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## Evaluation Kit & Driver User's Guide<sup>©</sup>

### 1. Introduction

This document describes the operation of the Evaluation Kit and Driver Ver. SW-DR-2 for exclusive use with the Agiltron MxN CrystaLatch™ (CL) series, LightBend™ (LB) series optical switches and DD series digital photonic delay lines. The evaluation board integrates virtual COM port (VCP) USB, RS-232, and TTL interfaces and provides the control logic and configurations for customized control of NxM optical switches. The board is compatible with ROHS6 version and a Windows® application program is included for evaluation, testing, and demonstration of switch and delay line operation.

The Evaluation Kit includes an electronic circuit board, a serial port connection cable, and a power supply.

The delivered Evaluation Kit circuit is internally programmed for drive compatibility with only one switch configuration.

### 2. Circuit board layout and functions

Fig. 1,2 shows the layout of evaluation kit circuit board (control board and switch daughter board) for reference in the following description of operation.

#### Hardware Control Functions

16-Pin Header (**J4**): User-configured control connector for TTL and RS232 with pin-out defined in Table 1.

DIP Switch (**J5**): Data input for TTL Emulator control

Push Button Switch (**SWITCH**): Write TTL Emulator input (as set by Dip Switch) to set switch state.

Push Button Switch (**READ**): Read TTL Emulator output (switch status) from switch controller to the switch and trigger LED indicator

LED Indicator (**LED2~5**): Indicates switch triggering performing Read Switch operation using the TTL Emulator function. The switch status is defined with 4 bits as in section 7

LED Indicator (**LED1, LED**): Power On indicator

DB9-Male (**J5**): Connector for communication with computer using serial port cable. Only the cable supplied with Evaluation Kit should be used to insure a successful connection. (Connection of the cable is straight through). Bits per second: 9600; data bits: 8; parity: none; stop bits: 1; flow control: none;

USB (**J1**): virtual COM port for this USB port. It is using FTDI chips for communication with computer.

Power Jack (**J2**): Power supply connector. Power supply (+12V) is supplied with Evaluation Kit.

Selection for USB or RS232 (**J7**): using USB, J7 should be opened and using RS232, J7 should be closed. It doesn't work if not select.

Electronic Connector (**J3**): 30-pin connector for connecting switch control board to switch daughter board for control switch device.



Fig. 1: Layout of evaluation kit control board.

### **Dimensioned Mechanical Date of the evaluation kit control board:**

Board's size: 99 mm L X 60 mm W X 17 mm H

Distance of the holes: 91 mm (L side) X 52 mm (W side)

\*(from a central of the hole to central of the hole)

Diameter of the holes: 3 mm

**Dimensioned Mechanical Date of the evaluation kit switch board:**

Is the same as the evaluation kit control board.

