




**MX Control**  
Reflash Tool  
& Procedure Manual

*The Leader In*  
***Solid State Motor Control***  
*Technology*





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# 1 Introduction

# INTRODUCTION

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## **General Information**

The MX Control card may be upgraded via a PC and the Benshaw Reflash Tool software. This is accomplished by using flash memory technology contained on the card. New software features can be “flashed” into existing products, which allows the product to be upgraded to the newest feature set available.

## **Manual Overview**

This manual provides information on product, personal computer (PC), and software requirements to upgrade reflashable products. Connection diagrams for using stock Benshaw Inc. products are also provided, as are detailed instructions for configuring and operation the Reflash Tool. This manual assumes that the user has a working knowledge of Microsoft Windows® operating systems and PC hardware connections. Please refer to Microsoft’s documentation for information regarding the operation of the particular Windows® system being used. Refer to your PC’s documentation for information about your specific hardware configuration.

## **Related Documents**

890023-00 – RediStart Soft Starter RBX or RCX Power with MX Control

## **Publication History**

Please see page 16 of this manual for further information concerning the Publication History.

## **2 Requirements**

# REQUIREMENTS

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Certain equipment and software requirements are necessary to flash new firmware. This section details the hardware and software requirements for flashing all reflashable Benschaw products including the MX Control card.

## 2.1 PC Requirements

The Reflash Tool has been designed to operate with Windows® 95, Windows® 98, Windows® Me, Windows® 2000 and Windows® XP. The following PC hardware requirements are also recommended:

- Pentium (or equivalent) processor or greater.
- 32 MB (minimum) of RAM.
- RS-232 serial port

## 2.2 RS-232 to RS-485 Protocol Converter

Reflashing of the MX Control card is accomplished through its RS-485 port. However, the standard serial ports provided on PCs use the RS-232 protocol. A protocol converter is required to convert from RS-232 to RS-485. Many third party protocol converters may be used. However, the operating system of the PC may affect which protocol converter can be used.

Since RS-232 is a full duplex protocol and RS-485 is a half duplex protocol, the converter must somehow know when to enable the RS-485 driver in order to transmit on the RS-485 side and when to disable the RS-485 driver in order to receive from the RS-485 side. Converters generally do this with one of two different methods; “RTS” controlled or “Automatically” controlled.

“RTS” controlled 485 drivers utilize the Request To Send (RTS) line from the RS-232 side of the converter to determine when to enable and disable the 485 driver. This requires that the software controlling the RS-232 port (the PC software) control the RTS line with each transmission.

“Automatically” controlled 485 drivers generally turn on the 485 driver when the RS-232 side transmits the first bit, and then turn off the 485 driver some time after the RS-232 side stops sending bits. This is sometimes referred to as the turn-off delay. Some converters have a fixed turn-off delay, and others have a configurable turn-off delay. Configurable ones may be set either by specifying the baud rate, or by specifying a time period. In either case, for proper operation, the 485 driver must not turn off before the RS-232 transmission completes, but it must turn off before the device on the RS-485 side sends a response message.

The Reflash Tool does not control the RTS line with each transmission. Therefore, only RS-232 to RS-485 converters with a means of “Automatic” 485 driver control may be used. When the MX Control card receives a message from the Reflash Tool, it will respond with a message no sooner than 1 millisecond. The Reflash Tool begins communication with the MX Control card at 9,600 bps, but then increases the baud rate to 38,400 bps. So, if the RS-232 to RS-485 converter used has a configurable turn-off delay, it should be set for 9,600 baud or anywhere between 0.1 and 1 milliseconds.

The RS-485 port on the MX Control card used for reflashing is optically isolated. Therefore, it is not necessary for the RS-232 to RS-485 converter to be optically isolated. This allows less expensive, port-powered converters to be used.

## 2.3 B&B Electronics RS-232 to RS-485 Converter

Benschaw has used and has had success with converters from B&B Electronics Manufacturing Company ([www.bb-elec.com](http://www.bb-elec.com)). They use the term Send Data (SD) control for their converters with the “Automatic” 485 driver control. The particular model that’s been used by Benschaw is the 485SD9TB. It’s a port powered converter with a DB9 connector on the RS-232 side and a terminal block on the RS-485 side.

