DZ11

OVERLAY FOR ITP

MD-11-DZDZB-B

EP-DZDZB-B-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN U.S.A

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZDZB-B-D

PRODUCT NAME: DZ11 OVERLAY FOR INTERPROCESSOR TEST PROGRAM

PROGRAM DATE: OCTOBER 1976

MAINTAINER: DIAGNOSTICS

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1.0 ABSTRACT.

THIS PROGRAM IS DESIGNED AS A MAINTENANCE AID FOR
FIELD SERVICE PERSONEL. IT WILL VERIFY THE PROPER OPERATION
OF A COMPLETE COMMUNICATION LINK FROM ONE PDP-11
SYSTEM TO ANOTHER OR TO A COMMUNICATION TEST CENTER.

THIS PROGRAN MUST BE USED IN CONJUNCTION WITH THE INTERPROCESSOR
TEST PROGRAM(DZITP) ON A PDP-11 SYSTEM WITH A DL-11 INTERFACE.

2.0 REQUIREMENTS.

2.1 EQUIPMENT

A. PDP-11 SYSTEM WITH 4K OF CORE.
B. A DZ11 COMMUNICATION INTERFACE.

2.2 STORAGE.

4K OF CORE

3.0 LOADING PROCEDURE
THIS PROGRAM IS IN ABSOLUTE FORMAT.
THE ABS LOADER MUST BE USED TO LOAD THE PROGRAM.

4.0 OPERATING PROCEDURES.

A. TWO METHODS OF ENTERING PARAMETERS ARE PROVIDED
1. LOAD ADDRESS 200 AND START TO ENTER PARAMS FROM CONSOLE TTY, PROCEED TO SECTION B.
2. LOAD ADDRESS 200 AND SET SWITCH REGISTER BIT 15 BEFORE
STARTING TO ENTER PARAMS FROM CONSOLE SWITCHES, PROCEED TO SECTION C.
*THE PROGRAM MAY BE RESTARTED AT LOC 204 (ONCE PARAMETERS HAVE ALREADY BEEN SELECTED)

B. CONSOLE DIALOGUE PARAMETER INPUT (CURRENT VALUES FOR PARAMETERS ARE FOUND IN OVERLAY)

1. THE PROGRAM WILL TYPEOUT THE NAME OF THE VARIABLE OVERLAY.
A. IF YOU WISH TO SETUP JUST THE INDICATED OVERLAY, TYPE A CARAGE RETURN
B. IF YOU WISH TO SETUP A DN11, TYPE IN DN.
C. IF YOU WISH TO SETUP A DM11BB, TYPE IN DMB.

IF DN OR DMB WAS TYPED IN STEP 1 ABOVE THEN THE BUS ADDRESS,
VECTOR ETC. REFERED TO IN STEPS 2 THRU 7, PERTAIN TO THE DN11 OR DMBB.

2. THE PROGRAM WILL TYPE THE DEFAULT BUS ADDRESS OF THE INTERFACE UNDER TEST.
A. TYPE A CAR. RETURN TO USE DEFAULT BUS ADDRESS
B. TYPEIN ACTUAL BUS ADDRESS

3. THE PROGRAM WILL TYPE OUT THE DEFAULT VECTOR ADDRESS
A. TYPE A CAR. RETURN TO USE DEFAULT ADDRESS
B. TYPEIN ACTUAL VECTOR ADDRESS

4. THE PROGRAM WILL TYPE OUT THE DEFAULT INTERFACE PRIORITY
NOTE: 200=PRIO 4, 240=PRIO 5, 300=PRIO 6, ETC.

A. TYPE A CAR. RETURN TO USE DEFAULT VALUE
B. TYPEIN ACTUAL VALUE

5. THE PROGRAM WILL TYPEOUT THE DEFAULT VALUE OF PARAM#1
IF REQUIRED BY THE ISR.(SEE SECT. 10.0 IN OVERLAY LISTING FOR PARAMETER DESCRIPTION)
A. TYPE A CAR. RETURN TO USE DEFAULT VALUE
B. TYPEIN ACTUAL VALUE

6. THE PROGRAM WILL TYPEOUT THE DEFAULT VALUE OF PARAM#2
IF REQUIRED BY THE ISR.
A. TYPE A CAR. RETURN TO USE DEFAULT VALUE
B. ENTER ACTUAL VALUE

7. THE PROGRAM WILL TYPEOUT THE DEFAULT VALUE OF PARAM#3
IF REQUIRED BY THE OVERLAY.
A. TYPE A CAR. RETURN TO USE DEFAULT VALUE
THE DN-11 WILL USE PARAM #3 AS THE # TO DIAL.
IF USING A MODEM WITHOUT AUTOMATIC HANDSHAKING,
THE NUMBER MUST TERMINATE WITH A
"END-OF-NUMBER" CHARACTER (:).
B. ENTER ACTUAL VALUE.

8. THE PROGRAM WILL RETURN TO STEP B1 IF THIS SETUP
WAS FOR DN11 OR DM11BB.

9. THE PROGRAM WILL REQUEST THAT SWITCH REGISTER BE SET.
A. SETUP SWITCH REGISTER AS SPECIFIED IN STEP D.
AND TYPE A CAR. RETURN.

NOTE: IF ANY OF THE ABOVE ITEMS 2 THRU 7 WERE CHANGED BY ENTERING
NEW VALUES,THE NEW VALUE BECOMES THE DEFAULT VALUE FOR SUBSEQUENT
RESTARTS OF THE PROGRAM.

C. MANUAL PARAMETER INPUT FROM SWITCH REGISTER
1. THE PROGRAM HALTS FOR ISR(INTERFACE SERVICE ROUTINE) SPECIFICATION
SWR14=SETUP DM-11B ISR
SWR13=SETUP DN-11 ISR
SWR=000000=SETUP VARIABLE ISR

2. THE FOLLOWING HALTS ARE REPEATED FOR EACH ISR SPECIFIED.
SETUP SEQUENCE IS: DN11,DM11-BB THEN VARIABLE OVERLAY. (EACH ENTRY SET SWICHES THEN HIT CONTINUE.)
A. HALT FOR BUS ADDRESS OF INTERFACE
B. HALT FOR VECTOR ADDRESS OF INTERFACE
C. HALT FOR PRIORITY OF INTERFACE
D. HALT FOR INTERFACE PARAM #1 (SEE SECT. 10.0 IN OVERLAY LISTING FOR PARAMETER DESCRIPTION)
E. HALT FOR INTERFACE PARAM #2 (DN11 AND DMBB PARAMETERS ARE DISCUSSED IN SECT. 10.0 OF THE MONITOR.
F. GO BACK TO STEP A IF THIS SETUP WAS FOR DN OR DMB.

3. HALT FOR OPERATIONAL SWITCH SETTINGS. (SEE STEP D.)
A. PRESS CONTINUE TO START TESTING

BEFORE ATTEMPTING TO RUN THIS PROGRAM, THE OPERATOR MUST
ACCERTAIN THE COMPLETE COMMUNICATION LOOP AND PROCEEDURES
TO BE USED, INCLUDING THE TYPE OF MODEMS, THE TYPE OF
INTERFACE BEING USED AT THE OTHER CPU AND THE MODES OF OPERATION,
DATA AND PARAMETERS TO BE USED AT EACH CPU.

THIS WILL REQUIRED VOCAL COMMUNICATION WITH THE OPERATOR
AT THE OTHER CPU UNLESS ITS CONFIGURATION AND OPERATION
ARE FIXED AS A TEST CENTER.

AFTER DETERMINING THAT THE EQUIPMENTS ARE COMPATIBLE AND
AGREEING ON THE MODE AND VARIABLE PARAMETERS TO BE USED,
THE SYSTEM WHICH IS TO RECEIVE DATA FIRST SHOULD BE
LOADED AND STARTED. IF THE MODEM BEING USED ON THIS SYSTEM
HAS AN AUTOMATIC ANSWER FEATURE, IT SHOULD BE ENABLED.

THE SYSTEM WHICH IS TO TRANSMIT FIRST SHOULD THEN BE LOADED
AND STARTED AND THE CONNECTION ESTABLISHED EITHER MANUALLY
OR AUTOMATICALLY (VIA DN-11).

D. OPERATIONAL SWITCH SETTINGS.

SW15=1 HALT ON ERROR
SW14=1 SINGLE PASS
    SW14 HAS NO EFFECT IF SW04=0
SW13=1 INHIBIT ERROR TYPEOUTS
SW12=1 INHIBIT ALL TYPEOUTS EXCEPT ERRORS
    IF SW12=0 AND SW04=1 END PASS IS TYPED
    AND TRANSMITTED/RECEIVED DATA IS TYPED.
SW11=1 USE PREVIOUSLY SPECIFIED DATA
SW10=1 DATA SELECT (WITH SW09)
SW09=1 DATA SELECT (WITH SW10)
    00=1 GET DATA FROM OPERATOR
    01=1 TEST MESSAGE #1 ($A QUICK BROWN FOX)
    10=1 TEST MESSAGE #2 ($B NUMERICS)
    11=1 TEST MESSAGE #3 ($C COMTEST/QUICK BROWN FOX/NUMERICS)
SW08=1 TRANSMIT RECEIVED DATA (INTERNAL LOOPBACK MODE)
SW07=1 DO NOT TEST RECEIVED DATA
SW06=1 MONITOR TRANSMITTED DATA ON CONSOLE TTY.*
SW05=1 MONITOR RECEIVED DATA ON CONSOLE TTY.*
    * IN MANY CASES, NOT ALL DATA WILL APPEAR ON THE CONSOLE
    TTY. THIS IS ESPECIALLY TRUE WHEN THE COMM INTERFACE IS
    RUNNING AT A FASTER BAUD THAN THE CONSOLE, BUT EVEN AT EQUAL
    OR SLOWER BAUDS, ALL CHARACTERS MAY NOT APPEAR ON THE CONSOLE.

