ENG INF

The quarterly for BBC engineering, technical and operational staff

SPRING 1993 *No 52*

BBC Radio now on Astra

Radios 1, 4 and 5, along with BBC World Service in English are now available in mono on the Astra satellite system. Starting on page 3, Henry Price describes how these new services are transmitted and what is required to receive them.

Astra Marketing Ltd

Graphical illustration of Astra satellites 1A, 1B and 1C in orbit

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ENG INF

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As *Eng Inf* is an internal BBC magazine, it would be appreciated if no reference was made to it in articles, magazines etc, published outside the BBC.

Stories for the Autumn issue should be forwarded to the editor by Friday 20th August, 1993.

Transmitter News

The following services have opened or changed since our last issue:

New TV relays

Farleigh	Kent
Farningham	Kent
Neath Abbey	West Glamorgan

New FM stations

Barnoldswick	N Lancashire
Croeserw	West Glamorgan
Penmaen Rhos	Clwyd
Rheola	West Glamorgan

Radio 1 on FM

Kirkconnel	Dumfries & Galloway

Radios 1 and 4 on FM

Campbeltown	W Strathclyde
Girvan	S Strathclyde
Llanfyllin	Powys
Llanrhaeadr-ym-Mochnant	Clwyd

Local Radio

As featured on page 21, Radio Carlisle has moved into new stereo-equipped premises. The transmitters now broadcasting Radio Carlisle in stereo are Sandale, Kendal, Morecambe Bay and Windermere.

Further information from EID on White City (07) 25040.

Radio Romania calls on BBC expertise

Following a request for assistance from Radio Romania, Jeff Bottom of Radio Projects has made three visits to Bucharest since last August.

According to Jeff: *"The Broadcasting House in Bucharest was built in the early 1950s and many of its facilities are from that original installation by Siemens. The building is H-shaped (similar to our BH EXT), with the transmission studios and CTA in the lower floors of the centre section. However, the structure of their building suffered severe earthquake damage in 1978, 1986 and again in 1990. As it cannot be repaired or strengthened while still occupied, and further earthquakes could cause a total collapse, a replacement facility is the only way forward."*

Assisted by Roy Newrick (previously of Radio Projects), Jeff has assessed the situation at first hand and reviewed various alternative strategies for the future. *"The concept of separate project management staff has been introduced and a project team has begun work on a brief for consultants to prepare a feasibility study. An existing partially-completed museum building has been transferred to Radio Romania, as a way of speeding up the provision of new broadcasting facilities that are not subject to earthquake risk. A lot of time has been spent transferring knowledge gained from experiences in the BBC to the local staff who, although highly qualified and technically competent, have not had the opportunity to do any project work.*

While in Bucharest, Jeff was able to operate his own hand-held Amateur Radio equipment on 2 Metres FM, using the callsign *YO/G3SDG* under a permit from the Ministry of Communications. Many contacts were made in the Bucharest area, mainly using the repeater on channel R1 (input 145.025 MHz; output 145.625 MHz) which resulted in Jeff being invited to operate on HF frequencies using local amateur stations.

Jeff leaves the BBC in July but discussions are in hand to determine the future of this cooperation with Radio Romania.

Display Screen Equipment

Now that the *Display Screen Equipment* regulations are in force, all computer workstations in the BBC will have to be assessed for Health and Safety.

There are over 900 screens within the former Engineering Directorate and a Project Team has been recruited — comprising Les Davis, Tony Dent and Paul Kinsey — to assess these work-stations by the end of the year.

Not only are the obvious parts of the workstation (such as the degree of flicker on the screen) under scrutiny: incorrect posture can lead to Upper Limb Disorder, Repetitive Strain Injury (RSI), backache etc. Thus, properly chosen and correctly-adjusted chairs are critical to avoid these risks.

Martin Nutt
Safety Services
Engineering

STOP PRESS...

Further to the article in *Eng Inf* No 51 on the LS5/8 and AM8/20, Development Group now announces the **AM8/21**. This is effectively a stereo AM8/20 and comprises: one power supply, four amplifier channels and two cross-overs – all in a 3U 19" case with convection cooling. The price should be about 1½ times that of the AM8/20 (ie, equivalent to *two* mono AM8/16s).

Further details can be obtained from Graham Whitehead at Avenue House. Tel: (036) 4273

ASTRA SATELLITE
BBC Radio Services now available

In early April, four of the BBC's radio services — Radio 1, Radio 4, Radio 5 and World Service in English — began transmissions in mono on the *UK Gold* channel of the Astra satellite. Henry Price gives some background to the Astra system and describes how to receive these satellite-delivered BBC radio services.

The Astra satellite system is owned and operated by the Luxembourg-based company SES (Societe Europeenne des Satellite). Presently, two satellites — Astra 1A and 1B — are used to transmit thirty-two television services and a similar number of radio channels to most of Western Europe. A third satellite — Astra 1C — was launched in mid-May 1993 and is expected to come into operation in July/August, increasing the capacity of the system to forty-eight television services in total. Additionally, 1C has two channels intended for cable television distribution which are outside the frequency range normally covered by domestic satellite receivers.

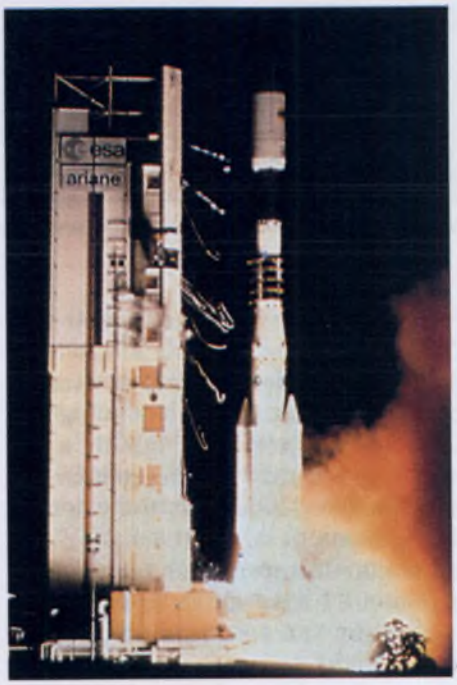
The satellites are located at nominally the same position in space: 19.2 degrees east on the geostationary orbit (about 36,000 km vertically above Zaire), so that a single dish antenna will be able to receive all forty-eight channels. The three satellites, which each weigh up to 2.7 tonnes and are about the size of a double-decker bus, are all located within a 70 km cube. Their position is closely controlled from SES headquarters at Chateau Betzdorf, Luxembourg, to ensure that they do not collide or block one another's view of the earth.

