IDENTIFICATION

PRODUCT CODE: DEC-8E-EUZC-D

PRODUCT NAME: TD8-E DECTAPE FORMATTER

DATE CREATED: DECEMBER 7, 1971

MAINTAINER: DIAGNOSTIC PROGRAMMING GROUP

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1. ABSTRACT

THE TD8-E DECTAPE FORMATTER PROGRAM RECORDS THE TIMING AND MARK TRACKS ON A DECTAPE MOUNTED ON THE TU56 DECTAPE TRANSPORT.

THE PROGRAM INTERACTS WITH THE OPERATOR VIA THE TELETYPE TO OBTAIN THE NECESSARY DATA FOR EACH SET OF DECTAPES TO BE FORMATTED. AS SOON AS ONE SET OF TAPES IS FORMATTED, THE PROGRAM IS READY TO FORMAT ANOTHER SET.

THREE FULL PASSES ARE REQUIRED TO COMPLETELY FORMAT EACH DECTAPE, AND UP TO TWO DECTAPES MAY BE FORMATTED AT A TIME (UNITS 0 AND 1 WITH A TD8-E; IOT CODE OF 677X). UPON COMPLETION OF A CYCLE, NEW TAPES MAY BE MOUNTED AND FORMATTED AS THE LAST, WITH A MINIMUM OF OPERATOR-PROGRAM COMMUNICATION. ONE TAPE EXCLUDING TAPE SETUP TIME, REQUIRES THREE MINUTES FROM START TO FINISH.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-8E, TELETYPE, TD8-E (IOT CODE 677X), AND A TU56 DECTAPE TRANSPORT.

2.2 STORAGE

THIS PROGRAM USES LOCATIONS 0000-3400. THE LOADERS MUST BE STORED IN THE LAST MEMORY PAGE.

2.3 PRELIMINARY PROGRAMS

ALL BASIC PDP-8E DIAGNOSTIC PROGRAMS AND MAINDEC-8E-D3A(N) SHOULD HAVE BEEN SUCCESSFULLY RUN.

3. LOADING PROCEDURE

LOAD THE PROGRAM INTO FIELD 0 USING THE STANDARD BINARY LOADER.

4. STARTING PROCEDURE

4.1 STARTING ADDRESS

SET SWITCH REGISTER TO 0200 AND PRESS LOAD ADDRESS. NOW PRESS CLEAR AND THEN CONTINUE. "UNIT" IS PRINTED ON THE TELETYPE.

MOUNT THE DECTAPES TO BE MARKED ONTO THE TAPE TRANSPORTS, WITH JUST ENOUGH TURNS OF TAPE ON THE RIGHT HAND REEL OF EACH TRANSPORT TO PROVIDE A GRIP. MAKE SURE THAT NO TWO TAPE UNITS ARE SET TO THE SAME UNIT NUMBER. SET THE SWITCH ON THE TD8-E TO WTH POSITION. FOR EACH TRANSPORT TO BE USED, SET THE WRITE ENABLED-WRITE LOCK SWITCH TO WRITE ENABLED, AND THE REMOTE-OFF-LOCAL SWITCH TO REMOTE.

4.2 OPERATING PROCEDURE

THE PROGRAM AND OPERATOR NOW CONVERSE. THE PRINTOUT "UNIT?" IS ASKING WHICH DECTAPE UNITS WILL BE USED. THE OPERATOR TYPES ONE OR TWO UNIT NUMBERS, CORRESPONDING TO THE DECTAPE UNITS UPON WHICH HE HAS MOUNTED TAPES. FOR INSTANCE, IF THE OPERATOR HAS MOUNTED TAPES ON UNITS 0 AND 1, HE WOULD TYPE 0 1↵ (WHERE ↵ SIGNIFIES CARRIAGE RETURN). SPACES ARE IGNORED, SO IT MAKES NO DIFFERENCE IF THE OPERATOR TYPES SPACES BETWEEN THE UNIT NUMBERS. ONLY ONE SPECIFICATION OF A UNIT IS SIGNIFICANT, I.E. TYPING 000111 HAS THE SAME EFFECT AS TYPING 01.