## 2.4 Quatech USB and PCMCIA Serial Converters

Many new laptop computers are being manufactured without RS-232 serial ports in order to reduce size and weight. They do however have USB ports and PCMCIA card slots. USB to RS-232 converters are readily available and can be used to connect to an RS-232 to RS-485 converter. Alternatively, either a USB to RS-485 converter or a PCMCIA card with an RS-485 port may be used. Benschaw has used and has had success with devices from Quatech ([www.quatech.com](http://www.quatech.com)). Their USB to RS-485 converter is model DSU-200/300 and provides two RS-485 ports. Their PCMCIA card is model SSP-200/300 and provides one RS-485 port. The devices must be configured for half-duplex mode and auto toggle of the 485 driver.

# **3 Connecting to the MX Control Card**



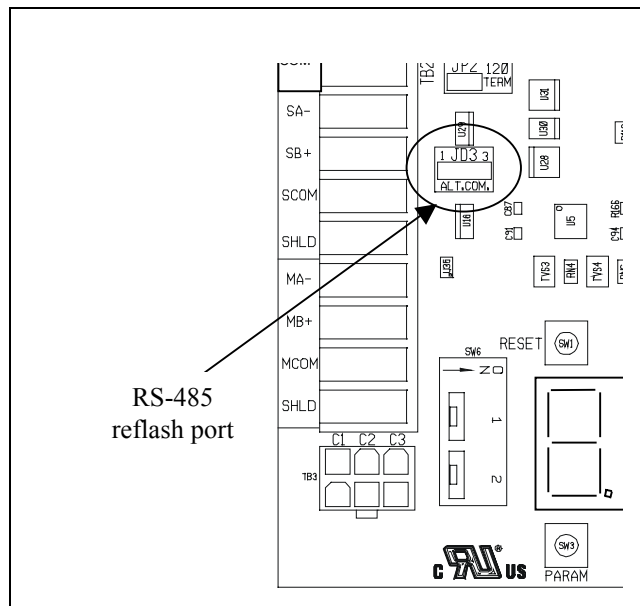
# CONNECTING TO THE MX CONTROL CARD

## 3.2 Connecting to the MX Through the Quick Connect Header

The same reflash port that is available on the terminal strip is also available on a quick connect, three-pin header. A custom cable can be assembled to connect to this header. The header is label JD3 on the card. Pin 1 is on the left and Pin 3 is on the right. The pin designations are as follows:

JD3	
Pin Number	Description
1	RS-485 A signal (also known as -)
2	RS-485 B signal (also known as +)
3	RS-485 Common

Figure 2 – RS-485 Reflash Port on Quick Connect Header



The three-pin header is standard 0.1 inch spacing. Parts may be ordered from Digi-Key or any other similar supplier to create a custom cable to connect to this header. Following are some example parts from Molex.

Description	Part Number
C-Grid Crimp Connector Housing	50-57-9003
C-Grid Box Crimp Terminals (22-24 AWG)	16-02-0102
C-Grid Box Crimp Terminals (24-30 AWG)	16-02-0096



## **4 Using the Reflash Tool**

# USING THE REFLASH TOOL

## 4.1 Installation

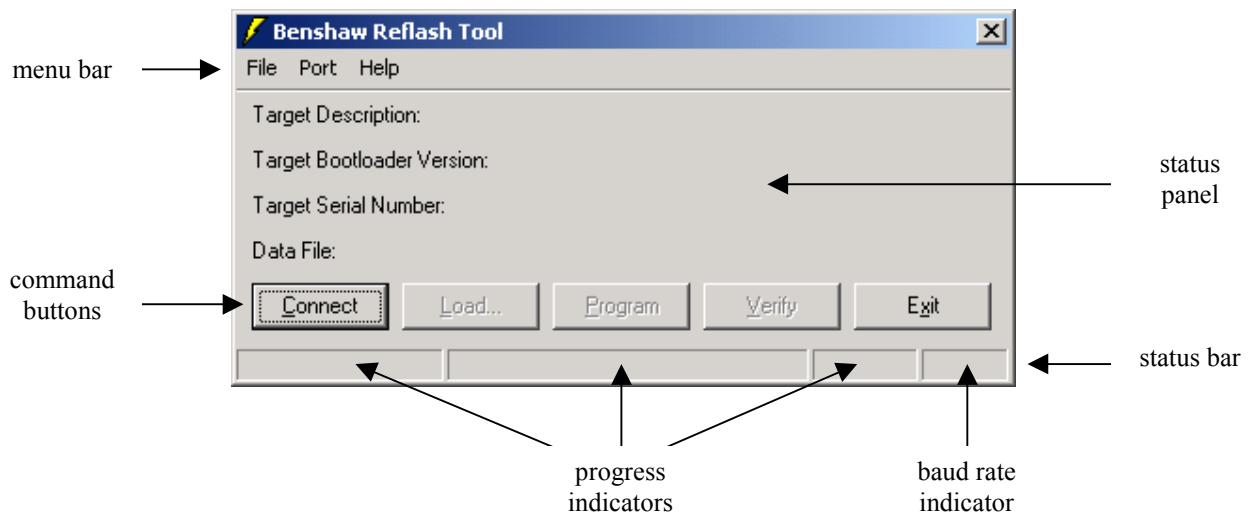
Contact Benschaw to obtain the Reflash Tool. Uninstall any previous version of the Reflash Tool before installing a new version. Previous versions may be uninstalled by clicking on the Start Menu, selecting Settings and Control Panel. Then double-click on the Add/Remove Programs icon. Select the “Benschaw Reflash Tool” from the resulting list and then click the Change/Remove or Remove button.

