

SBC SCSI Software Release 1.1 Software Release Guide

November 1993

Product ID: P301.01

Release Media Part Number:

Source: QIC *82Y8TSS187B*

Read me first!

This Software Release Guide (SRG)
contains important information that you
need before you install or use this product.

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Product Overview

Note Please read this entire document before attempting to install this product. This document supersedes all other installation instructions.

The Single Board Computer (SBC) SCSI Software is a building block for SCSI services. In the context of this manual, SCSI Software describes the Firmware used to control the SCSI I/O Processor (SIOP) chip on supported boards. It does not include operating system specific device drivers nor does it include SCSI peripheral device support. A user-supplied *Application* (e.g., a device driver) builds command packets and sends them to the Firmware, which along with the SIOP handles the logical aspects of the SCSI protocol.

The SBC SCSI Software is intended for developers who have a working knowledge of SCSI.

The SCSI Software is written to be independent of any particular operating system. The SBC SCSI Software is a component reused in Motorola system products such as SYSTEM V/68, SYSTEM V/88, VMEexec, and ROM-based Debuggers (e.g., MVME167Bug and MVME187Bug). In source form, it can be adapted to work for many other applications.

Example code is provided as unsupported software. This code provides examples of the use of the SCSI Software.

Parts Checklist

The following table provides the Motorola part numbers for the SBC SCSI Software release together with a brief description.

Marketing Number	Software Number	Description
SBCSCSISRC1	82Y8TSS187B	The Single Board Computers (SBC) SCSI Software, containing the entire contents of this release; on QIC-24 tape; cpio format.
SBCSCSI/S1	N/A	Software Release Guide — SBC SCSI Software Release 1.1 (this document).

Related Documentation

The publications listed in the following table are applicable to the MVME162/166/167/187/197 and may provide additional helpful information pertinent to the use of the SCSI Software. If not shipped with this product, they may be purchased by contacting your local Motorola sales office.

Document Title	Motorola Part Number
Single Board Computers SCSI Software User's Manual	SBCSCSI
MVME162 Embedded Controller Programmer's Reference Guide	MVME162PG
MVME166/MVME167/MVME187 Single Board Computers Programmer's Reference Guide	MVME187PG
MVME197LE/DP/SP Single Board Computers Programmer's Reference Guide	MVME197PG
MVME162Bug Debugging Package User's Manual	MVME162BUG
MVME167Bug Debugging Package User's Manual	MVME167BUG
Debugging Package for Motorola 68K CISC CPUs User's Manual	68KBUG
MVME187Bug Debugging Package User's Manual	MVME187BUG
MVME197Bug Debugging Package User's Manual	MVME197BUG
Debugging Package for Motorola 88K RISC CPUs User's Manual	88KBUG
MVME162 Embedded Controller User's Manual	MVME162
MVME162LX Embedded Controller User's Manual	MVME162LX
MVME166 Single Board Computer User's Manual	MVME166
MVME167 Single Board Computer User's Manual	MVME167
MVME187 RISC Single Board Computer User's Manual	MVME187
MVME197LE Single Board Computer User's Manual	MVME197LE

Note Although not shown in the above list, each Motorola Computer Group manual publication number is suffixed with characters which represent the revision level of the document, such as "/D2" (the second revision of a manual); a supplement bears the same number as a manual but has a suffix such as "/D2A1" (the first supplement to the manual).

The following non-Motorola items are referenced in this document:

ANSI Small Computer System Interface-2 (SCSI-2), Draft Document X3.131-198X, Revision 10c; Global Engineering Documents, P.O. Box 19539, Irvine, CA 92714.

NCR 53C710 SCSI I/O Processor, Document NCR53C710DM; NCR Corporation, Microelectronics Products Division, Colorado Springs, CO.

Prerequisites

A summary of prerequisites for starting to use this product:

Installation This package can be installed on a SYSTEM V/68 or a SYSTEM V/88 Host, or any other system capable of extracting a **cpio**-format archive from a QIC-24 tape.

Disk space The contents of this tape require **6600** 512-byte blocks of free disk space to install. However, it is generally recommended that in all, there be at least 10000 blocks free to accommodate compilation.

Run-time This software is meant to be used as a component in a system. Such a system might be a kernel, firmware, or a stand-alone application running on bare hardware. Systems incorporating this component include, for example, versions of the SYSTEM V/68, SYSTEM V/88, and VMEexec kernels; the BUG ROM, SSID, and numerous ISV and custom software packages. A system designed to incorporate the SBC SCSI Software is required.

