1974 – Pitt Exchange, The Scene of Major Telephone Cut-overs in the Heart of Sydney

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Features of the Pitt Street, telephone exchange building and of the various types of telecommunication equipment accommodated in this building are included in this survey of the historic major intensive effort needed to successfully cut over Sydney's inner city business areas to crossbar equipment.

INTRODUCTION

1974 is the year of major cutovers in Sydney's newest and largest telephone complex in the Pitt Street Telephone Exchange Building, on which, by 1975, some $27 million will have been spent.

The Pitt building consists of 18 floors designed to house a major local telephone exchange for subscribers in the inner-City area, a major automatic trunk exchange for Sydney's growing demand, and a manual trunk exchange with 230 operators positions (initially) to switch National and International trunk traffic. By 1980 the equipment installed in the building is expected to have reached maximum capacity.

THE SUBSCRIBERS LOCAL EXCHANGE

On the 14th June this year the Australian Post Office undertook the largest single telephone exchange cutover yet attempted in Australia. Some 11,500 lines of subscribers equipment serving subscribers numbers starting with '28' and some '25' codes were replaced within a few hours by 14,000 lines of equipment in the Pitt Street Building. Before cutover these subscribers were connected to the 53 years old "City North" telephone exchange located on an adjacent block at the rear of the new building. Because this is the heart of the business area of Sydney, the average calling rate of these subscribers is among the highest in Australia. The equipment necessary to serve these lines is approximately three times that needed to serve the same number of lines in a suburban area, and occupies three floors of the new building.

The cutover introduced 14,000 lines of crossbar employing 1000 outlet group selector and Reg. LP register equipment at a cost of about $5 million. Some of this equipment is shown in Fig. 1. The external plant costs for the 70,000 cable pairs from some 48 cables that radiate into the network from the new building and associated tunnels account for a further $4 million.

Approximately one third of the total cable pairs provided to interconnect Sydney's telephone exchanges in the twelve months up to June 1974 terminate at Pitt. These terminate on a main distribution frame (MDF) which is two storeys high and 31 meters long (see Fig. 2). The first storey terminates the subscribers' cables and the second junction cables. This frame will eventually replace the smaller frame in the City North buildings. 42,000 cable pairs have been provided to interconnect the frames in these two buildings to allow the old subscribers and junction lines to be progressively transferred to the new MDF.

The installation of the crossbar equipment was carried out by Plessey Telecommunications Pty. Ltd. under contract to the APO. This task took about two years to complete, during which time 1800 racks of equipment on the 3 floors were installed (Fig. 3). This included 1/6th of the total consumption of crossbar switch racks from one year's Australian construction programme.

A realistic target for the cutover was needed to allow directory preparation and subscribers advices to be realeased well in advance. Despite industrial problems, equipment shortages and continual slippages to associated projects such as cable tunnel excavations in the city area, it was decided to have the cutover coincide with the 1974 White Page Directory issue and to introduce controls to ensure this target was achieved.

