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The following paragraphs provide testing procedures for the DZV11 option in all its variations. It is assumed that the user has a good working knowledge of the LSI11 QBUS and the DZV11. If not, the following references are required reading:

1. DZV11 User's Guide (ED-DZV11-UG-xxx)
2. Microcomputer Handbook
3. LSI11, PDP11/03 User's Manual (ED-LSI11-TM-xxx)

The DZV11 is a four line asynchronous interface that is used with the LSI11 processor. It provides an EIA interface and enough data set control to permit dial-up operation with full duplex modems such as the Bell series 103, 113 and equivalent.

The DZV11 can be supplied in two different configurations, each designated by a suffix letter (A or B). Each multiplexor configuration utilizes a quad height module designated the M7957. All input and output leads of the M7957 conform to EIA standard RS232C and are available on a Berg header.

The required hardware for the DZV11-A option is just the M7957 module. Cabling assemblies to terminals and modem channels are not supplied with this option, but are available in the DZV11-B configuration. Each DZV11-B configuration consists of an M7957 module, BC11U-25 cable assembly, and two accessory test connectors, H329 and H325.

1. DZV11 Device Address

The device address assigned to the DZV11 resides in the floating address space of the LSI11. This address space ranges from 160010 (8) to 163776 (8). Each DZV11 requires increments of 10 (8) address locations and the first option should be configured with an address of 160010. The initial configured address assumes that the system consists of only DZV11's in the floating address field. If the DUV11 option is also configured in the floating address field, assign the DZV11 an address which establishes a gap of 10 (8) address locations between the last DUV11 and the first DZV11. For example: If the system consisted of one DUV11 located at 160010 (8), then the DZV11 should be configured with an address of 160030.

1.1 Setting the Device Address

Once the position of the DZV11 has been established in the floating address scheme, the QBUS address is selected by a switch pack on the M7957 module. The IC designator for the ten position dip pack is E30. For a logical one (1) on a QBUS address line, set the rocker switch that corresponds to the particular address bit to the ON (closed) position. The ON

position is when the rocker is depressed at the ON side of the switch. Rocker #1 corresponds to the most significant address bit, bit 12, rocker #10 is the least significant address bit selector. The following figures represent the address selector, E30, and the switch settings for some example device addresses.

Address Selector E30

	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03
on	1	2	3	4	5	6	7	8	9	10
off	|	|	|	|	|	|	|	|	|	|

ADDRESS	A12	A11	A10	A09	A08	A07	A06	A05	A04	A03
160000	-	-	-	-	-	-	-	-	-	-
160010	-	-	-	-	-	-	-	-	-	X
160020	-	-	-	-	-	-	-	-	X	-
160030	-	-	-	-	-	-	-	-	X	X
160040	-	-	-	-	-	-	-	X	-	-
etc										
.										
.										
163760	-	-	X	X	X	X	X	X	X	-
163770	-	-	X	X	X	X	X	X	X	X

Note: X=ON
-=OFF

2. DZV11 Interrupt Vector

Similiar to the device address, the vector address of the DZV11 resides in the floating vector space of the LSI11. The vector space ranges from address 300 (8) to address 776 (8). Each DZV11 requires increments of 10 (8) address locations for its two contiguous interrupt vectors. If the DZV11 is the only option in the floating vector area, configure it for a vector of 300 (8). If there are options other than the DZV11 residing in the floating vector area, other configuration rules must be applied. When configuring the device vector, only the first vector address musr be considered. The first vector, or base vector, must start on a zero boundary.

A zero boundary is one which has the three least significant bits equal to zero. The second vector is controlled by the first vector and data bit 02. Data bit 02 is generated by the M7957 hardware.

2.1 Setting the Interrupt Vector

Once the position of the DZV11 has been established in the floating vector scheme, the QBUS vector is selected by a switch pack on the M7957 module. The IC designator for the eight position dip pack is E2. To generate a logical one (1) for the QBUS vector bit, set the rocker switch that corresponds to that particular bit to the ON (closed) position. The ON position is when the rocker is depressed at the ON side of the switch. Rocker #1 corresponds to the most significant vector bit, bit 08, rocker #6 is the least significant vector bit selector. The following figures represent the vector selector, E2, and the switch settings for some example vector addresses.