Building from source Generating an executable image requires a compilation environment for the run-time system. Refer to documentation for your system on how to generate software for it.

To build, the SBC SCSI Software requires a standard K&R or ANSI "C" compilation system and SCRIPTS preprocessor and compiler binaries for the development host's architecture (see below).

NCR 53C710 Compiler

This release contains object modules of the NCR SCRIPTS compiler for execution on many common development platforms. The source for this compiler is NCR Proprietary and is not provided as part of this product. It is available from NCR Corporation.

Hardware Supported

The SBC SCSI Software is designed to work with the NCR 53C710 SCSI I/O Processor (SIOP) contained on the MVME166, MVME167, MVME187, and MVME197. It also works on all versions of the MVME162 containing the SIOP.

Peripherals Supported

The SBC SCSI Firmware is SCSI-2 compliant and provides support for SCSI-1 and SCSI-2 peripherals. The SCSI Firmware does not contain knowledge about any specific SCSI peripheral. All of the knowledge concerning a particular SCSI peripheral is contained in a user-supplied device driver. Refer to the *Single Board Computer SCSI Software User's Manual* and to the *Known Problems* chapter of this SRG for additional information.

Reporting Problems

Technical Action Requests (TARs) for this source release of the SBC SCSI Software are filed under the product ID P301.01.

Distribution Media

The release media for this release consists of one cartridge tape, software part number **82Y8TSS187B**.

Disk Space Required

Installation of this release requires approximately **6600** free blocks of disk storage, typically in **/usr** (it may be installed in any file system).

Installation Procedure

The SCSI Software source is installed using the “copy file archives in and out” utility (**cpio**). To install, re-install, or upgrade the source, perform the following steps:

1. Create the top level directory where the SCSI Software source is to be installed. All of the files are installed starting at this level. For example purposes, the rest of this section assumes the top level directory is **/usr/scsi**. Some systems may require you to log in as super-user, i.e. **root**.

```
mkdir /usr/scsi
```

2. Change to this new directory:

```
cd /usr/scsi
```

3. Retrieve the source modules by typing the following command:

```
cpio -iBcduv </dev/r41t (for SYSTEM V/R3)
```

OR

```
cpio -iBcduv </dev/ctape1 (for SYSTEM V/R4)
```

```
.  
.  
(the tape contents are listed as they are read off the tape)  
.
```

Barring any errors, the entire contents of the tape will now be on your system. The current directory will be the top level of a tree whose contents are described in Chapter 5, *Release Contents*.

Removal Procedure

The SCSI Software product is de-installed through removal of the one directory created in step 1 above. To remove the SCSI Software package, follow the procedure below (some systems may require you to log in as super-user, i.e., **root**):

Type:

```
rm -rf /usr/scsi
```

Introduction

This chapter contains information particular to the P301.01 release of the SBC SCSI Software.

Using the Product

Refer to the *Related Documentation* section in Chapter 1 of this SRG for a list of documents that contain information applicable to the use of this product.

Hardware Initialization Requirements

The SCSI Firmware uses the free-running Prescaler Counter in the VMEchip2 when executing on certain versions of the MVME167/187. When used on these boards, the Firmware expects the Prescaler to be properly initialized to count at a one microsecond rate. Refer to the *Known Problems* chapter of this SRG for additional information.

Compiling the Source Modules

No operating system specific Makefiles are provided with this product because the SBC SCSI Software is written to be independent of any particular operating system. The SCSI Software is used by other Motorola-supplied products such as SYSTEM V/68, SYSTEM V/88, VMEexec, and the MVME167/MVME187 ROM Debuggers (MVME167Bug and MVME187Bug). Makefiles are provided in these products to compile the SCSI Software.

The SBC SCSI Software can be adapted to work with nearly all software running on the MVME162/166/167/187/197. Most of the source is written in "C"; there are no 68K/88K assembly language source modules.

There is one source module (**iscript.n**) that contains the NCR 53C710 SCSI SCRIPTS code. This source module is compiled into a "C" source file through the use of the NCR 53C710 compiler. Once this "C" source file is created, it must then be compiled into object form using the standard "C" compiler.

