ENG INF

Autumn 1987 No. 30

# Sypher 3 and 4 enter service at TVC

Sypher suites 3 and 4 recently entered service at Television Centre. Located under TC1 in the area that previously housed the manual PBX, Sypher 3 is a replacement for Sypher 1, and Sypher 4 is a new facility. Each comprises a post-production sound control room, and a small sound studio. There are also two Sypher preparation rooms.

Sypher is an acronym for "**SY**nchronised **P**ost Dub, **H**elical-scan and **E**ight track **R**ecorder" and indicates that it is a sound-dubbing process in which a multi-track sound recorder (MSR) is synchronised to a non-broadcast HVTR. The procedure is to record the original master vtr sound-track on to track 3 of the MSR, and EBU time-code, for synchronisation purposes, on to track 8. This allows additional sound effects and music etc. to be mixed with the original sound track and re-recorded on to track 5 of the MSR. The additional sound may originate from tape or cartridge machines or gramophones but where the mix is too complex to handle in one pass an intermediate track-lay process is used to produce them as synchronous sources on tracks 1 - 4 of the MSR. In either case when the final mix has been completed it is transferred back to the vtr in place of the original sound track.

*Sypher 3 control room*

Each control room is equipped with an SSL 5000 series computer-assisted desk; this offers thirty-six mono channels, six stereo channels, four stereo groups, and four VCA groups. The desk has the normal range of equalisers, filters, pre and after fade listens and pan controls. The SSL computer is used to store information about the settings of the faders and six

**Continued on Back page**

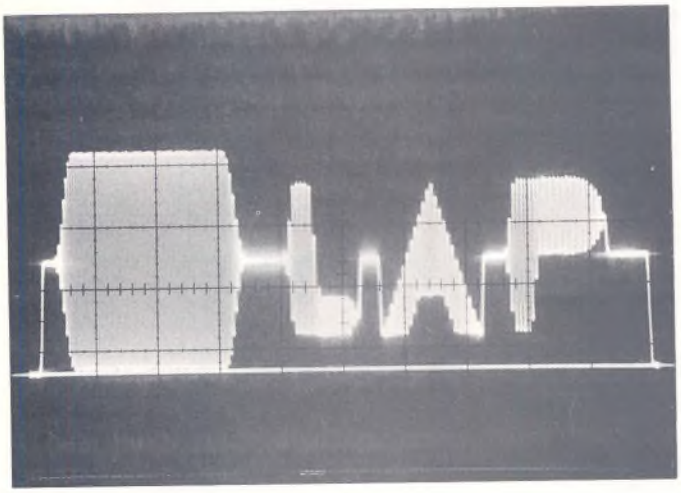
## New radio mic

Design Group RF Section have produced a high power Band I radio microphone system comprising transmitter, receiver and ancillary units.

Following the Merriman report, the BBC's Band I allocation was substantially reduced so it became necessary to replace existing wide-bandwidth radio microphone equipment with a new generation of equipment requiring much reduced RF spectrum per channel. The new equipment uses 15kHz peak FM deviation to achieve this and recovers the consequent loss of signal to noise ratio using companding techniques. Attention has also been paid to the transmitter output stage to enable several links to be used in close proximity without incurring intermodulation problems. Receivers may be used singly or in diversity pairs.

The full line-up of new generation equipment comprises 4W transmitter TM3P/9, receiver RC4P/10, Circular units FL2/29A and B, attenuator FL2/30, 2-way rack EP1P/60, 7-way rack EP1MP/61 (for receivers), head amplifier AM14/60, filters FL2/31 A and B, splitter FL6/37 and power supply PS4/50.

# Novel waveform generator identifies sources.



*ENG Ident: London Airport*

Design Group, Design & Equipment Department have recently supplied for the London Airport studio an ENG Video Waveform Generator, GE6S/558. When the studio is not in use, the generator is connected to line and produces a test waveform similar to the line-19 ITS upon which most waveform measurements can be made, but its novel feature is the identification waveform which it produces on alternate lines. This waveform is so designed that when viewed on a waveform monitor an easily identifiable display is produced, based on alphanumeric characters formed by the combination of suitably modulated subcarrier and luminance. For London Airport the letters 'LAP' have been used as seen in the illustration. Other generators have been supplied for ENG sites at Crystal Palace, Barbican and the Topical Production Support vehicle. Most characters, some inevitably more stylised than others, can be represented using this novel technique devised by Richard Hubbard of Video Section.

# Licence Agreements.

Agreements on the following Licences for BBC-designed equipments have been reached.

A new burn and shading corrector, and an improved head-amplifier, have been developed for Rank-Cintel Mk III telecine machines. Known as FESTIVAL, the PEC Head Amplifier, AM1/616 and Burn Processor Unit, UN26/604 are now available through Digi-Grade Systems Ltd of Farningham.

Continental Microwave Ltd of Luton, and SVT Video Systems Ltd of Maldon are producing equipment for UHF TV transmitter sites. The Transmitter Demodulator, DM1M/506 and Rebroadcast Receiver, RC5M/503 were designed to replace equipment installed when colour was first introduced around twenty years ago.

