

**XPRZModem**

**COLLABORATORS**

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**REVISION HISTORY**

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## Chapter 1

# XPRZModem

### 1.1 XPRZModem.guide

XPRZModem.library

Version 3.1  
Oct 01,1993

Contents:

Introduction  
Installation  
Options  
Serial Port Settings  
Receiving Files  
Sending Files  
Technical Information  
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### 1.2 introduction

Introduction

XPRZModem.library is an Amiga shared library (with full source code) which provides ZModem file transfer capability to any XPR-compatible communications

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program. The XPR (eXternal PRotocol) standard describes an interface method which allows various file transfer protocols to be implemented as Amiga shared libraries. These libraries may then be used interchangeably in any compatible communications program. This takes a heavy load off of the comm program author, who no longer has to support dozens of different file transfer protocols in their program in order to make it widely useful and popular. The comm program is also smaller and more efficient as a result, since all those obscure protocols (you know, the ones \*you\* don't need) are no longer taking up space.

The XPR standard also helps users, who can mix and match their favorite file transfer protocols with their favorite comm programs. And when new protocols are invented, the user simply plugs in a new library, and voila!, it's ready to use. Hopefully, making protocols easy to support will allow more and better comm programs to be written, as authors can concentrate on their programs instead of constantly re-inventing the wheel.

Of course, for all of this wonderful stuff to happen, there needs to be a good selection of these XPR libraries available to the public. It's the classic chicken-and-egg problem; comm program authors won't be motivated to support the XPR standard unless there are a sizable number of protocols available for it. And other programmers won't be motivated to write XPR libraries until there are a sizable number of comm programs which can use them. In an effort to do my bit [ B^ ) ] for the Amiga community, which has given me so many neat toys to play with over the past few years, I decided to try and help get the ball rolling.

Hopefully, the early availability of a ZModem library will help stimulate interest in the XPR standard, resulting in better Amiga telecomms for all of us. And by making my source code PD, I hope to help others interested in writing XPR libraries by giving them some serious example code. Also, having ZModem library code readily available to John Q. Hacker should help ensure a steady stream of enhanced ZModem libraries (with enzymes) for all of us to use in the future.

Of course, no discussion of the XPR standard would be complete without giving proper credit to the author,

Willy Langeveld  
of the Stanford Linear

Accelerator Center. Many thanks are due him for this effort. If you have any further questions about the XPR standard, be sure and download the spec; it should be available on BIX (since he's a sysop there), or on most other major systems.

All files in this archive which are not copyrighted are hereby released to the public domain (which they were anyway, by way of not being copyrighted, but I want to make sure YOU realize that). Do as you like with them. Please make lots of copies and distribute them all over the place, and make lots of derivative works, and everything! Heck, you can even publicly perform and/or display this code if you can figure out how...

## 1.3 installation

Just copy the xprzmodem.library file into your LIBS: directory. All XPR-compatible comm programs should provide a way for you to select which XPR

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protocol you wish to use, either by giving you a file requester showing LIBS:xpr\*.library, or by automatically detecting these libraries and adding them into their menus.

680x0\_1x : All Kickstarts, all Prozessors.

680x0\_2x : For Kickstart 2.x (37.175) or higher, all Prozessors.

68020+\_1x: All Kickstarts, optimized code for Prozessor-Type 68020, 68030 and 68040.

68020+\_2x: For Kickstart 2.x (37.175) or higher, optimized code for Prozessor-Type 68020, 68030 and 68040.

## 1.4 options

The XPR standard lays out two ways for the comm program user to specify options for the XPR. The more primitive option is for the comm program to provide a method of passing an option string to the XPR library before transferring files. The precise format and usage of this option string is left up to the XPR author; the comm program just sends it verbatim. If an environment variable is found with the same name as the XPR (i.e. there's a file in the ENV: directory called "xprzmodem"), the comm program is supposed to use this string (contents of file) to initialize the protocol options. Also, a menu option or some such should normally be provided which will allow the user to be prompted for the option string interactively.

Version 2.0 of the XPR standard created a new, more sophisticated way for the comm program user to specify XPR options. If the comm program supports it, the XPR library can give the comm program a list of option prompts, and the comm program can then let the user interactively set the various options individually, possibly even using nice gadgets and stuff.

In any case, no matter how your particular comm program feels like handling it, these are the options supported by this implementation of ZModem:

### Text Translation Mode

- Controls whether or not CR/LF pairs are translated.

### Overwrite Mode

- Controls what happens when a duplicate filename is found.

