DH11/VT20

HOST COMPUTER PROGRAM

MD-11-DZVTG-A

EP-DZVTG-A-DL

FICHE 1 OF 1

JUN 1978

digital

MADE IN USA

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DIVTG-A-D

PRODUCT NAME: DM11/VT20 HOST COMPUTER PROGRAM

DATE: OCTOBER, 1975

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: E. BOUSE/P. NELSON

TABLE OF CONTENTS

1. ABSTRACT

THIS PROGRAM IS A COMBINATION DM11 DIAGNOSTIC AND DATA HANDLING ROUTINE. IT IS USED IN CONJUNCTION WITH MAINDEC-11-D8VTA (VT28 SYSTEM DIAGNOSTIC), TEST 21. THE PROGRAM IS COMPLETELY OPERATOR INTERACTIVE BY MEANS OF A CONSOLE DEVICE AND WILL RESPOND TO ANY OPERATOR INPUTS. BY MEANS OF THE CONSOLE DEVICE, TRANSMITTER & RECEIVER LINES CAN BE VERIFED, SPECIFIED LINES CAN BE HELD FROM TRANSMITTING, RECEIVER BUFFERS CAN BE EXAMINED, DATA CAN BE ORIGINATED AND TRANSMITTED, AND SYSTEM STATUS MONITORED. THE PROGRAM ALSO HAS A PROVISION TO BOOT (TRANSFER) PROGRAMS I.E. VT28 DIAGNOSTIC, FROM THE HOST READER TO ANY SPECIFIED VT28 SYSTEM.

THE PROGRAM HAS BEEN WRITTEN TO EXERCISE ALL 16 DM11 LINES SIMULTANEOUSLY. THE BAUD RATE OF EACH LINE IS USER SELECTABLE AND IS SETUP ON PROGRAM INITIALIZATION.

ALL LINE NUMBERS ARE TO BE ENTERED AS DECIMAL VALUES. THE PROGRAM WILL RESPOND TO ALL ILLEGAL INPUTS BY TYPING '?'. THIS INDICATES THAT THE PREVIOUSLY INPUTTED CHARACTER WAS IGNORED. USE (CR) TO TERMINATE ALL INPUTS. RUBOUT MAY BE USED TO DELETE PREVIOUSLY INPUTTED CHARACTERS WHEN ENTERING ADDRESSES AND LINE NUMBERS. THE RUBOUT WILL HAVE NO EFFECT IN THE SEND MODE (REFER TO 6.J).

2. REQUIREMENTS (EQUIPMENT & MEMORY)

A. ANY PDP-11 FAMILY COMPUTER WITH A KW11 LINE CLOCK, A CONSOLE DEVICE AND AT LEAST 4K OF MEMORY. THIS IS THE MINIMUM CONFIGURATION TO SUPPORT TESTING OF TWO VT28 SYSTEMS. THEREAFTER, AT LEAST 1K OF ADDIONAL MEMORY IS REQUIRED FOR EACH VT28 SYSTEM TO BE TESTED.

3. LOADING PROCEDURE

A. USE STANDARD PROCEDURE FOR LOADING BINARY TAPES.

4. STARTING PROCEDURE

LOAD AND START PROGRAM AT LOCATION 200. THE PROGRAM WILL RESPOND BY TYPING THE PROGRAM HEADER AND THEN ASK FOR THE DH11 'SCR' ADDRESS.

1. RESPOND WITH (CR) IF . DEFAULT ADDRESS OF 160020 IS TO BE USED.

2. OTHERWISE, RESPOND WITH THE ADDRESS OF THE DH11 'SCR' ADDRESS TO BE USED.

5. PROGRAM ACTION

AFTER RECEIVING THE DH11 'SCR' ADDRESS, THE PROGRAM VALIDATES THAT THE 'SCR' ADDRESS IS PRESENT AND THEN MAPS THE DH11 VECTOR ADDRESSES AND SETS UP THE SERVICE ROUTINES. ANY ERRORS ENCOUNTERED WHILE MAPPING THE DH11 WILL RESULT IN AN ERROR PRINTOUT. THESE ARE CONSIDERED 'FATAL ERRORS' AND MUST BE CORRECTED BEFORE THE PROGRAM WILL CONTINUE.

THE PROGRAM ALSO CHECKS THAT THE KW11 LINE CLOCK IS AVAILABLE I.E. RETURNS A SLAVE SYNC WHEN ADDRESSED. IF THE LINE CLOCK DOESN'T RESPOND, THE FOLLOWING MESSAGE WILL BE PRINTED: "NO SLAVE SYNC RETURNED ADDRESSING THE KW11 LINE CLOCK. THIS PROGRAM WILL RUN WITHOUT IT BUT ALL SYSTEM ERRORS MAY NOT BE REPORTED".

THE PROGRAM THEN REQUESTS AND SETS UP THE BAUD RATE FOR EACH LINE. IF AN ILLEGAL BAUD RATE IS ENTERED, IT WILL BE IGNORED AND THE LINE NUMBER WILL BE PRINTED AGAIN. ALL UNUSED LINES SHOULD BE ENTERED AS '0' BAUD TO AVOID ERRONEOUS ERRORS.

AFTER ACCEPTING THE LINE BAUD RATES, EACH ACTIVE LINE, DEFINED BY THE USER, IS THEN TESTED. THIS TESTING ENVOLVES SETTING THE MAINTAINANCE BIT (9) AND THEN TRANSMITTING A '125'. A CHECK IS THEN MADE THAT A TRANSMITTER AND RECEIVER INTERRUPT OCCURRED AND THAT THE '125' WAS RECEIVED CORRECTLY. THE PROGRAM THEN PRINTS A '@@T' THIS INDICATES THAT THE PROGRAM HAS ENTERED THE MONITOR MODE.

IN THE MONITOR MODE, THE PROGRAM IS READY TO AUTOMATICALLY RECEIVE AND TRANSMIT DATA RECEIVED FROM ANY INITIALIZED VT28 SYSTEM. ALSO IN THE MONITOR MODE, THE PROGRAM RUNS BACKGROUND JOBS OF PRINTING ERRORS, KEEPING ACCOUNT OF SYSTEM STATUS AND EXECUTING OPERATOR REQUESTS.

6. MONITOR COMMANDS

THERE ARE SEVERAL MONITOR COMMANDS WHICH ENABLE THE OPERATOR TO CONTROL AND COMMAND THE PROGRAM. THERE ARE TWO TYPES OF COMMANDS: MONITOR RESPONSE COMMANDS I.E. ^A,^C,^D,^E,^O&^T AND 8 LINE DEPENDANT COMMANDS. I.E. ^B,^H,^L,^R,^S & ^X. ON RECEIPT OF A MONITOR RESPONSE COMMAND, THE PROGRAM WILL IMMEDIATELY EXECUTE THE COMMAND. ON RECEIPT OF A LINE DEPENDENT COMMAND THE PROGRAM WILL WAIT FOR A LINE NUMBER AND A CARRIAGE RETURN (CR) BEFORE EXECUTING THE COMMAND. THE FORM OF THIS TYPE OF COMMAND IS "COMMAND & LINE NO. (CR)". IN SOME CASES, THE COMMAND WILL ALLOW FOR MULTIPLE LINE NUMBERS TO BE ACCEPTED. IN THESE CASES THE LINE NUMBERS ARE TO BE SEPERATED BY COMMAS AND TERMINATED BY (CR). AN EXAMPLE WOULD BE: "^V8,4,6,7(CR)". ON RECEIPT OF THIS COMMAND, LINES 8,4,6 & 7 WOULD BE VERIFIED (REFER TO THE ^V COMMAND SECTION 6.V).

THE OMMISSION OF A LINE NUMBER I.E. (CR) ONLY, WILL RESULT IN LINE '8' BEING SERVICED. IN ALL CASES, THE LINE NUMBERS MAY BE INPUTTED IN ANY ORDER. ALL CONTROL CHARACTERS I.E. ^A,^B ETC. ARE OBTAINED BY TYPING THE 'CNTRL & CHARACTER SPECIFIED' KEYS SIMULTANEOUSLY.

A. ^A (ABSOLUTE SYSTEM RESTART).

ONE RECEIPT OF THIS COMMAND, THE PROGRAM WILL BE RESTARTED. THIS WILL ENABLE FOR A NEW DM11 'SCR' DEVICE ADDRESS AND NEW BAUD RATES TO BE ENTERED.

B. ^B (BOOT SELECTED LINES).

THE PURPOSE OF THIS COMMAND IS TO BOOT A ROUTINE FROM THE READER OF THE HOST COMPUTER TO SELECTED VT28 SYSTEMS. UPON RECEIPT OF THE (^B), THE PROGRAM WILL WAIT FOR THE LINE OR LINES NUMBERS OVER WHICH THE PROGRAM IS TO BE TRANSFERED. AFTER RECEIVING THE LINE NUMBER(S), THE PROGRAM WILL REQUEST THE READER DEVICE & VECTOR ADDRESSES. THIS QUESTION WILL ONLY BE ASKED ON THE INITIAL USE OF THE BOOT ROUTINE, HOWEVER THESE ADDRESSES CAN BE CHANGED BY TYPING A (^E). THEN ON THE NEXT OCCURANCE OF THE (^B) COMMAND, A NEW READER DEVICE ADDRESS WILL BE REQUESTED.

IN ORDER FOR PROGRAMS TO BE BOOTED TO A SELECTED VT28 SYSTEM, THE BOOTSTRAP LOADER (SEE NOTE 2) IN THE PDP-11/85 OF THE VT28 MUST BE MODIFIED. THIS WILL ENABLE THE PDP-11 TO ACCEPT THE BOOTED PROGRAM. TO DO THIS, SIMPLY REPLACE THE PC11 OR TTY 'CSR' ADDRESS IN LOCATION '37776' WITH A DL11 'CSR' ADDRESS OF EITHER '175610 OR 175620'. THE ABSOLUTE LOADER WILL BE THE FIRST PROGRAM BOOTED (UNLESS A BM792YL IS PRESENT) AND AFTER THE SUCCESSFUL COMPLETION OF THE ABSOLUTE BOOT (37500 FOR AN 8K COMPUTER, ETC). THE BOOT ROUTINE IS CAPABLE OF BOOTING ALL '16' DH LINES SIMULTANEOUSLY. IF A BM792YK BOOT IS UTILIZED ONLY THE EVENS LINES (175610 ADDRESS) CAN BE UTILIZED FOR THE BOOT OPERATION, HOWEVER NO PROGRAM MODIFICATION IS REQUIRED.

NOTE1: BEFORE BOOTING ANY PROGRAMS, INCLUDING THE ABSOLUTE LOADED, NOTE2: SUCCESSFUL BOOT OPERATION WILL BE INDICATED BY A HALT THE VT28 BOOTED. THE LINE (S) TO BE BOOTED SHOULD FIRST BE VERIFIED (REFER TO "V COMMAND).

C. "C (CLEAR SOFTWARE SWITCHES EXIT PRESENT MODE).

THIS COMMAND CAN BE EXECUTED AT ANYTIME TO TERMINATE OPERATOR REQUESTS I.E. SEND, HOLD, BOOT MODES ETC., AND RESET THE SYSTEM STATUS TO A KNOWN STATE. THE ("C) WILL NOT EFFECT THE STATE OF ACTIVE RECEIVERS AND TRANSMITTERS. HOWEVER, ALL LINES THAT WERE BEING HELD, REMAIN HELD UNTIL RELEASED BY THE ("R) COMMAND.

D. "D (PRINT RECEIVED DATA)

THIS COMMAND ENABLES ALL DATA BEING RECEIVED BY THE HOST PROGRAM, REGARDLESS OF LINE NUMBER, TO BE PRINTED. THIS IS A DOUBLE FUNCTION COMMAND WHICH ON THE FIRST RECEIPT OF ("D) WILL ENABLE THE DIAGNOSTIC MODE. THIS WILL RESULT IN THE MESSAGE "DIAGNOSTIC MODE ENABLE" TO BE TYPED. ON THE SECOND RECEIPT OF A '"D', THE DIAGNOSTIC MODE WILL BE DISABLED.

THE USE OF THIS COMMAND SHOULD BE RESTRICTED TO RUNNING ONE LINE AND THEN ONLY IF THERE ARE NO ERRORS BEING REPORTED BY THAT LINE. IT IS RECOMMENDED THAT THE ("P) FEATURE BE USED IN LIEU OF THE DIAGNOSTIC MODE IF MULTIPLE LINES ARE BEING EXERCISED.

E. "E (ESCAPE RESTART/REINITIALIZE HARDWARE AND SOFTWARE).

THIS COMMAND IS TO BE USED IF MULTIPLE RECEIVER AND/OR TRANSMITTER ERRORS ARE BEING REPORTED AND THE USE OF ("C) HAS NO APARENT EFFECT. ON RECEIPT OF A ("E), ALL SYSTEM SOFTWARE AND HARDWARE FLAGS ARE RESET. THIS WILL RESULT IN TERMINATING THE OPERATION OF ANY LINES WHICH WERE ACTIVE UPON THE RECEIPT OF THE ("E). HENCEFORTH, ALL VT28 SYSTEMS WILL HAVE TO BE REINITIALIZED. THIS COMMAND WILL ALSO RE-INITIALIZE THE DH11 AND RESET THE MONITOR TRANSFER AND ERRORS COUNTERS. THESE ARE THE COUNTS DISPLAYED WHEN LISTING MONITOR STATUS (REFER TO "L).

F. "H (HOLD SELECTED LINES).

THIS COMMAND WILL ENABLE FOR A SELECTED LINES' BUFFER TO BE HELD FROM BEING TRANSMITTED. THE COMMAND MAY BE USED SOLEY TO HOLD LINE TRANSMISSION OR USED IN CONJUNCTION WITH THE ("S) FEATURE. THIS WILL ENABLE A USER TO CREATE A BUFFER WHICH CAN BE RELEASED, ON COMMAND, IN A BURST AT TRANSMITTER BAUD RATE. REFER TO THE MONITOR COMMAND ("S) FOR INSTRUCTIONS ON CREATING THIS BUFFER. THIS COMMAND WILL FACILITATE HOLDING UP TO '16' DH LINES SIMULTANEOUSLY IN ANY ORDER. THE LINES CAN THEN BE RELEASED (REFER TO "R) INDIVIDUALLY OR SIMULTANEOUSLY.

G. "L (LIST SELECTED LINE STATUS)

THIS COMMAND WILL ENABLE FOR THE CURRENT SYSTEM STATUS TO BE MONITORED. THE ("L) OPTION CAN BE USED IN ONE OF TWO WAYS: (1) TYPE ""L(CR)" TO PRINT THE STATUS OF ALL DH11 LINES. (2) TYPE ""L & LINE NO., LINE NO....(CR)" TO PRINT THE STATUS OF SPECIFIED LINE(S). THE FOLLOWING IS AN EXAMPLE AND EXPLAINATION OF THE MONITOR PRINTOUT. REFER TO SECTION 7.(ERRORS) FOR A FURTHER EXPLANATION OF THE ERROR DATA.

EXAMPLE:

LINE	IN	OUT	OR	PAR.	FRAM	TRAN	ST.	HELD	PEND	BAUD
A	B	C	D	E	F	G	H	I	J	K

A. NO. OF LINE BEING MONITORED
B. NO. OF BLOCKS OF DATA RECEIVED
C. NO. OF BLOCKS OF DATA TRANSMITTED
D. NO. OF OVERRUN ERRORS INCURRED
E. NO. OF PARITY ERRORS INCURRED
F. NO. OF FRAMING ERRORS INCURRED
G. NO. OF ILLEGAL TRANSMITTER INTERRUPTS INCURRED.
H. NO. OF ILLEGAL START CODES INCURRED.
I. TO '1' IF LINE IS CURRENTLY BEING HELD.
J. TO '1' IF A HELD LINE HAS DATA PENDING
K. TO THE LINE BUAD RATE SELECTED BY THE USER

H. "P (PRINT SELECTED LINE BUFFER)

THIS COMMAND IS USED TO PRINT THE CONTENTS OF A SELECTED LINES' BUFFER. IT SHOULD BE NOTED THAT THE START CODE (377) IS DETECTED AND PRINTED AS AN UP-ARROW ("). THE EOP CODE (14) IS ALSO DETECTED AND IS PRINTED AS "(EOP)". UPON COMPLETION OF PRINTING A BUFFER OR IF THE BUFFER IS EMPTY, A DOT WILL BE PRINTED INDICATING A RETURN TO THE MONITOR. THIS COMMAND SUPERCEDES "D AND AUTOMATICALLY EXITS THE 'PRINT RECEIVED DATA MODE.'

I. ^R (RELEASE SELECTED LINES).

THIS COMMAND IS USED TO RELEASE LINES THAT WERE HELD USING THE (^H) FEATURE. LINES MAY BE RELEASED IN ANY ORDER AND EITHER INDIVIDUALLY OR COLLECTIVELY. THE (^L) COMMAND CAN BE USED TO DETERMINE IF A SELECTED LINE IS BEING HELD. THE (^R) COMMAND WILL FACILITATE RELEASING UP TO 16 LINES SIMULTANEOUSLY.

J. ^S (SEND FOLLOWING DATA TO SELECTED LINES VT28 SW88=1).

THIS COMMAND IS USED TO SEND DATA, ORGINATED ON THE HOST CONSOLE DEVICE, TO SELECTED TRANSMITTER LINE(S). IN THIS MODE, AS EACH CHARACTER IS RECEIVED IT IS STORED IN THE RESPECTIVE LINE(S) DATA BUFFER. UP TO 384 CHARACTERS MAY BE INPUTTED. AFTER THE DESIRED BUFFER HAS BEEN CREATED, TYPE (ALT). THIS WILL RESULT IN THE SEND MODE BEING TERMINATED AND THE RESPECTIVE LINE(S) TRANSMITTERS BEING ACTIVATED. AN ALTERNATE TO THIS IS TO HOLD SELECTED LINES AND THEN RELEASE THEM ON COMMAND. THIS IS DONE USING THE (^H) FEATURE TO HOLD SELECTED LINE(S) AND THEN ENTERING THE (^S) MODE. WHEN THE DESIRED BUFFER HAS BEEN CREATED, EXIT THE (^S) MODE BY TYPING (ALT). THE PROGRAM WILL RESPOND BY A DOT, INDICATING A RETURN TO THE MONITOR. THE DATA BUFFER(S) CAN THEN BE PRINTED (REFER TO ^P) AND/OR RELEASED (REFER TO ^R).

WHEN USING THE (^S) FEATURE, SW88 MUST BE SET TO A '1' (UP) ON THE VT28 SYSTEM RECEIVING THE DATA. OTHERWISE, THE DATA WILL LOOK AND BE HANDLED AS DATA, OR RECEIVER ERRORS. THIS SWITCH SHOULD BE RESET (DOWN) WHEN NOT USING THE SEND MODE.

K. ^V(VERIFY SELECTED LINES IF VT28 IS CYCLING TST21, SW08,01=1).

THIS COMMAND IS DEFINITLY THE MOST USEFUL AND BENIFICIAL COMMAND THAT THE OPERATOR CAN USE TO BRING UP A VT28 SYSTEM. IT IS USED TO VERIFY THAT A SELECTED DH11 LINE OR LINES ARE FUNCTIONING (I.E. TRANSMITTING & RECEIVING). TO USE THIS ROUTINE, TYPE ^V LINE NO., LINE NO,....(CR). THE SELECTED LINE (S) WILL THEN HAVE A CODE OF '125' TRANSMITTED OVER THEM (REFER TO NOTE). A CHECK IS THEN MADE THAT ALL LINE RECEIVERS RESPONDED WITH THE CORRECT DATA. THIS CODE IS TRANSMITTED '5' TIMES PER LINE AND THEN THE MESSAGE; "LINE XXX VERIFIED OK" IS PRINTED. IF A LINE FAILS TO RESPOND, THE MESSAGE: "LINE XXX NO VERIFY DATA RETURNED" IS PRINTED. IF A LINE RESPONDS BUT THE DATA IS INVALID, THE MESSAGE: "LINE XXX VERIFY DATA ERROR, SENT=125 RECV'D =XXX" IS PRINTED. THE DATA IS THEN RE-TRANSMITTED AND AGAIN VERIFIED. THIS WILL CONTINUE UNTIL A '^C' IS TYPED BY THE OPERATOR TO TERMINATE THE TEST, OR '5' SUCCESSFUL DATA CODES ARE RECEIVED.

NOTE: IN ORDER FOR THIS TEST TO FUNCTION, EITHER 'TST21' OF THE VT28 DIAGNOSTIC (MAINDEC-11-DBVTA) MUST BE LOADED AND RUNNING WITH 'SW08 & SW01' SET OR THE FOLLOWING DL11 ECHO PATCH ROUTINE MUST BE TOGGLED INTO THE VT28 SYSTEM UNDER TEST.

```
1000/   105737 1756X0          TSTB @DLRCSR            ;WAIT FOR DATA
1004/   100375                 BPL  .-4
1006/   113737 1756Y2 1756N6   MOVB @#DLRBUF,@DLXBUF   ;ECHO CHAR.
1014/   771                    BR   .-14               ;WAIT NEXT CHAR.
```

WHERE: X= ADDRESS OF SELECTED DL11 RECEIVER CONTROL STATUS REGISTER
Y= ADDRESS OF SELECTED DL11 RECEIVER DATA BUFFER REGISTER
N= ADDRESS OF SELECTED DL11 TRANSMITTER DATA BUFFER REGISTER

NOTE: IF TEST 21 IS USED, ALL TUBES TO BE VERIFIED MUST BE CLEARED OF ANY PRIOR ACTIVITY (CONTROL C OR CONTROL E).

L. ^X (TRANSMIT ON SELECTED LINES)

THIS COMMAND FORCES A CONTINUOUS TRANSMISSION OF THE CODE 125 OCTAL ON THE LINES SPECIFIED. ALL DATA ERRORS INTO THE HOST ARE IGNORED ALTHOUGH, IF TEST 21 OF DBVTA IS RUNNING WITH SW0 & 1 SET, IN THE VT28S' CONNECTED TO THE LINES SELECTED, ALL TRANSMISSION ERRORS WILL BE COUNTED AND RECEIVE DATA DISPLAYED. THIS COMMAND IS DESIGNED TO BE A TOOL TO AID IN THE INSTALLATION AND INITIAL LINE CHECK-OUT AND TROUBLE-SHOOTING. THIS COMMAND MUST BE EXITED VIA ^E ONLY!

M. AUXILLARY COMMANDS

^O (INHIBIT A PRINTOUT) - INHIBITS THE PRINTING OF ONE MESSAGE ONLY. THIS WOULD EITHER BE THE MESSAGE CURRENTLY PRINTING OR THE NEXT MESSAGE WHICH WAS TO BE PRINTED.

^T (INHIBIT ALL ERROR PRINTOUTS) - ALLOWS CONTROL OF THE

PRINTING OF ERRORS. FIRST CONTROL T DISABLES ERROR PRINTOUT AND SECOND CONTROL T RE-ENABLED ERROR PRINTOUTS. CONTROL A AND CONTROL C WILL BOTH CAUSE RE-ENTRY INTO THE ERROR PRINTING MODE.

* THESE COMMANDS SHOULD BE PRECEEDED BY A CONTROL C OR E AT THE VT20'S TO BE TESTED TO AVOID MISLEADING ERROR PRINTOUTS.

7. ERROR REPORTER

THE PROGRAM HANDLES ERRORS IN TWO PHASES (1) FATAL ERRORS (INCURRED WHILE MAPPING THE DH11 ADDRESS AND VECTORS) AND (2) NON-FATAL SYSTEM ERRORS (INCURRED WHILE RECEIVING AND TRANSFERRING DATA). FATAL ERRORS MUST BE CORRECTED BEFORE THE PROGRAM WILL CONTINUE.

A. FATAL ERRORS

THESE ERRORS CAN RESULT FROM THE USER ENTERING ILLEGAL DEVICE ADDRESS OR SIMPLY BY HAVING A BAD DH11 PRESENT. FATAL ERRORS OF THIS NATURE WILL RESULT IN ONE OF TWO TYPEOUTS:

1. "THAT DH11 ADDRESS IS NOT PRESENT"

   THIS PRINTOUT WILL RESULT IF THE ADDRESS ENTERED BY THE USER DIDN'T RETURN A 'SLAVE SYNC' WHEN ADDRESSED.

2. "NO INTERRUPT RESPONSE FROM DEVICE NNNNNN"

   THIS PRINTOUT WILL RESULT AFTER MAPPING IF THE DH11 RECEIVER FAILS TO INTERRUPT WHEN ENABLED.

