USER’S GUIDE
AC-T089B-MC

Configurable Diagnostic System Package

For SGB

Diagnostic Engineering, Merrimack
CONFIDENTIAL PROGRAM DIALOGUE

The program will identify itself by printing  "DSP Confligurator Program" required to run from the CTL. The program will then print: Loading the T138, After the tables are loaded the conflation will ask questions aligned. Answers are either "YES", "NO", or selecting the default return. All inputs are terminated with a carriage return.

The D711 and D1411 device and vector addresses used is the prompt for the number of devices, and according to the NAMIB floating address and vector of multiple devices, the address and vectors must be sequential.

The following is an example dialog:

1) Boot the RA80 after running diagnostics? (Y/N, <CR> = Y)
   (This question is in conjunction with question 2 allowing field service to enter "no answer is "for field service"
   (Y) =  (Y) = (Y)

2) Boot the T138 after running diagnostics? (Y/N, <CR> = Y)

3) Do you want to answer the configuration questions again? (Y/N, <CR> = Y)
   (This question allows the user to change the parameters путем answering all the questions)

4) Enter CPU type. (11 44=11 24=24 <CR> = 11 44)

5) Select memory type installed in each CPU backplane position: (1
   depending on answer to 1) system configuration
   A = MS1L 16 256KB ECC memory, Module 8722-B
   (MS1L LD, M189-D1 256 KB parity memory if 11 24)
   B = MS1L FB, (1024KB) ECC memory, Module 8743-B
   C = No memory installed in this slot.

   CPU Backplane slot #29 (03 11 24)
   CPU Backplane slot #10 (04 11 24)
   CPU Backplane slot #11 (05 11 24)
   CPU Backplane slot #12 (06 11 24)
   At least one memory type must have been selected or the user will)

6) Is there a UDA50 on the target system? (Y/N, <CR> = Y)
   (If the answer to this question is "N" the next 4 questions are skipped)

7) Enter the UDA50 device address in octal. (<CR> = 172150)

8) Enter the UDA50 vector address in octal. (<CR> = 154)

9) How many RA80's on the UDA50? (OCTAL, <CR> = 1)
   (Two RA80's can be connected to one UDA50)

10) How many D711's on the target system? (OCTAL, <CR> = 1)
    (Maximum of 16 allowed)
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11) Enter the first DUP11 device address in octal (<CR>=1600'h) (Addresses are sequential)

12) Enter the first DUP11 vector address in octal (<CR>=310'h) (Vectors are sequential)

13) Each DUP installed in the system can be individually selected to run by the prompt for running the test is answered positively ("Y"), you will be asked if external loopback is needed. (Y/N)

   1 = Cable loopback (EZ25 test connector).
   2 = Modem 1 (DUP11 Loopback. The special cable, 70-1909-25 must be in the modem to perform this type of testing). If the prompt is answered ("N"), internal loopback will be performed and not be needed for testing.

   Perform loopback testing for DUP11 @[x] (Y/N, <CR>=Y) (repeated for each DUP 11x = DUP number)

   Enter 1 for Cable or 2 for modem loopback.

   (This question will only appear if loopback testing selected)

14) How many DZ11's on the target system? (OCTAL, <CR>=3) (Maximum of 16 allowed.)

15) Enter the first DZ11 device address in octal (<CR>=160110'h) (Addresses are sequential)

16) Enter the first DZ11 vector address in octal (<CR>=320'h) (Vectors are sequential)

   After the above questions have been answered the program will print a

   For example:

   (see next page)
INTRODUCTION

The SGB system comes with its own Self Test Package. This package allows the user to verify that the SGB system is operating properly. It is built into this package is the ability to configure the number of devices, and type of CPU supported in this diagnostic package. This document describes the Self Test Package. It is divided into three sections:

1. Normal Operation
2. System Fault Indication
3. Test Package Configuration Procedure

COMPONENTS:

The SGB System Test Software Package consists of three parts:

1. ROM diagnostics that will provide basic CPU and memory tests before booting, (reading in) the TUS8 tape. (The TUS8 cartridge is normally left installed in a drive in the user's system)
2. The TUS8 monitor will load and run extensive CPU, memory, and device diagnostics. Test coverage limited to all accessible hardware that requires no external operator setup.
3. Customer system software host. Upon completion of the testing, the RABO (disk) will be addressed and the system software will be loaded and started.

The kit number containing the TUS8 and this document is ZJD351-RG

The ROM part numbers are:

1 2306731900
2 2306714900
3 2306714900

The TUS8 part number is: BE7051H-RG

EVENT INDICATIONS:

System component test completion is indicated by printing the alphabet in reverse order on the console terminal. Each major test results in a character being printed on one line, starting with the letter "Z" and ending with "A". In the event of a failure the last letter printed will indicate where the failure has occurred.

To verify that the configuration is correct and write the file on the I question.

13. Is this configuration correct? (Y/N)
   (If the answer to this question is "N" the program will clear the error and return to the start all over with question number 1.)

14. Write configuration on master tape in drive X? (Y/N)
   (Where "X" is equal to your 1. The answer to this question is "Y" the
   test to block 2 on the tape and output continue at question number 10
   printed. NOTE: If the master tape is configured, the program stops-
   "Operation Complete.")

15. The Configuration Program was loaded off the Master tape in drive
    Master tape in that drive. Type a carriage return when ready.
    (This prompt is used to notify the user that switching tapes during
    could cause multiple errors. If the tapes were not properly
    would destroy the Master and never notify the user via error 71
    tapes.)
The following table lists the Field Replaceable Unit (FRU) to which the test package will isolate failures:

- II/44 and II/24 PE with two on board S11s (console and TL 50) and VPPI 2 boot type ROM
- VPPI up to four memory modules, MS11 MB for II/44 and II/21, MS11 MB for II/44 and MS11-LD for II/21.
- BZ 11 line asynchronous multiplexer communications option, (may vary per system 1 unit).
- BZ P11 single channel medium-speed synchronous serial line communications option with local loopback thru the modem, loopback can also be achieved by using a cable loopback connector.
- UDA50 disk controller which interfaces the system bus with up to 2 standard disk interface disk drives. The UDA50 contains self-test diagnostics in microcode.
- RAM disk drive contains self-test diagnostics in microcode.
- TU58 286 drive; drive tape mass storage device, contains self-test diagnostics in microcode.
- Console interface.