The three satellites operate within the fixed services satellite (FSS) band as follows:

Satellite 1A	11.20 to 11.45 GHz
Satellite 1B	11.45 to 11.70 GHz
Satellite 1C	10.95 to 11.20 GHz

(The two cable channels operate just below 10.95 GHz)

The frequency range 10.95 to 11.70 GHz was originally intended for telecommunication satellites; not for broadcasting, which has been allocated the range 11.7 to 12.5 GHz. As a result, Astra was not subject to the original European Community satellite broadcasting directive, introduced in 1986, which required all direct broadcast satellites (DBS) to use the MAC transmission system. Hence, broadcasters using Astra have been able to operate in PAL or MAC as has suited their purposes.



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Ariane launching an Astra satellite

The satellites are powered from solar cells which are backed up by batteries. These come into play during the spring and autumn equinoxes when the satellite passes into the Earth's shadow. Over a period of 22 days, the eclipse builds up to a maximum of around 70 minutes at the equinox (about 22.10 to 23.20 hours GMT), then falls away to zero over the next 22 days. During the eclipse, the batteries have to provide the 2 kW of power the satellite consumes.

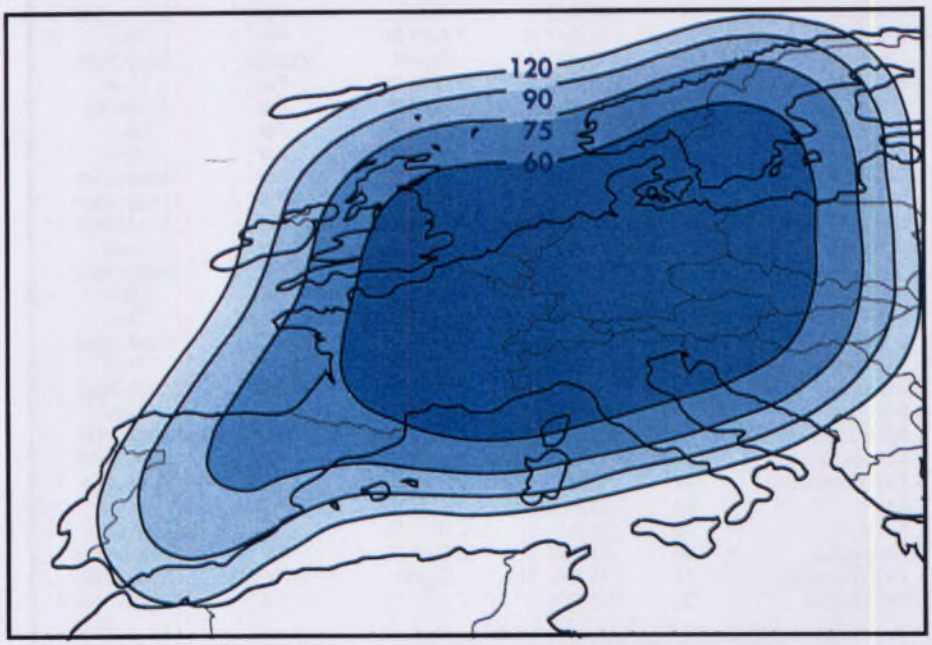

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Fig 1: the footprint of Channel 23 on Astra 1B (UK Gold), showing the antenna diameter required (in centimetres) for direct-to-home reception

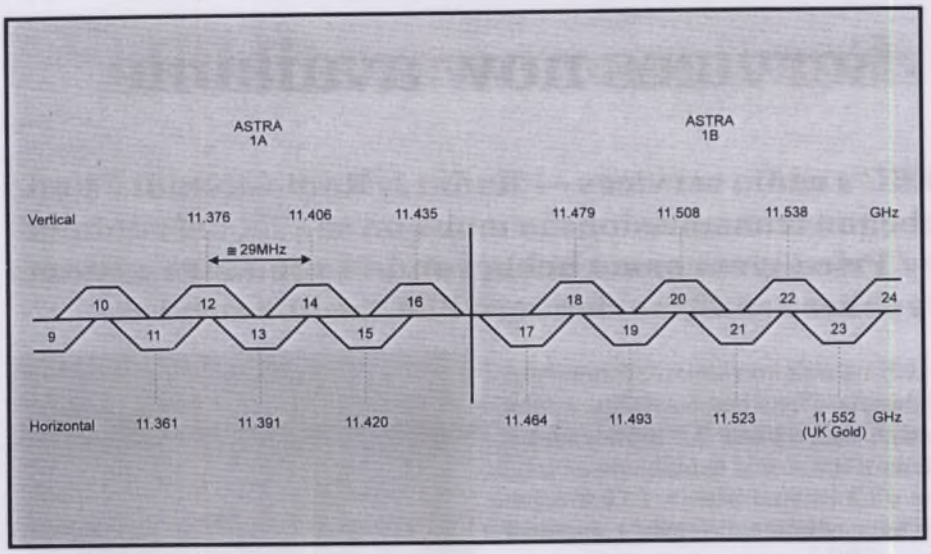


Fig 2: frequency allocation in the region between satellites 1A and 1B

Transponders on 1A are rated at 47 W, while those on 1B deliver about 63 W. The signals are transmitted towards Earth via highly-directional antennas, which are aimed at roughly the French/German border. The erp at the centre of the beam is about 54 dBW, so the transmit antennae have a gain of about 37 dB (which is roughly equivalent to a standard 60 cm domestic dish).