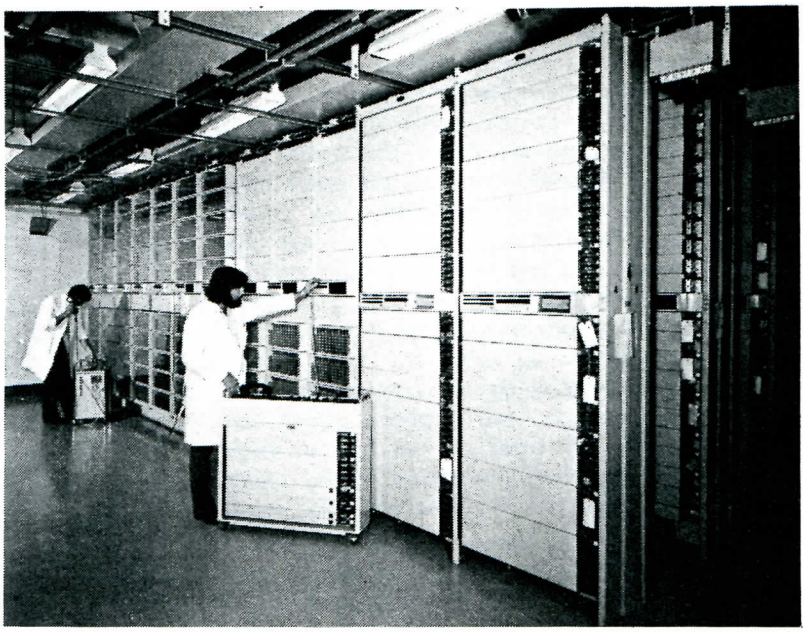

Fig. 1.—View of Half-suite – ARF Equipment Room – 5th Floor.

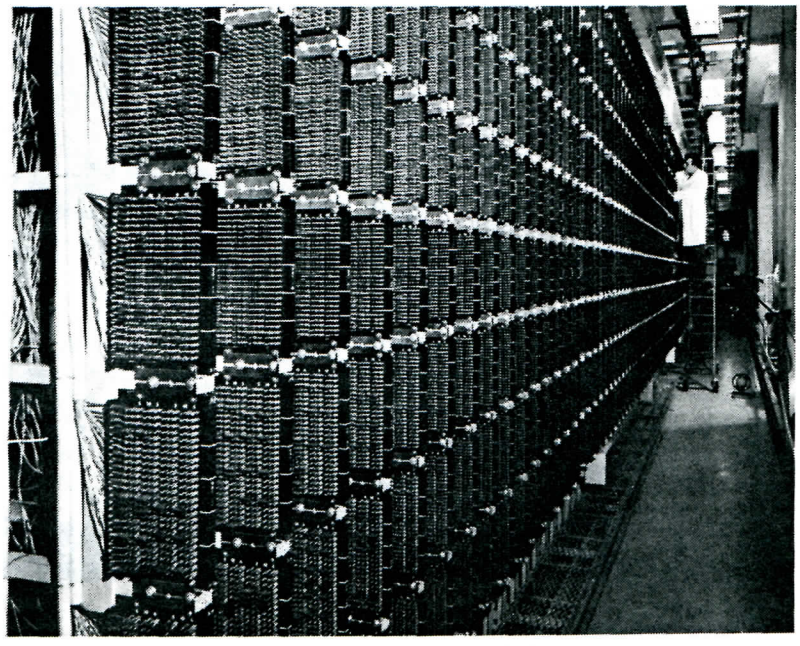

Fig. 2 — View of Equipment Side of Main Distributing Frame (MDF) — 2nd Floor

Fig. 3.—View Down Central Equipment Aisle – ARF Equipment Room – 5th Floor.

To the subscribers involved the cutover meant new telephone numbers, starting with 233, 232 and some 231 codes, and improved service with new facilities such as STD. As almost half of the lines involved in the cutover were connected to subscribers' private automatic exchanges or switchboards, the cutover preparations required officers of the Telecommunications Division to determine the necessary alterations to switchboard designation strips and the engraved key caps associated with some substation equipment. Key cap replacements were provided by Post Office technicians, and Service Advisors made brief visits to all subscribers prior to cutover and provided temporary redesignations where necessary. As night switching facilities and special telephone attachments were numerous in the types of businesses involved in the cutover, consultation with subscribers concerning these services was necessary. Modifications were carried out on some types of private automatic branch exchange (PABX) to ensure compatibility with the new crossbar equipment.

