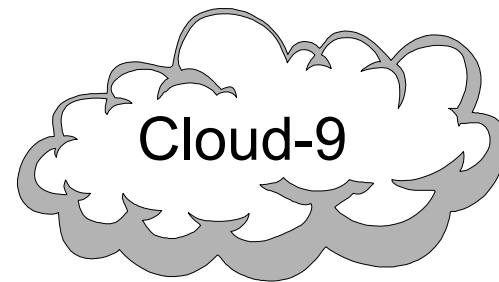


NitrOS-9 ROM Kit

User Manual



Cloud-9
3749 County Road 30
Delano, MN 55328
Telephone 763.972.3261
www.cloud9tech.com

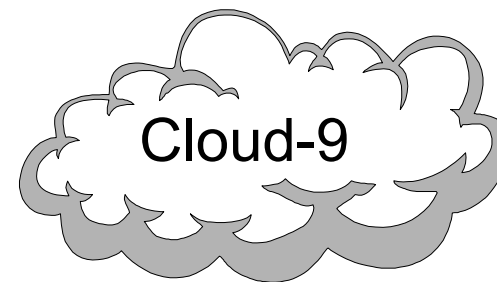
NitrOS-9 ROM Kit
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1. Congratulations!

Congratulations on purchasing the NitrOS-9 Kit. With this product, you will be able to place NitrOS-9 into an EPROM and boot your TRS-80/Tandy Color Computer directly into NitrOS-9. This flexibility gives you the potential to design and embed programs for dedicated applications using the NitrOS-9 operating system.

Before You Begin

To make use of the NitrOS-9 ROM Kit, you must have the following:

- **An EPROM Burner.** If you do not, then you can contact us at support@cloud9tech.com. You provide us your custom ROM image and we will provide the EPROM burning service for a reasonable fee.
- **A Development CoCo System** with either two floppies or one floppy and a hard drive. This can be either a CoCo 1, 2, or 3. The ROM can be built from any of these setups.
- **The Latest Version of NitrOS-9 from the NitrOS-9 Website.** Cloud-9 only supports NitrOS-9, a community-based, free version of OS-9 for the Color Computer. Please visit the website for the project at <http://www.nitros9.org> to download the disk images and follow the instructions to create real floppy diskettes from the disk images.

5. Support Information

If you have problems with this product, you are welcome to contact Cloud-9 at support@cloud9tech.com, or visit our website: <http://www.cloud9tech.com>

4. Suggestions and Notes

As mentioned earlier, the limitation that the ROM imposes doesn't allow for a large set of boot modules. Because of this, we recommend the following:

- Write your embedded application in assembly language. Writing it in C will produce an executable that will probably be too large. Writing it in Basic09 will require that you include RunB, which will also probably be too large to fit in the ROM.
- If you want to ROM NitroS-9/6x09 Level 2 on a CoCo 3, you will have to use the VDG screen. The modules required to support the 40- and 80-column screens are too large to fit into the ROM.

With a conservative bootlist, you will have around 3 or 4K of space for your application under NitroS-9 Level 1, and between 10 and 12K of space under NitroS-9 Level 2. Keep this in mind when developing your embedded application.

Embedded Ideas

Here are a few ideas that you can put an embedded CoCo to work doing:

- Home alarm system
- Temperature monitor/recorder
- Terminal interface

- **A Target CoCo.** This will be the CoCo that will run NitroS-9 in ROM.
- **Appropriate ROM or ROMs.** Depending upon your target CoCo, you will need one or more ROMs of varying types. This is discussed in the next chapter.

If you're all set, then proceed to the next chapter.

2. Why NitrOS-9 In ROM?

For those who have always used NitrOS-9 on a Coco, it may seem odd that the operating system could be run totally from ROM, but this is the way that OS-9 was designed to run. In the embedded OS-9 world, a disk drive or other mass storage device is incidental, or in most cases, impractical. Yet in the CoCo world, it has been a necessity, until now. So if it is possible to use NitrOS-9 without a disk drive, then why do it?

Since NitrOS-9 provides multi-user and multi-tasking services along with a broad range of system calls, it makes an ideal embedded operating system for certain type of monitoring and controlling applications. Add to that the CoCo's on-board I/O devices which can be interfaced to the real-world, and you have an ideal embedded hardware/software combination. No floppy drives, disk controller, or additional hardware is needed. Your CoCo can run NitrOS-9 and your specific application completely by itself.

Preparing Your Development CoCo

The CoCo system that you will be using to run the scripts that create the ROM image should be either a two-disk system or a system with a hard drive. It should also be running the latest version of NitrOS-9.

