Bob Cooper's

MAY 15 2003

SatFACTS

MONTHLY

Reporting on "The World" of satellite television in the Pacific and Asia

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Quick & Easy VHF-UHF TV Transmitters

Testing LNBf's for performance and quality

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✓ Latest Hardware News
✓ First NSS 6, As4 Report
✓ Observer Reports

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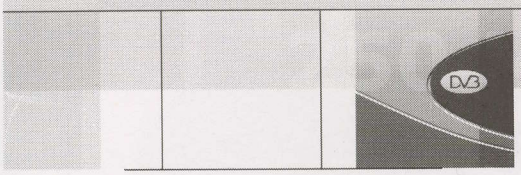
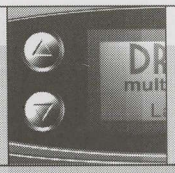


DREAMBOX
DM 7000-S

Power • speed • stability • design



Global Innovation

In the DREAMBOX you will find power united with intelligence: The Power PC processor from the house of IBM combined with the LINUX operating system provides lightning switching times together with high stability.

The 100 Mbit Ethernet connection makes the DREAM- BOX Intranet and Internet ready. Thus the user can update the operating software and new setting lists directly, or even download new skins for individual adaptation and configuration of the user interface.

A further innovation in the area of the satellite receiver is the built-in flashcard reader, with which flashcards and minidrives can be read and written.

In addition, the low power consumption (standby mode 1.2 W) together with the minimal heat generation speaks for this receiver.

The DREAMBOX will take you to the future of the satellite receiver.

Features:
- 250 MHz IBM PowerPC Processor (350 Mips)
- Linux open source (most parts under the terms of GPL, accordingly expandable)
- Supports Linux Standard API (Direct-FB, Linux-FB, LIRC, ...)
- DVB Common-Interface Slot
- 2 x Smartcard-Reader
- Integrated Compact Flash Interface Slot
- MPEG2 Hardware decoding (fully DVB compliant)
- Support for MPEG4 decoding
- Common available NIMs (DVB-S, DVB-T, DVB-C)
- 100 MBit full duplex Ethernet Interface
- USB Port Keyboard, Pointing Devices, WebCams and other devices
- V.24/RS232 Interface
- Big-size LCD-Display
- Up to 256 MByte of RAM
- integrated IDE UDMA66 Master/Slave Interface
- Support for internal HDD in any capacity
- unlimited channel lists for TV/Radio
- channel-change time < 1 second
- full automatic service scan
- supports directly 6 bouquet-lists (indirect unlimited)
- supports EPG (electronic program guide)
- supports videotext (insertion)
- various applications such Web-Browser or Mail-clients
- supports multiple LNB-Switching control (supports DiSEqC)
- fully adaptable OSD in many languages (skin-support)
- SPDI/F Interface for digital bit stream out (AC-3 / DTS)
- 2 x Scart-interfaces (fully controlled by software)

DREAM multimedia.TV

Contact and more informations at:
www.dream-multimedia-tv.com

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is published 12 times each year (on or about the 15th of each month) by Far North Cablevision, Ltd. This publication is dedicated to the premise that as we are entering the 21st century, ancient 20th century notions concerning borders and boundaries no longer define a person's horizon. In the air, all around you, are microwave signals carrying messages of entertainment, information and education. These messages are available to anyone willing to install the appropriate receiving equipment and, where applicable, pay a monthly or annual fee to receive the content of these messages in the privacy of their own home. Welcome to the 21st century - a world without borders, a world without boundaries.

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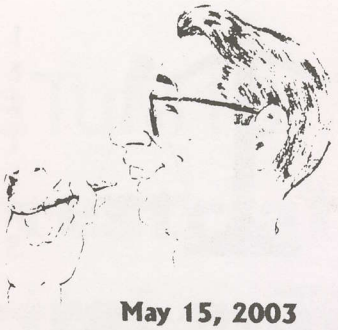
our NINTH year!

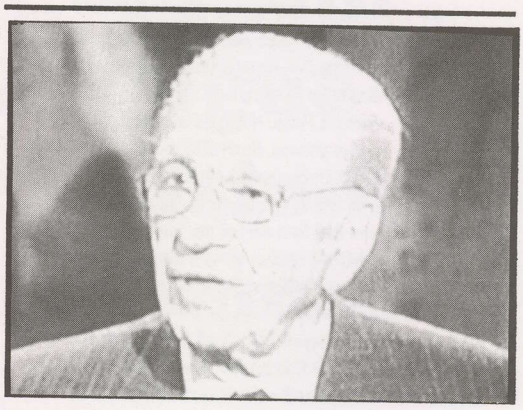
COOP'S COMMENT



May 15, 2003

On the day US troops entered Baghdad, Rupert Murdoch received confirmation that his News Corp had been given approval by General Motors to acquire the world's largest satellite-to-home pay-TV provider, DirecTV. GM owns controlling interest in DirecTV and several similar affiliated subsidiaries in the satellite TV world. Now, for US$6.6 billion News Corp. will be the new owner.

The financial deal is exceptionally complex, even for News Corp. First of all, it is not General Motors that is selling DirecTV. It is 19.9% of Hughes Electronics that is being sold - which in the world of high finance is a suitable percentage to "control the company." Because Hughes owns 34% of DirecTV and Hughes is a subsidiary of GM. If you are asking how 19.9% of 34% controls DirecTV, you are not alone. But it does and will.



Moreover, it is not News Corp or Murdoch family which is buying 19.9% of 34%, it is one of those offshore Murdoch specials called "Fox Entertainment Group" which happens to be the owner/operator of (the) Fox News Channel and is 80.7% owned by News Corp.

So *who* will really operate DirecTV and why should we care since this North American pay-TV operator does not reach the Pacific or Asia? We should care (not that there is anything we can do or even say about it) because buried down even deeper than 19.9% of 34% is 81% of PanAmSat. Yes, Hughes owns this massive chunk of the satellite company PanAmSat and now through the purchase of Hughes Electronics somebody named "Fox Entertainment Group" controls PanAmSat. That's PAS-2, 4, 8 and 10 of interest to us in the Pacific and plenty more on the opposite side of the globe. Now, for the first time, Murdoch owns satellites to go along with his controlling interests in Sky NZ, BSkyB in the UK, Star in Asia, Sky Brasil, Sky Mexico and a defining interest in Australia's Foxtel (see p. 31, here). PanAmSat is the world's largest "privately owned" satellite operator.

One of my favourite quotations following this complicated announcement came from a man named Ivor Reis, a media analyst. He said: *"This deal makes Rupert king of the kids in the TV business."*

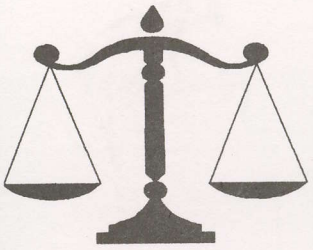
Someplace up at the top of this pyramid sits the Murdoch family controlling just enough of each entity to make them "kingpins" on the respective Boards of Directors. Immediately following the DirecTV announcement came word that New Zealand's Independent News Limited (INL) which publishes a string of newspapers and magazines in New Zealand is being sold to another Australian media group; Fairfax. What is not being sold is INL's 66% controlled interest in New Zealand satellite pay-TV operator Sky TV. INL is another of those "percentage controlled" Murdoch cornerstones. What happens next with Sky NZ is unknown but one of the possibilities includes some Murdoch entity going into the market to buy back all public held Sky NZ stock. Whatever path Murdoch takes with Sky NZ, most of us won't comprehend the implications until the ink is long dry on the contracts.

Neil Chenoweth, Australia based financial writer who has authored books about Murdoch, writes to me, *"Murdoch will control a sprawling world-wide enterprise valued at US$70 billion, making it the biggest media group in the world. And News becomes a new model of what a global media empire is, and how it operates. And this will transform the whole nature of News Corporation."* And perhaps, your life and mine as well.

In Volume 9 ◆ Number 105

-On the cover-

Welding elevation adjustment rod on 3.8m dish for Cakrawarta tests at SF (p. 22) -p 6.



LETTERS

February helpful

"SatFACTS #102 includes an analysis of problems we are experiencing here on the Gold Coast. May I have permission to reproduce part of this issue in our TESA Newsletter (http://www.tetia-tesa.org) and include your contact details for subscriptions?"

Barbara Philip, Hi-Tech Electronics, Qld.

Permission granted. SatFACTS material is routinely republished in Europe and North America and all that we request is that those who would do so ask our permission first (it is part of the 'copyright thing') and when published send us along a copy to PO Box 330, Mangonui, Far North, NZ.

April Fool

"I really enjoyed your April Fool article - Reviving C-band dishes for C & Ku use. Keep up the good work!"

Geoff via well-com.net.au

Actually, our Technical Topix discussion of "impedance bumps" was the April Fool article!

Wiring a motel

"A local motel has been quoted $2,600 to have three Sky channels installed and plugged into the existing TV1-2-3 RG6 cable distribution system. I looked at the system which serves 15 rooms and by plugging a VCR with a UHF modulator into the system, amplifying it to 100 dBuV, and checking for signal at the end of the cable line, the best I could measure was under 50 dBuV. This suggests that Sky to make this work to the end, as they distribute at UHF as well, will have to run modulator outputs of at least 110 dBuV. Is my math correct?"

BCW, NZ

It depends upon where in the UHF spectrum you ran the VCR modulator. Older motel/hotel facilities did not use directional couplers (relying on splitters) and if these are plastic-cased hard wired splitters, their performance at UHF is very poor. And it becomes worse (the losses increase significantly) as you pass 600 and then 700 megahertz. Sky usually spaces out their modulators (as they are double sideband) and it is not unusual to have one above 700 MHz. Moreover, there is no guarantee Sky's modulators after they have been "combined" into a single output will in fact enter the system at much more than 100 dBuV (when three channels are married to the same cable, there are losses of at least 8 dB and more often 10 or more in the combining network. Thus the actual modulator output has to be recalculated (lowered) to reflect the combining losses before the system itself begins. We suggest our TB9405 "Satellite to Room Systems" reference manual for a solid foundation in wiring up commercial buildings (see p. 32, here).

Surfing for Fiji 1

"We have a 12' dish and Indovision presently at a surfing resort on a Fijian out-island and want to add Fiji-1 which broadcasts at UHF. Will TB9303 ("Big UHF Antennas") help?

Michael Hammond

It will - copy provided (see p. 32 here).

PROGRAMMER PROGRAMMING PROMOTION UPDATE

MAY 15, 2003

OPTUS C1? Still no "formal" word when launch will take place, rumour mills continue to suggest second/third week in June. SF#99 published footprints we believed were "real" (as real as they can get before a launch and positioning of the satellite) but that left unanswered many other operational questions. Craig Sutton received confirmation of some detail not previously acknowledged, as follows: 16 total transponders will be 36 MHz wide of which 8 will be "Australia / New Zealand," 6 will be "Australia only" and 2 will be "Australia or East Asia." There are also 8 transponders 72 MHz in width (twice 36, meaning the symbol rate could be much higher than the present 29.473 - or and this is the more likely scenario - 72 will be a single transponder, operated as two half transponders; 36 x 2). With NDS becoming the CA provider (see p. 31, here), the probability is that lower symbol rates will be used since NDS does not do well with SRs above 30.000. Optus also advised Craig, "*Optus B3 will be moved to 152E*" which is as we suggested. Our SF#99 footprint maps identified transponders 1 - 10 vertical as Australia/NZ, 11 - 20 horizontal as "National B" and transponders 21 - 24 horizontal as Asia + Hawaii. If you add-up 16 x 36 (=576 MHz) and 8 x 72 (also = 576 MHz) and then sum the two, the answer is 1,152 MHz. Obviously they cannot fit half of that (576 MHz) into 12.25 - 12.75 which means one side or the other at 12.250 or 12.750 is going to be "pushed" beyond normal upper and lower limits. Or, they will be using some lower segment in 10 (or 11) GHz region as well to fit in the "extra" 152 MHz of spectrum space they now admit to having on board. And none of this addresses "where is the military?" - certainly *not between* 12.25 and 12.75!

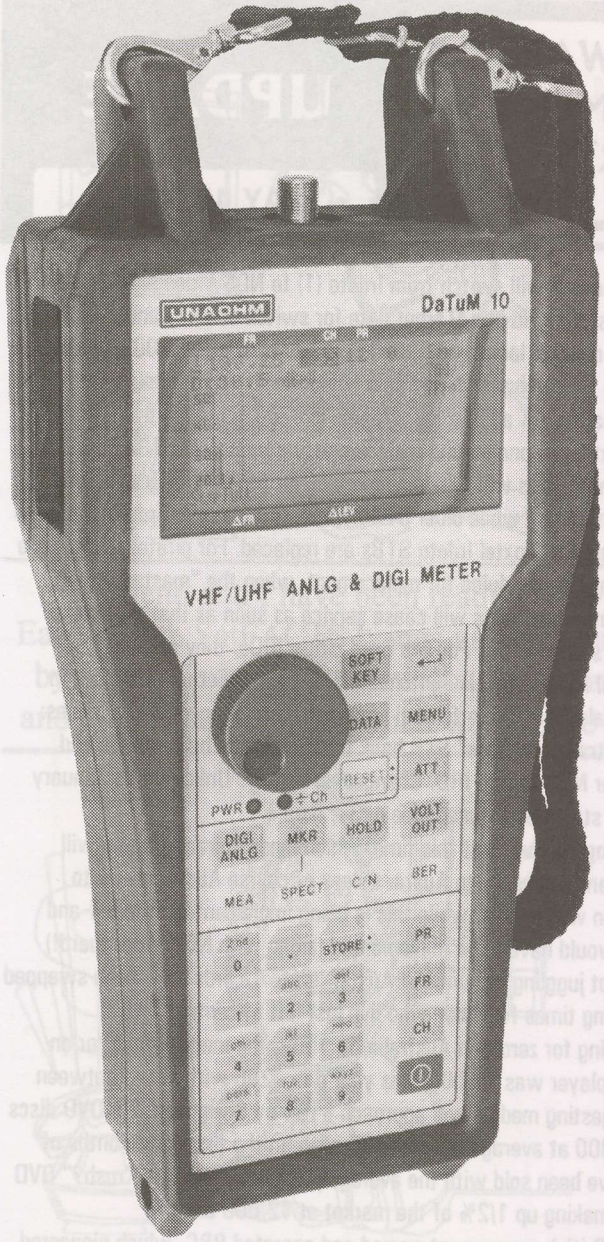
Optical fibres woven by spiders? Scientists at the University of California may have created the next revolution in photonics - silk-based optical fibres created through an amazing amalgam of spider silk and ceramic. According to the British journal New Scientist, engineers have successfully taken spider silk, coated it with a glassy silicate solution, and baked the mixture. When exposed to high heat, the silk burns away and the coating shrinks and turns to glass, leaving a hollow fibre whose core is just 2 nanometers wide (50,000 times thinner than human hair). These "spider fibres" may be useful to the telecommunications and computing industries as nanoscale optical circuits.

Sony's Internet TV. Project Altair is a TV set designed to accept a wide range of digital inputs including web streaming video. The prototype receiver, not expected to be shown openly until later this year, has a plasma format screen. The design allows direct consumer access to terrestrial TV (digital or analogue), cable, satellite, Internet email and the streaming video that is becoming increasingly popular in those areas where full-time ("always on") broadband Internet is available.

SBS's Iraqi tactical error. SBS attorneys are defending a charge from BBC which resulted from the broadcaster suspending "normal programming" during the opening days of the Iraqi war and rebroadcasting BBC coverage in its entirety. SBS has a contract to take "news material" from BBC for its own news shows, apparently not entire shows to rebroadcast verbatim.

Rumours. Australia awash in numerous C1 + Foxtel rumours. No, symbol rate "limits" on existing universe of Austar + Foxtel IRDs will NOT play a part in C1 operations. Yes, Sky NZ *could be* closed down and all NZ homes switched to C1 Foxtel service (it already uses NDS - see p. 31 here) but don't hold your breath! On the other hand, it would save News Corp millions per year to eliminate separate NZ services and explain Sky NZ changing from public to private ownership.

DaTuM10
Terrestrial Digital and Analogue Television Instrument



- **Automatic Digital signal measurement.**
- **Simultaneous view of Seven channels.**
- **Spectrum Analyser with variable Spans, MAX, MIN, FREEZE and Dual markers.**
- **Auto Carrier to Noise ratio measure.**
- **50 memory 7 program Data Logger.**

DaTuM10 is a new hand held TV Signal Level meter that measures 45 to 860 MHz Analogue and Digital, COFDM and QAM. The signal levels of any 7 channels can be shown simultaneously in the new histogram function. Spectrum Analysis and Expanded Spectrum with 2 Markers enable a broad range of detailed and specialised measurements to be made. A moulded rugged Rubber Holster protects the DaTum10 against knocks and falls. The keypad has been designed for use even in humid and dusty environments and a Pulse Encoder knob speeds function selection.

It detects Digital from Analogue, automatically adjusting the signal level read to Digital Channel Power and tuning to the centre of the channel. Measurements include Signal Level, D.C.P., Carrier to Noise Ratios, Vision to Audio Ratio, and Bit Error Rate estimation. The graphic LCD can be read in darkness or daylight. Clear Menus guide the user through functions which include mast or line amplifier powering and Data Logging. DaTuM10 employs precision signal level detection circuitry (superior to AGC detection) that reliably measures signals as weak as 20dBµV and provides Peak and Average detectors.

Internal Ni-MH battery life can be extended with optional external batteries and the instrument can recharge whilst still being used from the mains switch mode power supply included or 6V DC.

DaTuM 10, exciting instrumentation that needs neither a mortgage to buy it or a sherpa to carry it.

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"Til death do us part..."

"Reference your 'Oops!' letter advising me my subscription has expired. Double oops!! Please renew forever until death do us part! "

Steffen Holzt. New Caledonia

Famed (well, famous in some circles) amateur radio magazine publisher Wayne Green (CQ, 73 and others) used to offer 'Lifetime Subscriptions' for some outrageous number such as US$200, which for someone 20 or so seemed like a heck of a deal. There was one caveat in the fine print: "Valid for your life or the life of the magazine, which ever expires first."

Magazines to Malaysia?

"Why did you send us the two back issues we requested in two separate envelopes? Are you guys thick headed or what?"

Shahrul Imran Sultan, Malaysia

The New Zealand postal service has a 200 gram weight limit and one magazine falls below this while two in your case weighed 242 grams. The postage for one magazine (or anything else up to 200 grams) is NZ$3 whereas the postage for two in one envelope is $10.42. So two times $3 is obviously an economy for us although it certainly creates a bigger burden (two to handle, two to pack, two to scan et al) for the postal service. Hey - the same Government allowed Maori TV founders to spend company money on underwear!

Newbie

"I am just starting in this hobby and have a Humax 5400Z and 60cm dish. I am sixty years old. What do you suggest I concentrate on first now that I have the basic equipment and a subscription to SatFACTS? I know nothing."