B. SYSTEM ERRORS

SYSTEM ERRORS ARE HAN' ED AS BACKGROUND JOBS. WHEN AN ERROR IS INCURRED IT IS CATEGORIZED BY GIVING IT A UNIQUE NUMBER AND PUSHED INTO AN ERROR BUFFER.

THESE ERRORS ARE THEN PRINTED (IN THE ORDER OF INCURRENCE) BY THE MONITOR. A MAXIMUM OF SIX(6) ERRORS PER/LINE, REGUARDLESS OF TYPE, ARE SAVED IN THE ERROR BUFFER AND PRINTED. THE SYSTEM DOES, HOWEVER, KEEP A RUNNING COUNT OF ALL ERRORS. THIS INFORMATION CAN BE ACCESSED BY USE OF THE (^L) COMMAND. THESE ERROR COUNTERS ARE RESET ONLY ON SYSTEM START UP AND BY THE (^E) & (^A) COMMANDS. EACH ERROR PRINTOUT WILL CONSIST OF THE LINE NUMBER AND A MESSAGE DESCRIBING THE ERROR TYPE.

FOLLOWING IS A LIST AND DESCRIPTION OF THE POSSIBLE ERROR MESSAGES THAT MAY OCCUR:

1. ILLEGAL NON-EX MEMORY INTERRUPT

   THIS ERROR WILL RESULT IF THE NPR HARDWARE PLACES THE ADDRESS OF A MEMORY LOCATION ON THE UNIBUS AND NO SLAVE SYN IS RECEIVED IN 20USEC.

2. "ILLEGAL TRANS. INTERRUPT"

   THIS ERROR WILL RESULT IS THE LINE RECEIVER IS ACTIVE AND A TRANSMITTER INTERRUPT IS SERVICED.

3. "OVERRUN ERROR"

4. "FRAMING ERROR"

5. "PARITY ERROR"

6. "ILLEGAL START CODE"

   THIS ERROR IS A RESULT OF THE FIRST CHARACTER RECEIVED, OTHER THAN A NULL CODE, NOT BEING '377'. (REFER TO DATA FORMAT, SECTION 8., FOR A FURTHER EXPLAINATION.)

7. "ILLEGAL READER INTERRUPT"

8. "ATTEMPT TO RECEIVE WHILE IN SEND MODE"

   THIS MESSAGE IS PRINTED IF DATA IS RECEIVED FROM THE VT20 ON THE SAME LINE AS THE USER HAS SPECIFIED TO BE USED AS A 'SEND' DATA LINE.

9. "VERIFY CHECK OK"

   THIS MESSAGE IS PRINTED AFTER '5' SUCCESSFUL TRANSMIT RECEIVE OPERATIONS HAVE BEEN COMPLETED WHEN VERIFYING A LINE.

10. "DATA VERIFY ERROR, SENT=125 RECV'D=XXX"

    IF THIS ERROR OCCURS, THE VERIFY CODE (125) WILL BE RE-TRANSMITTED. THIS WILL CONTINUE UNTIL EITHER '5' SUCCESSFUL TRANSMIT/RECEIVE OPERATIONS HAVE BEEN COMPLETED OR A (^C) IS TYPED TO TERMINATE THE VERIFY TEST.

11. "NO VERIFY DATA RETURNED"

    IF THIS ERROR OCCURS, NO FUTHER ATTEMPT IS MADE TO RE-TRANSMIT THE DATA, AND THE VERIFY TEST THAT PARTICULAR LINE IS ABORTED.

12. "NO TRANSMITTER INTERRUPTS OCCURRING"

    THIS MESSAGE IS PRINTED IF NO TRANSMITTER INTERRUPT IS OCCURRED WHEN THE PROGRAM ATTEMPTS TO CHECK THE RECEIVER TRANSMITTER LOGIC. THIS CHECK IS MADE BY SETTING THE MAINTENANCE BIT (9) AND TRANSMITTING A CHARACTER (125).

    IT SHOULD BE NOTED AGAIN, THAT IS CHECK IS AUTOMATICALLY PERFORMED BY THE PROGRAM AFTER THE BAUD RATES HAVE BEEN SET UP, AND ARE NOT OPERATOR DEPENDANT. THIS CHECKING TAKES PLACES EVERYTIME A (^E OR ^A) IS TYPED.

13. "NO RECEIVER INTERRUPTS OCCURRING"

    THIS ERROR IS ASSOCIATED WITH THE AUTOMATIC CHECKING OF THE RECEIVER AND TRANSMITTER AS DESCRIBED ABOVE. IN THIS CASE THOUGH, NO RECEIVER INTERRUPT OCCURRED FROM THE DESCRIBED CHECK.

    IF THIS ERROR IS DETECTED, THE USER SHOULD TYPE A (^E). THIS WILL CAUSE THE SEQUENCE WHICH CAUSED THE ERROR TO BE REPEATED. IF THE ERROR RE-OCCURRES, THEN THE DH11 DIAGNOSTICS SHOULD BE LOADED. IF THE USER ATTEMPTS TO CONTINUE RUNNING THE PROGRAM AFTER ENCOUNTERING THIS ERROR, THE PROGRAM MAY HANG.

14. "DATA CHECK ERROR, SENT =125 RECV'D =XXX'

    THIS ERROR IS ALSO ASSOCIATED WITH THE AUTOMATIC CHECKING SEQUENCE. ONLY IN THIS CASE, THE DATA RECEIVED ON THE CHECK WAS NOT THE CODE TRANSMITTED (377).

8. DATA FORMAT

ALL DATA RECEIVED FROM THE VT28 SYSTEMS IS SPECIALLY FORMATTED. THIS FORMAT IS CHECKED AND TRANSMITTED EXACTLY AS IT WAS RECEIVED. THE FORMAT OF THIS DATA IS: 4 NULL CHARACTERS (000), A START CODE(377), DATA (UP TO 384 CHARACTERS ORIGINATED BY USER), AND A EOP (END OF PARAGRAPH CODE=14).

NOTE - THE DATA ORIGINATED FROM A VT20 MAY BE IN ONE OF THREE FORMATS:

A. RANDOM, GENERATED FROM THE KEYBOARD

B. INCREMENTAL, GENERATED BY ^A

C. WORST CASE, GENERATED BY ^W

REFER TO MAINDEC-11-DBVTA WRITEUP FOR DETAILS.

WHEN DATA IS RECEIVED, THE PROGRAM VERIFIES THAT THE FIRST CHARACTER, OTHER THAN NULLS), IS A START CODE. ON RECEIPT OF THE START CODE, THE RECEIVER SERVICE ROUTINE IS INITIALIZED. ALL DATA FROM THIS POINT, UNTIL THE RECEIPT OF AN EOP CODE, IS STORED IN THE APPROPRIATE LINES' BUFFER. ON RECEIPT OF THE EOP, THE RECEIVER SERVICE ROUTINE IS TERMINATED. THE TRANSMITTER SERVICE ROUTINE IS THEN INITIALIZED. THUS, NO DL11 TRANSMITTER AND RECEIVER ARE ACTIVE SIMULTANEOUSLY. THE RECEIVED DATA IS THEN TRANSMITTED, EXACTLY AS IT WAS RECEIVED.

IT SHOULD BE NOTED THAT WHEN A LINES' BUFFER IS PRINTED, THE START CODE CHARACTER IS DETECTED AND PRINTED AS AN UP-ARROW (^). THIS ALSO HOLDS TRUE ON THE VT20 END, WHERE THE START CODE IS DISPLAYED AS AN (^) ON THE SCREEN.

9. DISPLAY REGISTER OPTION

IF THIS PROGRAM IS BEING RUN ON A PDP-11/45 THE ACTIVITY OF THE DH11 LINES MAY BE VISUALLY MONITORED. THIS IS DONE BY SETTING THE DATA DISPLAY SELECT SWITCH, ON THE /45 CONSOLE, TO THE "DISPLAY REGISTER" POSITION. THEN EVERY TIME A DH11 TRANSMITTER BECOMES ACTIVE, IT'S CORRESPONDING LINE NUMBER WILL BE REFLECTED BY LIGHTING A LIGHT IN THE DATA LIGHT REGISTER. IT CAN BE NOTED, THAT IF A SELECTED LINE IS HELD, THE LIGHT REFLECTING THAT LINE WILL BE LIT IF THAT LINE IS READY TO BE RELEASED.

10. LISTING

```
                                        .TITLE DM11/VT28 HOST DIAGNOSTIC PROGRAM
                                        .ABS
                                        .ENABLE AMA
                                ;MAINDEC-11-DZVTG-A-D
                                ;COPYRIGHT APRIL 30, 1975
                                ;REVISED OCTOBER,1975
                                ;DIGITAL EQUIPMENT CORP. MAYNARD, MASS. 01754
                                ;PROGRAMMER: EARL L. BOSE

                                ;REGISTER DEFINITIONS

000000                          R0=%0
000001                          R1=%1
000002                          R2=%2
000003                          R3=%3
000004                          R4=%4
000005                          R5=%5
000006                          SP=%6
000007                          PC=%7

                                ;INSTRUCTION DEFINITION

005726                          POP1SP=005726
022626                          POP2SP=022626
024646                          PUSH2SP=024646
000240                          NOP=240
001100                          STACK=1100
000014                          EOP=14

                                ;LOAD TRAP CATCHER INTO LOC 0-1000

000000                                  .=0
                                .REPT   200
                                        .+2
                                        4                       ;LOAD TRAP WITH 'IOT' TRAP VECTOR
                                .ENDR

                                        .=20
000020  010664                          MAPVEC                  ;MAPPER TRAP ROUTINE
000022  000340                          340
000024  010460                          PWRFAL                  ;POWER FAIL HANDLER
000026  000340                          340
000030  010564                          EMTSRV                  ;EMT SERVICE ROUTINE
000032  000340                          340
000060                                  .=60
000060  003150                          KEYSRV                  ;TTY KEYBOARD SERVICE ROUTINE
000062  000200                          200
000200                                  .=200
000200  000137  001342                  JMP     START           ;PROGRAM STARTING ADDRESS

                                ;REGISTER ADDRESSES
001200                                  .=1200
001200  177776                  PSW:    177776                  ;ADDRESS OF PROCESSOR STATUS REG.
001202  177560                  TKS:    177560                  ;ADDRESS OF KEYBOARD STATUS REG.
```

```
001204  177562          TKB:    177562                  ;  "   "      "   BUFFER  "
001206  177564          TPS:    177564                  ;  "   "  PRINTER STATUS REG.
001210  177566          TPB:    177566                  ;  "   "  PRINTER BUFFER REG.
001212  177570          SWR:    177570                  ;  "   "  SWITCH REG.

                        ;TRAP EQUIVALENCE TABLE:

        104000          PRINT=EMT                       ;SUBROUTINE TO PRINT ASCII MESSAGES.
        104001          PRTOCT=PRINT+1                  ;SUBROUTINE TO PRINT A 6 DIGIT OCTAL NO
        104002          BINDEC=PRTOCT+1                 ;SUBROUTINE TO CONVERT OCTAL TO BINARY & PRINT IT
        104003          OCTPR3=BINDEC+1                 ;SUBROUTINE TO PRINT A 3 DIGIT OCTAL NO.

                        ;********************************************************************
                        ;LINE CLOCK REGISTER AND VECTOR ADDRESSES
                        ;********************************************************************

001214  177546          KW11:   177546
001216  000100          KWVTR:  100
001220  000102          KWBR:   102

                        ;********************************************************************
                        ;DH11 ADDRESS TABLE
                        ;THIS TABLE IS OVERLAYED WITH DH11 ADDRESSES SPECIFIED BY THE USER
                        ;ON PROGRAM INITIALIZATION.
                        ;*******************************************************************

001222  160020          DHSCR:  160020                  ;SYSTEM CONTROL REGISTER
001224  160022          DHNRC:  160022                  ;NEXT RECEIVED CHARACTER REGISTER
001226  160024          DHLPR:  160024                  ;LINE PARAMETER REGISTER
001230  160026          DHCAR:  160026                  ;CURRENT ADDRESS REGISTER
001232  160030          DHBCR:  160030                  ;BYTE COUNT REGISTER
001234  160032          DHBAR:  160032                  ;BUFFER ACTIVE REGISTER
001236  160034          DHBKR:  160034                  ;BREAK CONTROL REGISTER
001240  160036          DHSSR:  160036                  ;SILO STATUS REGISTER
001242  000540          DHRVTR: 540                     ;RECEIVER VECTOR ADDRESS
001244  000542          DHRBR:  542                     ;RECEIVER 'BR' LEVEL ADDRESS
001246  000544          DHTVTR: 544                     ;TRANSMITTER VECTOR ADDRESS
001250  000546          DHTBR:  546                     ;TRANSMITTER 'BR' LEVEL ADDRESS

                        ;********************************************************************
                        ;RECEIVER BAUD SPEED EQUIVALENCE TABLE
                        ;********************************************************************

001252  000000          RCBAUD: 0                       ;ZERO
001254  000100                  100                     ;50
001256  000200                  200                     ;75
001260  000300                  300                     ;110
001262  000400                  400                     ;134.5
001264  000500                  500                     ;150
001266  000600                  600                     ;200
001270  000700                  700                     ;300
001272  001000                  1000                    ;600
001274  001100                  1100                    ;1200
001276  001200                  1200                    ;1800
```

