G.703 Modular Campus Driver Interface Card

FEDERAL COMMUNICATIONS COMMISSION
AND
CANADIAN DEPARTMENT OF COMMUNICATIONS
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de
classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.*

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

<u>**TRADEMARKS USED IN THIS MANUAL**</u>

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CE NOTICE

The CE symbol on your equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU).

Contents

1. Specifications

Applications —   64K G.703 codirectional PCM network extension or network replacement

Connector —   Symmetrically balanced pair, 4-wire RJ-45 female

Interface —   Entire module plugs into 2- or 4-Wire Campus Driver (ME480A or ME485A)

Operating Modes/Speed —   Supports octet mode or clear-channel mode; Co-directional timing; RX recovered: 64 Kbits + 500 ppm; Octet Timing auto-detect on receiver

Line Coding —   AMI with block violation for octet timing

Timing Modes —   Supports network-timing mode or modem-timing mode

Transmit Level —   2.0V differential, into 100 ohms, nominal

Load Impedance —   120 ohms

Input Signal Level —   0 to -10 dB

Jitter Performance —   CTR 14, G.823. <0.05UI jitter for network-extension applications

Isolation —   2000 VRMS isolation, transformer-coupled

PC Board Dimensions —   2.95" x 3.2"

Compliance —   FCC Class A; EN 50081-1, Emissions; EN 50082-1, Susceptibility; CTR 14

2. Introduction

2.1 Description

The G.703 Modular Campus Driver Interface Card converts data from a 64K G.703 network into a Transistor-Transistor Logic (TTL) compatible signal that is transported by the 2- or 4-Wire Campus Driver, or a similar 2- or 4-wire short-haul modem that has identical pinouts and edge-connector style (see NOTE, below). The G.703 network provides a 64K co-directional three-level signal using either octet timing or clear-channel mode. The Card will detect and pass either octet timing (preserving byte integrity over a 128-Kbps modem link) or clear-channel timing (without byte integrity preservation) over a 64-Kbps modem link. The Card is capable of handling either network timing or modem timing, so it can be used for either network-extension or network-replacement configurations. Clock jitter is attenuated according to G.823.

NOTE

If a host other than a 2- or 4-Wire Campus Driver is used, then the modem should have more than 75 mA of available current at 5V DC on the edge connector.

2.2 Features

- Provides 64K codirectional interface compliant with the G.703 electrical specs.

- Offers a single TX/RX interface with a standard RJ-45 connector as specified in TBR 14.

- Option to work in two timing modes: Clear channel or octet timing.

- Complies with ITU/CCITT G.823 (Control of Jitter).

- Point-to-point distance up to 4000 feet (1219 m) using 24-AWG twisted pair.

2.3 System Description

This section describes the features that the entire system (G.703 interface, combined with the modems) will support.

NOTE

The "smoothed" clocks referred to in this section indicate that a phase-locked VCO is used to create a jitter-free clock that is locked to a source clock.

There are two typical applications that result in two different timing modes for the G.703 interface. These are illustrated below.

Timing of Application 1: Network-Loop Extension
In this application, the network supplies the timing for the entire system. The first G.703 recovers the timing. It has to smooth the clock before it supplies the clock (XCLK1) and the data (TXD1) to the first modem transmitter, so it can directly use the clock. The RX of the second modem recovers the clock and presents a "jittery" clock (RXCLK1) and data (RXD1) to the second G.703's transmitter. This transmitter has to smooth the clock before it uses the clock to transmit.

The RX of the second G.703 recovers the timing and clocks the data into a FIFO. The TX of the second modem takes its recovered clock and sends it (TXCLK1) to the G.703 FIFO for data (TXD1). The RX of the first modem recovers the timing and clocks (RXCLK1) the data (RXD1) into a FIFO. The TX of the first G.703 uses the first G.703's recovered clock and sends it to the FIFO for data.