### Buffer Size

- Controls the size of the file I/O buffer.

### Frame Size

- Sends an ACK after X-many bytes.

### Error Count

- Determines the number of sequential errors before ZModem will abort the transfer.

**Block Size**

- Determines the maximum block size.

**Auto-Activate**

- Controls whether or not ZModem will automatically activate a receive.

**Delete After Sending**

- Controls whether or not the file is deleted after it has been sent.

**Keep Partial Files**

- Controls whether or not partially received files are kept.

**Receive Full Dir Path**

- Controls whether or not ZModem will use the full directory path sent.

**Send Full Dir Path**

- Controls whether or not ZModem will send the full directory path.

**Default Receive Path**

- Gives the default path for downloads to be.

If setting the options via the option string method (either ENV: file or primitive comm program), note that the setting for each option must immediately follow the option character with no intervening characters ("TY", not "T Y" or "T=Y"). When setting multiple options at once, separate the options from each other with commas and/or spaces; for example, "TN,OR,F0". You don't have to specify all options every time; the options you specify will be merged into the current option settings, replacing their old values. Upper/lower case is not significant. The default option settings if you don't change anything are "TC, ON, B16, F0, E10, AY, DN, KY, SN, RN, P".

If the comm program supports the `xpr_options()` call added in version 2.0 of the XPR spec, you should be prompted for each option with a nice prompt message such as "Text mode (Y,N,?,C):" and possibly be able to use Intuition string and/or button gadgets instead of being stuck with the semi-cryptic option string format described above.

## 1.5 Text Translation Mode

Text Translation Mode

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- Text Yes (TY) - If receiving, translate CR/LF pairs or solo CR chars to normal Amiga LF chars. Ignore data past ^Z. If sending, suggests to receiver that they should receive this file in text mode.
- Text No (TN) - Receive file verbatim, without changes. If sending, suggest to receiver that they receive this file verbatim, without translations.
- Text (T?) - If receiving, use sender's suggestion as to whether to do Status EOL translations or not. If sending, tell receiver to use Unknown default mode, because we don't know either.
- Text Comm (TC) - The library asks the comm program whether or not to use (Default) Text mode for each file. If the comm program doesn't support the necessary xpr\_finfo() call, or if the call fails, this option acts like T?. From the user's point of view, what this option normally does is set the Text mode to match the comm program's built-in text/binary/end-of-line/translation mode, if any.

NOTE: The T option serves only as a suggestion to the receiving system when sending files; the receiver makes the final decision as to whether to take your advice or to force the files to be received in text or binary mode.

## 1.6 Overwrite Mode

### Overwrite Mode

- Overwrite Yes (OY) - If about to receive file with same name as one which already exists, delete the old file and receive the new file in its place.
- Overwrite No (ON) - If about to receive file with same name as one which (Default) already exists, append ".dup" onto the name of the new file to keep them separate.
- Overwrite (OR) - If about to receive file with same name as one which Resume already exists, resume receiving file data from the current end of the existing file.
- Overwrite Skip (OS) - If about to receive file with same name as one which already exists, tell sender never mind, skip this file, we don't want it. Batch transfers will move on to the next file in the set, if any.

## 1.7 Buffer Size

- Buffer Size (Bnnn) - XPRZModem.library adds a layer of file I/O buffering in addition to whatever the comm program may or may not provide. This option sets the size of XPRZModem's file (Default 16) ↔

I/O buffer in kilobytes. The minimum value is 1 KB, for those using RAM drives or fast hard drives, or those whose comm programs already provide sufficient buffering. The maximum value is as much contiguous RAM as you have available in your Amiga.

If you specify more than is actually available, XPRZModem will keep decrementing the buffer size requested by 1 KB until the memory allocation works. That way, if your RAM is too fragmented to use the amount you request, XPRZModem simply uses the largest block available. Buffering is especially helpful for floppy drive users; it keeps your drive from continuously gronking and slowing things down all through the transfer. If you are a floppy drive user, you might need to set the

Frame Size

.

NOTE: Versions of VLT prior to 5.034 couldn't handle buffer sizes  $\geq$  32 KB. If you wanted to use larger buffers before and couldn't, try again now.

