

Optelecom 9000 Series Installation and Operation Manual

Model 9971-C

10-Base T to High-Speed Port Interface Card

For transport of a 10 base T Ethernet signal via duplex high-speed port available on selected models of Optelecom video transmission cards

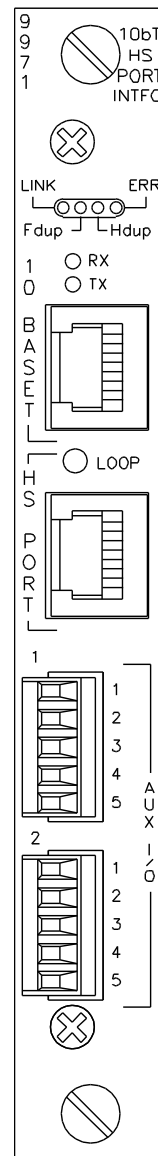
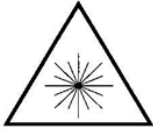


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Safety Instructions

The safety information contained in this section, and on other pages of this manual, must be observed whenever this unit is operated, serviced, or repaired. Failure to comply with any precaution, warning, or instruction noted in the manual is in violation of the standards of design, manufacture, and intended use of the unit. TKH Security Solutions USA assumes no liability for the customer's failure to comply with any of these safety requirements.



LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (MAGNIFIERS)
CLASS 1M LASER PRODUCT

CAUTION:
DISCONNECTED OPTICAL CONNECTORS MAY EMIT OPTICAL ENERGY.
DO NOT VIEW BEAM WITH OPTICAL INSTRUMENTS (MAGNIFIERS)

This product contains Class 1M lasers or LEDs.

- Class 1M laser product according to IEC60825-1:1993+A1+A2
- **CAUTION: Use of controls or adjustments or procedures other than those specified herein may result in hazardous radiation exposure.**
- Precautions should be taken to prevent exposure to optical radiation when the unit is removed from its enclosure or when fiber is disconnected from the unit.
- Laser radiation may be present on a fiber connection to this unit even when the power has been removed from the unit.
- This unit is intended for installation in locations where only trained service personnel have access to the fiber connections.
- The locations of all optical connections are listed in the Connection Locations and Function section of this manual.
- Optical outputs and wavelengths are listed in the Specifications section of this manual.

The optical devices used in this equipment are Hazard Level 1M. As required by IEC60825-1, the installer is responsible for insuring that the label depicted below is present in the restricted locations where this equipment is installed.

Hazard Level 1M

The border shall be black and the background shall be yellow



This assembly contains parts sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting parts or assemblies.

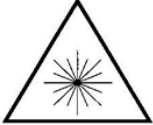


The chassis into which this unit is installed must be housed in a properly rated NEMA enclosure.



When this unit is operated in extremely elevated temperature conditions, it is possible for internal and external metal surfaces to become extremely hot. Care should be taken to insure this unit is installed in a restricted area where only properly trained service personnel have access to the unit.

Debe observarse la información de seguridad contenida en esta sección, y en otras páginas de este manual siempre que se opere, dé servicio o repare esta unidad. Si no se cumple con alguna precaución, advertencia o instrucción indicada en este manual se infringen los estándares de diseño, fabricación y el uso destinado a la unidad. TKH Security Solutions USA no asume ninguna responsabilidad si el cliente no cumple con alguno de estos requisitos de seguridad.



RADIACIÓN LÁSER
NO VER DIRECTAMENTE CON INSTRUMENTOS ÓPTICOS (DE AUMENTO)
PRODUCTO LÁSER CLASE 1M

PRECAUCIÓN:
LOS CONECTORES ÓPTICOS DESCONECTADOS PUEDEN AMITIR ENERGÍA ÓPTICA
NO VER EL HAZ CON INSTRUMENTOS ÓPTICOS (DE AUMENTO)

Este producto contiene rayos láser o diodos emisores de luz Clase 1M.

- Producto láser Clase 1M conforme a la norma IEC60825-1: 1993+A1+A2
- **PRECAUCIÓN:** El uso de los controles, ajustes o procedimientos, aparte de los aquí especificados, pueden ocasionar exposición peligrosa a la radiación.
- Deben tomarse precauciones para evitar la exposición a la radiación óptica cuando se saque la unidad de su alojamiento, o cuando se desconecte la fibra de la unidad
- Puede haber radiación laser en una conexión de fibra a esta unidad aun cuando se haya eliminado la corriente de la unidad.
- Este equipo está destinado a instalarse en lugares donde sólo el personal de servicio debidamente entrenado tenga acceso a las conexiones de fibra.
- La ubicación de todas las conexiones ópticas se enumeran en la sección Ubicación de los conectores y funciones de este manual.
- Las salidas ópticas y longitudes de onda aparecen en la sección Especificaciones de este manual.

Los dispositivos ópticos usados en este equipo son de Nivel de Riesgo 1M. Según lo exige la norma IEC60825-1, el instalador es responsable de asegurar que la etiqueta descrita a continuación esté presente en las áreas restringidas donde se instale este equipo.

Nivel de Riesgo 1M

El borde debe ser negro y el fondo debe ser amarillo



Este ensamblaje contiene piezas sensibles al daño por descargas electrostáticas (ESD, por sus siglas en inglés). Use procedimientos para prevenir las descargas electrostáticas al tocar, desmontar o insertar piezas o ensamblajes.

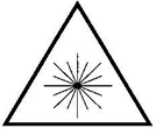


El chasis en el cual está instalada esta unidad debe estar dentro de un alojamiento debidamente calificado por NEMA.



Cuando se opera esta unidad en condiciones de temperatura sumamente elevada, es posible que las superficies internas y externas de metal se pongan extremadamente calientes. Debe tenerse cuidado para asegurar que esta unidad se instale en un área restringida donde sólo tenga acceso a la unidad el personal de servicio debidamente capacitado.

Die in diesem Abschnitt und auf anderen Seiten dieses Handbuchs enthaltenen Sicherheitsinformationen müssen befolgt werden, wenn diese Einheit betrieben, gewartet oder repariert wird. Falls Vorsichtsmassnahmen, Warnungen oder Anweisungen in diesem Handbuch nicht befolgt werden, verstösst dies gegen die Konstruktions-, und Herstellungsstandards und erfolgt im gegensatz zum vorgesehenen Verwendungszweck dieser Einheit. TKH Security Solutions USA übernimmt keine Haftung für das Verabsäumen des Kunden, diese Sicherheitsanforderungen einzuhalten.



LASER-STRAHLUNG
NICHT DIREKT MIT OPTISCHEN INSTRUMENTEN (LUPEN) ANSEHEN
LASER-PRODUKT DER KLASSE 1M

VORSICHT:
ABGEKLEMMTE OPTISCHE STECKVERBINDER KÖNNEN OPTISCHE ENERGIE FREI SETZEN
NICHT MIT OPTISCHEN INSTRUMENTEN (LUPEN) IN DEN STRAHL BLICKEN.

Dieses Produkt enthält Laser oder LEDs der Klasse 1M.

