TrueTime

Model 560-5143-1
Fiber Optic Transceiver Manual

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March 19, 1998

Serial Number _____

SECTION ONE

1. GENERAL INFORMATION

1.1. PURPOSE OF EQUIPMENT

The Model 560-5143-1 Fiber Optic Transceiver card provides a fiber optic input and output interface for the backplane reference signals REF A, B, or C. The card can be configured to drive REF A, B, or C with the fiber optic input signal and/or to transmit REF A, B, or C via the fiber optic output. The card is intended to be configured as a repeater, where the output is an echo of the input.

The three backplane signals are distributed via 50 ohm controlled-impedance traces, terminated at Slot 17. For best signal quality, the Transceiver card must be located in Slot 1 through 4.

1.1.1. PHYSICAL SPECIFICATIONS

Dimensions:	0.8"w X 4.4"h X 5.0"d (2 cm X 11 cm X 13 cm)
Weight:	Approximately ½ pound (¼ kg)

1.1.2. ENVIRONMENTAL SPECIFICATIONS

Operating Temp:	0° to +50°C
Storage Temp:	-40° to +85°C
Humidity:	Up to 95% relative, non-condensing
Cooling Mode:	Convection

1.1.3. POWER REQUIREMENTS

Voltage:	18-72 VDC ±20%
Power:	3 W

1.1.4. FUNCTIONAL SPECIFICATIONS

1.1.4.1. RECEIVER FIBER OPTIC INPUT

Signal:	820 nM, -16 dBm to -26 dBm
Connector:	ST
Fiber type:	Multi-mode 50, 62.5 or 100 micron

1.1.4.2. TRANSMITTER FIBER OPTIC OUTPUT

Signal:	890 nM, -18.8 dBm typical, into 50 micron fiber
Signal:	890 nM, -16 dBm typical, into 62.5 micron fiber
Signal:	890 nM, -12 dBm typical, into 100 micron fiber
Connector:	ST

1.1.4.3. RECEIVER BACKPLANE OUTPUT TO REF A, B, AND C

Signal Type:	Squarewave, AC-coupled
Amplitude:	4 Vpp into 50 ohms

1.1.4.4. TRANSMITTER BACKPLANE INPUT FROM REF A, B, AND C

Signal Type:	Squarewave
Amplitude:	2.2 Vpp - 5 Vpp

1.1.4.5. DRC CARD COMPATIBILITY

Location:	Slot 1-4
Compatibility:	See DRC Card Compatibility Matrix

SECTION TWO

2. INSTALLATION AND OPERATION

2.1. HOT-SWAPPING

All cards, input cables and output cables are hot swappable. It is not necessary to remove chassis power during insertion or removal. Hot swapping and reference-source changes are abrupt, the effects difficult to characterize; however, the system is designed to protect against permanent effects and minimize temporary effects of these events.

Typically, adjacent-card hot swapping has a negligible effect on the Fiber Optic Transceiver. The hot swapping event typically lasts less than one clock-period and has an average of 0 Volts. The effect of redundant power supply switch-over is also negligible.

Hot swapping of a Fiber Optic Transceiver affects the system in varying ways depending upon whether it is configured to drive REF A, B, or C and depending upon which reference input is the currently-highest priority. These effects are discussed in individual card manuals.

2.2. REMOVAL AND INSTALLATION

CAUTION: Individual components on this card are sensitive to static discharge. Use proper static discharge procedures during removal and installation.

Refer to CARD COMPATIBILITY section prior to installing new card.

To remove card, loosen the captive retaining hardware at the top and bottom of the assembly, then firmly pull on the handle, (or on any connector on rear panel adapter cards) at the bottom of the card. Slide the card free of the frame. Refer to the SETUP section for any required switch settings; or, set them identically to the card being replaced. Reinstall the card in the frame by fitting it into the card guides at the top and bottom of the frame and sliding it in slowly, avoiding contact between bottom side of card and adjacent card front panel, until it mates with the connector. Seat card firmly to avoid contact bounce. Secure the retaining screws at the top and bottom of the card assembly.

2.3. SETUP

The setup of the Fiber Optic Transceiver involves selection of the reference: REF A, B, or C. While it is possible to connect the input and output to different references, the card is intended to be used in a repeater configuration. For non-repeater applications, verify that the reference signal (REF A, B, or C) meets the Fiber Optic card input signal specifications. If the card is to be used as a fiber optic receiver only, the

transmitter should be disabled. If the card is to be used as a fiber optic transmitter only, with another card driving REF A, B, or C, the receiver must be disabled.

