

User Guide

XM Control for Polk XRt12

Version 3.1



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Introduction

XM is a satellite-based radio service with over 150 channels of digital music, talk, and entertainment. The Polk XRt12 XM tuner, like all XM receivers, displays current artist and song title information and the channel to which the receiver is tuned. The XM Control application connects to the XRt12 and displays this information on any computer in your house — and lets you change channels as well.



There are two versions of the XM Control application:

- The XM Master program, which runs on the computer that has an RS232 serial connection to your Polk XRt12 tuner.
- The XM Remote program, which runs on any computer in your house, connected to the Master computer by a high-speed home network (wired or wireless).

Connecting the XRt12 to Your Computer

The Polk XRt12 has an RS232 serial connector on its rear panel, which can provide the current song data and permits external devices to change channels. You can connect a serial COM port on a computer to the serial connector on the XRt12 tuner. Then you can run the XM Master application program on the computer, and it will display the artist and song title information and permit you to change channels with a click of your mouse. The XM serial interface operates at 9600 bps, 8 data bits, 1 stop bit, no parity. These parameters are not configurable.

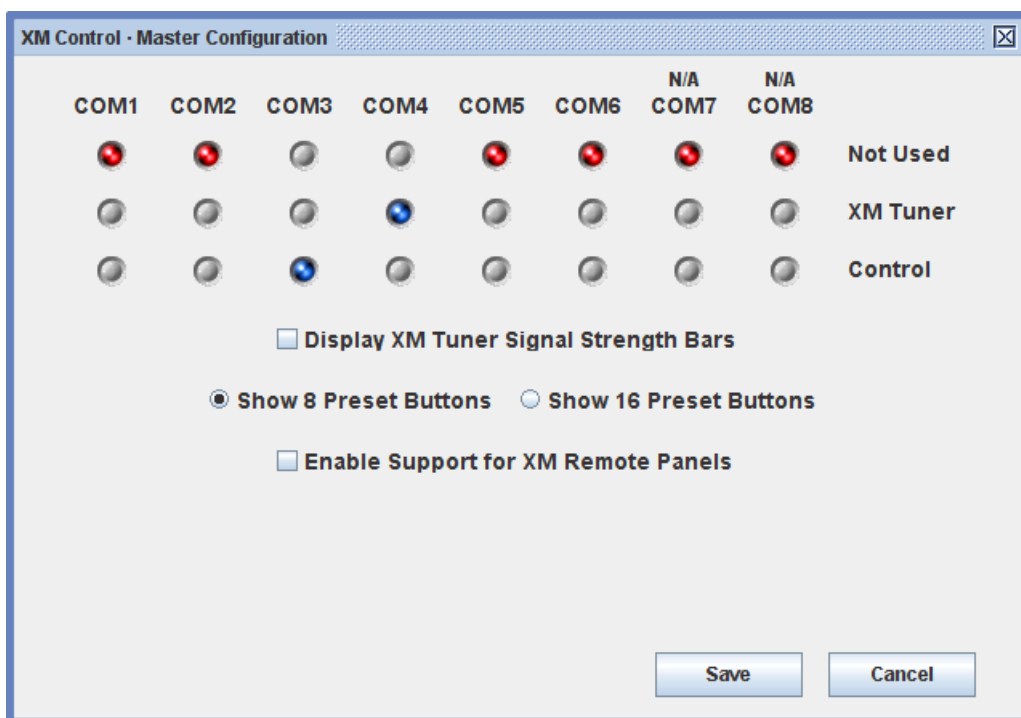


The rear panel of the XRt12 has a male DB9 (9-pin) connector. To connect the XRt12 to your computer, you will need a “straight-through” (1:1) serial cable with

female DB9 connectors on both ends. Probably the easiest way to obtain such a cable is to use a “straight-through” serial cable with a female DB9 connector on one end, a male DB9 connector on the other end, and a female-to-female “gender changer”. You *may* be able to find a ready-made serial cable with female DB9 connectors on both ends, but be careful! Most such cables are actually “null modem” cables, they are not 1:1, and they *will not work!*

XM Master Configuration

When you start the XM Master program for the first time, it will “pop up” the Master Configuration dialog. Enter your hardware configuration options. When you click the **Save** button, the XM Control panel appears. Thereafter, if you need to change the hardware configuration parameters, run the Master Configuration program (found in the XM Control folder, in your Start Menu in Windows or in the Applications folder in Mac OS X). The Master Configuration dialog looks like this:



A few words are in order about each of the configuration options:

XM Tuner

Before saving your configuration, you *must* specify the serial COM port that is connected to your XM tuner (Polk XRt12). In the example above, COM4 has been selected for the XM tuner.