What follows is an extract from a Makefile showing an example **.n.o** make rule for compiling a SCRIPTS module. This example is specific to a SYSTEM V/68 host. For a SYSTEM V/88 host, N710P should be set to use **n710p80k** and N710C should likewise be set to **n710c80k**.

```

TMPDIR = ./tmp_hdrs
INCDIR = ../incl

CPP     = cc -E
N710C   = n710c68k
N710P   = n710p68k

PFLAGS = -Um68k -UsysV68 -Um88k -Uunix -I$(INCDIR)

EXTHDRS= $(INCDIR)/ncr.h \
          $(INCDIR)/ncr710.h \
          $(INCDIR)/scsi.h \
          $(INCDIR)/scsi_err.h \
          $(INCDIR)/sfw_cnfg.h

.n.o:
1  rm -rf $(TMPDIR); mkdir $(TMPDIR)
2  @for i in $(EXTHDRS); \
3  do \
4      j=`basename $$i`; \
5      grep '^#.*[^\]$$' $$i >$(TMPDIR)/$$j; \
6  done
7  $(CPP) $(PFLAGS) $*.n | \
8  sed -e 's/ */ /g' -e '/^# *ident/d' -e '/^# *pragma/d' \
9      -e '/^# *[0-9][0-9]*/d' -e 's/[ \] /g' \
10     -e 's/[ \] /g' > $*.i
11  $(N710P) $*.i
12  $(N710C) $*.i -u -o $*.j
13  sed "/typedef.*ULONG/s/long/int/g" $*.j > $*.c
14  $(CC) -c $*.c
15  rm -rf $(TMPDIR) $*.i $*.j $*.c

```

An explanation of this “.n.o” rule follows:

Line(s)	Function
1	Create a directory, TMPDIR, into which filtered headers will be placed.
2-6	Strip the headers down to only the single-line preprocessor directives.
7	Apply the C preprocessor to perform macro substitution on the SCRIPTS module. Pipe the output to sed for more preprocessing.
8-10	Use sed to remove blank lines, unknown compiler directives, and other cpp ejecta which are meaningless to the build utilities (or worse).
11	Invoke the Motorola-supplied SCRIPTS preprocessor.
12	Compile using NCR's SCRIPTS compiler.
13	Convert the ULONG typedef from an unsigned long to an unsigned int .
14	Turn the <i>file.c</i> output of the SCRIPTS compiler into an object module.
15	Remove all intermediate files and the directory of massaged header files.

Notable Changes Since P301.00

In addition to assorted bug fixes and the information listed below, structural changes were made to support new functionality.

- ❑ Support for the MVME197 was added. This support requires that code calling the SBC SCSI Software:
 1. Use the new `init_type_1` initialization scheme.
 2. Provide call-outs for toggling serialized memory access. See the header file `incl/sfw_cnfg.h` for details.
 3. To execute on hardware containing a defective BusSwitch, bursting must be turned off. Turn it off at initialization time by setting the `SCSI_DCB` bit in the `snoopmode` field of the initialization structure.
- ❑ The sample application **t167** has been added to the release tape. It is provided without documentation and is unsupported.
- ❑ The structure `ncr_relinfo` was defined in `incl/ncr.h` in order to support certain compilers. This structure is not public and should be expected to change.
- ❑ Tagged command queueing has been implemented.
- ❑ The definition of the initialization structure (`siop_init`) has been expanded to support the MVME197. Existing code will continue to compile and run on earlier boards, but all new applications and those intended to run on the MVME197 and later boards must conform to the new scheme.

The `initvals` parameter to the entry point `siop_init()` should be changed to point to an `INIT_TYPE_1` data structure and initialized according to that new structure's definition. In particular, note that the clock speed value `sclk_speed` has a new definition completely unrelated to its predecessor, `clk_speed`.

- ❑ Two new files have been added: `ncr710/sfw_getrev.c` and `incl/sfw_cnfg.h`. These support the run-time query mechanism and compile-time configuration, respectively.
- ❑ A run-time query mechanism now exists to find out the revision of the SBC SCSI Software being executed. This new entry point, `sfw_getrev()`, provides essential identification information if you are reporting problems with the SBC SCSI Software after it has been built into an application.
- ❑ The Firmware can now call out when it requires that serialized access to memory be enforced. You may select this feature during compile-time

configuration. It is necessary that you use it while compiling code to run on 88110-based systems. It is only useful on such systems, and requires that you supply your own call-out functions. The SBC SCSI Software is shipped with this feature disabled. See the comments in the header file **incl/sfw_cfg.h** for further information.

