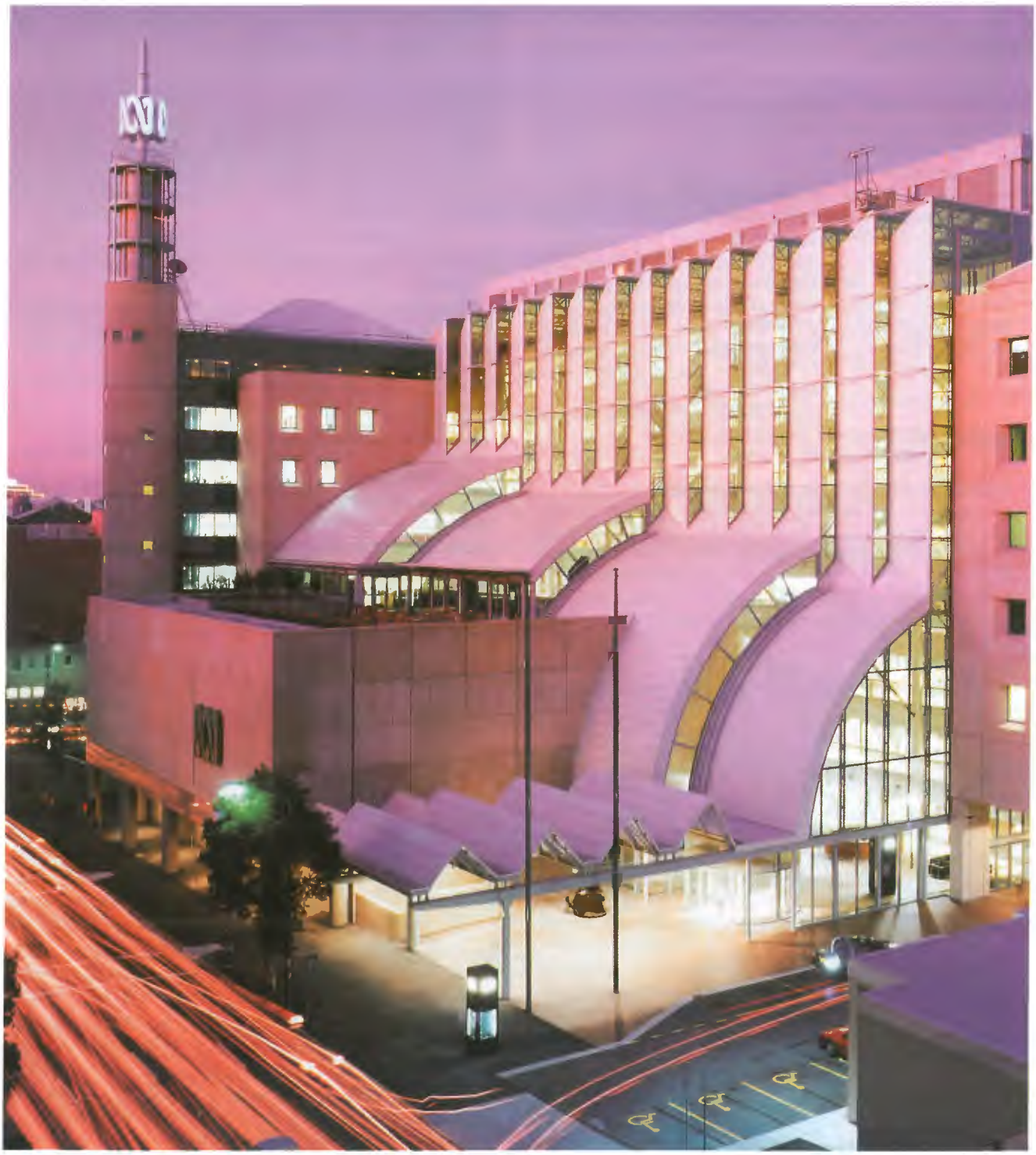
The BROADCASTER

Newsletter of the Broadcasting Division

No. 23 July 1992



THE ABC ULTIMO CENTRE

THE BROADCASTER

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

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EDITORIAL

This month is the 60th Anniversary of the establishment of the Australian Broadcasting Commission.

In 1929, the Government acquired the A Class stations comprising 4QG, 2BL, 2FC, 3LO, 3AR, 7ZL, 5CL and 6WF to form the National Broadcasting Service.

The Postmaster General's Department was given responsibility for operation of the studio technical facilities, the transmitters and program lines, as well as planning and provision of future services. The provision of programs was contracted out to the Australian Broadcasting Company Ltd.

On 1 July 1932, the Australian Broadcasting Commission was formed to take over program aspects of the service. With the introduction of television in 1957, the Commission also undertook responsibility for provision of programs for the National Television Service.

The Commission was succeeded by the Australian Broadcasting Corporation on 1 July 1983 and now sixty years on, is an enormous organisation. Staff numbers have grown from 265 to about 6000, studio networks have increased from 1 to 8 plus Radio Australia, the radio transmitter outlets alone now exceed 486 compared with 12 in 1932 and the annual budget has grown from $0.5 million to well over $500 million.

Today, one of the ABC's priorities is to ensure an efficient, forward looking and responsive organisation with a focus on results.

JACK ROSS

Front Cover:

Photo courtesy ABC.

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"YOU SAY THE ABC IS SIXTY YEARS OLD... BAH! THE GOLDEN DAYS OF RADIO DIED YEARS AGO!"

Leon Sebire.

FROM MY DESK

In the last issue of *THE BROADCASTER* I spoke of changes in our industry stemming from the formation of the National Transmission Agency (NTA) and the potential introduction of competition into our sphere of activities.

With the current emphasis in our business thrusts on "delighting the customer" it is perhaps appropriate to consider our relationships with others and attempt to define precisely who it is we should aim to delight.

Strictly speaking, our major customer will be seen to be the NTA, the body who will determine the work to be done in the National Broadcasting Transmission Service and who will do it. Currently, with about 95% of our revenue coming from this source, we need to establish pricing and a quality level that does not merely satisfy, but more importantly impresses, this important customer.

The ABC and SBS can be regarded as direct customers of the NTA because, at this time, they have no alternative source of transmission facilities. In consequence, it is essential that we ensure that these customers of our major customer are completely satisfied with the performance and reliability of the facilities we hope to continue to supply.

The audiences are ultimately the customer of the ABC and SBS and we also need to ensure that the availability and performance of the transmission system ultimately "delights" the viewers and listeners.

Not to be forgotten are the suppliers and service providers on whom we are dependent, as a customer, for obtaining much of what we need to do our job.

Managing these interfaces to the complete satisfaction of all parties concerned is vital to the continued success of our business.

The above is the major thrust of what is now referred to as Total Quality Management (TQM), a subject with which all of us will need to become familiar in the near future.

LEON SEBIRE

General Manager, Broadcasting

STATION ROLL CALL

2ABC-FM SYDNEY

The very early days of Sydney's National FM service had a somewhat colorful beginning.

An experimental, locally built Frequency Modulated 1kW transmitter was put to air from the PMG's Radio-communication Radio Laboratory at 24 West Street, North Sydney during 1952. This transmission system used an existing 30m tower with an antenna of unknown type.

Program for the service was supplied from the ABC's studio at Forbes Street, Sydney.

The rig caught fire some time during 1958, and was partially destroyed.

The remains were transported to Gore Hill where it was rebuilt by TV staff under guidance of STO Charlie Youngston.

A new exciter was locally constructed, based on the Marconi Fequency Modulated Quartz (FMQ) television transmitter sound exciter unit.

The service was recommissioned during 1959, at Gore Hill using a six inch rigid copper feeder driving a series of vertical dipoles mounted on a 27m vertical pole on the top of the existing television tower.

The service was discontinued during 1960, and the equipment sold to the North Sydney Technical College for training purposes.

On Saturday 26 January, 1976, the ABCFM – fine music service – was established in Australia with program originating in the Adelaide studios of the ABC.

At Gore Hill a 10kW FBN-5100B series transmitter was installed using the existing six inch rigid copper feeder and a new antenna system.

During 1985, the NEC transmitter was replaced by an NEC type FBN-9100E unit.

LEN GREENING

ABN2 SYDNEY

ABN 2 Gore Hill, Sydney commenced transmission on 5 November, 1956 in time to telecast the Olympic Games held in Melbourne in that year.

The first ABN2 transmission originated from a 5kW vision and 1kW sound transmitter manufactured by Marconi Ltd, England. The transmitters were connected to a Marconi Batswing antenna on top of a temporary 30m self supporting tower.

In 1958, the system was upgraded by the installation of a Marconi 18kW vision and a 4kW sound transmitter plus the now familiar 144m tower. The antenna system consisted of an eight stack Marconi designed and manufactured Supergain antenna type BD773B, and associated rigid copper line feeders complete with the necessary expansion joints which allows for change in the rigid feeder length between summer and winter month temperatures.

It is of interest to note that this antenna and feeder arrangement is still in operation some 35 years later. With the need to increase the effective radiated power of this service, the old Marconi antenna system and feeder arrangement will shortly be replaced.

In March 1975, a pair of Marconi/AWA type TVB10C transmitters were commissioned to replace the then ageing Marconi equipment.

These Marconi/AWA transmitters were a hybrid combination of solid state and valves and proved to be vastly superior in telecasting the newly introduced colour signals.

On 1 February, 1992, the Marconi/AWA 10kW transmitters were replaced by a pair of 2 x 20kW NEC type PCN-1420SSL IF modulated VHF TV transmitters, completing the cycle from all valve to total solid state operation.