16. Loading Data from Master tape for copy to drive X
   (Indication to the user to account for the access to the tape)

17. windling
   (New tapes should be wound and rewound to retention the tape to notify the user of the progress)

18. rewinding
   (Notification to the user of the rewind in progress)

19. Load a write-enabled cartridge into drive 1 and type a carriage return

20. Copy in process.
   (No prompt is required.)

   (No prompt is required. If the master tape was configured, this will execute a self branch.)

22. Do you want to make another tape? (Y/N)
   (If the answer to this question is "Y", the next question is printed. If the answer is "N", the system will print "Operation complete" and then execute a self branch. The process will not be exited if a master tape was configured.)

23. Will the next tape have the same configuration tables as the last tape? (Y/N)
   (If the answer is "Y", prompt number 16 will be printed and continue as desired. If the answer is "N", the configuration table will be cleared with question number 1.)
NORMAL OPERATION

The test package is intended to be used prior to loading the system software. This is accomplished by installing a configured tape cartridge in either drive and loading the system. Standard 825 systems have the special 825 ROMS installed to perform some testing and then boot the TI 55. The following is an example of the printout on the console of a PDP-11/44 after running the diagnostics error test.

```
ZAN别200000000MLKJHGIEDCBA
```

The number printed between "A" and "M", (total) will have the value of the last memory address found plus 2. This is printed from the CPU diagnostic ROM.

To run the diagnostics on the RAM, the RUN STOP switch on the front of the drive must be in the RUN position (pushed in). If the switch is not in the RUN position, the diagnostics will fail in the RAM testing and the operating system software will not be bootup. The user select switches must also have one port selected (A or B).

When the D212s are tested, data is sent to the USERS TERMINALS. This will cause random characters to be printed on any devices connected to the D212. If this is not desirable, any devices connected to the D212's should not be powered on during the testing.

To bypass the alphabet test, remove any TI 58 cartridges from the drives B and C. If no tape is found in the B50, the RAM will be booted.

A 586P TI 58 tape cartridge can be booted by replacing the 56B tape cartridge with the

```
AAPPG TI 58 tape
```

SECTION 2

SYSTEM FAULT INDICATION

System faults are divided into two categories. These are "Fatal Errors" and "Soft Errors". Fatal Errors are classed as fatal that would prevent the 825 system software from operating successfully. Soft Errors are recorded on the TI 50 diagnostic cartridge for the operating system to review. If a Soft Error occurs, testing continues. It is also indicated on the console terminal as an indication to the user.

The following is an example of a Fatal Error indication:

```
ZAN别200000MLKJHGIEDCBA
```

CONFIGURATOR PROGRAM ERRORS

The following is a list of errors printed in response to improper setup.

The first list is the input or operation errors that will stop the question being printed. The error message printed is in "quotes" and is a part of the parenthesis (parenthesis).

**CONFIGURATOR INPUT OR OPERATION ERRORS**

- "Maximum number of devices exceeded." (1 or 2 for the number of RAM's or 1 to 20 octal for the number of 1/0)
- "Not an octal number." (Number response contained an x or a Q)
- "Invalid Response." (Response does not mean anything to numbers or punctuation in question.)
- "No Default is Allowed. Please input proper response." (Error input if the question does not have a default answer was not printed)
- "No memory selected. Please select the correct amount of memory!" (This is typed if the user typed "C" as an memory choice for all four memory slots must have memory.)
- "Invalid device address." (Device address typed in by the user was not within the valid octal or"
- "Invalid vector address." (Vector address typed in by the user was not within the valid octal or"
- "Load a WRITE enabled MASTER tape into drive X and type a carriage return." (This message is printed when the Master tape was selected to be configured)
- "Load a MASTER tape into drive Y and type a carriage return." (This message is printed when the blank tape was configured and the Master tape is equal to 0 or a 1)
- "Load a write PROTECTED MASTER tape into drive Y and type a carriage return." (This message is printed when the blank tape was configured and the Master tape is equal to 0 or a 1)
- "Please type a "I" or a "N" followed by a carriage return." (This message is printed if the first character of the response to a "Yes" or "No" prompt was anything except a "Y" or "N" or a "carriage return."
- "Cartridge write protected." (This message is printed when the read-after-writing option is not selected)
CONFIGURATION FATAL ERRORS

- "Fatal TIMB error"
  (This message is printed if any error occurs concerning the TL is after a 23 present and write protect. If a data check error occurs, this message is printed after the program stops)
- "Data check error on drive X"
  (Where X = 0 or 1. This is a FATAL ERROR. This message indicates a read or write verify operation. Since the problem could be with the memory or the drive, the system is notified of the drive in error. After printing this message the I/O and execution is stopped)

FATAL ERRORS

- CPU failures consisting of instructions, stack processing, etc.
- Memory failures including cache and memory management, ECC or parity memory logic.
- DMA/IB disk controller failures, microdiagnostic and maintenance.
- RAM disk drive failures, microdiagnostic and maintenance.
- System console interface failures. (Limited to internal loop and bit function failures)
- All other errors not "soft"

SOFTWARE ERRORS

- CPU failures. This includes everything from dead lines to non-volatile devices. The failures will be indicated on the console but the testing will continue and the system software will be halted.
- DRI failures. This also includes everything from dead lines to non-volatile devices. The failures will be indicated on the console but the testing will continue and the system software will be halted.
- Data blocks read off the TVIs with errors

Refer to Appendix A for detailed subject descriptions

It must be noted that a CATASTROPHIC ERROR could cause the entire system to hang or print the "ERROR" message during any of the testing.
SECTION 3

TEST PACKAGE CONFIGURATION PROCEDURE

The configurator program allows selecting the number of devices, address and vector, and type of CPU supported in this diagnostic package. The configuration information is then written onto the tape. The tape could be for this system or another system. The program supports using one tape as a master and copying the configured diagnostic to another cartridge if two TL 58 drives are available on the system.

