

:NLIST SEQ  
:REM 1

IDENTIFICATION  
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PRODUCT CODE: AC-E815R-MC  
PRODUCT NAME: CXLPFB0 LP20 MODULE  
PRODUCT DATE: SEPTEMBER 1978  
MAINTAINER: DEC/X11 SUPPORT GROUP

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1. ABSTRACT  
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"LPFB" IS AN I/O MODULE THAT EXERCISES THE LP20 CONTROLLER AND EITHER AN LP10 OR LP05 LINE PRINTER THAT MAY BE CONNECTED TO THE CONTROLLER.

2. REQUIREMENTS  
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HARDWARE: ONE LP20 LINE PRINTER CONTROL UNIT AND EITHER AN LP10 OR LP05 LINE PRINTER CONNECTED TO THE CONTROLLER

STORAGE: LPF REQUIRES:  
1. DECIMAL WORDS: 819  
2. OCTAL WORDS: 1483  
3. OCTAL BYTES: 3146

3. PASS DEFINITION  
-----

A SINGLE PASS CONSISTS OF 32. ITERATIONS OF THE TEST SEQUENCES.

4. EXECUTION TIME  
-----

RUNNING ALONE ON A PDP11/40 USING AN LP10, THE INITIAL PASS (WITH PRINTING ENABLED) TAKES APPROXIMATELY 40 SECONDS. SUBSEQUENT PASSES (WITH PRINTING INHIBITED) TAKE APPROXIMATELY 10. SECONDS.

5. CONFIGURATION REQUIREMENTS  
-----

DEFAULT PARAMETERS:

DEVADR: 175400 VECTOR: 754 BR1: 4 DEVCNT: 1

REQUIRED PARAMETERS:

"SR1" IS USED TO SPECIFY MODULE OPTIONS AS DESCRIBED BELOW:

SR1 (LO BYTE) BIT02 IS USED TO SPECIFY THE TYPE OF CHARACTER SET. IF IT IS A "H" IT INDICATES A 64. CHAR SET - ANY OTHER COMBINATION IN THE LO BYTE SIGNIFIES A 96. CHAR SET.

SR1 (HI BYTE) THE HIGH BYTE SPECIFIES PRINTING OPTIONS AS SHOWN BELOW:

SRI+1 = 0 PRINT ON FIRST PASS ONLY  
SRI+1 = 1 NEVER PRINT  
SRI+1 = 2 PRINT ON ALL PASSES

THE DEFAULT VALUE FOR SRI IS 000000 WHICH SIGNIFIES  
64. CHAR SET AND PRINT ON FIRST PASS ONLY.

6. MODULE OPERATION  
-----

- A. SET UP INTERRUPT SERVICE VECTORS.
- B. TEST (RAM) MEMORY WITH DATA TEST.
- C. TEST (RAM) MEMORY ADDRESSING LOGIC.
- D. TEST PRINTING USING A TEST PATTERN OF ALL LEGAL CHARACTERS  
THIS TEST WILL USE RAM TRANSLATION AND CAUSE INTERRUPTS  
AT EACH CHARACTER.
- E. REPEAT STEPS C. THRU D. THREE (3) TIMES  
THEN DO ENDPAS CALL.

7. OPERATION OPTIONS  
-----

NONE

!



241	000330	019967	177704	MOV	R0,LPCCTR
242	000334	012760	000000	ADD	#2,R0
243	000340	010067	177676	MOV	R0,LPTDAT
244	000344	019700	177248	MOV	VECTR,R0
245	000350	012720	000000	MOV	#LINIT,(R0)+
246	000354	016720	177432	MOV	R0,(R0)+
247	000360	105010		CLRB	(R0)
248					

