DP11

OVERLAY FOR ITEP

MD-11-DZDPO-C

EP-DZDPO-C-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN U.S.A

IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZDPO-C-D
PRODUCT NAME:	DP11 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 PROGRAM 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 DP11 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<DO1> 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 POP-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 DP11 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 INTERUPTS 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 DP11

PARAM#1 IS LOADED INTO THE RECEIVER STATUS REGISTER(RCSR)
BIT 1 HALF DUPLEX (1), DEFAULT= HALF DUPLEX (1)
BITS 8,9,10 CHARACTER LENGTH, DEFAULT= 8 BITS (000)

PARAM#2 IS LOADED INTO THE TRANSMITTER STATUS REGISTER (XCSR).
BIT 0 FULL DUPLEX (1), DEFAULT= HALF DUPLEX (0)
(BIT 0) IS NOT LOADED INTO THE XCSR, IT IS ONLY A SOFTWARE FLAG)

PARAM#2(HIGH BYTE) IS LOADED INTO THE SYNC REGISTER, DEFAULT=26 (26)

PARAM#3 IS NOT USED (177777).

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                                ;*****************************************************************
                                ;       DP11 INTERFACE SERVICE PARAMS
                                ;*****************************************************************
                        011000          .=11000
011000  050104  000040        DP11:   .ASCIZ  /DP /           ;ISR NAME
011004  174770                BA:     174770                  ;BUS ADDRESS
011006  000300                RIV:    300                     ;VECTOR ADDRESS
011010  000240                PRIOR:  240                     ;PRIORITY
011012  000002                PARAM1: 2                       ;PARAM #1
011014  013000                PARAM2: 13000                   ;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
```

```
                                ;*****************************************************************
                                ;       DP11-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  013606          MOV     #RISR,  (R2)+   ;INTERRUPT
011124  013722  011010          MOV     PRIOR,  (R2)+   ;VECTORS
011130  012722  013514          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  000004          MOV     R2,     XCSR(R4);IN CSR'S
011164  113764  011015  000003  MOVB    PARAM2+1,SYNC(4);SETUP SYNC CHAR.
011172  005037  011032          CLR     TIME            ;RESET TIMER
011176  005037  013102          CLR     DELAY           ;SET FOR NO TIME DELAY.

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

011202  005037  011032  GO:     CLR     TIME
011206  005037  013102          CLR     DELAY
011212  005037  013106          CLR     STOP
011216  032700  000001          BIT     #OWO,MODE
011222  001402                  BEQ     1$
011224  000137  011400          JMP     $OWO
011230  032700  000002  1$:     BIT     #OWI,MODE
011234  001402                  BEQ     2$
011236  000137  011272          JMP     $OWI
011242  032700  000010  2$:     BIT     #ILB,MODE
011246  001402                  BEQ     3$
011250  000137  011476          JMP     $ILB
011254  032700  000004  3$:     BIT     #XLB,MODE
011260  001402                  BEQ     4$
011262  000137  011726          JMP     $XLB
011266  000000  4$:     HALT
011270  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".
                                ;*****************************************************************
```

```
                                SOWI:   KBDIN
011272  104416                          JSR     PC,STARTR
011274  004737  013404                  BIT     #RFLG,STAT
011300  032700  040000          1$:     BNE     2$
011304  001013                          CMP     TIME,#100
011306  023727  011032  000100          BLO     1$
011314  103771                          MOV     @RCSR,R2
011316  011402                          MOV     XCSR(R4),R3
011320  016403  000004                  HLT     1
011324  104001                          CLR     TIME
011326  005037  011032                  BR      1$
011332  000762
011334  032777  000200  177502  2$:     BIT     #NODAT,@SWR
011342  001002                          BNE     3$
011344  004737  012316                  JSR     PC,TESTD
011350  042700  040000          3$:     BIC     #RFLG,STAT
011354  032777  000020  177462          BIT     #LOOP,@SWR
011362  001405                          BEQ     4$
011364  012737  011376  013104          MOV     #4$,BACK
011372  000137  012156                  JMP     EOP
011376  000735                  4$:     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.
                                ;*****************************************************************
011400  104416                  $OWO:   KBDIN
011402  004737  013110                  JSR     PC,STARTX
011406  005037  011032                  CLR     TIME
011412  032700  100000          1$:     BIT     #XFLG,STAT
011416  001013                          BNE     2$
011420  023727  011032  000100          CMP     TIME,#100
011426  103771                          BLO     1$
011430  011402                          MOV     @RCSR,R2
011432  016403  000004                  MOV     XCSR(R4),R3
011436  104001                          HLT     1
011440  005037  011032                  CLR     TIME
011444  000762                          BR      1$
011446  042700  100000          2$:     BIC     #XFLG,STAT
011452  032777  000020  177364          BIT     #LOOP,@SWR
011460  001405                          BEQ     3$
011462  012737  011474  013104          MOV     #3$,BACK
011470  000137  012156                  JMP     EOP
011474  000741                  3$:     BR      $OWO
```

