ROMXce
Apple IIe, IIc

User Guide

JD MICRO

Contents

ROMXc/e Overview

Thank you for purchasing ROMXc and/or ROMXe! We hope that you have some fun playing around with different ROM images, and maybe even have a go at ROMifying some utilities/games/applications to share!

We will be sharing tools, ROM images, and related documentation at www.theromexchange.com – be sure to check the site regularly for updates.

This user guide documents the features available on ROMXc/e for firmware version 1.00. If you have an earlier version of the firmware installed, we recommend updating your firmware to the current release.

ROMXc/e are in-system programmable devices that replace the system ROM(s) in your Apple IIc or Apple IIe computer. They store up to 15 ROM images and present them for selection via an on-screen menu system. In addition, the menu system itself (the ROMX firmware) is programmable in-system.

Being in-system programmable means that you can re-program ROMXc/e with your own ROM images without removing the device from your computer, and without need for an external programmer. Uploading of new ROM images is done through either the ROMX menu, or by running the ROMXCE.DISK utility from the ROMXce Utility DIsk image. The firmware is also upgradeable using the same process.

A ROM image doesn't have to be a system ROM! We've ROMified DOS images as well as games and utilities. Linking a System ROM image to a DOS image means you can boot DOS *instantly*. ROMified games also load instantly. There are also a number of diagnostic ROM images available.

ROMXc/e have an on-board real-time clock with battery backup. A custom clock driver has been built for ProDOS allowing you to boot ProDOS instantly, with support for the real-time clock.

ROMXc/e also feature a ROM-Link interface that connects the ROMXc/e board to an optional ROMX text/video ROM module. The ROMX menu allows you to select one of 16 fonts to use as the default, or to associate a font with a specific ROM image. By using a switch (stock keyboard switch for 28pin video ROM, or user installed switch for 24 pin video ROM), a second bank of 16 fonts can be enabled, for a total of 32 fonts. See the Text/Video ROM section for the list of available fonts.

Note that the text/video ROM module is not in-system programmable, however the programming adapter PCB design has been made freely available. Using the adapter, the video ROM can be reprogrammed in an EPROM programmer if you would like to further customise the font selection.

Should a firmware update fail for any reason (power outage, etc), ROMXc/e include a recovery mode. By removing the recovery jumper, a special recovery menu is launched from where you can boot the system and re-flash the firmware.

Firmware 1.00 supports ZIP chips for ROMXc/e, in addition to UltraWarp and FASTchip accelerators for the Apple IIe. Per image acceleration settings are available (see the I)nfo for image section in this guide for further details).

ROMXc/e ship with a default set of system ROM images pre-installed for your enjoyment.

ROMXc Hardware

When the Apple IIc was first introduced, a 16KB Monitor ROM known as ROM 255 or ROM $FF was used. The hardware was designed with onboard solder jumpers to enable a 32KB ROM however, and later machines shipped with a 32KB Monitor ROM.

ROMXc includes images of all the major ROM revisions that were shipped. If you have a 16KB ROM machine you will need to perform the 32KB ROM modifications – see the ROMXc Installation Guide for further details.
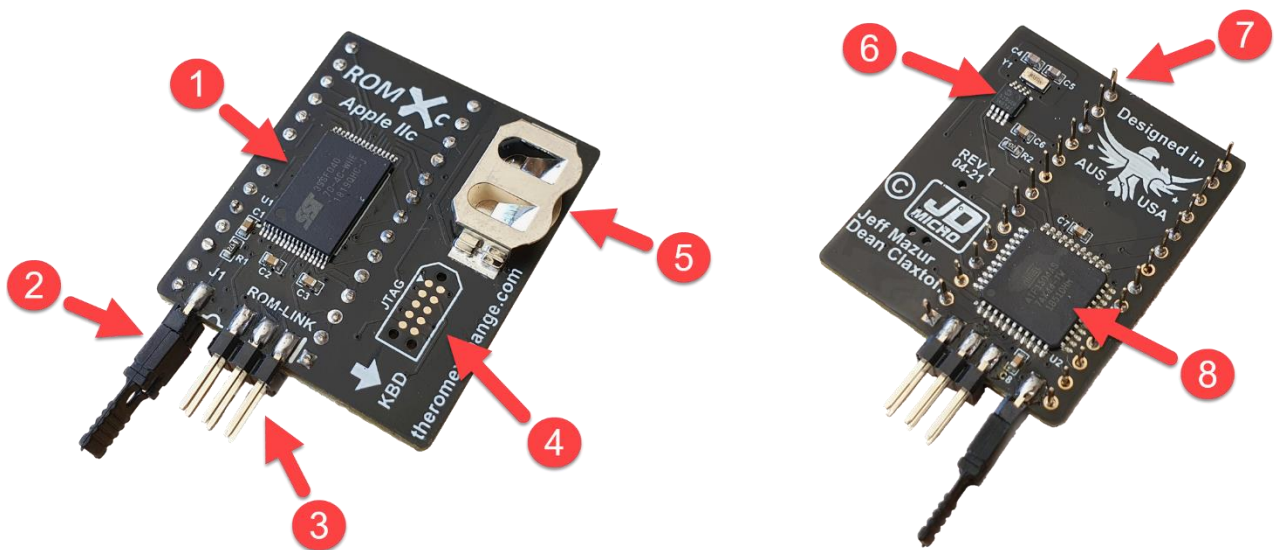
1. 4Mbit Flash Memory
2. Recovery Jumper (normally installed). Remove to enable recovery mode. See the Recovery Mode section for further details).
3. ROM-Link header for link to the ROMXce Video ROM – Pin 1 end (white bar on PCB)
4. JTAG header (production programming only – do not use)
5. Battery holder for CR1220 RTC backup battery
6. Real Time Clock
7. Pin headers (legs)
8. CPLD (Complex Programmable Logic Device)

ROMXe Hardware

When the Apple IIe was first introduced, the 16KB System ROM was stored in two 8KB ROM chips. These are known as the CD ROM ($**C**100-$**D**FFF), and the EF ROM ($**E**000-$**F**FFF). Later, when the Extended Keyboard or Platinum Apple IIe was introduced, the 16KB System ROM was stored in a single 16KB ROM chip known as the CF ROM ($**C**100-$**F**FFF).

ROMXe was designed to support both single and dual ROM socket configurations – the main ROMXe printed circuit board (PCB) is used alone for single socket (CF ROM) motherboards, and used in conjunction with a ROMXe EF Adapter PCB for dual socket (CD, EF ROM) motherboards. In the dual socket configuration, an EF-Link cable is used to connect the ROMXe EF Adapter PCB to the main ROMXe PCB.
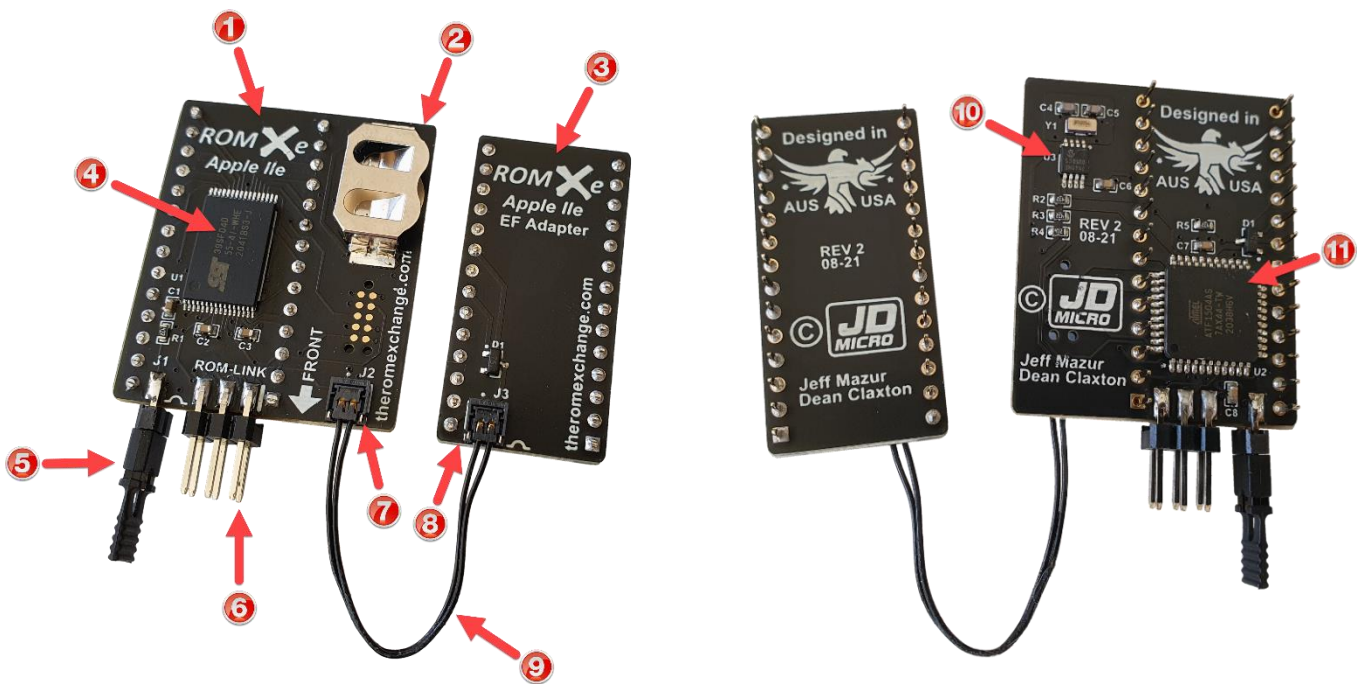
1. ROMXe Printed Circuit Board (PCB).

2. Battery holder for CR1220 RTC backup battery.

3. ROMXe EF Adapter PCB.

4. 4Mbit flash memory chip.

5. Recovery jumper.

6. ROM-Link header – Pin 1 end (white bar on PCB).

7. EF-Link J2 header.

8. EF-Link J3 header.

9. EF-Link cable.

10. RTC (Real-Time Clock).

11. CPLD (Complex Programmable Logic Device).

ROMXce Video ROM

The ROMXce video ROM is loaded with 32 different fonts including both stock enhanced (MouseText) and unenhanced (no MouseText) fonts. The font list is covered in the user guide and is divided into 2 banks of 16 fonts. Bank selection is via external switch and the ROMX menu system allows selection of a font from the active bank to be used as the system default, or associating a particular font with a ROM image. The video ROM connects to ROMXc/e via the supplied ROM-Link cable.

Two versions of the ROMXce Video ROM exist to accommodate the Apple IIc and Apple IIe – one for 24 pin and one for 28 pin video ROM sockets. Each ROMXce version has a slightly different mechanism for bank selection.

24 Pin Video ROM

Bank selection is via a user installed switch or jumper on the SW1 pads.
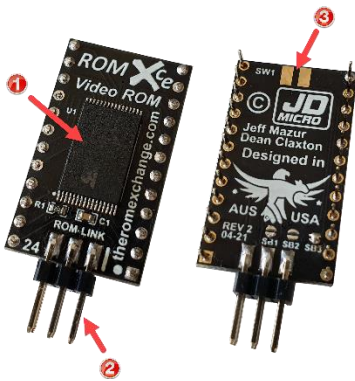
1. 1Mbit Flash Memory.
2. ROM-Link Header – Pin 1 end (white bar on PCB).
3. Connection pads for external keyboard switch.

