

XStream-PKG Wireless Stand-alone modem

Operation Manual v 1.5

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9XStream-PKG FCC Compliance

FCC NOTICE

WARNING: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Qualifications

IMPORTANT: The 9XSTREAM module has been certified by the FCC for integration without any further certification (as per FCC section 2.1091.) Changes or modifications not expressly approved by MaxStream could void the user's authority to operate the equipment.

In order to fulfill the certification requirements, however, the OEM must comply with FCC regulations:

The 9XStream may be used only with Approved Antennas that have been tested with this module.

9XStream Approved Antenna List

with Antenna Separation Distances for complaince with FCC Expsosure Requirements

Manufacturer	Part Number	Туре	^e Gain Application		Minimum Separation Distance
MaxStream	A09-Y6	Yagi	6.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y7	Yagi	7.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y8	Yagi	8.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y9	Yagi	9.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y10	Yagi	10.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y11	Yagi	11.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y12	Yagi	12.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y13	Yagi	13.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y14	Yagi	14.2dBi	Fixed/Mobile	20cm
MaxStream	A09-Y15	Yagi	15.2dBi	Fixed/Mobile	20cm
MaxStream	A09-F2	Omni Direct.	2.2dBi	Fixed	20cm
MaxStream	A09-F5	Omni Direct.	5.2dBi	Fixed	20cm
MaxStream	A09-F8	Omni Direct.	8.2dBi	Fixed	20cm
MaxStream	A09-F9	Omni Direct.	9.2dBi	Fixed	20cm
MaxStream	A09-W7	Omni Direct.	7.2dBi	Fixed	20cm
MaxStream	A09-M7	Omni Direct.	7.2dBi	Fixed	20cm
MaxStream	A09-H	1/2 wave antenna	2.1dBi	Fixed/Mobile	20cm
MaxStream	A09-HBMM-P6I	1/2 wave antenna	2.1dBi	Portable	1cm
MaxStream	A09-QBMM-P6I	1/4 wave antenna	1.9 dBi	Portable	1cm
MaxStream	A09-QI	1/4 wave integrated wire antenna	1.9 dBi	Portable	1cm

RF Exposure

WARNING: This equipment is approved for mobile, base station and portable applications. When using the 9XStream with mobile or base station antennas, a minimum separation distance of 20 centimeters or more should be maintained. For portable applications, refer to the minimum separation distances in the Approved Antenna list. To ensure compliance, operation at distances closer than this is not recommended.

The preceding statement must be included as a CAUTION statement in manuals for OEM products to alert users on FCC RF Exposure compliance.

9XStream Warranty

The 9XStream module from MaxStream (the "Product") is warranted against defects in materials and manufacturing under normal use in accordance with instructions and specifications published by MaxStream in connection with its Development Kits or as otherwise published by MaxStream from time to time, for a period of 90 days from the date of purchase from MaxStream. In the event of a product failure due to materials or workmanship, MaxStream will repair or replace the defective product. For warranty service, return the defective product to MaxStream, shipping prepaid, for prompt repair or replacement.

The foregoing sets forth the full extent of MaxStream's warranties regarding the Product. Repair or replacement at MaxStream's option is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND MAXSTREAM SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MAXSTREAM, ITS SUPPLIERS OR LICENSORS BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS, OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES. THEREFOR, THE FOREGOING EXCLUSIONS MAY NOT APPLY IN ALL CASES. This warranty provides specific legal rights. Other rights which vary from state to state may also apply.

24XStream-PKG FCC Compliance

FCC NOTICE

WARNING: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

ANTENNA WARNING

WARNING: This device has been tested with Reverse Polarity SMA and MMCX connectors with the antennas listed below. When integrated in the OEMs product, these fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions.

IMPORTANT: The 24XSTREAM module has been certified by the FCC for integration without any further certification (as per FCC section 2.1091.) Changes or modifications not expressly approved by MaxStream could void the user's authority to operate the equipment.

In order to fulfill the certification requirements, however, the OEM must comply with FCC regulations:

The system integrator must ensure that the external label provided with this device is placed on the outside of the final product.

