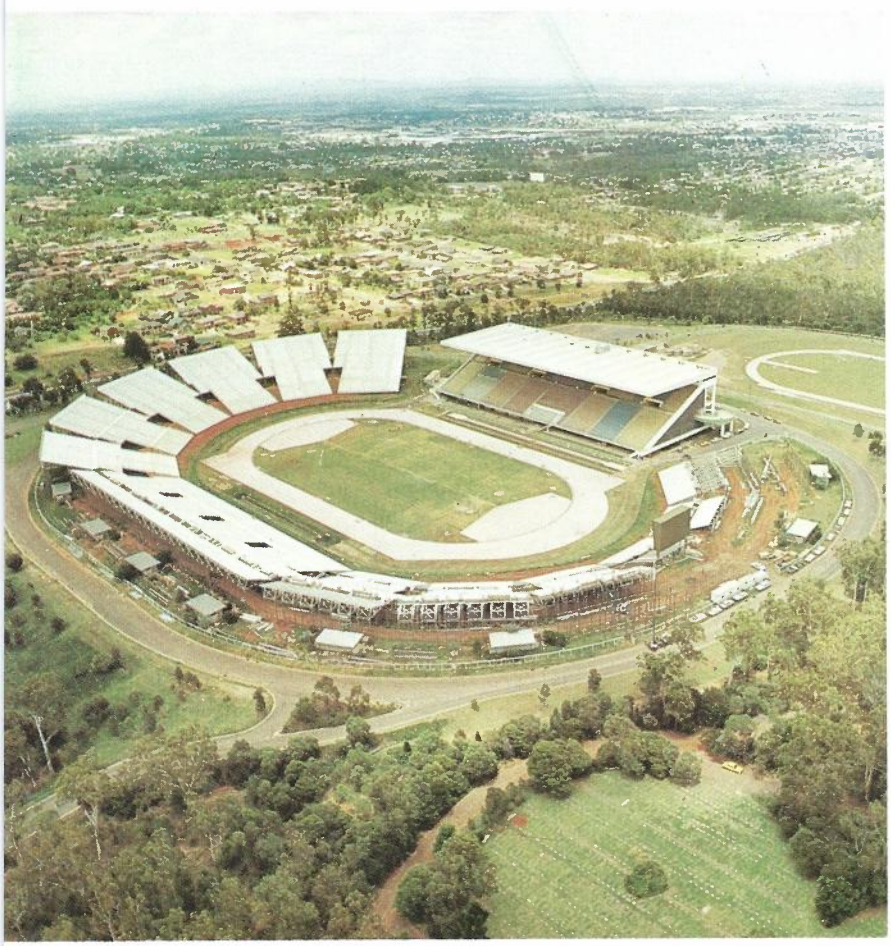
Volume 32, No. 3, 1982

the telecommunication journal of Australia



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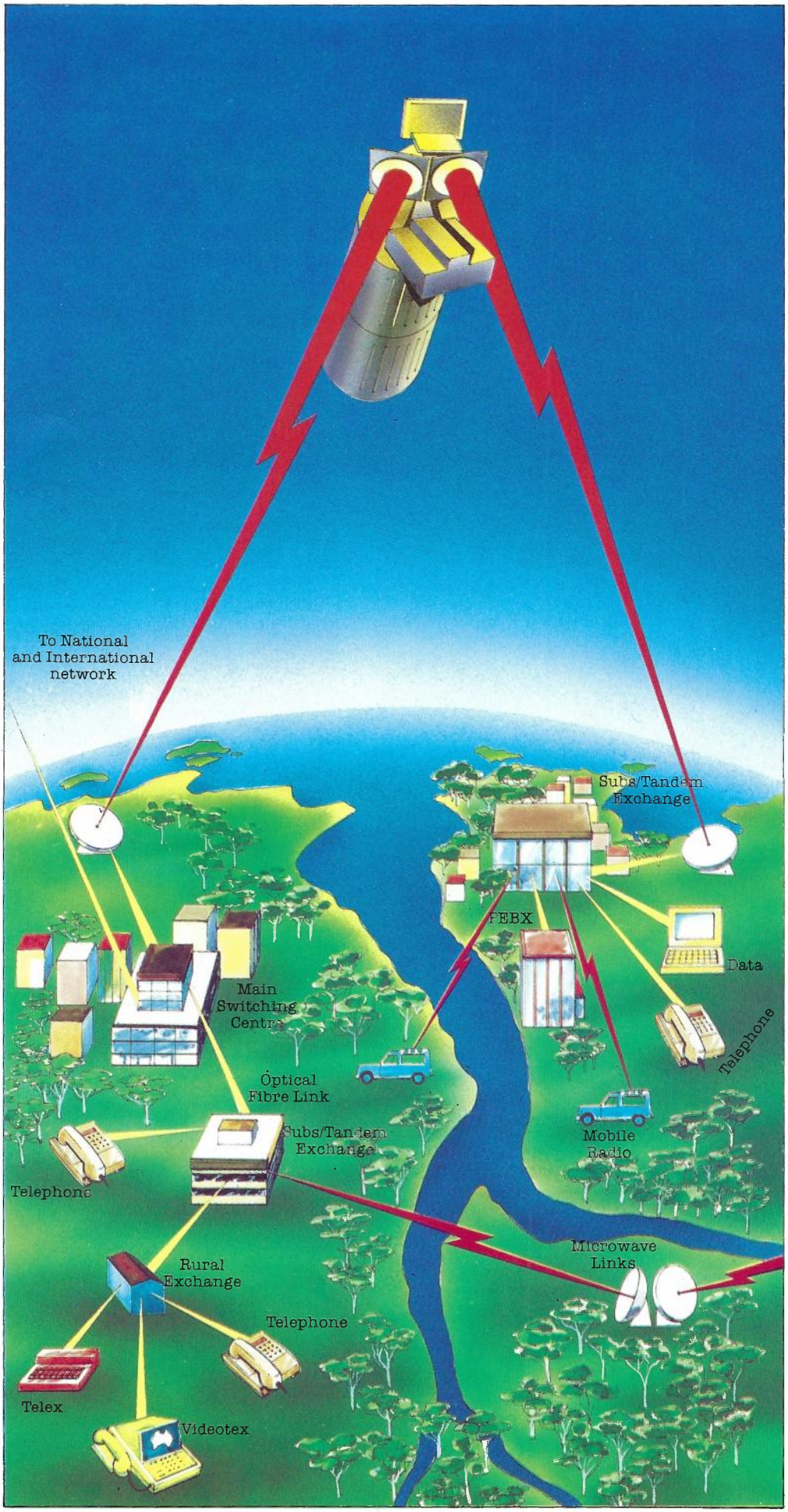
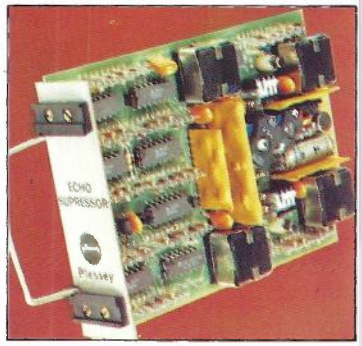
Telecommunications at the XII Commonwealth Games Brisbane 1982.

Plessey: now you're talking.





Top: IXT.
New generation fully electronic telephone.

Lower: Echo Supressor.
Advanced hybrid technology in transmission equipment.

Our involvement in communication goes back more than half a century to bring you the future, sooner.

The result of our efforts is seen in the hundreds of products which daily touch the lives of a very large number of people not only across Australia but throughout the world.

Products that include:

- Computer controlled digital exchanges.
- PEBX.
- Satellite terminals.
- Microwave links.
- Subscriber telephones.
- UHF/VHF mobile radios.
- Optical fibre links.
- Videotex terminals.
- Line transmission equipment.

And more.

Plessey Australia Pty Limited
Telecommunications Division
Faraday Park, Railway Road
Meadowbank NSW 2114
Telex: AA21471
Telephone: (02) 807 0400

PLESSEY

PT134

The Society Reporter

Volume 32 No. 2
supplement

This supplement to the Telecommunication Journal of Australia will bring you news of topical and programmed society events in all States and of the people involved in running your Society.

The Reporter is supplied in this form so that you can conveniently separate it from the Journal for your ready reference while its contents are current, or possibly to pass it on to a potential new member to kindle an interest in the Society's affairs.

SA Welcomes New Members

The Society warmly welcomes the following new members who have joined us this year.

From SANTOS: John Saywell

From TELECOM

Engineering: Rod Blanchard, David Booth, Adrian de Brenni, Brian Eglinton, Neil Gale, Kym McCauley, Stephen Salamon, Don Smith, Des Solly, Chris Soutter, Norm Tucker, Michael Vial, Ken Wagnitz, Barry Webb.

Operations: Bruce Bowman, Henry Ehman, Ashley Martin, Vern Wensley, Michael Harris.

ACTIVITIES IN QUEENSLAND

Queensland Lectures.

Since 1976, the Queensland Division has held some lectures in conjunction with the IE (Aust.) and IREE. This has developed into a regular pattern of three lectures each year, and each is hosted by one of the Societies, usually at their own venue.

Topics are carefully chosen to have a broad spectrum of interest, and the best attended lecture to date was "Communications for the Commonwealth Games". Other subjects covered areas as diverse as power generation, medical physics, power line carrier, and satellites. Future topics include fibre optics, and public automatic mobile telephone systems.

The local experience is that these joint lectures have the best attendance of the series, despite the 6.15 p.m. starting time. Other TSA lectures are held at 12.30 p.m., which is most convenient to the majority of our members.

The joint lecture format is also beneficial to the lecturer, in that the increased size and broad spectrum of interests of the audience encourages him to present a well prepared talk. The overall success of the joint program has ensured that that all three societies will continue with them indefinitely.

Queensland members are encouraged to notify suitable events for inclusion in the Society Reporter to Rod Torkington, phone (07) 225 8706 or telex 43432.

PEOPLE in the news

Arthur Wilson retires after 68 years in Telecommunications

The name Arthur Wilson will stir the memories of many older members of the Telecommunication Society.

Mr Wilson retired in February from Plessey Australia after a career which must surely be a record - 68 years in the telecommunications industry.

Arthur Wilson was born in Australia in 1896. He joined the PMG Department in Sydney as a junior assistant engineer in March 1914. His employment was interrupted by First World War service; he joined the First Division Signals Company, No. 2 Section, in 1916, and served in France.

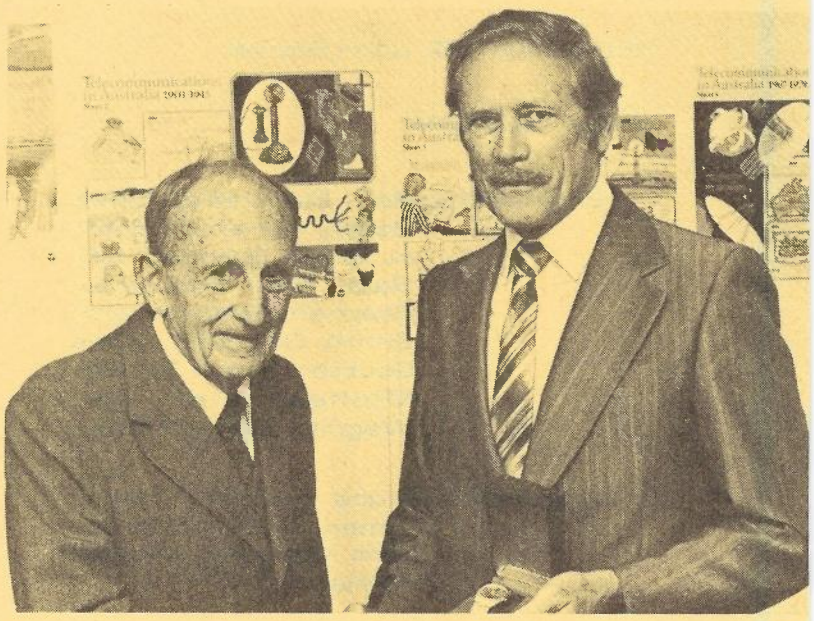
Mr Wilson qualified as a professional engineer with the PMG Department in 1925. During the 1920s he was Divisional Engineer, Telephone Equipment, and supervised a number of automatic exchange installations in the City of Sydney. In 1929 he was involved in the first Australia/United Kingdom radio telephone service via HF radio link.

He moved to Melbourne in 1938 to the central office of the PMG Department, where he was appointed supervising engineer in charge of telephone equipment. The Postmaster-General of the day was keen to secure supplies of locally manufactured equipment for the rapidly expanding telephone exchange program and Mr Wilson was active in the establishment of the Australian telephone equipment manufacturing industry. In 1938 both Plessey (then known as Telephone Electrical Industries) and STC of Sydney commenced the manufacture of Strowger telephone equipment.

Mr Wilson retired from the Postmaster General's Department in 1961 after 47 years of service and joined Plessey Australia as Melbourne Liaison Manager. He represented the company in Melbourne, particularly in its business relations with Telecom Australia, until his recent retirement.

He is now the 227th member of the long established "21 Club" sponsored by the Plessey Company, and is the oldest member.

Many of Telecom Australia's and the company's top management attended the celebration which was held at the Kelvin Club, Melbourne, to mark Mr Wilson's retirement from Plessey. The photograph shows Mr Walter Fielder-Gill, Director and Gener Manager of Plessey Australi presenting Mr Wilson with a gol watch on behalf of the company management and directors. Mr W J. B. Pollock, Managing Director Telecom Australia, also made presentation in recognition of M Wilson's long service with the in dustry.

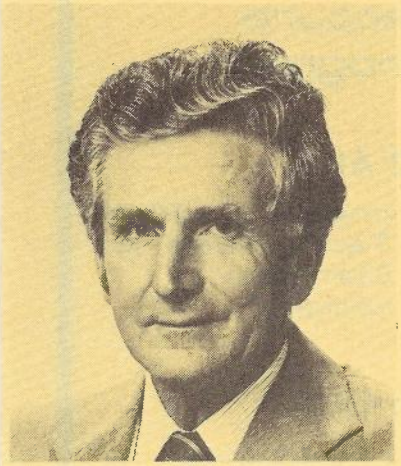


Eric Ledin's visit to Melbourne

The last issue of the Reporter mentioned the return visit to Australia of Mr Eric Ledin, a retired engineer from L. M. Ericsson, Sweden, who in 1935 installed an automatic telephone exchange for the Victorian Railways and presented a paper on the subject to the Postal Electrical Society.

On his recent visit, Mr Ledin was awarded honorary membership of the Telecommunication Society of Australia. Our photograph shows Mr Laurie Bennett, president of the Society's Victorian Division, presenting this award to Mr Ledin.

New CSE — South Australia



In March this year, Society member Frank Gubbins was promoted to Chief State Engineer for South Australia and the Northern Territory.
Frank's life and career have been characterised by challenging situations, not the least of which was his RAAF bombing assignments over Germany in World War II and for which he was awarded the DFC.
He was vitally involved in the provision of telecommunications for military operations at Woomera and Maralinga and for the ELDO Blue Streak project at Gove in the Northern Territory. Also, Frank played a major role in the redevelopment of the aerial trunk routes from Adelaide to Perth and Darwin. All of these transmission projects were undertaken in harsh environments and against tight deadlines.
For three years in the early 1970s, Frank was chosen to lead the 30 man Australian Telecommunications Mission in Indonesia and on his return to Adelaide was successively the Superintending Engineer, Regional Operations and Field Engineering.
We congratulate Frank and wish him well in undertaking the challenges of his new position.

Award to Member

Earlier this year the Chairman of the SA Division of the Institution of Engineers, Australia presented one of our Engineer members, Michael Vial, from the Construction Branch, with one of the two cash awards which are made annually by the Institution to the University of Adelaide and the SA Institution of Technology.
We congratulate Michael for this and for his success in obtaining a first class Honours in Electrical Engineering.

Letters to the Editor

Editor in Chief
Telecom Journal

I take the opportunity to respond to your invitation included in Vol 31 No. 3 1981 to write to you re my thoughts on the "Journal" and the Society in general.

As you know, I have recently commenced a term as Chairman of the Victorian Branch of the Society. I was eager to take the job on because I see a need to expand and broaden our membership base.

I would like to see a society where lineman, clerks, draftsmen, technical officers, engineers, accountants, trainers — in fact all who have an interest in Telecommunications, can find a common ground and increase their awareness of what people in other sections do.

It appears to me that our society is composed mainly of "technical" people and that is the image which the society presents. One only has to glance through the current Journal to see this. I have been trying to interest non-technical staff in my district and to encourage them to join the society. However, when they flick through the pages of the Journal and find approximately 40% of them contain what appears to be highly technical diagrams they lose sight of the fact that three of the features can be read and partly understood by people who are not technically minded.

My plea is this. Let us have articles which will give a clerk an understanding of a carrier system, a lineman an understanding of a laser, a technician an understanding of marketing concepts, a draftsman an understanding of what "digital" means. Let us include them in a special journal with a much larger than normal print run, and hand complimentary copies to the people I think we should be trying to attract with an invitation to join our society.

The Wireless Insitute of Australia tried a similar tactic recently and results indicate a very significant increase in membership

Teachers who speak over the heads of their pupils are not good teachers. Many of the writers of technical articles fall for the trap of designing their paper to ***teach*** *rather than to aquaint. This leads me to my second plea for editors to ensure that any technical articles are kept simple and easily understood. Those who want to know more will follow up in other publications anyhow.*

Please regard these comments as constructive and an indication of the desire to see our society grow and prosper along with the "Telephone Operating Company" style of management being introduced by Telecom Australia.

Laurie Bennett
Internal Plant Manager — Ivanhoe

Editor-in-Chief
Telecommunication Journal.

Enclosed, please find completed 'User Survey — 1981'.

Whilst many of the articles have proven too technical for me to understand, I have thoroughly enjoyed those articles written on new equipment/products. These articles have allowed me to maintain an awareness of what is happening in the telecommunications world, and have enhanced my efficiency as a Senior Traffic Officer (International), and in more recent times, as an Account Representative with the Industry Sales Section. Recent articles concerning the Black Mountain Tower were extremely interesting.

With regard to Question 14, I would like to stress that little scope exists for the 'layman' to contribute articles to the Journal, and whilst I have been involved in a number of operational areas, a far better job in presenting articles concerning such operations is always evidenced when they are written by Engineers. However, in my new position, scope does exist to offer articles for publication, and I will endeavour to submit material in due course.

Ian A. Cameron
INDUSTRY SALES

PIN UP

FORTHCOMING EVENTS

Queensland Lecture Program

The Queensland Division committee has looked to a wide variety in the range of lecture topics programmed to appeal to members' interests. Here is the program of lectures to be presented in Brisbane during 1982:

- JULY 21 — Wednesday, 6.15 pm, Room 313, Axon Building, University of Queensland "Fibre Optical Communications — Device and System Capabilities" — Dr K. S. Tucker (Joint Meeting with IE (Aust) and IREE hosted by IE (Aust)).
- AUGUST 24 — Tuesday, 12.30 pm, Telecom Theatrette "Remote Area Television (RATV)" — V. L. Cavallucci.
- SEPTEMBER 14 — Tuesday, 12.30 pm, Telecom Theatrette "Leopard" — P. J. Chippendale.
- OCTOBER 13 — Wednesday, 6.15 pm, Telecom Theatrette "Public Automatic Mobile Telephone System" — J. Boland and K. Phillips. (Joint Lecture with IE (Aust) and IREE hosted by IREE).
- NOVEMBER 23 — Tuesday, 12.30 pm, Telecom Theatrette "Videotex" — L. Cunningham.

South Australia's Lecture Program

- **2 AUG.**
  Impact of Digital Techniques on Communications
- **4 OCT.**
  Forecasting of Customer Demand in Telecom
- **6 DEC.**
  Call Charge Recording

Lectures are held in Chapman Hall, 11 Bagot Street, North Adelaide at 7.30 p.m.

KEEP UP

WITH THE LATEST

JOIN

THE TELECOMMUNICATION SOCIETY OF AUSTRALIA

VICTORIAN LECTURE PROGRAM 1982

- **9 August.** Telecoms Capital Investment Policies and Practices.
- **11 October.** Directory Assistance Services.

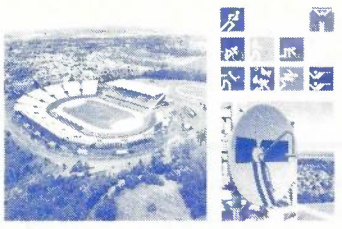
Location: H. C. Sleigh Theatre, 1st Floor Cnr. Queen and Bourke Sts., Melbourne.

Time: 4.30 p.m.

THE TELECOMMUNICATION JOURNAL OF AUSTRALIA

ISN 0040 2486

Volume 32 No. 3, 1982



Cover:
The QEII Stadium, Brisbane Games symbols and Microwave link to the venues.

CONTENTS

TELECOMMUNICATIONS at the XII Commonwealth Games Brisbane 1982.

OTHER ITEMS

Editorial

I was delighted, indeed honoured, to be asked to write the Foreword to this edition of the Telecommunications Journal of Australia, a publication largely devoted to the communications aspects of the XII Commonwealth Games.

The XII Commonwealth Games is the largest sporting event ever to be held in Australia; it is larger than the 1956 Melbourne Olympics and certainly larger than the Commonwealth Games in Perth in 1962.

Since then the sports, and society in general, have become more and more reliant upon technology and there is no part of the present games which is unaffected by communications in one way or another.

I have been interested, I might even say fascinated, to observe the growth of the Foundation's technical systems from their conception, through their developmental stages to the implementation of an almost bewildering array of equipment which will not only assist us in running the games, but which will also allow our enjoyment of Australia's Games to be shared by millions of people around the world.

Planning for the Commonwealth Games commenced early in 1968, almost fifteen years in advance of the actual event.

It was not until 1976 that the Foundation had any premises of its own. Until then all meetings were held in the homes or offices of the people involved.

In 1976 the Foundation's full time staff consisted of three people. Since then, the Foundation has grown until it has a full time staff of approximately 150 and about 5,400 dedicated volunteers.

The games will cost in the vicinity of $22 million to run and this will be on top of nearly $51 million of capital expenditure.

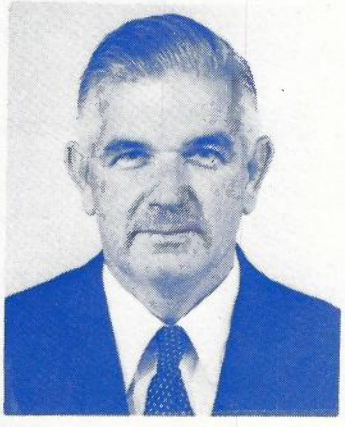
Provision of the venues and their facilities was funded by the three levels of Government. The cost of staging the games is however, the responsibility of the Foundation.

Many organisations and individuals have been generous in their support of the games and much of this support takes the form of the provision of goods and services rather than cash.

The Communication Division has been fortunate in that companies and organisations within the telecommunication industry have supported the games to a very generous extent also, many individuals with most valuable skills, have given their time and energy, on a voluntary basis.

My colleagues on the Foundation's Board of Directors and I have been most impressed with the way in which the technical systems have performed.

Nevertheless, people are still our most important resource. I would like to offer to Neil Watson, our conscientious and industrious Chairman of the Communications Division, the people of Telecom, OTC, the ABC's Commonwealth Games Unit and all of our own people of the Communications Division, a warm and personal vote of thanks.



GUEST EDITOR

THE HONOURABLE
SIR EDWARD WILLIAMS, KBE.

CHAIRMAN,
XII COMMONWEALTH GAMES
FOUNDATION

This edition of the Telecommunications Journal of Australia, is devoted to recording the part played by the telecommunication industry of Australia, in the running of the XII Commonwealth Games. The whole edition has been set in the official colours of the games. The papers for this edition have all been edited and co-ordinated by Mr F. Scott of Telecom, Queensland.

The History, Development and Communication Needs.

T. F. STEER Dip. Eng.

This paper provides an overview of the history and structure of the Commonwealth Games. The paper discusses the development of the XII Games in Brisbane and goes on to describe the venues and the communication needs for the Brisbane Games.

HISTORY AND STRUCTURE

The first games were held at Hamilton, Canada, in 1930 and there have been eleven subsequent games held in various parts of the world, each numbered consecutively as they take place, every fourth year.

The direction of the games is vested in the Commonwealth Games Federation, the governing body, with its headquarters in London, England. Each eligible country is represented on the Federation by delegates from its Commonwealth Games Association. It is fairly common, especially in the smaller Commonwealth Countries to have a combined Commonwealth and Olympics Games Association.

The honour of holding the games is entrusted to a Commonwealth Games Association, affiliated to the Federation, at a venue recommended by the Association and approved by the Federation.

The selected Commonwealth Games Association may, if so desired, delegate the running of the games to an organising committee, which, while working in conjunction with its Commonwealth Games Association, shall also be responsible to the Federation.

Such an organising committee was formed by the Australian Commonwealth Games Association and this committee has become the XII Commonwealth Games Foundation. Effectively the Foundation is the executive body charged with the planning, organisation and conduct of the celebration of the XII Commonwealth Games.

The games are open to amateur competitors from the Commonwealth Nations.

The sports which will be contested at the XII Games are:

AQUATICS
ARCHERY
ATHLETICS
BADMINTON
BOXING
CYCLING
LAWN BOWLS
SHOOTING
WEIGHTLIFTING
WRESTLING

In addition to the above sports, there will be at Brisbane, two demonstration sports and one exhibition sport. These are —

Table tennis
Australian Rules Football
Water Polo

The demonstration and exhibition sports are a traditional part of each Commonwealth Games. They are not governed by the rules of the Constitution and, generally speaking, at least one of them is a sport of particular interest within the Host Country and not usually played, to a great extent, elsewhere. For instance, one of the demonstration sports at Edmonton (1978) was Lacrosse.

DEVELOPMENT OF THE XII COMMONWEALTH GAMES

It all started in 1969 at a meeting of the Australian Commonwealth Games Association to consider the nominations of cities for future games. A Queensland representative put forward the concept of nominating Brisbane as the host for the 1978 games. There was, however, insufficient time available to achieve that goal.

Staging an event as complex as the games requires considerable capital funds and necessarily involves, amongst others, all levels of Government — Federal, State and Local. By the time that agreement in principle for the support of the bid had been obtained, the deadline for 1978 nominations had been narrowly missed and Edmonton was awarded the games.

The groundwork had, however been laid and in May, 1974 the Association nominated Brisbane as its sole candidate for 1982. Somewhat brashly, work commenced on the construction of the QE II Stadium in a matter of weeks following the nomination.

England's candidate, Birmingham, remained in contention for the honour until the last minute. At the 11th hour, just before the Federation made its decision during the 1976 Montreal Olympics, Birmingham's nomination was withdrawn.

The choice of the dates for the games is at the discretion of the host country. Before choosing the September 30th to October 9th period, the organisers consulted the Meteorological Bureau and took in to account factors such as —

- Humidity
- Hours of daylight
- Hours of sunshine
- Average wind velocity
- Average temperature — day and night
- Average rainfall

Following tradition, the games will commence with an opening ceremony. Teams from all of the competing countries will be led into the arena by Canada as the host country of the XI Games. Australia, as the current host, will march on to the field after all of its guests have led the way.

This opening ceremony will mark the culmination of the organisational efforts of approximately 5,000 people, most of them volunteer workers. It will also signal the start of ten days of frenetic activity by the same people.

The XII Commonwealth Games are the first to have had the advantage of being able to exercise most of their systems in advance of the actual games. The S.G.I.O. Building Society Games (better known as the Mini-Games) were held on the 2nd, 3rd and 4th of October, 1981. Of course, these games were held on a restricted budget and it was not possible to test all facilities to their fullest extent. However, many valuable lessons were learned.

They were particularly fruitful from the point of view of the communication facilities, as many of the sports officials had their first brush with the technology to be used during the games. The technicians, on the other hand, learned much about the conduct of the sporting events. Several mis-conceptions, on both sides were corrected as a direct result of the mini-games.

THE VENUES

The venues are perhaps the most expensive aspect of the Commonwealth Games — that is, if you consider them in terms of capital outlay only. Construction of the venues accounted for almost all of the $40 million provided for capital works by the three levels of Government.

In addition a further $11 million was allocated to the construction of the athletes village.

Chandler Sports Complex (Fig. 1)

This complex was constructed at a cost of $23 million and contains the venues for four of the sports, one of the demonstration sports and the exhibition sport of water polo.

The venues within this complex are —

— The Aquatics Centre: A magnificent building with the capacity to seat up to 5,000 spectators. The capital cost of the Aquatics Centre was $12 million. Swimming and diving events will be held here, as will water polo.

— The Velodrome: The site of most of the cycling events, with the capacity for 6,000 spectators (including temporary seating).

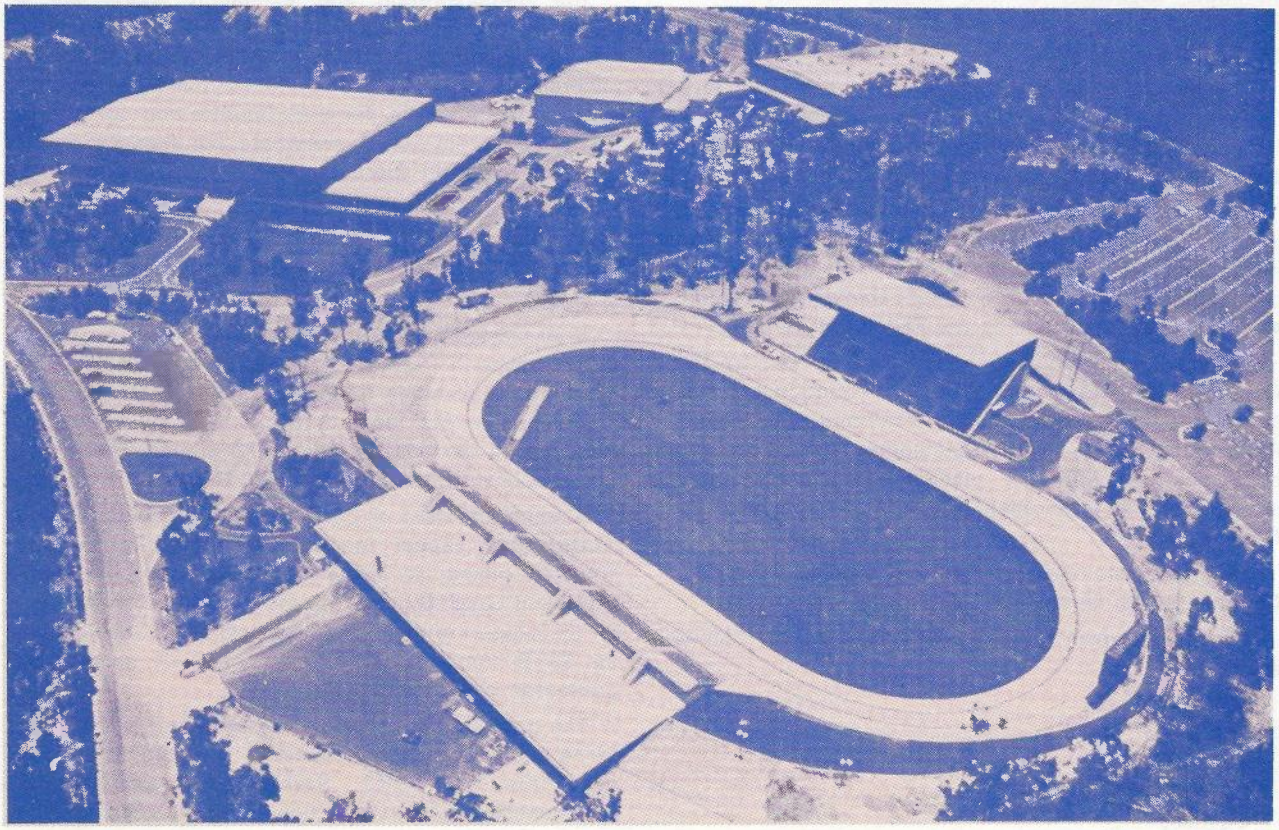


Fig. 1 — Chandler Sports Complex

The capital costs of the velodrome were —

Grandstand	$800,000
Amenities building	$400,000
Track construction	$800,000
Temporary seating	$400,000

— The Sports Hall: **(Fig. 2)** A general sports hall, completely covered, with seating for 2,500 spectators. Capital cost of the Sports Hall was $3.75 million. This hall is the venue for badminton and the demonstration sport of table tennis. The hall is suitable for any sport which can be played indoors and has already been the site for tennis, wrestling and badminton events.

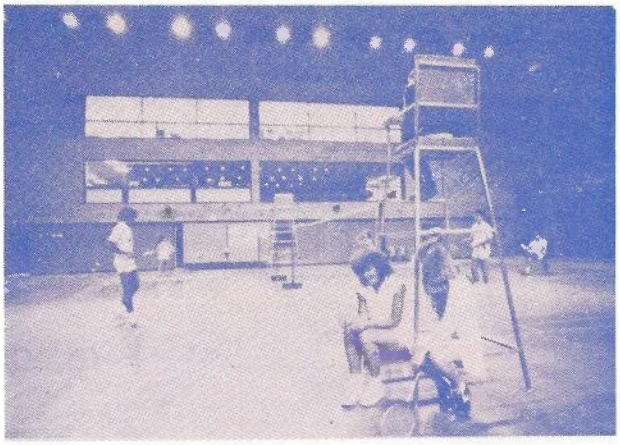


Fig. 2 — Sports Hall, Chandler

— The Weightlifting Theatre: **(Fig. 3)** The theatre has the capacity for 1500 spectators and was built at a capital cost of $3 million. This building will be used after the games as a venue for theatrical productions. It has already been the site of an eisteddfod and has been used for the volunteer induction courses for the Foundation.

Additional site works at the complex account for the remainder of $23 million expended on the Chandler Sports Complex.

The complex was designed to retain as much of the natural surroundings as possible. As a result, the entire area is most attractive and is proving increasingly popular for family outings.

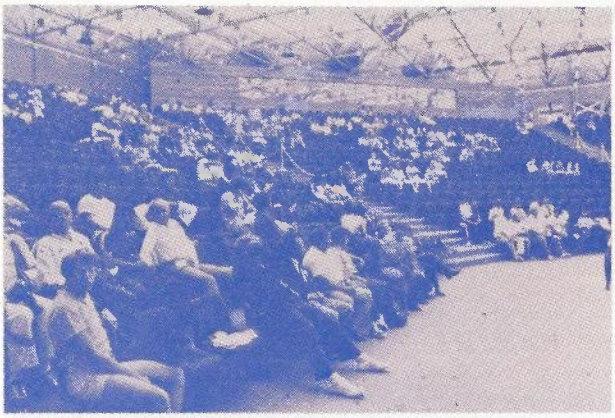


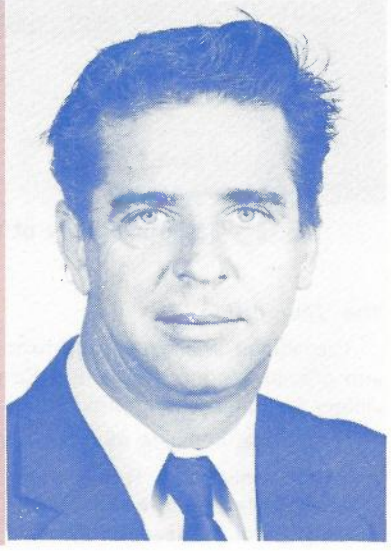
Fig. 3 — Weightlifting Theatre, Chandler

Belmont Rifle Range (Fig. 4)

The Belmont Rifle Range is an existing facility which has been the home for several Queen's Shoots and other major shooting events. It has the capacity to accommodate 1,000 spectators and is set in natural bush surroundings.

