



Optelecom 9000 Series Installation and Operation Manual

Model 9191DT Model 9191DR

Rack-Mount Fiber Optic Two Channel Video
Transmitter and Receiver Cards with Simplex
High-Speed Data Port

For transporting two NTSC or PAL video signals and
high-speed data over optical fiber using 9-bit digital
encoding and multiplexing techniques

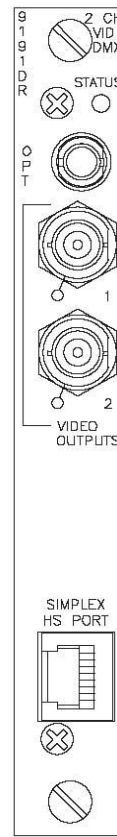
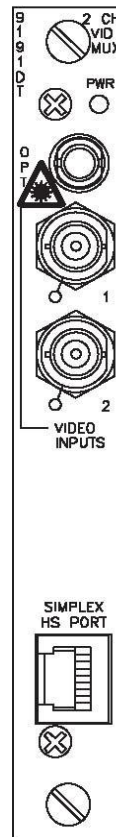
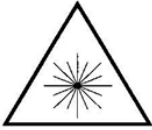


Table of Contents

Section	Page
Safety Instructions	4
Instrucciones de Seguridad	5
Sicherheitsanleitungen	6
Consignes de Sécurité	7
Fiber Information	8
Functional Description	9
9191DT Indicator and Connector Locations	10
9191DR Indicator and Connector Locations	11
Set Up and Operation of the 9191D	12
Typical Application diagram for the 9191D	13
Troubleshooting the 9191D	14
Operation of the 9191D with the Network Management System	15
Specifications for the 9191D	16

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.

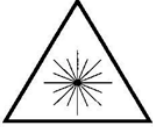


The chassis into which this unit is installed must be housed in a properly rated NEMA enclosure.



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.



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.

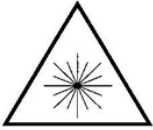


El chasis en el cual está instalada esta unidad debe estar dentro de un alojamiento debidamente calificado por NEMA.



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.

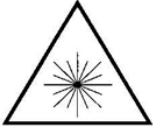


Wenn diese Einheit bei besonders hohen Temperaturen betrieben wird, können interne und externe Metallflächen extrem heiß werden. Es muss darauf geachtet werden, dass diese Einheit in einem Bereich mit eingeschränktem Zugang aufgestellt wird, damit nur geschultes Wartungspersonal Zugang zur Einheit hat.

Consignes de Sécurité

RM-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 Model 9191DT transmitters accept two composite video signals in NTSC or PAL format via two BNC video input ports. The baseband video signals are each sampled at a 16 Mhz rate by an A-to-D converter operating with nine bits of precision. The nine bits of digitized video and one high-speed data signal are multiplexed, serialized, and converted to an optical signal for transmission over the fiber.

The 9191DR receiver accepts the optical signal, converts it to an electrical signal, then deserializes it and demultiplexes it into two digitized video and one high-speed data stream. The digitized video is converted back to the two original video signals via D-to-A converters.

