# ADM X-Stream

## RF Radio Modems

# INSTRUCTION MANUAL


...Clearly a Better Value

# Contents

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# XStream RS-232/485 RF Modem

The XStream-PKG-R RS-232/485 RF Modem is a **long range, low power** and **low cost** solution for the expanding RFd2d (radio frequency device-to-device) segment of the wireless market. This manual contains information critical to basic XStream RS-232/485 RF Modem operation. More advanced topics are covered in the "XStream Advanced Programming & Configuration" manual.

**XStream-PKG-R RS-232/485 RF Modem:** XStream RF Modems now include "DIP-Switchable" RS-232/485/422 support and Firmware Version 4.2A [See next page for list of features].

When compared to competing RF Modems, MaxStream solutions stand out in terms of money and time saved during project development. MaxStream RF Modems handle the complexities associated with wireless communication (including modulation, demodulation, frequency synthesizers, amplifiers, filters, FCC approvals, etc.), so system integrators can focus on their own product development.

## Accessories Package

The accessories listed below are included with XStream-PKG-R RS-232/485 RF Modems that carry the "-RA" suffix on the product number. For example: Part number "X09-019PKC-RA" includes the listed accessories and part number "X09-019PKC-R" does not.

**Table 1. Accessories Package** (Items included with XStream-PKG-R RF Modems having the "-RA" suffix)

| Item Name | Qty. | Description | MaxStream part number |
|---|---|---|---|
| Quick Start Guide | 1 | Familiarizes users with some of the RF Modem's most important functions. The guide provides step-by-step instructions including how to perform a range test. | MD0008 |
| CD - Documentation and Configuration Software | 1 | Helps developers to build & manage reliable wireless connections using XStream-PKG RF Modems. CD includes manuals, X-CTU (X-CTU) Software & development tools. | MD0006 |
| Antenna | 1 | RPSMA half-wave dipole antenna connects to the antenna port of the RF Modem. | A09-HASM-675 (900 MHz)<br>A24-HASM-525 (2.4 GHz) |
| Serial Loopback Adapter | 1 | Connects to the female RS-232 (DB-9) serial connector of the XStream-PKG RF Modem and can be used to configure the RF Modem to function as a repeater (for range testing). | JD2D3-CDL-A |
| NULL Modem Adapter (male-to-male) | 1 | Connects to the female RS-232 (DB-9) serial connector of the XStream-PKG RF Modem and can be used to connect the RF Modem to another DCE (female DB9) device. | JD2D2-CDN-A |
| NULL Modem Adapter (female-to-female) | 1 | Can be used to bypass RF Modems in order to verify serial cabling is functioning properly. | JD3D3-CDN-A |
| Male DB-9 to RJ-45 Adapter | 1 | Facilitates adapting a DB-9 Connector to a CAT5 cable (female RJ45 to male DB9) | JE1D2-CDA-A |
| Female DB-9 to RJ-45 Adapter | 1 | Facilitates adapting a DB-9 Connector to a CAT5 cable (female RJ45 to female DB9) | JE1D3-CDA-A |
| RS-232 Cable (6') | 1 | Used to connect XStream-PKG RF Modems to devices having an RS-232 serial port. | JD2D3-CDS-6F |
| AC Power Adapter | 1 | Wall-based transformer with US 2-prong plug. | JP4P2-9V4-6F |
| 9V Battery Clip | 1 | Allows the XStream-PKG RF Modem to be powered by a 9V battery. | JP2P3-C2C-4I |

# Features

**Easy Integration**

- Out-of-box RF experience
- Easy Integration of advanced functions
- Simple AT and Binary command interface

**New DIP Switch Settings**

- RS-232/485/422 support (multidrop included)
- 2-wire (half-duplex) or 4-wire RS-485/422 operation
- Multiple data formats (7/8/9 Bits, Even/Odd/Mark/Space Parity)

**Range** (900 MHz)

- Indoor/Urban: **up to 1500'** (450 m)
- Outdoor line-of-sight: **up to 7 miles** (11 km) w/ dipole antenna
- Outdoor line-of-sight: **up to 20 miles** (32 km) w/ high gain antenna

**Range** (2.4 GHz)

- Indoor/Urban: **up to 600'** (180 m)
- Outdoor line-of-sight: **up to 3 miles** (5 km) w/ dipole antenna
- Outdoor line-of-sight: **up to 10 miles** (16 km) w/ high gain antenna

**Receiver sensitivity**: **-110 dBm** (900 MHz), **-105 dBm** (2.4GHz)

- Compare with -93 dBm, industry average

Frequency-Hopping Spread Spectrum (**FHSS**) technology

Power-down current as low as **1 mA**

**Advanced Networking & Security**

- True Peer-to-Peer networking ("Master" radio not required)
- Source & Destination addressing for point-to-multipoint networks
- Supports Point-to-Point, Point-to-Multipoint & Multidrop applications
- Packet retries and acknowledgements
- Native RS-485/422 (multidrop bus) protocol support

**Specifications** [Appendix B]

**1-year Warranty** [Appendix B]

**Free & Unlimited Technical Support** [Appendix C]

## Worldwide Acceptance

**FCC Certified (USA)** [Go to Appendix A for FCC Requirements]
Devices that contain MaxStream radios can inherit MaxStream's FCC certification

**IC (Industry Canada)** certified

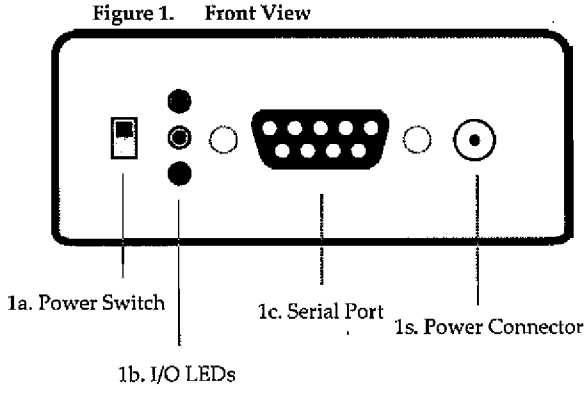
**ISM** (Industrial, Scientific & Medical) frequency band

MaxStream products have been manufactured under **ISO 9001:2000 registered standards** since 2000.

9XStream-PKG-R (900 MHz) RF Modems are approved for use in **US, Canada, Australia, Israel** and more. 24XStream-PKG-R (2.4 GHz) adds **EU** and other approvals. Go to www.MaxStream.net for complete list of approvals.

# XStream-PKG-R Interface

Figure 1. Front View




### 1a. Power Switch

Move the Power Switch to the on (up) position to power the RF Modem. DIP Switch [2a] settings are only read during a power-up sequence.

### 1b. I/O LEDs

LED indicators visualize diagnostic status information. The radio modem's status is represented as follows:

**Yellow** (top LED) = Serial Data Out (to host)

**Green** (middle) = Serial Data In (from host)

**Red** (bottom) = Power/TX Indicator (Red light is on when powered, off briefly during RF transmission)

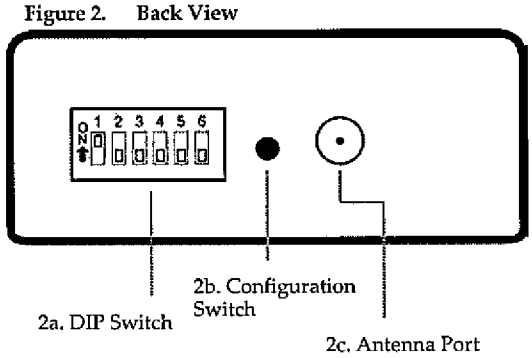
### 1c. Serial Port

Standard female DB-9 (RS-232) DCE connector – This connector can be also used for RS-485 and RS-422 connections.