1. The 24XStream may be used only with **Approved Antennas** that have been tested with this module.

24XStream Approved Antenna List

with Antenna Separation Distances for complaince with FCC Exposure Requirements

Manufacturer	Part Number	Туре	Gain Application		Minimum Separation Distance
MaxStream	A24-Y6	Yagi	6dBi	Fixed	2m
MaxStream	A24-Y8	Yagi	8.8dBi	Fixed	2m
MaxStream	A24-Y9	Yagi	9dBi	Fixed	2m
MaxStream	A24-Y10	Yagi	10dBi	Fixed	2m
MaxStream	A24-Y11	Yagi	11dBi	Fixed	2m
MaxStream	A24-Y12	Yagi	12dBi	Fixed	2m
MaxStream	A24-Y12	Yagi	12.5dBi	Fixed	2m
MaxStream	A24-Y13	Yagi	13.5dBi	Fixed	2m
MaxStream	A24-Y15	Yagi	15dBi	Fixed	2m
MaxStream	A24-F2	Omni Direct.	2.1dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24-F3	Omni Direct.	3dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24-F5	Omni Direct.	5dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24-F7	Omni Direct.	7.2dBi	Fixed	2m
MaxStream	A24-F8	Omni Direct.	8dBi	Fixed	2m
MaxStream	A24-F9	Omni Direct.	9.5dBi	Fixed	2m
MaxStream	A24-F10	Omni Direct.	10dBi	Fixed	2m
MaxStream	A24-F12	Omni Direct.	12dBi	Fixed	2m
MaxStream	A24-F15	Omni Direct.	15dBi	Fixed	2m
MaxStream	A24-P8	Panel	8.5dBi	Fixed	2m
MaxStream	A24-P13	Panel	13dBi	Fixed	2m
MaxStream	A24-P14	Panel	14dBi	Fixed	2m
MaxStream	A24-P15	Panel	15dBi	Fixed	2m
MaxStream	A24-P16	Panel	16dBi	Fixed	2m
MaxStream	A24-P19	Panel	19dBi	Fixed	2m
MaxStream	A24- HABMM- P6I	Dipole	2.1dBi	2.1dBi Portable/Mobile/Fixed	
MaxStream	A24- HBMM-P6I	Dipole	2.1dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24- HABSM	Dipole	2.1 dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24- QABMM- P6I	Monopole	1.9 dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24- QBMM-P6I	Monopole	1.9 dBi	Portable/Mobile/Fixed	20cm
MaxStream	A24-QI	Monopole	1.9 dBi	Portable/Mobile/Fixed	20cm

RF Exposure

WARNING: This equipment is approved only for mobile and base station transmitting devices, separation distances of (i) 20 centimeters or more for antennas with gains < 6 dBi or (ii) 2 meters or more for antennas with gains ≥ 6 dBi should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at distances closer than this is not recommended.</p>
The preceding statement must be included as a CAUTION statement in manuals for OEM products to alert users on FCC RF Exposure

24XStream Warranty

compliance.

The 24XStream module from MaxStream (the "Product") is warranted against defects in materials and manufacturing under normal use in accordance with instructions and specifications published by MaxStream in connection with its Development Kits or as otherwise published by MaxStream from time to time, for a period of 90 days from the date of purchase from MaxStream. In the event of a product failure due to materials or workmanship, MaxStream will repair or replace the defective product. For warranty service, return the defective product to MaxStream, shipping prepaid, for prompt repair or replacement.

The foregoing sets forth the full extent of MaxStream's warranties regarding the Product. Repair or replacement at MaxStream's option is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND MAXSTREAM SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MAXSTREAM, ITS SUPPLIERS OR LICENSORS BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS, OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES. THEREFOR, THE FOREGOING EXCLUSIONS MAY NOT APPLY IN ALL CASES. This warranty provides specific legal rights. Other rights which vary from state to state may also apply.

How to use this manual

The XStream-PKG contains the MaxStream Interface Board and an OEM module. The purpose of this document is to help you understand the technologies and where to go for the information to help MaxStream provide a solution to your wireless communication needs.

Use this manual after performing a range test as directed in the "Getting Started Guide." The "Overview" section of this manual will provide just a little background on the product. You may choose to jump to the section that best fits your application: RS-232 operation, RS-482 half-duplex operation, RS-485 full-duplex operation or RS-422 operation. These sections provide a quick schematic and instructions for configuring the XStream-PKG for your application. Note that there are detailed descriptions for the components and features of the interface board in the appendix to the manual.