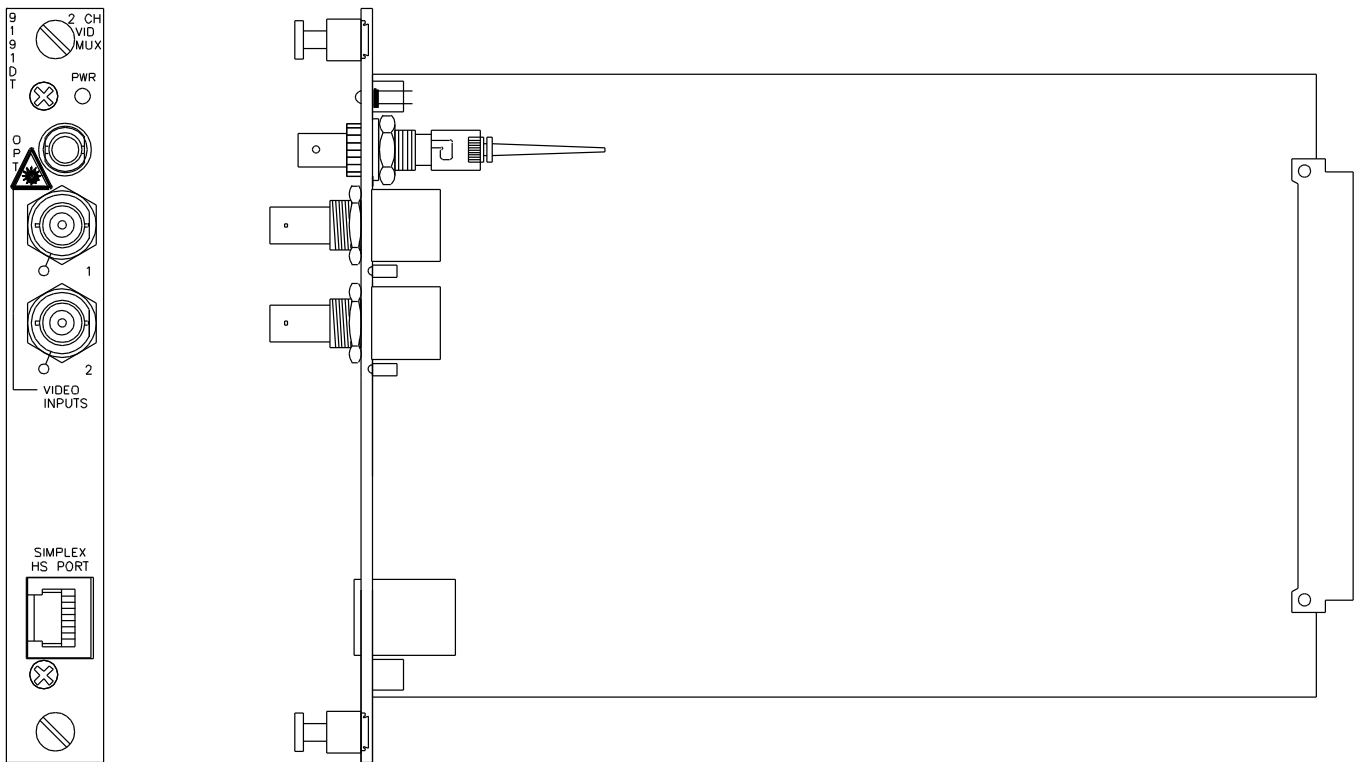
9191DT and DR cards are optically compatible with the 9195DT and DR standalone modules.

The simplex high-speed port on the 9191DT and 9191DR cards, which operate in the same direction as the video, transport synchronous 16 Mbps or 1.6 Mbps asynchronous RS422 data. This port is designed to operate with the 9961-C and 9962-C option module host cards and other cards that add data, audio, and contact closure transmission capabilities to TKH Security USA video transmission systems.

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

9191DT Indicator and Connector Locations

FIGURE 1



1. POWER INDICATOR

This LED illuminates *green* when 6V power is applied to the card via the chassis backplane.

2. OPTICAL OUTPUT PORT

The output optical connection is made here.

3. CHANNEL 1 AND CHANNEL 2 VIDEO INPUT CONNECTORS

These BNC connectors are the inputs for the video signals.

