

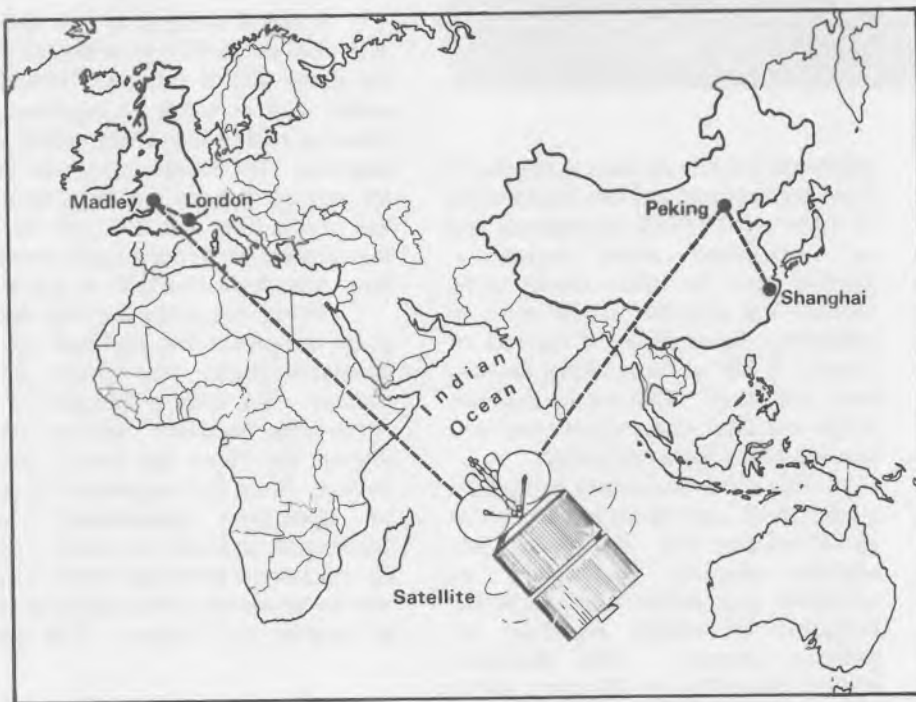
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ENG INF

The Quarterly For BBC Engineering Staff



LIVE STEREO FROM CHINA~ANOTHER FIRST



A concert given by the BBC Symphony Orchestra in Shanghai was broadcast live on Radio 3 on Sunday 17th May this year. The stereo programme was digitally coded in the City Hall in Shanghai and was relayed to Broadcasting House, London using a television channel on an Intelsat satellite as bearer.

The communication planning for this major stereo OB initially concentrated on using the conventional system for most international relays. A 48 kHz group from Shanghai to London would have been obtained and then two 15 kHz stereo-capable channels derived by means of FDM (Frequency Division Multiplex) equipment. The decision to use the satellite link was finally taken because the small number of telephone channels between London and China made it virtually impossible to arrange the release of a whole group. Establishing direct communications between the appropriate authorities in

both countries was an added difficulty.

The only problem that remained was to find and rent a television channel from Shanghai City Hall to the Peking Earth Station where the programme was to be sent over the Indian Ocean route – the local Shanghai Earth Station only works the Pacific Ocean satellite which would have meant an expensive double satellite hop to relay the signal to London. After direct discussions with the Shanghai Broadcasters and numerous telexes to the Chinese PTT, a route to Peking was established. This involved an SHF television OB link from the City Hall to the Shanghai Television Station, a coaxial cable to the PTT terminal and a long terrestrial television link to Peking.

Having had confirmation that an overall television link could be provided, it was decided to encode the signals digitally using the BBC's latest NICAM 3 2048 kbit/s equipment borrowed from the Birmingham terminal of the

recently installed BM – LO PCM link. A back-up system, using the older 704 kbit/s 2 channel NICAM equipment, was provided by Neil Gilchrist and Reg Dean of Research Department. Decoders for both systems were installed in London Control Room.

Mike Rushmere took both sets of encoding equipment to Shanghai, installed them in the City Hall and established the communications facilities in China. He was joined there by Frank Howard, Geoffrey Purrier and Colin Hayles, who were accompanying the BBC Symphony Orchestra on its tour of the Far East, and who were responsible for setting up the rest of the BBC equipment, from microphones to mixer desks, used in the broadcast.