28 Pin Video ROM

Bank selection is via the stock keyboard switch fitted to the underside of the keyboard.
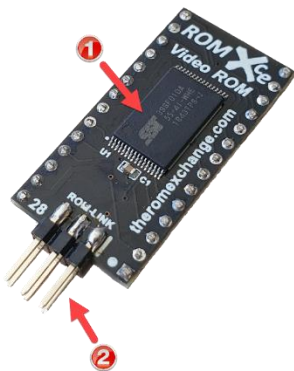
1. 1 Mbit Flash Memory.
2. ROM-Link Header – Pin 1 end (white bar on PCB).

ROMX Menu System

Overview

ROMXc/e pre-loaded ROM images vary between the two models, however the menu system operates in the same manner.

The ROMX menu system is structured as below:
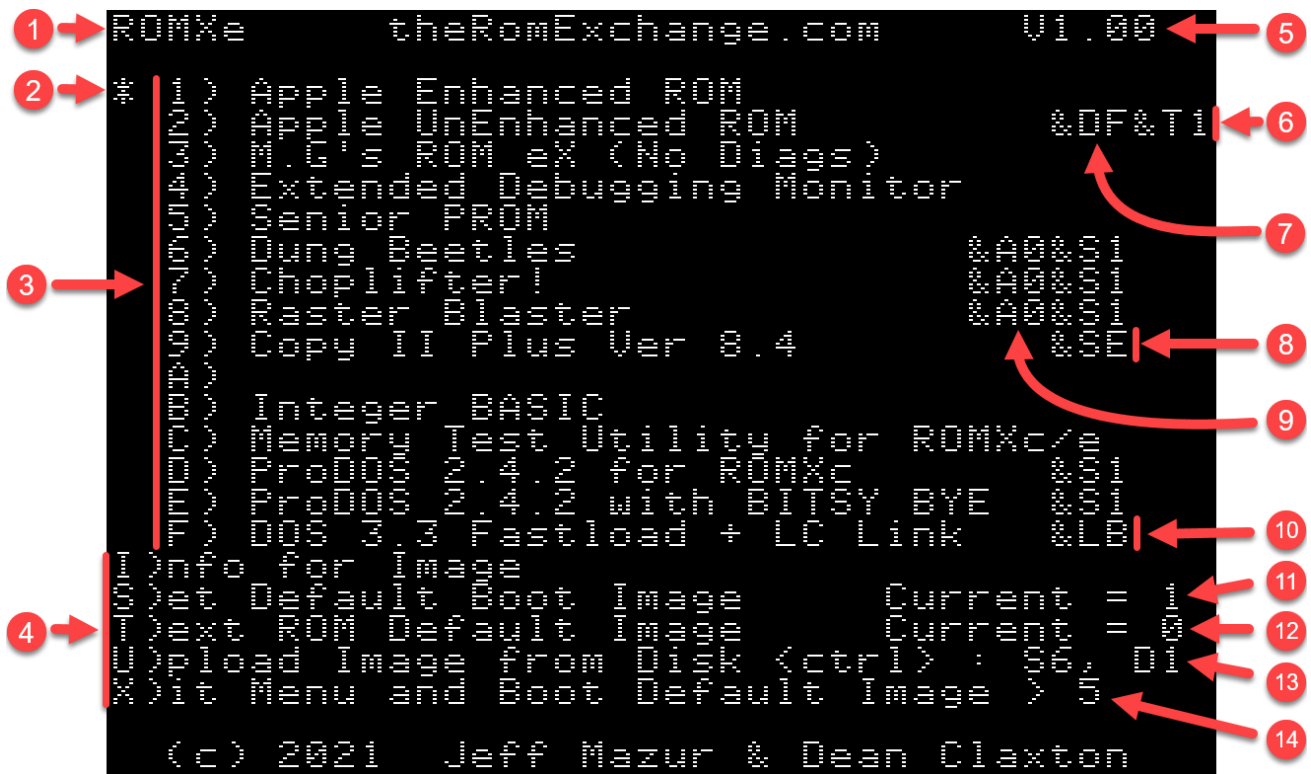
1. ROMX model (ROMXc, ROMXe)
2. Asterisk to the left of the ROM image menu shows the current default ROM image, which is also shown at item 11.
3. ROM image selection menu - pressing a key 1 through F will immediately boot the computer using the selected ROM image.
4. ROMX command menu.
5. ROMX firmware version.
6. Example &Tn Text ROM associations (active with ROMXce video ROM module installed).
7. Example &Dn DOS Image association (links ROM with DOS 3.3 Image loaded in slot F).
8. Example &Sn System ROM link for an application (linked system ROM is loaded before launching the application image).
9. Example &An Acceleration control – sets accelerator speed for ROM image.
10. Example &Ln language card link for a DOS Image (DOS image loads the linked language card image into the language card memory).
11. Default Boot ROM image
12. Default Video/Text ROM image.
13. Default Disk][slot and drive number used for image U)pload.
14. Menu delay countdown timer.

On initial power-up, the ROMX menu will be displayed for a period determined by the boot delay setting. By default, this is approximately 3.5 seconds. If no menu selection has been made during this time, then the system will automatically boot using the default system ROM (see items 2 and 11 above).

The boot delay timer has a user adjustable range from 0 to approximately 5.2 seconds. Selecting a boot delay of 0 will bypass the menu completely on power up. You will then have to use the disk version of the firmware (ROMXCE.DISK) to make further changes. See section *Editing the Delay Timer.*

Pressing a bank key at any time will boot the corresponding image. Any other key will halt the countdown timer.

Image Selection Menu

The image selection menu displays the list of ROM images 1 through F that are stored on the ROMX module.
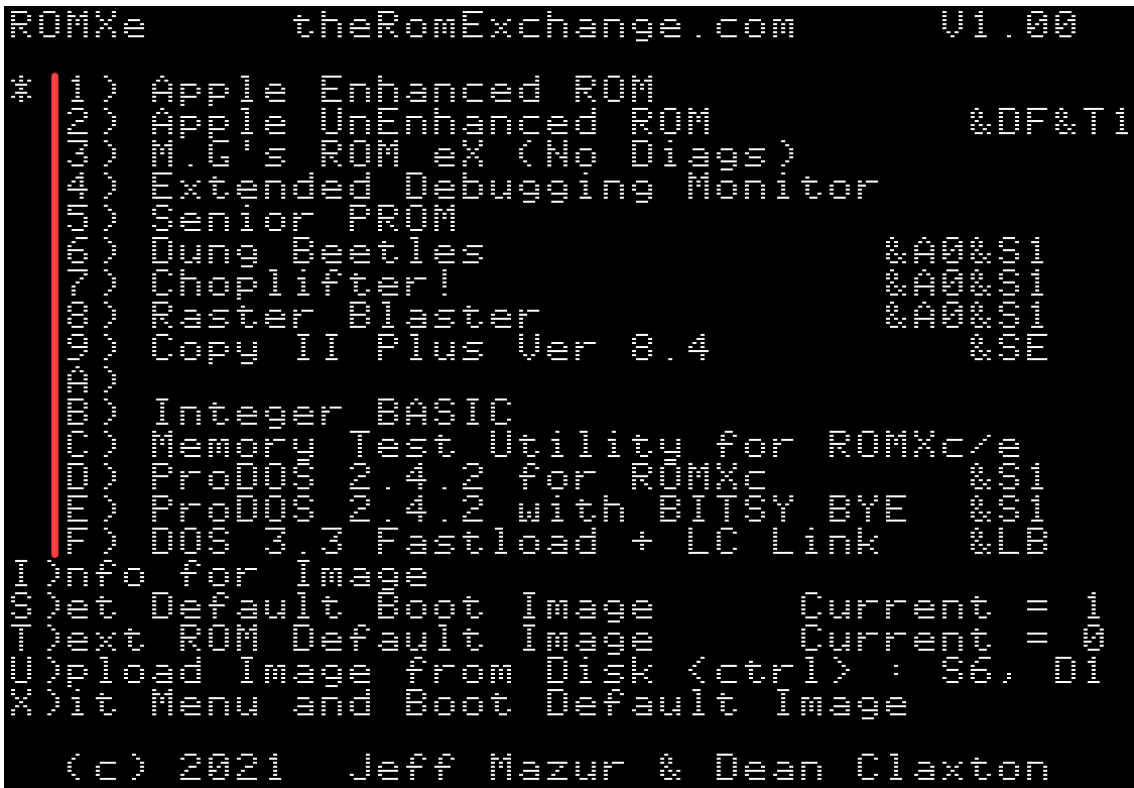
ROM Images are selected using keys 1 though F on the keyboard. On keypress, the selected image will immediately be used to boot the system.

After an image has been booted, ROMX becomes invisible to the system. Subsequent RESETs will be handled according to the reset handler in the selected ROM image.

Images with a Text ROM association are displayed above with &T*n* at the end of the description line, where n represents a font number 0 to F. If you have a ROMXce Video ROM installed, selecting one of these images will automatically switch the font via the ROM-Link interface. Text ROM associations override the default video ROM setting.

All 15 image slots are in-system programmable – you can overwrite them or customize them as desired.

Details on uploading a custom ROM image are covered in the Adding a ROM Image section.

NOTE: It is possible to programmatically switch between system ROM images and video ROM images. See the ROMXce API Reference in the Documentation section at https://theromexchange.com

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Command Menu

Keys I, S, T, U and X are used to access the following items from the command menu:

- I)nfo for Image
- S)Set Default Boot Image
- T)ext ROM Default Image
- U)pload Image from Disk
- X)it Menu and Boot Default Image

```
ROMXe        theRomExchange.com        V1.00
* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM                    &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor
  5) Senior PROM
  6) Dung Beetles                            &A0&S1
  7) Choplifter!                             &A0&S1
  8) Raster Blaster                          &A0&S1
  9) Copy II Plus Ver 8.4                       &SE
  A)
  B)  Integer BASIC
  C)  Memory Test Utility for ROMXc/e
  D)  ProDOS 2.4.2 for ROMXc          &S1
  E)  ProDOS 2.4.2 with BITSY BYE     &S1
  F)  DOS 3.3 Fastload + LC Link      &LB
I)nfo for Image
S)et Default Boot Image          Current = 1
T)ext ROM Default Image          Current = 0
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

These command options are detailed in the following sections.

I)nfo for Image

From the main menu, pressing the I key will invoke the I)nfo for Image command, which will display the Information page:
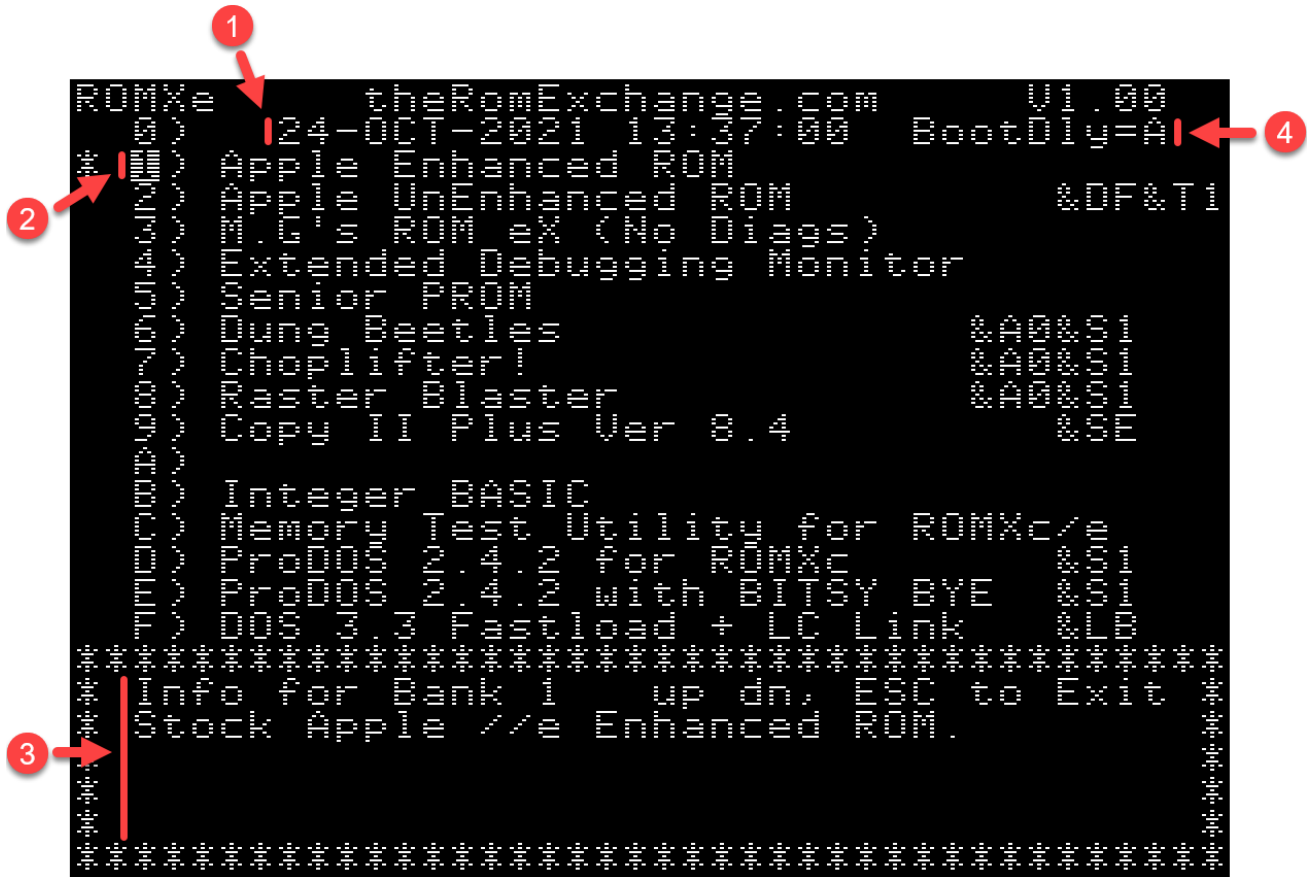
1. Current date and time retrieved from the Real Time Clock (RTC).
2. Currently selected image.
3. Information for selected image.
4. Delay timer setting.

You can use the up and down arrow keys or keys 1-F to move between images, and the ESC key to return to the main menu.

There are several functions available from the information page, which are detailed in the following sections:

- View or adjust the real time **C**lock (CTRL+**C** to edit)
- View and Edit the **B**oot Delay Timer (CTRL+**B** to edit),
- View and edit the **D**escription for each ROM image (CTRL+**D** to edit)
- View and edit the stored **I**nformation for each ROM image (CTRL+**I** to edit)

Setting the Real-Time Clock

ROMXc/e use the Microchip MCP7940N Real-Time Clock chip, with the following major features:

- Battery-backed Real-Time Clock/Calendar
- Hours, Minutes, Seconds, Day of Week, Day, Month, Year
- Leap year compensated to 2399
- On-chip Digital Trimming/Calibration
- 64 Bytes battery-backed SRAM

With a low typical timekeeping current of only 925nA, a quality CR1220 battery (38mAh capacity) should last in the order of 3.5 to 4.5 years.

We have developed a ProDOS driver to support this device and this is available from https://theromexchange.com.

NOTE: Firmware does not currently use the Day of Week register or SRAM, though these may be utilized in a future revision. The CLOCK.SET program on the ROMXce Utility Disks demonstrates how to set and read the Day of Week if you would like to make use of it.

Using the key combination CTRL-C from the Information page, the current date and time may be edited:

When in edit mode, the current field to be edited will be shown in inverse text as per item 1 above. Use the left and right arrows to move across the fields (day, month, year, hour, minute, second), and the Up and Down arrows to edit the value. Press the Return key to save the changes and exit edit mode.

General instructions are shown in the information text (item 2) at the bottom of the display.

The new CLOCK.SET program included on the ROMXce Utility Disk allows adjustment of the OSCTRiM register in the RTC chip. This register contains a 7-bit value plus a sign bit thus allowing a trim value between -127 and +127. Each unit represents roughly 1PPM (part per million) which translates to about 1 second every 11 days.

When using CLOCK SET to adjust the trim, you can bypass setting the clock by first pressing "N" and then enter just the trim value. Note that the current trim setting will be displayed to the right.

```
SET CLOCK? Y/N N



INPUT OSCTRM (+/-127)?※      CUR=0
```

To adjust your clock accuracy, start by setting the clock to a known good time source (a modern computer synchronized to an internet time source is ideal). Then check the time again 11 days later.

If the ROMX clock is running slow, you need to lower the OSCTRIM value; if running fast, then increase it. If the clock is off by more than 1 second, change the value by 1; if off by more than 2 seconds, change it by 2, etc. This should bring the clock into the proper range.

Note that temperature changes and other factors will also determine the ultimate accuracy of the clock but you should be able to adjust the trim to achieve less than 30 seconds drift per year.

Editing the Delay Timer

Use the key combination CTRL-B from the Information page to edit the boot delay timer (BootDly).

Valid boot delay timer entries are 0 to F, with a default setting of A. From the table below, this equates to a default of 3.46 seconds.

A user adjustable range from 0 to approximately 5.2 seconds is available in 0.346 second increments:

Delay Entry	Delay Time (seconds)	Delay Entry	Delay Time (seconds)
0	0 (menu not displayed)	8	2.769
1	0.346	9	3.114
2	0.692	A	3.46
3	1.038	B	3.806
4	1.384	C	4.152
5	1.730	D	4.498
6	2.076	E	4.844
7	2.422	F	5.190

If you set the boot delay time to zero, then the menu will not be displayed at power-up and the default system ROM image will be used. You must then use the disk version of the ROMX firmware (ROMXCE.DISK) to make any changes to the ROMX configuration or revert the boot delay timer setting. See the *ROMXce System and Utilities Disk* section.

Image descriptions may be edited directly from the information page. This makes it very easy to modify command suffixes also.

From the information page, use the up/down arrows to select an entry to be edited (or press the key associated with the image 1-9, A-F), then press CTRL+D to edit the description:

A maximum length of 35 characters is available for an image description, including any specified ROMX image link suffixes such as &An for accelerator cards, &Tn for text ROM association, &Dn for DOS image association, &Sn for System ROM association, or &Ln for Language Card image association (see following section).

When you have finished editing the description, use the right arrow key to move the cursor beyond the last character, and press the RETURN key to save the changes. Any text to the right of the cursor will be erased after pressing the RETURN key. You can also use the ESC key to cancel.

The following suffixes are available to allow linking of one image to another.

&An

The firmware supports per image acceleration settings for computers fitted with accelerators. Currently ROMXce firmware supports ZIP Chip, UltraWarp and FASTchip.

You can set the accelerator speed by including &A*n* at character position 27-29 of the description line of the image, where *n* represents the speed as tabulated below:

ACCELERATOR SPEED CONTROL (MHz)				
&A	ZIP CHIP 4000	ZIP CHIP 8000	FASTChip	UltraWarp
0	ZIP OFF	ZIP OFF	1.000	1.000
1	0.667	1.334	0.200	13.000
2	0.750	1.500	0.400	13.000
3	0.800	1.600	0.600	13.000
4	1.000	2.000	0.800	13.000
5	1.067	2.133	1.000	13.000
6	1.333	2.667	1.500	13.000
7	1.500	3.000	2.000	13.000
8	1.600	3.200	3.100	13.000
9	1.667	3.333	3.800	13.000
A	2.000	4.000	5.000	13.000
B	2.667	5.333	6.200	13.000
C	3.000	6.000	8.300	13.000
D	3.200	6.400	10.000	13.000
E	3.333	6.667	12.500	13.000
F	4.000	8.000	16.600	13.000

The easiest way to enter the accelerator speed is to press the right arrow until you reach the end of the line (computer will beep), then press the left arrow 9 times and enter the link suffix &A*n*.

&T*n*

Text (Video) ROM Link used to link a specific Text ROM with a system ROM Image. When the system ROM is selected, the linked text/video ROM image will be applied.

Associate a specific text/video ROM to be used with a system ROM by including &T*n* at the end of the description line (in positions 33-35), where *n* represents the video ROM image 0-F. With this association in place (and with a ROMXce video ROM module installed), the font will change when the ROM image is selected.

The easiest way to enter the Text ROM link is to press the right arrow until you reach the end of the line (computer will beep), then press the left arrow 3 times and type the link suffix.

See the Text ROM section for a list of available fonts.

&Dn

DOS Image Link. Used to link a DOS image to a system ROM image such that after loading the system ROM, the DOS image is loaded into RAM and executed. DOS is instantly available. You can load either DOS 3.3 or ProDOS this way.

You can link a system ROM image with a DOS image for instant DOS boot by including &D*n* at character position 30-32 of the description line, where *n* represents the slot number of a DOS image (1-F).

The easiest way to enter the DOS image association is to press the right arrow until you reach the end of the line (computer will beep), then press the left arrow 6 times and type the link suffix. You may optionally then type the video ROM association &T*n* immediately after &D*n*.

&Ln

Language Card Image Link. Used to a load a language card image (such as Integer BASIC) into memory when a DOS image is loaded. Boot to DOS instantly, with Integer BASIC loaded into the language card!

Valid for supporting DOS images only, such as the image factory installed in slot F.

You can link a DOS image to a language card image by including &L*n* at character position 30-32 of the description line of the DOS image, where *n* represents the slot number of a language image (1-F).

The easiest way to enter the Language image association is to press the right arrow until you reach the end of the line (computer will beep), then press the left arrow 6 times and the link suffix.

&Sn

System ROM link. Used for application images that require a system ROM to operate such as the Choplifter image. When the application image is selected, the application is firstly loaded into RAM, the selected System ROM is activated, and the application is executed.

You can link a system ROM image with an application by including &S*n* at character position 30-32 of the applications description line, where *n* represents the slot number of a system ROM image (1-F).

The easiest way to enter the System ROM image association is to press the right arrow until you reach the end of the line (computer will beep), then press the left arrow 6 times and type in the link suffix.

Editing the Image Information

Image information may be edited from the information page. Use the up/down arrows to select an entry to be edited (or press the key associated with the image 1-9, A-F), then press CTRL+I to edit the information:

```
ROMXe     theRomExchange.com     V1.00
  0)  24-OCT-2021 13:37:00  BootDly=A
* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM          &DF&T1
  3) M.G's ROM_eX (No Diags)
  4) Extended Debugging Monitor
  5) Senior PROM
  6) Dung Beetles                  &A0&S1
  7) Choplifter!                   &A0&S1
  8) Raster Blaster                &A0&S1
  9) Copy II Plus Ver 8.4          &SE
  A)
  B) Integer BASIC
  C) Memory Test Utility for ROMXc/e
  D) ProDOS 2.4.2 for ROMXc       &S1
  E) ProDOS 2.4.2 with BITSY BYE  &S1
  F) DOS 3.3 Fastload + LC Link   &LB
*************************************
* Info for Bank 6    up dn, ESC to Exit *
* Bob Bishop's Dung Beetles - a maze    *
* game published by Datasoft in 1982.   *
* Use the keys I,J,K,M to move around   *
* the maze.                             *
*************************************
```

Four lines of text are available for storing information text. Each line can store up to 36 characters for a total of 144 characters.

Each of the four lines are edited in sequence using the left and right arrow keys to reposition the cursor on the current line. Once a line is complete, position the cursor to the right of any text that you wish to retain, then press the Return key. Anything beyond the cursor will be erased, and the cursor will move to the next line.

The information text will be saved after completing the fourth line.

The default boot image is used when the delay timer expires, or when the *X)it Menu and Boot Default Image* command is invoked from the main menu.

The current default image is highlighted with an asterisk to the left of the ROM image number, and also listed to the right of the command (Current = *n*).

From the main menu, press the S key to invoke the S)et Default Boot Image command:

Enter the default boot image 1 to F, and press Return.

T)ext ROM Default Image

From the main menu, pressing the T key will invoke the T)ext ROM Default Image command, allowing you to change the default text/video ROM image:

```
ROMXe      theRomExchange.com      V1.00

* 1) Apple Enhanced ROM
   2) Apple UnEnhanced ROM              &DF&T1
   3) M.G's ROM eX (No Diags)
   4) Extended Debugging Monitor
   5) Senior PROM
   6) Dung Beetles                      &A0&S1
   7) Choplifter!                       &A0&S1
   8) Raster Blaster                    &A0&S1
   9) Copy II Plus Ver 8.4                &SE
   A)
   B) Integer BASIC
   C) Memory Test Utility for ROMXc/e
   D) ProDOS 2.4.2 for ROMXc             &S1
   E) ProDOS 2.4.2 with BITSY BYE  &S1
   F) DOS 3.3 Fastload + LC Link    &LB
I)nfo for Image
*********************************************
*                                           *
* Set Text CHARGEN ROM *    ESC to Exit *
*                                           *
*********************************************
```

Select the default video ROM image 0 to F. If you have the optional ROMXce video ROM module installed, then the selected default video ROM will be used unless there is an overriding video ROM association in the system ROM image description.

If you do not have a ROMXce video ROM installed, then this setting will have no effect.

Note that the Text ROM selection will not take effect until the menu system is exited, and that font 0 (US Enhanced ROM) will be used when entering the menu after power on.

The default Text ROM image is displayed to the right of the command (CURRENT = *n*).

Note also that the actual font displayed will depend on the position of the keyboard switch (if installed) as the switch is used to toggle between two banks of 16 fonts.

See the *Text ROM* section for a list of the available video ROMs (fonts).
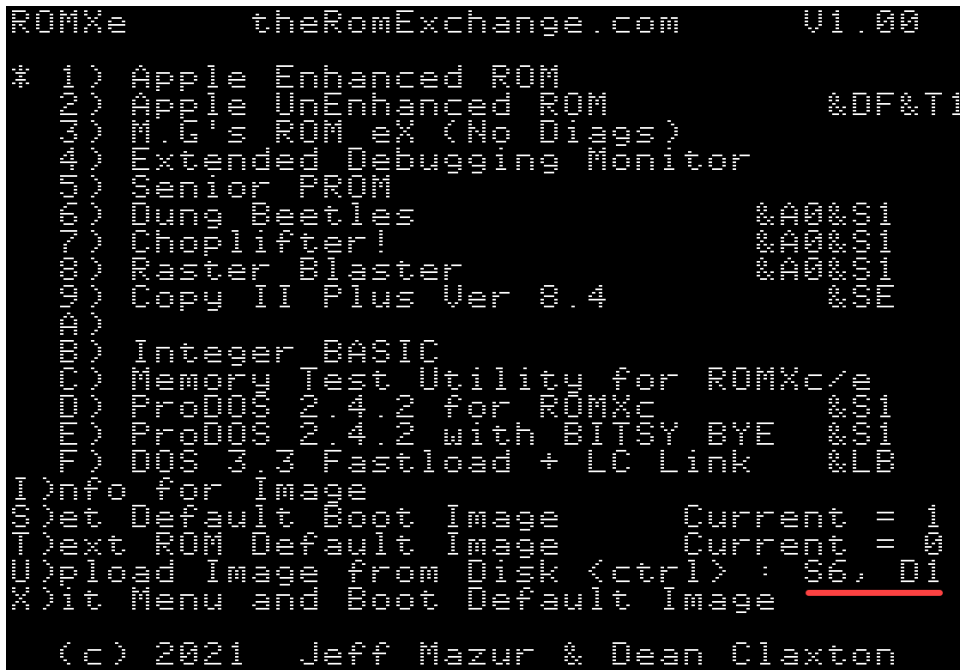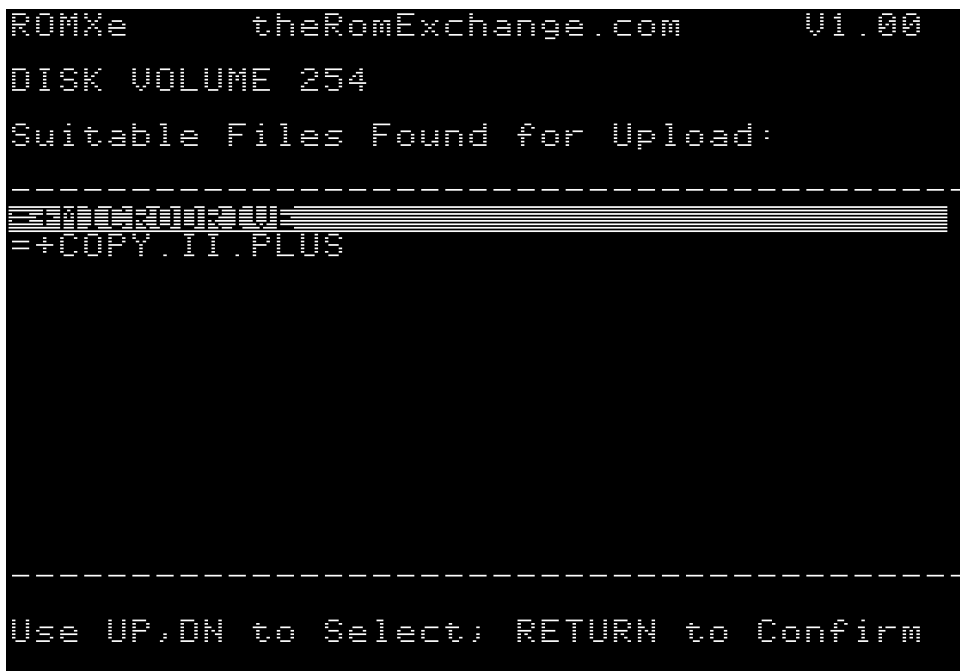
ROMXc/e support direct loading of disk based images from within the firmware using the U)pload Image from Disk command.

Firstly, the Disk][controller card slot and drive number must be configured from the main menu screen :

```
ROMXe       theRomExchange.com       V1.00
* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM               &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor
  5) Senior PROM
  6) Dung Beetles                       &A0&S1
  7) Choplifter!                        &A0&S1
  8) Raster Blaster                     &A0&S1
  9) Copy II Plus Ver 8.4                 &SE
  A)
  B) Integer BASIC
  C) Memory Test Utility for ROMXc/e
  D) ProDOS 2.4.2 for ROMXc              &S1
  E) ProDOS 2.4.2 with BITSY BYE   &S1
  F) DOS 3.3 Fastload + LC Link    &LB
I)nfo for Image
S)et Default Boot Image       Current = 1
T)ext ROM Default Image       Current = 0
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

From the main menu screen, Press CTRL + S to cycle the slot number (1-7), and CTRL + D to cycle the drive number (1-2).

Press the U key to invoke the U)pload Image from Disk command – the firmware will examine the contents of the disk (or disk image) in the selected slot/drive and display a list of valid images for selection.

```
ROMXe       theRomExchange.com       V1.00

DISK VOLUME 254

Suitable Files Found for Upload:
----------------------------------------
=+MICRODRIVE
=+COPY.II.PLUS




----------------------------------------

Use UP/DN to Select; RETURN to Confirm
```

IMPORTANT NOTE for ROMXc users : *Before using the U)pload command, make sure that your Default image is set to a standard //c image (preferably ROM 0 or later to use Smartport devices). Otherwise, you may not see your disk devices and/or get a CHECK SLOT # error message.*

Only files that are possible images will be shown - those that are 66/67 sectors (16K) or 131/132 sectors (32K) in size. 16K images will be prefaced with a minus sign (-) while 32K images will have an equal's sign (=). Those files with RMX metadata will also show a plus sign (+) preceding the filename.

After selecting the file to Upload, select a bank into which the image will be loaded. After selecting a bank, if the file contains RMX info, the Description field will automatically populate with the suggested description. Otherwise, you can type your own description to use. Remember to add the appropriate link commands (&T, &D, &S, or &L) in the correct line position if needed (see *Editing the Image Description* for further details).

```
ROMXe       theRomExchange.com       V1.00

* 1) Apple Enhanced ROM
   2) Apple UnEnhanced ROM              &DF&T1
   3) M.G's ROM eX (No Diags)
   4) Extended Debugging Monitor

*******************************************
*                                         *
* Select Bank to Program: A               *
*                                         *
* Add Description for this Bank:          *
* MicroDrive/Turbo Setup Util  &S1*       *
*                                         *
*                                         *
*                                         *
*                                         *
*******************************************

S)et Default Boot Image      Current = 1
T)ext ROM Default Image      Current = F
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

After entering the description, you are prompted to press U to upload the image, or ESC to exit the upload process:

```
ROMXe      theRomExchange.com     V1.00

* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM              &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor

*****************************************
*                                       *
* Select Bank to Program: A             *
*                                       *
* Add Description for this Bank:        *
* MicroDrive/Turbo Setup Util  &S1      *
*                                       *
*                                       *
*   Press U to Upload; ESC key to Exit  *
*****************************************

S)et Default Boot Image     Current = 1
T)ext ROM Default Image     Current = F
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

After pressing U, the ROM image will be uploaded :

```
ROMXe      theRomExchange.com     V1.00
                                   ^  E2
* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM              &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor

*****************************************
*                                       *
* Select Bank to Program: A             *
*                                       *
* Add Description for this Bank:        *
* MicroDrive/Turbo Setup Util  &S1      *
*                                       *
*                                       *
* UPLOADING IMAGE.    PLEASE WAIT...    *
*****************************************

S)et Default Boot Image     Current = 1
T)ext ROM Default Image     Current = F
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

Once the Upload is complete, the new image will be displayed in the menu. You may edit the description or information text from the I)nfo page.