ONCE THE OPERATOR HAS SPECIFIED THE UNITS HE WISHES TO USE, THE PROGRAM TYPES "FORMAT?". THE OPERATOR RESPONDS BY TYPING MARK OR MARK XXXX↵. IF HE TYPES MARK↵, THE PROGRAM ASSUMES 201 WORDS 2702 BLOCKS (STANDARD PDP-8 FORMAT). OTHERWISE XXXX IS ACCEPTED AS A DECIMAL NUMBER OF WORDS PER BLOCK AND MUST BE DIVISIBLE BY 3. NOTE THAT TYPING MARK 384 WILL CAUSE THE PROGRAM TO GENERATE A STANDARD PDP-10 FORMAT DECTAPES (1102(8) BLOCKS OF 600 WORDS, WHICH IS EQUIVALENT TO 1102(8) BLOCKS OF 200 WORDS WHERE EACH WORD IS 36 BITS RATHER THAN 12 BITS).

THE PROGRAM NOW TYPES "XXXX WORDS, YYYY BLOCKS OK? (YES OR NO)." THIS SERVES AS A FINAL CHECK FOR BLOCK COUNT. XXXX AND YYYY ARE OCTAL VALUES REPRESENTING THE FINAL OUTCOME OF A FORMULA SOLVED BY THE PROGRAM, DETERMINING THE NUMBER OF BLOCKS THAT MAY BE WRITTEN ON A DECTAPE KNOWING THE NUMBER OF WORDS. IF A NO ANSWER IS GIVEN, THE PROGRAM REVERTS TO "FORMAT?". OTHERWISE (IF YES), THE PROGRAM TYPES OUT "SET SWITCH TO WTM". THEN THE OPERATOR HITS CARRIAGE RETURN ON THE TELETYPE AND THE TAPE ON FIRST UNIT SPECIFIED BEGINS TO MOVE IF THE SWITCH IS SET.

ONCE ALL OF THE TAPES SPECIFIED HAVE BEEN MARKED, THE PRINOUT "SET SWITCH TO OFF" APPEARS. THEN THE OPERATOR RESETS THE WTM SWITCH TO OFF, AND STRIKES THE RETURN KEY ON THE TELETYPE, STARTING THE SECOND PASS. NOTE THAT DURING THE SECOND PASS WITH MULTIPLE DECTAPE UNITS, AS SOON AS ONE TAPE STOPS AND THE NEXT TAPE STARTS, THE FIRST TAPE IS COMPLETED AND MAY BE REPLACED WITH A FRESH TAPE IN PREPARATION FOR RECYCLING.

THE PROGRAM CONTINUES BY ITSELF UNTIL COMPLETED, AT WHICH TIME THE "FORMAT" PRINTOUT OCCURS. TYPING "SAME↵" REPEATS THE ENTIRE PROCESS WITH THE ORIGINAL CONSTANTS. THE NEW DECTAPES MUST BE MOUNTED AND READY TO WRITE TIMING AND MARK TRACKS BEFORE A CARRIAGE RETURN IS HIT ON THE TELETYPE AFTER THE TYPEOUT "SET SWITCH TO WTM". ALSO, IN RESPONSE TO "DIRECT?", TYPING "RDR↵" CAUSES THE PRINTOUT OF THE UNIT NUMBER OF THE DECTAPE AND THE LAST 22 BLOCK NUMBERS; "RDF↵" CAUSES THE PRINTOUT OF THE UNIT NUMBER AND THE FIRST 22 BLOCK NUMBERS; AND "RESTART↵" RETURNS THE PROGRAM TO "UNIT?". UNIT NUMBERS ARE PRINTED AS "000N" WHERE N IS THE UNIT NUMBER.