```
                                ;*****************************************************************************
                                ;       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.
                                ;*****************************************************************************

011476  104416                  $ILB:   KBDIN
011500  004737  013404                  JSR     PC,STARTR
011504  005037  011032                  CLR     TIME
011510  032700  040000          1$:     BIT     #RFLG,STAT
011514  001013                          BNE     2$
011516  023727  011032  000100          CMP     TIME,#100
011524  103771                          BLO     1$
011526  011402                          MOV     @RCSR,R2
011530  016403  000004                  MOV     XCSR(R4),R3
011534  104001                          HLT     1
011536  005037  011032                  CLR     TIME
011542  000762                          BR      1$
011544  032777  000200  177272  2$:     BIT     #NODAT,@SWR
011552  001002                          BNE     3$
011554  004737  012316                  JSR     PC,TESTD
011560  042700  040000          3$:     BIC     #RFLG,STAT
011564  032777  000020  177252          BIT     #LOOP,@SWR
011572  001405                          BEQ     4$
011574  012737  011606  013104          MOV     #4$,BACK
011602  000137  012156                  JMP     EOP
011606  032777  000400  177230  4$:     BIT     #400,   @SWR    ;USE EXTERNAL DATA?
011614  001416                          BEQ     7$              ;BR IF NO
011616  013702  011020                  MOV     IRDA,   R2      ;SET POINTER
011622  013703  011022                  MOV     IXDA,   R3      ;SET POINTER
011626  010337  011070                  MOV     R3,     XDA     ;SETUP XMIT DATA ADDR
011632  112223                          MOVB    (R2)+,  (R3)+   ;MOVE INPUT TO OUTPUT
011634  001376                          BNE     .-2             ;LOOP IF NOT ZERO CHAR
011636  112743  000177                  MOVB    #177,   -(R3)   ;INSERT A FILL CHAR
011642  005203                          INC     R3              ;BUMP ADDRESS
011644  112723  000177                  MOVB    #177,   (R3)+   ;INSERT ANOTHER FILL
011650  105023                          CLRB    (R3)+           ;INSERT ZERO CHAR
011652  005037  011032          7$:     CLR     TIME
011656  004737  013110                  JSR     PC,STARTX
011662  032700  100000          5$:     BIT     #XFLG,STAT
011666  001013                          BNE     6$
011670  023727  011032  000100          CMP     TIME,#100
011676  103771                          BLO     5$
011700  011402                          MOV     @RCSR,R2
011702  016403  000004                  MOV     XCSR(R4),R3
011706  104001                          HLT     1
011710  005037  011032                  CLR     TIME
011714  000762                          BR      5$
011716  042700  100000          6$:     BIC     #XFLG,STAT
011722  000137  011476                  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.
                                ;*************************************************************************