B2

```
001300  001300                          1300                    ;2400
001302  001400                          1400                    ;4800
001304  001500                          1500                    ;9600

                                ;*****************************************************************
                                ;TRANSMITTER BAUD SPEED EQUIVALENCE TABLE
                                ;*****************************************************************

001306  000000                  TRBAUD: 0                       ;ZERO
001310  002000                          2000                    ;50
001312  004000                          4000                    ;75
001314  006000                          6000                    ;110
001316  010000                          10000                   ;134.5
001320  012000                          12000                   ;150
001322  014000                          14000                   ;200
001324  016000                          16000                   ;300
001326  020000                          20000                   ;600
001330  022000                          22000                   ;1200
001332  024000                          24000                   ;1800
001334  026000                          26000                   ;2400
001336  030000                          30000                   ;4800
001340  032000                          32000                   ;9600

                                ;*****************************************************************
                                ;REQUEST AND SET UP A DH11 DEVICE ADDRESS TABLE.
                                ;*****************************************************************

001342  012777  000340  177630  START:  MOV     #340,@PSW       ;SET PROCESSOR PRIORITY '07'
001350  012706  001100                  MOV     #STACK,SP       ;INITIALIZE STACK POINTER
001354  005077  177622                  CLR     @TKS            ;CLR KEYBOARD INTERRUPT ENABLE
001360  005037  005546                  CLR     VERPT           ;RESET VERIFY REPEAT REQUEST
001364  005037  007646                  CLR     PRTERR          ;RESET INHIBIT ERROR PRINTOUT
001370  004737  010626                  JSR     PC,OVRLAY       ;OVERLAY TRAP AREA.
001374  012737  001412  000004          MOV     #CORSIZ,@4      ;RESET TIMEOUT
001402  012701  020000                  MOV     #20000,R1       ;TEST CORE SIZE
001406  005721                          TST     (R1)+
001410  000776                          BR      .-2
001412  162701  001000          CORSIZ: SUB     #1000,R1        ;SAVE THIS ADDRESS AS ERROR BUFFER LIMIT
001416  010137  014274                  MOV     R1,MEMSIZ
001422  012737  000006  000004          MOV     #6,@4
001430  012737  000004  000006          MOV     #4,@6           ;RESET '6' TO TRAP
001436  012700  014376                  MOV     #BUFPTR,R0      ;SETUP TO CLR BUFFER & STORAGE AREA
001442  005020                          CLR     (R0)+
001444  023700  014274                  CMP     MEMSIZ,R0       ;DONE?
001450  001374                          BNE     .-6             ;NO
001452  005737  014270                  TST     MONFLG          ;HAS THE HEADER BEEN TYPED?
001456  001004                          BNE     START1          ;YES, SKIP RE-TYPING IT
001460  005237  014270                  INC     MONFLG          ;NO, SET FLAG
001464  104000  011031                  PRINT,  TITLE           ;TEXT 'DH11 DATA HANDLING ROUTINE'
001470  104000  012346          START1: PRINT   ,MFIAD          ;ASK FOR THE DH11 'SCR' ADDRESS
001474  004737  004722                  JSR     PC,GETLN1       ;GET & DECODE THE LINE ADDRESS
001500  005737  015044                  TST     DEVADR          ;WAS AN ADDRESS INPUTTED?
001504  001003                          BNE     START2          ;YES, SET IT UP.
001506  012737  160020  015044          MOV     #160020,DEVADR  ;NO, USE DEFAULT 160020 AS 'SCR' ADDRESS
```

```
001514  013701  015044          START2: MOV     DEVADR,R1       ;GET READY TO ASSEMBLE DH11 ADDRESSES
001520  012704  001222                  MOV     #DHSCR,R4       ;SET UP POINTER TO SAVE ACTIVE DL'S
001524  012737  001636  000004          MOV     #START5,@#4     ;SET UP TIME-OUT ADDRESS
001532  012737  000340  000006          MOV     #340,@#6
001540  052711  040000                  BIS     #40000,(R1)     ;TEST IF ADDRESS IS PRESENT BY SETTING
001544  000240                          NOP                     ;THE INITIALIZE BIT
001546  000240                          NOP
001550  010105                  START3: MOV     R1,R5
001552  062705  000020                  ADD     #20,R5          ;SET UP END ADDRESS COMPARE
001556  010124                  1$:     MOV     R1,(R4)+        ;SAVE ADDRESS IN TABLE
001560  062701  000002                  ADD     #2,R1           ;SET UP NEXT DH ADDRESS
001564  020105                          CMP     R1,R5           ;AT END OF ADDRESSES?
001566  001373                          BNE     1$              ;NO
001570  012737  001606  000004          MOV     #START4,@#4     ;SET UP TIME-OUT ADDRESS
001576  005777  177412                  TST     @KW11           ;IS LINE CLOCK AVAILABLE?
001602  000240                          NOP
001604  000403                          BR      START6
001606  104000  013010          START4: PRINT,  MES14           ;TEXT "CLOCK NOT AVAILABLE"
001612  000402                          BR      START7
001614  005237  014272          START6: INC     LINCLK          ;YES, SET THE SOFTWARE FLAG
001620  012737  000006  000004  START7: MOV     #6,@#4          ;NO, RESET TRAP WITH A 'IOT' TRAP
001626  012737  000004  000006          MOV     #4,@#6
001634  000403                          BR      FINVEC          ;NOW SETUP VECTOR ADDRESS
001636  104000  012133          START5: PRINT,  MES1            ;TEXT 'THAT DH11 ADDRESS IS NOT PRESENT',
001642  000712                          BR      START1          ;REQUEST A NEW ADDRESS

                                ;**********************************************************************
                                ;NOW THAT AN 'ACTIVE' DEVICE TABLE HAS BEEN SETUP, AN INTERRUPT IS FORCED
                                ;AND THE DH11 VECTOR ADDRESSES ARE MAPPED.
                                ;**********************************************************************

001644  013700  001222          FINVEC: MOV     DHSCR,R0        ;SET UP 'SCR' ADDRESS POINTER
001650  012701  001242                  MOV     #DHRVTR,R1      ;SET UP RECEIVER VECTOR ADDRESS POINTER
001654  005077  177320                  CLR     @PSW            ;SET PROC. PRIORITY 00
001660  052737  000001  015144          BIS     #1,FMAP         ;SET MAPPING FLAG
001666  012710  001100                  MOV     #1100,(R0)      ;SELECT: MAINTENANCE MODE, REC. INTR. ENABLE
001672  052710  000200                  BIS     #200,(R0)       ;CAUSE RECEIVER INTERRUPT
001676  000240                          NOP
001700  000240                          NOP
001702  012777  000340  177270          MOV     #340,@PSW
001710  005010                          CLR     (R0)            ;CLEAR 'SCR'
001712  005737  015144                  TST     FMAP            ;DID INTERRUPT OCCUR?
001716  001412                          BEQ     LDVECT          ;YES, NOW LOAD THE VECTOR ADDRESS
001720  005037  015144                  CLR     FMAP            ;CLEAR THE SOFTWARE FLAG
001724  104000  012177                  PRINT,  MES2            ;TEXT 'NO INTERRUPT RESPONSE FROM DEVICE'
001730  010037  015122                  MOV     R0,KSTOR1       ;PRINT 'SRC' ADDRESS
001734  104001  015122                  PRTOCT, KSTOR1
001740  000137  001470                  JMP     START1

                                ;**********************************************************************
                                ;AT THIS POINT THE RECEIVER AND TRANSMITTER VECTOR ADDRESSES HAVE BEEN
                                ;MAPPED.  THE FOLLOWING SUBROUTINE LOADS THE VECTOR ADDRESSES WITH THEIR
                                ;RESPECTIVE SERVICE ROUTINE ADDRESSES AND BR LEVELS.
                                ;**********************************************************************
```

```
                                                LOVECT: MOV     DMRVTR,R1       ;SET UP TO LOAD THE SERVICE ADDRESSES
                                                        MOV     #RECVER,(R1)+   ;LOAD THE RECEIVER SERVICE ADDRESS
                                                        MOV     #340,(R1)+      ;SET RECEIVER TO BR LEVEL 7
                                                        MOV     #TRNMIT,(R1)+   ;LOAD THE TRANSMITTER SERVICE ADDRESS
                                                        MOV     #340,(R1)+      ;SET TRANSMITTER TO BR LEVEL 7

                                                ;*****************************************************************
                                                ;ENTERED HERE TO REQUEST THE BAUD RATE FOR EACH OF THE 16 DH LINES.
                                                ;THIS ROUTINE CHECKS FOR LEGAL BAUD RATES, ASSEMBLES THEM INTO USABLE
                                                ;RECEIVER & TRANSMITTER BAUD EQUIVALENCE VALUES AND SAVES THEM IN A TABLE.
                                                ;THIS TABLE IS THEN LATTER LOADED INTO THE LINE PARAMETER REGISTER.
                                                ;*****************************************************************

001770  012701  014450          GTBAUD: MOV     #LPWORD,R1      ;SET UP LINE PARAMETER TABLE POINT
001774  005011                          CLR     (R1)            ;CLEAR 1ST WORD IN TABLE
001776  005037  015032                  CLR     LINNO
002002  012702  014512                  MOV     #BAUDMS,R2      ;SET UP POINTER TO SAVE 'ASCII' BAUD VALUES
002006  104000  012556                  PRINT,  MES12           ;REQUEST THE LINE BAUD RATES
002012  104002  015032          1$:     BINDEC, LINNO           ;PRINT THE LINE NUMBER
002016  004737  010334                  JSR     PC,DECODE       ;GET & DECODE BAUD VALUE
002022  000773                          BR      1B              ;RETURN HERE FROM DECODE ON ILLEGAL ENTRY
002024  013703  015034                  MOV     OFFSET,R3       ;SET UP OFFSET
002030  016311  001252                  MOV     RCBAUD(R3),(R1) ;SAVE RECEIVER BAUD RATE
002034  056311  001306                  BIS     TRBAUD(R3),(R1) ;SAVE TRANSMITTER BAUD RATE
002040  052721  000023                  BIS     #23,(R1)+       ;SELECT: FULL DUPLEX, ODD PARITY, PAR. ENABLED, 8-BIT
002044  012703  016526                  MOV     #TTYBUF,R3      ;SET UP TO SAVE 'ASCII' VALUE OF BAUD SETTING
002050  012322                          MOV     (R3)+,(R2)+     ;SAVE FOR PRINTING BAUD RATE IN MONITOR (^M) ROUTINE
002052  012322                          MOV     (R3)+,(R2)+
002054  005237  015032                  INC     LINNO           ;UPDATE THE LINE NUMBER
002060  022737  000020  015032          CMP     #20,LINNO       ;DONE ALL '16' LINES?
002066  001351                          BNE     1B              ;NO

                                                ;*****************************************************************
                                                ;PROGRAM ENTERED HERE TO INITIALIZE ALL SOFTWARE SWITCHES (BOTH FOR
                                                ;USER OPTIONS I.E. ^S, ^P, ETC. AND PROGRAM SWITCHES. THIS IS ENTER-
                                                ;ED EITHER FROM THE MONITOR ON PROGRAM LOADS OR BY TYPING A '^E'.
                                                ;*****************************************************************

002070  012777  000340  177102  SERVCE: MOV     #340,@PSW       ;SET PROC. PRIORITY 07
002076  012706  001100                  MOV     #STACK,SP       ;RESET STACK POINTER
002102  005037  005546                  CLR     VERPT           ;CLEAR CONTROL X FLAG
002106  005037  005544                  CLR     LINSTR          ;RESET CONTROL X LINE STORAGE
002112  005037  007646                  CLR     PRTERR          ;RESET ERROR PRINT FLAG
002116  012701  014614                  MOV     #HOLDSW,R1      ;SET UP TO CLEAR ALL SOFTWARE SW'S.
002122  005021                  1$:     CLR     (R1)+
002124  023701  014274                  CMP     MEMSIZ,R1       ;DONE?
002130  001374                          BNE     1B              ;NO
002132  012702  014450                  MOV     #LPWORD,R2      ;SET UP LINE PARAMETER TABLE POINTER
002136  012701  030100                  MOV     #30100,R1
002142  012777  004000  177052          MOV     #4000,@DMSCR    ;ISSUE MASTER CLEAR TO INITIALIZE THE 'DH'
002150  010177  177046          2$:     MOV     R1,@DMSCR       ;SELECT: REC, TRANS & NON-EX MEM INTERRUPTS
002154  012277  177046                  MOV     (R2)+,@DMLPR    ;LOAD THE LINE PARAMETER REG. FROM TABLE
```

```
002160  012777  005542  177042          MOV     #VERDAT,@DMCAR  ;SET UP CURRENT ADDRESS REGISTER
002166  012777  177777  177036          MOV     #-1,@DMBCR      ;SET BYTE COUNT REGISTER
002174  005201                          INC     R1              ;UPDATE THE LINE NUMBER
002176  032701  000020                  BIT     #20,R1          ;LOADED ALL '16' LINES?
002202  001762                          BEQ     2$              ;NO
002204  005077  177030                  CLR     @DMSSR          ;SET SILO ALARM TO '0' IF NO CLOCK
002210  005737  014272                  TST     LINCLK          ;IS A LINE CLOCK AVAILABLE?
002214  001521                          BEQ     RESTRT          ;NO
002216  012777  000040  177014          MOV     #32.,@DMSSR     ;SET SILO ALARM FOR '32' CHARACTERS
002224  012777  006250  176764          MOV     #CLKSRV,@KWVTR  ;YES, SERVICE RECEIVER SILO ON INTERRUPT
002232  012777  000300  176760          MOV     #300,@KWBR      ;SET CLOCK TO BR LEVEL 6
002240  052777  000100  176746          BIS     #100,@KW11      ;SET THE INTERRUPT ENABLE

                                ;***************************************************************
                                ;EACH ACTIVE TRANSMITTER (DEFINED BY THE USER) IS NOW TESTED TO BE OPERATIONAL.
                                ;THIS IS DONE BY TRANSMITTING A '125' CHARACTER ON EACH ACTIVE TRANSMITTER
                                ;WITH THE MAINTENANCE BIT (9) SET. A CHECK IS THEN MADE THAT THE
                                ;TRANSMITTER INTERRUPTED AND THAT THE RECEIVER INTERRUPTED AND
                                ;RECEIVED THE '125' TEST CHARACTER.
                                ;THE ERRORS CODES FOR THIS CHECKING ARE:
                                ;14=NO TRANSMITTER INTERRUPT OCCURRED
                                ;16=NO RECEIVER INTERRUPT OCCURRED
                                ;***************************************************************

002246  012700  015704          TRNCHK: MOV     #ERRBUF,R0      ;SETUP THE ERROR BUFFER
002252  010005                          MOV     R0,R5
002254  052777  000100  176720          BIS     #100,@TKS       ;ENABLE KEYBOARD INTERRUPTS
002262  104000  014262                  PRINT,  DOT             ;TO INDICATE READY
002266  005077  176706                  CLR     @PSW            ;SET PROC. PRIORITY 00
002272  012701  014450                  MOV     #LPWORD,R1      ;SET UP POINTER TO CHECK ACTIVE TRANSMITTER
002276  012702  000001                  MOV     #1,R2
002302  005003                          CLR     R3
002304  022721  000077          1$:     CMP     #77,(R1)+       ;IS THIS LINE ACTIVE?
002310  002043                          BGE     3$              ;NO
002312  052777  001000  176702          BIS     #1000,@DMSCR    ;SET THE MAINTENANCE BIT
002320  056337  014276  015020          BIS     LINENO(R3),RECVCK ;SET THE RECEIVER CHECK SW.
002326  056337  014276  015022          BIS     LINENO(R3),ACTIVE ;YES, SET LINE ACTIVE BIT
002334  056337  014276  315152          BIS     LINENO(R3),TRNSWH
002342  050277  176666                  BIS     R2,@DMBAR       ;START TRANSMITTER
002346  005037  015006                  CLR     CLKCTR
002352  022737  000003  015006          CMP     #3,CLKCTR       ;WAIT FOR CLOCK INTERRUPT TO GIVE
002360  001374                          BNE     .-6             ;TRANSMITTER AMPLE TIME
002362  005737  015022                  TST     ACTIVE          ;HAS A TRANSMITTER INTERRUPT SERVICED?
002366  001405                          BEQ     2$              ;YES
002370  112720  000014                  MOVB    #14,(R0)+       ;NO, POST AS NO TRANSMITTER INTERRUPT
002374  110310                          MOVB    R3,(R0)         ;SET UP TO SAVE FAILING LINE NUMER
002376  106220                          ASRB    (R0)+
002400  000407                          BR      3$
002402  005737  015020          2$:     TST     RECVCK          ;DID THE RECEIVER INTERRUPT?
002406  001404                          BEQ     3$              ;YES
002410  112720  000016                  MOVB    #16,(R0)+       ;NO, POST AN RECEIVER ERROR
002414  110310                          MOVB    R3,(R0)         ;SAVE FAILING LINE NUMBER
002416  106220                          ASRB    (R0)+
002420  042777  001000  176574  3$:     BIC     #1000,@DMSCR    ;CLEAR THE MANINTENANCE BIT
```

```
                                CLR     ACTIVE
                                CLR     TRNSWM
                                CLR     RECVCK
                                ASL     R2              ;UPDATE POINTER
                                ADD     #2,R3           ;UPDATE OFFSET
                                CMP     #32.,R3         ;TESTED ALL LINES?
                                BNE     1$              ;NO
                                BR      MONITR          ;YES, ENTER THE MONITOR

                        ;***************************************************************
                        ;RESTART ENTRY POINT WHEN '^C' IS TYPED.
                        ;ENTRY HERE ONLY CLEARS USERS SOFTWARE SWITCHES AND RESETS THE ERROR
                        ;BUFFER POINTERS TO INHIBIT PRINTING FOR PREVIOUSLY BUFFERED ERRORS.
                        ;***************************************************************

RESTRT: MOV     #STACK,SP       ;RESET STACK POINTER
                MOV     #SENDSW,R1
4$:     CLR     (R1)+           ;CLEAR THE  '^C' SOFTWARE SWITCHES.
                CMP     #RECSWM,R1      ;DONE?
                BNE     4$
                CLR     PRTERR          ;PRINT ALL ERRORS
                MOV     #ERRBUF,R0      ;SETUP ERROR BUFFER
                MOV     R0,R5
                BIS     #100,@TKS       ;ENABLE KEYBOARD INTERRUPTS
                PRINT,  DOT             ;TO INDICATE READY
                CLR     @PSW            ;SET PROC. PRIORITY 0

                        ;***************************************************************
                        ;PROGRAM RUNS IN THE FOLLOWING SUBROUTINE BREAKING OUT TO SERVICE
                        ;DLM11, LINE CLOCK, READER AND KEYBOARD INTERRUPTS, IT ALSO RUNS
                        ;A BACKGROUND JOB OF PRINTING ERRORS ENCOUNTERED BY THE PROGRAM.
                        ;***************************************************************

MONITR: MOV     ACTIVE,@SWR     ;DISPLAY SYSTEM STATUS
                CMP     #ERRBUF+390.,R0 ;TEST THAT THE ERROR BUFFER ISN'T EXCEEDED
                BGT     MONTR1          ;BUFFER OK
                MOV     #ERRBUF,R0      ;NO, RE-SET THE BUFFER POINTER
                MOV     R0,R5
MONTR1: JSR     PC,SRVERR       ;CHECK ERROR BUFFER
                JSR     PC,SYSCK1       ;CHECK IF LINES ARE BEING VALIDATED
                JSR     PC,TSTBOT       ;CHECK IF ANY LINES ARE BEING BOOTED
                BR      MONITR

                        ;***************************************************************
                        ;ENTERED HERE TO CHECK STATUS OF ANY LINES BEING BOOTED
                        ;***************************************************************

TSTBOT: TST     BOOTFG          ;CURRENTLY BOOTING PROGRAMS?
                BEQ     TSTEXT          ;NO, EXIT
                CMP     REDONE,KSTOR4   ;YES, HAVE ALL TRANSMITTERS FINISHED?
                BNE     TSTEXT          ;NO, EXIT
                CLR     REDONE          ;YES, CLEAR COUNTER
                MOV     #READBF,BOOTP2  ;RESET READER BUFFER POINTER
                CLR     READCT          ;CLEAR THE CHARACTER COUNTER
```

```
002624  012777  000101  012322          MOV     #101,@RCSR          ;SET READER GO TO RESTART BOOT
002632  000207                  TSTEXT: RTS     PC                  ;RETURN

                                ;*******************************************************************
                                ;ENTERED HERE TO REPORT THE SYSTEM ERRORS, ALL ERRORS ARE BUFFERED
                                ;IN THE SERVICE ROUTINES I.E. RECEIVER, READER AND TRANSMITTER,
                                ;THESE ERRORS ARE THEN REPORTED AS BACKGROUND JOBS.
                                ;*******************************************************************

002634  020005                  SRVERR: CMP     R0,R5               ;ARE THERE ANY ERRORS PENDING?
002636  001441                          BEQ     SRVEXT              ;NO, EXIT
002640  005737  015132                  TST     RMODE               ;YES, DATA REPORT MODE REQUESTED?
002644  001106                          BNE     DATA                ;YES, GO TO DATA REPORT ROUTINE
002646  112537  015124                  MOVB    (R5)+,KSTOR2        ;GET THE ERROR CODE
002652  112537  015122                  MOVB    (R5)+,KSTOR1        ;GET FAILING UNIT NO.
002656  104000  012255          2$:     PRINT,  MES3                ;TEXT 'LINE'
002662  104002  015122                  BINDEC, KSTOR1              ;PRINT FAILING UNIT NO.
002666  013704  015124                  MOV     KSTOR2,R4           ;PICK UP OFFSET TO PRINT ERROR TYPE
002672  042704  177760                  BIC     #177760,R4
002676  006304                          ASL     R4
002700  016437  002744  002710          MOV     ERRTBL(R4),ERRMES+2
002706  104000  000000          ERRMES: PRINT,  HALT                ;MODIFIED TO PRINT ERROR MESSAGE
002712  022704  000024                  CMP     #24,R4              ;IS THIS A VERIFY DATA ERROR?
002716  001403                          BEQ     3$                  ;YES,
002720  022704  000036                  CMP     #36,R4              ;NO, IS THIS A CHECK DATA ERROR
002724  001006                          BNE     SRVEXT              ;NO, EXIT
002726  112537  015122          3$:     MOVB    (R5)+,KSTOR1        ;YES, PICK UP THE BAD DATA
002732  104003  015122                  OCTPR3, KSTOR1              ;PRINT IT
002736  104000  014262                  PRINT,  DOT
002742  000207                  SRVEXT: RTS     PC                  ;RETURN

002744  013224                  ERRTBL: CODE00                      ;- ILLEGAL RECEIVER INTERRUPT
002746  013260                          CODE01                      ;- OVERRUN ERROR
002750  013301                          CODE02                      ;- FRAMING ERROR
002752  013322                          CODE03                      ;- PARITY ERROR
002754  013342                          CODE04                      ;- ILLEGAL START CODE RECEIVED
002756  013501                          CODE05                      ;- ILLEGAL READER INTERRUPT
002760  013535                          CODE06                      ;- ILLEGAL TRANSMITTER INTERRUPT
002762  013571                          CODE07                      ;- ATTEMPT TO RECEIVE WHILE IN SEND MODE
002764  013642                          CODE10                      ;- TRANSMITTER NON-EX MEMORY INTERRUPT
002766  013711                          CODE11                      ;- VERIFY CHECK OK
002770  013730                          CODE12                      ;- DATA VERIFY ERROR, SENT=377 RECV'D=XXX
002772  013775                          CODE13                      ;- NO VERIFY DATA RETURNED
002774  014030                          CODE14                      ;- NO TRANSMITTER INTERRUPTS OCCURRING
002776  014077                          CODE15                      ;- IS ACTIVE, CAN'T VERIFY - TYPE '^E'
003000  014146                          CODE16                      ;- NO RECEIVER INTERRUPTS OCCURRING
003002  014212                          CODE17                      ;- DATA CHECK ERROR, SENT=377 RECV'D=XXX

                                ;***********************************************************
                                ;ENTERED HERE TO REPORT LINES THAT DIDN'T RESPOND WHEN VERIFIED
                                ;***********************************************************

003004  005737  015004          SYSCK1: TST     SYSSH1              ;ARE THERE ANY VALIDATING LINES HUNG?
003010  001423                          BEQ     SYSEXT              ;NO, EXIT
```

