USER'S MANUAL

8 CHANNEL RS232
FIBER OPTIC MODEM / MULTIPLEXER
MODEL 9561

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SAFETY INSTRUCTIONS

CERTAIN VERSIONS OF THIS PRODUCT CONTAIN A CLASS
IIIb LASER. OTHER VERSIONS UTILIZE LED FIBER OPTIC
EMITTERS. THE FOLLOWING SAFETY PRECAUTIONS
APPLY TO THE LASER EQUIPPED UNITS.

WARNING: Do not disconnect the fiber optic connector while the
unit is powered up. Exposure to Class IIIb laser radiation is
possible when the internal fiber optic connector is disconnected
while the unit is powered up.

All Laser versions have a **DANGER** label, shown below, found
on the front panel and on the edge of the circuit card containing
the laser, near the fiber optic connector.

DANGER

Invisible Laser Radiation
When Open AVOID DIRECT
EXPOSURE TO BEAM
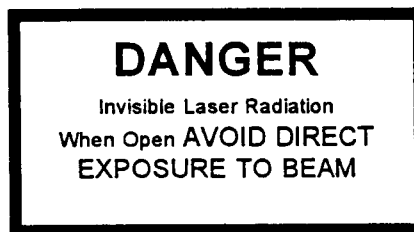
CAUTION: Using controls, making adjustments or performing
operations other than those specified may result in hazardous
radiation exposure. Exposure for only seconds can cause
permanent eye damage as well as other injuries.

SECTION 1 - INTRODUCTION

1.1   GENERAL DESCRIPTION

The Optelecom Model 9561 is an eight channel high speed fiber optic full duplex RS232 modem/multiplexer which communicates over two singlemode or multimode optical fibers, depending on the specific model. The shortest distance model (9561-S-ST) with an 850 nm LED can communicate in excess of 5 km. The longest distance model (9561-LD3-FC) with a 1550 nm laser can communicate over 80 km. Various connector types are available. See the List of Model below for the proper version for your application.

The Model 9561 has two operating modes -- Modem mode and Multiplexer mode.

A)   In the Modem mode, the unit is configured to emulate a wire modem (DCE) in the way the signals are routed (see fig 8). Also, in modem mode, a full complement of clock source and rates may be selected for synchronous operation.

B)   In Multiplexer mode the unit is configured as a straight through, transparent, full duplex RS232 data time division multiplexer. Also, in this mode a data re-clocking circuit may be enabled to re-synchronize the received data on the primary channel with the transmit clock input to a channel reserved for that purpose. This feature allows the unit to function in a synchronous tail circuit without any concern for the link transmission delay.

The units feature eleven indicator LEDs for easy operational status monitoring. Indicators include PWR (power on), SYNC (local demux sync), LOOP (remote demux sync, confirming a good two way fiber link), and eight RD (received data) LEDs. In addition, an electrical NPN open collector alarm output is pulled low in the event of the loss of demux sync at the local unit. The units operate on regulated or unregulated +8 to 14 VDC power. The optional Model 3200PS 110 VAC to DC adapter may be used to supply this power.

The units can be mounted for stand alone operation on a flat surface using the optional 9000MOUNT-1 mounting kit. Or, they may be rack mounted via the System 9000 rack mountable chassis using the optional Model 9000KIT-5 mounting kit. The Models 9000-0, -1, and -2 chassis can hold 9, 8, or 7 units, respectively. See section 2.2 for details.

Table 1 - LIST OF MODELS AND FEATURES

MODEL	Wavelength	Optical Port	Optical budget (range)	
			62/125 µm fiber	9/125 µm fiber
✓ 9561-S-ST	850 nm	ST	19 dB(5.3 km)	N/A
9561-S-SM	850 nm	SMA	19 dB(5.3 km)	N/A
9561-H1-ST	865 nm	ST	23 dB(6.7 km)	N/A
9561-H1-SM	865 nm	SMA	23 dB(6.7 km)	N/A
9561-L-ST	1310 nm	ST	18 dB(10 km)	N/A
9561-L-SM	1310 nm	SMA	18 dB(10 km)	N/A
9561-L1-ST	1310 nm	ST	21 dB(12 km)	9 dB(12 km)
9561-L1-SM	1310 nm	SMA	21 dB(12 km)	9 dB(12 km)
9561-L2-ST	1310 nm	ST	25 dB(14.7 km)	21 dB(36 km)
9561-L3-ST	1550 nm	ST	23 dB(13.3.km)	19 dB(64 km)
9561-LD-ST	1310 nm	ST	N/A	25 dB(44 km)
9561-LD-FC	1310 nm	FC	N/A	25 dB(44 km)
9561-LD3-ST	1550 nm	ST	N/A	25 dB(88 km)
9561-LD3-FC	1550 nm	FC	N/A	25 dB(88 km)

