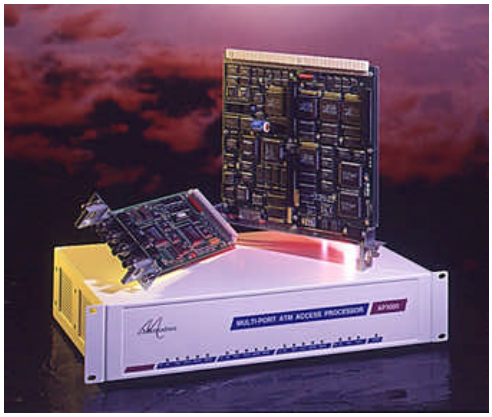
APSAT Satellite Platform

The Flexible Solution to Satellite Infrastructure

Satellite Division

PLATFORM OVERVIEW



FEATURES:

- 3, 4, 5, 8 and 9 Slot Chassis Available
- EIA530, HSSI, ECL, G.703, ASI Modems Supported
- E1, E2, E3, DS-3, OC-3 and Fiber Optics
- ATM or non-ATM Supported on Serial Interfaces
- Bit Rates in 1bit increments up to 155.52Mbps
- Asymmetric, Simplex and Full Duplex
- Point-to-Point, Point-to-Multi-point
- Redundant Power Supply on 4/5/8/9 Port APSAT
- When Operated as a Point-to-Multi-Point /Hubspoke Satellite Hub Multiplexer the APSAT can support up to 9 Remote Sites

About APSAT

The Metrodata APSAT Satellite Platform has evolved out of customer requirements for back-hauling satellite links and multiplexing terrestrial services over satellite. Due to its flexibility and scalability the APSAT makes a perfect choice upon which to base your Satellite Infrastructure.

The Metrodata Access Processor provides a single Core Platform for integrating Satellite & Telecoms Hardware and Services.

Utilising the Metrodata APSAT will allow you to re-design, optimise and transform your satellite network. You can design truly innovative satellite services, as Metrodata give you a platform to use your imagination. With the Metrodata APSAT you have a platform for building a lasting competitive advantage, because you can remove the thresholds placed on YOUR Service Delivery, by YOUR infrastructure.

Metrodata Satellite Division are at the leading edge of Satellite Communications, working with Telecoms and Satcoms Hardware Manufacturers to develop a truly scalable and flexible Core Platform for satellite service delivery.

Metrodata are offering you the opportunity to turn our product innovations into new, exciting and profitable services.

There has always been an invisible demarcation point between Telecoms Knowledge and Satcoms Knowledge. This is not just a knowledge barrier, but a hardware barrier as well. Most of the thresholds placed on your service delivery, come from your Satcoms and Telecoms Infrastructure. With the Metrodata APSAT Platform you can remove these thresholds and build truly scalable solutions, whilst drastically simplifying your network infrastructure.

BENEFITS OF THE APSAT INCLUDE:

- INCREASE THE USABLE BANDWIDTH OF YOUR CURRENT SATELLITE NETWORK
- REDUCE COST AND ENSURE SCALABILITY AND ADD CAPACITY
- DELIVER NEW AND EXCITING SERVICES

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ACCESS PROCESSOR OVERVIEW

There are 3 Main APSAT Chassis available in the Access Processor Range. These are the AP3000 (3 Slot), AP4000 (4 Slot) and AP8000 (8 Slot). On the AP4000 and AP8000 we also offer an "APLite" option, whereby we remove the In Band Management Module. This gives you an extra Slot, so the AP4000 becomes a 5 Slot Chassis and the AP8000 becomes a 9 Slot Chassis. These are known as AP4000L and AP8000L.

AP3000

- 3 Slot Chassis - Small and Compact
- 2RU 19" Rack Mountable
- Built In 10/100BaseT Ethernet Port
- The AP3000 is typically used to back-haul Asymmetric satellite services cost effectively over Fiber, WAN, ATM or Microwave Radio Links. As part of the APSAT Platform the AP3000 also can be used as a Satellite De-multiplexer in a Hub/Spoke Network.

The AP3000 is a Fully Functioning ATM Switch. It can support ATM in and out on any port, non-ATM in and ATM out, and even non-ATM in and non-ATM out (Only using ATM across the back-plane).