249						}RAM MEMORY FLOATING 1'S AND 0'S DATA TEST.
250				TEST1:	CLR	R0 ;R0=CURRENT (RAM ADDRESS).
251	000362	005000		1S:	MOV	T02L,R1 ;R1=LIST LENGTH.
252	000370	012762	001030		MOV	#T02L+2,R2 ;R2=LIST DATA ADDRESS.
253	000374	012267	177506	2S:	MOV	(R2)+,ASB ;EXPECTED RESULTS TO ASB.
254	000376	010067	177506		MOV	R0,#ASADR ;SAVE RAM ADDRESS FOR TYPEOUT.
255	000404	012777	001400	3S:	MOV	#LOINIT+1STERR,#LPCSRA ;INIT LP20.
256	000412	010977	177622		MOV	R0,#LPCCTR ;LOAD (RAM) ADDRESS REGISTER.
257	000416	016777	177622		MOV	ASB,#LPRAND ;LOAD (RAM) WITH TEST PATTERN.
258	000424	005177	177610		COM	#LPCCTR ;DISTURB THE ADDRESS REGISTER.
259	000430	010977	177622		MOV	R0,#LPCCTR ;LOAD (RAM) ADDRESS REGISTER.
260	000434	010977	177622		MOV	#LPRAND,#AWAS ;ACTUAL RESULTS TO AWAS.
261	000452	026767	177440		CMP	ASB,#AWAS ;TEST RESULTS.
262	000452	017767	177546		BNE	4S ;OK!
263	000452	017767	177546		MOV	#LPCSRA,#ACSR
264	000452	017767	177546		MOV	#LPCSRA,#CSA
265	000466	104404	000000			*****
266						DATERS,BEGIN ;DATA ERROR!!!
267						*****
268	000472	005394		4S:	DEC	R1 ;END OF LIST YET?
269	000476	005200			BNE	ZS ;NO!
270	000500	020027	000377		INC	R0 ;UPDATE (RAM) ADDRESS.
271	000504	101727			CMP	R0,#RANTOP ;DONE YET?
272					BLOS	1S

```

286 ;RAM MEMORY BASIC ADDRESS TEST.
287 ;
288 ;
289 000506 005000 ;TEST2: CLR R0 ;R0=CURRENT (RAM) ADDRESS
290 ;
291 000510 012777 001400 177506 1S: MOV #LOINIT1STERR,@LPCSRA ;INIT LP20
292 ;
293 000516 010077 177516 MOV R0,@LPCCTR ;LOAD (RAM) ADDRESS.
294 000522 010077 177510 MOV R0,@LPRAMD ;LOAD (RAM) DATA REGISTER.
295 ;
296 000526 005200 INC R0 ;UPDATE (RAM) ADDRESS.
297 ;
298 000530 020027 000377 CMP BLOS R0,#RAMTOP ;ALL (RAMS) LOADED?
299 000534 101785 ;NOI
300 ;
301 ;EACH (RAM) IS LOADED WITH ITS ADDRESS NOW TEST IT.
302 ;UPPER (RAM) ADDRESS.
303 ;
304 000536 012701 000377 2S: MOV #RAMTOP,R1 ;R1=TOP OF RAM MEMORY.
305 000542 010167 177336 MOV R1,WASADR ;SAVE (RAM) ADDRESS FOR TYPEOUTS.
306 ;
307 000546 010177 177466 3S: MOV R1,@LPCCTR ;LOAD (RAM) ADDRESS
308 000552 017787 177460 177330 MOV @LPRAMD,AWAS ;ACTUAL RESULTS TO AWAS.
309 ;
310 000560 010187 177322 MOV R1,ASB ;EXPECTED RESULTS TO ASB.
311 000564 042787 010086 177316 BIC #PARITY,AWAS ;CLEAR PARITY BIT.
312 ;
313 000572 026787 177310 177310 CMP ASB,AWAS ;TEST RESULTS.
314 000600 001410 BEQ 4S ;NOI
315 ;
316 000602 017767 177416 177272 MOV @LPCSRA,ACSR
317 000610 016767 177410 177262 MOV LPCSRA,CSRA
318 ;*****
319 ;***** DATA ERROR !! *****
320 ;*****
321 ;*****
322 ;
323 000622 005301 4S: DEC R1 ;ADJUST (RAM) ADDRESS.
324 ;
325 000624 020127 000000 CMP R1,#RAMBOT ;ARE WE AT BOTTOM OF (RAMS)?
326 000630 101744 BLOS 2S ;NOI

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326 ;