FOLLOWING ARE SEVERAL EXAMPLES OF SUCCESSFUL OPERATION. THE UNDERLINED STATEMENTS ARE PRINTED BY THE PROGRAM. ALL OPERATOR RESPONSES SHOULD BE FOLLOWED BY A CARRIAGE RETURN.

A. CREATE A STANDARD PDP-8 TAPE ON UNIT 1

<u>UNIT? 1</u>
<u>FORMAT? MARK</u>
<u>0201 WORDS, 2702 BLOCKS, OK? (YES OR NO)</u>

YES
SET SWITCH TO WTM
SET SWITCH TO OFF
FORMAT?

8. CREATE 4 STANDARD PDP-10 FORMAT TAPES, TWO AT A TIME ON UNITS 0-1

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UNIT? 01
FORMAT? MARK 384
0600 WORDS, 1102 BLOCKS OK? (YES OR NO)
YES
SET SWITCH TO WTM
SET SWITCH TO OFF
FORMAT? SAME
SET SWITCH TO WTM
SET SWITCH TO OFF
FORMAT?
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4.3 ERRORS

4.3.1 ERRORS TYPED TO "UNIT" AND "FORMAT" REVERT BACK TO "UNIT?" OR "FORMAT?"

4.3.2 ERROR MESSAGES FOR RESPONSE TO MARK XXXX

NOT DECIMAL	A CHARACTER IN XXXX IS NOT 0-9
NOT DIVISIBLE BY 3	XXXX CANNOT BE DIVIDED EVENLY BY 3
TOO MANY WORDS	THE NUMBER OF WORDS PLUS 15 EXCEEDS 7777(8).
TOO MANY BLOCKS	THE NUMBER OF BLOCKS GENERATED BY XXXX EXCEEDS 7777

4.3.3 ERROR MESSAGES FOR RESPONSE TO "SET SWITCH TO WTM".

1. SETUP? INDICATES AN ERROR IN THE DECTAPE SETUP (SEE SECTION 4.1 FOR DECTAPE SETUP) ONE OF THE UNITS SPECIFIED IS IN WRITE LOCK POSITION, NOT SELECTED, OR THE WRITE FLIP-FLOP IS UNABLE TO BE SET, OR THERE MAY BE A TIMING ERROR. (AFTER MESSAGE REVERT BACK TO "UNIT"

2. SWITCH NOT SET TO WTM OR SINGLE LINE FLAG FAILED TO SET
   SET SWITCH TO WTM.

   THIS TYPE OUT SAYS THAT EITHER THE SWITCH ON THE M868 MODULE IS NOT SET TO THE WTM POSITION OR THE TIMING GENERATOR FOR WRITING THE MARK AND TIMING TRACKS IS NOT SETTING THE SINGLE LINE FLAG.

   RECOVERY:

   IF THE SWITCH WAS NOT SET TO WTM POSITION SET THE SWITCH AND HIT CARRIAGE RETURN ON THE TELETYPE.

   IF THE SWITCH WAS SET TO WTM POSITION AND THIS TYPE OUT OCCURRED, TRY AGAIN OR EXAMINE THE TIMING GENERATOR CIRCUIT.

4.3.4 ERROR MESSAGES FOR MARKING AND VERIFYING A TAPE

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PC      XXXX    MARK TRACK ERROR PHASE Y
PC      XXXX    BLOCK NUMBER ERROR PHASE Y
PC      XXXX    DATA ERROR PHASE Y
PC      XXXX    CHECKSUM ERROR PHASE Y
PC      XXXX    TIMING ERROR PHASE Y
PC      XXXX    WRITE ERROR PHASE Y

XXXX EQUALS THE PROGRAM COUNTER AT TIME OF THE FAILURE.
Y EQUALS THE PASS WHICH IT WAS IN.  (SEE SECTION 4.4)
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4.4 RECOVERY

ALTHOUGH AN ERROR SHOULD CAUSE DOUBT CONCERNING THE ENTIRE PROCESS, A RESTART MAY BE MADE (EXCEPT IN PHASE 0) BY TYPING "RETRY↵" RETRY CAUSES THE PROGRAM TO GO BACK TO PHASE 1, TYPE "RESTART↵" TO RETURN TO "UNIT?"

