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Bob Cooper's

MAY 15 1995

SatFACTS

MONTHLY

Reporting on "The World" of satellite television in the Pacific Ocean Region

IN THIS ISSUE

GALAXY LAUNCH: Australia's Pay TV is off and running in a cloud of controversy

BUILDING CABLE TV: How do you reach out to your neighbourhood with programmes?

IRD DECODERS: How many will you need, what will they cost, and what are the hassles?

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SatFACTS
MONTHLY

SatFACTS Monthly is published 12 times each year (on or about 15th of each month) by Far North Cablevision, Ltd. This publication is dedicated to the premise that as we enter 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 the messages in the privacy of their own home. Welcome to the 21st century - a world without borders, a world without boundaries.

Editor/Publisher:
Robert B. Cooper
(ZL4AAA)
Office Manager:
Gay V. Cooper
(ZL1GG)

Reaching SatFACTS
Tel: 64-9-406-0651
Fax: 64-9-406-1083
Mail: PO Box 330
Mangonui, Far North
New Zealand

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COOP'S COMMENT

May 15, 1995

Two April visitors to my rural New Zealand home were M. Raajhendhran (the RAJ in G1's "Raj-TV") and Shankar Karikar of Skyline Communications. The two operate the Tamil language satellite broadcasts from studios in Madras on what just happens to be "the most powerful satellite TV service channel in the world." They visited New Zealand (and Australia) listening to viewer feedback and searching for the "right mix" of programming to expand their television broadcast day to a full 24 hours. Their visit to New Zealand started when SF reader Mark Fahey of SpaceLabs Medical (North Ryde NSW) drove by their Madras studio during a business visit to India and then faxed me asking if I thought he should stop in to say "*hello.*" I did.

"Mr. Raj," Coop, Shankar in NZ

Fahey educated a quickly excited "Mr. Raj" by sharing with him some videotape he carried of his RAJ-TV reception in New South Wales. To that point, nobody at RAJ-TV understood the truly unique "reach" of Rimsat G1, transponder 6 (see SF#8, p.2). Mark left behind a copy of SatFACTS and this prompted the Tamil broadcaster to call us. "*Yes,*" we assured him, "*your signal reaches all over the Pacific and there are undoubtedly programmers down here who would like to broadcast to such a sizeable audience.*" And so Mr. Raajhendhran and Mr. Karikar came to visit.

Their detailed, frankly hair-raising tales of what it is like to be involved in the presently unstable Indian cable-satellite marketplace were fascinating and a subject for a later report. I was struck, however, by the great similarities between the uncertainties of the Indian satellite world and our own in Australia and New Zealand. It is sometimes fashionable to make jokes and poke fun at the apparent chaotic uncertainty within the Australian pay TV world and to somehow believe Australia's mistakes are unique. We explore the status of the new Galaxy service starting on page 2 here but I assure you this is a story now repeating world-wide.

In Volume 1 ◆ Number 9

-ON THE COVER-

Autumn south of the equator and the corn shuckers are preparing for winter by stocking their pantry with Country Music Television and pumpkins to ward off the Antarctic chills.

8 CHANNELS NOW: 32 Promised

GALAXY: AUSTRALIA'S FIRST SERIOUS PAY TV ENTRANT

How Many Channels? When? How Much?

Australia's two-decade struggle to bring to consumers a pay television service finally bore fruit on January 26 with the launch of a sometimes controversial, always newsworthy Premier Sports Network. Now, some 109 days after PSN came alive, the controversy surrounding the Galaxy service is reaching a fever pitch. The struggles leading to the launch of the pay service only seem to have been a prelude to what is just ahead. Nothing, not even the transmission format, seems to be stable at this writing.

Australis (parent of Galaxy) placed more than A$200 million on the line just for the legal right to operate. Then the search for partners with money and expertise began. American cable TV giant TCI (the world's largest cable TV operating company) was an early investor. Rupert Murdoch's News Corp and Australia's largest corporation Telstra (operator of the primary telephone company) are the most recent; dropping A$79.4 into the pot in March **(1)**.

Australis/Galaxy was possibly rushed into operation at the wrong point in history. Australian regulations are heavily in favour of an all digital delivery system; the reality has been that hardware suppliers are not ready to deliver a working all digital system. Not at consumer level pricing, in consumer quantities. American firm TCI, certainly with 'clout' through their equity position in Galaxy, has been a staunch supporter of General Instrument (GI) for more than a decade. By some US cable TV industry estimates, if TCI were to stop purchasing from GI tomorrow, GI sales would fall by between 25 and 30%. TCI pushed Australis to consider, ultimately contract for, the GI Digicipher system. Unfortunately, at the time of the decision (mid-1994) the Digicipher system was not a mature compressed digital video technology. GI had two major problems with Digicipher:

GI had designed their own compressed digital video protocol (technology) and it is unique. If you transmit in Digicipher, you are forced to install Digicipher protocol receivers.

Digicipher 1 is not only unique, it also lacks the final refinements of the world MPEG-2 standard that was ultimately adopted in late 1994 by the world's technology societies. Ultimately, this will require all early Digicipher 1 format systems to be replaced with a Digicipher 2 updated version.

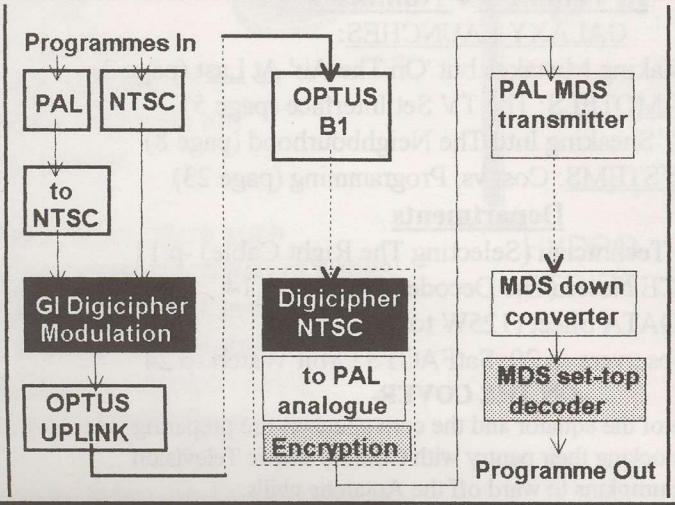
Additionally, Australis had another tough decision:

Digicipher 1 is only an NTSC (American standard) system. If you elected to use it in Australia, any (PAL format) receiver plugged into the system would require a standards converter; from Digicipher NTSC to PAL.

As the Australis Galaxy system matured on paper several decisions were made.

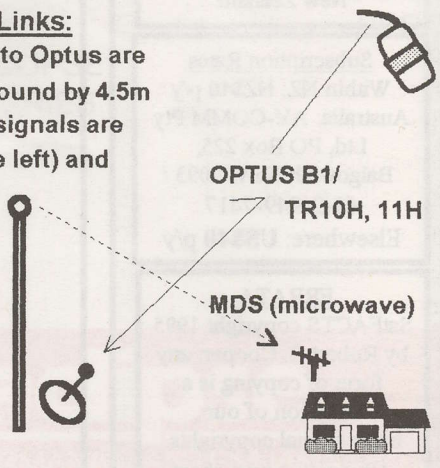
1) The service would 'come out' first on MDS (terrestrial microwave) in the major markets: Sydney, Adelaide, Melbourne, Perth and Brisbane.

2) Optus satellite would distribute the signals using the Digicipher 1 (NTSC) format primarily because PAL was not available. At each MDS transmitter site, the



The GALAXY Links:

Uplink signals to Optus are received on ground by 4.5m range dishes, signals are processed (see left) and retransmitted using MDS analogue microwave to individual subscribers



THE LOOK OF GALAXY: The First Six Channels Available

SHOWTIME movies fed from USA | PREMIER SPORTS: world-wide sources | QUEST: Documentary

ENCORE: "classic movies," USA fed | 'RED': Australian/World Music | TV1: Old sitcoms, variety

The 'contract' between Galaxy and the subscribers calls for 8 channels of programming to be delivered to the home. Through the 28th of April, Galaxy was "two channels short" of that eight and of the six available (see off-screen photos above), not all were full-time (TV1, Music Video, Documentary for example). The addition of 'MAX', based largely on the USA Nickelodeon network programmes, and 'ARENA', a mixture of specials and concerts, completes the initial 8 channel package sold at A$49.95 per month (CNBC is included as well).

programming would be standards converted from NTSC to PAL.

3) The PAL signals would be encrypted to prevent 'piracy' (signal theft); a lesson learned elsewhere in the world where MDS receivers are sometimes sold openly to people who buy the receiving systems to circumvent the normal monthly subscription procedures.

All of this is worked out to the benefit of GI. They would supply their satellite uplink Digicipher encryption system (the package of electronics that converts an analogue TV programme to digital) at a price of US$775,000 for the first programme channel. They would supply GI Digicipher 1 Model 1500 IRDs (integrated receiver-decoder) to the MDS sites. And through a wholly owned subsidiary, they would supply the analogue encryption units and set-top decoders for the MDS reception. Down the road, after MDS was underway, GI was the firm most likely to supply DTH (direct to home) IRD units as well. But that would have to wait until the PAL version (Digicipher 2) was available; the likely date was to be mid-1995.

The plan was to launch with Digicipher 1 because only a few hundred model 1500 receivers would be required and the NTSC format video (from uplink studio through the satellite to the MDS transmitter site) would be confined to that portion. When Digicipher 2 was available, with its PAL compatibility, these receivers would be changed out or converted to Digicipher 2 and the system would cease using NTSC at all; it would be a totally PAL system from initial digital uplink to the subscriber's PAL format receiver.

Enter News Corporation. On March 9 (1995) Rupert Murdoch's News Corp, telephone company Telstra and Galaxy had an announcement:

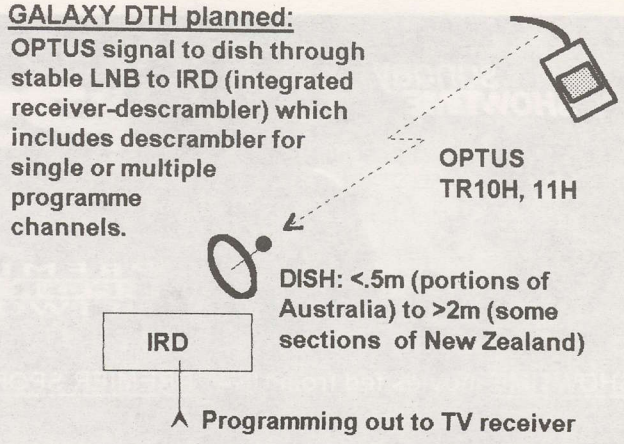
Murdoch and Telstra were pooling their resources to invest a much-hyped A$3.9 billion to build a massive fibre plus coaxial cable pay TV wired network. They said it would pass before 1.1 million Australian homes by 1999. To provide programming for this new massive cable TV system, News Corp and Telstra each purchased shares in Australis. From Australis to cable

1/ Readers with an interest in an in-depth analysis of the "Galaxy Problems" should order CTD 9404 at NZ$30 from Coop's Technology Digest, PO Box 330, Mangonui, New Zealand (newly issued April 28)

UNCERTAIN GALAXY DTH PLANS:

Galaxy engineering had anticipated a cost per household of A$1,150 for each DTH system package using dishes in the under 1m class, a "phase-locked" LNB, and an IRD to be supplied by General Instrument (DSR-2200 in PAL format; see p.21 SF#8). The announced installation price per home was to be A$300. Significant community (Council) opposition to the threat of dishes on rooftops in Sydney and Brisbane suburbs will complicate the dish installation process. With word that Rupert Murdoch's News Corporation has manipulated the hardware decision to bring in the NTL digital system in place of GI Digicipher, it is back to ground zero for the planners. Murdoch will use NTL plus PACE receivers for his AsiaSat 2 service.

GALAXY DTH planned:



would come an initial 8 TV programming services. Within a month the influence of News Corp was increasing and the sword dropped on GI:

Galaxy would toss out Digicipher in favour of the NTL (British bred) System 2000; the same system STARnet will introduce on AsiaSat 2 when it launches sometime after August.