LEN GREENING

NATIONAL AUSTRALIA DAY COUNCIL AWARD

Gary France, Supervising Structural Engineer, in the Engineering Services Section of the Broadcasting Division, National Office, was recently presented with a National Australia Day Council Award by Les Rodgers, Acting General Manager, Broadcasting. Gary earned this award for the outstanding service to the community in the areas of education, life saving and the environment. Gary has actively served on many committees, including Noble Park Kindergarten, First Noble Park Scout Group, the Society for Growing Australian Plants, to name but a few. He frequently takes part in money raising activities for these groups as well as for the Chelsea Life Saving Group.

Acting General Manager, Broadcasting, Les Rodgers (L) presenting Award to Gary France.

Gary has been a Noble Park Primary School Council Member since 1987, and is the current President. He invests much of his spare time attending meetings, curriculum days, working bees and serves on a number of sub-committees. As President, Gary obtained the support and assistance of the City of Springvale Councillors and the Environment Officer and was heavily involved in developing a major planting project in the school's grounds. With his enthusiasm and organisational skills, Gary was successful in planning and gaining funding for an "Urban Forest" to beautify the school grounds. Planting of the indigenous "Urban Forest" has commenced. The project aims to reinstate the original vegetation to the area adjacent to the railway line. As a flow on from the school's own planting projects, pupils have become involved with the "3 Stations Project" to the benefit of the broader community.

Gary joined Telecom's Broadcasting Directorate in February 1986 as Engineer Class 3 after having worked in private enterprise for a number of years including service with the Consulting Engineers, H.R. Keogh & Co.; Fabricators Standard Steel; Johns and Waygood; and Maunsell and Partners, Consulting Engineers. Since joining Telecom, he has been engaged in a wide range of structural engineering projects associated with the Division's television and sound broadcasting responsibilities.

SANDRA MANNINGS

REMOTE SWITCHING OF TV TRANSMITTERS

With the aid of modern technology, TV transmitters of the National service can be remotely switched ON and OFF from the ABC Master Control Centre via AUSSAT satellite and B-MAC decoders which also carry the TV plus sound program.

In the transmitted B-MAC signal is a data channel in which are found B-MAC encrypted data packets. Each decoder has a large random number programmed into its microprocessor and this is used to decrypt the data packets. Each number is unique and this ensures that a data packet for a particular decoder does not get decrypted by others. Also, from a security stand point, it means that unauthorised parties cannot transmit to a decoder since the secret number is known only to the legitimate operator.

A wide variety of data is contained in the packets and from a Telecom point of view, it is usually used to authorise a decoder to switch ON or OFF as required. The request to switch a decoder number is required before anything can happen and a data packet is usually made by Telecom staff at a transmitter site for testing and maintenance purposes. The decoder is sent to just that decoder. In the case of a switch OFF, the decoder on receiving the packet, removes the vertical field block from the decoded signal and, in the time honoured fashion, the transmitter switches OFF. A packet to switch ON simply restores the vertical field group. The microprocessor in the decoder, containing the information about itself, is totally self contained and tamper proof. It accepts only inputs from a B-MAC encoder and any attempt at manipulation, results in total destruction of the information. Motorola spent three years developing the system and it has never been defeated.

LIAM NEYLON

LEON DUDLEY SEBIRE, AM

As reported in the July 1991 issue of *THE BROADCASTER*, our General Manager was made a member of the Order of Australia for service to communications, particularly broadcasting.

On 1 May 1992, he was invested with the Award at Government House by His Excellency the Honorable Richard E McGarvie, Governor of Victoria.

PRE-EMINENT BROADCASTER

MR A J (ALEC) McKENZIE

Alec McKenzie, a dedicated broadcaster for most of his working life, passed away in Melbourne on Tuesday, 3 December, 1991.

Alexander John McKenzie was born in 1905 in country Victoria and was educated at State Schools at Moorookyle and Smeaton, and at Ballarat College where he was Dux in 1922 and matriculated with First Class Honours and an Exhibition in Leaving Honours Physics.

He then went on to the Engineering school at the University of Melbourne gaining Exhibitions in electrical engineering in 1924 and graduating Bachelor of Electrical Engineering with First Class Honours and the Dixon Prize in 1926. In 1938, he completed a Masters Degree.

Alec joined the staff of the Research Laboratories of the Engineering Branch of the Postmaster General's Department in 1927. He worked in this area until 1944 and then transferred to the Radio Section of the Engineering Branch. During the period he was engaged in many important radio engineering projects including:

Mr A J (Alec) McKenzie

• The design of the 3.5kW broadcast transmitter to replace the outdated 6WF transmitter in 1932. This was the first broadcast station to be designed with the transmitter being manufactured and installed by the PMG's Department, after the Department took over the A Class stations throughout Australia to form the National Broadcasting Service.

• The development of a loaded flat top lattice steel radiator for medium frequency transmission, and having anti-fading properties. In this work he was a member of a team engaged in radio and structural design. Subsequently, he designed a radiator of this type having a top loading network enabling the mast to have optimum anti-fading properties at two frequencies. Masts to this design were subsequently erected at NBS stations and are still in service. Details of the design were published in the Transactions of the Institute of Radio Engineers, USA in 1955.

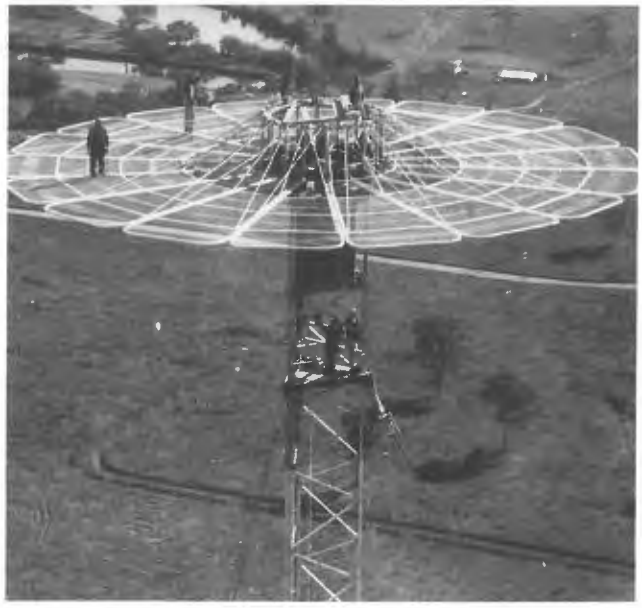
• In 1938, he designed and developed a network to enable 3LO/3AR to simultaneously transmit from a single radiator. Other stations were later equipped with similar networks.

• The design and installation of a number of high frequency transmitting aerials at Lyndhurst, including an aerial capable of simultaneous transmissions on three frequencies.

• The design of aerials, transmissions lines and a switching system for Radio Australia, Shepparton, project during the War years.

• The design and construction of two VHF transmitters which operated at Jolimont, Melbourne for a number of years on an experimental basis before the commencement of a full scale FM service.

Following the establishment of the Australian Broadcasting Control Board he occupied the position of Assistant Director Technical Services (Development) from 1949 to 1968. This was followed by two years as Director of Technical Services of the Board. He was a member of the team engaged in the technical planning for the television broadcasting service which commenced in 1956. Alec attended many overseas professional conferences including meetings in London, Paris, Stockholm and Los Angeles.



Erection 4QG/4QR top loaded dual frequency radiator, one of Alec's major contributions to broadcast engineering.

He retired from the Board in 1968, and for eight years worked with the acoustic consulting firm Gerald Reilly specialising in specifications for duct sound attenuators for large ventilation systems.

As well as his professional career, Alec was a family man, helping his wife Beth raise their four children, and was a strong churchman, being an elder of the Presbyterian Church for 40 years, a member of the Board of Management and a Sunday school teacher. He also found time for a wide range of other interests, including a passion for poetry, especially that of Robbie Burns.

In both private and professional life, Alec was a tolerant and compassionate man while setting high standards which he expected to be met. This was coupled with a dry sense of humour. Alec will be remembered with affection by all who knew him.

GIFF HATFIELD

THE DYNAMIC DAMPER

"What is a Dynamic Damper?" I hear you say. No, it is not a "super-dooper" damp cloth to be placed to the feverish brow. However, it does have a similar effect on a vibrating tower or mast structure. It absorbs the dynamic energy causing slowing, and ultimately stopping, the wind induced vibrations in a structure. For a better understanding read on.

All towers and masts move in response to the wind pressure on them. The fluctuations in wind strength and the turbulence created by certain shapes of bluff body object (i.e. large UHF antenna arrays) is enough to excite some structures into an oscillating motion. If the structure is excited to vibrate at or near its own natural frequency and the structure has low natural damping, then the vibrations can build with potentially catastrophic effects. This is a rare occurrence.

Typical sealed sloshing damper container.

For broadcasting structures there are two main areas of concern associated with structural vibration. Firstly, if the amplitude of the movement is too great particularly at low wind speed, then the resulting movement of the antenna array will cause the broadcast signal to fluctuate to an unacceptable level. Broadcasting towers and masts are generally designed with sufficient stiffness to ensure that the broadcast signal remains within the acceptable field strength limits for at least 99.9% of the time.

The second area of concern is that of structural fatigue created by repeated fluctuations in component stresses. The effects of this may become apparent in both the short or long terms, dependent on the stress magnitude relative to the number of vibration cycles.