An overall test was performed on Friday 15th May and, apart from some asymmetry of the signal which was greatly improved by reducing the sending level in Shanghai, produced very satisfactory results on both the 704 kbit/s and the 2048 kbit/s systems. The live broadcast was a great success and the technical quality was excellent.

This occasion was the first "On Air" use of the NICAM 3 equipment designed by Robin Caine, Alan English and John Robinson of Designs Department. NICAM stands for "Near-Instantaneously Companded Audio Multiplex" and is designed for permanent contribution and distribution circuits for Radio Broadcasting, as well as providing stereo links for outside broadcasts.

The equipment is mainly intended to encode six high quality (15 kHz) audio channels in a form suitable for the 2048 kbit/s Post Office digital telephony circuits. These digital systems are now taking over the wires which up till now have provided the BBC with permanent and temporary analogue circuits of the "carrier-phantom" type. The equipment is equally suitable for use on video circuits, radio links and other bearers.

For convenience in stereo use, channel coders and decoders are assembled in two-channel pairs to 'continued on page 2'

Stereo from China

'continued from page 1'



Digital Equipment at Shanghai City Hall

provide the required number of channels. Other equipment will also be provided which can add or insert channels to a six channel bitstream without decoding the PCM, or conversely extract two channels from a bitstream to send to some special destination.

Two coder-pairs have been installed in Pebble Mill to provide four mono or two stereo channels to London, where two decoder pairs have been installed in Broadcasting House control room, as described in *Ariel*, (April 15th 1981). These contribution circuits use a video bearer, since no digital bearer is available, and provide high-quality circuits, for stereo concerts, for example, which are of a quality comparable with the main distribution network. Later this year a similar facility will exist in Manchester.

The long circuit from Shanghai although good by international TV

standards was not as clean as the circuit from Birmingham and the combination of video noise (38dB unweighted) and an unexplained signal asymmetry, possibly due to video clamp units, brought the decoder to the point of registering digital errors at the rate of about 1 in 10^6 at times during the two hour broadcast. This meant that the effect was faint clicks about every two seconds during the worst period.

This effect was greatly reduced by a new circuit card which corrects errors by calculating the average of two adjacent samples to replace an erroneous one, rather than the earlier technique of merely repeating the previous sample. John Robinson worked feverishly on this card, which uses a microprocessor to calculate the replacement sample, up until two days before the link was tried out on the Friday before the transmission.



Mr. Chew, the Senior Engineer at Shanghai with Assistants Mr. Chang (left) and Mr. Ting and Mrs. Zhu (interpreter)



Editorial

Royal Wedding fever is in the air, with the shops full of souvenirs, and the streets full of tourists. The nation settles back to watch on television, or listen on radio to all of the action as it happens. The viewer or listener takes for granted that the quality of pictures and sound from the BBC will be the best there is, rarely stopping to consider how this high standard is achieved.

The credit, on the day, will rightly go to the production staff and outside broadcast teams who made it all possible. But spare a thought for the "back-room engineers" without whose support the "front line troops" would be lost. From the engineers in O & M, to Specialist Departments, from transmitter engineers to aerial riggers, all will have contributed in some small way to the success of the operation, and all deserve our thanks. Well done.

BBC MICRO-COMPUTER

In EID we are often asked about the much publicised BBC micro-computer. To set the record straight, these devices are being manufactured and marketed by Acorn Ltd., to a BBC specification. They will be available for purchase direct from Acorn in the Autumn, and there are no plans for a BBC staff discount. Engineers requiring further information or order forms can obtain them direct from Acorn Ltd., at 27 Bridge Street, Cambridge.

ENG INF

Delays in the preparation and printing past editions of "Eng Inf" have resulted in the seasons changing before the magazine had reached all of our readers. We have therefore prepared an eight-page copy this time, with a shorter interval between editions. We hope that it reaches you in Summer, and not early Autumn!

Alan Lafferty

STUDIO 'B'-MANCHESTER

Studio 'B': Manchester

The new television studio will bring all Manchester's broadcasting activities under one roof for the first time. The 2,500 sq. ft. studio — known as Studio 'B' — will be used mainly by Regional Television for the production of the nightly news magazine 'Look North West' and other regional programmes, but it is also expected that Network programmes will be produced from the studio from time to time. The new studio concludes a £12 million radio and television development which started in 1975 with the opening of Studio 'A' and a suite of radio studios.