The satellite coverage area comprises most of the low countries, Germany, France, Switzerland, northern Spain, northern Italy and the UK — with a total population of some 240 million people. Fig 1 shows the footprint of the *UK Gold* service on Astra 1B (which is similar to the footprints of the services on 1A and 1C).

Astra has standardised on a transponder bandwidth of 27 MHz, compared to the 36 or 72 MHz transponders used on many other telecommunications satellites. Each Astra satellite has eight transponders operating on horizontal polarisation and eight on vertical. Fig 2 shows how the frequency is allocated in the region between satellites 1A and 1B. As can be seen, the spectrum from adjacent transponders overlaps very significantly — interference-free reception is thus very dependent on the receiving antenna being able to discriminate between the two polarisations. In practice, this seems to cause little problem — provided the receiving dish has been correctly aligned during installation.

Five of the 32 transponders presently in operation carry D2-MAC transmissions; the rest carry PAL television services, many of which are scrambled. All the services aimed at the UK use PAL, either in the clear or scrambled with the *VideoCrypt* system. Table 1 gives an up-to-date list of the television services presently on Astra.

The VideoCrypt System

When Sky first started broadcasting scrambled services on Astra in 1989, it standardised on the *VideoCrypt* system. This is an active-line-rotation scrambling system which only scrambles the picture; it does not scramble the sound. Although the picture is scrambled, the line and field syncs remain intact as does any teletext signal. So a television receiver fed with a VideoCrypt-scrambled signal continues to operate normally — there is just no sensible picture!

The system uses a combination of smart card and over-air addressing to

Television Service	Ch	RF Carrier (GHz) + P	Sound Carrier (MHz)	Coding	Encryption
RTL 2	1	11.214 H	7.02/7.20	Pal	Clear
RTL Plus	2	11.229 V	7.02	Pal	Clear
TV3 (Sweden)	3	11.243 H	Digital	D2Mac	EuroCrypt
Eurosport/Quantum	4	11.258 V	7.02	Pal	Clear
VOX	5	11.273 H	7.02/7.20	Pal	Clear
Sat 1	6	11.288 V	7.02/7.2	Pal	Clear
TV 1000	7	11.302 H	Digital	D2Mac	EuroCrypt
Sky One	8	11.317 V	7.02/7.20	Pal	Clear
TV Asia	8	11.317 V	7.02/7.20	Pal	Clear
Teleclub	9	11.332 H	7.02	Pal	Nagravision
3 Sat	10	11.347 V	7.02/7.20	Pal	Clear
FilmNet	11	11.361 H	Digital	D2Mac	EuroCrypt
Sky News	12	11.376 V	7.02/7.20	Pal	Clear
RTL 4	13	11.391 H	7.02/7.20	Pal	IRDETO
Pro 7	14	11.406 V	7.02/7.20	Pal	Clear
MTV Europe	15	11.420 H	7.02/7.20	Pal	Clear
Sky Movies Plus	16	11.435 V	7.02/7.20	Pal	VideoCrypt
Premiere	17	11.464 H	7.02/7.20	Pal	Nagravision
Movie Channel	18	11.479 V	7.02/7.20	Pal	VideoCrypt
ARD Eins Plus	19	11.493 H	7.02/7.20	Pal	Clear
Sky Sports	20	11.508 V	7.02/7.20	Pal	VideoCrypt
DSF	21	11.523 H	7.02/7.20	Pal	Clear
MTV Europe	22	11.538 V	7.02/7.20	Pal	Clear
UK Gold	23	11.552 H	7.02/7.20	Pal	VideoCrypt
Children's Channel	24	11.567 V	7.02/7.20	Pal	Clear
Japan Sat TV	24	11.567 V	7.02/7.20	Pal	VideoCrypt
N3	25	11.582 H	7.02/7.20	Pal	Clear
Adult Channel	26	11.597 V	7.02/7.20	Pal	VideoCrypt
Movies Gold	26	11.597 V	7.02/7.20	Pal	VideoCrypt
TV3 (Denmark)	27	11.611 H	Digital	D2Mac	EuroCrypt
CNN	28	11.626 V	7.02	Pal	Clear
N-TV	29	11.641 H	7.02/7.20	Pal	Clear
Cinemania	30	11.656 V	7.02/7.20	Pal	Nagravision
TV3 (Norway)	31	11.670 H	Digital	D2Mac	EuroCrypt
Documania	32	11.685 V	7.02/7.20	Pal	Nagravision

Table 1: the television services currently available on Astra

control access to the service. A subscriber's smart card can be updated over the air, either to remove the ability to receive services or to extend entitlement.

VideoCrypt can also operate in a so called "soft-scrambled" mode. This means that the signal is scrambled, but that a VideoCrypt decoder can descramble the signal without a smart card. The *UK Gold* service is operating in this mode at present.

In the early days of the *BSkyB* Astra service (it was just *Sky* at that time), a separate satellite receiver and VideoCrypt decoder were required to receive the scrambled pictures. Today, most satellite receivers sold in the UK have the VideoCrypt decoder built in and are known as IRDs (Integrated Receiver Decoders). In continental Europe, however, most PAL receivers will not incorporate a VideoCrypt decoder, as BSkyB channels are only intended for UK residents.

People often remark that it is quite astonishing that a transmitter with the power of a standard domestic light bulb is capable of being received 36,000 km away on Earth. The physics of the situation is no less astonishing. In effect, the 50 Watts or so of power from the satellite is spread fairly uniformly over the whole of the western half of Europe, an area of some 5 million square km. The resulting average power flux density from the satellite is, therefore, about -110 dB(W/m^2). This is about 7 dB lower than the DBS power density specified at WARC-77.

The standard 60 cm receiving antenna now intercepts about 0.3 square metres worth of this signal (-115 dBW) and delivers some 60% of it (-117 dBW) to the receiver. A "standard" low-noise block (LNB) on the dish, with a 1.8 dB noise figure, will result in a carrier-to-noise ratio of some 13 dB at the receiver's input which gives a reasonably noise-free picture and sound.

Incidentally, the WARC-77 DBS plan assumed a 90 cm dish, an LNB noise figure of 8 dB and a carrier-to-noise figure of 14 dB.