Ted Hughes, Queensland

You knew enough to subscribe to SatFACTS - now the fun begins. The 5400Z is capable of many things which a 60cm dish won't do for you so step one is to run down to Avcomm Pty Ltd in Sydney (the telephone will do - no need to burst a blood vessel actually running) and get yourself a dish worthy of the 5400Z. Say a 2.4m that is good for Ku as well as C. Pick up an actuator motor while you are 'there'. And a copy of Garry Cratt's newly revised 'Practical Guide to Satellite TV.' Then hold on tight - the rocket you just boarded will go straight to geostationary orbit at the speed of light!

Noise figure?

"I am confused by the term 'noise figure' or is it actually 'noise temperature'. How can noise have a temperature? And why should this, whatever it is or means, be a criteria for me selecting an LNB or LNBf? Is this some sort of advertising trick created by manufacturers?"

Edward J, NSW

When the universe was created (some say more than 12 billion years ago) molecules of matter were released to travel at the speed of light (the 'Big Bang' theory). Molecules (electrons) in motion generate "radio noise" - which on the Kelvin scale is right around 4 degrees. Dead silence which equates to no molecular motion is 0 degrees Kelvin. No life at 0 degrees, no motion, no-nothing. Electronics moving as electricity inside of an LNB/LNBf generate the same kind of 'radio noise' and if we start at 0 Kelvin as 'dead' and 4 Kelvin as the 'background noise of deep space' a LNB with a noise temperature of 15 or 20 degrees is pretty darned quiet. How does this equate to satellite system performance?

Go to p. 14 and read on.

HARDWARE EQUIPMENT PARTS UPDATE

MAY 15, 2003

Foxtel announcement it will switch from Irdeto (1) to NDS Videoguard (see p. 31, here) also includes other tid-bits. Target date for switch over is January 2004. Target date for much delayed launch of Optus C1 is "June or after, 2003." NDS Videoguard and Irdeto (1) can be (and may now be) transmitted in "simulcrypt" which means two separate CA addressing streams married into each transponder. With "simulcrypt" Foxtel can one by one replace existing Irdeto (1) STBs with NDS format STBs as the new units will locate and key off of the parallel transmitted Videoguard instruction stream while older STBs still in service using Irdeto will continue to function until all Foxtel Irdeto STBs are replaced. For pirates, if they are cloning from a STB that is scheduled for replacement, when the "master" is replaced, the clone-authorised units will cease service as soon as that particular address in Irdeto 1 is switched off. For Fun Card pirate IRDs, they are likely to continue working until Irdeto itself is switched off by Foxtel. For units located in PNG, Norfolk, New Caledonia (i.e. offshore) some interesting logistics challenges: Getting existing "Australian address" STB back to Oz so it can be turned in and replaced with a newer NDS format IRD. Changeover timing? Unknown; is January end of changeover or start? Stay tuned (see p. 31, here).

Austar is not changing over - at this time. Which means piracy cloning will switch from Foxtel card addresses to Austar unless of course Austar elects to upgrade to Irdeto 2. In which case, while this is being implemented, Irdeto 1 and Irdeto 2 addressing would have to be implemented (along with NDS Videoguard!) using fancy simulcrypt juggling act until all Austar Irdeto 1 cards have been swapped for Irdeto 2. Interesting times for those who live just left of centre.

DVD players heading for zero-$ in Australia. In 1999, the median price for an Australian-sold DVD player was $1,000; this year it is $260 with prices between $100 and $150 suggesting median will approach $150 by Christmas. 2m DVD discs were sold in all of 2000 at average price of $35 each; in the first four months of 2003, 5.5 million have been sold with the average price $28. Next big "rush?" DVD recorders, currently making up 1/2% of the market at $2,000 each.

Point-1 for BBC. British government owned and operated BBC, which pioneered broadcast TV in 1936, has been paying Rupert Murdoch's BSkyB A/NZ$20 million per year to be included in News Corp's several hundred channel satellite mux. BSkyB charges other telecasters as well and viewers were forced to purchase and install a BSkyB Digibox system and arrange a "free smartcard" through the BBC for access. Of course these "free to air BBC view homes" promptly became leading candidates to be harassed by BSkyB to also become subscribers to a pay-TV package (a decision they had voted against by deliberately choosing the BBC FTA package when they purchased their Digibox equipment package). From May 30th, BBC says they will put the exact same 8 channels of service in a new free to air mux package on newly available Astra 2D. No more Murdoch Digiboxes, no more smart cards (which BBC said costs it A/NZ$30 million each year to buy from Murdoch's NDS card company and administer). And begin to phase out their relationship with Murdoch. This is a "victory" for FTA broadcasting in the UK, after it appeared Murdoch had the entire country by the short and curlies when he manoeuvred BBC into being "exclusively available" via satellite within his pay-TV mux. Now BBC competitor, ITV, says they too are looking at doing the same thing. Meanwhile in NZ, Murdoch holds sway by forcing FTA viewers to pay $17.29 per month for "equipment rental" after initially charging NZ$200-400 for the installation.

OK ... so why should **YOU** advertise in SatFACTS???

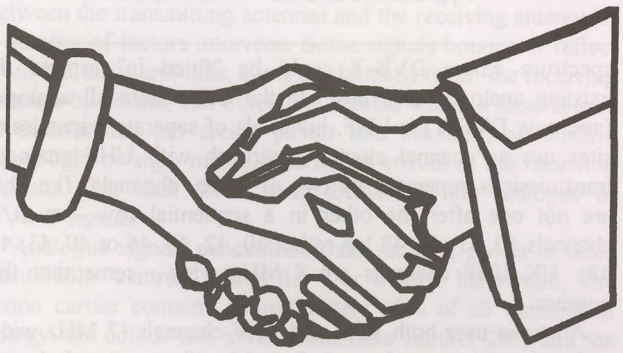
"My friend and I have been reading SatFACTS from day one and I have a complete set. Each month SatFACTS brings us new challenges and we are inspired to educate ourselves by experimenting with new concepts. Each time, we learn something from our mistakes and our successes. And when we fail, we look forward to the next issue to help us along."

☒ REASON ONE: **Readership loyalty**. 88% of all subscribers renew - more than 300 (out of 9,900 readership impressions per issue) have been with us from Vol. 1, Number 1!

☒ REASON TWO: **Enquiring minds**. SatFACTS readers are the leading edge sellers, installers, fix-it-folks for C, Ku, S-band installations throughout the Pacific and Asia.

☒ REASON THREE: **Volume**. SatFACTS readers sell equipment. To others. And they buy that equipment from firms who advertise in SatFACTS!

"Your SF#105 report on reviving once-proud larger dishes, and correcting their deformities, was exceptionally well done. I have been in satellite for a decade, have strung dishes in the past but never have I see it so clearly explained."



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Brits wrestling with DVB-T solutions

Coping with Analogue + Digital terrestrial receiving systems

To date, the commercially most successful rollout of DVB-T (digital via broadcasting [via/using] terrestrial [transmitters]) has occurred in the UK. There are two competitive forces at work here; the satellite delivered BSkyB 400+ channel service offered by a subsidiary of News Limited and a problem-laced attempt by Britain's terrestrial broadcasters to encourage UK homes to switch from the present-day 4 or 5 channel analogue service to a 30+ channel digital service.

To date, BSkyB has attracted approximately 5 times as many "digital-delivery viewers" as the recently born-again terrestrial effort now called "Freeview." However, Approximately 50% of BSkyB's digital viewers actually subscribe to UK cable systems that act as an intermediary between BSkyB and the ultimate viewing home and in that process, virtually all of the BSkyB cable viewers are actually "analogue viewers" because that is the delivery medium still operating with British cable.

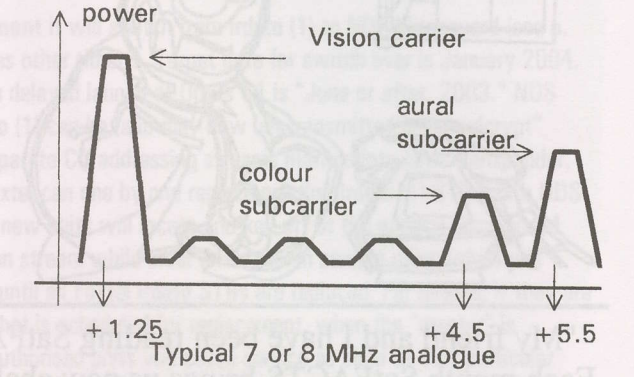
At the end of the day (year, decade) the objective is clear: Be in a position to turnoff all UK analogue TV transmitters (operating only in the UHF bands IV and V region as VHF transmitters were shut down decades ago). As a matter of "public policy" the British Government has attempted to not overtly favour terrestrial over satellite, or vice-versa. All they really want is to end up with hundreds of megahertz of ex-analogue TV channels which can then be put out to public auction to raise funds for Government operations. If this ultimately means every home in the UK owns and uses a satellite dish, or there is some mixture of satellite plus cable + DVB-T, so be it.

Rupert Murdoch's News group of course is in favour of a total-satellite solution; no terrestrial TV at all, and certainly not terrestrial DVB-T. As Britain's only provider of satellite TV, it is News' wish they end up being the only provider of any television. Period. And they have played "rough" to gain that ultimate position, including hacking of the original DVB-T subscription cards and then releasing the hacking information through a British run, California based web site; or so the lawsuits filed against News' NDS group claim.

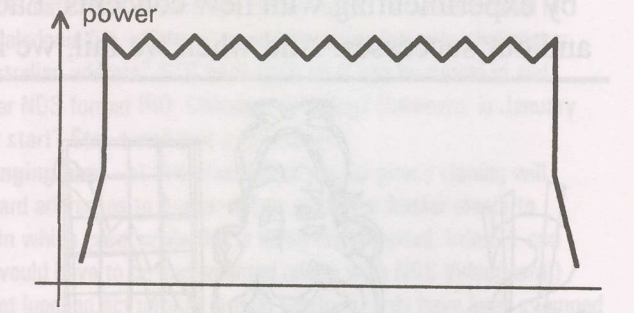
DVB-T, in the UK and essentially any other spot on the globe, doesn't really need NDS hacking of subscription cards to fail; it has all of the ingredients built-in to fail on its own, without any outside prodding. And now that more than one million DVB-T "home systems" have been distributed within the UK (the majority of these were "given away" when "subscribers" agreed to pay for service over a contract period), there is a considerable (and growing) data base of practical experience which we can tap for our own education about how DVB-T home system installations are, indeed, quite a challenge. This report details what is now known and it translates quickly to the Australian DVB-T reception world as well.

Those pesky carriers

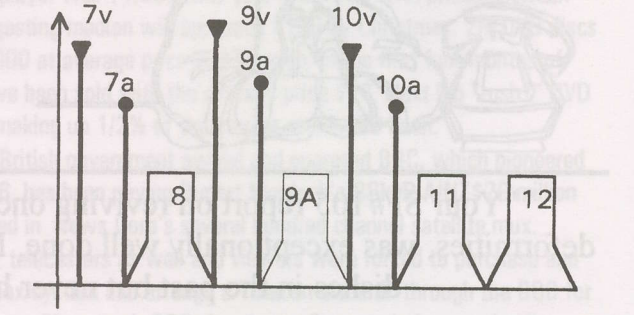
The UK and Australia use a similar transmission format known officially as COFDM. The major challenge before either launched transmissions was to identify frequency



Typical 7 or 8 MHz analogue



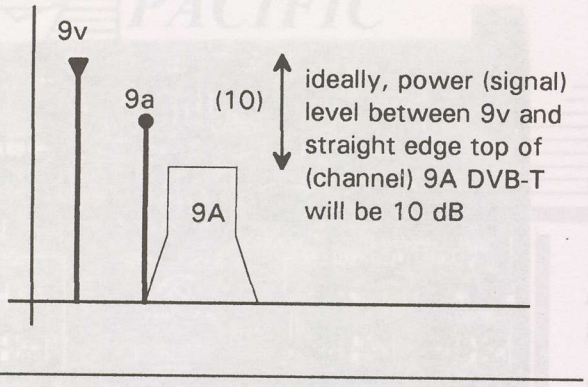
Typical 7 or 8 MHz DVB-T

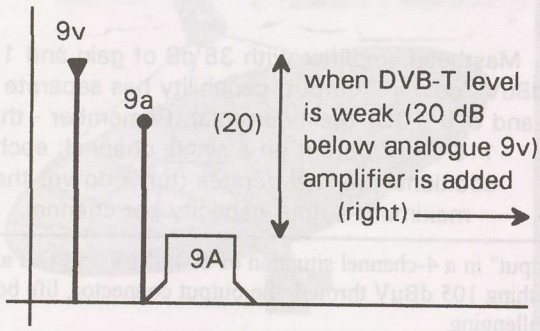


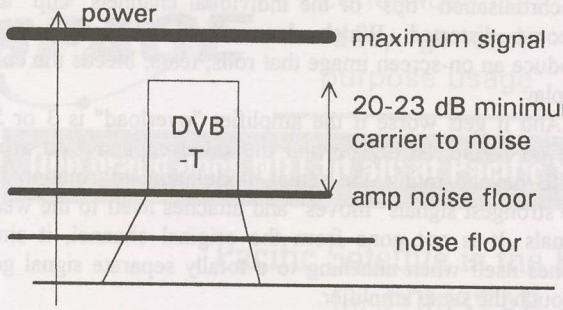
Typical Australian mixed spectrum

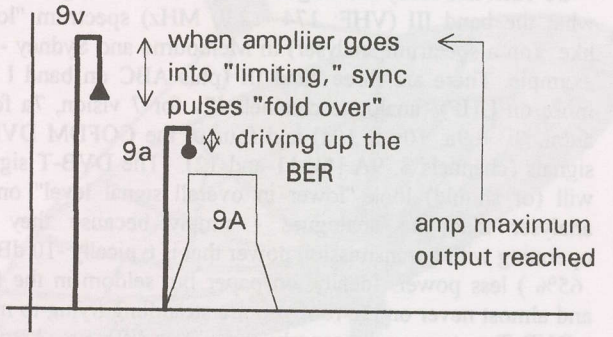
spectrum where DVB-T could be "fitted in" around the existing analogue channels. In the UK, where all analogue (and now DVB-T) is UHF, hundreds of separate transmission sites use a "channel cluster" approach with UHF analogue transmissions separated by two or more "channels" (i.e. they are not one after the other in a sequential row - such as channels 40, 41, 42, 43 but rather 40, 42, 44, 46 or 40, 43, 46, 48). UK UHF channels are 8 MHz wide - remember that number.

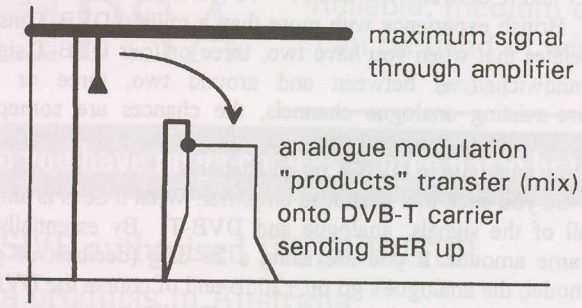
Australia uses both VHF and UHF channels (7 MHz wide) and major cities use channels 7, 9, 10 with an unused channel space between 9 and 10 (i.e. they are not sequential). Both the











UK and Australia believed that by placing DVB-T on the non-analogue-used "buffer channels) (8, newly assigned 9A, and 11 for example) the two different formats could coexist without problems. In theory, they might do this provided every TV set out there received exactly proportional service signal levels from each analogue and each DVB-T transmitter. Unfortunately, this almost never happens for 'in the air" between the transmitting antennas and the receiving antenna(s) a number of factors intervene. Some signals bounce or reflect from buildings and hills; some are blocked from the receiving antenna by terrain; still others are located where a local source of interference (an arcing power line insulator, an electric street light or sign, motor generators) arrives at the receiving antenna with such force as to drown out the analogue or DVB-T signals.

Analogue signals concentrate their radiated power at three identifiable "centres" within the 7 or 8 MHz bandwidth. The vision carrier contains approximately 60% of all transmitted energy, the colour and aural subcarriers another 20% and the balance is spread more or less randomly in the "holes" between vision, colour and aural. A DVB-T signal using the COFDM format uses more than 1,700 separate carriers and it "spreads" the transmitted energy evenly throughout the 7 or 8 MHz bandwidth (diagrams, p. 6).

In a theoretical world, the vision carrier for an analogue signal must be at least 40 dB greater than the receive system "noise floor" to eliminate large grain noise elements (commonly called "snow" by consumers). By comparison, also in theory, a DVB-T signal will have no "snow" if the signal carrierS are between 20 and 23 dB stronger than the receiver noise floor. Snow or picture impairments on an analogue signal are annoying but seldom become distracting to viewing the image until the signal level drops to someplace between 25 and 30 dB above (stronger than) the noise floor. This area of degraded reception (signal levels between 25 and 40 dB of carrier greater than the noise floor) if termed "fringe area" service. DVB-T has no fringe area. Either the signal is strong enough to produce a flawless image (no interference at all) or it is too weak to produce any picture at all. Typically, when a received signal has 1 "digital error" detected in 10,000 data bits received, the DVB-T receiving system "locks" on the screen and reception simply quits. One in ten-thousand? That's 0.001% error.

There are a number of ways to create one-in-ten thousand data bit errors. Naturally, too little signal to attain the mandatory 20>23 dB carrier to system noise threshold is one. BER or Bit Error Rate is how DVB-T "quality" is measured. The first step to create the 20>23 dB carrier to system noise threshold that DVB-T demands to show a flawless image might be to try to make the DVB-T signal stronger. For a normal installation, there are four choices:

1/ Go on the roof and move the receive antenna around, up and down, looking for a stronger signal. This require a signal measurement device that measures either digital signal strength or BER.

2/ Take down the first aerial and replace it with one that is larger, creating more signal gain. You might have to do both 1/ and 2/ simultaneously.

3/ Inspect and if required replace the transmission line and/or connectors between the rooftop aerial and the DVB-T set-top box. If the line is old, or has too much signal loss, by upgrading to newer and physically larger cable, you might gain enough additional signal to get over the "BER threshold."

4/ Add a signal amplifier.

Naturally /4 seems like the quickest, easiest approach. Alas, it is least likely to produce suitable BER results if you are in a location that has both analogue and DVB-T signals being received. Why won't an amplifier fix the problem?

Go back and study the diagram on p. 6, bottom right. This is what the band III (VHF; 174 - 230 MHz) spectrum "looks like" (on a spectrum analyser) in Melbourne and Sydney - for example. There are three band III (plus ABC on band I and more on UHF) analogue channels (7v for 7 vision, 7a for 7 aural, 9v + 9a, 10v + 10a) and four of the COFDM DVB-T signals (channels 8, 9A [*], 11 and 12). The DVB-T signals will (or should) look "lower in overall signal level" on an analyser than the analogues - simply because they are operating with a transmission power that is typically -10 dB (or 65%) less power. Ideally, on paper but seldom in the field and almost never on the roof you are straddling trying to make a DVB-T system work properly, the power difference between 9v and DVB-T on channel 9A would be -10 dB (diagram, p. 7, top left). The same -10 dB ratio should also exist between 7v and 8, between 10v and 11 + 12 (12 is ABC DVB-T).