011726  104416                  $XLB:   KBDIN
011730  032737  000001  011014          BIT     #FULL.DUPLEX,PARAM2
011736  001402                          BEQ     1$
011740  004737  013404                  JSR     PC,STARTR
011744  004737  013110          1$:     JSR     PC,STARTX
011750  005037  011032                  CLR     TIME
011754  032700  100000          2$:     BIT     #XFLG,STAT
011760  001016                          BNE     3$
011762  032700  040000          7$:     BIT     #RFLG,STAT
011766  001024                          BNE     4$
011770  023727  011032  000100          CMP     TIME,#100
011776  103766                          BLO     2$
012000  011402                          MOV     @RCSR,R2
012002  016403  000004                  MOV     XCSR(R4),R3
012006  104001                          HLT     1
012010  005037  011032                  CLR     TIME
012014  000757                          BR      2$
012016  032737  000001  011014  3$:     BIT     #FULL.DUPLEX,PARAM2
012024  001356                          BNE     7$
012026  042700  100000                  BIC     #XFLG,STAT
012032  004737  013404                  JSR     PC,STARTR
012036  000746                          BR      2$
012040  032737  000001  011014  4$:     BIT     #FULL.DUPLEX,PARAM2
012046  001420                          BEQ     8$
012050  032700  100000                  BIT     #XFLG,STAT
012054  001013                          BNE     6$
012056  023727  011032  000100          CMP     TIME,#100
012064  103765                          BLO     4$
012066  011402                          MOV     @RCSR,R2
012070  016403  000004                  MOV     XCSR(R4),R3
012074  104001                          HLT     1
012076  005037  011032                  CLR     TIME
012102  000756                          BR      4$
012104  042700  100000          6$:     BIC     #XFLG,STAT
012110  042700  040000          8$:     BIC     #RFLG,STAT
012114  005037  011032                  CLR     TIME
012120  032777  000200  176716          BIT     #NODAT,@SWR
012126  001002                          BNE     5$
012130  004737  012316                  JSR     PC,TESTD
012134  032777  000020  176702  5$:     BIT     #LOOP,@SWR
012142  001671                          BEQ     $XLB
012144  012737  011726  013104          MOV     #$XLB,BACK
012152  000137  012156                  JMP     EOP
```

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

012156                                  EOP:
012156  104414  000340                          STPS,PRTY7              ;SET PS PRIORITY TO 7
012162  016437  000004  012314                  MOV     XCSR(R4),QTPIE  ;SAVE TX CSR
012170  042737  177677  012314                  BIC     #^C<TIE>,QTPIE  ;CLEAR ALL BUT TX IE.
012176  042764  000100  000004                  BIC     #TIE,XCSR(R4)   ;CLEAR TX IE (EVEN IF IT WASN'T SET)
012204  012766  012244  000002                  MOV     #ENTER,2(SP)    ;SET FOR RETURN IF SW 14=1
012212  010037  013066                          MOV     R0,SAVR0        ;SAVE REGISTER 0
012216  010137  013070                          MOV     R1,SAVR1        ;SAVE REGISTER 1
012222  010237  013072                          MOV     R2,SAVR2        ;SAVE REGISTER 2
012226  010337  013074                          MOV     R3,SAVR3        ;SAVE REGISTER 3
012232  010437  013076                          MOV     R4,SAVR4        ;SAVE REGISTER 4
012236  010537  013100                          MOV     R5,SAVR5        ;SAVE REGISTER 5
012242  000207                                  RTS     PC              ;RETURN TO CONTROL PROGRAM

012244                                  ENTER:
012244  013700  013066                          MOV     SAVR0,R0        ;RESTORE R0
012250  013701  013070                          MOV     SAVR1,R1        ;RESTORE R1
012254  013702  013072                          MOV     SAVR2,R2        ;RESTORE R2
012260  013703  013074                          MOV     SAVR3,R3        ;RESTORE R3
012264  013704  013076                          MOV     SAVR4,R4        ;RESTORE R4
012270  013705  013100                          MOV     SAVR5,R5        ;RESTORE R5
012274  012737  177777  013102                  MOV     #-1,DELAY
012302  053764  012314  000004                  BIS     QTPIE,XCSR(R4)  ;IF ORGINALLY SET; SET TX IE
012310  000177  000570                          JMP     @BACK
012314  000000                          QTPIE:  000000


                                        ;*********************************