SVT Video Systems Ltd have also taken a Licence for the Digital Stereo Sound with Terrestrial Television equipment, more commonly known as NICAM-728. This range of units, comprising a Coder, Modulator, Demodulator and Decoder, was designed as a prototype model by Research Department, in order to test various possible methods of broadcasting stereo sound with television: the current specification has been approved by the Government as the UK standard. However, following much interest from other broadcasting organisations world-wide, SVT are now developing the equipment further, to a form more suited to regular use in an operational environment.

Finally, Eddystone Radio Ltd of Birmingham are designing a range of modular r.f.i.-shielded enclosures, based on Design and Equipment Department's CH1/86A&K screened chassis. These modules, protected by patent, have become the standard method of packaging for r.f.-susceptible equipment, and Eddystone expect to develop these in a similar way to their ever-popular die-cast box.

Contact the D&ED Liaison Engineer, Peter Jefferson, on LBH 4345 if you would like further information.

# Transmitter News.

The following transmitters have opened or changed since June:

**UHF Television**

| | |
|---|---|
| Bridge of Allan | Central Scotand |
| Burbage | Derbyshire |
| Byrness | Northumberland |
| Clachan | Argyllshire |
| High Keil | Argyllshire |
| Mottram | Grtr. Manchester |
| Stockport | Grtr. Manchester |
| Tayvallich | Argyllshire |

**VHF Radio**

| | |
|---|---|
| Abergavenny | Gwent |
| Ballycastle | Cty Antrim |
| Pendle Forest | Lancs |
| Redruth | Cornwall |

# Manchester VT developments.

*The Manchester VT control room*

The first major redevelopment of Manchester's central video tape area since the present BH opened twelve years ago has recently been completed. One year of careful planning, followed by six months of site work, brought the new areas into service on schedule at the beginning of August. The objective of the redevelopment was to bring the facilities available up to the present day programme requirements, and recognise the change from 16mm film for news and current affairs to PSC and ¾" U-matic helical vtr. To achieve this, whilst maintaining Manchester's high programme output required the work to be carried out in two phases, concurrent with the construction of a temporary edit suite housed in a portable radio studio built within the vt OB garage. The technical equipment for the temporary facility, originally built for the 1986 Commonwealth Games, was made available to Manchester by P.I.D.Tel. When the equipment left Manchester it found a new home in BH Plymouth.

Building work in the new area included replacing the computer floor, electrical installation, additional walls and decorative acoustic wall boarding. B.E.S.M., Bill Sanderson, redesigned the air conditioning to give a more positive extract from points of maximum static heat load and provide enough air movement at the operator positions for maximum comfort without draughts. This work has given the areas a much enhanced appearance and improved working environment. The space for two new vt areas, VT3 and VT4 was made possible by the removal of a life expired Rank Cintel MK II tk machine from an adjacent room. The whole area was then rearranged to form a vt complex equipped with two independent ¾" U-matic high band transmission suites and three 1" C-format suites.

Each of the ¾" U-matic suites is equipped with two Sony BVU 800 vt machines and associated BVT 800 time-base correctors. The machines are linked to each other and the outside lines via a control and monitoring desk designed so that the whole suite can be operated by one person. Comprehensive control of the vtr's, sound, vision and the communications required for live transmissions is available from the desk position. A feature, incorporated at the suggestion of operations department is real time colour balancing. This was achieved by using a Cox 339 colour corrector unit adapted to preserve operational compatibility with Tariff 2, including the provision of lift and gain control on the z axis of the joysticks.

The U-matic vtr's can be remotely controlled using serial or parallel systems which ensure compatability with all existing suites and mobile vt vehicles. The desks and control panels were custom designed by Manchester Tel.Rec. Services, in conjunction with operations department. The carcase was manufactured by Willsher & Quick, and the control panels by D & ED workshops.

As an alternative facility, each ¾" U-matic suite is equipped for editing, either as a sample two-machine suite, or in conjunction with other 1" suites. This facility is enhanced by the inclusion of audio and vision mixers which can be operated together or independently.

All crews now have available by switch selection an electronic vt clock with line-up tone. Designed by Manchester Services, it is controlled by a small portable keyboard which can be plugged into the wallbox of any vt suite. Facilities are also provided via wallboxes for control of DVE and vision mixers. VTR serial bus access is available to allow simple plugging of external edit controllers.

The entire project was undertaken by local Tel.Rec. Services effort, led by John Smith assisted by John Pickering, Tony Bailey and Ian Jones. The wiring was undertaken by local wireman Robert Scott. Building, ventilation and electrical services work was planned by Manchester Building Engineering Services Department, under the leadership of Bill Sanderson, and carried out by contractors.

# New antenna testing facility at K.W.

*The new antenna range at Kingswood*

A new measurement range, specially designed for testing microwave antennas, has been installed recently at Kingswood Warren.