4. CHANNEL 1 AND CHANNEL 2 VIDEO PRESENT INDICATORS

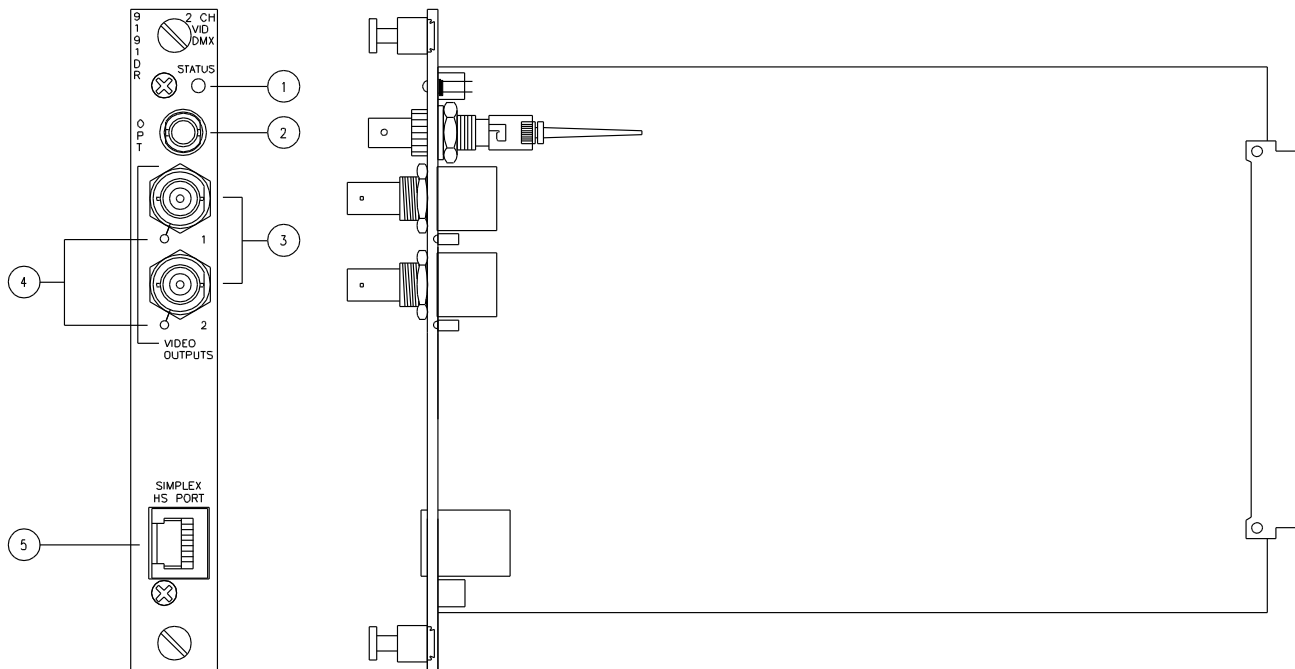
Each of these indicators will illuminate *green* when a video signal is present on its respective Video Input connector.

5. HIGH-SPEED PORT CONNECTOR

This RJ45 connector is the input for the high-speed port.

9191DR Indicator and Connector Locations

FIGURE 2



1. STATUS INDICATORS

This LED illuminates **green** when the received optical signal quality is sufficient and the receiver can properly decode the electrical signal. If illuminated **red**, the optical signal is too low or the electrical signal cannot be decoded properly.

2. OPTICAL INPUT CONNECTOR

The input optical connection is made here.

3. CHANNEL 1 AND CHANNEL 2 VIDEO OUTPUT CONNECTOR

These BNC connectors provide the outputs for the two video signals.

4. CHANNEL 1 AND CHANNEL 2 TX VIDEO PRESENT INDICATOR

This LED illuminates **green** when the transmitter reports that a valid video signal is connected to the respective input BNC of the *transmitter* card. This duplicates the operation of the Video Present indicator at the *transmitter* end.

5. HIGH-SPEED PORT CONNECTOR

This RJ45 input connector is the output for the high-speed port.

Set Up and Operation of the 9191D

Set up and operation of the 9191DT and DR units consists of installing the unit into a Series 9000 series chassis, then connecting the optical cables and the video input and output signals. There are no switches to set or adjustments that can be made on this unit.

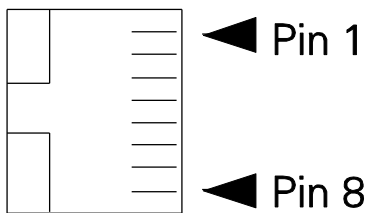
High-Speed Port Operation

The high-speed port carries 16 Mbps simplex synchronous RS422 data. The port may be used asynchronously at speeds of up to 1.6 Mbps. It is designed to interface with the 9961-C and 9962-C option module host cards or other cards that may become available for operation with the high-speed port. The 9961-C and 9962-C allow the addition of up to eight simplex data, contact closure, or stereo audio channels to the two video channels already on the fiber.