British experience with more than a million DVB-T installs relates that when you have two, three or four DVB-T signals sandwiched in between and around two, three or four pre-existing analogue channels, the chances are someplace around 10,000 to one that you will not have a -10 dB ratio from analogue to DVB-T on all channels.

So you stick in a masthead amplifier. What it does is amplify all of the signals; analogue and DVB-T. By essentially the same amount. If you are using a 20 dBg (decibels of gain) model, the analogue's go up +20dB and of course the DVB-Ts go up 20 dB. And we still have a 20 dB ratio between the analogue and DVB-T channels. Yes, you have more signal, no you have not solved the "signal ratio" problem.

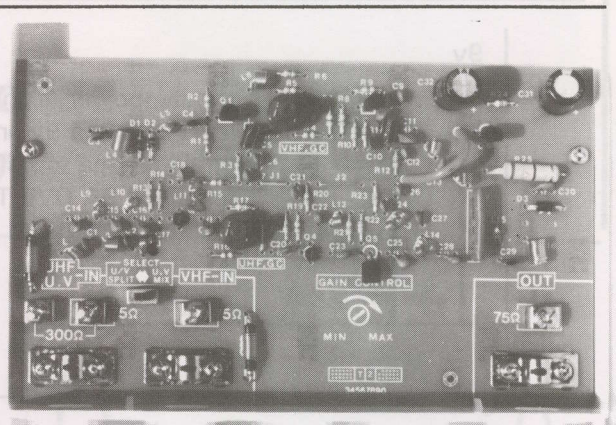
It gets worse.

An amplifier (any amplifier) has a maximum signal output capacity. Most mastheads provide an internal "VHF" and (or) "UHF" gain control. This is there because the amplifier designer knows he cannot accurately predict how much input-to-the-amplifier signal the masthead will receive in the field. If an amplifier has 20 dB of gain, careful reading of the written specifications will also reveal a maximum "total output signal" - a phrase such as "110 dBuV for one channel, 107 dBuV for 2 channels, 104 dBuV for 4 channels, 101 dBuV for 8 channels" and so on.

The total number of "carriers" is not determined by counting the analogues alone; the DVB-T, while weaker than the analogues, also count as well. If you have 4 analogues and 4 DVB-Ts, what you really have is 8 carriers flowing through the amplifier.

When the input signalS flow through the amplifier and are "boosted" by 20 dB, the output of the amplifier is 20 dB greater than the input. On all channels. Perhaps.

If the input signals are all 85 dBuV and there are four of them - what will come out is 85 + 20 or 105 dBuV on each of four channels. Now, if the amplifier has a "maximum total output" in a 4-channel situation of 104 dBuV and you are now pushing 105 dBuV through the output connector, life becomes challenging.



Masthead amplifier with 35 dB of gain and 115 dBuV "power" (output) capability has separate VHF and UHF "GC" (gain controls). Remember - that's 115 dBuV output on a single channel; each additional channel derates (turns down) the maximum output capacity per channel.

The amplifier transistor(s) are now "saturated" or operating in an "overload" situation. When this happens, the synchronisation "tips" of the individual channels "clip" as in become distorted. Which does what? Clipped sync tips produce an on-screen image that rolls, tears, bleeds the colour display.

And it gets worse if the amplifier "overload" is 3 or 5 or heaven forbid 10 dB beyond the rated capacity. At around +3dB beyond rating, the actual modulation information from the strongest signals "moves" and attaches itself to the weaker signals. It is not gone from the original channel, it simply clones itself when attaching to a totally separate signal going through the same amplifier.

In our analogue + DVB-T situation, there were four analogue carriers (including ABC on VHF channel 1 or 2) and four DVB-T carriers. The DVB-T are weaker because they were transmitted on purpose in a weaker manner. So where does the wandering analogue modulation products clone itself and attach to?

Correct. The weaker DVB-T carriers.

We diagram this on p. 7, the two right hand drawings. Think of it this way. The masthead has a maximum output capability - a "roof" as it were. When the input signal level + the gain of the amplifier creates a dBuV number of any channel that is greater than that capability, the amplified analogue signal(s) "bounces off the roof" of the amplifier spraying around looking for a weaker, subordinate carrier to attach to. Bingo - attach to the DVB-T.

If there is one thing the DVB-T BER system dislikes more than too much "noise," it is "too much interference." Modulation products from an analogue channel, attaching to a DVB-T carrier, are about the worst scenario of interference you can create. And you do this all by yourself by selecting either the wrong masthead amplifier (not enough output capability), or, by neglecting to use the masthead "gain control" to turn the amplifier down until the BER suddenly indicates quality DVB-T reception.

There are some field rules here:

1/ *It only takes one* extra-strong analogue signal to cause the masthead to "go into overload." Calculate it: First, measure the inputs of all analogues (such as 85 dBuV). Second, add the full rated gain of the masthead (85 + 20 = 105). Third, go to the specification sheet and identify the maximum output capability. If the input level measured plus the gain results in a dBuV number greater than that specification, you will either have to turn the amplifier gain control down or replace the masthead with a beefier version.

2/ Probing the roof area with the reception antenna will often dramatically affect the relative readings of the various analogue and DVB-T signal levels. If the DVB-T transmitters come from a direction that differs from the analogues, you might do better by misdirecting the antenna towards the DVB-T site and away from the analogue transmitter site(s).

3/ When there is a dB difference between an analogue signal and its immediate upper channel (such as 7 to 8, 9 to 9A, 10 to 11) of 20 dB or more, you are a dead duck. Between 10 and 20 dB difference the DVB-T will work some of the time at some locations provided you have not "over-amplified" the full set of channels. Your goal is to create a 10 dB difference between the two (analogue 10 dB stronger than next-upper channel DVB-T).

So in summary, an amplifier is seldom a cure-all for DVB-T ills. It raises *both* analogue *and* DVB-T signals, does not directly affect the relative dB difference between the two, and will often result in topping out the amplifier's rated output capability.

More British experience

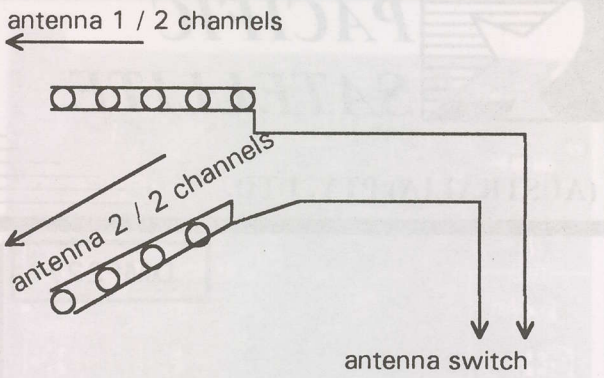
What follows will not sound even slightly "friendly" to individual home installations. And unfortunately the British experience raises serious questions about the financial viability of individual installations.

First the good news. If the DVB-T transmissions are strong enough without a masthead and relatively equal in signal level, a single antenna feeding both analogue and DVB-T to the receiving system will function without extra problems. What this may mean is a replacement of the existing aerial (especially if it is not a 75 ohm antenna using coaxial cable downlead) and some modest amount of "roof probing" to locate the cleanest DVB-T service (a BER meter such as DaTuM 10 from Laceys.tv is almost mandatory for this work).

When the DVB-T signals simply will not resolve properly, this calls for channel by channel techniques. The British are finding that within a terrestrial "mux" often one or two of the "channels" (each carrying 8 TV programme channels) won't resolve in one antenna location and setting where the balance of that mux will work. This gets especially complex when a second antenna location cleans up the one or two missing but loses another one that was fine at the first location! The message here is that unless you check all four/five/six DVB-T signals available at your location, you could quite erroneously select a location, install the antenna, run the cable and then when arriving at the set-top box find a missing channel or two. Ooops.

The British solution is to erect two or more antennas for each installation, each one positioned for whatever channels as it will properly decode. That's wonderful news for the aerialist installing antennas, doubtful news for the consumer who thought his or her $500 set-top box was going to be the total investment only to learn that the same amount, again, is now required for the aerial work.

Two antennas present new user and installer problems. In theory it might be possible to "mix" the two antennas on the roof and run a single combined downline. *In theory.* In practice, each of the antennas receives at least some signal from the full set of DVB-T (and analogue) channels. On analogue, mixing two antennas usually creates severe ghosting (time delayed, reflected images) which might be acceptable if the home never intended to watch analogue again; hardly realistic.



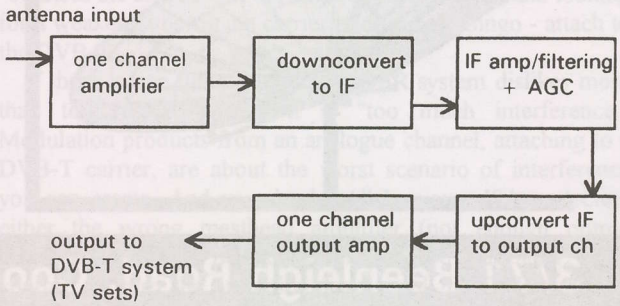
Not a good solution - technically or for consumer cost. DVB-T planners didn't see this one coming!

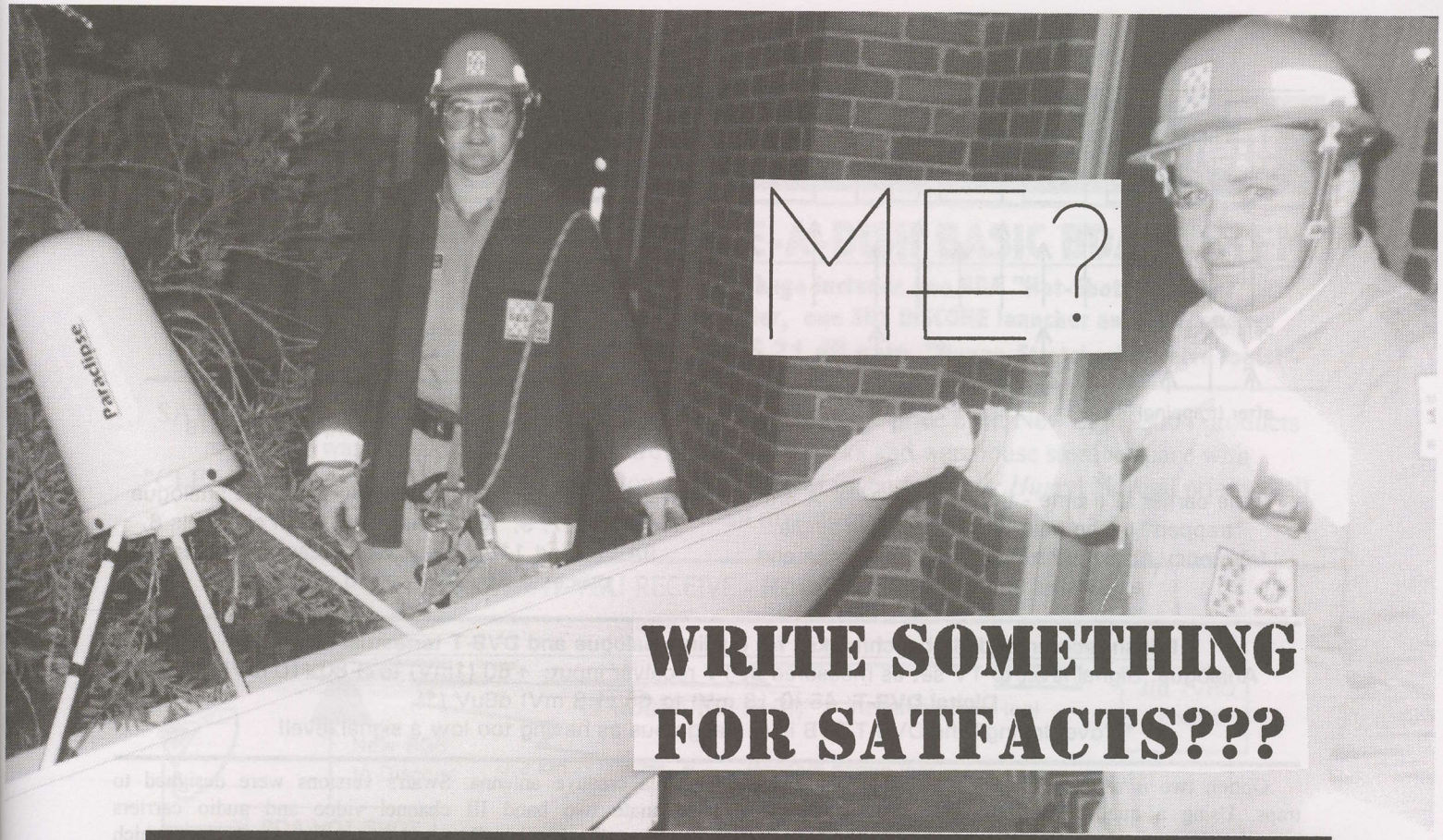
The other possibility is to bring both lines to the set-top box and provide a switch to select the appropriate antenna for the channel to be viewed. Of course this is difficult to integrate into the viewer's lounge chair operated remote control! So "upgrading" to DVB-T may have a "get up and switch it manually" negative attached.

When the analogues are simply too powerful (>20dB +) to resolve the weaker DVB-Ts, there are three options (other than creative antenna positioning), none of them inexpensive. A newly available "Channel Processor" receives one DVB-T channel, downconverts it to IF (intermediate frequency), filters out the strong analogues on both channel sides, and then upconverts the IF to the same or a new VHF or UHF channel. Now the stand-alone DVB-T signal has a chance to be resolved. The Brits are quite adamant about "when" they have to go to this expense: "Whenever the undesired analogue signal is +15 dB relative to the desired DVB-T."

Expense? Four DVB-T channels to process equals four times the cost of one Channel Processor. There goes a couple of grand, fast! Practical? Perhaps in a hotel or large motel. For a home? Only those superrich and perhaps super-crazy at the same time.

Another - not a cost effective DVB-T solution for a typical household. And again, the DVB-T planners neglected to see this problem. Silly planners!





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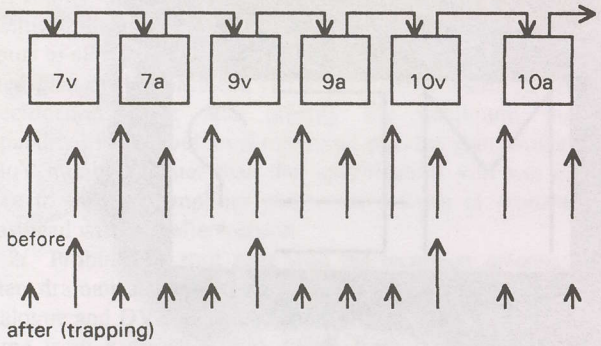
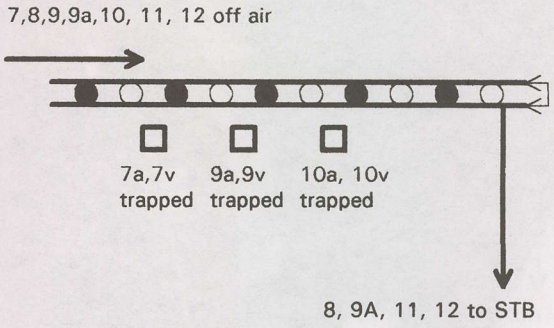


One carrier at a time - the 7, 9, 10 V + A are "trapped" in the field with a tuneable single frequency attenuation device. Troublesome and expensive to implement.



Traps built into "logi" attenuate undesired analogue channels (7, 9, 10) leaving DVB-T on channels 8, 9A, 10 and 11 at levels which can be properly processed by STB at end of downline.

British recommended "benchmarks" for quality analogue and DVB-T terrestrial reception

Analogue: Signal level to TV set as measured at TV receiver input: +60 (1mV) to +80 (10 mV) dBuV

Digital DVB-T: 45 (0.18 mV) to 65 (1.8 mV) dBuV (*)

* "overdriving" the DVB-T STB is as dangerous as having too low a signal level!

Option two is a string of in-line tuneable single channel traps. Using a quality spectrum analyser and/or analogue meter, three tuneable traps are notch-tuned in the field to take out as a minimum of 7v, 9v and 10v analogue carriers before they reach the STB. In some situations, the traps might number four tuned to 7a, 9v, 9a and 10v. In still worse situations, 7v, 7a, 9v, 9a, 10v and 10a. The traps don't have to be especially selective except - except - they should not be so broad (in design capability or as tuned in the field) so that one used to notch-trap 7v (for example) also attenuates the channel 8 DVB-T signal as well. This becomes especially challenging when you are trying to notch-trap 7a (which sits in frequency just below channel 8) or 9v (the immediate opposite side of channel 8). The same caveat applies to tuning out 9a or 10v for the DVB-T on channel 9A, or 10a for the DVB-T on channel 11.

Field tuneable traps are difficult to find (Blonder Tongue Labs has MWT-3b tuning 174-230 MHz through Toner Cable Equipment, Inc. fax ++1-215 675 7453; no known Pacific distributor). Other sources for similar products could be Laceys.tv (p. 3, here) and the USA versions cost around US$90 each. So once again, short of locating a more reasonably priced replacement, this is hardly a solution for the typical home installation.

The third solution is more theory than available at this time. Back in the late 1950s, a California creator named Oliver Swan designed an outdoor TV antenna that had both yagi (single channel, high gain) and log (multiple channel, more modest gain) characteristics. What was unusual about Swan's "logi" was the ability to build-into the antenna itself "notch traps" that would significantly attenuate the tuned-to carrier frequencies right at the antenna. Think of this as a marriage between the field tuneable traps (which typically go inside the building because of their size and susceptibility to weather) and a creative antenna. Swan's versions were designed to attenuate two band III channel video and audio carriers thereby allowing installers to create antenna systems which were capable of receiving without interference longer distance analogue channels that just happened to be located immediately adjacent (in frequency) to semi-local analogue signals. For example, a "logi" with traps for 8v, 8a and 10v made it possible for distant channels 7 and 9 to be viewed. One Canadian company (Lindsay Speciality Products) in Ontario adapted Swan's "field-trapped logi" design to commercial cable TV antennas (Lindsay, by the way, was an early supplier of Canadian TV antenna technology to Hills and others when TV began in Australia). To the best of our research, nobody makes antennas in this format today but that is not to say that a clever job-shop in Australia or elsewhere could not recreate the antenna for the special needs of DVB-T.

Summary

None of the DVB-T planners foresaw the practical problems which occur when sticking existing analogue onto "adjacent channels" (whether VHF or UHF - it gets worse at UHF because getting "selectivity" becomes far more expensive in bands IV and V to implement). What this means is that a high percentage of locations are more than difficult - *they are impossible* with standard "TV aerial + cable + STB" bare-bones equipment. No improvement in the STB DVB-T processing algorithms will change this fact and therein nestles the challenge facing DVB-T world-wide.

Some (not all) of the problems would disappear when the analogue channels are shut-down. But how do you get from analogue to digital (while the world is adopting digital) unless you leave the analogues "on the air?" Do you ask viewers to "pardon the interruption for the next 2/5/10 years" - do you ask them to "come back when we turn off the analogue?" *Good grief* - who got us into this mess!

OK - tell SatFACTS about YOUR experiences with DVB-T installations. The industry is looking for firsthand "been-there, done-it" and SatFACTS PAYS for such reports (see p. 11, here).