                                        ;       SUBROUTINE TO CHECK
                                        ;       RECEIVER DATA.
                                        ;*********************************
012316  013746  011056                  TESTD:  MOV     ERDBR,  -(SP)   ;WAS THERE A RECEIVE ERROR?
012322  001413                                  BEQ     TSTDAT          ;BR IF NO
012324  032777  020000  176512                  BIT     #BIT13,@SWR     ;INHIBIT PRINTOUTS?
012332  001007                                  BNE     TSTDAT          ;BR IF YES
012334  104400  012526                          TYPE    ,MSG0           ;<15><12>THERE WAS A RECEIVE ERROR. RBUF=
012340  004077  176464                          JSR     R0,@#2016       ;PRINT CONTENTS OF RBUF
012344  005746                                  TST     -(SP)
012346  104400  012607                          TYPE    ,MSG1           ;<15><12>
012352  013701  011022                  TSTDAT: MOV     #XDA,   R1      ;SETUP XMIT DATA ADDR
012356  013702  011020                          MOV     #RDA,   R2      ;SETUP RCV DATA ADDR
012362  122122                          SCAN4:  CMPB    (R1)+,  (R2)+   ;DATA OK ?
012364  001776                                  BEQ     SCAN4           ;BR IF OK
012366  123741  011040                          CMPB    TX.TERM,-(R1)   ;IS IT END OF DATA
012372  001453                                  BEQ     TESTDX          ;BR IF YES
012374  122742  000002                          CMPB    #002,-(R2)
012400  001005                                  BNE     2$
012402  010237  012410                          MOV     R2,1$
012406  104400                                  TYPE
```

```
                                        1$:     .WORD   0
                                                BR      TESTDX
                                        2$:
012414  105712                                  TSTB    (R2)            ;
012416  001441                                  BEQ     TESTDX          ;BR IF YES
012420  122721  000177                          CMPB    #177,   (R1)+   ;IS IT FILL CHAR?
012424  001756                                  BEQ     SCAN4           ;BR IF YES
012426  005301                                  DEC     R1              ;BACKUP
012430  122722  000177                          CMPB    #177,   (R2)+   ;IS IT FILL?
012434  001752                                  BEQ     SCAN4           ;BR IF YES
012436  105742                                  TSTB    -(R2)           ;BACK UP POINTER
012440  123722  011015                          CMPB    PARAM2+1,(R2)+  ;WAS SYNC CHAR IN BUFFER?
012444  001746                                  BEQ     SCAN4           ;BR IF CHAR WAS SYNC
012446  000240                          SCAN5:  NOP                     ;DATA ERROR
012450  032777  020000  176366                  BIT     #BIT13,@SWR     ;INHIBIT PRINTOUTS
012456  001016                                  BNE     DERR            ;BR IF YES
012460  104400  012612                          TYPE    ,MSG2           ;<15><12>RECEIVED DATA = <15><12>
012464  013737  011020  012474                  MOV     IRDA,   RDAX    ;SETUP DATA ADRESS
012472  104400                                  TYPE                    ;PRINT RECEIVED DATA
012474  000000                          RDAX:   0                       ;RECEIVED DATA ADDR.
012476  104400  012637                          TYPE    ,MSG3           ;<15><12>DATA SHOULD BE<15><12>
012502  013737  011022  012512                  MOV     IXDA,   .+10    ;SETUP ADDR.
012510  104400                                  TYPE                    ;PRINT GOOD DATA
012512  011022                                  IXDA
012514  111103                          DERR:   MOVB    (R1),R3 ;SETUP XMIT DATA
012516  114202                                  MOVB    -(R2),R2        ;SETUP RCV DATA
012520  104007                                  HLT+7                   ;DATA ERROR HALT
012522  005726                          TESTDX: TST     (SP)+           ;POP STACK
012524  000207                                  RTS     PC              ;RETURN FROM SUB/ROUT

012526  005015  044124  051105          MSG0:   .ASCIZ  <15><12>/THERE WAS A RECEIVER ERROR. REGISTER (SEL 2) =/
012607     015  000012                  MSG1:   .ASCIZ  <15><12>
012612  005015  042522  042503          MSG2:   .ASCIZ  <15><12>/RECEIVED DATA = /<15><12>
012637     015  042012  052101          MSG3:   .ASCIZ  <15><12>/DATA SHOULD BE/<15><12>
012662  005015  046120  040505          MSG4:   .ASCII  <15><12>/PLEASE MAKE CONNECTION (DIAL NUMBER)./