For in depth information about the Low power and Network features, please see the XStream OEM module manual. The <u>http://www.maxstream.net</u> website has reference schematics, schematics for the interface board found in the product, mechanical drawings of all products and a searchable web forum with many of the answers to your questions.

Overview

Thank you for considering the XStream-PKG radio modems for your application. You have discovered the simplest most reliable radio modem available in the industry today.

The XStream-PKG is a small, low-power solution for providing the MaxStream 9XStream and 24XStream wireless modules in a housing ready for use with existing RS-232 and RS-485/422 systems. With the help of the MaxStream Interface Board and wireless modules, adding wireless capabilities to existing RS-232 and RS-485/422 systems has never been easier. Simply connect the XStream-PKG to an RS-232 or RS-485/422 connection to send frequency hopping, FCC-approved wireless data and capture it on any receiver within range.

The XStream-PKG radio modems are able to communicate right out of the box with no configuration necessary. In fact, they will operate in a broadcast mode by default which can be used to send data from one transmitter to many receivers. This mode of operation is perfect for use in a multi-drop environment with a protocol that works with RS-485.

The XStream-PKG radio modems use frequency-hopping wireless technology to provide wireless serial communication between equipment using a standard asynchronous serial data stream. The half-duplex transmission of the XStream can sustain a continuous data stream at the factory default data rate.

The XStream is perfect for many applications including:

- Supervisory Control and Data Acquisition (SCADA)
- Remote meter reading
- Home Automation
- Security
- Instrument monitoring
- Point of Sale Systems (POS)

Features

- Frequency-Hopping Spread Spectrum (FHSS) technology
- Noise and interference resistance
- Enhanced sensitivity and range
- Multiple Low-power modes (down to 1 Microamp)
- Standard serial digital interface connection
- Built-in Networking and addressing
- Simple AT command interface
- 9600 and 19200 baud transfer rates available
- Packet retries and acknowledgements

Using XStream-PKG with RS-232

The Interface Board is shipped in the RS-232 configuration. The following steps should be followed if the board setup is changed, or if the modules are programmed such that the 'CS' parameter changes.

To use hardware flow control the "CS" parameter (see "Command Mode" section in the XStream OEM manual) must be set to '0' (default setting).

Install the RS-232 level converter (Sipex PN SP312ACP or equivalent) into the 18-pin DIP socket U10.

Uninstall jumpers J1, J7, J8, and J11.

Note: The RS-485/422 level converter (U2) must not be installed for correct RS-232 operation.



Figure 3 - Reference schematic for RS-232 configuration on the Interface Board.



RS-485 Half-duplex operation

Figure 4 – Diagram of Interface Board in a half duplex RS-485 environment.

DB-9 Connections

DB-9 Pin on Interface Board	RS-485 Half Duplex
2	TX+/RX+
3	TX-/RX-
5	GND

Jumper Settings

Jumper	RS-485 Half Duplex
J1	Install – Inserts termination resistor
	Open – No termination resistor used.
J7	INSTALL
J8	INSTALL
J11	INSTALL across pins 2 and 3

Module Configuration

• Program the "CS" parameter to '1' using AT or Binary Command Mode, or use the RS-485 profile in the XStream Configuration and Test Utility (XCTU) as described in the "Module Profiles" section of the Getting Started manual. (The Interface Board must be configured for RS-232 operation when programming the module.)

Note: The RS-232 level converter (U10) must not be installed for correct RS-485 operation.

Interface **RS-485** Board Device Termination Resistor 3 RX+ Transmit Receive TX+ Data Data TX-RX-Termination Resistor RX+ Receive Transmit TX+ Data Data RX-TX-TX-TX+ TX-TX+ RX-RX-RX. RX-**RS-485 RS-485** Device Device

RS-485 Full-duplex operation

Figure 5 – Diagram of Interface Board in a full duplex RS-485 environment.

DB-9 Connections

Pin Number	Signal	
2	TX+	
3	TX-	
6	RX+	
7	RX-	
5	GND	

Jumper Settings

Jumper	RS-485 Full Duplex		
J1	Install – Inserts termination resistor		
	Open – No termination resistor used.		
J7	OPEN		
J8	OPEN		
J11	INSTALL across pins 1 and 2		

Module Configuration

Program the "CS" parameter to '1' using the RS-485 profile in the XStream Configuration and Test Utility (XCTU) as described in the "Module Profiles" section of the Getting Started manual. (The Interface Board must be configured for RS-232 operation when programming the module.)