The natural damping within a structure comes from a combination of energy dissipating characteristics such as slippage in bolted joints, etc. Generally, there is enough natural damping within structures to dissipate vibrations relatively quickly once the source of the vibration is removed. However, in some cases continued forced vibration can cause large amplitude motion to build up and be maintained with little effect from the natural damping. This can lead to undesirably high peak stresses and accelerated fatigue.

The most expedient way of mitigating this problem, particularly in existing structures, is to install auxiliary damping. This can take various forms but it is necessary to tune it to the structure. Two such systems have so far been developed for broadcasting structures in Australia.

One is a Tuned Sloshing Damper system in which the dynamic energy of the structure is dissipated by wave action. This is achieved by liquid sloshing against the sides of a container which is fixed to the structure. The mass of liquid can be optimised by using many containers with small amounts of liquid in each.

Stack of 10 sloshing containers. Eight stacks were installed within Mt Wellington tower.

However, this arrangement is unsuitable for structures where there is insufficient room for a large number of containers, such as masts. Consequently, a different system utilising a single doughnut-shaped cylindrical tank has been developed for the Lookout Hill mast in Victoria. This unit mounted at the point of maximum deflection, at the top of the UHF antenna, provides the optimum effect. The damping action is achieved by liquid sloshing against the cylinder walls, and strategically positioned and sized baffles.

The hostile environment of these broadcasting sites has necessitated the liquid being an ethylene glycol solution to prevent freezing.

TOM GLASS

ARMY STATION

5DR DARWIN

The initial stations which formed the National Broadcasting Service in 1929, were taken over from operators of A Class stations. From that beginning, expansion of the network resulted from installations by the PMG's Department and later Telecom, with the exception of a few isolated cases. One of these was 5DR (later 8DR) Darwin.

The station was originally commissioned for and operated by the Australian Army Amenities Service using a transmitter manufactured by Thom and Smith Pty Ltd, Sydney.

In August, 1944, I went to Darwin to select a site in the company of an Army Officer for an Army Amenities broadcasting station. Two sites were selected, with one being at Cemetery Plains for a transmitting station and the other at Leanyah Swamp for a receiving station.

The transmitter/studio building was a couple of Sydney-Williams huts joined together to form one large structure and lined with sound absorbing material. One section housed the transmitters and another housed the speech/input equipment which consisted of microphone, gramophone equipment and land/line switching panels for program lines from the receiver site. This section also served as the studio. Programs consisted mostly of 16 2/3 rpm records of USA origin with news and other items available from the BBC and Radio Australia from the receiver site.

The transmitter, a BC200 series made for eight broadcasting stations throughout New Guinea and other areas under military control north of Australia, was mounted in metal cabinets and used two 813 valves in parallel providing 200 watts RF output. The high level modulator employed a pair of 813 valves in push-pull.

The transmitting aerial was a centre fed flat top with three elements connected to wooden spreaders at each end. The array was mounted between two sectionalised guyed wooden masts 100ft (30m) high and 250ft (76m) apart. Matching equipment linking a six wire 200 ohm transmission line to the aerial comprised an inverted L network and meters mounted in a metal box.

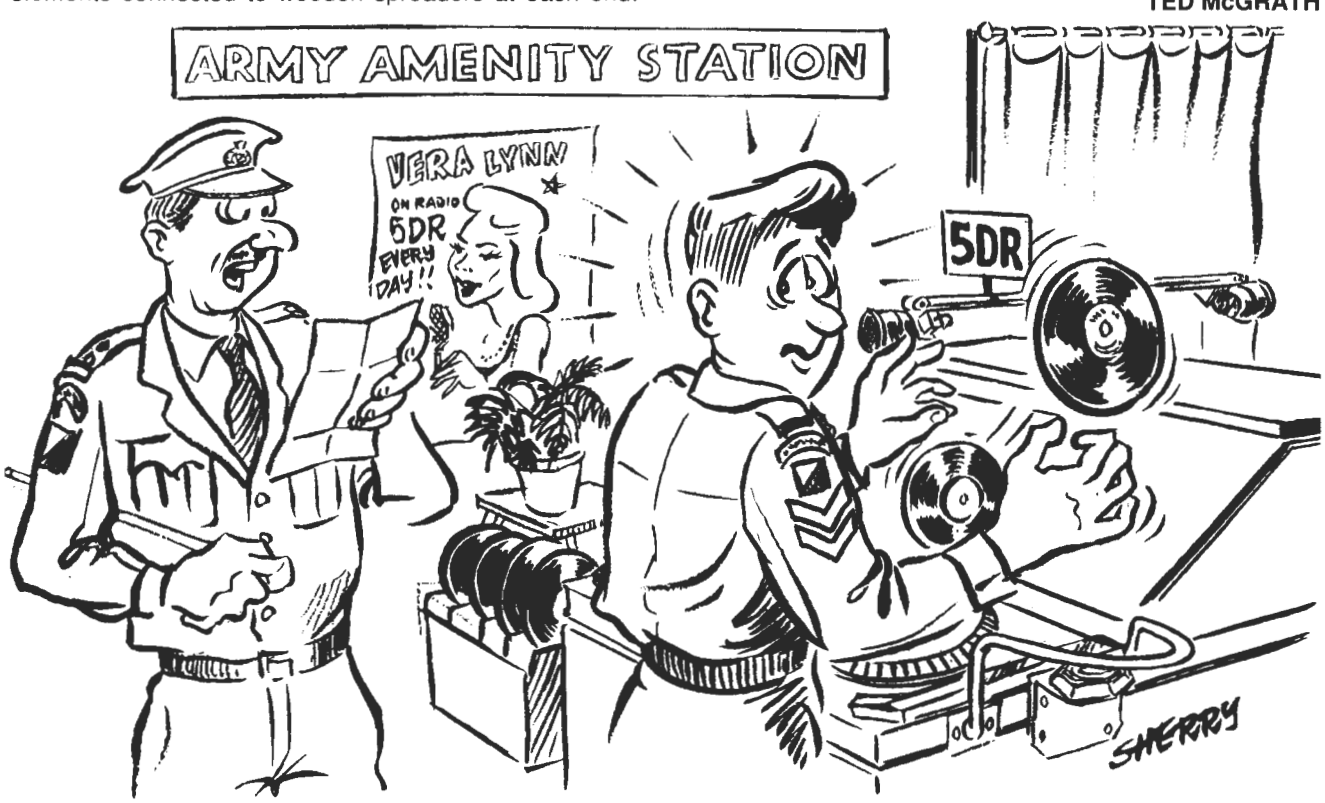
At the receiving station, receivers were mounted in a single Sydney-Williams hut. Aerials comprised reversible rhombics aimed at Shepparton and London, plus three centre fed dipole types. All were supported by 75ft (23m) Metters towers and used open wire transmission lines.

The buildings, transmitter and receivers were supplied by the Army which also acquired the sites and provided the land lines. The planning, design, supply and installation of the rest of the facilities were carried out by staff of the Broadcast Division from Adelaide, including the Radio Lines party.

The broadcasting facility was completed and handed over to the Army on 11 February 1945 with call sign 5DR as an Army Amenities Broadcasting Station. It operated under Army control until it closed down shortly after the end of the War. It became a unit of the NBS when it was installed at a new site overlooking the Botanic Gardens and commenced operation on 12 March 1947, using the same transmitter and some of the buildings but with more elaborate up-to-date studio and speech input equipment. The same type of transmitting aerial system and feedline were installed at the new site and the associated receivers and aerials were installed at the racecourse where an area had been acquired for the purpose.

The Army station was controlled by 17 LOC Signals group. The Lieutenant-in-Charge, Ken Crossman, had been an announcer with Adelaide Commercial station 5DN and program presentation was conducted in a professional manner. Technical maintenance was the responsibility of Sergeant Alf Cole a former Departmental officer. After the War, Alf returned to duty with the PMG's Department and on retirement was OIC at the Metropolitan Transmitting Centre 5CL/5AN Pimpala.

TED McGRATH



"IF WE DON'T GET SOME NEW RECORDS, THE TROOPS WILL BLOW THIS PLACE APART"

4QY CAIRNS

FAREWELL OLD FAITHFUL

As reported in the July 1992 issue of *The Broadcaster*, the Department of Transport and Communications in conjunction with the ABC decided that 4QY Cairns, along with 4QA Mackay were to be replaced with wide area coverage FM services. In the case of the Cairns service, the FM transmitter was to be located at the National Television Service site at Bellenden Ker.

Plans were under consideration as early as the mid 1930's for establishment of an MF station in the Cairns area, but the outbreak of the Second World War put the plan on hold.

Ray King with a 4279Z valve. These valves had exceedingly long operating life with 40000 hours being typical.

However, a service was provided in 1941 when the Government took over the Commercial station 4AT Atherton and transmitted ABC programs.

The low signal strength in Cairns resulted in an inferior service and even before the cessation of hostilities, a site had been acquired at Kamma, just out of Gordonvale, for establishment of a station as soon as circumstances would permit.

With pressure for establishment of stations at other towns, and the shortage of broadcasting materials and equipment, it was not until 1949 that equipment installation commenced.

The station was commissioned on 20 January, 1950 with a pair of STC type 4SU-14 two kilowatt transmitters, operating in main/standby mode. The power amplifier employed a push-pull/pair of 4279A triodes which were later replaced by 4279Z types.

When 4QY was established the population of about 18000 was centred mainly around the Port of Cairns and a transmitter of output power of 2kW operating into a one eighth wavelength mast was adequate.

In recent times, great changes have occurred to the region and since the advent of the international airport, tourism

The station building erected 1948.

has nudged out sugar as the chief industry.