Control

Optionally, you may also specify a second serial COM port that is connected to an automation controller, such as those made by AMX and Crestron. In the example above, COM3 has been selected as a “control” port that connects to a home automation controller.

Display XM Tuner Signal Strength Bars

This option is provided for three reasons:

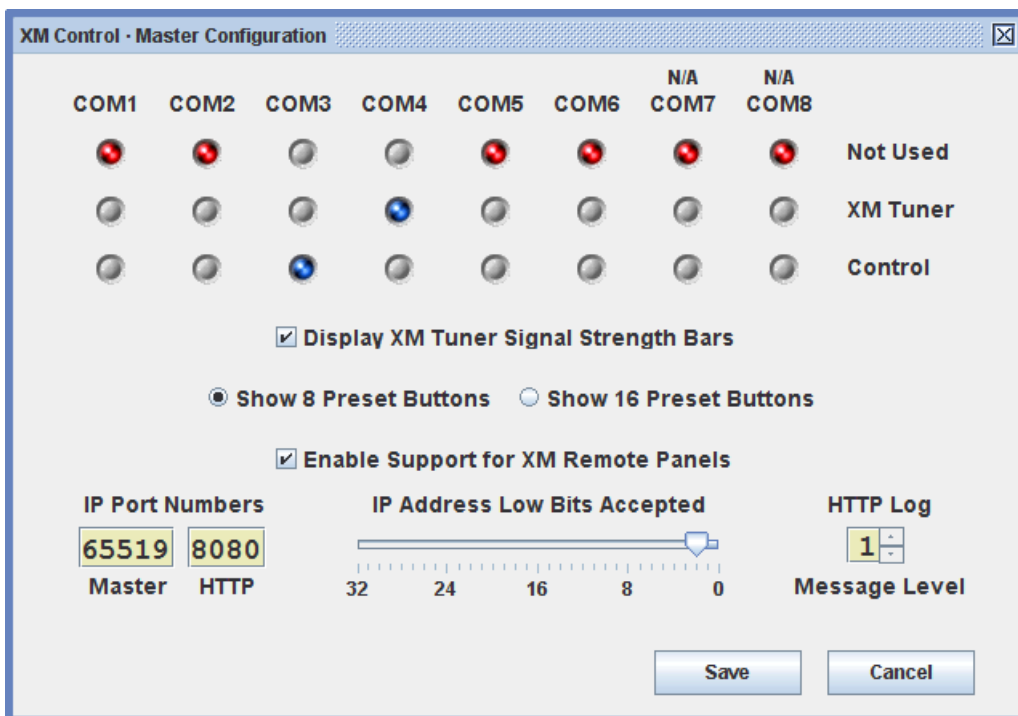
- The Polk XRt12 is not mobile, it is designed for permanent installation in your home. Most likely you have installed the XM antenna in a protected outdoor location (such as under an overhang) or in a window with a clear view of the southern sky. In that case, you probably get consistent, high-quality XM reception and thus do not need to see the signal strength “meter”.
- Activating the signal strength display requires the XM Master program to “query” the XRt12 tuner for the current signal strength value. This is done about once per second. Although this “overhead” is small, it is something that can be eliminated if you really do not need to see the signal strength meter.
- Lastly (and this is the “real” reason for this option), there was a defect in early versions of the XRt12 firmware that caused it to stop responding to the signal strength query (via the RS232 serial port) after some period of operation. This “glitch” happened perhaps three or four times a day, usually after several hours of operation. When it happened, the only “cure” was to power-down the XRt12 and unplug it from the power outlet, then wait a couple of seconds and plug it back in (merely powering the tuner off and then on did *not* fix the problem). Polk eventually released updated firmware that fixed this problem. If you have an older XRt12 tuner that has this defect, contact Polk for an update. The firmware in the Polk XRt12 can be updated via the RS232 serial port.

