Datum Systems, Inc.
23 Las Colinas Lane, #112
San Jose, CA 95119

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Technical Note

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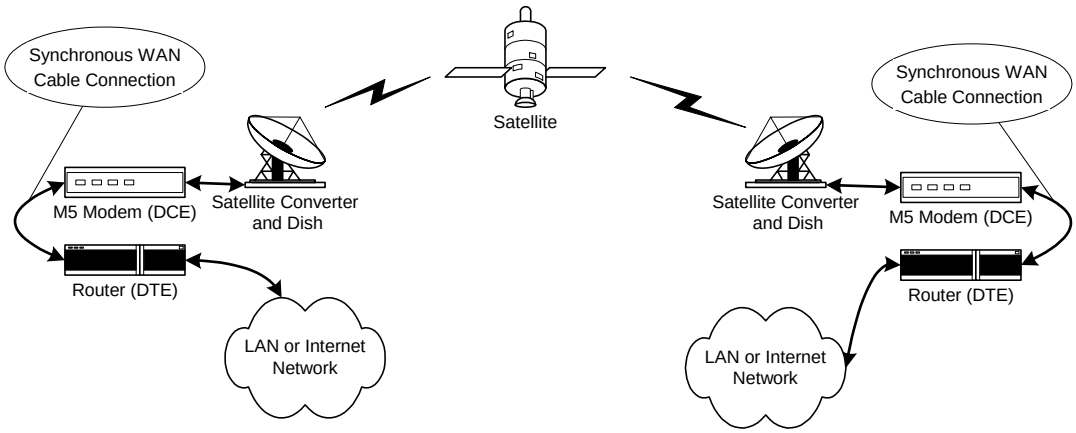
Subject: Connecting Cisco Routers to Datum Systems M5 and M500 Series Modems

This Tech Note is intended to provide system integrators and users of the Datum Systems M5 and the newer M500 Series of satellite modems with basic connection and setup information on interfacing to common Cisco routers. Many of our modems are used in this type of application, where a satellite link forms an extension of Ethernet or TCP/IP Networks.

Basic Link Description:

The basic link for this type application is very simple. It consists of an SCPC type satellite link with 2 modems and two Cisco routers connected to the modem on each end. The information is also applicable to one end even if the other is some other device such as a SnIP card.



The router forms a LAN to WAN conversion, bridging between the Ethernet physical LAN connection and the synchronous serial WAN satellite link. The WAN side in this application uses a WIC (WAN Interface Card) plug in specific to the physical interface type. The WAN side could also use a Cisco HSSI interface for higher speed when coupled to the M500 series modem equipped with the HSSI interface option card. The WAN can use several different protocol forms, but one of the common types is HDLC packets. Besides the physical layer conversion, the router

is also managing the particular TCP/IP packets that are allowed to traverse the WAN link. This is an OSI model layer 3 function.

Note that there are actually several different ways to make the connection between the router and the modem. One alternative is to use an M5 Modem equipped with our Ethernet Bridge option interface. The router would then be one with an Ethernet type WAN port. Another way to accomplish the same connection would be to use a small Ethernet to synchronous converter like the RAD Tiny Bridge or CTC Union ET10A bridge converter between a router with an Ethernet type WAN port and the M5 modem. And finally the aforementioned HSSI interface.

Unit Definitions and Conventions:

As always a modem is by definition a DCE (Data Communications Equipment) device. To properly connect to the DCE modem the router must take the form of a DTE, or Data Terminal Equipment. These definitions bring with them several standard conventions. First the DCE normally presents a female connector, while the DTE presents a male connector. Also a DCE will normally provide both send and receive clocks to the DTE. The major exception to this clock convention is when interfacing to a synchronous standard that comes with embedded clocks, such as E1 and T1 links.

The Ethernet or TCP/IP packets on the LAN side can be considered as synchronous bits within a group of asynchronous packets. The WAN side is strictly synchronous following normally a V.35, RS-449 or EIA530 type physical connection.

M5 Modem Interface Clock Settings:

The modem clock settings are the default and simplest form of clocking. The Modem as DCE device supplies both the Send and Receive Timing signals to the router. Thus the Modulator Clock Source is set to "Internal" and the Demodulator Clock source is set to "Demod". This makes each link direction independent. The router supplies no clocks itself, as would be the case with Terminal Timing, but takes the clocks from the modem.

There also should be no need to use any modem buffering on the receive side as the router takes care of this function in its protocols.

The same basic configuration is also applicable to the use of the HSSI option interface card in the M500 series modem. With the M523 Feature Set the HSSI interface can be operated to a maximum of 29.52 Mbps using appropriate modulation and FEC modes.