### 1d. Power Connector

7-18 VDC Power Connector (Center positive, 5.5/2.1mm) – Power can also be supplied through Pin 9 of the DB-9 Connector.

Figure 2. Back View




### 2a. DIP Switch

DIP Switch automatically configures the RF Modem to operate in various modes. Each time the modem is powered-on, intelligence on the XIB-R interface board programs the modem according to the positions of the DIP Switch. [See Figure 3 for DIP Switch settings]

In cases where AT Commands should not be sent each time the RF Modem is powered-on, the processor must be disabled by populating J7 on the interface board. [See "DIP Switch Configurations" section [p14] for more information]

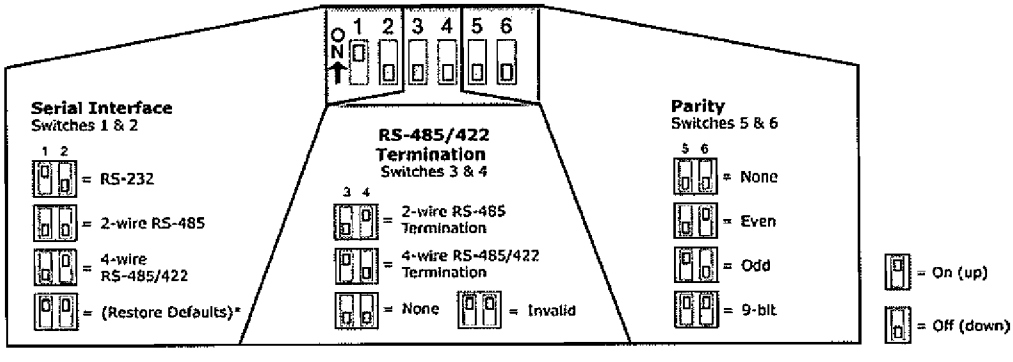
### 2b. Configuration Switch

Configuration Switch provides an alternate way to enter "AT Command Mode". To enter "AT Command Mode" at the radio modem's default baud rate, hold the Configuration Switch down while powering on the module using the Power Switch [1a].

### 2c. Antenna Port

Port is a 50Ω RF signal connector for connecting to an external antenna. The connector type is RPSMA (Reverse Polarity SMA).

Figure 3. Dip Switch Settings




* The '(Restore Defaults)' setting, for switches 1 & 2, can be used to reset all module parameters to their default states. Once switches are in their "ON" (up) positions, reset occurs during the next power-up.

# Adapters

The XStream-PKG-RA RS-232/485 RF Modems come with several adapters. The adapters facilitate several functions such as the following:

- Performing Range Tests
- Testing Cables
- Connecting to other RS-232 DCE and DTE devices
- Connecting to terminal blocks or RJ-45 connectors (for RS-485/422 devices)

## NULL Modem Adapter (male-to-male)

**Part Number: JD2D2-CDN-A** (Black, DB9 M-M) The male-to-male NULL modem adapter can be used to connect two DCE devices. A DCE device is one that connects with a straight-through cable to the male serial port of a computer (DTE).

**Figure 4. Male NULL modem adapter and pinouts**

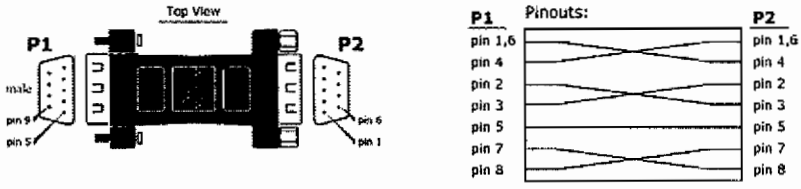
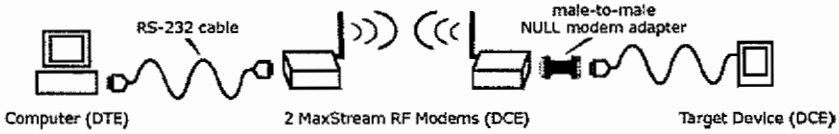


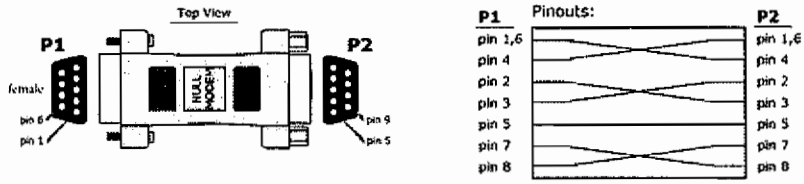

**Figure 5. MaxStream RS-232/485 RF Modem (DCE Device) connecting to another DCE device**




## NULL Modem Adapter (female-to-female)

**Part Number: JD3D3-CDN-A** (Gray, DB9 F-F) The female-to-female NULL modem adapter can be used to verify serial cabling is functioning properly. To test cables, insert the female-to-female NULL modem adapter in place of a pair of RF Modems and test the connection without any RF Modems in the connection.

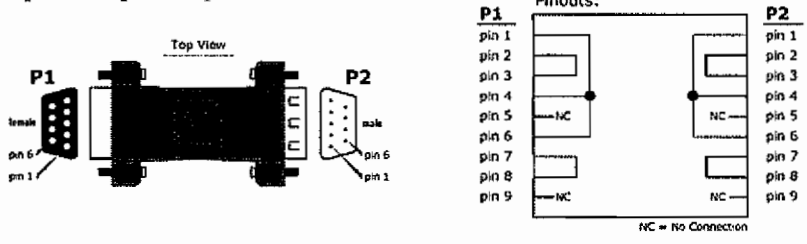
**Figure 6. Female NULL modem adapter and pinouts**




## Serial Loopback Adapter

**Part Number: JD2D3-CDL-A** (Red, DB9 M-F) The serial loopback adapter is used for range testing. During a range test, the serial loopback adapter configures the RF Modem to function as a repeater by looping serial data back into the radio for retransmission.

**Figure 7. Serial loopback adapter and pinouts**



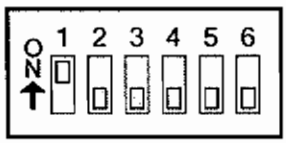

Male and female DB-9 to RJ-45 adapters are also included in the accessories kit. Refer to the "RS-485/422 Connection Guidelines" section [p12] for more info.

# Using the XStream RS-232/485 RF Modem

## RS-232 Operation

### DIP Switch Settings and Serial Port Connections

**Figure 8.**
RS-232 DIP Switch Settings




DIP Switch settings are read and applied only while powering-on.