Use the tables below to set the Fiber Optic Transceiver into the repeater mode. Jumper 1 selects the reference to be driven by the Fiber Optic Receiver. Jumper 2 selects the reference source for the Fiber Optic Transmitter.

To use REF A:

	A	**B**	**C**
XCVR-JP1	JUMPER	OPEN	OPEN
XMTR-JP2	JUMPER	OPEN	OPEN

To use REF B:

	A	**B**	**C**
XCVR-JP1	OPEN	JUMPER	OPEN
XMTR-JP2	OPEN	JUMPER	OPEN

To use REF C:

	REF A	**REF B**	**REF C**
XCVR-JP1	OPEN	OPEN	JUMPER
XMTR-JP2	OPEN	OPEN	JUMPER

To DISABLE FIBER OPTIC RECEIVER:

	REF A	**REF B**	**REF C**
XCVR-JP1	OPEN	OPEN	OPEN

To DISABLE FIBER OPTIC TRANSMITTER:

	REF A	**REF B**	**REF C**
XMTR-JP2	OPEN	OPEN	OPEN

2.4. FAULT INDICATION

This card has no fault indication.

2.5. MAINTENANCE

This card has no maintenance requirements.

SECTION THREE

3. THEORY OF OPERATION

3.1. GENERAL INFORMATION

This section contains a detailed description of the circuits in the Fiber Optic Transceiver card. These descriptions should be used in conjunction with the drawings in SECTION FOUR.

3.2. CIRCUIT BOARD DESCRIPTION

The 560-5143-1 Assembly provides a single Fiber Optic input channel which may be connected to any one of three signal buses by means of a jumper. It also provides a single Fiber Optic output channel which may likewise be connected to any one of three signal buses. The input channel and the output channel are normally connected to the same signal bus, and the card acts as a repeater, echoing whatever is fed to the input channel out onto the output channel.

3.3. DETAILED DESCRIPTION

Reference drawing 560-5143-1, sheet 3 of 3

3.3.1. INPUT CHANNEL

The signal source for the input channel is an optical signal between 1 and 10 MHz. It is applied via a fiber optic cable to U2 which detects and amplifies the signal. The signal is then applied to U4:A which amplifies the signal further before passing it on to successive stages of U4 to achieve as close to an amplitude limited signal as possible. The output of U4:C is applied to a Schmitt Trigger, U1:A, for squaring up of the edges before applying it to a digital squelch circuit composed of One Shot U5:A, Flip Flop U3:A, and Nand gate U10:A. If a properly limited signal of sufficiently high frequency is applied to this squelch circuit, it opens up the gate and passes on the signal to a paraphrase generator consisting of U11:A and U11:B. This circuit generates two signals that are 180 degrees out of phase with each other which are used to drive a transformer in push pull mode via buffers composed of U1:C, U1:D, U1:B, and U1:E. The output windings of the transformer are paralleled and connected to one of three signal buses via terminating resistor R2 and Jumper JP1. The output level seen on the bus, which itself is terminated by a 50 Ω resistor, is 4 Vpp. If the optical input signal is too low in amplitude, or not present, then the squelch circuits prevents any output from being impressed on the bus. This guards against two possible failures, a broken fiber or a failed driver.

3.3.2. OUTPUT CHANNEL

The signal source for the output channel is a 1 to 10 MHz, 2.2 Vpp (min.) squarewave available from one of three signal buses coming onto the card through P1 and selected by JP2. It is applied through a 1KΩ resistor, R4, and a 270 pF capacitor, C10, to the base of Q1 which performs a level shifting function to drive the input of Schmitt Trigger U1:F. The output of the Schmitt Trigger is capacitively coupled by C6 to the input of an LM6321 buffer, U9, which is biased to +5 VDC by R6 and R7. This biasing sets the quiescent current of the Fiber Optic Driver U8. Current for this LED device is limited by R15 and R16 in parallel. Note that the component designated C23 is now actually a Zero Ω resistor. The actual range of acceptable input signals goes from 2.2 Vpp to 10 Vpp as well as 1 Vpk to 5 Vpk, although monopolar signals are not normally used on this design.

