

DataGeneral

**TECHNICAL
STATEMENT**

TEXT LISTING

068-001122-00

PROGRAM

MICRO-NOVA DG/DAC ANALOG CONVERSION
SYSTEM DIAGNOSTIC

TEXT TAPE

097-001122-00

ABSTRACT

THIS IS A DIAGNOSTIC PROGRAM FOR THE ANALOG CONVERSION DEVICES OF THE DG/DAC PROGRAMMED I/O SYSTEM. THE ANALOG CONVERSION SECTION INCLUDES: 1) 4280 SERIES ANALOG TO DIGITAL CONVERTERS, 2) 4281/82 SERIES ANALOG MULTIPLEXORS AND 3) 4288/89 SERIES DIGITAL TO ANALOG CONVERTERS.

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? NAME: UGAD.TX          PART NUMBER: 097-1122
?
? DESCRIPTION: MN UG/DAC ANALOG CONVERSION SYSTEM DIAGNOSTIC
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? REVISION HISTORY
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? REV.          DATE
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? 00          12/15/78
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? COPYRIGHT (C) DATA GENERAL CORPORATION, 1978
? ALL RIGHTS RESERVED
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?1. PROGRAM NAME: UGAD.Skr ; MN 06/DAC ANALOG CONVERSION
? SYSTEM DIAGNOSTIC
?
?2. REVISION HISTORY: N/A
?
?3. MACHINE REQUIREMENTS
? 1. MINOVA CPU WITH A1
? 2. LEAST 4K READ/WRITE MEMORY
? 3. 4300M 06/DAC CHASSIS CONTROL CARD
? 4. 4300M 06/DAC I/O CHASSIS
? 5. BASIC I/O TELETYPE INTERFACE AND CONTROL
?
?5.1 OPTIONAL EQUIPMENT TABLE
? BOARD TYPE ID BOARD #
? *****
?
? A/U CONVERTERS:
? *****
? (+/- 10 VOLTS) 41 4280
? (+/- 5 VOLTS) 41 4280-A
? (0 - 10 VOLTS) 41 4280-B
? (0 - 5 VOLTS) 41 4280-C
?
? ANALOG MUX GATES:
? *****
? 50 MA DIFFERENTIAL 42 4281-C
? CURRENT INPUTS
? DIFFERENTIAL VOLTAGE 42 4281
? INPUTS
? DIFFERENTIAL VOLTAGE 42 4281-G
? INPUTS (PRUG. GAIN) 42 4281-G
? SINGLE-ENDED VOLTAGE 42 4282
? INPUTS
?
?5.2 THIS PROGRAM MAY BE RUN IN A HOST/DCU COMPUTER
? CONFIGURATION.
?
?5.3 ALL NUMERIC INPUTS TO THE PROGRAM SUCH AS STARTING
? ADDRESSES, SLOT #'S, DEVICE CODES ETC. ARE
? EXPECTED TO BE IN OCTAL UNLESS OTHERWISE NOTED.

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4. TEST REQUIREMENTS: N/A

5. SUMMARY:

THIS IS A DIAGNOSTIC PROGRAM FOR THE ANALOG CONVERSION DEVICES OF THE DG/DAC PROGRAMMED I/O SYSTEM. THE ANALOG CONVERSION SECTION INCLUDES: 1) 4280 SERIES ANALOG TO DIGITAL CONVERTERS, 2) 4281/82 SERIES ANALOG MULTIPLEXORS AND 3) 4288/89 SERIES DIGITAL TO ANALOG CONVERTERS.

THE PROGRAM ASSUMES ONLY THE EXISTENCE OF A DG/DAC I/O CHASSIS AND CHASSIS CONTROLLER. A STAND-ALONE CHASSIS CONTROLLER SURVEY IS INCLUDED AND IS RUN BEFORE ANY OTHER TESTS.

THIS DIAGNOSTIC INCLUDES LOGIC LEVEL TESTING FOR THE DG/DAC ANALOG TO DIGITAL CONVERTERS AND ANALOG INPUT MULTIPLEXORS. NO ANALOG SECTIONS ARE TESTED ON EITHER THE A/D OR MULTIPLEXORS IN THIS DIAGNOSTIC. NOTE THAT THE ANALOG MULTIPLEXORS MUST BE USED IN CONJUNCTION WITH AN A/D CONVERTER.

NO D/A CONVERTER TESTS ARE CONTAINED IN THIS PROGRAM.

TESTS AND CALIBRATION PROCEDURES FOR THE ANALOG SECTIONS OF THE A/D CONVERTERS, ANALOG MULTIPLEXORS AND THE D/A CONVERTERS ARE CONTAINED IN THE DG/DAC ANALOG CONVERSION SYSTEM EXERCISER PROGRAM (LISTING = 096-476; AB TAPE = 095-476).

