The BROADCASTER

Newsletter of Telecom Broadcasting

No. 29 July 1994

CONSTRUCTION MT. WELLINGTON TOWER

THE BROADCASTER

The Broadcaster is the in-house newsletter of Telecom Broadcasting and is published three times a year to inform and recognise the people who make up this organisation.

Articles appearing in The Broadcaster do not necessarily reflect the views of the management of Telecom Australia.

Written and photographic contributions are welcome. All material should bear the contributors name and location and be directed to:

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EDITORIAL

One of the articles in this issue reminds us that this year is the Golden Jubilee of the first transmission from Radio Australia, Shepparton, when an RCA 50 kW transmitter was commissioned. Although not in active service today, the transmitter, and a twin built from redundant parts of the original, are still in situ at the station. It would be interesting to be able to look into the future and see how many of the solid state 50 kW transmitters being installed today would still be operational in 50 years time.

Although the story of the High Frequency Inland Service using transmitters at Lyndhurst, Sydney, Brisbane and Perth - now all closed down - has been covered in past issues of The Broadcaster, it is not generally known that the A Class stations 4QG, 3LO, 3AR and 6WF undertook trials with short wave transmissions in the 1920's to extend their coverage to rural areas, with 3LO even broadcasting to overseas listeners. Perhaps we might be able to cover some of this interesting work in a future issue.

JACK ROSS
Editor

Front Cover: Photo by Gary Harding ABT2.

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Les Rodgers

JUST BRIEFLY . . .

Deregulation has been the catch-cry all around the world with respect to telecommunications . Technological change is accelerating this deregulation and bringing telecommunications and broadcasting much closer together, causing great problems for governments. Actually, to some extent, deregulation is a misnomer. The driving force has been the introduction of competition rather than deregulation. In fact, new regulators have been introduced to oversight the deregulation. In Australia, the regulator for telecommunications is Austel and for broadcasting, it is the Australian Broadcasting Authority.

One of the most difficult things for governments to manage is the capability of satellites to broadcast programs into countries where they are not necessarily wanted. More and more satellites are being launched in our region including Asia with greater sophistication and power. Governments, particularly in emerging countries, feel threatened by this development and are moving to improve their own broadcasting facilities in order to have some control over the program content that is being delivered to their citizens. Normal free to air transmission techniques are being used for this. Digital technologies promise to make huge capacity available in telecommunications networks. Added to this are new digital compression techniques which will further multiply that capacity. It is now possible to carry a good quality television picture on the same pair of wires which provide the telephone service.

This is a structural change which will greatly affect the broadcasting industry and has led to alliances between broadcasting program providers and telecommunications carriers to deliver pay television services. This convergence of broadcasting, telecommunications and also computers, is leading to what is now called multi-media. The introduction of multi-media is also causing difficulties for governments. Fortunately, for we broadcasters, requirements for free to air transmission facilities will continue to exist for many years to come.

LES RODGERS

STATION ROLL CALL

4TI THURSDAY ISLAND

In early 1971, the then Australian Broadcasting Control Board proposed a 50 watt transmitter for Thursday Island but later in the year, revised the plan to provide for a 1 kW unit. Subsequent further studies revealed that even this power would be inadequate to cover the proposed service area covering the many islands in the area, and by 1975, the original plan was further amended to provide for a 2 kW installation.

Two STC 1 kW transmitters with a combining unit recovered from Kununurra in Western Australia, and associated input equipment were housed in a type 521 telephone exchange type building in Brisbane, road transported to Cairns, shipped to Thursday Island and then erected on site.

With call sign 4TI on 1062 kHz the station went to air on 18 June 1979 using a temporary 32m Hills Industries lattice steel radiator. Twelve months later, a four channel coupling unit catering for 4TI on 1062 kHz and OTC on 488.5, 500 and 512 kHz was commissioned at the base of an OTC mast allowing 4TI to share the OTC 46 m mast.

Program was originally fed via Cairns ABC studio to Bamaga over an open wire line, then via UHF radio link across Torres Strait and on to 4TI by cable via the local telephone exchange. Today, program is fed from Cairns via digital link to Thursday Island and via a local Torres Strait Island Media Association studio to the transmitter at Tamwoy.

During 1992, OTC closed down its Thursday Island operation after staffing the Coast Radio Station since 1913 leaving 4TI as the only service using their radiator.

In November 1988 station 4ABCRN began operation on 107.9 MHz providing a second ABC service for local listeners.

NOEL HOOPER

ABQ/8 THURSDAY ISLAND

A television service for Thursday Island was commissioned on 6 December 1981 in a building on Green Hill adjacent to an old fort which had been erected complete with a massive gun at the turn of the century. The gun is still in position, never having fired a shot in anger.

Thursday Island which was first settled by Europeans in 1877 is about 40 km north of Cape York and has an area of about 2.5 square kilometres. The island is the administrative centre of the Torres Strait Islands. Some 2500 people live on the island with the majority being Torres Strait islanders.

The ABC TV programs were originally received via Intelsat IV satellite but on 9 December 1985, the service was cut over to the Aussat satellite employing a 4.6 m earth station antenna. The dish was shipped to Thursday Island from Melbourne via Groote Island where another dish had been off loaded for a service at Weipa. The first attempt to ship a dish was unsuccessful after a mishap on a Melbourne wharf, caused considerable damage to the unit.

ABQ/8 uses an NEC TBV1210S 10 watt transmitter to broadcast to Thursday Island, adjacent islands and a part of Cape York Peninsula. It employs a horizontally polarised omnidirectional antenna and ERP of 10 watts. Most island communities have their own rebroadcast facilities.

During September 1988, Commercial service QQQ6, also located on Green Hill, began operation with a horizontally polarised antenna and ERP of 10 watts with program being provided via satellite.

OVERSEAS VISIT

DEVELOPMENTS IN DIGITAL RADIO AND DIGITAL TELEVISION

During March our Manager Project Design, Robin Blair, was able to attend two important conferences in North America dealing with emerging digital broadcasting technologies. These conferences were the Second International Symposium on Digital Audio Broadcasting, held in Toronto and the National Association of Broadcasters' Convention at Las Vegas.

The Toronto conference indicated that the European "Eureka 147" system of Digital Audio Broadcasting (DAB) is very much at the forefront in becoming one world standard. Most European countries and Canada have had very active DAB Committees formed by Government and Commercial Broadcasters to oversight its introduction into their regions. The British and Canadian Governments in particular have taken strongly supportive positions, and are expected to formally announce policy commitments towards establishing networks in the very near future.

European broadcasters see multi channel digital outlets as their future gateways to providing a variety of services in entertainment and information – "the ramp on to the information super highway". The attitude in the USA could hardly be more different. There the emphasis is on developing single channel systems using existing frequency allocations - the In Band On Channel or IBOC approach - with an evident desire to protect the established industry hierarchy. In technical terms, the development of these systems is well behind that of Eureka 147, but while some USA Engineers are sceptical about their future, they are being championed by a very vociferous minority.