Multimode range estimates based on 3 dB/km @ 850 nm and 1.5 dB/km @ 1310 nm. Singlemode range based on 0.5 dB/km @ 1310 nm and 0.25 dB/km @ 1550 nm.

1.2   PHYSICAL/ENVIRONMENTAL SPECIFICATION

Dimension		3.17"H X 5.0"L X 1.48"W
Weight		10 ounces
Connectors	Optical	SMA, ST, or FC depending on the model
	RS232 Data I/O	DB25S
	Power & Alarm	4 Position mini screw terminal
Indicators		PWR, SYNC, LOOP, and (8) RD
Temperature		
	Operating	-40 to +70 °C
	Storage	-50 to +85 °C
Humidity		0 to 100% R.H., non-condensing

1.3   FUNCTIONAL SPECIFICATIONS

Optical

Emitter version	S	H1	L	L1	L2	L3	LD	LD3
Output power (dBm), average, launched into:								
50/125 um	-20	-16	-21	-15	-11	-13	N/A	N/A
✓ 62.5/125 um	-16	-12	-17	-14	-10	-12	N/A	N/A
09/125 um	N/A	N/A	N/A	-26	-14	-16	-10	-10
Wavelength(nm)	850	865	1310	1310	1310	1550	1310	1550

Receiver input power for 10^{-9} BER

Minimum	-35	dBm (all versions)
Maximum	-10	dBm
Composite Data Rate	11.0592 Mbps, Manchester encoded	

Electrical

Signal Compatibility	RS232
No. of Channels	8 (mux mode)
Channel Sampling Rate	921.6 kHz
Data Rate, async	DC to 115.2 kbps
Pulse width distortion, max	
at 19.2 kbps	2%
at 115 kbps	12.5%
DCE clock rate, sync	1.2 to 115.2 kHz (see table 2)
Alarm Output	Open Collector, upon loss of local SYNC

Power Requirements

Voltage	+8 to +14 VDC
Current	360 mA
Recommended Adapter	Model 3200PS (90-125 VAC input for proper operation with the Model 9561)

1.4   AGENCY COMPLIANCE   Meets FCC Class A radiated and conducted via Model 3200PS (UL and CSA Approved)
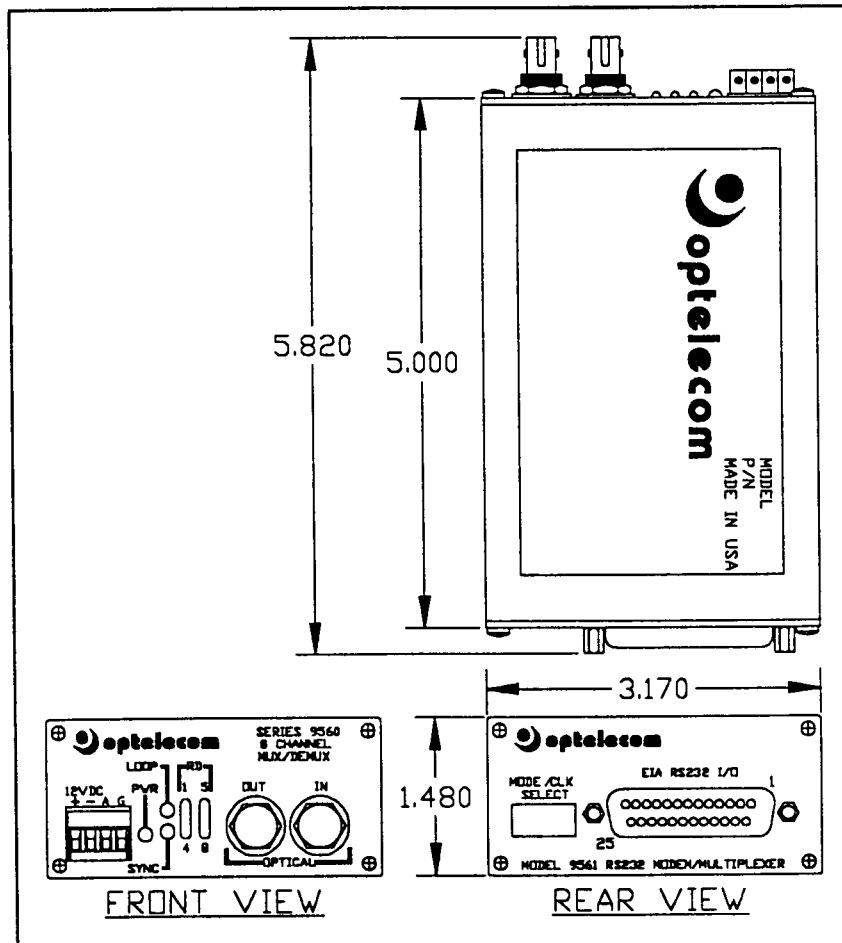