## 1.8 Frame Size

Frame Size (Fnnn) - Although normally avoided, ZModem has the ability to require an ACK to be sent from the receiver to the sender every X-many data bytes. Normally you don't want to use this feature, because not waiting for ACKs is part of how ZModem works so fast. However, this feature can be very useful in conjunction with file I/O buffering on slow devices namely those floppy drives). If you set up a large I/O buffer to avoid gronking your floppy so often, you'll find that when the buffer finally \*does\* get around to being flushed that it can take a very long time; so long, in fact, that the delay can cause timeouts and errors. But if you set your ZModem to require the sender to wait for an ACK every buffer's-worth of data, the sender will politely wait for you to flush your buffer to the slow floppy and send it an ACK saying it's OK to continue now. This value should be set to 0 to disable ACKs (normal mode), or set it to the actual number of data bytes allowed between ACKs. For example, if you set B64 because of your floppy, you should also set F65536.

## 1.9 Error Count

Error Count (Ennn) - This allows you to set the number of sequential errors which will be required to convince ZModem to abort the transfer. The normal value is 10, meaning that 10 errors must happen in a row with no valid data being transferred in order to cause an abort. This setting is provided for those using XPRZModem with a BBS, who may wish to use a relaxed setting, or those with really lousy phone lines

who are desperate and patient enough to want the transfer to continue in spite of horrible performance.

## 1.10 Block Size

Block Size (Mnnn) - Size of Block to transfer. Default of ZModem is 1024, minimum is 64 Bytes and the Maximum is 8192 Bytes (8K). Be careful with this option! If the uploaders blocks are bigger than the receiver because there is a older zmodem you will get errors and your cps-rate will slow down. Large blocks are useful if you have a good phoneline and a fast modem eg. 9600/14400 and higher. If you use larger blocks you will save a little bit transfer overhead and the cps-rate will get a little better. Remember, the sender controls the Blocksize. For Example, if you use 4096 and the BBS-System the default (1024), so if you upload the ZModem use 4K-Blocks, if the BBS send data you receive data with 1K-Blocks. For Sysop's it will be usefull if they install ZModem with different Blocksize maybe 1K (Standart) to 8K, so the users can take what they wants. This ZModem also runs with ZModem 8K or ZedZap up to 8K.

## 1.11 Auto Activate

Auto-Activate Yes (AY) - If the comm program supports the ability, the library will automatically go into receive mode when the start of a ZModem download is detected.  
(Default)

Auto-Activate No (AN) - Don't try to automatically start downloading, make the user activate it.

## 1.12 Delete After Sending

Delete After Sending Yes (DY) - Delete each file after it has been sucessfully sent.

Delete After Sending No (DN) - Don't delete files after sending them.  
(Default)

## 1.13 Keep Partial Files

Keep Partial Files Yes (KY) - Keep the fragment of a file received ←  
so far if  
(Default) file reception is aborted. This allows you to  
use the  
Overwrite Resume

option above to pick up  
where you left off on your next attempt.

Keep Partial Files No (KN) - Delete any partially-received file after an aborted transfer.

## 1.14 Send Full Directory Path

Send Full Directory Path Yes (SY) - Send full filenames including directory path to receiver.

Send Full Directory Path No (SN) - Send only simple filenames, not including directory path.  
(Default)

## 1.15 Receive Full Directory Path

Receive Full Directory Path Yes (RY) - Use full filename exactly as received, instead of using the P option directory path. ↔

Receive Full Directory Path No (RN) - Ignore received directory path (if any), use P option directory path instead.  
(Default)

## 1.16 Default Path

### Default Path

Default Path for (Pxxx) - Store all received files in directory "xxx" if option Received Files

RN  
set. Ignored if option  
RY  
set. "xxx" can be any valid existing directory, with or without trailing "/" (e.g. "Pdf0:", "PComm:hold", etc.).

## 1.17 Serial Port Settings

This implementation of ZModem requires that your serial port be set to 8 data bits, no parity, 1 stop bit. This allows ZModem to send full 8-bit binary data bytes without having them munged on the way through the modem. If your comm program supports the `xpr_setserial()` function, XPRZModem will use it to set your serial port to 8N1 before doing a transfer, and will set your port back the way it was again after it's done. If your comm program doesn't

support `xpr_setserial()`, you'll need to make sure it's in 8N1 mode yourself.

ZModem works well in all serial port handshaking modes; none, XON/XOFF, or 7-wire/RTS/CTS. Since any or all of those handshaking modes may be appropriate at different times, with different modems or remote systems, XPRZModem lets you set the handshaking mode and doesn't mess with it.

