



**Model 560-5198  
RS-422 Square Wave Output SILIOM Manual**

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# SECTION ONE

## 1. GENERAL INFORMATION

### 1.1. SCOPE OF MANUAL

This manual contains the information necessary to operate and maintain a TrueTime Model 560-5198 RS-422 Square Wave Output SILIOM. SILIOM stands for Single In-Line Input / Output Module.

### 1.2. PURPOSE OF EQUIPMENT

The Model 560-5198 card provides a method of adding an RS-422 output to a 560-5153 E1T1 motherboard.

#### 1.2.1. PHYSICAL SPECIFICATIONS

Dimensions:	4.25" long X .687" wide
Weight:	Approximately 2 ounces

#### 1.2.2. ENVIRONMENTAL SPECIFICATIONS

Operating Temp:	0° to +50°C
Storage Temp:	-40° to +85°C
Humidity:	Up to 95% relative, non-condensing
Cooling Mode:	Convection
Altitude:	Sea level to 10,000 ft.

#### 1.2.3. POWER REQUIREMENTS

Voltage:	+5 VDC ±10%
Current:	+50 mA
Power:	250 mW

#### 1.2.4. OUTPUT RATING

Voltage:	RS-422 Levels
Load:	120Ω

## SECTION TWO

### 2. INSTALLATION AND OPERATION

#### 2.1. INTRODUCTION

This section contains installation instructions and operating instructions.

#### 2.2. REMOVAL AND INSTALLATION

**CAUTION:** All SILIOMS contain static sensitive semiconductor devices. Use a personal grounding strap and a static safe workstation while performing any handling of the SILIOM and/or the Motherboard.

This SILIOM is a customer installed option. To install the SILIOM in the motherboard, grasp it gently by the ends and insert it into the SIMM style connector on the motherboard while orienting it perpendicularly to the face of the motherboard. Then press the top of the SILIOM down and toward the bottom edge of the motherboard until the retainer clips snap down over the SILIOM. Removal is accomplished by spreading the retainer clips apart with your fingers while pushing the SILIOM top up with your thumbs. The SILIOM is keyed to prevent improper insertion, and only gentle pressure is required.

If replacing the SILIOM, check the switch setting on the old SILIOM and set the switches on the new SILIOM the same. The proper location for the SILIOM is determined by deciding in which of the six possible channels you want the SILIOM to reside. If you are replacing a SILIOM simply use the same slot. If this is a new addition then you must wire the appropriate connector on the rear panel adapter associated with the Channel you decide to use. Any SILIOM can be used in any slot without restriction.

Each SILIOM edge connector is associated with an "Output Jumper" located on the 560-5153 Card, which must be set according to the type of SILIOM installed. JP1 is associated with Channel A (at the top of the 560-5153), JP2 is associated with Channel B, and so on through JP6 and Channel F. The card JP(X) must have a shunt installed across pins 1 and 2 (out of 4). Pin 1 is near the top of the card when viewed from an "as installed" perspective. The JP blocks are located near the end of the SILIOM edge connectors that are farthest from the Front Panel of the 560-5153 Card. Revision 2 and later cards have additional jumper blocks (JP7-12) that are used for special JTAG operations on the card. If shunts are installed on these jumper blocks they should be "stored" on only one pin of the jumper block.

#### 2.3.

## OPERATION

There are no operator actions required by this SILIOM other than setting the configuration switches. Other possible operator actions can be carried out by use of software associated with the Fault Monitor card in a 56000 system. See the following charts for switch function definition. SW1-3 is used to clear faults on the card in factory test procedures. It should always be left in the **ON** position *unless* you wish to disable fault detection on this module.

### SW1 bit definition

SW1-1	SW1-2	Meaning
ON	ON	Output = 64 kHz
OFF	ON	Output = 8 kHz
ON	OFF	Output = 1.544 MHz
OFF	OFF	Output = 2.048 MHz

SW1 bit definition, continued.

SW1-3	SW1-4	Meaning
ON	x	Fault reporting enabled
OFF	x	Fault reporting disabled/clear faults
x	ON	AIS does not disable output
x	OFF	AIS disables output

You must also set or verify the Output Configuration Jumper (JP1-JP6) associated with the channel (A-F, J2-J7) that the card is installed in on the 560-5153 card. Store the shunt for this card on pin 1 of JP(X).

## SECTION THREE

### 3. THEORY OF OPERATION

#### 3.1. GENERAL INFORMATION

This section contains a detailed description of the circuits on this SILIOM. These descriptions should be used in conjunction with the drawings in SECTION FIVE.

#### 3.2. SILIOM DESCRIPTION

The 560-5198 SILIOM contains all the circuitry needed to add an RS-422 level output to a 560-5153 E1T1 card. It can drive a 120 $\Omega$  load to RS-422 levels at frequencies of 8, 64, 1544, and 2048 kHz. It also monitors its own output and can detect a shorted output as well as stuck high or stuck low faults. These it reports back to the 560-5153 card.

#### 3.3. DETAILED DESCRIPTION

Reference drawing 560-5198, sheets 2 and 3 of 3. U2 is a CPLD which contains all the logic circuits needed on the SILIOM. U1, an RS-422 transceiver, buffers the CPLD to the output and feeds its output back into its own receiver circuit for fault checking purposes. As long as the output signal is OK the receiver will echo a copy back to a peak detector. C13 prevents a stuck high signal from being detected as OK. R6 is a DC return path for the junction of C13 and D1. The detected signal is integrated by C14 and fed to the inverting input of U3. R9 simply discharges C14 in the absence of a proper signal. R7 and R8 form a voltage divider which develops the set point voltage for Comparator U3. When the voltage across C14 drops below the voltage on Pin 2 of U3 then Pin 7 of U3 will go high to indicate a Line fault. When a failure is detected, that information is latched in U2 and reported to the 560-5153 card and thence to the Alarm Monitor card if one is installed in the system. There are three ways to clear the fault, the preferred one is to use the Fault Monitor cards software, another is to momentarily move SW1-3 to the OFF position and then back to the ON position (possible only if the 560-5153 card is on an extender card), and the third is to power down the system (necessary if there is no Fault Monitor card). U2 is programmed in-system using a JTAG port and a dedicated fixture or the JTAG port on the 560-5153, and a special cable and software running on a PC.