Show 8 Preset Buttons / Show 16 Preset Buttons

This option determines how many preset buttons are shown on the Master panel. You can choose to show either 8 buttons (one row of buttons) or 16 buttons (two rows of buttons).

Enable Support for XM Remote Panels

If you “check” this option, the Master Configuration dialog changes, to display four additional configuration options. The Master Configuration dialog then looks like this:



In most cases, you will not need to change the default values of the “Remote Support” configuration items. The following explanations will help you understand these options, and whether or not you need to alter them:

IP Port Numbers

The Master version and the Remote version(s) exchange status and control information with each other via a private, proprietary “XM Control IP” protocol. The XM Master uses an IP port to broadcast XM channel, artist, and song title information to the Remote panels. The Remote panels use this same IP port to send “change channel” and “set preset button” commands to the XM Master application. For this Master port, we have picked IP port number 65519, which is a port number that is unlikely to be used by any other application.

In addition to the private “XM Control IP” protocol used to exchange status and control information between the Master and Remote(s), the XM Control Master operates its own simple, highly secure Web server (also known as an “HTTP server”). The “IP Address Low Bits Accepted” option, described below, controls access to XM Control’s HTTP server, as well as to the private XM Control protocol. Furthermore, XM Control’s HTTP server allows access only to certain files within the XM Control product folder and its subdirectories.

XM Control’s HTTP server is active only when the support for remote panels is enabled and the Master is active. It is used to provide support for remote

operation of XM Control by means of a Web page. This is primarily intended for remote operation via PDAs and cell phones that have Web browsers.

The default IP port number for XM Control's HTTP server is 8080, which is the "standard alternate" port number for Web servers. If you prefer to configure the HTTP server to "listen" on port 80, which is the standard port number for Web servers, you may do so; however, be aware that under Linux or Mac OS X it will then be necessary to have "superuser" privileges to start the XM Control Master.

If you have a conflict with another application, or issues with an IP firewall, you might need to change one or both of these IP port numbers. The Master port can be configured for IP port number values from 1024 through 65535; the HTTP port can be configured for any valid IP port number (0 through 65535).



There are three distinct ranges of IP port numbers. Port numbers from 0 through 1023 are called "Well Known Ports"; they are assigned by the Internet Assigned Numbers Authority (IANA). The Well Known Ports are used by "system-level" applications (such as Web servers); on Unix-derived operating systems (which includes Linux and Mac OS X), "superuser" privileges are required for starting applications that "listen" on Well Known Ports. Port numbers in the range 1024 through 49151 are "Registered Ports"; they are listed by the IANA "as a convenience to the community". Many of these numbers are unassigned, so they can be used, but only with caution. Port numbers in the range 49152 through 65535 are called "Dynamic and/or Private Ports"; they are the most appropriate numbers to use for XM Control's IP port.

IP Address Low Bits Accepted

This option is a security measure, intended to prevent access to your XM Control Master by computers outside your home. The default value is "2 bits", which allows access to the XM Control Master by other computers whose IP Addresses are the same as the Master's IP address, except for the low-order 2 bits. That means a set of four IP addresses, near to and including the IP address of the master. If this option is changed to "3 bits", it will allow 8 adjacent IP addresses; "4 bits" will allow 16 IP addresses; and so on.

If you are using a typical Cable Modem Router or DSL Router that does address translation so that all the computers in your house share a single IP address for access to the Internet, then you can just set this option to a large value (such as 16 or even 32) and forget about the "security issue". In that case your home LAN has a "private address space" and IP applications such as XM Control that run on your computers are invisible to the outside world. This option is intended to handle the situation in which your house has its own block of static IP addresses that are externally visible.

HTTP Log Message Level

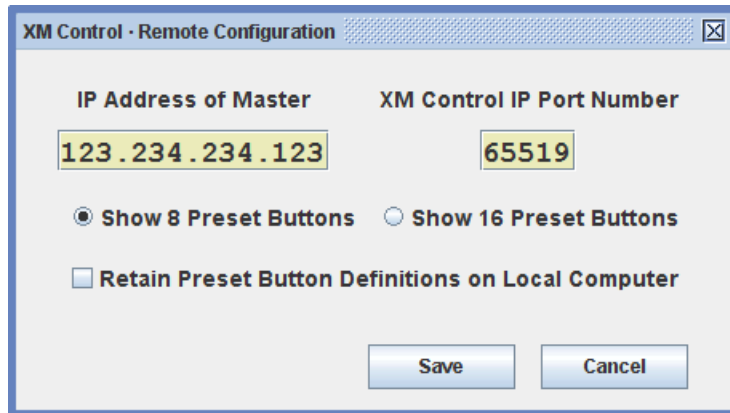
The “HTTP Log Message Level” option controls the minimum “severity level” of the informational, warning, and error messages that XM Control’s HTTP server writes to a file named **HTTP.LOG** in the **LOGFILES** subdirectory of the XM Control product folder. The supported values for this option are from 0 through 3, and they are defined as follows:

Level	Meaning
0	Informational messages. One of these is generated for every file that is successfully retrieved from the HTTP server.
1	Warning messages. A typical example is “not found: <i>filename</i> ”.
2	Ordinary error messages. These describe unusual, but non-fatal conditions involving the IP protocol or reading data files. A typical example is “connection reset by peer”.
3	HTTP server initialization messages. Most of these are error messages for severe conditions that prevent the HTTP server from becoming operational. An example is “no IP address could be found for this server”. However, the informational message for <i>successful</i> initialization of the HTTP server is also set to severity level 3, to guarantee that it will always be written to the log file.

The default value for the “HTTP Log Message Level” option is 1. At this severity level, all messages except level 0 (informational) are written to the log. Note that the “HTTP Log Message Level” option cannot be set higher than 3, so the HTTP server initialization messages are *always* written to the log file.


XM Remote Configuration


When you start the XM Remote program for the first time, it will “pop up” the Remote Configuration dialog. Enter your IP network configuration options. When you click the **Save** button, the remote version of the XM Control panel appears. Thereafter, if you need to change the hardware configuration parameters, run the Remote Configuration program (found in the XM Control folder, in your Start Menu in Windows or in the Applications folder in Mac OS X). The Remote Configuration dialog looks like this:



IP Address of Master

This option specifies the IP address that is assigned to the XM Master computer on your home network. It is advisable to configure your XM Master computer with a *static* IP address rather than a dynamic (or “DHCP”) IP address. Otherwise, the Master’s IP address could change from time-to-time, and your XM Remote computer(s) would no longer be able to contact the Master, since they would no longer be configured with its current IP address.

 Note that the XM Remote program will even operate on the same computer as the XM Master application. While this may not be relevant for “normal use”, it can be useful for testing purposes. In that case, the IP Address of Master can be set to the IP “loopback address” (which is **127.0.0.1**). This might be helpful if you do not recall the actual IP address of the Master computer.

 When you configure the XM Remote program on a genuine “remote” computer, you will need to supply the correct IP address of the Master. (Looking for this information depends on your operating system. In Windows, it is found in the Properties dialog of the TCP/IP object under Network Neighborhood. In Mac OS X, it is found in the Network dialog under System Preferences.)

Another way to obtain the Master’s IP address is to look in the **HTTP.LOG** file in the **LOGFILES** subdirectory of the XM Control product folder. After you have configured the Master for remote support and then closed the Master and re-started it, the Master’s IP address will appear in the “successful initialization” message in **HTTP.LOG**.

XM Control IP Port Number

This option, of course, must be configured to match the value that was specified in the Master Configuration dialog. The default value of this item is 65519, and in most cases, you will not need to change it.

Show 8 Preset Buttons / Show 16 Preset Buttons

This option determines how many preset buttons are shown on the Remote panel. You can choose to show either 8 buttons (one row of buttons) or 16 buttons (two rows of buttons).

Retain Preset Button Definitions on Local Computer

If this option is not “checked”, then when you make a change to the channel that is assigned to a preset button, the new channel assignment is sent to the XM Master, where it is saved, and the XM Master broadcasts the new button definition to all XM Remote computers. In this manner, the preset button channel assignments are “global” — they stay “in sync” among all your XM Control computers (Master and Remote).

However, if you “check” this option, the XM Remote computer saves new preset button definitions locally and does *not* share them with the Master (or other Remotes). This allows you to configure an XM Remote computer with its own individual preset button definitions. In this case, the preset button definitions that are broadcast from the Master (or, indirectly, from other Remotes) are ignored *for those preset buttons that have been defined locally*. Preset definitions broadcast by the Master are still honored, however, for any preset buttons that have *not* been explicitly redefined on the XM Remote computer. In this way, it is possible to have a mixture of preset buttons with “local” and “global” definitions.

