

USER MANUAL

MODEL 2086 Series
Optically Isolated
RS-232 to RS-485
Interface Converter



*An ISO-9001
Certified Company*

Part# 07M2086-C
Doc# 055051UC
Revised 05/11/99

SALES OFFICE
(301) 975-1000
TECHNICAL SUPPORT
(301) 975-1007
<http://www.patton.com>

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 2086 Series components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product.

Patton Electronics specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

1.1 RADIO AND TV INTERFERENCE

The Model 2086 Series generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model 2086 Series has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 2086 Series does cause interference to radio or television reception, which can be determined by disconnecting the RS-232 interface, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

1.3 SERVICE

All warranty and nonwarranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Services at:

Tel: **(301) 975-1007**
Email: **support@patton.com**
www: **http://www.patton.com**

NOTE: Packages received without an RMA number will not be accepted.

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Patton Model 2086 Series. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

2.1 FEATURES

- Operates asynchronously, point to point or multipoint, over 2 or 4 wires
- Up to 32 multipoint device drops in a polling environment
- Data rates to 115.2 Kbps
- Passes transmit & receive data
- Operates off 5V power supply
- Operates without “echo”
- Driver controlled as “constantly on”, “controlled by RTS”, or “controlled by DTR”
- Compact size (3.8” x 2.10” x 0.8”)
- Twisted pair connection via strain relief, RJ-11 or RJ-45
- 2500 Vrms Optical Isolation

2.2 DESCRIPTION

The Model 2086 Series High Speed RS-232 to RS-485 Interface Converter provides exceptional versatility in a compact package. The Model 2086 Series supports asynchronous RS-232 data rates to 115.2 Kbps over one or two unconditioned twisted pair.

The Model 2086 Series can handle up to 32 terminal drops in a multipoint polling environment. Carrier may be set to “constantly on” or “controlled by RTS”, or “controlled by DTR” and the unit operates without “echo”.

The Model 2086 Series is equipped with a DB-25 for the RS-232 connection. Options for twisted pair connection include RJ-11, RJ-45, or Terminal Block. 2500Vrms optical isolators provide isolation between the RS-232 and RS-485 interfaces.

3.0 CONFIGURATION

The Model 2086 Series is configured using a four position DIP switch and two headers. Figure 1 (below) shows the location of the DIP switch and the two headers on the board.

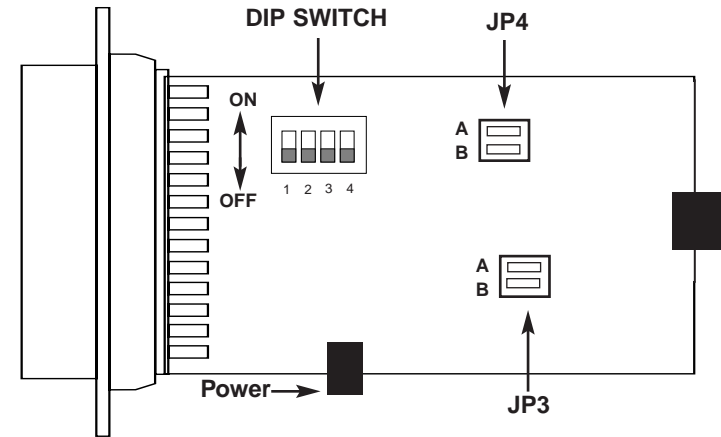


Figure 1. Top View of Model 2086 Series board, showing Dip switch and jumpers

3.1 DIP SWITCH CONFIGURATION

The DIP switches control the transmit/receive signals on the Model 2086 Series. The table below shows the default configuration of the switches. Following the default table is a chart showing the different switch and jumper combinations that the Model 2086 Series has to offer. Also included in this section is a description of the switches.