CONFIGURING A TAPE:

The following are the steps required to invoke the configurator program:

1. Install the SGB test cartridge into the TL 58 drive area.
2. Boot the SGB system test tape using the SGB host ROMs or any standard TL 58 boot.
3. The program will identify itself and prompt for information.

If the tape has not been configured, the configurator program is invoked automatically after printing the letter "F." If the letter "T" is printed after the letter "F" refer to the section, "Reconfiguring A Configured Tape."

For detailed descriptions and examples of the Configurator program prompts, refer to Appendix B.

HARDWARE REQUIREMENTS:

The configurator program requires a minimum of the following to configure tapes:

- PDP 11-11 or PDP 11/20 CPU
- 64 KB ROM Memory
- TL 58 tape drive

If the configurator is going to be used to copy the master tape onto new cartridges the system must have 2 TL 58 drives available.

Appendix B

PDP 11-44 Switch Jumper Configuration

To select the PDP 11-44 host of power up to the second device boot-strap, the switches must be set on the CPU modules as follows:

- To enable power-on boot CPU control S1 must be closed (on) in the M700 module.
- To enable the internal booting of the PDP 11-44 (as opposed to a 4400 etc.) E29.2 must be closed (on). This switch is located on the M700 module.
- To enable the upper address bits to boot to the selected device ROM (773XXX) E11 switch E29.1 must be open (off). This switch is located on the M700 module.
- The lower 3 digits of the host address must be set to the second device of 20 bits. The switch settings on the 16 E29.5 thru E29.10 are as follows: N through S4 then S5 through S8, and S9 through S10. This yields a host address of 773 located on the M700 module. Consult sheet P 111 of the M700 module in a table of switch settings, or PDP 11-44 System User's Guide Chapter 3.
RECONFIGURING A CONFIGURED TAPE:

1. Boot the tape using the SCAM boot ROMs or any standard T1-38 boot. The diagnostic will print the reverse alphabet and start testing.

2. After the letter "S" is printed and before the letter "T" is printed, halt the processor. The time span between these characters is greater than 1 minute.

3. Next, start the program running at address 2000 octal (using ODT). This will invoke the configurator program and the tape can be reconfigured. For a description of ODT refer to the system user's guide.

4. The program will then print "initializing...". The program has to initialize the T1-38 controller because it was in the process of reading the diagnostic package off the tape. This operation takes about 30 seconds.

5. The configurator program will then identify itself and prompt for input. Refer to Appendix B for detailed descriptions.

The following is a list of jumper and switch configurations that are required on the T1-38 tape drive. The jumper and switch configuration tables are located in the customer's print set.

JUMPERS:
- J1 installed, indicating that the T1-38 receiver error bits are enabled in the receiver error register, bits 12-15.
- J1 installed, allowing the reading of the receiver error bits in bits 14-15 of the receiver buffer.
- J10 installed, indicating that the T1-38 transmitter status register has been set and cleared.
- J11 removed, indicating that the T1-38 parity detection and generation error bit will remain cleared.
- J12 and J11 removed, indicating that the character length for the T1-38 switch is 8 bits.

SWITCHES:
- To set the T1-38 receiver and transmitter speed to 600 baud set the foll. switch to "OFF" and switches E7, E8, E9 to "ON".
- Set switch E7 to "OFF" for 2 stop bits at 8 bits character.
- To enable the internal decode of the T1-38 address switch E78-1 must be "ON".
- To set a T1-38 vector of 300 the following switches are set to "ON": E7, E8, E9, E10, E11.
- To set a T1-38 address of 756-400 the following switches are set to "ON": E7, E8, E9, E10, E11.
STATUS TABLE DEFINITIONS

The status table containing a record of soft errors that occur during the booting is stored in block 1 on the T158 cartridge. This information can be read by the operating system after startup. After reading the information the operating system must initialize the status table by writing the identification code in the first word, 12 bytesto block 1 on the T158. This resets the soft error information to zero for the next diagnostic run.

The following were the definitions of each word in the status block:

**WORD 0**

This contains the SGB identification code. The value is 111002 octal. This transforms to ASCII characters "$\text{BB}$". After the operating system has read the status block this word must be written, 2 bytetransfer to initialize the status block. If this operation is not performed and the diagnostics were not invoked on the next boot, it would appear to the operating system that the diagnostics had been run.

**WORD 1**

The high byte contains a "null" (0000 octal) and the low byte contains the revision number. Refer to Appendix D for the revision number. This corresponds to the revision number printed after the letter "A" before the operating system is booted.

**WORD 2**

This is the SGB completion code. When this word is zero it indicates that the diagnostics were not run or the status table could not be written onto the tape. This word containing a 100000 octal indicates diagnostics have run with no soft errors detected. A 000 octal in this location indicates soft errors. To determine what device failed, the rest of the words in the status table must be examined.

Some of the following status words are represented by a "bit mask". A "1" octal in this location indicates the first device in error. A "1" octal in this location points to third device. A "1" octal in this location points to the sixteenth device failed. Any bit set in these words sets word 2 to 000 octal, indicating a soft error.

**WORD 3**

This location contains the bit mask of the failing DH-P11. This 16 bit word allows the logging of up to 16 DH-P11's in error.

**WORD 4**

This location contains the bit mask of the failing DH-P11 loop back test. These bits correspond to the 16 DH-P11's in word 3.

**WORD 5**

This location contains T158 soft error information. The low byte of this word contains the drive number on which the soft error occurred. This can be a zero or a one. If the high byte contains a zero this indicates no soft error. If the high byte contains a zero this indicates dirty heads or a worn cartridge.
WORD 6:

This location contains the bit mask of the failing DZ11. This 16-bit word allows the locating of up to 16 DZ11's in error. If the error is associated with a line number(s), the line number(s) indicated in words 7 through 15 one word for each line. No line failures indicate a controller failure.