Log File

The **HTTP.LOG** file is always written when XM Master is configured for remote support and is made active. This file, and how to control the volume of messages that are written to it, was discussed in the section entitled **XM Master Configuration**. Note that XM Control always appends new messages to the end of the HTTP server log, so it always grows larger, it is never erased. From time to time, you may want to take a look at this file and then delete it, so that it becomes “small” again. (It is okay to delete the **HTTP.LOG** file, even while XM Master is active.)

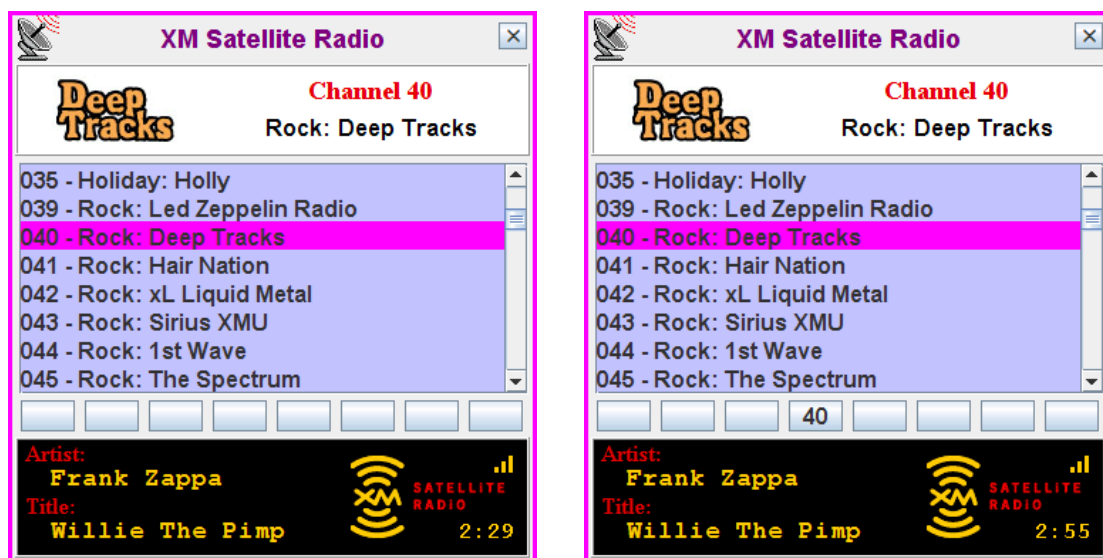
If you are running a remote-enabled XM Master on a computer with an IP address that is visible externally (on the Internet), the **HTTP.LOG** file will occasionally contain warning and error messages resulting from attempts to “break in” to your computer. These attempts are usually generated by automated “bots” that are trying to install malicious software (virus, Trojan Horse, *etc.*) on your computer. They will not succeed! (At least, not when they are dealing with *our* HTTP server.)

Setting Preset Buttons

The preset buttons on the XM Master and XM Remote panels are initially “blank” (undefined). They are set in a manner that is similar to the way that preset buttons are set on most automobile radios:

1. Using the scrollable list of channels, select the channel that you want to assign to a preset button.
2. Using your mouse, click the desired preset button and hold it for two seconds. After two seconds, you will hear an audible “beep”.
3. Release the mouse button. The preset button will now be set to the desired channel, and the channel number will be displayed on that button. The channel category and channel name will also appear as a “tool tip” when the mouse pointer is located over that preset button.