These days, Cairns ranks as one of Queensland's largest regional cities with the population of the region exceeding 80000 and growing steadily. The topography of the area, with a narrow coastal plain and surrounding heavily forested mountains, has resulted in the city's suburbs extending into the valleys and northward along the coast. Consequently, both the position and the signal strength of 4QY became less than optimum.

Although the program input equipment had been replaced twice, the original STC 2kW valve transmitters have given sterling service for the entire life of the station of more than 42 years.

Six wire transmission line to main 43m radiator. This was the first six wire line used in Queensland for the NBS.

When I joined the Postmaster General's Department in 1966, it was as a shift Technician at 4QY where the permanent staff numbered five. The Supervising Technician and his family lived in an adjoining cottage. All this ended in 1973 when the station became remotely operated from Cairns. In more recent years, remote control was assumed by the State Monitoring Centre in Brisbane.

Advancing technology is fast relegating thermionic valves to the shelves of museums, but there are still many technical staff who can look back with some nostalgia and recall that since 1923 when broadcasting began in Australia, these wonders of glass, metal and vacuum played an important role in public entertainment and service.

RAY KING

OUR BROADCASTING PIONEERS

MR R L (RALPH) BONGERS

Like many Queensland boys in the early 1920's, Ralph Bongers was caught up in the excitement of talk about the possibility of a broadcasting station being established in Brisbane. He lived at Booval near Ipswich, west of Brisbane, and while still attending school, built a crystal set, learning the Morse Code by listening to coastal radio station VIB, the only permanent radio station on air within range of the crystal set.

Ralph Bongers

Except for Amateur station operators who broadcast experimental programs on the 200 metre band and in the MF band from the Windmill Tower located in Wickham Terrace from 1923, there was no regular program broadcast until July 1925 when the Queensland Government commissioned 4QG.

Ralph joined the Postmaster General's Department on 26 June 1921 as a Junior Mechanic-in-training and was allocated to the Telephone Workshops which, at the time, was situated at the rear of the GPO.

Until the mid 1930's, Ralph spent his time establishing a mechanic's district at Boonah and working on the Manual Central Telephone Exchange in Brisbane. In 1929, the Exchange was replaced by a Siemens 16 Automatic type and he was initiated into the mysteries of automatic telephony.

By 1935, he had qualified as Senior Mechanic, Telephone Installation and Maintenance and also as Senior Mechanic Broadcasting. He was elated when in July 1936 he was offered the opportunity of taking up a position as Senior Mechanic at 4QG.

At that stage, the only National stations in operation in Queensland were 4QG Brisbane and 4RK Rockhampton which had been commissioned on 29 July 1931 using a 2 kW water cooled transmitter.

However, work was well advanced with the construction of a second regional station, 4QN Townsville. The new station became operational on 26 November 1936 with operating staff residing on site and power being provided by generating plant. Although Ralph was to be later appointed to the OIC position of this station, he never took up the position, being engaged on essential war-time activities.

Transmission from 4QG took place at specified times during the day and night, and maintenance of the transmitter and studio facilities were carried out during the short shut-down periods. As there was no standby transmitter, maintenance routines and attention had to be carried out quickly to ensure that transmission resumed on time. The broadcasting schedule Monday to Friday was 7am to 9am, 10.30am to 2pm, 3pm to 4.30pm and 5.30pm to 11.30pm. On Sunday, transmission did not commence until 10am. The next NBS station to begin operation was 4QR on 7 January 1938. It provided a second outlet for ABC Metropolitan programs. The 4QR facilities, including self supporting radiator were located at the Telephone Exchange Building several blocks away from 4QG. When the War started, both stations were hurriedly transferred out of the city centre to Bald Hills.

When Arthur Clark, Officer-in-Charge moved to Dalby to take charge of the new 4QS 10kW station installation in 1939, Ralph became OIC of the Brisbane Studio Network and the 4QG/4QR transmitting station.

During the War years, he was attached to a temporary Aeradio Division to supervise the installation of radio facilities including the installation and calibration of a number of high frequency direction finding (HFDF) stations for the RAAF. The Aeradio Division was formed to handle the urgent installation of radio communication and navigation equipment for the RAAF, the American Army and the Department of Civil Aviation.

In between these hectic activities, Ralph found time to study for the Open Engineers Examination, eventually qualifying in four subjects including Transmission and Radio. In 1943, he was appointed Acting Engineer carrying out duties for extended periods including a long period in the 1950's in the Radio Service Division being responsible for the operation and maintenance of National regional broadcasting stations and inspection of Commercial stations on behalf of the Australian Broadcasting Control Board.

Although broadcasting was Ralph's first love, it appeared likely during the early phase of his career in the Department that he may be destined to spend his working life in telephone engineering. However, the change in direction when he transferred to 4QG in 1936 was the start of involvement in work which gave him a great deal of satisfaction for more than 30 years. During the period, he witnessed great expansion in the establishment of new regional transmitting stations and studios, and upgrading of metropolitan transmitters and the ABC studio complex. In addition, the Queensland Radio Section was responsible for the establishment of MF and HF broadcasting stations and studios in Papua New Guinea.

One of Ralph's memorable contributions to Papua New Guinea was field survey work with Doug Sanderson in locating a site for the 9RB transmitter at Rabaul.

In November 1955, Ralph transferred from the position of Supervising Technician Grade 5, Metropolitan Studios to Supervising Technician Grade 5, Inspections, a position he occupied until retirement in March 1967. At that stage, there were 16 MF stations operational in the State as well as the VLM/VLQ HF services. Important changes which had occurred just prior to his retirement included the transfer of responsibility for control of the studio technical facilities to the Australian Broadcasting Commission, the installation of 50kW broadcast transmitters in the network and the introduction of television.

JACK ROSS

STC 55kW valve transmitter installed 3WV 1960.

Nautel 50kW solid state transmitter installed 3WV 1988.

STC parallel 5kW transmitters installed 5CK 1966.

DIAMOND JUBILEE OF ABC

SIXTY YEARS OF TRANSMITTING EQUIPMENT FOR ABC PROGRAMS

When the Australian Broadcasting Commission took over responsibility on 1 July, 1932 for the provision of programs for the National Broadcasting Service, there were 12 transmitting stations in operation.

They comprised metropolitan stations 4QG Brisbane, 2FC Sydney, 2BL Sydney, 3AR Melbourne, 3LO Melbourne, 7ZL Hobart, 5CL Adelaide and 6WF Perth together with country stations 4RK Rockhampton, 2NC Newcastle, 2CO Corowa and 5CK Crystal Brook.

Operating frequencies varied from 560 kHz (2CO) to 1245 kHz (2NC), and unmodulated carrier powers into the aerial ranged from 1kW (7ZL) to 7kW (2CO and 5CK). At the time, the ABC boasted that its programs were being broadcast with a combined power of 40kW across the nation. Today that it flea power.

Although some modifications had been made to some of the AWA built stations 4QG, 2FC, 3LO, 5CL and 6WF, the PMG's Department planned to replace these and other A Class station transmitters with more modern equipment as soon as possible. However, first priority was given to the establishment of transmitters in country centres, with 2NC and 4RK being provided with STC 2kW water cooled transmitters in 1930-31, followed by 2CO and 5CK with STC 7kW water cooled models in 1931-32. Filament, bias and high tension voltages were provided by motor generator plant. The 12 kV voltage for the final stage of the 2CO and 5CK units was supplied by a three phase half wave rectifier using water cooled diode valves.

In the case of the 6WF, the AWA transmitter was in urgent need of replacement and the Department's Research Laboratories staff designed, assembled and commissioned a 3.6kW water cooled transmitter in 1932. It was the first time the Department had undertaken such a large radio engineering project for a complete station including transmitter, program input equipment, aerial system and a coaxial feeder.

Rapid expansion to country areas took place in the 1930's with 7 kW STC transmitters being installed at 7NT, 2NR and 4QN, and 10kW models at 6WA, 3WV and 2CR. The 10kW transmitter was a modified version of the 7kW model using a parallel push-pull configuration in the output stage with 4220B valves.

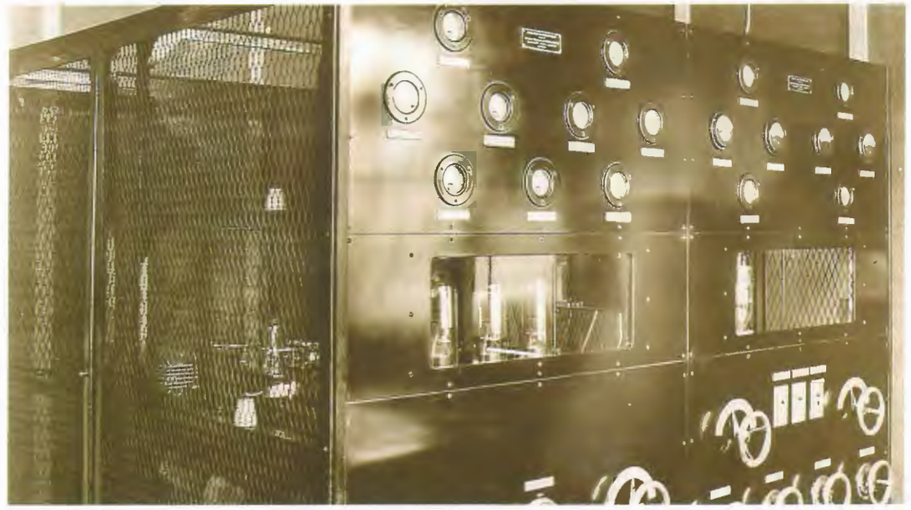
A new 10kW transmitter of modular design and incorporating negative feedback was developed by STC just before the Second World War and installed at new stations 4QS and 2CY and as replacements at 2FC, 3LO and 3AR.