A measurement range was available at Kingswood Warren for operation up to u.h.f., but no test facility was available within the BBC suitable for use at microwave frequencies. Therefore a new measurement range has been designed and commissioned to augment the existing one, extending the frequency range to beyond 18 GHz. Both ranges are now operated from a purpose-built building situated in the grounds of Kingswood Warren. The accompanying photograph shows the new range in action, with tests in progress on a new dish antenna for Television OB links.

There are established suppliers of equipment for antenna measurement, but their equipment is very costly and is tailored to the comprehensive systems that such firms supply. In this case individual items were procured from various alternative sources, and in some cases the equipment was tailored precisely to our needs. Much of the measurement hardware was built by Technical Services at Research Department. The engineer in charge of this project was Chris Gandy, a Senior Research Engineer in Transmitters and Propagation Section.

A wide range of antenna patterns is required for practical operations, from the narrow beam of a long distance communications link to the nearly omni-directional patterns required in some Outside Broadcast operations. Amongst the many areas of research at Kingswood Warren, there is a strong commitment to providing the service with specialist antenna designs to meet a wide range of requirements. This covers transmitting and receiving broadcast antennas, and communication antennas for both contribution and distribution of television and radio services. The 1.2 metre dual-band dish antenna for OB links, shown in the accompanying photograph is a typical example.

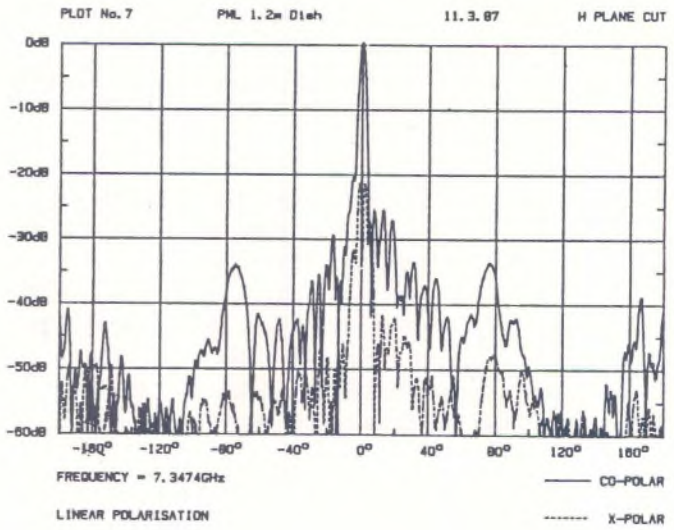
In order to assess commercial antennas and to develop designs to meet specific service requirements, it is necessary to have an effective antenna measurement range. Conventionally the pattern is measured by rotating the antenna under test about a vertical axis whilst it is receiving from, or transmitting to another antenna some distance away. The distance between the two antennas is important because it must be sufficient to simulate the conditions in which the antenna under test will ultimately be used; insufficient range length causes errors in the measured pattern. In this case at least 80m length was required and this dictated an outdoor range. It is equally important that the range should be clear of objects such as trees and buildings which could give rise to spurious reflected signals, or "clutter", which would effectively superimpose several radiation patterns on top of one another. This includes a contribution from the ground reflection and the only simple remedy is to elevate or slant the range above the ground.

Given these requirements the possible locations in the grounds of Kingswood Warren were soon whittled down to one; from the roof of the mansion, out over the croquet lawn to a spot in the grounds to the east of the mansion. The 100m path was suveyed at s.h.f. and was found to be sufficiently free from clutter provided that the remote site was elevated to at least 5m above ground level. After consideration of temporary structures and towers the decision was made to erect a proper brick building at this spot and to mount the antenna under test on its roof. The many advantages of a permanent building include the provision of decent laboratory facilities within the building, operator safety on the roof, and security for the very expensive equipment used in these measurements. The building takes

the form of a 4m cube with a wide external staircase leading to the roof.

One of the most critical items in the measurement system is the positioner for the antenna under test, which in this case is a remotely controlled turntable. This was required to support antennas as large as 1m in diameter and to provide an angular resolution of 0.2 degrees. None of the turntables in use at Research Department came anywhere near this specification and the cost of suitable equipment from one of the well known, industry standard manufacturers was immense. Fortunately, ERA Technology Ltd. was willing to develop a suitable turntable at a reasonable price, so an order was placed with this firm. The design includes a computer interface so the pattern measurement process can be controlled by a micro-computer. This offers great improvements in the speed of repetitive measurements and in the presentation of results, and allows a degree of post-processing which has hitherto not been possible. A typical result is the radiation pattern shown in the accompanying diagram: this took about two minutes to measure and plot, and the process was initiated simply to pressing a key. A BBC micro-computer is used and a comprehensive software package has been written at Research Department for this application.

