



Optelecom 9000 Series Installation and Operation Manual

Model 9221DT Model 9221DR

Rack-Mounted Fiber Optic Video Duplex Data
Transmitter and Receiver Cards

For transport of one NTSC, PAL, or SECAM video
signal and one duplex RS232, RS422, RS485, or
Manchester data over one optical fiber. Digital
encoding and transmission techniques are utilized for
the video (9-bit) and the data.

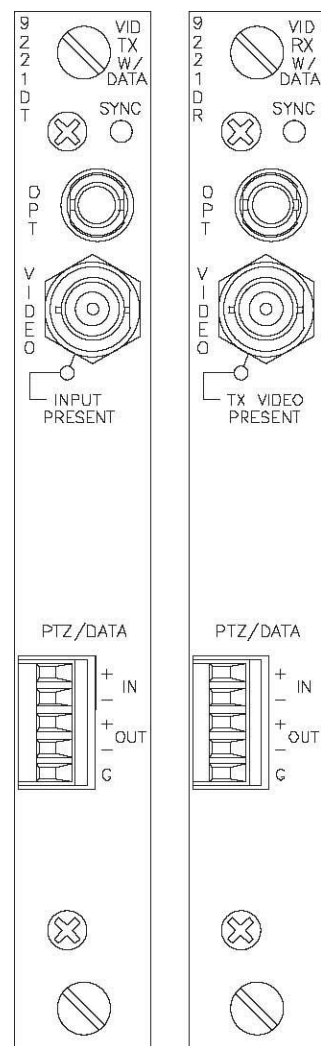


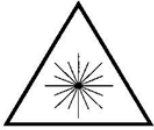
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Safety Instructions

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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.

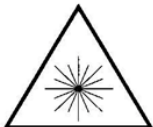


When this unit is operated in extremely elevated temperature conditions, it is possible for internal and external metal surfaces to become extremely hot. Care should be taken to insure this unit is installed in a restricted area where only properly trained service personnel have access to the unit.

Instrucciones de Seguridad

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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.

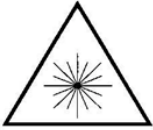


Cuando se opera esta unidad en condiciones de temperatura sumamente elevada, es posible que las superficies internas y externas de metal se pongan extremadamente calientes. Debe tenerse cuidado para asegurar que esta unidad se instale en un área restringida donde sólo tenga acceso a la unidad el personal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

Sicherheitsanleitungen

RM-1

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 Bedienelemente 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 kann 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.

Gefahrenstufe 1M

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.

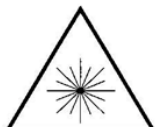


Wenn diese Einheit bei besonders hohen Temperaturen betrieben wird, können interne und externe Metallflächen extrem heiß werden. Es muss darauf geachtet werden, dass diese Einheit in einem Bereich mit eingeschränktem Zugang aufgestellt wird, damit nur geschultes Wartungspersonal Zugang zur Einheit hat.

Consignes de Sécurité

RM-1

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.

Fiber Information

This unit was manufactured with attention to fiber cleanliness by TKH Security Solutions USA. Beyond the optical safety information contained in this manual, the following guidelines should be observed when working with optical fibers.

The biggest problem is **dirt!**

It takes very little contamination to cause problems with optical fiber connections; cleanliness is extremely important to proper operation of optical equipment.

