

EN I NF

SUMMER 1989 No. 37

NEW SATELLITE LINK FOR RADIO OBs

Radio OBs, based at Concord Road in West London, has taken delivery of a new satellite link system. It operates in conjunction with Eutelsat 1, Flight 2, positioned at 7° east over the equator, and was provided in record time by Transmission Engineering Department, based at Warwick.

The transportable up-link enables a stereo circuit of the highest quality to be achieved from anywhere in the UK

- provided it can 'see' Eutelsat 1. The satellite signals are received via a 3 m dish antenna, sited on the roof of Broadcasting House in London, from where they can readily be routed to any of the four radio networks.

The new equipment was first used - live on Sunday 4 June, when it provided the circuit back to Broadcasting House for the Morning Service from Rodborough, near Stroud. It has also

been used successfully at Glyndebourne, for a live opera on Radio 3, and is currently accompanying the Radio 1 RoadShow around the coast of Britain on its summer tour.

Starting on page 16, Simon Shute (G MOps & Eng, Radio) explains why the new link has been acquired and Nigel Adams, of Transmission Engineering Department, describes the technicalities of the system.

RESEARCH DEPARTMENT

A SPECIAL FEATURE BEGINS ON PAGE 7



A visitor's first glimpse of the mansion at Research Department, Kingswood Warren. Fortunately, most of the trees along the driveway survived the big storm of October 1987 but a hundred and twenty-three others were blown down and many more disfigured.

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ENGINEERING

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The closing date for stories to be included in our autumn issue (No. 38) is 25 August.

Mike Meyer

By the time this issue of 'Eng Inf' lands on your desk, you should also have received the 1988 edition of the Coded Equipment Register (CER), which has replaced Registered Designs and Coded Equipment (RD&CE), Part I - commonly known as the 'silver book'.

The 1988 edition differs from previous issues in a number of ways. The most significant is that it includes only those codes which have been taken out during the last twelve months. Therefore, it is essential that you retain your 1987 volume, if you want to refer to equipment which is over a year old!

As well as containing the usual information on new designs, the 1988 edition of CER also includes an addendum to the Technical Document Cross-Reference (previously published separately), and information on the availability of

licensed equipment. This latter section has previously been included towards the back of D&ED's Engineering Components Catalogue.

As a result of this combination of documents, and the added complication of changes to job titles and addresses, I have had to completely revise the mailing list for this edition of the Register. Therefore, if you have not received a copy, but you used to get either RD&CE or the Cross-Reference (or both), then please let me know so that I can send you one of my limited supply of spare copies, and amend my list for next time. However, do note that many areas are serviced by a departmental distribution point, so please check with them first.

Peter Jefferson
Liaison Engineer, D&ED
Tel: AH 375

LETTER

Sir

Can I appeal through your columns to those who order components from outside the BBC - please make sure that the correct delivery address is known to the supplier. Many parcels arrive simply addressed to 'BBC, Broadcasting House, London W1'.

Post Room sends them to EID - where else! - and it can take a considerable effort to trace the proper destination. This month's detective work led to destinations in Tel OBs, Kendal Avenue, and at a Midlands local radio station!

So please give your full name and BBC address when ordering components from outside suppliers.

By the way, EID still has an electric motor which arrived nine months ago! The manufacturer knows we have it but nobody has claimed it yet. Any takers?

Charles Hope, EID

TELEVISION PB

The Summer 1989 edition of the pocket booklet 'BBC Television Transmitting Stations' is now available from EID. Please telephone LBH 5040 to order your free copy(ies).

'ENGINEERING INFORMATION' ON CEEFAX

EID's 'Engineering Information' page on Ceefax has been transferred from BBC 1 (page 195) to BBC 2 (page 297).

The move results from a plan to re-launch Ceefax in the autumn, when 'Engineering Information' will again be moved, this time to a more permanent page yet to be announced.

According to Graham Norwood, Editor Ceefax: 'The aim in re-launching Ceefax is to provide it with a bigger output and faster access time'.

'Ceefax now comes under the News and Current Affairs directorate and the new-look output will more accurately reflect the parent department.'

TRANSMITTER NEWS

The following stations opened between 1 April and 30 June:

| | | |
|---------------|---------------|---------------------|
| Television | Far Highfield | Lancashire |
| Branscombe | Pen-y-Banc | Clwyd |
| Bronwydd Arms | Devon Dyfed | |
| Charmouth | Dorset | |
| Chudleigh | Devon | FM Radio |
| Cynwyl Elfed | Dyfed | Dumfries & Galloway |
| | Kirkconnel | |

ACROSS THE CHANNEL

bit by bit!

The end of July should see the commissioning of a unique PCM programme link to the Channel Isles and the realisation of several years test and development work involving several BBC departments. The link forms a spur from the BBC's main 8 Mbit radio distribution network on the mainland and has the capacity to convey 12 high-quality audio channels and Radio Data information to Les Platons on Jersey, the BBC's main FM station for the Islands.

