

# TA11

CASSETTE LOADER  
MD-11-DZTAF-C

EP-DZTAF-C-DL-A  
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The microfiche strip contains approximately 15 frames. The frames contain the following content:

- Frame 1: A small table with 2 columns and 4 rows.
- Frame 2: A table with 2 columns and 4 rows.
- Frame 3: A table with 2 columns and 4 rows.
- Frame 4: A table with 2 columns and 4 rows.
- Frame 5: A table with 2 columns and 4 rows.
- Frame 6: A table with 2 columns and 4 rows.
- Frame 7: A table with 2 columns and 4 rows.
- Frame 8: A table with 2 columns and 4 rows.
- Frame 9: A table with 2 columns and 4 rows.
- Frame 10: A table with 2 columns and 4 rows.
- Frame 11: A table with 2 columns and 4 rows.
- Frame 12: A table with 2 columns and 4 rows.
- Frame 13: A table with 2 columns and 4 rows.
- Frame 14: A table with 2 columns and 4 rows.
- Frame 15: A table with 2 columns and 4 rows.

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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZTAF-C-D  
PRODUCT NAME: TALL CASSETTE ABSOLUTE LOADER (TALDR)  
DATE: 21 JANUARY, 1974  
MAINTAINER: DIAGNOSTIC GROUP  
AUTHOR: R. KOLLER

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1. ABSTRACT

TALDR IS A LOADER PROGRAM DESIGNED TO LOAD MAINDEC-11 DIAGNOSTIC PROGRAMS FROM TAI1 CASSETTES.

THE TALDR LOADER IS THE FIRST FILE STORED ON A TAI1 MAINDEC-11 CASSETTE. IT IS LABELLED "TALDRB.SYS". IT IS FOLLOWED BY ONE OR MORE MAINDEC-11 DIAGNOSTIC PROGRAMS STORED IN ABS LOADER FORMAT.

EACH TAI1 MAINDEC-11 CASSETTE IS PROVIDED WITH A DIRECTORY, THAT LISTS THE TALDR LOADER, AND ALL THE PROGRAMS STORED IN THE CASSETTE.

EACH FILE NAME IN THE CASSETTE IS NUMBERED WITH AN OCTAL SEQUENCE NUMBER. TALDR HAS THE SEQUENCE NUMBER OF 1. THE FILE NUMBER IS USED TO SPECIFY TO THE TALDR LOADER WHICH PROGRAM IS TO BE LOADED.

IN ORDER TO PREVENT ACCIDENTAL ERASURE OF CASSETTES, EACH CASSETTE TO BE LOADED FROM, SHOULD BE "WRITE-LOCKED". WRITE LOCKING OF A CASSETTE IS ACCOMPLISHED BY UNCOVERING THE SMALL HOLES AT THE BACK OF THE CASSETTE BY FLIPPING THE SMALL PLASTIC TABS OUT OF THE WAY.

ABILITY OF THE TALDR LOADER TO SUCCESSFULLY LOAD A PROGRAM DEPENDS ON THE SIZE OF THE PROGRAM TO BE LOADED. TALDR CAN NOT LOAD A PROGRAM THAT INFRINGES ON ITS OWN STORAGE AREA.

2. REQUIREMENTS2.1 HARDWARE REQUIREMENTS

- A. A PDP11 PROCESSOR
- B. BM792-YH CASSETTE BOOTSTRAP ROM (MAY BE SIMULATED BY A TAI1 BOOTSTRAP LOADER PROGRAM)
- C. TAI1 TAPE CASSETTE CONTROL UNIT
- D. TU60 TAPE CASSETTE TRANSPORT
- E. 8K MINIMUM STORAGE

2.2 SOFTWARE REQUIREMENTS

- A. MAINDEC-11 DIAGNOSTIC TAPE CASSETTES
- B. TAI1 BOOTSTRAP LOADER PROGRAM (IF BM792-YH IS NOT INSTALLED) (THIS PROGRAM MUST BE MANUALLY TOGGLED IN)

2.3 STORAGE REQUIREMENTS

ONCE LOADED AND RELOCATED, THE TALDR LOADER OCCUPIES THE UPPERMOST 258(10) WORDS OF AVAILABLE MEMORY, UP TO 28K.



3. USE PROCEDURE3.1 LOADING FROM UNIT 0. BM792YH ROM INSTALLED

IN THE STEPS THAT FOLLOW, ANY HALT AT OTHER THAN LOC XX7014 IS AN ERROR. REFER TO SECTION 4. HALTS, FOR HALT INFORMATION.

- A. MOUNT WRITE-LOCKED CASSETTE IN UNIT 0. (LEFT HAND DRIVE).
- B. LOAD ADDRESS 173300 (BM792YH START ADDRESS)
- C. SET SR WITH FILE NUMBER OF PROGRAM TO BE LOADED. REFER TO CASSETTE DIRECTORY. FILE NUMBER MUST BE GREATER THAN 1.
- D. PRESS START
- E. THE CASSETTE IS REWOUND, TALDR IS LOADED, RELOCATED, AND PROGRAM HALTS AT LOC XX7014.
- F. THE HALT AT LOC XX7014 INDICATES THAT TALDR WAS SUCCESSFULLY LOADED, AND IS READY TO LOAD A PROGRAM. SINCE YOU HAVE ALREADY SET THE SR TO DESIRED PROGRAM NUMBER, PRESS CONT TO LOAD THE PROGRAM.
- G. THE CASSETTE IS REWOUND. TALDR SEARCHES FORWARD FOR THE DESIRED PROGRAM, AND LOADS IT.
- H. IF THE PROGRAM JUST LOADED IS SELF-STARTING, THE PROGRAM IS STARTED. IF NOT, THE PROGRAM HALTS AT LOC XX7014, INDICATING A SUCCESSFUL LOAD, AND READINESS TO LOAD ANOTHER PROGRAM. AT THIS POINT, THE PROGRAM JUST LOADED CAN BE STARTED MANUALLY (MOST MAINDEC-11 PROGRAMS START AT LOC 000200), OR ANOTHER PROGRAM CAN BE LOADED.
- I. TO LOAD ANOTHER PROGRAM, SET THE SR TO FILE NUMBER OF DESIRED PROGRAM, AND PRESS CONT. GO TO STEP E.

3.2 LOADING FROM UNIT 1. BM792YH ROM INSTALLED

IN THE STEPS THAT FOLLOW, ANY HALT OTHER THAN AT LOC XX7014 IS AN ERROR. REFER TO SECTION 4. HALTS.

- A. MOUNT WRITE-LOCKED CASSETTE ON UNIT 1. (RIGHT HAND DRIVE).
- B. DEPOSIT 177500 INTO RO (SEE NOTE BELOW)
- C. DEPOSIT 000400 INTO LOCATION 177500 (SELECTS UNIT 1) (SEE NOTE BELOW)
- D. DEPOSIT 173306 IN PC (R7) (BM792YH START ADDRESS+6)
- E. SET SR WITH FILE NUMBER OF PROGRAM TO BE LOADED. REFER TO CASSETTE DIRECTORY. FILE NUMBER MUST BE GREATER THAN 1.
- F. PRESS CONT
- G. THE CASSETTE IS REWOUND, TALDR IS LOADED, RELOCATED, AND PROGRAM HALTS AT LOC XX7014
- H. THE HALT AT LOC XX7014 INDICATES THAT TALDR HAS SUCCESSFULLY LOADED, AND IS READY TO LOAD A PROGRAM. SINCE YOU HAVE ALREADY SET THE SR WITH THE DESIRED FILE NUMBER (STEP E), PRESS CONT TO LOAD PROGRAM.
- I. THE CASSETTE IS REWOUND. TALDR SEARCHES FORWARD FOR THE DESIRED PROGRAM, AND LOADS IT.
- J. IF THE PROGRAM JUST LOADED IS SELF-STARTING, THE PROGRAM IS STARTED. IF NOT, THE PROGRAM HALTS AT LOC XX7014, INDICATING A SUCCESSFUL LOAD, AND READINESS TO LOAD ANOTHER PROGRAM. AT THIS POINT, THE PROGRAM JUST LOADED CAN BE STARTED MANUALLY (MOST MAINDEC-11 PROGRAMS START AT LOC 000200), OR ANOTHER PROGRAM CAN BE LOADED.
- K. TO LOAD ANOTHER PROGRAM, SET THE SR TO FILE NUMBER OF DESIRED PROGRAM, AND PRESS CONT. GO TO STEP G.