H2

```
                                                MOV     SYSSW1,R1       ;YES, REPORT THEM
                                                MOV     #1,R2           ;SET UP AS POLLING BIT
                                                CLR     R3              ;SET UP AS LINE NO.
                                        18$:    BIT     R2,R1           ;LINE HUNG?
                                                BEQ     28              ;NO
                                                MOVB    #13,(R0)+       ;YES, POST AS NO DATA RETURNED ON VERIFY
                                                MOVB    R3,(R0)         ;SET UP LINE NO.
                                                ASRB    (R0)+
                                        28$:    ASL     R2
                                                ADD     #2,R3
                                                CMP     #32.,R3         ;TESTED ALL LINES?
                                                BNE     18$
                                                CLR     SYSSW1          ;CLEAR THE SOFTWARE SWITCH
                                        SYSEXT: RTS     PC              ;RETURN

                                        ;*****************************************************************
                                        ;ENTERED HERE WHEN IN DIAGNOSTIC MODE  TO TYPE DATA RECEIVED FROM THE VT28
                                        ;*****************************************************************

                                        DATA:   TSTB    @TPB
                                                BPL     .-4
                                                CMPB    #377,(R5)       ;CHAR. = TO START CODE?
                                                BNE     PRTAS1          ;NO, CHECK FOR 'LF' CODE
                                                MOVB    #336,@TPB       ;YES, CHANGE CODE TO '^'.
                                        PRTAS0: CLR     PRTCNT          ;CLR PRINT COUNT.
                                                PRINT,  CRLF
                                                BR      EXIT

                                        PRTAS1: CMPB    #12,(R5)        ;CHAR. = TO 'LF'
                                                BEQ     PRTAS0          ;YES, PRINT 'CR-LF'
                                                MOVB    (R5),@TPB       ;NO, PRINT CHAR. AS IS.
                                                INC     PRTCNT          ;INC. PRINT COUNT
                                                CMP     #64.,PRTCNT     ;LINE FULL?
                                                BEQ     PRTAS0          ;YES, PRINT CRLF.
                                        EXIT:   TSTB    (R5)+           ;INC. BUFFER POINTER.
                                                RTS     PC              ;RETURN

                                        ;*****************************************************************
                                        ;ENTERED HERE TO SERVICE KEYBOARD INTERRUPTS
                                        ;THE CHARACTERS SERVICED BY THE 'KEYSRV' ROUTINE ARE CATEGORIZED INTO
                                        ;ONE OF THREE (3) CATEGORIES: (1)CONTROL CHARACTERS, (2)CHARACTERS ENTERED WHILE
                                        ;IN THE SEND MODE, (3)LINE NO'S & ADDRESSES. ALL CONTROL CHARACTERS ARE
                                        ;TESTED AND VALIDATED BY THE 'KEYSRV' ROUTINE. IF IT ISN'T A CONTROL CHARACTER
                                        ;A TEST IS MADE TO SEE IF THE SEND MODE IS ACTIVE (CONSFL=1). THESE
                                        ;CHARACTERS ARE HANDLED BY THE 'SENDLN' ROUTINE. IF NEITHER OF THE ABOVE ARE
                                        ;TRUE, THE CHARACTER IS HANDLED BY THE 'SETLN2' ROUTINE. THIS ROUTINE
                                        ;ASSEMBLES LINE NUMBERS, REGISTER ADDRESSES AND BAUD RATES.
                                        ;*****************************************************************

                                        KEYSRV: MOV     R1,-(SP)        ;SAVE WORKING REG.'S
                                                MOV     R2,-(SP)
                                                MOV     R3,-(SP)
                                                MOV     R4,-(SP)
                                                MOVB    @TKB,R1         ;GET CHAR.
```

```
  487  003164  042701  177600            BIC     #177600,R1      ;STRIPE OFF PARITY BIT
  488  003170  010137  015030            MOV     R1,$CHAR        ;SAVE THE CHAR.
  489  003174  022701  000015            CMP     #15,R1          ;CHAR. = TO 'CR'?
  490  003200  001003                    BNE     48              ;NO
  491  003202  004737  006226            JSR     PC,TYPEIT       ;YES, ECHO IT
  492  003206  000554                    BR      EXITK8          ;EXIT
  493  003210  022701  000012      481:  CMP     #12,R1          ;CHAR. = TO 'LF'?
  494  003214  001536                    BEQ     GETLN           ;YES
  495  003216  020127  000033            CMP     R1,#33          ;CHAR. PRINTABLE?
  496  003222  002133                    BGE     GETLN           ;YES
  497  003224  012701  000136            MOV     #136,R1         ;NO, PRINT AS A CONTROL CHAR.
  498  003230  004737  006226            JSR     PC,TYPEIT
  499  003234  013701  015030            MOV     $CHAR,R1
  500  003240  052701  000100            BIS     #100,R1         ;MAKE CHAR. PRINTABLE
  501  003244  004737  006226            JSR     PC,TYPEIT
  502  003250  122701  000101            CMPB    #101,R1         ;CHAR. = TO '^A'?
  503  003254  001002                    BNE     .+6             ;NO
  504  003256  000137  001342            JMP     START           ;YES, RESTART PROGRAM
  505  003262  122701  000103            CMPB    #103,R1         ;CHAR. = TO '^C' ?
  506  003266  001557                    BEQ     CONC
  507  003270  122701  000105            CMPB    #105,R1         ;^E FOR ESCAPE AND RESTART
  508  003274  001002                    BNE     .+6
  509  003276  000137  002070            JMP     SERVCE          ;YES, DO A COMPLETE RESTART
  510  003302  005737  015010            TST     SYSBWM          ;SYSTEM ACTIVE?
  511  003306  001074                    BNE     QMARK           ;YES, IGNORE REQUEST
  512  003310  005237  015010            INC     SYSBWM          ;NO, SET REQUEST SW.
  513  003314  122701  000102            CMPB    #102,R1         ;CHAR. = TO '^B'?
  514  003320  001002                    BNE     108             ;NO
  515  003322  000137  005550            JMP     BOOT            ;YES, BOOT TAPE TO VT20.
  516  003326  122701  000130      108:  CMPB    #130,R1         ;CHAR.  = '^X' ?
  517  003332  001005                    BNE     118             ;NO
  518  003334  012737  000001  005546    MOV     #1,VERPT        ;YES-LOAD VERIFY REPEAT FLAG
  519  003342  000137  005310            JMP     VERIFY          ;AND GO VERIFY
  520  003346  122701  000124      118:  CMPB    #124,R1         ;CHAR. = '^T'?
  521  003352  001003                    BNE     128             ;NO
  522  003354  005137  007646            COM     PRTERR          ;COMPLEMENT PRINT INHIBIT FLAG
  523  003360  000463                    BR      PRTDOT          ;AND EXIT
  524  003362  122701  000104      128:  CMPB    #104,R1         ;CHAR. = '^D' ?
  525  003366  001505                    BEQ     COND            ;YES, DIAGNOSTIC MODE
  526  003370  122701  000110            CMPB    #110,R1         ;^H (HOLD)?
  527  003374  001466                    BEQ     CONH
  528  003376  122701  000122            CMPB    #122,R1         ;^R (RELEASE)?
  529  003402  001521                    BEQ     CONR
  530  003404  122701  000123            CMPB    #123,R1         ;^S (SEND)?
  531  003410  001002                    BNE     .+6             ;NO
  532  003412  000137  004066            JMP     CONS
  533  003416  122701  000114      18:   CMPB    #114,R1         ;^L (LIST SYSTEM STATUS)
  534  003422  001002                    BNE     28              ;NO
  535  003424  000137  005006            JMP     CONL            ;YES
  536  003430  122701  000120      28:   CMPB    #120,R1         ;^P (PRINT)?
  537  003434  001571                    BEQ     CONP
  538  003436  122701  000117            CMPB    #117,R1         ;^O (SUPPRESS PRINTING)
  539  003442  001007                    BNE     38              ;NO
  540  003444  005237  015026            INC     OSWITCH         ;YES, SET THE SOFTWAE FLAG
```

```
    541  003450  005337  015010              DEC     SYSSWH
    542  003454  112701  000040              MOVB    #40,R1          ;PRINT SPACE
    543  003460  000427                      BR      EXITKS          ;EXIT
    544  003462  122701  000126      3S:     CMPB    #126,R1         ;^V (VERIFY LINE)
    545  003466  001002                      BNE     5S              ;NO
    546  003470  000137  005310              JMP     VERIFY          ;YES, VERIFY LINE(S)
    547  003474  005337  015010      5S:     DEC     SYSSWH          ;CLR SYSTEM SWITCH ON ILLEGAL ENTRY
    548  003500  112701  000077      QMARK:  MOVB    #77,R1          ;ILLEGAL CHAR.
    549  003504  004737  006226      KEY1:   JSR     PC,TYPEIT       ;TYPE '?',
    550  003510  000413                      BR      EXITKS          ;IGNORE IT
    551  003512  005737  015040      GETLN:  TST     CONSFL          ;ARE WE IN SEND MODE?
    552  003516  001402                      BEQ     .+6             ;NO
    553  003520  000137  004136              JMP     SENDLN          ;YES, GO TO THE SEND ROUTINE
    554  003524  000137  004416              JMP     GETLN2          ;GO TO LINE NO. INPUT ROUTINE
    555
    556  003530  005037  015010      PRTDOT: CLR     SYSSWH
    557  003534  104000  014262              PRINT,  DOT
    558  003540  012604              EXITKS: MOV     (SP)+,R4        ;RESTORE THE WORKING REG.'S
    559  003542  012603                      MOV     (SP)+,R3
    560  003544  012602                      MOV     (SP)+,R2
    561  003546  012601                      MOV     (SP)+,R1
    562  003550  000002                      RTI                     ;EXIT
    563                              ;*****************************************************************
    564                              ;ENTERED HERE ON RECEIPT A '^H' TO HOLD A SPECIFIED TRANSMISSION LINE.
    565                              ;THIS ROUTINE SIMPLY SETS A SOFTWARE SWITCH (HOLDSW) TO INDICATE THAT A
    566                              ;SPECIFIED LINE OR LINES ARE TO BE HELD FROM TRANSMITTING DATA BACK TO THE VT20
    567                              ;COMMAND FORMAT: ^H (LINE NO.),(LINE NO.),...ETC (UP TO 16 LINE NO.'S
    568                              ;*****************************************************************
    569
    570  003552  004737  004626      CONH:   JSR     PC,FORMIT       ;FORM OFFSETS
    571  003556  056337  014276  014614      BIS     LINENO(R3),HOLDSW       ;SET HOLD SW. FOR THIS LINE.
    572  003564  005337  014732              DEC     BCDCTR          ;ANY MORE LINES TO BE HELD?
    573  003570  001403                      BEQ     CONH1           ;NO
    574  003572  004737  004632              JSR     PC,FORMON       ;YES, FORM OFFSET FOR LINE
    575  003576  000767                      BR      CONH+4          ;HOLD NEXT LINE
    576  003600  000753              CONH1:  BR      PRTDOT          ;EXIT
    577
    578                              ;*****************************************************************
    579                              ;SUBROUTINE ENTERED ON RECEIPT OF A '^D' TO ENTER DIAGNOSTIC MODE
    580                              ;*****************************************************************
    581
    582  003602  005137  015132      COND:   COM     RMODE           ;SET/CLEAR DIAGNOSTIC SW.
    583  003606  001403                      BEQ     1S              ;RESET POINTERS IF CLEARED
    584  003610  104000  012500              PRINT,  MES9            ;TEXT 'DIAG. MODE ENABLED'
    585  003614  000403                      BR      2S              ;EXIT
    586  003616  012700  015704      1S:     MOV     #ERRBUF,R0      ;RESET BUFFER POINTERS
    587  003622  010005                      MOV     R0,R5
    588  003624  000741              2S:     BR      PRTDOT          ;EXIT
    589
    590                              ;*****************************************************************
    591                              ;ENTERED ON RECEIPT OF A '^C' TO CLEAR ALL USER SOFTWARE SWITCHES.
    592                              ;*****************************************************************
    593
    594  003626  005002              CONC:   CLR     R2
```

```
595  003630  005003                  CLR     R3
596  003632  012604                  MOV     (SP)+,R4        ;RESTORE THE WORKING REG.'S
597  003634  012603                  MOV     (SP)+,R3
598  003636  012602                  MOV     (SP)+,R2
599  003640  012601                  MOV     (SP)+,R1
600  003642  000137  002460          JMP     RESTRT
601
602                                  ;*****************************************************************
603                                  ;ENTERED HERE ON RECEIPT OF A '^R' TO RELEASE A SPECIFIED TRANSMISSION
604                                  ;LINE. THIS COMMAND RELEASES HELD LINES IN ONE OF THREE WAYS; (1)LINES THAT
605                                  ;ARE INDICATED TO BE RELEASED AND WEREN'T BEING HELD ARE IGNORED, (2)LINES THAT
606                                  ;ARE BEING HELD BUT HAVE NO DATA PENDING, SIMPLY CLEAR THE HOLD SWITCH (HOLDSW),(3)LINES
607                                  ;THAT ARE BEING HELD AND HAVE DATA PENDING ARE RELEASED AND THE TRANSMITTERS FOR
608                                  ;THOSE LINES ARE INITIALIZED AND ACTIVATED.
609                                  ;*****************************************************************
610
611  003646  004737  004626  CONR1:  JSR     PC,FORMIT       ;FORM THE OFFSETS
612  003652  004737  003660          JSR     PC,RELESE       ;RELEASE HELD LINES
613  003656  000724                  BR      PRTDOT          ;EXIT
614
615  003660  036337  014276  014614 RELESE: BIT     LINENO(R3),HOLDSW       ;IS LINE BEING HELD?
616  003666  001445                  BEQ     CONR2           ;NO, EXIT
617  003670  046337  014276  014614 CONR11: BIC     LINENO(R3),HOLDSW       ;CLR HOLD SW. FOR THIS LINE.
618  003676  046337  014276  014616         BIC     LINENO(R3),SENDSW       ;CLEAR THE SEND SW.
619  003704  036337  014276  015150         BIT     LINENO(R3),PENDIN       ;IS DATA PENDING ON THIS LINE?
620  003712  001433                  BEQ     CONR2           ;NO SIMPLY RELEASE THE LINE
621  003714  056337  014276  015152         BIS     LINENO(R3),TRNSWH ;YES, SET TRNSMITTER SW.
622  003722  012777  000340  175258         MOV     #340,@PSW       ;TEMPORARILY INHIBIT ANY INTERRUPTS
623  003730  046337  014276  015150         BIC     LINENO(R3),PENDIN       ;CLEAR THE PEND SW.
624  003736  056337  014276  015022         BIS     LINENO(R3),ACTIVE ;SET WHEN TRANSMITTING
625  003744  052702  030500                  BIS     #30500,R2
626  003750  010277  175246                  MOV     R2,@DMSCR
627  003754  016377  015160  175250         MOV     BYTECT(R3),@DMBCR ;SET UP BYTE COUNT
628  003762  016377  014336  175240         MOV     BUFADR(R3),@DMCAR ;SET UP CURRENT ADDRESS
629  003770  056377  014276  175236         BIS     LINENO(R3),@DMBAR ;START UP TRANSMITTER
630  003776  005077  175176                  CLR     @PSW            ;RE-ENABLE INTERRUPTS
631  004002  005337  014732          CONR2: DEC     BCDCTR          ;ANY MORE LINES TO BE RELEASED?
632  004006  003403                  BLE     CONR3           ;NO
633  004010  004737  004632          JSR     PC,FORMON       ;YES, FORM OFFSET FOR NEXT LINE
634  004014  000721                  BR      RELESE          ;RELEASE NEXT LINE
635  004016  000207          CONR3: RTS     PC              ;RETURN
636
637                                  ;*****************************************************************
638                                  ;ENTERED HERE ON RECEIPT OF A '^P' TO PRINT THE DATA IN A SPECIFIED
639                                  ;LINES BUFFER, THIS CAN EITHER BE DATA RECEIVED FROM A SLAVE VT28
640                                  ;OR DATA ENTERED WHILE IN THE SEND MODE.
641                                  ;*****************************************************************
642
643  004020  005077  175154  CONP:   CLR     @PSW            ;ENABLE FURTHER INTERRUPTS
644  004024  005037  015132          CLR     RMODE           ;CLR DIAGNOSTIC MODE
645  004030  004737  004626          JSR     PC,FORMIT       ;FORM THE OFFSETS
646  004034  010437  004042  CONP1: MOV     R4,CONP2+2      ;SET UP BUFFER TO BE PRINTED
647  004040  104008  000000  CONP2: PRINT,  HALT
648  004044  005337  014732          DEC     BCDCTR          ;DONE PRINTING ALL REQUESTS
```

```
 649  004050  003405                        BLE     CONP3           ;YES
 650  004052  004737  004632                JSR     PC,FORMON       ;NO, FORM NEXT OFFSET
 651  004056  104000  014260                PRINT,  CRLF
 652  004062  000764                        BR      CONP1
 653  004064  000621                CONP3:  BR      PRTDOT          ;EXIT
 654
 655                                        ;*****************************************************************
 656                                        ;SUBROUTINE ENTERED TO SETUP TO SEND DATA FROM KB TO SPECIFIED LINE
 657                                        ;CALLING SEQUENCE: "S(LINE NO.),(LINE NO.),...ETC.  ;UP TO 16 LINE NO.'S
 658                                        ;               DATA                            ;UP TO 384 CHAR.'S
 659                                        ;               'ALT'MODE                       ;TO TERMINATE SEND MODE
 660                                        ;*****************************************************************
 661
 662  004066  004737  004626        CONS:   JSR     PC,FORMIT       ;FORM THE OFFSETS
 663  004072  005237  015040                INC     CONSFL          ;SET SOFTWARE SW.
 664  004076  010463  014376        CONS1:  MOV     R4,BUFPTR(R3)   ;SET UP THE BUFFER POINTER
 665  004102  012763  000005  015160        MOV     #5,BYTECT(R3)   ;INITIALIZE THE BYTE COUNTER
 666  004110  056337  014276  014616        BIS     LINENO(R3),SENDSW       ;SET THE SEND SW.
 667  004116  005337  014732                DEC     SCOCTR          ;ANY MORE LINES TO BE SETUP?
 668  004122  003403                        BLE     CONS2           ;NO
 669  004124  004737  004632                JSR     PC,FORMON       ;YES, SET THEM UP
 670  004130  000762                        BR      CONS1
 671  004132  000137  003540        CONS2:  JMP     EXITKB          ;EXIT
 672
 673                                        ;*****************************************************************
 674                                        ;ENTERED HERE FROM THE 'KEYSRV' ROUTINE WHEN THE SEND SWITCH (CONSFL) IS SET
 675                                        ;*****************************************************************
 676
 677  004136  004737  006226        SENDLN: JSR     PC,TYPEIT       ;ECHO CHAR.
 678  004142  005001                        CLR     R1
 679  004144  005002                        CLR     R2
 680  004146  005003                        CLR     R3
 681  004150  036337  014276  014616  CONS8:  BIT     LINENO(R3),SENDSW       ;SEND TO THIS LINE?
 682  004156  001422                        BEQ     TAGC            ;NO, CHECK NEXT LINE
 683  004160  016304  014376                MOV     BUFPTR(R3),R4   ;SET UP BUFFER POINTER
 684  004164  122737  000033  015036        CMPB    #33,SCHAR       ;*TO 'ALT' TO TERMINATE SEND MODE?
 685  004172  001424                        BEQ     TAGA            ;YES
 686  004174  122737  000175  015036        CMPB    #175,SCHAR      ;* ALT ON ASR33
 687  004202  001420                        BEQ     TAGA            ;YES,
 688
 689  004204  113724  015036        SENDBF: MOVB    SCHAR,(R4)+     ;SAVE CHARACTER IN BUFFER
 690  004210  112714  000014                MOVB    #EOP,(R4)       ;TERIMATE THE BUFFER
 691  004214  010463  014376                MOV     R4,BUFPTR(R3)   ;SAVE BUFFER POINTER
 692  004220  005263  015160                INC     BYTECT(R3)      ;COUNT NO. OF BYTES SAVED
 693  004224  005202                TAGC:   INC     R2              ;UPDATE THE LINE NO.
 694  004226  062703  000002                ADD     #2,R3
 695  004232  022703  000040                CMP     #32.,R3         ;DONE ALL LINES?
 696  004236  001344                        BNE     CONS8           ;NO
 697  004240  000137  003540                JMP     EXITKB          ;YES, EXIT
 698  004244  005037  015040        TAGA:   CLR     CONSFL
 699  004250  112714  000014                MOVB    #EOP,(R4)       ;TERMINATE BUFFER
 700  004254  036337  014276  014616  TAGB:  BIT     LINENO(R3),SENDSW       ;SENDING ON THIS LINE?
 701  004262  001445                        BEQ     TAGE            ;NO, CHECK NEXT LINE
 702  004264  046337  014276  014616        BIC     LINENO(R3),SENDSW       ;CLEAR THE SEND SW.
```

```
723  004272  005463  015160                  NEG     BYTECT(R3)          ;COMPLIMENT BYTE COUNT
724  004276  036337  014276  014614          BIT     LINENO(R3),HOLDSW   ;IS THIS LINE BEING HELD?
725  004304  001404                          BEQ     TAGD                ;NO
726  004306  056337  014276  015150          BIS     LINENO(R3),PENDIN   ;YES, SET THE PENDING SW.
727  004314  000430                          BR      TAGE
728  004316  012777  000340  174654  TAGD1:  MOV     #340,@PSW           ;TEMPORARILY INHIBIT FURTHER INTERRUPTS
729  004324  052702  030100                  BIS     #30100,R2           ;SET UP TO INITIALIZE TRANSMITTER
730  004330  010277  174666                  MOV     R2,@DMSCR
731  004334  016377  015160  174670          MOV     BYTECT(R3),@DMBCR
732  004342  016377  014336  174660          MOV     BUFADR(R3),@DMCAR
733  004350  056337  014276  015152          BIS     LINENO(R3),TRNSWM   ;SET TRNSMITTER SW.
734  004356  056337  014276  015022          BIS     LINENO(R3),ACTIVE
735  004364  056377  014276  174642          BIS     LINENO(R3),@DMBAR   ;START TRANSMITTER
736  004372  005077  174602                  CLR     @PSW                ;RE-ENABLE INTERRUPTS
737  004376  005202                  TAGE1:  INC     R2                  ;UPDATE THE LINE NO.
738  004400  062703  000002                  ADD     #2,R3
739  004404  022703  000040                  CMP     #32.,R3
740  004410  001321                          BNE     TAGB
741  004412  000137  003530                  JMP     @RTDOT              ;EXIT
742
743                                          ;*****************************************************************
744                                          ;SUBROUTINE ENTERED TO FORM ADDRESSES, BAUD RATES OR LINE NUMBER
745                                          ;*****************************************************************
746
747  004416  022701  000177          GETLN2: CMP     #177,R1             ;CHAR. = RUBOUT?
748  004422  001446                          BEQ     RUBOUT              ;YES
749  004424  005737  015024                  TST     RUBSWM              ;IS RUBOUT SW. SET?
750  004430  001402                          BEQ     1$                  ;NO
751  004432  104000  014265                  PRINT,  SLASH               ;YES, PRINT'/'
752  004436  005037  015024          1$:     CLR     RUBSWM              ;CLR SW.
753  004442  004737  006226                  JSR     PC,TYPEIT           ;ECHO CHAR.
754  004446  120127  000054                  CMPB    R1,#54              ;CHAR. = TO ','?
755  004452  001410                          BEQ     3$                  ;YES, SAVE IT
756  004454  120127  000060                  CMPB    R1,#60              ;LEGAL NO.?
757  004460  002403                          BLT     2$                  ;NO
758  004462  120127  000071                  CMPB    R1,#71