SW04=1 RETURN TO MONITOR FOR END PASS
    WHEN SW04=0 PROGRAM LOOPS IN THE OVERLAY NEVER RETURNING TO THE MONITOR.
SW03=1 INTERNAL LOOPBACK MODE
SW02=1 EXTERNAL LOOPBACK MODE
SW01=1 ONE-WAY-IN MODE
SW00=1 ONE-WAY-OUT MODE

THIS PROGRAM HAS BEEN MODIFIED TO RUN ON A PROCESSOR WITH OR WITHOUT
A HARDWARE SWITCH REGISTER. WHEN FIRST EXECUTED THE PROGRAM TESTS
THE EXISTENCE OF A HARDWARE SWITCH REGISTER. IF NOT FOUND A
SOFTWARE SWITCH REGISTER LOCATION (SWREG=LOC. 176) IS DEFAULTED TO.
IF THIS IS THE CASE, UPON EXECUTION THE CONTENTS OF THE SWREG ARE
DUMPED IN OCTAL ON THE CONSOLE TTY AND ANY CHANGES ARE REQUESTED

(IE) SWR=XXXXXX NEW=

POSSIBLE RESPONSES ARE:

1.	<CR>	IF NO CHANGES ARE TO BE MADE
2.	6 DIGITS 0-7	TO REPRESENT IN OCTAL THE NEW SWITCH REGISTER VALUE ;LAST DIGIT FOLLOWED BY <CR>.
3.	↑U	TO ALLOW REENTERING VALUE IF ERROR IS COMMITTED KEYING IN SWREG VALUE.

BUILT INTO THE PROGRAM IS THE ABILITY TO DYNAMICALLY CHANGE THE
CONTENTS OF SWREG DURING PROGRAM EXECUTION. BY STRIKING ↑G
(CNTL G) ON CONSOLE TTY THE OPERATOR SETS A REQUEST FLAG TO CHANGE
THE CONTENTS OF SWREG, WHICH IS PROCESSED IN KEY AREAS OF THE PROGRAM
CODE (IE) ERROR ROUTINES, AFTER HALTS END OF PASS, AND OTHER
APPLICABLE AREAS.

IF OPERATOR SPECIFIED DATA WAS INDICATED, THE PROGRAM WILL TYPE A
REQUEST FOR THE DATA. DATA MAY BE ENTERED AS ASCII CHARACTERS OR OCTAL CODE.
TYPE IN THE DATA TERMINATED WITH A CR. OCTAL CODE MAY BE ENTERED BY TYPING AN
↑(UP ARROW) FOLLOWED BY THE OCTAL CODE (IN THE RANGE 000 TO 377)
SEPERATED BY SPACES AND TERMINATED BY ↑(UP ARROW).
    I.E. ABCD↑ 000 123 377↑ EFG (CAR.RETURN)

A TYPICAL SWITCH SETTING FOR HALF-DUPLEX=003150 THIS SETTING USES
INTERNAL LOOPBACK MODE, LOOPS IN OVERLAY, MONITORS TRANSMITTED AND RECEIVED
DATA ON THE CONSOLE TTY, AND TESTS RECEIVED DATA USING TEST MESSAGE #3.

A TYPICAL SWITCH SETTING FOR FULL-DUPLEX=003144 THIS SETTING
IS THE SAME AS ABOVE EXCEPT IT USES THE EXTERNAL LOOPBACK MODE.

ALL STANDARD MESSAGES(TEST MESSAGES 1-3) ARE PRECEDED BY 2 FILL CHARACTERS(177),
AND ARE FOLLOWED BY A CR(015), LF(012),RECEIVE TERMINATING CHARACTER(001),
4 FILLS(177), AND A TRANSMIT TERMINATING CHARACTER(000). DURING TRANSMISSION,
WHEN A 000 CHARACTER IS SEEN THE TRANSMISSION IS STOPPED.DURING RECEPTION,
WHEN A 001 CHARACTER IS RECEIVED, THE RECEIVER IS SHUT OFF.
IF THE MESSAGE WAS INPUTED BY THE OPERATER, THE TERMINATING CHARACTERS ARE ADDED.

TEST MODES

INTERNAL LOOPBACK MODE

1. THE OVERLAY WAITS TO RECEIVE A MESSAGE (TERMINATED BY <001>)
2. VERFIES THE DATA AGAINST THE DATA SELECTED BY SW09 AND SW10(SW7=0)
3. TRANSMIT THE DATA SELECTED BY SW09 AND SW10 (SW8=0) OR
   TRANSMIT THE RECEIVED DATA (SW8=1)
4. RETURNS TO MONITOR FOR "END PASS" (SW4=1) OR
   GO TO STEP 1. (SW4=0)

EXTERNAL LOOPBACK MODE

1. THE OVERLAY SETS REQUEST TO SEND
2. WAIT FOR CLEAR TO SEND
3. TRANSMITS THE SELECTED DATA
4. RESETS REQUEST TO SEND
5. WAIT FOR MESSAGE TO BE RECEIVED
6. VERIFIES THE DATA (SW07=0)
7. RETURNS TO MONITOR FOR "END PASS". (SW04=1) OR
   GO TO STEP 1(SW04=0)

ONE-WAY-IN MODE

1. THE OVERLAY WAITS FOR MESSAGE TO BE RECEIVED.
2. VERIFIES THE DATA(SW07=0)
3. RETURNS TO MONITOR FOR "END PASS"(SW04=1) OR
   GO TO STEP 1 (SW04=0)

ONE-WAY-OUT MODE

1. THE OVERLAY SETS REQUEST TO SEND
2. WAITS FOR CLEAR TO SEND
3. TRANSMITS SELECTED DATA
4. RETURNS TO MONITOR FOR "END PASS". (SW04=1) OR
   GO TO STEP 1 (SW04=0)

E. THE OVERLAY IS THEN ENTERED AND A CONNECTION ESTABLISHED EITHER MANUALLY OR AUTOMATICALLY.

IF ONE-WAY-IN OR INTERNAL LOOPBACK MODES ARE SELECTED.
THE OVERLAY WILL SET DATA TERMINAL READY AND WAIT FOR DATA.

IF ONE-WAY-OUT OR EXTERNAL LOOPBACK MODES WERE SELECTED.
THE OVERLAY WILL SET DATA TERMINAL READY AND REQUEST TO SEND.
THE OVERLAY WILL THEN WAIT FOR CLEAR TO SEND BEFORE ATTEMPTING TO TRANSMIT DATA.

THE PROGRAM WILL PRINTOUT A "WAITING FOR CLEAR TO SEND" MESSAGE AND THE CONTENTS OF THE XMIT CSR EVERY 60 SECS. UNTIL CLEAR TO SEND IS ASSERTED.

F. IF SW04=0 THE OVERLAY WILL CONTINUE TO
TRANSMIT/RECEIVE DATA.

IF SW04=1 THE OVERLAY WILL RETURN
TO THE MONITOR AND TYPE "END PASS".

IF BOTH SW04=1 AND SW14=1, THE PROGRAM WILL REQUEST
NEW INTERFACE PARAMS AFTER ONE PASS OF THE SELECTED
TEST MODE.

TEST EXECUTION MAY BE INTERRUPTED BY TYPING THE FOLLOWING
CHARACTERS ON THE CONSOLE TTY.
LINE FEED = RESTART PROGRAM AT LOCATION 200.
QUESTION MARK = PRINTOUT FIRST 8 WORDS OF INPUT BUFFER.(ASCII)
THEN TYPE EITHER:
*WXXXXXX TO PRINTOUT THE 8 WORDS
AT LOC XXXXXX.

*BXXXXXX TO PRINTOUT THE 16 BYTES
AFTER LOC XXXXXX.

*C TO CONTINUE

PROGRAM MUST BE RESTARTED AT 200 AFTER PRINTING.
CARRIAGE RETURN = RESTART AT REQUEST FOR NEW OPERATIONAL SWITCHES.

5.0 PROGRAM AND/OR OPERATOR ACTION

IF THE OPERATOR WISHES TO MANUALY EXAMINE THE TRANSMIT OR RECEIVE
BUFFERS, DO THE FOLLOWING; TO FIND THE STARTING ADDRESS OF THE RECEIVE
BUFFER, LOAD ADDRESS 11020 AND EXAMINE. TO FIND THE STARTING ADDRESS
OF THE TRANSMIT BUFFER, LOAD ADDRESS 11022 AND EXAMINE.

5.1 NORMAL HALTS

SEE SECTION 4.

6.0 ERRORS

6.1 ERROR REPORTING

THE ONLY ERROR REPORT FROM THE CONTROL PROGRAM OCCURS IF THE
INTERFACE SPECIFIED IS NOT LOADED.

