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## MAP/950 Pro 2 Port RS422/ RS485 PCI Express Serial Card Technical Notes (LF686KB)

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This is a quick installation sheet for the Axxon MAP/950 Pro RS422/RS485 2 Port I/O Card for PCI Express

This product is capable of RS422 or RS485 communications up to 10 Mbps speed with a minor clock change.

Compatible with x1, x4, x8, x16 lane expansion slots. The LF686KB is a RoHS & Pb-free compliant product.

**RS422/RS485 Contacts are 25kv ESD, thermal and short circuit protected.** The transceivers applied in this model are 1/8<sup>th</sup> load devices and are the part # MAX3079EESD+ (RoHS) by Maxim Semiconductor.

### **Dipswitches**

This adapter card contains 6 banks of dipswitches. A switch positioned to the RIGHT is OFF. Positioned to the LEFT is ON. The plastic molding on the dipswitch covers contain an ON label with arrow to denote switch orientation.

### **Configuration Modes**

In RS422 mode of operation, the Transmitter and Receiver will be **ALWAYS ACTIVE**.

For RS422 mode of operation, switch the dipswitch to RS422 position.

In RS485 mode of operation, the Transmitter will be **AUTO-GATED** (using the DTR line) for multi-drop applications under the Windows OS. The Receiver is **ALWAYS ACTIVE** in this mode. See the end of this document to cancel local echo.

For RS485 mode of operation, switch the dipswitch to the RS485 position. **You must also select RS485 Active High Mode under the serial port configuration.** This configuration will toggle the DTR line HIGH during a byte transmit and LOW otherwise.

**RS485** communication mode is presently supported under Windows 9x, ME, NT, XP, XP64, 2000, 2003, Vista 32/64. Additional operating systems support may be available upon request. *Please contact Axxon for a WinNT device driver for RS485 operation.*

**RS422** communication mode is supported in at least Win 9x, ME, NT, XP, XP64, 2000, 2003, Vista 32/64 and Linux. For RS422 configuration, as an option you may use the default Microsoft serial driver.

DB9M P1 Connector (close to the PCI edge fingers) = Lower COM Port #.

DB9M P2 Connector (close to the top mounting screw) = Higher COM Port #.

### **DB9 Male Pinout (Full Duplex, 4 wire mode)**

S1.1 = FD to configure P1 connector as Full Duplex

S4.1 = FD to configure P2 connector as Full Duplex

Pin # 1 Ground  
Pin # 2 CTS- (optional)  
Pin # 3 RTS- (optional)  
Pin # 4 RX-  
Pin # 5 RTS+ (optional)  
Pin # 6 CTS+(optional)  
Pin # 7 TX+  
Pin # 8 TX-  
Pin # 9 RX+

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The use of the balanced hardware flow control lines is optional. If the h/w flow control lines are not required, configure as follows:

J1 (CTS0) = Middle and Left pins shorted to **DISABLE** flow control on P1. Do not use pins 3 & 5 on the DB9M connector.  
J3 (CTS1) = Middle and Left pins shorted to **DISABLE** flow control on P2. Do not use pins 3 & 5 on the DB9M connector.

To ENABLE hardware flow control:

J1 (CTS0) = Middle and Right pins shorted to **ENABLE** flow control on P1.  
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

That is,

CTS+ on LF686KB -> RTS+ on remote device  
CTS- on LF686KB -> RTS- on remote device  
RTS+ on LF686KB -> CTS+ on remote device  
RTS- on LF686KB -> CTS- on remote device

J3 (CTS1) = Middle and Right pins shorted to **ENABLE** flow control on P2.  
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

#### ***DB9 Male Pinout (Half Duplex, 2 wire mode)***

For Half Duplex wiring, place the dipswitch to the HD position.

S1.1 = HD to configure P1 connector as Half Duplex  
S4.1 = HD to configure P2 connector as Half Duplex

Pin # 1 Ground  
Pin # 2 CTS- (optional)  
Pin # 3 RTS- (optional)  
Pin # 5 RTS+ (optional)  
Pin # 6 CTS+(optional)  
Pin #7 TX+ / RX+  
Pin #8 TX- / RX-

The use of the balanced hardware flow control lines is optional. If the h/w flow control lines are not required, configure as follows:

J1 (CTS0) = Middle and Left pins shorted to **DISABLE** flow control on P1. Do not use pins 3 & 5 on the DB9M connector.  
J3 (CTS1) = Middle and Left pins shorted to **DISABLE** flow control on P2. Do not use pins 3 & 5 on the DB9M connector.

**OR**

J1 (CTS0) = Middle and Right pins shorted to **ENABLE** flow control on P1.  
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

J3 (CTS1) = Middle and Right pins shorted to **ENABLE** flow control on P2.  
Connect RTS+,RTS- and CTS+,CTS- to your remote device.

Slew Rate Control (J2 & J4): (Default is OPEN).