WORD 7:

Bit mask of line 0 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 8:

Bit mask of line 1 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 9:

Bit mask of line 2 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 10:

Bit mask of line 3 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 11:

Bit mask of line 4 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 12:

Bit mask of line 5 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 13:

Bit mask of line 6 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 14:

Bit mask of line 7 failures. These bit positions correspond to the bit mask of the failing device in word 6.

WORD 15:

Check-sum of the last 14 words. This is done as a simple addition. No overflow is saved or added.

---

Appendix C

2GB Boot ROM installation for PDP-11 24 and 44.

The following table calls out the socket location of the SRAM and 1 MROMs, and the PDP-11 44. These ROMs must be installed in these locations for proper operation:

<table>
<thead>
<tr>
<th>Entry</th>
<th>ROM NUMBER</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>234720900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>1</td>
<td>234730900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>2</td>
<td>234770900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>3</td>
<td>234780900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>4</td>
<td>234790900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>5</td>
<td>234800900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>6</td>
<td>234810900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>7</td>
<td>234820900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>8</td>
<td>234830900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>9</td>
<td>234840900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>10</td>
<td>234850900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>11</td>
<td>234860900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>12</td>
<td>234870900</td>
<td>PDP-11 1M708s</td>
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<td>13</td>
<td>234880900</td>
<td>PDP-11 1M708s</td>
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<tr>
<td>14</td>
<td>234890900</td>
<td>PDP-11 1M708s</td>
</tr>
<tr>
<td>15</td>
<td>234900900</td>
<td>PDP-11 1M708s</td>
</tr>
</tbody>
</table>

Note: The ROMs are replaced by 234750900.
Appendix A

Event Code Descriptions - Test Definitions

This diagnostic package is divided into sub-tests that exercise the various components of the system. In the event of a failure the last letter printed will indicate the test being performed when the failure occurred. This supplies repair personnel with information corresponding to a Field Replaceable Unit (FRI).

Note:

Because no characters are printed before the console interface internal loop tests are done, any console interface failure or internal register data path failure would look the same. Also, any console interface failure that could not be detected in internal loop could result in no characters being printed to the console terminal.

The characters "ZYXAWV" are printed from the diagnostic ROMs. Before the TL98 is hosted, the ROM portion of the diagnostic package checks at a minimum, the basic CPU instruction set and lower memory. Control is transferred to the CPU diagnostic ROM to take advantage that testing then control is returned to host the TL98. The remainder of the ROM validates the load path from the TL98 and the presence of a valid boot block in block zero on the tape cartridge. If a valid boot block is not found or no cartridge is present control is transferred to the boot ROM for the first device.

Boot Power-Up, Internal register DATA PATH and CONSOLE INTERFACE tests

Z ROM sequence verification test. The ROMs for this diagnostic package must be installed in the Boot ROM sockets for devices 2, 3, and 4.

Note:

The ROM diagnostics for the SGB system are stored on three 64 word ROMs. These ROMs must be installed correctly for the diagnostics to execute. The first ROM is installed in the second device socket in the PDP-11/44 and 11/24 CPU. The other two ROMs are located in the device three and four sockets for sequential execution. If these ROMs are not in the correct order the testing stops after printing the letter "Z". If the first ROM is not in the correct socket no characters will be printed.

Y. Single operand instructions and condition code test

X. Initials are transferred to the PDP-11/44 or 11/244 CPU diagnostic ROM. This tests the basic instruction set and some of memory. The difference in the amount of memory tested is noted below.

The PDP-11/44 diagnostic ROM tests all available memory and prints the memory size (that address + 2) before returning to the SGB ROM. The PDP-11/44 only tests the lower 56K of memory. The following is an example of the character print out for a 11/24 with 512 K bytes of memory.

ZNYWZSWSWVSYJPSWMLKJHLKDJRWV Indicates no errors on a 11/24 system

ZNYWZSWSWVSYJPSWMLKJHLKDJRWV Indicates no errors on this 11/44
The following tests will print the message "ERROR" and then halt. These tests are with cache off and then cache on. These tests exercise memory from the RAM and the procedure to find the failing area in the memory tests:

1) Place the DR OFF (LOCAL LOCAL DISABLE STANDARD) switch in the...

2) Type a control P (P) to get the console prompt CONSOLE.

3) Type a "E 7 4" followed by a carriage return to get the halt by the following:

   E 7 4
   177777 4

   Where XXX comprises the failing address of the test.

The following table lists the test number, failing address factor XXX and the PDP-11/44.

<table>
<thead>
<tr>
<th>TEST NUMBER</th>
<th>ADDRESS</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>XXX</td>
<td>Test main memory from virtual 1K to 21K</td>
</tr>
<tr>
<td>16</td>
<td>256</td>
<td>Memory data error</td>
</tr>
<tr>
<td>17</td>
<td>356</td>
<td>Memory data error</td>
</tr>
<tr>
<td>18</td>
<td>XXX</td>
<td>Test main memory from virtual 1K to 21K with cache enabled</td>
</tr>
<tr>
<td>19</td>
<td>631</td>
<td>Data error</td>
</tr>
<tr>
<td>19</td>
<td>632</td>
<td>Cache did not reference the memory hit</td>
</tr>
<tr>
<td>19</td>
<td>666</td>
<td>Cache parity error</td>
</tr>
<tr>
<td>19</td>
<td>762</td>
<td>Trap 5 vector occurred check stuck</td>
</tr>
</tbody>
</table>

In the case of only 2 banks of memory in the configuration all the characters for memory testing will be printed to maintain the sequence.

Q: Testing first memory module

R: Testing second memory module (if present).

S: Testing third memory module (if present).

T: Testing fourth memory module (if present).

I: DTAS controller testing. This test invokes the DTAS and verifies successful completion.

J: RAM disk drive testing. This test invokes the RAM and verifies successful completion.

In the event of a RAM failure, the drive number is printed on the next line. The error indication is printed on the following line. The next example shows the indication of drive one causing a fatal error:

ZYXWW VTROJONMLKJ
1 (The "1" indicates the second drive)
ERROR

L: HP device testing Functional testing in hit stuff mode only
BIU-PII Loopback test - Through parameters entered during the configuration program table, or when no loopback testing can be selected. If neither was selected, this test will not be performed.