- Laserprodukt der Klasse 1M gemäß IEC60825-1:1993+a1+A2
- **VORSICHT: Wenn die Bedienungselemente anders als hier beschrieben bzw. andere Einstellungen verwendet werden, kann es zu schädlicher Strahlenaussetzung kommen.**
- Es müssen Vorsichtsmaßnahmen getroffen werden, um Aussetzung an optischer Strahlung zu vermeiden, wenn die Einheit aus dem Gehäuse genommen oder die Faseroptik von der Einheit getrennt wird.
- In einer Faseroptik-Verbindung dieser Einheit kan auch dann Laserstrahlung vorhanden sein, wenn die Stromversorgung zur Einheit abgeschaltet wurde.
- Diese Einheit ist zum Einbau an Orten vorgesehen, an denen nur geschultes Personal Zugang zu den Faseroptik-Verbindungen hat.
- Die Lage aller optischen Verbindungen ist im Abschnitt über die Lage von Anschlüssen und Funktionsweise dieses Handbuchs zu finden.
- Optische Ausgänge und Wellenlängen sind im Abschnitt mit den technischen Daten dieses Handbuchs zu finden.

Die optischen Vorrichtungen in diesem Gerät haben Gefahrenstufe 1M. Wie vorgeschrieben durch IEC60825-1 ist der Installateur dafür verantwortlich, sicherzustellen, dass die unten abgebildeten Schilder an den Orten mit eingeschränktem Zugang, an denen dieses Gerät aufgestellt ist, vorhanden sind.



Schwarzer Rand und
gelber Hintergrund



Diese Baugruppe enthält Teile, die durch elektrostatische Entladungen (ESD) beschädigt werden können. Vorsichtsmaßnahmen zum Schutz vor elektrostatischer Entladung treffen, wenn Teile oder Baugruppen berührt, ausgebaut oder eingefügt werden.



Das Gestell, in dem diese Einheit eingebaut ist, muss in einem entsprechend klassifizierten NEMA-Schutzgehäuse untergebracht sein.

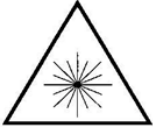


Wenn diese Einheit bei besonders hohen Temperaturen betrieben wird, können interne und externe Metallflächen extrem heiß werden. Es muss darauf geachtet werden, dass diese Einheit in einem Bereich mit eingeschränktem Zugang aufgestellt wird, damit nur geschultes Wartungspersonal Zugang zur Einheit hat.

Consignes de Sécurité

RM-3

Les consignes de sécurité contenues dans cette section et dans le reste de ce manuel doivent être respectées à chaque fois que cet appareil est utilisé ou fait l'objet d'une maintenance ou d'une réparation. Le non-respect d'une précaution, d'un avertissement ou d'une instruction figurant dans ce manuel est une violation des normes de conception, fabrication et indication d'usage de l'appareil. TKH Security Solutions USA n'est pas responsable du non-respect de ces consignes de sécurité par le client.



RAYONNEMENT LASER
NE PAS REGARDER DIRECTEMENT AVEC DES INSTRUMENTS OPTIQUES (LOUPES)
PRODUIT LASER DE CLASSE 1M

ATTENTION:
LES CONNECTEURS OPTIQUES DEBRANCHES PEUVENT EMETTRE UNE ENERGIE OPTIQUE.
NE PAS REGARDER LE FAISCEAU AVEC DES INSTRUMENTS OPTIQUES (LOUPES)

Ce produit contient des lasers ou diodes électroluminescentes de classe 1M.

- Produit laser de classe 1M conformément à IEC60825-1:1993+A1+A2
- **ATTENTION: L' utilisation de commandes ou réglages, ou de procédures différentes de celles indiquées ici risque de provoquer une exposition dangereuse au rayonnement.**
- Prendre des précautions pour empêcher une exposition au rayonnement optique lorsque l' appareil est retiré de son boîtier ou lorsque la câble optique fibre est débranché de l' appareil.
- Un rayonnement laser pourra être présent dans un câble optique branché sur cet appareil, même une fois l'alimentation coupée.
- Cet appareil est prévu pour une installation à des endroits où seul un personnel de maintenance formé accès aux câbles optiques.
- Les points de branchement de tous les câbles optiques sont indiqués à la section Points de branchement et fonction de ce manuel.
- Les sorties et longueurs d' onde optiques figurant à la section Caractéristiques techniques de ce manuel.

Les appareils optiques utilisés dans cet équipement correspondent à un niveau de danger 1M. Comme exigé par la norme IEC60825-1, il incombe à

l'installateur de s'assurer que l'étiquette ci-dessous est présente aux endroits d'accès limité où cet équipement est installé.

Niveau de danger 1M

La bordure doit être noire et
le fond jaune



Cet ensemble contient des pièces sensibles aux décharges électrostatiques (ESD). Prendre les précautions relatives aux ESD avant de toucher, retirer ou insérer des pièces ou des ensembles.



Le châssis dans lequel est installé cet appareil doit être placé dans une enceinte NEMA conforme aux spécifications nominales.



Lorsque cet appareil fonctionne à une température ambiante extrêmement élevée, il est possible que les surfaces métalliques internes et externes deviennent extrêmement chaudes. S'assurer que cet appareil est installé dans une zone dont l'accès est limité à un personnel de maintenance correctement formé.