Figure 1 - ENGINEERING VIEWS AND DIMENSIONS

SECTION 2 - INSTALLATION

2.1 SET-UP PROCEDURES

Although the rear panel MODE/CLK SELECT switches may be set at any time, it may be more convenient to set them prior to mounting the units, These switches allow the user to select:

A) Modem or Multiplexer mode.
B) Synchronous re-clocking enable (Multiplexer mode).
C) Clock source/rate (Modem mode).

Switches 1 through 4 are for clock source/clock rate select. Refer to table 2 for the applicable settings. The clock rates given are for DCE source outputs from pin 15 of the Model 9561. If EXTERNAL is selected, the clock signal from the local DTE is input on pin 24 of the Model 9561. If RECEIVE is selected, the clock signal recovered from the received optical signal is output on pin 17 and pin 15.

Table 2 - SWITCH SETTINGS FOR INTERNAL CLOCK RATE
OR CLOCK SOURCE

Clock Rate / Source	MODE / CLOCK SELECT SWITCHES			
	Pos 1	Pos 2	Pos 3	Pos 4
1.2 kHz	up	dn	dn	up
1.8 kHz	dn	dn	dn	up
2.4 kHz	up	dn	up	dn
3.6 kHz	dn	dn	up	dn
4.8 kHz	up	dn	up	up
7.2 kHz	dn	dn	up	up
9.6 kHz	up	up	dn	dn
14.4 kHz	dn	up	dn	dn
19.2 kHz	up	up	dn	up
28.8 kHz	dn	up	dn	up
38.4 kHz	up	up	up	dn
57.6 kHz	dn	up	up	dn
76.8 kHz	up	up	up	up
115.2 kHz	dn	up	up	up
External	dn	dn	dn	dn
Receive	up	dn	dn	dn

matters for asynch mode?

Sw1 must be down
JSW 2/10/99

o Switch 5 enables the synchronous data re-clocking when used in a synchronous tail circuit. This switch is usually not set until the system is in operation to determine if it should be down. See section 3.1. If in Modem mode the switch must be off. *Up=no reclocking /*

NSTX Switch Settings: 1   2   3   4   5   6
                       DN   DN   DN   DN   UP   UP

o   Switch 6 should be up for Multiplexer mode and down for Modem mode. See UP
Figure 8 & 9 for the signal routing in each of these modes.

2.2   MOUNTING

2.2.1 Stand alone mounting

The Model 9561 can be mounted directly to a
flat surface using the 9000MOUNT-1 kit. The
kit includes a mounting plate that attaches to
the bottom of the unit using four screws. Use
the oval holes in the plate to mount the unit to
the flat surface. Refer to kit instructions for
hole spacing. It is best to mount the unit to a
heat conductive surface to maximize heat
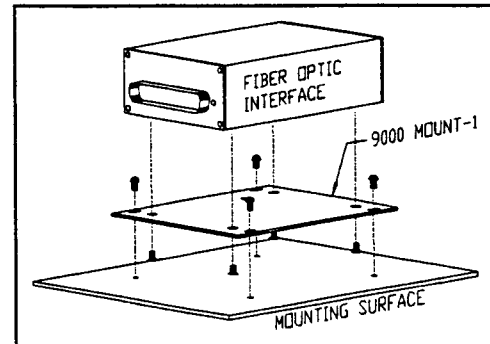transfer away from the units.

