

SYSTEMS ENGINEERING LABORATORIES PROGRAM LIBRARY

SOFTWARE DESCRIPTION

CATALOG NO. 303002B

DOCUMENTATION REV\*           

DATE June 15, 1970

PROGRAM TITLE                   810A/B Instruction Simulation and Comparison  
                                  (IS&C)

PURPOSE:                         Executes mainframe instructions and simulates  
                                  them if possible by software. The results are  
                                  compared and an error condition occurs on an  
                                  error. Some instructions cannot be simulated  
                                  easily so they are executed and the results com-  
                                  pared to a constant.

CONFIGURATION:                 Basic SYSTEMS 810A/B Computer

SOFTWARE ENVIRONMENT:         Stand-Alone

PROGRAM LANGUAGE:             SYSTEMS 810A/B Assembly Language

SIZE: 2000<sub>8</sub> - 4163<sub>8</sub>           TIMING: Approx 20 Seconds/Cycle

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### REASON FOR CHANGE:

Changes were made to allow this program to run with the Keytran System and output all messages to the selectric typewriter by setting Sense Switch 13.

### USE:

Start at location 2000g, the program will run until manually halted.

When running under the Keytran System, the Diagnostic Number for this program is four (4). The program will automatically be started at location 2000g and will run continuously until the Index Key is depressed on the selectric typewriter at which time control will be returned to the Keytran Diagnostic Loader.

If an error occurs, consult the routine description to find what instruction failed.

### Sense Switch Settings:

SSW 0 up - A successful cycle type-out will occur approximately every 25 seconds only if there have been no errors during that cycle.

SSW 1 up - Errors will be ignored.

SSW 2 up - No error type-out will occur, the machine will halt and the A-Accumulator may be displayed for the error location.

SSW 3 up - A halt will occur after the error type-out.

SSW 13 up - Indicates program is being run with the Keytran System and that all output will be via the selectric typewriter.

### Type-Out Formats

Successful Cycles - NNNN

NNNN = Decimal number of cycles in which no errors occurred.

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Machine error preceeding location XXXXX  
XXXXX = Octal location from which a SPB occurred after an error condition found by the program.

### METHOD:

#### Clear A-Accumulator (CLAT)

The A-Accumulator is loaded with the counter and cleared. A is then checked for zero. The counter is then incremented.

The test is repeated for every case. An error at location 2053<sub>8</sub> indicates a CLA error.

#### Skip if A-Accumulator is Zero (SAZT)

The B-Accumulator is incremented and transferred to A. A is checked for zero by the SAZ and then A is checked for zero by the CMA. An error will occur at location 2071<sub>8</sub> if a skip occurs when A is not zero and at location 2074<sub>8</sub> if there is not a skip when A is zero. An error can also occur at 2100<sub>8</sub> if a skip does not occur when A is zero, and if a skip occurs but A is not zero there will be an error indication at 2102<sub>8</sub> or 2104<sub>8</sub>.

#### Skip if A-Accumulator is Positive (SAPT)

B is incremented in the same manner as the zero test. An error at location 2114<sub>8</sub> means a skip should have occurred. An error at location 2125<sub>8</sub> indicates a skip occurred when A was not positive. A counter is used to test every case.

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### Skip A-Accumulator is Negative (SANT)

Operates in the same manner as the A positive Test. An error at location 2140<sub>g</sub> indicates an illegal skip and an error at 2150<sub>g</sub> indicates no skip occurred.

### Skip on A-Accumulator Sign (SAST)

Runs similar to the previous tests except that there are three possibilities instead of two. An error at 2164<sub>g</sub> or 2166<sub>g</sub> indicates A was zero and the SAS did not detect this condition. An error at 2173<sub>g</sub> will occur when the SAS did not detect a positive sign. If a negative sign is not sensed, an error will occur at 2200<sub>g</sub>.

### Compare Memory to A-Accumulator (CMAT)

The A-Accumulator is loaded with the counter, a CMA to zero is executed and according to the skip after the CMA, the A-Accumulator is tested for more, less, or equal to zero.