Note: The RS-232 level converter (U10) must not be installed for correct RS-485 operation.



Figure 6 – Reference schematic for RS-485 configuration on the Interface Board.

RS-422 Operation



Figure 7 - Diagram of Interface Board in an RS-422 environment

Pin Number	RS-422
2	TX+
3	TX-
6	RX+
7	RX-
5	GND

DB-9 Connections

Jumper Settings

Jumper	RS-422
T1	Install – Inserts termination resistor
J 1	Open – No termination resistor used.
J7	OPEN
J8	OPEN
J11	INSTALL across pins 1 and 2

Module Configuration

• Program the "CS" parameter to '1' using the RS-485 profile in the XStream Configuration and Test Utility (XCTU) as described in the "Module Profiles" section of the Getting Started manual. (The Interface Board must be configured for RS-232 operation when programming the module.)

Note: The RS-232 level converter (U10) must not be installed for correct RS-422 operation.



Figure 8 – Reference schematic for RS-422 configuration on the Interface Board.



Interface Board Diagram

[TOP VIEW]

Figure 1 –MaxStream Interface Board including wireless module connectors, probe pads, jumpers, and other accessories.

Symbol	Description	Typical	Min	Max	Units
V _{SUPP}	Supply Voltage	9	7	18	V
I _{IDLE}	Idle Mode Current	75.2	75.3	75.0	mA
I _{TX}	Transmit Current	178- 193	155-176	178- 192	mA
I _{RX}	Receive Current	78.0	78.2	77.7	mA
I _{PSL}	Pin Sleep Current	1.8	1.8	1.7	mA
I _{SPS}	Serial Sleep Current	26.5	26.5	26.4	mA

Power Requirements

Component Description

D1 – LEDs

Two LEDs are provided to assist with development and troubleshooting. Both LEDs are controlled by signals generated by the XStream module. The bottom LED, *TX/PWR, is on when the module is powered on (and not in sleep mode) and turns off momentarily during data transmissions.

The topmost LED, RXLED, turns on when the module receives data at the antenna.

The signals that drive the RXLED and *TX/PWR lines come from pins 7 and 8 respectively on the XStream module. (See the Appendix A in the XStream manual for details regarding RXLED and *TX/PWR signal timings.)

J1 – RS-485/422 Termination Jumper

This jumper controls the line impedance for RS-485/422 operation.

Jumper Installed	A 100 Ohm termination resistor is placed across the RX+ and RX- differential lines.
Jumper Not Installed	No termination resistor.

J2 – DB-9 Female Header



Figure 2 – Diagram of female DB-9 connector as implemented on the MaxStream Interface Board.

The MaxStream Interface Board connects to an RS-232 or RS-485/422 device using a standard female DB-9 connector as shown in Figure 2. Tables 1, 2, and 3 (on the following page) describe the RS-232, RS-485, and RS-422 signals and how they are made available on the DB-9 connector.

J2 DB-9 PIN	RS-232 NAME	DESCRIPTION	IMPLEMENTATION ON XSTREAM WIRELESS MODULE	XSTREAM MODULE PIN
1	RLSD	Received Line Signal Detector	Not Implemented. (Set high.)	-
2	RXD	Received Data	Serial data sent from XStream module to host device.	3
3	TXD	Transmitted Data	Serial data sent to XStream module from host device.	4
4	DTR	Data Terminal Ready	Enables Sleep Mode on the XStream wireless module. (Sleep when low.)	2
5	GND	Signal Ground	Ground.	11
6	DSR	Data Set Ready	Not Implemented. (Set high.)	-
7	RTS	Request to Send	Enables Command Mode on the XStream wireless module or provides RTS flow control. (Command Mode when low.)	5
8	CTS	Clear to Send	Enables RS-485/422 transmitter or provides CTS flow control for RS-232 devices. (Clear to Send when low.)	1
9	RI	Ring Indicator	Optional power supply for XStream module.	-

RS-232 Signals

Table 1 – Listing of the RS-232 signals and their implementation on the XStream modules.