To install the Reflash Tool, simply run the setup.exe program provided with the installation and follow the prompts on the screen.

## 4.2 Overview

The installation program creates a group called “Benschaw” in the start menu containing an icon for the Reflash Tool. Start the Reflash Tool by clicking this icon. The Reflash Tool consists of a single, simple to use screen.

Figure 3 – Reflash Tool Screen



### Command Buttons

The command buttons provide a quick means of completing all of the steps involved in reflashing the MX Control card. There are four steps to reflashing the card and the buttons are arranged from left to right in the order of the steps to be followed.

### Status Panel

The Reflash Tool refers to the device to be reflashed as the “Target”. In this case the target is the MX Control card. After connecting to the MX Control Card, information about the card is displayed in the status panel. Also, after a data file is loaded, the file name is displayed in the status panel.

### Status Bar

The status bar is divided into four sections. The first three sections on the left provide progress indication. The first indicates what action is currently being taken or has just occurred. The second is a progress bar graph. The third indicates which block of flash memory is being programmed or verified. The fourth section indicates the baud rate at which the Reflash Tool is communicating to the MX Control card.

### Menu Bar

All of the commands available with the command buttons are also available through the File menu on the menu bar. Also in the File menu is a list of recently loaded data files. The menu bar also allows a different serial port to be selected (COM1 through COM4) and provides access to a Help About... screen which displays the version number of the Reflash Tool.

### 4.3 Reflashing Procedure

Be aware that upgrading the software in an MX Control card may or may not cause parameter values to be lost depending on the differences in the old and new software. Be sure to record the parameter values before beginning the reflash process if necessary.

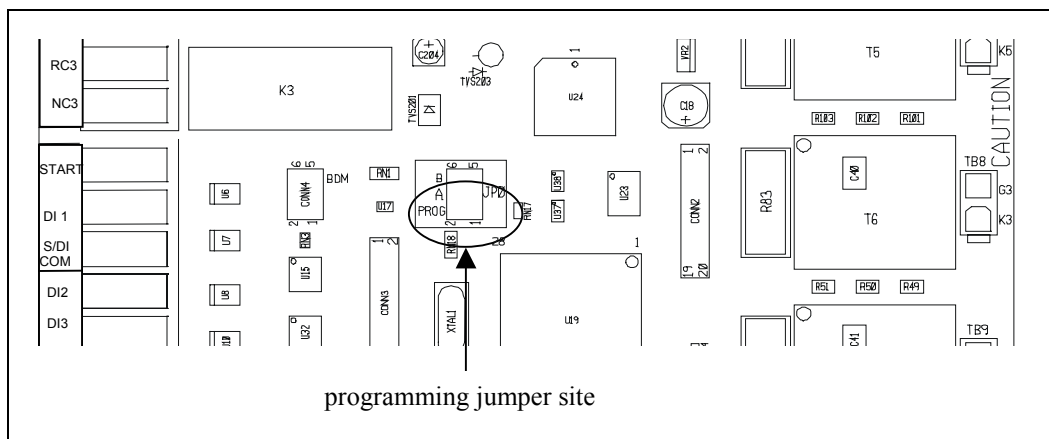
Reflashing of the MX Control card is accomplished with four sequential commands to the Reflash Tool. But first, the MX Control card must be placed in reflashing mode. Once it is in reflashing mode and the PC has been connected to the card's RS-485 reflashing port, then the four commands may be executed. First, the Reflash Tool must establish a connection the MX Control card. Then, the data file to be programmed is loaded into the Reflash Tool. Then the flash memory is programmed through the serial port. And finally, the programming is verified through the serial port.