IF DATA IS RECEIVED AND SWITCH 7 (NO DATA COMPARE)
IS RESET, THE DATA WILL BE COMPARED AGAINST THE PRESELECTED
DATA AFTER A LINE FEED CHARACTER IS RECEIVED. IF THERE IS A
MISMATCH, THE FOLLOWING ERROR REPORT IS PRINTED:

RECEIVED DATA=RRRRRR
DATA SHOULD BE TTTTTT
DATA COMPARE ERROR; BAD DATA=BBB GOOD DATA=GGG

WHERE RRRRRR IS THE RECEIVE BUFFER (UP TO 512 CHARACTERS)
TTTTTT IS THE TRANSMIT BUFFER (UP TO 512 CHARACTERS)
BBB IS THE BAD DATA CHARACTER
GGG IS THE GOOD DATA CHARACTER

IF THE INTERFACE DETECTS A DATA ERROR, THE FOLLOWING
WILL BE PRINTED BEFORE THE DATA IS COMPARED:

THERE WAS A RECEIVER ERROR. RECEIVER DATA REGISTER =XXXXXX

WHERE XXXXXX IS THE CONTENTS OF THE RECEIVER DATA REGISTER
THE LOW BYTE IS THE DATA, AND THE HIGH BYTE IS THE ERROR BITS.

IF A RECEIVE TERMINATING CHARACTER<001> IS NOT DETECTED
WITHIN 512 CHARACTERS A "BUFFER FULL" PRINTOUT WILL OCCUR.

7.0 RESTRICTIONS

THE OPERATION OF THIS PROGRAM REQUIRES COORDINATION BETWEEN
THE OPERATOR AND THE OPERATOR OF ANOTHER PDP-11 SYSTEM
UNLESS ONE OF THE SYSTEMS IS ALWAYS OPERATING IN A FIXED
MODE. THE FOLLOWING TABLE LISTS THE VALID COMBINATIONS:

CPU #1	CPU #2
ONE-WAY-OUT	ONE-WAY-IN
ONE-WAY-IN	ONE-WAY-OUT
EXTERNAL-LOOPBACK	INTERNAL-LOOPBACK
INTERNAL-LOOPBACK	EXTERNAL-LOOPBACK
EXTERNAL-LOOPBACK	EXTERNAL-LOOPBACK (FULL DUPLEX)

WHEN THE COMMUNICATION LINK INVOLVES MODEMS THE FOLLOWING
RESTRICTION APPLY:

IF RUNNING IN FULL DUPLEX MODE BOTH SYSTEMS
MUST BE IN EXTERNAL LOOP BACK MODE.

BOTH SYSTEMS SHOULD BE RUNNING IDENTICAL ROUTINES.
EXAMPLE:
SWITCHES 14,13,7,4 SHOULD BE THE SAME
ON BOTH CPU'S

IF PROGRAM IS WAITING IN A SCAN ROUTINE AND TYPES OUT
A "WAITING MESSAGE",IF AN INCOMING MESSAGE STARTS DURING
THE TYPE OUT, IT WILL BE LOST BECAUSE THE TYPEOUT PRIORITY
IS AT LEVEL 7. THIS WILL RESULT IN OVERRUN OR SILO OVER-
RUN ERRORS, DEPENDING ON THE DEVICE.TO AVOID THIS SITUATION
RUN WITH SWITCH 13 UP. IF OVERRUN DOES OCCURE DURING A
TYPEOUT THE PROGRAM SHOULD BE RESTARTED.

IF USING AN ASYNCRONOUS DEVICE, MODEMS AND THE
MAYNARD TEST STATION AND INITALIZE DOES NOT CLEAR THE
CONNECTION (EXAMPLE THE DJ11) IF THE PROGRAM IS RESTARTED
IN THE MIDDLE OF A MESSAGE AT LOC 204 OR BY HITTING CR
AN IMMEDEATE ERROR MESSAGE FROM MAYNARD WILL BE RE-

CEIVED. THIS IS BECAUSE THE TEST STATION IS STILL LOOKING
FOR THE REST OF THE INTERUPTED MESSAGE. TO AVOID THIS
ERROR , RESTART PROGRAM ONLY AT THE END OF THE MESSAGE
CURRENTLY BEING TRANSMITTED.

8.0 MISCELLANEOUS

ITEP WAS CHECKED OUT USING THE FOLLOWING BELL TELEPHONE MODEMS.
201A (HALF-DUPLEX SYNCHRONOUS 2000 BAUD)
202C (HALF-DUPLEX ASYNCHRONOUS 1200 BAUD)
103A (FULL-DUPLEX ASYNCHRONOUS 110 BAUD)

9.0 PROGRAM DESCRIPTION

9.1 THE DZ11 INTERFACE SERVICE PARAMS ARE SETUP, AS SPECIFIED BY THE OPERATOR,
BY THE ITEP CONTROL PROGRAM.

TIME: PROVIDES A MEANS OF MEASURING ELASPED TIME. IT IS INCREMENTED
EVERY SECOND BY A CLOCK INTERRUPT ROUTINE IN ITEP.

9.2 WHEN THE OVERLAY IS FIRST ENTERED BY ITEP AT LOCATION START:,
THE CONTENTS OF THE SWITCH REGISTER ARE STORED IN REGISTER 0.
THE MODE AND DATA SELECTIONS ARE FIXED AT THIS TIME AND CANNOT
BE ALTERED WITHOUT RETURNING TO THE CONTROL PROGRAM.
THE INTERRUPT VECTORS AND VARIABLES ARE THEN SETUP.
THE SELECTED ROUTINE DETERMINED BY THE MODE IS THEN ENTERED

9.3 THE OVERLAY THEN LOOPS IN ROUTINES: $OWI ,IF "ONE WAY IN" MODE
WAS SELECTED. $OWO,IF "ONE WAY OUT" MODE WAS SELECTED.
$ILB, IF "INTERNAL LOOP BACK" MODE WAS SELECTED.
$XLB,IF "EXTERNAL LOOP BACK" WAS SELECTED.

9.31 $OWI: IN THIS ROUTINE THE RECEIVER IS INITIALIZED AND PROGRAM
LOOPS WAITING FOR THE RECEIVER TO FINISH.IF NOTHING IS RECEIVED
FOR 60 SECS A "WAITING" MESSAGE IS TYPED. WHEN THE RECEIVER IS
DONE,THE PROGRAM CHECKS DATA IF SWITCHES PERMIT,AND TYPES END
PASS DEPENDING ON SWITCH SETTINGS.

9.32 $OWO: THE TRANSMITTER IS INITIALIZED AND PROGRAM LOOPS
WAITING FOR TRANSMITTER TO FINISH,A "WAITING" MESSAGE IS TYPED
EVERY 60 SECS IF THERE IS NO ACTION. WHEN THE TRANSMITTER IS
DONE, THE PROGRAM EITHER LOOPS BACK TO $OWO OR TYPES END PASS
DEPENDING ON SWITCH SETTINGS.

9.33 $ILB: THE RECEIVER IS INITIALIZED AND PROGRAM LOOPS WAITING FOR
RECEIVER TO FINISH, A "WAITING" MESSAGE IS TYPED EVERY 60 SEC
IF NO ACTION. WHEN RECEIVER IS DONE PROGRAM CHECKS DATA IF SWITCH
SETTINGS PERMIT, AND END PASS IS TYPED IF SWITCH SETTINGS PERMIT.
THEN THE TRANSMITTER IS INITIALIZED, A "WAITING" MESSAGE IS TYPED
EVERY 60 SEC IF NO ACTION. WHEN TRANSMITTER IS DONE PROGRAM RETURNS
TO START OF ROUTINE. ($ILB)

9.34 $XLB: IF IN HALF DUPLEX THE TRANSMITTER IS INITIALIZED,
A "WAITING MESSAGE IS TYPED EVERY 60 SEC IF THERE IS NO ACTION

WHEN THE TRANSMITTER IS DONE THE RECEIVER IS INITIALIZED
,A "WAITING" MESSAGE IS TYPED EVERY 60 SEC IF THERE IS NO ACTION.
WHEN THE RECEIVER IS DONE,DATA IS CHECKED IF SWITCH SETTINGS
PERMIT AND END PASS IS TYPED IF SWITCHES ALLOW.THE PROGRAM NOW
REPEATS CYCLE STARTING AT $XLB.
IF IN FULL DUPLEX THE RECEIVER AND TRANSMITTER ARE INITIALIZED
, A "WAITING" MESSAGE IS TYPED EVERY 60 SEC IF THERE IS NO
ACTION. WHEN BOTH THE RECEIVER AND TRANSMITTER ARE DONE,DATA IS
CHECKED, END PASS IS TYPED AND PROGRAM LOOPS TO $XLB DEPENDING
ON THE SWITCH SETTINGS.

9.4 THE RETURN TO MONITOR ROUTINE FOR END PASS AT EOP:
LOCKS OUT INTERRUPTS AND SAVES THE TRANSMITTER INTERUPT ENABLE
BIT AND ALL GENERAL REGISTERS. IT THEN RETURNS TO THE MONITOR
TO TYPE "END PASS". THE MONITOR CHECKS SW14 IF UP IT RETURNS
TO ENTER:, OTHERWISE IT RESTARTS THE PROGRAM.

