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**Electro-Optical Link Acceptance Test Procedure**

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# ELECTRO-OPTICAL LINK ACCEPTANCE TEST PROCEDURE

Serial Number: \_\_\_\_\_

Date Tested: \_\_\_\_\_

Tested By: \_\_\_\_\_

## 1.0 INTRODUCTION

The Electro-Optical Link (EOL) system transmits digital signals from one location to another in the form of light guided through thin fibers of glass. Running copper cables in an electro-magnetic interference (EMI) or radio frequency interference (RFI) hostile environment necessitates pulling them through adequately shielded conduits. With fiber optics, we have complete immunity to EMI. The fiber optic cables can be installed from point to point passing right next to major EMI sources with no effect.

The following tests verify the performance of the EOL system.

## 2.0 EQUIPMENT

The following equipment, or their equivalents, shall be used to performance this acceptance test.

Tracewell T-Frame VME card tester

jxi2 VME-SyncClock32 Global Position System (GPS) clock receiver board.

SRS Model DS345 30 MHz Synthesized Function Generator.

SRS Model SR620 Universal Time Interval Counter.

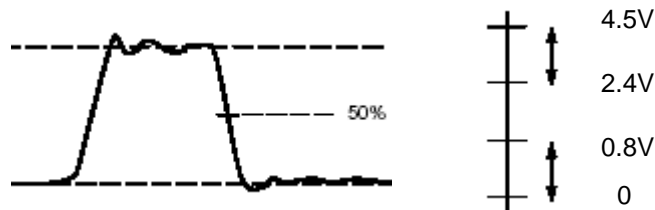
Tektronix 2465 300 MHz Oscilloscope.

D990194 ISC Clock Fanout Board

## 3.0 DEFINITION

3.1 Transistor-Transistor Logic (TTL) Power Supply:  $V_{cc} = 5.0\text{ V}$

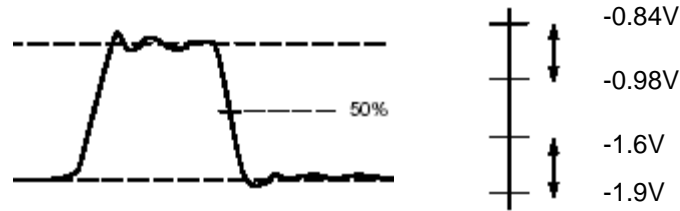
3.1.1 TTL Switching Characteristics:



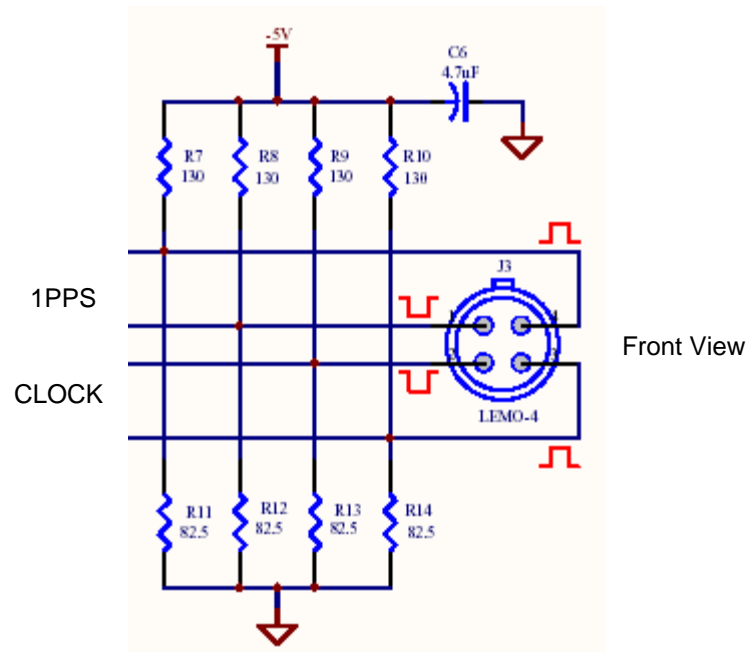
### 3.2 Emitter-Couple-Logic (ECL) Power Supply:

Vee = -5.0V

#### 3.2.1 ECL Switching Characteristics:



#### 3.2.2 Standard pinout of the 4 pin LEMO connector used in the EOL:



## 4.0 TEST PROCEDURE

For convenience, this acceptance test shall be divided into three parts. Part A tests the performance of the EOL Transmitter board (D050054). Part B tests the performance of EOL Receiver (D050055) and Part C tests the EOL FanOut Chassis {consisting of the EOL Fanout Receiver (D050056) and EOL Fanout Transmitter (D050057) boards internally} in the complete Electro-Optical Link configuration.