By way of contrast, at the NAB Conference the consortium of USA Manufacturers known as the Grand Alliance formally announced that consensus had been reached on a standard for Digital Terrestrial Television Broadcasting (DTTB). This was obviously the most important specific issue at the convention, and the theme behind most of the technical sessions and the manufacturers trade displays.

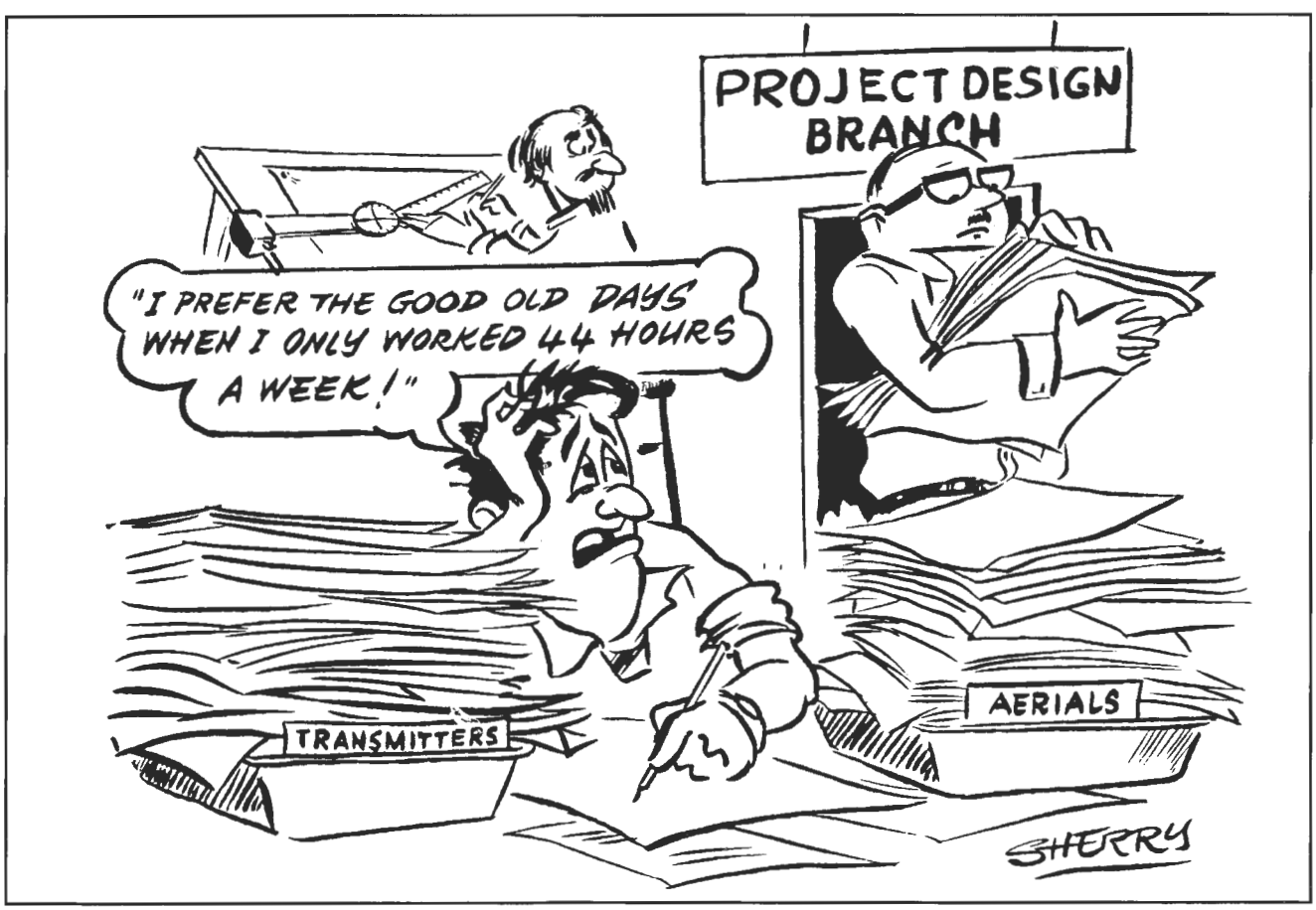
Although similar, the Grand Alliance system differs in some significant respects, from the Eureka 95 proposal which had also received considerable development in Europe. However, judging by the enthusiasm shown for the USA system at NAB, there seems little chance of the two being melded into a single uniform world standard.

Commercially, and to a lesser extent technically, Australian broadcasting has features in common with both the USA and European scenes. These two major markets seem inescapably bent on adopting different solutions, and our industry will be faced with difficult decisions in choosing between the two.

By way of emphasising the focus on digital TV this year, the NAB exhibition area featured a large section on "multi media" in which compressed digital video features predominantly. The ISO MPEG (moving picture expert group) compression standard which is used in both the Grand Alliance and Eureka broadcast TV system is also finding extensive application in computer displays - one manufacturer expressed the opinion that applications with uncompressed video would soon simply be not available.

The NAB convention is not, of course, a single issue symposium. It is in fact by far the largest convention in the world for broadcasters and covers all aspects of the industry. The attendance this year was reportedly 75000 people and even the vast convention and traffic handling facilities of Las Vegas were obviously stretched. Many people, including the author, had trouble finding hotel accommodation and even the largest lecture halls were insufficient to accommodate those wishing to attend some of the technical presentations.

ROBIN BLAIR



6PB PERTH

PARLIAMENTARY BROADCAST TRANSMITTER

Broadcast of Parliamentary proceedings began on 10 July 1946 using transmitters of the National Broadcasting Service with the Australian Broadcasting Commission handling the programming aspects of the broadcasts.

Within a few years, consideration was given to the establishment of a separate network for broadcasting Parliamentary proceedings, but it was not until 1988 that firm plans were developed.

Telecom Broadcasting in conjunction with ABC and NTA produced a plan to free the National service of responsibility for transmitting programs originating in Parliament by converting standby transmitters to operate on discrete frequencies. Call sign 'PB' was allocated to the transmitters involved.

The plan was designed over a period of time, for some Commercial stations in capital cities to be transferred to the FM band with the MF transmitting facilities being transferred to the Government for use in the Parliamentary Broadcasting Network.

In Western Australia, it was initially proposed to use the 6WN (6RN) 2 kW Philips 1656 type transmitter for the service, but the proposal was changed, and when service began on 11 October 1988, an STC 5 kW transmitter type 4-SU-105B, one of a pair destined for 6GN Geraldton, was put into operation.

The transmitter operating system was fully automatic, the start up sequence being initiated when signal was present on the program line, and closedown occurring after program ceased.