	100-250V AC / 50-400Hz Version	-48V DC Version
AP3000 3 Slot Chassis	Order Code 80-07-003	Order Code 80-18-003

AP4000

- 4 or 5 Slot Chassis - Scalable Infrastructure
- 4RU 19" Wide - Non Rack Mountable
- Optional Redundant Power Supply
- The AP4000 is typically used as a Satellite Hub Multiplexer to aggregate multiple terrestrial services over satellite, or aggregate multiple satellite services over Fiber, WAN, ATM or Microwave L:inks. Where Redundant Power Supplies are a requirement it can also be used as a Satellite De-Multiplexer in a Hub/Spoke Network.

The AP4000 is typically used for high speed satellite link back-haul, where there is a requirement to support 3-4 satellite services over a Link. This was the first of our Access Processor products, having been developed specifically to integrate satellite and terrestrial networks. As with any of the APSAT Platform it supports all the AP Modules, which means it makes a good upgrade path from the AP3000.

The added feature of the AP4000 is that it can be fitted with or without an In Band Management Module. Without the Module you have 5 slots available to use. The name of this product is the AP4000L. With the Redundant Power Supply fitted this would be the AP4000LR.
The AP4000 with In-Band Management is simply the AP4000. With a Redundant Power Supply it's the AP4000R.

	100-250V AC / 50-400Hz Version	-48V DC Version
AP4000L 5 Slot Chassis	Order Code 80-07-101	Order Code 80-18-101
AP4000LR 5 Slot Chassis	Order Code 80-07-121	Order Code 80-18-121
AP4000 4 Slot Chassis	Order Code 80-07-001	Order Code 80-18-001
AP4000R 4 Slot Chassis	Order Code 80-07-021	Order Code 80-18-021

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AP8000

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- 8 or 9 Slot Chassis - Scalable Infrastructure
- 6RU 19" Wide - Non Rack Mountable
- Optional Redundant Power Supply

The AP8000 can be used to aggregate multiple satellite services, at high data rates across a variety of infrastructures. Within Military Satcoms it provides a means of multiplexing up to 8 Remote Satellite Terminal Links into a single back-haul or reach-back link. Added to this is the fact that it can run 7 x EIA530 Crypto End to End Links at a Maximum 20Mbps per link.

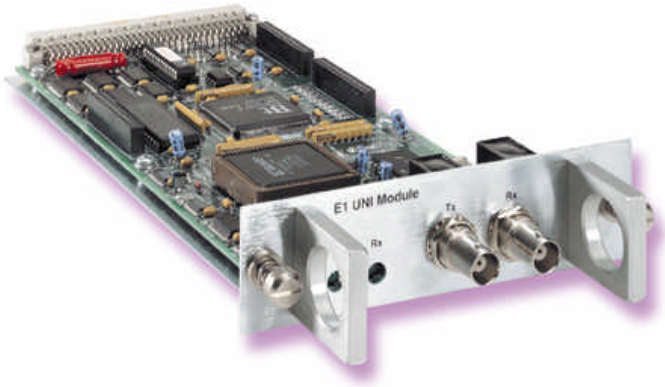
The AP8000 is typically used for high speed satellite link back-haul, where there is a requirement to support 7-8 satellite services over a Link. This was tadded to the Access Processor range primarily as a means of fanning out lower speed services from a E3, DS-3 or OC-3 Link. As with any of the APSAT Platform it supports all the AP Modules. The AP8000 can provide a variety of different interfaces such as E1 (Voice), 10/100BaseT (Email/Internet), ASI (Video) and EIA530 (Crpyto) and support these across all the different Satellite Modems. This is particularly useful for Welfare Communications over Satellite.

The added feature of the AP8000 is that it can be fitted with or without an In Band Management Module. Without the Module you have 9 slots available to use. The name of this product is the AP8000L. With the Redundant Power Supply fitted this would be the AP8000LR.
The AP8000 with In-Band Management is simply the AP8000. With a Redundant Power Supply it's the AP8000R.

	100-250V AC / 50-400Hz Version	-48V DC Version
AP8000L 9 Slot Chassis	Order Code 80-07-111	Order Code 80-18-111
AP8000LR 9 Slot Chassis	Order Code 80-07-131	Order Code 80-18-131
AP8000 8 Slot Chassis	Order Code 80-07-011	Order Code 80-18-011
AP8000R 8 Slot Chassis	Order Code 80-07-031	Order Code 80-18-031

AP MODULES

"Flexibility through choice"... With a Universal Interface Module



Metrodata APSAT supports a wide range of Modules to allow integration of Satellite, Terrestrial, Wireless and Fiber based networks. These might be Satellite specific such as HSSI, ASI or ECL. Or Military with EIA530 Serial CE Module that supports up to 20Mbps.