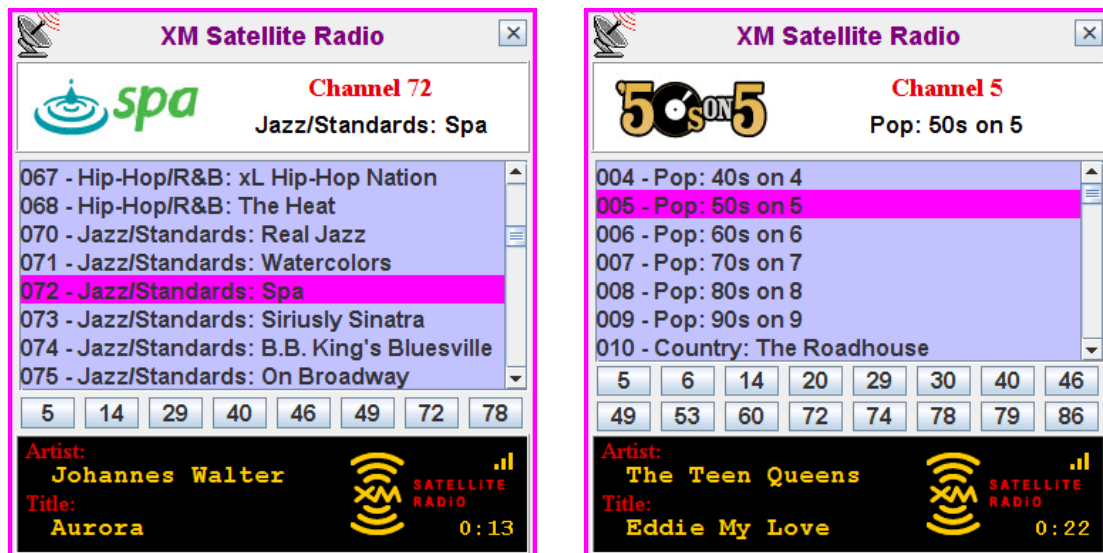
The following example shows an XM Control panel before and after setting the first preset button:



The preset buttons can be cleared by deleting the file named `BUTTONS.OBJ` in your XM Control product folder. This will clear all the preset buttons — there is no way to clear an individual button, but individual buttons can be reset to different channels at any time.

Operation

Both applications (XM Master and XM Remote) look and function identically. When configured for **8 Preset Buttons** or for **16 Preset Buttons**, they both look like this:



Operation of the XM Control panel is completely self-explanatory. Use your mouse to scroll the list of available channels. (No keyboard interface is provided.) As your mouse moves over the channel names in the list, a more detailed description of each channel will appear as a "tool tip". Click your mouse on the channel that you want to hear, and the XRt12 XM tuner will instantly change to that channel.

Cell Phone and PDA Support

When XM Master is configured for remote support, it operates a "personal Web server" that you can access from any cell phone or PDA that has a Web browser. To access this Web server, you must enter the IP address of the XM Master computer (the same IP address that you configure in the XM Remote configuration dialog). Typically, you must append the port number 8080 to this IP address. The file name **xm.htm** completes the URL that you enter into the Web browser. A complete URL looks like this:

http://12.34.43.21:8080/xm.htm

The following example shows the typical appearance of this Web page on an Apple iPhone:



In this example, there are 9 preset buttons represented by XM channel icons. These buttons “follow” the settings of the preset buttons on your XM Master. They are updated automatically when the preset buttons are redefined on the XM Master (or on an XM Remote that is configured to transmit its preset button settings to the XM Master).

The preset buttons on the Web page interface cannot be set independently from the XM Master. In particular, the preset buttons on the Web page interface cannot be set or reset on the Web page interface itself.

Note: To set all 9 buttons in the default template (shown at left), you will need to configure the XM Master for 16 buttons, at least temporarily. You can then re-configure the XM Master for 8 buttons, if desired. The Web interface will continue to display up to 16 buttons.

You can change the appearance of the XM Control Web page by editing the template file named **XM.HTM** in your XM Control product folder on the XM Master computer. All you need is to know a little HTML!

For your convenience, a number of pre-coded template files are included in the XM Control product. Some templates use text buttons (displaying the channel number), and some templates use XM channel icon buttons (as shown above). The sample template files all have self-describing names, and their names all end with the extension “.htm”. All that you need to do to change the template is to copy the desired template to the file named **XM.HTM** in your XM Control product folder. As shipped, the **XM.HTM** file contains the template with 9 XM channel icon buttons (as shown in the example above).

Serial Control Interface

If you have an automation controller, such as those made by AMX and Crestron, you can configure a second COM port on your computer as a Control port. This provides an interface between XM Master and the automation controller. Using this interface, panels (typically, touch screens) attached to the automation controller can display channel, artist, and song title information for the selection currently playing on your XM tuner. The automation controller's panels can also provide buttons or other controls that let you change the channel on your XM tuner. An automation controller can send commands that change the channels assigned to the preset buttons in XM Master and XM Remote.