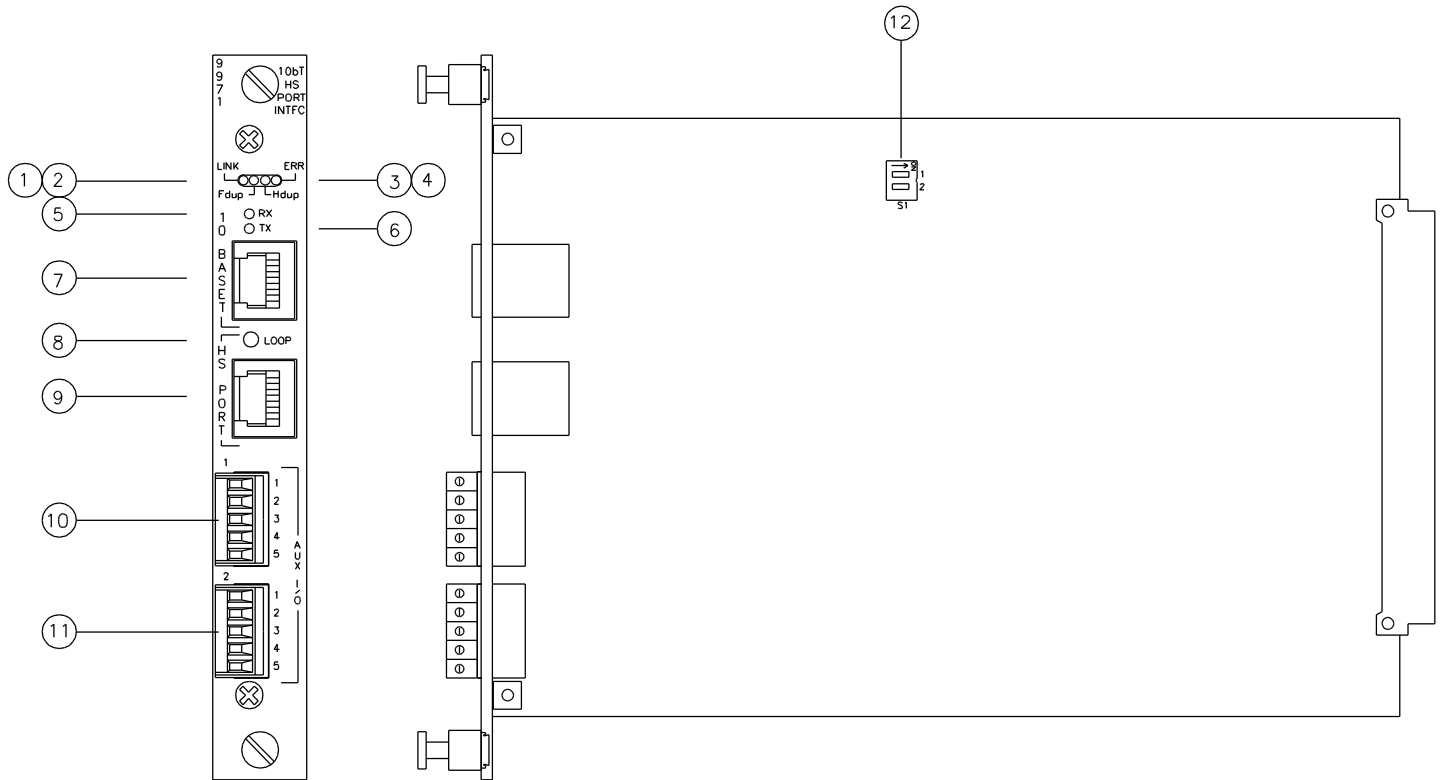
Functional Description

A pair of 9971-C interface cards provide transmission for one 10 Base T Ethernet link and two independent 115 Kbps data channels via the duplex high-speed ports available on selected video or data over fiber transmission cards. Currently, the 9971-C will operate with the 9252DT/DR, the 9421DT/DR, and the 9672 cards.

The cards operate on 6VDC as supplied by the chassis into which it is installed.

9971-C Indicator and Connector Locations

FIGURE 1



1. LINK INDICATOR

This indicator illuminates **green** when the RJ45 Ethernet port is connected to an active Ethernet connection.

2. FDUP INDICATOR

This indicator illuminates **green** when the RJ45 Ethernet port is operating in the full duplex mode.

3. HDUP INDICATOR

This indicator illuminates **yellow** when the RJ45 Ethernet port is operating in the half duplex mode.

4. ERR INDICATOR

This indicator illuminates **red** when the local RJ45 Ethernet port is operating full duplex and 9971-C at the other end of the optical link is operating in half duplex or vice versa.

5. Rx INDICATOR

This **green** LED blinks when the RJ45 Ethernet port is receiving data.

6. Tx INDICATOR

This **green** LED blinks when the RJ45 Ethernet port is transmitting data.

7. 10 BASE T ETHERNET CONNECTOR

This RJ45 connector is the MIDX compatible Ethernet connector. It operates like a hub port and will connect with a standard cable to a PC or other device. When connecting to a hub, use either the a standard cable to uplink port on the hub or a crossover cable to a standard hub port.

8. LOOP INDICATOR

This three-color indicator provides status on the high-speed port connection to the opposite end of the link

- If **red** (No Sync, No Loop), there is a problem with the signal being received from the opposite end of the link.
- If **yellow** (Sync, No Loop), the local receiver is receiving a good signal from the far end, but the far end is not receiving the signal from the local end.
- If **green** (Sync, Loop), the local receiver has a good signal and the remote receiver is reporting a good signal.

9. HIGH-SPEED PORT CONNECTOR

This RJ45 connector connects to the high-speed port on the fiber communication card via the provided standard Cat5 Ethernet cable.

10. CHANNEL 1 DATA I/O CONNECTOR

This removable screw type connector serves as the I/O cable for data channel 1.

11. CHANNEL 2 DATA I/O CONNECTOR

This removable screw- type connector serves as the I/O cable for data channel 2.

12. 12. S1 DIPSWITCH

This dipswitch sets half/full duplex mode for the Ethernet link.

Set Up and Operation of the 9971-C

Set up and operation of the 9971-C cards consists of setting the data port switches, installing the unit into a Series 9000 chassis, connecting the provided Cat5 jumper cable from the high-speed port on the optical communications card to the 9971-C. Any standard (not crossover) RJ45 Cat5 cable will also work correctly. The card should be removed to set dipswitch S1, as the switch is only read during the power up cycle.

Setting S1 Dipswitch

TABLE 1		
Switch S1		NOTE: Both ends of a 9971 link must be operating in the same mode. The error LED will illuminate if they are not operating in the same mode.
Position 1	Position 2	Function
On	On	<i>Half Duplex:</i> Select this mode if one or both 9971s are to be connected to half duplex device such as a hub.
On	Off	<i>Full Duplex:</i> Select this mode if both 9971s are connected to devices that are set/forced to 10 mbs full duplex.
Off	Off	<i>Auto-Negotiate:</i> Select this mode when connecting to 10/100 full duplex device, such as a switch. NOTE: This mode is, strictly speaking, not valid for a 10 mbs only device such as a 9971. The Auto-Negotiate process may fail when connecting to a switch that already has heavy traffic running. The failure can be observed by the fact that the full duplex LED is blinking. The workaround is to temporarily remove the source of the traffic until the 9971 Auto-Negotiate completes.

Limitations for Half Duplex

When an Ethernet link operates in the half duplex mode, there are limitations imposed on the end-to-end length of the system. Operating on fiber does not change these limitations and the user should be aware that, in general, the collision domain limits the total network diameter to 4000 meters or less, including fiber runs. If portions of the system are operating at 100 Mbps, the distances may be less.

Setting the Data Port Mode Switches

The 9971-C supports two Data Option Module Type B Plug-ins. The switches on each one are identical and are set according to the charts below.

Option Module Type B — Duplex Data

SET UP

Compared to the first and interim versions, the latest version has an additional bias switch to set for more robust RS485 operation of the data module. The bias resistors keep the differential signal pair biased so that when it is in a High-Z state the line receivers interpret the line as being inactive (no data transmitted). Refer to Table 2 for connector and switch locations.

- Left hand connector row(s) (nine pins each).
- Switch S1: This eight position dipswitch is used in conjunction with dipswitches S2 and S3 to select the data interface. Refer to Table B-2 for setting this switch.
- Switch S2: This six position dipswitch is used in conjunction with dipswitches S1 and S3 to select the data interface. Refer to Table B-2 for setting this switch.
- Switch S3: This four position dipswitch is used in conjunction with dipswitch S1 and S2 to select the data interface. Refer to Table B2 for setting this switch.
- Right hand connector rows (seven pins each).

NOTE: *Both inputs and outputs on both ends of the link are set independently and can be configured as different data types.* This allows different interface settings on each input and output on both ends of a data link. For example, one end of the link could be configured for RS232 and the other for RS485 4-wire. The Option Module converts the data in and out to the selected data types. **This eliminates the need for data converters.**

NOTE: Use this table *only* for the latest version.

TABLE 2 — INTERFACE SELECTION TABLE																		
Data Interface Settings																		
Input/Output Type	Switch S1								Switch S2						Switch S3			
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4
RS232 Input							OFF	ON	OFF						OFF	OFF		
RS232 Output											OFF	OFF	ON	OFF			OFF	OFF
RS422 Input		T	T	ON	ON	T	ON	OFF	ON						ON*	ON*		
RS422 Output										OFF	OFF	OFF	OFF	ON			OFF	OFF
RS485 4-Wire Input		T	T	ON	ON	T	ON	OFF	ON						B	B		
RS485 4-Wire Output										OFF	ON	OFF	OFF	ON			B	B
RS485 2-Wire (Duplex)		T	T	ON	ON	T	ON	OFF	ON	ON	ON	OFF	OFF		B	B		
Manchester Input		T	T	OFF	OFF	ON	ON	OFF	ON						OFF	OFF		
Manchester Output										OFF	OFF	ON	OFF	ON			OFF	OFF

NOTES:

- * Setting S3, positions 1 and 2, to the "On" position for RS422 insures that the input line receiver interprets the input as "inactive" under all conditions if there is no active RS422 signal driving the input. If this is not important, these switches can be left in the "Off" position.
- "T" indicates Termination Resistor. When set to the "On" position, the Termination Resistors are enabled; "Off" disables the Termination Resistors. Refer to the Termination Rules Section.

