IDENTIFICATION

PRODUCT CODE: AC-8488C-MC
PRODUCT NAME: CZDMLCO DH11 OVRLY FOR ITEP
PROGRAM DATE: MARCH 1978
MAINTAINER: DIAGNOSTICS
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1.0  ABSTRACT.

THIS PROGRAM IS DESIGNED AS A MAINTENANCE AID FOR
FIELD SERVICE PERSONNEL. 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 CDMLCO DH11 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 20D AND START TO ENTER PARAMS FROM CONSOLE TTY, PROCEED TO SECTION B
   2. LOAD ADDRESS 20D AND SET SWITCH REGISTER BIT 5 BEFORE
      STARTING TO ENTER PARAMS FROM CONSOLE SWITCHES, PROCEED TO SECTION C
      (THE PROGRAM MAY BE RESTARTED AT LOC 20D (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 CARGAGE RETURN
      B. IF YOU WISH TO SETUP A DH11 TYPE IN DN,
      C. IF YOU WISH TO SETUP A DH11B, TYPE IN DMB.

      IF DN OR DMB WAS TYPED IN STEP 1 ABOVE THEN THE BUS ADDRESS
      VECTOR ETC. REFERRED TO IN STEPS 2 THRU 7, PERTAIN TO THE DH11 OR DM11.

   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: 20D=PRIO 4, 240=PRIO 5, 30D=PRIO 6, ETC.
A. Type a CAR. RETURN to use default value
B. Type in actual value

5. The program will typeout the default value of PARAM#1
   If required by the ISR (see sect. ID.0 in overlay listing for parameter description)
   A. Type a CAR. RETURN to use default value
   B. Type in 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 DH-11 will use PARAM #3 as the # to dial.
   If using a modem without automatic handshaking, the number must terminate with an
   "end-of-number" character (;).
   B. Enter actual value.

8. The program will return to step 6 if this setup was for DHII or DHIIIB.

9. The program will request that switch register be set.
   A. Setup switch register as specified in step 6.
   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 DN-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 DN11-BB THEN VARIABLE OVERLAY. (EACH ENTRY SET SWITCHES 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 DN11-BB PARAMETERS ARE DISCUSSED IN SECT. 10.0 OF THE MONITOR.
      F. GO BACK TO STEP A IF THIS SETUP WAS FOR DN1 OR DN1-B.
   3. HALT FOR OPERATIONAL SWITCH SETTINGS. (SEE STEP D.)
      A. PRESS CONTINUE TO START TESTING

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

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

AFTER DETERMINING THAT THE EQUIPMENT IS 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 SWD4=0
SW13=1 Inhibit Error Timeouts
SW12=1 Inhibit All Timeouts Except Errors
If SW12=0 and SWD4=1 End Pass Is Typed
And Transmitted/Received Data Is Typed.
SW11=1 Use Previously Specified Data
SW10=1 Data Select (With SWD9)
SW9=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 (A8 NUMERICS)
11=1 Test Message #3 (SB 0000/0000/0000/0000)
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.

SWD4=1 Return to Monitor for End Pass
When SWD4=0 Program Loops in the Overlay Never Returning to the Monitor.
SWD3=1 Internal Loopback Mode
SWD2=1 External Loopback Mode
SWD1=1 One-Way-In Mode
SWD0=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 (SWREGLOC 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 KEING 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 0 TO 377) SEPERATED BY SPACES AND TERMINATING BY (UP ARROW).
I.E. ABCD 000 123 377  EFG (CR.RETURN)

A TYPICAL SWITCH SETTING FOR HALF-DUPEX=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-DUPEX=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(0D1), 4 F Ills(177), AND A TRANSMIT TERMINATING CHARACTER(0D1). DURING TRANSMISSION, WHEN A 0D1 CHARACTER IS SEEN THE TRANSMISSION IS STOPPED. DURING RECEPTION, WHEN A 0D1 CHARACTER IS RECEIVED, THE RECEIVER IS SHUT OFF. IF THE MESSAGE WAS INPUTTED BY THE OPERATOR, THE TERMINATING CHARACTERS ARE ADDED.
TEST MODES