Fig. 4 — Belmont Rifle Range

Trevor Steer joined the APO as a Technician-in-Training in 1956. He worked as a Technician and Senior Technician in various areas and was promoted as an Engineer, in 1972. In June 1980, he was seconded to the XII Commonwealth Games Foundation as the manager of its Communications Division. At the time of his secondment, he was Senior Engineer, Special Services in Telecom's Customer Networks and Equipment Section.



The Queen Elizabeth II Jubilee Stadium (Fig. 5, 6)

The QE II Stadium was constructed at a cost of $17.5 million and during the games it will seat 58,000 spectators. 10,000 of the spectators can be accommodated in permanent seating in the grandstand and the remaining 48,000 in temporary seating constructed around the arena.

QE II is the site for athletics and the opening and closing ceremonies.

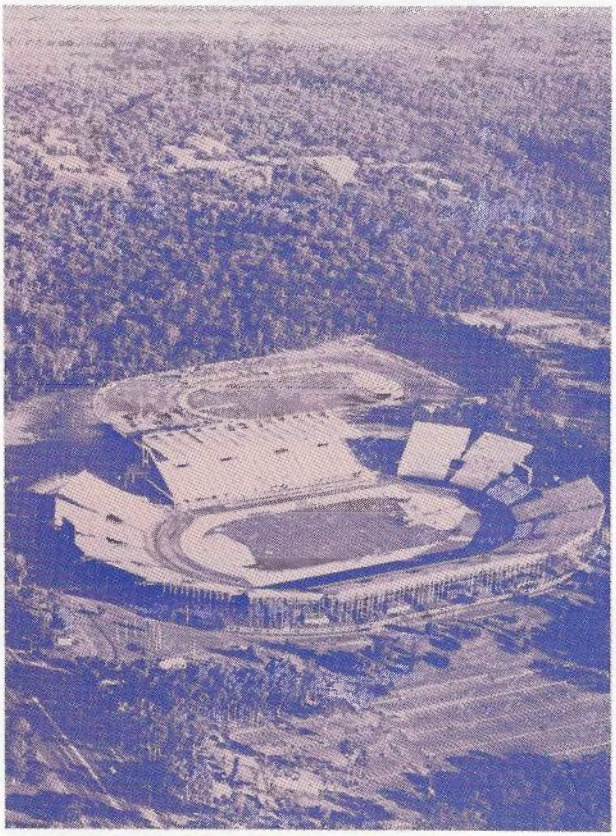


Fig. 5 — QEII Stadium

Fig. 6 — Fish-eye view of QEII Stadium

The Village (Fig. 7)

The village will house approximately 2,000 athletes and officials during the games. Construction cost of the village facilities was approximately $11 million.

The village consists of three major sections:

- Griffith University: This is the main village area. The housing facilities which were constructed for the village, will be used to house university students and nursing staff from the nearby QE II Hospital after the games. Students and other eligible people are already in residence in these housing units.
- Mt. Gravatt College of Advanced Education: When it became apparent that the housing at Griffith University would not be able to cope with the expected influx of teams, arrangements were made for the temporary occupancy of student accommodation at the Mt. Gravatt C.A.E. Further construction work at Griffith would not have been economical and would have resulted in badly under-utilised buildings for a considerable time.

Both Griffith University and Mt. Gravatt C.A.E. will house athletes and team officials from the competing countries.

- University of Queensland: This is the Technical Official's Village. Technical officials are those people who supervise the conduct of the sports and ensure that the rules of the international sporting bodies are obeyed. They are not part of the competing teams. The colleges at the campus of the Queensland University will be used for their housing.

Fig. 7 — The Village

Moorooka Bowls Club (Fig. 8)

This is an existing bowls club and with the addition of temporary seating there will be accommodation for 2,500 spectators. The cost of providing temporary seating and other site works was $120,000.

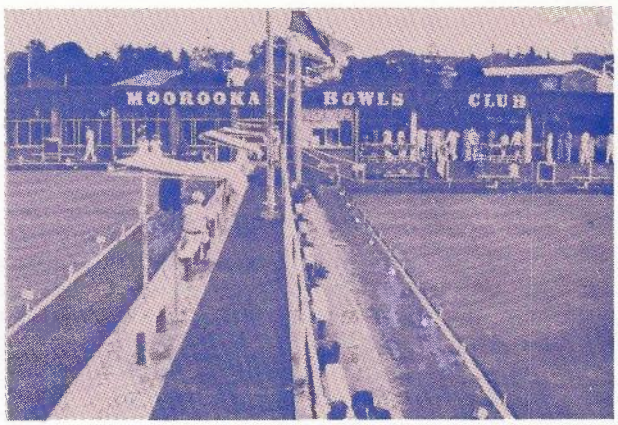


Fig. 8 — Moorooka Bowls Club

City Hall (Figs. 9, 10 and 11)

The Brisbane City Hall is one of Brisbane's best known landmarks and is the venue for wrestling. It has a seating capacity of 1,500.

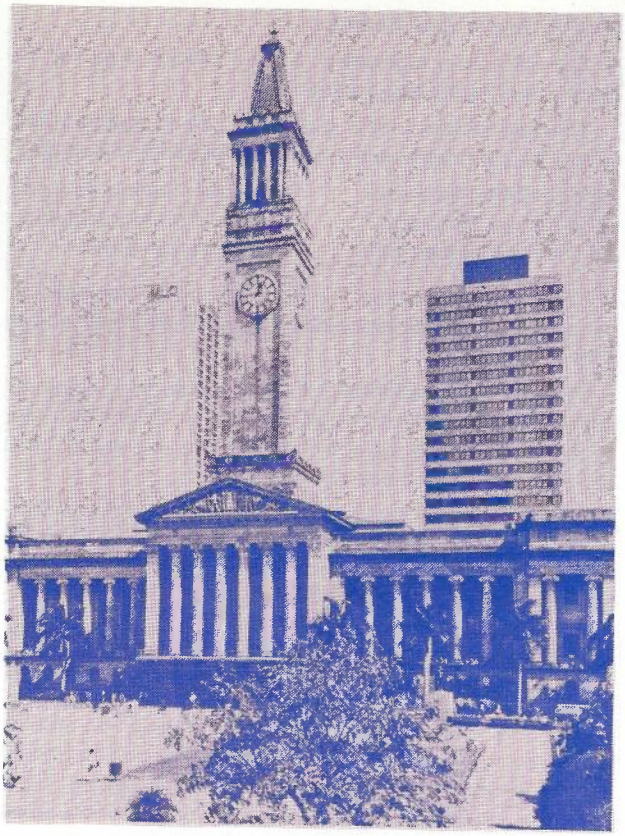


Fig. 9 — Brisbane City Hall

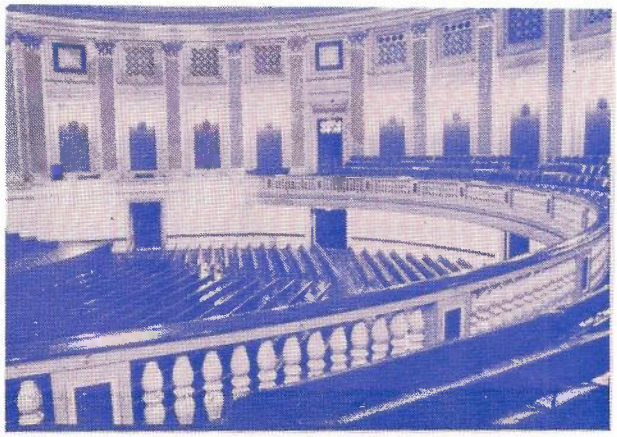


Fig. 10 — City Hall Interior

Festival Hall (Fig. 12 and 13).

Another landmark in the heart of Brisbane, Festival Hall is well known as the home of professional boxing in Brisbane. It will accommodate 5,000 spectators for the boxing events at the games.

Murarrie Sports Ground

Murarrie is the home for the Archery events. It is reclaimed land and temporary seating will be provided for 1,000 spectators during the games.

COMMUNICATIONS

The technical services for the games are the responsiblity of the Foundation's Communications Division and the major services for which this division is responsible, are —

Fig. 11 — Wrestling in Brisbane City Hall

Fig. 12 — Festival Hall

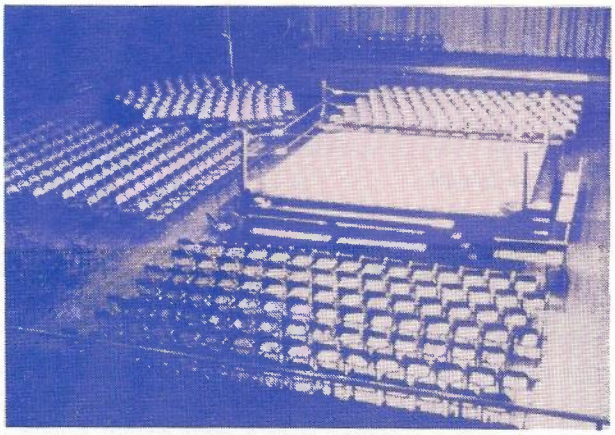


Fig. 13 — Interior of Festival Hall

- The Telephone Systems
- The Results Network
- Mobile Radio and Paging Services
- Reproduction and Facsimile Services
- Closed Circuit Television
- Scoreboards and Timing System
- Public Address Systems
- The Foundation's Computer Systems
- The Host Broadcaster forms a separate division

within the Foundation, but works closely with the Communications Division.

Telephone Systems:

The basic communication device for the games is the telephone.

One of the earliest decisions which had to be made concerned the structure of the Foundation's PABXs. Should there be a number of PABXs based on the venues and linked by tie-lines or should a centralised PABX be used? After considering previous games systems and of course, the economics of several alternatives, it was decided to use a central PABX.

In designing the PABX the traffic figures for the Edmonton system were examined. It is difficult to compare figures between two telephone administrations where different policies and calling habits apply and we chose to design for a lesser traffic handling capacity than the Edmonton figures indicated; this decision was based partly on economic considerations and partly on differing calling habits. Interestingly, the Edmonton figures indicate that we can expect the maximum traffic in the two weeks prior to the games and a very quiet period during the games.

A Siemens EMS 1200 PABX was chosen because of its many useful and easily invoked facilities. This PABX was cut over on the 27th February and replaced a smaller Siemens ESK 60/400 crosspoint PABX.

There will be extensions off the PABX at all venues for the games and about 1100 extensions need to be provided. The number of extensions and the facilities available have necessitated the preparation of a computer system to keep track of them.

Beaudesert and Gatton (two average size provincial towns in Queensland) each have about 1100 telephones which have been connected over a considerable number of years; thus Telecom is faced with the prospect of installing, in a few months a telephone system which compares with that of a provincial town, having it used for a matter of weeks and then dismantling most of it in a few more weeks.

Telecom will also produce the telephone directory for the games family.

In addition to the PABX about three hundred exchange line services and a number of private wire telephones will be provided.

The Results Network:

This is a computer system based on two DEC 11/70 processors. The software is to a large extent a legacy from Edmonton to which substantial modifications have been made. Most of the changes result from changes in the rules of the sports. The software for archery has been developed locally as archery was not a sport in the Edmonton Games.

The Results Network is designed to collect and collate data from the venues and to disseminate it to all interested parties. The main users are the sports officials, the media and the athletes village.

It will be used to prepare the results and draw list information for the daily programmes. The typesetting commands for the daily programmes are incorporated in the Results Network software to speed production and meet the tight deadlines which exist in this area.

Mobile Radio and Paging:

The Motorola company is the official supplier of mobile and radio equipment.

The Foundation makes extensive use of mobile radio which may be discussed under the following headings:-

(1) City Wide Networks
(2) In-venue Networks
(3) Defence Forces radio
(4) Radio Paging services
(5) The Communications Control Room

(1) City Wide Networks — Both the city wide and in-venue networks are located in the UHF bands at about 400 MHz.

The city wide networks provide radio communications within the Brisbane metropolitan region. There are four separate networks with 97 mobile and 41 hand-held units, in total, on these networks.

Generally, the networks are shared by at least two sets of users. The Transport Division with its large fleet of vehicles and difficult logistics is the only Division which has sole use of one of the networks.

All the city wide nets are dual frequency systems with at least one remote unit controlling the network base station.

The city wide networks are used mostly for mobile communications for divisions whose responsibilities span all the sports venues, villages and other games sites although some use will be made of them in the road events in support of the Defence Forces radio.

(2) In-venue systems: These are almost entirely single frequency simplex systems of low power. These networks provide radio support at the major venues and are used mainly by sporting and administrative officals in the conduct of the sports at a given venue.

There are 150 units on eight frequencies. By using hand held units with multiple available bands and distributing them according to the timing of the events, most of the (reasonable) demands for this service, have been met.

(3) Defence Forces Radio: Because of the difficult terrain near the road events — marathon, road walk and two cycling road events — the Australian Defence Forces will provide the required radio links.

By a combination of the Military and Foundation systems, adequate coverage for these road events will be provided.

(4) Radio Paging: 500 Tone and Voice Pagers will be used on a VHF paging system and also on the public paging system.

Edmonton logged 11,000 paging calls during the 1978 Games and it is expected that Brisbane will handle a similar number, in 1982.

(5) Communications Control Room: This room will be staffed for 24 hours per day during the games. It will provide a central point for the communication systems of the Foundation during its most hectic periods. The worth of this room was established during the mini games of 1981.

This room will contain the control units for the city wide radio networks and all paging calls will be handled there. It also acts as the focal point for all telephone enquiries.

Closely associated with it will be the Operations Control Centre. This centre decides what is to be done in emergent circumstances and the Communciations Room ensures that the decisions are appropriately delivered.

Reproduction and Facsimile:

The media and sports officials have apparently an insatiable appetite for photocopies of all draw lists and results. For example, in the three days of the mini-games and the 1982 Easter Shoot, 68,000 photocopies, were produced. Given the ten days of competition and 56 competing nations, we expect to produce about ten times that number in 1982.

Facsimile systems are largely provided as a back up to the Results Network. They are used however, to collect the results at shooting and we expect some use of them by the media during the games.

Rank Xerox are supplying all of the Foundation's requirements for this equipment.

Closed Circuit Television:

Athletics (track), cycling and weightlifting, are all entitled, by their rules, to use video replays to assist in deciding the outcome of events. Weightlifting, in particular, places great reliance on video to determine whether some of its more esoteric rules have been complied with.

The Host Broadcaster's signal, video taped at the velodrome, will be the basis for adjudication on alleged rule infringements during cycling events. As well as this signal, the Foundation will be using four video cameras at the Velodrome to provide additional camera angles.

There will be eight video cameras mounted around the track at QEII for surveillance of the athletics track events.

In addition, there is a great demand for replays of the Host Broadcaster's video signal. To meet this demand, four TV theatres with projection television sets are provided at the village. The television signal will be taped at each venue for later replay in these theatres.

Arrangements have been made with the Host Broadcaster so that the Foundation may copy their signal without infringing the copyright laws.

Scoreboards, Timing and Public Address

The Brisbane City Council (BCC) is largely responsible for the provision of these facilities. The Communications Division is responsible for ensuring that the facilities meet the standards required for the Commonwealth Games.

As the BCC and its contractors did not have a working scoreboard available at the QEII stadium for the mini-games, Foundation staff, consultants and one of the sub-contractors provided the scoreboard at these events. This was done by using the display (sign) at QEII and connecting it to the DEC 11/70 processor which was being used for the Results Network. This was an expensive but very effective solution to the problem.

In the venues that are not owned by the BCC, co-operation with the owners was the key to ensure that the public address systems are adequate.

Computer Systems:

The Foundation operates a number of computer systems, namely —

- Tickets
- Accreditation
- Personnel
- Supply
- Accounts

There are plans in hand for three more computer systems based on microprocessors.

These are —

- Telephone Management
- Village Accounting
- Telethon

The Tickets, Accreditation and Accounts Systems operate as bureau services. The Personnel and Supply Systems are both on the Foundation's recently acquired in-house computer.

The Telephone Management System is required to analyse and report on call data which is generated by the PABX.

The Village Accounting System is required to prepare accounts for residents in the villages.

The Telethon System was used to collect and report on data for the Telethon which was conducted in June, 1982.

The Communications Division is responsible for the preparation of specifications for such systems and oversights their operation when they have been implemented.

Host Broadcaster Facilities

The Host Broadcaster needs a floor area of almost 3000 square metres to provide temporary TV and radio studios for the large contingent of local and visiting electronic media personnel. This is known as the Broadcast Centre and needs direct TV links to most of the venues and to Telecom's video network. It is also the centre of a network of almost 600 radio program lines which serve the venues and must be connected into the telecommunication network with some 23 program channels to the southern capitals.

CONCLUSION

The XII Commonwealth Games is the largest sporting event to be held in Australia. It is necessary to go back to the 1956 Melbourne Olympics to find an event of comparable magnitude. Since these Olympics, and the 1962 Commonwealth Games in Perth, the sports, and society in general, have become more reliant on technology.

Not only is there need to employ technology to assist with the control and running of the games but, under the rules of the international sporting bodies, record performances in the major sports are not recognised unless the results are verified by electronic timing and measuring devices. Many of the other sports utilise electronics, such as video recording equipment to assist in the adjudication of disputed decisions.

The planning for the communication needs for the XII Commonwealth Games in Brisbane 1982, started with an appreciation of the history of the games in order to define the requirements.

The Committee, The Organisation and The Staff

N. C. WATSON B.E. (Elec.), M.E., F.I.E.A.

To provide the communication requirements for the games, co-ordination and control were the initial requirements. A Communication Committee was therefore formed and this paper describes the establishment and staffing of the committee and goes on to outline Telecom Australia's part in providing the required communications.

INTRODUCTION

The Communications Division of the Games Foundation is one of the twenty three divisions set up to run the games (**Table 1**). It is responsible for establishing a telephone network equivalent to that of a medium size town, a paging network of over 500 pagers, several small closed circuit TV and radio networks and an elaborate Results Distribution Network as well as a number of lesser systems, such as mobile radio, reproduction and facsimile, public address, scoreboards and the Foundation's computer systems. In terms of the overall games budget, the Communication Division is one of the big spenders, even after allowance is made for the extremely generous contributions of some of the sponsors.

THE COMMITTEE

The Communication Division is responsible to a committee consisting of a chairman, and seven members who are part time, and the Communications Manager who is fully involved in the work of the division.

The chairman was appointed more than four years ago so that he would have had some association with the previous games and could therefore commence arranging services which have a long lead time. It is generally accepted that it is extremely advantageous if the chairman is a senior officer of the telecommunications authority which will be providing the main communication service.

In relation to all the other groups who play a part in running the games, the committee is one of the earliest to be formed and this should occur almost four years in advance of the programmed date for the games. Committees for previous games have varied greatly in size but the one selected for the XII Games has been found in practice, to be quite appropriate both in size and composition.

The committee is made up of senior officers from the communication organisations which play a part in the games. One is from OTC (A) and, fortuitously, has had close contact with the media over many years. One is from the Host Broadcaster Organisation, whilst another came with long standing sales experience from Telecom. One other was also from Telecom with expertise in computer systems and another was from a private company and was chosen mainly for his ability in financial budgeting. Another represented one of the major sponsors and had radio expertise and the remaining member, provided secretarial assistance.

The committee operated on a part time basis for one and a half years before a manager was appointed. The person chosen for the role as manager, was an engineer from Telecom who was also well skilled in computer systems. He is sponsored by Telecom and on appointment, joined the committee on a full time basis to take control of the division's 469 staff. He is also a member of the Computer Advisory Group.

In its early stages, the committee was heavily involved in coming to grips with just what was wanted. The systems provided for the XI Games (Edmonton) were so much more complex and expensive than those provided for earlier games that almost one year was spent on endeavouring to find simpler systems. However, expectations of spectators and media are now very high for a major games and it was eventually decided to employ systems which are fairly similar to those used at Edmonton.

In the earlier years, the load on the individual members of the committee was quite high. However, when the manager was appointed, the bulk of the day to day work passed to him and the part time committee assumed more of a supportive role.

The full time staff of the division has slowly increased until, at the time of the games it will have a manager, three technical officers, one administrative officer and one giving secretarial assistance.

The remainder of the division are volunteers. These number 464, one hundred of whom will operate the Results Network, fifty-five will operate the communication room and fifty are required at each of the major venues to ensure the smooth running of the various video, PA systems and scoreboards. The

training and familiarisation work associated with these volunteers is quite large and most have already given a great deal of their time in performing their roles at lead up events.

It is worth noting that there are usually a number of events leading up to the games which are used to try out the major systems that assist in running those events. While these serve a very useful purpose, indeed are almost essential, they do increase the load on the staff.

MAJOR DECISIONS

The initial problems of the committee and manager were to determine what was wanted and then, how to provide these services at a reasonable level. The total size of the system (about $1m of equipment has been ordered) is not large when set, for example, against the State Capital Works Programme for an organisation such as Telecom. Because of the unusual nature of the requirements, however, it did take a great deal of time at the beginning to decide on such things as just what the results distribution system should be, whether there should be one central PABX with a large number of long external extensions, but simple to operate, or a number of inter-linked PABXs centred on each venue but more complex to operate, although perhaps of lower cost.

The level of provision was difficult to determine with more often than not, some degree of understanding of human nature being required in the ultimate decision. There is some status, for many, in having a paging unit in the pocket and a walkie-talkie by the side; or an individual PABX extension. If the expense is being borne elsewhere, the pressure to provide can become high and some degree of wisdom was required to achieve the most cost/effective solution.

Details such as precise location of phones are dependent on others who are not always aware of the inherent problems in providing a large network in a few months. The larger press groups and wire services know well in advance what they will want, and advise accordingly. However, it is very difficult to obtain information from the smaller press contingents and guesses must be made until the day they arrive and start using the facilities.

It is important that systems be as simple as practicable to operate. It is quite surprising, for example, to find how many people have trouble in operating a press-to-talk, hand-held radio. This tends to direct the telephone system towards a single centralised PABX and the use of a central communications centre to supervise paging calls.

During the final lead-up to the events and during the events, the success of the communications is heavily in the hands of the volunteers. It is at that stage that all the detailed preparation will count.

THE TELECOM AUSTRALIA INVOLVEMENT

As the major telecommunication administration in Australia, Telecom is heavily committed to ensuring that the games will be provided with adequate communication services.

Space has been made available in a major Telecom building for the Broadcast Centre and this also facilitated the connection of radio and TV programs into the trunk network.

In addition to a PABX system with 1,200 extensions, 200 direct telephone services for the media, (many with enhanced facilities) telexes, facsimile machines, public telephones and data lines, Telecom installed video and radio links to the venues and developed the national network to enable broadcasts to be seen and heard throughout Australia and many parts of the world.

It has become traditional for the telecommunication authority to feature a cover for the metropolitan white page directory appropiate to the games and to provide, or at least make a substantial contribution to, an in-house directory for the "Games Family".

A Telecommunications Centre, staffed for sixteen hours each day and providing international coin phones,

Neil Watson is Chief Manager, Operations Department, Telecom, Queensland. He graduated from the University of Queensland with a B.E. degree in 1951 and an M.E. in 1964 and is a Fellow of the institution of Engineers, Australia. He has occupied a variety of positions in the Engineering Department of Telecom, and as Executive Aide to the State Manager before his present appointment. In 1978 he was appointed Chairman of the Communications Division of the Commonwealth Games Foundation and also liaison officer between the Foundation and Telecom.

telegram and telex services is provided at the residential village.

There are other aspects which affect Telecom. These vary from providing telecommunications for the royal visit to upgrading the sporting recorded announcements. There are many functions of a cultural nature requiring video coverage which run concurrently with the games and a substantial demand for circuits associated with the various security systems. A task force was set up to install the large number of outdoor extensions and exchange services associated with the media. This group continued on as a maintenance group. A dedicated telephone number was arranged for fault reporting and full details of all services were computerised.

CONCLUSION

Four and a half years have past since a small group of people started to think about the communication needs of the XII Commonwealth Games.

Since that time a considerable amount of time, effort and experience has been given by many people within the telecommunication industry.

Co-ordination and control are essential ingredients to a successful outcome and this has been recognised as the prime function of the Communication Committee.

ACCOMMODATION	MARKETING
ACCOUNTS	MEDIA SERVICES
ACCREDITATION	MEDICAL
CEREMONIAL	OPERATIONS
COMMUNICATIONS	PERSONNEL
CORPORATE FUNDING	PROTOCOL
AND SPECIAL EVENTS	SECURITY
EXECUTIVE	SPORTS
FESTIVAL '82	SUPPLY
FILM AUSTRALIA	TICKETING
HOSPITALITY	TRANSPORT
HOST BROADCASTER	VILLAGE

Table 1. Federation Divisional Structure

Note:

The above list is typical of the divisions required to organise the games. Frequent alterations were made in response to changing emphasis and needs.

A cable hauling team from Telecom's Newstead's Line Depot in Brisbane, feed video cables into the Chandler Aquatic Centre, one of the venues on which most interest will centre during the Commonwealth Games.

The Telecommunications Centre

GRIFFITH UNIVERSITY "VILLAGE"

A Telecommunications Centre will be established at Griffith University on the ground floor of the science block to service competitors and team officials. The centre will operate for three weeks prior to the Games and for two days after the closing date.

Counter services available will include full telegram lodgement facilities, and international and national trunk call bookings. Twelve ISD public telephones with 20 and 50 cent operation will be provided along with six CB hand sets for connection of calls, pre-paid and booked, with the counter staff.

A temporary TRESS centre for transmission and receipt of telegrams will be established and manned by CTO Telegraphists on a rostered basis. Delivery of incoming telegrams will be made to a central point from where the Games Foundation will arrange delivery.

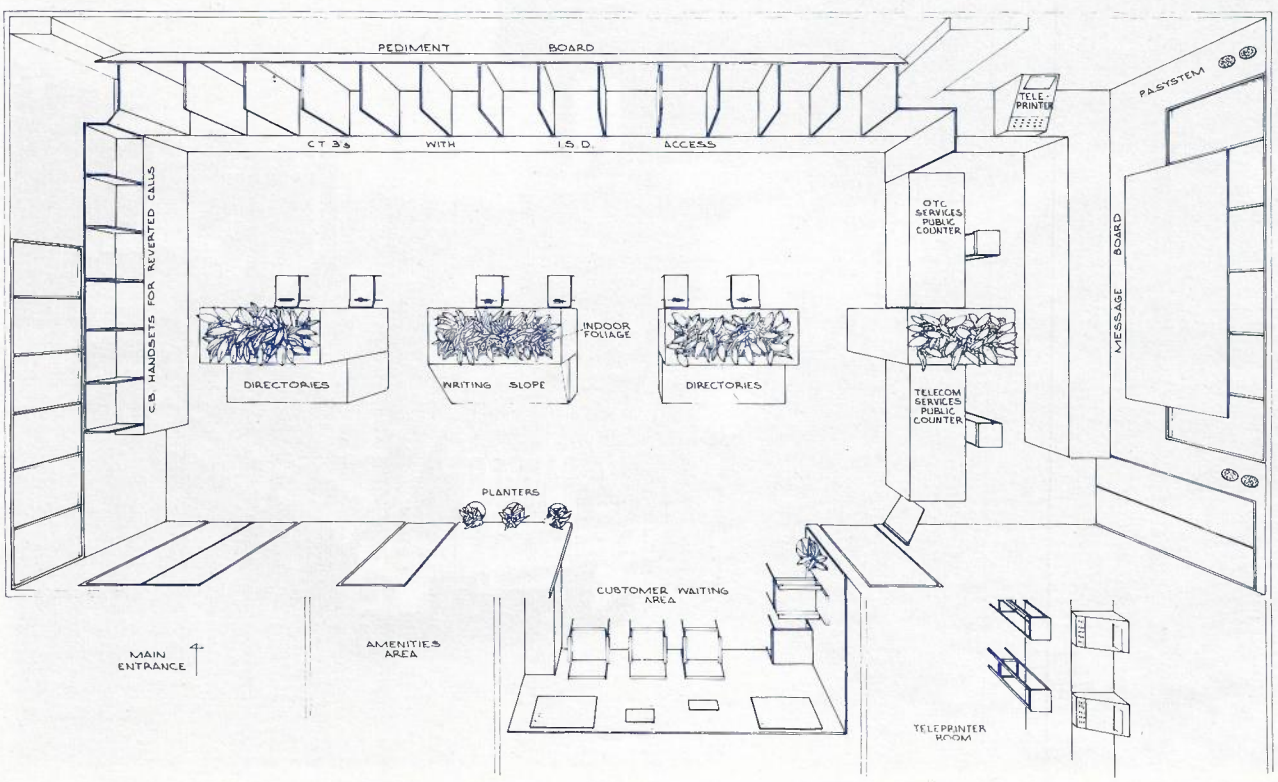
A special Telegraphic Code Address "GAMESCOMP BRISBANE" has been registered and advised to officials of all competing countries to facilitate addressing of telegrams/cables to competitors and officials.

It is proposed to staff the centre from 8 am to 2 am daily to cope with expected busy periods and time differences with overseas countries. Staffing will be based broadly on traffic handled through the equivalent centre at the previous Edmonton Games. The availability of ISD public telephones is expected to reduce telegram lodgements significantly in comparison to Edmonton's traffic, where incoming and outgoing messages totalled approximately 400 per day.

The Overseas Telecommunications Commission will also have a presence in this centre, primarily concerned with the acceptance and delivery of overseas telegrams.

Only six days will be available to outfit the centre and all furniture to be used will be completely modular to simplify installation and recovery. Use of indoor plants and selected colour prints of Australian scenes and scenic attractions will feature in the decor. An artist's impression of the completed centre is shown below.

F. PERRY,
Project Officer,
TBO Development.



XII COMMONWEALTH GAMES
COMMUNICATIONS FACILITY
PLAN PERSPECTIVE (CEILING REMOVED)

TELECOMMUNICATIONS at the
XII Commonwealth Games
Brisbane 1982.

Planning and Installation Aspects of the Telecom Involvement

R. G. BALL, BE, Dip. Eng., A. BRININ, MIE (Aust.), J. HORCHNER, BE (Elec).

The Engineering involvement of Telecom in the preparations for the XII Commonwealth Games is looked at from three aspects, viz the interstate and overseas requirements, the planning of local links in the metropolitan network, and installation activities at the major exchanges and venues. This paper shows the extent of Telecom's involvement and indicates the types of problems encountered and the solutions devised within the constraints of a growing State network.

INTRODUCTION

In 1976, when Brisbane was granted permission to hold the 1982 Commonwealth Games, Queensland was undergoing a burst of development which has scarcely abated over the last decade, despite the national recession. It was realised that providing communication services for the games, on top of the abnormal requirements for ongoing statewide development, would place a severe strain on resources, particularly manpower and there was seen, a need to take every advantage of modern, reliable equipment to meet the anticipated demands.

PLANNING PARAMETERS

Formal planning began with a meeting early in 1978 of Telecom and Overseas Telecommunications Commission staff and the Commonwealth Games Foundation Chairman. As seen by that meeting, the major engineering considerations for Telecom involvement were:

- Video Programs — local, interstate and international;
- Audio Programs — associated with video;
  — local, interstate and international broadcast requirements;
  — backup and order wires;
- Telephone Lines — direct exchange services;
  — outdoor extension from PABXs;
  — tie lines between PABXs;
- Radio Paging;
- Data lines to and from the results computer;
- Teleprinter and facsimile lines;
- Security and surveillance lines.

Non-engineering considerations — venue facilities, enquiry position staffing, credit facilities, directories, financing, were all studied by their respective specialist planning sections and will be reported elsewhere.

Dimensioning

Tentative quantities for video, voice frequency and data lines were assumed, based on data from the Christchurch Games, and these were progressively refined following the Edmonton Games in September of 1978. However, it was not until the Commonwealth Games Foundation appointed a Communications Manager, that real progress on planning of the various facilities could proceed with any degree of confidence. Likewise the appointment of the Australian Broadcasting Commission as Host Broadcaster enabled planning of the video requirements to be developed in the early stages — which was essential considering the long lead time needed for providing video and microwave equipment.

PLANNING CONSTRAINTS

Financial and Technical

Inevitably, planning was performed under the usual constraint of limited financial support. The brief was to minimise expenditure on plant which could not be re-used either in situ, or throughout Australia within the two or three years following the games. Planning was also complicated by the progressive introduction of pulse code modulation (PCM) carrier systems, which severely restricted the funds available for new junction cables, and at the same time radically altered the ratio of loaded to unloaded pairs in existing cables — a change which made obsolete, all historical growth records of cable occupancies. A major alteration to the algorithm used to design the switched network junction circuits, the

imminent introduction of digital telephone exchanges and optical fibre technology and the increasing growth in special services, all conspired to further complicate the planning processes.

Geographic Considerations

One of the major planning problems with the Brisbane games was that the two major venues are so remote from the heart of the city, see **Fig. 1.** Chandler Sports Complex, the site of five major sports including swimming, is 17 km by road from the GPO, and Nathan, where the Queen Elizabeth II Jubilee Sports Centre (QEII) is located, is 15km away. The major venues at Edmonton, Christchurch and other previous games cities were mostly within a few kilometres of the city centre. The longer distances in Brisbane restricted the availability of alternate routing of circuits for reliability.

PRELIMINARY PLANNING

Early information indicated that there would be several PABXs and PBXs, with one at Nathan (QEII) and one at Chandler, with several hundred outdoor extensions to the games village (originally to be sited some 7 km from Nathan at Wishart) and the Host Broadcaster situated somewhere in the city centre.

Video Developments

The availability of several floors in the new Woolloongabba exchange complex and the convenience of a stub tower on the roof capable of carrying a limited number of microwave dishes on each face, **Fig. 2,** prompted Telecom to offer accommodation to the Host Broadcaster in this building.