### 4.1 Part A - Transmitter Board Acceptance Test Procedure

Serial Number: \_\_\_\_\_

Date Tested: \_\_\_\_\_

Tested By: \_\_\_\_\_

With the power to the Tracewell T-Frame VME card tester turned OFF, insert one each of the following cards: GPS clock receiver board; EOL Transmitter board; EOL Receiver board and D990194 ISC Fan Out Board into the tester as shown in Figure 1.

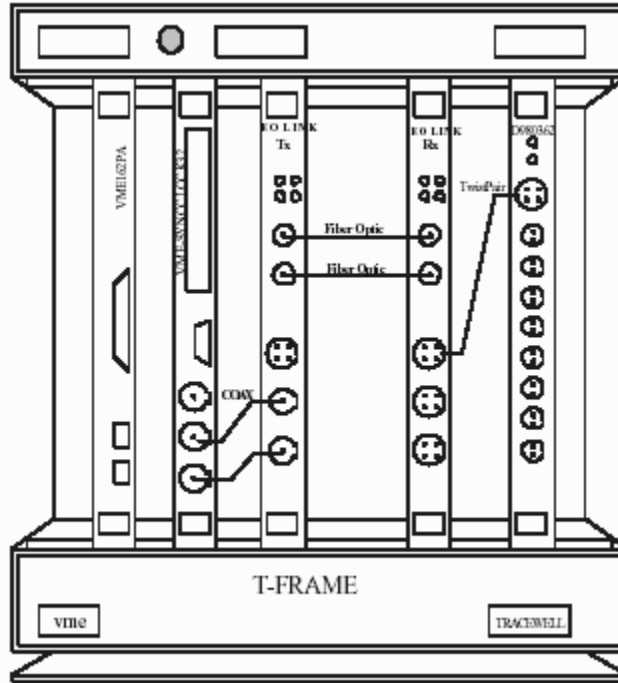


Figure 1. Transmitter and Receiver Board Test Setup

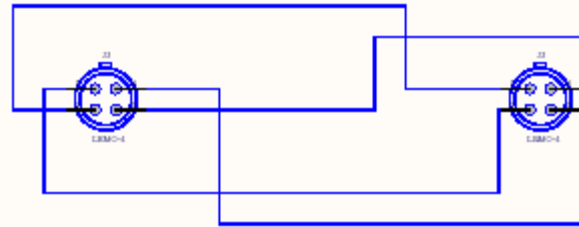


Figure 2. 1PPS Sync Pulse Test Cable Assembly

Use two short BNC cables, connect the 1PPS and Clock outputs from the GPS board to the corresponding inputs on the Transmitter board.

Use the 1 PPS Sync Pulse test cable connect the MONITOR output of the Transmitter board to the input of the ISC Clock Fan Out board.

Use a short BNC cable connect D990194 CLK MON output to the input of the oscilloscope.

On the oscilloscope, select the DC 50 Ohm input termination for the BNC cable.  
Set the amplitude to 1 Volt/Div and the timing to 50 mS/Div.

Turn ON power to the T-Frame and verify the following:

On the Tx (D050054) board,

+ 5V LED is ON

- 5V LED is ON

1PPS LED is pulsing

Clock LED is ON

On the D990194 board

CLK LED is blinking at approximately 1 PPS

TTL 1 PPS sync pulse on the oscilloscope display

Replace the 1PPS Sync Pulse test cable with a standard LEMO cable (1:1)  
and adjust the time interval on the scope to 500 nS per division.

On the D990194 board

CLK LED is Blinking

On the Oscilloscope

4 MHZ CLOCK pulse on the oscilloscope display

This completes testing of the Transmitter Board.

Turn OFF power to the T-Frame Test Set.