#### 4.3.1 Entering Reflash Mode

Before the MX Control card can be reflashed, it must be placed in the reflashing mode. To do this, remove control power from the card and install a jumper on the two header pins 1 and 2 labeled "PROG" at the bottom of jumper site JP0. Reapply control power to the MX Control card. The 4-digit, display on the card will display *FLSH*. If a remote display is attached to the card, it will not be active.

Note: If a jumper is not available, one from either the Analog Output configuration (JP1) or the Analog Input configuration (JP3) may be used. Just be sure to return the jumper to its original location after reflashing is complete.

Figure 4 – "PROG" Jumper on MX Control Card



Depending on the software already programmed into the MX Control card, there may be a second method of entering reflash mode. If the software contains a Misc Command parameter, setting that parameter to "Reflash Mode" causes the MX Control card to enter reflash mode without having to cycle control power to the card. Refer to the manual for the particular software residing in the MX Control card for details of the Misc command parameter.

#### 4.3.2 Establishing a Connection

Once the MX Control card is in reflash mode, either click the Connect button or select Connect from the File menu to establish a connection between the Reflash Tool and the MX Control card. When a connection is established, the Reflash Tool verifies that a programmable target card is attached and in reflash mode and negotiates the fastest baud rate possible. In the case of the MX Control card, the baud rate is 38,400. The baud rate is displayed in the very right section of the status bar at the bottom.

After a connection is established, the Reflash Tool retrieves information from the target including a description, a serial number and the version of the bootloader software residing in the target. This information is then displayed in the status panel. Depending on the variation of the MX Control card, the description may be "D3", "ID3", "PD3" or something else.

## USING THE REFLASH TOOL

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### 4.3.3 Loading a Data File

Once a connection has been established, the data file to program into the MX Control card must be loaded. Either click the Load button or select Load from the File menu to browse for a data file to load. Data files for the MX are provided in Motorola S-Record format with a .s19 extension. In the resulting Load Data File dialog box, be sure to select the proper file type from the drop down list at the bottom of the box.

Alternatively, a recently loaded file may be selected from the File menu and loaded without having to browse for the file with the Load Data File dialog box.

### 4.3.4 Programming the Flash

Once the data file has been loaded, the MX Control card may be programmed. Either click the Program button or select Program from the File menu to begin the programming step. During this step, the status bar at the bottom of the Reflash Tool indicates the progress with a bar graph. While this step is executing, the 4-digit display on the MX Control card displays *PROG*. When the programming step is complete, the display on the MX Control card displays *DONE*.

Note: Users who are familiar with reflashing other products may be aware that on some products, the programming step is a critical step and the loss of power during this step can cause an irrecoverable failure. The MX Control card is more robust and contains checks that allow it to recover if power is lost during the programming step. If this occurs, the MX Control card automatically enters the reflash mode when power is reapplied and the reflashing procedure may be repeated from the beginning.

### 4.3.5 Verifying the Flash

After the MX Control card has been reflashed with the Program command, the flash memory may be verified to ensure that no errors occurred. The programming step utilizes a checksum with each packet of data sent to the MX Control Card, so the likelihood of a verification failure is low. However, flash memory can have defects or wear out, so it is recommended to perform verification anyway. The verification process reads the data from the flash memory out of the MX Control Card and compares it against the data loaded from the data file.

Either click the Verify button or select Verify from the File menu to begin the verification step. During this step, the status bar at the bottom of the Reflash Tool indicates the progress with a bar graph. While this step is executing, the 4-digit display on the MX Control card displays *VERIFY*. When the verification step is complete, the display on the MX Control card displays *DONE*.

### 4.3.6 Resetting the MX Control Card

After reflashing the MX Control card, the card must be reset in order to exit the reflash mode. To reset the card, remove the "PROG" jumper and then cycle control power. When cycling control power to the card, the power must remain off for approximately five seconds to ensure a proper reset.

Be aware that upgrading software in an MX Control card may or may not cause parameters values to be lost depending on the differences between the old and the new software. If this is the case, then a Fault 95 will occur when the card is reset. To recover from a Fault 95, the PARAM and ENTER buttons must be held down while resetting the card. This causes parameters to be set to their default values.

Before returning the MX Control card to normal operation, verify that all of the parameters have be set to their proper values.

# 5 Troubleshooting

# TROUBLESHOOTING

## 5.1 Reflash Tool Error Messages

If any step in the reflash process fails, the Reflash Tool will display a message describing the failure. Following are the possible errors reported by the Reflash Tool, causes for the errors and possible solutions.