Vector Selector E2

	V08	V07	V06	V05	V04	V03	NOT USED	
on	1	2	3	4	5	6	7	8
off	|	|	|	|	|	|	|	|

VECTOR	V08	V07	V06	V05	V04	V03
300	-	X	X	-	-	-
310	-	X	X	-	-	X
320	-	X	X	-	X	-
330	-	X	X	-	X	X
etc						
.						
.						
760	X	X	X	X	X	-
770	X	X	X	X	X	X

Note: X=ON
-=OFF

3. Jumper Configuration

There are sixteen jumpers located on the M7957 module. Insertion or removal of a jumper is dependent on its function. Jumper locations can be found on the Unit Assembly drawing of the M7957 module. Jumpers are catagorized as those required for:

3.1 Module Test

There are six (6) jumpers specified to be removed only during module test time at the General Radio test level. At all other levels of testing and for device operation these jumpers must be installed. These jumpers are designated as W9, W12, W13, W14, W15, and W16.

3.2 Device Operation

Two (2) jumpers, W10 and W11, are specified as those which are required for device operation. These jumpers must be installed only when the module is used in an H9270 backplane, or a backplane that applies the QBUS signals to the C and D sections of the module. When installed or tested in a C/D Bus type LSI11 backplane, these jumpers are required to be removed.

3.3 Modem Control Support

There are eight (8) jumpers which are used for modem control support. These jumpers, W1 thru W8, are required to be installed at module test, opcion test and acceptance time. Jumpers W1 thru W4, when installed, allow assertion of the Request to Send lead to the modem by the setting of Data Terminal Ready in a DZV11 device register. Each line is provided with a jumper option. W1 represents the jumper option for line 3, W2 for line 2, W3 for line 1 and W4 for line 0. The remaining four jumpers, W5 thru W8, allow the Request to Send lead to control the Forced Busy lead to the modem. The assertion of a Request to Send lead applies an ON or Busy condition to the Forced Busy lead. Each line is provided with a jumper option, W5 represents line 3, W6 represents line 2, etc. The Forced Busy option is available with 103E and 113B modems.

4. Power Requirements

1.15 Amps @+5 Volts
0.39 Amps @+12 Volts

5. Enviornmental Specifications

The DZV11 operates in an environment from 5 to 50 degrees Centigrade (41 to 122 degrees F) with a relative humidity of 10% or less to 95% without condensation.

6. Maintenance Philosophy

Maintenance of the DZV11 is accomplished by following this test procedure while using the device diagnostics. The testing can be divided into five areas.

6.1 Visual Inspection

This is a visual check for solder shorts and damaged or missing components. A visual inspection can often save needless checkout time.

6.2 Internal Loopback

This is the simplest maintenance mode provided and it is the first logical mode used in this procedure. With bit 03 of the DZV11's Control and Status Register set, the output serial data from the Uarts are looped back into their respective serial data inputs. All lines are looped around simultaneously.

6.3 Staggered Loopback

In this mode of operation, the output signals from line 0 connect back to the inputs of line 1 and the output signals of line 1 connect back to the inputs of line 0. Lines 2 and 3 are looped back in the same manner. To operate in this mode, the H329 test connector is required and the device maintenance bit (CSR 03) is kept cleared.

6.4 External Test

This maintenance mode tests the lines to the point where the customer attaches the modem or terminal. Testing in this mode requires that the H325 test connector be attacned to one individual line of the BC11U cable assembly. In external mode, each line of the DZV11 can be tested by changing the H325 to a new line required for each test.

6.5 On Line Test with Terminal

In this mode of operation, an EIA terminal is connected to a single line of the BC11U cable assembly. All lines are individually checked out with the aid of a device diagnostic.

