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DATCHK - COMPUTER CHECKOUT OF DATACON II ON THE PDP-11

INTRODUCTION

This is a preliminary description of a software checkout package to be used before beam lines are turned over for experimental use. Its prime purpose is to minimize experimental downtime due to problems associated with computer control of power supplies. The program is not complete as of this date but it is usable in its present form.

GENERAL DESCRIPTION

The program has the capability of checking out up to 40 power supplies on any one of the four ports. It will also check out any one of the terminals (8 available) that the experiments will use for control of the power supplies. The initial assignment of the port, elements associated with the port and the terminal is accomplished through the PDP-11 switch register in response to requests made by the console teletype. After the initial set up has been made, all future commands are made through the use of the terminal that was assigned to the port. Two categories of commands are used; one which affects all elements entered during initial setup and another which affects individual elements. A third type of command (not initiated yet) will set up conditional error printout.

During the initial setup, two transmissions are sent to each element. The first one sets up the sub-address so that the magnet shunt is read. The second transmission reads the magnitude and the status of each element. These readings are used as the initial error mask. The magnitude mask has a built-in software tolerance which allows the magnitude to change about 10% before a magnitude error is recorded. The A/D invalid bit is masked out of

the status so it will not cause status errors. After the two initial transmissions, all elements are locked out until a look-at-me bit is set in the function word of the element via input from the terminal. The two element function words store the commands associated with the element. In addition to the eight normal command bits for each element, there are 16 additional commands. Only five have been implemented in this version. They are, increment magnitude, decrement magnitude, connect the eight element command bits to the switch register, connect the sixteen magnitude bits to the switch register and set the look-at-me bit. Error counters associated with each element count no reply errors, parity errors, element status errors, and magnitude errors. If a status error occurs, the previous status and current status will be printed out. If an element has three consecutive errors, then the element is not polled any more and a complete history of the last transmission is printed out. Normally, the element cards have a hardware lockout feature which prevents them from replying if they have not been addressed. The failure of this hardware can cause multiple replies on the datacon line. In this checkout package is a routine which is activated if an error occurs. This routine takes the last address, command, and magnitude that was sent; rearranges these bits to conform to the actual transmission; generates a parity bit; plugs in a key bit; and then stores this information in trap registers. The completed datacon reception is treated in the same manner. These bit patterns are then systematically compared with the element addresses. Each equal comparison is flagged as a possible lockout problem and the address is printed out. To ensure that all possible bit patterns will be placed on the datacon line, a dummy element is used in conjunction with all other elements. The dummy element generates all possible bit patterns.

OPERATIONS

The program is loaded from paper tape at the starting address indicated by the absolute loader (157500).

The console will print out

* SELECT 1ST PORT ADD

and halt. Set the switch register to 0, 10, 20, or 30 and press continue.

* SELECT EL. ADD.

Set the switch register to 377 and press continue. (Address of dummy supply.)

* SELECT EL. ADD.

Set the switch register (0 → 376) to the first element and press continue.

* SELECT EL. ADD.

↓

Continue till all elements are loaded. To exit from element address loop, set switch register to 1000 and press continue.

* SELECT TTY FOR 1ST PORT

Set the register to 00, 10, 20, 30, 40, 50, 60, or 70 and press continue.

At this point, the initial setup is finished. Two transmissions have been sent out and the elements are locked out. Type in ,, ST which inhibits all transmissions. Now set up the individual parameters for each element. For example, if you wish to check lockouts, then type in 01,, MU. The dummy supply will now follow the magnitude increments generated by the software. Then set the look-at-me bit in each of the elements by typing:

01,,LM

02,,LM

03,,LM

"

"

"

XX,,LM

where XX is the last element on the line.

Finally, negate the stop transmission command by typing NE,,ST. The system will now check out all elements for lockout problems, parity errors, no replys, status errors, and magnitude errors. When the transmission counter is full ($\approx 2^{16}$ transmissions), a listing of the elements is printed out, all the counters are reset to zero and the checkout will continue. It takes about twelve minutes (excluding printout time) to check out twenty supplies. For example, the F.E.B. line indicated four elements with possible lockout problems when this test program was used. It took about fifteen minutes to isolate the four supplies.

TYPICAL HISTORY FOR GOOD ELEMENT AFTER $\approx 2^{16}$ TRANSMISSIONS

COUNTER IS FULL					
PORT		ADDRESS		1 110 000 000 010 000	= 160020 (8
ELEMENT		ADDRESS		0 000 000 001 101 000	= 150 (8
CMBST	BEFORE	1ST	LOAD	0 000 000 010 000 000	DONE BIT SET
CMBST	AFTER	MAG.	LOAD	0 000 100 000 000 000	DONE BIT CLEARED BUSY ONE BIT SET
CMBST	AFTER	CMD.	LOAD	0 000 100 000 000 000	NO ACTION TAKEN
CMBST	AFTER	ADD.	LOAD	0 000 110 000 000 000	BUSY TWO BIT SET TRANSMISSION STARTED
CMBST	AFTER	DONE BIT	SET	0 000 000 010 000 000	BUSY BITS CLEARED DONE BIT SET
CMB1		SENT		0 000 000 000 000 000	MAGNITUDE SENT
CMB1		RECEIVED		0 000 000 000 011 111	MAGNITUDE RECEIVED
CMB2		SENT		0 110 100 000 000 000	ADDRESS AND COMMAND SENT
CMB2		RECEIVED		1 111 000 000 001 000	STATUS RECEIVED
NO REPLY	ERRORS			0 000 003 000 000 000	
PARITY	ERRORS			0 000 000 000 000 000	
ELEMENT	MAGNITUDE	ERRORS		0 000 000 000 000 000	
ELEMENT	STATUS	ERRORS		0 000 000 000 000 000	
TOTAL	TRANSMISSIONS			1 111 111 111 111 111	
ELEMENT	FUNCTIONS	SET		0 000 000 000 000 000	
**********					
COUNTER IS FULL					
PORT		ADDRESS		1 110 000 000 010 000	
ELEMENT		ADDRESS		0 000 000 001 101 001	
CMBST	BEFORE	1ST	LOAD	0 000 000 010 000 000	
CMBST	AFTER	MAG.	LOAD	0 000 100 000 000 000	