DIP SWITCH DEFAULT SETTING TABLE			
		Default	
Position	Function	Switch	Function
S1	RTS Control	off	no RTS control of transmitter
S2	DTR Control	off	no DTR control
S3	<i>Reserved</i>	off	n/a
S4	Transmitter Control	ON	Constantly ON

SWITCH COMBINATION CHART							
Transmission Mode	S1-1 [^] RTS Control	S1-2 [^] DTR Control	S1-3 Reserved always off	S1-4 [^] RS485 TX always ON	JP4A [*]	JP4B	JP3A & JP3B ^{**}
RS-485, FDX, Transmitter is always on	off	off	off	ON	off	n/a	off
RS-485, FDX, Transmitter is controlled by RTS	ON	off	off	off	off	n/a	off
RS-485, FDX, Transmitter is controlled by DTR	off	ON	off	off	off	n/a	off
HDX, 4-Wire controlled by RTS	ON	off	off	off	ON	n/a	off
HDX, 2-Wire controlled by RTS	ON	off	off	off	ON	n/a	ON
HDX, 4-Wire controlled by DTR	off	ON	off	off	ON	n/a	off
HDX, 2-Wire controlled by DTR	off	ON	off	off	ON	n/a	ON

KEY: [^] S1-1, S1-2, and S1-4: only one switch can be ON at any time. The other two must be off. It is recommended that you, the user disconnect (the model 2086 Series) while changing configurations.

* JP4A: If this jumper is off, only the RS-485 transmitter is controlled by RTS or DTR. If this jumper is ON, both the RS-485 transmitter and receiver are controlled by RST or DTR. When the transmitter is off, the receiver will be ON, and similarly, when the transmitter is ON, the receiver is off.

** JP3A & JP3B: Both jumpers or either On or off. When the jumpers are ON, the RS-485 transmitter and receiver are connected directly together. This will only function in HDX. When the jumpers are off, the RS-485 transmitter and receiver are disconnected from each other. This can be operated in either HDX or FDX, depending on the setting of JP4A.

Switch S1: RTS Control

When Switch S1 is in the On position, the DTE input signal RTS (Pin 4) is used to control the transmitter of the Model 2086 Series. In this mode, when RTS is high, the 2086 Series transmits data from the RS-232 port to the RS-485 port. **Switch S2 and S4 must be OFF position when Switch S1 is ON.**

<u>S1</u>	<u>Setting</u>
On	RTS Controls the Transmitter
Off	RTS Control is OFF

Switch S2: DTR Control

When Switch S2 is in the ON position, the DTE input signal DTR (Pin 20) is used to control the transmitter of the Model 2086 Series. In this mode, when DTR is high, the 2086 Series transmits data from the RS-232 port to the RS-485 port. **Switches S1 and S4 must be OFF position when Switch S2 is ON.**

<u>S2</u>	<u>Setting</u>
On	DTR Controls the Transmitter
Off	DTR Control is OFF

Switch S3: Reserved

Switch S3 is reserved for future use and must remain in the OFF position.

Switch S4: Transmitter Control

When Switch S4 is in the OFF position, the input of RTS or DTR controls whether the unit can send data (based on the configuration of switch S1 and S2). In this setting, and when in the appropriate signal is high, the 2086 Series can transmit data from the RS-232 port to the RS-485 port. When S4 is ON, the 2086 Series transmitter is always enabled.

<u>S4</u>	<u>Setting</u>
On	Constant Transmitter
Off	Transmitter is controlled by RTS or DTR

3.2 JUMPER CONFIGURATION

Jumper straps JP3 and JP4 are used to control two-wire/four-wire, half-duplex/full-duplex operation, and receive impedance, respectively.

INTERFACE CARD STRAP SUMMARY TABLE			
Strap	Function	ON	Off
JP3A	2 Wire/4 Wire Mode	2 Wire	4 Wire*
JP3B	2 Wire/4 Wire Mode	2 Wire	4 Wire*
JP4A	Half/Duplex	Half Duplex	Full Duplex*
JP4B	Impedance	120 Ohm	12K Ohm *

*NOTE: Default Settings shown in bold italics

4.0 INSTALLATION

Once you have properly set the configuration switches and jumpers, you are ready to connect the Model 2086 Series to your system. This section tells you how to properly connect the Model 2086 Series to the RS-485 and RS-232 interfaces, and how to operate the Model 2086 Series.