## 1.18 Receiving Files

Once you get the  
ZModem options  
and your  
serial port configuration  
set

up properly, you're ready to actually use this thing (gasp!). Receiving files via ZModem is quite simple. First, get the file sender going by using whatever command it wants. ZModem is a batch file transfer protocol, meaning that it's capable of transferring several files in a single exchange, so the remote system may allow you to specify multiple files to be sent to you at one time. It may also allow you to use wildcard characters in the filename(s); this is all system dependant.

This may be all you have to do. If you specified option {"AY" link A} ({"auto-activate" link A on), and your comm program supports it, XPRZModem should automatically activate at this point and start receiving your files. If you specified

AN

, or your comm program doesn't support auto-activation, you should now use whatever option your comm program provides to activate file reception. This will usually be a menu option or button gadget. Either way, once XPRZModem starts receiving files, it should automatically receive all of the files you specified into the proper directory as indicated by the

R

and

P

options.

Make sure that you have set the ZModem options properly before starting the transfer; especially, make sure you only use

TY

if you know

that all of the files being transferred in this batch are printable ASCII text files. If you use

TY

on normal binary files like .ARCs or .ZOOs, they'll be mangled beyond use.

## 1.19 sending

Sending files using ZModem is fairly straightforward. First, activate the file receiver with whatever command the remote system requires. You

may or may not need to specify a filename or directory to the remote system; this depends on their implementation of ZModem. Once the remote system is ready to receive files, activate your comm program's ZModem send function. Your comm program will prompt you for which file(s) to send. Although ZModem is a batch protocol, your comm program may or may not allow you to specify multiple file names to be sent; also, wildcards may or may not be supported. These decisions are up to the comm program author; ZModem will handle multiple files and wildcards if the comm program allows them. Once you've specified the file name(s), the file(s) will be sent to the remote system.

If errors occur while sending the file(s), you'll probably notice a small enhancement I made to the normal ZModem error recovery procedures. Normally, file transfer protocols have to compromise between efficient data transmission on good, clean phone lines and quick error recovery on bad, noisy phone lines. If you pick a large packet size, you get high throughput on clean lines due to low packet overhead, but you have slow recovery times and large amounts of retransmitted data on noisy lines. If you've used YModem on noisy lines you've seen this problem. But, if you use small packets to reduce retransmitted data on noisy lines, you increase the amount of time the protocol spends sending packet overhead, and your throughput suffers. The solution is to vary the block size according to the experienced error rate during the transfer. That way you aren't stuck with a rigid packet length which will sometimes be the wrong size no matter what. I came up with this idea back when I first wrote the ZModem code for Opus, and cleared it for future compatibility with ZModem's designer, Chuck Forsberg, back then. Since then the basic concept has been extensively tested in the Opus BBS system, and has proven quite effective; it has also been incorporated into various other ZModem implementations over time. The actual algorithm for deciding what size packets to use when is pretty much up to the protocol author. XPRZModem uses a modified version of the Opus algorithm which prevents locking the packet size at a small value when a large one-time burst of errors occurs.

## 1.20 technical

Here are some notes for the "other" XPR standard users, namely the ←  
comm program  
authors:

Certain XPR callback functions *\*must\** be implemented by the comm program author in order for XPRZModem to be used. If any of these functions are not supported by your comm program, XPRZModem will display an error message and abort when invoked. These required functions are:

```
xpr_fopen(), xpr_fclose(), xpr_fread(), xpr_fwrite(),  
xpr_fseek(), xpr_sread(), xpr_swrite(), and xpr_update()
```

The `xpr_update()` function provides many data fields for your comm program to potentially display to the user. These are the XPR\_UPDATE struct elements which XPRZModem will keep updated during transfers:

```
xpru_protocol, xpru_filename, xpru_filesize, xpru_msg,  
xpru_errormsg, xpru_blocks, xpru_blocksize, xpru_bytes,  
xpru_errors, xpru_timeouts, xpru_blockcheck, xpru_expecttime,
```



different filenames. If, for example, you set `xpr_filename` to point to the first node of a linked list of filenames and/or templates to be sent, rather than just having it point to a string, you can have your `ffirst` and `fnext` routines traverse this linked list in order to determine the next file to be sent. Or you could have `xpr_filename` point to a buffer containing a list of filenames separated by commas, and your `ffirst/fnext` routines could return each filename in this list in turn. The key here is that if you provide these two routines, you're in complete control over the series of names fed to `XProtocolSend`. If you omit these routines, `XPRZModem` is stuck with single-file mode. Once again, if these two routines are provided, `XPRZModem` will *\*always\** call them; it makes no attempt to use the `xpr_filename` pointer for anything itself. This is not explicitly spelled out in the XPR standard, but it seems the only reasonable way to handle batch protocols to me. Hopefully other XPR library authors will follow this precedent as well, so that comm program authors will be able to count on multiple-filename batch sessions being handled properly.