The activities at cutover on 14th June were planned to ensure efficient deployment of staff who were given defined tasks and a clear understanding of the order of action. The equipment cables on the City North MDF were cut away by 20 men, 10 on platforms above the rest, whilst the Pitt Exchange was connected by inserting MDF cables at the switching equipment racks. Technical and ser-

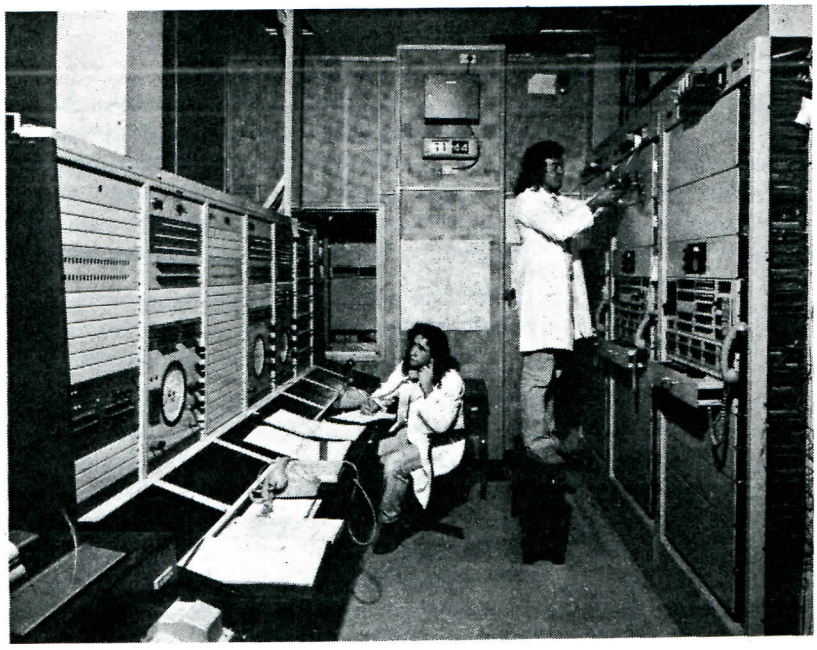

Fig. 4.—ARF Service Control Area with Traffic Route Testers (TRT) and Service Control Racks – 2nd Floor.

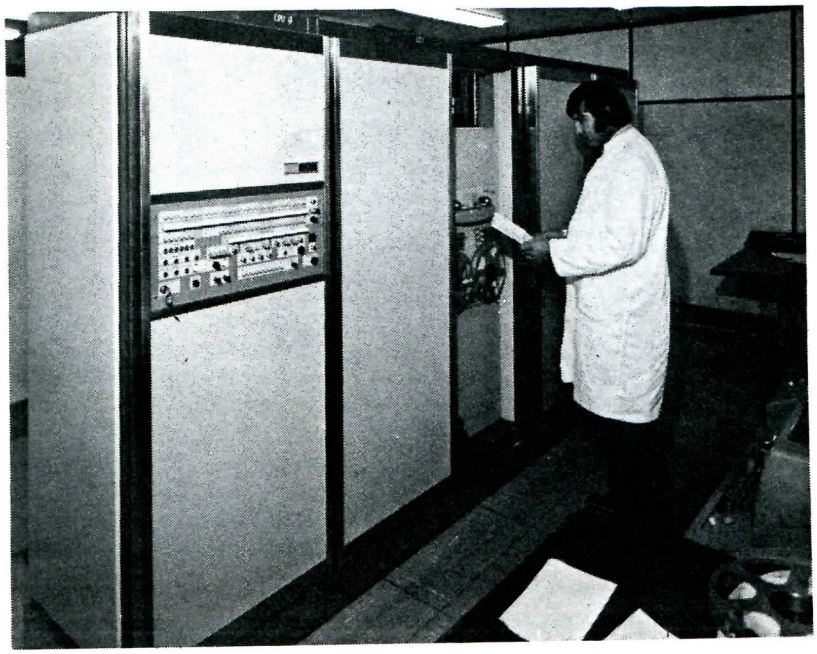

Fig. 5 — Pitt 10C Trunk – Processor Room with ITT3200 Central Processor Control Panel (left) and Paper Tape Reader.

vice test calls were made to subscribers as soon as possible after cutover, but the final test occurred when Sydney's heart resumed business on Tuesday morning 18th June after the long week-end. By 2.00 am on 15/6/74 the cutover was effectively completed and the post cutover testing commenced.

A publicity campaign using TV, radio and newspaper media was run to inform the public of the cutover and the number changes.