4.1 CONNECTION TO THE RS-485 INTERFACE

To function properly, the Model 2086 Series *must* have one or two twisted pairs of metallic wire. These pairs must be "dry" (unconditioned) metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance).

For your convenience, the Model 2086 Series is available with either an RJ-11 jack or RJ-45 jack.

4.1.1 4-WIRE CONNECTION USING RJ-11 OR RJ-45

The RJ-11 and RJ-45 connectors on the Model 2086 Series RS-485 side are pre-wired for a standard TELCO wiring environment. The signal/pin relationships are shown below:

<u>RJ-11</u>	<u>SIGNAL</u>	<u>RJ-45</u>	<u>SIGNAL</u>
1.....	GND*	1.....	N/C
2.....	RCV-	2.....	GND*
3.....	XMT+	3.....	RCV-
4.....	XMT-	4.....	XMT+
5.....	RCV+	5.....	XMT-
6.....	GND*	6.....	RCV+
		7.....	GND*
		8.....	N/C

*Connection to ground is optional

RJ-11



RJ-45



In most modular RS-485 applications it is necessary to use a "cross over" cable. The diagram below shows how a cross over cable should be constructed for an environment where both the Model 2086 Series and the RS-485 device use a 6-wire RJ-11 connector. Similar logic should be followed when using RJ-45 connectors or a combination of the two.

	<u>MODEL 2086 Series</u>	<u>RS-485 DEVICE</u>			
	<u>SIGNAL</u>	<u>PIN#</u>	<u>PIN#</u>	<u>RS-485 SIGNAL</u>	
	GND†	1	-----	N/C	
Pair 2	RCV-	2	-----	4	XMT-B
	XMT+	3	-----	5	RCV-A
Pair 1	XMT-	4	-----	2	RCV-B
	RCV+	5	-----	3	XMT-A
	GND†	6	-----	N/C	

4.1.2 2-WIRE CONNECTION

Most RS-485 devices employ a two-wire, half duplex configuration. When using this configuration, be sure to first set the Model 2086 Series to "two wire" mode—then use *only the transmit (XMT) pair* as shown on the following page.

<u>2086 Series SIGNAL</u>	<u>RS-485 SIGNAL</u>
XMT+.....	XMT-A
XMT-.....	XMT-B

The above wiring pattern applies regardless of whether you are making the RS-485 connection via RJ-11 or RJ-45. For specific wiring instructions, please refer to the previous page of Section 4.

4.2 WIRING FOR MULTIPOINT CIRCUITS

The Model 2086 Series supports multi-point applications using either a star or daisy chain topology. Both topologies require special wiring, as well as specific DIP switch settings for units.

Note: Refer to **Section 3.0** for DIP switch settings.

4.2.1 STAR TOPOLOGY

Using a star topology, you may connect several Model 2086 Series together in a master/slave arrangement. Maximum distance between the units will vary based upon the number of drops, data rate, wire gauge, etc. Call Technical Support for specific distance estimates.

Figure 2 (below) shows how to wire the two-pair cables properly for a Model 2086 Series star topology. Note that the ground connection is not needed.

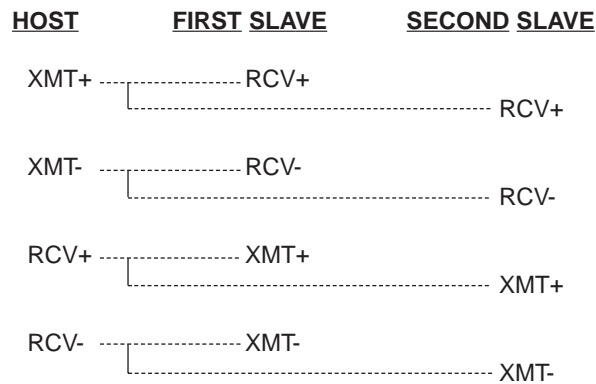


Figure 2. Star wiring for Model 2086 Series host and slaves

4.2.2 DAISY CHAIN TOPOLOGY

Using a daisy chain topology, you may connect several Model 2086 Series together in a master/slave arrangement. Maximum distance between the units will vary based upon the number of drops, data rate, wire gauge, etc.