## \*\*\*NOTE\*\*\*

STEP B. FOR TAI1 WITH NON-STANDARD ADDRESS, DEPOSIT NON-STANDARD ADDRESS IN RO.

STEP C. FOR TAI1 WITH NON-STANDARD ADDRESS, DEPOSIT 000400 IN NON-STANDARD ADDRESS.

3.3 LOADING FROM UNIT 0. NO BM792YH ROM

IN THE STEPS THAT FOLLOW, ANY HALT AT OTHER THAN LOC XX7014 IS AN ERROR. REFER TO SECTION 4. HALTS.

- A. MOUNT WRITE-LOCKED CASSETTE ON UNIT 0. (LEFT HAND DRIVE).
- B. TOGGLE-IN (DEPOSIT) THE 28 WORD SOFTWARE BOOT SHOWN IN APPENDIX B, STARTING AT LOCATION XX7706.
- C. LOAD ADDRESS XX7706
- D. SET SR WITH THE FILE NUMBER OF PROGRAM TO BE LOADED. REFER TO CASSETTE DIRECTORY. FILE NUMBER MUST BE GREATER THAN 1.
- E. PRESS START
- F. THE CASSETTE IS REWOUND, TALDR IS LOADED, RELOCATED, AND PROGRAM HALTS AT LOC XX7014.
- G. THE HALT AT LOC XX7014 INDICATES THAT TALDR WAS SUCCESSFULLY LOADED, AND IS READY TO LOAD A PROGRAM. SINCE YOU HAVE ALREADY SET THE SR TO THE DESIRED PROGRAM NUMBER, PRESS CONT TO LOAD THE PROGRAM.
- H. THE CASSETTE IS REWOUND, TALDR SEARCHES FORWARD FOR THE DESIRED PROGRAM, AND LOADS IT.
- I. IF THE PROGRAM JUST LOADED IS SELF STARTING, THE PROGRAM IS STARTED. IF NOT, THE PROGRAM HALTS AT LOC XX7014, INDICATING A SUCCESSFUL LOAD, AND READINESS TO LOAD ANOTHER PROGRAM. AT THIS POINT, THE PROGRAM JUST LOADED CAN BE STARTED MANUALLY (MOST MAINDEC-11 PROGRAMS START AT LOC 000200), OR ANOTHER PROGRAM CAN BE LOADED.
- J. TO LOAD ANOTHER PROGRAM, SET THE SR TO FILE NUMBER OF DESIRED PROGRAM, AND PRESS CONT. GO TO STEP H.

3.4 LOADING FROM UNIT 1. NO BM792YH ROM  
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IN THE STEPS THAT FOLLOW, ANY HALT AT OTHER THAN AT LOC XX7014 IS AN ERROR. REFER TO SECTION 4. HALTS.

- A. MOUNT WRITE-LOCKED CASSETTE ON UNIT 1. (RIGHT HAND DRIVE).
- B. TOGGLE-IN (DEPOSIT IN CORE) THE 28 WORD SOFTWARE BOOT SHOWN IN APPENDIX B, STARTING AT LOC XX7706
- C. DEPOSIT 177500 INTO RO (SEE NOTE BELOW)
- D. DEPOSIT 000400 INTO LOCATION 177500 (SELECTS UNIT 1) (SEE NOTE BELOW)
- E. DEPOSIT XX7714 IN PC (R7)
- F. SET SR WITH FILE NUMBER OF PROGRAM TO BE LOADED. REFER TO CASSETTE DIRECTORY. FILE NUMBER MUST BE GREATER THAN 1.
- G. PRESS CONT
- H. THE CASSETTE IS REWOUND, TALDR IS LOADED AND RELOCATED, AND THE PROGRAM HALTS AT LOC XX7014.
- I. THE HALT AT LOC XX7014 INDICATES THAT TALDR WAS LOADED SUCCESSFULLY, AND IS READY TO LOAD A PROGRAM. SINCE YOU HAVE ALREADY SET THE SR WITH THE DESIRED PROGRAM NUMBER, PRESS CONT TO LOAD THE PROGRAM.
- J. THE CASSETTE IS REWOUND, TALDR SEARCHES FORWARD FOR THE DESIRED PROGRAM, AND LOADS IT.
- K. IF THE PROGRAM JUST LOADED IS SELF-STARTING, THE PROGRAM IS STARTED. IF NOT, THE PROGRAM HALTS AT LOC XX7014, INDICATING A SUCCESSFUL LOAD, AND READINESS TO LOAD ANOTHER PROGRAM. AT THIS POINT THE PROGRAM JUST LOADED CAN BE STARTED MANUALLY ( MOST MAINDEC-11 PROGRAMS START AT LOC 000200), OR ANOTHER PROGRAM CAN BE LOADED.
- L. TO LOAD ANOTHER PROGRAM, SET THE SR TO FILE NUMBER OF DESIRED PROGRAM, AND PRESS CONT. GO TO STEP J.

\*\*\*NOTE\*\*\*

STEP C. FOR T11 WITH NON-STANDARD ADDRESS, DEPOSIT NON-STANDARD ADDRESS IN RO.

STEP D. FOR T11 WITH NON-STANDARD ADDRESS, DEPOSIT 000400 IN NON-STANDARD ADDRESS.



3.5 LOADING A PROGRAM AFTER EXECUTING PREVIOUSLY LOADED PROGRAM

IT IS POSSIBLE TO LOAD A PROGRAM FROM CASSETTE AFTER A PREVIOUSLY LOADED PROGRAM HAS EXECUTED, PROVIDED THAT THE PREVIOUS PROGRAM HAS NOT DESTROYED THE TALDR LOADER. TO LOAD A PROGRAM:

- A. MOUNT WRITE-LOCKED CASSETTE ON SAME UNIT AS PREVIOUSLY USED. (TALDR SAVED THE TALI ADDRESS, AND UNIT NUMBER USED IN PREVIOUS LOAD).
- B. LOAD ADDRESS XX7776
- C. PRESS START
- D. PROGRAM SHOULD HALT AT LOC XX7014. IF ANYTHING ELSE HAPPENS, TALDR HAS BEEN DESTROYED. USE ONE OF THE LOADING PROCEDURES DESCRIBED IN SECTIONS 3.1 THROUGH 3.4
- E. SET S11 WITH FILE NUMBER OF PROGRAM TO BE LOADED. REFER TO CASSETTE DIRECTORY. FILE NUMBER MUST BE GREATER THAN 1.
- F. PRESS CONT
- G. THE CASSETTE IS REWOUND, TALDR SEARCHES FORWARD FOR DESIRED PROGRAM AND LOADS IT.
- H. IF THE PROGRAM JUST LOADED IS SELF-STARTING THE PROGRAM IS STARTED. IF NOT, THE PROGRAM HALTS AT LOC XX7014, INDICATING A SUCCESSFUL LOAD, AND READINESS TO LOAD ANOTHER PROGRAM. AT THIS POINT, THE PROGRAM JUST LOADED CAN BE STARTED MANUALLY, OR ANOTHER PROGRAM CAN BE LOADED.