**Figure 9.**
Pins used on the female RS-232 (DB-9) Serial Connector

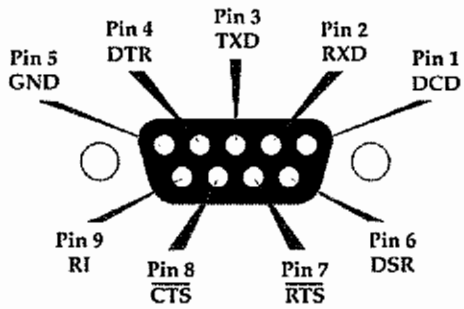
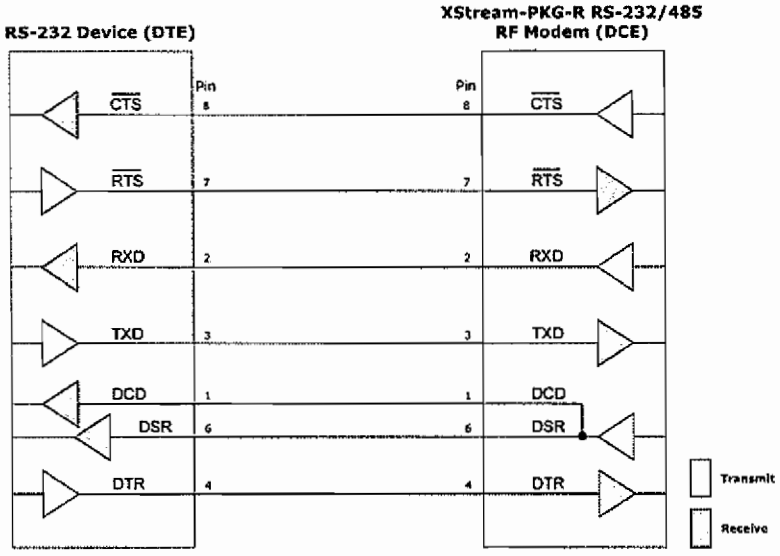



**Table 2. RS-232 Signals and their implementations on the XStream-PKG-R RF Modem**
(Low-asserted signals are distinguished by horizontal line over pin name.)

| DB-9 Pin | RS-232 Name | Description | Implementation |
|---|---|---|---|
| 1 | DCD | Data-Carrier-Detect | Connected to DSR (pin6) |
| 2 | RXD | Received Data | Serial data OUT of RF Modem (to host) |
| 3 | TXD | Transmitted Data | Serial data IN to RF Modem (from host) |
| 4 | DTR | Data-Terminal-Ready | Can enable POWER-DOWN on the RF Modem |
| 5 | GND | Ground Signal | Ground |
| 6 | DSR | Data-Set-Ready | Connected to DCD (pin1) |
| 7 | $\overline{\text{RTS}}$/ CMD | Request-to-Send | Enables "Command Mode" on the RF Modem or provides RTS flow control |
| 8 | $\overline{\text{CTS}}$ | Clear-to-Send | Provides Clear-to-Send flow control |
| 9 | RI | Ring Indicator | Optional power input that is connected internally to the positive lead of the front power connector |

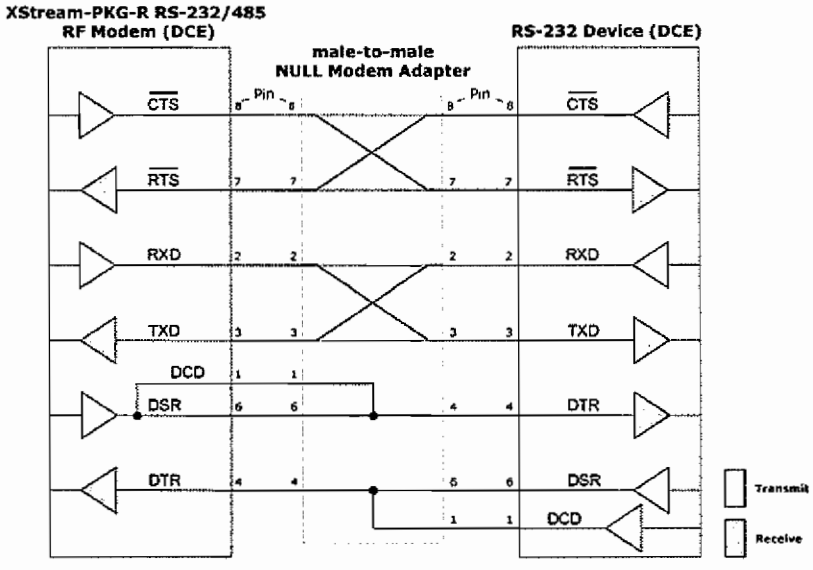
## Wiring Diagram: RS-232 DTE Device to an RF Modem

Figure 10. MaxStream RF Modem wired to an RS-232 DTE (male connector) device




## Wiring Diagram: RF Modem to an RS-232 DCE Device

Figure 11. MaxStream RF Modem wired to an RS-232 DCE (female connector) device




## Sample Wireless Connection: DTE ⇔ DCE DCE ⇔ DCE

Figure 12. Typical wireless connection used for serial communications between DTE and DCE devices

# RS-485 (2-wire) Half-Duplex Operation

## DIP Switch Settings and Serial Port Connections

**Figure 13.**
RS-485 (2-wire) Half-Duplex
DIP Switch Settings

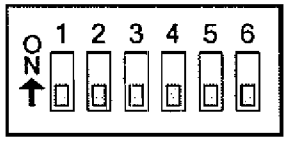



**Figure 14.**
Pins used on the female DB-9
Serial Connector

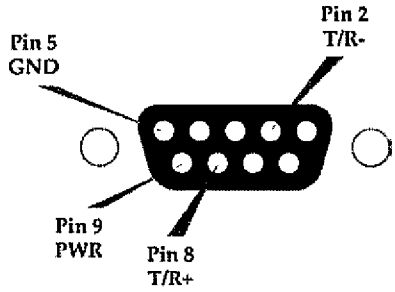
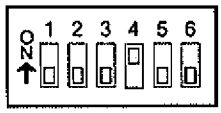



**Figure 15.**
RS-485 (2-wire) with Termination (Optional)




Termination is the 120Ω resistor between T+ and T-.

DIP Switch Settings are read and applied only while powering-on.

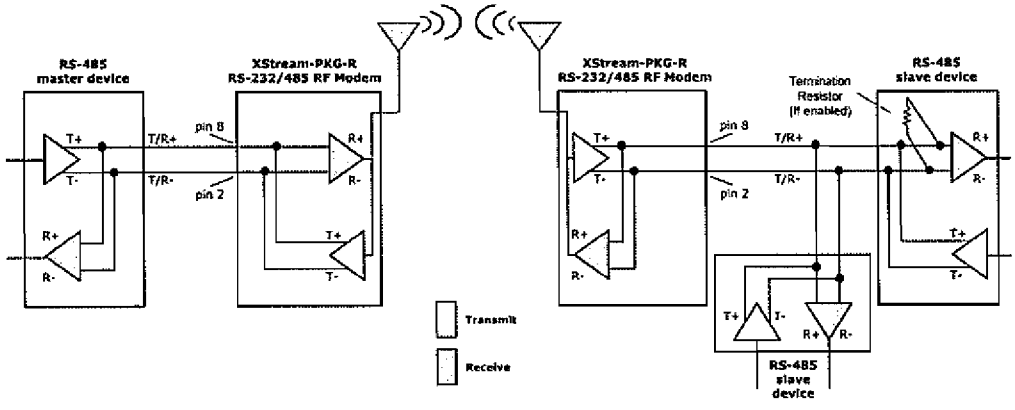
**Note:** Refer to Figures 22 and 23 [page 12] for RJ-45 connector pin designations used in RS-485/422 environments.