- "B" indicates Bias Resistors. The bias resistors may be necessary on RS485 systems to eliminate data errors. Information on setting these resistors can be found in the Termination Rules section (page 17).
- Empty locations do not apply to the particular Input or Output type listed on the left side.
- When using bidirectional or duplex data, you must set both the input and output switches to the correct data type.

EXTERNAL CONNECTIONS

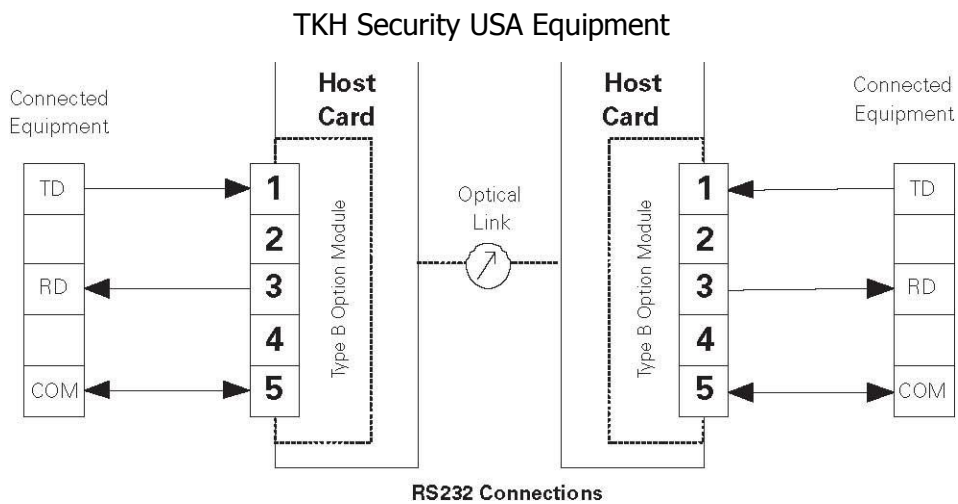
Connections are made to the module via the 5-pin removable screw terminal connector. Refer to the following tables and figures for the connection configurations. Note that on all signal connection drawings, the arrows indicate signal flow direction.

RS232

Option Module type B supports 3-wire RS232 communications. The signal input to pin 1 of the terminal block is transmitted to the other end of the link and is output on pin 3. Care must be taken to insure that the external equipment is connected input to output and output to input.

TABLE 3 — OPTION MODULE B RS232 SIGNALS AND CONNECTIONS		
Pin #	Function	RS232 (DTE) Signal Name
1	Input	RD
2	No Connection	
3	Output	TD
4	No Connection	
5	Signal Common	Common

FIGURE 2 — RS232 CONNECTIONS



RS422

Option Module B supports both 2-wire (simplex) and 4-wire (duplex) RS422 communications. RS422 is a differential communications scheme and uses the polarity difference between the + and – leads to transmit the data bits. The signals input on pins 1 and 2 at one end of the link are transmitted to the other end of the link and are output on pins 3 and 4.

Different manufacturers mark their RS422 devices in different ways and there is no consistent common terminal marking scheme. In RS422, when there is no data activity, the system is said to be in a mark state. During data transmission, the system toggles between mark and space states. During idle (mark state), when no data is being transmitted, the output + terminal will be positive with reference to the output – terminal. Care must be taken to ensure that external equipment has its output terminals connected to the external equipment input terminals. Connect + to + (plus) and – to – (minus).

RS422 is a “one-to-many” type system, permitting up to 10 receivers to be electrically connected to one transmitter. Refer to the “Termination Rules for RS422, RS485, and Manchester” on page 15 for more details on terminations to ensure you have terminated multiple connections correctly. Fiber connections isolates each end of a system, effectively creating more than one electrical buss. A system controller for Pan, Tilt, and Zoom (PTZ) could connect to up to 10 B-type Option Module inputs, with only the last input having the termination enabled. At the other end of each link, *each* RS422 output could drive 10 more inputs. Since this end of the link is optically isolated from the transmit end, it must be treated as a separate system and should have the last input in the daisy chain terminated.

Although RS422 and RS485 are differential input communications standards and are more immune to noise caused by poor grounding and electrical noise, the shielding and grounding of the signal wires is still important.

Signal grounds and shields should be connected at both ends on most signal runs. When the ground potential of one end of the electrical connection is at a different potential than the other, the voltage differential can exceed the maximum common mode immunity of the input circuits and cause improper operation of the equipment. If this voltage should become exceedingly large due to lightning or static buildups, damage to the signal inputs is possible. Connecting the ground (and shield) connections on both ends reduces this potential.

Data connections in outdoor locations (traffic and external security systems, for example) are especially vulnerable to these kinds of problems and should have grounds connected at both ends of the wiring. In addition, power, data, and video signals should have noise and surge protection modules installed in the lines ahead of the communications equipment.

Refer to the section on “Termination Rules” for more details on RS422 termination.

Pin Number	Function
1	Input +
2	Input –
3	Output +
4	Output –
5	Signal Common

FIGURE 3 — RS422 4-WIRE DUPLEX CONNECTIONS

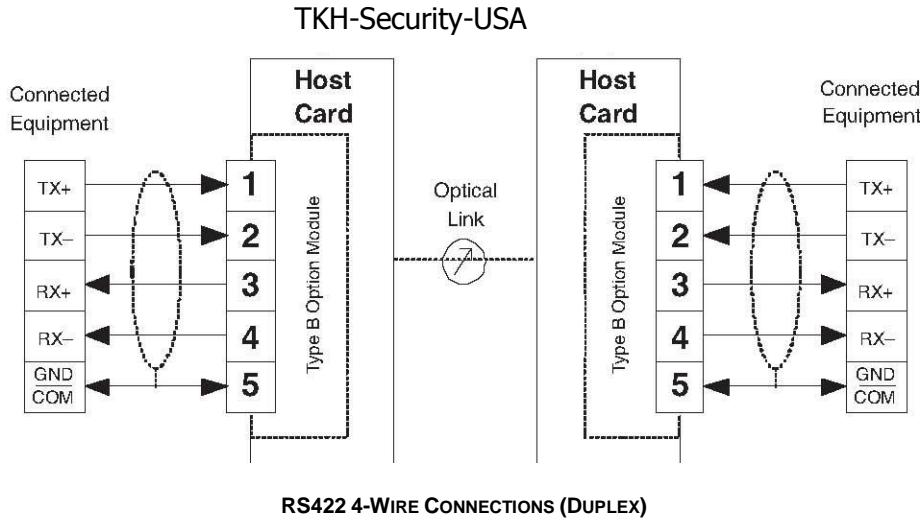
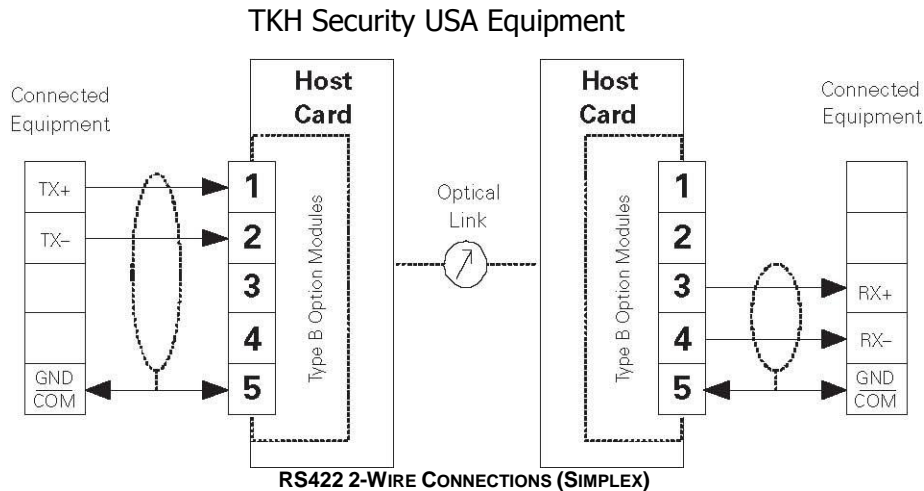