The first G.703 interface is in **Network Timed** mode. The second is in **Modem Timed** mode. See Figure 2-1 on the next page.
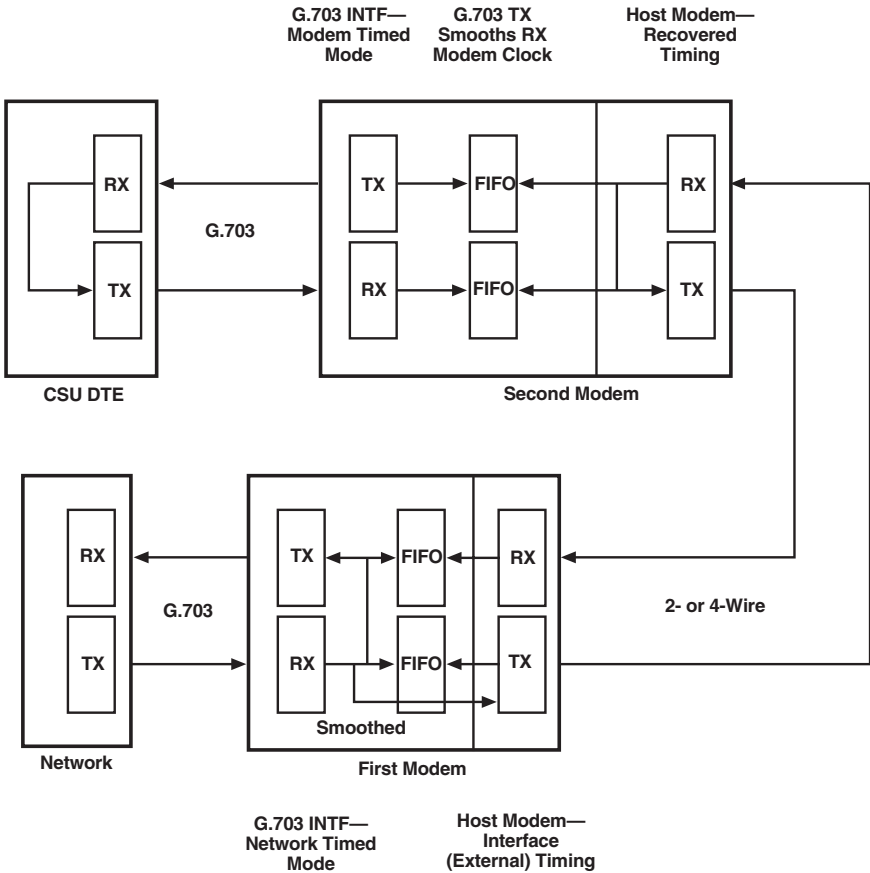
Figure 2-1. Network-Loop-Extension Configuration.

Timing of Application 2: Network Replacement

The first modem uses an internal timing source and supplies the timing for the entire system. The first G.703 recovers the timing and clocks the data into the FIFO. The TX of the first modem takes its internal clock and sends it (TXCLK1) to the G.703 FIFO for data (TXD1). The RX of the second modem recovers the clock and presents a "jittery" clock and data to the second G.703's transmitter. It has to smooth the clock before it uses the clock to transmit.

The RX of the second G.703 recovers the timing and clocks the data into a FIFO. The TX of the second modem sends the second modem's recovered clock (TXCLK1) to the G.703 FIFO for data (TXD1). The RX of the first modem uses its internal clock (RXCLK1) to send data (RXD1) into the FIFO. The TXof the first G.703 smooths the first modem's recovered timing and sends it to the FIFO for data.