**Figure 2 - STAND ALONE
MOUNTING**

2.2.2 System 9000 chassis mounting

The 9561 can alternately be mounted in a
Model 9000 chassis. Nine units will fit in one
9000-0 chassis, eight will fit in a 9000-1
chassis and seven will fit in a 9000-2 chassis.
Attach the 9000KIT-5 to the unit using the
four corner screws that hold the rear panel on
the Model 9561 (D shell connector end).
Then attach the units to the chassis using the
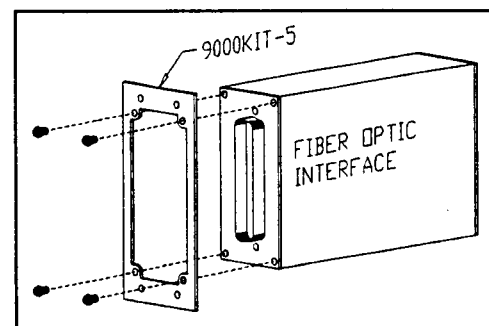captive screws in the plate supplied with the
kit.

**Figure 3 - SYSTEM 9000 CHASSIS
MOUNT**

2.3   OPTICAL CABLING

Optical I/O for each mux is served by two optical fibers. Route the optical fiber
from the optical OUT of one 9561 to the optical IN of the remote 9561.

Remove the plastic dust caps from the optical ports on both units and save them
in a safe place. If you remove the terminated fibers from the optical ports, cover
the ports with the plastic dust caps. It is recommended to clean the ends of the
optical fiber according to supplier's recommendations prior to plugging into these
units. Alternately, use laboratory grade Isopropyl alcohol on a lint-free swab and
dry with canned air.

A. ST® OPTICAL CONNECTION

1) Align the key and the bayonet slots on the ST connector with the keyway and the bayonets of the ST optical port.

2) Slide the connector ferrule into the port until the key and bayonets are engaged.

3) Push the coupling nut forward until it can be turned clockwise to lock the connector into the port.
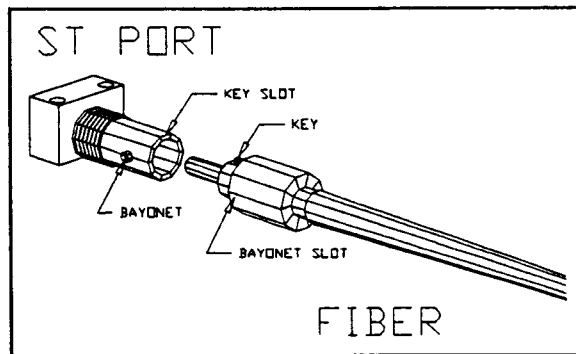   ® ST is a registered trademark of AT&T

Figure 4 ST® CONNECTION

B. SMA OPTICAL CONNECTIONS

1) Slide the SMA ferrule into the threaded SMA optical port.

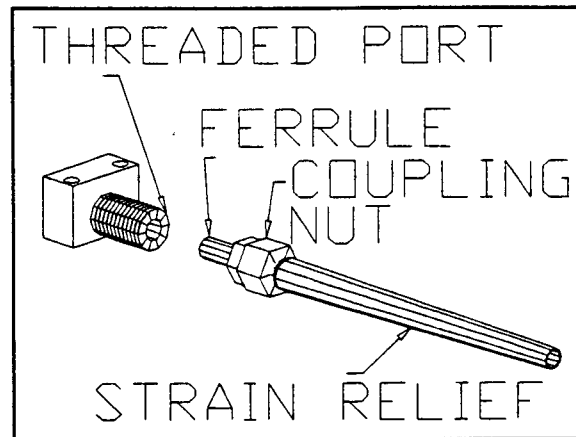2) Screw the coupling nut onto the threaded port until it is finger tight.

Figure 5 - SMA CONNECTION

C. FC CONNECTION

1) Align the key on the FC connector with the keyway on the FC port.

