, B and C for AU$24,000 per month until 31/12/94.

19.2 Should The University request Cray and Cray agrees to add additional hardware or software to the system the charges for such additional equipment and software will be negotiated between the parties.

19.3 The charge becomes payable from and including the date of acceptance. If this represents part of a month the charge will, subject to the previous clause, be calculated on the ratio if the number of hours the system is available for use to the total number of hours in the month.

19.4 The University will pay charges within fourteen (14) days of the receipt of an invoice from Cray.

19.5 Cray Australia will provide Maintenance Service for the periods of coverage chosen by The University and agreed to by Cray Australia, in accordance with Cray's maintenance procedures for this Equipment advised in writing by Cray, provided that The University makes the Equipment available for Maintenance Service as reasonably required. Cray Australia will maintain the Equipment in good working condition and in material conformance to the specifications contained in Cray
Research, Inc's technical manuals supplied to The University with the Equipment. Cray Australia undertakes to maintain that, for any rolling three month period, the computer mean time to failure (hardware only, as software depends on applications and software) is not substantially worse than average for Cray Research Inc's supercomputers of the same type and in similar configuration. The basis of the comparison shall be a 3 month rolling average, rolling month by month, and no challenge or inquiry may be made unless the average uptime (excluding scheduled maintenance and interrupts caused by external sources beyond the control of Cray Australia) falls below 95%. In any case, information disclosed hereunder shall be deemed confidential.

19.6 Should Cray not achieve the standard of Maintenance described in 19.5 in any month Cray and The University will negotiate the appropriate monthly charge having regard to Cray's Maintenance Service coverage for this Equipment and the severity of the loss of Systems Resources. In such negotiations the following guidelines will apply:

(a) If no uptime, as defined in 19.5, is achieved then The University will not be liable for any of the monthly charge.

(b) If 95% uptime, as defined in 19.5, is achieved then The University is liable for the full monthly charge.

(c) If less than 95% uptime, as defined in 19.5, is achieved and such lesser uptime can be attributed to The University deciding in a particular fault incident not to request maintenance on-site at earlier than next-day basis, then The University is liable for the full monthly charge.

(d) Other circumstances are to be negotiated having regard to these guidelines.

(e) In such negotiations The University will be represented by the Director Prentice Centre.

19.7 Cray agrees that in any 24 hour period The University may exceed 80% of use of Systems Resources to offset loss due to system downtime at no further charge to The University and in priority after Cray's requirements of its use of residual systems resources.

19.8 Software listed in Schedule B will be supplied by Cray in accordance with its Software Terms and Conditions described in Attachment D. The University agrees to these Terms and Conditions.

20. RELOCATION OF EQUIPMENT

20.1 Except for temporary emergency relocation of the Equipment to prevent its damage or destruction The University will not relocate the Equipment.

21. PATENTS AND COPYRIGHTS

Cray will indemnify The University as to any rightful claim that any Cray trademarks infringe any United States trademark rights or that the Equipment, or any part thereof, furnished by Cray under this Agreement constitutes an infringement of any United States patent, trademark, copyright, or trade secret. To qualify for this indemnity, however, The University must give Cray prompt notice of any such claim and must co-operate fully with Cray's defence or settlement. If the use of the Equipment, or any part thereof, is enjoined, Cray will, at its own expense and at its option, either (A) procure for The University the right to continue using the Equipment or the infringing part thereof;
(B) replace same with non-infringing Equipment; (C) modify it so it becomes non-infringing; or (D) if Cray finds no commercially reasonable solution under (A), (B), or (C) above, accept return of the infringing Equipment, or part thereof, and grant The University a credit equal to the trade-in value of the Equipment, or part thereof, as specified in Cray's then current trade-in-policy. Cray will not be liable to The University for any such claim which is based upon use of the Equipment in connection with equipment, software, or devices not approved by Cray, or in a manner for which the Equipment was not designed.

22. ASSIGNMENTS

Neither party may assign its rights under this Agreement without the written consent of the other.

23. APPLICABLE LAW

This Agreement is governed by laws of the State of Victoria. Any legal action in connection with this Agreement must be filed within two (2) years after the cause for such action has accrued.

24. NOTICES

Notices will be effective when received in writing and shall be sent to the person and address designated on the signature page of this Agreement or such other person or address as may have been furnished to The University by Cray by notice according to this Article.

25. CONFIDENTIALITY

Cray and The University shall treat and shall ensure that their servants, agents, representatives, advisers or Sub-contractors shall treat all technical and other information proprietary to the other party and provided to each by the other in connection with the Agreement and marked COMMERCIAL-IN-CONFIDENCE or as otherwise classified, as appropriate, and shall not disclose it without the prior consent in writing of the other party to anyone other than such persons having a need-to-know who will be required to take appropriate measures to safeguard such information. This obligation shall survive any termination of this Agreement. Neither party shall issue any press release concerning this Agreement without prior written consent of the other party.

26. THE OWNERSHIP OF INTELLECTUAL PROPERTY

The Intellectual Property in all countries of the world in the Supplied and Technical Data which is expressly developed for the purposes of The University under the Agreement, are from the time of creation of each right, the property of The University. The University has the sole right to apply for registration of any such right in all countries of the world.

Where any patentable or non-patentable invention or process or other intellectual property right contained in the Supplies or Technical Data is expressly developed for the purposes of The University under the Agreement, the manufacturer or producer of such Supplies or Technical Data may seek a licence from The University to use the invention or process or exercise that other intellectual property right, subject to such terms as are mutually agreed.

