Telecast
Fiber Systems, Inc.

DiamondBack 2™

8-Channel Video Multiplexer

Instruction Manual

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Diamondback2 Trransmitter, rear and front views

Diamondback2 Receiver, rear and front views

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Laser Safety

WARNING! Class 1 laser. Do not look into a fiber port or connector.

Laser Radiation

This TX unit contains a CDRH Class 1 laser device. Although this means it is eye safe, you must avoid looking directly at, or staring into, the laser bean located on an optical connector or on the end of a fiber.

Infrared radiation is produced at the fiber connection port on the rear of the TX unit and at the end of any unterminated optical fibers that are attached to this port. Avoid any direct exposure to the light that comes from these sources.

Do not power up the unit when no fiber is attached to the fiber port.

There are no user adjustments inside the Diamondback2. Do not attempt any type of service to this instrument other than any as instructed this manual. Refer all servicing to Telecast Fiber, Inc.

FCC Part A Manual Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency (RF) energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct such interference at their own expense.

WARNING CE

This is a Class A product. In a domestic environment this product may cause radio interference.

Introduction

The Telecast DiamondBack2™ system consists of a dual optical output fiber optic transmitter/multiplexer (TX) and a mating receiver/demultiplexer (RX). The TX unit multiplexes and launches simultaneously onto the fiber up to eight NTSC/PAL/SECAM video signal channels plus a ninth auxiliary port for compatible data use only. The compatible devices include the Telecast Adder™ 161 and Adder™ 882i, which mux audio and data/switch or intercom and data/switch information onto a coax to the BNC input on the DiamondBack2 TX.

Within a DiamondBack2 TX, the video signals are first digitized at 23.04 Mb/sec x 10 bits and then multiplexed at a data clock rate of 2.488 Gb/s. This digital data is converted to an optical signal and launched into the fiber. The DiamondBack RX receives the optical transmission and restores the video and data signals to the corresponding output ports.

The DiamondBack2 TX is optionally equipped with two parallel laser outputs for redundancy or split feeds. In redundant operation, the DiamondBack RX accepts two optical inputs, with automatic switchover protection.

The DiamondBack2 TX and RX units have similar appearances; front and rear views are shown in the photo on the opposite page. Front panel indicators for channel and system status are very similar, and the locations of the electrical I/O connections on the rear panels are identical.

A rotary switch and BNC output on both TX and RX front panels enables the selection of one of the eight video signal channels for display on a local monitor.

An internal Ni-Cad battery provides backup in the event of line power loss.

DiamondBack2's are housed in a standard 19 inch electronics rack.

Setup

The DiamondBack system consists of:

- One DiamondBack2 TX Transmitter
- One DiamondBack2 RX Receiver
- Two external power supplies (AC/DC adapters)
- Rack mount adapter kits (ears)

After unpacking, inspect the units for mechanical damage, and all electrical connectors for bent or damaged pins and latches. Report any damage to the carrier and to Telecast Fiber Systems, Inc.

Leave the protective caps on the optical connectors until it is time to attach the fiber to the units. Replace the caps whenever the fiber is disconnected.

Attaching the Rack Mount Adapters

Units are shipped ready for rack use. Each adapter is held in place by two #10 flat head screws; see Figure 1.

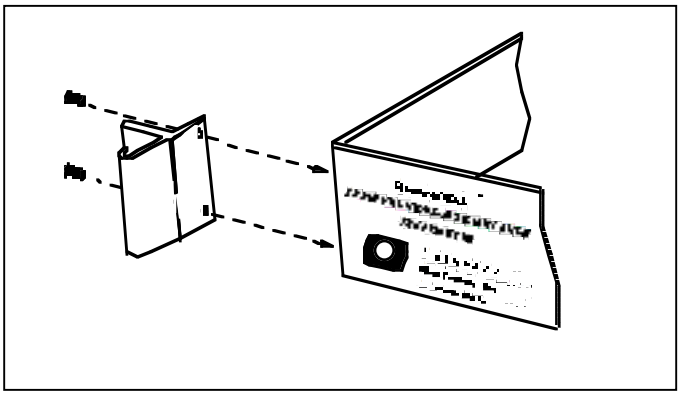

Figure 1: Installing the Rack Mount Adapters

Place each unit in its intended location before attaching any cables or wires to prevent accidental damage to the cables or their connectors.