It was decided to use microwave links to Chandler, to avoid the excessive irrecoverable cost of coaxial cable. On the other hand, coaxial cable was initially proposed for Nathan, as it could subsequently be extended to provide an alternate route from the city to nearby Mt Gravatt Radio Terminal. Further investigation indicated that relief to the radio terminal could be provided much more effectively if delayed until optical fibre cable became available, and, as a survey indicated a clear radio path was available from Woolloongabba to the top of the

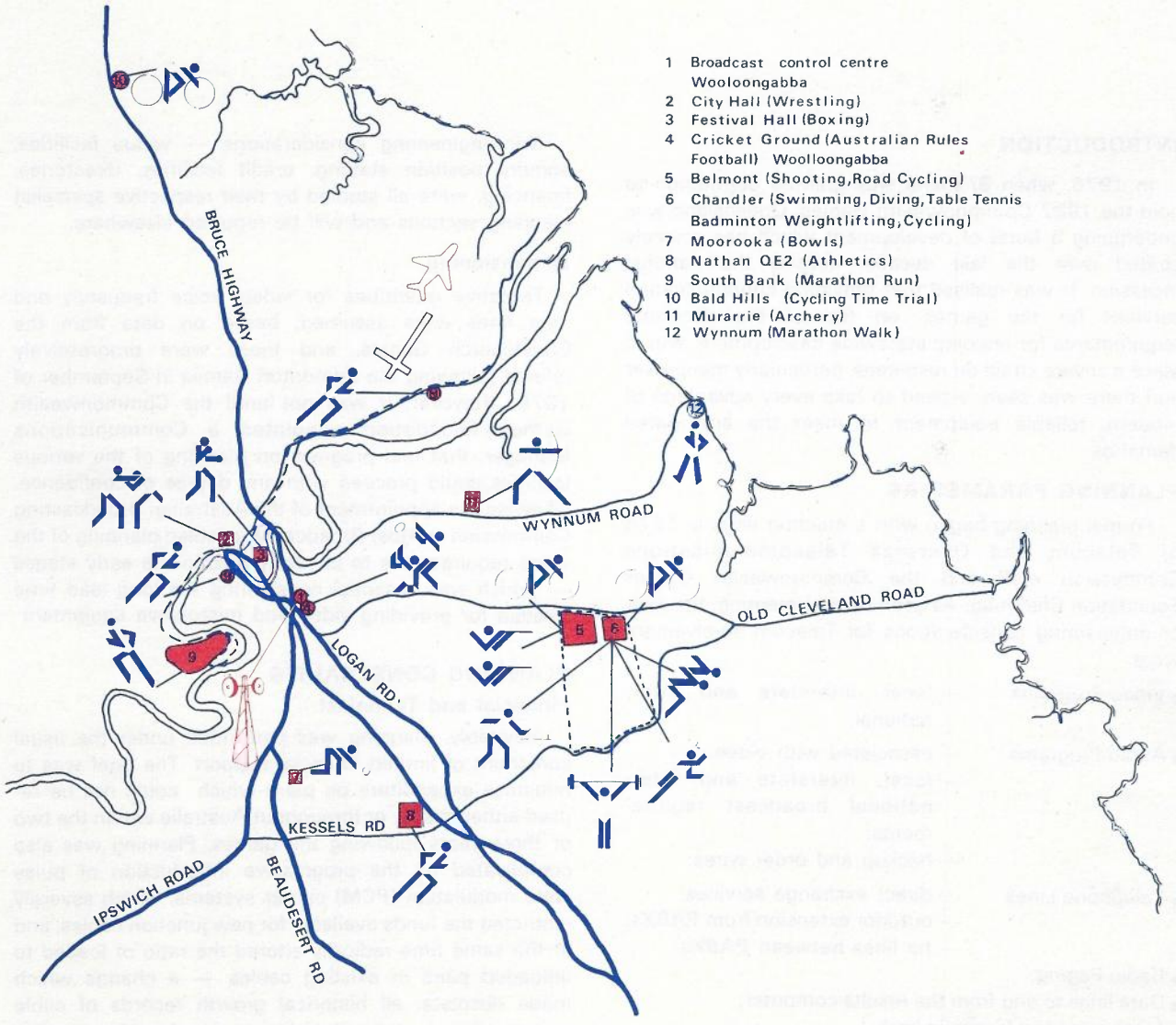


Fig. 1 — Locality Map — Brisbane Games.

grandstand at QEII **(Fig. 3)**, the bearer for the video systems to Nathan was altered to microwave radio. All other sports venues were planned to be served by single quad balanced pair cable or by outside broadcast links mostly provided by the Host Broadcaster with their own facilities.

Telephone Needs

The initial information mentioned above was modified by later advice which moved the games village from Wishart to Griffith University at Nathan (alongside the QEII stadium). In the early stages, the use of PCM carrier systems was envisaged to provide the bulk of the outdoor extensions and tielines, with only the exchange lines, program lines and order wires and data and telex links on physical pairs.

As planning proceeded, problems of accommodation of long line equipment and conversion relay sets at venues and, the cost and effort involved in relocating this equipment after the games, combined with the realisation of the delays in delivery of PCM equipment which were arising, caused the complete reconsideration of the PABX network. It became evident that there were substantial advantages in using only one large PABX and in locating it in the Woolloongabba exchange building. By using the newly developed Z-trols (voice switched amplifiers) and loop extenders on loaded cable pairs, it was possible to provide all the outdoor extensions on a two-wire basis apart from a handful which required four-wire amplification. This reduced the pair requirement for Chandler, Griffith University (where the games village

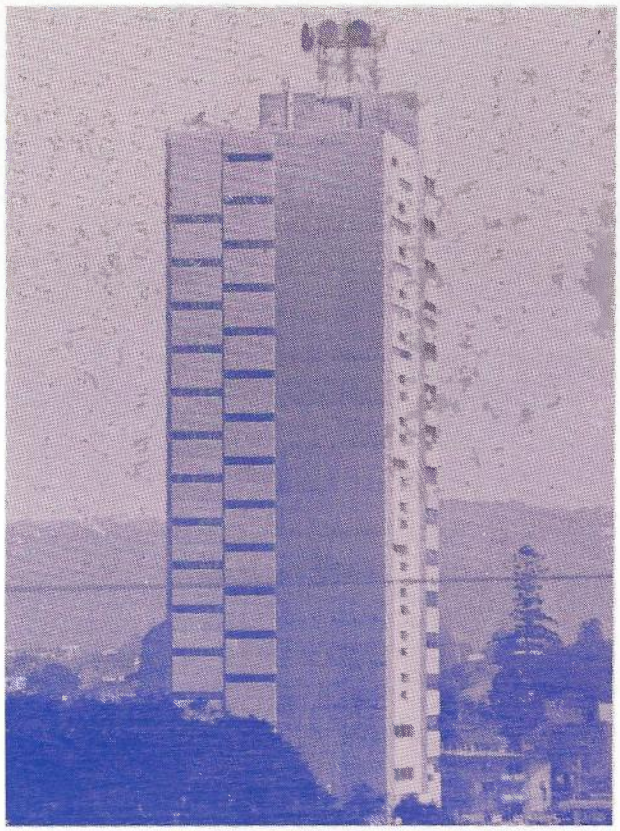
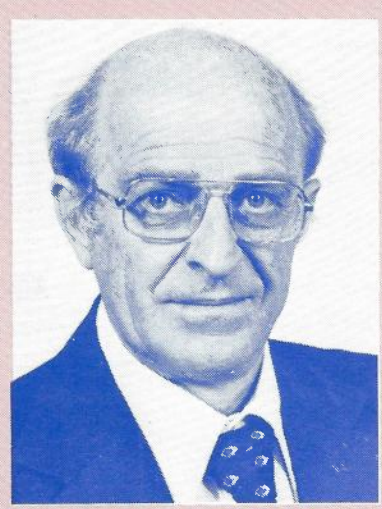


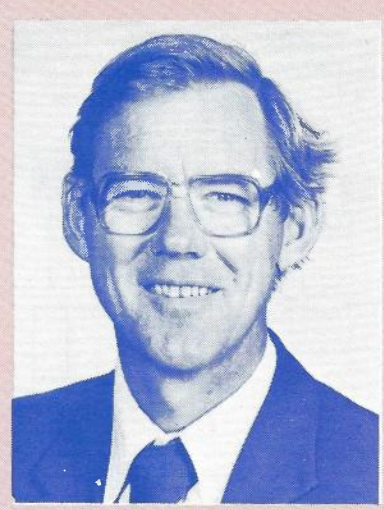
Fig. 2 — Woolloongabba Building Showing the Radio Stub Tower.

Robert Ball (left) became a Cadet Engineer with the APO in 1950 after completing an electrical apprenticeship with the Brisbane City Council. After graduating in 1954 he occupied positions in Subscriber Installation, Rockhampton and various District Work Divisions followed by nine years with Primary Works Cables and Conduits and a year in Country Lines Planning. Since 1970 he has been involved as a Senior Engineer in Transmission and Lines Planning in the Brisbane metropolitan area.

Arthur Brinin (centre) commenced with the APO in 1947 as a Technician-in-Training. He was appointed to the position of Engineer in 1959 and after a few years in the external plant area joined the Construction Branch in 1961. Currently he is Supervising Engineer, Country Installation.

John Horchner (right) graduated in Electrical Engineering at the University of Queensland in 1962. He has worked in the telegraphs area, both in Brisbane and in Headquarters, Telecom, where he became involved in the installation of automated telex equipment. Later he joined Long Line Equipment Installation during the introduction of 12 MHz coaxial cable systems. He joined the Planning Branch in 1974 and prepared plans of Brisbane local and trunk switching equipment and broadband systems for the trunk transmission network.





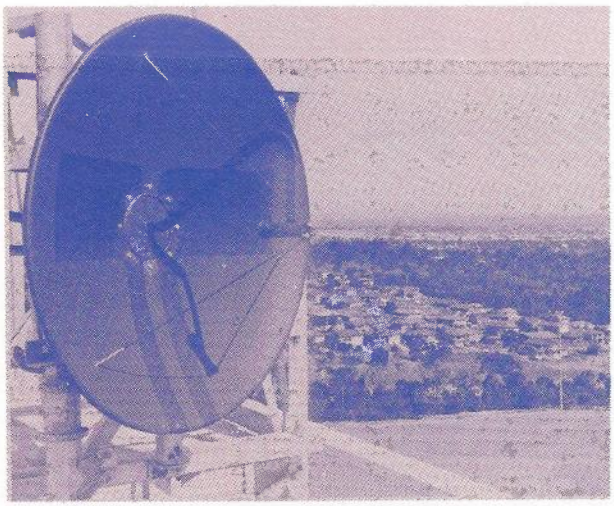


Fig. 3 — Microwave Dish on top of QEII Grandstand.

had been relocated) and QEII Stadium, to manageable proportions. As the time for the games approached, the Games Foundation decided to fix the number of extensions to the PABX at a known quantity (a maximum of 1100), so that any subsequent requests would have to be met by straight line services to the nearest public exchange. This considerably eased the problem of catering for unforeseen demands both with external plant and with line conditioning equipment.

Program Lines and Order Wires

Each commentator's broadcast position at the various sports required one main 10kHz program line and three, 3kHz lines for program co-ordination and order wire usage. Landlines are also required for audio programs associated with each video link. Thus, physical cable pairs for broadcast and video purposes proved to be one of the major demands of the games on external plant, over a large part of the metropolitan junction network.

Non-exchange Lines

The remaining special service lines constituted a minority of pairs and could be accommodated within the groups of loaded and unloaded pairs made available for broadcast and telephony needs.

SUBSEQUENT NETWORK DEVELOPMENTS

Starting with the major venues, the adequacy of all cables capable of serving each complex was assessed. In some instances, provision of PCM systems to serve long distance junction needs, released sufficient four wire circuits to cater for games requirements. However, several new cables had to be programmed to serve as ultimate PCM bearers and physical junction links, but with an interim use as a games cable. The new cable requirements are shown in **Fig. 4,** and some indication of the extent of junction cable commitments is shown in **Fig. 5.** However from the time of inception to completion of the telecommunications facilities for the games the circuit requirements varied continuously and inevitably upwards. Management of the metropolitan junction network to provide services for the games was an extensive task. When it is realised that approximately 10,000 inter-exchange cable pairs had to be provided and allocated to these services, then an idea of the magnitude of the project can be gauged.

An idea of the variations in predicted demand can be obtained from **Table 1** which compares the expected

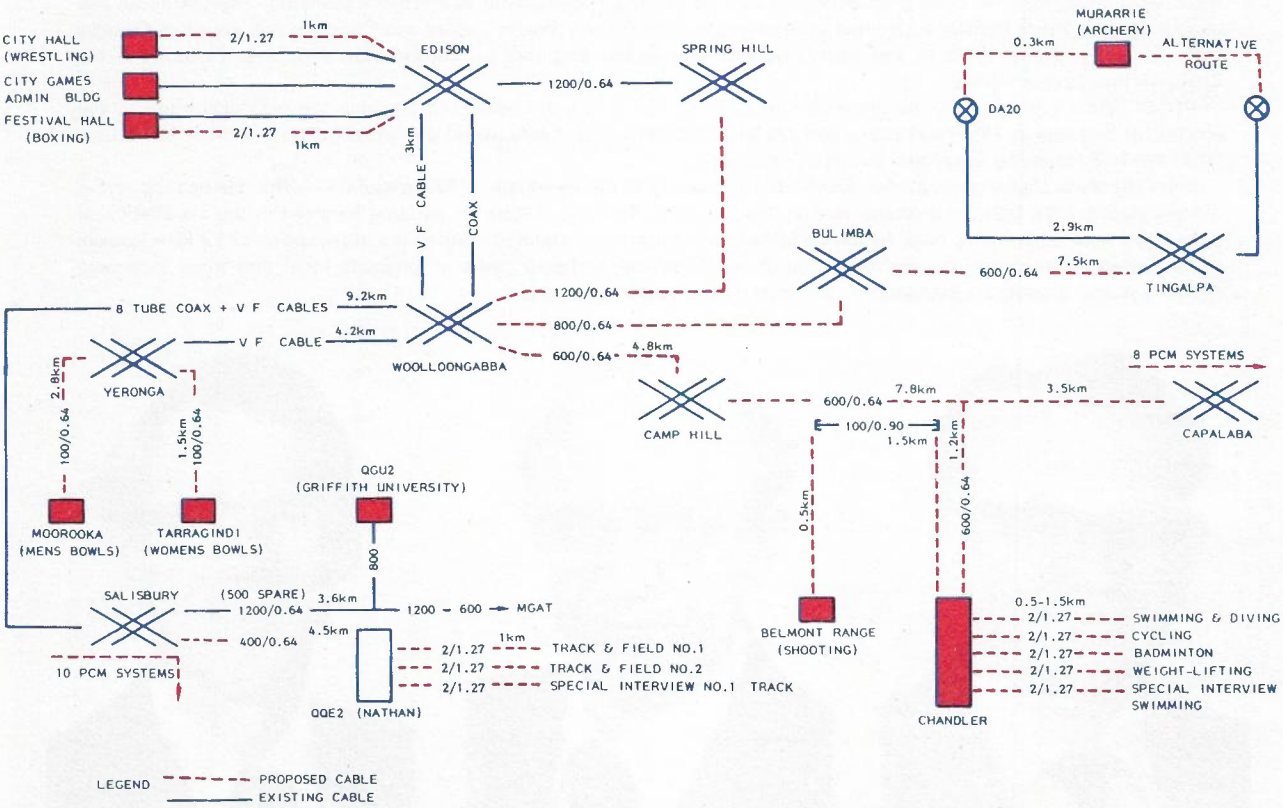


Fig. 4 — Existing and New Cables in the Metropolitan Network.

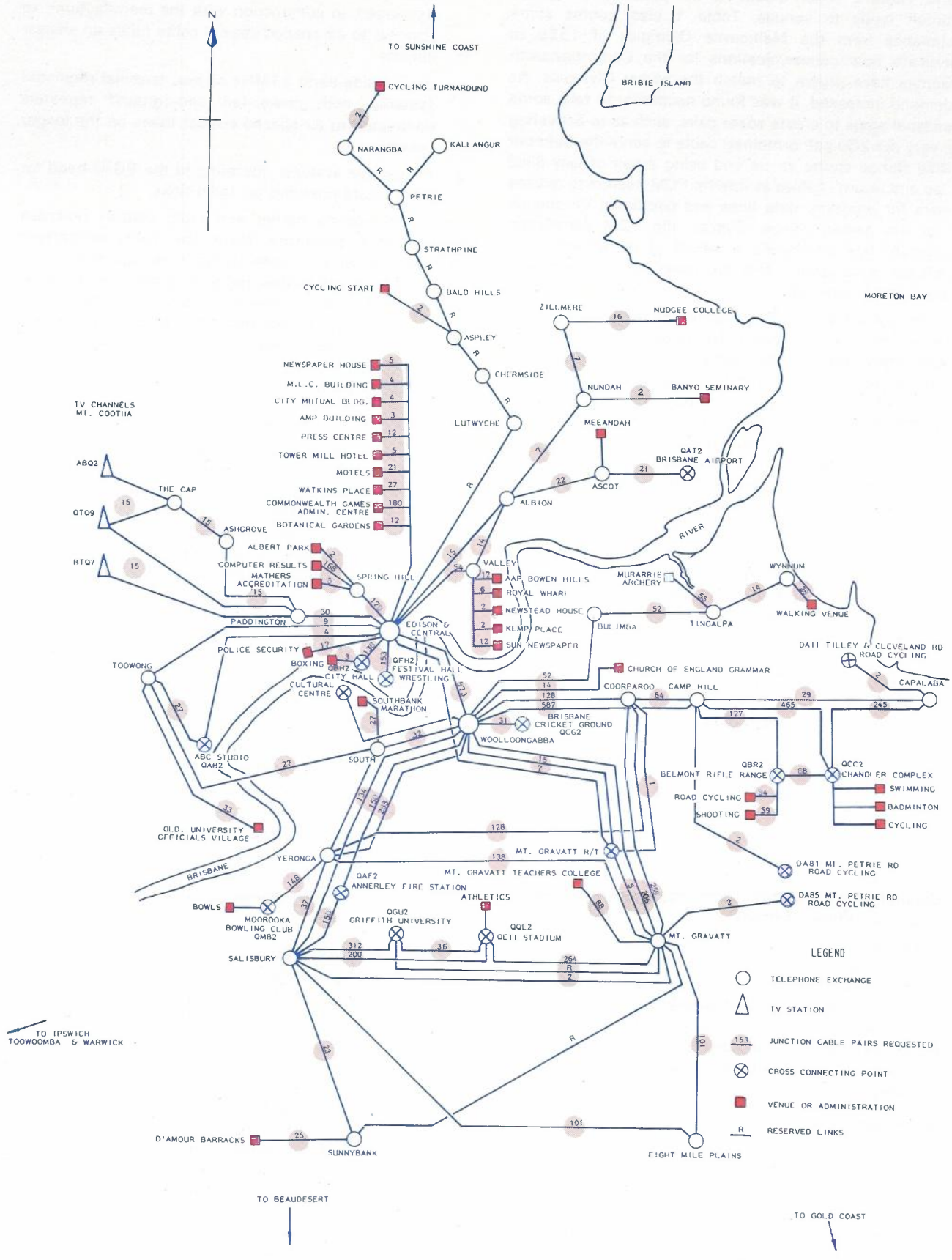


Fig. 5 — Junction Cable Pair Requirements.

requirements at various stages in the planning of facilities and **Table 2** which illustrates the break-up of various circuit types to venues. Table 1 also quotes some statistics from the Melbourne Olympics of 1956 to indicate how communications for the Commonwealth Games have grown to match the earlier Olympics. As demand increased, it was found necessary to take some unusual steps to create spare pairs, such as re-activating a very old 200 pair armoured cable to serve the Belmont Rifle Range sports venue and using a pair of jelly-filled "go and return" cables as interim PCM bearers to release pairs for program, data lines and additional VF circuits into the games village. Overall, the PCM installation program has undergone a series of modifications to release additional pairs to meet the known and anticipated demands.

One of the most difficult problems was to predict the requirements of the media. The large networks such as AAP have been quite good in advising their firm requirements, but at Christchurch and Edmonton, it was found that the smaller groups and the freelance journalists were liable to turn up just before the games and demand full facilities at a moment's notice. In consequence, a special procedure was arranged to expedite the issue of Service Orders and to ensure the costs are brought to account.

The other serious impediment to orderly planning of the minor venues and accommodation sites has been the uncertainty of their locations. Fortunately, for the minor venues and for supplementary accommodation areas, the communication demands were small and could usually be met by available plant.

ULTIMATE NETWORK PLANNING AND CONSTRUCTION PHASE

Metropolitan Video Network

Once the decision was taken to centralise the video network on Woolloongabba, and to use microwave bearers from Nathan and Chandler, with single quad cable from Festival Hall (boxing) and City Hall (wrestling), it was possible to draw up a metropolitan plan of video links (see **Fig. 6**). Included on the plan are the games venues and likely media coverage centres such as the Cultural Centre and the Cricket Ground (demonstration of Australian Rules Football).

Of particular interest to the installers of the video bearers was the interconnection between the Broadcast Centre console at Woolloongabba, the radio terminal at Mt Gravatt and the carrier equipment office at the Edison trunk telephone exchange. The plan of the metropolitan video links includes the ABC studios at Toowong, the coaxial cable Brisbane-Lismore-Newcastle (Sydney) and the television transmitters on Mt Coot-tha.

Types of Equipment Installed

The selection of equipment to provide the metropolitan video links was based on known performance and reliability. The main categories utilised were:

- video distribution amplifiers (VDAs) connected to unbalanced coaxial cables for circuits up to a few hundred metres;
- video equalising amplifiers with active transmit and receive units connected to balanced quad cable for circuits up to 3 km. During the progress of the installations an unbalanced equalising amplifier was developed, in conjunction with the manufacturer, to connect to air-spaced coaxial cable tubes on shorter circuits;
- double side-band 21MHz carrier, terminal regulated systems, with power-fed underground repeaters connected to air-spaced coaxial tubes on the longer circuits;
- microwave systems operating in the 8GHz band for the circuits provided on radio links.

At the existing carrier and radio centres no-break power was available from the rectifier/battery installations. Similar installations were provided at the new Chandler and Nathan radio equipment terminals. At the actual sporting venue sites, any active equipment was generally powered from the normal AC mains. Arrangements were made with the Host Broadcaster for access to their AC power from emergency back-up units where these were provided.

Coaxial and Single Quad Cable Network

The task at hand was to rearrange the existing coaxial network triangle, Edison - Woolloongabba - Mt Gravatt, with minimal disruption to create spare capacity for games bearers. After the games the temporary arrangements are to be straightened out. At all times the planning option chosen was to minimise the cost to the Foundation but to force the change in such a direction that after the games the network changes are minimal but with optimum benefit.

Three coaxial cables, run between Edison and Woolloongabba, two between Woolloongabba and Mt Gravatt and one between Edison and Mt Gravatt. One four-tube coaxial cable from Edison tees into Woolloongabba so that two tubes are used for an Edison-Lismore coaxial cable system; the other two tubes are used for a Woolloongabba-Newcastle system. Without describing the detailed rearrangements needed, **Table 3** lists the work to be done in 1981/82 to make available metropolitan and interstate video, program co-ordination and control channels. The end result of considerable work and effort can be seen in **Table 4** where the video links provided in the metropolitan area are tabulated.

Microwave Links

The Chandler - Woolloongabba video links are carried over a microwave radio system consisting of five, 8GHz video bearers. The system spans the 11.3 km path from the Chandler complex to the Woolloongabba Broadcast Centre, see Fig 1.

At Chandler, patch panels allow the switching of video bearers on single quad cable from the individual venues — swimming, cycling, badminton and weight-lifting — to the five radio bearers. Surveys from the Chandler complex indicated that a satisfactory line of sight path to Woolloongabba with reasonable antennae structure height was possible from only one end of the site. The location of the sports buildings were not suitable for the mounting of a microwave dish. Other constraints placed on the Chandler communication centre were that it was to be as inconspicuous as possible and the antennae support was to look like a flagpole as, it is near the all nations flagpole area. The building with the concrete pole

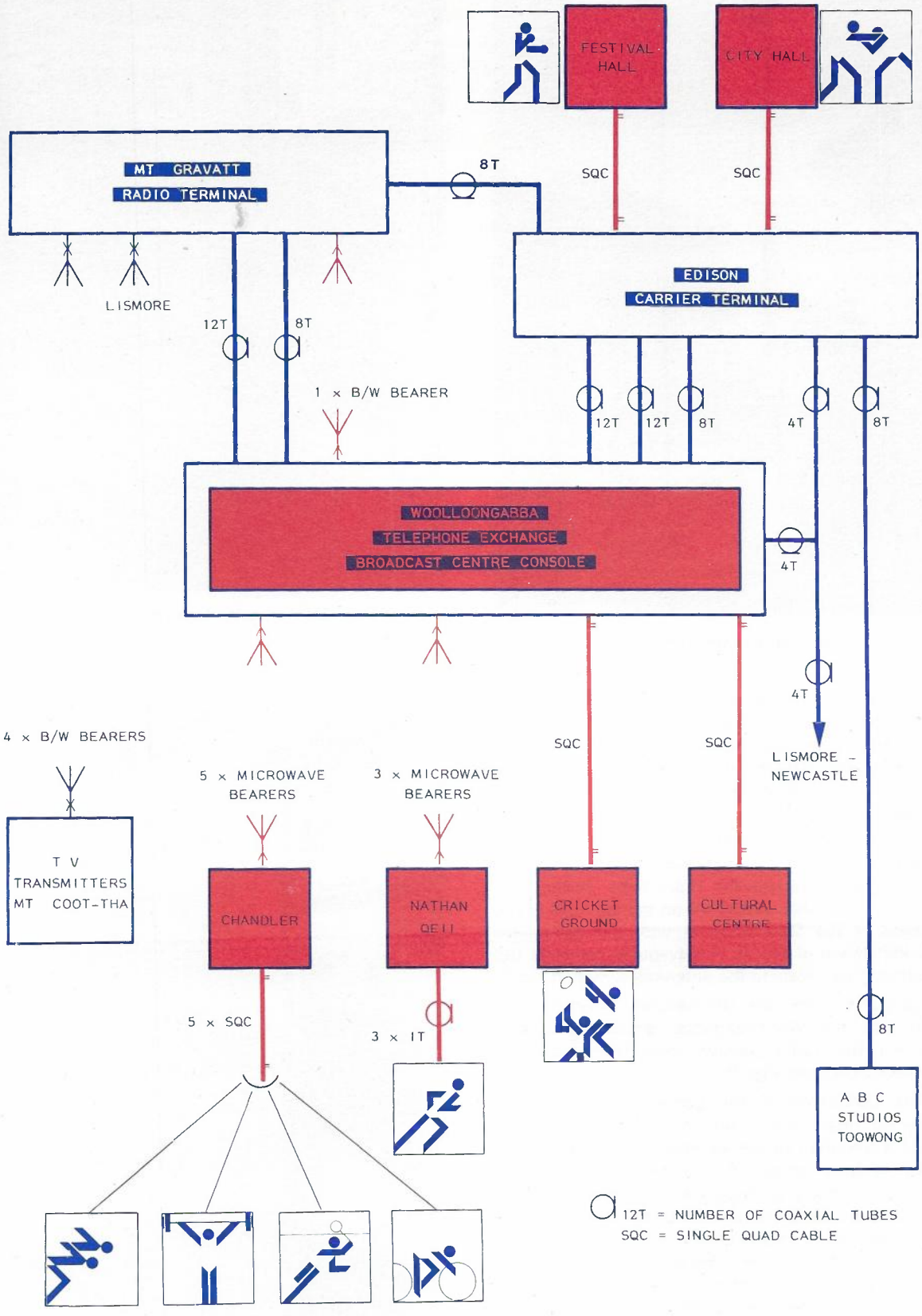


Fig. 6 — Layout of Metropolitan Video Links.

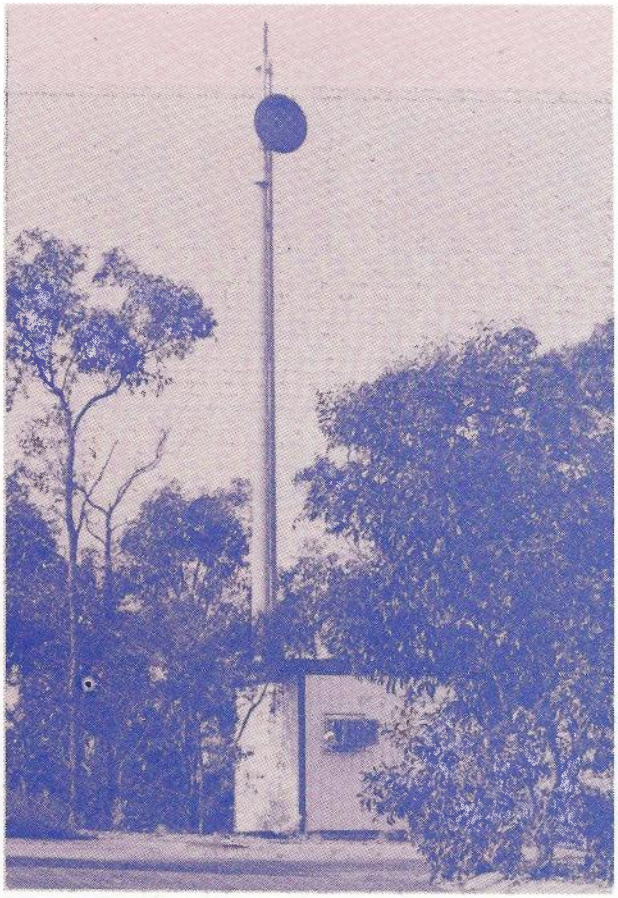


Fig. 7 — Chandler Communication Building.

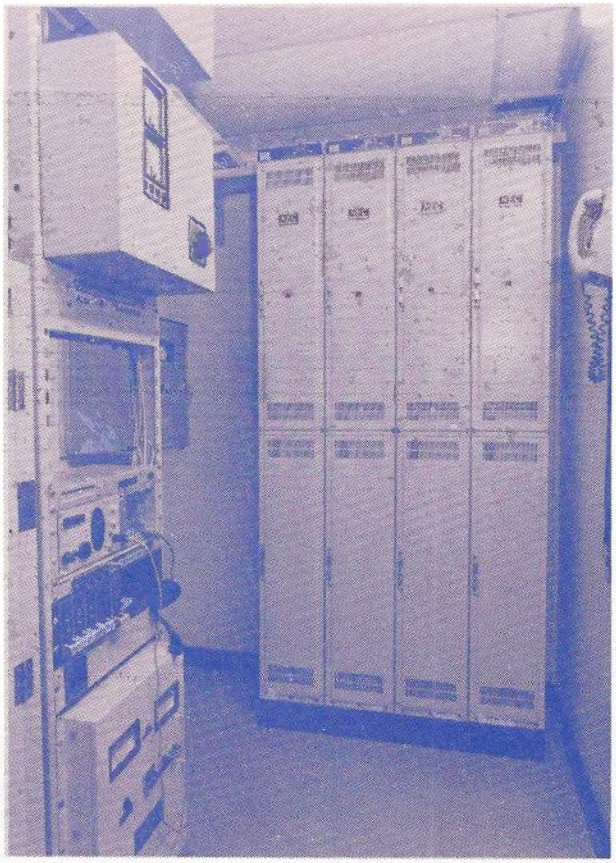


Fig. 8 — Equipment Installation in the QEII Grandstand.

antennae support is shown in **Fig. 7** and this houses the radio terminals to Woolloongabba, the receive units of the video equalising amplifiers, the patch panels and the associated power installation. This was the first use in Queensland of a concrete pole to support a microwave dish antennae.

The track and field venues at Nathan similarly feed three coaxial cable links via video distribution amplifiers for connection to microwave radio links. Space was made available for this equipment on the top level of the grandstand at the QEII Stadium with the equipment installation shown in **Fig. 8.** A waveguide connects the radio transmit terminals to the antennae shown in Fig 3.

These eight video links (5-Chandler, 3-Nathan) are sourced into the Woolloongabba Broadcast Control Centre via the radio receive terminal installation established there, see **Fig. 9.**

At the conclusion of the games, it is Telecom's intention to retain permanent video links from both Chandler and Nathan as well as other centres such as the City Hall, Cultural Centre and Cricket Ground, for use by broadcasters at future sporting events. With this in mind, ready access is provided to users of a cable or cable-radio circuit as required by means of an interface connection at the transmit terminal of the video equalising amplifier as shown in **Fig. 10.** These connect points are provided at the individual sport venues and are a simple plug-socket connection.

One of the four links between the Broadcast Centre and Mt Gravatt had to be established as a radio bearer, at

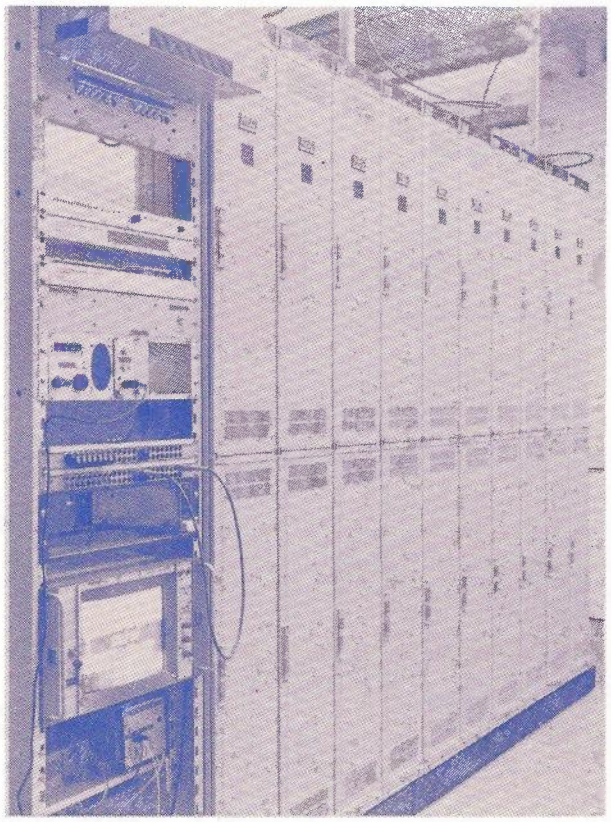


Fig. 9 — Microwave Video Receive Systems — Woolloongabba.

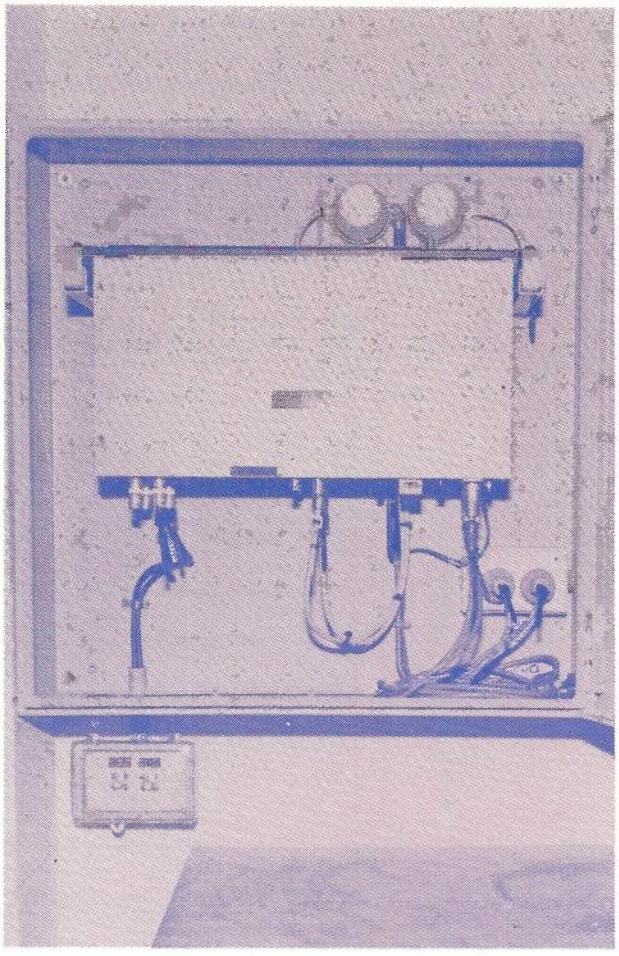


Fig. 10 — Typical User Access Point to Video Circuits.

a frequency of 8GHz, to supplement the coaxial cable capacity. This radio bearer will be recovered after the games because the frequency sense of the system's two terminals is opposite to the long-term trunk network plan.