**Table 3. RS-485 (2-wire Half-duplex) Signals and their implementations on the XStream RF Modem**

| DB-9 Pin | RS-485 Name | Description | Implementation |
|---|---|---|---|
| 2 | T/R- (TRA) | Negative Data Line | Transmit serial data to and from the XStream-PKG-R RF Modem |
| 5 | GND | Ground Signal | Ground |
| 8 | T/R+ (TRB) | Positive Data Line | Transmit serial data to and from the XStream-PKG-R RF Modem |
| 9 | PWR | Power | Optional power input that is connected internally to the front power connector |
| 1, 3, 4, 6, 7 | Not used | | |

## Wiring Diagram: RS-485 (2-wire) Half-Duplex

**Figure 16. XStream PKG-R RF Modem in a 2-wire (half-duplex) RS-485 environment**



# RS-485 (4-wire) and RS-422 Operation

## DIP Switch Settings and Serial Port Connections

**Figure 17.**
RS-485 (4-wire) and RS-422
DIP Switch Settings

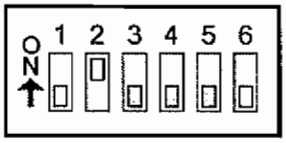



**Figure 18.**
Pins used on the female DB-9
Serial Connector

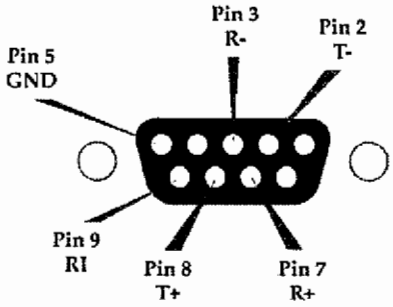
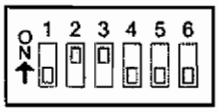



**Figure 19.**
RS-485/422 (4-wire) with Termination (Optional)




Termination is the 120Ω resistor between T+ and T-.

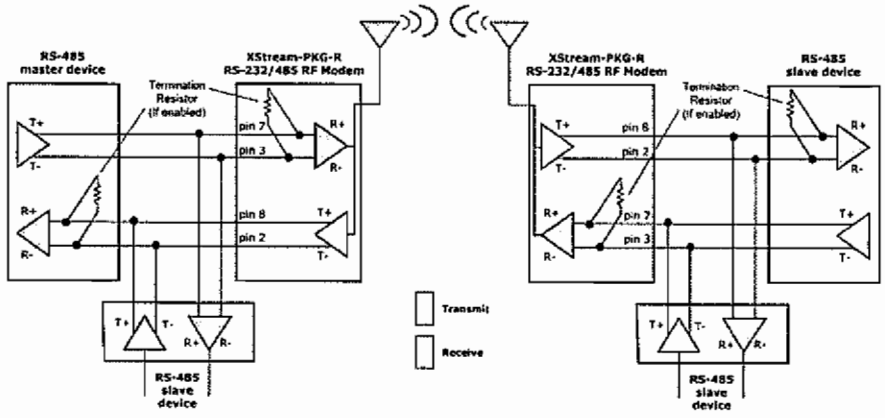
DIP Switch settings are read and applied only while powering-on.

**Table 4. RS-485/422 (4-wire) Signals and their implementations with the XStream-PKG-R RF Modem**

| DB-9 Pin | RS-485/422 | Description | Implementation |
|---|---|---|---|
| 2 | T- (TA) | Transmit Negative Data Line | Serial data Sent from the XStream-PKG-R RF Modem |
| 3 | R- (RA) | Receive Negative Data Line | Serial data Received by the XStream-PKG-R RF Modem |
| 5 | GND | Signal Ground | Ground |
| 7 | R+ (RB) | Receive Positive Data Line | Serial data Received by the XStream-PKG-R RF Modem |
| 8 | T+ (TB) | Transmit Positive Data Line | Serial data Sent from the XStream-PKG-R RF Modem |
| 9 | PWR | Power | Optional power input that is connected internally to the front power connector |
| 1, 4, 6 | Not Used | | |

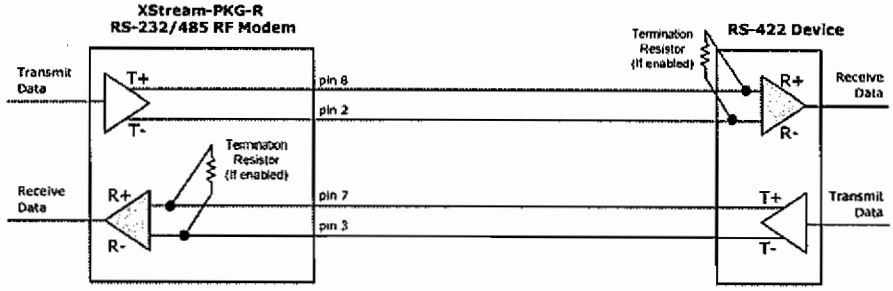
## Wiring Diagram: RS-485 (4-wire)

**Figure 20. XStream PKG-R RF Modem in an RS-485 (4-wire) environment**



## Wiring Diagram: RS-422

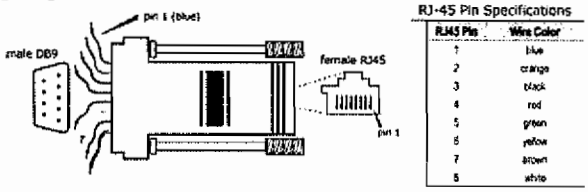
Figure 21. XStream PKG-R RF Modem in an RS-422 environment




### Male DB-9 to RJ-45 Adapter

Part Number: JE1D2-CDA-A (Yellow, RJ45 female to DB-9 male) This adapter facilitates adapting a DB-9 connector to a CAT5 cable.

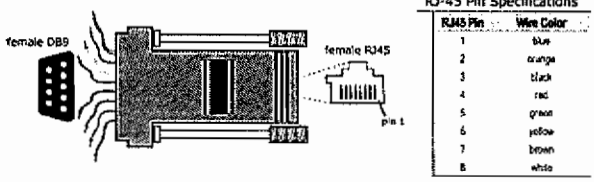
Figure 22. Male RS-485/422 Adapter and pin specifications




### Female DB-9 to RJ-45 Adapter

Part Number: JE1D3-CDA-A (Green, RJ45 female to DB9 female) This adapter facilitates adapting a DB-9 connector to a CAT5 cable.

Figure 23. Female RS-485/422 Adapter and pin specifications




### RS-485/422 Connection Guidelines

The RS-485/422 protocol provides a solution for wired communications that can tolerate high noise and push signals over long distances. RS-485/422 signals can communicate as far as 4000 feet (1200 meters). (RS-232 signals are only suitable for distances up to 100 feet (30.5 meters) RS-485 offers multidrop capability in which up to 32 nodes can be connected. The RS-422 protocol is used for point-to-point communications.

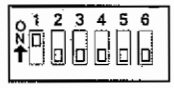
Interface voltages are interdependent of data protocol. Therefore, different RS-232/485/422 settings can be used in different nodes of one data radio system. In such a scenario, the RF Modem can function as a RS-485 to RS-232 converter.

**Suggestions for integrating the XStream-PKG-R RF Modem with RS-485/422 protocol:**

1. When using Ethernet twisted pair cabling: Select wires so that T+ and T- are connected to each wire in a twisted pair. Likewise, select wires so that R+ and R- are connected to a twisted pair. (For example, tie the green and white/green wires to T+ and T-.)
2. For straight-through Ethernet cable (not cross-over cable) – The following wiring pattern works well: Pin 3 to T+, Pin 4 to R+, Pin 5 to R-, Pin 6 to T-
3. Note that the connecting cable only requires 4 wires (even though there are 8 wires).
4. When using phone cabling (RJ-11) – Pin 2 in the cable maps to Pin 3 on opposite end of cable and Pin 1 maps to Pin 4 respectively.

# Modem Configuration

## Automatic DIP Switch Configurations




Each time the RF Modem is powered-on, intelligence on the MaxStream Interface Board (located inside the RF Modem) sends AT Commands that program the RF Modem based on positions of the DIP Switch. Automatic configurations that take place during the power-on sequence affect RF Modem parameter values as shown below [Table 6].