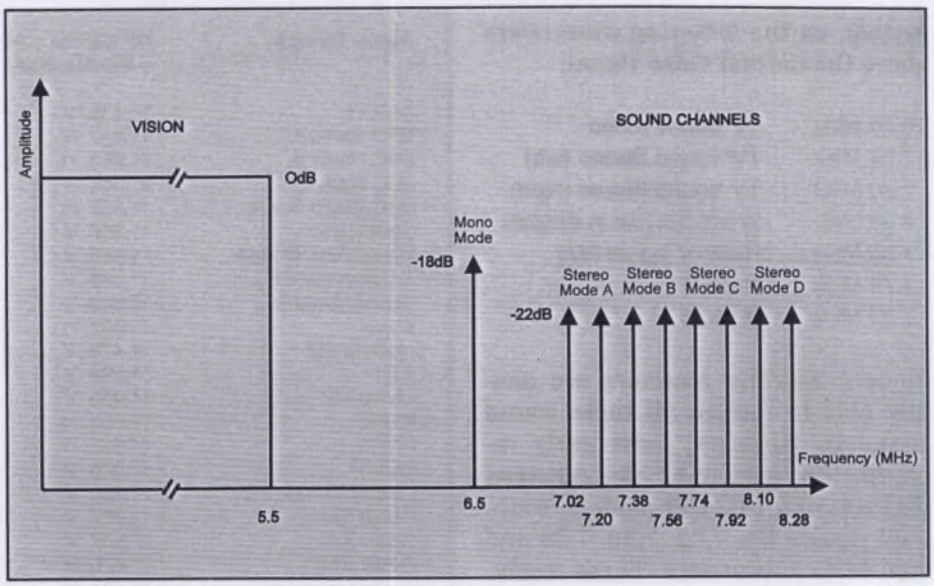


Fig 3: Panda 1 arrangement of FM sub-carriers above the vision signal

Radio Services on Astra

The transponders which carry PAL services can also carry several radio channels, in addition to the normal television sound. In fact, each television signal could in theory be accompanied by up to nine or ten sound signals although, in practice, no channel carries more than seven at present.

The sound signals are modulated onto high frequency FM subcarriers which are added at baseband to the video signal. On Astra, the lowest frequency subcarrier — located at 6.5 MHz — always carries the television programme sound in mono with a deviation of 85 kHz and a pre-emphasis of 50 µS. As this is a relatively high-level subcarrier, the sound is not compressed.

For the rest of the sound signals, nearly all the channels on Astra use a particular sound multiplex and compression system called *Panda 1*, developed by the Wegener Company. Referring to Fig 3, this system can carry multiple FM subcarriers spaced 180 kHz apart, starting from 7.02 MHz. Because these subcarriers are injected at a relatively low level, the sound is compressed at the uplink and expanded in the receiver in order to provide an adequate signal-to-noise ratio. The peak deviation of these subcarriers is 50 kHz.

Not all receivers use the proprietary Wegener Panda decoding system, and in some cases this can result in the sound quality being less than ideal. Receivers which use licensed Panda decoders can be identified by the "Panda" symbol (see Fig 4) which is usually displayed on the front of the equipment.

Fig 4: the "Panda" symbol

The subcarriers can be used separately to carry mono sound signals or grouped in stereo pairs as follows:- 7.02/7.20, 7.38/7.56, 7.74/7.92 and 8.10/8.28 MHz. With a mono television service, the 7.02 MHz subcarrier is usually used for the programme sound. If the programme sound is stereo then the 7.02 and 7.20 MHz subcarriers are used.

Table 2 lists the radio services that are presently available on the Astra satellites.

BBC Radio Services

The BBC's radio services are carried on *UK Gold* using the Wegener Panda *1*

system, on the following subcarriers above the normal video signal:

6.50 MHz	TV Sound mono
7.02 MHz	TV Sound Stereo (left)
7.20 MHz	TV Sound Stereo (right)
7.38 MHz	World Service in English
7.56 MHz	Radio 4 (as on FM)
7.74 MHz	Radio 1
7.92 MHz	Radio 5

Modern satellite receivers are usually able to receive all these sound channels. However, some early receivers (in particular the Amstrad SRX100 and SRX200 models) could only receive the 7.02, 7.20, 7.38 and 7.56 MHz subcarriers. These receivers will not be able to receive the Radio 1 and Radio 5 services. However, upgrade kits are available to enable them to operate over the full range of subcarrier frequencies, but their installation is very much a job for a trained technician.

Most receivers have a number of audio modes. In order to select the appropriate mode, the user usually has to press a button marked 'mode' or 'audio' on the remote control which steps the receiver from one mode to the next. For instance, a typical receiver might organise its audio modes as follows:

Stereo A	7.02/7.20 MHz
Stereo B	7.38/7.56 MHz
Stereo C	7.74/7.92 MHz
Stereo D	8.10/8.28 MHz
Mono 1	6.50 MHz (Tunable)
Mono 2	7.02 MHz
Mono 3	7.20 MHz
Mono 4	7.38 MHz (WS)
Mono 5	7.56 MHz (Radio 4)
Mono 6	7.74 MHz (Radio 1)
Mono 7	7.92 MHz (Radio 5)
Mono 8	8.10 MHz
Mono 9	8.28 MHz

UK Gold's programme sound is stereo, so the receiver should initially be set to Stereo Mode A. If this is the case, then the audio button will have to be pressed *seven* times to get World Service (7.38 MHz), eight times to get Radio 4, etc. Alternatively, the receiver could be set to receive *UK Gold* sound in Mono Modes 1, 2 or 3, in which case the number of button presses will be less!