There are several sound reasons for this abrupt change. First, NTL has not been as slow to fully develop compressed digital video MPEG-2 hardware because they own and control the operations that manufacture the much-in-demand MPEG-2 decoding chips which every receiver and decoder requires. GI has frequently blamed its own failure to meet delivery schedules for Digicipher 2 on the "shortage" of decoding chips. GI does not own and control the manufacture of chips; it depends upon outside suppliers.

Second, from the business vantage point of News Corp, a switch to NTL System 2000 will mean additional income for Murdoch: The system's conditional access (software that allows viewers into the programming) and subscriber management system (which keeps track of customers and automates the billing procedures, especially for pay-per-view programmes as distinct from pay channels) is owned by News Datacom. Yes, that is another Murdoch subsidiary.

Although no supplier for the System 2000 receivers has been announced, most everyone believes it will be PACE which is already building and shipping similar receivers for the launch of STARnet MPEG-2 service.

AND DTH?

The DTH launch from Galaxy could easily be delayed until late in 1995, or early 1996, given the more pressing problems associated with the conversion from GI to NTL and the need for significant numbers of DTH receivers before the system is launched. The announced price of A$300 installation and monthly A$50 may be adjusted. As an example, the original A$299 MDS installation price for Galaxy was dropped to A$99 late in April.

Each receiver is totally addressable; per programme channel or for the service as a whole. The present OPTUS B1 transponders in use are high power and concentrate their coverage along the coast line from Brisbane south and then west to Perth. Enough signal spills into New Zealand that dishes as small as 1.2m have been successfully tested in the Auckland area under clear sky conditions. TV GUIDE for New Zealand, owned by Murdoch, used a full page March 24 to 'hype' the "*coming of 120 multi-digital programme channels for Kiwis.*" To date, however, nobody within Galaxy has been willing to comment on how, or when, the services might be offered to Kiwi homes. Out of luck are Australian regions away from the coastal strips served by transponders 10H and 11H, and other Pacific Ocean Region areas; for now.

'ARENA' and 'MAX' were added 4PM April 30

Part Two

ADDING SATELLITE CHANNELS TO A MASTER ANTENNA SYSTEM

Review

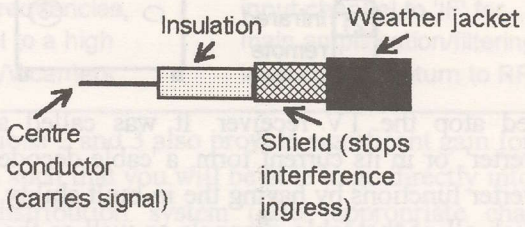
In SF#8 we explained that DSB (double sideband) modulators are spectrum inefficient polluters, although low in cost. Each DSB modulator occupies at least two TV channels; its designed-for channel and by spillage of energy, the immediately lower channel as well.

We also learned that if the modulator used in an SMATV system is of 'cable TV design' we will not only eliminate the unwanted 'sideband' energy that pollutes the lower adjacent channel, but we will also gain the ability to adjust the desired channel's sound carrier to ensure that the immediate upper adjacent channel will not suffer 'sound-bar-interference'. The sum of these two benefits strongly suggests that planning the addition of satellite TV signals to existing motel / hotel / condominium coaxial cable distribution systems should always be done with 'cable TV modulators'; also known as 'VSB' (vestigial sideband [modulators]).

The TV Set Interface

Individual television sets, designed and manufactured since approximately 1970, contain a limited amount of adjacent channel filtering. This design feature allows these receivers to be utilised in an environment where equal-in-signal-level TV channels are presented to the TV receiver on immediately adjacent channels. Channel numbers give us some clue as to whether they are 'adjacent' or non-adjacent. 2 is followed by 3 which is followed by 4 in numerical sequence; logically 3 in this sequence would be adjacent to both 2 and 4 within the radio frequency spectrum. Unfortunately the designers of TV 'bands' (spectrum space for the transmission of TV programme channels) were not nearly as logical as the people who designed the numerics counting system. And as we saw in SF#8 (p.11), in different portions of the world differing approaches to TV 'bands' has left us with the legacy of non-uniform utilisation of the VHF TV spectrum (essentially 45-230 MHz). The reader is referred to SF#8, page 11 to more fully understand how the spectrum has been 'laid out' in different world regions and once you have a grasp of that you can more fully appreciate why a television receiver designed to function in New Zealand, for example, may not always be able to tune-in all of the channels in use in Australia. The cable TV industry tackled and solved this challenge in the 1970s by creating a brand new 'channelling

Anatomy of Coaxial Cable

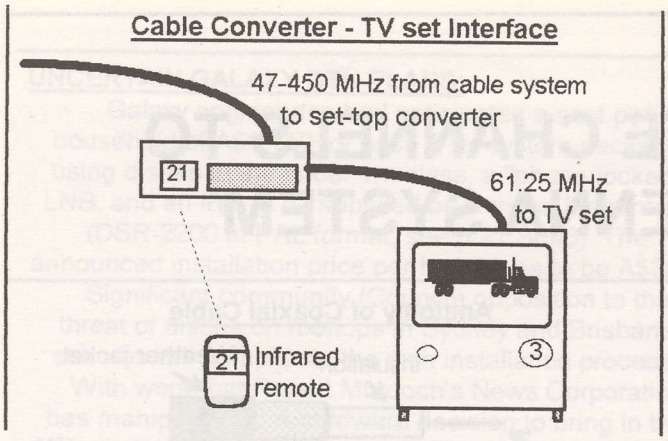


scheme' of their own. This is possible for cable purposes because while New Zealand, for example, was not able to utilise for TV broadcasting the spectrum space between 69 and 90 MHz because of prior-to-TV use of this spectrum by various two-way radio and signalling systems, the cable system is largely protected from these radio system users by the shielded nature of its coaxial cable distribution system.

In all situations, how one utilises various portions of the spectrum is largely dictated by the concern that interference between users not occur. Coaxial cable, if properly designed and installed, has a very high immunity to something called 'ingress'; the opacity of the cable's inside transmission wire to any same-frequency signals that originate outside of the cable proper.

Thus it was deemed practical to create 'cable-only' TV channels for use by the coaxial distribution system even where the 'outside world' (beyond the cable) were utilising the same frequencies for dispatching police cars or ambulances. It should be noted that there are practical limits to the cable's ability to 'shield' itself from ingress; if there exists in an area very powerful transmitters in a certain frequency range (such as FM broadcasting stations in the 88-108 MHz region), transmissions from these non-cable sources can ingress into the cable system and cause interference to cable-only transmissions being carried; a function of the 'power level' of the FM broadcasters. Conversely, the relatively low power two-way radio transmitters will not penetrate the coaxial cable's 'shielding' except at very close distances.

By creating 'cable-only' TV channels, the cable industry had to face the fact that many (probably most) TV sets then in manufacture would not be able to tune-in these cable-only channels. The solution to this was to design a new consumer-use box that typically is



placed atop the TV receiver. It was called a 'cable converter', or in its current form, a 'cable decoder'. The converter functions by having the in-built ability to tune through all of the cable channels as well as the locally assigned broadcasting channels. Each channel tuned-in is processed by the converter and then outputted to the standard TV set. In this procedure the TV set is tuned to a single channel (typically one of the lower channels between 45 and 70 MHz) where it stays. The channel 'changing' is done by the converter; it tunes-in the selected cable channel and redirects it to the TV set on the output channel of the converter.

As cable penetration in North America and Europe increased (more and more homes signing up for cable) the TV receiver manufacturers took notice of this cable solution and ultimately TV sets were offered to the market for direct-cable-tuning; i.e., the TV set's tuner was designed like the cable converter tuner to directly access each cable TV channel.

Alas, the TV set manufacturers always seemed to be from 1 to 3 years behind the cable industry's insatiable appetite to continue adding new cable channels and an inter-industry war began that continues to this day.

Recall from SF#8 that if you start from a specific frequency (such as Australian channel 0 at 46.25 MHz, or New Zealand channel 1 at 45.25, or European channel 2 at 48.25) and using numerics create a new TV channel every 7 MHz above the base frequency, you end up with an approximation of the 'cable spectrum'. created by the cable TV industry. But it is only an *approximation* and for TV sets sent to Australia and to work on cable the TV set's tuner must correspond to the TV channelling 'scheme' selected by the cable operator. Even in the United States where such things are now closely regulated by Federal rules, there are four separate, distinct, channelling schemes. Thus a TV set that claims to be "cable ready" (meaning it has cable tuning built-in) can easily not be ready for a specific cable system but it would work fine in another.

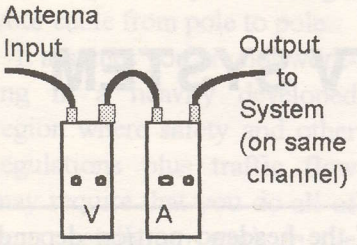
Cable set-top converters (produced by a number of firms including General Instrument and Scientific Atlanta, and many in Asia) usually avoid this problem by providing the cable system technicians a method of adjusting the converters, internally, for the channelling scheme in use. TV receiver manufacturers have not yet reached this level of flexibility.

All of this comes home for the motel or condominium project adding one or more satellite delivered programme channels. Obviously the added channel(s) must conform to the tuning ability (range) of the TV receivers already in place; or, the motel operator must elect either set-top converters or to replace the TV receivers with a model that has the added channel tuning capacity. Fortunately for the designer / installer of the new system, the manufacturers of VSB modulators give you total freedom to select virtually any modulator output channel you wish; literally from 5 MHz to 800+ MHz. This suggests that you begin your modulator channel selection process by first determining (a) what channels are 'open' in the existing system, and, (b) the ability of the TV receivers to tune these not-in-use channels. A subset of this routine is the consideration of how you will fold the satellite channels into the existing in-use channels.

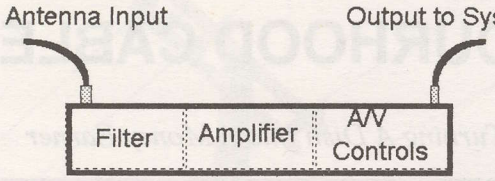
As we saw in SF#8, a TV receiver can properly tune-in and display channels that are frequency-adjacent provided the channels are equal (even) in signal level; at the TV set. If channels 5 and 7, for example, are local terrestrial channels already on the cable distribution network and you wish to add channel 6 as a modulator channel, first you must determine whether 5 and 7 are equal in level within the system. Equal in level means the visual carrier levels of 5 and 7 should be within +/- 2 dB of each other, worst case. Now, if everything works out, you can slide in a VSB modulator on channel 6 without having interference between channels.

If, on the other hand, channel 5 is stronger within the system by 6 dB than channel 7, it will be difficult to find an appropriate in-system signal level for channel 6's VSB modulator that will not cause 7 to 6 problems or 6 to 5 problems. The answer here is that *before* you can utilise our channel 6 example for satellite programming, first you must correct the imbalance between terrestrial channels 5 and 7. This can be an expensive chore since proper level control for terrestrial signals on 5 and 7 will require individual channel processing of each channel. It is within the individual channel processing hardware that you can control the separate carrier levels (visual and audio) for these two channels. A less expensive solution is to insert wave-traps into the channel 5 and 7 antenna line before signal amplification and attenuate the appropriate channel 5 and 7 carriers to create a balance between them. The problem, with wave traps, is twofold:

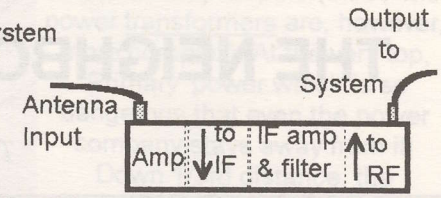
THREE CHOICES: Treating Terrestrial Signals Before Adding Adjacent Channels



Wave Traps require separate units for picture carrier level and aural carrier level control



Single channel ('on-channel') strip amplifiers filter out other frequencies, amplify the single channel to a high output level and control A/V carriers



Heterodyne Processors take input channel to 'IF' for main amplification/filtering/ level control, return to RF

1) They introduce 'phase delay' to the received signal, and may create ghosts and smeared colour where before there was crisp pictures;

2) Wave trap tuning is sensitive to ambient temperature change and after you laboriously adjust the traps at the time of installation (with a quality signal level meter), a 20 degree swing in temperature causes the circuits in the wave-traps to retune themselves. Suddenly the traps are no longer functioning properly and you, the installer, have a serious service call on your hands. The only solution to this one is to install the wave traps in a container that maintains a suitably stable ambient temperature; +/- 5 degrees C.