Router Protocols:

Cisco Routers can use one of several WAN protocols, and the normal ones used are either PPP (Point to Point Protocol) or Frame Relay. Cisco Router's default encapsulation on synchronous serial lines uses HDLC framing. Cisco uses a proprietary HDLC packet header. Whatever protocol is used on one end of the link must be used on the other end.

The router will also typically show the status of the WAN link once it is set up in the form of Link and Protocol status as "Up" or "Down". If the satellite link was not correct, then the actual indication would be that the "Link" was down, while if the protocol was not correct then the indication would be that the Link is "Up" and the protocol is "Down".

The M500 series SnIP interface card running Linux can also be used on the other end of a link from a Cisco router connected as above. The SnIP should be set up in router mode which uses the Cisco HDLC headers by default.

What Cables to Use:

The most common WAN link seems to be V.35, although RS-449 or EIA530 should work equally well. The V.35 has the disadvantage of being a very old standard with a bulky connector. You can see pictures of the Datum Systems cables at
http://www.datumsystems.com/m5_pictures.htm

V.35 Connection – You can use either the DSF00-083 cable to adapt the modems DB37 connector to a Winchester M34 type V.35 female connection, or the standard DSF00-080 cable and a DSF00-082, DB25 to Winchester female adaptor. The Cisco cable used would then be the CAB-V35 MT (or CAB-SS-V35 MT if your router uses the smart serial cable), which adapts the Cisco's High density interface to a Winchester M34 Male connector.

CAB-V35 MT

DSF00-083

CAB-SS-V35 MT

RS-449 Connection – You connect the modem's DB37 female connector directly to the male end of the Cisco cable number CAB-449 MT (or CAB-SS-449 MT if your router uses the smart serial cable) which adapts the Cisco's High density interface to a DB37 Male connector.

CAB-449 MT

EIA530 Connection – You can use either the DSF00-080 cable to adapt the modems DB37 connector to a standard DB25 female connection. The Cisco cable used would then be the CAB-530 MT (or CAB-SS-530 MT if your router uses the smart serial cable) which adapts the Cisco's High density interface to a DB25 Male connector.

DSF00-080

CAB-530 MT not shown

HSSI Connection – You use a single cable on this connection between the router's interface and the Modem's HSSI interface – A Cisco CAB-1HSSI cable, which has the same 50 pin SCSI-2 type connector on both ends.

Cisco Interface and Cable Information:

The following information is taken from the Cisco Documentation web site. It refers to several common Cisco routers, and the WAN Interface Card (WIC) and cable information is applicable to a wide variety of equipment.

Notes written with yellow shading as in ***(Definitely not recommended!)*** are added by Datum Systems for clarification.

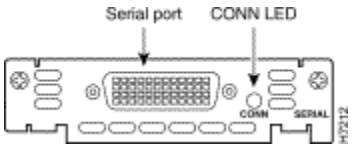
1- and 2-Port Serial WAN Interface Cards

The single and dual port serial WAN interface cards provide serial connections to remote sites or legacy serial network devices such as SDLC concentrators, alarm systems, POS devices, etc.

Table 18-236: Platform support and minimum IOS release

Product Number	Cisco 1600	Cisco 1720	Cisco 2600	Cisco 3620/40	Cisco 3660
WIC-1T	Yes	12.0X	11.3(2)XA	11.1(7)AA	12.0(5)T
WIC-2T	No	12.0X	11.3(2)XA	12.1(1)T	12.0(7)XK1
WIC-2A/S	No	12.0X	11.3(2)XA	12.1(1)T	12.0(7)XK1

Figure 18-110: One-Port Serial WAN Interface Card, WIC-1T



- The WIC-1T features the Cisco 5 in 1 connector which supports several serial protocols (V.35, X.21, RS-232, RS-449, RS-530) when used with the appropriate transition cable. This facilitates easy configuration and re-configuration as network requirements change without the need to purchase a different serial interface card.

  Note: When used in a Cisco 1720 and 1600 series router, the WIC-1T may also be operated in asynchronous mode. The WIC-1T is not supported in asynchronous mode when used in the Cisco 2600 and 3600 series.