2) Slide the connector ferrule into the port while the key engages the slot.

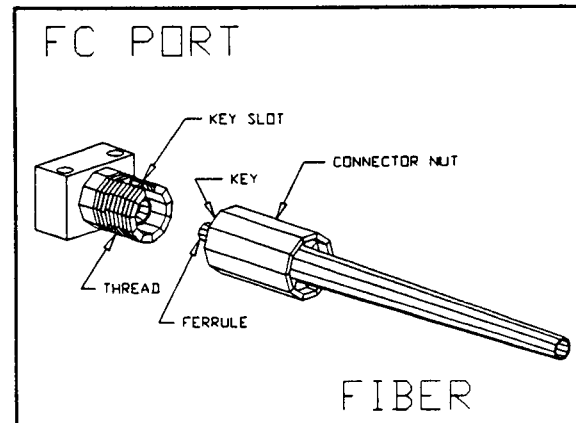3) Push the connector nut forward until it can be turned clockwise to thread the connector onto the port.

Figure 6 FC CONNECTION

2.4   ELECTRICAL CABLING

The RS232 signals are connected to the Model 9561 via a single mating 25 pin male D-shell connector. Connect the signals to the connector per the following figures. For transmission of data and clock information use two RS232 channels.

In modem mode, in most cases, it is possible to make a 1 to 1 wire connection between the DTE and the 9561's. Refer to Figure 7 & 8 for the signal routing.

In multiplexer mode, if used as an asynchronous multiplexer or if clock and data are being transferred in a setup other than a synchronous tail circuit, Simply connect your equipment outputs to the 9561 inputs and vice-versa, per Fig. 7.

If the 9561's are used in a synchronous tail circuit, wire the data and clock I/O per the synchronous tail circuit hookup, Fig. 9. Other channels may be hooked up as desired to carry control lines or other RS232 signals.
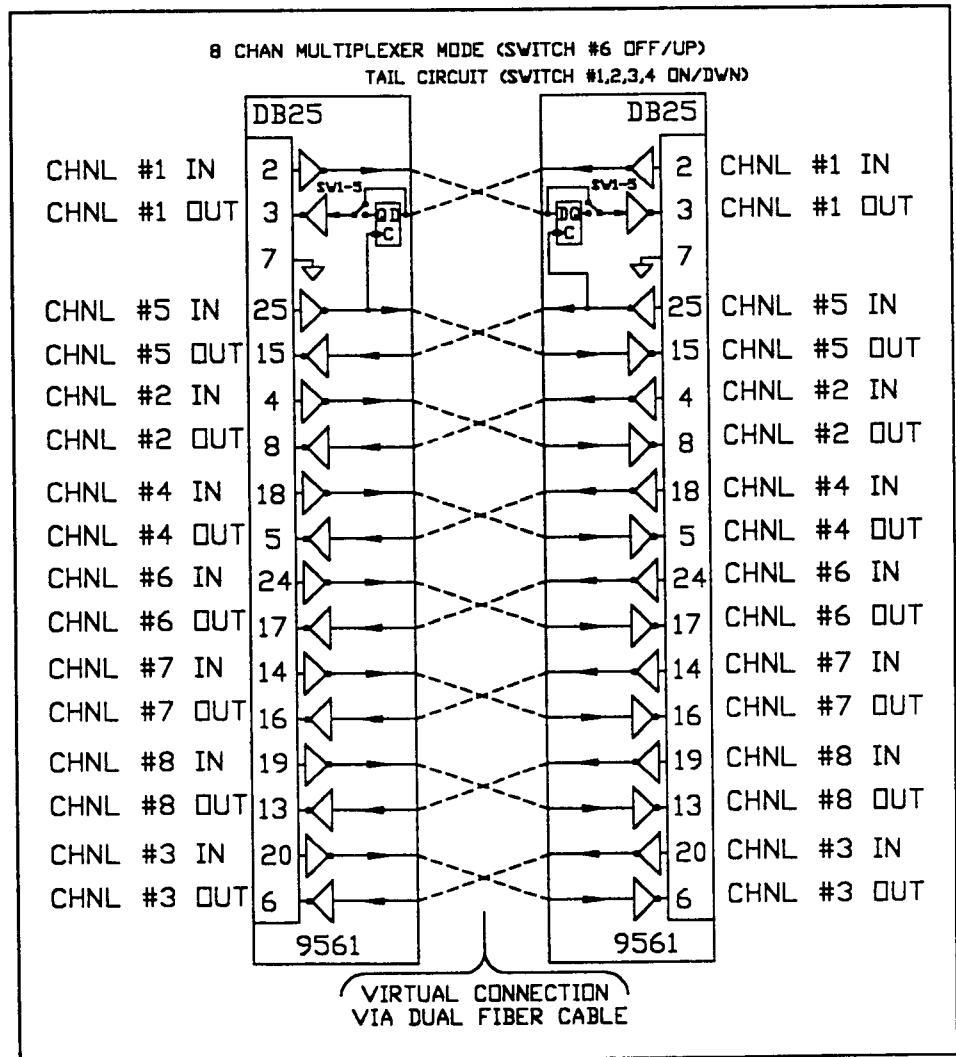