3.6 DIAGNOSTIC MODE OPERATION  
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TALDR HAS A DIAGNOSTIC MODE, DESIGNED TO AID THE MAINTENANCE ENGINEER IN DIAGNOSING TAIL PROBLEMS. DIAGNOSTIC MODE OPERATES DURING LOADING AND RELOCATING OF THE TALDR LOADER, AND IS ACTIVATED BY SETTING THE SR TO 000000, INSTEAD OF THE FILE NUMBER OF A PROGRAM TO BE LOADED. THE SEQUENCE THAT FOLLOWS ASSUMES USE OF THE BM792YH, TAIL CONTROL AT STANDARD ADDRESS, AND USE OF UNIT 0 .

- A. MOUNT WRITE-LOCKED CASSETTE ON UNIT 0. (LEFT HAND DRIVE).
- B. LOAD ADDRESS 173300
- C. SET SR TO 000000 (INDICATES DIAGNOSTIC MODE).
- D. PRESS START
- E. CASSETTE REWINDS. TAPE MOVES FORWARD AND STOPS. PROGRAM HALTS AT LOC 000016. THIS IS THE "POST BOOT" HALT. AT THIS POINT THE FIRST 64 WORDS OF THE TALDR LOADER SHOULD BE STORED IN MEMORY, STARTING AT LOC 000000. THESE 1ST 64 WORDS ARE REFERRED TO AS THE "PRE-LOADER". THE PRE-LOADER CONTENTS CAN BE VERIFIED BY EXAMINING CORE STARTING AT LOC 000000, AND REFERENCING THE TALDR LISTING. AFTER VERIFICATION, OR IF NOT VERIFYING, PRESS CONT.
- F. THE CASSETTE REWINDS, MOVES FORWARD, AND THEN HALTS AT LOC 000132. THIS OPERATION IS PERFORMED BY THE "PRE-LOADER"; THE 64 WORDS OF CODE READ IN DURING STEP E. IF THE CASSETTE GETS HUNG (DOES NOT STOP, DOES NOT EVEN GET STARTED), THE PRE-LOADER CODE SHOULD BE EXAMINED FOR CORRECT OPERATION. WHEN THE PROGRAM HALTS AT LOC 000132, THE ENTIRE TALDR LOADER HAS BEEN READ INTO LOWER CORE. THE HALT OCCURS JUST PRIOR TO RELOCATING THE TALDR LOADER TO UPPER MEMORY. R4 SHOULD CONTAIN THE VALUE XX6714, WHICH IS THE INITIAL ADDRESS WHERE TALDR IS TO BE RELOCATED. PRESS CONT.
- G. TALDR IS RELOCATED TO UPPER MEMORY AND THE PROGRAM HALTS AT LOC XX7014, WHICH IS THE "READY TO LOAD" HALT. AT THIS POINT A PROGRAM NUMBER MAY BE SET IN THE SR TO LOAD A PROGRAM. R0 SHOULD CONTAIN THE ADDRESS OF TAIL CONTROL (IN THIS CASE 177500). IF LOADING A PROGRAM, PRESS CONT.

4. HALTS  
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IN THE HALT DESCRIPTIONS THAT FOLLOW, HALTS ARE IDENTIFIED BY THE LOCATION OF THE HALT IN MEMORY, AND NOT BY ANY CONSOLE DISPLAY LIGHTS. IN ORDER TO CORRECTLY IDENTIFY A HALT ON THE VARIOUS PDP-11 PROCESSORS, USE THE TABLE BELOW:

CPU USED -----	ADDRESS LIGHTS DISPLAY -----
11/20	HALT LOCATION
11/05	HALT LOCATION+2
11/45	HALT LOCATION+2
11/40	HALT LOCATION+2
LOC 000016	POST BOOT HALT. OCCURS AFTER 1ST BLOCK OF TALDR HAS BEEN READ BY HARDWARE OR SOFTWARE BOOT, AND SR=0 (DIAGNOSTIC MODE OPERATION). PRESS CONT TO PROCEED WITH TALDR LOAD OPERATION.
LOC 000132	TALDR PRE-RELOCATION HALT. OCCURS IN DIAGNOSTIC MODE ONLY. INDICATES THAT THE ENTIRE TALDR LOADER HAS BEEN READ INTO CORE, AND THE PROGRAM IS READY TO RELOCATE THE TALDR LOADER TO UPPER CORE. PRESS CONT TO ACCOMPLISH RELOCATION.
LOC 000172	TAPI HARDWARE ERROR DETECTED IN PRE-LOADER SECTION OF TALDR LOADER (1ST 64 WORDS OF THE LOADER). PRESS CONT TO TRY AGAIN.
LOC XX7014	GOOD LOAD HALT; READINESS TO LOAD A PROGRAM. THE TALDR LOADER RESIDES IN UPPER MEMORY, AND IS READY TO LOAD A PROGRAM. THIS HALT ALSO OCCURS AFTER TALDR HAS SUCCESSFULLY LOADED A PROGRAM, AND IS READY TO LOAD ANOTHER PROGRAM.
LOC XX7026	ERROR. THE USER HAS SPECIFIED A PROGRAM FILE NUMBER THAT IS LESS THAN 2. THE .ST FILE (TALDR) IS NOT A VALID PROGRAM FOR LOADING, AS IT IS NOT IN ABSOLUTE FORMAT. ALSO IF THE SR IS SET TO 0, TALDR DOES NOT KNOW WHAT TO DO ABOUT THAT. SET CORRECT FILE NUMBER IN SR AND PRESS CONT TWICE.
LOC XX7060	ERROR. SENTINEL FILE FOUND. THE END OF WRITTEN TAPE HAS BEEN FOUND BEFORE THE FILE SPECIFIED BY USER. INCORRECT FILE NUMBER HAS BEEN SPECIFIED. SET THE CORRECT FILE NUMBER IN SR AND PRESS CONT TWICE.

(4. CONT'D)

- LOC XX7164 CHECKSUM ERROR. TALDR HAS DETECTED A CHECKSUM ERROR WHILE READING THE PROGRAM. TO TRY AGAIN PRESS CONT. TALDR REVERSES TO START OF PROGRAM AND TRIES AGAIN. IF AFTER SEVERAL TRIES THE HALT STILL OCCURS, THE PROGRAM IS NOT LOADABLE. GO TO SECTION 3.5 TO LOAD ANOTHER PROGRAM IF DESIRED.
- LOC XX7210 TALDR LOADER OVERRUN. THE PROGRAM IN PROCESS OF BEING LOADED IS ENTERING INTO THE TALDR STORAGE SPACE, DUE TO ITS SIZE. THE PROGRAM CAN NOT BE LOADED COMPLETELY WITH THE SYSTEM'S CURRENT STORAGE CAPACITY.
- LOC XX7462 TAI1 ERROR. CASSETTE ERROR HAS BEEN DETECTED BY THE TALDR LOADER WHILE PERFORMING CASSETTE OPERATIONS. EXAMINE CONTENTS OF TAI1 CONTROL REGISTER TO DETERMINE CAUSE OF ERROR. TO TRY AGAIN, PRESS CONT TWICE.
- LOC XX7756 SOFTWARE BOOT TAI1 ERROR. HARDWARE ERROR DETECTED BY SOFTWARE BOOT, OR 1ST BYTE OF THE BLOCK READ BY THE BOOT IS NOT A 240, INDICATING THAT THE FIRST PROGRAM IN THE CASSETTE IS NOT THE TALDR LOADER. IF HARDWARE ERROR (EXAMINE TAI1 CSR), PRESS CONT TO TRY AGAIN. IF NOT HARDWARE ERROR, LOAD THE PROPER CASSETTE, AND PRESS CONT.
- LOC 173350 TAI1 ERROR, OR 1ST BYTE OF DATA READ FROM CASSETTE'S 1ST BLOCK NOT A 240. DETECTED BY HM792YH ROM. IF HARDWARE ERROR (EXAMINE TAI1 CSR), PRESS CONT TO TRY AGAIN. IF NOT HARDWARE ERROR, LOAD THE CORRECT CASSETTE, AND PRESS CONT.