Readjusting (balancing) local channels, then, have three options:

1) Use wave traps (cost around NZ$450 per channel inside a housing heated with a light bulb operated by a thermostat);

2) Use on-channel 'strip-amplifiers' which offer you both gain as well as channel filtering and individual control of the audio and visual carrier levels (NZ$590 per channel);

3) Use heterodyne signal processors which allow you to select any input channel (47-862 MHz), amplify plus filter plus 'adjust' it, and then produce any output channel (47-550 MHz) you wish (NZ$1440 per channel).

Solutions 2 and 3 also provide significant gain for the channel such that you will be able to go directly into the cable distribution system (after appropriate channel mixing) without need for further amplification. They also provide stiff 'AGC' (automatic gain control) which eliminates virtually all signal level deviations at the TV receivers caused by up and down swings in the incoming terrestrial signal level. Since the ultimate level to each receiver establishes the TV set's ability to properly deal with adjacent channels, this AGC function is of some importance. Your VSB cable modulators will be totally stable in output level in normal operation and the end result will be a 'stable distribution system' not effected by weather or other propagation abnormalities.

Alas, many smaller motels will not be able to afford the high costs associated with processing the terrestrial channels, and you can avoid this cost by simply not placing the new satellite channels adjacent to existing terrestrial services. This is a practical solution provided you have:

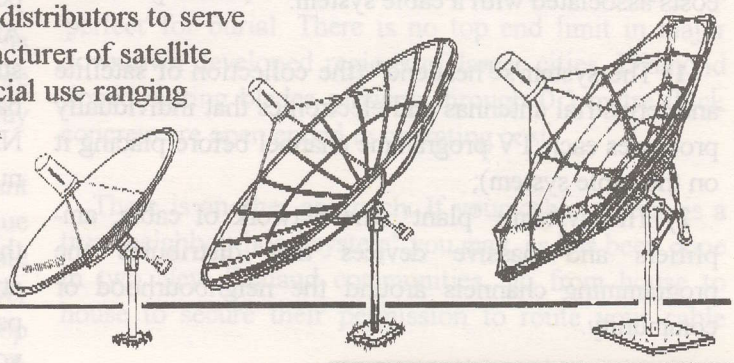
1) Available, unused channels in abundance such that you do not require the channels adjacent to terrestrial signals, and,

2) That the facility's TV sets are capable of tuning in the channel(s) you are selecting for the satellite delivered programming.

This series will continue in SF#10.

PARACLIPSE SEARCHING FOR DISTRIBUTOR

Paraclipse, The World Leader in Satellite Antenna Technology, is continuing to expand services world-wide and is now accepting applications for distributors to serve New Zealand and Australia. Paraclipse, a manufacturer of satellite receive antennas for both residential and commercial use ranging from 1.8 to 4.8 metres in size, is headquartered in Columbus, Nebraska U.S.A. Interested parties should contact Paraclipse Sales Manager Mr. Norman Bruner via telephone, fax or letter.



Paraclipse, Inc.
P.O. Box 686, Columbus, Nebraska 68602 U.S.A.
Tel. 402-563-3625 • Fax 402-564-2109

Part Three

THE NEIGHBOURHOOD CABLE TV SYSTEM

Turning A Dish Into A Money Earner

In Review

A cable television system is a business designed to earn money for its investors. Most systems planned in recent years have intended to service entire towns or even large cities and the investment required for such a business can easily approach several thousand dollars (in NZ or Australia currency) per actual subscriber. Most cable systems find they approach a level of 'penetration' (i.e., percentage of homes actually subscribing to the service out of the total number of homes which the cable wires 'pass') as follows:

At end of year:

One: 10-12% will subscribe
Two: 15-18% will subscribe
Three: 21-25% will subscribe
Four: 27-30% will subscribe
Five: 32-35% will subscribe

In the United States, cable penetration runs between 60 and 65% on 'mature' cable systems; those that are ten years or older. In Europe, penetration runs as low as 25% (UK after 5 years) to 92% (Holland and Belgium after 15 years). Systems that are locally owned and managed tend to have higher penetration numbers than those operated by absentee management; perhaps because a local owner more closely identifies the system with the actual community itself. A cable TV system is a 'local service' and its real opportunity to grow is almost always interwoven to the extent that it makes an effort to be a 'community service'. As a matter of fact, the least profitable cable systems are virtually always owned by a large company that makes a conscious effort to run the 'local system' as if it were in fact a part of a much larger network.

There are two fundamental capital (investment dollar) costs associated with a cable system:

1) The system's "headend" (the collection of satellite and terrestrial antennas and electronics that individually processes each TV programme channel before placing it on the cable system);

2) The system's "plant" (the network of cable, amplifiers and passive devices that distributes the programming channels around the neighbourhood or community.

The invested cost of the headend portion depends almost entirely upon the number of channels the system offers; each channel costs more investment money because of the added equipment required. In more complex cable systems using "addressable converters" (where each subscriber home can be individually addressed through the cable for approval to view certain channels or services), there is a considerable increase in investment for the addressing equipment. For this reason most smaller systems elect not to be "addressable;" a system that will ultimately serve fewer than 5,000 homes (as a minimum) probably has no business considering an "addressable system design."

The cable plant investment cost will vary significantly as a function of the costs associated with installing the coaxial cable and electronics required. If a kilometre of suitable cable with the required electronics could be laid directly on the ground in a straight line, the "installed" cost would average under NZ$6,000 per kilometre. Unfortunately there are sound reasons why you cannot simply string out a kilometre of cable in a straight line laying it on the surface of the ground.

1) It would be subject to damage;

2) It would never be approved 'laying on the ground' by the local (Council) authorities.

There are two alternatves to laying it on the ground.

1) Suspend it from utility poles (called 'aerial') using suitable hardware developed for this purpose, typically 1 to 1.5 metres below (lower than) the top-of-pole electrical wires (the distance is a matter of safety); or,

2) Bury the cable in the ground, where ultimately most (utility) services will end up anyhow.

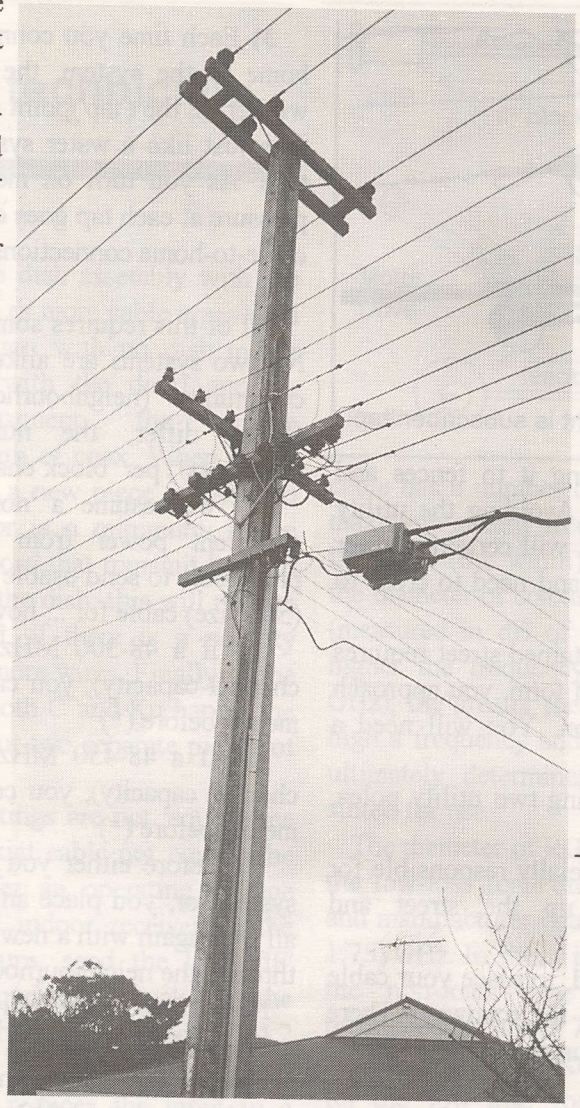
Suspending the cable on utility poles is more labour intensive than simply rolling it out on the ground and requires approximately NZ$40 in hardware for each pole. In a kilometre, there will on average be 16 poles. All up, labour and hardware, the surcharge cost for stringing the system on poles will add NZ$1,300 to the basic cost of the equipment (as laid out on the ground); NZ$7,300 is a suitable planning number. But that number assumes conditions that may not exist for you:

It assumes no rearrangement of the existing wires on the utility poles will be required before your TV cable is attached. The cost of such rearrangements are typically paid by the cable operator and a pole with a massive (in your way) power transformer can cost several thousand dollars to 'clear' for cable TV wires.

It assumes no significant tree trimming is required to get your cable from pole to pole.

It assumes you are not working in a heavily developed region where safety and other regulations plus traffic flow may require that you do all of your installation work in the middle of the night (!).

Thus NZ$7,300 is a starting number, to be increased for 'aerial' plants based upon the local conditions.



Anatomy Of Cable On A Pole

This is a complex pole (those with power transformers are, however, more complex): At the very top, 'Primary' power which is so dangerous that even the power company stays away from it! Down 1/3rd distance, the secondary power which serves homes in the neighbourhood with two (wooden) crossbars; the lower one is a power 'take-off' point for mains service to homes down a street to the right centre.

Cable "messenger" wire; crossarm

Cable TV lines (3) and amplifiers (see below)

To reduce the chance for electrocution, the cable TV "pole space" is protected by a wooden crossarm (lowest one on pole). The main cable line comes to the pole in the bundle of 3 seen plugging into the weather-tight equipment housings just to right of pole. A single (obviously smaller) cable comes out of the amplifiers heading down the street to right.

Burial plants start from the same base number; around NZ$6,000 per kilometre. There is no direct 'hardware' as such with a buried plant but you do have ground mounted pedestals; fibreglass containers similar to those you have noticed from the telephone company, protruding out of the ground .3 to 1 metre in height. It is inside of these housings that every connection and piece of electronics is placed. The size of the housing depends upon what goes inside. As a rule of thumb, you will place housings at a 'lot line' where two neighbouring parcels share a common boundary. Inside will be the customer tap-off device for those two homes.

By utilising 'direct burial' cable (designed to go directly into the ground, without PVC ducting to protect the cable your costs will be lower but your flexibility to upgrade or replace cable at a later date will drop to 'zero'. 40 to 50mm PVC ducting allows you to pull the actual coaxial cable through the underground conduit system; directly burying the cable (open up a trench, slide the cable in and fill the trench back in) eliminates this future option.

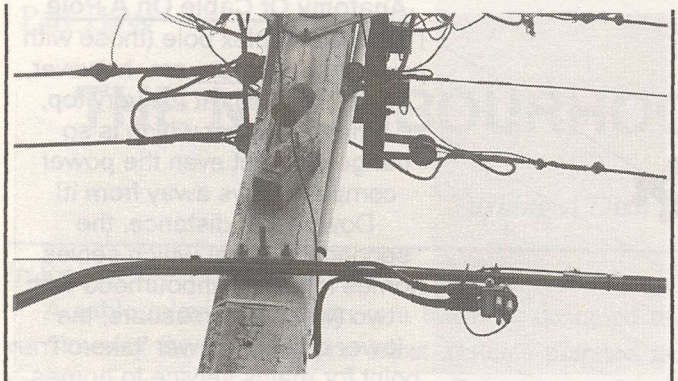
Bare-ground burial, with or without PVC ducting, is the minimum cost level for a buried plant. Far more significant (and expensive) are sidewalks and roadway surfaces to be cut for the cable's burial.

There are no rules of thumb for buried cable plant costs since each bit of terrain has its own unique obstacles. Sandy soil can be direct buried at a rate exceeding 200 metres per hour; rocky soil at a far lower rate. Sidewalks and roadways that have to be 'cut' drop to as little as ten metres per hour just to 'open' the trench or slot. Rates for direct burial depend upon all of these variables (and more) and of greatest importance, the skills and equipment of the people doing the work. A properly equipped rig just for sandy and loose rock burial will cost upwards of NZ$40,000 with running costs (replacing broken digging teeth is a big item) running to NZ$100 per hour.