The studio has been equipped as a joint project by external contractors and S.C.P.D. The vision system has been supplied by Pye TVT Ltd., the sound system by Calrec Audio Ltd., the lighting system by Berkey Colortran (UK) Ltd. and Thorn Theatre Lighting Ltd., and the communications and telephone system by S.C.P.D.

A combined production and vision control room houses a Central Dynamics 480 vision mixing desk, incorporating a Quantel DPS 3000 special effects unit. Cox 2 and 3 level synthesizers can be used in conjunction with a three part monochrome caption scanner and Ryley Caption Generator. Also in this area is a Thornlite 120 lighting console, which can handle up to one hundred and twenty channels connected to it; the console can store information about a hundred different lighting plots. The studio has four Philips LDK25 cameras. The sound control room houses a 28 channel Calrec mixing desk, Studer B62 tape recorders, and EMT950 record desks.



A Philips LDK 25 camera ready for "Look Northwest"

The studio area itself is divided into three — the main studio, an adjacent annexe (which can be used in conjunction with the main studio or separately as required), and a small presentation area. The 600 sq. ft. annexe has its own small production control room located close to the News Room, and it enables items such as national news contributions and 'Nationwide' inserts to be transmitted from the annexe without disturbing programme activity in the main studio.

The project, under A.C.E.D. and S.C.P.D. management with the close liaison of Manchester engineer Andy Shepherd, was completed on schedule, allowing the first programme — 'Look North West' — to be transmitted live on 18th May.

Transmitters Opened

The following uhf tv transmitters have opened since April:

Westward Ho!, Devon	15.81
Llandysul, Dyfed	8.5.81
Abergwynfi, W. Glam.	8.5.81
Salcombe, Devon	15.5.81
Dolybont, Dyfed	15.5.81
Delph, G. Manchester	5.6.81
Kirkoswald, Strath.	5.6.81
Union Mills, Isle of Man	19.6.81
Broad Haven, Dyfed	19.6.81
Backwell, Avon	26.6.81
Sunderland, Tyne & Wear	3.7.81
Crucorney, Gwent	3.7.81
Cartmel, Cumbria	10.7.81
Urswick, Cumbria	10.7.81
Hawkshead, Cumbria	17.7.81
Lauder, Borders	17.7.81
Stow, Borders	17.7.81
Kettlewell, N. Yorks	17.7.81
Fetlar, Shet. Isles	24.7.81
Monmouth, Gwent	24.7.81
Cerrigydrudion, Clwyd	31.7.81
Dolwyddelan, Gwynedd	31.7.81



Studio B production and vision control room undergoing acceptance tests

Equipment Department: Special feature



Audrey Seaman uses the microfilm reader

In the industrial heartland of Chiswick, W4, lies Avenue House, the headquarters of Equipment Department. The Department provides essential services to all technical areas in the BBC.

Equipment Department, or 'E.D.' to the lovers of initials, is probably best known as the base of Central Stores and the 'factory' which makes BBC designed equipment in quantities both large and small.

In recent years the Central Stores, part of Supply Group, has undergone a major revolution. Starting in 1973 the Stores were computerised with a system known best as Cemast 1900. In 1980 Cemast 2900 came into service, incorporating the lessons learned from the earlier system. The new system was an instant success and, supported by the new style, illustrated Central Stores Catalogue, offers a far quicker and more reliable service to customers. Engineers can now see what components look like and know exactly how much they will cost.

Alan Brownless, Supply Manager, said "Our aim is service and quality. You can pick up the phone or call at the door and our enquiries girl will immediately confirm the availability of the item you need. We normally despatch goods on the day of the request, but if it is really very urgent an order can be despatched in minutes."

As a result of these changes, orders for components and equipment have dramatically increased, resulting in a turnover of over £6 million in 1980. With over 17,000 items in stock, the stores can supply everything from Allen keys to attenuators, or washers to wire wound resistors.

PAPERWORK REVOLUTION

To control and maintain such a large stock required a lot of paperwork and filing space. Another minor revolution has taken place in the stock control unit where the paperwork for orders is received and processed.

"We are rapidly running out of space to store our paperwork" said Eric Rout, Head of Equipment Department. "When I came here in September last year Supply Group was almost submerged in paper. My predecessor, Gordon Parker, saw this happening and implemented micro-filing systems which, together with the on-line VDU based new stores system, rapidly disposed of the paper mountain! Information can be recalled from micro-film in seconds and five years records can be stored in a very small space."

STANDARDS MAINTAINED

Equipment Department sees itself as a business owned by the BBC and with the BBC engineers as its only customers. As with all other engineering activities, quality is a high priority.