5. DESCRIPTION  
-----5.1 BOOTSTRAP LOADER (CBOOT)  
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THIS PROGRAM IS SPECIFICALLY DESIGNED TO READ IN THE FIRST BLOCK OF THE TAI1 ABSOLUTE LOADER PROGRAM, VERIFY THAT THE BLOCK READ IN IS THE 1ST BLOCK OF TALDR, AND TRANSFER PROGRAM CONTROL TO THE TALDR PROGRAM. IT IS AVAILABLE IN TWO VERSIONS, 1) HARD WIRED INTO THE BM792-YH ROM OR 2) AS A SOFTWARE COPY THAT MAY BE DEPOSITED BY THE OPERATOR. REFER TO APPENDIX A FOR A COPY OF THE BOOT LOADER PROGRAM.

## REGISTER USAGE:

R0 - CONTAINS THE ADDRESS OF THE TAI1 CONTROL AND STATUS REGISTER

R1 - USED AS A POINTER TO THE COMMAND TABLE THAT HOLDS THE REQUIRED TAI1 CASSETTE COMMANDS

R2 - USED AS A DATA BUFFER POINTER AND DATA FLAG

R3 - HOLDS BIT TEST MASK REQUIRED TO QUERY THE TAI1 CONTROL AND STATUS REGISTER

## PROGRAM SEQUENCE:

CBOOT - THE FIRST INSTRUCTION LOADS R0 WITH THE TACSR ADDRESS, FOLLOWED BY A CLEAR OF THE TACSR TO INSURE SELECTING UNIT 0.

RESTRT - THE MOVE FOLLOWED BY THE ADD SETS UP R1 TO POINT TO THE FIRST BYTE IN THE COMMAND TABLE. THESE TWO INSTRUCTIONS RELATE THE LOCATION OF THE COMMAND TABLE TO THE PC WHICH INSURES THAT THE BOOT PROGRAM IS RELOCATABLE. FOLLOWING THIS, R2 IS LOADED WITH A CONSTANT OF 375(8) WHICH WILL FIRST SERVE TO DETECT THE BEGINNING OF THE DATA XFR AND THEN BE USED AS A DATA BUFFER POINTER TO LOAD 128 BYTES INTO CORE STARTING AT LOC. 0. R3 IS LOADED WITH THE FIRST BYTE IN THE COMMAND TABLE (A 240(8) WHICH ALLOWS TESTING THE "READY" AND "TRANSFER REQ" FLAGS IN THE TACSR) AND R1 AUTOMATICALLY UPDATED TO POINT TO THE SECOND BYTE AFTER AN ERROR HALT WILL RESTART THE LOADER AT "RESRTR".

(5.1 CONT'D)

LOOP1 - THE NEXT COMMAND IN THE COMMAND TABLE IS LOADED INTO THE TACSR AND R1 UPDATED TO POINT TO THE NEXT COMMAND. THIS LOOP IS EXECUTED FIVE TIMES TO FETCH THE FOLLOWING COMMANDS:

- 1) REWIND TO BEGINNING OF TAPE
- 2) SPACE FORWARD OVER HEADER BLOCK
- 3) READ FWD ONE BLOCK (128 BYTES TRANSFERRED INTO CORE LOC 0 TO 177)
- 4) CHECK THE CRC BYTES
- 5) TERMINATE (HIGH ORDER BIT OF COMMAND BYTE IS SET)

AFTER LOADING EACH COMMAND, A BMI TESTS FOR THE TERMINATOR AND TRANSFERS CONTROL TO "DONE" IF THE COMMAND BYTE IS NEGATIVE. IF NOT NEGATIVE THE PROGRAM FALLS THROUGH TO "LOOP2".

LOOP2 - A BITB FOLLOWED BY A BEQ TESTS FOR SUCCESSFUL COMPLETION OF THE CURRENT COMMAND. THE PROGRAM BRANCHES ON "LOOP2" UNTIL EITHER "READY" OR "TRANSFER REQUEST" IS ASSERTED. IF ONE OR BOTH OF THESE FLAGS ARE ASSERTED THE PROGRAM FALLS THROUGH AND INCREMENTS R2. (NOTE THAT R2 IS INCREMENTED WITH A BYTE INSTRUCTION AND STARTED AT 375) UNTIL THE "READ" COMMAND IS FETCHED THE PROGRAM LOOPS ON "LOOP1" VIA A BMI. AFTER THE READ COMMAND IS LOADED R2 INCREMENTS TO 000000 (HIGH ORDER CARRIES NOT PROPAGATED BEYOND BIT 7) AND THE PROGRAM FALLS THROUGH TO THE MOVB THAT LOADS DATA INTO CORE. IF THE FIRST CHARACTER READ IS NOT A 240(8) (INDICATING THE TALDR PROGRAM) THE PROGRAM BRANCHES TO A HALT AT "STOP". IF THE FIRST BYTE IS A 240(8) THE PROGRAM LOOPS ON "LOOP2" UNTIL 128 BYTES ARE TRANSFERRED INTO CORE AT WHICH TIME R2 GOES TO 200(8) (BECOMES NEGATIVE AGAIN). AT THIS TIME THE PROGRAM RETURNS TO "LOOP1" TO FETCH THE ILBS COMMAND FOLLOWED BY A TERMINATOR COMMAND.



(5.1 CONT'D)

- STOP - PROGRAM BRANCHES TO A HALT HERE IF THE 1ST BYTE TRANSFERRED INTO CORE IS NOT A 240(8). DEPRESSING CONTINUE CAUSES PROGRAM TO BRANCH TO "RESTRT".
- DONE - PROGRAM BRANCHES HERE AFTER FETCHING COMMAND TABLE TERMINATOR. IT THEN TESTS FOR CASSETTE CRC ERRORS AND CLEARS THE PC TO TRANSFER CONTROL TO LOCATION 0 IF NO ERRORS. IF AN ERROR IS DETECTED THE PROGRAM BRANCHES TO "STOP" AND HALTS.

TABLE - COMMAND TABLE:

TABLE+0	/	240	TEST FOR READY OR XFR REQ
+1	/	037	REWIND
+2	/	015	SPACE FWD BLOCK
+3	/	005	READ
+4	/	024	ILBS - TEST CRC
+5	/	224	TERMINATOR
+6	/	000	TWO WORDS OF FILLER
+7	/	000	
+10	/	000	
+11	/	000	

- VECTOR - IN SOME OF THE PDP11 PROCESSORS THE POWER FAIL VECTOR IS DESIGNED TO POINT TO A HARDWARE ROM. THE LAST TWO WORDS OF THE BOOT LOADER POINT THE PC TO THE START OF THE TA BOOT LOADER AND SET THE PROCESSOR PRIORITY TO 7 IF THE POWER FAIL VECTOR IS DESIGNED TO POINT TO 773376. THESE TWO WORDS AND THE TWO FILLER WORDS IN THE COMMAND TABLE ARE NOT REQUIRED IN THE SOFTWARE VERSION OF THE BOOT LOADER.

## 5.2 TALDR TAPE CASSETTE ABSOLUTE LOADER

-----

TALDR IS DESIGNED TO LOAD "ABS" FORMAT PROGRAMS FROM MAINDEC-11 TAII CASSETTES. THE PROGRAM CONSISTS OF TWO SECTIONS. FIRST, A 128 BYTE (64 WORDS) "PRE-LOADER" WHOSE FUNCTION IS TO READ IN THE ENTIRE TALDR LOADER INTO LOWER CORE, AND THEN RELOCATE IT TO THE TOP OF MEMORY. SECOND, THE CASSETTE LOADER ITSELF, WHOSE FUNCTION IS TO LOAD AN ABS FORMAT PROGRAM FROM CASSETTE WHOSE FILE NUMBER HAS BEEN SET IN THE SR.