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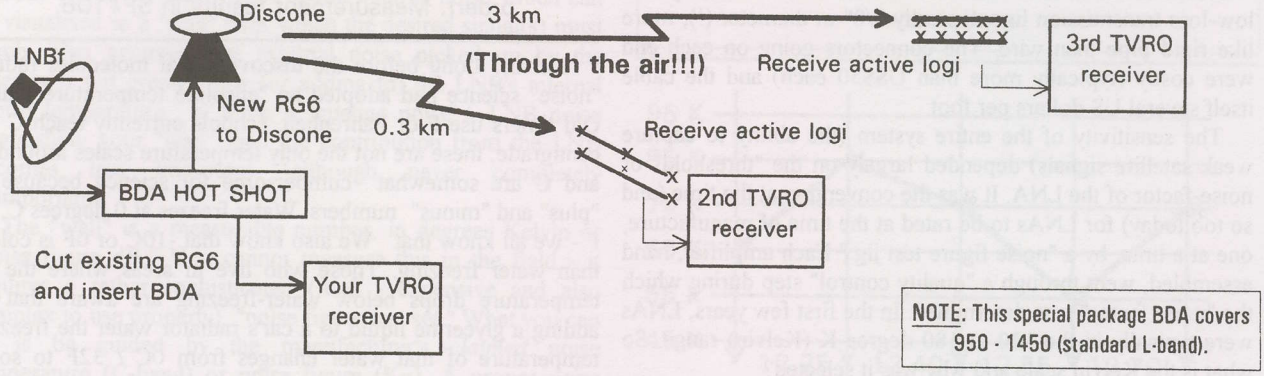

NOTE: This special package BDA covers 950 - 1450 (standard L-band).

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Telling a good one from a bad one (*part-one*)

Testing, evaluating LNBfs

In 1978 as the very first C-band home satellite systems were being installed in America, there was no such gadget as an LNB. Rather at the dish went an LNA (low noise amplifier) which did only one thing - amplifying the 4 GHz range signals sufficiently that a frequency changing "down converter" located indoors within the receiver could reduce the 4 GHz signal to some lower "IF" (intermediate frequency). Inside, more signal amplification followed ultimately by the analogue FM (frequency modulation) format "discriminator" - the magic stage that converted FM radio frequency signals into video and simultaneously allowed access to the subcarrier audio.

Between the dish + LNA and the indoor receiver, special low-loss transmission line, typically 7/8" in diameter (!), more like rigid pipe than wire. The connectors going on each end were costly (typically more than US$50 each) and the cable itself several US dollars per foot.

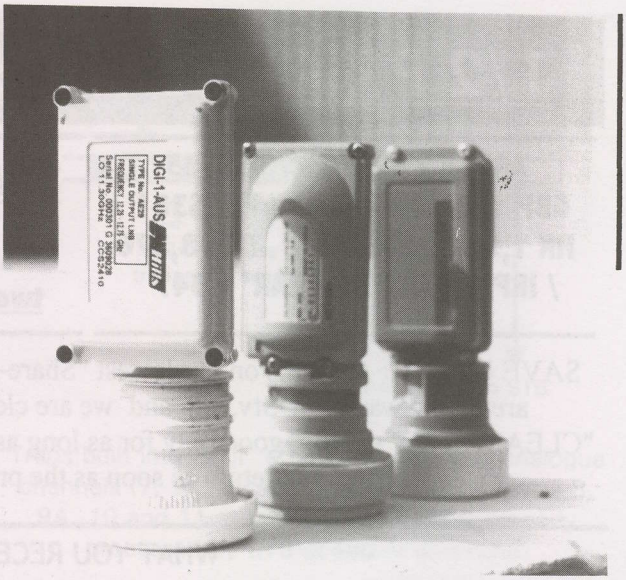
The sensitivity of the entire system (the ability to capture weak satellite signals) depended largely on the "threshold" or noise-factor of the LNA. It was the convention at the time (and so too today) for LNAs to be rated at the time of manufacture, one at a time, by a "noise figure test jig." Each amplifier, hand assembled, went through a "quality control" step during which the "noise factor" was determined. In the first few years, LNAs were typically in the 120 to 180 degree K (Kelvin) range. So what is the Kelvin scale and why was it selected?

Anything and everything that has moving molecules radiates noise. The blade of grass outside your window, the car driving down the street, even your body. Molecules are the "building blocks" of the universe and the only time a molecule is stationary is when it is dead (by definition a dead molecule is no longer a molecule).

Scientists in the 1930s worked out that because anything with moving molecules emits noise, a system could be created to "grade" or "quantify" the degree of molecular motion by simply detecting the "noise level." The trick here is important to what happens with a satellite TV signal. To measure the noise emitting from a blade of grass, for example, first you must eliminate all other sources of noise for the measurement. The blade of grass must be "suspended in isolation" so that as the measurement sensor is brought closer and closer to the blade of grass, only the noise from the grass is detected.

Yes - this has *everything* to do with satellite TV LNBs; stay tuned!

This is no easy trick to accomplish. A noise measuring test set using a probe (we would call it an antenna!) when brought down to mother earth will register something in excess of 300 degrees - Kelvin. A single blade of grass, isolated from the earth at the probe / antenna might *only be* 100 degrees Kelvin. But before you could be certain of that, the "background noise" from the earth around the grass has to be eliminated since 300 degrees is more than 100 and you cannot detect the "weaker" radiation until the stronger which acts as a "mask" is gone. The basis for LNB design is closely related to this measurement problem.



The good, the bad, the ugly (not necessarily in that order). Measurement results in SF#106.

Kelvin? Long before the discovery that molecules radiate "noise" science had adopted an "absolute temperature scale." Old timers use F or Fahrenheit, schools currently teach C for centigrade; these are not the only temperature scales around. F and C are somewhat cumbersome for science because of "plus" and "minus" numbers. Water freezes at 0 degrees C, 32 F - we all know that. We also know that -10C or 0F is colder than water freezing. Those who live in areas where the air temperature drops below water-freezing are aware that by adding a glycerine liquid to a car's radiator water the freezing temperature of that water changes from 0C / 32F to some lower number, thereby protecting the car's engine block from cracking because the water froze and expanded.

Obviously there are things and places that can be colder than say -100C or F. There is, in fact, a temperature of absolute zero. This is Kelvin 0 degrees. The definition of absolute zero is "all molecules stop moving" and logic suggests that life cannot exist at 0 Kelvin.

Kelvin when applied to C-band LNBs is a way to quantify how "good" the device is. A 25 K LNB is better than a 50 K LNB, a 15 K LNB is better than either. When electricity is applied to a circuit, electrons "flow" creating "molecular motion." Each part in the circuit now has (electron) motion and thus each generates noise that can be "measured" with an appropriate "Kelvin measurement device."

Noise versus noise

If you could somehow create a LNB with a 0 degree K that still worked, the only "noise" blocking reception would come from that portion of "deep space" illuminated (seen) by the receiving antenna. Deep space has an average noise of 4 degrees Kelvin, indicating there is still some molecular motion out there. Short of locating a "noise hole" in space (they do exist), it would be impossible to realise the benefits of "no noise" because 4 K is in fact "the noise floor" (see our earlier example of isolating a single blade of grass from the earth's surface); 0 K would be "masked" by 4 K.

Noise is inherent in our satellite system because (1) the LNB creates noise ("electron flow"). (2) the dish antenna points at or near objects which have their own "noise factor" and this noise becomes a part of what the LNB "sees" (the "noise" received by the antenna is "added to" the noise of the LNB).

Noise from the antenna portion increases as the elevation ("look angle") of the dish becomes smaller. For elevation angles of 10 degrees and less, the noise the antenna "sees" (primarily from the earth, nearby trees and buildings) will typically be more noise than the LNB creates.

Remember the blade of grass and the earth? If something other than the LNB creates noise, which the antenna "sees" and transmits to and through the LNB, this external noise level or source now becomes our "noise threshold"; anything you do to improve the noise factor of the LNB will be hidden or masked by the larger noise contribution picked up by the antenna. Said another way - the more "noise" the antenna sees, the less important the noise factor/temperature of the LNB.

Ku noise

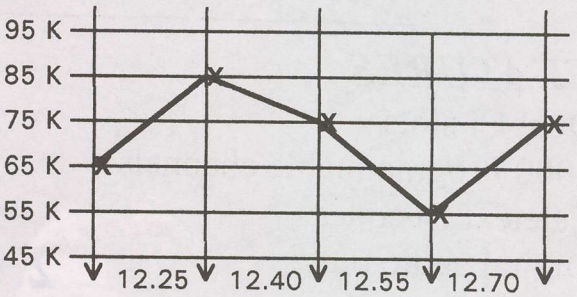
It is "traditional" to measure C-band LNB noise using the Kelvin temperature scale. It is equally traditional to measure Ku band noise using the "dB scale." The numbers are interchangeable as the table here shows. For every degree-Kelvin number there is a corresponding "noise figure dB" number. Neither scale is "best."

Both C and Ku band LNBs create internal noise which can be visualised as a "wall" over which the desired signal(s) must climb. This assumes that external noise picked up by the antenna is not greater than (or adding to) the LNB's internal "noise temperature." If there is antenna noise + LNB noise establishing your "wall" than the contribution from the LNB becomes less important (although never completely unimportant).

The "wall" is a measurable number, in degrees Kelvin or "noise figure dB." You cannot measure this in the field - it requires a rather sophisticated (read - expensive and also complex to use properly) "noise figure test set." What you can do is be guided by the manufacturer's *claimed* noise temperature (C-band) or noise figure (Ku). A proper noise measurement would check the actual noise at numerous points within the input band (such as 3.7 to 4.2 GHz on C; 12.25 - 12.75 on Ku). A typical Ku LNB measurement is shown at right. Note the noise temperature varies between 55 (degrees) Kelvin / 0.75 dB and 85 (degrees) Kelvin/ 1.1 dB between 12.25 and 12.75 GHz. Such a variation is common. Would the manufacturer rate this as 1.1 (worst case) or 0.75 (best case)? His incentive is to select 0.75 dB because he can charge a higher ("premium") price for a "lower noise figure" unit. If you need top performance at 12.4 GHz (1.1 dB), and depended upon the claimed 0.75 dB (12.7 GHz) noise factor, you'd be out of luck on this one. No LNB gives uniform results across the full 500 MHz Ku (or C) band. *None*. Would all LNBs from this particular manufacturer have similar "curves" between 12.25 and 12.75 GHz? Not at all. Every single LNB will vary, from all others; no two are alike. Which makes LNB selection where critical high quality performance is a "must" basically a "crap shoot."

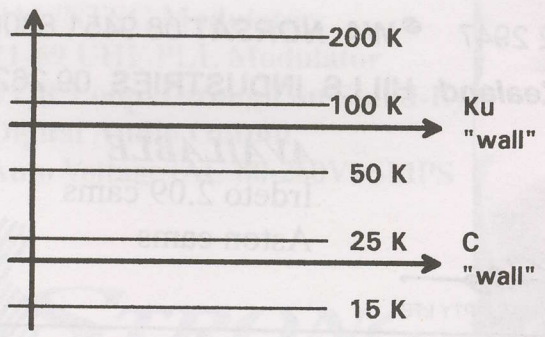
Temperature Kelvin	Noise figure in dB	Temperature Kelvin	Noise figure in dB
170	2(.0)	67	0(.9)
159	1(.9)	59	0(.8)
149	1(.8)	51	0(.7)
139	1(.7)	**43**	**0(.6)**
129	1(.6)	35	0(.5)
120	1(.5)	28	0(.4)
110	1.(4)	**21**	**0(.3)**
101	1(.3)	14	0(.2)
92	1(.2)	7	0(.1)
84	1(.1)	0	0(.0)
75	1(.0)		

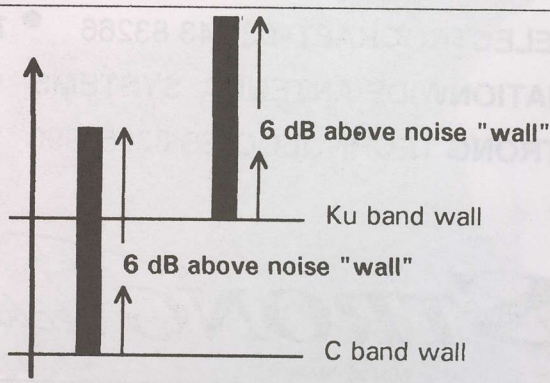
State of the art with Ku band is in the region of 0.6 dB / 43 degrees Kelvin. C-band manufacturers often "claim" 15-17 degrees Kelvin (0.25 dB) but such numbers are difficult to substantiate.



Noise factor testing at 5 points between 12.25 and 12.75 GHz. 75 K is same as 1.0 dB noise figure (table above). 85 K is 1.1 dB, 55K is 0.75 dB. How would manufacturer "rate" this LNB?

The wall. There is noise, and, there is signal. For your digital receiver to decode/demodulate the signal, there must be more signal (called "carrier" in the trade) than noise. Below, the "noise wall" established by the LNB and the signal through the





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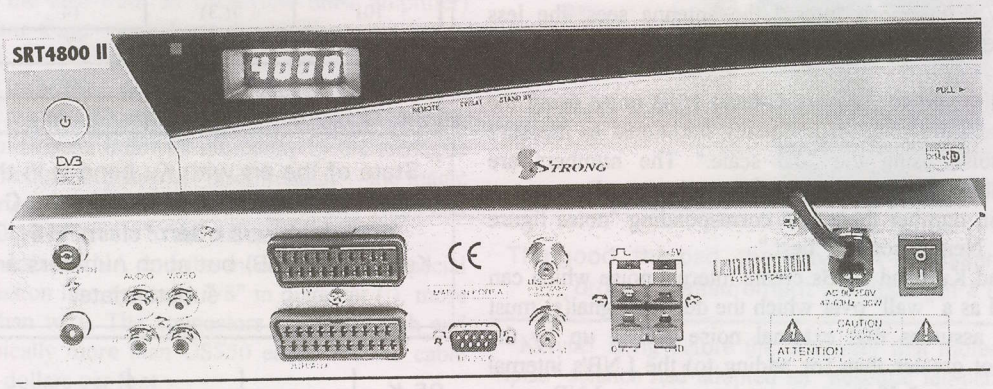

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LNB and dish portion. Most (not all - some are better, some are worse) require more signal-to-noise (or more properly expressed, "carrier-to-noise") to properly lock onto the carrier (signal). The two drawings (p. 15) suggest "6 dB more carrier" than the "noise wall" for the receiver to function. This is of course marginal, even with the very best ("low threshold") IRD.

There is a popular misconception that if you can measure 74 dBuV (or some other number) "signal" the IRD will "lock and load" a specific signal. This is a very dangerous "rule of thumb" to follow; here is why.

1/ 74 dBuV (or any other number quoted) is a "signal *voltage*" number. It totally ignores "where the noise wall" may be in a specific system. *A dB is a dB is a dB.* If this was an infallible "rule of thumb" then the "noise wall" would always be 74 dBuV minus (-) 6 dB, or 68 dBuV. As the "noise wall" is determined by the quality and grade of the LNB, and the presence or absence of antenna picked-up noise, it becomes a meaningless rule of thumb. It might work for you - once, or twice - but it will not "always work."

2/ The difference between a digital mux using a FEC (forward error correction) of 1/2 and one using a FEC of 7/8 is typically 3 dB. Which means? You need 3 dB *more signal* for a 7/8 FEC mux (transponder) than you do with a 1/2 FEC transponder. A "74 dBuV" *rule of thumb* for threshold overlooks this very relevant point.

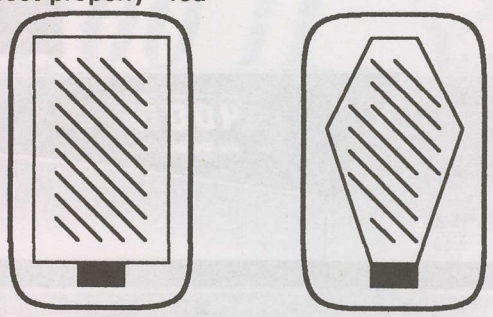
3/ A signal *voltage* is a function of *where* you measure the signal and the gain of the LNB. An LNB with 40 dB of gain (they exist) will produce less amplification of the original Ku to L-band converted transponder than a 50 dB gain LNB. The "10 dB difference" is easily measured on a signal level meter (74 dBuV with a 50 dB gain quickly becomes 64 dBuV with a 40 dB gain version).

The signal "level" is only relevant after you have established transponder lock (decoding) and only as it might affect the minimum input signal voltage level which the particular IRD you are using requires. Signal "level" must never be confused with "carrier to noise ratio" which as our illustration on p. 15 shows must be not less than 6 dB for a reasonable quality IRD. It is not how much signal "voltage" you have which determines whether the system will work; it is how much more carrier (signal) you have "above the noise wall" that determines performance.

Lowering the noise wall

In a marginal reception situation, you have only two choices. Choice number one - get more signal (as measured by carrier level). Choice number two - reduce (lower) the "noise wall." There are no other choices short of reprogramming the IRD to function with a higher error rate (not practical).

More signal typically means a larger dish (more dB of gain). If you go to SF#105 and read p. 6 onward you will see how prime focus dishes can be optimised for maximum gain. If you are using an offset dish, the first mistake most make is to neglect to select an LNBf ("f" is relevant here) which was designed to have a "feed pattern" the properly illuminates the physical structure of the dish you are using. "Shaped dishes" (this phrase often appears in the literature describing the dish) means somebody has designed the dish so that it has a "non-standard" shape. To properly "illuminate" (extract energy from) the dish requires a "shaped feed pattern" (the "f" in LNBf) as well. In most cases, the dish and the LNBf are sold as a "matched set" - the pattern of the feed on the LNB"f" is tailored to respond to the "shape" of the offset dish. If you select the wrong LNB"f" you run the very real risk the feed



The "feed" inside the LNBf must "see" the entire dish surface "evenly" for maximum gain

("f") of the LNB was designed for a dish of a totally different "shape." If the dish and LNB"f" are "matched" then the next step for the installer is a larger dish with more gain.

Lowering the noise wall. It is as "simple" as selecting an LNB(f) with a lower noise figure. Of course if the manufacturer of the LNB"f" has elected to "grade" or "rate" his product by calling it "0.75 dB noise figure" when in fact the LNB segment only reaches this claimed number for one point between 12.25 and 12.75 GHz, you are basically in trouble for the balance of the spectrum (see diagram, p. 15). One (or two or three) transponders might work fine, as you expected; others where there is a higher noise figure will work progressively less well as the noise figure climbs in their portion of the Ku band spectrum.

BER

A test instrument capable of measuring "carrier to noise" (a ratio measured in dB) was a perfectly acceptable device with analogue satellite. It is less suitable for digital measurements for a number of reasons. The replacement measurement, for digital (whether digital satellite / DVB-S or digital terrestrial / DVB-T) is bit error rate (BER). Several excellent meters exist for this function and their price has come down (and the physical size of the instrument has shrunk) in the past 18 months. Lacey's.tv offers a selection (p. 3, here). BER works this way. All digital transmissions have a "decoding threshold" and whether above or below this threshold, a BER meter can tell you exactly how many "bits of error" you have for a particular signal. A "bit" is a digital (only) data part and by "counting" how many errors occur in a precise period of time, the BER meter becomes a device that advises you how near (or far) you are from "performance threshold" with the system you are measuring.