759  004466  003402                          BLE     3$                  ;YES
760  004470  000137  003500          2$:     JMP     QMARK               ;NO, TYPE '?'
761  004474  110177  010312          3$:     MOVB    R1,@TTYPTR          ;SAVE CHAR. IN TTY BUFFER
762  004500  005237  015012                  INC     TTYPTR              ;UPDATE POINTER
763  004504  105077  010302                  CLRB    @TTYPTR             ;TERMINATE BUFFER WITH NULL
764  004510  042701  177770                  BIC     #177770,R1          ;STRIP
765  004514  006337  015044                  ASL     DEVADR              ;LEFT JUSTIFY 3 PLACES
766  004520  006337  015044                  ASL     DEVADR
767  004524  006337  015044                  ASL     DEVADR
768  004530  060137  015044                  ADD     R1,DEVADR           ;THEN ADD NEW DIGIT
769  004534  000137  003540                  JMP     EXITKB              ;EXIT
770
771  004540  005737  015024          RUBOUT: TST     RUBSWM              ;IS THE RUBOUT SW. SET?
772  004544  001002                          BNE     1$                  ;YES
773  004546  104000  014265                  PRINT,  SLASH
774  004552  005237  015024          1$:     INC     RUBSWM              ;SET SW.
775  004556  005337  015012                  DEC     TTYPTR              ;BACK UP BUFFER POINTER
776  004562  117701  010224                  MOVB    @TTYPTR,R1          ;PICK UP PREVIOUS CHAR.
```

```
                        CLRB    @TTYPTR         ;TERMINATE BUFFER
                        JSR     PC,TYPEIT       ;ECHO CHAR.
                        MOV     DEVADR,R1
                        BIC     #177770,R1
                        ASR     DEVADR
                        ASR     DEVADR
                        ASR     DEVADR
                        JMP     EXITKS          ;EXIT

;*****************************************************************
;SUBROUTINE ENTERED TO FORM THE ADDRESS AND REGISTER OFFSETS
;*****************************************************************

FORMIT: JSR     PC,GETLN1       ;FORM LINE NO.
FORMON: CLR     R1
        CLR     R2
        CLR     R3
        MOV     @BCDPTR,R4      ;PICK UP LINE NUMBER
        ADD     #2,BCDPTR       ;UPDATE POINTER FOR NEXT ENTRY
        TST     R4              ;IS THE LINE NO. '0'?
        BEQ     1$              ;YES, NO WORK NEEDED
        CMP     #15.,R4         ;LEGAL LINE NO?
        BGE     2$              ;YES
        MOV     #77,R1
        JSR     PC,TYPEIT
        BR      FORMIT
2$:     INC     R2              ;UPDATE LINE NO.
        ADD     #2.,R3          ;FORM THE ADDRESS OFFSET
        DEC     R4              ;DONE?
        BNE     2$              ;NO
1$:     MOV     BUFADR(R3),R4   ;SET UP THE BUFFER ADDRESS POINTER
        CLR     (R4)+
        CLR     (R4)+
        RTS     PC              ;RETURN

;*****************************************************************
;SUBROUTINE TO ENABLE FORMING OF A LINE NUMBER
;*****************************************************************

GETLN1: CLR     DEVADR          ;SET UP TO GET LINE NUMBER
        CLR     SCHAR
        CLR     TTYBUF
        MOV     #TTYBUF,TTYPTR  ;SET UP BUFFER POINTER
        BIS     #100,@TKS       ;ENABLE TTY INTERRUPTS
        CLR     @PSW            ;GET LINE NO.
1$:     MOV     ACTIVE,@SWR     ;DISPLAY SYSTEM STATUS
        CMP     SCHAR,#15       ;EXIT ON CARRIAGE RETURN
        BNE     1$
        JSR     PC,BCDBIN       ;CONVERT LINE NO. TO OCTAL
        PRINT   ,CRLF
        RTS     PC

;*****************************************************************
;ENTERED HERE ON RECEIPT OF A '^L' TO LIST SYSTEM STATUS. THE '^L'
;OPTION CAN BE USED IN ONE OF TWO WAYS: (1) TYPE '^L (CR)' TO PRINT THE
```

```
                                ;STATUS OF ALL DH11 LINES. (2) TYPE '^L & LINE NO.' TO PRINT THE STATUS
                                ;OF SPECIFIED LINE(S).
                                ;*****************************************************************
005006  005077  174166  CONL:  CLR     @PSW            ;ENABLE FURTHER INTERRUPTS
005012  004737  004626          JSR     PC,FORMIT       ;FORM THE LINE NUMBER
005016  012701  000020          MOV     #16.,R1         ;SET UP THE NO. OF DH LINES
005022  104000  012415          PRINT,  MES8            ;PRINT HEADER
005026  016337  015032  18:     MOV     R3,LINNO
005032  006237  015032          ASR     LINNO           ;SET UP THE LINE NO.
005036  104000  014260  28:     PRINT,  CRLF
005042  104002  015032          BINDEC, LINNO           ;PRINT THE LINE NO.
005046  016337  015222  015120  MOV     RECNTR(R3),TEMP
005054  104002  015120          BINDEC, TEMP            ;PRINT NO. OF BLOCKS RECEIVED
005060  016337  015370  015120  MOV     OR(R3),TEMP
005066  104002  015120          BINDEC, TEMP            ;PRINT NO. OF OVERRUN ERRORS
005072  016337  015474  015120  MOV     PAR(R3),TEMP
005100  104002  015120          BINDEC, TEMP            ;PRINT NO. OF PARITY ERRORS
005104  016337  015432  015120  MOV     FRM(R3),TEMP
005112  104002  015120          BINDEC, TEMP            ;PRINT NO. OF FRAMING ERRORS
005116  016337  015600  015120  MOV     TRN(R3),TEMP
005124  104002  015120          BINDEC, TEMP            ;PRINT NO. OF TRANSMITTER ERRORS
005130  016337  015536  015120  MOV     ST(R3),TEMP
005136  104002  015120          BINDEC, TEMP            ;PRINT NO. OF START CODE ERRORS
005142  005037  015120          CLR     TEMP
005146  036337  014276  014614  BIT     LINENO(R3),HOLDSW       ;IS THIS LINE BEING HELD?
005154  001402                  BEQ     .+6             ;NO
005156  005237  015120          INC     TEMP
005162  104002  015120          BINDEC, TEMP            ;PRINT STATUS IF HELD
005166  005037  015120          CLR     TEMP
005172  036337  014276  015150  BIT     LINENO(R3),PENDIN       ;IS THIS LINE PENDING?
005200  001402                  BEQ     .+6             ;NO
005202  005237  015120          INC     TEMP
005206  104002  015120          BINDEC, TEMP            ;PRINT STATUS OF PENDING
005212  010302                  MOV     R3,R2
005214  006302                  ASL     R2
005216  016237  014512  014440  MOV     BAUDMS(R2),MSGBUF
005224  062702  000002          ADD     #2,R2
005230  016237  014512  014442  MOV     BAUDMS(R2),MSGBUF+2
005236  005037  014444          CLR     MSGBUF+4
005242  104000  014440          PRINT,  MSGBUF          ;PRINT THE LINE BAUD RATE
005246  005237  015032          INC     LINNO           ;UPDATE THE LINE NO.
005252  062703  000002          ADD     #2,R3           ;UPDATE THE OFFSET NO.
005256  105737  016526          TSTB    TTYBUF          ;WAS A SPECIFIED LINE REQUESTED?
005262  001002                  BNE     38              ;YES, EXIT
005264  005301                  DEC     R1              ;NO, DONE ALL LINES?
005266  001263                  BNE     28              ;NO
005270  005337  014732  38:     DEC     @CDCTR          ;DONE ALL LINES?
005274  003403                  BLE     48              ;YES, EXIT
005276  004737  004632          JSR     PC,FORMON       ;NO SET UP NEXT LINE
005302  000651                  BR      18
005304  000137  003530  48:     JMP     PRTDOT
                                ;*****************************************************************
```

```
                        ;VERIFY LINE ROUTINE
                        ;ENTERED HERE ON RECEIPT OF A '^V'.  THIS ROUTINE IS USED TO VERIFY THAT A
                        ;SELECTED DH11 LINE OR LINES ARE FUNCTIONING I.E. TRANSMITTING & RECEIVING.
                        ;TO CALL THIS ROUTINE, TYPE: '^V LINE NO, LINE NO,...'(CR).  THE SELECTED
                        ;LINE(S) WILL THEN HAVE A CODE OF '125' TRANSMITTED OVER THEM (REFER TO NOTE).
                        ;A CHECK IS THEN MADE THAT ALL LINES RESPONDED WITHIN 16 MSEC. WITH THE
                        ;CORRECT DATA.  THIS CODE IS TRANSMITTED '5' TIMES PER LINE AND THEN THE
                        ;MESSAGE: "LINE XXX VERIFIED OK" IS TYPED.  IF A LINE FAILS TO RESPOND,
                        ;THE MESSAGE: "LINE XXX NO VERIFY DATA RETURNED" IS TYPED.  IF A
                        ;LINE RESPONDS BUT THE DATA IS INVALID, THE MESSAGE: "LINE XXX VERIFY DATA
                        ;ERROR, SENT =125 RECV'D=XXX" IS TYPED.
                        ;
                        ;NOTE:  IN ODRER FOR THIS TEST TO FUNCTION, EITHER 'TST21' OF THE VT28
                        ;DIAGNOSTIC MUST BE LOADED AND RUNNING WITH 'SW00 & SW01' SET OR THE
                        ;FOLLOWING DL11 ECHO PATCH ROUTINE MUST BE TOGGLED INTO THE VT28
                        ;SYSTEM UNDER TEST.
                        ;
                        ;1000/  105737  175610          TSTB @#DLRCSR   ;WAIT FOR DATA
                        ;1004/  100375                  BPL  .-4
                        ;1006/  113737  175612 175606   MOVB @#DLRBUF,@DLXBUF
                        ;1016/  771                     BR   .-14       ;WAIT FOR NEXT CHAR
                        ;
                        ;WHERE: # ADDRESS OF SELECTED DL11 RECEIVER CONTROL STATUS REGISTER
                        ;       + ADDRESS OF SELECTED DL11 RECEIVER DATA BUFFER REGISTER
                        ;       NNNNNN# ADDRESS OF SELECTED DL11 TRANSMITTER DATA BUFFER REGISTER
                        ;*************************************************************

005310  004737  004626        VERIFY: JSR     PC,FORMIT       ;FORM THE SELECTED LINE NUMBER
005314  013737  014732  005544        MOV     BCDCTR,LINSTR   ;STORE LINE COUNT IN CASE LOOP SET
005322  056337  014276  015004  VFRPT: BIS     LINENO(R3),SYSSW1
005330  012763  000001  014626        MOV     #1,VRFSWH(R3)   ;SET THE VERIFY SWITCH
005336  004737  005406                JSR     PC,VRFSND       ;TRANSMIT THE VERIFY CHARACTER
005342  005337  014732        VERNXT: DEC     BCDCTR          ;DONE ALL LINES?
005346  001403                        BEQ     VRFEXT          ;YES,CHECK REPEAT FLAG

005350  004737  004632        VERLN:  JSR     PC,FORMON       ;NO, FORM THE NEXT LINE NUMBER
005354  000762                        BR      VFRPT
005356  005737  005546        VRFEXT: TST     VERPT           ;REPEAT?
005362  001407                        BEQ     3$              ;NO-EXIT
005364  013737  005544  014732        MOV     LINSTR,BCDCTR   ;RESET LINE COUNTER
005372  012737  014736  014734        MOV     #BCDBUF,BCDPTR  ;RESET THE LINE POINTER
005400  000763                        BR      VERLN           ;AND REPEAT TESTS
005402  000137  003530        3$:     JMP     PRTDOT

005406  036337  014276  015146  VRFSND: BIT     LINENO(R3),RECSWH ;IS LINE CURRENTLY RECEIVING?
005414  001004                        BNE     1$              ;YES, REPORT LINE AS ACTIVE
005416  036337  014276  015152        BIT     LINENO(R3),TRNSWH ;IS LINE TRANSMITTING?
005424  001413                        BEQ     2$              ;NO, LINE IS IDLE
005426  046337  014276  015004  1$:     BIC     LINENO(R3),SYSSW1 ;CLEAR THE VERIFY REQUEST SW.
005434  005737  005546                TST     VERPT           ;CONTROL X?
005440  001004                        BNE     10$             ;YES-BYPASS ERROR LOGGING
005442  112720  000015                MOVB    #15,(R0)+       ;LINE IS ACTIVE, CAN'T VERIFY
005446  110310                        MOVB    R3,(R0)         ;SET UP LINE NUMBER
005450  106220                        ASRB    (R0)+
```

```
005452  000207                          10$:    RTS     PC              ;EXIT IF NO OTHER LINES TO BE CHECKED
005454  010302                          20$:    MOV     R3,R2
005456  006202                                  ASR     R2              ;SET UP THE LINE NUMBER
005460  052702  030100                          BIS     #30100,R2
005464  012777  000340  173506                  MOV     #340,@PSW       ;TEMPORARILY INHIBIT INTERRUPTS
005472  010277  173524                          MOV     R2,@DMSCR
005476  012777  177777  173526                  MOV     #-1,@DMBCR      ;SET UP BYTE COUNT
005504  012777  005542  173516                  MOV     #VERDAT,@DMCAR    ;SET UP THE CURRENT ADDRESS
005512  056337  014276  015152                  BIS     LINENO(R3),TRNSWW ;SET TRANSMITTER SW.
005520  056337  014276  015022                  BIS     LINENO(R3),ACTIVE
005526  056377  014276  173500                  BIS     LINENO(R3),@DMBAR ;START THE TRANSMITTER
005534  005077  173440                          CLR     @PSW
005540  000207                          VEREXT: RTS     PC

005542  052525                          VERDAT: 52525
005544  000000                          LINSTR: 0                       ;TEMP STORAGE FOR LINE COUNT
005546  000000                          VERPT:  0                       ;VERIFY REPEAT FLAG

                                        ;************************************************************
                                        ;BOOT SUBROUTINE
                                        ;THIS SUBROUTINE IS ENTERED ON RECEIPT OF A '^B' FROM THE KEYBOARD.
                                        ;ITS PURPOSE IS TO BOOT (TRANSFER) THE VT20 PROGRAM FROM THE READER
                                        ;OF THE HOST COMPUTER TO A SELECTED VT20 SYSTEMS.  WHEN ENTERED, THE
                                        ;THE PROGRAM WILL WAIT FOR THE LINE OR LINES OVER WHICH THE PROGRAM
                                        ;IS TO BE TRANSFERED. THE PROGRAM WILL THEN CHECK TO SEE IF A READER
                                        ;DEVICE ADDRESS HAS BEEN PREVIOUSLY SETUP. IF IT WASN'T, THE PROGRAM
                                        ;WILL REQUEST THE DEVICE & VECTOR ADDRESSES. AFTER COMPLETION OF
                                        ;LOADING, THE PROGRAM WILL RETURN TO THE MONITOR.
                                        ;************************************************************

005550  004737  004626                  BOOT:   JSR     PC,FORMIT       ;WAIT FOR LINE NUMBERS
005554  013737  014732  015130                  MOV     BCDCTR,KSTOR4   ;SAVE NO. OF LINE SET UP
005562  005037  014624                          CLR     BOOTLN          ;SET UP TO SAVE LINES TO BE BOOTED
005566  056337  014276  014624          BOOT1:  BIS     LINENO(R3),BOOTLN
005574  005337  014732                          DEC     BCDCTR          ;SET UP ALL LINES?
005600  001403                                  BEQ     BOOT2           ;YES,
005602  004737  004632                          JSR     PC,FORMON       ;NO, FORM OFFSETS FOR NEXT LINE
005606  000767                                  BR      BOOT1
005610  005237  014620                  BOOT2:  INC     BOOTFG          ;SET TO INDICATE THAT READER IS ACTIVE
005614  005737  015154                          TST     RCSR            ;HAS READER ADDRESS BEEN SETUP?
005620  001030                                  BNE     BOOT4           ;YES
005622  104000  012525                  BOOT3:  PRINT,  MES11           ;REQUEST READER DEVICE ADDRESS
005626  004737  004722                          JSR     PC,GETLN1       ;GET IT
005632  013701  015044                          MOV     DEVADR,R1
005636  005701                                  TST     R1              ;WAS ONE ENTERED?
005640  001770                                  BEQ     BOOT3           ;NO, MAKE HIM DO IT
005642  010137  015154                          MOV     R1,RCSR         ;YES, SET IT UP
005646  062701  000002                          ADD     #2,R1
005652  010137  015156                          MOV     R1,RDBR
005656  104000  012767                          PRINT,  MES13           ;ASK FOR VECTOR ADDRESS
005662  004737  004722                          JSR     PC,GETLN1       ;GET IT
005666  013701  015044                          MOV     DEVADR,R1
005672  012721  005736                          MOV     #READER,(R1)+   ;SET UP READER SERVICE ROUTINE
005676  012711  000200                          MOV     #200,(R1)       ;SET BR LEVEL #4
```

```
 973  005702  012737  016570  015052  BOOT4:  MOV     #READBF,BOOTP2
 974  005710  005037  015036          CLR     REDONE          ;CLEAR READ TRANSMIT DONE COUNTER
 975  005714  005037  015056          CLR     READCT
 976  005720  012777  000101  007226  MOV     #101,@RCSR      ;SET GO & INTERRUPT ENABLE FOR READER
 977  005726  005037  015010          CLR     SYSWW
 978  005732  000137  003560          JMP     EXITXS          ;EXIT
 979
 980                                  ;*****************************************************************
 981                                  ;READER INTERRUPT SERVICE ROUTINE
 982                                  ;THIS ROUTINE READS UP TO '64' CHARACTERS FROM THE PAPERTAPE READER AND THEN
 983                                  ;TRANSMITS THEM TO SPECIFIED LINE OR LINES ENTERED BY (^B).
 984                                  ;READER ERROR CODES ARE AS FOLLOWS:
 985                                  ;#5 = ILLEGAL READER INTERRUPT
 986                                  ;*****************************************************************
 987
 988  005736  010146          READER: MOV     R1,-(SP)                ;SAVE WORKING REGISTERS
 989  005740  010246                  MOV     R2,-(SP)
 990  005742  010346                  MOV     R3,-(SP)
 991  005744  017737  007204  015002  MOV     @RCSR,RSTAT     ;SAVE READER STATUS
 992  005752  017737  007200  015000  MOV     @RDBR,RCHAR     ;READ & SAVE CHAR.
 993  005760  013702  015052          MOV     BOOTP2,R2       ;SET UP THE READER BUFFER POINTER
 994  005764  005737  014620          TST     BOOTFG          ;IS READER ACTIVE?
 995  005770  001006                  BNE     READ1           ;YES, LEGAL INTERRUPT
 996  005772  112720  000005          MOVB    #5,(R0)+        ;CODE FOR ILLEGAL READER INTERRUPT
 997  005776  105020                  CLRB    (R0)+           ;LINE NO. IS NOT APPLICABLE
 998  006000  005077  007150          CLR     @RCSR           ;DISABLE FURTHER READER INTERRUPTS
 999  006004  000504                  BR      READ4           ;EXIT
1000  006006  005737  015002  READ1:  TST     RSTAT           ;END OF TAPE FLAG SET?
1001  006012  100416                  BMI     READ2           ;YES, EXIT
1002  006014  113722  015000          MOVB    RCHAR,(R2)+     ;SAVE CHAR IN READER BUFFER
1003  006020  010237  015052          MOV     R2,BOOTP2       ;SAVE BUFFER POINTER
1004  006024  005237  015056          INC     READCT          ;KEEP TRACK OF NO. OF CHAR'S READ.
1005  006030  022737  000100  015056  CMP     #64.,READCT     ;READ '64' CHAR'S?
1006  006036  001413                  BEQ     READ3           ;YES
1007  006040  012777  000101  007106  MOV     #101,@RCSR      ;START NEXT READ
1008  006046  000463                  BR      READ4           ;EXIT
1009  006050  005077  007100  READ2:  CLR     @RCSR           ;DISABLE READER INTERRUPT
1010  006054  005037  014620          CLR     BOOTFG          ;CLEAR THE SOFTWARE SW.
1011  006060  005737  015056          TST     READCT          ;ANY DATA TO TRANSMIT?
1012  006064  001452                  BEQ     READ3A          ;NO, EXIT
1013
1014                                  ;AT THIS POINT EITHER THE READER BUFFER IS FULL (64 CHARACTERS) OR THE END OF
1015                                  ;TAPE POINT HAS BEEN REACHED.  THE TRANSMITTERS ARE NOW SET UP TO
1016                                  ;TRANSMIT THE READER BUFFER.
1017
1018  006066  005003  READ3:  CLR     R3
1019  006070  005437  015056          NEG     READCT
1020  006074  036337  014276  014624  1$:     BIT     LINENO(R3),BOOTLN ;BOOTING THIS LINE?
1021  006102  001433                  BEQ     2$                      ;NO
1022  006104  010302                  MOV     R3,R2
1023  006106  006202                  ASR     R2              ;'R2' NOW = TO A LINE NO.
1024  006110  052702  030100          BIS     #30100,R2       ;ASSEMBLE 'SCR' WORD
1025  006114  012777  000340  173056  MOV     #340,@PSW       ;TEMPORARILY INHIBIT INTERRUPTS
1026  006122  010277  173074          MOV     R2,@DMSCR
```

```
1027  006126  013777  015056  173076          MOV     READCT,@DMBCR   ;SET UP BYTE COUNT
1028  006134  012777  016570  173066          MOV     #READBF,@DMCAR  ;SET UP CURRENT ADDRESS
1029  006142  056337  014276  014622          BIS     LINENO(R3),BOOTSW ;SET THE BOOT SW.
1030  006150  056337  014276  015022          BIS     LINENO(R3),ACTIVE ;SET ACTIVE WHEN TRANSMITTING
1031  006156  056377  014276  173050          BIS     LINENO(R3),@DMBAR ;START THE TRANSMITTER
1032  006164  012777  000200  173086          MOV     #200,@PSW       ;RE-SET BR #4
1033  006172  062703  000002          281:    ADD     #2,R3           ;SET UP TO GET THE NEXT LINE NO.
1034  006176  022703  000040                  CMP     #32.,R3         ;SERVICED ALL LINES?
1035  006202  001334                          BNE     1$              ;NO
1036  006204  005737  015002                  TST     RSTAT           ;WAS END OF TAPE REACHED?
1037  006210  100002                          BPL     READ4           ;NO
1038  006212  104000  014262          READ3A: PRINT,  DOT             ;YES.
1039  006216  012603                  READ4:  MOV     (SP)+,R3
1040  006220  012602                          MOV     (SP)+,R2
1041  006222  012601                          MOV     (SP)+,R1
1042  006224  000002                          RTI                     ;EXIT
1043
1044                                  ;*****************************************************************
1045                                  ;SUBROUTINE TO TYPE THE CHARACTER IN 'R1'
1046                                  ;*****************************************************************
1047
1048  006226  013777  015022  172756  TYPEIT: MOV     ACTIVE,@SWR     ;DISPLAY SYSTEM STATUS
1049  006234  105777  172746                  TSTB    @TPS            ;WAIT FOR PRINTER
1050  006240  100372                          BPL     TYPEIT
1051  006242  110177  172742                  MOVB    R1,@TPB         ;OUTPUT CHAR.
1052  006246  000207                          RTS     PC
1053
1054                                  ;*****************************************************************
1055                                  ;KW11 LINE CLOCK SERVICE ROUTINE
1056                                  ;ENTERED HERE ON RECEIPT OF CLOCK INTERRUPTS.  THIS ROUTINE SIMPLY INCREMENTS
1057                                  ;A CLOCK COUNTER (USED TO CHECK SYSTEM STATUS) ANDTHEN SERVICES THE RECEIVER
1058                                  ;SILO.
1059                                  ;*****************************************************************
1060
1061  006250  005237  015006          CLKSRV: INC     CLKCTR          ;UPDATE THE COUNTER
1062  006254  000400                          BR      RECVER          ;SERVICE RECEIVER SILO
1063
1064                                  ;*****************************************************************
1065                                  ;SUBROUTINE ENTERED TO SERVICE ALL DM11 RECEIVER INTERRUPTS.
1066                                  ;R0=ERROR ADDRESS POINTER
1067                                  ;R1=DATA BUFFER ADDRESS OFFSET (BUFFERS ARE 512 BYTES APART)
1068                                  ;R2=DEVICE REGISTER ADDRESS OFFSET
1069                                  ;R3=UNIT ADDRESS OFFSET
1070                                  ;R4=DATA BUFFER ADDRESS POINTER
1071                                  ;RECEIVER ERROR CODES ARE AS FOLLOWS:
1072                                  ;00 = ILLEGAL RECEIVER INTERRUPT
1073                                  ;01 = OVERRUN ERROR
1074                                  ;02 = FRAMING ERROR
1075                                  ;03 = PARITY ERROR
1076                                  ;04 = ILLEGAL START CODE
1077                                  ;07 = ATTEMPT TO RECEIVE DATA WHILE IN SEND MODE
1078                                  ;11 = VERIFIED 'OK'
1079                                  ;12 = VERIFY DATA ERROR
1080                                  ;17 = DATA CHECK ERROR, SENT=000 RECV'D=XXX
```

```
1081                                    ;*****************************************************************
1082
1083  006256  010146                    RECVER1 MOV     R1,-(SP)                ;SAVE WORKING REGISTERS