### 5.2.1 PRE-LOADER PROGRAM SEQUENCE

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- GJ: THE PROGRAM TESTS THE SWITCH REGISTER. IF SR = 0, THE PROGRAM HALTS AND THE OPERATOR MUST DEPRESS CONTINUE TO PROCEED TO "GO1". IF THE SR IS NOT ZERO THE PROGRAM FALLS THROUGH TO "GO1".
- GO1: THE STACK POINTER IS SET UP AND THE CORE MEMORY IS SIZED TO DETERMINE THE HIGHEST POSSIBLE MEMORY ADDRESS. LOCATION 4 IS SET TO POINT TO "GOTCOR" WHEN A BUS TIMEOUT OCCURS (NON-EX MEM). WHEN THE PROGRAM EXITS THE SIZER ROUTINE R4 CONTAINS AN ADDRESS TWO GREATER THAN THE HIGHEST POSSIBLE MEMORY ADDRESS.
- GOTCOR: THE PROGRAM NOW BACKSPACES ONE FILE, SPACES FORWARD ONE BLOCK TO SKIP THE HEADER (32 BYTES), AND THEN LOADS THE ENTIRE TALDR PROGRAM (6 BLOCKS - 768 BYTES) INTO CORE STARTING AT LOCATION 0. THE FIRST BLOCK WHICH HAD BEEN READ IN BY THE BOOTSTRAP LOADER GETS OVERLAYED. IF ANY ERRORS OCCUR WHILE READING, THE PROGRAM HALTS AT LOC 000172. IF NO ERRORS OCCUR THE PROGRAM TESTS THE SR AND IF IT IS EQUAL TO 000000, HALTS AFTER LOADING; OTHERWISE THE PROGRAM FALLS THROUGH TO "RELOC".
- RELOC: THIS ROUTINE RELOCATES THE TALDR CODE TO THE TOP OF MEMORY STARTING AT "PSTART". AFTER RELOCATION CONTROL IS TRANSFERRED TO "PSTART" AT LOC XX6714. THE PROGRAM THEN HALTS AT LOC XX7014 TO AWAIT OPERATOR INPUT.
- WAITA: SUBROUTINE CALLED TO ALLOW WAITING FOR THE TAPE CASSETTE TO TERMINATE ITS COMMANDS AND ALSO TO TEST FOR CASSETTE ERRORS.
- ERRORA: PROGRAM BRANCHES TO A HALT HERE IF IT DETECTS ANY CASSETTE ERRORS. INCLUDES BRANCH TO "GO" TO RESTART AFTER ERRORS WHEN CONTINUE IS DE-PRESSED.

5.2.2 TALDR PROPER - PROGRAM SEQUENCE

PSTART: START OF CODE THAT SETS UP POINTERS IN ORDER TO MAKE TALDR COMPLETELY POSITION INDEPENDENT.

START: THIS CODE USES POINTERS SET UP BY PSTART, IN PREPARATION TO LOADING A PROGRAM. IT THEN HALTS AT LOC XX7014 INDICATING READINESS TO LOAD A PROGRAM.

GETNUM: START OF CODE TO GET FILE NUMBER OF PROGRAM TO BE LOADED. IT READS THE FILE NUMBER FROM THE SR. IF THE NUMBER IS LESS THAN TWO (2), AN ERROR HALT OCCURS, AS THE 1ST FILE ON THE CASSETTE (TALDR ITSELF) IS NOT LOADABLE VIA TALDR.

GETFIL: CODE TO GET TO DESIRED PROGRAM FILE. THE SEQUENCE IS:

- A. REWIND THE CASSETTE
- B. SKIP THE NUMBER OF FILES REQUIRED TO GET TO THE FILE TO BE LOADED. AFTER A FILE IS SKIPPED, THE HEADER FOR THE NEXT FILE IS READ TO VERIFY THAT THE END OF WRITTEN TAPE HAS NOT BEEN REACHED (SENTINEL FILE). IF END OF TAPE IS REACHED, AN ERROR HALT OCCURS, INDICATING THAT AN INVALID FILE NUMBER HAS BEEN SPECIFIED.

LOADFL: THIS CODE IS THE ACTUAL PROGRAM LOADER. SEQUENCE FOLLOWS:

- A. LOAD READ BUFFER ("BUF") WITH ONE BLOCK OF DATA (JSR PC,GTDATA).
- B. CLEAR THE CHECKSUM WORD.
- C. GET A BYTE OF DATA UNTIL ONE WITH VALUE OF 1 IS FOUND.
- D. GET ANOTHER BYTE. IT MUST BE 0. IF NOT GO TO B. IF YES, BLOCK START HAS BEEN DETECTED.
- E. GET THE BYTE COUNT. (NUMBER OF BYTES IN BLOCK). 1 WORD.
- F. PUT BYTE COUNT IN R4. DEDUCT 4 FROM IT TO ACCOUNT FOR 2 BYTES OF BLOCK START, AND 2 BYTES OF BYTE COUNT.
- G. SEE IF REMAINDER IS 2. IF 2, THE BLOCK IS ADDRESS TRANSFER BLOCK. GO TO STEP N. IF NOT, IT IS A DATA BLOCK. FALL THROUGH.
- H. GET THE LOAD ADDRESS. 1WORD. LOAD ADDRESS IS THE ADDRESS WHERE DATA IN BLOCK IS TO BE STORED. LOAD ADDRESS IS IN R5.
- I. NOW GET A DATA BYTE. BRANCH IF BYTE COUNT COUNT IS NOT YET 0. GO TO STEP L.
- J. BYTE COUNT IS 0. TEST THE CHECKSUM. MUST BE 0. IF 0, GO TO STEP B. HALT IF NOT. CHECKSUM ERROR.

(5.2.2 CONT'D)

- K. UPON CONTINUE, REVERSE TO START OF FILE, SKIP THE HEADER, AND GO TO STEP A TO TRY AGAIN.
- L. CHECK THAT ADDRESS WHERE DATA IS TO BE STORED HAS NOT INFRINGED ON TALDR CORE SPACE. IF YES, HALT. UPON CONTINUE, GO TO "START"
- M. STORE DATA BYTE. GO TO STEP I.
- N. GET THE TRANSFER ADDRESS. (SAVED IN R5).
- O. GET ANOTHER BYTE. TEST THE CHECKSUM. IF NOT 0, GO TO J.
- P. SET A 5 IN LOC 41, INDICATING THAT LOAD MEDIUM IS CASSETTE.
- Q. SEE IF TRANSFER ADDRESS (IN R5) IS ODD. IF ODD, THE PROGRAM IS NOT SELF-STARTING. GO TO "START". IF EVEN, PUT R5 IN PC TO START PROGRAM JUST LOADED.

RD2FRM: GET NEXT SEQUENTIAL BYTE OF DATA SUBROUTINE. THE BYTE IS RETURNED IN R2. TAKEN FROM READ BUFFER.

RD2FRM: THIS SUBROUTINE ASSEMBLES 2 BYTES OF DATA INTO ONE WORD. THE WORD IS RETURNED IN R5.

RDHDR: READ FILE HEADER SUBROUTINE. A FILE HEADER CONSISTS OF A DATA BLOCK OF 32 BYTES. THE HEADER CONTAINS INFORMATION IDENTIFYING THE FILE, SUCH AS NAME, DATE, BLOCK SIZE, ETC. FOR PURPOSES OF TALDR, THE HEADER IS CHECKED ONLY TO INSURE THAT THE END OF TAPE HAS NOT BEEN REACHED (SENTINEL FILE; ALL ZEROES).