FIGURE 4 — RS422 2-WIRE SIMPLEX CONNECTIONS



RS485

Option Module B supports both 2-wire (duplex) and 4-wire (duplex) RS485 communications. RS485 is a differential communications scheme and uses the polarity difference between the + and – leads to transmit the data bits. It is similar to RS422, but has the capability of paralleling transmitters because the transmitters are tristated (shut off) when not actually transmitting data. Because of this, a duplex or bidirectional link can be operated on either two or four wires. In 4-wire operation, the signals input on pins 1 and 2 at one end of the link are transmitted to the other end of the link and are output on pins 3 and 4, respectively. For 2-wire operation, the signals input on pins 1 and 2 at one end of the link are transmitted to the other end of the link and are output on pins 1 and 2.

Different manufacturers mark their RS485 devices in different ways and there is no consistent common terminal marking scheme. During data transmission, the system toggles between mark and space states. Care must be taken to ensure that external equipment has its output terminals connected to the Option Module input terminals and the Option Module output terminas are connected to the external equipment input terminals. Generally speaking, connect + to + (plus) and – to – (minus). In rare cases, you may have to connect the Option Module + (plus) to the external equipment – (minus) and the Option Module – (minus) to the external equipment + (plus).

TABLE 5 — OPTION MODULE B RS485 SIGNALS AND CONNECTIONS		
Pin Number	Function	
	4-Wire	2-Wire
1	Input +	Input/Output +
2	Input -	Input/Output -
3	Output +	Internally Connected to Pin 1
4	Output -	Internally Connected to Pin 2
5	Signal Common — Chassis Ground	

FIGURE 5 — RS485 4-WIRE CONNECTIONS (DUPLEX)

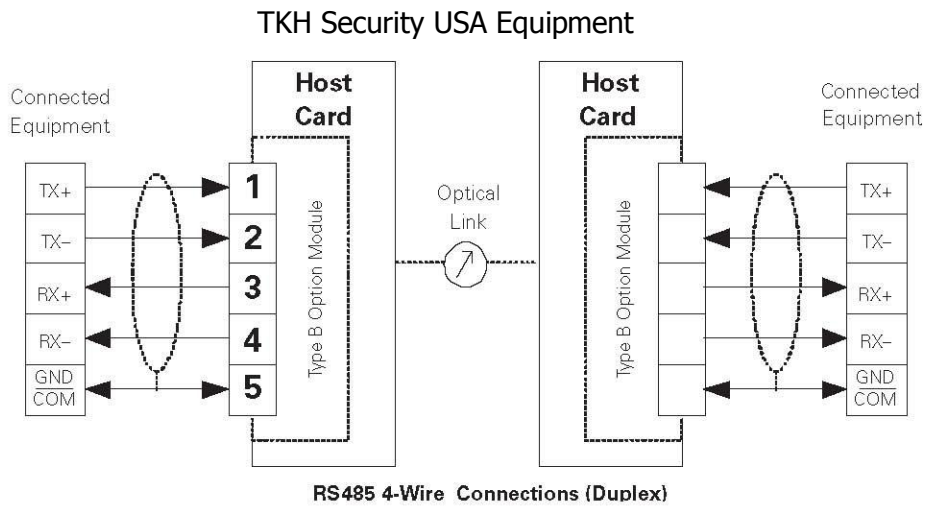
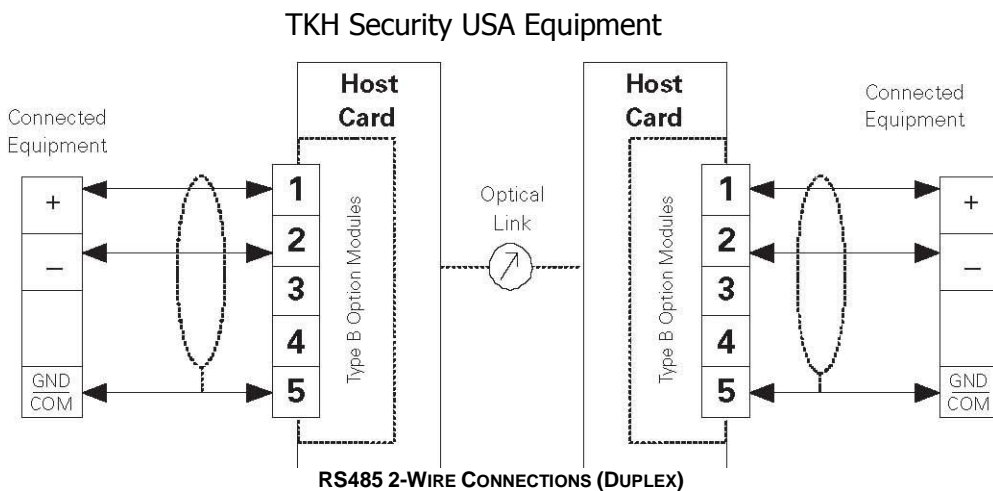


FIGURE 6 — RS485 2-WIRE CONNECTIONS (DUPLEX)



RS485 is a “many-to-many” type system, permitting up to 32 devices or receivers to be electrically connected to one transmitter. Refer to the “Termination Rules for RS422, RS485, and Manchester” later in this section for more details on terminations to ensure you have terminated multiple connections correctly. The fiber connection isolates parts of a system, effectively creating more than one electrical buss. A system controller for Pan, Tilt, and Zoom (PTZ) could connect to up to 32 B-type Option Module inputs with terminations required on both physical ends of the buss having the termination enabled. At the other end of each optical link, *each* RS485 I/O could interface with 31 other I/Os. Since this end of the link is optically isolated from the transmit end, it must be treated as a separate system and has each end of its bus terminated.

Although RS422 and RS485 are differential input communications standards and are more immune to noise caused by poor grounding and electrical noise, the shielding and grounding of the signal wires is still important.

Signal grounds and shields should be connected at both ends on most signal runs. When the ground potential of one end of the electrical connection is at a different potential than the other, the voltage differential can exceed the maximum common mode immunity of the input circuits and cause improper operation of the equipment. If this voltage should become exceedingly large due to lightning or static buildups, damage to the signal inputs is possible. Connecting the ground (and shield) connections on both ends reduces this potential.

Data connections in outdoor locations (traffic and external security systems, for example) are especially vulnerable to these kinds of problems and should have grounds connected at both ends of the wiring. In addition, power, data, and video signals should have noise and surge protection modules installed in the lines ahead of the communications equipment.