`xpr_finfo()`: Used to determine the filesize of files being sent, in order to tell the receiving system how big they are. Also used to determine the size of a file which already exists when in

- Overwrite Resume mode; `XPRZModem` must be able to get the size of the current portion of the file in order to be able to tell the sender where to resume sending from. If this routine isn't provided, Overwrite Resume mode is not allowed. This routine is also used to check if Text mode should be set to Y or N for each file when option TC is set.

`xpr_options()`: If you don't supply this, users will be stuck with setting the library options via the semi-cryptic text string method (`ENV:` and/or `xpr_gets()`). This routine and `xpr_update()` have a lot to do with the look and feel of your program when using XPR libraries; any skimping on these two routines will be painfully obvious to the user. Conversely, doing a nice job on these two routines will really make your program shine.

`xpr_unlink()`: Required by the `DY` and `KN` options, so if you don't supply it, those options are not allowed.



## 1.21 future

I don't want or expect this to be the last or only XPR ZModem library available. There are a lot of less-commonly-used ZModem features which have popped up over the past few years, and many people might like to see some of them made available. Such as full control-character escaping, or maybe 8th bit escaping to allow use of 7-bit serial channels. I didn't want to add a bunch of rarely-used bells and whistles to this version of the library, because I want it to be able to serve as comprehensible example code. I just want to provide a good solid ZModem which reliably handles the majority of people's needs. Hopefully, this will serve as a foundation for future enhanced versions, while providing a safe fallback for people to come back to if that fancy new enhanced version (with neo-maxi zoomed weebies) turns out to need some more debugging.

## 1.22 history

1.0, 29 Jul 89 - Original release.

1.1, 03 Aug 89 - Fixed `zsdata()` to send file data packet in one `swrite()` call instead of calling `zsendline` for every byte, to prevent hammering the serial.device with single-byte write requests during uploads, and to speed up effective data transmission rates.

2.0, 28 Oct 89 - Converted from Manx to Lattice C 5.04. Created prototypes and made other tweaks as required. Designed new library skeleton for Lattice code, replacing the old Manx library skeleton. Added new options TC, A, D, K, S, R, and P. Added support for `xpr_options()` callback routine, and generally brought things up to par with XPR Spec 2.0.

2.10, 12 Feb 91 - Fixed the following generally minor problems:

- o No longer munges A6 register (this was potentially serious), and added callback glue to ensure comm program can't munge OUR registers either. Decided that the protective glue was much safer than the more elegant direct invocation used in version 2.0.
  - o Slightly less transmission overhead (concatenates all output into single swrites, builds output packets a bit faster).
  - o Considerably less receive overhead; does a lot more waiting and a lot fewer sreads, especially at high speed. WARNING: this change doesn't work with VLT version 4.846 or earlier (yes, Willy; it really was broken B-)). This change may or may not actually do you any good, depending upon how your comm program implements the `xpr_sread()` function.
  - o Fixed problems getting synchronized with some systems on uploads.
  - o No longer closes files twice.
  - o Now uses fully-reentrant `sprintf()` from `amiga.lib`; no more nasty BSS.
-

- o A couple of obscure error messages were > 50 bytes long, causing problems with some comm program's transfer status windows, e.g. the infamous VLT "Incredible Shrinking Status Window."
- o Stabilized spastic data rate by computing elapsed time more accurately.
- o Fixed sprintf() error which caused invalid filelength to be sent on uploads.
- o Aligned all data for optimal performance on 68030++ CPUs (now that I have my A3000... B-)). Doesn't really make any noticeable difference, but it makes us 68030 owners feel better anyway. I'm also including a version of the library compiled for the 68020+ CPU, on the same principle.
- o Now uses .DUP2 instead of .DUP.DUP, etc.
- o Added config option E for number of errors which cause an abort.
- o Fixed bogus IO\_Torture false alarm concerning timer.device.
- o Tried to fix an elusive Enforcer hit on reading location 0, but I'm not sure I really got it, since I had trouble reproducing the problem.