INTERNAL LOOPBACK MODE
1. THE OVERLAY WAITS TO RECEIVE A MESSAGE (TERMINATED BY (0D))
   VERIFYES THE DATA AGAINST THE DATA SELECTED BY SW09 AND SW10 (SW7=0)
3. TRANSMIT THE DATA SELECTED BY SW09 AND SW10 (SWB=0) OR
   TRANSMIT THE RECEIVED DATA (SWB=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
   WAIT FOR CLEAR TO SEND
2. TRANSMITS THE SELECTED DATA
3. WAIT FOR MESSAGE TO BE RECEIVED
4. VERIFIES THE DATA (SWO7=0)
5. RETURNS TO MONITOR FOR "END PASS" (SWO4=1) OR
   GO TO STEP 1 (SWO4=0)

ONE-WAY-IN MODE
1. THE OVERLAY WAITS FOR MESSAGE TO BE RECEIVED.
2. VERIFIES THE DATA (SWO7=0)
3. RETURNS TO MONITOR FOR "END PASS" (SWO4=1) OR
   GO TO STEP 1 (SWO4=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" (SWO4=1) OR
   GO TO STEP 1 (SWO4=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 PRINT OUT 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 SHW4=0 THE OVERLAY WILL CONTINUE TO
TRANSMIT/RECEIVE DATA.

IF SHW4=1 THE OVERLAY WILL RETURN.
TO THE MONITOR AND TYPE "END PASS".

IF BOTH SHW4=1 AND SHW1=1 THE PROGRAM WILL REQUEST
NEW INTERFACE PARAMS AFTER ONE PASS OF THE SELECTED
"EST MODE.

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

*BXXXXXX TO PRINT OUT 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 MANUALLY EXAMINE THE TRANSMIT OR RECEIVE
BUFFERS, DO THE FOLLOWING; 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)
TTTTT 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 READER ERROR. READER DATA REGISTER =xxxxxxx

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

IF A RECEIVE TERMINATING CHARACTER (Q01) 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 PDQ-I1 SYSTEM
UNLESS ONE OF THE SYSTEMS IS ALWAYS OPERATING IN A FIXED
MODE. THE FOLLOWING TABLE LISTS THE VALID COMBINATIONS:

<table>
<thead>
<tr>
<th>CPU 1</th>
<th>CPU 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE-WAY-OUT</td>
<td>ONE-WAY-OUT</td>
</tr>
<tr>
<td>ONE-WAY-IN</td>
<td>ONE-WAY-IN</td>
</tr>
<tr>
<td>EXTERNAL-LOOPBACK</td>
<td>INTERNAL-LOOPBACK</td>
</tr>
<tr>
<td>INTERNAL-LOOPBACK</td>
<td>EXTERNAL-LOOPBACK</td>
</tr>
<tr>
<td>EXTERNAL-LOOPBACK</td>
<td>EXTERNAL-LOOPBACK (FULL DUPLEX)</td>
</tr>
</tbody>
</table>

WHEN THE COMMUNICATION LINK INVOLVES MODEMS THE FOLLOWING
RESTRICTIONS 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 TIMES OUT
A "WAITING MESSAGE", IF AN INCOMING MESSAGE STARTS DURING
THE TIMEOUT, IT WILL BE LOST BECAUSE THE TIMEOUT PRIORITY
IS AT LEVEL 9. THIS WILL RESULT IN OVERRUN OR A "ERROR"
 Wenn the COMMUNICATION LINC INVOLVES MODEMS THE FOLLOWING
RESTRICTIONS APPLY:

IF USING AN ASYNCHRONOUS DEVICE, MODEMS AND THE
MAYNARD TEST STATION AND INITIATE DOES NOT CLEAR THE
CONNECTION (EXAMPLE THE DIII). IF THE PROGRAM IS RESTARTED
IN THE MIDDLE OF A MESSAGE AT LOC 204 OR BY HITTING CR
AN IMMEDIATE ERROR MESSAGE FROM MAYNARD WILL BE RE...
CEIVED. THIS IS BECAUSE THE TEST STATION IS STILL LOOKING
FOR THE REST OF THE INTERRUPTED MESSAGE. TO AVOID THIS
ERROR, RESTART PROGRAM ONLY AT THE END OF THE MESSAGE
CURRENTLY BEING TRANSMITTED.