Radio Service	RF Carrier (GHz) + Polarisation	Sound Carrier (MHz)	Mono/ Stereo
AsdaFM	11.435 V	7.74	M
BBC Radio 1	11.552 H	7.74	M
BBC Radio 4	11.552 H	7.56	M
BBC Radio 5	11.552 H	7.92	M
BBC World Service	11.552 H	7.38	M
CNN Radio	11.266 V	7.92	M
Deutscheland Funk	11.288 V	7.74/7.92	M
Deutscheland Funk	11.288 V	7.38/7.56	S
Deutschewelle	11.229 V	7.56/7.38	M
Eviva	11.332 H	7.74/7.92	S
Holland FM	11.479 V	7.56	M
IDB	11.538 V	7.74/7.56	M/S
Maxat FM	11.435 V	7.92	M
NDR2	11.582 H	7.38/7.56	S
NDR4	11.582 H	7.74/7.92	S
QCMR	11.376 V	7.38	M
Quality Europe FM	11.435 V	7.38/7.56	S
Radio 538	11.317 V	7.74/7.92	S
Radio Asia	11.597 V	7.38	M
Radio RMF	11.420 H	7.74/7.92	S
Radio Ropa	11.406 V	7.74/7.92	S
Radio Sweden	11.597 V	7.74	M
RTL 4	11.391 H	7.74/7.92	S
RTL Radio	11.391 H	7.38/7.56	S
Sky Radio	11.317 V	7.38/7.56	S
StarSat	11.406 V	7.38/7.56	S
Sunrise Radio	11.479 V	7.38	M
Supergold	11.376 V	7.92	M
Spare	11.508 V	7.38	M
Sputnik	11.464 H	7.38/7.56	S
Switzerland	11.332 H	7.20	M
SWF 3	11.493 H	7.38/7.56	S

Table 2: the radio services currently available on Astra

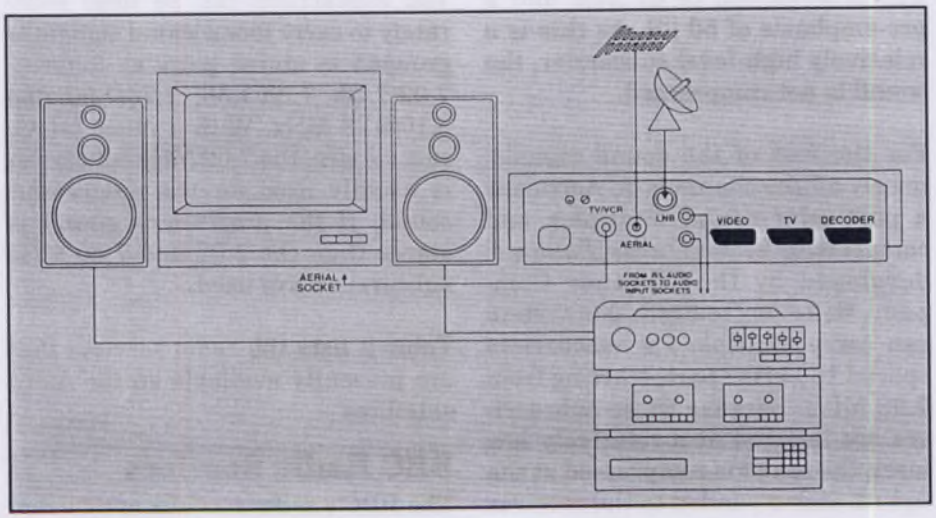


Fig 5: a typical satellite receiver installation

Some modern receivers use on-screen graphics menus, both to display and select the required subcarrier frequencies, and to store the appropriate settings. Since such procedures vary considerably from receiver to receiver, the user will need to consult the receiver handbook or their dealer.

Finally, Fig 5 shows a typical installation where the satellite receiver is linked to both a television set and a hi-fi system. Such an arrangement is ideal if the receiver is going to be used frequently for radio listening.

Henry Price
HEID

NETWORK RADIO

Radio 2's new transmission suites

John Tidy describes just a few problems which preceded the opening of Radio 2's new transmission suites.

Bankruptcies, lockouts, steam baths and General Elections: not the kind of things you would associate with building three on-air transmission suites for Radio 2 perhaps. But all these had a hand in shaping the story of how Continuities G, H and J — the rather shabby and tired-looking places where Radio 2 originated half of its DJ programme output — were turned gradually into Transmission Suites 1G, 1H and 1J: a comfortable comprehensively-equipped production centre for all Radio 2's presenter-led programmes. But first I must set the scene.

In the beginning...

... there were *continuity suites* and there were *studios*. The continuity suites were only used by DJs; the studios were used by, well, non-DJs. Thus you could never be sure where Radio 2's live programme was coming from — especially if, say, non-DJ Neil Kinnock was standing in for a professional self-operator like John Dunn. Things could quite well arrive late or go missing.

Then some clever beggar had a bright idea: why not combine the two functions in one area? And so the concept, then a little later the project, was born. All that remained was to come up with a control desk that would handle a full set of replay equipment in both the studio (for the DJ) and the cubicle (for an operator to use with a non-DJ). The whole lot would have to be crammed into a space that already seemed quite full with only half that amount of gear. It should be quite straightforward really!