Line Power

Any power supply used with the DiamondBack 2 must provide a minimum of 1.5 amperes, continuous, at 12 to 24 VDC. Although the units will operate at 12 VDC, 13.8 VDC is required to charge the internal UPS battery. This battery charges whenever the input voltage is 13.8 VDC or higher. Full charge takes approximately 16 hours.

Power input is through a 4-pin XLR connector located on the left side of the rear panel; see Table 1 for pinout and Figure 2 for location. Be sure that AC outlets are within reach of their 6-foot power cords.

PIN	SIGNAL
1	Ground
2	No Connection
3	No Connection
4	+12 –to 24 VDC

Table 1: Power XLR Pin-out

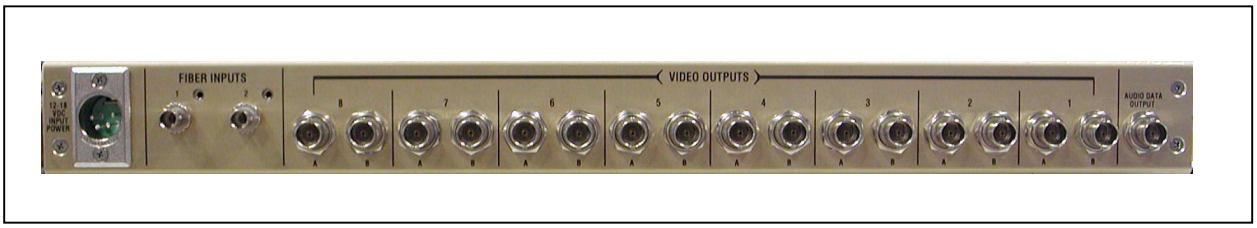

Figure 2: Rear Panel Connections

Configuring Signal I/O

Rear Panel Connections

All setups and connections are on the rear panel, which is basically the same for the TX and RX units; see Figure 2.

The rear panel has 16 BNC female connectors for video and a 17th BNC for Adder Data. From left to right in Figure 2, they are:

Fiber In/Outputs Depending on configuration, there will be one or two ST type bulkhead connectors for singlemode ST type fibers.

Video In/Ouputs TX & RX. Chan 8 to Chan 1 are the video inputs on the TX and the corresponding channel outputs on the RX. Each input or output has an additional looped input or output. These loops are self-terminating 75 Ohm.

Front Panel Indicators and Controls

The front panels of the RX and TX are shown on the next page in Figure 3.

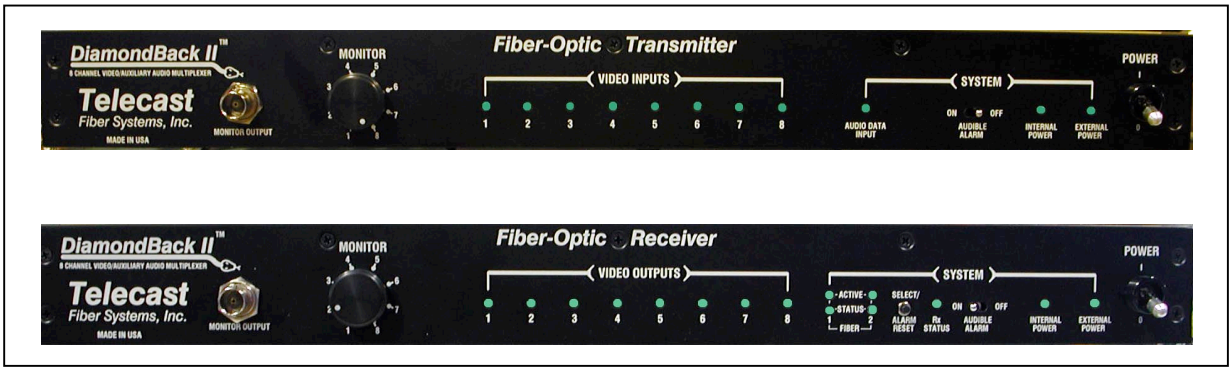

Figure 3: Front Panels, TX (Upper) and RX (Lower)

Monitor — On both RX & TX. A rotary switch to select one of the eight video channels for output to the adjacent BNC. A standard composite video monitor can be connected here. This is full broadcast quality.