In rural areas, a direct burial cost in the vicinity of NZ$2.50 per metre is a bargain; in more developed areas the numbers can skyrocket to $100 per metre when you tackle concrete roadway crossings.

So as a bare minimum, think in terms of NZ$2,500 burial (portion) cost per kilometre if everything is 'perfect' for burial. There is no top end limit in major downtown developed regions of larger cities. Diamond tipped cutting blades plowing through 0.5 metre thick concrete are open ended in operating cost.

There is another approach. If your cable system is a true "neighbourhood system" you may, as has been done in two New Zealand communities, go from house to house to secure their permission to route your cable



CABLE TV (bottom): Device to right is subscriber 'tap'

along back property lines, attaching it to fences and trees and whatever else is handy. Avoiding the utility poles, avoiding going underground, will certainly lower the costs. Until you reach a street and need to cross to go on with the system expansion.

Going across a government maintained street requires permission. In its least complicated form, you approach the local authorities for permission. You will need a plan.

1) Will you cross overhead (using two utility poles, city light poles), or underground?

2) Are you prepared to be financially responsible for any damage (such as slicing up the street and sidewalks?).

3) Are you prepared, if overhead, to place your cable the safe-mandated distance above the roadway? There are safety standards here in every jurisdiction.

Heading Down The Road

Returning to the headend, each channel has its own modulator (low power transmitter) or channel processor (for off-air terrestrial signals). And at the headend you combine (bring together) these individual channels to a single cable; your trunk line (see SF#8, p.8). The signal level (strength) of each channel as the trunk cable leaves your headend is the total 'signal power' you have available to reach the end of the line.

There are three simple technical rules here:

1) The further your signal travels through cable, the weaker the signal becomes. At some point it is too weak to use (watch on a TV set). A subset of this rule is that the larger the physical size of the (75 ohm) coaxial cable, the further your signal will travel before becoming too weak to use. Why? Bigger cable is more efficient.

2) If the cable spectrum is 48 to 450 megahertz (MHz), those channels that are in the 'low end' (smaller MHz number) of the spectrum will travel further (before growing weak) than their higher frequency companions. Why? Cable 'losses' increase with cable operating frequency.

3) Each time you connect into the cable to attach a home to the system, the signal goes down (becomes weaker) at the ('tap')point of connection. In other words, it is just like a water system with one source and ten taps. As you turn on more and more taps, the water pressure at each tap goes down. It is no coincidence that cable-to-home connections are also called 'taps'.

All of this requires some thinking and planning time. No two systems are alike because from community to community (neighbourhood to neighbourhood) the streets differ, the number of homes (potential customers!) per block changes.

If we assume a 'normal headend', we will have sufficient 'power' from our modulators and channel processors to send usable amounts of signal down a 1/2" (500 size) cable for ... how far?

1) If a 48-300 MHz bandwidth cable system (36 channel capacity), you can go in one direction for 909 metres before (*).

2) If a 48-450 MHz bandwidth cable system (57 channel capacity), you can go in one direction for 739 metres before (*).

*/ Before either you have reached the end of your system, or, you place an amplifier in the line and start all over again with a new chunk of cable snaking further through the neighbourhood.

Now, if we change only one parameter (the size of the cable) to 3/4" (750 size):

3) For the 36 channel (capacity) system, our line length extends to 1,313 metres before (*), and,

4) For the 57 channel system, the line grows to 1,069 metres before (*).

Now You Have Some Numbers

Conversion of an existing motel system from 3 terrestrial channels and 5 Sky Network pay-TV channels, to a terrestrial plus satellite delivered 15 channel system looks like this.

1) The headend will cost you around NZ$47,300 (see SF#7, p.8) for a 36 channel capacity system.

2) With the 'signal power' available at the headend, you can go out in one direction for 909 metres (or in two directions of 816 metres) to serve additional motels, hotels, clubs and homes with no 'plant' amplifiers involved.

How many potential cable customers might your cable 'pass' in one direction going 909 metres, or, two directions going 816 metres each? Get your tape measure out and start measuring. Draw yourself a 'map' showing how far it is from your proposed headend to the various customers along the way. We will start at this point (have your map ready!) in SF#10.

the SATELLITE technician

A "Harmless" Piece Of Wire

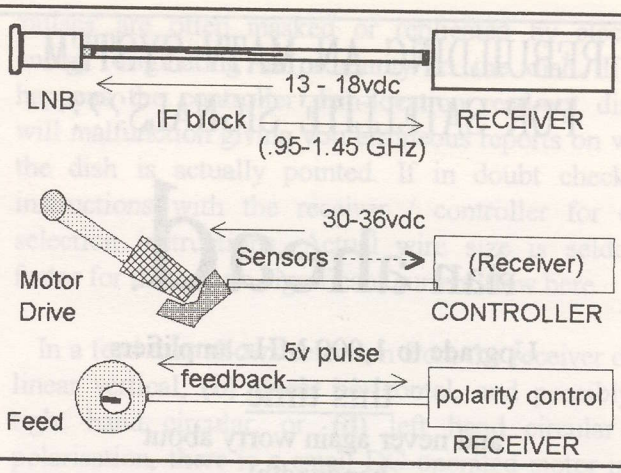
Interconnecting the satellite dish assembly with the indoor electronics requires one or more cable types. In a straight forward dish installation with no dish mover (actuator to scan the skies with the dish) and no polarisation (feed) adjustment the single interconnection cable is a length of coax. When motor drive (actuator jack) is added, a new piece of cable to carry the voltage to the motor is a minimum. If the actuator is equipped with 'sensors' that transmit back to the dish mover the position of the dish, this will require 2 or 3 additional wires. And, if there is a polarity rotation feed we require three more wires. Finally, if the dish system is being used on both C and Ku bands, the system now requires not one but two separate pieces of coaxial cable.

Just as all coaxial cable fittings are not 'equal' (see SF#8, p.14), so too is all coaxial cable not equal. The job of the cable is to transfer an operating voltage (typically 13-18vdc) from the indoor receiver to the LNB at the feed, and in return, send the LNB 'IF' (intermediate [block of] frequencies) back to the receiver. The LNB receives in the satellite band (3.7-4.2 range for C-band, 12.25-12.75 GHz for Ku band) and through frequency conversion reduces the input to a new block of frequencies; typically 950 MHz (.95 GHz) to 1,450 MHz (1.45 GHz). By doing this frequency conversion in the LNB, modest sized and cost coaxial cable can then be used to carry the satellite signals to the indoor receiver. The satellite bands (C and Ku) do not 'carry well' in coaxial cable smaller than 0.5" / 12.7mm diameter.

The most commonly recommended cable for the LNB-receiver run is RG6/U, of which there are nearly a dozen variations. The smaller cousin, RG59/U, is a very poor substitute and should never be used for runs in excess of 10 metres.

As the satellite bandwidth has increased (3.7-4.2 GHz to the new 3.4-4.2 GHz for the new Palapa C1, for example) the demands on the coaxial cable have also increased. Whereas the top frequency for C band has been around 1.45 GHz, with the C1 expansion down to 3.4 GHz the top end of the LNB 'IF' band will move up 300 MHz (0.3 GHz) to 1.750 GHz. Every move upward in the 'IF' band makes the job of the LNB to receiver cable more difficult.

The smaller version RG59/U cable is virtually never rated by the manufacturer for use above 1.0 GHz. A



cable has a number of characteristics that will limit its maximum useful frequency. The physical diameter of the cable (the width) is one the concerns. The smaller the diameter of coaxial cable, the greater the cable's loss (measured in dB of loss per foot or metre). And, the higher the frequency (1.75 GHz is higher than 1.45 GHz), the greater the loss. It is the combination of too high a frequency and too small a cable diameter which ultimately determines that a particular cable is not suited for use.

The diameter of RG59/U is 6.15mm. Loss per 30m for the 'low-loss' foam dielectric version is 11.5dB at 1 GHz and manufacturer data sheets do not rate it at 1.45 (nor 1.75) GHz. In short, its use is not recommended. Use of the non-foam type (i.e., solid dielectric) is not recommended above 700 MHz.

The diameter of RG6/U is 6.76mm. Loss per 30m is for the 'low loss' foam type is 8.9dB at 1 GHz and climbs to 11.8dB at 1.45 GHz. It, also, is not rated at 1.75 GHz.

As the LNB 'IF' widens and climbs higher, installers are well advised to reconsider their choice in lines. The next size 'up' in commonly available 75 ohm cable is RG11/U. There is a common belief that RG11/U is better than RG6/U. This is only true if you are comparing non-foam dielectric RG6 with non-foam RG11. The foam version of the RG6/U actually has 1.1 dB less loss at 1.0 GHz than the non-foam version of RG11/U. If you can locate a foam version of RG11/U, it will be superior to the foam version of RG6/U but foam 11 is not commonly stocked by most distributors.

As always, all connectors should be 'L-band rated' and this rules out virtually every known version of the crimp type 'F' fittings (see SF#8, p.14). And because of the critical nature of the L band (satellite IF band) frequencies, forcing the wrong fitting onto the wrong cable is a guarantee of disaster.

This note to be further explored in a future issue: 'Line amps' designed to boost satellite TV IF frequencies from .95 to 1.45 (or 1.75) GHz must be very

carefully selected and very sparsely utilised. They are almost never recommended for LNB to receiver runs of under 75 metres and should only be used when you are certain their own specifications are appropriate for the job at hand.

The DC motor in the linear actuator (jack screw) is driven by a voltage developed in either the receiver proper (when a 'dish controller' system is built into the receiver), or from a separate dish controller (power supply). A common operating voltage for jack screws is in the range of 30 to 36vdc and a common current load is 2 amps. While these are not extraordinary levels there are some warnings:

1) At a 2 amp current load a jack screw motor at the end of 100 metres of #18 (size) wire may drop the available voltage to the motor by 15% or more. Smaller diameter wire costs less to purchase (i.e., #18 is less expensive than #14) and for relatively short runs the voltage drop will not be significant. It is better to err on the side of a larger diameter wire (with less voltage drop) as excessive voltage drop to the jack screw actuator will slow down its operating speed and possibly cause overheating of the motor windings.

2) If you will be direct burying the cable, be certain the cable chosen has been designed for below ground operation. Not all outer jackets are moisture proof and stones and debris in the ground can cut into relatively thin jacketed cables which will allow water into the actual wires ultimately resulting in major problems.

The east-west position sensors are a subject of sufficient complexity to require their own detailed visit. Suffice to say that the wire chosen to connect the sensors to the receiver / controller may require an interference shield (woven web around the actual sensor wires) to prevent stray electrical pulses from getting into the sensor feedback circuits. Without this shield, sensor 'pulses' are often masked or replicated by electrical energy originating in proximity to the dish. If this happens the controller dish-location read-out display will malfunction giving you erroneous reports on where the dish is actually pointed. If in doubt check the instructions with the receiver / controller for cable selection instructions. Actual wire size is seldom a factor for there is no significant current flow here.

In a feed that allows selection from the receiver of **(a)** linear vertical, **(b)** linear horizontal, and possibly **(c)** right hand circular, or, **(d)** left hand circular of polarisation, there is a small DC operated motor in the feed that moves the LNB "probe" position around. The current is relatively small and the voltage low so wire size is not a factor except on runs exceeding 75 metres. However, wire shielding can be a factor and for the three separate wires required for the system the manufacturer of the polarisation system may require a form of shielded cable. The reason for this is the 'feedback' or probe position system which depends upon pulses from the probe end to advise the receiver end how the probe is actually positioned at any point in time. Virtually everything operated by electricity in a common household generates pulses these days and if any of these pulses radiate back into the probe sensor circuit, problems follow. Even electric fences for stock control can wreak havoc with a pulse sensing circuit. If it says "*use shielded cable*," do so.

With a world-wide installed universe approaching 20 million dishes, a significant body of installer information has taught us that when there is a problem with a consumer or commercial dish installation, nearly 50% of all problems relate to interconnection cabling and fittings. Proper cable selection, purpose-designed fittings and a belief that full waterproofing is mandatory on all fittings and connections will serve you well as an installer.

A technical and marketing advisory

memo

to the membership from your industry trade association group

May 15, 1995

SPACE Pacific

Satellite
Programme
Access
Committ**E**e

A trade association for users, designers, installers, sellers of private satellite-direct systems in the POR

DESCRAMBLING: Who, What, How Much?