27. SURVIVAL OF AGREEMENTS
Notwithstanding the termination or completion of this Agreement, all agreements, covenants, indemnities, and warranties made in this Agreement will continue in full force and effect to the extent required for their full observance and performance.

28. ENTIRE AGREEMENT

The terms and conditions in this Agreement and in the Schedules constitute the complete and exclusive statement of the Agreement between The University and Cray and supersede all prior oral and written statements of any kind whatsoever made by either party or their representatives. Any order form used by The University in connection with this Agreement will be considered to have its pre-printed clauses and statements deleted. Any waivers or amendments, to be effective, must be in writing, signed by both parties.

CRAY RESEARCH, INC
655 Lone Oak Drive
Eagan, MN 5512

By ______________________________
Name: ____________________________
Title: _____________________________
Date: ______________________________
Notices to: _________________________
Title: _____________________________

By ______________________________
Name: ____________________________
Title: _____________________________
Date: ______________________________
Notices to: _________________________
Title: _____________________________

---------------------------------------------

Alan W. Coulter Phone: 61 7 365 3521
Director, Prentice Centre Fax: 61 7 365 4477
The University of Queensland Internet: a.coulter@cc.uq.edu.au
Queensland 4072 AUSTRALIA
Page 2

4/4708 - 64 - P21

64MB
2 x 12GB IPI

$241C
$6,000

$5,100

4/330

24m²

2x327m²

150m² + geo

4xVME

12xVME

fei-3

2 boards - 100% active on the bus

2 rubber cables

330

se1000

$87k

55k - 44%
Pacific Digital
Bill Allen
Phil Dodd
(02) 905-6355
3 x 35kW @ $14,680
45kW
+ 1 HR
100kW
$220/kW
268,000 BTU/hr +102
78.59 kW.  86.45 kW.
Please find attached a revised quotation for the specifications we have selected as being more suitable in this quotation.

If you have any technical information please do not hesitate to contact this directly.

Yours faithfully,

[Signature]
Please find attached revised quotation for chiller system. We have selected a slightly smaller chiller in this quotation.

If you require any additional information, please do not hesitate to contact this office.

Yours faithfully,

G Fraser
21st June, 1993

Mr Graham Rees,
Prentice Centre,
University of Qld.,
BRISBANE 4001

Dear Sir,

Further to our conversation we are pleased to provide you with a quotation for a Chiller system as per your specification.

The Chiller system has built in redundancy in that it consists of three modules of which any two will operate. Each unit module has a separate pump, compressors and heat exchangers. The Chiller offered is 65KW which will provide capacity for expansion if required.

The Chiller will consist of the main module with the compressors inside and three outside condensers. These condensers will be located in or near the garden area as shown. The price for the installation consists of:

. Three circuits of pipework each 20 metres in length to connect the Chiller to the outdoor condensers.

. Three circuits of electrical cabling to connect the condensers to the Chiller controls.

. One new circuit from the main switchboard to supply new Chiller system. Please note, no alteration work to switchboard has been allowed for to obtain sufficient supply.

. Three metres of insulated pipework to connect Cray computer to Chiller.

. Installation of brackets on concrete slab for condensers.

. Delivery and positioning of Chiller and Condensers.

. 12 months parts and labour warranty.
Please refer to attached specification and quotation for all technical and pricing information.

If you require any additional information, please do not hesitate to contact our Brisbane office.

Yours faithfully,

LIEBERT CORPORATION AUSTRALIA PTY LTD.,

[Signature]

Greg Fraser,

SYSTEMS CONSULTANT.
Quotation

TO: University of Qld

FOR ATTENTION: Graham Rees

PHONE: 3654143 FAX: 3654177

PROJECT:

CONSULTANT: QA2154

QUOTATION No: 21/6/93

DATE: 21/6/93

<table>
<thead>
<tr>
<th>MODEL</th>
<th>QTY</th>
<th>PRICE</th>
<th>SALES TAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiller</td>
<td>CT 540A</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Condensers to suit Fan Speed Controllers</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Commissioning &amp; Labour Warranty</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Freight</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Optional:

- Preventative Maintenance
  12 Visits  ADD $1500.

- Water Detection
  ADD $870.

DELIVERY: 4-6 Weeks

NET TOTAL: $76,935 Excl. S/Tax Included

FREIGHT: 

ALL ENQUIRIES: Greg Fraser

SIGNED: 

LIEBERT CORPORATION AUSTRALIA PTY LTD A.C.N 603 469 654 - DIVISION OF EMERSON ELECTRIC U.S.A.

"Quality is Caring"
## AIR COOLED DATA

**Net Capacity Per Module (Based on 2 Modules Operating)**

<table>
<thead>
<tr>
<th></th>
<th>STD. PUMP</th>
<th>OPT. PUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaving Water Temperature - °C</td>
<td>11.1</td>
<td>12.2</td>
</tr>
<tr>
<td>Low Capacity - kW (Opt.)</td>
<td>35.3</td>
<td>36.9</td>
</tr>
<tr>
<td>Medium Capacity - kW</td>
<td>63.5</td>
<td>65.8</td>
</tr>
<tr>
<td>High Capacity - kW</td>
<td>88.0</td>
<td>91.1</td>
</tr>
<tr>
<td>Coolant Flow Rate - l/s</td>
<td>3.02</td>
<td>3.02</td>
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</table>