Where applicable Serial CE Modules operate in 1bit increments, and support Asymmetric, Simplex and Full Duplex operation.

All Modules will work in any of the AP Chassis, which means you can start with an AP3000 and as your services grow upgrade to an AP4000 or AP8000 Chassis.

This APSAT Platform Overview should give you an idea of what kind of Chassis and Modules you need, but please contact us to make sure. There are many ways of using the Metrodata APSAT, and it is advisable for you to discuss your requirements with our Technical Staff to ensure the optimal and most cost effective solution.

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Product Application Note: APN-043

UNIVERSAL INTERFACE MODULES

ATM UNI

When back-hauling Satellite Connections over Terrestrial Infrastructure, the APSAT platform uses ATM as a transport mechanism. However, we only use ATM where it suits the application. We make the use of ATM transparent to the network. If you consider that you are have a point-to-point link with Access Processors at either end, then the ATM UNI Modules are your line cards. Whether you are using a SONET/SDH DS-3, ATM OC-3 or E3 Microwave Radio it doesn't matter to the APSAT, you simply choose the module for your link rate. If you wish to transport 34/8Mbps over an E3 or 45/8Mbps over a DS-3 (Or similar rates) then the Zero Wastage feature will be useful for you. This is covered in more detail later on in this document.

The ATM UNI modules are all single port, and hot swappable. The AP product range provides a wide range of interface types and the E2 support is unique in the industry.

For the SDH Modules, WDM, 1550nm, RJ45, ST and FC/PC connector options are available, please contact us.

80-17-201	**E1 BNC**
80-17-202	**E2 BNC**
80-17-203	**E3 BNC**
80-17-206	**DS3 BNC**
80-17-207	**OC3 /STM-1 Multimode SC**
80-17-208	**OC3 /STM-1 Singlemode SC short-haul**
80-17-209	**OC3 /STM-1 Singlemode SC long-haul**
80-17-210	**OC3 /STM-1 Electrical BNC**
80-17-213	**HSSI UNI Interface**
80-17-215	**ASI UNI Interface**
80-17-214	**Policing Module**
80-17-217	**Resilient SDH UNI SM-SH**
80-17-219	**EIA-530 UNI**

IP / ETHERNET

80-17-604	**10/100 baseT**
80-17-605	**100 baseF MM SC**
80-17-608	**100 baseF SM SC short-haul**
80-17-609	**100 baseF SM SC long-haul**

If you require higher packet throughput than 30Mbps, we can support up to 68Mbps using the HSSI CE Module and an external HSSI to Ethernet Converter (LH1000).

Circuit Emulation

80-17-301	**T1 (quad) RJ45**
80-17-302	**E1 (dual) BNC**
80-17-303	**E1 (quad) RJ45**
80-17-304	**E2 (dual) BNC**
80-17-305	**E3 BNC**
80-17-306	**DS3 BNC**
80-17-308	**Structured E1 (quad) RJ45**
80-17-309	**HSSI Circuit Emulation Interface**
80-17-332	**ASI Circuit Emulation Interface**
80-17-344	**EIA530 Circuit Emulation**

The CBR modules use AAL.1 adaptation and support both synchronous and adaptive clocking modules. These modules are all hot swappable

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APSAT APPLICATION OVERVIEW

The Metrodata APSAT Platform has been developed for interfacing Satellite Modems with Terrestrial Networks. Further uses of the APSAT included back-haul of Asymmetric Satellite Connections over Leased Lines, and back-haul of HSSI/ECL Over Fiber.

Metrodata have a strong product in the Access Processor. Its features are highlighted on the right:

FEATURES:

- **ATM Connectivity at E1, E2, E3, DS-3 and OC-3 rates**
- **Fiber Connectivity at Multi Mode, Single Mode Short Haul and Long Haul**
- **Serial Connectivity at EIA530, HSSI/ECL and ASI Interfaces**
- **Serial Data Rates in 1Hz clock increments**
- **ATM to Serial Conversion for ATM Over Satellite using EIA530, HSSI, ECL and ASI Satellite Modems**
- **Ethernet, Voice and Video also supported**

Satellite Division

BUILDING BLOCKS

With the Access Processor we are able to provide connectivity between:

- ATM Switches, ATM Access Devices and ATM Concentrators
- Low Speed Synchronous Serial Equipment - Cryptographic Equipment
- Any speed Serial Satellite Modems
- ATM Encrypters
- Serial Encrypters
- Fiber Optic Modems
- Routers and SDH/Sonet Muxes

These are the "Building Blocks" of Global Communication Networks. These are inherent in almost all tactical/military and commercial satellite systems.