A team of 15 officers of the Telecommunications Division were involved in making telephone calls to cutover numbers on the morning of Saturday 15th June and on the following working days Tuesday and Wednesday. Special telephone numbers were advised for subscribers encountering problems at cutover and a temporary repair and dispatch centre was set up in the exchange to handle fault repair and complaint traffic. A team of technicians were on duty to clear exchange faults to attend problems at subscribers premises. Service advisors made a brief post cutover visit to each switchboard (PBX) after completion of the post cutover telephone calls.

A temporary manual exchange with 50 operators positions was installed in the Pitt building to handle the re-direction of calls to the new telephone codes after cutover. A further facility for up to 50 technicians to assist in the redirection of calls was provided and used on the first three working days following the cutover. The '28' and '25' cutover levels were intercepted with a voice announcement directing callers to a special code which accessed the interception operators.

The faults appearing in the post cutover period totalled only 222 of which 174 were exchange faults, 38 were external line faults and 10 were due to record or directory errors. By Tuesday 18/6/74 the number of outstanding faults had been reduced to fewer than 10. At 10.00 am on the Tuesday the re-direction manual exchange was handling approximately 11,500 calls per hour and an estimated 1800 Erlangs of traffic was being switched by the replacement exchange. Local TRT runs after cutover produced switching losses of 0.11% for the "232" exchange and 0.15% for "233". Network TRT runs through Pitt in June and July produced losses between 1.5% and 2.4%.

THE PITT 10C TRUNK EXCHANGE

The trunk exchange currently being installed in the Pitt Building is the first stored program controlled (SPC) trunk exchange installed for the Australian Post Office and is one of the largest of its type in the world.

Australia's requirements for telephone systems vary from those of other nations because of our particular geographical situation and widely dist-

Fig. 6.—Pitt 10C Trunk – Service Control Room with Magnetic Tape Reload Cabinets (in foreground) and Service Control Racks (in Background).

ributed population. The Pitt trunk exchange has virtually been "tailormade" for the Australian network and is known as a Metaconta 10C Exchange. It was designed by the Bell Telephone Manufacturing Co., Belgium, and is being installed under contract to the APO by Standard Telephones and Cables Pty. Ltd., (STC) Australia (see Figs. 5 and 6).

The introduction of the 10 C, SPC trunk exchange in Pitt Street led to the first manufacture of this type of equipment in Australia at a new plant built by STC (Aust.) at Alexandria. Local manufacture of this equipment, which is currently being supplied for similar exchanges in other Australian cities, was an important step in the progress of the Australian telecommunication industry.

The STD portion of the Pitt 10C Exchange was placed in service in September, 1974. This trunk exchange will share the total STD trunk load currently handled by the Haymarket ARM Exchange, and will progressively absorb the growth in trunk traffic to and from Sydney.

The manual assistance suites, which will be commissioned at a later date, have new and unique facilities, such as docketless positions, to handle the manual component of the increasing international and national traffic.

By 1975 some $9 million will have been spent on the trunk exchange Project.

THE PITT LONG LINE TERMINAL

To enable the trunk exchange to receive and process subscribers telephone calls, a complex network of trunk lines is required. Circuits to the exchange come from as far afield as Perth and Darwin, as well as from all other major cities of Australia. Moreover a dense network connects NSW country centres and the rapidly expanding Outer Sydney suburban area to the exchange.

The vast volume of telephone traffic passing over this interstate and intra-state network is carried to the Long Line Terminal by means of 12 MHz Coaxial Cable Carrier Systems each of which has the capacity to carry 2700 simultaneous telephone conversations on the pair of coaxial tubes contained within a cable composed of 12 such tubes.

The equipment used at Pitt, to receive the complex signals passing along the coaxial cable, is manufactured by Siemens (Germany), STC, (UK and Australia) and NEC (Japan) (Fig. 7). Its function is to separate the individual telephone communications one from the other, before connecting the circuits to the trunk and local exchanges for appropriate processing. In October 1974 this equipment provided some 2000 incoming and 2600 outgoing carrier circuits. Ultimately the Pitt Exchanges will have over 50,000 carrier circuits connected to them by means of the Long Line Terminal, while over

20,000 carrier circuits will be extended to other Sydney exchanges for switching.