Most of the components stocked in Central Stores are required to conform to rigid standards laid down by the Standards Section. Brian Ammon, the Standards Engineer, regularly attends liaison meetings with user departments. From these meetings emerges the range of preferred and approved components and materials that are adopted throughout Engineering Division.

The BBC specification for a component falls somewhere between the tight military standard, and that used generally throughout industry. Quite often small companies will ask suppliers to deliver goods to the "BBC spec". This enables them to order from a supplier, knowing that "if it's good enough for the BBC it's good enough for me!" The Section is well represented on the relevant BSI committees, ensuring that BBC standards are matched by suppliers in the UK and the EEC.

Maintaining high standards is difficult when manufacturers try to cut corners in order to save costs. Where possible, components are ordered from at least two sources so that if demand should suddenly increase, there will not be a hiccup in the supply situation and prices will remain competitive.

WORKSHOPS MANUFACTURE

ED is also well known for its manufacturing capabilities. Most of the coded equipment in operational service in studios and transmitters started life as



Jim Richardson turning P.T.F.E. aerial parts in the mechanical workshops

a bin of components and sheets of metal in the ED workshops. Because of the peaks and troughs in demand for coded equipment the department likes to know well in advance when major orders are being placed. Thus they can anticipate demand and allow the stocks of components and sub assemblies to be built up in advance. Clearly an order for say, video amplifiers, might be met with off the shelf equipment, but for large orders a guaranteed delivery date is agreed with the customer.

Because of the variations in demand for coded equipment it would be uneconomic to staff and equip Avenue House to cope with the peak demand. Peaks are catered for by using approved outside contractors who are selected by competitive tender. All components and drawings are given to these outside firms, and Equipment Department engineers make sure that the standards of quality and reliability are maintained by visiting the factories regularly and inspecting the work. The finished sub assemblies and completed equipments are always thoroughly checked and tested in the Test Laboratory before they are awarded their green "Equipment Department Tested" label, and released for operational use.

The Workshops are also involved in larger assemblies such as the MK III desks and equipment bays for Local Radio stations or Blue Streak TV transposers.

At Avenue House space is at a premium. For the Local Radio work, extra accommodation in the form of Portacabins has been used. Wiremen and technicians have been busy manufacturing complete control desks and bays which, once assembled, are thoroughly tested and accepted by the



Tony Davies of Shipley Chemicals Ltd. shows Supervisor Peter Hearn some new plating techniques

customer at Avenue House. The equipment is delivered by BBC transport, (also part of ED), when the installation team at the Local Radio site are ready to receive it.

"Storage of large assemblies such as control desks is a problem" said Eric Rout, "but by careful forward planning we can make sure that the desks and bays are ready at exactly the right time to match the SCPD or TCPD schedules".

The workshops can undertake almost any engineering job; they have the necessary ranges of lathes, jigs, drills, cutting and bending equipment for all types of the associated metal work. They also have teams of highly skilled wiremen who work either in Avenue House or at locations such as Television Centre or Manchester. Other facilities include an engraving area, a plated-through-hole shop for PCB manufacture, and gold plating.

GOLD PLATING

With any equipment using gold plated contacts it is necessary to check the quality of production to ensure that the correct amount of that expensive metal is being deposited. The Test Laboratory, is equipped with sophisticated test equipment that can determine the depth of a gold layer without damage. Other testing methods require a section to be cut, and this, of course, destroys the board for further use. The non-destructive test facility is much in demand from other departments such as Capital Projects, Designs, and Television.

CAPITAL PLANT

It can be said that ED, is the BBC's registrar of births and deaths, as new equipment is recorded by Capital Plant Registry and worn-out or obsolete plant finds its way to Avenue House for disposal to the second-hand market or the scrap merchant!

All the BBC's engineering equipment over a certain value is recorded on the Capital Plant Register and periodically checked on site by auditors. This unit is part of ED., and records of some 350,000 items are diligently maintained.

The three auditors are always well received at the sites that they visit, and are afforded every co-operation by the local staff. Fortunately no major discrepancies have been discovered in recent years, a tribute to the local care and control of engineering assets.

REDUNDANT PLANT

BBC equipment which is in working order is sought after by many organisations such as small commercial firms on the fringes of the audio-visual market, educational establishments and second-hand dealers. The objective of ED is to get the best return from these



John Fowler gets to grips with the uhf test set in the test laboratory

'continued on page 6'

ED Special

'continued from page 5'

transactions within the resources available.