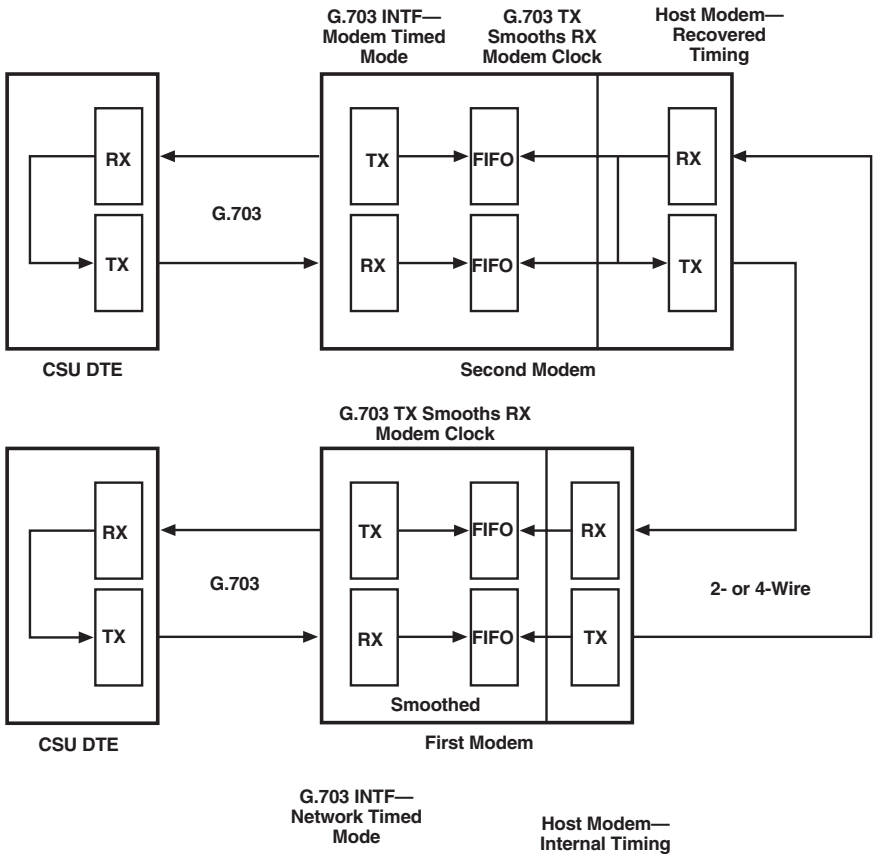Both G.703 interfaces are in **Modem Timed** mode. See Figure 2-2.

Figure 2-2. Network-Replacement Configuration.

2.4 Timing-Mode Selections

Based on the timing arrangements and clock sources mentioned previously, there are two timing modes in which the interface can work. These two modes select the clock sources mentioned above and determine which clock gets smoothed.

- **Network Timed —** This sets the interface to pass the smoothed recovered timing to the modem as XCLK1, with the RX data as TXD1, and also to the G.703 TX side.

- **Modem Timed —** This sets the interface to use the modem's TX timing (recovered or internal source) to send the RX data (as TXD1) to the modem and to smooth the modem's recovered timing for transmitting on the G.703 TX side.

In both cases, the transmitter uses the smoothed clock.

2.5 Operating-Mode Selections

There are two data modes in which the interface passes data and timing:

- **Octet Mode —** Data is passed at a 128K rate. This mode preserves the byte integrity associated with Octet timing. The Octet timing frame is embedded in the data.

- **Clear-Channel Mode —** Data is passed at a 64K rate. This does not preserve the byte integrity associated with Octet timing. Instead, an Octet timing alarm (on or off) is passed over the modem similar to the way signaling leads are passed.

3. Configuration

The G.703 Modular Campus Driver Interface Card is equipped with four DIP switches that allow configuration of the unit to match your application. These DIP switches are located on the top side of the module. Refer to Figure 3-1 for a description of the DIP switches' location on the module and a summary table detailing their settings.
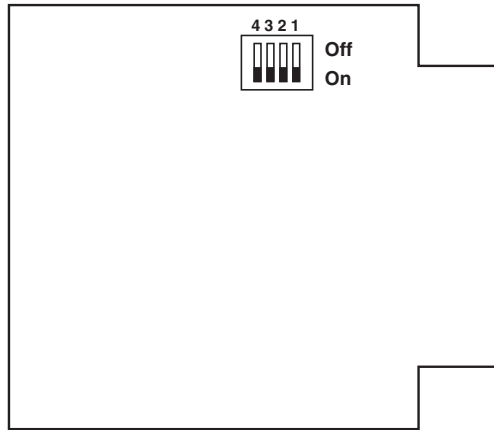

Figure 3-1. Top Side of the Card, DIP-Switch Location.

Switch	On	Off
S1-1	Modem Timed	Network Timed
S1-2	Not Used	Not Used
S1-3	Clear Channel Mode	Octet Mode
S1-4	Normal Operation	Reserved for Factory Use

NOTE: S1-4- must be On.

The default settings for DIP-switch S1 are:

Pin	1	2	3	4
Setting	On	On	On	On

4. Installation

Once the Card is properly configured, it is ready to be installed into a Campus Driver. This section tells you how to properly connect the Interface Card.

4.1 Installing the Card

Safety Precautions

The telecommunications interface is intended to be connected to Telecommunication Network Voltage (TNV) circuits that may carry dangerous voltages. Therefore, for safety measures, it is imperative that the following instructions be followed exactly.

The Card has a 50-pin card-edge connector on one side and an RJ-45 connector on the other side. The following instructions show you how it plugs into the back of a Campus Driver.