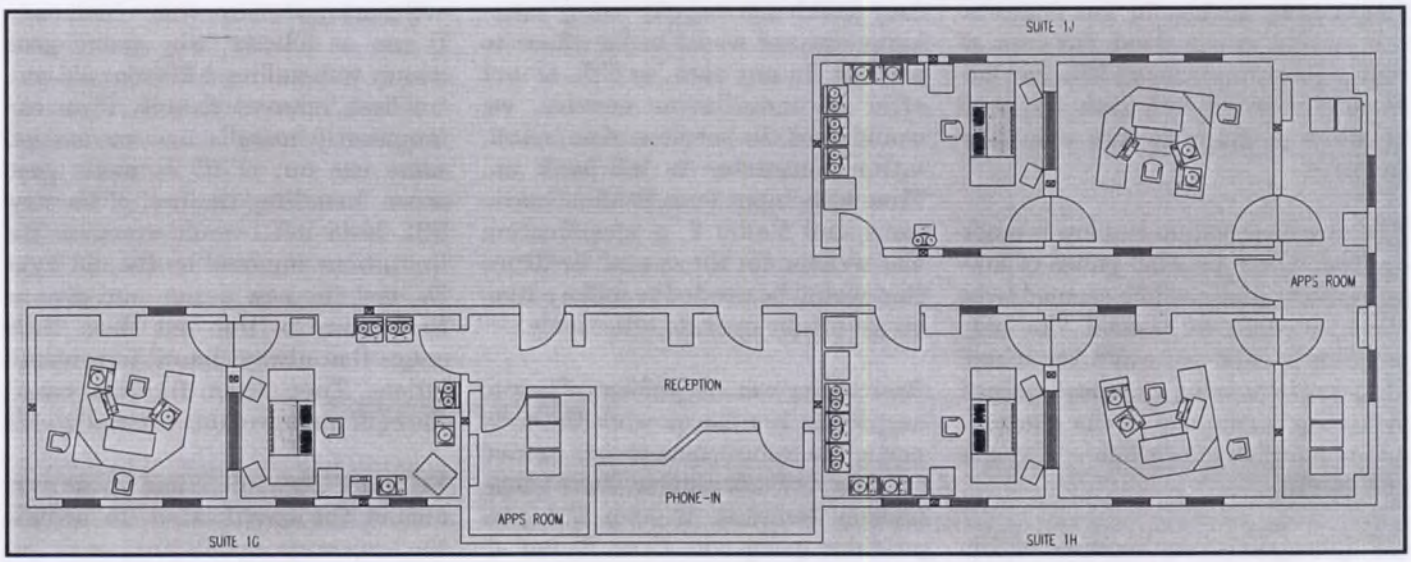
It was soon realised that the only control desk capable of supporting the required facilities was Solid State Logic's SL5000 series, and gradually a satisfactory proposal was worked out between SSL and the technical design team. The job of getting all the equipment to fit exercised many minds but eventually a plan evolved which in general worked, apart from Suite 1G's cubicle where a few millimetres error in a drawing meant having to move a tape machine at the last minute to the other side of the door!

In the middle...

The whole exercise was taking place in the middle of a complete refurbishment of BH, following the Governors' decision to keep Radio there rather than moving out to West London. So once it became known that BH had a long-term future, it was clear that something had to be done about the general working environment — especially the acoustics, the air-conditioning plant which was slowly rusting away on the roof outside, and the chill wind which steadfastly blew down the back of the DJs' necks.

Working to a brief from Radio Projects, a team from ACED (now BDMS) set about redesigning the whole area and its services — taking account of the requirements imposed by the new equipment and the desire to improve the appearance and acoustic environment, but without making major structural alterations.

Within the boundaries of the existing Camden partitions, a complete transformation was to take place. A complex



Plan view of Radio 2's new transmission suites

G. Hana Ltd

Suite 1G Studio: the fader tray can be covered with a neat ashwood panel when the studio is used in the non self-op mode

arrangement of duct-work around the windows to the outside was designed to enable the removal of the old supply and extract system, while still allowing in natural daylight.

The acoustic treatment was re-designed by Tony Woolf of RDER to allow a slightly longer and more even reverberation time than before, particularly in the cubicle. Diffusers were specified to make up some of the wall treatment. In addition the floor around the producer's and operator's positions was required to provide a long-lasting surface for the chairs to run on and to cut down the area of sound-absorbing carpet, the join between the two having been designed to allow a chair to run smoothly across it.

The new observation window is made up from three parallel panes of low-reflectivity glass, which seemed to be ideal for what we needed. The only problem is that you can't see it and it's possible to bang your nose against it leaving a smudge on the glass — not to mention your pride — if you're not careful.

All lighting has been recessed within the ceiling acoustic treatment, to minimise the possibility of creating distracting reflections. High-frequency fluorescent fittings have been supplemented by dimmable low-voltage spots on tracks.

Although a control desk specification had been agreed with Solid State Logic, and the finance approved for the purchase of three of these desks, this was by no means the end of the technical installation story. We agreed with SSL at the start that their desk would contain only standard equipment: anything they could not supply using catalogue options would be for others to provide. In any case, as SSL do not offer an installation service, we would need the services of an installation contractor to fall back on. Thus with input from Studio Operations and Radio 2, a specification was written for the special facilities that would be needed to make a live-on-air studio operate effectively.

More taxing was the problem of how to keep Radio 2 on the air while the early part of the refurbishment was carried out. The network requires three transmission facilities to keep the programmes going out. Cons H and J, being separated by only a narrow corridor, could not be worked on separately — noise, dust, too many people wanting to come and go, and deliveries of building materials would see to that. However Con G (to be given the treatment last) would be all right, being separated from all the disruption by a room we used to call the Network Supervisory Area which the builders would later transform into a reception area and phone-in room.

This left us with two remaining sets of temporary facilities to find. Suite 1C would be eminently suitable as it was equipped with the same Type D desks so familiar to Radio 2 from the original Cons H and J. And to complete the temporary facilities, we needed somewhere to act as a temporary home for another Type D package (recovered from the original continuities which were demolished to make way for Radio 5's production suites).

Studio S1 was available but, as it was the location of the original Baird-system experimental TV transmissions, it was of special interest to English Heritage. So, when we came to apply for planning consent, we had to be most careful over what we did to it.

A Clever idea....

All good projects have an event which, on reflection, can be seen as the point at which success or failure was determined. Such was the case with the clever idea which someone — I'm not quite sure who — had next. It ran as follows: why spend good money reinstalling a 20-year old control desk, however cheaply, if you can temporarily install a new one and get some use out of it? It made good sense. Installing the first of the new SSL desks in S1 would overcome the limitations imposed by the old Type Ds, test the new design and give us the chance to iron out those little snags that always haunt new installations. Then, when the time came, the equipment would be moved to 1G.

Brilliant! Now all I had to do was amend the specification to include the temporary installation work (as it was to be a cheap job) and persuade

the Architects and Building Services Engineers to quickly throw together the plans for alterations to S1. To be suitable, the cubicle and studio had to be reversed, an apparatus room had to be formed, a lower ceiling had to be constructed in the new cubicle using steel beams and woodwork slabs, and a new entrance door had to be cut though the wall of the structural tower going up the centre of old BH. The latter caused a few worries when major cracks running up the tower wall were discovered and had to be repaired.