Digital IRDs have a built-in software determined "BER threshold" - when the cumulative number of errors in a precise period of time exceeds some software determined number, the IRD simply ceases to function. BER performance acts like a "cut off valve" to the receiver and it does not take much imagination to see that if the software says it will tolerate (for example) 100 errors in a predetermined period of time, but 101 is one too many - that it follows the receiver as soon as BER reaches 101 will simply (on software command) stop functioning. We'll discuss BER properly in a future issue and began an analysis of how a number of "common" LNBf devices for Ku in particular "measure up" in SF laboratory testing (SF#106).

TECHNICAL TOPIX

Creating TV in East Timor

"I am doing volunteer work in East Timor teaching electronics and communications. The SDStv.com 20 mW transmitter system is being set up in a small community to allow people there to have a way to share 'visual' experiences and information. A BDA33 is also a candidate to repeat locally to the same receivers off-satellite services. While there may be some satellite equipment available, the typical village has VHF and some UHF receivers with a mixture of self-made antennas. What could I anticipate with off-the-shelf VHF or UHF amplifiers married to a VCR or other low power modulator connected to a TV aerial as a transmitting source?"

Tony J, ACT

Easy answer first. Take any VCR 70-75 dBuV VHF or UHF modulator, use it to drive an off-the-shelf high gain amplifier, and connect the amplifier output to a coaxial cable fed consumer VHF (or UHF as appropriate) receiving antenna and you will have instant "shared" television. Well, *almost.*

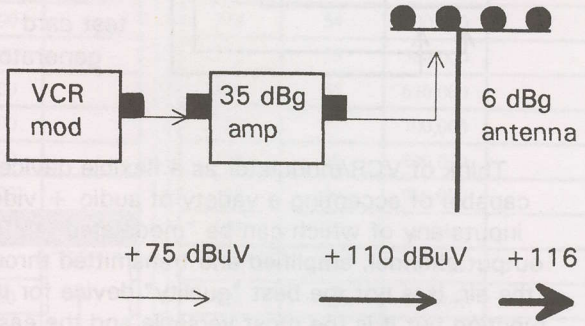
Power delivered to the transmitting antenna (diagram right, top) is "multiplied" by the gain of the antenna on the operating frequency (channel) of the amplified modulator signal. This "gain" is added to the transmitter "system" to arrive at something called "ERP" or "effective radiated power." If a 6 dBg (gain) antenna is used, and the amplifier delivers 110 dBuV to the antenna terminals, the ERP is 110 + 6 or 116 dBuV. 6 dB gain would model a typical medium grade consumer TV receiving antenna on a channel for which it has designed coverage. The ERP will be greater with a higher gain antenna, lower with a (0 dBg) dipole.

Within the first one-wavelength of the transmission antenna the power available to a receive antenna drops radically. If the transmission wavelength is 1 metre then at a distance only 1 metre in front of the transmission antenna the signal level will be reduced by approximately 20 dB. That's the bad news.

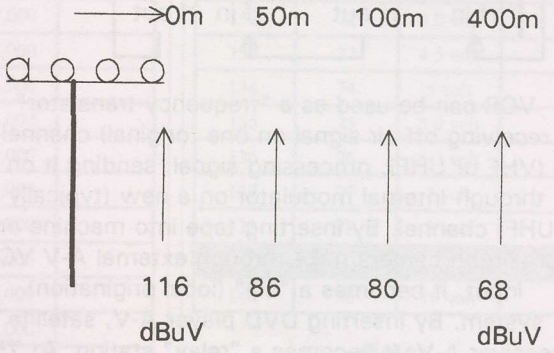
The good news is that the signal level drops off much more slowly for additional increments of distance (see diagram immediate right). Our example system described should be capable of delivering a signal level of around 60 dBuV at a distance of 1 km assuming there are no buildings, trees, or terrain blocking LOS (line of sight) "view" of the transmitter from the receiver.

There are some semi-technical warnings in all of this. First, the easiest method of making reception better (such as when blocked by terrain, buildings or trees) is to install a directional, higher gain reception antenna at the receiving site. Adding a masthead amplifier is also a logical way to extend service. The "total" output capability of the transmission amplifier should be verified by cross-checking the manufacturer's specification sheet. Some MATV/CATV grade "single channel" amplifiers are capable of more than 120 dBuV output "power" and although these 1/4 - 1/2 - 1 watt output devices cost considerably more money than a 110 to 120 dBuV rated consumer model, this might be a wise investment for a serious effort to cover a small community.

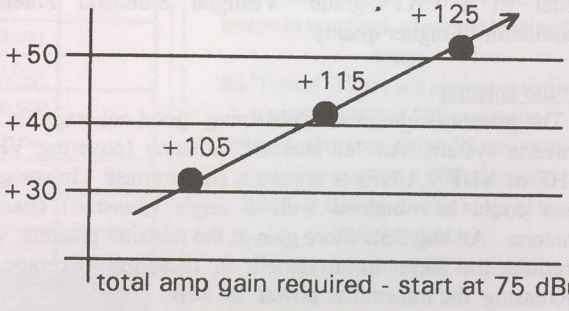
Next pay attention to the "total gain" (as opposed to the "total output capability") of the amplifier. If you are starting with no more than 75 dBuV (the output from a typical VCR modulator), and the gain of the amplifier you have chosen is 30 dB, there is no way to exceed 75 + 30 = 105 dBuV with such a package, even if the amplifier is rated at 120 dBuV (you are 15 dB gain shy in this example).

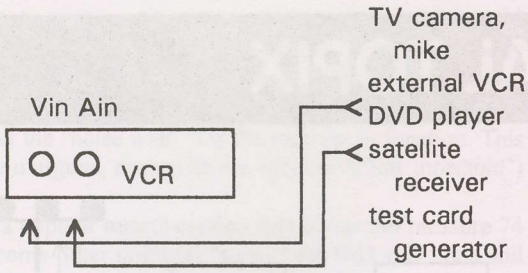


Typical VCR modulator produces not over 75 dBuV RF output. A "high gain" off-the-shelf amplifier may add 35 dB of gain (75 + 35 = +110 dBuV). If we assume 0 dB line loss from output of amplifier to input of suitable transmission antenna, and 6 dB of antenna gain - radiated power is +116 dBuV.

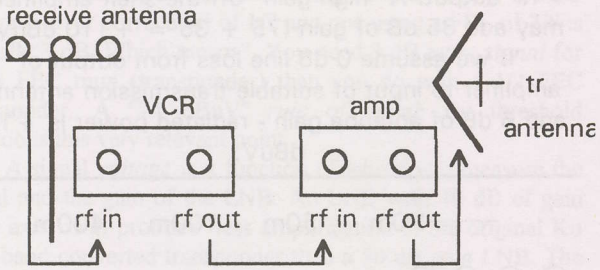


Assuming LOS (line of sight) clear path between the transmitting aerial and the receiving antenna, "free space loss" (signal lost through the air) will vary as a function of the transmission frequency with greater losses at high frequencies (i.e. 55 MHz is better than 550 MHz).





Think of VCR/modulator as a flexible device capable of accepting a variety of audio + video inputs any of which can be "modulated" to RF output channel, amplified and transmitted through the air. It is not the best "quality" device for this function but it is the most versatile and the easiest to configure to your specific needs.

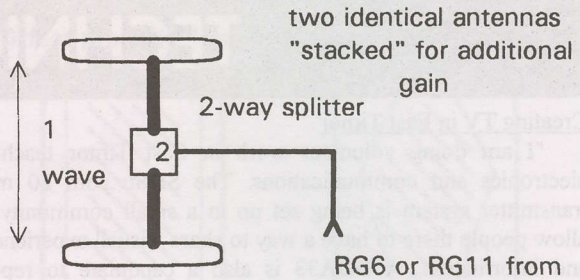


VCR can be used as a "frequency translator" receiving off-air signal on one (original) channel (VHF or UHF), processing signal, sending it on through internal modulator on a new (typically UHF) channel. By inserting tape into machine or turning on camera/mike through external A-V VCR input, it becomes a "LO" (local origination) system. By inserting DVD player A-V, satellite receiver A-V, it becomes a "relay" station. At 75 ohms system impedance, 130 dBuV is 1/8th watt; 133 dBuV = 1/4th watt; 136 dBuV = 1/2 watt and 139 dBuV = 1 watt, *before* antenna gain.

The only significant difference between your "backyard" VCR driven "station" and a "real" TV station is transmission power. And - the fact that VCR modulators are "double sideband" (broadcast TV stations filter or eliminate much of the lower sideband to maximise transmission power in the remaining "upper sideband"). More power is simply a "bigger amplifier" and if you really wanted to eliminate the unneeded "lower sideband" you could spend US$100 and order in a CATV-grade "Vestigial Sideband Filtered" modulator of higher quality.

At the antenna

The primary ingredient in obtaining "good coverage" is the antenna system. An "all-channel" antenna (covering VHF, UHF or VHF + UHF) is always a compromise - lower gain than could be obtained with a single (transmit) channel antenna. Adding 3dB more gain at the transmit antenna will produce the same improvement in reception coverage as increasing the transmitter power by 3dB.



"Stacking" two (or 4, 8) identical antennas and feeding the "array" with identical lengths of RG6/RG11 through a common signal splitter adds 3, 6 or 9 dB to "ERP" of your station signal without adding an amplifier. 121 dBuV fed to a 10 dB gain antenna equals 1/2 watt ERP.

Decibels (dBs) are additive. Doubling signal *voltage* is 6dB but it is way shy of "doubling" your transmit distance. 60 dBuV is 1,000 microvolts (1 mV) while 66 dBuV is 2,000 microvolts (2 mV); chart p. 21. And special care taken with the transmit antenna system is always worthwhile. If the transmitter is "off to the side" or at the "end" of a coverage area, a directional antenna array using one or more cut-to-channel "yagi" (single channel) antennas is worthwhile. Going from one antenna to two will add up to 3dB to the signal "power" (40% increase in received signal level).

Two identical antennas (same make, model) are mounted on a mast one wavelength at the transmission frequency apart. (Wavelength? Identify the transmit frequency in megahertz [MHz] such as 527.25 for Australian channel 28. Now divide 149.9 by 527.25 which equals 0.28. This is **1/2** wavelength for channel 28. Multiply by two [equals 0.57] and that is the answer in metres for 1 wavelength at 527.25 MHz. - 57cm). Mount the antennas so they are identically positioned, using the very same (as required) antenna matching transformer each "dressed" in an identical fashion. Now mount a 2-way splitter halfway in between the .57m spaced antennas, and cut two absolutely identical (to nearest mm) lengths of RG6 to connect from the splitter outputs to the matching transformer inputs on the individual antennas. Connect the RG6/RG11 down (transmission) line to the input of the splitter and you are away.

The receiving antenna

Any TV reception "path" (signal carriage from transmitter to receiver) depends largely upon the power at the transmitter. When that power is low, as it certainly is using a system as described here, much of the "system gain" transfers to the receiving side of the ledger. In other words, what the transmitter lacks in large amounts of power the receiving system must make up - with a suitable high gain, often amplified, reception antenna.

Beyond a few hundred metres distance, this rules out "rabbit ear" set-top antennas. A quality reception antenna, out of doors mounted so as to not be blocked by a sloping metal roof, trees, buildings becomes quite important. LOS or line of sight is very desirable simply because the transmitter lacks the "uumph" to force signals over, around and through blockages. A masthead amplifier may also be required. You can do some pretty amazing things with mini-power TV systems but here more than any other place attention to fine detail becomes mandatory.

dBuV	dBmV	microvolt	notes
11	-49	3.6	(1)
12	-48	4	
13	-47	4.5	
14	-46	5	
15	-45	5.6	
16	-44	6.3	
17	-43	7	
18	-42	8	
19	-41	9	
20	-40	10	(2)
21	-39	11	
22	-38	13	
23	-37	14	
24	-36	16	
25	-35	18	
26	-34	20	
27	-33	22	
28	-32	25	
29	-31	28	
30	-30	32	(3)
31	-29	36	
32	-28	40	
33	-27	45	
34	-26	50	
35	-25	56	
36	-24	63	
37	-23	70	
38	-22	80	
39	-21	90	
40	-20	100	(4)
41	-19	110	
42	-18	130	
43	-17	140	
44	-16	160	
45	-15	180	
46	-14	200	
47	-13	220	
48	-12	250	
49	-11	280	
50	-10	320	
51	-9	360	
52	-8	400	
53	-7	450	
54	-6	500	(5)
55	-5	560	
56	-4	630	
57	-3	700	
58	-2	800	
59	-1	900	
60	0	1,000	(6)
61	1	1,100	
62	2	1,300	
63	3	1,400	
64	4	1,600	
65	5	1,800	
66	6	2,000	
67	7	2,200	
68	8	2,500	
69	9	2,900	
70	10	3,200	(7)
71	11	3,600	
72	12	4,000	
73	13	4,500	
74	14	5,000	
75	15	5,600	(7)
76	16	6,300	
77	17	7,000	
78	18	8,000	
79	19	9,000	
80	20	10,000	
81	21	11,000	
82	22	13,000	
83	23	14,000	
84	24	16,000	
85	25	18,000	
86	26	20,000	
87	27	22,000	
88	28	25,000	
89	29	28,000	
90	30	32,000	
91	31	36,000	
92	32	40,000	
93	33	45,000	
94	34	50,000	
95	35	56,000	
96	36	63,000	
97	37	70,000	
98	38	80,000	
99	39	90,000	
100	40	100,000	
101	41	110,000	
102	42	130,000	
103	43	140,000	
104	44	160,000	
105	45	180,000	
106	46	2000,000	
107	47	220,000	
108	48	250,000	
109	49	280,000	
110	50	320,000	
111	51	360,000	
112	52	400,000	
113	53	450,000	
114	54	500,000	
115	55	560,000	
116	56	630,000	
117	57	700,000	
118	58	800,000	
119	59	900,000	
120	60	1 volt	
121	61	1.1 volt	
122	62	1.3 volt	
123	63	1.4 volt	
124	64	1.6 volt	
125	65	1.8 volt	
126	66	2 volt	
127	67	2.2 volt	
128	68	2.5 volt	
129	69	2.8 volt	
130	70	3.2 volt	
131	71	3.6 volt	
132	72	4.0 volt	
133	73	4.5 volt	
134	74	5 volt	
135	75	5.6 volt	
136	76	6.3 volt	
137	77	7 volt	
138	78	8 volt	
139	79	9 volt	(8)
140	80	10 volt	

Notes:

(1) "Basic noise level" within a PAL format 5 MHz bandwidth is 2 dBuV (1.25 microvolt); defined as a 75 ohm terminating resistor at room temperature.

(2) A high quality (sensitive) TV set will "frame lock" at 10 microvolts but not be watchable

(3) A high quality (low internal noise figure) masthead amplifier at Bands III, IV or V will produce a viewable image at 30/32 microvolts.

(4) A sensitive TV set will show "grain" (dancing noise dots) at 100 microvolts; with a low noise masthead, a reasonably colourful image.

(5) "Typical" TV set will produce grain-free image in colour at 500 microvolts.

(6) Low quality (sensitivity) TV sets produce grain-free image at 1,000 microvolts

(7) 3,200 - 5,600 microvolts; range of typical VCR modulators

(8) 1 watt region (peak sync pulse)

Handy SatFACTS Chart for terrestrial signal level benchmarks

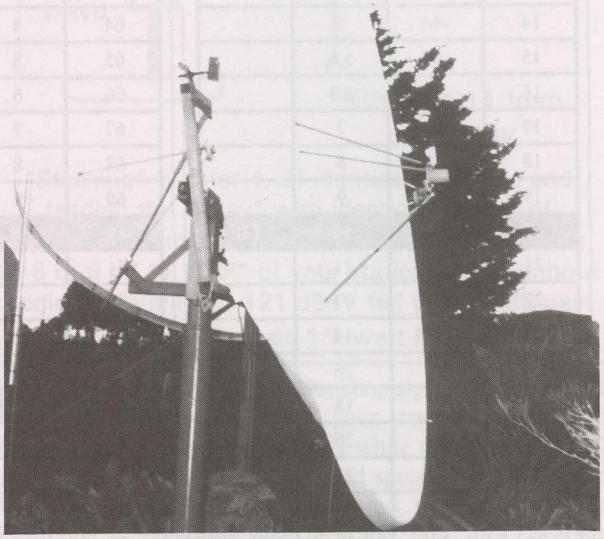
Cakrawarta at the end of the line

This is one of those things you try "because it is there" - or so you hope in the case of distant satellite signal recovery. Indonesia's unique S-band (2.5-2.7 GHz) five transponder service is a 35 (+) channel service packaging the usual pay-TV programmers (CNN, CNBC, Star Sports, Star World et al) plus more attractive ones (HBO Movies, Cinemax Asia) along with two FTA Indonesia terrestrial service channels (SWARA, "Q"). When SF reported recent work done in New Caledonia to interrogate this service package with dishes in the 1-2m range, our own curiosity was piqued as to what we might do 1,050 miles further to the south and slightly further east. A Gardiner S-band LNB coupled to an ADL S-band feed from Sciteq was installed on a recently refurbished 3.8m dish and away we went at a look angle of ten degrees.

With the elevation preset less than 30 seconds elapsed before we found the five distinctive transponders appearing on an Avcom model PSA-37D spectrum analyser. Not exactly a major challenge (or so we thought). The initial "stop there!" location of the signals showed a slight +/- 1.5 dB variation in level from the highest to the lowest. Two hours of tweaking on the azimuth, elevation, feed centring, feed probe rotation (at 11.30 - nearly vertical - for us on the originally horizontal signal) and we gave it up. Not even a fraction of a dB improvement from our first grasp of signal.

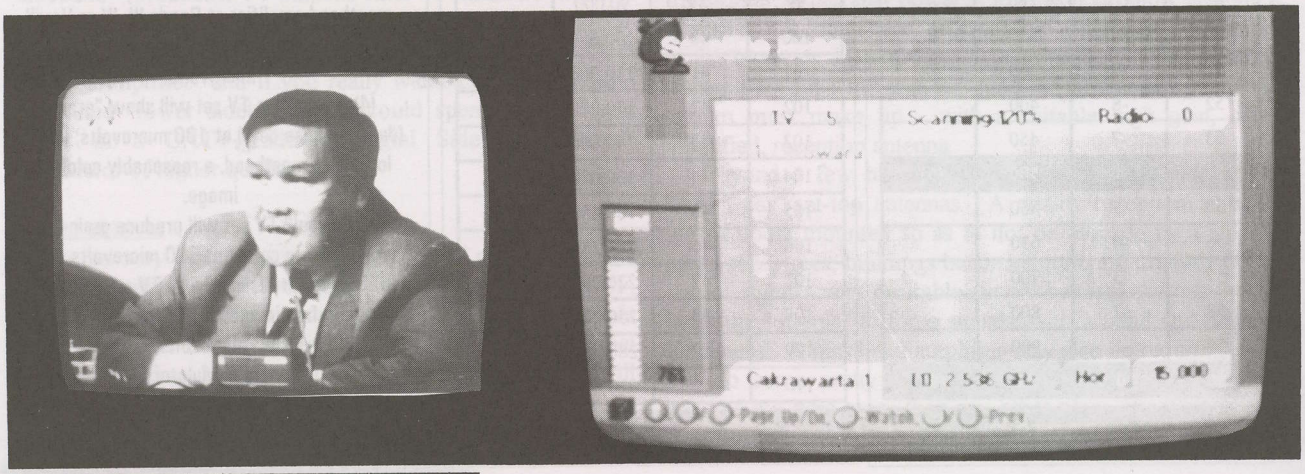
Only one transponder is above digital threshold on the receiver and as it is only 0.5 dB stronger than 3 of the others (which will not lock) we obviously have essentially "no headroom." The reason of course is the FEC of 7/8 which is at best very unforgiving. Fortunately, this is TP1 or 2.535 GHz which has the only (2) FTA channels on board. Apparently those in the Sydney area do much better (3m) and Melbourne must be very fortunately located (1.2m).