1. Protect optical connectors by leaving the connector covers in place on unused fiber connections and on the fiber tips themselves.
2. Personnel who remove and replace fibers should be equipped with a fiber cleaning kit. These are inexpensive and can be obtained from any fiber equipment supply house. If you choose to, you can use propanol and lint-free tissue to clean fibers.
 - a. Do not use isopropanol alcohol (typically called rubbing alcohol) mixed with water. This can cause additional spots. (**Caution: *Pure isopropanol is very flammable!***)
 - b. Use lintless tissues to clean fibers.
 - c. Clean the fiber with a folded tissue moistened with the propanol, pulling the connector tip across the tissue, then turn the connector 90 degrees and repeat in a different spot on the tissue.
 - d. Don't pull the fiber across and then push it back. This will put the dirt that was cleaned off back on again.
 - e. Repeat the process on a dry, folded tissue.
3. When removing fibers, ***always*** clean them when replacing them no matter how long you had them off.
4. When connecting fibers, pay attention to the bend radius of the fibers. A general rule is to have a 3-inch (8 cm) bend radius. A bend radius less than 3 inches is an attenuator and can cause optical signal loss.
5. Installers of fiber equipment should be equipped with the equipment manuals and an optical power meter to measure the optical inputs and outputs in a system. An optical power meter is an inexpensive tool that can save much time and effort in getting optical communications links up and running. Properly equipped and trained installers can quickly determine the source of any problems that occur.

Functional Description

The 9221DT transmitter accepts a composite video signal in NTSC, PAL, or SECAM format via the BNC video input port. This baseband video signal is sampled at a 16 KHz rate by an A-to-D converter operating with nine bits of precision. Data signals are combined into the bit stream and converted to an optical signal for transmission over the optical fiber.

The receiver accepts the optical signal and converts it back to a serial bit stream. The signal is deserialized and converted back into the video and data signals, which are output on the BNC and data connectors.

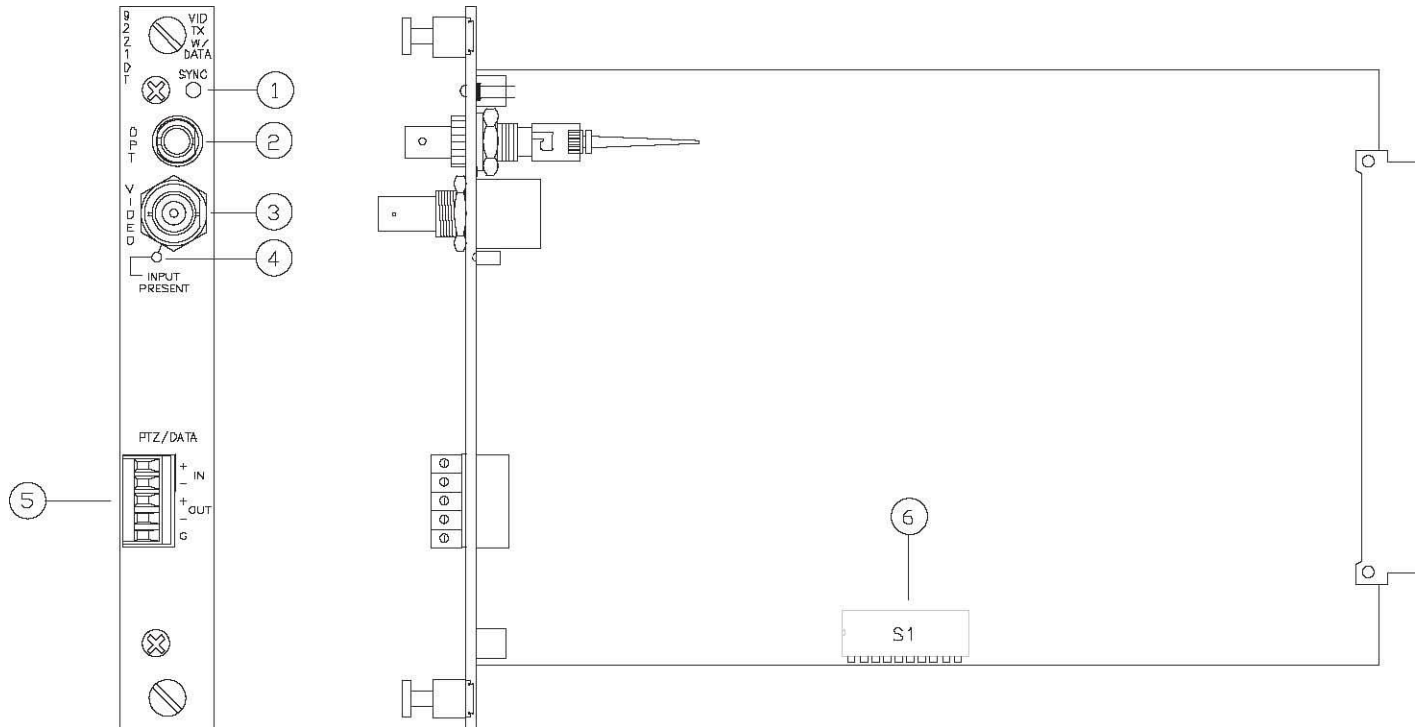
Data in the reverse direction is converted to an optical signal by the receiver at a different wavelength and sent over the fiber to the transmitter where it is decoded and converted back to the data format for output.