Video — TX (signal input) and RX (signal output). LEDs, one per signal channel, which illuminate green when a video sync pulse or a data stream is present. These LEDs will flicker when unsynchronized video (e.g., RGB) is present.

Fiber 1/2 — RX only. Includes the following:

Active: LEDs which indicate the fiber being used to communicate with the transmitter.

Status: LED which illuminates green if the system has valid optical data. RED when there is no optical power.

Select: A push-button that toggles between the two fiber inputs. The default on power up is always Fiber 1, if the TX is already activated. This button also resets the alarm.

Power — External: LED which illuminates green when 12 to 24 VDC of external power is supplied to the unit.

Internal: LED which illuminates green after approximately 30 minutes of battery charging, and illuminates red when external voltage is absent and battery is discharging.

Aud Data In — TX only. LED which illuminates green when there is data present on the auxiliary input BNC.

Alarm — TX Alarm, An intermittent beep will sound when the alarm switch is on and the system is being powered by the internal battery backup. The alarm will stop automatically if external power is restored.

RX Alarm: For power monitoring conditions, the RX alarm functions the same as the TX alarm. For fiber switching situations, the alarm will continue to sound even if the optical signal is restored, indicating to the user the type of malfunction that has occurred. The RX alarm must be manually reset with the SELECT/RESET button.

System Examples

The combination of Telecast's DiamondBack video multiplexer and Telecast's Adder 161 Audio/Data multiplexer or Adder 882i intercom/Data multiplexer provides a powerful network solution for carrying audio, video and data economically from point to point. The Aux Input on the DiamondBack TX is intended for a coaxial connection to the Adder 161 or 882i.

An example of the use of the DiamondBack and the Adder 161 is shown in Figure 4. The Adder 161 can multiplex up to 16 channels of audio, 2 streams of digital data, and 4 switch closures for delivery on its coaxial output to the DiamondBack TX.

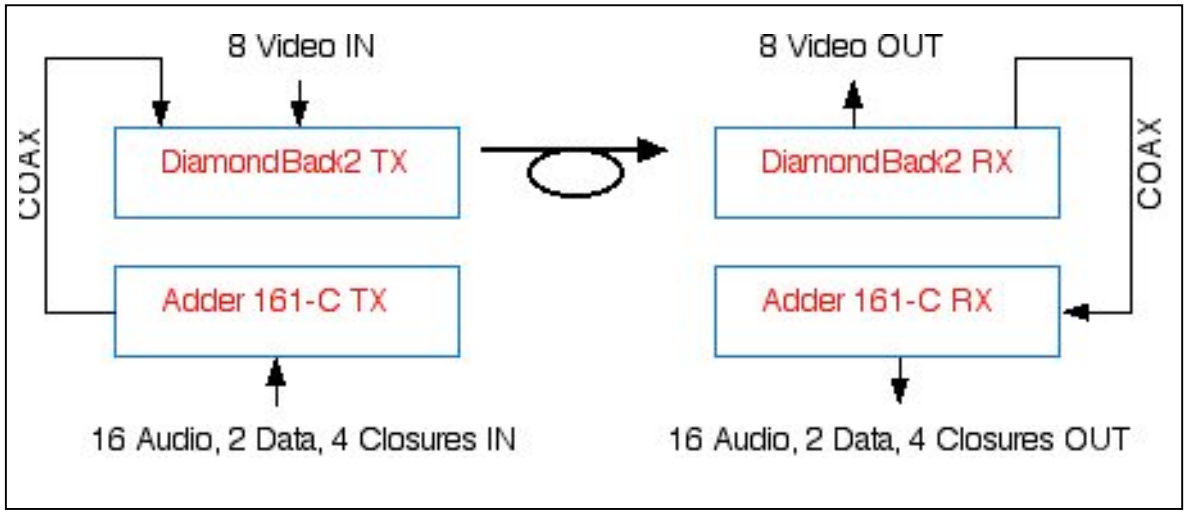

Figure 4: Example of the DiamondBack/Adder 161 Network

Figure 5 shows the use of bi-directional Diamondback2's with the Adder 882i. This will provide for up to ten 4-wire circuits or 2 4-wire circuits PLUS 4 dual channel RTS signals or 8 single channel ClearCom signals.