For ergonomic reasons it was decided to operate the antenna under test as a receiving antenna (although the same patterns would be measured with it transmitting), and it is effectively illuminated by a distant source antenna,




about 15m about ground level, on the roof of the mansion. Access to this roof area is relatively difficult, so a switchable system of s.h.f. source antennas has been installed, and this can be controlled remotely by the micro-computer in the measurement building. All of the useful source polarisations are provided using very high quality corrugated horn antennas. Facilities have also been included for fitting alternative horns to cover other frequency bands (such as the 5.5 GHz and 7 GHz bands used by Television OB links)

The completed measurement range now provides a much needed facility for antenna research and development, for checking antennas that are in service and for verifying the performance of new antennas which are being considered for future use.

# WARC plans HF broadcasting

Over six hundred and fifty delegates from 117 countries gathered under the auspices of the International Telecommunications Union (ITU), in Geneva in January earlier this year at the World Administrative Radio Conference (WARC) to plan the high-frequency bands allocated to broadcasting. Seven members of BBC staff from External Broadcasting and Research Department attended the conference, which followed from an earlier session in 1984. The earlier conference had asked the International Frequency Registration Board (IFRB) to devise a method by which the HF bands could be planned so that all Administrations had equal access across the bands. Now that the dust has settled, this article will look at the implications for the BBC on the decisions reached.

**Background**

Currently each Administration using the HF bands chooses it own frequencies to meet its broadcasting needs (see Eng Inf No 23, Winter 1985/86), and these are submitted to the IFRB on a seasonal basis. (For the uninitiated the ionosphere changes its reflective nature through the seasons, and sunspot cycle and affects the HF frequencies which can be used throughout the year). Any interference by one broadcaster to another is left to the individual Adminstrations to sort out.

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**HF WARC**

**Continued from page 5**

Many countries, particularly the emerging third world nations, felt that this had become a "first come, first served" system favouring established broadcasters such as the BBC.

The HFBC WARC in 1984 was therefore asked to determine the technical parameters to be used in planning the bands, and to devise a planning method. The 1987 HFBC WARC would then analyse the results of the planning system based on a set of broadcast requirements and determine a date for its implementation.

The test plans were published from July 1986 onwards, a total of six eventually being made available on microfiche or computer magnetic tape by the start of the second session (January 27 1987). An analysis by the BBC of these test plans, each of which required 15 MB of data storage, showed that if implemented, there would be a catastrophic impact on the audibility of BBC External Services. Only some 60% of the BBC HF broadcasting requirements were actually allocated a frequency. Even worse, only some 40% of our requirements were satified with the minimum acceptable quality level. A further shortcoming was the lack of continuity from hour-to-hour. For example a particular requirement could have a frequency for 30 minutes, no frequency for the next 30 minutes, and perhaps a totally different frequency for the next hour! The analysis of all these plans was a joint exercise by Bush House and Research Department using Transmission Planning Units VAX 11/750, and the results produced providing the main source of information for the DTI and FCO, not only of our own transmissions but for those of every other country.

This inability of the BBC to deliver its programmes to it massive audience world-wide under this planning system was unacceptable to both the BBC and the Foreign and Commonwealth Office (FCO) who actually fund External Services and prescribe the services to be broadcast.

The UK decided to send a very strong delegation to the Conference made up of representatives from the FCO, DTI and BBC. The DTI, as the 'UK Administration', would normally lead the UK delegation but, for this conference Sir John Graham, a retired high-level Ambassador to Nato, was appointed as leader.

*Geoff Spells, Ian Davey and Brian Tait at a WARC technical committee meeting*

The BBC team was led by Gerard Mansell, ex MDXB and ex-Deputy DG of the BBC. Others were John Corbett, CEXB; Dennis Thompson, HTPU: Ian Davey, SE(L&P), TPU; Geoff Spells SE(FM&RR), TPU; Brian Tait, Engineer, Research Department; Michael Harrison, Special Assistant to MDXB; and Cathy Tait, Secretary to CEXB.

## The Decisions reached

In the short term the decisions reached mean no immediate changes to the current system of broadcast frequency management at HF (ie Article 17 of the Radio Regs).

In the longer term, two recommendations may have an impact on the BBC External Services, although both will need to be ratified at a future conference.

It was recommended that the IFRB should, in the light of the agreed 1987 modifications and improvements to the planning method, revise their computerised planning system and test it prior to a further conference which would consider and ratify, if appropriate, the revised system. This new system would incorporate a planned spectrum alongside a 'free for all', the frequency spectrum for the former encompassing the 1979 expansions for HF Broadcasting, plus some of the existing spectrum operated under Article 17, as shown in fig 1.

Additionally another reallocation conference was requested in order to increase further the spectrum allocated exclusively to HF Broadcasting.

It was also recommended that HF broadcasting should move towards single side-band (SSB) transmissions, phaseing out the existing double side-band (DSB) system by

the year 2015. However the timetable is only provisional, presents many problems during the transitional transfer to SSB and depends largely on the availability of cheap, easily tuned, stable domestic receivers. Interestingly this proposal would not, at least during the transitional, period result in large power savings at BBC HF transmitters, since the carrier would not be completely suppressed, which is generally the case with existing SSB fixed service link transmissions.