1084  006260  010246                            MOV     R2,-(SP)
1085  006262  010346                            MOV     R3,-(SP)
1086  006264  010446                            MOV     R4,-(SP)
1087  006266  017702  172732            RECNXT1 MOV     @DMNRC,R2               ;READ NEXT WORD FROM THE SILO
1088  006272  010203                            MOV     R2,R3
1089  006274  000303                            SWAB    R3                      ;SET UP TO USE LINE NO. AS OFFSET
1090  006276  042703  177760                    BIC     #177760,R3
1091  006302  006303                            ASL     R3
1092  006304  005702                            TST     R2                      ;IS CHARACTER VALID?
1093  006306  100402                            BMI     1$                      ;YES
1094  006310  000137  007132                    JMP     RECEXT                  ;NO, SILO IS EMPTY, EXIT
1095  006314  036337  014276  014616  1$:      BIT     LINENO(R3),SENDSW       ;IS THIS LINE IN SEND MODE?
1096  006322  001412                            BEQ     RECVR1                  ;NO
1097  006324  005263  015642                    INC     SND(R3)                 ;KEEP TRACK OF NO. OF SEND ERRORS
1098  006330  022763  000005  014670            CMP     #5,ERRCTR(R3)           ;HAS UNIT EXCEEDED ERROR LIMIT?
1099  006336  002753                            BLT     RECNXT                  ;YES, SERVICE THE NEXT CHAR.
1100  006340  112720  000007                    MOVB    #7,(R0)+                ;NO, POST AS SEND ERROR
1101  006344  000137  007116                    JMP     RECERR
1102
1103  006350  032702  070000            RECVR1: BIT     #70000,R2               ;ANY RECEIVER ERROR FLAGS SET?
1104  006354  001444                            BEQ     RECVR2                  ;NO, VALID CHAR.
1105  006356  032702  040000                    BIT     #40000,R2               ;YES, IS IT AN OVERRUN ERROR?
1106  006362  001412                            BEQ     FRAMER                  ;NO
1107  006364  005263  015370                    INC     OR(R3)                  ;KEEP TRACK OF OVERRUN ERRORS
1108  006370  022763  000005  014670            CMP     #5,ERRCTR(R3)           ;HAS UNIT EXCEEDED ERROR LIMIT?
1109  006376  002733                            BLT     RECNXT                  ;YES, SERVICE NEXT CHAR.
1110  006400  112720  000001                    MOVB    #1,(R0)+                ;YES, POST AS OVERRUN ERROR
1111  006404  000137  007116                    JMP     RECERR
1112
1113  006410  032702  020000            FRAMER: BIT     #20000,R2               ;IS IT A FRAMING ERROR?
1114  006414  001412                            BEQ     PARITY                  ;NO
1115  006416  005263  015432                    INC     FRM(R3)                 ;KEEP TRACK OF FRAMINING ERRORS
1116  006422  022763  000005  014670            CMP     #5,ERRCTR(R3)           ;HAS UNIT EXCEEDED ERROR LIMIT?
1117  006430  002716                            BLT     RECNXT                  ;YES, SERVICE NEXT CHAR.
1118  006432  112720  000002                    MOVB    #2,(R0)+                ;YES, POST AS FRAMING ERROR
1119  006436  000137  007116                    JMP     RECERR
1120
1121  006442  005263  015474            PARITY: INC     PAR(R3)                 ;KEEP TRACK OF PARITY ERRORS
1122  006446  022763  000005  014670            CMP     #5,ERRCTR(R3)           ;HAS UNIT EXCEEDED ERROR LIMIT?
1123  006454  002704                            BLT     RECNXT                  ;YES, SERVICE NEXT CHAR.
1124  006456  112720  000003                    MOVB    #3,(R0)+                ;POST AS PARITY ERROR
1125  006462  000137  007116                    JMP     RECERR
1126
1127  006466  016304  014376            RECVR2: MOV     BUFPTR(R3),R4           ;SET UP DATA BUFFER POINTER
1128  006472  036337  014276  015146            BIT     LINENO(R3),RECSWM       ;IS THIS LINE CURRENTLY RECEIVING?
1129  006500  001116                            BNE     RECVR6                  ;YES, SAVE CHAR.
1130  006502  036337  014276  015020            BIT     LINENO(R3),RECVCK       ;MAINT. CHECKING THIS RECEIVER?
1131  006510  001414                            BEQ     3$                      ;NO
1132  006512  046337  014276  015020            BIC     LINENO(R3),RECVCK       ;YES, CLEAR THE CHECK SW.
1133  006520  122702  000125                    CMPB    #125,R2                 ;IS THE CHECK CHAR. = 125
1134  006524  001660                            BEQ     RECNXT                  ;YES, IT IS OK
```

```
1135  006526  112728  000017          MOVB    #17,(R0)+               ;NO, POST AS A DATA CHECK ERROR
1136  006532  110310                  MOVB    R3,(R0)                 ;SAVE LINE NO.
1137  006534  106220                  ASRB    (R0)+
1138  006536  110220                  MOVB    R2,(R0)+                ;SAVE RECV'D CHAR.
1139  006540  000652                  BR      RECNXT                  ;SERVICE THE NEXT CHAR.
1140
1141  006542  005763  014626    5$:   TST     VRFSWM(R3)              ;VERIFYING THIS LINE?
1142  006546  001435                  BEQ     R4A                     ;NO
1143  006550  046337  014276  015004  BIC     LINENO(R3),SYSSW1       ;YES, CLEAR SOFTWARE SW.
1144  006556  005737  005546          TST     VERPT           ;CONTROL X?
1145  006562  001163                  BNE     RECEXT          ;YES BY-PASS ERROR CHECKING
1146  006564  122702  000125          CMPB    #125,R2                 ;YES, IS DATA CORRECT?
1147  006570  001411                  BEQ     R1A                     ;YES
1148  006572  112720  000012          MOVB    #12,(R0)+               ;NO POST AS VERIFY DATA ERROR
1149  006576  110310                  MOVB    R3,(R0)                 ;SET UP TO SAVE LINE NO.
1150  006600  106220                  ASRB    (R0)+
1151  006602  110220                  MOVB    R2,(R0)+                ;SAVE THE BAD DATA
1152  006604  004737  005406    R2A:  JSR     PC,VRFSND               ;SEND ANOTHER CHARACTER
1153  006610  000137  006266          JMP     RECNXT                  ;SERVICE THE NEXT CHARACTER
1154
1155  006614  005263  014626    R1A:  INC     VRFSWM(R3)
1156  006620  022763  000006  014626  CMP     #6,VRFSWM(R3)           ;HAVE WE HAD FIVE (5) GOOD TRANSFERS?
1157  006626  001366                  BNE     R2A                     ;NO, START NEXT TRANSFER
1158  006630  112720  000011          MOVB    #11,(R0)+               ;YES, POST AS LINE VERIFIED
1159  006634  005063  014626          CLR     VRFSWM(R3)              ;CHAR THE SW.
1160  006640  000530                  BR      RECER1                  ;EXIT
1161
1162  006642  105702    R4A:  TSTB    R2                      ;NULL CHAR.?
1163  006644  001610                  BEQ     RECNXT                  ;YES, IGNORE IT
1164  006646  122702  000377          CMPB    #377,R2                 ;# TO START CODE CHAR.?
1165  006652  001413                  BEQ     RECVR3                  ;YES, SET UP TO RECEIVE DATA
1166  006654  005263  015536          INC     ST(R3)
1167  006660  022763  000005  014670  CMP     #5,ERRCTR(R3)           ;HAS UNIT EXCEEDED ERROR LIMIT?
1168  006666  003002                  BGT     5$
1169  006670  000137  006266          JMP     RECNXT                  ;YES, SERVICE NEXT CHAR.
1170  006674  112720  000004    5$:   MOVB    #4,(R0)+                ;NO, POST AS ILLEGAL START CODE
1171  006700  000506                  BR      RECERR
1172
1173                            ;ENTERED HERE ON RECEIPT OF A START CODE (377)
1174
1175  006702  056337  014276  015146  RECVR3: BIS     LINENO(R3),RECSWM       ;SET RECEIVER SW.
1176  006710  046337  014276  015022          BIC     LINENO(R3),ACTIVE       ;KEEP TRACK OF SYSTEM STATUS
1177  006716  016304  014336          MOV     BUFADR(R3),R4           ;SET UP BUFFER ADDRESS POINTER
1178  006722  005024                  CLR     (R4)+
1179  006724  005024                  CLR     (R4)+
1180  006726  012763  000004  015160  MOV     #4,BYTECT(R3)           ;INITIALIZE BYTE COUNT
1181  006734  000403                  BR      RECR4A
1182
1183                            ;ENTERED HERE TO PROCESS THE CHAR, WHEN THE 'RECSWM' IS SET
1184
1185
1186  006736  122702  000377    RECVR4: CMPB    #377,R2                 ;CHAR, # TO START CODE?
1187  006742  001757                  BEQ     RECVR3                  ;YES, RE-SET RECEIVER
1188  006744  110224    RECR4A: MOVB    R2,(R4)+                ;SAVE CHARACTER IN BUFFER
```

```
 1189  006746  005263  015160            INC     BYTECT(R3)              ;UPDATE BYTE COUNT
 1190  006752  005737  015132            TST     RMODE                   ;RUNNING DATA REPORT MODE?
 1191  006756  001401                    BEQ     RECVR5                  ;NO
 1192  006760  110220                    MOVB    R2,(R0)+                ;YES, SAVE CHAR. IN ERROR BUFFER
 1193  006762  010463  014376  RECVR5:   MOV     R4,BUFPTR(R3)           ;SAVE DATA BUFFER POINTER
 1194  006766  122702  000014            CMPB    #EOP,R2                 ;CHAR. = END OF PARAGRAPH?
 1195  006772  001402                    BEQ     .+6
 1196  006774  000137  006266            JMP     RECNXT                  ;NO, SERVICE THE NEXT CHAR.
 1197  007000  046337  014276  015146    BIC     LINENO(R3),RECSWM       ;YES, CLEAR THE RECEIVER SW.
 1198  007006  036337  014276  014614    BIT     LINENO(R3),HOLDSW       ;IS THIS LINE BEING HELD?
 1199  007014  001405                    BEQ     RECVR6                  ;NO, SET UP TO TRANSMIT
 1200  007016  056337  014276  015150    BIS     LINENO(R3),PENDIN       ;YES, SET THE PENDING DATA SW.
 1201  007024  000137  006266            JMP     RECNXT                  ;SERVICE THE NEXT CHARACTER
 1202  007030  010301          RECVR6:   MOV     R3,R1
 1203  007032  006201                    ASR     R1                      ;# TO CURRENT LINE NUMBER
 1204  007034  052701  030500            BIS     #30500,R1               ;ASSEMBLE THE 'SCR' WORD
 1205  007040  010177  172156            MOV     R1,@DMSCR
 1206  007044  005463  015160            NEG     BYTECT(R3)              ;COMPLIMENT BYTE COUNT
 1207  007050  016377  015160  172154    MOV     BYTECT(R3),@DMBCR       ;LOAD THE BYTE COUNT REG.
 1208  007056  016377  014336  172144    MOV     BUFADR(R3),@DMCAR       ;LOAD THE CURRENT ADDRESS REGISTER
 1209  007064  056377  014276  172142    BIS     LINENO(R3),@DMBAR       ;START THE TRANSMITTER.
 1210  007072  005263  015222            INC     RECNTR(R3)              ;COUNT NO. OF BLOCKS RECEIVED
 1211  007076  056337  014276  015152    BIS     LINENO(R3),TRNSWM       ;SET TRNSMITTER SW.
 1212  007104  056337  014276  015022    BIS     LINENO(R3),ACTIVE       ;KEEP TRACK OF SYSTEM STATUS
 1213  007112  000137  006266            JMP     RECNXT                  ;SERVICE THE NEXT CHAR.
 1214  007116  005263  014670  RECERR:   INC     ERRCTR(R3)              ;KEEP TRACK OF NO. OF ERRORS
 1215  007122  110310          RECER1:   MOVB    R3,(R0)                 ;GET FAILING LINE NO.
 1216  007124  106220                    ASRB    (R0)+                   ;SET IT UP TO BE PRINTED
 1217  007126  000137  006266            JMP     RECNXT                  ;SERVICE THE NEXT CHAR.
 1218  007132  012604  RECEXT:  MOV     (SP)+,R4                ;RESTORE THE WORKING REGISTERS
 1219  007134  012603                    MOV     (SP)+,R3
 1220  007136  012602                    MOV     (SP)+,R2
 1221  007140  012601                    MOV     (SP)+,R1
 1222  007142  000002                    RTI
 1223
 1224                          ;*****************************************************************
 1225                          ;SUBROUTINE ENTERED TO SERVICE ALL DH11 TRANSMITTER & NON-EX MEM. INTERRUPTS
 1226                          ;TRANSMITTER ERROR CODES ARE AS FOLLOWS:
 1227                          ;04 = ILLEGAL TRANSMITTER INTERRUPT
 1228                          ;10 = TRANSMITTER NON-EX MEMORY INTERRUPT
 1229                          ;*****************************************************************
 1230
 1231  007144  042777  100000  172058  TRNMIT: BIC     #100000,@DMSCR          ;CLEAR THE INTERRUPT REQUEST
 1232  007152  010146                    MOV     R1,-(SP)                ;SAVE THE WORKING REGISTERS
 1233  007154  010246                    MOV     R2,-(SP)
 1234  007156  010346                    MOV     R3,-(SP)
 1235  007160  013701  015022            MOV     ACTIVE,R1               ;GET THE CURRENTLY ACTIVE TRANSMITTERS
 1236  007164  017702  172044            MOV     @DMBAR,R2               ;READ THE STATUS OF THE ACTIVE TRANSMITTERS
 1237  007170  040201                    BIC     R2,R1                   ;R1 =TO TERMINATED TRANSMITTERS
 1238  007172  012702  000001            MOV     #1,R2                   ;USE 'R2' AS A POLLING BIT
 1239  007176  005003                    CLR     R3                      ;USE 'R3' AS ADDRESS OFFSET POINTER
 1240  007200  030201  TRAN1:  BIT     R2,R1                   ;TRANSMITTER DONE?
 1241  007202  001007                    BNE     TRAN2                   ;YES, SERVICE IT
 1242  007204  006302  TRAN1A: ASL     R2                      ;NO, POLL NEXT RECEIVER
```

```
1243  007206  062703  000002          ADD     #2,R3                   ;UPDATE POINTER
1244  007212  022703  000040          CMP     #40,R3                  ;CHECKED ALL LINES?
1245  007216  001370                  BNE     TRAN1                   ;NO
1246  007220  000444                  BR      TRNEXT                  ;YES, EXIT
1247  007222  036337  014276  014622  TRAN2:  BIT     LINENO(R3),BOOTSW       ;BOOTING THIS LINE?
1248  007230  001411                  BEQ     TRAN3                   ;NO
1249  007232  005237  015036          INC     REDONE                  ;YES, COUNT NO. OF LINE'S THAT HAVE FINISHED
1250  007236  046337  014276  014622  BIC     LINENO(R3),BOOTSW       ;CLEAR THE BOOT SW.
1251  007244  046337  014276  015022  BIC     LINENO(R3),ACTIVE       ;CLEAR LINE ACTIVE FLAG
1252  007252  000754                  BR      TRAN1A                  ;SERVICE THE NEXT LINE
1253  007254  036337  014276  015152  TRAN3:  BIT     LINENO(R3),TRNSWH       ;IS THIS TRANSMITTER ENABLED?
1254  007262  001012                  BNE     TRAN4                   ;YES
1255  007264  112720  000006          MOVB    #6,(R0)+                ;NO, SAVE AS ILLEGAL TRANSMITTER INTERRUPT
1256  007270  004737  007276          JSR     PC,TRNERR               ;SET UP TO REPORT ERROR
1257  007274  000743                  BR      TRAN1A                  ;SERVICE THE NEXT LINE
1258
1259  007276  005263  014670  TRNERR: INC     ERRCTR(R3)              ;KEEP TRACK OF NO. OF ERRORS
1260  007302  110310                  MOVB    R3,(R0)
1261  007304  106220                  ASRB    (R0)+                   ;SAVE THE FAILING LINE NO.
1262  007306  000207                  RTS     PC                      ;RETURN
1263
1264  007310  046337  014276  015152  TRAN4:  BIC     LINENO(R3),TRNSWH       ;CLEAR THE TRANSMITTER SW.
1265  007316  005263  015264          INC     XFERCT(R3)              ;COUNT NO. OF BLOCKS TRANSFERRED
1266  007322  046337  014276  015022  BIC     LINENO(R3),ACTIVE       ;CLEAR LINE ACTIVE FLAG
1267  007330  000725                  BR      TRAN1A                  ;SERVICE THE NEXT LINE
1268  007332  032777  002000  171662  TRNEXT: BIT     #2000,@DMSCR            ;NON-EX MEMORY INTERRUPT?
1269  007340  001407                  BEQ     1$                      ;NO
1270  007342  052777  000400  171652  BIS     #400,@DMSCR             ;CLR NON-EX MEM. INTERRUPT
1271  007350  112720  000010          MOVB    #10,(R0)+               ;YES, SET UP ERROR CODE
1272  007354  004737  007276          JSR     PC,TRNERR               ;REPORT IT
1273  007360  012603          1$:     MOV     (SP)+,R3                ;RESTORE THE WORKING REGISTERS
1274  007362  012602                  MOV     (SP)+,R2
1275  007364  012601                  MOV     (SP)+,R1
1276  007366  000002                  RTI
1277
1278                          ;*****************************************************************
1279                          ;MESSAGE PRINT ROUTINE, ENTERED VIA EMT DISPATCH HANDLER.
1280                          ;ROUTINE PICKS UP CONTENTS OF THE 'PC' AND USES THIS AS
1281                          ;THE ADDRESS OF MESSAGE TO BE TYPED.
1282                          ;*****************************************************************
1283
1284  007370  003077  171604  TYPMES: CLR     @PSW
1285  007374  010237  015016          MOV     R2,TYPSV2               ;SAVE R2
1286  007400  017602  000000          MOV     @(SP),R2                ;GET THE MESSAGE ADDRESS FROM START
1287  007404  062716  000002          ADD     #2,(SP)                 ;SET UP STACK TO EXIT
1288  007410  010146                  MOV     R1,-(SP)                ;SAVE R1
1289  007412  005037  015134          CLR     PRTCNT
1290  007416  005737  015026  TYPER1: TST     @SWITCH                 ;IS THE '-D' SWITCH SET?
1291  007422  001103                  BNE     TYPEXT                  ;YES, SUPPRESS PRINTING & EXIT
1292  007424  005737  007646          TST     PRTERR                  ;INHIBIT PRINT SWITCH SET?
1293  007430  001100                  BNE     TYPEXT                  ;YES-EXIT
1294  007432  112201                  MOVB    (R2)+,R1                ;NO, PICK UP CHAR.
1295  007434  105701                  TSTB    R1                      ;TEST FOR NULL CHARACTER
1296  007436  001475                  BEQ     TYPEXT                  ;IF SO, EXIT
```

```
 1297  007440  122701  000012          CMPB    #12,R1          ;TEST FOR LINE FEED
 1298  007444  001003                  BNE     18              ;NO
 1299  007446  004737  007560          JSR     PC,TYPECL       ;YES, TYPE 'CR/LF'
 1300  007452  000761                  BR      TYPERA
 1301  007454  122701  000377  18:     CMPB    #377,R1         ;TEST FOR START CODE
 1302  007460  001455                  BEQ     TYPERB
 1303  007462  122701  000014          CMPB    #EOP,R1         ;TEST FOR 'END OF PARAGRAPH'
 1304  007466  001447                  BEQ     TYPEOP          ;TYPE '(EOP)'
 1305  007470  122701  000045          CMPB    #45,R1          ;TEST FOR '%'
 1306  007474  001003                  BNE     28              ;NO
 1307  007476  004737  007560          JSR     PC,TYPECL       ;YES, TYPE 'CR/LF'
 1308  007502  000745                  BR      TYPERA
 1309  007504  122701  000040  28:     CMPB    #40,R1          ;IS THIS CHAR, PRINTABLE?
 1310  007510  003410                  BLE     38              ;YES, PRINT IT
 1311  007512  010146                  MOV     R1,-(SP)        ;NO, SAVE IT
 1312  007514  012701  000336          MOV     #336,R1         ;PRINT IT AS A CONTROL CHAR.
 1313  007520  004737  007540          JSR     PC,OUTPUT
 1314  007524  012601                  MOV     (SP)+,R1        ;RETRIEVE CHAR.
 1315  007526  052701  000100          BIS     #100,R1         ;MAKE IT PRINTABLE
 1316  007532  004737  007540  38:     JSR     PC,OUTPUT
 1317  007536  000727                  BR      TYPERA
 1318
 1319  007540  004737  006226  OUTPUT: JSR     PC,TYPEIT
 1320  007544  005237  015134          INC     PRTCNT
 1321  007550  022737  000100  015134  CMP     #64.,PRTCNT     ;LINE FULL?
 1322  007556  003012                  BGT     TYPRET          ;NO, CHECK NEXT CHAR.
 1323  007560  005037  015134  TYPECL: CLR     PRTCNT
 1324  007564  012701  000015          MOV     #15,R1
 1325  007570  004737  006226          JSR     PC,TYPEIT       ;TYPE 'CR'
 1326  007574  012701  000012          MOV     #12,R1
 1327  007600  004737  006226          JSR     PC,TYPEIT       ;TYPE 'LF'
 1328  007604  000207          TYPRET: RTS     PC              ;RETURN
 1329
 1330  007606  012702  013215  TYPEOP: MOV     #EOPMSG,R2
 1331  007612  000701                  BR      TYPERA
 1332
 1333  007614  012701  000336  TYPERB: MOV     #336,R1
 1334  007620  004737  006226          JSR     PC,TYPEIT       ;PRINT '^'
 1335  007624  004737  007560          JSR     PC,TYPECL       ;TYPE 'CR/LF'
 1336  007630  000672                  BR      TYPERA
 1337
 1338  007632  005037  015026  TYPEXT: CLR     OSWITCH         ;CLEAR THE '^O' SOFTWARE SWITCH
 1339  007636  013702  015016          MOV     TYPSV2,R2       ;RESTORE R2
 1340  007642  012601                  MOV     (SP)+,R1        ;RESTORE R1
 1341  007644  000002                  RTI                     ;RETURN
 1342  007646  000000  PRTERR: 0              ;PRINT INHIBIT SWITCH
 1343
 1344
 1345                                  ;*****************************************************************
 1346                                  ;SUBROUTINE TO TYPEOUT A '3 OR 6' DIGIT OCTAL NO. THE 'PC' CONTAINS
 1347                                  ;THE ADDRESS OF 'NUMBER' TO BE TYPED
 1348                                  ;*****************************************************************
 1349
 1350  007650  005077  171324  OCTPRT: CLR     @PSW
```

```
1351  007654  005737  007646          TST     PRTERR          ;INHIBIT ERROR PRINT?
1352  007660  001057                  BNE     OCTEXT          ;YES-EXIT
1353  007662  010137  010022          MOV     R1,OCTSV1       ;SAVE R1
1354  007666  010237  010024          MOV     R2,OCTSV2       ;SAVE R2
1355  007672  017601  000000          MOV     @(SP),R1        ;THE ADDRESS OF WORD TO BE TYPED
1356  007676  062716  000002          ADD     #2,(SP)         ;SET UP STACK TO EXIT
1357  007702  005737  010026          TST     OCTSV3          ;PRINT '6' DIGITS?
1358  007706  001402                  BEQ     .+6             ;YES
1359  007710  042711  177400          BIC     #177400,(R1)    ;NO,STRIPE TO '3' DIGITS
1360  007714  012737  000006  015126  MOV     #6,KSTOR3
1361  007722  012737  000376  010030  MOV     #376,MASK       ;MASK FOR FIRST BIT
1362  007730  000401                  BR      .+4
1363  007732  006111          MOVEIT: ROL     (R1)
1364  007734  006111                  ROL     (R1)
1365  007736  006111                  ROL     (R1)
1366  007740  005337  010026          DEC     OCTSV3
1367  007744  002013                  BGE     MOVEON
1368  007746  111102                  MOVB    (R1),R2
1369  007750  143702  010030          BICB    MASK,R2
1370  007754  052702  000260          BIS     #260,R2
1371  007760  132777  000200  171220  BITB    #200,@TPS
1372  007766  100374                  BPL     .-6
1373  007770  110277  171214          MOVB    R2,@TPB         ;PRINT CHAR.
1374  007774  012737  000370  010030  MOVEON: MOV     #370,MASK       ;MASK FOR NEXT '3' DIGITS
1375  010002  005337  015126          DEC     KSTOR3
1376  010006  001351                  BNE     MOVEIT
1377  010010  013701  010022          MOV     OCTSV1,R1       ;RESTORE R1
1378  010014  013702  010024          MOV     OCTSV2,R2
1379  010020  000002          OCTEXT: RTI
1380
1381  010022  000000          OCTSV1: 0
1382  010024  000000          OCTSV2: 0
1383  010026  000000          OCTSV3: 0
1384  010030  000376          MASK:   376
1385  010032  005037  010026  XOCTP6: CLR     OCTSV3
1386  010036  000704                  BR      OCTPRT
1387
1388  010040  012737  000003  010026  XOCTP3: MOV     #3,OCTSV3
1389  010046  000700                  BR      OCTPRT
1390
1391                          ;*****************************************************************
1392                          ;SUBROUTINE TO CONVERT 'N' 'BCD' WORDS SEPERATED VIA COMMA'S TO OCTAL
1393                          ;*****************************************************************
1394
1395  010050  010146          BCDBIN: MOV     R1,-(SP)                ;SAVE WORKING REGISTERS
1396  010052  010246                  MOV     R2,-(SP)
1397  010054  010346                  MOV     R3,-(SP)
1398  010056  010446                  MOV     R4,-(SP)
1399  010060  012704  016526          MOV     #TTYBUF,R4      ;PICK UP BUFFER POINTER
1400  010064  012737  014736  014734  MOV     #BCDBUF,BCDPTR  ;SET UP BUFFER POINTER
1401  010072  005037  014732          CLR     BCDCTR          ;COUNT NO. OF ENTRIES IN BUFFER
1402  010076  005001          BCDBN0: CLR     R1
1403  010100  105714          BCDBN1: TSTB    (R4)            ;END OF DATA?
1404  010102  001431                  BEQ     BCDEND          ;YES, EXIT
```