J2 DB-9 PIN	RS-485 NAME	DESCRIPTION	IMPLEMENTATION ON XSTREAM WIRELESS MODULE	XSTREAM MODULE PIN
2	TX/RX+	Differential data line.	The differential lines from pins 2 and	
3	TX/RX-	Differential data line.	3 transmit serial data to and from the XStream module.	3, 4
5	GND	Ground signal.	Ground.	11
1, 4, 6 – 9	Not Used	-		-

RS-485 (Half Duplex) Signals

Table 2 – Listing of the RS-485 half duplex signals and their implementation on the XStream wireless modules.

RS-485 (Full Duplex) / RS-422 Signals

J2 DB-9 PIN	RS-422 NAME	DESCRIPTION	IMPLEMENTATION ON XSTREAM WIRELESS MODULE	XSTREAM MODULE PIN
2	TX+	Transmit differential data line.	Serial data sent from module	3
3	TX-	Transmit differential data line.	Serial data sent nom module.	5
6	RX+	Receive differential data line.	Sarial data received by module	4
7	RX-	Receive differential data line.	Serial data received by module.	4
5	GND	Ground signal	Ground	11
1, 4, 6, 9	Not Used	-	-	-

Table 3 – Listing of the RS-485 full duplex and RS-422 signals including their implementation on the XStream wireless modules.

J3 – Ground

Ground connection for debugging. Not populated by default.

J4 – Programming Header

Used to program the XStream wireless modules and not populated by default. The pinout for this header is given in the following table.

Pin	Implementation
1	Connects to RXLED signal on XStream
	module.
2	+5V DC
3	Not Implemented
4, 6, 8, 10	Ground
5	Connects to *RESET on XStream module.

7	Connects to *CONFIG on XStream module.
9	Connects to *TX/PWR on XStream module.

J5 – Optional Power Supply

Allows an external supply to power the Interface Board and XStream module through pin 9 of J2.

Jumper Installed	Pin 9 on J2 is connected to the power connector (U12) on the Interface Board.
Jumper Not Installed	Pin 9 on J2 is not connected to the power connector (U12).

J6 – I/O Screw Terminal

This connector can be populated with an optional 4-pin Phoenix header (Phoenix Contact part number JPNX4F) to provide an interface to various signals from the XStream module. The pinout for the terminal is shown in the following table. (See Appendix A in the XStream operating manual for more information on these signals.)

Pin	Implementation
1	GND
2	Power supply line
3	Connected to *CONFIG signal.
4	Connected to RXLED signal.

J7 – TX-/RX- Jumpers (RS-485)

These jumpers must be installed when operating in RS-485 half duplex mode and should be left open for RS-232, RS-485 full duplex, and RS-422 operation.

Jumpers Installed	Connects TX- and RX- lines together. (Required for RS-485 half duplex).
Jumpers Not	Required for RS-232, RS-485 full
Installed	duplex, and RS-422 operation.

J8 – TX+/RX+ Jumpers (RS-485)

These jumpers must be installed when operating in RS-485 half duplex mode and should be left open for RS-232, RS-485 full duplex, and RS-422 operation.

Jumpers Installed	Connects TX+ and RX+ lines together. (Required for RS-485 half duplex).
Jumpers Not	Required for RS-232, RS-485 full
Installed	duplex, and RS-422 operation.

J10 – Regulator Bypass Jumper

Used to bypass the Voltage Regulator (U1). To avoid damaging the XStream module, this jumper should only be installed when a regulated 5V power supply is used to power

the module. With the jumper installed, any supply voltage greater than 5V can cause permanent damage to the XStream module and/or the Interface Board.

Jumper Installed	Voltage Regulator (U1) is bypassed.
Jumper Not	A +7-18V DC power supply must be used to
Installed	power the Interface Board. A regulated 5V
	input is supplied to the module by the voltage
	regulator.

J11 – RS-485/422 Receive Jumper

Selects the receive enable on the RS-485/422 logic converter.

Connection	Receiver Enabled by:
Pin 1 – Pin 2	Ground. (Permanently enabled.)
Pin 2 – Pin 3	*CTS

J12 – RS-232 Receive Control Jumper

Pins 2 and 3 of this jumper are connected with a trace on the bottom side of the Interface Board by default. J12 should not be used unless it is desired to permanently enable the RS-232 receivers. In this case, the trace between pins 2 and 3 (on the bottom side) must be cut before the jumper can be installed.