NOTE 1: If no GPS board is available during testing, both the TTL 1 PPS and CLOCK (4 MHz) pulses can be simulated using the DS345 function generator with the following settings:

Function: Square Wave

Amplitude: 0 to 3.0 Volt peak to peak

Frequency: 1 Hz for the 1 PPS and 4 MHz for the Clock

4.2 Part B - Receiver Board Acceptance Test Procedure:

Serial Number: \_\_\_\_\_

Date Tested: \_\_\_\_\_

Tested By: \_\_\_\_\_

Connect the 1 PPS and Clock outputs on the Transmitter to the corresponding inputs on the Receiver board with a ST to ST duplex multimode fiber optic cable.

Use the inverting 1PPS LEMO test cable, connect the Channel 1 output of the Receive board to the input of the ISC Clock Fan Out board

On the oscilloscope, select the DC 50 Ohm input termination for the BNC cable. Set the amplitude to 1 Volt/Div and the timing to 500 mS/Div.

Turn ON power to the T-Frame Test Set and observe the following:

On the Receiver board,

+ 5V LED is ON

- 5V LED is ON

1PPS LED is pulsing

Clock LED is ON

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the LEMO cable connecting Channel 1 to Channel 2 on the Receiver board and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the LEMO cable connection from Channel 2 to Channel 3 on the Receiver board and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Replace the 1 PPS Sync Pulse LEMO test cable with the standard (1:1) one.

On the oscilloscope, select the DC 50 Ohm input termination for the BNC cable. Set the amplitude to 1 Volt/Div and the timing to 50 nS/Div.

Connect the Channel 1 output on the Receiver board to the input of the ISC Clock Fan Out board and observe the following:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the LEMO cable connection from Channel 1 to Channel 2 on the Receiver board and observe the following:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the LEMO cable connection from Channel 2 to Channel 3 on the Receiver board and observe the following:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

The completes the Acceptance Test for the Receiver Board.

Turn OFF power to the T-Frame.

4.3 Part C - Acceptance Test Procedure for the FanOut Chassis

Serial Number: \_\_\_\_\_

Date Tested: \_\_\_\_\_

Tested By: \_\_\_\_\_

Using two duplex multimode fiber optic cables of the same length, re-arrange the test setup from Figure 1 to Figure 3 below.