The ports are wired as shown in Figures 3 and 4 and in Tables 1 and 2 below. The 9961-C and 9962-C cards are normally supplied with a properly configured cable for connection to a high-speed port. A standard (not crossover) RJ45 CAT5 cable will also work correctly. Cable lengths should not exceed 1.3 meters (4 feet).

FIGURE 3

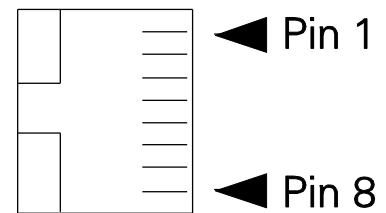
High-Speed Port Connectors
9152DT, 9191DT, 9195DT, 9421DT



Front View

FIGURE 4

High-Speed Port Connectors
9961-C/9962-C



Front View

TABLE 1 — 9191DT SIMPLEX HIGH-SPEED PORT INPUT

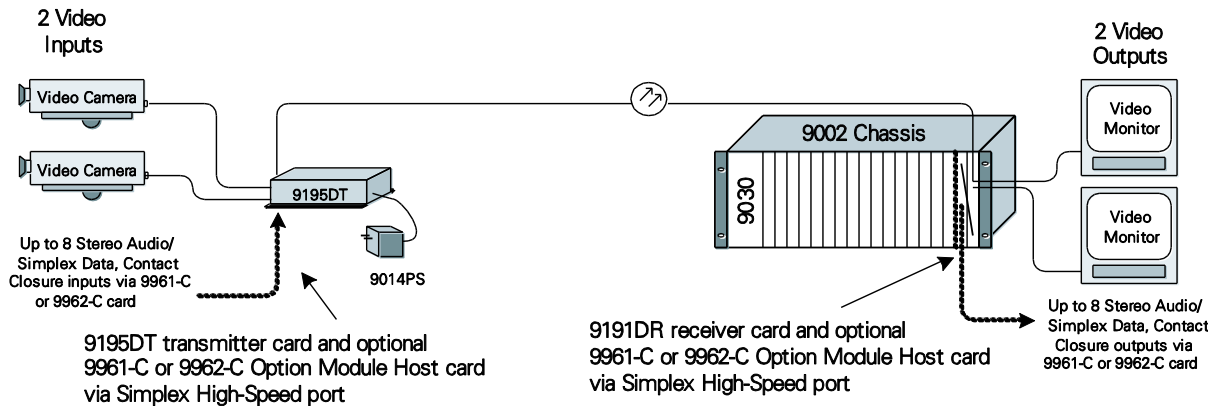
RJ45 Pin Number	Signal Name
1	TX Data (+) Input
2	TX Data (-) Input
3	TX Clock (+) Output
4	Not Used
5	Not Used
6	TX Clock (-) Output
7	Not Used
8	Not Used

TABLE 2 — 9191DR SIMPLEX HIGH-SPEED PORT OUTPUT

RJ45 Pin Number	Signal Name
1	Not Used
2	Not Used
3	Not Used
4	RX Data (+) Output
5	RX Data (-) Output
6	Not Used
7	RX Clock (+) Output
8	RX Clock (-) Output

Typical Application diagram for the 9191D

This application drawing shows an example of a point-to-point 9191D system.



Troubleshooting the 9191D

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

On the 9191DT transmitter, the power indicator should be illuminated; if no indicators are illuminated, check the chassis power supply, power source, and connections.

When video is applied, the Video Present indicator should be illuminated **green**. If the Video Present indicator is not green, then check the video source and connections.

On the 9191DR receiver, the status indicator should be illuminated either **red** or **green**; if no indicators are illuminated, check the chassis power supply, power source, and connections.

When the STATUS indicator is illuminated **green**, operation is normal. The STATUS indicator will be illuminated **red** to indicate insufficient optical signal at the optical input. Check the fiber for poor connections or optical losses greater than the unit specifications.

If the STATUS indicator is illuminated **green** and the TX Video Present indicator is not illuminated, the video source at the *transmitter* end should be checked.