7. Diagnostics

Four device diagnostics have been created for checkout of the DZV11. These are available as libkit #ZJ251. In addition to the diagnostics, a DEC/X11 exercisor module, Maindec-11-DXDZB, is available. The following is a short description of each program.

7.1 Maindec Introduction

A) Maindec-11-DVDZA. This is the first diagnostic of a two part series which is used for basic option checkout. This program exercises the read/write bits of the registers, performs simple transmission and reception exercises for each line and verfies the interrupt capabilities of the option.

B) Maindec-11-DVDZB. This diagnostic continues the series of basic option diagnostics. Exercises of the transmitters and receivers in all possible operating modes and at all possible data rates are performed. Error conditions are induced on the line and the option is then checked for its ability to recognize these errors.

C) Maindec-11-DVDZC. Maindec DVDZC verifies the cable interface connection between the module and the EIA connector. The diagnostic provides the operator a choice of testing the cable interface assembly or testing the actual connection of a line to an EIA supported terminal.

D) Maindec-11-DVDZD. This program is designed as a verification aid for the field service personnel in establishing a communication link from the DZV11 to another LSI11 or to a communications test center. It is used with the Interprocessor Test Program (Maindec-11-DZITP) as an overlay to the monitor.

E) Maindec-11-DXDZB. DXDZB is a systems exercisor module used with DEC/X11. It can operate up to eight consecutively addressed DZV11 multiplexors. Internal maintenance mode is implemented for transmission and reception of character bursts of data. All lines of each selected multiplexor are enabled for running.

7.2 Operation of Diagnostics

The basic checkout programs, Maindecs DVDZA, DVDZB, and DVDZC, each require 4K of memory for operation. All programs are in absolute format and can be loaded using the absolute loader. Other media, such as disks, may also be used.

Once a diagnostic has been loaded into memory, it is started at location 200 (8). The diagnostics will either autosize the system or request operating parameters before execution of the tests. The value contained in the software switch register determines the startup mode of the program. Address 176 (8) is reserved as the software switch register. The writeups for each diagnostic provide a more detailed explanation of their operation.

7.2.1 Autosizing

When a diagnostic is initially started and the software switch register location is cleared, autosizing will be performed. The autosizer routine is designed to detect all DZV11 device and vector addresses within the floating address and vector area. Other parameters required for device testing are given defaulted values. These values include testing of all four lines, with internal maintenance mode selected and at a baud rate of 19.2K baud.

The autosized values used during testing will be displayed on the console in the form of a DZV11 status table. The status table values must be verified for their correctness by the operator. Maindec's DZDVA and DZDVB are the only diagnostics to have autosizing capabilities. The remaining diagnostics require either a monitor or manual intervention for execution and do not autosize.

7.2.2 Parameter Input

An operator may also supply specific parameters for testing if it is desired. This feature is provided by having the software switch register bit 00 set when Maindec DVDZA or Maindec DVDZB is started. The operator must then input a response to the following dialogue on the console terminal:

1st CSR ADDRESS (160000:163770):
(You must type in the first DZV11 CSR in the system you wish testing to begin at. Range: 160000:163770.)

1st VECTOR ADDRESS (300:770):
(You must type in the vector of the first DZV11 in the system under test. Range: 300:770.)

MAINTENANCE MODE
(EXTERNAL (H325) (E))
(INTERNAL (DZCSR03=1 (I))
(STAGGERED (H329) (S))
(Type "E" or "I" or "S" depending on which mode you wish to run in. If running "EXTERNAL", all selected lines must be terminated by H325 test connectors.)

OF DZV11's (IN OCTAL) (1:20):
(Type the total number of DZV11 to be tested in the system. Range is 1 thru 20 in octal.)

All responses are terminated by typing a carriage return. It is important to note that all the DZV11's must be contiguous for both address and vector. Also all the extra parameters such as the default baud rate and the number of active lines for each device are given to the existing DZV11's in the system.