Interstate Video Links

The existing 4-tube coaxial cable, Brisbane - Lismore - Newcastle, carries one video link in each direction in a 12MHz coaxial cable line system. The second Brisbane to Sydney coastal video link is on the bearer of a 6.1GHz radio system, Brisbane-Lismore, connecting to other radio systems, Lismore-Sydney.

The Commonwealth Games links No. 3 and 4 were planned to be provided on the inland route, Brisbane - Toowoomba - Glen Innes - Moree - Tamworth - Sydney. Originally it was planned to use off-air receivers to bridge the missing gap between the Passchendaele Ridge radio terminal in Queensland and the Mt Deepwater radio terminal in New South Wales. This plan was subsequently changed to a direct link using a microwave bearer. The route shown on **Fig. 11** gives diversity and security away from the coastal route. It also makes use of an ABC facility immediately after the games for Remote Area Television (RATV). This transmits studio programs from Brisbane to the Moree earth station on the terrestrial link just described and then is sent to satellite for transmission to remotely located earth receivers throughout Queensland.

This facility had been planned for some time and was brought forward in time such that two video bearers, one the intended RATV, the other its video protection bearer, could become temporarily the games links No. 3 and 4. The planning decisions came relatively late and material ordering times had to be reduced to the absolute minimum for the target date to be achieved. The ordering, delivery, installation and commissioning shortcuts taken for the radio equipment make miraculous stories on their own, as well as the hurried provision of buildings and radio antennae and towers along the inland route. The interstate connections are a complex series of telephony and video bearers encompassing all of the Eastern States. Some of these bearers are normally used for protection or standby functions, others temporarily removed from normal traffic and dedicated for two weeks of games traffic. Maintaining continuity of a number of such connections is complicated, particularly as the normal functions of the bearers are neutralised temporarily. A separate article, associated with this issue, will present the maintenance approaches adopted during the games.

Sound Program Circuits

As was the case with the video circuits, Telecom was given the role to "pick-up" and ship the sound program from the various sporting venues to the Host Broadcaster's centre in the Woolloongabba building. Here the Host Broadcaster studio facilities are used to package the incoming material into a finished sound or sound/video product by the world wide client broadcasters. These games programs are then passed back to Telecom for distribution and transmission over links for local, national and international networks. Whereas the video links were complex but few in number, the sound program circuits were relatively straightforward but large in number as shown in Table 1.

In the metropolitan network, 10kHz program lines are provided to commentator positions at the sporting venues on unloaded cable pairs of the junction network. Each 10kHz circuit is supported by three other voice frequency circuits for use as order wires and program co-ordination. Separate amplifier and equaliser units are installed at the Woolloongabba Office, **Fig. 12** and repeaters are inserted at intermediate exchanges on the longer circuits. The overall installation of the equalisers and amplifiers, the cross connection or jumpering through the intermediate exchanges, the measurements for the design of the equalisers and the final commissioning of the circuits, engaged a small team of technical staff for approximately 12 months to complete the work.

Interstate 10kHz circuits, were generally provided by sound program carrier circuits utilising channels 4-6 of a basic group. Some effort was made to use a digital 2 Mbit/s system working over a data above voice (DAV) addendum on a radio bearer but this was aborted due to late delivery of equipment and the unknown performance of the DAV on the particular radio system. Use was also made of available frequency spectrum by fitting additional equipment to the reverse direction of the existing Sydney-Brisbane 15kHz stereo FM relay network.

For maintenance, access was required for testing and patching at Woolloongabba and to some extent at the State Sound Operating Centre (SOC) at the Edison carrier

terminal. In conjunction with the video/sound networks a comprehensive order wire network was also developed to assist in the control of the performance and patching of circuits as required. At the Mt Gravatt radio terminal which serves as the State Television Operating Centre (TOC) a 20 by 20 matrix video and audio switcher was installed **Fig. 13.** This was required to facilitate the numerous and frequent circuit allocations that are necessary during the games period and was designed to accommodate the normal day to day programme connections as well as those explicitly for the games.

Other States, particularly New South Wales, besides installing the receive terminals of the video and sound equipment emanating from Brisbane, had a large construction programme of work, in extending the circuits further into the national network and also to the

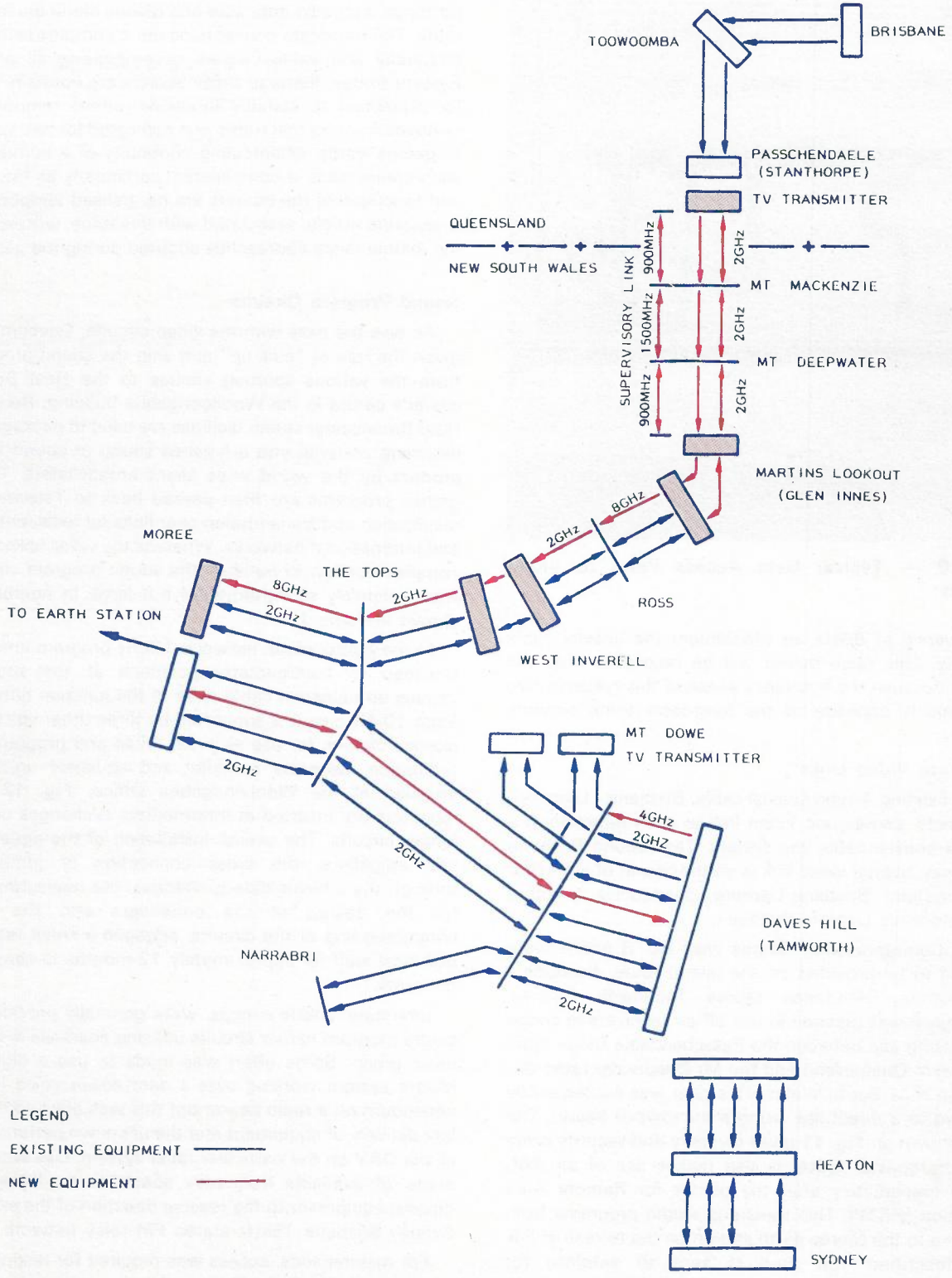


Fig. 11 — Inland Radio Route, Brisbane-Sydney.

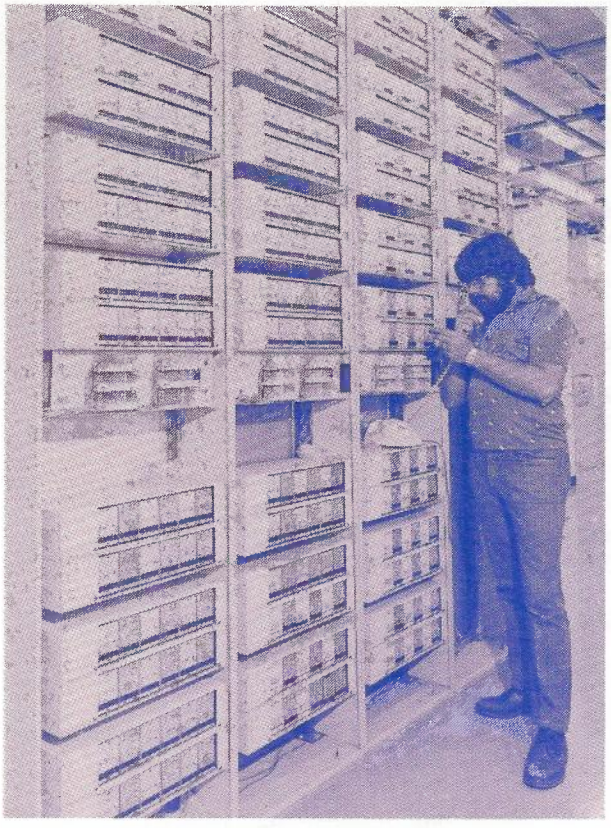


Fig. 12 — 10kHz Program Equipment Installation — Woolloongabba.

international carriers for transmission via satellite and submarine cables to overseas countries.

Voice Frequency Circuits

The telephony requirements, in the form of exchange lines, outdoor extension tielines etc for the games is equal to that of a medium sized Australian country town. Coupled with the added need of voice frequency circuits for data, teleprinter, security and other miscellaneous purposes, the planning and construction personnel were presented with a formidable task.

From the beginning it was obvious that a careful check would need to be kept of the incessant modifications to demand that could be anticipated if the experience of the Edinburgh, Christchurch and Edmonton Games were any criteria. Also to ensure that plant would be available, block booking of cable pairs and carrier channels and block ordering and installation of program amplifiers, Z-trols, loop extenders and so on was vital. This then needed to be followed up by translation of these block bookings and block installations into individual service orders, as firm requests were received. The last statement presented the biggest problem. Within weeks, even days before the games opening, information was still not available or was being amended as to the location and quantities of the services required. Some competing nations, press and other media needs were submitted to the Games Foundation very late and prevented firm requests being placed with Telecom.

At an early stage, personnel were allocated to maintaining plans, records and block reservations; to design outdoor extensions and special service circuits; and to control the issue of service orders.

The Games Foundation developed a computer data bank to keep track of service requests, printouts from which served as a basis for the block booking, circuit design and service order preparation. One of the major activities consequent on this work, was the jumpering or cross-connection needed on a number of exchange main distribution frames, as well as the provision of the telephone instrument or facility at the users end.

In some areas, technical officers were appointed as co-ordinators and project team leaders, to do this work and subsequently maintain the networks.

CO-ORDINATION

The key word to the achievement of communication facilities for the games was co-ordination. The needs had first to be determined, followed by who-was-to-do-what, with a requirement to remain flexible as changes eventuated. Also, Telecom customers, mainly the Games Foundation and the Host Broadcaster, had to be provided with the facilities they requested and for which they were prepared to pay.

Co-ordination was established not only with Telecom personnel within the State, within other States, and Headquarters, but also with the Games Foundation, Host Broadcaster, numerous other organisations, local and State Governments, venue managers, private contractors etc. Some of these co-ordination ties were established as early as 1976 during the development of the venues. In several instances verbal agreement was reached in resolving problems to be followed much later with the formal paper work. Regular co-ordination meetings were held in the several areas of concern. These meetings served to highlight the problem areas and to identify what action was required.

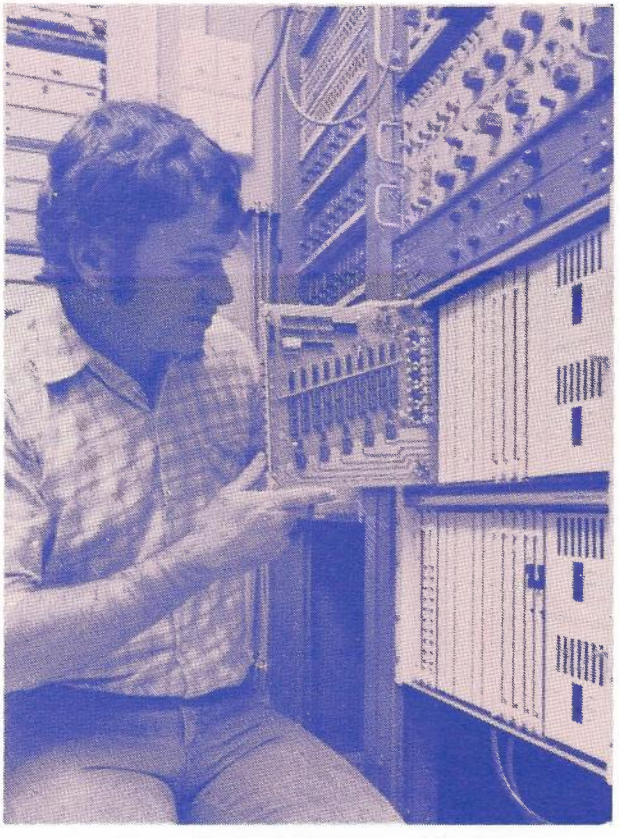


Fig. 13 — Matrix Switcher — Mt. Gravatt.

In most areas of Telecom the project was treated as a bulge on normal activities without the appointment of special co-ordinators or project leaders. In order to avoid severe disruption to normal work programmes, the larger installations (with the exception of the telephony network which was delayed mainly through the lack of information) were approached on a "few personnel-longer installation" base rather than a "short installation-large personnel" commitment.

CONCLUSION

Catering for the communication requirements of the XII Commonwealth Games has been a demanding experience. It developed into one of the bigger projects undertaken by Telecom in Queensland, in recent years.

Progress has been achieved through good will, co-operation, flexibility and understanding by all persons involved in this complex, dynamic project.

TYPES OF LINES	TRENDS AND COMPARATIVE TOTALS				MELBOURNE OLYMPICS 1956
	May 1979	May 1981	May 1982	June 1982	
Video	5	17	24	24	—
Program	148	183	220	245	394
Voice Freq or order wire	400	452	522	688	400
PABX extensions and tielines	619	1059	850	870	750
PABX or switch boards	3	1	1	1	36
Exchange and facsimile	50-70	568	610	678	1500
Public Telephones	42	18	60	64	190
Security and surveillance	34	18	14	20	—
Data and results	2	110	197	213	—
Telex and teleprinters	0	30	29	47	300
Private and direct lines	6	13	50	64	560
Picturegram	0	0	4	30	4
PMBX	0	0	30	38	—
Emergency Circuits	0	0	176	176	—

Table 1 — Development of Circuit Requirements

Advice No.	Project
1	Rearrange 12MHz patch system Edison-Woolloongabba-Mt Gravatt
2	Reroute 12MHz tail Edison-Mt Gravatt
3	Reroute radio link Edison-Mt Gravatt
4	Recover 4MHz tail Edison-Mt Gravatt
5	Provide video link Woolloongabba-Mt Gravatt
6	Bearer changes of NV401, NV403 Edison-Mt Gravatt
7	Provide two video bearers Woolloongabba-Mt Gravatt
8	Provide one video link Woolloongabba-Toowong studio
9	Provide video links City Hall-Woolloongabba
10	Provide video links Festival Hall-Woolloongabba
11	Provide video links Cultural Centre-Woolloongabba
12	Provide video links Cricket Ground-Woolloongabba
13	Provide video links Chandler-Woolloongabba
14	Provide video links Nathan-Woolloongabba
15	Provide video link Woolloongabba-Mt Gravatt
16	Provide video link Passchendaele Ridge-Martins Lookout
17-20	Miscellaneous work
21	Provide six 10kHz program lines Brisbane-Sydney
22	Provide 360 metropolitan 3kHz program lines
23	Provide five 10kHz program lines Brisbane-Sydney
24	Provide one 10kHz program line Brisbane-Melbourne
25	Provide 35 co-ordination circuits Brisbane-Sydney
26	Numbering of video and audio lines

Table 3 — Trunk Alteration Advices — Work Required in 1981/82

VENUE	TYPE OF LINES												
	Program	Voice Frequency Order Wire	PABX ODX	Exchange & Facsimile	Public Telephone	Security & Surveillance	Data & Results	Telex & Teleprinter	Private & Point to Point	Picturegram	PMBX	Emergency circuits	Video
Chandler	79	111	135	218	10	—	50	9	11	9	0	13	5
Belmont	17	45	26	30	4	—	9	0	0	0	0	9	4
Murarrie	1	1	22	15	2	—	10	0	0	0	0	4	0
Wynnum	1	2	5	12	2	—	1	0	0	0	0	3	0
Woolloongabba Cricket Ground	5	11	2	10	0	—	0	0	0	0	0	7	1
East Brisbane Grammar School	0	0	1	0	0	—	8	1	0	0	0	4	0
Mt Gravatt Village 2	1	2	67	1	2	—	2	0	1	0	0	6	0
Nathan	30	81	97	205	16	—	52	11	31	24	37	15	3
Griffith University Village 1	3	3	205	18	18	—	18	2	3	0	1	7	0
Moorooka	17	47	28	35	5	—	8	0	4	0	0	7	2
D'Amour Barracks	0	0	15	2	0	—	0	0	3	0	0	5	0
St Lucia Queensland University	0	2	5	21	0	—	2	0	0	0	0	4	0
Toowong	12	10	0	0	0	—	0	0	0	0	0	6	0
South Bank	0	3	0	21	0	—	0	0	0	0	0	3	0
City Hall	16	46	24	35	0	—	8	0	1	0	0	6	2
Festival Hall	18	51	23	46	0	—	8	0	0	0	0	6	2
Spring Hill Results Centre	0	0	0	0	0	—	155	0	0	0	0	3	0
Security	0	0	4	0	0	—	0	0	0	0	0	3	0
Botanical Gardens	0	0	1	2	2	—	0	0	0	0	0	3	0
OTC City	0	0	2	2	2	—	0	0	0	0	0	4	0
City Various	0	0	11	7	0	—	10	14	9	0	0	18	0
Fortitude Valley	0	4	0	0	0	—	5	9	9	4	0	8	0
Royal Wharf	0	0	1	0	0	—	0	0	0	0	0	0	0
Mt Gravatt	9	7	0	0	0	—	0	0	2	0	0	9	0
Mt Cootha	4	5	0	0	0	—	0	0	0	0	0	21	0
Bald Hills — Caboolture	0	0	0	6	0	—	0	0	0	0	0	0	0
Airport	0	4	22	3	0	—	4	0	0	0	0	9	0

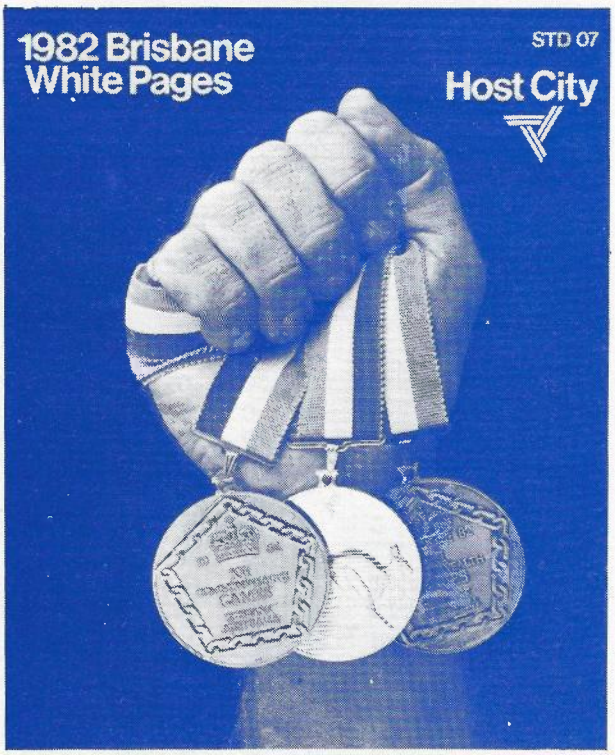
Table 2 — Services Required at Each Venue and Village

FROM	TO	NO. OF LINES
ABC Studio Toowong	Mt Gravatt	3
Mt Gravatt	ABC Studio Toowong	2
Woolloongabba Broadcast Centre	ABC Studio Toowong	1
Woolloongabba Broadcast Centre	Mt Gravatt	4
City Hall	Woolloongabba Broadcast Centre	2
Festival Hall	Woolloongabba Broadcast Centre	2
Cultural Centre	Woolloongabba Broadcast Centre	1
Cricket Ground	Woolloongabba Broadcast Centre	1
Chandler	Local Links + Radio	5
Nathan	Local Links + Radio	3

Table 4 — Metropolitan Video Links via Coaxial, Single Quad or Radio

The Telephone Directory

In 1980, Telecom, Queensland, responded to a request from the Commonwealth Games Foundation and agreed to feature some aspect of the Commonwealth Games on the front cover of the 1982 Brisbane White Page Directory.



In February 1982, it was established that the cover feature should clearly relate to the Games, be very dramatic in nature and still be quite appealing to the community.

The advertising agencies serving Telecom and the Games Foundation were asked to submit suggested material for consideration. A selection was made and one agency was commissioned to prepare final art work. Local artisans were engaged in the photographic and art processes required to produce the material to the high standard specified by Telecom's printing contractor for a very professional result.

The front cover depicts the three medals (Gold, Silver and Bronze) for which participants from all Commonwealth Nations will be competing. The medals are held in a closed fist to give them a clear and dramatic presentation. The medals were made by Brisbane designer Michael Bryce from silver (gold plated), silver and bronze base metal.

Telecom Australia's print contractor selected a special ink to produce the jet black background so essential to the presentation and to facilitate an ultra violet plastic coating process to give the cover a gloss finish.

The outside back cover identifies the various venues which will be used in the Brisbane area for the events which will be featured in the games. To assist with the promotion of the games, two pages were included in the back of the directory detailing the programme of events and the public transport arrangements for access to the Q.E. II Jubilee Sports Centre. Although the items are printed in a number of publications, the telephone directory is readily accessible to most of the community at the time they will be required.

Telecom also produced the games internal PABX book — known as the Games Family Directory — for the Foundation. The format was devised to illustrate how to operate the facilities and included information which would be of valuable assistance to local and visiting people, at the games venues. The directory contains telephone information in relation to the training and the main operating venues, administration venues, diplomatic representatives, villages and organisational divisions. In addition, there are service numbers associated with Festival '82 which is being conducted in conjunction with the games.

The front and back covers are smaller scaled versions of those that were used for the Brisbane White Pages. 6000 copies of the PABX directory and 2000 additional copies of the covers were produced for the Games Foundation. Provision was made inside the cover for autographs as it is expected to be a popular souvenir.

RON WARNOCK
Manager, Directories, QLD.

Host Broadcaster Facilities

L. R. BLACKETT, BE, BSc, MIE (Aust), SMIEE (Aust).

The role of the Australian Broadcasting Commission (ABC) as Host Broadcaster for the XII Commonwealth Games in Brisbane is outlined.

The basis of engineering planning to provide for this role is covered and the resulting facilities are described, with particular reference to the purpose of these facilities and the needs of broadcasters. The description covers the two main areas of interest, sporting venues and the Broadcast Centre, with both radio and television in each area.

Some detail is included of the range and quantity of equipment required.

THE ROLE OF THE HOST BROADCASTER

The Host Broadcaster's (HB) role is to provide the organisation and the facilities whereby all broadcasters, who have gained rights to cover the events, can achieve that coverage. Without a HB, the broadcasters would have to separately arrange for venue facilities such as cameras and microphones, and production facilities such as studios and video and audio recorders. Equally, each would have to arrange with the games organisers, how these facilities could be used without inconvenience to athletes and spectators at the venues.

It has therefore become traditional for one organisation, the HB, to set up all venue and studio type production facilities for all radio and television organisations.

The HB thus becomes the single point of contact between the games organisers and those broadcasters.

In Brisbane in 1982 that function has been undertaken by the ABC. The ABC's Host Broadcaster Unit provides its TV clients with a continuous live coverage of all sports except archery and shooting, where highlights only are available. It also provides sufficient commentary booths at the venues to allow these television clients to match their commentary to the host produced picture.

Similarly, the radio clients are provided with commentary booths at each venue.

This arrangement is illustrated by the case of swimming. The host provides an outside broadcast van equipped with 6 cameras. These cameras are under the direction of a HB producer who provides the same visual coverage to all the client organisations such as the BBC, the NZBC and the CBA (Commonwealth Broadcasting Association).

There are 17 commentary positions at swimming, where the commentators of the BBC, etc. are located. These commentators are provided with TV monitors which show the picture the HB is producing at this venue.

From this picture and their direct view of the events, the TV commentators produce their own distinctive commentaries matched to the host picture. Radio commentators have identical facilities.

Both the vision and sound produced at each venue are simultaneously beamed back to the Broadcast Centre where each broadcast team has its own TV and radio production equipment. Here they are able to choose vision and sound from each venue according to its interest and to package programs to send to their respective countries. Essentially, the Broadcast Centre is the games radio and TV station.

The Broadcast Centre is provided by the Host Broadcaster and houses 7 television package suites and 10 radio studios in an area about the same size as the Aquatic complex (30,000 sq. ft.).

Six of the 7 TV package suites are used by the ABC, BBC, CBC, NZBC and the Australian commercial network. The remaining suite — the host unit — is operated by the HB to produce a daily 60 minute packaged program of games highlights for countries unable to send a TV representative.

It also provides a bookable facility for those organisations not taking up exclusive studio and videotape equipment.

For radio, 7 studios are taken up by the same 5 major groups with 2 other studios booked out to the CBA. The CBA represents national public service organisations of the Commonwealth and allocates these studios to its members. The final radio studio is used by the ABC's own external service, Radio Australia. It provides a coverage of games results and action to an audience in South-East Asia, the Asian Sub-continent and the Pacific.

Both the TV clients and the radio clients from overseas

have the choice of satellite or airfreight to take their live coverage and packaged coverage overseas, depending on their respective time zones and audience expectations.

The daily 60 minute TV package is transmitted interstate to the ABC's Sydney studios where multiple copies are made in several tape formats. In several cases, standards conversion is necessary in Sydney and, on some occasions, the package is transmitted by satellite.

The ABC domestic radio and television service uses terrestrial circuits for transmission of an extensive live coverage to all Australian states across 3 time zones.

Overseas satellite transmissions are utilised principally by the BBC, NZBC and CBC but also, to a lesser extent, by other countries. Some 200 hours of satellite time is used by Commonwealth broadcasters.

Over 400 ABC staff will man the radio and television facilities designed to meet the needs of the Australian and overseas broadcasters. About 600 broadcasters are expected to attend.

ENGINEERING PLANNING OF BROADCAST FACILITIES

The planning and design of the facilities to cover the Brisbane Games evolved from a study of previous venues, Christchurch and Edmonton, and was modified by discussion with client broadcasters and by production and technical developments in recent years.

Some initial and fundamental decisions were made in 1979 in the early planning stages, primarily to develop a budget and ensure funds were available before the HB role was able to be accepted.

A major decision was to purchase equipment for the Broadcast Centre and to use existing TV outside broadcast O/B vans from ABC branches in the 6 States, for the venue task.

Continuous TV coverage of events at 8 sports was planned at an early date with archery and shooting covered by recording on location. Commentary positions linked to the Broadcast Centre were planned at the same 8 sports for both TV and radio.

Use of helicopters and a camera car became part of the coverage plan.

As audio and video circuits from venues and outgoing from the Broadcast Centre are a major requirement, early estimates were provided to Telecom Australia. Vision links from 7 venues became Telecom's responsibility with lawn bowls and road events being serviced by the HB.

Additional interstate television bearers were seen to be necessary to provide for direct satellite transmissions from earth stations at Moree, in New South Wales and Ceduna in South Australia, as well as for Australian broadcasters' needs. Therefore, 2 additional circuits were made available from Brisbane to Sydney and one additional from Sydney to Melbourne.

Based on the Edmonton experience, it was determined that the BC required 10 radio studios and 7 major TV package suites with supporting audio editing booths and TV studios.

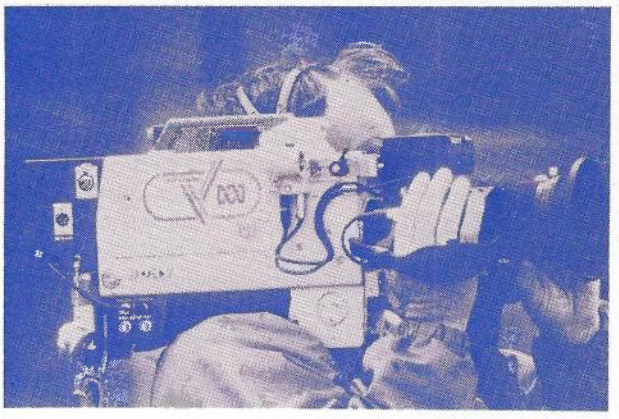


Fig. 1 — One of 24 Cameras Purchased for the Games.

Len Blackett joined the Australian Broadcasting Commission in 1957 in Melbourne as Senior Engineer, Television shortly after the commencement of the Australian television service.

In 1965 he moved to Queensland as the Director of Engineering, covering the ABC's radio and television studio systems in Queensland and at that time its radio studios in Papua-New Guinea. During this period the conversion to colour TV was carried out.

Following the ABC's acceptance of the role of Host Broadcaster to the Commonwealth Games in 1979, the ABC's Commonwealth Games Unit was established. Len became Engineering Manager in the unit, which will disband when the games broadcasting facilities have been dismantled and dispersed.

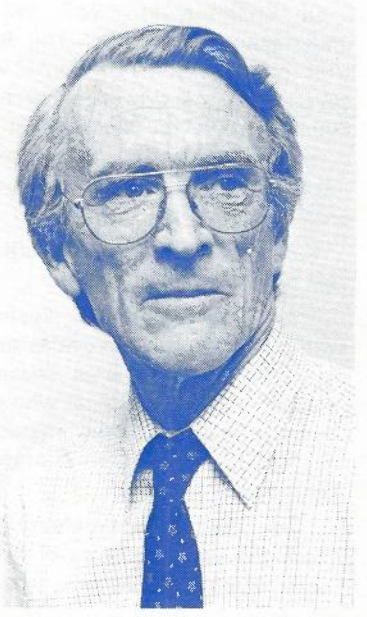


Fig. 2 — Three of the Ten Videotape Recorders in the ABC Television Suite.

At an early stage, it was estimated that an additional 24 TV cameras **(Fig. 1)** as well as 50 to 60 videotape recorders **(Fig. 2)** would be needed.

From these basic plans and an estimate of manpower, the budget figure was arrived at with provision for escalation due to inflation. Not unexpectedly, the capital equipment cost is 70% of the total budget.

The year 1980 saw the broad plan converted to detailed equipment requirements, with the need to order well in advance, often out-running the production and operations plan.

The Broadcast Centre

An early decision was the location of the Broadcast Centre and it was fortunate that Telecom Australia could provide 4 floors of one of their buildings, in a convenient location, for this purpose.

Conversion required partitioning into offices and radio studios on one floor, TV package suites on a second and, the host TV suite and central apparatus area on a third. Use of a fourth floor area as a store, completed the facility, in which about 100 "rooms" were created.

Construction is of steel frame and plaster board with floor carpet in all areas and with acoustically treated walls in studios.

In both TV and radio, the emphasis is on packaging but with the ability to go to air, live.

A TV packaging suite has 2 main areas;

- an office area; and
- a production area, including 4 to 10 videotape machines.

To these are added an off-tube booth and, in some cases, a studio with 1 or 2 cameras, depending upon client broadcaster requirements. The off-tube booth with its TV monitor and microphone, allows commentary to be added in the Broadcast Centre. The choice of videotape format was a significant one since it would also commit the ABC in the period following the games. The aim was to use only one tape format and one inch tape, Type C, was the selection. However, some 3/4" Umatic, both high (BVU) and low band, have been provided to cover requirements of smaller countries and of TV news teams. No film facilities are provided.

A feature of the program distribution system, is the use of a single sound and vision switcher, to service incoming and outgoing programs and internal distribution between recorders and mixers, and between suites. The switcher has 100 inputs and 110 outputs.

Timing of vision signals is achieved by the use of frame stores, permitting excellent flexibility.

A radio studio complex is basically a 3 room area:

- an on-air booth;
- a control area; and
- an office;

with each providing a buffer from adjacent areas.

Basic equipment includes a 16 channel audio desk and four 1/4" tape recorders.

TV monitoring of programs from all venues and from some other sources, is available in the radio suites, in offices and in TV areas. Distribution uses an RF system with domestic type receivers. This use of such receivers is a feature of the facilities, providing relatively cheaply, but effectively, for the significant monitoring requirements.

One innovation for use on outgoing circuits is the use of line identifications by means of digitally recorded speech in memory chips, a device developed in the ABC's design section.

Several new techniques were introduced into the installation work particularly related to fast termination of cables.

Production area furniture is plain but effective and attractive, using prefabricated metal frames and chip board.

The Venues

The venue task introduced another dimension — the co-ordination of broadcasting needs with those of others particularly the sporting bodies and the Brisbane City Council.

The first contact with venue construction occurred in 1976 when the QEII Athletics Stadium was being designed and before Brisbane was awarded the games. Subsequently, the 4 new venues at Chandler — Aquatic, Weightlifting, Badminton and Velodrome — were designed and in all these new venues ABC staff and subsequently, the ABC's Host Broadcaster Unit, were able to anticipate broadcasting needs with provision of power, cable access ways, camera and link platforms, etc.

Track athletics coverage with 7 cameras and field events coverage with 6 cameras, are separately fed to the Broadcast Centre, as is swimming with 5 cameras, cycling with 5 cameras and wrestling, boxing, badminton, weightlifting, and lawn bowls with 4 cameras each.

The teams cycle race and 30 km walk, being at locations remote from Brisbane city, are covered by highlights, edited from material recorded at the venue.