Connection	RS-232 Shutdown by:
Pin 1 – Pin 2	VCC (Permanently enabled)
Pin 2 – Pin 3	Module Transmit LED (*TX/PWR)

P1 through P12 – Probe Pads

Several probe pads are provided on the Interface Board to facilitate product development and troubleshooting. The probe pads allow most signals to be easily measured and observed. The probe pads connect to all major signal lines before and after passing through the RS-232 and RS-485/422 level converters.

U1 – Voltage Regulator

This component provides a regulated 5V input to the XStream module.

U4 – Optional Power Interface

Three-pin (0.1 inch spaced) male header allows an external voltage source to be connected to U12 on the Interface Board.

Pin	Implementation
1	+7-18V DC
2	Not implemented
3	GND

U5 – Power Switch

The MaxStream Interface Board comes equipped with a small vertical slide switch for controlling the power supply to the board.

U6 – Configuration Switch

This switch provides a reliable way to enter Command Mode on the wireless modules. To enter AT Command Mode at the module's default baud rate, press the Configuration Switch while powering on the Interface Board. See the "Command Mode" section of the XStream operating manual for more information.

U12 – Power Connector

The power connector is a 2.1mm barrel connector with a positive center pin. The power connector can accept a 7-18V DC power source.

Glossary

AT commands – A set of commands that can be used to customize and configure the XStream module to meet specific needs. AT commands are sent via a serial communications program such as HyperTerminal.

Binary commands – A set of commands used to configure the XStream module. Binary commands are sent with RTS/CMD asserted. The RT command must be used to enable binary programming prior to using binary commands. Multiple Binary commands can be issued sequentially while RTS/CMD is asserted.

Clear to send – See CTS pin.

CMOS logic – Logic levels used by the XStream module (0-5V).

Command Byte - First byte sent when executing a Binary Command. This byte identifies which command will be executed.

Command Mode – A mode of operation, which manually modifies the configurable parameters of the XStream module. Both Binary and AT command modes are available.

Command table – Table containing 28 currently implemented commands. This table lists all of the adjustable parameters along with a brief description of each.

CRC – See Cyclic Redundancy Check.

 $\overline{\text{CTS}}$ pin – The low-asserted Clear To Send pin (Pin 1) provides flow control for the XStream module. When CTS is asserted (low), serial data can be sent to the module for transmission. If the module is unable to transmit the data, CTS may de-assert (high) once the DI buffer nears capacity to prevent buffer overflow.

Cyclic redundancy check (CRC) – Used by the XStream module to ensure data integrity during transmission. A CRC is computed on the bits to be transmitted over-theair and sent with each data packet. The CRC is recomputed by the receiver and compared with the original CRC bits. The packet is valid if the receiver CRC matches the CRC computed by the transmitter.

Cyclic sleep – Sleep Mode setting in which the module enters a low-power state and awakens periodically to determine if any transmissions are being sent.

DI buffer – Collects incoming serial data prior to over-the-air data transmission. The DI buffer can hold up to 132 bytes at a given time. When the buffer fills to 115 bytes, the Clear To Send (CTS) pin is de-asserted to stop the flow of incoming serial data.

Data packets – A grouping of data to be sent over-the-air. Each data packet contains a header and data that is collected from the DI buffer. The size of the packets varies up to 64 bytes depending on how many bytes of data are in the DI buffer.

Data validity – Comparison of received data with transmitted data to ensure accurate transmission. Data validity is verified by performing a CRC check.

DI pin – All incoming serial data enters the XStream module on the Data In (DI) pin (Pin 4).

DO pin – All received over-the-air data leaves the XStream module through the Data Out (DO) pin (Pin 3). The data can then be sent to a microcontroller or RS-232 device.

FCC – The Federal Communications Commission is the US government agency responsible for regulating radio communications standards in the United States.

Flow control – Method of determining when serial data can be sent to the module for over-the-air transmission. Flow control is used to prevent buffer overflow. This can be implemented in hardware and/or software. Hardware flow control is implemented in the XStream module using the CTS pin.

Frequency Hopping Spread Spectrum (FHSS) – Method employed by the XStream module which involves transmitting data over several different channels in a specific channel hopping sequence known by the transmitter and the receiver(s).