It is on this system that you will need to create a configuration disk. We recommend that you create a backup of the NitrOS-9 Modules disk (disk #2 from the NitrOS-9 project) and label the backup "NitrOS-9 ROM Kit

file into an EPROM and place into the ROM socket of your Color Computer.

If you have installed the ROM correctly, turn on the CoCo. You should see either an the NITROS9 BOOT screen, then the NitrOS-9 sign-on message and a shell prompt. From here, type MDIR and the module directory should appear on the screen.

Where To Go From Here

Now that you have successfully created a NitrOS-9 ROM, you can attempt to develop an application, include it in the `rom.bl` file, and follow the steps to recreate the ROM file. We suggest that you read the following chapter for best practices and suggestions.

Creating The NitroS-9 ROM

For our purposes, we will create a “minimal” NitroS-9 ROM using the existing `rom.bl` file, without modification. By minimal, we mean a ROM that boots up to NitroS-9, provides a shell, and one command: `mdir`. Obviously, this is not the best use of the ROM kit, but it will get you familiar with the process of building a ROM.

With the “NitroS-9 ROM Kit Configuration” disk in drive 0, type the following commands, based upon the version of NitroS-9 you wish to create a ROM for:

NitroS-9/6809 Level 1:

```
chd /d0/NITROS9/6809L1/SCRIPTS
chx /d0/NITROS9/6809L1/CMDS
```

NitroS-9/6809 Level 2:

```
chd /d0/NITROS9/6809L2/SCRIPTS
chx /d0/NITROS9/6809L2/CMDS
```

NitroS-9/6309 Level 2:

```
chd /d0/NITROS9/6309L2/SCRIPTS
chx /d0/NITROS9/6309L2/CMDS
```

Next, type the following script name to start the ROM creation process:

```
mr
```

Don't be alarmed if you see several `ERROR #216` messages. Unless you referenced a non-existent file in the `rom.bl` file, the script should continue running.

If the script finishes without any fatal errors, the ROM file will reside in the current directory. You can then burn this

Configuration.” The following steps are for a two-disk system:

1. Insert the NitroS-9 System Master Disk (disk #1) into drive 0 and boot into NitroS-9.
2. At the shell, type:

```
load copy dsave load makdir tmode
```
3. Remove the boot disk and insert the disk labeled “NitroS-9 ROM Kit Configuration” into drive 0.
4. Insert the NitroS-9 ROM Kit into drive 1.
5. At the shell, type:

```
chd /d1
chx /d1/cmds
dsave /d0 ! shell -p
```

At this point, the entire contents of the NitroS-9 ROM Kit diskette should be transferred to the “NitroS-9 ROM Kit Configuration” diskette. This is the disk you will use to make your NitroS-9 ROM.

Preparing Your Target CoCo

Depending upon your model of Color Computer, it may be necessary to remove its internal BASIC ROMs. For all CoCo 1s and some CoCo 2s, there are two 24 pin ROMs on the motherboard. For later model CoCo 2s, there is one 28 pin ROM on the motherboard. You will need to check your target CoCo to verify where its ROMs are located.

If your CoCos ROMs are socketed, then you merely need to remove them and replace them with your NitroS-9 ROMs. If, however, your CoCos ROMs are not socketed, you will

need to have them desoldered. If you are not comfortable with this delicate procedure and don't fully understand the above instructions, then you should have an experienced technician perform this modification.

For the Tandy Color Computer 3, it is necessary to desolder the ROM if it hasn't already been done so. This is done by clipping the 28 pin ROM (labeled IC2 and located at the lower right section of the motherboard), desoldering the holes and installing a 28 pin socket. Again, this is a very delicate procedure and you could easily damage your CoCo motherboard if you are not careful. If you are in doubt, then have someone with experience perform the modification.

3. ROM Configuration And Creation

The process of creating a NitrOS-9 ROM is mostly automated, but still may require some customization on your part. In the BOOTLISTS directory of the respective version of NitrOS-9 (6809L1, 6809L2 or 6309L2) is a file called `rom.bl`. It contains a list of all the NitrOS-9 modules that will be included in the ROM.

You will want to modify the `rom.bl` file based upon your specific project. However, you must keep in mind the following limitations:

- For a CoCo 1 or 2, the maximum space a bootfile may take up is \$2E00 (11776) bytes. The rest of the space is taken up by the kernel track and loader.
- For a CoCo 3, the maximum space a bootfile may take up is \$6C00 (27648) bytes. The rest of the space is taken up by the kernel track and loader.

These space limitations are imposed by the size of the ROM, which is 16K for a CoCo 1 or 2, and 32K for a CoCo 3. If the total size of the modules in your `rom.bl` file exceeds these limits, the script will fail with an error and abort.