9.5 ENTER: IS ENTERED FROM THE MONITOR AFTER TYPEING "END PASS",
IT RESTORES THE GENERAL REGISTERS AND THE TRANSMITTER CSR
AS SAVED IN EOP. THE DELAY FLAG IS SET AND PROGRAM RETURNS TO
THE SCAN ROUTINE(OWO,OWI,ILB,XLB) WHERE IT CAME FROM.

9.6 THE INITIALIZE TRANSMIT SUBROUTINE AT STARTX:
SETS UP THE INTERFACE AND POINTERS NECESSARY TO
INITIATE A TRANSMIT OPERATION.
AFTER SETTING "DATA TERMINAL READY" AND "REQUEST TO SEND" A CHECK
IS MADE ON PARAM2 TO DETERMINE IF HALF DUPLEX OPERATION
WAS SELECTED BY THE OPERATOR. IF IT WAS, THE
SUBROUTINE WAITS FOR CLEAR TO SEND.
A 'WAITING FOR CLEAR TO SEND' PRINTOUT OCCURS
EVERY 30 SECONDS UNTIL CLEAR TO SEND IS ASSERTED.

9.7 THE INITIALIZE RECEIVED SUBROUTINE AT STARTR:
SETS UP THE INTERFACE AND POINTERS NECESSARY TO
RECEIVE A MESSAGE.

9.8 THE TRANSMIT INTERRUPT SERVICE ROUTINE,
AT XISR:, IS ENTERED VIA TRANSMIT INTERRUPTS
FROM THE INTERFACE.
A TEST IS MADE TO SEE IF THE LAST CHARACTER
TRANSMITTED WAS A NULL (ALL ZEROS) CHARACTER.
IF IT WAS; THE TRANSMIT LOGIC IN THE INTERFACE
IS RESET AND THE TRANSMIT COMPLETE FLAG IS SET.
AT XISR1: THE NEXT CHARACTER IS TRANSMITTED
AND PRINTED ON THE TTY IF THE MONITOR TRANSMIT
SWITCH IS SET.

9.9 THE RECEIVE INTERRUPT SERVICE ROUTINE
,AT RISR:, IS ENTERED VIA RECEIVER INTERRUPTS
FROM THE INTERFACE.
THE RECEIVED CHARACTER IS STORED IN
THE INPUT BUFFER AND PRINTED ON THE TTY IF
THE MONITOR RECEIVER SWITCH IS SET.
IF THE INPUT BUFFER IS FULL, A 'BUFFER FULL'
PRINTOUT WILL OCCUR. THIS INDICATES THAT A
LINE FEED CHARACTER WAS NOT RECOGNIZED

IN THE RECEIVED DATA (WITHIN 1000 CHARACTERS).
IF THE RECEIVED CHARACTER IS A LINE FEED,
THE RECEIVED LOGIC IS RESET AND THE
RECEIVE COMPLETE FLAG IS SET.
IF A 'RECEIVE ERROR' IS DETECTED AT RISR:, THE
CSR AND DBR WILL BE SAVED AND PRINTED OUT
AFTER THE COMPLETE MESSAGE HAS BEEN RECEIVED.

9.10 THE DATA TEST SUBROUTINE AT TESTD: IS
ENTERED AFTER A COMPLETE MESSAGE HAS BEEN
RECEIVED.
IF A 'RECEIVE ERROR' HAD BEEN DETECTED,
THE CONTENTS OF THE 'RECEIVE BUFFER' AT THE
TIME THE ERROR OCCURRED WILL BE PRINTED.
THE DATA IS COMPARED UNTIL A 'ALL ZEROS'
CHARACTER IS RECOGNIZED. 'FILL' (ALL ONES)
CHARACTERS ARE IGNORED. IF A MISMATCH
IS DETECTED, THE COMPLETE CONTENTS OF THE
INPUT BUFFER AND GOOD DATA IS PRINTED.

10.0 PARAMETERS FOR THE DZ11

PARAM#1 IS LOADED INTO THE LINE PARAMETER REGISTER(DZLPR)

BITS 0-2	LINE NUMBER BEING USED, DEFAULT = LINE 0
BITS 3,4	CHARACTER LENGTH, DEFAULT = EIGHT BITS
BIT 5	STOP BIT COUNT, DEFAULT IS TWO STOP BITS
BITS 6,7	PARITY ENABLE AND SELECT, DEFAULT IS NO PARITY
BITS 8-11	BAUD RATE SELECT, DEFAULT IS 110 BAUD
BIT 12	RECEIVER ON (THIS SHOULD ALWAYS BE SET)

PARAM#2 IS NOT USED AT THIS POINT IN TIME

PARAM#3 IS NOT USED(177777).

DZ11 RESTRICTIONS

THE RTS MODEM SIGNAL ON THE DZ11 IS JUMPER SELECTABLE
AT THE TERMINATION PANEL. IT IS EITHER ALWAYS ASSERTED OR
ASSERTED WHEN DATA TERMINAL READY (DTR) IS SET.
CONSEQUENTLY, AT THIS POINT IN TIME, DZ11 ITEP CAN NOT BE USED
WITH SERIRES 200 AND OTHER HALF DUPLEX MODEMS. ALL ITEP
MODES ARE VALID WITH FULL DUPLEX MODEMS, AND ALL MODES
MAY BE USED TO TERMINALS (ONLY ONE WAY OUT AND IN ARE
RECOMMENDED HERE, HOWEVER).

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                                ;*****************************************************************
                                ;       DZ11 INTERFACE SERVICE PARAMS
                                ;*****************************************************************
                        011000          .=11000
011000  055104  000040        DZ11:   .ASCIZ  /DZ /           ;ISR NAME
011004  160010                BA:     160010                  ;BUS ADDRESS
011006  000300                RIV:    300                     ;VECTOR ADDRESS
011010  000240                PRIOR:  240                     ;PRIORITY
011012  011070                PARAM1: 11070                   ;PARAM #1
011014  177777                PARAM2: 177777                  ;PARAM #2
011016  177777                PARAM3: 177777                  ;PARAM #3
011020  000000                IRDA:   .WORD   0               ;INITIAL READ DATA ADDRESS
011022  000000                IXDA:   .WORD   0               ;INITIAL XMIT DATA ADDRESS
011024  000000                SETTLE: .WORD   0               ;LINE SETTLE DELAY FLAG
011026  000000                        .WORD   0               ;
011030  000000                B2016:  .WORD   0               ;ADDR OF BIN TO OCT TYPE ROUTINE
011032  000000                TIME:   .WORD   0               ;TIMER
011034  000000                        .WORD   0               ;
011036  011102                        .WORD   START           ;ADDR OF START OF PROGRAM
011040                          TX.TERM:
011040      000                 .BYTE   000                 ;TRANSMITTER TERMINATING CHAR.
011041                          RX.TERM:
011041      001                 .BYTE   001                 ;RECEIVER TERMINATING CHAR.
011042  000000                FLAG:   .WORD   0
011044  177570                SWR:    177570
011046  177570                DISPLAY:177570

                                ;*****************************************************************
                                ;       CONSTANTS + WORKING STORAGE
                                ;*****************************************************************
                        000000          STAT=R0
                        100000          XFLG=100000             ;XMIT COMPLETE FLAG
                        040000          RFLG=40000              ;RCV COMPLETE FLAG
                        020000          DSFLG=20000             ;DATA SET STATUS CHANGE FLAG
                        020000          BIT13=20000             ;INHIBIT PRINTOUTS

011050  000000        SXCSR:  0               ;SAVED XMIT CSR
011052  000000        SRCSR:  0               ;SAVED RCV CSR
011054  000000        ERCSR:  0               ;RCV CSR SAVED ON ERROR
011056  000000        ERDBR:  0               ;RCV DATA REG SAVED ON ERROR
011060  000000        DSSTAT: 0               ;RCV CSR SAVED ON DS CHANGE

011062  000000        XCC:    0               ;XMIT CHAR COUNT
011064  000000        RCC:    0               ;RCV CHAR COUNT
011066  000000        RDA:    0               ;RCV DATA ADDR.
011070  000000        XDA:    0               ;XMIT DATA ADDR.