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PHASE 0:        WRITE TIMING AND MARK TRACK FORWARD
PHASE 1:        READS MARK TRACK REVERSE
PHASE 2:        WRITE DATA, FORWARD BLOCK AND REVERSE BLOCK NUMBERS FORWARD AND WRITES THE CHECKSUMS
PHASE 3:        DISPLAYS BLOCK NUMBERS IN AC REVERSE
PHASE 4:        READS DATA, FORWARD BLOCK AND REVERSE BLOCK NUMBERS FORWARD AND CALCULATES THE CHECKSUM
PHASE 5:        READS REVERSE BLOCK NUMBERS IN REVERSE
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THE ENTIRE PROGRAM MAY BE RESTARTED AT 0200 ANY TIME.

5. DETAILS OF OPERATION AND STORAGE

THE PROGRAM WRITES TIMING AND MARK TRACK ON A DECTAPE FORWARD WITH WTM SWITCH SET. THEN IT READS THE MARK TRACK IN THE REVERSE DIRECTION WITH THE SWITCH SET TO OFF. THE PROGRAM CHECKS ALL OF THE MARK TRACK ONCE IT IS IN SYNC. (SEE FLOW FIGURE 1) WHEN IT FINISHES READING THE MARK TRACK REVERSE, IT BOUNCES OFF THE END ZONE AND STARTS WRITING ZEROES TO THE FIRST BLOCK MARK. THE PROGRAM IS NOW IN SYNC. THE PROGRAM NOW CONTINUES WRITING FORWARD BLOCK NUMBERS, REVERSE CHECKSUM, DATA, CHECKSUM, AND REVERSE BLOCK NUMBERS FOR THE REST OF TAPE. WHEN IT SEES THE END ZONE, IT TURNS AROUND AND STARTS DISPLAYING THE REVERSE BLOCK NUMBER IN THE ACCUMULATOR UNTIL IT HITS THE END ZONE AGAIN. NOW THE TAPE TURNS AROUND AND STARTS READING AND COMPARING ALL FORWARD BLOCK NUMBERS, REVERSE CHECKSUM, ALL DATA, CHECKSUM AND REVERSE BLOCK NUMBERS THAT WAS WRITTEN IN PHASE 2. THIS COMPARISON IS DONE ON ALL BLOCKS UNTIL THE END ZONE IS REACHED. THE TAPE TURNS AROUND IN THE END ZONE AND STARTS LOOKING FOR REVERSE BLOCK NUMBERS AND COMPARING THEM ALL THE WAY DOWN TAPE TO THE END ZONE. THE FORMATTING IS NOW COMPLETE, THE TAPE STOPS, AND "FORMAT" IS TYPED OUT WAITING FOR NEW DIRECTIONS.

THE NUMBER OF BLOCK FRAMES TO BE WRITTEN IS A FUNCTION OF THE NUMBER OF WORDS PER BLOCK
THE FORMULA

$$\text{BLOCKS PER TAPE} = [(212080)/(NW+15)]+2$$

WHERE NW EQUALS THE NUMBER OF WORDS TO BE WRITTEN, IS USED BY THE PROGRAM TO COMPUTE THE NUMBER OF BLOCKS, BUT IS ADJUSTED BY THE PROGRAM TO PROVIDE THE STANDARD PDP-8 FORMAT OF 129(10) (12-BIT) WORDS, 1474(10) BLOCKS, AND STANDARD PDP-10 FORMAT OF 128(10) (36-BIT) WORDS, 578(10) BLOCKS.

5.1 THEORY