327 ;
328 ;
329 ;
330 000632 012777 001400 177364 ;TEST3 PRINTS A LINE OF ALL LEGAL CHARACTERS FOLLOWED BY A LINE OF ALL ILLEGAL CHARACTER
331 ;
332 000632 012777 001400 177364 ;TEST3: MOV #LOINIT1STERR,@LPCSRA ;INIT LP20.
333 ;
334 000640 004767 000644 JSR PC,RAMSET
335 ;
336 000644 004767 001126 JSR PC,VFULOX ;LOAD VFU
337 ;
338 ;START PRINTING
339 ;
340 000650 012767 177753 000110 ;TEST3A: MOV #-21,,CYCCNT ;SET 21 LINES.
341 ;
342 000656 012705 177574 1S: MOV #-132,,R5 ;SET CHARACTER COUNTER TO 132(10).
343 000658 012705 000770 2S: MOV #BUFFER,R1 ;R1=TOP BUFFER ADDRESS.
344 000666 012702 000040 40,R2 ;SET FIRST CHARACTER.
345 ;
346 000672 110221 3S: MOVB R2,(R1)+ ;LOAD PRINT BUFFER.
347 ;
348 000674 005205 INC R5 ;INCREMENT CHARACTER COUNT.
349 000676 001415 BEQ 5S ;BRANCH IF LINE IS FINISHED.
350 ;
351 000700 005202 INC R2 ;NEXT CHARACTER.
352 ;
353 000702 132767 000002 177106 BITB #2,SRI ;CHECK CHARACTER SET.
354 000710 001404 BEQ 4S ;BRANCH IF 64 CHARACTER SET.
355 ;
356 000712 022702 000200 CMP #200,R2 ;LEGAL CHARACTER?
357 000716 001763 BEQ 4S ;MAKE SPACE IF NOT LEGAL.
358 000720 000764 BR 3S ;CONTINUE IF LEGAL.
359 ;
360 000722 022702 000140 4S: CMP #140,R2 ;LEGAL CHARACTER?
361 000726 001757 BEQ 4S ;MAKE SPACE IF NOT LEGAL.
362 000730 000760 BR 3S ;CONTINUE IF LEGAL.
363 ;
364 000732 112721 000012 5S: MOVB #12,(R1)+ ;ISSUE LINE FEED.
365 000736 105021 CLR B (R1) ;LOAD BUFFER TERMINATOR.
366 ;
367 000740 012702 000770 MOV #BUFFER,R2 ;PRINT THE BUFFER.
368 000744 004767 JSR PC,LPTRES
369 ;
370 000750 005267 000012 INC CYCCNT ;DONE ALL LINES?
371 000754 001340 BNE 1S ;NO!
372 ;
373 000756 104413 000000 EPASS: ENDDITS,BEGIN ;SIGNAL END OF ITERATION.
374 000762 000167 177644 JMP TEST3 ;MONITOR SHALL TEST END OF PASS
375 000766 000300 ;
376 000770 000214 ;
377 ;
378 ;
379 001420 000033 ;TEST LISTS
380 001424 010000 T02L: T02Z-T02L/2
381 001428 000001 10000

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424                                     ;THESE ROUTINES HANDLE PRINTING AND TEST PRINTING.
425                                     ;DATBUF CONTAINS THE ACTUAL DATA AND IS 400(8) OR 256(10) WDS
426                                     ;LONG. LOAD WITH CHRLD. CHRLD WILL PUT WHAT YOU TYPE INTO THE BUFFER.
427
428
429
430 001546- 000000      DATSIZ: 0                ;* # BYTES IN BUFFER
431 001545- 000000      DATBUF: 0
432 001545- 000000      TSTTYP: 0                ;TST TYPE TO BE RUN DURING TEST (RIGHT JUSTIF)
433 001545- 000000      SETDEL: 0                ;-1=SET UNDCR BEFORE SETTING GO,0=DON'T
434 001546- 000000      INTERX: 0                ;-1=SET INTERX=0=DON'T