Half-duplex – A mode for radio operations. Radios that operate in half-duplex are able to either transmit data or receive data at a given time, but cannot do both simultaneously. When one module is transmitting, all modules (of the same VID and network) within range listen to the transmission and will only transmit once the transmission is complete.

Hardware flow control – See Flow Control.

Headers – Information that prefaces the data bits in transmitted data packets. The header contains information used by the receiver(s) to synchronize to the transmitter.

HyperTerminal – A serial communications program useful for communicating with the XStream module and configuring user-defined operating parameters through AT commands.

Idle Mode – A mode of operation in which the module is neither transmitting nor receiving.

Industrial Temperature – Temperature tested version of XStream modules extending beyond normal operating specifications (0°C to 70°C). These modules are tested for a temperature range from -40°C to 85°C.

Integration – The process of incorporating the XStream module into an application in place of a serial cable.

Interface board – An optional board available with the XStream module that converts RS-232-level data into CMOS logic levels and supplies regulated 5V to the module.

Long header – A long header (length determined by LH command – see Appendix E) sent out to ensure that modules running in a cyclic sleep mode detect the header when they awake and synchronize to the transmission.

Low-power modes – See Sleep Mode.

Module Addresses – Provides a layer of addressing among modules. Modules with the same Module Addresses can communicate together.

Module Address Masks – Provide a layer of filtering to over-the-air data packets that are received by the module. The address (of the transmitting module) is logically "ANDed" with the Module Address Mask of the receiver. The resulting value must match the Module Address of the receiver for the packet to be received. All "0" values are not compared.

Networks – Provides a layer above Module Addresses for communicating between modules. Each network has a unique hopping sequence that allows modules on the same network to remain synchronized together.

Parameter Byte – Two bytes sent during a Binary Command following the Command Byte. These bytes are used to set the value of the command specified by the Command Byte. The Least Significant Byte is sent first followed by the Most Significant Byte.

Pin layout – Describes the layout and functionality of all pins on the XStream module.

Pin sleep - A Sleep Mode setting which puts the XStream into a minimal power state when the SLEEP pin is asserted. It remains in Pin sleep until the SLEEP pin is deasserted. This setting must be enabled using the SM command.

Power-saving modes - See Sleep Mode.

Receive Mode – A mode of operation that receives over-the-air data and transmits all valid data packets out to the serial port. The module must be in Idle Mode to transition to Receive Mode.

RF – Radio Frequency

RS-232 logic – Standard logic levels implemented in devices using the RS-232 communication protocol.

RTS/CMD (Request to Send/Command) – The RTS/CMD pin (Pin 5) is used primarily to configure Binary commands (CMD). RTS flow control is not implemented in the XStream module.

Sensitivity -A measurement specification that describes how weak a signal can be (in dBm) and still be detected by the receiver.

Serial data – Data that enters the XStream module through its serial port.

Serial port sleep – A Sleep Mode setting in which module runs in a low power state until data is detected on the DI pin. This setting must be enabled using the SM command.

Sleep Mode – A mode of operation in which the XStream enters a low power consuming state. Several Sleep Mode settings are available and can be configured using the SM command.

SLEEP pin – If Pin Sleep is enabled, the SLEEP pin (Pin 2) determines if the module is in Sleep Mode or Idle Mode. See **Pin sleep**.

Standby Mode – See Idle Mode.

Start bit – A low UART signal sent to signify the beginning of an eight-bit data sequence.

Stop bit – The last bit in a UART data sequence. The stop bit is high and indicates the end of an eight-bit data sequence.

Synchronization – Synchronization is used to ensure that the transmitter and receiver are communicating properly with each other and following the same channel hopping sequence.

Transmission Latency – Time required to send a packet of data. This value is dependent on the number of bytes being sent and the baud rate of the module.

Transmit Mode – Mode of operation in which over-the-air data can be transmitted from a module to other modules.

TTL (Transistor-transistor logic)

VID (Vendor Identification number) – This number allows modules with the same VID to communicate. Any module with a different VID will not receive their data transmissions.

Application Notes

Troubleshooting and FAQs

- Several on-line support features are available. Please see the following links for additional help. If your answer is not found here, contact technical support at support@MaxStream.net.
- FAQs <u>http://www.maxstream.net/support_faq.html</u>

Discussion Forum - http://www.maxstream.net/support_discussionforum.html

Documentation - http://www.maxstream.net/support_documentation.html

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