Often these "Blocks" cannot be fitted together, because of an incompatibility between their interfaces, protocols or clock/data rates. This is where Metrodata can help. The Access Processor basically provides the "cement" between the Blocks, removing interface connectivity issues, optimising the use of specific protocols and resolving clocking problems.

As well as being a fully functional ATM Switch [ATM in, ATM out], the AP Products can also Multiplex non-ATM services into a Single ATM Trunk.

ATM Interfaces supported are E1, E2, E3, DS-3 and OC-3. Non-ATM Interfaces supported are T1, E1, E2, E3, DS-3, 10/100BaseT, HSSI/ECL, ASI and EIA530. ATM Over Satellite or ATM Over Serial Modules are currently HSSI/ECL, G.703 and ASI.
The Access Processor can provide speed, interface and protocol conversion between incompatible network products. We can convert atm to non-atm, atm to atm (DS-3 to E3 etc), atm to fiber, atm to serial, atm to wan, ethernet to wan, ethernet to G.703, ethernet to serial, ethernet to fiber, serial to fiber, fiber to fiber and WAN to serial.

The only limit to using the APSAT as your Platform for integrating Satellite and Terrestrial Networks is your imagination.

We sit in various points of the network, but historically this has been between the Satellite Modems and the Telecoms Network.

This might be a Router, SDH Mux, Fiber Optic Modem or an ATM Network for example.

Metrodata APSAT has strengths that mean it is the best solution out there for Satellite Service Back-haul.

These are:

- HSSI, EIA530, ECL, ASI and G.703 Satellite Modem Interfaces Supported
- Data rates from 8k to 155.52Mbps
- Asymmetric Services supported in 1Bit increments
- Multiple Satellite Links Supported
- Offer Point-to-Multi-point networks at data rates up to 155.52Mbps.

Dark Fiber Modules and WDM allow Tx and Rx on one single Fiber

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INTEGRATING SATELLITE AND TERRESTRIAL NETWORKS

WHAT IS THE APSAT?

With the Metrodata Access Processor we :

- Satellite Service Back-haul
- Satellite Service Multiplex
- Terrestrial Service Multiplex

How we do this is shown in the diagrams below

Please note that these are generic diagrams, and as such do not show the full and complete functionality, scalability and flexibility of the APSAT Platform. These just let you see where it might be worthwhile deploying the APSAT Platform within your network.

"I found the Metrodata APSAT to be the best Engineered solution that scales"...

Another Satisfied Customer!

Satellite Division

SATELLITE SERVICE BACKHAUL

This is the most common application the APSAT is used for. Using the AP3000 here makes sense for single or dual services.

In this diagram we are supporting HSSI Satellite Modems and HSSI Router

This could just as easily be ASI / EIA530 / G.703 Satellite Modems and a HSSI Router

The Back-haul or Long-haul link between the 2 x AP3000's can be pretty much anything.

Data Rates can be Asymmetric | Simplex | Full Duplex. We support Alarm Masking on Simplex links.

Shipped Pre-Configured the AP3000 is Plug & Play!

SATELLITE SERVICE MULTIPLEX

Primarily for Point-To-Multi-Point, the fact that we can accept Serial Satellite Modem Interfaces at their Maximum Rates (EIA530 - 20Mbps & HSSI - 90Mbps) means we offer more scalability of data rate than any other Satellite Hub Multiplexer.

The Modular architecture of the APSAT means different Satellite Modems and Different Satellite Services can be multiplexed together and back-hauled over a single link.