After the War, transmitters were purchased from STC, AWA, Philips and others, mainly in the 2kW to 10kW range. By the 1960's, the STC 55kW model became available and was installed at many stations throughout Australia.

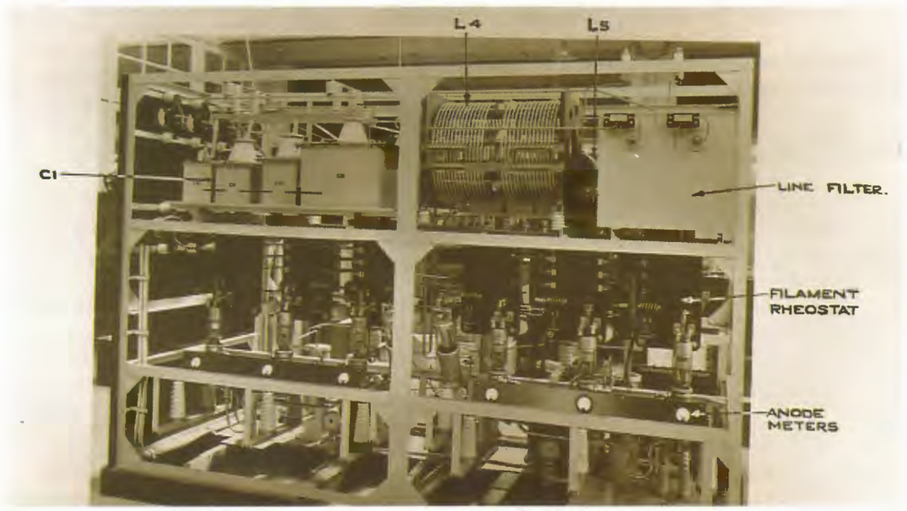
In more recent times, solid state units have been developed and are rapidly replacing the valve types. The first 50kW Nautel solid state transmitter was installed at 3WV in 1988. The first dual metropolitan replacement took place at 3LO/3RN (3AR) during 1991.

JACK ROSS

AWA 10kW transmitter installed 7ZL 1958.



STC 2kW transmitter installed 2NC 1930 and 4RK 1931.



Final RF amplifier STC 10kW transmitter installed 6WA, 3WV and 2CR 1936-37.

ENVIRONMENTAL FACTORS AFFECTING PERFORMANCE

External application of ceramic insulators covers a wide field and includes base and sectionalising insulators for vertical radiators, guy sectionalising insulators, transmission line post insulators, lead-through insulators, strain and line termination insulators, line and feeder spacer insulators, line switching stand-off insulators, matrix switch insulators, catenary sectionalising insulators and others.

Insulator damage caused by lightning.

The shape, dimension, mounting arrangement, electrical and mechanical performance requirements vary with each application, and design by radio and ceramic engineers is one of those important challenges which is not well publicised in the technical literature.

Typical factors which may need to be taken into account in designing or selecting an insulator for a particular application will often include operating frequency, effective shunt capacitance, voltage gradient, site humidity, rainfall characteristics, isoceraunic level, vibration, mechanical loading, allowable temperature rise above ambient, shape, dimensions, mounting or loading arrangements, effect of flashover on insulator integrity and others. Porcelain has relatively poor tensile and shear characteristics compared with compression and where possible, design should be such that the insulator ceramic is operated in a compression mode. Guy and tower base support insulators are typical cases where a pull or lift loading characteristic has been converted to compression of the ceramic by appropriate design of fittings. There are of course some cases where for electrical reasons, an insulator in tension is preferred to one in compression. For example, egg type insulator designs are inferior to rod designs in transmission lines, feeders and wire type aerial systems.

Great care needs to be taken during installation to ensure that the insulator is not subjected to shear or tensile forces. This particularly applies to the installation of base and sectionalising insulators for tall radiators. Normal practice is to mount the bottom section of the structure on large wooden blocks until the first guy level is reached and permanent guys attached.

After insertion of lifting jacks under the mast legs and the load transferred to the jacks, the wooden blocks are removed and the insulator placed in its correct position. The structure is then carefully lowered to allow the insulator to take the load. Notwithstanding great care taken by mast erectors, accidents do happen. At 5CL/5AN Pimpala where an assembly of four oil filled base insulators was used, an accident resulted in a considerable quantity of oil escaping from the insulators. Refilling was not an easy exercise. At 4QN Brandon, cracks were detected in the base insulator and some of the guy insulators some years after erection of the structure. It was not determined when the damage occurred.

Insulator damage caused by RF arc.

The electrical performance of an insulator is affected by a number of issues including onsite environmental factors such as relative humidity, rain and airborne contaminants.

Performance decreases considerably as the humidity is increased. For example, tests on strain insulators conducted during development of insulators for Radio Australia, Cox Peninsula in the 1960's, indicated that for a 300mm insulator designed for a flashover voltage of 110kV under very dry conditions, the flashover voltage fell to 85kV at 30% relative humidity and to 72kV for a relative humidity of 95% which would be normal for the tropical site for much of the year. For simulated rain test, the fall was even more dramatic. For four samples tested, average flashover was 44kV at 50Hz. On an equivalent RF basis this is about 35kV. This figure is the same as the peak line voltage for 100% modulation with 500kW transmitter input to line so considerable effort was diverted to redesigning end caps to improve the factor of safety.

Contaminants can sometimes have an even greater effect in reducing flashover characteristics than rain water. At some stations located close to the seas, such as 5CL/5AN Pimpala, wind blown salt deposited on the four parallel sectionalising insulators resulted in the transmitter going through a series of drop outs and recycling with the onset of rain and sometimes taking a minute or more to clear.

Salt and other contaminants appear to have a greater effect on horizontally mounted insulators than vertically mounted ones in an aerial system. With Cox Peninsula developmental work, studies were made of the influence of deposits of salt spray, carbon dust from bush fires, pulverised dry grass and powdered dust from the site.

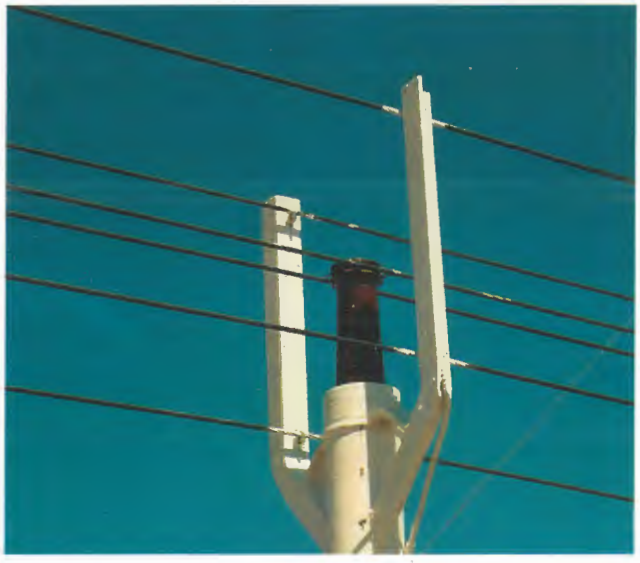
Using samples of 40mm diameter insulators, each 300mm in length and fitted with similar end cap designs, the dry flashover voltage averaged better than 110kV. Average flashover voltages for horizontally mounted insulators were 17kV following a three second salt water mist spray, 45kV for carbon dust deposit and 95kV for soil dust deposit. The carbon and soil deposits were blown into a box in which the insulator was located and the material allowed to settle for a few minutes before tests were carried out. For vertically mounted insulators, there was improvement of 20–25% on the horizontal figures. Flashover voltages for the carbon dust and soil dust samples dropped significantly following the application of a three second mist spray of de-ionized water. During tests in connection with temperature rise characteristics, it was observed that dark brown glazed insulators were on the average 2–4°C higher than white glazed types. The tests were conducted out of doors, and it was suggested that the rise differential may have been due to the greater heat absorption from the sun of the brown glazed types. However, the matter was not taken further at the time.

Whatever the reason for insulator flashover in the field, the result can sometimes be disastrous on the integrity of the insulator ceramic and/or its associated hardware. At high frequency stations in particular, with transmitters producing 250kW and more into lines and aerials, discharges can occur over great distances. These discharges referred to as plumes or flares were observed at Cox Peninsula to extend up to two metres in length with one end terminating on the insulator end cap or corona ring, and the other diffusing in the air. The power dissipated was probably many kilowatts as on a number of occasions large metal components of the aerial system melted, with the metal falling to the ground and setting fire to dry grass as well as causing damage to the aerial system itself. On one occasion, an insulator shattered and broke away immediately beneath the corona ring, some 75mm from the end cap.

Lead-through insulator installations are often not given the detailed consideration they require, particularly at high power stations. Frequently they are mounted under eaves of coupling huts, transmitter buildings or switch huts where they accumulate dust, cobwebs, bird droppings etc., and are not regularly washed by rain. Many dramatic failures have occurred at 50kW stations where insulators have cracked, shattered and in some cases producing evidence that the porcelain had melted during the discharge. In a number of cases the initial discharge resulted from a lightning discharge to the radiator, and after travelling along the transmission line, it flashed across the lead-through insulator with the discharge being maintained by the transmitter after the lightning pulse had ceased.