To avoid overwriting previously stored custom configurations (due to the automatic configurations that take place each time the RF Modem is powered-on), it is necessary to disable a processor located on the XIB-R interface board. To disable the processor, populate J7 of the XIB-R Interface Board. By default, J7 jumper is not populated.

**Table 5. RF Modem Power-up Options** (J7 jumper and Config Switch)

| Condition | Behavior |
|---|---|
| If J7 is populated | Processor is disabled and AT Commands are not sent to the RF Modem |
| If Config Switch is pressed | Processor is disabled and RF Modem enters into AT Command Mode |
| If J7 is NOT populated and Config Switch is NOT pressed | Execute logic as shown in Table 6. |

**Table 6. AT Commands Sent as result of DIP Switch Settings** (SW = DIP Switch)

| Condition | Behavior | |
|---|---|---|
| **Restore Default Parameter Values of the RF Modem** | | |
| If SW1 & SW2 are ON (up) | AT Commands sent: | ATRE (Restore Defaults) Command<br>ATWR (Write) Command |
| **Serial Interfacing Options** | | |
| If SW1 is ON (up) | AT Commands sent: | ATCS 0 (RS-232 Operation: CTS function for CTS line, DB-9 pin 8)<br>ATCD 2 (DO3 - RX LED = low) |
| If SW1 is OFF (down) | AT Commands sent: | ATCS 3 (RS-485 or RS-422 Operation)<br>ATCD 2 (DO3 - RX LED = low) |
| **Parity Options** | | |
| If SW5 & SW6 are OFF (down) | AT Commands sent: | ATNB 0 (parity = none) |
| If SW5 is OFF (down) & SW6 is ON (up) | AT Commands sent: | ATNB 1 (parity = even) |
| If SW5 is ON (up) & SW6 is OFF (down) | AT Commands sent: | ATNB 2 (parity = odd) |
| If SW5 is ON (up) & SW6 is ON (up) | AT Commands sent: | ATNB 5 (parity = 9th bit data over-the-air) |
| **Exit AT Command Mode** | | |
| Always | AT Commands sent: | ATCN (Exit AT Command Mode) |

# Software Configurations

The X-CTU software can be used to setup and monitor communications using an XStream-PKG-R RF Modem and a PC. The software provides an easy-to-use interface that is divided into tabs that help users to setup a PC Serial Com Port, configure XStream-PKG-R RS-232/485 RF Modem Parameters and perform range tests.

- **PC Settings** tab - Setup PC serial ports to interface with an XStream Module assembly
- **Range Test** tab – Test XStream Modem's range and monitor packets sent and received
- **Terminal** tab – Configure and read XStream Modem parameters using AT Commands
- **Modem Configuration** tab – Configure and read any XStream Radio Modem parameters

**To install the X-CTU Software:**

1. Double-click the "setup_X-CTU.exe" file located in the "software" folder of the MaxStream CD or under the "Downloads" section of the following web page: www.maxstream.net/helpdesk/. Then follow the prompts of the installation screens.

## Advanced Modem Configurations (Optional)

While XStream-PKG-R RF Modems operate out-of-box without configuration, you can use the "Modem Configuration" screen of the X-CTU software to activate advanced functionality that includes, but is not limited to the following:

- Changing Interface baud rates (steps shown below)
- Low power modes
- Packet retries and acknowledgements
- Advanced networking and security

### Change Serial Interface Baud Rate of RF Modem

(Optional) You can interface with an XStream-PKG-R RF Modem at different baud rates than the RF Modem's default (though actual throughput is fixed at the default baud rate). To change a RF Modem baud rate, you must first select a PC Serial Com Port baud rate that matches the RF Modem's default [steps 1-3]. You then change the baud rate of the RF Modem itself [steps 4-6]. Lastly, you reselect the baud rate of the PC Com Port to match the new baud rate of the RF Modem [step 7].

**Optional Example - Change Interfacing Baud Rate:**

1. Open the X-CTU program: (Start --> Programs --> MaxStream --> X-CTU)
2. Under the "PC Settings" tab, select the PC Serial Com Port from the dropdown list that will be used to connect to the RF Modem.
3. Select a "Baud rate" to match the default baud rate of the RF Modem. Use default values for all other fields.
4. Click on the "Modem Configuration" tab. [Figure below]
5. In the "Serial Interfacing" section of the command hierarchy, select the new desired baud rate from the "Baud Rate" drop-down list.
6. Chick the "Write Parameters" button. (This stores parameter settings for reuse after powering-off. If the button is not clicked, the RF Modem will use previously stored parameters when power-on again.)
7. Click on the "PC Settings" tab and select the value from the "Baud" drop-down list that matches your new baud rate. This configures the PC Com Port to communicate at the new baud rate.

# AT Commands (Short Reference)

The following table lists commands available to XStream RF Modems. Refer to the "XStream Advanced Programming and Configuration" manual for more information.

AT Commands issued without a parameter value will return the currently stored parameter.

**Table 7. XStream AT Commands as of Firmware Version 4.2AA**

Modems expect numerical values in hexadecimal. "d" denotes decimal equivalents.