INDIVIDUAL TEST OPERATIONS ARE INCLUDED IN SECTION 7.

RESTRICTIONS: SEE SECTION 5

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7. PROGRAM DESCRIPTIONS/THEORY OF OPERATION:

7.0: INITIALIZATION

IN THE ABSENCE OF A REAL-TIME CLOCK, THE FOLLOWING IS ASKED TO ESTABLISH THE TIME BASE "

"RTU BAUD RATE?" (3-DIGIT DECIMAL #)

ALL TEST SET-UPS ARE PROCEEDED BY THE CHASSIS INITIALIZATION SEQUENCE, UNLESS SPECIFICALLY SKIPPED BY ANSWERING "NO" TO THE FOLLOWING QUESTION-

"INITIALIZE? "

THIS IS THE FIRST QUESTION ASKED WHEN STARTING ANY TEST. IF NO IS THE RESPONSE, THE FOLLOWING QUESTIONS ARE OMITTED (RETAINING THE PREVIOUS CONFIGURATION) AND THE PROGRAM PROCEEDS TO THE INDIVIDUAL TEST SET-UP. OTHERWISE THE FOLLOWING WILL BE ASKED-

"CHASSIS DEVICE CODE "

(VALID RANGE = 40 - 76)

"CHASSIS MASK BIT " (0 - 17)

THIS IS THE DEVICE MASK BIT FOR THE "CPU MASKU" INSTRUCTION AND IS JUMPER SELECTED ON THE CONTROL CARD.

"DCU? " (YES OR NO)

YES INDICATES THAT THE DG/DAC CHASSIS IS BEING CONTROLLED BY A DCU-50 (DATA CONTROL UNIT) AND THE FOLLOWING IS ASKED-

"DCU DEVICE CODE "

(VALID RANGE=20-76: PRIMARY DEVICE CODE=34)

QUESTIONS ARE RE-TYPED IF INCORRECT RESPONSES ARE MADE. THE PROGRAM PROCEEDS TO THE INDIVIDUAL TEST SET-UPS AFTER INITIALIZATION.

NOTE THAT THE INITIALIZATION SEQUENCE MUST BE DONE WHEN STARTING THIS DIAGNOSTIC FOR THE FIRST TIME (I.E. ON INITIAL PROGRAM LOADING). WHEN DOING MULTIPLE TESTS, THE INITIALIZATION CAN GENERALLY BE SKIPPED AFTER THE FIRST TEST SET-UP.

"DCU HALTED" WILL BE TYPED IF THE DCU IS EITHER NOT IN THE SYSTEM OR THE INCORRECT DEVICE CODE WAS INPUT.


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PROGRAM CONTROL TO GO TO UOI (NOTE: THIS IS AN
OPTIONAL COMMAND AND IS AVAILABLE ONLY IF
UOIPK IS PRESENT)

THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE
CURRENT OPERATING MODES.

THIS COMMAND GIVEN AT ANY TIME WILL LOCK THE
PROGRAM INTO SWITCH MODIFICATION MODE WHERE
MORE THAN 1 BIT CAN BE CHANGED.

:9. OPERATING PROCEDURE/OPERATOR INPUT:
:
:19.1 GENERAL
:
: 1.A LOAD PROGRAM VIA BINARY LOADER
:
: 1.B MAKE NECESSARY HARDWARE CONNECTIONS
:    PERTAINING TO THE INPUT/OUTPUT TYPES AND/OR
:    SYSTEM CONFIGURATION.
:
: 1.C SET SWITCHES EQUAL TO ONE OF THE STARTING
:    ADDRESSES SHOWN BELOW
:    PRESS START
:
: 1.D STARTING ADDRESS
:
:    70 UOI DIRECT ENTRY ONLY
:    500 CHASSIS CONFIGURATION
:    501 A/D-MUX LOGIC TEST
:
:10. PROGRAM OUTPUT/ERROR DESCRIPTION:
:
: WHEN AN ERROR IS DETECTED, THE PROGRAM PRINTS THE
: VALUE OF THE PC ON THE CALL TO HALT AND THE
: CONTENTS OF AC'S 0-2, AND THEN LOOPS ALLOWING THE
: OPERATOR TO SET SWPAK (SEE SWITCH SETTING).
:
: DEPENDING UPON SWPAK SETTINGS, THE PROGRAM MAY EITHER CONTINUE
: ON TO THE NEXT TEST OR GO INTO A SCOPE LOOP BETWEEN THE
: LAST CALLS TO .LOOP AND .SETUP.
:
: THE PARTICULAR SIGNIFICANCE OF AC'S 0-2 IS EXPLAINED IN
: THE LISTING FOR THE PARTICULAR TEST INVOLVED.
:
: IF A DG/DAC CHASSIS POWER FAIL INTERRUPT IS DETECTED
: (FLAG=21) THE PROGRAM WILL HALT. THIS IS DONE TO AVOID
: POSSIBLE PROGRAM DESTRUCTION. IF THIS OCCURS,
: RE-START THE PROGRAM AFTER DG/DAC CHASSIS POWER-UP.
:
:11. DEBUG HELP:
:
: UOITU 11
:
: OCTAL DEBUG TOOL (ODT)
:
: THE DIAGNOSTIC IS EQUIPPED WITH A BUILT IN UOI WHICH CAN
: BE ACCESSED BY HITTING CONTROL 0 ("0") AT ANY TIME DURING
: THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-
: METERS)
:
: ON ENTERING OUI THE ADDRESS OF THE LOCATION HAVING THE
: NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.
:
:11.1 CONVENTIONS AND SYMBOLS
: THE FOLLOWING CONVENTIONS ARE USED BY THE UOI:
: ? POUND WITH A "?"
: @ ODI IS READY AND AT YOUR SERVICE.
:
:11.2 COMMAND STRUCTURE
: AN UOI COMMAND HAS THE FOLLOWING FORMAT:

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OPTIONAL COMMAND AND IS AVAILABLE ONLY IF
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THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE
CURRENT OPERATING MODES.

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PROGRAM INTO SWITCH MODIFICATION MODE WHERE
MORE THAN 1 BIT CAN BE CHANGED.

:9. OPERATING PROCEDURE/OPERATOR INPUT:
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:19.1 GENERAL
:
: 1.A LOAD PROGRAM VIA BINARY LOADER
:
: 1.B MAKE NECESSARY HARDWARE CONNECTIONS
:    PERTAINING TO THE INPUT/OUTPUT TYPES AND/OR
:    SYSTEM CONFIGURATION.
:
: 1.C SET SWITCHES EQUAL TO ONE OF THE STARTING
:    ADDRESSES SHOWN BELOW
:    PRESS START
:
: 1.D STARTING ADDRESS
:
:    70 UOI DIRECT ENTRY ONLY
:    500 CHASSIS CONFIGURATION
:    501 A/D-MUX LOGIC TEST
:
:10. PROGRAM OUTPUT/ERROR DESCRIPTION:
:
: WHEN AN ERROR IS DETECTED, THE PROGRAM PRINTS THE
: VALUE OF THE PC ON THE CALL TO HALT AND THE
: CONTENTS OF AC'S 0-2, AND THEN LOOPS ALLOWING THE
: OPERATOR TO SET SWPAK (SEE SWITCH SETTING).
:
: DEPENDING UPON SWPAK SETTINGS, THE PROGRAM MAY EITHER CONTINUE
: ON TO THE NEXT TEST OR GO INTO A SCOPE LOOP BETWEEN THE
: LAST CALLS TO .LOOP AND .SETUP.
:
: THE PARTICULAR SIGNIFICANCE OF AC'S 0-2 IS EXPLAINED IN
: THE LISTING FOR THE PARTICULAR TEST INVOLVED.
:
: IF A DG/DAC CHASSIS POWER FAIL INTERRUPT IS DETECTED
: (FLAG=21) THE PROGRAM WILL HALT. THIS IS DONE TO AVOID
: POSSIBLE PROGRAM DESTRUCTION. IF THIS OCCURS,
: RE-START THE PROGRAM AFTER DG/DAC CHASSIS POWER-UP.
:
:11. DEBUG HELP:
:
: UOITU 11
:
: OCTAL DEBUG TOOL (OUI)
:
: THE DIAGNOSTIC IS EQUIPPED WITH A BUILT IN UOI WHICH CAN
: BE ACCESSED BY HITTING CONTROL 0 ("0") AT ANY TIME DURING
: THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-
: METERS)
:
: ON ENTERING OUI THE ADDRESS OF THE LOCATION HAVING THE
: NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.
:
:11.1 CONVENTIONS AND SYMBOLS
: THE FOLLOWING CONVENTIONS ARE USED BY THE UOI:
: ? POUND WITH A "?"
: @ ODI IS READY AND AT YOUR SERVICE.
:
:11.2 COMMAND STRUCTURE
: AN UOI COMMAND HAS THE FOLLOWING FORMAT:

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; ARGUMENTS (COMMAND)
; AN ARGUMENT MAY BE ONE OF THE FOLLOWING:
; "EXP" AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS
; SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-
; ING ZEROS NEED NOT BE TYPED.
; "ADR" AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT
; THAT BIT 0 IS NEGLECTED.
; A COMMAND IS A SINGLE TELETYPE CHARACTER

;11.5
; ODT COMMANDS
; THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE
; USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:
; INTERNAL CPU CELLS AND MEMORY LOCATIONS.