The encryption (pay to view) TV world is young, evolving, and committing its share of mistakes along the road to maturity. In an ideal, grown-up pay-TV universe, all of the rules would be cast in stone, every player would understand his or her options, and all equipment would work perfectly all of the time. Not this year, probably not next. Maybe even not before 2000.

MPEG is a wonderful system of making numerous TV programme channels available in radio spectrum space capable of transmitting only a single analogue TV channel. MPEG is a technique, but it is not a singular, unique system with only one set of workable technical parameters. There are more than a dozen, working and workable MPEG systems in existence and none of them will "*speak to each other*" because each has its own, unique, internal "*protocol*" or software (digital) language. The broadcasting world attempted to avoid this situation by adopting one, singular, universal and world-wide MPEG "*protocol.*" It seemed in the interest of all players, especially those who would actually *use* the MPEG system, to have a single system that would plug in and work at any point on earth. But, for largely selfish reasons some early creators of MPEG formats elected not to do it this way. When GI originally sold Australis on its Digicipher 'format', for example, it was creating a 'Digicipher technology island' which SA, NTL, CLI and others could not invade. If you could sell a user on your particular digital transmission format, you'd guarantee that *only* your firm could sell receivers into that system. Think of it this way: Suppose the 35mm film format had never been adopted as a 'standard'. Further suppose that Kodak sold cameras requiring 30mm film, Canon cameras required a 33mm cartridge, Pentax required 36mm and so on. Each camera manufacturer makes its own film and film cartridges are not interchangeable.

That's where we are today with MPEG. And it is a very difficult situation. Now further suppose Kodak would only sell its film to professionals and you must purchase a minimum of 1,000 cartridges at a time. That

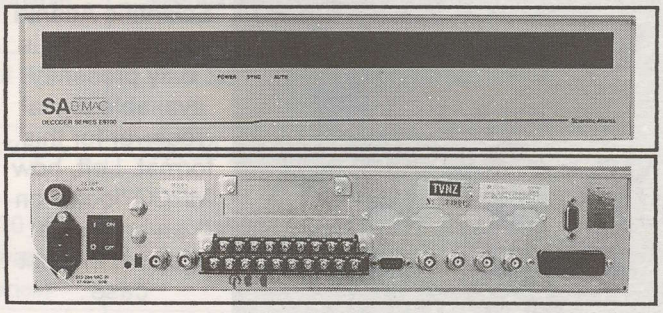
AN INVITATION TO JOIN **SPACE** Pacific

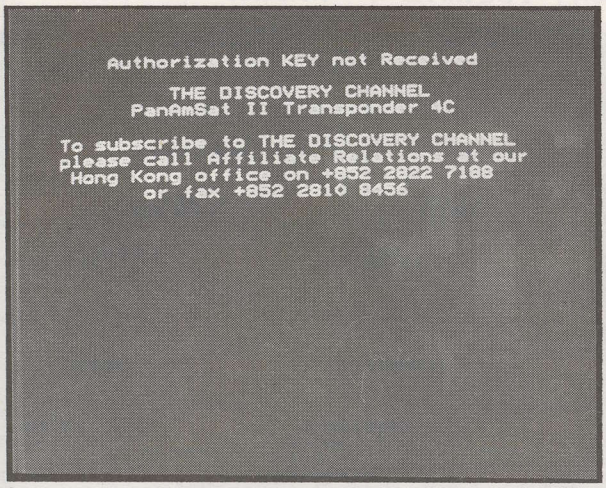
There is a category of membership for virtually every reader of SatFACTS; each membership class carries distinct privileges. A SPACE membership explanation package of materials is available at no charge and includes membership application forms. Classes are: Individual Member (an individual owning a satellite dish for private viewing), Installer / Dealer Member (those who sell and install satellite-direct systems), Retransmission Member (those who own or operate cable TV, SMATV, broadcast TV systems), Importer/Manufacturer/Programmer Member (firms importing and distributing through dealers equipment, manufacture equipment, or distribute programming for satellite-direct use). Each category has an Advisory Committee that assists in the creation of SPACE policy in each area of interest. You may request a SPACE Membership Packet using the form on page 26 in this issue; there is no obligation. Or fax **SPACE** Pacific at 64-9-406-1083.

B-MAC (An analogue encryption scheme)

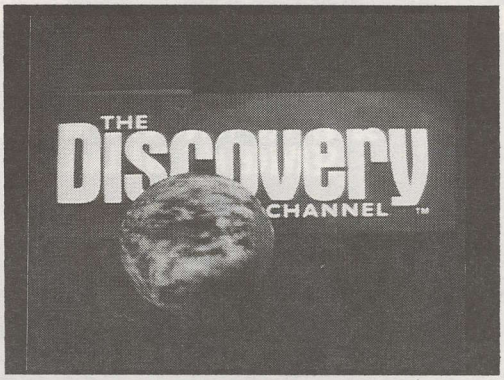
B-MAC was originally designed for industrial (medical, private teleconference) use in North America. When Aussat selected it for the Homestead Service (1985) it hit the big-time and subsequently it was adopted by AFRTS and early European pay-TV services. The video has been 'broken' by pirates but the audio remains secure.

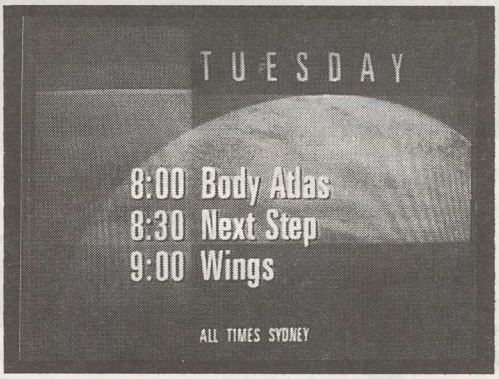
Scientific Atlanta model E-9700-2 is one PAL format version available. Left, what B-MAC looks like on TV screen when encrypted.





When you have a B-MAC unit that is not part of the authorisation 'stream' you are told so with a display that looks like that left. Optus Ku services ABC and SBS also use PAL B-MAC but decoders for them may not work on PAL formatted Discovery. ESPN is B-MAC but NTSC which requires a different model decoder.





Who To Contact

ESPN(*): Sandy Brown (Hong Kong)
Tel: 852-2887-1199; Fax: 852-2887-0813
Discovery: Mark Lay (Hong Kong)
Tel: 852-2822-7188; Fax: 852-2810-8456
TNT / Cartoons: Gwin Scott (Sydney)
Tel: 61-2-957-5255; Fax: 61-2-957-5161
(*- Other than New Zealand; see p.16)

is roughly analogous to how the Chinese Television Network wants to sell Zhong Tian and the Dadi channels. They also want their money in advance.

Further assume that Canon only sells to one store in your country and that store in turn refuses to resell its film to anyone else. That's analogous to how ESPN allows New Zealand's Sky Network to use its sports channel product, and, Prime Sports sells itself to Australis / Galaxy.

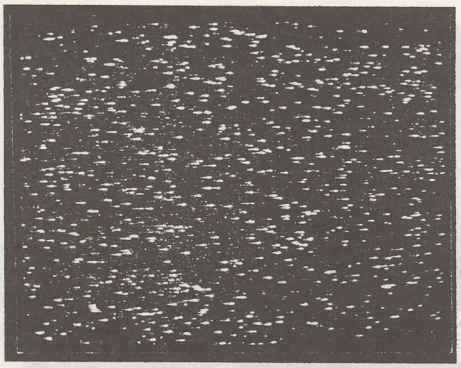
Or assume that Pentax has two versions of its 36mm cartridge film; one with square holes that only works on a camera with square sprocket knobs while the other has round sprockets that only works on ... you get the idea. Now substitute PAL format B-MAC for the square sprocket and round sprockets for NTSC and you have a grasp of the B-MAC quandary. Then to further confuse the marketplace, take the square sprocket 36mm film and vary the size of the sprockets and film holes. Large holes represent PAL for Optus ABC and SBS, smaller square holes represent Discovery. And remember, if you don't have the right film for your camera, you can't take pictures!

Stir all of this in the marketplace and watch the camera-loving picture takers get really angry. Now watch how long it takes a clever engineer to figure out how to make one roll of film have self-forming holes that automatically align themselves with a wide range of sprocket formats, film cartridge widths, and hole dimensions. A universal film cartridge that works for everyone.

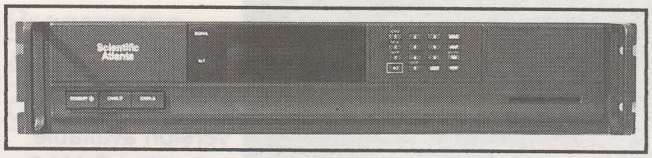
In the MPEG world this "*universal film cartridge*" is being called 'DVB Compatible' and it has originated in Europe where users and planned users of MPEG have drawn a 'line in the sand' and proclaimed, "*If you want*

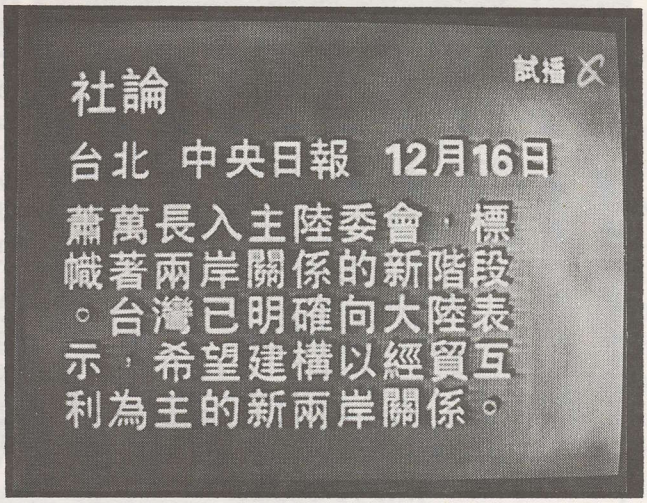
SCIENTIFIC ATLANTA MPEG

SA MPEG 1 is the format now in use on PAS-2 although MPEG 2 is slowly replacing the '1' version elsewhere in the world. Users include (TR1V) Asian Business News, Chinese Television Network (2 programme channels) and CCTV; TR2H's CBS and CMT; TR9V's Encore, Prime Sports, Showtime (fed to Galaxy Australis).



Scientific Atlanta model D9222 is only presently available digital receiver for this format. Left, how MPEG 'looks' on an analogue receiver in 'best case'.





When you have a SA receiver that is not part of the authorised 'universe' for a specific programme channel the screen tells you so (left, above). However, the "What To Do Next" information will probably be quite useless (some give a U.S.A. '800' toll free number to call). Of those now using SA MPEG 1, ABN and CMT are the least hassle to deal with for arranging subscriptions. For the moment, CTN (above, right) and CCTV are somewhere between 'difficult' and 'impossible' while CBS is 'iffy' and TR9V feeds impossible; see table, p. 17.

us to purchase your system, it must be 'interoperable' between different vendor products." DVB 'compliant' MPEG products are coming; probably not this year, possibly not in the first half of 1996, but certainly by the last half of next year.

Correction

SPACE for April 15th reported that Country Music Television SMATV/Motel rates were set at US$25 per month. This is in error; the correct rate is $25 per year.

Country Music TV Dealer Packs

SPACE is now distributing a package of in-store and consumer promotional materials to Dealer Members. The package includes 4-colour in-store wall posters, two sizes of handout brochures that explain CMT to potential subscribers, CMT promotional advertising materials and 'logos' for dealer advertising, in-store displays for counter tops and ceiling hanging, and, two X-Large CMT 'T' shirts. We hope to announce additional Dealer Member promo packages for other programmers shortly. We are very grateful to CMT for their assistance in this Dealer Member display pack.

Contacting Programmers

The list on page 17 (right) of contacts for programming access is our latest list. Many of the programmers 'talk through SPACE' but only take actual subscription orders direct (ABN, CBS, et al). Others (CTN, TFC) are uncertain exactly how they want to accept South Pacific orders. Still others (see ESPN, Discovery, TNT/Cartoons on p.15) will deal directly with you as a dealer only (ESPN will not deal with anyone in New Zealand, period, and Sky will not resell ESPN here; Discovery and TNT/Cartoon will deal directly with dealers). Numbers given are Fax; if you are a member and require a telco number, contact SPACE at 64-9-406-1282.