A sound control desk, out of date and tired, by BBC standards, but still working, can be sold for a four figure sum whilst the remains of an equipment bay, pillaged for spares by the area which had been its base for twenty years, will go for its scrap value of twenty or thirty pounds.

In any case Fred Cherryman and his team will ensure that the BBC gets a fair deal.

After all saleable articles have been sold there remains little but odd bits of wiring, metal and plastic which is put in a skip and taken away as rubbish.



Bernard Delikan checks a customer's order



Checking whether or not an item is in stock

IMPRESSIONS

Despite the rather drab surroundings of the industrial estate around it, Avenue House has advantages, with several members of staff having spent over 25 years in the Department. There is a family atmosphere in the building, and this is hardly surprising with at least one father and his son employed there. The staff are all friendly and anxious to live up to the reputation of providing equipment with the quality of Harrods, but the price of John Lewis; a reputation that will keep Equipment Department in business - always ready to provide the "Service" and "Quality" that we have come to expect.

had been picked up from high frequency transmitters in the UK. The satellite system will considerably improve the quality and consistency of the programme signals."

The programmes will pass over conventional analogue circuits from Bush House to the British Telecom ground station at Madley in Herefordshire. There each will be converted into a digital bitstream, and beamed up to the satellite. A new 10 m dish aerial will be installed at the Makarios ground station in Cyprus to pick up the satellite. Once reconverted into their original analogue form, the programmes will pass over high-quality microwave links to the transmitter station.

The new circuits are the result of a programme of changes designed to improve the quality and audibility of External Services programmes throughout the world. Negotiations are proceeding with the local telecommunications authorities in Oman and Singapore with a view to feeding the transmitters in the Middle and Far East. The satellite signals will be receivable anywhere within its "footprint", an area bounded by South Africa and the UK in the West, and Japan and Australia in the East, centred on the Indian Ocean. The same satellite was recently used for an Outside Broadcast of the BBC Symphony Orchestra in Shanghai China. (This edition of Eng Inf).

Proposed Satellite Link to Cyprus

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The quality of reception of External Services programmes in the Middle East will improve when a new satellite link system is operational in 1982. Following an agreement reached between Communications Department, British Telecom, Intelsat and the Cyprus Telecom Authority, programmes will be beamed up to the Intelsat satellite, which is in geostationary orbit over the Indian Ocean.

Simon Shute, Head of Engineering, Communications Systems in Communications Department, said "For many listeners to the External Service programmes in the Eastern Mediterranean area the quality of reception is limited by the circuits from the UK. In the past the Cyprus transmitter station has had to rely on programmes relayed off air after they



The Makarios ground station

McMichael to make Electronic Clock



Gordon Parker, HDD, hands contract to David Wright, MD of McMichael Ltd.

The equipment that electronically produces the clock and logos which appear at programme junctions on BBC 2, is to be made available to other broadcasters following an agreement reached between Designs Department and McMichael Limited. It will be manufactured by McMichael under licence and will allow other broadcasting organisations to benefit from the advanced technology.

The equipment was developed by Richard Russell of DD, who said, "We

needed to find a cheap way of producing a clock and network symbol without the use of cameras. Adopting a solid state approach avoids the problems associated with the use of cameras, slide scanners and mechanical clocks, especially when in continuous operation".

The microprocessor-generated symbols have been in use on BBC 2 since last September. Besides producing the clock and its associated logo the equipment can also be programmed to

produce static logos such as the Open University symbol, or simple animated logos.

The clock symbol is generated from two components. The first covers the fixed elements of the clock face such as numerals, centre spot and gating circles, which are produced by storing the positional information in a Programmable Read Only Memory (PROM). The other component involves the moving elements, the clock hands themselves. These are generated in a similar fashion, although the data is stored in a random access memory (RAM). A microprocessor keeps track of the time of day, and once every second it calculates the correct angles and positions of the hands. The network logo data is also stored in a PROM and it is possible to generate up to 32 different colours.

The facilities offered by the generating equipment were demonstrated at the IBC 80 exhibition last September. Many visitors to the show expressed an interest in the equipment, resulting in the new licence agreement. Engineering designs are often available for licence by British manufacturers and industry; and this is the second such licence taken by McMichael this year. The first, the advanced four fields standards conversion equipment ACE, was at the Montreux International Television Symposium in June.