For Military Applications we support EIA530 Crypto and Remote Satellite terminals up to 20Mbps

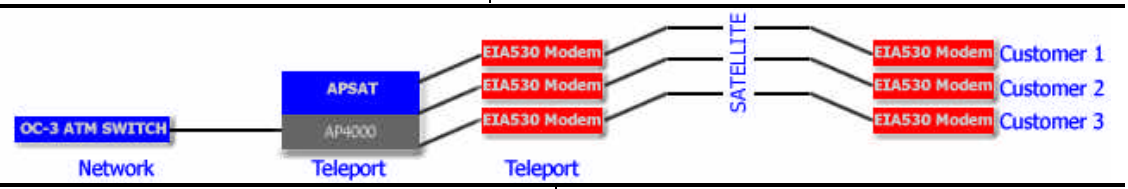
Using the AP8000 as a Satellite Hub Multiplexer we can support up to 8 Remote Sites

We support ATM Over Satellite using HSSI, ASI and EIA530 Serial Satellite Modems

2 x EIA530 at 20Mbps Can be transported across a DS-3 link

7 x EIA530 at 20Mbps can be transported across an OC-3 Link

Dark Fiber can be utilised and Multiple HSSI transported across it.



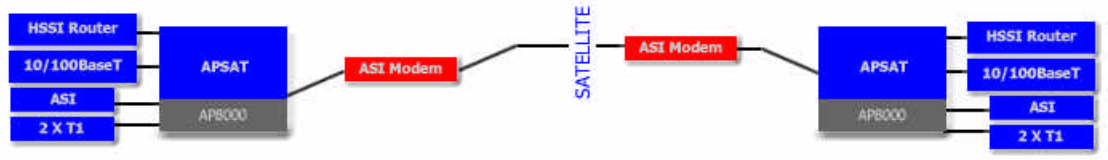
TERRESTRIAL SERVICE MULTIPLEX

This is something new, and can be anything from 7 x E1's/T1's muxed together over a Single HSSI Satellite Link, to a whole multitude of Services transported across a single satellite link.

This Diagram shows a Military Welfare Communications network

Troops Phoning Home, Surfing The Web, Answering Emails and receiving Video Based Distance Learning are all supported on the APSAT Platform

This could also all be encrypted, by adding an ATM Cell Crypto.



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APSAT EXTRA FEATURES

The Metrodata APSAT supports a number of features that are specifically useful to Satellite Networks.

These features are specific to certain applications, and are covered in more detail in our extensive Application Notes.

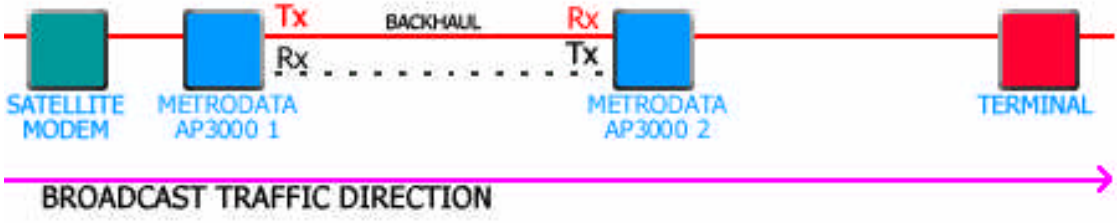
These Include:

- **Simplex Alarm Masking**
- **Zero Wastage Architecture**
- **WDM Modification For Dark Fiber**

These features are standard in all APSAT Products.

Simplex Alarm Masking

When back-hauling or extending a Simplex/Broadcast Satellite Link it is important to consider the implications on the Network Equipment of the link only operating in one direction. With the Metrodata APSAT, we had a customer with a Broadcast / Simplex Application. They were building a completely redundant switched system. When you are transmitting in only one direction, the link can generate errors. These errors would be relayed to the redundancy Switch, causing a Switch Over.
In the diagram below we have shown the basis of a Simplex back-haul link.

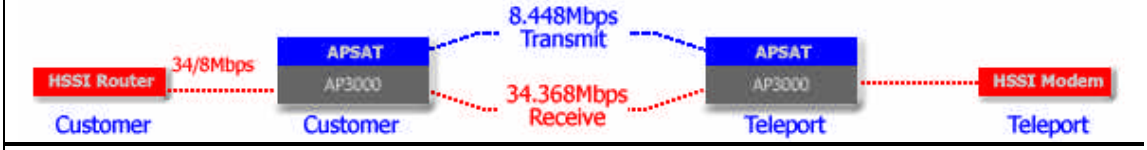


The Broadcast Traffic Stream goes from left to right. On the Metrodata **AP3000 1** it can be seen that we are transmitting out of the Back-haul Port, and then at the other end of the Back-haul we are receiving on **AP3000 2**. However, there is no traffic in the return direction. This means that the following happens. On Metrodata **AP3000 2** we get a Transmit Under-run because there is nothing being transmitted. This would normally mean a Minor Alarm, and wouldn't constitute a Switch Over. However, on **AP3000 1**, you would get a Loss Of Signal as the unit would not be able to see the Back-haul Link at all. This would be a Major Alarm and as such would force a Switch Over.