SERVICE	TR NUMBER	FORMAT	DTH Fee	CATV Fee	Ease of Subscription	Contact
Asia Bus. News (Singapore)	PAS2: 2H	SA MPEG 1	US$50 p/year	NZ$0.25 p/m	Good	Chris Wanden Fx65-323-0788
CBS TV (NY, USA)	PAS2: 1V	SA MPEG 1	Negotiable	Negotiable	Difficult	Nell Donovan Fx212-975-7452
CCTV China	PAS-2: 2H	SA MPEG 1	Not Set	Not Set	Very difficult	He Zongjiu Fx86-1851-5554
CMT	PAS2: 1V	SA MPEG 1	US$50 p/y	US$0.30 p/m	Good	Thru SPACE 64-9-406-1282
Chinese TV Net Hong Kong	PAS2: 2H	SA MPEG 1	US$20 p/m upwards (varies)	Negotiable	Difficult	K.F. Lau Fax 852-2515-6521
Encore (Denver, USA)	PAS2: 9V	SA MPEG 1	Not Accepting; no interest	Not Accepting; no interest	Impossible	Jill Miller Fx303-333-4644
Galaxy Sydney, NSW	Optus B/: TR10, 11H	GI Digicipher 1	Still to be set (October?)	Still to be set (September?)	Impossible at this time	Ph61-2-3257333 Fx61-2-3257444
Prime Sports (Houston, USA)	PAS2: 9V	SA MPEG 1	Not accepting ; may in future	Not accepting; may in future	Impossible at this time	L. Morton Fx713-661-1256
Showtime (Denver, USA)	PAS2: 9V	SA MPEG 1	Not accepting; no interest	Not accepting; no interest	Impossible	Jill Miller Fax 303-333-4644
The Filipino Ch. Manila	PAS2: 14H	GI Digicipher 1	US$50 p/y	US$50 p/y	Very difficult	Gina Leviste Fx632-924-2732

Current to 5 May

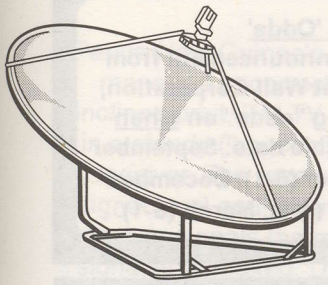
SatFACTS PACIFIC/INDIAN DATA BASE

LOCATION	SATELLITE	INCLINED	BAND(s)	SEEN IN
124.9W	Galaxy 5	+/-0.03	3.7-4.2 GHz	NZ
130.9W	Satcom C3	+/-0.0.8	3.7-4.2	NZ, Tahiti
133.0W	Galaxy 1R	+/-0.02	3.7-4.2	Tahiti
134.9W	Satcom C4	+/-0.03	3.7-4.2	NZ, Tahiti
137.0W	Satcom C1	+/-0.03	3.7-4.2	NZ
138.9W	Aurora 2	+/-0.03	3.7-4.2	NZ
169.6W(A)	Raduga 21	+/-4.96	3.4-3.65	No Reports
177.0W	Intel 503	+/-4.5	3.7-4.2	(Occ.Video)
180	Intel 511	+/-2.4	3.7-4.2	See Pg. 24
178.1E(B)	InMarSat2F3	+/-0.8	3.6-3.623	(Not Video)
177.0E	Intel 703	+/-0.02	3.7-4.2 11.7-11.95 12.5-12.75	See Pg. 24
174.2E	Intel 701	+/-0.01	3.7-4.2 11.7-11.95 12.5-12.75	See Pg. 24
169.0E	PAS-2	+/-0.02	3.7-4.2 11.7-12.75	See Pg. 24
160.0E	Optus B1	+/-0.01	12.25-12.75	See Pg. 24
155.9E	Optus A3	+/-0.01	12.25-12.75	See Pg. 24
151.7E	Optus B3	+/-0.48	12.25-12.75	(In storage)
144.4E(C)	G'Zont 21	+/-2.16	3.65-3.95	See Pg. 24
142.2E	Rimsat G2	+/-0.80	3.65-3.95	See Pg. 24
140.2E	G'Zont 18	+/-3.27	3.65-3.95	See Pg. 24
138.0E	ApStar 1	+/-0.00	3.6-4.2	N.Australia
130.0E	Rimsat G1	+/-0.30	3.65-3.95	See Pg. 24
127.6E	Raduga 27	+/-2.0	3.4-3.65	No Reports
118.1E	Palapa B1	+/-0.012	3.7-4.2	N. Australia
115.0E	Chinsat 5	+/-0.06	3.7-4.2	N. Australia
113.0E	Palapa B2P	+/-0.04	3.7-4.2	N. Australia
110.6E	DFH-25	+/-0.03	3.7-4.2	NZ.Australia
108.0E	Palapa B2R	+/-0.04	3.7-4.2	Australia
105.4E	AsiaSat 1	+/-0.04	3.7-4.2	N. Australia

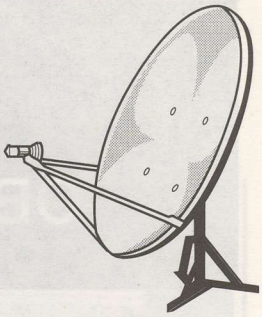
Sources are official tracking agencies world-wide; observer updates are, as always, invited; see page 25 here.

LOCATION	SATELLITE	INCLINED	BAND(s)	SEEN IN
104.6E	Raduga 24	+/-2.93	3.4-3.65	No Reports
103.2E	G'Zont 25	+/-0.90	3.65-3.95	Australia, NZ
102.5E	DFH-18	+/-5.57	Dead?	No Reports
98.2E	DFH-26	+/-0.04	3.7-4.2?	No Reports
96.5E	G'Zont 19	+/-3.16	3.65-3.95	Australia
93.6E(D)	Insat 2B	+-/0.06	3.8-4.2	No Reports
91.5E	Intel 501	+/-6.03	Dead?	No Reports
89.9E	G'Zont 28	+/-0.48	3.65-3.95	Australia
87.6E	DFH-22	+/-1.49	Dead?	No Reports
84.5E	Raduga 26	+/-2.26	3.4-3.65	Unknown
84.0E	Raduga 30	+/-0.45	3.4-3.65	W. Australia
82.9E	Insat 1B	+/-0.08	4.0-4.2	No Reports
79.9E	G'Zont 24	+/-1.28	3.65-3.95 11.525	W. Australia
78.4E(E)	Thaicom 1, 2	+/-0.04	3.7-4.2	No Reports
73.8E	Insat 2A	+/-0.04	3.9-4.2	No Reports
69.9E	Raduga 1-1	+/-3.38	3.4-3.65	Unknown
69.7E	Raduga 32	+/-1.42	3.4-3.65	W. Australia
69.4E	Raduga 25	+/-2.76	3.4-3.65	Unknown
66.0E	Intel 510	+/-2.14	3.7-4.2	(Storage)
65.8E(F)	Intel 704	+/-0.06	3.7-4.2 11.45-11.7	W. Australia
64.8E	Intel 505	+/-4.59	3.7-4.2	(Storage)
64.5E	Inmarsat 2F1	+/-1.77	3.6-3.623	(Not Video)
62.9E(G)	Intel 602	+/-0.03	3.7-4.2 10.95-11.2 11.45-11.7	W. Australia
60.0E	Intel 604	+/-0.03	3.7-4.2 10.95-11.2 11.45-11.7	W. Australia
57.3E	Intel 507	+/-3.99	3.7-4.2 10.95-11.2 11.45-11.7	Unknown
56.5E	Insat 1C	+/-4.56	Dead?	No Reports
52.8E	G'Zont 27	+/-0.37	3.65-3.95 11.525	W. Australia

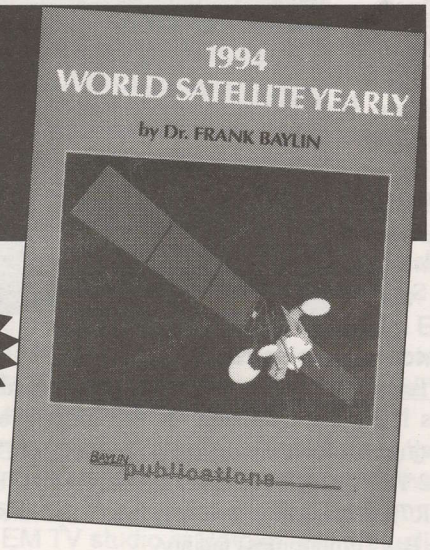
(A/ Raduga class satellites are capable of video but usually are limited to narrow band (voice, data); note they fall in 3.4-3.65 GHz region requiring a receiver IF that extends to 1750 MHz (LNBs may also not function here properly). (B/ InMarSat uses 3.60-3.623 MHz on 24 dBw Global beam to link downward; all narrow band telephony, data. (C/ All Ghorizonts/Rimsats also have 11.525 GHz capability on board. (D/ Insat satellites are low power and seldom 'spill over' south of their Indian boresight. (E/ Thaicom has 2 satellites at 78.5E and TV signals in vertical linear format may be viewable in western Australia. (F/ Intelsat 704 at 65.8E has S/A MPEG in abundance beamed into Middle East (need spectrum analyser to see). (G/ Intelsat at 62.9E, 60.0E and 57.3E have many analogue Ku west (beam) and some Ku east (beam) transponders in use with European and Asian programming.



AV-COMM SATELLITE TV EQUIPMENT



1994 WORLD SATELLITE YEARLY



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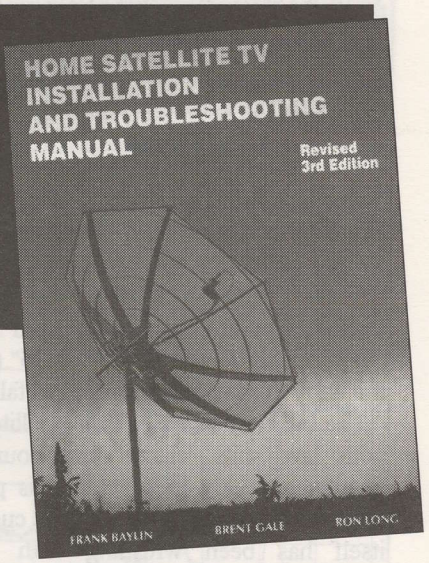

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WITH THE OBSERVERS

AsiaSat 2 Launch 'Odds'

In the absence of an official announcement from either AsiaSat or China's Great Wall Corporation, Hong Kong bookies are giving "odds" on when AS2 will launch. Earliest possible date: September (10-1); October (8-1); November (6-1); December (5-1); January (3-1); February (4-1); March (6-1).

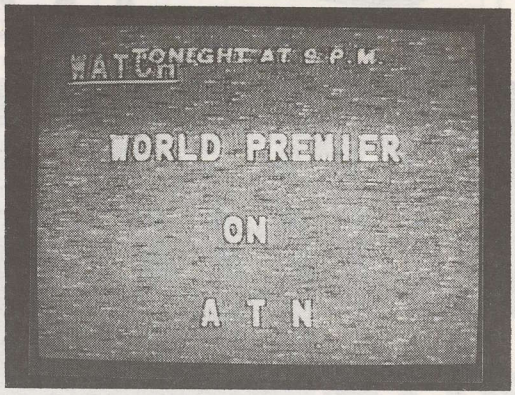
Shane Wilson (Mareeba via Cairns, Qld) reports the new multiethnic Indian broadcaster 'APNA' as *"noisy but watchable on 103E (1375 IF)."* This broadcaster had announced plans to be on 103E and 140E (a Russian operated Ghorizont) late in April but now advises their plans for 140E are no longer firm. Brian Oliver, using the University of Auckland 7.3m studies dish, also reports the 103E signal as *"very marginal"* into New Zealand. APNA planned 6 (Indian) language broadcasts, 24 hours per day (see SF#8, p.22) and SF has learned a New Zealand firm has been negotiating to have redistribution rights for the programming in the South Pacific. At one point during April APNA advised they were *"negotiating for use of G1 TR R6"* (the RAJ-TV transponder) but early in May that appeared to fall through.