The 6WF standby aerial, an Alexanderson design installed in 1932, was utilised and retuned to the 6PB operating frequency of 585 kHz by remote controlled Johnson switches in the three tuning huts.

In the event of a failure of the main 6WF transmission system, the station logic controller (PLC) would close down the 6PB transmitter, retune the standby aerial to 720 kHz and switch it to the 6WF standby transmitter.

Station 6PB would remain off air until 6WF was restored to the main aerial/main transmitter configuration, whereupon the PLC would reset the standby aerial to 585 kHz, and restart the 6PB transmitter.

This system worked fairly well, but in time the STC 5 kW unit was required at Geraldton, so a Nautel ND5 held for 6BE Broome was put into service in its place. The situation lasted several months, but eventually, a decision was made to provide a 2.5 kW Nautel Ampfet transmitter as standby for 6WF, and convert the original 6WF 10 kW standby STC transmitter from 720 kHz to 585 kHz as a dedicated 6 PB service, still however sharing the 6WF standby aerial with the new 2.5 kW Nautel unit.

This system was installed over several frantic nights during the Parliamentary recess in May 1990, and has remained to the present day.

The addition of manual switches and links in the STC 10kW has meant that this unit can be retuned from 6PB frequency 585 kHz to 6WF frequency 720 kHz in under 15 minutes. This action can be taken for prolonged outages of the 6WF 55 kW plant, provided Parliament is not sitting at the time.

Together with the current 6WF and 6RN transmitters, the 6PB unit is due for replacement in late 1994 with a Nautel solid state 10 kW, at the same time finally being provided with a dedicated aerial.

DEREK PROSSER

STC 10kW transmitter employed with 6PB service.

SOUTHERN TASMANIA

MAJOR UPGRADE AND EXPANSION PROJECT

In conjunction with the project being carried out in Northern Tasmania, work has also been undertaken on a major project in Southern Tasmania. The Southern Tasmania project involves the aggregation of the Southern Cross Network from Northern Tasmania into Southern Tasmania, as well as the upgrade of the ABC/SBS services and National FM services.

Specifically, the work conducted in Southern Tasmania can be divided into three stages. The first stage was the work required to allow Southern Cross into the southern market of Tasmania by 30 April 1994. This work involved the installation of a UHF slot antenna and 30 kW UHF TV transmitter for Southern Cross at Mt. Wellington. The UHF slot antenna will be used to broadcast Southern Cross until the final Mt. Wellington UHF antenna is installed next summer. In addition, new translator sites were installed at Strahan and Swansea and station upgrades were carried out at Queenstown (Mt. Owen), Rosebery (Mt. Read), Bicheno and Taroona.

The second stage of the work planned for completion by 30 June 1994 involved the upgrade of FM services in Southern Tasmania. This work involved the installation of Radio National and Radio Regional FM services at the east coast sites of Bicheno and Swansea, and the rearrangement and upgrading of FM services on the west coast. This rearrangement consisted of the changing of feeding arrangements of the FM Regional Radio services from 7QN, Queenstown to Waratah. In addition, new Radio National services were installed at the west coast sites.

The third stage of the work involves the construction of four new translator facilities around the Hobart area. These sites which are due for completion by 30 October 1994 are located at Orford, Cygnet, Geeveston and Dover. At this stage, most of the external and internal plant work is complete at these sites and only the power and telephone services need to be connected before the sites are completed.

An interesting point to note regarding this project was that the first stage of the project was completed in eight months from receipt of purchase order from the NTA. This is much faster than the twelve to eighteen months which is usually taken for completion of translator facilities. In fact, in order to achieve this date, the translators had to be air freighted from Japan, instead of the normal sea freighting.

Many unique and difficult tasks occurred during this project. Some of these occurred due to the extreme weather conditions which occur on the sites on the west coast, particularly Mt. Owen. At Mt. Owen, the only access to the site is via four wheel drive vehicles with large drops both sides of the road and a very steep and winding road. Our staff did a magnificent job to get all the external plant and

UHF antenna being placed in position on mast at Taroona.

Building and mast at Dover.

internal plant material up this site and installed in a very short time.

Another interesting incident occurred at Mt. Wellington after the installation of the UHF slot antenna. One night, a cable drum which weighs nearly two tonnes, was moved five metres sideways by the wind which was blowing at over 160 km/h and fell onto the newly installed UHF feeder. This caused a short circuit between the inner and outer of the feeder and tripped the VSWR protection of the Southern Cross transmitter putting them off air. Luckily, Southern Cross was only transmitting test pattern but it does show the extreme weather conditions that can occur at Mt. Wellington.

The external plant work on this project was conducted by a lines crew from Victoria and another made up of staff from Western Australia, South Australia and the Northern Territory. These people all worked extremely hard under difficult conditions.

The internal plant work was carried out by staff from Victoria and local Hobart operations staff. They too did a magnificent job and completed their work in the required time.

The final part of the Southern Tasmania project will be the completion of the work at Mt. Wellington. This work involves the installation of Band I, Band II/III and UHF antennas and radome on the new concrete tower and the installation of a new Band I transmitter and FM transmitters. This work is programmed for the 1994/95 summer.

MARK STEVENS

Mast thrust block formwork and steelwork in place, Strahan.

Mt. Read tower with UHF TV antenna.

Tower at Cygnet.

OUR BROADCASTING PIONEERS

MR. W. H. R. (BILL) ROBINSON

Bill Robinson had learnt visual signalling while a student at Crown Street Superior Public School during 1915, and was taught the Morse Code and elements of telegraphy by an enterprising Aunt. In 1918, he became Patrol Leader (Signals) in the Scouts and in the same year passed the Qualifying Certificate Examination at school.

As part of the National Service Scheme at the time, Bill was inducted into the Royal Australian Naval Reserve in 1919 and was allotted to the Signals Branch (Visual).

One of his relatives was a Mechanic in the Postmaster General's Department and encouraged Bill to take the examination for Junior Mechanic-in-training. In January 1920, he joined the Department's Engineering Branch as a

Bill Robinson

temporary employee pending the results of the examination. On appointment to the permanent staff in 1921, he was attached to Workshops for training and simultaneous part-time attendance at Sydney Technical College.

Continuing his duties with the Navy, he transferred from Signals to the Wireless Branch of the Service and later became a Petty Officer Telegraphist as a Senior Cadet. From 1921 to 1923, his training with both the Department and the Navy resulted in experience being gained in a wide range of technical areas.

By 1925, Bill was sent to Canberra to work on the wiring and equipment for the Parliament House telecommunications facilities. Although by this stage he had fulfilled his obligations of service with the Navy and was discharged, he rejoined the Navy on a voluntary basis as a Petty Officer Telegraphist.