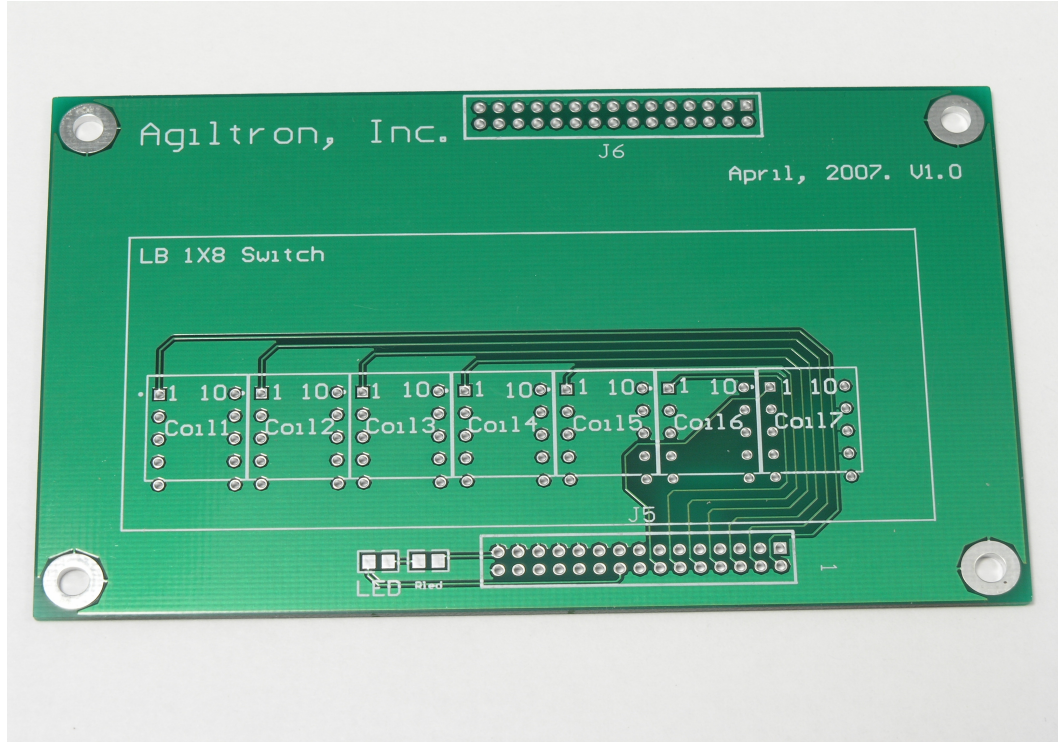


Fig. 2: Layout of evaluation kit switch daughter board

**Table 1 Connector Pin-Out (J4)**

| Pin # | Symbol | I/O | Description   |
|-------|--------|-----|---|
| 1     | +5V    | Out | +5V power supply  |
| 2     | GND    |     | Power supply ground   |
| 3     | D1     | I/O | Switch status (least significant bit)   |
| 4     | D2     | I/O | Switch status   |
| 5     | D3     | I/O | Switch status   |
| 6     | D4     | I/O | Switch status (most significant bit)  |
| 7     | NC     |     | No Connect  |
| 8     | NC     |     | No Connect  |
| 9     | SWITCH | In  | High to low transition triggers switching. Keeps at low 15 $\mu$ s and then to go to high.  |
| 10    | READ   | In  | High to low transition triggers reading. Keeps at low 15 $\mu$ s and then to go to high.  |
| 11    | BUSY   | Out | BUSY goes from high to low within 5 $\mu$ s at SWITCH/READ trigger. Then it goes from low to high at completion of a cycle time*. |
| 12    | NC     |     | No Connect  |
| 13    | Tx     | Out | Tx of RS232 (LVTTL)   |
| 14    | Rx     | In  | Rx of RS232 (LVTTL)   |
| 15    | GND    |     | Power supply ground   |
| 16    | +5V    | Out | +5V Power Supply  |

- \* :
- 1) Pin 17-30 reservation.
  - 2) The cycle time is a time for the switch to finish a cycle. It is the switch voltage pulse width. You can find the date of the voltage pulse width from the switch

datasheet or from our Web page.

The cycle time is a time for the READ only to finish an active of the read data.

### 3. Electrical Specifications

Table 2 provides the electrical specifications of the switch driver control board in the Evaluation Kit.

**Table 2 Electrical Specifications**

| Parameters                           | Min | Nom  | Max  | Unit | Notes  |
|--------------------------------------|-----|------|------|------|--|
| Number of Coils                      | 1   |      | 8    |      |  |
| Supply Switching Voltage             |     | 5    |      | V    |  |
| Supply Switching Current (Pulse)     |     |      | 2    | A    | Total coils                                  |
| Total Switching Current (Continuous) |     |      | 2.0  | A    |  |
| Supply Output Pulse Width            | 0.1 |      | 3.0  | ms   | Adjustable by calibration software           |
| Power Supply Voltage                 | 5.5 | 12.0 | 36.0 | V    | Input power supply through J2                |
| Power Supply Current (No Switching)  |     |      | 50   | mA   | Hot pluggable. Less than 1.5A inrush current |
| Power Consumption (No Switching)     |     |      | 0.25 | W    |  |
| RS232                                |     | ±7   |      | V    | Direct connection to PC. J7--Closed          |
| USB                                  |     | 5    |      | V    | Direct connection to PC J7-- Opened          |
|                                      |     |      |      |      |  |

### 4. Switch Configuration Setting

Agiltron has configured the Truth-Table logic in the switch control board firmware for a specific switch type.