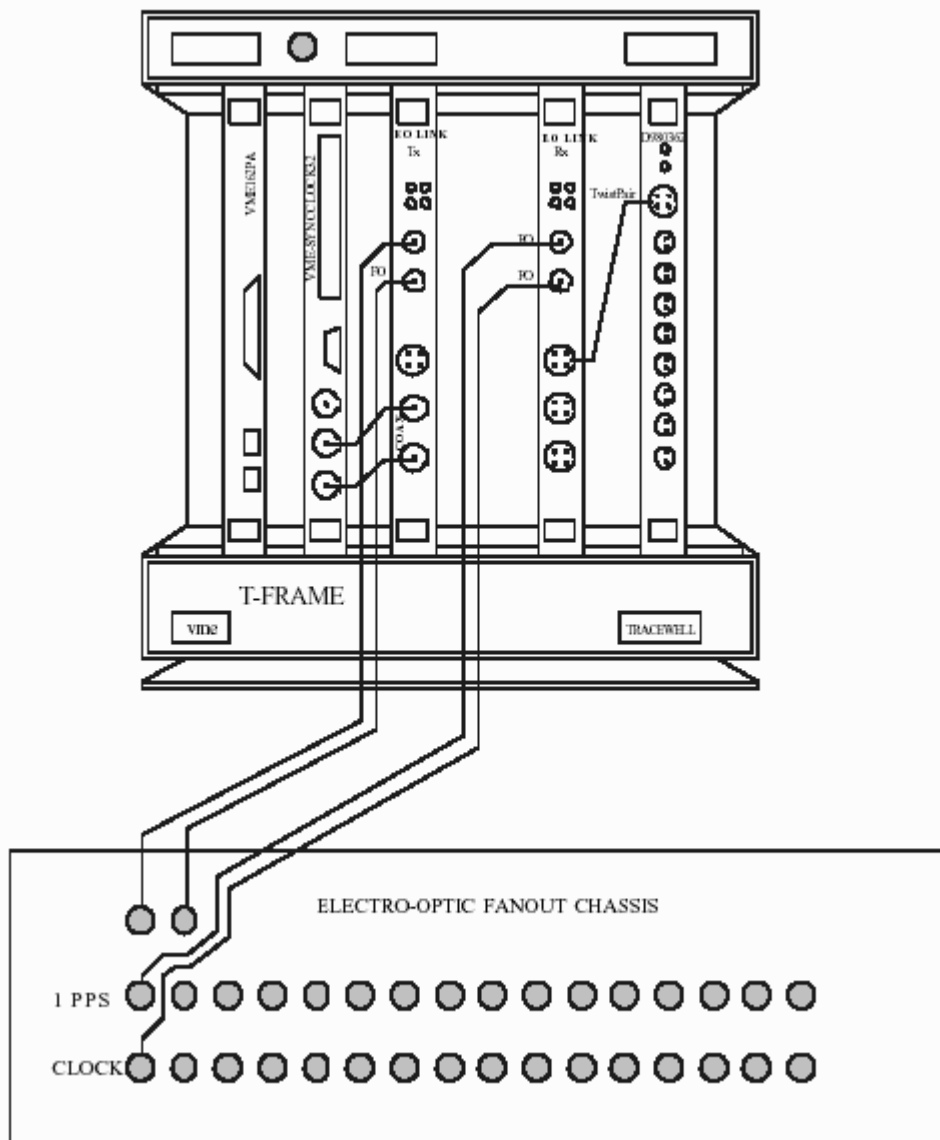


Figure 3. Test Setup for the EOL Fanout Chassis



Use the 1PPS Sync Pulse LEMO test cable, connect the Channel 1 output of the Receiver board to the input of the ISC Clock Fan Out board

On the oscilloscope, select the DC 50 Ohm input termination for the BNC cable. Set the amplitude to 1 Volt/Div and the timing to 500 mS/Div.

Turn ON power to the T-Frame as well as the EOL Fanout chassis and verify the following LED indicators on the Fanout chassis:

+ 5V LED is ON

1PPS LED is pulsing

Clock LED is ON

On the D990194  
CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope  
TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 1 on the Fanout Chassis to Channel 2 and observe the following:

On the D990194  
CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope  
TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 2 on the Fanout Chassis to Channel 3 and observe the following:

On the D990194  
CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope  
TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 3 on the Fanout Chassis to Channel 4 and observe the following:

On the D990194  
CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 4 on the Fanout Chassis to Channel 5 and observe the following:

On the D990194

CLK LED is Blinking at approximate 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 5 on the Fanout Chassis to Channel 6 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 6 of the Fanout Chassis to Channel 7 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 7 on the Fanout Chassis to Channel 8 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 8 on the Fanout Chassis to Channel 9 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 9 on the Fanout Chassis to Channel 10 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 10 on the Fanout Chassis to Channel 11 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 11 on the Fanout Chassis to Channel 12 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 12 of the Fanout Chassis to Channel 13 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 13 of the Fanout Chassis to Channel 14 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 14 of the Fanout Chassis to Channel 15 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

Move the output Fiber Optic cable from Channel 15 of the Fanout Chassis to Channel 16 and observe the following:

On the D990194

CLK LED is Blinking at approximately 1 PPS

On the Oscilloscope

TTL 1 PPS sync pulse on the oscilloscope display

This completes testing of the 1 PPS output.

On the oscilloscope, select the DC 50 Ohm input termination for the BNC cable. Set the amplitude to 1 Volt/Div and the timing to 50 nS/Div.

Move the output Fiber Optic cable on the Fanout Chassis from Channel 15 back to Channel 1.