**Coolant Pump Data**

<table>
<thead>
<tr>
<th></th>
<th>STD. PUMP</th>
<th>OPT. PUMP</th>
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</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Size - kW</td>
<td>1.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Flow Rate - l/s</td>
<td>3.02</td>
<td>4.04</td>
</tr>
<tr>
<td>Total Head - kPa</td>
<td>307</td>
<td>307</td>
</tr>
<tr>
<td>Module Pressure Drop - kPa</td>
<td>75.6</td>
<td>123</td>
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<tr>
<td>Hose Kit Pressure Drop - kPa</td>
<td>9.2m</td>
<td>58</td>
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<tr>
<td></td>
<td>18.3m</td>
<td>92</td>
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Gty. of Supply & Return Hoses for above PD values

8

**Electrical Data**

<table>
<thead>
<tr>
<th></th>
<th>1 Power Supply</th>
<th>2 Power Supplies</th>
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</thead>
<tbody>
<tr>
<td>Supply - V/Ph/Hz</td>
<td>415/3/50</td>
<td>415/3/50</td>
</tr>
<tr>
<td>FLA - A</td>
<td>93.4</td>
<td>46.7</td>
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**Separate Pump Power Supply**

<table>
<thead>
<tr>
<th></th>
<th>One Power Supply</th>
<th>*</th>
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</thead>
<tbody>
<tr>
<td>Utility - A</td>
<td>84.0</td>
<td></td>
</tr>
<tr>
<td>U.P.S. - A</td>
<td>9.4</td>
<td></td>
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**Dimensions**

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Height</th>
<th>Depth</th>
<th>Weight</th>
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<tbody>
<tr>
<td></td>
<td>2337mm</td>
<td>1829mm</td>
<td>889mm</td>
<td>1234kg</td>
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</table>
**CSU 3000 TRIPLE MODULE**

**CT 543A**

**AIR COOLED DATA CONT.**

<table>
<thead>
<tr>
<th>Condensers</th>
<th>@29°C Ambient</th>
<th>@35°C Ambient</th>
<th>@38°C Ambient</th>
<th>@41°C Ambient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (QTY.)</td>
<td>C284 (3)</td>
<td>C337 (3)</td>
<td>C403 (3)</td>
<td>C506 (3)</td>
</tr>
<tr>
<td>No. of Fans</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Weight - kg</td>
<td>75</td>
<td>91</td>
<td>127</td>
<td>136</td>
</tr>
<tr>
<td>Liquid Line - mm</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>34.9</td>
</tr>
<tr>
<td>Hot Gas Line - mm</td>
<td>28.6</td>
<td>28.6</td>
<td>28.6</td>
<td>34.9</td>
</tr>
</tbody>
</table>

*Values reflect 2 coolant pumps, 2 compressors, 2 control circuits and 2 heat rejection systems, powered from a single source.*
GF/VK

ACN No. 003 469 664

18th June, 1993

Mr Graham Rees,
Prentice Centre,
University of Qld.,
BRISBANE 4001

Dear Sir,

Further to our conversation we are pleased to provide you with a quotation for a Chiller system as per your specification.

The Chiller system has built in redundancy in that it consists of three modules of which any two will operate. Each unit module has a separate pump, compressors and heat exchangers. The Chiller offered is 110kW which will provide capacity for expansion if required.

The Chiller will consist of the main module with the compressors inside and three outside condensers. These condensers will be located in or near the garden area as shown. The price for the installation consists of:

. Three circuits of pipework each 20 metres in length to connect the Chiller to the outdoor condensers.

. Three circuits of electrical cabling to connect the condensers to the Chiller controls.

. One new circuit from the main switchboard to supply new Chiller system. Please note, no alteration work to switchboard has been allowed for to obtain sufficient supply.

. Three metres of insulated pipework to connect Cray computer to Chiller.

. Installation of brackets on concrete slab for condensers.

. Installation of water detection cable within computer room.
Delivery and positioning of Chiller and Condensers.

Pipework to include strainers, gauges and ball valves.

12 months parts and labour warranty.

Please refer to attached specification and quotation for all technical and pricing information.

If you require any additional information, please do not hesitate to contact our Brisbane office.

Yours faithfully,

LIEBERT CORPORATION AUSTRALIA PTY LTD.

Greg Fraser,

SYSTEMS CONSULTANT.
Quotation

TO: University of Qld
FOR ATTENTION: Graham Rees
PHONE: 3654143 FAX: 3654477
PROJECT:
CONSULTANT: QA2154
QUOTATION No: 18/6/93

<table>
<thead>
<tr>
<th>MODEL</th>
<th>QTY</th>
<th>PRICE</th>
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<tr>
<td>Chiller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT663A</td>
<td>1</td>
<td>71,640</td>
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<tr>
<td>Condensers to suit Fan Speed Controllers</td>
<td>6</td>
<td>11,340</td>
</tr>
<tr>
<td>Commissioning &amp; Labour Warranty</td>
<td>6</td>
<td>1,800</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td>15,210</td>
</tr>
<tr>
<td>Water Detection</td>
<td></td>
<td>870</td>
</tr>
<tr>
<td>Freight</td>
<td></td>
<td>800</td>
</tr>
</tbody>
</table>

Optional:
Preventative Maintenance
12 Visits ADD $1500.