What this tells us is that if we really wanted to recover this mux-bouquet, in the extreme Far North of New Zealand, not only would we require the grey market (and expensive) Indonesian sourced Videoguard receiver but at least a 4.6m quality dish as well. It also tells us that while Melbourne and Noumea may get by with dishes in the 1m range, this particular satellite suffers from on-the-horizon low look angle coverage design problems and the pattern to the east-southeast of the bird is anything but uniform. We'll pass on this one.



3.8m dish used for tests (above). The five Cakrawarta 1 2.5 GHz region transponders on Avcom PSA-37D (below).

Combo FTA + CA channel 2535 MHz loads for our tests with surprising 75% percent "signal quality" (left) and plays pretty much as you would expect (Strong SRT 4800 II receiver which has Cakrawarta programmed into memory) - right hand photo. But balance did not load nor play (even as CA).



SatFACTS Pacific/Asian MPEG-2 Digital Watch: 15 May 2003

Bird	Service	RF/IF &Polarity	# Program Channels	FEC	Msym	Receivers and Errata
Thcm3/78.5	SkyChAust	3695/1455H	up to 3	3/4	5(.000)	CA (#1, 3); FTA audio #2 (dm)
	Indiavision	3685/1465H	1	3/4	6(.830)	Tests Jan 2003; not permanent
	MRTV-Myn	3676/1474H	1	2/3	6(.000)	erratic service
	Korean Central	3665/1485H	1	2/3	3(.367)	Global footprint; changes 02/03
	TARBS ME mux	3640/1510H	12TV, 12 radio	3/4	28(.066)	CA + 2 FTA(A1TV, IRB3)(DM)
	Ch Nepal	3626/1524V	1	3/4	15(.556)	New 03/03; FTA
	Mahar mux	3600/1550H	11TV, 1 rad	3/4	26(.667)	Thai + Indian services; FTA (DM)
	SE asia Mux	3569/1581H	2+ TV	3/4	12(.500)	MRTV3, MRTV (DM)
	RR Sat mux	3551/1600H	8TV,10 radio	3/4	13(.333)	3TV, 5radio currently in use (DM)
	JAIN TV	3538/1612V	1TV	3/4	3(.300)	PIDs 4132/4133
	PTV1 +	3521/1629V	1TV, 1 radio	3/4	3(.333)	frequency change
	TARBS	3520/1630H	12TV, 12 radio	3/4	28(.066)	Feeds to TARBS Australia and PAS-8 (DM)
	TVK Cambodia	3448/1702H	1TV	1/2	6(.312)	**FTA**
	TARBS/Th5	3480/1670H	12 TV+radio	2/3	26(.667)	**3FTA**: TV5, VTV4m ATN Bangla (DM)
	KCTV/Korea	3424/1726H	1TV	3/4	3(.366)	Not 24 hour
	Thai Global	3425/1725V	up to 7?	2/3	27(.500)	FTA (reaches SE Australia)
InSat 2E/83	**ETV mux**	4005/1145V	6+ TV	3/4	27(.000)	Several ETV now here; wide beam
-	**Hyd Dig 2E**	3910/1240V	1	3/4	5(.000)	SCPC, OK E. Aust. wide beam
	Kairali TV	3699/1451V	1	3/4	3(.184)	SCPC, OK E. Aust wide beam
	Indian mux	3643/1507V	3	3/4	19(.531)	New 07/02; corrections 12/02
	ETV Mux#2	3485//1665V	4+TV	3/4	27(.000)	Several new ETV here; Asia beam
	Sky Bangla	3430/1720V	1TV	3/4	6(.000)	New - November 2002
ST1/88E	MMBN	3632/1518V	12TV	3/4	26(.667)	Nagravision, some FTA; erratic
NSS6/95E	Tests	12.600H	?	5/6	30(.000)	Test signals noted January 2003
As2/100.5E	**Shandong TV**	4070/1080H	1TV	3/4	6(.811)	New - October 2002
	Euro Bouqt	4000/1150H	6TV, 2Ir	3/4	28(.125)	FTA TV + radio
	Sichuan TV	3946/1204H	1TV + radio	3/4	4(.420)	New April 2003
	Reuters News	3905/1245H	1TV	3/4	4(.000)	Was 3923H; sometimes **FTA**
	WorldNet	3880/1270H	4+/28radio	1/2	20(.400)	FTA; multiple audio services
	Hubei/HBT	3854/1296H	1	3/4	4(.418)	FTA SCPC, teletext, 2 radio
	Hunan/SRT	3847/1303H	1	3/4	4(.418)	FTA SCPC, teletext
	Guan./GDT	3840/1310H	1	3/4	4(.418)	FTA SCPC, radio APID 81
	In. Mongolia	3828/1322H	2	3/4	8(.397)	FTA: #1 Mongolian, #2 Mandarin
	APTN Asia	3799/1351H	1	3/4	5(.632)	Sometimes **FTA**; also 3895Vt
	Reuters/Sing	3775/1375H	1	3/4	5(.631)	**FTA** & CA
	Liaonin/Svc2	3734/1416H	1	3/4	4(.418)	FTA SCPC, radio APID 256
	Jiangx/JXT	3727/1423H	1	3/4	4(.418)	FTA SCPC, teletext, radio APID 81
	Fujian/SET	3720/1430H	1	3/4	4(.418)	FTA SCPC, + radio APID 80
	QinghaiTV	3713/1437H	1	3/4	4(.418)	FTA SCPC, + 2radio (APID 80)
	Henan/Main	3706/1444H	1	3/4	4(.418)	FTA SCPC, + radio
	Egypt/Nilesat	3640/1510H	7+, radio	3/4	27(.850)	Thru TARBS Aust, occ **FTA**
As2/100.5E	**Macau MUX**	4148/1002V	5TV	3/4	11(.850)	5 chs TV, FTA, some tests
	Feeds	4086/1064V	1	3/4	5(.632)	FTA SCPC feeds
	Dubai MUX	4020/11430V	4+, radio	3/4	27(.500)	FTA including sport
	Jilin Sat TV	3875/1275V	1	3/4	4(.418)	FTA SCPC, + radio
	Shanghai BN	3846/1304V	1	3/4	4(.800)	V1110, A1211 + 2 radio ; FTA Jan 2003
	HeiLongJian	3834/1316V	1	3/4	4(.418)	FTA SCPC
	JSTV	3827/1323V	1	3/4	4(.418)	FTA SCPC, + radio
	Anhui TV	3820/1330V	1	3/4	4(.418)	FTA SCPC + radio
	ShaanxiQQ	3813/1337V	1	3/4	4(.418)	FTA SCPC, radio APID 81
	Guan/GXTV	3806/1344V	1	3/4	4(.418)	FTA SCPC, radio APID 257
	Fashion TV	3795/1355V	1	3/4	2(.626)	FTA as of May 01, 2003
	Myawady	3766/1384V	1	7/8	5(.080)	FTA SCPC - difficult to load
	Saudi TV1	3660/1490V	7+/tests	3/4	27(.500)	FTA MCPC; Yemen, MBC Europe tests
As3S/105.5E	Telstra I-Net	12.596V	no TV	5/6	30(.000)	Signal useful for dish testing - no TV
	Zee bouquet	3700/1450V	10TV	3/4	27(.500)	Mediaguard (SECA) CA; 2 FTA
	Macau MUX	3713/1437H	2TV	3/4	5(.868)	New June 2002; low res MUX
	Arirang TV	3755/1395V	1	7/8	4(.418)	FTA SCPC; audio now OK
	Now TV +	3760/1390H	up to 8TV	7/8	26(.000)	CA + NOW, B'berg, Indus FTA
	Star TV	3780/1370V	15(+)TV	3/4	28(.100)	NDS CA (Pace DVS211, Zenith)
	Star TV	3860/1290V	21(+)TV	3/4	27(500)	NDS CA (Pace DVS211, Zenith)
	Star TV	3880/1270H	20(+)TV	7/8	26(.850)	NDS CA (Pace DV211, Zenith)
	HK Mux	3900/1250V	2+TV	7/8	27(.895)	FTA PAL + occ feeds and CA
	Star TV	3940/1210V	7(+)TV	7/8	26(.850)	NDS CA as above
	CNNI	3960/1190H	8(+)TV	3/4	27(500)	PowVu CA; new SR Apr 29
	StarTV	3980/1170V	12+TV	3/4	28(.100)	NDS CA (Pace DVS211, Zenith)
	Star TV	4000/1150H	9(+)TV	7/8	26(.850)	NDS CA w/ **4(Chinese) FTA**
	Sahara digital	4020/1130V	8TV	3/4	27(.500)	New Sr, Dubai MUX
	Sun TV	4095/1055H	1	3/4	5(.554)	"History Channel" testing SCPC
	TVB Mux	4010/1040H	3	3/4	11(.230)	**MATV Chinese movies FTA**; + CA
	CCTV bqt	4129/1021H	4(+) TV	3/4	13(.240)	moved from 4115
	Zee Bqt #2	4140/1010V	8(+) TV	3/4	22(.000)	Mediaguard (SECA) CA
Cak1/107.5	Indovision (S-band)	2.536, 2.566, 2.596, 2.626	33(+) TV	7/8	20(.000)	NDS CA using RCA/Thomson, Pace IRDs
T'Kom/108E	**IndoBqt**	3460/1690H	up to 6	3/4	28(.000)	also 3586H/17.500, 3496H/19.615
C2M/113E	**TPI**	4185/965V	1	3/4	6(.700)	FTA SCPA; NTNC only
	Anteve	4144/1006V	1	3/4	6(.510)	change from 4055V; FTA SCPC

Bird	Service	RF/IF & Polarity	# Program Channels	FEC	Msym	Receivers and Errata
(C2M)	**Indo Mux**	4080/1070H	5+ TV	3/4	28(.125)	Global TV - frequent changes in lineup
	Indosiar	4074/1076V	1	3/4	6(.500)	FTA; solid on 3.5m in New Caledonia
	SCTV	4048/1102V	1	3/4	6(.618)	FTA SCPC; NT/NC only
	Indone.Mux	4000/1250H	6+TV	3/4	26(.085)	unstable platform - testing?
	Satelindo	3935/1215H	1TV	3/4	6(.700)	Test card only reported
	Bali TV	3926/1224H	1TV	3/4	4(.208)	Returned to air Nov. 2002; V33, A36
	Indo. MUX	3880/1270H	3+ TV	7/8	28(.121)	FTA; Sr, FEC change 01/03
	GlobalMUX	3760/1390H	up to 11 TV?	7/8	28(.121)	Test cards (11); new Sr, FEC -1/03
	Brunei/Sing	3733/1417H	1TV	3/4	6(.000)	FTA; share time, Brunei-23hrs,Sing1h
	TBN/Trinity	3727/1423H	1 TV	3/4	3(.000)	New PIDs 02/03: V177, A180
	Unknown	3605/1545H	1TV	3/4	2(.900)	Tests-multi-screen, may have no video
	RCTI	3473/1677H	2	3/4	8(.000)	FTA SCPC, Australia, NC OK
	Myawad TV	3706/1444H	1	3/4	5(.924)	may be test; svc has been erratic
Jc3/12	Miracle Net	3996/1154V	3 up to 6	5/6	22(.000)	PowVu, some **FTA** (ch # 1,3)
	Asian bqt	3960/1190V	up to 8	7/8	30(.000)	CA & **FTA** NTSC: Japan, Taiwan
Jc2A54	**BYU tests**	3.915/1245V	2	3/4	3(.703)	Part-time; Sr change 03/03.
MeaSs2	New Mux	12.532H	17	3/4	41(.500)	New Sept 2002; unknown source
	Astro Mux	11.602H	up to 17TV	3/4	41(.500)	Aust East beam - **3 FTA** + 14 CA
	VTV MUX	11.522Vt	3 TV	3/4	9(766)	WA only? Skew path, intended Asia
B3/156	**Mediasat**	12.336V/T2	13TV,11radio	2/3	30(.000)	Hungary now CA; BVN FTA
	Aurora	12.407V/T3		2/3	30(.000)	Aust, NZ 90 cm
	Aurora	12.532V/T5		3/4	30(.000)	Aust only; changein FEC
	Aurora	12.595V/T6		2/3	30(.000)	Possibly Aust + NZ; FEC change
	Aurora	12.657V/T7	data only?	3/4	30(.000)	Aust only; in transition
	Aurora	12.720V/T8		3/4	30(.000)	Aust only; - smart card p. 26
	Austar	12.313H/T9	iTV + here	3/4	30(.000)	Austar Interactive + demos); p. 29, SF#97
	Austar/Optus	12.376H/T10		3/4	29(.473)	CA, subscription available Australia
	Austar/Foxtl	12.438H/T11		3/4	29(.473)	CA, subscription available Australia
	Austar/Foxtl	12.501H/T12		3/4	29(.473)	CA, subscription available Australia
	Austar/Foxtl	12.564H/T13		3/4	29(.473)	CA, subscription available Australia
	Austar/Foxtl	12.626H/T14		3/4	29(.473)	CA, subscription available Australia
	Austar/Foxtl	12.688H/T15	(some FTA ra)	3/4	29(.473)	CA, subscription available Australia
B1/160	**ABC NT fd**	12.258V	1TV, 3 radio	3/4	5(.026)	V832, A833; occ. drops power 10dB
	ABC feeds	12.317H	1	3/4	6(.980)	also 12.326, 12.335; ex PAS8 Ku
	Net 7 service	12.397H	1	3/4	7(.200)	Full schedule less commercials
	Central 7	12.354H	1TV + 1 radio	3/4	3(.688)	V1280, A 1281; occ. 2nd TV ch
	Imparja mx	12.379H	2TV + 8 radio	3/4	5(.424)	V1024, A1025, P1024; also try 12.360, 12.380
	7 digital feeds	12.397H	1TV	3/4	7(.200)	Occ digital feeds, FTA
	Feeds to NZ	12.411V	1 TV	3/4	6(.111)	NTSC; sport feeds USA-Aust-NZ
	Sport feeds	12.420V	1	3/4	6(.110)	Weekend footy feeds reported-FTA
	Mediasat#3	12.424H	3+ TV	2/3	19(.800)	
	TVNZ DTH	12.456/483V	4+TV	3/4	22(.500)	FTA 4 channels (TVNZ x 4)
	Nine Net	12.512H	1 TV typ.	3/4	5(.632)	testing digital feeds; Sr may be incor.
	Sky NZ	12.519/546V	7TV/7TV	3/4	22(.500)	NDS CA, subscription available NZ
	Sky NZ	12.581/608V	6TV/6TV	3/4	22(.500)	NDS CA, subscription available NZ
	Sky NZ	12.644/671V	9TV	3/4	22(.500)	NDS CA, subscription available NZ
	ABC HDTV	12.603H	5TV	7/8	14(.300)	also 12..626,.643,.670, 688, & 706H
	Sky NZ	12.707/733V	8+TV	3/4	22(.500)	NDS CA, subscriptions available NZ.
	Mix 106.3	12.574H	1 radio	3/4	1(.851)	Radio SCPC; was 12.570Hz
P8/166	**ABC A-P**	12.284H	1TV, 2 radio	5/6	5(.858)	Feed, Adelaide; not permanent; was 12.301Hz
	TARBS3	12.326H	13TV + radio	3/4	28(.066)	TPG/EurodecMDS CA, occ. FTA
	TARBS	12.526H	13TV + radio	3/4	28(.066)	TPG /Eurodec MDSCA, **radio FTA**
	TARBS2	12.606H	13TV + radio	3/4	28(.066)	TPG/Eurodec MDS CA; **TRT FTA**
	TARBS5	12.646H	testing	3/4	28(.066)	TPG/Eurodec MDS CA
	TARBS4	12.726H	13TV + radio	3/4	28(.066)	TPG/Eurdec MDS CA; **Thai TV, FTA**
	JEDI/TVB	12.686H	11+ TV	3/4	28(.126)	June 2002-Irdeto-2 CA
	ABC A-P	4180/970H	2TV, 2 radio	3/4	27(.500)	Dateline west; east PAS2, 3901
	Disney Pac	4140/1010H	typ 6 TV	5/6	28(.125)	PowVu CA
	NHK Joho	4060/1090H	7TV, 1 radio	3/4	26(.470)	PowVu CA & **FTA**; subscription avail
	FOX MUx	4040/1110V	up to 5TV	7/8	26(.470)	was PAS-2, previously 2992Vt
	NET +	4121/1029V	1 TV	3/4	4(774)	NET25 V539-A530; INC V257-A258; FTA
	ESPN USA	4020/1130H	8+TV, data	3/4	26(.470)	PowVu CA; ch 11 DCP-CCP bootload; new FEC
	Discovery	3980/1170H	8 typ.	3/4	27(.690)	PowVu/CA (some audio **FTA**)
	CalBqt/Pas8	3940/1210H	up to 8TV	7/8	27(.690)	PowVu CA & **FTA (EWTN +)**
	CNBC HK	3900/1250H	up to 7TV	3/4	27(.500)	FTA at this time
	FilipinoMUX	3880/1270V	up to 8TV+radio	5/6	28(.694)	**Myx FTA** V1960, A1920 + radio FTA
	TaiwanBqt	3860/1290H	12TV + 30 r	5/6	28(.000)	Mixed FTA & CA; Taiwan Hallmark, STC
	CCTV Mux	3839/1311H	up to 4	3/4	13(.240)	PowVu FTA, replaces PAS-2 svc
	TVBS-N	3836/1314V	**1FTA**, 4+ CA	3/4	22(.000)	Difficult because of CCTV cross pole
	EMTV PNG	3808/1342V	1 + 2 radio	3/4	5(.632)	was As2; PowVu CA
	CNNI	3780/1370H	3, up to 5 TV	3/4	25(.000)	PowVu, CNN/CNNI now CA
	Discovery Asia	3769/1381V	Upto 5 TV	3/4	13(.240)	PowerVu; Asian MUX
	MTV	3740/1410H	8	2/3	27(.500)	#2, 8 **MTV China FTA (V0385, A0386);** rest CA
P2/169E	P2/169	12.281V	2+ TV, radio	2/3	27(.500)	PowVu CA, WIN, ABC NT
	WA PowVu	12.637(.5)V	4TV, 8 radio	1/2	18(.500)	PowVu CA, WA only - D9234
	NBN-TV	4126/1024V	1TV	3/4	3(.075)	3m up (NZ), 1.8m up Australia
	TARBS	4087V	9TV + radio	3/4	21(.000)	Occ FTA (Syria, Al-Manar) TARBS input links
	TVB(S)	4020/1130V	1TV	3/4	6(.620)	feeds to (USA) pay-TV
	Feeds	3966/1184V	1	2/3	6(.620)	PowVu (FTA) occ feeds
	Feeds	3957/1193V	1	2/3	6(.620)	PowVu (FTA) occ. feeds
	Feeds	3929/1221V	1	3/4	10(.850)	PowVu (FTA) occ sport feeds
	Feeds	3912/1238V	1	2/3	6(.620)	PowVu(FTA) occ. feeds
	Feeds	3898/1252V	1	2/3	12(.000)	PowVu (FTA) occ. feeds
	Middle East	3836/1314V	4 typ	3/4	13(.331)	**02/03: Now ALL Irdeto 2 CA**
	Feeds	3803/1347V	1	3/4	6(.000)	PowVu (FTA) occ sport feeds
	PAS mux	3743/1407V	3	3/4	21(.800)	**test card FTA**, others nominally CA