Operation of Maindec DVDZC always requires an opening dialogue. Special software switch register settings are not required when this diagnostic is started. Since this program provides both a cable interface test and a terminal echo test, the response depends on the specific test required by the operator. The following is printed on the console terminal when the cable test is selected:

VECTOR ADDRESS-
(You type a vector followed by a carriage return.)

CONTROL REGISTER ADDRESS-
(You type in the DZV11 CSR address under test followed by a carriage return.)

WHICH TEST? ECHO OR CABLE (E OR C)
(Type C and a carriage return.)

BAUD RATE-
(Type either 50, 110, 135, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600 followed by a carriage return.)

LINE-
(You type the line which has the H325 test connector. Type either 0, 1, 2, 3). Program will then print:)

CABLE TEST-
(The diagnostic is now exercising the selected line.)

Selection of the terminal echo test will repeat the vector and control register address questions and print out the following:

WHICH TEST? ECHO OR CABLE (E OR C)
(Type E and a carriage return.)
BAUD RATE-
(Type a baud rate value followed by a carriage return.)
LINE-
(Type a line number followed by a carriage return. The program will print:)
TERMINAL ECHO TEST
TYPE A CHARACTER ON THE DZV11 TERMINAL
(The program has now transmitted an output message to the DZV11 terminal and is waiting for a printable character to be typed on the terminal. The program will then echo all printable characters that are received.)

By typing any printing key on the cinsole terminal, a request for a new line number will be asked. At this time the operator should attach either the H325 test connector or the output terminal to a new line and continue operating the program until all lines are checked.

7.2.3 Status Table

This is the description given to a reserved area of memory, addresses 1500 thru 1740, that DZDVA and DZDVB use for storing the operating parameters of the tests. Each DZV11 on the system requires five consecutive address locations for storage and a total status table support of sixteen DZV11s. The methods described previously, autosizing or console input, are used to configure this input table. The following represents a typical status table printout:

```
MAP OF DZV11 STATUS
1500      160100
1502      000300
1504      000017
1506      017470
1510      100000
```


The previous information will be repeated for each of up to 16 DZV11's in the system. Explanation.

1500	160100	This is the system control registe for the first DZV11 in the system.
1502	000300	This is the receiver interrupt vector for the first DZV11 in the system.
1504	000017	This is the bit representation of the active lines to be tested.
1506	017470	This is the parameter location used in most of the tests. It signifies the following: Receiver Enabled, 19.2K Baud, Eight bits per character, and Two stop bits. This value is loaded into the Line Parameter Register of the device.
1510	000000	This location contains the type of maintenance selected for testing. 000000=Internal Maintenance Mode 000200=External Maintenance Mode H325 100000=Staggered Mode (H329)

8. Test Procedure

8.1 Module Checkout

All DZV11 modules are General Radio tested and require no further testing at this level. Jumpers W9, W12, W13, W14, W15, and W16 must be removed for tnis level of testing. When module checkout is complete, all jumpers must be installed for the level of checkout.

8.2 Option Checkout

This procedure checks both variations of the DZV11 (DZV11-A & B) Any differences in the checkout procedure due to the different optios are noted where applicable.

8.2.1 Preliminary Setup:

a) Visually inspect the module for broken or damaged components and make any necessary replacements.
b) Verify that all current ECO's, if any, are installed.
c) Set the address dipswitch to 160010 and the vector dipswitch to 300. Refer to the DZV11 Address and Interrupt Vector sections for assistance. Note also that all jumpers

should be installed before testing. Jumpers W10 and W11 are exceptions as they apply to the type of QBUS backplane to be used.
d) Check for power shorts to ground and for shorts between different voltages. The power distribution on the module pins is as follows:
+5v pins BV1 or A2 of all sections
+12v pin BD2
gnd pins C2 or T1 of all sections