9.0 MISCELLANEOUS
ITEP WAS CHECKED OUT USING THE FOLLOWING BELL TELEPHONE MODEMS.
20A (HALF-DUPLEX SYNCHRONOUS 2400 BAUD)
202C (HALF-DUPLEX ASYNCHRONOUS 1200 BAUD)
103A (FULL-DUPLEX ASYNCHRONOUS 110 BAUD)

9.0 PROGRAM DESCRIPTION
9.1 THE C2DMLCO DHI INTERFACE SERVICE PARAMS ARE SETUP, AS SPECIFIED BY THE OPERATOR,
BY THE ITEP CONTROL PROGRAM.
TIME, PROVIDES A MEANS OF MEASURING ELAPSED 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: $90I, IF "ONE WAY IN" MODE
WAS SELECTED. $90W, IF "ONE WAY OUT" MODE WAS SELECTED.
$91B, IF "INTERNAL LOOP BACK" MODE WAS SELECTED.
$XLB, IF "EXTERNAL LOOP BACK" WAS SELECTED.

9.31 $90I: 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 $90W: 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 $90W OR TYPES END
PASS DEPENDING ON SWITCH SETTINGS.

9.33 $91B: 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. ($91B)

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 50 SEC IF THERE IS NO ACTION.
WHEN THE RECEIVER IS DONE DATA IS CHECKED IF SWITCH SETTINGS
PERMIT END PASS IS TYPED IF SWITCHES ALLOW THE PROGRAM NOW
REPEATS CYCLE STARTING AT $XLB.
IF IN FULL DIPLEX THE RECEIVER AND TRANSMITTER ARE INITIALIZED
A "WAITING" MESSAGE IS TYPED EVERY 50 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 INTERRUPT ENABLE
BIT AND ALL GENERAL REGISTERS, IT THEN RETURNS TO THE MONITOR
TO TYPE "END PASS", THE MONITOR CHECKS SW4 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($OMO, OM1, 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 PARAM 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 XISR: 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 RECEIVING 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 ANY OF THE
CSR AND DBB WILL BE SAVED AND PRINTED OUT.
AFTER THE COMPLETE MESSAGE HAS BEEN RECEIVED
THE DATA TEST SUBROUTINE AT TESTD IS
ENTERED AFTET 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.

DHIII RESTRICTIONS
IF A DHIII EXIST IN THE SYSTEM WITH THE DHII BEING
TESTED, BUT MODEM CONTROL IS NOT DESIRED AND THE DHII
WAS NOT INITIALIZED BY ITPE, THE PROGRAM WILL HANG IN THE
DHII TRANSMITTER INITIALIZATION ROUTINE. TO CORRECT THIS
LOAD LOCATION "DIIIBB" WITH AN ADDRESS THAT WILL TIME OUT (NO
SLAVE SYNC RESPONSE). THE ADDRESS OF DIIIBB CAN BE FOUND
IN THE CROSS REFERENCE TABLE IN THE BACK OF THIS LISTING.

10.0 PARAMETERS FOR THE DHII
PAR#1 IS LOADED INTO THE SYSTEM CONTROL REGISTER (SCR)
BIT 0-3 LINE SELECTION, DEFAULT = LINE 0 (0000)

PAR#2 IS LOADED INTO THE LINE PARAMETER REGISTER (LPR)
BIT 0-1 CHARACTER LENGTH, DEFAULT = 8 BITS (11)
BIT 2 STOP BITS, DEFAULT = 2 STOP BITS (1)
BIT 3 PARITY ENABLED (1), DEFAULT = (0)
BIT 4 ODD PARITY (1), DEFAULT = (0)
BIT 5 EVEN PARITY (1), DEFAULT = (0)
BIT 6-9 RECEIVER SPEED, DEFAULT = 110 BPS (0011)
BIT 10-13 TRANSMIT SPEED, DEFAULT = 110 BPS (0011)
BIT 14 HALF DUPLEX (1), DEFAULT = FULL DUPLEX (0)