011072  177560        TKS:    177560
011074  177562        TKB:    177562
011076  177564        TPS:    177564
011100  177566        TPB:    177566

                        000001          FULL.DUPLEX=000001
```

```
                                        ;*****************************************************************
                                        ;       DZ11-X INTERFACE SERVICE ROUTINE
                                        ;*****************************************************************
011102  000240                  START:  NOP
011104  017700  177734                  MOV     @SWR,   R0      ;SETUP MODE IN R0
011110  042700  177400                  BIC     #177400,        R0      ;STRIP JUNK
011114  013702  011006                  MOV     RIV,    R2      ;SETUP
011120  012722  013666                  MOV     #RISR,  (R2)+   ;INTERRUPT
011124  013722  011010                  MOV     PRIOR,  (R2)+   ;VECTORS
011130  012722  013354                  MOV     #XISR,  (R2)+   ;
011134  013722  011010                  MOV     PRIOR,  (R2)+   ;
011140  013704  011004                  MOV     BA,     R4      ;SETUP BUS ADDR INDEX
011144  013714  011012                  MOV     PARAM1, @RCSR   ;SETUP VARIABLES
011150  013702  011014                  MOV     PARAM2,R2       ;
011154  042702  000001                  BIC     #0001,R2        ;
011160  010264  000000                  MOV     R2,     XCSR(R4);IN CSR'S
011164  052714  000020                  BIS     #DCLR,@RCSR     ;CLEAR SILO+UARTS
011170  032714  000020          1$:     BIT     #DCLR,@RCSR     ;CLEAR PULSE DONE?
011174  001375                  2$:     BNE     1$              ;BR IF NO
011176  013737  011012  013512          MOV     PARAM1,TEMP1
011204  042737  010000  013512          BIC     #RCVON,TEMP1    ;DON'T TURN ON RECEIVER YET
011212  013764  013512  000002          MOV     TEMP1,LPR(R4)   ;LOAD LINE NUMBER AND PARAMETERS
011220  010046                  3$:     MOV     R0,-(SP)        ;SAVE R0
011222  012700  000001                  MOV     #1,R0
011226  013701  011012                  MOV     PARAM1,R1
011232  042701  177770                  BIC     #^C<7>,R1       ;ISOLATE THE LINE NUMBER
011236  001403                  4$:     BEQ     5$              ;CALCULATE TCR BIT
011240  006300                          ASL     R0
011242  005301                          DEC     R1
011244  000774                          BR      4$
011246  010037  013516          5$:     MOV     R0,TCRTMP       ;SAVE THE ACTIVE TCR BIT
011252  012600                          MOV     (SP)+,R0
011254  113764  013516  000005          MOVB    TCRTMP,TCR+1(R4)        ;SET DATA TERMINAL READY

                                        ;*****************************************
                                        ;       ROUTINE USED TO GOTO
                                        ;       SUBROUTINE DEPENDENT
                                        ;       ON MODE SELECTED.
                                        ;*****************************************

011262  005037  011032          GO:     CLR     TIME
011266  005037  013152                  CLR     DELAY
011272  005037  013156                  CLR     STOP
011276  032700  000001                  BIT     #OWO,MODE
011302  001402                          BEQ     1$
011304  000137  011460                  JMP     $OWO
011310  032700  000002          1$:     BIT     #OWI,MODE
011314  001402                          BEQ     2$
011316  000137  011352                  JMP     $OWI
011322  032700  000010          2$:     BIT     #ILB,MODE
011326  001402                          BEQ     3$
011330  000137  011556                  JMP     $ILB
011334  032700  000004          3$:     BIT     #XLB,MODE
011340  001402                          BEQ     4$
011342  000137  012006                  JMP     $XLB
011346  000000                  4$:     HALT
```

```
011350  000776                          BR      .-2


                                ;*****************************************************************
                                ;       ROUTINE USED IF "ONE WAY IN" MODE WAS SELECTED.
                                ;       NOTE THAT WHEN IN THIS MODE HALF DUPLEX IS THE
                                ;       ONLY MODE AVAILABLE.
                                ;       "ONE WAY IN" MEANS THAT ONLY THE RECEIVER IS
                                ;       ENABLED. THE TRANSMITTER IS NEVER "TURNED ON".
                                ;*****************************************************************


011352  104416                  $OWI:   KBDIN
011354  004737  013524                  JSR     PC,STARTR
011360  032700  040000          1$:     BIT     #RFLG,STAT
011364  001013                          BNE     2$
011366  023727  011032  000100          CMP     TIME,#100
011374  103771                          BLO     1$
011376  011402                          MOV     @RCSR,R2
011400  016403  000000                  MOV     XCSR(R4),R3
011404  104001                          HLT     1
011406  005037  011032                  CLR     TIME
011412  000762                          BR      1$

011414  032777  000200  177422  2$:     BIT     #NODAT,@SWR
011422  001002                          BNE     3$
011424  004737  012376                  JSR     PC,TESTD
011430  042700  040000          3$:     BIC     #RFLG,STAT
011434  032777  000020  177402          BIT     #LOOP,@SWR
011442  001405                          BEQ     4$
011444  012737  011456  013154          MOV     #4$,BACK
011452  000137  012236                  JMP     EOP
011456  000735                  4$:     BR      $OWI


                                ;*****************************************************************
                                ;       ROUTINE USED IF "ONE WAY OUT" WAS SELECTED.
                                ;       NOTE THAT WHEN IN THIS MODE HALF DUPLEX IS THE ONLY
                                ;       MODE AVAILABLE.
                                ;       "ONE WAY OUT" MEANS THAT ONLY THE TRANSMITTER IS
                                ;       ENABLED. THE RECEIVER IS NEVER "TURNED ON.
                                ;*****************************************************************


011460  104416                  $OWO:   KBDIN
011462  004737  013160                  JSR     PC,STARTX
011466  005037  011032                  CLR     TIME
011472  032700  100000          1$:     BIT     #XFLG,STAT
011476  001013                          BNE     2$
011500  023727  011032  000100          CMP     TIME,#100
011506  103771                          BLO     1$
011510  011402                          MOV     @RCSR,R2
011512  016403  000000                  MOV     XCSR(R4),R3
011516  104001                          HLT     1
```

```
   754  011520  005037  011032                    CLR     TIME
   755  011524  000762                            BR      1$
   756  011526  042700  100000            2$:     BIC     #XFLG,STAT
   757  011532  032777  000020  177304            BIT     #LOOP,@SWR
   758  011540  001405                            BEQ     3$
   759  011542  012737  011554  013154            MOV     #3$,BACK
   760  011550  000137  012236                    JMP     EOP
   761  011554  000741                    3$:     BR      $OWO
   762
   763
   764
```

```
                                        ;*************************************************************************
                                        ;       ROUTINE USED IF INTERNAL LOOP BACK" WAS SELECTED.
                                        ;       NOTE THAT WHEN IN THIS MODE; HALF DUPLEX IS THE
                                        ;       ONLY MODE AVAILABLE.
                                        ;       "INTERNAL LOOP BACK" MEANS THAT THE RECEIVER IS "TURNED ON"
                                        ;       AND A COMLPETE MESSAGE IS RECEIVED. IF DATA IS TO BE CHECKED
                                        ;       IT IS; IF "END PASS" IS DESIRED; IT IS GIVEN.
                                        ;       THEN THE TRANSMITTER IS ENABLED. AFTER THE WHOLE MESSAGE
                                        ;       IS TRANSMITTED; THE CYCLE IS REPETED AS ABOVE.
                                        ;*************************************************************************

011556  104416                  $ILB:   KBDIN
011560  004737  013524                  JSR     PC,STARTR
011564  005037  011032                  CLR     TIME
011570  032700  040000          1$:     BIT     #RFLG,STAT
011574  001013                          BNE     2$
011576  023727  011032  000100          CMP     TIME,#100
011604  103771                          BLO     1$
011606  011402                          MOV     @RCSR,R2
011610  016403  000000                  MOV     XCSR(R4),R3
011614  104001                          HLT     1
011616  005037  011032                  CLR     TIME
011622  000762                          BR      1$
011624  032777  000200  177212  2$:     BIT     #NODAT,@SWR
011632  001002                          BNE     3$
011634  004737  012376                  JSR     PC,TESTD
011640  042700  040000          3$:     BIC     #RFLG,STAT
011644  032777  000020  177172          BIT     #LOOP,@SWR
011652  001405                          BEQ     4$
011654  012737  011666  013154          MOV     #4$,BACK
011662  000137  012236                  JMP     EOP
011666  032777  000400  177150  4$:     BIT     #400,   @SWR    ;USE EXTERNAL DATA?
011674  001416                          BEQ     7$              ;BR IF NO
011676  013702  011020                  MOV     IRDA,   R2      ;SET POINTER
011702  013703  011022                  MOV     IXDA,   R3      ;SET POINTER
011706  010337  011070                  MOV     R3,     XDA     ;SETUP XMIT DATA ADDR
011712  112223                          MOVB    (R2)+,  (R3)+   ;MOVE INPUT TO OUTPUT
011714  001376                          BNE     .-2             ;LOOP IF NOT ZERO CHAR
011716  112743  000177                  MOVB    #177,   -(R3)   ;INSERT A FILL CHAR
011722  005203                          INC     R3              ;BUMP ADDRESS
011724  112723  000177                  MOVB    #177,   (R3)+   ;INSERT ANOTHER FILL
011730  105023                          CLRB    (R3)+           ;INSERT ZERO CHAR
011732  005037  011032          7$:     CLR     TIME
011736  004737  013160                  JSR     PC,STARTX
011742  032700  100000          5$:     BIT     #XFLG,STAT
011746  001013                          BNE     6$
011750  023727  011032  000100          CMP     TIME,#100
011756  103771                          BLO     5$
011760  011402                          MOV     @RCSR,R2
011762  016403  000000                  MOV     XCSR(R4),R3
011766  104001                          HLT     1
011770  005037  011032                  CLR     TIME
011774  000762                          BR      5$
011776  042700  100000          6$:     BIC     #XFLG,STAT
012002  000137  011556                  JMP     $ILB
```