While all this was going on, we had tendered the installation package and subsequently engaged Elliott Bros Ltd. They immediately got busy building the add-on goodies that did not come as part of the SSL equipment. Thereafter, the process of putting S1 into service in May 1991 was surprisingly uneventful.

Not so for Judith Chalmers, however, who let out a shriek of surprise one day when a soil pipe from the little-used Gents above the studio gave away its secret hiding place in the structural column, which we had packed full of sound-deadening material to prevent just such an incident. Some you win, some you lose!

A catalogue of problems...

Soon it was August and the contractors moved into 1H and 1J. Work started well but, after a couple of months, progress was slipping and we began to detect that the builders were having financial problems; they were not making payments to subcontractors, who were threatening to leave the site. Finally, in January 1992 following a lot of frank exchanges, the main contractor admitted to being on the point of insolvency. There followed a furious week of meetings, faxes and phone calls at the end of which we had extricated ourselves from the original contract and agreed a new contract with another builder.

The project team heaved a huge sigh of relief, until just a few days later: the mechanical subcontractors (who were doing the air conditioning) told us they couldn't provide the bank guarantee we required to ensure they would complete the contract, and so would also be calling in a Receiver. The benefits of cheap prices from contractors were now turning into a liability with a vengeance.

Despite all the difficulties, progress on Suite 1J was only just behind timetable. Elliott Bros had moved onto part of the site and the second SSL desk had arrived. Before we knew it, they were ready for us to begin testing the first of the three new permanent suites. Amazingly, everything went smoothly and preparations were being made for the first live broadcast on Monday 16th March. Only later did I discover that someone had locked the temporary door to the site which the builders had still not taken away, leaving the production team only minutes before the first broadcast to get the key, set up the studio and prepare to go live at 6.00 am.

While the installers continued to work on Suite 1H, Radio 2 broadcast from 1J, though they nearly stopped one day during the Jimmy Young programme when suddenly the studio began to fill with steam! It was so fog-like that Jimmy and his guest, only four feet apart, could not see each other and condensation ran down the windows. The explanation was in the new air-conditioning system, which includes humidity control by injecting steam from the high pressure main into the ducts; somehow a sensor had been installed in the wrong place and so did not throttle back the control valve. Fortunately no damage was done.

CUBICLE

SSL SL5428 frame comprising the following:

16	Stereo line-level input channels controlled by cubicle or studio faders
4	Audio sub-groups with compressor-limiter
8	VCA groups
6	Mono mic/line inputs
6	Stereo outside source channels
1	Instant reset computer
2	End-table sections and rack mountings

Tapes	3 x Studer A80 1 x Studer A810
Gram	2 x EMT950
CD	3 x EMT981 or 2 x Technics SLP1200
Carts	3 x ITC99
Cassettes	2 x Studer A710 1 x Neal 6278 logging machine
LS Monitoring	BBC LS5/8

NTP OS selector panel

Drake network switcher panel

Jackfield: 23U double-density 24 jacks per row

STUDIO

Grams	3 x EMT950
CD	3 x Tascam 701
Carts	3 x Soniflex HS200
LS Monitoring	BBC LS3/5A

Custom Frame: sixteen channel faders and four VCA groups. This contains no audio but provides control of the cubicle channel VCAs

The technical equipment installed in Radio 2's new transmission suites

— Radio 2 —

The run-up to the General Election saw Jimmy Young playing host to the party leaders. Sadly no-one had made it clear that when the PM's turn came, as well as checking the building site, his security staff would want the area completely cleared, stopping all progress for half a day.

With the third installation in 1H complete and undergoing final checks, Ed Stewart decided that the S1 Studio desk needed refreshing with a cup of coffee. The SSL of course doesn't like coffee and so it packed up. The programme makers took a chance, moved into 1H and got on with the broadcasting. We kept our fingers crossed, but need not have as all went smoothly.

With S1, 1J and 1H in service, together with 1C, it was now time to start on 1G. This work went very well as the contractors, having done the job twice already, knew what was wanted. However, there were some snags with getting the special low-reflectivity observation window glass installed properly. A new glazing contractor had to be found, as the first was still owed money by the original main contractor and was trying to recover the losses by charging extortionate prices. The new glazier took three goes and two sets of glass to get it right!

Another clever idea....

There was a lot of noisy and disruptive work going on in BH at the time (and still is). We became conscious that somewhere like S1, tucked away in a corner, would be useful to have while all the crashing and bashing went on. Also the flexibility of the equipment meant it was well liked, so much so that when it was suggested we should buy another (fourth) set of equipment for 1G, the idea was readily accepted.

SSL was happy to make another desk, and Elliott Bros were happy to accept the variation to the existing contract to install it. All went well; they were old hands at it now, after all. And in the end, the technical commissioning engineers were very pleased with the result — praise indeed!

So Radio 2 now has three bang-up-to-date transmission suites to take them through to Charter Renewal and beyond. It was a long journey, with quite a few bumps along the way, but in the end we got there safe and sound — most importantly, ahead of time and within budget!

John Tidy
Radio Projects

G. Hana Ltd

Suite 1G Cubicle with view of studio through the low-reflectivity window glass

WSTV Europe
Improvements to *BBCfax*

Viewers of World Service TV Europe — from the Nordic countries to Spain, and well into Eastern Europe — have a teletext service called *BBCfax*, which is similar to Ceefax on BBC2. Peter Weitzel describes how new equipment has greatly speeded up and improved this service.

With the dash for new technology at Ceefax (as described in the previous issue), there was also pressure to provide a better service for *BBCfax*. In particular, with the use of only three line-pairs in the vertical blanking interval (VBI), *BBCfax* was very, very slow. One solution was to buy a new transmission system for WSTV Europe — like the two that have now been provided for BBC1 and BBC2 — but this would have involved a substantial refit of the Ceefax computer room. The cost and time required to do this, prior to the relaunch of Ceefax, ruled out this option.