SatFACTS Digital Watch: Supplemental Reference Data / May 2003

Bird	Service	RF/IF & Polarity	# Program Channels	FEC	Msym	Receivers and Errata
(PA8/169E)	**Feeds**	4040/1010H	1	3/4	10(.850)	PowVu occ FTA feeds
	7thDayAdv.	3872/1278H	1	3/4	6(.620)	Sat, Sun 0030, 0900+UTC?)
	Feeds	3868/1182H	1	2/3	6(.620)	FTA (occ sport); also try 3863,Sr6.100
	Feeds	3939/1211H	2 (typ NTSC)	2/3	6(.620)/7(.498	FTA-typ NTSC-occ sport, live Shuttle
	Cal PowVu	3901/1249H	up to 8	3/4	30(.800)	PowVu CA + **FTA** (BBC gone)
	HK bouquet	3850/1300H	up to 8	2/3	24(900)	was 4148Vt; some **FTA**
	occ feeds	3776/1374H	1 typ	3/4	5(.560)	occ feeds, typ FTA; also Sr 5.600
	Korean Bqt	3771/1379H	1	3/4	9(.041)	Korean MUX, reload 02/03
I702/176E	**RFO Poly**	4027/1123R	1TV	3/4	4(566)	SE spot beam
I701/180E	TNTV	11.060&11.514	9	3/4	30(.000)	east spot; 10TV + r each, vertical pol.
	Canal+Sat	11.610II	16TV, 1 radio	3/4	30(.000)	1+ **FTA**, Mediaguard; also 10.975 weak
	TVNZ	4195/955RHC	1	3/4	5(.632)	DMV/NTL early vers., occ feds, typ ca
	TVNZ/BBC	4186/964RHC	1	3/4	5(.632)	DMV/NTL early vers. occ feds, typ ca
	TVNZ	4178/972RHC	1	3/4	5(.632)	DMV/NTL early vers., occ feds, typ ca
	AFRTS DTS	4175/975L	3 TV, 3 radio	2/3	3(680)	'DTS' **radio, TV audio FTA** some IRDs
	TVNZ/Aptn	4170/980RHC	1	3/4	5(.632)	DMV/NTL early vers. occ feds, typ ca
	TVNZ/feeds	4161/989RHC	1	3/4	5(.632)	DMV/NTL early vers., occ feds, typ ca
	RFO-Canal+	4086/1064L	4TV, radio	5/6	12(.041))	east hemi 20.5 dBw thru 2003+; new Sr
	TVNZ/feeds	4052/1098RHC	1	3/4	5(.632)	DMV/NTL early vers.,occ feeds, typ ca
	TVNZ feeds	4044/1106R	1	3/4	5(.632)	SCPC, mixed CA and **FTA** feeds
	NZ Prime TV	4024/1126L	1	2/3	6(.876)	PowVu CA; Auckland net feeds
	NBC to 7 Oz	3960/1190R	1	7/8	6(447)	CA, Leitch encoded
	WorldNet	3886/1264R	1TV, 37 radio	3/4	25(.000)	New Feb 2002; very strong NZ, Pacific
	Ioarana	3772/1378L	1	3/4	4(.566)	FTA SCPC; East Hemi Beam-Tahiti
	TVNZ	3846/1304R	1	3/4	5(.632)	SCPC, mixed CA & **FTA**, feeds
	10 Australia	37691381R	4	7/8	20(.000)	PowVu CA & **TBN-JCTV FTA**
	USA feeds	3749/1401R	4?	?	26(400)	16-QAM (not MPEG-2 compatible)

MPEG-2 DVB Receivers: (Data here believed accurate; we assume no responsibility for correctness!

Aston Simba 201. Embedded SECA (Zee, Canal +); review SF#97. MediaStar 61-2-9618-5777.

AV-COMM R3100. FTA, excellent sensitivity (review SF May 1998); new version Sept. '99. Av-COMM P/L, 61-2-9939-4377.

AV-COMM R3100(A). FTA, good sensitivity, ease of use exc (review SF May 2002). See above contact.

Benjamin DB6600-CI. FTA, Foxtel/Austar w/CAM+card. Autosat Pty Ltd 61-2-9642-0266 (review SF#72)

eMTech eM-100B (FTA), eM-200B (FTA + CIx2), eM210B (FTA + 2xCI + positioner); KanSat 61-7-5484 6246 (review SF#89)

Humax F1-CI. Primarily sold for TRT(Australia), does (limited) PowerVu (not Optus Aurora approved).

Humax ICRI 5400 (Z). Embedded Irdeto + 2 CAM slots; initial units had NTSC glitch, now fixed. Widely available, SF#76.

Humax IRCI 5410 (Z). Adaptable version capable of holding multi-CA systems (SF#98, 99). Wldely available.

Hyundai-TV/COM. HSS100B/G (Pacific), HSS-100C (China) FTA. Different software versions; 2.26/2.27 good performers, 3.11 and those with Nokia tuners also good; later 5.0 not good. SATECH (V2.26)

Hyundai HSS700. FTA, PowerVu, SCPC/MCPC. Review SF March 1999. Kristal Electronics, 61-7-4788-8902.

Hyundai HSS800CI. FTA, Irdeto (with CAM) + other CA systems, PowerVu, NTSC. Kristal Electronics, above; review SF#63.

MediaStar D7. FTA, preloaded w/ known services, exc. software (review SF July 1998). MediaStar Comm. 61-2-9618-5777

MediaStar D7.5. New (May 00) single chip FTA; review June 00 SF. MediaStar Comm. Int. 61-2-9618-5777

MediaStar D10. FTA and Irdeto embedded CA. VG receiver; see review SF#96, August 2002. Contacts immediately above.

MultiChoice (UEC) 660. Essentially same as Australian 660, not grey market contrary to reports. Sciteq tel 61-8-9306-3738

Nokia "d-box" (V1.7X). European, FTA, may only be German language, capable of Dr. Overflow software. SF#95, p. 14.

Nokia 9200/9500. When equipped with proper software, does Aurora, pay-TV services provided software has been "patched" with "Sandra" or similar program. See SF#95, p. 14, SF#96 p. 15. SatWorld 61-3-9773-9270 (www.satworld.com.au)

Pace DGT400. Originally Galaxy (Now Foxtel+Austar). Irdeto, some FTA with difficulty (Foxtel Australia 1300-360818). Units being replaced with UECs.

Pace DVR500. Original DGT400 modified for NBC (PAS-2)/RSA use, with CAM equivalent to DGT400 but more reliable.

Pace "Worldbox" (DSR-620 in NZ). Non-DVB compliant NDS CA including Sky NZ, no FTA; similar "Zenith" version.

Panasat 520/630/635. MCPC FTA, Irdeto capable, forerunner UEC 642, 660. Out of production, spares fax ++27-31-593-370. No longer wotrk with Austar/Foxtel.

Panasonic TU-DS10. FTA + Irdeto CA; one of 2 IRDs approved by Optus for Aurora, but never available in Australia.

Phoenix 111, 222. PowVu capable, NTSC, graphics, ease of use. (111 review SF#57). SATECH(below)- 222; terminated

Phoenix 333. FTA SCPC, MCPC, analogue + dish mover. Detailed SF review SF#51. SATECH 61-3-9553-3399.

Pioneer TS4. Mediaguard CA (no FTA), embedded Msym, FEC, only for Canal+Satellite (AntenneCal ++687-43.81.56)

PowerVu (D9223, 9225, 9234). Non-DVB compliant MPEG-2 unless loaded with software through ESPN Boot Loader (see below). Primarily sold for proprietary CA (NHK, GWN+ PAS-2 Ku, CMT etc). Scientific Atlanta 61-2-9452-3388.

Prosat 2102S. FTA SCPC/MCPC, NTSC/PAL, SCART + RCA. Sciteq 61-8-9306-3738.

SatCruiser DSR-101. FTA SCPC/MCPC, PowVu, NTSC/PAL. (Skyvision Australia 61-3-9888-7491, Telsat 64-6-356-3749)

SatCruiser DSR-201P. FTA SCPC/MCPC, PowVu, NTSC/PAL, analogue, positioner - (Skyvision - see above).

Strong Technologies SRT2620. SCPC, MCPC FTA, exc sensitivity, ease use, programming. Review SF#91 (ph. below).

Strong SRT 4600. SCPC, MCPC, PowerVu; exc graphics, ease of use, review SF#64. Strong Technologies 61-3-8795-7990.

Strong 4800. SCPC, MCPC, embedded Irdeto+ CAM slots, Aurora. Strong Technologies 61-3-8795-7990.

Strong 4800 II. SCPC, MCPC CAM slots x 2 for Aurora +, Zee, Canal +. Strong Technologies (above); review SF#103.

Strong 4890. SCPC, MCPC, 30Gb PVR, 2 CAM slots, DiSEqC 1.0, 1.2 (review SF#84); Strong Technologies, # above.

UEC642. Designed for Aurora (Irdeto), approved by Optus; w/new software, C-band FTA; faultyP/S. Norsat 61-8-9451-8300.

UEC660. Upgraded UEC642, used by Sky Racing Aust., Foxtel-limited FTA. (Nationwide - 61-7-3252-2947); P/S problems.

UEC700/720. Single chip Irdeto built-in design for Foxtel; unfriendly for FTA. Power supply problems, seldom sold to consumers; propensity to fall off back of trucks.

Winersat DigiBox 200. C + Ku basic receiver but includes Teletext for NZ TVOne, 2 VBI. Satlink NZ, fax 64-9-814-9447

Xanadu. DVB compliant special-priced receiver for members of SPACE Pacific (Av-comm Pty Ltd, tel +61-2-9939-4377)

Accessories:

Aurora smart cards. New v1.6 now available, 1.2 no longer available for RABS. Price now A$105, Sciteq 61-8-9306-3738.

PowerVu Software Upgrade: PAS-8, 4020/1130Hz, Sr 26.470, 3/4; pgm ch 11 and follow instructions (do not leave early!)

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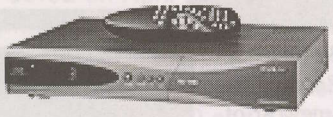

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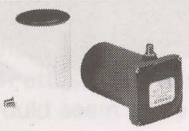

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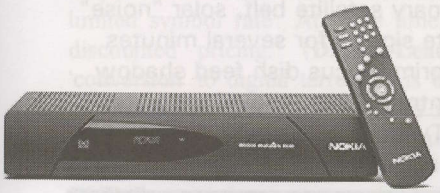

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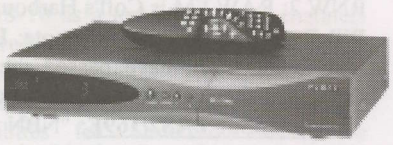

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WITH THE OBSERVERS

AT PRESS DEADLINE

Oceania beam operating PAS2, 4040Vt, Sr 19.531, 3/4. This is Internet Data and Steffen Holzt (s.holzt@pacificip.com) needs carrier to noise (C/NR) measurements from Pacific region. Can you oblige? As4 horizontal signals reported "stronger than" verticals but both are at least with unmodulated carriers "whomping."

AsiaSat 2/100.5E: "Sichuan TV + radio new on 3946Hz, Sr 4.420, 3/4; TV PIDs 308/256 and radio 2046." (**Edward T**, Taiwan) "Fashion TV is back in the clear, 3795Vt, new Sr of 2.626, 3/4." (**Dr Don**) (Editor's note: Francois Thiellet of Fashion TV advises service could remain FTA for "some time" [francois@ftv.com]. Fashion TV is sharing time with Main Event currently on Foxtel; not exactly full time.)

AsiaSat 4/122E: Test carriers just starting as we go to press - see. p. 29 opposite.

Gorizont 33/145E: "Inclined orbit satellite (+/- 1.0) has Telekanal Rossiya back on 3875 RHC in SECAM (analogue)." (**Edward T**, Taiwan)

Intelsat 701/180E: "JC-TV seen here FTA within 3969RHC mux, Sr 20.000, 7/8; TBN youth oriented Christian rock-rap music videos, English." (**Clarence**, NZ)

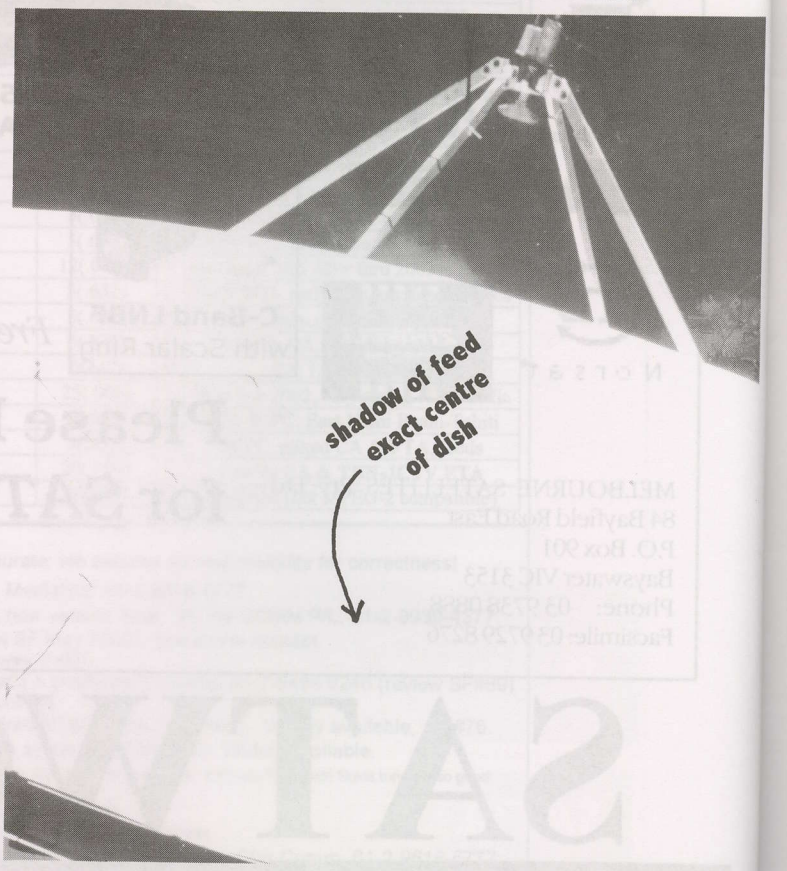
Intelsat 702/176E: "RFO/Polysat 4027 Sr 4.566, 3/4 has changed to RHC (right hand circular) from LHC." (**Grant Waldref,** Tahiti)

LMI / 75E: "Malagasy TV analogue 3980Vt has switched from SECAM video to PAL video; audio is 5.58 subcarrier." (**DM**, NSW)

NSS 6/95E: "Also testing unknown data service transponder 12.570Hz, Sr 5.500, FEC 1/2 which if nothing else provides a 'beacon' for those with a spectrum analyser." (**Bill Richards**, Aust)

Optus B3/156E: "Sorry NZ - ABC National has left 12.595Vt (Aurora channel 49)." (**SJ**, NZ) "Raw FM has started on 12.336Vt, APID 1722 and SID10." (**Craig S.**, NZ) "Westlink's 'Access 31' found on 12.527Vt (Aust beam only) Aurora channel 23 CA and also on channel 35, FTA; could Westlink be getting its own Aurora channel?." (**IF**, Qld.) "Globecast radio line-up changes: 1/TRT FM, 2/VOT, 3/ABS Radio, 4/ Tamil Radio, 5/ SNG IFB, 6/ DMX Music (CA), 7/ Kossuth Radio, 8/ RNW3, 9/ RAW FM, 10/ RNW 1, 11/ RNW 2; RAW FM is Coff's Harbour youth station. " (**IF**, Qld.; **Bill R**. Australia). (Editor's note: BVN and the Dutch Radio services seem to have passed their 1-month trial period - suggesting they will now be permanent here.)

PanAmSat PAS2/169E: "NBN (Philippines) is now solid above threshold at (level) 15, (quality) 60 on 4126Vt (Sr 3.075, 3/4; V1160, A1120) while by comparison BBC is 50/68 on same satellite using Hyundai HSS 800CI." (**BW**, South Island NZ). "4022 Hz, Sr 13.238, FEC 2/3 V1160/A1120 Napa test card FTA." (**Bill R**, Australia) "3777Vt, Sr 6.110, V3601/A3604 + 3800Vt, Sr 13.232, 3/4 V3601/A3604 both car racing feeds FTA. 3897Vt, Sr 5.632, 3/4, V308/A256 colour test card FTA." (**Bill R**, Australia) "3992Vt, Sr 26.470, FEC 7/8 WWE Stamford feed, V1360/A1320." (**Bill R**, Australia) "BBC has vacated 3744Vt (test card now), something they planned to do 8 months ago." (**Edwin T.**) "3785Vt, 3/4, Sr 5.700, 3/4 V3601 / A3604 Japan



THE sun she comes, the sun she goes. "Solar alignment" affected C and Ku band reception in southern hemisphere late in March - early April. When the sun's movement causes it to be directly behind the geostationary satellite belt, solar "noise" drowns out satellite signals for several minutes each day. When a prime-focus dish feed shadow falls directly in centre of dish (above), you are being zapped! Twice a year - next time in early-mid September.

WITH THE OBSERVERS: Reports of new programmers, changes in established programming sources are encouraged from readers throughout the Pacific and Asian regions. Information shared here is an important tool in our ever expanding satellite TV universe. Photos of yourself, your equipment or off-air photos taken from your TV screen are welcomed. TV screen photos: If PAL or SECAM, set camera to f3.5-f5 at 1/15th second with ASA 100 film; for NTSC, change shutter speed to 1/30th. Use no flash, set camera on tripod or hold steady. Alternately submit any VHS speed, format reception directly to SatFACTS and we will photograph for you. Deadline for June 15th issue: June 3 by mail or 5PM NZT June 5th if by fax to 64-9-406-1083 or Email skyking@clear.net.nz.