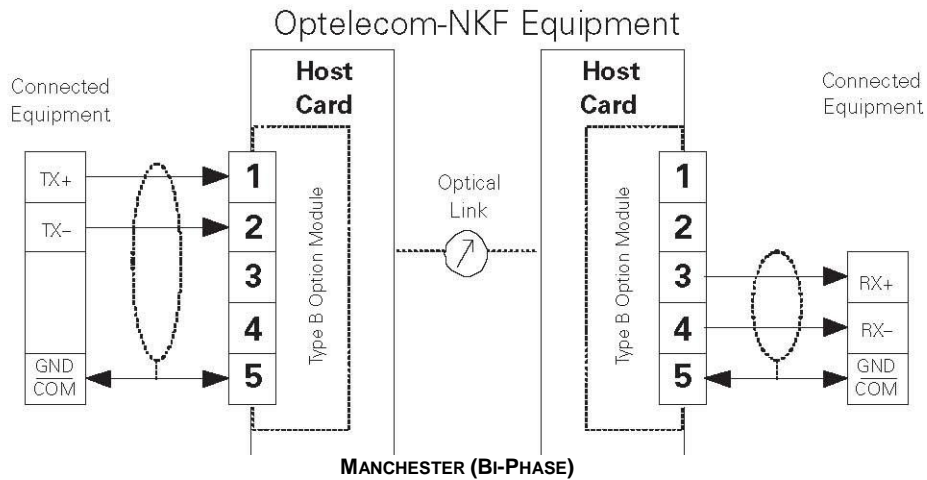
Refer to the section on “Termination Rules” for more details on RS485 termination.

MANCHESTER

The B Option Module supports the different types of Manchester encoded data including Pelco D, Philips (Burle), American Dynamics, Bi-Phase, and other similarly encoded data signals. It is normally a simplex transmission (single direction) and operates on two wires. It operates differently than RS232, RS422, or RS485, but does require that the end of the buss be terminated as in RS422. Although the diagram in Figure B-8 does not indicate so, the link does operate in both directions with the inputs always on pins 1 and 2 and the outputs at the opposite end of the link on pins 3 and 4. Typically Manchester is not used as a duplex or bidirectional link. Refer to the “Termination Rules for RS422, RS485, and Manchester” later in this section of the manual to ensure you have terminated multiple connections correctly.

TABLE 6 — OPTION MODULE B MANCHESTER SIGNALS AND CONNECTIONS	
Pin Number	Function
1	Input +
2	Input –
3	Output +
4	Output –
5	Signal Common

FIGURE 7 — MANCHESTER CONNECTIONS



TERMINATION RULES FOR RS422, RS485, AND MANCHESTER

On RS422, RS485, and Manchester connections, it is possible that multiple devices may be connected in parallel. In RS422 systems, this is usually a transmitter and many receivers connected together. In RS485, it is many transceivers. In these configurations, a parallel bus is created and it must be terminated correctly for proper operation. Use the following rules to determine if the termination resistors should be enabled or disabled.

- 4-Wire RS422 and RS485
 - Terminate only the last transceiver I/O, leaving all other I/Os unterminated.
 - Terminations should only be made at the physical end of the electrical wiring.
 - RS422 and RS485 4-wire interfaces should never be connected in a "star" type configuration, but in daisy chain. "Star" configurations cannot be terminated correctly.
- 2-Wire Duplex RS485
 - Terminate both ends of the bus. Since any device can be a transmitter or receiver, both ends of the bus require the terminations be enabled; leaving all other I/Os unterminated.
 - Terminations should only be made at the physical end of the electrical wiring.
 - RS485 2-wire should never be connected in a "Star" type configuration, but in daisy chain. "Star" configurations cannot be terminated correctly.
- Manchester
 - Terminate only the last input if there are fewer than five inputs. If there are more than five inputs, leave all inputs unterminated.

Refer to Figures 8 and 9 for the termination examples.

SETTING THE BIASING RESISTORS (Switch 3, positions 1, 2, 3, and 4)

The biasing resistors may need to be enabled to insure that RS485 the communications bus is never left in a "floating" condition when the bus is not being driven. An RS485 bus left in the "floating" condition may not provide reliable communications. Many devices already have these resistors permanently installed and, in that case, the biasing resistors may set to disabled (off). In cases where the communications system does not appear to operate reliably, it may be necessary to enable the biasing resistors. It is unlikely that this condition will occur in RS422 systems.

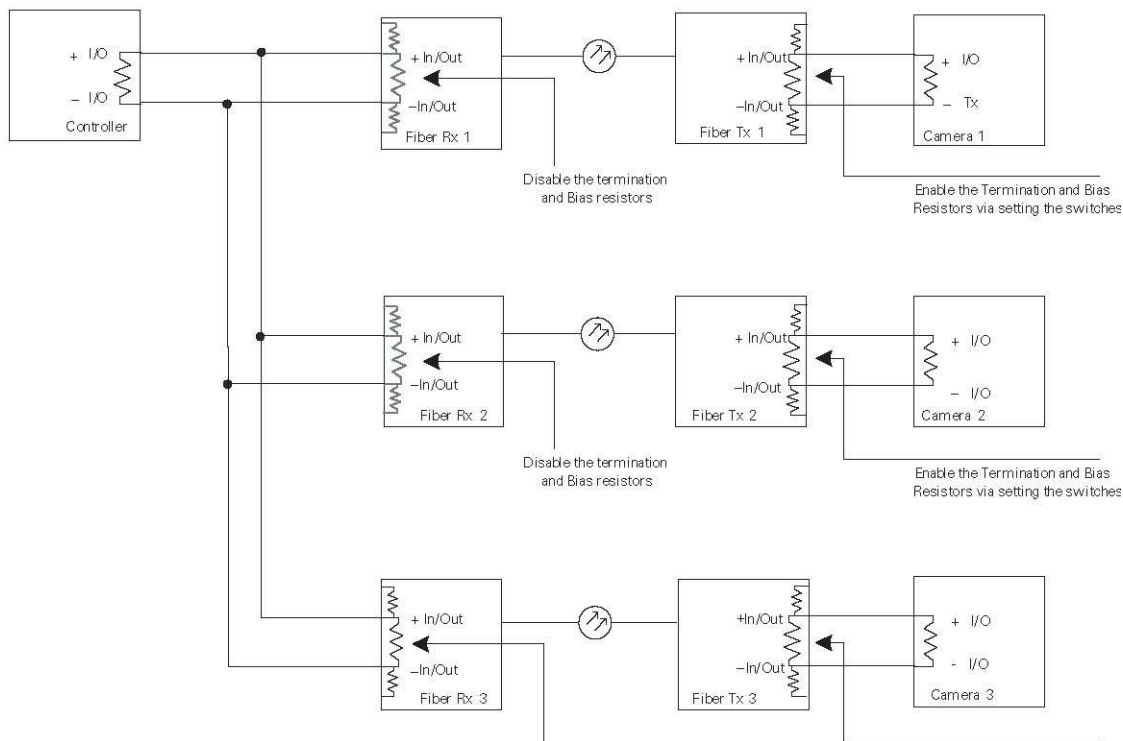
Dipswitch positions 1 and 2 enable/disable 390 ohm bias resistors for the terminals 1 and 2, which serve as the input terminals in a 4-wire system and as the I/O terminals in a 2-wire system. Dipswitch positions 3 and 4 enable/disable 390 ohm resistors on terminals 3 and 4, which serve as the output terminals in an RS485 4wire system. In normal operation of RS485 systems, the + (plus) terminals should be biased positive and the – (minus) terminals should be biased to signal ground. To determine if the bias resistors need to be enabled, make the following voltage measurements between the + (plus) signal line and the – (minus) signal line.