| AT Command | Binary Command | AT Command Name | Range | Command Category | # Bytes Returned | Factory Default |
|---|---|---|---|---|---|---|
| AT | 0x05 (5d) | Guard Time After | 0x02 – 0xFFFF (x 100 ms) | AT Command Mode Options | 2 | 0x0A (10d) |
| BD | 0x15 (21d) | Baud Rate | 0 – 6 | Serial Interfacing | 1 | RF data rate |
| BT | 0x04 (4d) | Guard Time Before | 0 – 0xFFFF (x 100 ms) | AT Command Mode Options | 2 | 0x0A (10d) |
| CC | 0x13 (19d) | Command Sequence Character | 0x20 – 0x7F | AT Command Mode Options | 1 | 0x2B ("+") |
| CD v 4.29D* | 0x28 (40d) | DO3 Configuration | 0 - 3 | Serial Interfacing | 1 | 0 |
| CN | 0x09 (9d) | Exit AT Command Mode | none | AT Command Mode Options | n/a | none |
| CS v 4.27D* | 0x1F (31d) | DO2 Configuration | 0 – 4 | Serial Interfacing | 1 | 0 |
| CT | 0x06 (6d) | AT Command Mode Timeout | 0x02 – 0xFFFF (x 100 ms) | AT Command Mode Options | 2 | 0xC8 (200d) |
| DT | 0x00 (0d) | Destination Address | 0 – 0xFFFF | Networking | 2 | 0 |
| E0 | 0x0A (10d) | Echo Off | none | AT Command Mode Options | n/a | none |
| E1 | 0x0B (11d) | Echo On | none | AT Command Mode Options | n/a | none |
| ER | 0x0F (15d) | Receive Error Count. | 0 – 0xFFFF | Diagnostic | 2 | 0 |
| FH | 0x0D (13d) | Force Wake-up Initializer | none | Sleep (Low Power) | n/a | none |
| FL | 0x07 (7d) | Software Flow Control | 0 – 1 | Serial Interfacing | 1 | 0 |
| FT v 4.27B* | 0x24 (36d) | Flow Control Threshold | 0x0 – 0xFF (bytes) | Serial Interfacing | 2 | varies |
| GD | 0x10 (16d) | Receive Good Count | 0 – 0xFFFF | Diagnostic | 2 | 0 |
| HP | 0x11 (17d) | Hopping Channel | 0 – 6 | Networking | 1 | 0 |
| HT | 0x03 (3d) | Time before Wake-up Initializer | 0 – 0xFFFF (x 100 ms) | Sleep (Low Power) | 2 | 0xFFFF |
| ID v 4.27C* | 0x27 (39d) | Modem VID | 0 – 0xFFFF (Read-only) | Networking | 2 | none |
| LH | 0x0C (12d) | Wake-up Initializer Timer | 0 – 0xFF (x 100 ms) | Sleep (Low Power) | 1 | 1 |
| MK | 0x12 (18d) | Address Mask | 0 – 0xFFFF | Networking | 2 | 0xFFFF |
| NB v 4.27B* | 0x23 (35d) | Parity | 0 – 4 | Serial Interfacing | 1 | 0 |
| PC v 4.22* | 0x1E (30d) | Power-up Mode | 0 – 1 | AT Command Mode Options | 1 | 0 |
| PW v 4.22* | 0x1D (29d) | Pin Wake-up | 0 – 1 | Sleep (Low Power) | 1 | 0 |
| RE | 0x0E (14d) | Restore Defaults | None | (Special) | n/a | none |
| RN v 4.22* | 0x19 (25d) | Delay Slots | 0 – 0xFF (slots) | Networking | 1 | 0 |
| RO v 4.2AA* | 0x21 (33d) | Time before Transmission | 0 – 0xFFFF (x 0.2 ms) | Serial Interfacing | 2 | 0x20 (32d) |
| RP v 4.2AA* | 0x22 (34d) | RSSI PWM Timer | 0 - 0x7F (x 100 ms) | Diagnostic | 1 | 0 |
| RR v 4.22* | 0x18 (24d) | Retries | 0 – 0xFF | Networking | 1 | 0 |
| RS v 4.22* | 0x1C (28d) | RSSI | 0x06 – 0x36 (Read-only) | Diagnostic | 1 | none |
| RT | 0x16 (22d) | DI2 Configuration | 0 - 2 | Serial Interfacing | 1 | 0 |
| SH v 4.27C* | 0x25 (37d) | Serial Number High | 0 – 0xFFFF (Read-only) | Diagnostic | 2 | none |
| SL v 4.27C* | 0x26 (38d) | Serial Number Low | 0 – 0xFFFF (Read-only) | Diagnostic | 2 | none |
| SM | 0x01 (1d) | Sleep Mode | 0 – 8 | Sleep (Low Power) | 1 | 0 |
| ST | 0x02 (2d) | Time before Sleep | 0x10 – 0xFFFF (x 100 ms) | Sleep (Low Power) | 2 | 0x64 (100d) |
| SY | 0x17 (23d) | Time before Initialization | 0 – 0xFF (x 100 ms) | Networking | 1 | 0 (disabled) |
| TR v 4.22* | 0x1B (27d) | Transmit Error Count | 0 – 0xFFFF | Diagnostic | 2 | 0 |
| TT v 4.22* | 0x1A (26d) | Streaming Limit | 0 – 0xFFFF [0 = disabled] | Networking | 2 | 0xFFFF |
| VR | 0x14 (20d) | Firmware Version | 0 x 0xFFFF (Read-only) | Diagnostic | 2 | none |
| WR | 0x08 (8d) | Write | none | (Special) | n/a | none |

* Firmware version in which the command was introduced. All subsequent firmware versions also support the command.

## Modem Profiles

Modem Profiles provide a method of saving radio parameters to a PC for later use. When configuring a RF Modem, use the "Save Profile" button to store custom settings.

**How to Use Modem Profiles**

1. Connect the RF Modem to the serial port of a PC (Using an RS-232 cable)
2. Launch the X-CTU software
3. Click the "Modem Configuration" tab
4. Set modem parameters according to data radio system's criteria.
5. Click "Save Profile" button then navigate to any folder located on the PC.

→ To load a previously saved profile, click "Load Profile" button and navigate to the file.

### Full-Duplex

USE: This profile can be used to simulate Full-Duplex communication between 2 MaxStream radios. Use this profile if communication may be initiated from either RF Modem simultaneously.

**Parameters:**
RT = 2
RR = 20
RN = 4

DESCRIPTION: When streaming data, this profile inserts delays (RN) after it has transmitted the number of bytes determined by the TT command. This allows the other radio the opportunity to transmit its data and simulates a full-Duplex mode. Flow control should be observed.

### Low Power Cyclic Sleep (Base)

USE: To wake a remote modem in cyclic sleep mode.

**Parameter:**
SY = 14

DESCRIPTION: Set a RF Modem to send a .6 second to 16.1 second channel initialization header that will wake a modem in the .5 second to 16 second cyclic sleep mode. Notice that Time-to-Sleep (ST) on the remote must be a tenth of a second shorter than the time-to-Long-Header (HT) on the base modem.

SPECIAL: This profile should be programmed into the base modem that is to initiate communication. Use "Lower Power Cyclic Sleep Remote" profile for remote.

### Low Power Cyclic Sleep (Remote)

USE: To have a radio go to low power mode.

**Parameters:**
ST = 14
SM = [3 - 7]

DESCRIPTION: Use this profile to set a modem to a low power mode where it will wake up every (.5 to 16) seconds to check for a transmission. If there is a transmission the radio will wake up and receive the incoming data, returning to sleep after 2 seconds (ST) of no transmitting or receiving data.

SPECIAL: This profile should be programmed into the low power remote modem. Use "Low Power Cyclic Sleep Base Station" profile for base.

**Low Power Mode (Pin Sleep)**

USE: Pin sleep mode can be used to control the sleep and wake states of the radio.

**Parameter:**
SM = 1

DESCRIPTION: This profile tells the radio to monitor the DTR pin to control the sleep and wake states.

**Low Power Mode (Serial Port Sleep)**

USE: Radio is in low power mode until an RS-232 character is received.

**Parameter:**
SM = 2

DESCRIPTION: If this state is enabled, the modem goes into Sleep Mode after a user-defined period of inactivity (no transmitting or receiving of data). In this mode, the PWR LED is off. The modem will return to Idle Mode after the (ST) inactivity time.

**Modem Emulation (Base)**

USE: This allows a PC to initiate point-to-point connections between a "base modem" and multiple "remote modems" - one at a time.

**Parameters:**
RR = 14
SM = 1
CT = 258
PC = 1

DESCRIPTION: This profile configures a "base modem" to "dial" uniquely addressed remote modems using an ATDT dialing string. The modem will default to command mode when turned on - use DTR to control power. After 60 seconds, the modem will automatically revert to data mode (CT) using the previously saved modem address (DT). Retries (RR) are enabled to ensure a reliable connection.

SPECIAL: Use in conjunction with the Modem Emulation (Remote) profile.

**Modem Emulation (Remote)**

USE: Allow a PC to initiate point-to-point connections between a "base modem" and multiple "remote modems" - one at a time.

**Parameters:**
RR = 14
DT = [1 - n]

DESCRIPTION: This profile configures a "remote modem" to respond when the base modem "dials" the address "1 to n" using an ATDT dialing string. Retries (RR) are enabled to ensure a reliable connection.

SPECIAL: To contact this modem, send the dialing string "ATDT4, CN"<cr> to the base modem to initiate the communication. Use in conjunction with the Modem Emulation (Base) profile.

**RS-485**

USE: This profile is for half-duplex RS-485 operation.

**Parameter:**
CS = 1

DESCRIPTION: This profile programs the radio to use the CTS (J1 - pin 1) as an RS-485 Transmit Enable.

SPECIAL: This mode is configured automatically through proper DIP Switch settings. This mode will be overwritten if the RF Modem is configured through the DIP Switch for RS-232 operation.