### 5. Control MxN switch through Windows® and serial port computer connection

**Please refer to Agiltron's *Fiberoptic Switch Evaluation Kit Windows® Switch Operation Program User's Guide*©**

This document is included with the Evaluation Kit both in hard copy and on the accompanying CD.

### 6. Control MxN Switch through RS-232 in Command/Response format

Agiltron provides a switch control interface for customized programming through RS-232. The command set is compatible with most current versions of software development

environments. The commands and responses are of fixed length binary format given in Table 3. There are 4 bytes for command and 4 bytes for response. The command set is provided in Table 4.

**Table 3: RS232 Command/Response Format**

|           |  |        |      |      |
|-----------|--|--------|------|------|
| Command:  | <Addr>   | <Code> | <Dx> | <Dy> |
| Response: | <Addr>   | <Code> | <Dx> | <Dy> |
| <Addr>    | Module Address: 0 for all modules and 1-255 for specified module. Default: 1 |        |      |      |
| <Code>    | Control Code: Refer to Command Code Table                                    |        |      |      |
| <Dx>      | One byte data, high byte   |        |      |      |
| <Dy>      | One byte data, low byte  |        |      |      |

**Table 4: RS232 Command Code Table**

| Code | Description   |
|------|---|
| 0x01 | Read Module Address<br>Address = <Dx> <Dy>  |
| 0x02 | Set Module Address<br><Dx> <Dy> = 1 ~ 255   |
| 0x03 | Read Module Serial Number (Higher 2 Bytes)<br>S/N (Higher 2 Bytes) = <Dx> <Dy>  |
| 0x04 | Read Module Serial Number (Lower 2 Bytes)<br>S/N (Lower 2 Bytes) = <Dx> <Dy>  |
| 0x05 | Read Module Type<br>Type = <Dx> <Dy> (m × n switch: n — first two digits from left; m — third and fourth digit from left)                 |
| 0x06 | Read Module Version<br>Hardware Version = <Dx> / 10; Firmware Version = <Dy> / 10   |
| 0x11 | Read Switch Status<br>N = <Dx><Dy> (D <sub>4</sub> D <sub>3</sub> D <sub>2</sub> D <sub>1</sub> D <sub>0</sub> = N-1)                     |
| 0x12 | Set Switch to Status N (N = D <sub>4</sub> D <sub>3</sub> D <sub>2</sub> D <sub>1</sub> D <sub>0</sub> +1, 1≤N≤32)<br><Dx><Dy> = N        |
| 0x13 | Read Individual Switch Status<br>Status = <Dx><Dy>.<br>Bit-M: 0 — Switch (M+1) L Position; 1 — Switch (M+1) U Position;                   |
| 0x14 | Set Individual Switch Positions<br><Dx><Dy><br>Bit-M: 0 — Switch (M+1) L Position; 1 — Switch (M+1) U Position;                           |
| 0x21 | Read Module Alarm<br>Normal: <Dx> <Dy> = 0<br>Temperature Alarm: [Bit-0 of <Dx> <Dy>] = 1<br>Power Supply Alarm: [Bit-1 of <Dx> <Dy>] = 1 |
| 0x22 | Read Module Temperature<br>T(°C) = <Dx> <Dy> / 10   |
| 0x23 | Read Power Supply Voltage<br>V(mV) = <Dx> <Dy>  |
| 0x31 | Read Low Temperature Alarm Threshold<br>T(°C) = <Dx> <Dy> / 10  |
| 0x32 | Set Low Temperature Alarm Threshold   |

|      |  |
|------|--|
|      | $\langle Dx \rangle \langle Dy \rangle = 10 \times T(^{\circ}C)$   |
| 0x33 | Read High Temperature Alarm Threshold<br>$T(^{\circ}C) = \langle Dx \rangle \langle Dy \rangle / 10$     |
| 0x34 | Set High Temperature Alarm Threshold<br>$\langle Dx \rangle \langle Dy \rangle = 10 \times T(^{\circ}C)$ |

## 7. Control of MxN switches using TTL interface

Switches control can also be implemented through the TTL interface. TTL control is provided through J4 connectors with its definition provided in Table 1. The switch position status is defined by 4-bits, given in Table 5.