Local Modem Loopback: A special cable has been inserted to allow the loopback test to be performed. The cable is connected to the node in local loopback mode for cable and modem testing. The cable is loopbacked. If a cable loopback was selected, you must supply a loopback connector to the end of the cable.

GeOZI device testing. Controller and single line errors are recorded on the TELW.

If a BIU or BIU-PII fails, the test continues. However, the fact that one or more of the devices have failed is indicated on the console terminal. The following indicates that the BIU-PII failed local loopback testing.

ZYAWXTSRQNONMLAJI
8096EBH11 (The "0" indicates the device.)

The status condition would be printed if the BIU-PII was set to an address other than what was specified in the configuration table. The next example indicates a failure in the second BIU-PII on internal and local modem loopback.

ZYAWXTSRQNONMLAJI
10
1GFEDB14B (The "1" indicates the second device.)

The next example shows the printout that would occur if the first and third BIU-PII were to fail.

ZYAWXTSRQNONMLAJI
1
2FEDB14B (The "2" indicates the third device.)

E. Line clock testing. This verifies that the clock is operational.

F. First device boot ROM, CRC check. This test calculates the CRC on the first device boot ROM and verifies that it matches the CRC stored in the ROM.

G. Diagnostic testing complete.

H. Printed to maintain the sequence of the alphabet.

I. The TELW monitor is in the process of writing the status table containing the test results onto tape. If an error occurs, control will be transferred to the first boot ROM. The rest of the characters will not be printed.

J. Indicates the transfer of control to the first device boot ROM (normally the RAVO boot ROM). This will bring up the customer operating system software.

K. This is the revision level of the diagnostic package. Refer to Appendix D for the current revision level and changes made to each revision. Appendix D also indicates the method of writing the revision level in the event the diagnostic does not complete.
APPENDIX B

CONFIGURATOR PROGRAM DIALOGUE

The program will identify itself by printing “CDSP Configurator Program”. It will then load the tables required to run from the T13S. The program will then print “Loading Tables” before accessing the T13S. After the tables are loaded, the user will be directed to answer questions about the system to be configured. Answers are either “YES” or “NO”, actual numbers, or selecting the default by just typing a carriage return “<CR>-”. All inputs are terminated with a carriage return “<CR>-”. The BY1 and DUP11 device and vector addresses used in the prompts are calculated based on the number of devices, and according to the UHBE Sloating address and vector assignments. In the case of multiple devices, the addresses and vectors must be sequential. The following is an example dialog:

1) Boot the RAM after running diagnostics? (Y/N, <CR>-Y).
(C): Boot is necessary to continuously run diagnostics. (Y: answer is Y, <CR>-Y.)

2) Boot the T13S after running diagnostics? (Y/N, <CR>-Y).

3) Do you want to answer the configuration questions again? (Y/N, <CR>-Y).
(C): Allows the user to change the parameters of question 1 or 2 for a system without re-answering all the questions.


5) Select memory type installed in each CPU backplane position for this PDP-11 44 (or 11: 24 depending on answer to 4) system configuration.
A = MS11 MB 256KB ECC memory, Module: M8722-B2
(MS11 LD, M7891 DT: 256 KB parity memory if 11: 24)
B = MS11-PK (1024KB) ECC memory, Module: M8743-B2
C = No memory installed in this slot.

CPU Backplane slot 009 (03 if 11: 24)
CPU Backplane slot 010 (04 if 11: 24)
CPU Backplane slot 011 (05 if 11: 24)
CPU Backplane slot 012 (06 if 11: 24)

All 3 system memory types must have been selected or the user will be asked the question again.

6) Is there a UDA50 on the target system? (Y/N, <CR>-Y).
(C): If the answer to this question is “N” the next 3 questions are skipped.

7) Enter the UDA50 device address in octal. (<CR>-172150).

8) Enter the UDA50 vector address in octal. (<CR>-154).

9) How many RAMs on the UDA50? (OCTAL, <CR>-1).
(ARMS can be connected to one I DA50).

10) How many DUP11’s on the target system? (OCTAL, <CR>-1).
(Maximum of 16 allowed).

The following table lists the failing address for diagnostic ROM:

<table>
<thead>
<tr>
<th>ADDRESS</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>116</td>
<td>This error is caused by trapping in location 116 on the first 4K of memory. The program does not access memory on this time.</td>
</tr>
<tr>
<td>150</td>
<td>A failure with either the base instruction set of the PDP-11 or the CPU board. (M1713).</td>
</tr>
<tr>
<td>552</td>
<td>Memory system failure. First suspect the memory then the memory divide. The contents of PARM (1577212) by 256 octa.</td>
</tr>
<tr>
<td>761</td>
<td>A data error has occurred in the console MA.</td>
</tr>
</tbody>
</table>
1. Enter the first D/P11 device address in octal (<CR> = 160000).
   Addresses are sequential.

2. Enter the first D/P11 vector address in octal (<CR> = 310).
   Vectors are sequential.

3. Each DUT installed in the system can be individually selected to run the external loopback test. If the prompt for running the test is answered positively ("Y"), you will be prompted for which type of external loopback:
   1 = Cable loopback, (RJ25 test connector).
   2 = Modern Local Loopback. The special cable, 70-19903-25 must be installed from the D/P11 to the modem to perform this type of testing.
   If the prompt is answered ("N"), internal loopback will be performed. (The cable or modem will not be needed for testing).
   Perform loopback testing for D/P11/xyz? (Y/N, <CR> = Y).
   (repeated for each D/P xyz D/P number)
   Enter 1 for Cable or 2 for modern loopback.
   (This question only asked if loopback testing selected)

4. How many D/P11's on the target system? (OCTAL, <CR> = 3)
   (Maximum of 16 allowed)

5. Enter the first D/P11 device address in octal (<CR> = 160110).
   (Addresses are sequential)

6. Enter the first D/P11 vector address in octal (<CR> = 320).
   (Vectors are sequential)

After the above questions have been answered the program will print a configuration table.