The 9221DT and 9221DR are compatible with the 9225DT and 9225DR stand-alone models.

The 9221DT and 9221DR operate on 6VDC as supplied from the chassis in which it is installed.

9221DT Indicator and Connector Locations

FIGURE 1



1. SYNC INDICATOR

This multicolor LED provides status information about the link as follows:

- OFF indicates no power is applied to the card.
- **Red** (NO SYNC, NO LOOP) indicates the local unit is not receiving sufficient optical signal from the remote unit or the local demux circuitry is not able to synchronize to the incoming signal.
- **Yellow** (SYNC, NO LOOP) indicates the local unit has synchronized to the incoming signal, but the remote unit has not synchronized with the local unit.
- **Green** (SYNC, LOOP) indicates that both local and remote units are communicating correctly.

2. OPTICAL OUTPUT CONNECTOR

The output optical fiber connection is made here.

3. VIDEO INPUT CONNECTOR

The video input signal cable is connected to this BNC connector.

4. VIDEO PRESENT INDICATOR

This green LED illuminates when a video signal is present on the input BNC connector.

5. PTZ/DATA CHANNEL CONNECTOR

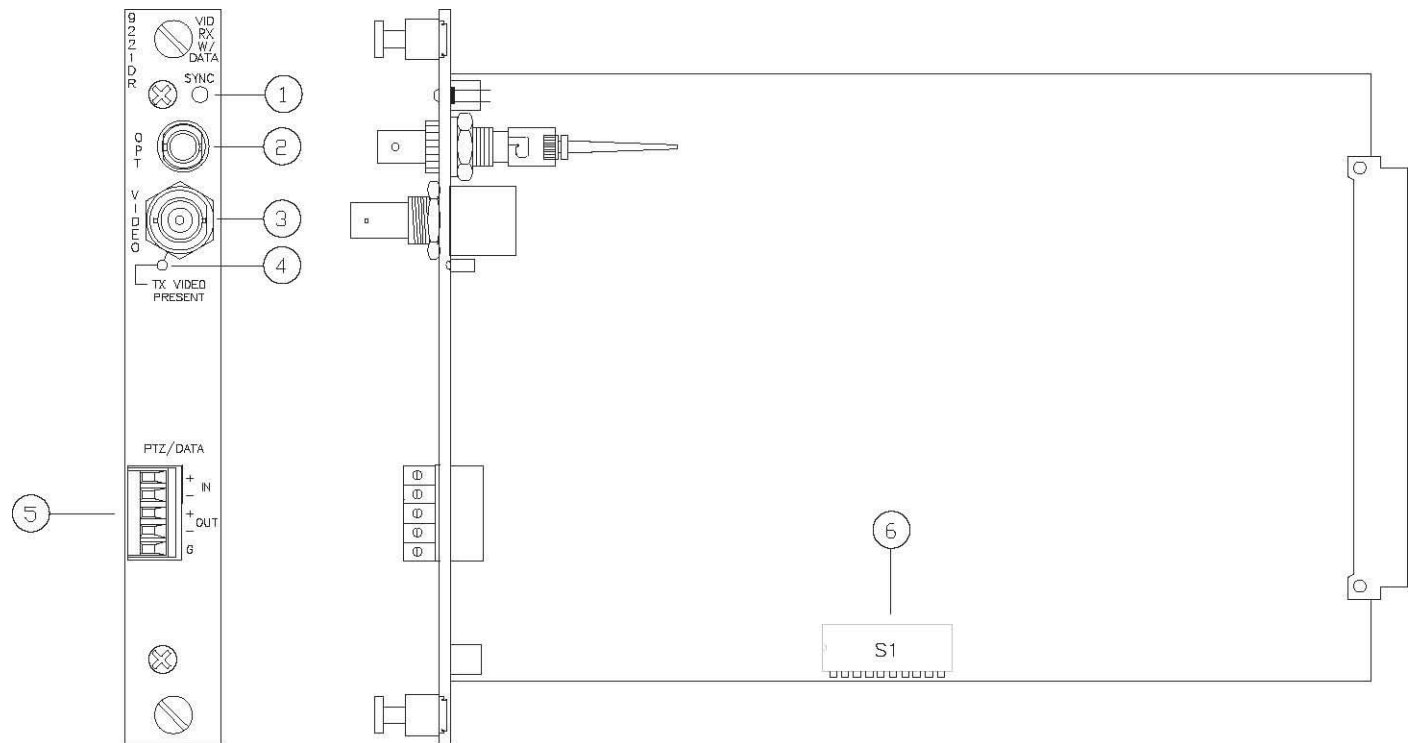
This is the data I/O connector.