If external TTL signal is used to control the switch, put all BITS on DIP switch (J5) to “1” position.

**Table 5: TTL Bit Definition**

|   |      |      |      |     |     |      |      |      |
|---|------|------|------|-----|-----|------|------|------|
| D <sub>4</sub> D <sub>3</sub> D <sub>2</sub> D <sub>1</sub> | 0000 | 0001 | 0010 | ... | ... | 1101 | 1110 | 1111 |
| Status  | 1    | 2    | 3    | ... | ... | 14   | 15   | 16   |

Timing diagram of TTL interface is illustrated in Fig.3.

## 8. Manual Control MxN Switches

Manual control emulation is provided on the evaluation board and is controlled as follows.

**Read switch port status:** Set D1~4 on **Dip Switch (J5)** to position 1. Press and hold READ push button switch and LED2~5 will indicates port status

**Set switch port:** Set D1~4 on **Dip Switch (J5)** to specified positions refer to Table 5. Press SWITCH push button switch

## 9. Serial Communication Port Setting

Three wire RS-232 serial port with no handshake, 9600 baud rate, 8 data bits, 1 stop bit, no parity bit.

## 10. For Command Control Example:

### 1) to change the CL 1X1 Switch to different status:

Command: 0x01 12 00 01 – OFF  
0x01 12 00 02 – ON

Detail: 1) 0x – this command is using HEX;  
2) 01 – Address, which means that it choose this board  
(our switch control board);

- 3) 12 – CODE, which means that it is setting switch to status;
- 4) D4, D3, D2, D1 – Status 0,0,0,1 or 0,0,0,2 (for 1x1 switch, D4-2 = 0,0,0, only D1 = 1 or 2; D1 is different status which is ON / OFF. Here is Hex. The ON is 1 and the OFF is 2);

**2) To read the module address:**

Command: 0x01 01 00 00

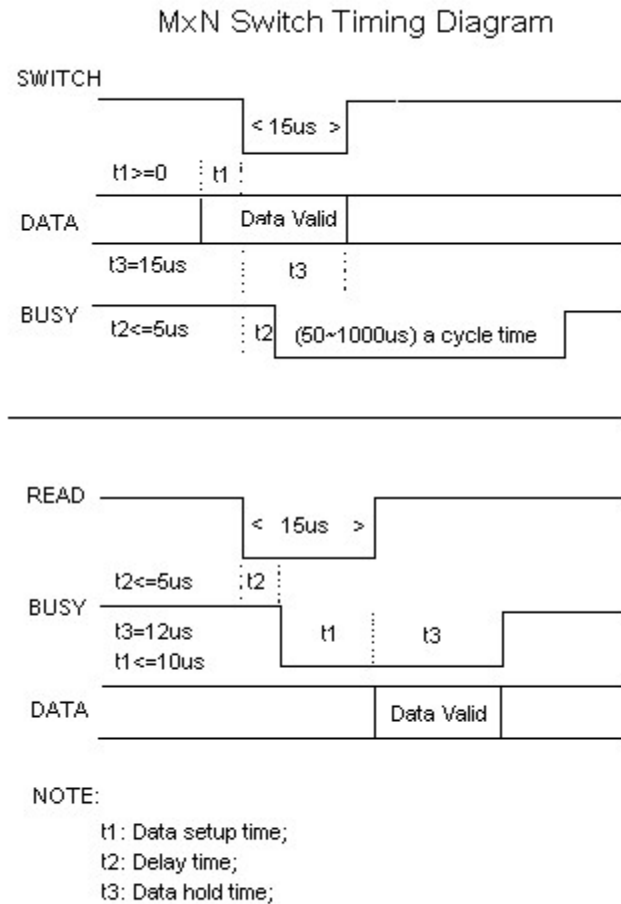


Fig. 3: Timing diagram of TTL Interface