;11.5.1 OPENING INTERNAL CELLS
; THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF
; THE FORM "na" WHERE N IS ANY OCTAL EXPRESSION BETWEEN
; 0 AND 7
; 0-3 FOR ACCUMULATORS 0-3
; 4 FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN
; THE EVENT OF A "P" COMMAND.
; 5 CPU AND I/O STATUS
; BIT INTERPRETATION
; 15 STATUS OF I/O DONE FLAG
; 14 STATUS OF INTERRUPT'S (ION FLAG)
; 13 STATUS OF CARRY BIT
; 6 ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF
; ANY)
; 7 INSTRUCTION AT THE BREAK POINT LOCATION

; OTHER COMMANDS TO OPEN CELLS ARE:
; "ADR/" OPEN THE CELL AND PRINT ITS CONTENTS
; "/ OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER
; AND PRINT ITS CONTENTS.
; "*/ADP/" ADD "ADR" TO THE POINTER, OPEN THE CELL
; AND PRINT ITS CONTENTS.
; "*/ADP/" SUBTRACT "ADR" FROM THE POINTER, OPEN
; THE CELL AND PRINT ITS CONTENTS.
; "CR" THE RETURN KEY IS USED TO CLOSE THE OPEN CELL
; WITH OR WITHOUT MODIFICATION.
; "LF" LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR
; WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING
; CELL. THE OPEN CELL WITH OR WITHOUT MODIFICATION
; AND OPEN THE PRECEDING CELL
; / CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
; OPEN THE CELL POINTED TO BY ITS CONTENTS.
; + "ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
; OPEN THE CELL POINTED TO BY ITS CONTENTS + "ADR".
; - "ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
; OPEN THE CELL POINTED TO BY ITS CONTENTS - "ADR".

;11.5.2 MODIFICATION OF A CELL
; ONCE A CELL HAS BEEN OPENED ITS CONTENTS CAN BE MODIFIED
; BY TYPING THE NEW VALUE THE CELL IS TO CONTAIN IN THE
; FORM OF AN OCTAL EXPRESSION FOLLOWED BY "CR" OR "LF".
; IF A OR = IS TYPED AS THE FIRST CHARACTER OF THE EX-
; PRESSION THEN THE VALUE OF THE EXPRESSION IS ADDED TO OR
; SUBTRACTED FROM THE OLD CONTENTS OF THE CELL. THE

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; ADDRESS ITSELF OR AN EXPRESSION RELATIVE TO THE ADDRESS
; CAN BE DEPOSITED BY TYPING A "u" OR "r" OCTAL EXPRESS-
; ION". A ROBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL
; ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE
; TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.

;11.5.3 OTHER ODT COMMANDS
; ROBOUT THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED
; DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST
; DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF
; THE ROBOUT KEY IS PRESSED RIGHT AFTER OPENING A
; CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS
; CONTENTS. THIS ALLOWS THE MODIFICATION OF THE CELL
; AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE
; KEY WAS PRESSED.
; "ADR"B INSERT A BREAK POINT AT LOCATION "ADR".
; ONLY ONE BREAK POINT CAN BE INSERTED AND ANY
; ENTRY TO ODI AFTER EXECUTING A BREAK POINT WILL
; CAUSE IT TO BE DELETED.
; D DELETE THE BREAK POINT IF ANY.
; P RESTART THE EXECUTION OF THE PROGRAM AT LOCATION
; POINTED BY "A".
; "ADR"H START EXECUTING THE PROGRAM AT "ADR" AFTER AN
; IO-RESET.
; K KILL THE STRING TYPED SO FAR. THE ODT RESPONDS
; WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT
; MODIFICATION.
; = PRINT THE OCTAL VALUE OF THE INPUT ONLY.
; THIS WILL CLOSE ANY OPEN CELLS WITHOUT
; MODIFICATION AND WILL NOT OPEN A CELL

; NOTE: IN PROGRAMS WHICH RELOCATE THEMSELVES THE
; USER SHOULD PLACE BREAK POINTS ONLY IN THE
; ORIGINAL PROGRAM AREA. IF A BREAK POINT IS
; PLACED OUTSIDE THIS AREA THE RESULTS WILL
; BE UNPREDICTABLE.

;12. SPECIAL NOTES/SPECIAL FEATURES: N/A
;15. RUN TIME: DEPENDS ENTIRELY ON SETUP
; CAN VARY FROM 2-15 MIN.

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**00000 TOTAL ERRORS, 00000 PASS 1 ERRORS

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