4-6 Weeks DELIVERY
Nett 30 Days From Date of Invoice

VALIDITY: 30 Days

$102,702 Excl. S/Tax NET TOTAL Included

TERMS OF PAYMENT

ALL ENQUIRIES Greg Fraser

SIGNED:
CSU 3000 10 - 125KW MAINFRAME COOLING SYSTEMS

FEATURES AND BENEFITS

Easy Expansion
Dynamic response to growth in computer capacity with dual and triple capacities at the touch of a button.

Redundancy
100% redundancy for CDD and 50% redundancy for CT chillers. Automatic switchover for fail-safe protection, with every critical element duplicated for dependability.

Back-Up Coolant Tank Option
Total protection during power outages.

Solid State Reliability
Proven electronic controls and alarms to keep the system on-line.

Remote Monitoring
With the optional information gathering module, full data of the chiller operating modes and alarm information can be signalled to Liebert Sitemaster or Site-Scan.

Easy Installation
Flexible plug-compatible hose connections to CDU.

Energy Efficiency
Semi-hermetic compressors with highest COP in the industry to minimise energy cost.

Alternate Water Source
Energy saving configuration with existing building chilled water, backed by Liebert CSU 3000 single module.

Built-In Dependability
CSU 3000 chillers contain dual or triple, totally independent, complete cooling units. Compressors, pumps, condensers and control electronics are all duplicated to prevent single component failure from taking down the system.

Dual/Triple Capacity Control
All models can be equipped with capacity control that enables the chiller to increase or decrease its cooling capacity to match a change in computer loads and allow anticipated growth in computer equipment.

REV: 05 12/16/92

CSU 3000 - 1

"This is an uncontrolled copy of document"
LAC0076
Liebert Corporation
1050 Deerborn Drive, Columbus, OH 43229
Air Chiller Performance
3/23/1972

Model: CT 663A, (50 Hz)

Design Ambient: 75 Deg F
Stage: 2
Percent Glycol: 0

Condenser Data:
Manufacturer: LIEBERT
Model Number: CD-366L

Evaporator Data:
Manufacturer: 0/7
Model Number: CH80073641
Baffle Spacing: A1
Surface Area: 233.8 SqFt
Number of Tubs: 127
Number of Passes: 1
Diameter: 7.0 In
Length: 36.0 In

Compressor Data:
Manufacturer: COPELAND
Model Number: 4DA3-2000 *

Leave Water Ambient Ente- Total Total Evap Evap Cond Alt Comp LMTD U
Water Flow Temp Water Cool Heat Side Taps Temp Power Factor
Temp
Deg F GPM Deg F Deg F KBTUH KBTUH Ft Deg F Deg F Ft KW Deg F
52.0 64.0 95.0 63.0 379.0 472.9 39.6 44.1 117.5 0 27.5 9.16 88.57

III kW/
CSU 3000 10 - 125KW MAINFRAME COOLING SYSTEMS

General

Water-cooled mainframe computers rely on a continuous supply of liquid coolant to maintain processor temperature below a specified limit. Coolant specifications typically are 16°C or below. Exceeding temperature specification can result in imminent shutdown, interruption of computer operations, and possible hardware damage resulting in costly repairs at the user's expense. Re-starts following such a shut-down can be time consuming.

Liebert CSU 3000 Series Chillers are application matched to the temperature control and heat rejection requirements of water cooled processors, and provide 100% back-up in the unlikely event of failure. Both coolant flow and temperature are precisely regulated to keep processor cooling within specification.

Unlike building chillers, every critical element is duplicated for dependability. No single component failure will interrupt operation. A monitoring system alerts personnel to alarm conditions instead of allowing temperature shutdown, and in case of malfunction, switch-over to the stand-by module is automatic.

The 3000's close-coupled, closed loop system also supplies cleaner coolant to the processor heat exchanger, reducing the fouling factor. Use of the CSU 3000 is also more efficient. Cooling requirements can be met during periods of low outside temperature without the extra expense of operating a large chiller.

Installation is simple. Liebert chillers can be supplied with plug-in hose connections and pre-charged refrigeration circuits. And, in case of expansion, the CSU 3000 has the capability to be easily upgraded to increase cooling capacity. The CSU 3000 is available in both dual and triple capacity models, allowing precise cooling over a wide range of heat loads.

The advantages of Liebert 3000 Series Chillers make them a clear choice for meeting the cooling requirements of mainframes.
## CSU 3000 10 - 125KW MAINFRAME COOLING SYSTEMS

### GENERAL CONT.

<table>
<thead>
<tr>
<th>Desirable Feature</th>
<th>Packaged System</th>
<th>Building Chiller</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Redundancy automatic switchover.</strong></td>
<td>Yes. 100%</td>
<td>No.</td>
</tr>
<tr>
<td><strong>Easy Installation.</strong></td>
<td>Yes. Flexible plug-compatible nose connections to CDU.</td>
<td>Doubtful. Piping, pumping and control may require special design.</td>
</tr>
<tr>
<td><strong>Efficiency.</strong></td>
<td>Yes. Many energy saving features. Highest COP in the industry.</td>
<td>Usually not. Chiller capacity probably is far in excess of computer needs, making operation of the chiller inefficient during some periods.</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>Yes. Local and Remote.</td>
<td>Not available.</td>
</tr>
<tr>
<td><strong>Proven Design.</strong></td>
<td>Yes. Factory assembled and tested.</td>
<td>Tapping into building chillers with needed controls and is typically a &quot;first time&quot; approach.</td>
</tr>
<tr>
<td><strong>Easy Expansion.</strong></td>
<td>Yes. Dual and Triple Capacities increase cooling capability at the touch of a button.</td>
<td>Difficult. Re-design and re-sizing of pumping equipment.</td>
</tr>
<tr>
<td><strong>Precise Control Of Flow and Temperature.</strong></td>
<td>Yes. Integral Control System.</td>
<td>More difficult. Piping length and fittings can introduce transport lag.</td>
</tr>
</tbody>
</table>
STANDARD FEATURES

Compressorised Systems

High efficiency semi-hermetic compressors are standard equipment. Built-in sight glasses, allow fast determination of refrigerant and oil levels. Overload protection, suction line strainers, reversible oil pumps for forced feed lubrication and pump down control are provided. They are mounted on vibration-isolating springs and, running at only 1450RPM, are quiet in operation.