Lightning activity may also result in puncture of the ceramic even though the voltage required to puncture well made porcelain is very high. Insulators at sectionalising points, at cabin lead-through points and at capacity hat support points have failed due to puncture. Typical examples include 5CL/5AN Pimpala and 4QG/4QR Bald Hills.

Excessive temperature rise has to be avoided in insulators used for external applications. Insulators have been known to shatter when a sudden rain squall drenched the station facilities. The internal heating of a dielectric is proportional to the frequency of the applied voltage, the square of the voltage gradient, the power factor of the dielectric and the dielectric constant. The product of the power factor and dielectric constant is called the loss factor and is an important parameter to be considered in the selection of an insulator for radio frequency applications.



Typical transmission line post insulator.

Care has to be taken in the use of existing transmission lines and aerial systems when the station transmitter power is to be increased. For example, a strain type insulator with loss factor of .007 may exhibit a temperature rise of around 5°C at 25MHz for 100kW input to line, but if the station is upgraded with 500kW transmitters, the temperature rise above ambient of the insulator would he of the order of 26°C at carrier power without modulation. This is the normally accepted upper limit for operation of a porcelain insulator, and clearly an insulator of lower loss factor would be required.

Although the loss factor of the ceramic is important from a heating point of view it does not have much bearing upon the maximum operating voltage which may be applied to the insulator. The voltage limit is more influenced by shape, size, freedom from sharp edges and the use of well designed end caps, corona shields and attachments.

JACK ROSS

Typical mast base insulator.

PROFILES

RAMON DINEEN

Ray Dineen, PTTO 1 Broadcasting Services Centre, Adelaide joined the PMG's Department in 1964. On completion of his first year as a Technician-in-training, he was allocated to the Radio Section.

In 1974, he was promoted to the SA/NT Installation team as a Technical Officer. The next 15 years saw Ray involved in many installations like the RATV project and the HF Vertical Incidence Service in the Northern Territory.

He claims however that his most memorable project was when the township of Leigh Creek was relocated. It required eight installations of five transmitters to supply the two towns with television and radio without any loss of program.

Since becoming Officer-in-Charge of the Broadcasting Services Centre he has organised the relocation of the Centre from St Marys to Edwardstown sharing the new building with the Administration and Engineering groups. The Services Centre repairs and installs a wide range of technical equipment from Public Address, CCTV and VDU's to Broadcasting equipment for the NBS as well as Commercial operators.

Ray and Yvonne have two boys, Ross and Roy. Much of Ray's spare time is taken with junior swimming and recreational gymnastics instruction.

Ramon Dineen

Rodger Hedley

RODGER HEDLEY

Rodger Hedley, Technical Manager of Mt. Lofty Broadcasting District, joined the PMG's Department in 1957 as a Technician-in-training. At the end of his training period, he joined the Radio Telephone Installation Group.

In 1967, Rodger transferred to Alice Springs to take charge of the HF Radio Telephone network which serviced the outback areas of that region. After four very interesting years, he took a shift leader position at the newly established ABRS3 TV site at Loxton.

In 1977, he became the Officer-in-Charge of the Loxton Broadcasting District facilities which included the 5MV site at Berri and maintenance of the ABC Studios in Renmark.

After 15 years in Loxton, Rodger was appointed at TOIC at ABS 2, Mt. Lofty. This was an era of considerable change for this site, including the establishment of the Monitoring Information Centre as well as new services such as SBS TV and its translator, replacement FM transmitter for ABC FM, the installation of 5JJJ FM, and the replacement of the original Marconi TV transmitters for the ABS2 service.

Rodger is married to Glenda and they have two daughters and one grand daughter. In their spare moments they both enjoy gardening around the house and travelling far and wide.

JOHN DHU

John Dhu, PTTO1, is the Technical Manager of the South East Broadcasting District of South Australia based at Mt. Burr near the town of Mt. Gambier. He joined the Postmaster General's Department in Brisbane as a Technician-in-training in 1960.

Following the completion of his training, he was appointed to the position of Technician – country relief – working out of the Bald Hills Broadcasting Depot, Brisbane. In 1966, he was appointed to the position of Technician on shift at 4QA, Mackay, North Queensland.

Between 1966 and 1977, John was appointed to positions at Mackay Radiocom and Port Moresby Broadcasting Station. From 1977, he was a shift leader on route control at Blake St., Darwin until 1981 when he transferred to Cairns as a TV shift leader based at the Cairns Radiocom Centre. The actual transmitter site is at the top of Bellender Ker, the second highest mountain in the State. The normal access to the site is by cable car.

With the formation of the Broadcasting Directorate in 1985, he was appointed to the Second-in-Charge position of the Cairns Broadcasting District.

John commenced in his present position as Technical Manager in 1988.

John Dhu

Iain Fraser

IAIN FRASER

Iain Fraser, Technical Manager, Eyre Peninsula District, South Australia, joined the PMG's Department with the last intake of the 1970 Technician-in-training course. After completion of the second year's training he was allocated to the Radio Section, TV & MF Group and spent the next two years learning the techniques of broadcast engineering at the various manned stations within South Australia.

In December 1974, he was appointed acting Technician at ABGS-1 Mt. Burr until being appointed Technician on the successful completion of his apprenticeship. Over the following years in the South East, Iain attained his Technical Officer qualifications via the Mature Age Training Scheme and gained promotion to TO2 Shift Leader.

With the formation of the Broadcasting Directorate, new Districts were created including Eyre Peninsula to which he was appointed OIC. In this position he was faced with the task of establishing the District and coming to grips with new equipment and technologies, and problems associated with remote services. The lack of staff support at the start compounded the problem, as initially he had only one Technician as assistant.

Iain's spare time is devoted to wife Tina and teenage duo Simon and Peta, the study of Management Principles at the TAFE College, computers and VHF/UHF radio.

CAIRNS ABC STUDIO

MOVING INTO THE SPACE AGE

May 3, 1991 is a date written in large red letters in the annals of the ABC's Cairns studios. That was the day we moved house – left behind technology circa 1960's, and embraced the wonders of space-age communication in our program-making.

It cost $2million to move from our old headquarters on the second floor of the Suncorp building in Shields Street to our new home at the corner of Sheridan and Upward Streets. That's what it cost for the land, buildings and fitout.

Judith Langridge, Manager ABC, Far North Queensland at the controls.

We experienced a few delays along the way. Our new building was completed just before Cyclone Joy hit the far north on December 21st – and the flooding that followed her trek down the coast was largely responsible for us not moving until the beginning of May.

All the electronic equipment to be installed in our new building was in Brisbane for testing when the floods started and the continuing rain meant the gear stayed there until the end of March.

A prominent feature of the new building – and it was a real traffic stopper while it was being hoisted onto the roof by a large crane – is the 6.8 metre Andrews satellite dish. Only three of these large dishes have been installed by the ABC in Queensland – the other two are at Townsville and Rockhampton. Most of our other studios, except in metropolitan areas have 4.6 metre dishes. The 6.8 metre dish was installed in Cairns to provide the higher gain needed to overcome the signal attenuation that occurs in high rainfall areas like Far North Queensland.

The move into our new studios has had a tremendous impact on the way we source material for our morning talks program "Top of the State" that is broadcast through the six transmitters that make up our far northern network.

There is our new FM transmitter which will shortly replace the AM station 4QY Gordonvale after 42 years service. The FM station is located on Bellenden Ker together with our FM Stereo fine music transmitter and the Radio National transmitter. Then there are 4AT Atherton, 4MS Mossman, 4WP Weipa, 4TI Thursday Island and Regional Radio FM 105.7 at Cooktown. Cooktown's FM transmitter was originally to have been a satellite fed outlet but representations by the Cooktown residents led to a change in sourcing and now Cooktown receives Cairns programs on Regional Radio.

This multiplicity of outlets from Cairns led to the evolution of our callsign "ABC Radio Far North" which made for much simpler programming.

BM – before move – what interviews we weren't above to do live in the studio during the course of each edition of "Top of the State" had to be pre-recorded either the day before or while the program was in progress. We did not have telephone talkback in the old studios because there just was not enough room to install the necessary technical equipment in the old console.

Now AM – after move – not only do we have telephone talkback and a digital delay system, we have the added dimension of satellite communications which allows us to bring program segments in from anywhere in Australia that is linked through the satellite. This means in effect that I, sitting in my studio in Cairns, can interview the Prime Minister sitting in a studio in Melbourne, and put the interview live to air. A far cry from the old way of doing things.

And, no more musical chairs as the rural reporter hurries out of the only studio at the end of rural report segment so the breakfast presenter can slide in and take over for the breakfast program. All that is finished.

We now have two studios, each with a 24-channel PKE desk (or, more technically a Paul Kirk Electronic Stereo Broadcast Mixer Console) on which we have 19 modules operational. Then we have the compact disc players, turntable, cuemaster, cartridge machines and Otari reel to reel recorders.

Something in the very new and "gee-whiz" category is our compact disc juke box – or to give it its correct title an Auto Disc Loader CDK3000PII – a jazzy little number that holds 60 compact discs and, by using a control box on the announcer's desk we can put all the tracks on all those discs to air without anyone touching the discs. The unit is manufactured by SONY but was developed by ABC engineers and technicians to help cope with the changing face of regional broadcasting.

With the video links tied in to the television dub-editing suite it means video material gathered in Cairns can now be sent through the satellite to any destination in Australia.

I won't go into too much detail of the small dramas that evolved as we moved up to Move-day including training in the new studios so we would have a modicum of expertise when we began using the new studios. Just suffice to say it was like moving from a pushbike to a Porsche – you can imagine the rest.