In May 1928, while on Annual Continuous Training on HMAS Australia, at the request of his employer the PMG's Department, Bill was given a special course by the Navy on high power wireless equipment operation and maintenance because at that time, the Department was taking steps to build up a core of suitably trained staff as part of the Government's plan to take over the A Class stations to form the National Broadcasting Service. Following an examination by the Department's Radio Inspector, Bill was issued with a 'Limited Certificate of Proficiency in Radio Telephony', Serial Number 2.

At the conclusion of his naval training course and return to normal duties with the Department, he was sent to 2BL at Coogee to take over the station from the owner's technical staff and to set up operation and maintenance procedures using company personal who had accepted an offer to join the Public Service.

During 1929, after operation of the station had been established on a sound basis, Bill transferred to general duties in connection with a range of NBS activities and liaison with staff of the Australian Broadcasting Company in connection with technical aspects of program production.

In June 1930, he went to Beresfield to install Australia's first regional station 2NC Newcastle for the NBS. Bill had recently married and took up resident in the house erected on the site for the Officer-in-Charge.

While working at 2NC he qualified as Senior Technician Research but although offered a position in the Research Laboratories, declined the offer. He was appointed Officer-in-Charge of 2NC on commissioning of the station and remained there until July 1934 when he joined 2UE as Assistant Chief Engineer under Chief Engineer Murray Stevenson. The station which had been in service since Australia Day 1925 operated with two studios and control rooms on 6th Floor, 296 Pitt Street, Sydney and 1000 watt transmitter employing Heising method of modulation at Lilli-Pilli, Port Hacking some 13 km from the GPO.

During his period with Commercial station 2UE, Bill was associated with the design, construction and installation of new studios on 4th Floor, 29 Bligh Street where facilities included five studios, three control rooms, disc recording equipment and hourly time signal 'pips', an innovative 'first' at the time.

At the outbreak of the War in 1939, he was commissioned in the Australian Military Forces, serving initially as an Instructor at Eastern Command School of Signals. In 1940, he became Assistant Chief Signals Officer, Eastern Command and later Command Wireless Officer. In 1943, Bill commanded the Heavy Wireless Company Allied Land Forces HQ in Melbourne at which he organised establishment of a chain of overseas radio services to London, New Zealand, Chungking, New Guinea and front line positions in Australia. He later served in New Guinea and at the conclusion of hostilities returned to Australia as Australian Staff Signals Officer, being demobilised in 1946 and returning to his previous position with 2UE. Bill was appointed Chief Engineer of 2UE in 1956 and retired from the position in 1965. However, he maintained an interest in radio following appointment as Quality Controller of Radio Equipment with Standard Telephones and Cables Ltd., until 1975.

Bill was also active in many community affairs. These included appointment to the Board of St. George Hospital, Kogarah as Director in 1952, and a member of the Kogarah Council from 1953 serving as Deputy Mayor for five terms and Mayor 1961-62.

For his community service, he was honoured in 1980 with the Medal of the Order of Australia.

Bill Robinson died in November 1985.

I am indebted to Bill's daughter Frances Robinson, and the St. George and Sutherland Shire Leader for background material in compiling this article.

JACK ROSS

RADIO STUDIOS

30TH ANNIVERSARY - TRANSFER OF TECHNICAL FACILITIES TO ABC

This year, 1994 marks a milestone of 30 years since responsibility for design, installation, operation and maintenance of the technical facilities at the ABC radio studios were transferred from the Postmaster General's Department to the ABC.

Prior to 1964, the Department had been responsible for the studio technical facilities following takeover by the Government of A Class stations 2BL, 2FC, 3AR, 3LO, 4QG, 5CL, 6WF and 7ZL during 1929 to form the National Broadcasting Service. The stations, all based in metropolitan centres, had begun operation during the period 1923-25.

Programs for the Service were provided under contract by the Australian Broadcasting Company Ltd. After two years, the Government changed the program supply arrangement by establishing the Australian Broadcasting Commission, effective from 1 July 1932.

For the entire period 1929 until 1964, there was concern by those providing the programs that they did not have direct control over staff operating the studio technical facilities and the determination of what technical plant was to be provided.

Two of the State Managers of the Australian Broadcasting Company Ltd, and who subsequently transferred to the Commission, Thomas Bearup in Victoria and John Robinson in Queensland had technical backgrounds in the technology, and as a result of their recommendations, the Commission made repeated representations to the Minister, the Postmaster General to have the role of the Department changed.

A major area of concern by ABC program professionals was that they could spend almost a full day on rehearsal for an important evening concert broadcast, liaising with the technician on such matters as microphone placement, balance, levels, switching and fading sequences and generally, fine tuning to ensure there would be no last minute technical difficulties, only to find that another technician had been rostered - on to operate the controls when the actual broadcast went to air.

The arrangement whereby the PMG's Department was responsible for the technical facilities when the NBS was formed, was the brainchild of H P (Horsepower) Brown, Director General of the Post Office. He vigorously opposed any change every time the Commission or others raised the matter of transfer of facilities to ABC control.

In 1940-42, a Joint Parliamentary Committee on Broadcasting looked into the matter of control following pressure from the ABC but the Committee was unanimous in recommending that the situation be left as it was. However, many years later with the introduction of television, the ABC was successful in gaining control of the studio technical facilities and staff. This left the way open to eventually take control of the radio sound studios in 1964.

Studio facilities in Western Australia were the first to be transferred to the ABC. It was just another day; no trumpets, no fanfare, no speeches, no comment except to tell staff who had decided to remain with the facilities that as from that time they were members of the ABC staff. On air time of 5.30am came and went without incident, programs continued, but sometimes very disjointed as the production staff attempted to take charge of their new found toy. Oh yes! The ABC Manager was in attendance to hear the first few words broadcast.

JACK MEAD/JACK ROSS

Setting reinforcement in position.

Close up view of reinforcement and ring beam formwork.

Formwork and reinforcement set up prior to pouring foundation ring beam.

MOUNT WELLINGTON

UNIQUE BROADCASTING TOWER

As part of equalisation in Tasmania, a new broadcasting tower is being constructed at 1252m above sea level on Mt Wellington, overlooking Hobart. This tower is to replace the existing lattice steel tower, which has been withstanding the extremes of the snow, ice and winds deriving from the "Roaring Forties" for the last 34 years.

The new tower has been designed by Telecom Broadcasting to suit the needs of the site and the environment. It will consist of a fully enclosed reinforced concrete section with a non-uniform vertical taper up to 67m height, and a radome-enshrouded latticed steel antenna support column from 67m up to approximately 130m. The tower is to support Band 1, Band 2 and Band 4/5 antenna arrays, and the local radio communication requirements. Provision is being made to enable broadcasting on Band 3 from the same aperture as the Band 2 array. The tower will be circular in cross-section over its total height and will be fitted with tuned liquid dampers to absorb the energy of wind-induced dynamic motions. Many of the features of this tower have been derived from the experience gained in maintaining the existing tower.