```
ROMXe      theRomExchange.com      V1.00

* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM                &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor
  5) Senior PROM
  6) Dung Beetles                        &A0&S1
  7) Choplifter!                         &A0&S1
  8) Raster Blaster                      &A0&S1
  9) Copy II Plus Ver 8.4                &SE
  A) MicroDrive/Turbo Setup Util    &S1 ←
  B) Integer BASIC
  C) Memory Test Utility for ROMXc/e
  D) ProDOS 2.4.2 for ROMXc         &S1
  E) ProDOS 2.4.2 with BITSY.BYE    &S1
  F) DOS 3.3 Fastload + LC Link     &LB
I)nfo for Image
S)et Default Boot Image      Current = 1
T)ext ROM Default Image      Current = F
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

   (c) 2021  Jeff Mazur & Dean Claxton
```

X)it Menu and Boot Default Image

Pressing the X key from the main menu will immediately boot the computer using your default boot image. If you have installed the optional ROMXce Video ROM module, then your default Text ROM image will also be applied, else a Text ROM that has been associated with the default boot image.

Text/Video ROM

The ROMXce Video ROM contains a total of 32 different fonts, divided into 2 banks of 16. For Apple IIc and International Apple IIe (28 pin video ROMs), the stock keyboard switch will select the bank.

Note that the stock keyboard switch also selects a second keymap via the MAP ROM. On many international machines the two key maps stored in the MAP ROM are identical however for US based Apple //c's the second key map is the Dvorak layout.

We have a ROMX MAP ROM Override board available that can be installed such that only key map 1 is used regardless of the switch position, leaving the keyboard switch to select only the video ROM bank.

For US Apple IIe with a 24 pin video ROM, an external switch can be installed:
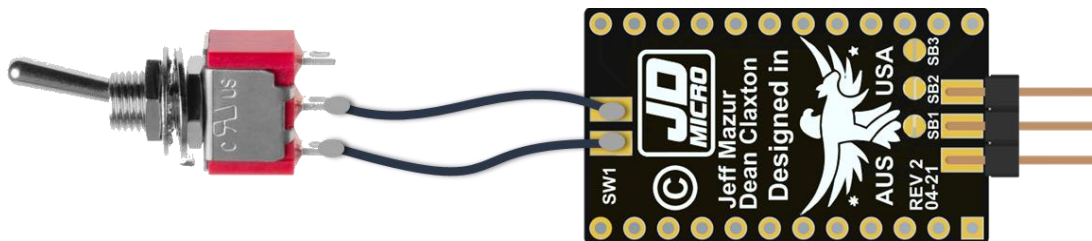
The following table lists the fonts available. The font number is used in the ROMX menu system to associate the font. The memory offset in the SST39SF010A flash memory chip is also shown should you wish to further customize the Video ROM (see the ROMXce Video ROM Programming Guide).

ROMXce Font #	Keyboard Switch Off		Keyboard Switch On	
	Address	Font Name	Address	Font Name
0	00000	US Enhanced	10000	Euro Un-Enhanced
1	01000	US Un-Enhanced	11000	Euro Enhanced
2	02000	Clinton Turner V1 Enhanced	12000	Clinton Turner V2 Enhanced
3	03000	ReActiveMicro Enhanced	13000	Improved German Enhanced
4	04000	Dan Paymar Enhanced	14000	Improved German Un-Enhanced
5	05000	Blippo Black Enhanced	15000	French Canadian Enhanced
6	06000	Byte Enhanced	16000	French Canadian Un-Enhanced
7	07000	Colossal Enhanced	17000	Hebrew Enhanced
8	08000	Count Enhanced	18000	Hebrew Un-Enhanced
9	09000	Flow Enhanced	19000	Apple][Plus Enhanced
A	0A000	Gothic Enhanced	1A000	Apple][Plus Un-Enhanced
B	0B000	Outline Enhanced	1B000	Katakana Enhanced
C	0C000	Pigfont Enhanced	1C000	Cyrillic Enhanced
D	0D000	Pinocchio Enhanced	1D000	Greek Enhanced
E	0E000	Slant Enhanced	1E000	Esperanto Enhanced
F	0F000	Stop Enhanced	1F000	Videx Enhanced

Many of the included fonts are Enhanced, meaning that they include MouseText. MouseText is a set of 32 graphical characters designed by Bruce Tognazzini, which replaced a redundant set of inverse uppercase characters and made it possible to display simple text user interfaces resembling the Macintosh GUI.