Replace the 1 PPS LEMO test cable connecting the Receiver to the D990194 with a standard (1:1) one and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 1 to Channel 2 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 2 to Channel 3 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 3 to Channel 4 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 4 to Channel 5 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 5 to Channel 6 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 6 to Channel 7 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 7 to Channel 8 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 8 to Channel 9 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 9 to Channel 10 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 10 to Channel 11 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 11 to Channel 12 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 12 to Channel 13 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 13 to Channel 14 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 14 to Channel 15 and observe:

On the D990194

CLK LED is Blinking

On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

Move the output Fiber Optic cable on the Fanout Chassis from Channel 15 to Channel 16 and observe:

On the D990194

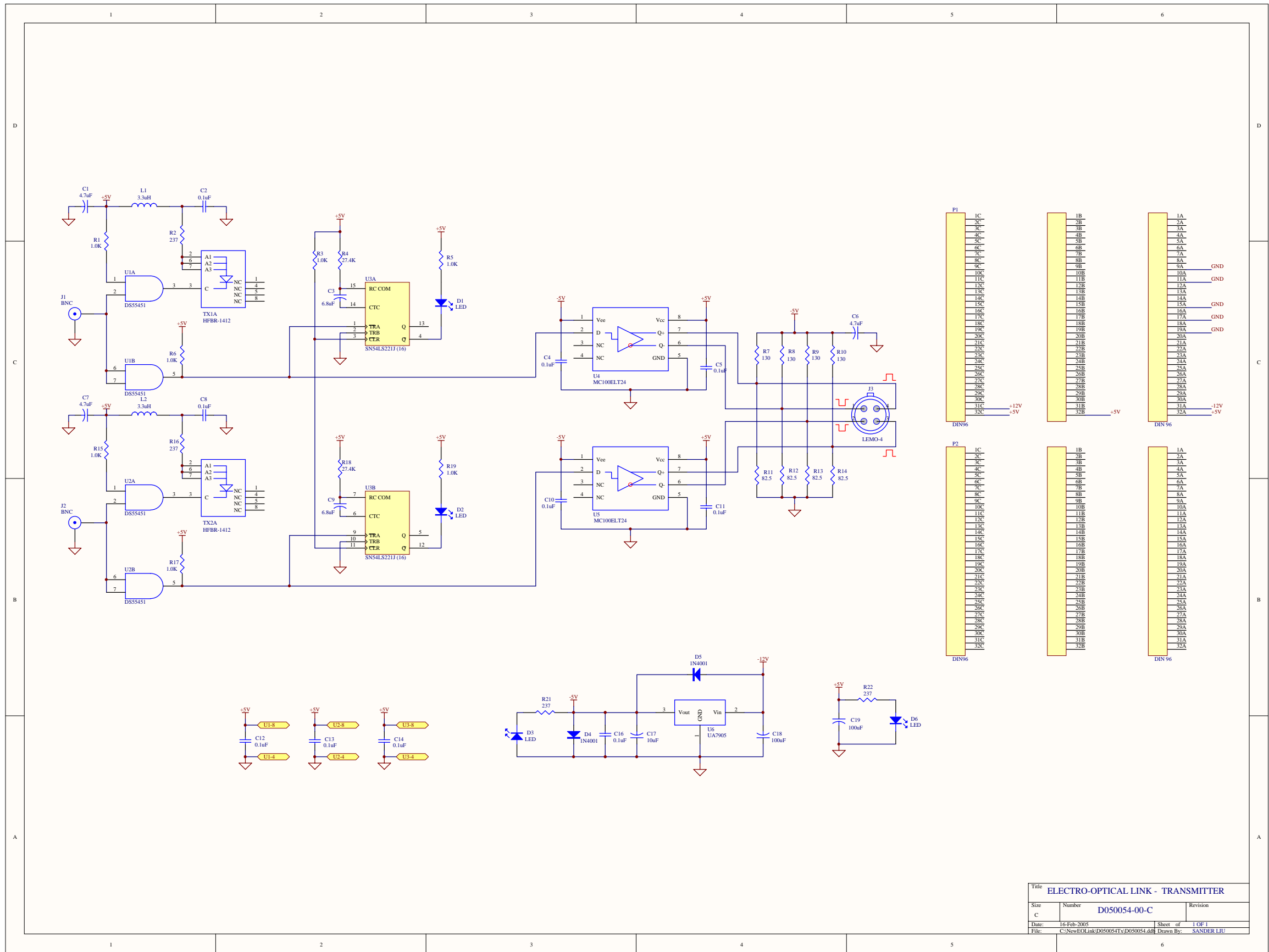
CLK LED is Blinking

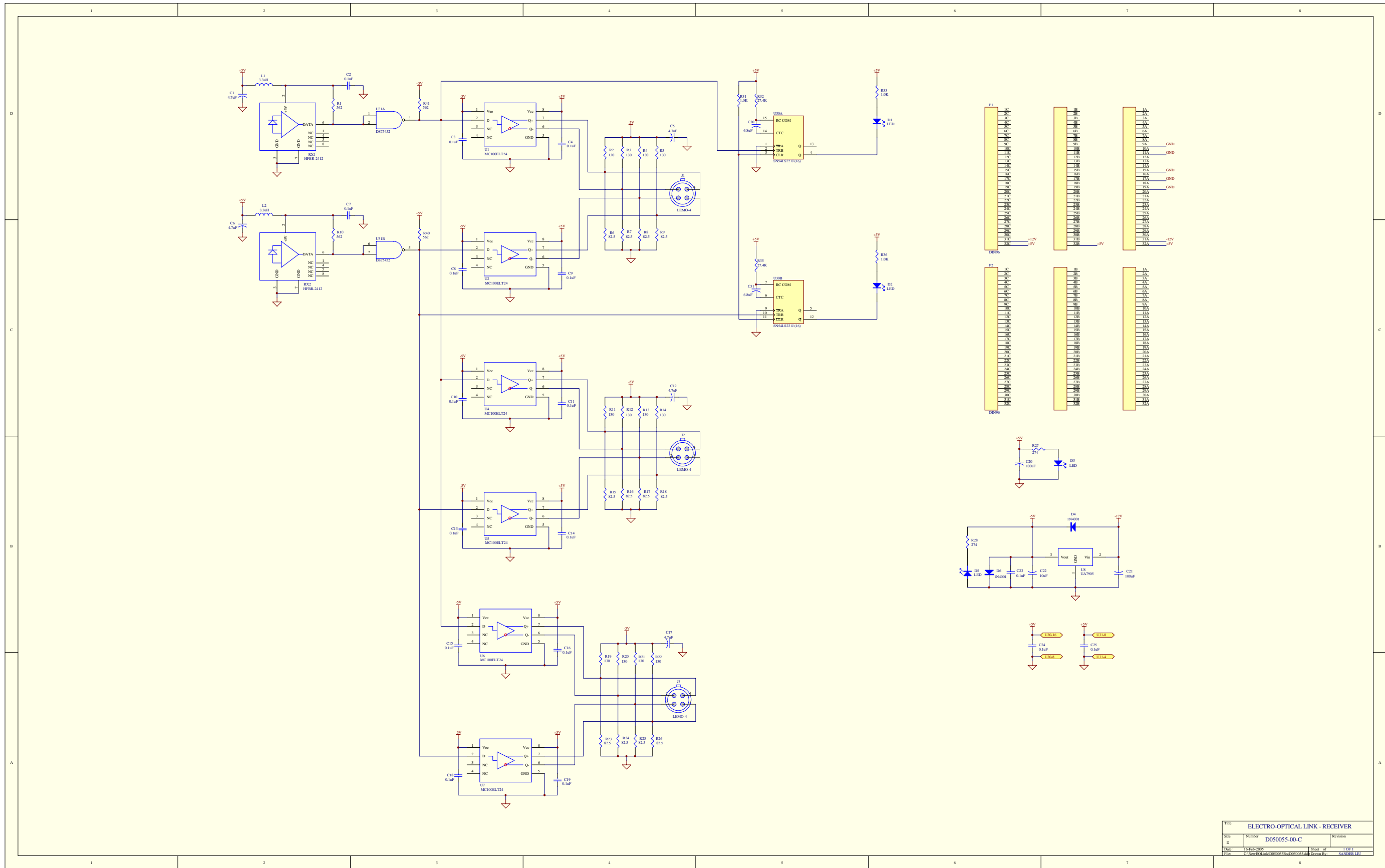
On the Oscilloscope

4 MHz clock pulse on the oscilloscope display

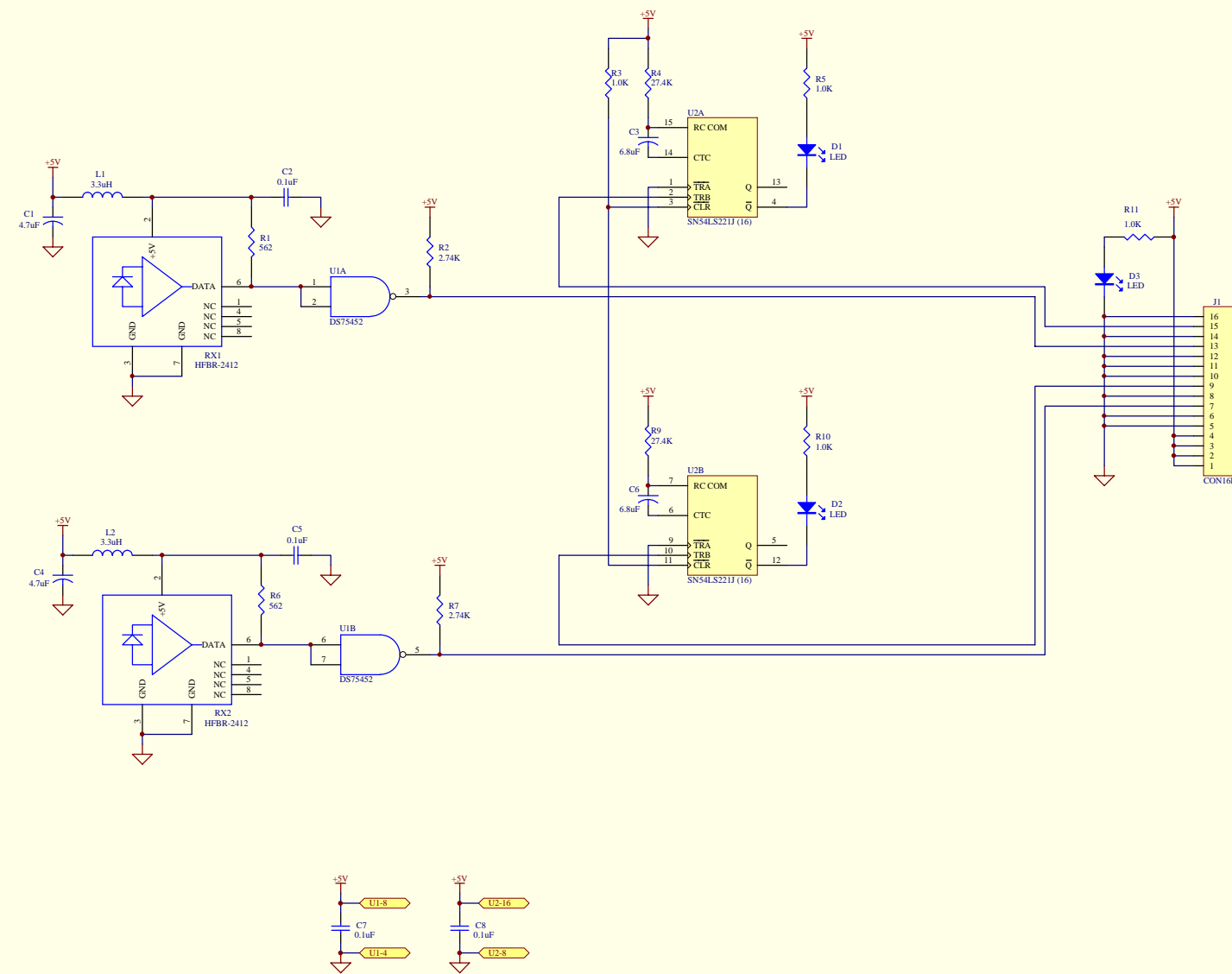
This concludes the acceptance test for the Electro-Optical Link system.