3.3.3. POWER SUPPLY

Power is applied to the board at a nominal 48 VDC level. It is filtered by L1, C9, and C19, and applied to a DC to DC converter, U7, which is used to supply +10 VDC to the on card circuitry. A linear post regulator, U6, supplies +5 VDC to the logic and receiver circuits. Both the +10 VDC and the +5 VDC levels are heavily filtered by tantalum and ceramic capacitors. In addition RF chokes L2 and L3 are employed to isolate the transmitting section and the power supply section of this card from the receiving section of the card.

SECTION FOUR

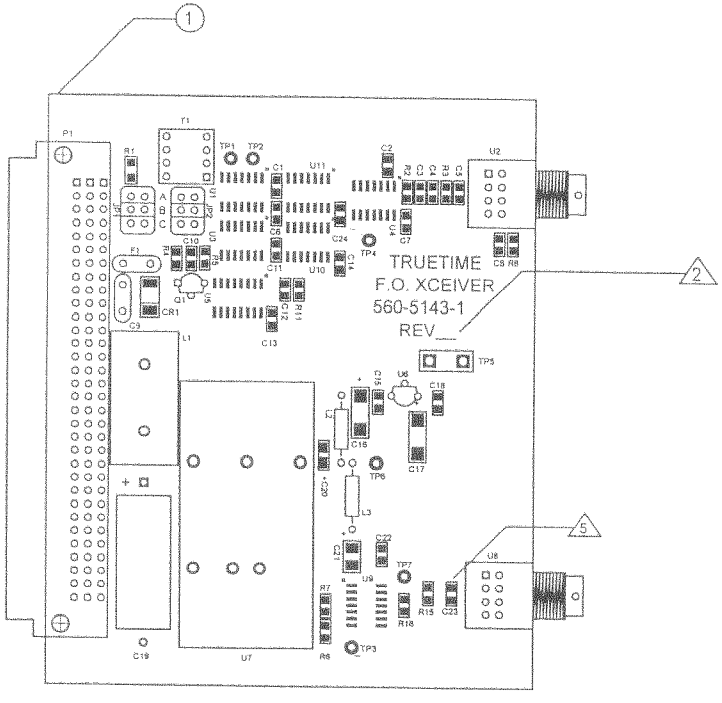
4. DETAILED DRAWINGS

4.1. 560-5143-1 DETAILED DRAWINGS / BILL OF MATERIALS

NOTES: UNLESS OTHERWISE SPECIFIED

1. VALUES OF RESISTORS ARE IN OHMS AND CAPACITORS ARE IN uf
2. STAMP REVISION LEVEL.
3. ASSEMBLE PER ASSEMBLY REQUIREMENTS DOCUMENT 421-11.
4. DO NOT INSTALL C2
5. INSTALL 0 OHM RESISTOR AT C23 LOCATION.

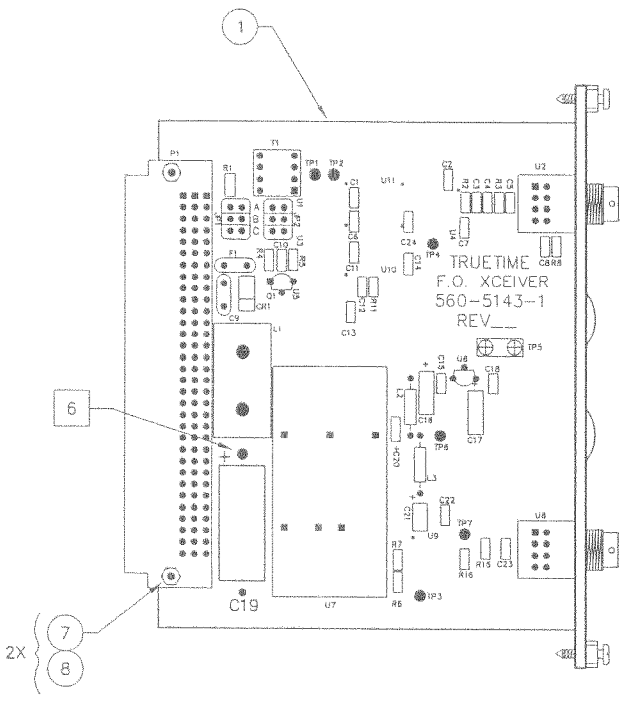
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	DESIGN UPDATES	8-12-96	
B	CAR 1139; CAR 1198	1-25-99	1/28/99