An illegal skip to n+1 will cause an error at location 2214<sub>g</sub>. An illegal skip to n+2 will cause an error at location 2217<sub>g</sub>. An illegal skip to n+3 will cause an error at location 2226<sub>g</sub>.

### Load and Store Instructions (LASA, LBSB)

The Accumulator is loaded with the counter and then stored in the location tagged STOP. A comparison between the stored data and the accumulator is then executed. The data is then compared with the counter. Errors at 2237<sub>g</sub> or 2241<sub>g</sub> indicate a bad STA, errors at 2243<sub>g</sub> or 2245<sub>g</sub> indicate a bad LAA. If an error occurs at location 2257<sub>g</sub> or 2261<sub>g</sub> the STB instruction failed, errors at 2264<sub>g</sub> or 2266<sub>g</sub> indicate LBA failed.

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### Transfer and Interchange A & B (TATB)

A is loaded with the counter and transferred to B, B is then stored and compared to A. An error at 2301<sub>g</sub> or 2303<sub>g</sub> indicates this phase failed.

B is loaded with the counter and is then transferred to A. A is compared to the counter and an error will occur at location 2310<sub>g</sub> or 2312<sub>g</sub> if TBA fails.

IAB is tested by loaded A with the counter and B with minus one. After an IAB, A is compared to minus one, B is stored and A is loaded with STOR. A comparison then takes place. Errors at location 2317<sub>g</sub> or 2321<sub>g</sub> indicate a bad LAA. If an error occurs at location 2257<sub>g</sub> the STB instruction failed, errors at 2264<sub>g</sub> or 2266<sub>g</sub> indicate LBA failed.

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IAB is tested by loading A with the counter and B with minus one. After an IAB, A is compared to minus one, B is stored and A is loaded with STOR. A comparison then takes place. Errors at location 2317<sub>g</sub> or 2321<sub>g</sub> indicate A did not contain a minus one. If B did not contain the proper information errors will occur at 2325<sub>g</sub> or 2327<sub>g</sub>.

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Negate A-Accumulator (NEGT)

The counter is subtracted from zero in A and stored. A is then loaded with the counter and negated. The results are compared and an error will occur at location 2343<sub>8</sub> or 2345<sub>8</sub> if they are not equal.

Shift Instructions (BEG1)

The RSA is tested extensively by loading A with a constant and shifting zero positions the first time. A comparison through an indirect address (DAT1, location 2412<sub>8</sub>), checks the proper constant. The shift is incremented along with the indirect address. After all tests are completed, the shift and indirect address are returned to their original quantities. An error at 2355<sub>8</sub> or 2357<sub>8</sub> indicate an RSA error.

The rest of the shift instructions (SHTE) are tested two to six times, each shifting one position at a time. The results are compared to the proper constants.

Errors will occur at the following locations:

2421 <sub>8</sub>	}	LSA	2520 <sub>8</sub>	}	RSL	2472 <sub>8</sub>	}	RSA
2423 <sub>8</sub>			2522 <sub>8</sub>			2474 <sub>8</sub>		
2426 <sub>8</sub>			2525 <sub>8</sub>			2477 <sub>8</sub>		
2430 <sub>8</sub>			2527 <sub>8</sub>			2501 <sub>8</sub>		
2434 <sub>8</sub>			2455 <sub>8</sub>	2505 <sub>8</sub>				
2436 <sub>8</sub>			2460 <sub>8</sub>	2507 <sub>8</sub>				
2441 <sub>8</sub>			2463 <sub>8</sub>	2512 <sub>8</sub>				
2443 <sub>8</sub>			2466 <sub>8</sub>	2514 <sub>8</sub>				
2447 <sub>8</sub>								
2451 <sub>8</sub>								