012731     015  053412  042510                  .ASCIZ  <15><12>/WHEN CONNECTION COMPLETE; HIT CONTINUE SWITCH./<15><12>
013014  005015  046120  040505          MSG5:   .ASCIZ  <15><12>/PLEASE MAKE CONNECTION (DIAL NUMBER)./<15><12>
                                                .EVEN
013066  000000                          SAVR0:  0
013070  000000                          SAVR1:  0
013072  000000                          SAVR2:  0
013074  000000                          SAVR3:  0
013076  000000                          SAVR4:  0
013100  000000                          SAVR5:  0
013102  000000                          DELAY:  0
013104  000000                          BACK:   0
013106  000000                          STOP:   0
```

```
                                ;*****************************************************************
                                ;       INITIALIZE TRANSMIT SUBROUTINE
                                ;*****************************************************************

013110  005037  011032          STARTX: CLR     TIME
013114  005737  013102                  TST     DELAY           ;IF SW04=1 & SW14=0 WAIT BEFORE TURINING ON TX
013120  001416                          BEQ     1$              ;NO GO AHEAD AND TURN ON TX
013122  005037  013510                  CLR     TEMP1           ;PREPARE FOR DELAY
013126  012737  000007  013512          MOV     #7,TEMP2
013134  062737  000001  013510          ADD     #1,TEMP1        ;INCREMENT DELAY.......
013142  001374                          BNE     .-6
013144  005337  013512                  DEC     TEMP2
013150  001371                          BNE     .-14
013152  005037  013102                  CLR     DELAY           ;ZERO POINTER.
013156  013737  011022  011070  1$:     MOV     IXDA,   XDA     ;SETUP XMIT DATA ADDR.
013164  042700  100000                  BIC     #XFLG,  STAT    ;RESSET XMIT COMPLETE FLAG
013170  052764  000001  000004          BIS     #DTR,XCSR(R4)   ;SET DATA TERMINAL READY.
013176  005737  013106                  TST     STOP
013202  001004                          BNE     CTSW
013204  104400  013014                  TYPE    ,MSGS
013210  005137  013106                  COM     STOP

013214  032764  010000  000004  CTSW:   BIT     #MRDY,  XCSR(R4);IS MODEM READY SET?
013222  001037                          BNE     CTSOK           ;BR IF YES
013224  032764  010000  000004  CTSXYZ: BIT     #MRDY,XCSR(R4)  ;KEEP CHECKING MODEM READY.
013232  001017                          BNE     CTSABC          ;BR IF READY NOW.
013234  023727  011032  000036  CTSWN:  CMP     TIME,   #36     ;30 SECS ELASPED?
013242  103770                          BLO     CTSXYZ          ;BR IF NO
013244  011402                          MOV     @RCSR,  R2      ;SETUP RECEIVE CSR
013246  016403  000004                  MOV     XCSR(R4),R3     ;SETUP XMIT CSR
013252  032777  010000  175564          BIT     #SW12,@SWR      ;INHIBIT PRINTOUTS?
013260  001001                          BNE     1$              ;BR IF YES
013262  104002                          HLT+2                   ;PRINTOUT "WAITING TO XMIT" MESSAGE
013264  005037  011032          1$:     CLR     TIME            ;RESET TIMER
013270  000755                          BR      CTSXYZ          ;WAIT SOME MORE
013272  005037  013510          CTSABC: CLR     TEMP1           ;PREPARE FOR DELAY
013276  012737  000005  013512          MOV     #5,TEMP2
013304  062737  000001  013510          ADD     #1,TEMP1        ;INCREMENT DELAY.......
013312  001374                          BNE     .-6
013314  005337  013512                  DEC     TEMP2
013320  001371                          BNE     .-14
013322  032737  000001  011014  CTSOK:  BIT     #FULL.DUPLEX,PARAM2
013330  001004                          BNE     2$
013332  032764  004000  000004          BIT     #4000,XCSR(R4)
013340  001374                          BNE     .-6
013342  052764  001000  000004  2$:     BIS     #RQTS,XCSR(R4)
013350  012702  000005                  MOV     #5,R2           ;SETUP SYNC. COUNTER

013354  113764  011015  000006  1$:     MOVB    PARAM2+1,XBUF(R4);LOAD A SYNC CHAR

013362  105764  000004                  TSTB    XCSR(R4)                ;IS XMIT READY
013366  100375                          BPL     .-4             ;BR IF NO
013370  005302                          DEC     R2              ;DECREMENT COUNTER
013372  001370                          BNE     1$              ;BR IF NOT ZERO