J2 will configure the slew rate for the interface on connector P1 (bottom DB9M).

J4 will configure the slew rate for the interface on connector P2 (top DB9M).

Open: Maximum Baud Rate 115.2k (Default)

Short (center peg) to 500k for Maximum Baud Rate 500k operation Slew Rate

Short (center peg) to 10M for Maximum Baud Rate 10M operation Slew Rate

This circuit board offers the option for 2 methods of termination for the Transmitter, Receiver, CTS and RTS lines for each of the 2 serial ports.

Method # 1 – Use **onboard manufacturer provided termination resistors** + Dip Switch S2

S2\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)

S2\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

S2\_Switch 2: Off (Right) = No termination, ON (Left) = Terminate CTS lines with onboard 120 ohm resistor (Port P1)

S2\_Switch 1: Off (Right) = No termination, ON (Left) = Terminate RX lines with onboard 120 ohm resistor (Port P1)

S5\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)

S5\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

S5\_Switch 2: Off (Right) = No termination, ON (Left) = Terminate CTS lines with onboard 120 ohm resistor (Port P2)

S5\_Switch 1: Off (Right) = No termination, ON (Left) = Terminate RX lines with onboard 120 ohm resistor (Port P2)

Method # 2 – DO NOT use the Dip Switch S2 = Leave OFF. This method allows for **user provided termination** values.

R31 = User provided termination resistor for TX (through hole ¼ watt or higher) (Port P1)

R30 = User provided termination resistor for RX (through hole ¼ watt or higher) (Port P1)

R51 = User provided termination resistor for TX (through hole ¼ watt or higher) (Port P2)

R52 = User provided termination resistor for RX (through hole ¼ watt or higher) (Port P2)

### **Common Configuration Example # 1**

#### **4 wire RS422 mode for P1**

S1.1 = FD (Left) (ON)

S1.2 = 422 (Right) (OFF)

S1.3 = Echo ON (Right) (OFF)

S1.4 = Left (ON)

#### **4 wire RS422 mode for P2**

S4.1 = FD (Left) (ON)

S4.2 = 422 (Right) (OFF)

S4.3 = Echo ON (Right) (OFF)

S4.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S2\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)

S2\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

## **Common Configuration Example # 2**

### **4 wire RS485 mode for P1 with Local Echo OFF**

S1.1 = FD (Left) (ON)  
S1.2 = 485 (Left) (ON)  
S1.3 = Echo OFF (Left) (ON)  
S1.4 = Right (OFF)

Apply termination if at the end or start of the network as follows:

S2\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)  
S2\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

### **4 wire RS485 mode for P2 with Local Echo OFF**

S4.1 = FD (Left) (ON)  
S4.2 = 485 (Left) (ON)  
S4.3 = Echo OFF (Left) (ON)  
S4.4 = Right (OFF)

Apply termination if at the end or start of the network as follows:

S5\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)  
S5\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

### **4 wire RS485 mode for P1 with Local Echo ON**

S1.1 = FD (Left) (ON)  
S1.2 = 485 (Left) (ON)  
S1.3 = Echo ON (Right) (OFF)  
S1.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S2\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P1)  
S2\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P1)

### **4 wire RS485 mode for P2 with Local Echo ON**

S4.1 = FD (Left) (ON)  
S4.2 = 485 (Left) (ON)  
S4.3 = Echo ON (Right) (OFF)  
S4.4 = Left (ON)

Apply termination if at the end or start of the network as follows:

S5\_Switch 4: Off (Right) = No termination, ON (Left) = Terminate TX lines with onboard 120 ohm resistor (Port P2)  
S5\_Switch 3: Off (Right) = No termination, ON (Left) = Terminate RTS lines with onboard 120 ohm resistor (Port P2)

In RS485 mode of operation, the Transmitter will be **AUTO-GATED** (using the DTR line) for multi-drop applications. The Receiver can be switch configured to either **ENABLE** or **DISABLE** the Local Echo.

For RS485 mode of operation, switch the dipswitch to the RS485 position. **You must also select RS485 Active High Mode under the serial port configuration.** This configuration will toggle the DTR line HIGH during a byte transmit and LOW otherwise.

### **Fail-Safe Biasing**

*Varying with your installation, external resistors may be required for fail-safe biasing of other devices in your communication wiring. That is, to ensure an IDLE state during the absence of all transmitters in the RS485 interface, external pull up resistor for the TX+/RX+ and an external pull down resistor for the TX-/RX- connection. Note: The receivers used in the LF686KB design are internally fail-safe but other non-Axxon designs may not offer this feature. Without a fail-safe biasing the receiver may pick up stray noise as a start bit causing data corruption.*

The values for these resistors are based on the total load of the RS485 network. A common tested value is 330 ohms for both the pull up and pull down leads. This value assumes that termination will be used, otherwise 4.7K is another choice. **Axxon uses 4.7k to fail-safe bias the externally connected devices, so termination should NOT be used.** You may use your own values as an option as noted.