*Make the measurements with **no** data transmissions occurring.*

1. In 4-wire RS485 communications, check the receiver pair (terminals 1 and 2) and the transmitter pair (terminals 3 and 4) separately. With the + (plus) voltage probe on the + (plus) signal line and the – (minus) probe on the – (minus) signal line, the voltage should measure greater than +0.2 V (200 mv).
2. In 2-wire RS485 communications, there is only one pair (terminals 1 and 2). With the + (plus) voltage probe on the + (plus) signal line and the – (minus) probe on the – (minus) signal line, the voltage should measure greater than +0.2 V (200 m.).

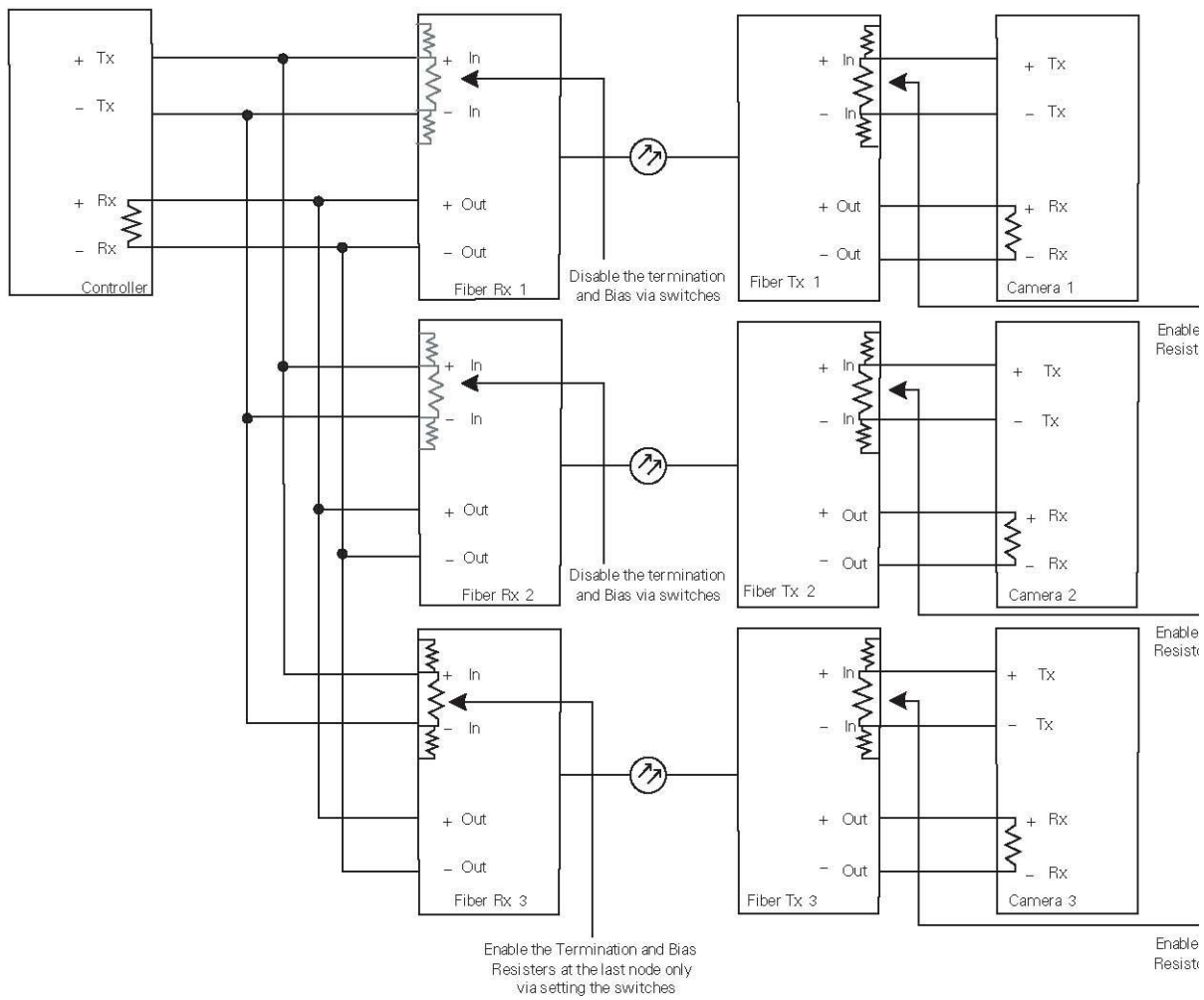
If the reading is less than 0.2V (200 mv), the bias resistors should be enabled on only one device on the bus.

FIGURE 8 — RS485 2-WIRE WITH THE TERMINATION AND BIAS RESISTORS



Note: Normally both ends of a point-to-point RS485 bus are terminated. On a daisy chain bus, only the first and last units are terminated.

FIGURE 9 — RS485 4-WIRE WITH THE TERMINATION AND BIAS RESISTORS



Note: Normally both ends of a point-to-point RS485 bus are terminated. On a daisy chain bus, only the first and last units are terminated.

SPECIFICATIONS

Data Input Types

RS232, RS422, RS485 2- or 4-wire, Manchester

Data Rate

DC to 115 Kbps (RS232, RS422, RS485)

32 Kbps (Manchester)

FIGURE 10 — FRONT VIEW OF DATA OPTION MODULE TYPE B

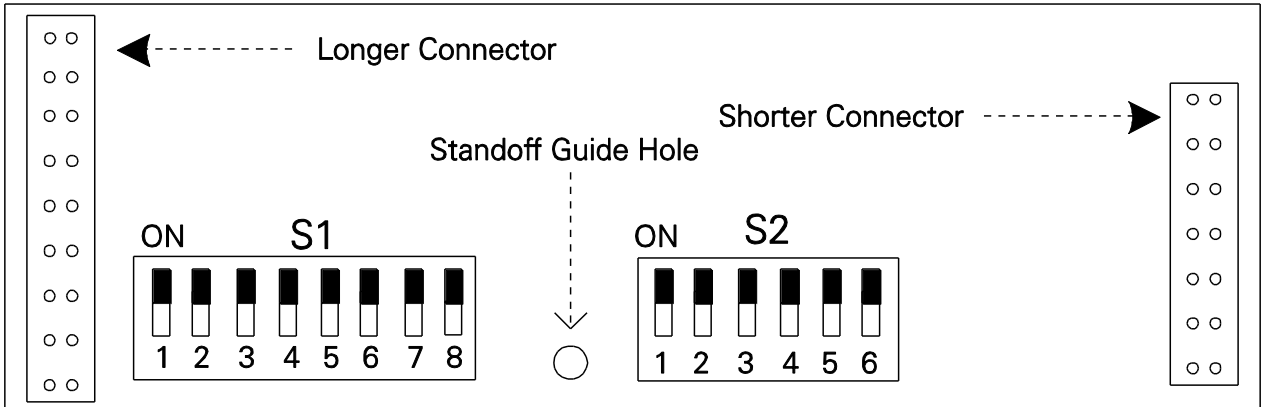


TABLE 7 — DATA OPTION MODULE TYPE B SETTINGS

Input/Output Type	Switch 1 Switch 2													
	1	2	3	4	5	6	7	8	1	2	3	4	5	6
RS232 Input	-	-	-	-	-	-	Off	On	Off	-	-	-	-	-
RS232 Output	-	-	-	-	-	-	-	-	-	-	Off	Off	On	Off
RS422 Input	-	T	T	On	On	T	On	Off	On	-	-	-	-	-
RS422 Output	-	-	-	-	-	-	-	-	-	Off	Off	Off	Off	On
RS485 Input	-	T	T	On	On	T	On	Off	On	-	-	-	-	-
RS485 Output	-	-	-	-	-	-	-	-	-	Off	On	Off	Off	On
RS485 (2-wire) (Duplex Only)	-	T	T	On	On	T	On	Off	On	On	On	Off	Off	On
Manchester Input	-	T	T	Off	Off	On	On	Off	On	-	-	-	-	-
Manchester Output	-	-	-	-	-	-	-	-	-	Off	Off	On	Off	On

Notes
 1. - = This position is not applicable for the input/output type.
 2. T = When on, these positions enable the termination resistor for the designated input. When off, the termination resistor is disabled. See text for details.