The individual road cycle race and the marathon are covered live, with multiple feeds coming directly to the Broadcast Centre from fixed points, from the camera car and from helicopters. These feeds are integrated into a

finished production in the HB package suite for distribution live to the broadcasters within the Broadcast Centre.

Whereas most broadcasting organisations have a variety of equipment which is perfectly adequate if used separately, when a composite program from several venues is attempted an "unevenness" of vision facilities usually detracts from the result. For these games therefore, the HB has re-equipped its O/B van complement and all Broadcaster Centre areas with new, matching, vision switchers and character generators to provide a uniform "look" to the TV output.

Emphasis has been placed on the use of replays by providing a separate vision effects producer at major venues. This producer, with staff and facilities, is in an area away from the O/B van control room and there, carries out the specialised job of recording, selecting and controlling the replays. The producer can sub-switch any camera to a number of recorders and thus have available, views of sports action (isolated camera replays) not previously seen by the viewer and can replay in slow motion.

This area also provides a TV archive service which is of great assistance to broadcasters who may miss recording an essential element of their required coverage. The HB records all of its continuous coverages by locating archive recorders at the venues. A motor cycle courier collects tapes upon completion of each session and these tapes are available at the Broadcast Centre for replays. In addition, should a transmission break from the venue occur, any missed sports action can be replayed from archive material via the circuit, when restored.

A further function of this area is to provide for information from the results computer and from timing systems, to be formated for the TV screen and presented to air using a standard character font and presentation style.

The electronic results system is provided by the Games Foundation, and, at 5 venues and in the host TV packaging suite it is interfaced with the TV system.

Electronic timing at swimming, cycling and athletics also interface to TV together with diving scores. Interfacing equipment has been developed by the ABC design section and includes purchased character generators.

Further TV interfaces are associated with the clocks at boxing and wrestling and the judges lights at weightlifting.

THE BROADCAST CENTRE — BROADCASTING FACILITIES

Television

In TV, the basic task is to provide package suites where programs are assembled from the incoming signals from the venues.

Essential to this task is the use of videotape equipment for recording, editing and replaying.

Also required are suitable vision and sound mixing equipment, a studio with camera, captioning facilities etc.

Distribution of the signals within the Broadcast Centre becomes a major task, requiring not only distribution of signals from venues but also between package suites and between videotape machines. This task is undertaken at the Master Control **(Fig. 3)**.

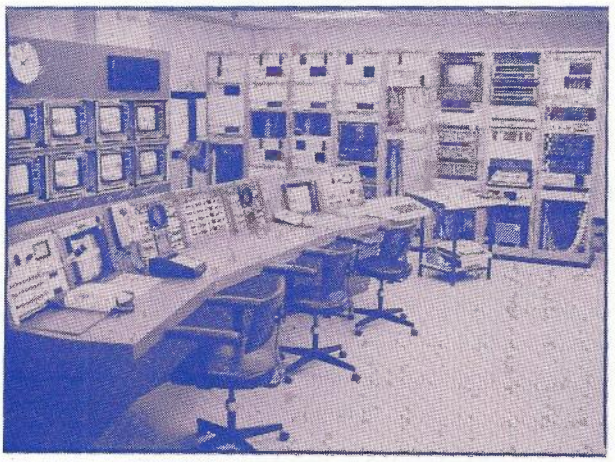


Fig. 3 — Master Control in the Broadcast Centre.

These switching requirements are met by the use of one switching matrix, the routing switcher, with 100 inputs and 110 outputs, with some 4000 of the possible switching cross points provided.

A typical TV packaging suite has access to 12 venue signals — 9 sports (since track and field are separate productions) plus the back up circuits from QEII Athletics Stadium, from the Chandler Complex with its 4 venues and from lawn bowls.

Access is provided also to outputs of the other package suites, to 8 HB videotape machines and to the host TV studio as well as to test signals.

In the case of venue and package suite outputs as sources, these require special attention to timing to the Broadcast Centre system. This is achieved by the use of frame stores.

Ten such frame stores allow 10 timed sources (of the 12 venues and 7 package suites) to be available at any one time to all users. Since all sports are not in progress at any one time this gives sufficient flexibility on a session to session basis.

Within the suite, the local vision mixer has, in addition, access to its own videotape machines (from 4 to 10) and, in some cases, to its own TV studio and to a character generator.

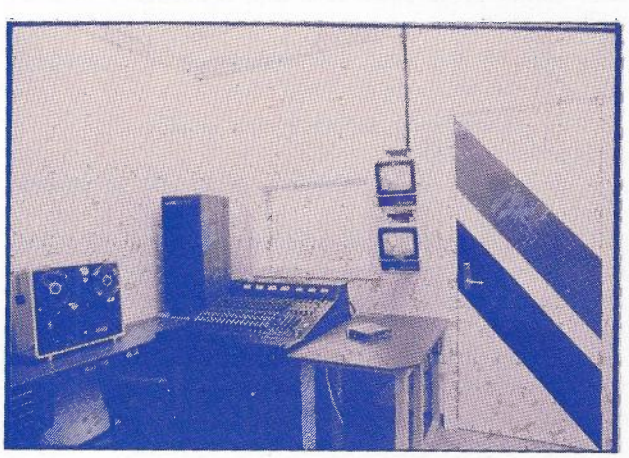


Fig. 4 — A Typical TV Package Suite — Vision Facilities.

Fig. 4 depicts a typical TV package suite vision distribution system, including the main suite mixer and 3 sections of the routing switcher (RSw) — frame store input selection (FS), suite delegation switching and videotape recorder pre-selection switching.

The latter 2 sections are provided for each package suite, with some variations, whereas the frame store selection is a single central facility providing the same 10 timed programs, to all suites.

The audio component of host venue programs is in international sound — that is "effects" sound without commentary.

The audio distribution thus requires, in addition to this international sound associated with the various vision signals, commentary sound from up to 8 venues at any one time. **Fig. 5** shows a typical TV suite audio distribution system.

The videotape (V/T) section of the suite switching requires considerable flexibility both for inputs and outputs.

Thus each V/T machine has its pre-selector panel which allows access to the routing switcher. Sources available include test signals, venues, packaging suite outputs and host V/T machines. Each source is married ie both video and audio are switched together. In the case of venue sources, this audio is "effects" sound only and it is necessary to mix the commentators sound with the "effects" sound to provide a final product. A 3 input mixer is provided for this purpose. The V/T machine also has 3 audio tracks available for recording and replay.

V/T machines are arranged in pairs in the packaging suite to allow for easy editing between machines, when required. Between each pair of machines there is an equipment rack containing the routing switcher pre-selector panels, talkback, patching and a remote roll panel which allows any number of machines in the packaging suite to be slaved together for editing or multiple recording requirements.

Radio

For radio, there are 10 radio studio/control room suites. All are of equal size and have similar facilities. The approximate studio dimensions are 7 feet by 10 feet and the control room, 10 feet by 15 feet. In addition, the ABC and BBC suites have a small editing room and a bookable editing room is provided for other broadcasters.

The basic equipment provided in the studio area consists of a commentator unit as used at the Olympic Games at Montreal and the Commonwealth Games at Edmonton and also to be used at each sporting venue at the Brisbane Games. In addition, a TV monitor, 2 microphone/headset units and 2 table microphones are provided.

The commentator unit permits the 2 microphone/headsets or one table microphone to be switched on from the studio. Provision is also made for the 2 table microphones to be cabled direct to the audio mixing console in the control room and thus be switchable from that point. A tape recorder or a gramophone unit may be plugged into the commentator unit for replay into program.

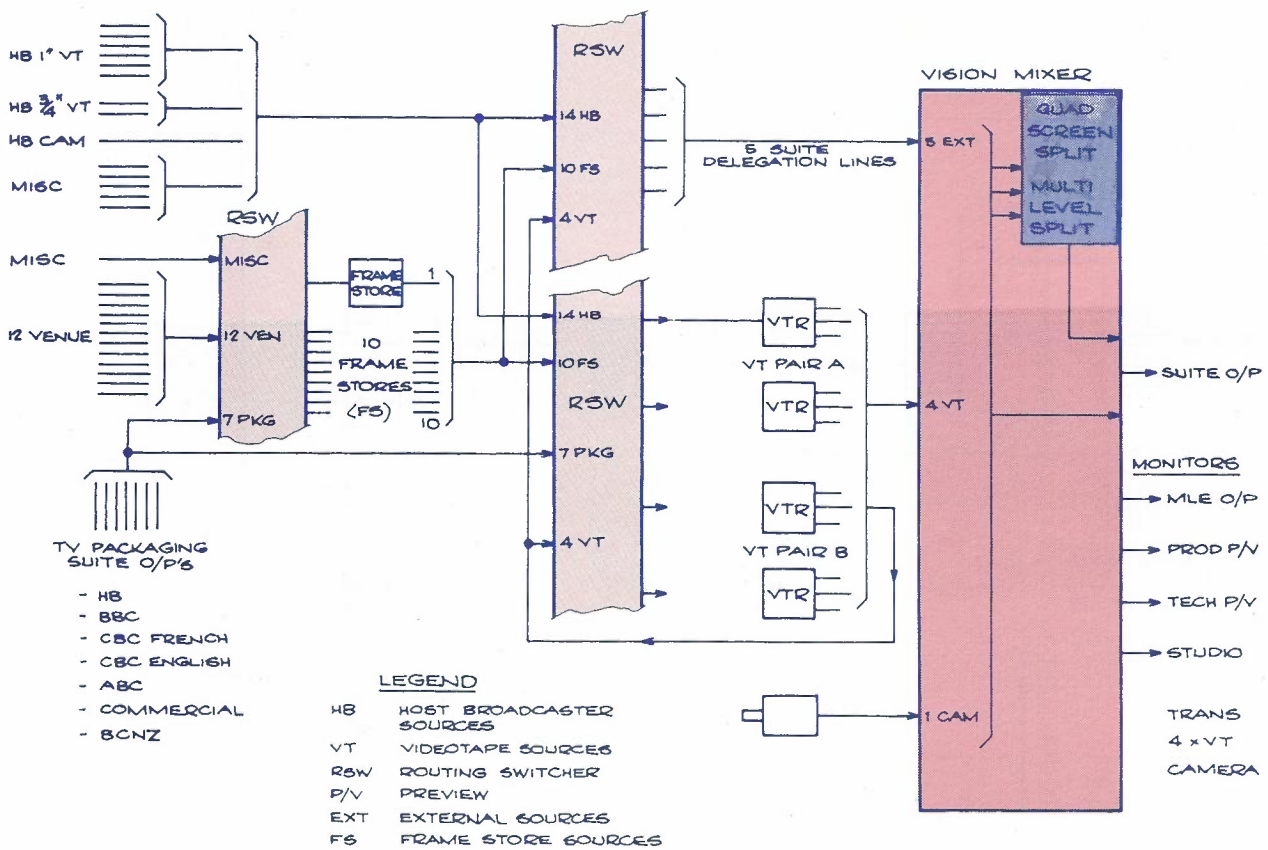


Fig. 5 — A Typical TV Package Suite — Audio Facilities.

The commentator unit also enables the announcer to talk to the studio producer, with reception in one headphone. The announcer's second headphone will provide monitoring of the international sound from the venue displayed on the TV monitor or the program output of the studio/control room suite, with the choice of superimposed announcer sidetone.

The TV monitor is switchable to any venue being televised by the HB or to the output of any TV suite in the Broadcast Centre. International sound, in the case of a venue, or program sound in the case of a TV suite, may be heard by the announcer.

The control room area (see **Fig. 6**) contains the following equipment:

- a 16 channel input audio mixing console;
- 3 or 4 tape recorders;
- remote control units for the 4 recorders;
- a telephone recorder connector;
- a monitoring loudspeaker;
- a TV monitor;
- a jackfield for patching and access;
- a talk back unit for the producer.

The audio mixing console inputs are allocated as follows:

- 8 for program lines from commentators at sporting venues;
- 3 for output from associated studio;
- 4 for outputs from the tape recorders;
- 1 test signal.

Other inputs available for patching to the mixer are the international sound from each venue, that is the "effects" sound produced by the HB, and also bookable interview lines from the village, archery and shooting where commentator boxes are not provided.

The telephone recorder connector provides a voice report input, using the normal telephone network on 3kHz lines. A two way conversation is accompanied by the required "beeps" but these are not included on the unit's output.

In conjunction with telephone attachments at venues, recorded interviews can be played through this input circuit to a suite recorder or direct to the mixer.

Outputs are provided for:

- program line to home country or network;
- control room loudspeaker;
- office loudspeaker;
- control room output monitoring for announcer.

All inputs may be equalised and comprehensive mixing and monitoring facilities are available at the console.

All tape recorders in the studio/control room complex are full track mono. All associated equipment is intended to handle mono program only.

The recorders are located on a bench along 2 walls of the control room. Their inputs are connected — via the jackfield — to 4 of the commentator program lines from the venues. Their outputs — once again via the jackfield — are wired to 4 inputs on the audio mixing console.

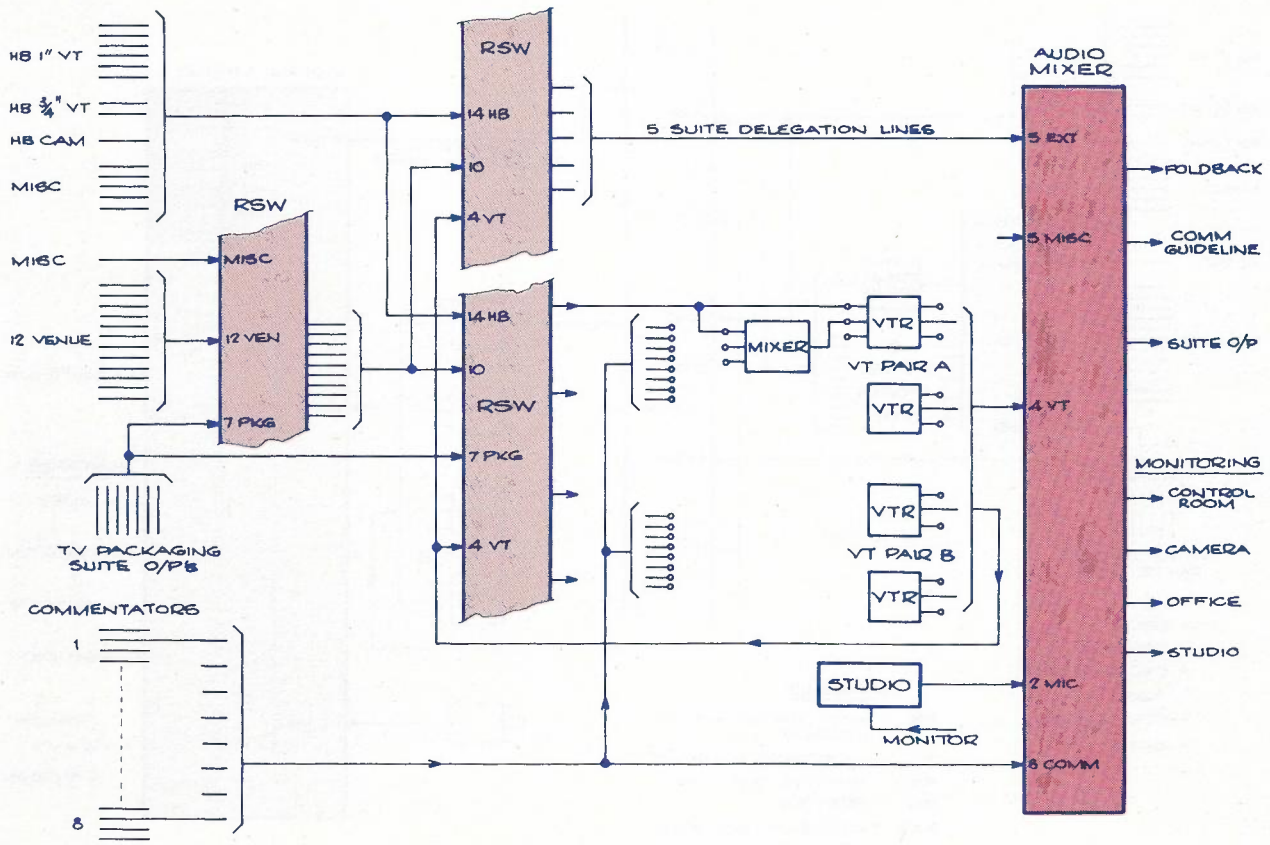


Fig. 6 — A Radio Suite Production Control Room.

Other configerations, such as for dubbing purposes, can easily be arranged on the jackfield.

These recorders provide full professional facilities for recording and editing. They have variable speed spooling and electronic tape timer.

Remote control units are provided for the tape recorders.

A high quality loudspeaker is provided in the control room along with a driving amplifier.

A TV monitor is also available in the control room. It is switchable to any of the sporting venues being televised by the HB. International sound from that venue may also be heard. Alternatively the monitor can be switched to the output of any TV suite.

A comprehensive jackfield is provided so that full patching facilities are available.

The producer has talk back facilities to and from the studio announcer. He also has talkback to the venue commentators and, if lines have been booked and provided, to his home country or network.

Additional equipment such as gramophone units, cartridge units or cassette recorders can be incorporated in the control room as jack-in facilities and spare input channels to the mixing console exist.

THE VENUE FACILITIES

The primary TV facilities at each venue are provided by a standard ABC O/B van equipped with cameras, vision and sound mixers, a character generator, a production area with monitoring and communications facilities **(Fig. 7)** and ancillary equipment which makes the van a complete program production unit.

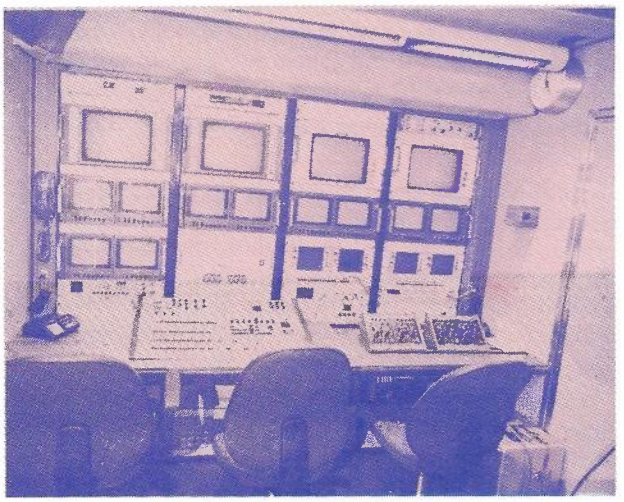


Fig. 7 — The Production Area of the Lawn Bowls O/B Van.

Seven major and 2 minor O/B vans from the 6 states are used and one major O/B van has been purchased — and is to be used at the lawn bowls venue **(Fig. 8)**.

All major vans have been re-equipped with new vision mixers and have undergone significant upgrading of other facilities, such as monitoring.

The additional requirements, at venues, of V/T facilities and of TV interfaces to results and timing systems at some venues, is covered by a separate area. In several cases this is in a room at the venue. Otherwise it is in a caravan or demountable building and, in the case of athletics, the field coverage uses the ABC's major production control van, recently constructed for normal major sporting telecasts.

At the athletics stadium, 2 completely separate programs are produced by the HB — one field and one track. Also, for the opening ceremony, a different configuration is needed using both sets of facilities as one unit.

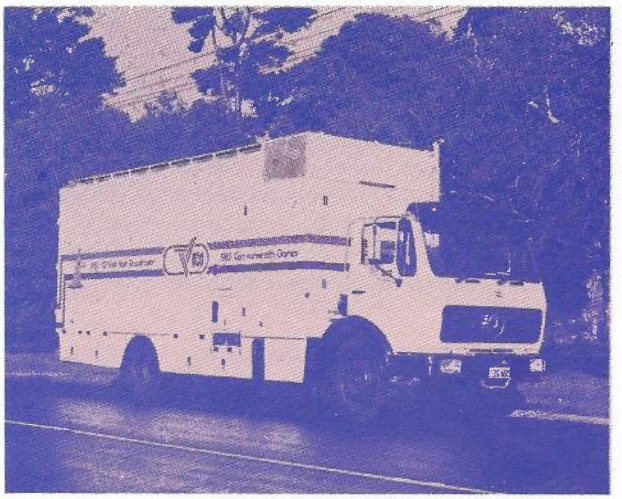


Fig. 8 — The TV O/B Van Purchased for the Lawn Bowls Venue.

The other major venue facility is that for commentators. Some 140 commentator boxes are provided at 8 venues, with a peak number of 24 at athletics.

These each contain a commentator's unit, as used at Montreal and Edmonton, and hired from the CBC in Canada **(Fig. 9)**. TV monitors in each box display the local venue picture (or ABC off air program as an alternative). At athletics, this requires both a track and field monitor in each box.

Fig. 9 — A Venue Commentator Box in Use at the Athletics Venue.

Audio from the commentator boxes is independent of host program, where "effects" sound only, is used. Each

box uses 4 audio circuits to the Broadcast Centre — commentary, reverse program cue and 2-way talkback. These 4 circuits are patched as a group to the radio or TV suite of the broadcaster using the commentary box.

Venue audio circuits total over 600, with one in 4 being 10kHz lines and the remainder 3kHz lines. These are provided by Telecom, Australia.

Additionally each commentator box and several HB areas are equipped with standard telephones, totalling about 170 for all venues.

One of the major tasks at venues has been the provision of many individual facilities, such as camera platforms, interview areas, equipment rooms, microwave link sites and power supplies. These have required extensive negotiation with the Games Foundation, particularly where they affect seating or the athletes. They also have involved discussion with the venue owners, the Brisbane City Council, where structural work is involved. At lawn bowls, for example, a crane is necessary as a camera platform behind the stand to permit coverage of rinks on 2 greens without obstructing the view of spectators.

The road events — marathon, walk, individual road cycle and teams road cycle — present a different set of problems. Of these the marathon (through Brisbane City) and the individual road cycle (on a course encompassing the Chandler venues area) are covered live, whereas the other 2, being more remote, are covered by recording on location with later editing and packaging in the Broadcast Centre.

Both the live coverages require relocation of TV vans from other venues. Microwave links are extensively used to bring signals from widely spaced locations, from helicopters **(Fig. 10)** and from a camera car, to the Broadcast Centre.

For these events and the host commitments at lawn bowls, 15 link transmitter/receiver systems are necessary. These are additional to Telecom links provided at other venues.

The major use of the helicopters and camera car is at the 4 road events, but a helicopter is also used for the opening ceremony and some general games coverage.

One helicopter is a camera platform with a link to ground and a second helicopter is primarily a link platform to receive a signal from the camera car and pass it back to ground.

With the extensive venue facilities planned an excellent coverage of all sports in ensured.

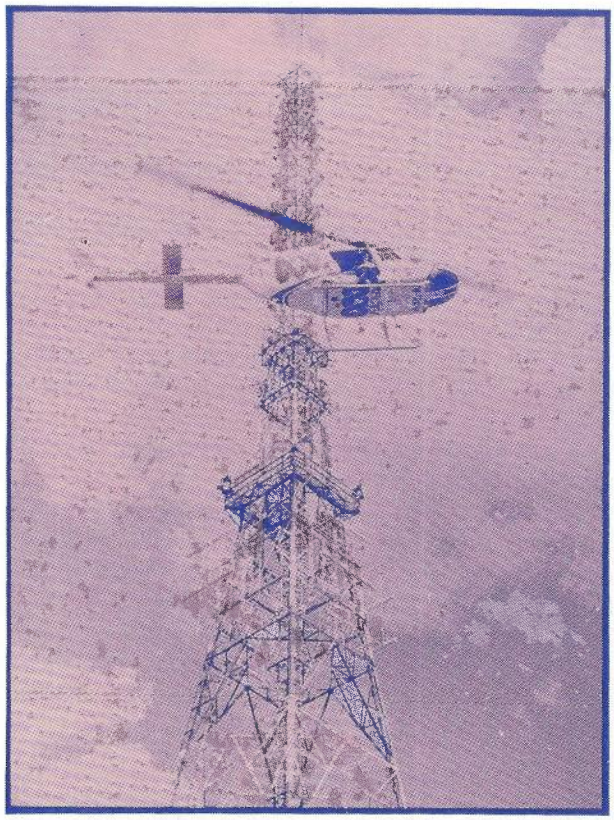


Fig. 10 — The ABC Helicopter, One of Two Used by the Host Broadcaster.

CONCLUSION

The provision of broadcasting facilities by a Host Broadcaster for coverage of a Commonwealth Games has become a major task. It requires planning for at least 4 years in advance of the games and, overall, occupies an average of some 30 full time staff for up to 3 years.

The operation it serves extends over little more than 10 days.

With no opportunity to change facilities in this short period, the determination of the requirement becomes of prime importance. It must suit the local games environment and the individual wishes of broadcasters. In both these areas it is difficult to obtain early and firm information; "Games" personnel are generally new to the task and broadcasters have other priorities.

However, for the XII Commonwealth Games in October '82, the ABC's Games Unit is confident it has provided a versatile and comprehensive facility.

In Brief

TELEPHONE RESULTS SERVICE FOR THE GAMES

People throughout Australia are able to use their telephones to get up-to-date results of Commonwealth Games events.

Telecom has provided a recorded results service on the number 1188.

It will operate through the capital city networks in each State.

Results will be fed to Telecom from games venues and the 1188 recording will be continually updated as results become available.

The Radio Networks

W. P. ALLINSON

Radio communication is used for control and administration purposes at the games. This paper describes the radio networks which have been established.

INTRODUCTION

From early September 1982, during the final preparatory phase for the Commonwealth Games, and then for about two intensely active weeks in September/October 1982 it is the responsibility of the Foundation's communication system to facilitate the total exchange of information and instruction for all participating sections of the Games Family. This paper concerns the radio network component of the total system.

THE USERS

The users of the Foundation Radio Networks may be summarised as follows:-

- ADMINISTRATION;
  (a) Foundation control
  (b) Venue management.
- TRANSPORT;
  (a) Total logistic support (personnel and stores)
  (b) Venue traffic and parking
- ENGINEERING
- SPORTING; control of schedules and all other operational activities of individual sports at their dedicated venues
- ELECTRONIC MEDIA & FESTIVAL '82
- The "VILLAGES"

NETWORK DESIGN FACTORS

General

There are 14 separate venues at which competitions will be conducted; three separate villages to house athletes and officials, one village for international performing artists, a supply and transport depot, the Foundation HQ, a Ceremonial Teams' depot, training venues and the reception areas at Brisbane Airport.

Of the above only one sporting venue is outside a 16 km radius of the Foundation HQ in Brisbane City centre, viz the teams' time trial cycling venue at Bald Hills (10, Fig 1) and all but seven of these locations are on the south side of the Brisbane River.

From the above, it would seem:-

(i) A city wide network should provide reliable coverage of all areas if a suitable antenna, base repeater station with maximum permitted power output and normal receiver sensitivity is installed in an appropriate site; and,

(ii) the relatively close proximity of most venues with each other would create the need to take all of the usual precautions to avoid mutual interference and traffic corruption.

The Terrain

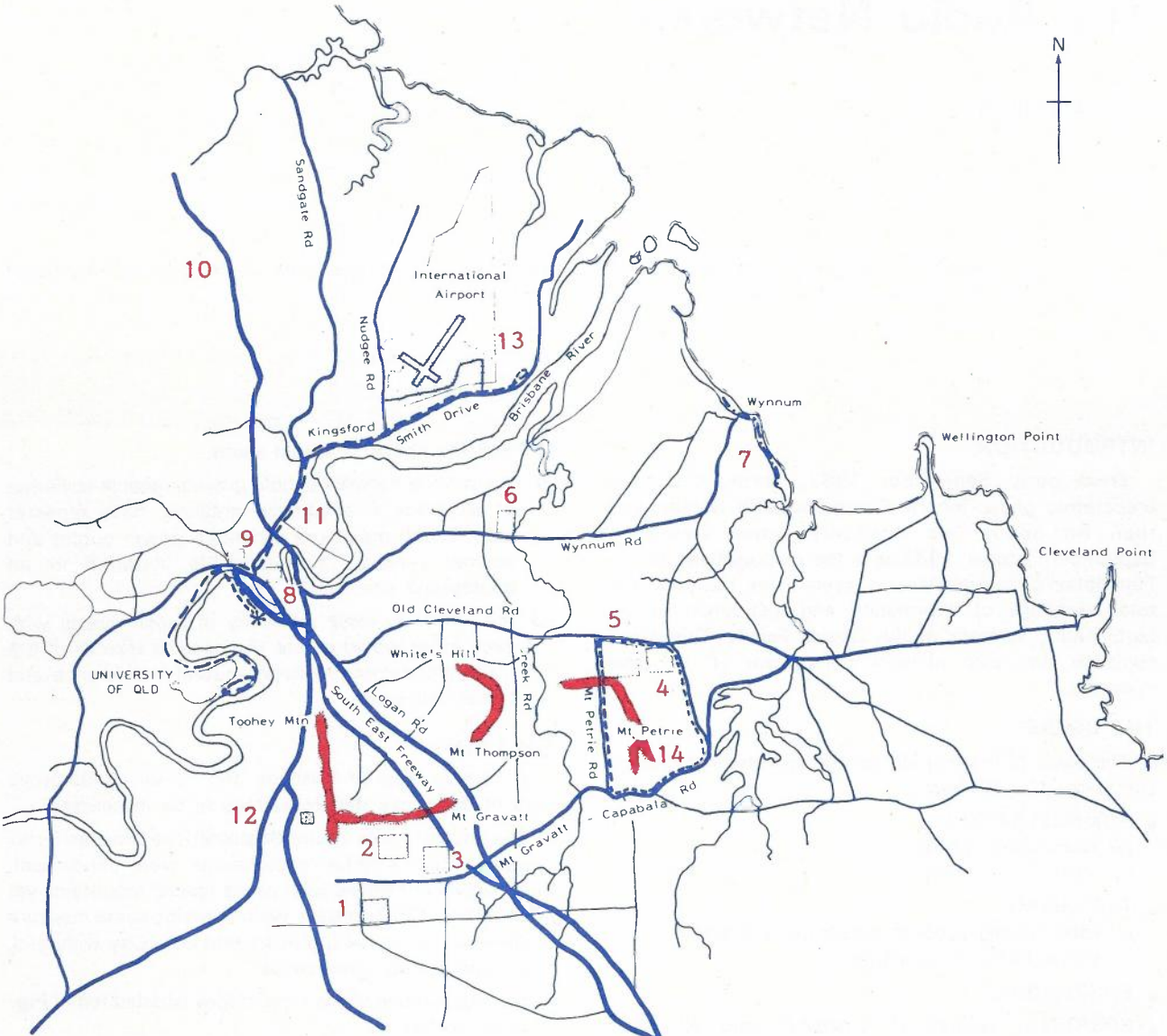
A contour map of Brisbane and its surrounds prove both of the above generalisations to be inaccurate.

The southern side of the Brisbane River has (as far as the Foundation's radio requirements were concerned), three significant ridges with peaks (called mountains yet none exceeds 200 metres), which provide some measure of shadow-loss to radio propagation both City-wide and, more significantly, inter-venue.

The significance of the three ridges (shaded red in **Fig. 1**) is as follows:

1. Starting about 6 km SSE of the base station site, (city centre) extending south and then due east for about 3.5 km is a ridge which includes Mt. Toohey (110 m) and Tooheys Forest Reserve (90 m), then rising to and terminating abruptly in Mt. Gravatt (194 m). This ridge is directly between the Supply and Transport Depot (25 m) (1, Fig 1) and the city base, and limits transmissions from the depot to those vehicles fitted with high-powered mobiles. Meanwhile, reception at the Transport Depot of the city-wide network is degraded but still workable. A bonus from this ridge is the radio isolation of the bowls venue at Moorooka, (12, Fig 1), from all other venues. It also provides an additional barrier to radio interference between the village and QE II Jubilee Sports Centre (2 and 3, Fig 1) and other venues at Chandler and Belmont, (4 and 5, Fig 1).
2. A ridge extending in an arc from about 115 to 130

degrees and distant about 12.5 km from the base station. The peaks included in this arc are White's Hill (112 m), Sankey's Mt. (90 m), Pine Mt. (107 m) and Mt. Thompson (109 m). This ridge isolates the archery venue (6, Fig. 1) at Murarrie from the athletic venue at Nathan, and the QE II stadium. It also shades two major routes used by Foundation transport, for various distances, usually in the order of 300 m. This degradation of radio communication is not considered significant enough to warrant expensive remedies.



1. TRANSPORT DEPOT
2. GRIFFITH UNIVERSITY
3. QEII JUBILEE SPORTS CENTRE
4. SLEEMAN SPORTS COMPLEX
5. BELMONT (ALL SHOOTING)
6. MURARRIE ARCHERY
7. GAMES WALK VENUE
8. FESTIVAL HALL (BOXING)
9. CITY TOWN HALL (WRESTLING)
10. BALD HILLS (CYCLING TIME TRIAL)
11. MARATHON ROUTE
12. MOOROOKA BOWLS
13. INTERNATIONAL AIRPORT
14. CYCLING ROAD RACE

Fig. 1 — Map of Brisbane

3. The remaining significant ridge rises abruptly from Old Cleveland Road (30 m) to a peak of 90 m within 0.5 km then extends SE for 4 km through peaks of 109 m, 107 m, 170 m, 171 m (Mt. Petrie), 131 m and 165 m falling within 0.5 km to the Mt. Gravatt-Capalaba Road (30 m). The complex in which aquatics, cycling, badminton and weightlifting occur, together with their immediate neighbour shooting at Belmont, are all located on the eastern foothills of Mt. Petrie and are screened from the village, QE II and bowls by this second barrier. The individual cycling road race venue (14, Fig. 1) is around and across this outcrop.

Design Criteria

The following general considerations were noted in completing the network design:

- Simplex operation was to be employed with known and proven techniques and equipment.
- Network reliability to be paramount.
- A need for total venue coverage for:
  - administration;
  - transport;
  - engineering;
  - electronic media and Festival '82.
- Intra-venue coverage needed for:
  - venue and sports control;
  - intra-venue transport control;
  - villages.

It was ultimately agreed, by all concerned, that 13 channels in the UHF band, between 400 and 500 MHz, would be needed and, as can be seen from the profile diagrams **(Fig. 2)**, it has been possible, to exploit the terrain to share some radio channels. This enables interchange of radio equipment between venues on a demand basis. Knowledge of program schedules allows pre-planning of this interchange.

Where venues are not isolated from their neighbours as in Chandler, Belmont and Murarrie the separation is by channel allocation. As all hand-held units are multi-channelled, by grouping various channels it is possible to interchange units between administration and sport, within the same venue, and between venues, over the entire pre-games and games period.

In cycling road races, the marathon and walk, radios will be obtained from existing stocks at various venues and switched to appropriate channels. In all of the above events, radio is used in two roles;

- to provide mobile control of the conduct of the event; and
- to relay results (both progressive and final) to the Central Communications Room in the Foundation HQ where they will be entered in to the Results Computer.