The existing tower was built in the summer of 1959-60 by Johns & Waygood Ltd, to support the ABT-2 antenna array. During the following winter it suffered extensive damage due to falling ice. This became an on-going problem with a degraded broadcast signal being not uncommon during winter, and structural repairs frequently required during summer. By the late 1970's the antenna array had reached the end of its serviceable life and a replacement array was planned along with a 7.6m diameter protective radome. Tower upgrading, antenna installation and radome construction commenced during the summer of 1979-80 and was finally completed during the summer of 1982-83. Included in this work was a 12m high extension to the tower to support an FM antenna array within a 2.0m diameter radome. a single channel UHF slot antenna was added within the Band 1 radome in 1986 to broadcast SBS television.

Although the radome was successful in stopping ice damage to the antennas, it created other problems associated with wind-induced dynamic excitation of the whole tower. This led to an on-going maintenance problem, particularly associated with bolted connections throughout the tower. The fitting of tuned liquid dampers high up in the tower in 1992 has helped reduce the vibration-related problems. Ice damage to the open latticed sections of the tower continues and maintenance is difficult because of the frequent occurrence of inclement weather.

The existing tower and its antenna systems are not capable of being satisfactorily upgraded to support the additional television and FM radio services required to be broadcast. This in conjunction with the significant maintenance requirements formed the justification for the construction of a replacement tower. Planning and developmental work to this end started in December 1991. Following an extensive environmental impact assessment including public forums, the general form and location of the new tower was finalised and two variations of this were presented to the Hobart City Council for planning approval in February 1993. After a number of steps in the bureaucratic process, planning approval was granted in July,

Slipform at RL 5.0m and progressing upwards.

Close up view of slip form and hoist guide frame.

Alimak personnel access hoist guide frame attached to the tower.

1993 and Federal Parliamentary funding approval was granted in December, 1993.

The primary loading for the design of the tower is wind loading, and this has been derived from Bureau of Meteorology wind data recorded on the Mt Wellington Broadcasting Site over a number of years. These wind loading parameters confirm Mt Wellington's reputation of being a very windy place.

The new tower is to be constructed in two stages over two summer seasons. Stage 1 consists of the reinforced concrete section up to RL 67m and the associated internal access and cable runway steelwork. Stage 2 is to include the lattice steel support column, the antenna arrays, tuned liquid dampers and the radome.

The design of the tower has included a dynamic analysis to determine the tower's sensitivity to wind excitations in both the along-wind and cross-wind directions. Specially designed Tuned Liquid Dampers will be installed at two levels high up in the tower to absorb the energy of any wind-induced movement, particularly in the vicinities of the fundamental natural frequencies of the tower. This will be beneficial to the tower serviceability deflection requirements and to the long-term fatigue life of the structural components.

The design of Stage 1 was sub-contracted to the consulting engineering group Structural Mechanics & Dynamics. They have also been awarded the design and supply of the Tuned Liquid Dampers. A contract for the construction of the Stage 1 was let in December 1993 to Concrete Constructions (Tasmania). Construction commenced in January 1994 with the excavation of the foundations and pouring of blinding concrete, approximately 90 cubic metres of which was used to replace significant clay seams in the foundation rock. The ring beam was then anchored to the bedrock by 18 rock anchors at depths varying between 10 and 15 metres. Each of these were post-tensioned to 2000 kN (≈ 200 tonnes).

The tower shaft was poured using a specially designed slipform. The slipform was based on a Swedish design, incorporating the ability to reduce in diameter and vary the wall thickness and slope. This occurred while constantly moving upwards at an optimum rate of approximately 200mm per hour. It was assembled on the ring beam and after tests and adjustments, the concrete pour commenced on 23 March. Due to some technical problems and the frequent intervention of the weather, the slipforming period was extended from 3 weeks to approximately 8 weeks.

Although it was scheduled to operate continuously 24 hours per day for up to 6 days the regular occurrence of high winds, snow and icing frequently made shut-downs necessary, particularly in the latter stage of the slipforming operation. Construction work often continued in the poor weather conditions until a stoppage was forced by the wind speed exceeding the maximum operating speed of the Alimak personnel access hoist.

The tower is to be temporarily capped during the winter period and the internal access ladders and cable runway steelwork is to be installed before the commencement of Stage 2 of the construction, scheduled for November 1994.

TOM GLASS

Final stage of slipform assembly and adjustment.

Slipform at RL49m and progressing upwards.

3PB MELBOURNE

PARLIAMENTARY BROADCAST FACILITY

The Parliamentary Broadcast Network station 3PB Melbourne began transmission from the 3RN/3LO Sydenham site using the standby 3RN 10 kW STC transmitter type 4-SU-64 and associated aerial, on frequency 1526 kHz.

In 1990, the operators of Commercial station 3TT (formerly 3DB) on 1026 kHz were granted a licence to transfer to the FM band and as part of the licence agreement the AM broadcasting facility was transferred to the National Transmission Agency which planned to employ the facility for use with the Parliamentary Broadcast Network. The FM service with call sign 3TTT became operational on 24 June 1990.

Station 3DB began operation on 21 February 1927 as a B Class station with licence being held by Druleigh Business and Technical College Pty Ltd, with the call sign being derived from the business name. Subsequent licensees included 3DB Broadcasting Co,. Pty Ltd and The Herald and Weekly Times Ltd. Call sign was later changed to 3TT with licence being held by Korfield Pty Ltd.

The site occupies approximately 4 hectares of prime residential land in the suburb of Viewbank, some 15km east of Melbourne. The station includes two Nautel AMPFET 10 solid state transmitters in a near new brick building with transmitter room, test room and engine room. The 134m high lattice steel omnidirectional radiator is fed by an underground coaxial cable.

In April 1993, the 3PB service began operation from the Viewbank site using one of the Nautel 10kW transmitters. The program input equipment was configured to provide automatic start up under control of program fed from the studios. Operating frequency was changed from the previous 1526 kHz, to the 3TT frequency of 1026 kHz.

3 PB 10kW Nautel transmitter at Viewbank.

Aerial tuning unit switchable between 3 PB and 3 LO.

The other Nautel 10kW transmitter was set up to provide an alternative outlet for 3LO with a new coupling unit being provided. This added facility was later expanded to provide a service for both 3PB and 3LO when required, at a power of 10kW. Programmed arming and configuration is provided under MIC control via ACTTs and IDEC controller.