```
                                ;*****************************************************************************
                                ;       ROUTINE USED IF "EXTERNAL LOOP BACK" WAS SELECTED.
                                ;       EITHER HALF OR FULL DUPLEX MAY BE SELECTED IN THIS MODE.
                                ;       "EXTERNAL LOOP BACK" MEANS THAT THE TRANSMITTER IS FIRST
                                ;       TURNED ON (IF HALF DUPLEX) AND THE WHOLE MESSAGE IS TRANSMITTED;
                                ;       THEN THE RECEIVER IS ENABLED. AFTER THE WHOLE MESSAGE IS RECEIVED
                                ;       DATA WILL THEN BE CHECKED IF DESIRED AND END PASS WILL
                                ;       BE GIVEN IF DESIRED.    THEN THE CYCLE IS REPEATED
                                ;       AS ABOVE.  IF RUNNING IN FULL DUPLEX THE PROGRAM
                                ;       WAITS FOR BOTH THE RECEIVER AND TRANSMITTER TO
                                ;       FINISH THEN RESTARTS THE RECEIVER AND TRANSMITTER.
                                ;*****************************************************************************

012006  104416                  $XLB:   KBDIN
012010  032737  000001  011014          BIT     #FULL.DUPLEX,PARAM2
012016  001402                          BEQ     1$
012020  004737  013524                  JSR     PC,STARTR
012024  004737  013160          1$:     JSR     PC,STARTX
012030  005037  011032                  CLR     TIME
012034  032700  100000          2$:     BIT     #XFLG,STAT
012040  001016                          BNE     3$
012042  032700  040000          7$:     BIT     #RFLG,STAT
012046  001024                          BNE     4$
012050  023727  011032  000100          CMP     TIME,#100
012056  103766                          BLO     2$
012060  011402                          MOV     @RCSR,R2
012062  016403  000000                  MOV     XCSR(R4),R3
012066  104001                          HLT     1
012070  005037  011032                  CLR     TIME
012074  000757                          BR      2$
012076  032737  000001  011014  3$:     BIT     #FULL.DUPLEX,PARAM2
012104  001356                          BNE     7$
012106  042700  100000                  BIC     #XFLG,STAT
012112  004737  013524                  JSR     PC,STARTR
012116  000746                          BR      2$
012120  032737  000001  011014  4$:     BIT     #FULL.DUPLEX,PARAM2
012126  001420                          BEQ     8$
012130  032700  100000                  BIT     #XFLG,STAT
012134  001013                          BNE     6$
012136  023727  011032  000100          CMP     TIME,#100
012144  103765                          BLO     4$
012146  011402                          MOV     @RCSR,R2
012150  016403  000000                  MOV     XCSR(R4),R3
012154  104001                          HLT     1
012156  005037  011032                  CLR     TIME
012162  000756                          BR      4$
012164  042700  100000          6$:     BIC     #XFLG,STAT
012170  042700  040000          8$:     BIC     #RFLG,STAT
012174  005037  011032                  CLR     TIME
012200  032777  000200  176636          BIT     #NODAT,@SWR
012206  001002                          BNE     5$
012210  004737  012376                  JSR     PC,TESTD
012214  032777  000020  176622  5$:     BIT     #LOOP,@SWR
012222  001671                          BEQ     $XLB
012224  012737  012006  013154          MOV     #$XLB,BACK
012232  000137  012236                  JMP     EOP
```

```
                                        ;*****************************
                                        ;       ROUTINE TO RETURN
                                        ;       TO MONITOR FOR
                                        ;       END PASS.
                                        ;*****************************

012236                                  EOP:
012236  104414  000340                          STPS,PRTY7              ;SET PS PRIORITY TO 7
012242  016437  000000  012374                   MOV     XCSR(R4),QTPIE  ;SAVE TX CSR
012250  042737  137777  012374                   BIC     #^C<TIE>,QTPIE  ;CLEAR ALL BUT TX IE.
012256  042764  040000  000000                   BIC     #TIE,XCSR(R4)   ;CLEAR TX IE (EVEN IF IT WASN'T SET)
012264  012766  012324  000002                   MOV     #ENTER,2(SP)    ;SET FOR RETURN IF SW 14=1
012272  010037  013136                           MOV     R0,SAVR0        ;SAVE REGISTER 0
012276  010137  013140                           MOV     R1,SAVR1        ;SAVE REGISTER 1
012302  010237  013142                           MOV     R2,SAVR2        ;SAVE REGISTER 2
012306  010337  013144                           MOV     R3,SAVR3        ;SAVE REGISTER 3
012312  010437  013146                           MOV     R4,SAVR4        ;SAVE REGISTER 4
012316  010537  013150                           MOV     R5,SAVR5        ;SAVE REGISTER 5
012322  000207                                  RTS     PC              ;RETURN TO CONTROL PROGRAM

012324                                  ENTER:
012324  013700  013136                           MOV     SAVR0,R0        ;RESTORE R0
012330  013701  013140                           MOV     SAVR1,R1        ;RESTORE R1
012334  013702  013142                           MOV     SAVR2,R2        ;RESTORE R2
012340  013703  013144                           MOV     SAVR3,R3        ;RESTORE R3
012344  013704  013146                           MOV     SAVR4,R4        ;RESTORE R4
012350  013705  013150                           MOV     SAVR5,R5        ;RESTORE R5
012354  012737  177777  013152                   MOV     #-1,DELAY
012362  053764  012374  000000                   BIS     QTPIE,XCSR(R4)  ;IF ORGINALLY SET; SET TX IE
012370  000177  000560                           JMP     @BACK
012374  000000                          QTPIE:   000000


                                        ;*********************************
                                        ;       SUBROUTINE TO CHECK
                                        ;       RECEIVER DATA.
                                        ;*********************************
012376  013746  011056                  TESTD:   MOV     ERDBR,  -(SP)   ;WAS THERE A RECEIVE ERROR?
012402  001413                                   BEQ     TSTDAT          ;BR IF NO
012404  032777  020000  176432                   BIT     #BIT13,@SWR     ;INHIBIT PRINTOUTS?
012412  001007                                   BNE     TSTDAT          ;BR IF YES
012414  104400  012576                           TYPE    ,MSG0           ;<15><12>THERE WAS A RECEIVE ERROR  RBUF=
012420  004077  176404                           JSR     R0,@B2016       ;PRINT CONTENTS OF RBUF
012424  005746                                   TST     -(SP)
012426  104400  012657                           TYPE    ,MSG1           ;<15><12>
012432  013701  011022                  TSTDAT:  MOV     IXDA,   R1      ;SETUP XMIT DATA ADDR
012436  013702  011020                           MOV     IRDA,   R2      ;SETUP RCV DATA ADDR
012442  122122                          SCAN4:   CMPB    (R1)+,  (R2)+   ;DATA OK ?
012444  001776                                   BEQ     SCAN4           ;BR IF OK
012446  123741  011040                           CMPB    TX.TERM,-(R1)   ;IS IT END OF DATA
012452  001447                                   BEQ     TESTDX          ;BR IF YES
012454  122742  000002                           CMPB    #002,-(R2)
012460  001005                                   BNE     2$
012462  010237  012470                           MOV     R2,1$
012466  104400                                   TYPE
```

```
                                1$:     .WORD   0
                                        BR      TESTDX
                                2$:
                                        TSTB    (R2)            ;
                                        BEQ     TESTDX          ;BR IF YES
                                        CMPB    #177,   (R1)+   ;IS IT FILL CHAR?
                                        BEQ     SCAN4           ;BR IF YES
                                        DEC     R1              ;BACKUP
                                        CMPB    #177,   (R2)+   ;IS IT FILL?
                                        BEQ     SCAN4           ;BR IF YES
                                SCAN5:  NOP                     ;DATA ERROR
                                        BIT     #BIT13,@SWR     ;INHIBIT PRINTOUTS
                                        BNE     DERR            ;BR IF YES
                                        TYPE    ,MSG2           ;<15><12>RECEIVED DATA = <15><12>
                                        MOV     IRDA,   RDAX    ;SETUP DATA ADRESS
                                        TYPE                    ;PRINT RECEIVED DATA
                                RDAX:   0                       ;RECEIVED DATA ADDR.
                                        TYPE    ,MSG3           ;<15><12>DATA SHOULD BE<15><12>
                                        MOV     IXDA,   .+10    ;SETUP ADDR.
                                        TYPE                    ;PRINT GOOD DATA
                                        IXDA
                                DERR:   MOVB    (R1),R3 ;SETUP XMIT DATA
                                        MOVB    -(R2),R2        ;SETUP RCV DATA
                                        HLT+7                   ;DATA ERROR HALT
                                TESTDX: TST     (SP)+           ;POP STACK
                                        RTS     PC              ;RETURN FROM SUB/ROUT

                                MSG0:   .ASCIZ  <15><12>/THERE WAS A RECEIVER ERROR. REGISTER (SEL 2) =/
                                MSG1:   .ASCIZ  <15><12>
                                MSG2:   .ASCIZ  <15><12>/RECEIVED DATA = /<15><12>
                                MSG3:   .ASCIZ  <15><12>/DATA SHOULD BE/<15><12>
                                MSG4:   .ASCII  <15><12>/PLEASE MAKE CONNECTION (DIAL NUMBER)./
                                        .ASCIZ  <15><12>/WHEN CONNECTION COMPLETE; HIT CONTINUE SWITCH./<15><12>
                                MSG5:   .ASCIZ  <15><12>/PLEASE MAKE CONNECTION (DIAL NUMBER)./<15><12>
                                        .EVEN
                                SAVR0:  0
                                SAVR1:  0
                                SAVR2:  0
                                SAVR3:  0
                                SAVR4:  0
                                SAVR5:  0
                                DELAY:  0
                                BACK:   0
                                STOP:   0
```