013374  052764  000100  000004          BIS     #TIE,   XCSR(R4);SET XMIT INTERRUPT ENABLE
```

```
 1004  013402  000207                          RTS     PC              ;EXIT FROM SUBROUTINE
 1005
 1006                                  ;*****************************************************************
 1007                                  ;       INITIALIZE RECEIVER SUBROUTINE
 1008                                  ;*****************************************************************
 1009  013404  005737  013106          STARTR: TST     STOP
 1010  013410  001007                          BNE     1$
 1011  013412  052764  000001  000004         BIS     #DTR,XCSR(R4)   ;SET DTR
 1012  013420  104400  013014                 TYPE    ,MSG5           ;MAKE CONNECTION
 1013  013424  005137  013106                 COM     STOP
 1014  013430  005037  011032          1$:    CLR     TIME
 1015  013434  013737  011020  011066         MOV     IRDA,RDA
 1016  013442  012737  001000  011064         MOV     #1000,  RCC     ;SETUP RCV CHAR COUNT
 1017  013450  042700  040000                 BIC     #RFLG,  STAT    ;RESET RCV COMPLETE FLAG
 1018  013454  005037  011054                 CLR     ERCSR           ;RESET ERROR RECORDS
 1019  013460  005037  011056                 CLR     ERDBR
 1020  013464  042714  004000                 BIC     #4000,@RCSR     ;CLEAR ACTIVE IF SET
 1021  013470  005764  000002                 TST     RBUF(R4)        ;CLEAR ANY RXDONE
 1022  013474  052764  000001  000004         BIS     #DTR,   XCSR(4) ;SET DATA TERM READY
 1023  013502  052714  000100                 BIS     #RIE,@RCSR      ;SET INTERRUPT ENABLES
 1024  013506  000207                          RTS     PC              ;EXIT FROM SUBROUTINE
 1025  013510  000000                  TEMP1:  0
 1026  013512  000000                  TEMP2:  0
```

```
1027                                    ;*****************************************************************
1028                                    ;       TRANSMIT INTERRUPT SERVICE ROUTNE
1029                                    ;*****************************************************************
1030  013514  000240                    XISR:   NOP
1031  013516  127737  175346  011040            CMPB    @XDA,TX.TERM    ;FINISHED XMITTING?
1032  013524  001006                            BNE     XISR1           ;BR IF NO
1033  013526  052700  100000                    BIS     #XFLG,  STAT    ;SET XMIT COMPLETE FLAG
1034  013532  042764  001100  000004          BIC     #TIE+RQTS,XCSR(R4);RESET XMIT INTERRUPT ENABLE
1035  013540  000417                            BR      XISR2           ;
1036
1037  013542  117764  175322  000006  XISR1:  MOVB    @XDA,   XBUF(R4);XMIT NEXT CHAR.
1038  013550  032777  000100  175266            BIT     #100,   @SWR    ;MONITOR OUTPUT?
1039  013556  001406                            BEQ     NOXMON          ;BR IF NO
1040  013560  105777  175312                    TSTB    @TPS            ;IS TTY AVAILABLE
1041  013564  100003                            BPL     NOXMON          ;BR IF NO
1042  013566  117777  175276  175304          MOVB    @XDA,@TPB       ;TYPE THE CHAR
1043  013574                    NOXMON:
1044  013574  005237  011070                  INC     XDA             ;INCRMENT ADDRESS
1045  013600  005037  011032    XISR2:  CLR     TIME            ;RESET TIMER
1046  013604  000002                            RTI                     ;RETURN FROM INTERRUPT
1047                                    ;*****************************************************************
1048                                    ;       RECEIVE INTERRUPT SERVICE ROUTNE
1049                                    ;*****************************************************************
1050  013606  000240                    RISR:   NOP
1051  013610  116401  000002                    MOVB    RBUF(R4),R1     ;STORE CHAR.
1052  013614  110177  175246                    MOVB    R1,     @RDA    ;MOVE CHAR TO INBUF
1053  013620  032777  000040  175216            BIT     #40,    @SWR    ;MONITOR INPUT?
1054  013626  001405                            BEQ     NORMON          ;BR IF NO
1055  013630  105777  175242                    TSTB    @TPS            ;IS TTY AVAILABLE?
1056  013634  100002                            BPL     NORMON          ;BR IF NO
1057  013636  110177  175236                    MOVB    R1,@TPB         ;TYPE THE CHAR
1058  013642                    NORMON:
1059  013642  005237  011066                  INC     RDA             ;BUMP POINTER