CDD models are provided with dual capacity control. CT models are provided with dual/triple capacity control. The capacity of the refrigeration system may be increased or decreased by the use of capacity control valves on one head of the compressor. A selector switch is provided in each module. A crankcase heater is standard to prevent refrigerant migration.

A in-line desiccant absorbs moisture contamination in the refrigerant for longer compressor life and trouble free service.

An external equalised thermostatic expansion valve smoothly controls refrigerant flow and provides precise control of superheat.

All compressors have high/low pressure switches. To prevent compressor cycling at high pressure, the high pressure switch must be manually reset after high pressure cut-out.

Compressorised/Air Cooled

A Liebert manufactured, low profile, direct-drive, propeller fan air cooled condenser operates quietly and efficiently. Copper tubing with aluminium fins provide effective heat-exchange.

Compressorised/Water Cooled

Water cooled condensers are brazed tube plate heat exchanger type, constructed of stainless steel. These condensers provide high efficiency heat transfer for their compact construction.

2-way, head pressure operated valves accurately control the condensing temperature, maintaining system capacity for varying entry flow rates and temperatures.

Separate liquid receivers incorporated in each system hold the entire refrigerant charge during pump down.

REV: 05 12/16/92
CSU 3000 10 - 125kW MAINFRAME COOLING SYSTEMS

STANDARD FEATURES CONT.

Options Water Cooled

Two regulating valve options are available:

A two-way bypass controls condensing temperature. Valve pressure drop is reduced by the bypass with gate valve shut-off.

A three-way valve accurately controls condensing temperature, maintaining constant system capacity while keeping condenser water flow constant.

For installations where multiple stories and increased hydrostatic pressures are encountered, a high pressure option including two-way pressure regulating valve and a 300 PSIG condenser is available.

Optional Equipment - All Systems

A reserve coolant tank provides up to 20 minutes of processor cooling in the event of a power failure. Requires the coolant pump to be supplied with Uninterruptible power.

Optional hose kits allow fast coupling of coolant lines to the processor heat exchanger. Kits are available in 9 and 18 metre lengths:

RR430 Kit. 4-flexible, insulated, 9m. hoses eliminate the cost of rigid piping and reduce installation cost. Couplings are Hansen ML-6-H31 (Parker Hannifin SS-H6-62) quick connect.

RR460 Kit. 4-hose kit same as above with 18m. length.

Under-Floor Header

Manifold for connection of two CSU3000 and two processors. Includes isolation valve and four 3/4" FPT connections. Used with RR hose kits.

Adjustable Floorstand

Available in heights from 19 to 65cm in 7.6cm increments. Adjustable within a 7.6cm range. Allows complete installation of chiller prior to installing raised floor.
STANDARD FEATURES CONT.

Liquitect Sensor/Liquitect Panel

Liquitect is a solid state water sensor for instantaneous detection of water in critical areas. Sensor operates on conductivity through platinum coated titanium electrodes. Sensor connections are hermetically sealed and potted to prevent contamination. The sensors are unaffected by dirt or vibration. Water detected is displayed on Liquitect monitoring panel.

The Liquitect panel monitors up to 20 sensors. Display maps sensed area with individual lighted indicators for pinpointing location of liquid. When activated by a Liquitect sensor, the indicator is accompanied by an audible alarm. Alarm can be silenced, but the lighted indicator remains on until the problem is corrected.

Capacity Control Valves

Capacity control valves, mounted on each semi-hemetic compressor can increase or decrease the capacity of the refrigeration system with a press of a button. The valve, when activated, reduces the cooling capacity of the system by approximately one-half.
TRIPLE MODULE SYSTEM

CSU 3000
PREVIOUS
1. MODULE ELECTRICAL CONTROL PANEL
2. COOLANT CIRCULATING PUMPS
3. INDEPENDENT CONTROL MODULE
4. OUTDOOR UNIT SELECTOR

Liebert Corporation
Australia Pty. Ltd.

REV: 05 12/16/92

CSU 3000 - 35

"This is an uncontrolled copy of document"
LA00076
In addition to the specific alarm messages, a general alarm message such as "CALL FOR SERVICE" or "ALARM" may be specified.

Monitoring System POE2000

The POE2000 is a portable monitor system, designed primarily for the testing of the CSU 3000, its components, and the operational conditions of the system. It features a user-friendly interface and a comprehensive suite of diagnostic tools. The system is designed to provide real-time monitoring of the system's performance and to alert the operator to any potential issues.

The POE2000 is equipped with advanced features, including the ability to perform diagnostics on the system's various components, such as the power supply and the cooling system. The system also includes a comprehensive set of alarm criteria, allowing for the detection of any deviations from normal operating conditions.

The POE2000 is designed to be user-friendly and easy to use, with a color graphical interface that displays real-time data and allows for easy navigation.