Technical Calculations

Each network path has been surveyed and antenna heights calculated. Some of the steps involved in the calculations are as follows:

- Calculate Geometric mean antenna height
- Calculate Smooth Earth Loss from **Fig. 3.**
- Determine Shadow Loss from **Fig. 4.**
- Add Shadow Loss to Smooth Earth Loss.
- When two sharply defined features are in the path each is treated separately as if the other did not exist; take the square root of the product of the squares of the individual losses, as the net loss.

For example — The village network antenna is at the Mt. Gravatt College of Advanced Education. The effective antenna height is 100m. The antenna at Belmont (hand-held units) maximum effective height is 40m.

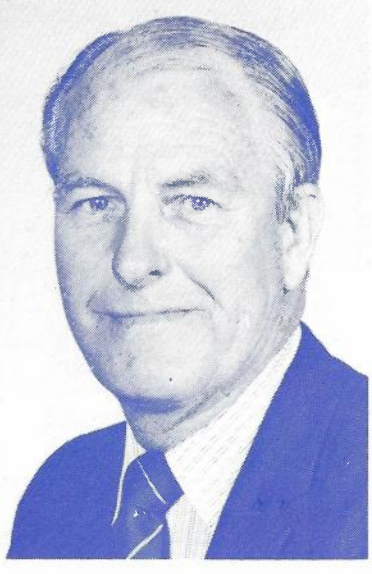
- mean antenna height = 63.25 m.
- from Fig. 3, Smooth Earth Loss = 101 dB.
- from Fig. 4, Shadow Loss = 28 dB.
- Net Loss $>$ 100 dB.

Therefore no effective direct transmission should take place along this path.

Bill Allinson served in the Royal Australian Navy from 1938 to 1950 as a Wireless Telegraphist, being involved in most war theatres with ship and shore radio establishments.

He joined the Department of Civil Aviation in 1950 and later transferred from radio maintenance to the Technicians Training School, as a lecturer. From 1955 to 1957 he was stationed in Lebanon as a Radio Adviser for the United Nations International Civil Aviation organisation.

Prior to his retirement in 1979 he was Senior Technical Officer in charge of the Brisbane Airport RADAR Maintenance in the Department of Transport. Since December 1980, Bill has worked as a volunteer for the 12th Commonwealth Games Foundation Communications Division, specialising in radio communication.



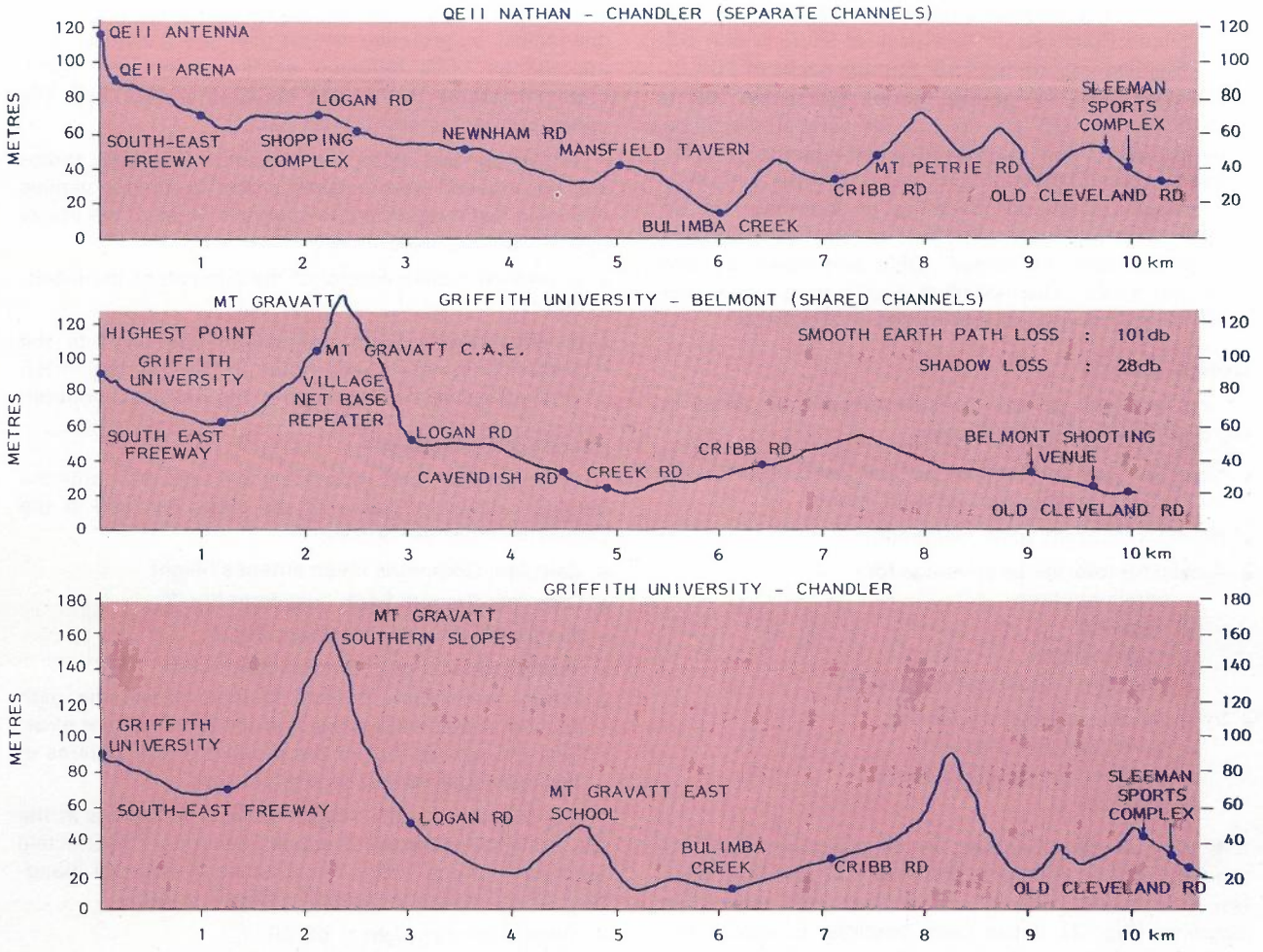


Fig. 2 — Path Profiles

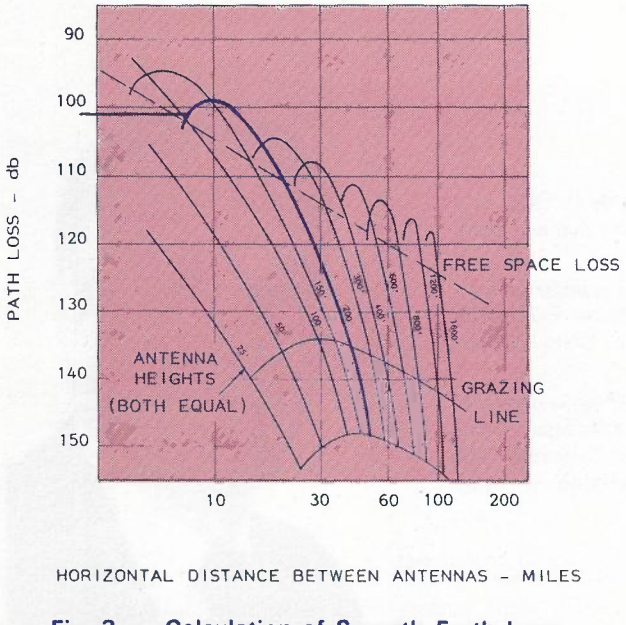


Fig. 3 — Calculation of Smooth Earth Loss

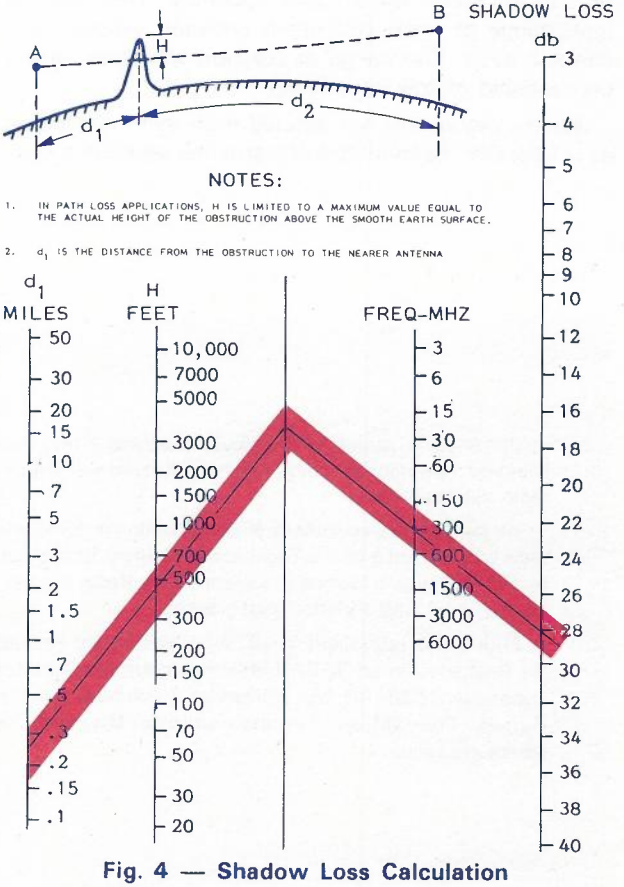


Fig. 4 — Shadow Loss Calculation

NETWORK SECURITY

Experience at the trial events confirmed that it is necessary that a properly authenticated procedure is used particularly in the results transmissions and that all users and operators of the radio system must understand and conform to the Foundation's rules on procedures and responsibilities. It has been found absolutely vital that circuit discipline be observed without exception. It would be tragic to have an outage at a critical phase caused by an operator error. Training and briefing is therefore included in the planning of the radio system.

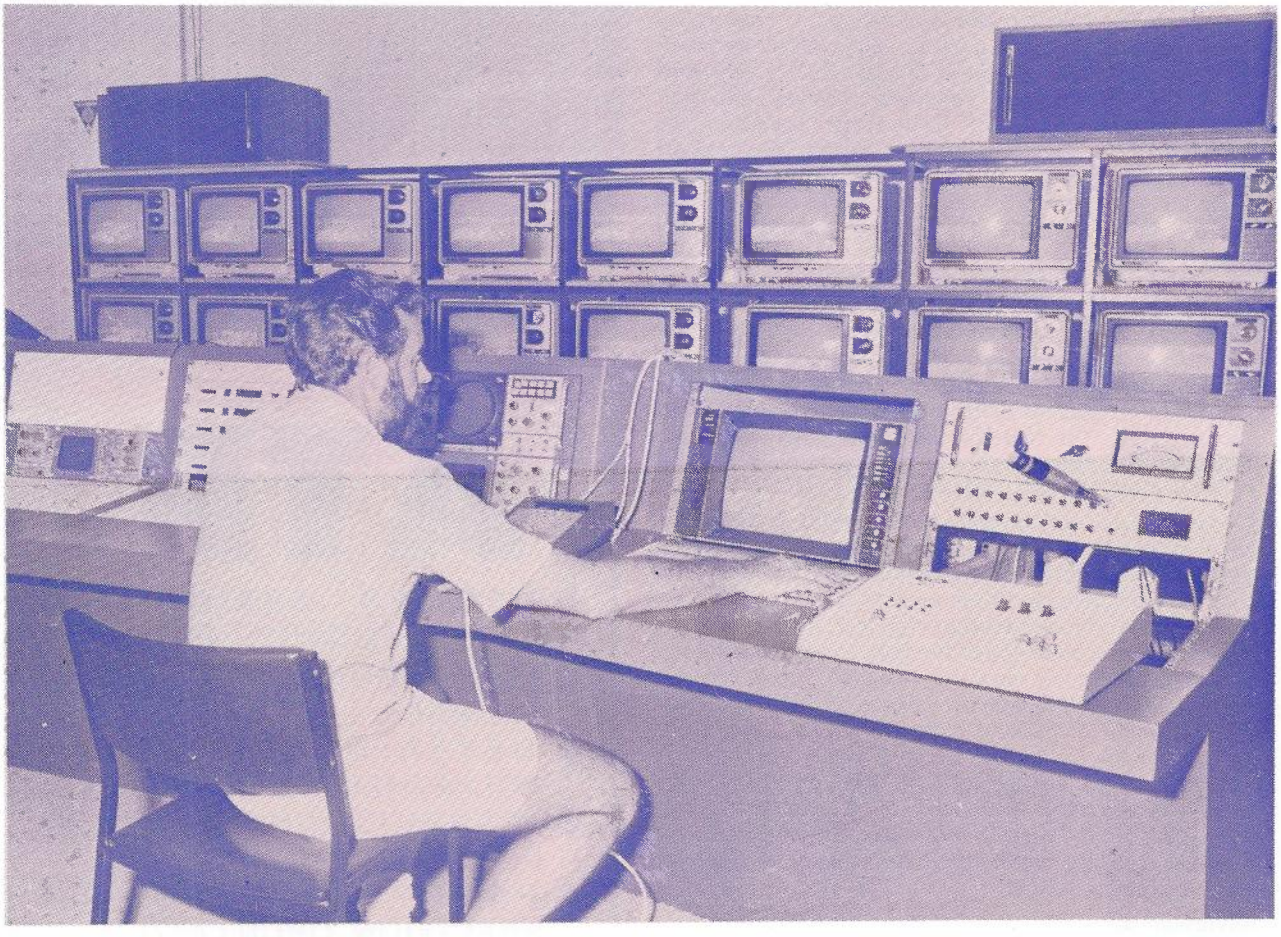
City-wide networks are controlled from the Foundation HQ Central Communications Room. Remote control is via landlines provided by Telecom, to the base repeater station located in the city centre (antenna height is about 100 m). The network operator in the Central Communications Room has complete control of that network at all times.

PAGING

Voice Paging by radio is also provided for about 500 games personnel and visiting officials, this network is being shared with a commercial venture. As it stands the network cannot meet the requirements of the Foundation for coverage within all venues. Reference to the section on terrain partially explains this deficiency. Another factor is the relative insensitivity of receivers for voice paging reception. To overcome the problem, one additional transmitter, connected by landline to the master unit has been installed at Garden City to provide sequential paging and adequate coverage.

CONCLUSION

The XII Commonwealth Games Foundation radio networks, correctly used in conjunction with all other communication avenues, will ensure the efficient exchange of information and instruction essential to the success of the Games at Brisbane.

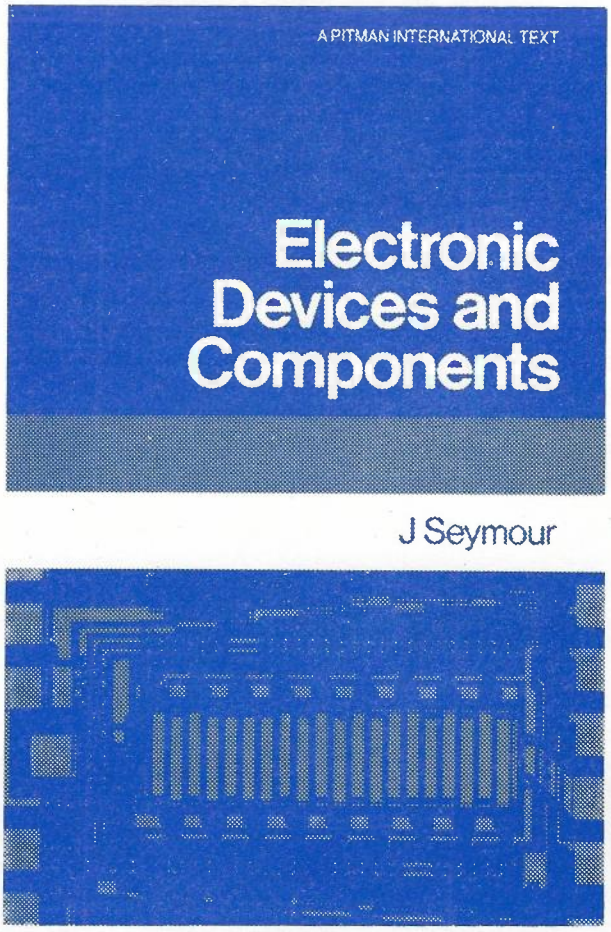


Television monitors in the Telecom switching room at the Broadcast Control Centre being tested. From here television coverage of the Commonwealth Games will be directed to more than 30 countries and an estimated 500 million viewers.

BOOK REVIEW

ELECTRONIC DEVICES AND COMPONENTS

J. Seymour; Pitman, 1981. Price $29.50



This book is an introduction to the physical principles that govern the operation of present-day electronic devices and components. It is the result of an extensive revision of the 1972 text "Physical Electronics". The material has been chosen to provide a complete course in electronic engineering or applied science, and is based upon a lecture series presented at the Thames Polytechnic, London. A set of problems, with answers, appears at the end of each chapter, so that the book can be used as a self-study program by practising engineers and physicists.

The first two chapters contain essential physical theory and establish the behaviour of electrons in atoms (Ch. 1) and crystals (Ch. 2). This leads to an examination of the contact boundary between two materials in Chapter 3, with the properties of the diffused p-n junction being highlighted.

The remainder of the book is oriented towards devices and components, and the same general approach is followed throughout. A simple physical theory is developed to describe the operation of the device. Then an equivalent circuit is derived and the limitations of the device explored.

Bipolar junction transistors are treated in Chapter 4, where the Ebers-Moll model and hybrid — equivalent circuit are used to analyse performance. Opto-electronic devices provide a diversion in Chapter 5 — a very wide variety of sources and detectors receives attention. Seven different types of field effect transistor are reviewed (Ch. 6) and charge transfer devices are introduced. Integrated circuit fabrication techniques are considered in Chapter 7, which also offers a comparison of the common logic families and operational amplifier designs. A summary of electron emission phenomena (Ch. 8) prepares the way for a discussion of photo-multipliers, cathode ray tubes and thyratrons. Important thermionic devices such as the klystron, magnetron and travelling wave tube are covered in Chapter 9, but much greater emphasis is placed upon solid state microwave components including tunnel, Gunn, varactor, impatt and trapatt diodes. The two concluding chapters look at the properties and component applications of dielectric (Ch. 10) and magnetic (Ch. 11) materials.

The text is well-written, the notation is clear and mathematical arguments are supported by a generous number of diagrams. Undoubtedly this is a valuable book for the undergraduate. When assessing the text from the point of view of the practising engineer, the fine balance between overall coverage of the field and sufficient detail to individual topics must be weighed. Generally, the author achieves an adequate balance. In chapters where the discussion of particular devices tends towards the superficial, the reference list has been expanded to compensate. At an approximate cost of $15 for the paperback version, this book is a valuable library acquisition and a useful reference for engineers and scientists seeking basic information about present-day semi-conductor devices.

Reviewed by:
Dr P. V. H. Sabine
Telecom Technology Branch
Research Department
Telecom Australia.

The Results Network

P. ROBERTSON, B.E.E, J. HEALY

A computerised results network is being provided for the XII Commonwealth Games. This article covers the function and operation of the network, the development and brief description of the computer system.

INTRODUCTION

The 1978 Commonwealth Games at Edmonton used, for the first time, a computerised system for the collection, collation and distribution of results to interested parties. The development of this system was undertaken by Digital Equipment of Canada, and under the agreement, the software would be available to the Commonwealth Games Foundation for use at future games.

The XII Commonwealth Games in Brisbane will use this Edmonton system, however, extensive modifications have been made to the original software, for several reasons, including the addition of archery as a new sport, rule changes in existing sports, different interfaces for scoreboards and the Host Broadcaster, as well as general improvements to the system.

OVERVIEW

The results system provides:

Results
- As they happen
- Final results
- Event summaries

Start-Lists
- Lists of athletes starting in each event

Schedules
- Time and date for events

Athletes
- Biographical information
- Personal histories
- Athletic histories
- Games results and medals

Countries
- General information
- Athletes participating
- Events entered
- Medals obtained

Medals
- Athlete
- Country
- Sport

This information is used by a wide range of people including:

Games personnel and officials.
Athletes, coaches and managers.
Host Broadcaster (ABC Television).
Written press and wire services (AAP).
Various games newspapers.
Daily venue programmes.
Scoreboard displays.
The general public.

There are two distinct functions of the results network:

1. Entry — entry of information into the system.
2. Enquiry — obtaining information from the system.

Entry of information falls into two classes, entry prior to the commencement of the games and entry during the games. Information that can be input prior to the games is as follows:-

Athlete details. (approx. 2000 athletes)
Country general information. (56 countries)
Venue information.
Schedule of events.
Sport information. (approx. 200 events)

Approximately 500 hours of processing time has been required to input this data.

Information that must be input during the games includes:

- Results
- Start lists
- Medals received

There will be results network terminals at each of the venues and all of the sports will be served by the network. Some terminals will be primarily for input, while others will be limited to enquiry, as shown in **Fig. 1**. For example, a terminal will be located close to the high jump so that results for this event may be entered during the progress of the event. When the high jump is completed, this terminal would be moved to another location to enter results for another field event.

At no time would a terminal be required to handle more than one function at a time. This simplifies the operation of the system, although operators will be required to operate in different functional areas at various times.

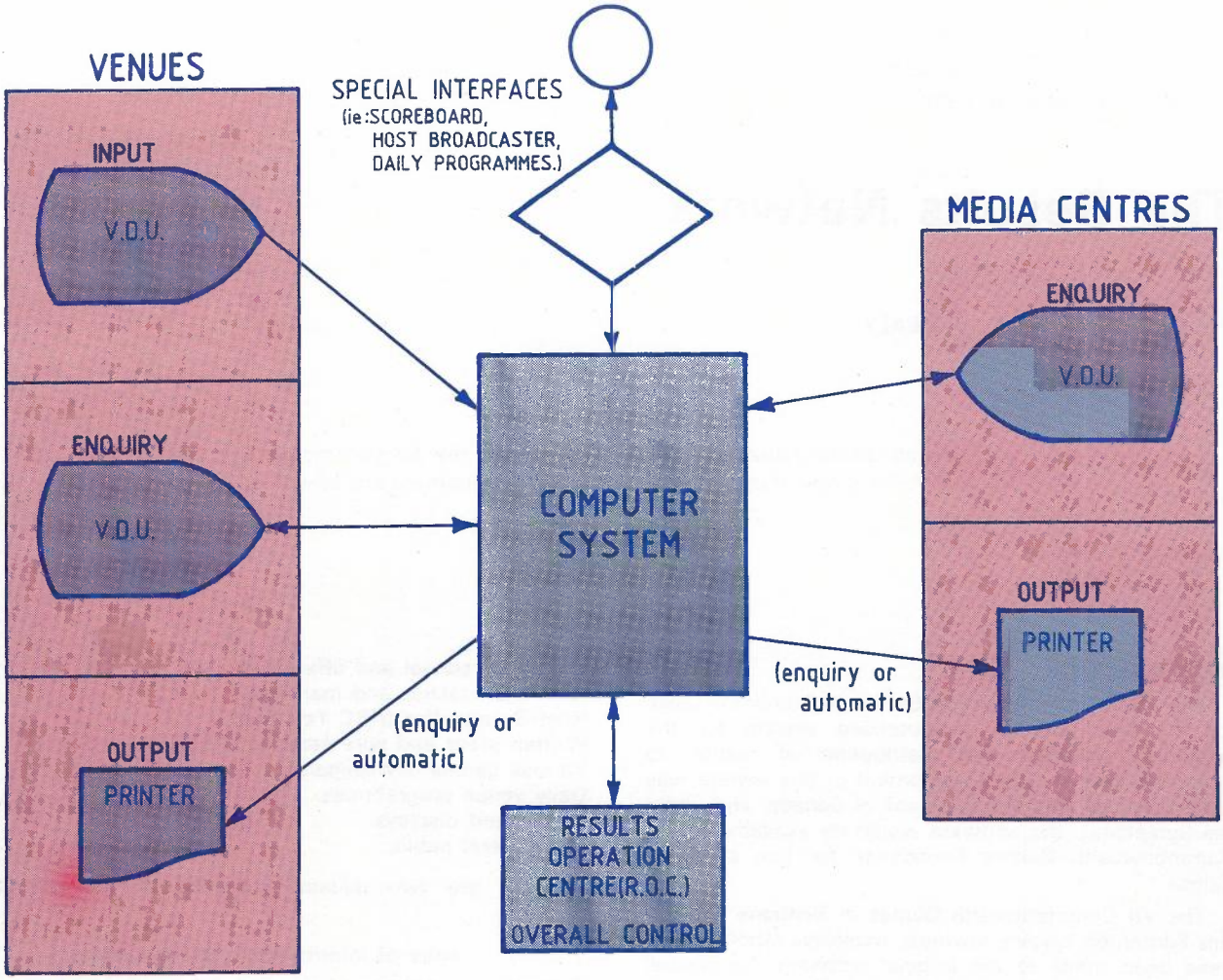


Fig. 1 — System Functions

OUTPUTS

Printing of games information is achieved either automatically, for start lists and results, or as a result of an individual enquiry on a particular topic. A special results network spooler controls the production of hardcopies. This spooler is pre-programmed so that only relevant automatic printouts are sent to each location. For example, at each venue only results and start lists for that sport are required, whereas at the main media centre all sports are needed. In the case of enquiries, the spooler distributes the hardcopies to the designated printers. Queueing of messages is possible so that none are lost during busy periods or printer outages.

The Host Broadcaster also has VDU terminals operating in enquiry mode, which allow access to information stored in the system. This information is further processed by a character generator to allow presentation of the information for TV transmission. To fit their production requirements, quick response from the system is essential.

Some of the venue scoreboards are interfaced to the results network to allow results and start lists to be displayed as soon as possible.

The written media receive copies of all start lists and results immediately they become available. Copies are received on printers at the media centres and photo copies distributed.

At Griffith University (the home for athletes during the games), a printer will be installed to provide information to team managers, coaches and athletes. Also the information will be used to assist in the production of a games newspaper.

A typeset interface has been provided to present information from the results network in a suitable format for the production of the daily programmes.

RESULTS OPERATION CENTRE (ROC)

The ROC will be set up at the Queen Elizabeth II Jubilee Athletics Stadium (QE II) to allow complete supervision of the network. Some of the functions of this centre include assignment of terminal tasks, logging and correction of system errors, scheduling of operators and technical support to all venues.

To prevent loss of information entered into the system, a backup processor has been provided and backup of all data files will be carried out on a regular basis, determined by the ROC. The ROC will need to assign priorities to the tasks should the standby processor be required to take over, as this processor has less ports available.

OPERATION

Operation of the results network is simplified by using a menu driven structure **(Fig. 2)**. An operator "logs on" to the computer using a password and gains access to the results network by entering operator number and password. These two levels of gaining access to the system allow for both security and flexibility to be maintained.

The basic menu allows selection of enquiry or entry/edit mode of operation. From this starting point, information, as described in the overview, is available to the operator, and hence to all that require such information. Also, information can be entered by logically following the menu prompts which guide the operator to a "form" (an electronic form on the VDU). Extra facilities available under this menu structure, allow parameters such as terminal type and spooling details to be entered. A great deal of network flexibility is gained by having facilities such as these available from the VDU keyboard. This function would only be available to ROC staff.

SPORTS/RESULTS NETWORK INTERACTION

Athletics consist of a diversity of events in both track and field and additional special events Hepathlon and Decathlon. Field events can be described in broad categories of horizontal jumps (long jump, triple jump), vertical jumps (high jump, pole vault), and throwing events (javelin, discus, shot put, hammer). Each category requires unique software and file structure. In track events, sprints require consideration of wind factor, while long distance events require recording of intermediate elapsed times; these points once again demonstrating software differences.

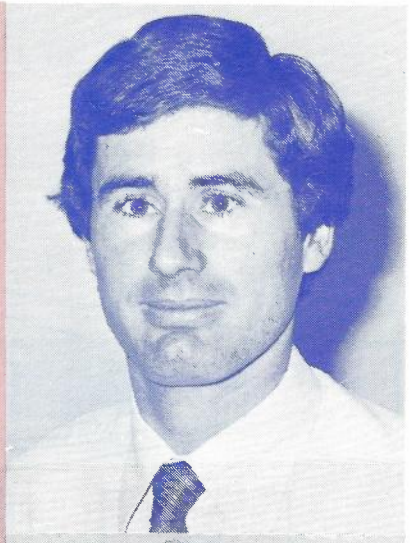
The entry of these results relies heavily on the close co-operation of the operator and the sport's officials. Operators will receive training on each of the sporting events and the sport's officials will be given details about the results network requirements. This understanding and co-operation has been enhanced during the individual sporting trials.

The software for the Decathlon is further complicated by the fact that four of its ten events are decided by timing while the remainder are decided by distance. Overall scoring is achieving by a points system.

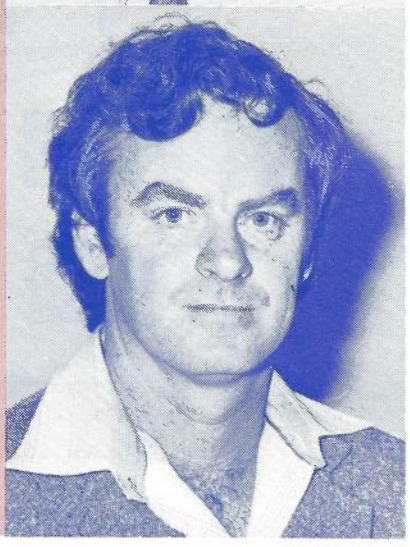
To illustrate the interaction of the results network with athletics, two events will be considered from results input through to distribution. For field events, seven terminal

Peter Robertson graduated in 1978 with a Degree in Electrical Engineering from the Darling Downs Institute of Advanced Education. He joined Telecom in December 1978 and has worked in the Customer Networks and Equipment Section ever since. Presently he is involved in Datel and the Digital Data Network.

As a volunteer for the Commonwealth Games Foundation, he has worked for two years on the implementation of the Results Network.



John Healy joined Telecom in 1963 as a Technician-in-Training. He is currently employed as a Senior Technical Officer in the Operations Support Systems Section, Engineering Department, Brisbane, and is working part time for the Commonwealth Games Foundation conducting tests on the computerised Results Network and training operating staff.



points will be positioned on the field (marked by X in **Fig. 3**). A VDU will be provided at the most suitable point for the duration of an event to allow efficient entry of results.

Fig. 4(a) shows a "form" as it could appear on the terminal covering pole vault. Entry of results is supervised by a sports official and periodically, this information would be sent to the media printer and regarded as a progress report. The Competition Director could access this information as often as he requires from his enquiry terminal, helping him to maintain control over all sporting activities.

When the event is finished, these results are automatically spooled to a printer for use by sport officials, and to a printer in the media centre for distribution to the press. **Fig. 4(b)** shows the format of a completed event; in this case, the pole vault event.

The Host Broadcaster can access any information for inclusion in the television presentation.

A terminal is provided in the scoreboard room to enable quick presentation of results and start lists for the public.

The Operation Centre is provided to enable entry or edit of start lists and correction of results.

Track events are similar except that the entry point for all events is from a terminal in the photo timing cabinet. Video monitors off this terminal are provided for the competition director and scoreboard operator.

Fig. 5 shows the results output for 100m sprint.

The discussion above concentrated, as an example, on athletics. Other sports have many interesting factors worth mentioning to demonstrate the complexity of the sports. In fact, the complexity of the sports presents greater difficulty in training operators than does the manipulative skills required to operate the terminals.

In general, all sports fall into one of three categories, round robin, elimination, or trials and within this structure are both individual and team events. In round robin each athlete competes against all others once. Elimination events results in athletes not moving to later rounds of competition, once defeated. Trials are events won by time, distance or points.

Below is a list of distinguishing points of each of the sports.

Athletics — all events are trials.

Archery — trials; all archers compete over three distances, the winner being the one with the highest final score.

Badminton — individual events are decided by elimination and team events by round robin.

Lawn Bowls — is a round robin competition.