GTDATA: SUBROUTINE TO LOAD BUFFER WITH ONE BLOCK'S WORTH OF DATA (128 BYTES). FILE DATA IS STORED IN BLOCKS OF 128 BYTES. GTDATA READS 128 BYTES OF DATA INTO A READ BUFFER CALLED "BUF".

WAIT: WAIT SUBROUTINE. AWAITS COMPLETION OF PREVIOUSLY ISSUED CASSETTE FUNCTION AND CHECKS FOR ERRORS. IF AN ERROR OCCURS, A TALL HARDWARE ERROR OCCURS.

APPENDIX A

TAIL BOOTSTRAP LOADER

```

                                .ABS
                                .=173300
                                R0=%0
                                R1=%1
                                R2=%2
                                R3=%3
                                PC=%7

773300 012700 177500          CBOOT:  MOV #177500,R0    ;R0 HOLDS ADDRESS OF TAIL
773304 005010                CLR (R0)        ;SELECT UNIT ZERO
773306 010701                RESTRT: MOV PC,R1      ;USE FOR PIC
773310 062701 000052        ADD #TABLE--,R1   ;R1 HOLDS ADDRESS OF COMMAND TABLE
773314 012702 000375        MOV #375,R2       ;MEMORY POINTER AND DATA FLAG
773320 112103                MOVB (R1)+,R3    ;MOVE TEST BITS TO R3

773322 112110                LOOP1:  MOVB (R1)+,(R0)  ;MOVE COMMAND FROM TABLE TO TAIL
773324 100413                BMI DONE    ;IF COMMAND IS NEGATIVE, THEN QUIT
773326 130310                LOOP2:  BITB R3,(R0)  ;TEST READY AND TRANSFER REQUEST BITS IN TACS
773330 001776                BEQ LOOP2   ;BRANCH IF BITS ARE NOT SET
773332 105202                INCB R2    ;ADVANCE MEMORY POINTER
773334 100772                BMI LOOP1   ;IF NIMUS, TRY ANOTHER TABLE COMMAND
773336 116012 000002        MOVB 2(R0),(R2)  ;READ DATA INTO MEMORY
773342 120337 000000        CMPB R3,#0    ;FIRST BYTE READ SHOULD BE '240'
773346 001767                BEQ LOOP2   ;IF EQUAL, GO READ ANOTHER BYTE

773350 000000                STOP:    HALT        ;HALT ON ERROR
773352 000755                BR RESTRT ;RESTART ON CONTINUE

773354 005710                DONE:    TST (R0)     ;CHECK FOR ERROR
773356 100774                BMI STOP    ;BRANCH TO HALT ON ERROR
773360 005007                CLR PC      ;JUMP TO 0

773362                TABLE:      ;HIGH BYTE          LOW BYTE
773362 017640                .WORD 037*400 + 240 ;ILBS+REWIND+GO    READY+TRANSFER REQUEST
773364 002415                .WORD 005*400 + 015 ;READ +GO         SPACE FORWARD BLOCK+GO
773366 112024                .WORD 224*400 + 024 ;READ+ILBS+END TABLE READ+ILBS
773370 000000 000000 **      .WORD 0,0      ;TWO WORDS OF FILLER

773374 173300                **      VECTOR: CBOOT    ;POWER-UP VECTOR (PC)
773376 000340                **      000340    ;POWER-UP STATUS (PS)

```

\*\* NOT INCLUDED IN THE SOFTWARE VERSION

APPENDIX B  
-----

## TALI BOOTSTRAP LOADER - TOGGLE-IN LISTING

ALTHOUGH THE TOGGLE-IN BOOT IS POSITION INDEPENDENT, IT IS RECOMMENDED  
THAT IT BE STORED STARTING AT LOCATION XX7706

LOCATION	CONTENTS
-----	-----
XX7706	012700
XX7710	177500
XX7712	005010
XX7714	010701
XX7716	062701
XX7720	000052
XX7722	012702
XX7724	000375
XX7726	112103
XX7730	112110
XX7732	100413
XX7734	130310
XX7736	001776
XX7740	105202
XX7742	100772
XX7744	116012
XX7746	000002
XX7750	120337
XX7752	000000
XX7754	001767
XX7756	000000
XX7760	000755
XX7762	005710
XX7764	100774
XX7766	005007
XX7770	017640
XX7772	002415
XX7774	112024



↑  
.TITLE DZTAF-C TALDR TALI DIAGNOSTIC ABS LOADER

:  
.ABS

802  
803  
804  
805  
806  
807  
808  
809  
E10  
811  
812  
813  
814  
815  
816  
E17  
E18  
819  
820  
821  
822  
823  
824  
825  
826  
827  
828  
829  
830  
831  
832  
833

177570  
000000  
000001  
000002  
000003  
000004  
000005  
000006  
000007  
  
000005  
000020  
000007  
000035  
000033  
000031  
000037  
001064  
001400  
000270  
000274  
000364  
000544  
000636  
000260  
000264

.LIST ME,BIN,SEQ  
.NLIST MD,TOC,MC  
  
SR =177570  
R0 =%0  
R1 =%1  
R2 =%2  
R3 =%3  
R4 =%4  
R5 =%5  
R6 =%6  
SP =%6  
PC =%7  
  
READ =5  
ILBS =20  
SRF =7  
SFB =35  
SFF =33  
SRB =31  
RWD =37  
MOVCNT =PRGEND-PSTART  
BYTCNT =PRGEND+200&177600  
SVRO =STRT2+2  
SVUNIT =STRT3+2  
CHKSUM =RX20+2  
CHRCNT =RDFRAM+2  
BUFADR =GTDATB+2  
SPADR =START+2  
WAITAD =STRT1+2

;TACS READ FUNCTION  
;TACS INIT LAST BYTE SEQUENCE CODE.  
;TACS SPACE REV FILE AND GO  
;TACS SPACE FWD BLOCK AND GO  
;TACS SPACE FORWARD FILE AND GO.  
;TACS SPACE REV BLOCK.  
;TACS REWIND AND GO.



```

      .SBTTL  PRE-LOADER SECTION OF TALDR (128 BYTES)
      240                                ;NOP FOR CBOOT.
      BR      GO
      .WORD  GOTCOR,0
GO:   TST     SR                                ;SR = 0?
      BNE    GO1                              ;BR IF NOT.
      ;*****
      HALT                                     ;YES. POST BOOT HALT
      ;*****
GO1:  MOV     #BYTCNT+100,SP
      CLR    R4                                ;SIZE CORE.
      1$:   TST     (4)                          ;REFERENCE.
      ADD    #20000,R4
      BR     1$
GOTCOR: SUB    #MOVCNT,R4                       ;DETERMINE RELOC ADDR.
      MOV    #WAITA,R3                          ;WILL GO TO WAITA VIA R3
      MOVB   #SRF,(0)                           ;REVERSE TO START OF FILE.
      JSR    PC,(3)                              ;WAIT.
      MOVB   #SFB,(0)                           ;SKIP 1ST BLOCK.
      JSR    PC,(3)                              ;WAIT.
      CLR    R5                                ;LOAD ADDRESS IS 0.
      MOV    #BYTCNT,R2                          ;R2 = TOTAL BYTES TO READ.
      1$:   CLR    R1                                ;START READING A BLOCK.
      MOVB   #READ,(0)                          ;ISSUE READ FUNCTION.
      JSR    PC,(3)                              ;WAIT.
      2$:   MOVB   2(0),(5)+                       ;STORE BYTE.
      JSR    PC,(3)                              ;WAIT FOR XFR REQUEST.
      INCB   R1                                ;HAVE READ 128 BYTES?
      BPL    2$                                ;BR IF NO.
      BISB   #ILBS,(0)                          ;START END BLOCK SEQUENCE.
      JSR    PC,(3)                              ;WAIT.
      SUB    R1,R2                              ;ALL BYTES READ?
      BNE    1$                                ;BR IF NOT TO READ NEXT BLOCK.
      TST    SR                                ;SR 0?
      BNE    RELOC                             ;BR IF NOT. SKIP DIAGNOSTIC HALT.
      ;*****
      HALT                                     ;PRE-RELOCATION HALT
      ;*****
RELOC: MOV    #PSTART,R1                       ;RELOCATE CODE STARTING AT "PSTART"
      MOV    R4,R2
      MOV    #MOVCNT,R3
      1$:   MOVB   (1)+,(2)+                       ;RELOCATE A BYTE.
      DEC    R3                                ;DONE?
      BNE    1$                                ;BR IF NOT.
      MOV    R4,PC                              ;GET STARTED.
      WAITA: BIT   #240,(0)                       ;CHECK FOR ERROR/XFR REQUEST
      BEQ    WAITA
      TST    (0)                               ;CHECK FOR ERROR.
      BMI    +4                                ;BR IF ERROR.
      RTS    PC                                ;OK. EXIT.
      ;*****
      HALT                                     ;HARDWARE ERROR
      ;*****
      BR     GO1                              ;GO TRY AGAIN.