**Conclusions**

The congestion of the HF bands will continue for the forseeable future, as a decision for planning these bands is suspended for another conference to decide. The extension of the HF bands must be welcomed, but will not alleviate the basic problem, "How do you fit a quart into a pint pot?"

| Freq. Band (MHz) | Current Spectrum | Proposed Planned | Proposed Improvements | Future Extensions |
|---|---|---|---|---|
| 26 | 25.6 -26.1 | 25.9 -26.1 | 25.76-25.9 | - |
| 21 | 21.45 -21.75 | 21.65 -21.85 | 21.45-21.65 | 21.75 -21.85 |
| 17 | 17.7 -17.9 | 17.55 -17.75 | 17.75-17.9 | 17.55 -17.7 |
| 15 | 15.1 -15.45 | 15.4 -15.6 | 15.1 -15.4 | 15.45 -15.6 |
| 13 | - | 13.6 -13.8 | - | 13.6 -13.8 |
| 11 | 11.7 -11.95 | 11.65 -11.7 | 11.7 -11.975 | 11.975 -12.05 |
| 9 | 9.5 - 9.775 | 9.775- 9.9 | 9.5 - 9.775 | 9.775 - 9.9 |
| 7 | 7.1 - 7.3 | - | 7.1 - 7.3 | - |
| 6 | 5.95 - 6.2 | - | 9.5 - 6.2 | - |

# New Glasgow tv continuities

The project to replace the existing Glasgow television continuity with a new area, has just been completed. The layout and type of equipment is similar in style to that in Cardiff continuity 'B' and the Belfast television continuity, but it has been adapted to suit the conditions of working in Glasgow. An adjacent single camera television studio has also been provided. The camera has a fixed position, and the area equipped with simple production lighting, prompt equipment and cue monitoring. The area could later be adapted as a simple second continuity to cover simultaneous opt-outs on both television networks.

The mixer,made by Abekas Cox is an audio/video mixer of the 'knob a channel' type, with remote control of both audio and video. The video channels are fitted with 'cut' buttons and the audio channels are equipped with 'add' buttons to facilitate 'lead with sound' working.

*Alan Smith BSM Scotland, Martin Shaw and Mike Lyons, PID Tel in the Glasgow TV continuity*

There are several major differences to the older mixers: new type Penny & Giles quadrant faders are used, which are considerably smaller than the old Plessey type. No 'by-pass' facility is provided, as the computer controlled technical router makes its provision unnecessary; no designated 'network' channel has been provided, as it is more flexible to use any of the five outside source lines as required. The mixer has been equipped for stereo audio, as has the whole television continuity, although no 'panning' controls have been fitted. The electronics of the mixer and the other technical equipment are located in the Central Technical Area (CTA).

There are several caption sources available to the mixer. An electronic "Slide File" has been provided, with local control in the CTA, and operational control from the television continuity desk. The existing Cintel twin-port caption scanner has been re-installed in the new caption room, fitted with new logic control, and can be controlled operationally from the Slide File control panel in the continuity desk. A Ryler Capgen 2 has been provided, which has been equipped with logos for 'BBC', 'TWO' and 'Reporting Scotland'. The existing electronic clock has been re-installed, along with the Network 1 symbol. The split screen unit used to add the 'BBC1'

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**Glasgow: Continued from previous page.**

*Martin Shaw, PID Tel, in the continuity studio*

from the symbol onto the clock has been re-used.

The first three main channels on the mixer are pre-selected by a small Probel audio/video matrix, which will also be used for monitoring. As well as the caption sources, the matrix has local vt and studio outputs for both audio and video. Five channels are combined audio/video channels selected via a vdu controller on the continuity desk, from the CTA router, the particular network for the opt-out normally being one of the selections. The remaining channels are designated for local audio.

Two microphone channels are provided (main and reserve), each fed from a mic fitted to an anglepoise type fitting on the desk. An EMT 938-120 gram unit has been provided, and the ITC Series 99 cartridge machines have been re-installed, together with a Studer B67 reel-to-reel unit. The spare channel is now fitted with a CD player.

A downstream keyer channel is provided on the mixer, in conjunction with an external genlock sync pulse generator. The inserted caption, from either Ryler Capgen or Slidefile/Caption Scanner, can be colour infilled and edged by the mixer.

A 'letter box' facility has also been provided as an option on the downstream keyer channel - the inserted caption, however, cannot be colour filled or edged. An auto opt-out facility, derived from ICE equipment, is also provided. The existing ICE equipment has been re-used, and new equipment using Datacast may be provided later. Green screen monitors are provided in the desk for use with Presfax.

The continuity has a range of picture monitors. Three grade 1 colour monitors (Melford BU5-20C) have been provided, as well as nine Melford BU3-9 monochrome monitors.