1. Make sure the host modem's power switch is off. Leave the power cord plugged into a grounded outlet to keep the unit grounded. The telephone cord must remain disconnected from the telecommunications system until the card has been installed in the host.

2. Hold the Card with the faceplate toward you and align it with the guide slots in the Campus Driver's rear panel.

3. While keeping the Card's faceplate parallel with the Campus Driver's rear panel, slide the Card straight in so that the card edge contacts line up with the socket inside the chassis. Refer to Figure 4-1 on the next page.

NOTE

The card-edge connector should meet the socket when it is almost all the way into the chassis. If you encounter a lot of resistance, remove the module and repeat Steps 2 and 3.
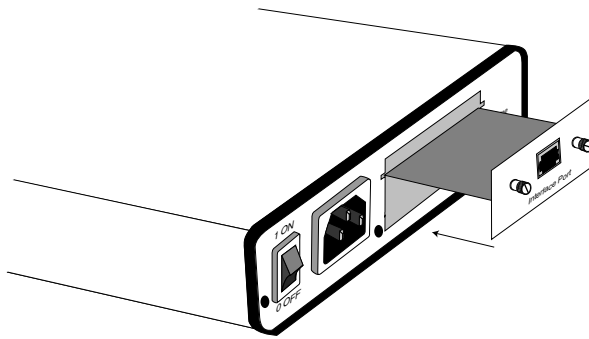
Figure 4-1. Installing the Interface Card.

4. With the card-edge contacts aligned with the socket, firmly seat the Card by using your thumbs to apply pressure directly to the right and left edges of the faceplate. Applying moderate and even pressure should be sufficient to seat the Card. You should hear it click into place.

5. To secure the Card in place, push the thumbscrews into the chassis and turn the screws clockwise to tighten.

6. The enclosure provides the necessary protection of the operator, and the power can now be applied to the Campus Driver and then the network connected.

4.2 Removing the Existing Interface Card

Safety Precautions

If you want to open the host equipment, the network connection must be disconnected prior to accessing any internal parts that may carry TNV, and the following instructions should be followed exactly.

1. Turn off the modem's power switch. Leave the power cord plugged into a grounded outlet to keep the unit ground. The line connection should also be disconnected before removing the module.

2. Loosen the two thumbscrews on the card by turning them counterclockwise.

3. Grasp the thumbscrews and gently pull the card from the unit. Apply equal force to the thumbscrews to keep the card straight as you remove it.

4.3 Connection to the Twisted-Pair Interface

The G.703 Modular Campus Driver Interface Card supports communication between itself and a G.703 PCM network at distances up to 4000 feet (1219 m) using 24-AWG twisted-pair cable.

To function properly, the Card requires two twisted pairs of metallic wire. These twisted pairs must be unconditioned, dry metallic wire, between 22 and 26 AWG (0.4-mm to 0.6-mm diameter solid conductors). Higher-gauge wire may limit distance. Flat modular telephone-type cable is not acceptable.

The RJ-45 connector on the Card's twisted-pair interface is pre-wired according to the signal/pin relationships shown in Figure 4-2.

Connection of the Card to a CSU DTE requires a crossover twisted-pair cable. Connection of the Card to a PCM telecommunication network requires a straight-through pair cable.

Notice! Any modular twisted-pair cable connected to the G.703 Modular Campus Driver Interface Card must be shielded cable, and the outer shield must be properly terminated to a shielded modular plug on both ends of the cable.

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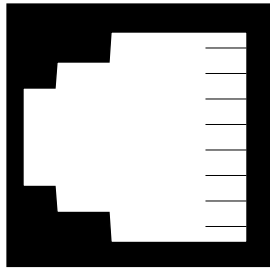
1 (RX Tip)
2 (RX Ring)
3 (N/C)
4 (TX Ring)
5 (TX Tip)
6 (N/C)
7 (N/C)
8 (N/C)

Figure 4-2. Twisted-Pair Interface Signal/Pin Relationship.

Pin	Signal Name	Direction	Function
	(In reference to Card)		
1	RD(T)	IN	Receive data in (tip)
2	RD(R)	IN	Receive data in (ring)
3			Not used
4	TD(R)	OUT	Transmit data out (ring)
5	TD(T)	OUT	Transmit data out (tip)
6			Not used
7, 8			Not used

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