Apart from its major function of directing telephone circuits to the Trunk Exchange, the Long Line Terminal conducts the feeding of some Radio Station programs to and from NSW country centres, and as a special function receives and distributes black and white and/or colour television programs from the Sydney Opera House.

THE SUPPORTING SERVICES AT PITT

The Pitt street building together with its electrical, mechanical and hydraulic equipment costing approximately $9.5m, posed many design problems. To accommodate the central processor equipment for the trunk exchange, environmental factors required special consideration, for example, the air conditioning units, which at the design stage, were the largest in the southern hemisphere, are capable of extracting 2 million watts of heat from the building and circulating 5663 cubic metres of air per minute.

Two units are required for this purpose, the largest filtering and conditioning unit being enclosed in a container 12.2m x 11.5m x 5.2m high and requiring reinforced concrete construction in lieu of the normal sheet metal. This contains heating, cooling (with chilled water) and humidity controls as well as dust filtering units. The cold outlet duct for this unit is approximately 1.82m x 1.82m cross section and the system operates at 6" of water gauge pressure which is about 4 times that required for a normal air system. Each unit is about 5 times the size of most large building units.

The fire protection system is a special "dry pipe" system, with Nitrogen gas at about twice atmospheric pressure fed to all sprinkler heads. When the electrical "early-warning" system detects an alarm condition from either smoke detectors or thermal sensors, throughout the building, hydraulic valves operate automatically and charge the sprinkler heads with high pressure water. This is released when required, when finally the sprinkler head fuses at the source of the fire.

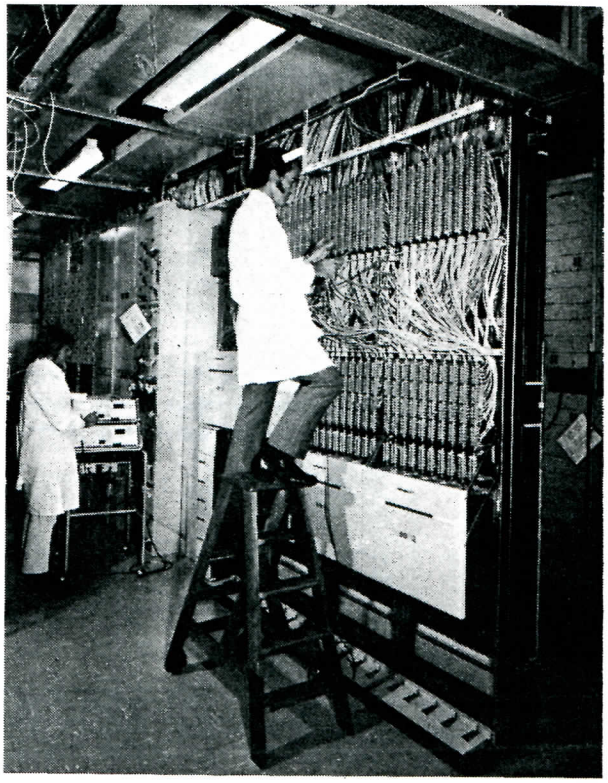

Fig. 7.—Broadband Transmission Equipment Racks and Super Group Distributing Frame (SGDF) – 10th Floor.

As would be expected, a building of such importance needs to be independent of failures to the supply of commercial electrical power. For this purpose a large electrical substation is provided in the building and two 1200 Kilowatt diesel alternators are installed, with compressed air automatic start.

The technological developments as featured in the Pitt Building are significant in the world scene and reflect the status of Australia's telecommunications industry and service.

REFERENCE

1. McKinley B. J., "An Introduction to the 10C Trunk Exchange System"; Telecomm. Journal of Aust., June 1973, Vol. 23, No 1, Page 85.