# Appendix A: Agency Certifications

## FCC Compliance

Devices that contain XStream Modems inherit MaxStream's FCC certifications. The following labeling and antenna conditions must be met:

### Labeling Requirements

**WARNING:** The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents as is shown in Figures A1 & A2.

### Antenna Warning

**WARNING:** This device has been tested with Reverse Polarity SMA connectors with the antennas listed in Tables A1 & A2 of Appendix A. When integrated in OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas not listed in the tables must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

Figure A1. Required FCC Label (900 MHz)

Contains FCC ID: **OUR9XSTREAM**

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.

Figure A2. Required FCC Label (2.4 GHz)

Contains FCC ID: **OUR-24XSTREAM**

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.

**IMPORTANT**: XStream 900 MHz & 2.4 GHz OEM Modules have been certified by the FCC for use with other products 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.

## 9XStream-PKG-R (900 MHz) Approved Antenna List

**Table A1. XStream-PKG-R 900 MHz Approved Antennas with Separation Distances compliant with FCC Exposure Requirements**

| Manufacturer | 900 MHz Part Number | Type | Gain | Application | Minimum Separation Distance |
|---|---|---|---|---|---|
| * | * | Yagi | 6.2dBi | Fixed/Mobile ** | 20cm |
| * | * | Yagi | 7.2dBi | Fixed/Mobile ** | 20cm |
| MaxStream | A09-Y8 | Yagi | 8.2dBi | Fixed/Mobile ** | 20cm |
| * | * | Yagi | 9.2dBi | Fixed/Mobile ** | 20cm |
| * | * | Yagi | 10.2dBi | Fixed/Mobile ** | 20cm |
| MaxStream | A09-Y11 | Yagi | 11.2dBi | 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 |
| * | * | Omni Direct. | 9.2dBi | Fixed ** | 20cm |
| * | * | 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-P5I | 1/2 wave antenna | 2.1dBi | Fixed/Mobile ** | 1cm |
| MaxStream | A09-QBMM-P5I | 1/4 wave antenna | 1.9 dBi | Fixed/Mobile ** | 1cm |
| * | * | 1/4 wave integrated wire antenna | 1.9 dBi | Fixed/Mobile ** | 1cm |

* FCC-approved antennas not inventoried by MaxStream – Contact MaxStream (801-765-9885) for information.

** Can be approved for portable applications if integrator gains approval through SAR (Specific Absorption Rate) testing.

MaxStream radio modems are pre-FCC approved for use in fixed base station and mobile applications. As long as the antenna is mounted at least 20 cm (8 in) from nearby persons, the application is considered a mobile application. If the antenna will be mounted closer than 20 cm to nearby persons, then the application is considered "portable" and requires an additional test performed on the final product. This test is called the Specific Absorption Rate (SAR) testing and measures the emissions from the radio modem and how they affect the person.

### 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 nearby persons during operation. 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.

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

1. The system integrator must ensure that the text on the external label provided with this device is placed on the outside of the final product.
2. The XStream-PKG-R 900 MHz may be used only with Approved Antennas that have been tested with this modem. [See Table A1 above]

## 24XStream-PKG-R (2.4 GHz) Approved Antenna List

**Table A2. XStream-PKG-R 2.4 GHz Approved Antennas with Separation Distances compliant with FCC Exposure Requirements**

| Manufacturer | 2.4 GHz Part Number | Type | Gain | Application | Minimum Separation Distance |
|---|---|---|---|---|---|
| * | * | Yagi | 6dBi | Fixed ** | 2m |
| * | * | Yagi | 8.8dBi | Fixed ** | 2m |
| * | * | Yagi | 9dBi | Fixed ** | 2m |
| * | * | Yagi | 10dBi | Fixed ** | 2m |
| * | * | Yagi | 11dBi | Fixed ** | 2m |
| * | * | Yagi | 12dBi | Fixed ** | 2m |
| * | * | Yagi | 12.5dBi | Fixed ** | 2m |
| * | * | Yagi | 13.5dBi | Fixed ** | 2m |
| * | * | Yagi | 15dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 2.1dBi | Fixed/Mobile ** | 20cm |
| * | * | Omni Direct. | 3dBi | Fixed/Mobile ** | 20cm |
| * | * | Omni Direct. | 5dBi | Fixed/Mobile ** | 20cm |
| * | * | Omni Direct. | 7.2dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 8dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 9.5dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 10dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 12dBi | Fixed ** | 2m |
| * | * | Omni Direct. | 15dBi | Fixed ** | 2m |
| MaxStream | A24-P8 | Panel | 8.5dBi | Fixed ** | 2m |
| MaxStream | A24-P13 | Panel | 13dBi | Fixed ** | 2m |
| * | * | Panel | 14dBi | Fixed ** | 2m |
| * | * | Panel | 15dBi | Fixed ** | 2m |
| * | * | Panel | 16dBi | Fixed ** | 2m |
| MaxStream | A24-P19 | Panel | 19dBi | Fixed ** | 2m |
| MaxStream | A24-HABMM-P6I | Dipole | 2.1dBi | Fixed/Mobile ** | 20cm |
| MaxStream | A24-HBMM-P6I | Dipole | 2.1dBi | Fixed/Mobile ** | 20cm |
| MaxStream | A24-HABSM | Dipole | 2.1 dBi | Fixed/Mobile ** | 20cm |
| MaxStream | A24-QABMM-P6I | Monopole | 1.9 dBi | Fixed/Mobile ** | 20cm |
| * | A24-Q1 | Monopole | 1.9 dBi | Fixed/Mobile ** | 20cm |
| * | * | Monopole | 1.9 dBi | Fixed/Mobile ** | 20cm |

* FCC-approved antennas not inventoried by MaxStream – Contact MaxStream (801-765-9885) for information.

** Can be approved for portable applications if integrator gains approval through SAR (Specific Absorption Rate) testing.

### 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 nearby persons during operation. 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.

# European Compliance (2.4 GHz only)

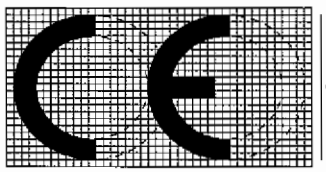
The 24XStream has been certified for several European countries. For a complete list, see www.maxstream.net.

If the 24XStream modems are incorporated into a product, the manufacturer must ensure compliance of the final product to the European harmonized EMC and low-voltage/safety standards. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive. Furthermore, the manufacturer must maintain a copy of the XStream user manual documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

## OEM Labeling Requirements

The 'CE' marking must be affixed to a visible location on the OEM product.

**Figure A3. CE Label Requirements**




The CE mark shall consist of the initials "CE" taking the following form:

- If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
- The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.
- The CE marking must be affixed visibly, legibly, and indelibly.

Furthermore, since the usage of the 2400 – 2483.5 MHz band is not harmonized throughout Europe, the Restriction sign must be placed to the right of the 'CE' marking as shown below. See the R&TTE Directive, Article 12 and Annex VII for more information

**Figure A4. CE Label Required on OEM Equipment**

## Restrictions

France – France imposes restrictions on the 2.4 GHz band. Go to www.art-telecom.Fr or contact MaxStream for more information.

Norway – Norway prohibits operation near Ny-Alesund in Svalbard. More information can be found at the Norway Posts and Telecommunications site (www.npt.no).

### 24XStream Declarations of Conformity

MaxStream has issued Declarations of Conformity for the 24XStream modules concerning emissions, EMC and safety. These files are located in the 'documentation' folder of the MaxStream CD.