```
                                        ;*****************************************************************
                                        ;       TRANSMITTER INITIALIZATION SUBROUTINE
                                        ;*****************************************************************

013160  005737  013152          STARTX: TST     DELAY           ;IF SW04=1 & SW14=0 DELAY
013164  001415                          BEQ     1$              ;NO DELAY START TRANSMITTER
013166  005037  013512                  CLR     TEMP1           ;PREPARE FOR DELAY
013172  012737  000007  013514          MOV     #7,TEMP2
013200  005237  013512                  INC     TEMP1           ;INCREMENT DELAY
013204  001375                          BNE     .-4
013206  005337  013514                  DEC     TEMP2
013212  001372                          BNE     .-12
013214  005037  013152                  CLR     DELAY
013220  042700  100000          1$:     BIC     #XFLG,STAT
013224  013737  011022  011070          MOV     IXDA,XDA        ;SET UP XMIT DATA ADD
013232  005737  013156                  TST     STOP            ;FIRST TIME HERE?
013236  001020                          BNE     2$              ;NO
013240  104400  012732                  TYPE    ,MSG4           ;MAKE CONNECTION
013244  000000                          HALT
013246  005137  013156                  COM     STOP            ;COMPLEMENT STOP
013252  005037  013512                  CLR     TEMP1           ;YES PREPARE FOR DELAY
013256  012737  000030  013514          MOV     #14*2,TEMP2
013264  005237  013512                  INC     TEMP1           ;INCREMENT DELAY
013270  001375                          BNE     .-4
013272  005337  013514                  DEC     TEMP2
013276  001372                          BNE     .-12
013300  013764  013516  000004  2$:     MOV     TCRTMP,TCR(R4)  ;SET LINE # IN TCR
013306  113764  013516  000005          MOVB    TCRTMP,TCR+1(R4) ;SET DATA TERMINAL READY
013314  032700  000004                  BIT     #XLB,MODE       ;XLB MODE?
013320  001412                          BEQ     3$              ;BR IF NO
013322  012737  177777  013522          MOV     #-1,TRNFLG      ;SET FLAG
013330  052714  040040                  BIS     #TIE+MSENAB,@RCSR       ;SET INTERUPT ENABLE
013334  000001                          WAIT
013336  000240                          NOP
013340  005737  013520                  TST     SNCFLG          ;FIRST CHAR RECEIVED YET?
013344  001375                          BNE     .-4             ;BR IF NO
013346  052714  040040          3$:     BIS     #TIE+MSENAB,@RCSR       ;SET INTERUPT ENABLE,SCAN ENABLE
013352  000207                          RTS     PC

013354  127737  175510  011040  XISR:   CMPB    @XDA,TX.TERM    ;IS CHAR TRANSMITTER TERMINATION CHAR
013362  001005                          BNE     XISR1           ;BR IF NO
013364  052700  100000                  BIS     #XFLG,STAT      ;SET XMIT DONE FLAG
013370  042714  040000                  BIC     #TIE,@RCSR      ;CLEAR ENABLES
013374  000440                          BR      XISR3
013376  116405  000001          XISR1:  MOVB    1(R4),R5        ;GET LINE NUMBER OF READY LINE
013402  042705  177770                  BIC     #^C<7>,R5       ;ISOLATE THE LINE NUMBER
013406  013701  011012                  MOV     PARAM1,R1       ;GET THE EXPECTED LINE NUMBER
013412  042701  177770                  BIC     #^C<7>,R1       ;ISOLATE IT
013416  120501                          CMPB    R5,R1           ;ARE THEY EQUAL?
013420  001407                          BEQ     XISR2           ;IF SO, GO TRANSMIT A CHARACTER
013422  011402                          MOV     @RCSR,R2        ;SET UP R2 WITH CSR CONTENTS
013424  005003                          CLR     R3
013426  104010                          HLT     10              ;ERROR WRONG LINE
013430  104400  014107                  TYPE    ,SCANE          ;TYPE ERROR MESSAGE
013434  000000                          HALT                    ;HALT
013436  000776                          BR      .-2
```

```
1025  013440  117764  175424  000006  XISR2:  MOVB    @XDA,TDR(R4)    ;TRANSMIT DATA
1026  013446  032777  000100  175370          BIT     #100,@SWR       ;MONITOR TX DATA?
1027  013454  001406                          BEQ     NOXMON          ;BR IF NO
1028  013456  105777  175414                  TSTB    @TPS            ;TTY READY?
1029  013462  100003                          BPL     NOXMON          ;BR IF NO
1030  013464  117777  175400  175406          MOVB    @XDA,@TPB       ;TYPE CHAR
1031  013472  005237  011070          NOXMON: INC     XDA             ;INC TTDR POINTER
1032  013476  005037  011032          XISR3:  CLR     TIME
1033  013502  005037  013522                  CLR     TRNFLG
1034  013506  000002                          RTI
1035  013510  000000                  ERROR1: 0
1036  013512  000000                  TEMP1:  0
1037  013514  000000                  TEMP2:  0
1038  013516  000000                  TCRTMP: 0
1039  013520  000000                  SNCFLG: 0
1040  013522  000000                  TRNFLG: 0
```

```
1041                                    ;*****************************************************************
1042                                    ;       RECEIVER INITIALIZATION SUBROUTINE
1043                                    ;*****************************************************************
1044
1045  013524  005737  013156        STARTR: TST     STOP            ;FIRST TIME HERE?
1046  013530  001005                        BNE     1$              ;BR IF NO
1047  013532  104400  012732                TYPE    ,MSG4           ;TYPE"MAKE CONNECTION"
1048  013536  005137  013156                COM     STOP            ;COMPLEMENT STOP
1049  013542  000000                        HALT
1050  013544  032700  000004        1$:     BIT     #XLB,MODE       ;XLB MODE?
1051  013550  001405                        BEQ     2$              ;BR IF NO
1052  013552  005037  013512                CLR     TEMP1           ;START DELAY
1053  013556  005237  013512                INC     TEMP1
1054  013562  001375                        BNE     .-4
1055  013564  042700  040000        2$:     BIC     #RFLG,STAT
1056  013570  013737  011020  011066        MOV     IRDA,RDA        ;SET UP RECEIVER DATA ADD
1057  013576  012737  001000  011064        MOV     #1000,RCC       ;SET UP BUFFER LIMIT
1058  013604  012737  177777  013520        MOV     #-1,SNCFLG
1059  013612  005037  011054                CLR     ERCSR           ;CLEAR ERROR RECORDS
1060  013616  005037  011056                CLR     ERDBR
1061  013622  005764  000002        3$:     TST     RBUF(R4)        ;CLEAR SILO
1062  013626  100775                        BMI     3$              ;KEEP CLEARING UNTIL BIT 15 CLEAR
1063  013630  013737  011012  013512        MOV     PARAM1,TEMP1    ;GET READY TO LOAD PARAMETERS
1064  013636  052737  010000  013512        BIS     #RCVON,TEMP1    ;BE SURE TO TURN RECEIVER ON
1065  013644  013764  013512  000002        MOV     TEMP1,LPR(R4)   ;LOAD PARAMETERS, ENABLE RECEIVER
1066  013652  113764  013516  000005        MOVB    TCRTMP,TCR+1(R4) ;SET DATA TERMINAL READY
1067  013660  052714  000140                BIS     #RIE!MSENAB,@RCSR ;SET INTERUPT ENABLE,RECEIVER ENABLE
1068  013664  000207                        RTS     PC
1069
1070  013666  105714                RISR:   TSTB    @RCSR           ;DID RECEIVER DONE SET?
1071  013670  100403                        BMI     1$              ;BR IF YES
1072  013672  011402                        MOV     @RCSR,R2        ;SAVE CSR
1073  013674  005003                        CLR     R3
1074  013676  104010                        HLT     10              ;ERROR RECEIVER INTERUPTED BUT DONE NOT SET
1075  013700  016401  000002        1$:     MOV     RBUF(R4),R1     ;GET CHAR
1076  013704  100403                        BMI     2$              ;BR IF YES
1077  013706  011402                        MOV     @RCSR,R2        ;SAVE CSR
1078  013710  005003                        CLR     R3
1079  013712  104010                        HLT     10              ;ERROR CHAR PRESENT NOT SET
1080  013714  042701  000200        2$:     BIC     #200,R1         ;STRIP A BIT
1081  013720  032701  070000                BIT     #ORUN+FRME+PARE,R1      ;CHECK FOR RECEIVER ERRORS
1082  013724  001404                        BEQ     3$              ;BR IF NO ERRORS
1083  013726  011437  011054                MOV     @RCSR,ERCSR     ;SAVE CSR
1084  013732  010137  011056                MOV     R1,ERDBR        ;SAVE RBUF
1085  013736  110177  175124        3$:     MOVB    R1,@RDA         ;STORE CHAR
1086  013742  032777  000040  175074        BIT     #BIT5,@SWR      ;MONITOR RXDATA?
1087  013750  001405                        BEQ     NORMON          ;BR IF NO
1088  013752  105777  175120                TSTB    @TPS            ;IS TTY READY?
1089  013756  100002                        BPL     NORMON          ;BR IF NO
1090  013760  110177  175114                MOVB    R1,@TPB         ;TYPE CHAR
1091  013764  005237  011066        NORMON: INC     RDA             ;INC RBUF POINTER
1092  013770  105077  175072                CLRB    @RDA            ;CLEAR NEXT POSITION
1093  013774  005337  011064                DEC     RCC             ;DEC CHAR COUNT
1094  014000  001007                        BNE     1$              ;BUFFER FULL YET?
1095  014002  000005                        RESET                   ;STOP THE SHOW,BUFFER OVERFLOWED
1096  014004  005002                        CLR     R2
```