6. PTZ/DATA CHANNEL DIPSWITCH

This switch is used to set the data parameters for the PTZ/Data Channel.

9221DR Indicator and Connector Locations

FIGURE 2



1. SYNC INDICATOR

This multicolor LED provides status information about the link as follows:

- OFF indicates no power is applied to the card.
- **Red** (NO SYNC, NO LOOP) indicates the local unit is not receiving sufficient optical signal from the remote unit or the local demux circuitry is not able to synchronize to the incoming signal.
- **Yellow** (SYNC, NO LOOP) indicates the local unit has synchronized to the incoming signal, but the remote unit has not synchronized with the local unit.
- **Green** (SYNC, LOOP) indicates that both local and remote units are communicating correctly.

2. OPTICAL INPUT CONNECTOR

The output optical fiber connection is made here.

3. VIDEO OUTPUT CONNECTOR

The video output signal cable is connected to this BNC connector.

4. VIDEO PRESENT INDICATOR

This **green** LED illuminates when a video signal is present on the input BNC connector at the *transmitter* input connector.

5. PTZ/DATA CHANNEL CONNECTOR

This is the data I/O connector.

6. PTZ/DATA CHANNEL DIPSWITCH

This switch is used to set the data parameters for the PTZ/Data Channel.

Set Up and Operation of the 9221D

Operation of the 9221DT and 9221DR units consists of setting the data parameter switches as required, installing the card in a compatible Series 9000 chassis, connecting the optical cable, the video input, and the data signals.

PTZ/DATA CHANNELS SWITCH SETTINGS AND CONNECTIONS

The PTZ data channel switch sets the data input and output formats. Refer to Table 1 and the input/output connection diagrams below to set and connect data signals.

FIGURE 3

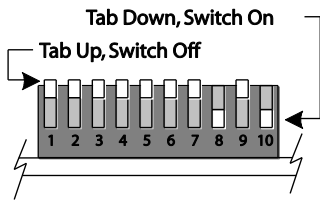


TABLE 1 — 9221D DIPSWITCH SETTINGS

Type/Switch Position	1	2	3	4	5	6	7	8	9	10
RS232	ON	OFF	OFF	OFF	OFF	N/A	N/A	OFF	ON	OFF
RS422	OFF	OFF	ON	ON	ON	T	T	ON	OFF	ON
RS485 2-Wire	ON	ON	OFF	ON	ON	T	T	ON	OFF	ON
RS485 4-Wire	OFF	ON	OFF	ON	ON	T	T	ON	OFF	ON
Manchester	ON	ON	ON	OFF	OFF	T	T	ON	OFF	ON
Disabled	OFF	OFF	OFF	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes

- ¹ N/A Switch position does not affect setting.
² T = Input Termination Setting, ON = Termination On, OFF = Termination Off.