With the Alarm Masking feature enabled, it is possible to mask the alarms that are caused by running a Simplex Connection.

Zero Wastage Architecture

When back-hauling Asymmetric rates, we use ATM as a mechanism for achieving what is in effect a full-duplex link across the Back-haul. ATM incurs an overhead of around 10%. Initially when back-hauling using ATM we found that this overhead presented a problem. For example, most of the ISP Backbone links were 34Mbps Transmit and 8Mbps Receive. This is fine if you are transporting this over a DS-3 Back-haul as this is 45Mbps. However, if you only have an E3 Back-haul, it can be difficult.
Whilst you can transport the 8Mbps receive as ATM cells running at 34Mbps, you cannot do the same with the 34Mbps transmit path. What we developed was the ability to use ATM only across the Back-plane of the APSAT.
Lets take the 34/8Mbps Back-haul over an E3 Link. This is shown in the diagram below.



The Red/Dotted Links show where ATM is not used, and the Blue/Dashed links where ATM is used. The Service to the Customer is non-ATM, and the Metrodata APSAT makes this completely transparent to the Customer or the Network. This requires an E3 UNI Module and an E3 CE Module at either end. This can also be done with a DS-3 Back-haul.

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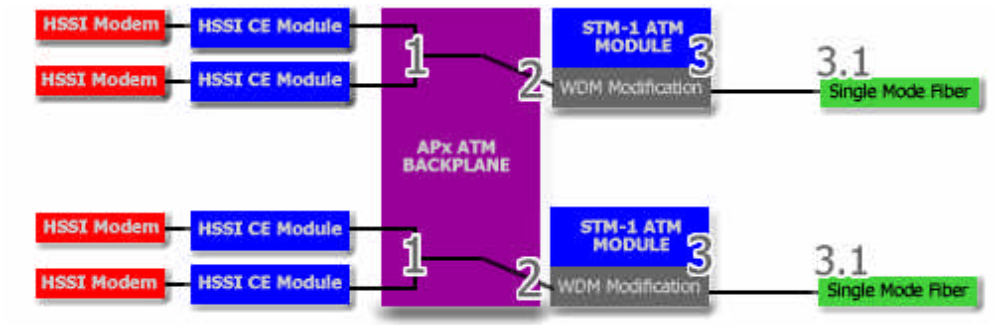
WDM Modification Over Dark Fiber

Fiber is becoming more widely used in Satellite Back-haul. This might be Military CDI/NRZ Fiber Links, Dark Fiber or "Dim" Fiber. Metrodata are specialists in HSSI and EIA530 Over Fiber. Here we are using the Access Processor almost as a HSSI Aggregation Switch. The maximum data rate we support on HSSI is 90Mbits. Generally speaking, the only equipment that runs HSSI at such rates is a Satellite Modem. Typically the maximum rate of most other HSSI devices is STS-1 or 51.84Mbits.

In this case, we are transporting 4 x 51.84Mbits HSSI Connections over a Single Pair or Fibers. This is possible due to the WDM Modification we can make to our Fiber Modules, allowing us to transmit and receive on the same Fiber.



1. Aggregate 4 x 51.84Mbits HSSI CE into 2 x ATM On the APx Backplane
2. ATM from the Backplane into the 2 x STM-1 Single Mode Fiber Module
3. Using the WDM Modification, Transport the 2 x STM-1 on a Pair of Fibers

3.1 Transmit on 1300nM & Receive on 1500nM Wavelengths

We can just as easily aggregate 2 x HSSI/EIA530 Links across a Single Fiber. This WDM Modification needs to be ordered at time of Manufacture, it is not an upgrade available to existing OC-3/STM-1 UNI Module Customers.

The APSAT also comes into its own here as a simple HSSI Fiber Optic Modem or HSSI FOM.

APSAT Application Notes

Please Note: This is simply a general product overview of the APSAT Platform. Metrodata have an extensive range of Application Notes covering Commercial and Military Satcoms. These notes are detailed Technical Documents, and are available on our Website or on CD. If you have any questions regarding the APSAT Platform, then please contact Metrodata, and we will be happy to discuss your application in more detail.

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