435 001546- 000000      PAGES: 10                ;SET PAG CTR TO THIS BEFORE SETTING GO
436 001546- 000000      LPSUM: 0                ;CHRSUM READ FROM LPT
437 001544- 000000      GDSUM: 0                ;CHRSUM CALCULATED FROM GOOD DATA
438
439
440
441 001566- 012777      001400 176430  LPTPNT: ;THIS ROUTINE ACTUALLY PRINTS ON THE LPT
442 001577- 012777      002306 176426  MOV    #DATBUF,@LPCSRB ;INIT LP20.
443 001600- 012777      177740 176422  MOV    DATSIZ,@LPCSTR ;SET UP BUS ADR
444 001614- 002477      176416  MOV    @LPCSTR ;SET UP + NR BYTES
445 001627- 012777      177724 176412  NEG    @LPCSTR ;NEGATE THE COUNT
446 001630- 004767      000412 176376  MOV    PAGES,@LPPCTR ;SET UP PAGE COUNTER
447 001630- 004767      000412 176376  MOVB   TSTTYP,@LPCSRB ;SET UP TSTTYP
448 001634- 052777      000103 176362  JSR    PC,PKSR ;GO CHECK *SR* OPTIONS
449 001642- 104400      000000  BIS    #103,@LPCSRB ;NOW SET GO AND PAREN
450                                     EXITS,BEGIN ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
451
452
453 001646- 000004      000000- 001654-  LPRINT:
454                                     -----
455 001654- 032777      100000 176342 1$: PIRQS,BEGIN,1$ ; QUEUE UP TO CONTINUE AT 1$ AND RTI
456 001662- 001402      BEQ    #100000,@LPCSRB ;ERROR FLAG SET?
457                                     ;NO!
458                                     ;YES.
459
460 001664- 104410      000000- 2$: ENDS,BEGIN ;
461 001674- 032777      000200 176326  BIT    #200,@LPCSRB ;WAIT FOR A FLAG
462 001676- 001016      BNE    5$ ;DONE
463
464 001700- 017767      176320 176174  MOV    @LPCSRB,ACSR
465 001706- 016767      176312 176164  MOV    @LPCSRB,CSRA
466 001714- 017767      176306 176162  MOV    @LPCSRB,ASTAT
467
468
469
470 001722- 104405      000000- 000000  ;*****
471 001730- 104410      000000-  ;ORDERS,BEGIN,NULL ;
472                                     ;*****
473                                     ENDS,BEGIN ;
474
475
476 001734- 004767      000002 5$: JSR    PC,TSTFLG ;DECIDE WHAT TO DO
477 001740- 000207      RTS     PC
478
479
480
481                                     ;NOW FOLLOWS SUBR TO FIGURE OUT WHAT TO DO WHEN WE GET A
482                                     ;FLAG WHILE WAITING FOR DONE.
483
484 001742- 105777      176256  TSTFLG: TSTB @LPCSRB ;IS IT DONE?
485 001746- 106412      DNFLG:  DNFLG ;YES,RTN
486 001750- 032777      040000 176246  BIT    #40000,@LPCSRB ;IS IT PAGE ZERO?
  
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480 001756- 001403      BEQ    SPFLG ;NO
481 001760- 016777      MOV    PAGES,@LPPCTR ;YES,RESET # PAGES
482 001766- 032777      MOV    #100,@LPCSRB ;SET GO AGAIN
483 001774- 006207      DNFLG:  RTS     PC ;CONTINUE
  