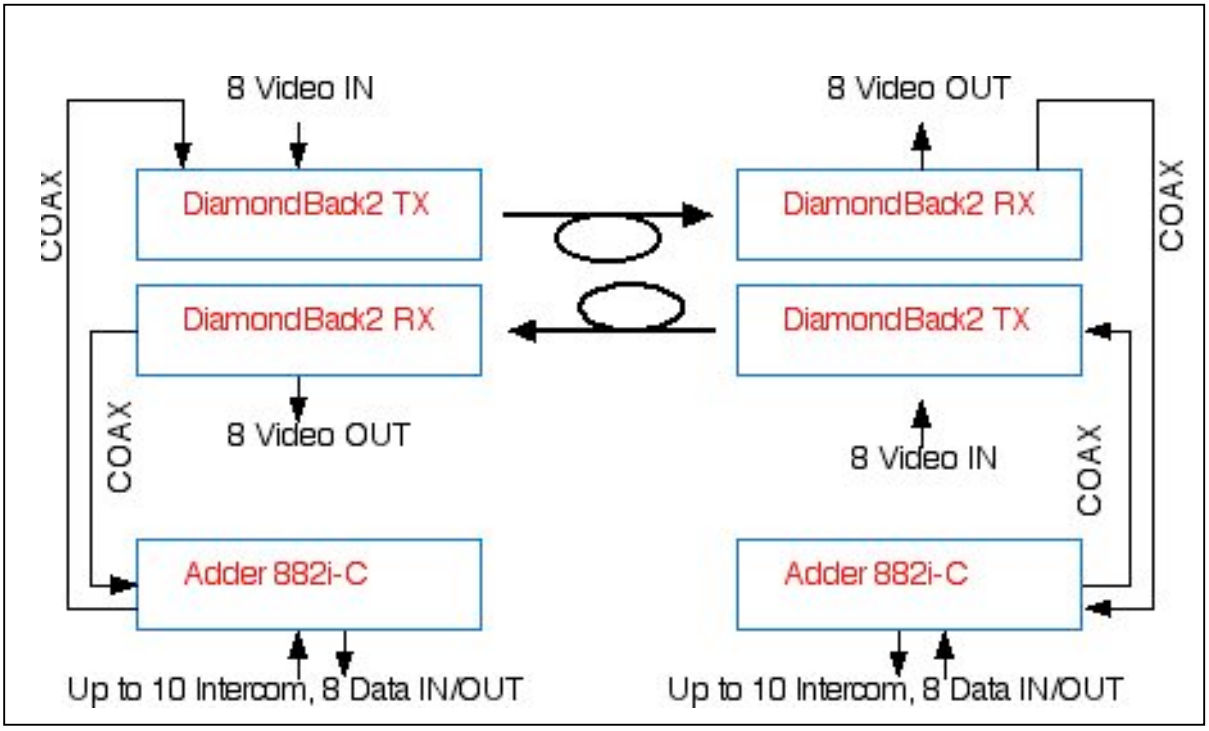

Figure 5: Example of the DiamondBack/Adder 161

Fiber Optic Cable Runs

The optical output from the TX is generated by an infrared laser diode that is coupled to the fiber. User connections are made at a bulkhead ST type connector on the rear panel; refer to Figure 2 on page 3. Operation is intended for use on single mode fiber.

The input at the RX uses a InGaAs pin diode and amplifier to convert the optical signal back into an electrical signal.

Never look directly into the end of a connected optical fiber while any component is operating; eye damage is possible.

DiamondBack2 launches the signals into 8.3 micron diameter core single mode fibers. Assembled cables and connectors are available from Telecast Fiber Systems, Inc.

The Transmitter's optical outputs Fiber 1 and Fiber 2 have the following characteristics:

- Fully redundant
- Have independent power drivers
- Both remain active in the absence of a power or device failure

The Receiver takes its signal selectively from Fiber 1. If the signal on Fiber 1 is lost, the RX automatically switches to its Fiber 2 input. If the signal on Fiber 1 is restored, and the signal on Fiber 2 is lost, the RX switches back to Fiber 1. If both fibers remain active, pressing the Select button on the front panel will toggle between them.