8.2.2 DZV11-A Testing

a) Install the DZV11-A option in the QBUS backplane. When inserting the module, make sure that the power is off and be careful to avoid snagging the components on the card guides and adjacent module.
b) Turn on power and load Maindec-11-DVDZA into memory.
c) Open location 176 (8) and enter the value 000001. This location is the software switch register and the value entered represents a request to input parameters from the console. Refer to section, Operation of Diagnostic, for assistance. Close the location with a carriage return.
d) Type 200G on the console. The introductory title for DVDZA will be printed and the parameter input dialogue will be entered. Respond appropriately to all questions, making sure that I is typed when selecting maintenance mode. Note that all DZV11-A options can only be tested with internal maintenance mode selected. Step C may be omitted if autosizing is desired. Internal maintenance mode operation is then defaulted to.
e) The program will then print RUNNING on the console and procede to execute the various tests. First pass execution time is approximately 20 seconds. Subsequent passes require approximately 90 seconds. Three error free end of pass printouts are required for each selected DZV11-A
f) At the completion of step E, load Maindec-11-DVDZB into memory.
g) The status table for the selected devices has not been modified by the loading of DVDZB. Open location 176 (8) and enter the value 000200. This indicates that the existing table can be used, as built, without the need for console input. Internal maintenance mode operation is then defaulted to.
h) Type 200G on the console. The introductory title for DVDZB will be printed, followed by RUNNING. Program execution will now begin. First pass run time is approximately 1½ minutes. Subsequent passes require 2½ minutes. Three error free end of pass printouts are required for each selected DZV11-A. DZV11-A option checkout is now complete.

8.2.3 DZV11-B Testing

a) Insert the H329 module test connector in the 40 pin housing of the module. It should be connected with the letter side facing up. Next install the option in the QBUS backplane. When inserting the module, make sure the power is off. Be careful to avoid snagging the components on the card guide edges and on adjacent modules.
b) Turn on power and load Maindec-11-DVDZA into memory.
c) Open location 176 (8) and enter the value 000001. This represents a request to input parameters from the console. Close the location by typing a carriage return.
d) Type 200G on the console. The introductory title for DVDZA will be printed and the parameter input dialogue will be entered. Respond appropriately to all questions, making sure that S is typed when selecting maintenance mode. All DZV11-B options are to be tested with staggered maintenance mode selected.
e) The program will print RUNNING on the console and procede to execute the various tests. First pass execution time is approximately 20 seconds. Subsequent passes require approximately 90 seconds. Three error free end of pass printouts are required for each selected DZV11-B.
f) At the completion of step E, load Maindec-11-DVDZB into memory.
g) The status table for the selected device has not been modified by the loading of DVDZB. Open location 176 (8) and enter the value 000200. This indicates that the existing table can be used as built, without the need for a console input. Close the location by typing a carriage return.
h) Type 200G on the console. The introductory title for DVDZB will be printed, followed by RUNNING. Program execution will now begin. First pass run time is approximately 1½ minutes. Subsequent passes require 2½ minutes. Again, three error free end of pass printouts are required for each selected DZV11-B.
i) At the completion of step H, stop the program and power down. Remove the module from its backplane slot. Replace the H329 test connector with the Berg end of the BC11U acble assembly. Terminate line 0 of the cable with an H325 connector. Install the module in the backplane and apply power.
j) Load Maindec-11-DVDZC into memory. Type 200G on the console terminal. Select the cable test, at 9600 baud for line 0.

k) The program will execute the cable test and printout the end of pass message within 15 seconds. Three error free end of pass printouts are required for each line. Longer execution times can be expected at lower baud rates.
l) Complete the checkout of the remaining lines by typing any printing key on the console terminal. This requests that a new line number be entered and that the H325 terminate the new line. Continue testing until all lines are successfully checked. DZV11-B option checkout is now complete.

8.3 System Test and Acceptance

The first level of system checkout for the DZV11(s) shall include a successful completion of that particular option using its option level testing procedure. The final level of system test will be to run the DEC/X11 systems exercisor module. Other options on the system should be exercised in addition to the DZV11 option(s) under test. Run the exercisor for three completions without error. If the DZV11 is an add-on and does not ship as part of a system, the exercisor is not required as part of the system acceptance. Check the shipping list (A-PL-DZV11-0-4) and verify nothing is missing. Acceptance is complete.