PAR#3 IS NOT USED (111111)
**DM11 INTERFACE SERVICE PARAMS**

```
DM11: ASCI: CH ; ISR NAME
BA: 16000 ; BUS ADDRESS
RV: 300 ; VECTOR ADDRESS
PRG: 240
PARAM: 6 ; PARAM #1
PARAM: 06307 ; PARAM #2
PARAM: 17777 ; PARAM #3
IRDA: .WORD 0 ; INITIAL READ DATA ADDRESS
IXDA: .WORD 0 ; INITIAL XMIT DATA ADDRESS
SETTLE: .WORD 0 ; LINE SETTLE DELAY FLAG
B2O16: .WORD 0 ; ADDR OF BIN TO OCT TYPE ROUTINE
TIME: .WORD 0 ; TIMER
WART: .WORD 0 ; ADDR OF START OF PROGRAM
TX.Term: .BYTE 000 ; TRANSMITTER TERMINATING CHAR.
RX.Term: .BYTE 001 ; RECEIVER TERMINATING CHAR.
FLAG: .WORD 0
SW: 177570
DISPLAY: 177570
```

**CONSTANTS + WORKING STORAGE**

```
STATE: 0
XFLG: 100000
RCFLG: 40000
DSFLG: 20000
BRK: 20000
SXR: 0
SCS: 0 ; SAVED XMIT CSR
SRC: 0 ; SAVED RCV CSR
ECR: 0 ; RCV CSR SAVED ON ERROR
ERBR: 0 ; RCV DATA REG SAVED ON ERROR
DS: 0 ; RCV CSR SAVED ON DS CHANGE
XCC: 0 ; XMIT CHAR COUNT
RCC: 0 ; RCV CHAR COUNT
RD: 0 ; RCV DATA ADDR
XDA: 0 ; XMIT DATA ADDR.
TKS: 177560
TKB: 177562
TTP: 177564
TBR: 177566
FULL.DUPLEX=000001
```
******DH11-X INTERFACE SERVICE ROUTINE******

START:

MOV 3MAR, R0       ;SETUP MODE IN R0
BIC #177900, R1    ;SETUP
MOV RIV, R2        ;STRIP JUNK
MOV #ISR, (R2)+    ;INTERRUPT
MOV #PRIOR, (R2)+  ;VECTORS
MOV #ISR, (R2)+    ;VECTORS
MOV #PRIOR, (R2)+  ;VECTORS
MOV BA, R4         ;SETUP BUS ADDR INDEX
MOV #ARC, ARCSR    ;BAR
BIS PARAM, ARCSR   ;BAR
BIS PARAVE, LPR(R4) ;BAR
CMPB PARANI, #17   ;BAR
BOLS 1$            ;NUMBER IN PARANI IS TOO LARGE;
BRA -2             ;MUST BE 17 OR LESS (LINE# IN OCTAL,
1$: MOV RO,-(SP)    ;SAVE RO
MOV #1, R0         ;1:
MOV R0, R1         ;RO
2$: TST R1          ;CALCULATE BAR BIT
BEQ 3$             ;BAR
PLS R0             ;BAR
DEC R1             ;BAR
BEQ 2$             ;BAR
DEC R0             ;BAR
BEQ 3$             ;BAR
MOV RO, BARTMP     ;BAR
MOV (SP)+, R0      ;BAR

******ROUTINE USED TO GOTO******

SUBROUTINE DEPENDENT
ON MODE SELECTED.

******GO******

GO:
CLR TIME
CLR DELAY
CLR STOP
BIT #0WO, MODE
BEQ 1$
JMP $940
1$: BIT #0N1, MODE
BEQ 2$
JMP $910
2$: BIT #1L1, MODE
BEQ 3$
JMP $980
3$: BIT #XLB, MODE
BEQ 4$
JMP $950
4$: BRA -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".

$SWI: KBDIN
JSR PCSTARTR
BIT #FLG,STAT
BNE 2$;
CMP TIME, #100
BNE 1$
BLO 1$
MOV DEC, R2
MOV ECS, R1
HLT 1$
CLR TIME
BR 1$

$SWI: KBDIN
JSR PCSTARTR
BIT #FLG,STAT
BNE 3$
BNE 2$
JMP #DOAT, JSWR

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".