JUDITH LANGRIDGE

RADIO AUSTRALIA

NEW FACILITIES AT COX PENINSULA

The article by Terry McManus in the March issue of *The Broadcaster* gave some brief details of the two new Thomson CSF 250kW transmitters to be installed at Radio Australia, Cox Peninsula. This will bring the station complement to five 250kW transmitters and complete the original design concept.

In addition to expansion of facilities to accommodate the new transmitters, opportunity will be taken to upgrade some of the existing facilities. Major works include the following:

- **Dismantling of Valve Store**

  The station was designed to accommodate a total of five 250kW transmitters in separate rooms, but was initially equipped with only three transmitters. The two spare areas were allocated for temporary use as a valve store and a component store.

  The old valve store has now been totally dismantled with all shelving, the mezzanine floor, air handling plant and hoist removed. The storage tanks for the de-ionised water supply which were located in this area have been relocated to the mechanical workshop.

- **Relocation of Offices**

  After considering a number of options, it has been decided to relocate the component store to the area originally used as an office and the existing office area has been relocated to the recreation room where aluminium framed, glass partitioning has divided the area into halves. One half is to be used as the OIC's office and general office and the other as a recreational room and/or lecture room.

  The museum which was located in the old bedding store area has been relocated into the recreation room area and the old store room has been converted into an office for use by visitors.

  The lighting has been upgraded and carpet laid on the parquetry floor.

  A new compactus is shortly to be installed in the old office area which has had new vinyl sheeting laid on the floor.

- **Power Supply**

  A commission has been given to Australian Construction Services to extend the main 11kV power switchboard to accommodate two new oil circuit breakers and to provide new high voltage submain cables to feed the proposed transmitters.

- **Control Room**

  The existing PIE in the Control Room is to be relocated into a new set or racks to be installed where the existing power supply control desk is located and additional equipment for the new transmitters installed.

  The indicating and control equipment in the power supply control desk is to be rationalised and miniaturised where possible and relocated into a purpose designed rack to be installed adjacent to the antenna matrix control cubicle. The existing antenna matrix control panel is also to be relocated to this cubicle.

- **RF Transmission Lines**

  Two additional transmission lines are to be installed between the transmitter building and the antenna matrix switch hut. The transmission line and supporting structures used to feed the dismantled Log Periodic antenna will be relocated to provide this facility and will provide an installation of matching appearance.

- **Antenna Matrix Switch Upgrade**

  Twenty additional switches are to be installed to complete the five by ten matrix in the antenna switch. This work is under contract to ASEA-Brown Boveri.

- **Transmitters**

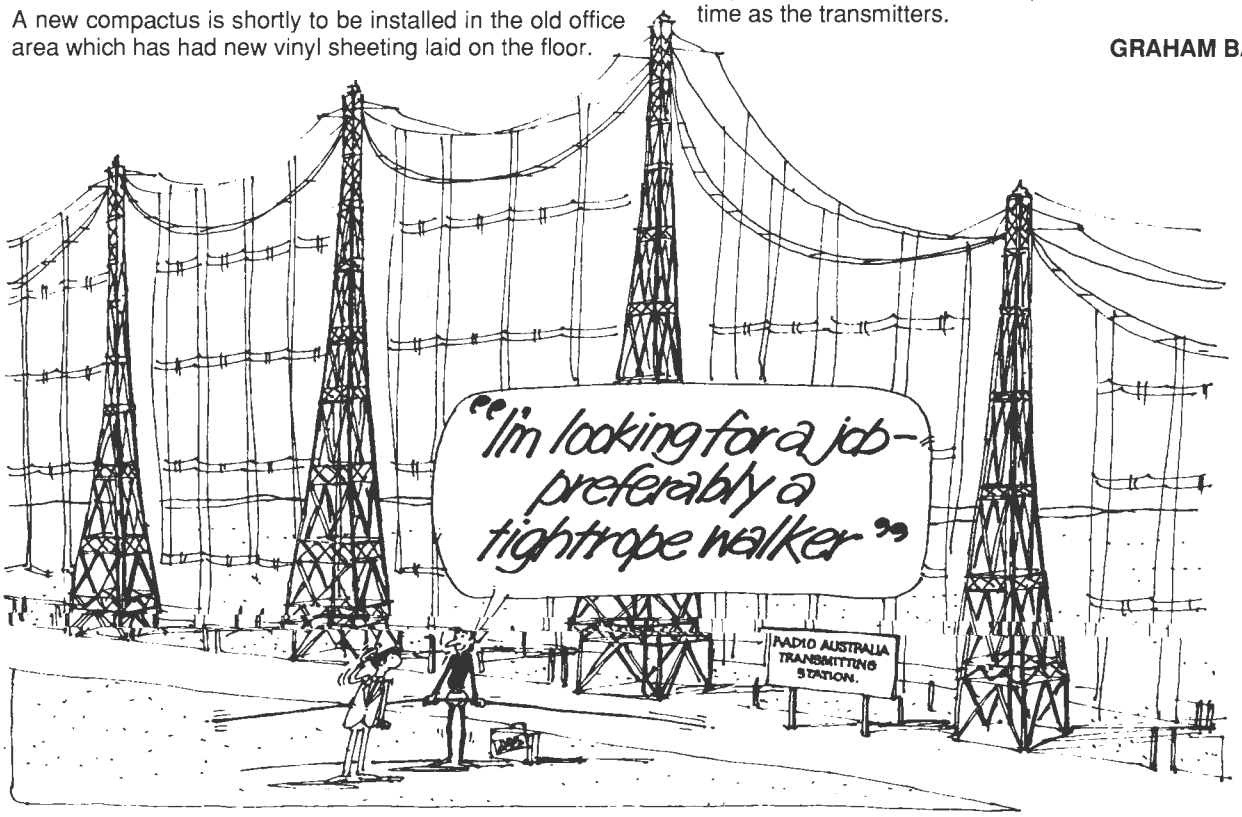
  The supply of transmitters is under contract to Thomson-CSF and they are to be of the very latest, high efficiency solid state design. Only one vacuum tube will be used in the proposed transmitters. They will be capable of full carrier AM, dynamically controlled reduced carrier AM and selectable carrier reduction SSB.

  It is expected that the transmitter will be commissioned during 1993.

- **Station Computer Control System**

  The station computer control system is to be replaced with upgraded hardware and software as part of the project. This work will be completed at about the same time as the transmitters.

GRAHAM BAKER



MT DANDENONG

SWITCH FRAME FAILURE

Late last year, a major failure occurred in the antenna switch frame of the SBS UHF transmitter at Mt. Dandenong, putting the transmitter off-air for four hours.

The extent of the damage to the switch frame components was such that it was difficult to be sure of the actual chain of events that caused the failure of so many components. However, the following comments are relevant:

- The PTFE that forms the dielectric portion of the contactless switch, CS1 Port 4, totally vaporized.

Damaged components. Note centre portion of boot missing.

- The outside of the "boot" was burnt through, suggesting that the source of heat was from below, and not above, i.e. not from the elbow further down the transmission line.
- The boot was also fractured, which may have occurred when the switch rotated during the multiplexing.
- When the switch dielectric burst into flame, the soot was blown along the transmission line by the switch cooling blower. This soot, totally blocked the insulator holes causing arcing and melting of the aluminium portion of the NAX elbows.
- The first two elbows were destroyed, with the one closest to the switch receiving the most damage.

It was fortunate that the rigid line is isolated from the flexible 3-1/8 inch section, and that the heat did not extend that far and vaporize the PTFE barrier, otherwise the main antenna feed would have been irreparably damaged.

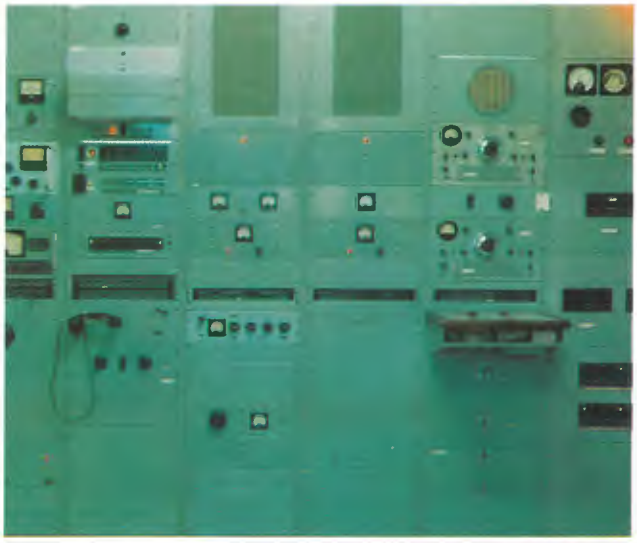
DOUG McARTHUR

LETTERS TO THE EDITOR

Contributors to Letters to the Editor are reminded that full names and addresses must be supplied. Letters should be brief and to the point. Long letters may be edited. The Editor's decision in respect of the suitability of letters for publication in *The Broadcaster* is final and no correspondence on The Editor's decision will be entered into.

Sir,

Enclosed is a photograph of the Control Room equipment racks at 4QL Longreach as it appeared in 1967. The two AR7 receivers on the right were tuned to shortwave transmitters VLM and VLQ at Bald Hills to provide emergency program cover. These receivers which were widely employed throughout the National Broadcasting Service for off-air program purposes were a pre-war RAAF



Part of 4QL Program Input Equipment facilities in 1967.

designed general purpose communications receiver and manufactured in the hundreds by Kingsley Radio Pty Ltd, Melbourne during the War years.