```

```

888
889
890 000176 010703
891 000200 062703 000056
892 000204 010367 000540
893 000210 010703
894 000212 062703 000512
895 000216 010367 000042
896 000222 010703
897 000224 062703 000744
898 000230 010367 000024
899 000234 010703
900 000236 062703 000516
901 000242 010367 000370
902 000246 010067 000016
903 000252 011067 000016
904
905
906
907 000256 012706 000000
908 000262 012703 000000
909 000266 012700 000000
910 000272 012710 000000
911
912 000276 000000
913
914
915
916 000300 013704 177570
917 000304 005304
918 000306 003002
919
920 000310 000000
921
922 000312 000761
923
924
925 000314 112710 000037
926 000320 004713
927 000322 112710 000033
928 000326 004713
929 000330 004767 000250
930 000334 005777 000276
931 000340 001002
932
933 000342 000000
934
935 000344 000744
936 000346 005304
937 000350 001364

```

```

.SBTTL TALDR LOADER PROPER
:THIS CODE IS RELOCATED TO TOP OF CORE.
PSTART: MOV PC,R3 ;SAVE ADDR OF "START"
ADD #START-,R3
MOV R3,LIMIT
MOV PC,R3 ;SAVE ADDR OF "WAIT" ROUTINE.
ADD #WAIT-,R3
MOV R3,WAITAD
MOV PC,R3 ;COMPUTE AND SAVE STACK ADDR.
ADD #STACK-,R3
MOV R3,SPADR
MOV PC,R3 ;COMPUTE AND SAVE "BUFADR"
ADD #BUF-,R3
MOV R3,BUFADR
MOV RO,SVRO ;SAVE TAIL ADDR.
MOV (0),SVUNIT ;SAVE UNIT NUMBER.

:START OF CODE THAT MUST REMAIN INTACT WHILE LOADING A PROGRAM
START: MOV #0,SP ;SET UP STACK. (#0 IS SPADR)
STRT1: MOV #0,R3 ;SET UP WAIT ROUTINE ADDR. (#0 IS WAITAD)
STRT2: MOV #0,RO ;RESTORE TAIL ADDR.(#0 IS SVRO)
STRT3: MOV #0,(0) ;RESTORE UNIT NUMBER. (#0 IS SVUNIT).
:*****
HALT ;GOOD LOAD HALT. READY TO LOAD AGAIN
:*****

:GET FILE # OF PROGRAM TO BE LOADED.
GETNUM: MOV #SR,R4 ;SR TO R4.
DEC R4 ;SR-1
BGT GETFIL ;BR IF GREATER THAN 0.
:*****
HALT ;ERROR! FIRST FILE IS NOT LOADABLE!!!
:*****
BR START ;TRY AGAIN.

:GET TO REQUIRED FILE
GETFIL: MOVB #RWD,(0) ;REWIND CASSETTE.
JSR PC,(3) ;WAIT.
1$: MOVB #SFF,(0) ;ISSUE SKIP FILE FWD FUNCTION.
JSR PC,(3) ;WAIT.
JSR PC,RDHDR ;READ HEADER.
TST #BUFADR ;1ST WORD MUST NOT BE 0.
BNE 2$ ;BR IF IT IS NOT.
:*****
HALT ;SENTINEL FILE FOUND! INVALID FILE #!!
:*****
BR START
2$: DEC R4 ;DONE SKIPPING?
BNE 1$ ;BR IF NOT.

```

```

938 ;LOAD THE FILE.
939 000352 005067 000374 LOADFL: CLR BLKCNT ;CLEAR BLOCK COUNTER.
940 000356 004767 000232 JSR PC,GTDATA ;READ FIRST DATA BLOCK.
941 000362 005027 000000 PX20: CLR #0 ;CLEAR THE CHECKSUM. (#0 IS CHKSUM)
942 000366 004767 000150 JSR PC,RDFRAM ;GET A BYTE.
943 000372 005302 DEC R2 ;BYTE IN R2. IS IS A SYNC? (1).
944 000374 001372 BNE RX20 ;BR IF NOT.
945 000376 004767 000140 JSR PC,RDFRAM ;NEXT BYTE MUST BE 0.
946 000402 105702 TSTB R2 ;IS IT 0?
947 000404 001366 BNE RX20 ;BR IF NOT. NOT A BLOCK START.
948 000406 004767 000150 JSR PC,RD2FRM ;OK.GET THE BYTE COUNT (WORD).
949 000412 010504 MOV R5,R4 ;PUT IT IN R4.
950 000414 162704 000004 SUB #4,R4 ;DEDUCT HEADER (SYNC AND BYTE COUNT).
951 000420 022704 000002 CMP #2,R4 ;IF 2, IT'S XFR BLOCK.
952 000424 001426 BEQ 6$ ;BR IF YES.
953 000426 004767 000130 JSR PC,RD2FRM ;GET LOAD ADDR.
954 000432 004767 000104 2$: JSR PC,RDFRAM ;GET A BYTE.
955 000436 100012 BPL 4$ ;BR IF BYTE COUNT STILL NOT 0.
956 000440 105767 177720 TSTB CHKSUM ;CHECKSUM OK?
957 000444 001746 BEQ RX20 ;BR IF YES.
958 3$:
959 ;*****
960 000446 000000 HALT ;NO. CHECKSUM ERROR.
961 ;*****
962 000450 112710 000007 MOVB #SRF,(0) ;ISSUE REVERSE FILE FUNCTION
963 000454 004713 JSR PC,(3) ;WAIT
964 000456 004767 000122 JSR PC,RDHDR ;SKIP HEADER.
965 000462 000733 BR LOADFL ;TRY AGAIN.
966 000464 020567 000260 4$: CMP R5,LIMIT ;REACHED LOADER START?
967 000470 103402 BLO 5$ ;BR IF NOT.
968 ;*****
969 000472 000000 HALT ;TALDR LOADER OVERRUN
970 ;*****
971 000474 000670 BR START
972 000476 110225 5$: MOVB R2,(5)+ ;STORE BYTE.
973 000500 000754 BR 2$
974 000502 004767 000054 6$: JSR PC,RD2FRM ;GET TRANSFER ADDR.
975 000506 004767 000030 JSR PC,RDFRAM ;CHECK FOR CORRECT CHECKSUM.
976 000512 105767 177646 TSTB CHKSUM ;IS IT?
977 000516 001353 BNE 3$ ;BR IF NOT.
978 000520 112737 000005 000041 MOVB #5,#41 ;SET CASSETTE LOAD INDICATION.
979 000526 006005 ROR R5 ;CHECK FOR ODD XFR ADDR.
980 000530 103652 BCS START ;BR IF ODD ADDR.
981 000532 006305 ASL R5 ;RESTORE XFR ADDR.
982 000534 010507 MOV R5,PC ;GO SELF START PROGRAM.
983