TYPICAL PRINTOUT AFTER STATUS ERROR

PORT	ADDRESS	1 110 000 000 010 000	
ELEMENT	ADDRESS	0 000 000 001 100 100	
CMBST	BEFORE 1ST LOAD	0 000 000 010 000 000	
CMBST	AFTER MAG. LOAD	0 000 100 000 000 000	
CMBST	AFTER CMD. LOAD	0 000 100 000 000 000	
CMBST	AFTER ADD. LOAD	0 000 110 000 000 000	
CMBST	AFTER DONE BIT SET	0 000 000 010 000 000	
CMB1	SENT	0 000 000 000 000 000	
CMB1	RECEIVED	0 000 000 001 001 111	
CMB2	SENT	0 110 010 000 000 000	
CMB2	RECEIVED	1 111 000 000 000 000	
NO REPLY ERRORS		0 000 000 000 000 000	
PARITY ERRORS		0 000 000 000 000 000	
ELEMENT MAGNITUDE ERRORS		0 000 000 000 000 000	
ELEMENT STATUS ERRORS		0 000 000 000 000 001	1st STATUS ERROR
TOTAL TRANSMISSIONS		0 000 000 001 011 101	
ELEMENT FUNCTIONS SET		0 000 000 000 000 000	

PORT	ADDRESS	1 110 000 000 010 000	
ELEMENT	ADDRESS	0 000 000 001 100 100	
CMB2	SENT	0 110 010 000 000 000	
CMB2	RECEIVED	1 111 000 000 001 000	
PREVIOUS STATUS		0 000 000 000 000 000	
CURRENT STATUS		0 000 000 000 001 000	SHOWS BIT THAT CHANGED

POSSIBLE LOCK OUT PROBLEMS

ADDRESSES OF ELEMENTS WOULD BE PRINTED
HERE IF ANY AGREED WITH THE COMPARISON LIST.

The following command structure has to be used in order for the software to recognize valid input.

```
**********************************
START OF COMPARE TESTS ON CHAR, IN I/O BUFFER
COMMAND STRUCTURE HAS TO BE TYPED IN AS FOLLOWS:

,,YY       :SET THE PORT BIT IN THE FUNCTION CMD. (YY),
NE,,YY     :CLEAR THE PORT BIT IN THE FUNCTION WRD. (YY),
XX,,YY     :SET THE CMD. BIT IN THE ELEMENT FUNCTION WRD.
NEXX,,YY           :CLR THE CMD. BIT IN THE ELEMENT FNCT. WRD.

XX=ELEMENT NUMBER (1 THRU 40.)
YY=PORT OR ELEMENT CMD.

R3 CONTAINS THE STARTING ADDRESS OF THE COMMAND
STRING IN THE PORT BUFFER. FIRST WORD IS WORD COUNT
```

The following commands are in the command file. Those marked with ** will not do anything. (The software hasn't been written yet.)

START OF ELEMENT FUNCTION LIST

RO	:READ ONLY COMMAND	
RD	:COMMAND BIT	
SE	:SUB ADD BIT	
SP	:SPARE	
AR	:ANNUN. RESET	
SC	:CONNECT SHUNT	
PA	:SET A POL.	
ON	:SET ON BIT	
SB	:SET STNDBY BIT	
25	:SET 25 MV POINT	**
75	:SET 75 MV POINT	**
ER	:TST CMBST ERROR	**
MU	:INC. MAGNITUDE	
MD	:DEC. MAGNITUDE	
RR	:READ STATUS ERRORS	**
C1	:CONNECT SWR TO MAG.	
C2	:CONNECT SWR TO CMD.	
LM	:LOOK AT ME BIT	
AT	:AUTO STNDBY	**

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AO	:AUTO ON	**
AU	:AUTO UP TO 1/4 OUTPUT	**
AI	:AUTO IDLE	**
AF	:AUTO OFF	**
AC	:AUTO CALIBRATE	**

PORT FUNCTION TESTS FOLLOW:

CN	:CLR ALL COUNTERS	
BU	:CLR ALL BUFFERS	
PE	:PRINT EVERY 10 ERRORS	**
RF	:PRINT EVERY TIME REGISTER FILLS	**
SE	:PRINT ON ALL CMBST ERRORS	**
LE	:PRINT ON ALL ELEMENT ERRORS	**
ST	:STOP ALL TRANSMISSIONS TO ELEMENTS	
LM	:LOOK AT ALL ELEMENTS IN PORT	**

SOME COMMENTS

This program should be run after individual checkout of the element cards and at two levels of power supply operation. The first level with the P.S. off and just the cards energized. This will check errors due to card malfunction. It is assumed that the noise level is reasonably low at this operating value. The second check should be made with the P.S. on and at some value of current. This will check the power supply element card interface for noise problems.

VK:as

Distr.: Adm. Group
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