Error Message	Cause/Solution
Could not open COM1	The specified serial port could not be opened either because the port does not exist, or because some other application has control of the port. Make sure no other application is running which may have control of the port, or select a different port. To select a different port, pick one from the Port menu in the menu bar.
Could not connect to target. Verify that the target is connected and in reflash mode.	<p>The Reflash Tool could not establish communications with the MX Control card. Possible reasons are; the card is not in reflash mode, the wrong serial port is selected, the RS-232 to RS-485 converter is not configured properly, or the RS-485 signals are not wired properly.</p> <p>Verify that the card is in reflash mode. The display on the card should show <i>FLASH</i>.</p> <p>Also, there are two LEDs on the card to aid in diagnosing communications over the RS-485 port. They are labeled “TX” and “RX” and they are below the LED labeled “CPU”. When the MX Control card receives bytes, the “RX” LED flashes green. When the card transmits bytes, the “TX” LED flashes red. If the “RX” LED is on solid green, this may indicate that the RS-485 A and B signals are wired backwards. If the “RX” LED does not blink at all when attempting to connect to the card, then either the wrong serial port is selected, or the RS-232 to RS-485 converter is not configured properly.</p>
The S-Record file contains data at address X on line Y, which is not supported by the target.	<p>When the Reflash Tool establishes a connection with the MX Control board, it asks the board for its range of addresses for the flash memory. When a data file is loaded that contains data outside of the card’s flash address space, then this message is produced. This message specifies the invalid address and which line of the data file contains the invalid address. Although Retry and Ignore are presented as options, continuing to program the MX with a data file containing invalid addresses will result in a card that won’t run (although it can still be reflashed).</p> <p>There are various versions of the MX Control card, each with a different memory map. The data files provided will only work with a specific version of the card. Contact Benschaw to ensure that you have the correct data file for the MX Control card to be reflashed.</p>
Checksum failure on line X. Continue Loading?	When the Reflash Tool reads the data file, it verifies the checksums that are contained in the file. If a checksum fails, this message is produced. Contact Benschaw to ensure that you have the correct data file.
Record length failure on line X. Continue Loading?	When the Reflash Tool reads the data file, it verifies the record length that is contained in each line of the file. If a record length does not match, this message is produced. Contact Benschaw to ensure that you have the correct data file.
Communications lost with target.	Communications was lost with the MX Control card either during a Program or a Verify operation. This could be due to the communications cable becoming disconnected at some point or the MX Control card losing power. Simply reconnect the cable or reapply power and issue a Connect command again. The data file does not need to be reloaded. The Program or Verify command can then be issued.
Verify error at address X. Byte in target is Y. Byte in buffer is Z. Continue verifying?	<p>This message is produced when the Verify operation fails. If attempts to reflash the board continue to fail, contact Benschaw.</p> <p>The flash memory in the MX Control card has a lifetime of 10 years. If the card is older than this and reflash attempts continue to fail, contact Benschaw about obtaining a replacement card.</p>

## 5.2 Other Symptoms

The following table describes other problems that may occur and possible solutions.

Symptom	Cause/Solution
The display stops responding when reflash mode is entered.	When the MX Control card is placed in reflash mode, only the display on the card is operational. Remote displays are not operational.
After reflashing the card and resetting it, the card appears dead. The display is blank and the "CPU" LED does not blink.	<p>This can occur when an MX control card is flashed with the wrong software. There are various versions of the MX Control card. Although it may be possible to program the card with the wrong data file, the data files provided will only work with a specific version of the card.</p> <p>Specifically, this will occur when an MX Control card with a part number of BIPC-300050 is programmed with software intended for MX Control cards with part numbers of BIPC-300043.</p> <p>Contact Benschaw to ensure that you have the correct data file for the MX Control card being reflashed.</p>

**Revision History**

Revision	Date	ECO#
00	04/12/2004	Initial release
01	04/23/2004	E0796



# BENSHAW PRODUCTS

## Low Voltage Solid State Reduce Voltage Starters

- ◆ RSD/RSM6 – SSRV Non or Separate Bypass
- ◆ RDB/RMB6 – SSRV Integral Bypass
- ◆ RSM7 – SSRV + DC Injection Braking
- ◆ RSM10 – SSRV + Reversing
- ◆ RSM11 – SSRV + DC Injection Braking + Reversing
- ◆ RSM10/12TS – SSRV Two Speed
- ◆ WRSM6 – SSRV Wound Rotor
- ◆ SMRSM6 – SSRV Synchronous
- ◆ DCB3 – Solid State DC Injection Braking
- ◆ RBX/RBM – SSRV with Integral or Separate Bypass
- ◆ RCX/RCM – SSRV Non Bypassed

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- ◆ 18 Pulse/IEEE 519 Compliant Drives

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