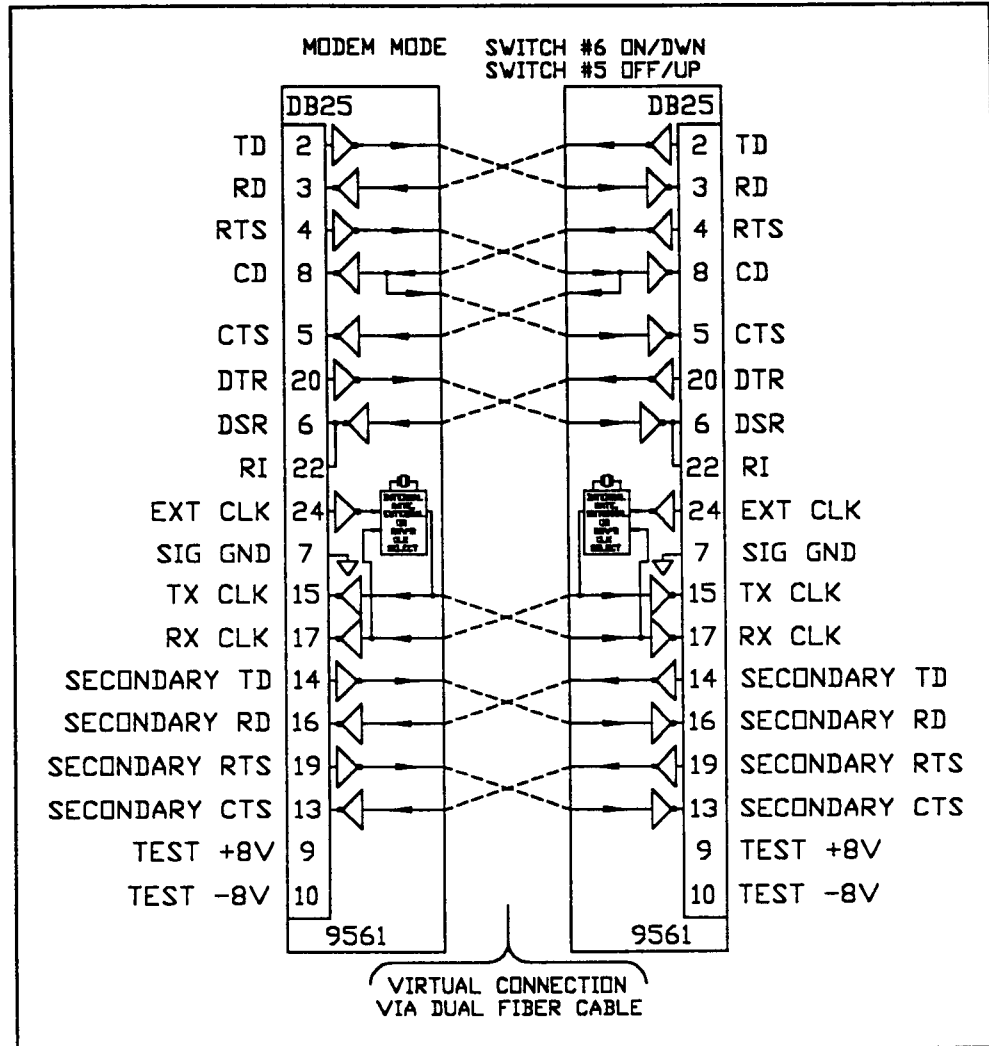**Figure 7 - SIGNAL ROUTING, MULTIPLEXER MODE**
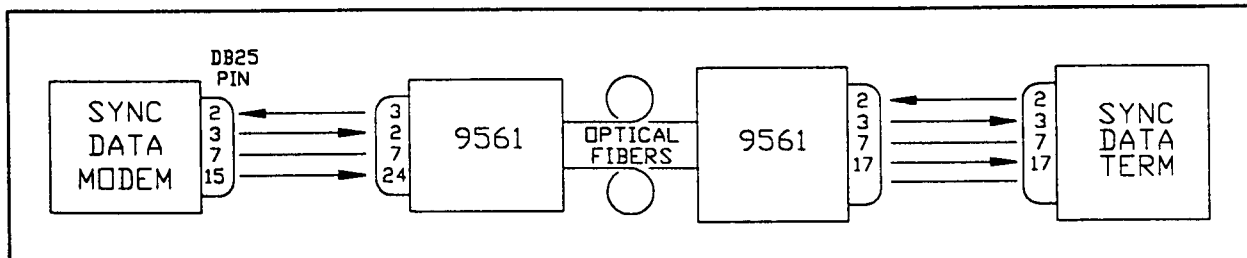
Figure 8 - SIGNAL ROUTING, MODEM MODE