Command messages flow from the automation controller to XM Master. Status messages flow from XM Master to the automation controller. There is no synchronous relationship between command messages and status messages. An invalid command is simply ignored, there is no error message in response. A valid command may have no response (for example, if it selects the channel that is already being received by the XM tuner) or it may indirectly produce several status messages (which contain new channel, artist, and song title information). The automation controller can receive status messages when no command has been issued (for example, when the current song changes, or the channel is changed by some other method).

The Control port interface operates at 38400 bps, 8 data bits, 1 stop bit, no parity. These parameters are not configurable. Special programming in your automation controller is required to use this interface. Details of the serial control interface protocol follow.

IP Interface

XM Remote uses a private IP protocol to communicate with XM Master. This IP protocol normally uses IP port 65519, but it can be configured to use a different port number.

As with the serial control interface, command messages flow from the XM Remote to the XM Master. Status messages flow from the XM Master to the XM Remote. There is no synchronous relationship between command messages and status messages. An invalid command is simply ignored, there is no error message in response. A valid command may have no response or it may indirectly produce several status messages. The XM Remote can receive status messages when no command has been issued.

The private IP protocol is very similar to the serial control interface. In fact, the commands have the same format and the command sets are nearly identical. Unlike the serial control interface, the IP interface can easily be used by programs running on the same computer as the XM Master. Details of the IP interface protocol follow.

Serial and IP Interface Details

General Considerations

All command messages and status messages are in text format (no binary data is involved). Each message consists of a single line of text, ending with a “line termination character”. For the serial control interface, the line termination character on all messages (command and status) is the Carriage Return character (hexadecimal code 0D or decimal code 13). For the IP interface, the line termination character on all messages (command and status) is the Line Feed character (hexadecimal code 0A or decimal code 10). All text characters are in the extended ASCII character set known as “Windows Code Page 1252” (which means that accented foreign letters may be present, as well as uncommon special characters such as “™”).

All serial command messages and serial status messages begin with a two-character prefix, which consists of the uppercase letters “**XM**”. This two-character prefix is *not* present in the IP command and status messages.

Command Messages

Command messages consist of a string of characters of text, followed by the required line termination character. In the case of the serial interface, the command string is prefixed by the two uppercase letters “**XM**”, and there are no blanks or other padding between the two-character prefix and the command string. The supported command strings are defined as follows:

Command String	Function
?	Query. XM Master will respond by sending a series of status messages that specify the current signal quality, channel, artist, and song title information. Serial interface only (the IP interface automatically sends a complete set of status messages upon connection to the Master’s IP port).
<i>nnn</i>	Select channel. The string <i>nnn</i> consists of one to three text digits that specify the requested channel. Valid channel values range from 1 to 255 . Leading zeros are okay (for example, 4 , 04 , and 004 are equivalent).
Bmm <i>nnn</i>	Set button <i>mm</i> to channel <i>nnn</i> . The string <i>mm</i> consists of one or two text digits that specify the button. Valid button values range from 1 to 16 . The string <i>nnn</i> consists of one to three text digits that specify the channel. Valid channel values range from 1 to 255 . There must be exactly one blank between Bmm and <i>nnn</i> .

Serial Control Status Messages

Serial status messages have the format "**XMstext**", followed by the required Carriage Return, where the status code **s** is a single uppercase letter and **text** is a string of text characters. No blanks or other padding are present between **XM** and the status code or between the status code and **text**. The supported serial control status messages are defined as follows:

Status Code	Text
Q	Signal quality. The text is a single digit character, from 0 (no signal) through 3 (good signal). When XM Master is not configured to display signal strength, the quality value in this message will always be 0 .
I	Channel number. The text is a string of zero to three text characters.
C	Channel category. The text is a string of 0 to 16 text characters.
N	Channel name. The text is a string of 0 to 16 text characters.
A	Current artist name. The text is a string of 0 to 16 text characters.
T	Current song title. The text is a string of 0 to 16 text characters.
B	Current preset button definition. The text is a string of the form mmnnn , where mm is the button number (exactly two digits, left-padded with a zero if necessary) and nnn is the assigned channel number (exactly three digits, left-padded with zeros if necessary). There is no blank between mm and nnn .