Preliminary (early) Reports for recently launched birds: NSS 6, AsiaSat 4 and InSat 3A

AsiaSat 4 reached 122E on April 25, 15 days after launch. The satellite has 28 C-band and 20 Ku-band transponders on board (one Ku beam can be boresighted on Australia). The only pre-launch user signed on board is a data firm known as REACH which will use one C-band transponder for message traffic. REACH, by the way, is co-owned by Australia's Telstra which has a Sydney uplink ready for accessing the satellite. Test carriers reported at 3640H, 3700V, 3720H, 3780V, 3820V, 3860V, 3900V, 3940V, 3980V, 4020V, 4060V, 4080H and 4140V. **David Leach** reports "a promise" to stick up a 'Welcome to AsiaSat 4' announcement at an early date to help you know you have found this new satellite.

InSat 3A arrived on station at 93.5E on April 20. This is a partial satellite with 12 C-band plus 6 "upper-extended C-band (apparently in 4.5 GHz region) and six Ku-band transponders. The published footprints show the coverage to be confined to areas north of the equator although Northern Territory (Australia) should find it accessible with reasonable size dishes. **David Leach** (NSW - 3.6m) reports unmodulated test carriers between 1400 and 1500MHz including 1425 and 1440.

NSS6 is a Ku band only satellite located at 95E. **Bill Richards** (Australia) reported 12.595Vt Sr 27.500, FEC 7/8 service from two video channels April 25, one of (if not "the") earliest report received. VPID 257 / APID 258 was a "SatLink"test card while VPID 513 / APID 514 was a video + audio loop promoting TARBS (!). David Mitchell, NSW, found the same two channels on his 65cm dish registering a signal quality of 80% on an eMTech receiver which attests to the significant signal level from this satellite into at least NSW (working backwards it would seem to be in region of 49 - 50 dB footprint, indicating this is on the Australia-aimed footprint/beam) of this satellite. Some early reports said this satellite was initially transmitting on 11.131Hz which - if true - would require a LNBf with a 9.750 LO (local oscillator) thereby producing L-band at 1381 MHz (or 10.000 for 1131 MHz). Other reports said 12.647Hz, Sr 27.500, 7/8 had SatLink test card (VPID 257 / APID 258) on NE Asia beam (not same as Australia beam, of course).

Tennis Open feed." (**Bill R.**, Aust.) "4036Hz, Sr 6.620, 3/4 V1160, A1120; pro basketball feed.) (**Bill R**, Aust.)

PanAmSat PAS8/166.5E: "4121V, Sr 4.774, 3/4 has two TV channels FTA: NET25 and INC. Plays at 20% quality on eMTech on 1.8m." (**DM**, NSW) (Editor: PIDs 529/530 and 257/258) "Z-Channel 3860H was for a day or two FTA, back to CA; MTV Taiwan also (reported) here FTA for a few days early May." (**DL**, NSW) "ABS-CBN mux 3880Vt has new FEC; 5/6." (**Albert**) (Editor: But - the power level is up as well.)

Thaicom 3/78E: "Korea's Central TV moved to 3424Hz, Sr 3.665, 3/4 VPID 308 / APID 256, radio 257." (**Norman**) "Indiavision now regular on 3685Hz, Sr 6.830, 3/4." (**Albert**) "Sky Channel (racing) bouquet 3695H, Sr 5.000, 3/4 has been going into and out of FTA frequently. When compared directly with Sky Channel here in Australia, the video was almost 10 seconds 'behind' (some delay!) - channels 1 and 3 had correct program audio while channel 2 was a test tone." (**Anthony**)

Soapbox: "Hot-Chip IRD source in Sydney telling people they will no longer handle Humax IRDs 'because of their limited symbol rate'. At same time, 5410Z is being sold at discounted pricing." (**David Leach**, NSW) "The USA's 'conversion' to digital terrestrial is badly clouded by an FCC anxious to make it seem that it 'is working' and a Consumer Electronics Association (CEA) equally anxious to paint the illusion that the consumer public is routinely purchasing DVB-T receiving equipment in lieu of analogue. CEA continues to report 'HDTV ready TV set' sales by counting every receiver with a rear deck plug or plugs that will accept an outboard set-top DVB-T box but it turns out that only 11.7% of such receivers actually can process HDTV. The real numbers are that less than 1/2 of 1% of all homes have the correct equipment to actually receive digital HDTV and although TV stations were supposed to be transmitting digital in parallel to analogue by May 1, fewer than 35% of the total have actually made that expenditure and conversion. As you have reported in SF, the challenge is that only 14% of US homes still use an antenna (including setback rabbit ears!) to receive TV anymore - 86% rely upon satellite or cable for their service and neither satellite nor cable have done more than toy with HDTV to date." (**M. Schubin**, USA) "Experimentation with providing Peltier cooling of an LNB/LNBf? Harvey Norman (Australia) has a (Sunbeam) $69 wine chiller which they claim will cool bottle in 8 minutes plus a 12 volt version which might be more adaptable to antenna mounting." (**IF**, Qld.) "Trouble remembering IRD codes? Think of them as dollar and cents. UEC is $99.49, old Pace DGT400 was $42.52 and now $28.78, Humax and eMTech's default are 'free' - $00.00 (but of course can be user changed." (**NS**, NSW) "NZ telco Telecom will shortly be offering Foxtel satellite and or cable TV packages as an optional extra." (**Roberts,** Qld.) "Am getting excellent results on C-band using Zinwell ZCF - D21A dual polarity LNBf. Has a claimed noise temperature of 15 degrees K, 65 dB of circuit gain. It has an adjustable f/D between 0.28 and 0.42 and comes with a plate for instant conversion to circular." (**DM**, NSW) "Interesting high speed I-net site (www.airsidetv.com) is NZ original, deals with NASA and aviation enthusiast activities." (**PB**, NZ) "Dreambox: Latest firmware testing for Dreambox DM7000-S IRD have been successfully completed for C-band at location in South Africa, using PAS-10 as a test source. All channels have been successfully stored in the IRD's set-up file allowing editing with DreamEdit receiver program. This is a 'first' for C-band and will when testing is completed open up many new receiver system possibilities for Southern Hemisphere enthusiasts." (**RD**, RSA). "If you have not recently checked the ABA website regarding 'out of area reception' suggest you do so - the saga never ends!" (**Brian**) "With digital cable coming to Australia - or there already - some might be interested in site offering 'test box' that allows viewing of pay-per-view movies and other events without being billed for the reception: http://www.winningformula.bz/cable/index.php?170." (**James**) (Editor's note: Several cautions including NTSC versus PAL and the concept that by using this you are somehow going around the two-way cable box's authorisation reporting routine!) "I saw the impossible - a DVB-T box installed in a car using a pair of vertical antennas on rear deck creating 'diversity' reception - when one antenna is 'blocked from reception' the other one being physically separated still works. The DVB-T box has dual tuners, each one processing from

one antenna, so 'comparison' between what each antenna 'sees' is done at digital level., not at IF or RF." (**PM**, Victoria) "If EPG is to be believed, 'EXPO' channel Austar 19 / Optus 14 has been promoting soccer matches on Sundays." (**George**) "Austar/Foxtel/Optus radio channel 4 was 'Sport 927' as well as on Aurora radio channel 68 (replacing Rhythm FM there). Now EPG lists as 'Radio2' ('Great Hits') which is a mystery as to why pay services would have dropped a sports radio channel." (**George**) "Advertisement in local paper reads, 'Sub Contractor work available - satellite pay-TV installations (this is NOT Foxtel or Austar work).' Firm is National Technology Installations at 1800 659 239." (**George**) "Article in Sunday-Herald forecasting DVD players will drop to A$100 by this Christmas." (**IF**, Qld) (Editor: They are already under US$50 in America.) "This guy claims he can watch and record different FTA and CI channels simultaneously on his PC. Try rtblair@infogen.net.nz." (**OO**, NZ) "French bouquet I701 update: TCM movie which used to be English or French (selectable) not almost 100% French only. Some Cine movies continue in English but more often are dubbed or subtitled. The only regular English service is EuroNews (selectable audio). New (replacement) smartcards are being distributed at this time." (**FK**, NZ) "Correction: Westlink is actually not FTA; you do have to have a card (Aurora or 'other') to view it!" (**NS**, NSW) "Suggestion for eMTech users. If a weak service such as NBN, CCTV-1 (AsiaSat 2, 3864Vt, 4.420 and 7/8) does not load- don't rush away. Leave receiver alone after it says 'sorry - cannot load' for five, even ten minutes. It will try again and it will usually load and once loaded from that point on you can re-access the service on recall." (**DM**, NSW) "Correction to SF#104, p. 28: "Info TV" should be VID 1040 not V1024 (which only gets you the normal Imparja video channel); PCR is indeed 1040 as well." (**George**) "In case you have not noticed, if you set up for NileSat 3640Hz, 27.850, 3/4 on As2 and then change to 3660Hz same other parameters on As3 you have Saudi mux." (**IF**, Qld.)

AT Sign-off

NDS to Foxtel: Very clever

When world-traveler Rolf Deubel visited Australia in mid 2000, he left behind a legacy of modified original smart cards (MOSC) which lingers to this day. Rolf claims he was responsible in 1998 for hiring a Swiss firm to dice and slice Irdeto smart cards, taking them apart a layer at a time to diagnose how Irdeto 1 worked and therefore how it could be "undone." And when Rolf was detained in Bangkok later in 2000, Rupert Murdoch's head of security Ray Adams flew from London to Thailand to confront the German borne super-hacker with a message: "You made a bloody mess in Australia and Rupert Murdoch wants your ass."

Now comes an announcement which succinctly explains many of the mysteries that have surrounded the continued deployment of Irdeto 1 in Australia since Rolf's whirlwind visit to the sixth continent. In 2004, NDS will become the conditional access provider of choice for Foxtel in Australia. Austar, at this point, will remain with Irdeto.

NDS Videoguard has been "hacked" but not in a way which leads to wholesale scamming of the security system in the marketplace. What made Irdeto 1 vulnerable was a failure on the part of the system designers to separate the three required "keys" into independent "safety vaults." What makes Videoguard far less vulnerable to hacking is the segmented approach to protecting the keys from discovery. Rolf's MOSC was successful because a hacker could identify the three keys, and reprogram a smart card with substitute keys borrowed from another legitimate smart card. This MOSC technique produces no hacker-joy with NDS.

NDS is 80% owned by News Corp and News Corp is inturn 16% owned by privately held Murdoch-family corporations. Foxtel is 25% owned by News Limited which gives Murdoch a direct voice on the Foxtel Board and an opportunity to push his own business agenda. Part of his agenda is for pay-TV providers such as Foxtel to be customers of NDS for Videoguard. NDS collects money from users of Videoguard in three ways. First, when a pay-TV provider such as Foxtel adopts Videoguard, there is encryption equipment and technical assistance purchased from NDS. Second, there are the smart cards created for Videoguard by NDS which are in theory much like the roll of film you buy for your camera. Lastly, there is a monthly/annual fee for each smart card paid to NDS - forever. This "maintenance fee" is more like a "royalty" - a charge made for ongoing use of a patent protected, proprietary (encryption) system.

The camera-film analogy is a close one to Videoguard. First you purchase the camera (NDS's encryption equipment), then you buy film (Videoguard smart cards) and then you have the film developed (payments to NDS for month-to-month use of the card/system). And when your film is all shot (the card is no longer usable for whatever reason), you replace the film with a new roll (new smart card).

Now the ingenious part. When News Corp owns a portion of a pay-TV operation, and has used that ownership position to "encourage" use of their Videoguard CA system, the stock-owning partners who agree to this are setting themselves up for a lifetime of payments to NDS (News Corp). These payments come off "the top," out of gross receipts and are no different than building and transponder rent, wages to employees, programming procurement. And the rate of payment to NDS can be "adjusted" as the pay-TV service grows. If Sky NZ, for example, starts off paying NDS $3 a month per smart card in use, and at some point actually looks like it might make a "profit" (as unlikely as that may seem), NDS simply ups the smart card monthly payments and now Sky NZ is back to losing money. This "sliding scale" of NDS payments can adjust indefinitely, forever, which at News' whim can keep a pay-TV service from ever paying dividends to stockholders. Which makes the stockholders vulnerable to internal financial manipulations over which there is no stockholder control or access.

In Foxtel's case it grows increasingly clever.

The Foxtel release said, "*NDS's Videoguard conditional access system will be introduced across Foxtel to prevent pay-TV piracy.*" And it also noted, "*Pay-TV group Austar will take Foxtel's programs via satellite even though it uses a different encryption system* (because) *Foxtel will 'simulcrypt' the* (satellite) *feed.*"

This leaves Austar, dirt poor and struggling from month to month, facing three choices:

1/ Stay with Irdeto 1 and suffer the ravages of piracy.

2/ Upgrade to Irdeto 2, issue new Irdeto smart cards to a universe of more than 400,000 subscribers, and hope for the best (Irdeto 2 being at the moment "cracked" but not in a way that allows wholesale distribution of MOSC).

3/ Join Foxtel and changeover to NDS.

Option 1 leaves Austar as a piracy target. Option 2 will cost them something in excess of A$12,000,000 to implement -money they can ill afford to spend but when push comes to shove, *perhaps their only option.* Number 3 involves replacing every single STB in their universe and signing up for lifetime monthly payments "off the top" to NDS. At what cost? Something greater than A$120,000,000 just to adopt NDS STBs. For a company barely managing to meet weekly payrolls, option 3 is a no go.

Which places Austar in what position? Between a rock (NDS) and a hard place (Irdeto 1 MOSC).

News/Foxtel wants Austar. They wish to own it, to control 100% of the Australian pay-TV market and they covet it "cheap." By adopting NDS, and leaving Austar on a street corner stark naked with the old fashioned Irdeto 1, they are driving a nail through the hand of Austar as it hangs on a cross dying. Austar sooner or later will fold into Foxtel and the adoption of NDS by Foxtel hastens that day of reckoning.

It has been a subject of wonderment that Foxtel has done so little to deal with MOSC piracy in Australia. Now we can work out why; they let it become *really serious* - serious enough to make switching to a new, less hackable (NDS) CA system "logical." And now they sit back and wait and watch as Austar takes a few more gasps of air and wilts, then coming to Foxtel offering to sell out for a depressed price.

NDS wins-wins-wins. Hundreds of millions of dollars will flow to NDS (Corp) with the CA conversion. And over the years, hundreds of millions more in monthly "user payments." And for dessert, Austar is forced into a corner from which there is no financial escape short of selling out to Foxtel, passing through News Corp on the way.

Rupert Murdoch may not be the brightest card in the deck, but he is, once again, the most clever.

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Hard Core (Serious) "How to do it" References

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☐ TB**9305**: Cable TV - the basics. How a cable system works, how you can build one! $15 all regions.

☐ **Nelson Parabolic Manual**. The "bible" of building your own 13 foot dish from scratch. Serious stuff for dedicated builders. $15 all regions (supply limited)

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☐ **SF#99** (November 2002) FunCARDS - how they work, software mods for Humax - $10 all regions

☐ **SF#100** (December 2002) d-box2 BIG report! AC3 Surround Sound for Nokia, PanAmSat's Terrorist Problem - $10 all regions

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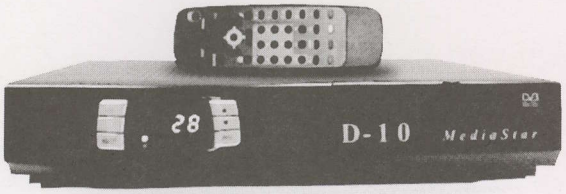

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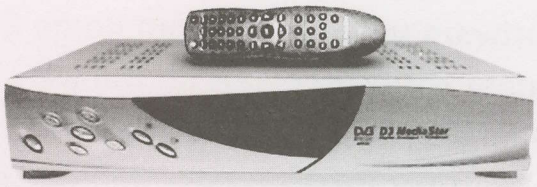

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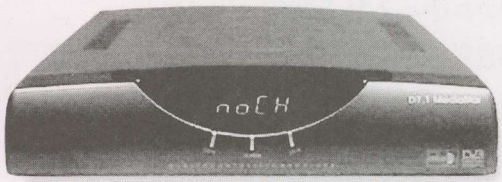

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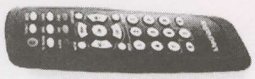

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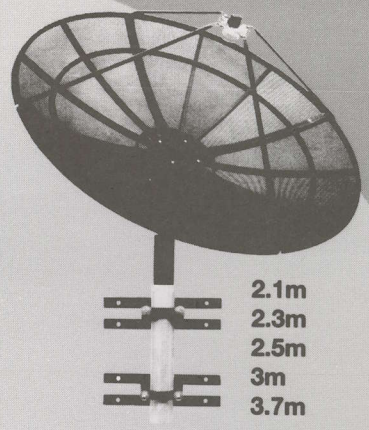

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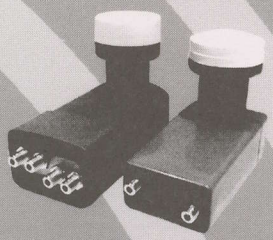

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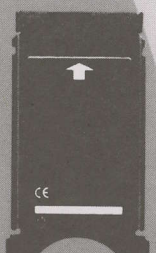

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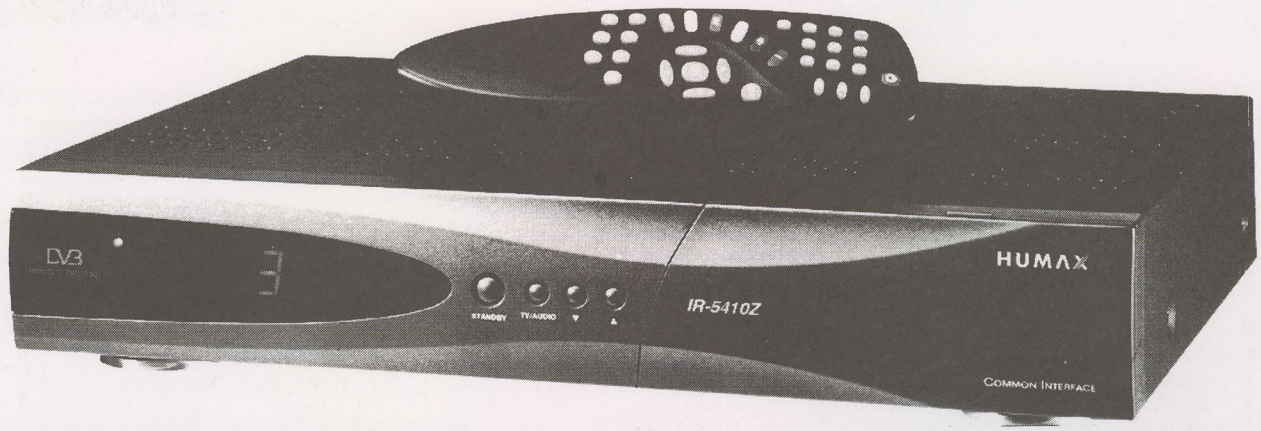

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