WSTV viewers were also interested in the depth of authoritative information that Ceefax provides on BBC2, but with programme listings information about World Service (rather than BBC2) in Magazine 6, ie the 600 series of pages. So the requirements were rapidly worked out:

- ☐ The service had to be branded *BBCfax*
- ☐ The time in row zero should be Central European Time (CET)
- ☐ The service should be "BBC2 Ceefax" in content, but with a WSTV listings magazine
- ☐ Page 100 and a few other pages should be unique to WSTV.
- ☐ *BBCfax* should be comparable to Ceefax but should not overload or limit the Ceefax operation, either editorially or technically.

Conceptually, the easiest solution seemed to be a box — a databridge — which took in BBC2 Ceefax and put out *BBCfax*. The databridge could be told what modifications should be done to the page header — CET is not always one hour in front of UK time and when does a day start?! The listings pages for WSTV could be "dripfed" as part of the normal BBC2 output datastreams and stored in the databridge; other pages unique to WSTV could be dealt with similarly.

MRG Systems had a suitable 1000-page databridge inserter, and experience of controlling remote teletext equipment via teletext! In conjunction with Protext Services, who were doing software modifications for the relaunch of Ceefax, we all managed to work out a suitable method of sending the WSTV listings pages and a command page.

The Ceefax computer has to take the listings pages from a library and work out what "today" is, so that it can determine tomorrow's listings and so on. Having assembled the pages and added the Fastext links, it creates the command page — which tells the bridge what pages it has to store and what today's row zero is.

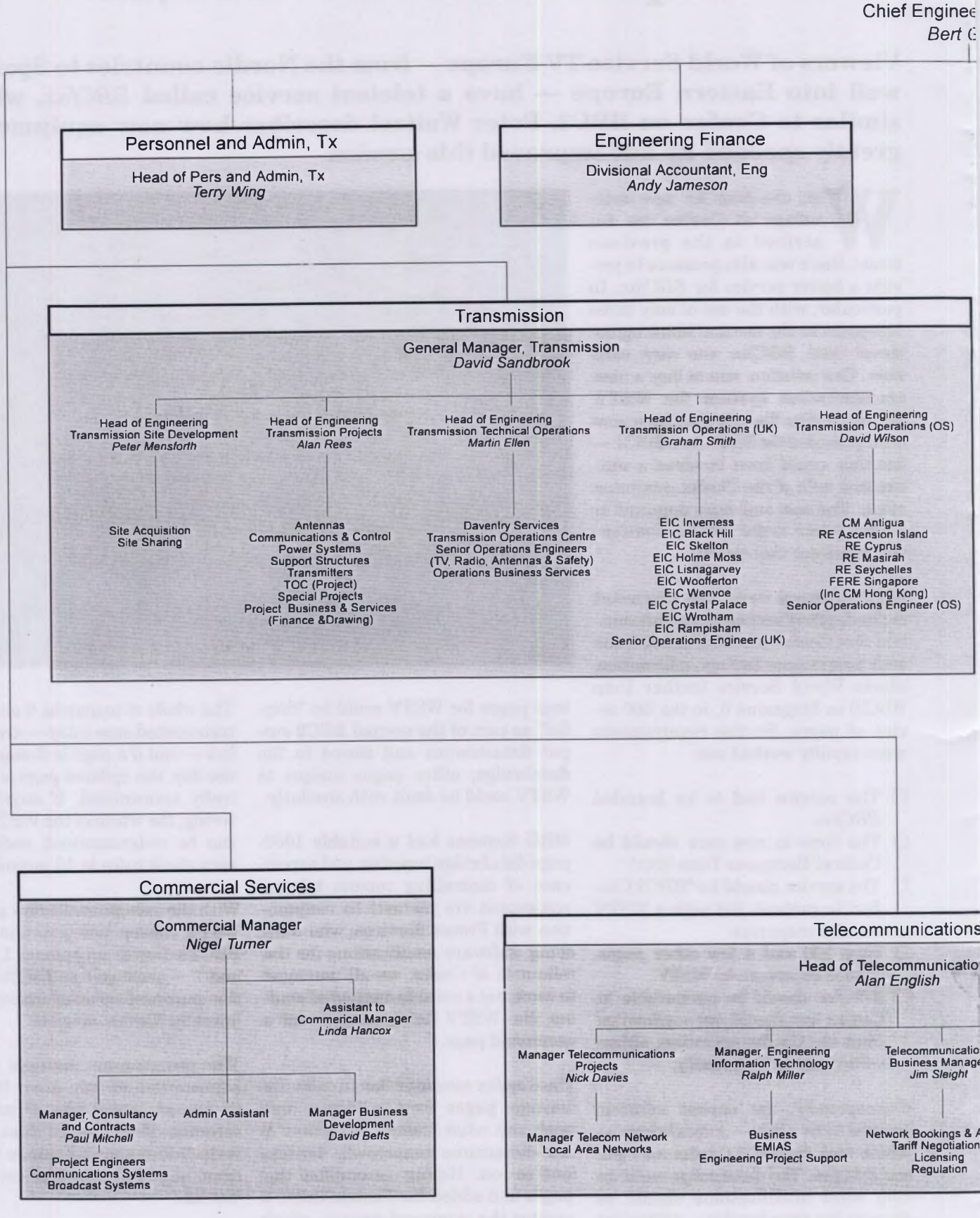
The whole of magazine 6 on WSTV is transmitted once a day — around 0430 hrs — and if a page is changed during the day, the updated page is automatically transmitted. If anything goes wrong, the whole of the WSTV listings can be re-transmitted; each page is sent about twice in 15 seconds.

With the exception of a few pages, the WSTV viewer now gets the whole of BBC2's *Ceefax* magazines 1, 2, 3, 4, 5 and 7 — packaged as *BBCfax* — with the improved speed of access now enjoyed by Ceefax viewers.

The programme listings are also transmitted on two other line-pairs, to give an access time of under four seconds. This means that *BBCfax* with 11 line-pairs has more VBI space than any other broadcast teletext service.

Peter Weitzel, Senior Engineer, Developments, TE&PS

FAMILY TREE: En



Structure of Engineering Division (part of the new Resources, Engineering and Services directorate): 15 June 1993

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