```

```
484 ;HERE IS THE ROUTINE TO LOAD THE VFU, SET UP THE BUFFER
485 ;AT "VFUDAT" TO THE DESIRED DATA AND "VFUSIZ" TO THE
486 ;DESIRED SIZE AND RUN VFUOX.
487
488 001776 032777 004000 176222 VFUOX: BIT #OPTOUF,@LPCSRB ;OPTICAL VFU?
489 002004 001077 3S ;YES!
490
491 002006 012777 001400 176210 MOV #LOINTT1RSTERR,@LPCSRB ;INIT LP20.
492 002014 012700 002740 176210 MOV #VFUDAT,R0 ;CALCULATE END OF BUFFER
493 002020 016700 000184 176210 ADD #357,R0 ;POINTS TO NEXT BYTE
494 002030 012777 000000 176172 MOV #VFUDAT-1,@LPSAD ;STOP VFU LOAD CODE
495 002030 012777 002737 176172 MOV #VFUDAT-1,@LPSAD ;SET UP BUS ADDR
496 002036 016777 000144 176166 MOV #VFUSIZ,@LPCTR ;SET UP + NR BYTES
497 002044 016777 000004 176160 ADD #2,@LPCTR ;EXTRA BYTES ON VFU LOAD
498 002052 016777 176154 NEG @LPCTR ;NEGATE THE COUNT
499 002056 116777 177470 176142 MOVB #TSTYP,@LPCSRB ;SET UP TSTYP
500 002064 112777 000010 176132 MOVB #10,@LPCSRB ;SET UP FOR VFU LOAD MODE
501 002072 052777 000003 176124 BIS #3,@LPCSRB ;NOW SET GO AND PARENB
502
503 002100 032777 100000 176116 1S: BIT #100000,@LPCSRB ;ERROR FLAG SET?
504 002106 001402 5S BEQ ;NO!
505
506 002110 104410 000000 176102 ENDS,BEGIN ;
507
508 002114 032777 060200 176102 5S: BIT #60200,@LPCSRB ;WAIT FOR A FLAG
509 002120 011769 177612 JSR #2,TSTFLG ;PAGEZERO,UNDCRR,DONE
510 002130 105777 176070 TSTB @LPCSRB ;DECIDE WHAT TO DO
511 002134 100304 176100 RPL #1 ;TEST FOR DONE
512 002144 017767 176100 177416 MOVB @LPTDAT,LPSUM ;NOT DONE YET
513 002150 012701 002740 CLR GDSUM ;SAVE THE LPTCHKSUM
514 002154 066701 000026 176100 ADD #VFUDAT,R1 ;NOW CALCULATE GOOD SUM
515 002164 112700 002737 176100 MOVB #VFUDAT-1,R0 ;CALCULATE ADR OF LAST BYTE
516 002166 060267 177372 2S: ADD #R2,GDSUM ;FIRST BYTE IS START CODE
517 002172 020001 2S: CMP R0,R1
518 002176 011767 177400 BNE #77400,GDSUM ;LOOP BACK FOR REST OF BUFR
519 002204 000207 3S: RTS
520
521 002206 000204 VFUSIZ: 204 ;#BYTES OF DATA FOR DAVFU
522 002210 005087 LPTNBS: 000070 ;CLEAR TALLY.
523 002214 012705 002306 MOV #DATBUF,R5
524
525 002220 112225 1S: MOVB (R2)+(R5)+ ;LOAD PRINTER BUFFER.
526 002222 005267 000056 INC TALLY ;UPDATE TALLY.
527
528 002226 105712 TSTB (R2) ;END OF MESSAGE?
529 002230 001373 BNE #1 ;NO!
530
531 002232 016767 000046 177306 MOV TALLY,DATSIZ ;YES!
532 002244 000207 177322 JSR #PC,LPTPNT ;SET MESSAGE SIZE.
533 RTS
534
535
536
537
538
```

```
539 ;THIS ROUTINE IS CALLED TO TEST THE SOFTWARE REGISTER IN THE MODULE
540 ;INTERFACE TO DECIDE HOW TO HANDLE PRINTING. THE LOCATION TESTED IS
541 ;"SR1+1:" AND IS TESTED FOR THE FOLLOWING CODES:
542
543 ;SR1+1 = 0 PRINT ON THE FIRST PASS ONLY
544 ;SR1+1 = 1 NEVER PRINT - TEST MODE ONLY
545 ;SR1+1 = 2 PRINT CONTINUOUSLY
546
547 ;IF "SR1+1:" CONTAINS ANY OTHER CODE THE PROGRAM DEFAULTS TO
548 ;A CODE OF "000".
549
550 002246 122767 000002 175543 CKSR: CMPB #2,SR1+1 ;PRINT CONTINUOUSLY ??
551 002254 001412 BEQ #25 ;BR IF YES
552
553 002256 122767 000001 175533 CMPB #1,SR1+1 ;NEVER PRINT ??
554 002264 001403 BEQ #15 ;BR IF YES
555
556 002266 005767 175542 TST PASCNT ;INITIAL PASS ??
557 002272 001403 BEQ #25 ;BR IF YES
558
559 002274 052777 000004 175722 1S: BIS #TSTMOD,@LPCSRB ;SET TEST MODE - INHIBIT PRINT
560 002302 000207 2S: RTS ;RETURN TO CALLER
561
562 002304 000000 TALLY: 0
563
```

```

LFPB0.P11 12-OCT-78 11:59
002306 000214
002736 000 356
002740 077 077 020
002749 077 077 002
002750 077 077 002
002751 077 077 002
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003143 077 077 002
000001
VFUDAT: .BLKW 140. ;512 DATA BYTES
.BYTE 0,356 ;START DAVFU LOAD CMD
.BYTE 77, 77, 20, 02, 24, 02, 30, 02
.BYTE 24, 02, 20, 06, 34, 02, 20, 02
.BYTE 24, 02, 30, 02, 64, 06, 20, 02
.BYTE 34, 02, 20, 02, 24, 02, 30, 16
.BYTE 24, 02, 20, 02, 34, 02, 20, 02
.BYTE 64, 07, 30, 02, 24, 02, 20, 02
.BYTE 34, 02, 20, 26, 24, 02, 30, 02
.BYTE 24, 02, 20, 02, 76, 16, 20, 02
.BYTE 24, 02, 30, 02, 24, 02, 20, 06
.BYTE 34, 02, 20, 02, 24, 02, 30, 02
.BYTE 64, 47, 20, 02, 34, 02, 20, 02
.BYTE 24, 02, 30, 16, 24, 02, 20, 02
.BYTE 34, 02, 20, 02, 64, 26, 30, 02
.BYTE 24, 02, 20, 02, 34, 02, 20, 06
.BYTE 24, 02, 30, 02, 24, 02, 20, 02
.BYTE 20, 00, 20, 00, 20, 00, 20, 00
.BYTE 20, 00, 20, 00, 00, 00, 00, 00