MELBOURNE DBM STAFF

PAPUA NEW GUINEA

VISIT TO AN INTERESTING COUNTRY

In February 1993 the National Broadcasting Commission (NBC) of Papua New Guinea requested assistance to develop a plan for a 'comprehensive overhaul' of its MF and HF antenna systems. As part of the ABU's Technical Advisory Service, Telecom Broadcasting was requested to address the NBC's requirements and an officer from Brisbane was seconded to the project. Initial discussions with the staff of the NBC saw the need for detailed inspections at some of the more problematic sites and an itinerary for a 3 week visit to the country during May 1992 was agreed.

This was by no means our first involvement with Papua New Guinea - indeed, prior to independence, the National Broadcasting Service of the (then) Territory of Papua and New Guinea was installed and operated by PMG radio staff over a period of some 30 years. The first NBS service to go to air was 9PA Port Moresby, which was opened by General MacArthur in February 1944 with a station staff consisting of both Australians and Americans.

There are several hundred languages in everyday use throughout Papua New Guinea particularly in areas outside the major townships, so it wasn't very long before the demand for greater localism in programming and the need for wider coverage gave way to the establishment of a network of provincial and national services. By the time the new Broadcasting Commission of Papua New Guinea took over all national assets in 1973 and PMG Department staff finally handed over operations in 1974, the network consisted of MF and HF services covering most of the nineteen provinces. Today, most of that same network still exists and, with a few additions since, consists of eight MF services, about thirty HF services and sixteen FM services.

The NBC is responsible for the provision, operation and maintenance of both the studio and transmission aspects of broadcasting in Papua New Guinea, and thus performs a similar function to the combined roles of the ABC, the NTA and Telecom Broadcasting here in Australia. My official contact and guide for the duration was Mr Joe Wafewa, Senior Technical Officer with the Transmission Section of the NBC.

My first port of call was the NBC headquarters in Boroko, Port Moresby where I spent a few days with the local NBC staff refining the terms of reference for the project, examining local records and inspecting the main transmission site for the National Capital District at Waigani, Port Moresby.

Travel by air in Papua New Guinea is the most common and often only means of traversing the rugged terrain of the mainland and the many islands. It was decided to inspect ten of the nineteen provincial sites comprising five mainland and five island sites; so with our flights booked, Joe and I set out on what seemed a whirlwind tour of the country.

From Port Moresby we travelled to Mt Hagen in the Western Highlands Province for a brief stop over. This was to be our only exposure to the pleasant and cooler climate of the highlands. The scenery in and out of Mt Hagen was spectacular - the flight path into Mt Hagen

Searching for the aerial coupling unit.

Air Niugini flight at Lae airport.

takes one past some of the highest (and sometimes snow-clad) peaks in Papua New Guinea; Mt Wilhelm being the highest at 4,509 metres.

From Mt Hagen we continued on to Madang on the North East coast of the mainland and then on to Wewak, in the East Sepik Province. The Sepik region is renowned for its artistic culture especially its paintings, carved masks, and wooden artifacts. The mighty Sepik River, one of the world's greatest rivers, enters the sea in this province. The Hotel is worth visiting just to see the magnificent crocodile bar, some 10 metres long and carved out of solid timber. Also in the same bar are dozens of huge carved wooden chairs (more like thrones), each of a solid one piece construction standing up to two metres tall and almost one metre across.

From Wewak we travelled to Vanimo, capital of the West Sepik (or Sandaun) Province in the far north west. This is one of the more isolated mainland Provinces, and Vanimo itself exists mainly as a shipping port for the local logging industry and as a guard post for the Irian Jaya border only 30km further to the west.

On leaving Vanimo we headed back to Wewak and then across the Bismark Sea to Manus Island, part of the Admiralty Islands group. Manus, situated just 2 degrees south of the equator, would have to be one of the most picturesque islands within Papua New Guinea - surrounded by hundreds of smaller islands and coral atolls, with palm trees flanking the white sandy beaches and crystal clear water - real postcard stuff. Standing by the waters edge one could see the colourful tropical fish in abundance. Although it has not always been so tranquil - the Japanese occupied Manus in 1942, and in 1944 American and Australian forces recaptured the island. It was then to become a large naval base to counterbalance the Japanese forces at Rabaul. At times, as many as 600 Allied ships were anchored in the harbour and an estimated one million Allied troops passed through. At the end of the war the Allied forces left as they came, leaving very little behind, and what couldn't be removed was scrapped. Only the barracks and hospital remain, along with some wreckage strewn along the harbour's edge.

From Manus we headed for Kavieng in the New Ireland Province and after an overnight stay headed for Rabaul, capital of East New Britain Province. Rabual is certainly one of the more interesting places in Papua New Guinea, lying on the rim of a huge flooded volcano and surrounded by several others. Daily earth tremors are a common occurrence and go unnoticed by the locals. There are also many war relics in the area to visit and apparently some of the best coral reefs in Papua New Guinea for the keen diver.

The remainder of our journey went on to Hoskins, back to Port Moresby, up to Lae and then finally to Daru in the remote Western Province, just kilometres from the Northern Waters of Australia. Throughout the land the PNG people were friendly and hospitable and apart from my formal duties it was a most interesting and enjoyable visit to what some would say is truly the last unknown continent.

KENT LECHMERE

Hotel on the beach at Wewak.

Parliament House Port Moresby.

RADIO AUSTRALIA

SHEPPARTON - 50 YEARS OF CONTINUOUS SERVICE

On the afternoon of 15 May 1944, scheduled overseas broadcasting from the new Shepparton International HF transmitting site was inaugurated. The first transmission took place in the 15 MHz band and was directed to the Philippines using an RCA 50 kW ML Series transmitter.

Records show that although the first transmission got off to a good start, it was not long before a momentary fault resulted in a transmitter overload and re-close. The clatter and bang of electrical contractors as the transmitter cycled 'off' and 'on' caused the assembled gathering to take up a new vantage point a little further down the transmitter hall. I am sure Officer-in-Charge Jack Hargreaves would have given his moustache a little twist and have taken charge of the situation!

And so began regular broadcasts from the Shepparton site - indeed the old ML Series transmitter is still installed at Shepparton and was only recently taken out of service. Nearly 50 years of continuous service has got to be a record in terms of Australian HF broadcasting.

The ML Series transmitter consisted of two 50kW power amplifier stages and a single modulator and power supply. This arrangement allowed a 50 kW amplifier to be preset to a new frequency and then switched into service as required - the forerunner of auto band changing.

The final power amplifier consisted of two 880 water cooled triodes operating in Class C push-pull, and driven by two 827R valves. The modulator also used two 880 triodes, in push-pull Class B, and were coupled by multiple 828 types as a cathode follower.

In 1959, the switched system of dual 50 kW amplifiers was modified and an additional modulator and power supply were constructed by local technical staff. The outcome of this work was two separate 50 kW transmitters.