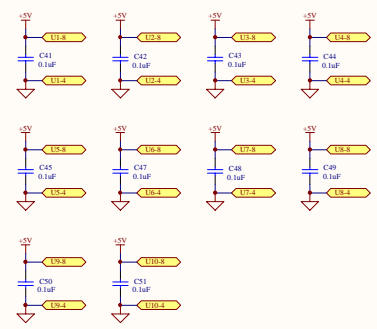
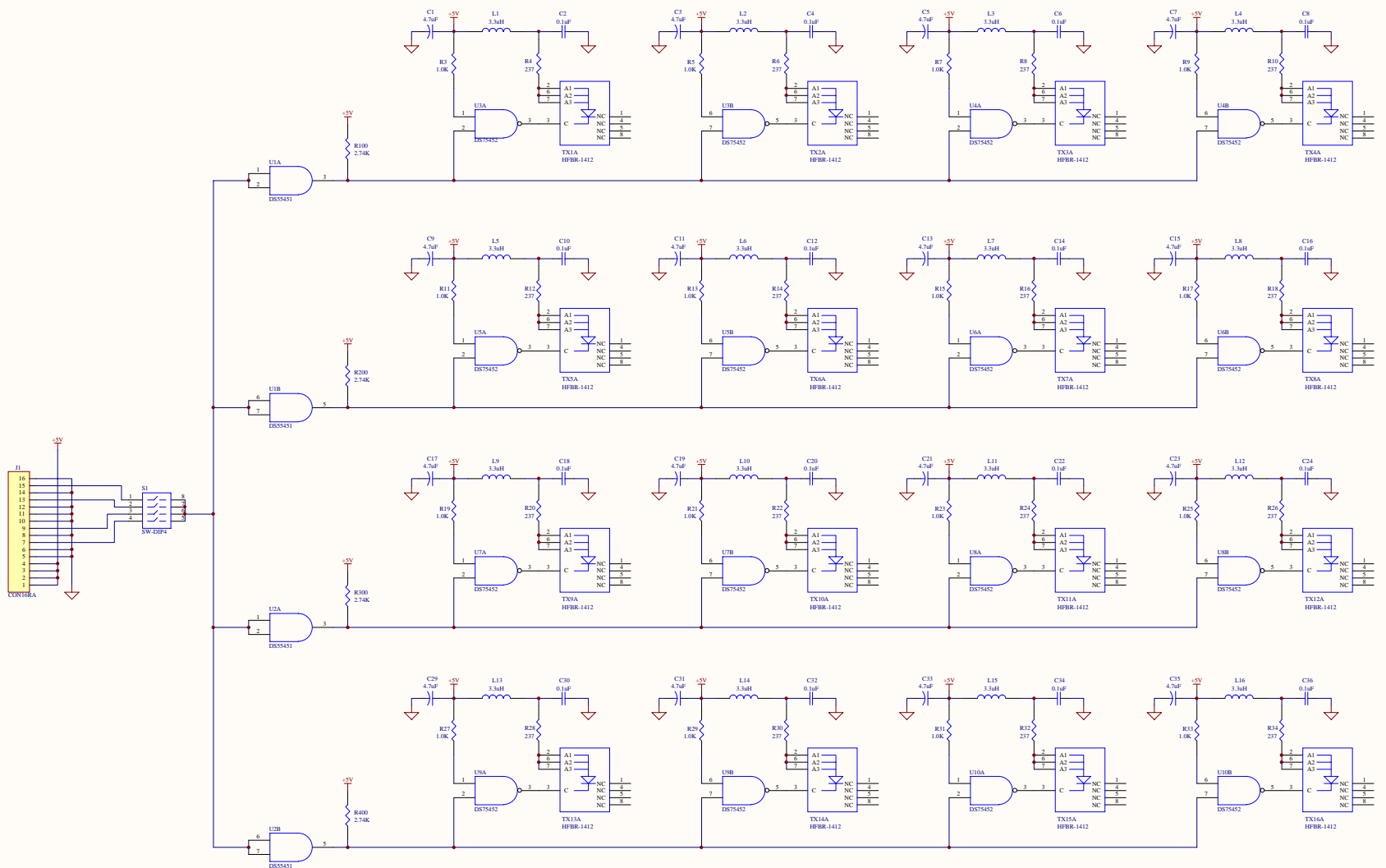




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Date	16-Feb-2007	Sheet of 1 (of 1)
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Title			ELECTRO-OPTICAL LINK FANOUT RECEIVER		
Size	Number	D050056-00-C		Revision	
C					
Date:	16-Feb-2005	Sheet of	1 OF 1		
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Title			ELECTRO-OPTICAL LINK FANOUT TRANSMITTER		
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