```

```

LFPB0.P11 12-OCT-78 11:59
CROSS REFERENCE TABLE -- USER SYMROLS
ACSR 000102R 171# 273* 316* 461*
ADDR 000006R 137# 227
ASR 000106R 149#
ASTAT 000104R 173# 263 263 270 310* 313
AMAS 000110R 176# 257* 270 308* 311* 313
BRTN = 000000R 144# 268*
BIT0 = 000000R 144# 276 319 371 448 452 457 466 468 506
BIT1 = 000002R 149#
BIT2 = 002000R 149#
BIT3 = 000000R 149#
BIT4 = 000000R 149#
BIT5 = 000000R 149#
BIT6 = 000000R 149#
BIT7 = 000000R 149#
BIT8 = 000000R 149#
BIT9 = 000000R 149#
BREAKS = 000000R 149#
BR1 000012R 139# 246
BR2 000013R 140#
BUDS = 000000R 149#
BUFFER = 000770R 341#
BUS16 = 000020R 217# 365 375#
BUS17 = 000040R 216#
CDATS = 000040R 149#
CGR 002246R 446#
CONFIG 000056R 159#
CRA 000100R 169# 274* 317* 462*
CFCR 001250R 338# 274* 317* 462*
DATBFF = 001250R 338# 368* 374#
DATBUF = 002306R 441# 527 564#
DATCK = 104411R 189#
DATCR2 = 104404R 189# 276 319
DELHLD = 002000R 371# 442 536*
DNFLG = 001774R 478# 483#
DOME = 000200R 214#
DVID1 = 000044R 149#
ENDITS = 104413R 149# 371
ENDS = 104410R 189# 457 468 506
ERRTYP = 000000R 370#
EXITS = 104400R 189#
GDSUM = 001564R 436# 514* 519* 522*
GETPAC = 104415R 189#
GD = 000001R 120#
GWBUF = 104414R 189#
HRDCK = 104405R 154# 466

```



LPFB DEC/X11 SYSTEM EXERCISER MODULE MACY11 30A(1052) 12-OCT-78 16:52 PAGE 22  
XLPPB0.P11 12-OCT-78 11:59 CROSS REFERENCE TABLE -- USER SYMBOLS

. = 003146R 375# 564#

SEQ 0020

. ABS. 000000 000  
003146 001

ERRORS DETECTED: 0  
DEFAULT GLOBALS GENERATED: 0

XLPPB0,XLPPB0/SOL/CRF:SYN=DDXCOM,XLPPB0  
RUN-TIME: 1 1 .3 SECONDS  
RUN-TIME RATIO: 17/3=4.6  
CORE USED: 7K (13 PAGES)