- ❑ The NCR SCRIPTS compiler has been updated to revision 2.2A. Compiler and preprocessor binaries are supplied in the **bin** subdirectory for various architectures, described as follows:

n710?68k	SVR3 68k (COFF)	
n710?68k.ELF	SVR4 68k (ELF)	<i>This is not officially supported!</i>
n710?80k	SVR3 88k (COFF)	
n710?88k.ABI	SVR4 88k (ABI 1.1)	
n710?sun3	Sun 3	<i>This is not officially supported!</i>
n710?sun4	SPARCstation	<i>This is not officially supported!</i>

The '?' represents a 'c' for the compiler or a 'p' for the preprocessor.

- ❑ The software works correctly with Revision D of the NCR 53C710, which can be identified by the part number on the chip (609-3400546) or the revision field in the CTEST8 register (2).

Introduction

This chapter describes known problems which may be encountered when using the SBC SCSI Software. Some of the problems are parts of the SCSI-2 specification that are unimplemented by this software or the NCR 53C710. Others are defects affecting certain VMEmodules.

Unimplemented SCSI-2 Capabilities

Parity Support

DESCRIPTION: The SCSI Firmware does not support parity error detection on the SCSI bus.

WORKAROUND: No workaround is available to detect a device or environmental condition which is inducing parity errors into the SCSI stream. The system integrator must take care that the hardware environment in which the SCSI is used eliminates the possibility of parity errors. The system integrator may keep parity detection enabled at the target devices. In the event of a parity error from the NCR 53C710 to the device during all but the data out phase, the firmware will attempt to recover by re-running the phase in which the parity error occurred.

It is highly recommended that the drivers retry commands that terminate in recoverable errors.

Target Role

DESCRIPTION: The SCSI Firmware does not support target role operation.

WORKAROUND: Do not send the Firmware command packets with the `TARG` bit set in the command control structure.

Do not attempt the SCSI select operation on a VMEmodule running the SBC SCSI Software. Reselection is of course permissible because it occurs in the initiator role.

SCSI-2 Wide Data Transfer Negotiation

DESCRIPTION: The SCSI Firmware does not support initiation of negotiation for SCSI-2 Wide Data Transfers. Setting the WIDESCSCI bit in the SCSI I/O Processor (SIOP) command control field will result in unpredictable behavior.

WORKAROUND: Do not set the WIDESCSCI bit. This will result in a default of 8-bit wide data transfers over the SCSI bus.

Target Initiated SCSI-2 Wide Data Transfer Negotiation

DESCRIPTION: The SCSI Firmware does not support negotiation of SCSI-2 Wide Data Transfers initiated by target devices.

WORKAROUND: Do not use a target device that initiates negotiation of SCSI-2 Wide Data Transfers. Target devices initiating this will result in unpredictable behavior by the SCSI Firmware.

Device Reset

DESCRIPTION: If a device reset message is sent to a specified controller on the SCSI bus, any commands outstanding to the device at the time of the reset will not have status returned.

WORKAROUND: Do not issue a device reset message if there are commands outstanding for that device or use the SCSI bus reset configuration command instead.

Hardware Defects Affecting the Use of this Software

Cache Line Bursts on the MVME197 BusSwitch (Versions 1 and 2)

DESCRIPTION: The BusSwitch1 and BusSwitch2 will lock up if the 53C710 performs burst transfers on the local bus. The BusSwitch3 is supposed to work correctly, but it has not been verified as of this writing.

WORKAROUND: When initializing the SIOP on affected MVME197s, set the SCSI_DCB bit in the snoopmode field.

NCR53C710 SCSI Phase Change with >1 Burst in FIFO

DESCRIPTION: Revision part numbers 609-3400643 and 609-3400654 of the NCR 53C710 (Revision 0 as read from the CTEST8 register) will lock up if there is a phase change on the SCSI bus while there is more than one DMA burst remaining in the FIFO. This problem has been observed with fast synchronous reads using a Seagate 11200.

WORKAROUND: Setting a peripheral for asynchronous transfers tends to give the 53C710 enough time to drain its FIFO before the peripheral changes the SCSI phase. Also, assuring that the 53C710 is not held off the local bus by other traffic will prevent its FIFO from backing up.