Figure 3 (below) shows how to wire the two-pair cables properly for a Model 2086 Series daisy chain topology. Note that the ground connection is not needed.

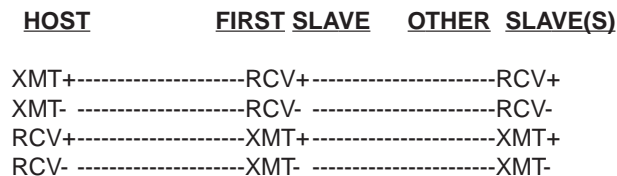


Figure 3. Daisy chain wiring for Model 2086 Series host and slaves

4.3 CONNECTION TO THE RS-232 INTERFACE

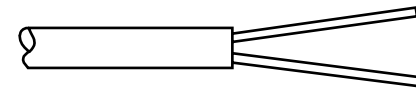
The Model 2086 Series is configured as a modem DCE. Once you have properly configured the Model 2086 Series and connected the twisted pair wires correctly, simply plug the Model 2086 Series directly into the DB-25 DTE port of the RS-232 device. Remember to insert and tighten the two captive connector screws.

(Note: If you must use a cable to connect the Model 2086 Series to the RS-232 DTE device, make sure it is a *straight through* cable of the shortest possible length—we recommend 6 feet or less).

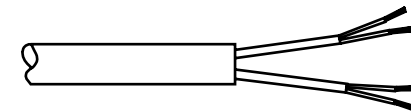
4.4 4-Wire Connection Using Terminal Blocks

If you purchased the Models 2086M or 2086F, you will need to open the case to access the terminal blocks. The following instructions will tell you how to open the case, connect the bare wires to the terminal blocks, and fasten the strain relief collar in place so that the wires won't pull loose.

1. If the case is not already open, open it now by twisting it open with a small plastic screwdriver.
2. Strip the outer insulation from the twisted pairs about one inch from the end.



3. Strip back the insulation on each of the 2 twisted pair wires about .25 inch.



4. Place the cable through the end plate, and make a small loop in the cable and feed the cable under the tie wrap which is currently installed in the board. When you have completed this assembly it should resemble figure 4. Connect *one pair* of wires to XMT+ and XMT- (transmit positive and negative) on the terminal block, making careful note of which color is positive, and which color is negative.

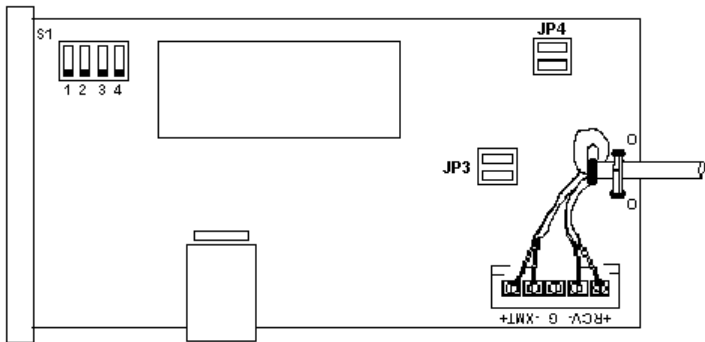


Figure 4. Model 2086M/2086F, Terminal Block & Cable Routing

5. Connect the other pair of wires to RCV+ and RCV- (receive positive and negative) on both of the terminal blocks, again making careful note of which color is positive, and which is negative.

Ultimately, you will want to construct a two pair cross over cable that makes a connection with the RS-422/485 device, as shown below.