CSU 3000 - 32
- 94 Kw

\[
\begin{align*}
265,080 \text{ Btu/h} + 10\% &= 290 \text{ Btu/h} \\
\text{310 Btu/h}
\end{align*}
\]

\[
\begin{align*}
125 \text{ lb} \times \$12 \text{/lb} &= \$1800
\end{align*}
\]
5/1

315

100A

RCU

97KVA

HEU

28.62KVA

MGS.

6.45KVA

175A input circuit

200A circuit

10x trap duty

F: 50/60 Hz; all divs: dried 110V

34 quincy lag 20A; N/019

In-house wiring - we do.

Refrigerant: 

- 18 US gals/m
- 68 gpm
- 310K 670/hr
400Hz 8uB
  only to 192A max

125A 1HP from Westhouse
  Call 3125

100A cable

fee 3 50 ft.

Australian standards in 60Hz ??

Then peandler is 15 fl.

IOC 370 Both MCR
  4 Ss
  tape units. IBM
tape
FACSIMILE TRANSMISSION

To:

UNIV.

Date: 17-6-93

File No.: 1059

Fax No.

Att'n:

No of Pages to Follow

Reference

Remarks: MAIN THE HEATING UNIT - CHILLER

CON 3654477
-signature

GRAHAM KEE

Signed
16th June, 1993

The Director
Building & Grounds
University of Queensland
ST. LUCIA QLD 4067

ATTENTION: Mr A. Yagnik

Dear Sir,

PRACTICE CENTRE
WATER CHILLER FOR
MAIN FRAME COMPUTER

We are pleased to submit the following budget estimate and fee proposal on the above project.

To supply and install a single 100 kw chiller including pipework to and from the computer site including a licence of $3,000.00 for 1993, plus $5,000.00 for the water treatment room itself. We quote $11,000.00 plus GST.

To increase the capacity of the chiller to 150 kw, including plumbing, cooling tower and $7,000.00 to the water treatment room.

The above figure is subject to variation due to variation in the equipment bought.

The chillers are expected to last for 8 to 10 years and should be proved by the manufacturer, and if proposed to be a continuing part of the University.

Our fixed fee for the peaks of 1993 is $20,000.00, which excludes any work to be done with either the computer or the water treatment room.

We trust the above information is of assistance to you in the event and await your earliest decision.

Yours faithfully,

RON HAWKINS & ASSOCIATES

Craig Ross
10561.1
AIR CONDITIONING

Alan Yamanagi  B&G  53289
Fax 365 1555

(1 US gal = 3.79 litres)

Water  310 l BTU/HR.

75.8 Lpm / 20 (US) GPM @ 50°F / 10°C.

15 PSI pressure drop (104 KPA)
(max charge 1 HR 50°F)

---

Graig Ross  Ron Hawley  &  Mecc

The only way to get a more detailed quote
is to get a consultant. Alan Y. recommends
above for this type of work.

---

Robert
Raven Lodge Rd (En Campbell St)
Raven Hills
Tel: 252 4125

Sieg Frieder  3:00 pm Wed 16th Jan.

---

Graig Ross  need 35/40 Kw. for AC
hope sells less than 221
maybe 321
Alan Yagameji
90kW

I do not have capacity over a 5 year plan to use a mechanical chiller. Reliability is a factor. I strongly recommend using a stand alone unit.

$35k / $40k
$70 / $80k

unit (double for install)

Total for install

Hot end 2.5 m 1.5 m

delivery 3/4 months
Hi Graham

The following chart may be helpful. It does NOT include the integral SSD which is in the 1409 system, hence some of the power figures may be a little low. Also the number of DD-49 disks in the chart is 8 whereas you may be getting 11.

At this stage use the chart as a general guide. The figures I have been quoting by phone are more correct. The exact information is in transit from the US.

I am also including a chart for a C94A system. This is a system where the cooling unit can operate either to computer room air or chilled water. The only intention with this is to show a logical upgrade path and the infrastructure required. Although newer technology gives more calculations per KW; the infrastructure (power feeds and chilled water) you will be installing for the current system will also accommodate the C94A. You will note that in Air cooled mode the C94A system exchanges 27 tons to air. This means the chilled water infrastructure needed by the current YMP will be useful in the future.

Please treat this information as Commercial in Confidence.

Best Regards
Dermot

NOTE: This printout is NOT to be distributed to the customer, it is intended for internal use only. Only a formal document such as a MUS should be presented to the customer.

---

**Mini MUS Chart Information For (BICMOS) Y-MP2/232400**

<table>
<thead>
<tr>
<th>ELECTRICAL REQ.</th>
<th>AIR CONDITIONING REQ.</th>
<th>WEIGHT Lb (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QTY KVA KW</td>
<td>KBTU/HR KW TONS</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>MFC-102</td>
<td>1 0.13 0.12</td>
<td>2500 (1134)</td>
</tr>
<tr>
<td>HEU-102</td>
<td>1 6.10 4.64</td>
<td>500 (227)</td>
</tr>
<tr>
<td>IOC-160</td>
<td>1 ----- -----</td>
<td>3220 (1460)</td>
</tr>
<tr>
<td>PDU-160</td>
<td>1 0.25 0.23</td>
<td>950 (431)</td>
</tr>
<tr>
<td>VBM</td>
<td>2 2.08 1.88</td>
<td>350 (158)</td>
</tr>
<tr>
<td>PEC-2</td>
<td>2 1.29 1.15</td>
<td>445 (202)</td>
</tr>
</tbody>
</table>