```

```

984      .READ FRAME SUBROUTINE.
985 000536 004767 000052  RDFRMA: JSR   PC,GTDATA      ;FILL UP BUFFER.
986 000542 005327 000000  RDFRAM: DEC   #0              ;BUF EMPTY? (#0 IS CHRCNT)
987 000546 100773          BMI   RDFRMA          ;BR IF YES.
988 000550 112102          MOVB  (1)+,R2          ;GET A BYTE FROM BUFFER.
989 000552 060267 177606  ADD   R2,CHKSUM        ;ADDIT TO CHECKSUM.
990 000556 005304          DEC   R4              ;DECREMENT BYTE COUNT.
991 000560 000207          RTS    PC              ;EXIT.
992      .READ 2 FRAMES SUB. (WORD).
993 000562 004767 177754  RD2FRM: JSR   PC,RDFRAM      ;GET A BYTE.
994 000566 010246          MOV   R2,-(6)          ;SAVE FRAME IN STACK.
995 000570 004767 177746  JSR   PC,RDFRAM      ;GET ANOTHER.
996 000574 110266 000001  MOVB  R2,1(6)         ;MAKE A WORD.
997 000600 012605          MOV   (6)+,R5         ;PUT IT IN R5
998 000602 000207          RTS    PC              ;EXIT.
999      .GET DATA ROUTINE. FILLS BUFFER WITH ONE BLOCKS WORTH.
1000 000604 012767 000040 177732 RDHDR: MOV   #32.,CHRCNT    ;WILL READ 32 BYTES.
1001 000612 000410          BR    GTDATB
1002 000614 005267 000132  GTDATA: INC   BLKCNT      ;INCREMENT BLOCK COUNT.
1003 000620 042767 177774 000124 BIC   #177774,BLKCNT    ;WANT 2 LEAST SIGNIFICANT DIGITS.
1004 000626 012767 000200 177710 MOV   #128.,CHRCNT     ;WILL READ 128 BYTES.
1005 000634 012701 000000  GTDATB: MOV   #0,R1      ;BUF START ADDR TO R1. (#0 IS BUFADR)
1006 000640 112710 000005  MOVB  #READ,(0)       ;ISSUE READ FUNCTION.
1007 000644 004713          JSR   PC,(3)          ;WAIT.
1008 000646 116021 000002  1S:  MOVB  2(0),(1)+     ;PUT BYTE IN BUFFER.
1009 000652 004713          JSR   PC,(3)          ;WAIT FOR XFR REQUEST.
1010 000654 005367 177664  DEC   CHRCNT          ;DONE 128?
1011 000660 001372          BNE   1S             ;BR IF NOT.
1012 000662 152710 000020  BISB  #ILBS,(0)       ;DO END BLOCK STUFF.
1013 000666 004713          JSR   PC,(3)          ;WAIT.
1014 000670 016701 177742  MOV   BUFADR,R1       ;BUFFER ADDR TO R1.
1015 000674 012767 000200 177642 MOV   #128.,CHRCNT
1016 000702 022767 000001 000042 CMP   #1,BLKCNT
1017 000710 001004          BNE   2S             ;COUNT = 1?
1018 000712 005721          TST  (1)+            ;BR IF NOT.
1019 000714 162767 000002 177622 SUB   #2,CHRCNT
1020 000722 000207          RTS    PC              ;FIRST WORD OF BUFFER IS NOT DATA.
1021      ;WAIT ROUTINE
1022 000724 105710          WAIT: TSTB (0)         ;DEDUCT 2 FROM DATA COUNT.
1023 000726 100405          BMI   1S             ;EXIT.
1024 000730 032710 000040  BIT   #40,(0)         ;XFR REQUEST?
1025 000734 001773          BEQ   WAIT          ;BR IF YES.
1026 000736 005710          TST  (0)            ;READY?
1027 000740 100401          BMI   .+4           ;BR IF NOT
1028 000742 000207          1S:  RTS    PC              ;BR IF ERROR.
1029      ;*****
1030 000744 000000          HALT                ;YES. ERROR SET?
1031      ;*****
1032 000746 011707          REPEAT: MOV   (7),PC  ;BR IF ERROR.
1033 000750 000000          LIMIT: 0           ;EXIT.
1034 000752 000000          BLKCNT: 0           ;*****
1035 000754 000100          BUF:   .BLKW 64.   ;HARDWARE ERROR HALT.
1036 001154 000006          STACK: .BLKW 6    ;GO TO "START".
1037      ;*****

```

```

1038                                     .SBTTL  CBOOT COPY
1039
1040         000000         ;R0=   %0
1041         000001         ;R1=   %1
1042         000002         ;R2=   %2
1043         000003         ;R3=   %3
1044         000007         ;PC=   %7
1045         177500         TACS=  177500         ;TA-11 CONTROL AND STATUS REG.
1046
1047
1048
1049 001170 012700 177500 CBOOT:  MOV   #TACS,R0
1050 001174 005010         CLR   (R0)         ;SELECT UNIT #0
1051 001176 010701         RESTRT: MOV   PC,R1         ;USE FOR PIC
1052 001200 062701 000052         ADD   #TABLE--,R1      ;R1 HOLDS ADDR. OF COMMAND TABLE
1053 001204 012702 000375         MOV   #375,R2      ;MEMORY PTR. AND DATA FLAG
1054 001210 112103         MOVB  (R1)+,R3     ;TEST BITS
1055
1056 001212 112110         LOOP1: MOVB (R1)+,(R0) ;COMMAND FROM TABLE TO TACS
1057 001214 100413         BMI  DONE        ;WHEN COMMAND CODE NEG., QUIT
1058 001216 130310         LOOP2: BITB  R3,(R0) ;TEST READY AND T-REQ. BITS IN TACS
1059 001220 001776         BEQ  LOOP2        ;LOOP 'TILL SOMETHING COMES UP
1060 001222 105202         INCB  R2         ;ADVANCE MEMORY PTR.
1061 001224 100772         BMI  LOOP1        ;IF MINUS, TRY NEXT COMMAND
1062 001226 116012 000002         MOVB  2(R0),(R2)   ;READ DATA INTO MEMORY
1063 001232 120337 000000         CMPB  R3,@#0      ;FIRST BYTE READ SHOULD BE '740'
1064 001236 001767         BEQ  LOOP2        ;IF O.K., GO READ ANOTHER BYTE
1065 001240 000000         STOP: HALT
1066 001242 000755         BR   RESTRT     ;RESTART ON CONTINUE
1067
1068 001244 005710         DONE:  TST   (R0) ;CHECK FOR ERROR
1069 001246 100774         BMI  STOP       ;HALT ON ERROR
1070 001250 005007         CLR   PC        ;= 'JMP @#0'
1071
1072 001252 017640         TABLE: .WORD  37*400+240 ;READY+T-REQ./ILBS+READY+GO
1073 001254 002415         .WORD  5*400+15      ;SFB+GO/READ+GO
1074 001256 112024         .WORD  224*400+24    ;READ+ILBS/READ+ILBS+E.O.TABLE
1075
1076 ;RESTART CODE. NOT PART OF CBOOT CODE ABOVE.
1077 001260 000632         BR   REPEAT     ;GO TO ABS LOADER.
1078 001262
1079         000001         PRGEND: .END

```





STRT1	000262	832	908*										
STRT2	000266	826	909*										
STRT3	000272	827	910*										
SVRO	= 000270	826*	902*										
SVUNIT	= 000274	827*	903*										
TABLE	001252	1052	1072*										
TACS	= 1.500	1045*	1049										
WAIT	000724	894	1022*	1025									
WAITA	000156	849	879*	880									
WAITRO	= 000264	832*	895*										
.	= 001262	882	891	894	897	900	1027	1035*	1036*	1052			