1060  013646  105077  175214                    CLRB    @RDA            ;CLEAR NEXT CHAR POSITION
1061  013652  005337  011064                  DEC     RCC             ;DECREMENT CHAR. COUNTER
1062  013656  001005                            BNE     1$              ;BR IF BUFFER NOT FULL
1063  013660  042714  000100                    BIC     #RIE,   @RCSR   ;RESET INTERRUPT ENAB
1064  013664  104006                            HLT+6                   ;RECEIVER BUFFER FULL
1065  013666  004737  013404                    JSR     PC,STARTR       ;INITIALIZE RECEIVER
1066
1067  013672  142701  000200    1$:     BICB    #200,   R1      ;STRIP PARITY
1068  013676  123701  011041            CMPB    RX.TERM,R1      ;IS IT LINE FEED?
1069  013702  001004                            BNE     RISR1           ;BR IF NO
1070  013704  042714  004100                    BIC     #RIE+RA ,@RCSR  ;DISABLE INTERRUPTS
1071  013710  052700  040000                    BIS     #RFLG,  STAT    ;SET RCVR COMPLETE FLAG
1072  013714                    RISR1:
1073
1074  013714                    RISR2:
1075  013714                    RISR3:
1076  013714  005037  011032            CLR     TIME            ;RESET TIMER
1077  013720  000002                            RTI                     ;RETURN FROM INTERRUPT
1078          000001                            .END
```

```
BA       011004            584#    643
BACK     013104            707*    735*    770*    850*    881     945#
BIT0   = 000001            578#
BIT1   = 000002            578#
BIT10  = 002000            578#
BIT11  = 004000            578#
BIT12  = 010000            578#
BIT13  = 020000            578#    613#    892     922
BIT14  = 040000            578#
BIT15  = 100000            578#
BIT2   = 000004            578#
BIT3   = 000010            578#
BIT4   = 000020            578#
BIT5   = 000040            578#
BIT6   = 000100            578#
BIT7   = 000200            578#
BIT8   = 000400            578#
BIT9   = 001000            578#
B2016    011030            594#    895
CD     = 004000            578#
CT     = 100000            578#
CTS    = 002000            578#
CTSABC   013272            973     983#
CTSOK    013322            971     989#
CTSW     013214            966     970#
CTSWN    013234            974#
CTSXYZ   013224            972#    975     982
DELAY    013102            650*    659*    879*    944#    953     961#
DERR     012514            923     932#
DIE    = 000040            578#
DISPLA   011046            604#
DP11     011000            583#
DSFLG  = 020000            578#    612#
DSSTAT   011060            619#
DTR    = 000001            578#    964     1011    1022
ENTER    012244            863     872#
EOP      012156            708     736     771     851     858#
ERCSR    011054            617#    1018*
ERDBR    011056            618#    890     1019*
FLAG     011042            602#
FULL.D=  000001            631#    810     826     831     989
GO       011202            658#
HD     = 000002            578#
ILB    = 000010            578#    667
IRDA     011020            590#    774     899     925     1015
IS     = 000002            578#
IXDA     011022            591#    775     898     929     931     962
KBDIN  = 104416            578#    689     720     752     809
LOOP   = 000020            578#    705     733     768     848
MIS    = 000020            578#
MR     = 000010            578#
MRDY   = 010000            578#    970     972
MSG0     012526            894     938#
MSG1     012607            897     938#
MSG2     012612            924     938#
MSG3     012637            928     938#
```

```
MSG4    012662          938#
MSG5    013014          938#    967    1012
NOOAT = 000200          578#    701     764     845
NORMON  013642         1054    1056    1058#
NOXMON  013574         1039    1041    1043#
OV    = 040000          578#
OWI   = 000002          578#    664
OWO   = 000001          578#    661
PARAM1  011012          587#    644
PARAM2  011014          588#    645     648     810     826     831     919     989     996
PARAM3  011016          589#
PRIOR   011010          586#    640     642
PRTY0 = 000000          578#
PRTY1 = 000040          578#
PRTY2 = 000100          578#
PRTY3 = 000140          578#
PRTY4 = 000200          578#
PRTY5 = 000240          578#
PRTY6 = 000300          578#
PRTY7 = 000340          578#    859
QTPIE   012314          860*    861*    880     882#
RA    = 004000          578#   1070
RBUF  = 000002          578#   1021    1051