$SWO: KBDIN
JSR PCSTARTX
CLR TIME
1$
BIT #FLG,STAT
BNE 2$
CMP TIME, #100
BNE 1$
BLO 1$
MOV DEC, R2
MOV ECS, R3
HLT 1$
CLR TIME
BR 1$

$SWO: KBDIN
JSR PCSTARTX
CLR TIME
1$
BIT #FLG,STAT
BNE 2$
CMP TIME, #100
762  011500  001405
764  011510  016737  011522  013122  BEQ  3:
764  011515  000137  012204  MOV  #3, BACK
765  011522  000741  3:
767  3:
768  3:  BR  $040
**REVIEWED 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 COMPLETE MESSAGE IS RECEIVED, IF DATA IS TO BE CHECKED
IT IS, IF "END POSI" IS DESIREL; IT IS GIVEN.
THEN THE TRANSMITTER IS ENABLED. AFTER THE WHOLE MESSAGE
IS TRANSMITTED, THE CYCLE IS REPEATED AS ABOVE.

$ILB: KB0IN, JSR PC, STARTTR

1$: BIT @FLG,STAT

2$: BR 1$-

3$: MOV XCSR(R4),R3

4$: MOV XCSR, R2

5$: CLR TIME

6$: CMP TIME, #100

7$: BNE 2$-

8$: CLR TIME

9$: MOV XCSR(R4),R3

10$: MOV XCSR, R2

11$: CMP TIME, #100

12$: BNE 2$-

13$: JMP EOP
***************

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
BIT 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
FINISH THEN RESTARTS THE RECEIVER AND TRANSMITTER.

***************
RECEIVER INITIALIZATION SUBROUTINE

START: BIT HALF.DUPLEX,PRM2 
BR IF YES 
BNL,MODE 
BR IF NO 
CLR TEMP1 ;START DELAY 
1%: INC TEMP1 
2%: BIC NRG,STAT ;CLEAR RFLG 
MOV IRDR,RDA ;SET UP RECEIVER DATA ADD 
MOV #1000,RCC ;SET UP BUFFER LIMIT 
MOV #1,SCFLG ;SET SOFTWARE FLAG 
CLR ERCR ;CLEAR ERROR RECORDS 
CLR ERDR ;CLEAR ERROR RECORDS 
BIS BIT11,ARCSET ;MASIER CLEAR 
BIS PARAM1,ARCSET ;SET LINE NUMBER 
BIS PARAM1,ARCSET ;SET INTERRUPT ENABLES 
RTS PC 

RIS: BIT #SI,ARCSET 
BR IF NO 
MOV ARC,ARC,R2 
CLR R3 
HLT 10 ;ERROR HLT 
TYPE ,SILO ;TYPE ERROR MESS 
HALT 000000 
1%: MOV NCR(R4),R1 ;PUT CHAR IN R1 
BIC #200,R1 ;STRIP A BIT 
TSI 1 ;VALID DATA? 
BIC 4% ;BR IF YES 
MOV ARC,R2 ;SAVE CSR FOR TYPEOUT 
CLR R3 
BIS #0,+PE,PE,R1 ;OVERFLOW ERROR? 
BR IF NO 
MOV ARC,ARC,R2 ;SAVE CSR 
MOV R1,EORR ;SAVE CHAR 
MOV R1,ARDA ;STORE CHAR IN BUFFER 
BIT $0346 ;MONITOR RECEIVE DATA? 
BR IF NO 
BIC 000000 ;OVERFLOW ERROR? 
BR IF NO 
MOV R1,ARDA ;STORE CHAR IN BUFFER 
CLR ARDA ;CLEAR NEXT LOCATION 
DEC RCC ;DEC CHAR COUNT 
BNE 1% ;BR IF BUFFER NOT FULL 
HLT 0 ;STOP THE SHOW BUFFER OVERFLOWED! 
HALT 000000
BR
CMPB AX,TERM,P1
IS CHARM RCV TERMINATION CHAR
BNE RISRI
BR IF NOT
BMI RIC+RJ CRCR
CLEAR INTERRUPT ENABLES
BIS RFLG, STAT
SET RCV DONE FLAG
RISRI:
CLR TIME
CLR SM, FLG
CLEAR FLAG
RTI
MFULL:
.asciiz 15</12>/ERROR! RECEIVER BUFFER FULL/
MFULL:
.asciiz 15</12>/ERROR! SILO OVERFLOW/
MFULL:
.asciiz 15</12>/NON EXISTENT MEMORY ERROR/
MFULL:
.asciiz 15</12>/PLEASE SELECT ONLY ONE LINE AT A TIME(PARM3)
EVERY:
.asciiz 15</12>
<table>
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Note: The values are represented as hexadecimal numbers.