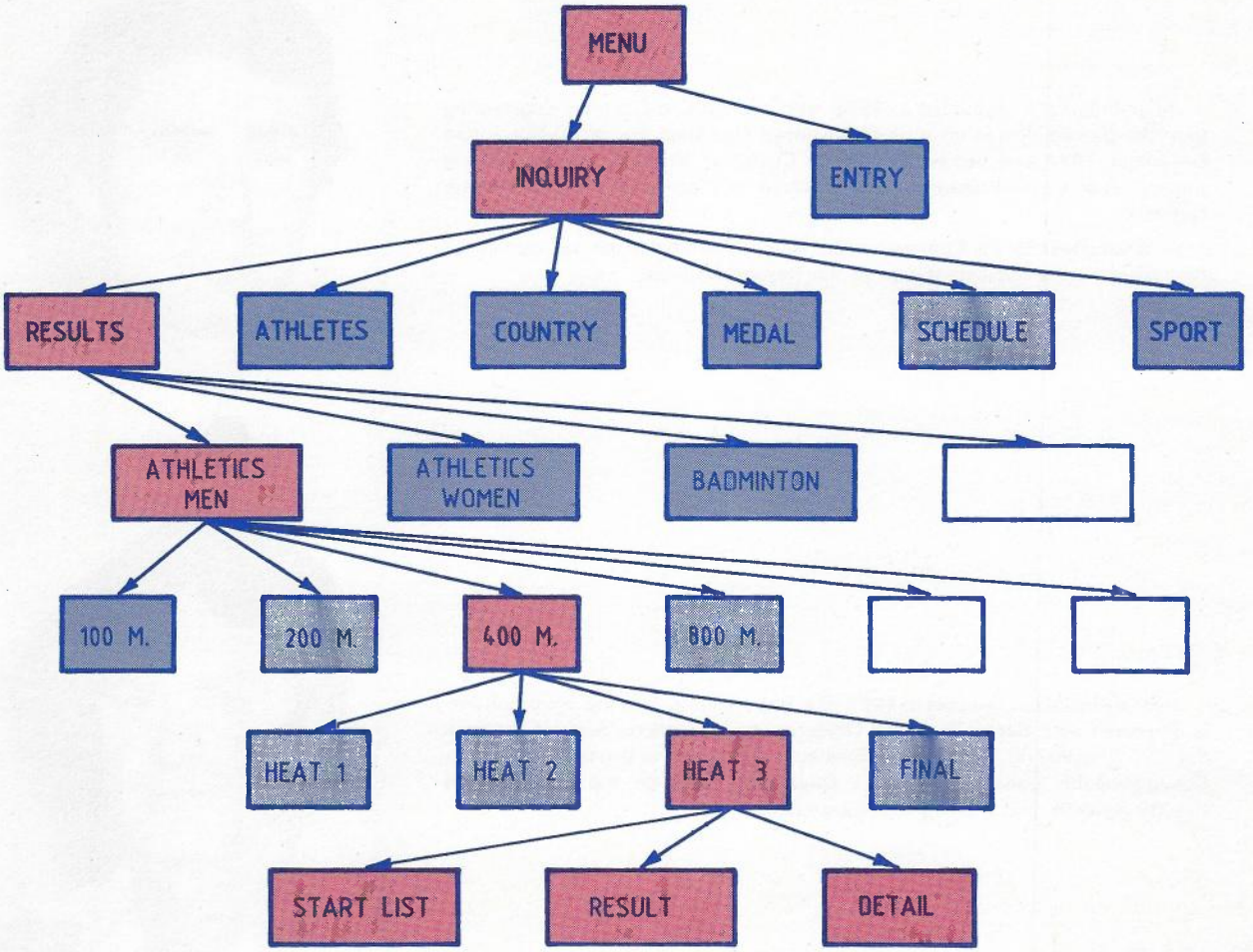


Fig. 2 — Menu Structure

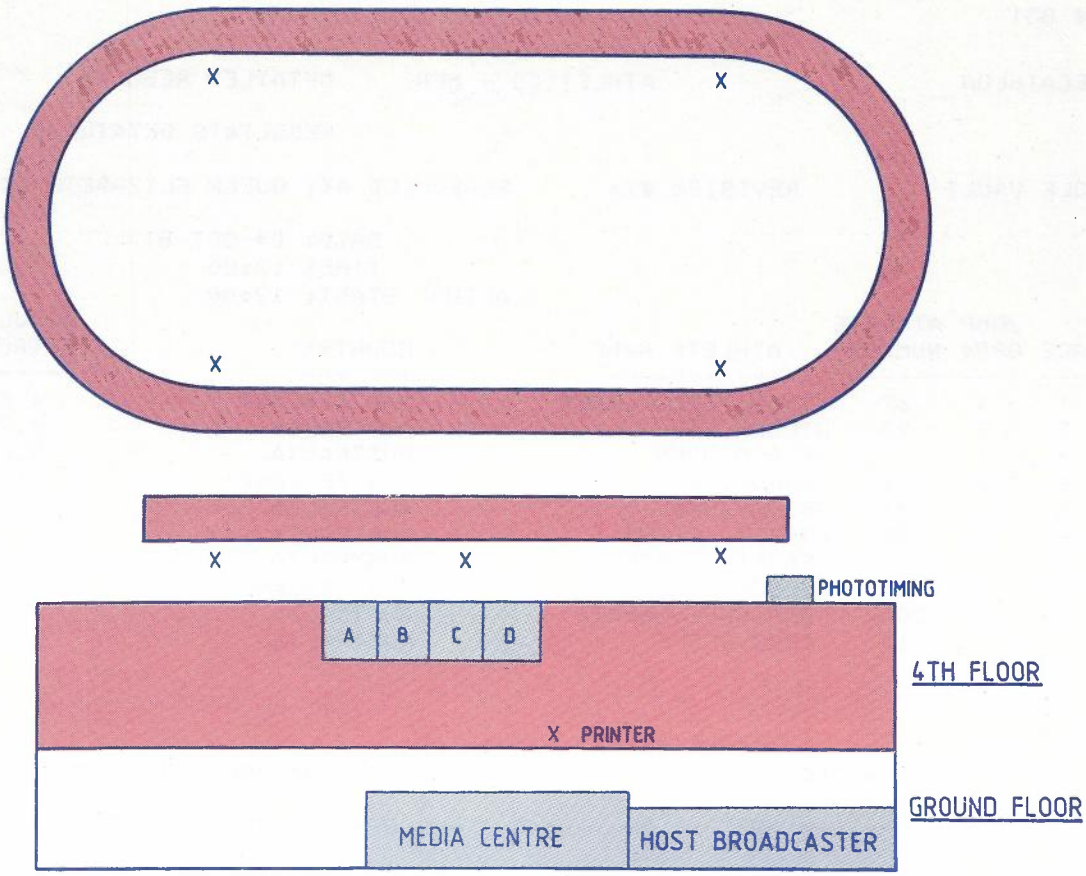


Fig. 3 — QEII Stadium Layout

Boxing — decided by elimination and the software is designed to automatically match bouts.

Cycling — is a complicated mixture of trial and elimination.

Swimming and Diving — all swimming events are time trials and diving events points trials, the points decided by judges plus a difficulty factor of the dive.

Shooting — trials; several different events incorporating a number of different weapons and decided by highest score.

Weightlifting — trials; total weight lifted in three styles of lift deciding the winner.

Wrestling — decided by elimination but different to boxing in that elimination occurs after two losses and that matchups cannot be done automatically by the system.

To go further with the description of the complexities of the sports is beyond the scope of this article.

DEVELOPMENT

The system at Edmonton used BASIC PLUS, Version 6, as the programming language. The Brisbane processor uses a later version of this language, hence extensive changes were required to run the software.

With over 300 programs, 800 files and 50 Megabytes of storage required, a massive learning phase was undertaken by the software consultants.

(HEIGHT OF THE BAR IN CM)

	ATH#	240	260	280	300	310	320	340	350	360	370	380	390	400
1	67	---	---	---	XO-	---	O--	---	O--	---	O--			
2	23	---	---	---	XXO	---	O--	XO-	O--	XO-	O--			
3	7	---	---	---	---	---	---	O--	---	XO-				
4	61	---	---	---	O--	---	---	XO-	---	O--				
5	146	---	---	---	XO-	---	O--	O--	---	XO-				
6	138	---	---	---	---	O--	---	O--	O--	XO-				
7	135	---	---	---	O--	---	---	O--	---	XXO				
8	75	---	O--	O--	XO-	XXX								
9	206	XO-	O--	O--	XXX									
10	119	---	---	---	---	XXX								

Fig. 4(a) — Input Data for Pole Vault

REPORT # 851

DECATHLON ATHLETICS - MEN DETAILED RESULTS

RESULTATS DETAILLES

POLE VAULT REVISION #16 SCHEDULED AT: QUEEN ELIZABETH II STADIUM

DATE: 04-OCT-81
TIME: 12:00
ACTUAL START: 12:00

PLACE	JUMP ORD#	ATHLETE NUMBER	ATHLETE NAME	COUNTRY	RESULTS (METRES)
1	4	67	MCNAB,PETER JAMES	NEW ZEALAND	4.00
2	2	23	WILSON,IAN	AUSTRALIA	3.90
3	1	7	DE BES,JOHN	AUSTRALIA	3.80
4	3	61	CONNON,GRANT DUNCAN	NEW ZEALAND	3.80
5	9	146	SPIVEY,MARK	AUSTRALIA	3.70
6	8	138	FOSSEY, PETER	AUSTRALIA	3.60
7	7	135	SEAGRIM,ANDREW	AUSTRALIA	3.60
8	5	75	WILSON,PAUL	NEW ZEALAND	3.00
9	10	206	NUNN,CHRISTOPHER	AUSTRALIA	2.80
	6	119	JONES,GEOFF	AUSTRALIA	

(HEIGHT OF THE BAR IN CM)

	ATH#	240	260	280	300	310	320	340	350	360	370	380	390	400	410
1	67	---	---	---	XO-	---	O--	---	O--	---	O--	XXO	O--	XXO	XXX
2	23	---	---	---	XXO	---	O--	XO-	O--	XO-	O--	XO-	XO-	XX-	---
3	7	---	---	---	---	---	---	O--	---	XO-	---	O--	XXX	---	---
4	61	---	---	---	O--	---	---	XO-	---	O--	---	XO-	XXX	---	---
5	146	---	---	---	XO-	---	O--	O--	---	XO-	XO-	XXX	---	---	---
6	138	---	---	---	---	O--	---	O--	O--	XO-	XXX	---	---	---	---
7	135	---	---	---	O--	---	---	O--	---	XXO	XXX	---	---	---	---
8	75	---	O--	O--	XO-	XXX	---	---	---	---	---	---	---	---	---
9	206	XO-	O--	O--	XXX	---	---	---	---	---	---	---	---	---	---
10	119	---	---	---	---	XXX	---	---	---	---	---	---	---	---	---

TEMPERATURE : 25 C
HUMIDITY : 65%
WIND : 0 KM/HR

Fig. 4(b) — Detailed Results of Pole Vault

The introduction of 'archery', a new sport to the 1982 Commonwealth Games, has required considerable software manhours to develop. Gymnastics has been deleted from the Brisbane Games, and some effort was required to remove all references to this sport.

Rule changes in the sports, such as differences in the method of breaking ties in the high jump and, addition of events such as teams events in shooting, has also involved considerable software effort.

As a result of the sporting trials, a number of deficiencies have been identified, and rectified. Interaction with sports officials has been invaluable in developing the system as an effective tool for all users.

Another area of major development has been in the

100M ATHLETICS - WOMEN RESULTS

FINAL REVISION #02 SCHEDULED AT: QUEEN ELIZABETH II STADIUM

DATE: 03-OCT-81
WIND VECTOR: +4.43 M/SEC TIME: 14:20
ACTUAL START: 14:20

PLACE	LANE	ATHLETE NUMBER	ATHLETE NAME	COUNTRY	RESULTS
1	9	76	BROWN,WENDY	NEW ZEALAND	11.63
2	7	15	HOLDEN,DIANE	AUSTRALIA	11.70
3	3	81	ROBERTSON,KIM	NEW ZEALAND	11.76
3	5	107	LEE,KATHY	AUSTRALIA	11.76
5	1	194	LOW,JENNY	AUSTRALIA	12.00
6	8	210	RICHTERS,LEANNE	AUSTRALIA	12.11
7	4	221	WEBB,BERNADETTE	AUSTRALIA	12.13
8	2	203	MCQUEEN,NARELLE LESLEY	AUSTRALIA	12.17
9	6	79	HENDREN,PAM	NEW ZEALAND	12.36

TEMPERATURE : 25 C
HUMIDITY : 65%
WIND : 0 KM/HR

WORLD RECORD (WR): 9.10
COMMONWEALTH RECORD (CR): 9.10
COMMONWEALTH GAMES RECORD (GR): 9.10

Fig. 5 — 100 Metre Sprint — Final Results

various interfaces, namely the Host Broadcaster, scoreboards and daily programmes. While these interfaces existed in Canada, the equipment used in Brisbane is different, requiring complete software rewrites.

Efficiency of the system is being examined with a view to improvement.

NETWORK

The network structure concept is simple with 70 terminals positions, each with its own 1200bps, full duplex, data line to the computer centre and each with a computer port. One 9600bps data link will be provided for the ROC as its functions are of critical importance. Consideration was given to multiplexing the network, but the wide spread of terminals and the short duration of the games resulted in the network shown in **Fig. 6**, being the most efficient on a cost, reliability and flexibility basis.

OPERATORS

The work involved in using the system will be carried out mainly by about 120 volunteer operators, a number of whom have gained experience at trials for each sport. The network has been tested and modified as a result of these sport trials, and training information documented. All operators received extensive training, prior to the games.

COMPUTER SYSTEM

Hardware MAIN PROCESSOR
PDP 11/70
Core memory . . 1.5Mbyte
64 Ports

STANDBY PROCESSOR
PDP 11/70
Core memory . . 0.75Mbyte
48 Ports

DISK DRIVES
2 x 68Mbyte

Software OPERATING SYSTEM
RSTS/E

PROGRAMMING LANGUAGE
BASIC PLUS Version 7.

FILE STRUCTURE DATABASE (developed for the results network)

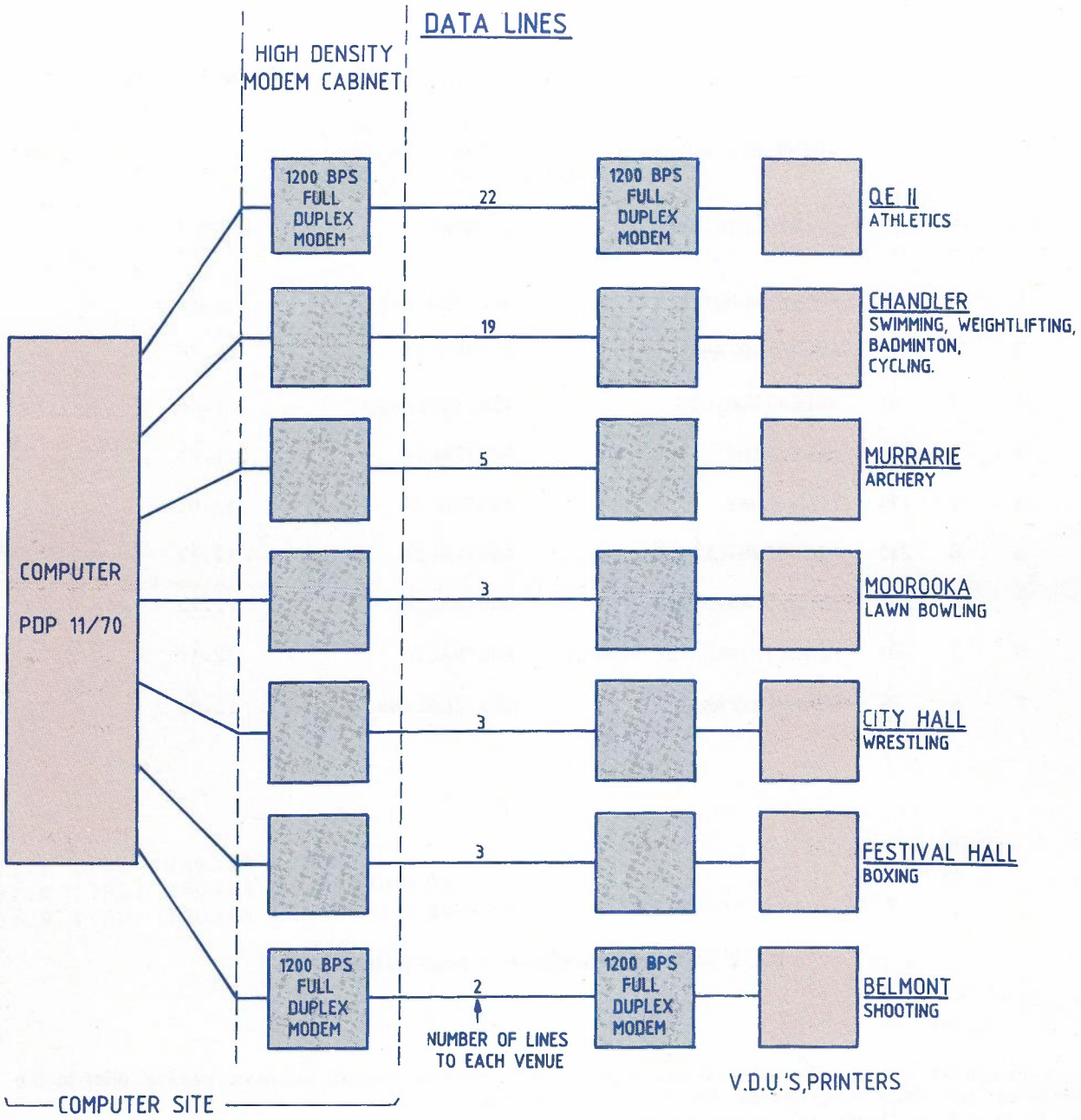


Fig. 6 — Network

CONCLUSION

Initial work centred on the technical operation of the computer system, but experience soon highlighted the importance of knowledge of the sports and official procedures. Having the system for 18 months prior to the games, and the opportunity to trial the system for all sports ensured the success of the results network for the XII Commonwealth Games in Brisbane.

TELECOMMUNICATIONS at the
XII Commonwealth Games
Brisbane 1982.

Electronic Scoreboards

T. F. STEER Dip. Eng.

At most venues, scoreboards and the public address system are the usual methods for keeping the public informed on progress of the games. This paper describes the electronic scoreboard systems employed at the games.

INTRODUCTION

Electronic scoreboards are used in the Aquatics Centre, QE II Stadium, the Velodrome, the Sports Hall and City Hall venues. There is also an Attempts Board at the Weightlifting Theatre. From a technical point of view the Attempts Board differs very little from a scoreboard; the difference is that it displays the weight which a lifter is trying to lift and not that which he actually succeeds in lifting. There is also a large display board, known as the NAP board (Nippon Advanced Products) which has been temporarily installed at QE II. **(Fig. 1).** The scoreboards display (basically) only alpha-numeric information while the NAP board displays both alpha-numeric and graphic information.

All of the scoreboards operate on the same fundamental principles. Their component parts are:

- a micro-processor which controls all of the subsidiary devices. The operating systems, editor and other system software are loaded into this processor from a floppy disk. This processor shall be termed the System Processor.
- VDU which serves as the operator/machine interface. The VDU is used to control the scoreboard during operation and for the preparation of pre-programmed displays, etc;
- disk drives;
- a sign. That is, the machine/spectator interface. As the signs are designed for the display of alpha-numeric information, their capacity to handle graphics is strictly limited; (the QE II, Velodrome and Aquatics scoreboards also use a separate processor to control the sign. Where it is necessary to refer to this processor, it shall be termed the Sign Processor).

The aquatics scoreboard interfaces with the Omega timing and scoring (Diving) equipment. The QE II scoreboard interfaces with the Results Network.

Except for the QE II and Velodrome scoreboards separate contractors were chosen to supply the scoreboard equipment. This precludes a detailed examination of all of the scoreboards and, therefore this paper will concentrate on the scoreboards at QE II.

SCOREBOARDS

At any given venue, the scoreboard and the public address system are the only available methods of keeping the spectators informed as to just what is going on. A person, experienced in a particular sport may understand the general proceedings at the games, however where there may be five events taking place at one time it could become confusing to most spectators. The public address announcements and the scoreboard displays must, therefore, be well co-ordinated.

So that the scoreboards may be properly controlled, each of the venues where an electronic scoreboard is installed has a Scoreboard Controller. The duties of the Controller are to:

- ensure that the rules of the particular sport regarding public information are obeyed at all times;
- ensure that all results and draw lists transmitted to the sign are both timely and accurate;
- ensure that the scoreboard displays are co-ordinated with the public address announcements;
- be responsible for all aspects of the scoreboard operation.

The Scoreboard Controller will, during the Games, report directly to the Competition Director who has overall responsibility for all matters related to the conduct of the sporting events.

The QE II Scoreboards

In-field Scoreboards and Count-down Clocks

As well as the previously mentioned main scoreboard and the NAP board, QE II has four In-field scoreboards and four digital countdown clocks.

The In-field scoreboards are used to indicate the results of field events as they are occuring. As there can be four of these events taking place at once and each requires the measurement of a distance, no single scoreboard could cope with the amount of information required. Physically, the scoreboard could cope with it, but the display time would be very short and the spectators would become more than a little confused.

Fig. 1 — QEII Scoreboard

The use of the In-field scoreboards allows spectators to closely follow any event in which they may have a particular interest, as it is taking place. The main scoreboard is used to display the results of all field events when they are completed. A spectator may thus obtain an overview of all of the athletics events and still attend closely to any chosen event.

The digital countdown clocks are used to indicate to the competitor the amount of time remaining before an attempt must be made in an event. These clocks are mainly for the information of officials and competitors. Generally speaking, about three minutes is allowed between the time a competitor is called up and the time when an attempt must be made.

The Main Scoreboard

The QE II scoreboard has the following component parts —

Sign: Eleven lines each of thirty characters. Each character is a Ferranti Packard dot matrix module measuring 457 mm in height with a 7 x 5 matrix.

Sign Controller: A Ferranti Packard FP 541 controller mounted in the sign structure. It accepts information from the Sphere computer and displays it on the sign.

Time of Day Clock: This clock is a self-contained unit mounted in the sign structure. The time is displayed on the four modules on the top, left-hand corner of the sign. The time is set from the system VDU.

Elapsed Time Display: This clock occupies the seven modules at the top, right-hand corner of the sign. The unit interfaces with the Omega timing equipment and is not accessible to the scoreboard operator. It is only used for track events. This clock is started by the same transducer which starts the photo-timing equipment. However, it is stopped by the breaking of a light beam 300 mm. beyond the finish line. The time for a track event is measured on the foremost part of the athlete's torso — not on the first part to cross the finish line. The light beam may be broken by an athlete's hand or arm and if the beam was exactly co-incident with the finish line, it may indicate a new record time when this was not the case — note the position of the hand of the third athlete in **Fig. 2.**

This elapsed time clock is the first time indicator available to the public and it is preferable that they do not get excited about non-existent records.

Line Isolators: The data line between the system controller and the sign controller is fitted with line isolation units. These units were installed after a Brisbane afternoon thunderstorm converted a couple of line cards to scrap plastic.

System Processor: This is a Sphere computer which controls both the scoreboard and the clock and provides for the interface with the Results Network. It also accepts operator input from the VDU and provides hard-copy output to the printer. The processor used is a Motorola

6809 CPU with 64K of fixed memory and access to 750K of rotating memory from the dual min-floppy disk drives. Seven of the 16 available I/O ports are in use.

Other devices: These are — Disk drives, system VDU, printer.

The system has the capacity to store up to eighty pre-programmed formats on each of five files on a disk, together with the Results Network interface software. This permits the Scoreboard Controller to call up all of the start lists for a day's events from the Results Network and load them on to a disk. The interface software formats the start lists in to the scoreboard's format as they are transferred. A powerful editor in the scoreboard software permits the modification of any start list, which is altered during the day, while retaining the correct format. If the Scoreboard Controller judges that the alterations have been too extensive to use the editor, he may recall any given start list/s from the Results Network.

The scoreboard staff are thus free to concentrate on the events as they are occuring.

The results of all events are input to the Results Network as soon as they are certified correct by the appropriate sports official. They are then available via the interface for display on the scoreboard. This system works well for field events which are official for each attempt as it is made. Track results are not official until the time for each competitor is certified.

Thus the times for the first three competitors may be decided and certified minutes before the times for the last entrant are final.

Scoreboard results must be timely and accurate, however during the mini-games, the track events were accurate but, certainly not timely. The problem was analysed during the athletics trials in March, 1982.

A results input terminal is located in the timing cabin and results are entered in to it as soon as they are certified; but they are not transmitted until all of the results are certified. Thus the information required for the scoreboard is delayed, and unavailable to the Scoreboard Controller (he has up to four field events producing results at the same time).

A video monitor was slaved off the VDU screen to provide the results in the scoreboard control room. The results are thus available to the Scoreboard Controller as soon as they are entered on to the terminal in the timing cabin. He may choose to enter them manually into the scoreboard as they appear or to wait and call for them across the interface. As he sees exactly what is occuring on the timing cabin terminal, he is also in a good position to judge the likely delay before certification of all of the results is completed.

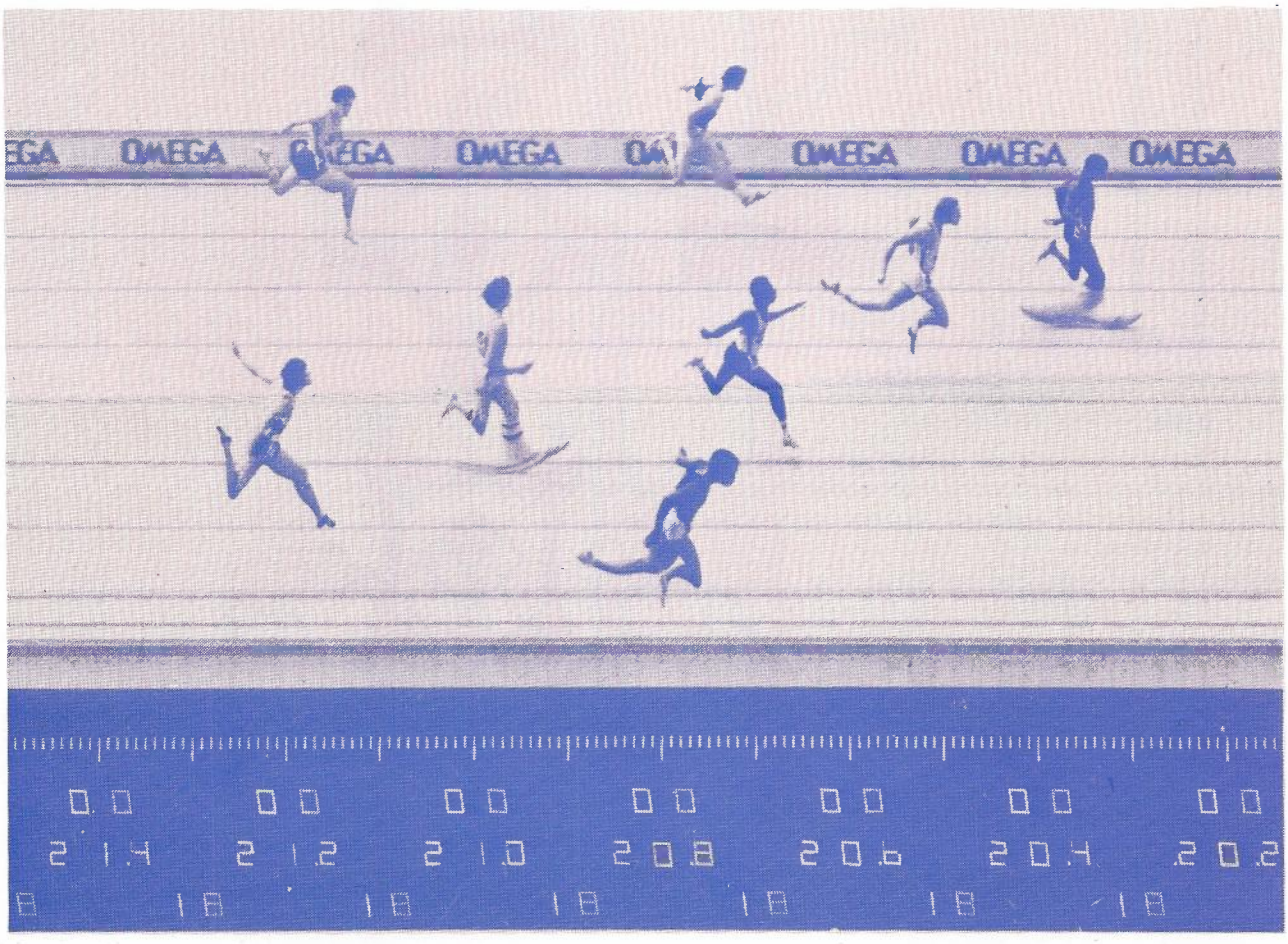


Fig. 2 — Omega Photo-timing

SIGN ELEMENTS

The main QE II scoreboard, in common with all except the Aquatics board, uses bistable magnetic devices as the elements of its matrix display. The Aquatics board uses incandescent lamps as the display elements because of the likelihood of corrosion affecting the performance of magnetic elements in the pool environment.

One side of the element is a matt black colour while the other is a bright fluorescent colour. The board's background is also matt black. The elements are "flipped" from one stable position to the other by reversal of the applied magnetic field. Remanent magnetism holds them in this position until the field is once again reversed.

In this way the energy demands of the scoreboard are kept to a minimum as power is only consumed while the element position is being reversed.

The elements are exposed to the weather and if the board is un-used for a few days, they tend to stick in the position they were last left in. The operators are instructed to run a test program when the system is first turned on. The test programs flip every element on the sign continuously from one state to the other which frees the elements. This program is run in the background of

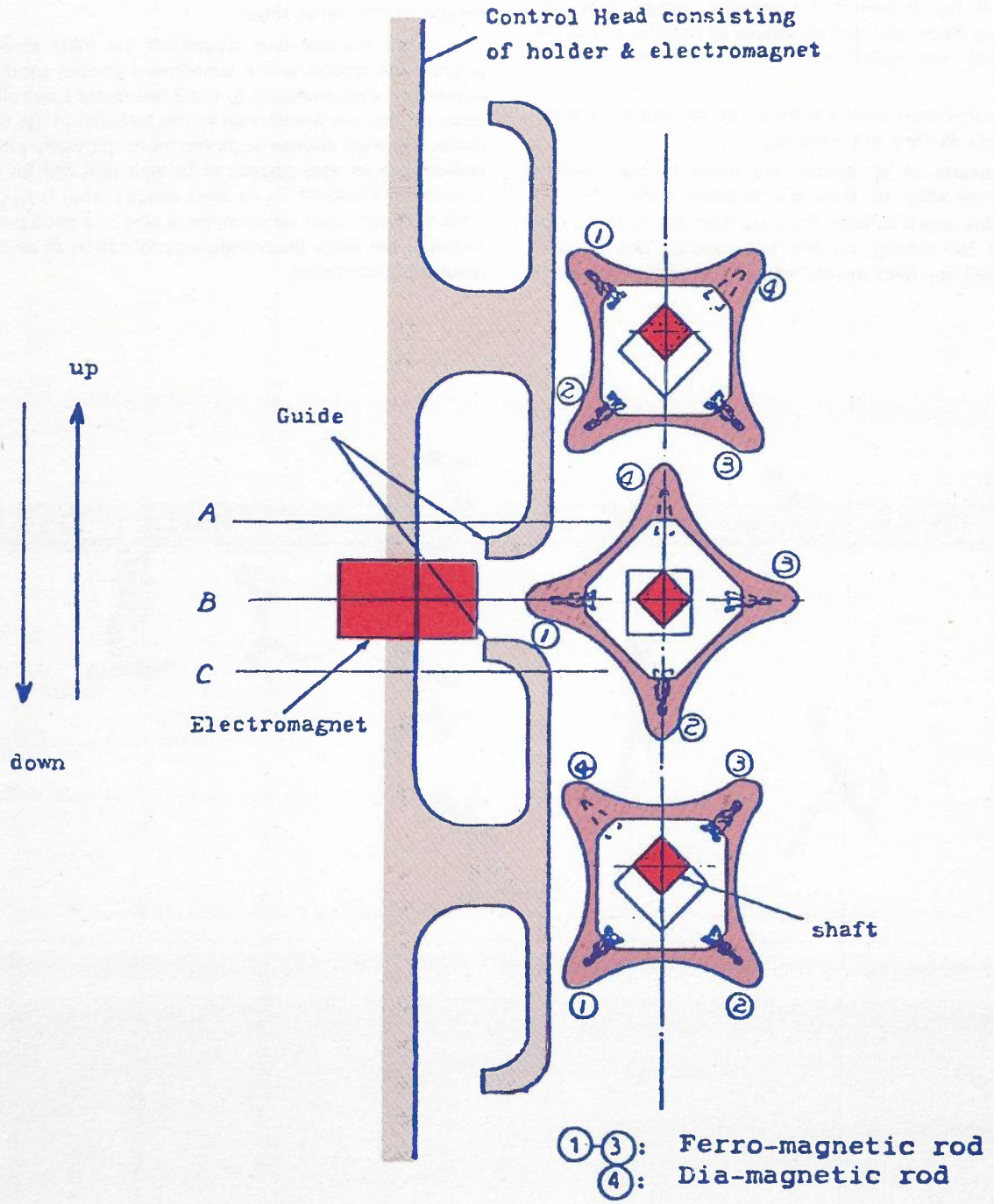


Fig. 3 — Positioning of Display Elements — NAP Board

the system processor so that the operator may simultaneously use the other system facilities.

THE NAP BOARD:

The NAP board is a display board which can provide graphic and alpha-numeric displays. It has been temporarily installed at the QE II stadium and is the first of its kind to be installed outside of Japan. After the games it will be re-located to its final position on one of the re-developed buildings in the Queen St. mall (Brisbane).

The board has a sign which measures 15 m. x 8 m. which is mounted above the temporary seating at the southern end of the arena. Control equipment for the board is installed in the scoreboard control room together with the control equipment for the main scoreboard.

The basic elements of the sign are four sided plastic prisms with each face being a different colour. These blocks are assembled onto a square horizontal shaft which fits loosely into the larger square shaft hole of the block. In the corner of each of the blocks there is a metallic rod; three of these rods are ferro-magnetic and one of them is dia-magnetic. These rods are used to detect the orientation of the rod on the shaft; **(Fig. 3)**.

The operation of the sign is controlled in the following sequence:

- The sensing elements are positioned on the first row which may be either at the top or the bottom of the sign. The sensing elements are mounted on a horizontal, movable arm known as the magnetic head alley.
- The square drive shaft is rotated by a motor.
- The electro-magnets in the head alley are pulsed with current as the shaft rotates.
- If the ferro-magnetic rod of an element is passing the electro-magnet, it is held in its current position as the loose fitting shaft may rotate without rotating the element. If the dia-magnetic rod is passing the electro-magnet, the element rotates with the shaft. Thus all of the elements in the row are brought to the same position on the shaft.
- The shaft continues to rotate; each of the electro-magnets is fed with the appropriate number of pulses to position each of the elements with the face of the new colour facing outwards.
- The head alley is moved into position on the next row and the procedure is repeated until the entire sign has been re-set.

A "wipe" of the sign takes about thirty-five seconds for completion. Each of the disks for the NAP board contains the data for twenty complete displays on the board. As the sign only consumes power while the sign is being "wiped", its energy demands are very modest. As thousands of plastic blocks flopping loosely about on the square drive shaft generate quite a bit of noise, one of the jobs for the Scoreboard Controller is to ensure that the NAP board does not start to "wipe" just as an athlete is about to make an attempt for a gold medal.

It is possible also to divide the sign into two separate displays. The sign is divided vertically and each half of the board may then be used as a separately addressable sign. The board is also capable of handling alpha-numeric characters input from the VDU keyboard **(Fig. 4)**.

Fig. 4 — NAP Board Sign Divided Into Two Displays

There are two methods of preparing graphic displays for the board —

(a) A fairly straight-forward set of graphic characters is addressable from the keyboard. These characters are useful for the preparation of displays which consist of geometric designs.

(b) A digitiser is available for the preparation of more complex graphic displays — e.g. cartoons or the reproduction of photographic material.

The NAP board is under the control of the Scoreboard Controller during the events. During the periods prior to and following the events, it will be used for 'soft-sell' advertising material.

SUMMARY:

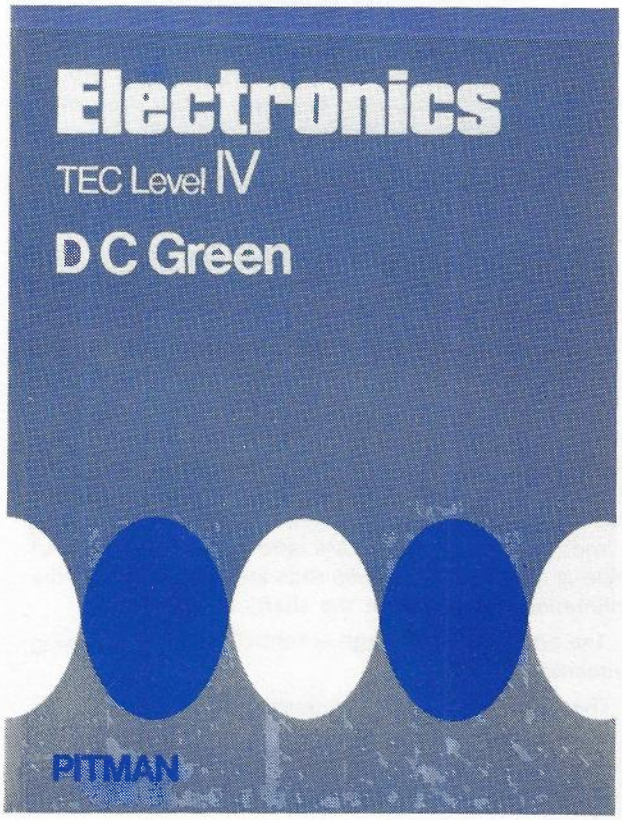
The scoreboards are an important part of the sporting events as they provide the spectators with timely information on the results of the events which are occuring. Only the most dedicated follower of a sport can appreciate the events without the information displayed on the scoreboard. Even a sports enthusiast can only be sure of the outcome of an event when the public information is made available, either on the scoreboard or by public address announcements.