For example: (see next page)
<table>
<thead>
<tr>
<th>OPTION</th>
<th>BUS ADDRESS</th>
<th>VECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU TYPE = 11/44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cache Enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TUSB-EB</td>
<td>176500</td>
<td>300</td>
</tr>
<tr>
<td>TUSB-AD</td>
<td>160050</td>
<td>310</td>
</tr>
<tr>
<td>TUSB-AD</td>
<td>160060</td>
<td>320</td>
</tr>
<tr>
<td>D211</td>
<td>160120</td>
<td>330</td>
</tr>
<tr>
<td>D211</td>
<td>160130</td>
<td>340</td>
</tr>
<tr>
<td>D211</td>
<td>160140</td>
<td>350</td>
</tr>
<tr>
<td>D211</td>
<td>172150</td>
<td>154</td>
</tr>
<tr>
<td>NUMBER OF RABO'S = 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPTION</th>
<th>CSR ADDRESS</th>
<th>VECTOR</th>
<th>SLOT NUMBER</th>
<th>MODULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS11-MB</td>
<td>172100</td>
<td>114</td>
<td>08</td>
<td>M8722-B</td>
</tr>
</tbody>
</table>

**To verify that the configuration is correct, write the file on the TI 58, answer the following questions.**

13) Is this configuration correct? (Y/N)
   (If the answer to this question is "N" the program will clear the current configuration table and start all over with question number 1.)

14) Write configuration on master tape to drive X? (Y/N)
   (Where "X" is equal to 0 or 1. If the answer to this question is "Y" the configuration table is written to block 2 of the tape and output continues at question number 20. Use the next status note for printer NOTE: If the master tape is configured the program stops, (branch self) after printing "Operation Complete")

15) The Configurator Program was loaded off the Master tape to drive "X". Please verify that the Master tape is in that drive. Type a carriage return when ready.
   (This prompt is used to notify the user that switching tapes during the configuration process could cause the Master to be destroyed. If the tapes were swapped the configurator program would destroy the Master and never notify the user via an error. This would produce 2 useless tapes.)
16) Loading Data from Master tape for copy to drive X.  
Indication to the user to account for the access to the Master tape. A= is equal to 0 or 1.

17) Rewinding...  
(Notes: Tapes should be wound and rewound to prevent loss of the tape. This message and the next is used to notify the user of the process.)

18) Rewinding...  
(Notes: Notification to the user of the process in progress.)

19) Load a write enabled cartridge into drive 1 and type a carriage return. <CR> when ready.

20) Copy in process.  
(No prompt is required.)

21) Operation complete.  
(No prompt is required. If the master tape was configured, this is the end of the operation. The program will just execute a self branch.)

22) Do you want to make another tape? (Y/N).  
(If the answer to this question is "Y", the program will print "Operation complete" and then execute a self branch. NOTE: This question will be asked if a master tape was configured.)

23) Will the next tape have the same configuration table as the last tape? (Y/N).  
(If the answer is "Y", prompt number 16 will be printed and continue for as many duplicate tapes as desired. If the answer is "N", the configuration table will be cleared and the program will start with question number 1.)
APPENDIX C

CONFIGURATOR PROGRAM ERRORS

The following is a list of errors printed in response to improper user responses or hardware failures.
The first list is the input or operation errors that will keep the question being asked until the input
is corrected. The error message printed is in "quotes" and the explanation of the errors are in
(parenthesis)

CONFIGURATOR INPUT OR OPERATION ERRORS

1. "Maximum number of devices exceeded." (4 or 5 for the number of D311's or DI P71's.)

2. "Not an octal number." (Number response contained an A or a B.)

3. "Invalid Response." (Response does not mean anything, i.e., numbers or punctuation in response to a yes or no question.)

4. "No Defaults Allowed. Please input proper response." (Printed if a question that does not have a default answer was not given an answer.)

5. "No programs loaded. Please select the correct amount of memory***" (This is typed if the user typed "C" as memory choice for all four memory slots. At least one memory slot must have memory.)

6. "Invalid device address." (Device address typed in by the user was not within the valid octal range of 160000 to 177776.)

7. "Invalid vector address." (Vector address typed in by the user was not within the valid octal range of 800 to 777.)

8. "Send a WRITE enabled MASTER tape into drive X and type carriage return when ready." (This message is printed when the Master tape was selected to be configured and the Master tape has been removed. "Y" is equal to a 0 or a 1.)

9. "Send a write PROTECTED MASTER tape in drive X and type a carriage return when ready." (This is printed when a blank tape is to be configured and the Master tape has been removed. "Y" is equal to a 0 or a 1.)

10. "Please type a "Y" or "N" followed by a carriage return." (This is printed if the first character of the response to a "yes", "no", or "carriage return please" prompt was anything except a "Y", "N", or a "carriage return". The prompt last printed will be reprinted after this message.)

11. "Carbide write protected." (This error could occur for question 15 or 16. The carbide has a write protect switch to allow recording. Move the switch in the direction of the arrow. If the switch is missing throw the carbide away.)

12. "No cartridge in drive X." (Where X = 0 or 1. The program will not continue until cartridge is installed. The last prompt will be reprinted.)
CONFIGURATOR FATAL ERRORS

- "Fatal TUE$ error"
  (This message is printed if any error occurs concerning the TUE$ after the initial check for tape present and write protect. If a data check error occurs this message is printed after it. This is a FATAL ERROR. Execution of the program stops.

- "Data check error on drive X"
  (Where X = 0 or 1. This is a FATAL ERROR. This message indicates a data check error during a read or write verify operation. Since the problem could be with the master, or the new tape, the user is notified of the drive in error. After printing this message the Fatal TUE$ error is printed and execution is stopped.)