Making the Fiber Connection

Inspect the fiber ends and clean them with dry compressed air or with Kim-Wipes that have been wet with pure isopropyl alcohol. Fingerprints or other dirt on the optical connector end surfaces will reduce the received optical signal level.

Connect the fibers to their matching ports on both the TX and RX units.

Powering Up

Never move the power switch on the front panel without first disengaging its lock by pulling on the switch lever.

With power off at both units, inspect the electrical and optical connections for damage. Firmly seat and latch all connectors.

1. Pull the switch lever away from the front panel and up for power on.
2. Be sure to switch power on to the transmitter and receiver; the power switches on both units must be on for the system to function normally.

Powering Down

Never disconnect the DC power input connector without first turning the power switch lever off. Failure to do this will result in the discharge of the internal UPS backup battery, affecting its integrity and lifetime.

Optical Transmitter Losses

The maximum fiber distance is defined by the optical loss operating margin. The RX signal must be - 21 dBm or higher. Losses on single mode fiber are approximately 0.5 dB/km or less. Refer to Table 1 for the expected TX output requirement and the consequent RX input power.

Optical Loss Margin			
	Signal Min		Unit
TX Optical Output	- 6*		dBm
RX Optical Input	- 21		dBm
Optical Loss Margin (Range)	+ 15	dB	

Table 2: Optical Power and margins.
** Standard output, high-power versions available*

Use an optical power meter for testing the optical signal development and its transmission over the fiber. Instructions for this test are supplied with the meter.

Preventive Maintenance

Battery Pack

Replace the internal Ni-Cad battery pack every two years; perform the following procedure:

1. Verify that power is off.
2. Open the top.
3. Cut the tie wraps holding the battery.
4. Replace the battery and tie wraps with the same or equivalent.
5. Reverse the procedure to reinstall the battery.

Repair

For assistance with your DiamondBack2 system, contact Telecast Fiber Systems, Inc. at 508-754-4858. To return a unit for repair, you must obtain a return material authorization (RMA) number from Telecast service.

Accessory List

The following accessories are available from Telecast:

- Optical power meter kit with wavelength filter
- Cable repair kit
- Loop-back cable to localize signals during installation test
- Replacement Ni-Cad battery pack
- Prefabricated cables built to custom lengths

Troubleshooting

Symptoms	Possible Cause	Corrective Action
No operation, all indicators are off.	Power switch is off or the DC power source is inactive	Turn on power switches to both units Verify that the external power supply is delivering13.8 and 24 VDC.
Internal LED off	Battery is depleted and the power switch is off	Turn on power switches to both units Recharge the battery
Internal LED red	External power loss or depletion of the internal reserve battery	Verify external power. The LED Illuminates green after 30 minutes of use with the AC power adapter. If the light does not turn green, replace the battery
No operation, Status LED red, fiber 1 LED and fiber 2 LED alternately flashing	Optical communication failure or power to the TX is off	Verify the following: • TX power switch is in the on position and the power indicator is illuminated. • Fibers are not broken/disconnected. • Fiber end tips are clean. • Optical connectors are properly mated. • Link loss budget has not been exceeded: The measured optical power at the RX unit should be > - 21 dBm.
Internal reserve battery fails quickly	Reserve battery is not charged or has failed	Connect to the 13.8 to 24VDC power source for 16 hours. Replace battery if charging is unsuccessful
System failure when external power is removed	Reserve battery is dead or disconnected	Check the battery connection. If okay, replace the battery
RX alarm sounds. Power LEDs green Status LED green Fiber 1 or Fiber 2 illuminated LED has switched to the other fiber	Failure of one of the redundant optical paths. If only one fiber is used, this may also indicate intermittent optical communication	Use an optical power meter to verify that both transmitter optical ports are functioning; measured optical power should be approximately - 6 dBm. Check for bad fibers or optical splices. Operation may be restored to the original fiber after repair by pressing the Select switch