Figure 9 - SYNCHRONOUS TAIL CIRCUIT HOOKUP

SECTION 3 - OPERATION

3.1   TURN ON PROCEDURE

Apply DC power to the + and - terminals of the PWR/ALRM screw terminal block. Observe that the PWR indicator is illuminated.

3.2   DIPSWITCH SETTINGS - SYNCHRONOUS RECLOCKING

If switch number 1 through 4 and 6 were not previously set, refer to section 2.1 for proper setup. If the 9561 is in multiplexer mode and operating as a synchronous tail circuit, switch #5 may have to be set to insure error free operation. When used in a tail circuit to synchronous equipment whereby the equipment outputs a clock and requires the data presented to it to be synchronous with that clock and to have the correct phase relationship to that clock, then the Synchronous Re-clock switch MAY have to be enabled, depending on the clock rate and the link distance.   Figure 9 shows the typical hookup for a tail circuit of a modem to terminal equipment, and Figure 10 gives examples of two different times of travel (from two different link lengths), one resulting in a situation where the reclocking can be disabled and one where it must be enabled. As a rule of thumb - leave the reclocking disabled, and enable it only if it doesn't work in the disabled mode. If this approach does not result in success (an operational link), it will be necessary to observe the clock and data signals at the clock source end with a breakout box and an oscilloscope. ONLY THE SWITCH AT THE CLOCK SOURCE END MUX SHOULD BE ENABLED IF REQUIRED, NOT THE SWITCH AT THE DATA SOURCE END.
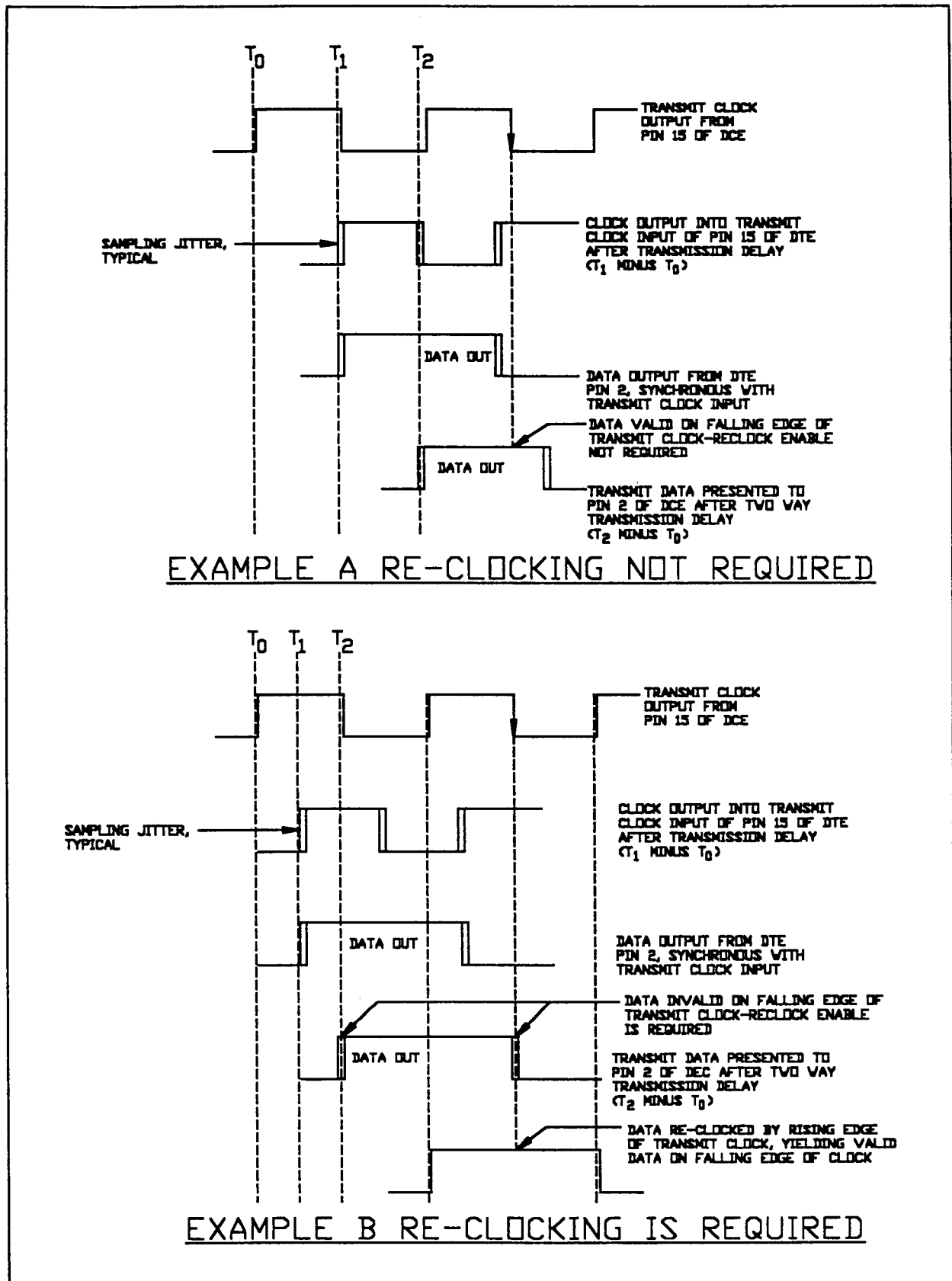
EXAMPLE A RE-CLOCKING NOT REQUIRED

EXAMPLE B RE-CLOCKING IS REQUIRED