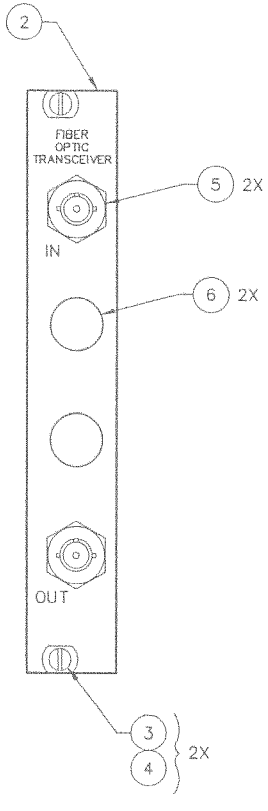


APPROVALS		DATE
CONTRACT NO.		
DRAWN BY	R.E.C.	6-3-96
CHECKED		
APPROVED		1/29/99
NEXT ASSY		

TrueTime, Inc.
Santa Rosa, California

Title	ASSY DRAWING FIBER OPTIC TRANSCEIVER	
Size	Number	Rev
B	560-5143-1	B
Date	8-12-96	R.E.C.
Filename	2143A.PCB	Sheet 1 of 3





6 INSULATE POSITIVE LEAD OF C19 (P/N 023-010-250) WITH TEFLON TUBING (P/N 229-002).

NOTES: (CONTINUED)

FILENAME: \560\5143-1
DATE: 01-25-99

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SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		560-5143-1	B

SCALE NONE

MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPTION
560-5143-1	FIBER OPT RCVR BUS MODULE MADE FROM 560-2143					EA		
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA		M. 1/27/99
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA		REV B (01-26-99)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA		560-5143-1 REV B
0000-REV	PCB REV LEVEL HERE >>>>		000000		1.0000	EA		560-2143 REV A
002S-000	RES 0 OHM 1/4W 0805	NIC NRC10Z0TR	000000		1.0000	EA		C23
008S-100	RES 10.0 OHM 1/8W 0805 1%	NIC NRC10F10R0TR	000000		1.0000	EA		R8
008S-1002	RES 10K OHM 1/8W 0805 1%	NIC NRC10F1002TR	000000		2.0000	EA		R6,7
008S-102	RES 1.00K OHM 1/8W 0805	NIC NRC10F1001TR 1%	000000		2.0000	EA		R4,5
008S-104	RES 100K OHM 1/8W 0805 1%	NIC NRC10F1003TR	000000		1.0000	EA		R2
008S-121	RES 120 OHM 1/8W 0805 5%	NIC NRC12R121TR	000000		2.0000	EA		R15,16
008S-154	RES 150K OHM 1/8W 0805 5%	NIC NRC12R154TR	000000		1.0000	EA		R11
008S-510	RES 51 OHM 1/8W 0805 5%	NIC NRC12R510TR	000000		1.0000	EA		R1
008S-5110	RES 510 OHM 1/8W 0805	NIC NRC12R5110TR	000000		1.0000	EA		R3
023-010-250	CAP AE 10UF 250V A	SPRAGUE TVA-1504	000000		1.0000	EA		C19
036-095	CAP MONO 0.1UF 50V R 20%	MURATA RPE122Z5U104M50V	000000		1.0000	EA		C9
036S-NP0101	CAP 100PF NP0 100V 0805	NIC NMC0805NP0101J100TR	000000		1.0000	EA		C3
036S-NP0270	CAP 27PF NPO 100V 0805	NIC NMC0805NP0270J100TR	000000		1.0000	EA		C10
036S-NP0470	CAP 47PF NPO 100V 0805	NIC NMC0805NP0470J100TR	000000		2.0000	EA		C4,12
036S-Y5V104	CAP CER .1UF Y5V 50V 0805 C1,5-8,11,13-15,18,22,24	NIC NMC0805Y5V104Z50TR	000000		12.0000	EA		
037S-105	CAP 1UF 16V 3216	NIC NTC-T105K16TRA	000000		1.0000	EA		C20
037S-106	CAP 10UF 25V 7343 10%	NIC NTC-T106K25TRD	000000		1.0000	EA		C17
037S-107	CAP TANT 100UF 16V 7343	AVX TPSE107K016R0125	000000		1.0000	EA		C16
037S-225	CAP 2.2UF 16V 3528	NIC NTC-T225K16TRB	000000		1.0000	EA		C21
045-33	INDUCTOR 33UH 5.5A	DALE IHM-2 33UH +/-10%	000000		1.0000	EA		L1
045-78F270	INDUCTOR 27UH AXIAL	JW MILLER 78F270J	000000		2.0000	EA		L2,L3
048-1414T	FIBER OPT XMTR ST STYLE	HP HFBR-1414T	000000		1.0000	EA		U8
048-2416TC	FIBER OPT RCVR, ST STYLE	HP HFBR-2416TC	000000		1.0000	EA		U2
048-4411	FIBER OPT NUT W/WASHER	HP HFBR-4411	000000		2.0000	EA		05
054-051	TRANSFORMER,PULSE,5VX1MS	PICO 74005	000000		1.0000	EA		T1
057S-4002	DIODE 4002	ROHM RLR4002	000000		1.0000	EA		CR1
175-2369	XSISTOR MPS2369 PLSTIC	MPS2369	000000		1.0000	EA		Q1
176-78L05	IC, REGULATOR +5V	MOTOROLA MC78L05ACP	000000		1.0000	EA		U6
176S-LM6321M	HIGH SPEED BUFFER	NATL LM6321M (SOIC)	000000		1.0000	EA		U9
178S-74HC00	74HC00 (14SO)	RCA CD74HC00M	000000		1.0000	EA		U10
178S-74HC14	74HC14 SURFACE MOUNT	74HC14 (SO14)	000000		1.0000	EA		U1
178S-74HC4538	74HC4538 (16SO)	MOTOROLA MC74HC4538D	000000		1.0000	EA		U5
178S-74HC74	74HC74 (14SO)	MOTOROLA MC74HC74D	000000		1.0000	EA		U3
178S-74HC86	74HC86 (14SO)	RCA CD74HC86M	000000		1.0000	EA		U11
178S-74HCU04	74HCU04 (14SO)	RCA CD74HCU04M	000000		1.0000	EA		U4
223-138	SCREW SH CH ZN M2.5X10	SCHROFF #21100-138	000000		2.0000	EA		08
223-144	NUT M2.5	SCHROFF #21100-144	000000		2.0000	EA		07
223-379	SCREW CAP NP M2.5 X 11	SCHROFF #21100-379	000000		2.0000	EA		03
223-464	SLEEVE, STAINLESS	SCHROFF 21100-660	000000		2.0000	EA		04

MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPT
229-002	TUBING TEFLON #STT20	ICO RALLY STT-20 NAT	000000		0.1000	FT		FOR C19
273-009	TERMINAL TEST POINT	COMP CORP PJ-201-25	000000		1.0000	EA		TP5
273-015	TERM TEST POINT (WHITE)	COMP. CORP TP-104-01-09	000000		6.0000	EA		TP1-4,6,7
274-005	PLUG HOLE NYL 3/8 DIA	HH SMITH 3091/HEYCO 2617	000000		2.0000	EA		06
355-BWR-5	DC-DC 18-72VIN +5/-5 OUT	DATEL BWR-5/700-D48	000000		1.0000	EA		U7
363-0.9LV	POLYSWITCH 0.9A (60 VOLT)	RAYCHEM RXE090	000000		1.0000	EA		F1
372-96RA	CONN,96-P FM DIN RT ANGLE	BERG 68353-296	000000		1.0000	EA		P1
401-01-01-34	CONN 36-P HDR SNGL RW W/W	3M 929834-01-36	000000		1.0000	EA		JP1,2 CUT TO FIT
403-000LP	JUMPER FEMALE LOW PROFILE	SAMTEC SNT-100-BK-T	000000		4.0000	EA		FOR JP1,2
560-1212-2	PNL,REAR FIBR OPT TRNSCVR	SCREEN	000000		1.0000	EA		02
560-2143	PCB FIBER OPT TRNSCVR	FAB	000000		1.0000	EA		01
LA	LABOR ASSEMBLY COST HRS		000000		0	EA		
LT	LABOR TEST COST HOURS		000000		0	EA		
OSV560-5143-1	OUTSIDE LABOR 560-5143-1	PCA	000000		1.0000	EA		