NCR 53C710 Retry Cycles (Offboard Access)

DESCRIPTION: Revision part numbers 609-3400643 and 609-3400654 of the NCR 53C710 (Revision 0 as read from the CTEST8 register) have the following problem which could affect the software that uses the SCSI Firmware. When the NCR 53C710 transfers data to the VMEbus and a retry occurs on the last data transfer, the chip gets confused and reads the next instruction from the address of the last data transfer. The last data transfer is not completed and unpredictable behavior by the SCSI Firmware results.

WORKAROUND: Do not use off-board memory in MVME167/187 systems where CTEST8 register contains a value of 0.

NCR 53C710 Selection Timeout Timer

DESCRIPTION: Revision part numbers 609-3400643 and 609-3400654 of the NCR 53C710 (Revision 0 as read from the CTEST8 register) contains a bug in its selection timeout circuitry. Following a successful command, if the SCSI device releases the SCSI bus BUSY line within a "problem window" time, the selection timeout timer may become locked up. Subsequent attempts to select a *non-existent* device will result in a hang condition if the user is relying on the NCR 53C710 selection timeout interrupt to signal a selection timeout condition.

WORKAROUND: On MVME167/187 systems where the CTEST8 register contains a value of 0, the following guidelines must be observed.

If the SCSI Firmware is functioning in the interrupt mode, then the user must *NOT* attempt to select any non-existing device on the SCSI bus. Any attempt to do so will risk a hang condition which will require the issuing of a SCSI Bus Reset by the user.

If the SCSI Firmware is functioning in the polled mode, the selection timeout will work properly. A software polling mechanism has been implemented in the Firmware which is used in addition to the NCR 53C710 selection timeout circuitry. The software polling mechanism uses the free-running Prescaler Counter in the VMEchip2 on the MVME167/187. The Firmware expects the Prescaler to be properly initialized to count at a one microsecond rate. This strategy gives the NCR 53C710 timeout circuitry a chance to work first, but provides a failsafe backup when in polled mode should the timeout circuitry malfunction.

List of Files

A list of files associated with this product release resides in the directory where the product was installed. The file name is **ss187.fl**. Refer to the *Installation Procedure* section in Chapter 2 for a description of the files.

Top Level Files and Directories

The release tape contains the following files and directory sub-trees:

.scsi.date	Date that the source was compiled
.scsi.rel	Release version information
COPYRIGHTS	Copyrights applicable to this software
bin	Object for the NCR 53C710 tools
lib	VMEexec libraries created with the SBC SCSI Software
sbcs_scsi	Source for the SBC SCSI Software, include files, and an example SCSI Driver Library (SDL)
src	Source for the NCR 53C710 preprocessor
ss187.fl	List of files associated with the product release
task	Source for a sample application that demonstrates the use of this product along with the SDL

All of the source files which comprise the NCR 53C710 SCSI Firmware are located in the **sbcs_scsi/ncr710** directory. The include files can be found in the **sbcs_scsi/incl** directory. The Firmware interfaces a user-supplied device driver which builds SCSI CDBs with the NCR 53C710 SCSI chip. All of the files in these directories are a supported portion of the product.

The files under the **lib** directory contain the object for the NCR 53C710 SCSI Firmware as well as the object for the example source found under **sbcs_scsi/sdl**.

The files under the **bin** directory contain the object for the NCR compiler and preprocessor.

The two files **.scsi.rel** and **.scsi.date** provide information as to the revision level and the date the firmware was compiled. The revision level should be mentioned in any problems reported with the NCR 53C710 SCSI Firmware.

Many of the source files included are for example purposes and are released as unsupported software. The following is a summary and a short description of the unsupported software:

sbc_scsi/sdl The files under **sbc_scsi/sdl** contain example SCSI peripheral support for a wide range of SCSI peripherals such as disk, tape, and optical. These files interface an operating system specific device driver with the NCR 53C710 SCSI Firmware. The source itself comprises all of the available documentation for these files. This directory can be deleted if desired, since it does not contain any of the NCR 53C710 SCSI Firmware source.

task/t167 The files under **task/t167** contain a sample application that demonstrates the NCR 53C710 SCSI Firmware in use along with the SDL. This application can be compiled either to be run stand-alone or as a VMEexec task, and for either the MVME167 or MVME187.

The files under the **src** directory contain the source for the NCR preprocessor. The preprocessor is used when compiling the NCR 53C710 SCSI Firmware. More information concerning the use of the preprocessor is in the section *Compiling the Source Modules*. The preprocessor is a supported portion of the product.