```
 1097  014006  005003                          CLR     R3
 1098  014010  104000                          HLT     0
 1099  014012  104006                          HLT     6               ;RECEIVER BUFFER FULL
 1100  014014  000000                          HALT
 1101  014016  000776                          BR      .-2
 1102  014020  123701  011041          1$:     CMPB    RX.TERM,R1      ;IS CHAR 001?
 1103  014024  001004                          BNE     RISR1           ;BR IF NO
 1104  014026  042714  000100                  BIC     #RIE,@RCSR      ;CLEAR RECEIVER INTERUPT ENABLE
 1105  014032  052700  040000                  BIS     #RFLG,STAT      ;SET R DONE FLAG
 1106  014036  005037  011032          RISR1:  CLR     TIME
 1107  014042  005037  013520                  CLR     SNCFLG
 1108  014046  000002                          RTI                     ;GO HOME
 1109  014050  005015  042522  042503  MFULL:  .ASCIZ<15><12>/RECEIVER BUFFER FULL ERROR!!/
       014107     015  042412  051122  SCANE:  .ASCIZ<15><12>/ERROR!   TRANSMITTER SCAN STOPPED ON WRONG LINE/
                014170                  .EVEN
                000001                  .END
```

```
DZ11 ITEP OVERLAY       MACY11 27(1006)  29-OCT-76  14:43  PAGE 27
DZDZBB.P11    05-AUG-76 09:27            CROSS REFERENCE TABLE -- USER SYMBOLS

BA        011004             594#     653
BACK      013154             731*     759*     794*     874*     905      966#
BIT0    = 000001             588#
BIT1    = 000002             588#
BIT10   = 002000             588#
BIT11   = 004000             588#
BIT12   = 010000             588#
BIT13   = 020000             588#     623#     916      943
BIT14   = 040000             588#
BIT15   = 100000             588#
BIT2    = 000004             588#
BIT3    = 000010             588#
BIT4    = 000020             588#
BIT5    = 000040             588#    1086
BIT6    = 000100             586#
BIT7    = 000200             588#
BIT8    = 000400             588#
BIT9    = 001000             588#
B2016     011030             604#     919
DCLR    = 000020             588#     658      659
DELAY     013152             683*     903*     965#     973      981*
DERR      012564             944      953#
DISPLA    011046             614#
DSFLG   = 020000             588#     622#
DSSTAT    011060             629#
DZ11      011000             593#
ENTER     012324             887      896#
EOP       012236             732      760      795      875      882#
ERCSR     011054             627#    1059*    1083*
ERDBR     011056             628#     914     1060*    1084*
ERROR1    013510            1035#
FLAG      011042             612#
FRME    = 020000             588#    1081
FULL.D  = 000001             641#     834      850      855
GO        011262             682#
ILB     = 000010             588#     691
IRDA      011020             600#     798      923      946     1056
IXDA      011022             601#     799      922      950      952      983
KBDIN   = 104416             588#     713      744      776      833
LOOP    = 000020             588#     729      757      792      872
LPR     = 000002             580#     663*    1065*
MFULL     014050            1109#
MSENAB  = 000040             588#    1000     1005     1067
MSG0      012576             918      959#
MSG1      012657             921      959#
MSG2      012662             945      959#
MSG3      012707             949      959#
MSG4      012732             959#     986     1047
MSG5      013064             959#
NODAT   = 000200             580#     725      788      869
NORMON    013764            1087     1089     1091#
NOXMON    013472            1027     1029     1031#
ORUN    = 040000             588#    1081
OWI     = 000002             588#     688
OWO     = 000001             588#     685
PARAM1    011012             597#     654      661      666     1015     1063
```

```
PARAM2  011014            598#    655     834     850     855
PARAM3  011016            599#
PARE  = 010000            588#   1081
PRIOR   011010            596#    650     652
PRTY0 = 000000            588#
PRTY1 = 000040            588#
PRTY2 = 000100            588#
PRTY3 = 000140            588#
PRTY4 = 000200            589#
PRTY5 = 000240            588#
PRTY6 = 000300            588#
PRTY7 = 000340            588#    883
QTPIE   012374            884*    885*    904     906#
RBUF  = 000002            588#   1061    1075
RCC     011064            632#   1057*   1093*
RCVON = 010000            588#    662    1064
RDA     011066            633#   1056*   1085*   1091*   1092*
RDAX    012544            946*    948#
RFLG  = 040000            621#    715     728     779     791     841     867    1055    1105
RIE   = 000100            588#   1067    1104
RISR    013666            649    1070#
RISR1   014036           1103    1106#
RIV     011006            595#    648
RWAIT = 104410            588#
RX.TER  011041            610*   1102
SAVR0   013136            888*    897     959#
SAVR1   013140            889*    898     960#
SAVR2   013142            890*    899     961#
SAVR3   013144            891*    900     962#
SAVR4   013146            892*    901     963#
SAVR5   013150            893*    902     964#
SCANE   014107           1022    1109#
SCAN4   012442            924#    925     938     941
SCAN5   012516            942#
SETTLE  011024            602#
SNCFLG  013520           1003    1039#   1058*   1107*
SRCSR   011052            626#
START   011102            607     645#
STARTR  013524            714     777     836     853    1045#
STARTX  013160            745     808     837     973#
STOP    013156            684*    967#    984     988*   1045    1048*
STPS  = 104414            588#    883
SWR     011044            613#    646     725     729     757     788     792     796     869     872     916     943    1026
                         1086
SW12  = 010000            588#
SXCSR   011050            625#
TCR   = 000004            588#    674*    995*    996*   1066*
TCRTMP  013516            672*    674     995     996    1038#   1066
TDR   = 000006            588#   1025*
TEMP1   013512            661*    662*    663     975*    977*    989*    991*   1036#   1052*   1053*   1063*   1064*   1065
TEMP2   013514            976*    979*    990*    993*   1037#
TESTD   012376            727     790     871     914#
TESTDX  012572            927     933     936     956#
TIE   = 040000            588#    895     886    1000    1005    1011
TIME    011032            605#    682*    717     722*    746*    749     754*    778*    781     786*    807*    811     816*
                          838*    843     848*    859     864*    868*   1032*   1106*
```

```
TKB     011074          637#
TKS     011072          636#
TPB     011100          639#    1030*   1090*
TPS     011076          638#    1028    1088
TRNFLG  013522          999*    1033*   1040#
TSTDAT  012432          915     917     922#
TX.TER  011040          608#    926     1008
TYPE  = 104400          588#    918     921     931     945     947     949     951     986     1022    1047
XCC     011062          631#
XCSR  = 000000          588#    657*    720     752     784     814     846     862     884     886*    904*
XDA     011070          634#    800*    983*    1008    1025    1030    1031*
XFLG  = 100000          620#    747     756     809     818     839     852     857     866     982     1010
XISR    013354          651     1008#
XISR1   013376          1009    1013#
XISR2   013440          1018    1025#
XISR3   013476          1012    1032#
XLB   = 000004          588#    694     997     1050
XWAIT = 104412          588#
$ILB    011556          693     776#    819
$OWI    011352          690     713#    733
$OWO    011460          687     744#    761
$XLB    012006          696     833#    873     874
.     = 014170          592#    698     802     950*    978     980     992     994     1004    1024    1054    1101    1109#
```

C03

```
DZ11 ITEP OVERLAY       MACY11 27(1006)  29-OCT-76  14:43  PAGE 31
DZDZBB.P11    05-AUG-76 09:27            CROSS REFERENCE TABLE -- MACRO NAMES

BOX             1#    589     616     642     969    1041
DCPARM          1#
DHDOC1          1#
DHPARM          1#
DJPARM          1#
DLPARM          1#
DPPARM          1#
DQDOC1          1#
DQPARM          1#
DUPARM          1#
DUPPAR          1#
DVDOC1          1#
DVPARM          1#
DZPARM          1#    560
HELLO           1#
HLT           588#    721     753     785     815     847     863     955    1021    1074    1079    1098    1099
$EQUAT          1#    588
$INTF           1#    588
$ITEP           1#    675
$SERV           1#    631

. ABS.  014170     000

 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

 ,DZDZBB.SEQ/SOL/CRF/NL:TOC=ITEP1.MAC,DZDZBB.P11
RUN-TIME: 10 13 .7 SECONDS
RUN-TIME RATIO: 57/26=2.2
CORE USED:  16K  (31 PAGES)
```

D03

Spooler runtime 4 Seconds, 20 KCS, 94 disk reads, 3 disk writes, 28 pages