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2534 <sub>8</sub>	2720 <sub>8</sub>	2642 <sub>8</sub>
2536 <sub>8</sub>	2722 <sub>8</sub>	2644 <sub>8</sub>
2541 <sub>8</sub>	2725 <sub>8</sub>	2647 <sub>8</sub>
2543 <sub>8</sub>	2727 <sub>8</sub>	2651 <sub>8</sub>
2547 <sub>8</sub>	2733 <sub>8</sub>	2655 <sub>8</sub>
2551 <sub>8</sub>	2735 <sub>8</sub>	2657 <sub>8</sub>
2554 <sub>8</sub>	2740 <sub>8</sub>	2662 <sub>8</sub>
2556 <sub>8</sub>	2742 <sub>8</sub>	2664 <sub>8</sub>
2563 <sub>8</sub>		2671 <sub>8</sub>
2565 <sub>8</sub>	2607 <sub>8</sub>	2673 <sub>8</sub>
2570 <sub>8</sub>	2611 <sub>8</sub>	2676 <sub>8</sub>
2572 <sub>8</sub>	2614 <sub>8</sub>	2700 <sub>8</sub>
2600 <sub>8</sub>	2616 <sub>8</sub>	2704 <sub>8</sub>
2602 <sub>8</sub>	2623 <sub>8</sub>	2706 <sub>8</sub>
	2630 <sub>8</sub>	2711 <sub>8</sub>
	2635 <sub>8</sub>	2713 <sub>8</sub>

FLA

FRL

FRA

FLL

Add (ADD1, ADD3)

ADD1 - A is cleared, one is added to A and the counter is incremented, the results are compared and an error will occur at location 3006<sub>8</sub> or 3011<sub>8</sub> if there is a failure. This test is repeated in the B-Accumulator. A failure in B is indicated by an error at location 3023<sub>8</sub> or 3025<sub>8</sub>.

ADD3 - The next test adds the counter to itself in A and B, the registers are then loaded with the counter and shifted left one position. The sums are compared and errors will occur at location 3040<sub>8</sub> or 3042<sub>8</sub> for an error in A and 3057<sub>8</sub> or 3061<sub>8</sub> for an error in B.

Subtract (SUB1, SUB2, SUB3)

SUB1 - A is loaded with the counter, it is then subtracted, the A-Accumulator is then checked for zero, a typeout at location 3072<sub>8</sub> indicates an error.

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SUB2 - Zero is subtracted from the counter, A is then compared to the counter, if there is an error, a typeout will occur at location 3102g or 3104g.

SUB3 - The counter is multiplied by two, it is then subtracted. A should then be equal to the counter, a halt at location 3115g or 3117g indicates A is not equal to the counter.

### And A & B Or A & B (ANOR)

Constants are and'ed and or'ed, the results are compared to constants. Error indications at locations 3144g, 3146g, 3162g, 3164g, and 3200g or 3202g are errors in the ABA instruction. Error indications at locations 3134g, 3136g, 3152g, 3154g, 3170g, 3172g, and 3206g or 3208g are errors in the OBA instruction. All worst cases are tested.

### Increment B and Skip (IBST)

B is loaded with minus one and incremented, the counter is operated in the same fashion. The B-Accumulator and the counter are compared. If no skip occurs while B is positive, an error will occur at location 3244g. If B skips when it is negative, an error will occur at location 3257g. An unequal comparison between B and the counter will cause an error at location 3247g or 3251g when B is positive and at location 3262g or 3264g when B is negative.

### Copy Sign of B - (CSBN, CSBP)

The CSB instruction is tested with the B sign bit on and off. With the bit on a CSB, NEG gets the bit into A, the counter is then negated and one is subtracted from it. The two answers are then compared. Error indications on this test are at locations 3303g and 3305g.



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With the B sign bit off a CSB, NEG is used again but the counter is only negated. After the comparison the error indications are at locations 3320<sub>g</sub> and 3322<sub>g</sub>.

### Complement Sign of A (ASCT)

The counter is loaded in A, the sign is changed by adding a minus sign. The counter's sign is then complemented. The two results are compared and if they are not equal, an error will occur at location 3336<sub>g</sub> or 3340<sub>g</sub>.

### Change Number Systems (CNST)

If the counter is negative, the data is checked, if the data is zero, nothing is done. All other cases the counter is changed by a CNS and a ASC, the counter is then negated. The results are compared and if they are not equal, an error will occur at location 3362<sub>g</sub> or 3364<sub>g</sub>.

The remaining part of memory contains the cycle counter, error routine, and typeout routines.