2.50, 15 Nov 91 - Fixed bugs and added the following features:

- o Added code to support 32 bit CRC (Circular Redundancy Check). CRC-32 adds a little more protection to the data being sent and received than does CRC-16. Source for the CRC-32 additions came from the Unix version of RZ/SZ by Chuck Forsberg.
- o Added code to update\_rate() function in utils.c to avoid the Guru # 80000005 if you decide to adjust the system clock during an upload or download from Daylight Saving Time to Standard Time. :-)
- o Proto additions using libinit.o and libent.o, and eliminating all of the assembler code was supplied by Jim Cooper of SAS. Jim also supplied the mysprintf() code to replace sprintf(). This version of XprZmodem can be compiled with the SAS version 5.10 C Compiler. I do not know how well it might compile with the Aztec compiler.

2.51, 29 Jan 92 - Rxtimeout changed from 600 to 300 for upload timeout problem by John Tillema.

2.52, 06 Mar 92 - Recompile code for 68020 library code. Non-68020 code worked fine but John Tillema was not able to test the 2.51 68020 version.

2.53, ?? ??? ?? - Special Version by Olaf 'Olsen' Barthel Author from "Term" (Don't know what he changed)

2.60, ?? ??? ?? - Don't know who made this version

2.60a, ?? ??? ?? - Don't know who made this version

2.61, 3 July 93 - Rainer Hess made the following changes:

- o NOT RELEASED! ONLY FOR BETATESTER.
-

- o `mysprintf()` in `Utils.c` - returned `int` changed to `unsigned int`. SAS/C gave a Warning about this.
- o In function `XProtocolHostMon()` (module `Utils.c`) declared `static UBYTE startrcv[] = { ZPAD, ZDLE, ZHEX, "00" };` SAS/C 6.x gave an error about this. Declared to:  
`static UBYTE *startrcv[] = { ZPAD, ZDLE, ZHEX, '0', '~'0' };`

2.62, 27 Jul 93 - Rainer Hess made the following changes:

- o NOT RELEASED! ONLY FOR BETATESTER.
- o Now `Blocksize` available

2.63, 30 Jul 93 - Rainer Hess made the following changes:

- o NOT RELEASED! ONLY FOR BETATESTER.
- o Now support `locale.library` to use different languages with `Workbench 2.1, 3.x`. On this time will be only the default `english-language` and a `german catalog-file`. Please send me the filled up `xprzmodem_catalog.ct` for your language.

2.64, 3 Aug 93 - Rainer Hess made the following changes:

- o NOT RELEASED! ONLY FOR BETATESTER.
- o `Blocksize` was global declared, it's now in `struct Vars`.
- o Bug-Fix in function `update_rate()`, machine crashes on little files e.g. 2 Bytes - old problem from 2.52 and before!

3.0, 13 Aug 93 - Rainer Hess made the following changes:

- o It's time to make a full release...

3.1, 01 Oct 93 - Documentation update by Geoffrey Faivre-Malloy

- o Conversion of documentation to `Amigaguide` format.

03 Oct 93 - Changes by Rainer Hess:

- o ZModem runs always with the sender `blocksize` or uses `standart-mode (M1024)` if there is on one system a older `zmodem`.

## 1.23 todo

Here are some features that would be nice for XPRZModem to have sometime in the future. If there are any capable hackers out there that would like to improve upon what has already been written, feel free to do so.

- o Preserve date of file being transferred.
-

- o Investigate possibility of saving file protection bits.
- o Work out ways to increase the transfer speed.
- o Additional changes as time and others may suggest.

## 1.24 credits

Special thanks (in alphabetical order) go to:

Olaf 'Olsen' Barthel

Jim Cooper

Geoffrey Faivre-Malloy

Rainer Hess

Rick A. Huebner

Willy Langeveld

Marco Papa

William M. Perkins

John Tillema

## 1.25 Olaf 'Olsen' Barthel

Who knows what he changed!

## 1.26 Jim Cooper

Supplied the `mysprintf` code.

## 1.27 Geoffrey Faivre-Malloy

Converted XPRZModem documentation to amigaguide format.

## 1.28 Rainer Hess

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Responsible for version 2.61 to 3.1.

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## **1.29 Rick A. Huebner**

Wrote XPRZModem.library! Without him we wouldn't have this wonderful source code to base this on :)

## **1.30 Willy Langeveld**

Invented the XPR version 1.0 and had help from  
Marco Papa  
updating it to  
version 2.0. Willy is the author of the popular telecomm program VLT.

## **1.31 Marco Papa**

Collaborated with  
Willy Langeveld  
in updating the XPR specs from 1.0 to 2.0.

## **1.32 William M. Perkins**

Spent many selfless hours of his life updating XPRZModem (2.50 & 2.52)

## **1.33 John Tillema**

John fixed a bug in 2.51 of the library.

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