Printed for Graham Rees <G.Rees@cc.uq.edu.au>
### Machine Unit Specification

**C94A INFORMATION**

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### Preliminary Information

**Mini MUS Chart Information For C94A/4128-3-512**

<table>
<thead>
<tr>
<th>QTY</th>
<th>ELECTRICAL REQ.</th>
<th>COOLING REQ.</th>
<th>AIR COOLED MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KVA</td>
<td>KW</td>
<td>KBTU/HR</td>
</tr>
<tr>
<td>C94A CHASSIS</td>
<td>1</td>
<td>37.34</td>
<td>35.10</td>
</tr>
<tr>
<td>C94A COOLING UNIT</td>
<td>1</td>
<td>16.77</td>
<td>10.90</td>
</tr>
<tr>
<td>SSD C94A CHASSIS</td>
<td>1</td>
<td>33.30</td>
<td>31.30</td>
</tr>
<tr>
<td>SSD C94A COOLING UNIT</td>
<td>1</td>
<td>16.92</td>
<td>11.00</td>
</tr>
<tr>
<td>VBM-2</td>
<td>2</td>
<td>2.94</td>
<td>2.64</td>
</tr>
<tr>
<td>GDT-200</td>
<td>2</td>
<td>0.88</td>
<td>0.80</td>
</tr>
<tr>
<td>LP-5</td>
<td>1</td>
<td>0.97</td>
<td>0.87</td>
</tr>
<tr>
<td>DE-60</td>
<td>2</td>
<td>9.80</td>
<td>5.00</td>
</tr>
<tr>
<td>20 DD-60</td>
<td>2</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FEC-1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FEC-1 ADPTR</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**System Total:** 118.92  97.61  333.03  97.61  27.76

---

*Printed for Graham Rees <G.Rees@cc.uq.edu.au>*

---

**120/208 VAC:** 27.69  24.43  138.04  40.73  11.56  19935 (9045)

**460 VAC:** 87.15  78.92
The following cooling requirements are for the system in Chilled water mode.

<table>
<thead>
<tr>
<th></th>
<th>ELEC RQMNTS.</th>
<th>COOLING REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(HEAT REJECT AIR)</td>
<td>(HEAT REJECT WATER)</td>
</tr>
<tr>
<td>KVA</td>
<td>KW</td>
<td>KBTU/HR</td>
</tr>
<tr>
<td>C94A COOLING UNIT</td>
<td>15.69</td>
<td>10.20</td>
</tr>
<tr>
<td>SSD C94A COOLING UNIT</td>
<td>15.69</td>
<td>10.20</td>
</tr>
</tbody>
</table>

MACHINE UNIT SPECIFICATION
CRAY C94A/4128-3-512
test
DATE:
Derek,

Just a few more points on the Cray proposal.

Firstly, perhaps we should recall the strategy. Biological Sciences and the Physical Sciences and Engineering Groups between them accounted for $5.606 million of the total UQ ARC Large Grants of $6.955 million in 1992. It is in these Groups and in large grants that we will gain the benefits from High Performance Computing. It is my personal view that if we do not establish the easy to use vector facilities now for training of staff and post-graduate students and for initial development of research projects, we will not compete in the "top 7 league" in the future and we will inevitably slide from our 4th position. Even QUT is better established than we are now in High Performance Computing.

Nevertheless, with the rapidity of technological advance, the State Government Supercomputer proposals and of the general scarcity of funds, there is a natural reluctance to invest the $3 or $4 million which would be necessary to be even modest players in the game. The advantage of the Cray proposal is that it will delay that investment, enable us to become significant players in the game and it provides a means by which one of our major collaborators can place research projects with us which underwrites a substantial part of the annual cost.

Some further notes on costs and financial outgoings follow:

<table>
<thead>
<tr>
<th>CRAY CHARGES 18 MONTH PERIOD</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cray Charge 18 months @ $25,000</td>
<td>450,000</td>
</tr>
<tr>
<td>Staff and Operational Charges as reduced by the HPCC 18 months @ $140pa</td>
<td>210,000</td>
</tr>
<tr>
<td></td>
<td>660,000</td>
</tr>
<tr>
<td>DPI Research Projects Contribution</td>
<td>285,000</td>
</tr>
<tr>
<td></td>
<td>375,000</td>
</tr>
<tr>
<td>Physical Sciences &amp; Engineering Group</td>
<td>150,000</td>
</tr>
</tbody>
</table>

Shortfall to be found from other University funds, Research Grants and other external contracts for usage 225,000

OTHER COSTS FOR SITING AND INSTALLATION AS A RESULT OF RECEIVING FURTHER INFORMATION AND TECHNICAL SPECS FROM CRAY

<table>
<thead>
<tr>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Chiller Plant 70,000</td>
</tr>
</tbody>
</table>

Front-end computer ($3,000 to be supplied

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by Prentice as it would be required after
period of use)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Wiring and switchboards</td>
<td>7,000</td>
</tr>
<tr>
<td>Plumbing</td>
<td>3,000</td>
</tr>
<tr>
<td>Additional power costs @ $80,000pa</td>
<td>120,000</td>
</tr>
<tr>
<td></td>
<td>200,000</td>
</tr>
</tbody>
</table>

**FIRST CRAY RESPONSE TO NEGOTIATIONS**

- Reduce monthly charge by $1,000 per month: 18,000
- Cray to contribute $21,000 to cost of Chiller Plant: 21,000
- 39,000

**REALITY**

I know and you know that the Centre will not put on more staff and we are unlikely to retrench staff. What will happen is a redistribution of staff from the IBM and a changed division of workload between MASPAR and the Cray. Indeed, being the professionals they are, I am sure the staff would work longer and harder to cover both systems. I would be surprised if the choice was put to Kevin Burrage of the Cray or his Post Doctoral Fellow, he would choose the Cray (not much point in having the Post Doctoral without the Cray). We do need a costed figure in justifying prices externally but we should be clear what is the extra money out the door.