M3

```
1405  010184  112403                  MOVB    (R4)+,R3        ;SAVE IT
1406  010186  022703  000054          CMP     #54,R3          ;CHAR. = TO ','?
1407  010112  001003                  BNE     BCDBN2          ;NO
1408  010114  004737  010146          JSR     PC,BCDBN3       ;YES, SAVE CURRENT WORD
1409  010120  000766                  BR      BCDBNR          ;CONVERT NEXT WORD
1410  010122  042703  000360  BCDBN2: BIC     #360,R3         ;STRIPE NO. TO BCD
1411  010126  010102                  MOV     R1,R2           ;SAVE CURRENT TOTAL
1412  010130  006301                  ASL     R1              ;NX2
1413  010132  006301                  ASL     R1              ;NX4
1414  010134  006301                  ASL     R1              ;NX8
1415  010136  060201                  ADD     R2,R1           ;NX9
1416  010140  060201                  ADD     R2,R1           ;NX10
1417  010142  060301                  ADD     R3,R1           ;N+NEW NO.
1418  010144  000755                  BR      BCDBN1
1419
1420  010146  010177  004562  BCDBN3: MOV     R1,@BCDPTR      ;SAVE WORD
1421  010152  062737  000002  014734  ADD     #2,BCDPTR       ;UPDATE POINTER
1422  010160  005237  014732          INC     BCDCTR          ;COUNT NO. OF ENTRIES IN BUFFER
1423  010164  000207                  RTS     PC              ;RETURN
1424
1425  010166  004737  010146  BCDEND: JSR     PC,BCDBN3       ;SAVE WORD
1426  010172  012737  014736  014734  MOV     #BCDBUF,BCDPTR
1427  010200  012604                  MOV     (SP)+,R4                ;RESTORE THE WORKING REGISTERS
1428  010202  012603                  MOV     (SP)+,R3
1429  010204  012602                  MOV     (SP)+,R2
1430  010206  012601                  MOV     (SP)+,R1
1431  010210  000207                  RTS     PC              ;EXIT
1432                          ;*****************************************************************
1433                          ;SUBROUTINE TO PRINT DECIMAL VALUE
1434                          ;*****************************************************************
1435
1436  010212  005077  170762  XBINDEC:CLR     @PSW
1437  010216  010237  010024          MOV     R2,OCTSV2       ;SAVE R2
1438  010222  017602  000000          MOV     0(SP),R2        ;PICK UP ADDRES OF VALUE
1439  010226  011202                  MOV     (R2),R2         ;MOVE VALUE TO R2
1440  010230  042702  160000          BIC     #160000,R2      ;CAN ONLY PRINT A '4' DIGIT NO.
1441  010234  062716  000002          ADD     #2,(SP)         ;SET UP STACK TO EXIT
1442  010240  010146                  MOV     R1,-(SP)
1443  010242  010446                  MOV     R4,-(SP)
1444  010244  012704  010322          MOV     #DECPTR,R4
1445  010250  012701  177777  TYPT1:  MOV     #-1,R1
1446  010254  005201          TYPT2:  INC     R1
1447  010256  161402                  SUB     (R4),R2
1448  010260  100375                  BPL     TYPT2
1449  010262  062402                  ADD     (R4)+,R2
1450  010264  052701  000260  DEC1:   BIS     #260,R1
1451  010270  004737  006226          JSR     PC,TYPEIT
1452  010274  005714                  TST     (R4)            ;DONE?
1453  010276  001364                  BNE     TYPT1           ;NO
1454  010300  012701  000240          MOV     #240,R1         ;YES, TYPE SPACE
1455  010304  004737  006226          JSR     PC,TYPEIT
1456  010310  013702  010024          MOV     OCTSV2,R2       ;RESTORE R2
1457  010314  012604                  MOV     (SP)+,R4
1458  010316  012601                  MOV     (SP)+,R1
```

```
1459  010328  000002                RTI
1460
1461  010322  001750          DECPTR: 1000.
1462  010324  000144                  100.
1463  010326  000012                  10.
1464  010330  000001                  1.
1465  010332  000000                  0
1466
1467                          ;*****************************************************************
1468                          ;SUBROUTINE ENTERED TO ACCEPT & DECODE BAUD RATES INPUT BY THE USER.
1469                          ;DECODE CALLING SEQUENCE:
1470                          ;       JSR     PC,DECODE               ;CALL DECODE
1471                          ;       RETURN  CALL+2                  ;ILLEGAL ENTRY RETURN
1472                          ;       RETURN  CALL+4                  ;LEGAL ENTRY RETURN
1473                          ;*****************************************************************
1474
1475  010334  013703  016526  DECODE: MOV     TTYBUF,R3               ;SAVE CONTENTS OF TTY BUFFER
1476  010340  004737  004722          JSR     PC,GETLN1               ;PICK UP INPUTTED BAUD RATE
1477  010344  005737  016526          TST     TTYBUF                  ;WAS A BAUD RATE INPUTTED?
1478  010350  001006                  BNE     DECOD1                  ;YES, DECODE IT
1479  010352  010337  016526          MOV     R3,TTYBUF               ;RESTORE CONTENTS OF TTY BUFFER
1480  010356  005737  014450          TST     LPWORD                  ;NO, HAS AN ENTRY BEEN MADE IN THE TABLE?
1481  010362  001033                  BNE     OUT2    #               ;YES, USE CURRENT BAUD SETTING
1482  010364  000434                  BR      OUT1                    ;NO, ILLEGAL ENTRY - RETURN TO CALL+2
1483
1484  010366  012703  013370  DECOD1: MOV     #BAUDTB,R3              ;SET UP MESSAGE MATCH TABLE POINTER
1485  010372  005037  015034          CLR     OFFSET
1486  010376  012704  016526  RECYCL: MOV     #TTYBUF,R4              ;SET UP TELETYPE BUFFER POINTER
1487  010402  122713  000040          CMPB    #40,(R3)                ;CHAR = TO SPACE?
1488  010406  001001                  BNE     .+4                     ;NO
1489  010410  105723                  TSTB    (R3)+                   ;YES, SKIP IT
1490  010412  122324          MATCH:  CMPB    (R3)+,(R4)+             ;COMPARE BUFFERS
1491  010414  001006                  BNE     FLUSH                   ;NOT EQUAL, SET UP NEXT WORD
1492  010416  122713  000054          CMPB    #54,(R3)                ;CHAR = COMMA?
1493  010422  001373                  BNE     MATCH                   ;NO, COMPARE NEXT CHAR.
1494  010424  006337  015034          ASL     OFFSET                  ;YES, SET UP THE OFFSET
1495  010430  000410                  BR      OUT2
1496  010432  005237  015034  FLUSH:  INC     OFFSET                  ;INCREMENT THE OFFSET CNTR.
1497  010436  105713                  TSTB    (R3)                    ;END OF MESSAGE?
1498  010440  001406                  BEQ     OUT1                    ;YES, ILLEGAL ENTRY - RETURN TO CALL+2
1499  010442  122723  000054          CMPB    #54,(R3)+               ;CHAR.=COMMA
1500  010446  001753                  BEQ     RECYCL                  ;YES, COMPARE NEXT WORD
1501  010450  000772                  BR      FLUSH+4                 ;NO, KEEP GOING
1502  010452  062716  000002  OUT2:   ADD     #2,(SP)                 ;SET UP TO RETURN TO CALL +4
1503  010456  000207          OUT1:   RTS     PC                      ;RETURN
1504                          ;*****************************************************************
1505                          ;POWER FAIL HANDLER
1506                          ;*****************************************************************
1507
1508  010460  010046          PWRFAL: MOV     R0,-(SP)
1509  010462  010146                  MOV     R1,-(SP)
1510  010464  010246                  MOV     R2,-(SP)
1511  010466  010346                  MOV     R3,-(SP)
1512  010470  010446                  MOV     R4,-(SP)
```

```
1513  010472  010546                        MOV     R5,-(SP)
1514  010474  013746  000024                MOV     24,-(SP)
1515  010500  010637  015120                MOV     SP,TEMP
1516  010504  012737  010514  000024        MOV     #PWRUP,#24
1517  010512  000000                        HALT
1518  010514  012777  000340  170456  PWRUP: MOV     #340,#PSW
1519  010522  005001                        CLR     R1              ;POWER UP DELAY
1520  010524  005201                        INC     R1
1521  010526  001376                        BNE     .-2
1522  010530  013706  015120                MOV     TEMP,SP
1523  010534  012637  000024                MOV     (SP)+,#24
1524  010540  012605                        MOV     (SP)+,R5
1525  010542  012604                        MOV     (SP)+,R4
1526  010544  012603                        MOV     (SP)+,R3
1527  010546  012602                        MOV     (SP)+,R2
1528  010550  012601                        MOV     (SP)+,R1
1529  010552  012600                        MOV     (SP)+,R0
1530  010554  104000                        PRINT
1531  010556  012263                        MES4
1532  010560  000137  002070                JMP     SERVCE
1533
1534                          ;*************************************************************************
1535                          ;EMT DISPATCH SERVICE ROUTINE
1536                          ;ARGUMENT OF EMT IS EXTRACTED AND USED AS OFFSET TO OBTAIN POINTER
1537                          ;TO THE SELECTED SUBROUTINE.
1538                          ;*************************************************************************
1539
1540  010564  011646                        EMTSRV: MOV     (SP),-(SP)      ;GET PC FOR TO RETURN
1541  010566  162716  000002                        SUB     #2,(SP)         ;PC OF EMT
1542  010572  017616  000000                        MOV     @(SP),(SP)      ;GET EMT
1543  010576  006316                EMTOK:  ASL     (SP)            ;MULTIPLY EMT ARG BY '2'
1544  010600  042716  177001                BIC     #177001,(SP)    ;CLEAR UNWANTED BITS
1545  010604  062716  010616                ADD     #EMTTAB,(SP)    ;POINTER TO SUBROUTINE ADDRESS
1546  010610  017616  000000                MOV     @(SP),(SP)      ;SUBROUTINE ADDRESS
1547  010614  000136                        JMP     @(SP)+          ;GO TO SUBROUTINE
1548
1549                          ;EMT DISPATCH TABLE
1550
1551  010616  007370                EMTTAB: TYPMES                  ;SUBROUTINE TO PRINT ASCII MESSAGES.
1552  010620  010032                        XOCTP6                  ;SUBROUTINE TO PRINT A '6' DIGIT OCTAL NO.
1553  010622  010212                        XBINDEC                 ;SUBROUTINE TO CONVERT OCTAL TO BINARY & PRNT IT
1554  010624  010040                        XOCTP3                  ;SUBROUTINE TO PRINT A'3' DIGIT OCTAL NO.
1555                          ;*************************************************************************
1556                          ;OVERLAY VECTOR AREA WITH '.+2' IN THE VECTOR FOLLOWED W/ IOT TRAP
1557                          ;*************************************************************************
1558
1559  010626  012701  000210        OVRLAY: MOV     #210,R1         ;GET DL11-E VECTOR BASE ADDRESS
1560  010632  012702  000212                MOV     #212,R2
1561  010636  012703  000004                MOV     #4,R3
1562  010642  010221                OVRLYA: MOV     R2,(1)+         ;LOAD VECTOR WITH IOT ERROR TRAP
1563  010644  010321                        MOV     R3,(1)+
1564  010646  062702  000004                ADD     #4,R2
1565  010652  020127  001000                CMP     R1,#1000        ;ALL VECTORS BEEN LOADED
1566  010656  001401                        BEQ     OVRLYB
```

```
1567  010660  000770                    BR      OVRLYA
1568  010662  000207          OVRLYB:   RTS     7                   ;EXIT
1569
1570                          ;*****************************************************************
1571                          ;MAPVEC - MAP VECTOR OR REPORT ERROR DEPENDING ON STATE OF 'FMAP' FLAG
1572                          ;*****************************************************************
1573
1574  010664  011637  015140  MAPVEC:  MOV     (SP),TOPC
1575  010670  022626                    POP2SP
1576  010672  011637  015142            MOV     (SP),FROMPC
1577  010676  005737  015144            TST     FMAP                ;MAPPING?
1578  010702  001427                    BEQ     ERTRAP              ;NO, REPORT ERROR
1579  010704  162737  000004  015140    SUB     #4,TOPC             ;SETUP TO LOAD RECEIVER VECTOR
1580  010712  013721  015140            MOV     TOPC,(R1)+          ;STORE RECEIVER VECTOR
1581  010716  062737  000002  015140    ADD     #2,TOPC
1582  010724  013721  015140            MOV     TOPC,(R1)+          ;STORE BR ADDRESS
1583  010730  062737  000002  015140    ADD     #2,TOPC             ;SET UP TO LOAD TRANSMITTER VECTOR
1584  010736  013721  015140            MOV     TOPC,(R1)+          ;STORE RECEIVER
1585  010742  062737  000002  015140    ADD     #2,TOPC
1586  010750  013721  015140            MOV     TOPC,(R1)+
1587  010754  005037  015144            CLR     FMAP
1588  010760  000002                    RTI
1589
1590                          ;ERROR TRAP HANDLER, ENTERED ON ILLEGAL TRAPS
1591
1592  010762  052777  004000  170232  ERTRAP:  BIS     #4000,@DMSCR            ;ISSUE MASTER CLEAR TO 'DM'
1593  010770  104000                    PRINT
1594  010772  012324                    MESS                        ;TEXT 'ILLEGAL TRAP TO'
1595  010774  162737  000004  015140    SUB     #4,TOPC
1596  011002  104001                    PRTOCT
1597  011004  015140                    TOPC                        ; TYPE 'PC' TRAPPED TOO
1598  011006  104000                    PRINT
1599  011010  012406                    MESS
1600  011012  162737  000002  015142    SUB     #2,FROMPC
1601  011020  104001                    PRTOCT
1602  011022  015142                    FROMPC                      ;TYPE WHERE IT TRAPPED FROM
1603  011024  000137  001342            JMP     START               ;RE-START TEST
1604
1605  011030     000            .BYTE
1606                          ;MESSAGES
1607
1608  011031     045  042045  030510  TITLE:   .ASCII               ;%%DH11/VT28 HOST DIAGNOSTIC PROGRAM%;
      011036  027461  052126  030062
      011044  044040  051517  020124
      011052  044504  043501  047516
      011060  052123  041511  050040
      011066  047522  051107  046501
      011074     045
1609  011075     115  044501  042116            .ASCII               ;MAINDEC-11-DZVTG-A-PB;
      011102  041505  030455  026461
      011110  055104  052126  026507
      011116  026501  041120
1610  011122  020040  032040  031457            .ASCII               ;   4/30/75.%;
      011130  027460  032467  022456
```

```
 1611  011136  054523  052123  046505          .ASCII          |SYSTEM COMMAND LIST%|
       011144  041440  046517  040515
       011152  042116  046040  051511
       011160  022524
 1612  011162  040536  020040  041101          .ASCII          |^A  ABSOLUTE SYSTEM RESTART%|
       011170  047523  052514  042524
       011176  051440  051531  042524
       011204  020115  042522  052123
       011212  051101  022524
 1613  011216  041136  020040  047502          .ASCII          |^B  BOOT SELECTED LINES%|
       011224  052117  051440  046105
       011232  041505  042524  020104
       011240  044514  042516  022523
 1614  011246  041536  020040  046103          .ASCII          |^C  CLEAR SOFTWARE SWITCHES/EXIT PRESENT MODE%|
       011254  040505  020122  047523
       011262  052106  040527  042522
       011270  051440  044527  041524
       011276  042510  027523  054105
       011304  052111  050040  042522
       011312  042523  052116  046440
       011320  042117  022505
 1615  011324  042136  020040  051120          .ASCII          |^D  PRINT RECEIVED DATA/DIAGNOSTIC MODE%|
       011332  047111  020124  042522
       011340  042503  053111  042105
       011346  042040  052101  027501
       011354  044504  043501  047516
       011362  052123  041511  046440
       011370  042117  022505
 1616  011374  042536  020040  046505          .ASCII          |^E  EMERGENCY RESTART/REINITIALIZE ALL SWITCHES%|
       011402  051105  042507  041516
       011410  020131  042522  052123
       011416  051101  027524  042522
       011424  047111  052111  040511
       011432  044514  042532  040440
       011440  046114  051440  044527
       011446  041524  042510  022523
 1617  011454  044136  020040  047510          .ASCII          |^H  HOLD SELECTED LINES/INHIBIT TRANSMISSIONS%|
       011462  042114  051440  046105
       011470  041505  042524  020104
       011476  044514  042516  027523
       011504  047111  044510  044502
       011512  020124  051124  047101
       011520  046523  051511  044523
       011526  047117     045
 1618  011531     136  020114  046040          .ASCII          |^L  LIST SELECTED LINE STATUS%|
       011536  051511  020124  042523
       011544  042514  052103  042105
       011552  046040  047111  020105
       011560  052123  052101  051525
       011566     045
 1619  011567     136  020120  050040          .ASCII          |^P  PRINT SELECTED LINE BUFFERS%|
       011574  044522  052116  051440
       011602  046105  041505  042524
       011610  020104  044514  042516
```

```
                011616  041040  043125  042506
                011624  022522
  1620          011626  051136  020040  042522          .ASCII          /^R  RELEASE SELECTED LINES%/
                011634  042514  051501  020105
                011642  042523  042514  052103
                011650  042105  046040  047111
                011656  051505     045
  1621          011661     136  020123  051440          .ASCII          /^S  SEND FOLLOWING DATA TO SELECTED LINES%/
                011666  047105  020104  047506
                011674  046114  053517  047111
                011702  020107  040504  040524
                011710  052040  020117  042523
                011716  042514  052103  042105
                011724  046040  047111  051505
                011732     045
  1622          011733     136  020117  044440          .ASCII          /^O  INHIBIT/KILL CURRENT PRINTOUT%/
                011740  044116  041111  052111
                011746  045457  046111  020114
                011754  052503  051122  047105
                011762  020124  051120  047111
                011770  047524  052125     045
  1623          011775     136  020124  044440          .ASCII          /^T  INHIBIT/RESTART ERROR PRINTOUTS%/
                012002  044116  041111  052111
                012010  051057  051505  040524
                012016  052122  042440  051122
                012024  051117  050040  044522
                012032  052116  052517  051524
                012040     045
  1624          012041     136  020126  053040          .ASCII          /^V  VERIFY SELECTED LINES%/
                012046  051105  043111  020131
                012054  042523  040514  052103
                012062  042105  046040  047111
                012070  051505     045
  1625          012073     136  020130  052040          .ASCIZ          /^X  TRANSMIT ON SELECTED LINES%/
                012100  040522  051516  044515
                012106  020124  047117  051440
                012114  046105  041505  042524
                012122  020104  044514  042516
                012130  022523     000
  1626
  1627          012133     045  044124  052101  ME01:   .ASCIZ          /%THAT DH11 ADDRESS IS NOT PRESENT?/
                012140  042040  030510  020061
                012146  042101  051104  051505
                012154  020123  051511  047040
                012162  052117  050040  040522
                012170  042523  052116  037477
                012176     000
  1628
  1629          012177     045  047516  051040  ME02:   .ASCIZ          /%NO RECEIVER INTERRUPT RESPONSE FROM DEVICE  /
                012204  041505  044505  042526
                012212  020122  047111  042524
                012220  051122  050125  020124
                012226  042522  050123  047117
                012234  042523  043040  047522
```

```
        012242  020115  042504  044526
        012250  042503  020040     000
  1630
  1631  012255     114  047111  020105  MES3:   .ASCIZ                  /LINE /
        012262     000
  1632  012263     045  051045  041505  MES4:   .ASCIZ                  /%%RECOVERED FROM POWER FAILURE.%/
        012270  053117  051105  042105
        012276  043040  047522  020115
        012304  047520  042527  020122
        012312  040506  046111  051125
        012320  027105  000045
  1633
  1634  012324  044445  046114  043505  MES5:   .ASCIZ                  /%ILLEGAL TRAP TO /
        012332  046101  052040  040522
        012340  020120  047524  000040
  1635
  1636
  1637  012346  042445  052116  051105  MFIAD:  .ASCIZ                  /%ENTER THE DH11 'SCR' ADDRESS? /
        012354  052040  042510  042040
        012362  030510  020061  051447
        012370  051103  020047  042101
        012376  051104  051505  037523
        012404  000040
  1638
  1639  012406  043040  047522  020115  MES6:   .ASCIZ                  / FROM /
        012414     000
  1640
  1641
  1642  012415     045  046514  042516  MES8:   .ASCIZ  /%LINE IN   OR.  PAR. FRAM TRAN ST.  HELD PEND BAUD/
        012422  044440  020116  020040
        012430  051117  020056  050040
        012436  051101  020056  051106
        012444  046501  052040  040522
        012452  020116  052123  020056
        012460  044040  046105  020104
        012466  042520  042116  041040
        012474  052501  000104
  1643
  1644
  1645  012500  042040  040511  027107  MES9:   .ASCIZ  / DIAG. MODE ENABLED./
        012506  046440  042117  020105
        012514  047105  041101  042514
        012522  027104     000
  1646  012525     045  042522  042101  MES11:  .ASCIZ  /%READER DEVICE ADDRESS? /
        012532  051105  042040  053105
        012540  041511  020105  042101
        012546  051104  051505  037523
        012554  000040
  1647  012556  047105  042524  020122  MES12:  .ASCII  /ENTER BAUD RATE OF EACH LINE. CONSECUTIVE LINE BAUD RATES MAY BE/
        012564  040502  042125  051040
        012572  052101  020105  043117
        012600  042440  041501  020110
        012606  044514  042516  020056
        012614  047503  051516  041505
```

```
                012622  052125  053111  020105
                012630  044514  042516  041040
                012636  052501  020104  040522
                012644  042524  020123  040515
                012652  020131  042502
  1648          012656  047105  042524  020122          .ASCII  /ENTER BY TYPING 'CR',(NOTE: ENTER UNUSED LINES AS '0' BAUD.)XX/
                012664  054502  052040  050131
                012672  047111  020107  041447
                012700  023522  024054  047516
                012706  042524  020072  047105
                012714  042524  020122  047125
                012722  051525  042105  046040
                012730  047111  051505  040440
                012736  020123  030047  020047
                012744  040502  042125  024456
                012752  022445
  1649          012754  044514  042516  041040          .ASCIZ  /LINE BAUD%/
                012762  052501  022504      000
  1650          012767      126 041505  047524  MES13:  .ASCIZ  /VECTOR ADDRESS? /
                012774  020122  042101  051104
                013002  051505  037523  000040
  1651          013010  047045  020117  046123  MES14:  .ASCII  /%NO SLAVE SYNC RETURNED ADDRESSING THE KW11 LINE CLOCK
                013016  053101  020105  054523
                013024  041516  051040  052105
                013032  051125  042516  020104
                013040  042101  051104  051505
                013046  044523  043516  052040
                013054  042510  045440  030527
                013062  020061  044514  042516
                013070  041440  047514  045503
  1652          013076  052045  044510  020123          .ASCII  /%THIS PROGRAM WILL RUN WITHOUT IT BUT ALL?
                013104  051120  043517  040522
                013112  020115  044527  046114
                013120  051040  047125  053440
                013126  052111  047510  052125
                013134  044440  020124  052502
                013142  020124  046101      114
  1653          013147      045 054523  052123          .ASCIZ  /%SYSTEM ERRORS 'MAY NOT' BE REPORTED./
                013154  046505  042440  051122
                013162  051117  020123  046447
                013170  054501  047040  052117
                013176  020047  042502  051040
                013204  050105  051117  042524
                013212  027104      000
  1654          013215      040 042450  050117  EOPMSG: .ASCIZ  / (EOP)/
                013222  000051
  1655          013224  044440  046114  043505  CODE00: .ASCIZ  / ILLEGAL RECVR, INTERRUPT%./
                013232  046101  051040  041505
                013240  051126  020056  047111
                013246  042524  051122  050125
                013254  022524  000056
  1656
  1657          013260  047440  042526  051122  CODE01: .ASCIZ  / OVERRUN ERROR%./
                013266  047125  042440  051122
```

```
        013274  051117  027045     000

  1658
  1659  013301     040  051106  046501  CODE02: .ASCIZ  / FRAMING ERROR%,/
        013306  047111  020107  051105
        013314  047522  022522  000056
  1660
  1661  013322  050040  051101  052111  CODE03: .ASCIZ  / PARITY ERROR%,/
        013330  020131  051105  047522
        013336  022522  000056
  1662
  1663  013342  044440  046114  043505  CODE04: .ASCIZ  / ILLEGAL START CODE%,/
        013350  046101  051440  040524
        013356  052122  041440  042117
        013364  022505  000056
  1664
  1665  013370  026060  032440  026060  BAUDTB: .ASCII  /0, 50, 75, 110, 134.5, 150, 200, /
        013376  033440  026065  030440
        013404  030061  020054  031461
        013412  027064  026065  030440
        013420  030065  020054  030062
        013426  026060     040
  1666  013431     063  030060  020054          .ASCIZ  /300, 600, 1200, 1800, 2400, 4800, 9600,/
        013436  030066  026060  030440
        013444  030062  026060  030440
        013452  030070  026060  031040
        013460  030064  026060  032040
        013466  030070  026060  034440
        013474  030066  026060     000
  1667
  1668  013501     040  046111  042514  CODE05: .ASCIZ  / ILLEGAL READER INTERRUPT%,/
        013506  040507  020114  042522
        013514  042101  051105  044440
        013522  052116  051105  052522
        013530  052120  027045     000
  1669
  1670  013535     040  046111  042514  CODE06: .ASCIZ  / ILLEGAL TRANS. INTERRUPT%,/
        013542  040507  020114  051124
        013550  047101  027123  044440
        013556  052116  051105  052522
        013564  052120  027045     000
  1671
  1672  013571     040  052101  042524  CODE07: .ASCIZ  / ATTEMPT TO RECEIVE WHILE IN SEND MODE%,/
        013576  050115  020124  047524
        013604  051040  041505  044505
        013612  042526  053440  044510
        013620  042514  044440  020116
        013626  042523  042116  046440
        013634  042117  022505  000056
  1673
  1674  013642  052040  040522  051516  CODE10: .ASCIZ  / TRANSMITTER NON-EX MEMORY INTERRUPT%,/
        013650  044515  052124  051105
        013656  047040  047117  042455
        013664  020130  042515  047515
        013672  054522  044440  052116
```

```
                013700  051105  052522  052120
                013706  027045      000
  1675
  1676  013711      040  042526  044522  CODE11: .ASCIZ  / VERIFIES OK%,/
        013716  044506  051505  047440
        013724  022513  000056
  1677
  1678  013730  042040  052101  020101  CODE12: .ASCIZ  / DATA VERIFY ERROR, SENT=377 RECV'D=/
        013736  042526  044522  054506
        013744  042440  051122  051117
        013752  020054  042523  052116
        013760  031455  033467  051040
        013766  041505  023526  026504
        013774      000
  1679
  1680  013775      040  047516  053040  CODE13: .ASCIZ  / NO VERIFY DATA RETURNED%,/
        014002  051105  043111  020131
        014010  040504  040524  051040
        014016  052105  051125  042516
        014024  022504  000056
  1681
  1682  014030  047040  020117  051124  CODE14: .ASCIZ  / NO TRANSMITTER INTERRUPTS OCCURRING%,/
        014036  047101  046523  052111
        014044  042524  020122  047111
        014052  042524  051122  050125
        014060  051524  047440  041503
        014066  051125  044522  043516
        014074  027045      000
  1683
  1684  014077      040  051511  040440  CODE15: .ASCIZ  / IS ACTIVE, CAN'T VERIFY - TYPE '"E'%,/
        014104  052103  053111  026105
        014112  041440  047101  052047
        014120  053040  051105  043111
        014126  020131  020055  054524
        014134  042520  023440  042536
        014142  022447  000056
  1685
  1686  014146  047040  020117  042522  CODE16: .ASCIZ / NO RECEIVER INTERRUPTS OCCURRING%,/
        014154  042503  053111  051105
        014162  044440  052116  051105
        014170  052522  052120  020123
        014176  041517  052503  051122
        014204  047111  022507  000056
  1687
  1688  014212  042040  052101  020101  CODE17: .ASCIZ / DATA CHECK ERROR, SENT=377 RECV'D=/
        014220  044103  041505  020113
        014226  051105  047522  026122
        014234  051440  047105  026524
        014242  033463  020067  042522
        014250  053103  042047  000055
  1689
  1690  014256  000040                  SPACE:  .ASCIZ  / /
  1691  014260  000045                  CRLF:   .ASCIZ                  /%/
  1692  014262  027045      000         DOT:    .ASCIZ  /%,/
```

```
014265     134     000          SLASH:  .ASCIZ  /\/
           014270                       .EVEN


014270  000000                  MONFLG: 0
014272  000000                  LINCLK: 0
014274  000000                  MEMSIZ: 0
014276  000001                  LINENO: 1
014300  000002                          2
014302  000004                          4
014304  000010                          10
014306  000020                          20
014310  000040                          40
014312  000100                          100
014314  000200                          200
014316  000400                          400
014320  001000                          1000
014322  002000                          2000
014324  004000                          4000
014326  010000                          10000
014330  020000                          20000
014332  040000                          40000
014334  100000                          100000


                                ;ADDRESSES AND CONSTANTS

014336  016672                  BUFADR: BUFFER
014340  017656                          BUFFER+500.
014342  020642                          BUFFER+1000.
014344  021626                          BUFFER+1500.
014346  022612                          BUFFER+2000.
014350  023576                          BUFFER+2500.
014352  024562                          BUFFER+3000.
014354  025546                          BUFFER+3500.
014356  026532                          BUFFER+4000.
014360  027516                          BUFFER+4500.
014362  030502                          BUFFER+5000.
014364  031466                          BUFFER+5500.