The Indian marketplace for satellite TV continues in disarray with law suits, claims and counterclaims making press headlines weekly there. Until this point in time most Indian satellite broadcasters have been customers of Rimsat which itself has been wrestling with a (U.S.) court ordered reorganisation (see SF#8, p.2). The possible scenarios for Rimsat are as follows:

- ✓ It will continue on operating as at present
- ✓ The Russian space corporation will take over the operation of the G1 and G2 birds
- ✓ A new 'operator' for G1 and G2 will appear, replacing Rimsat

Suggestions that some of the Indian users of G1 and G2 may be in arrears in their payments to Rimsat and therefore may be taken off of their transponders are found frequently in the Indian trade press. However, for every present Indian programmer now on Rimsat there are at least two standby 'replacements' available.

ATN, on G2 TR R1 (142.5E) with the unusual 'folded-over spot beam' that finds its way into much of Australia and most of New Zealand (see SF#8, p.4), is one of the most controversial programmers presently out of India. As Shane Wilson notes *"ATN is running huge 'Watch Me' promotions on air featuring many excerpts from U.S. and European networks."* The promos are in English (as are some of ATN's commercials) and claim the service will be carrying programming from the U.S. ABC and CBS (television) networks at some undefined *"early"* date. Recently, in addition to Hindi movies starting around 0900 UTC (9PM Auckland / 7PM Sydney) they have also been running 'specials' from non-Indian networks.



ST Teleport (a new transmit-to-satellite facility) in Singapore claims it is now uplinking, or will shortly be uplinking, the following: Golden Eagle (to G2, R9), MTV (Mandarin to PAS-2 TR3V) , ATN (G2, R1), AsiaNet (G1, R9) and SUN TV (G1, R7). ATN had previously been uplinked from Rimsat's Subic Bay (Philippines) facility.

Les Brooks (Alice Springs, NT) operates one of the best equipped satellite-direct installation firms currently reporting to SF. His dishes include a 4.25m Paraclipse, 3.6m Hills fibreglass, a pair of 1.6m Ku dishes, a 2.75m Bird dish, a 1.5m Orbitron, a 1.2m Orbitron and his 'show-off' antenna, a 36cm Ferguson offset he moved with him from the UK. The 36cm dish provides watchable pictures from PAS-2's Asia Business News test feed currently on Ku. Les has identified 18 different satellites from Intelsat 704 (66E) to 183E (I503) including horizontal-only transponders on AsiaSat 1 (138E).

Several Australian observers have asked if Ghorizont 19 at 96.5E has been replaced with a new satellite. Shane Wilson finds the CCTV-4 signal now *"almost noise free"* and that other users have *"changed transponders"* with greatly increased signals. As we note on p.18 in this issue, Ghorizont 19 as of mid-April was inclined at +/-3.16 degrees which indicates it would be nearing the end of a useful life. Certainly a change would not be unexpected.

Russian sources tell SF that the first launched Express class satellites (including a key one to 14W) are experiencing electronics problems. The C + Ku satellites are a dramatic improvement over the standard Ghorizonts:

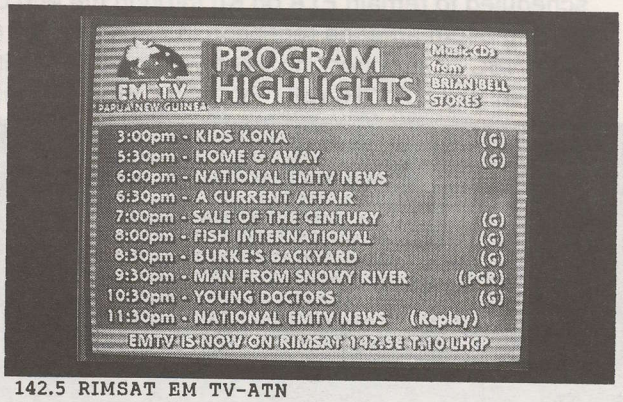
WITH THE OBSERVERS: Reports from Pacific Ocean Region (POR) satellite dish operators relating to reception, equipment changes, programming trends as reported to SatFACTS using our POR Observer reporting form on page 25 (this issue). Photos of satellite reception, equipment, personnel are invited. When snapping TV screen photos: Use ASA 100 film, set camera at 1/15th second for PAL / SECAM, 1/30th for NTSC with aperture of F3.5 to 4, camera on tripod or stand. Material submitted cannot be acknowledged except by publication; none can be returned. Material may also be faxed (64-9-406-1083); note deadline on Observer card.

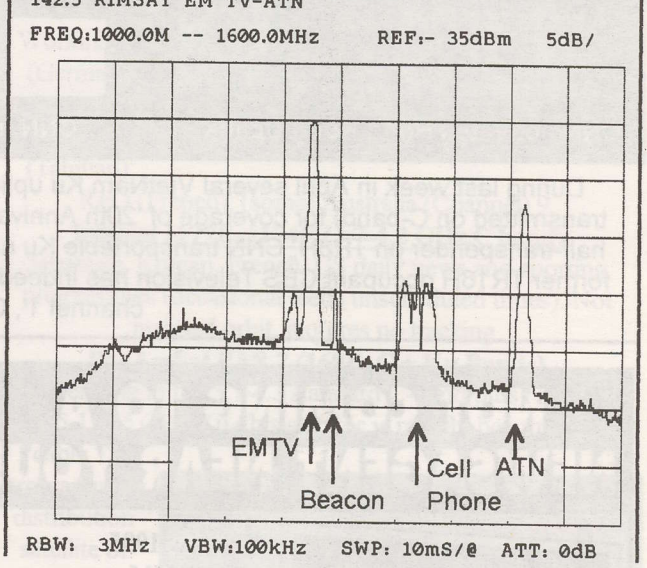
EM TV UPDATE

Papua New Guinea's EM TV (pronounced on-air as "Mmm-TV" by announcers) got off to a shaky start in April but managed to correct all but two technical problems by the end of the period. Because Rimsat G2 is moving in inclined orbit, EM TV must track it with their own uplink. Normally an uplinker will lock onto the satellite by tuning in a steady ('beacon') carrier on the satellite with a special receiver. The receiver monitors the steady-state beacon signal level and when it detects a fall off in signal level, the receiver signals the motor tracker to move the dish until the signal is repeaked. Unfortunately Ghorizont class satellites have no beacon (!) and for the first few days EM TV personnel had to monitor their own downlink signal and manually follow the satellite in inclined orbit. This was not always perfect and viewers saw the EM TV signal slowly fade out as the EM TV uplink lost 'sight' of G2. So the Subic Bay (Philippines) G2 uplink placed a substitute 'beacon' carrier on G2, at a receiver IF of approximately 1288 MHz, which gave EM TV something to 'lock onto'.

You can see the 'substitute beacon' on the spectrum analyser print (to right) provided by observer Steven McKelvie (Napier, NZ): EM TV is the strong carrier above the 'z' in kHz (bottom of chart) while the 'beacon' is just to the left of the next vertical line to the right from EM TV. If you ever find the 1288 MHz carrier is approaching the strength of EM TV, or is stronger on your receiver, that is a sure sign that EM TV has "lost" G2!"

Two other problems remain: The picture is 'grainy' ('busy-ness' [noise] in the picture background) even though the signal is strong. We believe this is a problem occurring between the EM TV studio in Boroko and the uplink to G2; this is actually 'AM' (amplitude modulated) noise of the type you would associate with less than high quality terrestrial (VHF) reception. And, number two, the audio is sometimes of a very poor quality which could also be explained by a design fault in the link from the studio to the uplink. Other than those observations, we report EM TV is very strong from the Cooks to western Australia and most points in between, and, we welcome them to our Pacific Ocean Region "neighbourhood! "





✓ Rather than 3.65 to 3.95 GHz, they have 12 C-band transponders spread between 3.65 and 4.2 GHz.

✓ Rather than 1 Ku, they have 2 (11.5-11.6 GHz)

✓ Beam (coverage) patterns can be 'steered' in space to suit the customers whereas Ghorizonts have a one time 'point and shoot' adjustment which prevents post-launch adjustments to coverage patterns when customer needs change

✓ Inclined orbit is gone (!) with a stability of +/- 0.2 degrees

✓ The lifetime is extended (from typically 3 years to typically 5-7 years)

PanAmSat PAS-2 Update (169E, 16 C + up to 8 Ku transponders for POR)

Turner's TNT / Cartoon Channel package, announced in SF#8 as likely to start transmission in FTA on TR10 (1/2 format, 1154 MHz IF) has been delayed with a new 'target date' around June 15. Observers report many Hong Kong tests of the new Turner (Net) uplink (see photo here) during the past 30 days. Asia Business News is scheduled to remain FTA on Ku through the end of May; very strong signal (vertical, IF 1113) widely reported including 34cm antenna reception in Alice Springs (!). MTV Mandarin signal (TR3V, 1346 IF) typically "*as strong as ANBC or stronger*;" no word yet on how long it will be FTA, or format if it encrypts. NHK now typically 14 hours per day (TR12H) with 'TV Japan' programming in FTA relay to U.S.A. for use there by DBS and cable TV.

CNN activates Hong Kong Uplink | CNN in Vietnam: TR8H | CMT TESTS on Ku

During last week in April several VietNam Ku uplinks were cross-strapped (i.e., PAS-2 received on Ku but transmitted on C-band) for coverage of '20th Anniversary' of American and allied pull-out from SE Asia. Using half-transponder on TR8H, CNN transportable Ku uplink (above) was typical. And PanAmSat has verified that former TR16H occupant CBS Television has indeed moved to TR1V in SA MPEG digital (CMT on 'programme channel 1', CBS on channel 2).

European reports say the 14W Express has "*lost*" both C and Ku transponders (i.e., they seem to have quit working) within months of launch. Russian sources say future Express launches will be delayed until the electronics problems are corrected. Ahead: Express locations announced for our part of the world include 53, 80, 90, 96.5, 103 and 140E (note 96.5E) as well as possible use by Rimsat, and, a joint Canadian -Soviet firm at 145E. SF#10 will take a detailed look at the Express Class design., similar to our look at G1 and G2 appeariung in our April issue (SF#8).

John Bracey (Mirrabooka, WA) has joined the C-band observers by re-equipping his 1.8m Ku dish with an Echostar 25 degree LNB and Chaparral feed mounted atop a Hills Clothing Hoist (!). ANBC is the best of his PAS-2 signals.

Ray Aldrige (Tamworth NSW) reports EM TV is "very clear" on his 3.7m dish equipped with a Chaparral MC115.

Alek Zapara (Gosnells, WA) reports MTV Manadarin on PAS-2 is not quite as good as ANBC and NHK is of the same level. From G2, he finds the EM TV signal 'P3' on a 1-5 scale with 5 perfect.

Tyrell Ruscoe (Wanganui, NZ) reports considerably increased PAS-2 Ku activity although none is known to be permanent at this time. Another Auckland area observer believes there are two MPEG digital carriers on Ku as well, possibly on one of the two China-beams (See SF#5, p.6). PanAmSat seldom releases information relating to 'test transmissions'.

Peter McDonald (Bendigo, Vc) first observed MTV tests April 15th on his 1.6m dish (actual testing started April 12).

The extra carrier signals on G2 (IF 1364) are in hemi-beam (SF#8, p.5) and are for linking between Cellcom (a firm) cellular sites (within SE Asia) for 'E-1 trunking' using something called 8PSK modulation. Their relative stability and good level makes the signals useful for G2 dish peaking.

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THE BASIC DEALER DEMO SYSTEM

First you need a dish: An Orbitron 3 metre model SX-10 with polar mount will cost you NZ$1,324. For the feed, you need C and Ku band capability. The Chaparral Co-Rotor handles C and Ku with right hand circular (Intelsat), left hand circular (Rimsat), linear vertical and horizontal (PAS-2) plus linear vertical and horizontal for Ku (PAS-2 and Optus): $289.66. Two LNBs are called for: Chaparral 20 degree on C ($169.66), Gardiner 0.6dB on Ku ($217.24). Cables required include 4-core motor drive actuator ($20.69 / 30m), 3-core feed polarisation control ($20.69 / 30m) and L-band rated RG6/U ($45.52, 60m). The actuator that drives the polar mounted dish through the orbit belt (from 180E to beyond 130E) is a 24" model ($227.59). The receiver needs a few 'wrinkles': Ability to remote control the dish and feed polarity; dual inputs for C and Ku feeds; wide IF (950-2050 MHz); variable IF bandwidth (12-27 MHz); tuneable audio subcarriers and stereo (MTV in stereo is awesome!); unfiltered / unclamped baseband output for future addition of analogue decoders (B-MAC) and a built-in (UHF) modulator. The Benjamin BEC-6000 does all of this for $568.97. Which brings us to an all inclusive dealer price of NZ$2,884.02 (+ GST, freight).