## SECTION FOUR

### 4. MAINTENANCE AND REPAIR

#### 4.1. MAINTENANCE

This module requires no maintenance. Schematics are provided in SECTION FIVE for those who desire to troubleshoot a problem down to the component level. All parts are standard commercially-available parts except for the printed circuit board itself.

#### 4.2. REPAIR

This module is constructed mostly of surface mount components. These components are extremely difficult to replace successfully without a great deal of specialized SMT rework equipment and specialized training. Additionally, the majority of the circuitry on this board resides in a programmable part which requires special equipment, software, and data files to program. For these reasons it is strongly recommended that you return any malfunctioning module to the factory where it can be repaired.

## **SECTION FIVE**

### 5. DETAILED DRAWINGS

5.1. 560-5198 DETAILED DRAWINGS / BILL OF MATERIALS

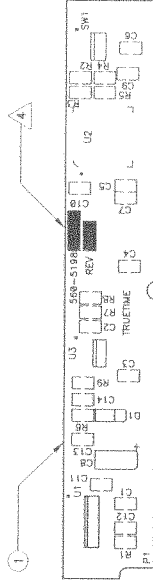
NOTES: UNLESS OTHERWISE SPECIFIED

1. ASSEMBLE PER ASSEMBLY REQUIREMENTS DOCUMENT 421-11.
2. RESISTOR VALUES IN OHMS, CAPACITORS IN MICRO FARADS.
3. POLARIZED CAPACITORS ARE SHOWN WITH A ROUNDED EDGE INDICATING THE POSITIVE SIDE.
4. STAMP DASH NUMBER & REVISION LEVEL.



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
02	ADDED C1,C14,D1,R6--R9, & U3; CHANGED SIGNAL NAMES	03/04/98	
03	ECO #1285	03/23/99	



CONTRACT NO.	RS-422 OUT
APPROVALS	ASSEMBLY DRAWING, TOP SIDE
DRAWN BY	SRAMEK
CHECKED	
APPROVED	
DATE	01-05-98
Size	B
Number	560-5198
Rev	03
Date	Tue Mar 23, 1999 08:54:12
Filename	2198-02.PCB
Sheet	1 of 3

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

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
560-5198	ASSY RS422 OUTPUT (T1E1)	MADE FROM 560-2198				EA	
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA	<i>DR 3/99</i>
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA	REV 03 (03-23-99)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA	560-5198 REV 03
0000-REV	PCB REV LEVEL HERE >>>>		000000		1.0000	EA	560-2198 REV 02
008S-102	RES 1K OHM 1/8W 1% 0805	NIC NRC12R102FTR	000000		1.0000	EA	R8
008S-103	RES 10K OHM 1/8W 0805 5%	NIC NRC12R103TR	000000		1.0000	EA	R6
008S-104	RES 100K OHM 1/8W 1% 0805	NIC NRC12R104FTR	000000		1.0000	EA	R9
008S-121	RES 120 OHM 1/8W 0805 5%	NIC NRC12R121TR	000000		1.0000	EA	R1
008S-392	RES 3.9K OHM 1/8W 0805	NIC NRC12R392TR	000000		1.0000	EA	R7
008S-472	RES 4.7K OHM 1/8W 0805 5%	NIC NRC12R472TR	000000		4.0000	EA	R2-5
036S-Y5V104	CAP CER .1UF Y5V 50V 0805	NIC NMC0805Y5V104Z50TR	000000		13.0000	EA	C1-7,9-14
037S-106-TL	CAP TANT 10UF 16V SIZE C	PANASONIC ECS-H1CC106R	000000		1.0000	EA	C8
057S-4148	DIODE 1N4148	ROHM RLS4148TR	000000		1.0000	EA	D1
065S-002	SWITCH DIP HALF PITCH	MEPCOPAL CHS-04A	000000		1.0000	EA	SW1
176S-LT1016	LT1016 (8SO)	LINEAR TECH LT1016CS8	000000		1.0000	EA	U3
178S-LTC491	LTC491 (14SO)	LINEAR TECH LTC491CS	000000		1.0000	EA	U1
178S-MACH211SP	IC, PROGRAMMABLE, CPLD	VANTIS MACH211 SP-15 VC	000000		1.0000	EA	
	INSTALL U2 (NOT PROGRAMMED/NOT SOCKETED) AT ASSEMBLY.						
	PART WILL BE PROGRAMMED AT TRUETIME DURING TEST FUNCTION. PROGRAM USING 185-011.WCH AND 185-011.J1 AND TEST FIXTURE 441-T1E1.						
185-011	PROGRAM (MACH)	FOR 560-5198	000000		1.0000	EA	FOR U2
560-2198	PCB RS422 OUTPUT (T1E1)	FAB	000000		1.0000	EA	01.
LA	LABOR ASSEMBLY COST HRS		000000		0	EA	
LT	LABOR TEST COST HOURS		000000		0	EA	
OSV560-5198	OUTSIDE LABOR 560-5198	PCA	000000		1.0000	EA	