Other monitors include a Melford Grade 1, DU5-16C, monitor fitted in the desk for graphic composition, along with a green screen Melford DU1-12GH for graphics editing. A similar green screen Melford DU1-12GH monitor has been provided in the desk above the mixer for use with Presfax (switchable to graphic edit or prompt). A 14 inch Philips 2619 off-air teletext receiver has been mounted on the back of the desk, and a Melford DU6-14C monitor with simple PAL decoder has been fitted in the CTA bays for monitoring. A Melford DU6-14C monitor has also been supplied for use in the studio for cueing, along with a Melford BU3-9 B/W monitor.

A custom-designed sound control desk, which houses the mixer and other control panels, has been installed as well as the monitors described above, and selection vdu.

A side wing fitted to the right hand side of the desk houses the gram unit, the cartridge unit and the CD player, and storage for cartridges. The reel-to-reel unit is housed in a matching trolley unit, so that it can be moved to different positions as required. On the left side is a small extension to house the graphic control equipment and space for a Production Assistant to operate, cueing local opt-outs, during some programmes, such as 'Breakfast Time'. For audio monitoring, two LS5/9 loudspeakers have been suspended from the ceiling adjacent to the monitor stack.

Studio

A simple in-vision tv studio has been built controlled from the continuity desk. It is equipped with a Sony DXC 3000 CCD colour camera,fitted with a Fujinon zoom lens.

The continuity has been provided with an Autoscript computerised prompt system, which is operated from the control room, with automatic upates fed over data circuits from similar equipment provided in the newsroom. Remote control of prompt scrolling can be extended to the announcer in the studio. The studio is equipped with suitable production lighting luminaries fitted on fixed barrels.

# Time on your hands? All is revealed

Towards the end of the year we will be wondering why some diaries show Saturday December 26th as Boxing Day and others Monday December 28th. I don't propose to enter into this particluar debate, which only arises at intervals of five, six or eleven years. But there are many other fuzzy areas in calendar and clock waiting to catch us out.

Next year is a leap year, and we regularly sympathise or envy those born on February 29th, while ladies enjoy the privilege of proposing marriage. But we've got the day wrong, the extra day in a leap year is actually February 24th. In the Roman calendar the extra day in the bissextile, or leap, year was inserted as an extra sixth day before the Kalends of March. If you look at a list of Saint's Days, or a 'name day' calendar in countries where these are celebrated, you will find that next year the feast of Saint Matthias the Apostle moves from 24th to the 25th of February and Torsten's name day from the 27th to the 28th. In a Finnish diary I happen to have handy I find 1980 February 24 marked as 'karkauspaiva - Skottdagen' (leap year).

Mother's Day is another problem. In many other European countries and in North America the second Sunday in May is designated as Mother's Day. In this country it is usually confused with Mothering Sunday, the fourth Sunday in Lent, when children away at work would be given time off to visit their mother, bringing flowers or cakes. It is interesting year by year to study the advertisements and shop displays and see that more and more are recognising the difference. But I've yet to visit a local restaurant on the second Sunday in May and insist on the free glass of champagne and rose for mother which they advertised for Mother's Day two months earlier. One advantage of the confusion is that it is possible to buy cheap Mother's Day cards shortly after Mothering Sunday.

Between these two comes Easter. To most people the day after Good Friday is Easter Saturday but this is really the Saturday in Holy Week. Easter week begins with Easter Day, followed by Easter Monday and ending with Easter Saturday.

Of particular interest to BBC employees are the years 1995, 2006 and 2017 when, because of Easter, pay day falls on April 18th and 2022 when Good Friday falls on April 15 so pay-day is not until the 19th.

And what about Friday the thirteenth? There are one, two or three of them every year, this year there are three. The pattern of the calendar repeats every 400 years, during which there are exactly 20,871 weeks, and 97 leap years. In this period the thirteenth of the month falls on 683 Saturdays, 684 Thursdays, 685 Wednesdays, 686 Mondays and Tuesdays, 687 Sundays and 689 Fridays. So the thirteenth of the month is more likely to fall on Friday than on any other day.

Even writing the date causes problems. In North America 07-04-87 means the fourth of July, elsewhere it means the seventh of April. There is an international standard on the Representation of calendar Dates for Information Interchange which specifies the sequence year-month-day, so Christmas Day will be 87-12-25. This standard is easily extended to give hour and minute. It currently has the advantage that it is obvious when it is being used, as the year number, which is much greater than the day or month numbers, comes first.

But we will all have to adopt this standard within the next few years otherwise a date such as 01-02-03 will have three different interpretations.

Week numbers present another possible source of confusion. According to an International Standard, the week runs from Monday to Sunday and week 1 contains the first Thursday of the year. However, some organisations use a different rule, which means that in some years they are out of step. If their week runs between different days, such as Saturday to Friday, the confusion can be worse still. BBC Programme Weeks run this way, and appear to take their cue from the first Tuesday of the year. So in two years out of seven, or, more precisely, 114 years out of 400 (if the BBC survives that long!) the Monday-Friday week has a BBC Programme Week number one less that the standard week number, as in 1986 and 1987.