Even without the complexity of decoders and digital receivers, there are 20 channels available to you (with Optus Ku) for "Show 'N Tell" in your shop (see right). Once you have the basic system running, you can one by one evaluate decoders for Discovery, ABN, CMT et al.

Prices shown are "dealer net" from respected distributors; for retail (dealer to customer) pricing add NZ$500 for installation, multiply total by 1.4.

Intelsat I180 (180E, 3.7-4.2GHz C band)

This satellite is aged and in "inclined orbit" requiring a second actuator for complete tracking (an optional extra to system priced here). In early 1996, this satellite will be replaced with a brand new geo-stationary bird. Programmers available: (US) NBC network, (some) CNN, (US) Worldnet + (German) Deutsche Welle, (Tahitian) RFO (French), (some) Australia (Channel) 9.

NBC NEWS FEEDS on I180

NBC NEWS CHANNEL
10PM SPORTS 4/11

****FEED IN PROGRESS****	PG 1
SP21 HEAT/KNICKS	1050-11
SP22 CAVS/MAGIC	22:06:10
SP23 HAWKS/SIXERS	22:36:40
SP24 PACERS/BULLS 3/4	22:30:00
SP25 MAVS/ROCKETS	1045-7
SP26 PISTONS/BUCKS	1040-7
SP27 BLAZERS/SPURS	22:37:40
SP28 CAPS/PENS	22:32:00
** MORE **	22:40:31 28/ET

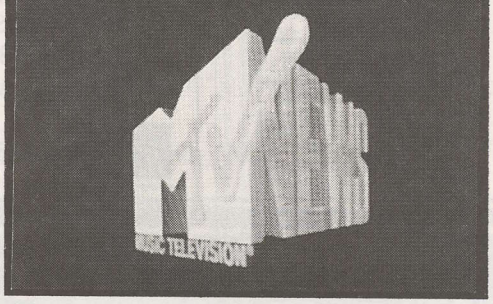
Intelsat I177E, I174E (3.7-4.2 GHz C band)

Japanese, Korean, French, US daily news and sporting programmes (occasional feeds unscheduled times). Not inclined orbit, requires no tracking.

PanAmSat PAS-2 (169E, C + Ku Bands)

Operating in the 3.7-4.2 standard C-band plus (11.75) 12.25-12.75 GHz Ku, this satellite is rapidly becoming the "cable TV programming distribution satellite of choice" for major programmers world-wide. Free-to-air programmers currently include: MTV Asia, ANBC, CNN, TNT / Cartoons, NHK (Japanese) on C-band, CMT + Asia Business News on Ku.

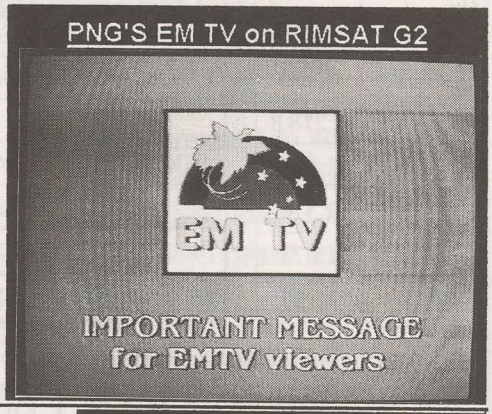
MTV ASIA on PAS-2



RIMSAT G2 (142.2E, C-band)

Presently offering FTA PNG's EM TV (an outlet for 9 Australia) and Hindi music-movie channel Asia Television Network.

PNG'S EM TV on RIMSAT G2



SatFACTS PACIFIC OCEAN ORBIT WATCH: 15 May 1995

TR#	IF freq
R6/-1	1,475
1	1,430
R7	1,425
1 - 2	1406/1425
3	1,385
R8	1,375
3 - 4	1346/1372
R9	1,325
6	1,310
6A	1,305
5 - 6	1288/1300
R10	1,275
10	1,256
7 - 8	1235/1249
R11	1,225
12	1,220
14	1,175
9 - 10	1161-Prime 1183/1154
16	1,135
11 - 12	1110/1115
18	1,105
13 - 14	1038/1060
22	1,015
15 - 16	985/985
23	984
23A	973
24	962

Gz/103	G1:130	Gz/140	G2:142.5	Gz/145	P169:Vt	P169:Hz	I174/177	I/180	Pattern
DublTV	RAJ TV	DublTV	ATN	DublTV					
								Keys.	w/29
APNA/Mus.	Sun:T	(APNA?)	JJAY						
					CMT:CBS/d	CTN/CCTV/ ABN/d			
								VDP	w/28
	ABC-5		(MCPC)						
					MTV	Discov/b			
	AsNET		Eagle:T					KDD	w/29
					ESPN/b	OccVid			
JainTV	Gemini		EMTV	DublTV				NBC/v	w/26
								Keyst.	w/26
					PAS-2	Tests			
	Money		Udaya:K						
								CBS/l	w/26
								Wnt	w/29
					Prime/d	CNN	←Cartoon (June Start)		
								NHK/l	w/25
						NHK			
								RFO	G/29
					ANBC	TFC/d			
								A9/b	G/25
						OccVid			
							NwsFds	NZ/d	G/22
							(Afrts/b)		
							NwsFds	TVNZ	G/22

MAY 1995 NOTES:

/d is digital, /b B-MAC,I other encryption. ANBC (underlined) is free to air FTA. Vdp(v) is Vidiplexed analogue, typically FTA but requiring Vidiplex unit. I180 patterns are: w/26 = western hemispheric, 26 dBw; G/22 = Global, 22 dBw (typically right hand circular). RIMSATS LHC. C-band IFs assume LNB 'LO' of 5150 MHz; Ku IFs 11,300. PAS-2 IFs: 1st Vt, 2nd Hz.

EMTV = usable 3m < dish

Discov/b = subscription available

Ku BAND ACTIVITY UPDATE

A3B1TR	IF Freq
1(**V**)	977
5L(**V**)	1,193
5U(**V**)	1,218.8
7L(**V**)	1,344
7U(**V**)	1,370
10(**H**)	1,073
11(**H**)	1,137

Optus A3/155.9E	Optus B1/160E
	TAB radio, data
ETV:>0000UTC	Occ.VideoNews
	Occ.Video
NHK:>1200UTC	ABC National
	SBS National
B1: Galaxy Digicipher, Ch. 0,2,5,6,(7)	
B1: Galaxy Digicipher, Ch. 0,1,2,5,6	

PAS2	IF Freq	Services/Users Reported
1K(H)	980nom	
2K(V)	980nom	
5K(H)	1100nm	
6K(V)	1100nm	Tests, special video feeds
9K(H)	1230nm	
10K(V)	1230nm	
13K(H)	1350nm	
14K(V)	1350nm	Tests, special video feeds

For PAS-2 Update, see p. 20-22.

Ku band data courtesy Robin Colquhoun (64-9-630-7127), Francis Kosmalski (64-9-849-3512), others. Galaxy digital (B1) is NTSC, GI Digicipher 1.

■ YOUR equipment survey:
Size dish(es): _____; Noise Temp LNB(s): _____
Make/model receiver(s): _____
Make/model standards conversion: _____

■ Friends with dishes (Will be sent literature explaining SPACE):

_____
_____
_____
_____
_____
_____

If mailing, to: SatFACTS Observers, PO Box 330, Mangonui, Far North, New Zealand

SatFACTS May 1995 SURVEY OF EM TV RECEPTION

We are seeking critical reports of the reception quality of Rimsat G1 EM TV (TR R10) to assist in mapping the coverage area. Please help!

My reception quality is: ☐ Excellent ☐ Good ☐ Fair ☐ Poor

I ___do ___do NOT notice variations in reception quality during the broadcast day

I ___do ___do NOT notice a graininess to the picture

I ___do ___do NOT find the sound acceptable

The size of my dish is: _____; my LNB is a _____

I ___do ___do NOT use a circular polarity feed horn

My satellite receiver is a _____ operated at a bandwidth of _____ MHz

My Name _____

Address _____

Town/City _____ _____ _____

Please return by 1 June to:

EM TV Survey, PO Box 330, Mangonui, Far North, NZ (Fax: 64-9-406-1083)

Instructions to Order from SatFACTS Data Shoppe:

○ **From anyplace in world:** Enclose payment in NZ$, or, in US$ at rate of $1NZ = 64 cents US (total in NZ$, multiply by .64) to **Far North Cablevision Ltd.**, PO Box 330, Mangonui, Far North, New Zealand

○ Complete your own ship-to information below.

Total amount of order (add items ordered on reverse side of this card): NZ$_____
(If paying in US$, multiply .64 times NZ$ number for total)

Ship to:

Name _____

Address _____

Town / City _____ _____ Country _____

IF Member of **SPACE** Pacific: Your membership Number (found on membership certificate, line 4:)_____

SatFACTS DATA SHOPPE

YOUR Source For Reference, Study Materials In The World Of Satellite TV

ENTRY LEVEL:

☐ **The WORLD of SATELLITE TV** (Asia Pacific edition) by Mark Long and Jeffrey Keating. The ideal "starter" manual for someone entering the field of satellite television. How the system works, what the parts do, how they all fit together. 226 high quality, well illustrated pages. Ease of comprehension plus excellent detail. Price: NZ$30 within NZ, NZ$35 elsewhere. Note: Limited copies remain in stock, these will surely sell out this month (We hope)!

☐ TB9402 / **MATV: Master Antenna Television Systems**. How to plan, select equipment for and install multiple outlet systems for motels, hotels, apartment flats and condos. Practical step by step guidance. Price: NZ$20 world-wide.

☐ TB9404 /**Home Satellite Systems**. What the parts are, how they go together for POR home TVRO systems; how you create a working system with maximum performance at minimum outlay. Price: NZ$20 world-wide.

☐ TB9405 / **Commercial Satellite Dish Systems** (SMATV). If you are building a system from scratch, also order TB9402 for the MATV portion basics. If you are rebuilding an existing MATV system to add satellite signals, you need this! Price: NZ$20 world-wide.

■ ALL 3 (TB9402, 9404, 9405) as a package for NZ$40 (you save $20).

DISH OWNING ENTHUSIAST LEVEL:

☐ **Coop's Satellite Operations Manual**. Originally written 1980, this manual explains how you locate and interpret the multitude of wide and narrow band signals available via satellite. Dozens of fun, new ways to get more from your dish system. Price: NZ$30 world-wide.

☐ **Gibson Satellite Navigator** (O/w 1980). The mechanics of the Clarke Orbit Belt, how a dish tracking system is designed and operated to allow full horizon to horizon reception with a motorised dish system. Very practical, very hands on with plenty of do-it-yourself instruction for inexpensive systems. Price: NZ$30 world-wide.

☐ **Coop's Basic Manual on Fine Tuning Satellite Terminals** (O/w 1980). The little things such as feeds, connectors, powering. Tips from the people who started home dish reception in the 1970s, building the foundation for the present TVRO industry day by day, discovery by discovery. Very practical, very hands on. Price: NZ$30 world-wide.

■ ALL 3 (Two from Coop, one Gibson) as a package for NZ$70 (you save $20).

BUSINESS MANAGEMENT REFERENCE MATERIAL:

☐ **CTD 9412 / StarNET TV Wants To Put You In The Cable TV Business.** When AsiaSat 2 is launched in mid year, StarNET's 7 free to air (plus 35 pay TV) services are designed to make you a cable TV operator. Price: NZ$30 world-wide.

☐ **CTD 9503 / COPYRIGHT - How It Works, Your Liabilities.** Must reading for anyone planning to distribute satellite programming to motels, hotels, communities. Price: NZ$30 world-wide.

☐ **CTD 9504/ GALAXY**- The detailed, inside story of what it is, where it wants to go. If your appetite to understand Galaxy is whetted by our 3 page report in this issue of SatFACTS, this detailed analysis (issued April 28th) is for you. Price: NZ$30 world-wide.

TO ORDER - USE BOTTOM CARD PORTION TO LEFT

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