Operation of the 9191D with the Network Management System

Operation of the 9191DT with the Network Management System consists of the following parameters:

1. Slot Number
2. Card Name (Model Number)
3. Serial Number
4. Time
5. Wavelength
6. Revision Number
7. Chronometer Value (Cumulative Hours of Operation)
8. Reset Cycles (Cumulative Number of Power Cycles)
9. Firmware Revision
10. Laser Drive Current
11. Video Input Present (each channel)

Operation of the 9191DR with the Network Management System consists of the following parameters:

1. Card Location
2. Card Name (Model Number)
3. Serial Number
4. Time
5. Wavelength
6. Revision Number
7. Chronometer Value (Cumulative Hours of Operation)
8. Reset Cycles (Cumulative Number of Power Cycles)
9. Firmware Revision
10. Local Demux Sync
11. Received Optical Power
12. Transmit Video Input Present (each channel)

NMS users should set the Alarm Status and Alarm Limits for each parameter as required for the specific application when the NMS software is operated for the first time.

When the 9191D card is installed into an existing system already utilizing NMS system software, an upgrade of the software will be necessary to add the 9191D card to the software database in the NMS software.

Consult the factory for guidance on how to download the latest version of the software from the TKH Security USA FTP download site.

Specifications for the 9191D

OPTICAL

Transmitter Model	LDS	LDL	LD	LD3	LD3(X) ¹
Transmitter Optical Output Wavelength	850	1310	1310	1550	CWDM
Mating Receiver Model	S	LM	L	L	L
Transmitter Optical Output Power (dBm) 50 μm	-7	-7	N/A	N/A	N/A
Transmitter Optical Output Power (dBm) 62.5 μm	-7	-7	N/A	N/A	N/A
Transmitter Optical Output Power (dBm) 09 μm	N/A	N/A	-7	0	0
Receiver Optical Input Sensitivity (dBm) 50 μm	-24	-30	N/A	N/A	N/A
Receiver Optical Input Sensitivity (dBm) 62.5 μm	-24	-30	N/A	N/A	N/A
Receiver Optical Input Sensitivity (dBm) 09 μm	N/A	N/A	-30	-30	-30
Maximum Receiver Optical Input (dBm)	-5	0	0	0	0
Link Budget (dB) 50 μm	17	23	N/A	N/A	N/A
Link Budget (dB) 62.5 μm	17	23	N/A	N/A	N/A
Link Budget (dB) 09 μm	N/A	N/A	23	30	30
Estimated Distance (km) 50 μm ^{2,3}	3	15.0	N/A	N/A	N/A
Estimated Distance (km) 62.5 μm ^{2,3}	2.5	15.0	N/A	N/A	N/A
Estimated Distance (km) 09 μm ^{2,3}	N/A	N/A	57	108	57-108

¹ Replace X with A through W to represent CWDM wavelength per the table below.

² Range estimates based on fiber losses of 3.0 dB/km @ 850 nm and 1.0 dB/km @ 1310 nm and 1550 nm on 62.5/125 fiber, 0.35 dB/km @ 1310 nm and 0.25 dB/km @ 1550 nm on 09/125 fiber, and include a 3 dB safety factor.

³ Range may be limited by modal and chromatic dispersion, fiber quality, and bandwidth. Range estimates for multimode are based on 500 Mhz/Km fiber.

CWDM Letter Code	Wavelength	CWDM Letter Code	Wavelength
A	1470	N	1290
B	1490	P	1310
C	1510	Q	1330
D	1530	R	1350
E	1550	S	1370
F	1570	T	1390
G	1590	U	1410
H	1610	V	1430
M	1270	W	1450

VIDEO

Video Sampling Rate	16 Mhz, 9-bit
Video Input/Output Signal	NTSC or PAL, 1V Pk-to-Pk, 75Ω
Video Input/Output Connector	BNC
Video Bandwidth	6.5 Mhz (-3.0 dB)
SNR	≥63 dB over entire optical budget
Differential Gain	≤1°
Differential Phase	≤2%

HIGH-SPEED PORT

Connector	RJ45
Data Format	Synchronous RS422 @ 16 Mbps simplex Asynchronous RS422 @ 1.6 Mbps simplex (10% distortion)

POWER

Requirements	6.0 VDC (chassis power supply)
9191DT	420 mA
9191DR	380 mA

PHYSICAL

Dimensions (in inches)	6.1 H x 0.8 W x 8.6 D
Weight (in pounds)	

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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