The propagation path across the English Channel is too long and unreliable for a microwave link so use has been made of the existing television receiving capability on Alderney, the nearest of the Channel Isles. Here, tv pictures are already received off-air from Stockland Hill, for onward distribution to Fremont Point on Jersey, the Islands' main tv station. What makes the new audio link unique is that it uses carrier frequencies on uhf channel 30, interleaved with the existing tv transmissions radiated from Stockland Hill (channels 23, 26, 29 and 33).

The link employs two uhf carriers within the channel 30 frequency allocation, each modulated by a 2 Mbit NICAM bitstream. The 'Tamed FM' (TFM) method of modulation is used - a form of phase shift modulation that produces a very well-controlled frequency spectrum.

Some of the more remarkable technical aspects of the link are:

- (a) the receiving system on Alderney will produce a decodable bitstream from an input carrier level of -92 dBm (0.6 pW!) in the presence of adjacent Channel 29 signals at a level 30 dB higher.
- (b) the level of carrier received at Alderney can vary from -95 dBm to -45 dBm, requiring a receiver agc loop with 50 dB of dynamic range.
- (c) the system should produce decodable audio (ie six high quality stereo channels, for 99.5% of the time over a distance of 136km - from only 10W of transmitter power.

(d) The ERP in the direction of Alderney is 250 W; the tv services from Stockland Hill have an ERP of 250 kW!

(e) the receiving site on Alderney employs a 9 m dish aerial which exhibits a gain of around 30 dB.

signals via microwave link to Les Platons for re-broadcasting.

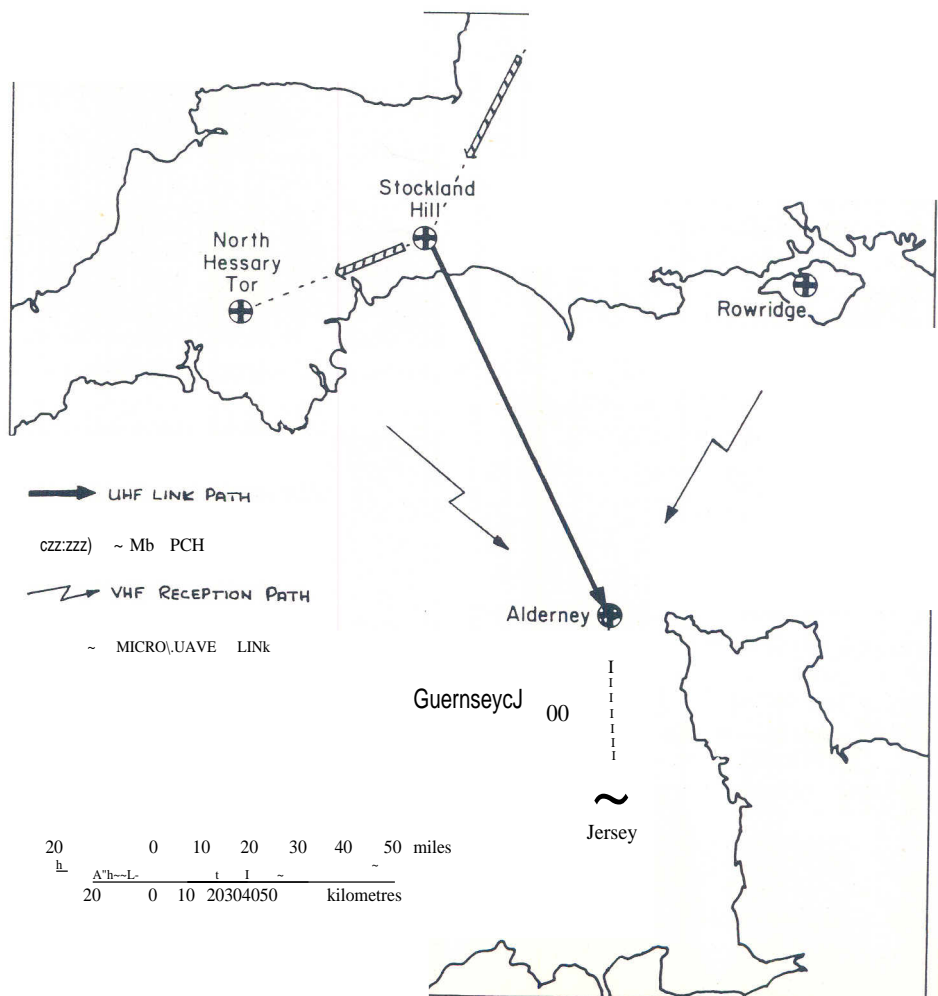
In 1984, a new international frequency plan was drawn up in Geneva which required the BBC to radiate some 8 dB less from Rowridge in the direction of France; this would be achieved by re-engineering its aerial system. However, its signal strength at Alderney would also be reduced by about 8 dB, rendering it unsuitable for re-broadcast purposes. Thus, an alternative arrangement would need to be found.