Modern scoreboards of any significance are almost universally controlled by micro-processor systems.

BOOK REVIEW

ELECTRONICS — TEC LEVEL IV

D. C. Green; Pitman, 1981. Price $22.50



This book is written as a text book for Level IV syllabus of the Technical Education Council (Britain). It covers areas dealt with in stages III and IV of the Victorian Certificate of Technology (Electronics) syllabus, which is a four year full-time course after year eleven, and provides the academic training for Technical Officers, Engineering Technicians, and Design Draftsmen.

The reader is assumed to have already completed Level III Electronics, Electrical Principles and Mathematics. The book does not develop any subject from its foundation — it starts abruptly at the beginning of Level IV and finished abruptly at the end of Level IV. It does, however, deal with a number of subjects well, and in common with all good text books contains a variety of worked examples and other exercises with solutions at the end of the book.

The most extensively treated subject is that of transistor amplifier design. Chapter 1 introduces the reader to transistors and their hybrid-pi and h-parameter models. There is a short departure from this theme in Chapter 2 to discuss the realization of components in integrated circuit form. Chapter 3 continues the subject of amplifier design, with detail on multistage amplifiers and frequency response calculations. Negative feedback and stability are discussed in Chapter 4. Chapters 5 and 6 deal with operational amplifiers and large signal amplifiers respectively. The next two chapters are devoted to signal generators — firstly sinusoidal oscillators including some comments on frequency stability and a brief introduction to crystal oscillators; and secondly non-sinusoidal generators. Chapter 9 deals briefly with the subject of noise, including the main noise sources in transistors. Chapter 10 is almost out of context with the rest of the book in that it gives a brief introduction to controlled rectification.

It must be understood that this is a text book for a particular year of an electronics course, and therefore the author is not concerned with leading readers with a variety of backgrounds gently into the art of circuit design — he assumes a particular well defined background and proceeds from there. Further, the book seems to be written to support a lecture series, as it does not always deal with the development of the mathematical expression presented in the text, and does not always state the assumptions made in their development. By omitting to discuss many of the practicalities of circuit design, and by using simplified circuit models, the author has made his subject seem simpler than it really is — the serious experimenter would soon have to resort to other references.

I would not recommend this book as a general reference. However, as a text book for a student about to commence Level IV Electronics where the book will be backed-up with lectures and practical work, it will serve as a useful reference for years to come.

Reviewed by:
Dr I. McGregor
Research Laboratories
Telecom Australia.

The Telecom Maintenance Plan

N. D. HOWARD M.I.E. Aust.

This article covers mainly those aspects of maintenance involved with the Telecom transmission network during the XII Commonwealth Games. Procedures are described which were developed after discussions between the relevant Telecom areas and the Host Broadcaster (HB)— the Australian Broadcasting Commission (ABC).

INTRODUCTION

The XII Commonwealth Games will utilise the Telecom network to the maximum and significantly increase the responsibility for the maintenance of service throughout the network.

As well as normal telephone traffic increasing in the local and trunk networks, the requirement for special services such as video, sound program, data, etc. will increase markedly. In fact the games will be the source of more hours of live video program transmission to national and overseas destinations, than any other event in Australian history.

Special co-ordination will be required in the event of a failure, and close contact is necessary between specialist sections and districts (Operations and Engineering). Interstate co-ordination is most important.

POLICY AND ORGANISATION

Wherever practicable, existing maintenance procedures have been adopted and will be carried out by staff who know the area and who normally work in the districts concerned. The teams will be augmented by specialist staff as required.

One exception to this policy is the establishment of a special Telecom Commonwealth Games Operations Centre (TCGOC) to co-ordinate fault reports associated with Commonwealth Games services in the local network.

In Brisbane, the main Telecom Operations Centres concerned with interstate services are as follows —

- Television Operating Centre (TOC)
- Sound Operating Centre (SOC)
- Mt. Gravatt Radiocommunications Terminal
- Edison Carrier Terminal
- Woolloongabba Carrier Terminal
- Service Restoration and Traffic Control Centre (SRTCC)

Involved closely with these centres is the Host Broadcast Centre operated by the ABC.

All audio and video programs from the sports venues are transmitted to the Host Broadcast Centre. Here the programs can be edited for transmission via the TOC or SOC to national or international destinations.

Interstate contact for maintenance oversight during the games period will be mainly as follows:

TOC to TOC
SOC to SOC
SRTCC to SRTCC

Each of the above centres in Sydney will be the main point of interstate contact for the Brisbane centres.

Interface with the Overseas Telecommunications Commission (OTC(A)) facilities for international relays, will be via the Sydney Telecom operating centres.

Television Operating Centre

The functions of the TOC may be summarised as follows:

- control and co-ordination of all switching on the Telecom video relay network;
- monitoring of video channel status and quality of transmission on the network;
- overall testing and mop-up equalisation of interstate video channels;
- fault control centre for processing complaints on performance received from the television authorities.

Additional video bearers to be installed for the games at the main Telecom centres in Brisbane are shown in **Fig. 1**. There are two existing outgoing interstate video bearers from Brisbane, both on coastal routes — one via coaxial cable to Newcastle and thence broadband radio to Sydney (Waverley) and one via broadband radio to Sydney (Redfern).

Route diversity is provided for the games as the additional two outgoing video bearers from Brisbane are via Toowoomba and Moree (inland route). (See Fig. 1 and Fig. 3).

The video systems from the venues, as can be seen in Fig. 1, are not accessible directly at the TOC. For the

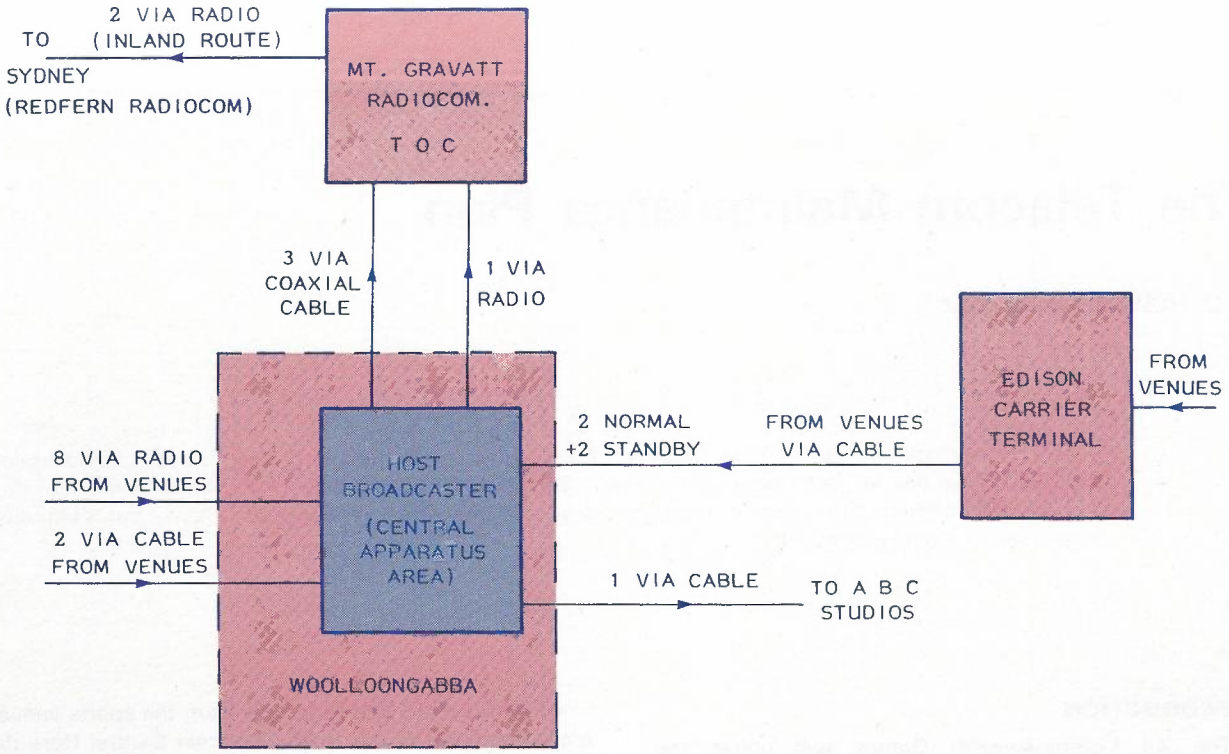


Fig. 1 — Additional Video Bearers (Brisbane)

period between the commissioning date of the venue video systems, and their usage date, a video test signal will be provided on these systems for surveillance purposes.

Sound Operating Centre

The functions of the SOC are generally similar to those outlined for the TOC except, of course, that they apply to sound program lines and relate to sound broadcasting authorities.

In addition, the SOC in Brisbane takes part in the set-up of picturegram lines (facsimile). Two groups or 24 circuits are being provided from SOC Brisbane to SOC Sydney for itinerant games usage (orderwires and picturegrams).

Additional program quality lines provided from the HB and from Telecom operating centres to interstate operating centres are shown in **Fig. 2.**

Allowing for program lines existing prior to the games requirements, a total of 19 program quality lines will be available outgoing from Brisbane to Sydney, during the games.

Program lines from the venues to the HB are not connected via the SOC and do not appear on Fig. 2.

In addition to the program quality lines from the HB, 35 co-ordination lines (3.4kHz bandwidth) have been installed between the HB and Sydney SOC.

Service Restoration and Traffic Control Centre

The SRTCC in each State oversights the activities of the national network to optimize the ability to withstand major plant disturbances such as the failure of a multiplex link. A National Centre (NSRTCC) co-ordinates the activities of the State centres.

FAULT REPORTING AND RESTORATION

Fault reporting and restoration of interstate bearers will follow normal procedures.

Guidelines for the "Utilisation of Video Program Channels," Issue 1A, Jan. 1982, apply. These instructions were developed and issued by Headquarters, Telecom.

In the above mentioned document general patching priority guidelines are established which apply to the restoration of higher priority broadband services by substitution, using video program channels. Specific patching priorities are to be co-ordinated by the SRTCC.

The opening and closing ceremonies at the games may be declared programs of national importance to which special precautions apply.

STAFFING

Arrangements are in hand for special staffing at key locations. Interstate locations are still to be finalised, but in Queensland, in the transmission area, special arrangements will be made at TOC (Mt Gravatt Radiocom), Woolloongabba Carrier Terminal and Radio Terminal, SOC (Edison Carrier Terminal) and the Chandler radio installation.

Extra staff for these locations will be obtained as required for the period of the games from technical staff normally based in such areas as Radio or Trunk Network Service, Sectional Office Advisory Groups or Repair Centres.

An evaluation of video and sound program bookings, as soon as they reach a firm stage, provides a useful indicator in deciding the extra resources required at Telecom centres.

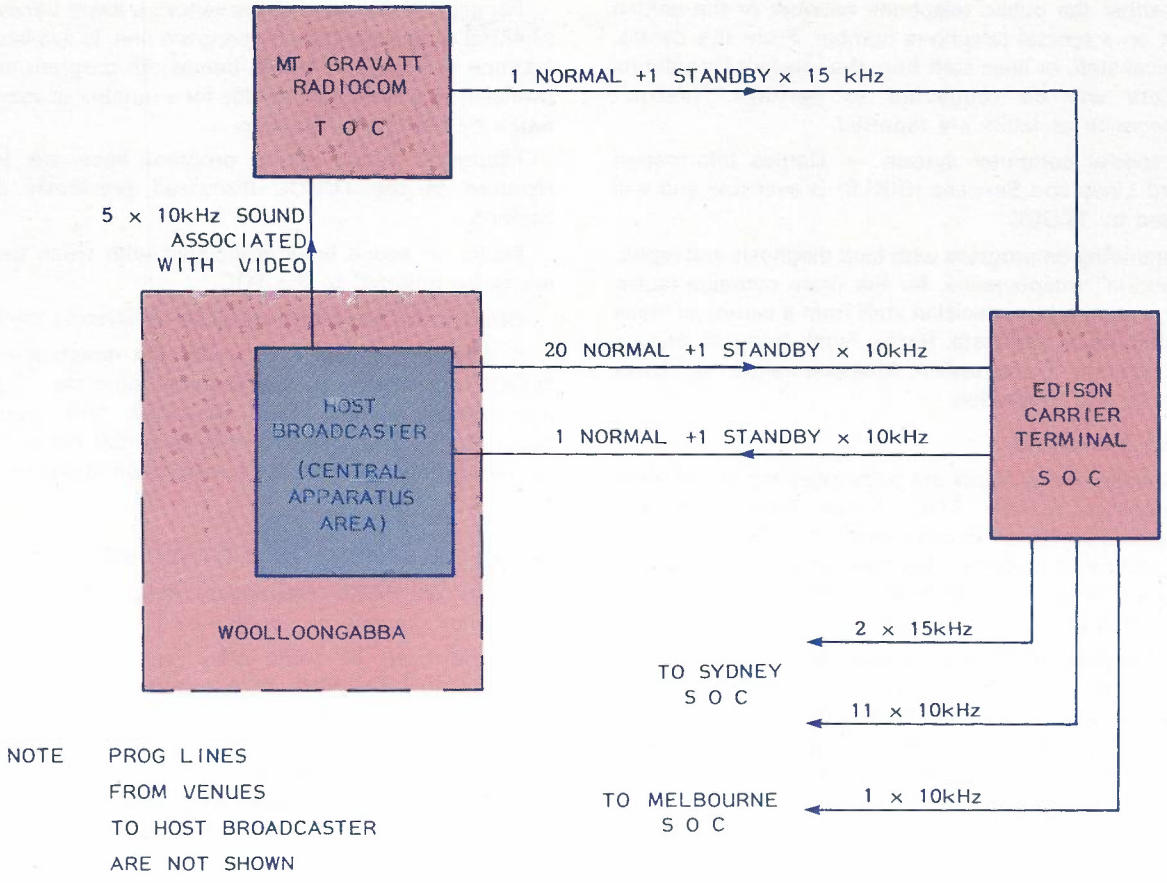


Fig. 2 — Additional Sound Program Lines (Brisbane)

In addition, regular contact with the HB, regarding routine test arrangements and earliest restoration time required, particularly on venue program lines, is useful in planning Telecom staffing timetables.

Arrangements are also in hand in Operations Districts, through which interstate bearers pass, for key staff and adequate resources to be available.

It is emphasised that reasonable allowance must be made for the possibility of a major failure apart from that portion of the network specially associated with the games.

Operations Department staff from the Metro South Telecom District, are responsible for the Telecom Commonwealth Games Operations Centre which is accessible

Neil Howard was appointed Technician-in-Training, APO, in 1948. After qualifying as Technician and with several years service in the Radio Section in Central Western Queensland, he qualified as Senior Technician. He was appointed Trainee Engineer in 1956 and qualified as an Engineer in 1960.

He then worked in the Training Division and District Works (Lines) and was a member of the Project Team on the survey, installation and commissioning phases of the Brisbane to Cairns Broadband Radio System.

In 1966 Neil moved to sound broadcasting installation and maintenance in Queensland and Papua New Guinea. He was transferred to the Trunk Service Section in 1973 where he is currently Senior Engineer, Transmission.

from either the public telephone network or the games PABX on a special telephone number. From this centre, technical staff, or lines staff from the relevant Operations Districts will be requested to perform "first-in" maintenance as faults are reported.

A special computer system — Games Information Record Lines and Services (GIRLS) is available and will be used by TCGOC.

Depending on progress with fault diagnosis and repair, "second-in" maintenance, for the more complex faults, may be required by specialist staff from a variety of areas e.g. Telegraphs and Data, Radio, Trunk Network Service (incorporation Transmission Measurements), or Lines Practices and Protection.

VIDEO BEARERS

All video bearer faults are to be reported by the Host Broadcaster to the TOC. Video bearers in the metropolitan area can be seen in Fig. 1 to be a mixture of radio and cable systems. Maintenance on these systems will be carried out by staff from the Radio Section or the Trunk Network Service Section of Telecom.

Of the four Brisbane to Sydney video bearers to be used during the games, two are broadband radio protection bearers. One of these is on the coastal route and one is on the inland route (see **Fig. 3**). No alteration to the mode of operation of these protection bearers, as regards priority of switching for telephony or video for the games is proposed.

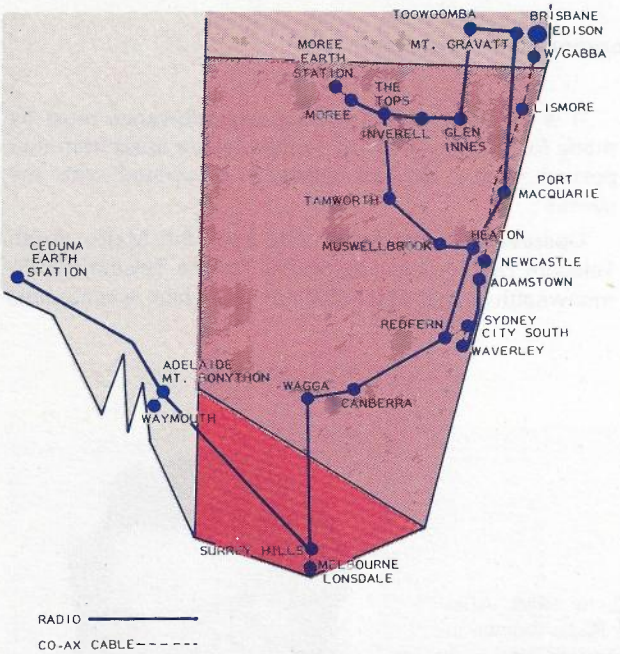


Fig. 3 — Commonwealth Games Interstate Video Routes

SOUND PROGRAM LINES

Sound program lines can be split into two categories viz. venue program lines (ie lines from venues to the HB) and program lines that connect the HB to the Telecom network.

Those in the latter category are shown in Fig. 2.

Six of the major venues are provided with a total of approximately 200 venue program lines.

For each of the users at the venues a lower bandwidth (3.4kHz) orderwire/standby program line, is available. In addition at least one 10kHz bandwidth program line, is available as a common standby for a number of users, for patch by the HB as required.

Faults on venue sound program lines are to be reported to the TCGOC discussed previously under Staffing.

Faults on sound lines associated with video bearers are to be reported to the TOC.

Other sound line faults are to be reported to the SOC.

If district technical staff under the direction of the TCGOC are unable to successfully complete "first-in" maintenance repairs, fault diagnosis and repair is continued by Trunk Network Service staff either in the carrier terminals or from the transmission measurements area.

LOCAL TELEPHONY AND OTHER SERVICES

Faults on PABX extensions, data services, public telephones etc. will be handled by the TCGOC.

In the case of some Data services, preliminary diagnosis will be made at a special reporting centre staffed and controlled by games' personnel. This preliminary diagnosis is to determine whether customer owned or Telecom equipment is involved. If further specialist action is required on Telecom equipment, strategically located Telecom Telegraphs and Data staff, are available.

SECURITY

External Plant

In order to minimise the possibility of interruption to communication circuits on critical junction and subscriber cables during the games, no access is allowed to manholes on these routes, no approval will be granted for cable depressurisation and no excavation is to be carried out adjacent to the nominated cables.

The restrictions apply to Telecom staff for a period of several weeks which encompasses the games period.

These restrictions also apply to all coaxial cable routes in the metropolitan and outer metropolitan areas.

Special authority may be granted for access to the routes for essential purposes.

During the above period field staff are encouraged to be more than usually alert to the excavating activities of other bodies, particularly in the vicinity of games venues.

Internal Plant

In order to maximise security of the network during the games, negotiations are in hand between Brisbane SRTCC, Sydney SRTCC and National SRTCC to restrict any activity during the games period which could put at risk —

- any interstate bearer between Brisbane and Sydney
- other bearers which are critical to the relay of programs internationally, by OTC (A).

MISCELLANEOUS MAINTENANCE NEEDS

Several organisational details which are important for the success of maintenance during an event such as the Commonwealth Games are listed below. An attempt has

been made to categorise them into those related to Staff and those related to Equipment.

Staff

- Access for vehicles and staff (includes security arrangements).
- Knowledge of local fire procedures by personnel unfamiliar with an area.
- "First-in" maintenance training for staff normally unfamiliar with equipment.
- After-hours staff call-out and release arrangments.

Equipment

- Adequate Order Wire network
- Mobile teams equipped with radio
- Strategic location of spares
- Standard designations for fault reporting purposes
- Use of shared coding for associated audio and video links e.g. CGN 7901V for video and CGN 70901B for associated audio.

CONCLUSION

Early involvement of maintenance and operations staff is required during the planning and construction phase of Telecom facilities for events such as the Commonwealth Games.

It is emphasised that the successful operation of these facilities during the games depends on team effort and special contributions have been made by many Telecom staff, to this end.

In Brief

LARGE RANGE OF TELEPHONES FOR THE MEDIA

Media representatives covering the Commonwealth Games will be using a wide variety of telephones, some specially modified by Telecom for particular locations and needs.

For example, in broadcast studios and ringside positions at venues such as boxing and weightlifting the 'phone won't ring — a light will flash on and off instead.

There'll be telephones with headsets and noise muting handsets, to stop "feed back" through the mouthpiece, located where crowd noise could be expected to make 'phone conversations difficult.

Other telephones will have intercom facilities, control locks to stop unauthorised use and volume controls to boost reception.

Media centres will also be equipped with international direct dialling public telephones, telex machines and lines for facsimile and picturegram transmission.

Telecom is modifying a number of telephones to include input jacks for portable tape recorders, a requirement for radio journalists to send interviews and reports to broadcasting stations.

Orders for Telecom's services have been received from media around the world.

Press agencies and individual newspapers from Britain, Canada, France, New Zealand and Australia have already booked services.

The largest order is from Australian Associated Press (AAP) which will also be servicing Reuter, the New Zealand Press Association and Associated Press.

The Host Broadcaster has arranged with Telecom for telephones and other services for the electronic media at Games venues and the Broadcast Control Centre.

SPECIAL TELEPHONE MAINTENANCE GROUP SET UP FOR GAMES

Telecom's GIRLS will ensure any faults which develop in the Commonwealth Games telecommunications network are fixed in a hurry.

GIRLS (Games Information Record of Lines and Services) is a data programme compiled by Telecom to identify individual line service numbers for the several thousand telephone extensions and exchange, telex and data lines.

A computer will record information on each service, including cable pair numbers, junctions, cable location, attached equipment and daily rental charges.

Customers reporting any problems with their service need only quote their line number and the computer quickly provides all necessary details for maintenance staff to test the service and identify the fault.

GIRLS is part of a special maintenance and installation system Telecom has set up for the games network.

From early September, direct access has been provided to the maintenance and installation group through a special games service difficulties and faults number — 1109.

The 1109 fault report number has been made available for connections to the Commonwealth Games' PABX and direct exchange lines at the games venues.

The special maintenance unit of about 15 people has been established to ensure that the best possible service is available for telecommunications users, at the games.

PERSONALITIES

CHANGES TO THE BOARD OF EDITORS

Bob Lorimer has been appointed to the Board of Editors to provide editorial coverage in business planning and financial subjects.

Mr R. A. Lorimer, BEE, MIE Aust., is a Principal Planning Officer in the Corporate Analysis Unit of the Business Development Directorate, Telecom Headquarters.

He commenced his career in telecommunications in 1950 as a Cadet Engineer in the Victorian Administration of the APO and has over 20 year's experience as an Engineer in Telecommunications Planning, Construction and Maintenance. During 1969, under the Australian External Aid Programme, he prepared and published a report on the development of telephone facilities in Tonga, South Pacific.

In 1975, Mr Lorimer moved into the Corporate Planning field and has been integrally involved in the development of the corporate and strategic business planning process in Telecom Australia.

Roger Shinkfield, after 15 years as South Australia's representative on the Board, has decided to step down and he has been replaced by Keith Vawser. Roger was made a life member of the Society for his long and energetic service. The Board, and in particular the past Editors in Chief, wish to thank Roger for his contribution.

CHANGES TO COUNCIL of CONTROL

The Society has been fortunate to secure the services of two highly qualified people for the Council of Control.

Mr David Matiske, (left) has accepted the appointment of Treasurer to the Society. David, who is the Manager, Business Analysis, HQ Telecom, brings to the position, a wealth of experience in financial matters as well as having a background in engineering. He has been awarded a Master's Degree in Business Administration from Melbourne University and he spent 2 years with the World Bank in Washington. On his return to Australia, he worked for four years with the Finance Directorate at Telecom. David has published one paper in the TJA on crossbar signalling and two papers with ATR on telephone traffic theory.

Dr Clem Pratt (right) has been appointed Vice-Chairman of the Council of Control to fill a position normally occupied by the Immediate Past Chairman (Rolo Brett left the Council of Control on taking up a position of State Manager, Victoria, Telecom). Clem is the Manager Systems Development, Information Systems at Telecom and has a long involvement with the Society as an author of several papers in the TJA and as a long standing member of the Board of Editors, of the ATR.

CHANGES AT ERICSSON

The telecommunication industry within Australia has lost one of its personalities with the retirement of Sigfrid Cronstedt (left) from the position of Managing Director, Ericsson Australia Mr Cronstedt was born in Stockholm Sweden and graduated from the Chalmers Technical University in 1949. He joined Ericsson in 1951 and has been with the Australian company since 1960. It is pleasing to note that Mr Cronstedt will remain in Australia, on retirement, and the Society wishes him good luck for a well earned rest.

Mr Cronstedt has been replaced by Lars Estberger (right) who has been, since 1978, the Chief Engineer for the Ericsson Group. Lars is well known throughout the industry in Australia, having made his first visit to this country in 1957 to install the first ARF, model exchanges. Mr Estberger returned to Australia in 1959 to assist with further crossbar installations and to train Telecom staff in the new technology. The Society offers its congratulations to Lars Estberger on his appointment and we look forward to a long and fruitful association.

JACK TRUSS RETIRES

Mr A. J. (Jack) Truss, BSc, M.I.E. Aust, retired this year as the Chief State Engineer, Telecom, South Australia, after 44 years' service to the industry.

Jack joined the APO in 1938 and, following four years' war service with the RAAF, was selected as a Cadet Engineer qualifying as an Engineer in 1951.

Jack's early career as an Engineer covered broadcasting and radio communication during the rapid expansion of these services in the 1950's and 1960's, including an extensive involvement in the National Television Service transmitting stations in South Australia. Following this period, his career included management positions in Long Line and Telegraphs, Radio, Planning and Programming. In 1976, he was promoted to the position of Chief State Engineer, Telecom.

Jack Truss has made a significant professional contribution towards telecommunications in South Australia and the Northern Territory and his work has formed a sound basis for meeting the corporate and business expectations subsequently adopted by Telecom.

Jack has always supported the activities of the Society and in 1961 he accepted the position of Treasurer on the South Australian Committee; he was Chairman during 1968 and 1969, and remained on the Committee until 1972.

On behalf of all members, we wish Jack an enjoyable retirement.

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ABSTRACTS: Vol. 32, No. 3

TELECOMMUNICATIONS at the XII Commonwealth Games Brisbane 1982.

THE HISTORY, DEVELOPMENT AND COMMUNICATION NEEDS; T. F. Steer, Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 171.

This paper provides an overview of the history and structure of the Commonwealth Games. The paper discusses the development of the XII Games in Brisbane and goes on to describe the venues and the communication needs for the Brisbane Games.

THE COMMITTEE, THE ORGANISATION AND THE STAFF; N. C. Watson; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 179.

To provide the communication requirements for the games, co-ordination and control were the initial requirements. A Communication Committee was therefore formed and this paper describes the establishment and staffing of the committee and goes on to outline Telecom Australia's part in providing the required communications.

PLANNING AND INSTALLATION ASPECTS OF THE TELECOM INVOLVEMENT; R. G. Ball, A. Brinin, J. Horchner; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 183.

The Engineering involvement of Telecom in the preparations for the XII Commonwealth Games is looked at from three aspects, viz the interstate and overseas requirements, the planning of local links in the metropolitan network, and installation activities at the major exchanges and venues. This paper shows the extent of Telecom's involvement and indicates the types of problems encountered and the solutions devised within the constraints of a growing State network.

HOST BROADCASTER FACILITIES; L. R. Blackett; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 197.

The role of the Australian Broadcasting Commission (ABC) as Host Broadcaster for the XII Commonwealth Games in Brisbane is outlined.

The basis of engineering planning to provide for this role is covered and the resulting facilities are described, with particular reference to the purpose of these facilities and the needs of broadcasters. The description covers the two main areas of interest, sporting venues and the Broadcast Centre, with both radio and television in each area.

Some detail is included of the range and quantity of equipment required.

THE RADIO NETWORKS; W. P. Allinson; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 205.

Radio communication is used for control and administration purposes at the games. This paper describes the radio networks which have been established.

THE RESULTS NETWORK; P. Robertson, J. Healy; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 211.

A computerised results network is being provided for the XII Commonwealth Games. This article covers the function and operation of the network, the development and brief description of the computer system.

ELECTRONIC SCOREBOARDS; T. F. Steer; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 219.

At most venues, scoreboards and the public address system are the usual methods for keeping the public informed on progress of the games. This paper describes the electronic scoreboard systems employed at the games.

THE TELECOM MAINTENANCE PLAN; N. D. Howard; Telecom Journal of Aust., Vol. 32, No. 3, 1982, page 225.

This article covers mainly those aspects of maintenance involved with the Telecom transmission network during the XII Commonwealth Games. Procedures are described which were developed after discussions between the relevant Telecom areas and the Host Broadcaster (HB) — the Australian Broadcasting Commission (ABC).

THE TELECOMMUNICATION JOURNAL OF AUSTRALIA

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The Journal reports on the latest developments, both technical and commercial, in telephony, radio and TV and is distributed to professional engineers, executives and technical staff engaged in the planning, marketing, installation and operation of telecommunication services in Australia and overseas, also to manufacturers in this field, government departments, universities and consultants.

The Journal is not an official journal of the Australian Telecommunications Commission. The Commission and the Board of Editors are not responsible for statements made or opinions expressed by authors.

Information on how to prepare and submit manuscripts and contributions for the Journal is available from members of the Board of Editors.

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RATES. All rates are post free (by surface mail). Remittances should be in Australian currency and made payable to the Telecommunication Society of Australia. The 1983 subscription fee is $7.00. Non-members may secure copies of the Journal for an annual fee of $12.00 within Australia or $20.00 for overseas. Single copies of the Journal may be purchased by members for $2.00, non-members $3.00 and overseas $5.50. Reprints of papers are also available at $1.00 per copy. Bulk orders will attract special quotations.

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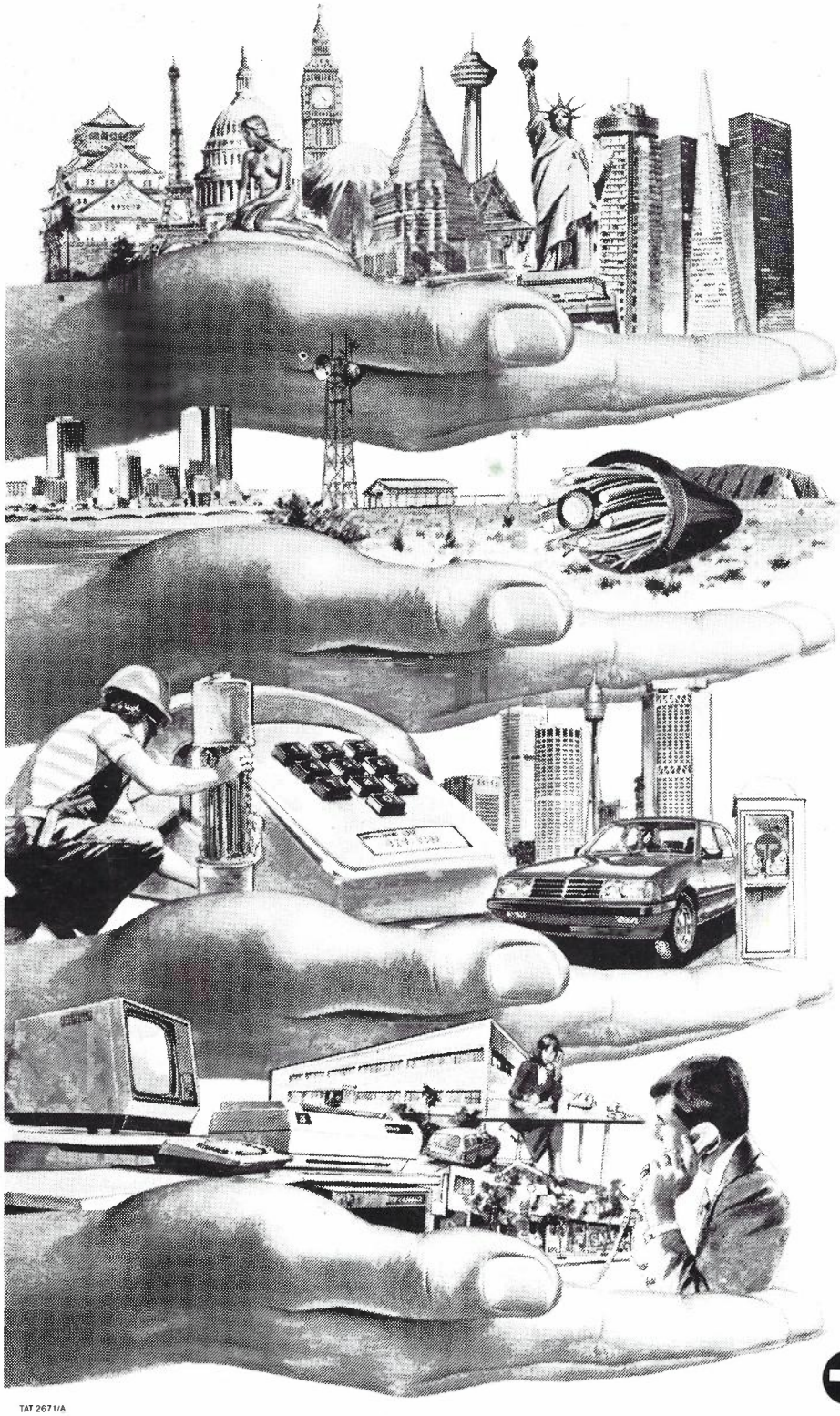

The World

Australia is no longer the distant cousin of international business. Through a highly sophisticated telecommunications system, the Telecom broadband network feeds and distributes international Telecom traffic–*ISD*, *Telex* and *Data* into and from *O.T.C.*'s gateway exchanges.

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The *Data* network links computers around the country on a cost and time-efficient basis.

The City

Doing business in the city depends on a high degree of communicability. Ideally, your city should be your office. And it is. There's the convenience of *Public Phones*, the accessibility of the *Telefinder Radio Paging* and, in Sydney and Melbourne, the *Mobile Phone* for your car. For more business there are the *Yellow Pages*. A *Red Phone* can attract customers, or provide your staff with their own "Private" Line. *Dial-It* information services like the Weather, Time and Stock Exchange Reports, keep you up to date.

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