Models 2086M/2086F		RS-422/485 Device
SIGNAL	TERMINAL BLOCK	SIGNAL
XMT+	TB (5)	RCV+
XMT-	TB (4)	RCV-
RCV+	TB (1)	XMT+
RCV-	TB (2)	XMT-

4.4.1 2-Wire Connection Using Terminal Blocks

Most RS-485 devices employ a two-wire, half duplex configuration. When using this configuration, be sure to first set the Models 2086M/2086F to half duplex mode by switching DIP switches and jumpers (refer to section 3.0 for this configuration)—then use *only the transmit (XMT) pair* as shown below

Model 2086M/2086F	RS-485 Device
XMT+	+
XMT-	-

4.5 OPERATING THE MODEL 2086 SERIES

Once the Model 2086 Series is properly installed, it should operate transparently—as if it were a standard cable connection. Operating power is derived from the RS-232 data and control signals; there is no “ON/OFF” switch.

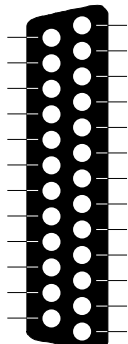
APPENDIX A

PATTON ELECTRONICS MODEL 2086 SERIES SPECIFICATIONS

Transmission Format:	Asynchronous
Data Rate:	Up to 115,200 bps
Range:	4,000 feet
RS-232 Interface:	DB-25, female, male
RS-485 Interface Options:	RJ-11, RJ-45 jack or Terminal Block
Transmit Line:	2, 4 wire unconditioned twisted pair
Transmit Mode:	4-wire, full or half duplex; 2-wire half duplex
Control Signals:	DSR turns "ON" immediately after the terminal raises DTR
Optical Isolation:	2500Vrms
Power:	Uses +5V regulated power supply (provided)
Temperature:	0 to 50° C
Humidity:	5 to 95%, non-condensing
Size:	3.8" x 2.1" x 0.8"

APPENDIX B

PATTON ELECTRONICS MODEL 2086 SERIES RS-232 PIN CONFIGURATIONS

DIRECTION	"DCE Female" SETTING	DIRECTION
To Model 2086		From Model 2086
	8- (DCD) Data Carrier Detect	From Model 2086
	7- (SG) Signal Ground	From Model 2086
	6- (DSR) Data Set Ready	To Model 2086
	5- (CTS) Clear to Send	To Model 2086
	4- (RTS) Request to Send	From Model 2086
	3- (RD) Receive Data	From Model 2086
	2- (TD) Transmit Data	To Model 2086
	1- (FG) Frame Ground	

PATTON ELECTRONICS MODEL 2086 Series RS-485 PIN CONFIGURATIONS

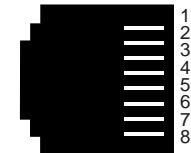
<u>RJ-11</u>	<u>SIGNAL</u>	<u>RJ-45</u>	<u>SIGNAL</u>
1.....	GND*	1.....	N/C
2.....	RCV-	2.....	GND*
3.....	XMT+	3.....	RCV-
4.....	XMT-	4.....	XMT+
5.....	RCV+	5.....	XMT-
6.....	GND*	6.....	RCV+
		7.....	GND*
		8.....	N/C

*Connection to ground is optional

RJ-11



RJ-45



APPENDIX C

PATTON ELECTRONICS MODEL 2086 SERIES LIST OF AVAILABLE MODELS

<u>MODEL</u>	<u>DB25 CONNECTOR</u>	<u>REMOTE CONNECTOR</u>
2086M	Male	Terminal Block
2086F	Female	Terminal Block
2086MRJ45	Male	RJ45
2086FRJ45	Female	RJ45
2086MRJ11	Male	RJ11
2086FRJ11	Female	RJ11
2086M/230	Male	Terminal Block
2086F/230	Female	Terminal Block
2086MRJ45/230	Male	RJ45
2086FRJ45/230	Female	RJ45
2086MRJ11/230	Male	RJ11
2086FRJ11/230	Female	RJ11

NOTE: The Models Codes that are “**BOLD**” are the international versions.