014366  032452                          BUFFER+6000.
014370  033436                          BUFFER+6500.
014372  034422                          BUFFER+7000.
014374  035406                          BUFFER+7500.

014376  000000                  BUFPTR: 0               ;THIS BUFFER AREA CONTAINS A POINTER
        014440                          .=.+40          ;ADDRESS WHICH POINTS TO THE NEXT
                                                        ;RECEIVER CHARACTER STORAGE BYTE

014440  000000                  MSGBUF: 0
        014450                          .=.+6
014450  000000                  LPWORD: 0               ;LINE PARAMETER WORD BUFFER
        014512                          .=.+40
014512  000000                  BAUDMS: 0               ;MESSAGE BUFFER FOR THE BAUD RATES
        014614                          .=.+100
```

```
 1747  014614  000000  HOLDSW: 0                       ;HOLD SW., SET = HOLDING A LINE
 1748  014616  000000  SENDSW: 0                       ;SEND SW., SET = LINE IN SEND MODE
 1749  014620  000000  BOOTFG: 0                       ;SET TO INDICATE READER IS ACTIVE
 1750  014622  000000  BOOTSW: 0                       ;BOOT SW., SET = BOOTING
 1751  014624  000000  BOOTLN: 0                       ;CONTAINS THE BOOT ADDR. LINE NO.
 1752  014626  000000  VRFSWH: 0
 1753          014670          .=.+40
 1754  014670  000000  ERRCTR: 0
 1755          014732          .=.+40
 1756  014732  000000  BCDCTR: 0
 1757  014734  000000  BCDPTR: 0
 1758  014736  000000  BCDBUF: 0
 1759          015000          .=.+40
 1760  015000  000000  RCHAR:  0
 1761  015002  000000  RSTAT:  0
 1762  015004  000000  SYSSW1: 0
 1763  015006  000000  CLKCTR: 0
 1764  015010  000000  SYSSWH: 0
 1765  015012  000000  TTYPTR: 0
 1766  015014  000000  CNTR:   0
 1767  015016  000000  TYPSV2: 0
 1768  015020  000000  RECVCK: 0
 1769  015022  000000  ACTIVE: 0
 1770  015024  000000  RUBSWH: 0
 1771  015026  000000  OSWITC: 0
 1772  015030  000000  SCHAR:  0
 1773  015032  000000  LINNO:  0
 1774  015034  000000  OFFSET: 0
 1775  015036  000000  REDONE: 0
 1776  015040  000000  CONSFL: 0
 1777  015042  000000  SAVCHR: 0
 1778  015044  000000  DEVADR: 0
 1779  015046  000000  PRTFLG: 0
 1780  015050  000000  BOOTP1: 0
 1781  015052  000000  BOOTP2: 0
 1782  015054  000000  BOOTAD: 0
 1783  015056  000000  READCT: 0                       ;CONTAINS NO. OF CHAR'S READ FROM READER
 1784          015120          .=.+40
 1785  015120  000000  TEMP:   0                       ;TEMPORARY STORAGE
 1786  015122  000000  KSTOR1: 0                       ;PERMANENT STORAGE
 1787  015124  000000  KSTOR2: 0                       ;PERMANENT STORAGE
 1788  015126  000000  KSTOR3: 0
 1789  015130  000000  KSTOR4: 0
 1790  015132  000000  RMODE:  0
 1791  015134  000000  PRTCNT: 0
 1792  015136  000000  PRTSWH: 0                       ;SOFTWARE SW.
 1793  015140  000000  TOPC:   0
 1794  015142  000000  FROMPC: 0
 1795  015144  000000  FMAP:   0                       ;SOFTWARE SW., SET IF MAPPING
 1796  015146  000000  RECSWH: 0                       ;RECEIVER SOFTWARE SW, SET=RECEIVING
 1797  015150  000000  PENDING:0                       ;SET WHEN A HELD LINE IS READY TO BE TRANS.
 1798  015152  000000  TRNSWH: 0                       ;TRANSMITTER SOFTWARE SW, SET=TRANSMITTING
 1799                  ;READER DEVICE ADDRESSES
 1800
```

```
1801  015154  000000  RCSR:   0
1802  015156  000000  RDBR:   0
1803  015160  000000  BYTECT: 0                        ;BUFFER AREA TO SAVE N OF RECEIVED BYTES
1804          015222            .=.+40                 ;ALLOCATE '1' LOCATION FOR EACH UNIT.
1805  015222  000000  RECNTR: 0
1806          015264            .=.+40
1807  015264  000000  XFERCT: 0
1808          015326            .=.+40
1809  015326  000000  REC:    0
1810          015370            .=.+40
1811  015370  000000  OR:     0
1812          015432            .=.+40
1813  015432  000000  FRM:    0
1814          015474            .=.+40
1815  015474  000000  PAR:    0
1816          015536            .=.+40
1817  015536  000000  ST:     0
1818          015600            .=.+40
1819  015600  000000  TRN:    0
1820          015642            .=.+40
1821  015642  000000  SND:    0
1822          015704            .=.+40
1823  015704  000000  ERRBUF: 0                        ;ERROR BUFFER STORAGE AREA.
1824          016526            .=.+400.
1825  016526  000000  TTYBUF: 0
1826          016570            .=.+40
1827  016570  000000  READBF: 0                        ;READER DATA BUFFER
1828          016672            .=.+64.
1829  016672  000000  BUFFER: 0                        ;DATA BUFFER STORAGE AREA.
1830  000001                    .END
```

```
ACTIVE  015022          307*    313     325*    358     624*    714*    801     928*    1038*   1048    1176*   1212*   1235
                       1251*   1266*   1769#
BAUDMS  014512          234     847     849     1745#
BAUDTB  013378         1484    1665#
BCDBIN  010058          884    1395#
BCDBN0  010076         1402#   1409
BCDBN1  010100         1403#   1410
BCDBN2  010122         1407    1410#
BCDBN3  010146         1408    1420#   1425
BCDBUF  014736          905    1400    1426    1758#
BCDCTR  014732          572*    631*    648*    667*    858*    893     897*    904*    950     953*    1401*   1422*   1756#
BCDEND  010166         1404    1425#
BCDPTR  014734          774     775*    905*    1400*   1422*   1421*   1426*   1757#
BINDEC* 104002           64#     65     236     395     822     824     826     828     830     832     834     839     844
BOOT    005550          515     949#
BOOTAD  015054         1782#
BOOTFG  014620          372     957*    994     1010*   1749#
BOOTLN  014624          951*    952*    1020    1751#
BOOTP1  015050         1788#
BOOTP2  015052          377*    973*    993     1003*   1781#
BOOTSW  014622         1029*   1247    1250*   1750#
BOOT1   005566          952#    956
BOOT2   005610          954     957#
BOOT3   005622          960#    964
BOOT4   005702          959     973#
BUFADR  014336          628     712     787     1177    1208    1720#
BUFFER  016672         1720    1721    1722    1723    1724    1725    1726    1727    1728    1729    1730    1731    1732
                       1733    1734    1735    1829#
BUFPTR  014376          150     664*    683     691*    1127    1193*   1737#
BYTECT  015160          627     665*    692*    703*    711     1180*   1189*   1206*   1207    1893#
CLKCTR  015006          310*    311     1861*   1763#
CLKSRV  006250          280     1861#
CNTR    015014         1766#
CODE00  013224          410     1655#
CODE01  013260          411     1657#
CODE02  013301          412     1659#
CODE03  013322          413     1661#
CODE04  013342          414     1663#
CODE05  013501          415     1668#
CODE06  013535          416     1670#
CODE07  013571          417     1672#
CODE10  013642          418     1674#
CODE11  013711          419     1676#
CODE12  013730          420     1678#
CODE13  013775          421     1680#
CODE14  014030          422     1682#
CODE15  014077          423     1684#
CODE16  014146          424     1686#
CODE17  014212          425     1688#
CONC    003626          506      594#
COND    003602          525      582#
CONH    003552          527      578#    575
CONH1   003600          573      576#
CONL    005006          535      815#
```

```
CONP    004020  537    643#
CONP1   004034  646#   652
CONP2   004040  646*   647#
CONP3   004064  649    653#
CONR    003646  529    611#
CONR1   003670  617#
CONR2   004002  616    620    631#
CONR3   004016  632    635#
CONS    004066  532    662#
CONSFL  015040  551    663*   698*   1776#
CONS0   004150  681#   696
CONS1   004076  664#   678
CONS2   004132  668    671#
CORSIZ  001412  142    146#
CRLF    014260  458    651    805    821    1691#
DATA    003062  391    452#
DECODE  010334  237    1475#
DECOD1  010366  1470   1484#
DECPTR  010322  1444   1461#
DEC1    010264  1458#
DEVADR  015044  168    162*   163    745*   746*   747*   748*   759    761*   762*   763*   795*   962
                970    1778#
DMBAR   001234  860    389*   629*   715*   929*   1031*  1289*  1236
DMBCR   001232  858    272*   627*   711*   925*   1027*  1287*
DMBKR   001236  870
DMCAR   001230  840    271*   628*   712*   926*   1028*  1288*
DMLPR   001226  830    270*
DMNRC   001224  820    1007
DMRBR   001244  900
DMRVTR  001242  890    195    218
DMSCR   001222  810    164    194    268*   269*   305*   326*   626*   710*   924*   1026*  1285*  1231*
                1268   1270*  1592*
DMSSR   001240  880    276*   279*
DMTBR   001250  920
DMTVTR  001246  910
DOT     014262  298    349    487    557    1838   1692#
EMTOK   010576  1543#
EMTSRV  010564  43     1540#
EMTTAB  010616  1545   1551#
EOP     000014  280    690    699    1194   1303
EOPMSG  013215  1330   1654#
ERRBUF  015704  295    346    359    361    586    1823#
ERRCTR  014670  1098   1108   1116   1122   1167   1214*  1259*  1754#
ERRMES  002706  399*   408#
ERRTBL  002744  399    410#
ERTRAP  010762  1578   1592#
EXIT    003144  459    467#
EXITKS  003540  492    543    550    558#   671    697    749    764    978
FINVEC  001644  185    194#
FLUSH   010432  1491   1496#  1501
FMAP    015144  197*   284    286*   1577   1587*  1795#
FORMIT  004626  570    611    645    662    770#   782    816    892    949
FORMON  004632  574    633    658    669    771#   868    908    955
FRAMER  006410  1186   1113#
```

```
FRM     015432            829    1115*   1813#
FROMPC  015142           1576*   1600*   1602    1794#
GETLN   003512            494     496    5514#
GETLN1  004722            159     770    795#    961     969    1476
GETLN2  004416            554    7274#
GTBAUD  001770           2314#
HOLDSW  014614            262     571*    615    617*    704     836    1198    1747#
KEYSRV  003150             46    4824#
KEY1    003504           5494#
KSTOR1  015122            288*    289    393*    395    405*    406    1786#
KSTOR2  015124            392*    396   1787#
KSTOR3  015126           1368*   1375*   1788#
KSTOR4  015138            374     958*   1789#
KWBR    001220            738     281*
KWVTR   001216            728     288*
KW11    001214            718     177    282*
LOVECT  001744            285    2184#
LINCLK  014272            182*    277   1698#
LINENO  014276            386     387    388     571     615     617     618     619     621     623     624     629     666
                          681     700    702     704     706     713     714     715     836     841     894     909     911
                          913     927    928     929     952    1020    1029    1030    1031    1095    1128    1138    1132
                         1143    1175   1176    1197    1198    1200    1209    1211    1212    1247    1258    1251    1253
                         1264    1266   1788#
LINNO   015032            233*    236    246*    247     819*    828*    822    852*   1773#
LINSTR  005544            268*    893*    904    9344#
LPWORD  014458            231     266    388    1488    1743#
MAPVEC  010664             39    1574#
MASK    010030           1361*   1369   1374*   1384#
MATCH   010412           1498#   1493
MEMSIZ  014274            147*    152    264    1699#
ME81    012133            186    1627#
ME811   012525            960    1646#
ME812   012556            835    1647#
ME813   012767            968    1658#
ME814   013010            180    1651#
ME82    012177            287    1629#
ME83    012255            394    1631#
ME84    012263           1531    1632#
ME85    012324           1594    1634#
ME86    012406           1599    1639#
ME88    012415            818    1642#
ME89    012500            584    1645#
MFIAD   012346            158    1637#
MONPLG  014270            154     156*   1697#
MONITR  002530            332     358#    366
MONTR1  002552            360    3634#
MOVEIT  007732           1363#   1376
MOVEON  007774           1367    1374#
MSGBUF  014440            847*    849*    858*    851    1741#
NOP   * 000240            264#
OCTEXT  010020           1352    1379#
OCTPRT  007650           1358#   1386    1389
OCTPR3* 104003            658     486
OCTSV1  010022           1353*   1377    1381#
```

```
OCTSV2  010024          1354*   1378    1382#   1437*   1456
OCTSV3  010026          1357    1366*   1383#   1385*   1388*
OFFSET  015034           239    1485*   1494*   1496*   1774#
OR      015370           825    1107*   1811#
OSWITC  015026           548*   1298    1338*   1771#
OUTPUT  007548          1313    1316    1319#
OUT1    010456          1482    1498    1503#
OUT2    010452          1481    1495    1502#
OVRLAY  010626           141    1559#
OVRLYA  010642          1562#   1567
OVRLYB  010662          1566    1568#
PAR     015474           827    1121*   1815#
PARITY  006442          1114    1121#
PC      =%000007         190     141*    159*    237*    363*    364*    365*    388*    408*    446*    468*    491*    498*
                         501*    549*    570*    574*    611*    612*    633*    635*    645*    658*    662*    669*    677*
                         733*    758*    778*    781*    798*    804*    806*    816*    868*    892*    896*    908*    919*
                         931*    949*    955*    961*    969*   1052*   1152*   1256*   1262*   1272*   1299*   1307*   1313*
                        1316*   1319*   1325*   1327*   1328*   1334*   1335*   1408*   1423*   1425*   1431*   1451*   1459*
                        1476*   1583*
PENDIN  015150           619     623*    786*    841    1288*   1797#
POP1SP* 005726           238
POP2SP* 022626           248    1575
PRINT   = 104000         628      63     157     158     188     186     207     235     298     349     394     408     487
                         458     597     584     647     651     731     753     885     818     821     851     968     968
                        1038    1538    1593    1598
PRTAS0  003104          4578     462     466
PRTAS1  003116           455    4618
PRTCNT  015134           457*    464*    465    1289*   1328*   1321    1323*   1791#
PRTDOT  003538           523    5568    576     588     613     653     721     862     987
PRTERR  007646           148*    261*    365*    522*   1292    1342#   1351
PRTFLG  015046          1779#
PRTOCT* 104001           638      64     289    1596    1601
PRTSWH  015136          1792#
PSW     001208           538     136*    196*    202*    257*    299*    358*    622*    638*    643*    788*    716*    888*
                         815*    923*    938*   1025*   1032*   1284*   1358*   1436*   1518*
PUSH2S* 024646           258
PWRFAL  010468            41    1588#
PWRUP   010514          1516    1518#
QMARK   003588           511    5488     748
RCBAUD  001252           988     248
RCHAR   015088           992*   1882    1768#
RCSR    015134           379*    958     965*    976*    991     998*   1887*   1889*   1881#
RDBR    015136           967*    992    1882#
READBF  016578           377     973    1828    1827#
READCT  015056           378*    975*   1884*   1885    1811    1819*   1827    1783#
READER  005736           971     988#
READ1   006006           995    1888#
READ2   006058          1881    1889#
READ3   006066          1886    1818#
READ3A  006212          1812    1838#
READ4   006216           999    1888    1837    1839#
REC     015326          1889#
RECERR  007116          1181    1111    1119    1125    1171    1214#
RECER1  007122          1168    1215#
```

```
RECEXT  007132          1094    1145    1218#
RECNTR  015222           823    1218*   1885#
RECNXT  006266          1087#   1099    1109    1117    1123    1134    1139    1153    1163    1169    1196    1201    1213
                        1217
RECR4A  006744          1101    1188#
RECSWH  015146           343     989    1128    1175*   1197*   1796#
RECVCK  015020           386*    319     327*   1130    1132*   1768#
RECVER  006256           219    1062    1083#
RECVR1  006350          1096    1183#
RECVR2  006466          1104    1127#
RECVR3  006702          1165    1175#   1187
RECVR4  006736          1129    1186#
RECVR5  006762          1191    1193#
RECVR6  007030          1199    1282#
RECYCL  010376          1486#   1508
REDONE  015036           374     376*    974*   1249*   1775#
RELESE  003660           612     615#    634
RESTRT  002460           278     340#    608
RMODE   015132           398     582*    644*   1190    1798#
RSTAT   015002           991*   1008    1036    1761#
RUBOUT  004540           728     751#
RUBSWH  015024           729     732*    751     754*   1778#
R0      =%000000         120     150*    151*    152     194*    198*    199*    203*    208     295*    296     315*    316*
                         317*    321*    322*    323*    346*    347     359     361*    362     388     438*    439*    440*
                         586*    587     916*    917*    918*    996*    997*   1108*   1110*   1118*   1124*   1135*   1136*
                        1137*   1138*   1140*   1149*   1150*   1151*   1158*   1170*   1192*   1215*   1216*   1255*   1260*
                        1261*   1271*   1508    1529*
R1      =%000001         130     143*    144     146*    147     163*    167*    170     172     173*    174     195*    210*
                         219*    220*    221*    222*    231*    232*    240*    241*    242*    262*    263*    264     267*
                         269     273*    274     308*    303     341*    342*    343     433*    436     482     486*    487*
                         488     489     493     495     497*    499*    508*    502     505     507     513     516     520
                         524     526     528     530     533     536     538     542*    544     548*    561*    599*    670*
                         727     734     736     738     741     744*    748     756*    759*    760*    771*    788*    817*
                         856*    962*    963     965     966*    967     970*    971*    972*    988    1041*   1051    1083
                        1202*   1203*   1204*   1205    1221*   1232    1235*   1237*   1240    1275*   1208    1294*   1295
                        1297    1301    1303    1305    1309    1311    1312*   1314*   1315*   1324*   1326*   1333*   1340*
                        1353    1355*   1359*   1363*   1364*   1365*   1368    1377*   1395    1402*   1411    1412*   1413*
                        1414*   1415*   1416*   1417*   1420    1430*   1442    1445*   1446*   1450*   1454*   1458*   1509
                        1519*   1520*   1520*   1500*   1502*   1584*   1586*
R1A     000614          1147    1155#
R2      =%000002         140     234*    244*    245*    266*    270     301*    309     320*    434*    436     441*    483
                         560*    594*    598*    625*    626     679*    693*    709*    710     717*    772*    783*    845*
                         846*    847     848*    849     920*    921*    922*    924     989     993*   1002*   1003    1022*
                        1023*   1024*   1026    1040*   1004    1007*   1008    1092    1103    1105    1113    1133    1138
                        1146    1151    1162    1164    1106    1108    1192    1194    1220*   1233    1236*   1237    1238*
                        1240    1242*   1274*   1205    1206*   1294    1330*   1339*   1354    1360*   1369*   1370*   1373
                        1378*   1396    1411*   1415    1416    1429*   1437    1438*   1439*   1440*   1447*   1449*   1456*
                        1510    1527*
R2A     000604          1152#   1157
R3      =%000003         150     239*    240     241     243*    244     245     302*    306     307     308     316     322
                         329*    330     435*    439     442*    443     484     559*    571     595*    597*    615     617
                         618     619     621     623     624     627     628     629     664*    665*    666     680*    681
                         683     691*    692*    694*    695     700     702     703*    704     706     711     712     713
                         714     715     718*    719     773*    784*    787     819     823     825     827     829     831
```

```
                        833     836     841     845     853*    894     895*    909     911     913     917     920     927
                        928     929     952     990     1018*   1020    1022    1029    1030    1031    1033*   1034    1039*
                       1085    1088*   1089*   1090*   1091*   1095    1097*   1098    1107*   1108    1115*   1116    1121*
                       1122    1127    1128    1130    1132    1136    1141    1143    1149    1155*   1156    1159*   1166*
                       1167    1175    1176    1177    1180*   1189*   1193*   1197    1198    1200    1202    1206*   1207
                       1208    1209    1210*   1211    1212    1214*   1215    1219*   1234    1239*   1243*   1244    1247
                       1250    1251    1253    1259*   1260    1264    1265*   1266    1273*   1397    1405*   1406    1410*
                       1417    1428*   1475*   1479    1484*   1487    1489    1490    1492    1497    1499    1511    1526*
R4      =%000004        160     164*    172*    396*    397*    398*    399     401     403     405     558*    596*    646
                        664     683*    689*    690*    691     699*    774*    776     778     785*    787*    788*    789*
                       1086    1127*   1177*   1178*   1179*   1188*   1193    1218*   1398    1399*   1403    1405    1427*
                       1443    1444*   1447    1449    1452    1457*   1486*   1490    1512    1525*
R4A     000642         1142    1162#
R5      =%000005        170     178*    171*    174     296*    347*    362*    388     392     393     405     454     461
                        463     467     587*    1513    1524*
SAVCHR  015042         1777#
SCHAR   015038          488*    499     684     686     689     796*    802     1772#
SENDBF  004284          689#
SENDLN  004136          553     677#
SENDSW  014616          341     618*    666*    681     700     702*    1095    1748#
SERVCE  002070          2579    589     1532
SLASH   014265          731     753     1693#
SND     015642         1097*   1821#
SP      =%000006        100     137*    258*    340*    402*    403*    404*    405*    558     559     560     561     596
                        597     598     599     988*    989*    990*    1039    1040    1041    1083*   1084*   1085*   1086*
                       1218    1219    1220    1221    1232*   1233*   1234*   1273    1274    1275    1286    1287*   1288*
                       1311*   1314    1340    1355    1356*   1395*   1396*   1397*   1398*   1427    1428    1429    1430
                       1438    1441*   1442*   1443*   1457    1458    1502*   1508*   1509*   1510*   1511*   1512*   1513*
                       1514*   1515    1522*   1523    1524    1525    1526    1527    1528    1529    1540*   1541*   1542*
                       1543*   1544*   1545*   1546*   1547    1574    1576
SPACE   014256         1698#
SRVERR  002634          363     388#
SRVEXT  002742          389     404     408#
ST      015536          833    1166*   1817#
STACK =  001100          27#     137     258     348
START   001342           49     1360    504     1683
START1  001470          155     158#    187     218
START2  001514          161     163#
START3  001550          178#
START4  001606          176     188#
START5  001636          165     186#
START6  001614          179     182#
START7  001620          181     183#
SWR     001212           58#    358*    881*    1048*
SYSCK1  003004          364     431#
SYSEXT  003060          432     446#
SYSSWH  015010          510     512*    541*    547*    556*    977*    1764#
SYSSW1  015004          431     433     445*    894*    913*    1143*   1762#
TAGA    004244          685     687     698#
TAGB    004254          708#    720
TAGC    004220          682     693#
TAGD    004316          705     708#
TAGE    004376          701     707     717#
TEMP    015120          823*    824     825*    826     827*    828     829*    830     831*    832     833*    834     835*
```

```
                        838*    839     848*    843*    844     1515*   1522    1705#
TITLE   011031          157     1608#
TKB     001204          550     486
TKB     001202          540     138*    297*    348*    799*
TOPC    015140          1574*   1579*   1588    1581*   1582    1583*   1584    1585*   1586    1595*   1597    1793#
TPB     001210          570     456*    463*    1851*   1373*
TPB     001206          560     452     1049    1371
TRAN1   007200          1240#   1245
TRAN1A  007204          1242#   1252    1257    1267
TRAN2   007222          1241    1247#
TRAN3   007254          1248    1253#
TRAN4   007310          1254    1264#
TRBAUD  001306          1170    241
TRN     015600          831     1819#
TRNCHK  002246          2950
TRNERR  007276          1256    1259#   1272
TRNEXT  007332          1246    1268#
TRNMIT  007144          221     1231#
TRNSWH  015152          388*    326*    621*    713*    911     927*    1211*   1253    1264*   1798#
TSTBOT  002570          365     372#
TSTEXT  002632          373     375     388#
TTYBUF  016526          243     797*    798     854     1399    1475    1477    1479*   1486    1825#
TTYPTR  015012          741*    742*    743*    755*    756     757*    798*    1765#
TYPECL  007560          1299    1307    1323#   1335
TYPEIT  006226          491     498     581     549     677     733     758     781     1048#   105#    1319    1325    1327
                        1334    1451    1455
TYPEOP  007606          1304    1338#
TYPERA  007416          1298#   1308    1308    1317    1331    1336
TYPERB  007614          1302    1333#
TYPEXT  007632          1291    1293    1296    1338#
TYPMES  007370          1284#   1551
TYPRET  007604          1322    1328#
TYPSV2  015016          1285*   1339    1767#
TYPT1   010250          1445#   1453
TYPT2   010254          1446#   1448
VERDAT  005542          271     926     933#
VEREXT  005540          931#
VERIFY  005310          519     546     892#
VERLN   005350          988#    906
VERNXT  005342          897#
VERPT   005546          139*    259*    518*    902     914     935#    1144
VFRPT   005322          894#    901
VRFEXT  005356          898     902#
VRFSND  005406          896     909#    1152
VRFSWH  014626          895*    1141    1155*   1156    1159*   1752#
XBINDE  010212          1436#   1553
XFERCT  015264          1265*   1287#
XOCTP3  010040          1388#   1554
XOCTP6  010032          1385#   1552
.     . 016674          328     36      38#     45#     48#     52#     145     153     312     453     503     508     531
                        552     837     842     1195    1358    1362    1372    1488    1521    1694#   1738#   1742#   1744#
                        1746#   1753#   1755#   1759#   1764#   1804#   1806#   1808#   1810#   1812#   1814#   1816#   1818#
                        1820#   1822#   1824#   1826#   1828#
```

```
ADD     171   173   329   442   694   718   748   775   784   848   853   966  1033  1243  1287
       1356  1415  1416  1417  1421  1441  1449  1502  1545  1564  1581  1583  1585
ASL     328   398   441   745   746   747   846  1091  1242  1412  1413  1414  1494  1543
ASR     761   762   763   828   921  1023  1203
ASRB    317   323   440   918  1137  1150  1216  1261
BEQ     205   275   278   314   320   373   389   402   432   437   462   466   494   506   525
        527   529   537   552   573   583   616   620   682   685   687   701   705   728   730
        735   777   837   842   898   903   912   954   964  1006  1012  1021  1096  1104  1106
       1114  1131  1134  1142  1147  1163  1165  1187  1191  1195  1199  1248  1269  1296  1302
       1304  1358  1404  1498  1500  1566  1578
BGE     304   496   779  1367
BGT     360  1168  1322
BIC     324   397   487   617   618   623   702   744   760   913  1090  1132  1143  1176  1197
       1231  1237  1250  1251  1264  1266  1359  1410  1440  1544
BICB   1369
BIS     167   197   199   241   242   282   297   305   306   307   308   309   348   500   571
        621   624   625   629   666   706   709   713   714   715   799   894   922   927   928
        929   952  1024  1029  1030  1031  1175  1200  1204  1209  1211  1212  1270  1315  1370
       1450  1592
BIT     274   436   615   619   681   700   704   836   841   989   911  1028  1095  1103  1105
       1113  1128  1130  1198  1240  1247  1253  1268
BITB   1371
BLE     632   649   668   739   859  1310
BLT     737  1099  1109  1117  1123
BMI    1001  1093
BNE     153   155   161   175   248   265   312   331   344   375   391   404   444   455   490
        503   508   511   514   517   521   531   534   539   545   696   720   752   786   803
        855   857   910   915   959   995  1035  1129  1145  1157  1241  1245  1254  1291  1293
       1298  1306  1352  1376  1407  1453  1478  1481  1488  1491  1493  1521
BPL     453  1037  1050  1372  1448
BR      145   179   181   185   187   238   318   332   366   459   492   523   543   550   575
        576   585   588   613   634   652   653   670   707   782   861   981   986   956   999
       1008  1062  1139  1160  1171  1181  1246  1252  1257  1267  1308  1308  1317  1331  1336
       1362  1386  1389  1409  1418  1482  1495  1501  1567
CLR     138   139   148   151   196   283   286   232   233   259   260   261   263   276   299
        302   310   325   326   327   342   345   350   376   374   435   445   457   556   594
        595   638   643   644   678   679   688   698   716   732   771   772   773   788   789
        795   796   797   800   815   835   848   850   930   951   974   975   977   998  1009
       1010  1018  1159  1178  1179  1239  1284  1289  1323  1338  1350  1385  1401  1402  1436
       1485  1519  1587
CLRB    743   757   997
CMP     152   174   247   264   303   311   330   343   359   374   388   401   403   443   465
        489   493   495   695   719   727   778   802  1005  1034  1090  1100  1116  1122  1156
       1167  1244  1321  1406  1565
CMPB    454   461   502   505   507   513   516   520   524   526   528   530   533   536   538
        544   684   686   734   736   738  1133  1146  1164  1186  1194  1297  1301  1303  1305
       1309  1487  1490  1492  1499
COM     522   582
DEC     541   547   572   631   648   667   755   785   856   858   897   953  1366  1375
EMT      62
HALT    400   647  1517
INC     156   182   246   273   464   512   548   663   692   693   717   742   754   783   838
        843   852   957  1004  1061  1097  1107  1115  1121  1155  1166  1189  1210  1214  1249
       1259  1265  1320  1422  1446  1496  1520
```

ERRORS DETECTED: 0

```
*DZVTGA,DZVTGA/CRF_DZVTGA.SRC
RUN-TIME:  7 15 3 SECONDS
CORE USED:  9K
```