Based on Cray’s first response to negotiations, the payments for 18 month period are:

<table>
<thead>
<tr>
<th>Description</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cray</td>
<td>432,000</td>
</tr>
<tr>
<td>Extra Power Costs</td>
<td>120,000</td>
</tr>
<tr>
<td>Installation Costs *</td>
<td>59,000</td>
</tr>
<tr>
<td></td>
<td>611,000</td>
</tr>
</tbody>
</table>

The committed recoveries for the same period are:

<table>
<thead>
<tr>
<th>Description</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPI</td>
<td>285,000</td>
</tr>
<tr>
<td>Physical Sciences &amp; Engineering Group</td>
<td>150,000</td>
</tr>
<tr>
<td></td>
<td>(435,000)</td>
</tr>
<tr>
<td></td>
<td>176,000</td>
</tr>
</tbody>
</table>

The University has committed itself to match from its own funds the DPI contribution i.e. an additional $135,000.

This leaves an extra $41,000 to be found from other external users over the 18 month period which I would not think is an impossible task.
* There will be probably some residual value from
  the sale of the chiller unit but this has not been
  included

PERPECTIVE

The University must expect to pay something if it wishes to enter effective
high performance computing accessible to researchers over a range of
disciplines. In my view, we are a few years late but enter the field
we must. This offers us a very good opportunity. It is not often that
we can start a new venture with such substantial external support. As for
the quantum of money, I think you may be surprised if you refreshed your
memory on the cost of hardware and software maintenance for the Library
systems and the power and airconditioning costs.

In my view, there will be a substantial cost to the University if we do not
go ahead but I guess you don't need me to detail the areas of loss.

CONCLUSION

I think we should move forward with further negotiations with Cray. I would
not expect, however, that I will do better than a slightly higher contribution
to the cost of the Water Chiller and a reduction of the monthly charge by
a further $1,000/month (i.e. to $23,000).

Time, of course, is critical if we are to be able to service the DPI research
contracts.

Approval is requested that I be empowered to negotiate with Cray on the basis
that a reasonable expectation can be given to Cray of proceeding if they meet
the above requirements.

Alan C.

+-----------------------------------------+-------------------+
| Alan W. Coulter            | Phone:  61 7 365 3521 |
| Director, Prentice Centre  | Fax:    61 7 365 4477 |
| The University of Queensland | Internet: a.coulter@cc.uq.edu.au |
| Queensland 4072  AUSTRALIA |                                 |
+-----------------------------------------+-------------------+
Computer Room 2.

8°C 75 rpm  pressure drop ≤20 kPa.

Roof Temp. 10°C main temp.

Heater 19 kW 67.6 kW
230,000 87V/kW.

Power Supply 100A/phase
25 mm² 19/35
(4 core 24 mm² cable) this may limit actual to 90A/6 continuous

Prevent water connections

Supply Location LL-6-1631

Backup Location LL-6-1631
Rental AC

Roof Top Chiller 65 kW
9/30/65 kW, $750

3081. Heat to liquid coolant
15.4 kW, 52,500 BTU/hour

CRAY 90 kW, $100

Total power Consumed x 240A/$

= 155 kW

Cost 150 x 24 x 365 x 1.05 x 9.99 / $/kW

$176,696, pa.

$94,620 pa.
IBM

21 gpm  6°C
55 gpm

Red top  33 gpm @ 15-20°C
REU  28.62 kVA  36 A/F
HEU  6.45 kVA  8 A/F
M6S  160 175 10 A/F
50/60Hz

230 A/F

90kW water
tank 35kW coil

CRAY  418V  115 kW  160

35 kW
150 kW  208

SUNI

Fei-3 4/330 was a problem with -12V power supply (3 years)

since Jan 1990
if it has power part# 300-1072-XX then it is OK needs -12V 2A

old part# 300-1034-XX -12V 8A

Fei-31 50A
+60 turn board
20 to 40 -5

Sunny Daniel, Mech. G. 53979

Sunny says it's the best one.
SCHEDULE A

TO THE CONTRACT FOR SALE OF CRAY RESEARCH, INC., EQUIPMENT
DATED __________________________

The above indicated Contract is amended to include the following Equipment:

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Qty</th>
<th>Description</th>
<th>Unit</th>
<th>Sale Price ($US)</th>
<th>Total</th>
</tr>
</thead>
</table>

Total Sale Price:

Scheduled Delivery Date: __________________________

Scheduled Installation Date: __________________________

Cray technical specifications: User technical manuals delivered with the Equipment

CUSTOMER AND CRAY AGREE TO THIS SCHEDULE AND THE FOREGOING TERMS AND CONDITIONS.

CUSTOMER: __________________________

By:________________________

Name:____________________

Title:_____________________

Date:_____________________

CRAY RESEARCH, INC.

By:________________________

Name:____________________

Title:_____________________

Date:_____________________

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