FIGURE 4

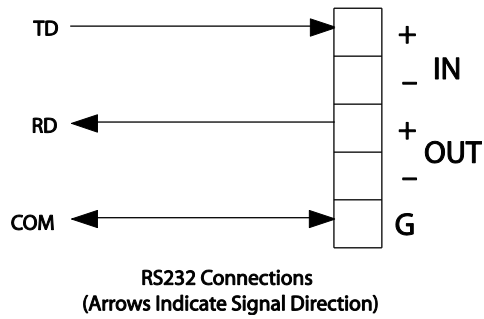


FIGURE 5

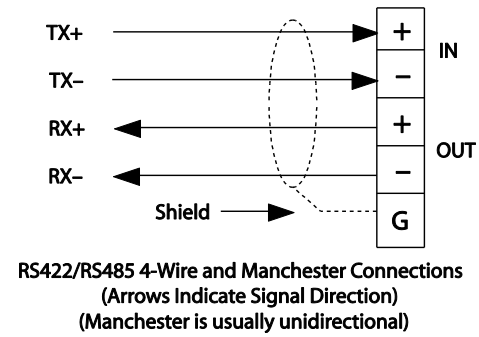


FIGURE 6

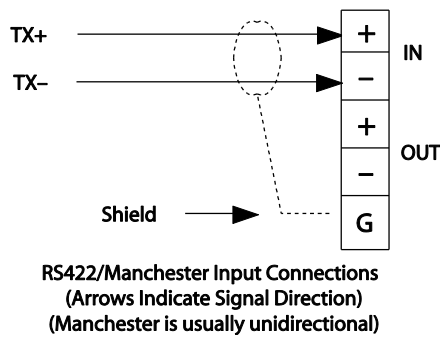


FIGURE 7

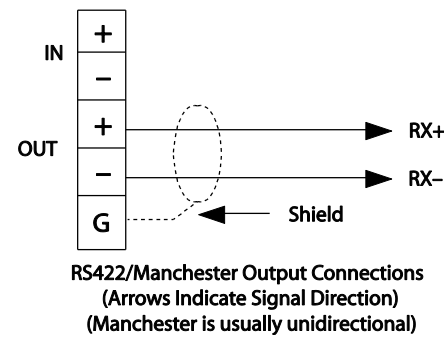
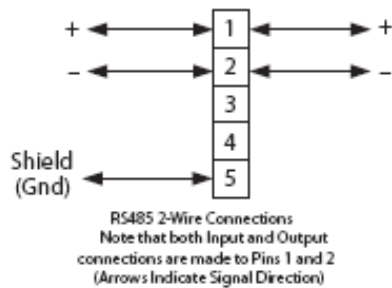
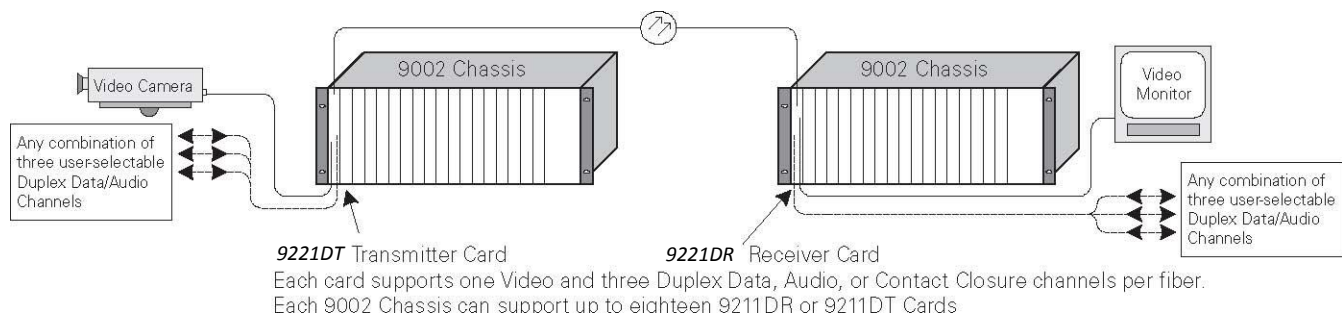