APPENDIX B

REVISION NUMBERS

When the testing is completed, the last letter is printed. ("A") followed by a space and then the revision level. The following example shows this:

ZVAWMTSRQPNMLKJHGFEDCBYA B

The letter B in this case corresponds to the following number that is used by S.D.C. for revision tracking:

Media identifier = CAN-BBA

A Previous revision of this test package used numbers instead of letters. It can be identified by the software typing:

ZVAWMTSRQPNMLKJHGFEDCBYA 3

The revision level of the self test package can be verified without running the diagnostics. This can be done by following the procedure for "Reconfiguring A Configured Tape" After the configurator program prints "loading tables ...", and after the tables are loaded, the configurator will print the revision letter of that package.

Example:
CDSP Configurator Program
  loading tables ...
  Version 3
  This program...... (text continues)
Appendix E

POP 11 44 Switch Jumper Configuration

To select the POP 11 44 to boot or power up, to the second device boot-strap ROM with CPU diagnosed selected the switches must be set on the CPU modules as follows:

- To enable power-on host CPU control S1 must be closed. ("on") This switch is located on the M5090 module.

- To enable the internal booting of the POP 11 44, (as opposed to a M2012 or M2014) F1 switch E29-2 must be closed. ("on") This switch is located on the M5090 module.

- To enable the upper address bits to boot to the selected device ROM, (upper 3 digits of address 7733XX) F1 switch E29-1 must be open. ("off") This switch is located on the M5090 module.

- The lower 3 digits of the host address must be set to the second device ROM. The lower 3 digits are 204. The switch settings on the CPU E29-1 through E29-10 are as follows: S1 and S9 = "ON" = "1"; S3, S7, thru S8, and S10 = "OFF" = "0". This yields a host address of 773204. These switches are located on the M5090 module. Consult sheet R 111 of the M5090 module in the customer print set for a table of switch settings. (POP 11 44 system user guide chapter 5).
The following is a list of jumper and switch configurations that are required for proper operation of the T1/58 tape drive. The jumper and switch configuration tables are located on sheet K388 of the M5096 module in the customer's print set.

Jumper:

- W1 installed, indicating that the T1/58 receiver error bits are enabled to the T1/58 receiver buffer register, bit 1245.
- W1 installed, allows the reading of the receiver error bits, e.g., bit 1512 of the console terminal receiver buffer.
- W10 installed, indicating that the T1/58 transmitter status register break bit (bit 0) is enabled to be set and cleared.
- W11 removed, indicating that the T1/58 parity detection and generation is disabled and the parity error bit will remain cleared.
- W12 and W11 removed, indicating that the character length for the T1/58 is 8 bits.

Switches:

- To set the T1/58 receiver and transmitter speed to 9600 baud set the following switches E7,1,2,5 to “OFF” and switches E7,2,5 to “ON”.
- Set switch E7,1 to “OFF” for 2-stop bits at 8 bits character.
- To enable the internal decode of the T1/58 address switch E7,9 must be “ON”.
- To set a T1/58 sector of 300 the following switches are set: E7,3,6,5,8 to “OFF” and E7,4,5 to “ON”.
- To set a T1/58 address of 175.600 the following switches are set: E704,2,3,5,7 to “ON” and E704,6,8,9,10 to “OFF”. 
Appendix F

PDP 11-24 Switch Jumper Configuration.

To select the PDP 11-24 to boot or power up the second device basestrap ROM with CPU diagnostic-selected, the jumper on the CPU module (M7134) must be set up as follows:

- Jumper W2 in, for boot or power up from power fail.
- Jumper W7 out, disallowing a halt instruction to be executed in kernel mode. If this jumper is left in and an error occurs in the CPU diagnostic ROM during testing, the CPU will halt and enter console OFF.
- Jumper W14 in. Bus address on power up to 16384. Console ROM then reads switches on Unibus-Map module indicating boot to second device.

To select the PDP 11-24 to start execution at the second host device the switches on the Unibus Map Module (M7134) must be set up as follows:

- To select the 11-24 to boot a device, set S1 to "OFF" at location E56.
- To select the host ROMs readable, set S2 to "ON" at location E58. To allow proper operation of the SDI host ROMs, the host ROMS must be readable. The SDI host ROMs perform a ROM sequence verification before transferring control to the second host ROM. If a timeout occurs in the testing will stop.
- The lower 8 bits of address E53000 must equal 201 to point to the second host device. Set switches E53 taken E58 10 as follows: S1 and S10 = "1" = "ON", S3, S6 then S8 and S10 = "OFF" = "0".

The T155 is connected to the second serial Line (alt. ISL2) on the 11-24. For proper operation configure the switches and jumpers on the CPU module (M7134) as follows:

- Set baud rate 2 to 4800 baud, switch pack E75 settings, S1 thru S6 = "OFF" = "ON"
- Set the baud rate selection of transmit and receive at S12 in baud rate 2 jumpers W10 W12 in and jumper W1 W19 W11, and W15 out
- To disable parity detection of S1A 2, remove jumper W7.
### Appendix C

**SGB Boot ROM installation for PDP-11 24 and 11 44.**

To determine the location of the SGB and HDV50 boot ROMs for the PDP-11 24 or 11 44, the ROMs MUST be installed in these locations for proper operation.

<table>
<thead>
<tr>
<th>ROM NUMBER</th>
<th>PDP-11 11 M708s</th>
<th>PDP-11 21 M734</th>
</tr>
</thead>
<tbody>
<tr>
<td>01000V900</td>
<td>E08</td>
<td>E75</td>
</tr>
<tr>
<td>21972V900</td>
<td>(WAS) E19</td>
<td>NA</td>
</tr>
<tr>
<td>21971V900</td>
<td>E50</td>
<td>E2</td>
</tr>
<tr>
<td>21974V900</td>
<td>E29</td>
<td>E83</td>
</tr>
<tr>
<td>21975V900</td>
<td>E19</td>
<td>E50</td>
</tr>
</tbody>
</table>

Replaced by 21975V900
## PDP-11/44 Diagnostic ROM Failure

In the case of being hung on this character with the CPU run light on, the CPU can be halted to determine the exact nature of the failure to get to the individual CPU board in error. The following is the procedure for halting the CPU to find the failing test in the CPU instruction tests.

1) Place the DC OFF LOCAL LOCAL DISABLE STANDBY switch in the LOCAL position.