It can be useful to express the date as a

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**Time: Continued from previous page.**
simple number, increasing by one every day. Then hire or interest charges based on days can be calculated over long periods without the problems of 'thirty days hath September ...' leap years or week 53. The Modified Julian Date (MJD) is often used for this purpose, it is a five-digit number with its origin (day 0) on 1858 November 17. We passed MJD 47 000 on 87-07-24.

Even when we've sorted out the date we can still find problems with the time. When William Willett proposed Daylight Saving time he suggested moving the clocks forward by twenty minutes on four consecutive weekends in Spring to lessen the confusion! We used to move our clocks forward at 2 a.m. until the habit spread to the continent who, while being an hour ahead of us, also changed at 2 a.m. by their clocks. Now we and the Irish change at 1 a.m. and the Finns and Greeks change at 3 a.m., in order that we all move our clocks forward at the same instant. At present we move back at the end of October whilst most of Europe moves back at the end of September, so we share the same time as our neighbours on the continent for most of October. When we move back, Australia and New Zealand move forward to their summer time, so there is a two-hour relative change. But some states in Australia, and some in the USA, as well as many other countries, don't change at all. Lord Howe Island and the Cook Islands change by only half an hour. All times are offset from 'Greenwich' Time by half-hour multiples in the range -11 to +14 hours, with the exception of Nepal at +5hours 45 minutes.

But what is this 'Greenwich' time? Until 1972 everything was simple. There were 60 seconds in the minute and slight adjustments were made to the length of the second from time to time to keep the clocks in step with the heavens. This was Greenwich Mean Time (GMT) which was offset by one hour to give British Summer Time (BST) and exceptionally during World War II by two hours to give Double Summer time. GMT is the basis of legal civil time in the UK but since the start of 1972 we have no longer have access to it. All our time signals, including the Greenwich Time Signal (GTS), are based on Coordinated Universal Time (UTC). This is defined in terms of an atomic frequency standard which, of course, is in no way locked to astromomical events. So there is a gradual drift between the two. In order to keep UTC within 0.9 s of GMT occasional extra 'leap' seconds are inserted. This is done at UTC midnight at the end of a year or at the end of June (1 a.m. on July 1st, BST), and is accompanied by a seven-pip GTS. This next occurs at the end of 1987. There are then 61 seconds in the last minute of the month , 23:59:58, 23:59:59:, 23:59:60, 00:00:00. Although the International Telecommunication Union (ITU) recommends that all programme announcements in international broadcasting be in terms of UTC, the BBC World Service still refers to GMT when giving the time after the GTS, even though there can be almost one second difference between the GTS and GMT. Perhaps a new name, such as 'Greenwich Time' is needed. In the BBC vernacular services the time is sometimes given as 'Greenwich Time' and sometimes at 'GMT'. Other broadcasters refer to 'UTC' or 'World Time'.

I wonder how long it will be before we (again) use the 24-hour clock in our programme schedules. I gave up using 'Radio Times' a long time ago after making several mistakes over ambiguous timings of radio programmes. Now that television on some channels continues until the early hours I find the same problem in reading the newspaper listings.

As engineers, we are encouraged to use the SI system of measurement. The unit of time is the second, and the preferred multiples are powers of 1,000. We pass the ages of 1 ks and 1 Ms at a very tender age, but 1 Gs falls at a more convenient time. I celebrated my gigasecond in the way that any Englishman does when he doesn't know what to do - I wrote to 'The Times' who published the letter in the coveted bottom right-hand corner of the letters page under the heading 'Second Thoughts'. I was also pleased to find that my fortieth birthday fell on MJD 46 000.

I started with a problem I did not wish to discuss, and I shall end in the same way. When does the next century, and the next millenium, start?

**John Chambers**, 1987-09-17

(Editors note: answers to John please!)

# Radio News and Current Affairs on line

The NCA routeing computer system described in Eng Inf No 21 (Summer 1985) has undergone a number of enhancements since the original article. After being the subject of a dispute for a considerable period, the system has now gone into service and is being used to control news and current affairs programme contributions from around the country.

When originally envisaged the NCA routeing system had a fairly modest number of sources that it could control (80 studios). In keeping with the expected expansion of the NCA system the software has now been rewritten to cater for up to 256 sources routed to London via 50 routeing points each seperately controlled and arriving at BH on up to 32 lines. This vast increase in capacity has had two effects on the system.

Firstly, the display format has been rationalised to show the additional sources without cluttering the operator's display. Originally the system used two display formats to provide the operator with information about the current state of the network: Page 1 gave a global view of the entire network and page 2 - 10 gave detailed information about sources and routers in a certain region. To cover the increased sources page 1 has been split into two sections, the first giving a global view of sources contributing from the north of the country, and the second giving a similar view of sources originating in the south. These two sections comprise pages 1 and 2 of the operators display; the original philosophy of allowing the operator to see all routes in progress on a single page has been maintained, so that those sources shown in detail on page 2 are still present on page 1, but in less detailed form, and vice versa. Pages 3-10 still carry detailed information about particular regions.