BACKGROUND TO THE LINK

New Frequency Plans

Network FM in the Channel Isles has, in the past, relied on off-air reception at Alderney of either Rowridge or North Hessary Tor. A 'diversity' reception system selected whichever station provided the better signal quality at any given moment and sent the chosen

Satellite links, submarine cables, etc would be very expensive, so it was decided to carry out propagation studies involving Stockland Hill, which was already a repeater site for the pcm network feeding North Hessary Tor.



- CHANNEL ISLES: new pem link -

Reliability Tests

To check that an in-band tv link would be feasible, Research Department performed a study to find suitable uhf frequencies which would minimise interference to other transmissions, yet provide a rugged system for carrying pcm signals to Alderney. The most likely causes of link problems would be a combination of deep signal fades, multipath propagation and interference from existing tv transmissions.

A complex reliability calculation was needed but, fortunately, useful propagation statistics were already available from the time that the tv re-broadcast arrangement on Alderney was first installed. The results of this earlier study indicated that a link based on channel 30 should be acceptable for the required 99.5% of the time.

Using the combined efforts of Research Department, Designs Department and TCPD (as they were then called), a prototype link on channel 30 was installed in June 1986. Computer-based data loggers were installed to monitor both ends and the link was left to transmit a string of simple data for a period of two and a half years:

A wide range of weather and tidal conditions were encountered during this period but the data, when analysed at Research Department, proved that the required 99.5% reliability had been achieved. It was then up to TED (formerly TCPD) to write the specification and procure a workable final realisation of the link.

The Equipment

Most of the required frequency conversion and amplification was fairly familiar to uhf transposer engineering, so Continental Microwave Ltd (CML) were approached to see if they could build such a link. Despite some of the rather stringent requirements of TED's spec, CML were confident that they could produce a system and a contract was placed with them to build the apparatus bays. These were to include a hybrid of CML transposer equipment, D&ED TFM equipment and TED control and changeover equipment.

By this stage the project was beginning to become a race against time. In addition to pressures created by the new frequency plan mentioned above, it was necessary to get the link into service before Rowridge could be re-

engineered for Radio 1 FM. The required TFM equipment was still under final development at D&ED and so, to meet the short timescale, the equipment for the link was produced 'in-house' at D&ED rather than going out to manufacture.

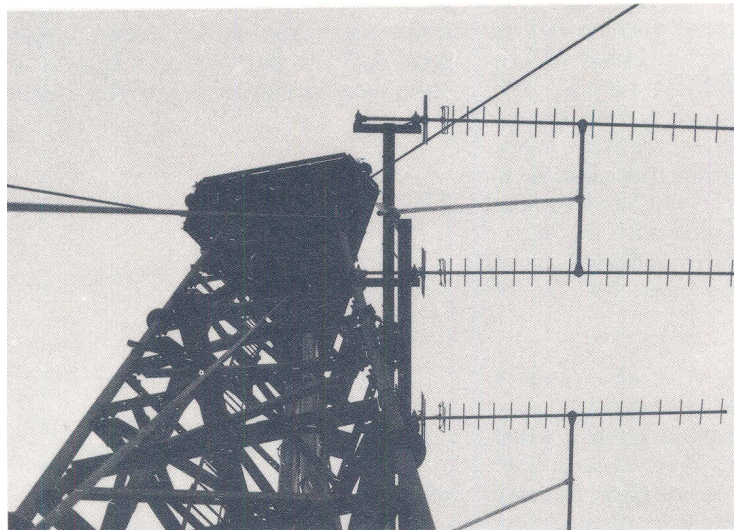
NICAM decoders would be required in the Channel Isles but, at this stage, it would have been impractical to manufacture more Mk 1 NICAM equipment. Thus, it was decided that the link would be the first application for the newly developed and much improved Mk 2 NICAM decoder. This would require the production of a new bay, the specification of which TED had already produced in order to meet the requirements of re-engineering the pcm network.

At the time of writing (late June), the link is almost a working reality. It has been seen to work in the factory (with

the English Channel simulated by up to 130 dB of attenuation!) and is now installed at Stockland Hill and Alderney - transmitting network bitstream under test. It will provide the Channel Isles with digital stereo feeds of Radios 2,3 and 4 (and Radio 1 in the future) as well as the Radio Data information that is carried by the pcm network.

The project represents the culmination of four years work by many people from various departments. They include: David Russell and Peter Gooderham of TED; Geoff Phillips and Mark Maddocks of RD; Bill Murray and Chris Newey of D&ED; Mike Nightingale of TOD and many more RD, D&ED, TED and TOD staff too numerous to mention.

Keith Hayler, Project Leader
Transmission Engineering Department



The transmitting array at Stockland Hill

The 9 m receiving dish 0/Alderney