The ML Series of transmitter was fitted with a Morse keying unit, and this was used to advantage during the early 1950's to initiate successful pulse reflections from the moon. A receiving site was established in NSW and transmitted moon bounce reflections received from Shepparton. The rhombic antenna used at Shepparton provided a small transmission window for earth-moon alignment. This was history in the making.

The old 50 kW transmitter was also used for successful 28 MHz propagation tests in the early 1960's.

So, on 15 May 1994, a milestone in PMG/Telecom broadcasting history took place. It was a day to look back and to think of 50 years of continuous service and those who had gone before us as well as the contribution made by Telecom in the shaping of the world around us. It was a time when technical staff reminisced and talked at length about some of those special times on shift - when valves sucked in water, when staff nearly forgot a transmission, or when a listener telephoned from overseas to say hello to the forgotten staff at the transmitter site.

When I browse through the old records and note the names of the hundreds of people who have worked at Shepparton, I am reminded of the role that HF broadcasting has played in so many people's lives, but more than that, I am reminded of the hundreds of thousands of broadcast hours which have been beamed all over the world, and the millions of listeners who have gained so much pleasure and enjoyment. Something for which we can all be justly proud.

BRUCE WILSON

The RCA installation today.(Photo Ian Carman)

TRAINING

TECHNICAL TRAINING IN ABC TELEVISION

The staff who plan, install and maintain the broadcast equipment in ABC Television are Broadcast Engineering Officers (BEOs). These skilled staff are required to have an Associate Diploma in Electronic or Electrical Engineering plus a broadcasting qualification equivalent to the TVOCP (Television Operators Certificate or Proficiency). The broadcast areas that BEOs service includes studios, outside broadcast, post production and master control. The range of equipment in each of these areas is considerable and the staff are required to be up-to-date in modern broadcast technology. There is minimal 'surplus' equipment available and BEOs have to be able to efficiently repair faulty items to meet television production demands. Therefore staff training plays a vital part in the television system.

Some years ago there was a steady stream of Technical Trainees in the ABC. However, the reduction in budgets and a shrinking in BEO numbers has meant that a complete change in training emphasis has occurred. In the past a great deal of training effort was put into trainees - now it has to be placed into knowledge and skills upgrading of existing staff.

The range of technical training can be roughly divided into three categories: broadcast technology, equipment orientated training and software training.

Broadcast Technology : This covers subjects such as digital audio, digital video, stereo principles, refresher courses and new developments in broadcasting. These type of courses are normally conducted by 'in-house' training officers. High reliability soldering (including SMD training) are scheduled to keep staff skills up to standard.

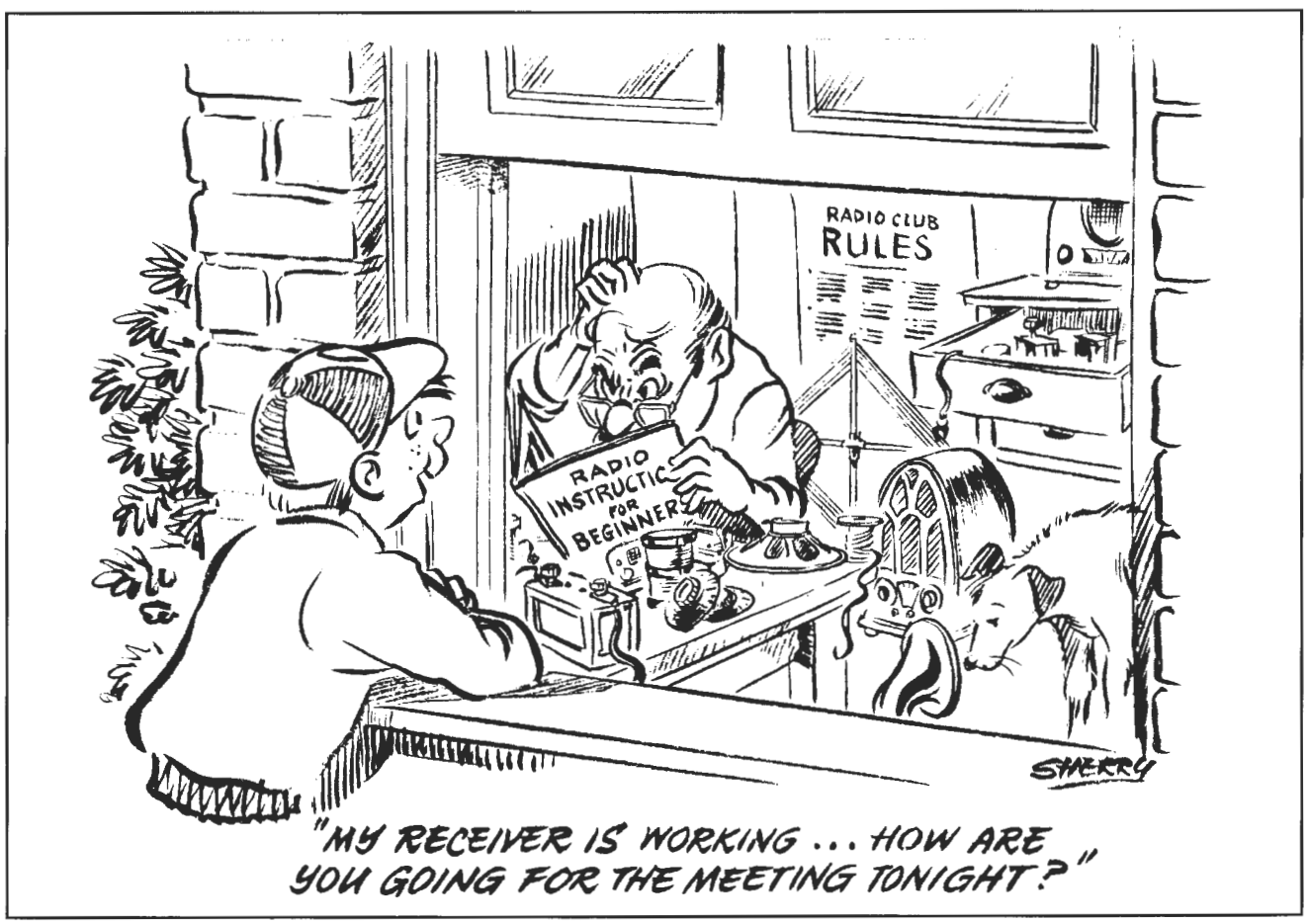
Equipment Training : It is now normal to expect comprehensive technical and operations training to be provided with the introduction of new range of broadcast equipment, whether it is new studio cameras or post production editors. This training is arranged via the supplier or manufacturer and ranges from 1 day to 2 weeks, depending on the complexity of the installation. When overseas trainers are involved, the cost of this training can be considerable. Computer hardware training also falls in this category.

Software Training : This includes training on subjects such as MS DOS, Financial packages and CAD training. It also includes Project Management courses. Most software training is obtained externally.