IP Interface Status Messages

IP protocol status messages have the format "**stext**", followed by the required Line Feed, where the status code **s** is a single letter (uppercase or lowercase) and **text** is a string of text characters. No blanks or other padding are present between the status code and **text**.

The only situation in which the status code **s** is a lowercase letter is when an XM Remote program makes initial contact with the XM Master, using the IP protocol. At initial contact, a complete set of status messages is sent to the IP Remote, with all of the status codes changed to lowercase, except for the "time" message with status code **S**.

The “time” message always has an uppercase status code **S**, and it flows only in the IP protocol and only at initial contact (it is not used in the serial control protocol). The purpose of the “time” message is to permit the XM Remote program to display the correct elapsed time for the selection that is playing at initial contact. Thereafter, the XM Remote program resets its elapsed time counter to zero whenever it receives any of the other status messages (with an *uppercase* status code), except when it receives the messages with status codes **Q** and **B**.

The supported IP interface status messages are defined as follows:

Status Code	Text
Q	Signal quality. The text is a single digit character, from 0 (no signal) through 3 (good signal). When XM Master is not configured to display signal strength, the quality value in this message will always be 0 .
I	Channel number. The text is a string of zero to three text characters.
C	Channel category. The text is a string of 0 to 16 text characters.
N	Channel name. The text is a string of 0 to 16 text characters.
A	Current artist name. The text is a string of 0 to 16 text characters.
T	Current song title. The text is a string of 0 to 16 text characters.
B	Current preset button definition. The text is a string of the form mm nnn , where mm is the button number (one or two digits) and nnn is the assigned channel number (one to three digits). There is exactly one blank between mm and nnn .
S	Time since the selection last changed, in milliseconds.

Web Browser Interface

When XM Master is configured for remote support, it operates a “personal Web server” that you can access from any Web browser. The file named **XM.HTM**, located in the XM Control product folder, is an *HTML template* that is used by XM Master to generate a dynamic Web page. This file consists of ordinary HTML, augmented by *fill field codes* in the format “%**dd**”, where the characters **dd** are two decimal digits. This template scheme permits XM Master to insert a considerable amount of unique data into the HTML files that it sends to Web browsers. The supported fill field codes are shown in the following table:

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Fill Code	Inserted Text
%00	IMAGES/XM <i>nnn</i> .GIF , where <i>nnn</i> is the current XM channel number (three digits, left-padded with zeros if necessary). This text is the path to the logo image file for the current XM channel. Inserts IMAGES/xm.gif if the current channel number has not been set.
%01	Channel <i>nnn</i> , where <i>nnn</i> is the current XM channel number (one to three digits). Inserts a string of length 0 if the current channel number has not been set.
%02	ccc: xxx , where <i>ccc</i> is the current channel category (1 to 16 text characters) and <i>xxx</i> is the current channel name (0 to 16 text characters). Inserts <i>xxx</i> alone if the current category string is of length 0.
%03	An HTML-format selection option list of all channels in the XM lineup. The HTML select tag preceding this list should specify a name="channel" attribute. Each item in the list has the format <option value="nnn">nnn - ccc: xxx</option> , where <i>nnn</i> is an XM channel number (three digits, left-padded with zeros if necessary), <i>ccc</i> is the corresponding XM channel category, and <i>xxx</i> is the corresponding XM channel name. In this list, the option tag generated for the currently-selected XM channel contains the selected attribute.
%04	Current artist name. The text is a string of 0 to 16 text characters.
%05	Current song title. The text is a string of 0 to 16 text characters.
%11 ... %26	<i>nnn</i> , where <i>nnn</i> is the XM channel number (one to three digits) currently assigned to preset button number 1 through 16 (respectively). This text can be used to generate a channel selection command, when used on an HTML submit button with tag attributes name="channel" and value="%dd" .
%41 ... %56	xm <i>nnnn</i> , where <i>nnn</i> is the XM channel number (three digits, left-padded with zeros if necessary) currently assigned to preset button number 1 through 16 (respectively). This text can be used to generate a channel selection command, when used on an HTML image button with a name="%dd" tag attribute.
%71 ... %86	IMAGES/XM <i>nnn</i> .GIF , where <i>nnn</i> is the XM channel number (three digits, left-padded with zeros if necessary) currently assigned to preset button number 1 through 16 (respectively). This text is the path to the logo image file for XM channel <i>nnn</i> .