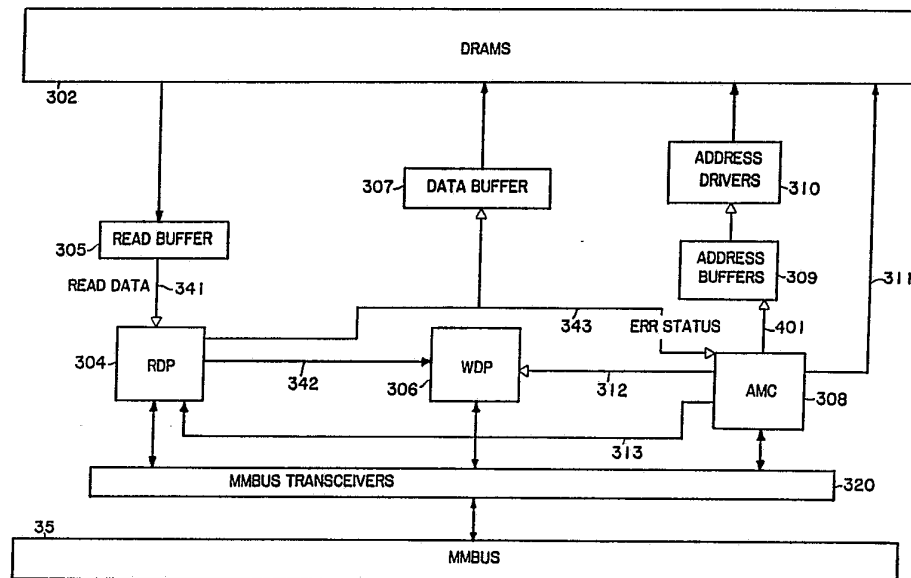




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification 4 : G11C 29/00, G06F 7/58</p>	<p>A3</p>	<p>(11) International Publication Number: WO 89/09471 (43) International Publication Date: 5 October 1989 (05.10.89)</p>
<p>(21) International Application Number: PCT/US89/01036 (22) International Filing Date: 15 March 1989 (15.03.89) (31) Priority Application Number: 176,699 (32) Priority Date: 1 April 1988 (01.04.88) (33) Priority Country: US (71) Applicant: DIGITAL EQUIPMENT CORPORATION [US/US]; 111 Powdermill Road, Maynard, MA 01754 (US). (72) Inventors: PIERCE, Donald, C. ; 148 Phillips Street, Fitchburg, MA 01420 (US). UTZIG, Edward, H. ; 465 H Boston Turnpike #1, Shrewsbury, MA 01545 (US). CROUSE, Robert, N. ; 15 Atkins Street, Brighton, MA 02135 (US). HESSION, Noreen ; 132 Pond Street, South Braintree, MA 02184 (US). SMELSER, Donald, W. ; 20 Woodside Drive, Bolton, MA 01740 (US). COLLINS, Hansel, A. ; 901C Ridgefield Circle,</p>	<p>Clinton, MA 01510 (US). (74) Agent: HILLMAN, Robert, E.; Fish & Richardson, One Financial Center, Suite 2500, Boston, MA 02111 (US). (81) Designated States: DE (European patent), FR (European patent), GB (European patent), IT (European patent), NL (European patent). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 16 November 1989 (16.11.89)</p>	

(54) Title: MEMORY SELFTEST METHOD AND APPARATUS



(57) Abstract

A method and apparatus for testing each memory location of a memory device, the method comprising the steps of: generating each of the memory addresses corresponding to each memory location in a pseudo-random order; generating a pseudo-random series of data words; storing one of the data words at each memory location; reading each data word back from memory; regenerating the series of data words; and comparing each read data word to the corresponding regenerated data word. The invention features generating and storing a second series of data words, each data word being the inverse of the data words in the first series. The second series of data words are read from memory and compared to regenerated data. The invention also features a novel linear feedback shift register for generating the pseudo-random memory addresses and can generate the address zero. An accumulating register is utilized to store the approximate location of malfunctioning memory locations.

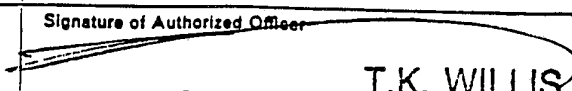
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INTERNATIONAL SEARCH REPORT

International Application No PCT/US 89/01036

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : G 11 C 29/00, G 06 F 7/58		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴ :	G 11 C 29/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁸		
Category *	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	IBM Technical Disclosure Bulletin, vol. 25, no. 3A, August 1982 (Armonk, NY, US) F. Tsui: "Testing of memory parts", pages 1216-1227, see page 1217, line 10 - page 1220, line 3; page 1221, line 39 - page 1222, line 9; page 1223, line 34 - page 1225, line 20; page 1226, line 11 - page 1227, line 12	1-4,7
A	--	11,14-17
X	Proceedings of the 1984 International Test Conference, 16-18 October 1984 Philadelphia, IEEE (US) Z. Sun et al.: "Self-testing of embedded RAMs", pages 148-156, see page 148, column 2, lines 34-48; page 149, column 2, lines 1-14; page 150, column 1, lines 28-43; page 151, column 1, lines 40-50; page 152, column 1, lines 1-6; page 152, column 2, line 17 - page 153, column 1, line 14	1-4,7
A		11,14-17
<p>* Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
18th July 1989	24 OCT. 1989	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	 T.K. WILLIS	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	Proceedings of the 1986 International Test Conference, 8-11 September 1986 Philadelphia, IEEE (US) W. Daehn et al.: "A test generator IC for testing large CMOS-RAMs", pages 18-24, see page 23, column 1, lines 1-12	1,4,6,8,9, 19,20,28-30
A	US, A, 4293950 (SHIMIZU et al.) 6 October 1981, see column 24, line 17 - column 25, line 25; claim 18	5,18
A	EP, A, 0031706 (FUJITSU) 8 July 1981, see claim 1	8,19,28

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claim numbers because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This international Searching Authority found multiple inventions in this international application as follows:

Please see PCT/ISA/206 dated 31 July 1989.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
1-22, 28-31
4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
 No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.

US 8901036

SA 28313

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 13/10/89. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4293950	06-10-81	JP-A- 54130848	11-10-79
		JP-A- 54130841	11-10-79
		JP-A- 54130842	11-10-79
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		JP-A- 54150086	24-11-79
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		JP-A- 55060872	08-05-80
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EP-A- 0031706	08-07-81	US-A- 4384348	17-05-83
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