Secondly, to accommodate the extra information files for these additional sources, the disc capacity of the system has been increased, and a 30Mbyte winchester is now used instead of floppy discs for the system database. A number of new routers have been installed at various regional and local radio sites including Plymouth, Glasgow, Radio Nottingham, and Radio Cambridge, with Edinburgh and Radio Sussex to follow in the next few months. A number of sources that are at present directly input to London will also be switched by a router at LBH in the near future.

The NCA system is in constant use over a 24hr period, and, to ensure reliable operation, a second computer has been added to provide a secure backup facility. An automatic changeover switch has been incorporated driven by a "watch-dog" arrangement, that constantly monitors processor activity and power. The ability of the NCA system to revert to an "Open Mix" in event of a total computer system has also been retained. Another enhancement has meant that the system software and database can easily be dumped to floppy disc so that a backup is always available if the system needs to be rebuilt after a hardware failure.

The NCA system also has become international in nature, as provision has been made to include sources in the USA with routers at New York and Washington. Although, as far as the system is concerned, the distant nature of these sources is not important, special consideration has had to be made for the propagation time of data between the computer and the routers as the current system expects a response from a router within 400ms or a communications fault is flagged to the operator. Also the New York office has the requirement to make selection of sources available on the Washington router. To this end Glensound electronics has undertaken to produce modified versions of their GSNR5 router for this application, featuring a front panel control for local selections. The NCA software has also been modified to flag the London NCA operator if a selection is made locally at a router site.

The operator himself has also been catered for in the recent enhancements. The colour display used to show network status has been improved by the use of non-interlaced monitors which reduce display flicker, and a number of "help" pages are now available at the operator's VDU to provide extra information.

Those involved with the project were: Nick Franklin RCP - Project Leader, Martin Harper RCP - Project Manager, Graham Clifford - Radio Networks Representative, Eric Hutchinson - RCP Engineer.

**Sypher 3 & 4**
**continued from front page.**

*The Sypher preparation room*

pluggable automated pan-pots, and can actually drive the faders, re-setting them complete with any alterations. Channels 1 to 24 of the desk are connected, via a jackfield, to a Studer A820 twenty-four track tape machine, and channels 35 to 32 to the master studer A80 eight-track machine.

To one side of the desk is a bay containing AMS RMX16 and Quantec QRS delay units, two BBC designed auto cross-fader units, and a SCAMP rack of assorted devices. Desk monitoring is via a pair of LS5/8 speakers supplemented by two small check speakers that enable monitoring of the sound in a typical domestic environment. A Sony Profeel monitor displays picture information complete with time-code inserts, which is retrieved from a JVC CR6650 U-matic helical-scan tape recorder.

Another part of the control room houses the sound effects area. Here are located three EMT 948 turntables, an AMS AudioFile, a CD player, and three standard Studer A812 twin-track tape machines; the Gram Operator has a complete set of BBC sound effects discs on vinyl and CD.

Next to the control room is a small sound studio, fully floating on rubber pads to isolate it from the studio activity in TC1 above. Each is equipped with a microphone table with six circuits connected to the control room. Part of the studio has a shingle, timber and paving stone effects-floor as well as an effects door. A window enables the Producer and Sound Supervisor at the control desk and the commentators in the studio to see each other.

The preparation rooms are equipped with a twelve-channel Amek sound desk, jackfield, a small SCAMP rack, monitoring facilities, timecode display selector and power units. Interconnections for two Studer A812 tape machines, two EMT 948 turntables, a JVC Umatic and VHS vcr's, cassette and CD players are provided on the desk. Monitoring is via LS5/8 loudspeakers and a Sony Profeel Picture monitor. The rooms also have a complete set of BBC sound effects discs available.

Before a production goes to the Sypher area two tapes are produced by VT. One is an eight-track recording with the original studio sound on track 3 (and 4 for stereo), and time-code on track 8. The second is a high-band U-matic recording with edited sound on one track and timecode on the other. The U-matic tape is used as the master in the syncronising system, the audio-tape machines following its EBU timecode with Studer TLS 4000 syncronisers.

There are three modes of operation: tracklay, mix and review. Additional effects, voice-overs and music are laid on spare tracks of the eight-track tape running in synchronism with the video HVTR. Console fader movements are recorded by the SSL computer. The computer repeats the mix as the programme is re-run. Motorised fader settings can be overridden at any time and the new mix will also be remembered. When the Sound Supervisor is satisfied, the mix is recorded on tracks 5 (& 6) of the eight-track; in this way the original sound is copied from tape to tape once only. Finally the result is reviewed with an automatic timecode offset to allow for the sound being recorded a short distance 'ahead' of the reproducing heads.

The eight-track tape with the final mix is then returned to VT where tracks 5 (and 6 for stereo) are put back onto the vision edited original.

The preparation rooms are used to provide a review and simple dubbing area. Productions may find it unnecessary to use the full Sypher suite, in which case the simpler, cheaper, preparation room facilities would be utilised.

The building conversion work was carried out by Higgs and Hill Ltd, under the direction of ACED. Technical installation and commissioning was planned and executed by a team from PID Tel led by Graham Cooke.