The MouseText characters were introduced with the Apple IIc and later retrofitted to the Apple IIe via the Enhancement kit which included a 65C02 processor, the updated Video ROM and updated system ROMs. All Enhanced Apple IIe machines include MouseText, and MouseText was also carried over to the IIgs with a couple of changes (they replaced the running man characters shown in positions 7 and 8 below).

The 32 MouseText characters for the IIc and IIe :

And the IIgs version of MouseText, which is included in the ReActiveMicro video ROM:

We have included a fair selection of un-enhanced fonts for older applications that may have used the alternate inverse character set (and would look pretty terrible with MouseText).

Included on the ROMXce Utility Disk are a couple of Applesoft Text ROM Demo applications that allow you to use the arrow keys to preview each font, including the MouseText characters (see the Utility Disk section).

So let's run through the fonts that are included on the ROMXce Video ROM module.

Bank 0 (Keyboard Switch OFF)

0 = Apple US Enhanced Video ROM :

1 = Apple US Un-Enhanced Video ROM :

2 = Clinton Turner V1 Enhanced (Clinton based his font off the Commodore 64):

3 = ReActiveMicro Enhanced (Henry S. Courbis - includes the IIgs version of MouseText):

4 = Dan Paymar Enhanced:
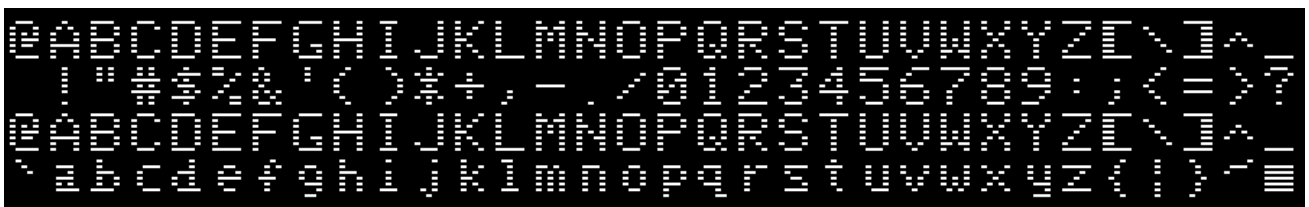
5 =Blippo Black Enhanced (adapted from DOS toolkit):

6 = Byte Enhanced (adapted from DOS toolkit):

7 = Colossal Enhanced (adapted from DOS toolkit):

8 = Count Enhanced (adapted from DOS toolkit):

9 = Flow Enhanced (adapted from DOS toolkit):

A = Gothic Enhanced (adapted from DOS toolkit):
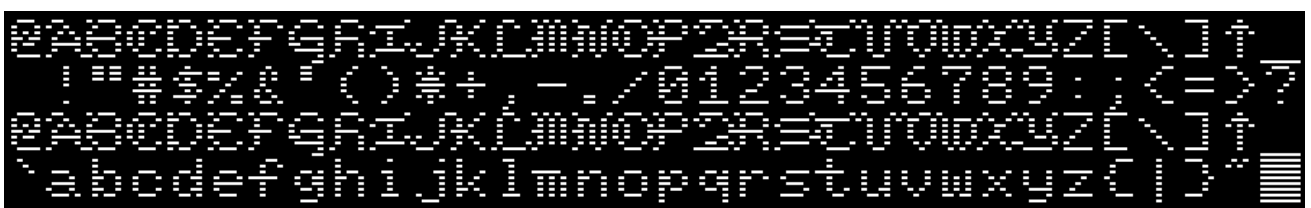
B = Outline Enhanced (adapted from DOS toolkit):

C = Pigfont Enhanced (Keith Comer):
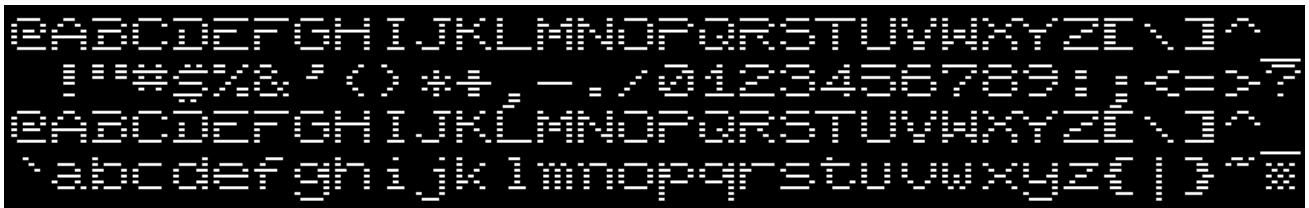
D = Pinocchio Enhanced (adapted from DOS toolkit):
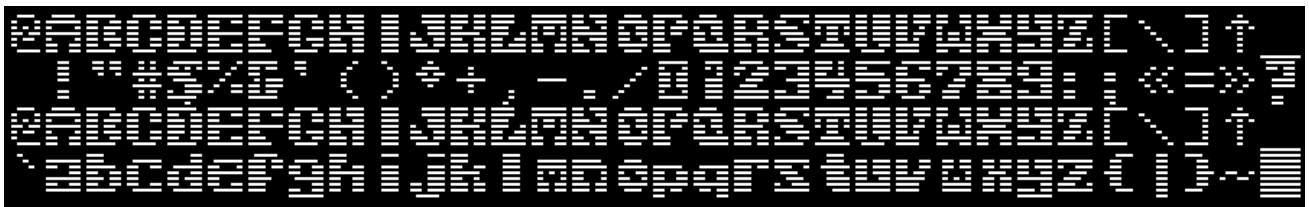
E = Slant Enhanced (adapted from DOS toolkit):
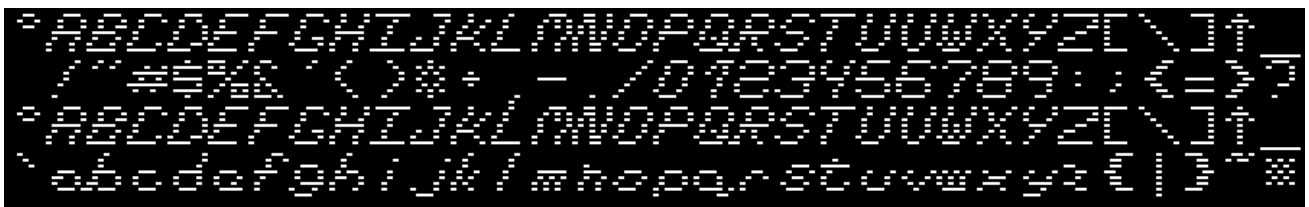
F = Stop Enhanced (adapted from DOS toolkit):
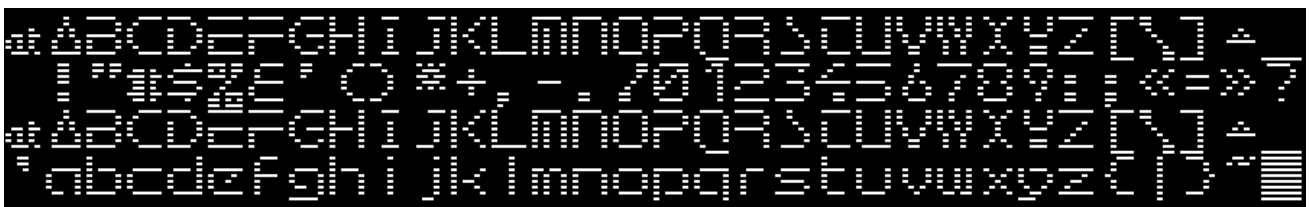
0 = Apple Euro Un-Enhanced :

1 = Apple Euro Enhanced :

2 = Clinton Turner V2 (Clinton created this version for viewing on LCD displays) :

3 = Apple Improved German Enhanced:

4 = Apple Improved German Un-Enhanced:

5 = Apple French Canadian Enhanced:

6 = Apple French Canadian Un-Enhanced:

7 = Hebrew Enhanced:
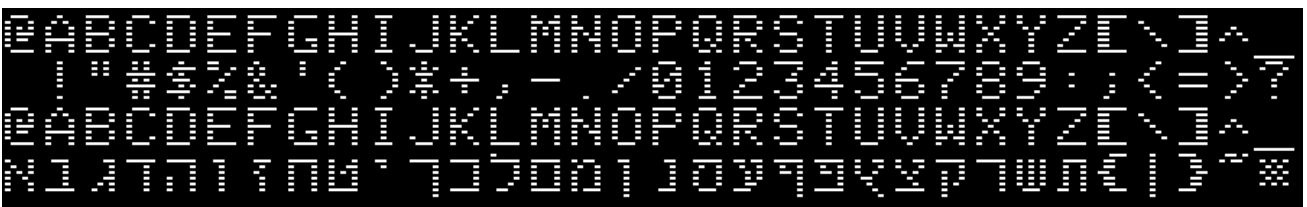
8 = Hebrew Un-Enhanced:
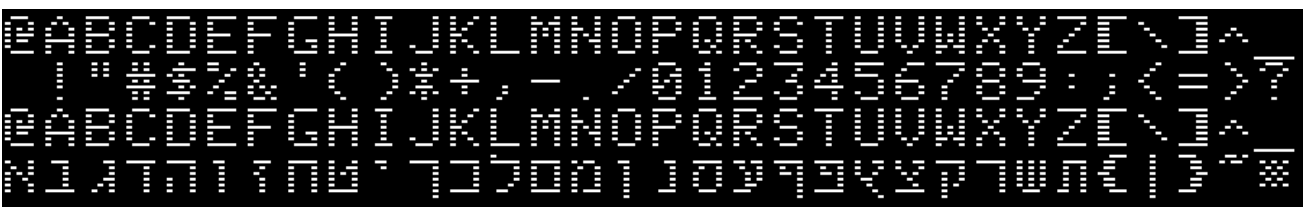
9 = Apple II Plus Enhanced:
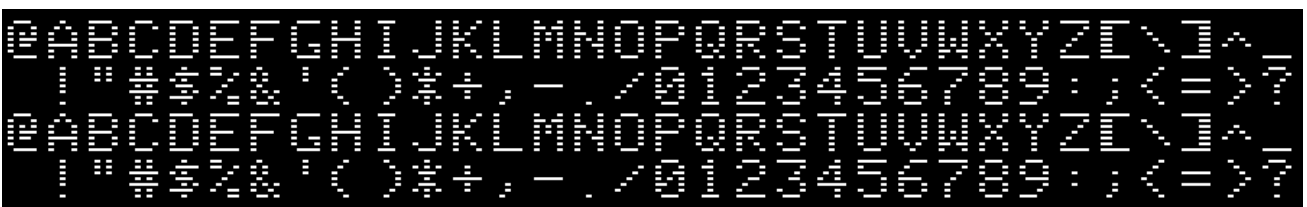
A = Apple II Plus Un-Enhanced:
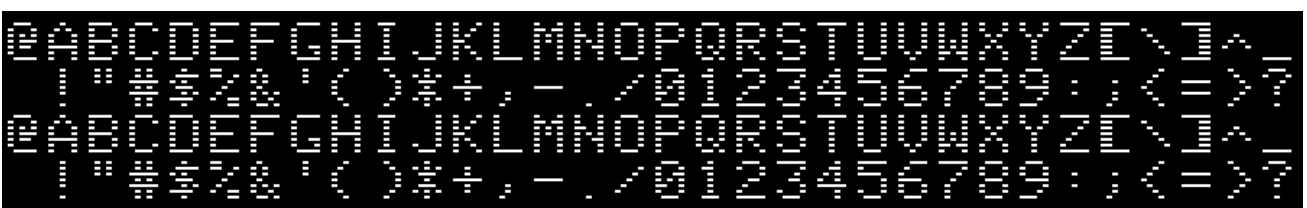
B = Katakana Enhanced (adapted from Apple J-Plus):
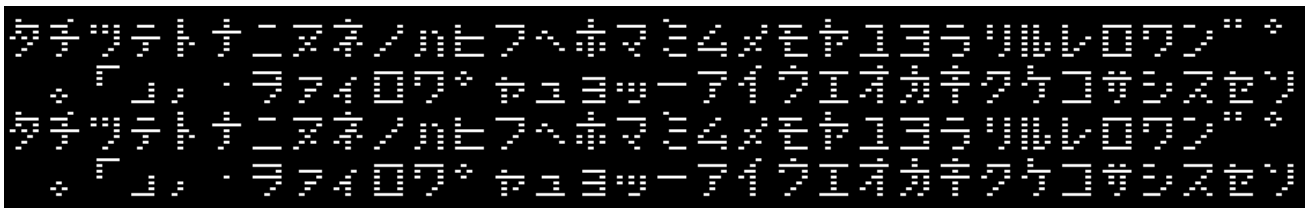
C = Cyrillic Enhanced (adapted from DOS toolkit):
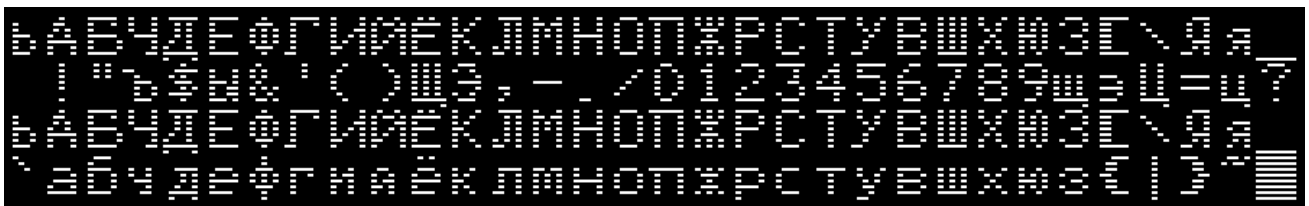
D = Greek Enhanced (adapted from DOS toolkit):
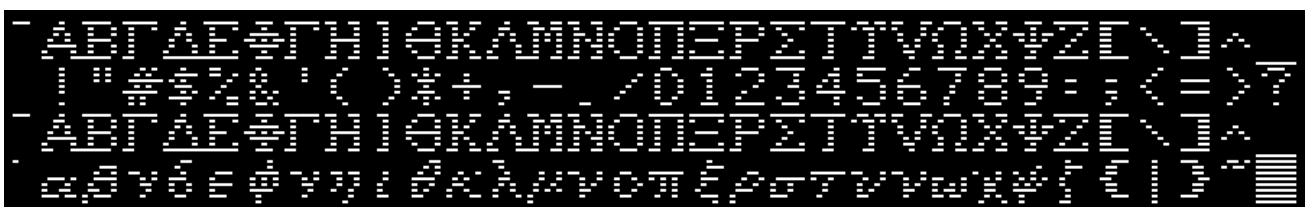
E = Esperanto Enhanced (adapted from DOS toolkit):

F = Videx Enhanced:

31
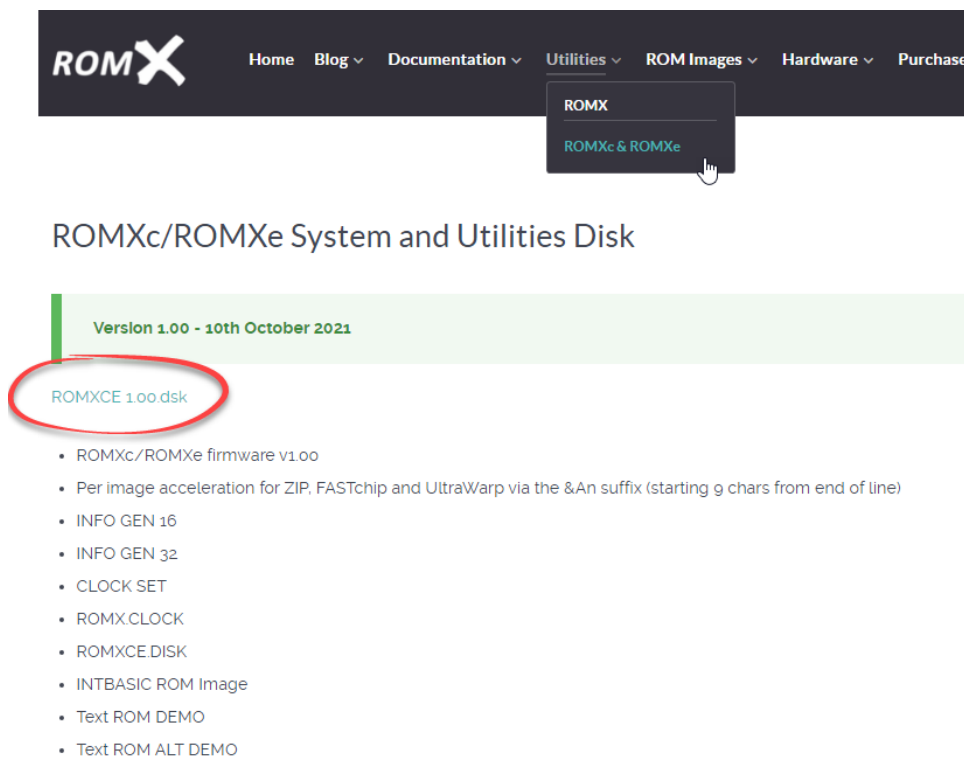
ROMXce System and Utilities Disk

Overview

The ROMXce System and Utilities Disk contains several software utilities for ROMXc/e, including the current ROMXce firmware release ROMXCE.FIRM and the disk based version of the ROMXce firmware ROMXCE.DISK.

Download the current disk image from https://theromexchange.com under the *Utilities -> ROMXc & ROMXe* section :

If you have a floppy emulator such as a Floppy Emu or wDrive, you can unzip this image then copy it straight onto the SD card and use it to boot the system.

If you are using physical media, you can unzip it then transfer the disk image to the Apple II using ADTpro (see https://www.adtpro.com/).

The disk contents for the v1.00 release of the ROMXce System and Utilities Disk are shown below:

```
DISK VOLUME 254

 A 006 HELLO
 A 011 CLOCK.SET
 B 002 ROMX.CLOCK
 A 007 INFO.GEN.16
 A 007 INFO.GEN.32
 B 067 INTBASIC
 B 050 ROMXCE.DISK
 B 067 ROMXCE.FIRM
 A 011 TEXT.DEMO
 A 011 TEXT.DEMO.ALT

]
```
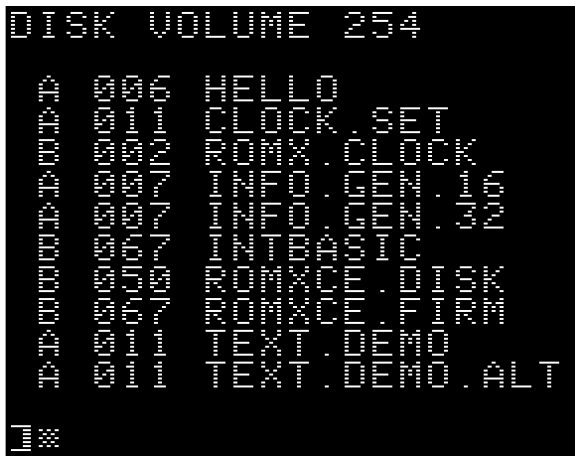
- HELLO – boot utility – catalogs disk.
- CLOCK.SET - An Applesoft BASIC program demonstrating how to set and read the clock programmatically. Also provides capability to set the oscillator trim.
- ROMX.CLOCK – Library functions to support the real-time clock (used by CLOCK.SET).
- INFO.GEN.16 - Program to add RMX metadata to 16K images.
- INFO.GEN.32 - Program to add RMX metadata to 32K images.
- INTBASIC - Apple Integer BASIC wrapped into an image that ROMX can load.
- ROMXCE.DISK - Program to configure ROMX (similar to the Firmware).
- ROMXCE.FIRM - The latest ROMXce firmware image. May be Uploaded into Bank 0.
- TEXT.DEMO - Demo of the video ROM fonts named as per Bank 0 of the Video ROM (ensure keyboard switch position is set for bank 0).
- TEXT.DEMO.ALT - Demo of the video ROM fonts named as per Bank 1 of the Video ROM ROM (ensure keyboard switch position is set for bank 1).

Adding a ROM Image

ROMXc/e support up to 15 user ROM images. Essentially the upload process involves 3 major steps :

1. Preparing the ROM image
2. Transferring the ROM image to disk
3. Uploading the ROM image

The following section details the steps to store a ROM in your ROMXc/e flash memory.

Preparing the ROM Image

A 32KB Apple //c ROM is mapped into the $C000-$FFFF address range as two 16KB banks, and the system uses soft switches to select the active bank.

16KB Apple //e ROMs are also mapped into the $C000-$F000 address range.

Address range $C000-$C0FF is not available for ROM access (this area is the hardware soft switch address range), thus a typical ROM image will have first 256 bytes of each 16KB bank containing writing credits in plain text or may be left blank ($00) as it is not accessible by the system.

ROM images downloaded from www.theromexchange.com may be distributed as 33024 byte RMX or 16640 byte RMX files. This file format includes the complete 32KB or 16KB ROM in addition to prefilled description and information text generated using the INFO GEN utility. The last 256 bytes of the file are the metadata. This file can be directly copied onto a disk and used. Refer to the following section.

Most ROMs downloaded from the internet will consist of a 32768 byte or 16384 byte file. That's perfect for ROMXc/e as well and you can transfer them directly to disk and use them. Refer to the following section.

If you would like to build an RMX file with Image metadata such as description and information added, see the section titled Creating RMX Files.

Transferring the ROM Image to Disk

Once you have a ROM image ready, the file needs to be transferred onto an Apple][disk. If you are wanting to create an RMX file to share, then it is recommended that you copy the INFO.GEN tools from the ROMXce System and Utilities Disk onto the same disk, as these utilities are required to create the metadata.

If you are a Windows user, we recommend you install CiderPress (https://a2ciderpress.com/) to complete this task. In addition to many other features, CiderPress will allow you to open the disk image file and insert the ROM image that you have created.

An alternative utility, and one that also supports Mac OS and Linux, is AppleCommander (http://applecommander.sourceforge.net/).

If you choose to use CiderPress, its helps to rename your ROM file to include the CiderPress attribute tag at the end of the filename. The attribute tag will ensure that the file type is set correctly as BIN (binary) and will also set the default memory address when BLOADing the file.
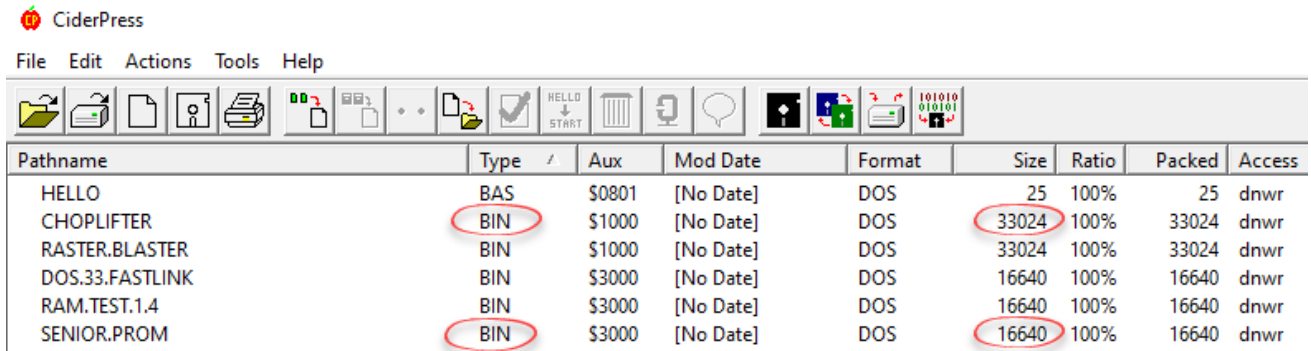
For 16KB ROM files, use the attribute tag **#063000**, and for 32KB ROM files use the attribute tag **#061000**

Ensure you select the option *Use file attribute preservation tags* when adding your ROM file.
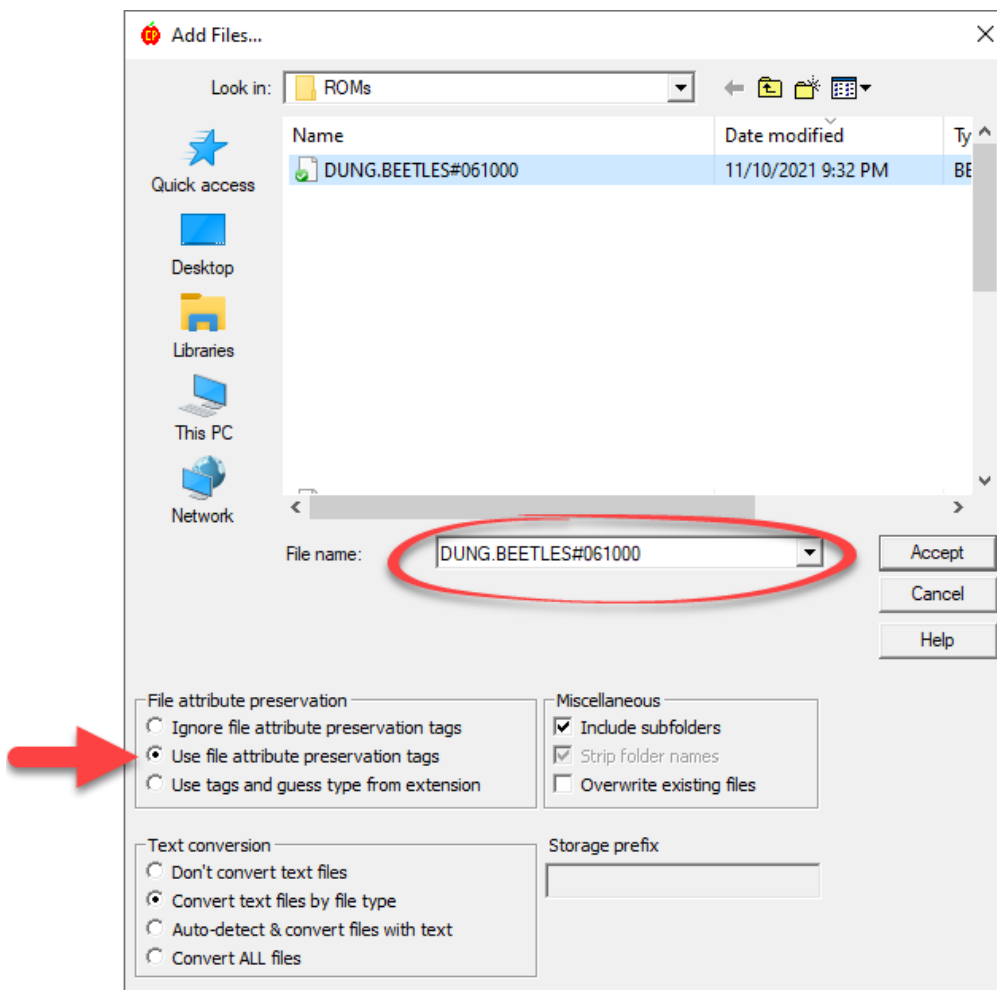
Whichever utility you elect to use, ensure that:

1. The file type on disk is Binary (BIN)
2. The file size on disk for a 32KB ROM is exactly 32768 bytes, or 33024 bytes for an RMX file.
3. The file size on disk for a 16KB ROM is exactly 16384 bytes, or 16640 bytes for an RMX file.

If you are using a floppy emulator such as Floppy Emu or wDrive, you may now copy the disk image to SD card and use it to boot the computer.

If you are using physical media, you can transfer the disk image to the Apple II using ADTpro (see https://www.adtpro.com/).

Uploading the ROM Image

The ROM image may now be uploaded via the U)pload command from the ROMX menu, or alternatively using the same command from the disk based version of the firmware ROMXCE.DISK. See the section titled U)pload Image from Disk for further information.

Adding a DOS Image

ROMXc/e support uploading of DOS images into ROM slots. A system ROM image may then be linked to a DOS image – when the system ROM is selected the computer will instantly boot DOS! This can be quite a time saver – DOS commands can be executed immediately after selecting the ROM.

In the example below the DOS 3.3 image in slot F has been linked to the Apple UnEnhanced ROM image in slot 2 via the &DF suffix (item 1).

This particular DOS image is a little special in that it supports a Language Card link. The Integer BASIC image in slot B has been linked to the DOS image via the &LB suffix (item 2).

The end result is that on selection of the ROM image in slot 2, DOS will be loaded into RAM, and the Integer BASIC language will be loaded into the Language Card memory space!

The DOS 3.3 FastLoad image is included by default, and a copy of it can be found on the ROMXce App1 disk on our web site. It's currently set up for a drive connected to a controller in Slot 6 but can be modified as follows :

> BLOAD DOS.33 (or any derivative)
> CALL -151
> 5AE9:n0 (where n is slot number desired; replaces $60)
> 5AEA:0n (where n is drive number desired; replaces $01)
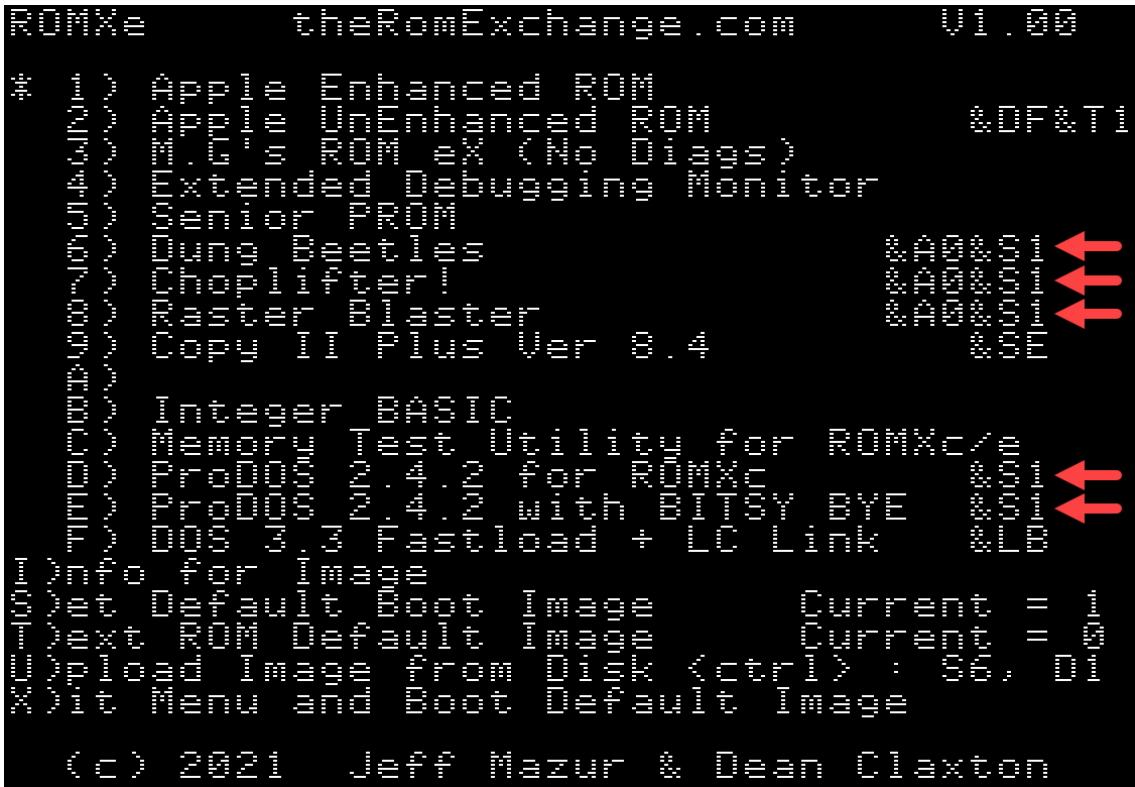> BSAVE MYDOS33 , A$3000, L$4100

The ProDOS 2.4.2 images are included by default and copies can be found on the ROMXce App2 disk. It is currently set up for a drive connected to slot 5, but can also be modified.

> BLOAD PRODOS 2.4.2 (or any derivative)
> CALL -151
> 4FA8:n0 (where n is slot number desired; replaces $50)
> BSAVE MYPRODOS.2.4.2 , A$1000, L$8100

One or more system ROM images may then be associated to a DOS image (see *Adding a ROM Image*).

Adding an Application Image

ROMXc/e support uploading of application images into ROM slots, such as the game and ProDOS images shown below :
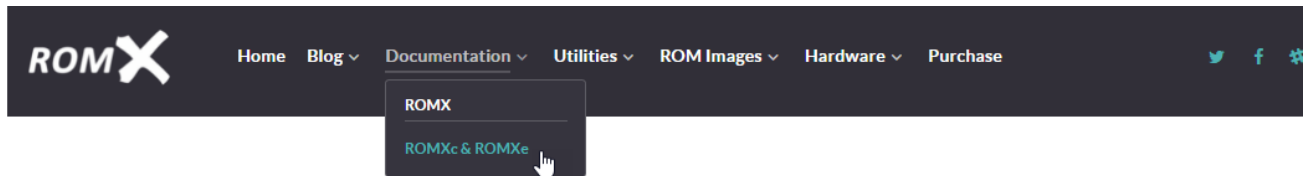
```
ROMXe        theRomExchange.com        V1.00

