Ethernet Address ROM Programming:

An Application Note

Order Number: EC–N3214–72

Revision/Update Information: This is a new document.

This application note provides information necessary to program the Ethernet address ROM.

Preliminary

Digital Equipment Corporation
Maynard, Massachusetts

April 1994

While Digital believes the information included in this publication is correct as of the date of publication, it is subject to change without notice.

Digital Equipment Corporation makes no representations that the use of its products in the manner described in this publication will not infringe on existing or future patent rights, nor do the descriptions contained in this publication imply the granting of licenses to make, use, or sell equipment or software in accordance with the description.

Printed in U.S.A.

Contents

Tables

Programming Address ROM

1 Overview

The programming information supplied in this application note applies to Digital supplied device drivers. The use of this information is not a hardware requirement; users may use other formats supported by their own device drivers.

2 Ethernet Address ROM

Two types of Ethernet address ROMs are available:

1. Single Address Ethernet ROM—part number XILINX XC1718 or XILINX XC1736 (or any other similar part that supports the same timing interface). This ROM is designed to contain a unique 48-bit address within any allocated Ethernet address space range. Since the part is manufactured with a unique 48-bit address, it shall not be reproduced (copied) by anyone for other prototyping, manufacturing, or any other reason.
2. Multiple Address Ethernet ROM—also part number XILINX XC1718 or XILINX XC1736 (or any other similar part that supports the same timing interface). This ROM is designed to provide a range of consecutive 48-bit addresses within any allocated Ethernet address space range. Applications that require multiple Ethernet addresses and want to minimize the amount of hardware required, should use this ROM.

2.1 Single Address Ethernet ROM Format

Table 1 lists the hexadecimal format of the single address Ethernet ROM. The example content column for this table lists the ROM content for the address of F0 2E 15 6C 77 9B. The octet column for this table can be summarized as follows:

- Octet 0 through octet 7 contain the entire 48-bit Ethernet address and checksum.
- Octet 8 through octet 15 contain the 48-bit Ethernet address and checksum in reverse order.
- Octet 16 through octet 23 contain the same address listed in octet 0 through 7.
- Octet 24 through octet 31 contains the test pattern that provides additional test coverage of the ROM. The test pattern content is as follows: FF 00 55 AA FF 00 55 AA.

Table 1 Single Address ROM Format

Octet	Contents	Example Content
0	Address Byte 0	F0
1	Address Byte 1	2E

(continued on next page)

Table 1 (Cont.) Single Address ROM Format

Octet	Contents	Example Content
2	Address Byte 2	15
3	Address Byte 3	6C
4	Address Byte 4	77
5	Address Byte 5	9B
6	Checksum Byte 1	63
7	Checksum Byte 2	2F
8	Checksum Byte 2	2F
9	Checksum Byte 1	63
10	Address Byte 5	9B
11	Address Byte 4	77
12	Address Byte 3	6C
13	Address Byte 2	15
14	Address Byte 1	2E
15	Address Byte 0	F0
16	Address Byte 0	F0
17	Address Byte 1	2E
18	Address Byte 2	15
19	Address Byte 3	6C
20	Address Byte 4	77
21	Address Byte 5	9B
22	Checksum Byte 1	63
23	Checksum Byte 2	2F
24	Test Pattern = FF	FF
25	Test Pattern = 00	00
26	Test Pattern = 55	55
27	Test Pattern = AA	AA
28	Test Pattern = FF	FF
29	Test Pattern = 00	00
30	Test Pattern = 55	55
31	Test Pattern = AA	AA

2.2 Multiple Address Ethernet ROM Format

Table 2 lists the hexadecimal format of the multiple address Ethernet ROM. Each multiple address ROM defines a range of consecutive addresses. The number of addresses defined, called the address count, depends on the ROM programming variant. The ROM encodes its range of addresses by storing the starting and ending address of the range. In addition, an overall checksum is stored. The overall checksum is a CRC-16 checksum over octet 0 through octet 63. The CRC checksum calculation is contained in octet 64 and octet 65.