The training section maintains a library of publications to assist BEOs in keeping abreast of broadcast operations and technology. This includes fundamental television subjects as well as equipment orientated material.

The introduction of digital broadcast equipment into ABC is around the corner. This will mean the development of strategic training plans to handle this massive change in equipment, facilities and operations. Overseas experience indicates that these changes will require special tailored training to meet BEO requirements in the late 90's and beyond.

BOB SITSKY



RADIO AUSTRALIA DARWIN

TRANSMITTER ACCEPTANCE TESTS

The testing of the new Thomson-CSF TRE 2325 transmitters at the Radio Australia transmitter station on Cox Peninsula near Darwin has recently been completed.

Tests of HF broadcast transmitters used for international broadcasting are in many ways unique because of the operational requirements of the transmitters and their limited production numbers. The transmitters are required to be frequency agile with short tuning cycle times, they operate at very high power and use modulation techniques to minimise power consumption while maximising recovered audio at the receiver.

Power Output Measurement

Conventional in-line wattmeters are generally not used in testing high power HF transmitters. Typically the output power is confirmed at the dummy load by calculating the rate of heat transfer.

High power dummy loads normally consist of a load resistance made from metal tubes in a conductive liquid of water mixed with soda ash. The liquid temperature is controlled in order to provide a constant load impedance and excess heat is dissipated through a heat exchanger into a separate cooling water path connected to a cooling tower. By measuring the temperature differential across the heat exchanger and the rate of cooling water flow, the rate of heat transfer in kW can be calculated.

Transmitter power conversion efficiency is normally determined at factory testing where the dummy load heat exchanger instrumentation is calibrated by applying mains power to the RF terminals and the input power is measured using the calorimetric method without calibration and the accuracy of the transmitter output power indicators is established at a couple of frequencies, usually the highest and lowest used by the transmitter. Subsequently output power is read only on the transmitter instruments.

The Thomson-CSF TRE2326 transmitters deliver in excess of 250 kW on all international broadcast band frequencies in the range 5.95 to 26.1 MHz.

Efficiency

Considerable emphasis is placed on the overall efficiency of high power transmitters because the cost of electricity is by far the most significant operating cost. In Darwin the cost of electricity for a conventional 250 kW transmitter operating 24 hours a day would be about $750,000 per year. In selecting transmitters a key factor in the final decision is the operating cost and typically penalty clauses are included in contracts which reduce the contract price if the overall efficiency is below that claimed by the manufacturer.

Efficiency is determined by comparing the output power into the dummy load against the input power to the complete transmitter including all auxiliary loads such as cooling fans, pumps, heat exchangers and power transformers. Definitive tests are normally conducted at the factory where the dummy load has been calibrated and precision mains power metering is available. On site tests are normally used only to confirm the factory test results as their accuracy cannot be assured.

The overall efficiency of the Thomson-CSF TRE2326 transmitter was measured at better than 75% and this represents a potential saving in operating costs in the order of $250,000 per year over conventional Class B plate modulated transmitters of the same output power.

Power consumption can also be reduced by using

The Thomson – CSF TRE 2326 transmitter.

dynamic carrier controlled modulation techniques and reduced carrier SSB.

Tuning Time

In international shortwave broadcasting the operating frequency needs to be changed regularly during the day to take into account diurnal variations in ionospheric characteristics and changes in target areas. In order to minimise disruption to programs the time taken to change frequency needs to be limited. Typically a maximum time in the order of one or two minutes is allowed in programming for frequency changes.

Limits of 10 seconds for frequency changes within the same shortwave broadcasting band and 45 seconds between bands are normally specified.

Testing of change times between frequencies and bands in both upward and downward directions is undertaken as part of the acceptance testing program. Worst case tests between maximum and minimum operating frequencies are

Transmitter control panel and video colour display module.

normally used.

Generally this tuning is between frequencies at which the transmitter has been pre-tuned and servo positions memorised. Often tuning to non memorised frequencies is required and tune times are generally longer as automatic matching is required.

Heat Run

In order to test the longer term capability of the transmitter to produce its rated output power a heat run test at extreme levels of average modulation is normally conducted. The test is typically for 24 hours and would consist of 12, two hour periods. During the first period the transmitter is run for 50 minutes at rated output power and modulated at 60% with tone, for the next 10 minutes the modulation is increased to 100%. During the second one hour period the transmitter is run at output power with processed audio peaking at 100% modulation. (This is equivalent to about 30% average modulation).

This test is in fact more strenuous than normal operation and is intended to heat stress the transmitter components in an attempt to ensure by a short duration test that the transmitter can perform adequately in the longer term under normal operating conditions.

Performance Tests

Other performance tests include:

- Audio Frequency and Amplitude Response
- Total Harmonic Distortion
- Intermodulation
- Spectral Purity & Carrier Harmonics

which are generally similar to testing carried out on other transmitters.

Computer Control Tests

Most major HF transmitters are now normally capable of remote computer control and monitoring and this function needs to be tested by fully exercising all controls remotely.

High pressure and low pressure air ventilation systems.

Safety

Inspection of safety features to ensure compliance with operational safety standards such as IEC 215 are required.

Similarly, testing of overload and over-temperature protection devices is required as part of the site acceptance testing procedure.

Marc Moreau and Guy Pellett of Thomson-CSF assisted with the installation and testing activities.

GRAHAM BAKER

BROADCASTING MILESTONES

4QL LONGREACH

Following a decision to provide a high power National regional station in Queensland's central west, a temporary low power installation with call sign 4QL and operating on 690 kHz was placed in service in 1947 at Longreach.

The transmitters were two Tasma BC200 types which were located in a fibro-cement sheeted timber framed building at the rear of the Post Office. The aerial wire went vertically up from the coupling box to the top of a 22m high 50 mm diameter steel pipe insulated at the base and then continued at an angle to the top of the nearby Council water tower.

In 1954, a new transmitting station was established across the river at Cramsie and the station at the Post Office closed down. The main 10kW transmitter at Cramsie was an AWA BTM type J56700 which fed a four pole delta aerial pending the provision of a lattice steel 198 m lattice steel radiator. The new radiator was commissioned on 31 August 1959. In 1988, the ageing BTM transmitter was replaced by a single solid state Nautel Amphet 10kW unit with the transmitter being installed in a Logan building near the main building. The original station building was removed during 1992.

Since unattended operation of the station commenced in 1983, many changes have occurred to improve operational reliability. The main/standby aerial switching and transmitter operation are all controlled by an Idec Program Logic Controller. Besides local housekeeping, the PLC is interfaced to the mini ACTTS so the Monitoring Information Centre can carry out switching functions if required.

DOUG McVEIGH

L-R : PIE rack, ACTTS rack, mains transformer, 10kW Nautel transmitter.

Main coupling hut and 198m radiator commissioned 1959.