Table 3: Troubleshooting guide

Operating Characteristics

Optical

Wavelength:	1300 nm (standard), 1550 nm (optional),1550 nm dFB (optional) or CWDM wavelengths (optional) designated at time of purchase.
Fiber:	Single mode over a maximum of 30 km.
Optical Data Rate:	2.488 Gb/sec
Optical Source	Laser diode
Link margin:	15 db
Distance	
@1310nm	30 km max
@1550nm	5 km max (dispersion limited)
@1550nm DFB	40 km max

Video and Data

NTSC,PAL and SECAM signals at any of the 8 signal channels. Adder data at The 9th port. (Adder 161 and 882i ONLY)

Interface	RS-170, NTSC, PAL, SECAM
Input/Output Impedance	75 Ohm
Video Signal to Noise Ratio	> 70 dB
Frequency Response (5 Hz to 6 MHz)	± 0.20 dB
Differential Gain	<=1.0%
Differential Phase	<=0.4 degrees
Chrom-Lum Delay	<= 10 nS NTSC, <= 15 nS PAL

Power Requirements

Voltage:	12 to 24 VDC
Current:	< 1.5 Amp
Power:	< 20 watts

NOTE: Although the units will operate at 12 VDC, 13.8 VDC is required to charge the internal UPS battery. Absolute maximum voltage is 30 VDC. Equipment damage may occur at higher voltages.

Mechanical/Environmental

Dimensions (L x W x H)	16.7” x 10.5” x 1.75”
Weight, each unit	5 lbs
Connectors	
Electrical	BNC
Optical	ST (standard)
Temperature Range	- 20C to + 55C case temperature
Humidity Range	0 to 95%, non-condensing

WARRANTY

LIMITED WARRANTY STATEMENT

Telecast Fiber Systems, Inc. (“Telecast”) expressly warrants to Buyer that the Products supplied shall be free from defects in materials and workmanship for a period of 12 months following the date the Products are delivered to Buyer (the “Warranty Period”). Telecast's liability under this limited warranty shall be limited, at its option, to providing refund of purchase price for Products, or replacing or repairing Products shown to be defective either in materials or workmanship. Buyer's sole and exclusive remedy for breach of warranty shall be such refund, replacement or repair.
A claim of defect in materials or workmanship in any Product shall be allowed only when it is submitted in writing to Telecast Fiber Systems, Inc. within seven days after discovery of the defect, and in any event within the Warranty Period. No claim shall be allowed in respect of any Product which has been altered, neglected, damaged or stored in any manner which adversely affects it. In order to obtain service under the terms of this warranty, Distributor’s customer or Distributor must notify Telecast of the defect prior to the expiration of the applicable warranty period and obtain a Return Authorization Number from Telecast. In no event may products be returned to Telecast or to Distributor for warranty service without having obtained from Telecast a Return Authorization Number.

This limited warranty applies only to new and unused Products delivered to Buyers located within the United States of America, or to international Buyers if sold through an authorized Distributor organization, and shall not extend to any equipment not manufactured by Telecast Fiber Systems, Inc., even though such equipment may be sold or operated with the Products. In addition, this limited warranty shall be void and of no further force or effect whatsoever if the Product is repaired or modified by any person other than an authorized representative of Telecast Fiber Systems, Inc. without the consent of Telecast Fiber Systems, Inc. This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. Nor shall this warranty apply to any damage caused in whole or in part by attempts by personnel other than Telecast’s personnel, as approved in advance in accordance with the foregoing provisions, to open, install, repair, or service the Product; nor to damage resulting from improper connection with incompatible equipment; nor to damage to a unit which has been modified by personnel other than Telecast personnel.

Products returned to Telecast for warranty service shall be shipped, freight prepaid to Telecast. Telecast will return the repaired product or ship a replacement, freight prepaid, to either Distributor or Distributor’s customer, as requested by Distributor’s customer, at a location within the United States or, at Telecast’s option, to Distributor’s location in the case of international sales.
This limited warranty shall also apply to Products that replace defective Products and Products that have been repaired by authorized representatives of Telecast Fiber Systems, Inc., but only for the original Warranty Period. The Warranty Period shall not be extended by reason of defect, or any period of time during which the Product is not available to Buyer because of defects or repairs, without the express written consent of Telecast Fiber Systems, Inc.

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