Table 2 Multiple Address ROM Format

Octet	Contents
0 through 31	Starting address block
32 through 63	Ending address block
64	Low-order octet of CRC-16 checksum
65	High-order octet of CRC-16 checksum

2.3 Ethernet Address Checksum Calculations

When an Ethernet address must be manually transcribed, it is desirable to append a checksum to detect transcription errors. This checksum can be used inside stations to verify the integrity of stored Ethernet addresses.

Assuming that an Ethernet address is available using the standard notation of six (A, B, C, D, E, and F) 8-bit bytes and each byte is a numeric value between 0 and 255, then the checksum is a 16-bit value (K) that is calculated using the following formula:

$$K = [A * 2^{10} + B * 2^2 + C * 2^9 + D * 2 + E * 2^8 + f]mod(2^{16} - 1)$$

When inputting or displaying an address together with its checksum, the address is in the form A B C D E F G H, where $K = G * 2^8 + H$.

The checksum can be calculated using 16-bit one's complement binary arithmetic, shifting left prior to adding each pair of octets, as illustrated by the following Pascal program:

```
VAR A, B, C, D, E, F, G, H, I, K;
Var Octet: Array[0...5] of integer;
Octet[0]:=A; Octet[1]:=B; Octet[2]:=C;
Octet[3]:=D; Octet[4]:=E; Octet[5]:=F;
K:=0;
For I=0 to 2 DO
Begin
      K:2*K;
      If K>=65536 Then K:=K-65535;
      K:= K + 256*Octet[2*I] + Octet[2*I + 1];
      If K>=65536 Then K:=K-65535;
End;
If K>=65536 Then K:=0;
G:=K Div 256;
H:=K Mod 256;
```

For example:

The Ethernet address F0-2E-15-6C-77-9B would be written with the checksum as F0-2E-15-6C-77-9B-63-2F.

Technical Support and Ordering Information

This section explains how to:

- Call for DECchip information and technical support.
- Order the DECchip 21040 Ethernet LAN Controller for PCI and the DECchip 21040 Evaluation Board Kit.

Information and Technical Support

Call the following phone numbers for information and technical support:

United States and Canada	**1–800–332–2717 (1–800–DEC–2717)**
TTY (United States only)	**1–800–332–2515 (1–800–DEC–2515)**
Outside North America	**+1–508–568–6868**

Ordering DECchip Products

To order the DECchip 21040 Ethernet LAN Controller for PCI or the DECchip 21040 Evaluation Board Kit, contact your local Digital sales office. Working with your sales representative, you may be able to take advantage of discounts and volume pricing.

You can order the following DECchip products from Digital.

Product	Order Number
DECchip 21040 Ethernet LAN Controller for PCI	21040–AA
DECchip 21040 Evaluation Board Kit	21A40–01

Associated DECchip Literature

The following table lists DECchip literature related to the DECchip 21040 Ethernet LAN Controller for PCI.

Title	Order Number
DECchip 21040 Ethernet LAN Controller for PCI Product Brief	EC–N0281–72
DECchip 21040 Ethernet LAN Controller for PCI Data Sheet	EC–N0280–72
DECchip 21040 Ethernet LAN Controller for PCI Hardware Reference Manual	EC–N0752–72
DECchip 21040 PCI Evaluation Board User's Guide	EC–N0753–72
Connecting the DECchip Ethernet LAN Controller to the Network: An Application Note	EC–N0737–72
Ethernet Address ROM Programming: An Application Note	EC–N3214–72

Ordering Associated DECchip Literature

To order any of the previously listed DECchip literature, send the following information by **FAX** or **mail**:

Name
Company name
Street address
City, state or county, and country
Document order number
Quantity

To order by . . .	Do this . . .
FAX (available 24 hours)	Call 1–508–351–4467.
Mail	Write to: Digital Equipment Corporation Order Administration NRO2–2/J6 444 Whitney Street Northboro, MA 01532 USA