50th 'C' format VTR

SCPD recently took delivery of a 'C' format one-inch video tape recorder bringing the total in service to 50. This machine, manufactured by Ampex, will eventually enter service at Television Centre, once it has been checked to make sure that it meets our performance requirements.

'C' format video tape recorders are gradually replacing worn out quadruplex machines, some of which have been in service since 1959. The new one-inch 'C' format machines offer significant technical and operational advantages because they can record one complete television field with each revolution of the recording head. This eliminates differential head banding effects, a common problem with the older quadruplex machines. It also enables the picture to be replayed during spooling, which, together with slow motion and still-frame operation, makes editing and post production work easier.

'continued on page 8'



Derek Wiseman, David Crow and Clive Vinall of SCPD, with the 50th 'C' format video tape recorder at Western Avenue

First Phase of new Dual-working Telecine Suite at TC



The team (from left) Phil Powell, Geoff Rowlands (Project Leader), Vic Stanley and Jim Crowthers (SCPD) and Shuja Fatih (ED) with the Digiscan

SCPD has just commissioned the first phase of a dual-working telecine suite which will eventually consolidate a novel technique of telecine operation. When the whole suite is opened it will have two Rank Cintel "Digiscan" telecine machines in the same operational area with the ability to be used as a pair for A-B roll working. This will enable film compilation programmes such as documentaries,

where source material is on different film stocks, to be more easily assembled. An existing temporary "electronic editing" suite provides for cuts, fades and wipes between the telecines and for stills and captions to be added.

In the present phase one half of the suite is in service with a "Digiscan" machine controlled from a new BBC-designed operating console. The

console uses a system of coloured i.e.d. indicators arranged in a traffic light configuration to show various operating modes. The colours displayed quickly indicate the condition of the telecine: green indicates to the operator that the equipment is safe for programme use, amber for "guarded" operation and red indicates a test condition and warns against operation.

The "Digiscan" machine itself has improved performance over previous telecines. It produces pictures with no flicker and which require none of the geometry corrections of the conventional jump scan machines. The improvements are achieved by adopting sequential instead of the normal interlaced line scanning at the picture gate. The standard video signal at the telecine output is then produced by first converting the sequential line video to digital form and reading out of a store in interlaced form. The machine will accept Super 8, 16mm and 35mm gauge films.

The suite also features the first application in Telecine of Rank Cintel's TOPSY (Telecine Operations Programming System), by means of which recorded instructions in a digital store automatically control the various operational modes of the telecine during transmission.

ROYAL WEDDING With subtitles

Designs Department was asked to continue its work on the real-time, verbatim subtitling of programmes using the Palantype mechanical shorthand system by providing a means of subtitling the live commentary to the Royal Wedding. BBC 2 will carry the Royal Wedding programme from BBC 1 but with in-vision captions (open captions) provided by a character generator. As far as possible the live commentary will be verbatim. However where the content is known beforehand, the subtitles will be replayed from a prepared data recording.

This occasion will be only the second time the equipment has been used on transmission. The first broadcast, the inaugural address of the US President in January, created considerable interest and was enthusiastically received by the deaf viewers who saw it on their CEEFAX television receivers.

As a result of the co-operation between Leicester Polytechnic and Designs Department a transportable system has been designed around the Cromemco Z-2H microcomputer which transcribes the output of an electronic Palantype Keyboard into English. The work has been going on for about three years using fairly modest resources. However since January this year the equipment has been augmented by the addition of an output subtitle processor which paces the transmission and gives a steady flow to the subtitles. A very significant update of the system's dictionary is being carried out and amendments have been made to deal with the very large number of specialised words that an occasion like the Royal Wedding commentary creates. It is hoped the system will be fully developed early in 1982.

Up to now Isla Beard of the Palantype organisation has provided all

'continued from page 7'

50th VTR

The machine offers two high-quality sound tracks, allowing stereo recordings to be made, and a lower quality track which is normally used for time-code signals.

Significant savings in tape storage costs can be made as the tape used is half the width of the earlier quadruplex standard tape, and the base material is thinner, giving smaller diameter reels for the same programme length. One inch tape costs slightly more than half the cost of the same programme length of two inch tape.

the Palantype input for the project. Recently Irene Last and Anne Pascoe joined her in order to provide a better subtitle coverage. The Royal Wedding is another step in the development of Palantype mechanical shorthand system as applied to broadcasting, and has shown that the system can play its part in a comprehensive subtitling service.