2) Type a control P (P) to get the console prompt CONSOLE.

3) Type a P followed by a carriage return to halt the CPU. The following will be displayed on the terminal:
   CONSOLE
   H

   XXXXXX

   Where XXXX comprises the failing address of the test.

The following table lists the test number, failing address, XXXX, and test description for the PDP-11 CPU:

<table>
<thead>
<tr>
<th>TEST NUMBER</th>
<th>TEST ADDRESS</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>070</td>
<td>Branch always.</td>
</tr>
<tr>
<td>02</td>
<td>106</td>
<td>CLR mode 0, BMI, BVS, BHL, BLT, BLO.</td>
</tr>
<tr>
<td>03</td>
<td>122</td>
<td>BMI mode 0, BPL, BEO, BGE, BLE.</td>
</tr>
<tr>
<td>04</td>
<td>151</td>
<td>ROR mode 0, BVG, BHIS, BNE.</td>
</tr>
<tr>
<td>05</td>
<td>172</td>
<td>Internal register and data path test</td>
</tr>
<tr>
<td>06</td>
<td>202</td>
<td>ROL, mode 0, BIC, BLT.</td>
</tr>
<tr>
<td>07</td>
<td>220</td>
<td>ADD, INC, COM mode 0, BCS, BLE.</td>
</tr>
<tr>
<td>08</td>
<td>240</td>
<td>ROR, BSI, BNS, ADD mode 0, BLO.</td>
</tr>
<tr>
<td>09</td>
<td>260</td>
<td>COM, BCL, mode 0, BCT, BLE.</td>
</tr>
<tr>
<td>10</td>
<td>280</td>
<td>SWAP, CMP, BHT, and DWE, BGT.</td>
</tr>
<tr>
<td>11</td>
<td>302</td>
<td>MOVX, SOB, CLR, TST, and BPL, BNE.</td>
</tr>
<tr>
<td>12</td>
<td>312</td>
<td>BPL failed.</td>
</tr>
<tr>
<td>13</td>
<td>331</td>
<td>SOB, CLR, or TST failed.</td>
</tr>
<tr>
<td>14</td>
<td>333</td>
<td>JSK, RTS, JMP.</td>
</tr>
<tr>
<td>15</td>
<td>336</td>
<td>JSK failed.</td>
</tr>
<tr>
<td>16</td>
<td>356</td>
<td>Stack failure.</td>
</tr>
<tr>
<td>17</td>
<td>366</td>
<td>RTS failed.</td>
</tr>
<tr>
<td>18</td>
<td>386</td>
<td>RTI failed.</td>
</tr>
<tr>
<td>19</td>
<td>396</td>
<td>JMP failed.</td>
</tr>
</tbody>
</table>
The following tests will print the message "ERROR" and then halt. These tests are the memory test with clocks off and then on. These tests exercise memory from 1K to 21K. The following is the procedure to find the failing area in the memory tests.

1) Place the POWER, LOCAL, DISABLE, STANDBY switch in the LOCAL position.

2) Type a control-P (P) to get the console prompt, CONSOLE.

3) Type a "J 7 6" followed by a carriage return to get the halt PC. The following will be displayed on the terminal:
   CONSOLE
   E 7 6
   11111111 163XXX
   Where XXX comprises the failing address of the test.

The following table lists the test number, failing address factor, XXX and test description for the PDP 11/44 CPU:

<table>
<thead>
<tr>
<th>TEST ADDRESS</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 11111111</td>
<td>Test main memory from virtual 1K to 21K</td>
</tr>
<tr>
<td>15 01000000</td>
<td>Memory data error.</td>
</tr>
<tr>
<td>15 00100000</td>
<td>Memory data error.</td>
</tr>
<tr>
<td>16 11111111</td>
<td>Test main memory from virtual 1K to 21K</td>
</tr>
<tr>
<td>16 00000000</td>
<td>Memory data error.</td>
</tr>
<tr>
<td>16 00000001</td>
<td>Data error.</td>
</tr>
<tr>
<td>16 00000010</td>
<td>Cache did not reference the memory bit.</td>
</tr>
<tr>
<td>16 00000100</td>
<td>Cache parity error.</td>
</tr>
<tr>
<td>16 00001000</td>
<td>Trap to vector 1 occurred - check stack for origin.</td>
</tr>
</tbody>
</table>
Appendix I

PDP-11 24 Diagnostic ROM Failures

If the system hangs on this character with the CPU run halted, the CPU can be halted to determine the exact nature of the failure by getting to the individual CPU board in error. The following is the procedure for halting the CPU to find the failing test in the CPU instruction tests.

1) Place the DROF LOCAL LOCAL DISABLE STANDBY switch in the LOCAL position

2) Type "BREAK" to get the console prompt

The PDP-11 24 for the SGI systems is strapped to disallow the execution of halt instructions in kernel mode. The execution of a halt instruction causes a trap to location 10 in memory. The SGI has ROM sets up the stack (R0) and location 10 to point to location 12 where a branch self will be executed. With the CPU halted the stack can be examined to determine the failure area. Use the following procedure to get the failing PC.

3) Type a "134 " followed by a carriage return to set the halt PC. The following will be displayed on the terminal

134 166XXX

Where XXX comprizes the failing address of the test
<table>
<thead>
<tr>
<th>ADDRESS</th>
<th>TEST DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>176</td>
<td>This error is caused by trapping to location 1 at any time prior to executing the memory test on the first 64K of memory. The program does accesses to some of the memory management registers during this time.</td>
</tr>
<tr>
<td>170</td>
<td>A failure with either the base instruction set or the EPS instruction set. First suspect the DCF11A Hybrid or the CPU board. (M7133).</td>
</tr>
<tr>
<td>162</td>
<td>Memory system failure. First suspect the memory then the KTF11A. To locate the failing bank of memory divide the contents of PARO ((172512)) by 256 and then multiply by 1</td>
</tr>
<tr>
<td>201</td>
<td>A data error has occurred in the console SIA.</td>
</tr>
</tbody>
</table>