Figure 11 - RECLOCKING TIMING EXAMPLE

3.3   VERIFICATION OF NORMAL OPERATION

Under normal operation, the PWR, SYNC, and LOOP indicators will be illuminated and selected RD indicators may be illuminated if data is being received on that channel. If wire connections are not yet made and you wish to confirm the operation of any one or more channel, just make a temporary connection between the Test (+) output, pin 9, and the input you wish to test. At the corresponding output per the signal routing diagram,

Table 3 - INDICATOR LIGHT INTERPRETATION

INDICATOR	COLOR	DEFINITION
PWR	green	Illuminates when the unit is powered up.
SYNC	green	Illuminates when the local demux is synchronized to the incoming data stream. In other words, the demux is receiving a good signal.
LOOP	green	Illuminates when the remote demux is receiving a good signal, to which it is synchronized. An illuminated LOOP LED confirms a good connection in both directions.
RD (1 to 8)	yellow	Illuminates when data is being received on that specific channel.

3.4   TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE
PWR not illuminated	The power supply is bad, the power connection is bad, or the connection is reversed.
SYNC not illuminated	The optical connections at either end is bad, the optical fiber cable is defective, or the Model 9561 is bad at either end. Test by looping the optical output to the input locally. SYNC and LOOP should illuminate.
LOOP not illuminated	The same causes as "SYNC not illuminated" but in the outgoing direction only.
Any individual RD LED inoperative	The electrical connections at either end are defective.