FIGURE 8



Typical Application of the 9221D



Troubleshooting 9221D Links

The Sync indicator LED on the transmitter and receiver provides information as to the optical and electrical status of the units. Troubleshooting normally starts at the transmitting end.

The SYNC LED serves multiple functions:

- OFF indicates no power is applied to the card. The receiver and/or chassis into which the card is installed have no power or the card is not seated into the chassis correctly.
- **Red** (NO SYNC, NO LOOP) indicates the local unit is not receiving sufficient optical signal from the remote unit or the local demux circuitry is not able to synchronize to the incoming signal. Check the fiber for poor connections or optical losses greater than the unit specifications.
- **Yellow** (SYNC, NO LOOP) indicates the local unit has synchronized to the incoming signal, but the remote unit has not synchronized with the local unit. Check the fiber for poor connections or optical losses greater than the unit specifications.
- **Green** (SYNC, LOOP) indicates that both local and remote units are communicating correctly.

Operation of the 9221D with the Network Management System Software

Operation of the 9221DT with the Network Management System consists of the following parameters:

1. Slot Number
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. Local Demux in Sync
10. Remote Demux in Sync
11. Video Present (9221DT)
12. Video Present at Tx Input (9221DR)
13. Laser Drive Current
14. Received Optical Power

Specifications for the 9221D

OPTICAL

Model	MM	MM	SM
Fiber Size	50/125	62.5/125	09/125
Tx Optical Output Power (dBm)	-21	-17	-7
Tx Output Wavelength	1310	1310	1310
Rx Receiver Sensitivity (dB)	-27	-27	-30
Tx Budget (dB)	6	10	23
Rx Optical Output Power (dBm)	-21	-17	-7
Rx Output Wavelength	850	850	1550
Tx Receiver Sensitivity (dB)	-38	-38	-30
Rx Link Budget (dB)	17	21	23
Estimated Distance (Km)	3	6	57

† Ranges based on 3.0 dB/km @ 850 nm or 1.0 dB/km @ 1310 nm for 62.5/125 fiber and 0.35 dB/Km loss on 09/125 fiber at 1310 nm or 0.25 dB/Km loss on 09/125 fiber at 1550 nm.

VIDEO

Video Sampling Rate/Resolution	16.0 Mhz., 9-bit
Video Input/Output Signal	NTSC, PAL, or SECAM, 1V p-p, 75W
Video Input/Output Connector	BNC
Video Bandwidth	6.5 Mhz (-3.0 dB)
SNR	≥63 dB
Differential Phase	≤1°
Differential Gain	≤2%

POWER

Requirements	6VDC supplied from chassis
9221DT	500 mA
9221DR	450 mA

PHYSICAL

Dimensions (in inches)	6.15 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

TKH Security Solutions
www.tkhsecurity.com

Sigura B.V.

Zuidelijk Halfrond 4 • 2801 DD Gouda
The Netherlands
Telephone: +31 182 592 333
Fax: +31 182 592 123
E-mail: sales.nl@tkhsecurity.com

TKH Security Solutions USA

12920 Cloverleaf Center Drive • Germantown
Maryland 20874 USA
Telephone: +1 301 444 2200
Toll Free: +1 800 293 4237
Fax: +1 301 444 2299
E-mail: sales.us@tkhsecurity.com