- Cables: Cisco 5-in-1 (60 pin) cable support includes
  Note: Each of these cables below originally listed both the male (MT) and female (FC) connector options. The females were removed because they represent the DCE type connection, when the router should use only the male DTE connection as required by the modem.
  - CAB-V35 MT
  - CAB-232 MT ***(RS-232 is Definitely not recommended!)***
  - CAB-449 MT

- CAB-X21 MT ***(Not used by the M5 Modem)***
- CAB-530 MT

Dual Port Serial WAN Interface Cards, WIC-2T and WIC-2A/S

Figure 18-111: WIC-2T

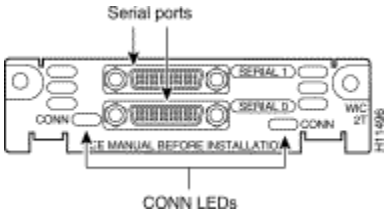
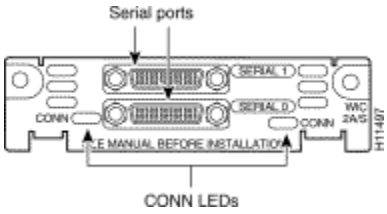


Figure 18-112: WIC-2A/S



The dual serial port WIC-2T and WIC-2A/S provide higher levels of serial port density for a single WAN interface card and are supported on the Cisco 2600 and 1720 series.

The WIC-2T supports speeds of up to a maximum port speed of 2.048 Mbps.

- Asynchronous transfer rates of 115.2 Kbps (per port - maximum) ***(Definitely not recommended!)***
- Synchronous transfer rates of 2.048 Mbps (per port - maximum)
  - Supports one port at 8 Mbps when used in NM-1FE1R2W, NM-1FE2W, NM-2FE2W, or NM-2W or 2600 chassis WIC slots. All other WIC ports on that network module or 2600 chassis must not be used.
  - Supports two ports at 4 Mbps each when used in NM-1FE1R2W, NM-1FE2W, NM-2FE2W, or NM-2W or 2600 chassis WIC slots. All other WIC ports on that network module or 2600 chassis must not be used.

The low serial speed WIC-2A/S supports up to 128Kbps synchronous or 115.2 Kbps asynchronous serial links. Each port can be configured independently of the other allowing support for different physical interfaces (protocol and DTE/DCE). ***(The WIC-2A/S is not recommended!)***

Both cards support mixed asynchronous and synchronous operation on a single card.

These dual-serial port WAN interface cards feature Cisco`s new, compact, Smart Serial connectors to support a wide variety of electrical interfaces when used with the

appropriate transition cable. This includes: V.35, RS-232, RS-449, RS-530, RS-530A in male and female versions for both DCE and DTE devices. This feature provides easy configuration and re-configuration as network requirements change without the need of purchasing a different serial interface card.

Two cables are required to support the two ports on the WIC.

Hardware Specifications

The WIC-2T and WIC-A/S are supported on the Cisco 3600 (on the NM-1FE2W, NM-2FE-2W, NM-2W, and the NM-1FE1R2W network modules), 2600 and 1720 series.

Cables: Cisco Smart Serial cable support includes:
Note: Each of these cables below originally listed both the male (MT) and female (FC) connector options. The females were removed because they represent the DCE type connection, when the router should use only the male DTE connection as required by the modem.

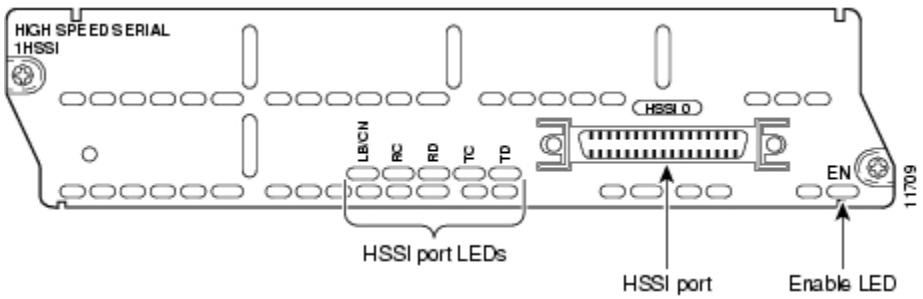
- CAB-SS-V35 MT
- CAB-SS-232 MT ***(RS-232 is Definitely not recommended!)***
- CAB-SS-449 MT
- CAB-SS-X21 MT ***(Not used by the M5 Modem)***
- CAB-SS-530 MT
- CAB-SS-530A MT

1-Port Serial HSSI Interface Cards

Router serial HSSI WAN interface cards, for example the Network Module NM-1HSSI interface for the Cisco 3600 and 3700 series, provide high speed serial connections to remote sites. These cards can connect directly to the M500 series modem HSSI interface.

The 1-port High-Speed Serial Interface (HSSI) network module (see Figure 13-1) provides connectivity for fractional DS3 rate links and slower.

Figure 13-1 HSSI Network Module



Resolving Problems:

The most common problems found with these links are attempting to use RS-232 or asynchronous standards as the interface, and using two different router protocols.

Setting up router links can be difficult and there are training courses and books available for study in addition to volumes of information available on the web.

For questions concerning this technical note please contact Datum Systems, Inc via email at support@datumsystems.com