### Important Note

MaxStream does not list the entire set of standards that must be met for each country. MaxStream customers assume full responsibility for learning and meeting the required guidelines for each country in their distribution market. For more information relating to European compliance of an OEM product incorporating the 24XStream module, contact MaxStream, or refer to the following web sites:

**CEPT ERC 70-03E** – Technical Requirements, European restrictions and general requirements: Available at www.ero.dk/

**R&TTE Directive** – Equipment requirements, placement on market: Available at www.ero.dk/

### Notifications and Required Information

Since the 2.4 GHz band is not harmonized throughout Europe, a notification must be sent to each country prior to shipping product according to Article 6.4 of the R&TTE Directive. A list of national contacts for most European countries may be found at www.ero.dk/.

The following technical data (relating to the 24XStream) is often required in filling out an notification form.

- Frequency Band: 2400 – 2483.5 MHz
- Modulation: Frequency Shift Keying
- Channel Spacing: 400 kHz
- ITU Classification: 400KF1D
- Output Power: 100 mW EIRP
- Notified Body Number: 0891

Contact MaxStream (801) 765-9885 if additional information is required.

**Table A3. Antennas approved for use with 24XStream (2.4 GHz) OEM RF Modules in Europe**

| Manufacturer | Part Number | Type | Gain | Application | Minimum Separation Distance |
|---|---|---|---|---|---|
| MaxStream | A24-HABMM-P6I | Dipole | 2.1 dBi | Fixed/Mobile * | 20cm |
| MaxStream | A24-HBMM-P6I | Dipole | 2.1 dBi | Fixed/Mobile * | 20cm |
| MaxStream | A24-HABSM | Dipole | 2.1 dBi | Fixed/Mobile * | 20cm |
| MaxStream | A24-QABMM-P6I | Monopole | 1.9 dBi | Fixed/Mobile * | 20cm |
| MaxStream | A24-QBMM-P6I | Monopole | 1.9 dBi | Fixed/Mobile * | 20cm |
| MaxStream | A24-Q1 | Monopole | 1.9 dBi | Fixed/Mobile * | 20cm |

* Can be approved for portable applications if integrator gains approval through SAR (Specific Absorption Rate) testing.

## IC (Industry Canada) Certification

Labeling requirements for Industry Canada are similar to those of the FCC. A clearly visible label on the outside of the final product enclosure must display the following text:

**Contains Model 9XTend Radio, IC: Pending**

Integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B - Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

# Appendix B: Additional Information

## XStream-PKG-R RF Modem Specifications

**Table B1. XStream-PKG-R RS-232/485 RF Modem Specifications**

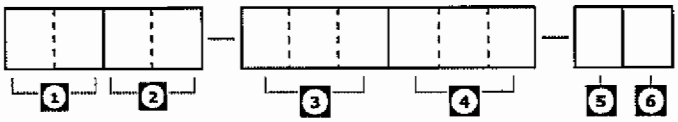
| Specification | 9XStream-PKG-R (900 MHz) | | 24XStream-PKG-R (2.4 GHz) | |
|---|---|---|---|---|
| **Performance** | | | | |
| Indoor/Urban Range | Up to 1500' (450 m) | | Up to 600' (180 m) | |
| Outdoor LOS Range | Up to 7 miles (11 km) w/ dipole antenna<br>Up to 20 miles (32 km) w/ high-gain antenna | | Up to 3 miles (5 km) w/ dipole antenna<br>Up to 10 miles (16 km) w/ high-gain antenna | |
| **Serial Data Throughput** | **9600 bps** | **19.2 kbps** | **9600 bps** | **19.2 kbps** |
| RF Baud Rate | 10,000 bps | 20,000 bps | 10,000 bps | 20,000 bps |
| Transmit Power Output | 100 mW (20 dBm) | 100 mW (20 dBm) | 50 mW (17 dBm) | 50 mW (17 dBm) |
| Receiver Sensitivity | -110 dBm | -107 dBm | -105 dBm | -102 dBm |
| **General** | | | | |
| Frequency | 902-928 MHz | | 2.4000-2.4835 GHz | |
| Spread Spectrum | Frequency Hopping, Wide band FM modulator | | Frequency Hopping, Wide band FM modulator | |
| Network Topology | Peer-to-Peer, Point-to-Multipoint, Point-to-Point, Multidrop | | Peer-to-Peer, Point-to-multipoint, Point-to-Point, Multidrop | |
| Channel Capacity | 7 hop sequences share 25 frequencies | | 7 hop sequences share 25 frequencies | |
| Serial Data Interface | RS-232/485/422 | | RS-232/485/422 | |
| I/O Data Rate | Software selectable 1200 - 57600 bps | | Software selectable 1200 - 57600 bps | |
| **Power Requirements** | | | | |
| Supply Voltage | 7-18 VDC | | 7-18 VDC | |
| Transmit Current | 200 mA | | 200 mA | |
| Receive Current | 70 mA | | 70 mA | |
| Power Down Current | < 1 mA | | < 1 mA | |
| **Physical Properties** | | | | |
| Enclosure | 7.1 oz. (200 g), Extruded aluminum, black anodized | | 7.1 oz. (200 g), Extruded aluminum, black anodized | |
| Enclosure Size | 2.75" x 5.50" x 1.124" (7.90 cm x 13.90 cm x3.80 cm) | | 2.75" x 5.50" x 1.124" (7.90 cm x 13.90 cm x3.80 cm) | |
| Operating Temperature | 0 to 70° C (commercial), -40 to 85° C (industrial) | | 0 to 70° C (commercial), -40 to 85° C (industrial) | |
| **Antenna** | | | | |
| Type | ½ wave dipole whip, 6.75" (17.1 cm), 2.1 dBi Gain | | ½ wave dipole whip, 5.25" (13.3 cm), 2.1 dBi Gain | |
| Connector | Reverse-polarity SMA | | Reverse-polarity SMA | |
| Impedance | 50 ohms unbalanced | | 50 ohms unbalanced | |
| **Certifications** (Refer to www.MaxStream.net for additional certifications) | | | | |
| FCC Part 15.247 | OUR9XSTREAM | | OUR-24XSTREAM | |
| Industry Canada (IC) | 4214A-9XSTREAM | | 4214A 12008 | |
| Europe | N/A | | ETSI, CE | |

# 1-Year Warranty

The XStream-PKG-R RS-232/485 RF Modem from MaxStream, Inc. (the "Product") is warranted against defects in materials and workmanship under normal use, for a period of 1-year from the date of purchase. 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.

# XStream-PKG-R RF Modem Part Numbers

**Figure B1. XStream-PKG RF Modem Part Number Key**




**Divisions of the MaxStream PKG RF Modem part numbers:**

**1 MaxStream Product Family**
- XC = XCite
- X = XStream
- XT = XTend

**2 Operating Frequency**
- 09 = 902-928 MHz
- 24 = 2.4000 - 2.4835 GHz (XStream only)
- H9 = 923 MHz (XStream only)

**3 RF Data Rate (baud)**
- 009 = 9600 bps
- 038 = 38400 bps (XCite Only)
- (blank) All XTend RF Modems support 1200 to 115200 bps.

**4 Operating Temperature**
- PKC = Commercial: 0 to 70° C
- PKI = Industrial: -40 to 85° C. Embedded RF Module is Conformal Coated
- PKT = Tested Industrial: -40 to 85° C. Embedded RF Module is Conformal Coated & 100% tested

**5 Interface Mode**
- R = RS-232, RS-485/422
- U = USB
- E = Ethernet
- T = Telephone

**6 Accessories Package**
- A = Accessories Package (specific to the Interfacing Mode) Included
- (blank) means the accessories package is not included

# NOTES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