RCC     011064          622#   1016*   1061*
RD    = 000200          578#
RDA     011066          623#   1015*   1052*   1059*   1060*
RDAX    012474          925*    927#
RFLG  = 040000          611#    691     704     755     767     817     843    1017    1071
RI    = 020000          578#
RIE   = 000100          578#   1023    1063    1070
RISR    013606          639    1050#
RISR1   013714         1069    1072#
RISR2   013714         1074#
RISR3   013714         1075#
RIV     011006          585#    638
RQTS  = 001000          578#    993    1034
RWAIT = 104410          578#
SX.TER  011041          600#   1068
SAVR0   013066          864*    873     938#
SAVR1   013070          865*    874     939#
SAVR2   013072          866*    875     940#
SAVR3   013074          867*    876     941#
SAVR4   013076          868*    877     942#
SAVR5   013100          869*    878     943#
SCAN4   012362          900#    901     914     917     920
SCAN5   012446          921#
SETTLE  011024          592#
SRCSR   011052          616#
SS    = 000001          578#
START   011102          597    635#
STARTR  013404          690    753     812     829    1009#   1065
STARTX  013110          721    784     813     952#
STOP    013106          660*   946#     965     968*   1009    1013*
STPS  = 104414          578#    859
SWR     011044          603#    636     701     705     733     764     768     772     845     848     892     922     978
                       1038   1053
```

```
SW12   = 010000            578#    978
SXCSR    011050            615#
SYNC   = 000003            578#    648*
TEMP1    013510            955*    957*    983*    985*   1025#
TEMP2    013512            956*    959*    984*    987*   1026#
TESTD    012316            703     766     847     890#
TESTDX   012522            903     909     912     935#
TIE    = 000100            578#    861     862    1003    1034
TIME     011032            595#    649*    658*    693     698*    722*    725     730*    754*    757     762*    783*    787
                           792*    814*    819     824*    835     840*    844*    952*    974     981*    1014*   1045*   1076*
TKB      011074            627#
TKS      011072            626#
TPB      011100            629#   1042*   1057*
TPS      011076            628#   1040    1055
TR     = 000200            578#
TSTDAT   012352            891     893     898#
TX.TER   011040            598#    902    1031
TYPE   = 104400            578#    894     897     907     924     926     928     930     967    1012
XBUF   = 000006            578#    996*   1037*
XCC      011062            621#
XCSR   = 000004            578#    647*    696     728     760     790     822     838     860     862*    880*    964*    970
                           972     977     991     993*    998    1003*   1011*   1022*   1034*
XDA      011070            624#    776*    962*   1031    1037    1042    1044*
XFLG   = 100000            610#    723     732     785     794     815     828     833     842     963    1033
XISR     013514            641    1030#
XISR1    013542           1032    1037#
XISR2    013600           1035    1045#
XLB    = 000004            578#    670
XWAIT  = 104412            578#
$ILB     011476            669     752#    795
$OWI     011272            666     689#    709
$OWO     011400            663     720#    737
$XLB     011726            672     809#    849     850
.      = 013722            582#    674     778     929*    958     960     986     988     992     999
```

N02

```
DP11 ITEP OVERLAY       MACY11 27(1006)  29-OCT-76  14:41  PAGE 29
DZDPOC.P11    05-AUG-76 09:23           CROSS REFERENCE TABLE -- MACRO NAMES

BOX             1#    579     606     632     948    1006    1027    1047
DCPARM          1#
DHDOC1          1#
DHPARM          1#
DJPARM          1#
DLPARM          1#
DPPARM          1#    561
DQDOC1          1#
DQPARM          1#
DUPARM          1#
DUPPAR          1#
DVDOC1          1#
DVPARM          1#
DZPARM          1#
HELLO           1#
HLT           578#    697     729     761     791     823     839     934     980    1064
SEQUAT          1#    578
SINTF           1#    578
SITEP           1#    651
SSERV           1#    621

. ABS.  013722     000

ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

.DZDPOC.SEQ/SOL/CRF/NL:TOC=ITEP1.MAC,DZDPOC.P11
RUN-TIME: 10 13 .8 SECONDS
RUN-TIME RATIO: 64/25=2.4
CORE USED:  16K  (31 PAGES)
```

Spooler runtime 3 Seconds, 20 KCS, 92 disk reads, 3 disk writes, 26 pages