The station was located on a site at Cramsie north of Longreach but had earlier been located in the town area. Station 4QL was the first post war Regional station to be installed in Queensland with work beginning in 1946 using two 200 watt transmitters. The Cramsie site was a remote locality frequently isolated from the town by flooding of the Thompson River and on-site housing was provided for the OIC and the three Technicians and their families. It was one of the two stations in Queensland to offer such accommodation for the entire staff. The other was 4QN at Clevedon.

The facilities at Cramsie in 1954, comprised a 10kW AWA transmitter and a four pole Delta type aerial. In 1956, a 2kW standby transmitter was installed but had to be switched on manually. In 1959, a 198 metre high radiator was put into service and the Delta them became an emergency aerial. It is of interest that the day time service area of 4QL was the largest in the State.

The station was converted into automatic operation in the 1970's and the houses relocated to the town area.

Longreach is famous these days for its Stockmans Hall of Fame which contains a list of Australia's Unsung Heroes. Perhaps the names of some of the staff who worked at 4QL over the years should appear on that list.

JOHN BERRY

TRANSMITTER FAULT

OPENING NIGHT AT 5DR

The official opening of 5DR, later to be known as 8DR and now 8RN, took place at the Gardens Hill premises on 12 March, 1947. The weather during March is characterised by high temperatures in the range 27 to 28 degrees Celcius together with humidity almost 100% with spasmodic violent thunderstorms and rain squalls. The opening night was spared the inconvenience of storms but not the oppressive temperature and humidity. The opening ceremony was performed by the Administrator at 8 p.m.

After the Administrator had delivered his address, Charles Wicks the ABC South Australian Manager spoke. Ted McGrath, Divisional Engineer, Broadcasting then read messages from the Department's Director General and the South Australian Director of Posts and Telegraphs. Ted continued with a speech of his own but it must have been too much for the transmitter. As he spoke, Ted noticed the Control Room Operator making wild gestures through a separation between the curtains.

Original 200 watt Tasma transmitter.

Ted finished his speech as nonchantly as possible and made his way into the Control Room to find the transmitter power had dropped to almost nothing and the telephone was running hot with rude comments about the transmission quality.

With no standby unit to fall back on, a dilemma arose as to whether to accept the embarrassment of closing down the 200 watt transmitter which was already a veteran, having served as an Army transmitter, or bluffing it out. The latter course was chosen.

After the invited guests had gone home, the technical staff and Ted who had made the 13 hour flight in the regular DC3 service from Adelaide to be present, set about locating the fault. The small Control Room also housed the transmitter and all the audio equipment which of course was all valve operated and generated a lot of heat. There was no air conditioning, in fact to my knowledge, unlike today, there was not a single building in Darwin that boasted the luxury of air conditioning. The first step in the fault diagnosis was to try to make yourself more

Darwin studio Announcer's Desk, 1947.

comfortable so off came the ties, shirts were unbuttoned, sleeves rolled up and as the night wore on, and the fault still eluded the team, some garments were removed as the frustration increased. As a 20-year-old Technician who probably revered the ground that Engineers walked on, the picture of a Divisional Engineer who also happened to be a very conservative gentleman, clad only in underpants and bathed in perspiration became indelibly engraved on my mind.

There is a happy ending to the story. The trouble was due to a very high resistor, 10 megohms or so, in the audio feedback network, slowly sliding towards open circuit about halfway through the evening. This had the effect of not only altering the quality of the program, but more importantly it also was slowly reducing the level of the first audio stage to the point where there was only about 10% modulation. In those days, there were no reliable testers available that could tell the difference between a 10 megohm resistor and an open circuit.

The same fault recurred a number of times during subsequent periods when I was involved in the maintenance of this transmitter and another identical unit provided late as standby. Needless to say, the diagnosis and rectification of the faults on those occasions were carried out more quickly and without trauma. Experience is a wonderful teacher.

BRIAN WOODROW

Studio and transmitter building.

NAUTEL SOLID STATE TRANSMITTERS

Readers of *The Broadcaster* will recall the article in the July 1988 issue outlining the production facilities of the Canadian based company, Nautical Electronic Laboratories Ltd which manufactures a range of Nautel AM transmitters being installed throughout Australia for the National Broadcasting Service. The power range includes 1, 2.5, 5, 10, 25 and 50kW transmitters.

Last year, the company entered the FM market with the FM7, a completely solid state FM transmitter. Designs are being developed to follow with 4kW and 10kW models as well as an FM exciter.

The Nautel FM7 transmitter is capable of 7500 watts housed in a single rack. It incorporates all of the advantages of solid state design, including on-air serviceability and modular redundancy.

However, the design was not without its problems. Designers had to overcome a number of factors which previously were major deterrents to the development of fully solid state FM transmitters.

These included:

- The very high cost of output devices for FM operation compared with AM, as well as the number of devices required to reach a high power level, previously made solid state FM (SSFM) uneconomical. The problem was overcome through simplicity of design to minimise add-on costs to keep transmitter prices to a 10-20% premium over comparable valve transmitters, up to 10kW.
- The poor efficiency – typically 50% – that resulted from traditional approaches to solid state FM was also a deterrent to SSFM development. Traditional cures to this problem required increased numbers of parts resulting in higher costs. New designs adopted have resulted in typical efficiency of about 65%.
- The high levels of intermodulation experienced with broadband SSFM were also a problem. The employment of patented combiner/filter design using tuned circuits to improve operating efficiency has narrowed the output bandwidth sufficiently to reduce intermodulation while still maintaining the output at a wide enough bandwidth to maximise performance.

An important benefit of solid state FM design is the reduction in AM noise, both synchronous and asynchronous over a valve type transmitter, meaning that the full potential of the exciter can be realised. In fact, the quality of transmission is determined solely by the quality of the output of the exciter used.

The power section of the FM7 transmitter is made up of twenty eight independent 250 watt solid state power amplifiers, mounted for convenience in seven power modules.

Each module consists of four 250 watt power amplifiers, one cooling fan, input splitter and temperature sensor. An eighth module, with two 250 watt power amplifiers is used for the IPA to drive the other power modules. In case of an IPA failure, one of the seven power modules may be used as a replacement IPA, allowing the transmitter to continue operating at a reduced output power level.

The outputs of the 28 power amplifiers are combined and filtered in the combiner/filter unit to give a rated maximum of 7500 watts into a 50 ohm load. This is done in such a way that in the event of a failure, the modules are isolated and can be removed from service with the transmitter on air.

The transmitter has three power supplies, one for the B+ which is set at 50 volt for 7500 watt output; one for the IPA; and one for the +24 volt DC (fans and relays) and the +15 volt DC (IC's).

The 60 degree combining technique used in the solid state FM transmitter is the same as that used in the Nautel solid state AM transmitters. Until the company developed this combining method, the standard way to combine many signals with failure isolation was hybrid networks with associated dummy load resistors.

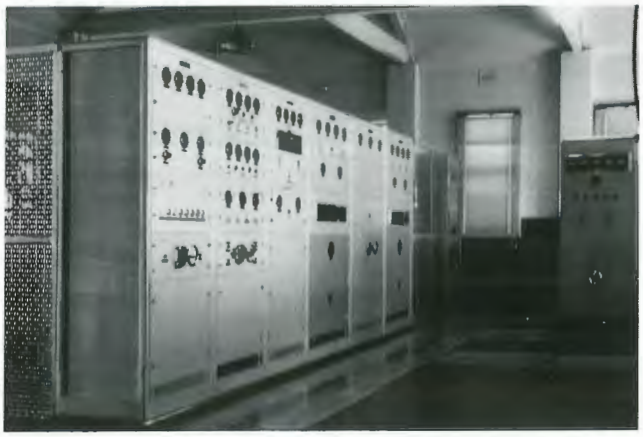
JOHN STANNARD

The 7kW AMFET FM7 solid state transmitter.

BROADCASTING MILESTONES

4QS DALBY

Station 4QS Dalby was the third regional transmitter of the NBS in Queensland to be commissioned. It went to air on 17 October, 1939 with an STC 10kW transmitter and a 218m high radiator connected via an above ground rigid coaxial copper line.



Original STC A513 10kW water cooled transmitter installed in 1939.

The original transmitter was similar to units installed at 3LO, 3AR, 2FC and 2CY and was a design which differed from models produced up to that time by the company. They were capable of being mass produced because of their modular construction. Previous transmitters had been individually fabricated.

The transmitter was basically two 5kW water cooled power amplifiers combined to produce 10kW output. Each 5kW unit employed two 4220B and later 4220C water cooled triodes with provision for a third as standby.

High voltage for these valves was supplied by six 4078A hot cathode mercury vapour valves in a three phase full wave rectifier configuration. Another important advance in design was the incorporation of negative feedback, resulting in considerable improvement in performance.

The transmitter was contained in six cabinets installed in line with high tension rectifier being located in a protective enclosure at the rear. The pumps and cooling radiator associated with the water cooled valves were located outside the main building with roof covering only.

Like most early installations, the station operated without a standby transmitter. This required staff to commence duty early in the morning in order to carry out all the preventative maintenance chores necessary with those water cooled transmitters. On at least one occasion, the radiator froze and burst the copper core.

An ABC studio located in beautiful Toowoomba provides local program as necessary.

In 1967, the original transmitter was replaced by a pair of 5kW STC 4SU-55 units in parallel, and the station now operates in an unattended mode.

The onsite house previously occupied by the Officer-in-Charge is now the headquarters for the Dalby Broadcasting District covering south-western Queensland.

BOB HORSLEY

Present twin STC 5kW transmitters installed in 1967.