Switch S3 & S6 permit selection between Axxon or user provided fail-safe resistors.

S3 is for the fail-safe biasing configuration of connector P1

S3\_Switch 1: Off (Right) = No fail-safe resistor on RX+ OR User provided fail-safe resistor using R43 (Pull-Up)  
S3\_Switch 1: ON (Left) = 4.7k Fail-safe resistor on RX+ (**User provided fail-safe resistor at R43 should not be installed**)

S3\_Switch 2: Off (Right) = No fail-safe resistor on TX- OR User provided fail-safe resistor using R41 (Pull-Down)  
S3\_Switch 2: ON (Left) = 4.7k Fail-safe resistor on TX- (**User provided fail-safe resistor at R41 should not be installed**)

S3\_Switch 3: Off (Right) = No fail-safe resistor on RX- OR User provided fail-safe resistor using R42 (Pull-Down)  
S3\_Switch 3: ON (Left) = 4.7k Fail-safe resistor on RX- (**User provided fail-safe resistor at R42 should not be installed**)

S3\_Switch 4: Off (Right) = No fail-safe resistor on TX+ OR User provided fail-safe resistor using R39 (Pull-Up)  
S3\_Switch 4: ON (Left) = 4.7k Fail-safe resistor on TX+ (**User provided fail-safe resistor at R39 should not be installed**)

R43 = User provided Pull Up resistor for RX+ (through hole ¼ watt or higher) (Port P1)  
R41 = User provided Pull Down resistor for TX- (through hole ¼ watt or higher) (Port P1)  
R42 = User provided Pull Down resistor for RX- (through hole ¼ watt or higher) (Port P1)  
R39 = User provided Pull Up resistor for TX+ (through hole ¼ watt or higher) (Port P1)

S6 is for the fail-safe biasing configuration of connector P2

S6\_Switch 1: Off (Right) = No fail-safe resistor on RX+ OR User provided fail-safe resistor using R67 (Pull-Up)  
S6\_Switch 1: ON (Left) = 4.7k Fail-safe resistor on RX+ (**User provided fail-safe resistor at R67 should not be installed**)

S6\_Switch 2: Off (Right) = No fail-safe resistor on TX- OR User provided fail-safe resistor using R65 (Pull-Down)  
S6\_Switch 2: ON (Left) = 4.7k Fail-safe resistor on TX- (**User provided fail-safe resistor at R65 should not be installed**)

S6\_Switch 3: Off (Right) = No fail-safe resistor on RX- OR User provided fail-safe resistor using R64 (Pull-Down)  
S6\_Switch 3: ON (Left) = 4.7k Fail-safe resistor on RX- (**User provided fail-safe resistor at R64 should not be installed**)

S6\_Switch 4: Off (Right) = No fail-safe resistor on TX+ OR User provided fail-safe resistor using R63 (Pull-Up)  
S6\_Switch 4: ON (Left) = 4.7k Fail-safe resistor on TX+ (**User provided fail-safe resistor at R63 should not be installed**)

R67 = User provided Pull Up resistor for RX+ (through hole ¼ watt or higher) (Port P1)  
R65 = User provided Pull Down resistor for TX- (through hole ¼ watt or higher) (Port P1)  
R64 = User provided Pull Down resistor for RX- (through hole ¼ watt or higher) (Port P1)  
R63 = User provided Pull Up resistor for TX+ (through hole ¼ watt or higher) (Port P1)

### Hardware Method to Cancel Local Echo

The decision to cancel or enable Local Echo may vary with your application. With Local Echo ON, the serial port will have the RECEIVER always ENABLED providing for a “local echo” of all transmitted data if configured for half-duplex (2 wire) mode. With Local Echo OFF, the local receiver will automatically DISABLE when the local transmitter is ENABLED and remain ENABLED otherwise. For RS422 mode, the Local Echo should be ENABLED.

#### **To ENABLE Local Echo on connector P1**

S1.3 = Echo ON (Right) (OFF)  
S1.4 = Left (ON)

#### **To ENABLE Local Echo on connector P2**

S4.3 = Echo ON (Right) (OFF)  
S4.4 = Left (ON)

#### **To cancel Local Echo on connector P1**

S1.3 = Echo OFF (Left) (ON)  
S1.4 = Right (OFF)

#### **To cancel Local Echo on connector P2**

S4.3 = Echo OFF (Left) (ON)  
S4.4 = Right (OFF)

Reference reading documents:

MAX3079EESD+ datasheet:

<http://pdfserv.maxim-ic.com/en/ds/MAX3070E-MAX3079E.pdf>

Questions? Please contact us via email: [support@softio.com](mailto:support@softio.com) or phone: 1-800-361-1913 to speak with our Tech Support staff from 10 AM to 6 PM (EST).