* 1) Apple Enhanced ROM
  2) Apple UnEnhanced ROM              &DF&T1
  3) M.G's ROM eX (No Diags)
  4) Extended Debugging Monitor
  5) Senior PROM
  6) Dung Beetles                      &A0&S1  ⬅
  7) Choplifter!                       &A0&S1  ⬅
  8) Raster Blaster                    &A0&S1  ⬅
  9) Copy II Plus Ver 8.4                &SE
  A)
  B) Integer BASIC
  C) Memory Test Utility for ROMXc/e
  D) ProDOS 2.4.2 for ROMXc             &S1   ⬅
  E) ProDOS 2.4.2 with BITSY BYE   &S1   ⬅
  F) DOS 3.3 Fastload + LC Link     &LB
I)nfo for Image
S)et Default Boot Image      Current = 1
T)ext ROM Default Image      Current = 0
U)pload Image from Disk <ctrl> : S6, D1
X)it Menu and Boot Default Image

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```

A system ROM may then be linked to the application via the &Sn suffix so that the ROM will be used when the application is executed.

Creating an Application Image

We have created a tutorial for those who are adventurous and would like to convert applications or games to run from ROM. We call this process "ROMifying" and the tutorial and accompanying disk image can be downloaded from https://theromexchange.com under Documentation -> ROMXc & ROMXe.

At first glance the tutorial may appear daunting, but once you start to work through it you will realize that most of the hard work has been done for you, and you can quite quickly build your own images.

Updating the ROMXc Firmware

The ROMXc/e firmware update process is almost identical to the regular ROM upload process and can be done either through the firmware when the computer is first powered on, else by running the disk based version of the firmware ROMXCE.DISK.

IMPORTANT NOTE for ROMXc users : *Before using the U)pload command, make sure that your Default image is set to a standard //c image (preferably ROM 0 or later to use Smartport devices). Otherwise you may not see your disk devices and/or get a CHECK SLOT # error message.*

Insert the ROMXCE Systems and Utilities disk containing the ROMXCE.FIRM firmware file, and select U)pload from the main menu.

Select the ROMXCE.FIRM file and when prompted for the bank to program, select bank 0. A warning is displayed that the firmware bank is about to be modified – press Y to confirm :

As a final step you will be prompted to press U to Upload, or ESC to cancel:

Press U to Upload – the firmware will begin and will update the various sectors of the flash chip, with the current sector displayed near the top of the screen:

```
ROMXe       theRomExchange.com       V1.00
                                       D6
* 1) Apple Enhanced ROM
   2) Apple UnEnhanced ROM            &DF&M
   3) M.G's ROM_eX (No Diags)
   4) Extended Debugging Monitor

*****************************************
*                                       *
* Select Bank to Program: 0             *
*                                       *
* Add Description for this Bank:        *
* ROMXce Firmware V1.00                 *
*                                       *
*                                       *
* UPLOADING IMAGE,    PLEASE WAIT...    *
*****************************************
*                                       *
*YOU ARE ABOUT TO MODIFY ROMX FIRMWARE  *
*                                       *
*                                       *
*****************************************
    (c) 2021  Jeff Mazur & Dean Claxton
```

Once the upload is completed, the new firmware is loaded immediately, and you will see the new version number displayed at the top right corner of the screen.

If for some reason you experience an issue when updating the firmware (such as power outage mid cycle!), then you may be left with a machine that will no longer boot.

In this scenario, follow the instructions in the Recovery Mode section to recover your ROMXc/e module from such an event.

Creating an RMX File

If you are looking to create an image to share with other ROMX users, then it is recommended that you use the RMX format. An RMX file contains an additional 256 bytes of metadata at the end of the ROM image, where the metadata is the Description and Information text which will be pre-populated when the image is uploaded to ROMX.

To create an RMX file:

1. Load the ROM Image into RAM
2. Generate the metadata using the appropriate INFO.GEN utility (32KB or 16KB)
3. Save the RMX file

Loading the ROM Image Into RAM

For 32KB ROM images, load the new ROM at address $1000 using the command:

```
BLOAD filename,A$1000
```

For 16KB ROM images, load the new ROM at address $3000 using the command:

```
BLOAD filename,A$3000
```

Generating Description and Information

ROMXc/e support a ROM description of up to 35 characters, which will be displayed alongside the image number on the main menu.

In addition to the image description, 144 characters of additional information or notes for the image can be stored and displayed on the information page.

When building an RMX file, this metadata can be created by running the appropriate version of the INFO GEN utility.

For 32KB images, run the INFO.GEN.32 utility:

```
RUN INFO.GEN.32
```

For 16KB images, run the INFO. GEN. 16 utility:

```
RUN INFO.GEN.16
```

The ROM Exchange Image Info Generator should load and prompt you to enter an image description. A maximum of 35 characters is allowed, including any required link suffixes.

```
ROMXc IMAGE INFO GENERATOR


ENTER DESCRIPTION:
Sabotage!                        &A0&S1※
```

After accepting the description by pressing the Enter key, you will be prompted to enter the image information that will be displayed on the I)NFO page. You can use the left and right arrows to move from line to line. What you see here is exactly as it will be displayed in the I)NFO page:

```
ROMXc IMAGE INFO GENERATOR


ENTER DESCRIPTION:
Sabotage!                            &A0&S1

ENTER ADDITIONAL INFO:
By Mark Allen - published in 1981 by
Online-Systems.▒
```

Pressing the Enter key will write the metadata to memory.

Double check the information you entered - If you made an error, re-run the appropriate INFO.GEN utility and edit the information. Whilst description and information text can be edited after the image is uploaded, it is important to ensure that the RMX file is correct in the first instance if you intend to share it.

Save the ROM Image

Once the information has been generated, the RMX file can be saved to disk. This is a simple matter of using the BSAVE command to save the memory contents to disk:

For 32KB ROM images, save the new ROM RMX file to disk using the command:

```
BSAVE filename,A$1000,L$8100
```

There is one slight issue however if you're going to create a 32K file. DOS 3.3 will not let you BSAVE a file with a length of $8000 (or $8100 if there is RMX info), which is required to build a 32K image. So you will need to either work in ProDOS (and constantly convert back and forth) or modify DOS 3.3 to allow this. The ROMXce Utilities Disk as well as the ROMifying Tutorial disk have such a modified DOS.

If you do find yourself ready to BSAVE a file but get a RANGE ERROR because you are in standard DOS, you can immediately eliminate the error by typing:

POKE 43364,255 (in Applesoft) or

A964:FF   (in the Monitor)

and then try the BSAVE again.

For 16KB ROM images, save the new ROM RMX file to disk using the command:

```
BSAVE filename,A$3000,L$4100
```

The resulting image file can now be shared via jdmicro@jdmicro.com (we'll put it up on the web page with credit) and uploaded to your own ROMXc/e either through the firmware U)pload process or by using the same U)pload function from the disk based version ROMXCE.DISK.

Recovery Mode

If you should experience an issue when updating the firmware such as a power outage mid programming cycle, then you may be left with a machine that will no longer boot.

To recover from such an event, turn off the computer, open the lid of the case and touch the power supply to discharge any static electricity that may have accumulated on your body. Then remove the J1 jumper from the ROMXc or ROMXe module to enable Recovery Mode. The J1 jumper is next to the ROM-Link header (ROMXc example shown below).
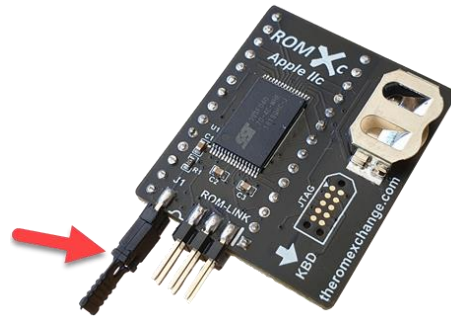
After removing the J1 jumper, turn the computer back on. Rather than running the regular ROMXce firmware and displaying the menu, a special recovery firmware will be executed. The computer will initially perform a memory test on the lower 2KB of RAM during which the screen will cycle through pages of inverse characters.

For those with an accelerator card it may be necessary to disable it, or reset the accelerator to 1MHz before rebooting into recovery mode.

If you should have any RAM issues in the lower memory bank, the recovery firmware will beep out the number of the chip that is faulty. If the RAM test passes, the following screen will be displayed:

Set up your system to boot using the ROMXce System and Utilities disk image, then select a ROM image to boot by pressing a key in the range 1-9, A-F.

If for some reason you do not have any valid ROM images installed on your ROMXc/e module, then please make contact via email so as we can try get you up and running again.

Once you have successfully booted the system using the ROMXce System and Utilities disk, while leaving the computer on, reinstall the recovery jumper on the ROMXc/e module.

You can now use the ROMXCE.DISK program to re-install the firmware (upload the firmware image to bank 0).

Note that if you are recovering from a corrupted firmware image, then you may find that whilst the ROM images you had previously installed on the module will still be present (and can be booted by pressing keys 1-9,A-F), the text description and information for the installed images may have been lost:

The stock images can be downloaded and reinstalled, else you can restore the image descriptions and information from I)nfo screen using CTRL-D to edit the description, and CTRL-I to edit the informational text.

Testing

The recovery mode is quite safe to test.

Pull the jumper and turn on the computer - it will do the memory test then display the recovery menu. Press a key 1-9, A-F to boot using the selected ROM image e.g press 1 to select the stock ROM $00 image.

Note that any linkages are ignored in recovery mode (&Tn, &Dn, &Ln).

When using recovery mode you would typically replace the jumper after booting the machine, so that you can run the ROMXCE.DISK utility to re-flash the firmware. If you were to run the ROMXCE.DISK utility without firstly replacing the jumper, ROMXCE.DISK will remind you to replace it.

Credits

Software Design	Jeff Mazur
Hardware Design	Dean Claxton Jeff Mazur
Documentation	Dean Claxton
Dual DOS	Peter Ferrie
Manufacturing	Dean Claxton

Special thanks to our Beta Testers for their valuable feedback – you've helped make ROMXc and ROMXe exceptional products!

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