Making Data Connections to the Option Module Connectors

Refer to the figures below for RS232, RS422, RS485, and Manchester connections to the data port connectors.

FIGURE 11

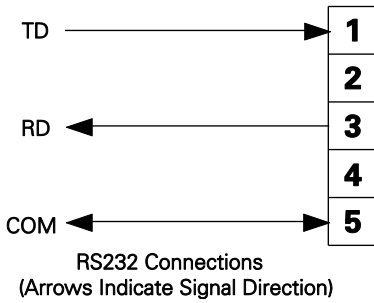


FIGURE 12

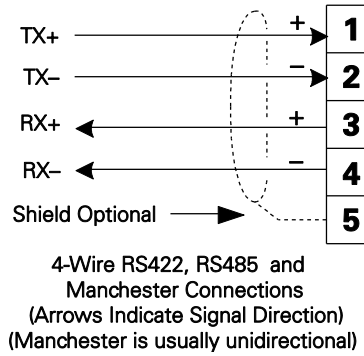
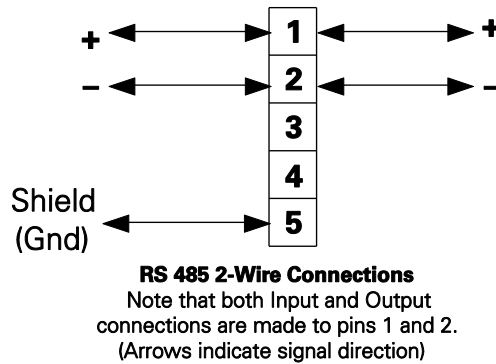


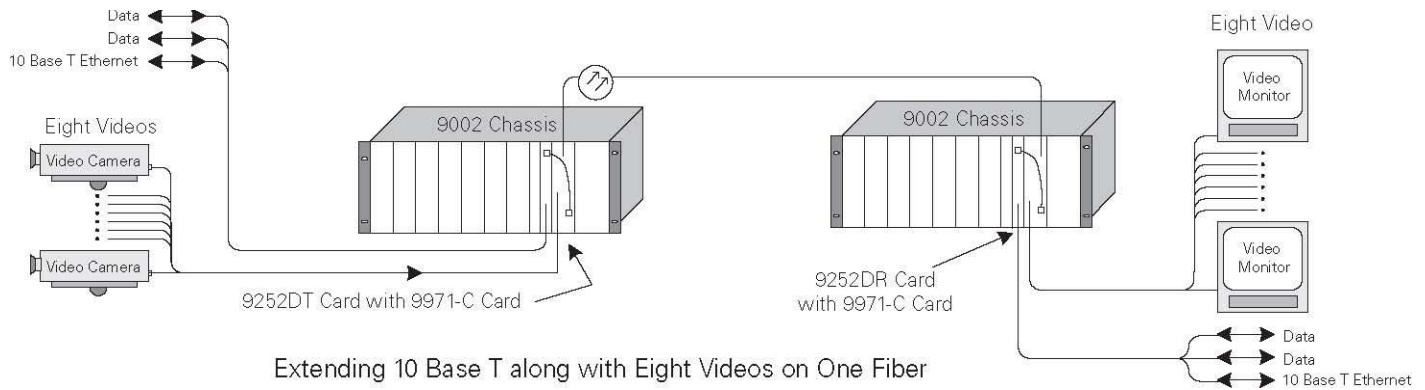
FIGURE 13



Using the Termination Resistors

RS422, RS485, and Manchester connections may require the use of input termination resistors in some applications. Normally if less than six inputs are electrically paralled, the termination resistor on each input should be left off all inputs *except the last one*. If six or more are electrically connected, all input terminations resistors should be disabled. This permits the setting of the bus impedance to acceptable operational levels. When signal inputs are paralled, the wiring should be done in a daisy chain fashion, rather than a hub and spoke manner. This facilitates terminating the *last* device in the chain.

Typical Application of the 9971-C



This application drawing shows a pair of 9971-Cs used in a system with the high-speed ports on a pair of 9252DT and DR cards. The combination provides eight simplex video, three built-in data ports on the 9252D pair, and the high-speed port is used for the 9971-Cs. The 9971-Cs support one 10 Base T Ethernet link and two 115.2 Kbps RS232, RS422, RS485, or Manchester switch-selectable data links.

Troubleshooting 9971-C Links

Normally, you should check to see if the optical link is operational as a first step. The 9971-C depends on a correctly operating duplex high-speed link. If the fiber and link status indicators on the video or data link cards are all normal, follow the procedures below.

Check the Loop indicator; it should be **green** on both ends. If either end is **red** or **yellow**, there is a problem with high-speed port link; check the jumper cables from the duplex high-speed ports on the optical link cards to the 9971-C high-speed port connector. These jumpers are standard non-crossover Cat5-type jumpers.

If both loop indicators are **green**, the data ports and the Ethernet port should be operational. The link indicator is the same as hub and switch link indicators, showing that the cable connection between two devices appears to be correct.

The Error indicator will be **red** if one end of the Ethernet link is operating in half duplex mode and the other end is operating in full duplex mode.

Operation of the 9971-C with Network Management Software

Operation of the 9971-C with the Network Management System consists of the following parameters:

1. Card Location
2. Card Size (Number of Slots)
3. Card Name (Model Number)
4. Serial Number
5. Revision Number
6. Chronometer Value (Cumulative Hours of Operation)
7. Reset Cycles (Cumulative Number of Power Cycles)
8. Firmware Revision
9. Loop (Local Demux in Sync, and Remote Demux in Sync)
10. Ethernet Link OK
11. Full Duplex Operation
12. Half Duplex Operation
13. Error Indication

Specifications

HIGH-SPEED PORT SPECIFICATIONS

Connector	RJ45
Data Format	Synchronous RS422 @ 16 Mbps Duplex

ETHERNET PORT

Connector	RJ45
Data Format	10 Mbps, MIDX, Full or Half Duplex, Auto Negotiate

DATA PORTS 1 AND 2 SPECIFICATIONS

Connector	Five-position removable screw terminal
Data Format	RS232 (3-wire), RS422 2- or 4-wire, RS485 2- or 4-wire, Auto Baud up to 115.2 Kbps or Manchester (Burle, American Dynamics Bi-Phase compatible, 32 Kbps)

POWER

Voltage	6VDC (Chassis power supply)
Current	
9971-C	350 mA

PHYSICAL

Dimensions (in inches)	6.1 H X 0.8 W x 8.6 D
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ENVIRONMENTAL

Operating Temperature	-40° C to +74° C
Storage Temperature	-55° C to +85° C
Relative Humidity	0 to 95% noncondensing

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